**Shenzhen GUOREN Certification Technology Service Co., Ltd.**

101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

# FCC PART 15 SUBPART C TEST REPORT

## FCC PART 15.247

| | | |
|---|---|---|
| **Report Reference No.....:** | **GRCTR231102014-01** | |
| **FCC ID..... :** | **2BDSR-K1MIC** | |
| Compiled by ( position+printed name+signature)..: | Testing Engineer Jimmy Wang | Jimmy Wang |
| Supervised by ( position+printed name+signature)..: | Project Engineer Kelley Zhang | Kelley Zhang |
| Approved by ( position+printed name+signature)..: | Manager Sam Wang | Sam Wang |
| Date of issue.....: | Nov. 28, 2023 | |
| **Testing Laboratory Name.....:** | **Shenzhen GUOREN Certification Technology Service Co., Ltd.** | |
| Address.....: | 101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China | |
| **Applicant's name.....:** | **Shenzhen Kaijuhong Technology Co., Ltd** | |
| Address.....: | 2nd Floor, Building 3, Shajinggangtou Industrial Zone, Bao'an District, Shenzhen | |
| **Test specification.....:** | | |
| Standard.....: | **FCC Part 15.247** | |

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| | |
|---|---|
| **Test item description.....:** | **Karaoke speaker（MIC）** |
| Trade Mark.....: | / |
| Manufacturer.....: | Shenzhen Kaijuhong Technology Co., Ltd |
| Model/Type reference.....: | K1 |
| Listed Models .....: | D13,k3,k11,k16,k32,k30,D20,K3,K5,K6,K11,K12,K13,K16,K23,K29,K30,K32,K52,K55,K56,K58 |
| Firmware Version.....: | V1.0 |
| Hardware Version.....: | V1.0 |
| Modulation .....: | GFSK, Π/4DQPSK,8DPSK |
| Frequency..... | From 2402MHz to 2480MHz |
| Rating.....: | 5.0V⎓1.0A(charged by DC 5V Power Adapter ) |
| Result.....: | **PASS** |

# TEST REPORT

| | | |
|---|---|---|
| Equipment under Test | : | Karaoke speaker（MIC） |
| Model /Type | : | K1 |
| Listed Models | : | D13,k3,k11,k16,k32,k30,D20,K3,K5,K6,K11,K12,K13,K16,K23,K29, K30,K32,K52,K55,K56,K58 |
| **Applicant** | : | **Shenzhen Kaijuhong Technology Co., Ltd** |
| Address | : | 2nd Floor, Building 3, Shajinggangtou Industrial Zone, Bao'an District, Shenzhen |
| **Manufacturer** | : | **Shenzhen Kaijuhong Technology Co., Ltd** |
| Address | : | 2nd Floor, Building 3, Shajinggangtou Industrial Zone, Bao'an District, Shenzhen |

| | |
|---|---|
| **Test Result**: | **PASS** |

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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# 1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

# 2 SUMMARY

## 2.1 General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | Nov. 08, 2023 |
| | | |
| Testing commenced on | : | Nov. 08, 2023 |
| | | |
| Testing concluded on | : | Nov. 28, 2023 |

## 2.2 Product Description

| | |
|---|---|
| Product Name: | Karaoke speaker（MIC） |
| Model/Type reference: | K1 |
| Listed Models: | D13,k3,k11,k16,k32,k30,D20,K3,K5,K6,K11,K12,K13,K16,K23,K29,K30,K32,K52,K55,K56,K58 (The products are identical in interior structure, electrical circuits and components, just model names and color are different.) |
| Power supply: | 5.0V⎓1.0A(charged by DC 5V Power Adapter ) |
| Adapter information (Auxiliary test supplied by test Lab): | Model:JYR9-05<br>Input:AC100-240V 50/60Hz, 0.3A<br>Output:DC 5V,2A |
| Testing sample ID: | GRCTR231102014-1# (Engineer sample),<br>GRCTR231102014-2# (Normal sample) |
| **Bluetooth** | |
| Supported Type: | Bluetooth BR/EDR |
| Modulation: | GFSK, π/4DQPSK, 8DPSK |
| Operation frequency: | 2402MHz~2480MHz |
| Channel number: | 79 |
| Channel separation: | 1MHz |
| Antenna type: | PCB antenna |
| Antenna gain*(Supplied by the customer): | -0.58 dBi |
| Remark:*When the information provided by the customer was used to calculate test results, if the information provided by the customer is not accurate, shenzhen GUOREN Certification Technology Service Co., Ltd. does not assume any responsibility. | |

## 2.3 Equipment Under Test

### Power supply system utilised

| | | | | | |
|---|---|---|---|---|---|
| Power supply voltage | : | ○ | 230V / 50 Hz | ○ | 120V / 60Hz |
| | | ○ | 12 V DC | ○ | 24 V DC |
| | | ● | Other (specified in blank below) | | |

DC 5.0V From external circuit

## 2.4 Short description of the Equipment under Test (EUT)

This is a Karaoke speaker（MIC）.
For more details, refer to the user's manual of the EUT.

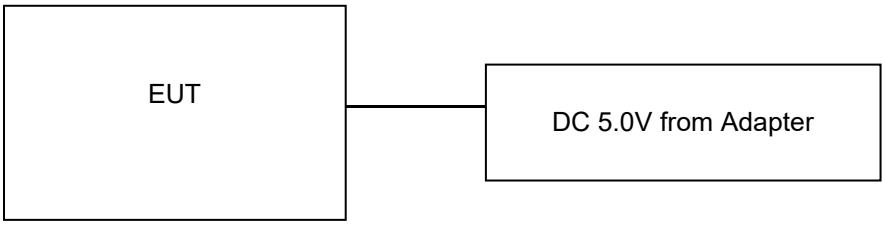
## 2.5 EUT operation mode

The Applicant provides communication tools software(SecureCRT) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 79 channels provided to the EUT and Channel 00/39/78 were selected to test.

**Operation Frequency：**

| Channel | Frequency (MHz) |
|---|---|
| 00 | 2402 |
| 01 | 2403 |
| ⋮ | ⋮ |
| 38 | 2440 |
| 39 | 2441 |
| 40 | 2442 |
| ⋮ | ⋮ |
| 77 | 2479 |
| 78 | 2480 |

## 2.6 Block Diagram of Test Setup




## 2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.8 Modifications

No modifications were implemented to meet testing criteria.

# 3 TEST ENVIRONMENT

## 3.1 Address of the test laboratory

**Shenzhen GUOREN Certification Technology Service Co., Ltd.**
101#, Building K & Building T, The Second Industrial Zone, Jiazitang Community, Fenghuang Street, Guangming District, Shenzhen, China

## 3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

**FCC-Registration No.: 920798 Designation Number: CN1304**

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

**A2LA-Lab Cert. No.: 6202.01**

Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

**ISED#: 27264 CAB identifier: CN0115**
Shenzhen GUOREN Certification Technology Service Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

**CNAS-Lab Code: L15631**
Shenzhen GUOREN Certification Technology Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories for the Competence of Testing and Calibration Laboratories.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

## 3.3 Environmental conditions

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

| | |
|---|---|
| Normal Temperature | 15-35 ℃ |
| Relative Humidity | 30-60 % |
| Air Pressure | 950-1050mbar |

## 3.4 Summary of measurement results

| Test Specification clause | Test case | Test Mode | Test Channel | Recorded In Report | | Test result |
|---|---|---|---|---|---|---|
| §15.247(a)(1) | Carrier Frequency separation | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Middle | Compliant |
| §15.247(a)(1) | Number of Hopping channels | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Full | GFSK | ☒ Full | Compliant |
| §15.247(a)(1) | Time of Occupancy (dwell time) | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Middle | Compliant |
| §15.247(a)(1) | Spectrumbandwidth of aFHSS system20dB bandwidth | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | Compliant |
| §15.247(b)(1) | Maximum output peak power | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | Compliant |
| §15.247(d) | Band edge compliance conducted | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Highest | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Highest | Compliant |
| §15.205 | Band edge compliance radiated | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Highest | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Highest | Compliant |
| §15.247(d) | TX spurious emissions conducted | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | Compliant |
| §15.247(d) | TX spurious emissions radiated | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | GFSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | Compliant |
| §15.209(a) | TX spurious Emissions radiated Below 1GHz | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | GFSK | ☒ Middle | Compliant |
| §15.107(a)<br>§15.207 | Conducted Emissions 9KHz-30 MHz | GFSK<br>Π/4DQPSK<br>8DPSK | ☒ Lowest<br>☒ Middle<br>☒ Highest | GFSK | ☒ Middle | Compliant |

Remark:
1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report.
3. N/A means “not applicable”.

## 3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01” Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1” and TR-100028-02 “Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 “ and is documented in the Shenzhen GUOREN Certification Technology Service Co., Ltd.quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GUOREN Certification Technology Service Co., Ltd.:

| Test | Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 30~1000MHz | 4.06 dB | (1) |
| Radiated Emission | 1~18GHz | 5.14 dB | (1) |
| Radiated Emission | 18-40GHz | 5.38 dB | (1) |
| Conducted Disturbance | 0.15~30MHz | 2.14 dB | (1) |
| Max output power | 30MHz~18GHz | 0.54 dB | (1) |
| Spectrum bandwidth | / | 1.2% | (1) |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

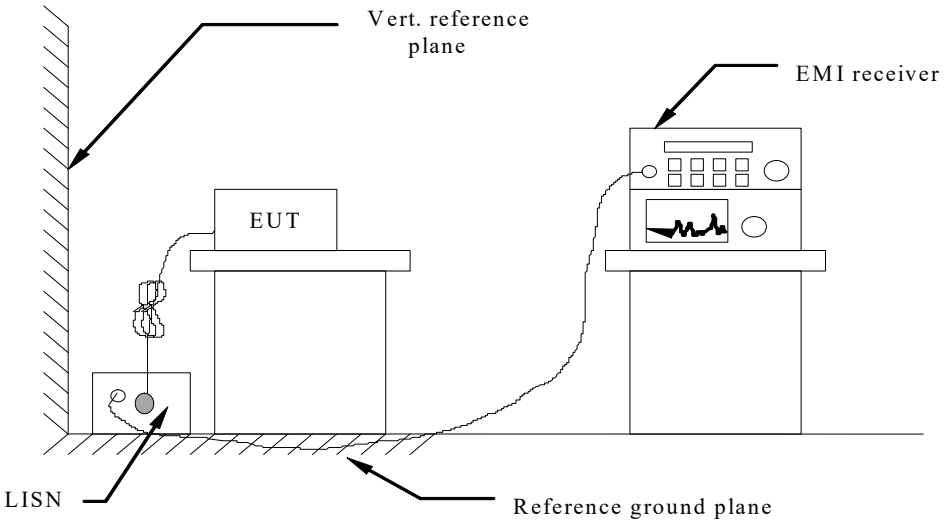
## 3.6 Equipments Used during the Test

| Test Equipment | Manufacturer | Model No. | Equipment No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| LISN | R&S | ENV216 | GRCTEE009 | 2023/09/27 | 2024/09/26 |
| LISN | R&S | ENV216 | GRCTEE010 | 2023/09/27 | 2024/09/26 |
| EMI Test Receiver | R&S | ESPI | GRCTEE017 | 2023/09/28 | 2024/09/27 |
| EMI Test Receiver | R&S | ESCI | GRCTEE008 | 2023/09/27 | 2024/09/26 |
| Spectrum Analyzer | Agilent | N9020A | GRCTEE002 | 2023/09/27 | 2024/09/26 |
| Spectrum Analyzer | R&S | FSP | GRCTEE003 | 2023/09/28 | 2024/09/27 |
| Vector Signal generator | Agilent | N5181A | GRCTEE007 | 2023/09/27 | 2024/09/26 |
| Analog Signal Generator | R&S | SML03 | GRCTEE006 | 2023/09/27 | 2024/09/26 |
| Climate Chamber | QIYA | LCD-9530 | GRCTES016 | 2023/09/27 | 2024/09/26 |
| Ultra-Broadband Antenna | Schwarzbeck | VULB9163 | GRCTEE018 | 2023/09/28 | 2026/09/27 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | GRCTEE019 | 2023/09/28 | 2026/09/27 |
| Loop Antenna | Zhinan | ZN30900C | GRCTEE020 | 2023/10/15 | 2026/10/14 |
| Horn Antenna | Beijing Hangwei Dayang | OBH100400 | GRCTEE049 | 2023/09/28 | 2026/09/27 |
| Amplifier | Schwarzbeck | BBV 9745 | GRCTEE021 | 2023/09/27 | 2024/09/26 |
| Amplifier | Taiwan chengyi | EMC051845B | GRCTEE022 | 2023/09/28 | 2024/09/27 |
| Temperature/Humidity Meter | Huaguan | HG-308 | GRCTES037 | 2023/09/27 | 2024/09/26 |
| Directional coupler | NARDA | 4226-10 | GRCTEE004 | 2023/09/27 | 2024/09/26 |
| High-Pass Filter | XingBo | XBLBQ-GTA18 | GRCTEE053 | 2023/09/27 | 2024/09/26 |
| High-Pass Filter | XingBo | XBLBQ-GTA27 | GRCTEE054 | 2023/09/27 | 2024/09/26 |
| Automated filter bank | Tonscend | JS0806-F | GRCTEE055 | 2023/09/27 | 2024/09/26 |
| Power Sensor | Agilent | U2021XA | GRCTEE070 | 2023/09/27 | 2024/09/26 |
| EMI Test Software | ROHDE & SCHWARZ | ESK1-V1.71 | GRCTEE060 | N/A | N/A |
| EMI Test Software | Fera | EZ-EMC | GRCTEE061 | N/A | N/A |

# 4 TEST CONDITIONS AND RESULTS

## 4.1 AC Power Conducted Emission

**TEST CONFIGURATION**




**TEST PROCEDURE**

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received power from variable frequency power supply, the AC 120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT.The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

**AC Power Conducted Emission Limit**

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

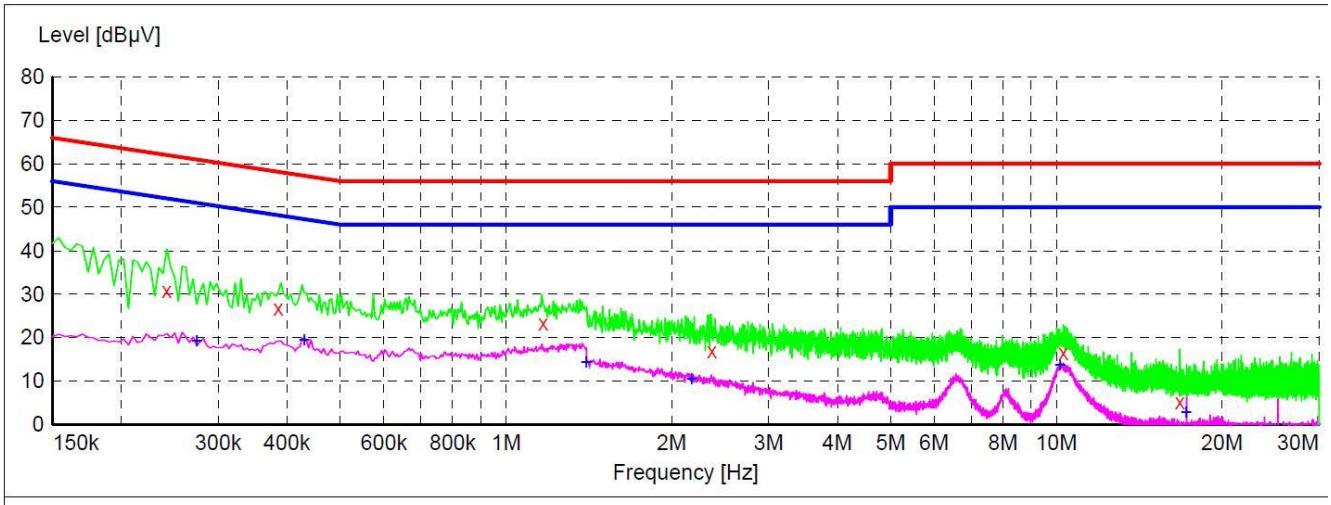
| Frequency range (MHz) | Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| * Decreases with the logarithm of the frequency. | | |

**TEST RESULTS**

Remark:
1. All modes of GFSK, Π/4 DQPSK and 8DPSK were test at Low, Middle, and High channel; only the worst result of GFSK Middle Channel was reported as below:

2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:

| Power supply: | DC 5V from Adapter AC 120V/60Hz | Polarization | L |
|---|---|---|---|




x x x MES GRCT1117003_fin

***MEASUREMENT RESULT: "GRCT1117003_fin"***

11/17/2023 9:45AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.242000 | 30.70 | 9.7 | 62 | 31.3 | QP | L1 | GND |
| 0.386000 | 26.70 | 9.7 | 58 | 31.4 | QP | L1 | GND |
| 1.170000 | 23.30 | 10.0 | 56 | 32.7 | QP | L1 | GND |
| 2.366000 | 16.90 | 10.0 | 56 | 39.1 | QP | L1 | GND |
| 10.298000 | 16.50 | 10.0 | 60 | 43.5 | QP | L1 | GND |
| 16.782000 | 5.20 | 10.1 | 60 | 54.8 | QP | L1 | GND |

***MEASUREMENT RESULT: "GRCT1117003_fin2"***

11/17/2023 9:45AM

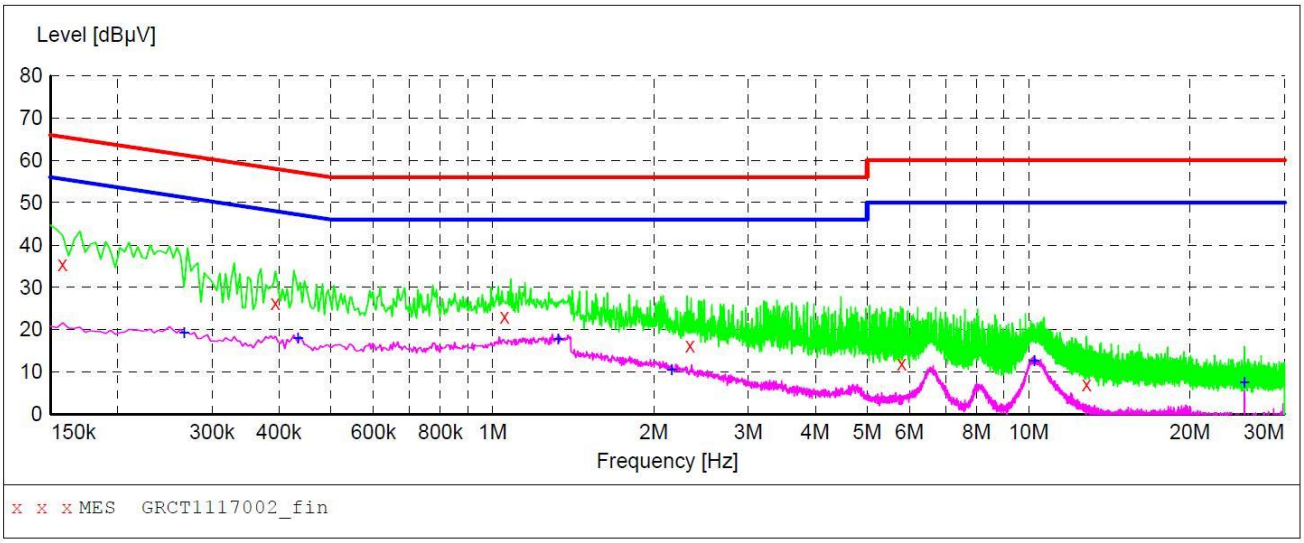
| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.274000 | 19.20 | 9.6 | 51 | 31.8 | AV | L1 | GND |
| 0.430000 | 19.50 | 9.8 | 47 | 27.8 | AV | L1 | GND |
| 1.398000 | 14.40 | 10.0 | 46 | 31.6 | AV | L1 | GND |
| 2.174000 | 10.50 | 10.0 | 46 | 35.5 | AV | L1 | GND |
| 10.158000 | 13.70 | 10.0 | 50 | 36.3 | AV | L1 | GND |
| 17.214000 | 2.90 | 10.1 | 50 | 47.1 | AV | L1 | GND |

Note:1).Level (dBµV)= Reading (dBµV)+ Transducer (dB)

2). Transducer (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). Margin(dB) = Limit (dBµV) - Level (dBµV)

| Power supply: | DC 5V from Adapter AC 120V/60Hz | Polarization | N |
|---|---|---|---|




***MEASUREMENT RESULT: "GRCT1117002_fin"***

11/17/2023 9:39AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.158000 | 35.40 | 9.5 | 66 | 30.2 | QP | N | GND |
| 0.394000 | 26.20 | 9.8 | 58 | 31.8 | QP | N | GND |
| 1.054000 | 23.00 | 10.0 | 56 | 33.0 | QP | N | GND |
| 2.338000 | 16.30 | 10.0 | 56 | 39.7 | QP | N | GND |
| 5.802000 | 12.00 | 10.0 | 60 | 48.0 | QP | N | GND |
| 12.834000 | 7.10 | 10.0 | 60 | 52.9 | QP | N | GND |

***MEASUREMENT RESULT: "GRCT1117002_fin2"***

11/17/2023 9:39AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 0.266000 | 19.30 | 9.6 | 51 | 31.9 | AV | N | GND |
| 0.434000 | 18.00 | 9.8 | 47 | 29.2 | AV | N | GND |
| 1.326000 | 17.80 | 10.0 | 46 | 28.2 | AV | N | GND |
| 2.158000 | 10.40 | 10.0 | 46 | 35.6 | AV | N | GND |
| 10.234000 | 12.70 | 10.0 | 50 | 37.3 | AV | N | GND |
| 25.254000 | 7.60 | 10.2 | 50 | 42.4 | AV | N | GND |

Note:1).Level (dBµV)= Reading (dBµV)+ Transducer (dB)

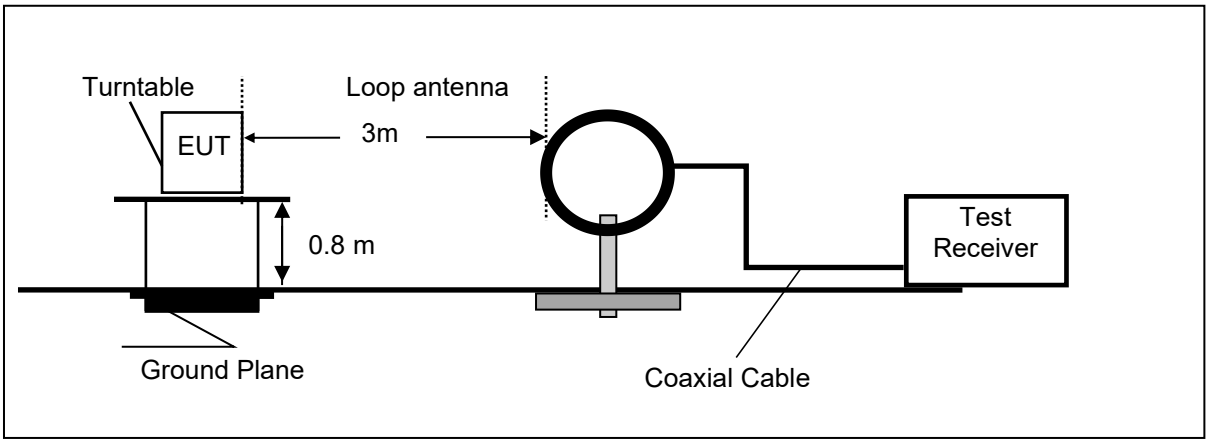
2). Transducer (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). Margin(dB) = Limit (dBµV) - Level (dBµV)

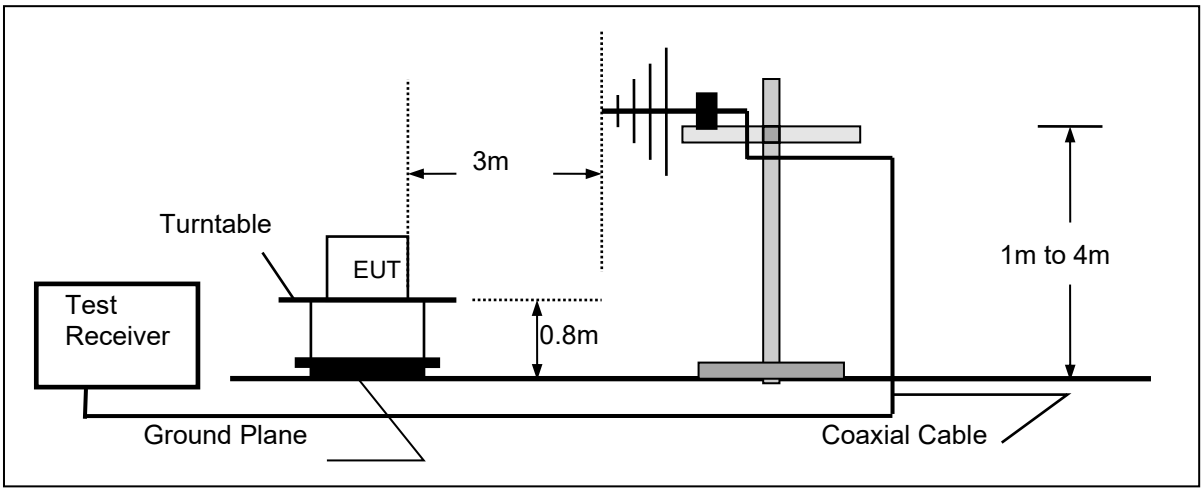
## 4.2 Radiated Emission

**TEST CONFIGURATION**

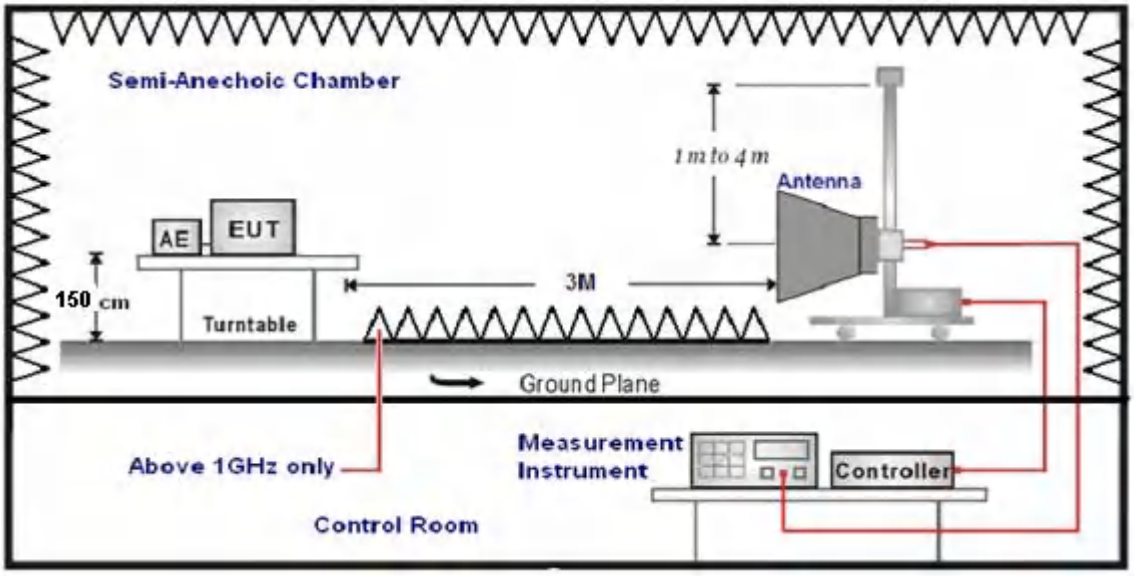
Frequency range 9 KHz – 30MHz




Frequency range 30MHz – 1000MHz




Frequency range above 1GHz-25GHz



## TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz, the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type | Test Distance |
|---|---|---|
| 9KHz-30MHz | Active Loop Antenna | 3 |
| 30MHz-1GHz | Ultra-Broadband Antenna | 3 |
| 1GHz-18GHz | Double Ridged Horn Antenna | 3 |
| 18GHz-25GHz | Horn Anternna | 1 |

7. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting | Detector |
|---|---|---|
| 9KHz-150KHz | RBW=200Hz/VBW=3KHz,Sweep time=Auto | QP |
| 150KHz-30MHz | RBW=9KHz/VBW=100KHz,Sweep time=Auto | QP |
| 30MHz-1GHz | RBW=120KHz/VBW=1000KHz,Sweep time=Auto | QP |
| 1GHz-40GHz | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto<br>Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto | Peak |

## Field Strength Calculation

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

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

| | |
|---|---|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

Transd=AF +CL-AG

## RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

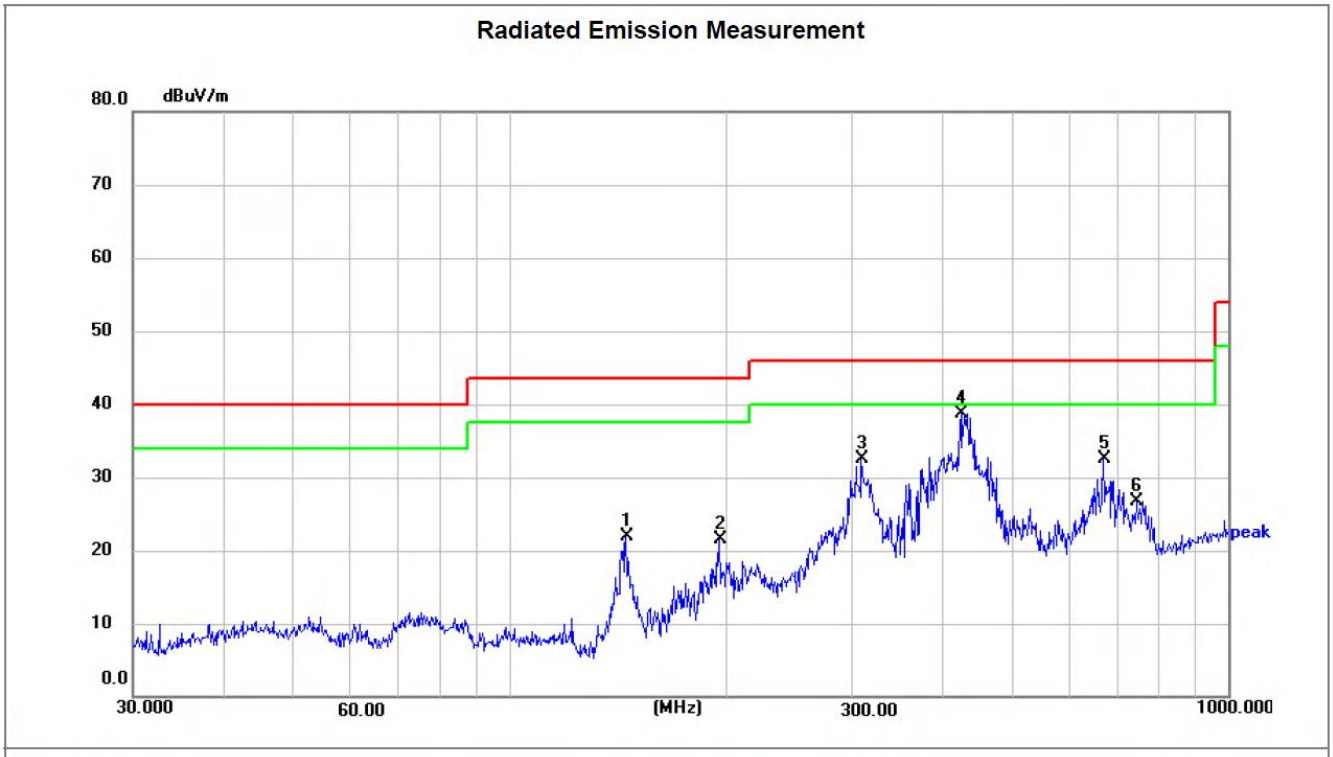
| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

**TEST RESULTS**

Remark:
1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. We measured Radiated Emission at GFSK,π/4 DQPSK and 8DPSK mode from 9 KHz to 25GHz and recorded worst case at GFSK DH5 mode.
3. For below 1GHz testing recorded worst at GFSK DH5 middle channel.
4. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

**For 30MHz-1GHz**

Horizontal




Site LAB
Limit: FCC Part15 RE-Class B_30-1000MHz
EUT: Karaoke speaker(MIC)
M/N: K1
Mode: GFSK DH5 CH 39
Note: N/A

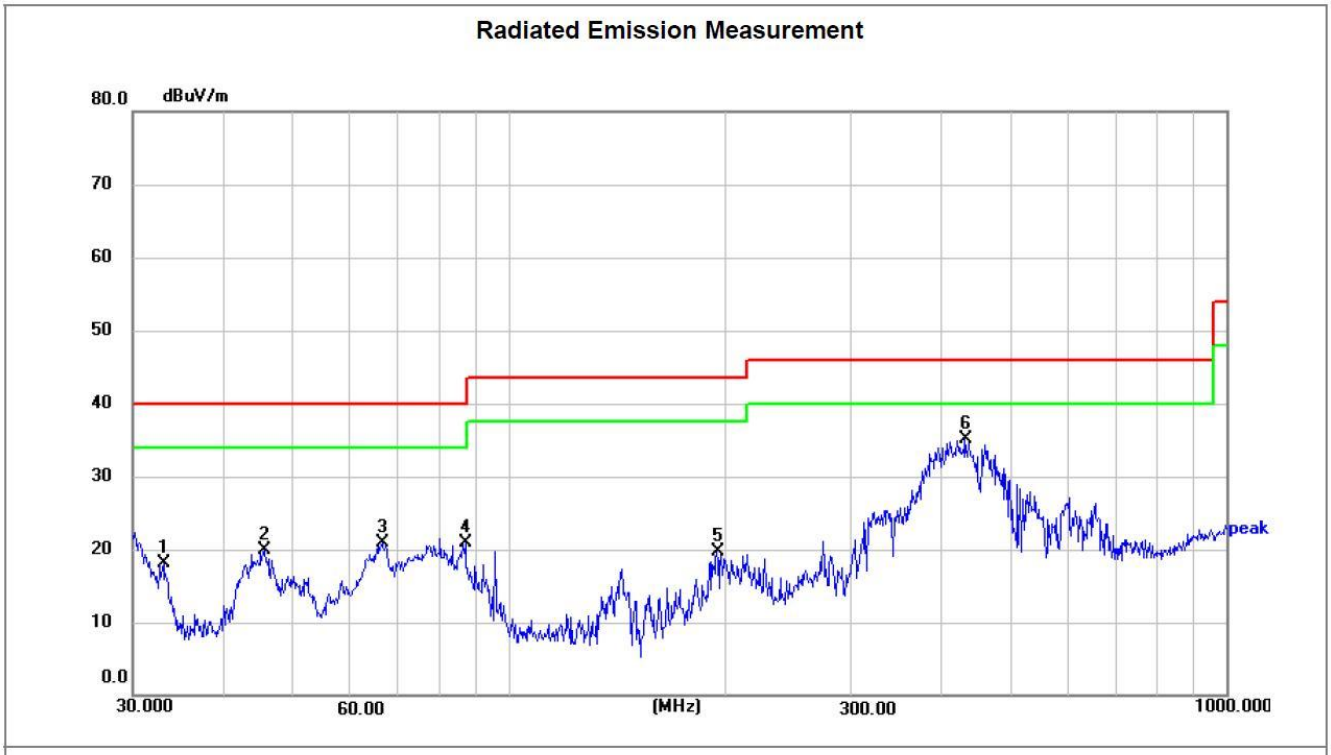
Polarization: ***Horizontal***
Power: AC120V/60Hz
Distance: 3m

Temperature: 24.5(C)
Humidity: 52 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 145.3506 | 43.56 | -21.75 | 21.81 | 43.50 | -21.69 | peak | 199 | 12 | P | |
| 2 | 195.8220 | 40.75 | -19.34 | 21.41 | 43.50 | -22.09 | peak | 100 | 123 | P | |
| 3 | 308.9126 | 49.32 | -16.90 | 32.42 | 46.00 | -13.58 | peak | 199 | 351 | P | |
| 4 * | 426.5210 | 54.04 | -15.42 | 38.62 | 46.00 | -7.38 | peak | 199 | 79 | P | |
| 5 | 670.4893 | 43.17 | -10.69 | 32.48 | 46.00 | -13.52 | peak | 100 | 78 | P | |
| 6 | 744.8661 | 36.87 | -10.13 | 26.74 | 46.00 | -19.26 | peak | 100 | 123 | P | |

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Level (dBμV/m) - Limit (dBμV/m)

Vertical




Site LAB
Limit: FCC Part15 RE-Class B_30-1000MHz
EUT: Karaoke speaker(MIC)
M/N: K1
Mode: GFSK DH5 CH 39
Note: N/A

Polarization: ***Vertical***
Power: AC120V/60Hz
Distance: 3m

Temperature: 24.5(C)
Humidity: 52 %

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Height (cm) | Azimuth (deg.) | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 33.0950 | 37.71 | -19.70 | 18.01 | 40.00 | -21.99 | peak | 100 | 274 | P | |
| 2 | 45.6948 | 37.37 | -17.55 | 19.82 | 40.00 | -20.18 | peak | 100 | 239 | P | |
| 3 | 66.7325 | 41.02 | -20.13 | 20.89 | 40.00 | -19.11 | peak | 100 | 35 | P | |
| 4 | 87.1117 | 42.24 | -21.31 | 20.93 | 40.00 | -19.07 | peak | 100 | 239 | P | |
| 5 | 195.1365 | 39.05 | -19.41 | 19.64 | 43.50 | -23.86 | peak | 100 | 359 | P | |
| 6 * | 432.5457 | 50.41 | -15.36 | 35.05 | 46.00 | -10.95 | peak | 199 | 288 | P | |

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Level (dBμV/m) - Limit (dBμV/m)

**For 1GHz to 25GHz**

*Note: GFSK , π/4 DQPSK and 8DPSK all have been tested, only worse case GFSK is reported.*

***GFSK (above 1GHz)***

| Frequency(MHz): | | | 2402 | | Polarity: | | HORIZONTAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4804.00 | 52.56 | PK | 74 | 21.44 | 73.72 | 28.42 | 5.14 | 54.72 | -21.16 |
| 4804.00 | 40.80 | AV | 54 | 13.20 | 61.96 | 28.42 | 5.14 | 54.72 | -21.16 |
| 7206.00 | 48.62 | PK | 74 | 25.38 | 63.04 | 34.15 | 6.46 | 55.03 | -14.42 |
| 7206.00 | 37.74 | AV | 54 | 16.26 | 52.16 | 34.15 | 6.46 | 55.03 | -14.42 |

| Frequency(MHz): | | | 2402 | | Polarity: | | VERTICAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4804.00 | 53.29 | PK | 74 | 20.71 | 74.45 | 28.42 | 5.14 | 54.72 | -21.16 |
| 4804.00 | 41.75 | AV | 54 | 12.25 | 62.91 | 28.42 | 5.14 | 54.72 | -21.16 |
| 7206.00 | 48.39 | PK | 74 | 25.61 | 62.81 | 34.15 | 6.46 | 55.03 | -14.42 |
| 7206.00 | 37.41 | AV | 54 | 16.59 | 51.83 | 34.15 | 6.46 | 55.03 | -14.42 |

| Frequency(MHz): | | | 2441 | | Polarity: | | HORIZONTAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4882.00 | 55.53 | PK | 74 | 18.47 | 75.77 | 28.76 | 5.34 | 54.34 | -20.24 |
| 4882.00 | 43.21 | AV | 54 | 10.79 | 63.45 | 28.76 | 5.34 | 54.34 | -20.24 |
| 7323.00 | 49.48 | PK | 74 | 24.52 | 63.11 | 34.41 | 6.83 | 54.87 | -13.63 |
| 7323.00 | 37.83 | AV | 54 | 16.17 | 51.46 | 34.41 | 6.83 | 54.87 | -13.63 |

| Frequency(MHz): | | | 2441 | | Polarity: | | VERTICAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4882.00 | 54.60 | PK | 74 | 19.40 | 74.84 | 28.76 | 5.34 | 54.34 | -20.24 |
| 4882.00 | 43.75 | AV | 54 | 10.25 | 63.99 | 28.76 | 5.34 | 54.34 | -20.24 |
| 7323.00 | 49.51 | PK | 74 | 24.49 | 63.14 | 34.41 | 6.83 | 54.87 | -13.63 |
| 7323.00 | 38.94 | AV | 54 | 15.06 | 52.57 | 34.41 | 6.83 | 54.87 | -13.63 |

| Frequency(MHz): | | | 2480 | | Polarity: | | HORIZONTAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4960.00 | 54.28 | PK | 74 | 19.72 | 73.81 | 29.52 | 5.63 | 54.68 | -19.53 |
| 4960.00 | 43.56 | AV | 54 | 10.44 | 63.09 | 29.52 | 5.63 | 54.68 | -19.53 |
| 7440.00 | 49.87 | PK | 74 | 24.13 | 63.07 | 34.49 | 7.23 | 54.92 | -13.2 |
| 7440.00 | 37.79 | PK | 54 | 16.21 | 50.99 | 34.49 | 7.23 | 54.92 | -13.2 |

| Frequency(MHz): | | | 2480 | | Polarity: | | VERTICAL | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 4960.00 | 55.94 | PK | 74 | 18.06 | 75.47 | 29.52 | 5.63 | 54.68 | -19.53 |
| 4960.00 | 40.28 | AV | 54 | 13.72 | 65.11 | 29.52 | 5.63 | 54.68 | -19.53 |
| 7440.00 | 51.12 | PK | 74 | 22.88 | 64.32 | 34.49 | 7.23 | 54.92 | -13.2 |
| 7440.00 | 37.90 | PK | 54 | 16.10 | 51.10 | 34.49 | 7.23 | 54.92 | -13.2 |

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

***Results of Band Edges Test (Radiated)***

*Note: GFSK, π/4 DQPSK and 8DPSK all have been tested, only worse case GFSK is reported.*

***GFSK***

| **Frequency(MHz):** | | | **2402** | | **Polarity:** | | **HORIZONTAL** | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2390.00 | 56.72 | PK | 74 | 17.28 | 81.44 | 25.72 | 4.32 | 54.76 | -24.72 |
| 2390.00 | 40.71 | AV | 54 | 13.29 | 65.43 | 25.72 | 4.32 | 54.76 | -24.72 |
| **Frequency(MHz):** | | | **2402** | | **Polarity:** | | **VERTICAL** | | |
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2390.00 | 58.46 | PK | 74 | 15.54 | 83.18 | 25.72 | 4.32 | 54.76 | -24.72 |
| 2390.00 | 42.15 | AV | 54 | 11.85 | 66.87 | 25.72 | 4.32 | 54.76 | -24.72 |
| **Frequency(MHz):** | | | **2480** | | **Polarity:** | | **HORIZONTAL** | | |
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2483.50 | 57.96 | PK | 74 | 16.04 | 82.53 | 25.78 | 4.48 | 54.83 | -24.57 |
| 2483.50 | 39.72 | AV | 54 | 14.28 | 64.29 | 25.78 | 4.48 | 54.83 | -24.57 |
| **Frequency(MHz):** | | | **2480** | | **Polarity:** | | **VERTICAL** | | |
| Frequency (MHz) | Emission Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 2483.50 | 56.88 | PK | 74 | 17.12 | 81.45 | 25.78 | 4.48 | 54.83 | -24.57 |
| 2483.50 | 40.52 | AV | 54 | 13.48 | 65.09 | 25.78 | 4.48 | 54.83 | -24.57 |

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

## 4.3 Maximum Peak Output Power

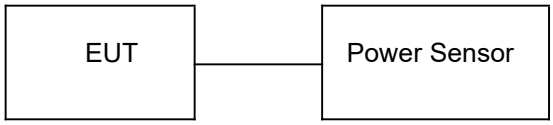
**Limit**

The Maximum Peak Output Power Measurement is 125mW (20.97).

**Test Procedure**

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

**Test Configuration**




**Test Results**

| Type | Channel | Output power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| GFSK | 00 | 5.95 | 20.97 | Pass |
| | 39 | 6.37 | | |
| | 78 | 5.99 | | |
| π/4DQPSK | 00 | 5.69 | 20.97 | Pass |
| | 39 | 6.06 | | |
| | 78 | 6.83 | | |
| 8DPSK | 00 | 5.74 | 20.97 | Pass |
| | 39 | 6.11 | | |
| | 78 | 6.69 | | |

Note: 1.The test results including the cable lose.

## 4.4 20dB Bandwidth

**Limit**

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

**Test Configuration**

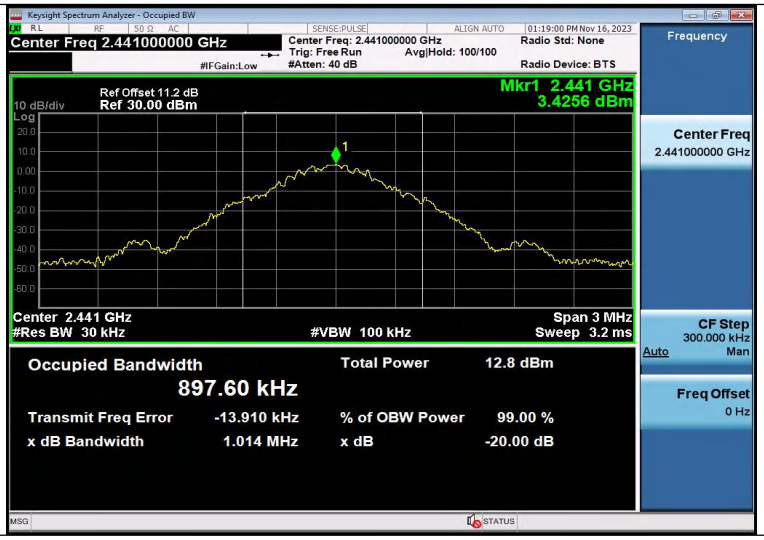
**Test Results**

| Modulation | Channel | 20dB bandwidth (MHz) | Result |
|---|---|---|---|
| GFSK | 00 | 1.034 | Pass |
| | 39 | 1.014 | |
| | 78 | 1.033 | |
| π/4DQPSK | 00 | 1.314 | |
| | 39 | 1.288 | |
| | 78 | 1.306 | |
| 8DPSK | 00 | 1.278 | |
| | 39 | 1.266 | |
| | 78 | 1.263 | |

**Test plot as follows:**

*GFSK Modulation*

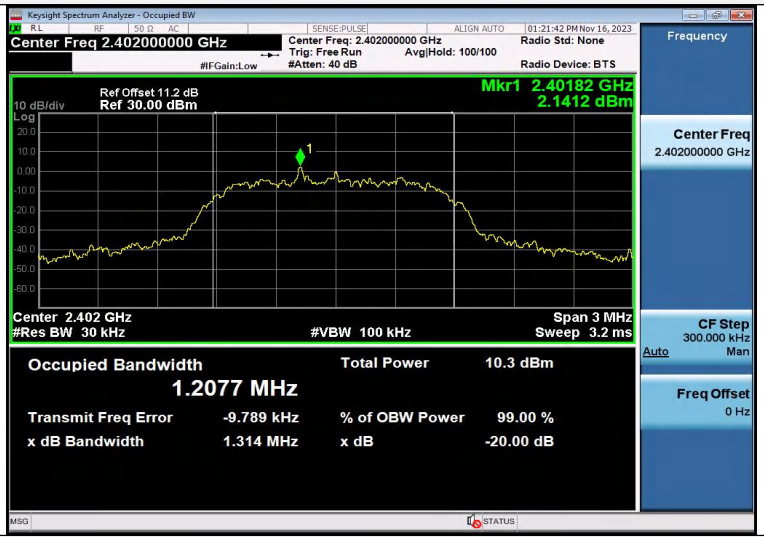
*CH00*



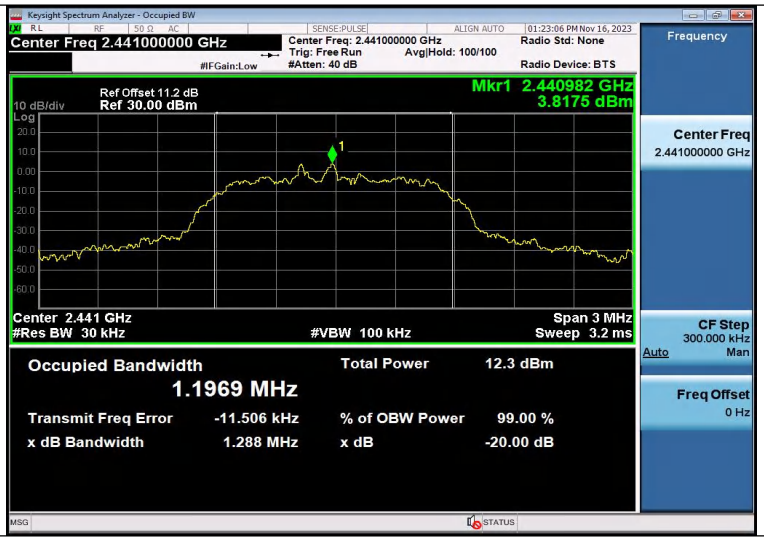

*CH39*

*CH78*

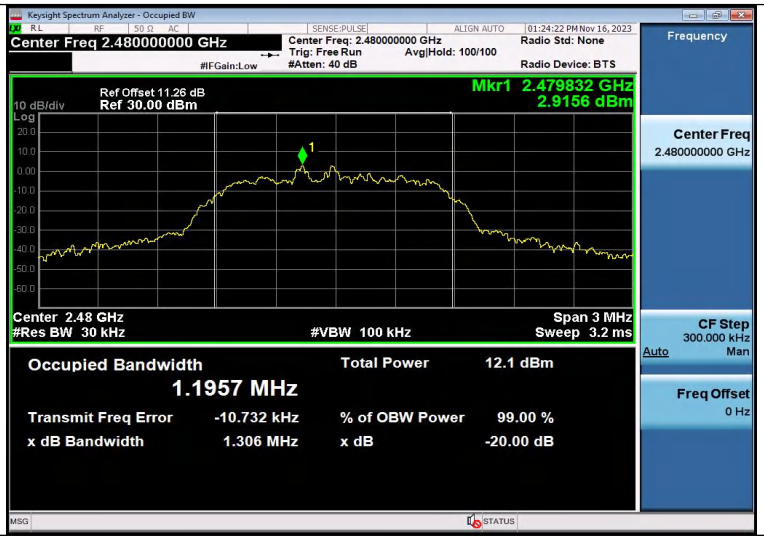
*π/4DQPSK Modulation*




*CH00*



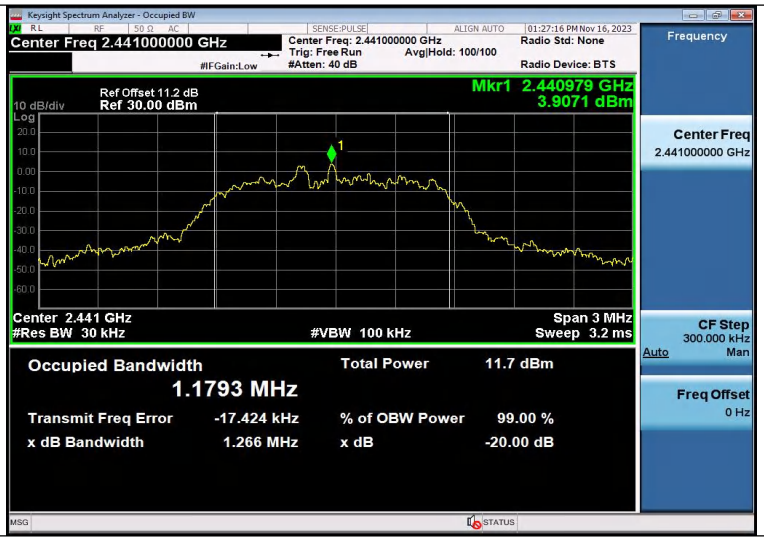

*CH39*




*CH78*

*8DPSK Modulation*

*CH00*




*CH39*

*CH78*

## 4.5 Frequency Separation

**LIMIT**

According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

**TEST PROCEDURE**

The transmitter output was connected to the spectrum analyzer through an attenuator. CH39 and CH40 was measured by spectrum analyzer with300 KHz RBW and 300 KHz VBW.

**TEST CONFIGURATION**

**TEST RESULTS**

| Modulation | Channel | Channel Separation (MHz) | Limit | Result |
|---|---|---|---|---|
| GFSK | CH39 | 1.138 | 0.676MHz | Pass |
| | CH40 | | | |
| π/4DQPSK | CH39 | 1.114 | 0.858MHz | Pass |
| | CH40 | | | |
| 8DPSK | CH39 | 1.140 | 0.842MHz | Pass |
| | CH40 | | | |

Note:
We have tested all mode at high, middle and low channel, and recorded worst case at middle.

**Test plot as follows:**

*GFSK*

*π/4DQPSK*

8DPSK

## 4.6 Number of hopping frequency

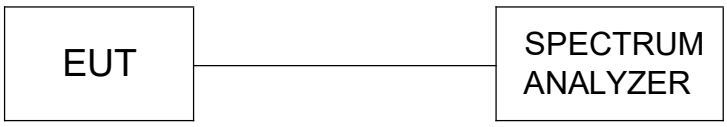
**Limit**

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz with 100 KHz RBW and 300 KHz VBW.

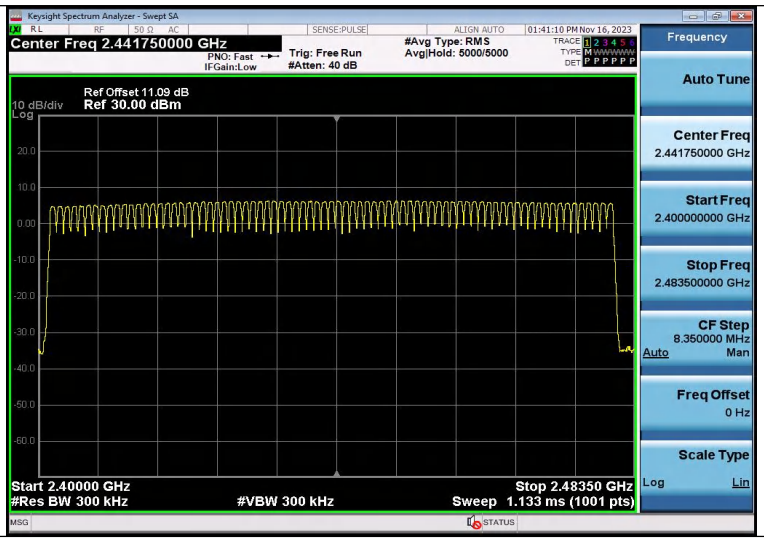
**Test Configuration**



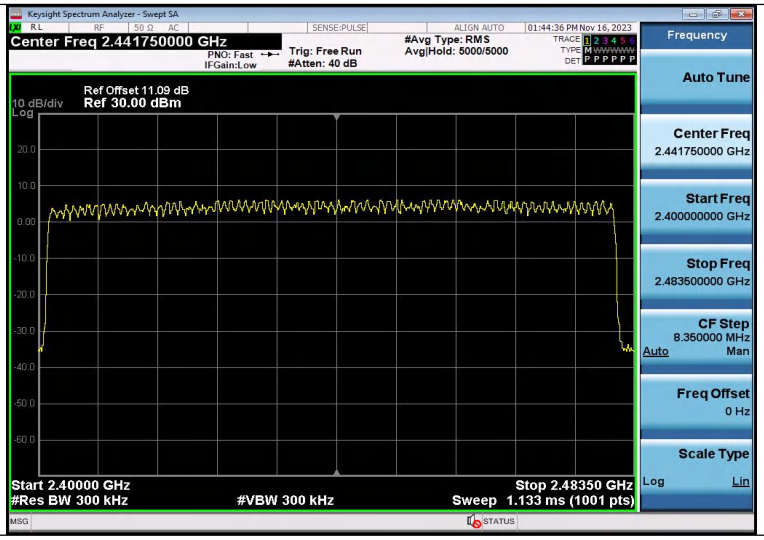

**Test Results**

| Modulation | Number of Hopping Channel | Limit | Result |
|---|---|---|---|
| GFSK | 79 | ≥15 | Pass |
| π/4DQPSK | 79 | | |
| 8DPSK | 79 | | |

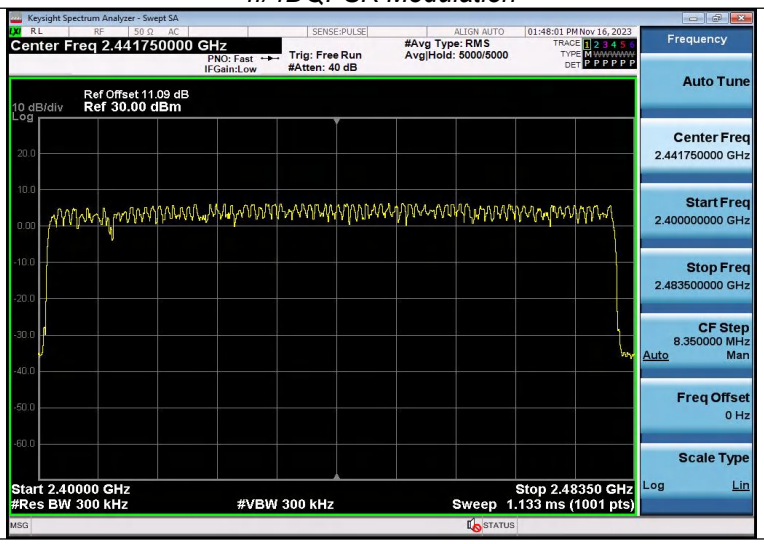
**Test plot as follows:**




*GFSK Modulation*




*π/4DQPSK Modulation*




*8DPSK Modulation*

## 4.7 Time of Occupancy (Dwell Time)

**Limit**

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 1MHz VBW, Span 0Hz.

**Test Configuration**

**Test Results**

| Modulation | Packet | Burst time (ms) | Dwell time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| GFSK | DH1 | 0.383 | 0.123 | 0.40 | Pass |
| | DH3 | 1.638 | 0.262 | | |
| | DH5 | 2.885 | 0.308 | | |
| π/4DQPSK | 2-DH1 | 0.391 | 0.125 | 0.40 | Pass |
| | 2-DH3 | 1.643 | 0.263 | | |
| | 2-DH5 | 2.891 | 0.308 | | |
| 8DPSK | 3-DH1 | 0.390 | 0.125 | 0.40 | Pass |
| | 3-DH3 | 1.643 | 0.263 | | |
| | 3-DH5 | 2.892 | 0.308 | | |

Note:We have tested all mode at high,middle and low channel,and recorded worst case at middle channel.

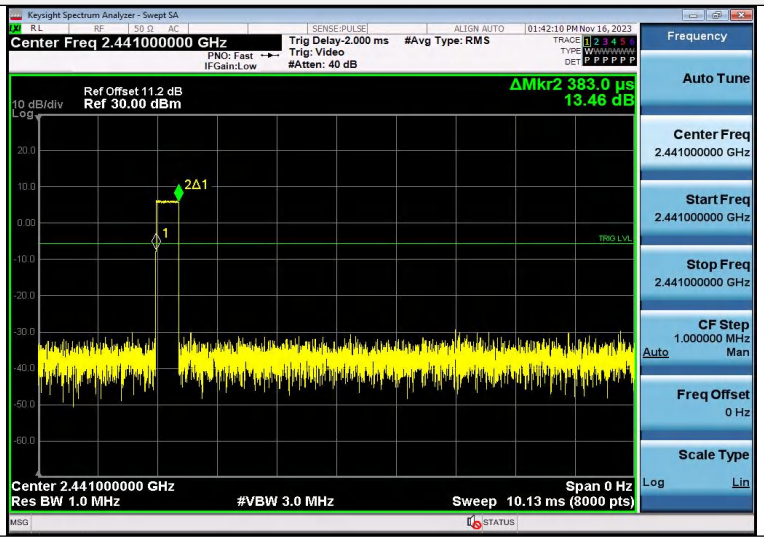
Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2-DH1, 3-DH1

Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second for DH3, 2-DH3, 3-DH3

Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second for DH5, 2-DH5, 3-DH5

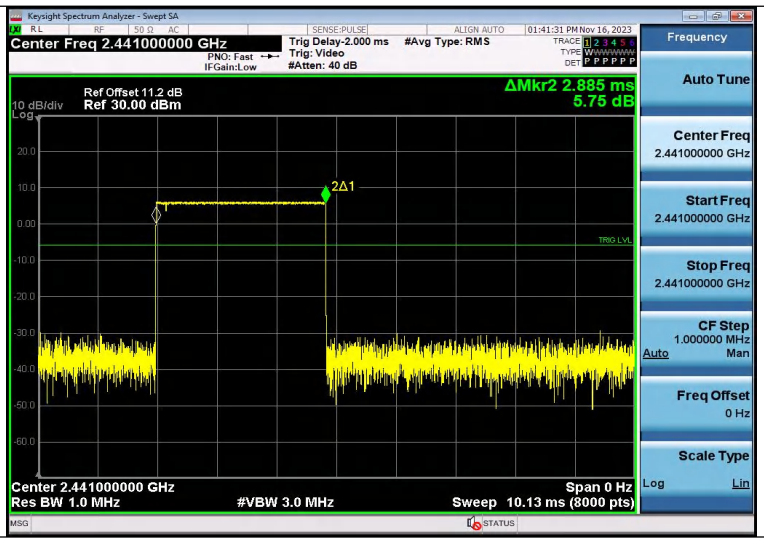
**Test plot as follows:**

GFSK Modulation



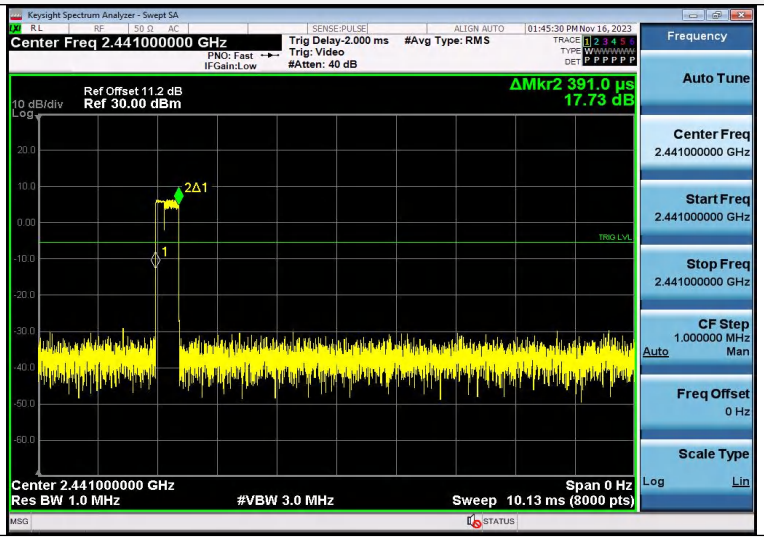

DH1 burst time

DH3 burst time

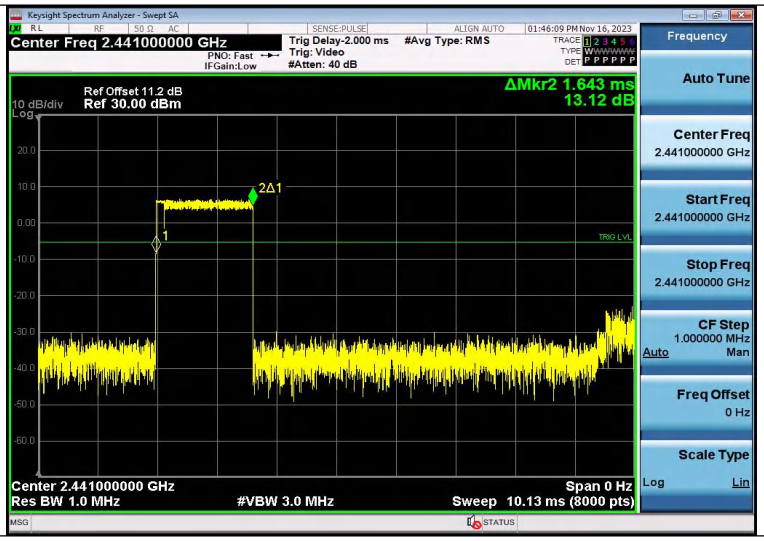



DH5 burst time

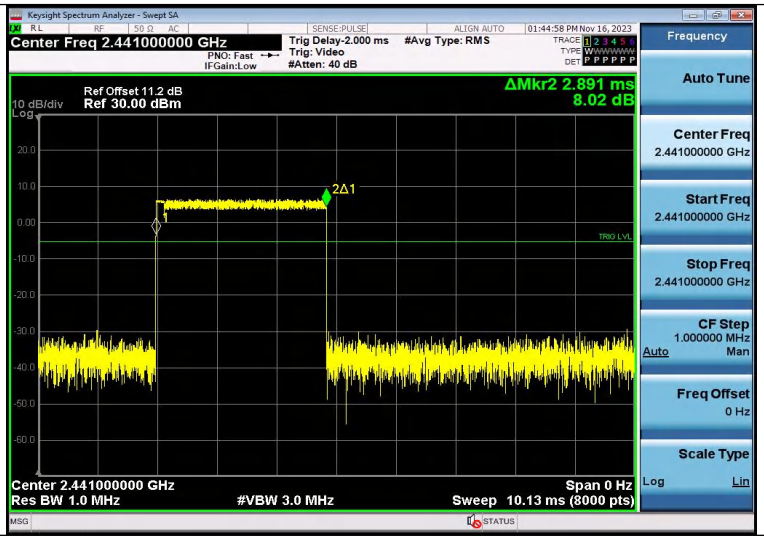
π/4DQPSK Modulation




2-DH1 burst time

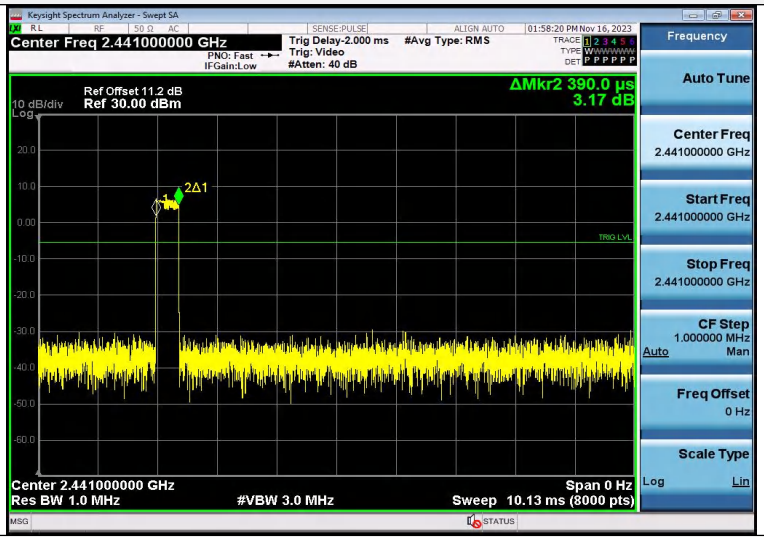



2-DH3 burst time

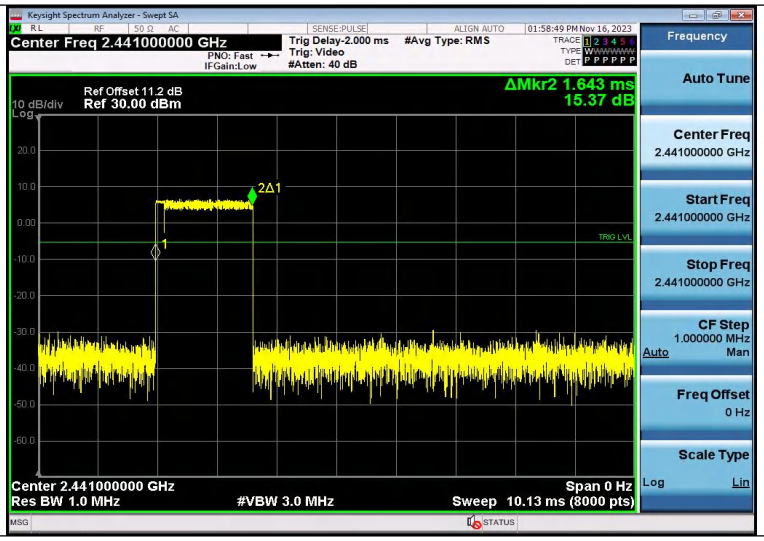



2-DH5 burst time

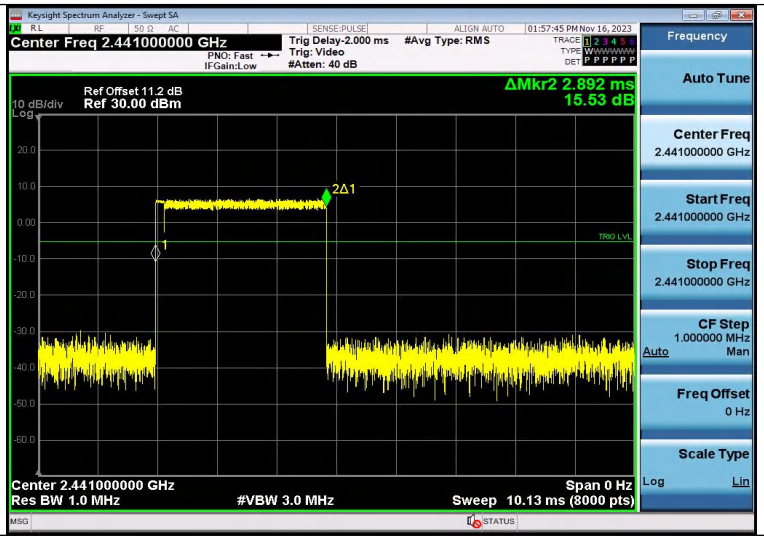
8DPSK Modulation




3-DH1 burst time




3-DH3 burst time




3-DH5 burst time