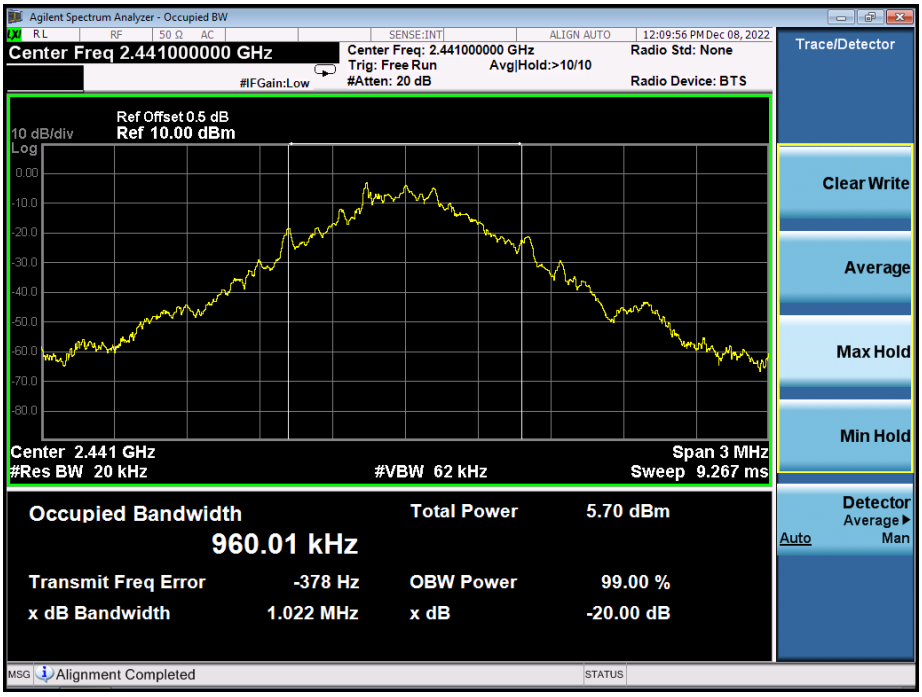
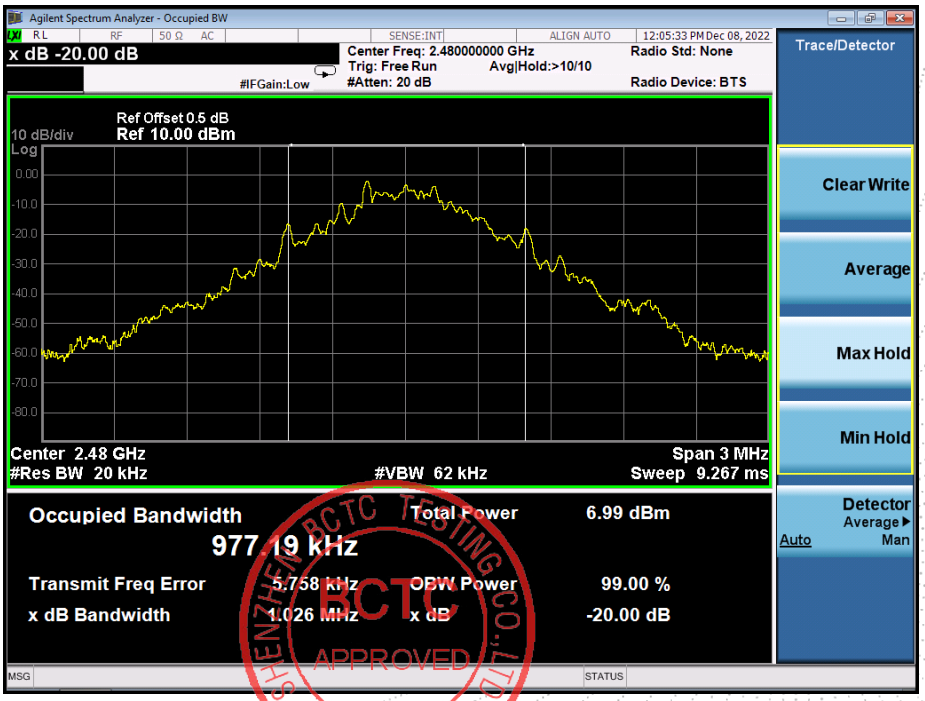
**GFSK Middle Channel**




**GFSK High Channel**

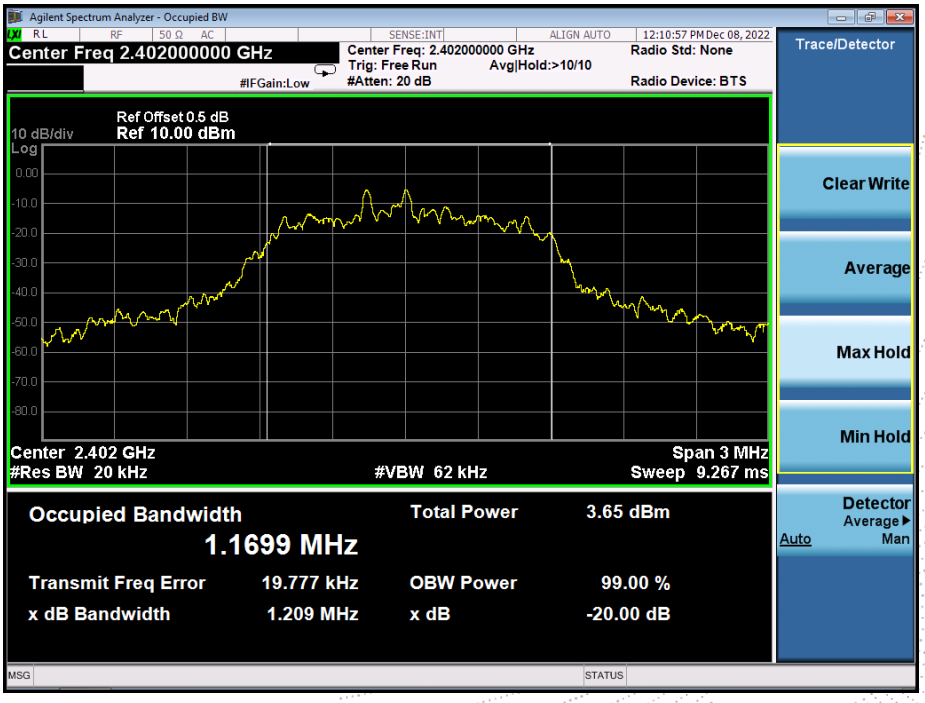


**π/ 4 DQPSK Low Channel**

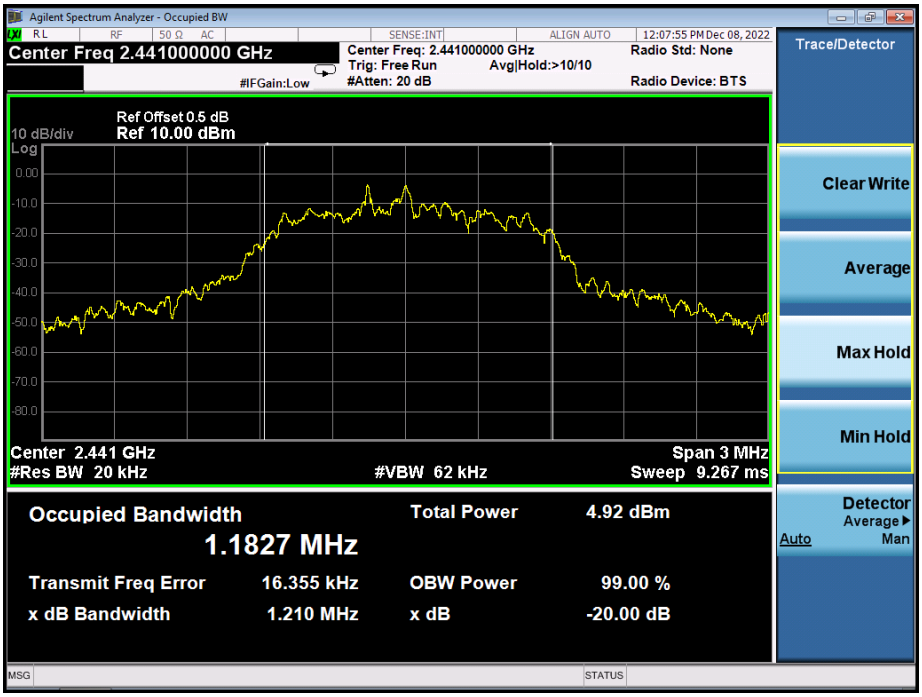

**π/ 4 DQPSK Middle Channel**

**π/ 4 DQPSK High Channel**

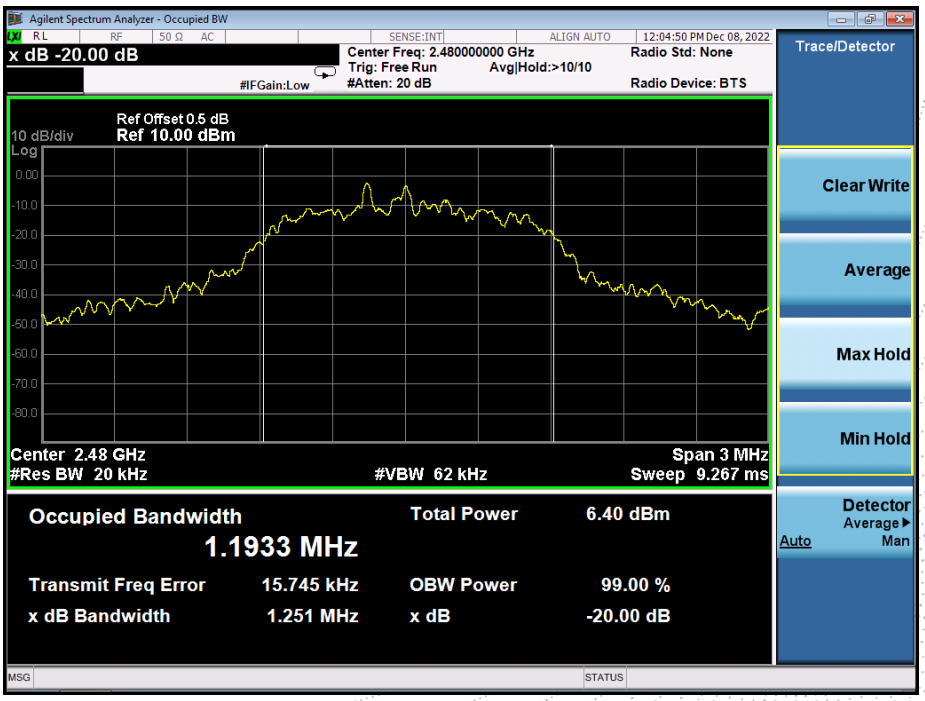

**8DPSK Low Channel**



**8DPSK Middle Channel**




**8DPSK High Channel**



## 11. Maximum Peak Output Power

### 11.1 Block Diagram Of Test Setup


### 11.2 Limit

| FCC Part15 (15.247) , Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247(b)(1) | Peak Output Power | 0.125 watt or 21dBm | 2400-2483.5 | PASS |

### 11.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 3MHz. VBW = 10MHz. Sweep = auto; Detector Function = Peak.

3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

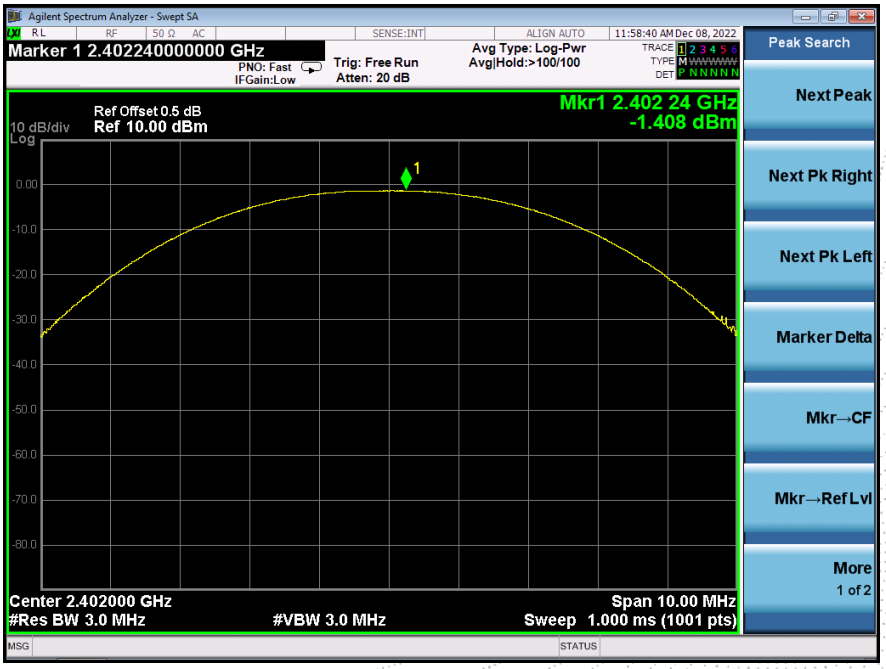
## 11.4 Test Result

| | | | |
|---|---|---|---|
| Temperature: | 26 ℃ | Relative Humidity: | 54% |
| Pressure: | 101KPa | Test Voltage : | DC 3.7V |

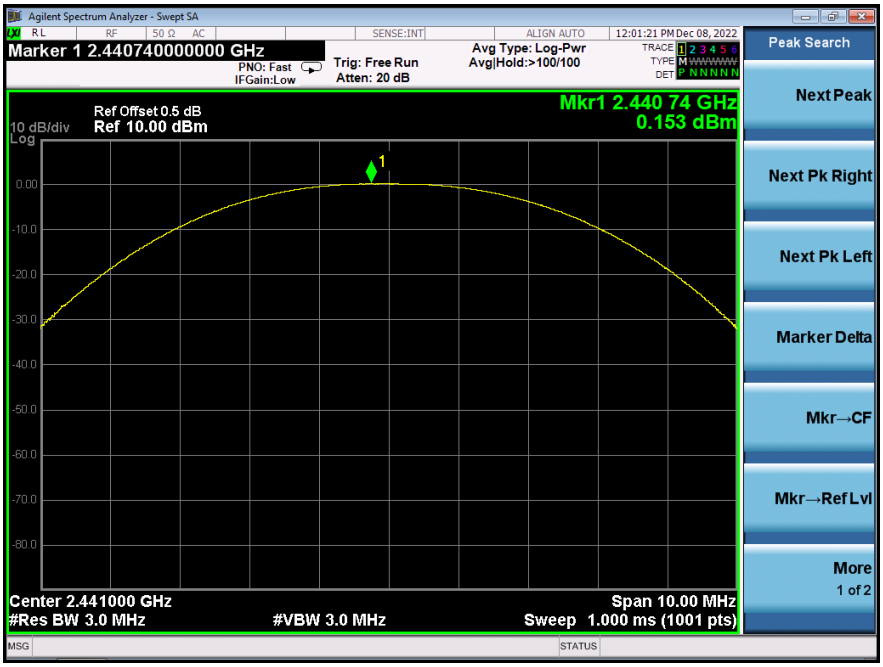
| Modulation | Test Channel | Output Power (dBm) | Limit (dBm) |
|---|---|---|---|
| GFSK | Low | -1.408 | 21 |
| GFSK | Middle | 0.153 | 21 |
| GFSK | High | 1.140 | 21 |
| π/ 4 DQPSK | Low | -0.643 | 21 |
| π/ 4 DQPSK | Middle | 0.861 | 21 |
| π/ 4 DQPSK | High | 1.843 | 21 |
| 8DPSK | Low | -0.158 | 21 |
| 8DPSK | Middle | 1.316 | 21 |
| 8DPSK | High | 2.177 | 21 |

**Test plots**

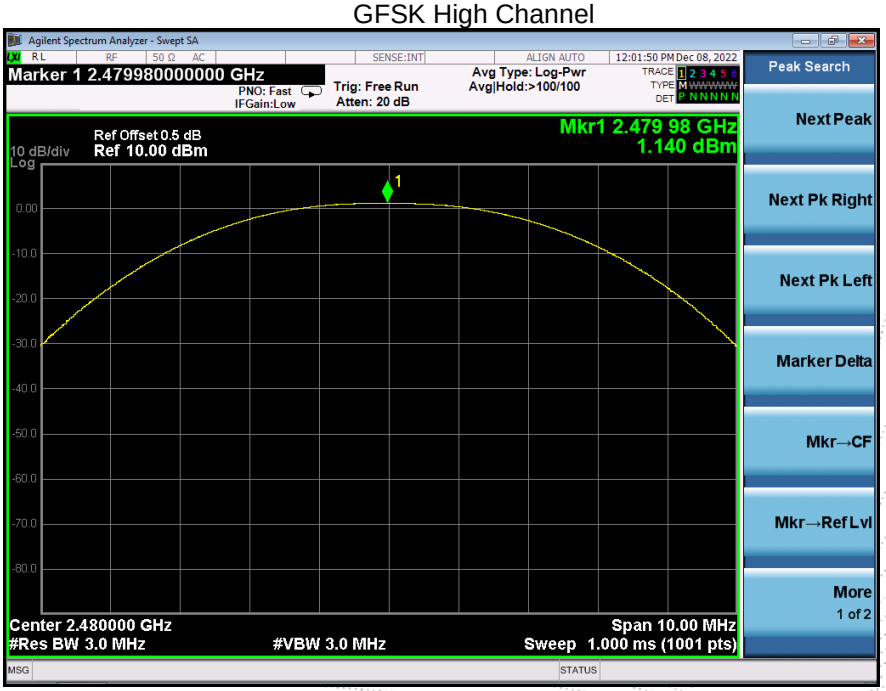
GFSK Low Channel



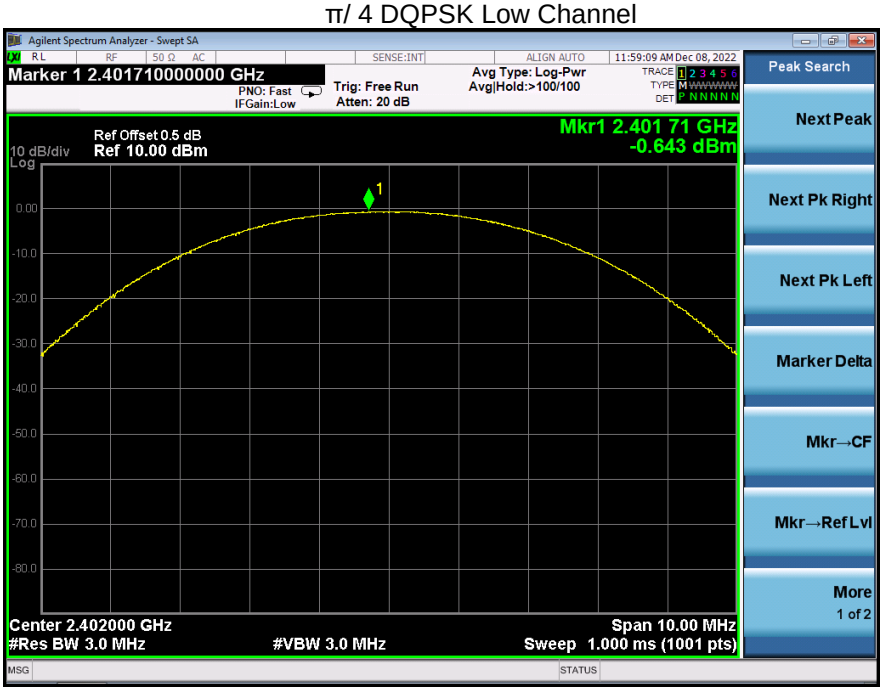
GFSK Middle Channel



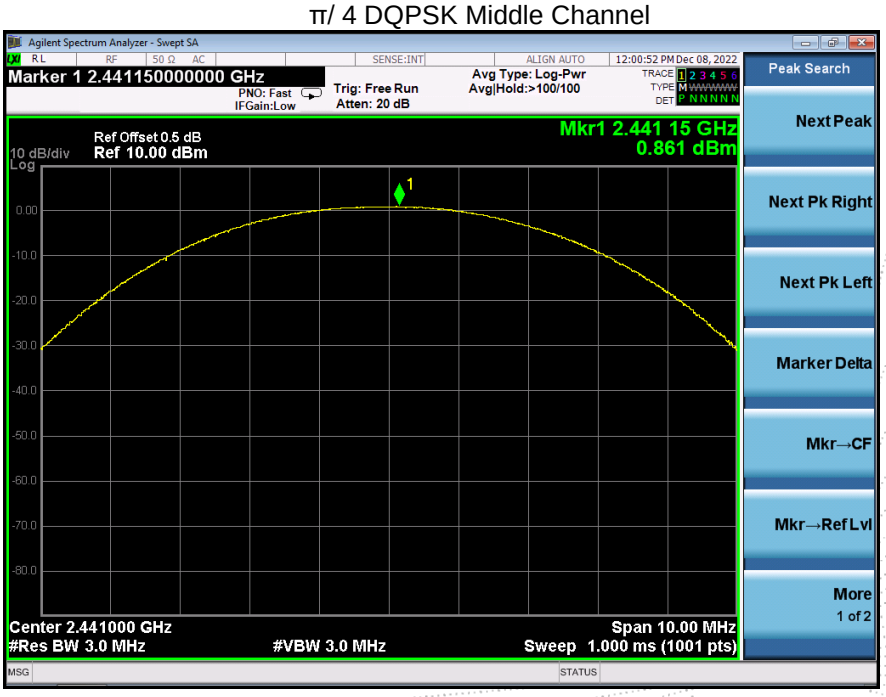

GFSK High Channel



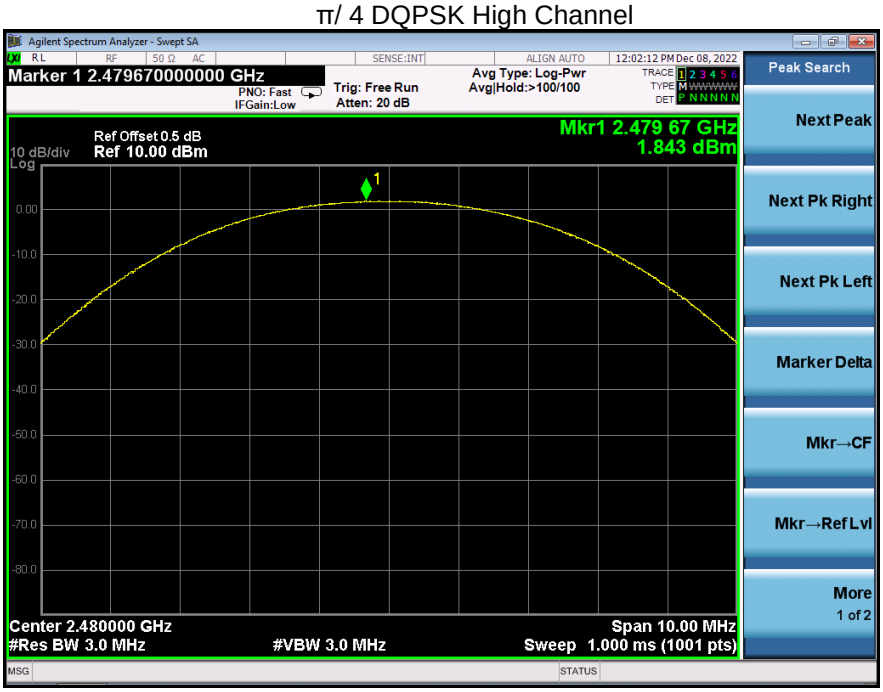
π/ 4 DQPSK Low Channel



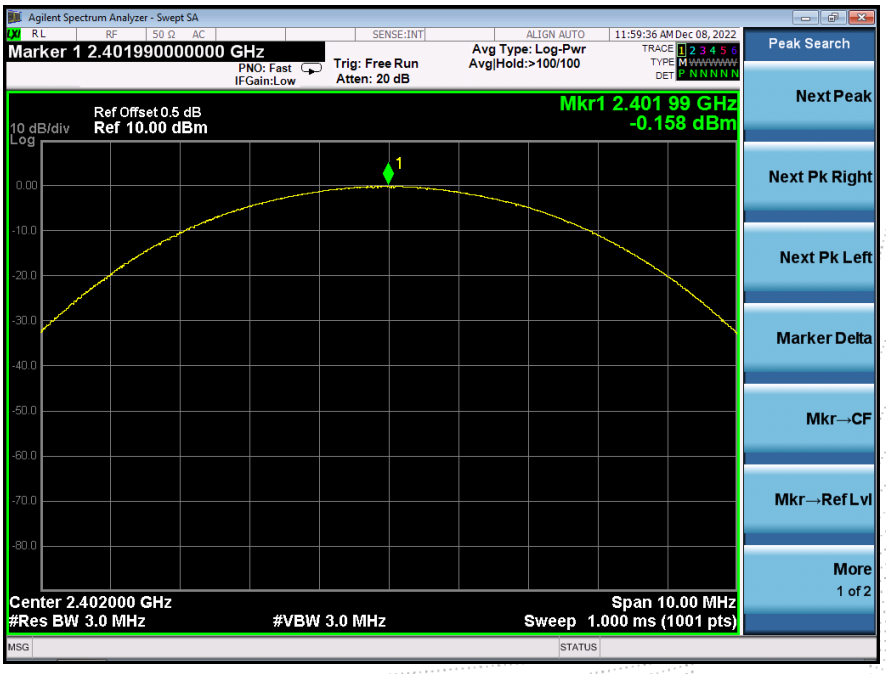

π/ 4 DQPSK Middle Channel



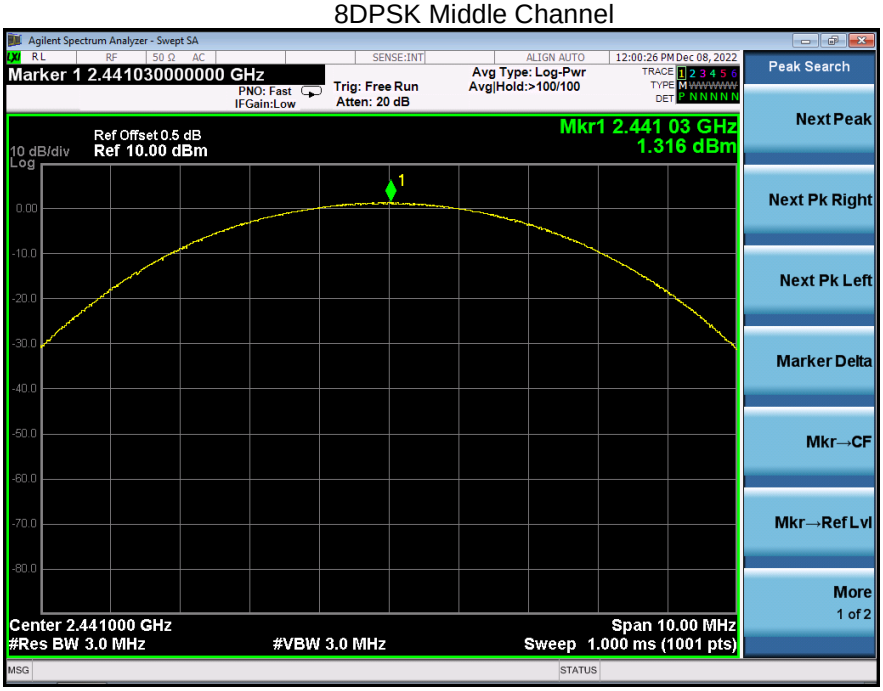
π/ 4 DQPSK High Channel



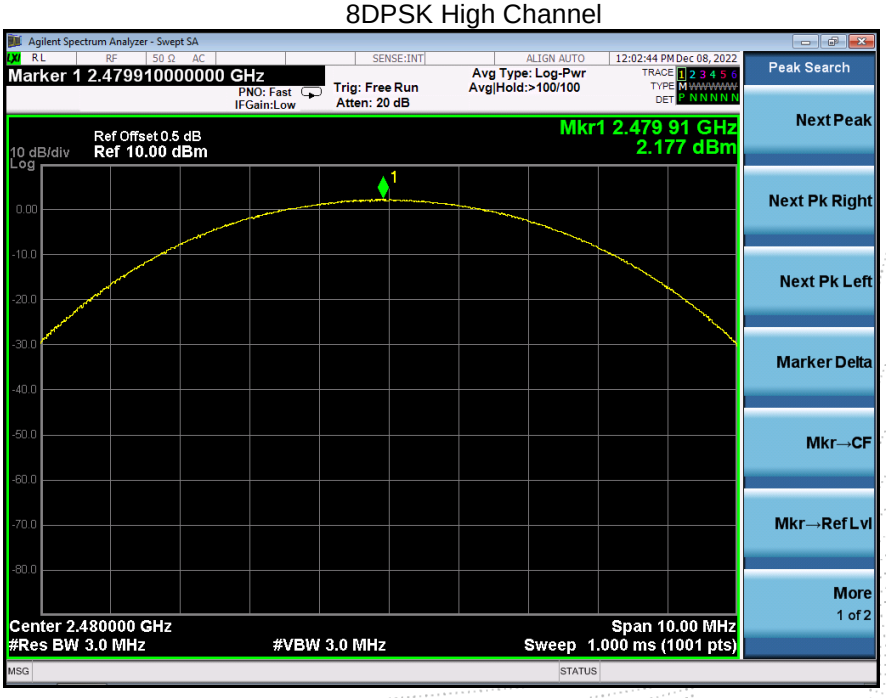

8DPSK Low Channel



8DPSK Middle Channel




8DPSK High Channel



## 12. Hopping Channel Separation

### 12.1 Block Diagram Of Test Setup


### 12.2 Limit

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. 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 0.125W.

### 12.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

## 12.4 Test Result

| Modulation | Test Channel | Separation (MHz) | Limit(MHz) | Result |
|---|---|---|---|---|
| GFSK | Low | 1.002 | 0.992 | PASS |
| GFSK | Middle | 0.994 | 0.681 | PASS |
| GFSK | High | 1.000 | 0.684 | PASS |
| π/ 4 DQPSK | Low | 1.002 | 0.828 | PASS |
| π/ 4 DQPSK | Middle | 0.998 | 0.843 | PASS |
| π/ 4 DQPSK | High | 0.998 | 0.851 | PASS |
| 8DPSK | Low | 1.002 | 0.806 | PASS |
| 8DPSK | Middle | 1.000 | 0.807 | PASS |
| 8DPSK | High | 1.002 | 0.834 | PASS |

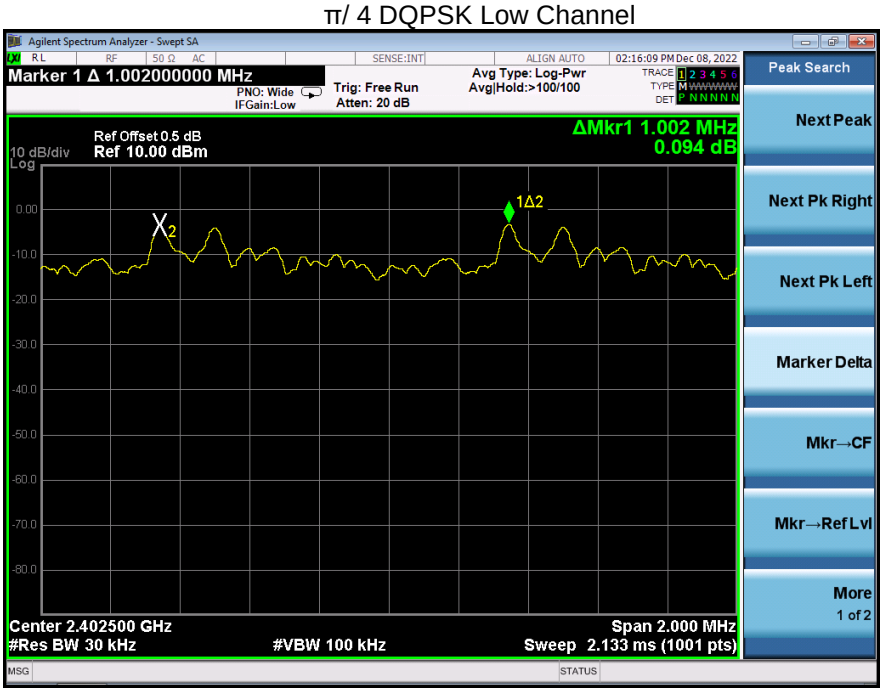
**Test plots**

GFSK Low Channel

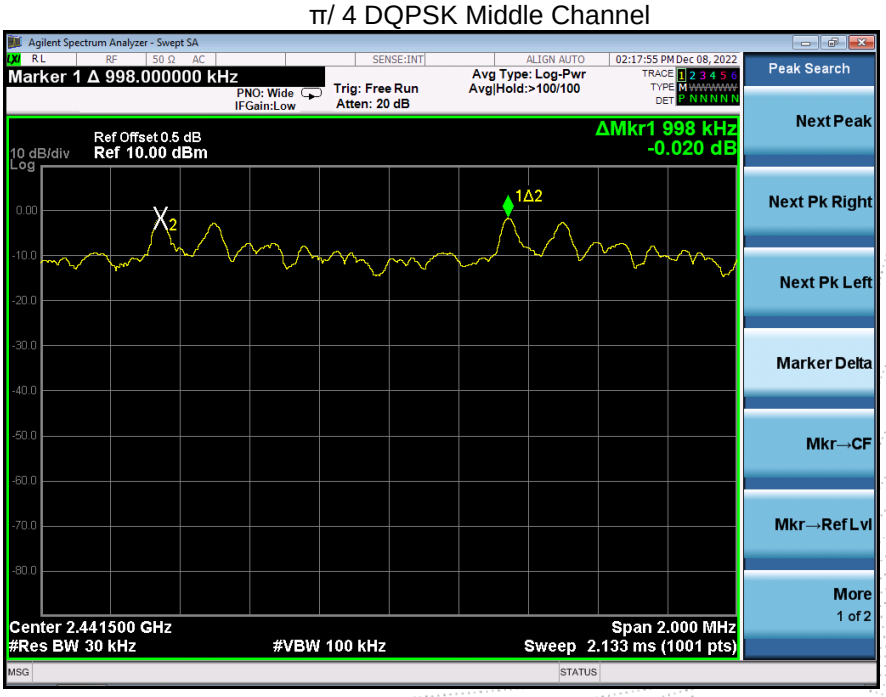
GFSK Middle Channel


GFSK High Channel

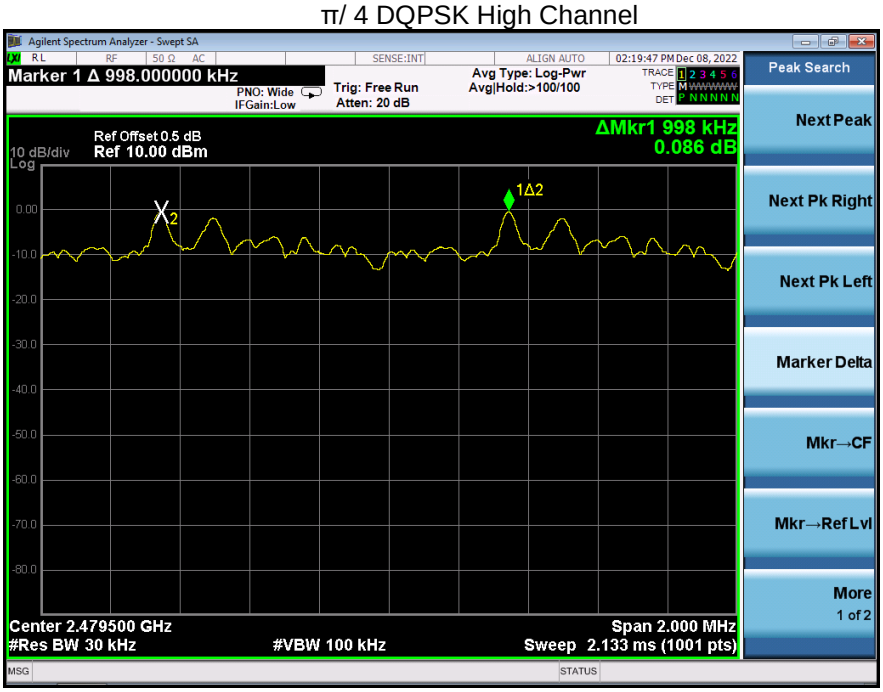
π/ 4 DQPSK Low Channel




π/ 4 DQPSK Middle Channel

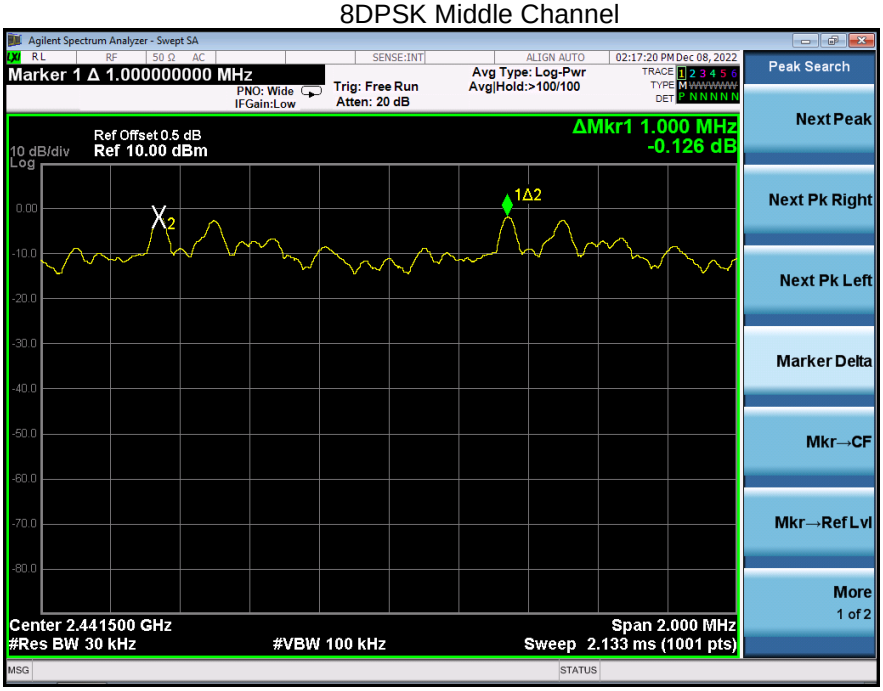


π/ 4 DQPSK High Channel

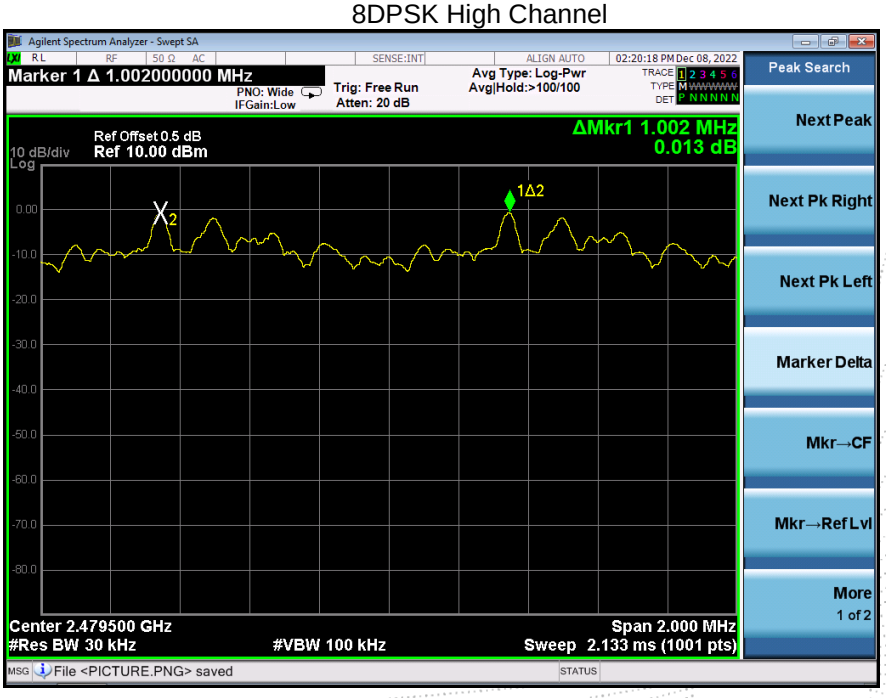



8DPSK Low Channel

8DPSK Middle Channel




8DPSK High Channel



## 13. Number Of Hopping Frequency

### 13.1 Block Diagram Of Test Setup


### 13.2 Limit

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

### 13.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

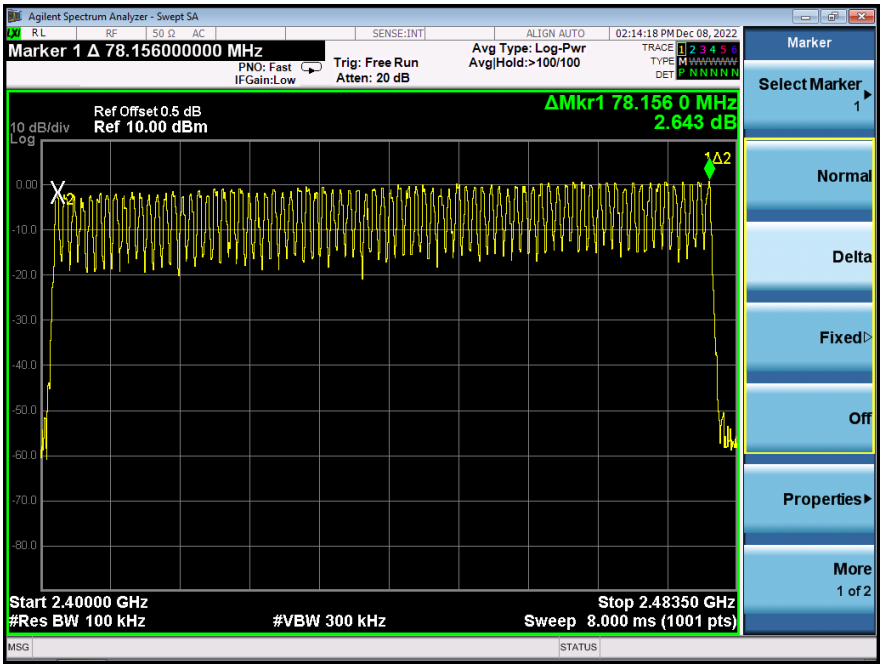
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

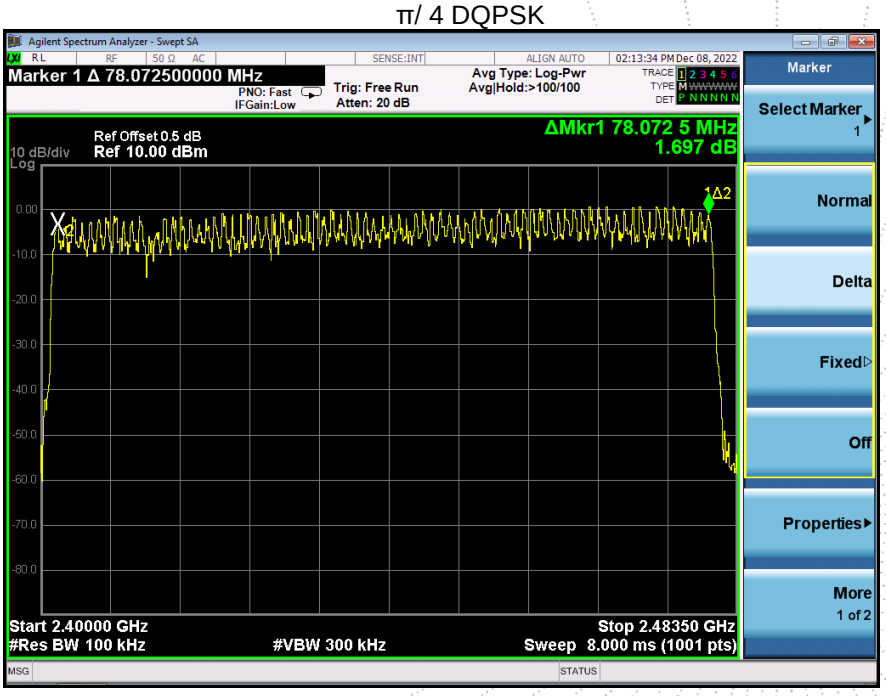
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

## 13.4 Test Result

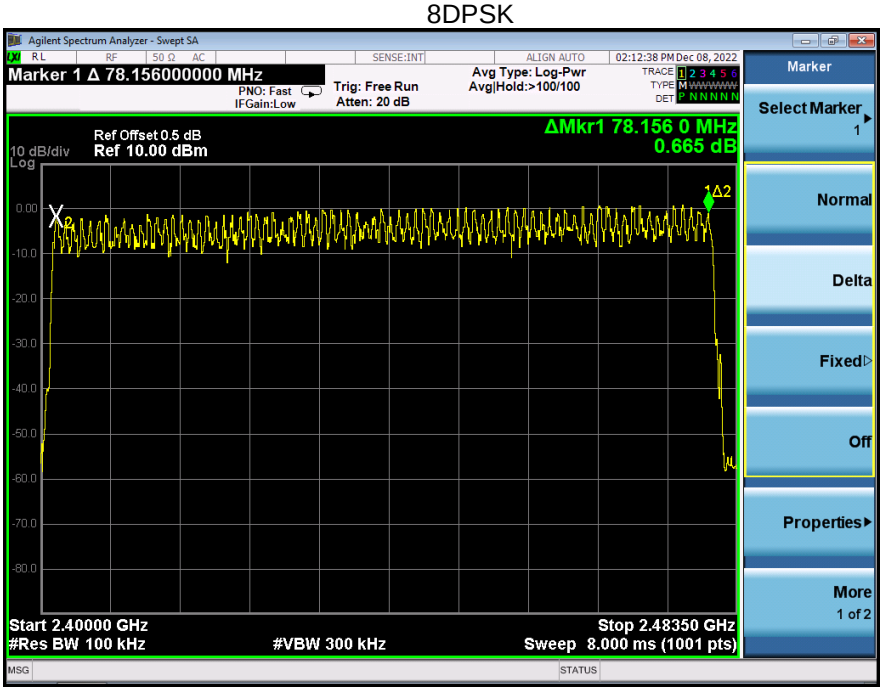
**Test Plots:**
79 Channels in total
GFSK




π/ 4 DQPSK

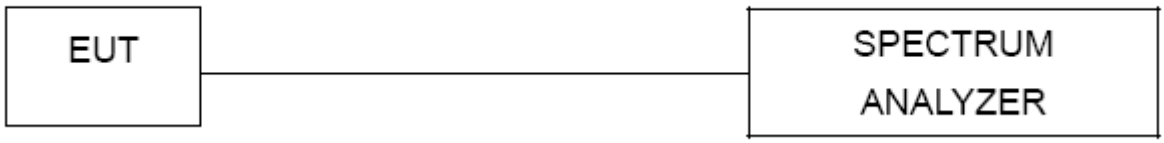


8DPSK


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 78.156000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
02:12:38 PM Dec 08, 2022
Ref Offset 0.5 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 78.156 0 MHz
0.665 dB
Start 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 8.000 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS

# 14. Dwell Time

## 14.1 Block Diagram Of Test Setup




## 14.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

## 14.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set spectrum analyzer span = 0. Centred on a hopping channel;

3. Set RBW = 1MHz and VBW = 3MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.

4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

## 14.4 Test Result

DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel

(5 time slots RX, 1 time slot TX).

DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel

(3 time slots RX, 1 time slot TX).

DH1 Packet permit maximum 1600 / 79 /2 hops per second in each channel

(1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

DH5:1600/79/6*0.4*79*(MkrDelta)/1000

DH3:1600/79/4*0.4*79*(MkrDelta)/1000

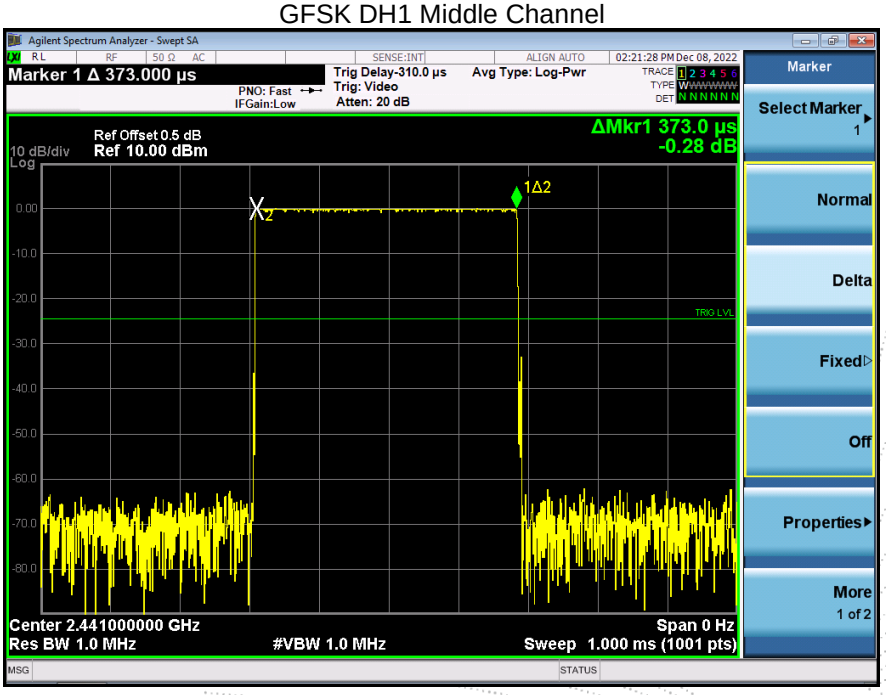
DH1:1600/79/2*0.4*79*(MkrDelta)/1000

Remark: Mkr Delta is once pulse time.

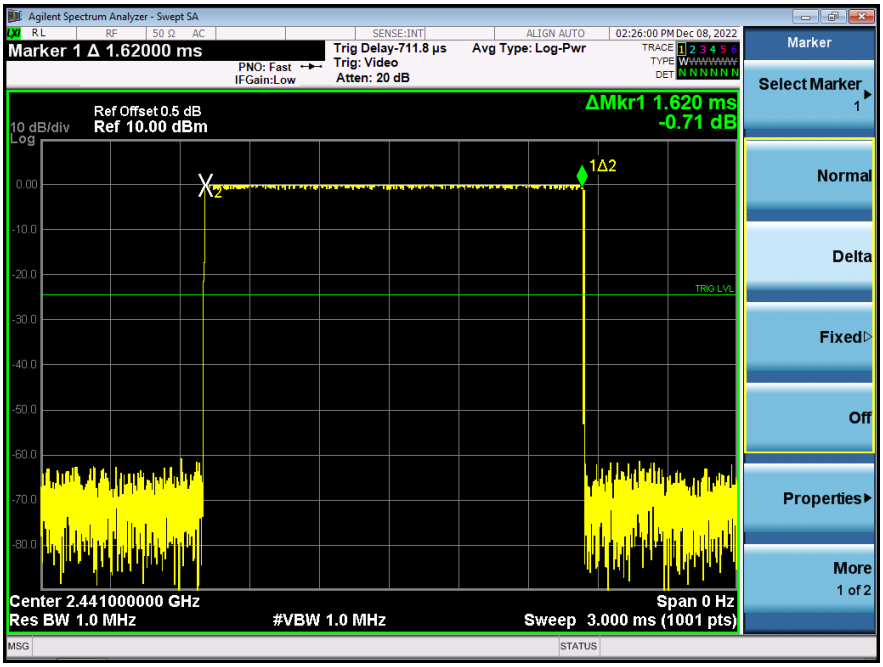
| Modulation | Channel Data | Packet | pulse time(ms) | Dwell Time(s) | Limits(s) |
|---|---|---|---|---|---|
| GFSK | Middle | 1DH1 | 0.373 | 0.119 | 0.4 |
| | | 1DH3 | 1.620 | 0.259 | 0.4 |
| | | 1DH5 | 2.870 | 0.306 | 0.4 |
| π/ 4 DQPSK | Middle | 2DH1 | 0.384 | 0.123 | 0.4 |
| | | 2DH3 | 1.632 | 0.261 | 0.4 |
| | | 2DH5 | 2.880 | 0.307 | 0.4 |
| 8DPSK | Middle | 3DH1 | 0.385 | 0.123 | 0.4 |
| | | 3DH3 | 1.623 | 0.260 | 0.4 |
| | | 3DH5 | 2.885 | 0.308 | 0.4 |

**Test Plots**

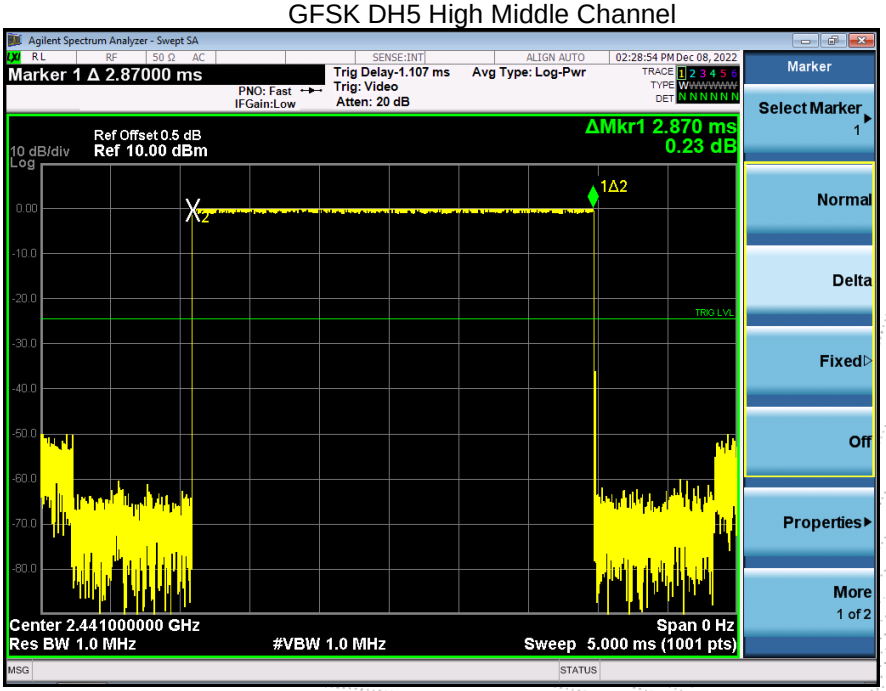
GFSK DH1 Middle Channel



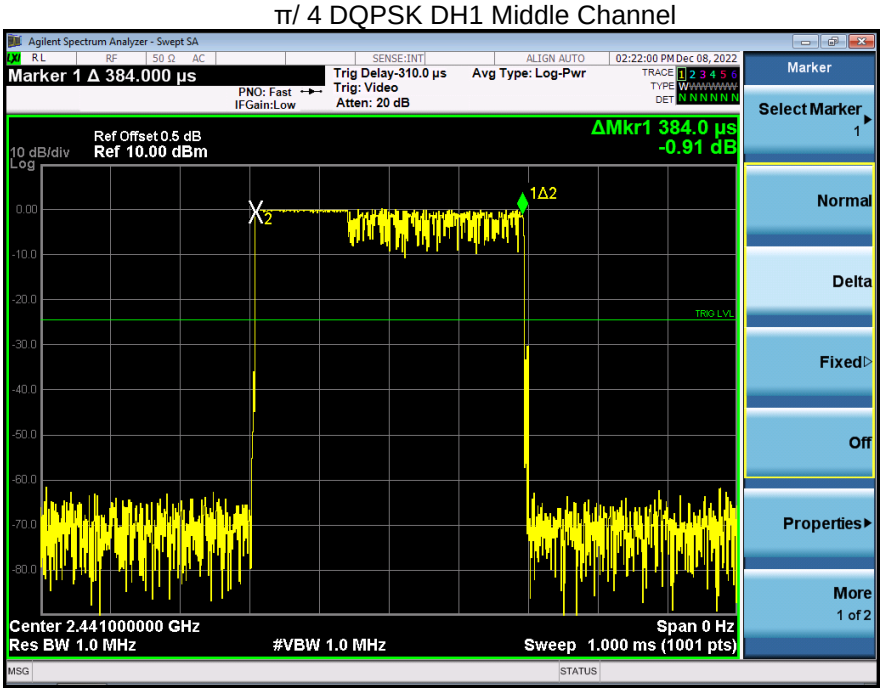
GFSK DH3 Middle Channel



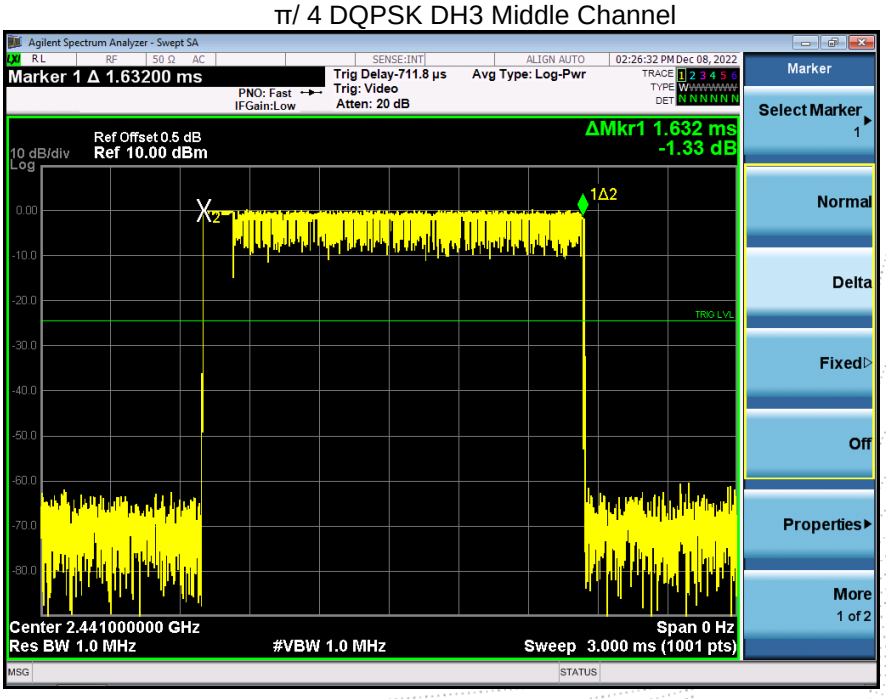

GFSK DH5 High Middle Channel



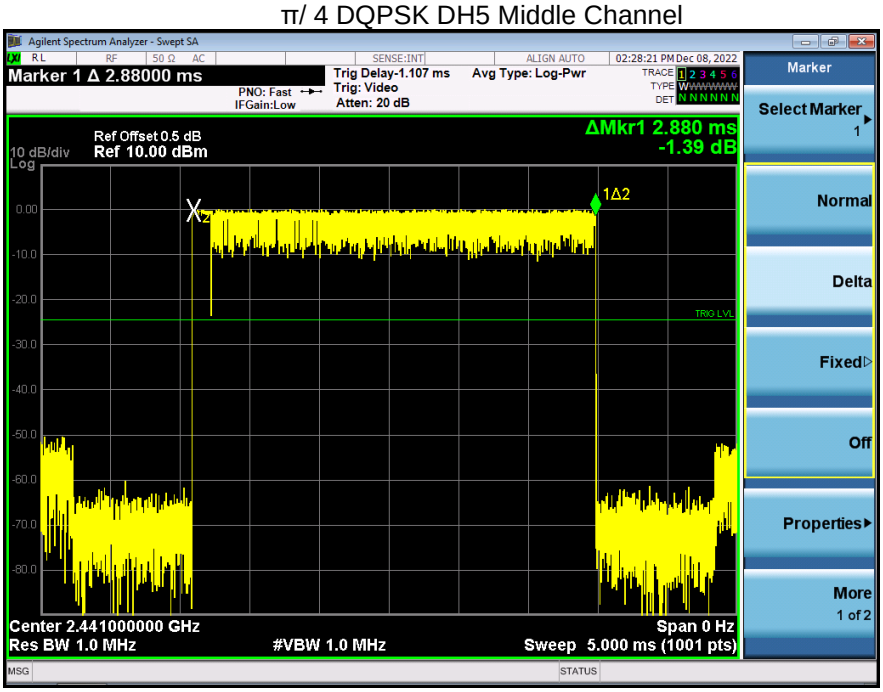
π/ 4 DQPSK DH1 Middle Channel



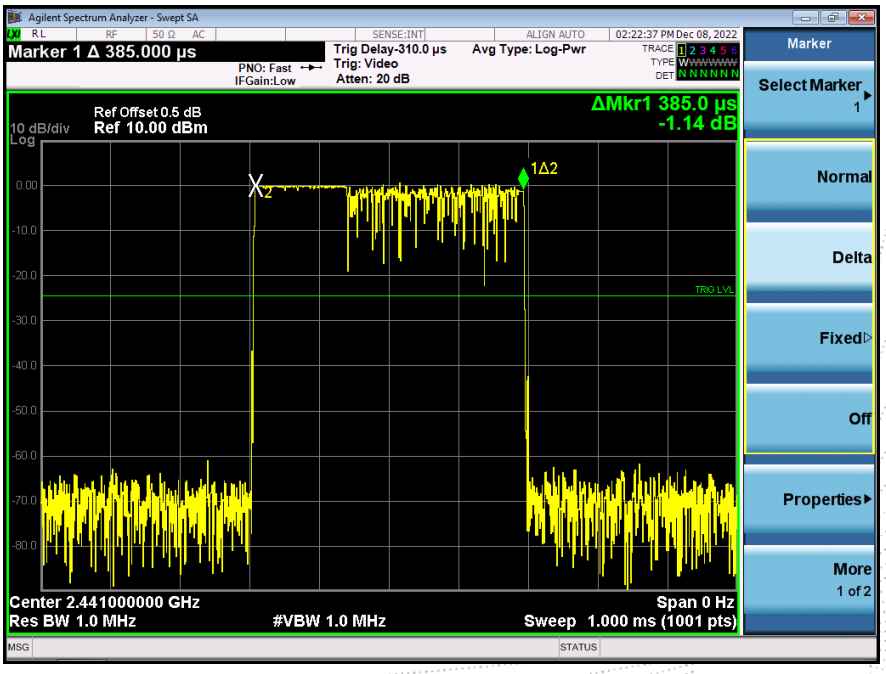

π/ 4 DQPSK DH3 Middle Channel



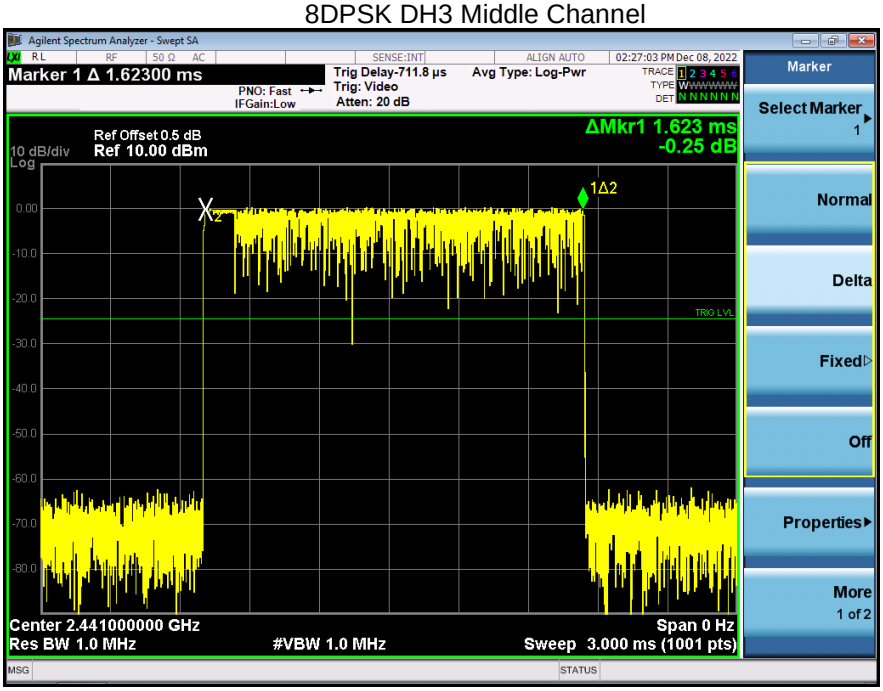
π/ 4 DQPSK DH5 Middle Channel



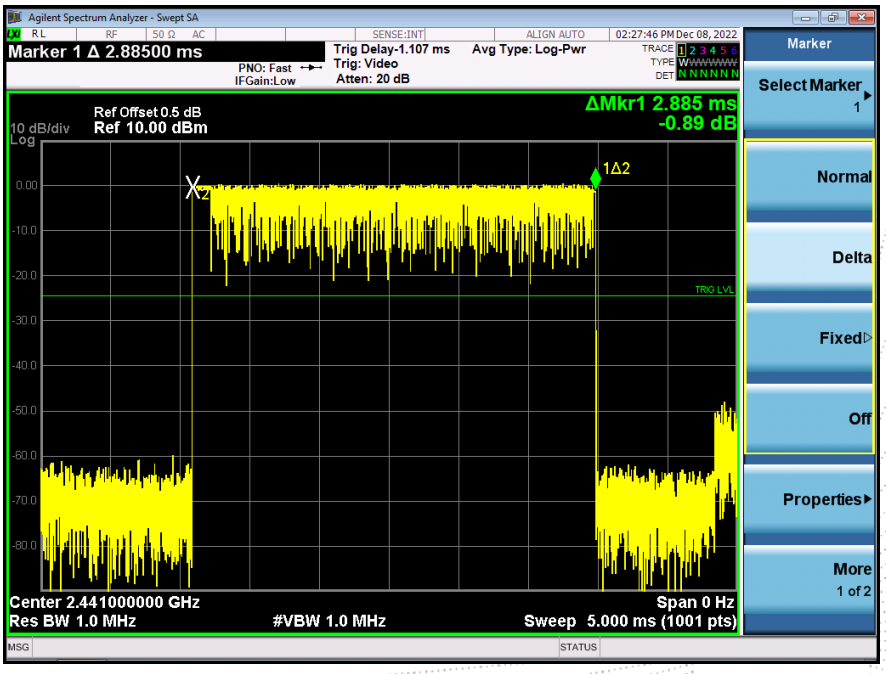

8DPSK DH1 Middle Channel



8DPSK DH3 Middle Channel




8DPSK DH5 Middle Channel



# 15. Antenna Requirement

## 15.1 Limit

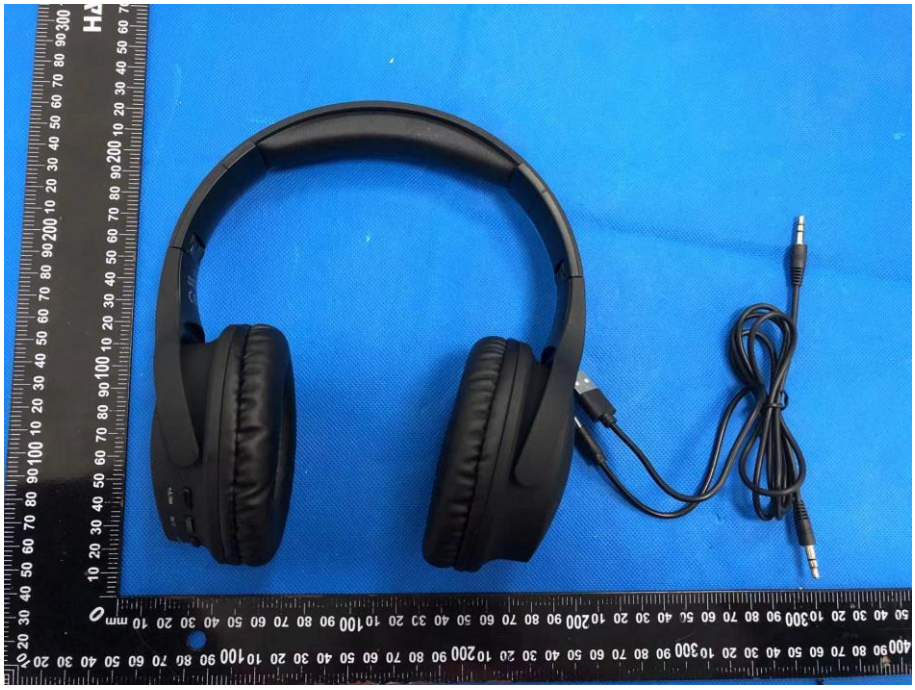
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

## 15.2 Test Result

The EUT antenna is Internal antenna, fulfill the requirement of this section.

## 16. EUT Photographs

EUT Photo

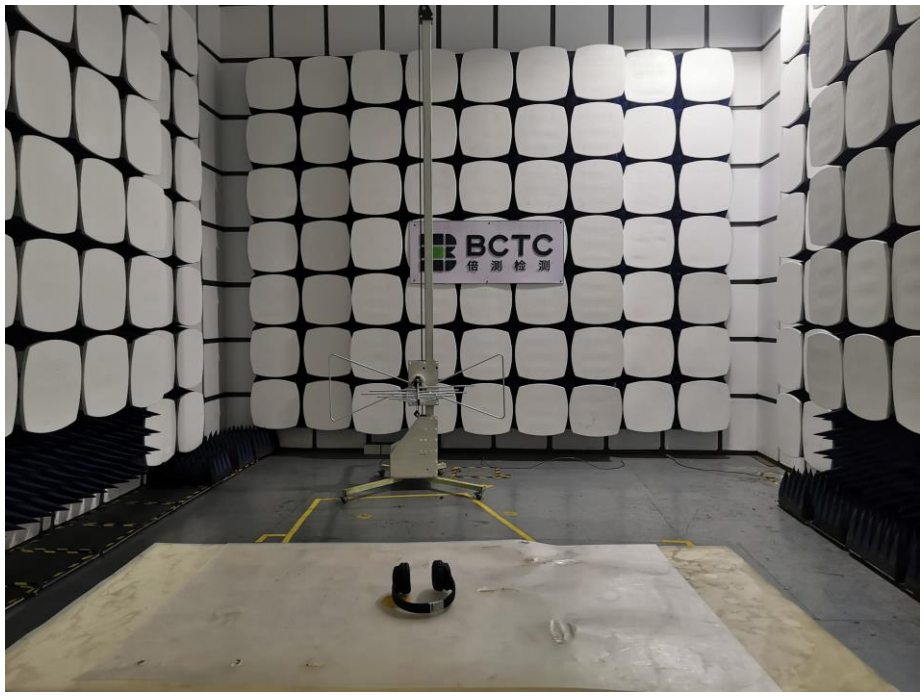


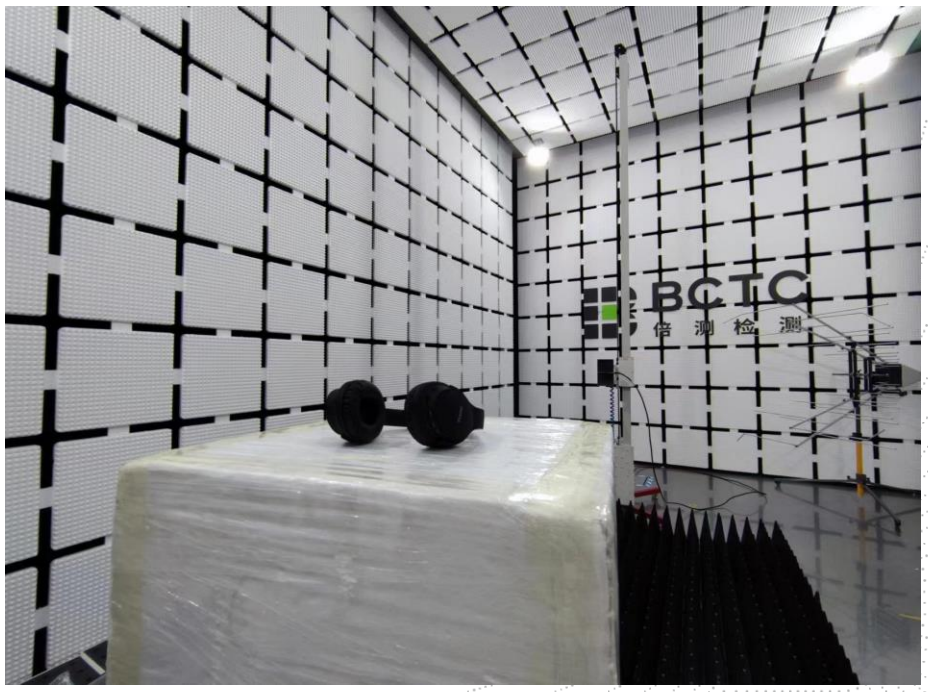
NOTE: Appendix-Photographs Of EUT Constructional Details

## 17. EUT Test Setup Photographs

Conducted emissions

Radiated Measurement Photos



# STATEMENT

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without the "special seal for inspection and testing".

4. The test report is invalid without the signature of the approver.

5. The test process and test result is only related to the Unit Under Test.

6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.

7. The test report without CMA mark is only used for scientific research, teaching, enterprise product development and internal quality control purposes.

8. The quality system of our laboratory is in accordance with ISO/IEC17025.

9. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:
1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

TEL：400-788-9558

P.C.: 518103

FAX：0755-33229357

Website：http://www.chnbctc.com

E-Mail：bctc@bctc-lab.com.cn

※※※※※ **END** ※※※※※