

# FCC TEST REPORT

## Client Information:

Applicant: Shenzhen Shengjiali Electronics Co., Ltd  
Applicant add.: Room 201-601, Building 3, No. 72, Xikeng Road, Fucheng Street, Longhua District, Shenzhen  
Manufacturer: Shenzhen Shengjiali Electronics Co., Ltd  
Manufacturer add.: Room 201-601, Building 3, No. 72, Xikeng Road, Fucheng Street, Longhua District, Shenzhen

## Product Information:

Product Name: TWB Bluetooth headset  
Model No.: GQ001  
Serial Model: N/A  
Brand Name: SJL  
FCC ID: 2A2ZX-GQ001

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

## Prepared By:

### Dongguan Yaxu (AiT) Technology Limited

No.22, Jinqianling Third Street, Jitigang, Huangjiang, Dongguan,  
Guangdong, China

Tel.: +86-769-8202 0499 Fax.: +86-769-8202 0495

Date of Receipt: Aug. 10, 2021 Date of Test: Aug. 10, 2021 ~ Aug. 19, 2021

Date of Issue: Aug. 20, 2021 Test Result: Pass

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

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Reviewed by: Simba Huang  
Simba Huang

Approved by: Seal.chen  
Seal.chen

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**Revision History**

| Revision | Issue Date    | Revisions     | Revised By |
|----------|---------------|---------------|------------|
| 000      | Aug. 20, 2021 | Initial Issue | Seal Chen  |
|          |               |               |            |
|          |               |               |            |

## 2 Test Summary

| Test Item                                  | Section in CFR 47  | Result |
|--------------------------------------------|--------------------|--------|
| Antenna Requirement                        | 15.203             | Pass   |
| AC Power Line Conducted Emission           | 15.207(a)          | Pass   |
| Conducted Peak Output Power                | 15.247 (b)(1)      | Pass   |
| 20dB Occupied Bandwidth                    | 15.247 (a)(1)      | Pass   |
| Carrier Frequencies Separation             | 15.247 (a)(1)      | Pass   |
| Hopping Channel Number                     | 15.247 (a)(1)(iii) | Pass   |
| Dwell Time                                 | 15.247 (a)(1)(iii) | Pass   |
| Radiated Emission and Restrict Bands       | 15.205/15.209      | Pass   |
| Conducted Unwanted emissions and Band Edge | 15.247(d)          | Pass   |

*Note The measurement uncertainty is not included in the test result.*

### 2.1 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 CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the AIT 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.

### 2.2 Measurement Uncertainty

| Test Item                        | Frequency Range | Measurement Uncertainty | Notes |
|----------------------------------|-----------------|-------------------------|-------|
| Radiated Emission                | 0.009MHz-30MHz  | 3.10dB                  | (1)   |
| Radiated Emission                | 30MHz-1GHz      | 3.75dB                  | (1)   |
| Radiated Emission                | 1GHz-18GHz      | 3.88dB                  | (1)   |
| Radiated Emission                | 18GHz-40GHz     | 3.88dB                  | (1)   |
| AC Power Line Conducted Emission | 0.15MHz ~ 30MHz | 1.20dB                  | (1)   |

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

### 3 Test Facility

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

**CNAS- Registration No: L6177**

**FCC Designation Number:CN1313**

**FCC Test Firm Registration Number:703111**

#### 3.1 Deviation from standard

None

#### 3.2 Abnormalities from standard conditions

None

#### 3.3 Environmental conditions

|                       |             |
|-----------------------|-------------|
| RF Conducted Testing: |             |
| Temperature:          | 24.6℃       |
| Humidity:             | 52.4%       |
| Atmospheric pressure: | 101kPa      |
| Test by:              | Simba Huang |

#### 3.4 Test Location

**Dongguan Yaxu (AiT) Technology Limited**

Address: No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan, Guangdong, China

Tel.: +86-769-8202 0499

Fax.: +86-769-8202 0495

## 4 General Information

|                        |                                                                                                                   |
|------------------------|-------------------------------------------------------------------------------------------------------------------|
| EUT Name:              | TWB Bluetooth headset                                                                                             |
| Model No:              | GQ001                                                                                                             |
| Serial Model:          | N/A                                                                                                               |
| Brand Name:            | SJL                                                                                                               |
| Test sample(s) ID:     | 21081002-1                                                                                                        |
| Sample(s) Status:      | Engineer sample                                                                                                   |
| Serial No.:            | N/A                                                                                                               |
| Operation frequency:   | 2402MHz~2480MHz                                                                                                   |
| Channel Number:        | 79                                                                                                                |
| Modulation Type:       | GFSK, $\pi/4$ -DQPSK, 8-DPSK                                                                                      |
| Modulation Technology: | FHSS                                                                                                              |
| Antenna Type:          | Chip Antenna                                                                                                      |
| Antenna Gain:          | 1.0dBi                                                                                                            |
| H/W No.:               | N/A                                                                                                               |
| S/W No.:               | N/A                                                                                                               |
| Power supply:          | DC5V (Charging Case) or DC3.7V from battery (Earphones)                                                           |
| Battery:               | DC 3.7V Li Battery                                                                                                |
| Model different:       | N/A                                                                                                               |
| Note:                  | For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. |

## 4.1 Test frequencies

EUT channels and frequencies list:

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

**Note:**

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

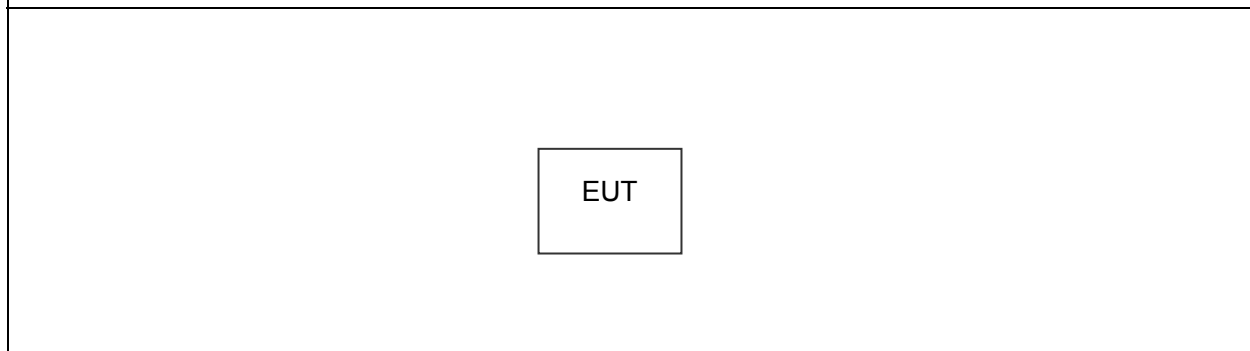
|                   |                                                 |          |          |
|-------------------|-------------------------------------------------|----------|----------|
| Transmitting mode | Keep the EUT in continuously transmitting mode. |          |          |
| Test software:    | BlueSuite2_4_13                                 |          |          |
| Frequency         | 2402 MHz                                        | 2440 MHz | 2480 MHz |
| Parameters(1Mbps) | Default                                         | Default  | Default  |
| Parameters(2Mbps) | Default                                         | Default  | Default  |
| Parameters(2Mbps) | Default                                         | Default  | Default  |

Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

## 4.2 Description of Test setup

EUT was tested in normal configuration (Please See following Block diagrams)

### 1. Block diagram of EUT configuration (TX Mode)



## 4.3 EUT Peripheral List

| No. | Equipment | Manufacturer | EMC Compliance | Model No. | Serial No. | Power cord | Signal cord |
|-----|-----------|--------------|----------------|-----------|------------|------------|-------------|
| 1   | N/A       | N/A          | N/A            | N/A       | N/A        | N/A        | N/A         |

## 4.4 Test Peripheral List

| No. | Equipment | Manufacturer | EMC Compliance | Model No.   | Serial No. | Power cord | Signal cord |
|-----|-----------|--------------|----------------|-------------|------------|------------|-------------|
| 1   | Adapter   | Nokia        | FCC            | AD-10W<br>U | N/A        | N/A        | N/A         |

## 5 Equipment Used during Test

| No | Test Equipment                      | Manufacturer | Model No        | Serial No              | Cal. Date  | Cal. Due Date |
|----|-------------------------------------|--------------|-----------------|------------------------|------------|---------------|
| 1  | Spectrum Analyzer                   | R&S          | FSV40           | 101470                 | 2020.08.28 | 2021.08.27    |
| 2  | EMI Measuring Receiver              | R&S          | ESR             | 101160                 | 2020.08.28 | 2021.08.27    |
| 3  | Low Noise Pre Amplifier             | HP           | HP8447E         | 1937A01855             | 2020.08.28 | 2021.08.27    |
| 4  | Low Noise Pre Amplifier             | Tsj          | MLA-0120-A02-34 | 2648A04738             | 2020.08.28 | 2021.08.27    |
| 5  | Passive Loop                        | ETS          | 6512            | 00165355               | 2020.09.05 | 2022.09.04    |
| 6  | TRILOG Super Broadband test Antenna | SCHWARZBECK  | VULB9160        | 9160-3206              | 2020.07.25 | 2023.07.24    |
| 7  | Broadband Horn Antenna              | SCHWARZBECK  | BBHA9120D       | 452                    | 2020.07.25 | 2023.07.24    |
| 8  | SHF-EHF Horn Antenna 15-40GHz       | SCHWARZBECK  | BBHA9170        | BBHA9170367d           | 2020.11.24 | 2023.11.23    |
| 9  | EMI Test Receiver                   | R&S          | ESCI            | 100124                 | 2020.08.28 | 2021.08.27    |
| 10 | LISN                                | Kyoritsu     | KNW-242         | 8-837-4                | 2020.08.28 | 2021.08.27    |
| 11 | LISN                                | R&S          | ESH3-Z2         | 0357.8810.54-101161-S2 | 2020.08.28 | 2021.08.27    |
| 12 | Pro.Temp&Humi.chamber               | MENTEK       | MHP-150-1C      | MAA08112501            | 2020.08.28 | 2021.08.27    |
| 13 | RF Automatic Test system            | MW           | MW100-RFCB      | 21033016               | 2020.08.28 | 2021.08.27    |
| 14 | Signal Generator                    | Agilent      | N5182A          | MY50143009             | 2020.08.28 | 2021.08.27    |
| 15 | Wideband Radio communication tester | R&S          | CMW500          | 1201.0002K50           | 2020.08.28 | 2021.08.27    |
| 16 | RF Automatic Test system            | MW           | MW100-RFCB      | 21033016               | 2020.08.28 | 2021.08.27    |
| 17 | DC power supply                     | ZHAOXIN      | RXN-305D-2      | 28070002559            | N/A        | N/A           |
| 18 | RE Software                         | EZ           | EZ-EMC_RE       | Ver.AIT-03A            | N/A        | N/A           |
| 19 | CE Software                         | EZ           | EZ-EMC_CE       | Ver.AIT-03A            | N/A        | N/A           |
| 20 | RF Software                         | MW           | MTS 8310        | 2.0.0.0                | N/A        | N/A           |
| 21 | temporary antenna connector(Note)   | NTS          | R001            | N/A                    | N/A        | N/A           |

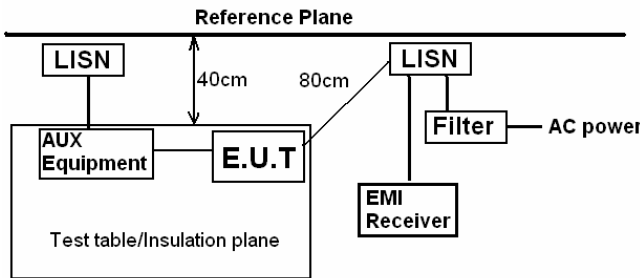
Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

## 6 Test results and Measurement Data

### 6.1 Antenna requirement

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Standard requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | FCC Part15 C Section 15.203 |
| <b>15.203 requirement:</b><br><p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <b>15.247(c) (1)(i) requirement:</b><br><p>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p> |                             |
| <b>E.U.T Antenna:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |
| <i>The antenna is Chip antenna, the best case gain of the is 1.0dBi, reference to the appendix II for details</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |

## 6.2 Conducted Emissions

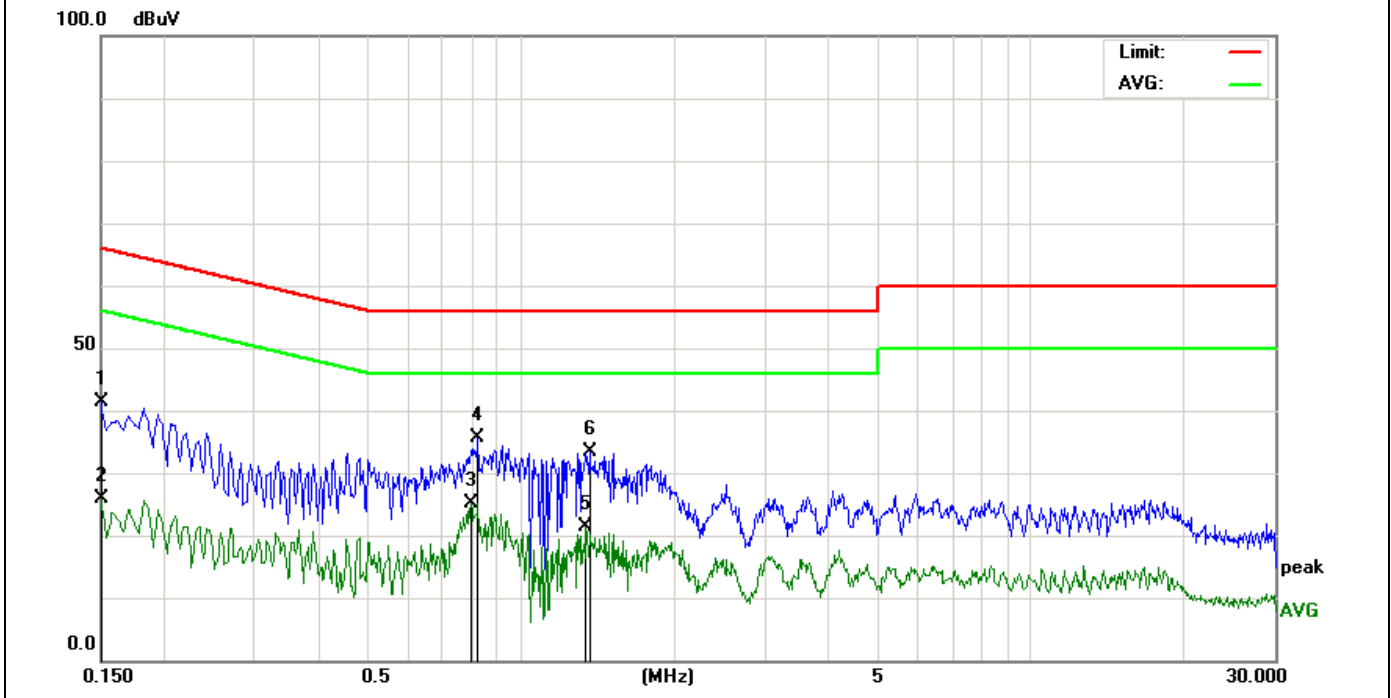
|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |              |     |           |          |  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------|-----|-----------|----------|--|
| Test Requirement:     | FCC Part15 C Section 15.207                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |              |     |           |          |  |
| Test Method:          | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |              |     |           |          |  |
| Test Frequency Range: | 150KHz to 30MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |              |     |           |          |  |
| Receiver setup:       | RBW=9KHz, VBW=30KHz, Sweep time=auto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |              |     |           |          |  |
| Limit:                | 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 setup:           | <div><p style="text-align: center;"><b>Reference Plane</b></p><p>Remark:<br/>E.U.T: Equipment Under Test<br/>LISN: Line Impedance Stabilization Network<br/>Test table height=0.8m</p></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |              |     |           |          |  |
| Test procedure:       | <div><div>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</div><div>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</div><div>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</div></div> |       |              |     |           |          |  |
| Test Instruments:     | Refer to section 5.0 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |              |     |           |          |  |
| Test mode:            | Refer to section 4.1 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |              |     |           |          |  |
| Test environment:     | Temp.:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 25 °C | Humid.:      | 52% | Press.:   | 1012mbar |  |
| Test voltage:         | AC 120V, 60Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |              |     |           |          |  |
| Test results:         | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |              |     |           |          |  |

Remark: Both high and low voltages have been tested to show only the worst low voltage test data.

### Measurement data:

Pre-scan all test modes, found worst case at GFSK 2480MHz, and so only show the test result of GFSK 2480MHz

|             |       |              |                                                                        |
|-------------|-------|--------------|------------------------------------------------------------------------|
| Model name: | GQ001 | Test Date :  | 2021-8-18                                                              |
| Phase :     | Line  | Test Result: | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |



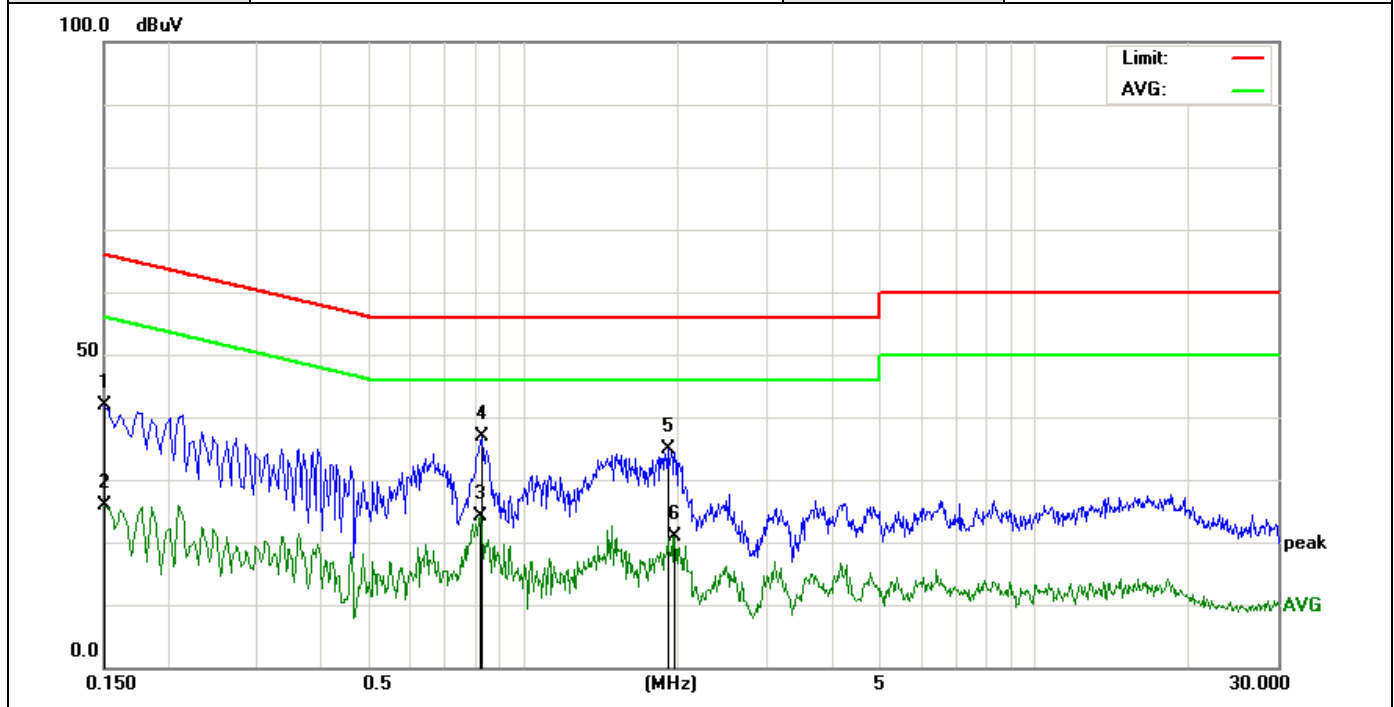
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Measurement Result=Reading Level +Correct Factor;

Over Limit= Measurement Result- Limit;

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|
| 1   |     | 0.1500       | 29.35                    | 11.94                   | 41.29                    | 65.99         | -24.70     | QP       |
| 2   |     | 0.1500       | 13.96                    | 11.94                   | 25.90                    | 55.99         | -30.09     | AVG      |
| 3   |     | 0.7980       | 15.15                    | 9.96                    | 25.11                    | 46.00         | -20.89     | AVG      |
| 4   | *   | 0.8220       | 25.73                    | 9.96                    | 35.69                    | 56.00         | -20.31     | QP       |
| 5   |     | 1.3380       | 11.52                    | 9.96                    | 21.48                    | 46.00         | -24.52     | AVG      |
| 6   |     | 1.3619       | 23.36                    | 9.96                    | 33.32                    | 56.00         | -22.68     | QP       |

|             |         |              |                                                                        |
|-------------|---------|--------------|------------------------------------------------------------------------|
| Model name: | GQ001   | Test Date :  | 2021-8-18                                                              |
| Phase :     | Neutral | Test Result: | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Measurement Result=Reading Level +Correct Factor;

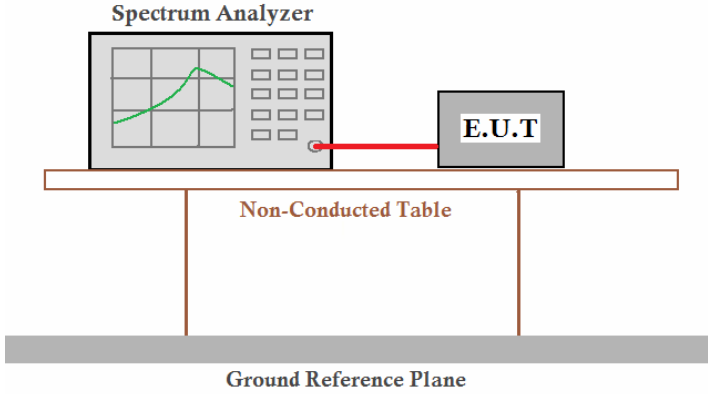
Over Limit= Measurement Result- Limit;

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV | Limit<br>dBuV | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|
| 1   |     | 0.1500       | 29.82                    | 11.94                   | 41.76                    | 65.99         | -24.23     | QP       |
| 2   |     | 0.1500       | 13.93                    | 11.94                   | 25.87                    | 55.99         | -30.12     | AVG      |
| 3   |     | 0.8180       | 14.19                    | 9.96                    | 24.15                    | 46.00         | -21.85     | AVG      |
| 4   | *   | 0.8300       | 26.89                    | 9.96                    | 36.85                    | 56.00         | -19.15     | QP       |
| 5   |     | 1.9140       | 24.79                    | 9.99                    | 34.78                    | 56.00         | -21.22     | QP       |
| 6   |     | 1.9740       | 10.99                    | 9.99                    | 20.98                    | 46.00         | -25.02     | AVG      |

#### Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

### 6.3 Conducted Peak Output Power

|                   |                                                                                    |
|-------------------|------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1)                                                 |
| Test Method:      | ANSI C63.10:2013                                                                   |
| Limit:            | 30dBm(for GFSK),20.97dBm(for EDR)                                                  |
| Test setup:       |  |
| Test Instruments: | Refer to section 5.0 for details                                                   |
| Test mode:        | Refer to section 4.1 for details                                                   |
| Test results:     | Pass                                                                               |

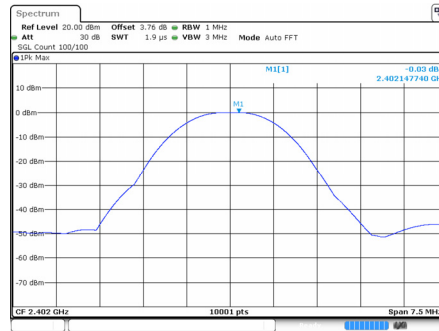
#### Measurement Data

| Mode           | Test channel | Peak Output Power (dBm) | Limit (dBm) | Result |
|----------------|--------------|-------------------------|-------------|--------|
| GFSK           | Lowest       | -0.03                   | 30.00       | Pass   |
|                | Middle       | 2.05                    |             |        |
|                | Highest      | 0.53                    |             |        |
| $\pi/4$ -DQPSK | Lowest       | 1.64                    | 20.97       | Pass   |
|                | Middle       | 3.37                    |             |        |
|                | Highest      | 2.08                    |             |        |
| 8-DPSK         | Lowest       | 1.6                     | 20.97       | Pass   |
|                | Middle       | 3.65                    |             |        |
|                | Highest      | 1.78                    |             |        |

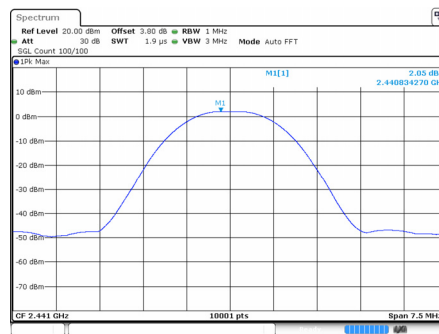
Test plot as follows:

Test mode:

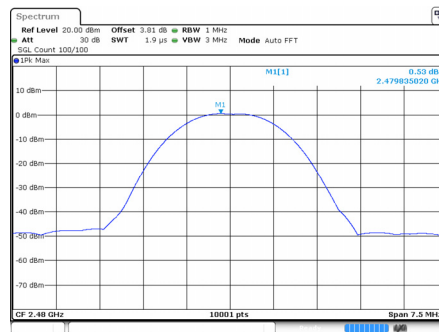
GFSK mode



Lowest channel

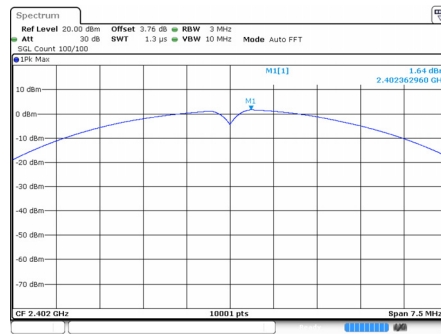


Middle channel

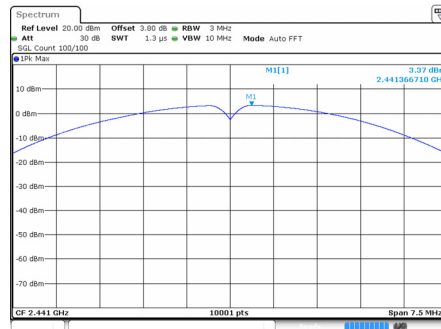


Highest channel

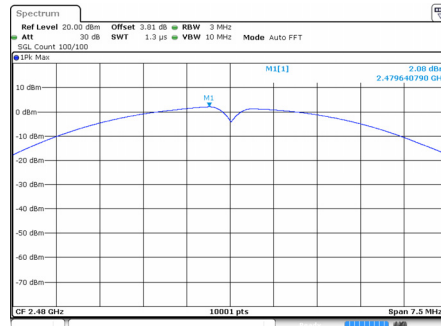
Test mode:

 $\pi/4$ -DQPSK mode


Lowest channel



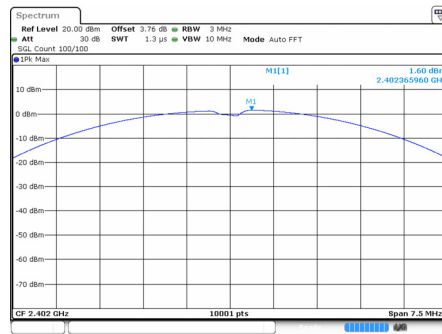
Middle channel



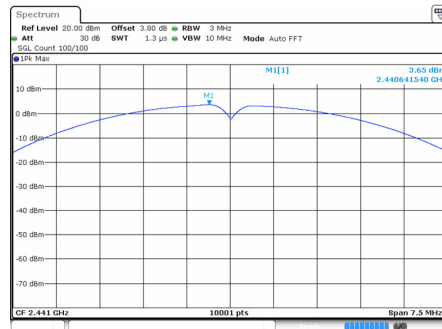
Highest channel

Test mode:

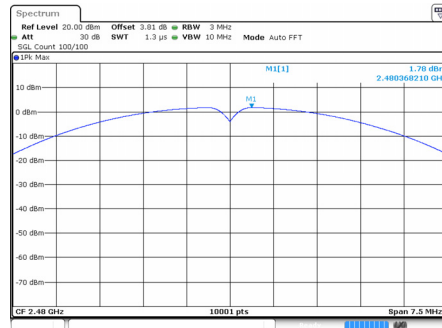
8-DPSK mode



Lowest channel

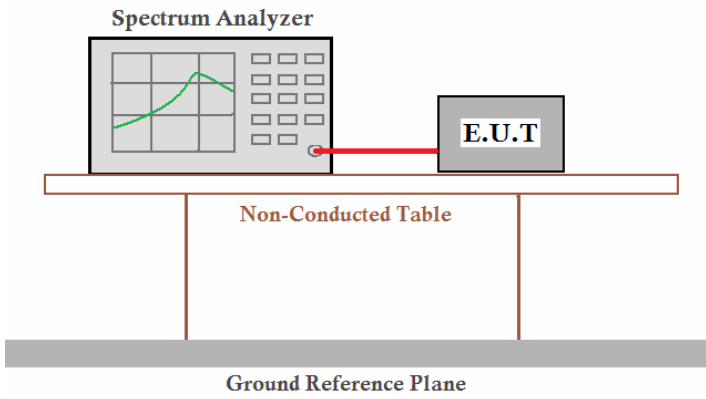


Middle channel



Highest channel

## 6.4 20dB Emission Bandwidth

|                   |                                                                                    |
|-------------------|------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1)                                                 |
| Test Method:      | ANSI C63.10:2013                                                                   |
| Limit:            | N/A                                                                                |
| Test setup:       |  |
| Test Instruments: | Refer to section 5.0 for details                                                   |
| Test mode:        | Refer to section 4.1 for details                                                   |
| Test results:     | Pass                                                                               |

## Measurement Data

| Mode   | Test channel | 20dB Emission Bandwidth (MHz) | Result |
|--------|--------------|-------------------------------|--------|
| GFSK   | Lowest       | 0.823                         | Pass   |
|        | Middle       | 0.76                          |        |
|        | Highest      | 0.992                         |        |
| 8-DPSK | Lowest       | 1.25                          | Pass   |
|        | Middle       | 1.21                          |        |
|        | Highest      | 1.261                         |        |

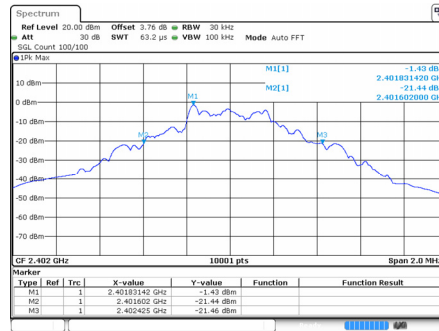
### Note:

- During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.

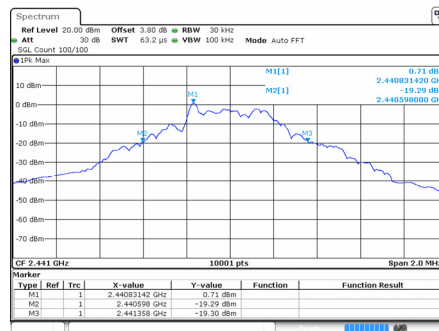
Test plot as follows:

Test mode:

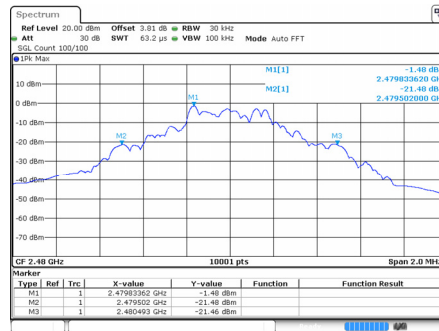
GFSK mode



Lowest channel



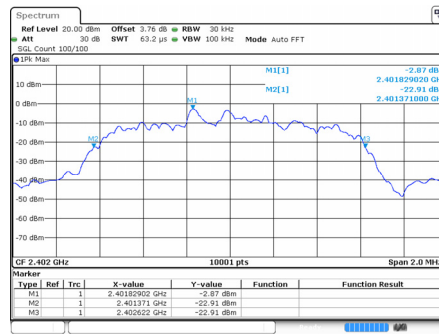
Middle channel



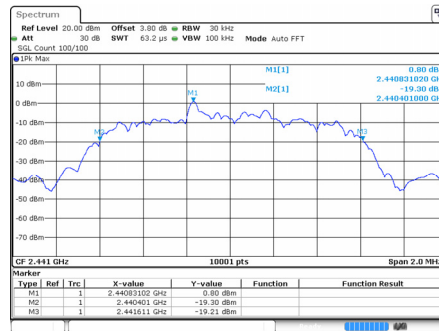
Highest channel

Test mode:

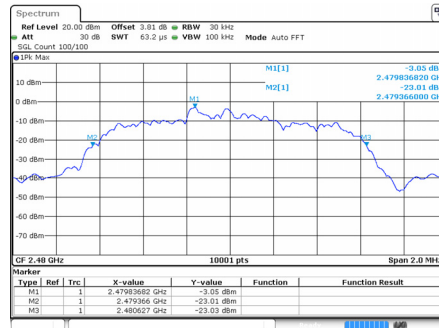
8-DPSK mode



Lowest channel

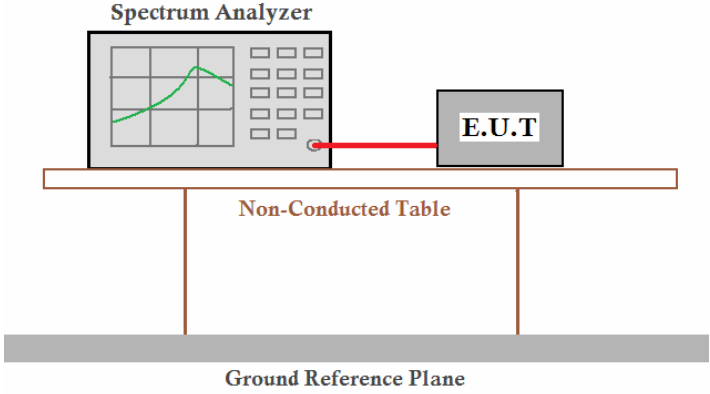


Middle channel



Highest channel

## 6.5 Carrier Frequencies Separation

|                   |                                                                                    |
|-------------------|------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1)                                                 |
| Test Method:      | ANSI C63.10:2013                                                                   |
| Receiver setup:   | RBW=100KHz, VBW=300KHz, detector=Peak                                              |
| Limit:            | 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)                       |
| Test setup:       |  |
| Test Instruments: | Refer to section 5.0 for details                                                   |
| Test mode:        | Refer to section 4.1 for details                                                   |
| Test results:     | Pass                                                                               |

### Measurement Data

| Mode   | Test channel | Carrier Frequencies Separation (kHz) | Limit (kHz) | Result |
|--------|--------------|--------------------------------------|-------------|--------|
| GFSK   | Lowest       | 1.002                                | 548.67      | Pass   |
|        | Middle       | 1.002                                | 506.67      | Pass   |
|        | Highest      | 1.001                                | 661.33      | Pass   |
| 8-DPSK | Lowest       | 1.003                                | 833.33      | Pass   |
|        | Middle       | 1                                    | 806.67      | Pass   |
|        | Highest      | 1.002                                | 840.67      | Pass   |

According to section 6.4

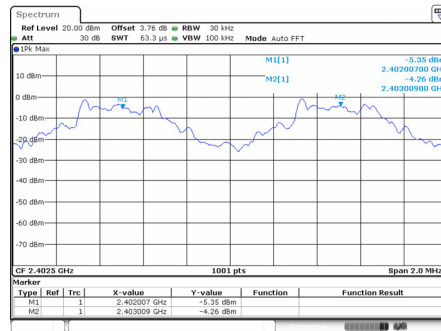
#### Note:

- During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.

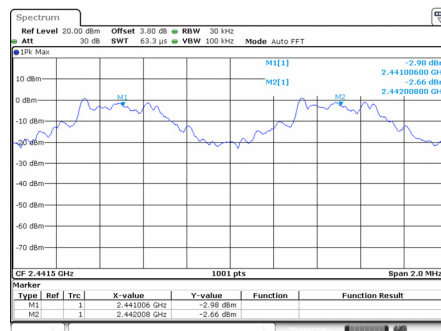
Test plot as follows:

Modulation mode:

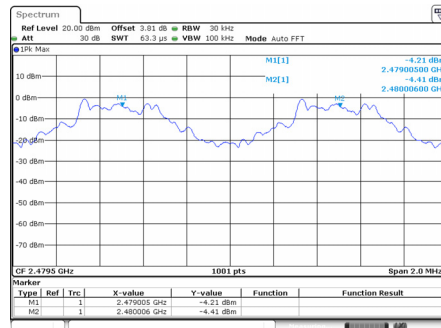
GFSK



Lowest channel



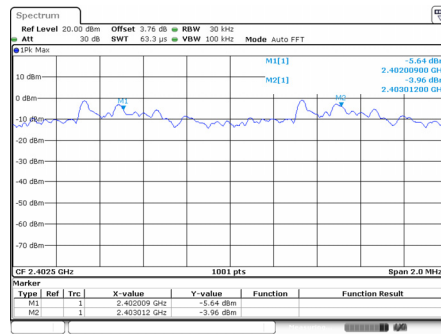
Middle channel



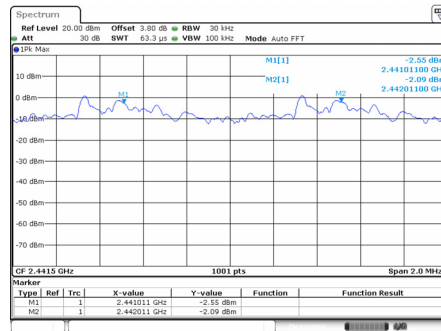
Highest channel

Test mode:

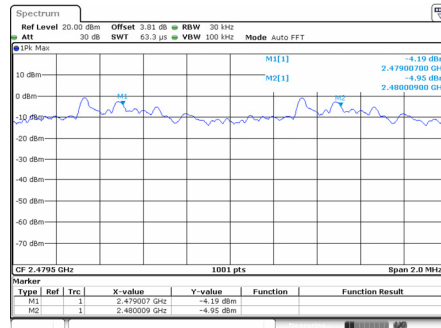
8-DPSK



Lowest channel

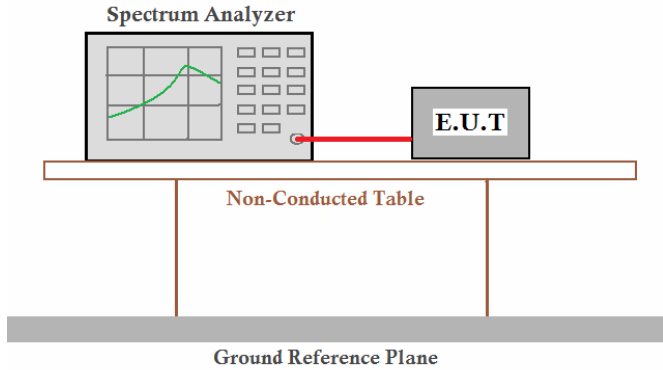


Middle channel



Highest channel

## 6.6 Hopping Channel Number

|                   |                                                                                                                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1)(iii)                                                                                                                                                                                                                                                                        |
| Test Method:      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                               |
| Receiver setup:   | RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak                                                                                                                                                                                                                                       |
| Limit:            | 15 channels                                                                                                                                                                                                                                                                                                    |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 5.0 for details                                                                                                                                                                                                                                                                               |
| Test mode:        | Refer to section 4.1 for details                                                                                                                                                                                                                                                                               |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                           |

### Measurement Data:

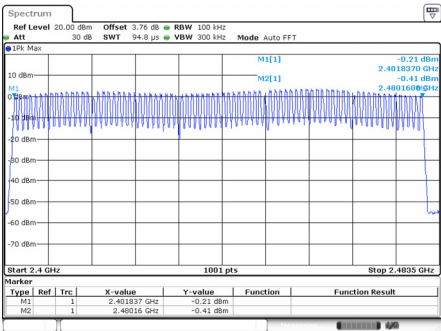
| Mode   | Hopping channel numbers | Limit | Result |
|--------|-------------------------|-------|--------|
| GFSK   | 79                      | ≥15CH | Pass   |
| 8-DPSK | 79                      | ≥15CH | Pass   |

### Note:

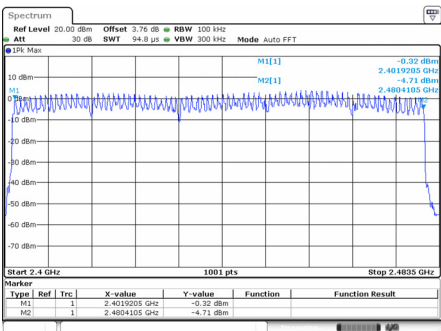
- During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.

Test plot as follows:

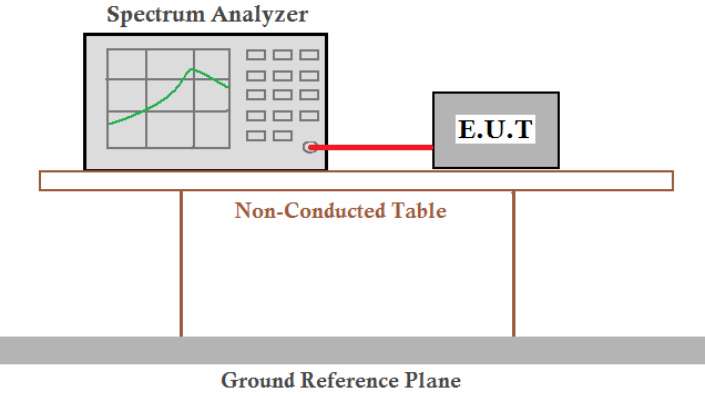
|            |      |
|------------|------|
| Test mode: | GFSK |
|------------|------|



|            |        |
|------------|--------|
| Test mode: | 8-DPSK |
|------------|--------|



## 6.7 Dwell Time

|                   |                                                                                                                                                                                                                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1)(iii)                                                                                                                                                                                                                                                                           |
| Test Method:      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                  |
| Receiver setup:   | RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak                                                                                                                                                                                                                                                                       |
| Limit:            | 0.4 Second                                                                                                                                                                                                                                                                                                        |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 5.0 for details                                                                                                                                                                                                                                                                                  |
| Test mode:        | Refer to section 4.1 for details                                                                                                                                                                                                                                                                                  |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                              |

### Note:

- During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.

## Measurement Data

### GFSK mode:

| Frequency | Packet | Dwell time(ms) | Limit(ms) | Result |
|-----------|--------|----------------|-----------|--------|
| 2402MHz   | DH1    | 129.195        | 400       | Pass   |
| 2402MHz   | DH3    | 274.23         | 400       | Pass   |
| 2402MHz   | DH5    | 314.172        | 400       | Pass   |

### Remarks:

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

Test channel: 2402MHz as blow

DH1 time slot =  $0.3817(\text{ms}) \times (1600 / (2 \times 79)) \times 31.6 = 122.14\text{ms}$

DH3 time slot =  $1.635(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6 = 261.60\text{ms}$

DH5 time slot =  $2.883(\text{ms}) \times (1600 / (6 \times 79)) \times 31.6 = 307.52\text{ms}$

### 8-DPSK mode:

| Frequency | Packet | Dwell time(ms) | Limit(ms) | Result |
|-----------|--------|----------------|-----------|--------|
| 2402MHz   | 3DH1   | 126.324        | 400       | Pass   |
| 2402MHz   | 3DH3   | 263.36         | 400       | Pass   |
| 2402MHz   | 3DH5   | 298.391        | 400       | Pass   |

### Remarks:

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

Test channel: 2402MHz as blow

DH1 time slot =  $0.390(\text{ms}) \times (1600 / (2 \times 79)) \times 31.6 = 124.80\text{ms}$

DH3 time slot =  $1.64(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6 = 262.40\text{ms}$

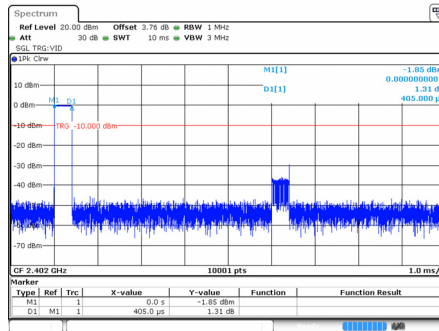
DH5 time slot =  $2.892(\text{ms}) \times (1600 / (6 \times 79)) \times 31.6 = 308.48\text{ms}$

Test plot as follows:

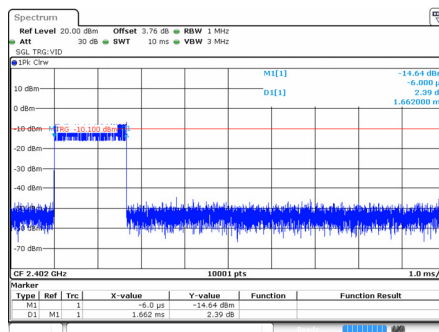
GFSK mode:

Test channel:

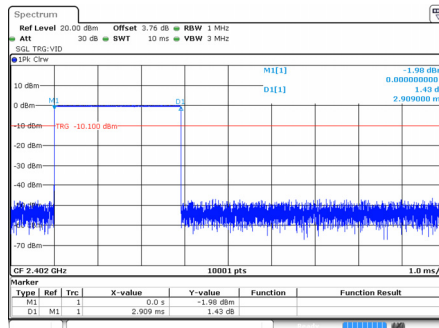
2402MHz



DH1



DH3

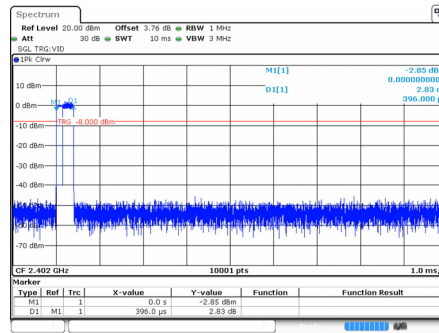


DH5

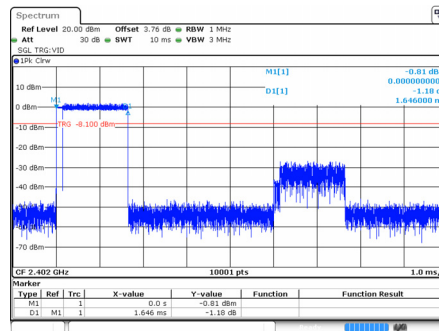
## 8-DPSK mode:

Test channel:

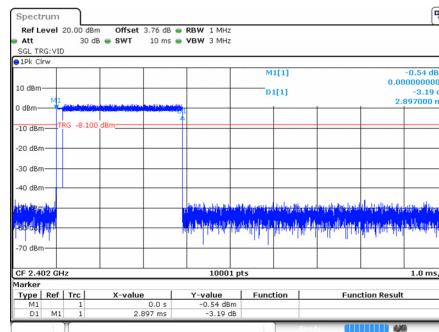
2402MHz



DH1



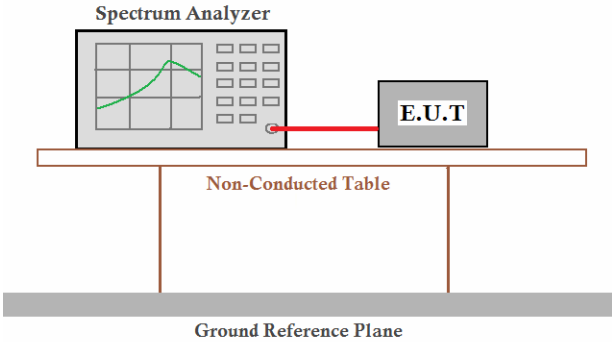
DH3



DH5

## 6.8 Band Edge

### 6.8.1 Conducted Emission Method

|                   |                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (d)                                                                                                                                                                                                                                                                                                                                                         |
| Test Method:      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                        |
| Receiver setup:   | RBW=100kHz, VBW=300kHz, Detector=Peak                                                                                                                                                                                                                                                                                                                                                   |
| Limit:            | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. |
| Test setup:       |  <p>The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by two legs. Below the table is a Ground Reference Plane.</p>      |
| Test Instruments: | Refer to section 5.0 for details                                                                                                                                                                                                                                                                                                                                                        |
| Test mode:        | Refer to section 4.1 for details                                                                                                                                                                                                                                                                                                                                                        |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                    |

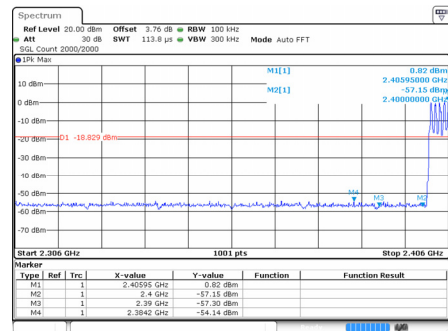
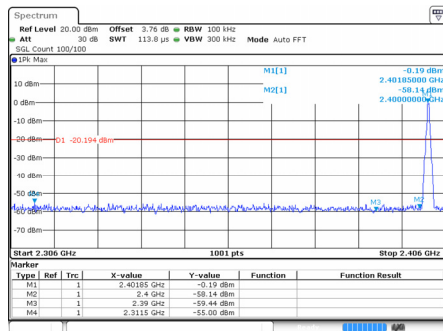
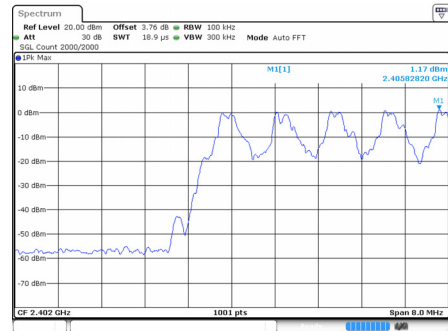
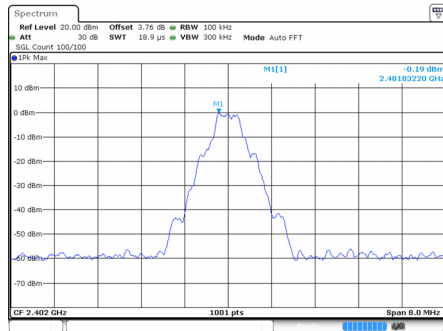
#### Note:

- During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, found the GFSK& 8-DPSK modulation which it is worse case, and show in this report.

## Test plot as follows:

Test channel:

Lowest channel

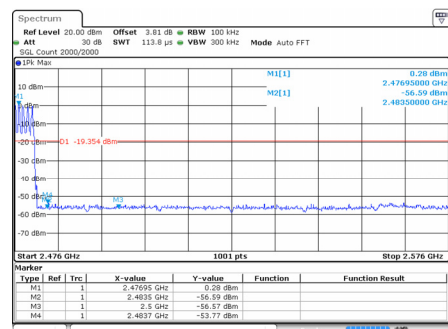
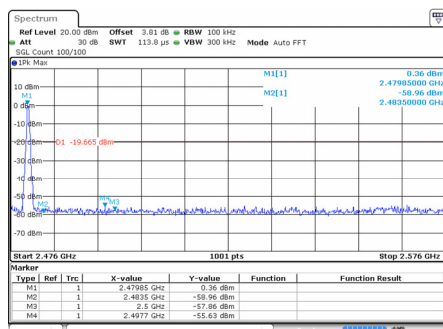
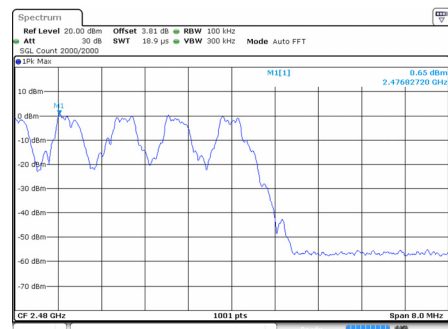
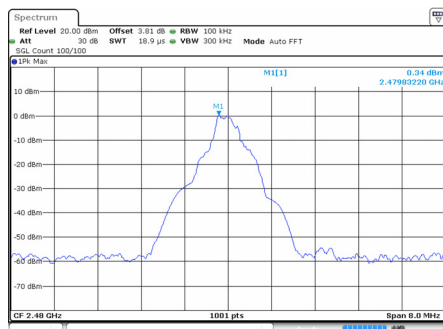


No-hopping mode

Hopping mode

Test channel:

Highest channel



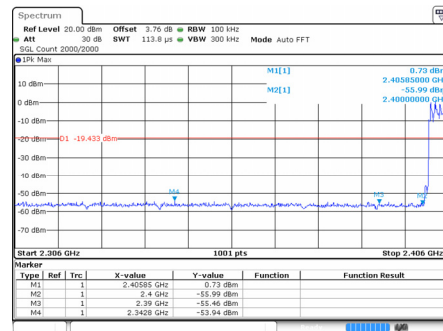
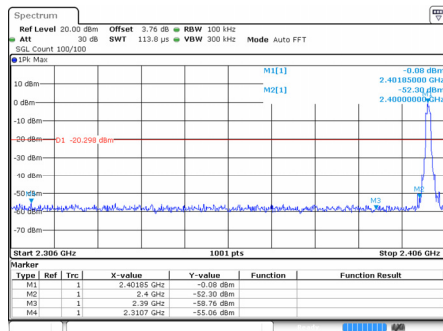
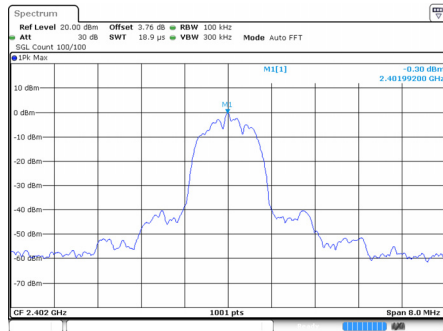
No-hopping mode

Hopping mode

## 8-DPSK Mode:

Test channel:

Lowest channel

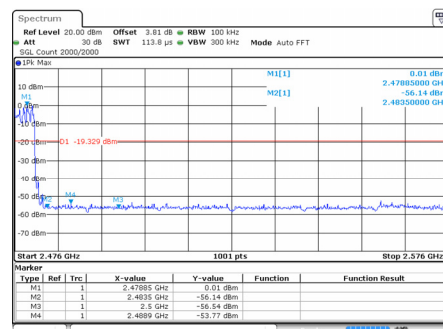
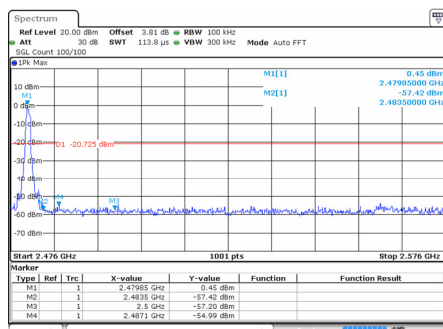
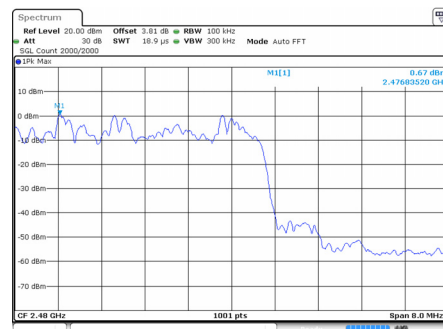
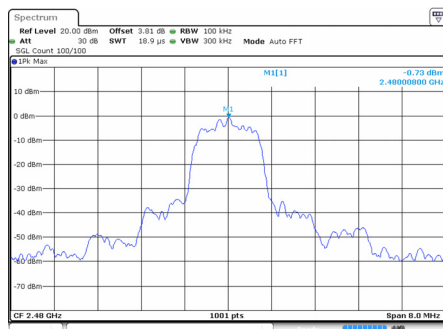


No-hopping mode

Hopping mode

Test channel:

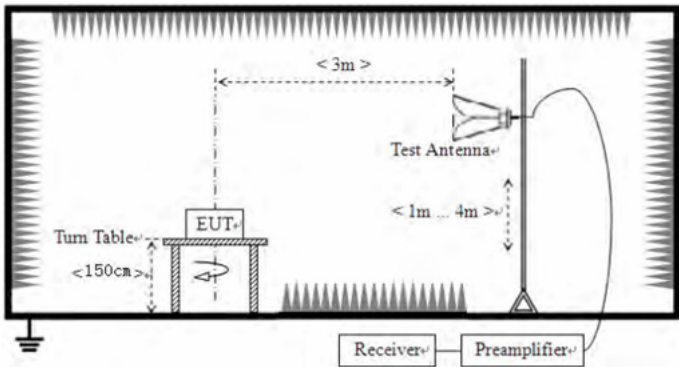
Highest channel



No-hopping mode

Hopping mode

## 6.8.2 Radiated Emission Method

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |                    |      |               |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------|------|---------------|
| Test Requirement:     | FCC Part15 C Section 15.209 and 15.205                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |                    |      |               |
| Test Method:          | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          |                    |      |               |
| Test Frequency Range: | All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |                    |      |               |
| Test site:            | Measurement Distance: 3m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |                    |      |               |
| Receiver setup:       | Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Detector | RBW                | VBW  | Remark        |
|                       | Above 1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Peak     | 1MHz               | 3MHz | Peak Value    |
|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Peak     | 1MHz               | 10Hz | Average Value |
| Limit:                | Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          | Limit (dBuV/m @3m) |      | Remark        |
|                       | Above 1GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          | 54.00              |      | Average Value |
|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          | 74.00              |      | Peak Value    |
| Test setup:           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |                    |      |               |
| Test Procedure:       | <div>1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</div> <div>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</div> <div>3. 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.</div> <div>4. 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.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>6. 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</div> |          |                    |      |               |



|                   |                                  |
|-------------------|----------------------------------|
|                   | data sheet.                      |
| Test Instruments: | Refer to section 5.0 for details |
| Test mode:        | Refer to section 4.1 for details |
| Test results:     | Pass                             |

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

**Vertical :**

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 2390.000  | 41.57         | -5.70  | 35.87          | 74.00    | -38.13 | peak          |
| 2390.000  | 31.86         | -5.70  | 26.16          | 54.00    | -27.84 | AVG           |

**Horizontal :**

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 2390.000  | 43.21         | -5.70  | 37.51          | 74.00    | -36.49 | peak          |
| 2390.000  | 31.40         | -5.70  | 25.70          | 54.00    | -28.30 | AVG           |

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

**Vertical :**

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 2483.500  | 42.81         | -4.98  | 37.83          | 74.00    | -36.17 | peak          |
| 2483.500  | 32.05         | -4.98  | 27.07          | 54.00    | -26.93 | AVG           |

**Horizontal :**

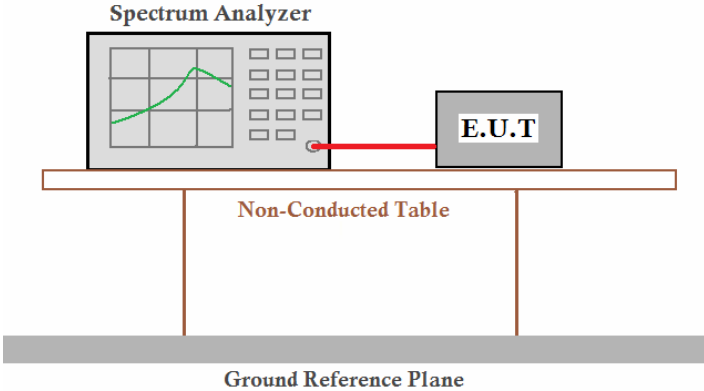
| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 2483.500  | 43.39         | -4.98  | 38.41          | 74.00    | -35.59 | peak          |
| 2483.500  | 31.86         | -4.98  | 26.88          | 54.00    | -27.12 | AVG           |

**Remarks:**

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
4. *During the test, pre-scan the GFSK, π/4-DQPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.*

## 6.9 Spurious Emission

### 6.9.1 Conducted Emission Method

|                   |                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (d)                                                                                                                                                                                                                                                                                                                                                         |
| Test Method:      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                        |
| Limit:            | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. |
| Test setup:       |  <p>The diagram illustrates the test setup for conducted emissions. A Spectrum Analyzer is connected to an Equipment Under Test (E.U.T.) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>     |
| Test Instruments: | Refer to section 5.0 for details                                                                                                                                                                                                                                                                                                                                                        |
| Test mode:        | Refer to section 4.1 for details                                                                                                                                                                                                                                                                                                                                                        |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                    |

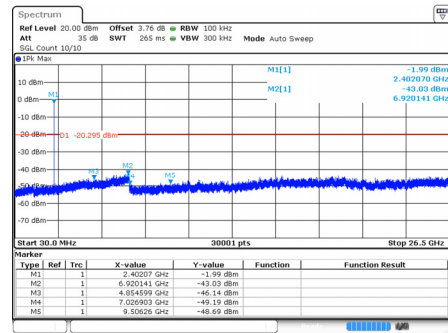
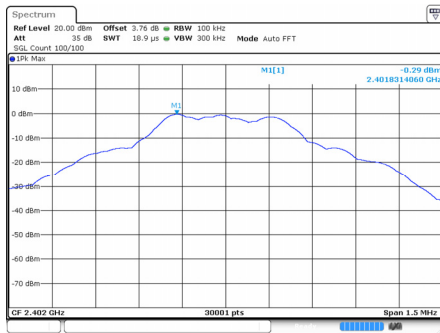
#### Note:

- During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, found the GFSK & 8-DPSK modulation which it is worse case, and show in this report.

GFSK mode:

Test channel:

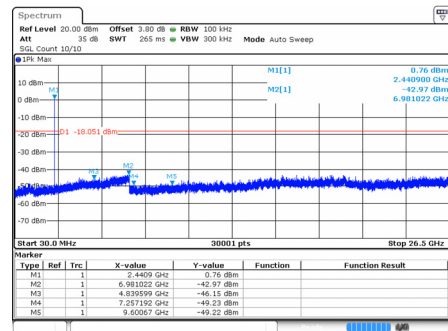
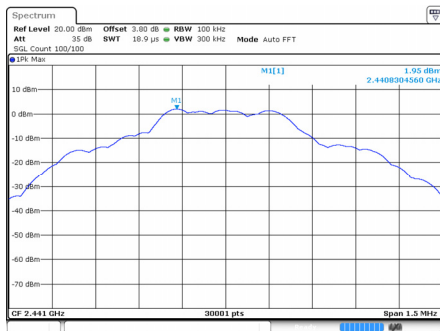
Lowest channel



30MHz~25GHz

Test channel:

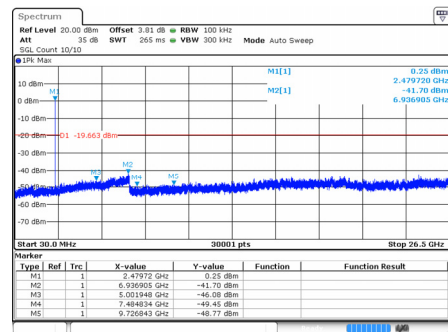
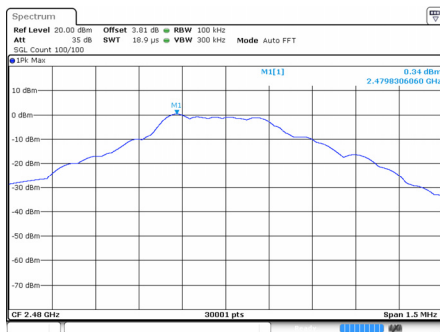
Middle channel



30MHz~25GHz

Test channel:

Highest channel

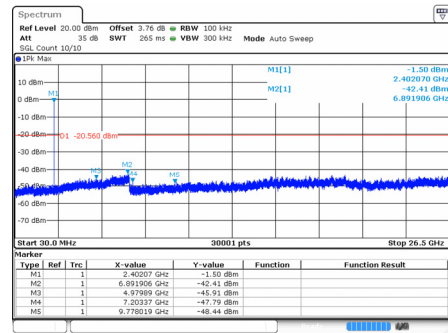
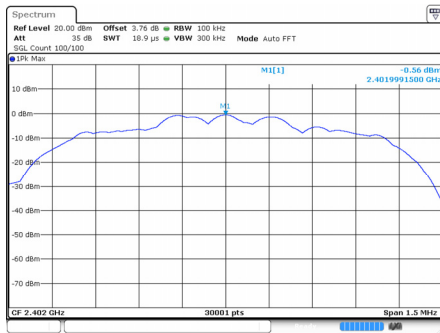


30MHz~25GHz

8-DPSK mode:

Test channel:

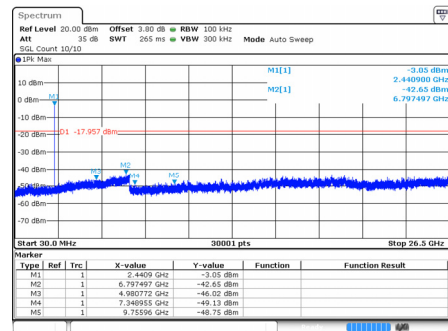
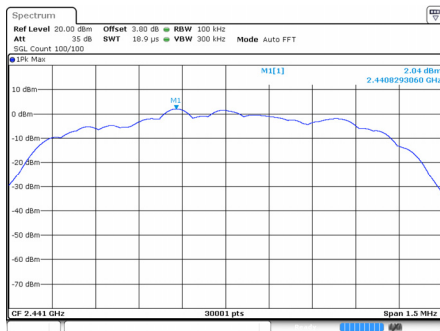
Lowest channel



30MHz~25GHz

Test channel:

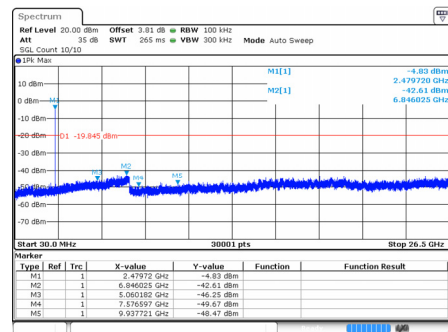
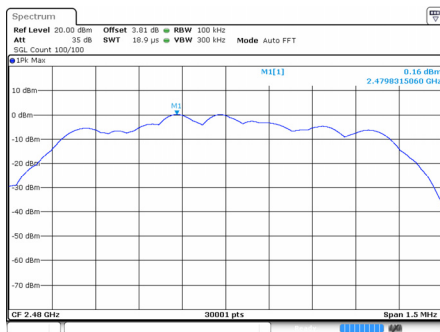
Middle channel



30MHz~25GHz

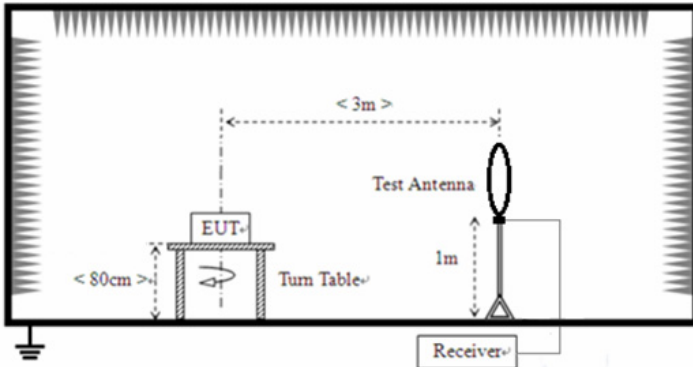
Test channel:

Highest channel

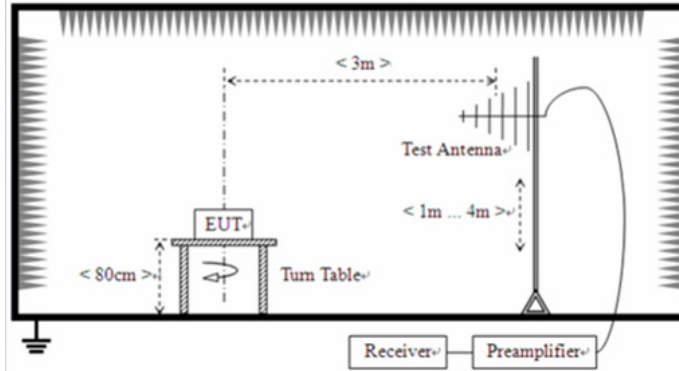


30MHz~25GHz

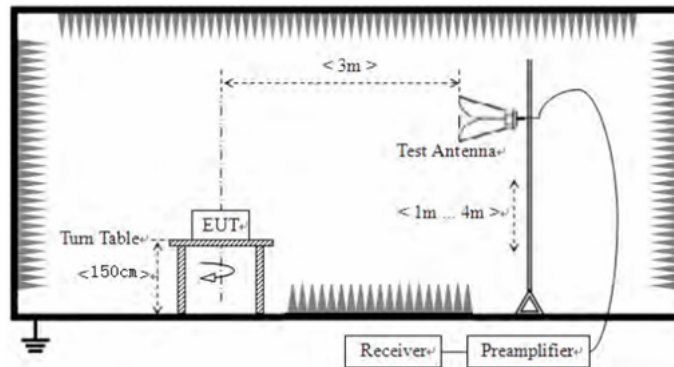
## 6.9.2 Radiated Emission Method

|                       |                                                                                      |              |        |         |                      |
|-----------------------|--------------------------------------------------------------------------------------|--------------|--------|---------|----------------------|
| Test Requirement:     | FCC Part15 C Section 15.209                                                          |              |        |         |                      |
| Test Method:          | ANSI C63.10:2013                                                                     |              |        |         |                      |
| Test Frequency Range: | 9kHz to 25GHz                                                                        |              |        |         |                      |
| Test site:            | Measurement Distance: 3m                                                             |              |        |         |                      |
| Receiver setup:       | Frequency                                                                            | Detector     | RBW    | VBW     | Value                |
|                       | 9KHz-150KHz                                                                          | Quasi-peak   | 200Hz  | 600Hz   | Quasi-peak           |
|                       | 150KHz-30MHz                                                                         | Quasi-peak   | 9KHz   | 30KHz   | Quasi-peak           |
|                       | 30MHz-1GHz                                                                           | Quasi-peak   | 120KHz | 300KHz  | Quasi-peak           |
|                       | Above 1GHz                                                                           | Peak         | 1MHz   | 3MHz    | Peak                 |
|                       |                                                                                      | Peak         | 1MHz   | 10Hz    | Average              |
| Limit:                | Frequency                                                                            | Limit (uV/m) |        | Value   | Measurement Distance |
|                       | 0.009MHz-0.490MHz                                                                    | 2400/F(KHz)  |        | QP      | 300m                 |
|                       | 0.490MHz-1.705MHz                                                                    | 24000/F(KHz) |        | QP      | 30m                  |
|                       | 1.705MHz-30MHz                                                                       | 30           |        | QP      | 30m                  |
|                       | 30MHz-88MHz                                                                          | 100          |        | QP      | 3m                   |
|                       | 88MHz-216MHz                                                                         | 150          |        | QP      |                      |
|                       | 216MHz-960MHz                                                                        | 200          |        | QP      |                      |
|                       | 960MHz-1GHz                                                                          | 500          |        | QP      |                      |
|                       | Above 1GHz                                                                           | 500          |        | Average |                      |
|                       |                                                                                      | 5000         |        | Peak    |                      |
| Test setup:           | For radiated emissions from 9kHz to 30MHz                                            |              |        |         |                      |
|                       |  |              |        |         |                      |

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



Test Procedure:

1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. 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.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. 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.

|                   |                                  |       |         |     |         |          |
|-------------------|----------------------------------|-------|---------|-----|---------|----------|
| Test Instruments: | Refer to section 5.0 for details |       |         |     |         |          |
| Test mode:        | Refer to section 4.1 for details |       |         |     |         |          |
| Test environment: | Temp.:                           | 25 °C | Humid.: | 52% | Press.: | 1012mbar |
| Test voltage:     | AC 120V, 60Hz                    |       |         |     |         |          |
| Test results:     | Pass                             |       |         |     |         |          |

#### Measurement data:

##### Remarks:

1. During the test, pre-scan the GFSK,  $\pi/4$ -DQPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.
2. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

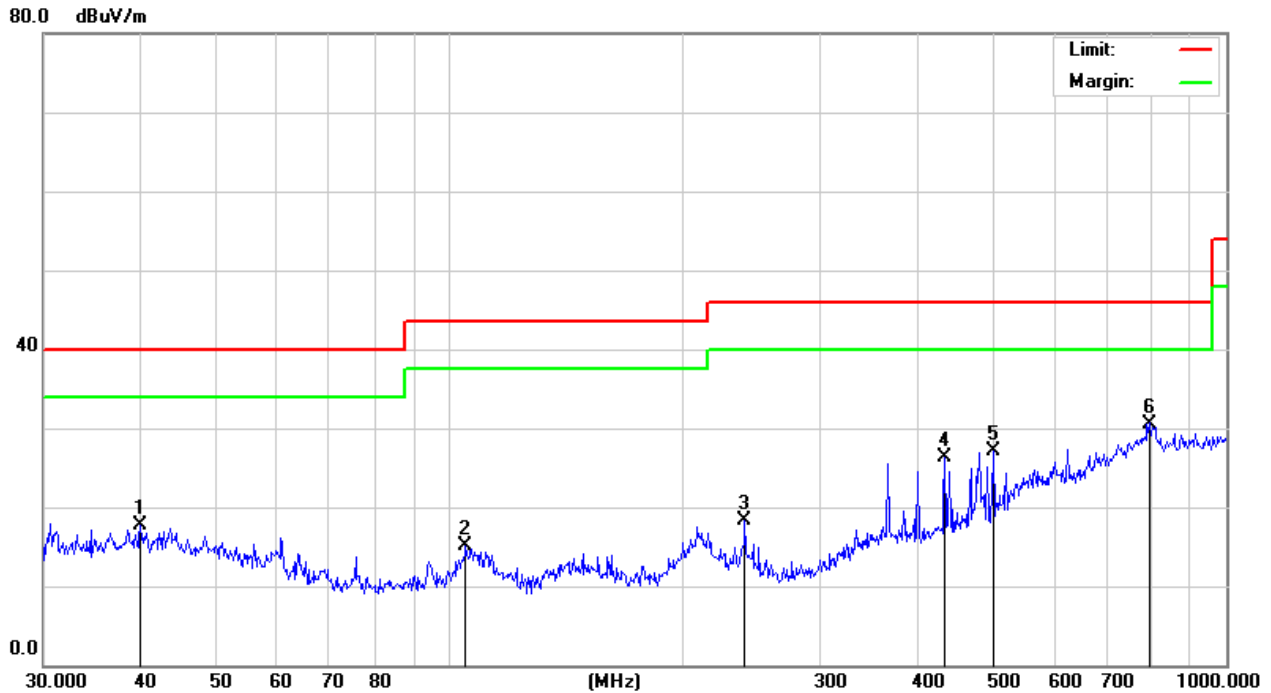
#### ■ 9kHz~30MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

## Below 1GHz

Pre-scan all test modes, found worst case at GFSK 2480MHz, and so only show the test result of GFSK 2480MHz

|                |          |              |                                                                        |
|----------------|----------|--------------|------------------------------------------------------------------------|
| Model name:    | GQ001    | Test Date :  | 2021-8-19                                                              |
| Polarization : | Vertical | Test Result: | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |



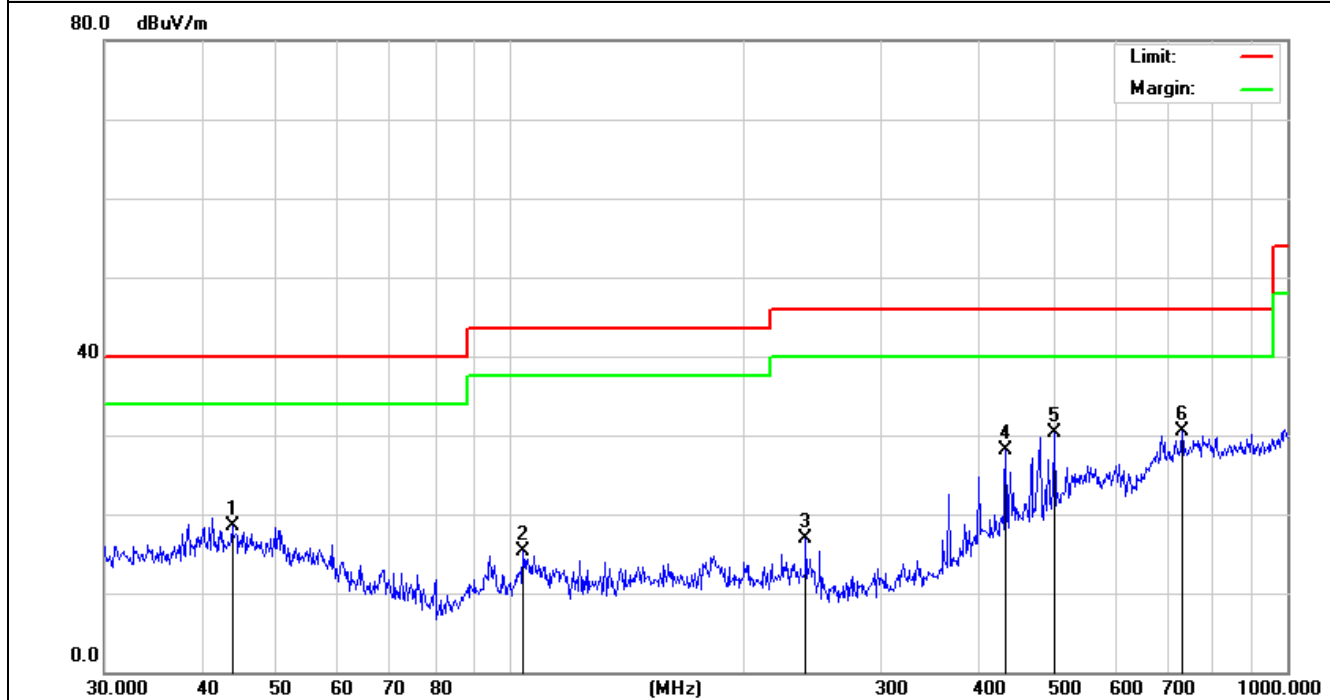
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Measurement Result=Reading Level +Correct Factor;

Over Limit= Measurement Result- Limit;

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|
| 1   |     | 39.9941      | 21.94                    | -4.19                   | 17.75                      | 40.00           | -22.25     | QP       |
| 2   |     | 104.9033     | 22.98                    | -7.84                   | 15.14                      | 43.50           | -28.36     | QP       |
| 3   |     | 239.9874     | 24.79                    | -6.52                   | 18.27                      | 46.00           | -27.73     | QP       |
| 4   |     | 434.0650     | 29.87                    | -3.53                   | 26.34                      | 46.00           | -19.66     | QP       |
| 5   |     | 501.1789     | 29.27                    | -2.12                   | 27.15                      | 46.00           | -18.85     | QP       |
| 6   | *   | 796.1829     | 22.90                    | 7.70                    | 30.60                      | 46.00           | -15.40     | QP       |

|                |          |              |                                                                        |
|----------------|----------|--------------|------------------------------------------------------------------------|
| Model name:    | GQ001    | Test Date :  | 2021-8-19                                                              |
| Polarization : | Vertical | Test Result: | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Measurement Result=Reading Level +Correct Factor;

Over Limit= Measurement Result- Limit;

| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|
| 1   |     | 43.8119      | 20.70                    | -2.12                   | 18.58                      | 40.00           | -21.42     | QP       |
| 2   |     | 103.8055     | 22.74                    | -7.36                   | 15.38                      | 43.50           | -28.12     | QP       |
| 3   |     | 239.9874     | 23.35                    | -6.52                   | 16.83                      | 46.00           | -29.17     | QP       |
| 4   |     | 434.0651     | 29.14                    | -0.95                   | 28.19                      | 46.00           | -17.81     | QP       |
| 5   |     | 501.1790     | 28.80                    | 1.43                    | 30.23                      | 46.00           | -15.77     | QP       |
| 6   | *   | 731.9203     | 23.37                    | 7.13                    | 30.50                      | 46.00           | -15.50     | QP       |

## ■ Above 1GHz

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

H

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4804.000  | 49.45         | 5.06   | 54.51          | 74.00    | -19.49 | PEAK          |
| 4804.000  | 39.20         | 5.06   | 44.26          | 54.00    | -9.74  | AVG           |
| 7206.000  | 42.92         | 7.03   | 49.95          | 74.00    | -24.05 | PEAK          |
| 7206.000  | 32.26         | 7.03   | 39.29          | 54.00    | -14.71 | AVG           |

V

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4804.000  | 47.92         | 5.14   | 53.06          | 74.00    | -20.94 | PEAK          |
| 4804.000  | 39.10         | 5.14   | 44.24          | 54.00    | -9.76  | AVG           |
| 7206.000  | 41.64         | 7.52   | 49.16          | 74.00    | -24.84 | PEAK          |
| 7206.000  | 33.33         | 7.52   | 40.85          | 54.00    | -13.15 | AVG           |

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

H

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|---------------|
| 4882.000           | 49.66                   | 5.14           | 54.80                      | 74.00              | -19.20         | PEAK          |
| 4882.000           | 39.92                   | 5.14           | 45.06                      | 54.00              | -8.94          | AVG           |
| 7323.000           | 42.36                   | 7.52           | 49.88                      | 74.00              | -24.12         | PEAK          |
| 7323.000           | 33.69                   | 7.52           | 41.21                      | 54.00              | -12.79         | AVG           |

V

| Frequency<br>(MHz) | Meter Reading<br>(dBμV) | Factor<br>(dB) | Emission Level<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) | Detector Type |
|--------------------|-------------------------|----------------|----------------------------|--------------------|----------------|---------------|
| 4882.000           | 48.04                   | 5.14           | 53.18                      | 74.00              | -20.82         | PEAK          |
| 4882.000           | 39.39                   | 5.14           | 44.53                      | 54.00              | -9.47          | AVG           |
| 7323.000           | 43.27                   | 7.52           | 50.79                      | 74.00              | -23.21         | PEAK          |
| 7323.000           | 33.65                   | 7.52           | 41.17                      | 54.00              | -12.83         | AVG           |

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

H

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4960.000  | 49.40         | 5.22   | 54.62          | 74.00    | -19.38 | PEAK          |
| 4960.000  | 39.51         | 5.22   | 44.73          | 54.00    | -9.27  | AVG           |
| 7440.000  | 42.83         | 8.06   | 50.89          | 74.00    | -23.11 | PEAK          |
| 7440.000  | 33.84         | 8.06   | 41.90          | 54.00    | -12.10 | AVG           |

V

| Frequency | Meter Reading | Factor | Emission Level | Limits   | Margin | Detector Type |
|-----------|---------------|--------|----------------|----------|--------|---------------|
| (MHz)     | (dBμV)        | (dB)   | (dBμV/m)       | (dBμV/m) | (dB)   |               |
| 4960.000  | 48.45         | 5.22   | 53.67          | 74.00    | -20.33 | PEAK          |
| 4960.000  | 38.86         | 5.22   | 44.08          | 54.00    | -9.92  | AVG           |
| 7440.000  | 42.38         | 8.06   | 50.44          | 74.00    | -23.56 | PEAK          |
| 7440.000  | 31.71         | 8.06   | 39.77          | 54.00    | -14.23 | AVG           |

Remarks:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. The test data shows only the worst case GFSK mode

## 7 Test Setup Photo

Reference to the **appendix I** for details.

## 8 EUT Constructional Details

Reference to the **appendix II** for details.

**\*\*End of report\*\***