

Appendix Report

Project No.:	CISR250415138
Test Engineer:	James Wang
Supervised by:	Rory Huang

1) Duty Cycle

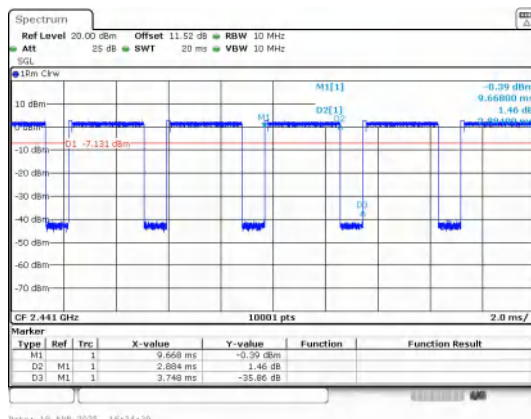
Test Result

Left:

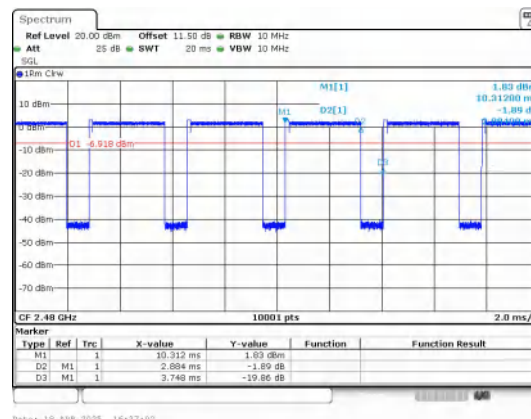
Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.878	3.748	76.79	0.7679	1.147	0.3475
		39	2.878	3.748	76.79	0.7679	1.147	0.3475
		78	2.880	3.748	76.84	0.7684	1.1441	0.3472
π /4DQPSK	2-DH5	0	2.884	3.748	76.95	0.7695	1.1379	0.3467
		39	2.884	3.748	76.95	0.7695	1.1379	0.3467
		78	2.884	3.748	76.95	0.7695	1.1379	0.3467
8DPSK	3-DH5	0	2.886	3.748	77.00	0.7700	1.1351	0.3465
		39	2.886	3.748	77.00	0.7700	1.1351	0.3465
		78	2.888	3.748	77.05	0.7705	1.1323	0.3463

Test Graphs

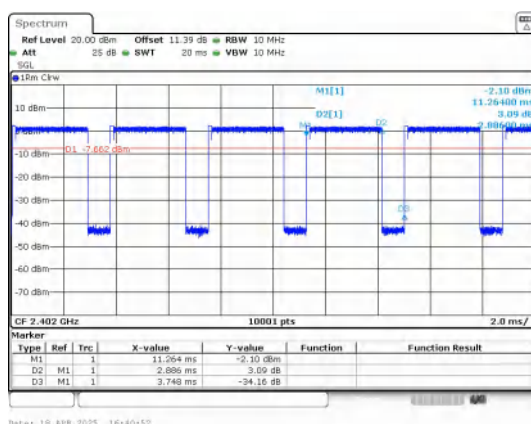




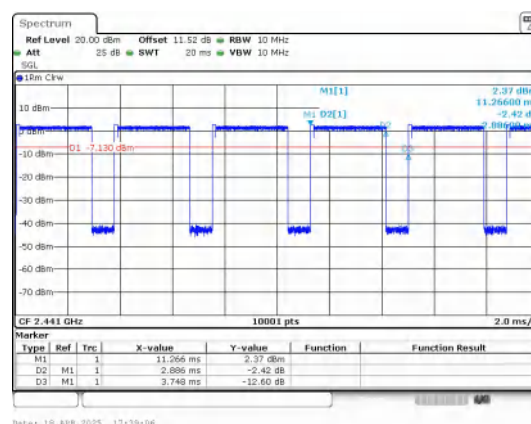
$\pi/4$ DQPSK(2-DH5)_Channel 39



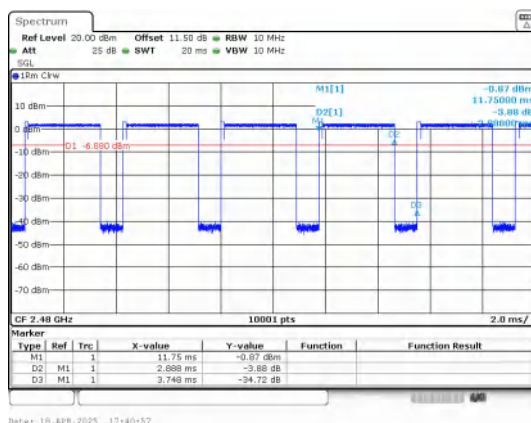
$\pi/4$ DQPSK(2-DH5)_Channel 78



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39



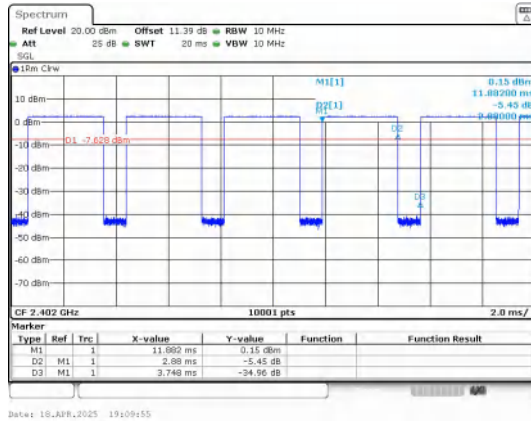
8DPSK(3-DH5)_Channel 78

Right:

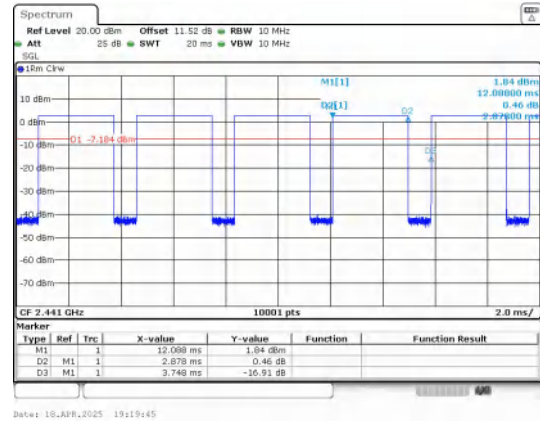
Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.880	3.748	76.84	0.7684	1.1441	0.3472
		39	2.878	3.748	76.79	0.7679	1.147	0.3475
		78	2.878	3.748	76.79	0.7679	1.147	0.3475
$\pi/4$ DQPSK	2-DH5	0	2.884	3.748	76.95	0.7695	1.1379	0.3467
		39	2.884	3.748	76.95	0.7695	1.1379	0.3467
		78	2.886	3.748	77.00	0.7700	1.1351	0.3465

8DPSK	3-DH5	0	2.888	3.748	77.05	0.7705	1.1323	0.3463
		39	2.886	3.746	77.04	0.7704	1.1328	0.3465
		78	2.888	3.748	77.05	0.7705	1.1323	0.3463

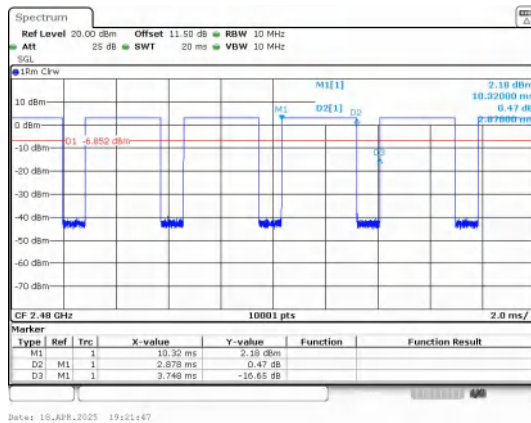
Test Graphs



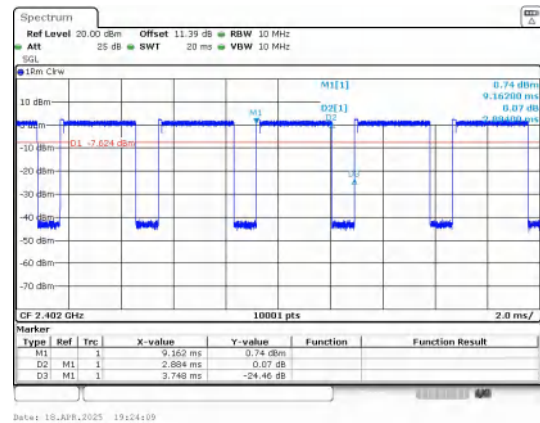
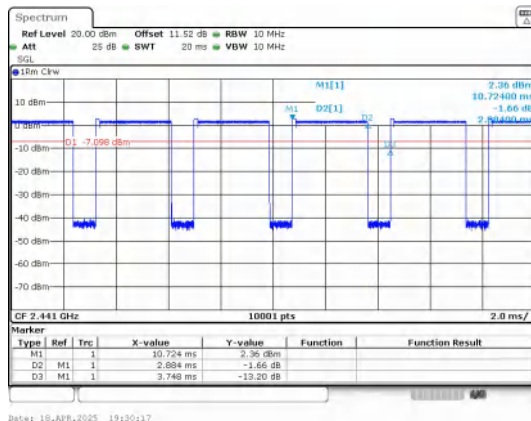
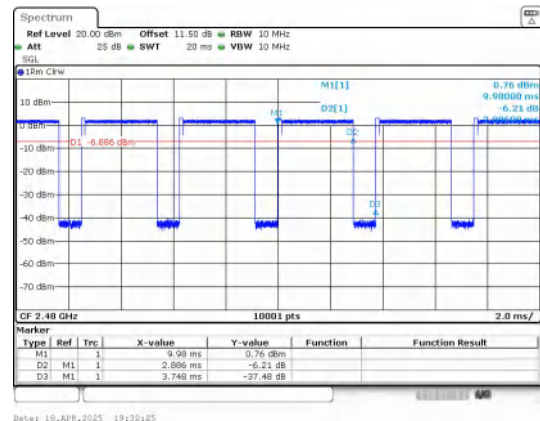
GFSK(DH5)_Channel 0

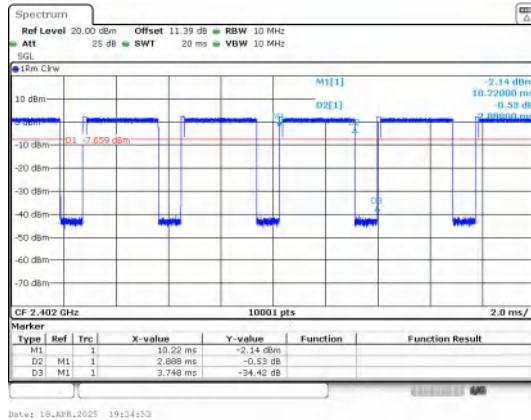


GFSK(DH5)_Channel 39

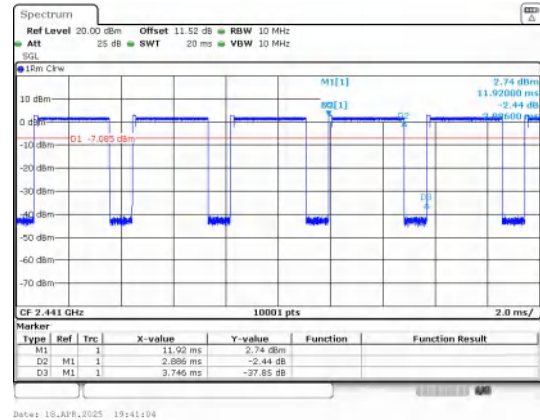


GFSK(DH5)_Channel 78

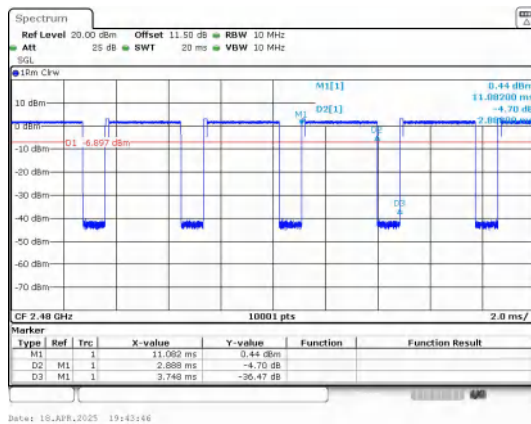

 $\pi/4$ DQPSK(2-DH5)_Channel 0

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

 $\pi/4$ DQPSK(2-DH5)_Channel 78



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39



8DPSK(3-DH5)_Channel 78

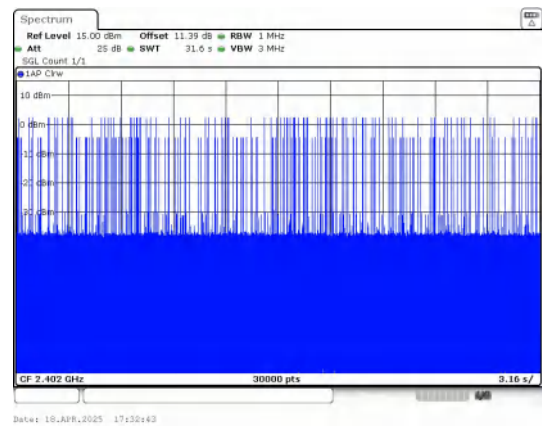
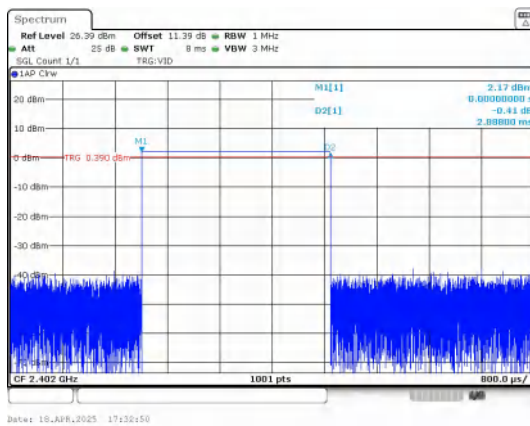
2) Dwell Time

Test Result

Left:

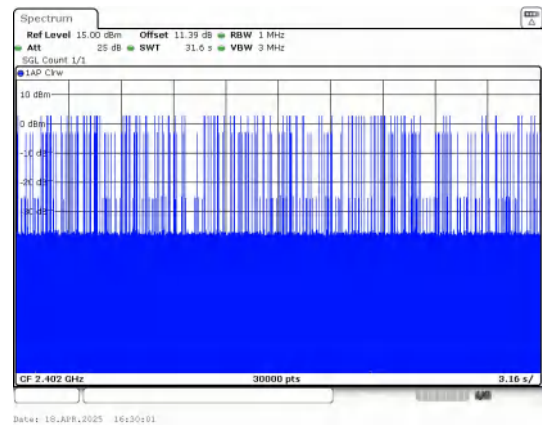
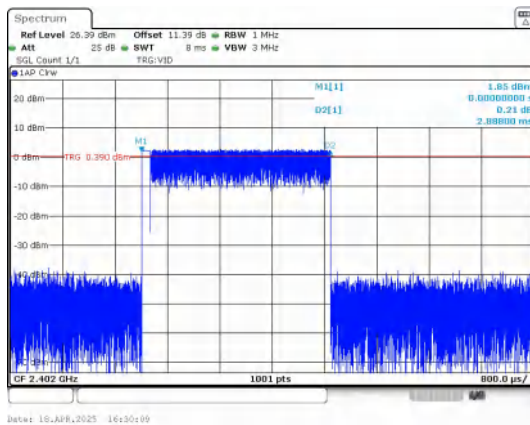
Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.888	95	274.36	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.888	102	294.58		PASS
8DPSK	3-DH5		2.888	90	259.92		PASS

Test Graphs



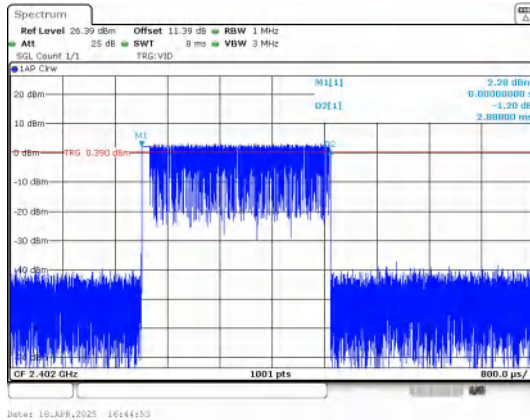
Pulse Width
GFSK_DH5

Number of Pulses in 31.6 seconds
GFSK_DH5

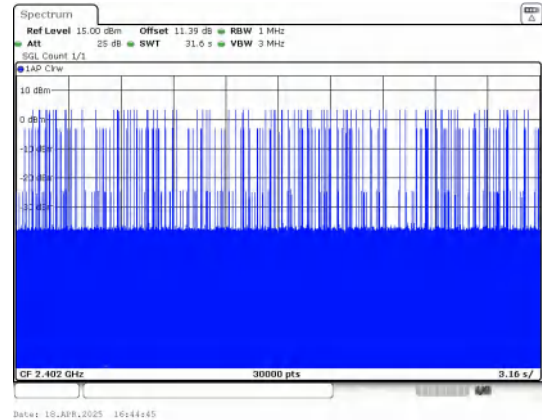


Pulse Width
 $\pi/4$ DQPSK_2-DH5

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



Pulse Width
8DPSK_3-DH5

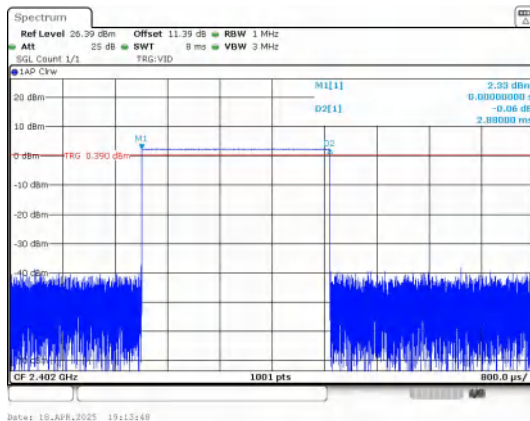


Number of Pulses in 31.6 seconds
8DPSK_3-DH5

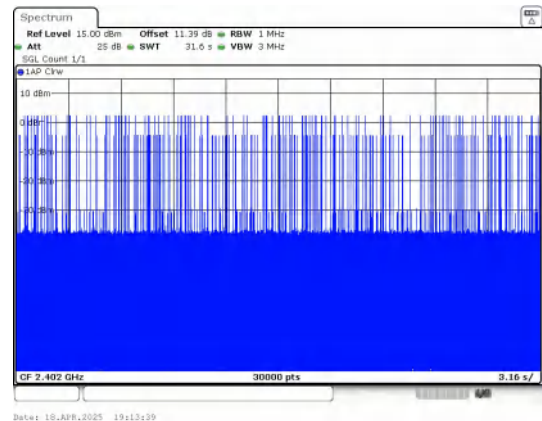
Right:

Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.880	116	334.08	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.888	104	300.35		PASS
8DPSK	3-DH5		2.896	117	338.83		PASS

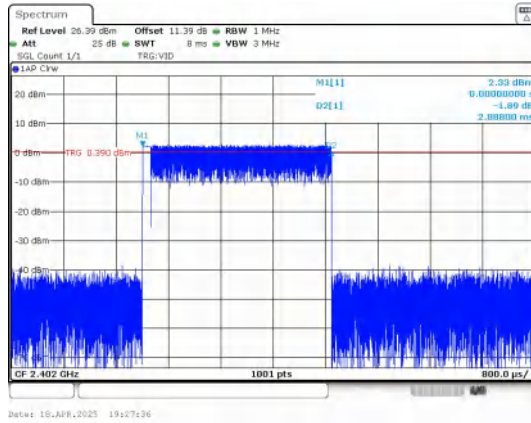
Test Graphs



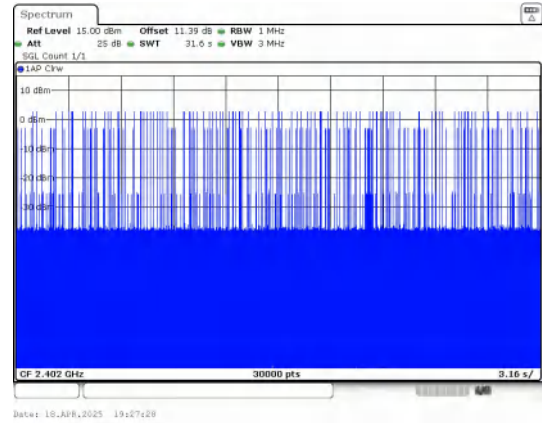
Pulse Width
GFSK_DH5



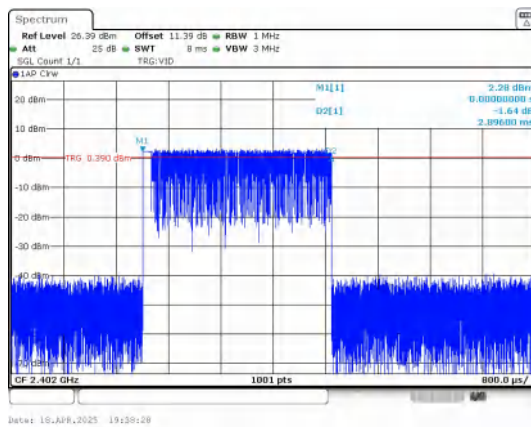
Number of Pulses in 31.6 seconds
GFSK_DH5



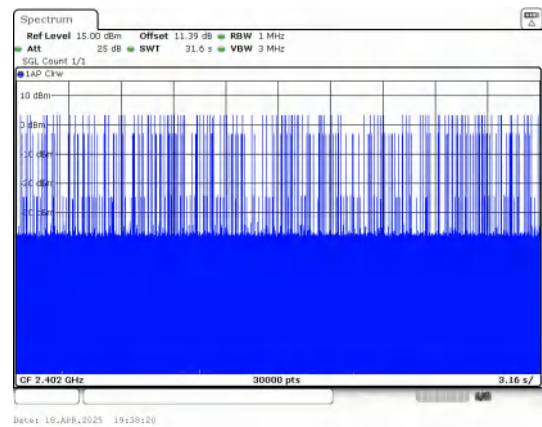
Pulse Width
 $\pi/4$ DQPSK_2-DH5



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



Pulse Width
8DPSK_3-DH5



Number of Pulses in 31.6 seconds
8DPSK_3-DH5

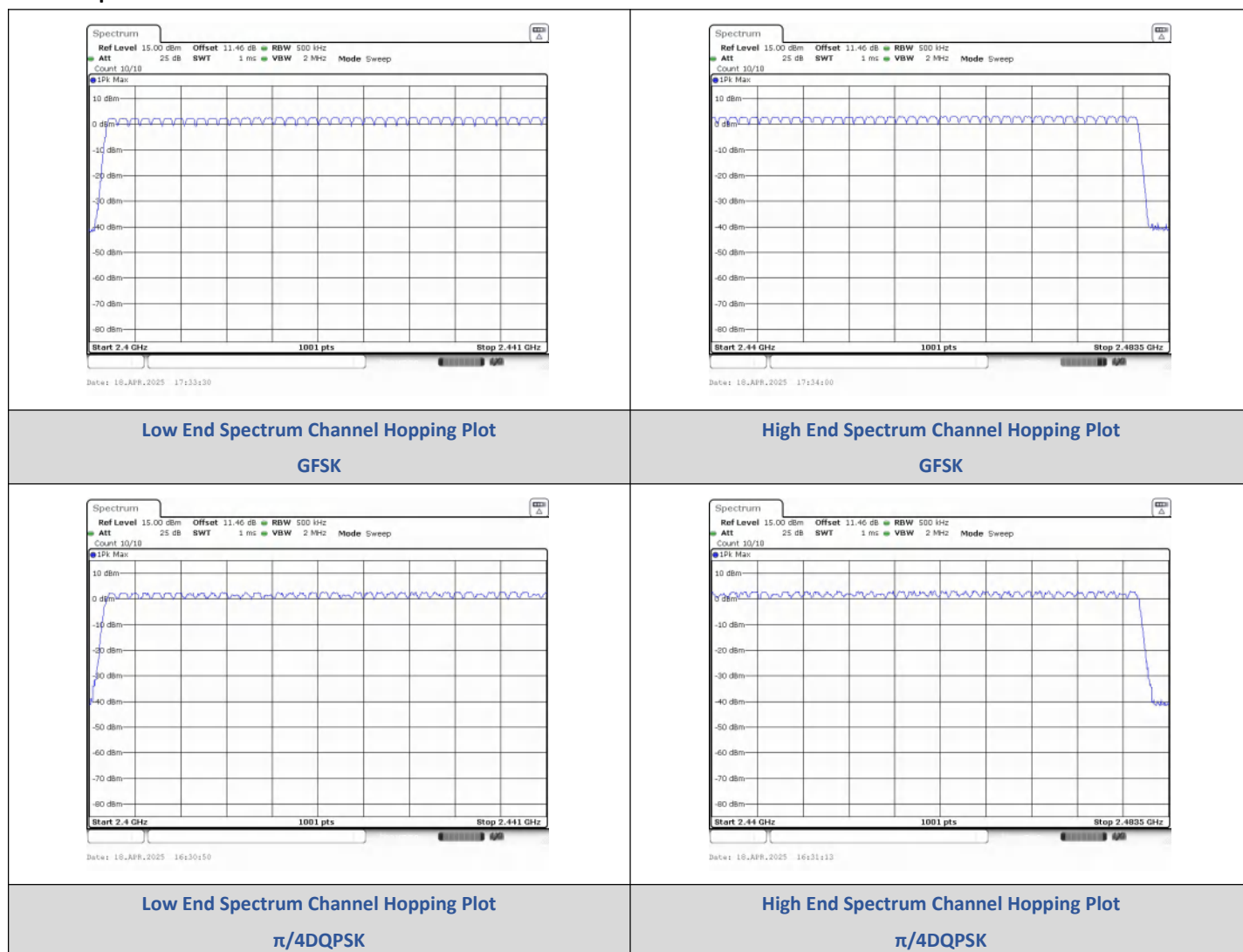
3) Number Of Hopping Channel

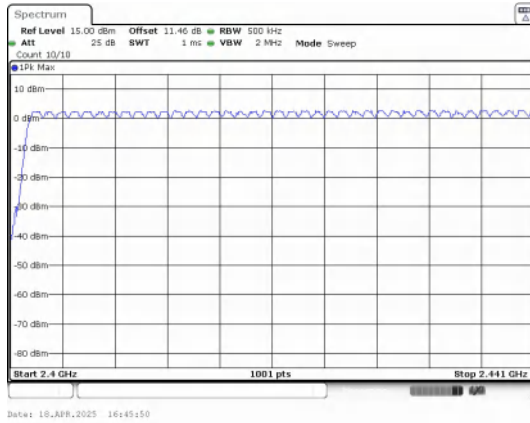
Test Result

Left:

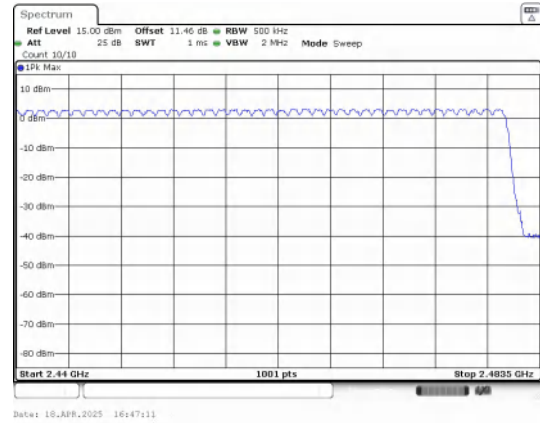
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
$\pi/4$ DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

Test Graphs





Low End Spectrum Channel Hopping Plot
8DPSK



High End Spectrum Channel Hopping Plot
8DPSK

Right:

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

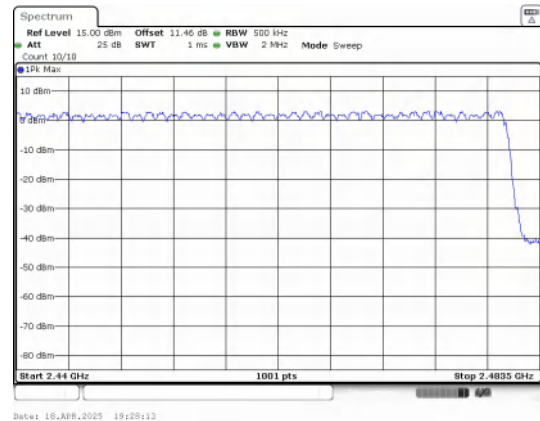
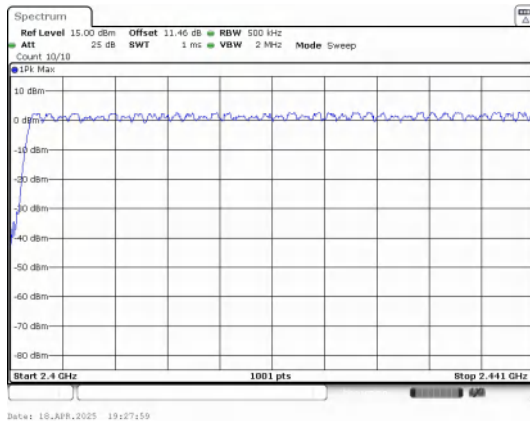
Test Graphs

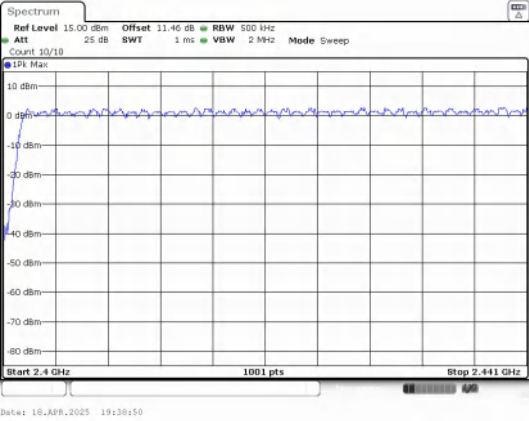
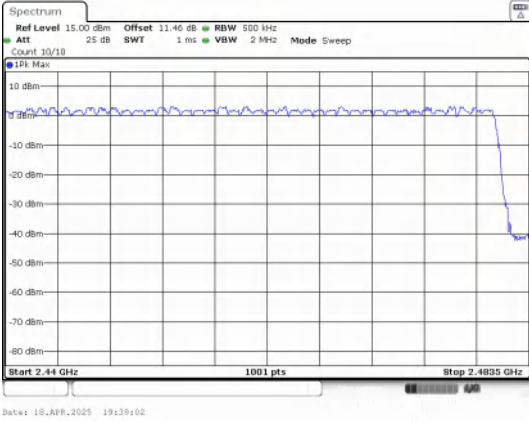


Low End Spectrum Channel Hopping Plot
GFSK



High End Spectrum Channel Hopping Plot
GFSK



Low End Spectrum Channel Hopping Plot π/4DQPSK 	High End Spectrum Channel Hopping Plot π/4DQPSK 
Low End Spectrum Channel Hopping Plot 8DPSK	High End Spectrum Channel Hopping Plot 8DPSK

4) Conducted Peak Output Power

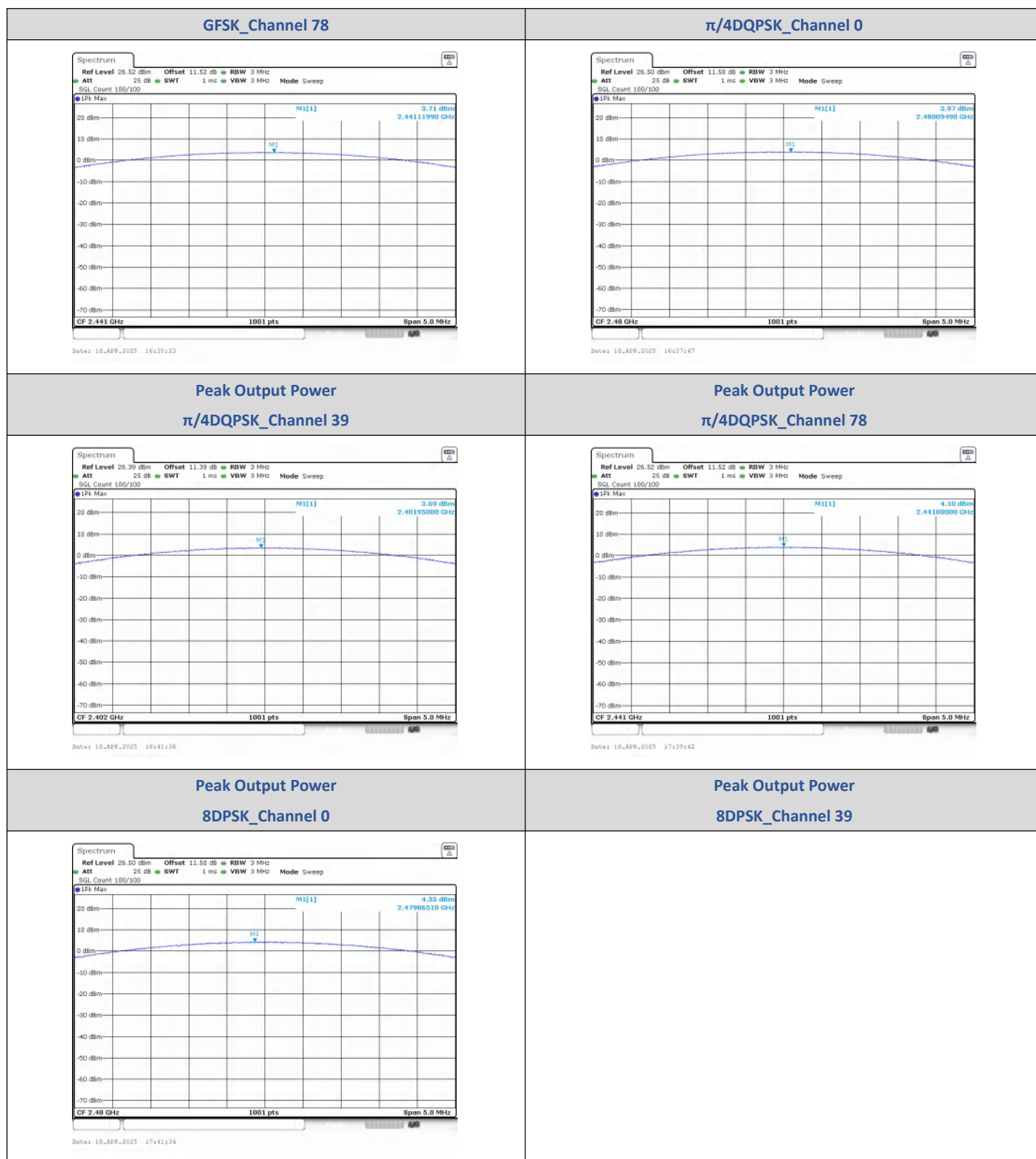
Test Result

Left:

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	2.35	1.72	≤30	PASS
		39	2.96	1.98		PASS
		78	3.18	2.08		PASS
$\pi/4$ DQPSK	2-DH5	0	3.21	2.09	≤20.97	PASS
		39	3.71	2.35		PASS
		78	3.97	2.49		PASS
8DPSK	3-DH5	0	3.69	2.34		PASS
		39	4.10	2.57		PASS
		78	4.35	2.72		PASS

Test Graphs



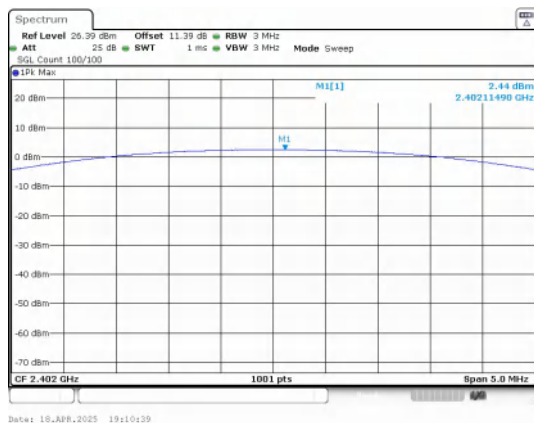


Right:

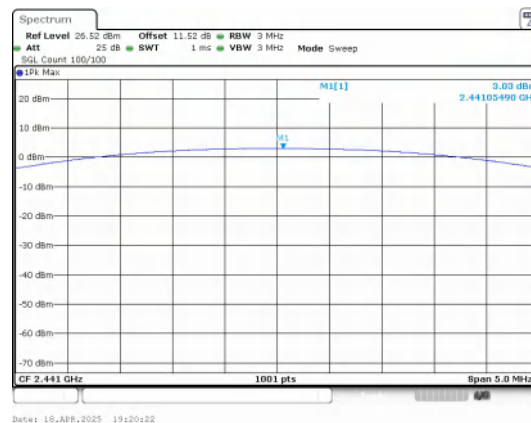
Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	2.44	1.75	≤30	PASS
		39	3.03	2.01		PASS
		78	3.20	2.09		PASS

$\pi/4$ DQPSK	2-DH5	0	3.26	2.12	≤ 20.97	PASS
		39	3.77	2.38		PASS
		78	3.93	2.47		PASS
8DPSK	3-DH5	0	3.65	2.32		PASS
		39	4.16	2.61		PASS
		78	4.34	2.72		PASS

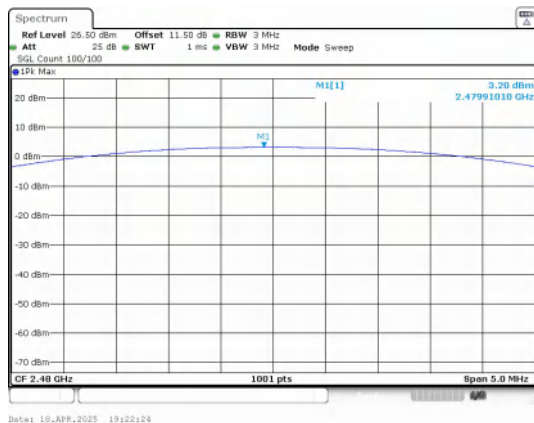
Test Graphs



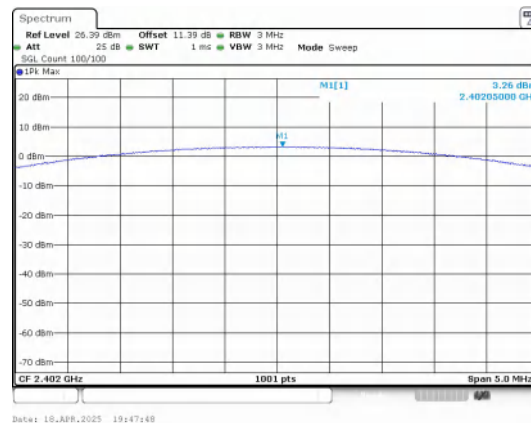
Peak Output Power
GFSK_Channel 0



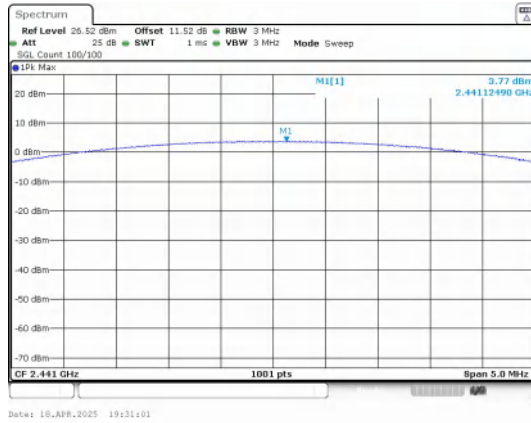
Peak Output Power
GFSK_Channel 39



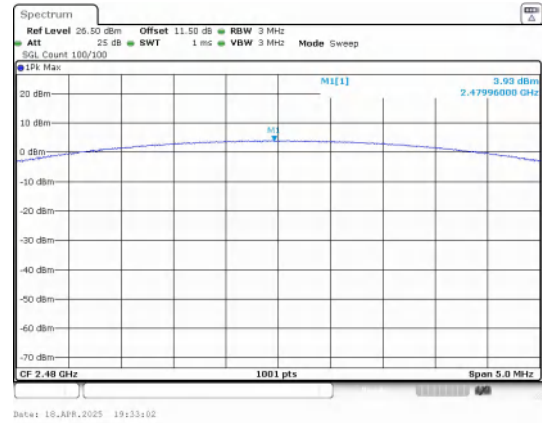
Peak Output Power
GFSK_Channel 78



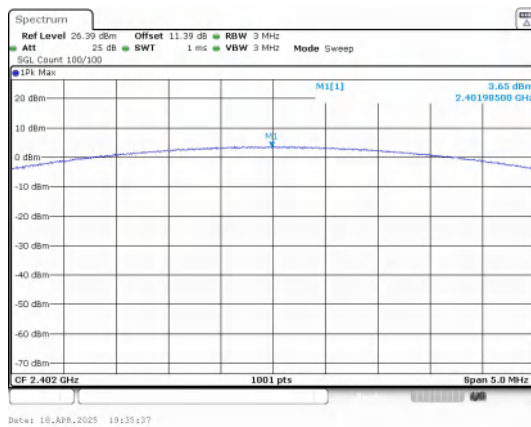
Peak Output Power
 $\pi/4$ DQPSK_Channel 0



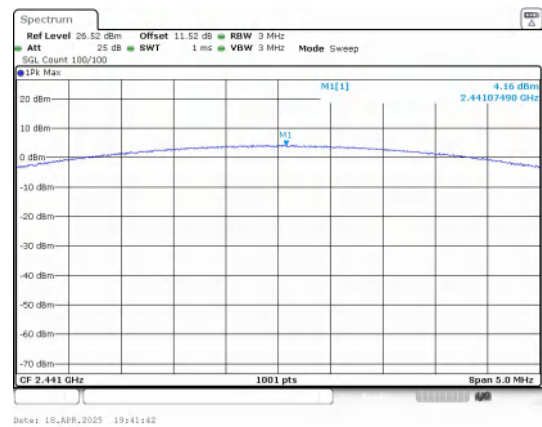
Peak Output Power
 $\pi/4$ DQPSK_Channel 39



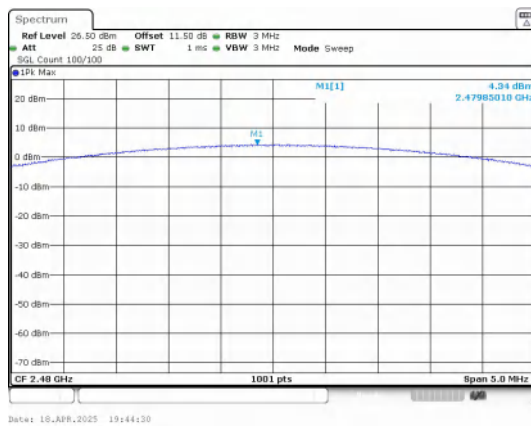
Peak Output Power
 $\pi/4$ DQPSK_Channel 78



Peak Output Power
8DPSK_Channel 0



Peak Output Power
8DPSK_Channel 39



Peak Output Power
8DPSK_Channel 78

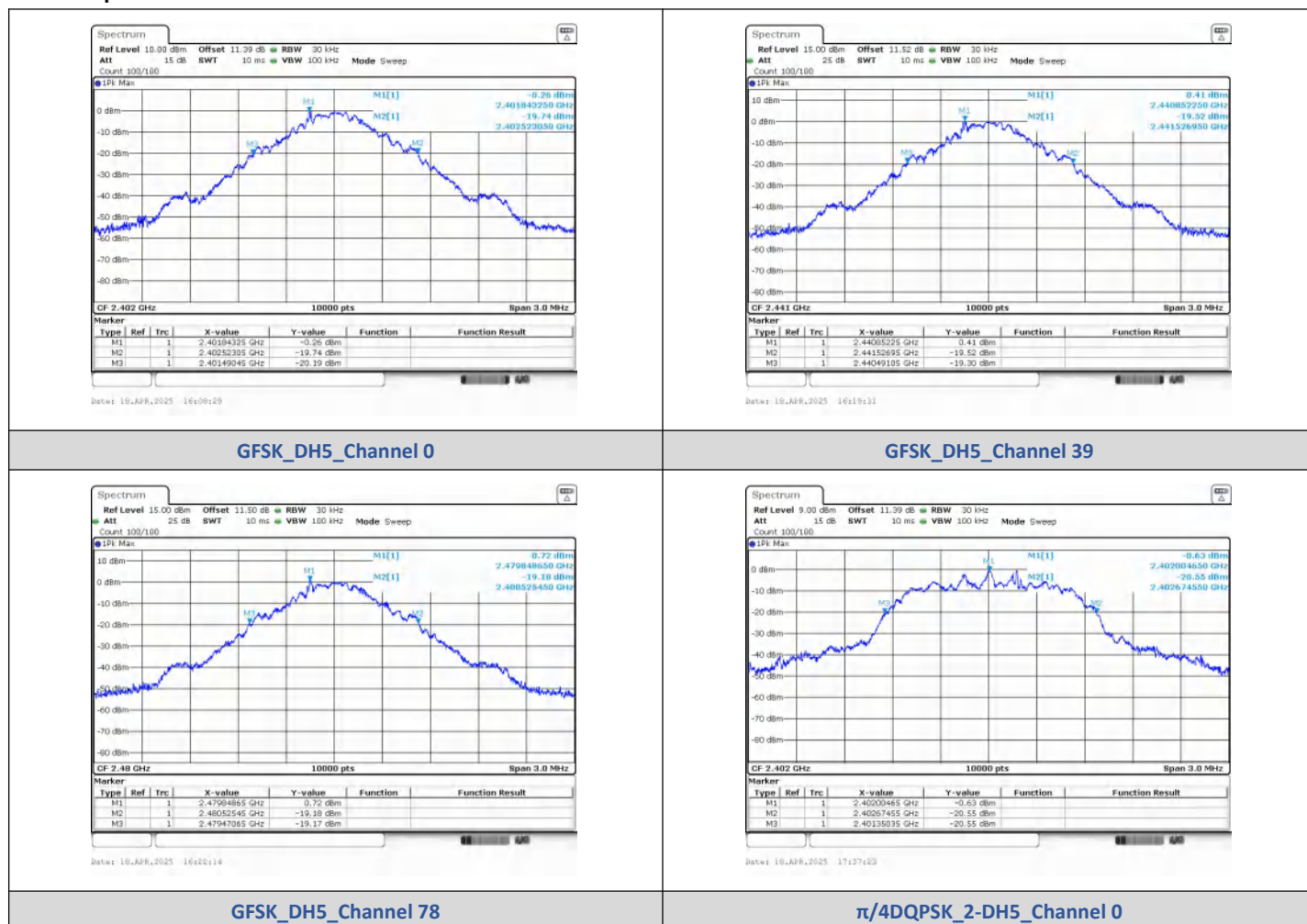
5) 20dB Bandwidth

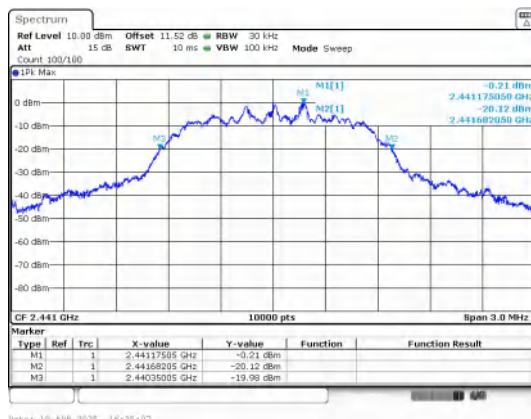
Test Result

Left:

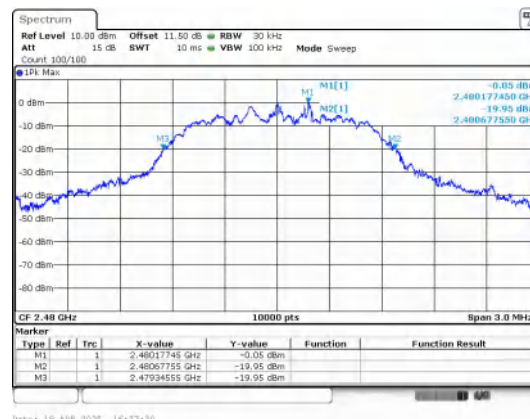
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.06
	39	2441 MHz	1.06
	78	2480 MHz	1.06
$\pi/4$ DQPSK	0	2402 MHz	1.320
	39	2441 MHz	1.330
	78	2480 MHz	1.330
8DPSK	0	2402 MHz	1.290
	39	2441 MHz	1.290
	78	2480 MHz	1.300

Test Graphs

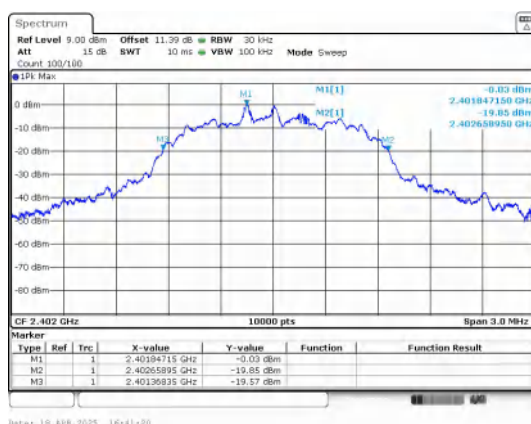




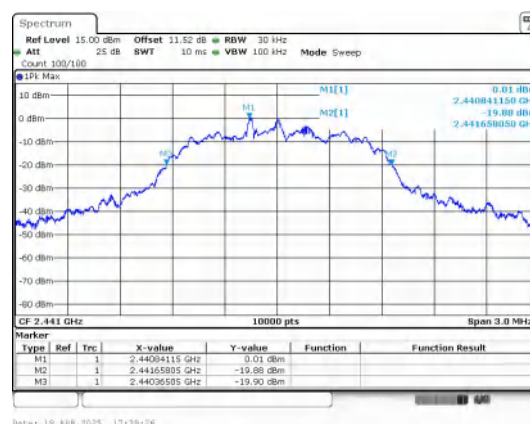
$\pi/4$ DQPSK_2-DH5_Channel 39



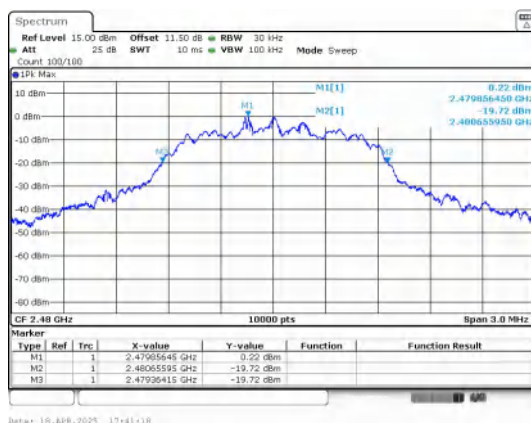
$\pi/4$ DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



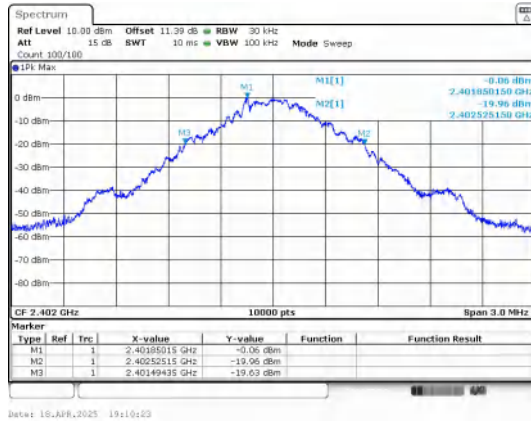
8DPSK_3-DH5_Channel 78

Right:

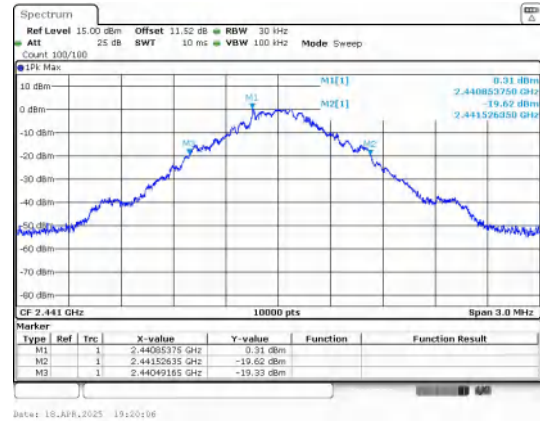
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.040
	39	2441 MHz	1.040
	78	2480 MHz	1.040
$\pi/4$ DQPSK	0	2402 MHz	1.320
	39	2441 MHz	1.330
	78	2480 MHz	1.330

8DPSK	0	2402 MHz	1.300
	39	2441 MHz	1.290
	78	2480 MHz	1.320

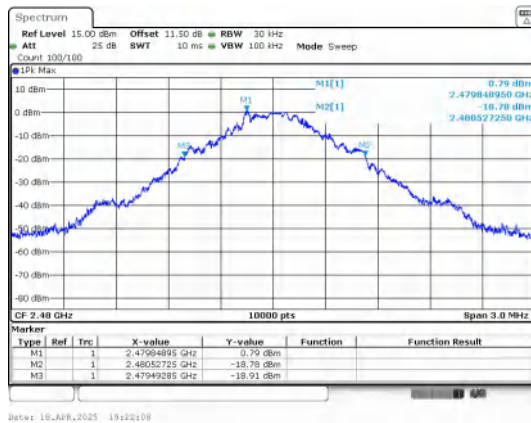
Test Graphs



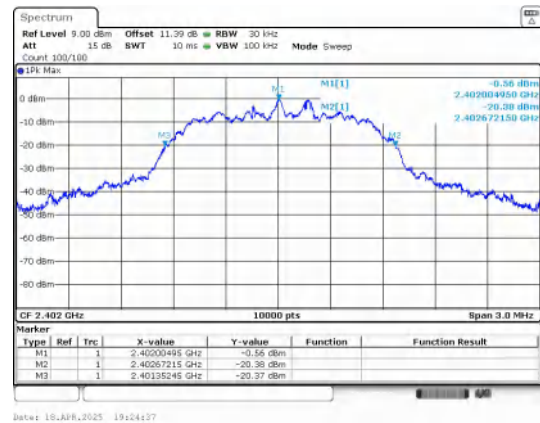
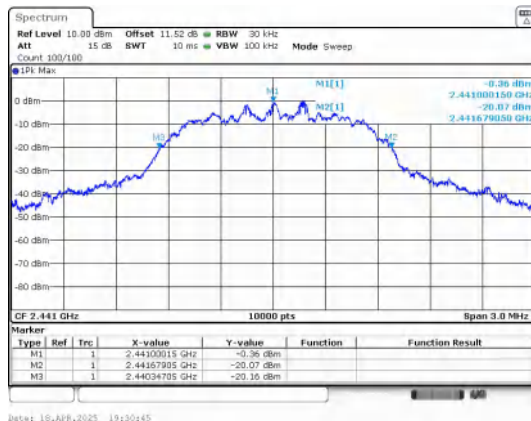
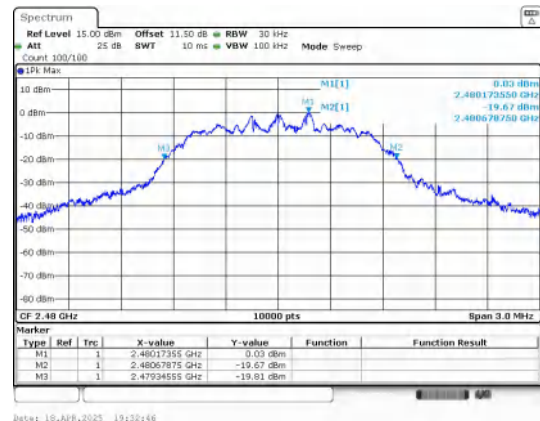
GFSK_DH5_Channel 0

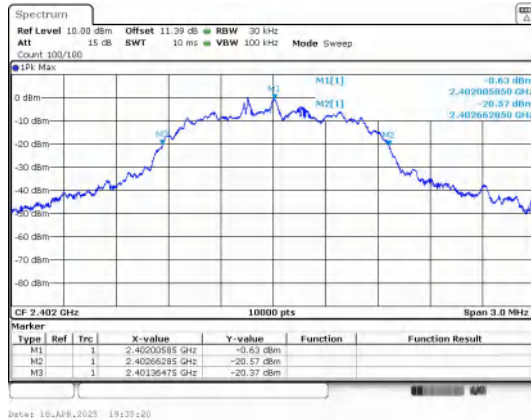


GFSK_DH5_Channel 39



GFSK_DH5_Channel 78

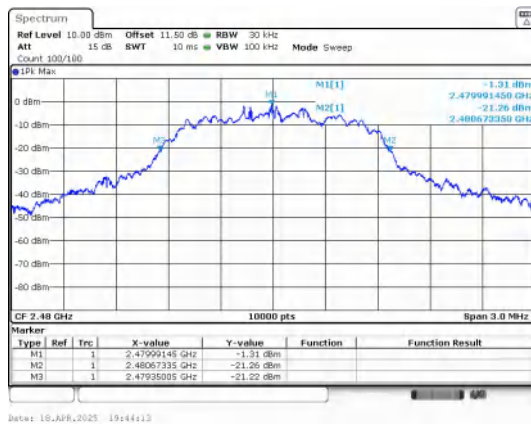

 $\pi/4$ DQPSK_2-DH5_Channel 0

 $\pi/4$ DQPSK_2-DH5_Channel 39

 $\pi/4$ DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



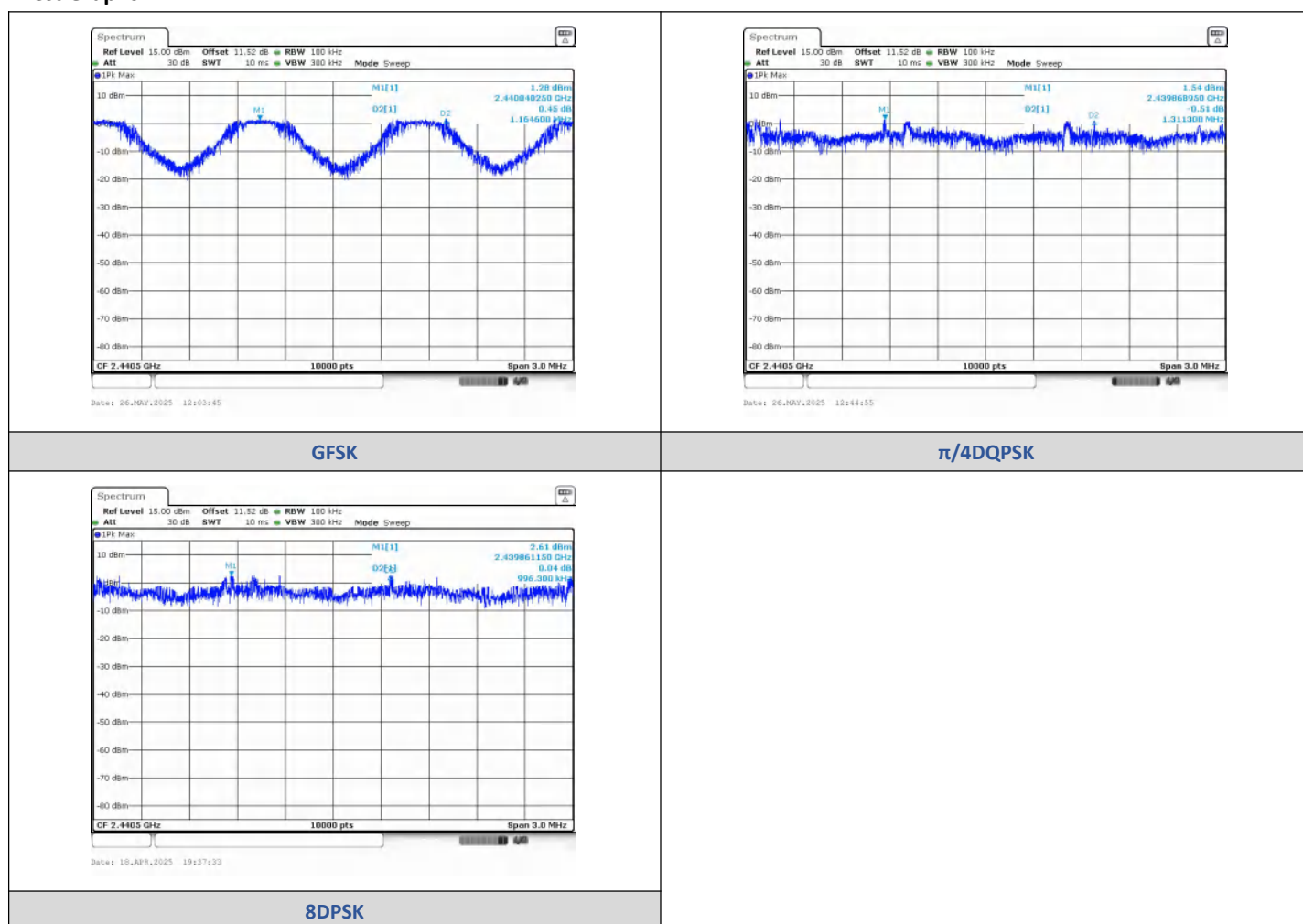
8DPSK_3-DH5_Channel 78

6) Carrier Frequencies Separation

Test Result

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.0403	2441.2049	1.1646	1.04	PASS
$\pi/4$ DQPSK	2-DH5	2439.869	2441.1802	1.3113	0.887	PASS
8DPSK	3-DH5	2439.8612	2440.8574	0.9963	0.867	PASS

Test Graphs

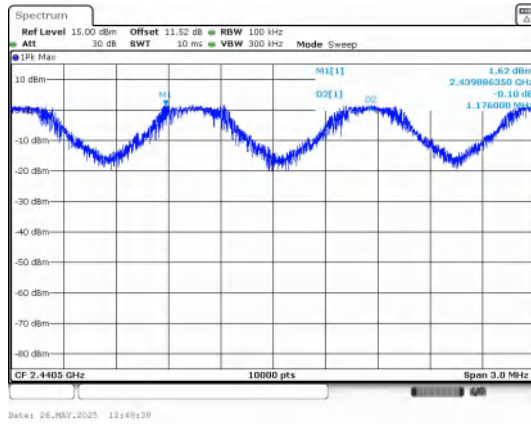


Right:

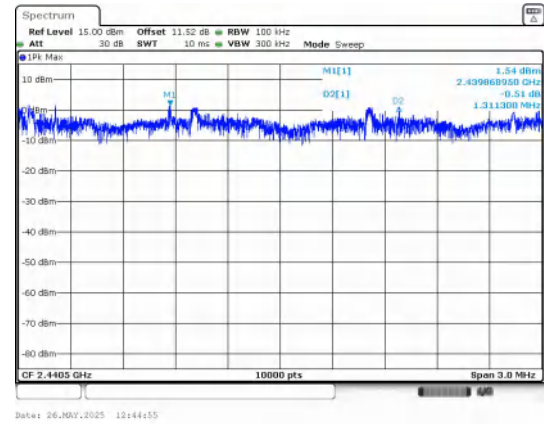
Test Result

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2439.8864	2441.0624	1.1760	1.04	PASS
$\pi/4$ DQPSK	2-DH5	2439.869	2441.1802	1.3113	0.887	PASS
8DPSK	3-DH5	2439.8888	2440.8872	0.9984	0.88	PASS

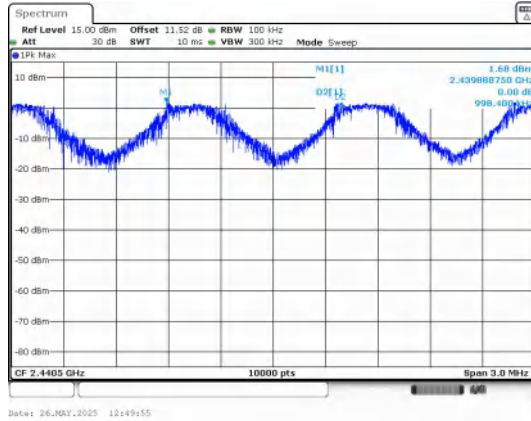
Test Graphs



GFSK



$\pi/4$ DQPSK



8DPSK

7) Conducted Out Of Band Emission

Test Result

Left:

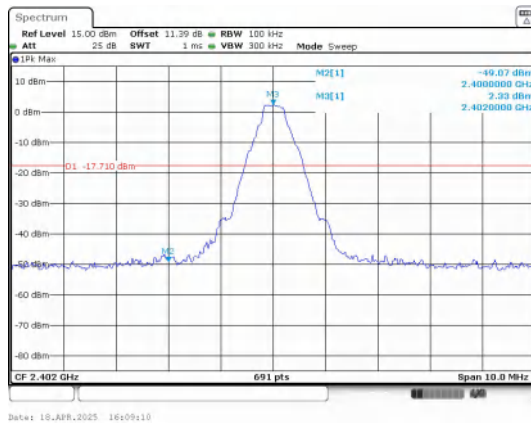
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-49.070	-17.71	-31.360	PASS
			9608.08	-42.269	-17.71	-24.559	PASS
		39	9763.72	-42.179	-17.08	-25.099	PASS
		78	2483.50	-49.970	-16.89	-33.080	PASS
			9920.20	-43.582	-16.89	-26.692	PASS
$\pi/4$ DQPSK	2-DH5	0	2400.00	-47.780	-17.79	-29.990	PASS
			9608.08	-41.413	-17.79	-23.623	PASS
		39	9763.72	-42.337	-17.46	-24.877	PASS
		78	2483.50	-49.600	-17.7	-31.900	PASS
			9920.20	-43.885	-17.7	-26.185	PASS
8DPSK	3-DH5	0	2398.73	-49.053	-17.8	-31.253	PASS
			2400.00	-49.060	-17.8	-31.260	PASS
			9608.10	-41.306	-17.8	-23.506	PASS
		39	9763.72	-42.159	-17.23	-24.929	PASS
		78	2483.50	-50.040	-17.09	-32.950	PASS

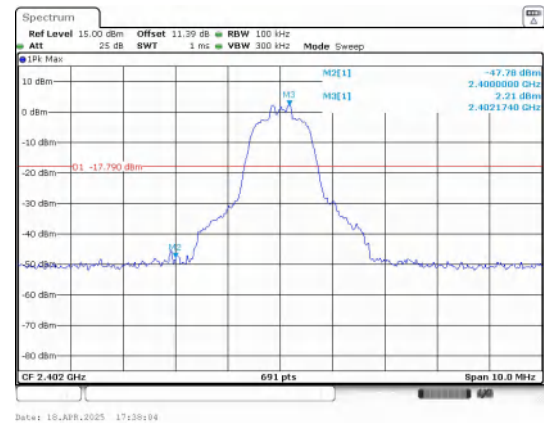
Hopping

Hopping							
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2398.96	-48.312	-17.79	-30.522	PASS
			2400.00	-48.790	-17.79	-31.000	PASS
			2483.50	-48.110	-17.0	-31.110	PASS
π/4DQPSK	2-DH5		2395.35	-47.993	-17.82	-30.173	PASS
			2400.00	-48.880	-17.82	-31.060	PASS
			2483.50	-49.620	-20.29	-29.330	PASS
8DPSK	3-DH5		2396.48	-47.151	-17.74	-29.411	PASS
			2400.00	-48.910	-17.74	-31.170	PASS
			2483.50	-49.340	-17.56	-31.780	PASS

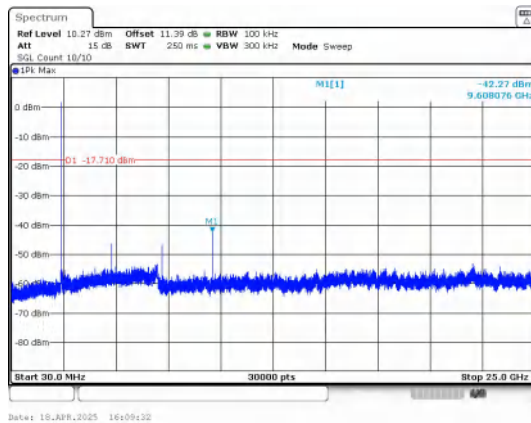
Test Graphs



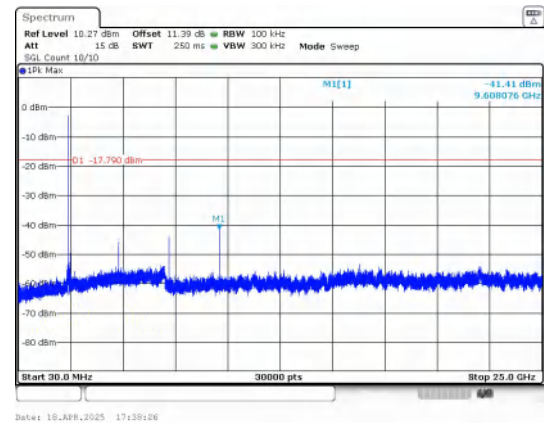
Out Of Band Emission
GFSK_DH5_Channel 0



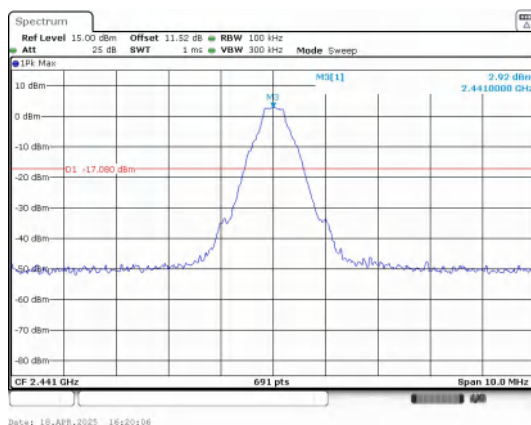
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 0



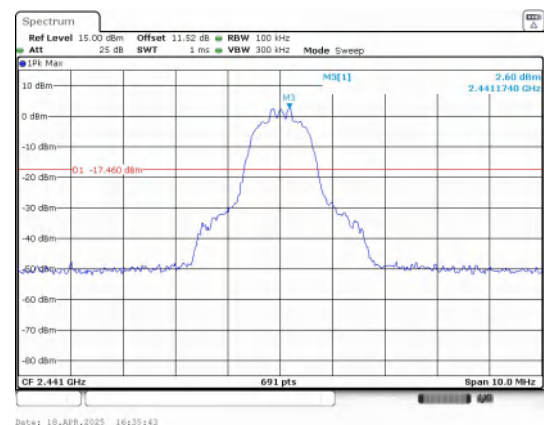
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 0



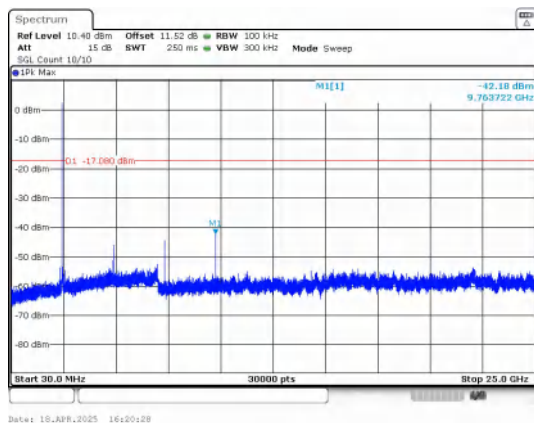
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 0



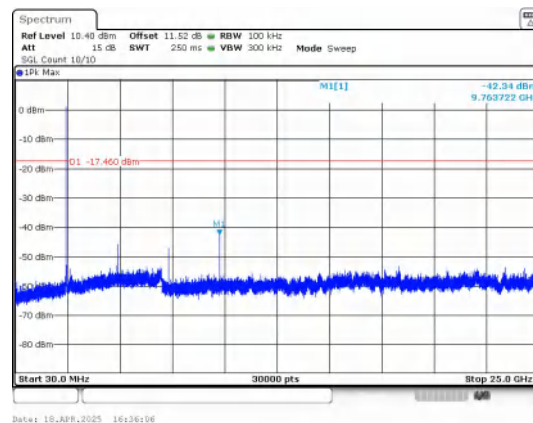
Out Of Band Emission
GFSK_DH5_Channel 39



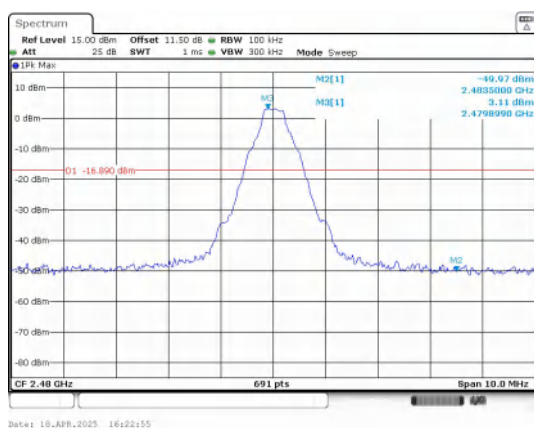
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 39



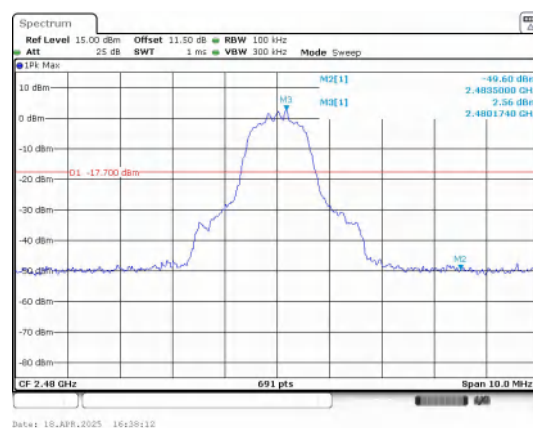
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 39



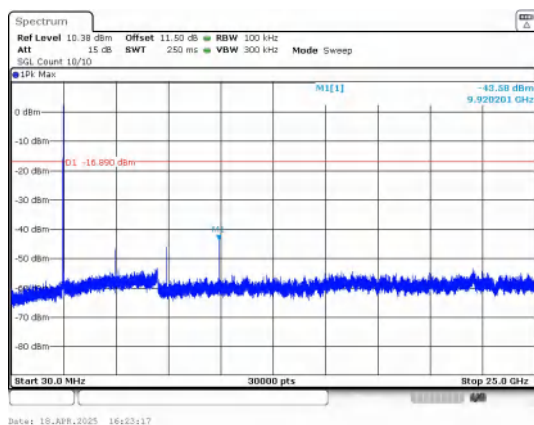
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 39



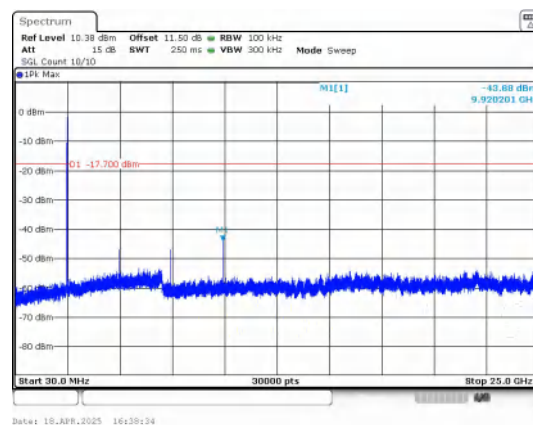
Out Of Band Emission
GFSK_DH5_Channel 78



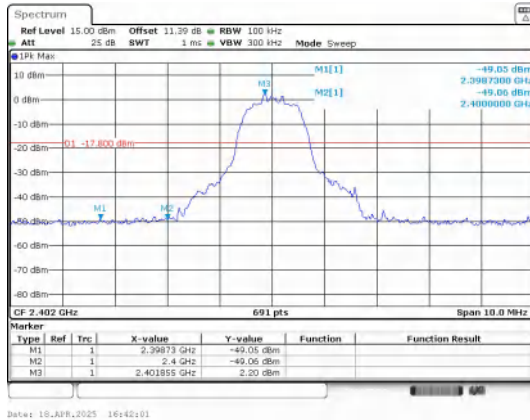
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78



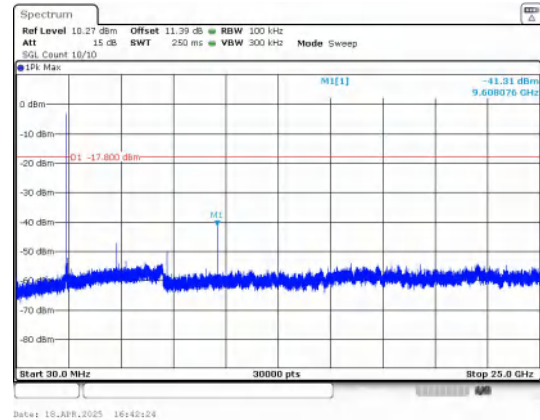
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



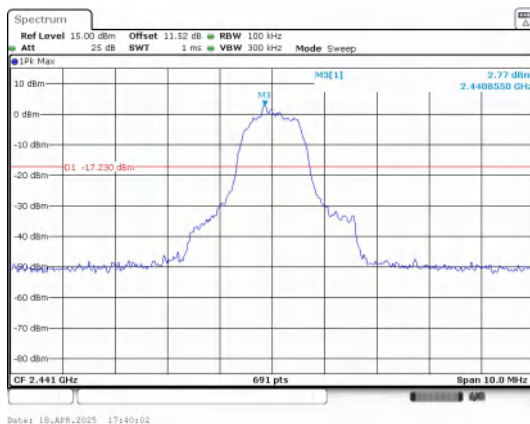
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 78



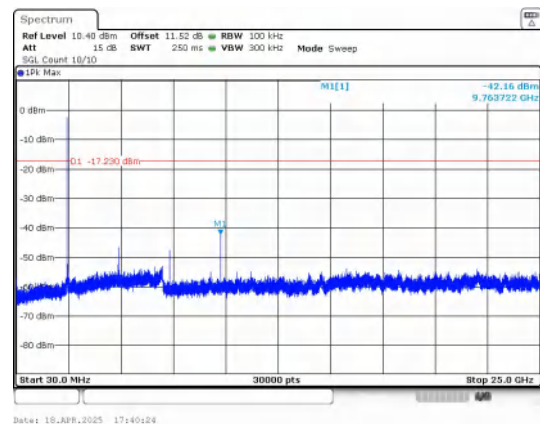
Out Of Band Emission
8DPSK_3-DH5_Channel 0



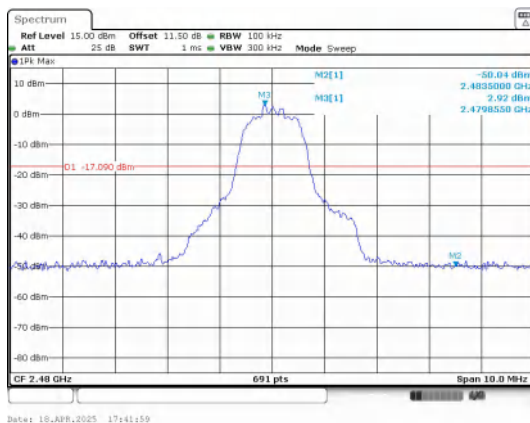
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0



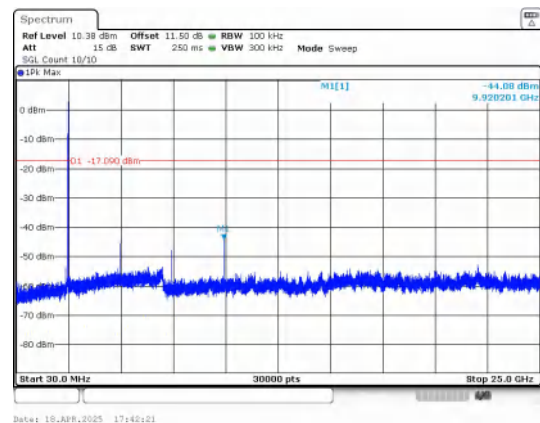
Out Of Band Emission
8DPSK_3-DH5_Channel 39



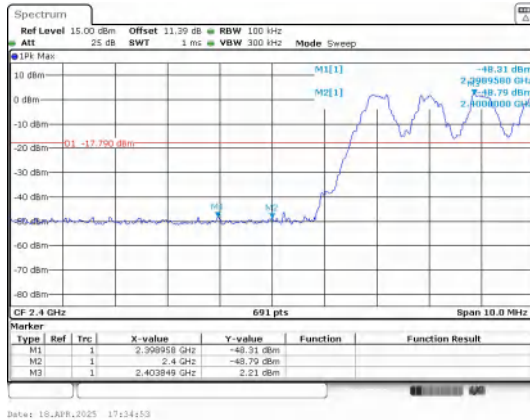
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39



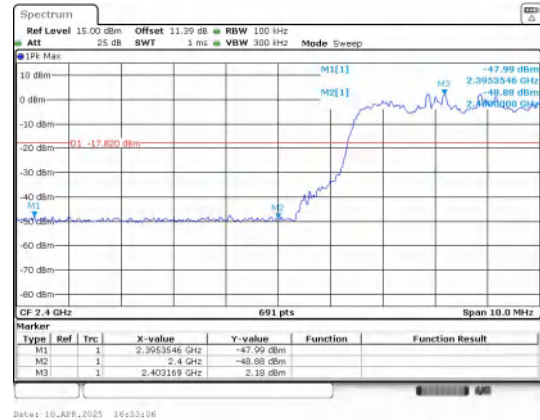
Out Of Band Emission
8DPSK_3-DH5_Channel 78



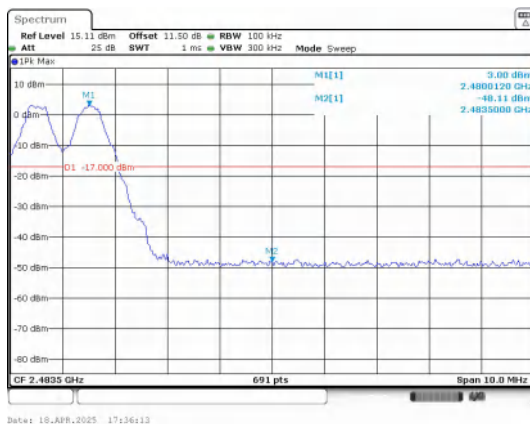
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78



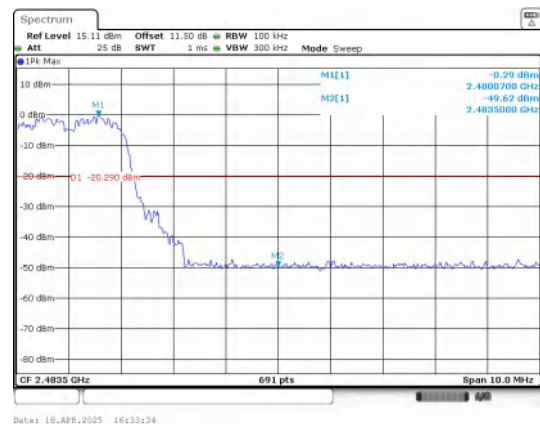
Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



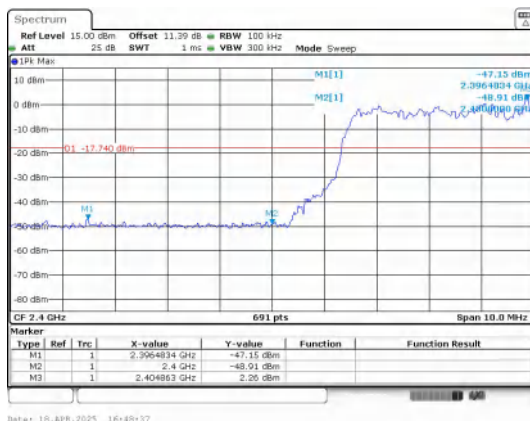
Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping



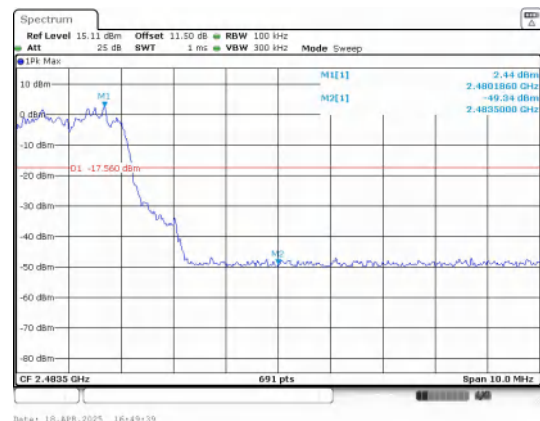
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



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



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



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

Right:
Non-Hopping

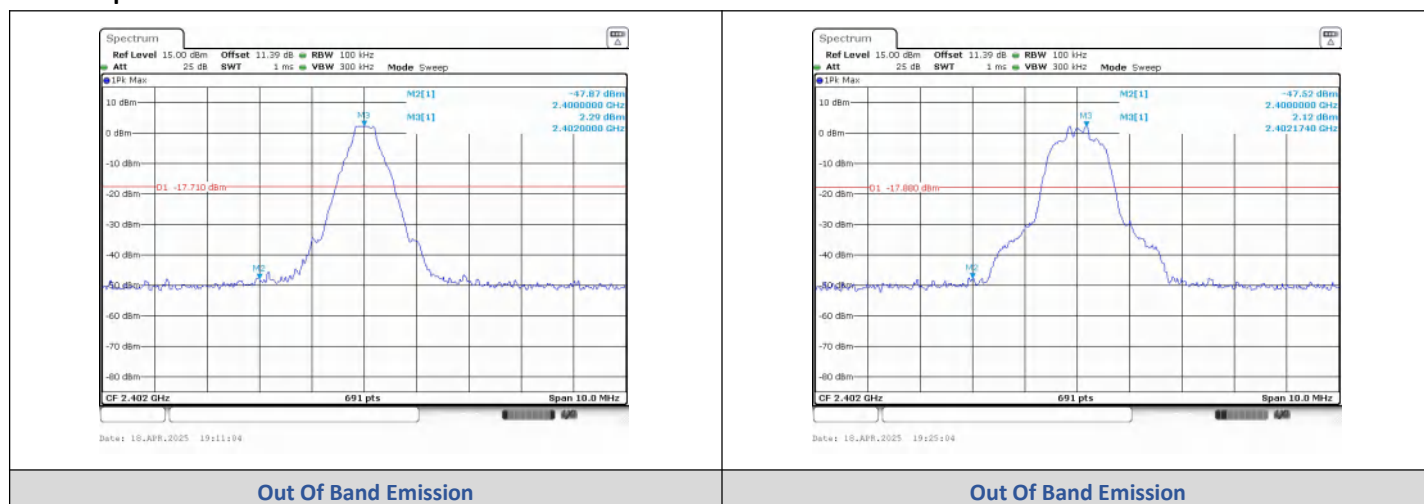
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
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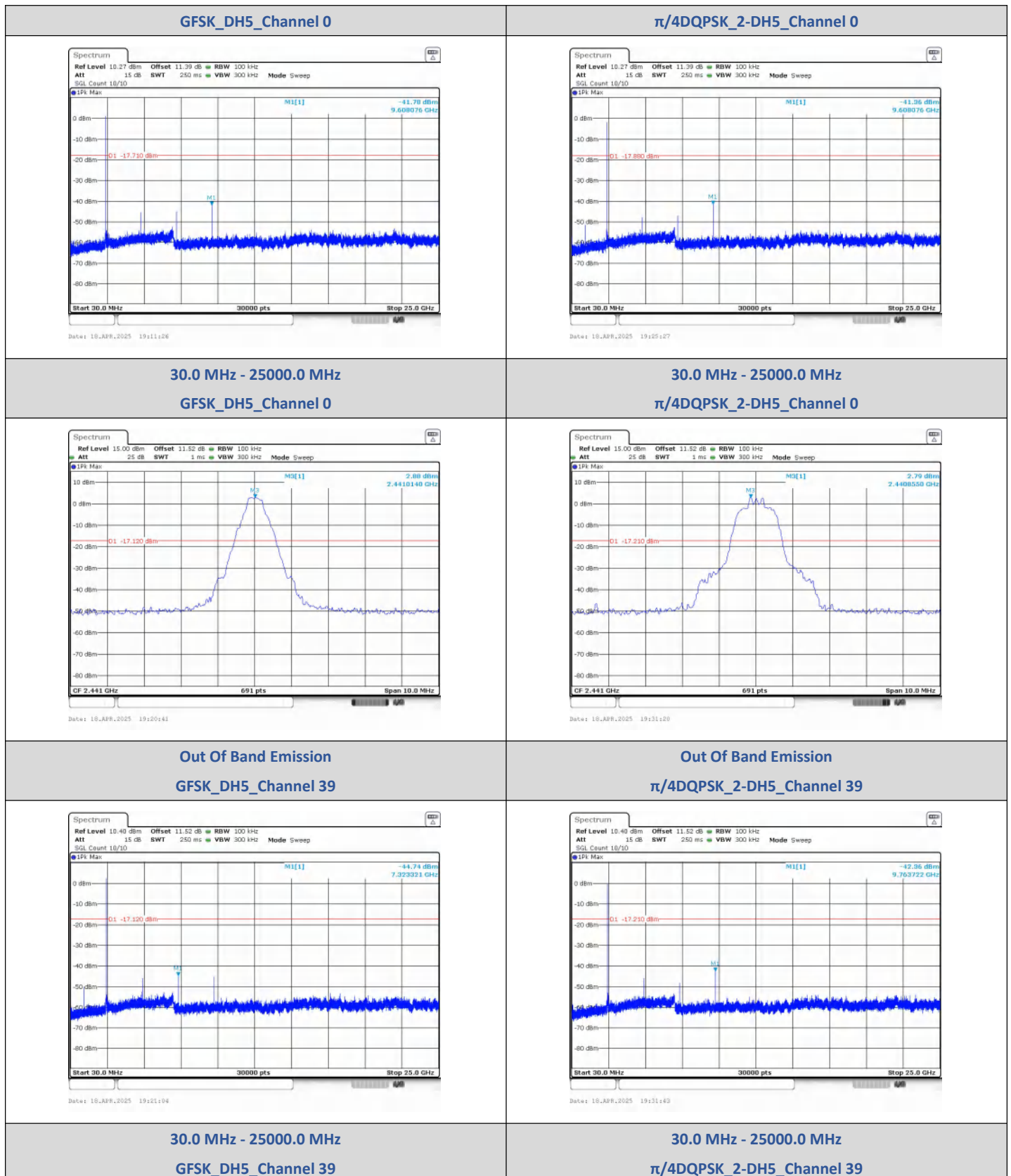
GFSK	DH5	0	2400.00	-47.870	-17.71	-30.160	PASS
			9608.08	-41.775	-17.71	-24.065	PASS
		39	7323.32	-44.739	-17.12	-27.619	PASS
		78	2483.50	-47.880	-16.88	-31.000	PASS
			9920.20	-45.395	-16.88	-28.515	PASS
$\pi/4$ DQPSK	2-DH5	0	2400.00	-47.520	-17.88	-29.640	PASS
			9608.08	-41.359	-17.88	-23.479	PASS
		39	9763.72	-42.359	-17.21	-25.149	PASS
		78	2483.50	-50.540	-17.19	-33.350	PASS
			9920.20	-43.475	-17.19	-26.285	PASS
8DPSK	3-DH5	0	2398.86	-48.866	-17.83	-31.036	PASS
			2400.00	-49.090	-17.83	-31.260	PASS
			9608.10	-40.648	-17.83	-22.818	PASS
		39	9763.72	-43.535	-17.25	-26.285	PASS
		78	2483.50	-48.920	-17.04	-31.880	PASS
			9920.20	-43.991	-17.04	-26.951	PASS

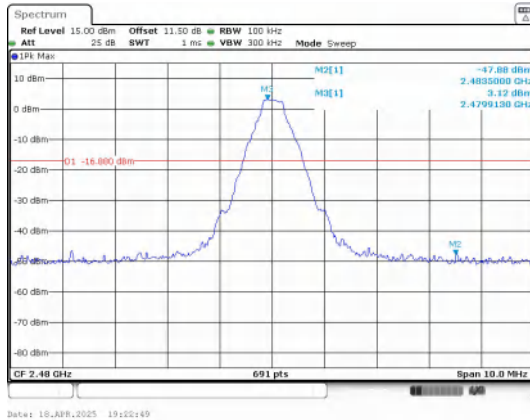
Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2395.25	-48.270	-24.8	-23.470	PASS
			2400.00	-48.810	-24.8	-24.010	PASS
			2483.50	-47.910	-24.04	-23.870	PASS
$\pi/4$ DQPSK	2-DH5		2395.73	-48.735	-20.25	-28.485	PASS
			2400.00	-49.470	-20.25	-29.220	PASS
			2483.50	-48.390	-18.25	-30.140	PASS
8DPSK	3-DH5		2398.68	-48.223	-26.33	-21.893	PASS
			2400.00	-50.770	-26.33	-24.440	PASS
			2483.50	-48.770	-24.13	-24.640	PASS

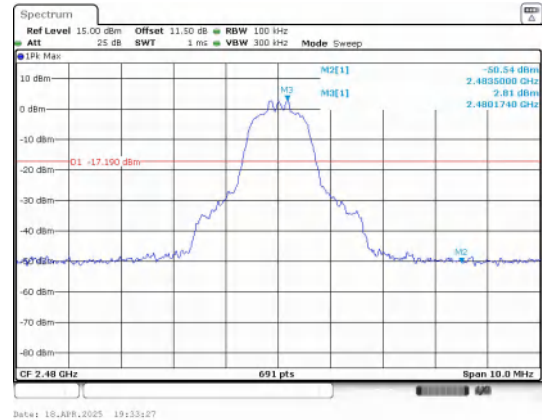
Test Graphs



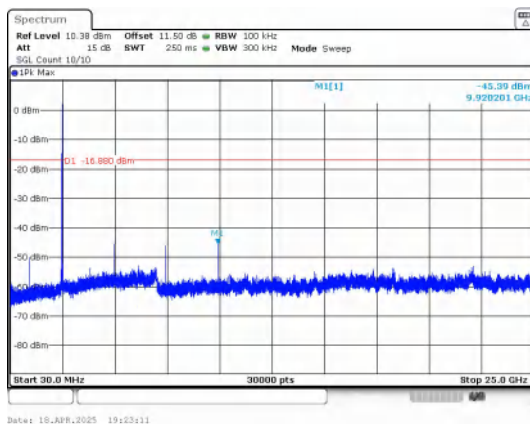




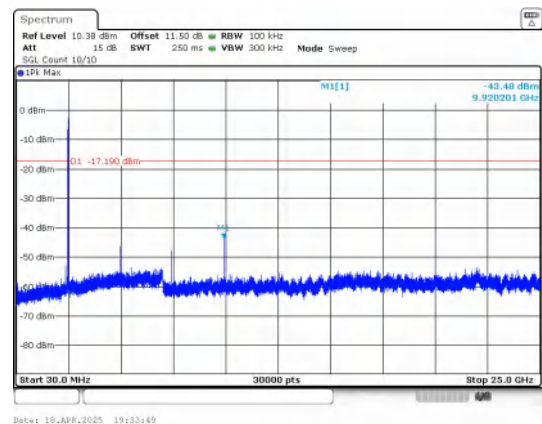
Out Of Band Emission
GFSK_DH5_Channel 78



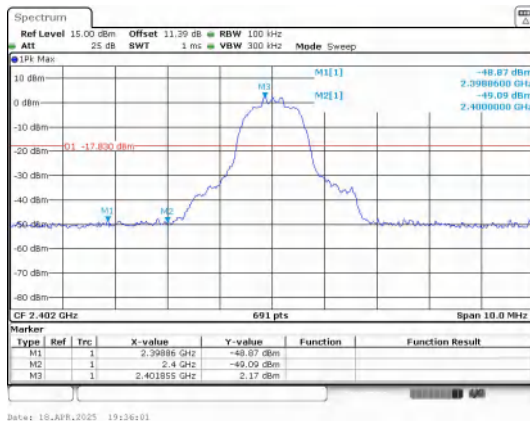
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78



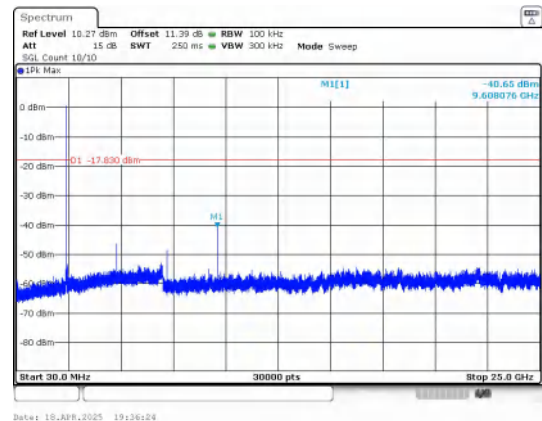
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



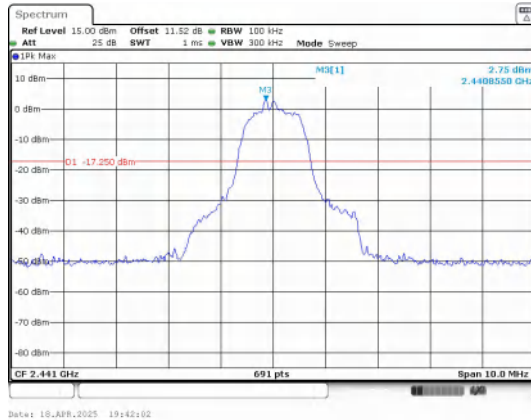
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 78



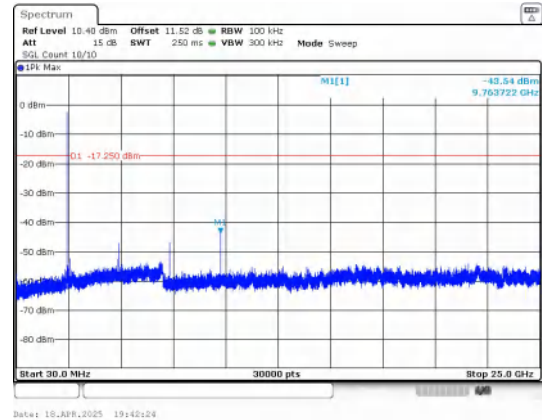
Out Of Band Emission
8DPSK_3-DH5_Channel 0



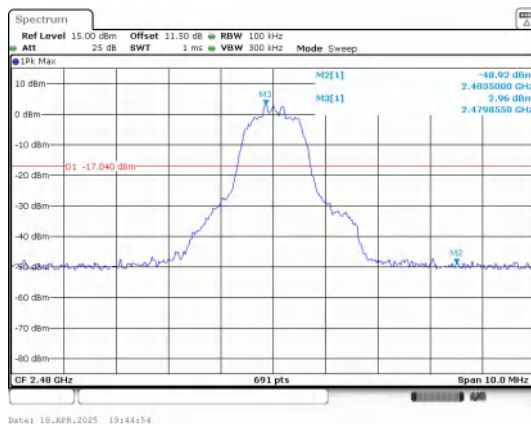
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0



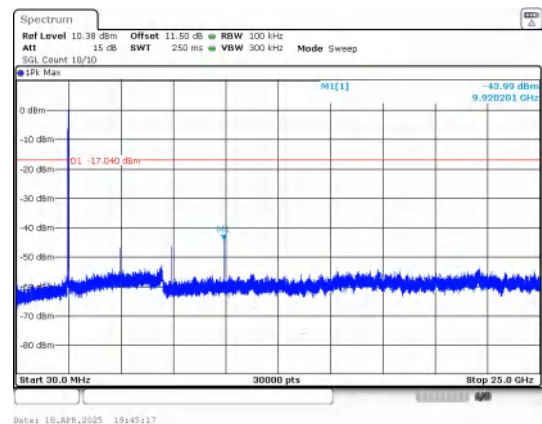
Out Of Band Emission
8DPSK_3-DH5_Channel 39



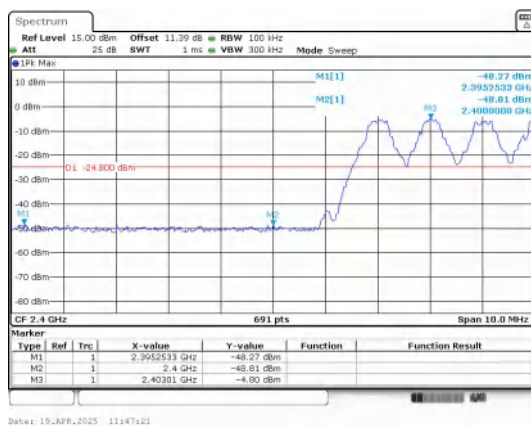
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39



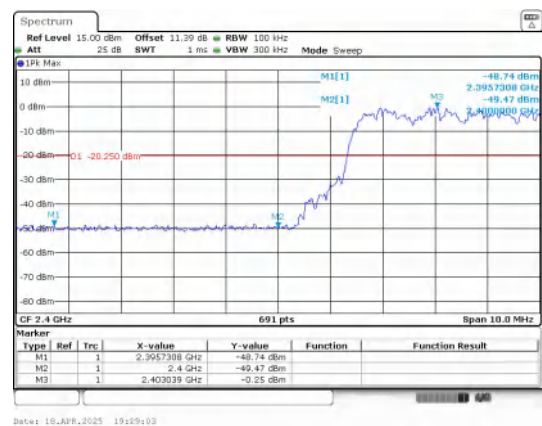
Out Of Band Emission
8DPSK_3-DH5_Channel 78



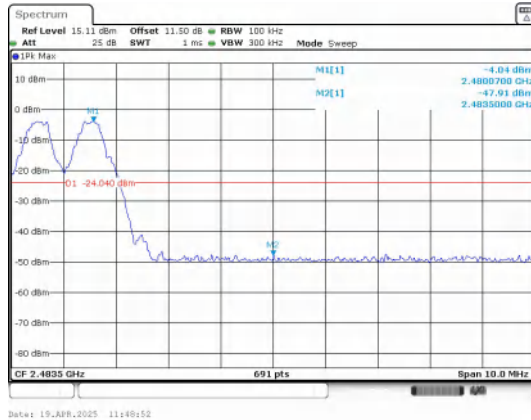
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78



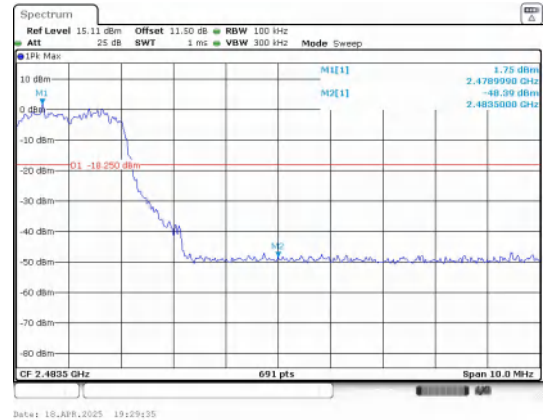
Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



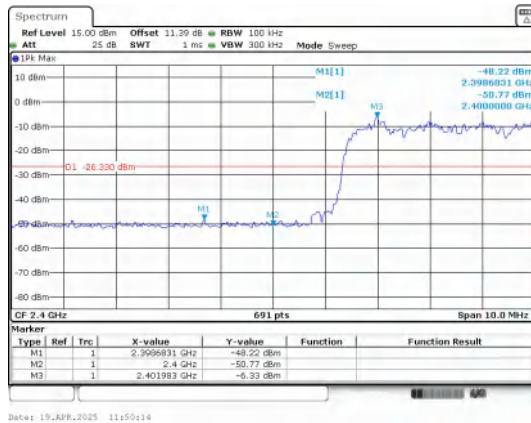
Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping



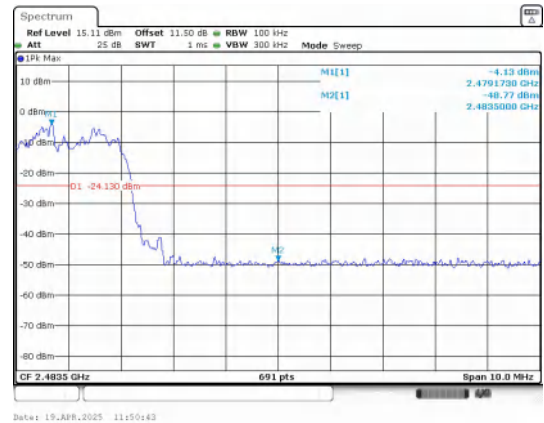
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



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



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



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

-----End of the report-----