

Appendix Report

Report No.:	CISRR250116148
Test Engineer:	Lucas Huang
Supervised by:	Rory Huang

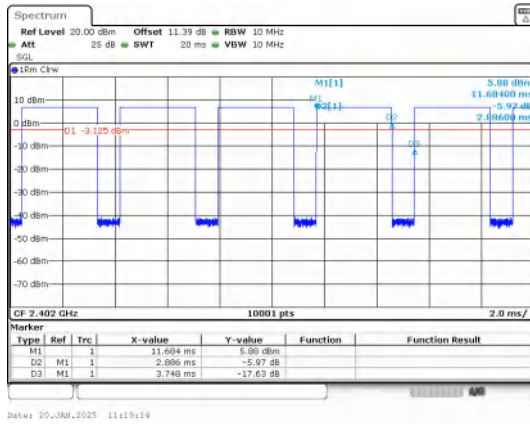
1) Duty Cycle

Test Result

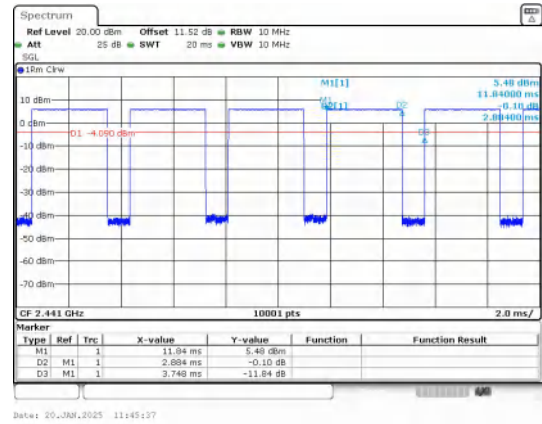
Left:

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	2.884	3.748	76.95	0.7695	1.1379	0.3467
		78	2.884	3.748	76.95	0.7695	1.1379	0.3467
$\pi/4$ 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	2.894	3.748	77.21	0.7721	1.1233	0.3455
		39	2.894	3.748	77.21	0.7721	1.1233	0.3455
		78	2.894	3.748	77.21	0.7721	1.1233	0.3455

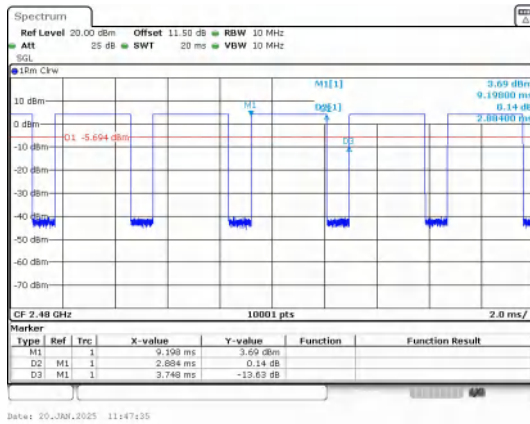
Test Graphs



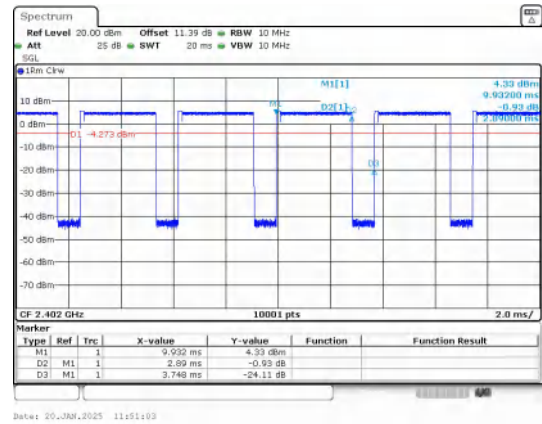
GFSK(DH5)_Channel 0



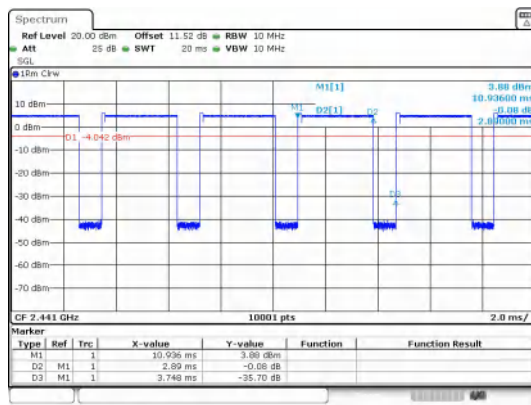
GFSK(DH5)_Channel 39



GFSK(DH5)_Channel 78

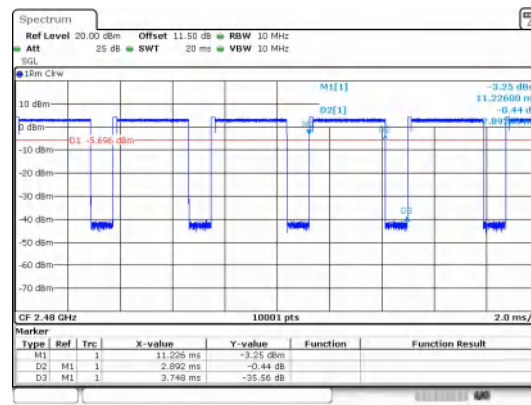


$\pi/4$ DQPSK(2-DH5)_Channel 0



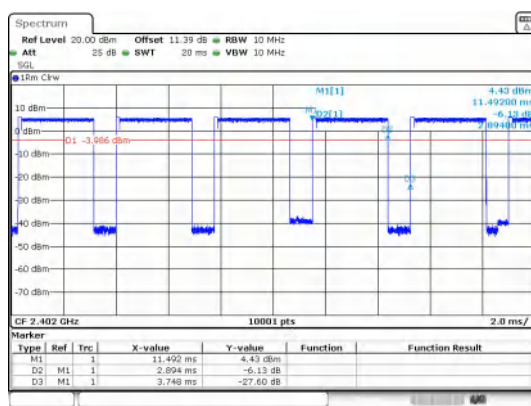
Date: 20_JAN_2025 11:59:20

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



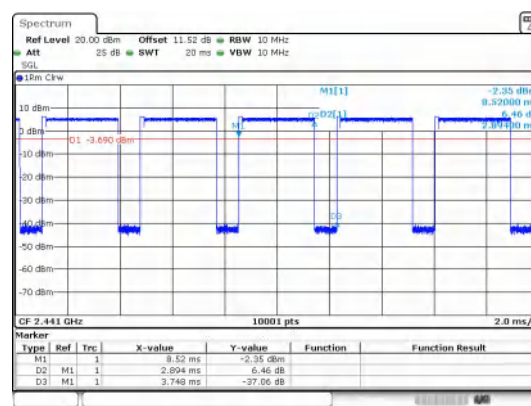
Date: 20_JAN_2025 12:03:16

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



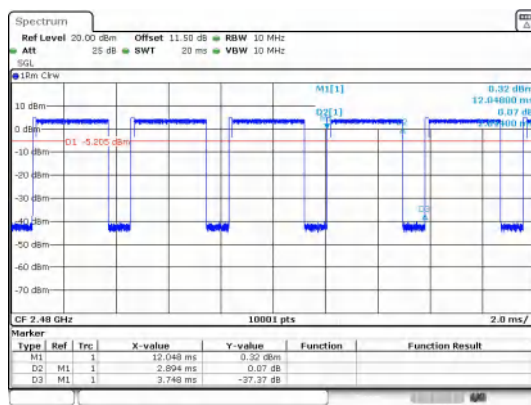
Date: 20_JAN_2025 14:05:23

8DPSK(3-DH5)_Channel 0



Date: 20_JAN_2025 14:03:13

8DPSK(3-DH5)_Channel 39



Date: 20_JAN_2025 14:03:54

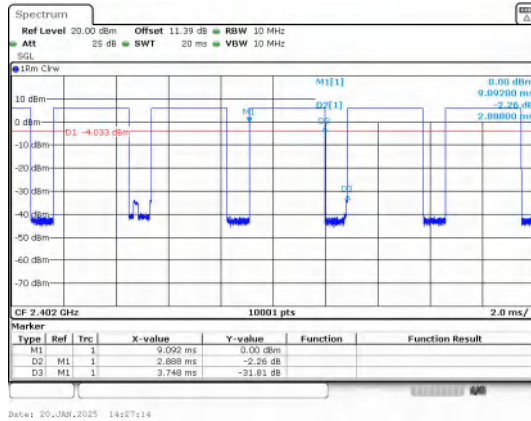
8DPSK(3-DH5)_Channel 78

Right:

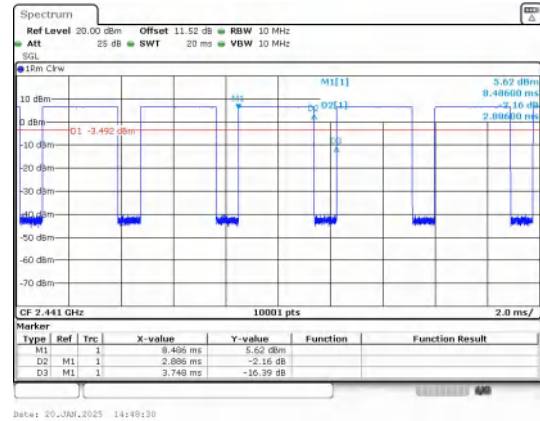
Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.888	3.748	77.05	0.7705	1.1323	0.3463
		39	2.886	3.748	77.00	0.7700	1.1351	0.3465
		78	2.886	3.748	77.00	0.7700	1.1351	0.3465
$\pi/4$ DQPSK	2-DH5	0	2.892	3.748	77.16	0.7716	1.1261	0.3458
		39	2.890	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	2.894	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

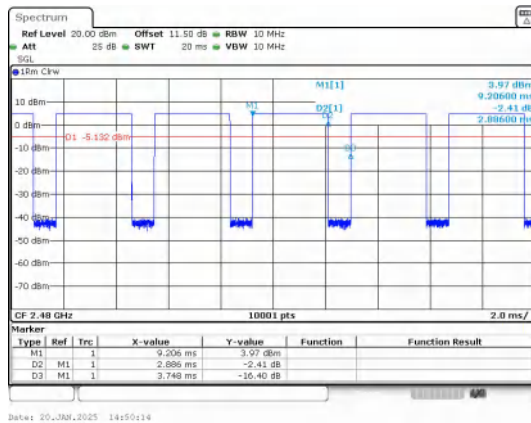
Test Graphs



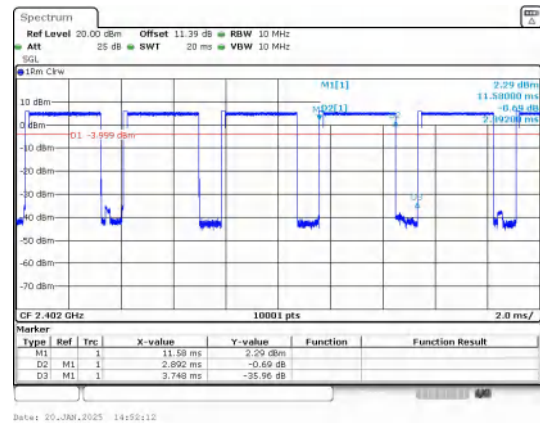
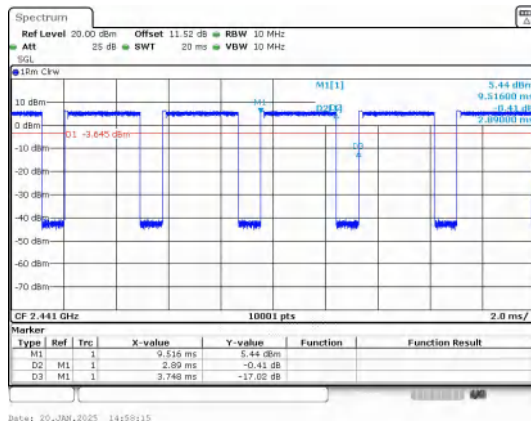
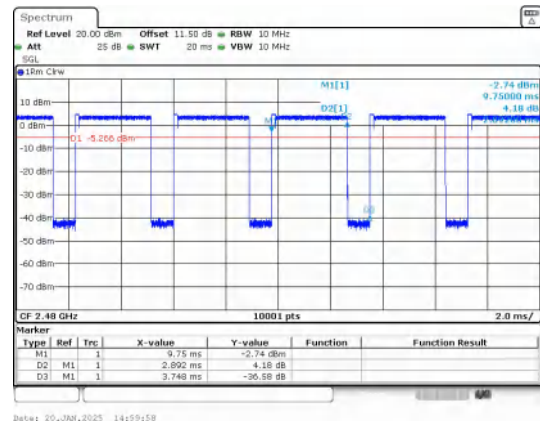
GFSK(DH5)_Channel 0

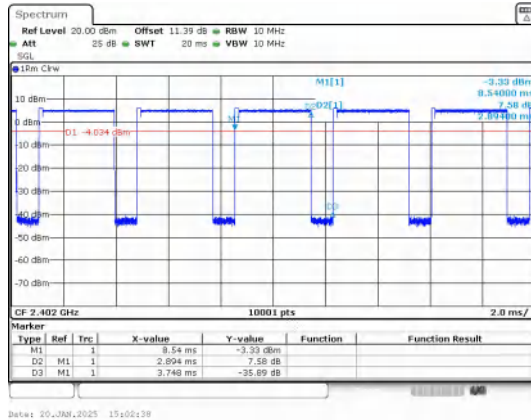


GFSK(DH5)_Channel 39

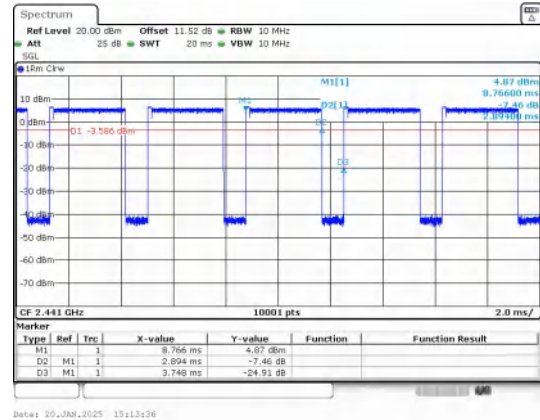


GFSK(DH5)_Channel 78

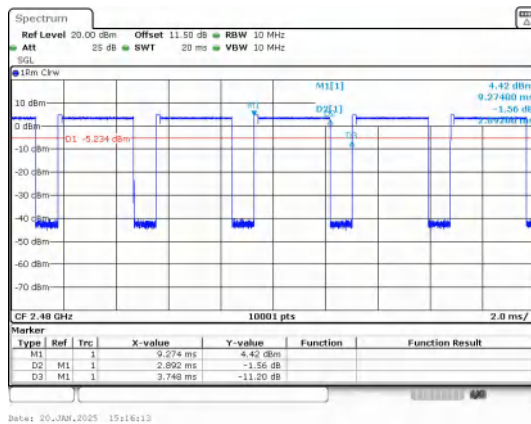

 $\pi/4$ DQPSK(2-DH5)_Channel 0

 $\pi/4$ 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

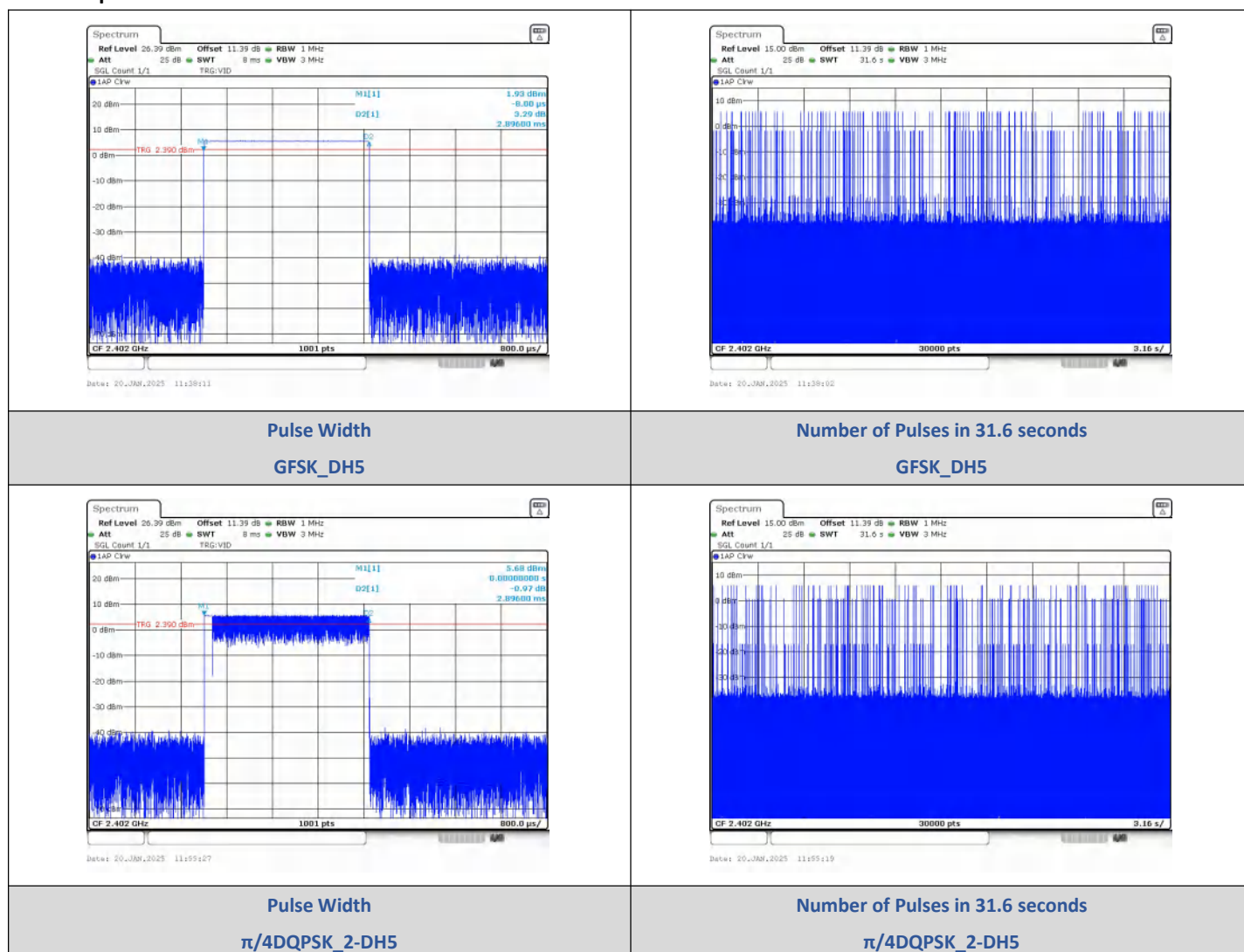
2) Dwell Time

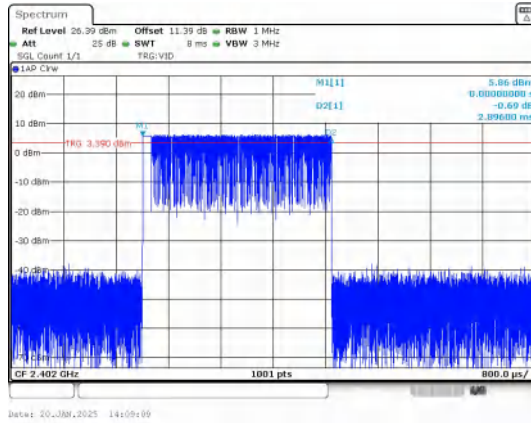
Test Result

Left:

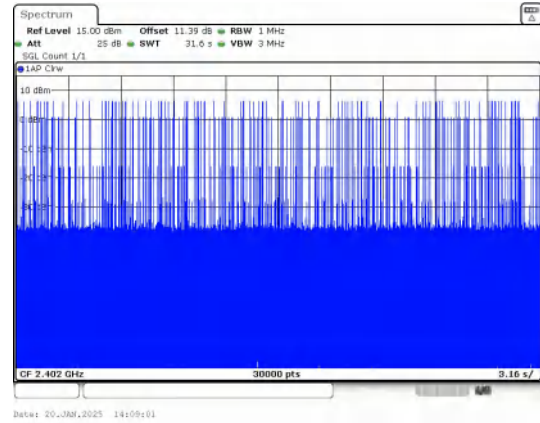
Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.896	103	298.29	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.896	92	266.43		PASS
8DPSK	3-DH5		2.896	94	272.22		PASS

Test Graphs





Pulse Width
8DPSK_3-DH5

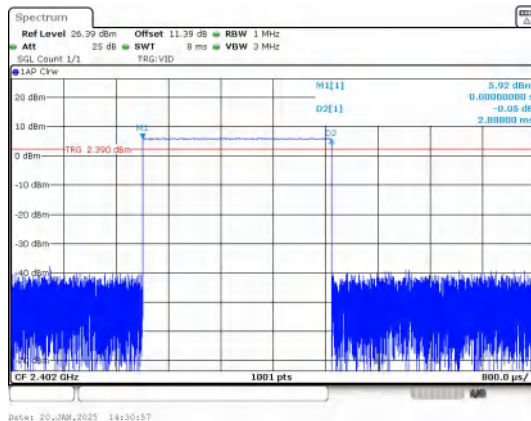


Number of Pulses in 31.6 seconds
8DPSK_3-DH5

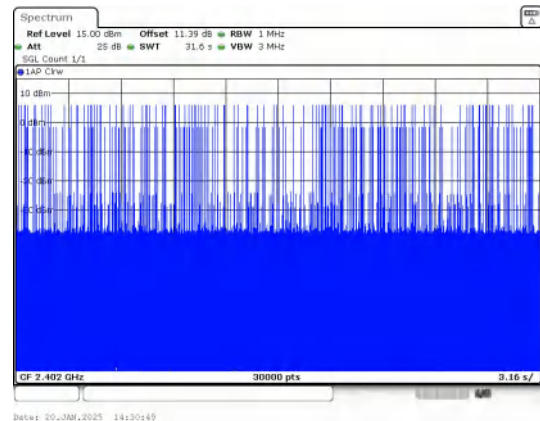
Right:

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	116	335.01	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.888	106	306.13		PASS
8DPSK	3-DH5		2.896	99	286.7		PASS

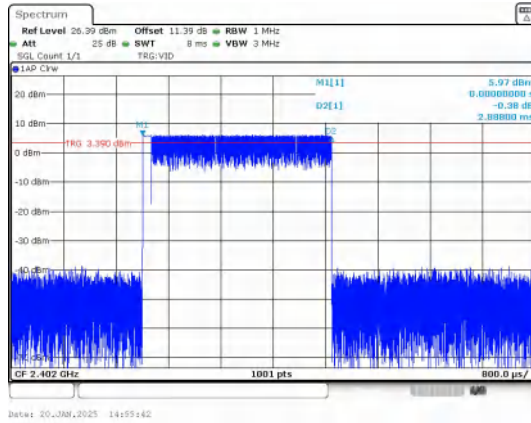
Test Graphs



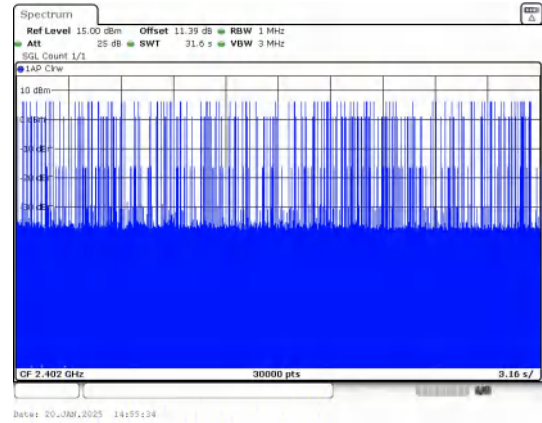
Pulse Width
GFSK_DH5



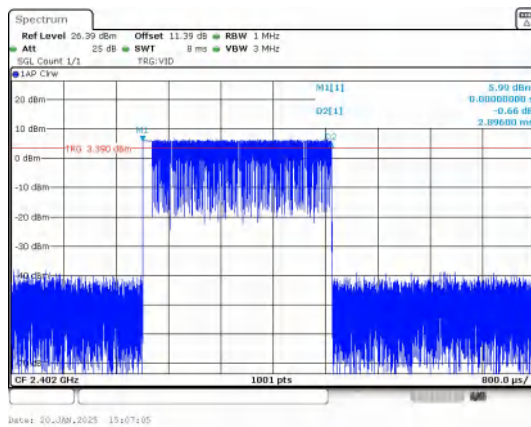
Number of Pulses in 31.6 seconds
GFSK_DH5



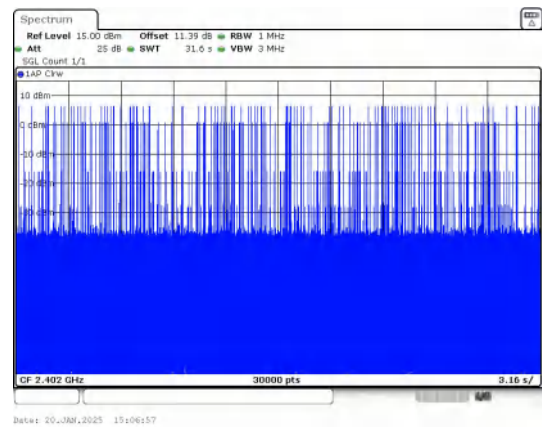
Pulse Width
 $\pi/4$ DQPSK_2-DH5



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

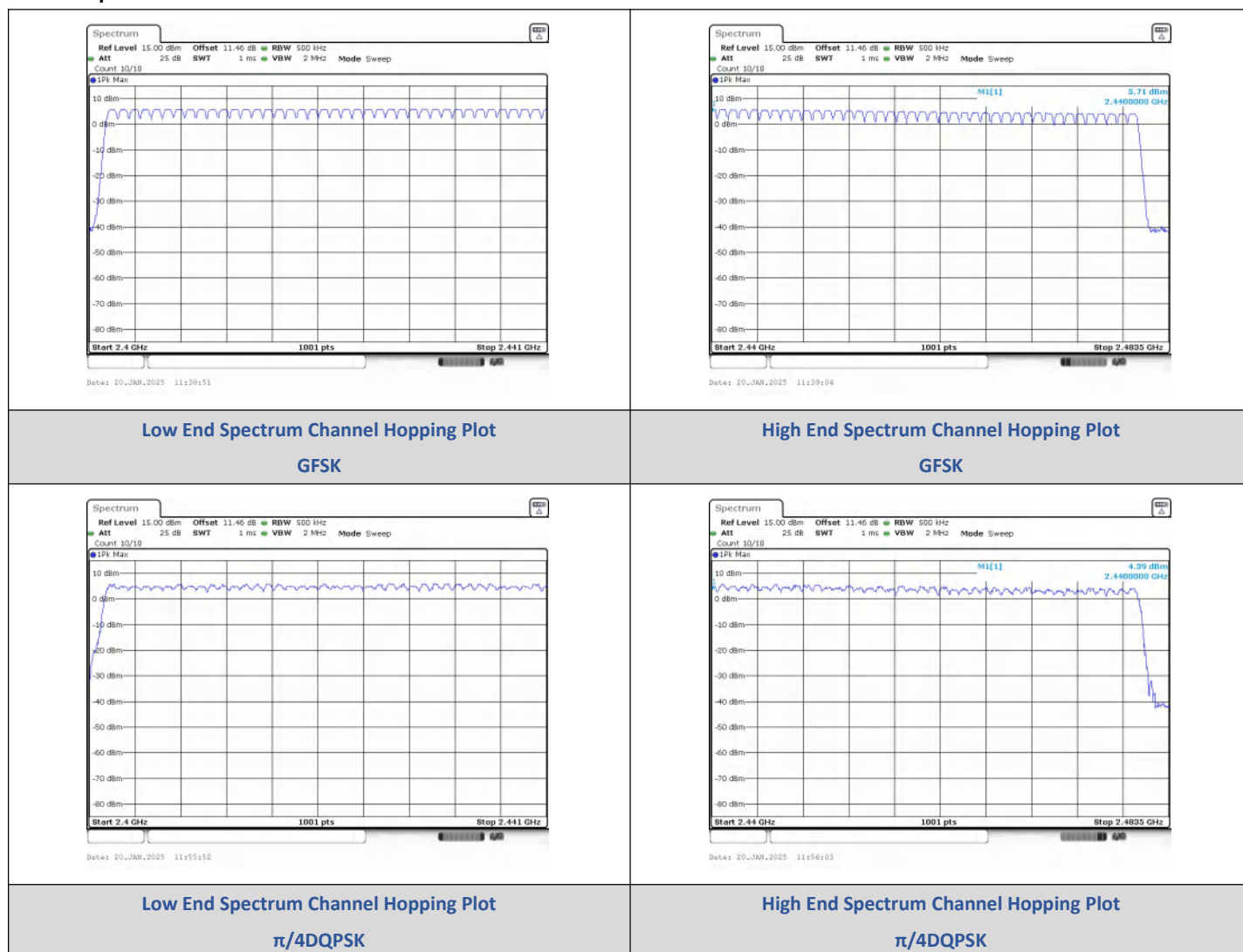
3) Number Of Hopping Channel

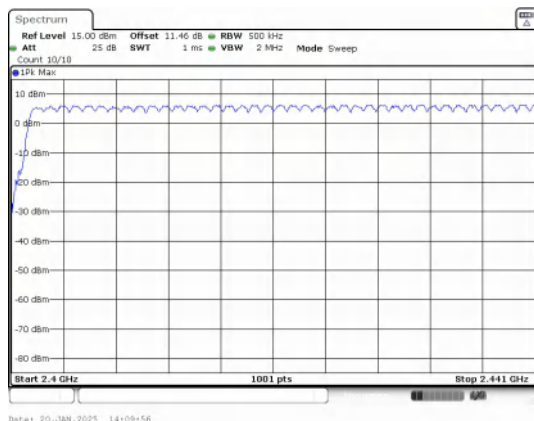
Test Result

Left:

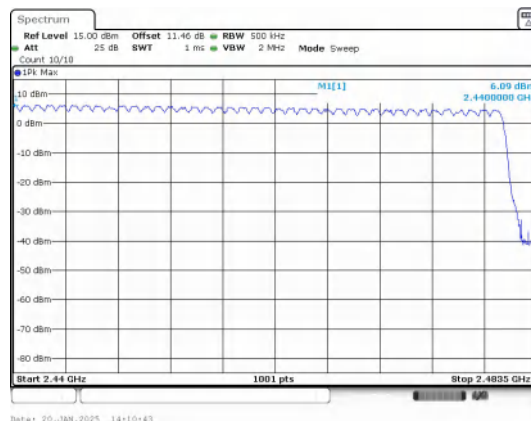
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
$\pi/4$ DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

Test Graphs





Low End Spectrum Channel Hopping Plot
8DPSK

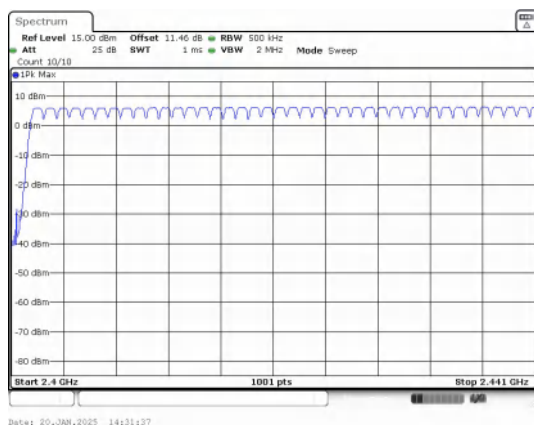


High End Spectrum Channel Hopping Plot
8DPSK

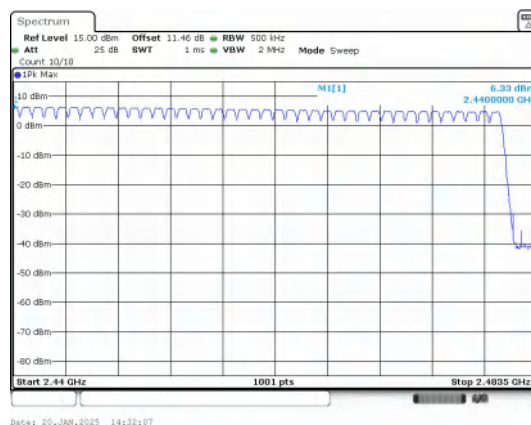
Right:

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

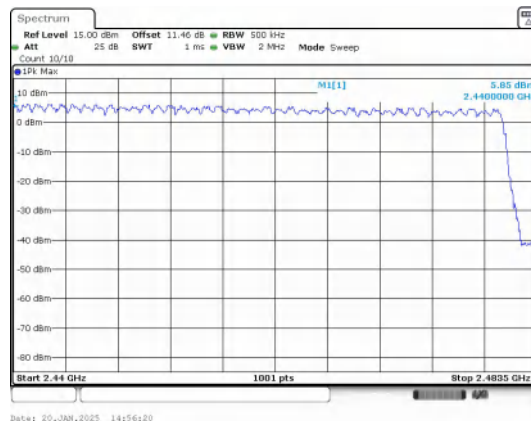
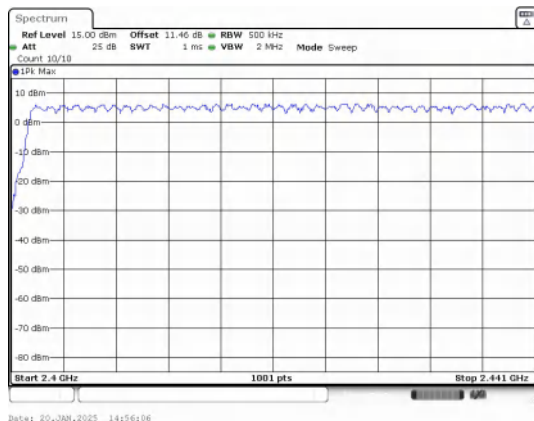
Test Graphs

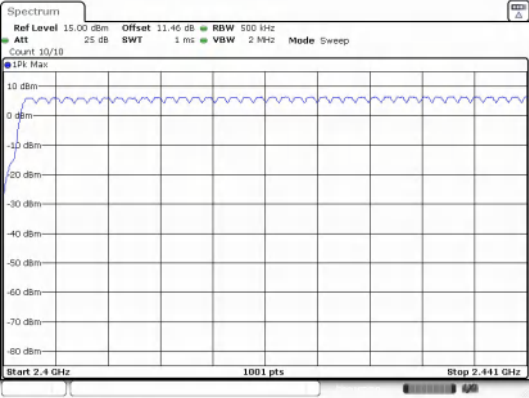
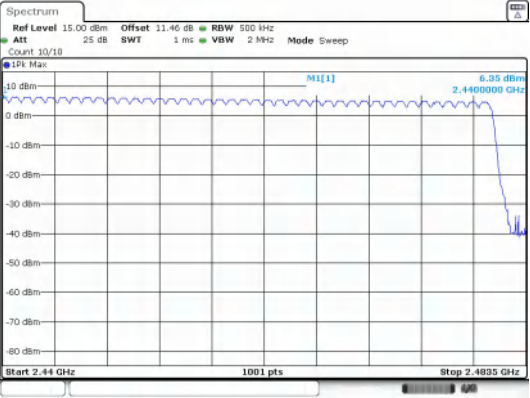


Low End Spectrum Channel Hopping Plot
GFSK



High End Spectrum Channel Hopping Plot
GFSK



Low End Spectrum Channel Hopping Plot $\pi/4$DQPSK	High End Spectrum Channel Hopping Plot $\pi/4$DQPSK
 Spectrum Ref Level 15.00 dBm Offset 11.46 dB RBW 500 Hz Att 25 dB SWT 1 ms VBW 2 MHz Mode Sweep Count 10/10 1Pk Max Start 2.4 GHz 1001 pts Stop 2.441 GHz Date: 20-JAN-2025 15:09:25	 Spectrum Ref Level 15.00 dBm Offset 11.46 dB RBW 500 Hz Att 25 dB SWT 1 ms VBW 2 MHz Mode Sweep Count 10/10 1Pk Max M1[1] 6.35 dBm 2.4408000 GHz Start 2.4 GHz 1001 pts Stop 2.4835 GHz Date: 20-JAN-2025 15:11:34
Low End Spectrum Channel Hopping Plot 8DPSK	High End Spectrum Channel Hopping Plot 8DPSK

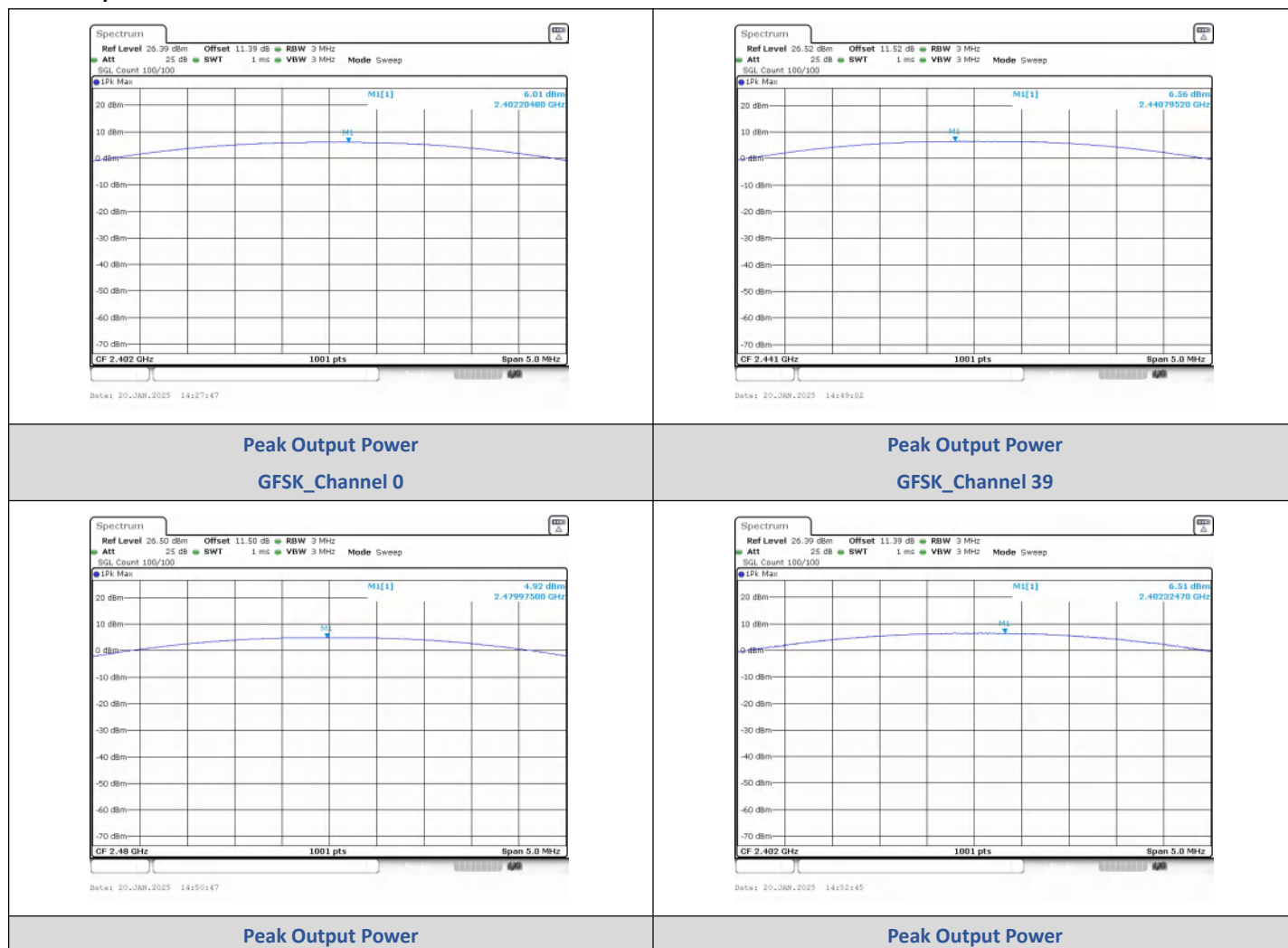
4) Conducted Peak Output Power

Test Result

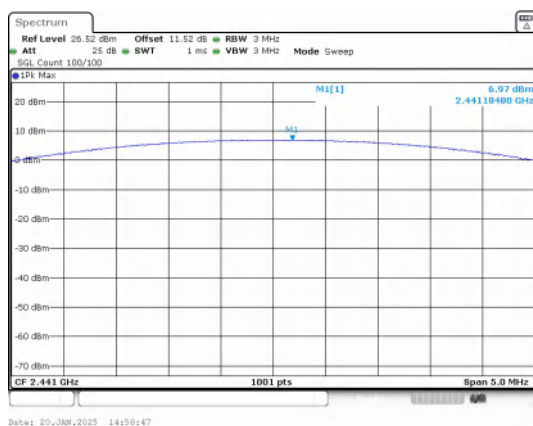
Left:

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	6.01	3.99	≤30	PASS
		39	6.56	4.53		PASS
		78	4.92	3.10		PASS
$\pi/4$ DQPSK	2-DH5	0	6.51	4.48	≤20.97	PASS
		39	6.97	4.98		PASS
		78	5.40	3.47		PASS
8DPSK	3-DH5	0	6.66	4.63		PASS
		39	7.18	5.22		PASS
		78	5.66	3.68		PASS

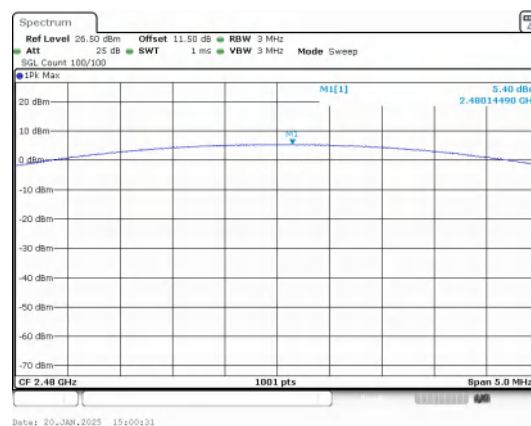
Test Graphs



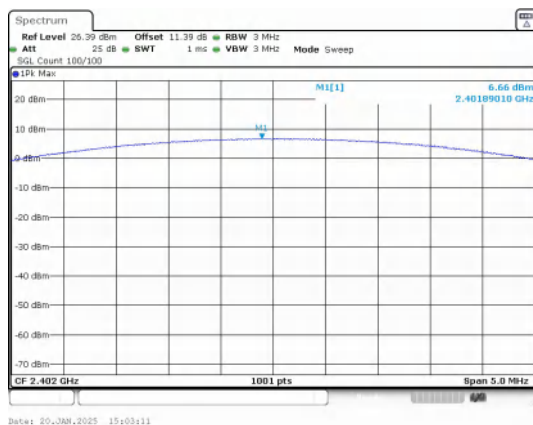
GFSK_Channel 78



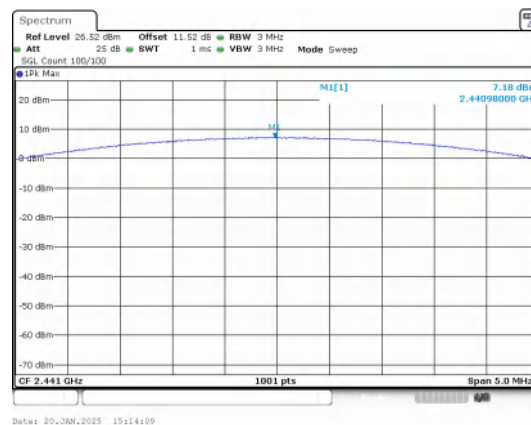
$\pi/4$ DQPSK_Channel 0



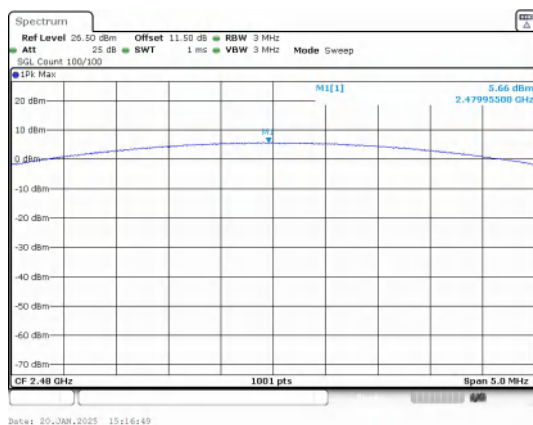
Peak Output Power
 $\pi/4$ DQPSK_Channel 39



Peak Output Power
 $\pi/4$ DQPSK_Channel 78



Peak Output Power
8DPSK_Channel 0



Peak Output Power
8DPSK_Channel 39

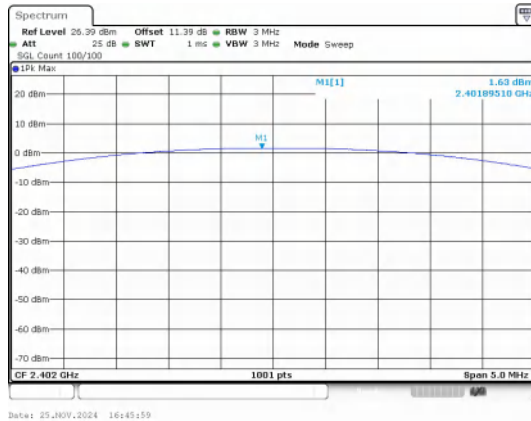
Peak Output Power
8DPSK_Channel 78

Right:

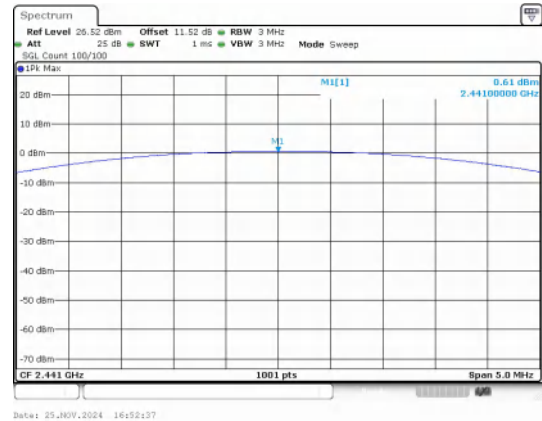
Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	1.63	1.46	≤30	PASS

		39	0.61	1.15		PASS
		78	-0.52	0.89		PASS
		0	2.45	1.76		PASS
$\pi/4$ DQPSK	2-DH5	39	1.41	1.38	≤ 20.97	PASS
		78	0.31	1.07		PASS
		0	2.85	1.93		PASS
8DPSK	3-DH5	39	1.82	1.52		PASS
		78	0.69	1.17		PASS
						PASS

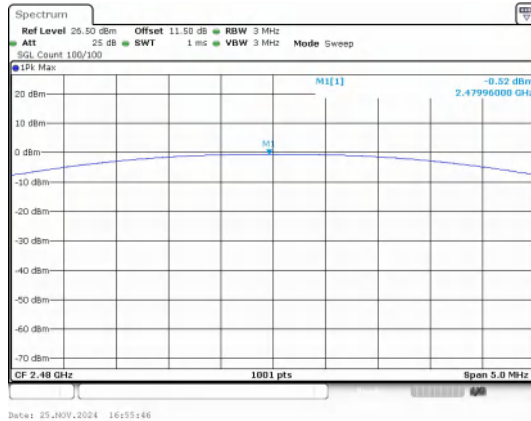
Test Graphs



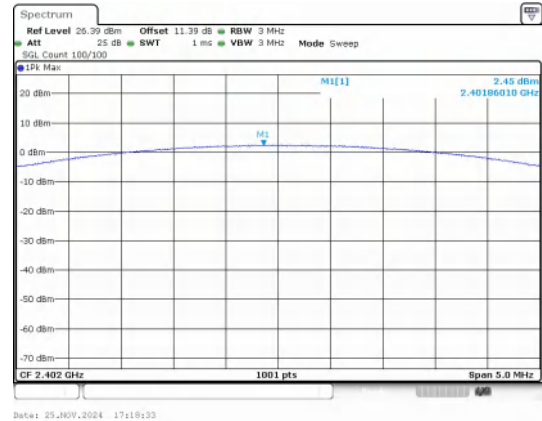
Peak Output Power
GFSK_Channel 0



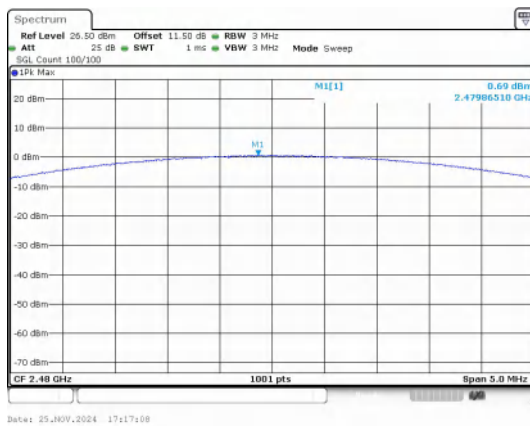
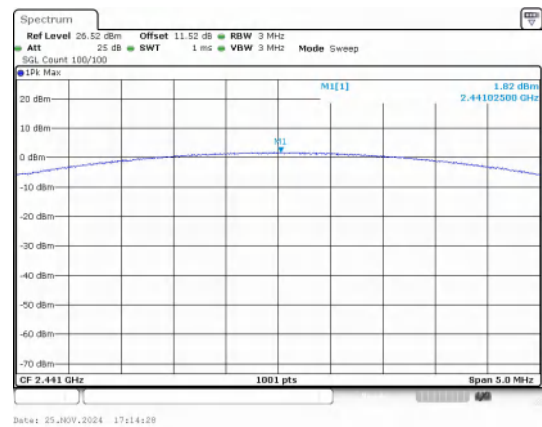
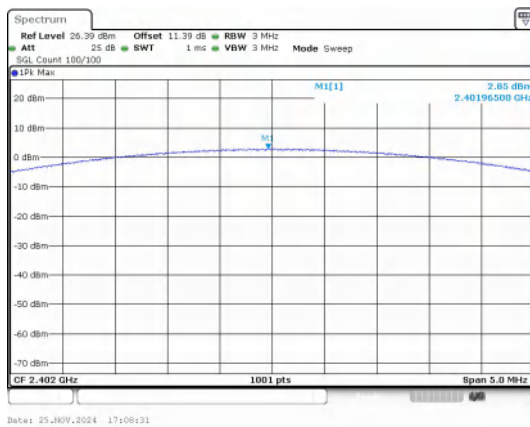
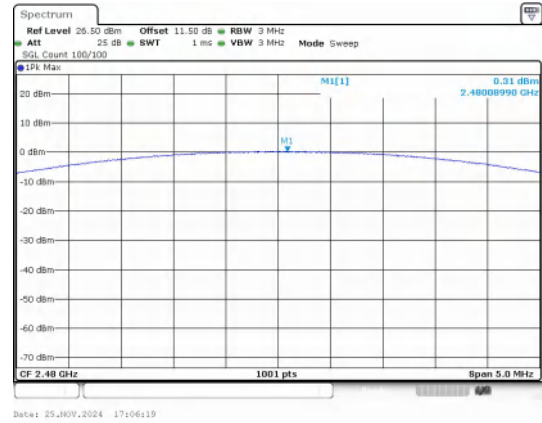
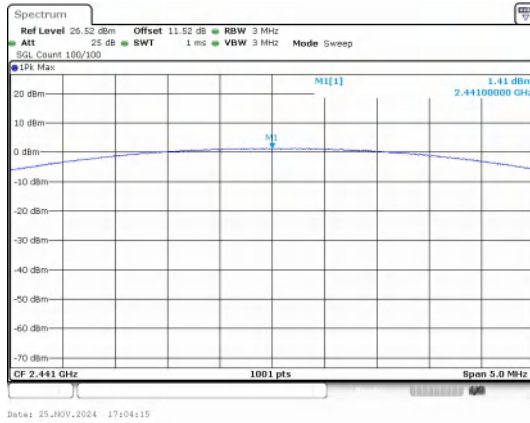
Peak Output Power
GFSK_Channel 39



Peak Output Power
GFSK_Channel 78



Peak Output Power
 $\pi/4$ DQPSK_Channel 0



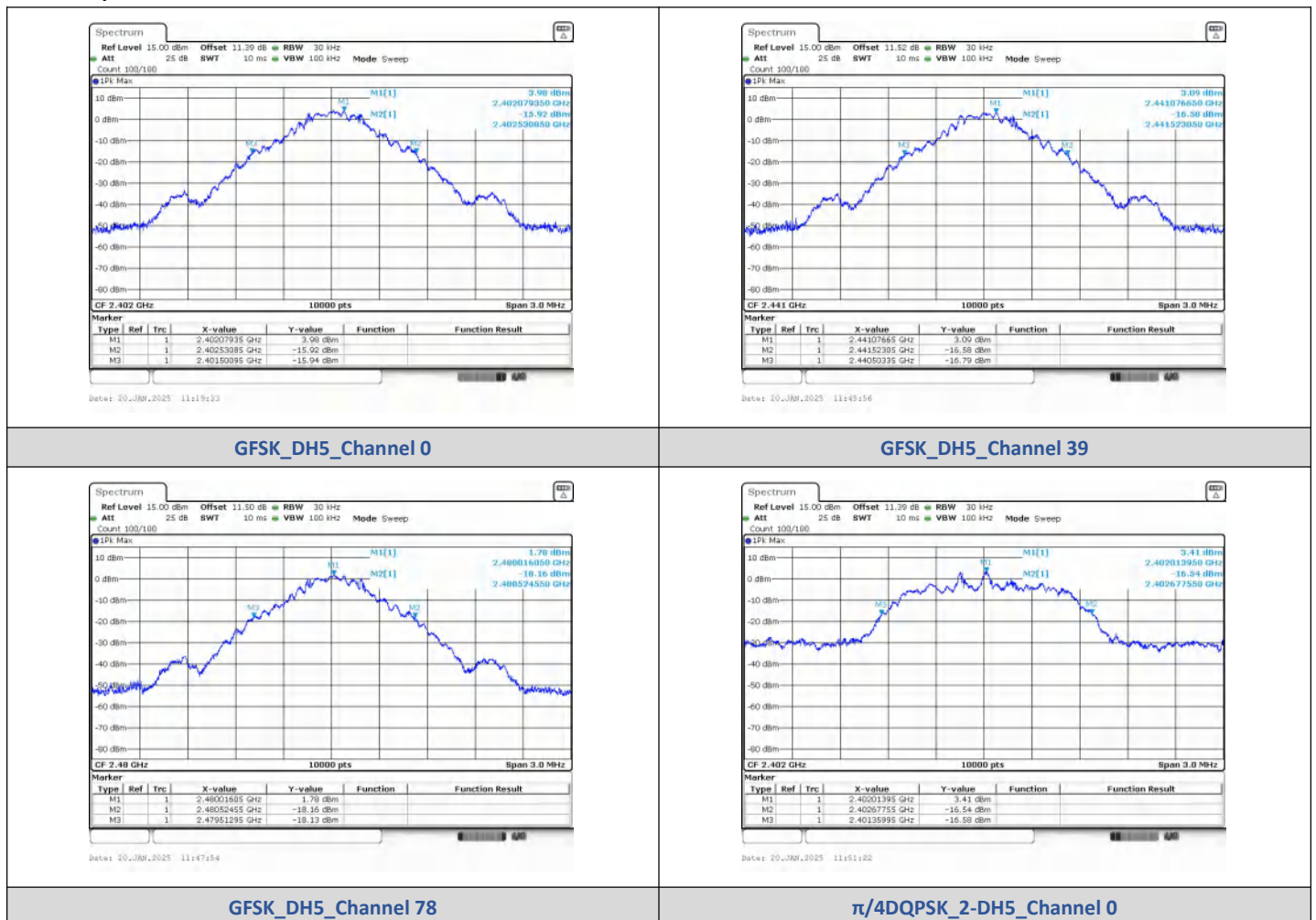
5) 20dB Bandwidth

Test Result

Left:

Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.030
	39	2441 MHz	1.020
	78	2480 MHz	1.010
$\pi/4$ DQPSK	0	2402 MHz	1.320
	39	2441 MHz	1.320
	78	2480 MHz	1.310
8DPSK	0	2402 MHz	1.290
	39	2441 MHz	1.290
	78	2480 MHz	1.290

Test Graphs

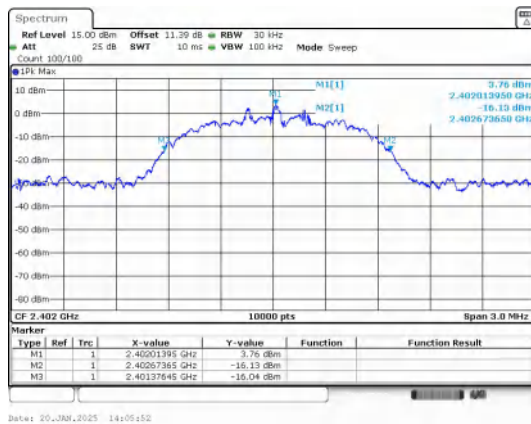




$\pi/4$ DQPSK_2-DH5_Channel 39



$\pi/4$ DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



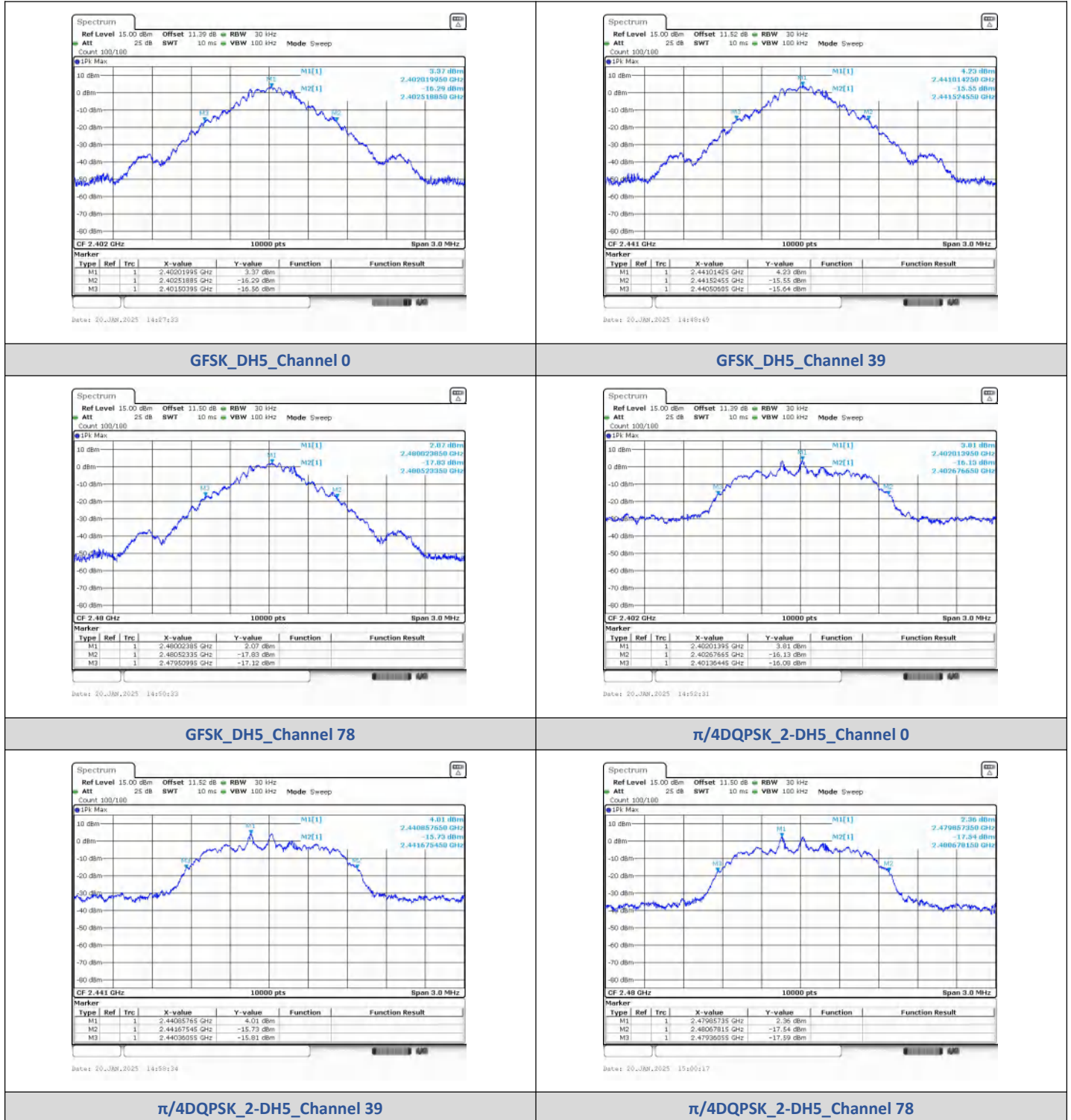
8DPSK_3-DH5_Channel 78

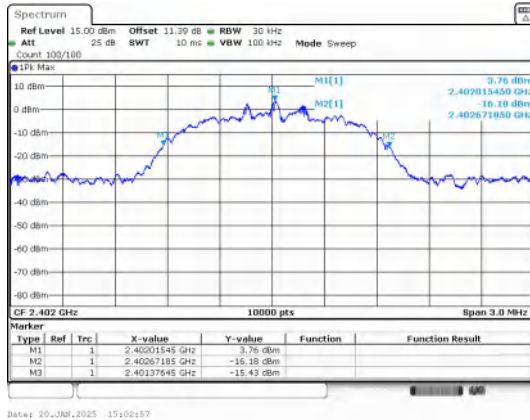
Right:

Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.020
	39	2441 MHz	1.010
	78	2480 MHz	1.010
$\pi/4$ DQPSK	0	2402 MHz	1.320
	39	2441 MHz	1.320
	78	2480 MHz	1.320

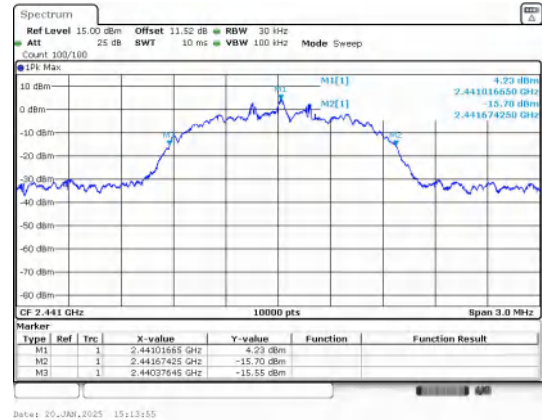
8DPSK	0	2402 MHz	1.290
	39	2441 MHz	1.290
	78	2480 MHz	1.290

Test Graphs

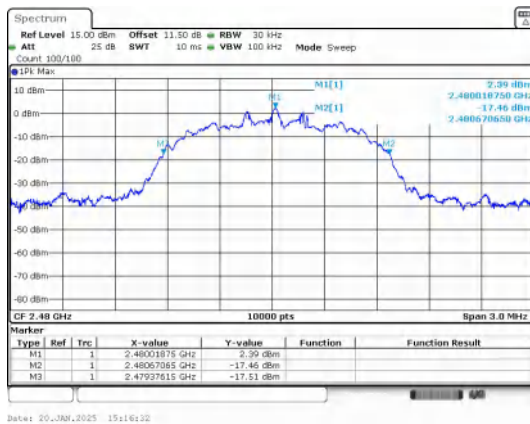




8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78

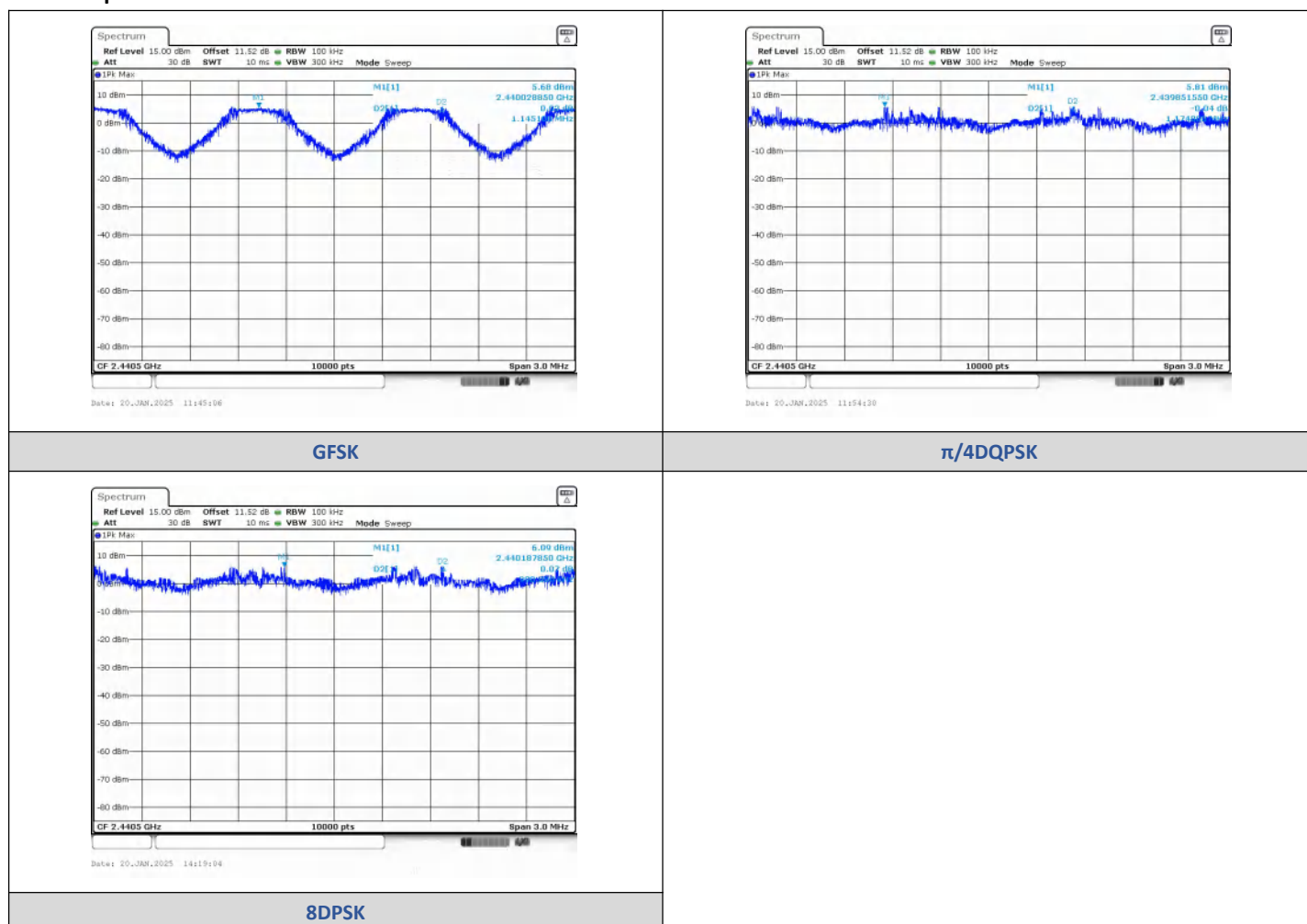
6) Carrier Frequencies Separation

Test Result

Left:

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.0289	2441.1739	1.1451	1.03	PASS
$\pi/4$ DQPSK	2-DH5	2439.8515	2441.0264	1.1748	0.88	PASS
8DPSK	3-DH5	2440.1878	2441.1779	0.9900	0.86	PASS

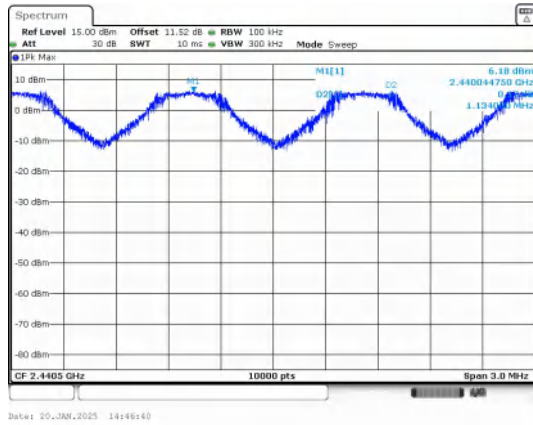
Test Graphs



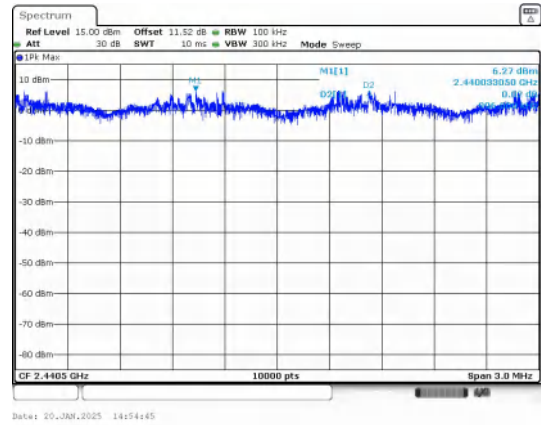
Right:

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.0448	2441.1788	1.1340	1.02	PASS
$\pi/4$ DQPSK	2-DH5	2440.0331	2441.0291	0.9960	0.88	PASS
8DPSK	3-DH5	2440.0381	2441.0129	0.9747	0.86	PASS

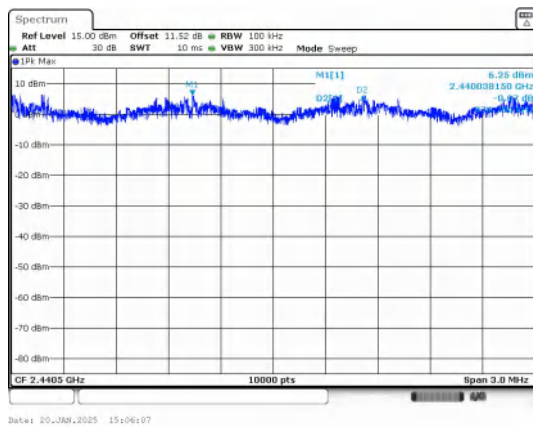
Test Graphs



GFSK



$\pi/4$ DQPSK



8DPSK

7) Conducted Out Of Band Emission

Test Result

Left:

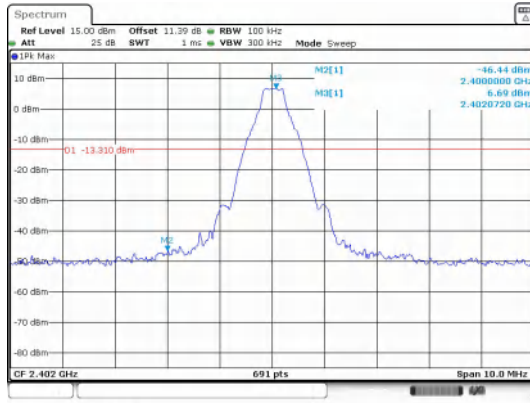
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-46.440	-13.31	-33.130	PASS
			5825.12	-39.340	-13.31	-26.030	PASS
		39	9763.72	-39.279	-14.22	-25.059	PASS
		78	2483.50	-50.350	-15.76	-34.590	PASS
			5820.96	-36.007	-15.76	-20.247	PASS
$\pi/4$ DQPSK	2-DH5	0	2400.00	-43.900	-14.36	-29.540	PASS
			7205.96	-40.386	-14.36	-26.026	PASS
		39	9763.72	-38.953	-14.21	-24.743	PASS
		78	2483.50	-50.010	-15.79	-34.220	PASS
			9920.20	-37.312	-15.79	-21.522	PASS
8DPSK	3-DH5	0	2400.00	-41.270	-14.02	-27.250	PASS
			7205.96	-39.445	-14.02	-25.425	PASS
		39	9763.72	-38.965	-13.76	-25.205	PASS
		78	2483.50	-49.470	-15.52	-33.950	PASS
			9920.20	-36.812	-15.52	-21.292	PASS

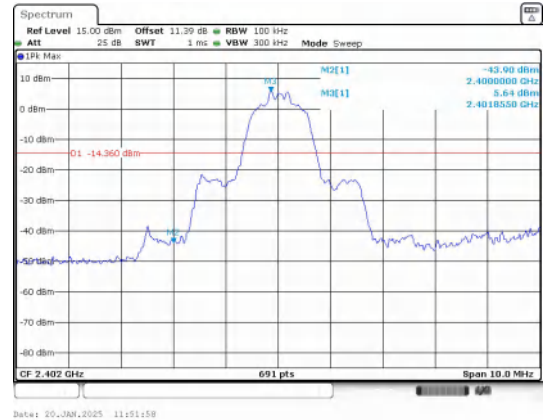
Hopping

Hopping							
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2396.76	-47.361	-14.43	-32.931	PASS
			2400.00	-49.090	-14.43	-34.660	PASS
			2483.50	-49.910	-15.92	-33.990	PASS
$\pi/4$ DQPSK	2-DH5		2400.00	-45.230	-14.71	-30.520	PASS
			2483.50	-49.610	-19.48	-30.130	PASS
8DPSK	3-DH5		2400.00	-42.740	-14.61	-28.130	PASS
			2483.50	-49.740	-15.72	-34.020	PASS

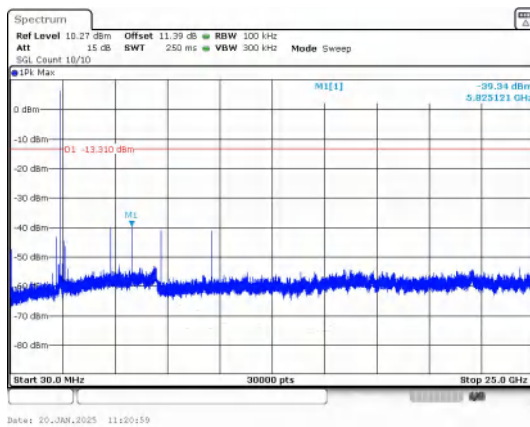
Test Graphs



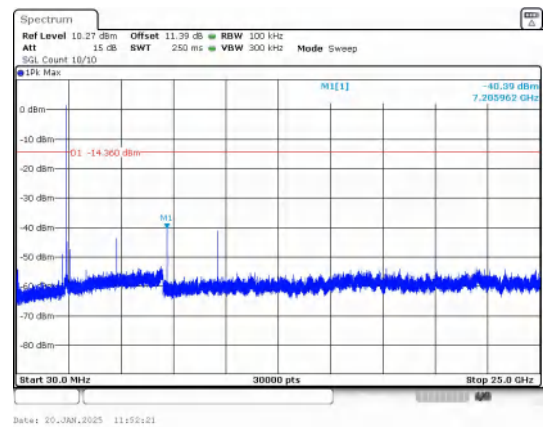
Out Of Band Emission
GFSK_DH5_Channel 0



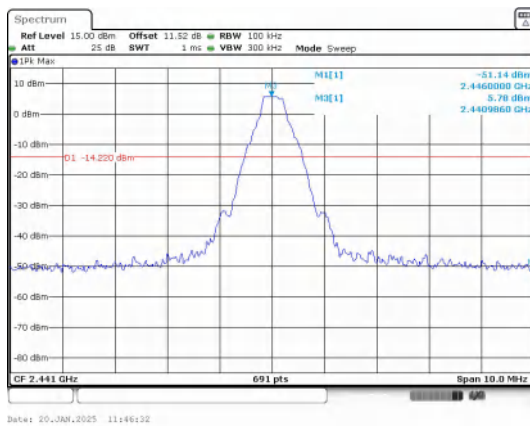
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 0



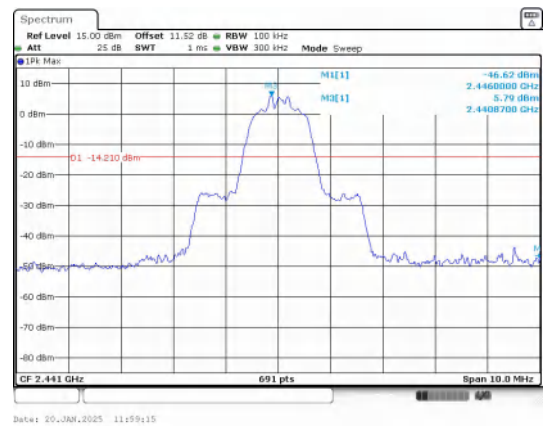
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 0



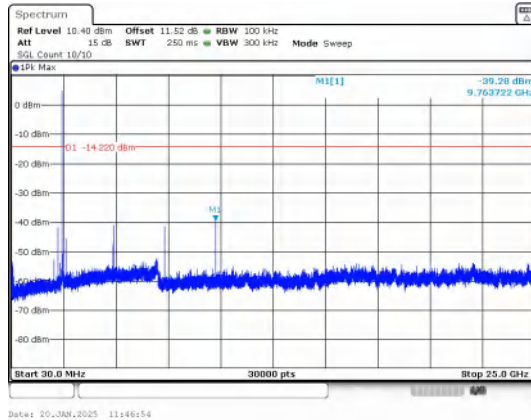
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 0



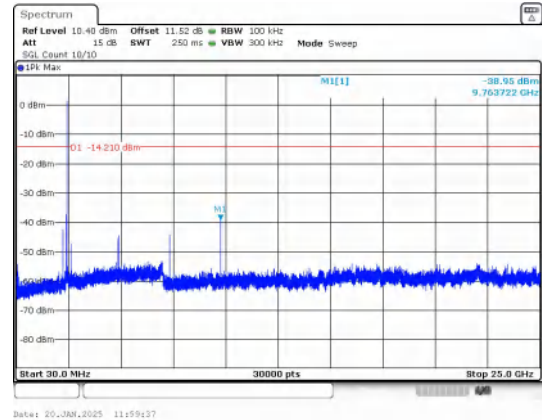
Out Of Band Emission
GFSK_DH5_Channel 39



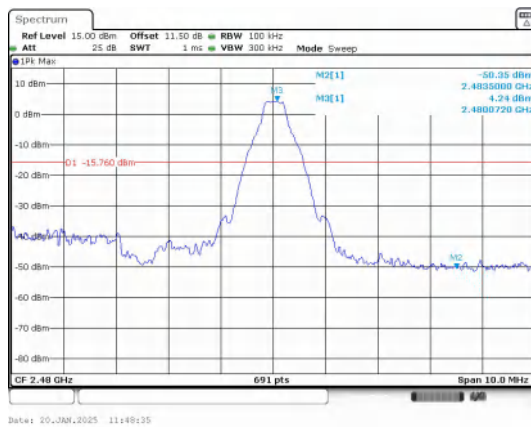
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 39



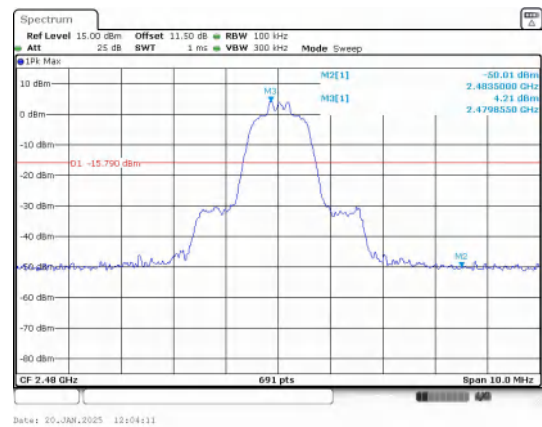
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 39



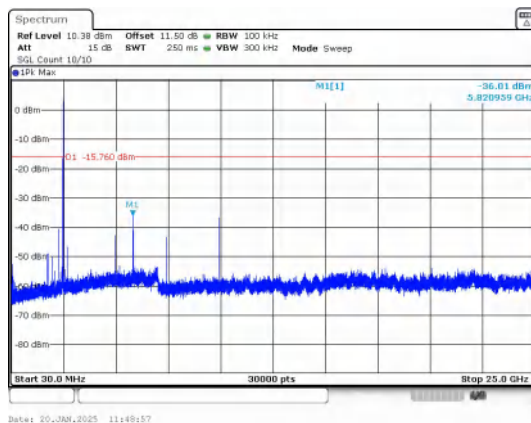
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 39



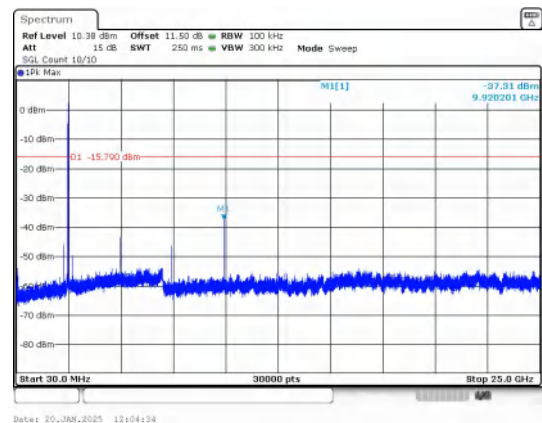
Out Of Band Emission
GFSK_DH5_Channel 78



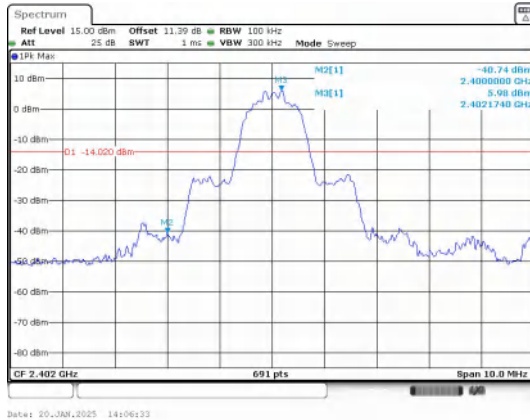
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78



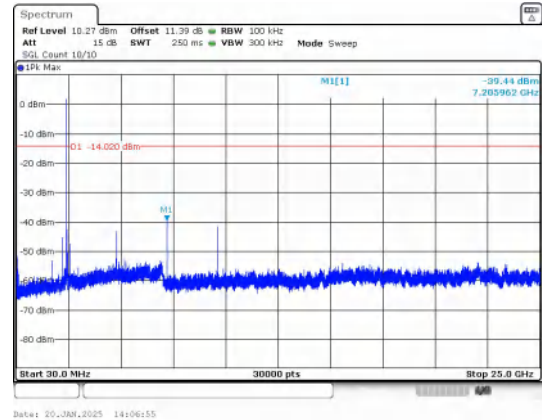
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



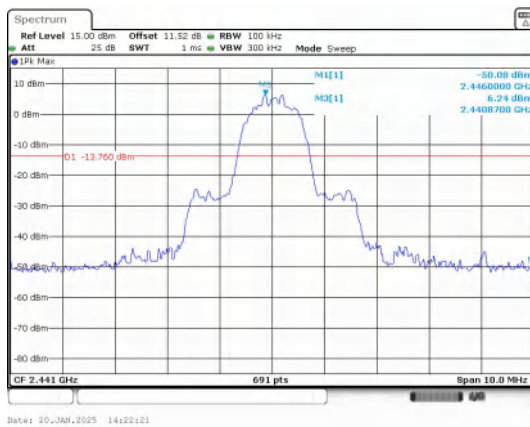
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 78



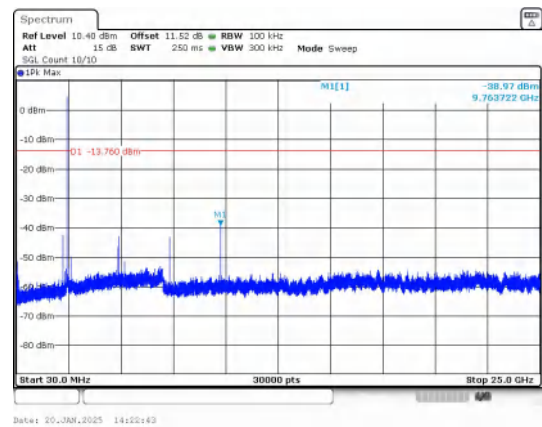
Out Of Band Emission
8DPSK_3-DH5_Channel 0



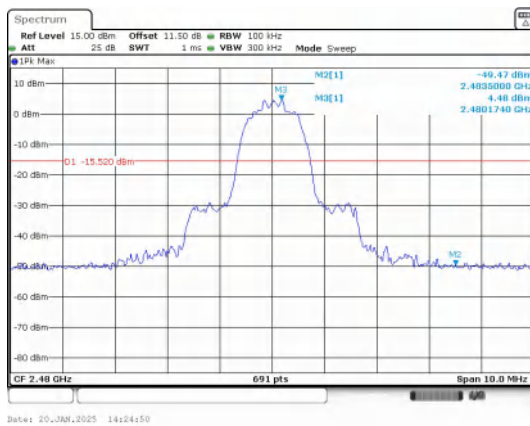
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0



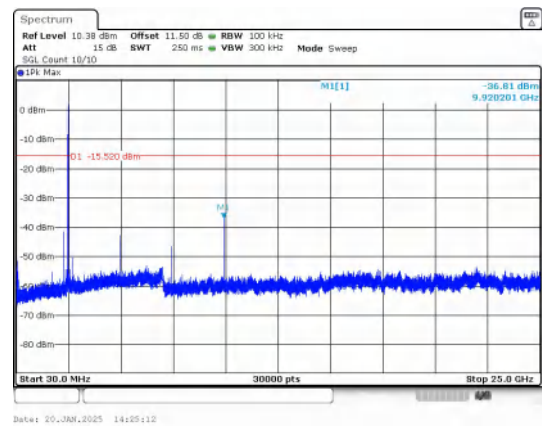
Out Of Band Emission
8DPSK_3-DH5_Channel 39



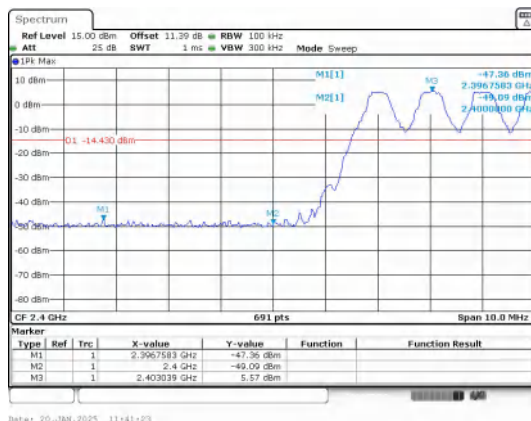
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39



Out Of Band Emission
8DPSK_3-DH5_Channel 78

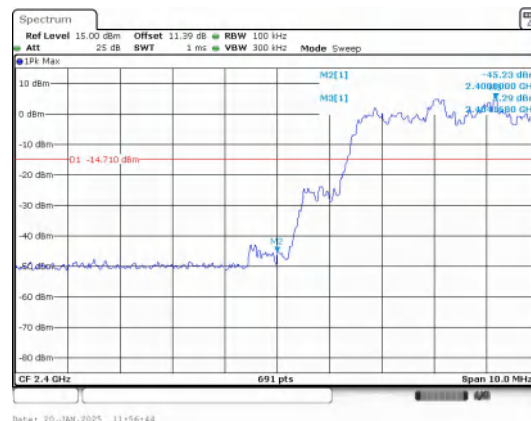


30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78



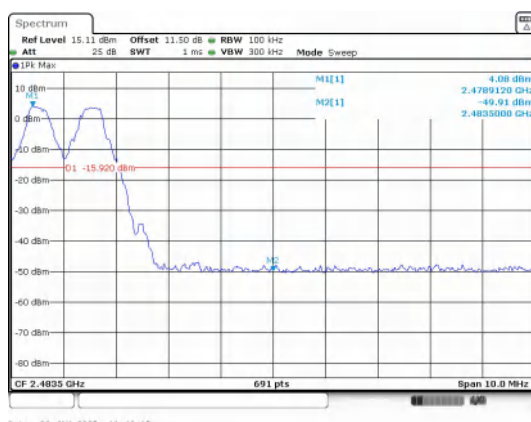
Date: 20-JAN-2025 11:41:23

Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



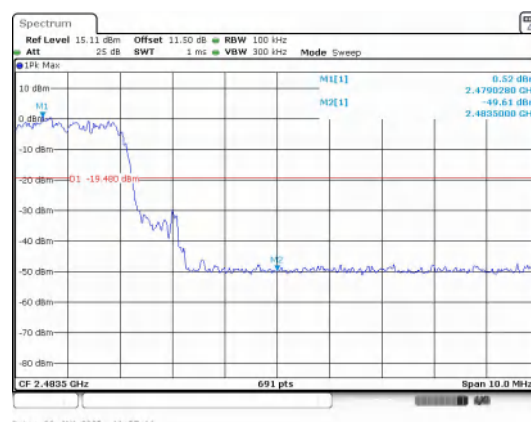
Date: 20-JAN-2025 11:56:44

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



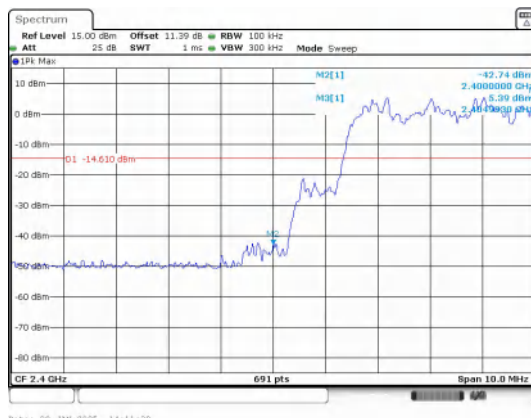
Date: 20-JAN-2025 11:42:15

Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



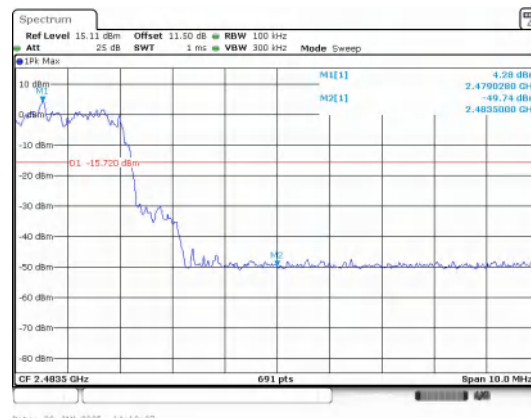
Date: 20-JAN-2025 11:57:11

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



Date: 20-JAN-2025 14:11:29

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



Date: 20-JAN-2025 14:12:07

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

Right:
Non-Hopping

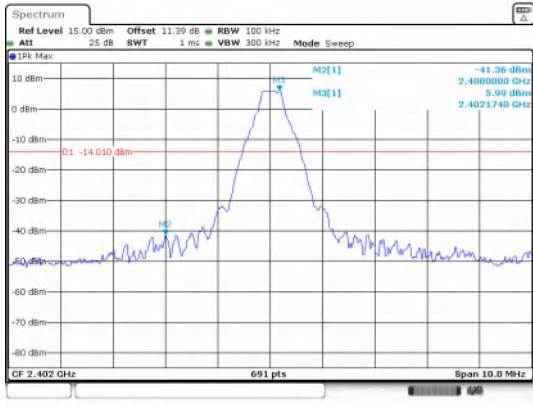
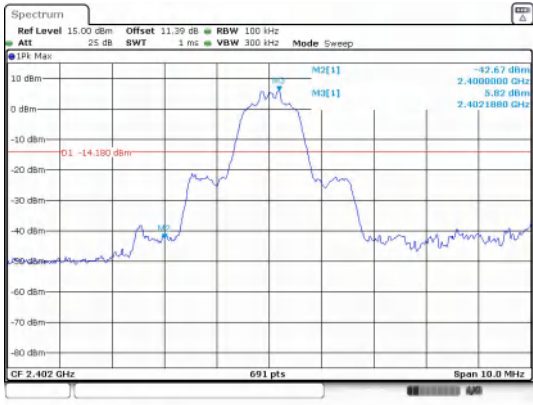
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
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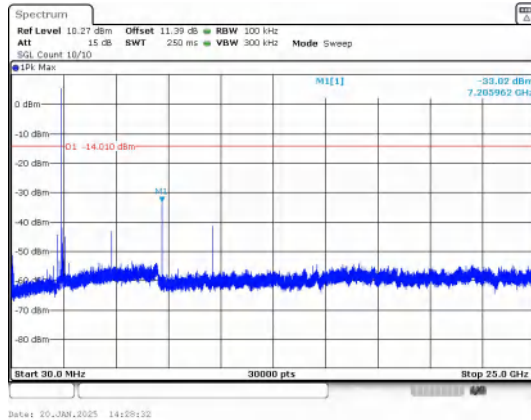
GFSK	DH5	0	2400.00	-41.360	-14.01	-27.350	PASS
			7205.96	-33.023	-14.01	-19.013	PASS
		39	7323.32	-37.935	-13.58	-24.355	PASS
		78	2483.50	-49.860	-15.25	-34.610	PASS
			9920.20	-37.172	-15.25	-21.922	PASS
$\pi/4$ DQPSK	2-DH5	0	2400.00	-42.670	-14.18	-28.490	PASS
			7205.96	-40.003	-14.18	-25.823	PASS
		39	9763.72	-39.214	-13.71	-25.504	PASS
		78	2483.50	-50.720	-15.3	-35.420	PASS
			9920.20	-36.935	-15.3	-21.635	PASS
8DPSK	3-DH5	0	2400.00	-41.800	-14.18	-27.620	PASS
			7205.96	-40.553	-14.18	-26.373	PASS
		39	9763.72	-38.857	-13.64	-25.217	PASS
		78	2483.50	-48.610	-15.35	-33.260	PASS
			9920.20	-37.001	-15.35	-21.651	PASS

Hopping

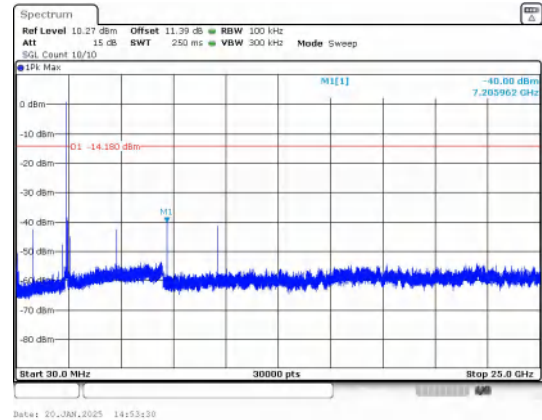
Hopping							
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2400.00	-43.910	-13.99	-29.920	PASS
			2483.50	-50.250	-15.44	-34.810	PASS
$\pi/4$ DQPSK	2-DH5		2400.00	-45.260	-14.08	-31.180	PASS
			2483.50	-49.790	-15.65	-34.140	PASS
8DPSK	3-DH5		2400.00	-41.400	-14.74	-26.660	PASS
			2483.50	-50.160	-16.11	-34.050	PASS

Test Graphs

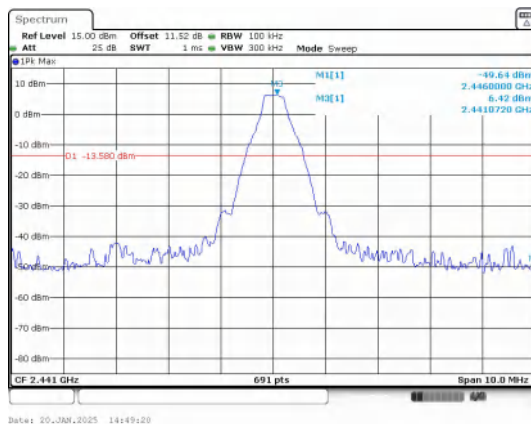
 Ref Level 15.00 dBm Offset 11.39 dB RBW 100 kHz Att 25 dB SWF 1 ms VBW 300 kHz Mode Sweep 10 dBm Max 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm CF 2.402 GHz 691 pts Span 10.0 MHz Date: 20-JAN-2025 14:28:10	 Ref Level 15.00 dBm Offset 11.39 dB RBW 100 kHz Att 25 dB SWF 1 ms VBW 300 kHz Mode Sweep 10 dBm Max 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm -80 dBm CF 2.402 GHz 691 pts Span 10.0 MHz Date: 20-JAN-2025 14:53:08
Out Of Band Emission GFSK_DH5_Channel 0	Out Of Band Emission $\pi/4$DQPSK_2-DH5_Channel 0



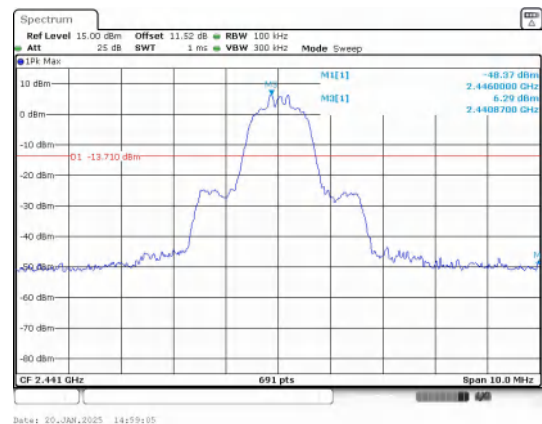
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 0



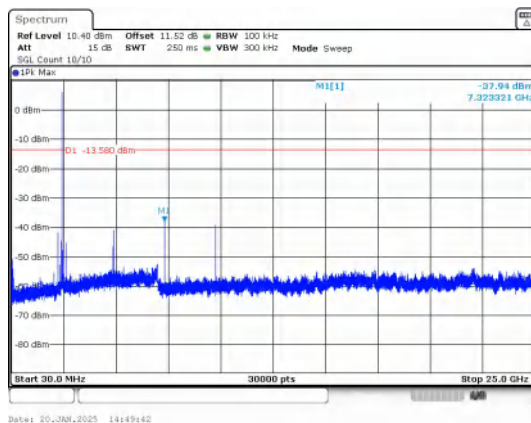
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 0



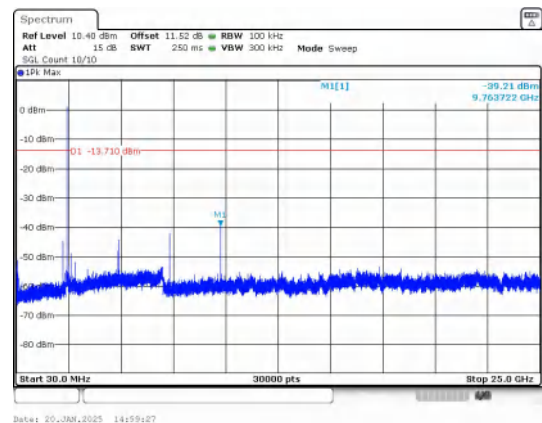
Out Of Band Emission
GFSK_DH5_Channel 39



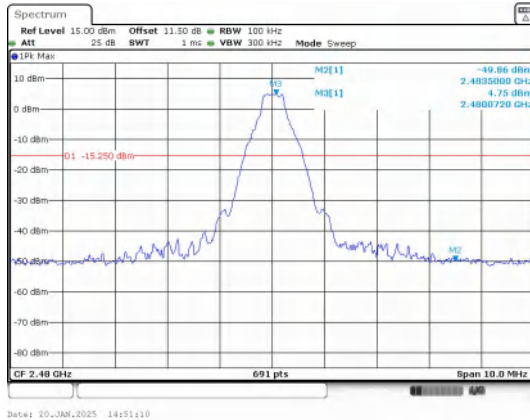
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 39



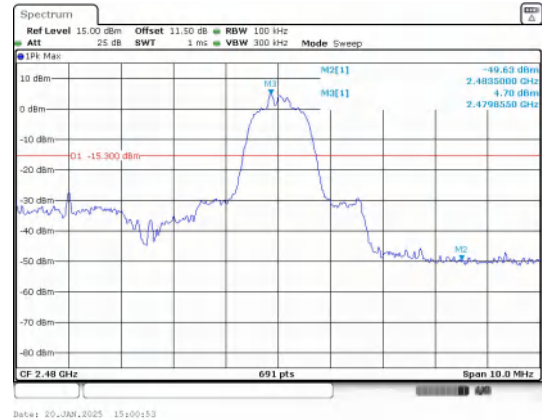
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 39



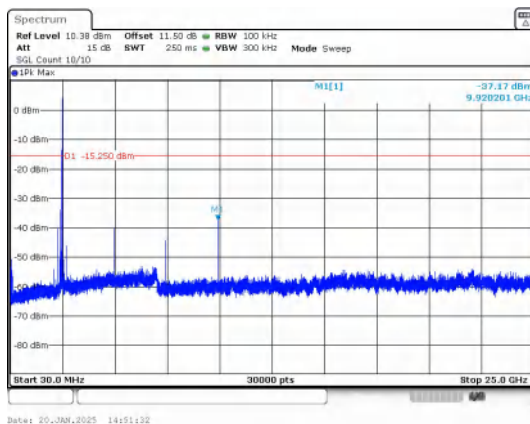
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 39



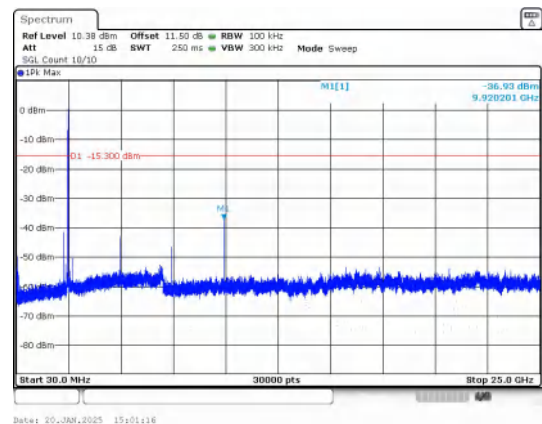
Out Of Band Emission
GFSK_DH5_Channel 78



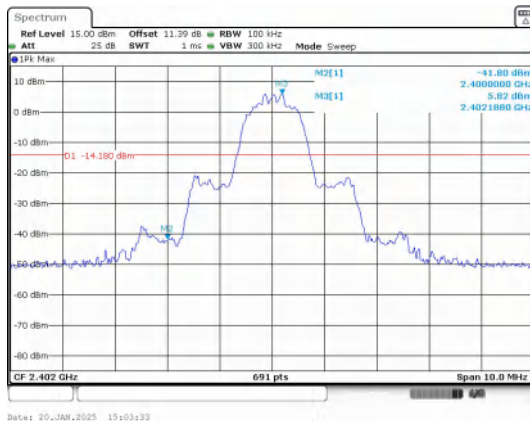
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78



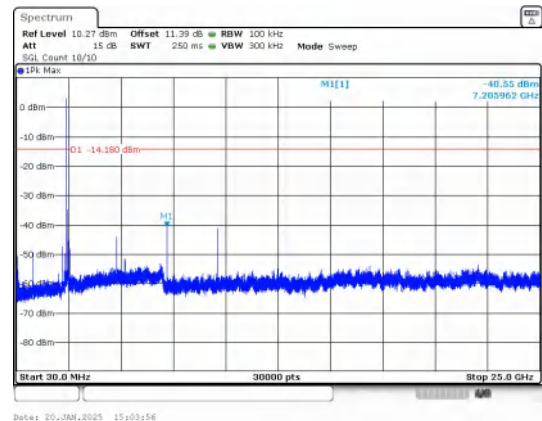
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



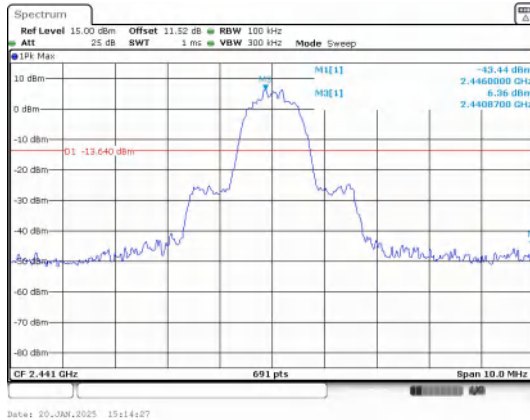
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 78



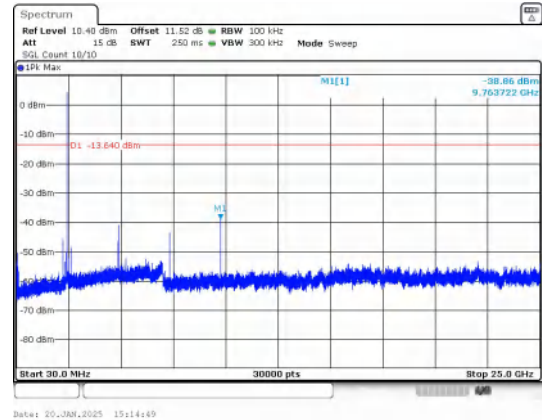
Out Of Band Emission
8DPSK_3-DH5_Channel 0



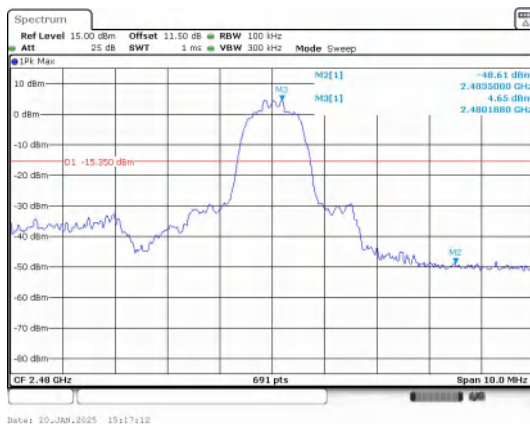
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0



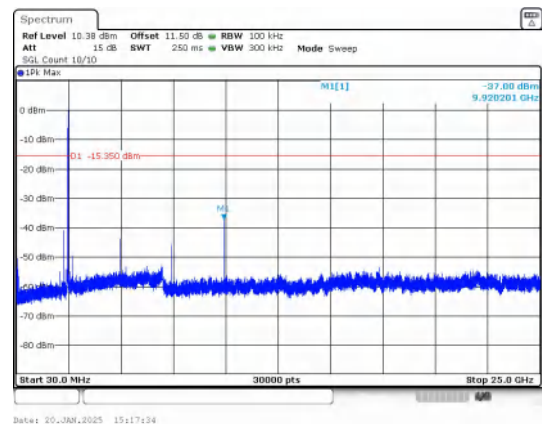
Out Of Band Emission
8DPSK_3-DH5_Channel 39



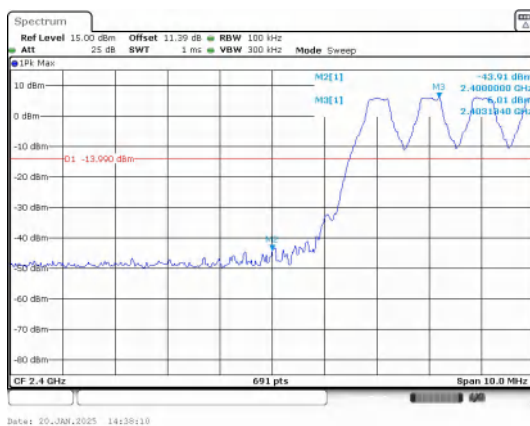
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39



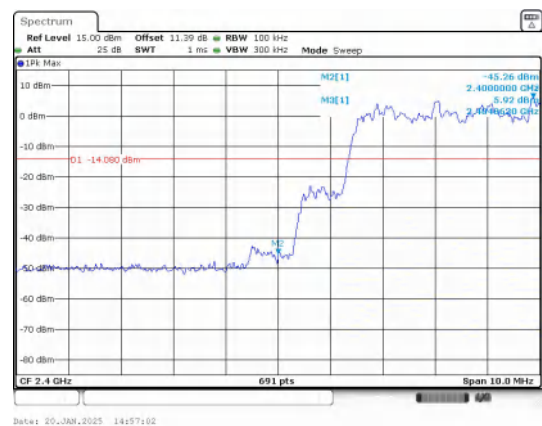
Out Of Band Emission
8DPSK_3-DH5_Channel 78



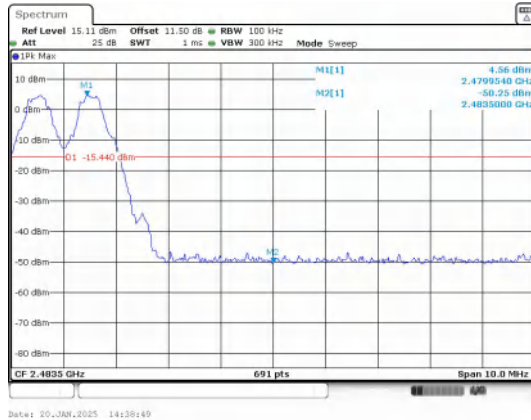
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78



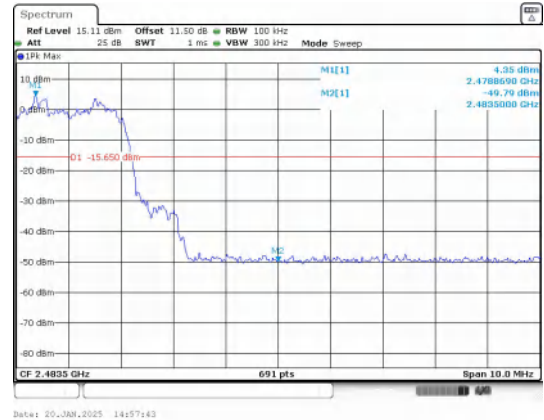
Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



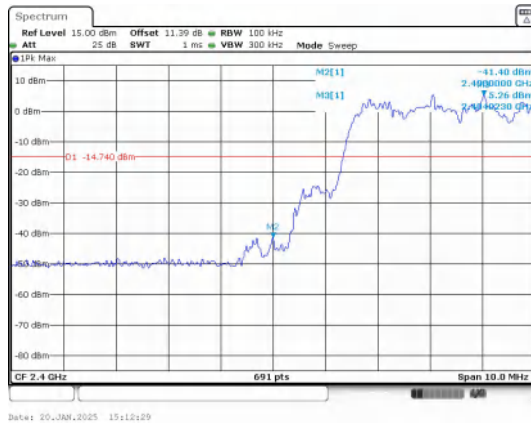
Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping



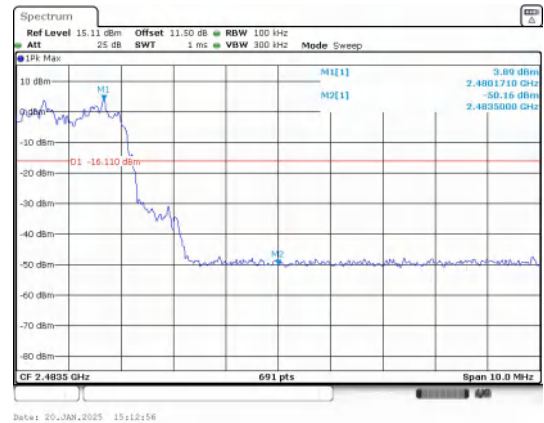
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



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

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