

# FCC Part 15C

## Measurement and Test Report

For

Dongguan saijia plastic electronics co. LTD

**FCC ID:2AR7A-T06**

|                                      |                                       |
|--------------------------------------|---------------------------------------|
| <b>FCC Rule(s):</b>                  | <u>FCC Part 15.247</u>                |
| <b>Product Description:</b>          | <u>TWS Wireless bluetooth headset</u> |
| <b>Tested Model:</b>                 | <u>T06</u>                            |
| <b>Report No.:</b>                   | <u>BSL181111980102RF</u>              |
| <b>Tested Date:</b>                  | <u>December 1-12, 2018</u>            |
| <b>Issued Date:</b>                  | <u>December 12, 2018</u>              |
| <b>Tested By:</b>                    | <u>Steven Wen / Engineer</u>          |
| <b>Reviewed By:</b>                  | <u>Lisa. Li / EMC Manager</u>         |
| <b>Approved &amp; Authorized By:</b> | <u>Mike mo / PSQ Manager</u>          |
| <b>Prepared By:</b>                  |                                       |

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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

|                                                                                                                                                                                         |                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Applicant:                                                                                                                                                                              | Dongguan saijia plastic electronics co. LTD                                        |
| Address of applicant:                                                                                                                                                                   | No.3, jiaoyitang jiuwaijie street, tangxia town, dongguan city, guangdong province |
| Manufacturer:                                                                                                                                                                           | Dongguan saijia plastic electronics co. LTD                                        |
| Address of manufacturer:                                                                                                                                                                | No.3, jiaoyitang jiuwaijie street, tangxia town, dongguan city, guangdong province |
| Product Name:                                                                                                                                                                           | TWS Wireless bluetooth headset                                                     |
| Model No.:                                                                                                                                                                              | T06, T07, T08                                                                      |
| Test Model No:                                                                                                                                                                          | T06                                                                                |
| Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are color, appearance and model name for commercial purpose. |                                                                                    |
| Quantity of tested samples                                                                                                                                                              | 1                                                                                  |
| Serial No.:                                                                                                                                                                             | T06, T07, T08                                                                      |
| Description test modes:                                                                                                                                                                 | N/A                                                                                |
| Hardware Version:                                                                                                                                                                       | WYT06-V7                                                                           |
| Software Version:                                                                                                                                                                       | Draft v0.4                                                                         |
| Operation Frequency:                                                                                                                                                                    | 2402MHz~2480MHz                                                                    |
| Channel numbers:                                                                                                                                                                        | 79                                                                                 |
| Channel separation:                                                                                                                                                                     | 1MHz                                                                               |
| Modulation type:                                                                                                                                                                        | GFSK,Pi/4 QPSK,8DPSK                                                               |
| Antenna Type:                                                                                                                                                                           | Internal antenna                                                                   |
| Antenna gain:                                                                                                                                                                           | 0dBi                                                                               |
| Power supply:                                                                                                                                                                           | DC 3.3V by battery                                                                 |

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1                                   | 2402MHz   | 21      | 2422MHz   | 41      | 2442MHz   | 61      | 2462MHz   |
| 2                                   | 2403MHz   | 22      | 2423MHz   | 42      | 2443MHz   | 62      | 2463MHz   |
| 3                                   | 2404MHz   | 23      | 2424MHz   | 43      | 2444MHz   | 63      | 2464MHz   |
| 4                                   | 2405MHz   | 24      | 2425MHz   | 44      | 2445MHz   | 64      | 2465MHz   |
| 5                                   | 2406MHz   | 25      | 2426MHz   | 45      | 2446MHz   | 65      | 2466MHz   |
| 6                                   | 2407MHz   | 26      | 2427MHz   | 46      | 2447MHz   | 66      | 2467MHz   |
| 7                                   | 2408MHz   | 27      | 2428MHz   | 47      | 2448MHz   | 67      | 2468MHz   |
| 8                                   | 2409MHz   | 28      | 2429MHz   | 48      | 2449MHz   | 68      | 2469MHz   |
| 9                                   | 2410MHz   | 29      | 2430MHz   | 49      | 2450MHz   | 69      | 2470MHz   |
| 10                                  | 2411MHz   | 30      | 2431MHz   | 50      | 2451MHz   | 70      | 2471MHz   |
| 11                                  | 2412MHz   | 31      | 2432MHz   | 51      | 2452MHz   | 71      | 2472MHz   |
| 12                                  | 2413MHz   | 32      | 2433MHz   | 52      | 2453MHz   | 72      | 2473MHz   |
| 13                                  | 2414MHz   | 33      | 2434MHz   | 53      | 2454MHz   | 73      | 2474MHz   |
| 14                                  | 2415MHz   | 34      | 2435MHz   | 54      | 2455MHz   | 74      | 2475MHz   |
| 15                                  | 2416MHz   | 35      | 2436MHz   | 55      | 2456MHz   | 75      | 2476MHz   |
| 16                                  | 2417MHz   | 36      | 2437MHz   | 56      | 2457MHz   | 76      | 2477MHz   |
| 17                                  | 2418MHz   | 37      | 2438MHz   | 57      | 2458MHz   | 77      | 2478MHz   |
| 18                                  | 2419MHz   | 38      | 2439MHz   | 58      | 2459MHz   | 78      | 2479MHz   |
| 19                                  | 2420MHz   | 39      | 2440MHz   | 59      | 2460MHz   | 79      | 2480MHz   |
| 20                                  | 2421MHz   | 40      | 2441MHz   | 60      | 2461MHz   |         |           |

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.

#### EUT Cable List and Details

| Cable Description | Length (M) | Shielded/Unshielded | With Core/Without Core |
|-------------------|------------|---------------------|------------------------|
| /                 | /          | /                   | /                      |

#### Auxiliary Equipment List and Details

| Description | Manufacturer                         | Model       | Serial Number |
|-------------|--------------------------------------|-------------|---------------|
| Notebook    | Lenovo                               | Lenovo B490 | BSTSZEMC-77   |
| DC Adapter  | Shenzhen Mingxin Technologies C.,Ltd | MX520J      | /             |

#### Special Cable List and Details

| Cable Description | Length (M) | Shielded/Unshielded | With Core/Without Core |
|-------------------|------------|---------------------|------------------------|
| /                 | /          | /                   | /                      |

## 1.2 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows: During the test, pre-scan F18m, F18, T06, and found the F18m model which it is worse case model.

| Test Mode List |             |         |                 |
|----------------|-------------|---------|-----------------|
| Test Mode      | Description | Channel | Frequency (MHz) |
| 1              | GFSK,       | CH1     | 2402            |
|                |             | CH40    | 2441            |
|                |             | CH79    | 2480            |
| 2              | Pi/4 QPSK   | CH1     | 2402            |
|                |             | CH40    | 2441            |
|                |             | CH79    | 2480            |
| 3              | 8DPSK       | CH1     | 2402            |
|                |             | CH40    | 2441            |
|                |             | CH79    | 2480            |

## 1.3 Test Standards

The following report accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

## 1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

## 1.5 Test Facility

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## 1.6 Measurement Uncertainty

| Measurement uncertainty        |            |                     |
|--------------------------------|------------|---------------------|
| Parameter                      | Conditions | Uncertainty         |
| RF Output Power                | Conducted  | $\pm 0.42\text{dB}$ |
| Occupied Bandwidth             | Conducted  | $\pm 1.5\%$         |
| Power Spectral Density         | Conducted  | $\pm 1.8\text{dB}$  |
| Conducted Spurious Emission    | Conducted  | $\pm 2.17\text{dB}$ |
| Conducted Emissions            | Conducted  | $\pm 2.88\text{dB}$ |
| Transmitter Spurious Emissions | Radiated   | $\pm 5.1\text{dB}$  |

## 1.7 Test Equipment List and Details

| Description                         | Manufacturer     | Model              | Serial No. | Cal Date   | Due. Date  |
|-------------------------------------|------------------|--------------------|------------|------------|------------|
| Communication Tester                | Rohde & Schwarz  | CMW500             | 100358     | 2018-11-08 | 2019-11-07 |
| Spectrum Analyzer                   | R&S              | FSP40              | 100550     | 2018-10-08 | 2019-10-07 |
| Test Receiver                       | R&S              | ESCI7              | US47140102 | 2018-10-08 | 2019-10-07 |
| Signal Generator                    | HP               | 83630B             | 3844A01028 | 2018-10-08 | 2019-10-07 |
| Test Receiver                       | R&S              | ESPI-3             | 100180     | 2018-10-08 | 2019-10-07 |
| Amplifier                           | Agilent          | 8449B              | 4035A00116 | 2018-10-08 | 2019-10-07 |
| Amplifier                           | HP               | 8447E              | 2945A02770 | 2018-10-08 | 2019-10-07 |
| Signal Generator                    | IFR              | 2023A              | 202307/242 | 2018-10-08 | 2019-10-07 |
| Broadband Antenna                   | SCHAFFNER        | 2774               | 2774       | 2018-11-06 | 2019-11-05 |
| Biconical and log periodic antennas | ELECTRO-METRIC   | EM-6917B-1         | 171        | 2018-10-21 | 2019-10-20 |
| Horn Antenna                        | R&S              | HF906              | 100253     | 2018-10-21 | 2019-10-20 |
| Horn Antenna                        | EM               | EM-6961            | 6462       | 2018-11-03 | 2019-11-02 |
| LISN                                | R&S              | ESH3-Z5            | 100196     | 2018-10-08 | 2019-10-07 |
| LISN                                | COM-POWER        | LI-115             | 02027      | 2018-10-08 | 2019-10-07 |
| 3m Semi-Anechoic Chamber            | Chengyu Electron | 9 (L)*6 (W)* 6 (H) | BSL086     | 2018-10-08 | 2019-10-07 |
| Horn Antenna                        | Schwarzbeck      | BBHA9170           | 00814      | 2018-10-21 | 2019-10-20 |
| Power Meter                         | Anritsu          | ML2495A            | 25406005   | 2018-10-21 | 2019-10-20 |
| Power Meter                         | Anritsu          | ML2411B            | 25406005   | 2018-10-21 | 2019-10-20 |

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## 2. SUMMARY OF TEST RESULTS

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| Test Item                                  | Section in CFR 47          | Result                                   |
|--------------------------------------------|----------------------------|------------------------------------------|
| RF Exposure (SAR)                          | Part 1.1307<br>Part 2.1093 | Pass*<br>(Please refer to<br>SAR Report) |
| Antenna Requirement                        | 15.203/15.247 (c)          | Pass                                     |
| AC Power Line Conducted<br>Emission        | 15.207                     | Pass                                     |
| Conducted Peak Output<br>Power             | 15.247 (b)(1)              | Pass                                     |
| 20dB Occupied Bandwidth                    | 15.247 (a)(1)              | Pass                                     |
| Carrier Frequencies<br>Separation          | 15.247 (a)(1)              | Pass                                     |
| Hopping Channel Number                     | 15.247 (a)(1)              | Pass                                     |
| Dwell Time                                 | 15.247 (a)(1)              | Pass                                     |
| Pseudorandom Frequency<br>Hopping Sequence | 15.247(b)(4)               | Pass                                     |
| Radiated Emission                          | 15.205/15.209              | Pass                                     |
| Band Edge                                  | 15.247(d)                  | Pass                                     |

*Pass: The EUT complies with the essential requirements in the standard.*

*Remark: Test according to ANSI C63.10:2013*

### **3. RF Exposure**

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#### **3.1 Standard Applicable**

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

#### **3.2 Test Result**

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

## **4. Antenna Requirement**

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### **4.1 Standard Applicable**

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

### **4.2 Evaluation Information**

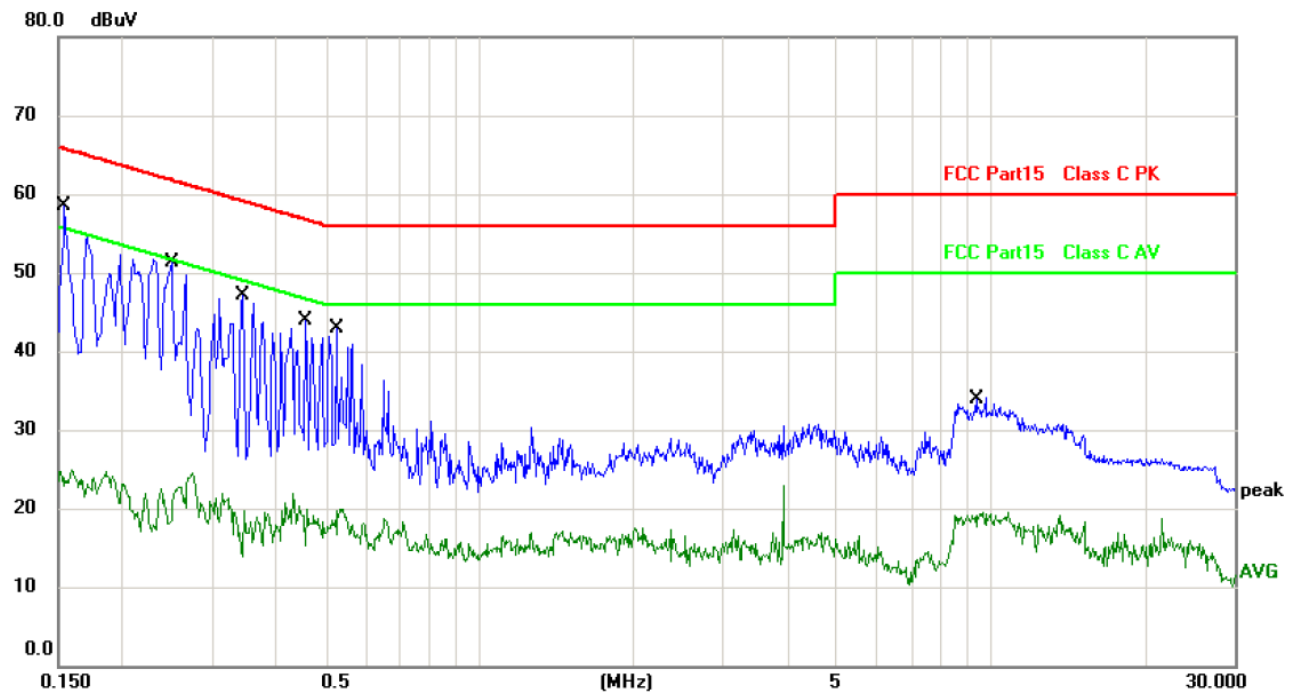
This product has a internal permanent antenna(0dBi), fulfill the requirement of this section.

## 5. Conducted Emissions

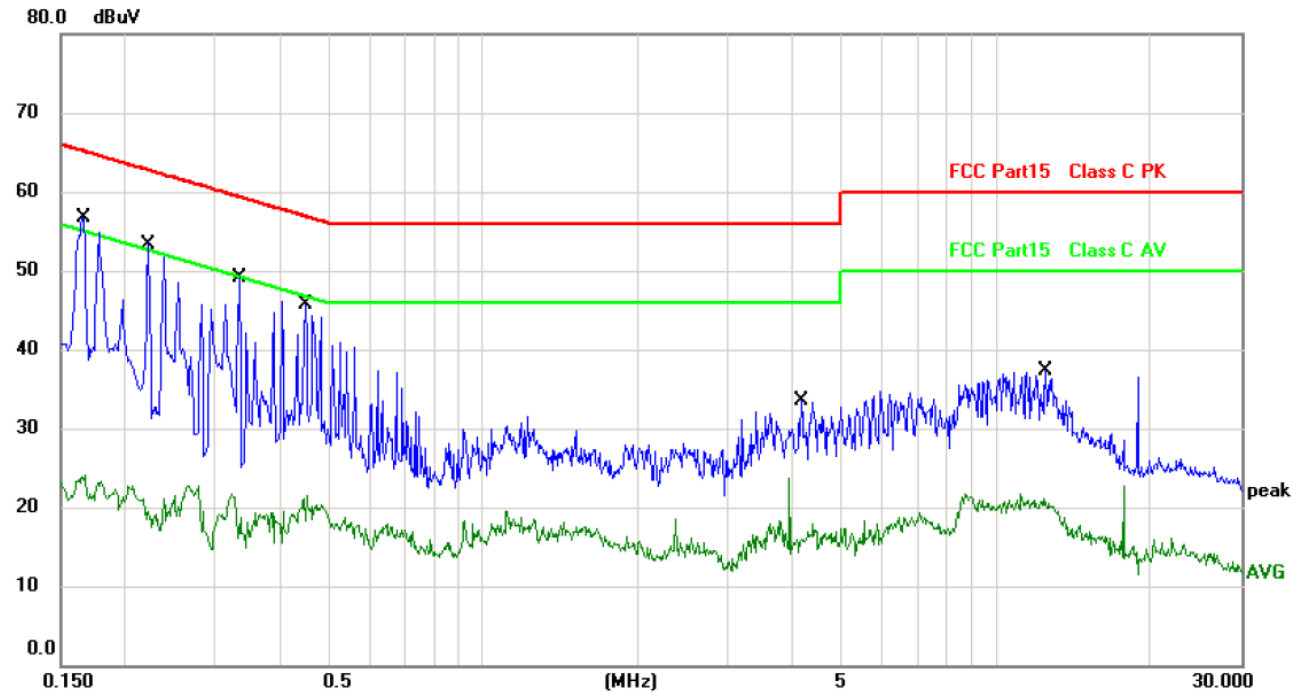
|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |           |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|
| Test Requirement:                                | FCC Part15 C Section 15.207                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |              |           |
| Test Method:                                     | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |           |
| Test Frequency Range:                            | 150KHz to 30MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |              |           |
| Class / Severity:                                | Class B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |              |           |
| 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><i>Remark</i><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 1.7 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |           |
| Test mode:                                       | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |           |
| Test results:                                    | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |              |           |

## Measurement data:

Line:



| No. | Mk. | Freq.  | Measure-<br>ment | Limit | Over   |          |         |
|-----|-----|--------|------------------|-------|--------|----------|---------|
|     |     | MHz    | dBuV             | dBuV  | dB     | Detector | Comment |
| 1   | *   | 0.1539 | 58.52            | 65.78 | -7.26  | QP       |         |
| 2   |     | 0.1539 | 25.36            | 55.78 | -30.42 | AVG      |         |
| 3   |     | 0.2500 | 51.24            | 61.75 | -10.51 | QP       |         |
| 4   |     | 0.2500 | 24.51            | 51.75 | -27.24 | AVG      |         |
| 5   |     | 0.3460 | 47.08            | 59.06 | -11.98 | QP       |         |
| 6   |     | 0.3460 | 18.25            | 49.06 | -30.81 | AVG      |         |
| 7   |     | 0.4580 | 43.96            | 56.73 | -12.77 | QP       |         |
| 8   |     | 0.4580 | 19.11            | 46.73 | -27.62 | AVG      |         |
| 9   |     | 0.5260 | 42.92            | 56.00 | -13.08 | QP       |         |
| 10  |     | 0.5260 | 19.47            | 46.00 | -26.53 | AVG      |         |
| 11  |     | 9.3739 | 33.87            | 60.00 | -26.13 | QP       |         |
| 12  |     | 9.3739 | 18.64            | 50.00 | -31.36 | AVG      |         |

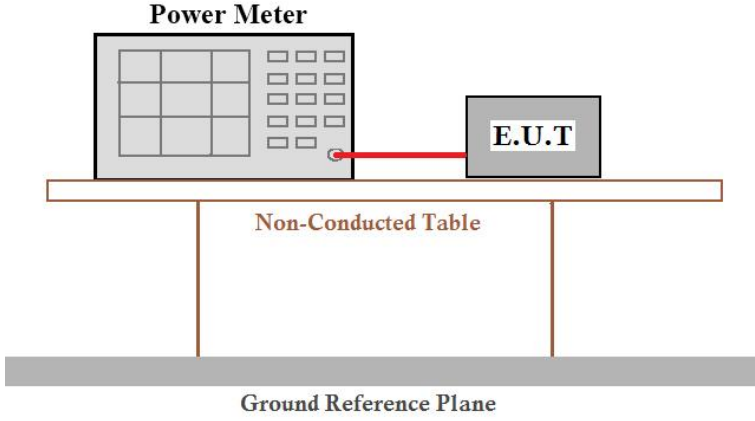
**Neutral:**

| No. | Mk. | Freq.   | Measure-<br>ment | Limit | Over   |          |         |
|-----|-----|---------|------------------|-------|--------|----------|---------|
|     |     | MHz     | dBuV             | dBuV  | dB     | Detector | Comment |
| 1   | *   | 0.1660  | 56.72            | 65.15 | -8.43  | QP       |         |
| 2   |     | 0.1660  | 23.50            | 55.15 | -31.65 | AVG      |         |
| 3   |     | 0.2220  | 53.27            | 62.74 | -9.47  | QP       |         |
| 4   |     | 0.2220  | 22.11            | 52.74 | -30.63 | AVG      |         |
| 5   |     | 0.3339  | 49.10            | 59.35 | -10.25 | QP       |         |
| 6   |     | 0.3339  | 21.34            | 49.35 | -28.01 | AVG      |         |
| 7   |     | 0.4500  | 45.61            | 56.87 | -11.26 | QP       |         |
| 8   |     | 0.4500  | 19.84            | 46.87 | -27.03 | AVG      |         |
| 9   |     | 4.1739  | 33.58            | 56.00 | -22.42 | QP       |         |
| 10  |     | 4.1739  | 24.93            | 46.00 | -21.07 | AVG      |         |
| 11  |     | 12.4579 | 37.29            | 60.00 | -22.71 | QP       |         |
| 12  |     | 12.4579 | 20.32            | 50.00 | -29.68 | 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

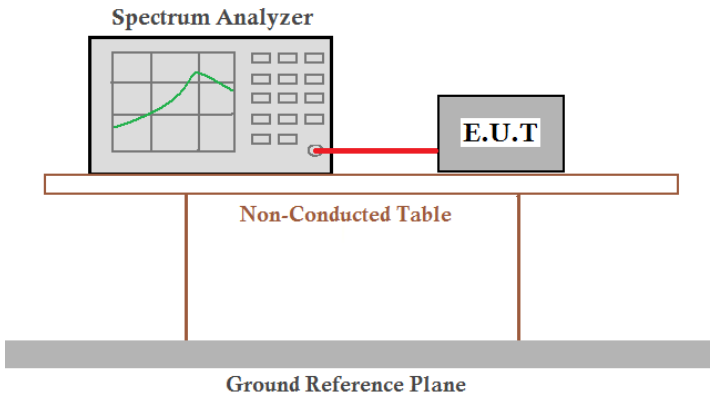
## 6. Conducted Peak Output Power

|                   |                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (b)(3)                                                                                                                                                                                                                                                                                                                                                   |
| Test Method:      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                     |
| Limit:            | 30dBm(for GFSK),20.97dBm(for EDR)                                                                                                                                                                                                                                                                                                                                                    |
| Test setup:       |  <p>The diagram illustrates the test setup. A Power Meter is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Power Meter and the E.U.T. are placed on a Non-Conducted Table. The table is supported by two vertical legs. Below the table is a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 1.7 for details                                                                                                                                                                                                                                                                                                                                                     |
| Test mode:        | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                                                                     |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                 |

### Measurement Data

| Mode     | Test channel | Peak Output Power (dBm) | Limit (dBm) | Result |
|----------|--------------|-------------------------|-------------|--------|
| GFSK     | Lowest       | 0.028                   | 30.00       | Pass   |
|          | Middle       | 0.589                   |             |        |
|          | Highest      | 0.893                   |             |        |
| Pi/4QPSK | Lowest       | 0.068                   | 20.97       | Pass   |
|          | Middle       | 0.077                   |             |        |
|          | Highest      | 0.052                   |             |        |
| 8DPSK    | Lowest       | -0.128                  | 20.97       | Pass   |
|          | Middle       | 0.322                   |             |        |
|          | Highest      | 0.241                   |             |        |

## 7. 20dB Emission Bandwidth

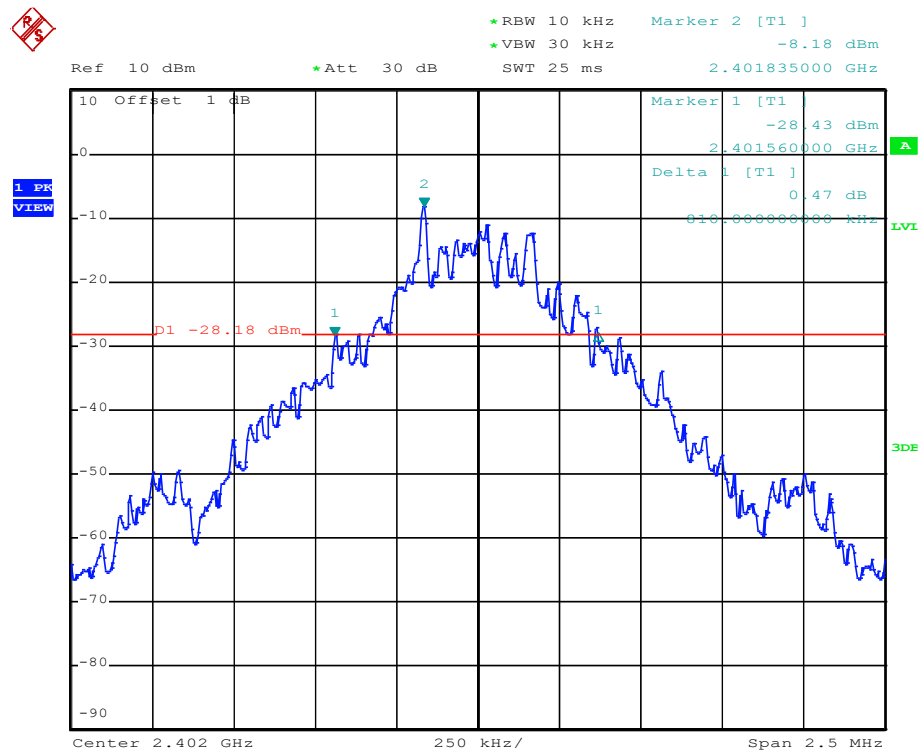
|                   |                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(2)                                                                                                                                                                                                                                                                                                                |
| Test Method:      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                  |
| Limit:            | N/A                                                                                                                                                                                                                                                                                                                                               |
| 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 the Spectrum Analyzer and the E.U.T are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 1.7 for details                                                                                                                                                                                                                                                                                                                  |
| Test mode:        | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                                  |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                              |

### Measurement Data

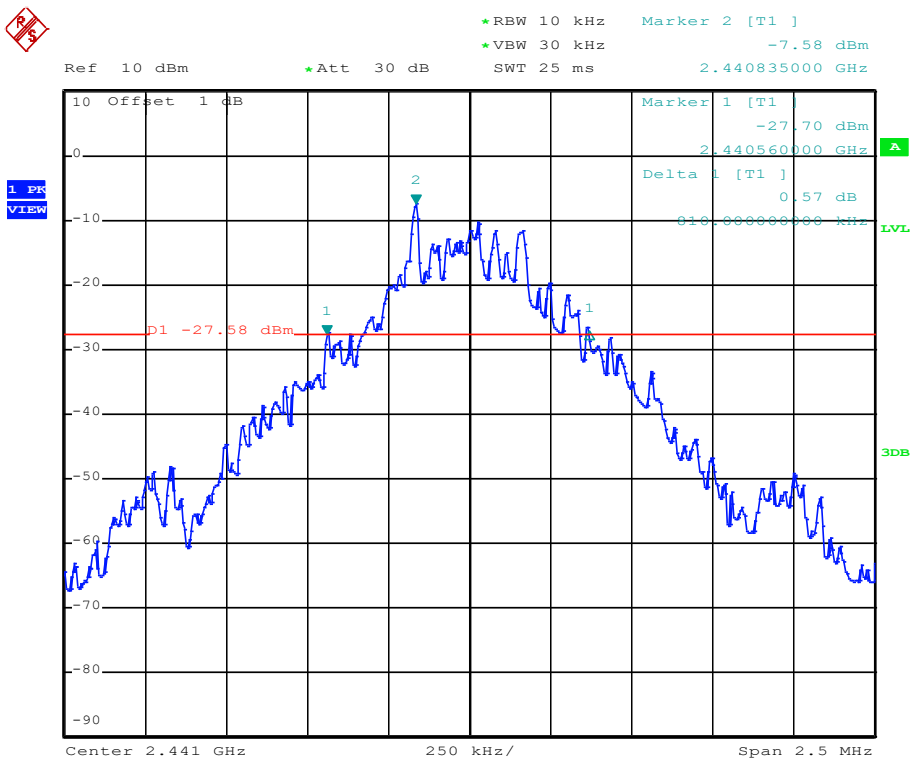
| Mode     | Test channel | 20dB Emission Bandwidth (MHz) | Result |
|----------|--------------|-------------------------------|--------|
| GFSK     | Lowest       | 0.810                         | Pass   |
|          | Middle       | 0.810                         |        |
|          | Highest      | 0.810                         |        |
| Pi/4QPSK | Lowest       | 1.080                         | Pass   |
|          | Middle       | 1.080                         |        |
|          | Highest      | 1.085                         |        |
| 8DPSK    | Lowest       | 1.080                         | Pass   |
|          | Middle       | 1.080                         |        |
|          | Highest      | 1.080                         |        |

Test plot as follows:

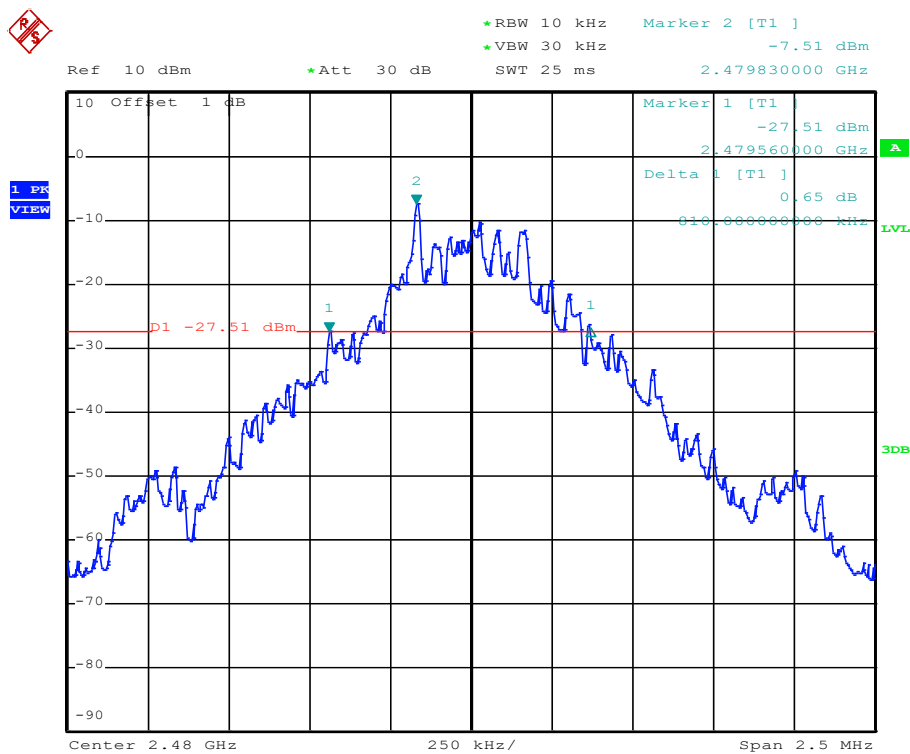
|            |           |
|------------|-----------|
| Test mode: | GFSK mode |
|------------|-----------|



Lowest channel

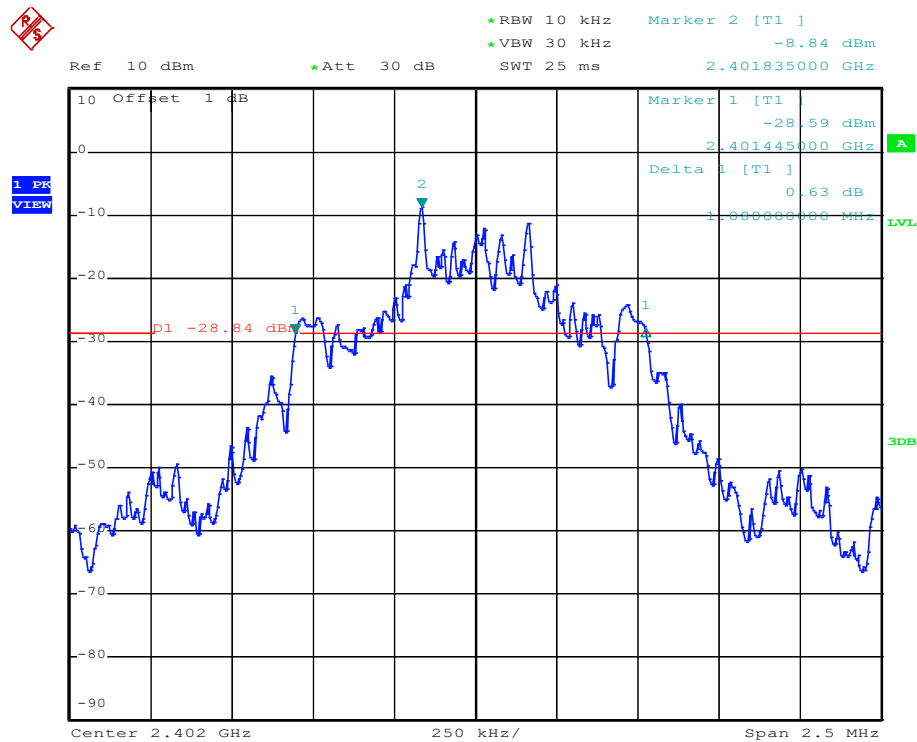


Middle channel

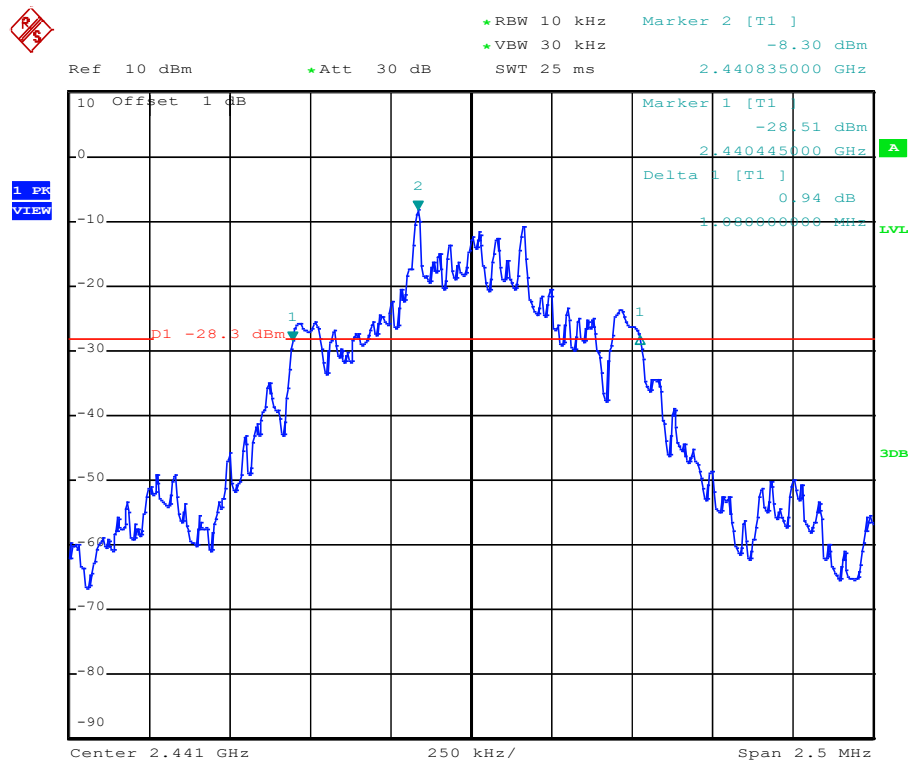


Highest channel

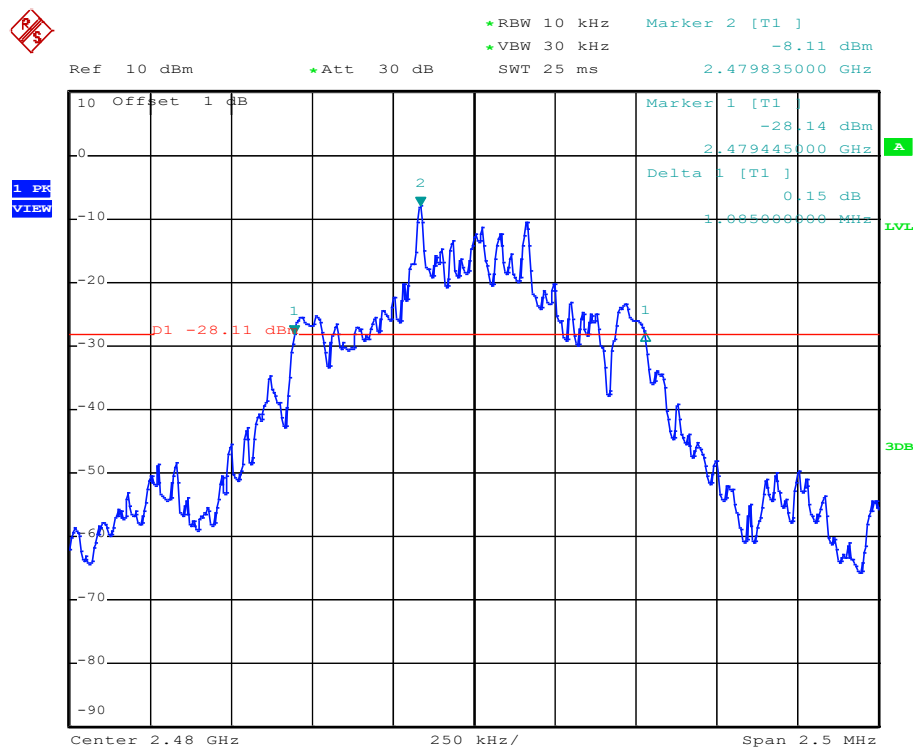
|            |               |
|------------|---------------|
| Test mode: | Pi/4QPSK mode |
|------------|---------------|



Lowest channel

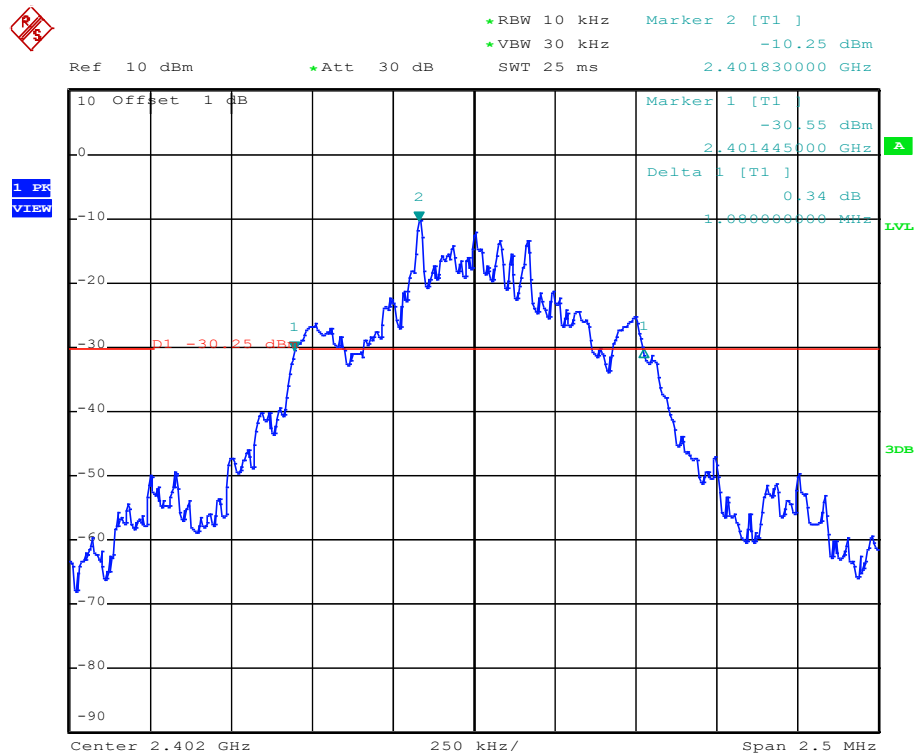


Middle channel

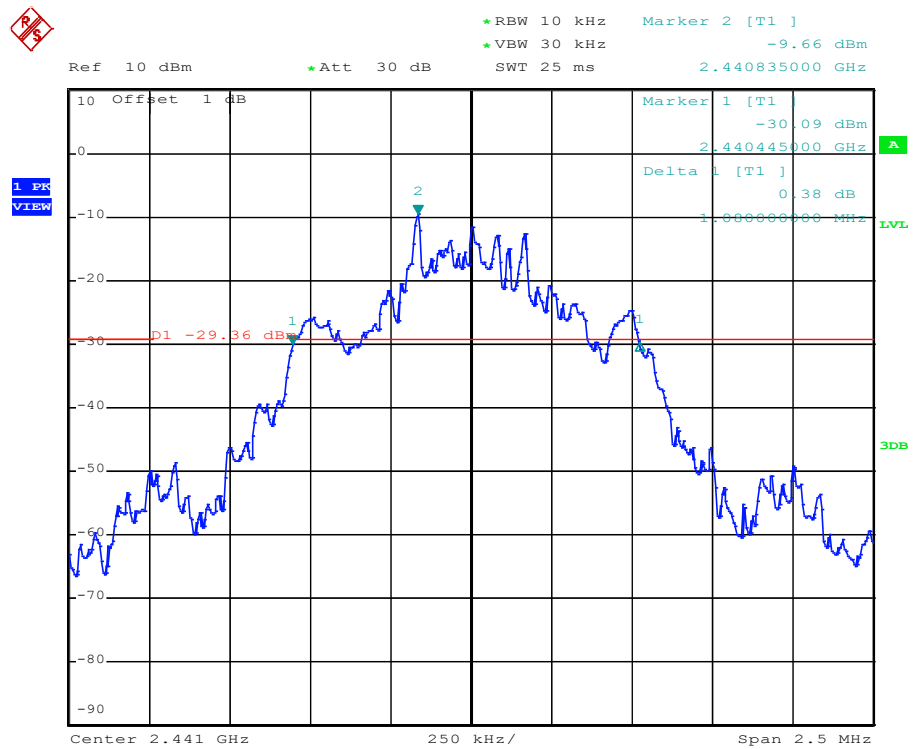


Highest channel

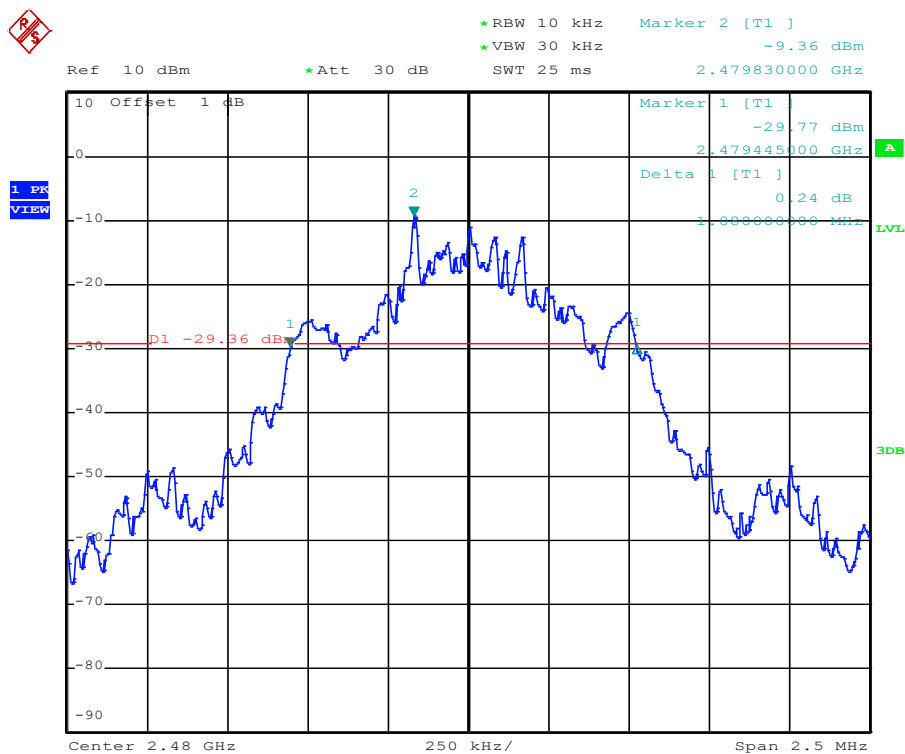
|            |            |
|------------|------------|
| Test mode: | 8DPSK mode |
|------------|------------|



Lowest channel

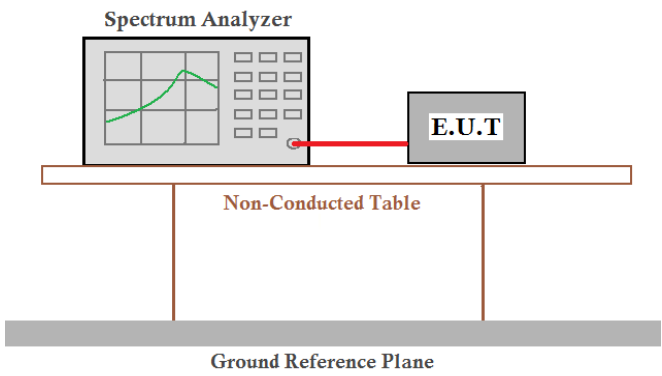


Middle channel



Highest channel

## 8. Carrier Frequencies Separation

|                   |                                                                                                                                                                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1)                                                                                                                                                                                                                                                                                                     |
| Test Method:      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                       |
| Receiver setup:   | RBW=20KHz, VBW=62KHz, detector=Peak                                                                                                                                                                                                                                                                                                    |
| Limit:            | 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)                                                                                                                                                                                                                                                                           |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer and an E.U.T. (Equipment Under Test) are connected by a red cable. They are positioned on a table labeled 'Non-Conducted Table'. Below this table is a 'Ground Reference Plane'.</p> |
| Test Instruments: | Refer to section 1.7 for details                                                                                                                                                                                                                                                                                                       |
| Test mode:        | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                       |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                   |

### Measurement Data

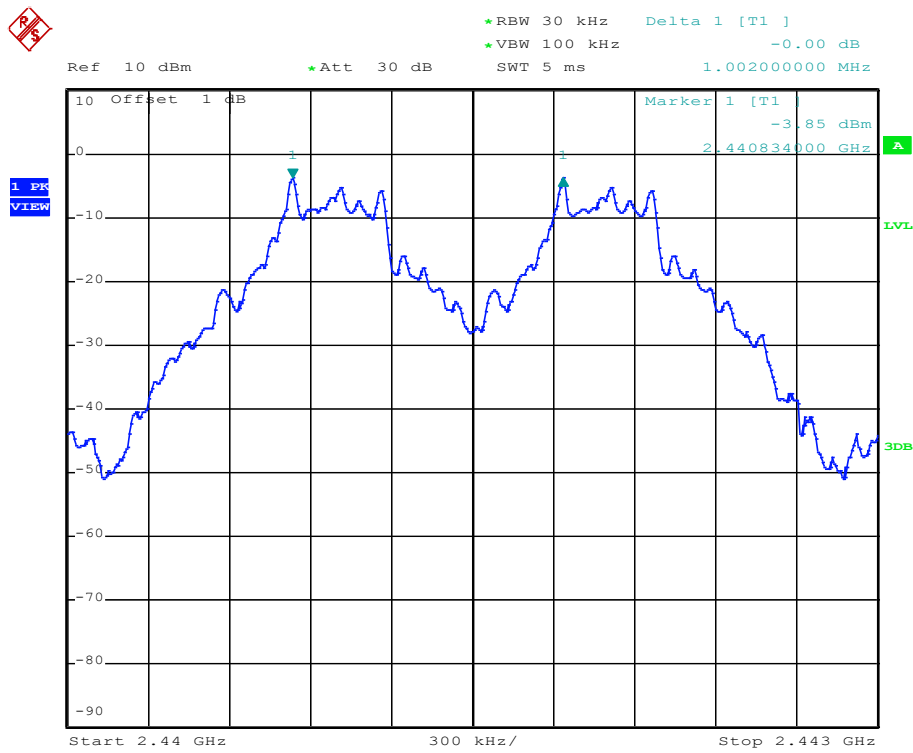
| Mode     | Test channel | Carrier Frequencies Separation (kHz) | Limit (kHz) | Result |
|----------|--------------|--------------------------------------|-------------|--------|
| GFSK     | Lowest       | 1002                                 | 623         | Pass   |
|          | Middle       | 1002                                 | 623         | Pass   |
|          | Highest      | 1002                                 | 623         | Pass   |
| Pi/4QPSK | Lowest       | 1002                                 | 841         | Pass   |
|          | Middle       | 1002                                 | 841         | Pass   |
|          | Highest      | 1002                                 | 841         | Pass   |
| 8DSK     | Lowest       | 1002                                 | 817         | Pass   |
|          | Middle       | 1002                                 | 817         | Pass   |
|          | Highest      | 1002                                 | 817         | Pass   |

Note: According to section 7.4

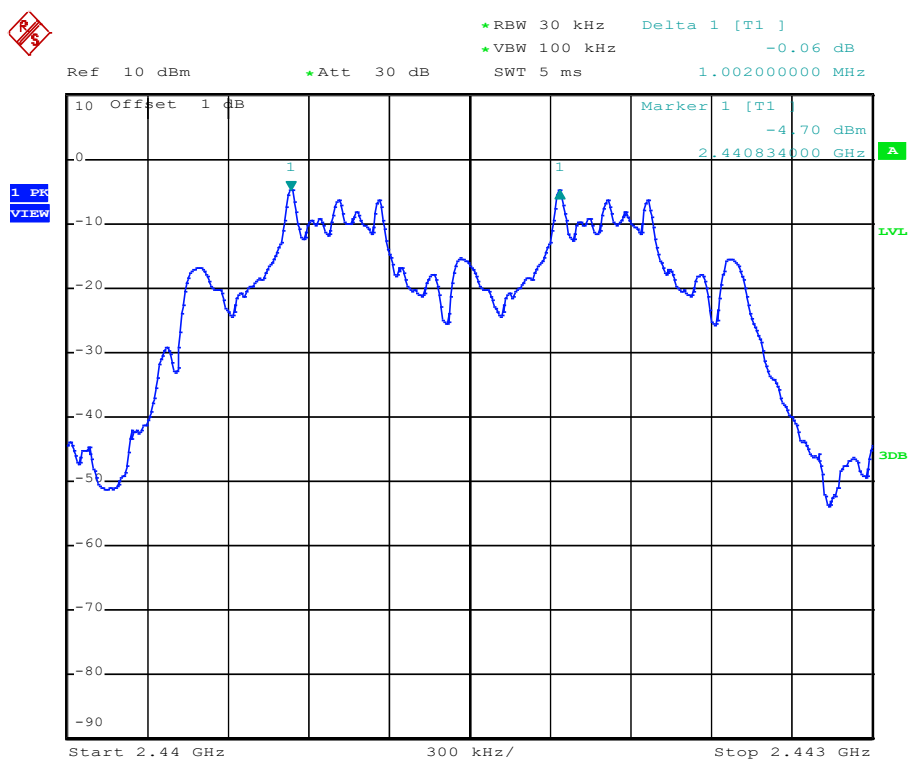
| Mode     | 20dB bandwidth (kHz)<br>(worse case) | Limit (kHz)<br>(Carrier Frequencies Separation) |
|----------|--------------------------------------|-------------------------------------------------|
| GFSK     | 810.00                               | 623                                             |
| Pi/4QPSK | 1085.00                              | 841                                             |
| 8DSK     | 1080.00                              | 817                                             |

Test plot as follows:  
Only show the worst case

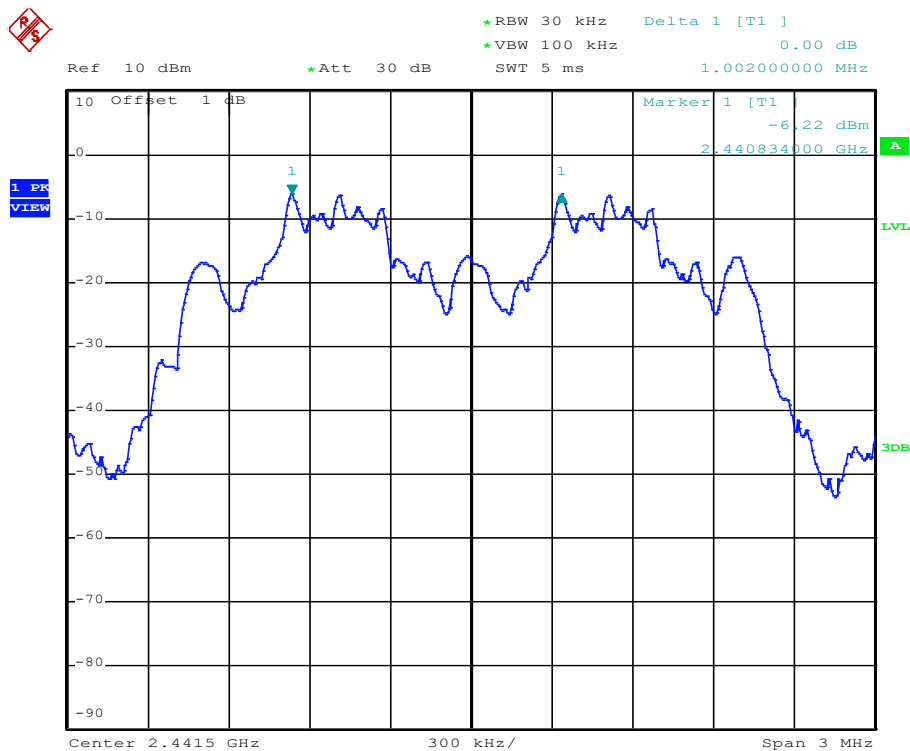
GFSK



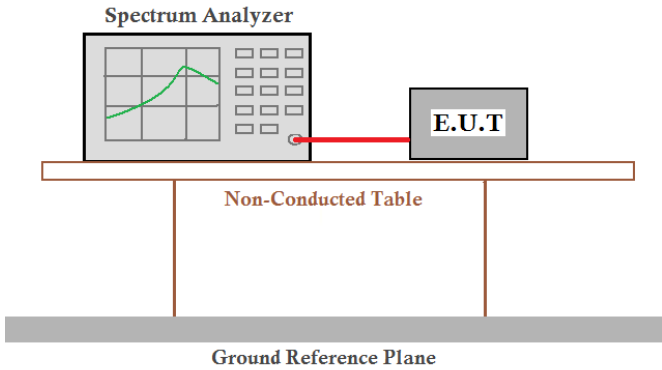
$\pi/4$ DQPSK



8DPSK



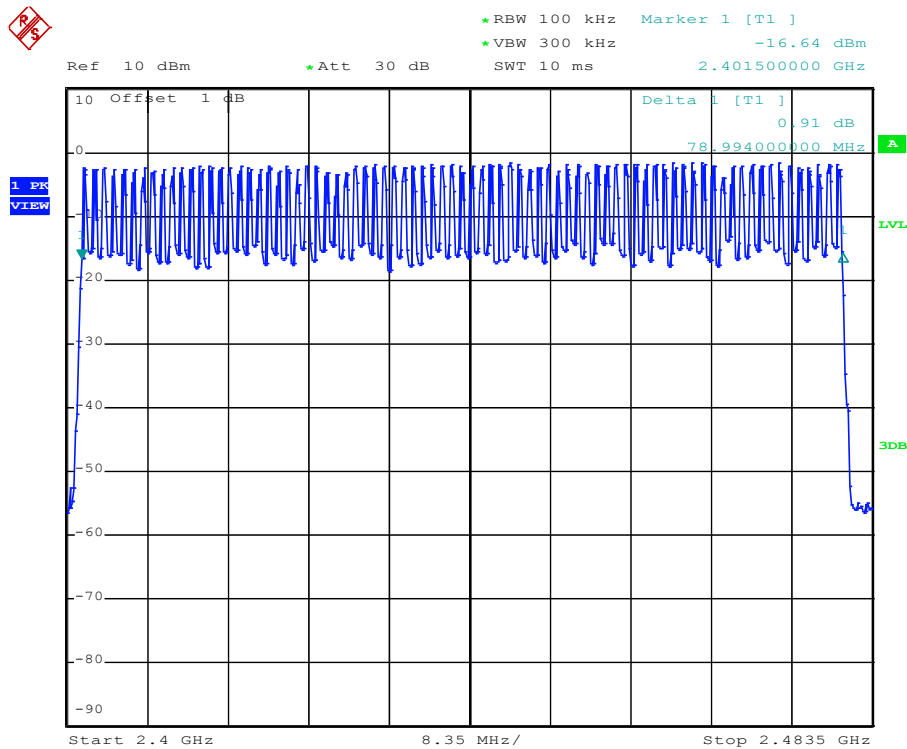
## 9. Hopping Channel Number

|                   |                                                                                                                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1)                                                                                                                                                                                                                                                                             |
| 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 1.7 for details                                                                                                                                                                                                                                                                               |
| Test mode:        | Refer to section 1.2 for details                                                                                                                                                                                                                                                                               |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                           |

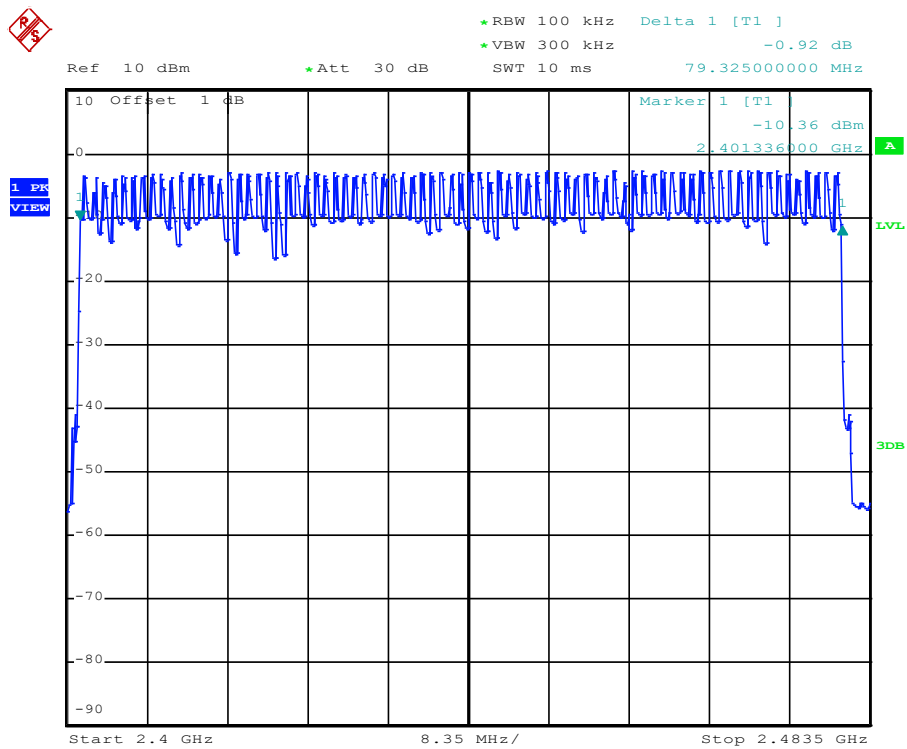
### Measurement Data:

| Mode     | Hopping channel numbers | Limit | Result |
|----------|-------------------------|-------|--------|
| GFSK     | 79                      | 15    | Pass   |
| Pi/4QPSK | 79                      | 15    | Pass   |
| 8DPSK    | 79                      | 15    | Pass   |

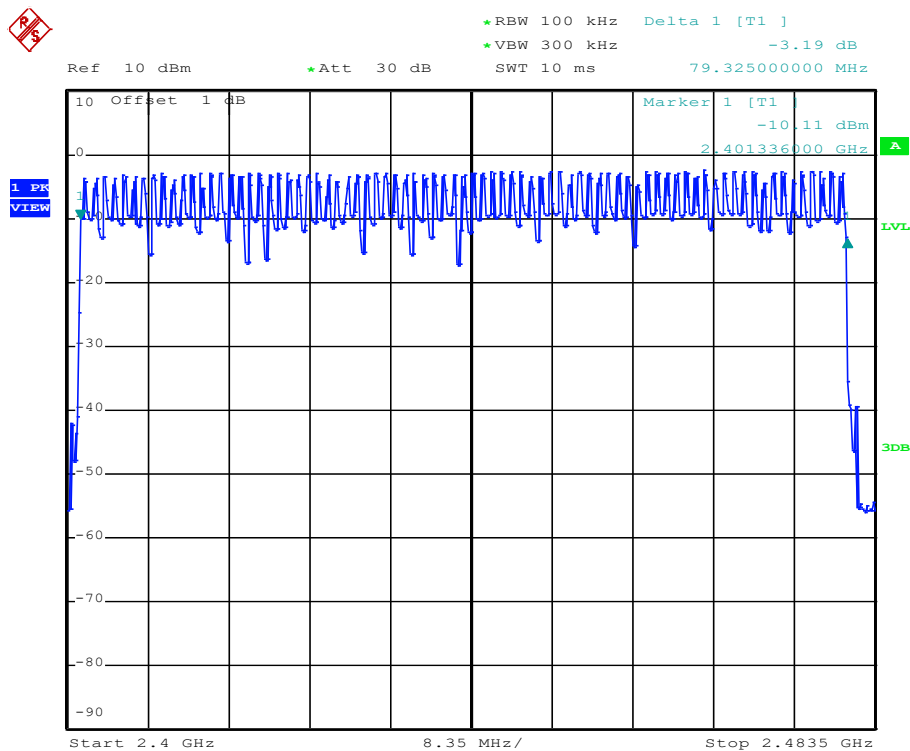
GFSK



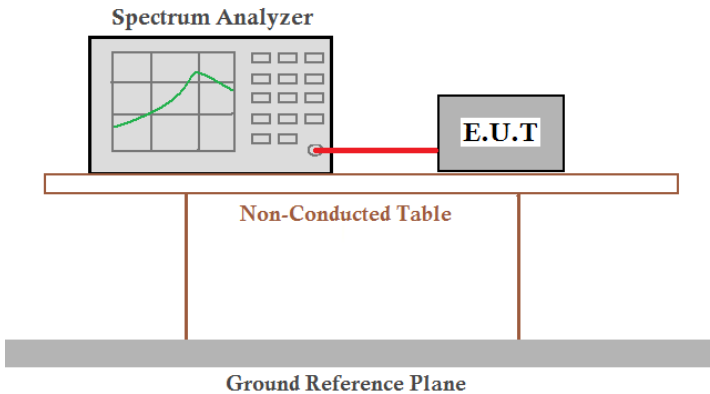
$\pi/4$ DQPSK



8DPSK



## 10. Dwell Time

|                   |                                                                                                                                                                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(1)                                                                                                                                                                                                                                                                                                     |
| 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 and an E.U.T. (Equipment Under Test) are connected by a red cable. They are positioned on a table labeled 'Non-Conducted Table'. Below this table is a 'Ground Reference Plane'.</p> |
| Test Instruments: | Refer to section 1.7 for details                                                                                                                                                                                                                                                                                                       |
| Test mode:        | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                       |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                   |

### Measurement Data

| Mode      | Frequency (MHz) | Burst Type | Pulse Width (ms) | Dwell Time (ms) | Limit (ms) | Verdict |
|-----------|-----------------|------------|------------------|-----------------|------------|---------|
| GFSK      | 2441            | DH1        | 0.4244           | 135.81          | 400        | PASS    |
|           |                 | DH3        | 1.6844           | 269.50          |            |         |
|           |                 | DH5        | 2.9244           | 311.94          |            |         |
| π/4-DQPSK | 2441            | DH1        | 0.4244           | 135.81          | 400        | PASS    |
|           |                 | DH3        | 1.6844           | 269.50          |            |         |
|           |                 | DH5        | 2.9444           | 314.07          |            |         |
| 8DPSK     | 2441            | DH1        | 0.4244           | 135.81          | 400        | PASS    |
|           |                 | DH3        | 1.6644           | 266.30          |            |         |
|           |                 | DH5        | 2.9244           | 311.94          |            |         |

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

Test channel: 2402MHz/2441MHz/2480MHz as blow

DH1 time slot= Pulse time (ms)\*(1600/ (2\*79))\*31.6

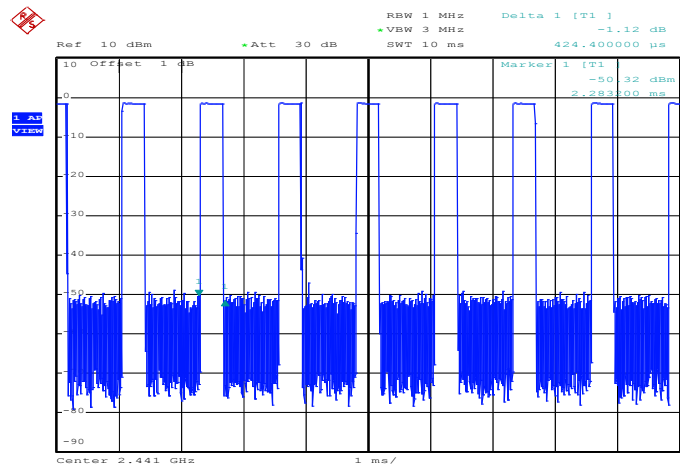
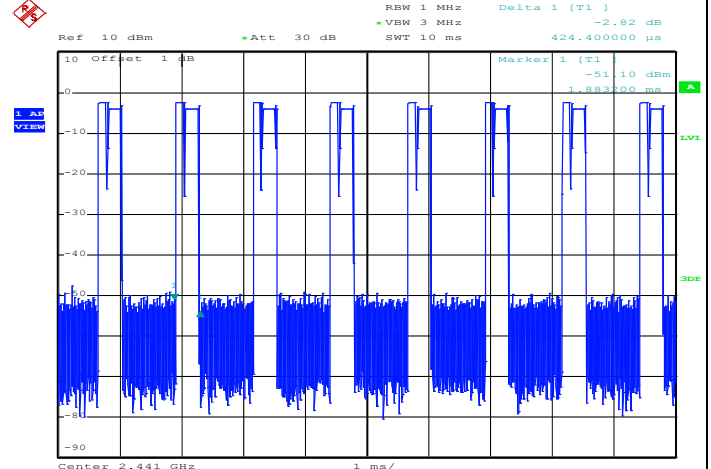
DH3 time slot= Pulse time (ms)\*(1600/ (4\*79))\*31.6

DH5 time slot= Pulse time (ms)\*(1600/ (6\*79))\*31.6

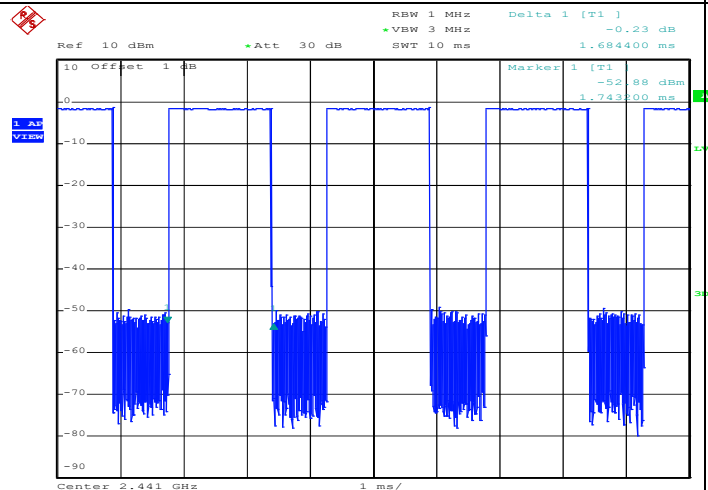
Test plot as follows:

## Dwell time

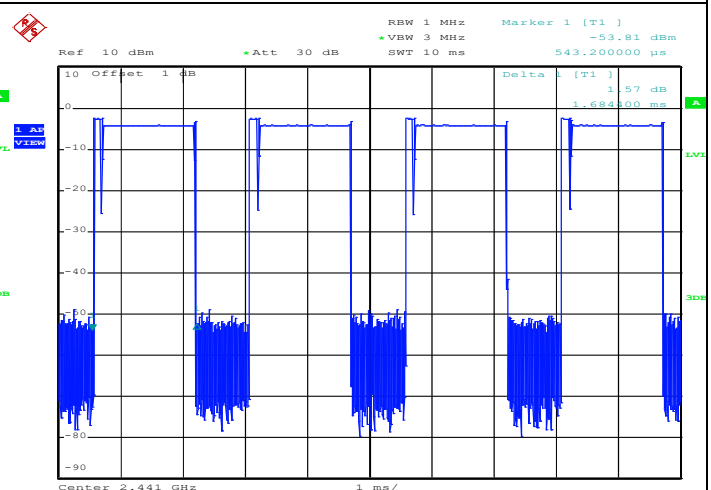
## GFSK

 $\pi/4$ -DQPSK

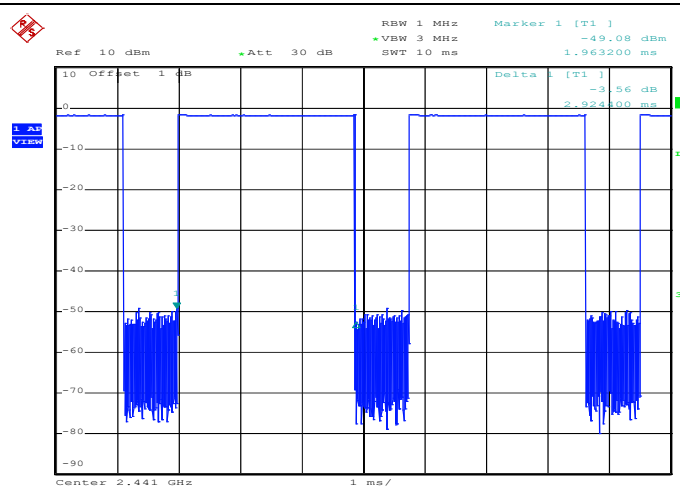
## Channel 39 / 2441 MHz - DH1



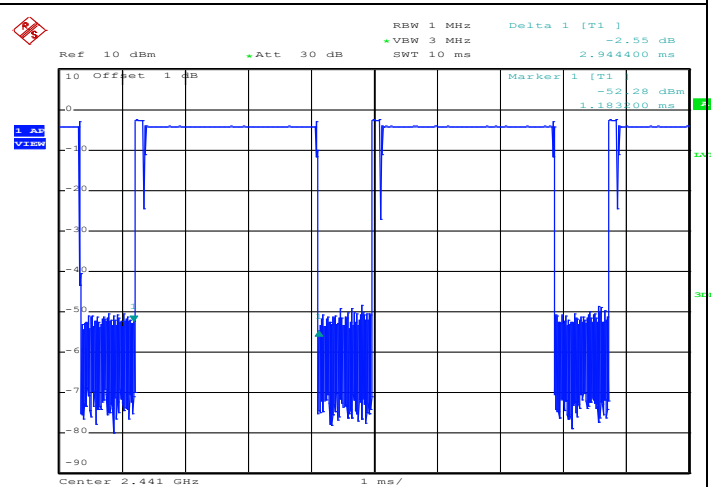
## Channel 39 / 2441 MHz - 2DH1



## Channel 39 / 2441 MHz - DH3



## Channel 39 / 2441 MHz - 2DH3



## Channel 39 / 2441 MHz - DH5



## Channel 39 / 2441 MHz - 2DH5



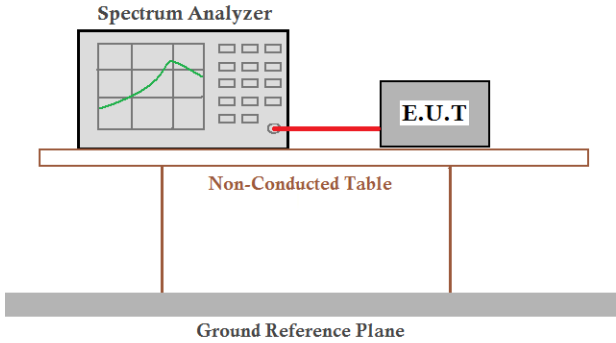
FCC Part 15.247

## 11. Pseudorandom Frequency Hopping Sequence

| Test Requirement:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | FCC Part15 C Section 15.247 (a)(1) requirement: |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| <p>Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.</p> <p>Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.</p>                                                                                                                                                                                                                          |                                                 |
| EUT Pseudorandom Frequency Hopping Sequence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                 |
| <p>The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.</p> <ul style="list-style-type: none"> <li>• Number of shift register stages: 9</li> <li>• Length of pseudo-random sequence: <math>2^9 - 1 = 511</math> bits</li> <li>• Longest sequence of zeros: 8 (non-inverted signal)</li> </ul> <div data-bbox="242 1153 1292 1303" data-label="Diagram"> </div> <p style="text-align: center;"><i>Linear Feedback Shift Register for Generation of the PRBS sequence</i></p> <p>An example of Pseudorandom Frequency Hopping Sequence as follow:</p> <div data-bbox="242 1473 1236 1630" data-label="Figure"> </div> <p>Each frequency used equally on the average by each transmitter.</p> <p>The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.</p> |                                                 |

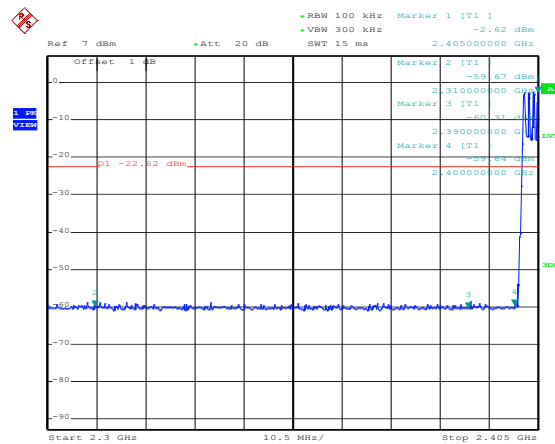
## 12. Band Edge

### 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. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) 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 1.7 for details                                                                                                                                                                                                                                                                                                                                                        |
| Test mode:        | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                                                                        |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                    |

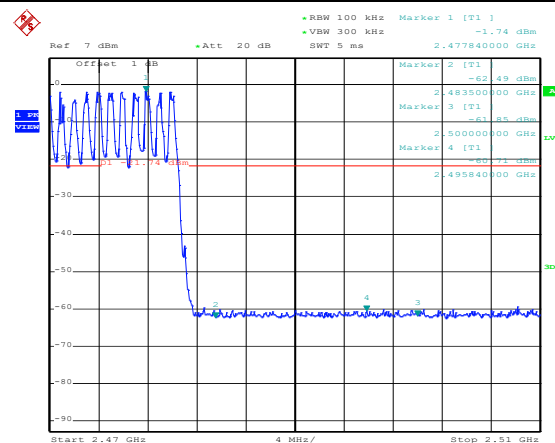
### GFSK Mode:

Lowest channel



Hopping mode

Highest channel

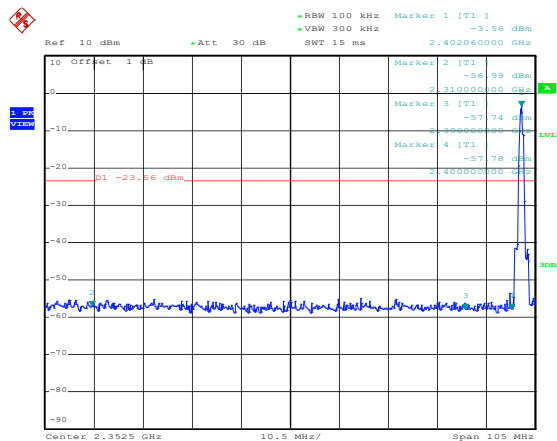


Hopping mode

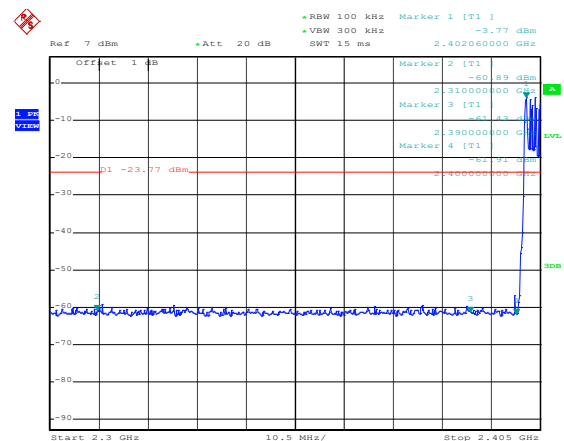
## Pi/4QPSK Mode:

Test channel:

Lowest channel



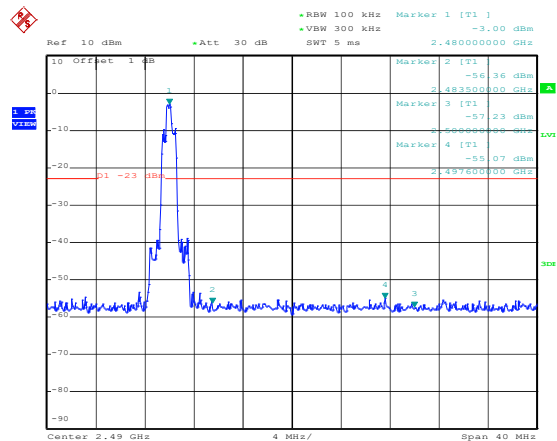
No-hopping mode



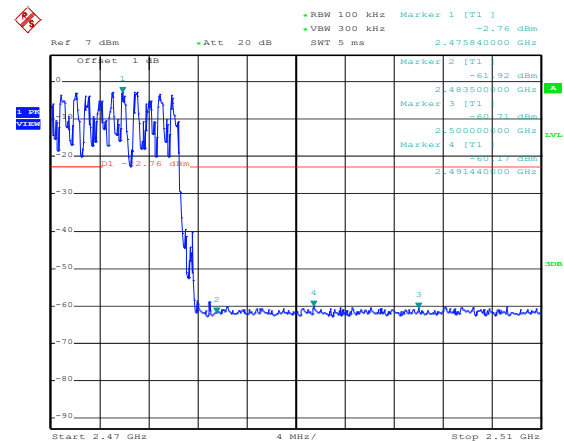
Hopping mode

Test channel:

Highest channel



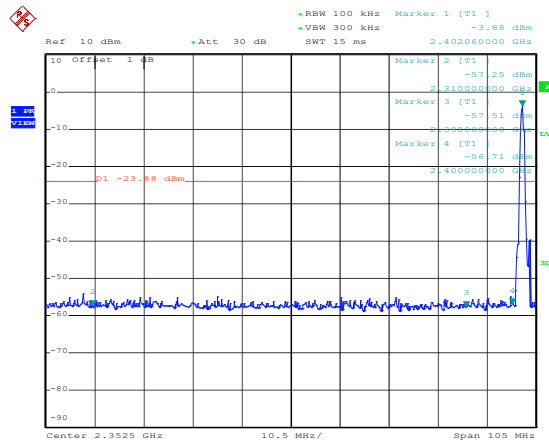
No-hopping mode



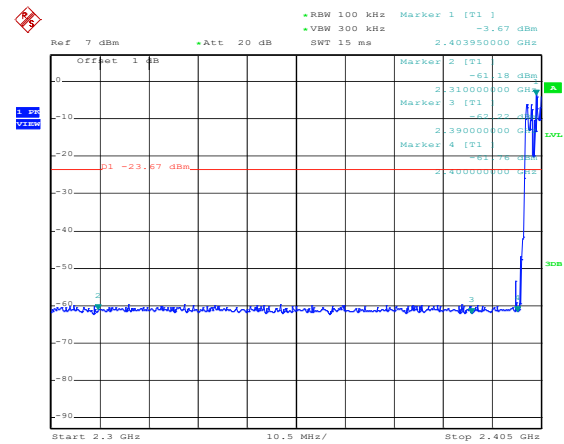
Hopping mode

**8DPSK Mode:**

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

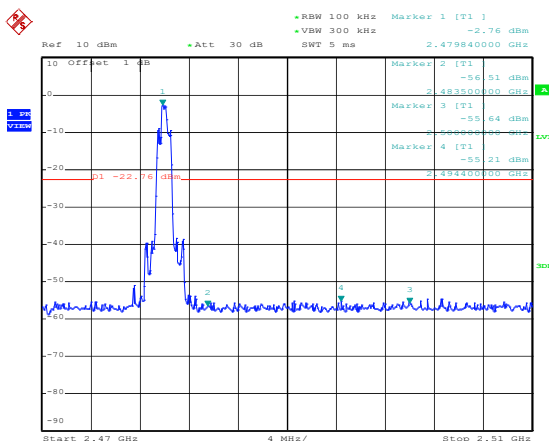


No-hopping mode

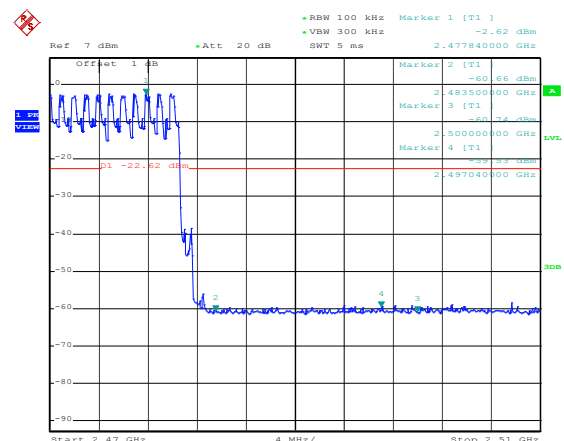


Hopping mode

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

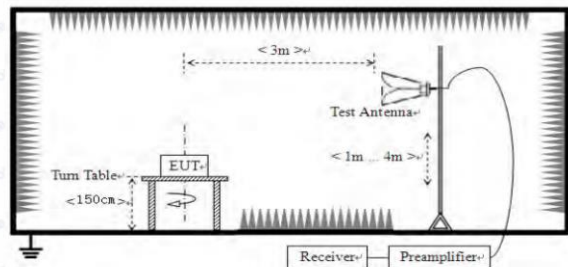


No-hopping mode



Hopping mode

**Radiated Emission Method**

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |                    |      |               |  |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------|------|---------------|--|
| Test Requirement:     | FCC Part15 C Section 15.209 and 15.205                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                    |      |               |  |
| Test Method:          | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |                    |      |               |  |
| Test Frequency Range: | All restriction band have been tested, and 2.31GHz to 2.5GHz band is the worse case                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |                    |      |               |  |
| 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 data sheet.</div> |          |                    |      |               |  |
| Test Instruments:     | Refer to section 1.7 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |                    |      |               |  |
| Test mode:            | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |                    |      |               |  |
| Test results:         | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |                    |      |               |  |

Remark: During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation

which it is worse case.

#### No-hopping mode

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

#### Peak value:

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 2390.00         | 51.26          | 74.00               | -22.74          | Horizontal   |
| 2400.00         | 55.37          | 74.00               | -18.63          | Horizontal   |
| 2390.00         | 50.68          | 74.00               | -23.32          | Vertical     |
| 2400.00         | 55.96          | 74.00               | -18.04          | Vertical     |

#### Average value:

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 2390.00         | 42.03          | 54.00               | -11.97          | Horizontal   |
| 2400.00         | 41.87          | 54.00               | -12.13          | Horizontal   |
| 2390.00         | 41.54          | 54.00               | -12.46          | Vertical     |
| 2400.00         | 42.66          | 54.00               | -11.34          | Vertical     |

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

#### Peak value:

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 2483.50         | 52.69          | 74.00               | -21.31          | Horizontal   |
| 2500.00         | 53.31          | 74.00               | -20.69          | Horizontal   |
| 2483.50         | 56.34          | 74.00               | -17.66          | Vertical     |
| 2500.00         | 54.71          | 74.00               | -19.29          | Vertical     |

#### Average value:

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 2483.50         | 42.39          | 54.00               | -11.61          | Horizontal   |
| 2500.00         | 43.61          | 54.00               | -10.39          | Horizontal   |
| 2483.50         | 44.88          | 54.00               | -9.12           | Vertical     |
| 2500.00         | 42.67          | 54.00               | -11.33          | Vertical     |

**hopping mode**

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

**Peak value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 2390.00         | 52.22          | 74.00               | -21.78          | Horizontal   |
| 2400.00         | 54.56          | 74.00               | -19.44          | Horizontal   |
| 2390.00         | 51.25          | 74.00               | -22.75          | Vertical     |
| 2400.00         | 56.27          | 74.00               | -17.73          | Vertical     |

**Average value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 2390.00         | 41.84          | 54.00               | -12.16          | Horizontal   |
| 2400.00         | 41.43          | 54.00               | -12.57          | Horizontal   |
| 2390.00         | 42.37          | 54.00               | -11.63          | Vertical     |
| 2400.00         | 42.89          | 54.00               | -11.11          | Vertical     |

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

**Peak value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 2483.50         | 53.51          | 74.00               | -20.49          | Horizontal   |
| 2500.00         | 53.77          | 74.00               | -20.23          | Horizontal   |
| 2483.50         | 55.26          | 74.00               | -18.74          | Vertical     |
| 2500.00         | 54.94          | 74.00               | -19.06          | Vertical     |

**Average value:**

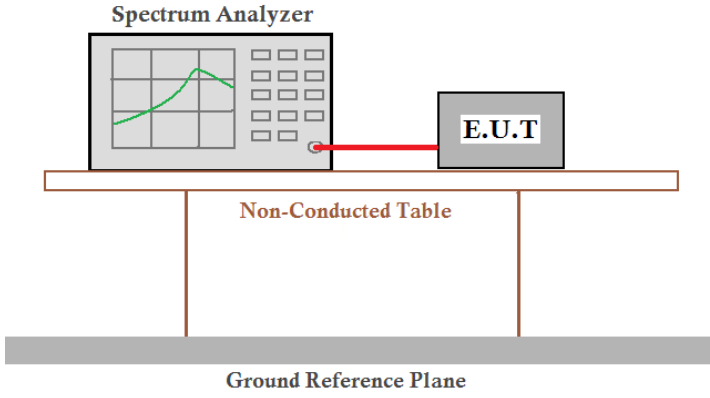
| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 2483.50         | 42.12          | 54.00               | -11.88          | Horizontal   |
| 2500.00         | 42.74          | 54.00               | -11.26          | Horizontal   |
| 2483.50         | 43.93          | 54.00               | -10.07          | Vertical     |
| 2500.00         | 43.47          | 54.00               | -10.53          | Vertical     |

**Peak value:***Remark:*

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.*

## 14. Spurious Emission

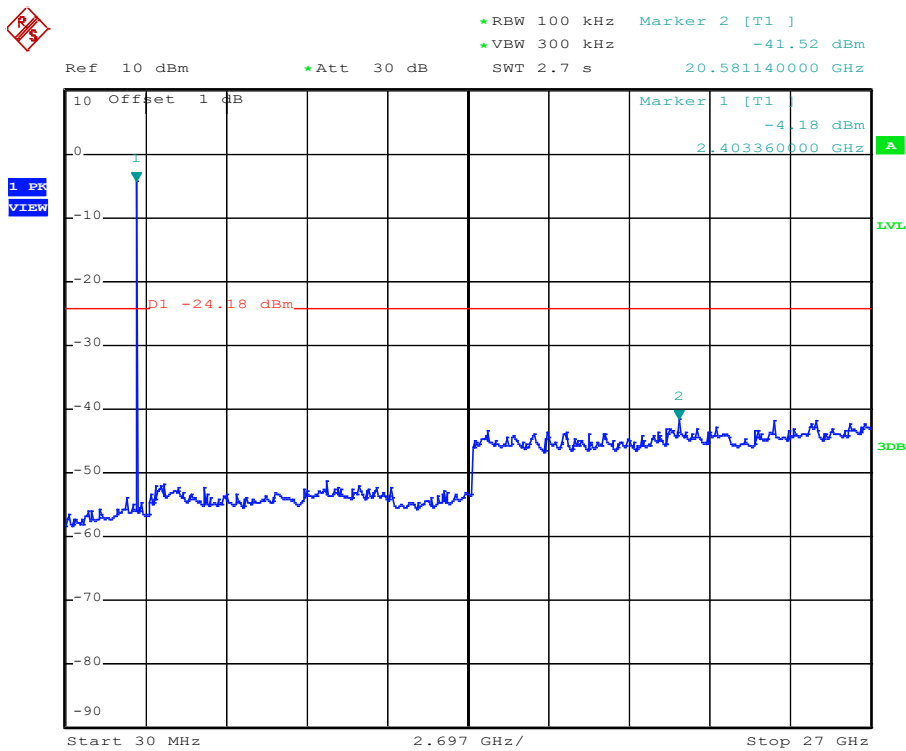
### Conducted Emission Method

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) 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 two vertical legs and sits on a Ground Reference Plane, which is represented by a thick gray bar at the bottom.</p> |
| Test Instruments: | Refer to section 1.7 for details                                                                                                                                                                                                                                                                                                                                                                                                                |
| Test mode:        | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                            |

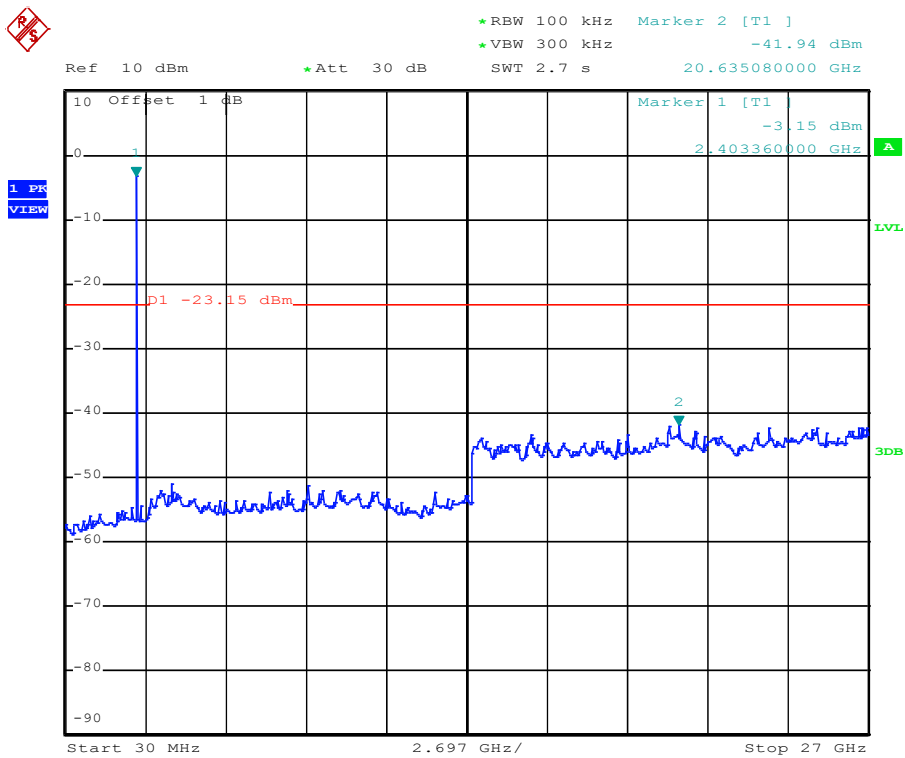
#### Remark:

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

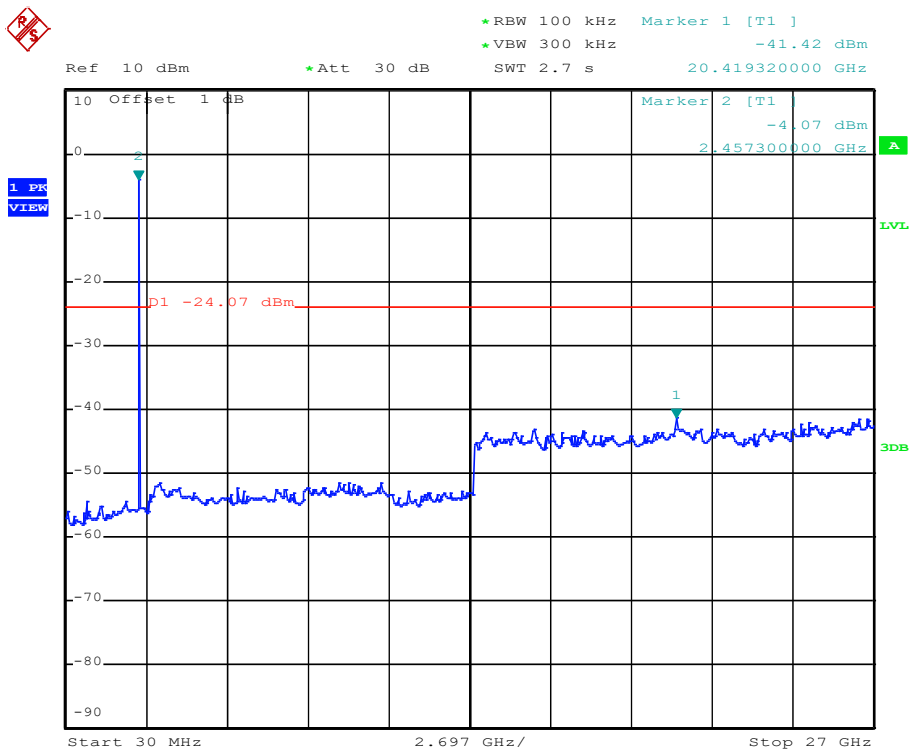
|               |      |
|---------------|------|
| Test channel: | GFSK |
|---------------|------|



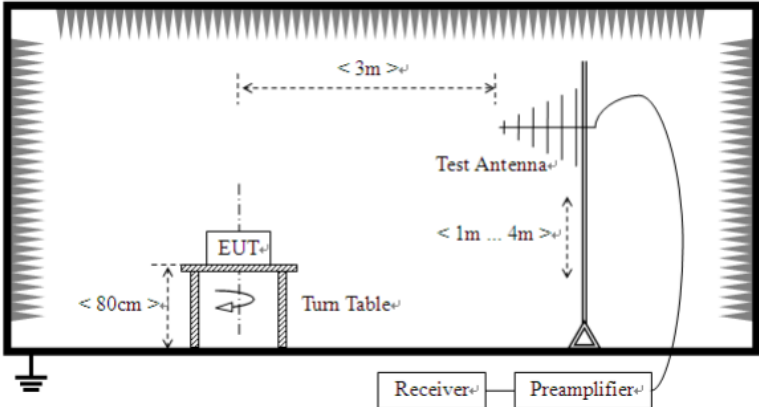
|               |       |
|---------------|-------|
| Test channel: | 4QPSK |
|---------------|-------|

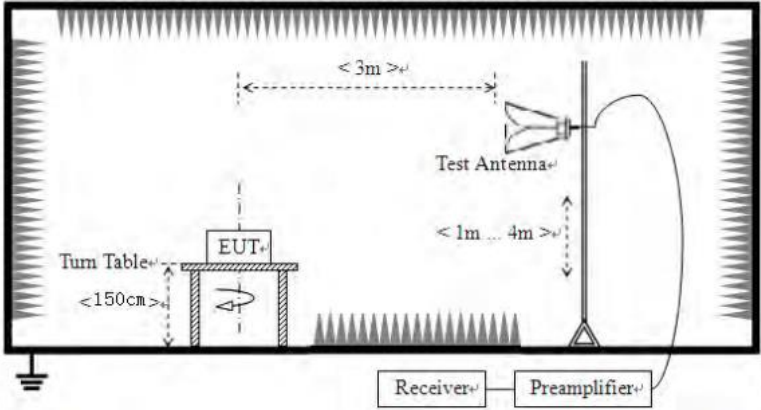


|               |       |
|---------------|-------|
| Test channel: | 8DPSK |
|---------------|-------|



**Radiated Emission Method**

|                       |                                                                                                 |            |                    |        |                  |
|-----------------------|-------------------------------------------------------------------------------------------------|------------|--------------------|--------|------------------|
| Test Requirement:     | FCC Part15 C Section 15.209                                                                     |            |                    |        |                  |
| Test Method:          | ANSI C63.10:2013                                                                                |            |                    |        |                  |
| Test Frequency Range: | 30MHz to 25GHz                                                                                  |            |                    |        |                  |
| Test site:            | Measurement Distance: 3m                                                                        |            |                    |        |                  |
| Receiver setup:       | Frequency                                                                                       | Detector   | RBW                | VBW    | Remark           |
|                       | 30MHz-1GHz                                                                                      | Quasi-peak | 120KHz             | 300KHz | Quasi-peak Value |
|                       | Above 1GHz                                                                                      | Peak       | 1MHz               | 3MHz   | Peak Value       |
|                       |                                                                                                 | Peak       | 1MHz               | 10Hz   | Average Value    |
| Limit:                | Frequency                                                                                       |            | Limit (dBuV/m @3m) |        | Remark           |
|                       | 30MHz-88MHz                                                                                     |            | 40.0               |        | Quasi-peak Value |
|                       | 88MHz-216MHz                                                                                    |            | 43.5               |        | Quasi-peak Value |
|                       | 216MHz-960MHz                                                                                   |            | 46.0               |        | Quasi-peak Value |
|                       | 960MHz-1GHz                                                                                     |            | 54.0               |        | Quasi-peak Value |
|                       | Above 1GHz                                                                                      |            | 54.0               |        | Average Value    |
|                       |                                                                                                 |            | 74.0               |        | Peak Value       |
| Test setup:           | Below 1GHz                                                                                      |            |                    |        |                  |
|                       | <div></div> |            |                    |        |                  |
|                       | Above 1GHz                                                                                      |            |                    |        |                  |

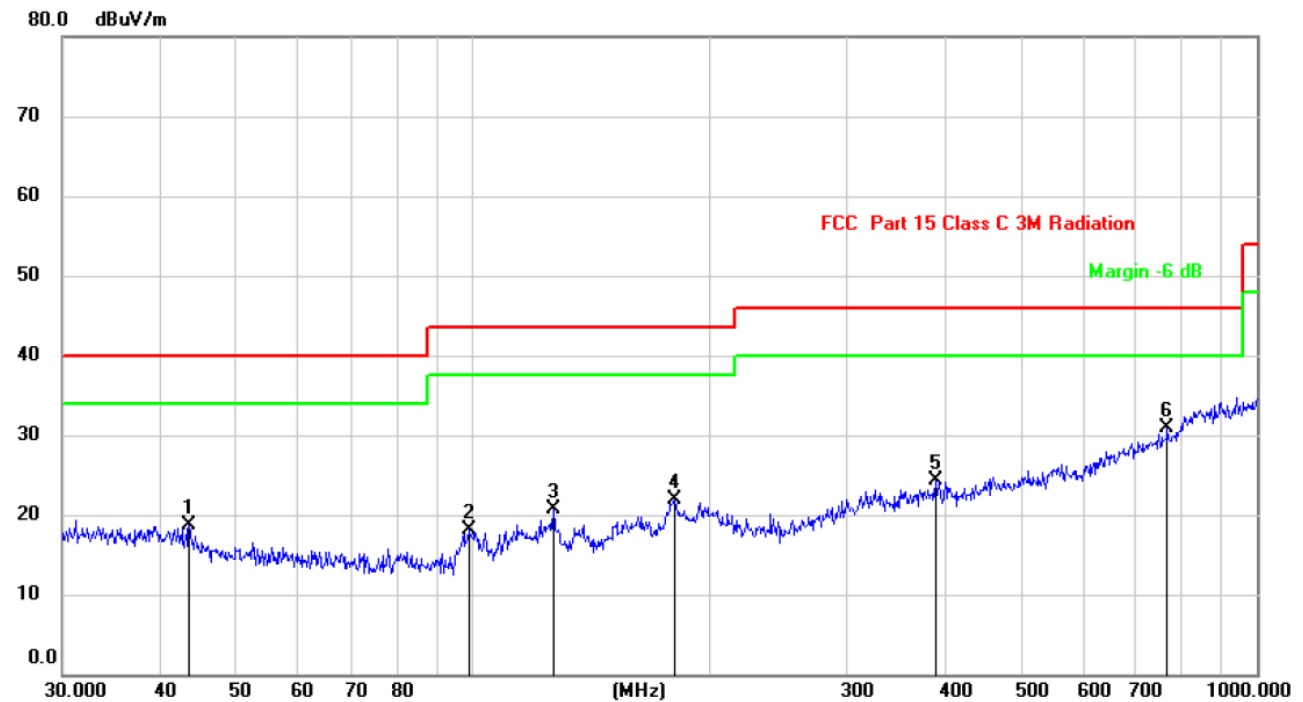
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |  <p>The diagram illustrates the test setup. An EUT (Equipment Under Test) is placed on a turn table with a diameter of 150cm. The turn table is positioned 3m away from a test antenna. The test antenna is mounted on a tower with a height adjustable from 1m to 4m. The antenna is connected to a receiver and a preamplifier. The ground is indicated by a ground symbol.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Test Procedure:   | <ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table (0.8 meters below 1G and 1.5 meters above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>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.</li> <li>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.</li> <li>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.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>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.</li> </ol> |
| Test Instruments: | Refer to section 1.7 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Test mode:        | Refer to section 1.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Remark:

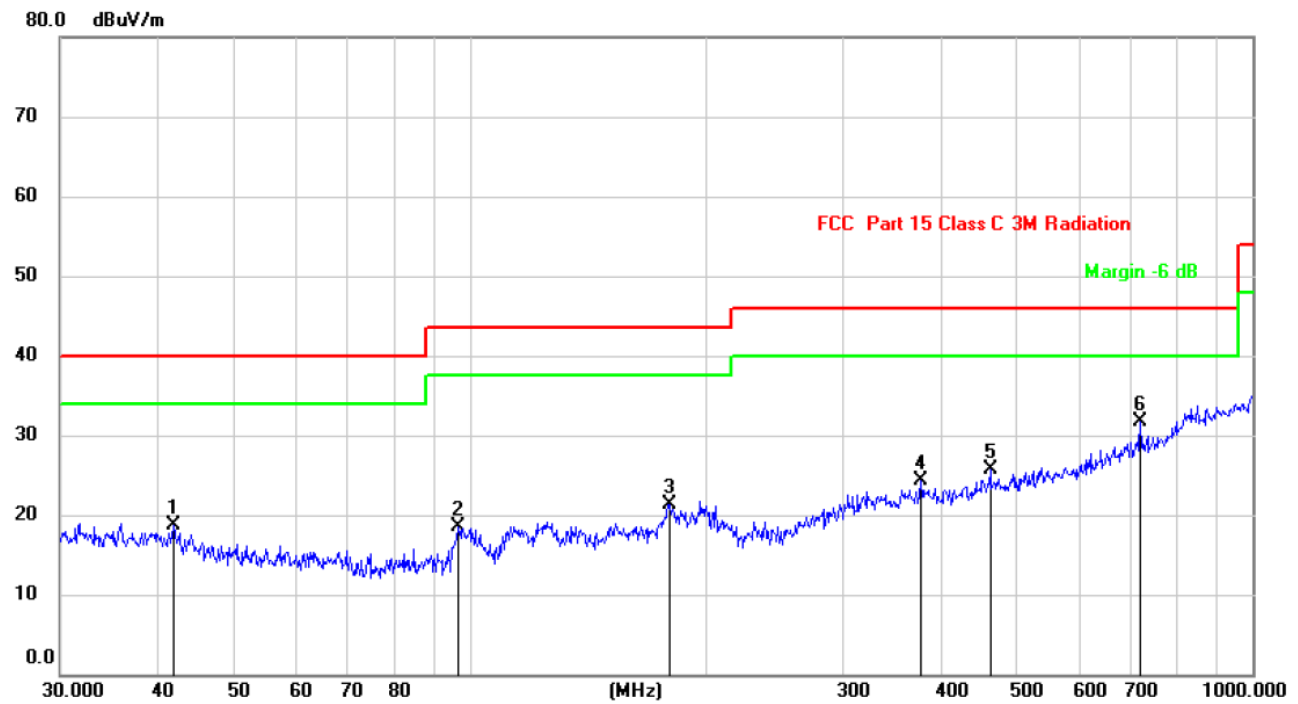
1. During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.
2. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

## Measurement data:

## Vertical:



| No. | Mk. | Freq.    | Measure-<br>ment | Limit  | Over   | Antenna<br>Height | Table<br>Degree |         |
|-----|-----|----------|------------------|--------|--------|-------------------|-----------------|---------|
|     |     | MHz      | dBuV/m           | dBuV/m | dB     | cm                | degree          | Comment |
| 1   |     | 43.5057  | 18.72            | 40.00  | -21.28 | QP                |                 |         |
| 2   |     | 98.8326  | 18.09            | 43.50  | -25.41 | QP                |                 |         |
| 3   |     | 126.7723 | 20.75            | 43.50  | -22.75 | QP                |                 |         |
| 4   |     | 180.6488 | 21.95            | 43.50  | -21.55 | QP                |                 |         |
| 5   |     | 389.3549 | 24.32            | 46.00  | -21.68 | QP                |                 |         |
| 6   | *   | 768.7481 | 30.84            | 46.00  | -15.16 | QP                |                 |         |

**Horizontal:**

| No. | Mk. | Freq.    | Measure-<br>ment | Limit  | Over   | Antenna<br>Height | Table<br>Degree |        |
|-----|-----|----------|------------------|--------|--------|-------------------|-----------------|--------|
|     |     | MHz      | dBuV/m           | dBuV/m | dB     | Detector          | cm              | degree |
| 1   |     | 41.8596  | 18.77            | 40.00  | -21.23 | QP                |                 |        |
| 2   |     | 96.7749  | 18.45            | 43.50  | -25.05 | QP                |                 |        |
| 3   |     | 180.0165 | 21.30            | 43.50  | -22.20 | QP                |                 |        |
| 4   |     | 377.2590 | 24.22            | 46.00  | -21.78 | QP                |                 |        |
| 5   |     | 462.3455 | 25.69            | 46.00  | -20.31 | QP                |                 |        |
| 6   | *   | 719.1994 | 31.80            | 46.00  | -14.20 | QP                |                 |        |

### ■ Above 1GHz

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

#### Peak value:

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 4804.00         | 44.38          | 74.00               | -29.62          | Vertical     |
| 7206.00         | 46.52          | 74.00               | -27.48          | Vertical     |
| 9608.00         | 49.67          | 74.00               | -24.33          | Vertical     |
| 12010.00        |                | 74.00               |                 | Vertical     |
| 14412.00        |                | 74.00               |                 | Vertical     |
| 4804.00         | 47.93          | 74.00               | -26.07          | Horizontal   |
| 7206.00         | 48.64          | 74.00               | -25.36          | Horizontal   |
| 9608.00         | 48.37          | 74.00               | -25.63          | Horizontal   |
| 12010.00        |                | 74.00               |                 | Horizontal   |
| 14412.00        |                | 74.00               |                 | Horizontal   |

#### Average value:

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 4804.00         | 34.63          | 54.00               | -19.37          | Vertical     |
| 7206.00         | 35.89          | 54.00               | -18.11          | Vertical     |
| 9608.00         | 37.62          | 54.00               | -16.38          | Vertical     |
| 12010.00        |                | 54.00               |                 | Vertical     |
| 14412.00        |                | 54.00               |                 | Vertical     |
| 4804.00         | 35.67          | 54.00               | -18.33          | Horizontal   |
| 7206.00         | 36.94          | 54.00               | -17.06          | Horizontal   |
| 9608.00         | 37.82          | 54.00               | -16.17          | Horizontal   |
| 12010.00        |                | 54.00               |                 | Horizontal   |
| 14412.00        |                | 54.00               |                 | Horizontal   |

#### Remark:

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.

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

**Peak value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 4882.00         | 44.83          | 74.00               | -29.17          | Vertical     |
| 7323.00         | 46.12          | 74.00               | -27.88          | Vertical     |
| 9764.00         | 48.76          | 74.00               | -25.24          | Vertical     |
| 12205.00        |                | 74.00               |                 | Vertical     |
| 14646.00        |                | 74.00               |                 | Vertical     |
| 4882.00         | 47.56          | 74.00               | -26.44          | Horizontal   |
| 7323.00         | 48.27          | 74.00               | -25.73          | Horizontal   |
| 9764.00         | 48.61          | 74.00               | -25.39          | Horizontal   |
| 12205.00        |                | 74.00               |                 | Horizontal   |
| 14646.00        |                | 74.00               |                 | Horizontal   |

**Average value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 4882.00         | 33.65          | 54.00               | -20.35          | Vertical     |
| 7323.00         | 34.76          | 54.00               | -19.24          | Vertical     |
| 9764.00         | 37.82          | 54.00               | -16.18          | Vertical     |
| 12205.00        |                | 54.00               |                 | Vertical     |
| 14646.00        |                | 54.00               |                 | Vertical     |
| 4882.00         | 36.46          | 54.00               | -17.54          | Horizontal   |
| 7323.00         | 35.81          | 54.00               | -18.19          | Horizontal   |
| 9764.00         | 37.67          | 54.00               | -16.33          | Horizontal   |
| 12205.00        |                | 54.00               |                 | Horizontal   |
| 14646.00        |                | 54.00               |                 | Horizontal   |

**Remark:**

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.*

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

**Peak value:**

| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 4960.00         | 44.63          | 74.00               | -29.37          | Vertical     |
| 7440.00         | 46.47          | 74.00               | -27.53          | Vertical     |
| 9920.00         | 49.72          | 74.00               | -24.28          | Vertical     |
| 12400.00        |                | 74.00               |                 | Vertical     |
| 14880.00        |                | 74.00               |                 | Vertical     |
| 4960.00         | 47.39          | 74.00               | -26.61          | Horizontal   |
| 7440.00         | 48.51          | 74.00               | -25.49          | Horizontal   |
| 9920.00         | 50.63          | 74.00               | -23.37          | Horizontal   |
| 12400.00        |                | 74.00               |                 | Horizontal   |
| 14880.00        |                | 74.00               |                 | Horizontal   |

**Average value:**

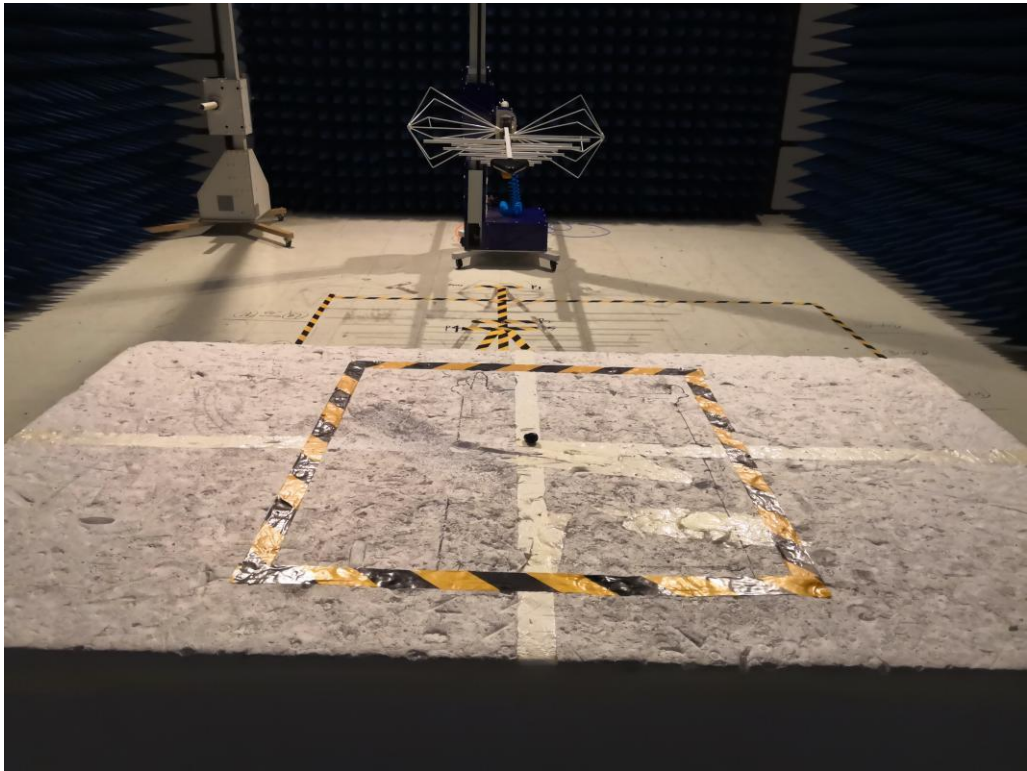
| Frequency (MHz) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|----------------|---------------------|-----------------|--------------|
| 4960.00         | 33.64          | 54.00               | -20.36          | Vertical     |
| 7440.00         | 35.89          | 54.00               | -18.11          | Vertical     |
| 9920.00         | 38.97          | 54.00               | -15.03          | Vertical     |
| 12400.00        |                | 54.00               |                 | Vertical     |
| 14880.00        |                | 54.00               |                 | Vertical     |
| 4960.00         | 36.73          | 54.00               | -17.27          | Horizontal   |
| 7440.00         | 37.29          | 54.00               | -16.71          | Horizontal   |
| 9920.00         | 38.48          | 54.00               | -15.52          | Horizontal   |
| 12400.00        |                | 54.00               |                 | Horizontal   |
| 14880.00        |                | 54.00               |                 | Horizontal   |

*Remark:*

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *“\*” means this data is 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.*

15. Test Setup Photo

Radiated Emission



#### Conducted Emission



## 16. EUT Constructional Details

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Please refer to report BSL181111980101RF.

-----End-----