

10. 20 dB Bandwidth

10.1 Block Diagram Of Test Setup



10.2 Limit

N/A

10.3 Test Procedure

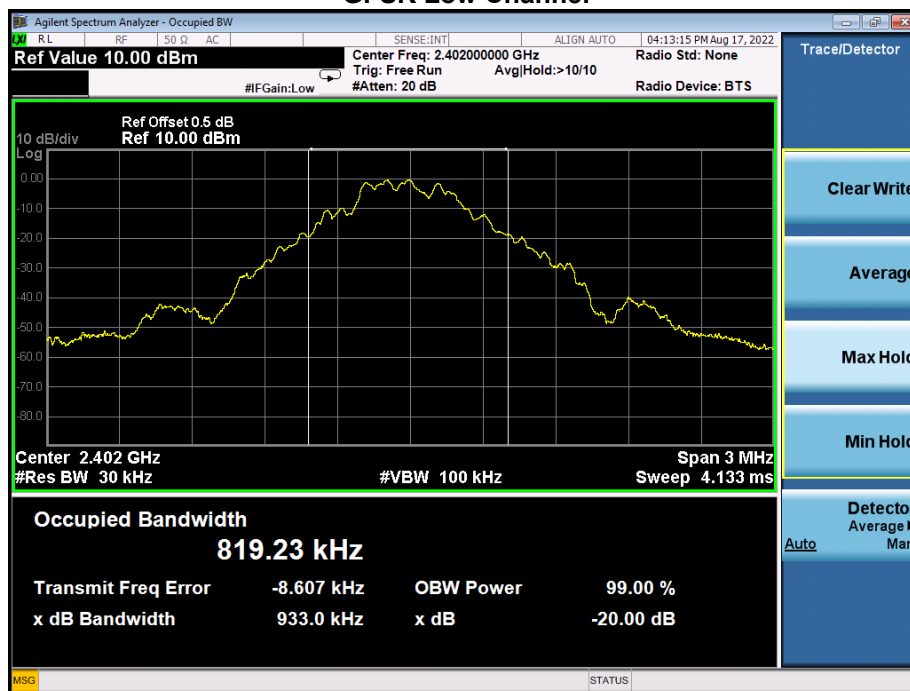
1. Set RBW = 30kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

10.4 Test Result

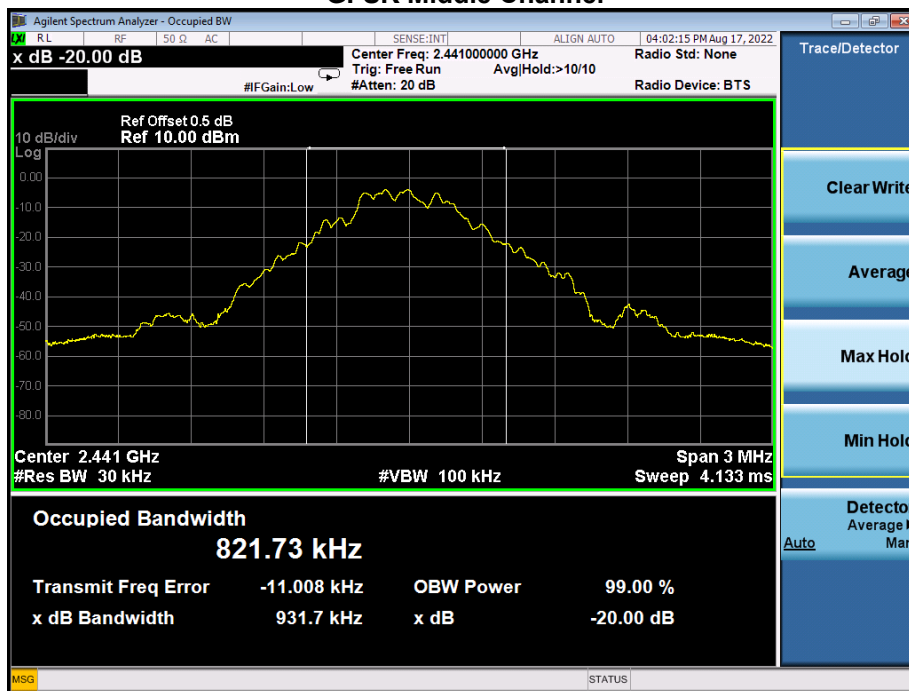
Temperature :	26°C	Relative Humidity :	54%
Test Voltage :	DC 3.7V	Remark:	N/A

Modulation	Test Channel	Bandwidth(MHz)
GFSK	Low	0.933
GFSK	Middle	0.932
GFSK	High	0.931
$\pi/4$ DQPSK	Low	1.291
$\pi/4$ DQPSK	Middle	1.299
$\pi/4$ DQPSK	High	1.293

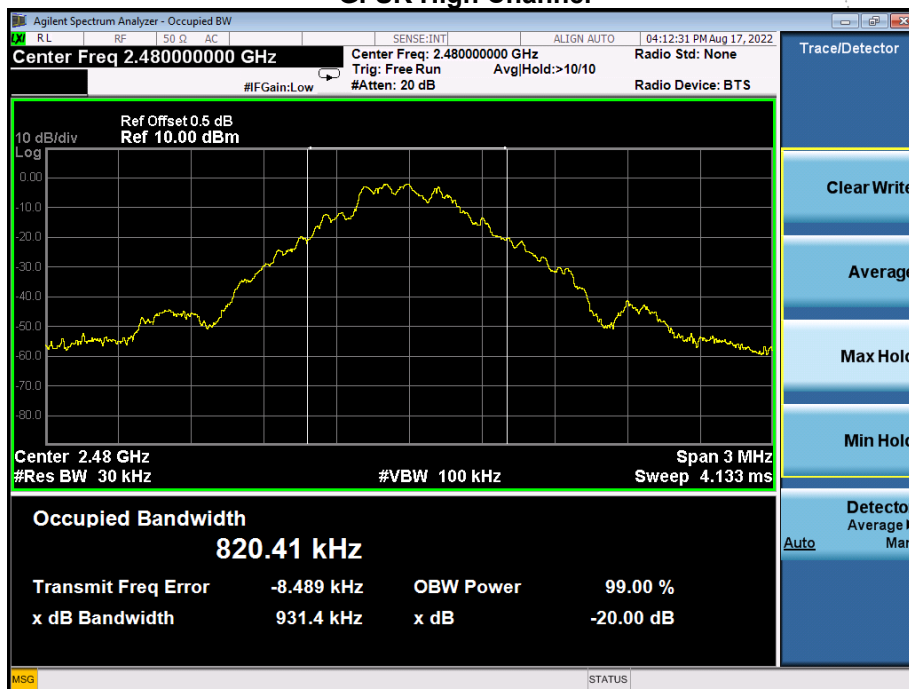
Test plots
GFSK Low Channel



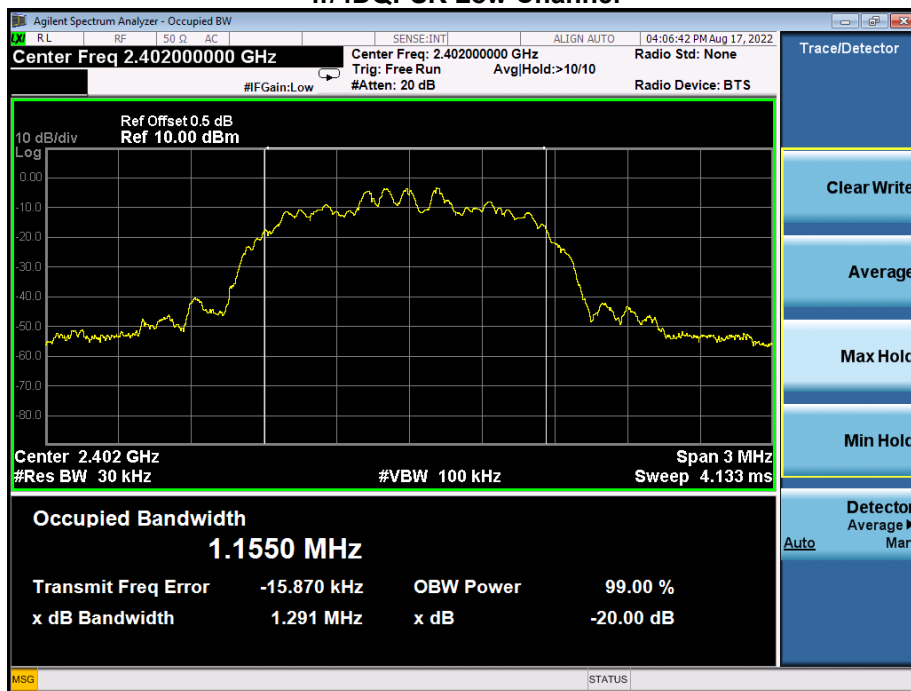
GFSK Middle Channel



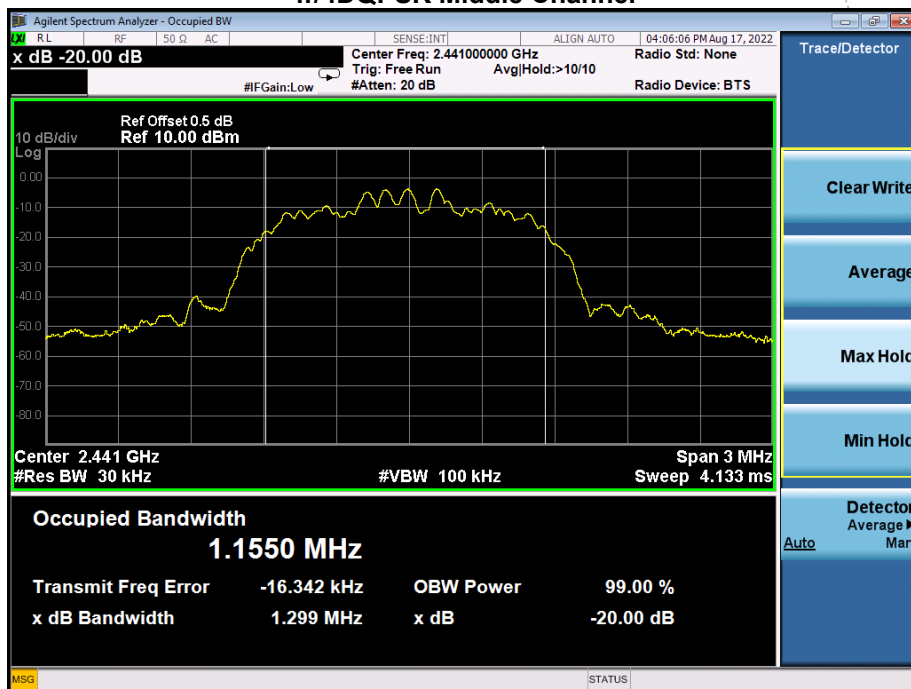
GFSK High Channel



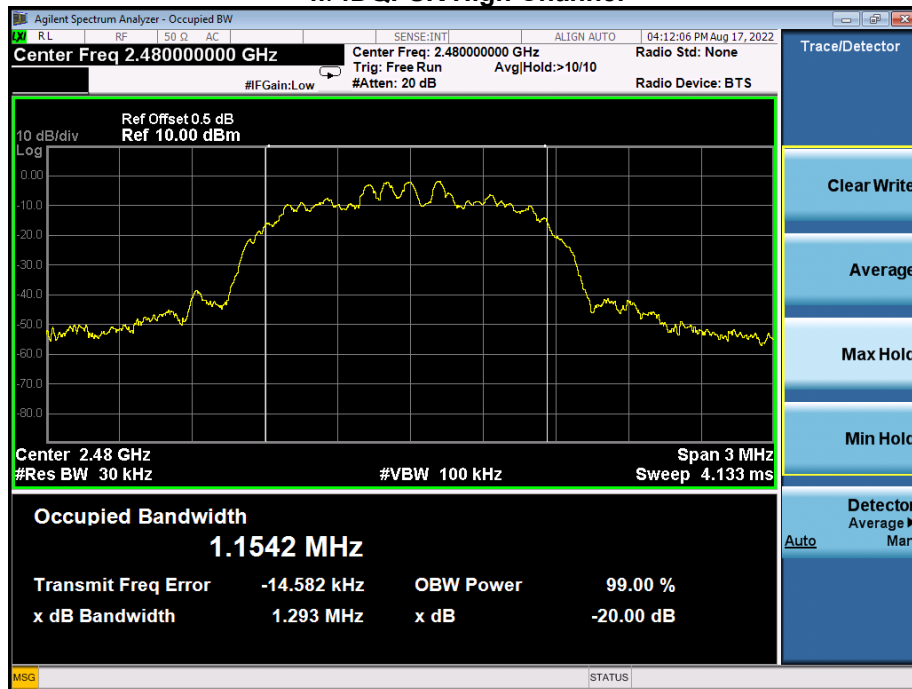
$\pi/4$ DQPSK Low Channel



$\pi/4$ DQPSK Middle Channel

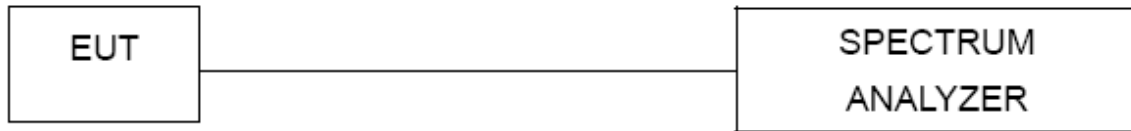


$\pi/4$ DQPSK High Channel



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 = 3MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

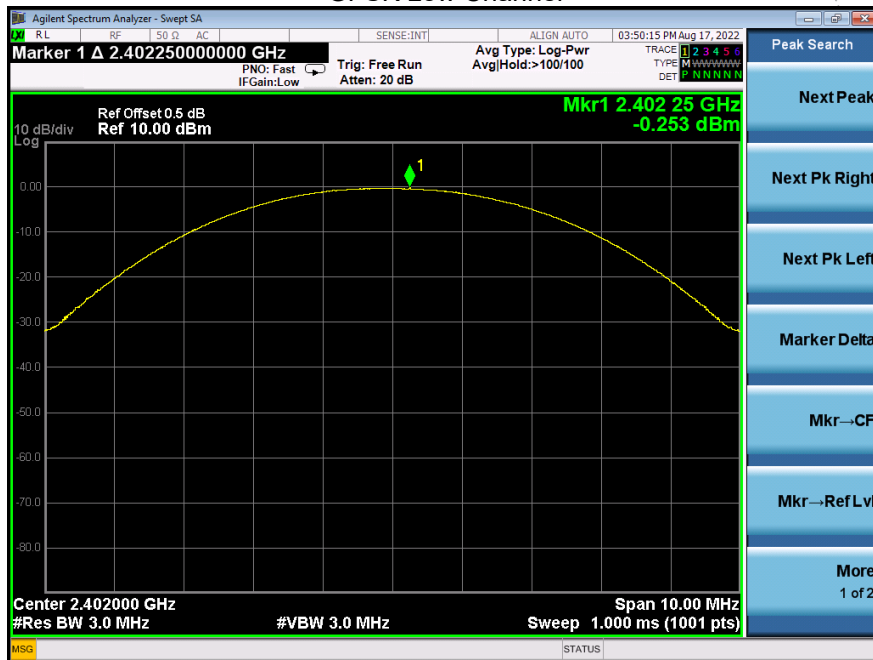
11.4 Test Result

Temperature :	26°C	Relative Humidity :	54%
Test Voltage :	DC 3.7V	Remark:	N/A

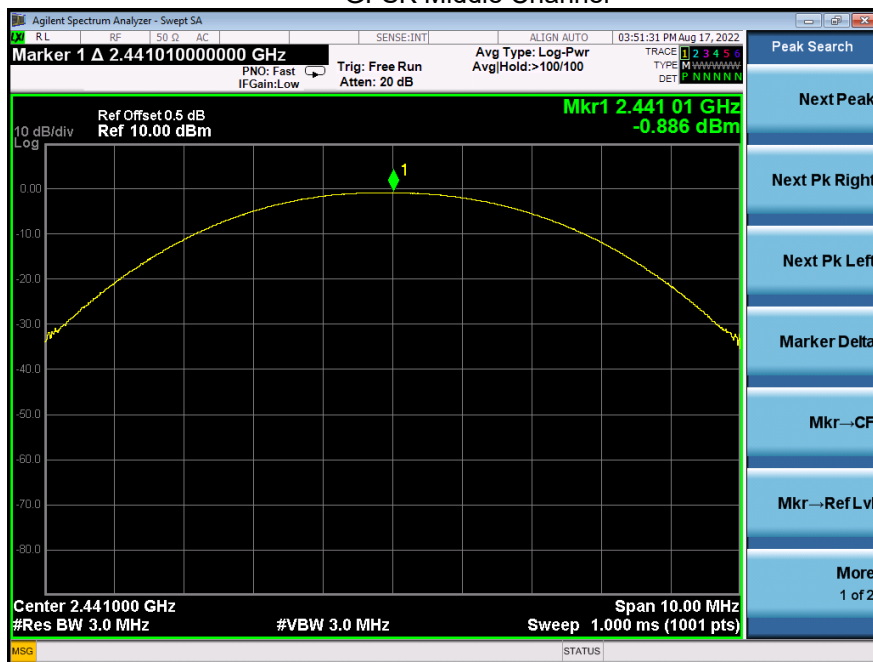
Left

Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Low	-0.253	21
GFSK	Middle	-0.886	21
GFSK	High	-2.020	21
$\pi/4$ DQPSK	Low	1.759	21
$\pi/4$ DQPSK	Middle	1.190	21
$\pi/4$ DQPSK	High	0.075	21

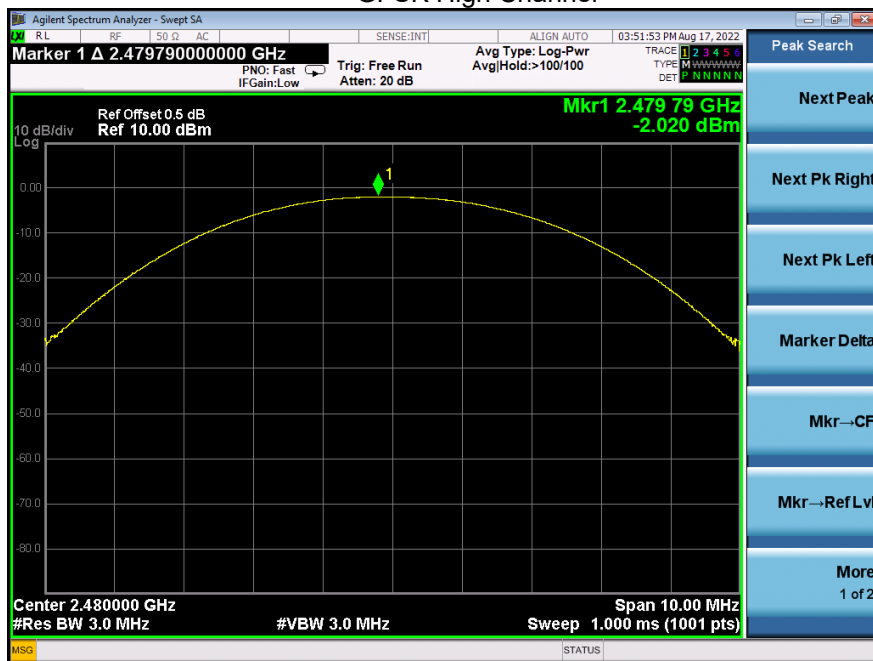
Test plots
GFSK Low Channel

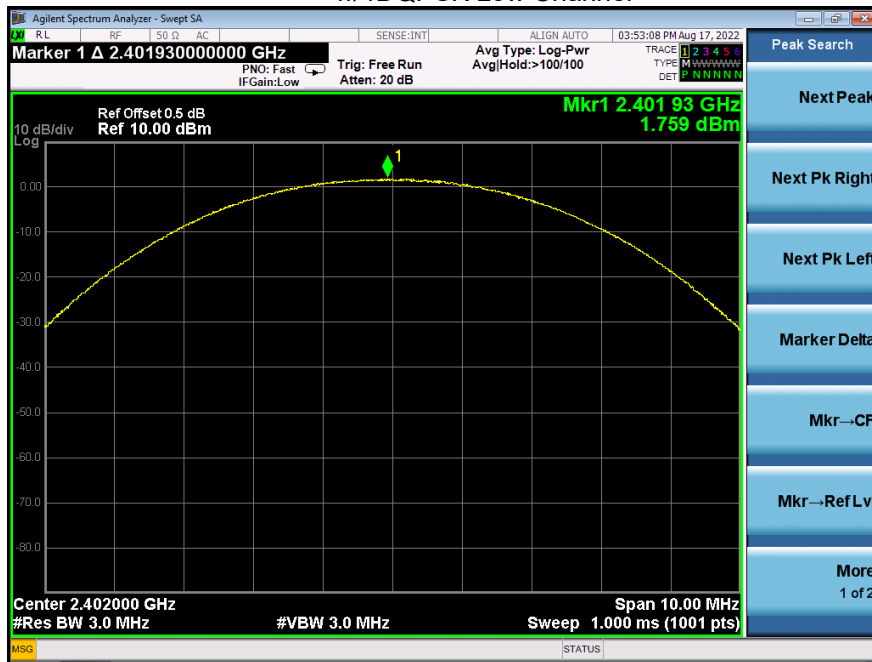
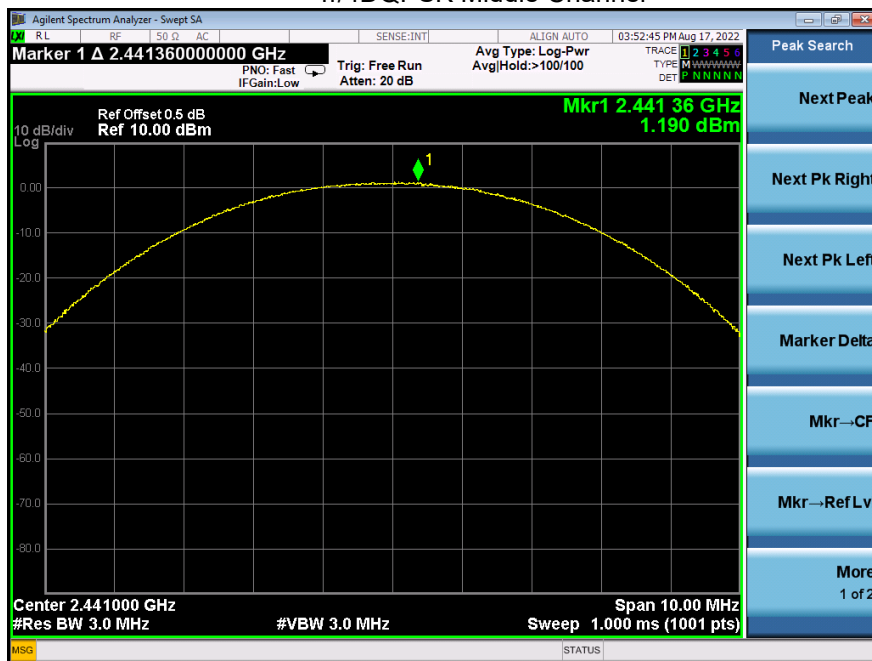


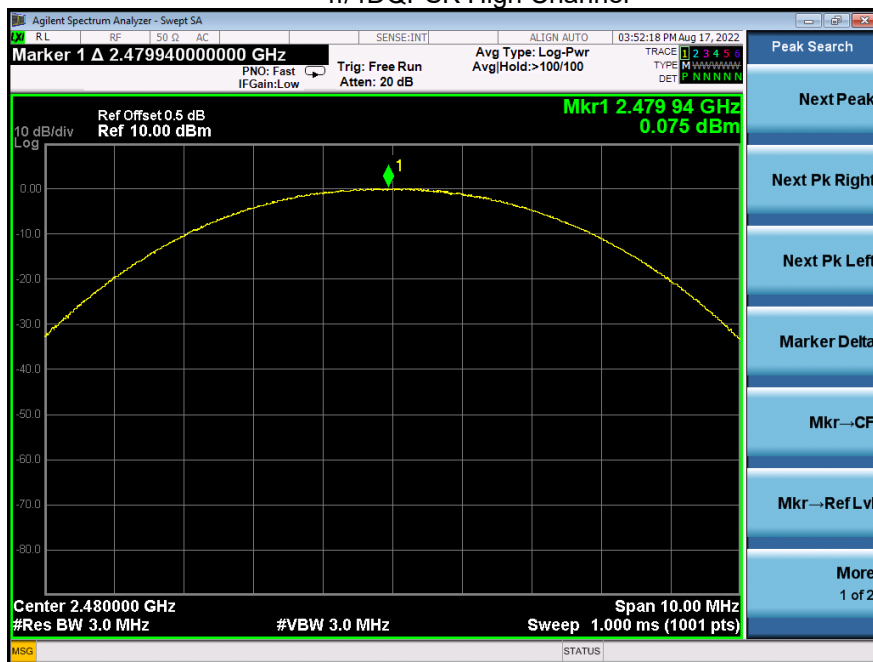
GFSK Middle Channel



GFSK High Channel



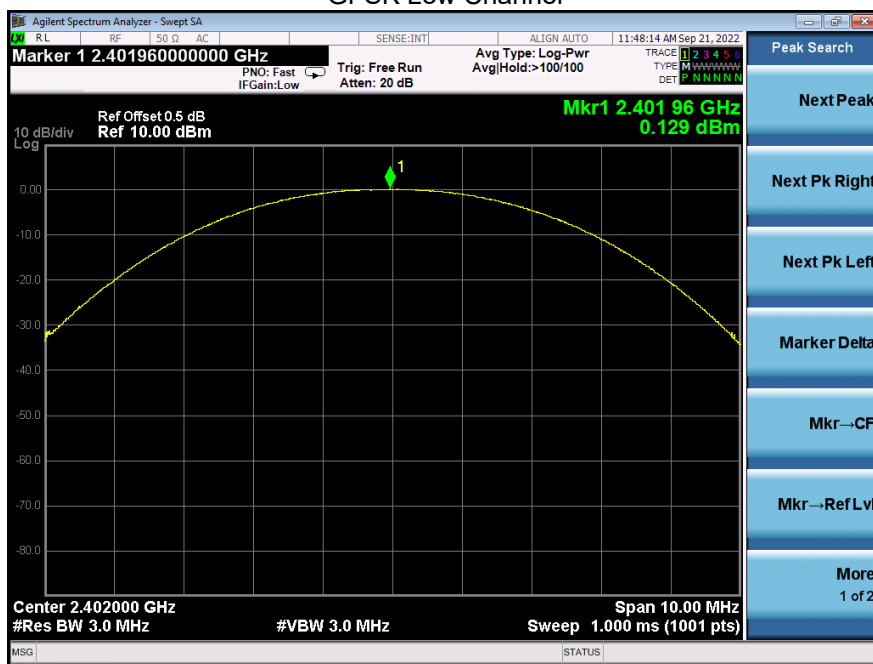
$\pi/4$ DQPSK Low Channel

 $\pi/4$ DQPSK Middle Channel


$\pi/4$ DQPSK High Channel


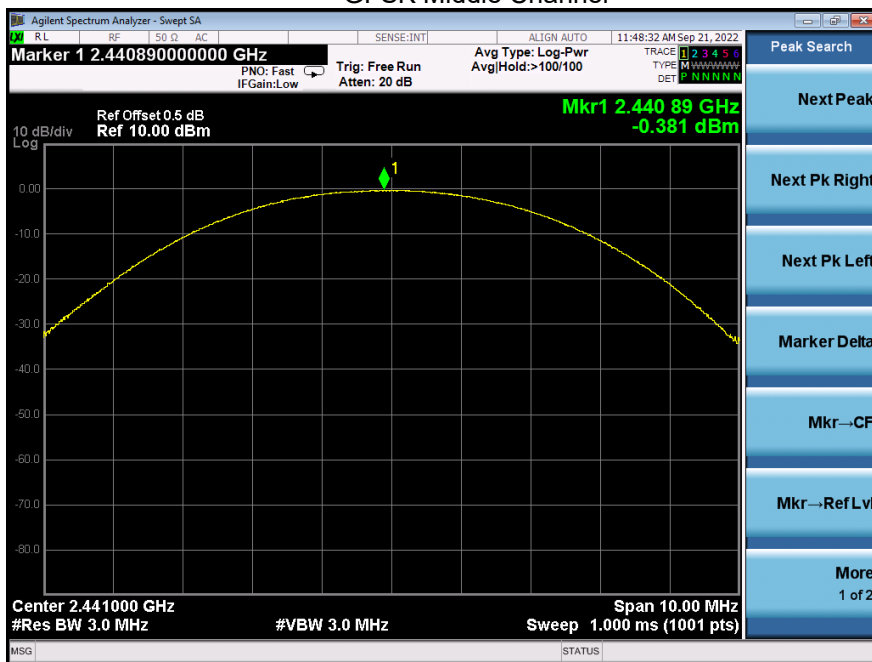
Right

Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Low	0.129	21
GFSK	Middle	-0.381	21
GFSK	High	-1.796	21
$\pi/4$ DQPSK	Low	2.119	21
$\pi/4$ DQPSK	Middle	1.639	21
$\pi/4$ DQPSK	High	-0.019	21

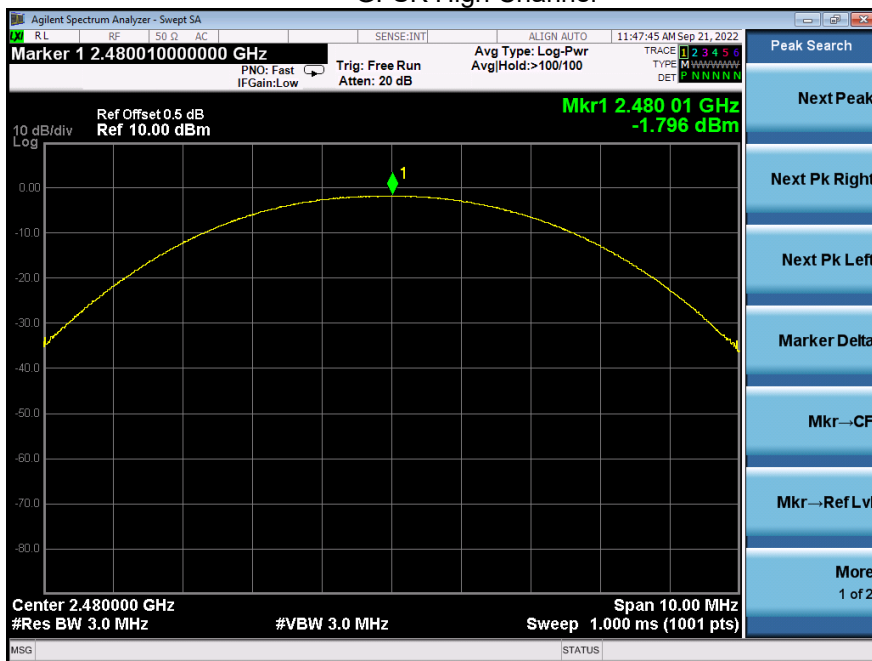
Test plots GFSK Low Channel

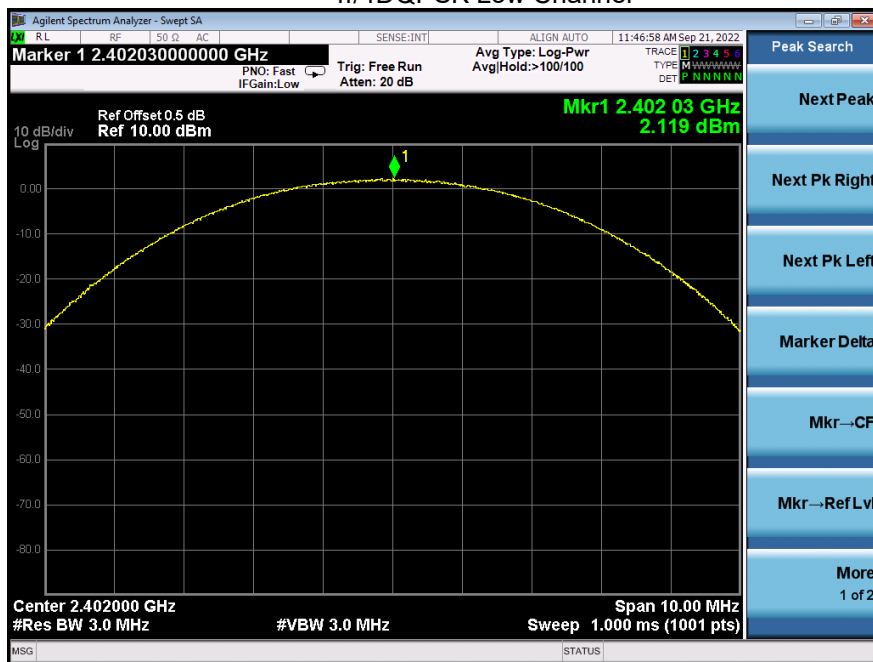
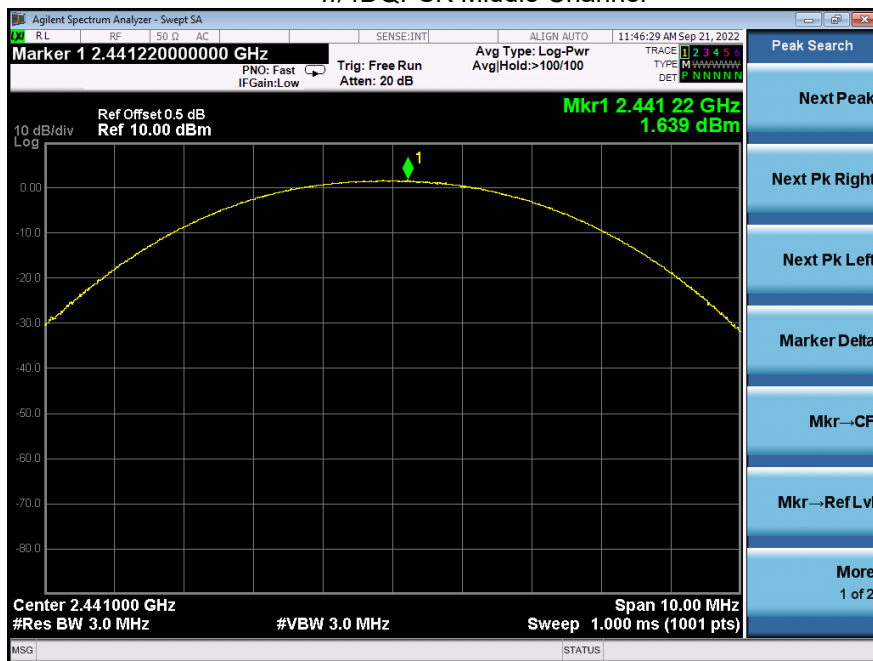


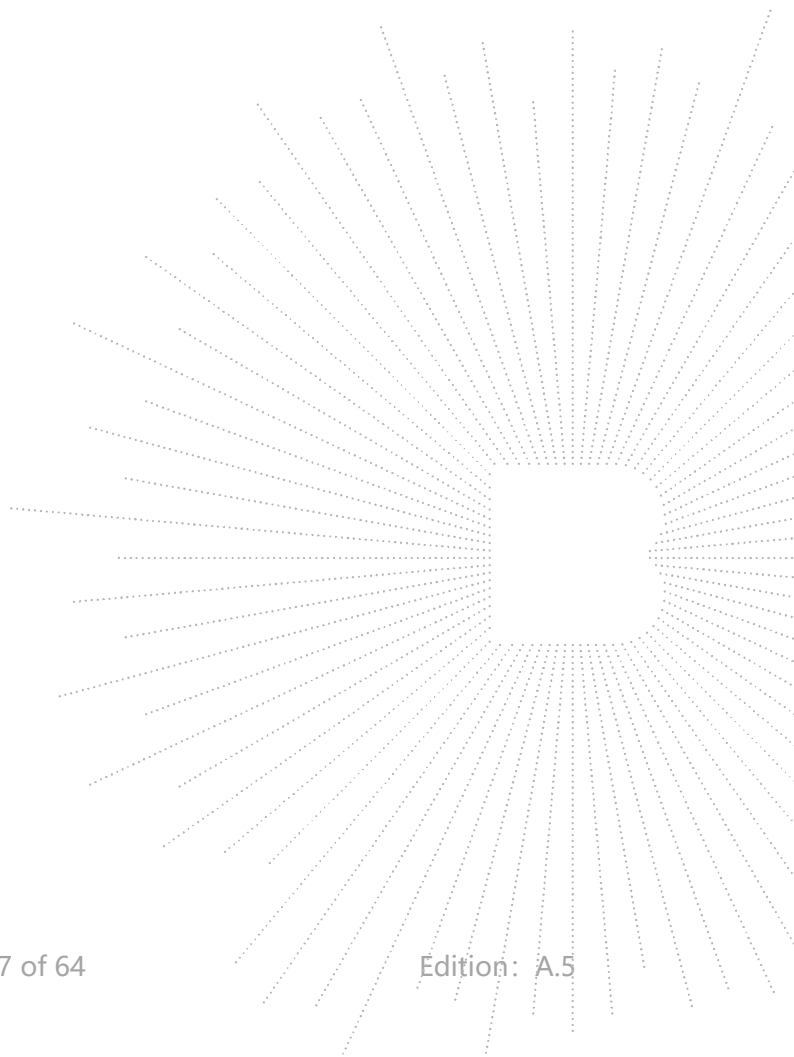
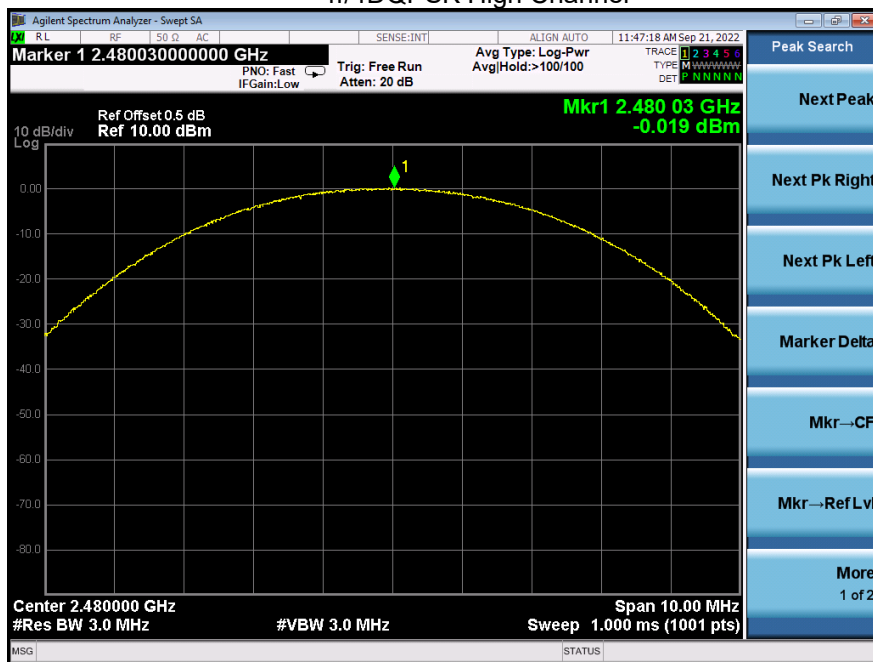
GFSK Middle Channel



GFSK High Channel



$\pi/4$ DQPSK Low Channel

 $\pi/4$ DQPSK Middle Channel


$\pi/4$ DQPSK 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	0.998	0.933	PASS
GFSK	Middle	1.004	0.932	PASS
GFSK	High	1.000	0.931	PASS
$\pi/4$ DQPSK	Low	1.000	0.861	PASS
$\pi/4$ DQPSK	Middle	1.006	0.866	PASS
$\pi/4$ DQPSK	High	1.002	0.862	PASS

Test plots
GFSK Low Channel

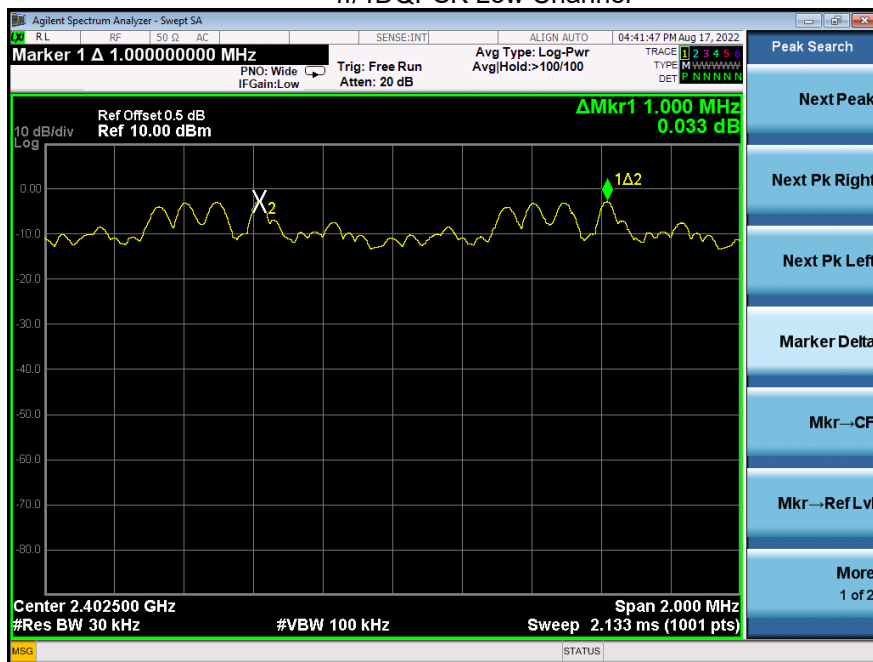
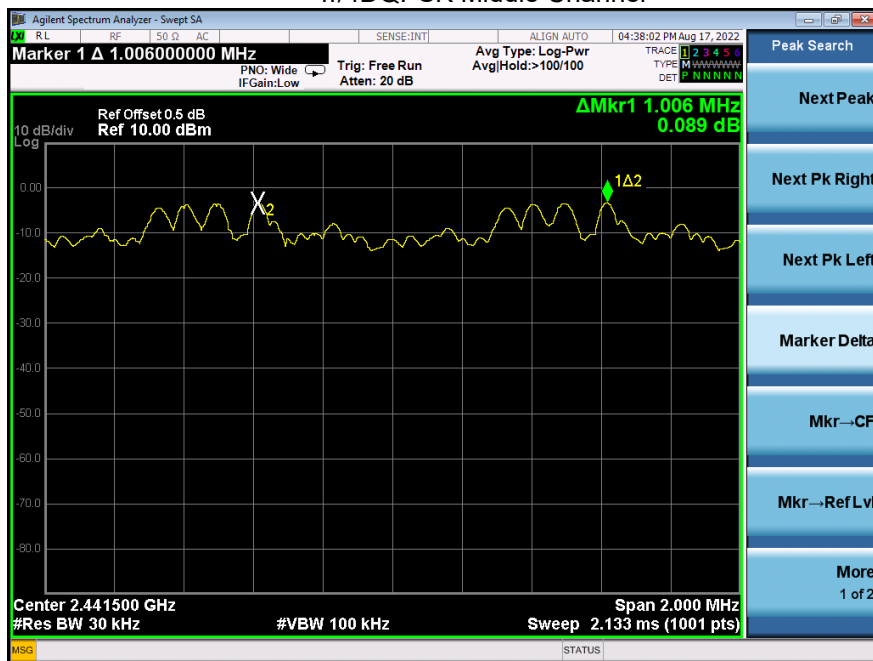


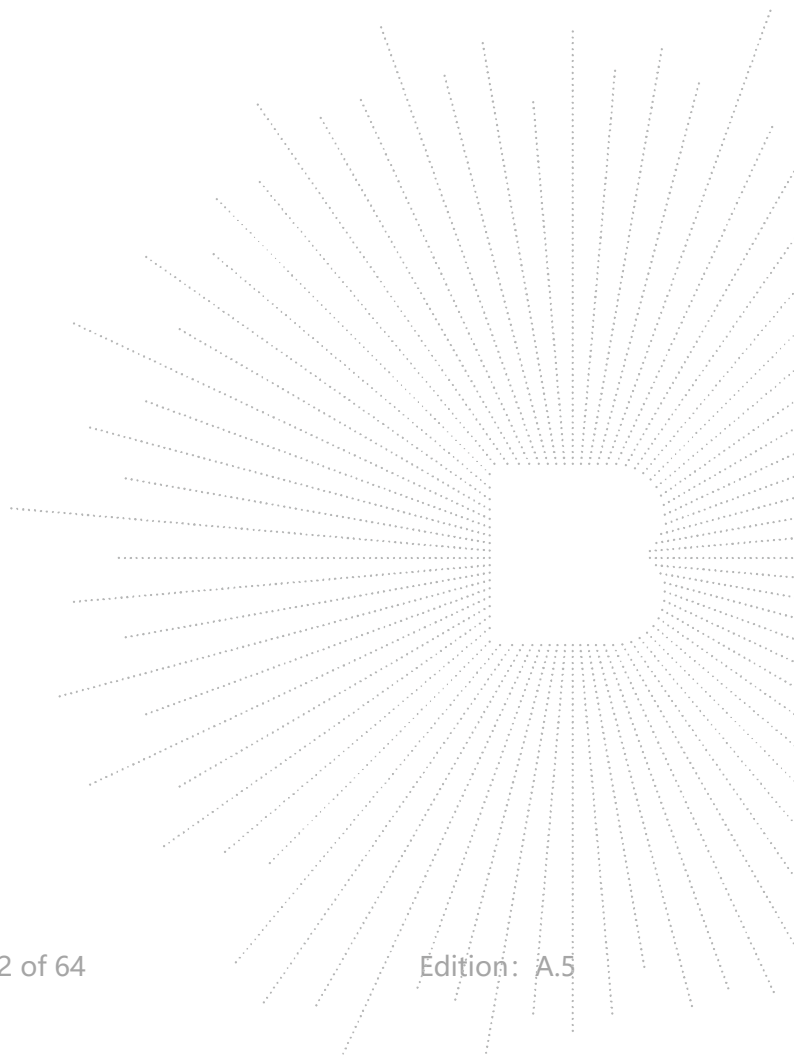
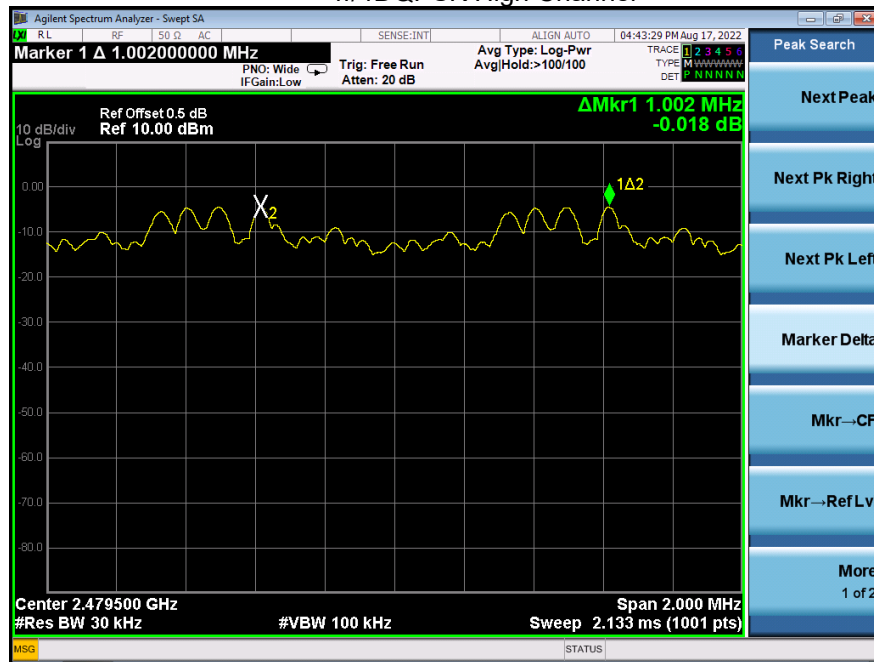
GFSK Middle Channel



GFSK High Channel



$\pi/4$ DQPSK Low Channel

 $\pi/4$ DQPSK Middle Channel


$\pi/4$ DQPSK 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

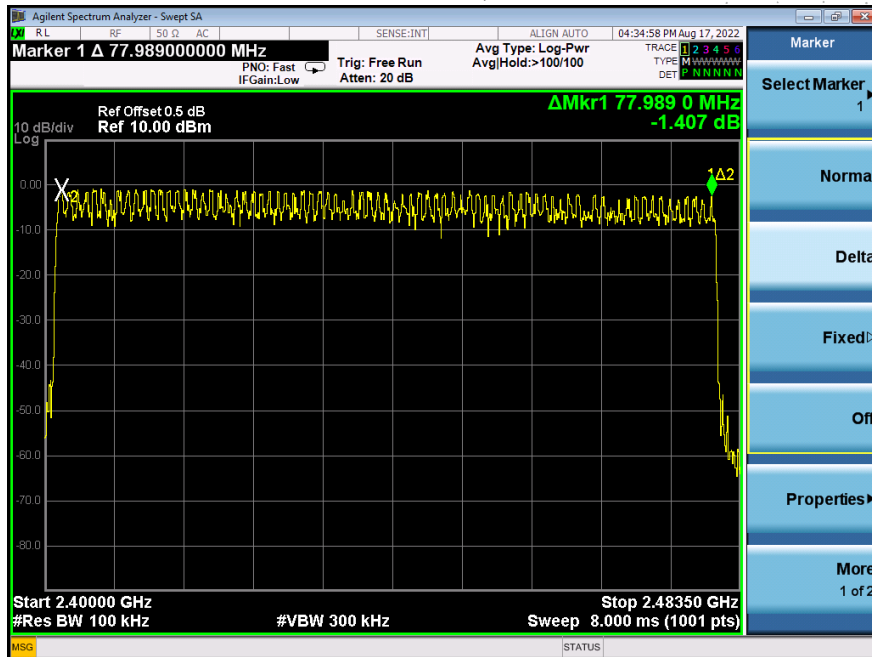
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to 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



$\pi/4$ DQPSK



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: $1600/79/6 \times 0.4 \times 79 \times (\text{MkrDelta})/1000$

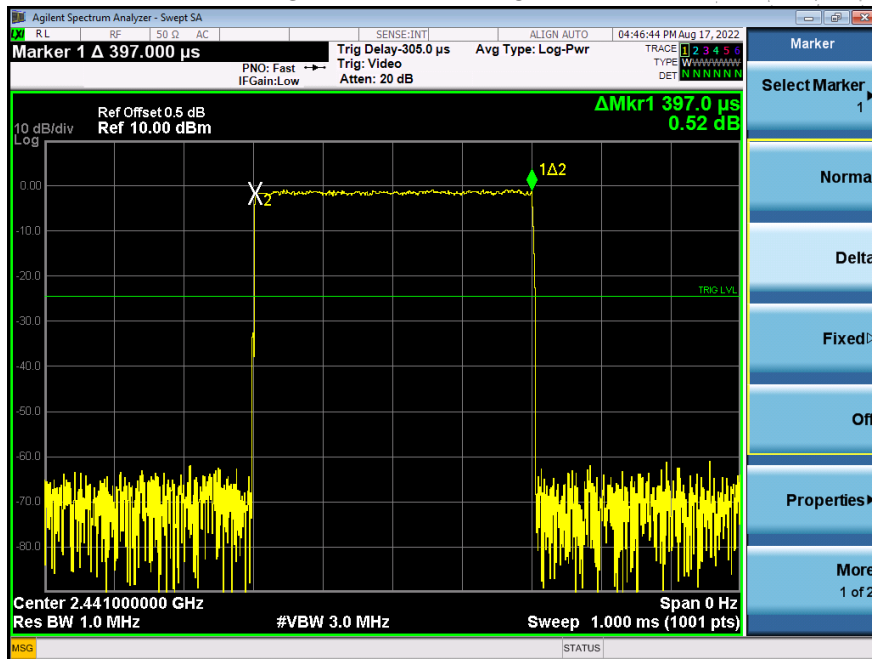
DH3: $1600/79/4 \times 0.4 \times 79 \times (\text{MkrDelta})/1000$

DH1: $1600/79/2 \times 0.4 \times 79 \times (\text{MkrDelta})/1000$

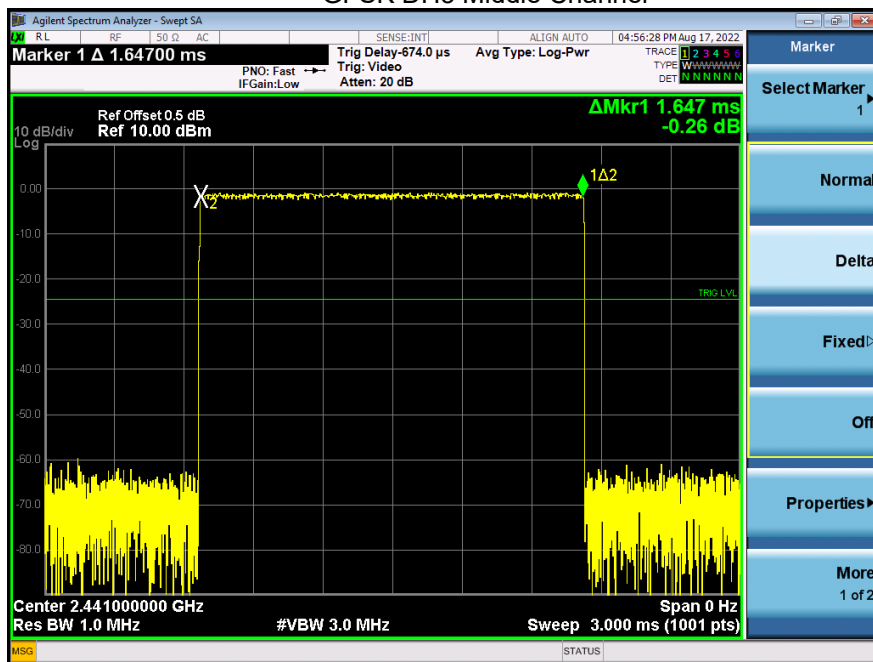
Remark: Mkr Delta is once pulse time.

Modulation	Channel Data	Packet	pulse time(ms)	Dwell Time(s)	Limits(s)
GFSK	Middle	DH1	0.397	0.127	0.4
		DH3	1.647	0.264	0.4
		DH5	2.895	0.309	0.4
$\pi/4$ DQPSK	Middle	2DH1	0.408	0.131	0.4
		2DH3	1.653	0.264	0.4
		2DH5	2.865	0.306	0.4

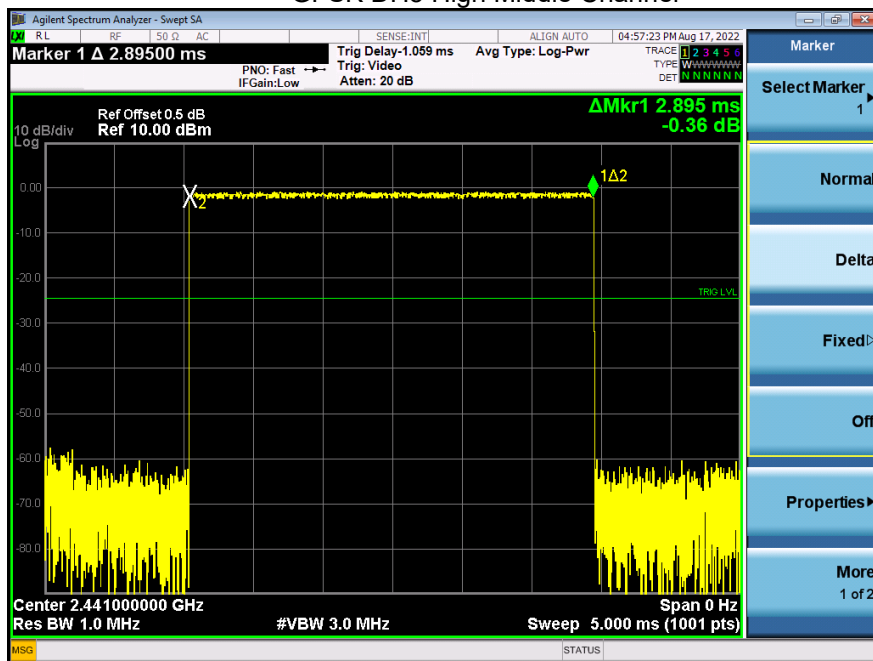
Test Plots
GFSK DH1 Middle Channel

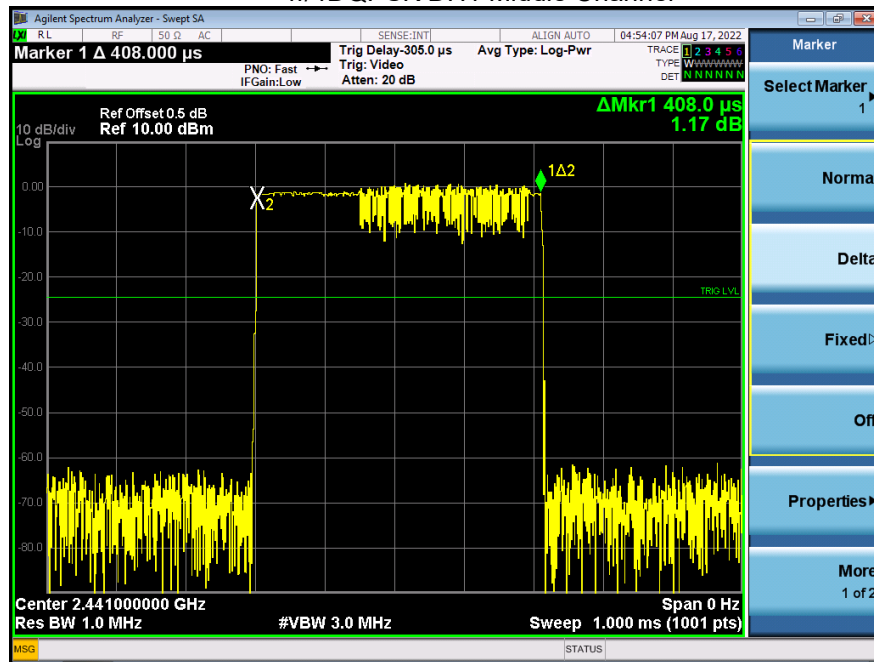
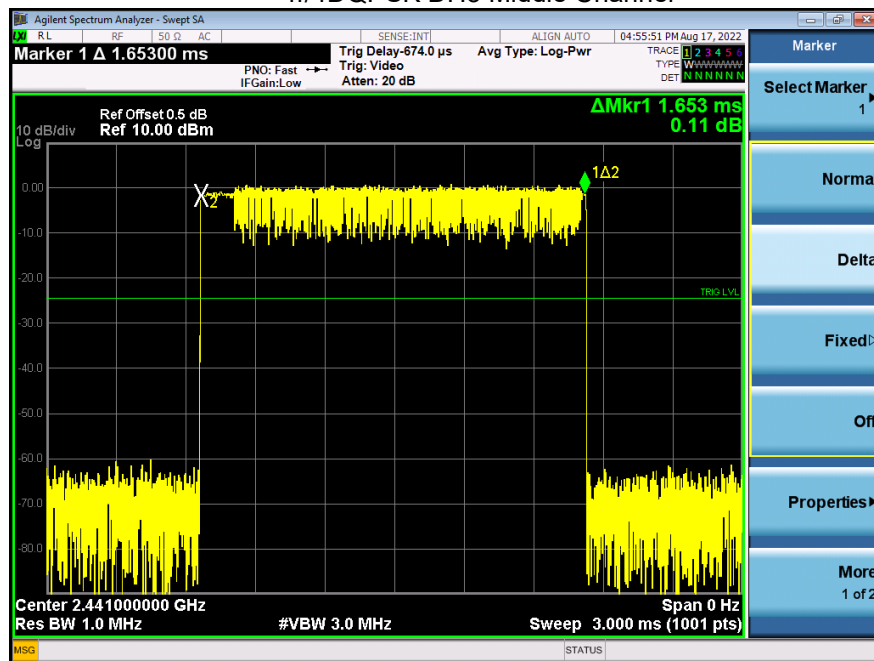


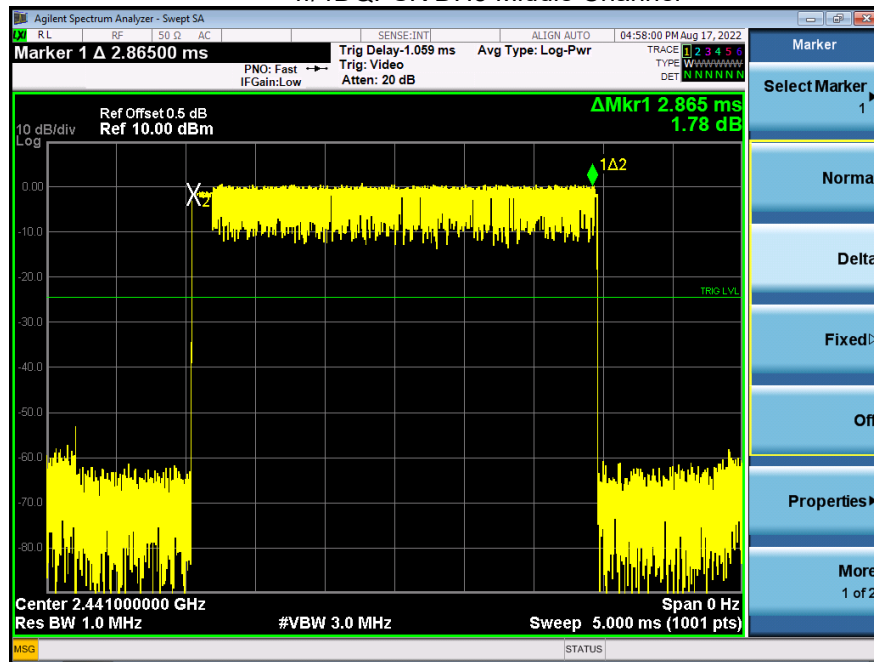
GFSK DH3 Middle Channel



GFSK DH5 High Middle Channel



$\pi/4$ DQPSK DH1 Middle Channel

 $\pi/4$ DQPSK DH3 Middle Channel


$\pi/4$ DQPSK DH5 Middle Channel


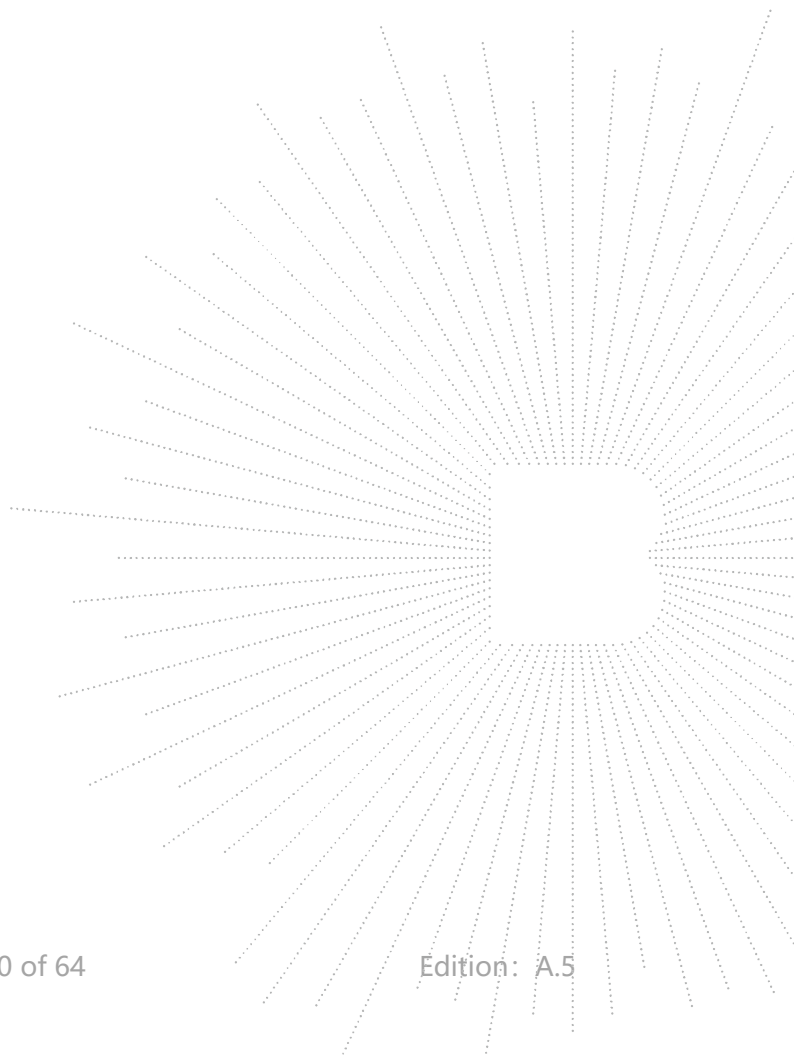
15. Antenna Requirement

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 Chip antenna, The antenna gain is 1.72dBi, fulfill the requirement of this section.

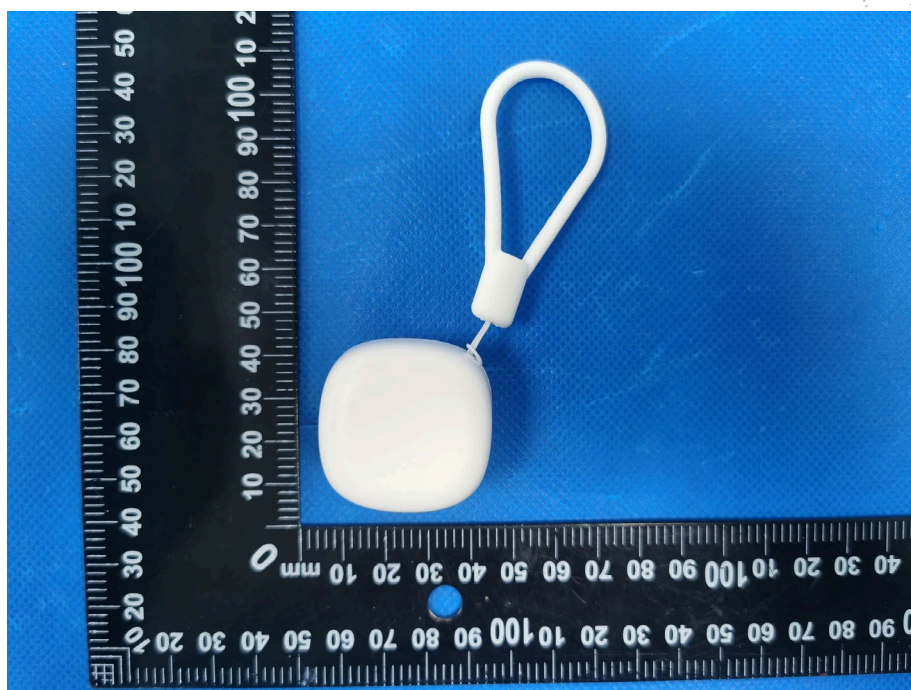


16. EUT Photographs

EUT Photo 1

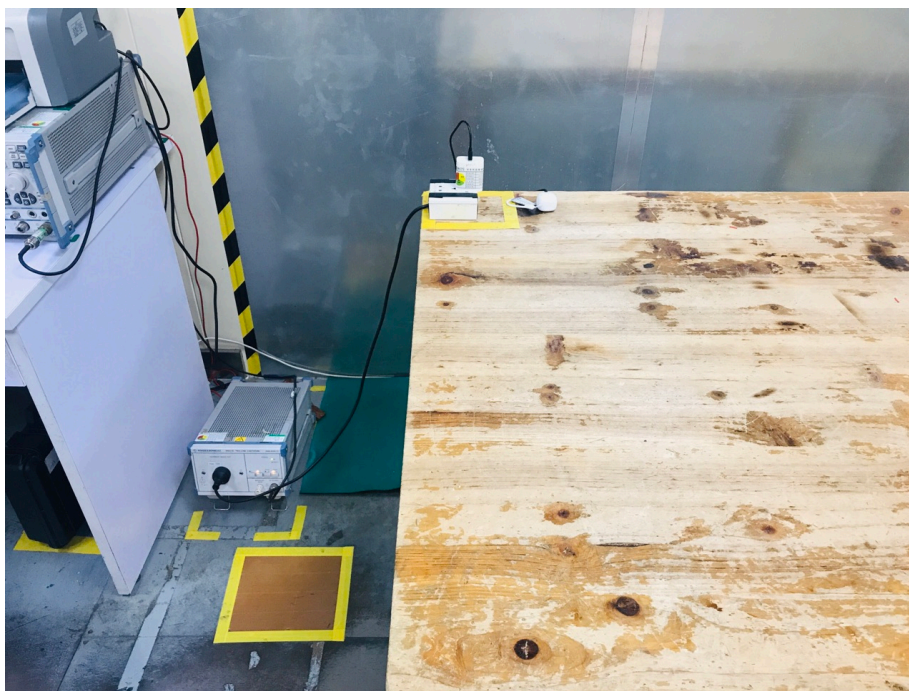


EUT Photo 2

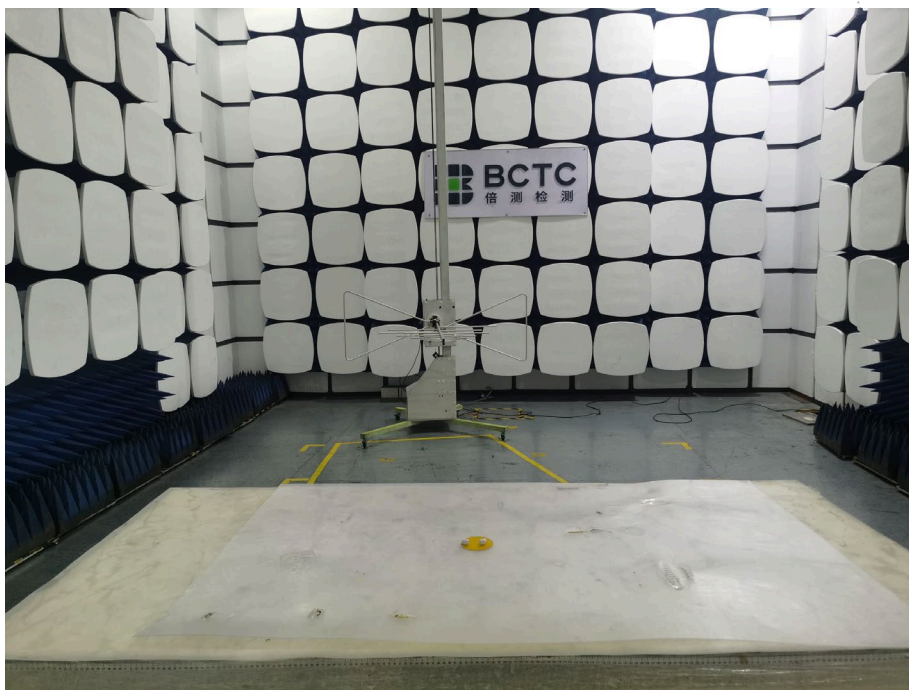


17. EUT Test Setup Photographs

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.

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FAX: 0755-33229357

Website: <http://www.chnbctc.com>

E-Mail: bctc@bctc-lab.com.cn

***** END *****