

Appendix Report

Report No.:	CISRR241220172
Test Engineer:	Lucas Huang
Supervised by:	Rory Huang

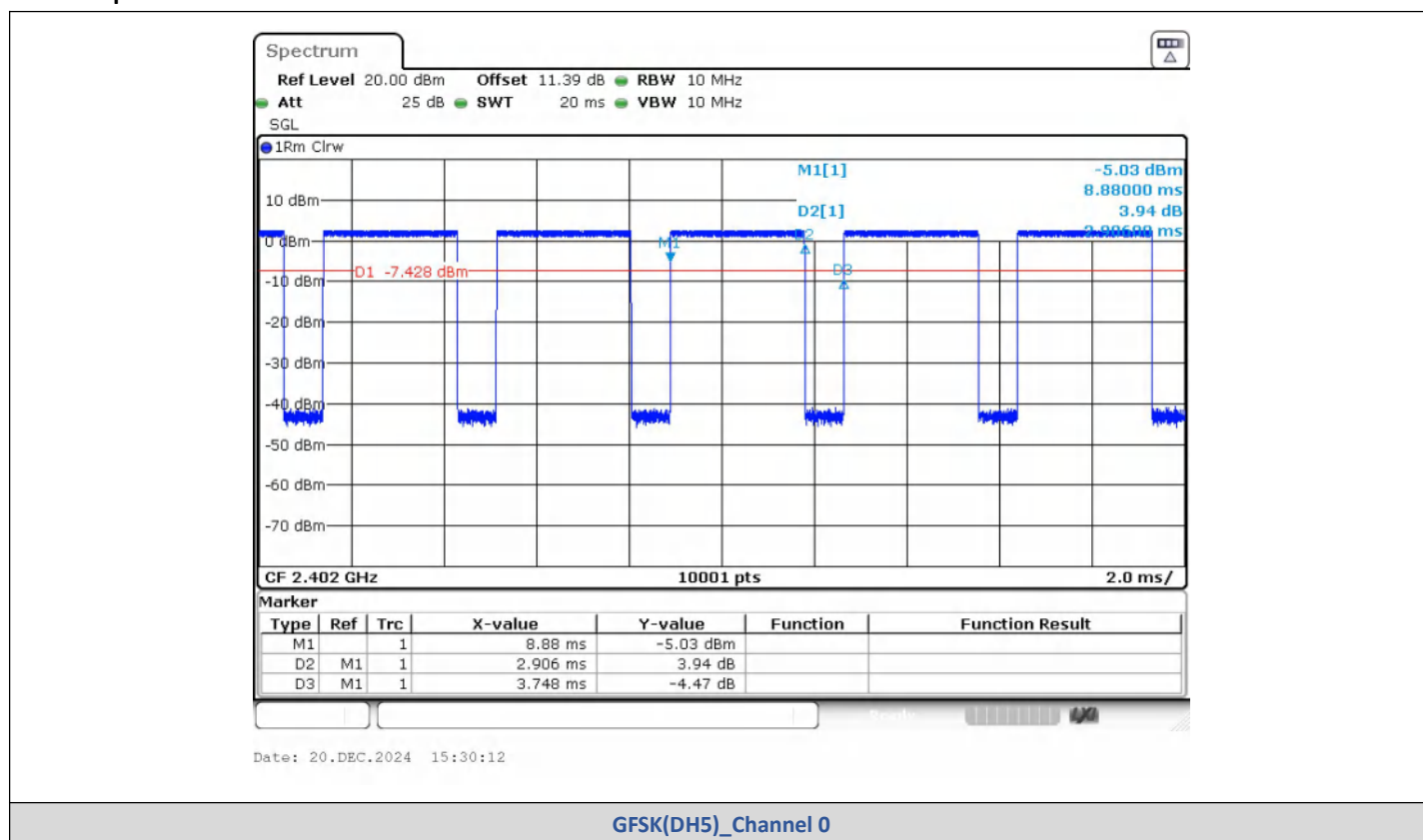
1) Duty Cycle

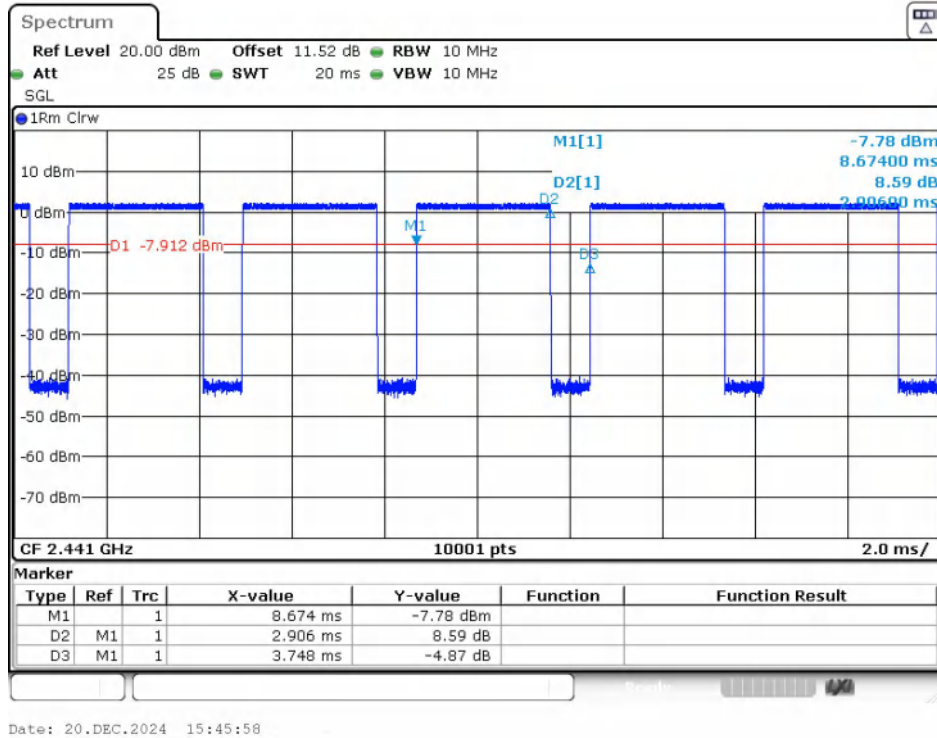
Test Result

Left:

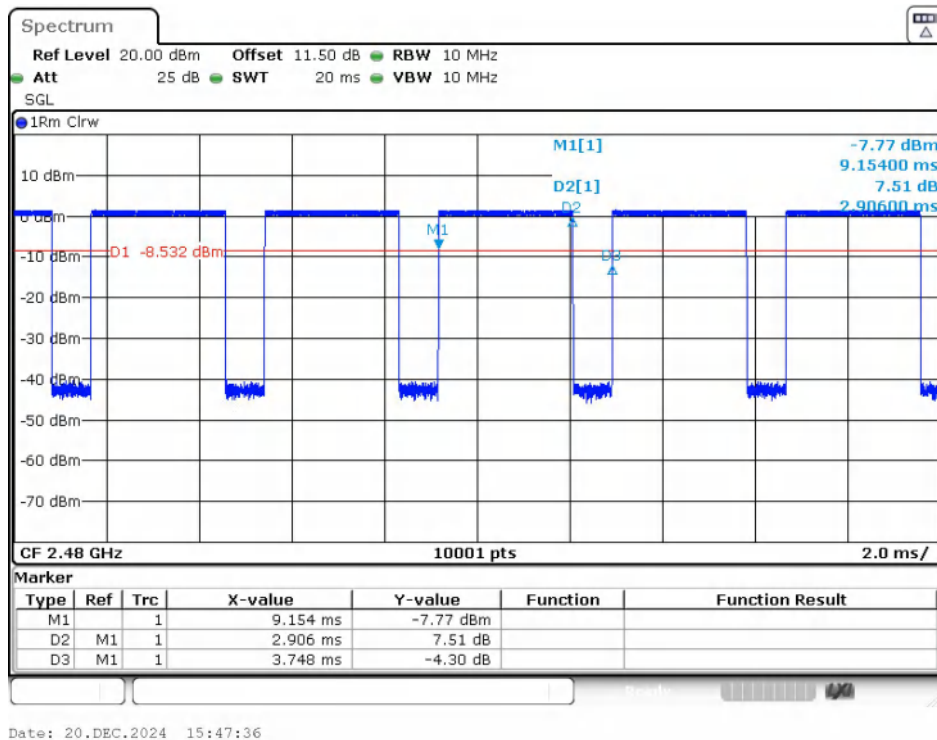
Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.906	3.748	77.53	0.7753	1.1053	0.3441
		39	2.906	3.748	77.53	0.7753	1.1053	0.3441
		78	2.906	3.748	77.53	0.7753	1.1053	0.3441
$\pi/4$ DQPSK	2-DH5	0	2.912	3.748	77.69	0.7769	1.0963	0.3434
		39	2.912	3.748	77.69	0.7769	1.0963	0.3434
		78	2.912	3.748	77.69	0.7769	1.0963	0.3434
8DPSK	3-DH5	0	2.914	3.748	77.75	0.7775	1.093	0.3432
		39	2.914	3.748	77.75	0.7775	1.093	0.3432
		78	2.916	3.748	77.80	0.7780	1.0902	0.3429

Test Graphs

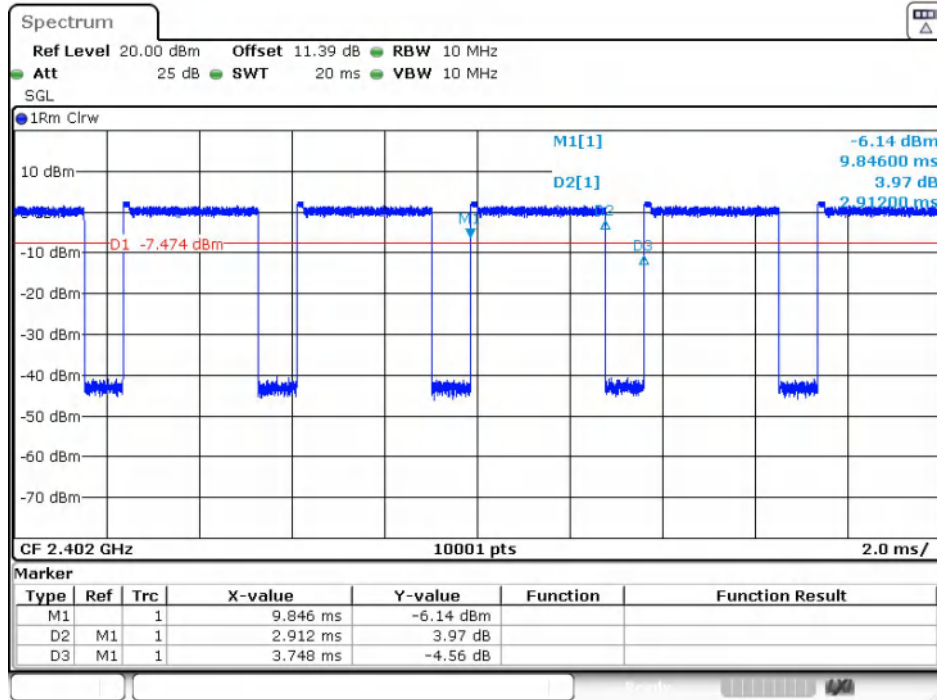




GFSK(DH5)_Channel 39

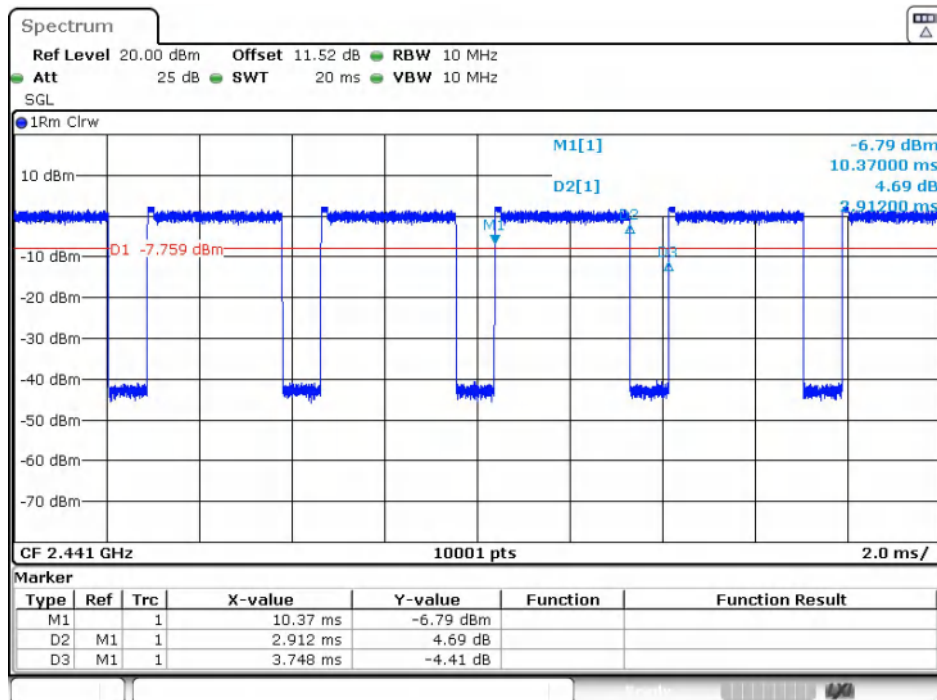


GFSK(DH5)_Channel 78



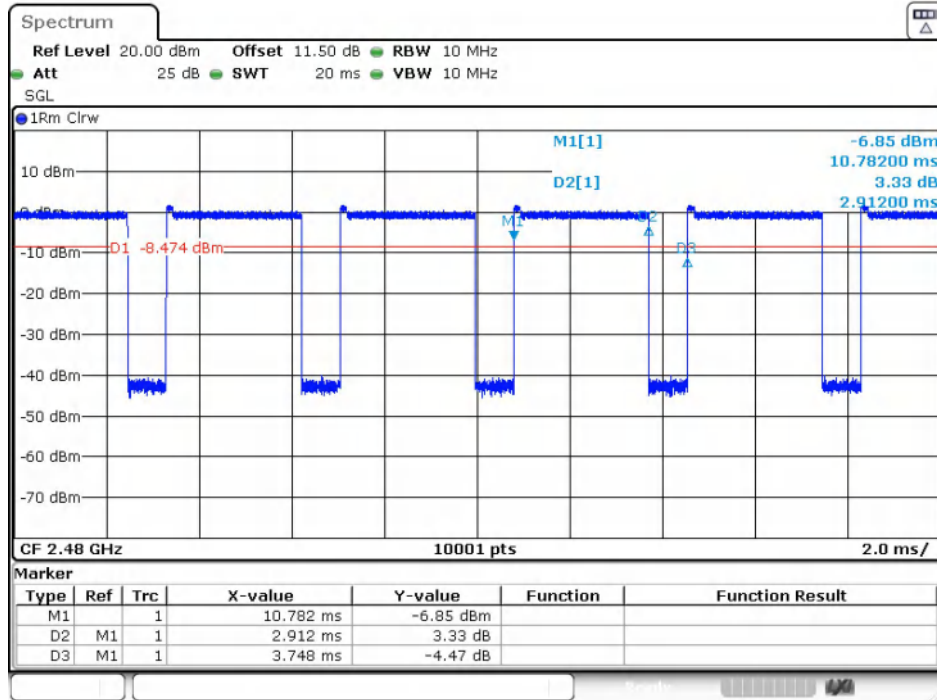
Date: 20,DEC,2024 15:52:15

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



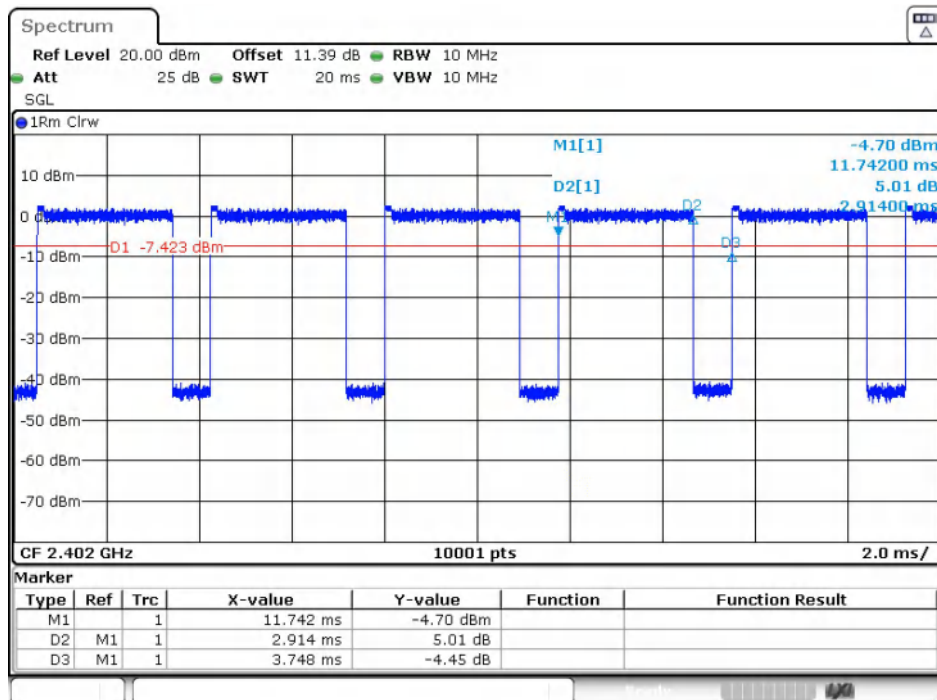
Date: 20,DEC,2024 16:08:26

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



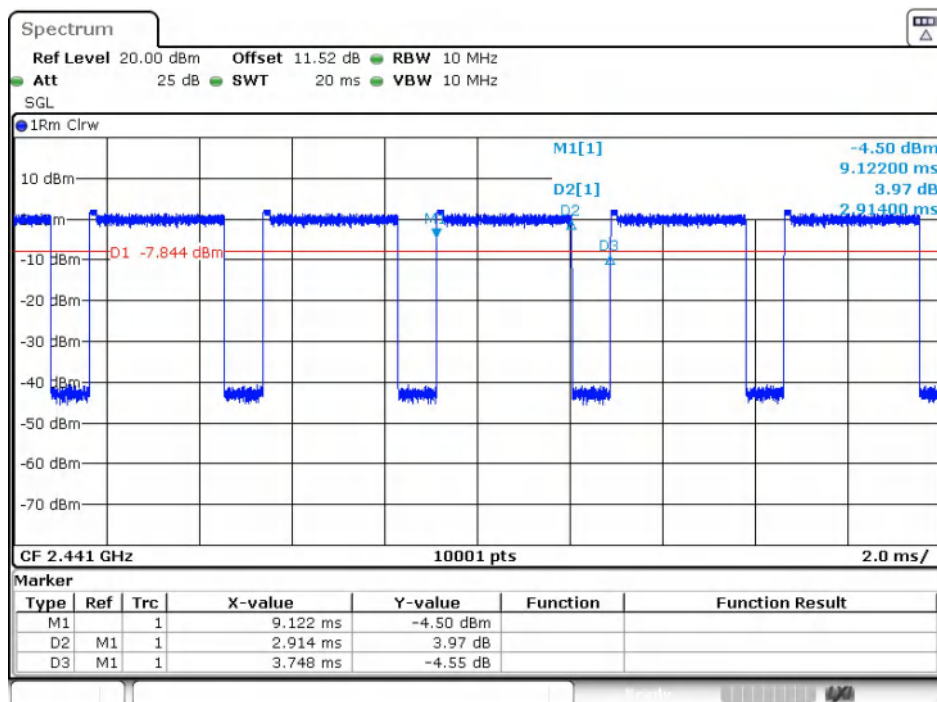
Date: 20, DEC, 2024 16:29:23

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



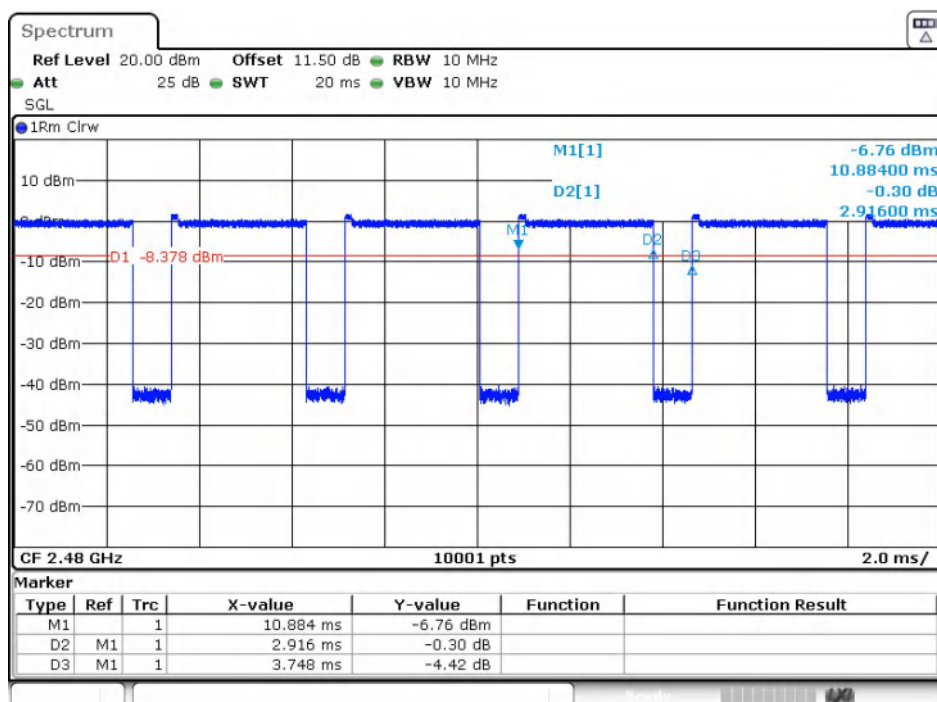
Date: 20, DEC, 2024 16:31:24

8DPSK(3-DH5)_Channel 0



Date: 20,DEC,2024 16:47:16

8DPSK(3-DH5)_Channel 39



Date: 20,DEC,2024 16:50:58

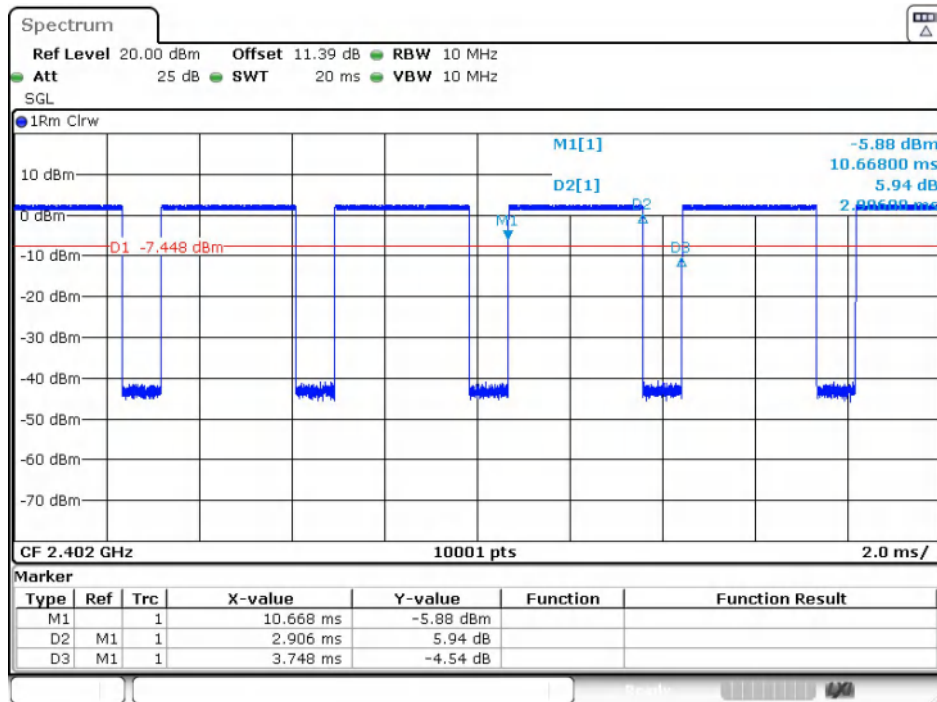
8DPSK(3-DH5)_Channel 78

Right:

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.906	3.748	77.53	0.7753	1.1053	0.3441
		39	2.906	3.748	77.53	0.7753	1.1053	0.3441

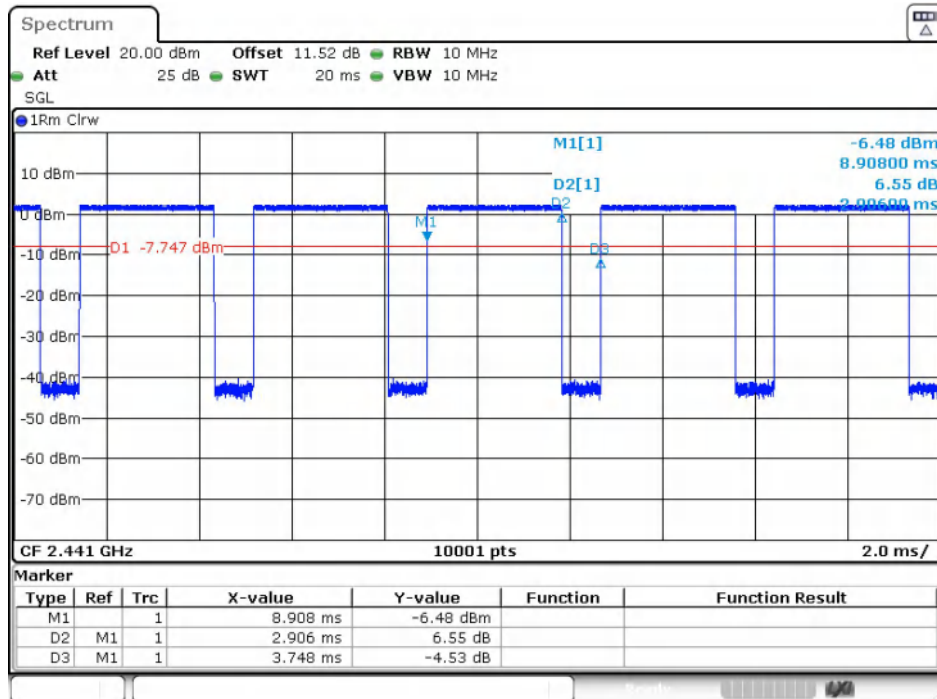
		78	2.906	3.748	77.53	0.7753	1.1053	0.3441
$\pi/4$ DQPSK	2-DH5	0	2.912	3.748	77.69	0.7769	1.0963	0.3434
		39	2.912	3.748	77.69	0.7769	1.0963	0.3434
		78	2.912	3.748	77.69	0.7769	1.0963	0.3434
8DPSK	3-DH5	0	2.914	3.748	77.75	0.7775	1.093	0.3432
		39	2.914	3.748	77.75	0.7775	1.093	0.3432
		78	2.916	3.748	77.80	0.7780	1.0902	0.3429

Test Graphs



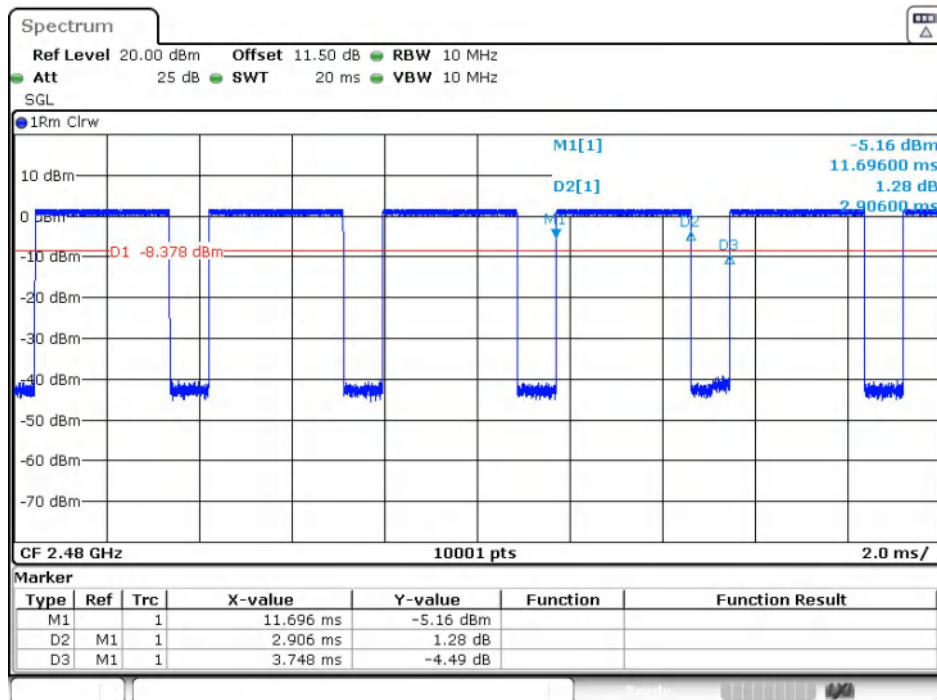
Date: 20, DEC, 2024 17:03:06

GFSK(DH5)_Channel 0



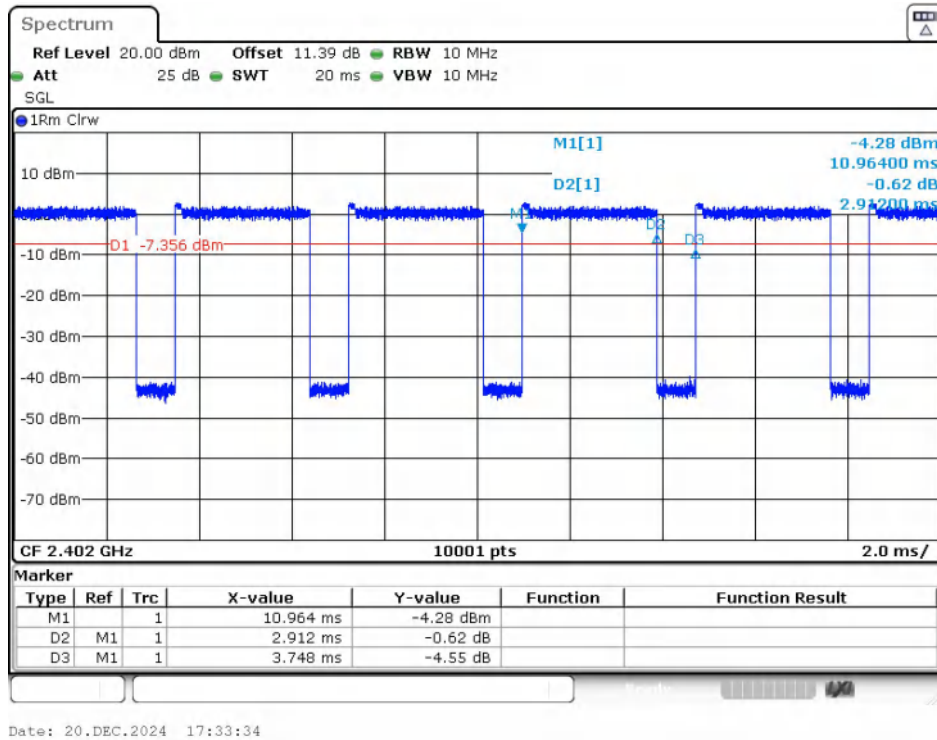
Date: 20,DEC,2024 17:29:52

GFSK(DH5)_Channel 39

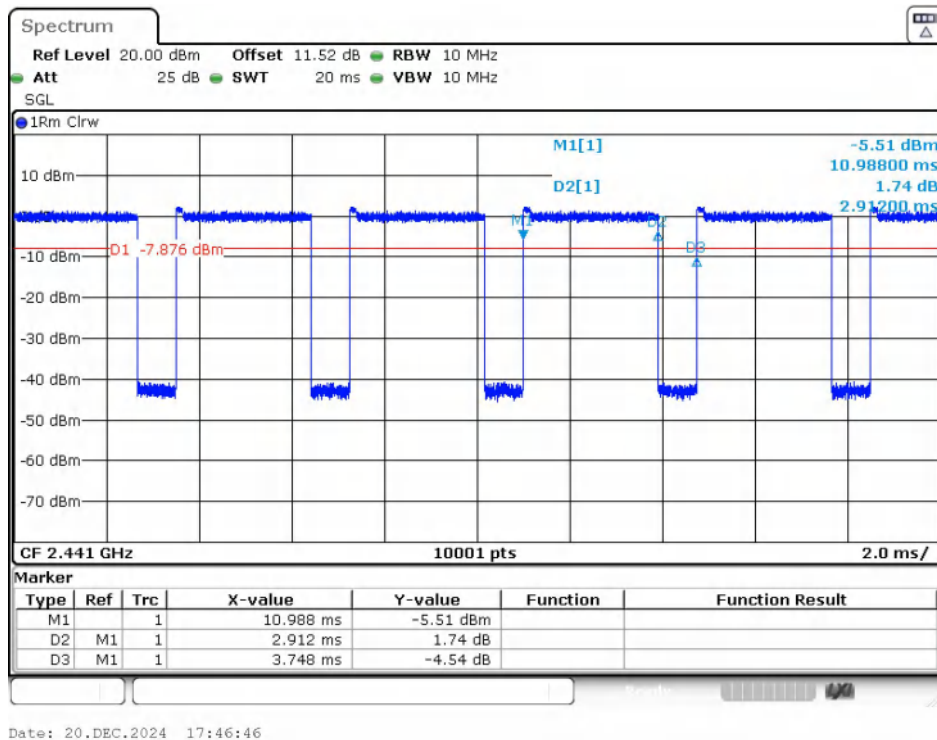


Date: 20,DEC,2024 17:31:48

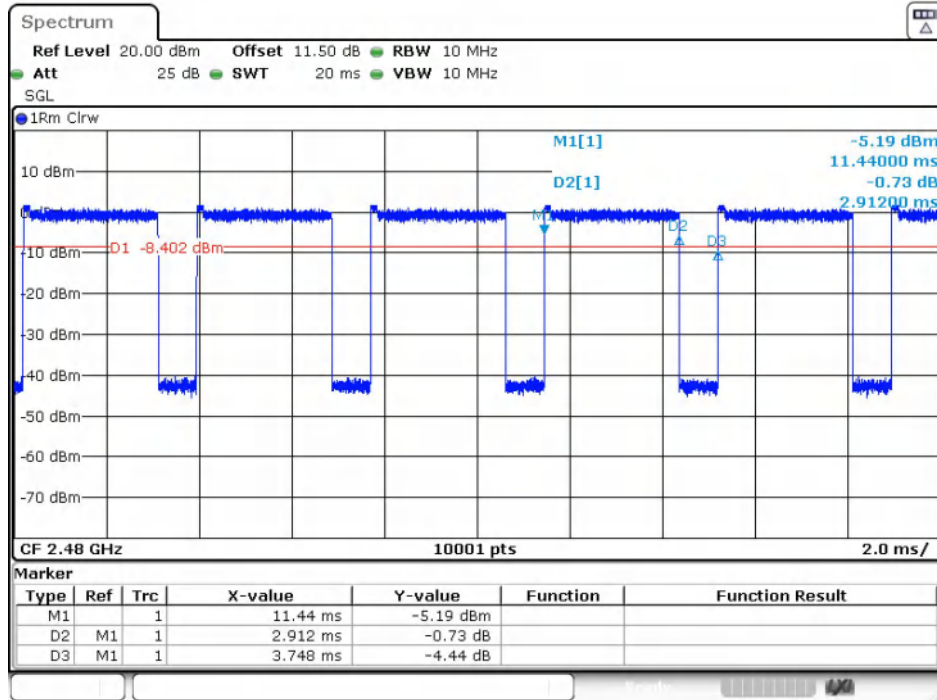
GFSK(DH5)_Channel 78



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

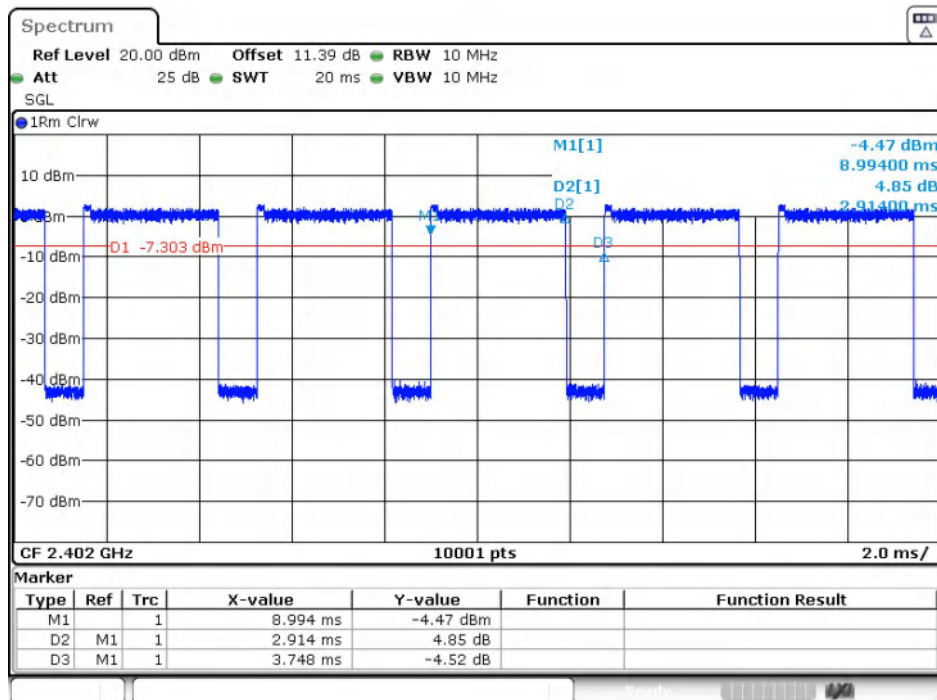


$\pi/4$ DQPSK(2-DH5)_Channel 39



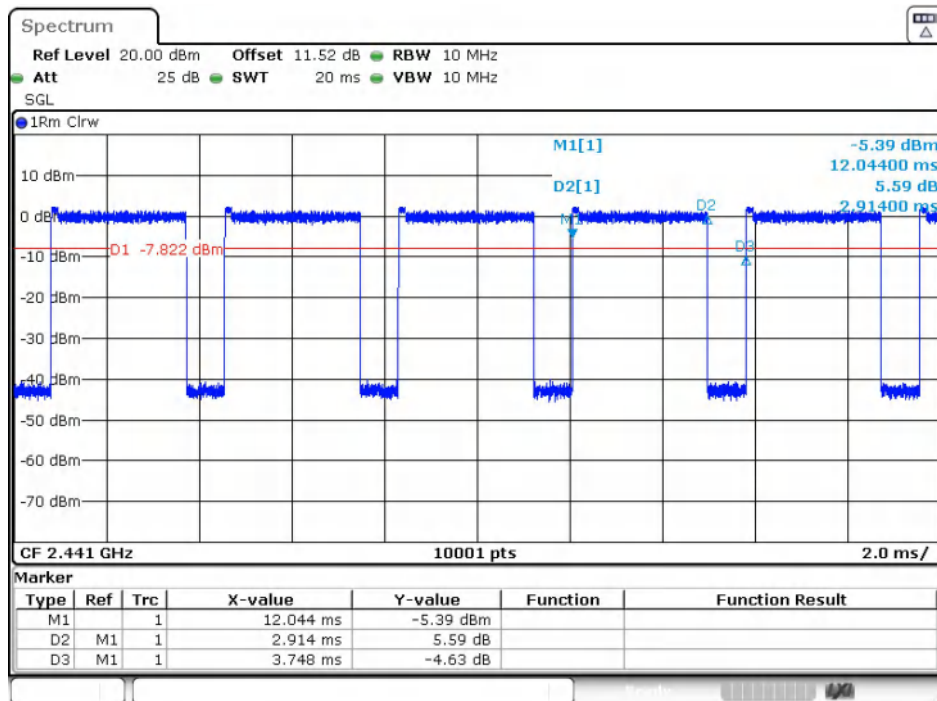
Date: 20,DEC,2024 17:48:30

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



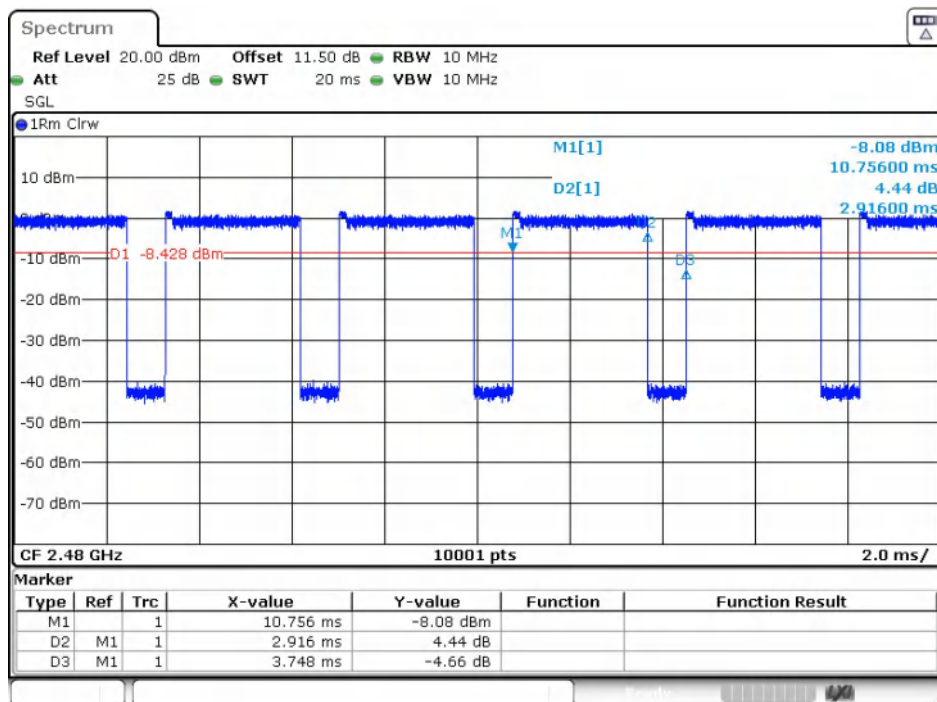
Date: 20,DEC,2024 17:50:32

8DPSK(3-DH5)_Channel 0



Date: 20,DEC,2024 18:04:06

8DPSK(3-DH5)_Channel 39



Date: 20,DEC,2024 18:05:47

8DPSK(3-DH5)_Channel 78

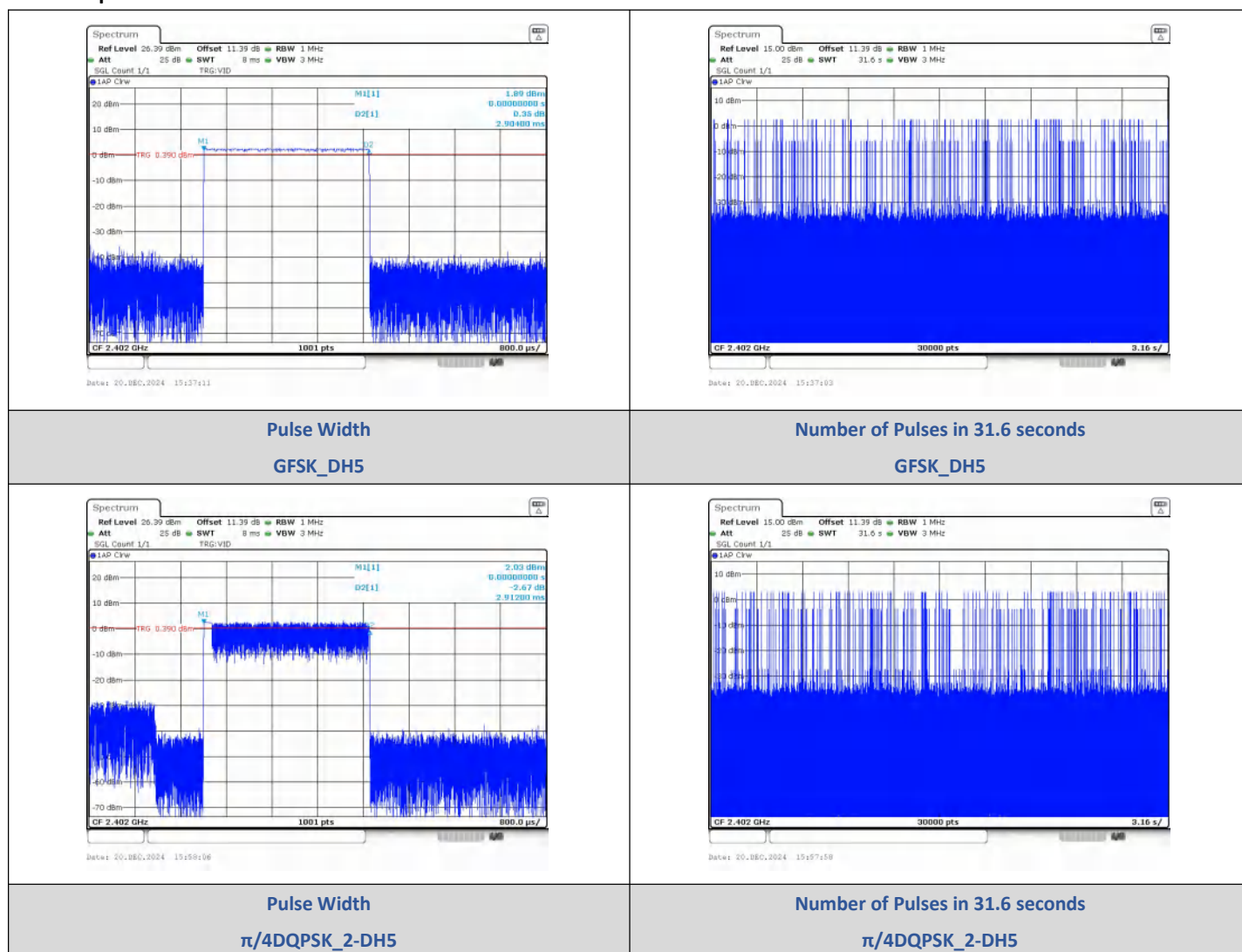
2) Dwell Time

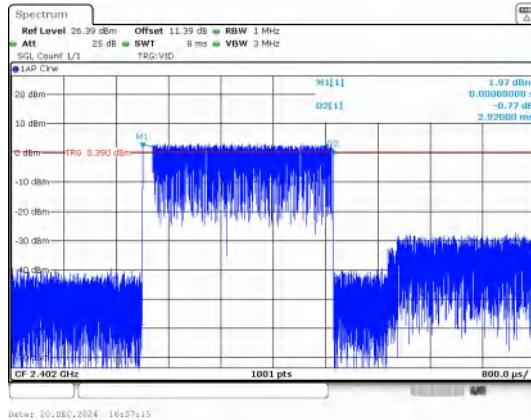
Test Result

Left:

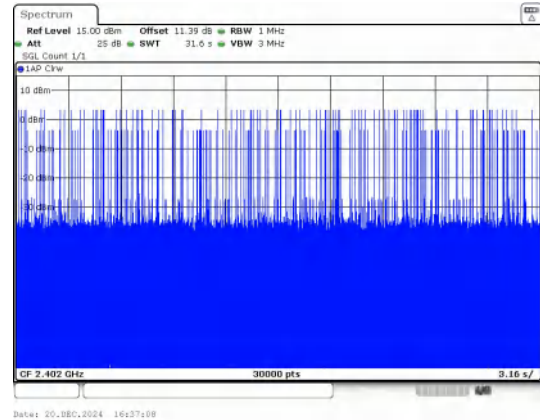
Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.904	99	287.5	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.912	117	340.7		PASS
8DPSK	3-DH5		2.920	100	292.0		PASS

Test Graphs





Pulse Width
8DPSK_3-DH5

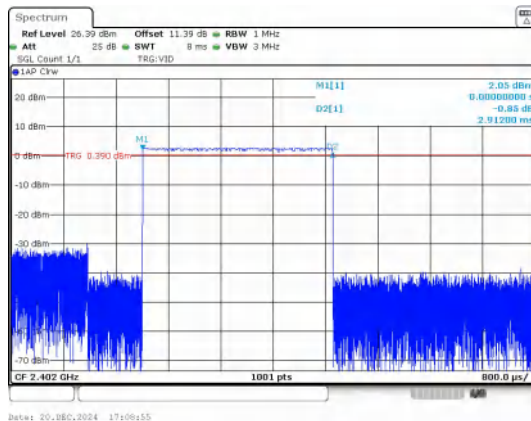


Number of Pulses in 31.6 seconds
8DPSK_3-DH5

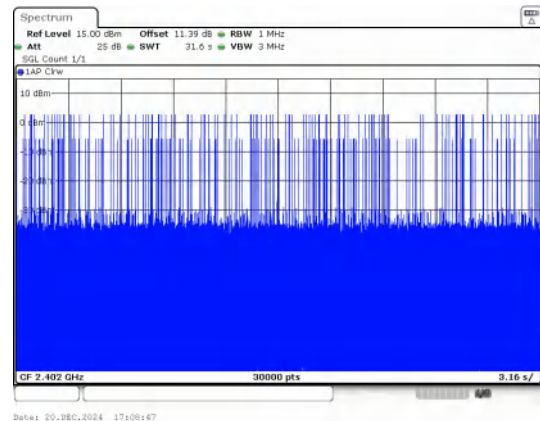
Right:

Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.912	102	297.02	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.912	111	323.23		PASS
8DPSK	3-DH5		2.912	100	291.2		PASS

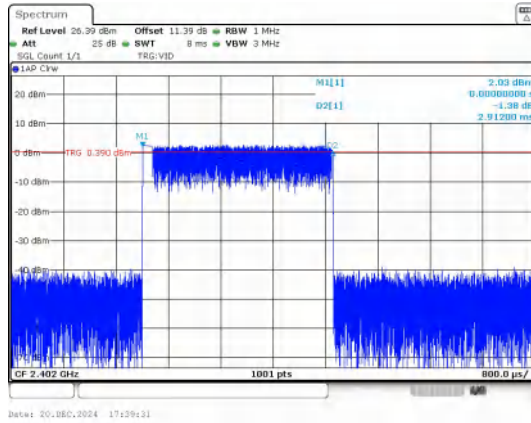
Test Graphs



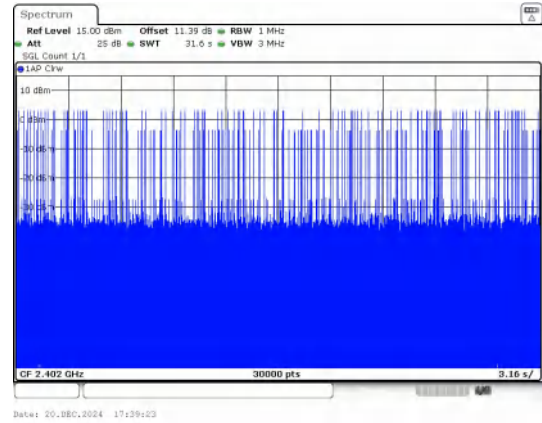
Pulse Width
GFSK_DH5



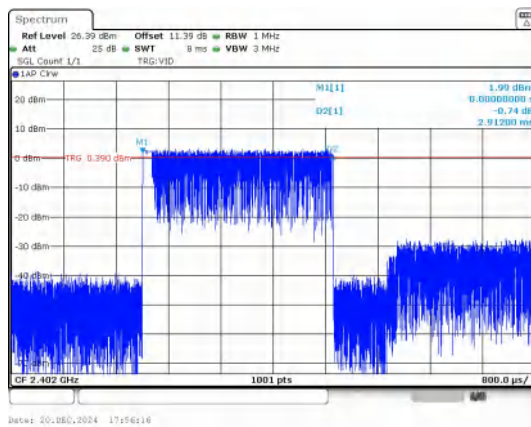
Number of Pulses in 31.6 seconds
GFSK_DH5



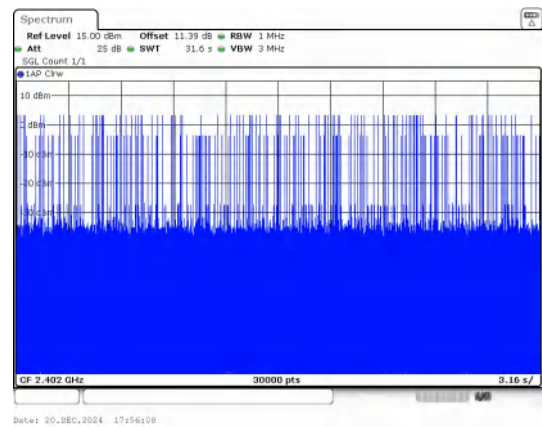
Pulse Width
 $\pi/4$ DQPSK_2-DH5



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

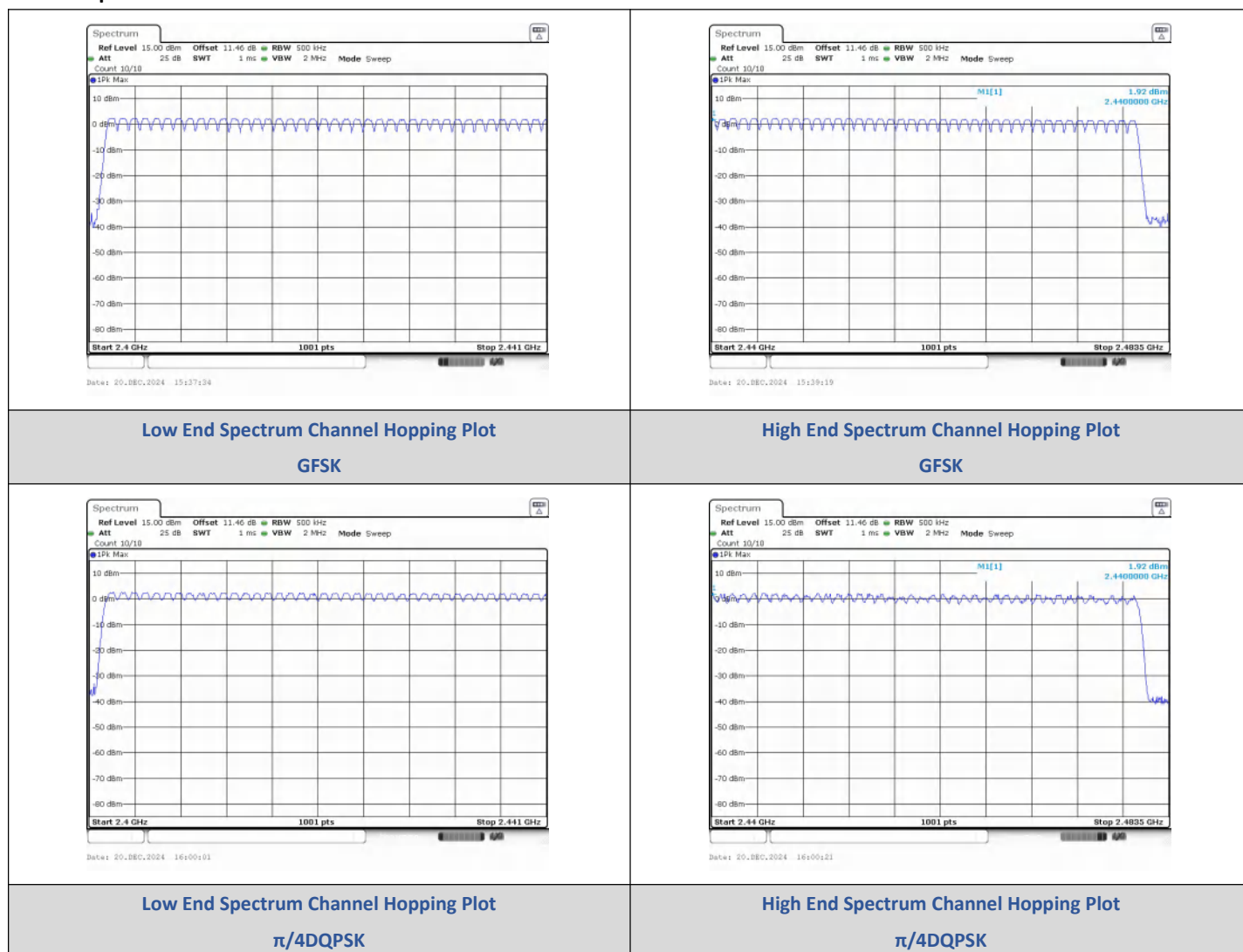
3) Number Of Hopping Channel

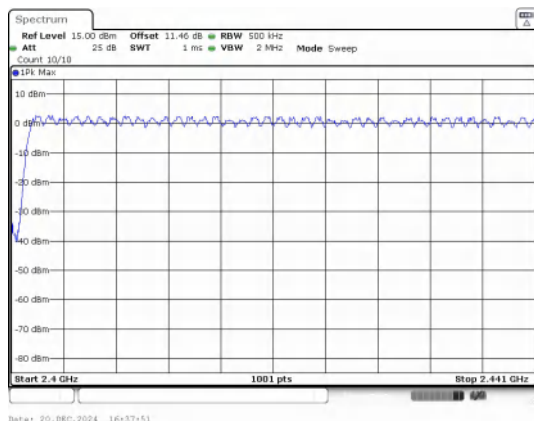
Test Result

Left:

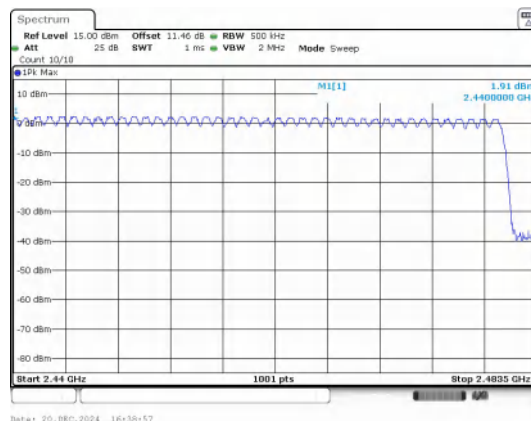
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
$\pi/4$ DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

Test Graphs





Low End Spectrum Channel Hopping Plot
8DPSK

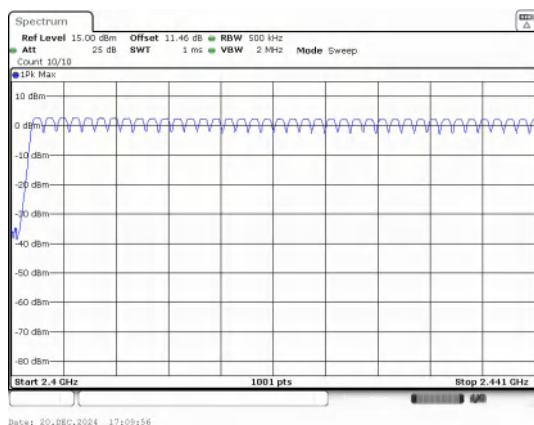


High End Spectrum Channel Hopping Plot
8DPSK

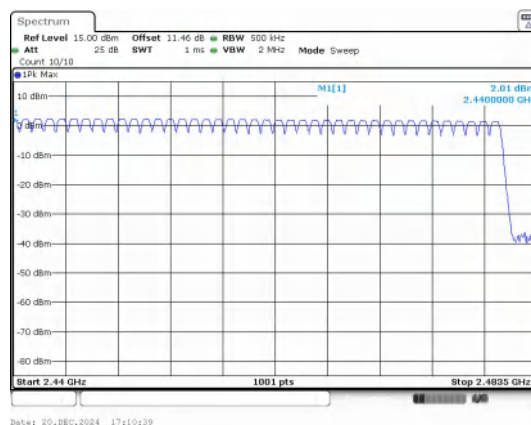
Right:

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

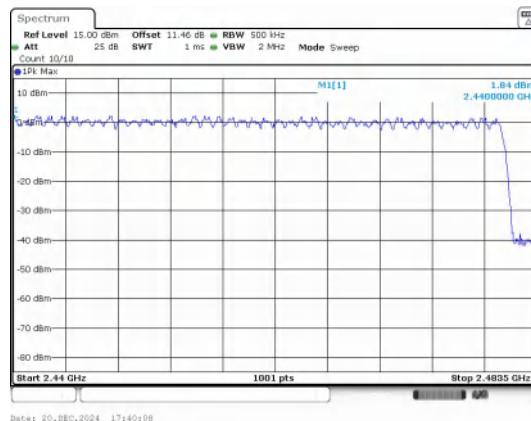
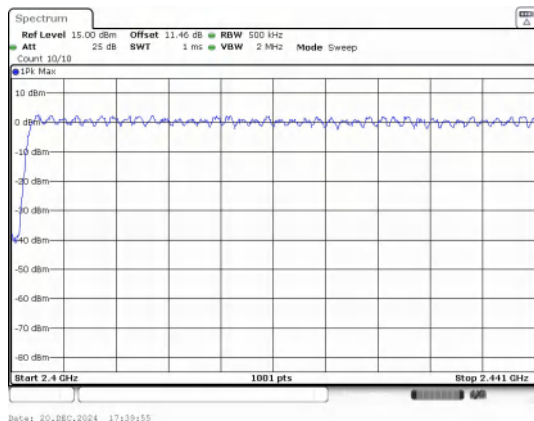
Test Graphs

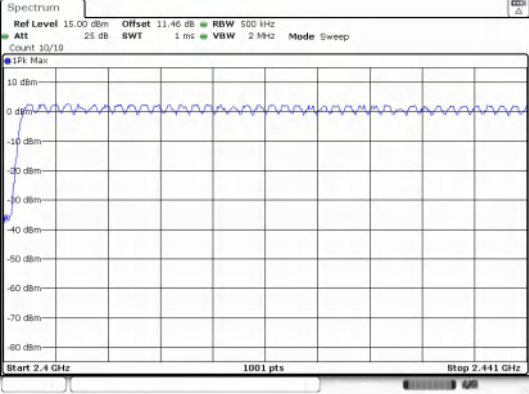
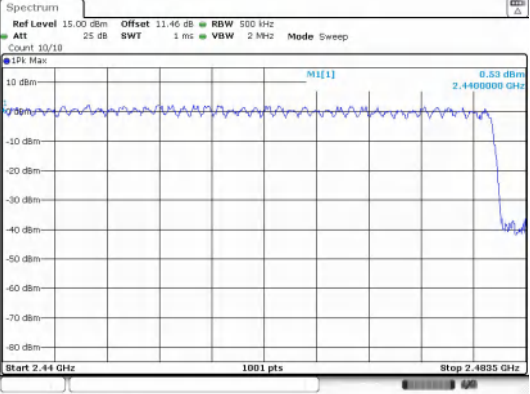


Low End Spectrum Channel Hopping Plot
GFSK



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.DEC.2024 17:57:13	 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 2.44 GHz 1001 pts Stop 2.4835 GHz Date: 20.DEC.2024 17:57:27
Low End Spectrum Channel Hopping Plot 8DPSK	High End Spectrum Channel Hopping Plot 8DPSK

4) Conducted Peak Output Power

Test Result

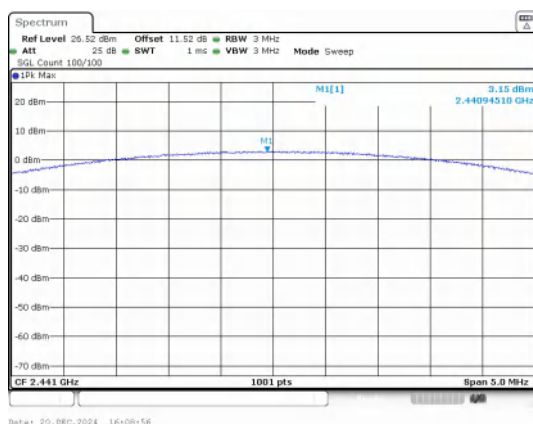
Left:

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	2.73	1.87	≤30	PASS
		39	2.25	1.68		PASS
		78	1.64	1.46		PASS
$\pi/4$ DQPSK	2-DH5	0	3.55	2.26	≤20.97	PASS
		39	3.15	2.07		PASS
		78	2.42	1.75		PASS
8DPSK	3-DH5	0	3.66	2.32		PASS
		39	3.29	2.13		PASS
		78	2.69	1.86		PASS

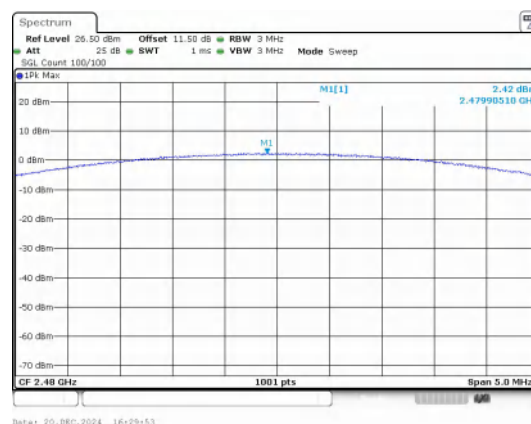
Test Graphs



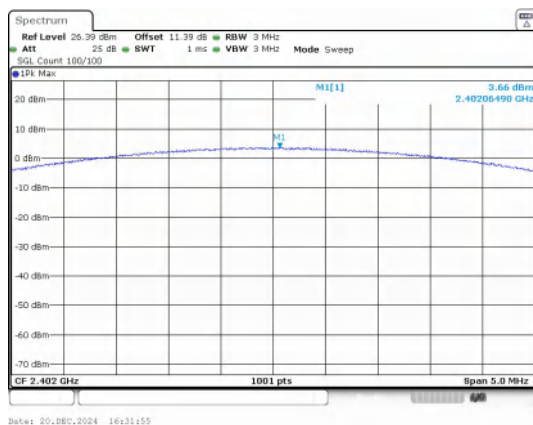
GFSK_Channel 78



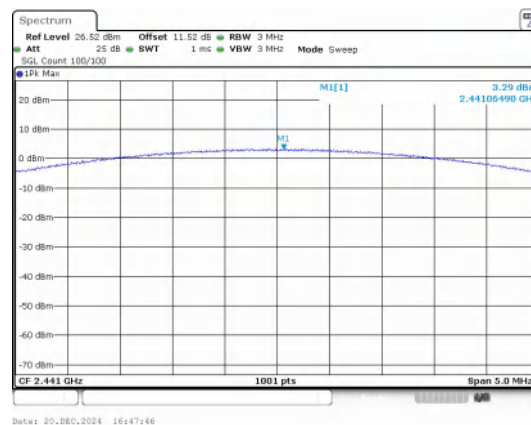
$\pi/4$ DQPSK_Channel 0



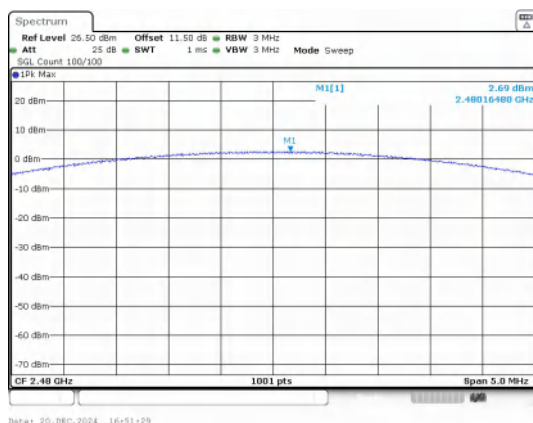
Peak Output Power
 $\pi/4$ DQPSK_Channel 39



Peak Output Power
 $\pi/4$ DQPSK_Channel 78



Peak Output Power
8DPSK_Channel 0



Peak Output Power
8DPSK_Channel 39

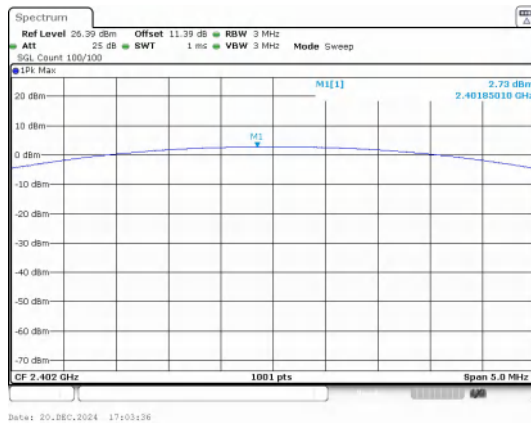
Peak Output Power
8DPSK_Channel 78

Right:

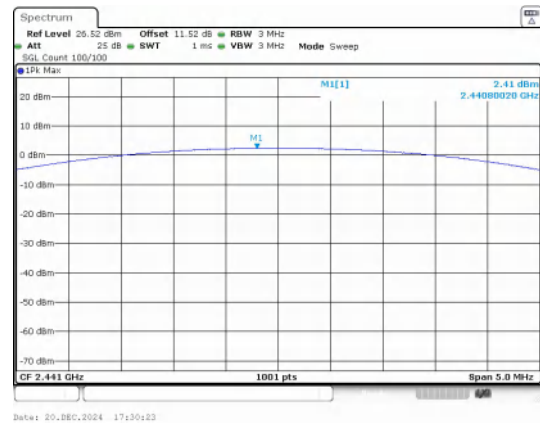
Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	2.73	1.87	≤30	PASS

		39	2.41	1.74		PASS
		78	1.80	1.51		PASS
		0	3.53	2.25		PASS
$\pi/4$ DQPSK	2-DH5	39	3.04	2.01	≤ 20.97	PASS
		78	2.53	1.79		PASS
		0	3.76	2.38		PASS
8DPSK	3-DH5	39	3.20	2.09		PASS
		78	2.64	1.84		PASS
						PASS

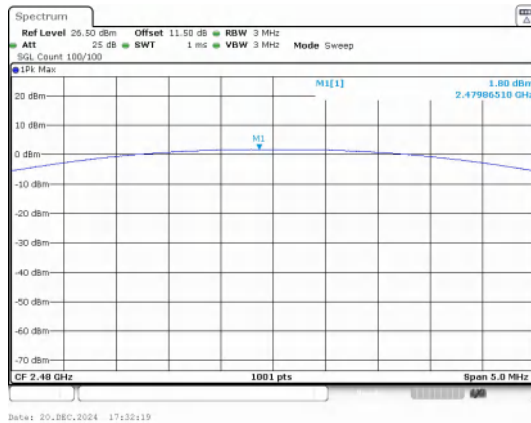
Test Graphs



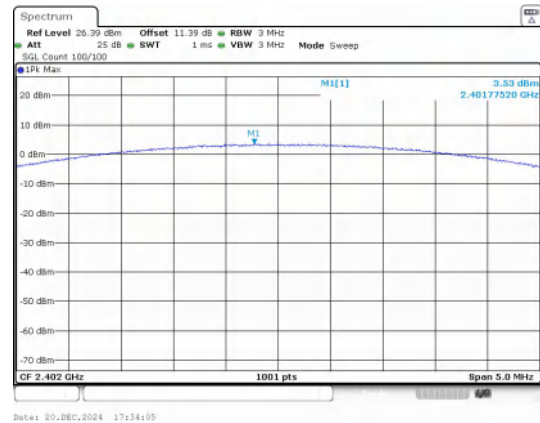
Peak Output Power
GFSK_Channel 0



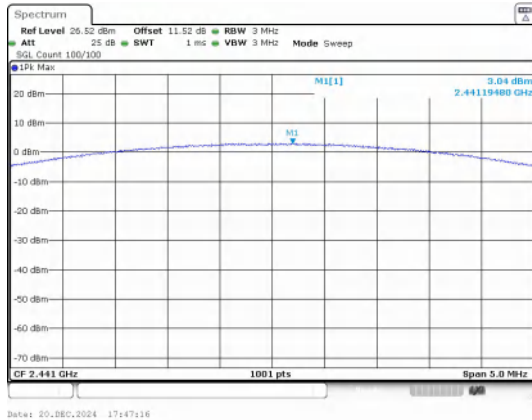
Peak Output Power
GFSK_Channel 39



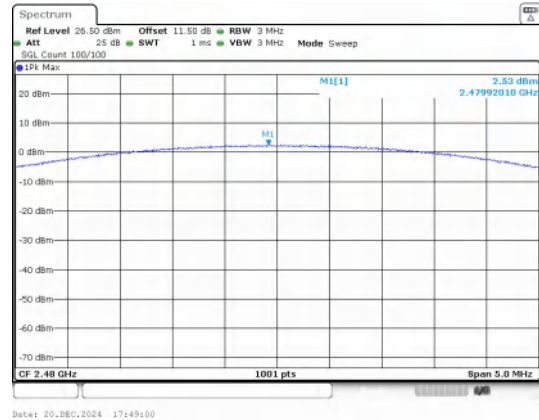
Peak Output Power
GFSK_Channel 78



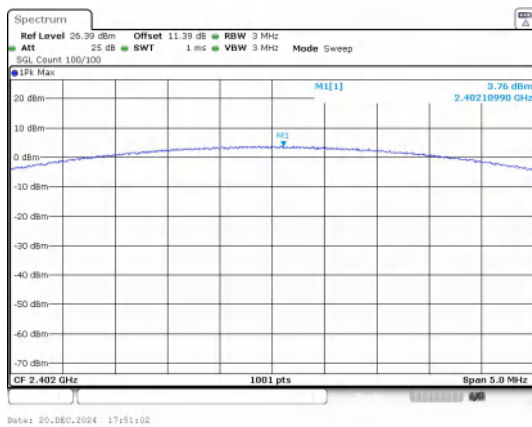
Peak Output Power
 $\pi/4$ DQPSK_Channel 0



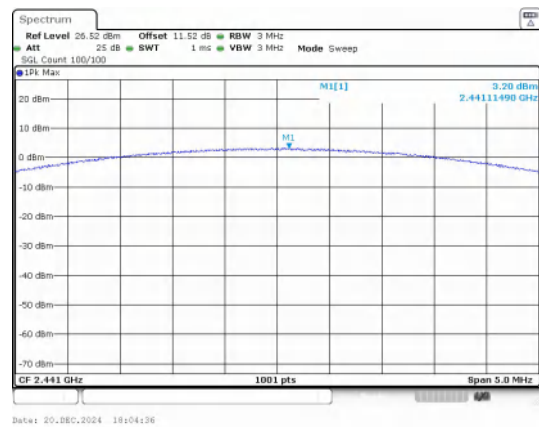
Peak Output Power
 $\pi/4$ DQPSK_Channel 39



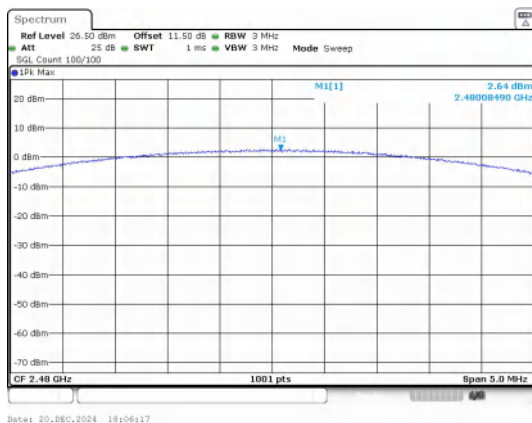
Peak Output Power
 $\pi/4$ DQPSK_Channel 78



Peak Output Power
8DPSK_Channel 0



Peak Output Power
8DPSK_Channel 39



Peak Output Power
8DPSK_Channel 78

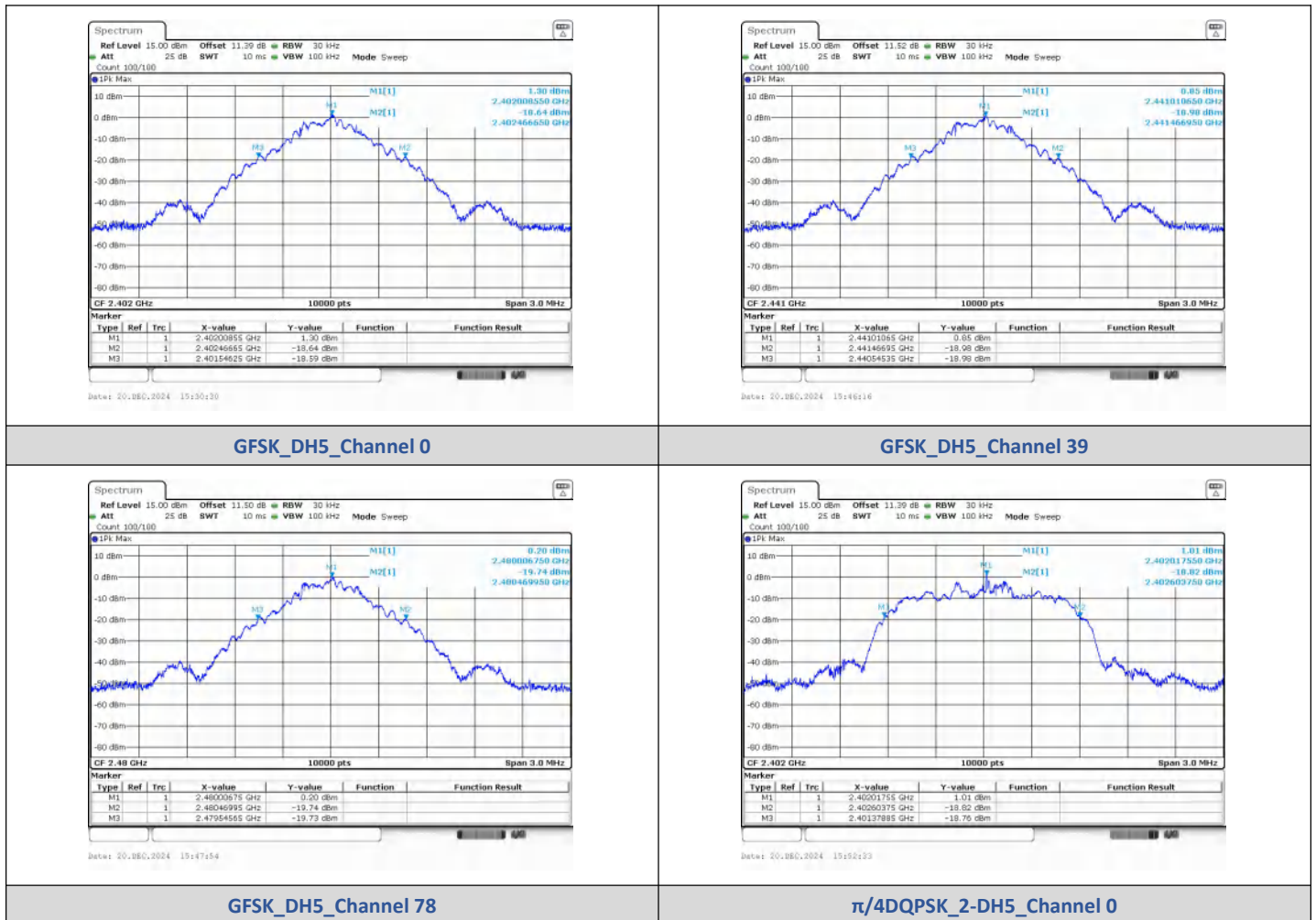
5) 20dB Bandwidth

Test Result

Left:

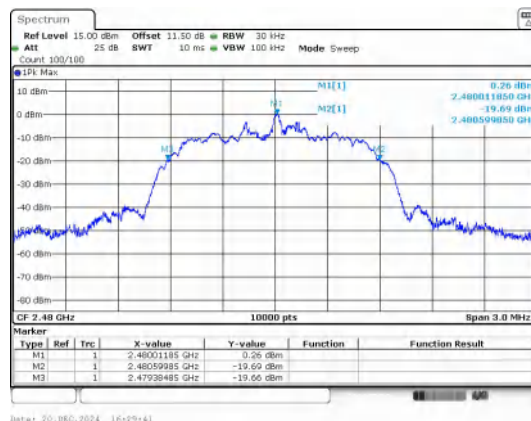
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	0.9200
	39	2441 MHz	0.9200
	78	2480 MHz	0.9200
$\pi/4$ DQPSK	0	2402 MHz	1.220
	39	2441 MHz	1.220
	78	2480 MHz	1.220
8DPSK	0	2402 MHz	1.250
	39	2441 MHz	1.270
	78	2480 MHz	1.270

Test Graphs

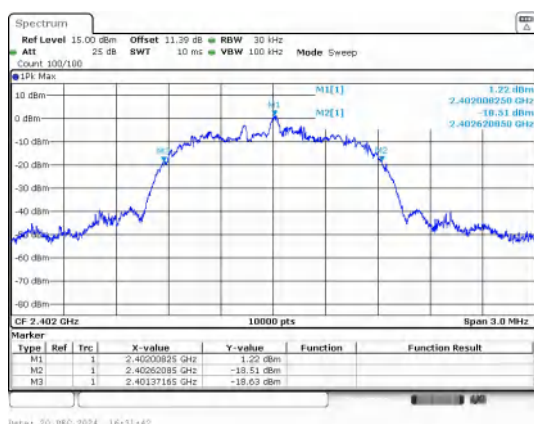




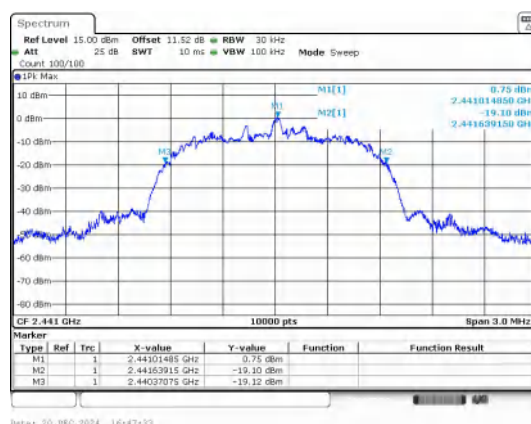
$\pi/4$ DQPSK_2-DH5_Channel 39



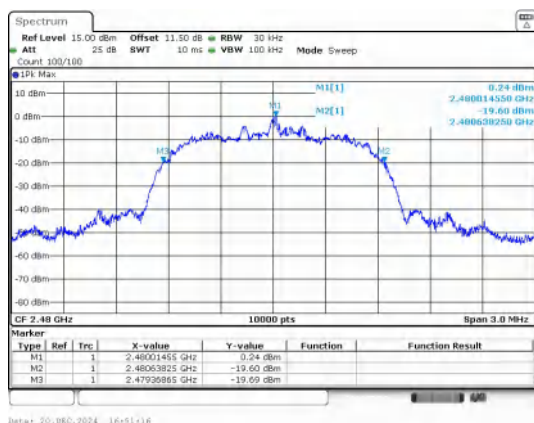
$\pi/4$ DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



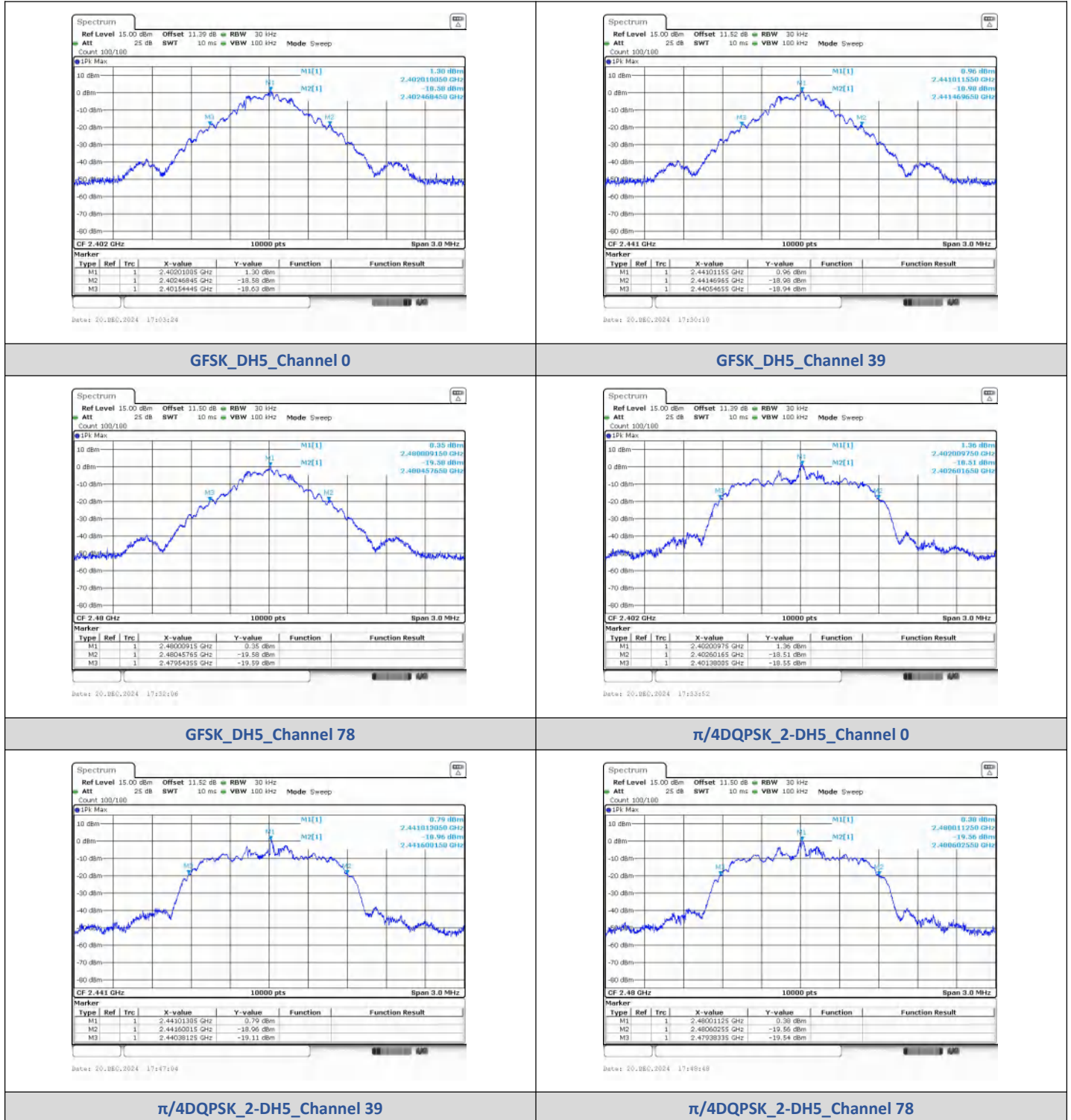
8DPSK_3-DH5_Channel 78

Right:

Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	0.9300
	39	2441 MHz	0.9200
	78	2480 MHz	0.9200
$\pi/4$ DQPSK	0	2402 MHz	1.220
	39	2441 MHz	1.220
	78	2480 MHz	1.220

8DPSK	0	2402 MHz	1.270
	39	2441 MHz	1.260
	78	2480 MHz	1.260

Test Graphs

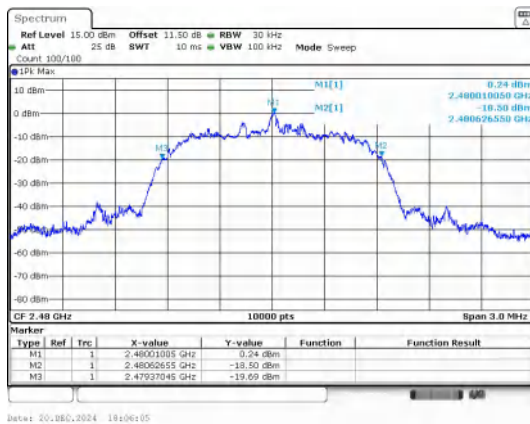




8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78

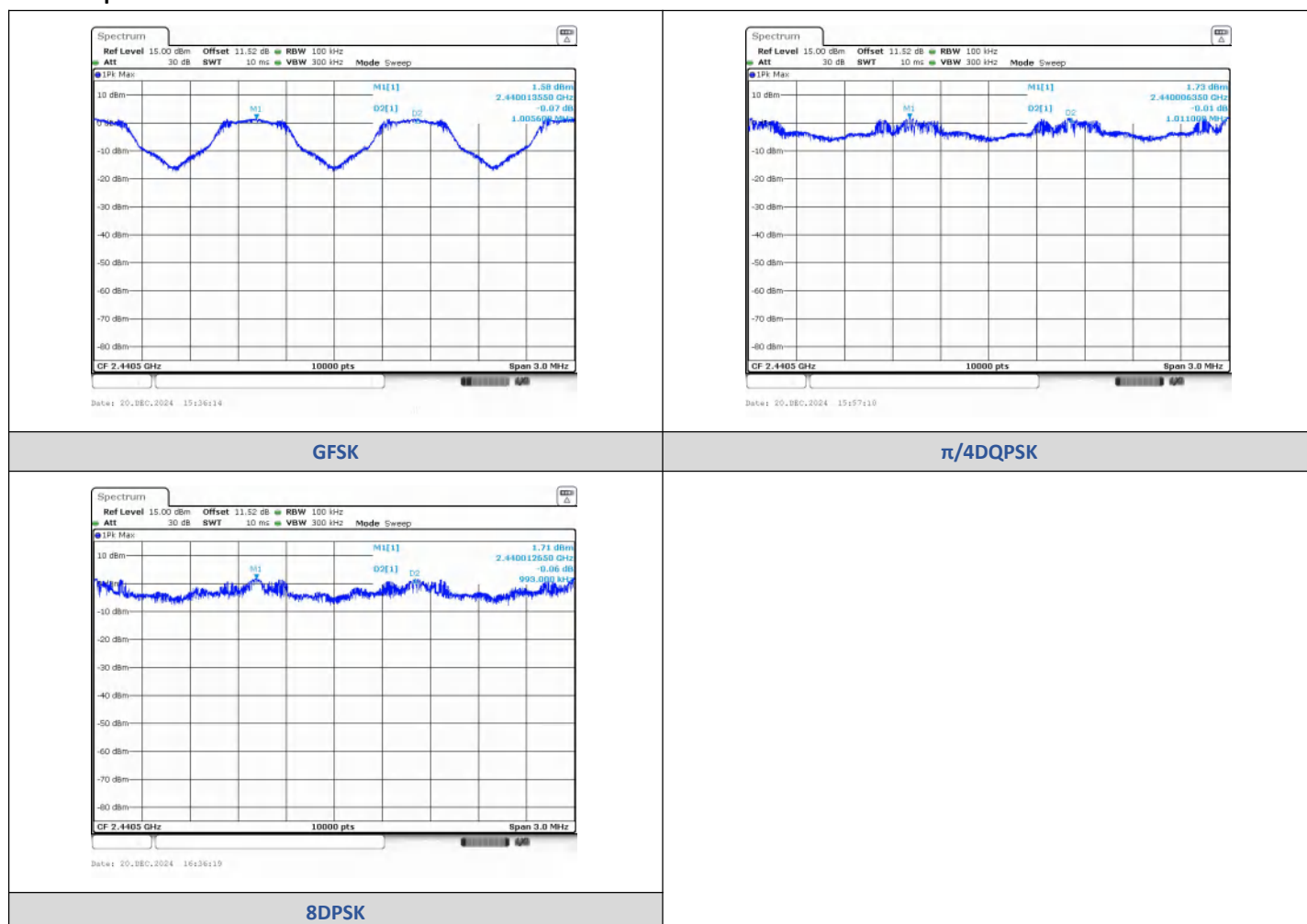
6) Carrier Frequencies Separation

Test Result

Left:

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.0136	2441.0192	1.0056	0.92	PASS
$\pi/4$ DQPSK	2-DH5	2440.0064	2441.0174	1.0110	0.813	PASS
8DPSK	3-DH5	2440.0127	2441.0057	0.9930	0.833	PASS

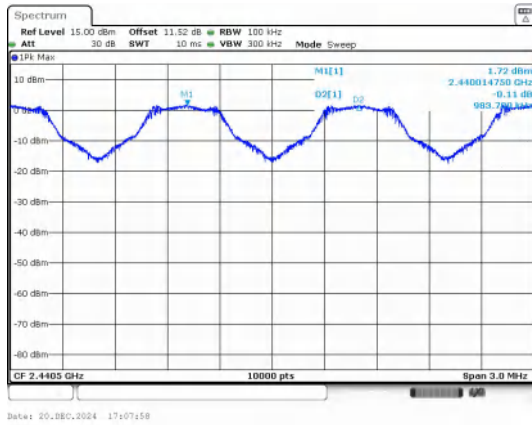
Test Graphs



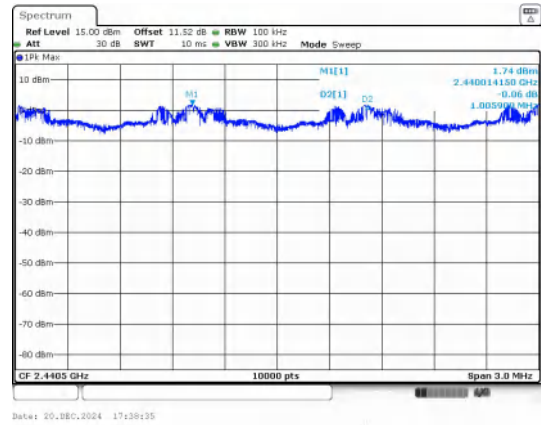
Right:

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.0147	2440.9985	0.9837	0.93	PASS
$\pi/4$ DQPSK	2-DH5	2440.0141	2441.0201	1.0059	0.813	PASS
8DPSK	3-DH5	2440.0132	2441.0147	1.0014	0.847	PASS

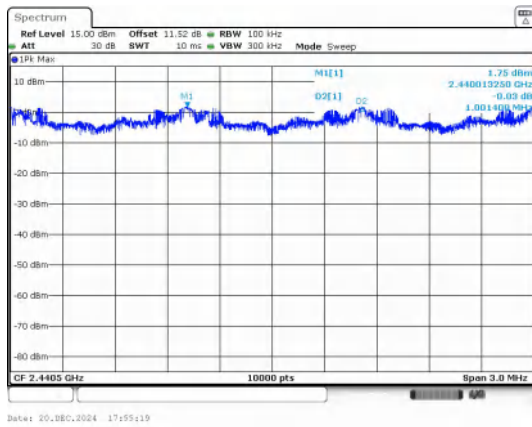
Test Graphs



GFSK



$\pi/4$ DQPSK



8DPSK

7) Conducted Out Of Band Emission

Test Result

Left:

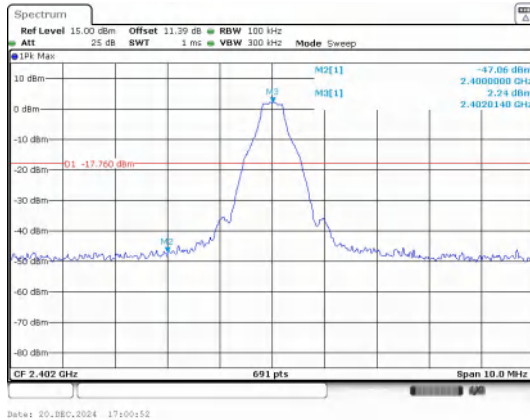
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-47.060	-17.76	-29.300	PASS
			4804.68	-38.967	-17.76	-21.207	PASS
		39	4882.09	-42.778	-18.35	-24.428	PASS
		78	2483.50	-49.140	-18.89	-30.250	PASS
			5241.66	-47.223	-18.89	-28.333	PASS
$\pi/4$ DQPSK	2-DH5	0	2400.00	-46.700	-17.73	-28.970	PASS
			4803.85	-41.879	-17.73	-24.149	PASS
		39	4882.09	-48.008	-18.23	-29.778	PASS
		78	2483.50	-48.230	-18.73	-29.500	PASS
			4960.33	-48.439	-18.73	-29.709	PASS
8DPSK	3-DH5	0	2400.00	-45.820	-17.72	-28.100	PASS
			4803.85	-44.760	-17.72	-27.040	PASS
		39	1783.31	-43.815	-18.3	-25.515	PASS
		78	1783.31	-36.281	-18.67	-17.611	PASS
			2483.50	-49.240	-18.67	-30.570	PASS

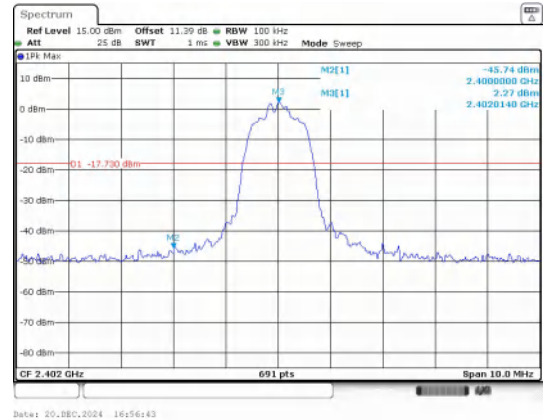
Hopping

Hopping							
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2395.88	-44.130	-17.86	-26.270	PASS
			2400.00	-44.210	-17.86	-26.350	PASS
			2483.50	-48.120	-18.81	-29.310	PASS
$\pi/4$ DQPSK	2-DH5		2398.15	-36.266	-17.84	-18.426	PASS
			2400.00	-45.710	-17.84	-27.870	PASS
			2483.50	-47.410	-18.93	-28.480	PASS
8DPSK	3-DH5		2395.89	-45.449	-17.67	-27.779	PASS
			2400.00	-46.590	-17.67	-28.920	PASS
			2483.50	-48.580	-18.92	-29.660	PASS

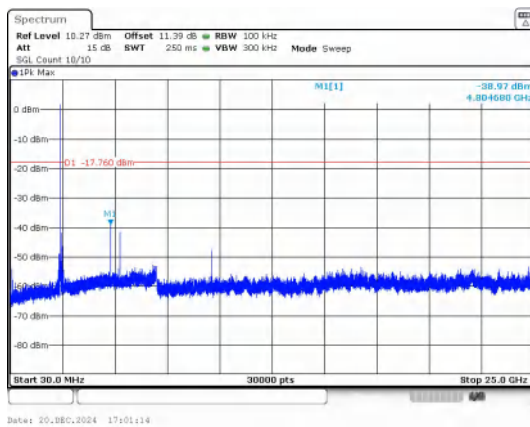
Test Graphs



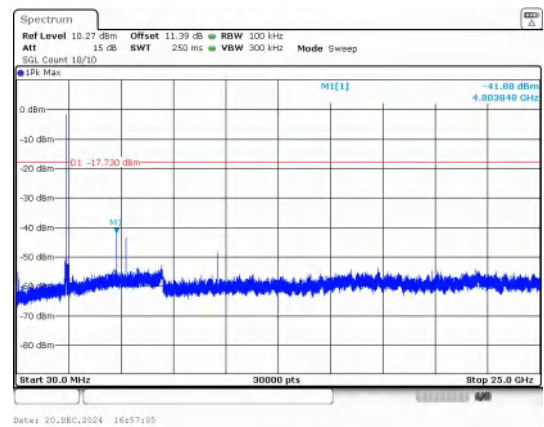
Out Of Band Emission
GFSK_DH5_Channel 0



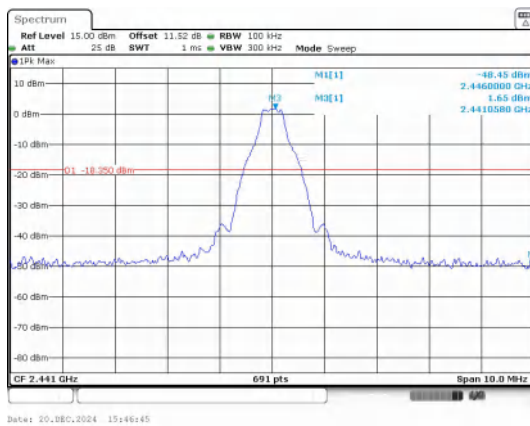
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 0



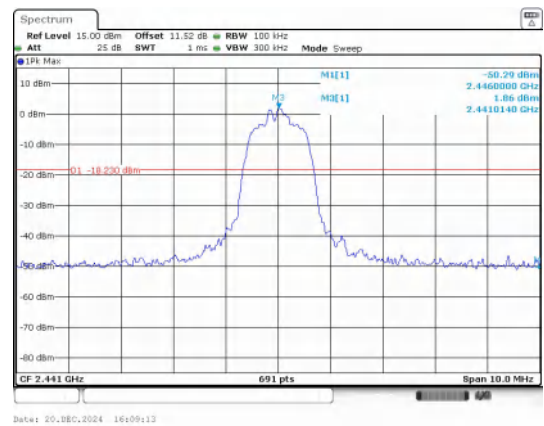
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 0



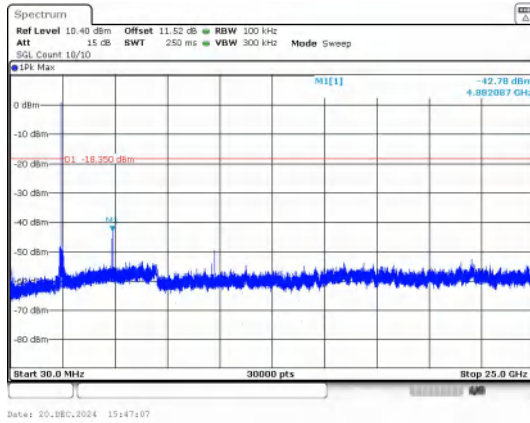
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 0



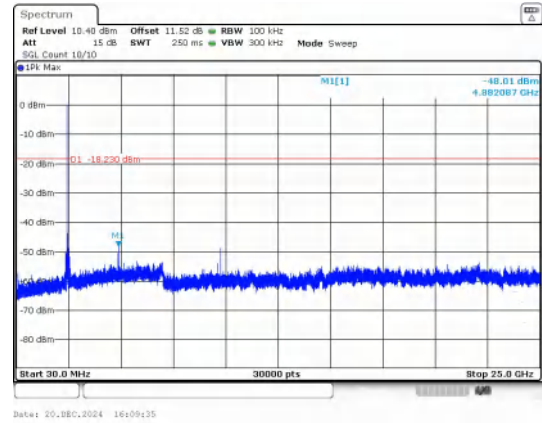
Out Of Band Emission
GFSK_DH5_Channel 39



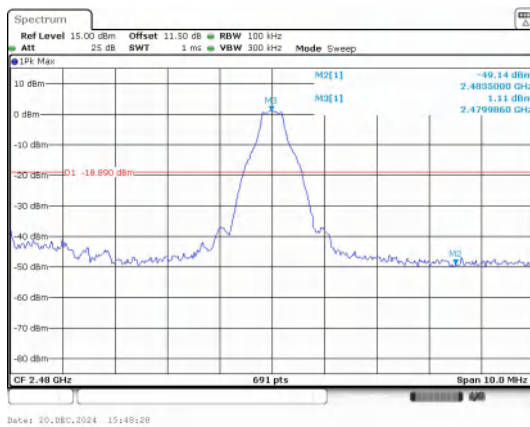
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 39



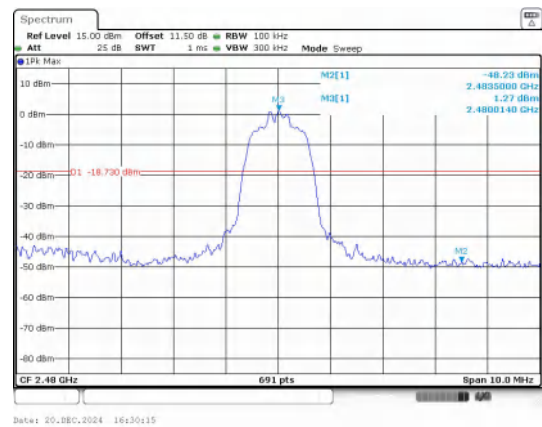
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 39



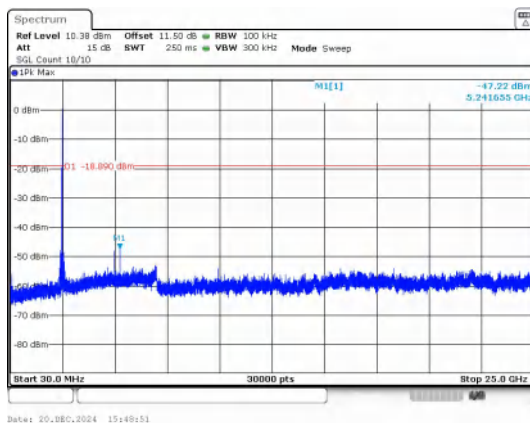
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 39



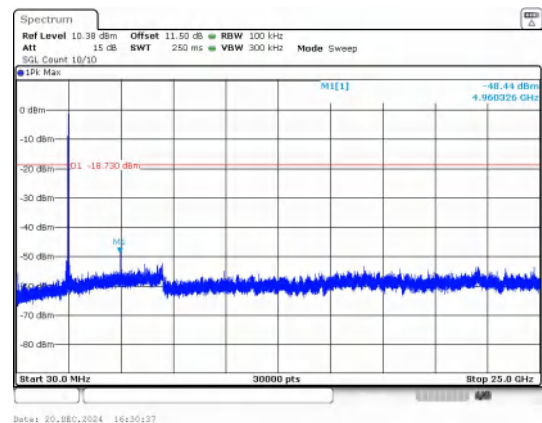
Out Of Band Emission
GFSK_DH5_Channel 78



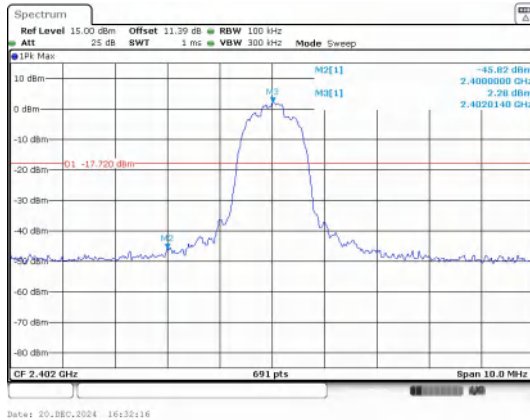
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78



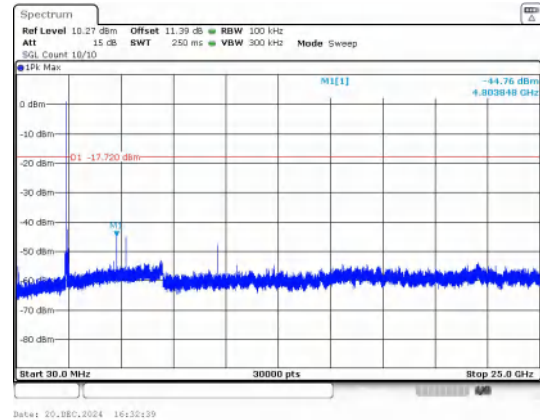
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



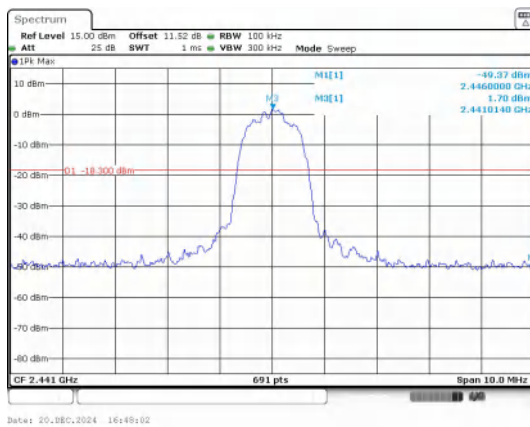
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 78



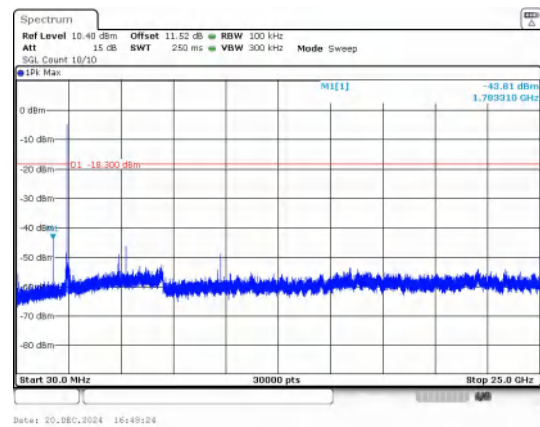
Out Of Band Emission
8DPSK_3-DH5_Channel 0



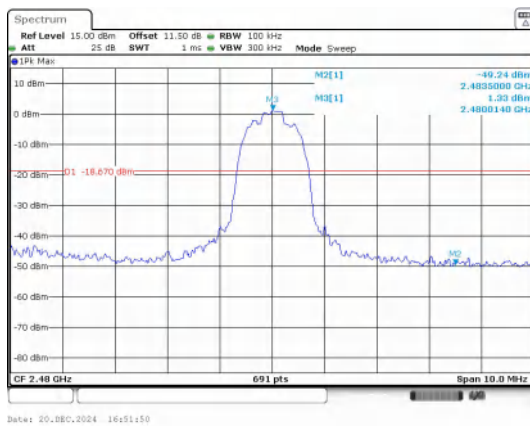
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0



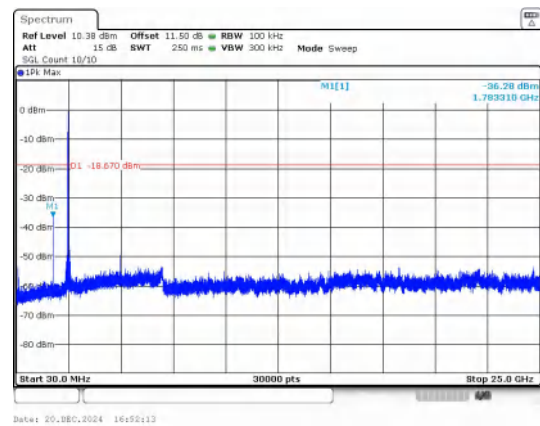
Out Of Band Emission
8DPSK_3-DH5_Channel 39



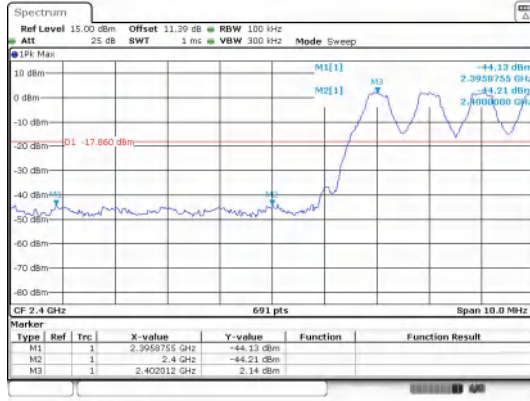
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39



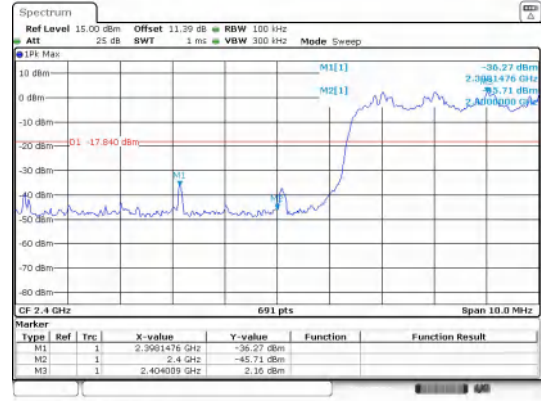
Out Of Band Emission
8DPSK_3-DH5_Channel 78



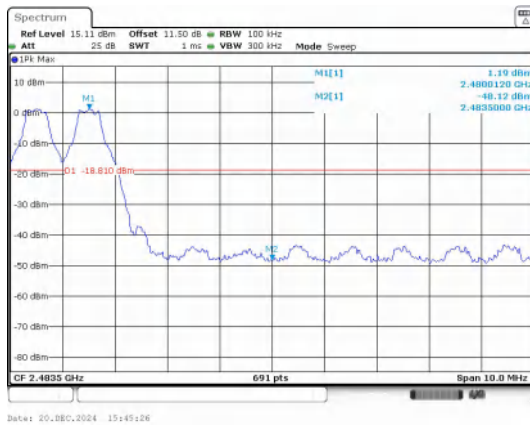
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78



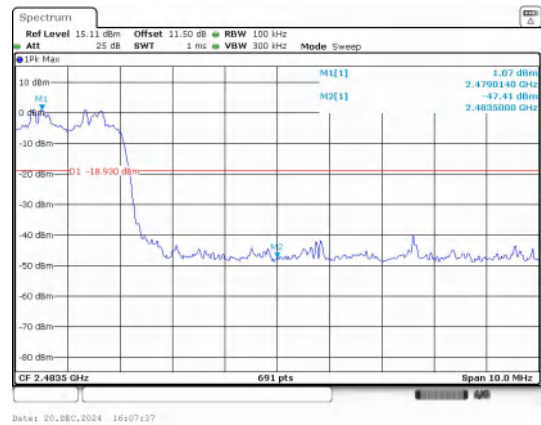
Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



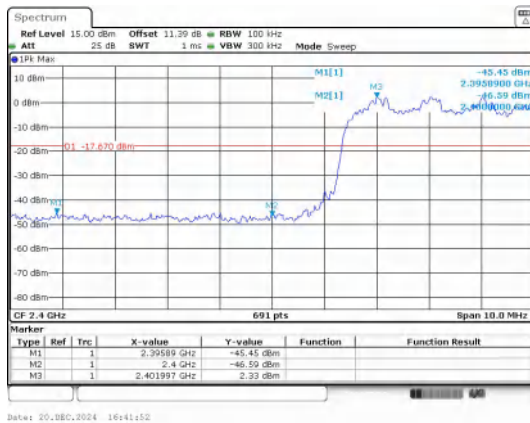
Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping



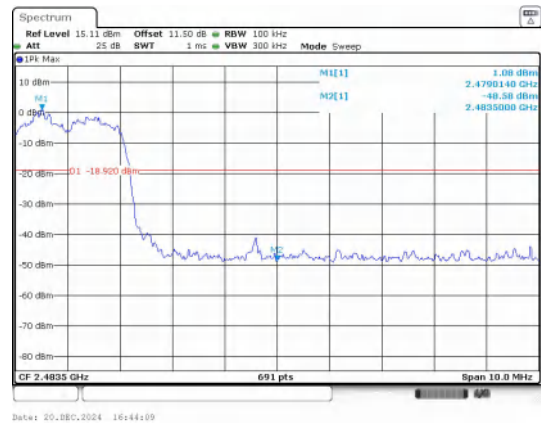
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



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



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



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

Right:
Non-Hopping

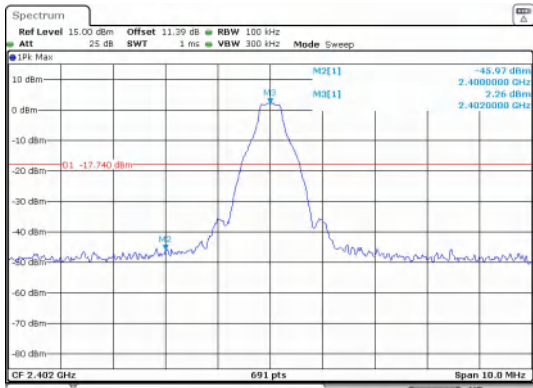
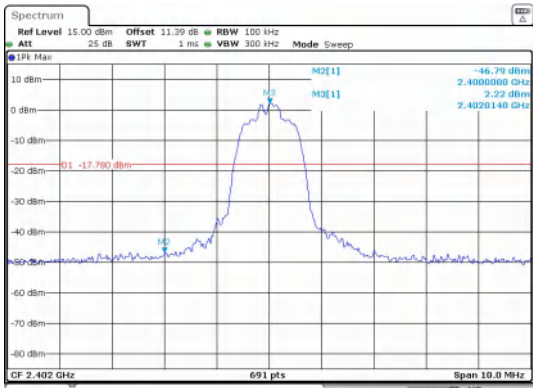
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
------------	--------	---------	------------------------------------	--------------------------------	----------------	--------------------	--------

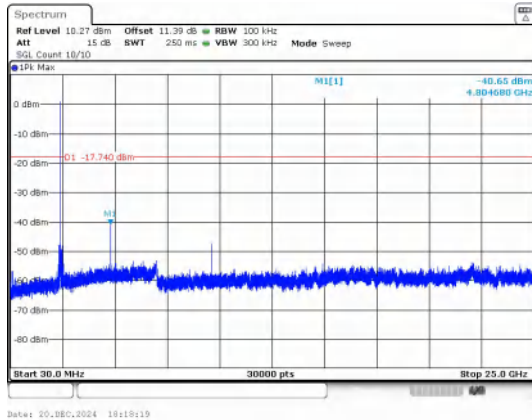
GFSK	DH5	0	2400.00	-45.970	-17.74	-28.230	PASS
			4804.68	-40.651	-17.74	-22.911	PASS
		39	4882.09	-45.528	-18.29	-27.238	PASS
		78	2483.50	-48.190	-18.89	-29.300	PASS
			2558.21	-47.766	-18.89	-28.876	PASS
$\pi/4$ DQPSK	2-DH5	0	2400.00	-46.790	-17.78	-29.010	PASS
			4803.85	-44.114	-17.78	-26.334	PASS
		39	828.62	-42.281	-18.37	-23.911	PASS
		78	2483.50	-48.730	-18.95	-29.780	PASS
			4960.33	-50.089	-18.95	-31.139	PASS
8DPSK	3-DH5	0	2400.00	-45.700	-17.8	-27.900	PASS
			4804.68	-44.636	-17.8	-26.836	PASS
		39	5237.49	-41.905	-18.47	-23.435	PASS
		78	2483.50	-49.360	-18.82	-30.540	PASS
			2532.41	-51.107	-18.82	-32.287	PASS

Hopping

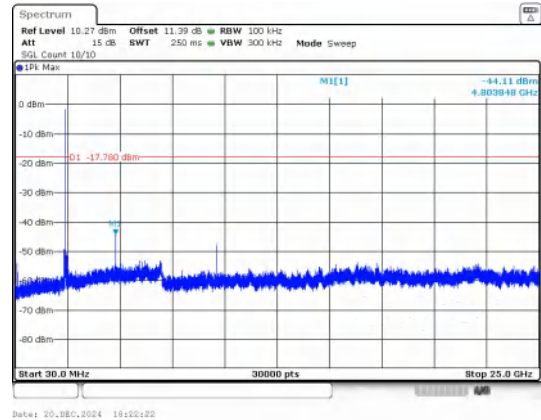
Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2398.91	-39.306	-17.76	-21.546	PASS
			2400.00	-43.670	-17.76	-25.910	PASS
			2483.50	-47.310	-18.65	-28.660	PASS
$\pi/4$ DQPSK	2-DH5		2396.15	-42.478	-17.92	-24.558	PASS
			2400.00	-47.560	-17.92	-29.640	PASS
			2483.50	-48.370	-18.94	-29.430	PASS
8DPSK	3-DH5		2400.00	-42.490	-17.81	-24.680	PASS
			2483.50	-47.500	-18.77	-28.730	PASS

Test Graphs

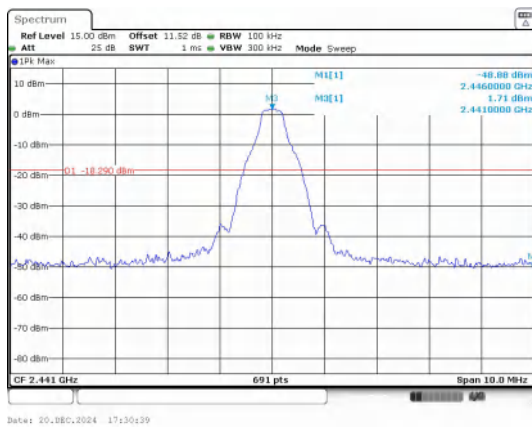
 Ref Level 15.00 dBm Offset 11.39 dB RBW 100 kHz Att 25 dB SWT 1 ms VBW 300 kHz Mode Sweep 1P1 Max M2[1] -45.97 dBm 2.4000000 GHz 2.2% dBm M3[1] -17.740 dBm CF 2.402 GHz 691 pts Span 10.0 MHz Date: 20.08.2024 18:17:57	 Ref Level 15.00 dBm Offset 11.39 dB RBW 100 kHz Att 25 dB SWT 1 ms VBW 300 kHz Mode Sweep 1P1 Max M2[1] -46.79 dBm 2.4000000 GHz 2.2% dBm M3[1] -17.780 dBm CF 2.402 GHz 691 pts Span 10.0 MHz Date: 20.08.2024 18:22:00
Out Of Band Emission GFSK_DH5_Channel 0	Out Of Band Emission $\pi/4$ DQPSK_2-DH5_Channel 0



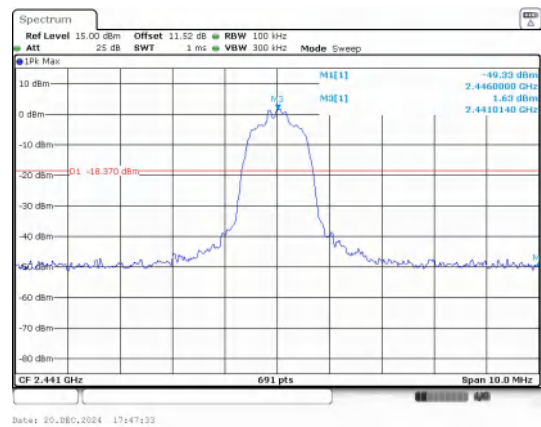
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 0



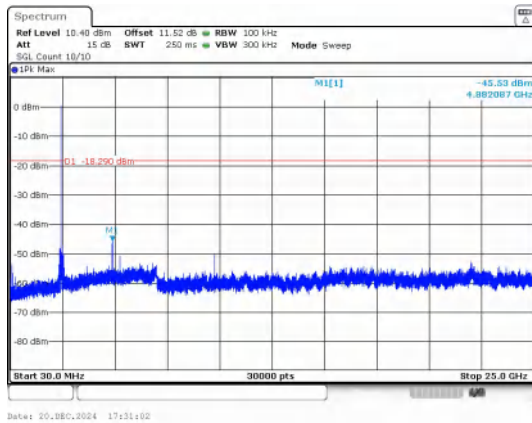
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 0



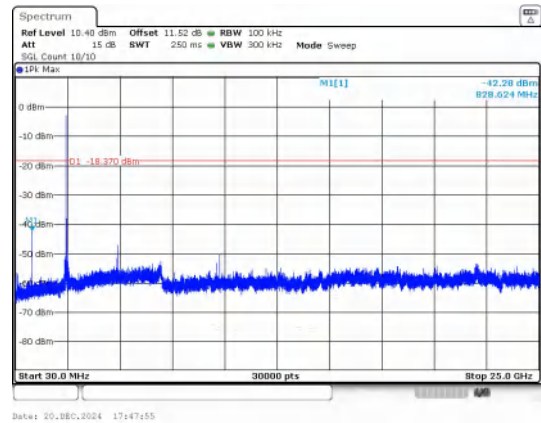
Out Of Band Emission
GFSK_DH5_Channel 39



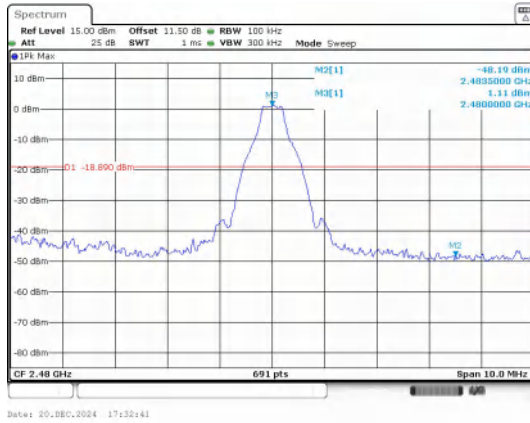
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 39



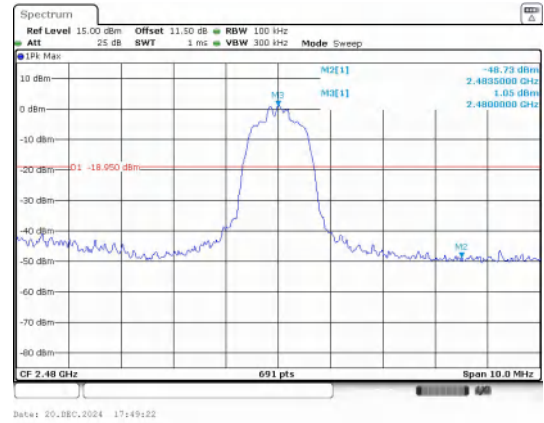
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 39



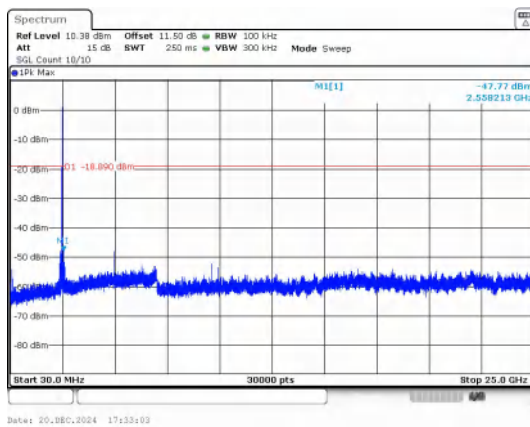
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 39



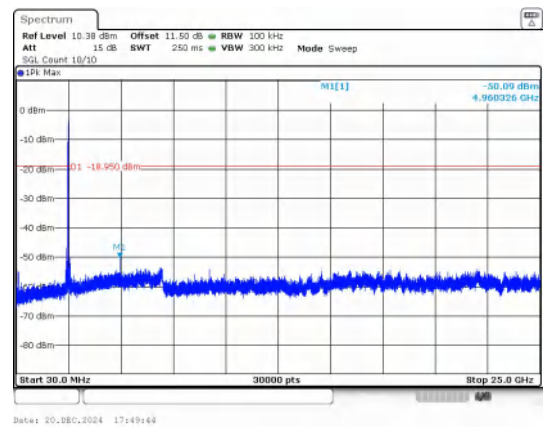
Out Of Band Emission
GFSK_DH5_Channel 78



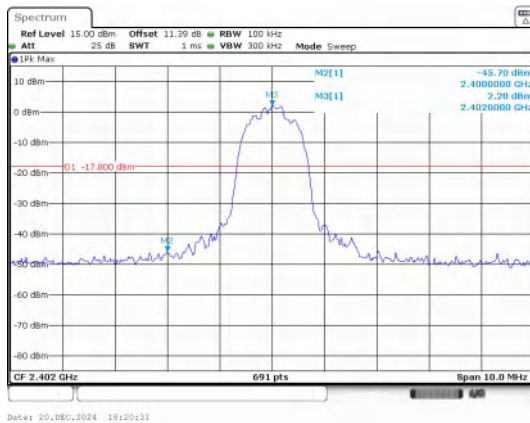
Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78



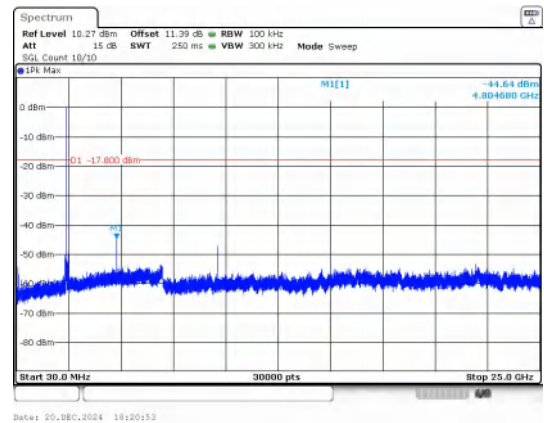
30.0 MHz - 25000.0 MHz
GFSK_DH5_Channel 78



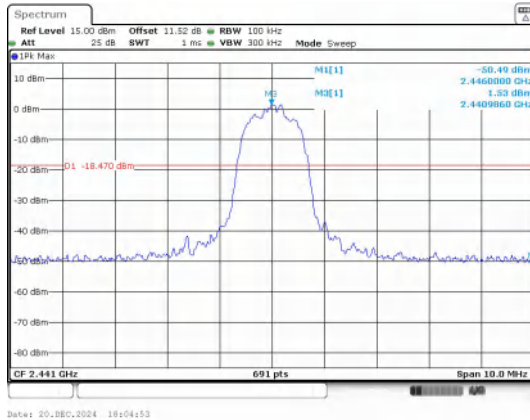
30.0 MHz - 25000.0 MHz
 $\pi/4$ DQPSK_2-DH5_Channel 78



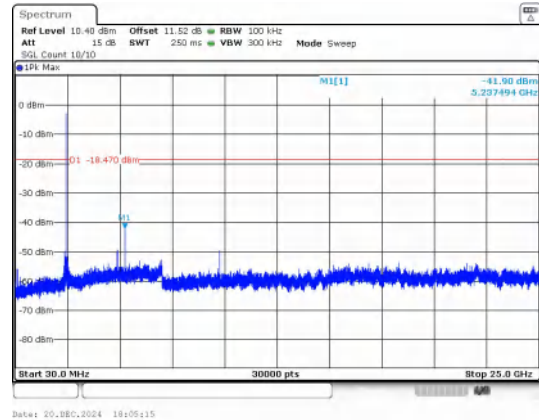
Out Of Band Emission
8DPSK_3-DH5_Channel 0



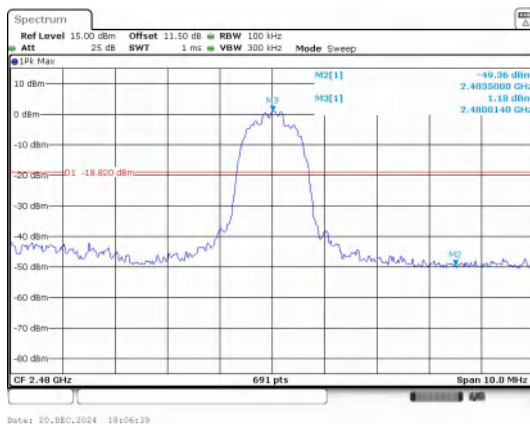
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 0



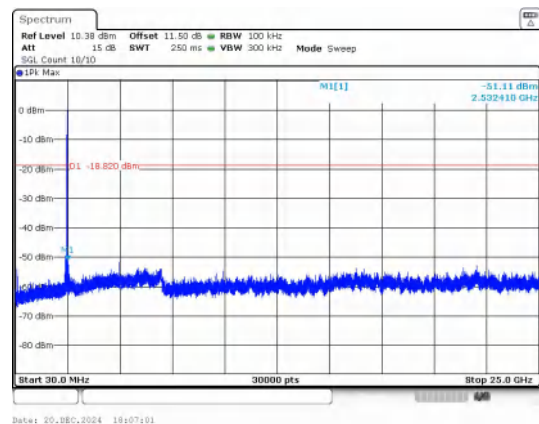
Out Of Band Emission
8DPSK_3-DH5_Channel 39



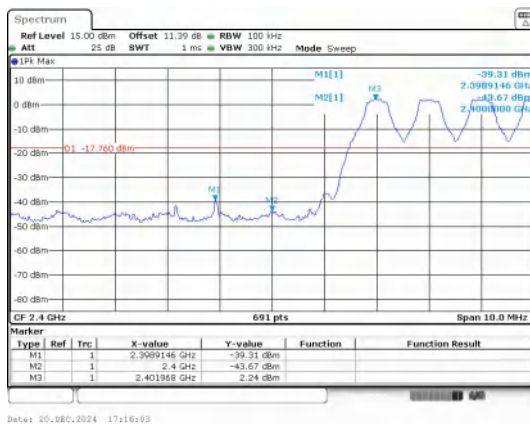
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 39



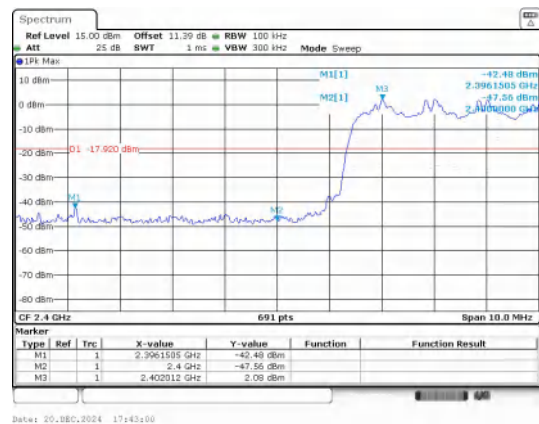
Out Of Band Emission
8DPSK_3-DH5_Channel 78



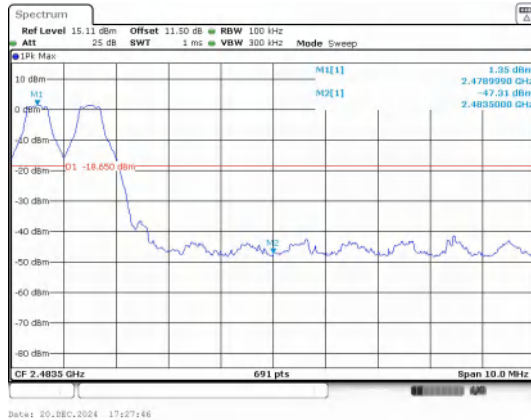
30.0 MHz - 25000.0 MHz
8DPSK_3-DH5_Channel 78



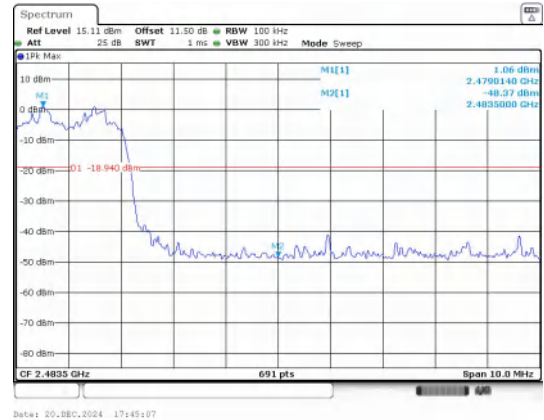
Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



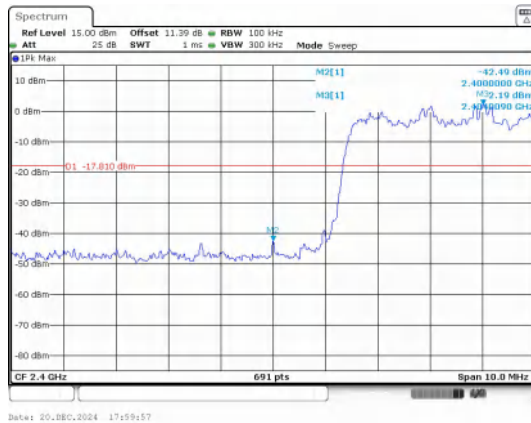
Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping



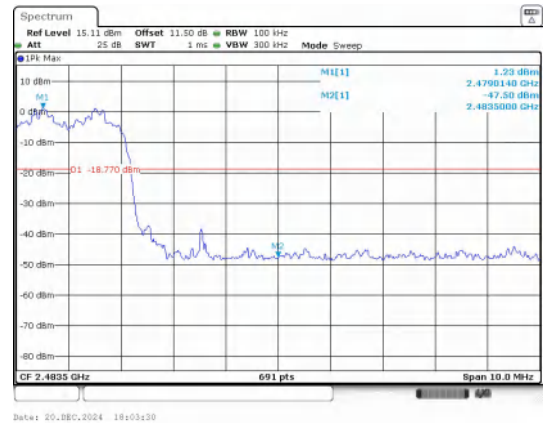
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



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-----