

Appendix Report

Project No.:	CISR250627309
Test Engineer:	James Wang
Supervised by:	Rory Huang

8.1. Duty Cycle

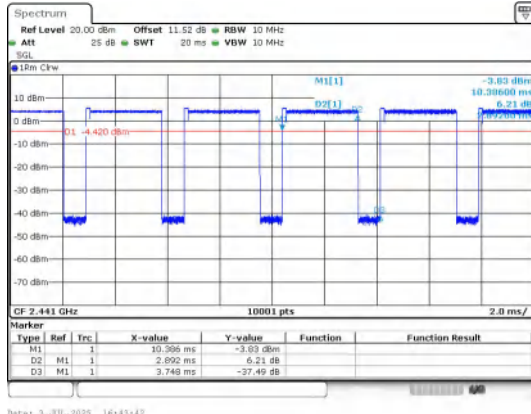
Test Result

Left:

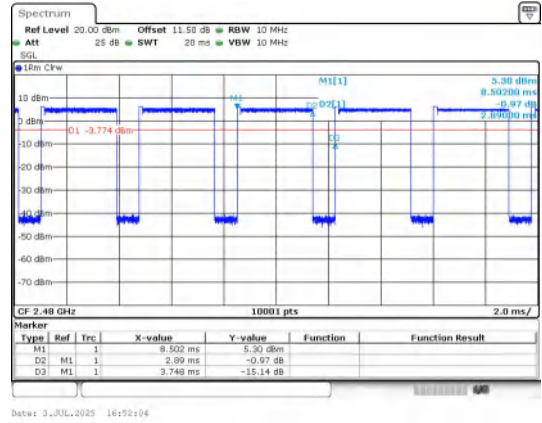
Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.888	3.748	77.05	0.7705	1.1323	0.3463
		39	2.886	3.748	77.00	0.7700	1.1351	0.3465
		78	2.886	3.748	77.00	0.7700	1.1351	0.3465
$\pi/4$ DQPSK	2-DH5	0	2.892	3.748	77.16	0.7716	1.1261	0.3458
		39	2.892	3.748	77.16	0.7716	1.1261	0.3458
		78	2.890	3.748	77.11	0.7711	1.1289	0.3460
8DPSK	3-DH5	0	2.364	3.748	63.07	0.6307	2.0018	0.4230
		39	2.362	3.748	63.02	0.6302	2.0052	0.4234
		78	2.362	3.748	63.02	0.6302	2.0052	0.4234

Test Graphs

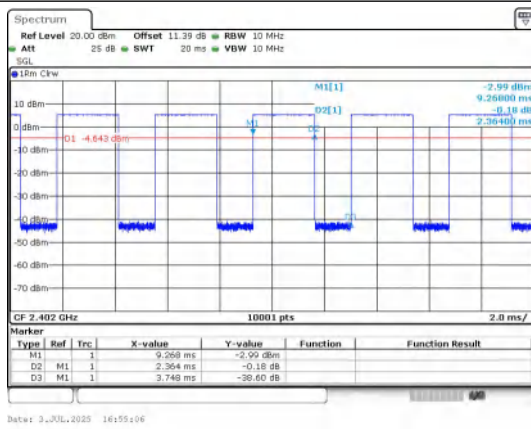




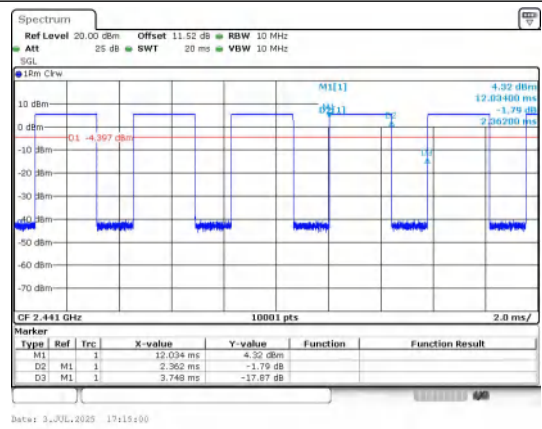
$\pi/4$ DQPSK(2-DH5)_Channel 39



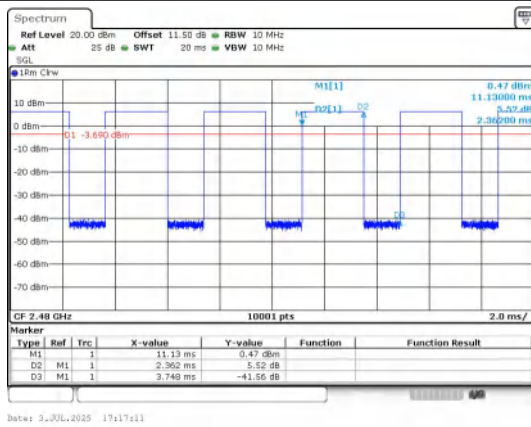
$\pi/4$ DQPSK(2-DH5)_Channel 78



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39

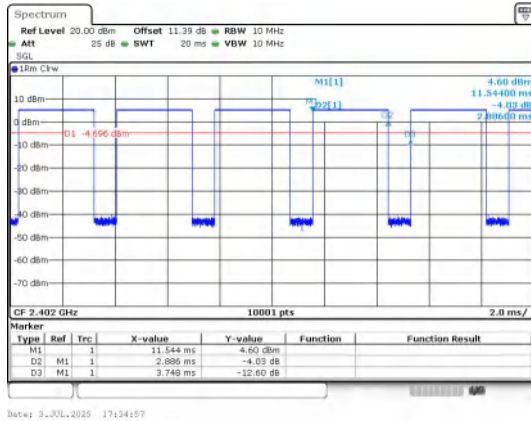


8DPSK(3-DH5)_Channel 78

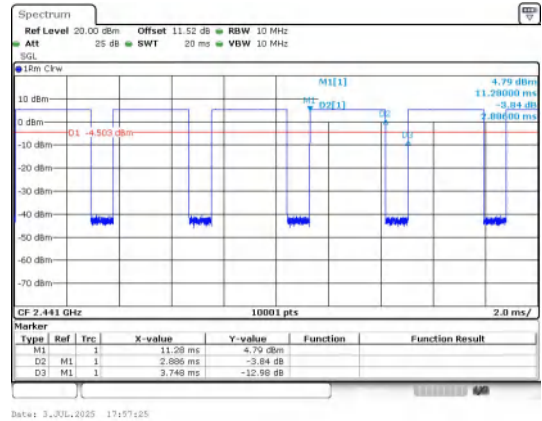
Right:

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.886	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
$\pi/4$ DQPSK	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	2.892	3.748	77.16	0.7716	1.1261	0.3458
8DPSK	3-DH5	0	2.362	3.748	63.02	0.6302	2.0052	0.4234
		39	2.362	3.748	63.02	0.6302	2.0052	0.4234
		78	2.362	3.748	63.02	0.6302	2.0052	0.4234

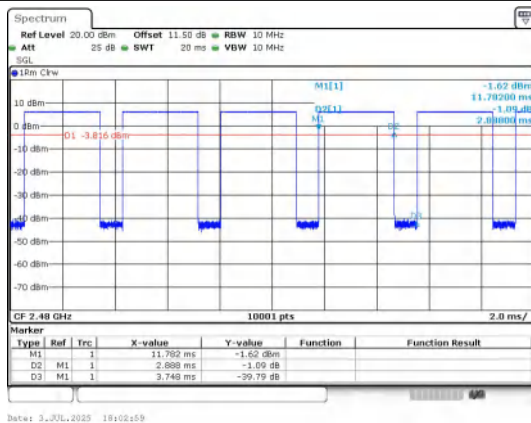
Test Graphs



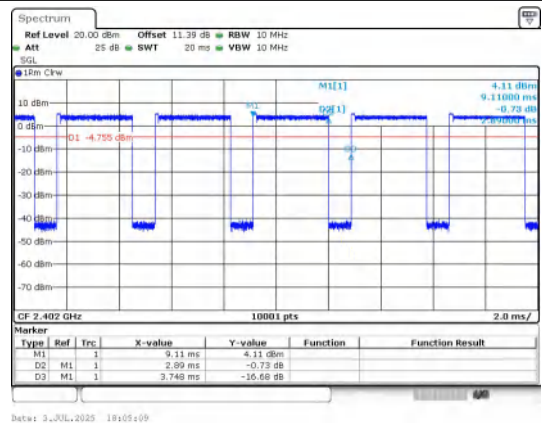
GFSK(DH5)_Channel 0



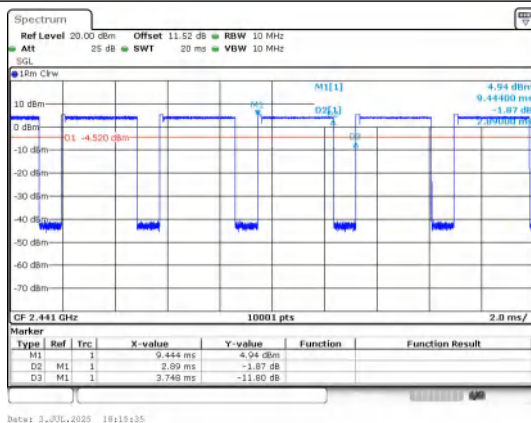
GFSK(DH5)_Channel 39



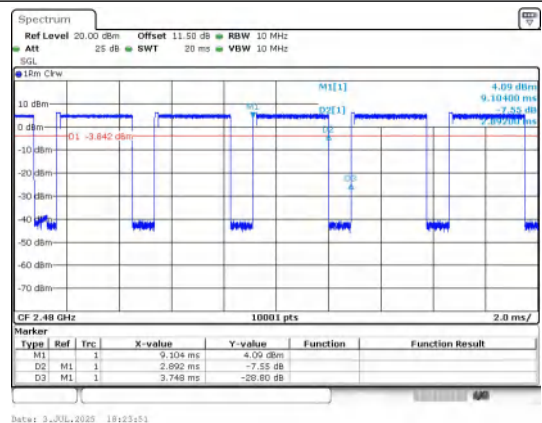
GFSK(DH5)_Channel 78



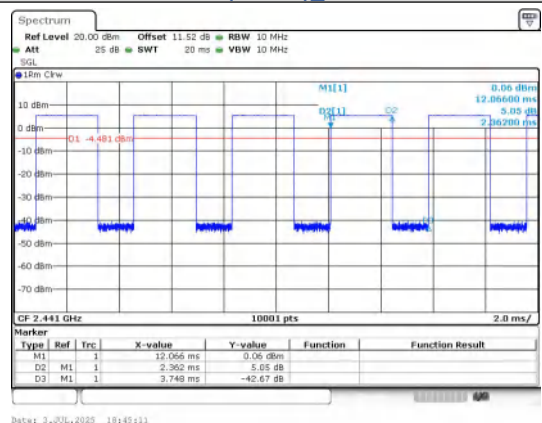
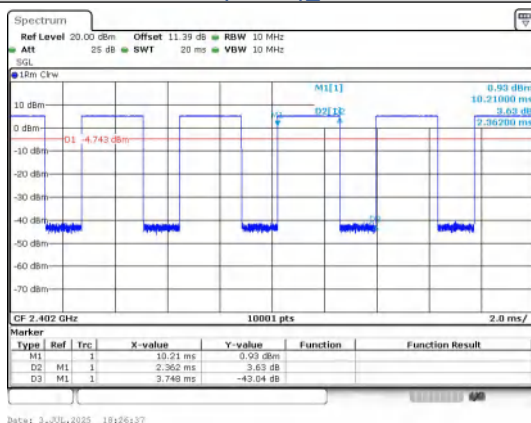
$\pi/4$ DQPSK(2-DH5)_Channel 0



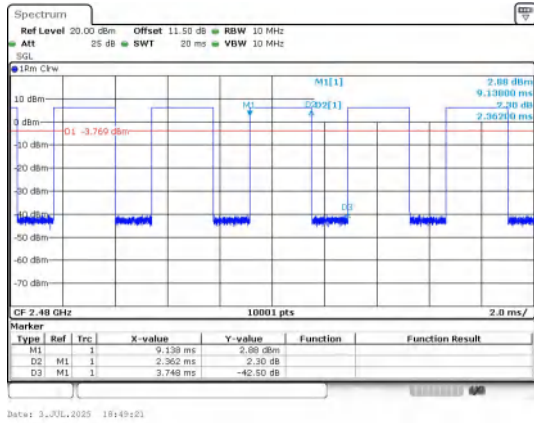
$\pi/4$ DQPSK(2-DH5)_Channel 39



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



8DPSK(3-DH5)_Channel 0



8DPSK(3-DH5)_Channel 39

8DPSK(3-DH5)_Channel 78

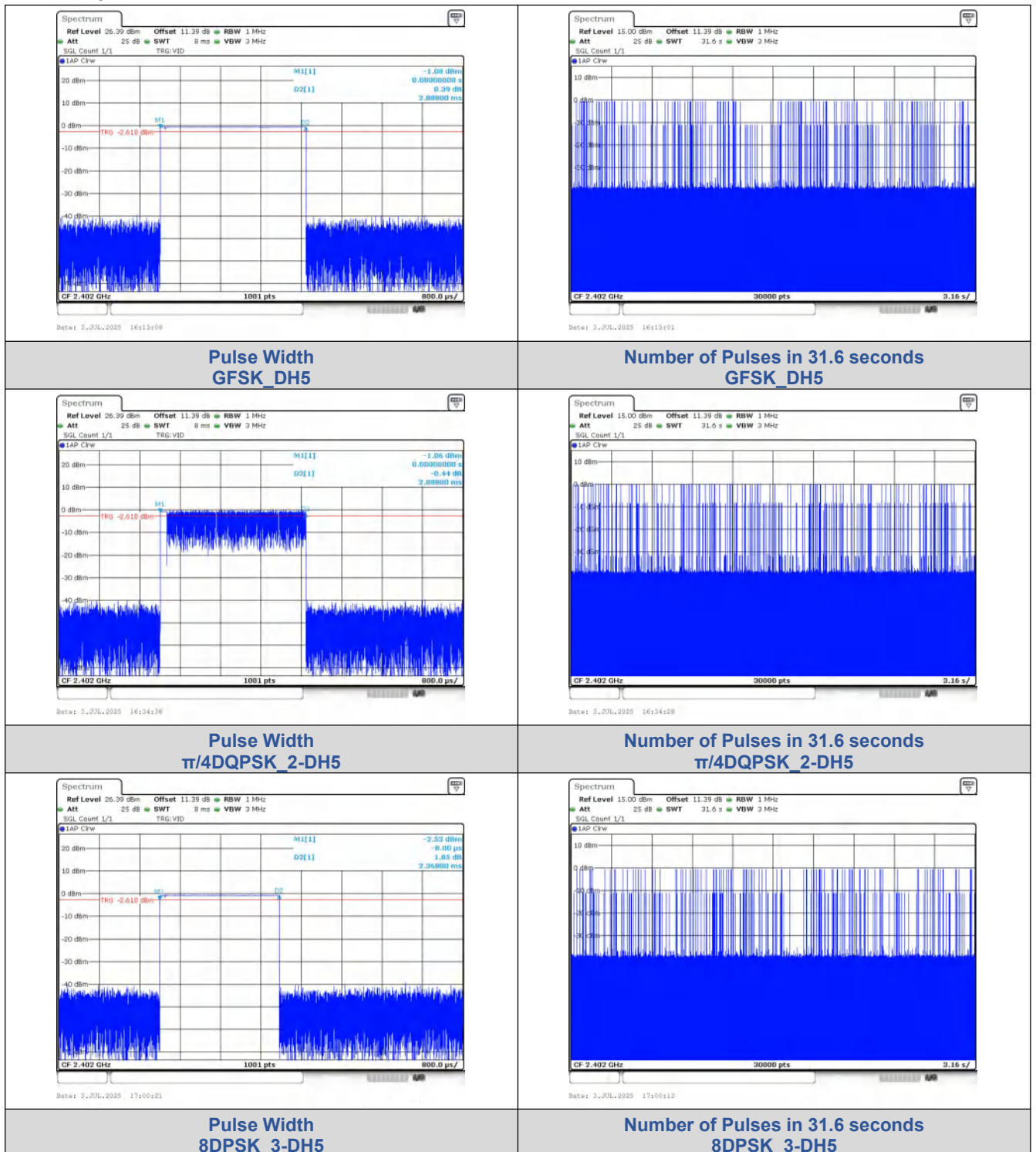
8.2. Dwell Time

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	122	352.34	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.888	107	309.02		PASS
8DPSK	3-DH5		2.368	100	236.8		PASS

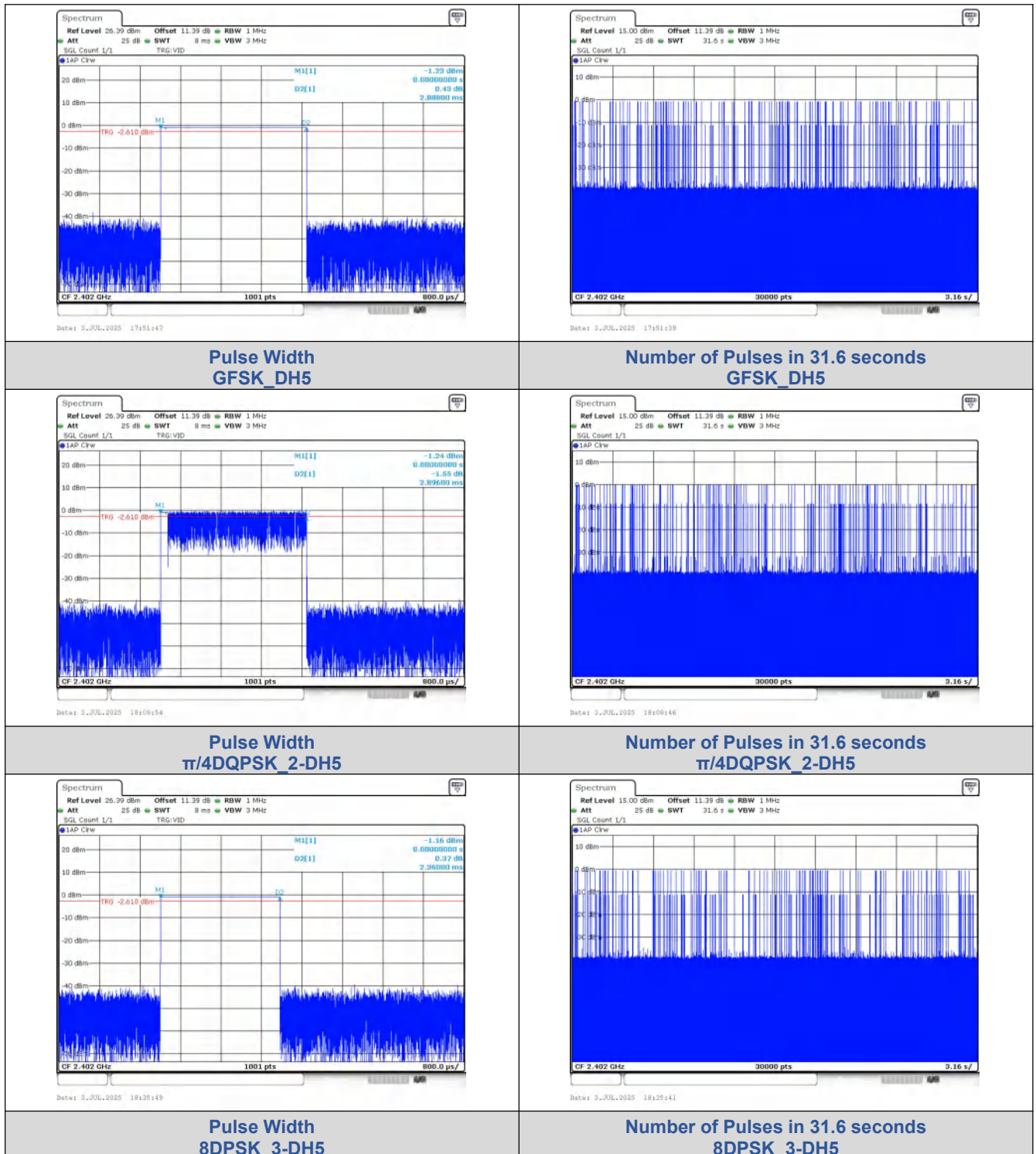
Test Graphs



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	123	355.22	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.896	121	350.42		PASS
8DPSK	3-DH5		2.360	112	264.32		PASS

Test Graphs



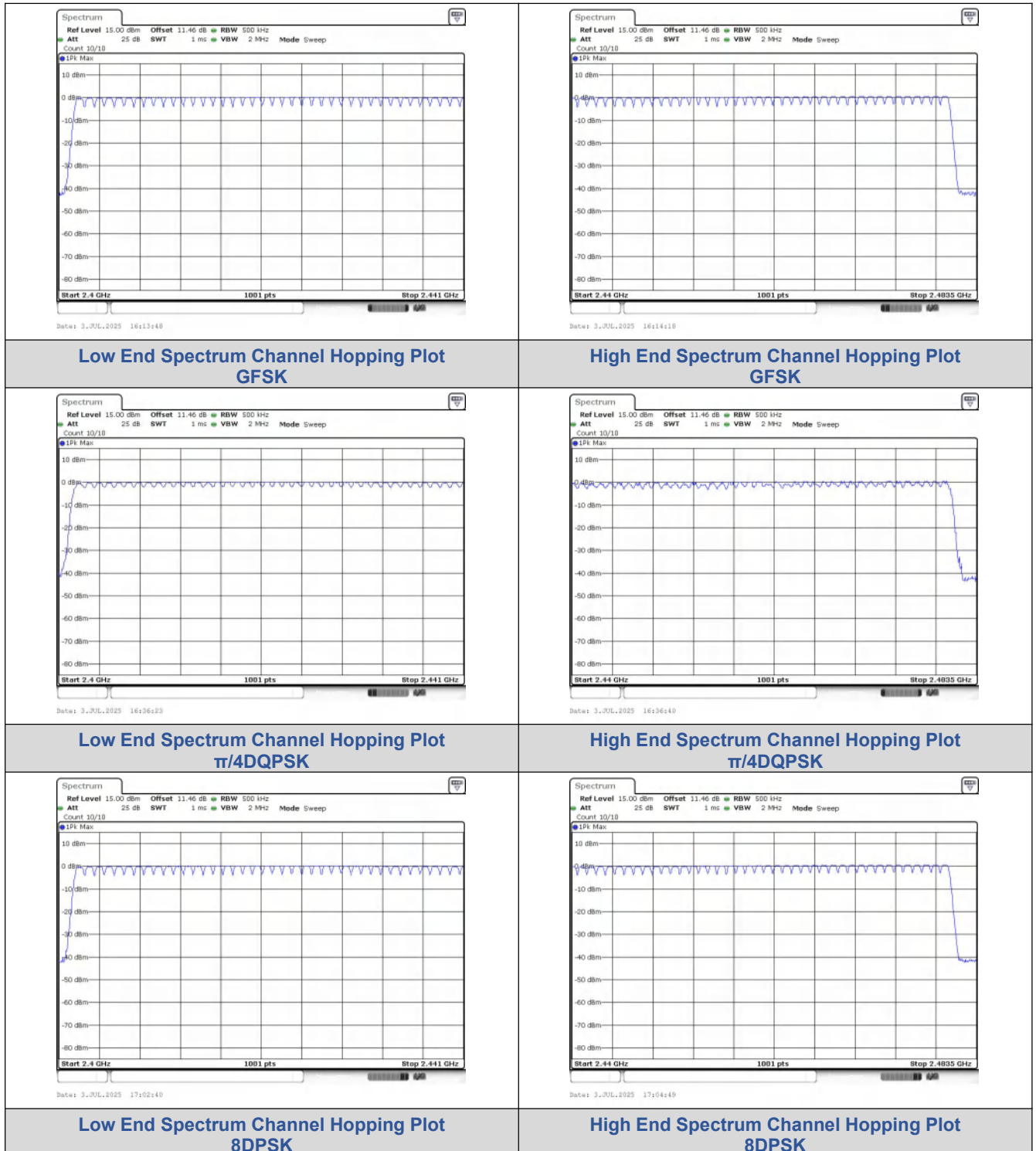
8.3. Number Of Hopping Channel

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

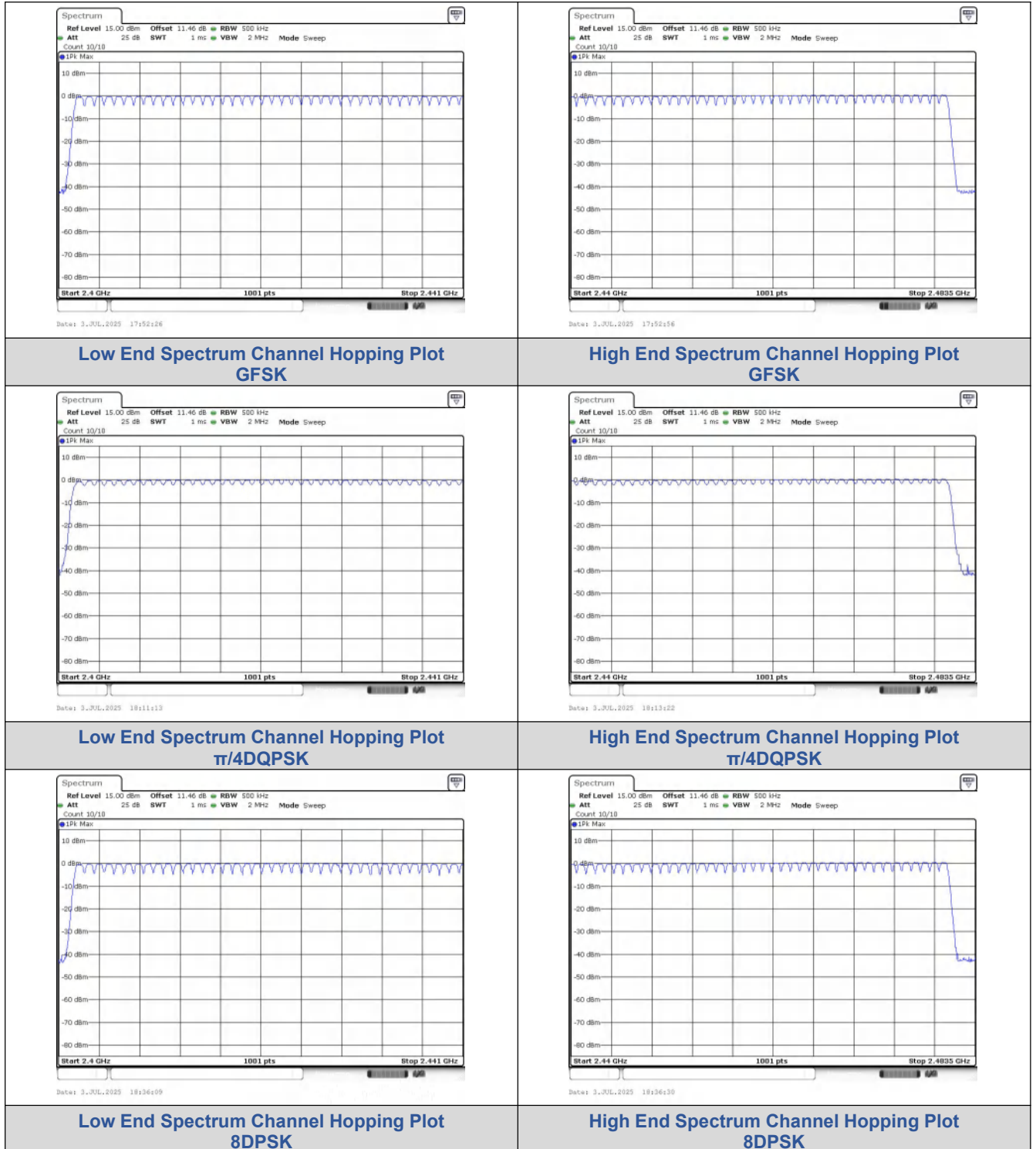
Test Graphs



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



8.4. Conducted Peak Output Power

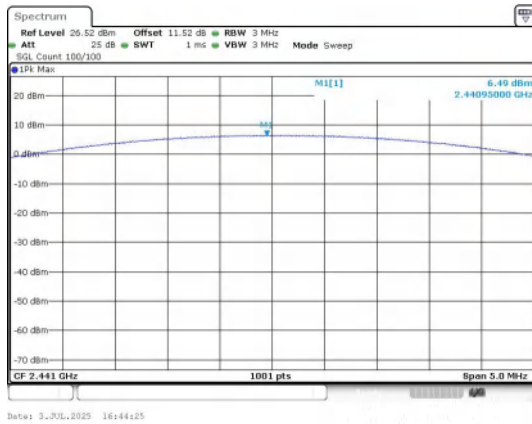
Test Result

Left:

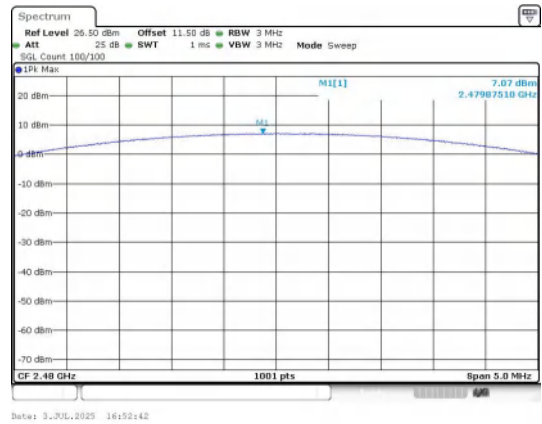
Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	5.48	3.53	≤30	PASS
		39	5.70	3.72		PASS
		78	6.38	4.35		PASS
$\pi/4$ DQPSK	2-DH5	0	6.26	4.23	≤20.97	PASS
		39	6.49	4.46		PASS
		78	7.07	5.09		PASS
8DPSK	3-DH5	0	5.42	3.48		PASS
		39	5.65	3.67		PASS
		78	6.36	4.33		PASS

Test Graphs

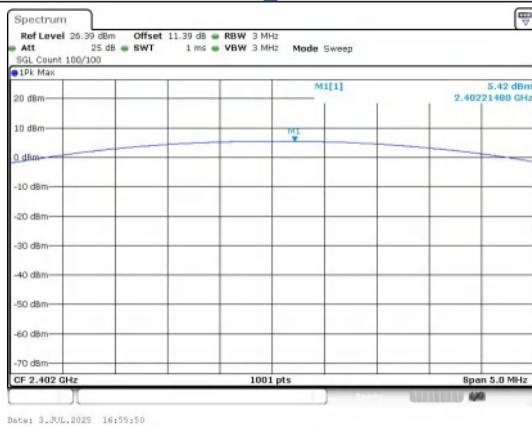




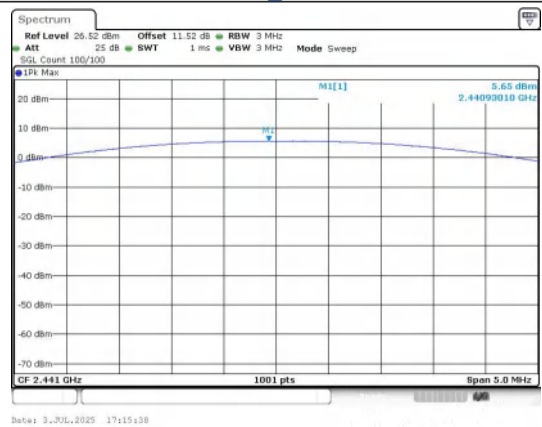
**Peak Output Power
 $\pi/4$ DQPSK_Channel 39**



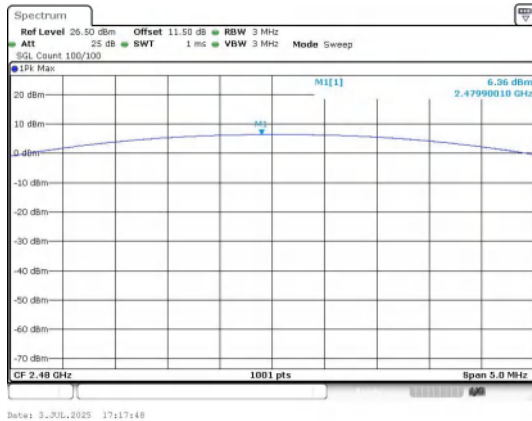
**Peak Output Power
 $\pi/4$ DQPSK_Channel 78**



**Peak Output Power
8DPSK_Channel 0**



**Peak Output Power
8DPSK_Channel 39**



**Peak Output Power
8DPSK_Channel 78**

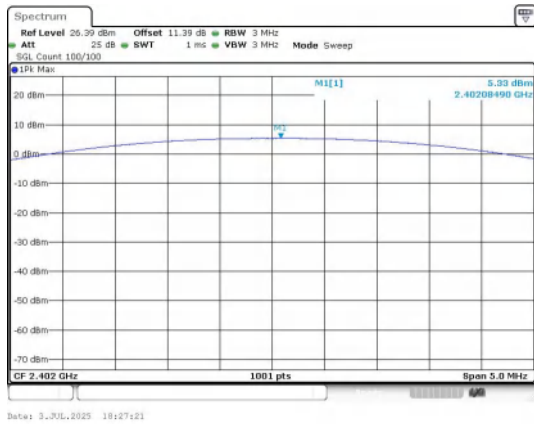
Right:

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	5.33	3.41	≤30	PASS
		39	5.54	3.58		PASS
		78	6.22	4.19		PASS
$\pi/4$ DQPSK	2-DH5	0	6.15	4.12	≤20.97	PASS
		39	6.38	4.35		PASS
		78	6.97	4.98		PASS
8DPSK	3-DH5	0	5.33	3.41		PASS
		39	5.57	3.61		PASS

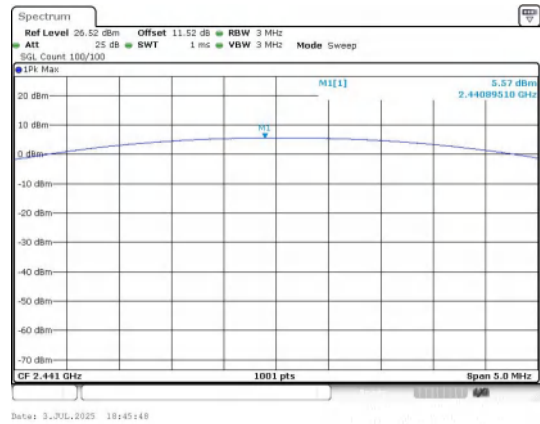
		78	6.28	4.25		PASS
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Test Graphs

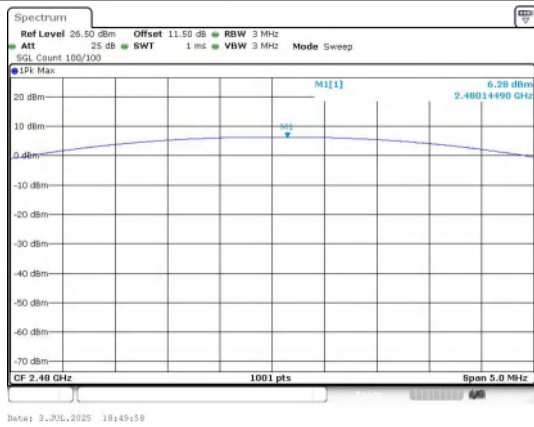




**Peak Output Power
8DPSK_Channel 0**



**Peak Output Power
8DPSK_Channel 39**



**Peak Output Power
8DPSK_Channel 78**

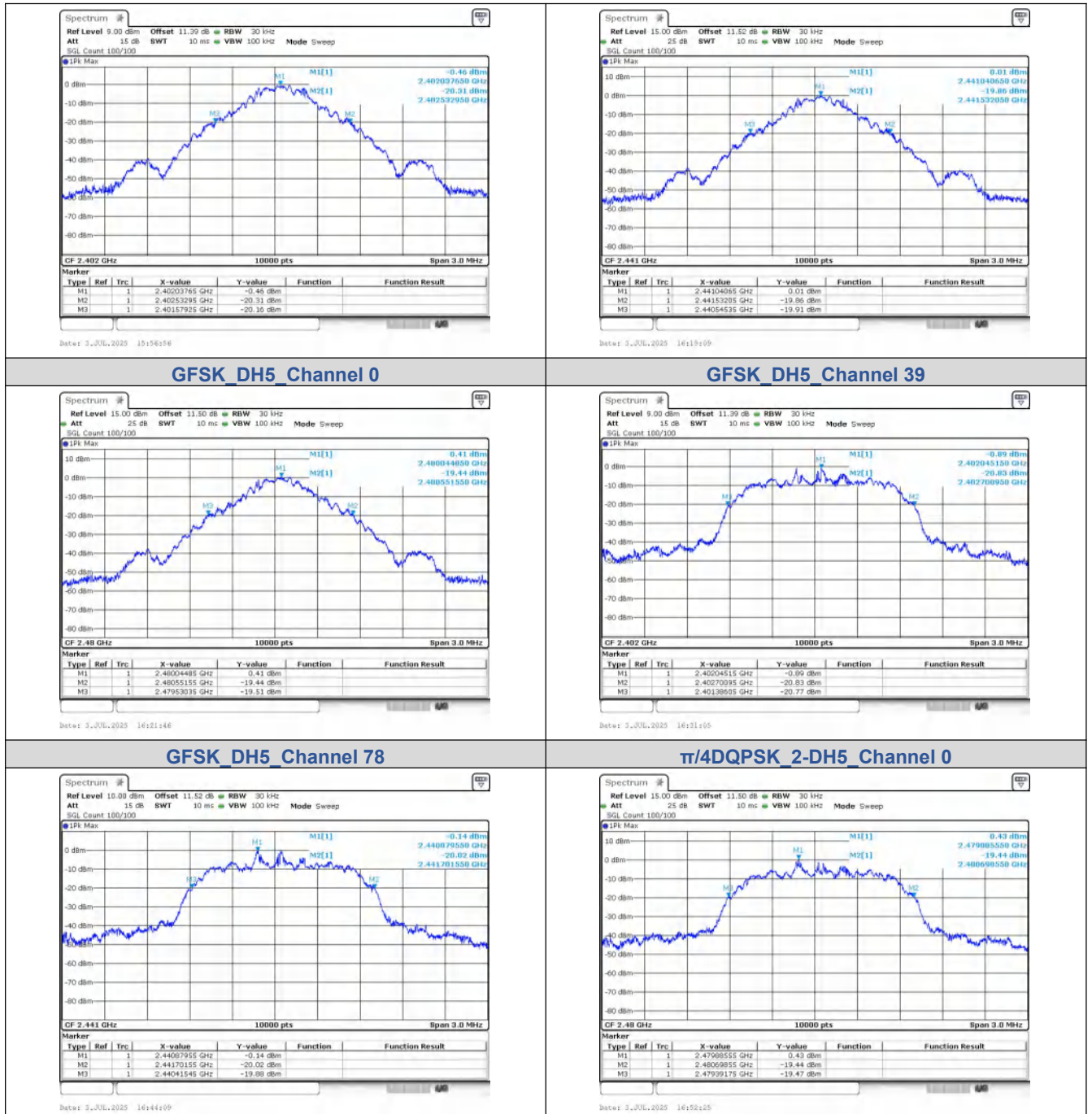
8.5. 20dB Bandwidth

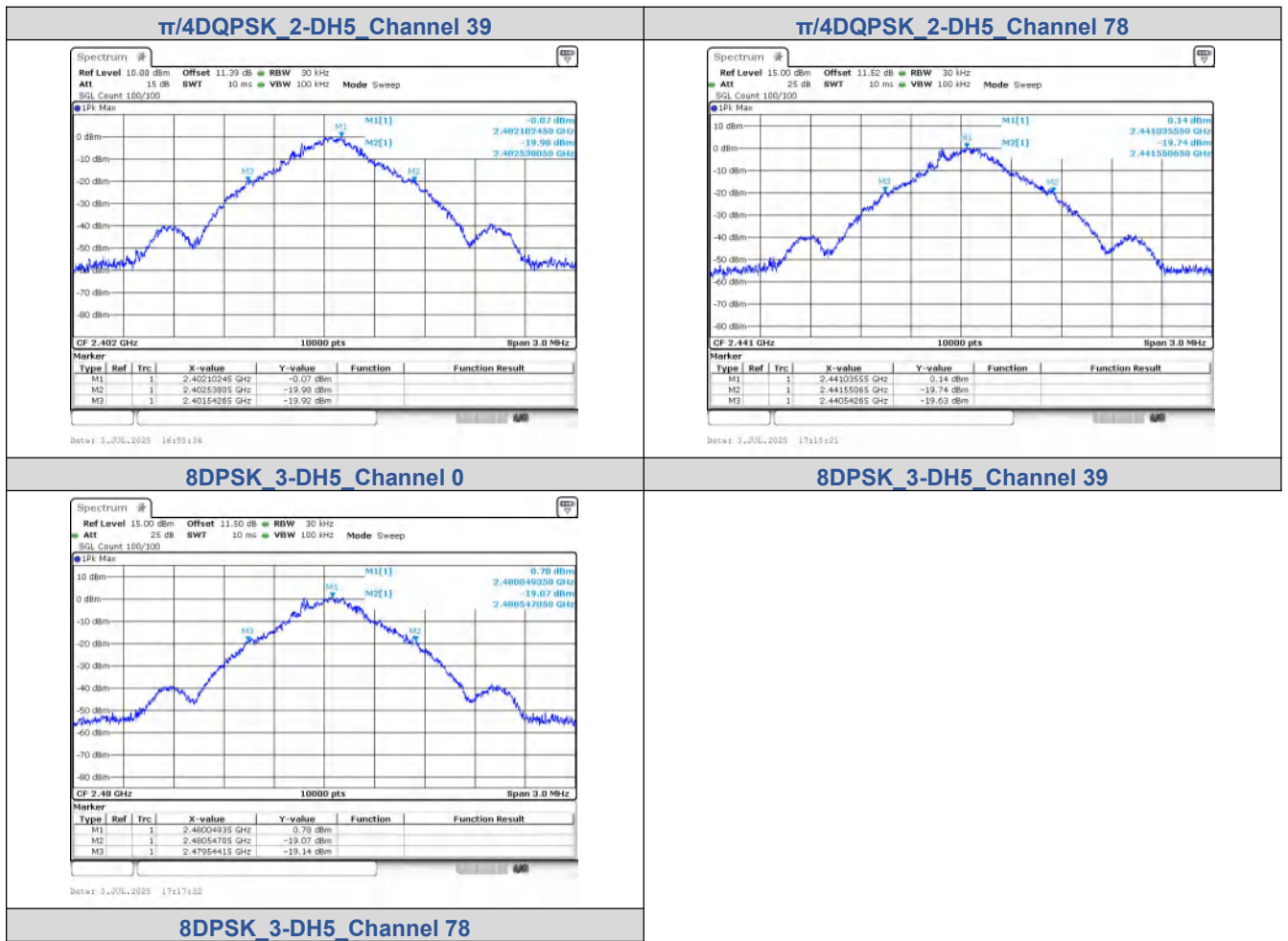
Test Result

Left:

Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	0.95
	39	2441 MHz	0.95
	78	2480 MHz	0.95
$\pi/4$ DQPSK	0	2402 MHz	1.310
	39	2441 MHz	1.280
	78	2480 MHz	1.310
8DPSK	0	2402 MHz	1.000
	39	2441 MHz	1.010
	78	2480 MHz	1.010

Test Graphs

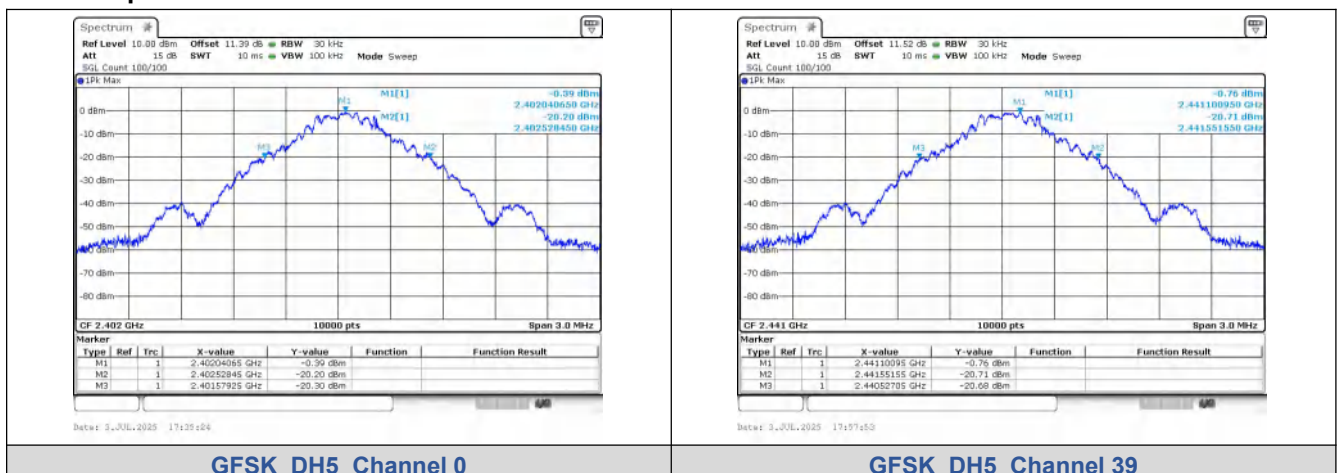


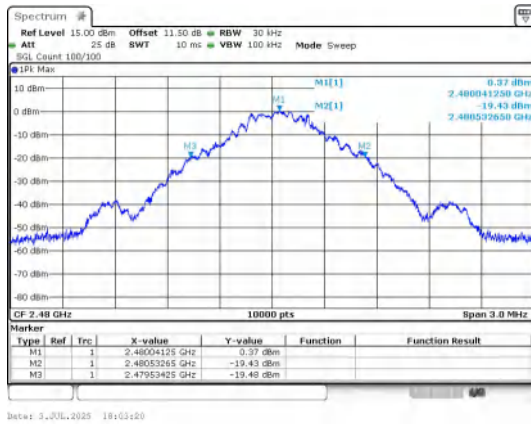


Right:

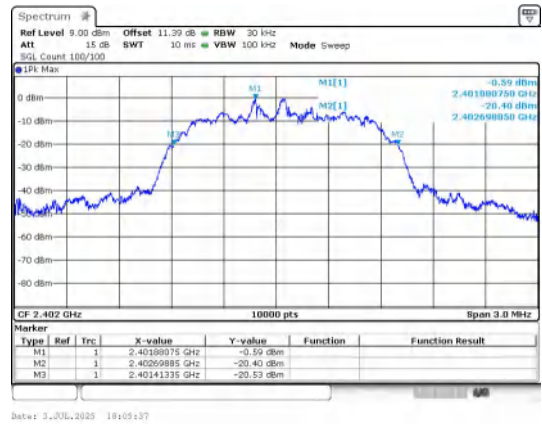
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.02
	39	2441 MHz	1.02
	78	2480 MHz	1.02
π /4DQPSK	0	2402 MHz	1.290
	39	2441 MHz	1.310
	78	2480 MHz	1.310
8DPSK	0	2402 MHz	0.9900
	39	2441 MHz	1.010
	78	2480 MHz	1.020

Test Graphs

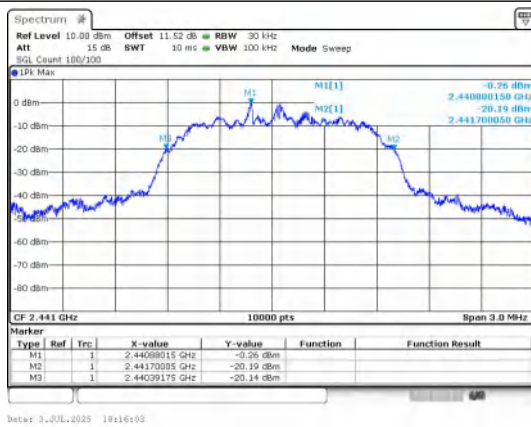




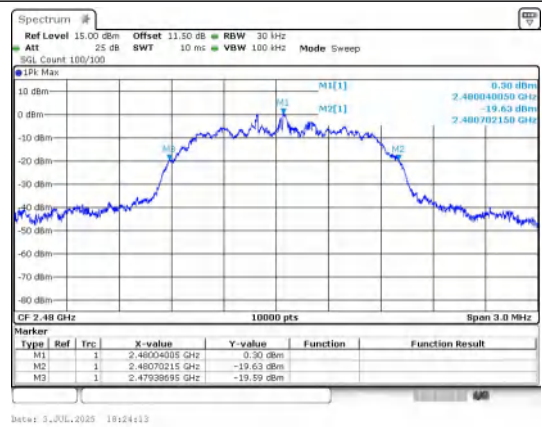
GFSK_DH5_Channel 78



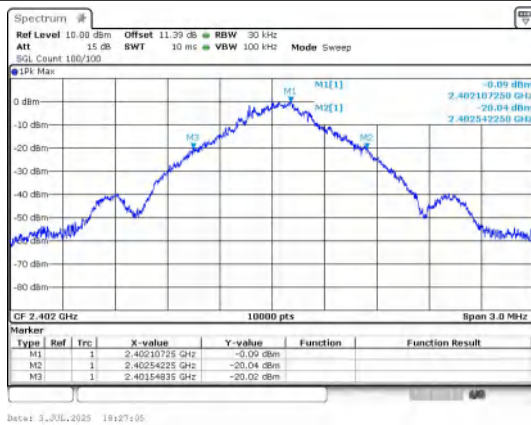
$\pi/4$ DQPSK_2-DH5_Channel 0



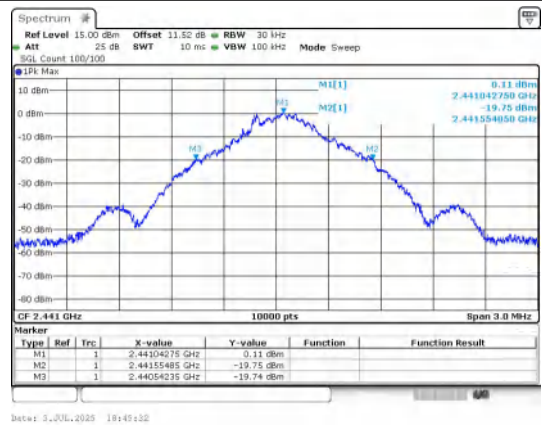
$\pi/4$ DQPSK_2-DH5_Channel 39



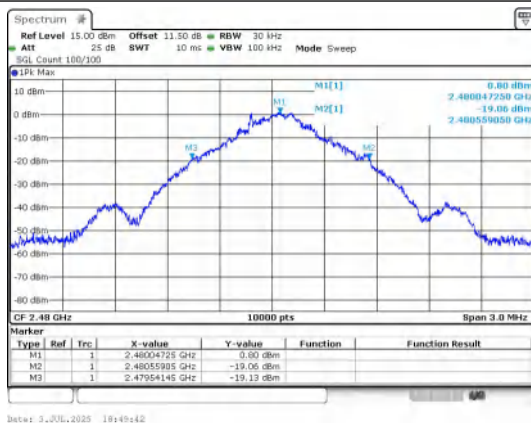
$\pi/4$ DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78

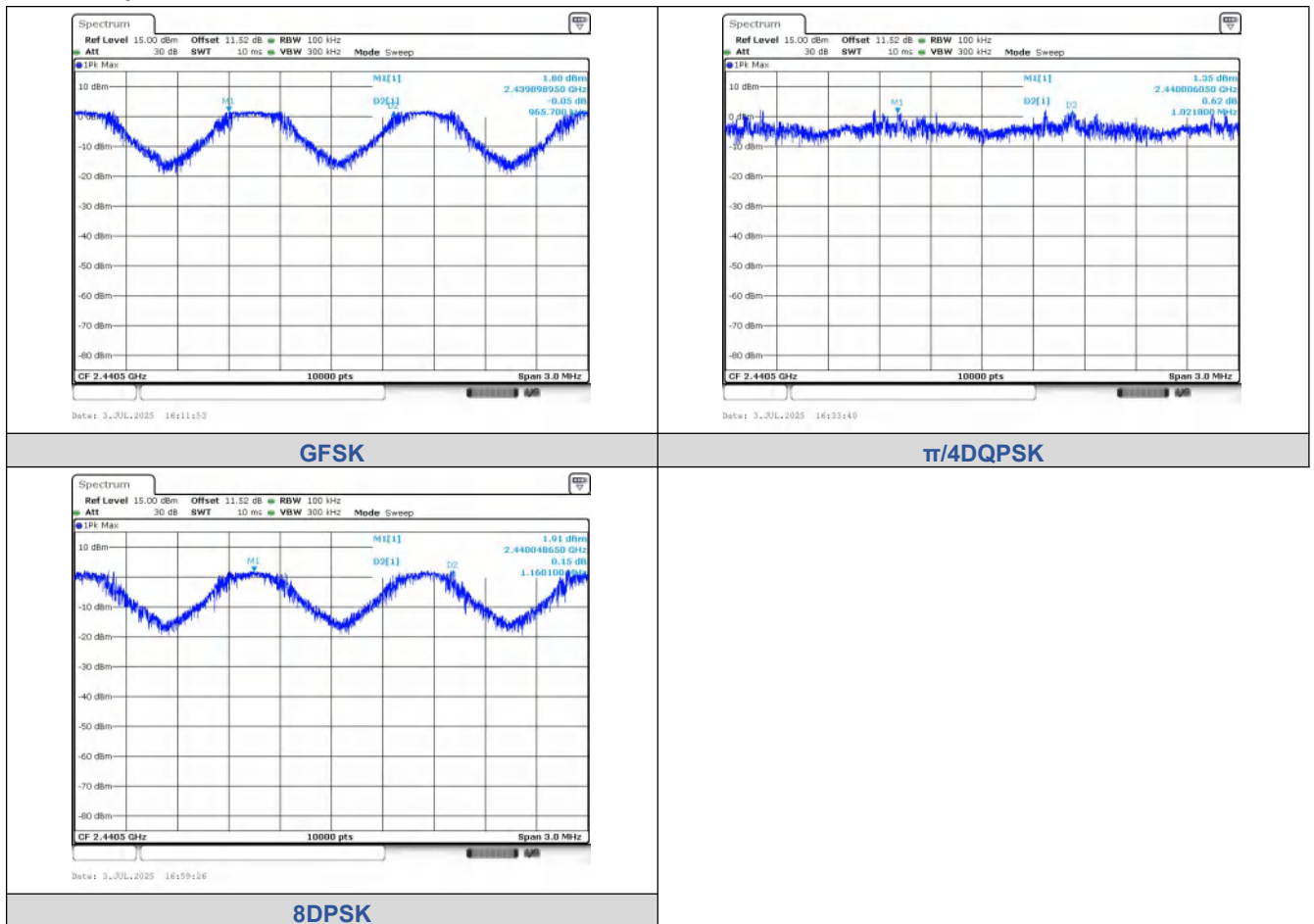
8.6. Carrier Frequencies Separation

Test Result

Left:

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2439.8989	2440.8646	0.9657	0.95	PASS
$\pi/4$ DQPSK	2-DH5	2440.006	2441.0278	1.0218	0.873	PASS
8DPSK	3-DH5	2440.0487	2441.2087	1.1601	0.667	PASS

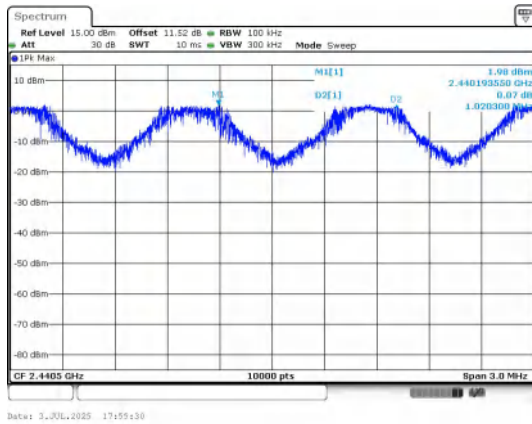
Test Graphs



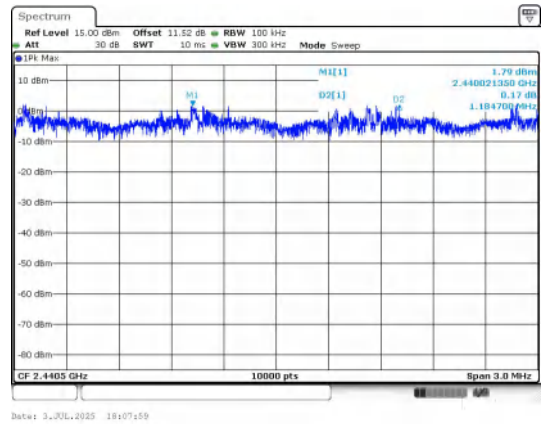
Right:

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.1935	2441.2139	1.0203	1.02	PASS
$\pi/4$ DQPSK	2-DH5	2440.0213	2441.206	1.1847	0.873	PASS
8DPSK	3-DH5	2440.0556	2440.889	0.8334	0.673	PASS

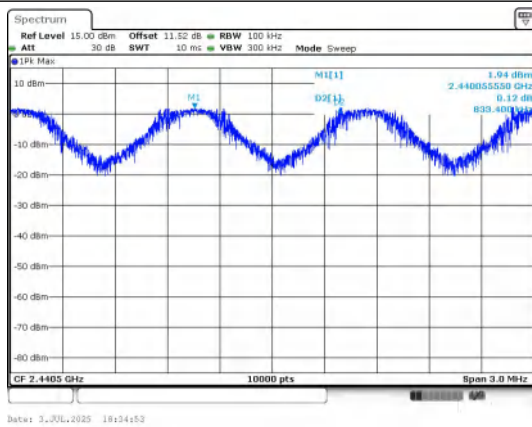
Test Graphs



GFSK



$\pi/4$ DQPSK



8DPSK

8.7. Conducted Out Of Band Emission

Test Result

Left:

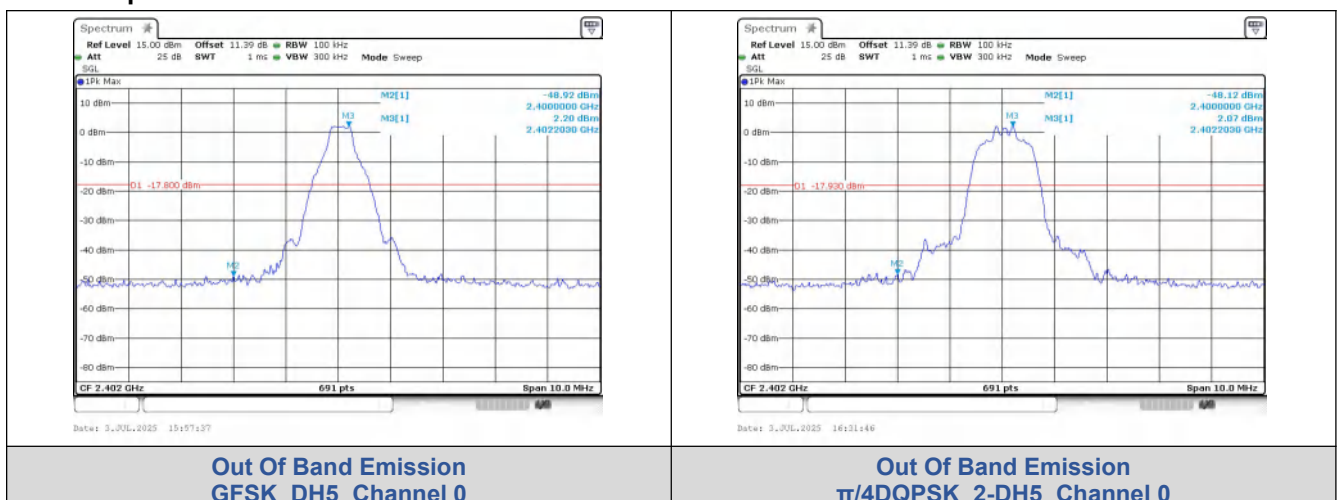
Non-Hopping

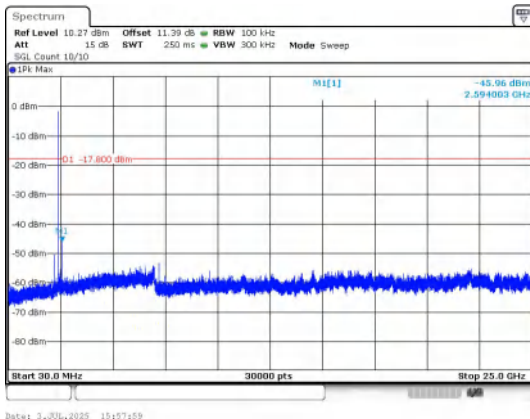
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-48.920	-17.8	-31.120	PASS
			2594.00	-45.958	-17.8	-28.158	PASS
		39	2633.12	-47.063	-17.7	-29.363	PASS
		78	2287.70	-48.900	-16.89	-32.010	PASS
			2483.50	-51.850	-16.89	-34.960	PASS
π /4DQPSK	2-DH5	0	2400.00	-48.120	-17.93	-30.190	PASS
			2594.00	-47.940	-17.93	-30.010	PASS
		39	2633.12	-49.267	-17.72	-31.547	PASS
		78	2483.50	-50.600	-17.07	-33.530	PASS
			2672.24	-48.658	-17.07	-31.588	PASS
8DPSK	3-DH5	0	2397.21	-49.634	-17.89	-31.744	PASS
			2400.00	-52.400	-17.89	-34.510	PASS
			2594.00	-46.385	-17.89	-28.495	PASS
		39	2633.12	-46.275	-17.49	-28.785	PASS
		78	2287.70	-48.684	-16.93	-31.754	PASS
			2483.50	-51.170	-16.93	-34.240	PASS

Hopping

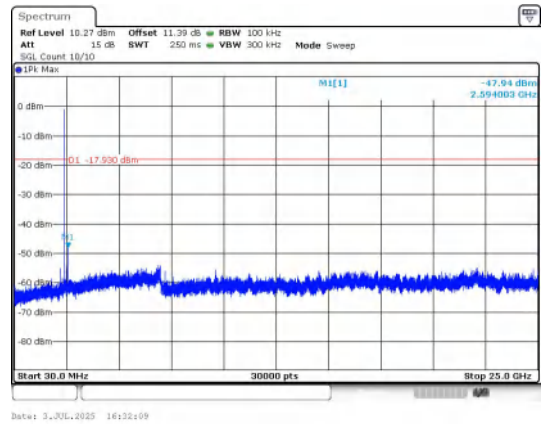
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2396.85	-48.773	-17.75	-31.023	PASS
			2400.00	-50.350	-17.75	-32.600	PASS
			2483.50	-50.570	-16.96	-33.610	PASS
π /4DQPSK	2-DH5		2396.38	-49.619	-19.07	-30.549	PASS
			2400.00	-51.700	-19.07	-32.630	PASS
			2483.50	-50.680	-17.6	-33.080	PASS
8DPSK	3-DH5		2396.43	-48.931	-17.73	-31.201	PASS
			2400.00	-50.530	-17.73	-32.800	PASS
			2483.50	-50.690	-17.25	-33.440	PASS

Test Graphs

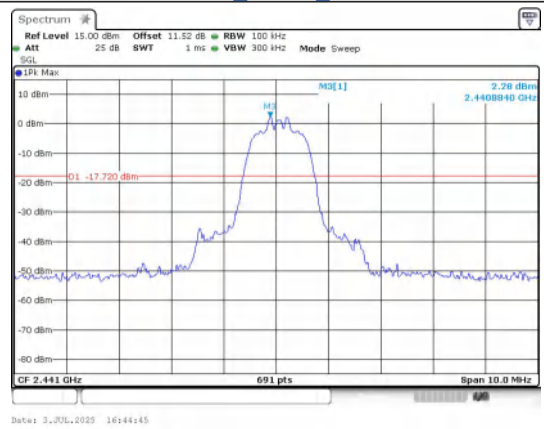
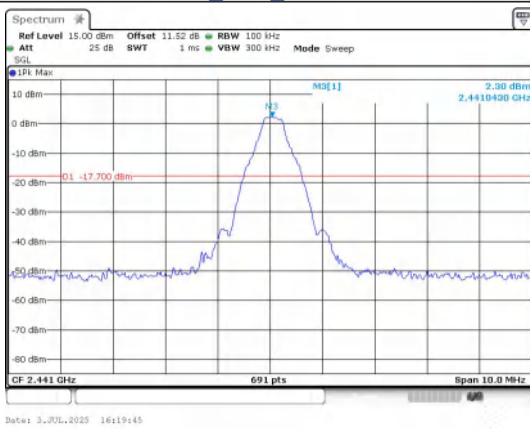




30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 0

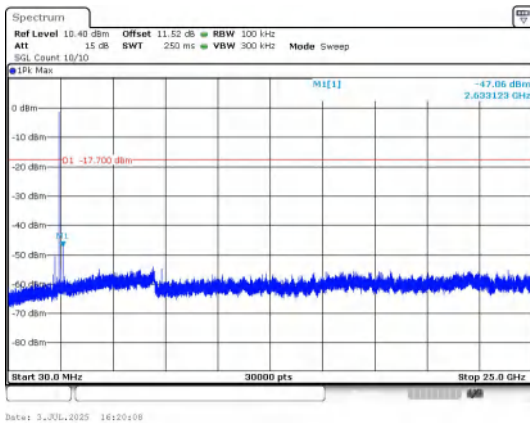


30.0 MHz - 25000.0 MHz
pi/4DQPSK_2-DH5_Channel 0

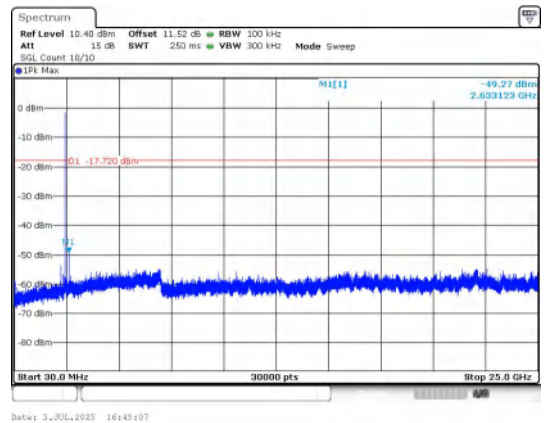


Out Of Band Emission
GFSK_DH5_Channel 39

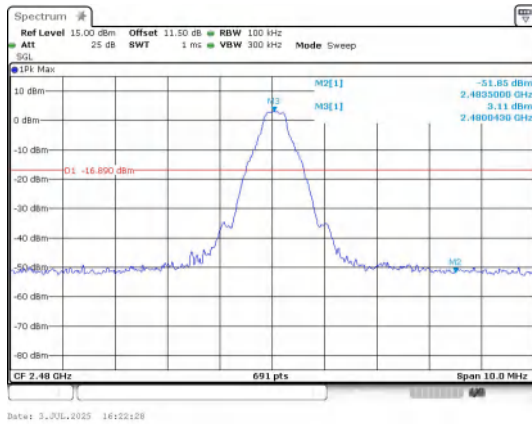
Out Of Band Emission
pi/4DQPSK_2-DH5_Channel 39



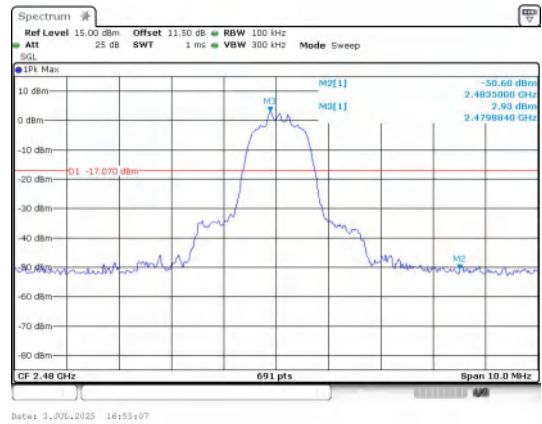
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 39



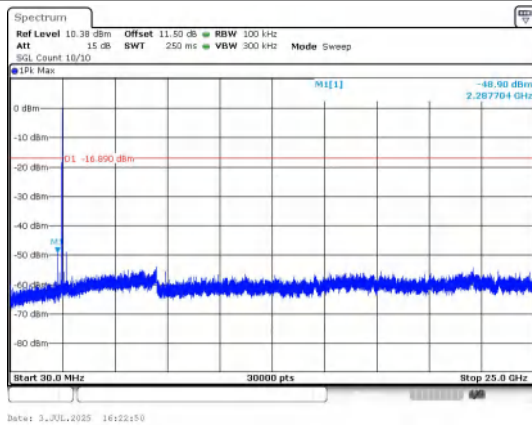
30.0 MHz - 25000.0 MHz
pi/4DQPSK_2-DH5_Channel 39



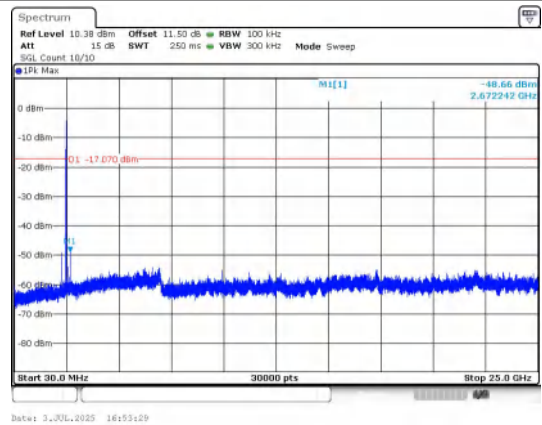
**Out Of Band Emission
GFSK_DH5_Channel 78**



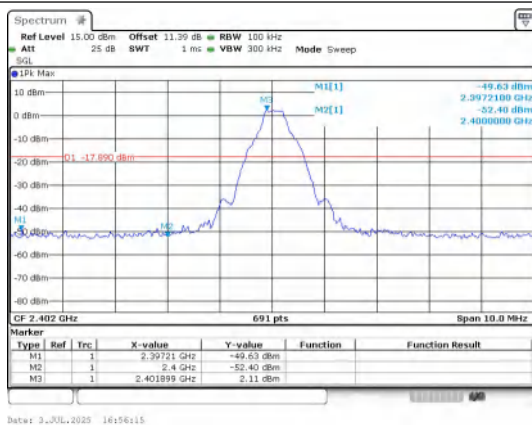
**Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78**



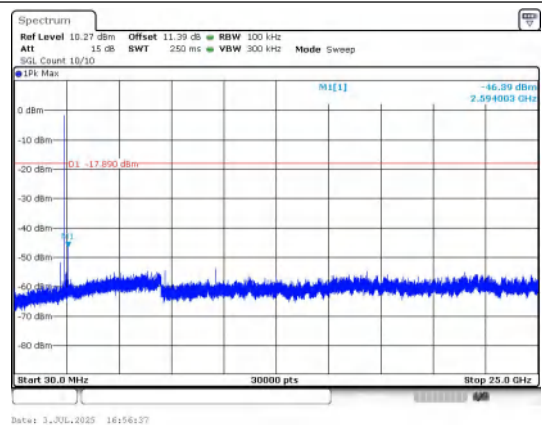
**30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78**



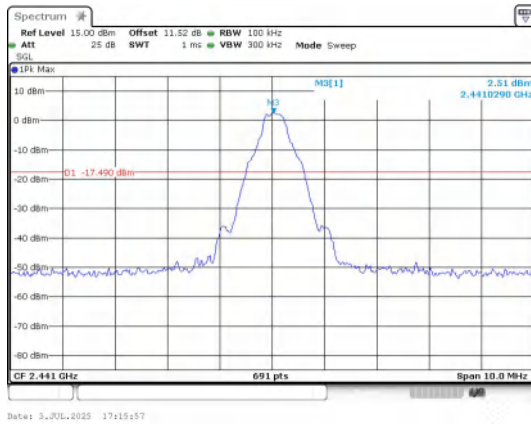
**30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 78**



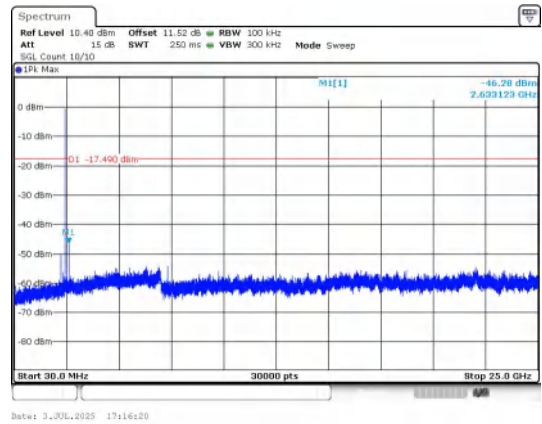
**Out Of Band Emission
8DPSK_3-DH5_Channel 0**



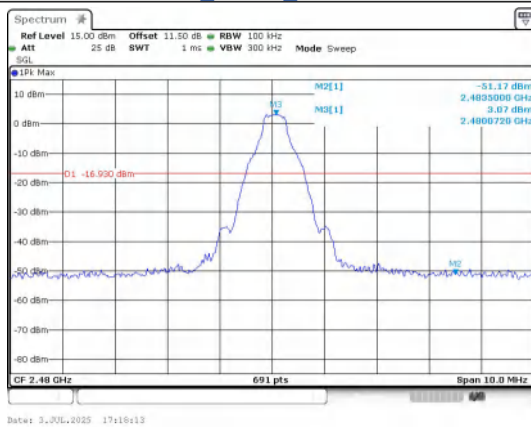
**30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0**



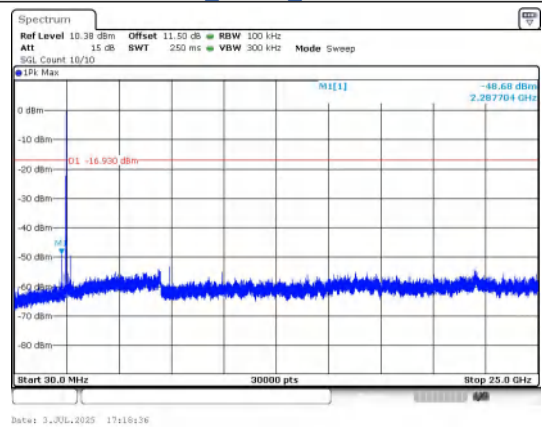
**Out Of Band Emission
8DPSK_3-DH5_Channel 39**



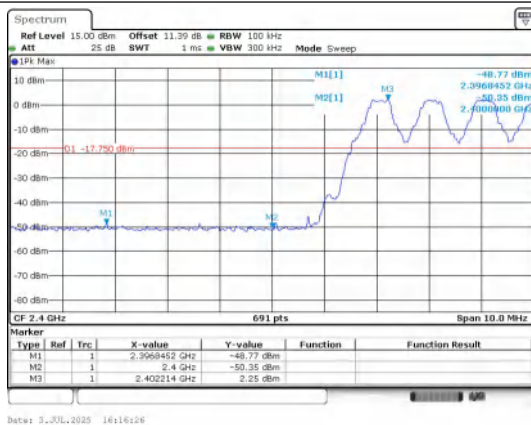
**30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39**



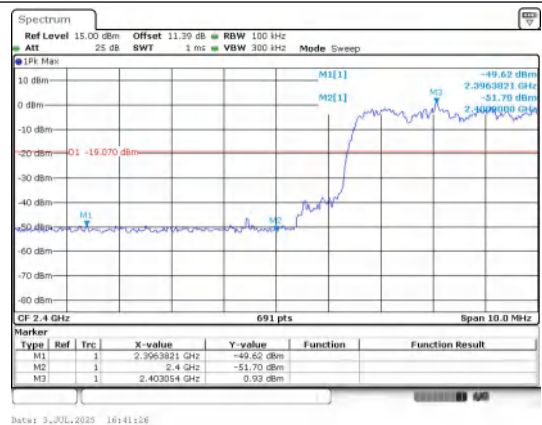
**Out Of Band Emission
8DPSK_3-DH5_Channel 78**



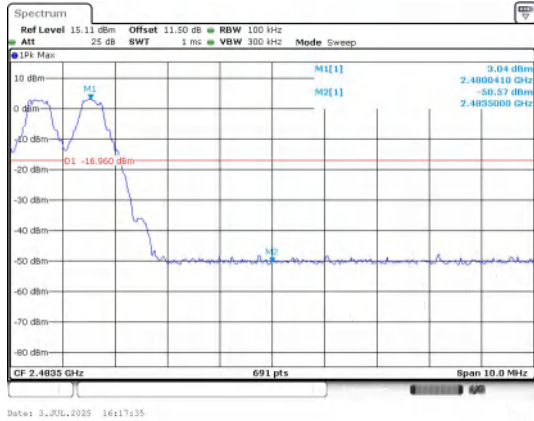
**30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78**



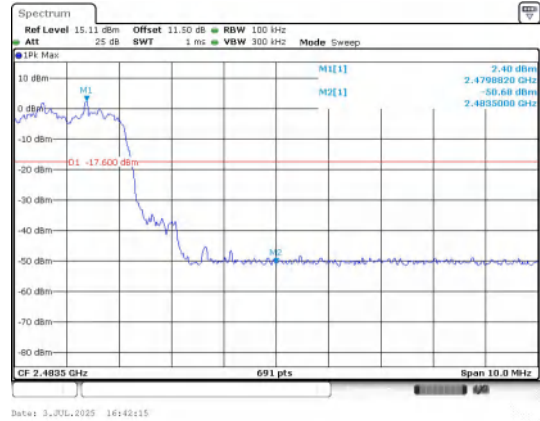
**Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping**



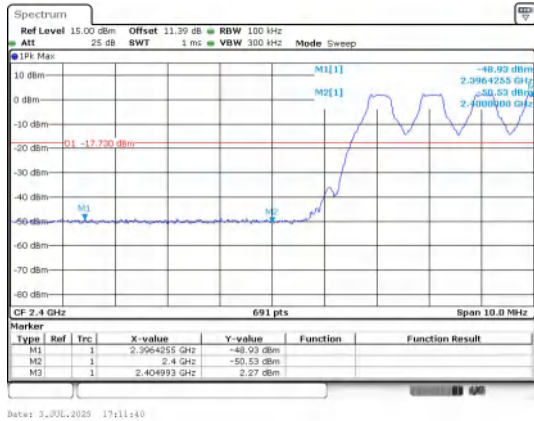
**Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping**



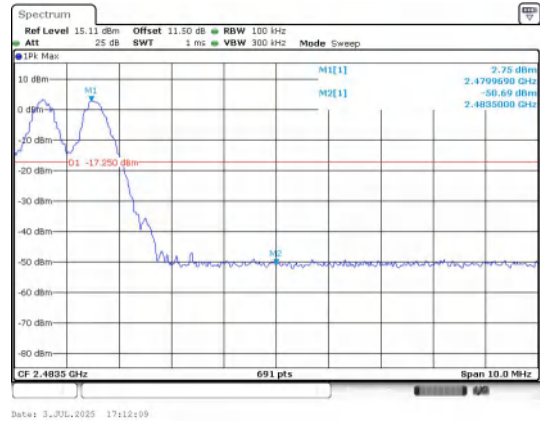
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



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

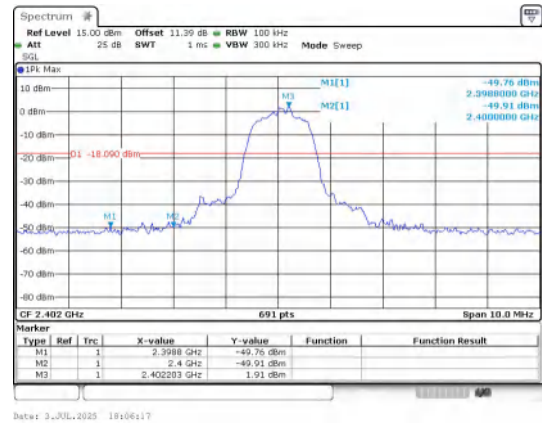
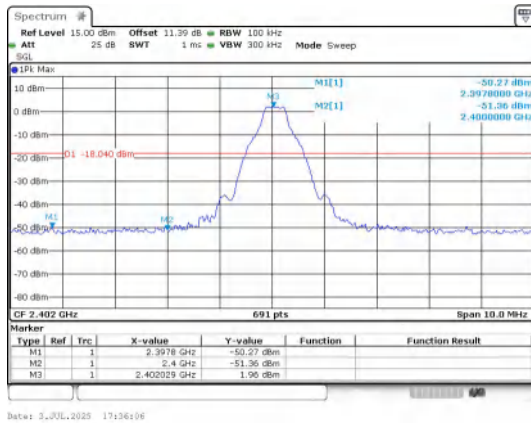
Right:
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2397.80	-50.271	-18.04	-32.231	PASS
			2400.00	-51.360	-18.04	-33.320	PASS
			2594.00	-46.790	-18.04	-28.750	PASS
		39	2633.12	-47.106	-17.88	-29.226	PASS
			2287.70	-48.512	-17.13	-31.382	PASS
			2483.50	-51.760	-17.13	-34.630	PASS
$\pi/4$ DQPSK	2-DH5	0	2398.80	-49.762	-18.09	-31.672	PASS
			2400.00	-49.910	-18.09	-31.820	PASS
			2594.00	-50.801	-18.09	-32.711	PASS
		39	2633.12	-50.551	-17.81	-32.741	PASS
			2483.50	-51.400	-17.14	-34.260	PASS
			2672.24	-52.494	-17.14	-35.354	PASS
8DPSK	3-DH5	0	2399.00	-49.962	-18.04	-31.922	PASS
			2400.00	-51.300	-18.04	-33.260	PASS
			2594.00	-46.118	-18.04	-28.078	PASS
		39	2633.12	-47.700	-17.57	-30.130	PASS
			2483.50	-51.420	-16.84	-34.580	PASS
			2672.24	-47.386	-16.84	-30.546	PASS

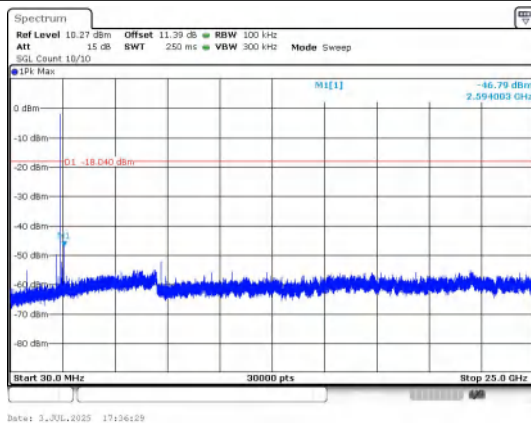
Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2396.11	-49.901	-17.88	-32.021	PASS
			2400.00	-51.360	-17.88	-33.480	PASS
			2483.50	-50.300	-17.13	-33.170	PASS
π/4DQPSK	2-DH5		2398.49	-49.314	-18.89	-30.424	PASS
			2400.00	-50.110	-18.89	-31.220	PASS
			2483.50	-50.820	-20.09	-30.730	PASS
8DPSK	3-DH5		2398.90	-49.669	-18.38	-31.289	PASS
			2400.00	-51.720	-18.38	-33.340	PASS
			2483.50	-50.230	-17.21	-33.020	PASS

Test Graphs

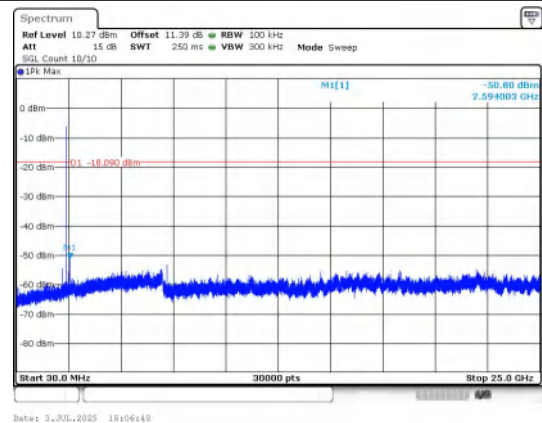


Out Of Band Emission GFSK_DH5_Channel 0

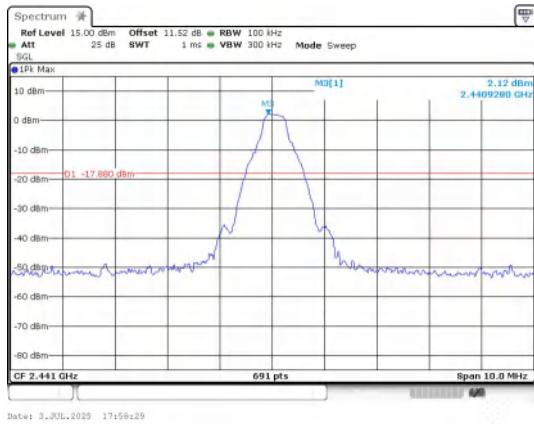


30.0 MHz - 25000.0 MHz GFSK_DH5_Channel 0

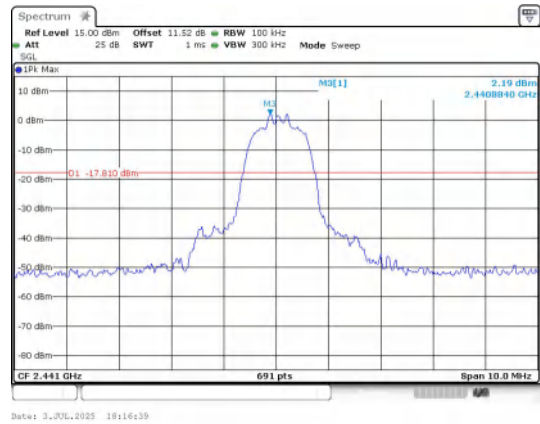
Out Of Band Emission pi/4DQPSK_2-DH5_Channel 0



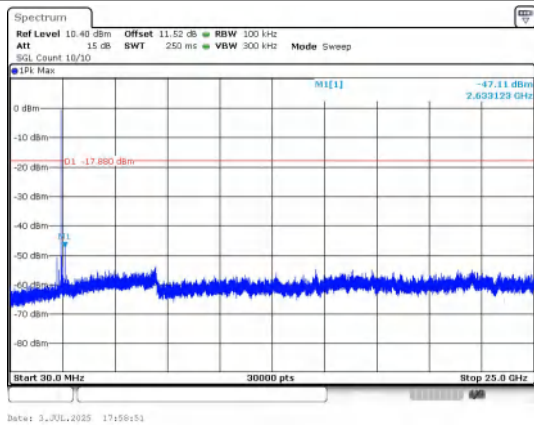
30.0 MHz - 25000.0 MHz pi/4DQPSK_2-DH5_Channel 0



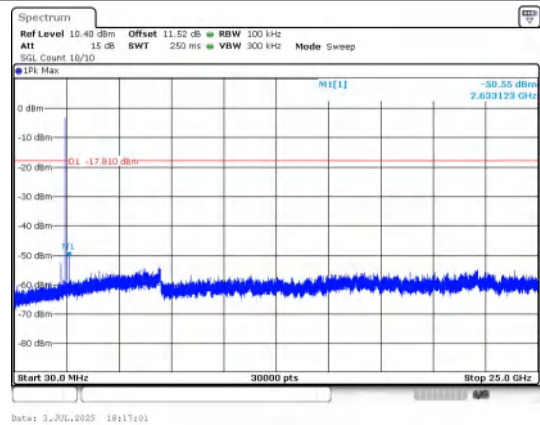
**Out Of Band Emission
GFSK_DH5_Channel 39**



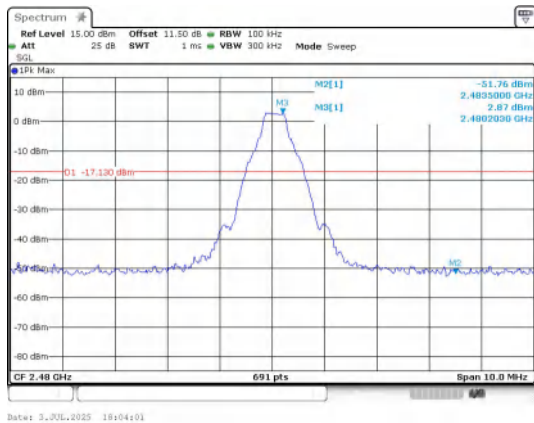
**Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 39**



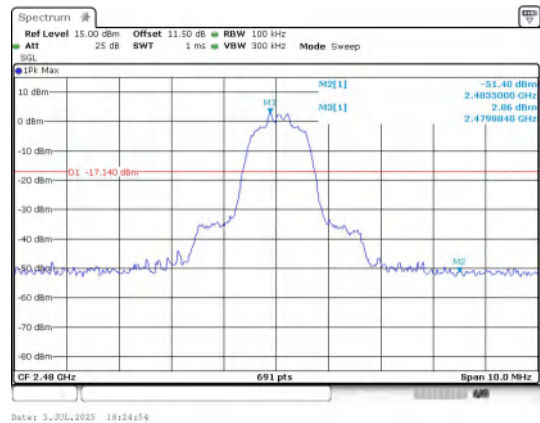
**30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 39**



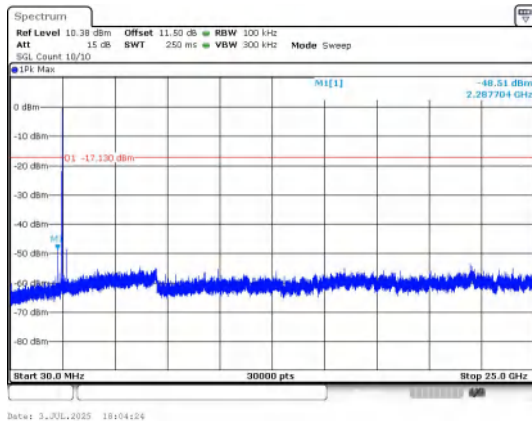
**30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 39**



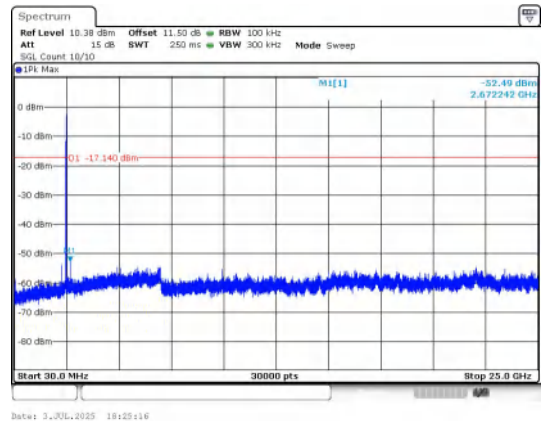
**Out Of Band Emission
GFSK_DH5_Channel 78**



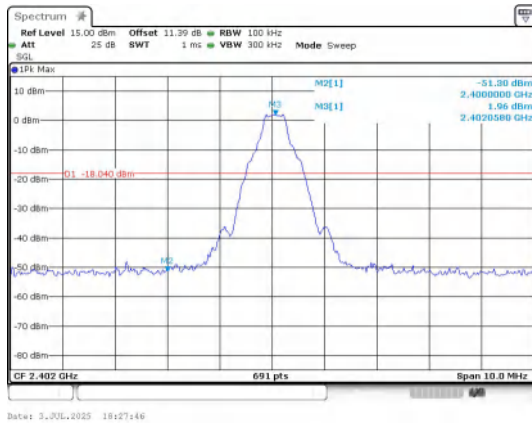
**Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78**



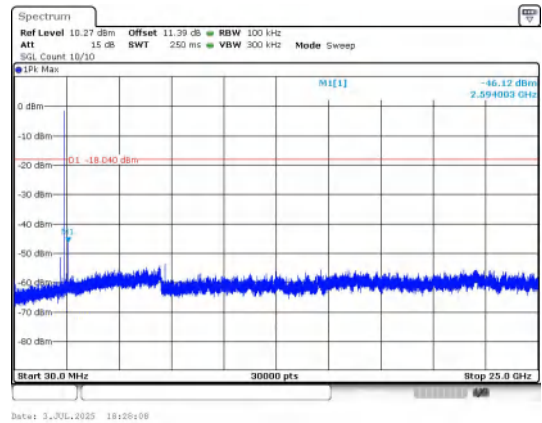
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



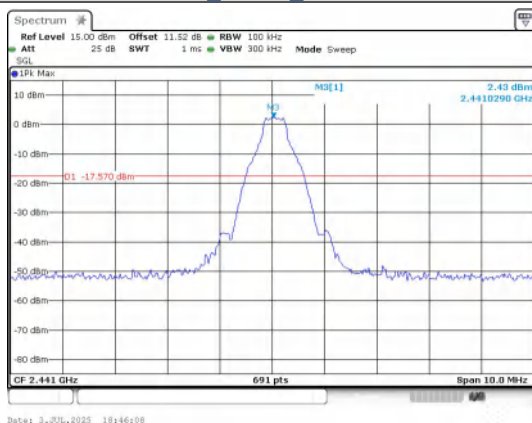
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 78



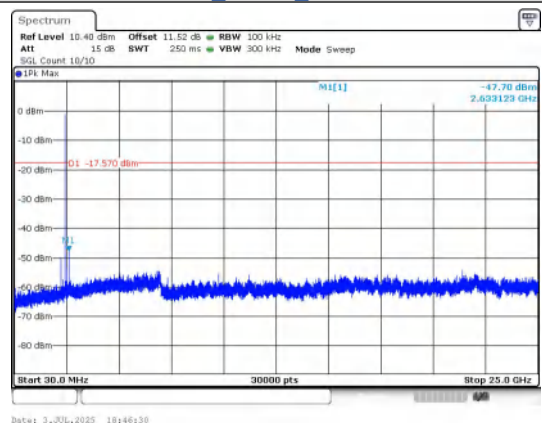
Out Of Band Emission
8DPSK_3-DH5_Channel 0



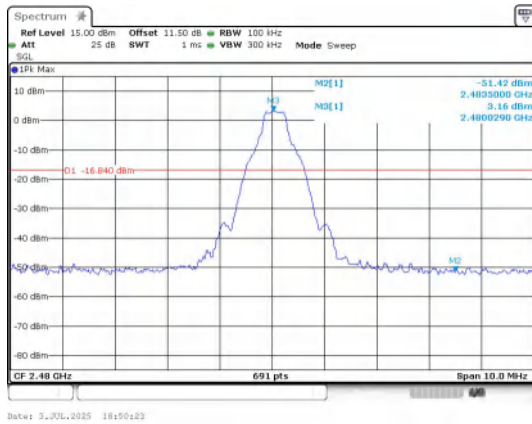
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0



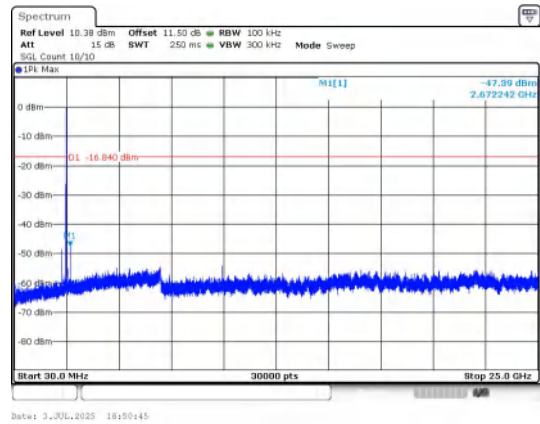
Out Of Band Emission
8DPSK_3-DH5_Channel 39



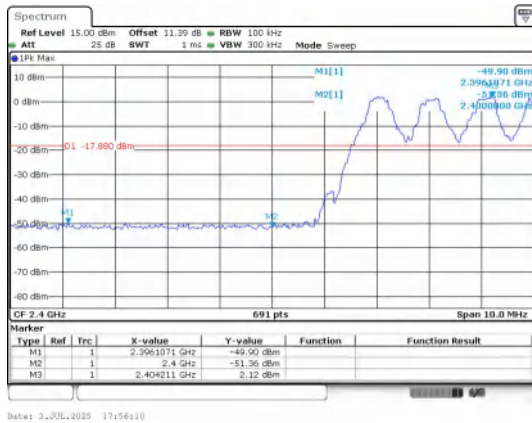
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39



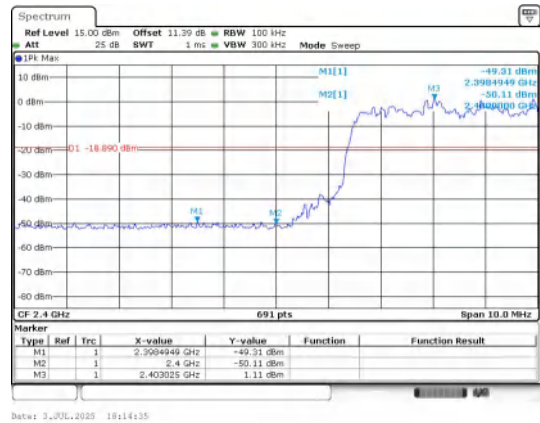
**Out Of Band Emission
8DPSK_3-DH5_Channel 78**



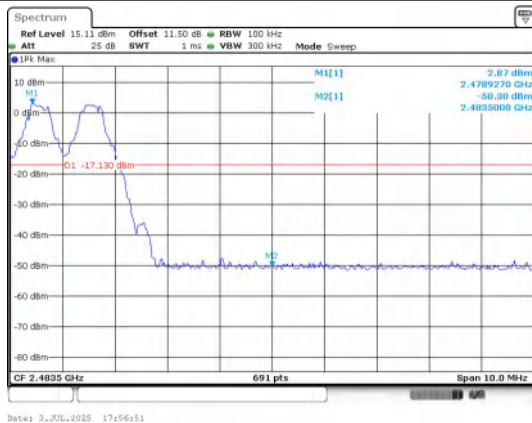
**30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78**



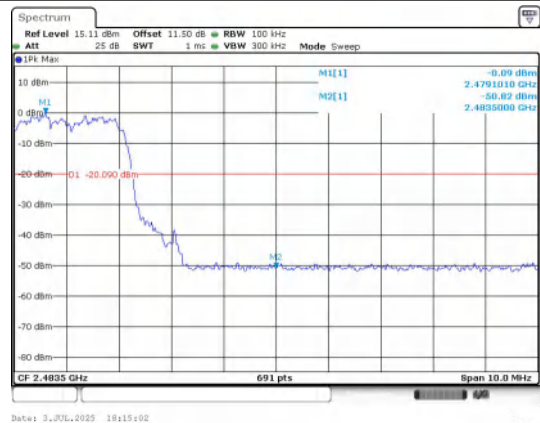
**Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping**



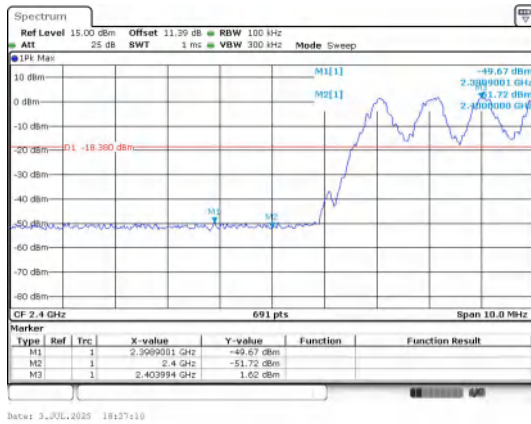
**Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping**



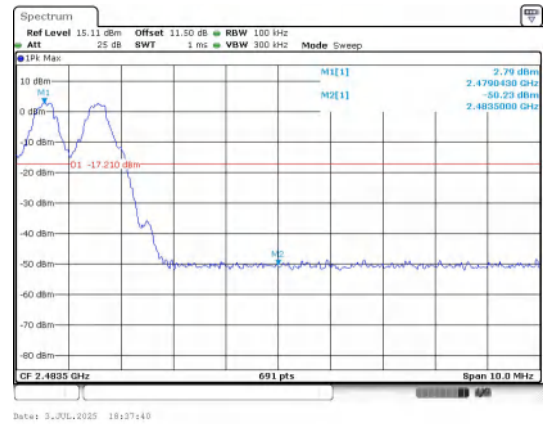
**Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping**



**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**

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