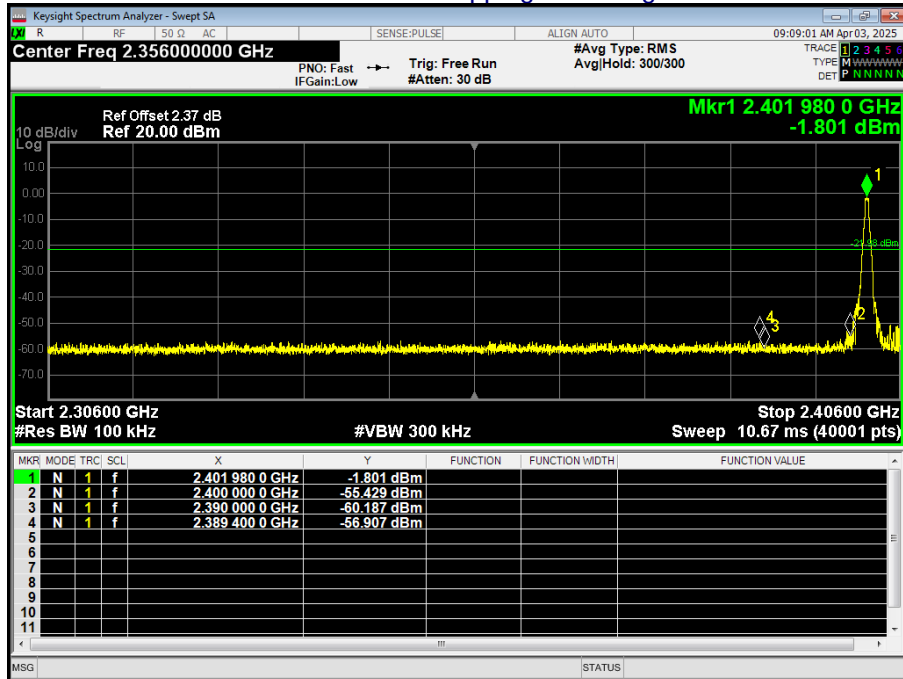
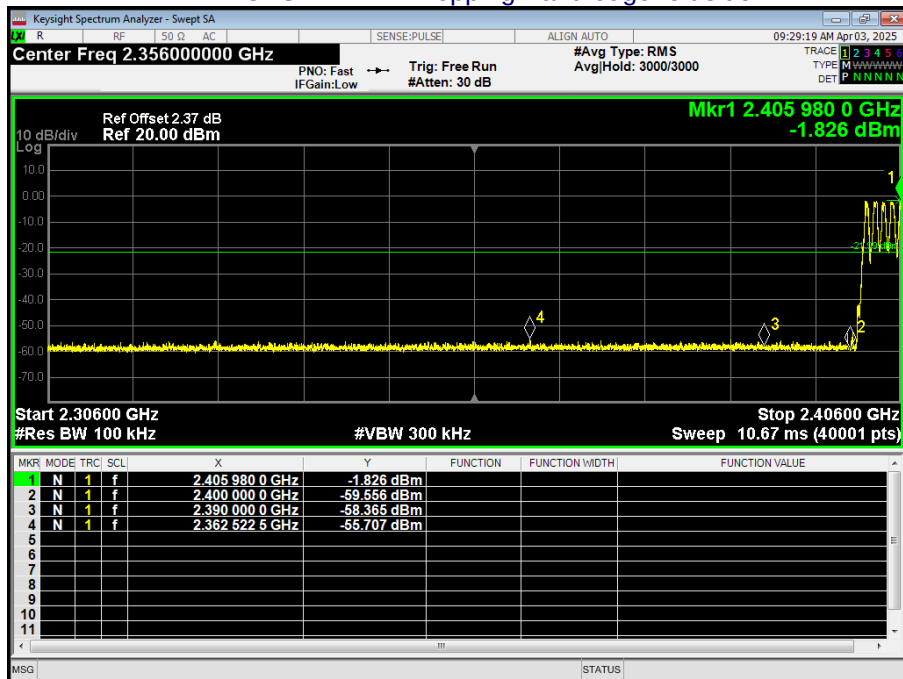




GFSK -1-DH1 No-hopping Band edge-left side

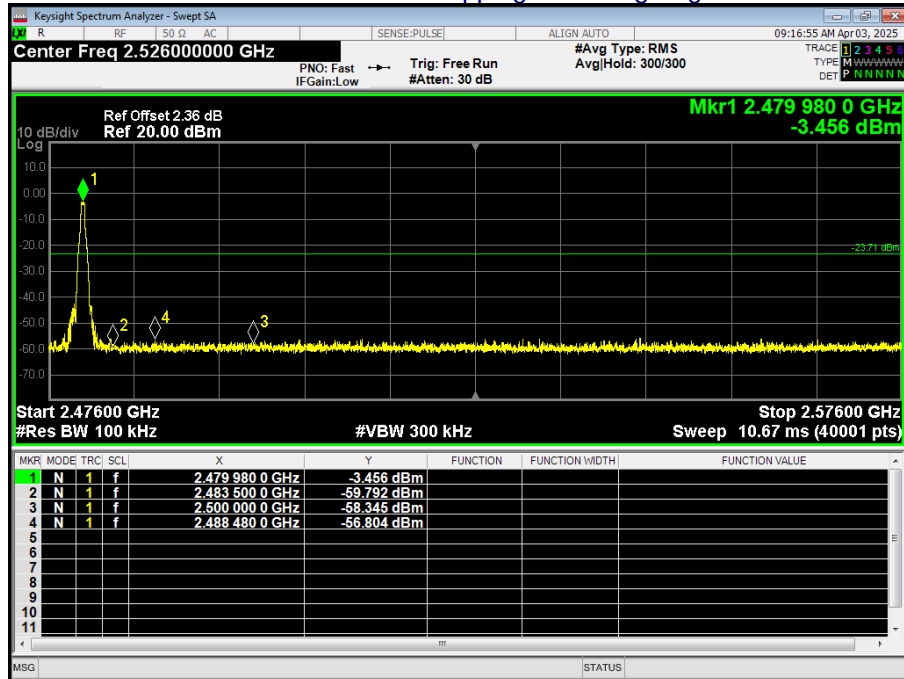


GFSK -1-DH1 Hopping Band edge-left side

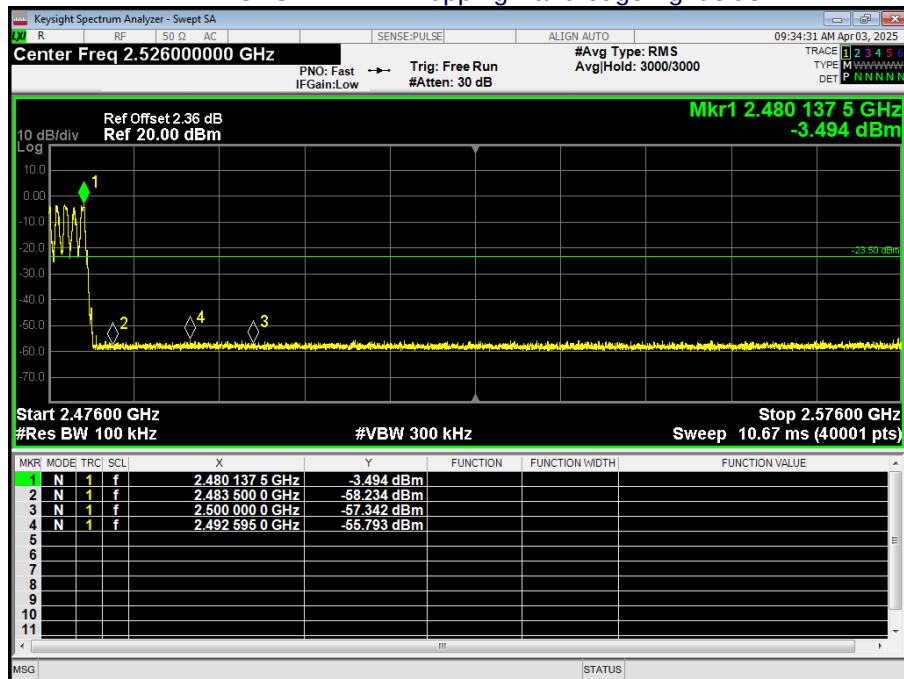




GFSK -1-DH1 No-hopping Band edge-right side

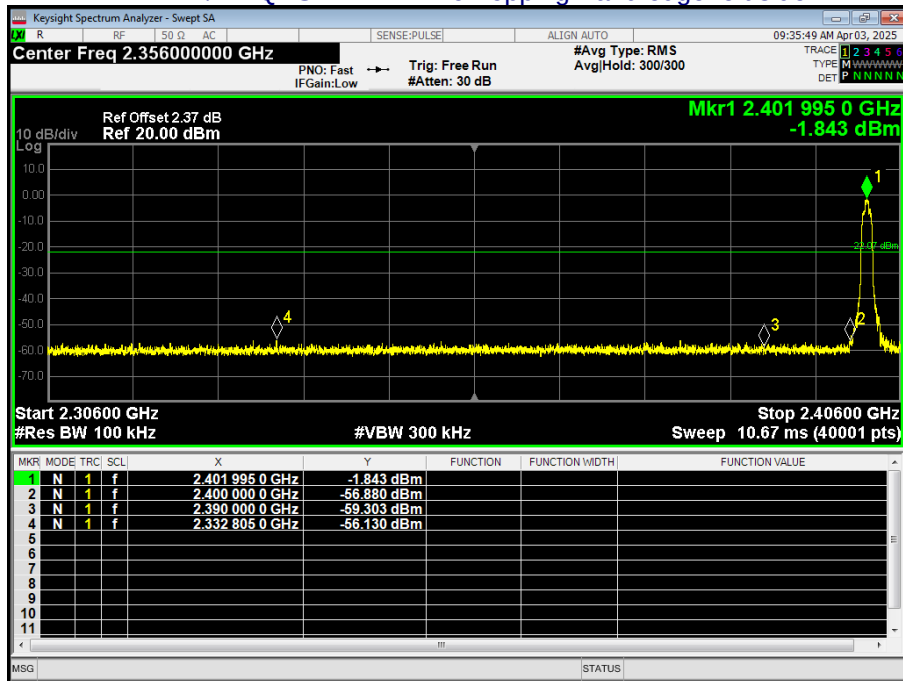


GFSK -1-DH1 Hopping Band edge-right side

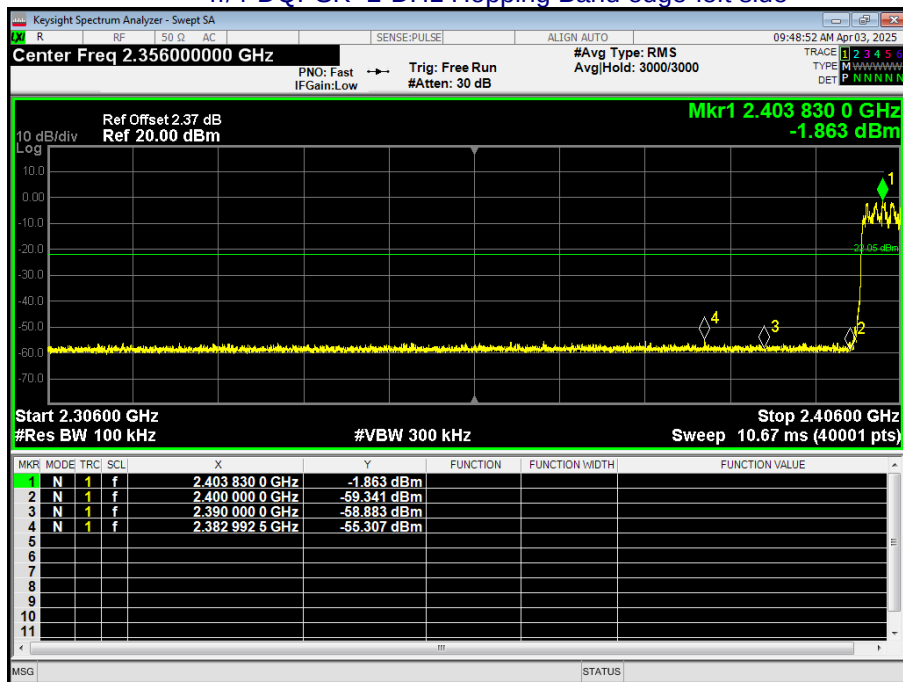




$\pi/4$ -DQPSK -2-DH1 No-hopping Band edge-left side

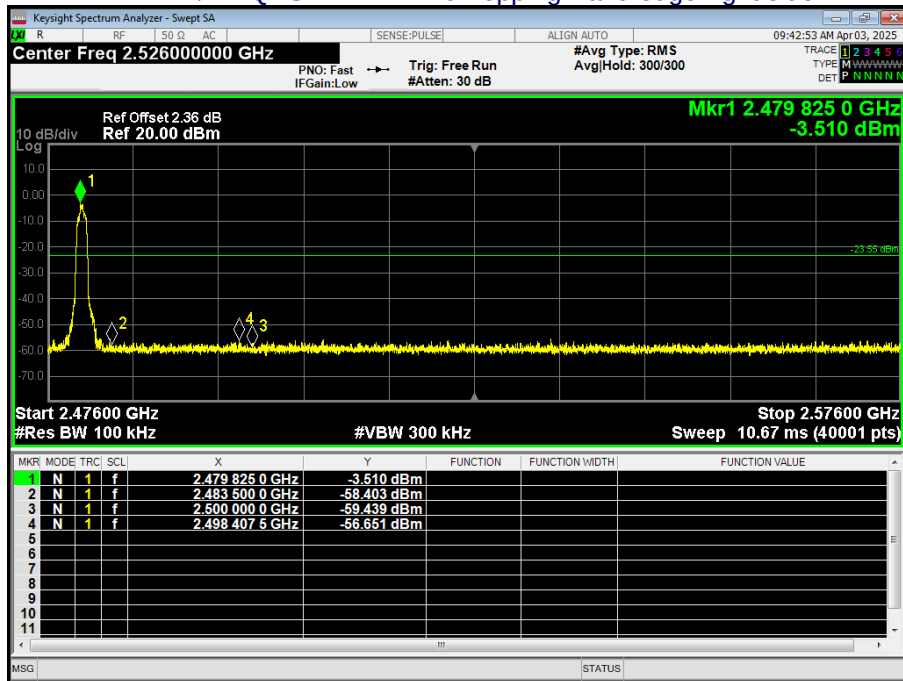


$\pi/4$ -DQPSK -2-DH1 Hopping Band edge-left side

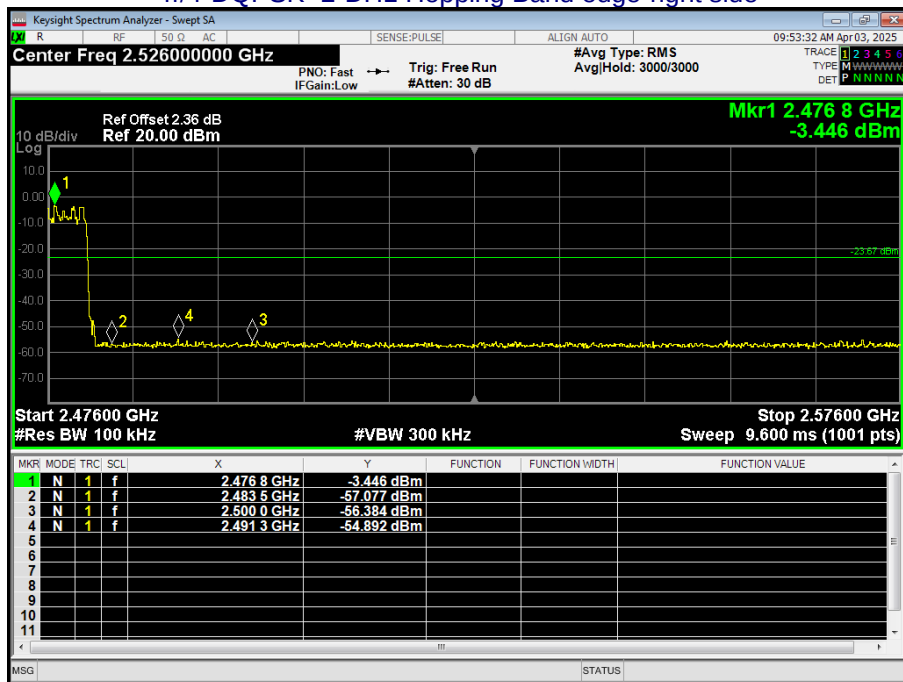




$\pi/4$ -DQPSK -2-DH1 No-hopping Band edge-right side

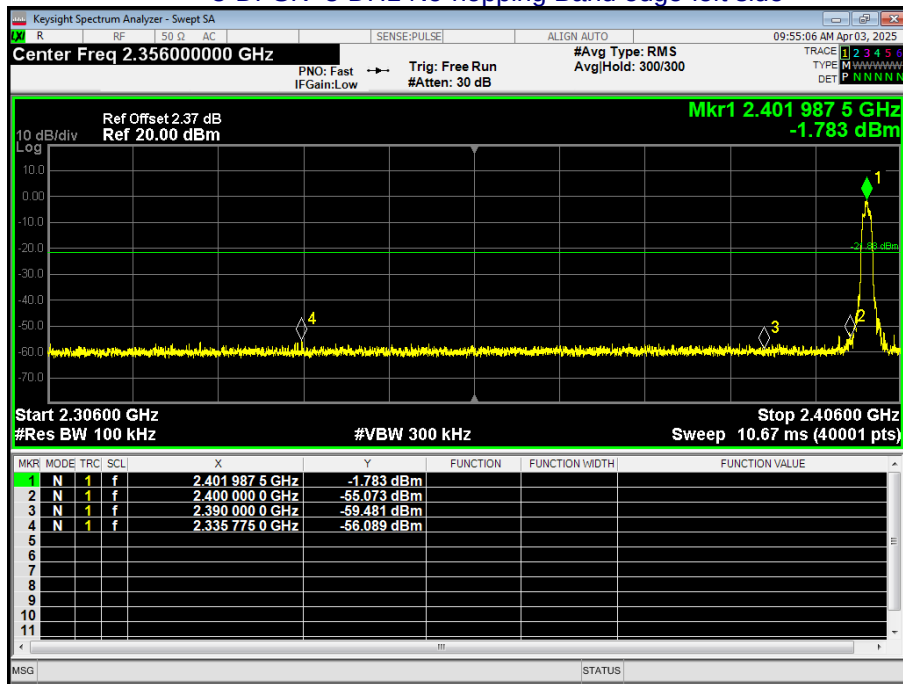


$\pi/4$ -DQPSK -2-DH1 Hopping Band edge-right side

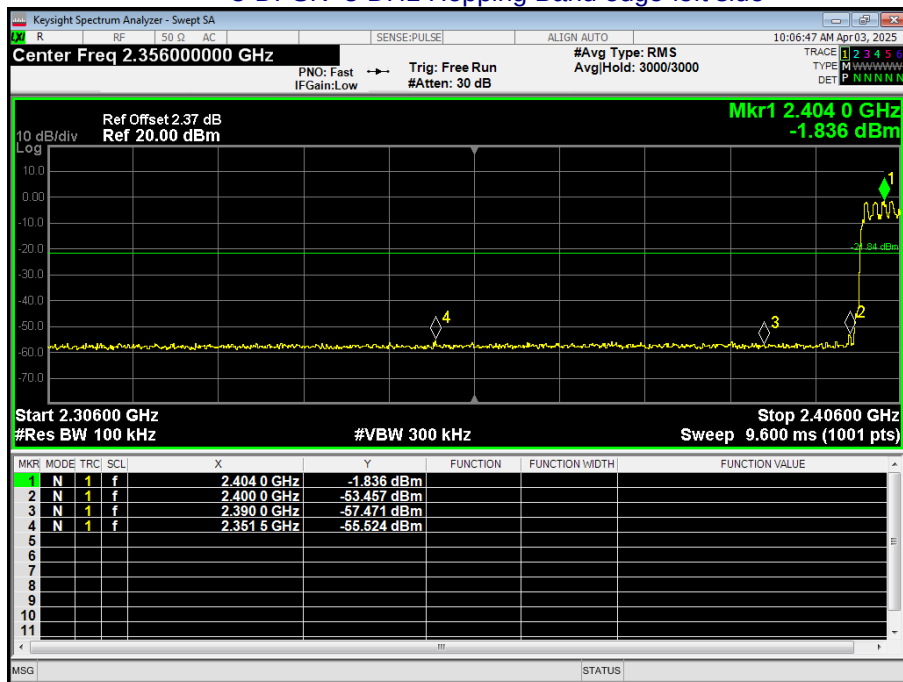




8-DPSK -3-DH1 No-hopping Band edge-left side

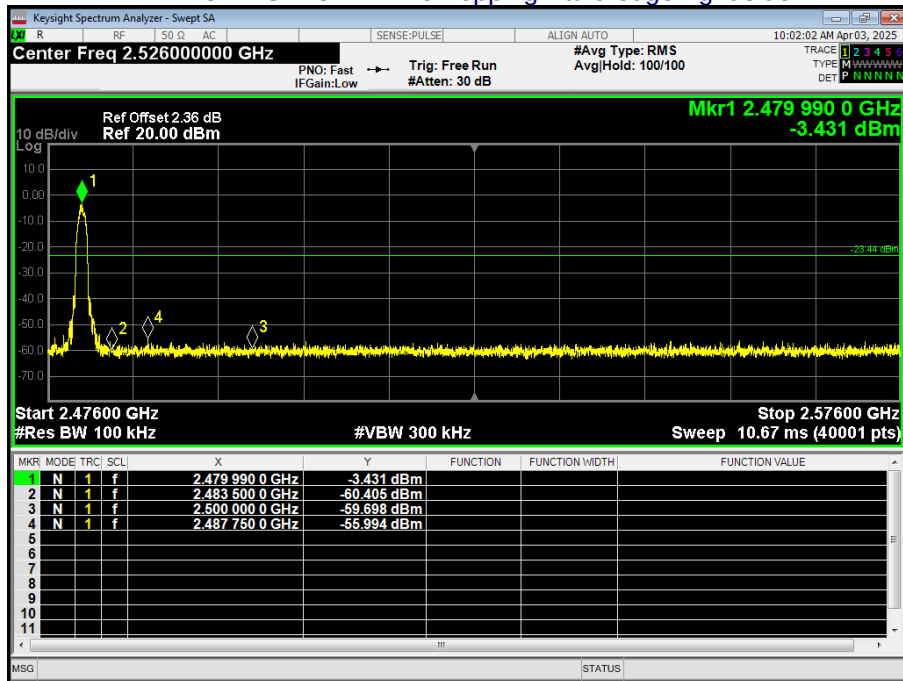


8-DPSK -3-DH1 Hopping Band edge-left side

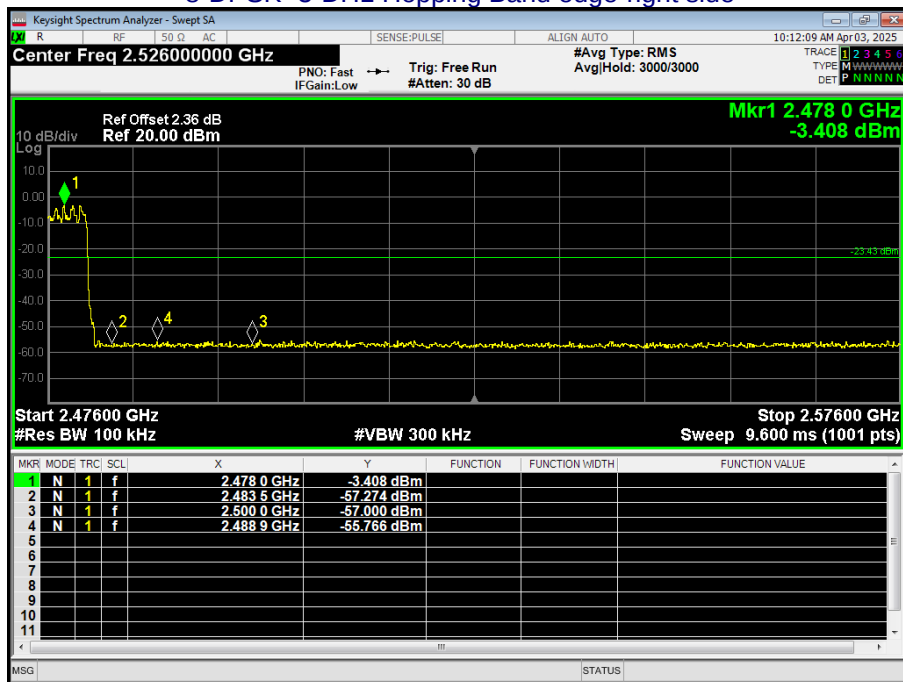




8-DPSK -3-DH1 No-hopping Band edge-right side



8-DPSK -3-DH1 Hopping Band edge-right side





7. 20DB OCCUPIED BANDWIDTH

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013

7.1 Test Setup



7.2 Limit

N/A

7.3 Test procedure

1. Set RBW = 30 kHz.
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 20 dB relative to the maximum level measured in the fundamental emission.

7.4 DEVIATION FROM STANDARD

No deviation.

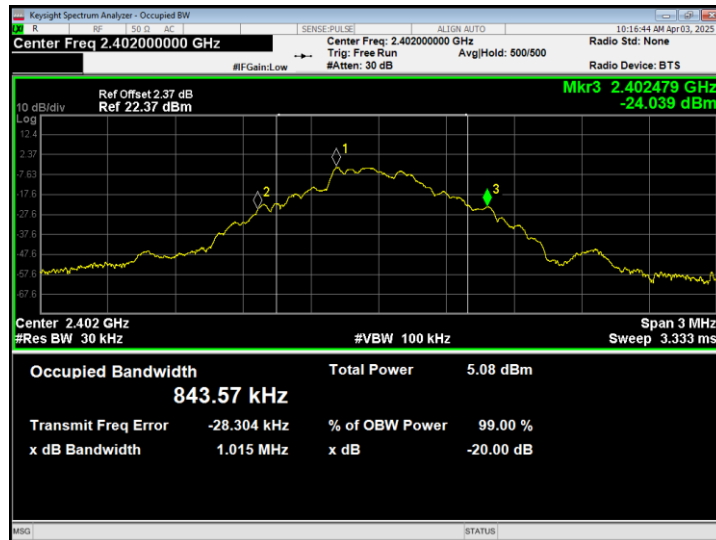


7.5 Test Result

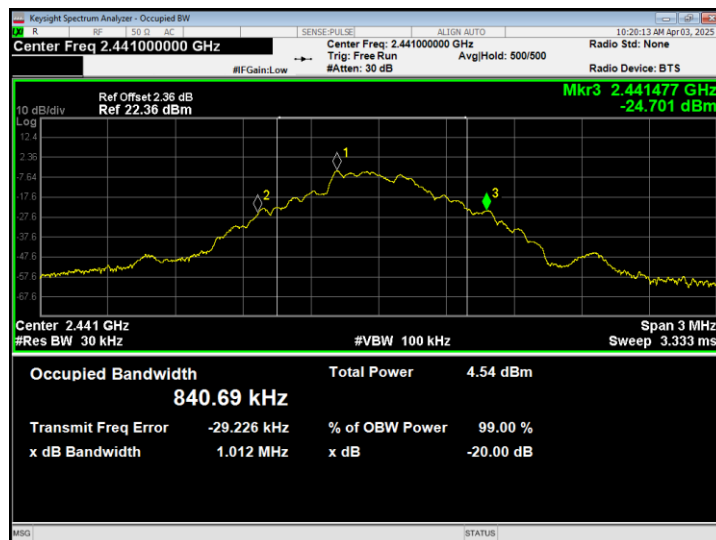
Modulation	Packet	Test Channel	20dB Occupied Bandwidth (MHz)	Result
GFSK	1-DH1	Lowest	1.015	Pass
		Middle	1.012	
		Highest	0.931	
$\pi/4$ -DQPSK	2-DH1	Lowest	1.272	Pass
		Middle	1.29	
		Highest	1.297	
8-DPSK	3-DH1	Lowest	1.25	Pass
		Middle	1.246	
		Highest	1.253	



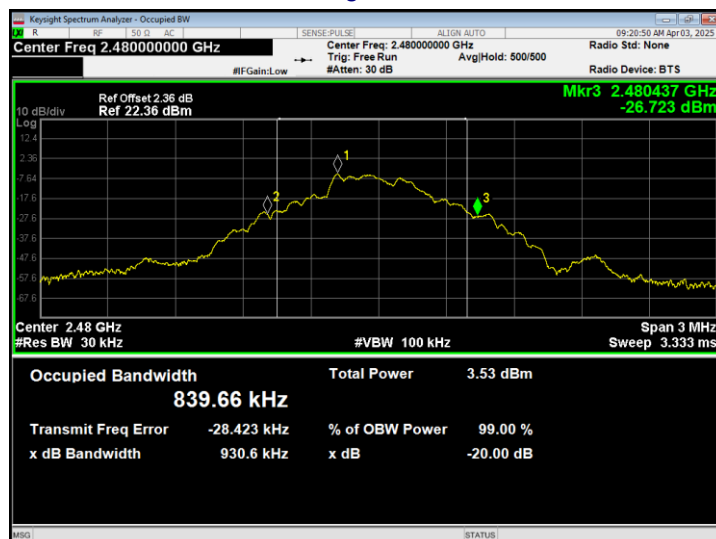
GFSK - 1-DH1 Test plots Low Channel



Middle Channel



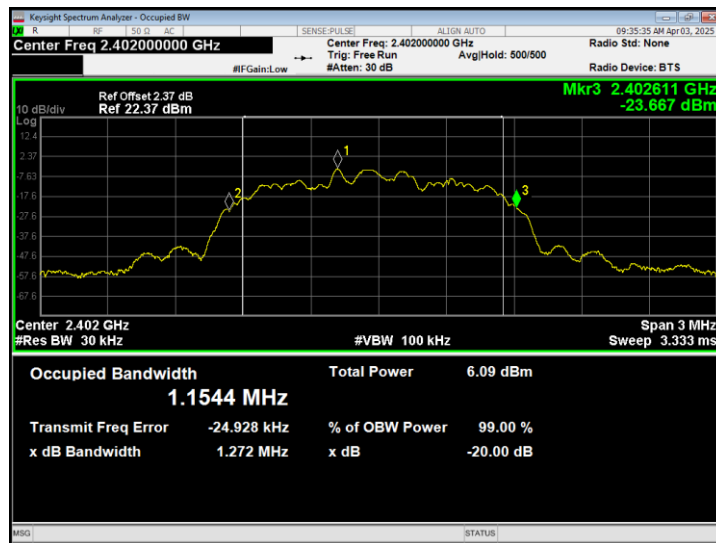
High Channel



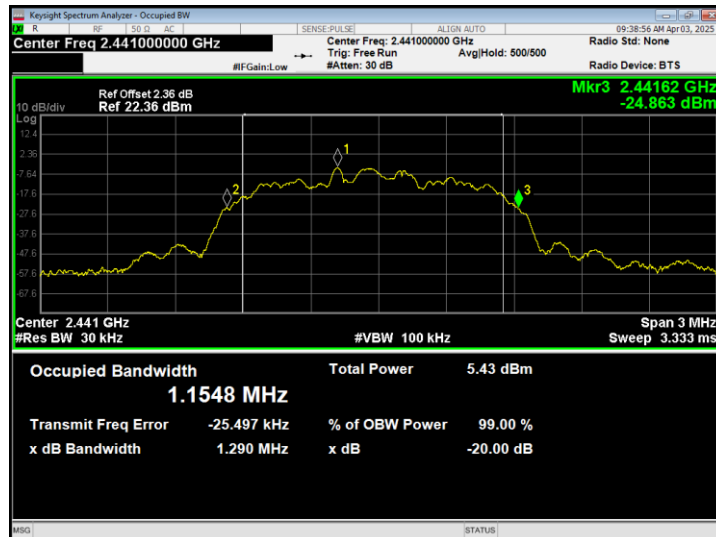


$\pi/4$ -DQPSK - 2-DH1 Test plots

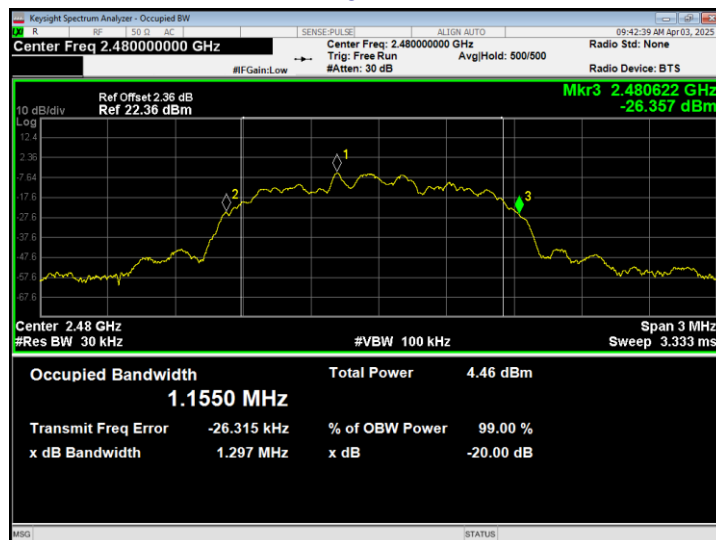
Low Channel



Middle Channel



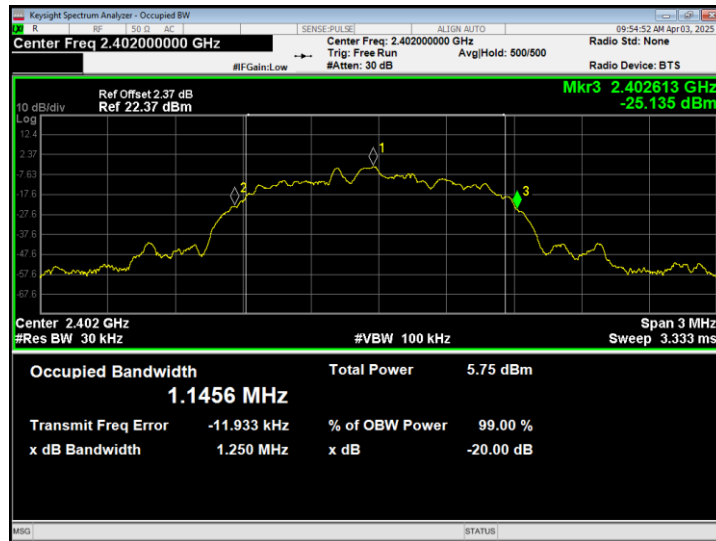
High Channel



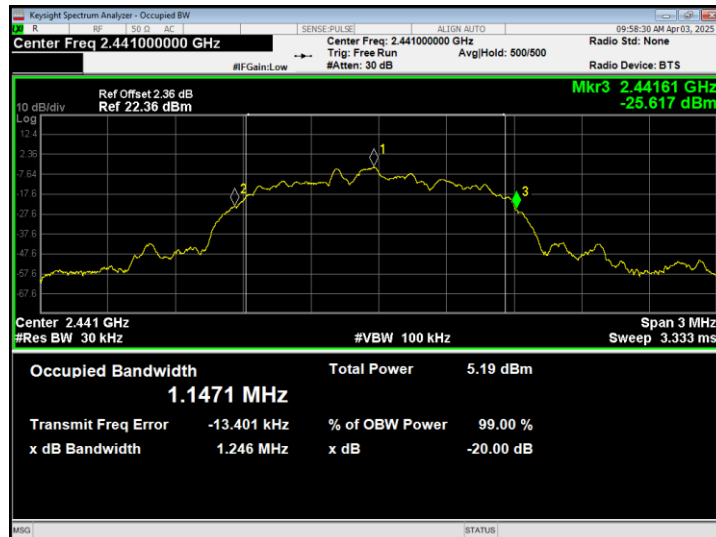


8-DPSK - 3-DH1 Test plots

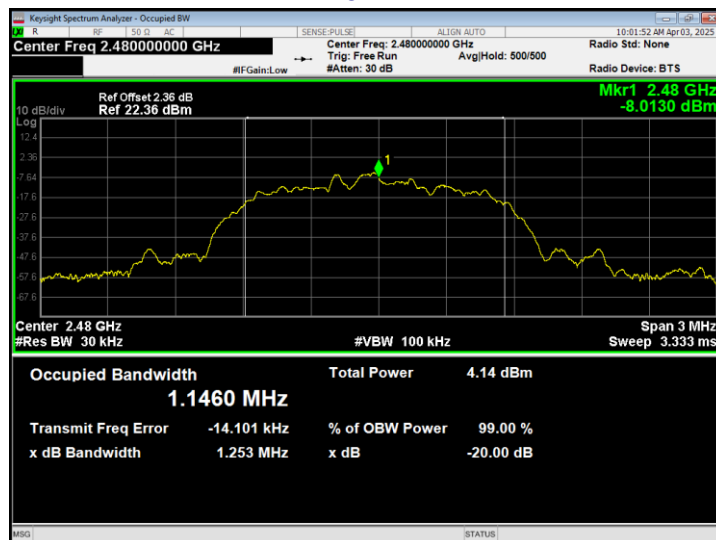
Low Channel



Middle Channel



High Channel

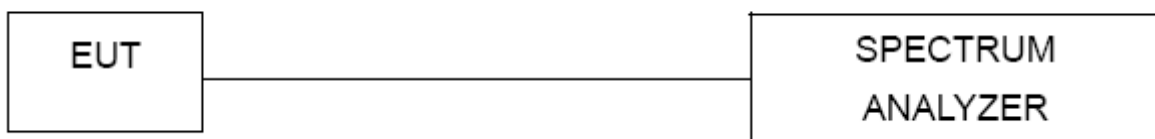




8. Maximum Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2013
Limit:	GFSK: 21 dBm $\pi/4$ -DQPSK & 8-DPSK: 20.97 dBm

8.1 Block Diagram Of Test Setup



8.2 Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt.
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W.

8.3 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 = 2MHz. VBW =6MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

8.4 DEVIATION FROM STANDARD

No deviation.

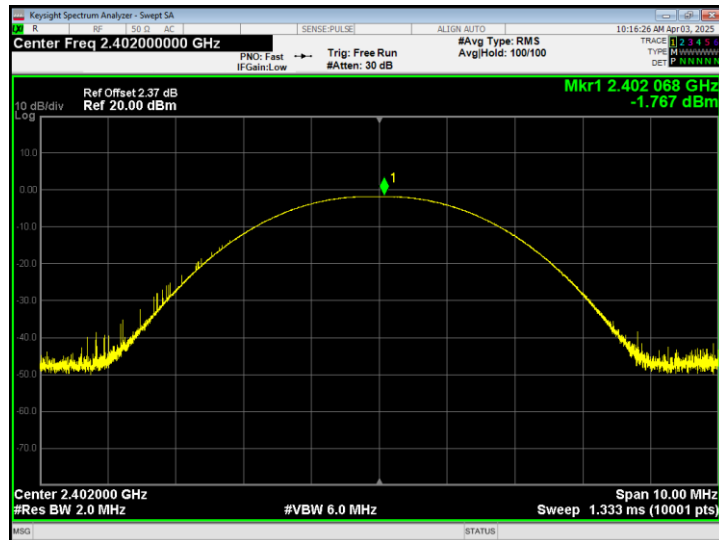


8.5 Test Result

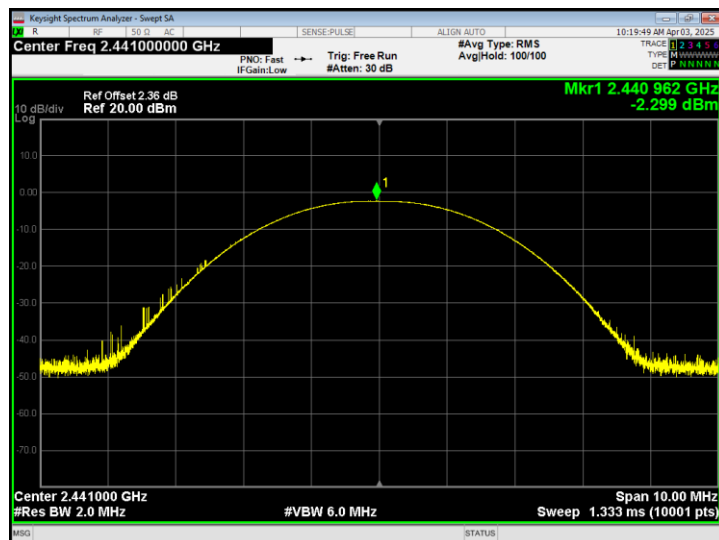
Modulation	Packet	Test Channel	Peak Output Power (dBm)	Limit (dBm)	Result
GFSK	1-DH1	Lowest	-1.767	21.00	Pass
		Middle	-2.299		
		Highest	-3.388		
$\pi/4$ -DQPSK	2-DH1	Lowest	0.492	21.00	Pass
		Middle	-0.076		
		Highest	-1.04		
8-DPSK	3-DH1	Lowest	0.939	21.00	Pass
		Middle	0.391		
		Highest	-0.635		



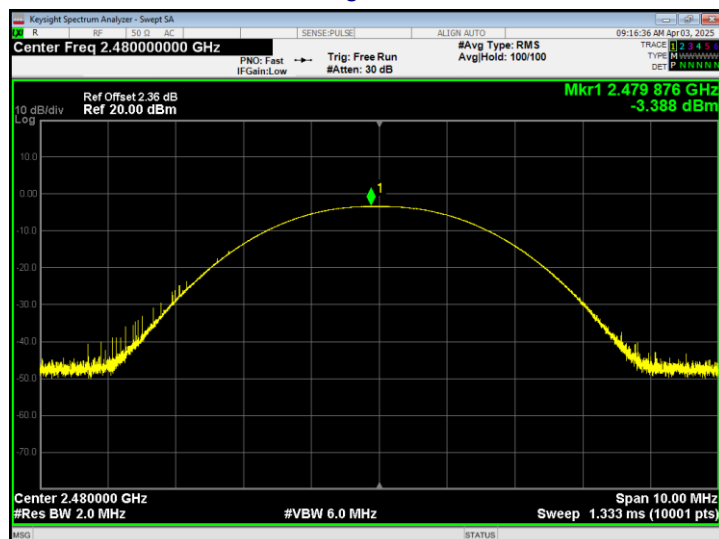
GFSK - 1-DH1 Test plots Low Channel



Middle Channel



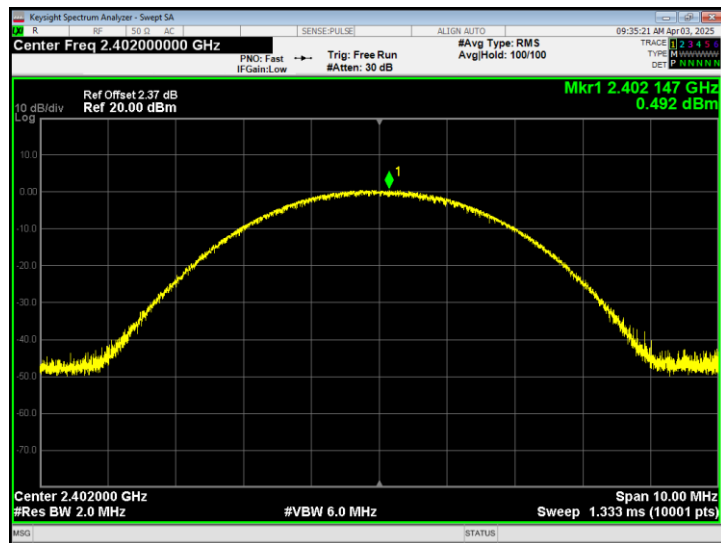
High Channel



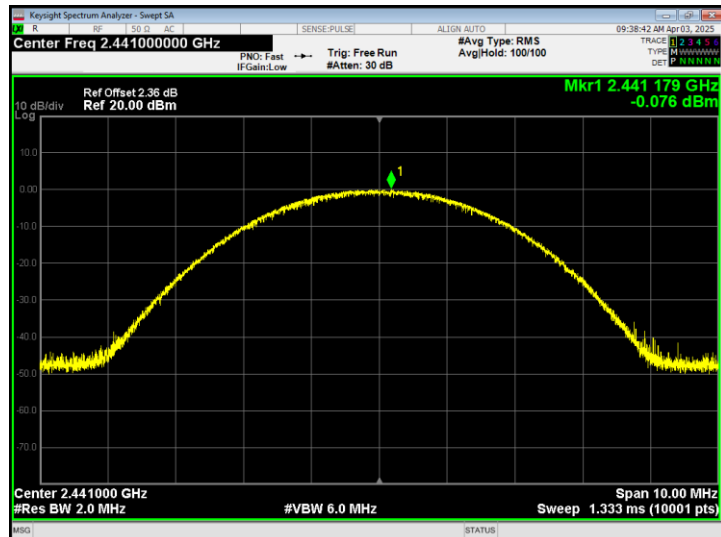


$\pi/4$ -DQPSK - 2-DH1 Test plots

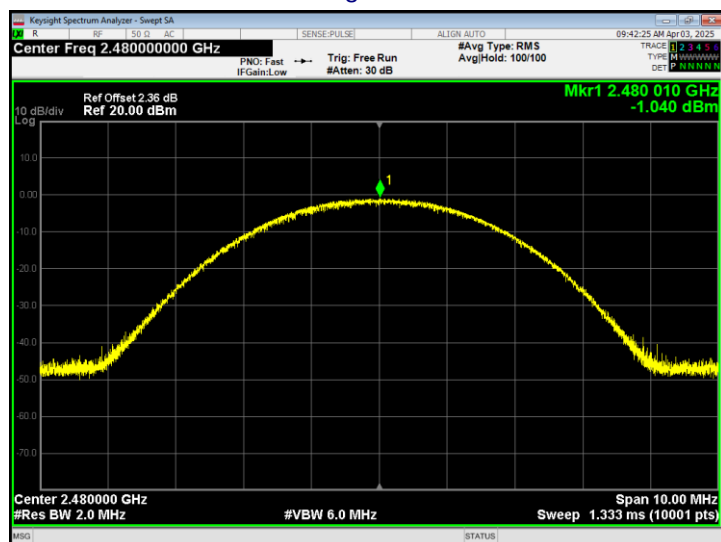
Low Channel



Middle Channel



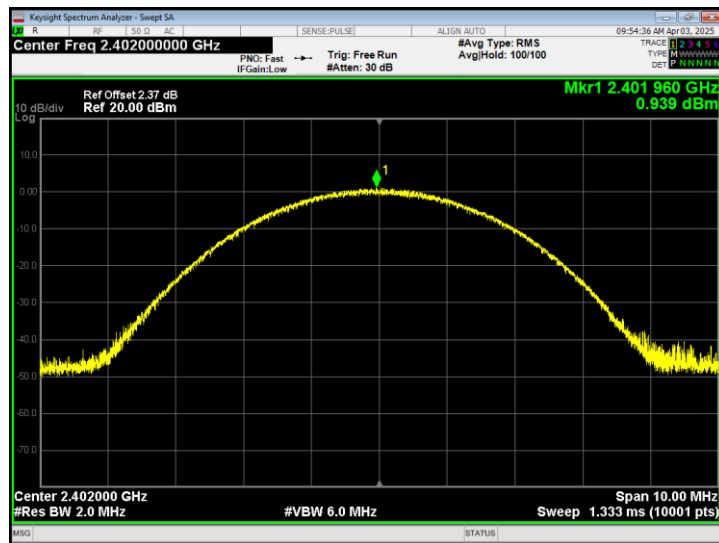
High Channel



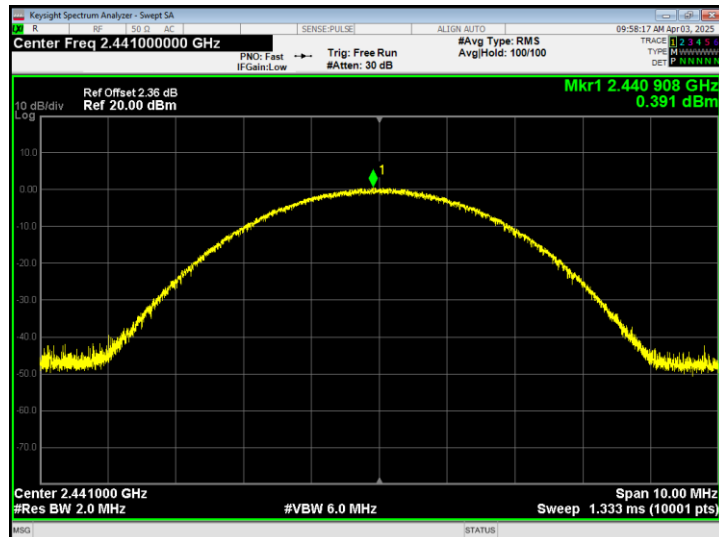


8-DPSK - 3-DH1 Test plots

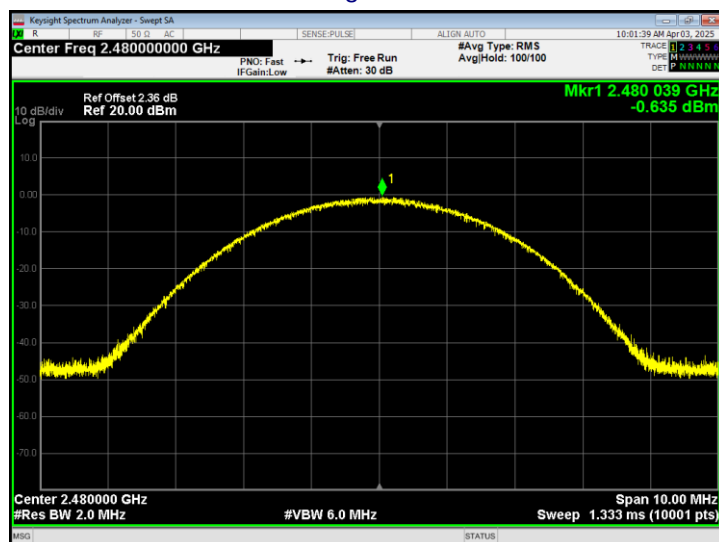
Low Channel



Middle Channel



High Channel





9. HOPPING CHANNEL SEPARATION

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=30KHz, VBW=100KHz, detector=Peak
Limit:	GFSK & $\pi/4$ -DQPSK & 8DSK: 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)

9.1 Test Setup



9.2 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 = 3.0MHz. 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.

9.3 DEVIATION FROM STANDARD

No deviation.



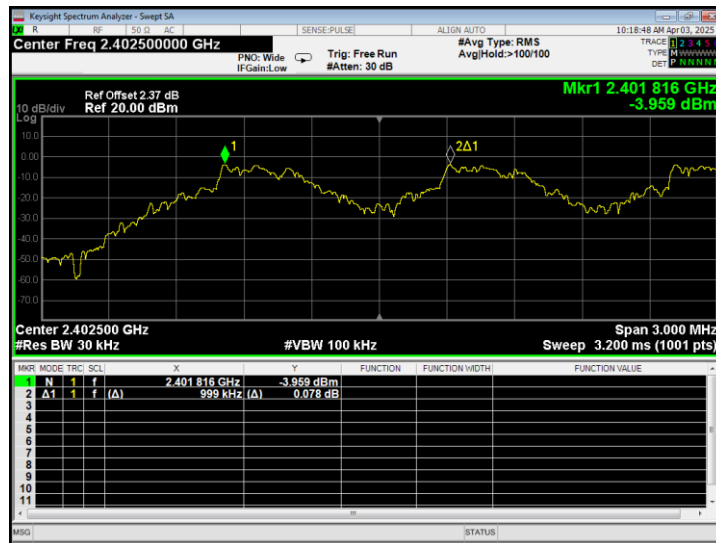
9.4 Test Result

Modulation	Packet	Test Channel	Separation (MHz)	Limit (MHz)	Result
GFSK	1-DH1	Low	0.999	0.677	PASS
		Middle	0.996	0.675	PASS
		High	0.981	0.621	PASS
$\pi/4$ -DQPSK	2-DH1	Low	0.984	0.848	PASS
		Middle	0.990	0.860	PASS
		High	0.996	0.8645	PASS
8-DPSK	3-DH1	Low	1.026	0.833	PASS
		Middle	1.008	0.831	PASS
		High	1.035	0.835	PASS



GFSK - 1-DH1 Test plots

Low Channel



Middle Channel



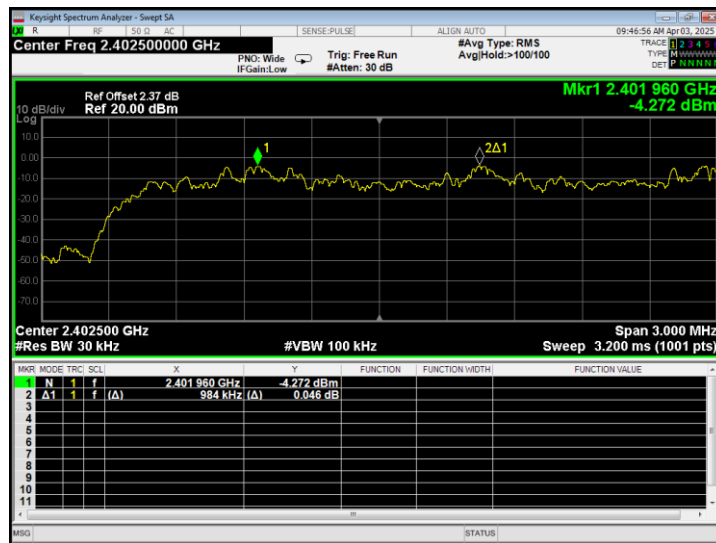
High Channel



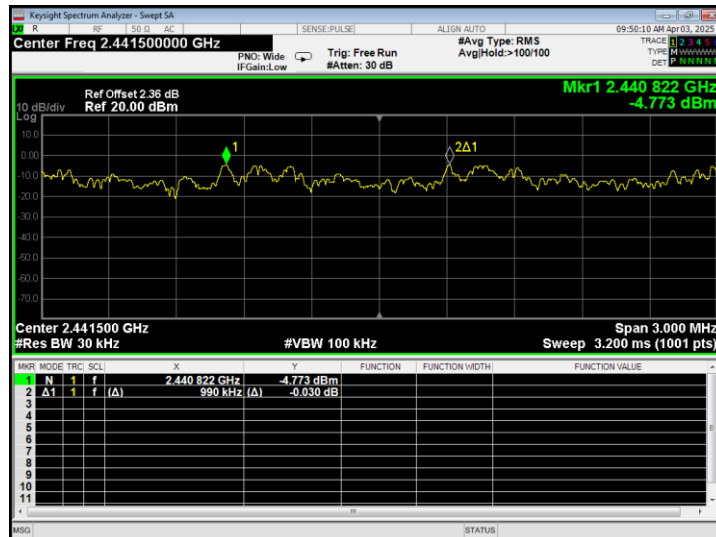


$\pi/4$ -DQPSK - 2-DH1 Test plots

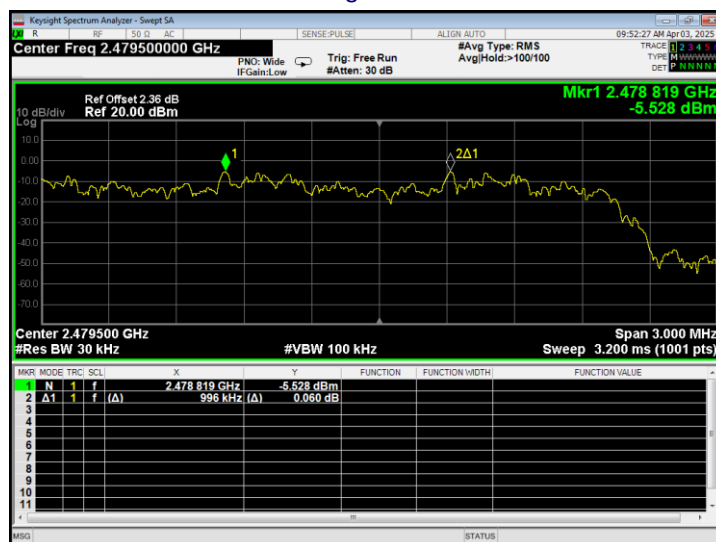
Low Channel



Middle Channel



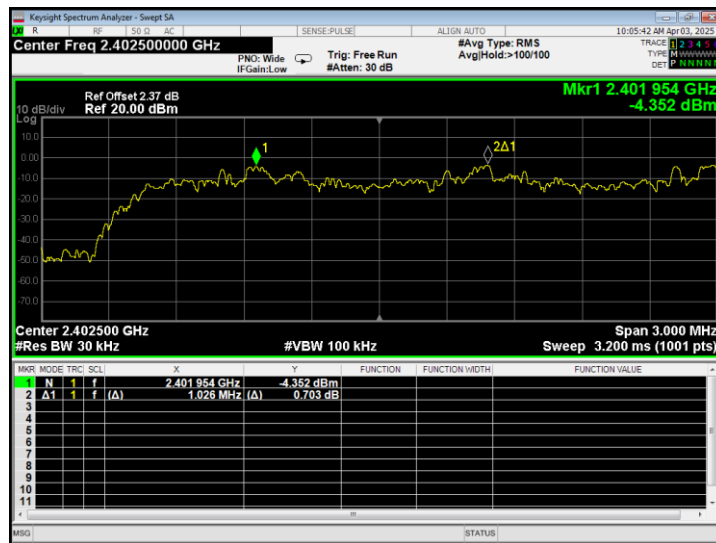
High Channel



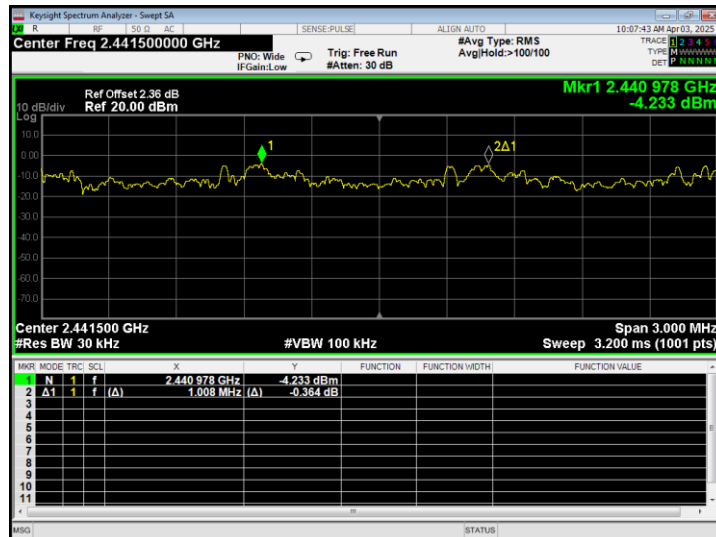


8-DPSK - 3-DH1 Test plots

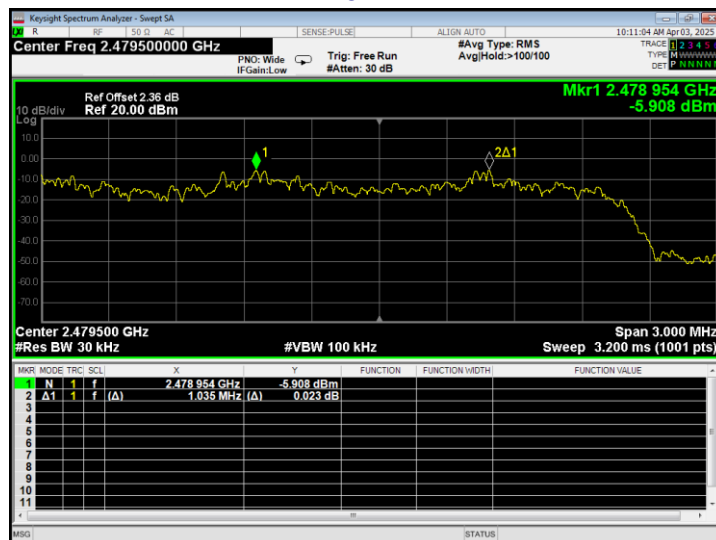
Low Channel



Middle Channel



High Channel





10.NUMBER OF HOPPING FREQUENCY

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 Channels

10.1 Test Setup



10.2 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;

10.3 DEVIATION FROM STANDARD

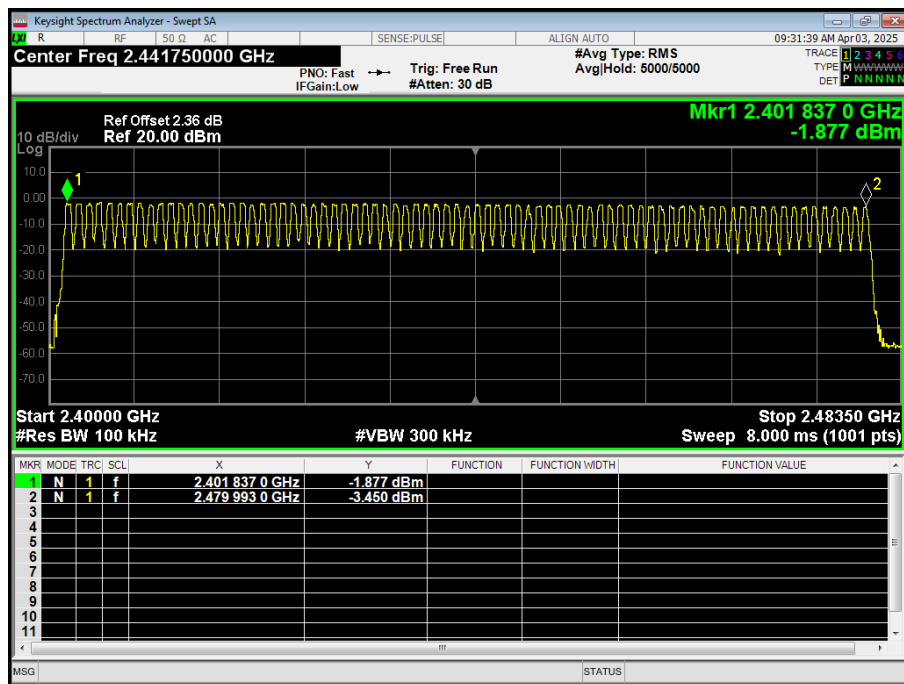
No deviation.



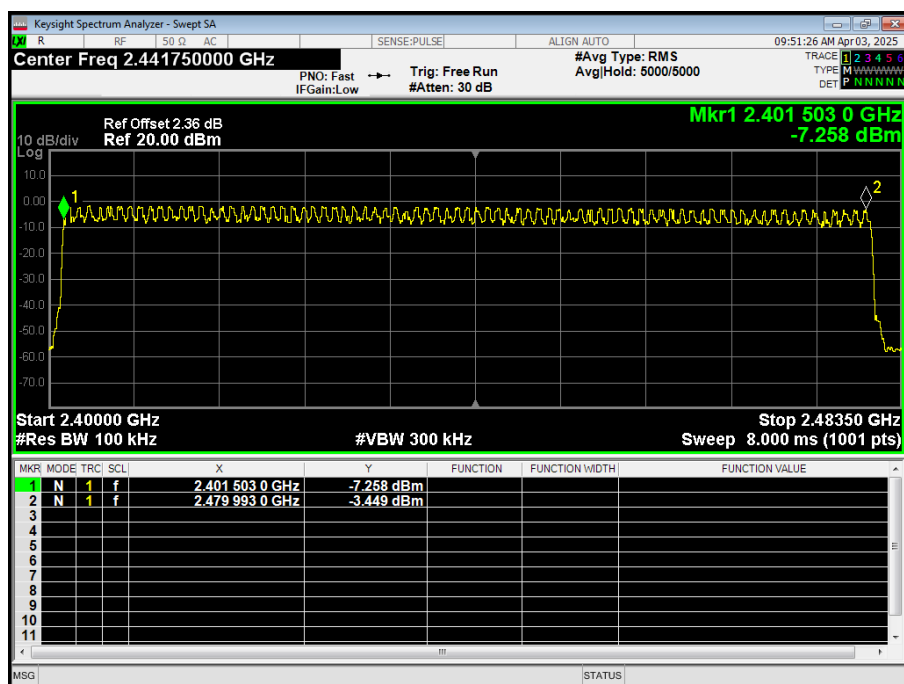
10.4 Test Result

Modulation	Packet	Hopping Number	Limit	Result
GFSK	1-DH1	79	15	Pass
$\pi/4$ -DQPSK	2-DH1	79	15	Pass
8-DPSK	3-DH1	79	15	Pass

GFSK - 1-DH1 Test Plots



$\pi/4$ -DQPSK - 2-DH1 Test Plots





11. DWELL TIME

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(iii)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=3MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second

11.1 Test Setup



11.2 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 = 0Hz;
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).

11.3 DEVIATION FROM STANDARD

No deviation.



11.4 Test Result

GFSK mode:

Frequency	Packet	Pulse Time (ms)	Total Dwell Time (ms)	Limit (ms)	Result
2441MHz	1-DH1	0.389	124.48	400	Pass
2441MHz	1-DH3	1.645	263.20	400	Pass
2441MHz	1-DH5	2.893	308.587	400	Pass

Remarks:

The test period: $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$
Test channel: as blow
CH:2441MHz time slot= $0.389(\text{ms}) \times (1600 / (2 \times 79)) \times 31.6 = 124.48 \text{ ms}$
CH:2441MHz time slot= $1.645(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6 = 263.20 \text{ ms}$
CH:2441MHz time slot= $2.893(\text{ms}) \times (1600 / (6 \times 79)) \times 31.6 = 308.587 \text{ ms}$

$\pi/4$ -DQPSK mode:

Frequency	Packet	Pulse Time (ms)	Total Dwell Time (ms)	Limit (ms)	Result
2441MHz	2-DH1	0.398	127.36	400	Pass
2441MHz	2-DH3	1.649	263.84	400	Pass
2441MHz	2-DH5	2.898	309.12	400	Pass

Remarks:

The test period: $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$
Test channel: as blow
CH:2441MHz time slot= $0.398(\text{ms}) \times (1600 / (2 \times 79)) \times 31.6 = 127.36 \text{ ms}$
CH:2441MHz time slot= $1.649(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6 = 263.84 \text{ ms}$
CH:2441MHz time slot= $2.898(\text{ms}) \times (1600 / (6 \times 79)) \times 31.6 = 309.12 \text{ ms}$

8-DPSK mode:

Frequency	Packet	Pulse Time (ms)	Total Dwell Time (ms)	Limit (ms)	Result
2441MHz	3-DH1	0.397	127.04	400	Pass
2441MHz	3-DH3	1.649	263.84	400	Pass
2441MHz	3-DH5	2.900	309.333	400	Pass

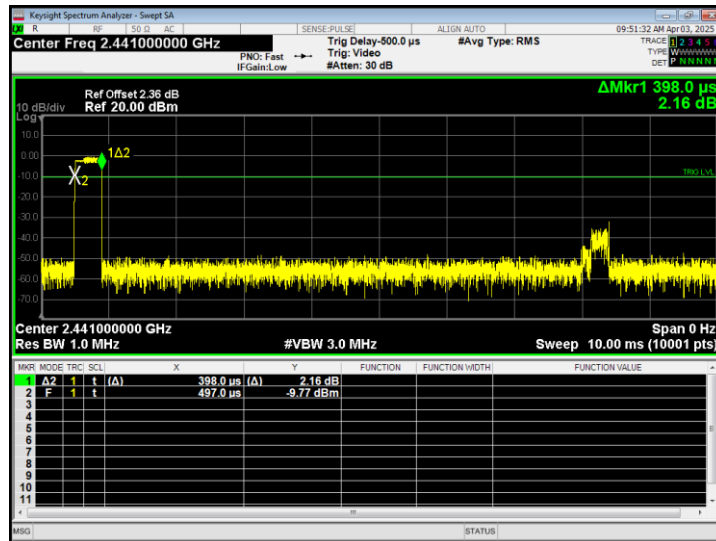
Remarks:

The test period: $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$
Test channel: as blow
CH:2441MHz time slot= $0.397(\text{ms}) \times (1600 / (2 \times 79)) \times 31.6 = 127.04 \text{ ms}$
CH:2441MHz time slot= $1.649(\text{ms}) \times (1600 / (4 \times 79)) \times 31.6 = 263.84 \text{ ms}$
CH:2441MHz time slot= $2.900(\text{ms}) \times (1600 / (6 \times 79)) \times 31.6 = 309.333 \text{ ms}$

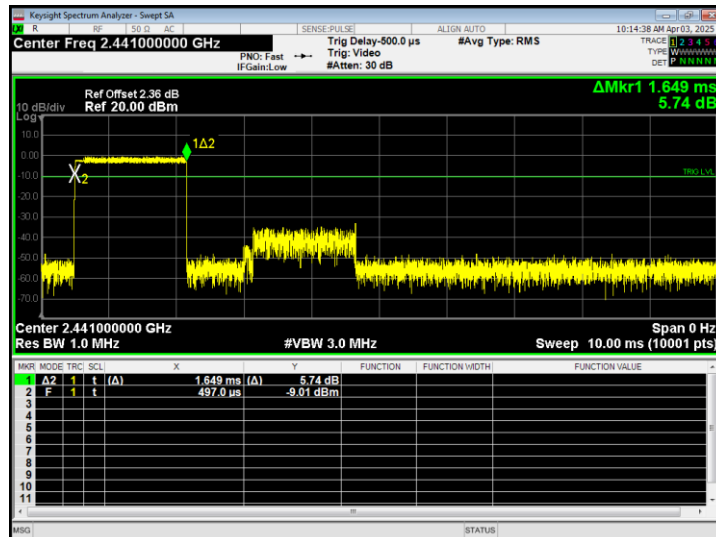


$\pi/4$ -DQPSK Test Plots

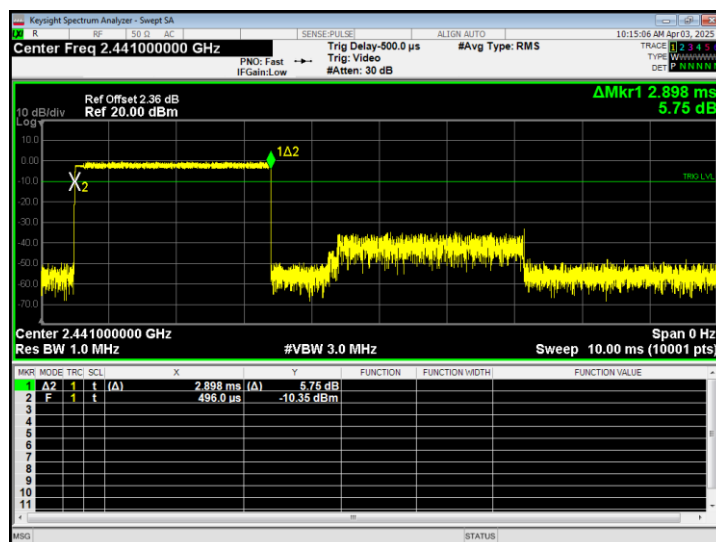
2-DH1 Middle Channel



2-DH3 Middle Channel

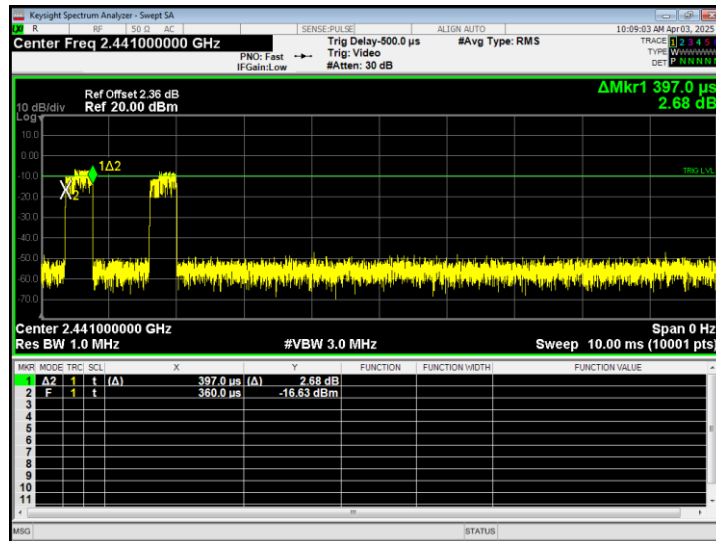


2-DH5 Middle Channel

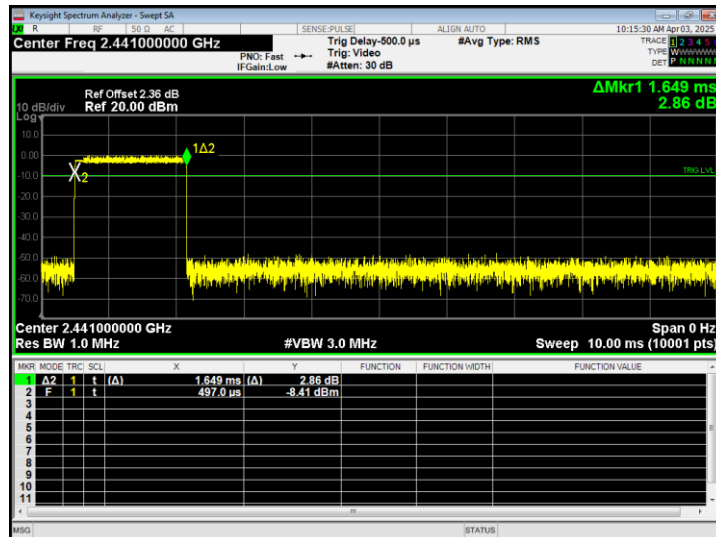




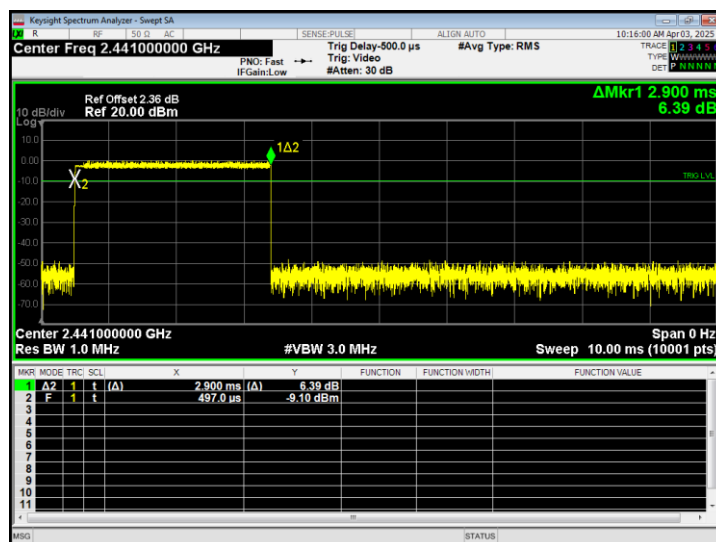
8-DPSK Test Plots 3-DH1 Middle Channel



3-DH3 Middle Channel



3-DH5 Middle Channel





12. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
EUT Antenna:	
The antenna is PCB Antenna, the best case gain of the antennas is -0.58dBi, reference to the appendix II for details.	



13. Test Setup Photo

Reference to the appendix I for details.

14. EUT Constructional Details

Reference to the appendix II for details.

******* END OF REPORT *******