# FCC Part 15C Test Report
# FCC ID: 2ADDH-43241

| | |
|---|---|
| Applicant: | Monoprice Inc. |
| Address: | 1 Pointe Drive Suite 400, Brea CA 92821 USA |
| Manufacturer: | Monoprice Inc. |
| Address: | 1 Pointe Drive Suite 400, Brea CA 92821 USA |
| EUT: | Powered Desktop Speakers |
| Trade Mark: | MONOLITH |
| Model Number: | 43241 |
| Date of Receipt: | Apr. 22, 2022 |
| Test Date: | Apr. 23, 2022 - May. 17, 2022 |
| Date of Report: | May. 18, 2022 |
| Prepared By: | Shenzhen DL Testing Technology Co., Ltd. |
| Address: | 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China |
| Applicable Standards: | FCC PART 15 C 15.247<br>ANSI C63.10:2013 |
| Test Result: | Pass |
| Report Number: | DL-20220509028E |

| | |
|---|---|
| Prepared (Test Engineer): | Pxing Huang |
| Reviewer (Supervisor): | Jack Bu |
| Approved (Manager): | Jade Yang |

*This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.*

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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| FCC Part15 (15.247) , Subpart C | | | |
|---|---|---|---|
| Standard Section | Test Item | Judgment | Remark |
| 15.207 | Conducted Emission | PASS | |
| 15.209(a) | Radiated Spurious Emission | PASS | |
| 15.205 | Restricted Band Edge | PASS | |
| 15.247(b)(1) | Peak Output Power | 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 | |
| 15.247(a)(1) | Hopping Channel Separation | PASS | |
| 15.247 (d) | Conducted Unwanted Emissions and Bandedge | PASS | |
| 15.203 | Antenna Requirement | PASS | |

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

## 1.1 TEST FACILITY

Shenzhen DL Testing Technology Co., Ltd.
Add. : 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China

FCC Test Firm Registration Number: 854456
Designation Number: CN1307
IC Registered No.:CN0118

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **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 | Conducted Emission Test | ±2.56dB |
| 2 | RF power,conducted | ±0.42dB |
| 3 | Spurious emissions,conducted | ±2.76dB |
| 4 | All emissions,radiated(<1G) | ±3.65dB |
| 5 | All emissions,radiated(>1G) | ±4.89dB |
| 6 | Temperature | ±0.5°C |
| 7 | Humidity | ±2% |

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| Product Name: | Powered Desktop Speakers |
| Model No.: | 43241 |
| Sample ID: | DL-20220509028E-1# |
| Serial No.: | N/A |
| Model Difference | N/A |
| Operation Frequency: | 2402~2480MHz |
| Channel numbers: | 79 Channels |
| Channel separation: | 1/2/3M |
| Modulation technology: | GFSK, π/4-DQPSK, 8DPSK |
| Antenna Type: | Chip Antenna |
| Antenna gain: | 5.19dBi |
| Power supply: | 100-240V~ , 50/60Hz |
| Power: | 150W |

Note:

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

2.The EUT's all information provided by client.

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 |
| ~ | ~ | ~ | ~ | ~ | ~ |
| 08 | 2410 | 35 | 2437 | 62 | 2464 |
| 09 | 2411 | 36 | 2438 | 63 | 2465 |
| 10 | 2412 | 37 | 2439 | 64 | 2466 |
| 11 | 2413 | 38 | 2441 | 65 | 2467 |
| 12 | 2414 | 39 | 2441 | 66 | 2468 |
| 13 | 2415 | 40 | 2442 | 67 | 2469 |
| ~ | ~ | ~ | ~ | ~ | ~ |
| 14 | 2416 | 41 | 2443 | 68 | 2470 |
| 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 | | |

## 2.2 DESCRIPTION OF TEST MODES

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

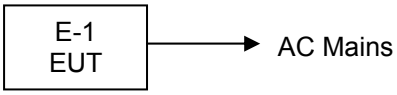
| Pretest Mode | Description | |
|---|---|---|
| Mode 1 | CH00 | GFSK, π /4 DQPSK, 8DPSK |
| Mode 2 | CH39 | |
| Mode 3 | CH78 | |
| Mode 4 | Link Mode | |
| **For Conducted & Radiated Emission** | | |
| Final Test Mode | Description | |
| Mode 1 | CH00 | GFSK, π /4 DQPSK, 8DPSK |
| Mode 2 | CH39 | |
| Mode 3 | CH78 | |
| Mode 4 | Link Mode | |

Note:

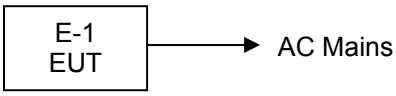
(1) The measurements are performed at the highest, middle, lowest available channels.

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test




Conducted Spurious Emission Test




## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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.

| Item | Equipment | Model/Type No. | Series No. | Note |
|---|---|---|---|---|
| E-1 | Powered Desktop Speakers | 43241 | N/A | EUT |
| AE | Notebook | B40-80 | MP07F6JD | AE |
| | | | | |

| Item | Shielded Type | Ferrite Core | Length | Note |
|---|---|---|---|---|
| | | | | |

Note:

(1) For detachable type I/O cable should be specified the length in cm in『Length』column.

## 2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

| Test software Version | Test program: Test program: BT-Tool-V1.0.9 | | |
|---|---|---|---|
| Frequency | 2402 MHz | 2441 MHz | 2480 MHz |
| Power Setting of Softwave | 7 | 7 | 7 |

## 2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 6db bandwidth test equipment

| Item | Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|---|---|---|---|---|---|---|
| 1 | Spectrum Analyzer (9kHz-26.5GHz) | Agilent | E4408B | MY50140780 | Nov. 06, 2021 | Nov. 05, 2022 |
| 2 | Test Receiver (9kHz-7GHz) | R&S | ESRP7 | 101393 | Nov. 06, 2021 | Nov. 05, 2022 |
| 3 | Bilog Antenna (30MHz-1GHz) | R&S | VULB9162 | 00306 | Nov. 06, 2021 | Nov. 05, 2022 |
| 4 | Horn Antenna (1GHz-18GHz) | Schwarzbeck | BBHA9120D | 02139 | Nov. 06, 2021 | Nov. 05, 2022 |
| 5 | Horn Antenna (18GHz-40GHz) | A.H. Systems | SAS-574 | 588 | Nov. 06, 2021 | Nov. 05, 2022 |
| 6 | Amplifier (9KHz-6GHz) | Schwarzbeck | BBV9743B | 00153 | Nov. 06, 2021 | Nov. 05, 2022 |
| 7 | Amplifier (1GHz-18GHz) | EMEC | EM01G8GA | 00270 | Nov. 06, 2021 | Nov. 05, 2022 |
| 8 | Amplifier (18GHz-40GHz) | Quanjuda | DLE-161 | 97 | Nov. 06, 2021 | Nov. 05, 2022 |
| 9 | Loop Antenna (9KHz-30MHz) | Schwarzbeck | FMZB1519B | 00014 | Nov. 06, 2021 | Nov. 05, 2022 |
| 10 | RF cables1 (9kHz-1GHz) | ChengYu | 966 | 004 | Nov. 06, 2021 | Nov. 05, 2022 |
| 11 | RF cables2 (1GHz-40GHz) | ChengYu | 966 | 003 | Nov. 06, 2021 | Nov. 05, 2022 |
| 12 | Antenna connector | Florida RF Labs | N/A | RF 01# | Nov. 06, 2021 | Nov. 05, 2022 |
| 13 | Power probe | KEYSIGHT | U2021XA | MY55210018 | Nov. 06, 2021 | Nov. 05, 2022 |
| 14 | Signal Analyzer 9kHz-26.5GHz | Agilent | N9020A | MY55370280 | Nov. 06, 2021 | Nov. 05, 2022 |
| 15 | Test Receiver 20kHz-40GHz | R&S | ESU 40 | 100376 | Nov. 06, 2021 | Nov. 05, 2022 |
| 16 | D.C. Power Supply | LongWei | PS-305D | 010964729 | Nov. 06, 2021 | Nov. 05, 2022 |

Conduction Test equipment

| Item | Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|---|---|---|---|---|---|---|
| 1 | 843 Shielded Room | ChengYu | 843 Room | 843 | Nov. 25, 2019 | Nov. 24, 2022 |
| 2 | EMI Receiver | R&S | ESR | 101421 | Nov. 06, 2021 | Nov. 05, 2022 |
| 3 | LISN | R&S | ENV216 | 102417 | Nov. 06, 2021 | Nov. 05, 2022 |
| 4 | 843 Cable 1# | ChengYu | CE Cable | 001 | Nov. 06, 2021 | Nov. 05, 2022 |

Other

| Item | Name | Manufacturer | Model | Software version |
|---|---|---|---|---|
| 1 | EMC Conduction Test System | FALA | EZ_EMC | EMC-CON 3A1.1 |
| 2 | EMC radiation test system | FALA | EZ_EMC | FA-03A2 |
| 3 | RF test system | MAIWEI | MTS8310 | 2.0.0.0 |
| 4 | RF communication test system | MAIWEI | MTS8200 | 2.0.0.0 |

# 3. EMC EMISSION TEST

## 3.1 CONDUCTED EMISSION MEASUREMENT

### 3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

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

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

a. The EUT was placed 0.1 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. 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.

c. 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.

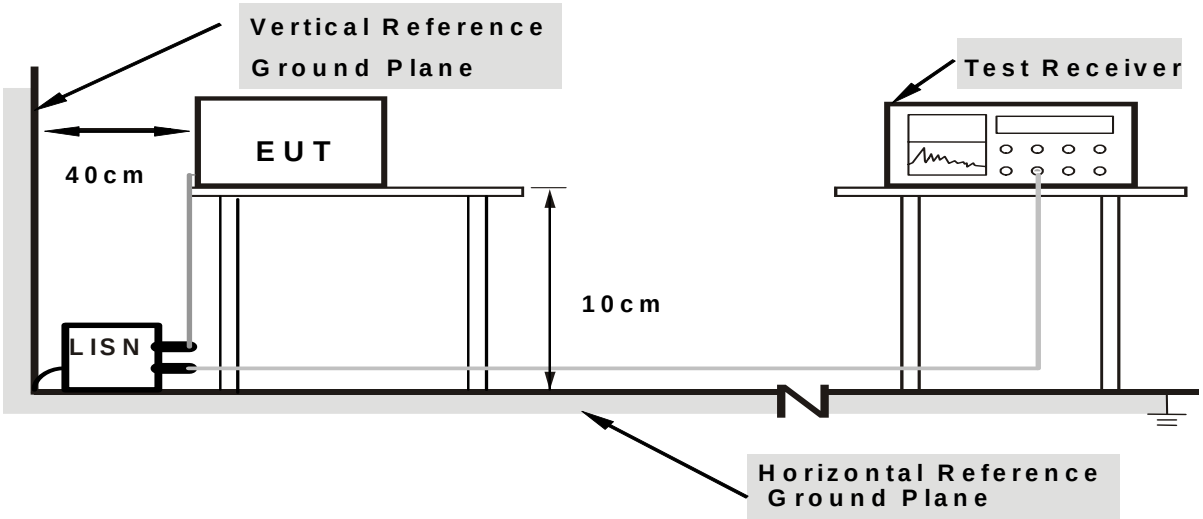
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 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 from other units and other metal planes

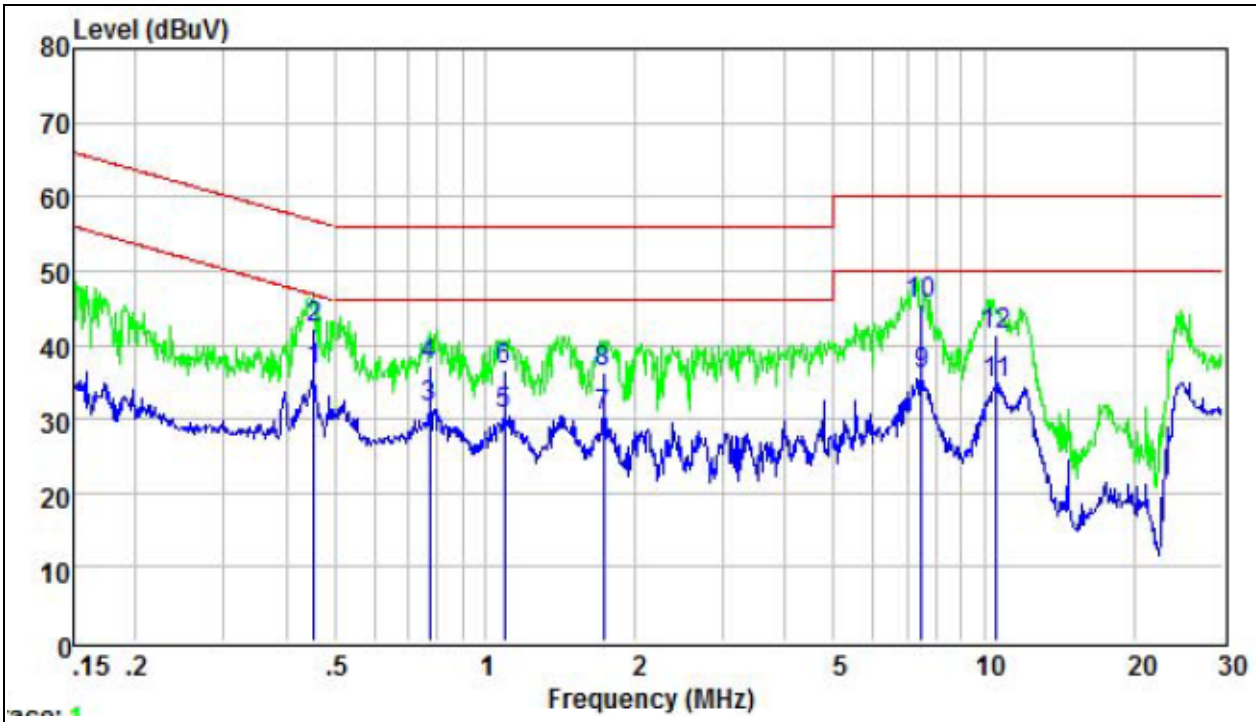
### 3.1.5 EUT OPERATING CONDITIONS

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.

### 3.1.6 TEST RESULTS

We pretest AC 120V and AC 230V, the worst voltage was AC 120V and the data recording in the report.

| | | | |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 54% |
| Pressure: | 1010hPa | Phase : | L |
| Test Voltage : | AC 120V/60Hz | Test Mode: | Mode 4 |

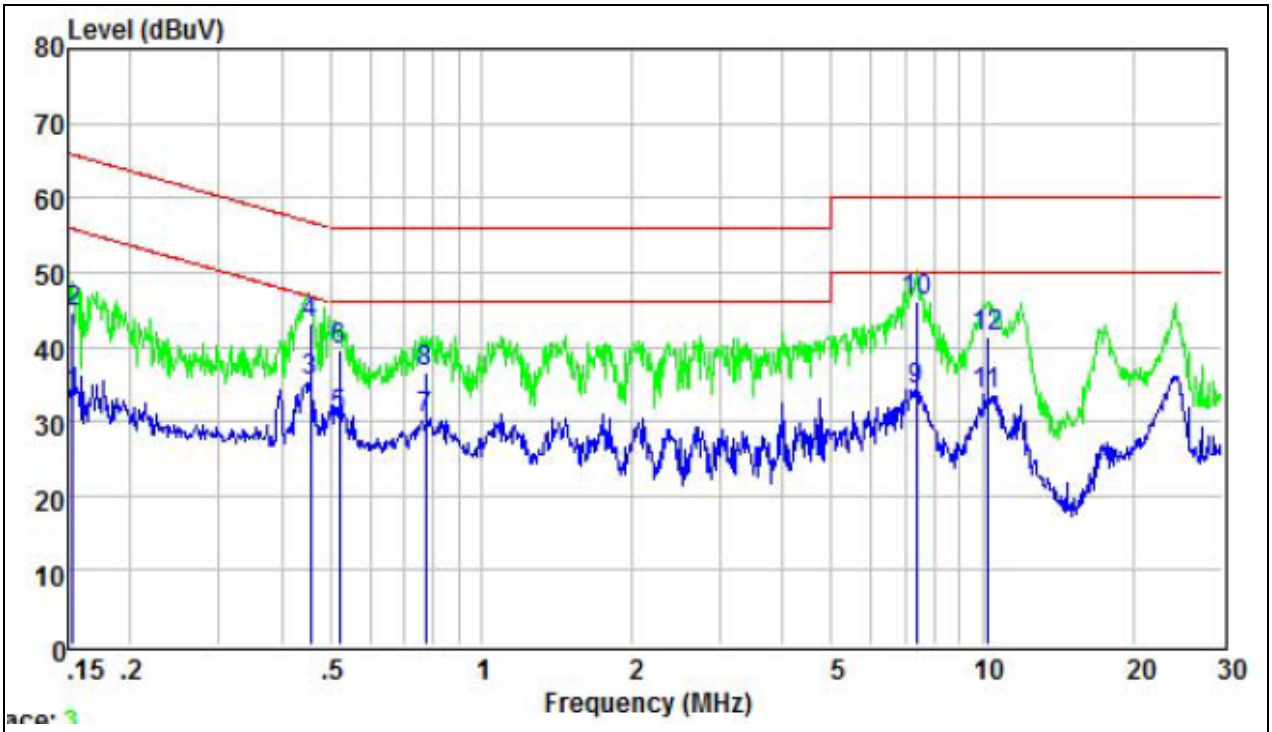



Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

| | Freq | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.45 | 27.00 | 9.49 | 0.01 | 36.50 | 46.80 | -10.30 | Average |
| 2 | 0.45 | 32.70 | 9.49 | 0.01 | 42.20 | 56.80 | -14.60 | QP |
| 3 | 0.78 | 22.13 | 9.50 | 0.01 | 31.64 | 46.00 | -14.36 | Average |
| 4 | 0.78 | 27.69 | 9.50 | 0.01 | 37.20 | 56.00 | -18.80 | QP |
| 5 | 1.09 | 21.16 | 9.51 | 0.01 | 30.68 | 46.00 | -15.32 | Average |
| 6 | 1.09 | 27.04 | 9.51 | 0.01 | 36.56 | 56.00 | -19.44 | QP |
| 7 | 1.73 | 20.83 | 9.53 | 0.01 | 30.37 | 46.00 | -15.63 | Average |
| 8 | 1.73 | 26.71 | 9.53 | 0.01 | 36.25 | 56.00 | -19.75 | QP |
| 9 | 7.49 | 26.27 | 9.68 | 0.01 | 35.96 | 50.00 | -14.04 | Average |
| 10 | 7.49 | 35.81 | 9.68 | 0.01 | 45.50 | 60.00 | -14.50 | QP |
| 11 | 10.56 | 25.07 | 9.78 | 0.01 | 34.86 | 50.00 | -15.14 | Average |
| 12 | 10.56 | 31.44 | 9.78 | 0.01 | 41.23 | 60.00 | -18.77 | QP |

| | | | |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 54% |
| Pressure: | 1010hPa | Phase : | N |
| Test Voltage : | AC 120V/60Hz | Test Mode: | Mode 4 |




Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

| | Freq | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.15 | 24.29 | 9.36 | 0.01 | 33.66 | 55.82 | -22.16 | Average |
| 2 | 0.15 | 35.23 | 9.36 | 0.01 | 44.60 | 65.82 | -21.22 | QP |
| 3 | 0.46 | 25.86 | 9.41 | 0.01 | 35.28 | 46.76 | -11.48 | Average |
| 4 | 0.46 | 33.78 | 9.41 | 0.01 | 43.20 | 56.76 | -13.56 | QP |
| 5 | 0.52 | 21.33 | 9.41 | 0.01 | 30.75 | 46.00 | -15.25 | Average |
| 6 | 0.52 | 30.21 | 9.41 | 0.01 | 39.63 | 56.00 | -16.37 | QP |
| 7 | 0.78 | 20.90 | 9.43 | 0.01 | 30.34 | 46.00 | -15.66 | Average |
| 8 | 0.78 | 27.12 | 9.43 | 0.01 | 36.56 | 56.00 | -19.44 | QP |
| 9 | 7.37 | 24.68 | 9.61 | 0.01 | 34.30 | 50.00 | -15.70 | Average |
| 10 | 7.37 | 36.58 | 9.61 | 0.01 | 46.20 | 60.00 | -13.80 | QP |
| 11 | 10.18 | 23.95 | 9.72 | 0.01 | 33.68 | 50.00 | -16.32 | Average |
| 12 | 10.18 | 31.50 | 9.72 | 0.01 | 41.23 | 60.00 | -18.77 | QP |

## 3.2 RADIATED EMISSION MEASUREMENT

### 3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (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 (Above 1000MHz)

| FREQUENCY (MHz) | Limit (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).

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 25GHz |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

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

### 3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.1 metre to 0.1 metre( Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel

Note:

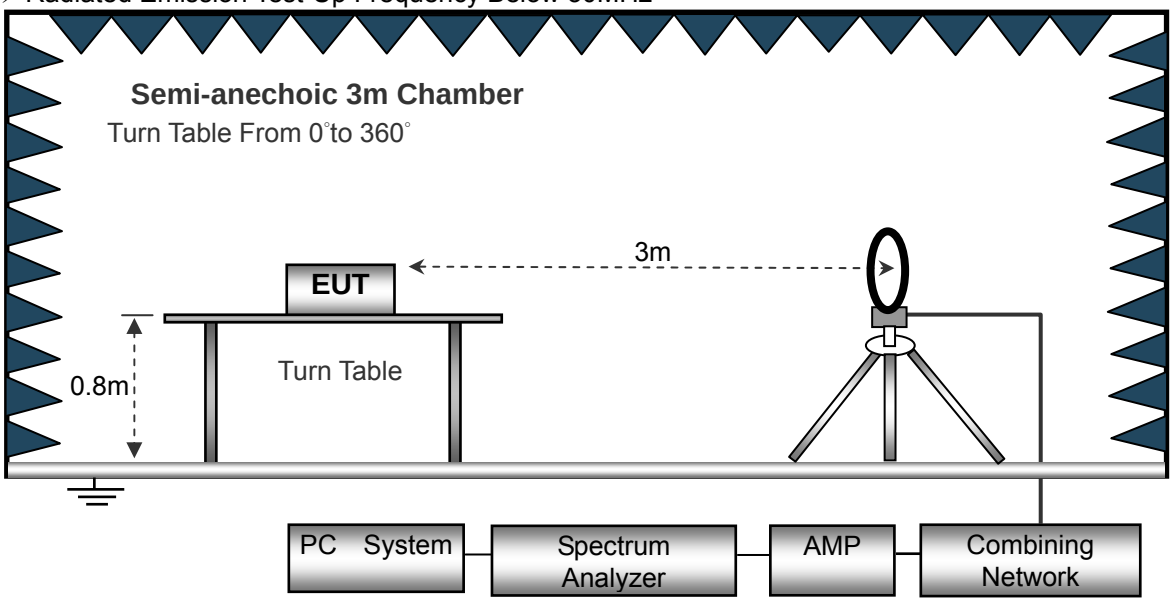
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.2.3 DEVIATION FROM TEST STANDARD

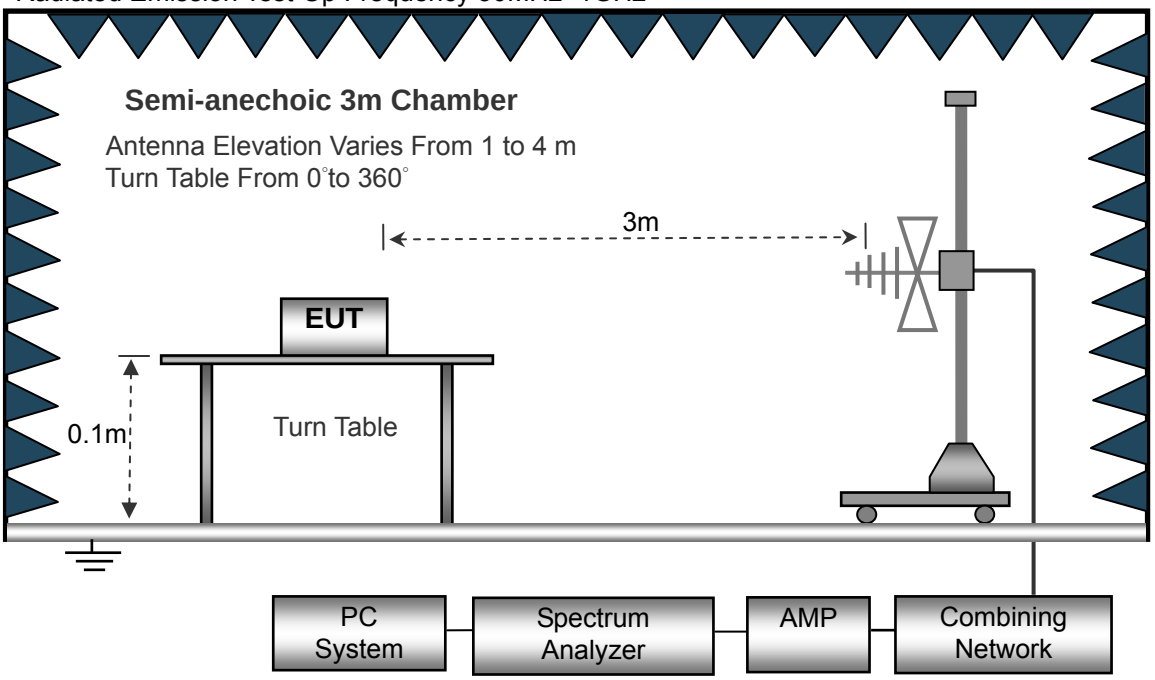
No deviation

### 3.2.4 TEST SETUP

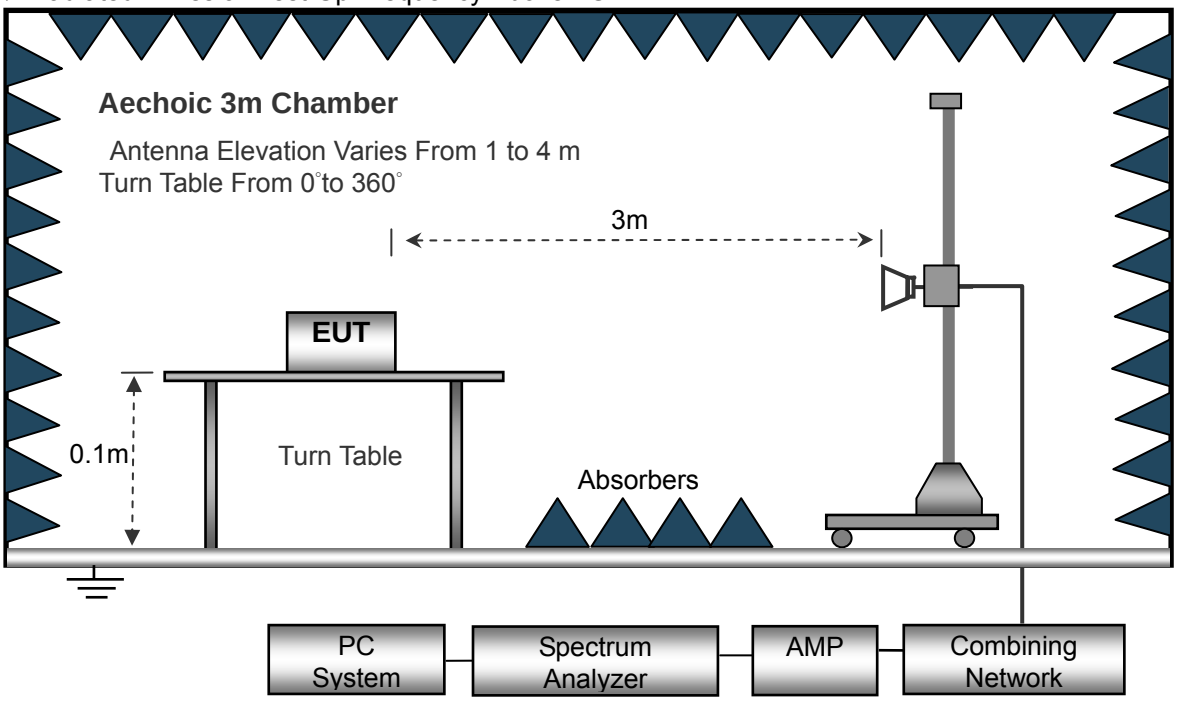
（A）Radiated Emission Test-Up Frequency Below 30MHz



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




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




### 3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

### 3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

| | | | |
|---|---|---|---|
| Temperature: | 20℃ | Relative Humidtity: | 48% |
| Pressure: | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | Mode 4 | Polarization : | -- |

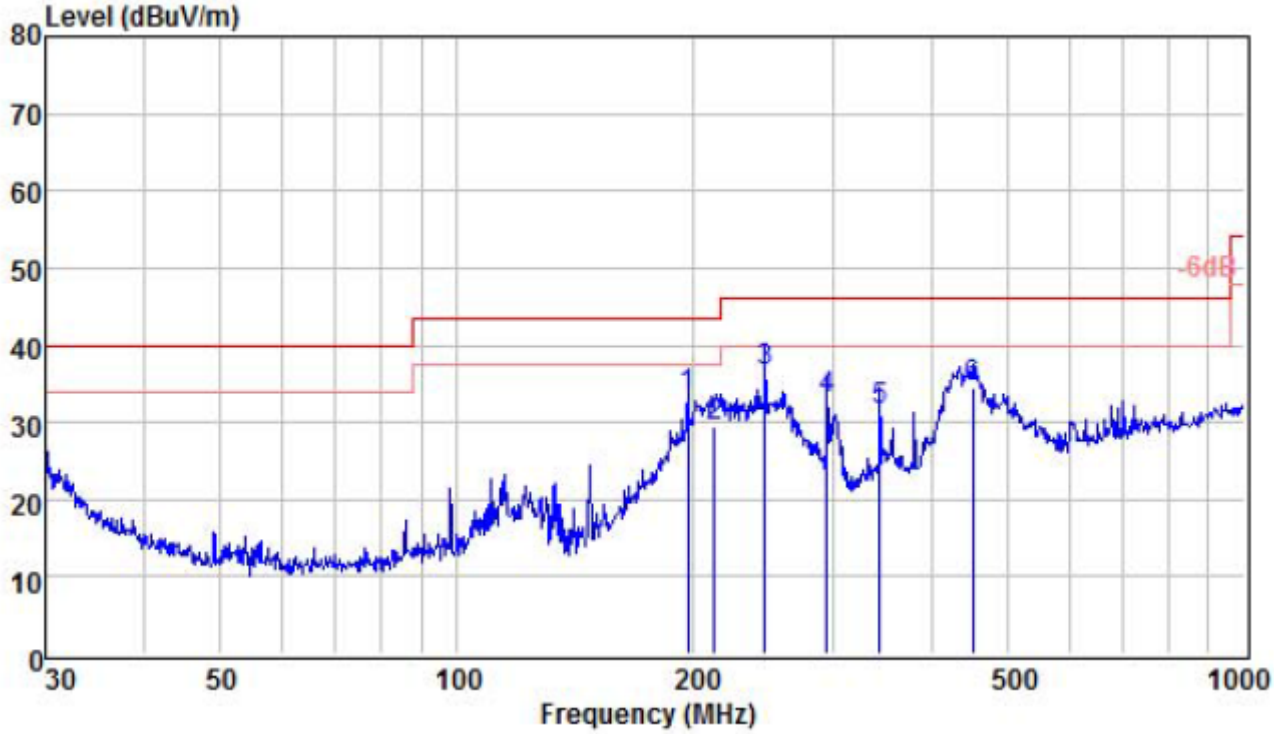
| Freq. | Reading | Limit | Margin | State |
|---|---|---|---|---|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F |
| -- | -- | -- | -- | PASS |
| -- | -- | -- | -- | PASS |

**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 (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

### 3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

| | | | |
|---|---|---|---|
| Temperature: | 26℃ | Relative Humidity: | 54% |
| Pressure: | 1010 hPa | Polarization : | Horizontal |
| Test Voltage : | AC 120V/60Hz | | |
| Test Mode : | Mode 4 | | |



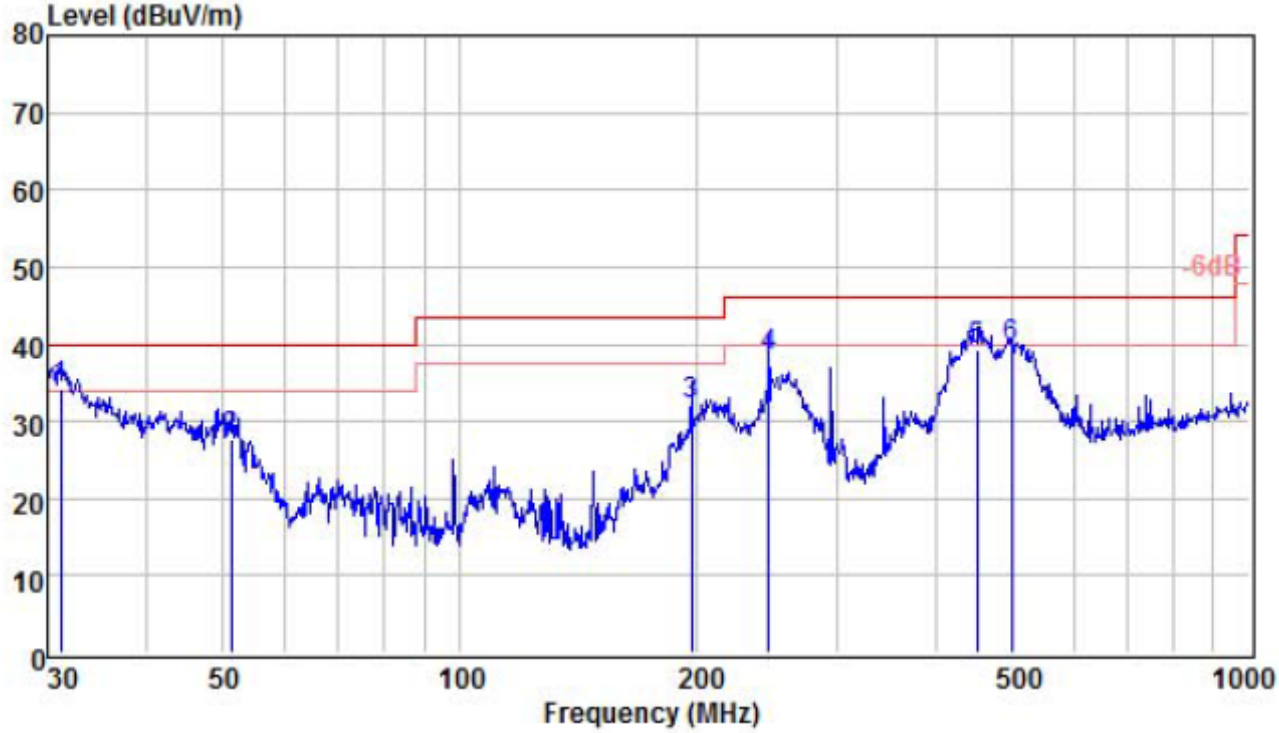

| | Freq | Read Level | Antenna Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dBuV/m | dBuV/m | dB | |
| 1 | 196.51 | 21.49 | 11.00 | 0.88 | 33.37 | 43.50 | -10.13 | QP |
| 2 | 212.27 | 16.91 | 11.60 | 0.88 | 29.39 | 43.50 | -14.11 | QP |
| 3 | 245.95 | 22.95 | 12.90 | 0.86 | 36.71 | 46.00 | -9.29 | QP |
| 4 | 295.15 | 18.68 | 13.60 | 0.85 | 33.13 | 46.00 | -12.87 | QP |
| 5 | 344.39 | 15.17 | 15.25 | 1.07 | 31.49 | 46.00 | -14.51 | QP |
| 6 | 451.14 | 15.35 | 17.60 | 1.49 | 34.44 | 46.00 | -11.56 | QP |

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

| | | | |
|---|---|---|---|
| Temperature: | 26℃ | Relative Humidity: | 54% |
| Pressure: | 1010 hPa | Polarization : | Vertical |
| Test Voltage : | AC 120V/60Hz | | |
| Test Mode : | Mode 4 | | |




| | Freq | Read Level | Antenna Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dBuV/m | dBuV/m | dB | |
| 1 ! | 31.18 | 15.58 | 18.10 | 0.54 | 34.22 | 40.00 | -5.78 | QP |
| 2 | 51.30 | 18.90 | 8.60 | 0.30 | 27.80 | 40.00 | -12.20 | QP |
| 3 | 196.51 | 20.62 | 10.69 | 0.88 | 32.19 | 43.50 | -11.31 | QP |
| 4 | 245.95 | 24.57 | 12.79 | 0.86 | 38.22 | 46.00 | -7.78 | QP |
| 5 | 451.14 | 20.20 | 17.63 | 1.49 | 39.32 | 46.00 | -6.68 | QP |
| 6 | 499.42 | 19.31 | 18.69 | 1.65 | 39.65 | 46.00 | -6.35 | QP |

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

### 3.2.8 TEST RESULTS (1GHZ~25GHZ)

GFSK Worst Case

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| **operation frequency:2402** | | | | | | | | | |
| V | 4804.00 | 54.36 | 30.55 | 5.77 | 24.66 | 54.24 | 74.00 | -19.76 | PK |
| V | 4804.00 | 44.36 | 30.55 | 5.77 | 24.66 | 44.24 | 54.00 | -9.76 | AV |
| V | 7206.00 | 53.39 | 30.33 | 6.32 | 24.55 | 53.93 | 74.00 | -20.07 | PK |
| V | 7206.00 | 44.12 | 30.33 | 6.32 | 24.55 | 44.66 | 54.00 | -9.34 | AV |
| V | 16132.00 | 52.36 | 30.85 | 7.45 | 24.69 | 53.65 | 74.00 | -20.35 | PK |
| H | 4804.00 | 54.36 | 30.55 | 5.77 | 24.66 | 54.24 | 74.00 | -19.76 | PK |
| H | 4804.00 | 44.59 | 30.55 | 5.77 | 24.66 | 44.47 | 54.00 | -9.53 | AV |
| H | 7206.00 | 52.36 | 30.33 | 6.32 | 24.55 | 52.9 | 74.00 | -21.1 | PK |
| H | 7206.00 | 42.35 | 30.33 | 6.32 | 24.55 | 42.89 | 54.00 | -11.11 | AV |
| H | 16132.00 | 53.62 | 30.85 | 7.45 | 24.69 | 54.91 | 74.00 | -19.09 | PK |
| **operation frequency:2441** | | | | | | | | | |
| V | 4882.00 | 53.58 | 30.55 | 5.77 | 24.66 | 53.46 | 74.00 | -20.54 | PK |
| V | 4882.00 | 41.85 | 30.55 | 5.77 | 24.66 | 41.73 | 54.00 | -12.27 | AV |
| V | 7323.00 | 52.69 | 30.33 | 6.32 | 24.55 | 53.23 | 74.00 | -20.77 | PK |
| V | 7323.00 | 43.78 | 30.33 | 6.32 | 24.55 | 44.32 | 54.00 | -9.68 | AV |
| V | 16132.00 | 51.36 | 30.85 | 7.45 | 24.69 | 52.65 | 74.00 | -21.35 | PK |
| H | 4882.00 | 51.87 | 30.55 | 5.77 | 24.66 | 51.75 | 74.00 | -22.25 | PK |
| H | 4882.00 | 41.69 | 30.55 | 5.77 | 24.66 | 41.57 | 54.00 | -12.43 | AV |
| H | 7323.00 | 52.89 | 30.33 | 6.32 | 24.55 | 53.43 | 74.00 | -20.57 | PK |
| H | 7323.00 | 41.78 | 30.33 | 6.32 | 24.55 | 42.32 | 54.00 | -11.68 | AV |
| H | 16132.00 | 52.66 | 30.85 | 7.45 | 24.69 | 53.95 | 74.00 | -20.05 | PK |
| **operation frequency:2480** | | | | | | | | | |
| V | 4960.00 | 52.87 | 30.55 | 5.77 | 24.66 | 52.75 | 74.00 | -21.25 | PK |
| V | 4960.00 | 42.58 | 30.55 | 5.77 | 24.66 | 42.46 | 54.00 | -11.54 | AV |
| V | 7440.00 | 52.58 | 30.33 | 6.32 | 24.55 | 53.12 | 74.00 | -20.88 | PK |
| V | 7440.00 | 42.96 | 30.33 | 6.32 | 24.55 | 43.5 | 54.00 | -10.5 | AV |
| V | 16132.00 | 54.73 | 30.85 | 7.45 | 24.69 | 56.02 | 74.00 | -17.98 | PK |
| H | 4960.00 | 52.47 | 30.55 | 5.77 | 24.66 | 52.35 | 74.00 | -21.65 | PK |
| H | 4960.00 | 43.58 | 30.55 | 5.77 | 24.66 | 43.46 | 54.00 | -10.54 | AV |
| H | 7440.00 | 54.63 | 30.33 | 6.32 | 24.55 | 55.17 | 74.00 | -18.83 | PK |
| H | 7440.00 | 43.68 | 30.33 | 6.32 | 24.55 | 44.22 | 54.00 | -9.78 | AV |
| H | 16132.00 | 52.88 | 30.85 | 7.45 | 24.69 | 54.17 | 74.00 | -19.83 | PK |

**Remark:**

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

## 3.3 RADIATED BAND EMISSION MEASUREMENT

### 3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Limit (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).

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 2300MHz |
| Stop Frequency | 2520 |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

### 3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel,the Highest channel

Note:

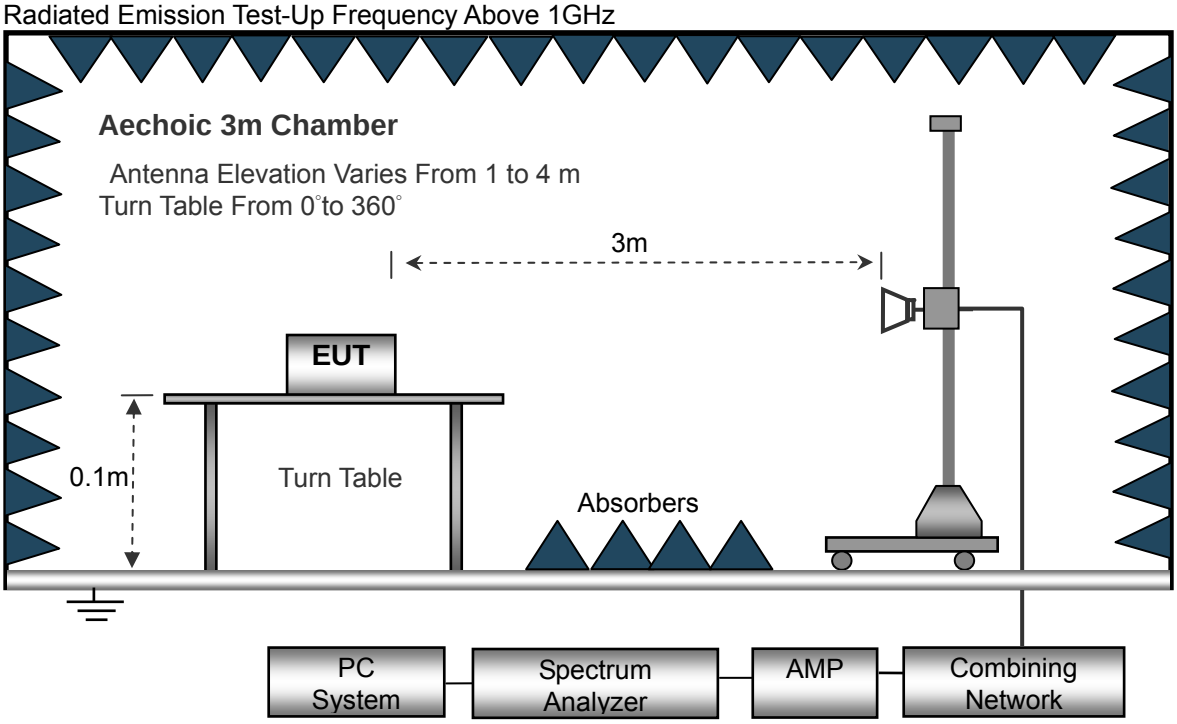
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.3.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz




### 3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

### 3.3.6 TEST RESULT

PASS
Remark: All modes of GFSK, π/4 DQPSK, 8DPSK were tested, only the worst result of GFSK was reported as below.

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2402 | | | | | | | | | |
| V | 2390.00 | 57.65 | 30.22 | 4.85 | 23.98 | 56.26 | 74.00 | -17.74 | PK |
| V | 2390.00 | 50.78 | 30.22 | 4.85 | 23.98 | 49.39 | 54.00 | -4.61 | AV |
| V | 2400.00 | 59.85 | 30.22 | 4.85 | 23.98 | 58.46 | 74.00 | -15.54 | PK |
| V | 2400.00 | 49.85 | 30.22 | 4.85 | 23.98 | 48.46 | 54.00 | -5.54 | AV |
| H | 2390.00 | 61.11 | 30.22 | 4.85 | 23.98 | 59.72 | 74.00 | -14.28 | PK |
| H | 2390.00 | 48.95 | 30.22 | 4.85 | 23.98 | 47.56 | 54.00 | -6.44 | AV |
| H | 2400.00 | 60.12 | 30.22 | 4.85 | 23.98 | 58.73 | 74.00 | -15.27 | PK |
| H | 2400.00 | 49.08 | 30.22 | 4.85 | 23.98 | 47.69 | 54.00 | -6.31 | AV |

| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| operation frequency:2480 | | | | | | | | | |
| V | 2483.50 | 60.23 | 30.22 | 4.85 | 23.98 | 58.84 | 74.00 | -15.16 | PK |
| V | 2483.50 | 49.15 | 30.22 | 4.85 | 23.98 | 47.76 | 54.00 | -6.24 | AV |
| V | 2500.00 | 61.36 | 30.22 | 4.85 | 23.98 | 59.97 | 74.00 | -14.03 | PK |
| V | 2500.00 | 48.98 | 30.22 | 4.85 | 23.98 | 47.59 | 54.00 | -6.41 | AV |
| H | 2483.50 | 59.88 | 30.22 | 4.85 | 23.98 | 58.49 | 74.00 | -15.51 | PK |
| H | 2483.50 | 48.68 | 30.22 | 4.85 | 23.98 | 47.29 | 54.00 | -6.71 | AV |
| H | 2500.00 | 60.23 | 30.22 | 4.85 | 23.98 | 58.84 | 74.00 | -15.16 | PK |
| H | 2500.00 | 48.52 | 30.22 | 4.85 | 23.98 | 47.13 | 54.00 | -6.87 | AV |

**Remark:**

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

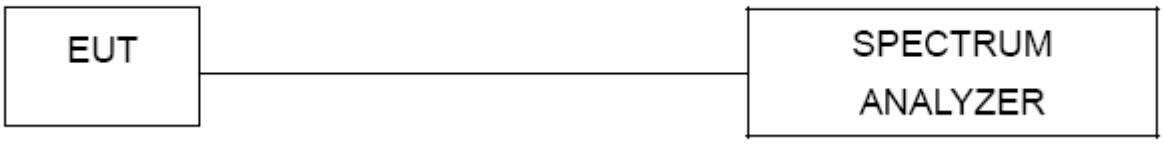
## 4. CONDUCTED BAND EDGE AND SPURIOUS EMISSION

| | |
|---|---|
| Test Requirement: | FCC Part15 C Section 15.247 (d) |
| Test Method: | KDB558074 D0115.247 Meas Guidancev05r02 |

### 4.1 LIMIT

Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 4.1.1 TEST SETUP




### 4.1.2 TEST PROCEDURE

Using the following spectrum analyzer setting:

A) Set the RBW = 100KHz.

B) Set the VBW = 300KHz.
C) Sweep time = auto couple.
D) Detector function = peak.
E) Trace mode = max hold.
F) Allow trace to fully stabilize.

### 4.1.3 DEVIATION FROM STANDARD

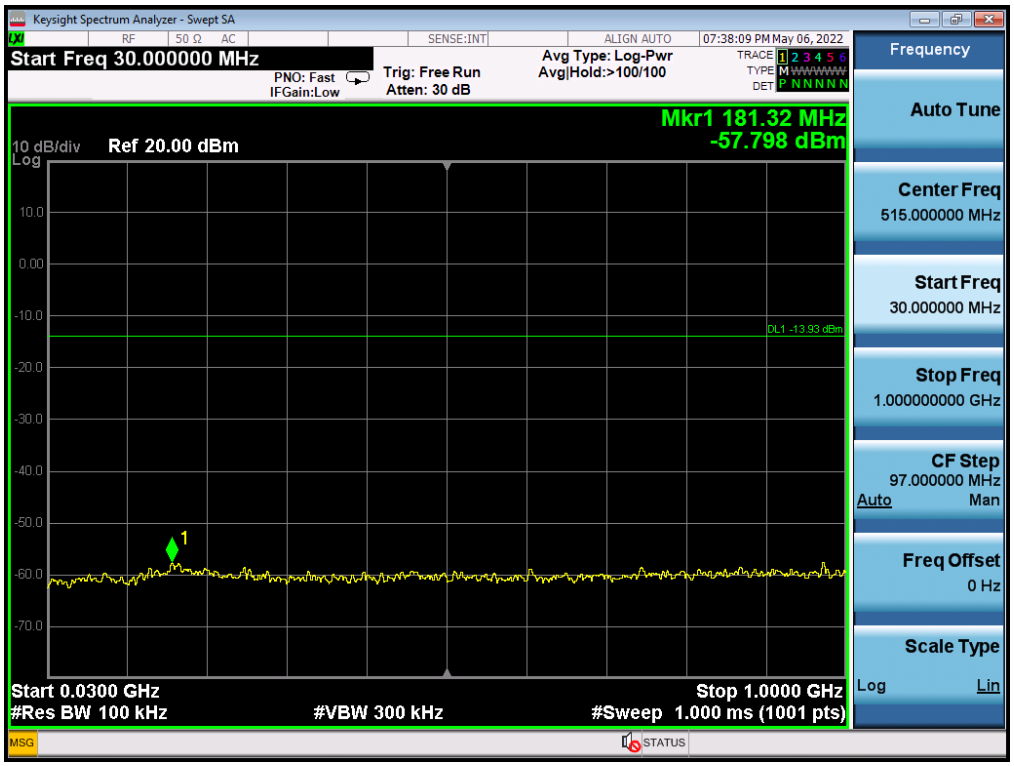
No deviation.

### 4.1.4 TEST RESULT

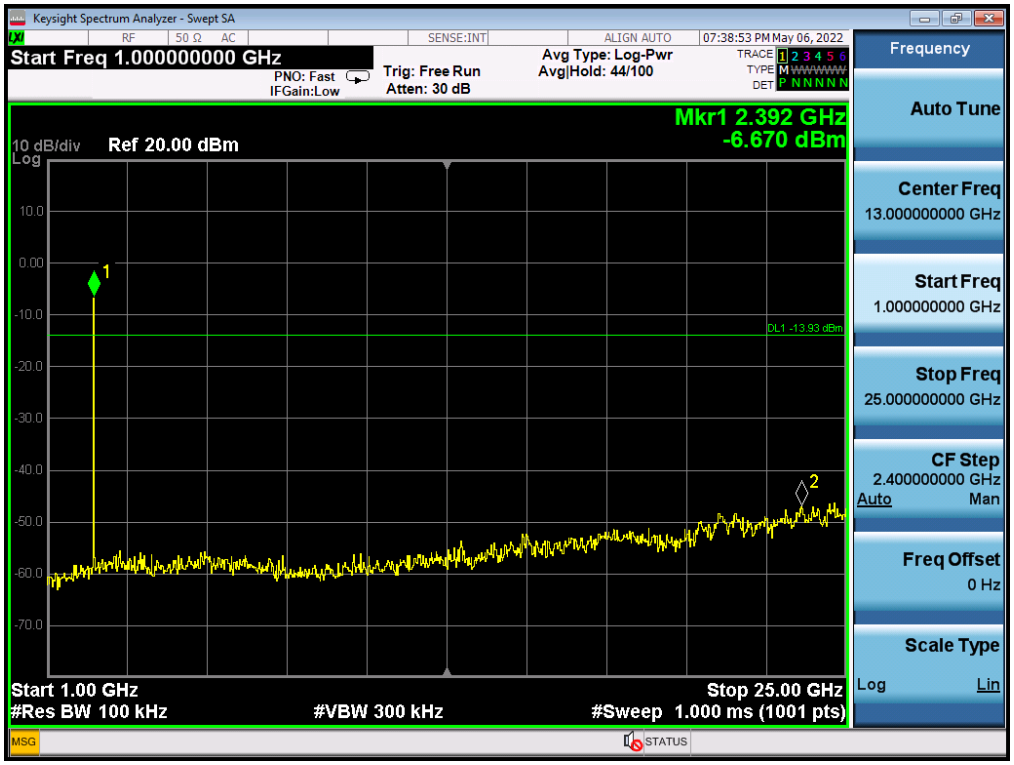
Remark: Spurious Emission all modes of GFSK, π/4 DQPSK, 8DPSK were tested, only the worst result of GFSK was reported as below:

GFSK mode:

CH:2402MHz

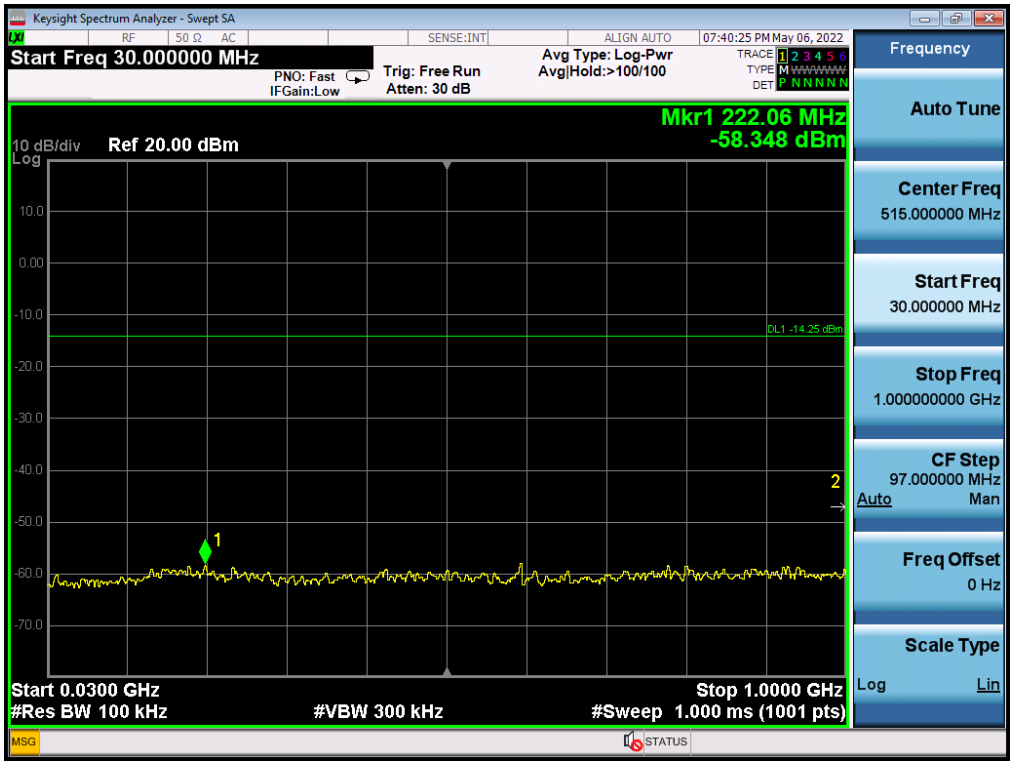



30MHz-1GHz




1GHz-25GHz

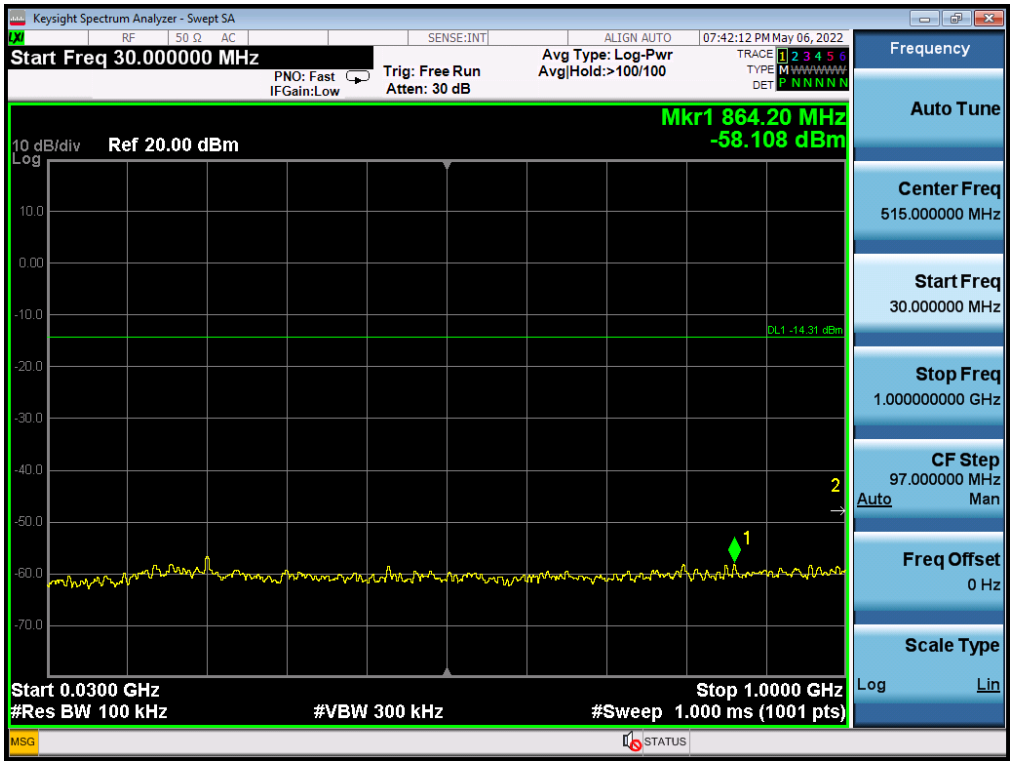
CH:2441MHz




30MHz-1GHz

1GHz-25GHz

CH:2480MHz




30MHz-1GHz

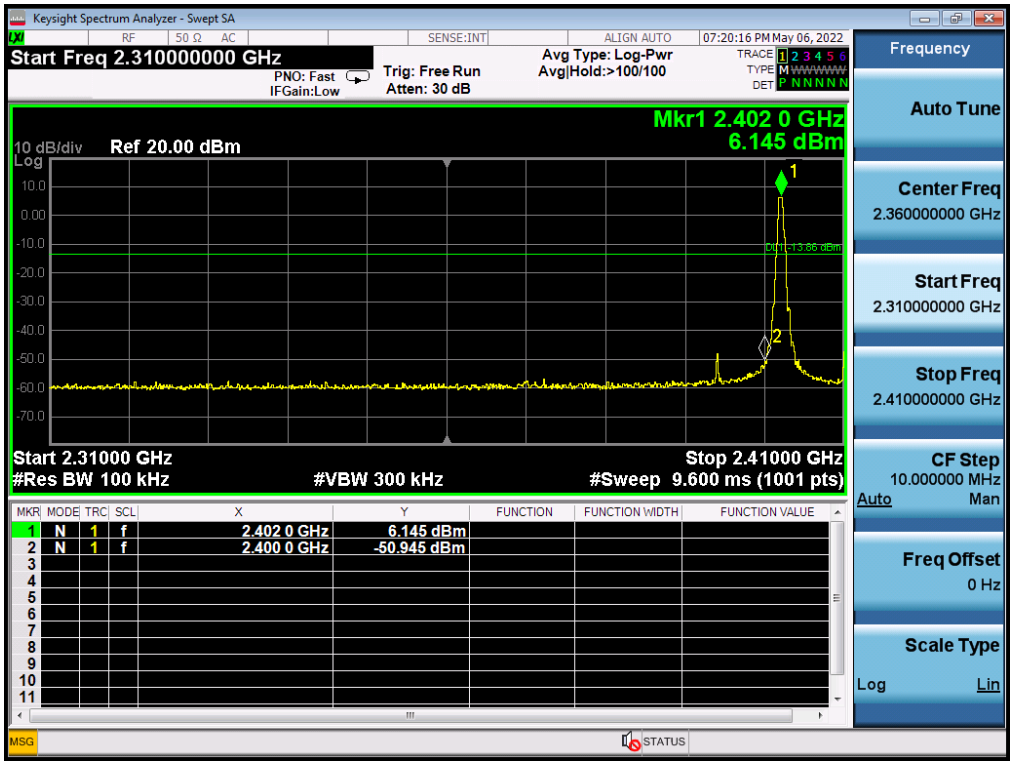
1GHz-25GHz

Conducted band edge

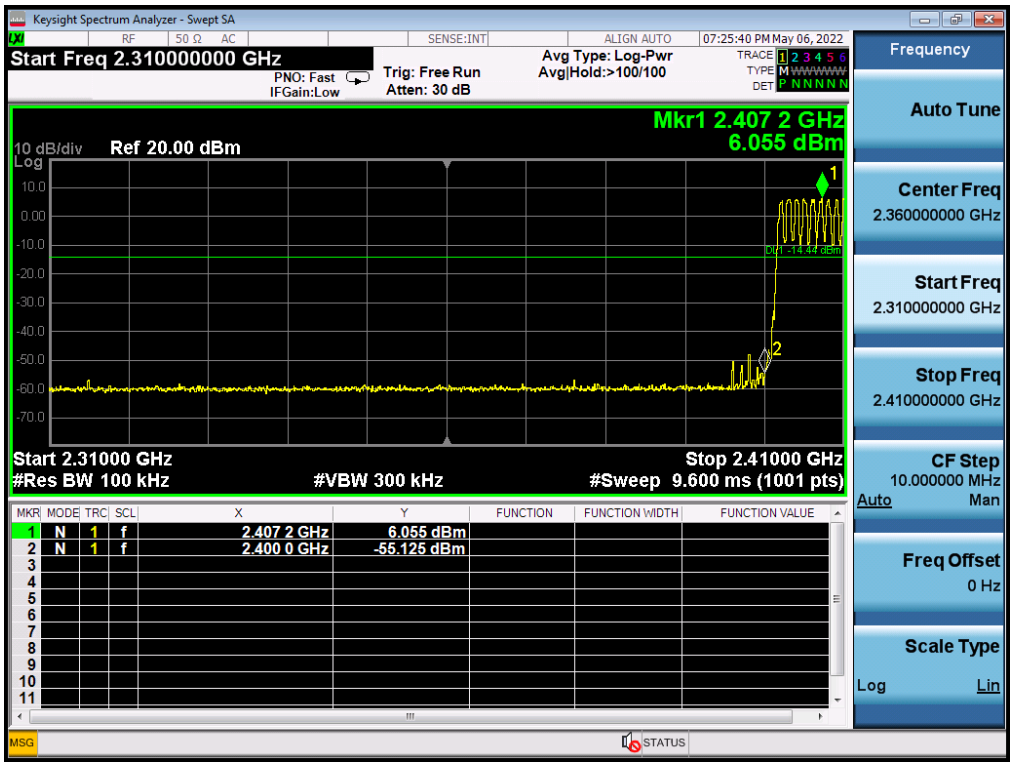
Test result

Pass

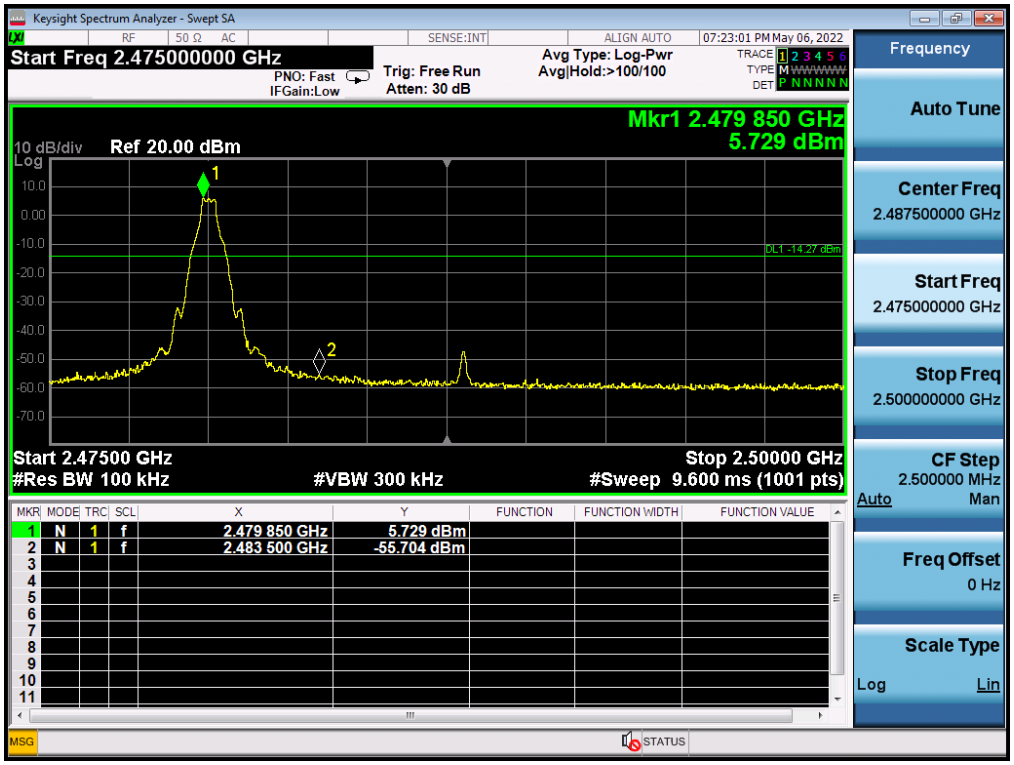
| Modulation | | Frequency Band | Delta Peak to band emission (dBc) | >Limit (dBc) | Result |
|---|---|---|---|---|---|
| GFSK | Non-hopping | Left Band | 57.090 | 20 | Pass |
| | | Right Band | 61.433 | 20 | Pass |
| | hopping | Left Band | 61.180 | 20 | Pass |
| | | Right Band | 65.513 | 20 | Pass |
| π/4DQPSK | Non-hopping | Left Band | 53.561 | 20 | Pass |
| | | Right Band | 58.016 | 20 | Pass |
| | hopping | Left Band | 53.462 | 20 | Pass |
| | | Right Band | 64.247 | 20 | Pass |
| 8DPSK | Non-hopping | Left Band | 48.380 | 20 | Pass |
| | | Right Band | 57.555 | 20 | Pass |
| | hopping | Left Band | 60.695 | 20 | Pass |
| | | Right Band | 64.764 | 20 | Pass |



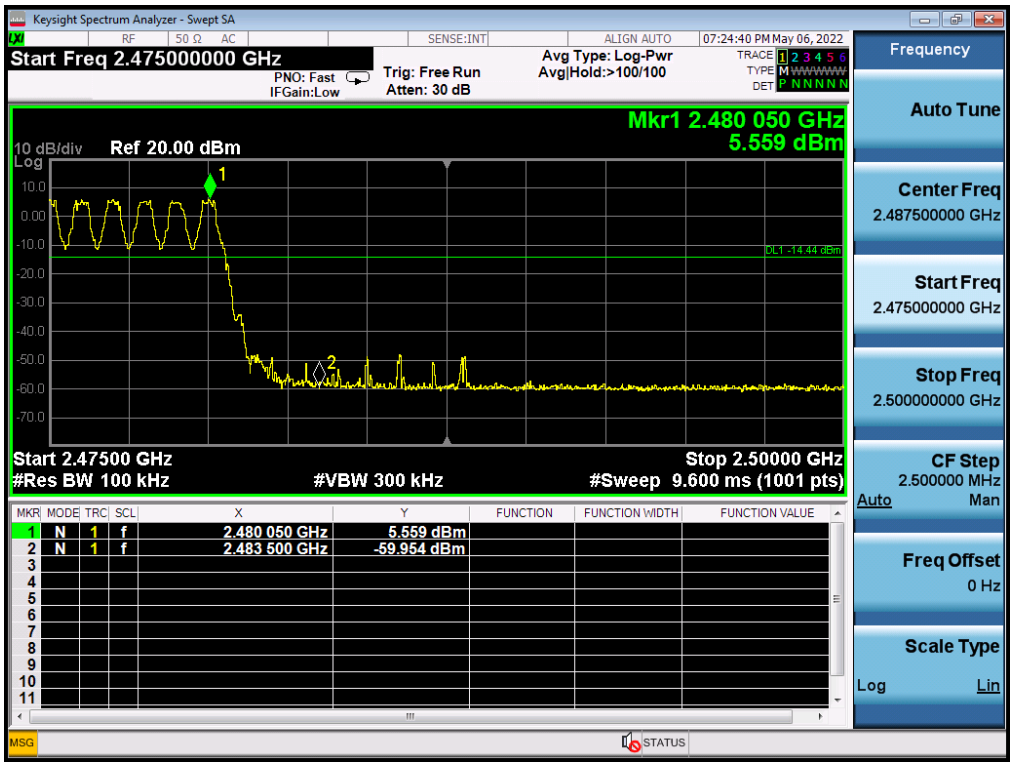

GFSK No-Hopping Band edge-left side



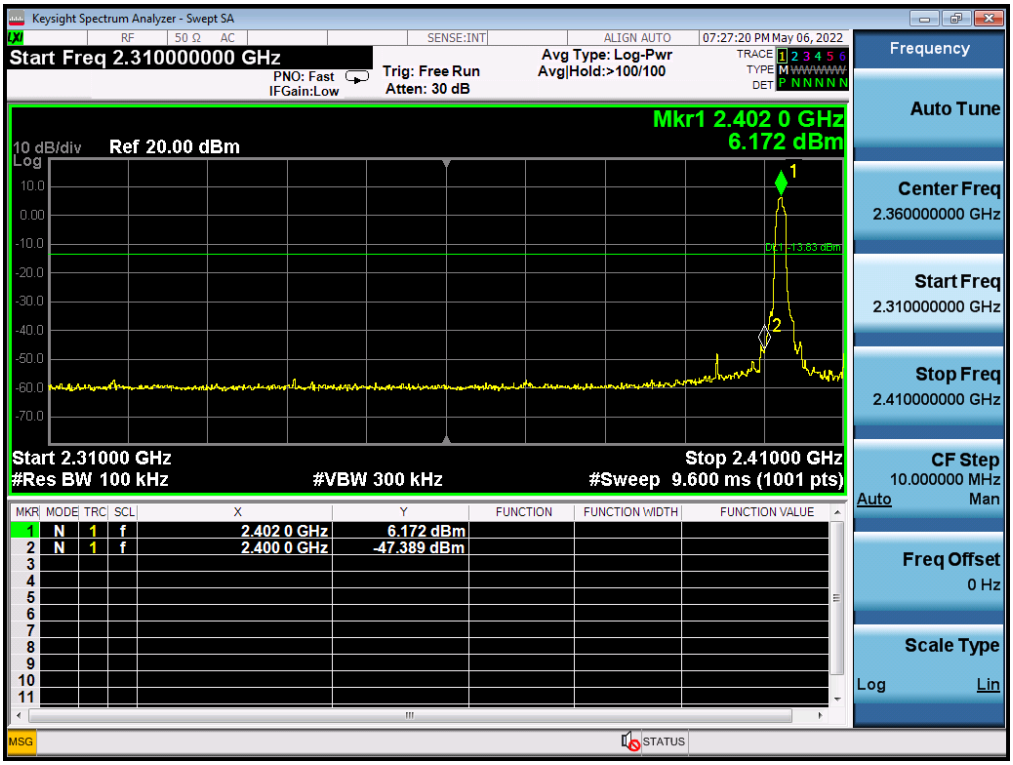

GFSK Hopping Band edge-left side



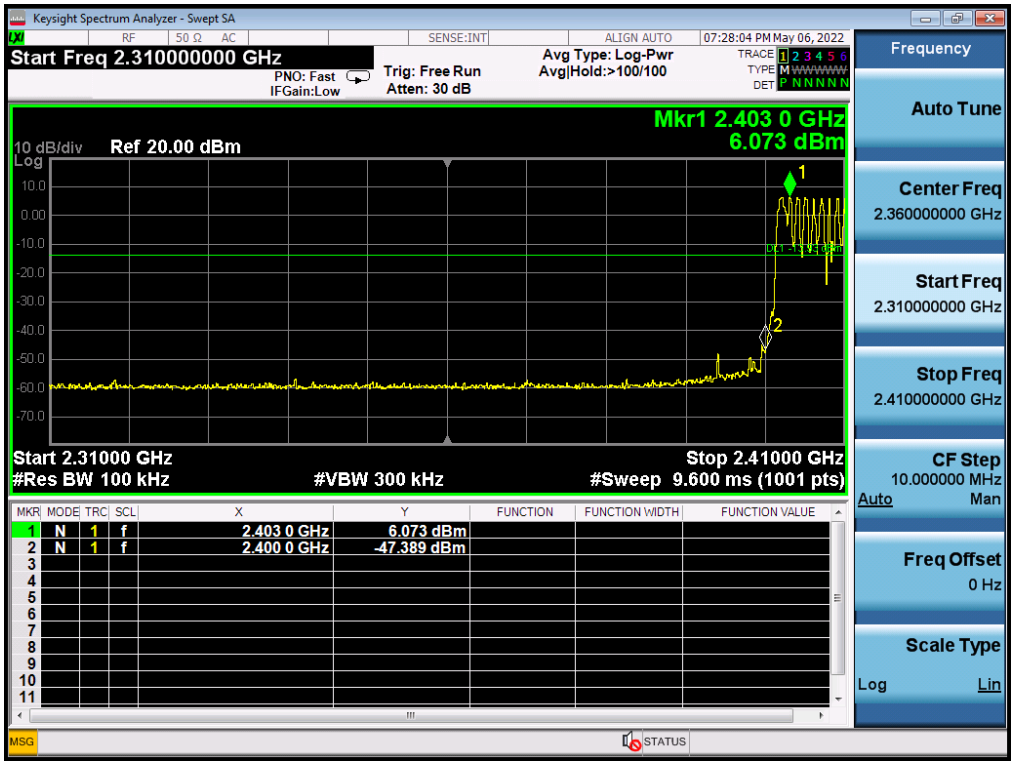

GFSK No-Hopping Band edge-Right side



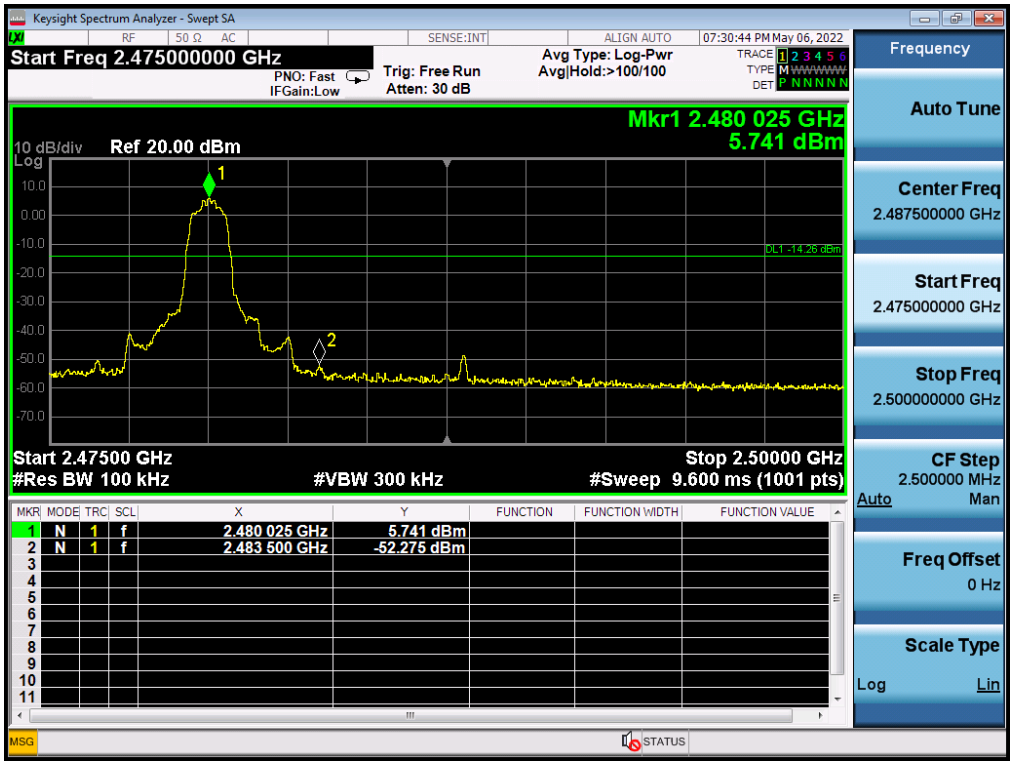

GFSK Hopping Band edge-Right side



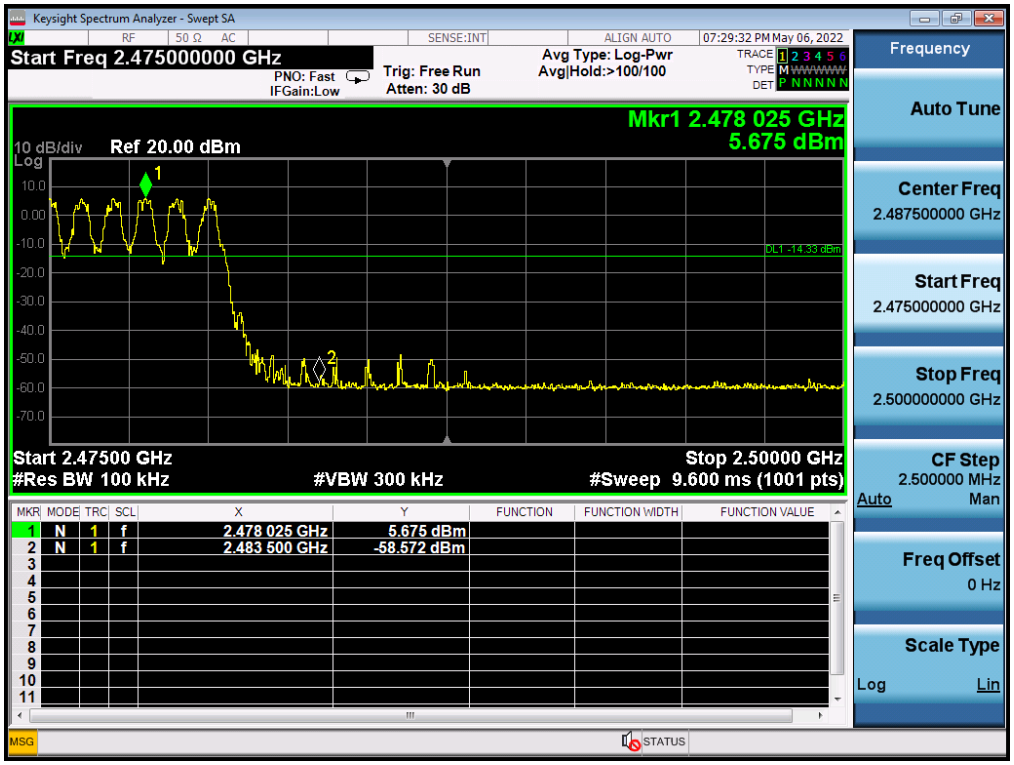

π/4DQPSK No-Hopping Band edge-Left side



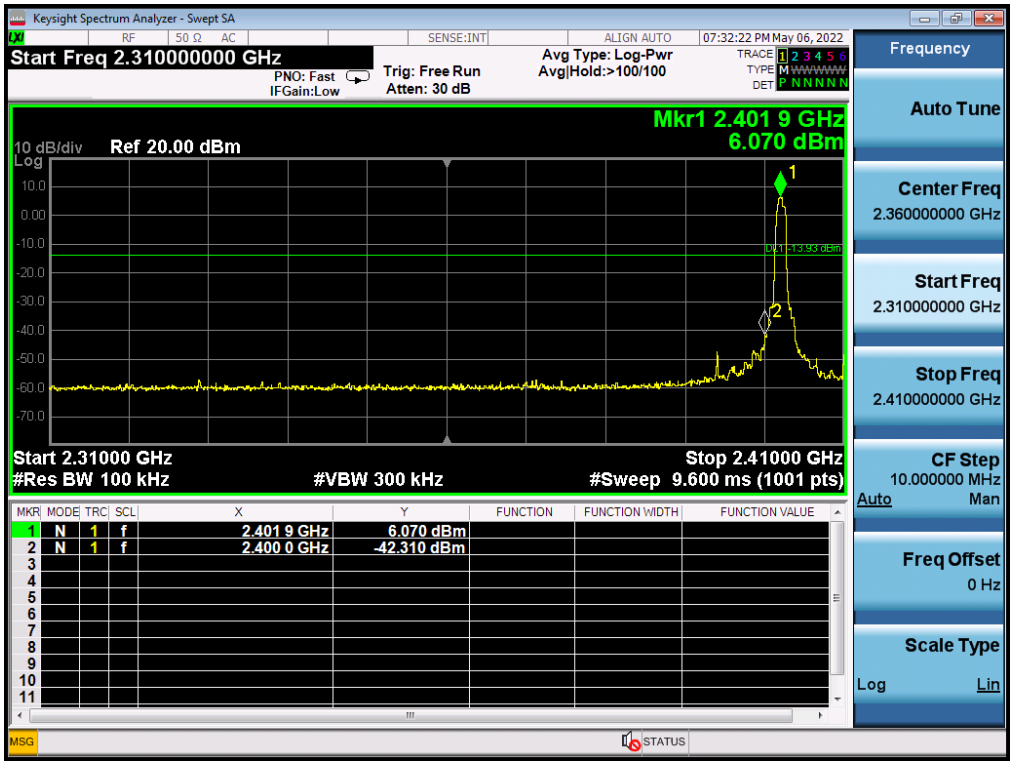

π/4DQPSK Hopping Band edge-Left side



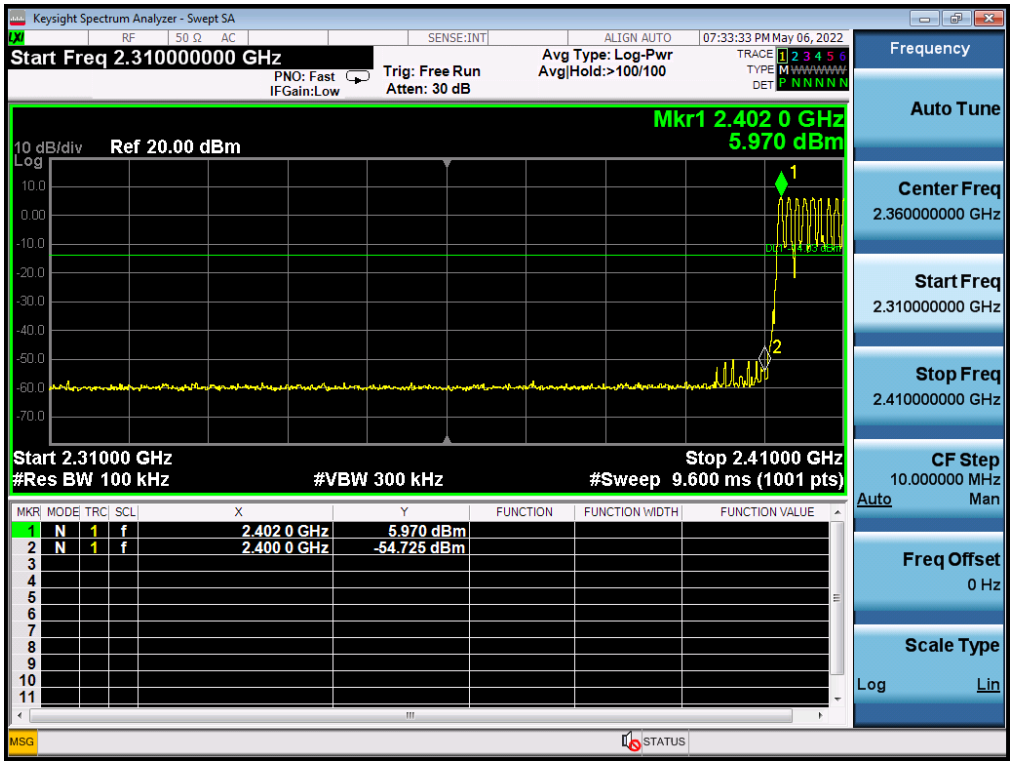

π/4DQPSK No-Hopping Band edge-Right side



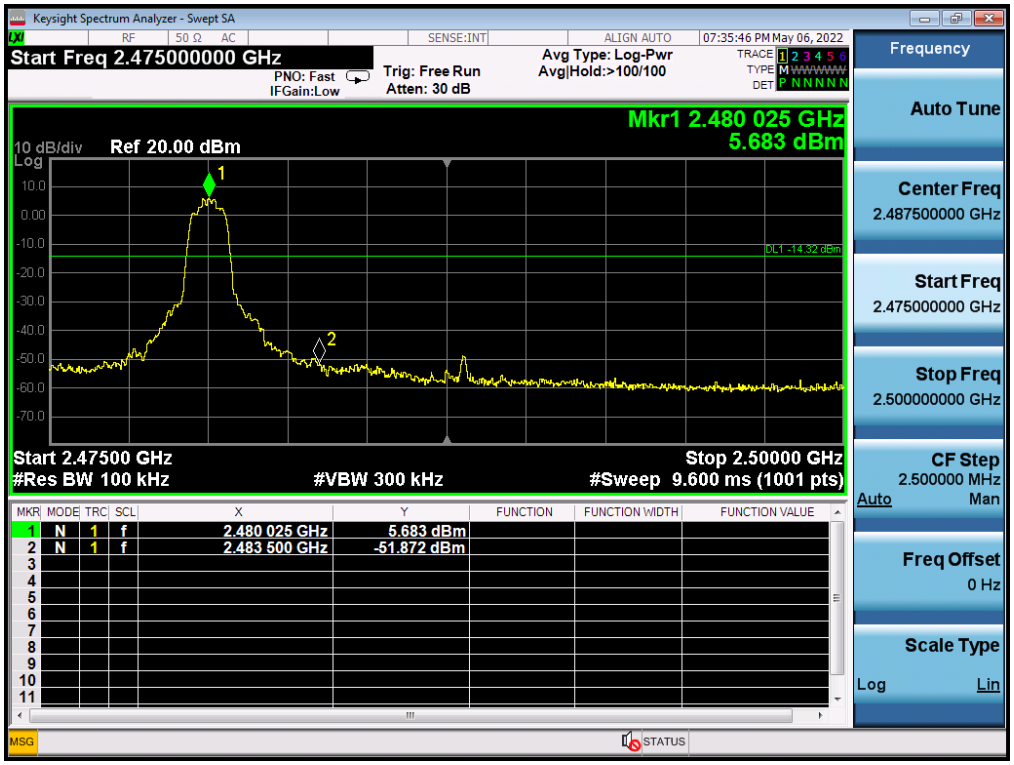

π/4DQPSK Hopping Band edge-Right side



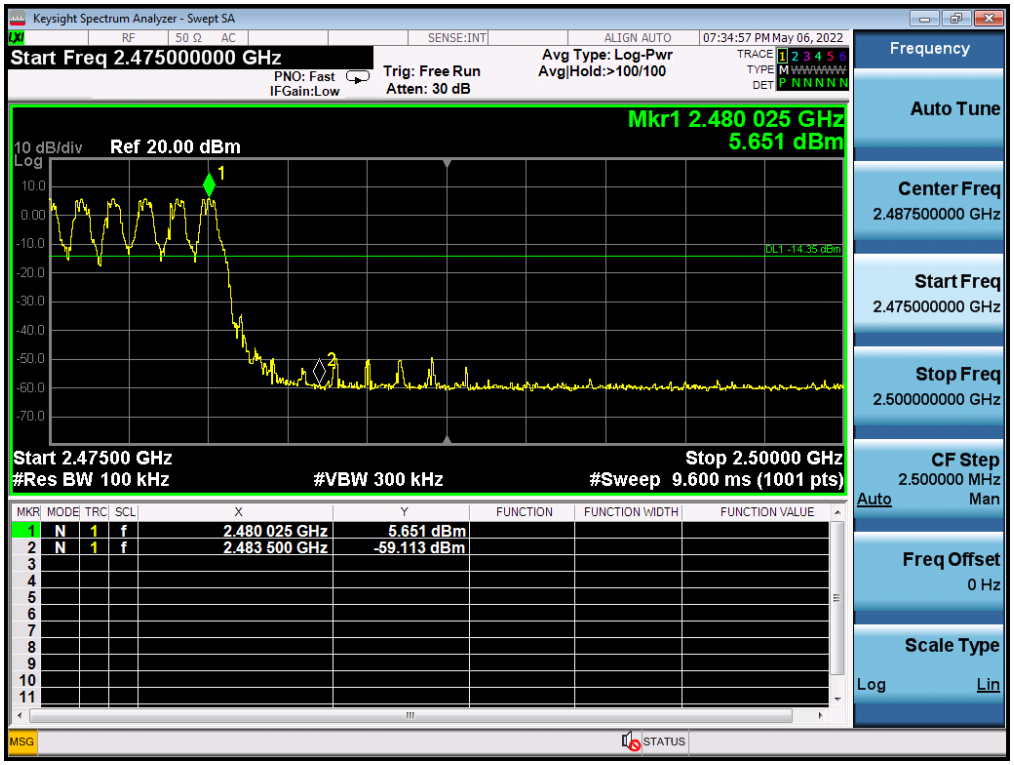

8DPSK No-Hopping Band edge-Left side




8DPSK Hopping Band edge-Left side




8DPSK No-Hopping Band edge-Right side




8DPSK Hopping Band edge-Right side

## 5. PEAK OUTPUT POWER

### 5.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (b)(i) | Peak Output Power | 30Bm or 20.96dBm | 2400-2483.5 | PASS |

#### 5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

VBW ≥ RBW

Sweep = auto

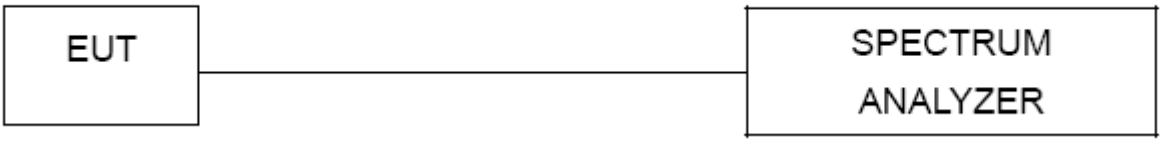
Detector function = peak

Trace = max hold

#### 5.1.2 DEVIATION FROM STANDARD

No deviation.

#### 5.1.3 TEST SETUP



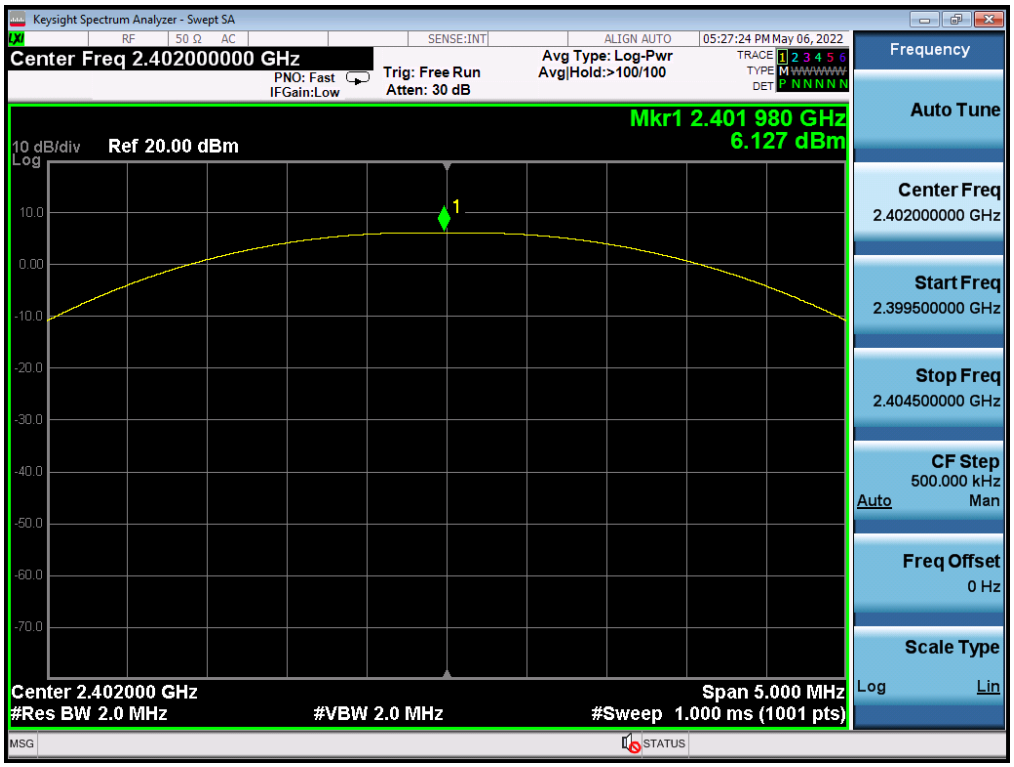

#### 5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

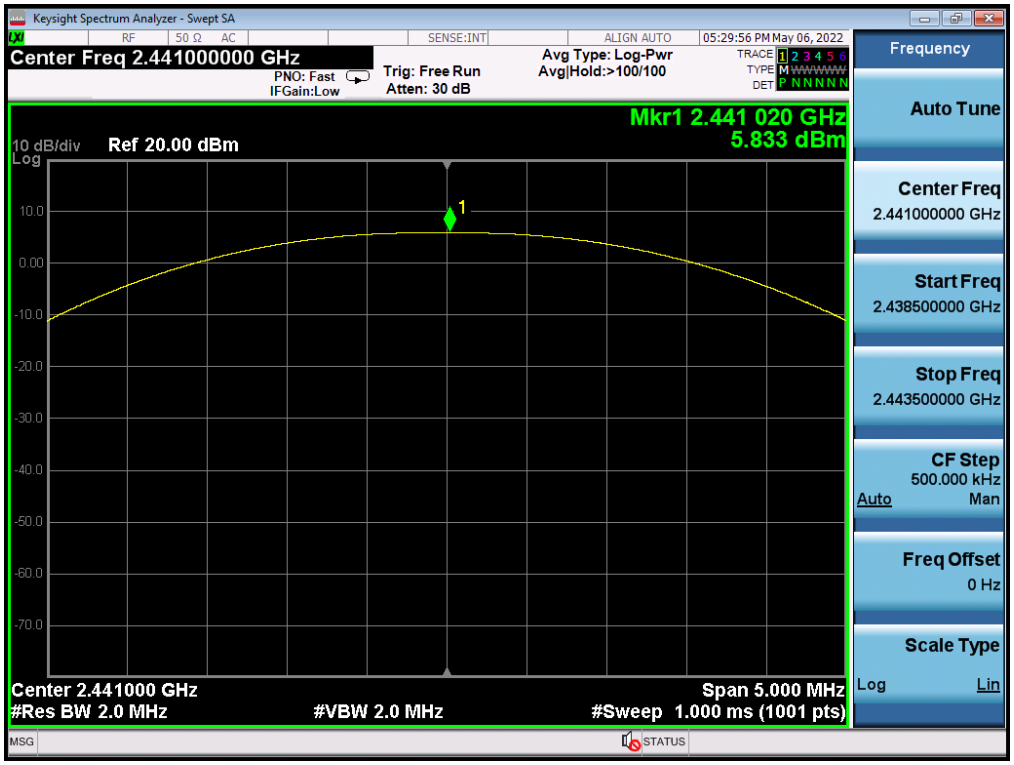
### 5.1.5 TEST RESULTS

| | | | |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 60% |
| Pressure: | 1012 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | CH00/ CH39 /CH78 (1M/2M/3Mbps Mode) | | |

| Mode | Test Channel | Peak Output Power (dBm) | LIMIT (dBm) |
|---|---|---|---|
| GFSK | CH00 | 6.127 | 20.96 |
| | CH39 | 5.833 | 20.96 |
| | CH78 | 5.782 | 20.96 |
| π /4 DQPSK | CH00 | 6.042 | 20.96 |
| | CH39 | 5.879 | 20.96 |
| | CH78 | 6.078 | 20.96 |
| 8DPSK | CH00 | 6.202 | 20.96 |
| | CH39 | 5.862 | 20.96 |
| | CH78 | 5.809 | 20.96 |

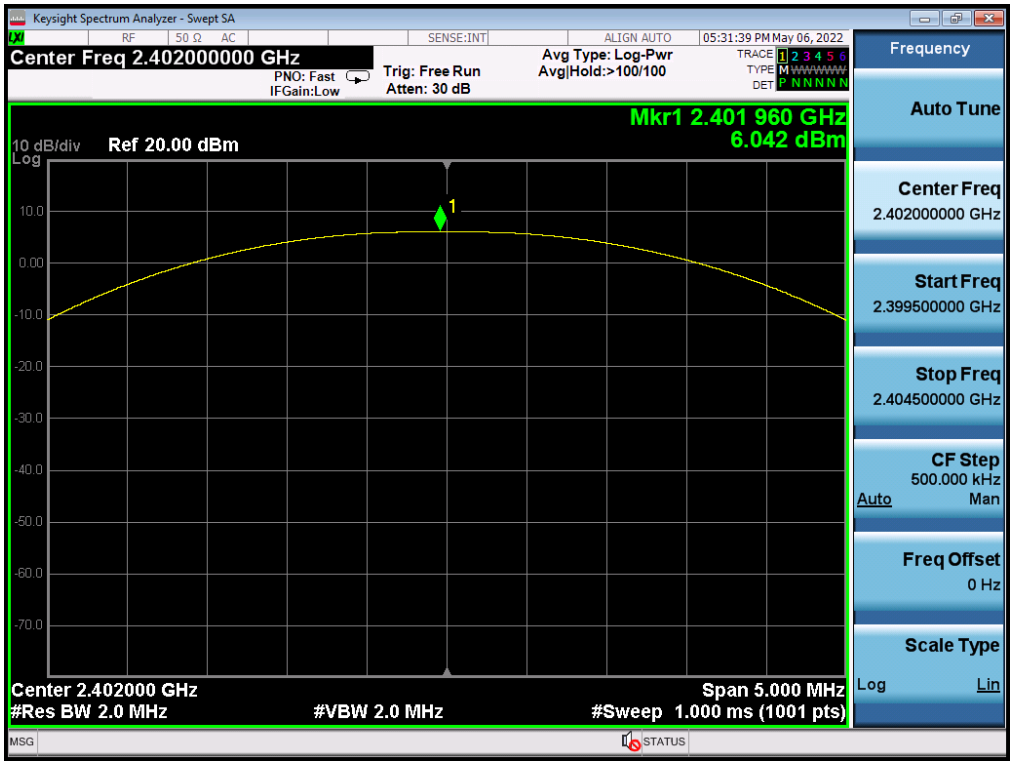



GFSK 2402MHz

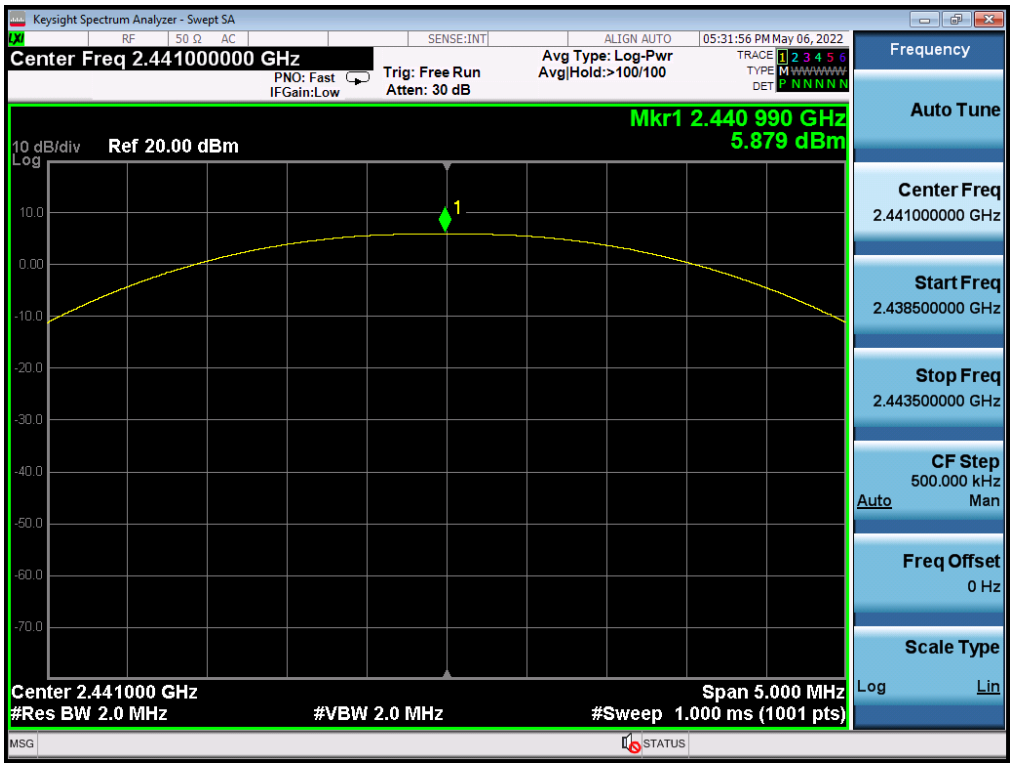



GFSK 2441MHz

GFSK 2480MHz

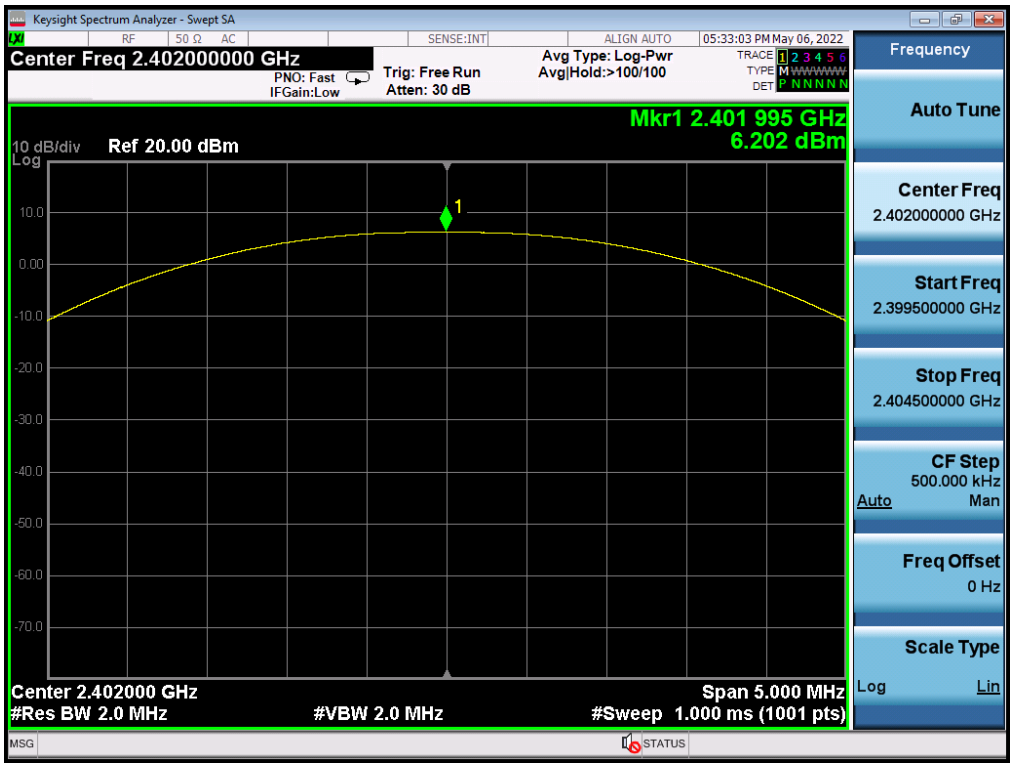



π /4 DQPSK 2402MHz



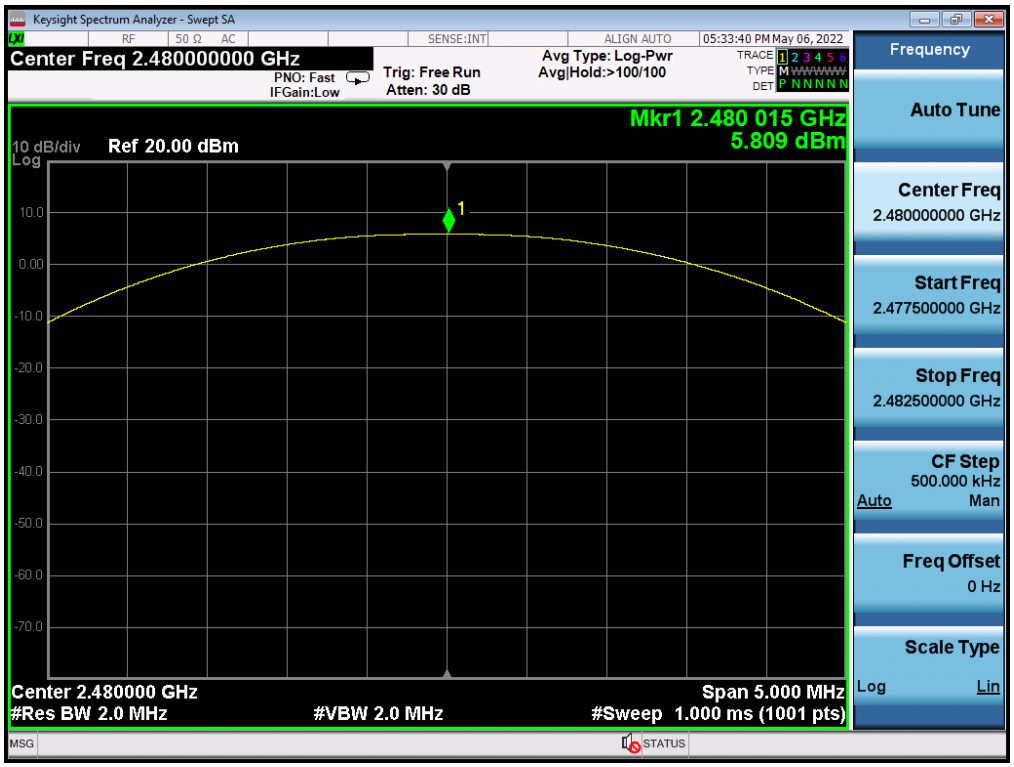

π /4 DQPSK 2441MHz

π /4 DQPSK 2480MHz




8DPSK 2402MHz

8DPSK 2441MHz




8DPSK 2480MHz

## 6. NUMBER OF HOPPING CHANNEL

### 6.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (a)(1)(iii) | Number of Hopping Channel | ≥15 | 2400-2483.5 | PASS |

| Spectrum Parameters | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | = the frequency band of operation |
| RB | RBW ≥ 1% of the span |
| VB | VBW ≥ RBW |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

#### 6.1.1 TEST PROCEDURE

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

#### 6.1.2 DEVIATION FROM STANDARD

No deviation.

#### 6.1.3 TEST SETUP

#### 6.1.4 EUT OPERATION CONDITIONS

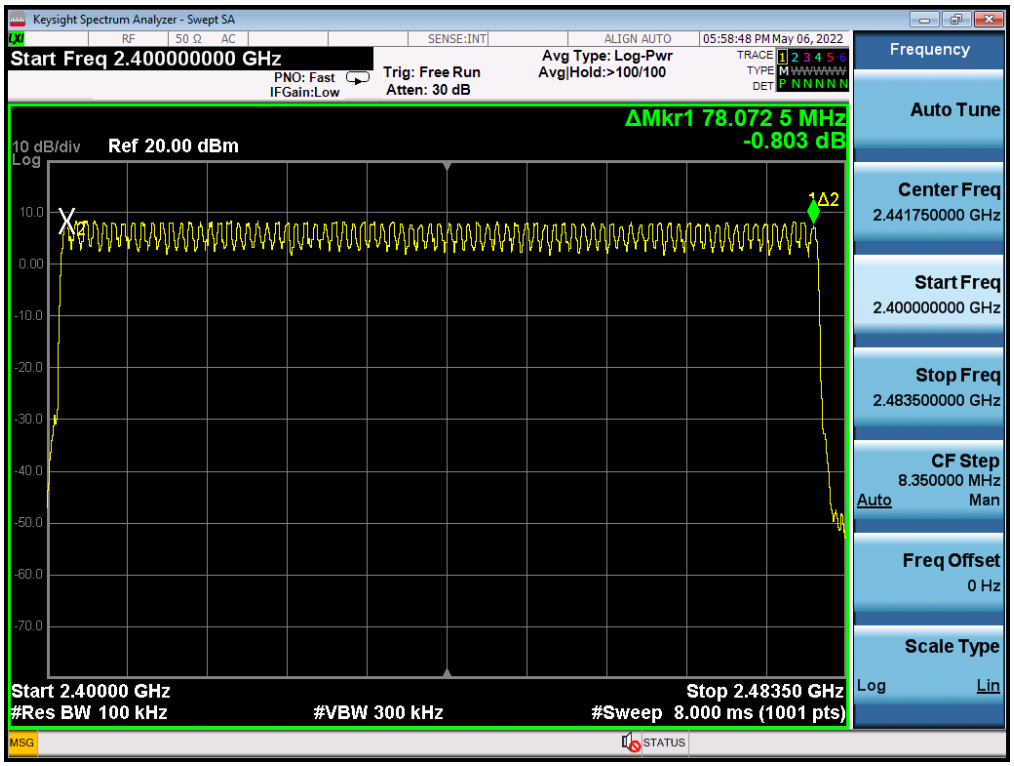
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

#### 6.1.5 TEST RESULTS

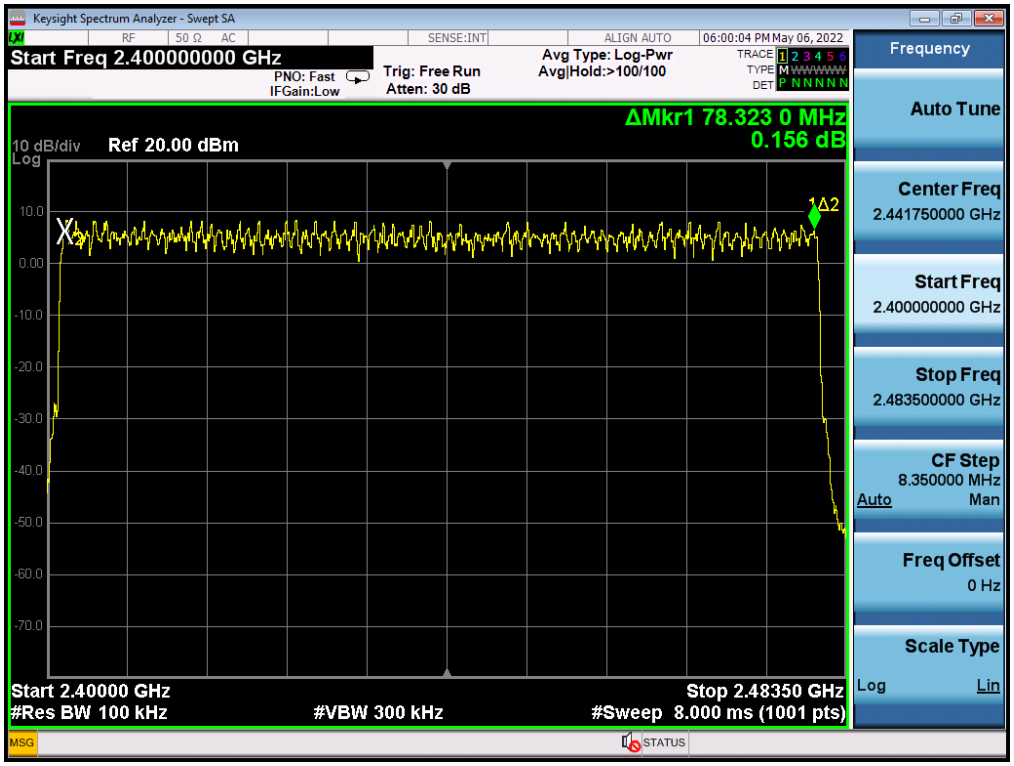
| Test Mode : | Hopping Mode |
|---|---|

| | | |
|---|---|---|
| Number of Hopping Channel | GFSK | 79 |
| | π /4 DQPSK | 79 |
| | 8DPSK | 79 |

GFSK




π /4 DQPSK


Keysight Spectrum Analyzer - Swept SA
Start Freq 2.400000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
06:00:04 PM May 06, 2022
ΔMkr1 78.323 0 MHz
0.156 dB
10 dB/div
Log
Ref 20.00 dBm
Start 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48350 GHz
#Sweep 8.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.441750000 GHz
Start Freq
2.400000000 GHz
Stop Freq
2.483500000 GHz
CF Step
8.350000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

8DPSK

## 7. BANDWIDTH TEST

### 7.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C | |
|---|---|
| Section | Test Item |
| 15.247(a)(1) | Bandwidth |

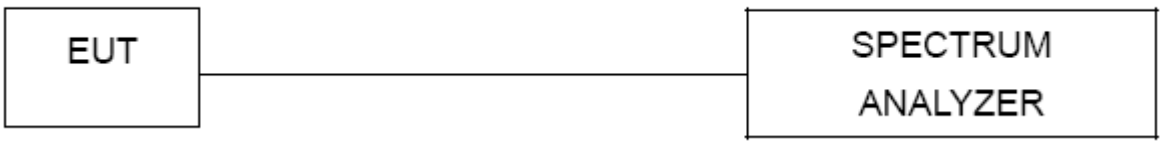
#### 7.1.1 TEST PROCEDURE

1. Set RBW = 30 kHz.
2. Set the video bandwidth (VBW) ≥RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

#### 7.1.2 DEVIATION FROM STANDARD

No deviation.

#### 7.1.3 TEST SETUP

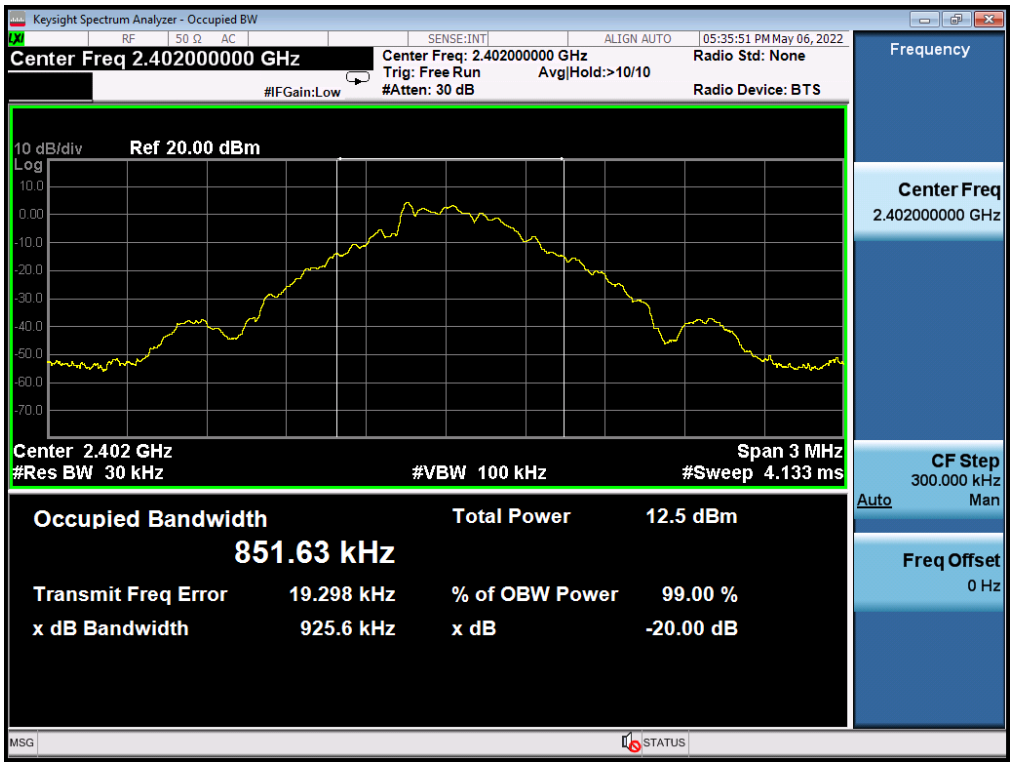



#### 7.1.4 EUT OPERATION CONDITIONS

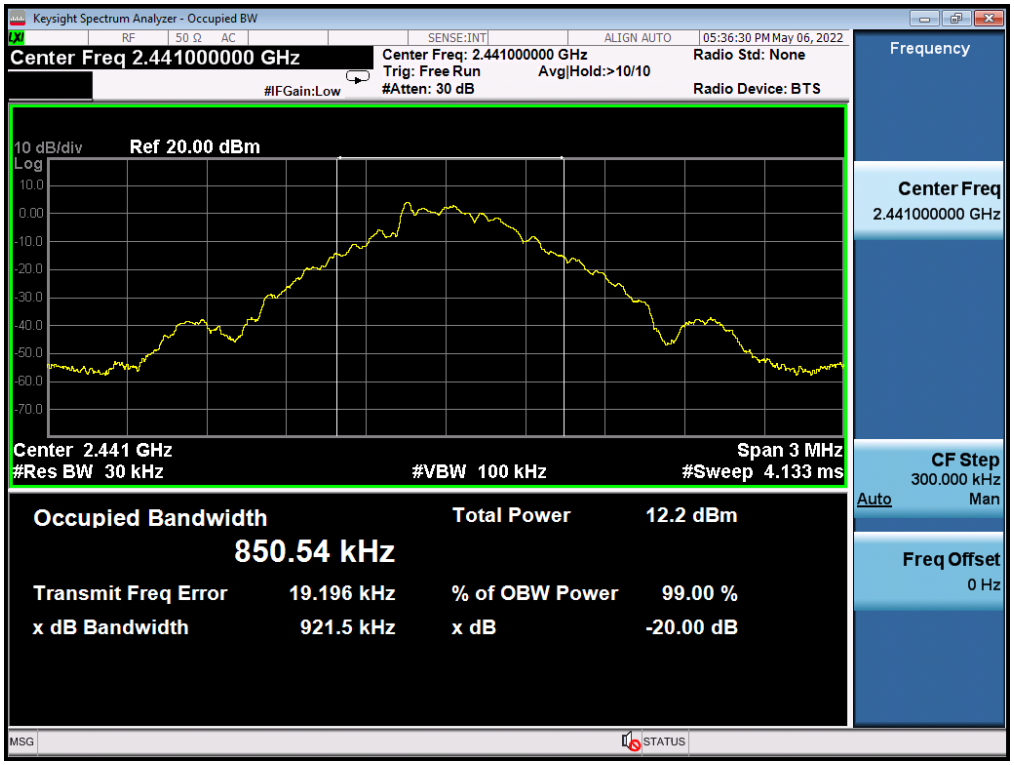
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

### 7.1.5 TEST RESULTS

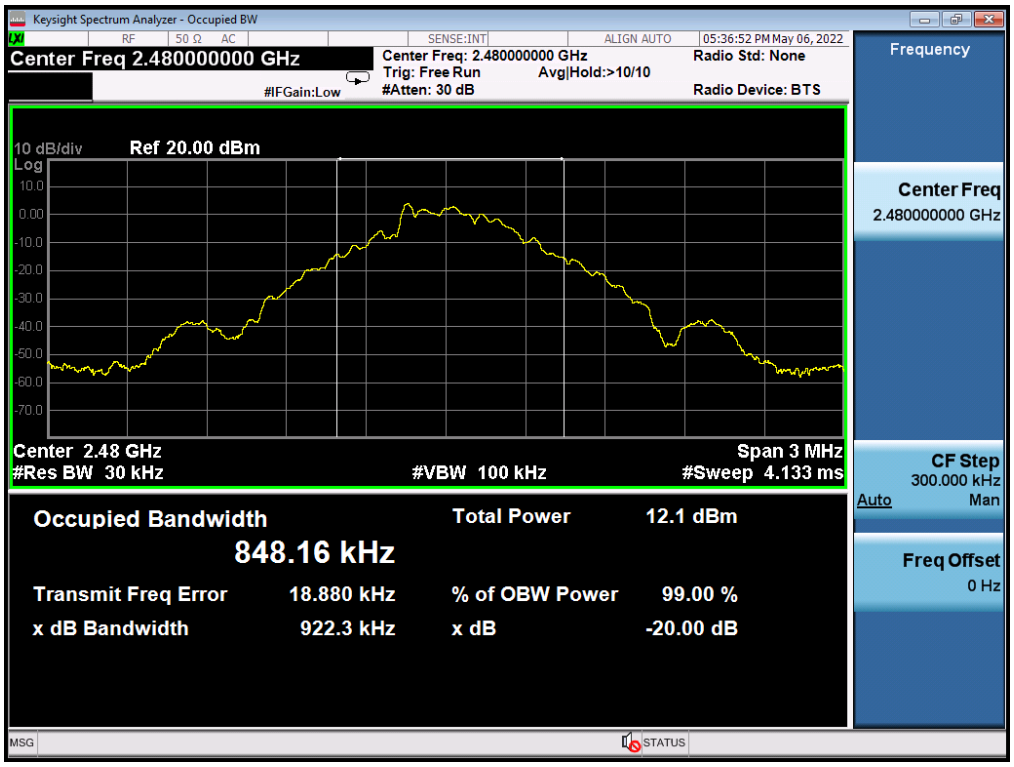
| | Frequency (MHz) | 20dB Bandwidth (MHz) | Result |
|---|---|---|---|
| GFSK | 2402 | 0.926 | Pass |
| | 2441 | 0.922 | Pass |
| | 2480 | 0.922 | Pass |
| π /4 DQPSK | 2402 | 1.317 | Pass |
| | 2441 | 1.224 | Pass |
| | 2480 | 1.225 | Pass |
| 8DPSK | 2402 | 1.264 | Pass |
| | 2441 | 1.212 | Pass |
| | 2480 | 1.212 | Pass |



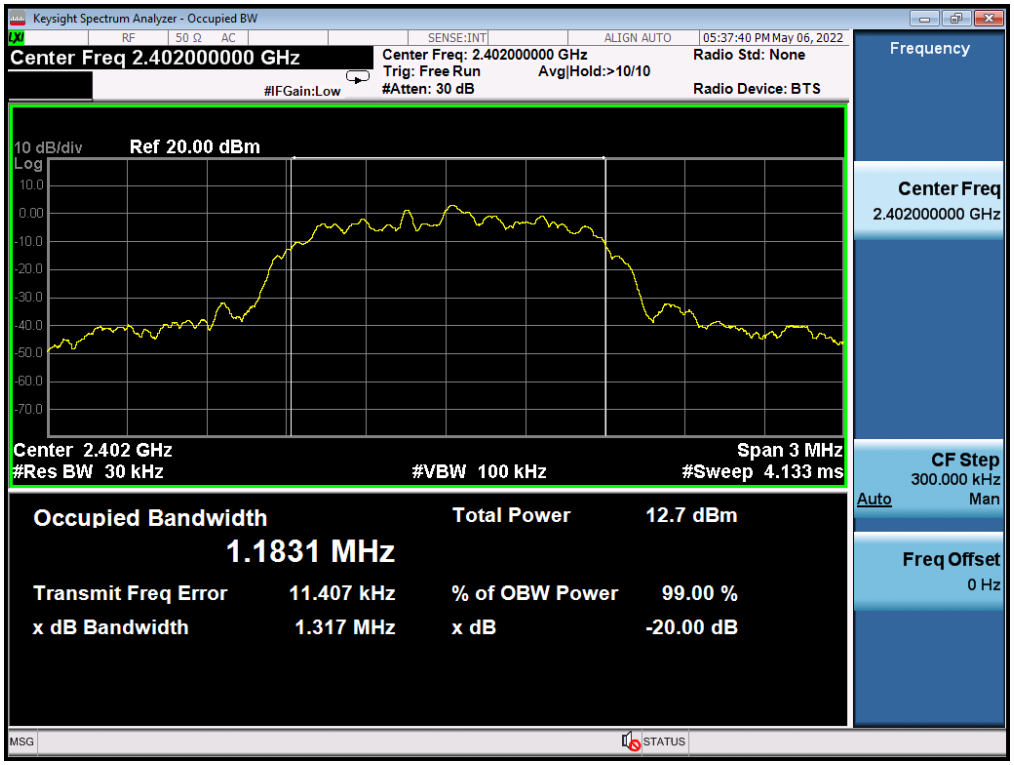

GFSK 2402MHz



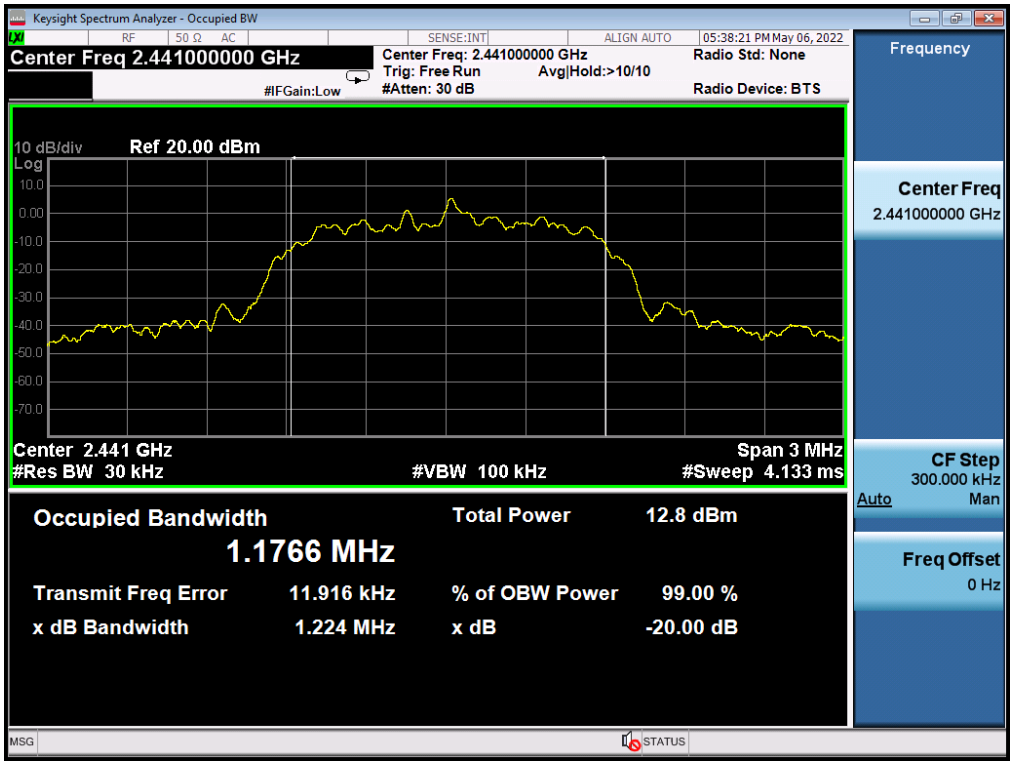

GFSK 2441MHz



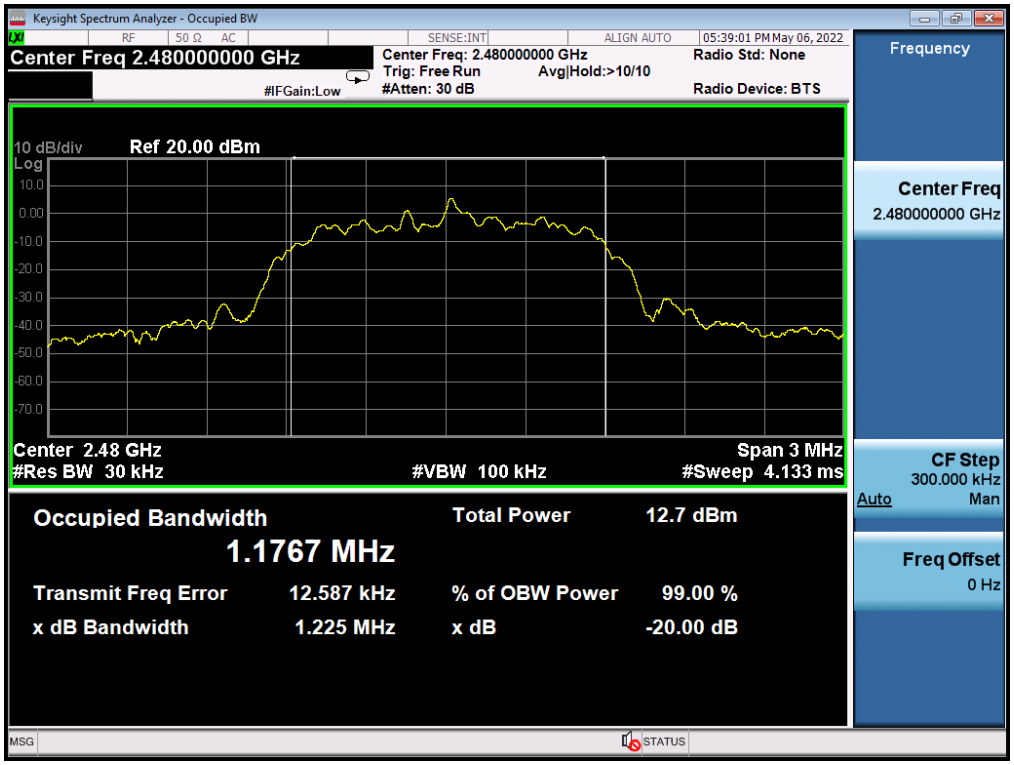

GFSK 2480MHz



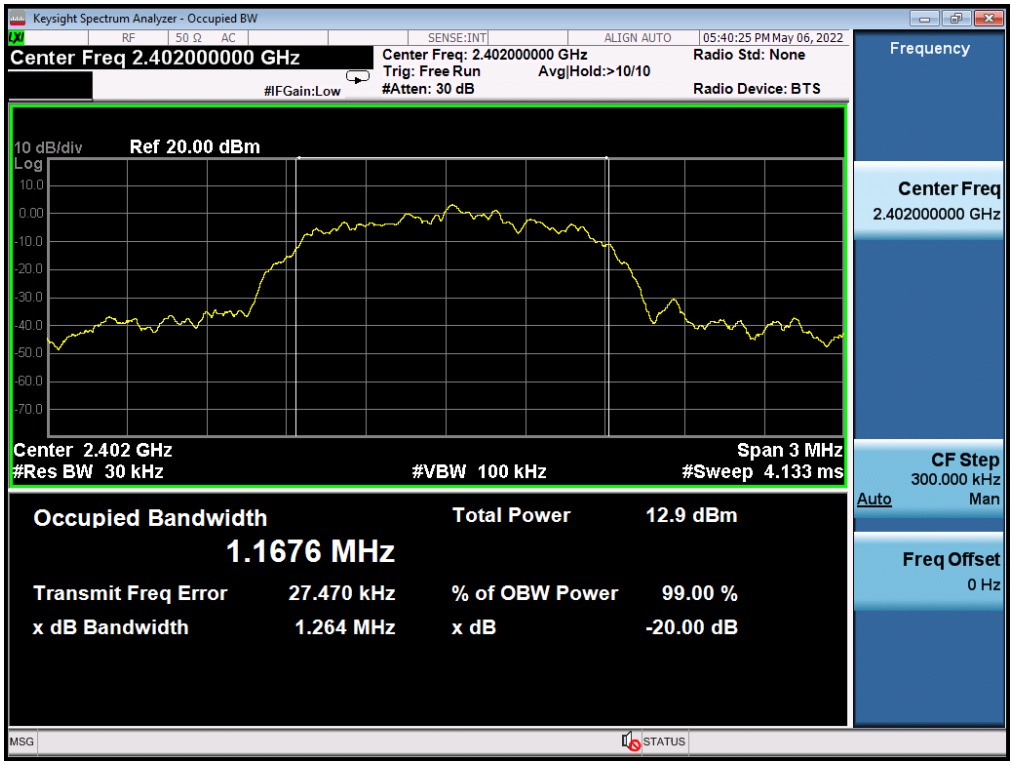

π /4 DQPSK 2402MHz



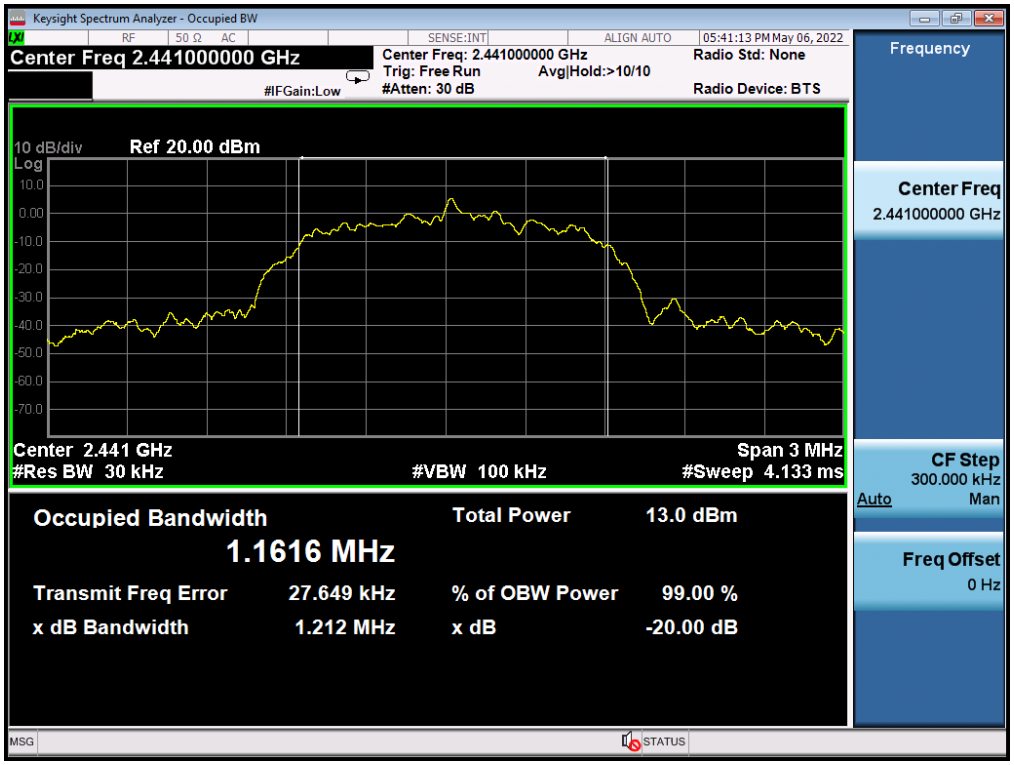

π /4 DQPSK 2441MHz



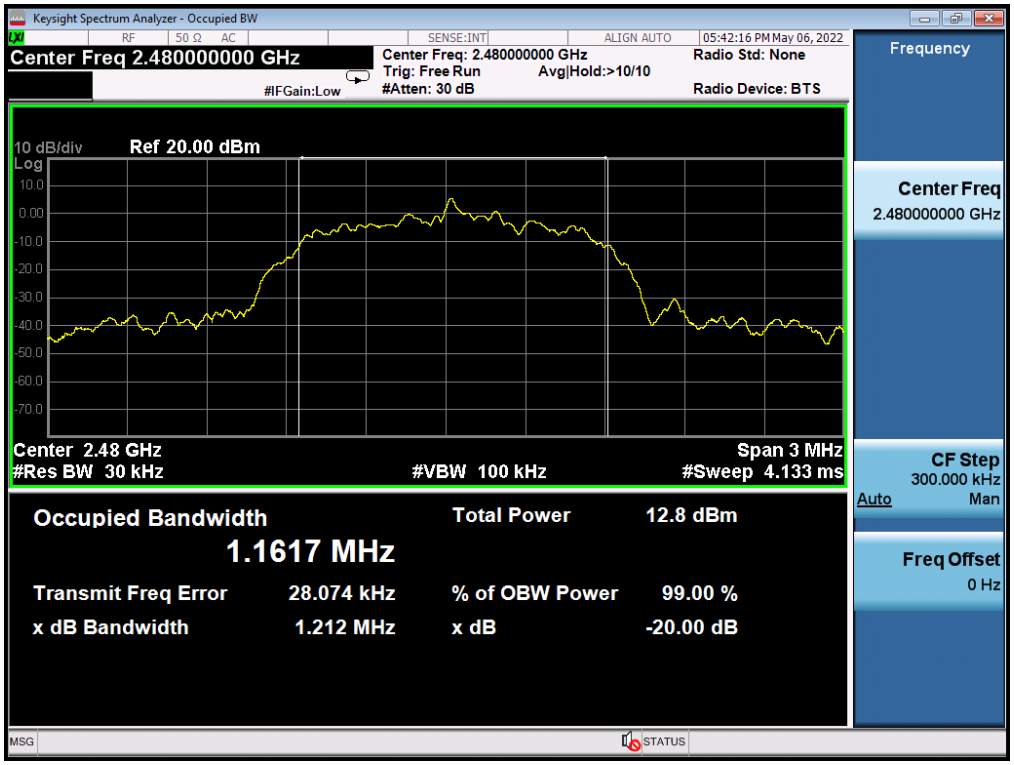

π /4 DQPSK 2480MHz




8DPSK 2402MHz




8DPSK 2441MHz




8DPSK 2480MHz

# 8. HOPPING CHANNEL SEPARATION MEASUREMENT

## 8.1 APPLIED PROCEDURES / LIMIT

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.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > Measurement Bandwidth or Channel Separation |
| RB | 100 kHz (Channel Separation) |
| VB | 300 kHz (Channel Separation) |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

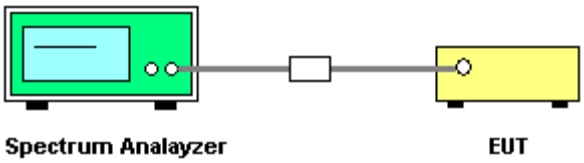
### 8.1.1 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
b. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised for channel separation measurement.

### 8.1.2 DEVIATION FROM STANDARD

No deviation.

### 8.1.3 TEST SETUP




### 8.1.4 EUT OPERATION CONDITIONS

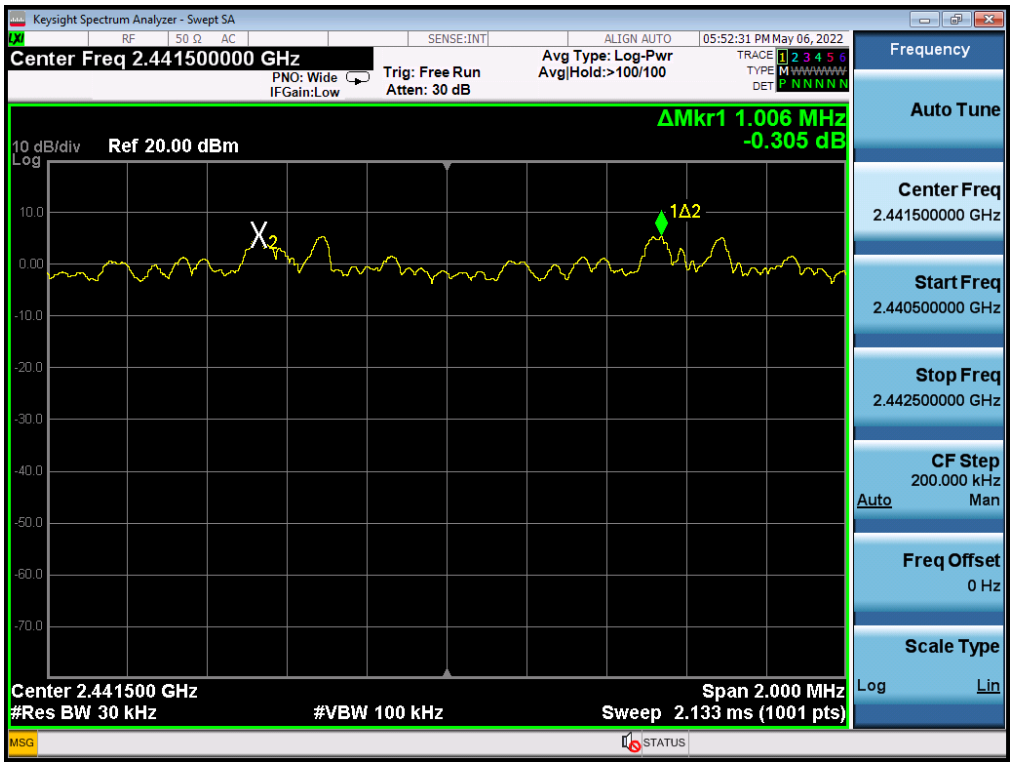
The EUT was programmed to be in continuously transmitting mode.

### 8.1.5 TEST RESULTS

| | | | |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 60% |
| Pressure: | 1012 hPa | Test Voltage : | AC 120V/60Hz |

| Test Mode | Ch. Separation (MHz) | Limit (MHz) | Result |
|---|---|---|---|
| GFSK | 1.016 | 0.615 | Complies |
| π /4 DQPSK | 1.006 | 0.816 | Complies |
| 8DPSK | 1.022 | 0.808 | Complies |

GFSK




π /4 DQPSK

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.441500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:53:57 PM May 06, 2022
ΔMkr1 1.022 MHz
-0.940 dB
10 dB/div Ref 20.00 dBm
Log
Center 2.441500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2.000 MHz
Sweep 2.133 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.441500000 GHz
Start Freq
2.440500000 GHz
Stop Freq
2.442500000 GHz
CF Step
200.000 kHz
Auto Man
Freq Offset
0 Hz
Scale Type
Log Lin

8DPSK

## 9. DWELL TIME OF OCCUPANCY

### 9.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (a)(1)(iii) | Average Time of Occupancy | 0.4sec | 2400-2483.5 | PASS |

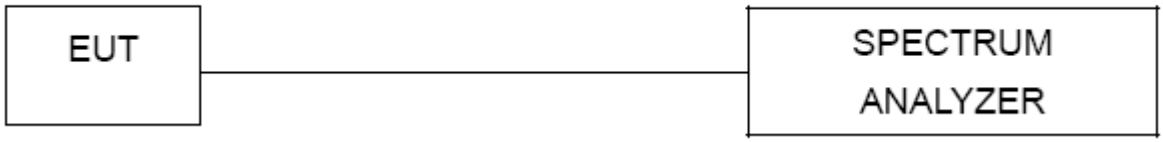
#### 9.1.1 TEST PROCEDURE

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0Hz;
3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

#### 9.1.2 DEVIATION FROM STANDARD

No deviation.

#### 9.1.3 TEST SETUP




#### 9.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

### 9.1.5 TEST RESULTS

GFSK DH5 mode:

| Frequency | Packet | Dwell time(ms) | Limit(ms) | Result |
|---|---|---|---|---|
| 2402MHz | DH5 | 313.60 | 400 | Pass |
| 2441MHz | DH5 | 313.60 | 400 | Pass |
| 2480MHz | DH5 | 317.87 | 400 | Pass |

Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

Test channel: as blow

CH:2402MHz time slot=2.940(ms)*(1600/ (6*79))*31.6=313.60ms

CH:2441MHz time slot=2.940(ms)*(1600/ (6*79))*31.6=313.60ms

CH:2480MHz time slot=2.980(ms)*(1600/ (6*79))*31.6=317.87ms

π/4-DQPSK mode:

| Frequency | Packet | Dwell time(ms) | Limit(ms) | Result |
|---|---|---|---|---|
| 2402MHz | 2DH5 | 313.60 | 400 | Pass |
| 2441MHz | 2DH5 | 315.73 | 400 | Pass |
| 2480MHz | 2DH5 | 313.60 | 400 | Pass |

Remarks:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

Test channel: as blow

CH:2402MHz time slot=2.940(ms)*(1600/ (6*79))*31.6=313.60ms

CH:2441MHz time slot=2.960(ms)*(1600/ (6*79))*31.6=315.73ms

CH:2480MHz time slot=2.940(ms)*(1600/ (6*79))*31.6=313.60ms

8DPSK mode:

| Frequency | Packet | Dwell time(ms) | Limit(ms) | Result |
|---|---|---|---|---|
| 2402MHz | 3DH5 | 313.60 | 400 | Pass |
| 2441MHz | 3DH5 | 313.60 | 400 | Pass |
| 2480MHz | 3DH5 | 313.60 | 400 | Pass |

Remarks:

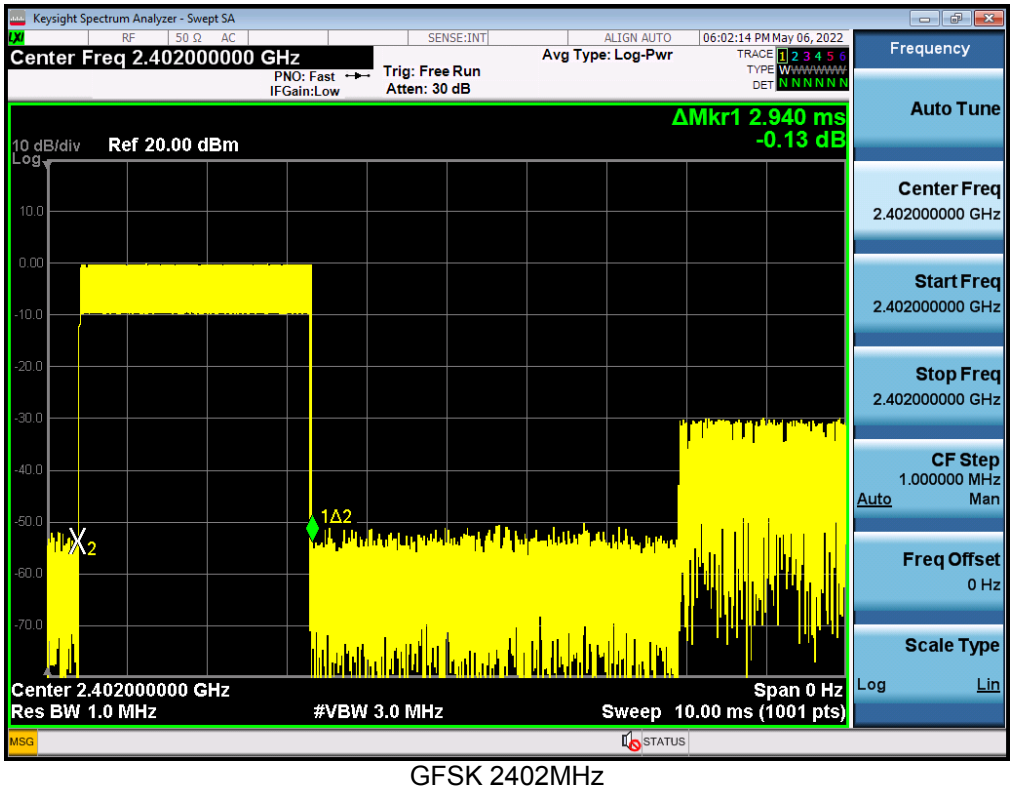
The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

Test channel: as blow

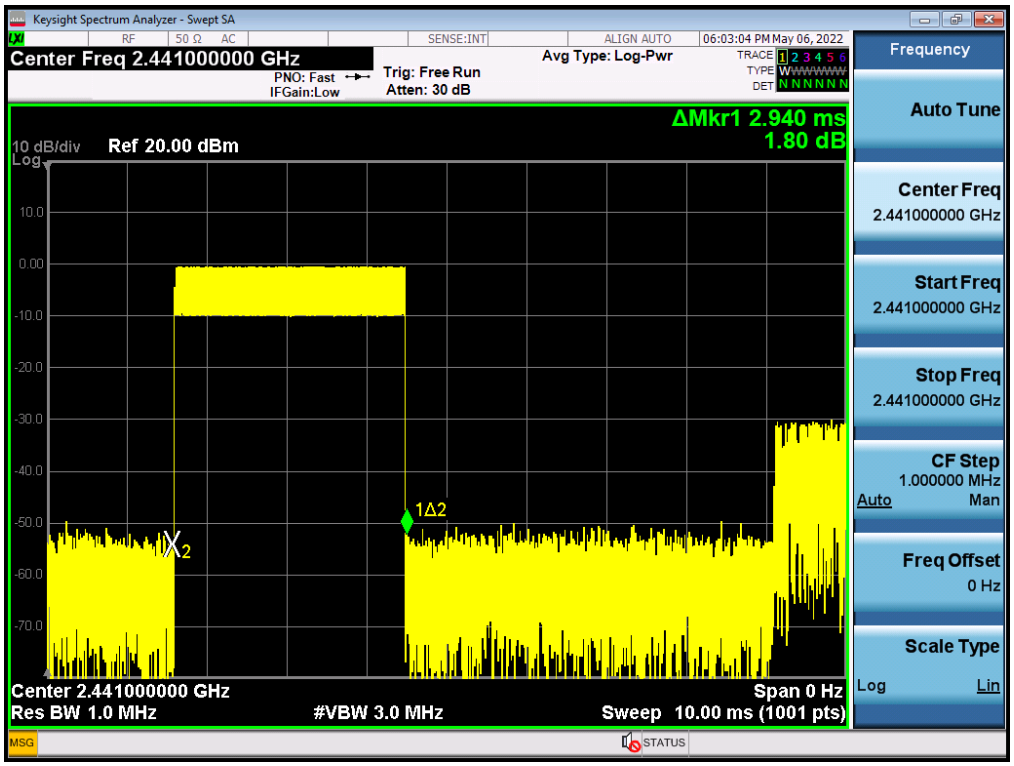
CH:2402MHz time slot=2.940(ms)*(1600/ (6*79))*31.6=313.60ms

CH:2441MHz time slot=2.940(ms)*(1600/ (6*79))*31.6=313.60ms

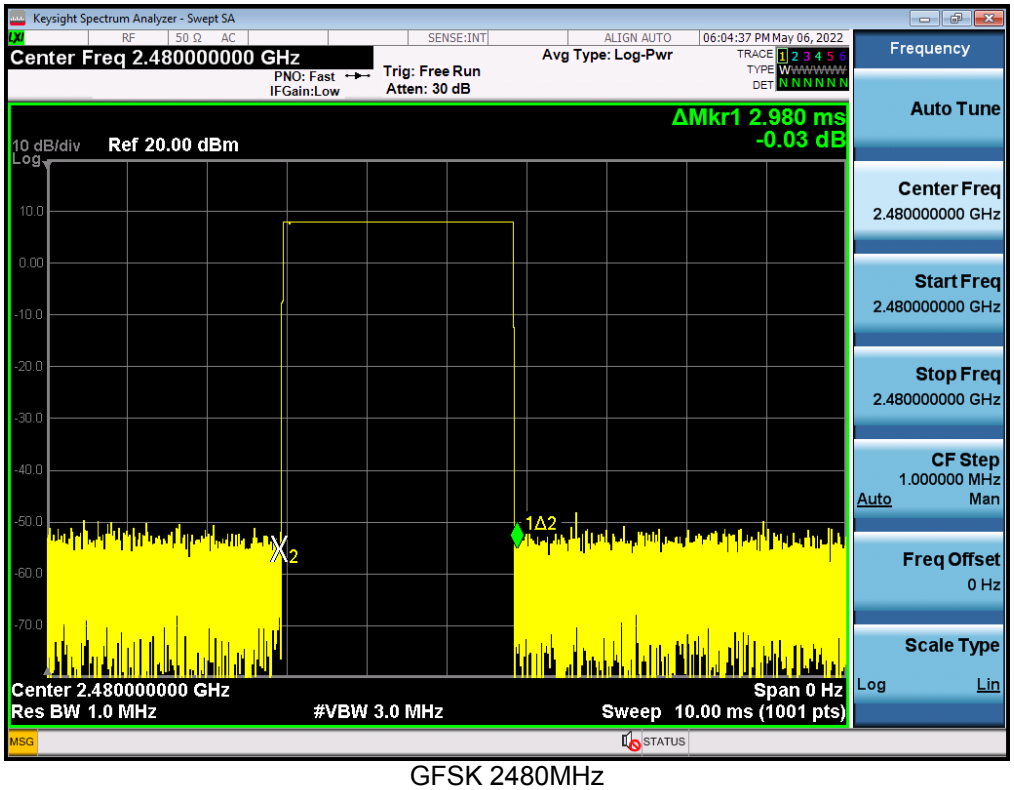
CH:2480MHz time slot=2.940(ms)*(1600/ (6*79))*31.6=313.60ms



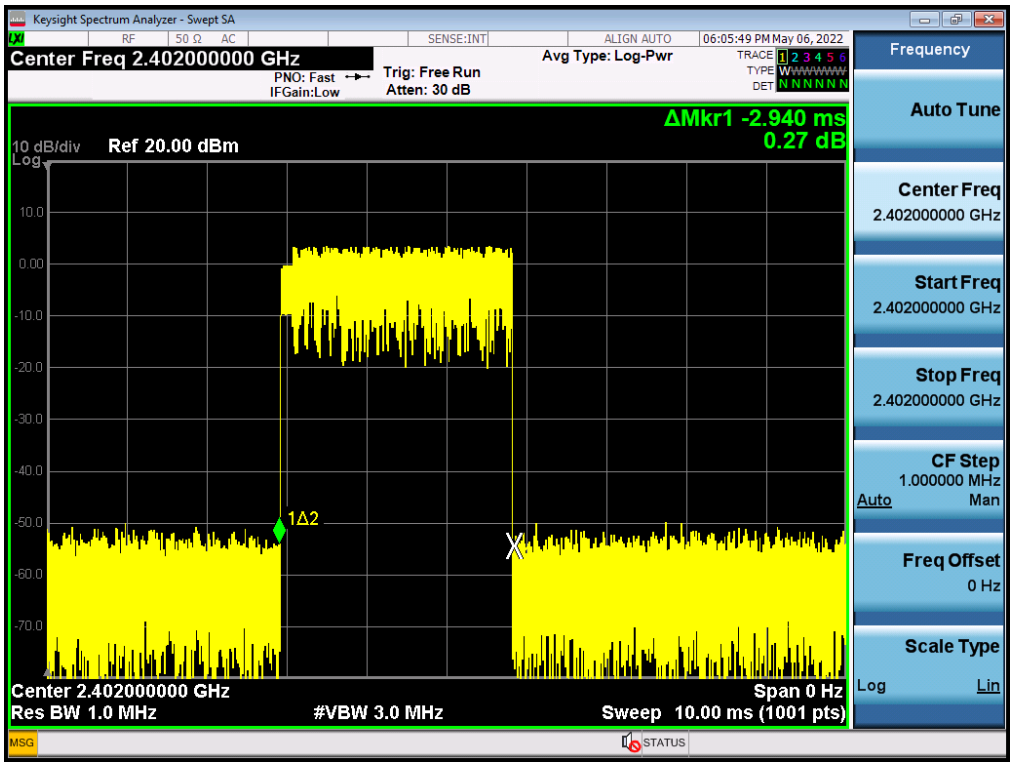

GFSK 2402MHz



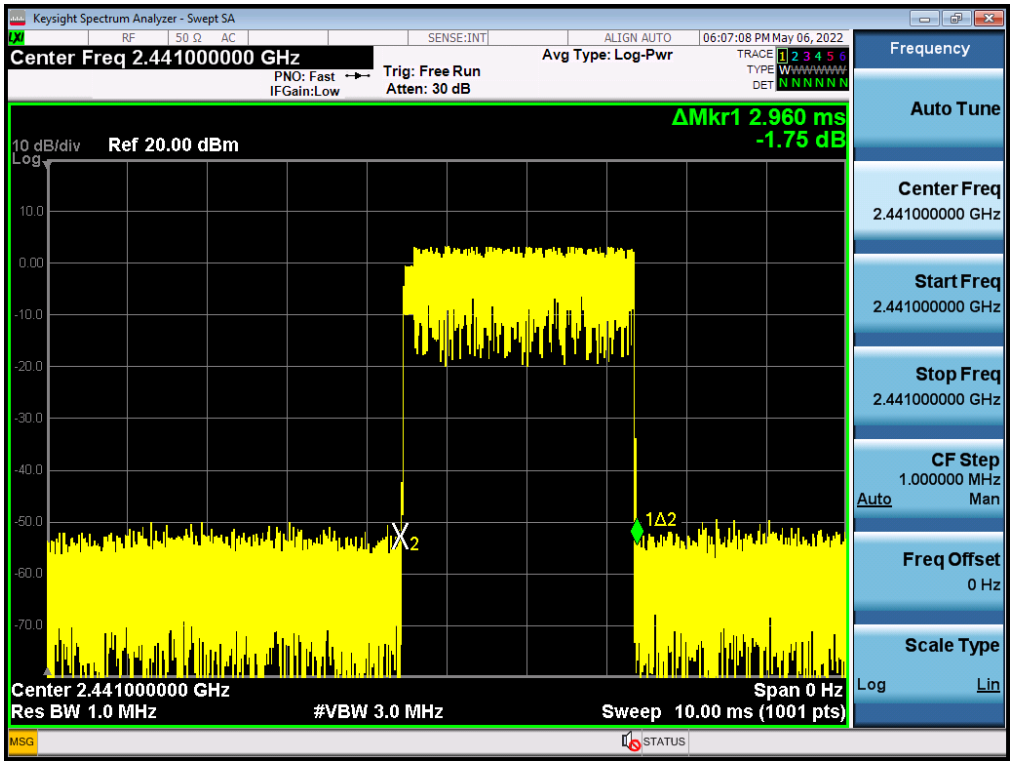

GFSK 2441MHz



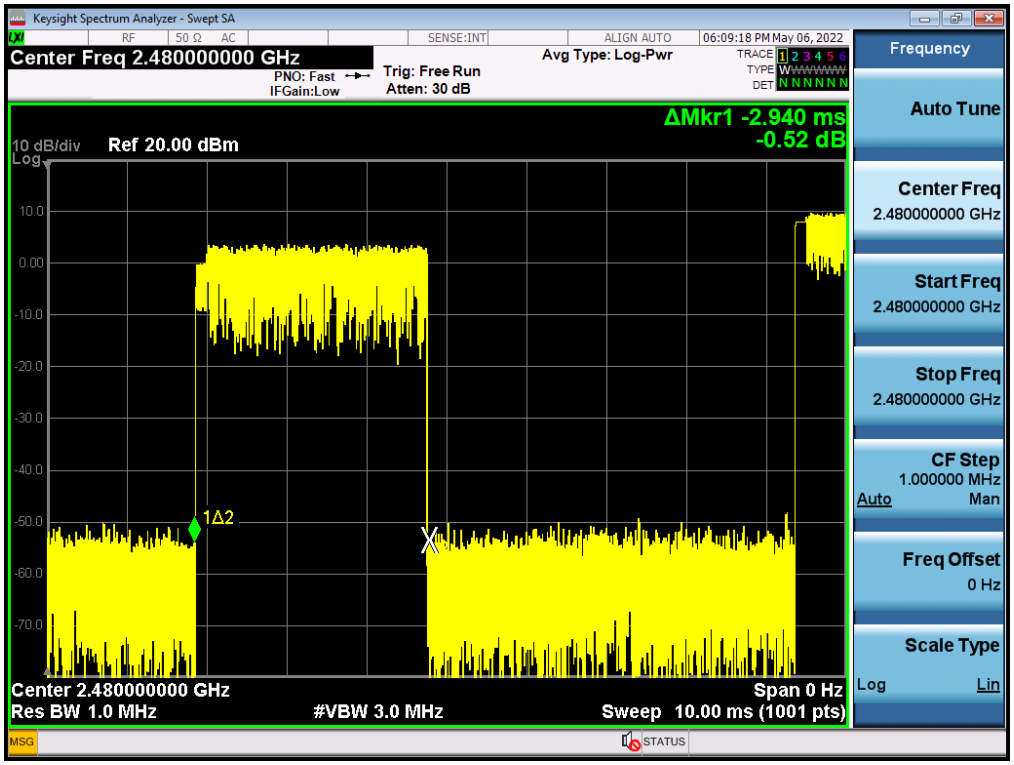

GFSK 2480MHz



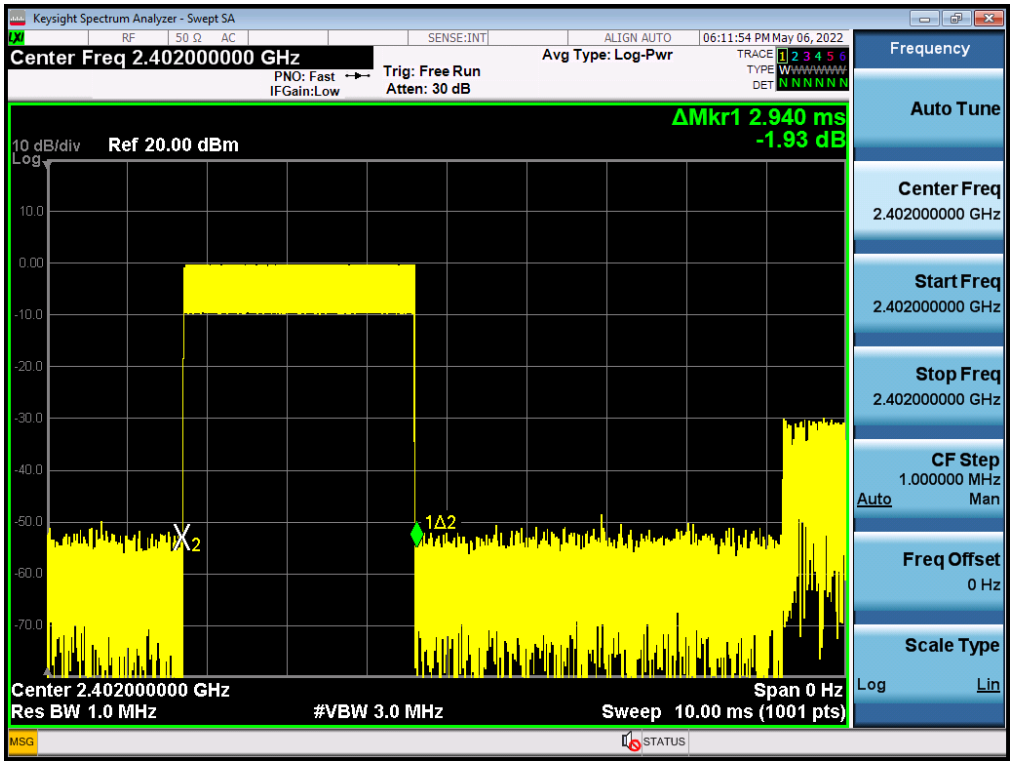

π /4 DQPSK 2402MHz



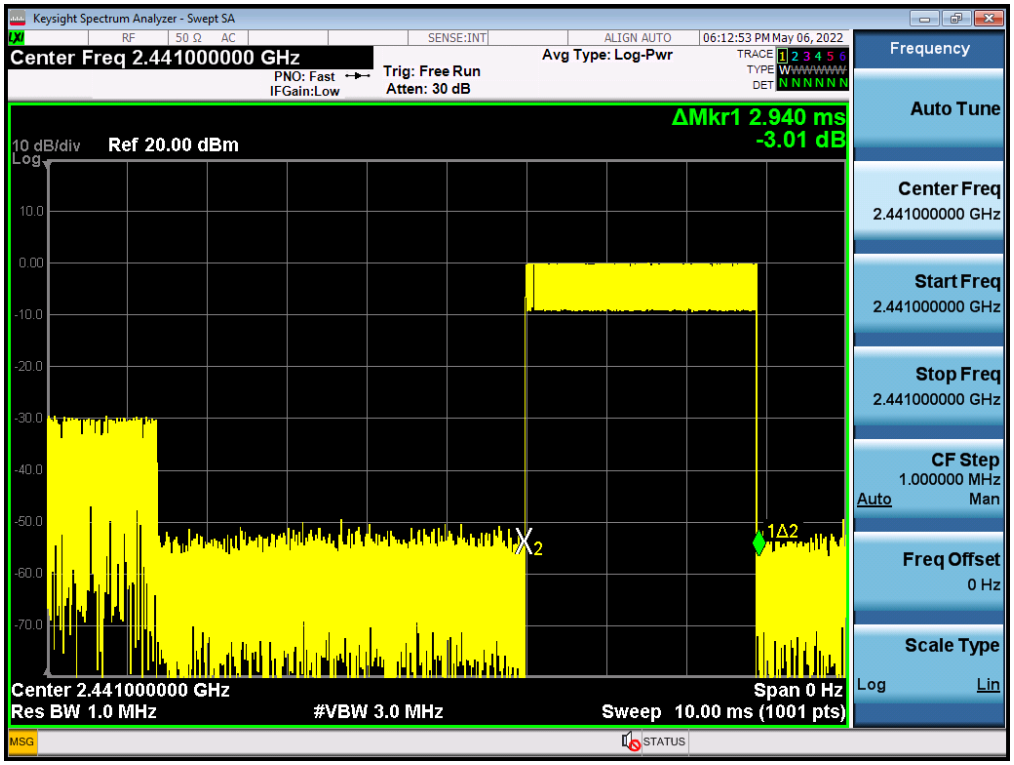

π /4 DQPSK 2441MHz



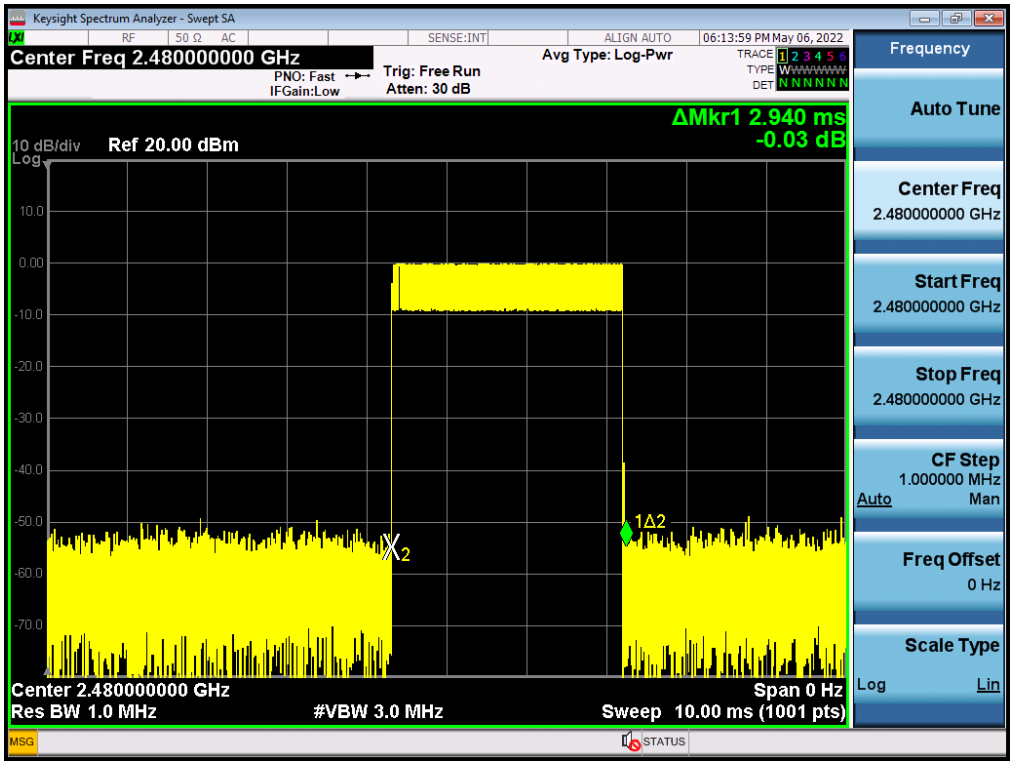

π /4 DQPSK 2480MHz




8DPSK 2402MHz




8DPSK 2441MHz




8DPSK 2480MHz

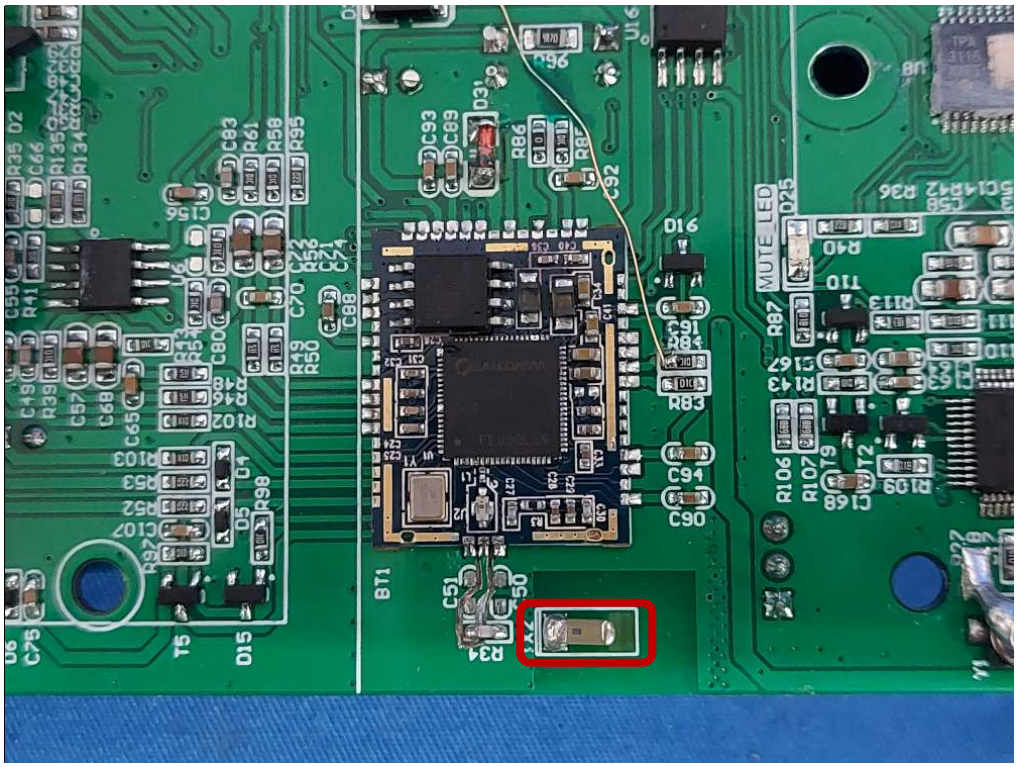
## 10. ANTENNA REQUIREMENT

### 10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### 10.2 EUT ANTENNA

The EUT antenna is Chip antenna, It comply with the standard requirement.



## 11. TEST SEUUP PHOTO

Reference to the appendix I for details.

## 12. EUT PHOTO

Reference to the appendix II for details.

※※※※※ **END OF REPORT** ※※※※※