# FCC Part 15C Test Report
# FCC ID: 2A3GH-MX10

| | |
|---|---|
| Applicant: | Mopink(shenzhen)Technology Limited. |
| Address: | Building 3, No. 41, Anliang Yanhe Road, Henggang District, Shenzhen, China |
| Manufacturer: | Mopink(shenzhen)Technology Limited. |
| Address: | Building 3, No. 41, Anliang Yanhe Road, Henggang District, Shenzhen, China |
| EUT: | Smart glasses |
| Trade Mark: | N/A |
| Model Number: | MX10, MX01, MX02, MX03, MX04, MX05, MX06, MX07, MX08, MX09, MX11, MX12, MX13, MX14, MX15 |
| Date of Receipt: | Oct. 11, 2021 |
| Test Date: | Oct. 11, 2021 - Oct. 23, 2021 |
| Date of Report: | Oct. 23, 2021 |
| 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-20211019001-1E |

| | |
|---|---|
| Prepared (Test Engineer): | Alisa Song |
| 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.*

**Table of Contents** **Page**


1 . SUMMARY OF TEST RESULTS 4
1.1 MEASUREMENT UNCERTAINTY 4
2 . GENERAL INFORMATION 5
2.1 GENERAL DESCRIPTION OF EUT 5
2.2 DESCRIPTION OF TEST MODES 6
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED 7
2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE) 7
2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING 7
2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS 8
3 . EMC EMISSION TEST 9
3.1 CONDUCTED EMISSION MEASUREMENT 9
3.1.1 POWER LINE CONDUCTED EMISSION LIMITS 9
3.1.2 TEST PROCEDURE 9
3.1.3 DEVIATION FROM TEST STANDARD 9
3.1.4 TEST SETUP 10
3.1.5 EUT OPERATING CONDITIONS 10
3.1.6 TEST RESULTS 10
3.2 RADIATED EMISSION MEASUREMENT 13
3.2.1 RADIATED EMISSION LIMITS 13
3.2.2 TEST PROCEDURE 14
3.2.3 DEVIATION FROM TEST STANDARD 14
3.2.4 TEST SETUP 14
3.2.5 EUT OPERATING CONDITIONS 15
3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ) 16
3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ) 17
3.2.8 TEST RESULTS (1GHZ~25GHZ) 19
3.3 RADIATED BAND EMISSION MEASUREMENT 23
3.3.1 TEST REQUIREMENT: 23
3.3.2 TEST PROCEDURE 23
3.3.3 DEVIATION FROM TEST STANDARD 23
3.3.4 TEST SETUP 24
3.3.5 EUT OPERATING CONDITIONS 24
4 . PEAK OUTPUT POWER 36
4.1 APPLIED PROCEDURES / LIMIT 36
4.1.1 TEST PROCEDURE 36
4.1.2 DEVIATION FROM STANDARD 36
4.1.3 TEST SETUP 36
4.1.4 EUT OPERATION CONDITIONS 36

**Table of Contents** **Page**


4.1.5 TEST RESULTS 37

5 . NUMBER OF HOPPING CHANNEL 40

5.1 APPLIED PROCEDURES / LIMIT 40

5.1.1 TEST PROCEDURE 40

5.1.2 DEVIATION FROM STANDARD 40

5.1.3 TEST SETUP 40

5.1.4 EUT OPERATION CONDITIONS 40

5.1.5 TEST RESULTS 40

6 . BANDWIDTH TEST 42

6.1 APPLIED PROCEDURES / LIMIT 42

6.1.1 TEST PROCEDURE 42

6.1.2 DEVIATION FROM STANDARD 42

6.1.3 TEST SETUP 42

6.1.4 EUT OPERATION CONDITIONS 42

6.1.5 TEST RESULTS 43

7 . HOPPING CHANNEL SEPARATION MEASUREMENT 46

7.1 APPLIED PROCEDURES / LIMIT 46

7.1.1 TEST PROCEDURE 46

7.1.2 DEVIATION FROM STANDARD 46

7.1.3 TEST SETUP 46

7.1.4 EUT OPERATION CONDITIONS 46

7.1.5 TEST RESULTS 46

8 . DWELL TIME OF OCCUPANCY 48

8.1 APPLIED PROCEDURES / LIMIT 48

8.1.1 TEST PROCEDURE 48

8.1.2 DEVIATION FROM STANDARD 48

8.1.3 TEST SETUP 48

8.1.4 EUT OPERATION CONDITIONS 48

8.1.5 TEST RESULTS 49

9 . ANTENNA REQUIREMENT 52

9.1 STANDARD REQUIREMENT 52

9.2 EUT ANTENNA 52

10 . TEST SETUP PHOTO 53

11 . EUT PHOTO 55

## 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 | |
| 15.247(c) | Radiated Spurious Emission | PASS | |
| 15.205 | Band Edge Emission | PASS | |
| 15.247(b)(1) | Peak Output Power | PASS | |
| 15.247(a)(iii) | Number of Hopping Frequency | PASS | |
| 15.247(a)(iii) | Dwell Time | PASS | |
| 15.247(a)(1) | Bandwidth | PASS | |
| 15.247(a)(1) | Hopping Channel Separation | PASS | |
| 15.203 | Antenna Requirement | PASS | |

NOTE:

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

### 1.1 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: | Smart glasses |
| Trademark | N/A |
| Model No.: | MX10, MX01, MX02, MX03, MX04, MX05, MX06, MX07, MX08, MX09, MX11, MX12, MX13, MX14, MX15 |
| Model Difference | All samples are the same except the model name, so we prepare " MX10" for test only. |
| BT Version: | 5.0 |
| Operation Frequency: | 2402~2480MHz |
| Channel numbers: | 79 Channels |
| Channel separation: | 1/2/3M |
| Modulation technology: | GFSK , π/4 DQPSK, 8DPSK |
| Antenna Type: | Internal Antenna |
| Antenna gain: | 2.4dBi |
| Power supply: | DC 5V from charger<br>DC 3.7V from battery |

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.

3.The RF chip used on the left and right sides of the PCB board of this product and the circuit schematic diagr am of the PCB board are the same.

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.

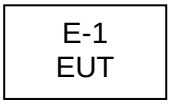
| Pretest Mode | Description | |
|---|---|---|
| Mode 1 | CH00 | GFSK,π/4 DQPSK,8DPSK |
| Mode 2 | CH39 | |
| Mode 3 | CH78 | |
| Mode 4 | Link Mode | |
| **For Conducted & Radiated Emission** | | |
| Final Test Mode | Description | |
| Mode 1 | CH00 | GFSK,π/4 DQPSK,8DPSK |
| Mode 2 | CH39 | |
| Mode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

Note:

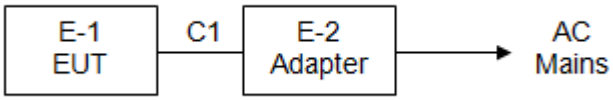
(1) The measurements are performed at the highest, middle, lowest available channels.

## 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 | Smart glasses | MX10 | N/A | EUT |
| E-2 | Adapter | HW-0501000E | N/A | Provide by test lab<br>Input: AC 100-240V 50/60Hz<br>Output: DC 5V/1A |

| 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: FCC_V2.24 | | |
|---|---|---|---|
| Frequency | 2402 MHz | 2441 MHz | 2480 MHz |
| Power Setting of Softwave | 10 | 10 | 10 |

## 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 | Dec. 07, 2020 | Dec. 06, 2021 |
| 2 | Test Receiver (9kHz-7GHz) | R&S | ESRP7 | 101393 | Dec. 07, 2020 | Dec. 06, 2021 |
| 3 | Bilog Antenna (30MHz-1GHz) | R&S | VULB9162 | 00306 | Dec. 07, 2020 | Dec. 06, 2021 |
| 4 | Horn Antenna (1GHz-18GHz) | Schwarzbeck | BBHA9120D | 02139 | Dec. 07, 2020 | Dec. 06, 2021 |
| 5 | Horn Antenna (18GHz-40GHz) | A.H. Systems | SAS-574 | 588 | Dec. 07, 2020 | Dec. 06, 2021 |
| 6 | Amplifier (9KHz-6GHz) | Schwarzbeck | BBV9743B | 00153 | Dec. 07, 2020 | Dec. 06, 2021 |
| 7 | Amplifier (1GHz-18GHz) | EMEC | EM01G8GA | 00270 | Dec. 07, 2020 | Dec. 06, 2021 |
| 8 | Amplifier (18GHz-40GHz) | Quanjuda | DLE-161 | 97 | Dec. 07, 2020 | Dec. 06, 2021 |
| 9 | Loop Antenna (9KHz-30MHz) | Schwarzbeck | FMZB1519B | 00014 | Dec. 07, 2020 | Dec. 06, 2021 |
| 10 | RF cables1 (9kHz-1GHz) | ChengYu | 966 | 004 | Dec. 07, 2020 | Dec. 06, 2021 |
| 11 | RF cables2 (1GHz-40GHz) | ChengYu | 966 | 003 | Dec. 07, 2020 | Dec. 06, 2021 |
| 12 | Antenna connector | Florida RF Labs | N/A | RF 01# | Dec. 07, 2020 | Dec. 06, 2021 |
| 13 | Power probe | KEYSIGHT | U2021XA | MY55210018 | Dec. 07, 2020 | Dec. 06, 2021 |
| 14 | Signal Analyzer 9kHz-26.5GHz | Agilent | N9020A | MY55370280 | Dec. 07, 2020 | Dec. 06, 2021 |
| 15 | Test Receiver 20kHz-40GHz | R&S | ESU 40 | 100376 | Dec. 07, 2020 | Dec. 06, 2021 |
| 16 | D.C. Power Supply | LongWei | PS-305D | 010964729 | Dec. 07, 2020 | Dec. 06, 2021 |

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 | Dec. 07, 2020 | Dec. 06, 2021 |
| 3 | LISN | R&S | ENV216 | 102417 | Dec. 07, 2020 | Dec. 06, 2021 |
| 4 | 843 Cable 1# | ChengYu | CE Cable | 001 | Dec. 07, 2020 | Dec. 06, 2021 |

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.

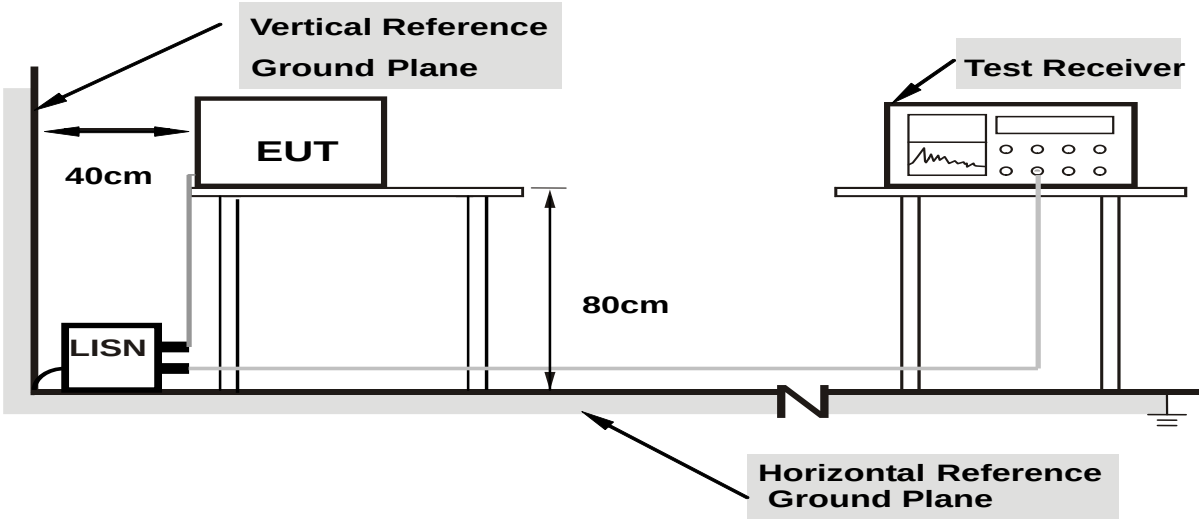
d. LISN at least 80 cm from nearest part of EUT chassis.

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



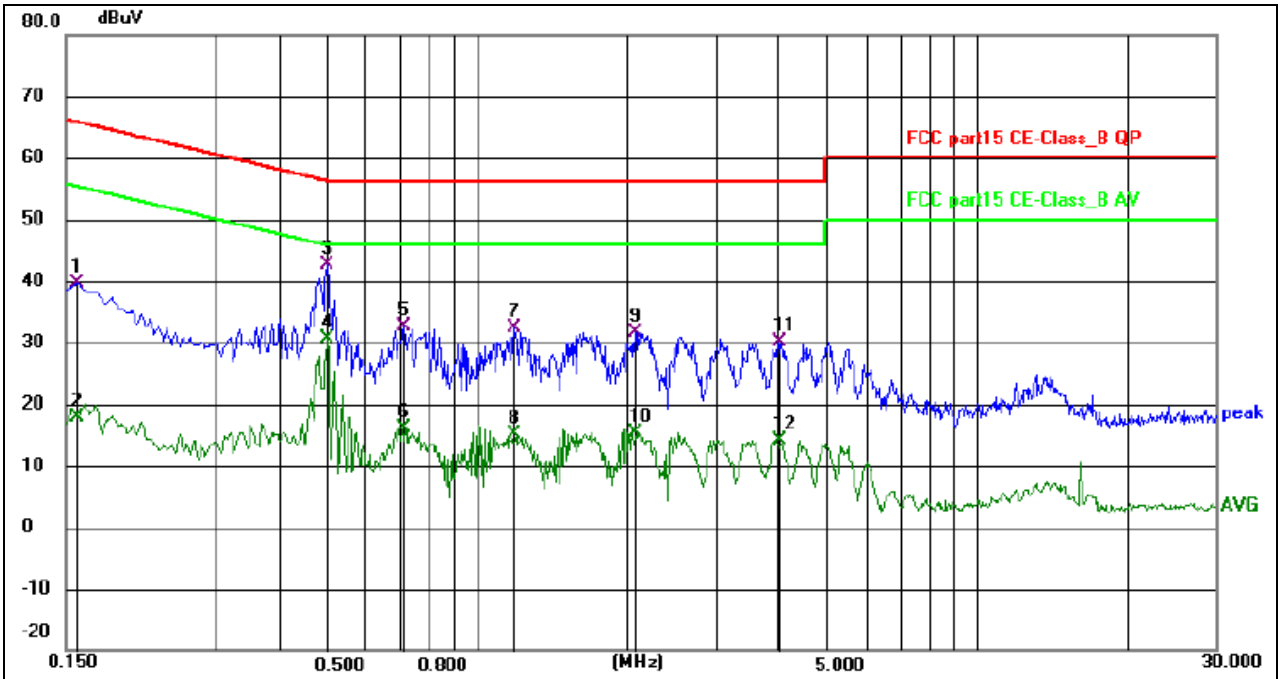

**Note: 1.Support units were connected to second LISN.**
**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes**

### 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

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

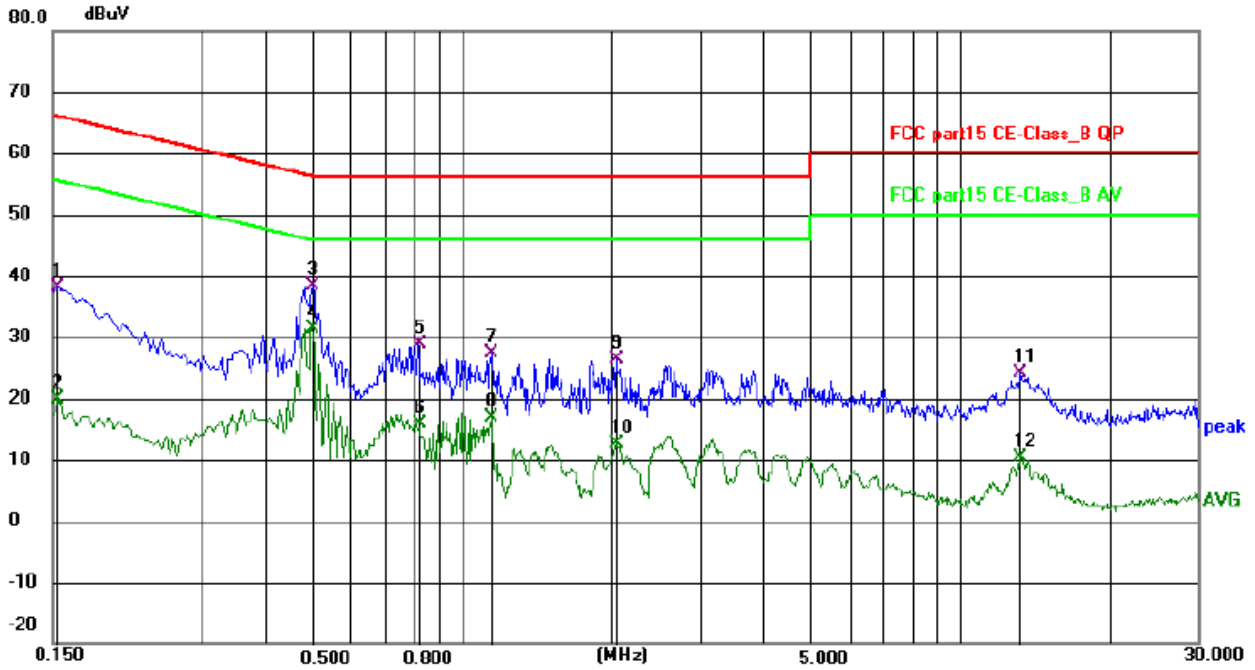



Remark:

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

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1590 | 29.22 | 10.49 | 39.71 | 65.52 | 25.81 | QP | P | |
| 2 | 0.1590 | 7.45 | 10.49 | 17.94 | 55.52 | 37.58 | AVG | P | |
| 3 * | 0.5010 | 33.17 | 9.35 | 42.52 | 56.00 | 13.48 | QP | P | |
| 4 | 0.5010 | 21.27 | 9.35 | 30.62 | 46.00 | 15.38 | AVG | P | |
| 5 | 0.7124 | 23.00 | 9.55 | 32.55 | 56.00 | 23.45 | QP | P | |
| 6 | 0.7124 | 6.47 | 9.55 | 16.02 | 46.00 | 29.98 | AVG | P | |
| 7 | 1.1894 | 22.79 | 9.55 | 32.34 | 56.00 | 23.66 | QP | P | |
| 8 | 1.1894 | 5.58 | 9.55 | 15.13 | 46.00 | 30.87 | AVG | P | |
| 9 | 2.0714 | 21.78 | 9.93 | 31.71 | 56.00 | 24.29 | QP | P | |
| 10 | 2.0714 | 5.42 | 9.93 | 15.35 | 46.00 | 30.65 | AVG | P | |
| 11 | 4.0020 | 20.33 | 9.76 | 30.09 | 56.00 | 25.91 | QP | P | |
| 12 | 4.0020 | 4.34 | 9.76 | 14.10 | 46.00 | 31.90 | AVG | P | |

| | | | |
|---|---|---|---|
| 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

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1544 | 27.73 | 10.40 | 38.13 | 65.76 | 27.63 | QP | P | |
| 2 | 0.1544 | 9.57 | 10.40 | 19.97 | 55.76 | 35.79 | AVG | P | |
| 3 | 0.5010 | 28.75 | 9.55 | 38.30 | 56.00 | 17.70 | QP | P | |
| 4 * | 0.5010 | 21.84 | 9.55 | 31.39 | 46.00 | 14.61 | AVG | P | |
| 5 | 0.8158 | 19.42 | 9.44 | 28.86 | 56.00 | 27.14 | QP | P | |
| 6 | 0.8158 | 6.37 | 9.44 | 15.81 | 46.00 | 30.19 | AVG | P | |
| 7 | 1.1444 | 17.73 | 9.63 | 27.36 | 56.00 | 28.64 | QP | P | |
| 8 | 1.1444 | 7.17 | 9.63 | 16.80 | 46.00 | 29.20 | AVG | P | |
| 9 | 2.0400 | 16.50 | 9.99 | 26.49 | 56.00 | 29.51 | QP | P | |
| 10 | 2.0400 | 2.75 | 9.99 | 12.74 | 46.00 | 33.26 | AVG | P | |
| 11 | 13.2225 | 13.73 | 10.30 | 24.03 | 60.00 | 35.97 | QP | P | |
| 12 | 13.2225 | 0.19 | 10.30 | 10.49 | 50.00 | 39.51 | AVG | P | |

## 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 ( Above 18GHz the distance is 1 meter).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel

Note:

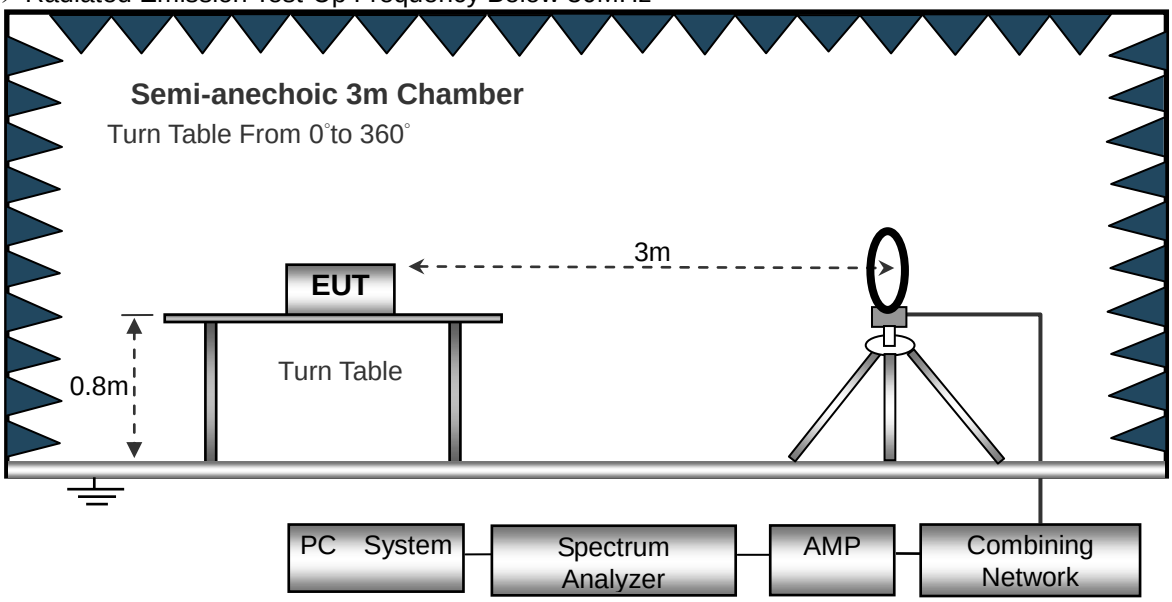
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.2.3 DEVIATION FROM TEST STANDARD

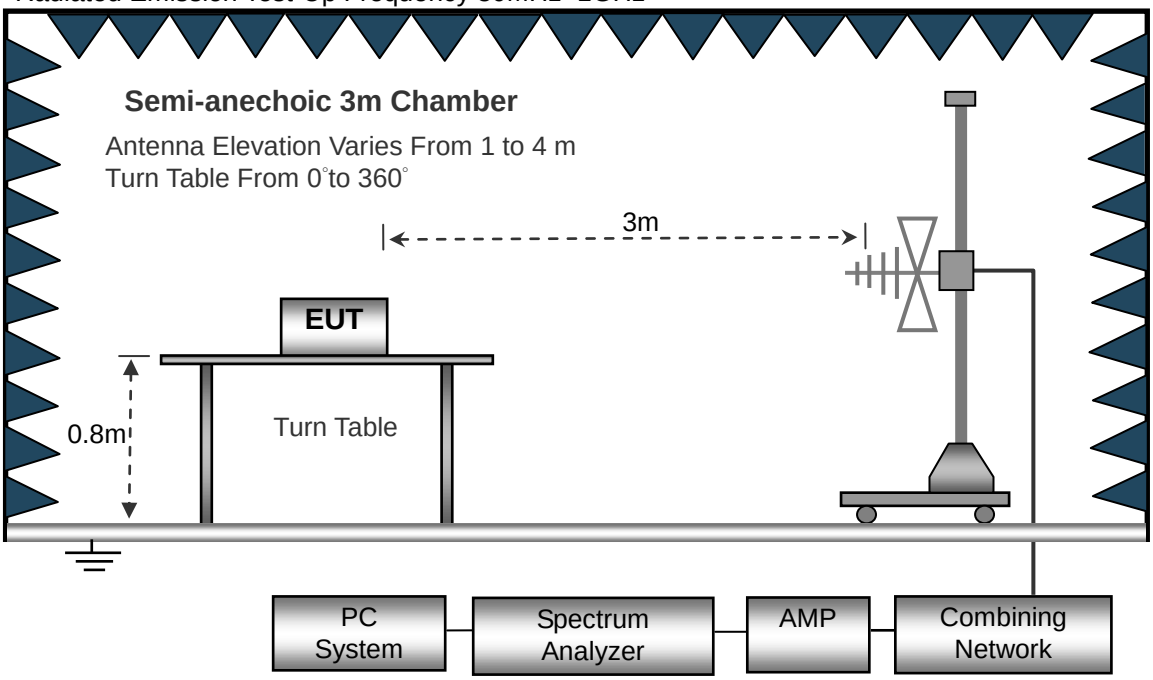
No deviation

### 3.2.4 TEST SETUP

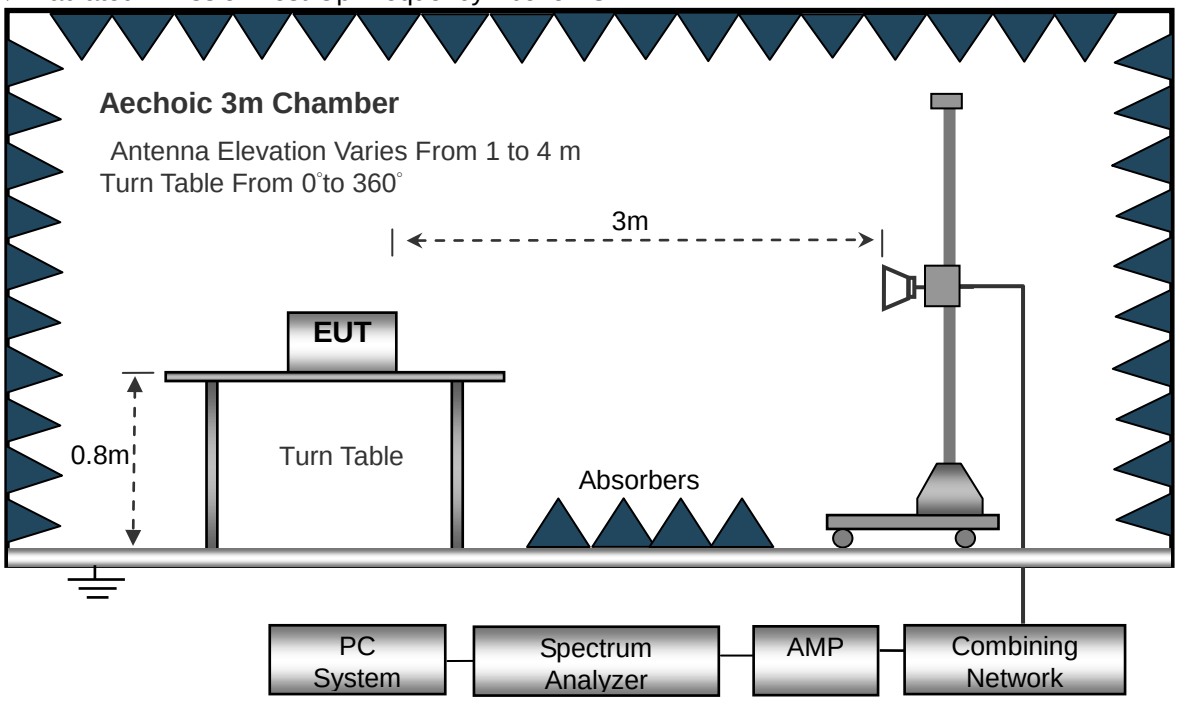
（A）Radiated Emission Test-Up Frequency Below 30MHz



（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 : | DC 3.7V |
| Test Mode : | Mode 4 | Polarization : | -- |

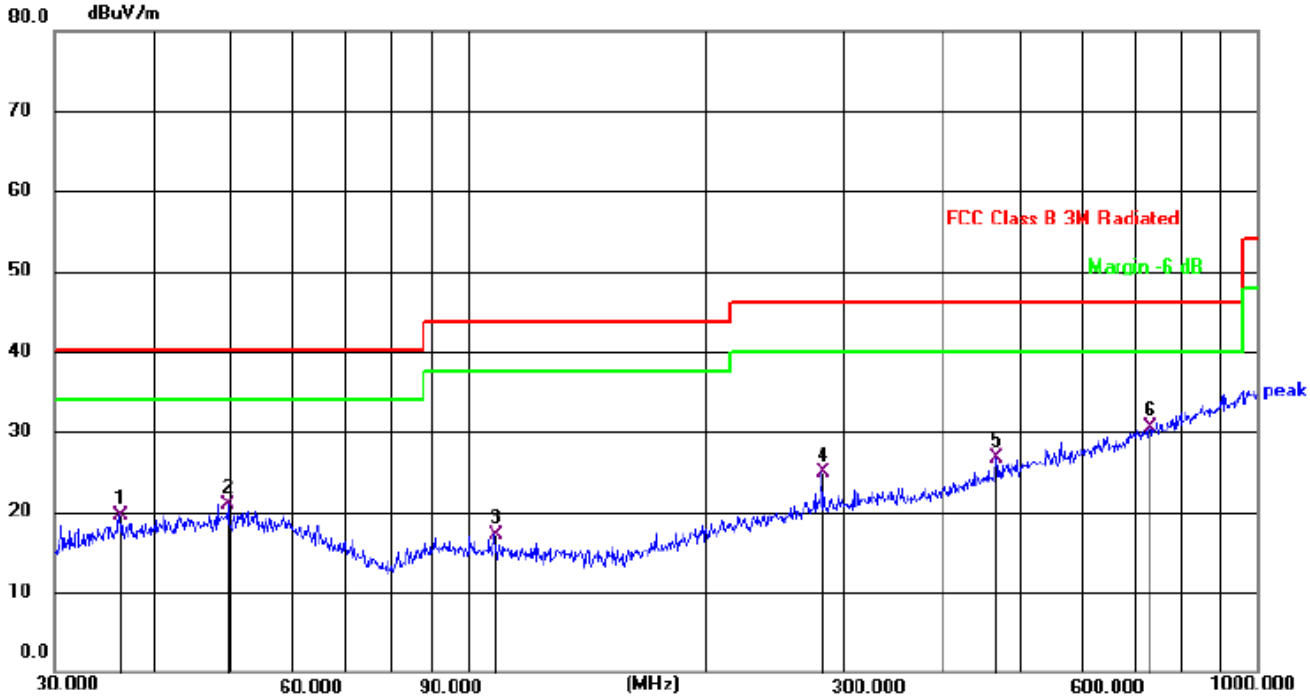
| Freq. | Reading | Limit | Margin | State |
|---|---|---|---|---|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F |
| -- | -- | -- | -- | PASS |
| -- | -- | -- | -- | PASS |

**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 : | DC 3.7V | | |
| Test Mode : | Mode 4 | | |



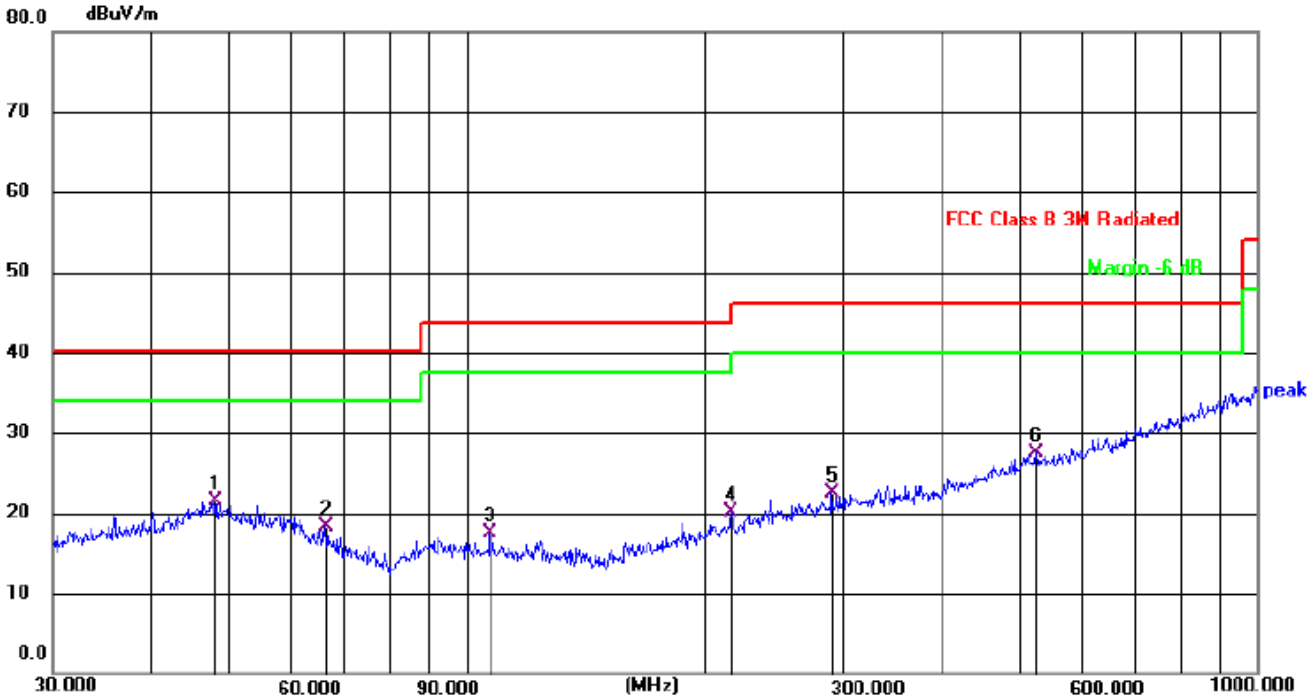

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dB/m | dB | Detector |
| 1 | | 36.2541 | 34.50 | -14.94 | 19.56 | 40.00 | 20.44 | QP |
| 2 | | 49.7068 | 34.19 | -13.33 | 20.86 | 40.00 | 19.14 | QP |
| 3 | | 108.2667 | 34.88 | -17.77 | 17.11 | 43.50 | 26.39 | QP |
| 4 | | 281.0075 | 37.86 | -13.04 | 24.82 | 46.00 | 21.18 | QP |
| 5 | | 467.2349 | 35.62 | -8.98 | 26.64 | 46.00 | 19.36 | QP |
| 6 | * | 729.3583 | 34.51 | -4.05 | 30.46 | 46.00 | 15.54 | 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 : | DC 3.7V | | |
| Test Mode : | Mode 4 | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dB/m | dB | Detector |
| 1 | * | 48.0166 | 35.07 | -13.50 | 21.57 | 40.00 | 18.43 | QP |
| 2 | | 66.3188 | 34.36 | -16.12 | 18.24 | 40.00 | 21.76 | QP |
| 3 | | 106.8945 | 35.29 | -17.73 | 17.56 | 43.50 | 25.94 | QP |
| 4 | | 216.4513 | 35.48 | -15.32 | 20.16 | 46.00 | 25.84 | QP |
| 5 | | 289.6581 | 35.20 | -12.79 | 22.41 | 46.00 | 23.59 | QP |
| 6 | | 526.0586 | 35.22 | -7.71 | 27.51 | 46.00 | 18.49 | 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

| 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 | 67.74 | 50.62 | 6.78 | 31.24 | 55.14 | 74.00 | -18.86 | PK |
| V | 4804.00 | 55.32 | 50.62 | 6.78 | 31.24 | 42.72 | 54.00 | -11.28 | AV |
| V | 7206.00 | 66.53 | 49.94 | 7.11 | 36.52 | 60.22 | 74.00 | -13.78 | PK |
| V | 7206.00 | 54.78 | 49.94 | 7.11 | 36.52 | 48.47 | 54.00 | -5.53 | AV |
| V | 16132.00 | 48.96 | 51.54 | 11.36 | 41.56 | 50.34 | 74.00 | -23.66 | PK |
| H | 4804.00 | 66.81 | 50.62 | 6.78 | 31.24 | 54.21 | 74.00 | -19.79 | PK |
| H | 4804.00 | 55.42 | 50.62 | 6.78 | 31.24 | 42.82 | 54.00 | -11.18 | AV |
| H | 7206.00 | 69.74 | 49.94 | 7.11 | 36.52 | 63.43 | 74.00 | -10.57 | PK |
| H | 7206.00 | 53.65 | 49.94 | 7.11 | 36.52 | 47.34 | 54.00 | -6.66 | AV |
| H | 16132.00 | 48.92 | 51.54 | 11.36 | 41.56 | 50.30 | 74.00 | -23.70 | PK |
| **operation frequency:2441** | | | | | | | | | |
| V | 4882.00 | 67.51 | 50.67 | 6.83 | 31.36 | 55.03 | 74.00 | -18.97 | PK |
| V | 4882.00 | 55.13 | 50.67 | 6.83 | 31.36 | 42.65 | 54.00 | -11.35 | AV |
| V | 7323.00 | 69.39 | 49.98 | 7.22 | 36.52 | 63.15 | 74.00 | -10.85 | PK |
| V | 7323.00 | 53.44 | 49.98 | 7.22 | 31.24 | 41.92 | 54.00 | -12.08 | AV |
| V | 16132.00 | 48.79 | 51.54 | 11.36 | 41.56 | 50.17 | 74.00 | -23.83 | PK |
| H | 4882.00 | 66.59 | 50.67 | 6.83 | 31.36 | 54.11 | 74.00 | -19.89 | PK |
| H | 4882.00 | 55.23 | 50.67 | 6.83 | 31.36 | 42.75 | 54.00 | -11.25 | AV |
| H | 7323.00 | 69.48 | 49.98 | 7.22 | 36.52 | 63.24 | 74.00 | -10.76 | PK |
| H | 7323.00 | 53.55 | 49.98 | 7.22 | 31.24 | 42.03 | 54.00 | -11.97 | AV |
| H | 16132.00 | 48.75 | 51.54 | 11.36 | 41.56 | 50.13 | 74.00 | -23.87 | PK |
| **operation frequency:2480** | | | | | | | | | |
| V | 4960.00 | 67.99 | 50.84 | 6.86 | 31.40 | 55.41 | 74.00 | -18.59 | PK |
| V | 4960.00 | 55.53 | 50.84 | 6.86 | 31.40 | 42.95 | 54.00 | -11.05 | AV |
| V | 7440.00 | 69.17 | 50.12 | 7.27 | 36.57 | 62.89 | 74.00 | -11.11 | PK |
| V | 7440.00 | 53.32 | 50.12 | 7.27 | 31.27 | 41.74 | 54.00 | -12.26 | AV |
| V | 16132.00 | 49.15 | 51.54 | 11.36 | 41.56 | 50.53 | 74.00 | -23.47 | PK |
| H | 4960.00 | 67.06 | 50.84 | 6.86 | 31.40 | 54.48 | 74.00 | -19.52 | PK |
| H | 4960.00 | 55.63 | 50.84 | 6.86 | 31.40 | 43.05 | 54.00 | -10.95 | AV |
| H | 7440.00 | 67.41 | 50.12 | 7.27 | 36.57 | 61.13 | 74.00 | -12.87 | PK |
| H | 7440.00 | 55.35 | 50.12 | 7.27 | 31.27 | 43.77 | 54.00 | -10.23 | AV |
| H | 16132.00 | 49.11 | 51.54 | 11.36 | 41.56 | 50.49 | 74.00 | -23.51 | 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.

π/4 DQPSK

| 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 | 67.42 | 50.61 | 6.78 | 31.23 | 54.82 | 74.00 | -19.18 | PK |
| V | 4804.00 | 55.71 | 50.61 | 6.78 | 31.23 | 43.11 | 54.00 | -10.89 | AV |
| V | 7206.00 | 66.32 | 49.93 | 7.11 | 36.51 | 60.01 | 74.00 | -13.99 | PK |
| V | 7206.00 | 53.40 | 49.93 | 7.11 | 36.51 | 47.09 | 54.00 | -6.91 | AV |
| V | 16132.00 | 49.39 | 51.53 | 11.35 | 41.55 | 50.76 | 74.00 | -23.24 | PK |
| H | 4804.00 | 69.53 | 50.61 | 6.78 | 31.23 | 56.93 | 74.00 | -17.07 | PK |
| H | 4804.00 | 56.44 | 50.61 | 6.78 | 31.23 | 43.84 | 54.00 | -10.16 | AV |
| H | 7206.00 | 66.38 | 49.93 | 7.11 | 36.51 | 60.07 | 74.00 | -13.93 | PK |
| H | 7206.00 | 54.72 | 49.93 | 7.11 | 36.51 | 48.41 | 54.00 | -5.59 | AV |
| H | 16132.00 | 47.83 | 51.53 | 11.35 | 41.55 | 49.20 | 74.00 | -24.80 | PK |
| **operation frequency:2441** | | | | | | | | | |
| V | 4882.00 | 67.14 | 50.66 | 6.83 | 31.35 | 54.66 | 74.00 | -19.34 | PK |
| V | 4882.00 | 55.35 | 50.66 | 6.83 | 31.35 | 42.87 | 54.00 | -11.13 | AV |
| V | 7323.00 | 66.87 | 49.97 | 7.22 | 36.51 | 60.63 | 74.00 | -13.37 | PK |
| V | 7323.00 | 55.89 | 49.97 | 7.22 | 31.23 | 44.37 | 54.00 | -9.63 | AV |
| V | 16132.00 | 48.93 | 51.53 | 11.35 | 41.55 | 50.30 | 74.00 | -23.70 | PK |
| H | 4882.00 | 66.64 | 50.66 | 6.83 | 31.35 | 54.16 | 74.00 | -19.84 | PK |
| H | 4882.00 | 55.74 | 50.66 | 6.83 | 31.35 | 43.26 | 54.00 | -10.74 | AV |
| H | 7323.00 | 65.08 | 49.97 | 7.22 | 36.51 | 58.84 | 74.00 | -15.16 | PK |
| H | 7323.00 | 53.42 | 49.97 | 7.22 | 31.23 | 41.90 | 54.00 | -12.10 | AV |
| H | 16132.00 | 48.37 | 51.53 | 11.35 | 41.55 | 49.74 | 74.00 | -24.26 | PK |
| **operation frequency:2480** | | | | | | | | | |
| V | 4960.00 | 67.53 | 50.83 | 6.86 | 31.39 | 54.95 | 74.00 | -19.05 | PK |
| V | 4960.00 | 55.10 | 50.83 | 6.86 | 31.39 | 42.52 | 54.00 | -11.48 | AV |
| V | 7440.00 | 66.21 | 50.11 | 7.27 | 36.56 | 59.93 | 74.00 | -14.07 | PK |
| V | 7440.00 | 54.81 | 50.11 | 7.27 | 31.26 | 43.23 | 54.00 | -10.77 | AV |
| V | 16132.00 | 46.74 | 51.53 | 11.35 | 41.55 | 48.11 | 74.00 | -25.89 | PK |
| H | 4960.00 | 66.42 | 50.83 | 6.86 | 31.39 | 53.84 | 74.00 | -20.16 | PK |
| H | 4960.00 | 54.29 | 50.83 | 6.86 | 31.39 | 41.71 | 54.00 | -12.29 | AV |
| H | 7440.00 | 65.34 | 50.11 | 7.27 | 36.56 | 59.06 | 74.00 | -14.94 | PK |
| H | 7440.00 | 55.68 | 50.11 | 7.27 | 31.26 | 44.10 | 54.00 | -9.90 | AV |
| H | 16132.00 | 47.96 | 51.53 | 11.35 | 41.55 | 49.33 | 74.00 | -24.67 | 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.

8DPSK

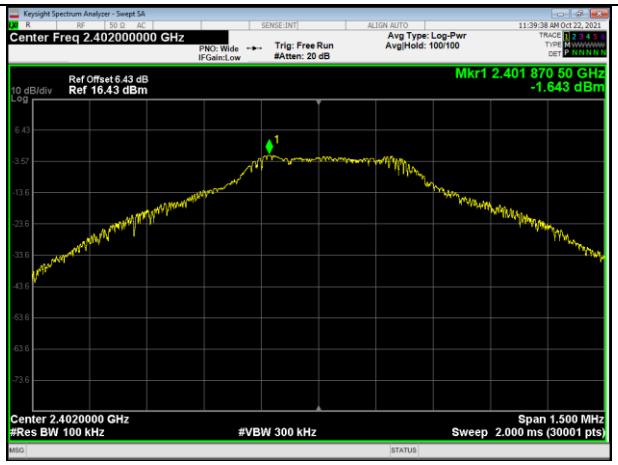
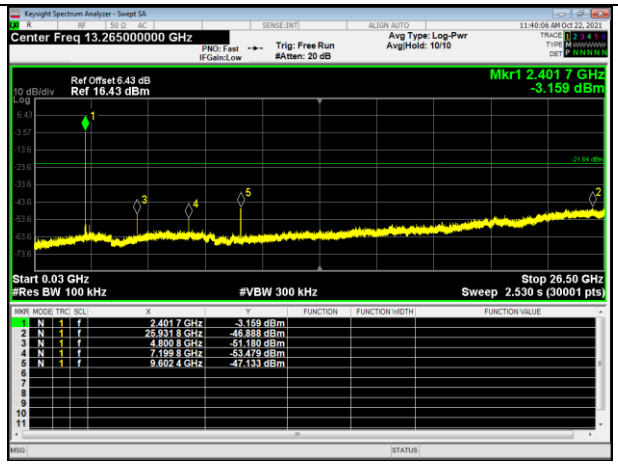
| Polar (H/V) | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Detector Type |
|---|---|---|---|---|---|---|---|---|---|
| **operation frequency:2402** | | | | | | | | | |
| V | 4804.00 | 66.88 | 50.63 | 6.78 | 31.24 | 54.27 | 74.00 | -19.73 | PK |
| V | 4804.00 | 55.71 | 50.63 | 6.78 | 31.24 | 43.10 | 54.00 | -10.90 | AV |
| V | 7206.00 | 66.22 | 49.94 | 7.11 | 36.52 | 59.91 | 74.00 | -14.09 | PK |
| V | 7206.00 | 53.38 | 49.94 | 7.11 | 36.52 | 47.07 | 54.00 | -6.93 | AV |
| V | 16132.00 | 46.66 | 51.55 | 11.36 | 41.56 | 48.03 | 74.00 | -25.97 | PK |
| H | 4804.00 | 66.61 | 50.63 | 6.78 | 31.24 | 54.00 | 74.00 | -20.00 | PK |
| H | 4804.00 | 55.66 | 50.63 | 6.78 | 31.24 | 43.05 | 54.00 | -10.95 | AV |
| H | 7206.00 | 64.57 | 49.94 | 7.11 | 36.52 | 58.26 | 74.00 | -15.74 | PK |
| H | 7206.00 | 54.38 | 49.94 | 7.11 | 36.52 | 48.07 | 54.00 | -5.93 | AV |
| H | 16132.00 | 47.47 | 51.55 | 11.36 | 41.56 | 48.84 | 74.00 | -25.16 | PK |
| **operation frequency:2441** | | | | | | | | | |
| V | 4882.00 | 66.77 | 50.68 | 6.83 | 31.36 | 54.28 | 74.00 | -19.72 | PK |
| V | 4882.00 | 54.94 | 50.68 | 6.83 | 31.36 | 42.45 | 54.00 | -11.55 | AV |
| V | 7323.00 | 65.61 | 49.98 | 7.22 | 36.52 | 59.37 | 74.00 | -14.63 | PK |
| V | 7323.00 | 53.44 | 49.98 | 7.22 | 31.24 | 41.92 | 54.00 | -12.08 | AV |
| V | 16132.00 | 47.88 | 51.55 | 11.36 | 41.56 | 49.25 | 74.00 | -24.75 | PK |
| H | 4882.00 | 65.37 | 50.68 | 6.83 | 31.36 | 52.88 | 74.00 | -21.12 | PK |
| H | 4882.00 | 53.67 | 50.68 | 6.83 | 31.36 | 41.18 | 54.00 | -12.82 | AV |
| H | 7323.00 | 65.07 | 49.98 | 7.22 | 36.52 | 58.83 | 74.00 | -15.17 | PK |
| H | 7323.00 | 53.45 | 49.98 | 7.22 | 31.24 | 41.93 | 54.00 | -12.07 | AV |
| H | 16132.00 | 46.77 | 51.55 | 11.36 | 41.56 | 48.14 | 74.00 | -25.86 | PK |
| **operation frequency:2480** | | | | | | | | | |
| V | 4960.00 | 67.62 | 50.85 | 6.86 | 31.40 | 55.03 | 74.00 | -18.97 | PK |
| V | 4960.00 | 54.67 | 50.85 | 6.86 | 31.40 | 42.08 | 54.00 | -11.92 | AV |
| V | 7440.00 | 64.89 | 50.13 | 7.27 | 36.57 | 58.60 | 74.00 | -15.40 | PK |
| V | 7440.00 | 53.45 | 50.13 | 7.27 | 31.27 | 41.86 | 54.00 | -12.14 | AV |
| V | 16132.00 | 48.53 | 51.55 | 11.36 | 41.56 | 49.90 | 74.00 | -24.10 | PK |
| H | 4960.00 | 67.54 | 50.85 | 6.86 | 31.40 | 54.95 | 74.00 | -19.05 | PK |
| H | 4960.00 | 54.78 | 50.85 | 6.86 | 31.40 | 42.19 | 54.00 | -11.81 | AV |
| H | 7440.00 | 65.32 | 50.13 | 7.27 | 36.57 | 59.03 | 74.00 | -14.97 | PK |
| H | 7440.00 | 54.07 | 50.13 | 7.27 | 31.27 | 42.48 | 54.00 | -11.52 | AV |
| H | 16132.00 | 47.88 | 51.55 | 11.36 | 41.56 | 49.25 | 74.00 | -24.75 | PK |

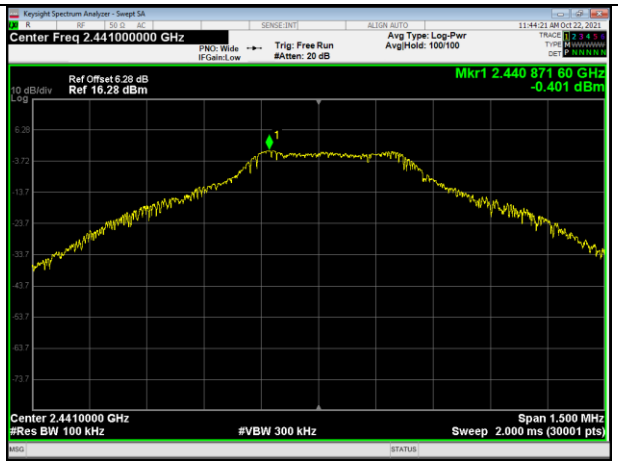
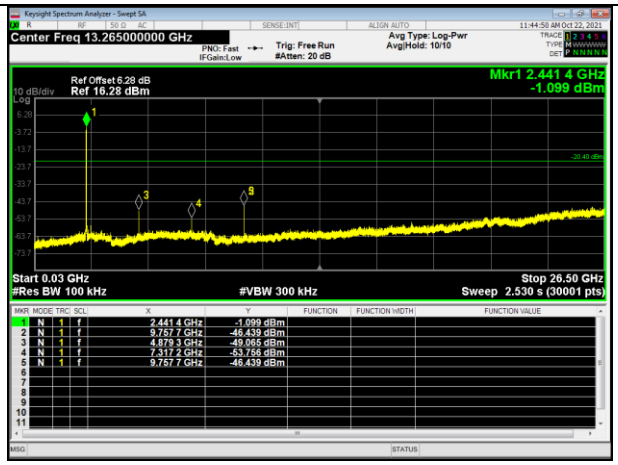
**Remark:**

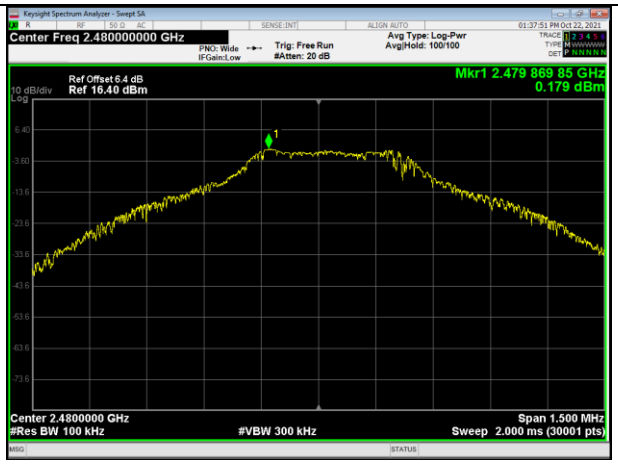
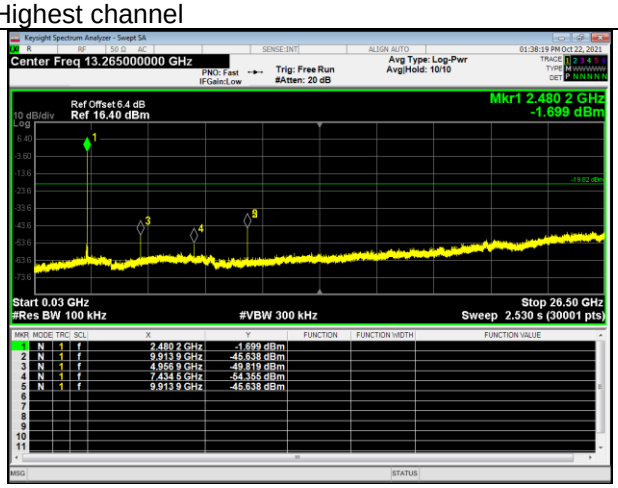
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need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

For Conducted

During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.

| Test channel: | Lowest channel |
|---|---|
|  |  |

| Test channel: | Middle channel |
|---|---|
|  |  |

| Test channel: | Highest channel |
|---|---|
|  |  |

## 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:

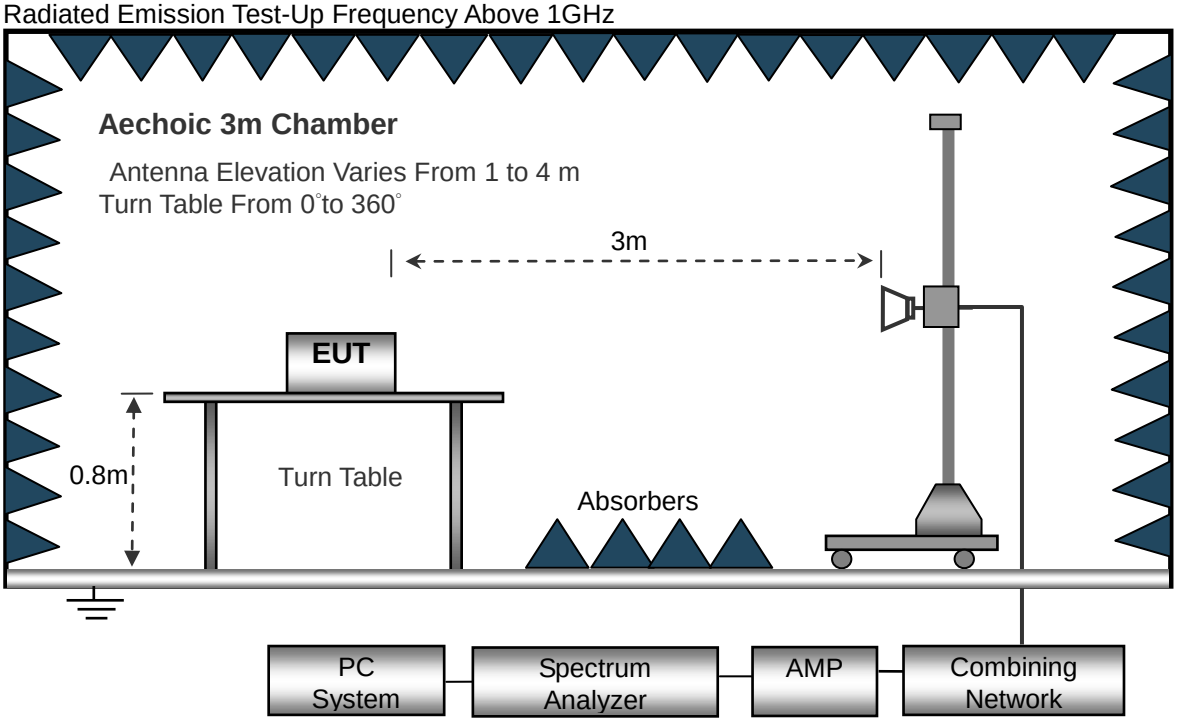
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

### 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

GFSK

| 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 | 76.42 | 52.11 | 2.73 | 27.37 | 54.41 | 74.00 | -19.59 | PK |
| V | 2390.00 | 65.18 | 52.11 | 2.73 | 27.37 | 43.17 | 54.00 | -10.83 | AV |
| V | 2400.00 | 76.63 | 52.15 | 2.78 | 27.40 | 54.66 | 74.00 | -19.34 | PK |
| V | 2400.00 | 64.77 | 52.15 | 2.78 | 27.40 | 42.80 | 54.00 | -11.20 | AV |
| H | 2390.00 | 76.71 | 52.11 | 2.73 | 27.37 | 54.70 | 74.00 | -19.30 | PK |
| H | 2390.00 | 65.21 | 52.11 | 2.73 | 27.37 | 43.20 | 54.00 | -10.80 | AV |
| H | 2400.00 | 76.58 | 52.15 | 2.78 | 27.40 | 54.61 | 74.00 | -19.39 | PK |
| H | 2400.00 | 65.15 | 52.15 | 2.78 | 27.40 | 43.18 | 54.00 | -10.82 | 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 | 76.63 | 52.22 | 2.86 | 27.43 | 54.70 | 74.00 | -19.30 | PK |
| V | 2483.50 | 65.42 | 52.22 | 2.86 | 27.43 | 43.49 | 54.00 | -10.51 | AV |
| V | 2500.00 | 76.57 | 52.25 | 2.88 | 27.48 | 54.68 | 74.00 | -19.32 | PK |
| V | 2500.00 | 64.88 | 52.25 | 2.88 | 27.48 | 42.99 | 54.00 | -11.01 | AV |
| H | 2483.50 | 76.75 | 52.22 | 2.86 | 27.43 | 54.82 | 74.00 | -19.18 | PK |
| H | 2483.50 | 65.46 | 52.22 | 2.86 | 27.43 | 43.53 | 54.00 | -10.47 | AV |
| H | 2500.00 | 76.37 | 52.25 | 2.88 | 27.48 | 54.48 | 74.00 | -19.52 | PK |
| H | 2500.00 | 65.72 | 52.25 | 2.88 | 27.48 | 43.83 | 54.00 | -10.17 | 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.

π/4 DQPSK

| 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 | 76.58 | 52.10 | 2.73 | 27.37 | 54.58 | 74.00 | -19.42 | PK |
| V | 2390.00 | 65.30 | 52.10 | 2.73 | 27.37 | 43.30 | 54.00 | -10.70 | AV |
| V | 2400.00 | 76.79 | 52.14 | 2.78 | 27.40 | 54.83 | 74.00 | -19.17 | PK |
| V | 2400.00 | 64.89 | 52.14 | 2.78 | 27.40 | 42.93 | 54.00 | -11.07 | AV |
| H | 2390.00 | 76.87 | 52.10 | 2.73 | 27.37 | 54.87 | 74.00 | -19.13 | PK |
| H | 2390.00 | 65.33 | 52.10 | 2.73 | 27.37 | 43.33 | 54.00 | -10.67 | AV |
| H | 2400.00 | 76.74 | 52.14 | 2.78 | 27.40 | 54.78 | 74.00 | -19.22 | PK |
| H | 2400.00 | 65.27 | 52.14 | 2.78 | 27.40 | 43.31 | 54.00 | -10.69 | 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 | 76.79 | 52.21 | 2.86 | 27.43 | 54.87 | 74.00 | -19.13 | PK |
| V | 2483.50 | 65.55 | 52.21 | 2.86 | 27.43 | 43.63 | 54.00 | -10.37 | AV |
| V | 2500.00 | 76.73 | 52.24 | 2.88 | 27.48 | 54.85 | 74.00 | -19.15 | PK |
| V | 2500.00 | 65.00 | 52.24 | 2.88 | 27.48 | 43.12 | 54.00 | -10.88 | AV |
| H | 2483.50 | 76.91 | 52.21 | 2.86 | 27.43 | 54.99 | 74.00 | -19.01 | PK |
| H | 2483.50 | 65.60 | 52.21 | 2.86 | 27.43 | 43.68 | 54.00 | -10.32 | AV |
| H | 2500.00 | 76.53 | 52.24 | 2.88 | 27.48 | 54.65 | 74.00 | -19.35 | PK |
| H | 2500.00 | 65.85 | 52.24 | 2.88 | 27.48 | 43.97 | 54.00 | -10.03 | 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.

8DPSK

| 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 | 76.76 | 52.11 | 2.73 | 27.37 | 54.75 | 74.00 | -19.25 | PK |
| V | 2390.00 | 65.48 | 52.11 | 2.73 | 27.37 | 43.47 | 54.00 | -10.53 | AV |
| V | 2400.00 | 76.98 | 52.15 | 2.78 | 27.40 | 55.01 | 74.00 | -18.99 | PK |
| V | 2400.00 | 65.05 | 52.15 | 2.78 | 27.40 | 43.08 | 54.00 | -10.92 | AV |
| H | 2390.00 | 77.05 | 52.11 | 2.73 | 27.37 | 55.04 | 74.00 | -18.96 | PK |
| H | 2390.00 | 65.51 | 52.11 | 2.73 | 27.37 | 43.50 | 54.00 | -10.50 | AV |
| H | 2400.00 | 76.92 | 52.15 | 2.78 | 27.40 | 54.95 | 74.00 | -19.05 | PK |
| H | 2400.00 | 65.44 | 52.15 | 2.78 | 27.40 | 43.47 | 54.00 | -10.53 | 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 | 76.98 | 52.22 | 2.86 | 27.43 | 55.05 | 74.00 | -18.95 | PK |
| V | 2483.50 | 65.72 | 52.22 | 2.86 | 27.43 | 43.79 | 54.00 | -10.21 | AV |
| V | 2500.00 | 76.91 | 52.25 | 2.88 | 27.48 | 55.02 | 74.00 | -18.98 | PK |
| V | 2500.00 | 65.15 | 52.25 | 2.88 | 27.48 | 43.26 | 54.00 | -10.74 | AV |
| H | 2483.50 | 77.09 | 52.22 | 2.86 | 27.43 | 55.16 | 74.00 | -18.84 | PK |
| H | 2483.50 | 65.76 | 52.22 | 2.86 | 27.43 | 43.83 | 54.00 | -10.17 | AV |
| H | 2500.00 | 76.71 | 52.25 | 2.88 | 27.48 | 54.82 | 74.00 | -19.18 | PK |
| H | 2500.00 | 66.01 | 52.25 | 2.88 | 27.48 | 44.12 | 54.00 | -9.88 | AV |

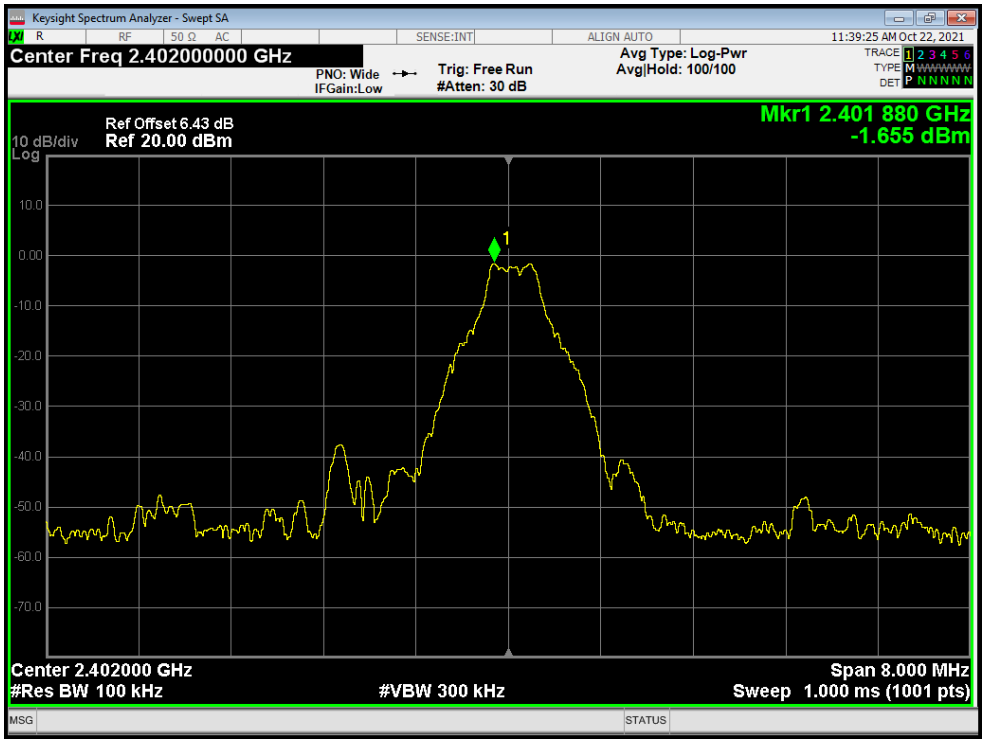
**Remark:**

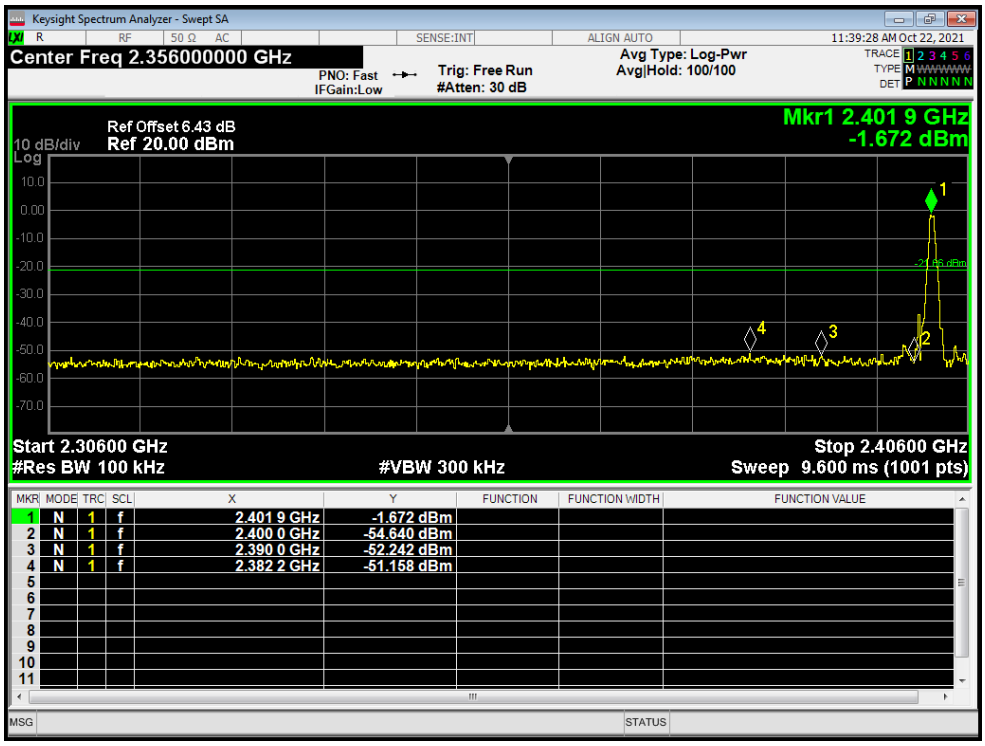
1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

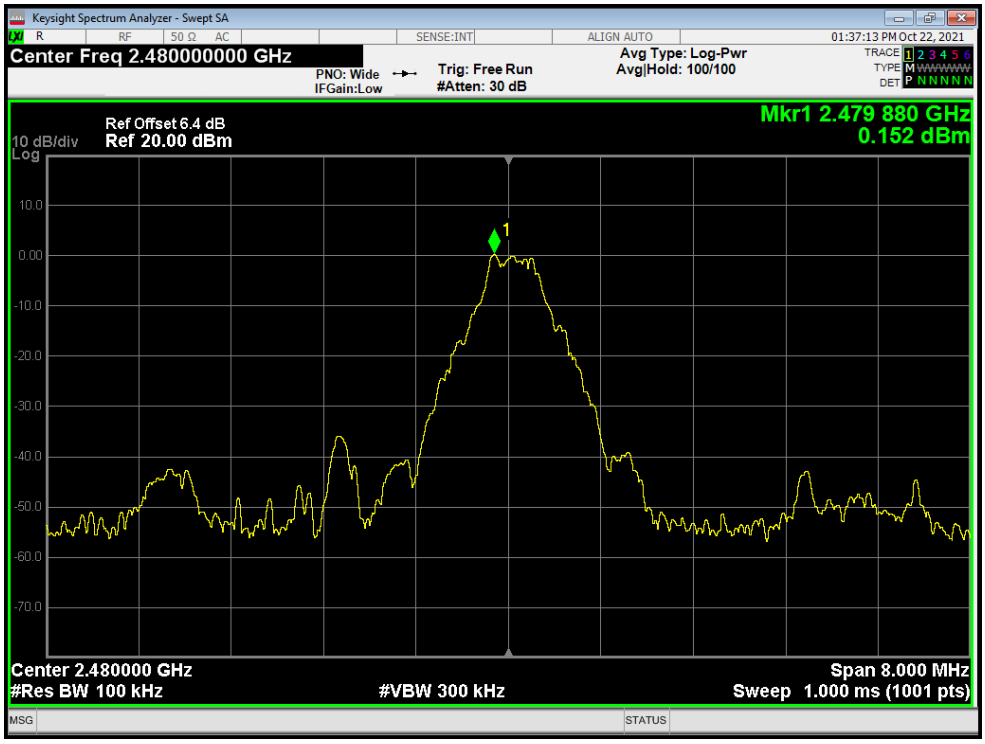
For Conducted

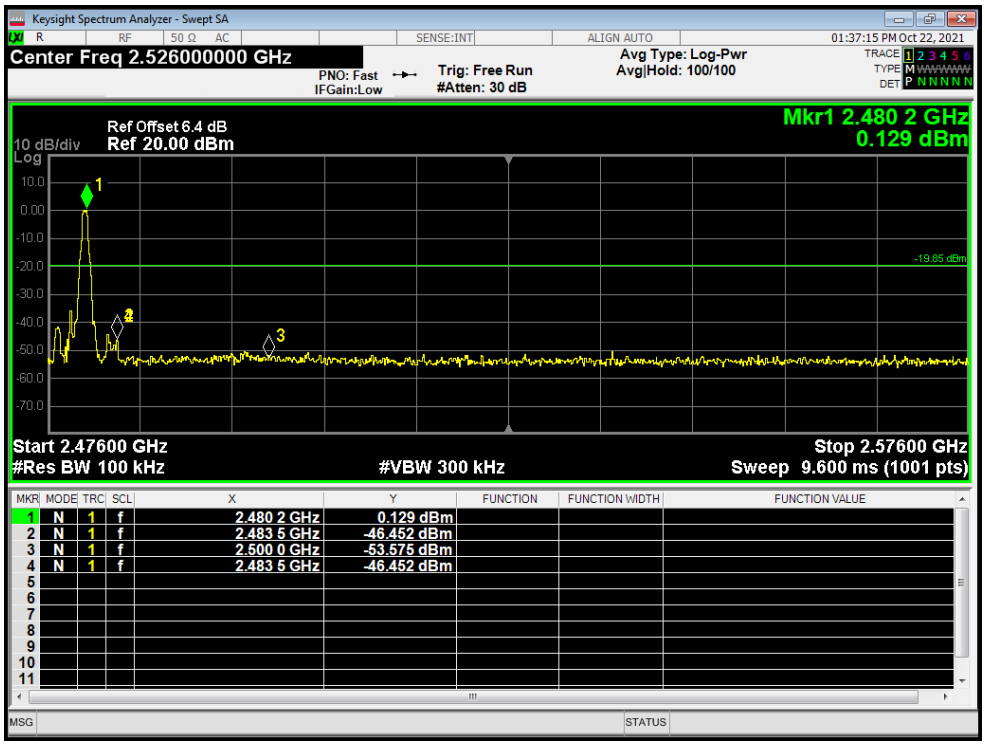
Unhopping

GFSK



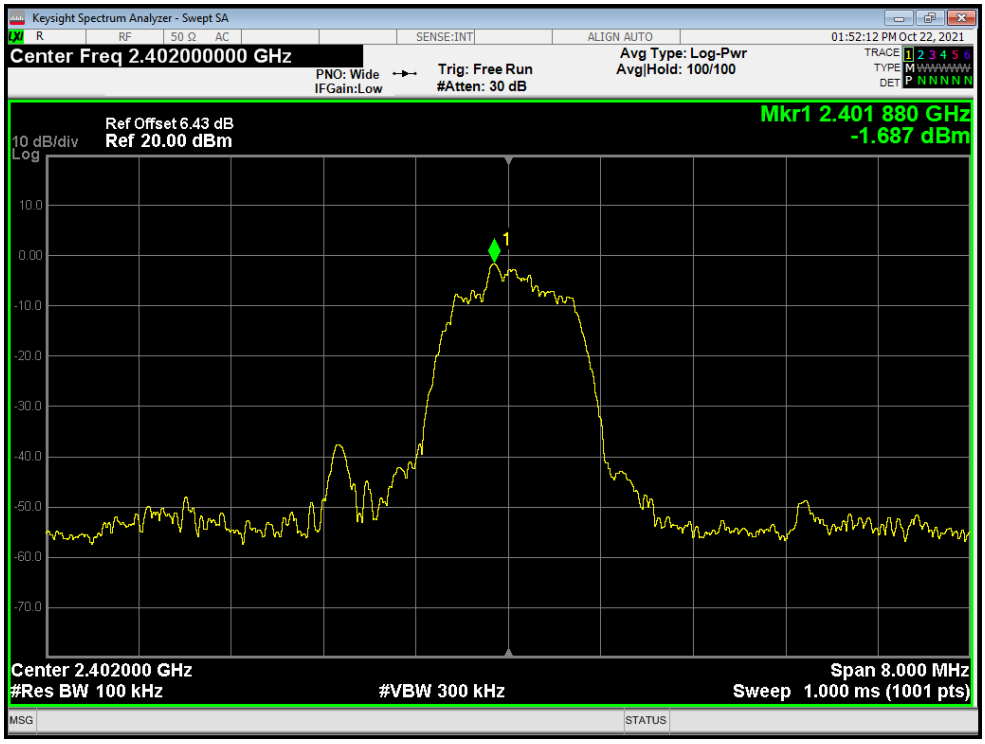



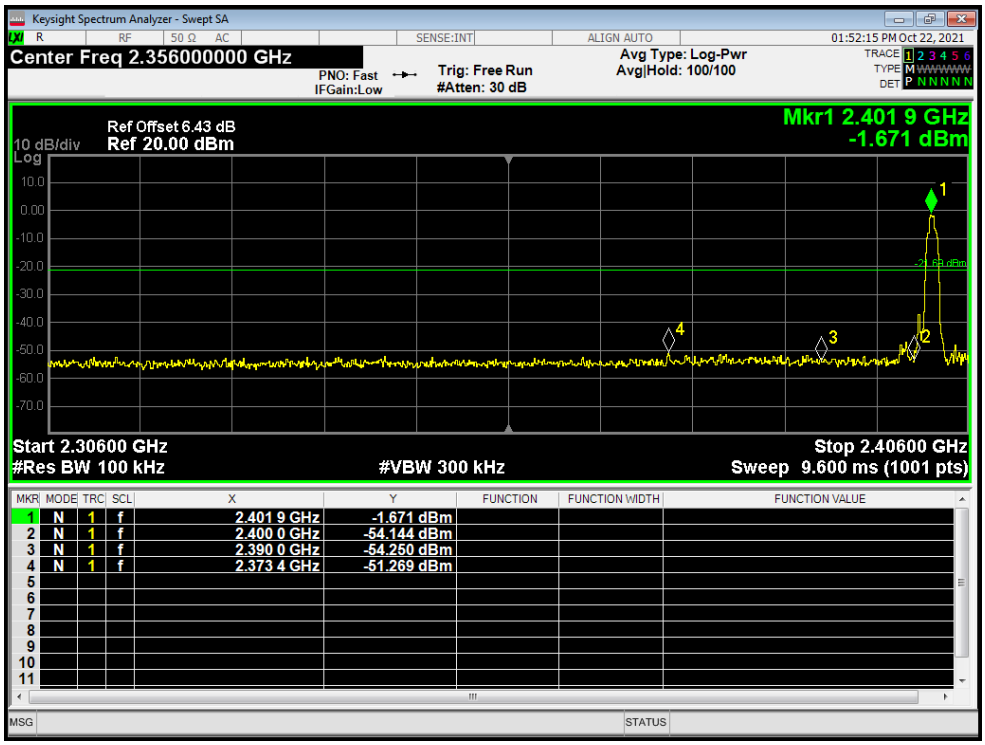


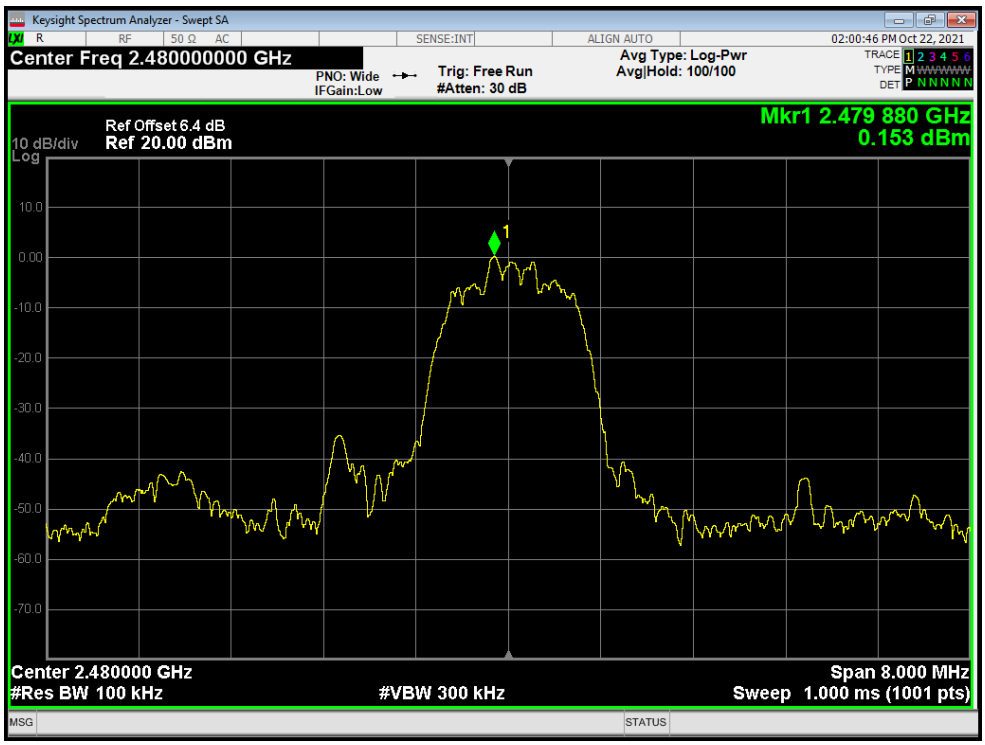



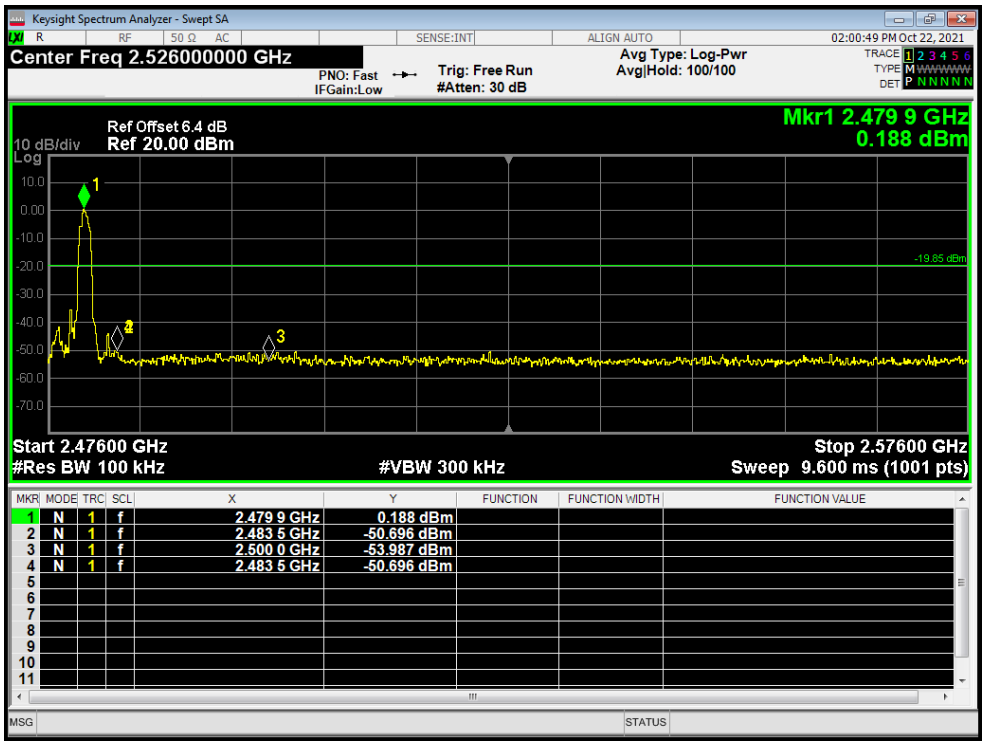

| MKR | MODE | TRC | SCL | X | Y | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.480 2 GHz | 0.129 dBm | | | |
| 2 | N | 1 | f | 2.483 5 GHz | -46.452 dBm | | | |
| 3 | N | 1 | f | 2.500 0 GHz | -53.575 dBm | | | |
| 4 | N | 1 | f | 2.483 5 GHz | -46.452 dBm | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |

π/4 DQPSK

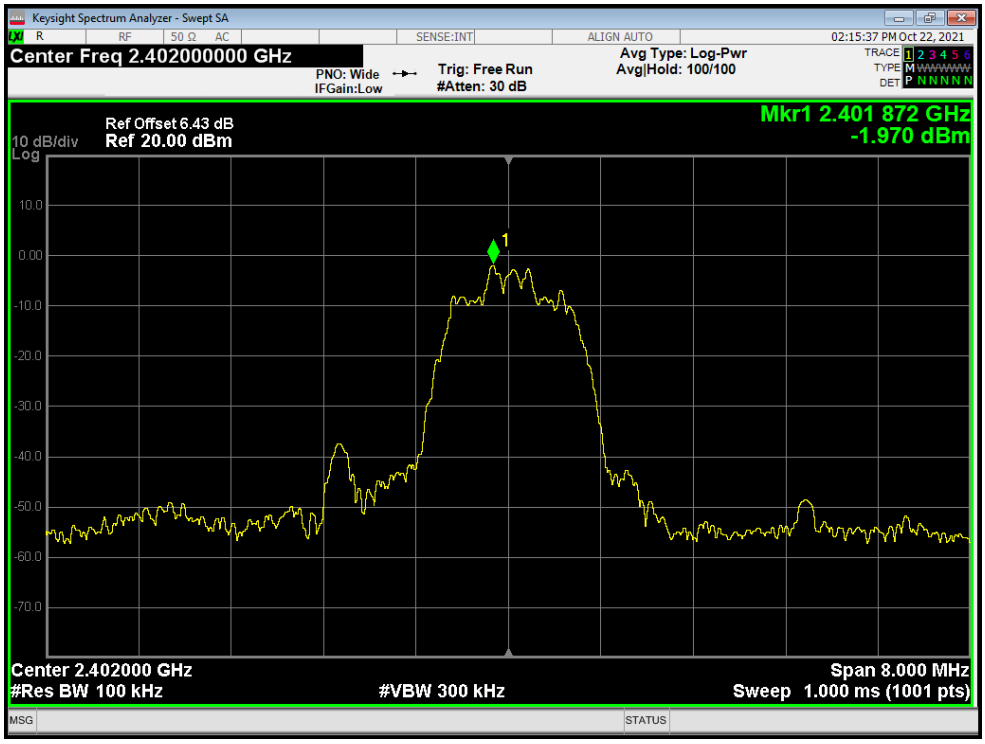

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.402000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
01:52:12 PM Oct 22, 2021
Ref Offset 6.43 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.401 880 GHz
-1.687 dBm
Center 2.402000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)

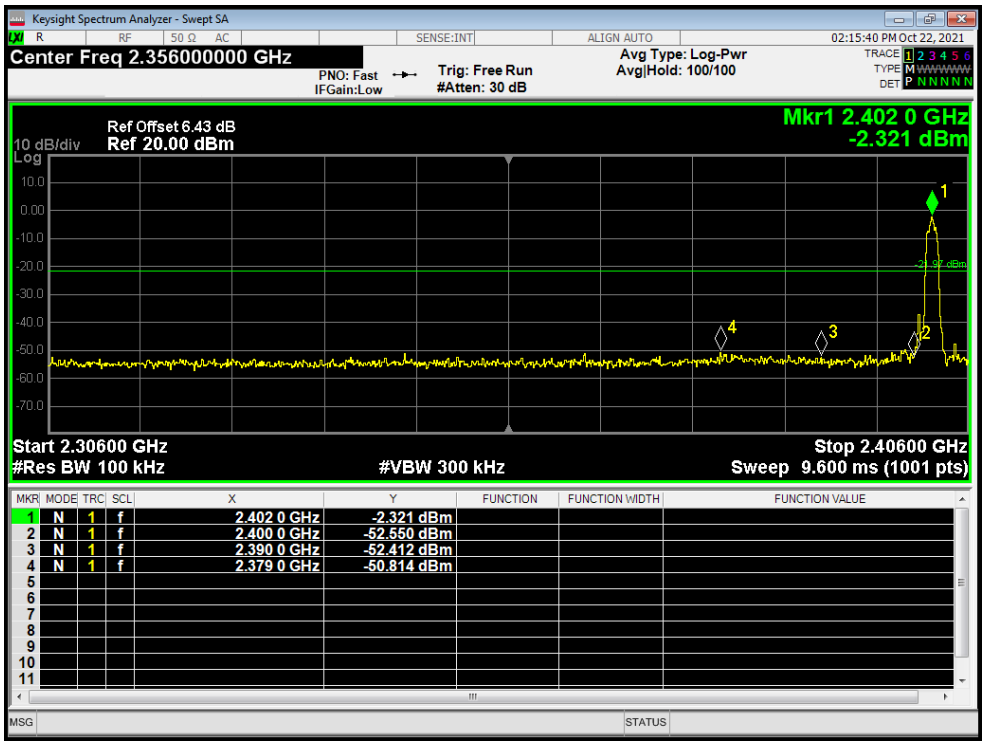

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.356000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
01:52:15 PM Oct 22, 2021
Ref Offset 6.43 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.401 9 GHz
-1.671 dBm
Start 2.30600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.40600 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.401 9 GHz -1.671 dBm
2 N 1 f 2.400 0 GHz -54.144 dBm
3 N 1 f 2.390 0 GHz -54.250 dBm
4 N 1 f 2.373 4 GHz -51.269 dBm

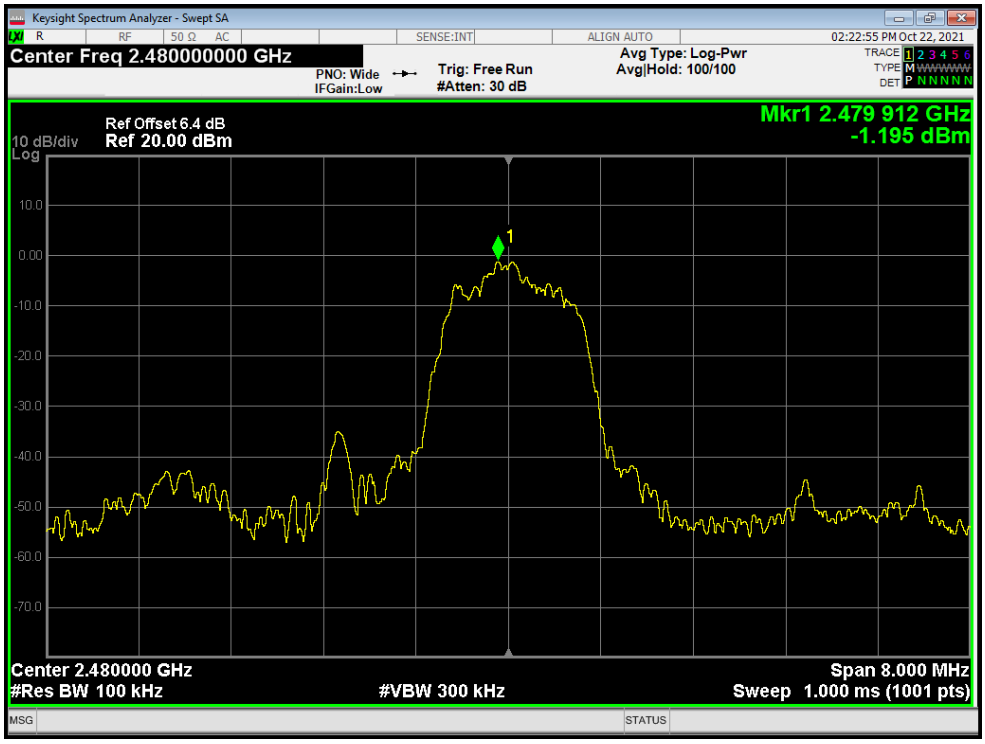

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:00:46 PM Oct 22, 2021
Ref Offset 6.4 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.479 880 GHz
0.153 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)

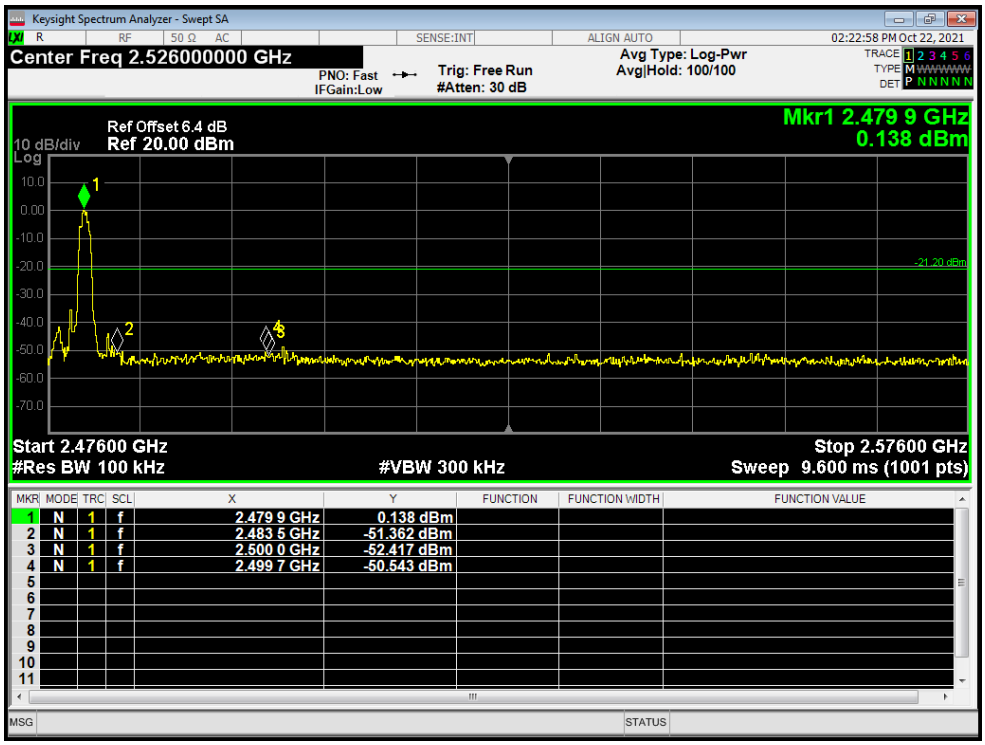

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.526000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:00:49 PM Oct 22, 2021
Ref Offset 6.4 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.479 9 GHz
0.188 dBm
-19.85 dBm
Start 2.47600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.57600 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.479 9 GHz 0.188 dBm
2 N 1 f 2.483 5 GHz -50.696 dBm
3 N 1 f 2.500 0 GHz -53.987 dBm
4 N 1 f 2.483 5 GHz -50.696 dBm

8DPSK

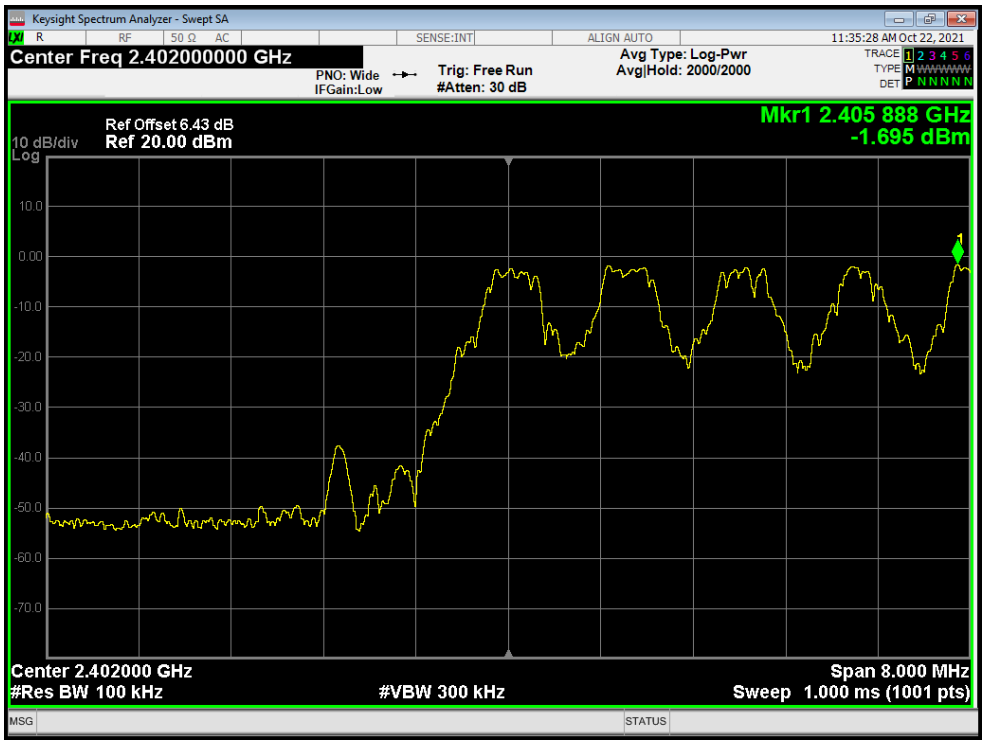

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.402000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:15:37 PM Oct 22, 2021
Ref Offset 6.43 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.401 872 GHz
-1.970 dBm
Center 2.402000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)

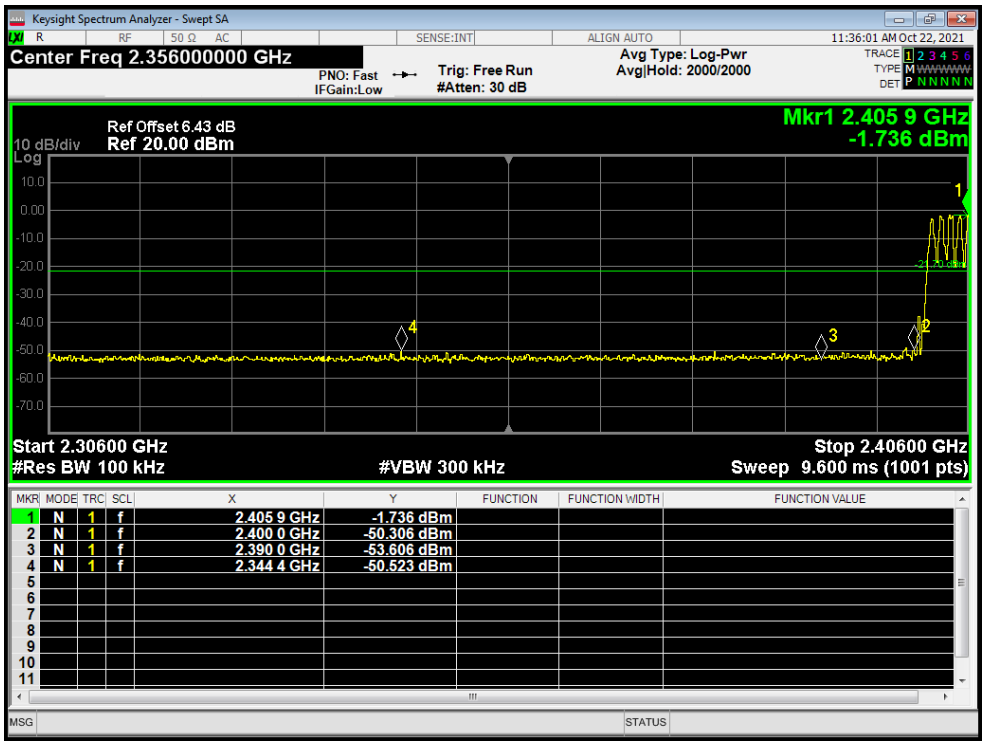

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.356000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
02:15:40 PM Oct 22, 2021
Ref Offset 6.43 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.402 0 GHz
-2.321 dBm
Start 2.30600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.40600 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.402 0 GHz -2.321 dBm
2 N 1 f 2.400 0 GHz -52.550 dBm
3 N 1 f 2.390 0 GHz -52.412 dBm
4 N 1 f 2.379 0 GHz -50.814 dBm


Keysight Spectrum Analyzer - Swept SA
R RF 50 Ω AC SENSE:INT ALIGN AUTO 02:22:55 PM Oct 22, 2021
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWWW
DET P N N N N N
Ref Offset 6.4 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.479 912 GHz
-1.195 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)
MSG
STATUS

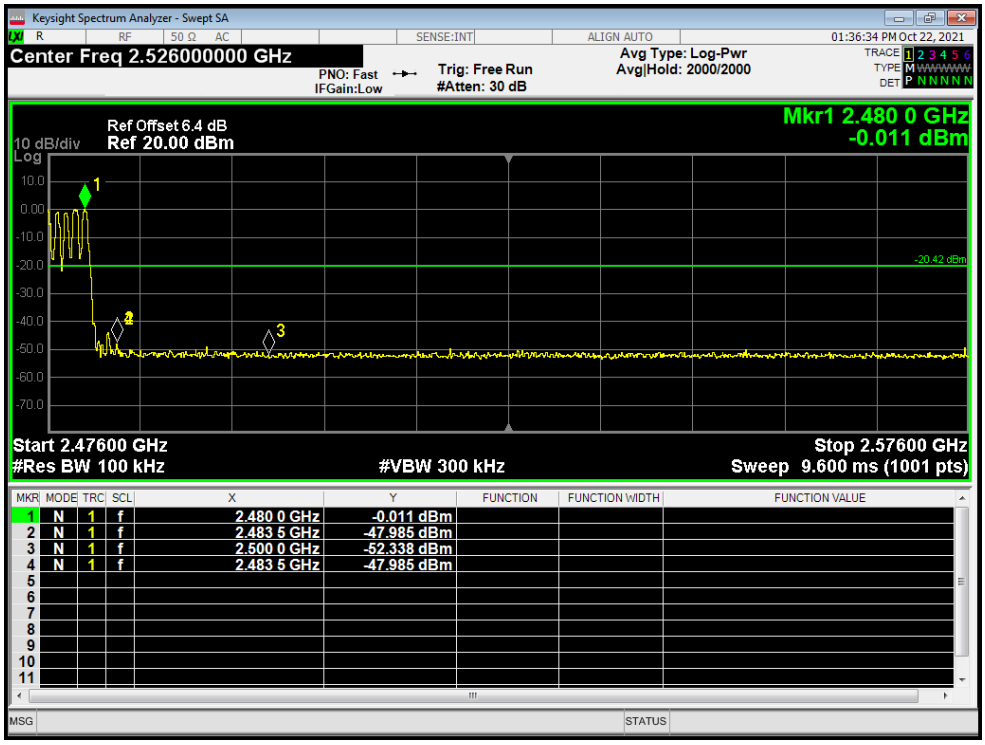

Keysight Spectrum Analyzer - Swept SA
R RF 50 Ω AC SENSE:INT ALIGN AUTO 02:22:58 PM Oct 22, 2021
Center Freq 2.526000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
TRACE 1 2 3 4 5 6
TYPE M WWWWWW
DET P N N N N N
Ref Offset 6.4 dB
10 dB/div Ref 20.00 dBm
Log
Mkr1 2.479 9 GHz
0.138 dBm
-21.20 dBm
Start 2.47600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.57600 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.479 9 GHz 0.138 dBm
2 N 1 f 2.483 5 GHz -51.362 dBm
3 N 1 f 2.500 0 GHz -52.417 dBm
4 N 1 f 2.499 7 GHz -50.543 dBm
MSG
STATUS

Hopping Mode



Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 2000/2000
01:36:01 PM Oct 22, 2021
Ref Offset 6.4 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.478 960 GHz
-0.422 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.526000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 2000/2000
01:36:34 PM Oct 22, 2021
Ref Offset 6.4 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.480 0 GHz
-0.011 dBm
-20.42 dBm
Start 2.47600 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.57600 GHz
Sweep 9.600 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.480 0 GHz -0.011 dBm
2 N 1 f 2.483 5 GHz -47.985 dBm
3 N 1 f 2.500 0 GHz -52.338 dBm
4 N 1 f 2.483 5 GHz -47.985 dBm

# 4. PEAK OUTPUT POWER

## 4.1 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 |

### 4.1.1 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

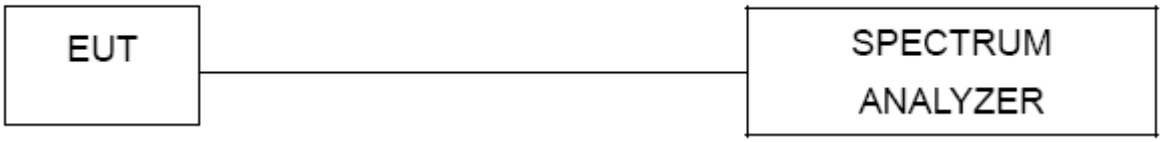
Detector function = peak

Trace = max hold

### 4.1.2 DEVIATION FROM STANDARD

No deviation.

### 4.1.3 TEST SETUP



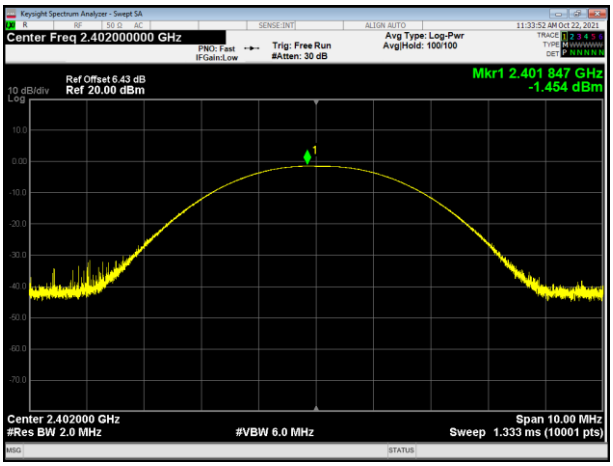
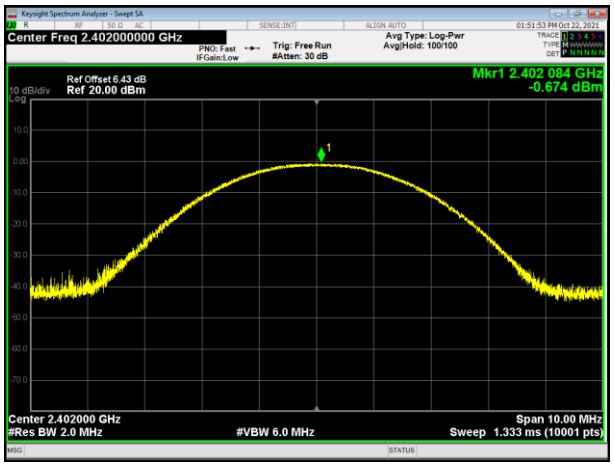
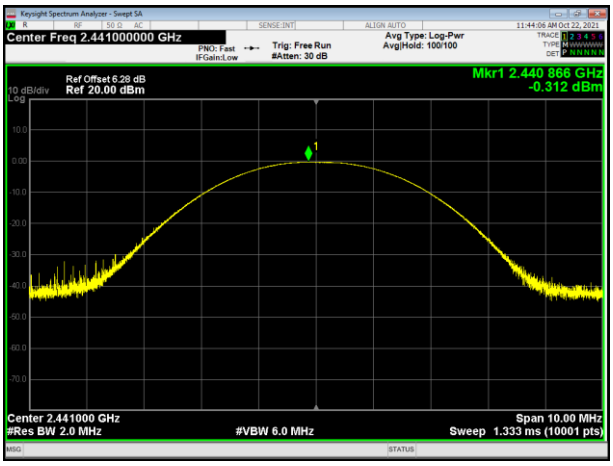
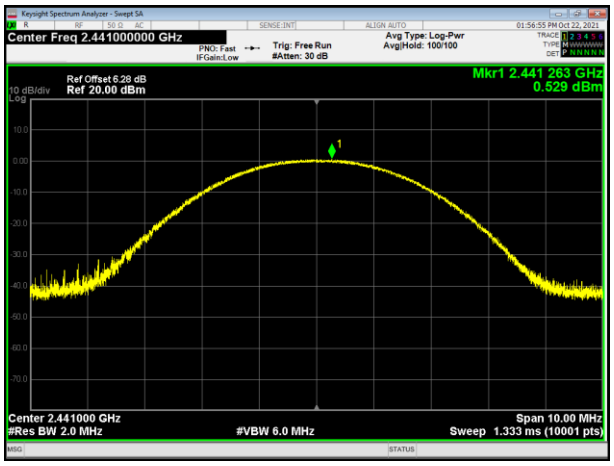
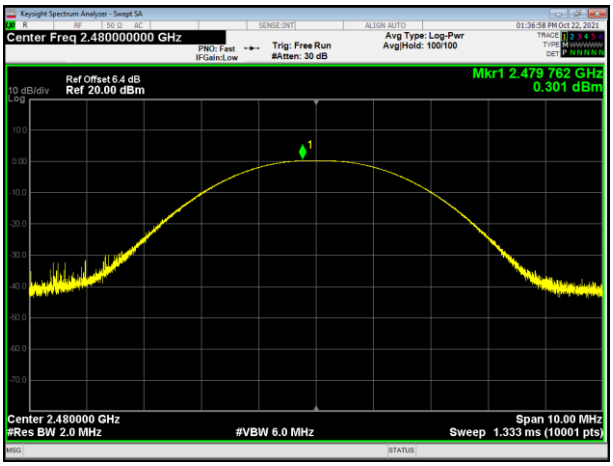
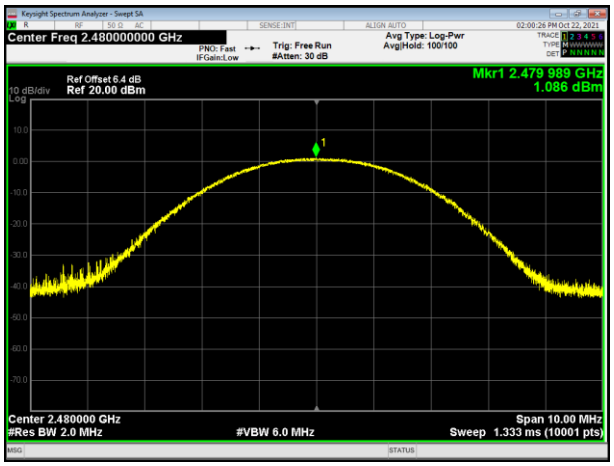

### 4.1.4 EUT OPERATION CONDITIONS

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.

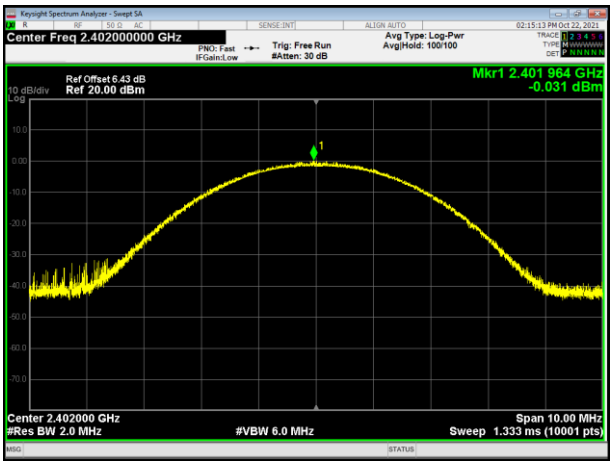
### 4.1.5 TEST RESULTS

| | | | |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 60% |
| Pressure: | 1012 hPa | Test Voltage : | DC 3.7V |
| Test Mode : | CH00/ CH39 /CH78 (1M/2M/3Mbps Mode) | | |

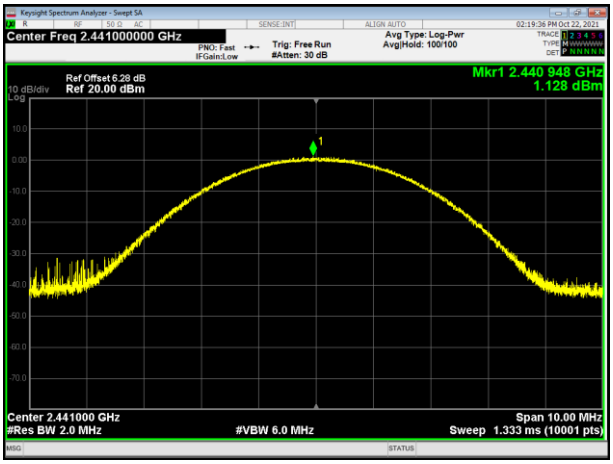
| Mode | Test Channel | Peak Output Power (dBm) | LIMIT (dBm) |
|---|---|---|---|
| GFSK | CH00 | -1.454 | 30.00 |
| | CH39 | -0.312 | 30.00 |
| | CH78 | 0.301 | 30.00 |
| π/4 DQPSK | CH00 | -0.674 | 20.96 |
| | CH39 | 0.529 | 20.96 |
| | CH78 | 1.086 | 20.96 |
| 8DPSK | CH00 | -0.031 | 20.96 |
| | CH39 | 1.128 | 20.96 |
| | CH78 | 1.714 | 20.96 |

| GFSK | π/4 DQPSK |
|---|---|
|  |  |
| 2402MHz | 2402MHz |
|  |  |
| 2441MHz | 2441MHz |
|  |  |
| 2480MHz | 2480MHz |

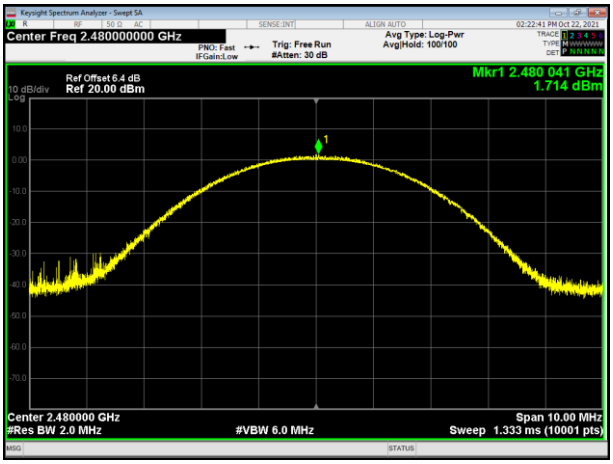
8DPSK




2402MHz




2441MHz




2480MHz

## 5. NUMBER OF HOPPING CHANNEL

### 5.1 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 |

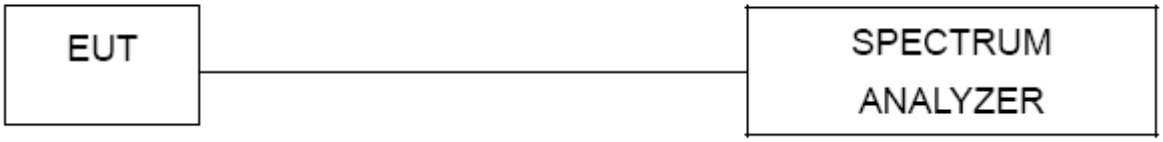
#### 5.1.1 TEST PROCEDURE

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.

#### 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

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

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