Appendix Report

Report No.:	CISR250401008
Test Engineer:	James Wang
Supervised by:	Rory Huang

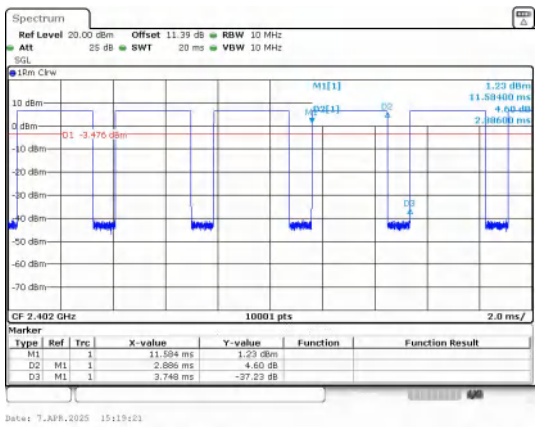
1) Duty Cycle

Test Result

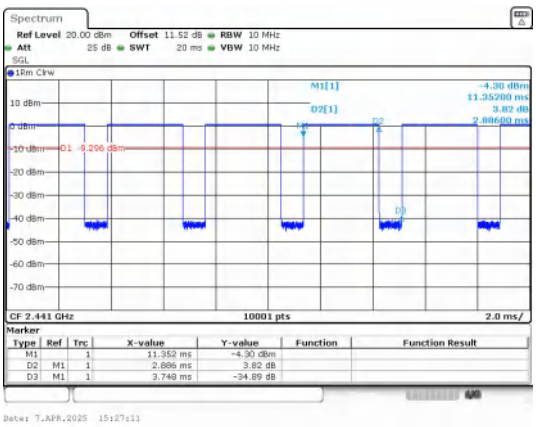
Left：

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.886	3.748	77.00	0.7700	1.1351	0.3465
		39	2.886	3.748	77.00	0.7700	1.1351	0.3465
		78	2.886	3.748	77.00	0.7700	1.1351	0.3465
π/4DQPSK	2-DH5	0	2.890	3.748	77.11	0.7711	1.1289	0.3460
		39	2.892	3.748	77.16	0.7716	1.1261	0.3458
		78	2.892	3.748	77.16	0.7716	1.1261	0.3458
8DPSK	3-DH5	0	2.894	3.748	77.21	0.7721	1.1233	0.3455
		39	2.894	3.748	77.21	0.7721	1.1233	0.3455
		78	2.892	3.748	77.16	0.7716	1.1261	0.3458

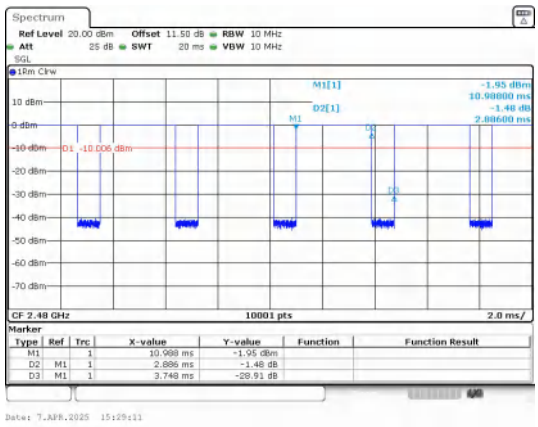
Test Graphs



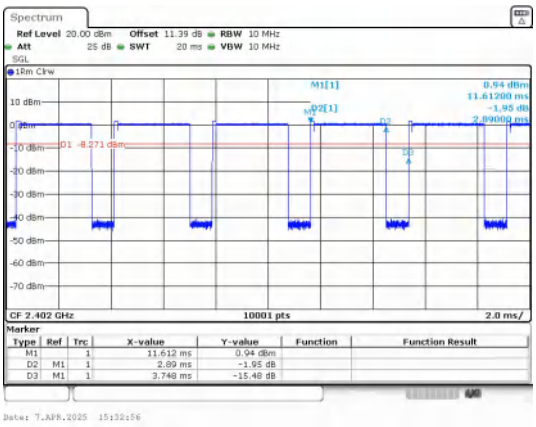
GFSK(DH5)_Channel 0



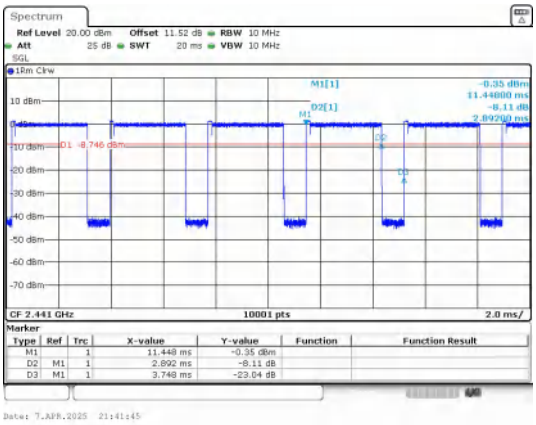
GFSK(DH5)_Channel 39



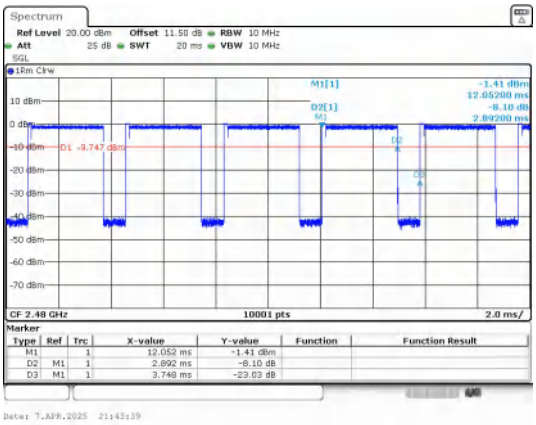
GFSK(DH5)_Channel 78



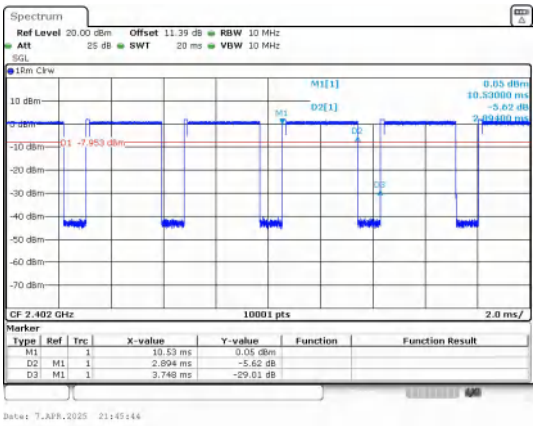
π/4DQPSK(2-DH5)_Channel 0



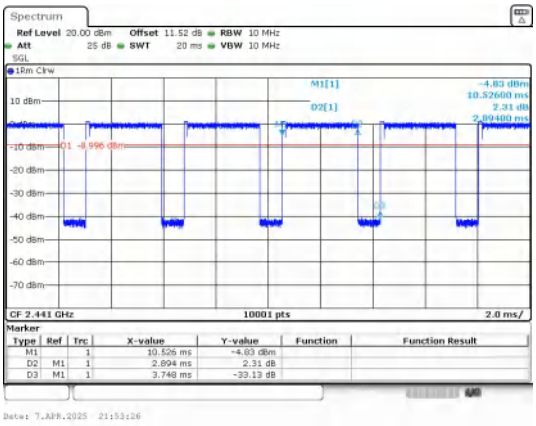
π/4DQPSK(2-DH5)_Channel 39



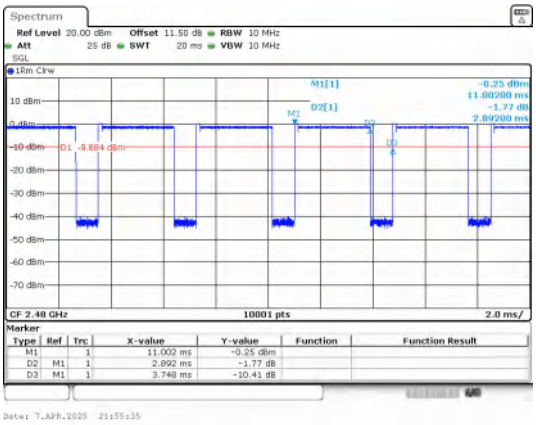
π/4DQPSK(2-DH5)_Channel 78



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39



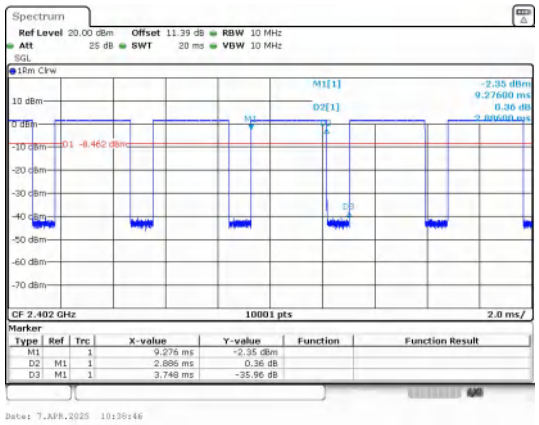
8DPSK(3-DH5)_Channel 78

Right:

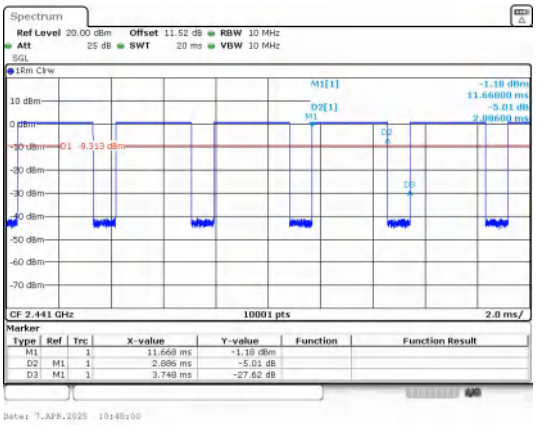
Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.886	3.748	77.00	0.7700	1.1351	0.3465
		39	2.886	3.748	77.00	0.7700	1.1351	0.3465
		78	2.886	3.748	77.00	0.7700	1.1351	0.3465
π/4DQPSK	2-DH5	0	2.890	3.748	77.11	0.7711	1.1289	0.3460
		39	2.890	3.748	77.11	0.7711	1.1289	0.3460

		78	2.890	3.748	77.11	0.7711	1.1289	0.3460
8DPSK	3-DH5	0	2.892	3.748	77.16	0.7716	1.1261	0.3458
		39	2.892	3.748	77.16	0.7716	1.1261	0.3458
		78	2.894	3.748	77.21	0.7721	1.1233	0.3455

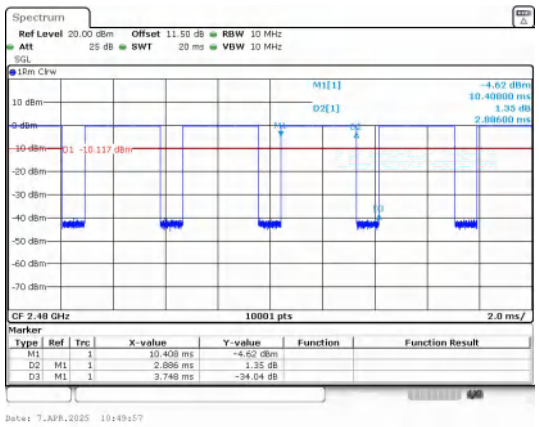
Test Graphs



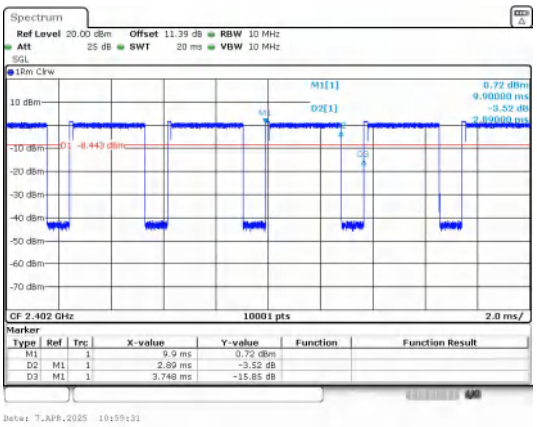
GFSK(DH5)_Channel 0



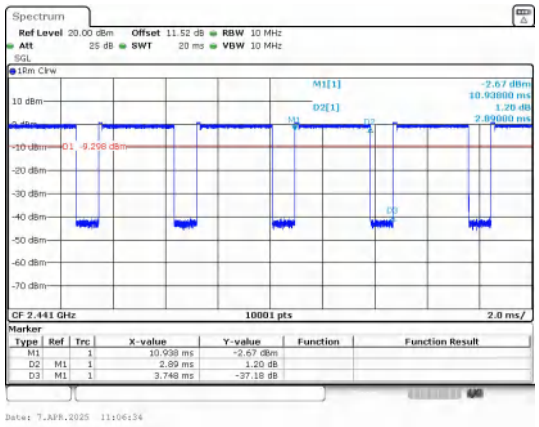
GFSK(DH5)_Channel 39



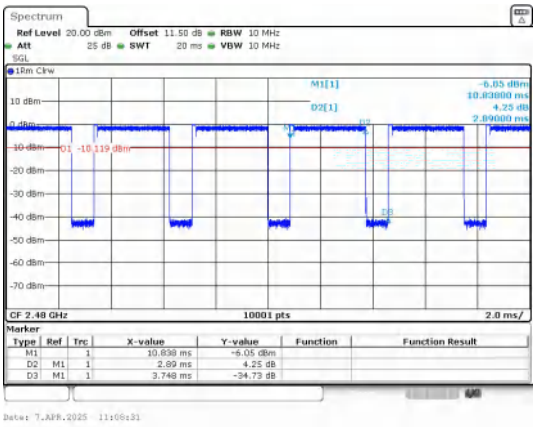
GFSK(DH5)_Channel 78



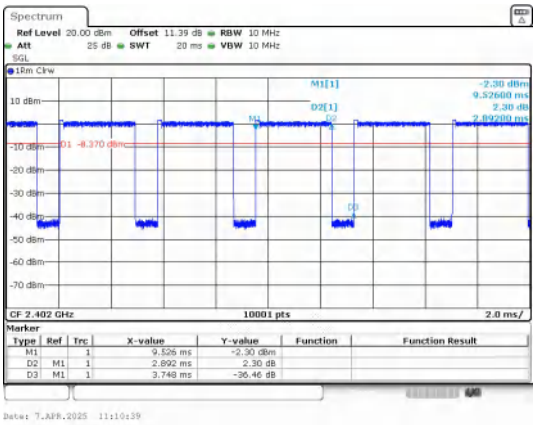
π/4DQPSK(2-DH5)_Channel 0



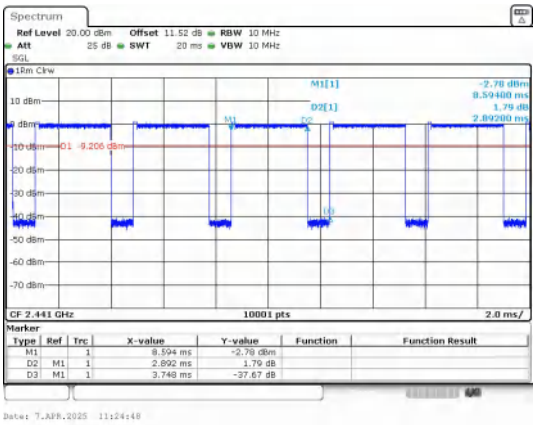
π/4DQPSK(2-DH5)_Channel 39



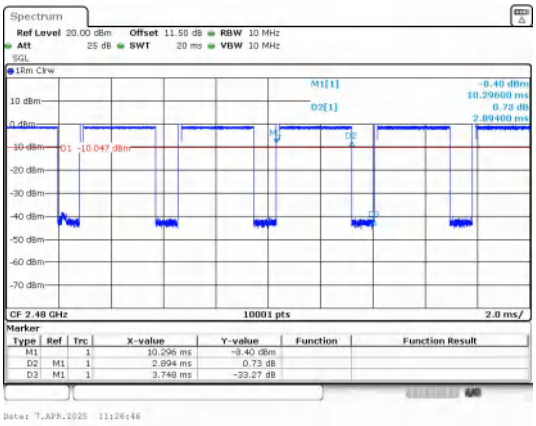
π/4DQPSK(2-DH5)_Channel 78



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39



8DPSK(3-DH5)_Channel 78

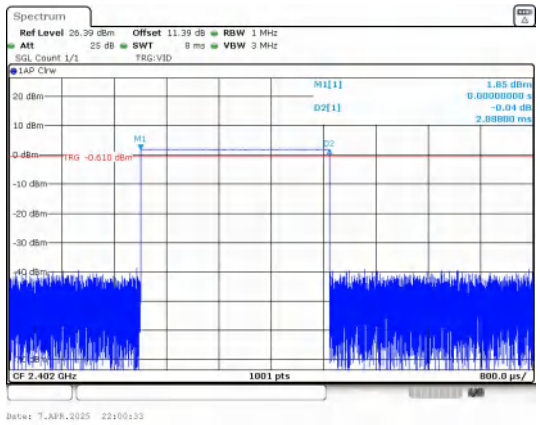
2) Dwell Time

Test Result

Left:

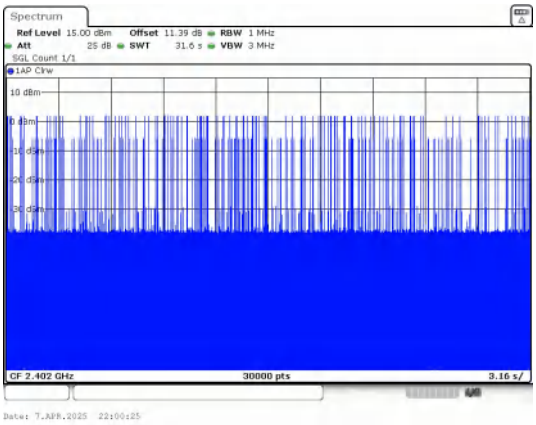
Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.888	119	343.67	< 400	PASS
π/4DQPSK	2-DH5		2.896	114	330.14		PASS
8DPSK	3-DH5		2.896	111	321.46		PASS

Test Graphs



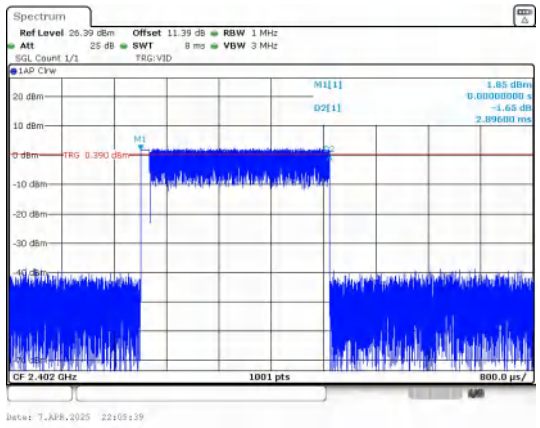
Pulse Width

GFSK_DH5



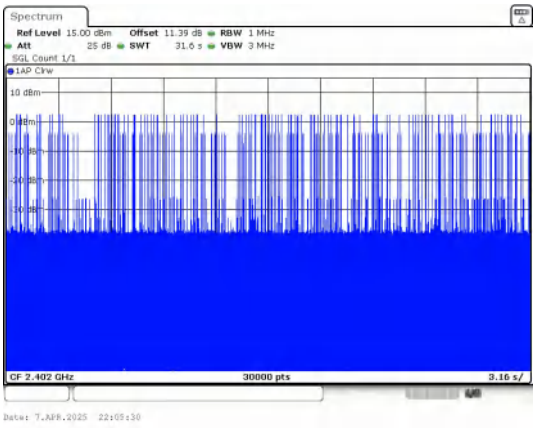
Number of Pulses in 31.6 seconds

GFSK_DH5



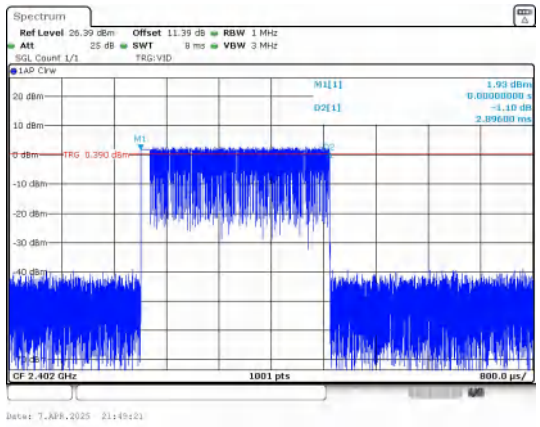
Pulse Width

π/4DQPSK_2-DH5



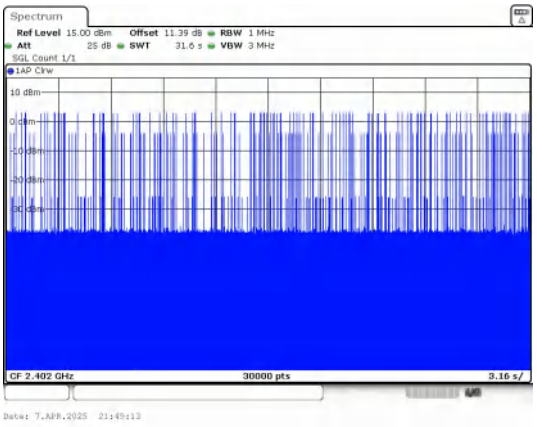
Number of Pulses in 31.6 seconds

π/4DQPSK_2-DH5



Pulse Width

8DPSK_3-DH5



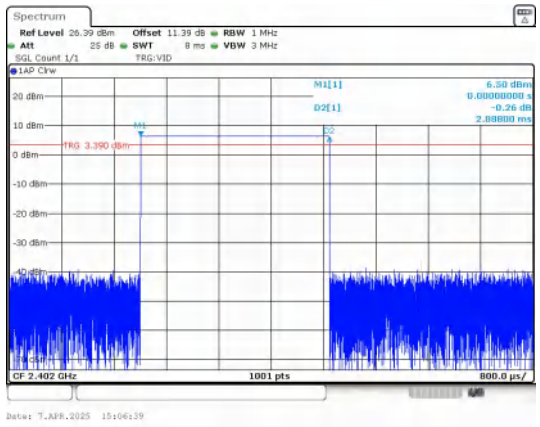
Number of Pulses in 31.6 seconds

8DPSK_3-DH5

Right:

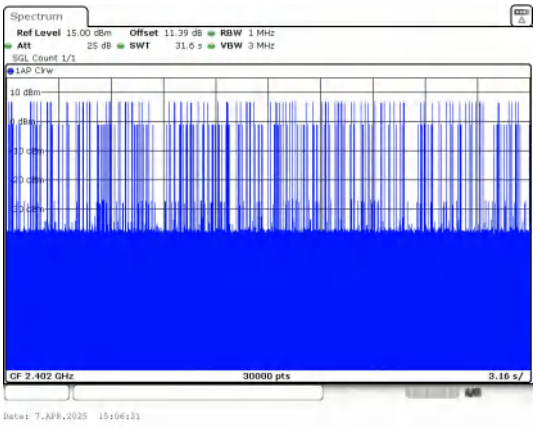
Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.888	101	291.69	< 400	PASS
π/4DQPSK	2-DH5		2.888	102	294.58		PASS
8DPSK	3-DH5		2.896	100	289.6		PASS

Test Graphs



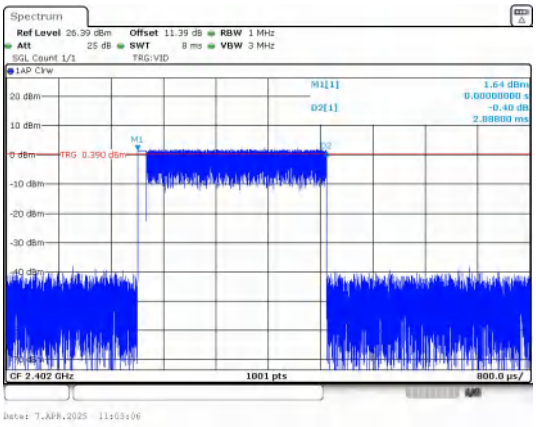
Pulse Width

GFSK_DH5



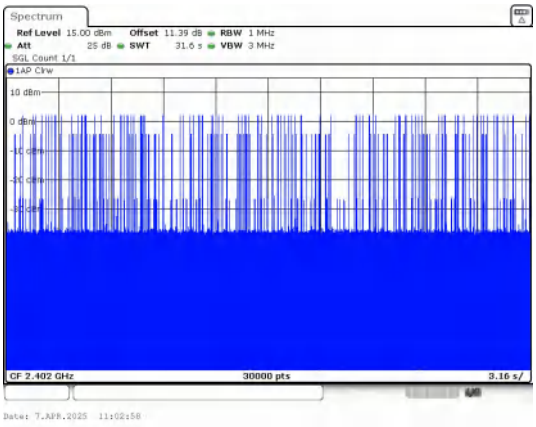
Number of Pulses in 31.6 seconds

GFSK_DH5



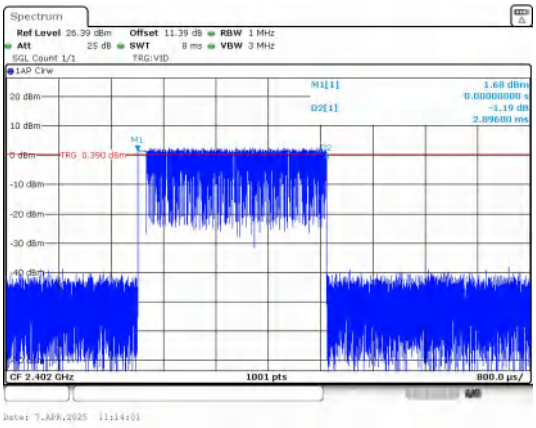
Pulse Width

π/4DQPSK_2-DH5



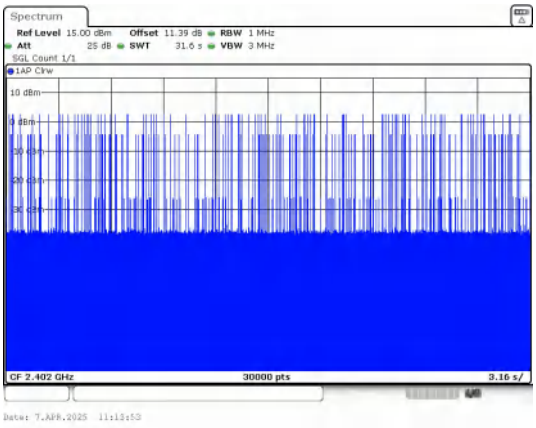
Number of Pulses in 31.6 seconds

π/4DQPSK_2-DH5



Pulse Width

8DPSK_3-DH5



Number of Pulses in 31.6 seconds

8DPSK_3-DH5

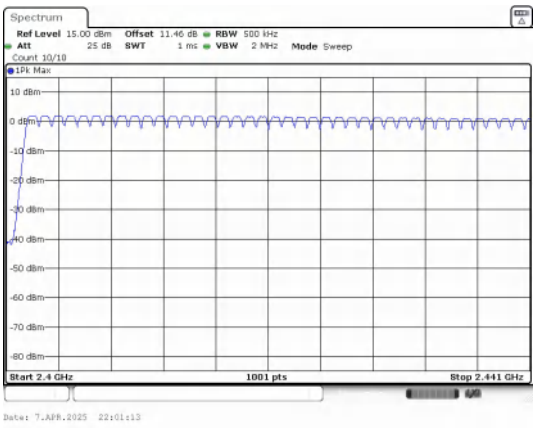
3) Number Of Hopping Channel

Test Result

Left:

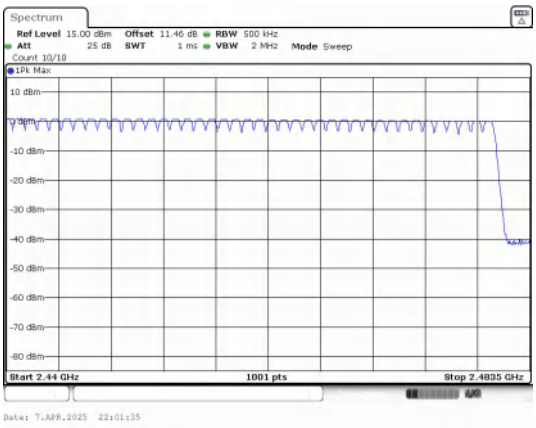
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
π/4DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

Test Graphs



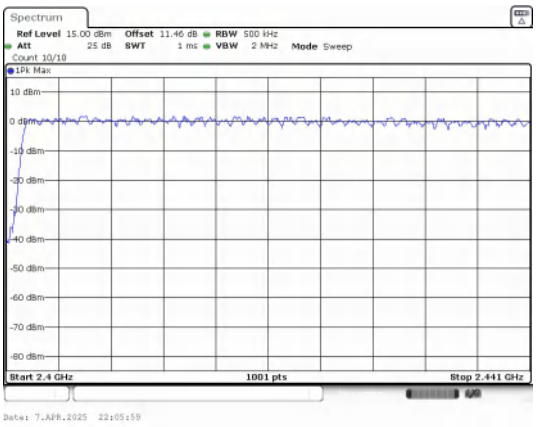
Low End Spectrum Channel Hopping Plot

GFSK



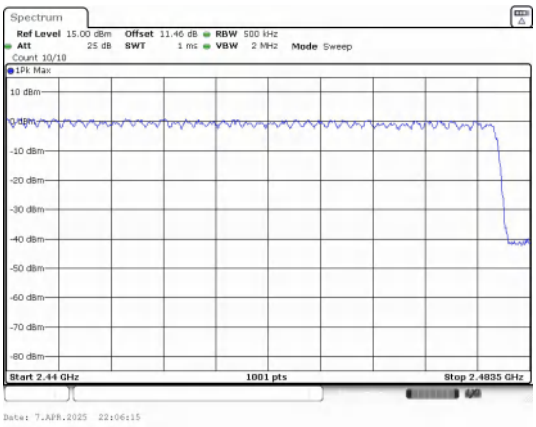
High End Spectrum Channel Hopping Plot

GFSK



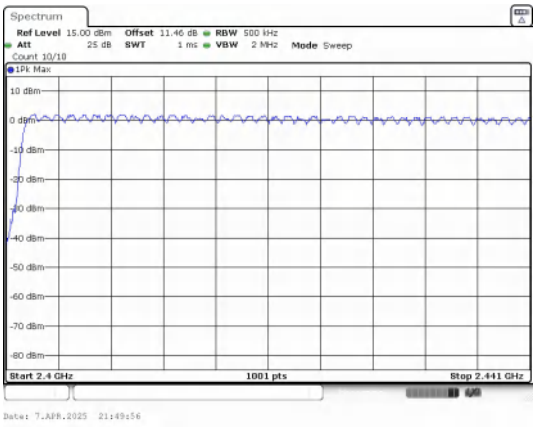
Low End Spectrum Channel Hopping Plot

π/4DQPSK



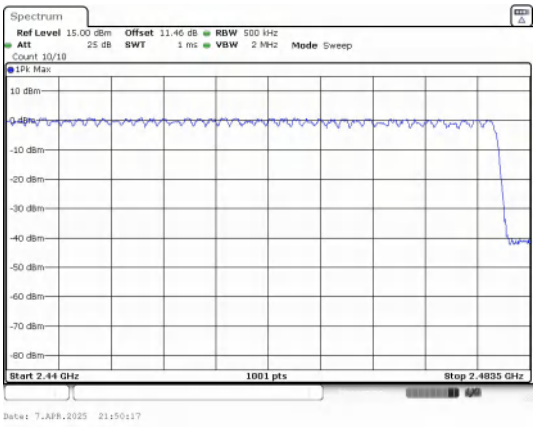
High End Spectrum Channel Hopping Plot

π/4DQPSK



Low End Spectrum Channel Hopping Plot

8DPSK



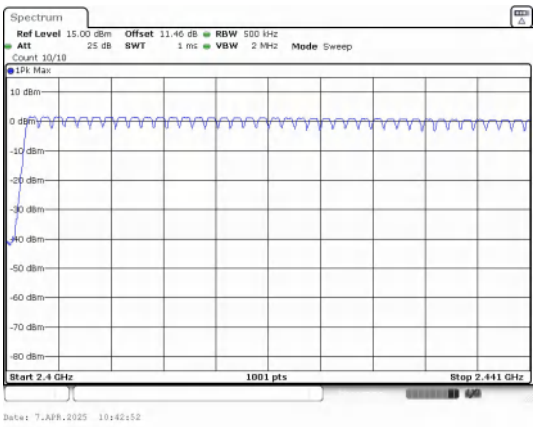
High End Spectrum Channel Hopping Plot

8DPSK

Right:

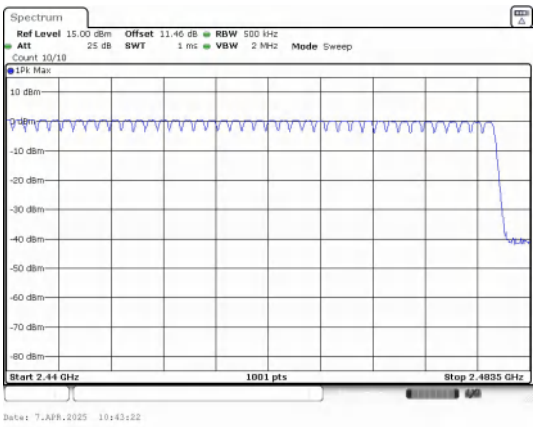
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
π/4DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

Test Graphs



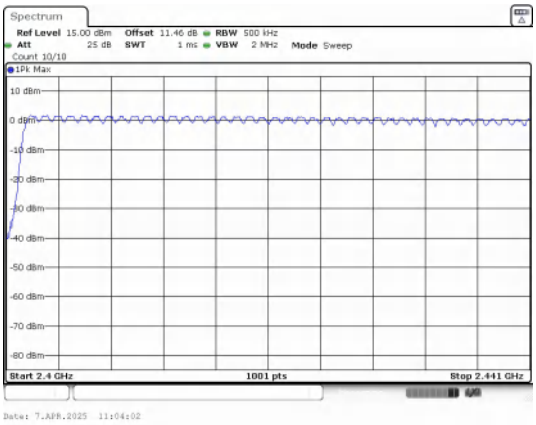
Low End Spectrum Channel Hopping Plot

GFSK



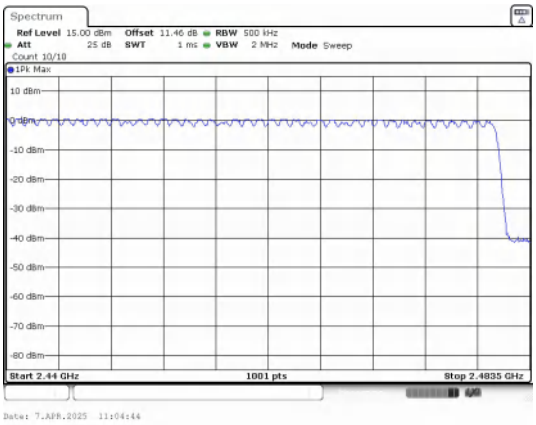
High End Spectrum Channel Hopping Plot

GFSK



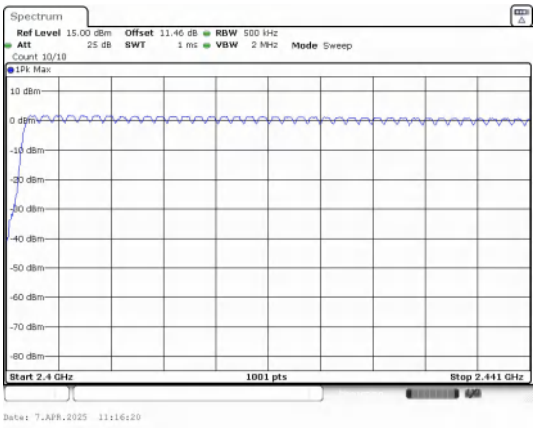
Low End Spectrum Channel Hopping Plot

π/4DQPSK



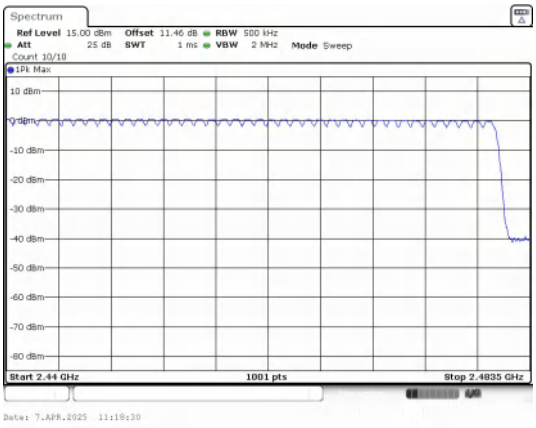
High End Spectrum Channel Hopping Plot

π/4DQPSK



Low End Spectrum Channel Hopping Plot

8DPSK



High End Spectrum Channel Hopping Plot

8DPSK

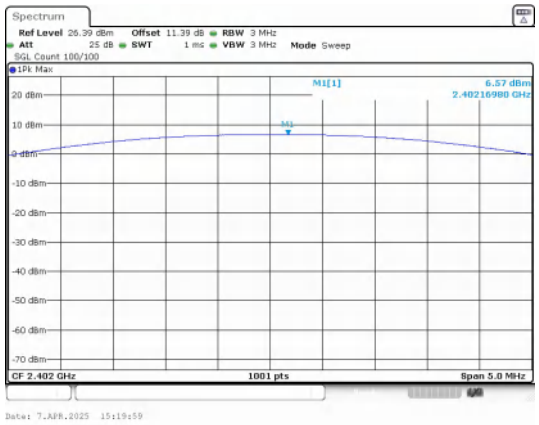
4) Conducted Peak Output Power

Test Result

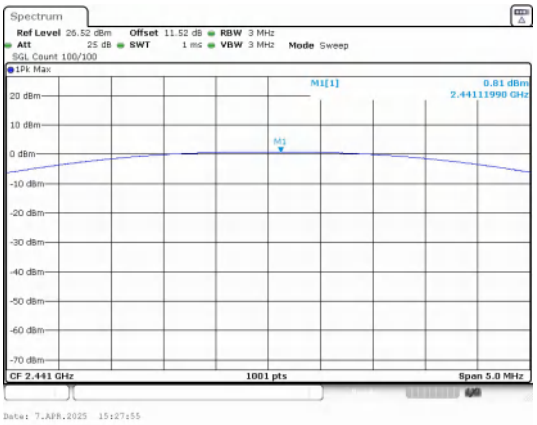
Left:

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	6.57	4.54	≤30	PASS
		39	0.81	1.21		PASS
		78	0.13	1.03		PASS
π/4DQPSK	2-DH5	0	2.59	1.82	≤20.97	PASS
		39	2.17	1.65		PASS
		78	1.21	1.32		PASS
8DPSK	3-DH5	0	3.35	2.16		PASS
		39	2.34	1.71		PASS
		78	1.46	1.40		PASS

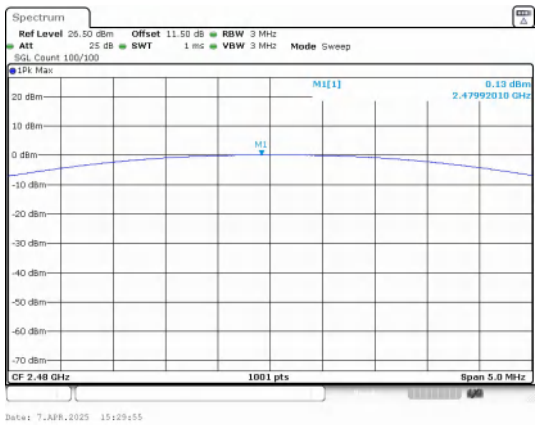
Test Graphs



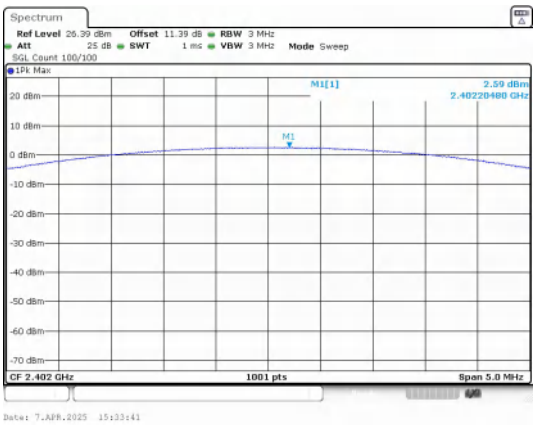
Peak Output Power
GFSK_Channel 0



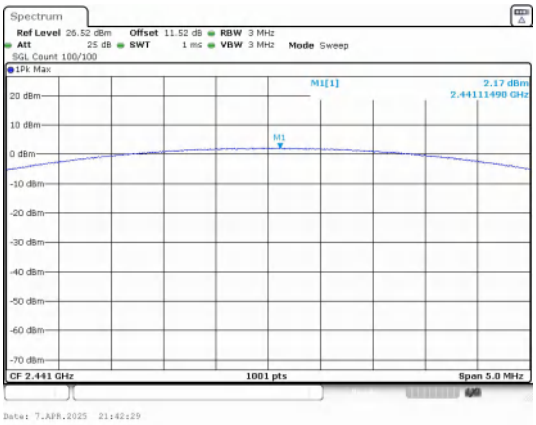
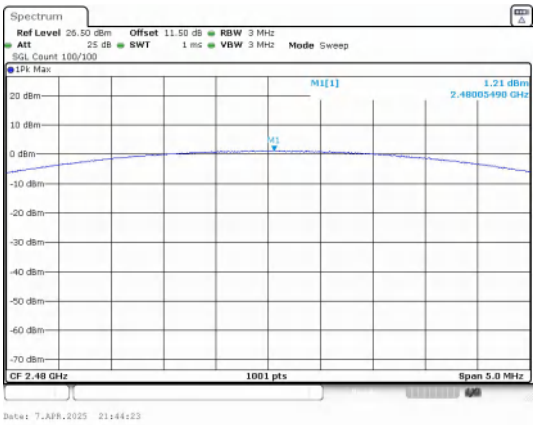
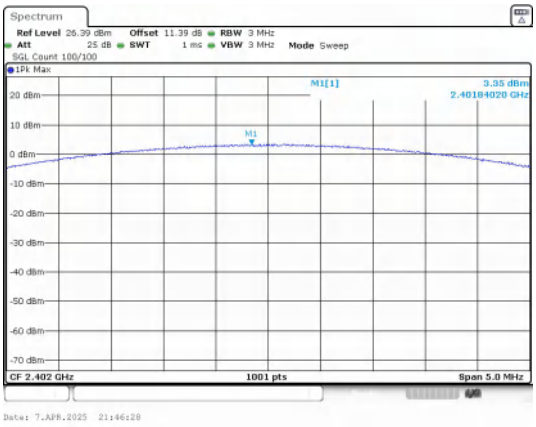
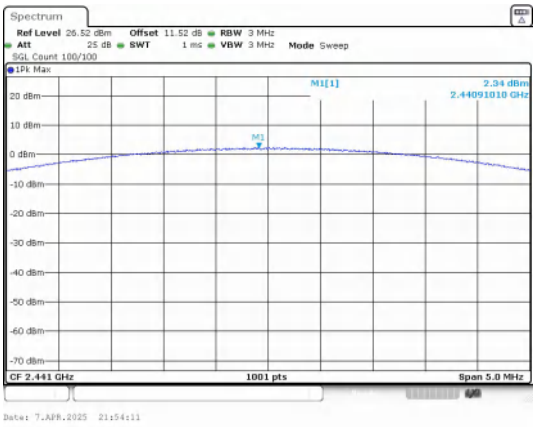
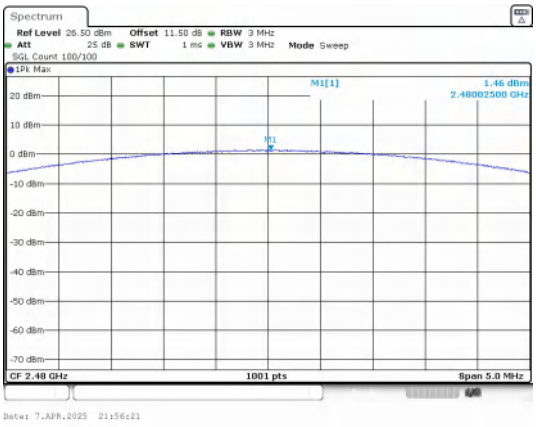
Peak Output Power
GFSK_Channel 39



Peak Output Power



Peak Output Power

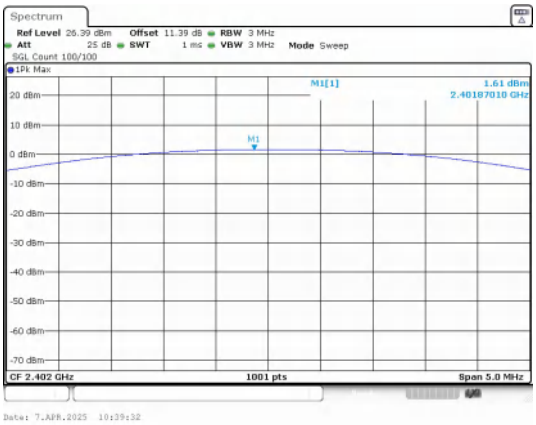
GFSK_Channel 78	π/4DQPSK_Channel 0
	
Peak Output Power π/4DQPSK_Channel 39	Peak Output Power π/4DQPSK_Channel 78
	
Peak Output Power 8DPSK_Channel 0	Peak Output Power 8DPSK_Channel 39
	
Peak Output Power 8DPSK_Channel 78	

Right:

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result

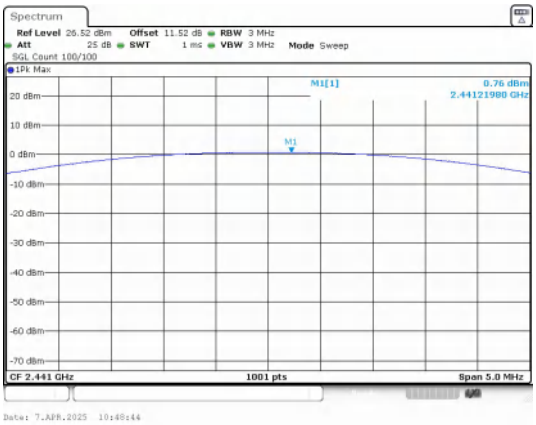
GFSK	DH5	0	1.61	1.45	≤30	PASS
		39	0.76	1.19		PASS
		78	-0.04	0.99		PASS
π/4DQPSK	2-DH5	0	2.45	1.76	≤20.97	PASS
		39	1.65	1.46		PASS
		78	0.84	1.21		PASS
8DPSK	3-DH5	0	2.87	1.94		PASS
		39	2.04	1.60		PASS
		78	1.20	1.32		PASS

Test Graphs



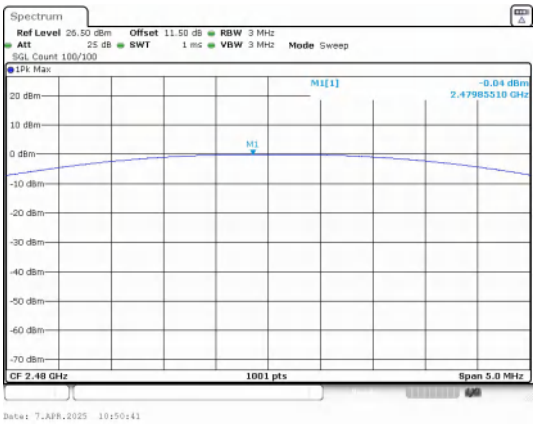
Peak Output Power

GFSK_Channel 0



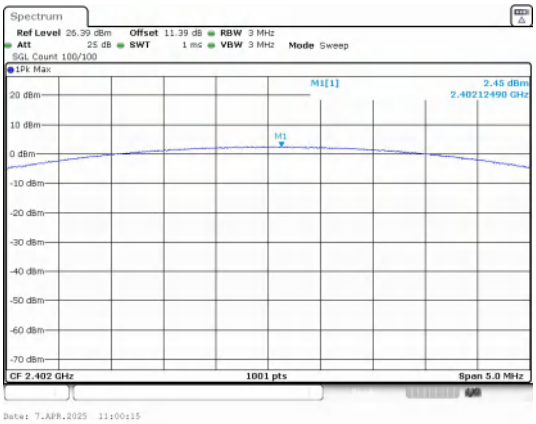
Peak Output Power

GFSK_Channel 39



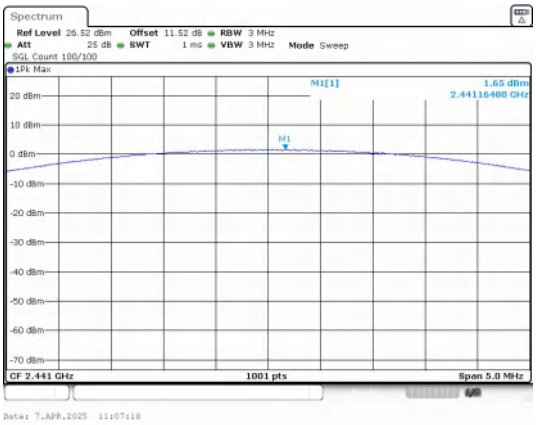
Peak Output Power

GFSK_Channel 78



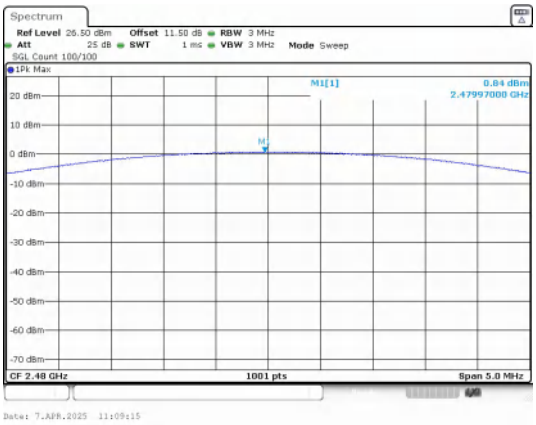
Peak Output Power

π/4DQPSK_Channel 0



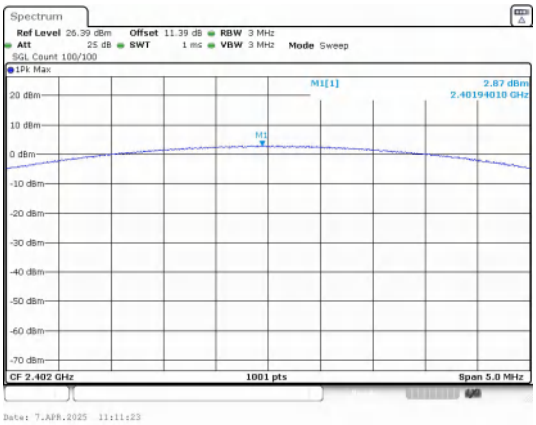
Peak Output Power

π/4DQPSK_Channel 39



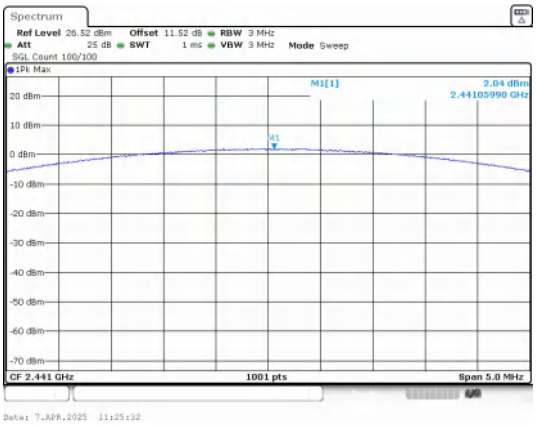
Peak Output Power

π/4DQPSK_Channel 78



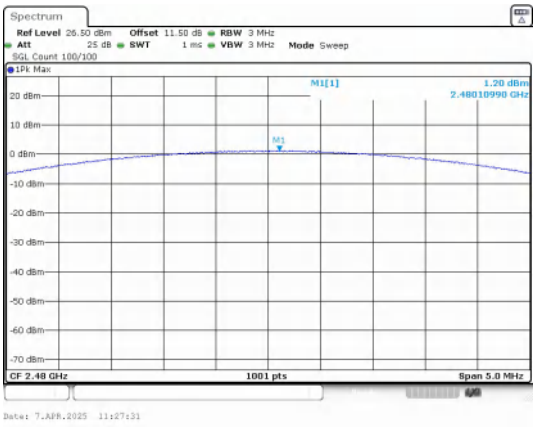
Peak Output Power

8DPSK_Channel 0



Peak Output Power

8DPSK_Channel 39



Peak Output Power

8DPSK_Channel 78

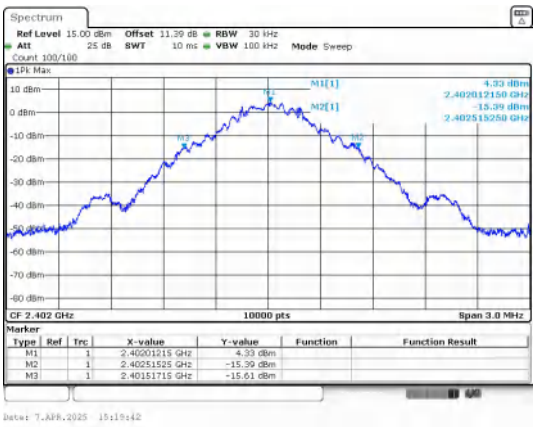
5) 20dB Bandwidth

Test Result

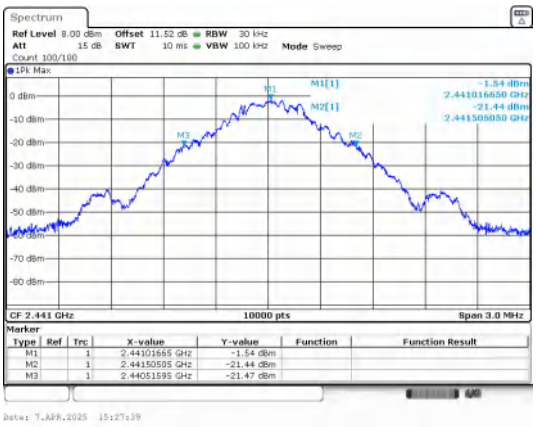
Left:

Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.0
	39	2441 MHz	1.0
	78	2480 MHz	1.0
π/4DQPSK	0	2402 MHz	1.280
	39	2441 MHz	1.280
	78	2480 MHz	1.300
8DPSK	0	2402 MHz	1.290
	39	2441 MHz	1.290
	78	2480 MHz	1.290

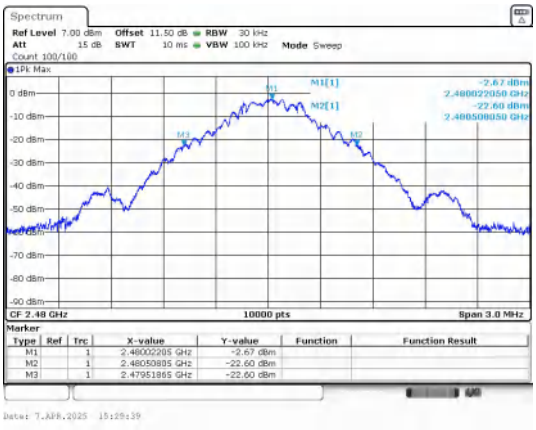
Test Graphs



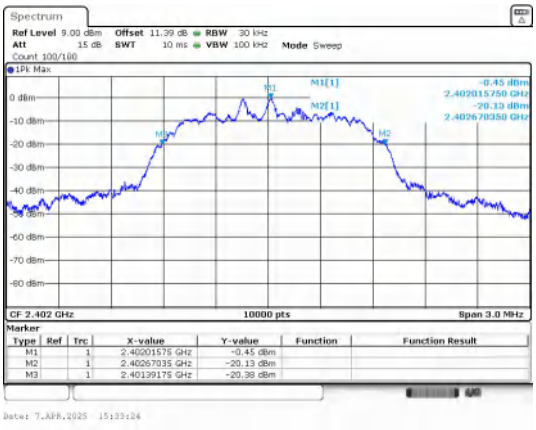
GFSK_DH5_Channel 0



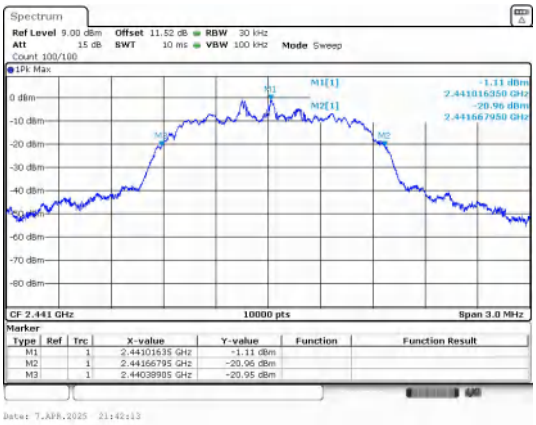
GFSK_DH5_Channel 39



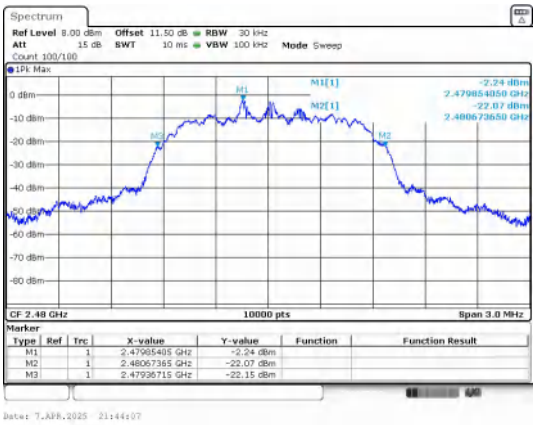
GFSK_DH5_Channel 78



π/4DQPSK_2-DH5_Channel 0

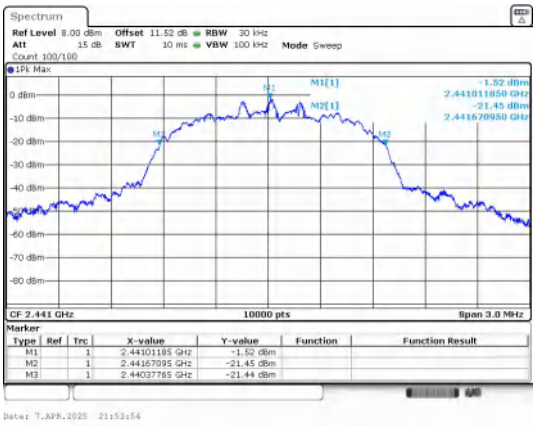


π/4DQPSK_2-DH5_Channel 39

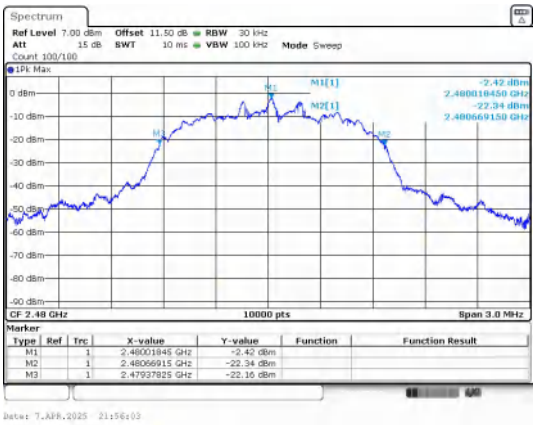


π/4DQPSK_2-DH5_Channel 78

8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



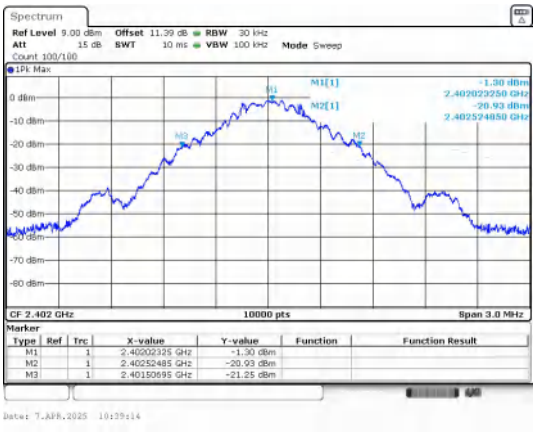
8DPSK_3-DH5_Channel 78

Right:

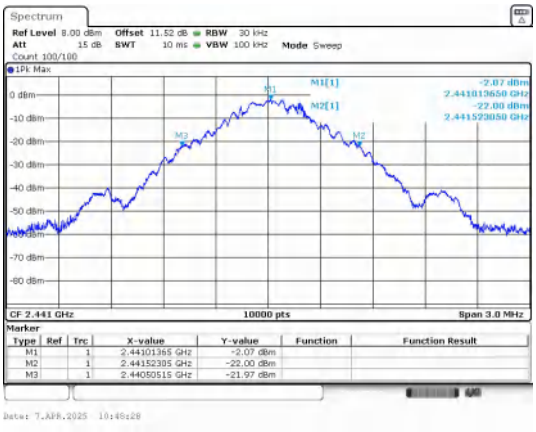
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.01
	39	2441 MHz	1.01
	78	2480 MHz	1.01
π/4DQPSK	0	2402 MHz	1.280
	39	2441 MHz	1.300
	78	2480 MHz	1.300

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

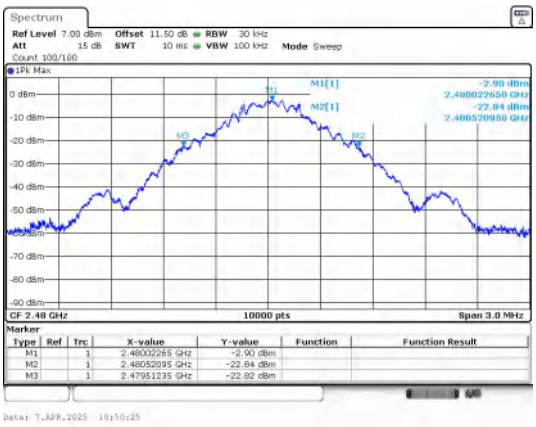
Test Graphs



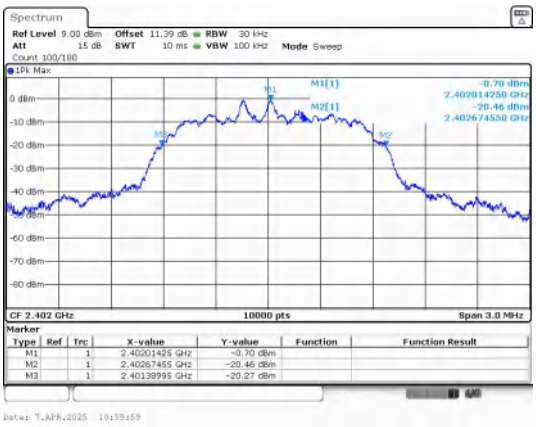
GFSK_DH5_Channel 0



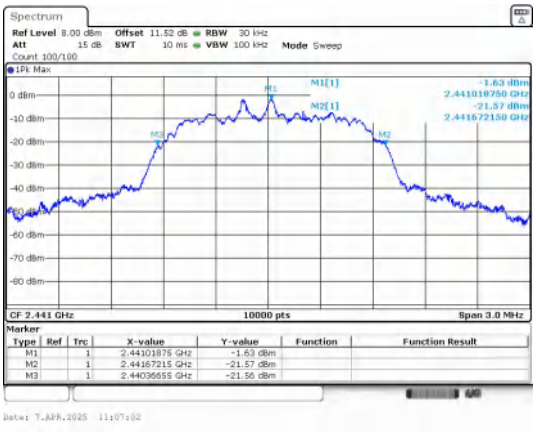
GFSK_DH5_Channel 39



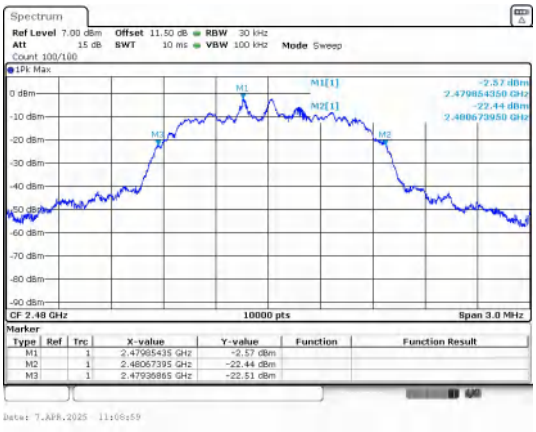
GFSK_DH5_Channel 78



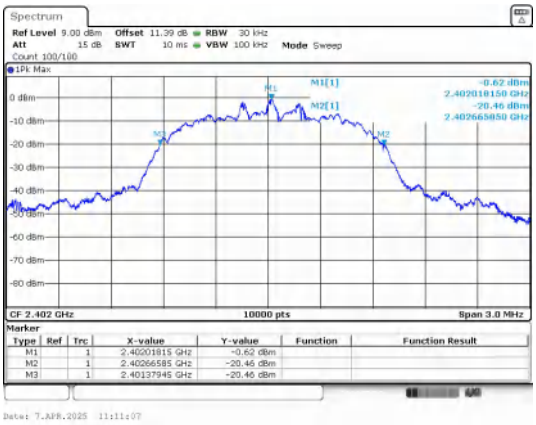
π/4DQPSK_2-DH5_Channel 0



π/4DQPSK_2-DH5_Channel 39

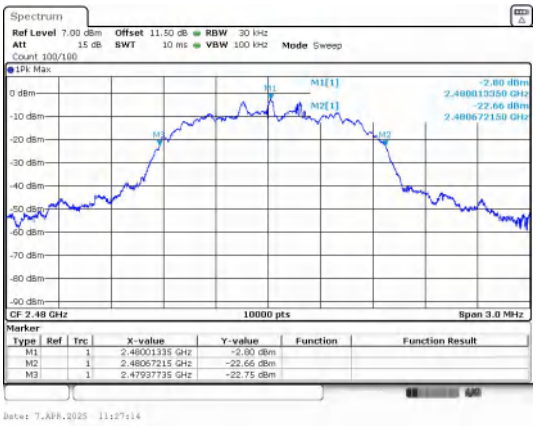


π/4DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0

8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78

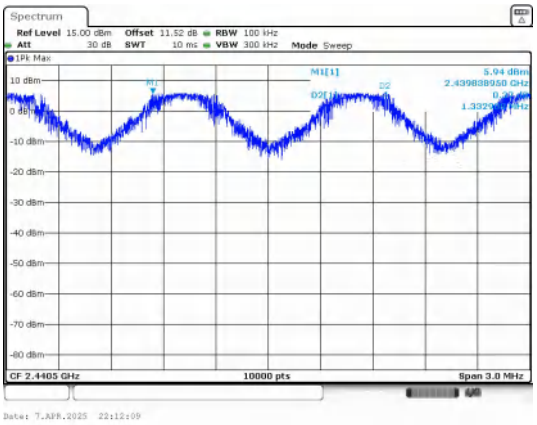
6) Carrier Frequencies Separation

Test Result

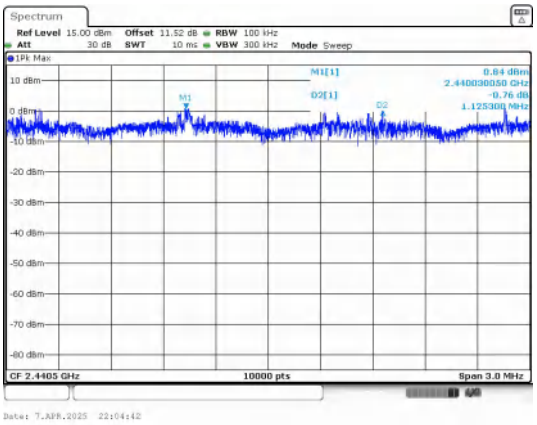
Left:

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2439.8389	2441.1719	1.3329	1.0	PASS
π/4DQPSK	2-DH5	2440.03	2441.1553	1.1253	0.867	PASS
8DPSK	3-DH5	2439.9877	2441.1917	1.2039	0.86	PASS

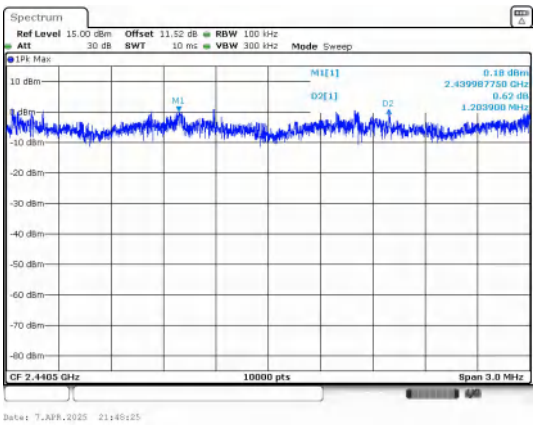
Test Graphs



GFSK



π/4DQPSK

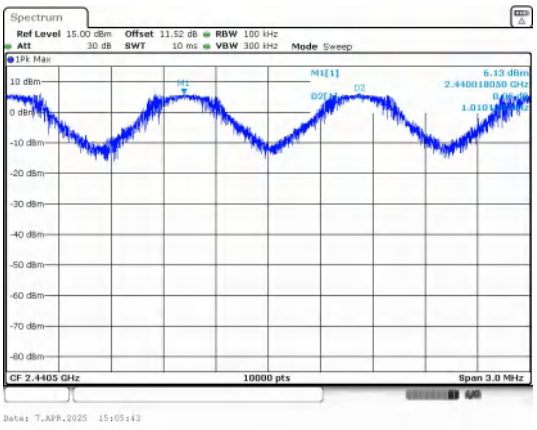


8DPSK

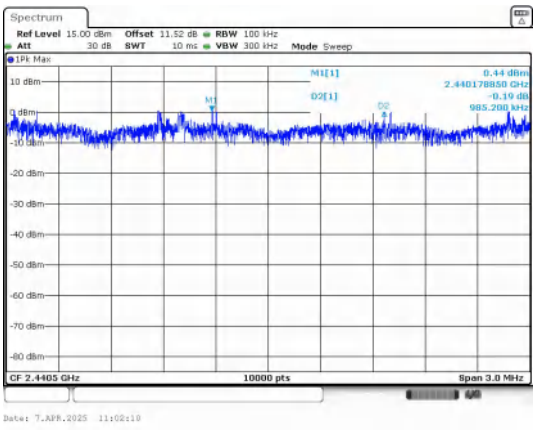
Right:

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.0181	2441.0282	1.0101	1.01	PASS
π/4DQPSK	2-DH5	2440.1788	2441.164	0.9852	0.853	PASS
8DPSK	3-DH5	2440.0267	2441.1802	1.1535	0.86	PASS

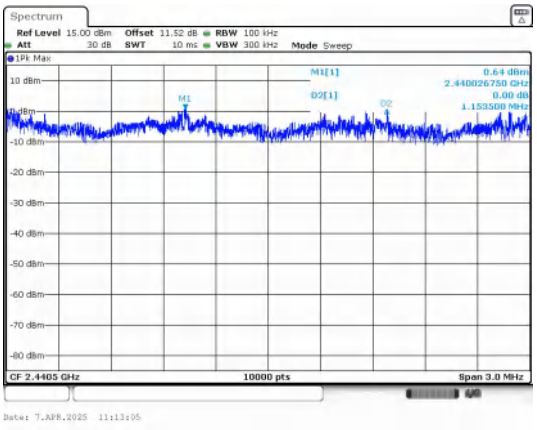
Test Graphs



GFSK



π/4DQPSK



8DPSK

7) Conducted Out Of Band Emission

Test Result

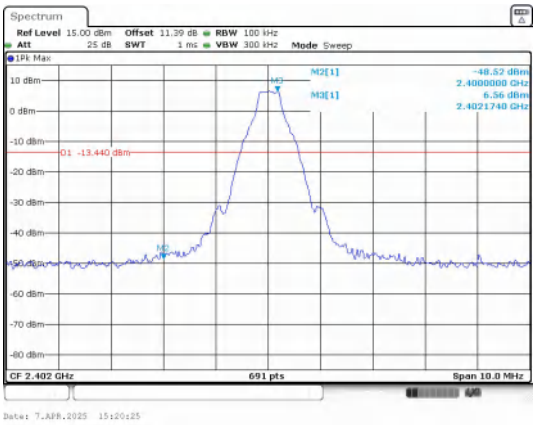
Left:

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-48.520	-13.44	-35.080	PASS
			7205.96	-36.605	-13.44	-23.165	PASS
		39	9763.72	-42.094	-19.24	-22.854	PASS
		78	2483.50	-49.270	-20.06	-29.210	PASS
			9920.20	-39.543	-20.06	-19.483	PASS
π/4DQPSK	2-DH5	0	2398.69	-49.020	-18.28	-30.740	PASS
			2400.00	-50.400	-18.28	-32.120	PASS
			9608.10	-44.309	-18.28	-26.029	PASS
		39	9764.55	-42.084	-18.91	-23.174	PASS
		78	2483.50	-50.390	-19.8	-30.590	PASS
			9920.20	-39.313	-19.8	-19.513	PASS
8DPSK	3-DH5	0	2400.00	-45.860	-18.08	-27.780	PASS
			9608.08	-43.825	-18.08	-25.745	PASS
		39	9763.72	-42.355	-19.15	-23.205	PASS
		78	2483.50	-49.730	-20.03	-29.700	PASS
			9920.20	-38.786	-20.03	-18.756	PASS

Hopping

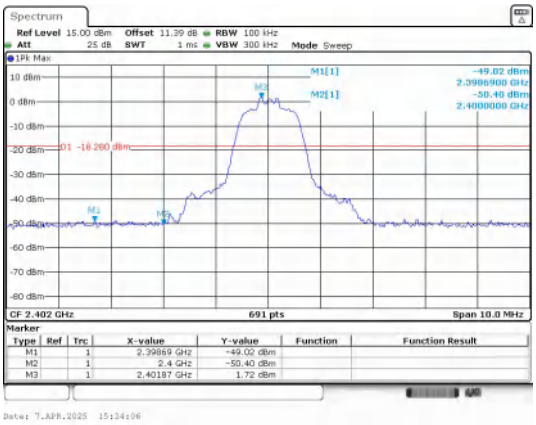
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2398.29	-47.905	-18.06	-29.845	PASS
			2400.00	-49.950	-18.06	-31.890	PASS
			2483.50	-49.950	-20.07	-29.880	PASS
π/4DQPSK	2-DH5		2397.84	-48.555	-18.53	-30.025	PASS
			2400.00	-50.380	-18.53	-31.850	PASS
			2483.50	-49.750	-24.19	-25.560	PASS
8DPSK	3-DH5		2398.38	-48.061	-18.16	-29.901	PASS
			2400.00	-49.620	-18.16	-31.460	PASS
			2483.50	-49.290	-21.66	-27.630	PASS

Test Graphs



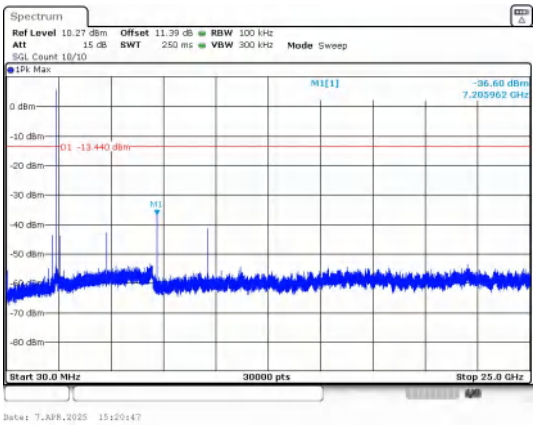
Out Of Band Emission

GFSK_DH5_Channel 0



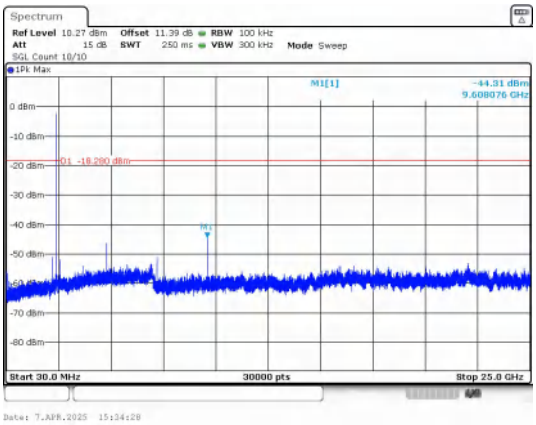
Out Of Band Emission

π/4DQPSK_2-DH5_Channel 0



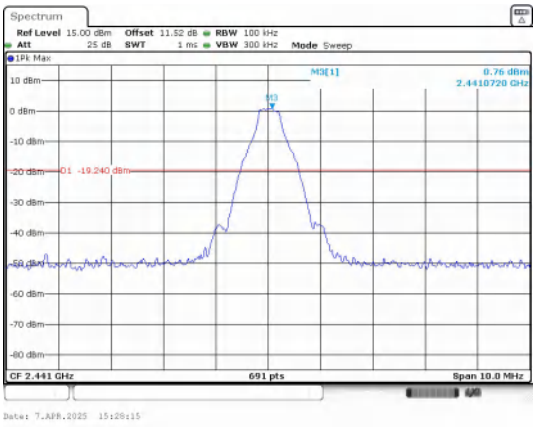
30.0 MHz - 25000.0 MHz

GFSK_DH5_Channel 0



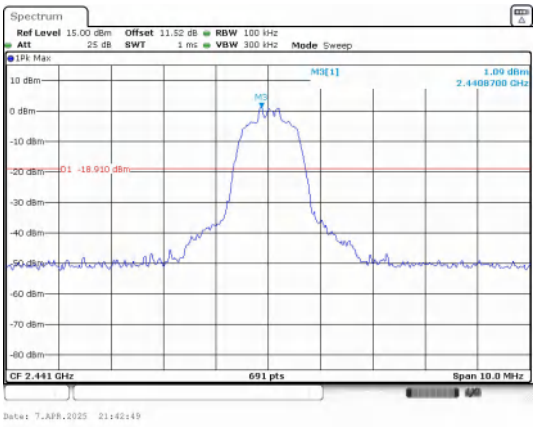
30.0 MHz - 25000.0 MHz

π/4DQPSK_2-DH5_Channel 0



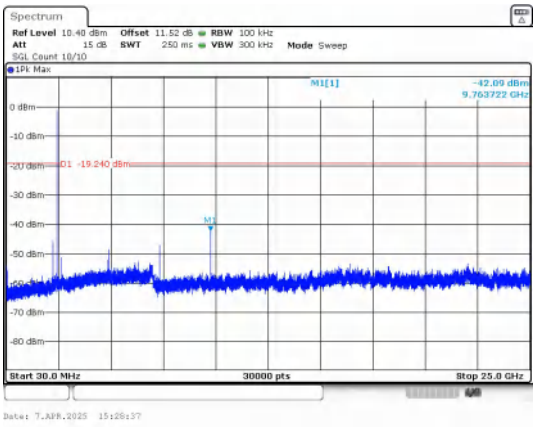
Out Of Band Emission

GFSK_DH5_Channel 39



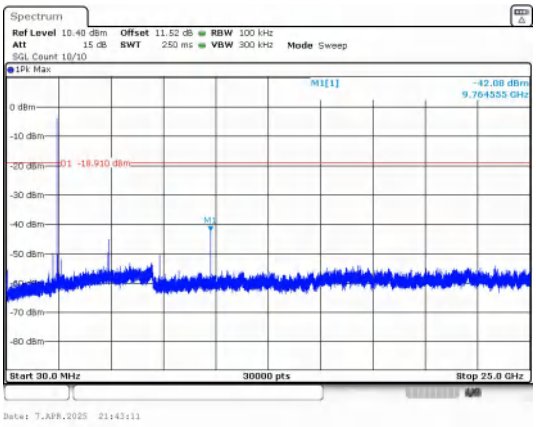
Out Of Band Emission

π/4DQPSK_2-DH5_Channel 39



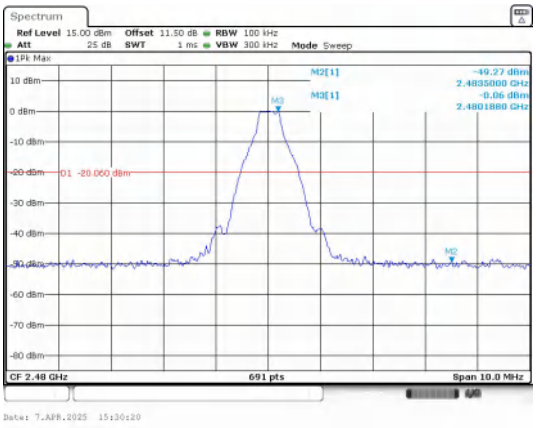
30.0 MHz - 25000.0 MHz

GFSK_DH5_Channel 39



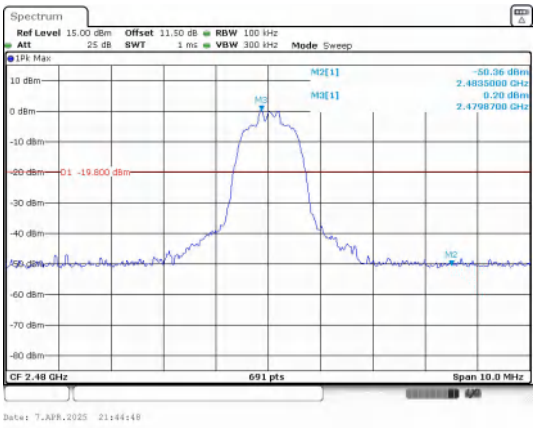
30.0 MHz - 25000.0 MHz

π/4DQPSK_2-DH5_Channel 39



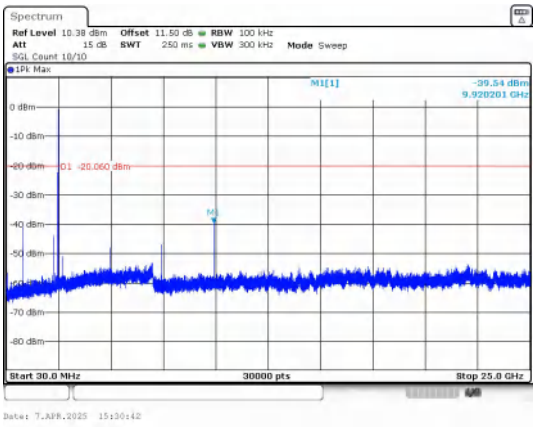
Out Of Band Emission

GFSK_DH5_Channel 78



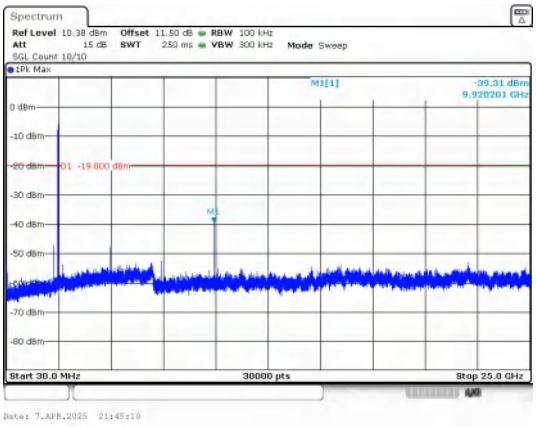
Out Of Band Emission

π/4DQPSK_2-DH5_Channel 78



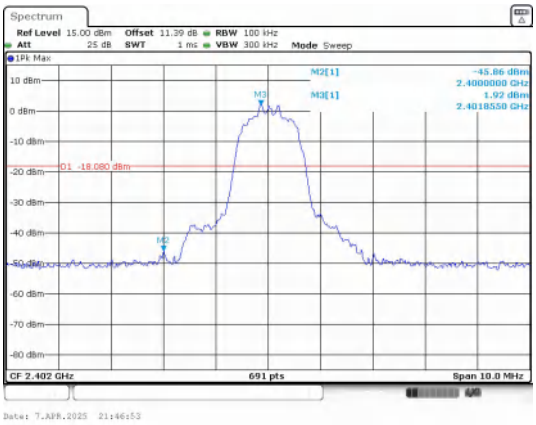
30.0 MHz - 25000.0 MHz

GFSK_DH5_Channel 78



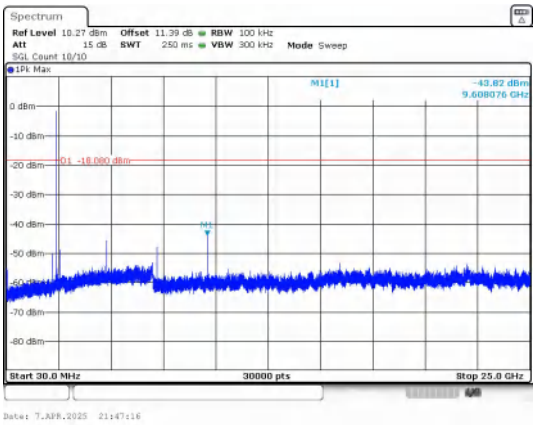
30.0 MHz - 25000.0 MHz

π/4DQPSK_2-DH5_Channel 78



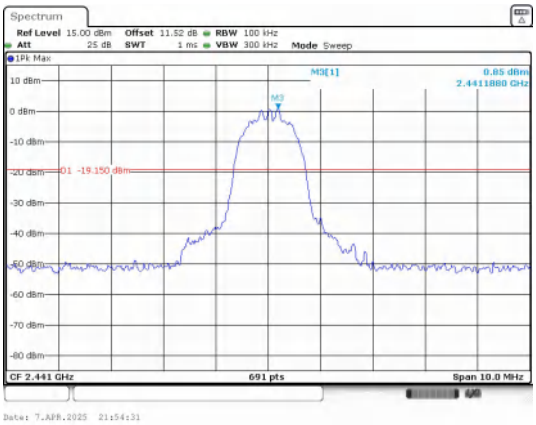
Out Of Band Emission

8DPSK_3-DH5_Channel 0



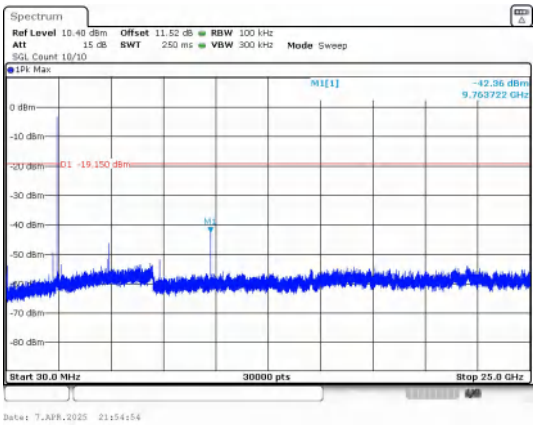
30.0 MHz - 25000.0 MHz

8DPSK_3-DH5_Channel 0



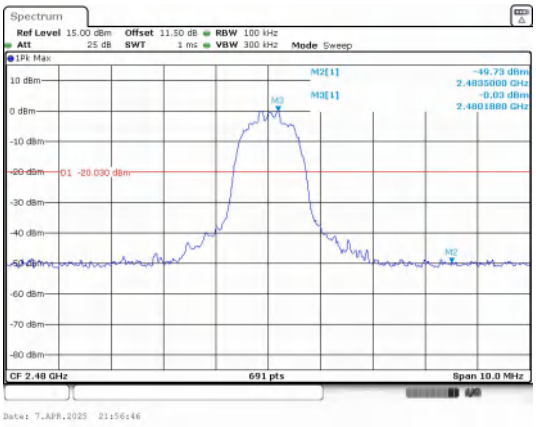
Out Of Band Emission

8DPSK_3-DH5_Channel 39



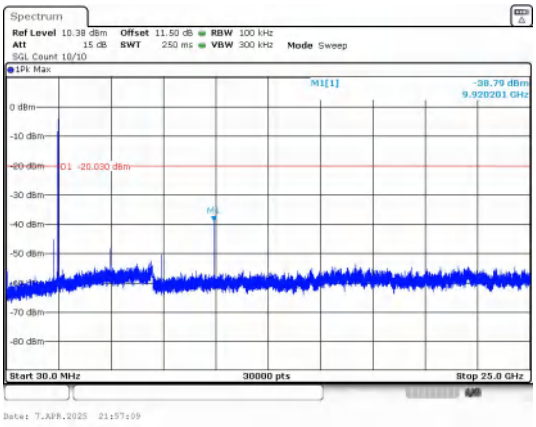
30.0 MHz - 25000.0 MHz

8DPSK_3-DH5_Channel 39



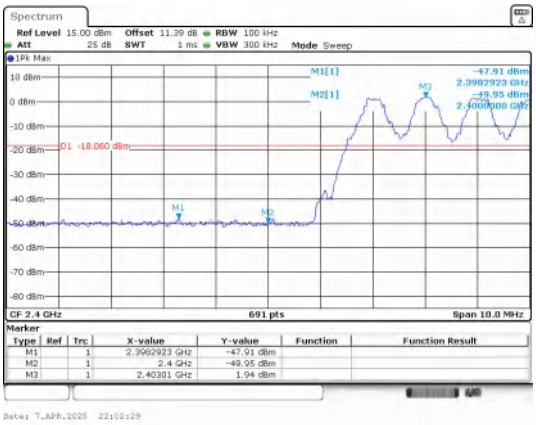
Out Of Band Emission

8DPSK_3-DH5_Channel 78



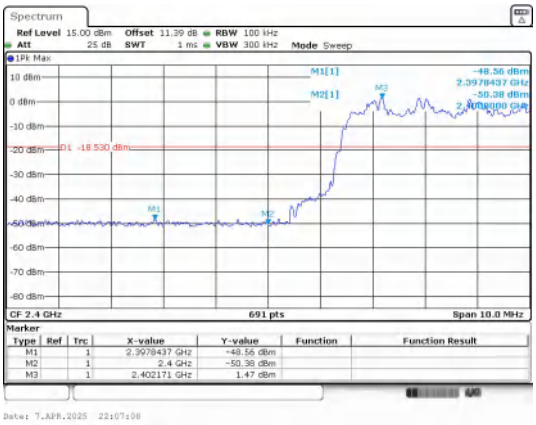
30.0 MHz - 25000.0 MHz

8DPSK_3-DH5_Channel 78



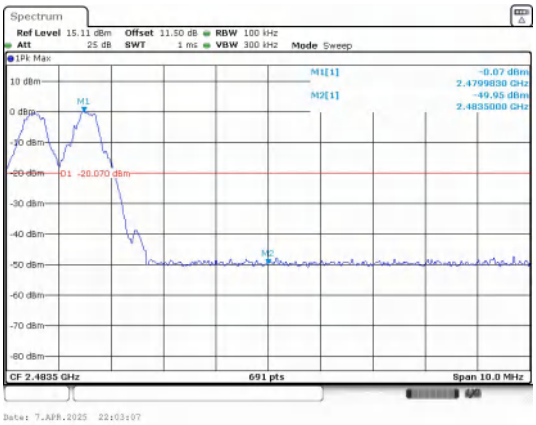
Out Of Band Emission(Left)

GFSK_DH5_Channel Hopping



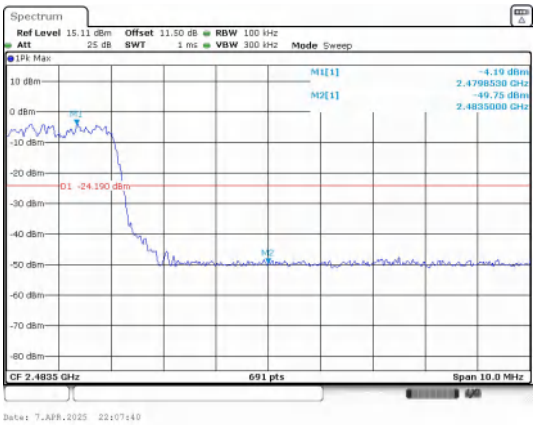
Out Of Band Emission(Left)

π/4DQPSK_2-DH5_Channel Hopping



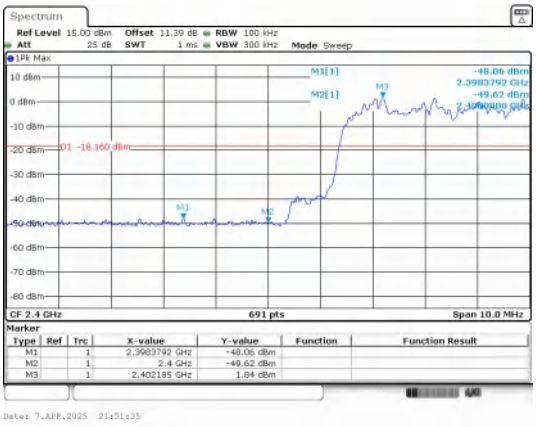
Out Of Band Emission(Right)

GFSK_DH5_Channel Hopping



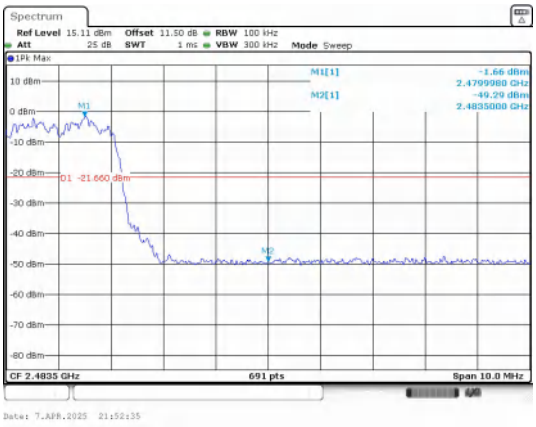
Out Of Band Emission(Right)

π/4DQPSK_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:

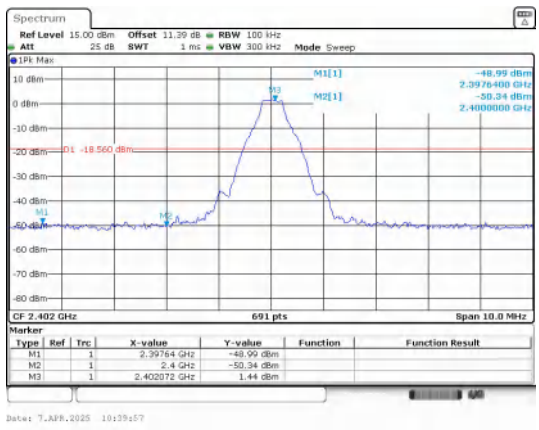
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result

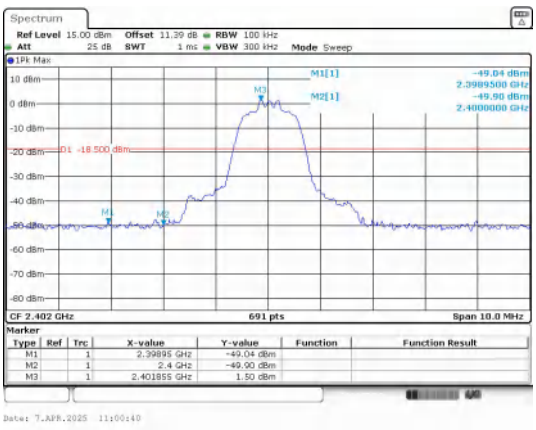
GFSK	DH5	0	2397.64	-48.995	-18.56	-30.435	PASS
			2400.00	-50.340	-18.56	-31.780	PASS
			9608.10	-44.389	-18.56	-25.829	PASS
		39	9763.72	-42.293	-19.37	-22.923	PASS
		78	2483.50	-50.710	-20.29	-30.420	PASS
			9920.20	-39.948	-20.29	-19.658	PASS
π/4DQPSK	2-DH5	0	2398.95	-49.039	-18.5	-30.539	PASS
			2400.00	-49.900	-18.5	-31.400	PASS
			9608.10	-44.157	-18.5	-25.657	PASS
		39	9763.72	-42.468	-19.41	-23.058	PASS
		78	2483.50	-49.820	-20.21	-29.610	PASS
			9920.20	-39.776	-20.21	-19.566	PASS
8DPSK	3-DH5	0	2400.00	-47.820	-18.41	-29.410	PASS
			9608.08	-44.173	-18.41	-25.763	PASS
		39	9763.72	-42.091	-19.32	-22.771	PASS
		78	2483.50	-49.870	-20.56	-29.310	PASS
			9920.20	-39.102	-20.56	-18.542	PASS

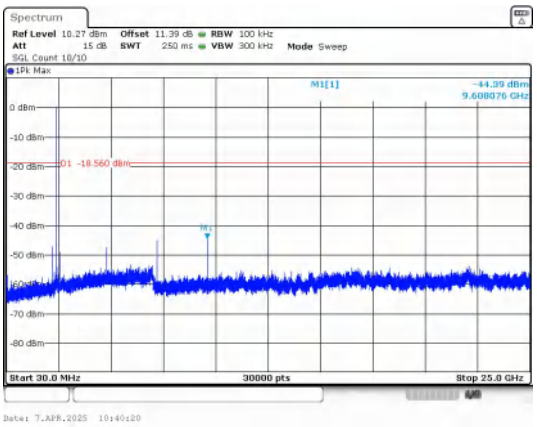
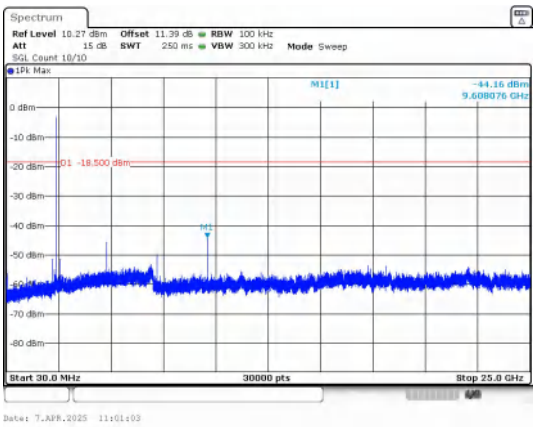
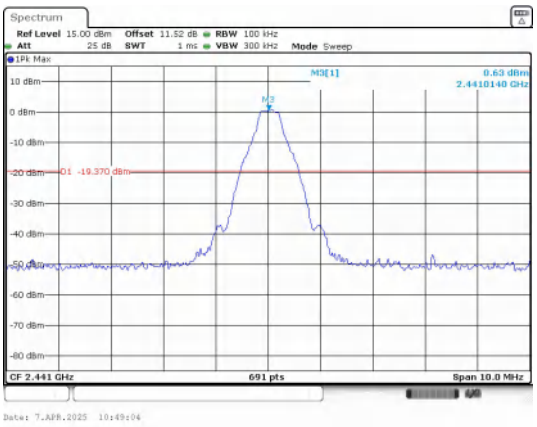
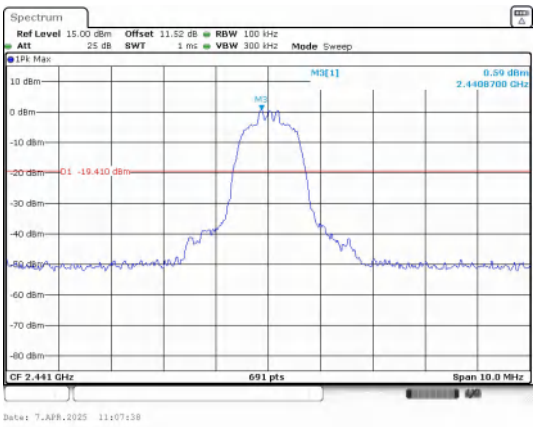
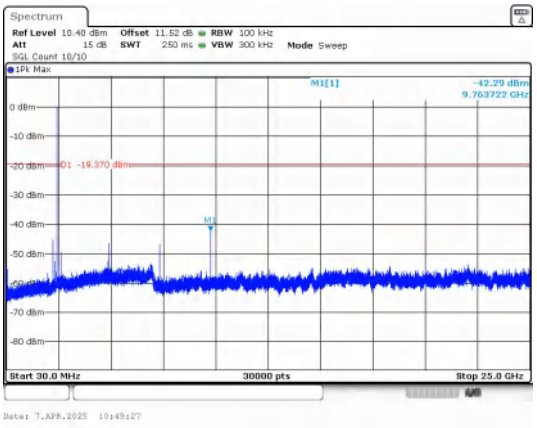
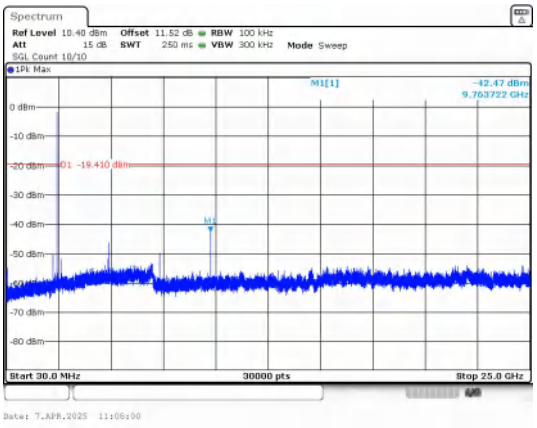
Hopping

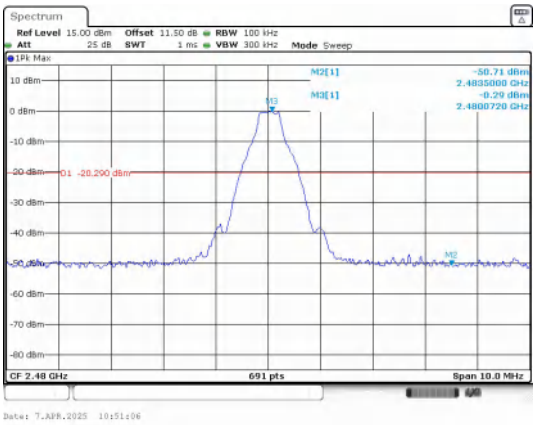
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2397.21	-48.136	-18.51	-29.626	PASS
			2400.00	-49.420	-18.51	-30.910	PASS
			2483.50	-49.740	-20.47	-29.270	PASS
π/4DQPSK	2-DH5		2398.76	-48.332	-19.18	-29.152	PASS
			2400.00	-50.910	-19.18	-31.730	PASS
			2483.50	-50.200	-23.38	-26.820	PASS
8DPSK	3-DH5		2396.45	-48.169	-19.01	-29.159	PASS
			2400.00	-50.030	-19.01	-31.020	PASS
			2483.50	-49.160	-20.17	-28.990	PASS

Test Graphs



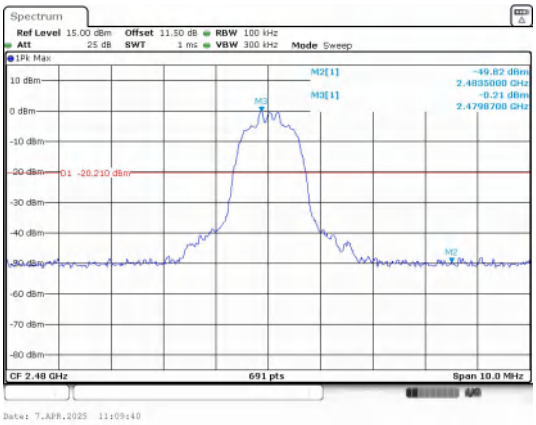


Out Of Band Emission GFSK_DH5_Channel 0	Out Of Band Emission π/4DQPSK_2-DH5_Channel 0
	
30.0 MHz - 25000.0 MHz GFSK_DH5_Channel 0	**30.0 MHz - 25000.0 MHz π/4DQPSK_2-DH5_Channel 0**
	
Out Of Band Emission GFSK_DH5_Channel 39	**Out Of Band Emission π/4DQPSK_2-DH5_Channel 39**
	
30.0 MHz - 25000.0 MHz GFSK_DH5_Channel 39	**30.0 MHz - 25000.0 MHz π/4DQPSK_2-DH5_Channel 39**



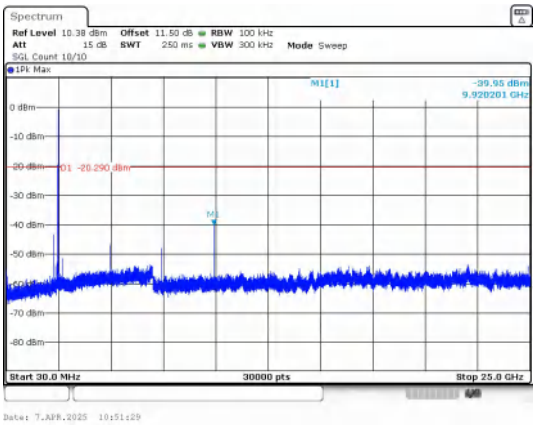
Out Of Band Emission

GFSK_DH5_Channel 78



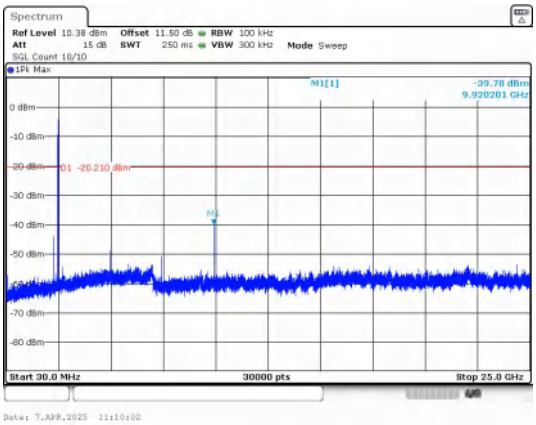
Out Of Band Emission

π/4DQPSK_2-DH5_Channel 78



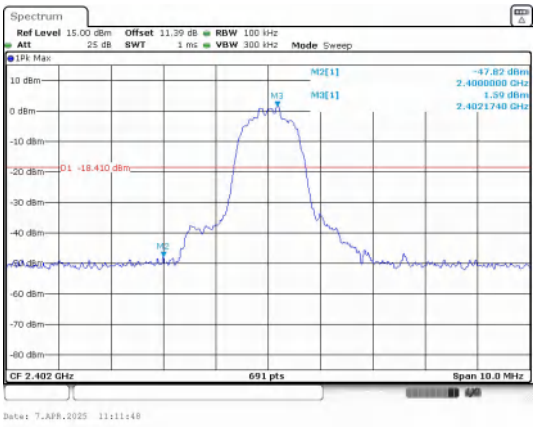
30.0 MHz - 25000.0 MHz

GFSK_DH5_Channel 78



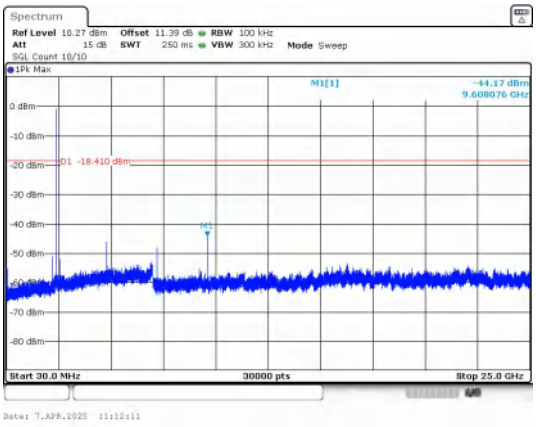
30.0 MHz - 25000.0 MHz

π/4DQPSK_2-DH5_Channel 78



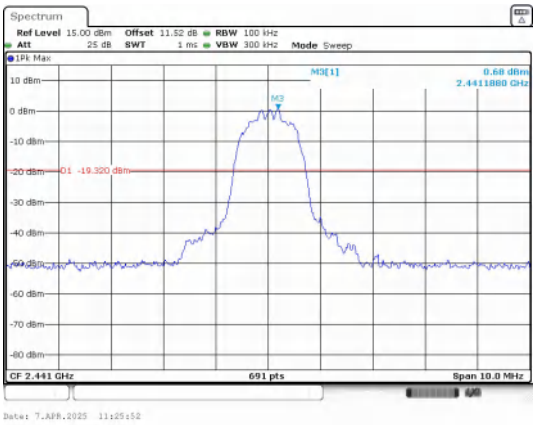
Out Of Band Emission

8DPSK_3-DH5_Channel 0



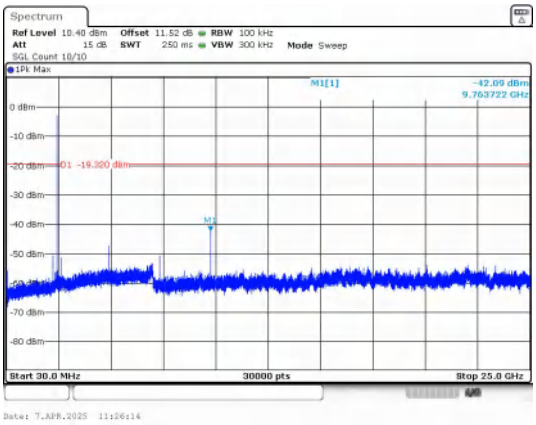
30.0 MHz - 25000.0 MHz

8DPSK_3-DH5_Channel 0



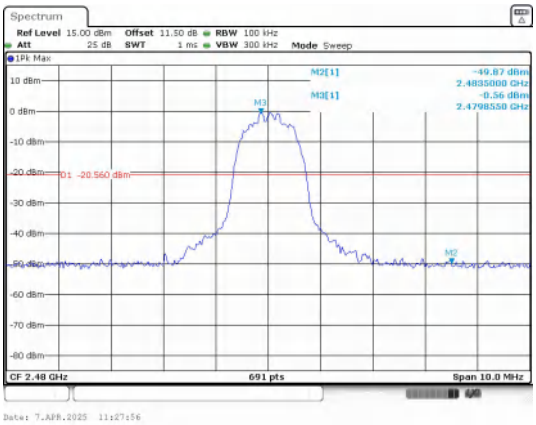
Out Of Band Emission

8DPSK_3-DH5_Channel 39



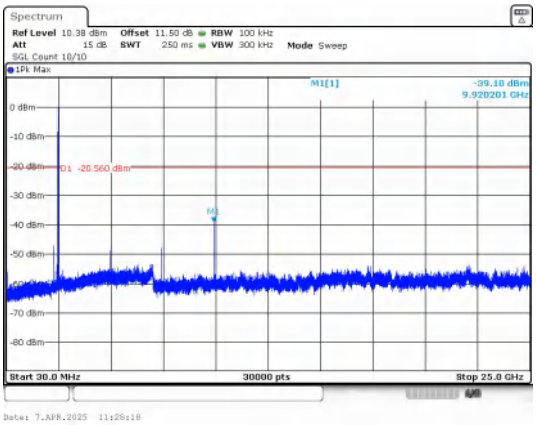
30.0 MHz - 25000.0 MHz

8DPSK_3-DH5_Channel 39



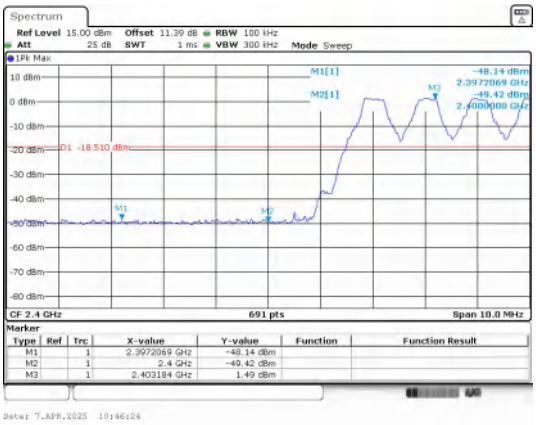
Out Of Band Emission

8DPSK_3-DH5_Channel 78



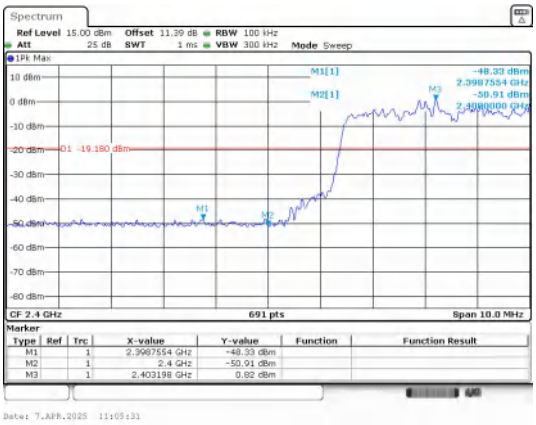
30.0 MHz - 25000.0 MHz

8DPSK_3-DH5_Channel 78



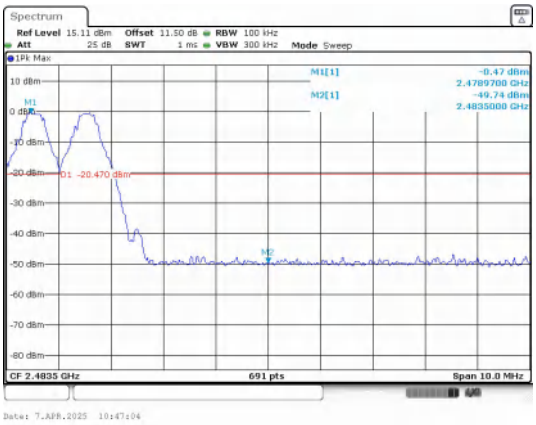
Out Of Band Emission(Left)

GFSK_DH5_Channel Hopping



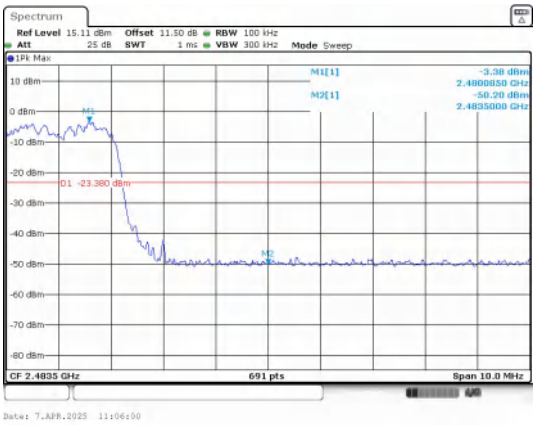
Out Of Band Emission(Left)

π/4DQPSK_2-DH5_Channel Hopping



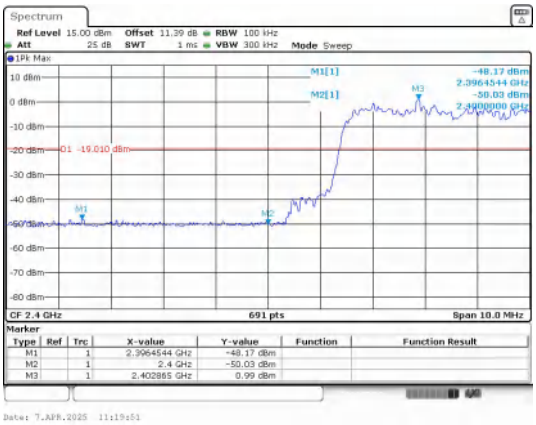
Out Of Band Emission(Right)

GFSK_DH5_Channel Hopping



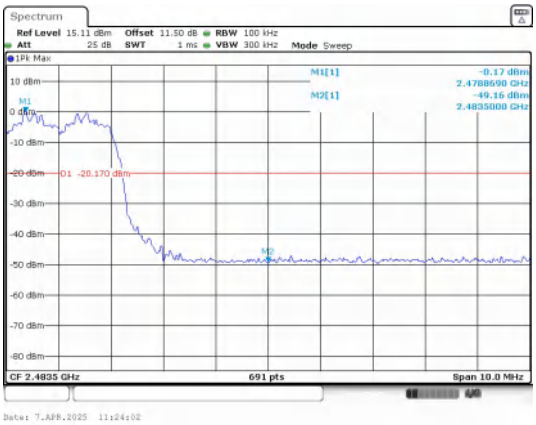
Out Of Band Emission(Right)

π/4DQPSK_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-----