

Appendix A

Report No.:	CISRR24042516301
FCC ID:	2BF5C-MMA4020
Product Name:	BLUETOOTH SPEAKER
Model No.:	MMA4020
Test Engineer:	Lucas Huang
Supervised by:	Rory Huang

1) Conducted Peak Output Power

Test Result

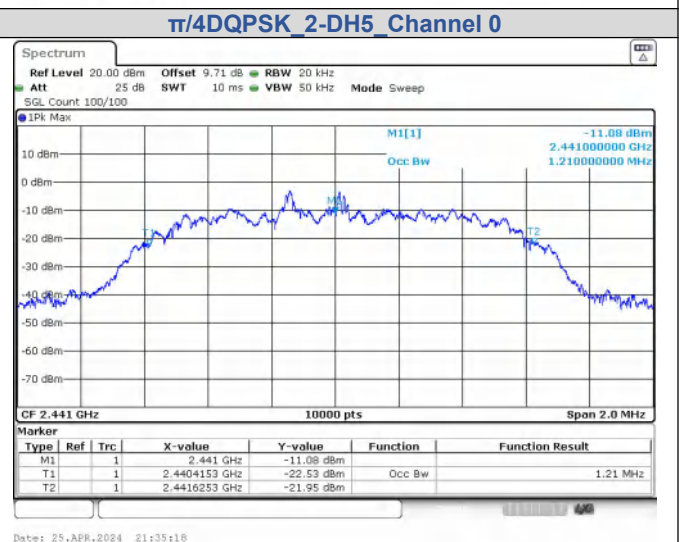
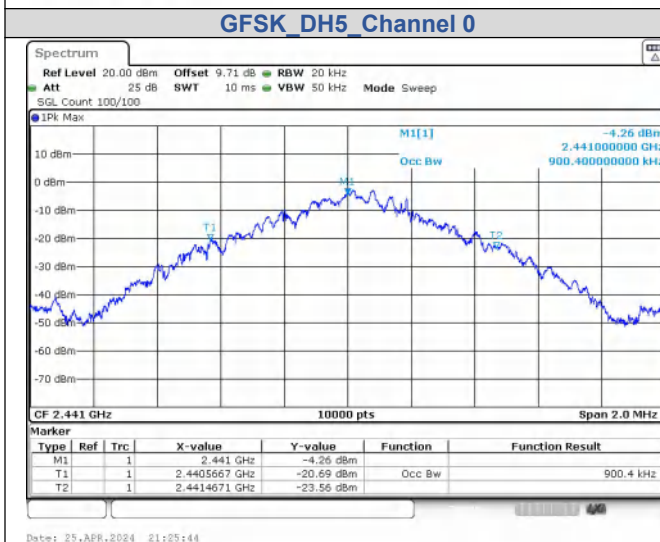
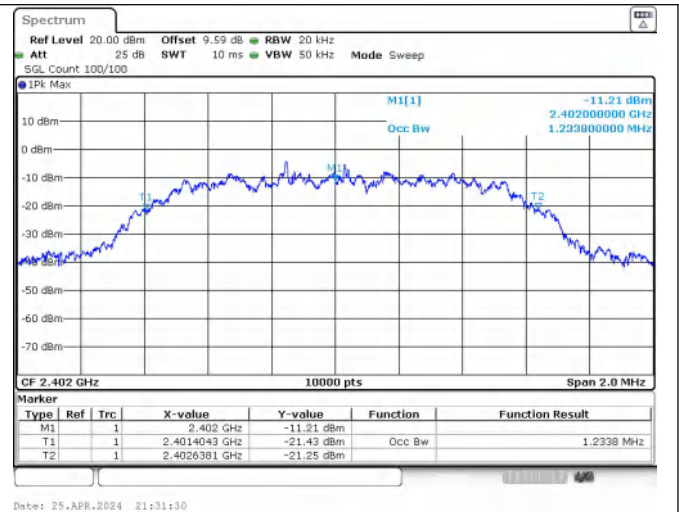
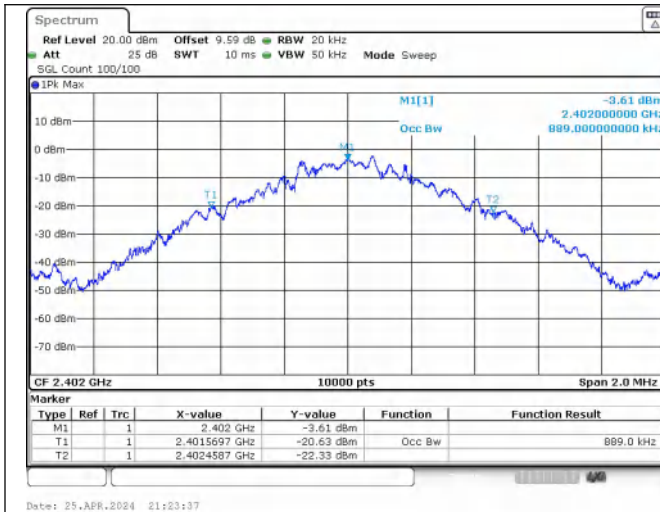
Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	1.274	1.341	30	PASS
		39	1.930	1.560		PASS
		78	1.529	1.422		PASS
$\pi/4$ DQPSK	2-DH5	0	1.767	1.502	20.97	PASS
		39	1.223	1.325		PASS
		78	1.343	1.362		PASS
8DPSK	3-DH5	0	1.647	1.461		PASS
		39	1.697	1.478		PASS
		78	1.599	1.445		PASS

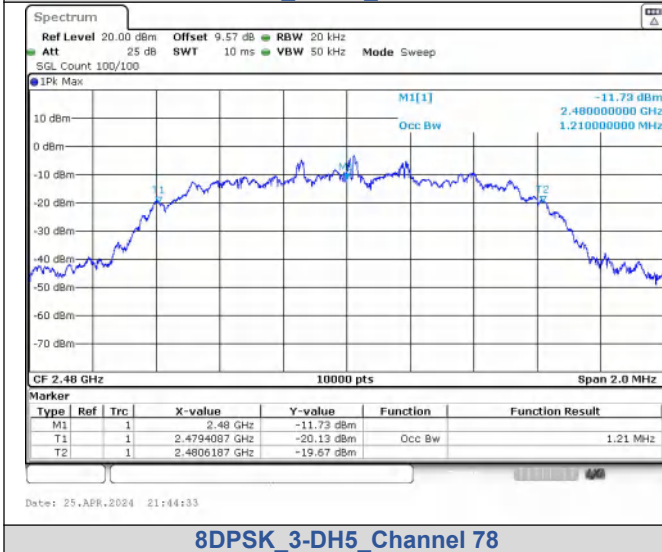
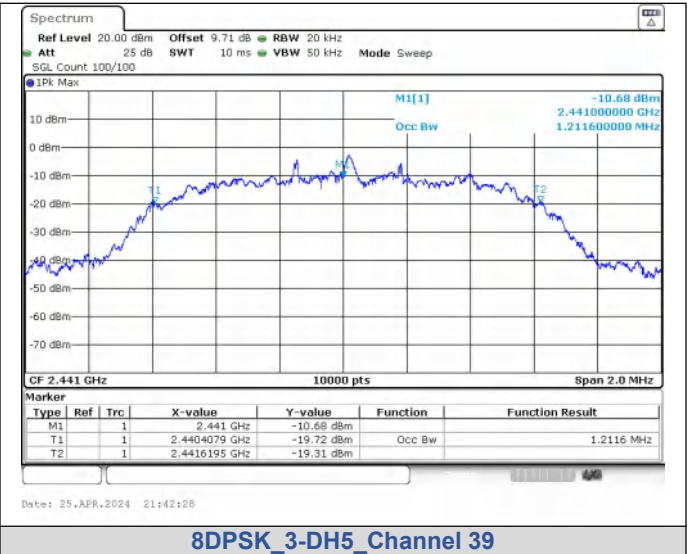
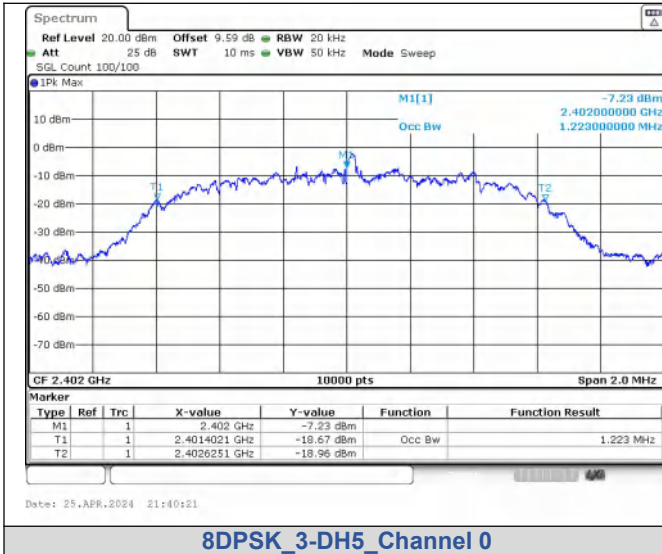
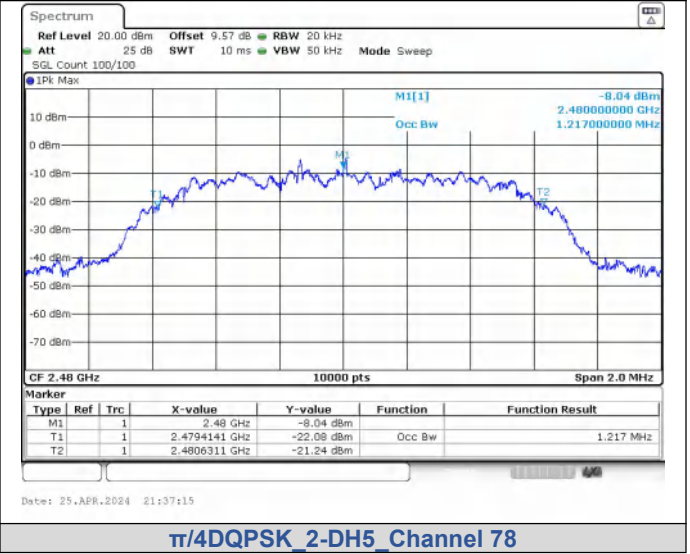
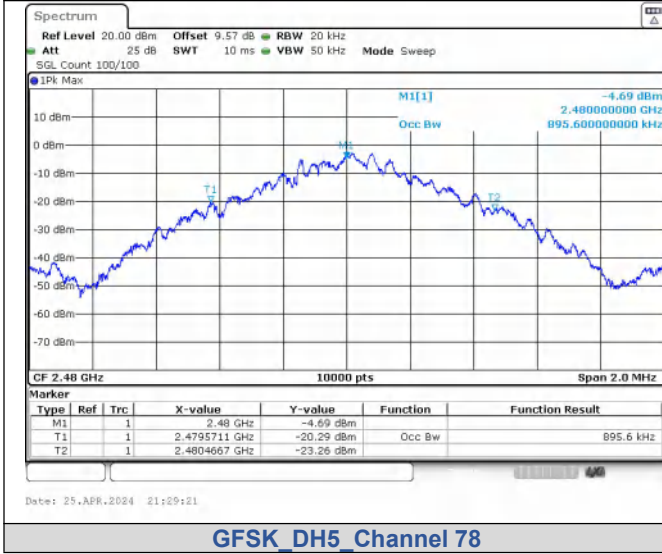
2) 99% Bandwidth

Test Result

Modulation	Channel	99% BW (MHz)
GFSK	0	0.88900
	39	0.90040
	78	0.89560
$\pi/4$ DQPSK	0	1.2340
	39	1.2100
	78	1.2170
8DPSK	0	1.2230
	39	1.2120
	78	1.2100

Test Graphs



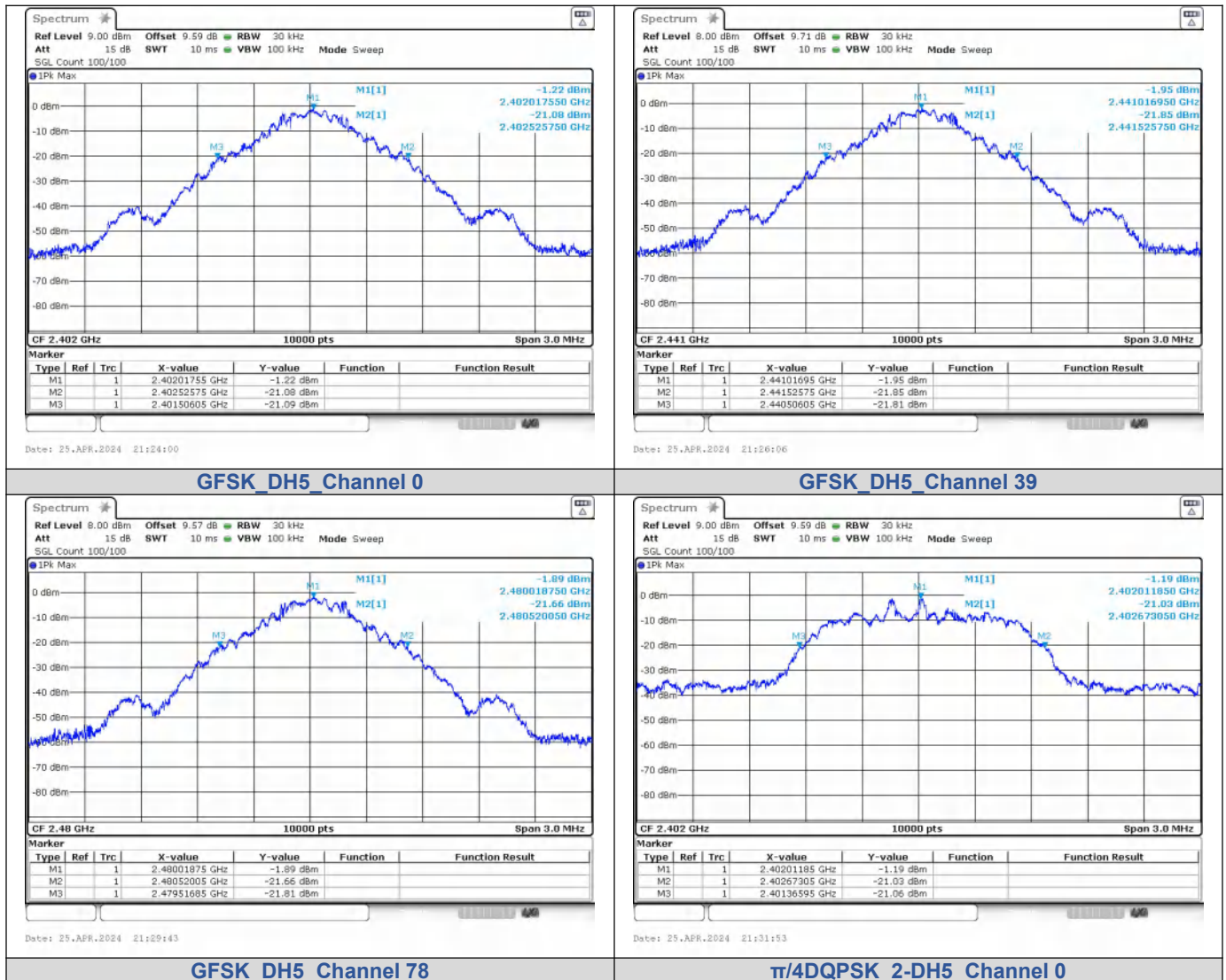


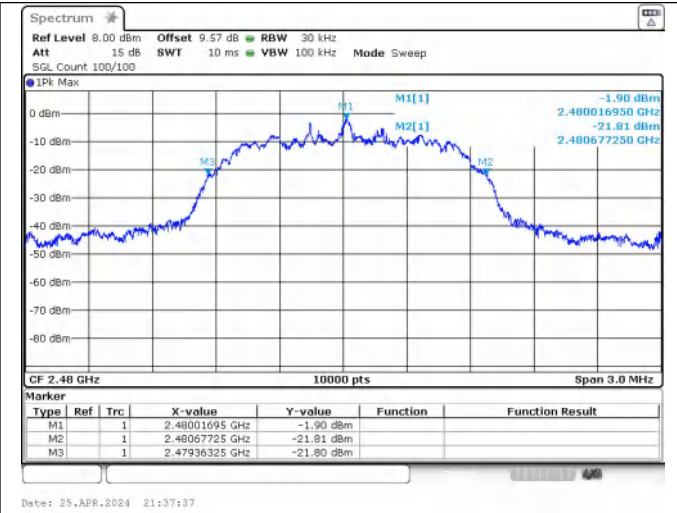
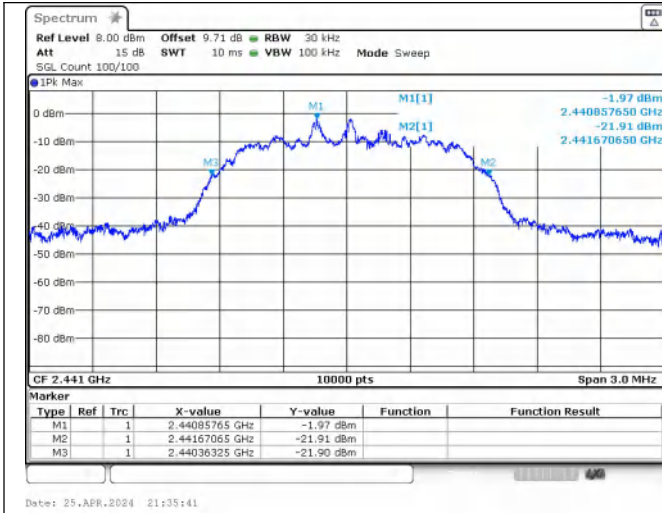
20dB Bandwidth

Test Result

Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.020
	39	2441 MHz	1.020
	78	2480 MHz	1.000
$\pi/4$ DQPSK	0	2402 MHz	1.300
	39	2441 MHz	1.310
	78	2480 MHz	1.320
8DPSK	0	2402 MHz	1.290
	39	2441 MHz	1.290
	78	2480 MHz	1.290

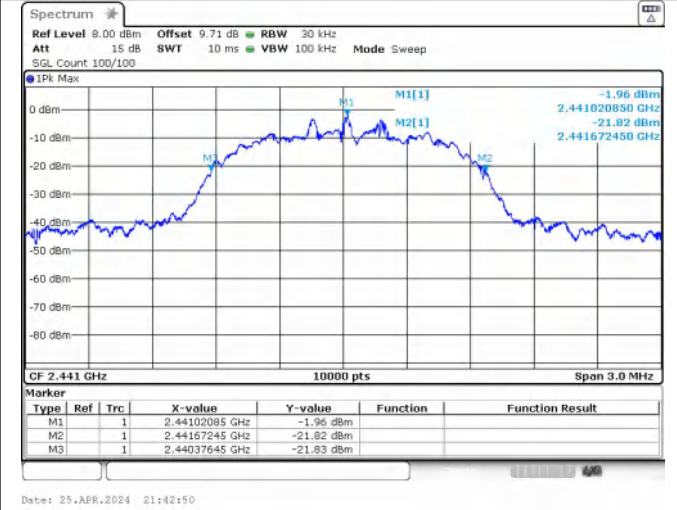
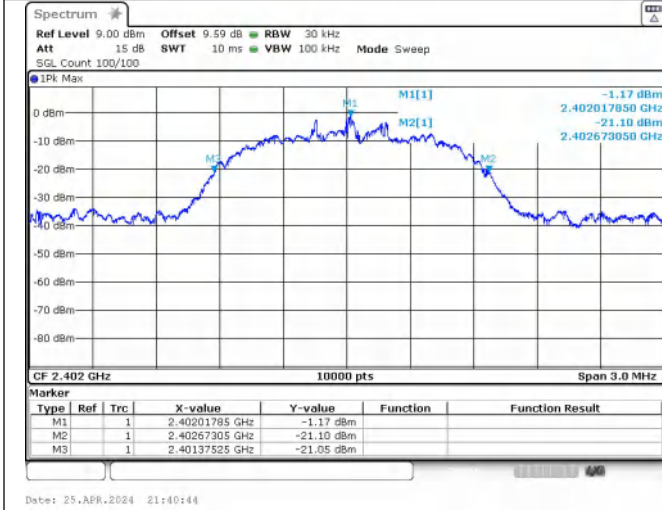
Test Graphs





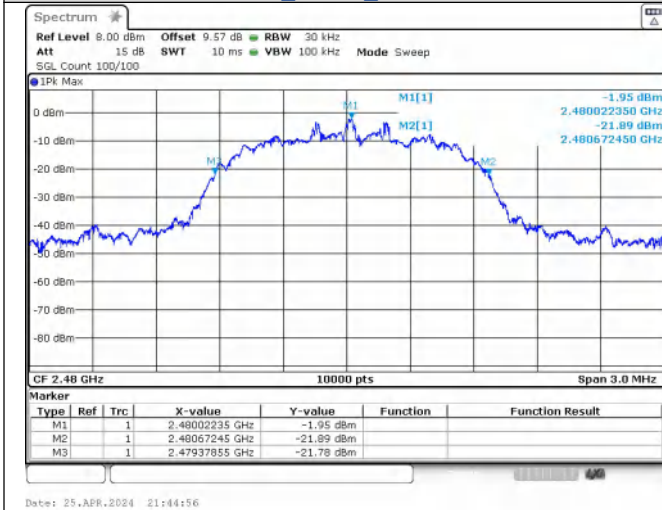
π /4DQPSK_2-DH5_Channel 39

π /4DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0

8DPSK_3-DH5_Channel 39



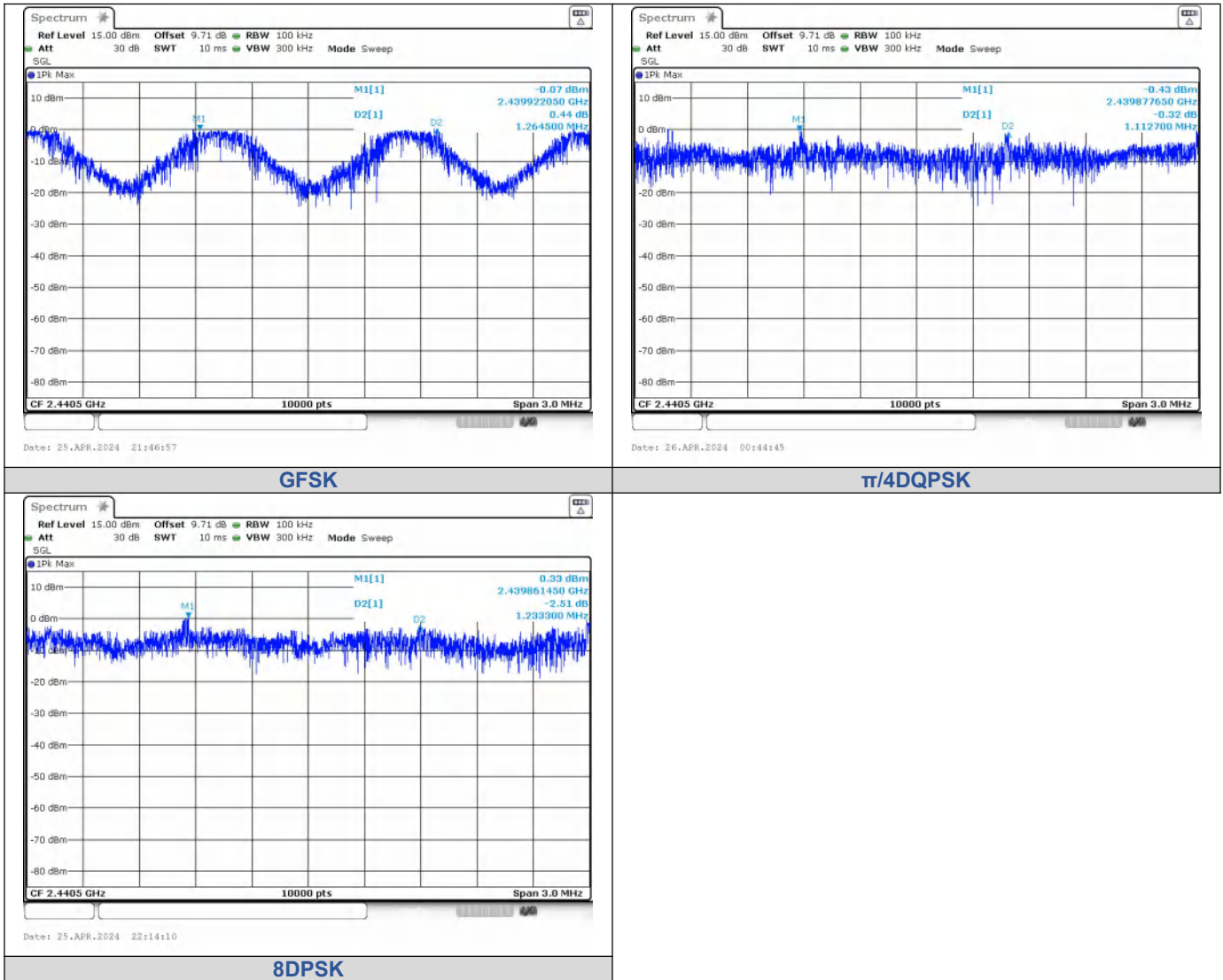
8DPSK_3-DH5_Channel 78

Carrier Frequencies Separation

Test Result

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2439.9221	2441.1865	1.2645	0.68	PASS
$\pi/4$ DQPSK	2-DH5	2439.8776	2440.9904	1.1127	0.867	PASS
8DPSK	3-DH5	2439.8614	2441.0948	1.2333	0.86	PASS

Test Graphs



Conducted Out Of Band Emission

Test Result

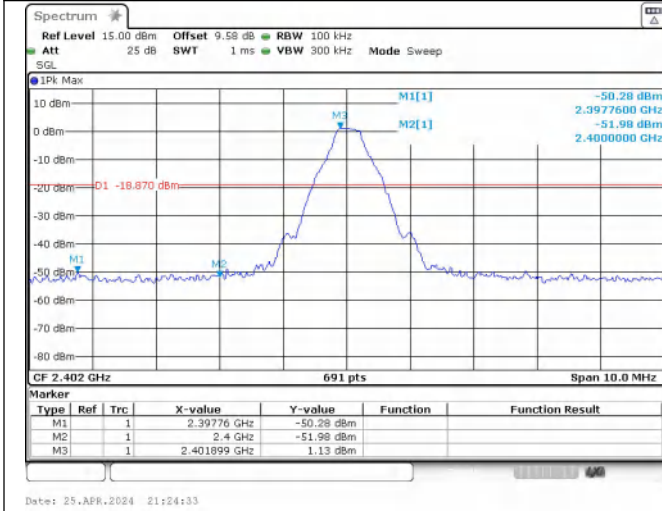
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result	
GFSK	DH5	0	2400.00	-51.983	-18.87	-33.114	PASS	
			2397.76	-50.285	-18.87	-31.415	PASS	
			7206.80	-40.983	-18.87	-22.113	PASS	
		78	39	9763.72	-41.219	-19.55	-21.669	PASS
			2483.50	-51.610	-19.43	-32.180	PASS	
			9920.20	-40.938	-19.43	-21.508	PASS	
$\pi/4$ DQPSK	2-DH5	0	2400.00	-46.458	-19.17	-27.288	PASS	
			7205.96	-44.063	-19.17	-24.893	PASS	
		39	9763.72	-42.079	-19.57	-22.509	PASS	
			2483.50	-52.426	-19.67	-32.756	PASS	
		78	9920.20	-40.734	-19.67	-21.064	PASS	
			2483.50	-53.063	-19.48	-33.583	PASS	
8DPSK	3-DH5	0	2400.00	-47.643	-18.84	-28.803	PASS	
			9608.08	-44.909	-18.84	-26.069	PASS	
		39	9763.72	-42.237	-20.77	-21.467	PASS	
			2483.50	-53.063	-19.48	-33.583	PASS	
		78	9920.20	-40.360	-19.48	-20.880	PASS	
			2483.50	-53.063	-19.48	-33.583	PASS	

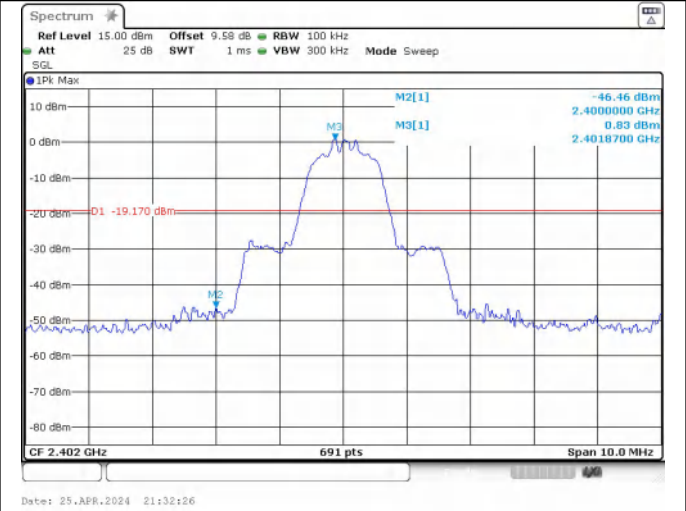
Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2398.96	-50.033	-18.71	-31.323	PASS
			2400.00	-52.031	-18.71	-33.321	PASS
			2483.50	-51.852	-19.6	-32.252	PASS
			2398.87	-49.617	-18.8	-30.817	PASS
			2400.00	-49.906	-18.8	-31.106	PASS
			2483.50	-51.895	-19.86	-32.035	PASS
$\pi/4$ DQPSK	2-DH5		2395.17	-50.417	-18.86	-31.557	PASS
			2400.00	-51.917	-18.86	-33.057	PASS
			2483.50	-50.628	-19.5	-31.128	PASS
			2396.11	-50.254	-21.21	-29.044	PASS
			2400.00	-52.884	-21.21	-31.674	PASS
			2483.50	-51.163	-23.71	-27.453	PASS
8DPSK	3-DH5	2398.06	-49.848	-18.8	-31.048	PASS	
		2400.00	-50.762	-18.8	-31.962	PASS	
		2483.50	-51.773	-20.7	-31.073	PASS	
		2400.00	-48.927	-19.15	-29.777	PASS	
		2483.50	-51.157	-20.33	-30.827	PASS	
		2483.50	-51.157	-20.33	-30.827	PASS	

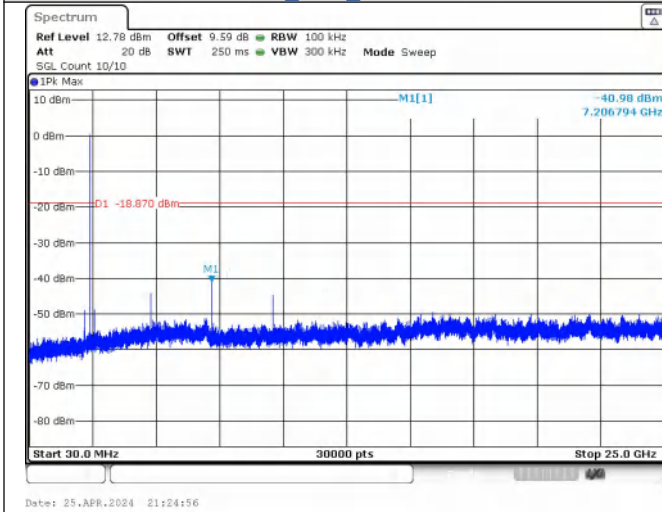
Test Graphs



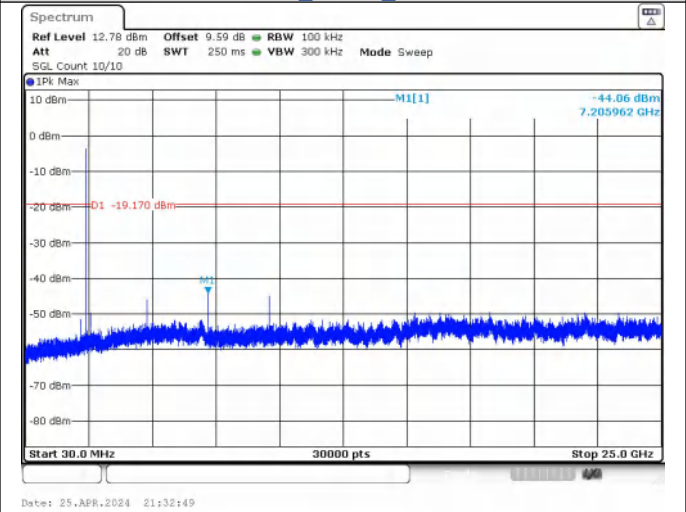
**Out Of Band Emission
GFSK_DH5_Channel 0**



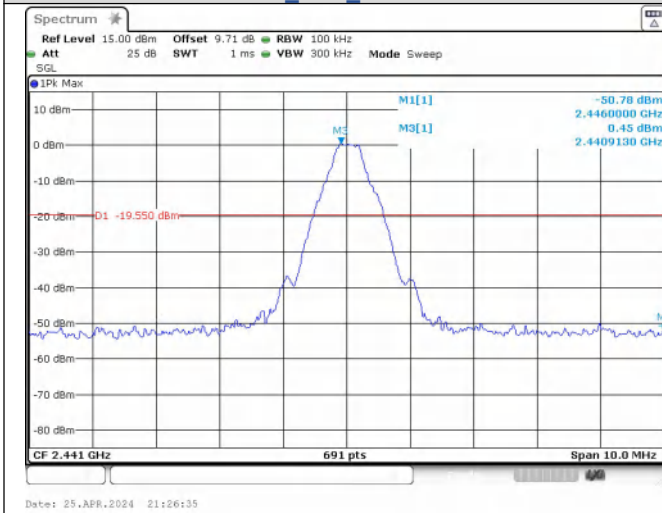
**Out Of Band Emission
 $\pi/4$ QPSK_2-DH5_Channel 0**



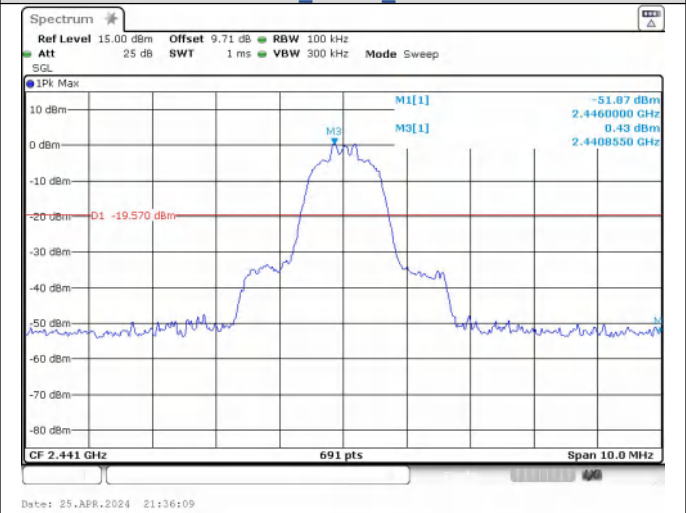
**Spurious Emission
GFSK_DH5_Channel 0**



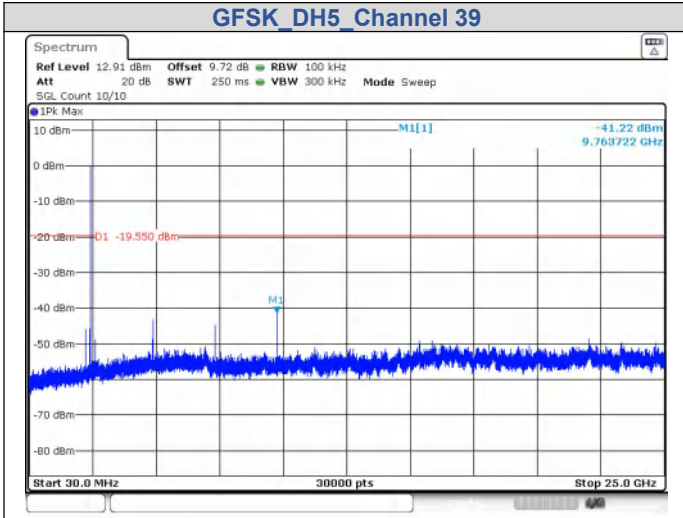
**Spurious Emission
 $\pi/4$ QPSK_2-DH5_Channel 0**



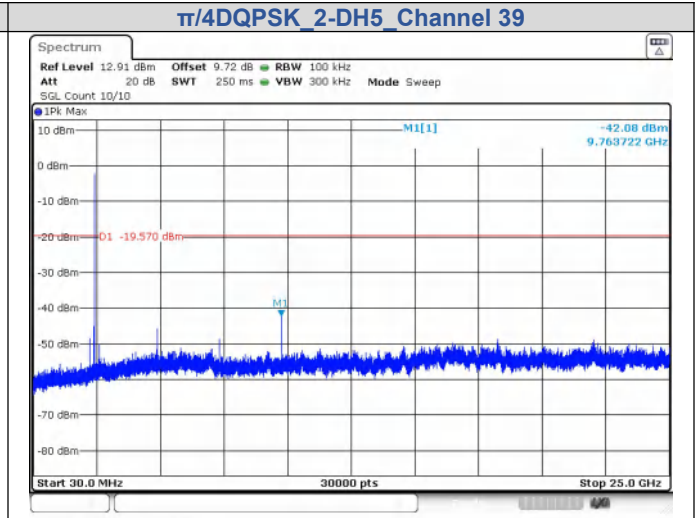
Out Of Band Emission



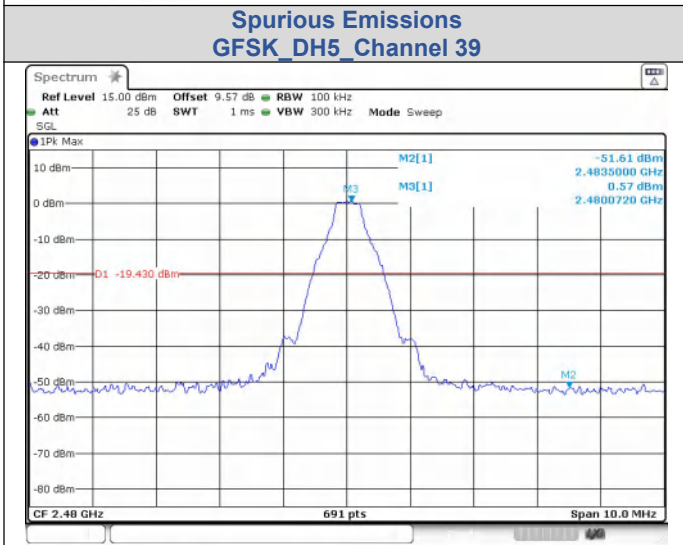
Out Of Band Emission



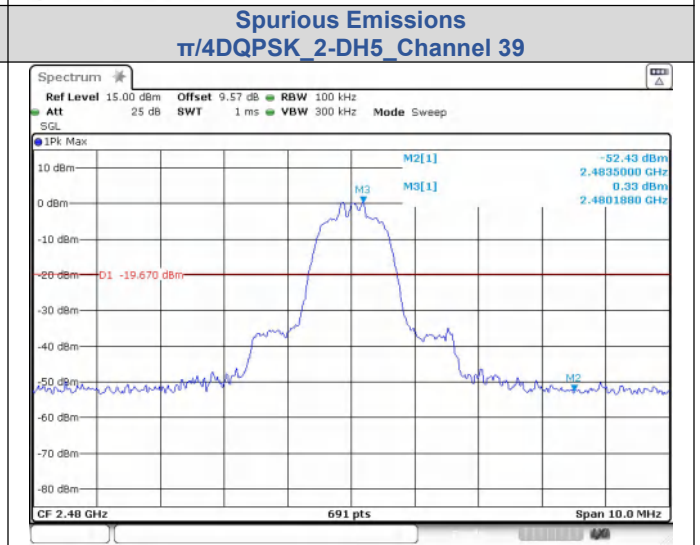
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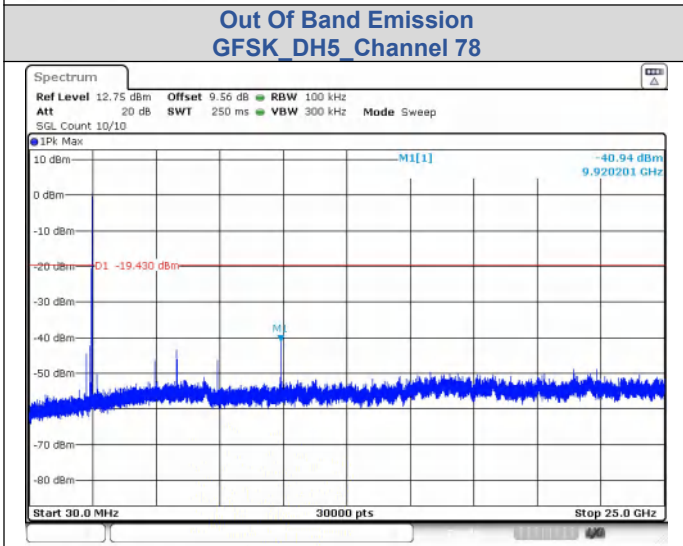
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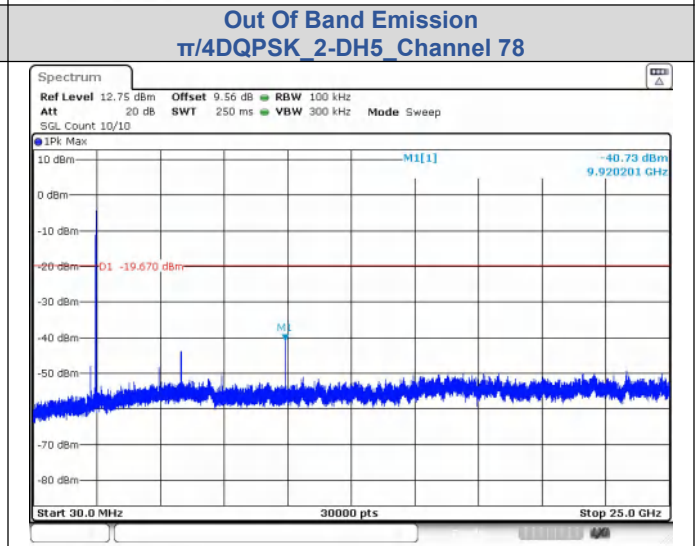
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Date: 25.APR.2024 21:38:11



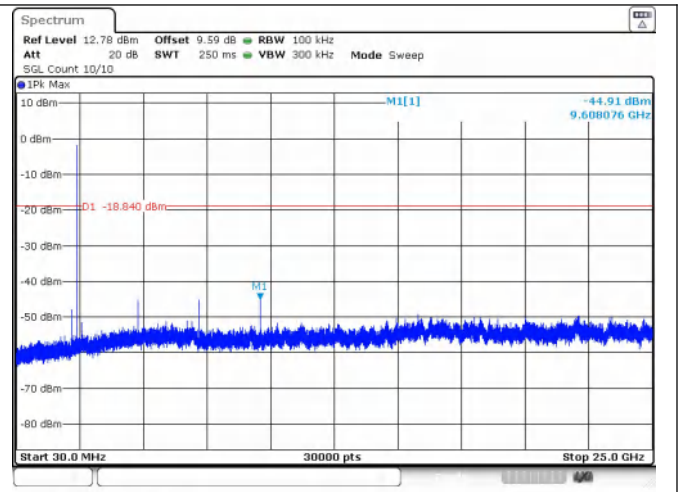
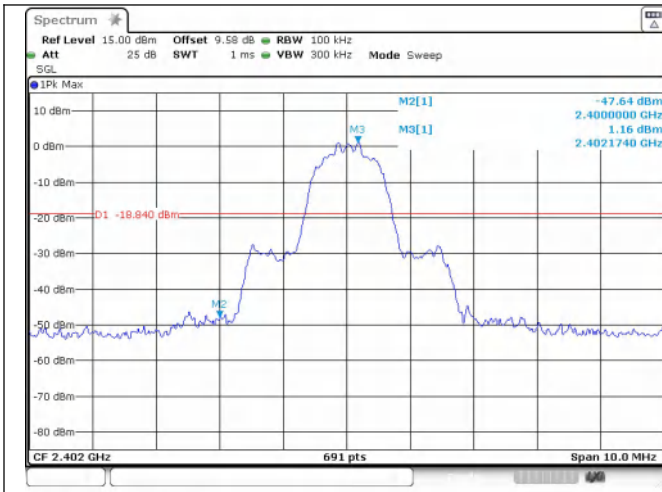
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Date: 25.APR.2024 21:38:33

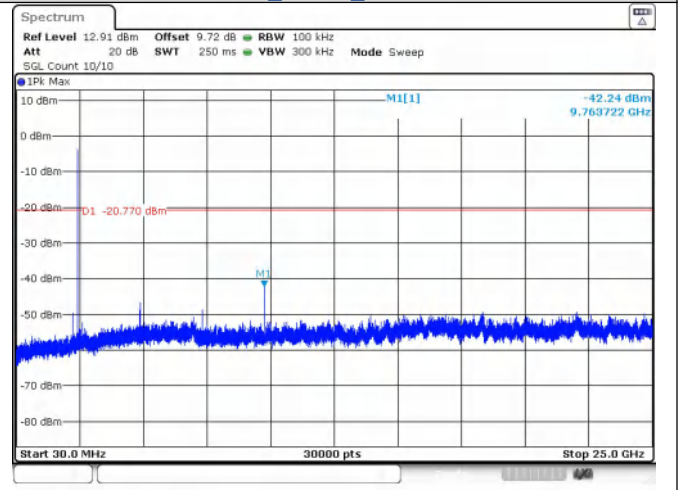
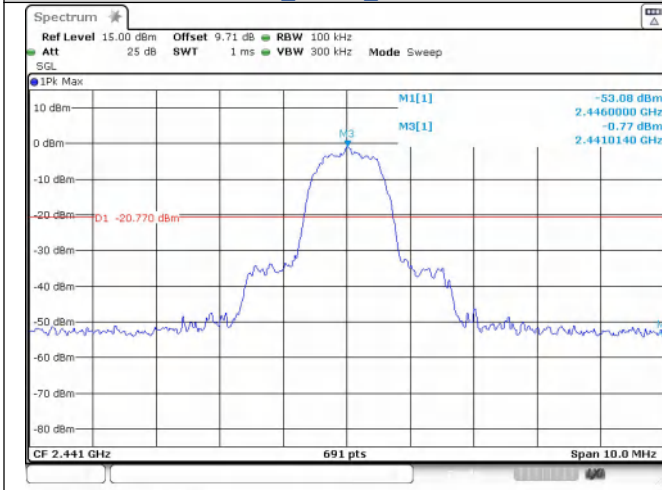
Spurious Emission
GFSK_DH5_Channel 78

Spurious Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78



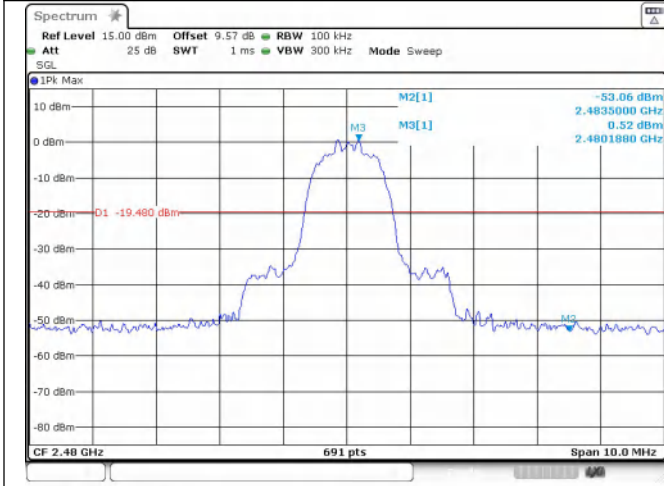
Out Of Band Emission
8DPSK_3-DH5_Channel 0

Spurious Emission
8DPSK_3-DH5_Channel 0



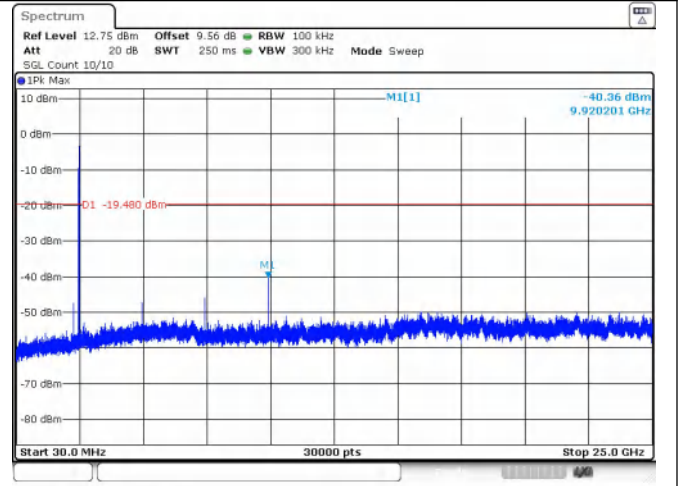
Out Of Band Emission
8DPSK_3-DH5_Channel 39

Spurious Emissions
8DPSK_3-DH5_Channel 39



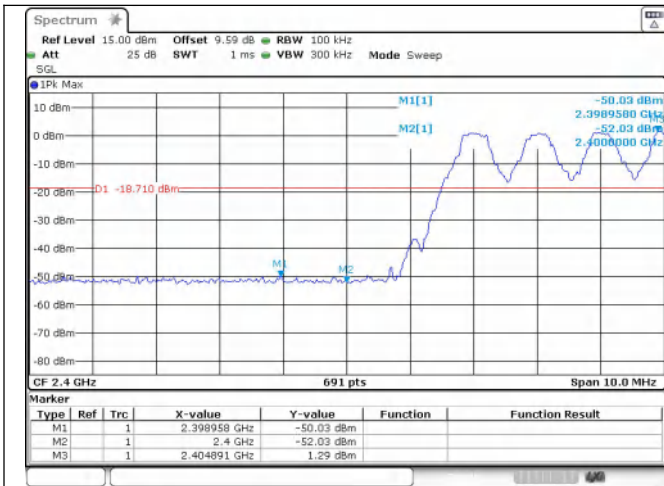
Date: 25.APR.2024 21:45:30

**Out Of Band Emission
8DPSK_3-DH5_Channel 78**



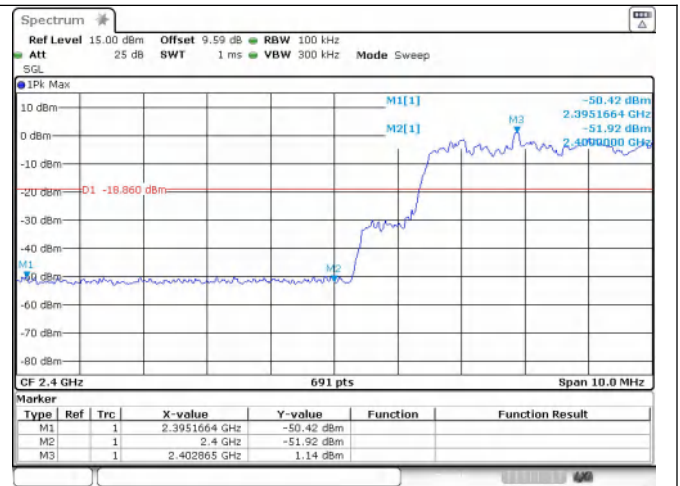
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**Spurious Emission
8DPSK_3-DH5_Channel 78**



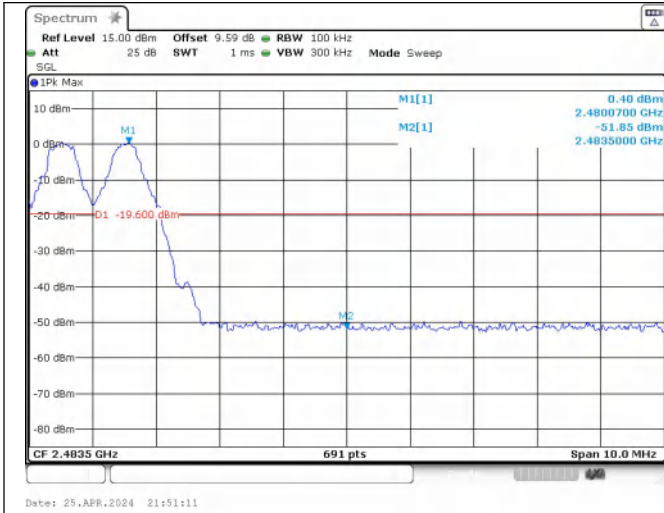
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**Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping**

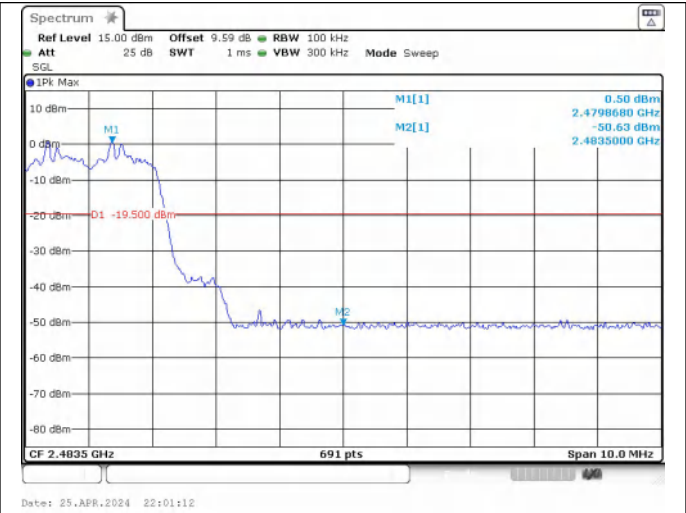


Date: 25.APR.2024 21:59:21

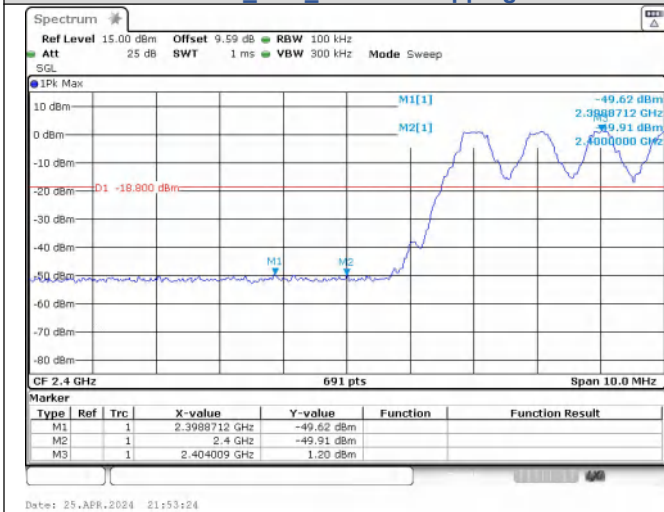
**Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping**



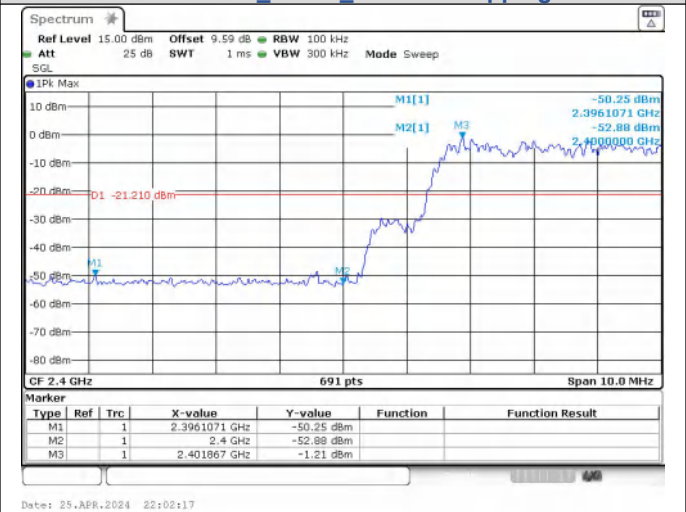
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



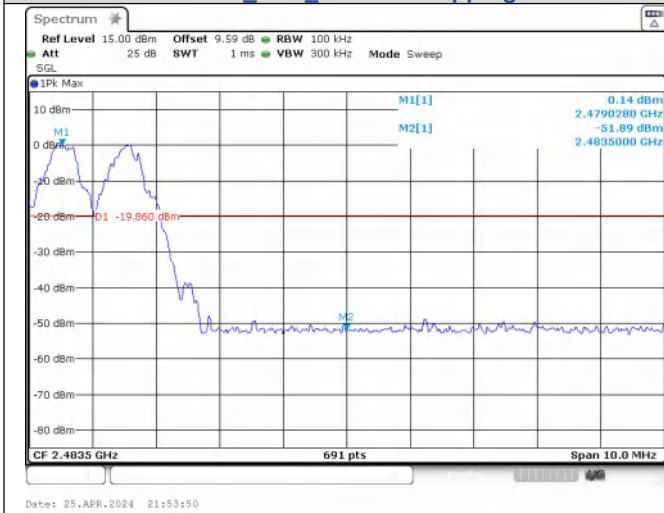
Out Of Band Emission(Right)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping



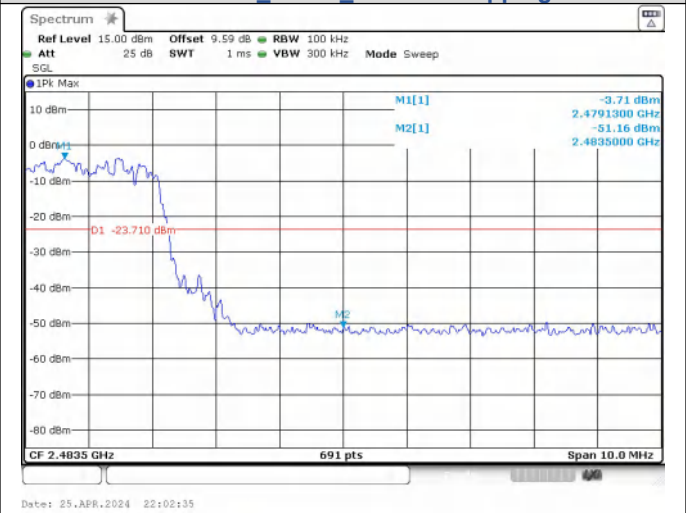
Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping

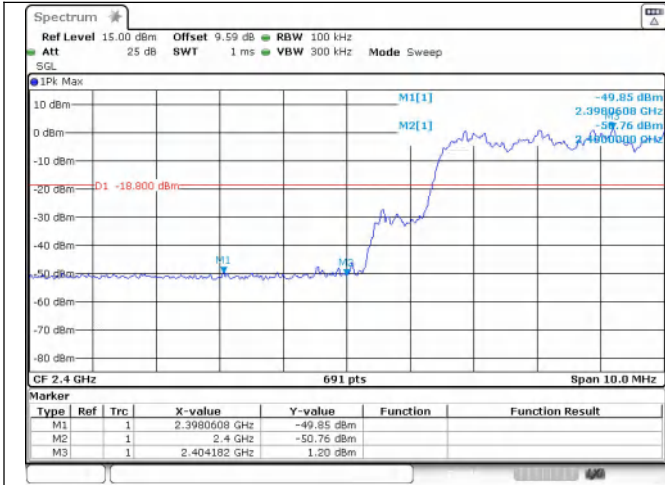


Out Of Band Emission(Right)

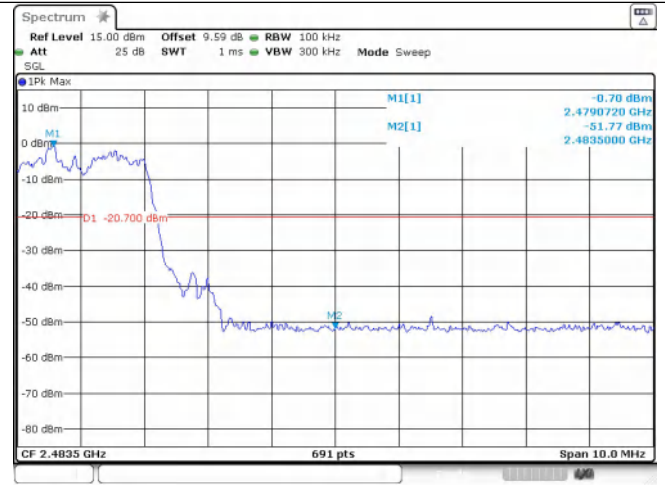


Out Of Band Emission(Right)

GFSK_DH5_Channel Hopping **$\pi/4$ DQPSK_2-DH5_Channel Hopping**

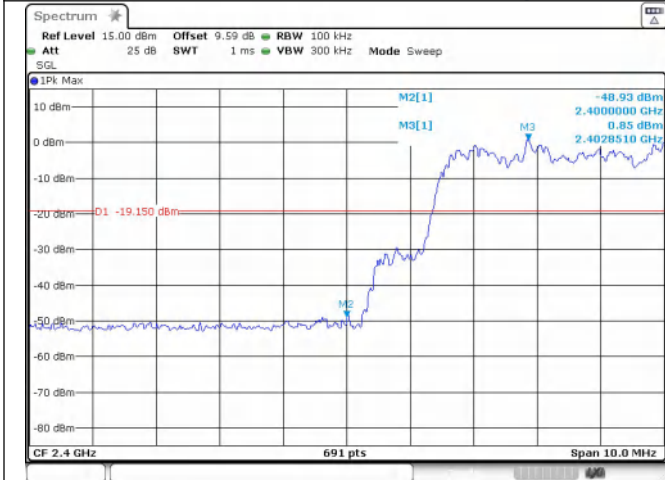


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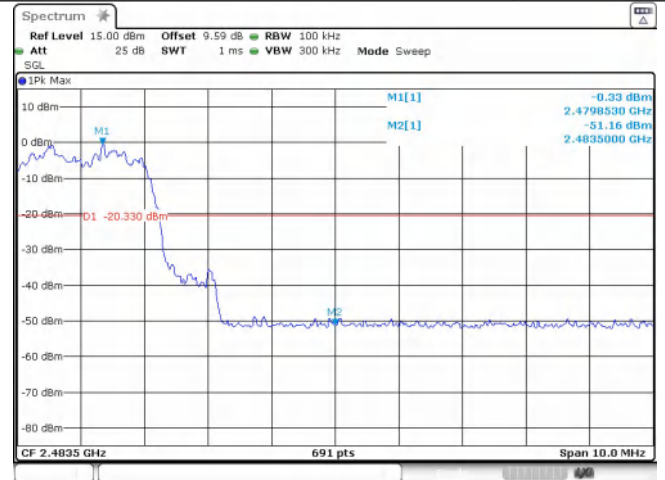
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Out Of Band Emission(Left)
8DPSK_3-DH5_Channel Hopping



Date: 25.APR.2024 22:11:47

Out Of Band Emission(Right)
8DPSK_3-DH5_Channel Hopping



Date: 25.APR.2024 22:13:08

Out Of Band Emission(Left)
8DPSK_3-DH5_Channel Hopping

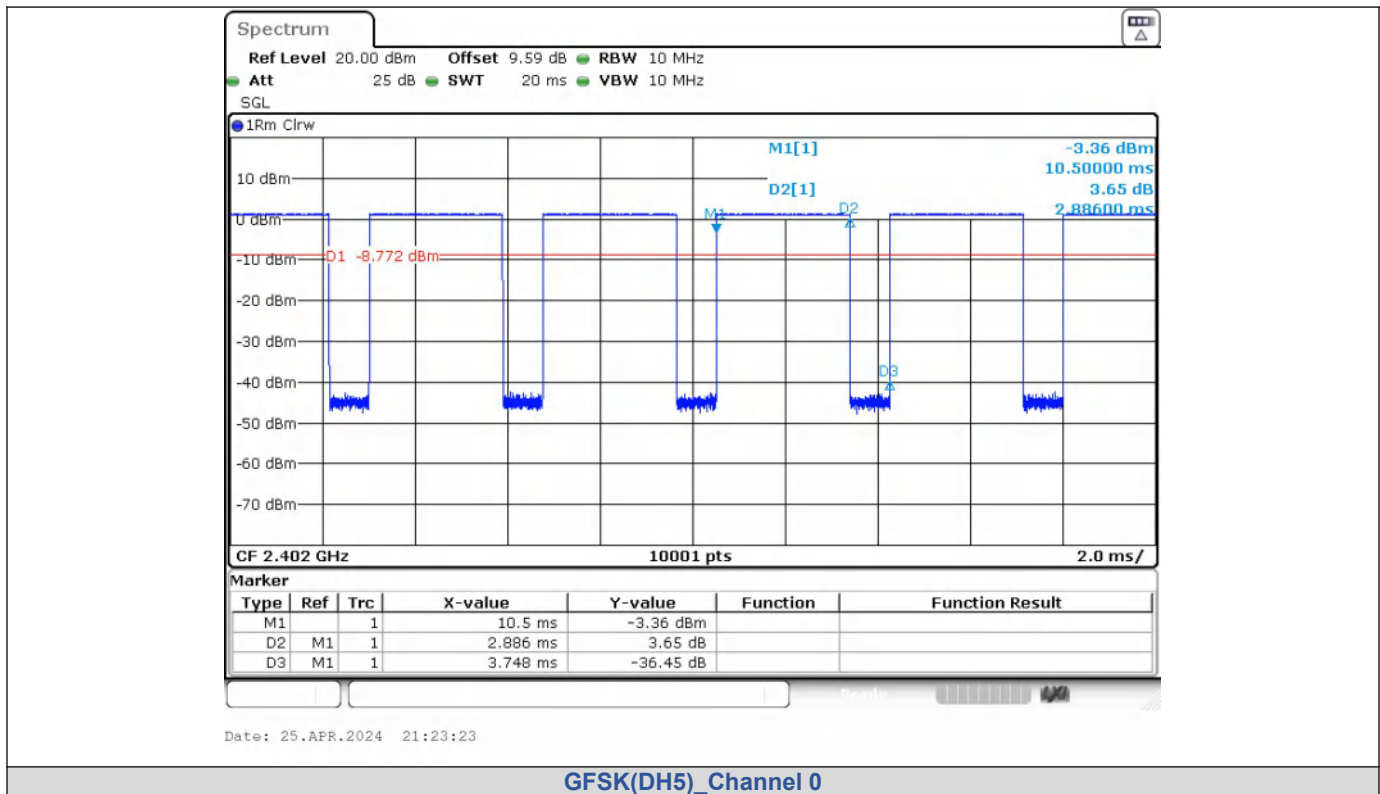
Out Of Band Emission(Right)
8DPSK_3-DH5_Channel Hopping

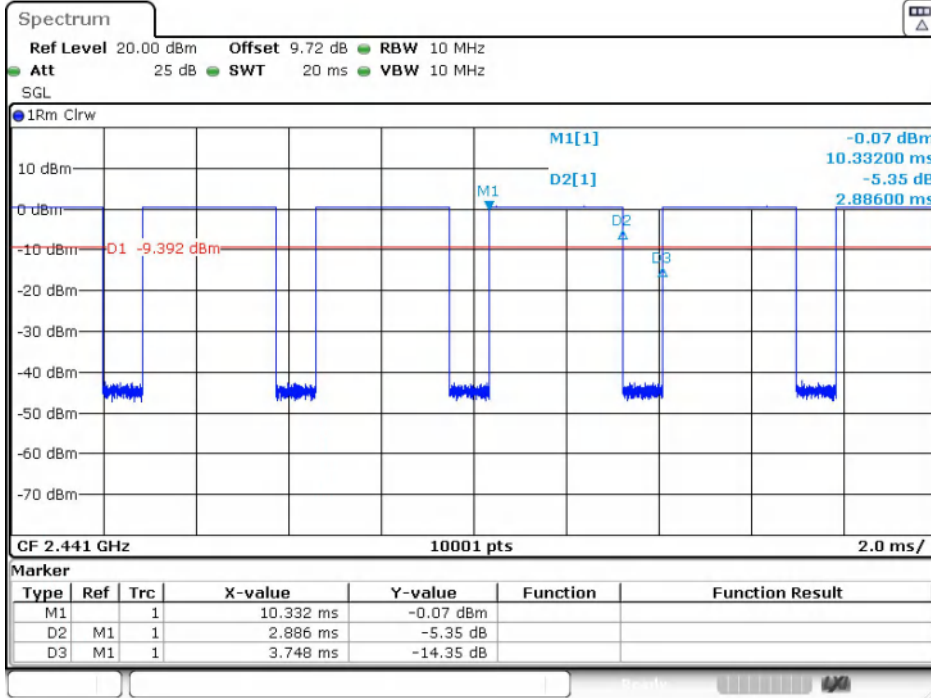
Duty Cycle

Test Result

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.886	3.748	77.00	0.7700	1.1351	0.35
		39	2.886	3.748	77.00	0.7700	1.1351	0.35
		78	2.886	3.748	77.00	0.7700	1.1351	0.35
$\pi/4$ DQPSK	2-DH5	0	2.892	3.748	77.16	0.7716	1.1261	0.35
		39	2.892	3.748	77.16	0.7716	1.1261	0.35
		78	2.890	3.746	77.15	0.7715	1.1266	0.35
8DPSK	3-DH5	0	2.892	3.748	77.16	0.7716	1.1261	0.35
		39	2.894	3.748	77.21	0.7721	1.1233	0.35
		78	2.894	3.748	77.21	0.7721	1.1233	0.35

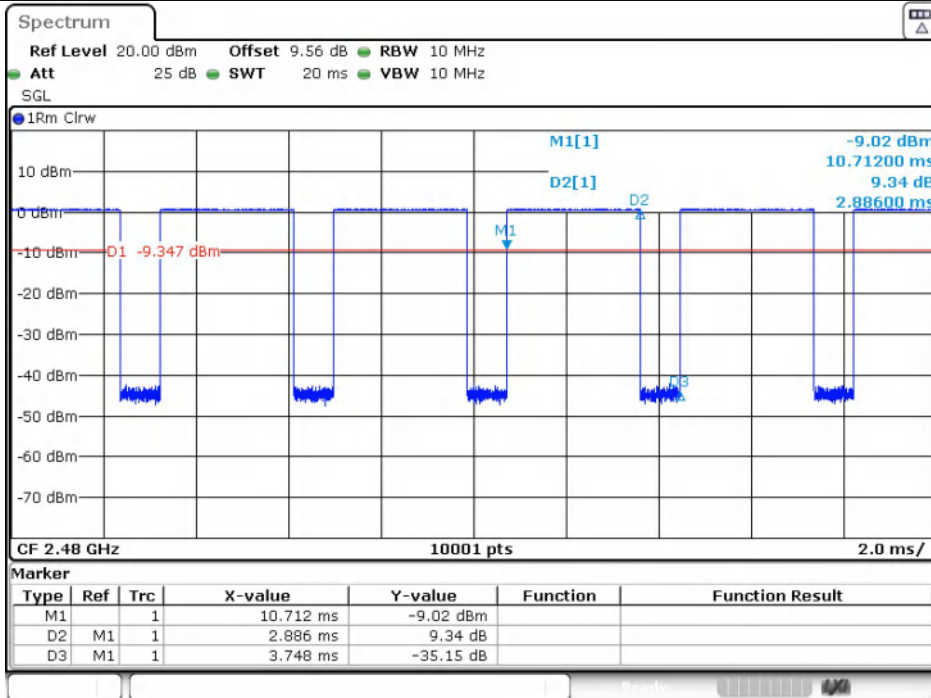
Test Graphs





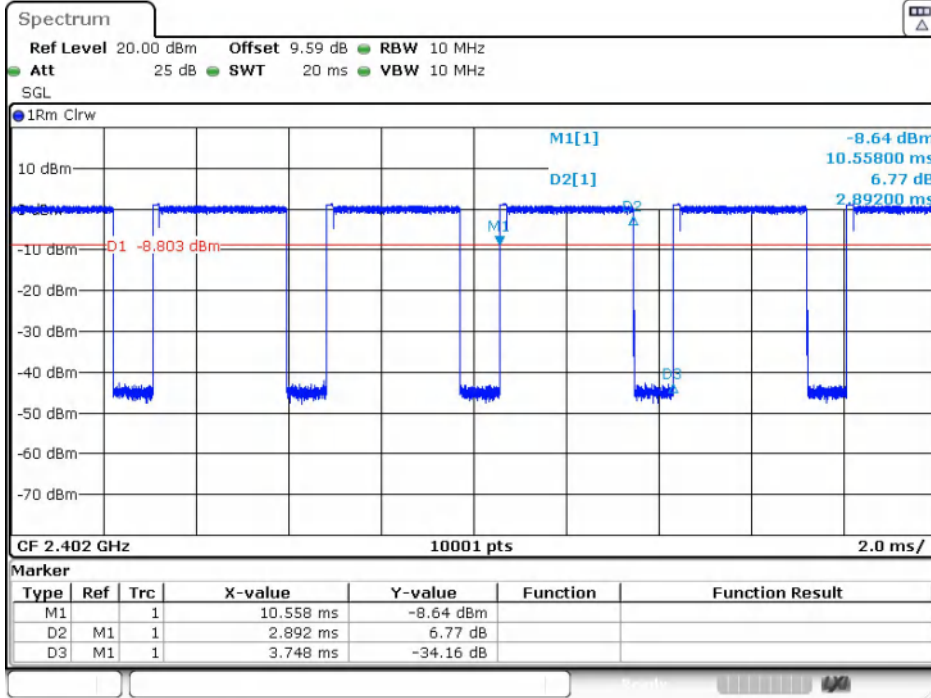
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GFSK(DH5)_Channel 39



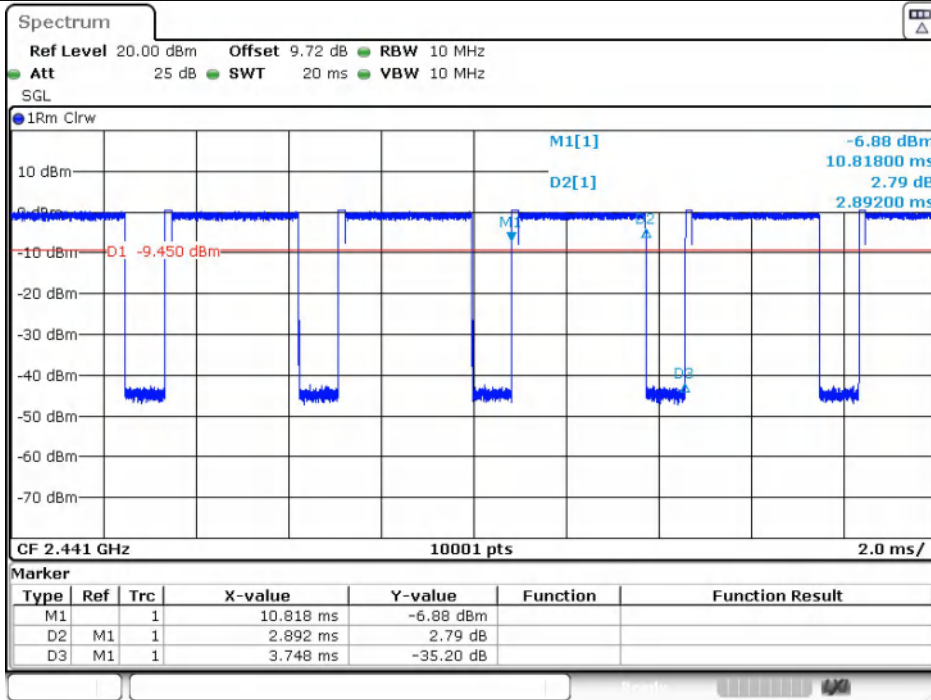
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GFSK(DH5)_Channel 78



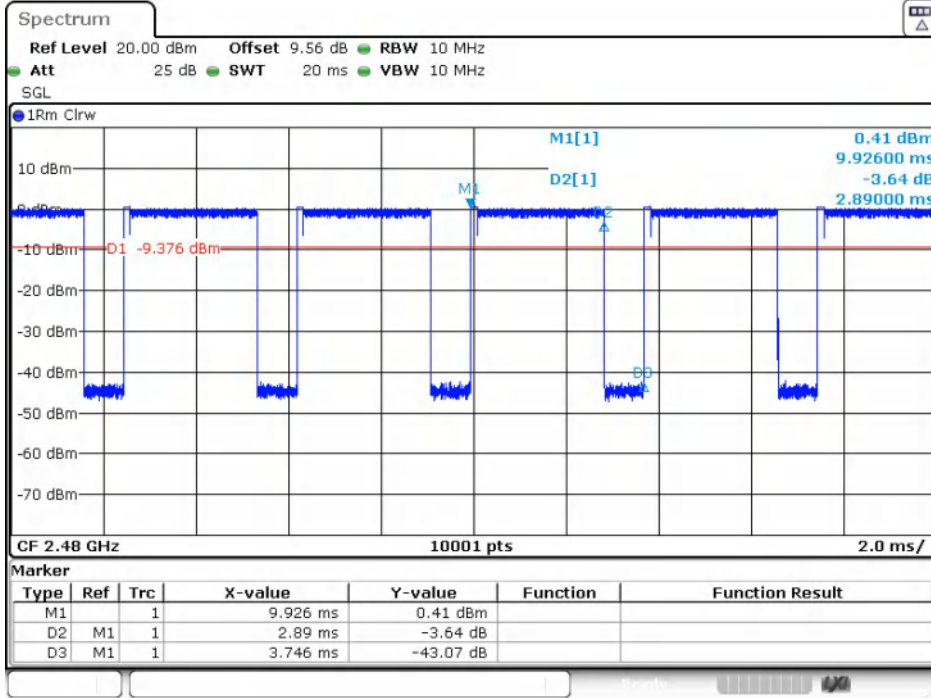
Date: 25.APR.2024 21:31:16

$\pi/4$ DQPSK(2-DH5)_Channel 0



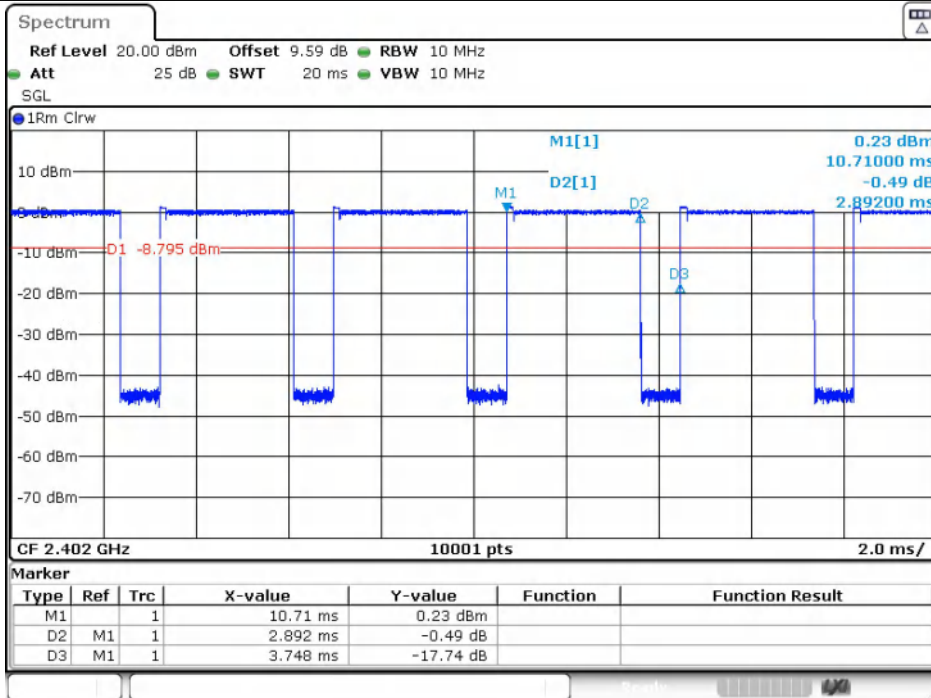
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$\pi/4$ DQPSK(2-DH5)_Channel 39



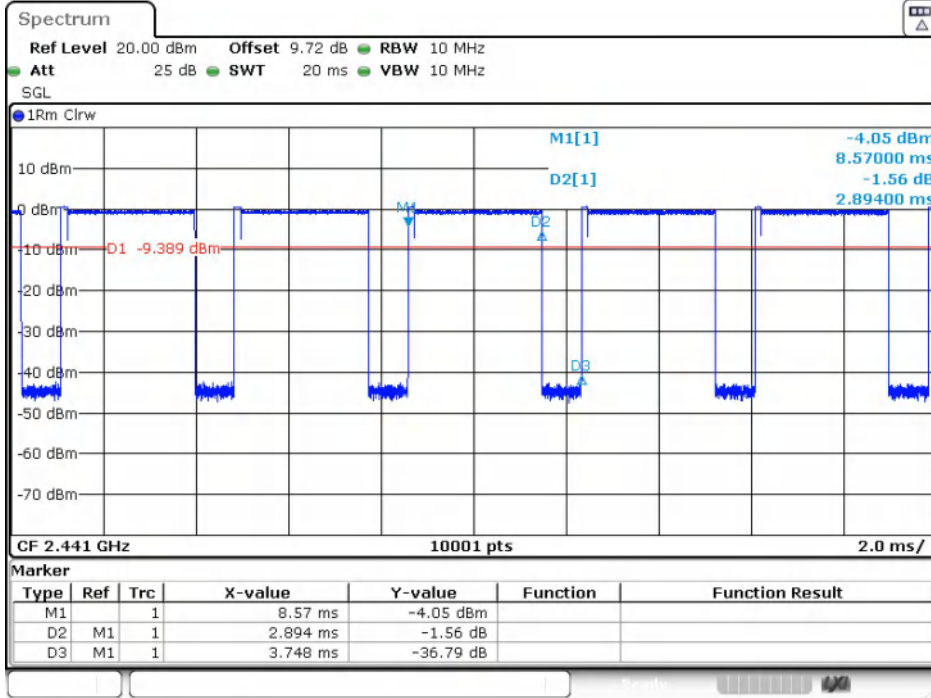
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π/4DQPSK(2-DH5)_Channel 78



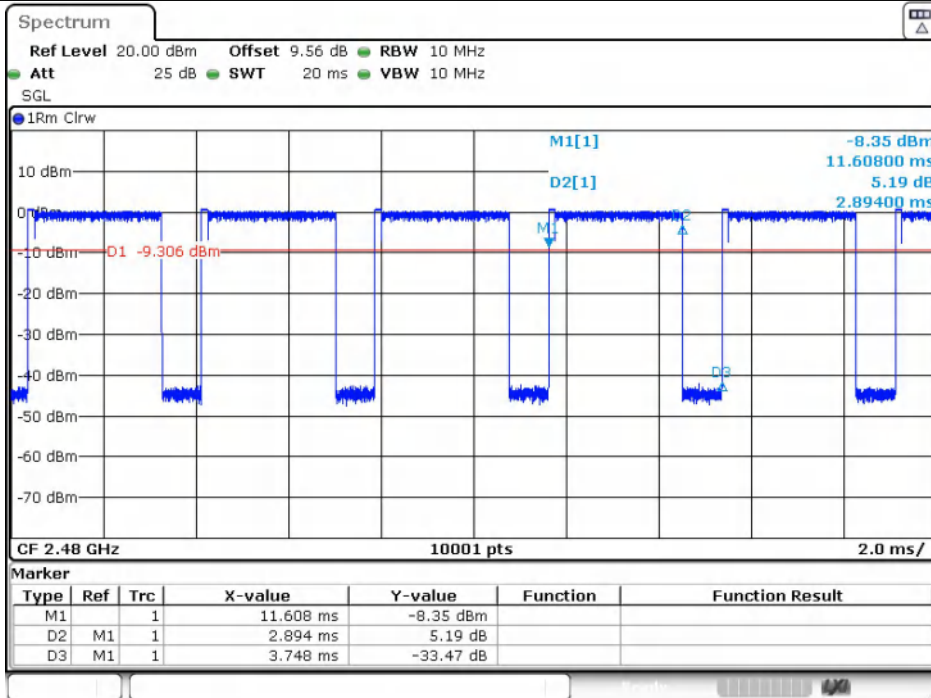
Date: 25.APR.2024 21:40:07

8DPSK(3-DH5)_Channel 0



Date: 25.APR.2024 21:42:14

8DPSK(3-DH5)_Channel 39



Date: 25.APR.2024 21:44:19

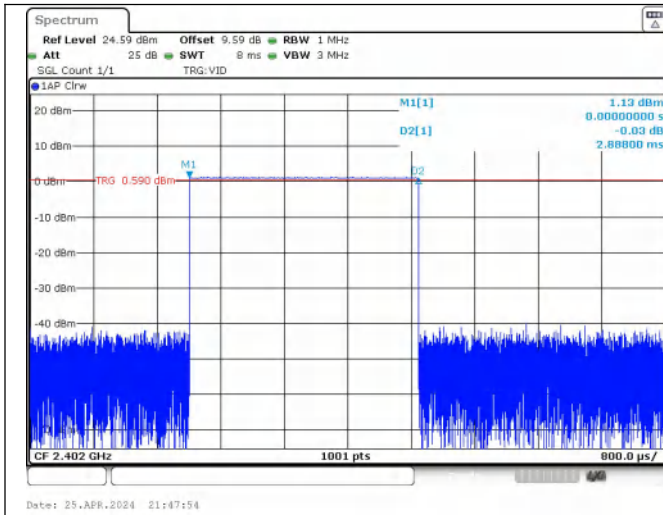
8DPSK(3-DH5)_Channel 78

Dwell Time

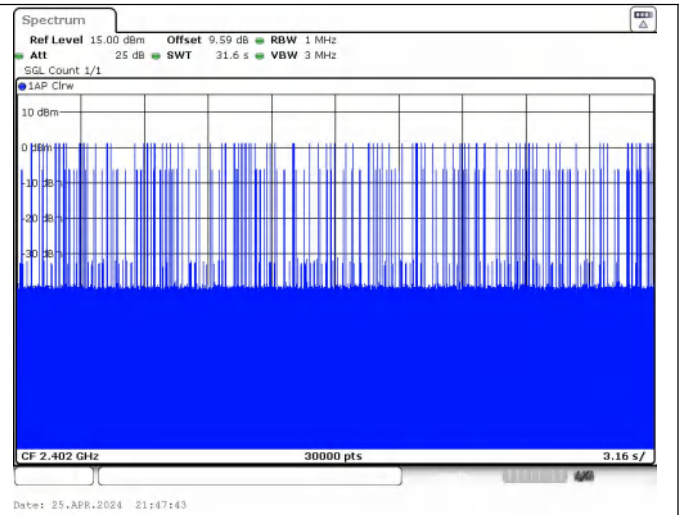
Test Result

Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.888	103	297.46	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.896	98	283.81		PASS
8DPSK	3-DH5		2.896	109	315.66		PASS

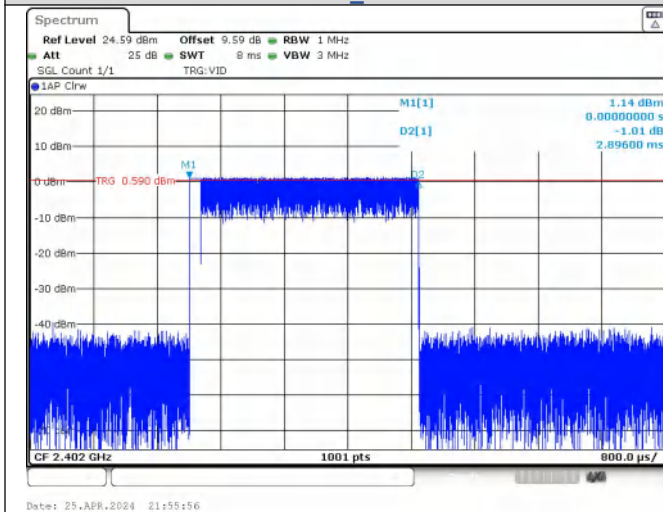
Test Graphs



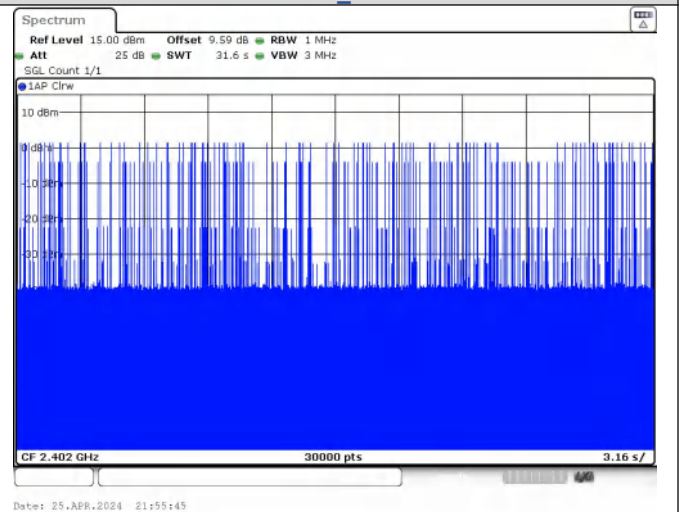
**Pulse Width
GFSK_DH5**



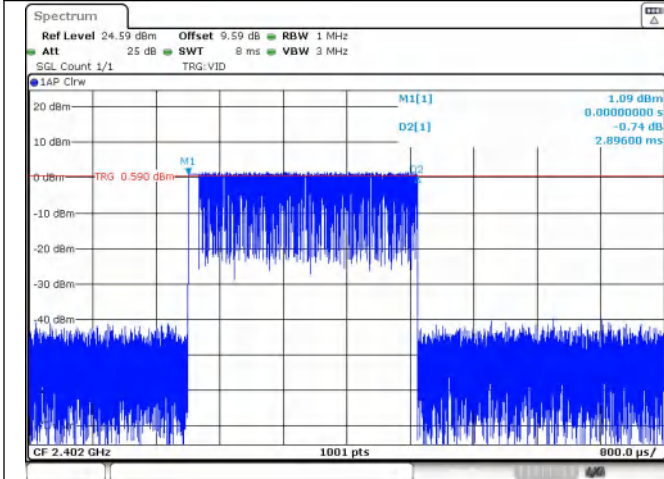
**Number of Pulses in 31.6 seconds
GFSK_DH5**



**Pulse Width
 $\pi/4$ DQPSK_2-DH5**

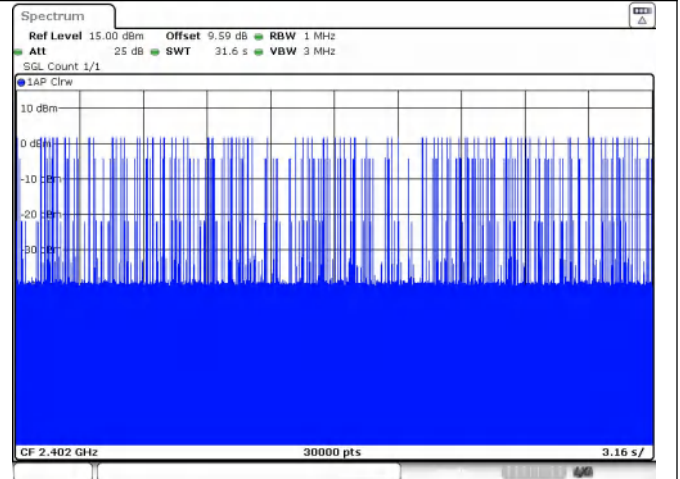


**Number of Pulses in 31.6 seconds
 $\pi/4$ DQPSK_2-DH5**



Date: 25.APR.2024 22:04:19

**Pulse Width
8DPSK_3-DH5**



Date: 25.APR.2024 22:04:08

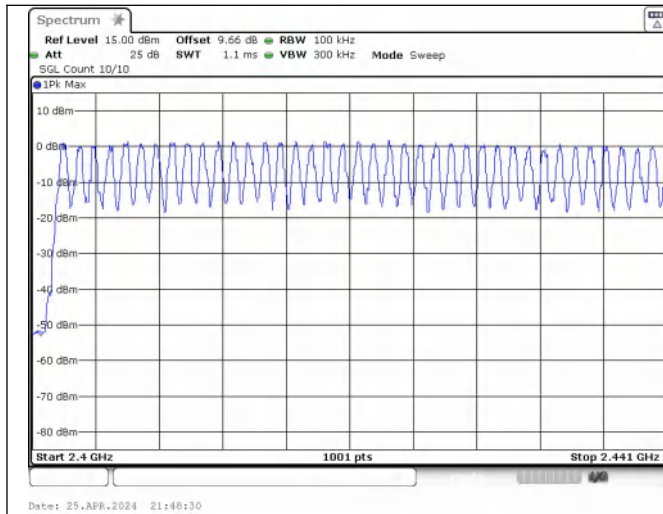
**Number of Pulses in 31.6 seconds
8DPSK_3-DH5**

Number Of Hopping Channel

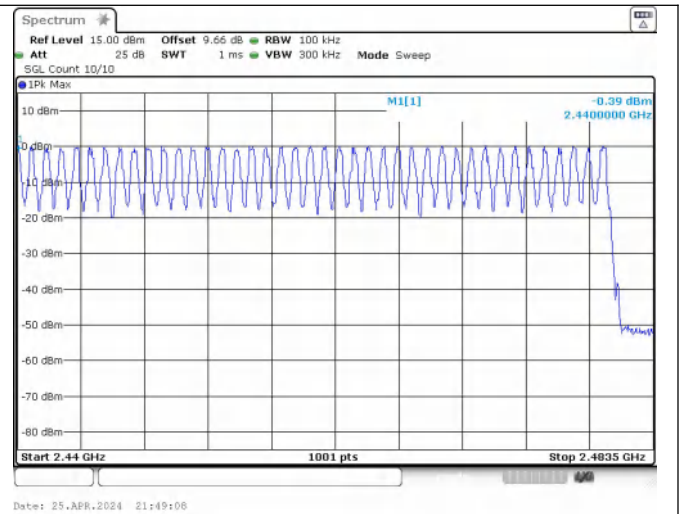
Test Result

Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
$\pi/4$ DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

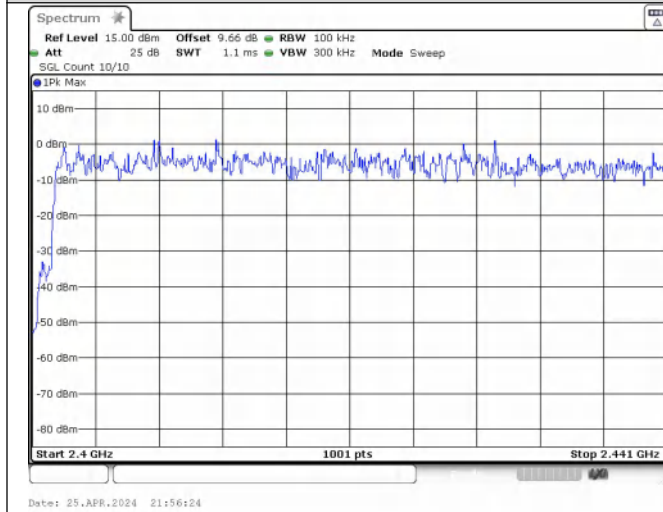
Test Graphs



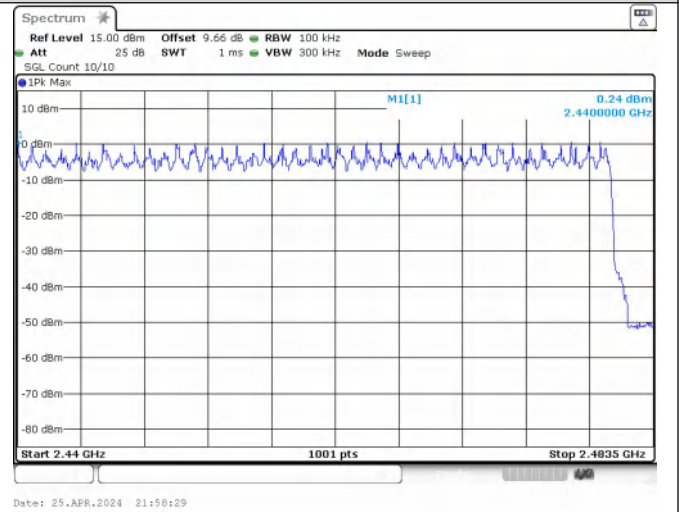
Low End Spectrum Channel Hopping Plot
GFSK



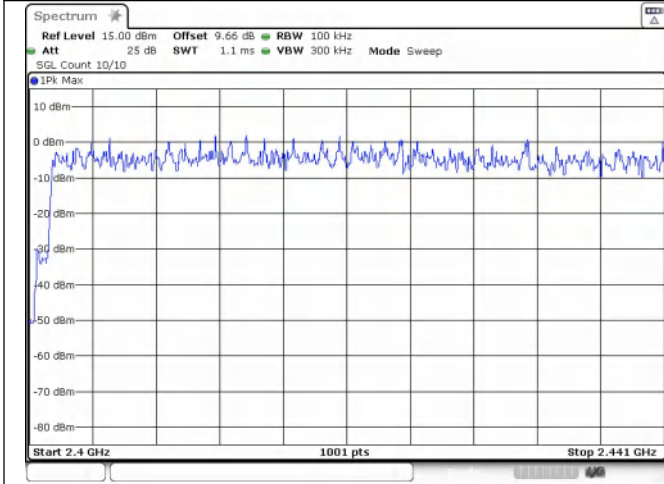
High End Spectrum Channel Hopping Plot
GFSK



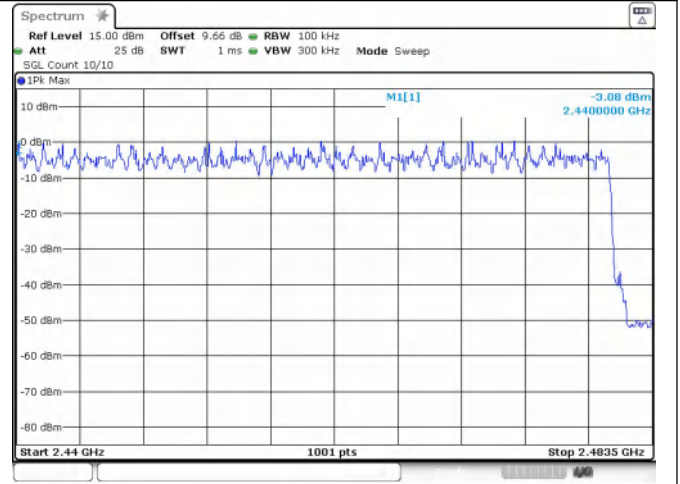
Low End Spectrum Channel Hopping Plot
 $\pi/4$ DQPSK



High End Spectrum Channel Hopping Plot
 $\pi/4$ DQPSK



**Low End Spectrum Channel Hopping Plot
8DPSK**



**High End Spectrum Channel Hopping Plot
8DPSK**