

Appendix A

Report No.:	CISRR24032311301
FCC ID:	2BFK3-FREEM1
Product Name:	Smart Bluetooth Hearing Aid (ITE)
Model No.:	FREE M1
Test Engineer:	Lucas Huang
Supervised by:	Rory Huang

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	5.352	3.429	30	PASS
		39	5.326	3.409		PASS
		78	5.267	3.363		PASS
$\pi/4$ DQPSK	2-DH5	0	6.040	4.018	20.97	PASS
		39	5.906	3.895		PASS
		78	5.873	3.867		PASS
8DPSK	3-DH5	0	6.373	4.338		PASS
		39	6.148	4.119		PASS
		78	6.060	4.037		PASS

Right

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (dBm)	Result
GFSK	DH5	0	5.088	3.227	30	PASS
		39	5.062	3.208		PASS
		78	5.003	3.164		PASS
$\pi/4$ DQPSK	2-DH5	0	5.776	3.781	20.97	PASS
		39	5.642	3.666		PASS
		78	5.609	3.638		PASS
8DPSK	3-DH5	0	6.109	4.082		PASS
		39	5.884	3.876		PASS
		78	5.796	3.798		PASS

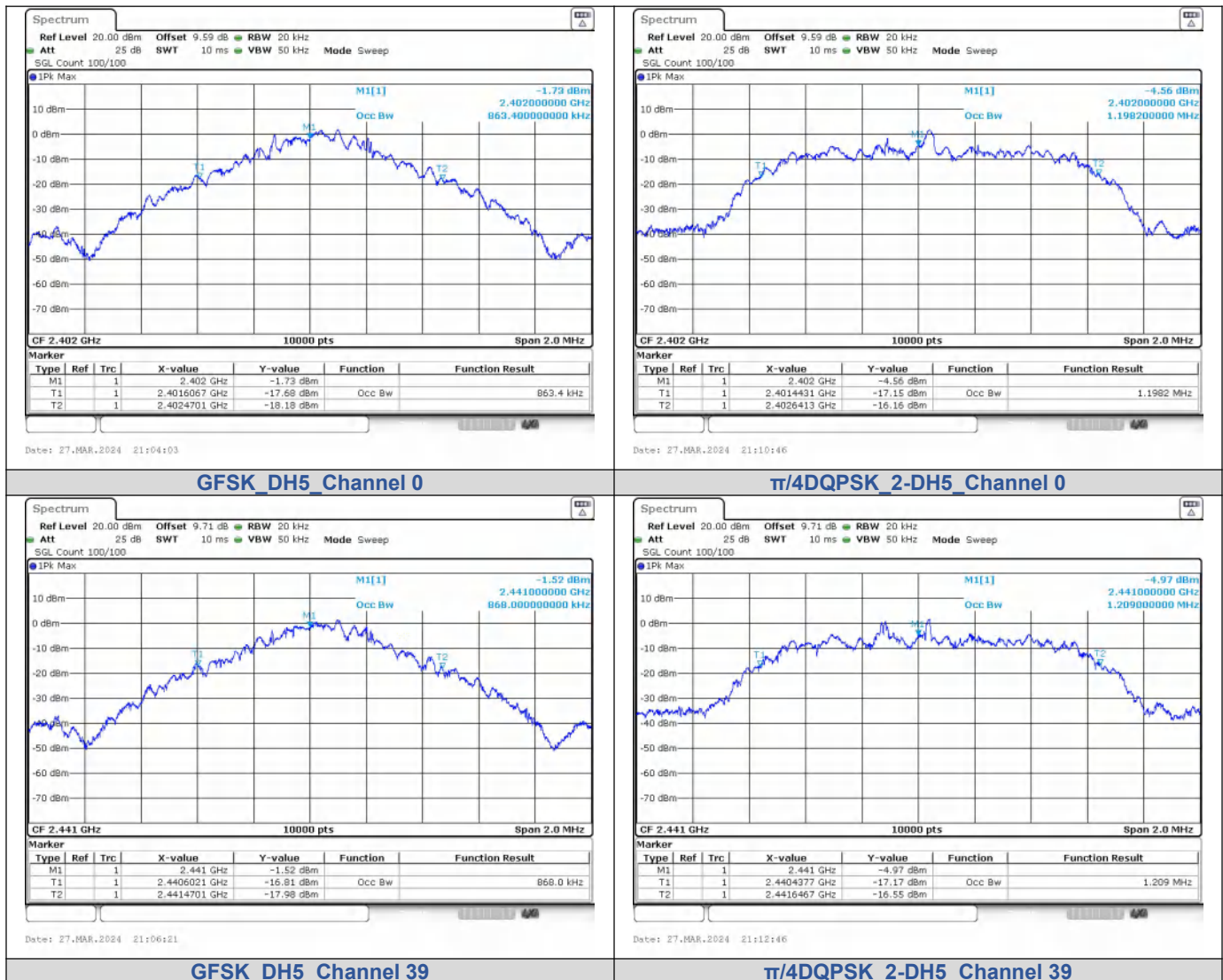
99% Bandwidth

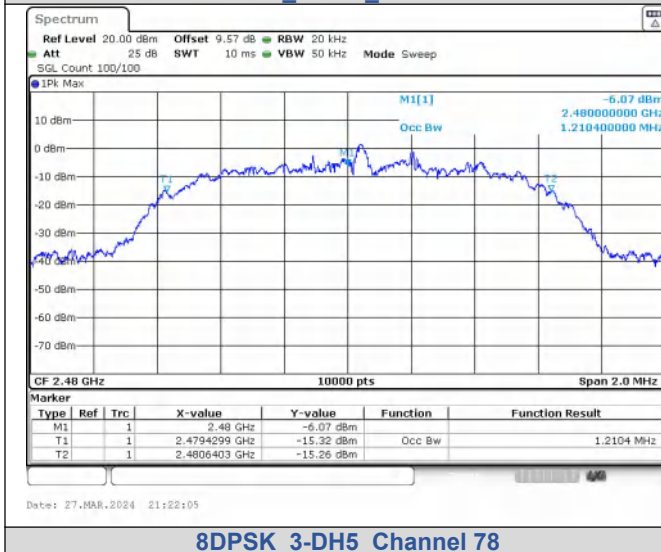
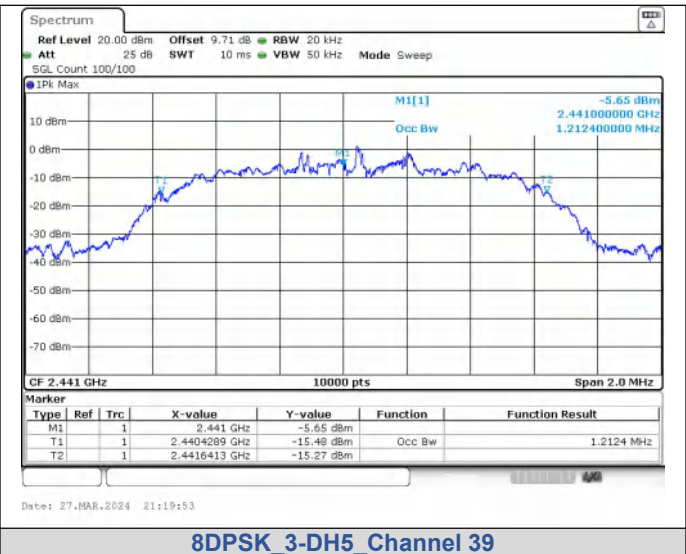
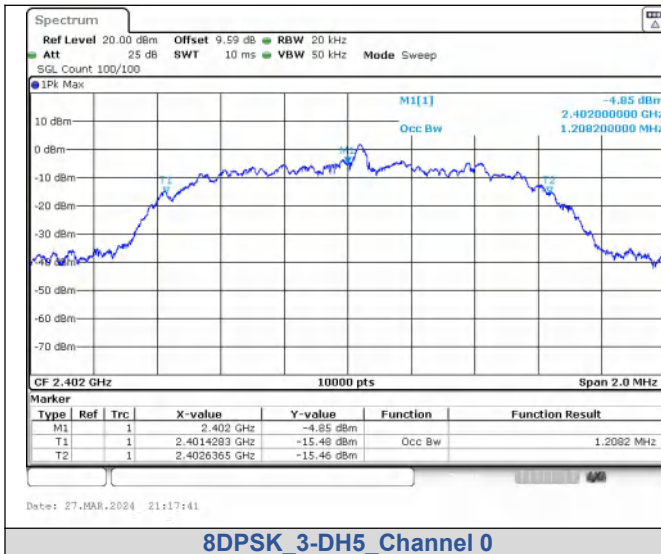
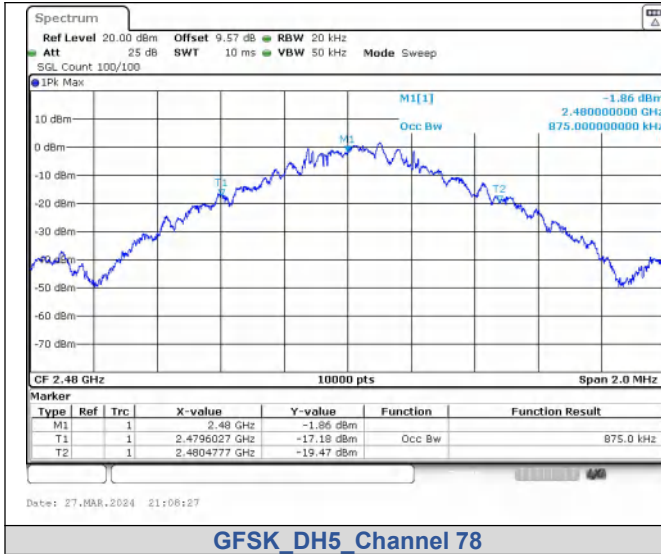
Test Result

Left

Modulation	Channel	99% BW (MHz)
GFSK	0	0.86340
	39	0.86800
	78	0.87500
$\pi/4$ DQPSK	0	1.1980
	39	1.2090
	78	1.1950
8DPSK	0	1.2080
	39	1.2120
	78	1.2100

Test Graphs



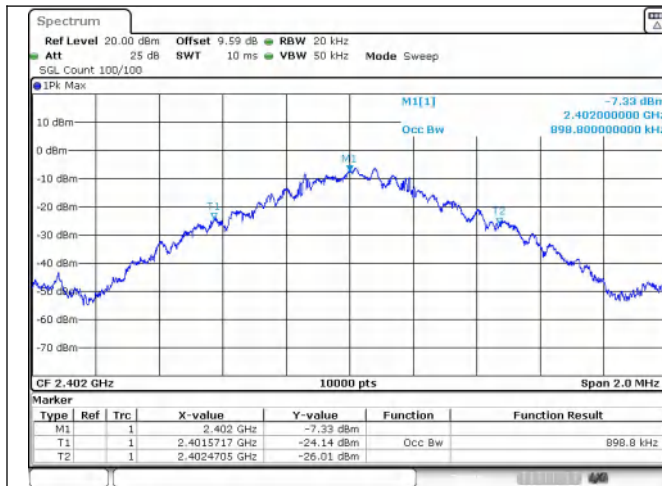


Right

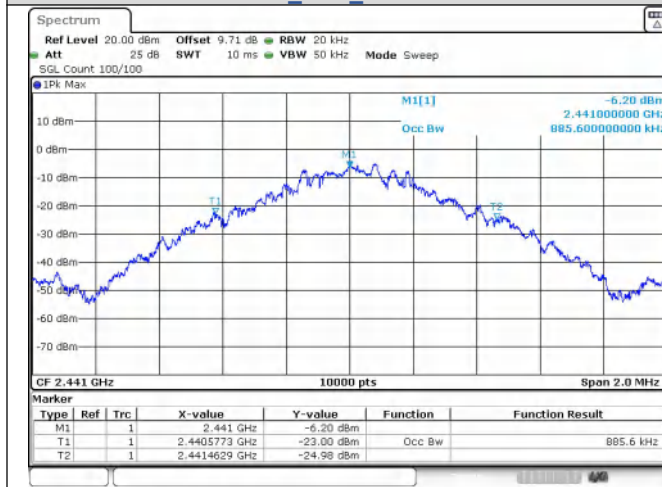
Test Result

Modulation	Channel	99% BW (MHz)
GFSK	0	0.89880
	39	0.88560
	78	0.88100
$\pi/4$ DQPSK	0	1.1980
	39	1.1950
	78	1.1960
8DPSK	0	1.2080
	39	1.2080
	78	1.2150

Test Graphs

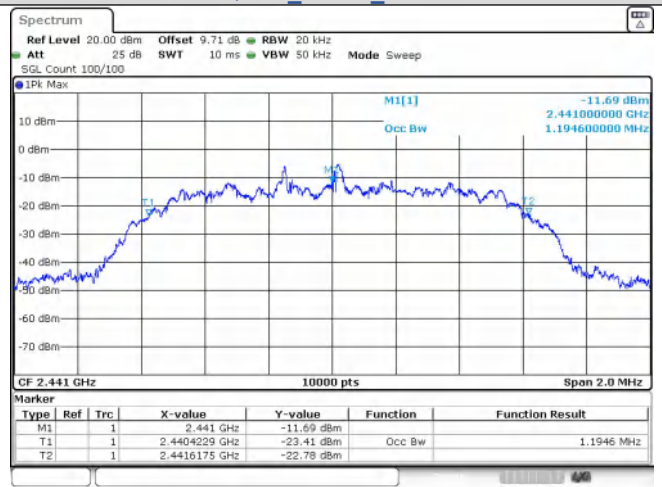


GFSK_DH5_Channel 0

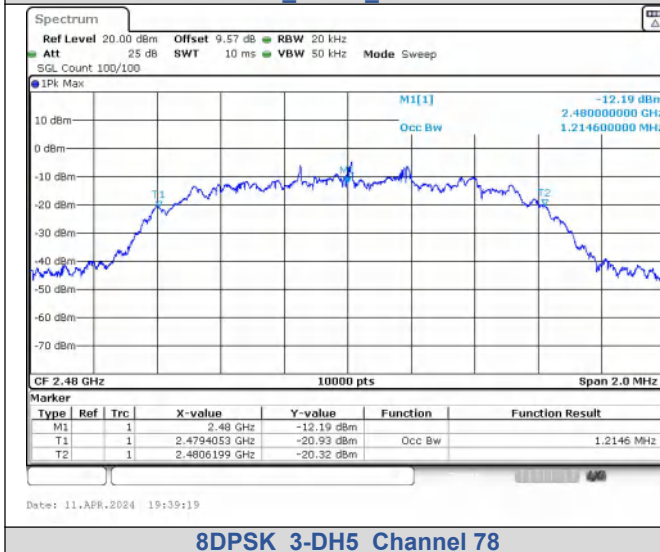
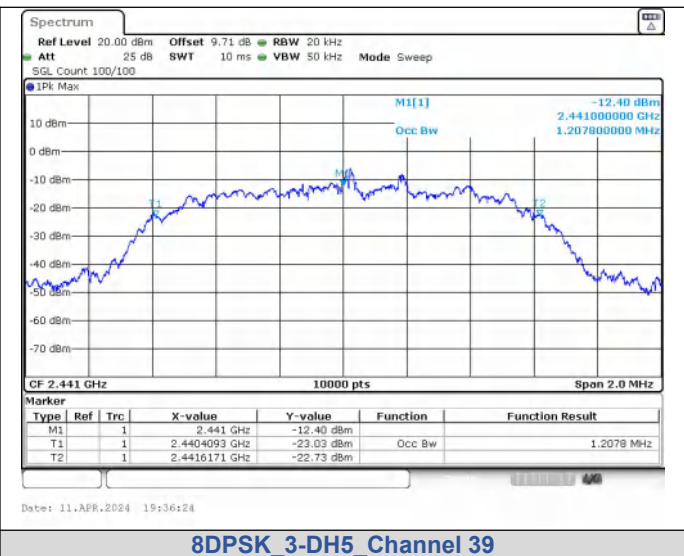
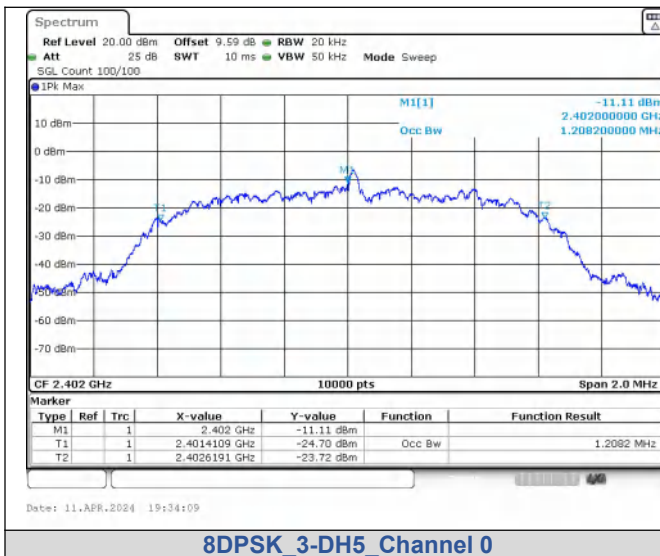
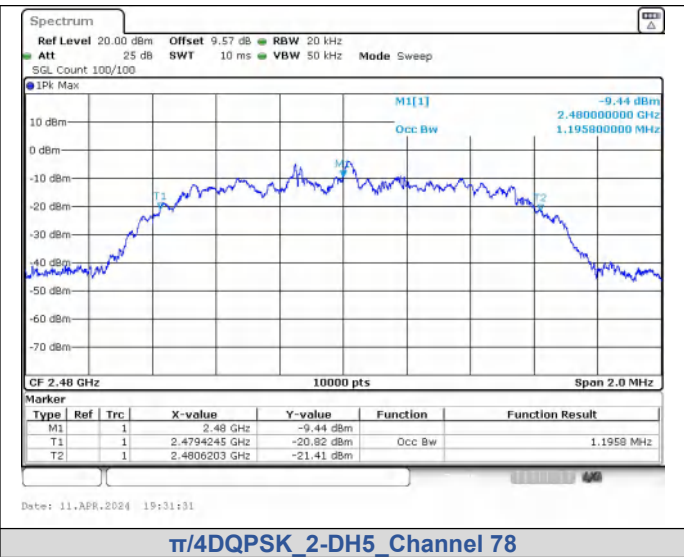
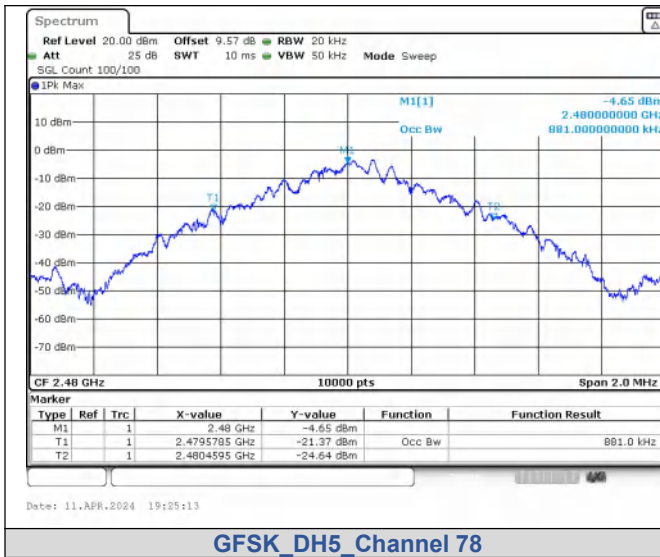


GFSK_DH5_Channel 39

$\pi/4$ DQPSK_2-DH5_Channel 0



$\pi/4$ DQPSK_2-DH5_Channel 39



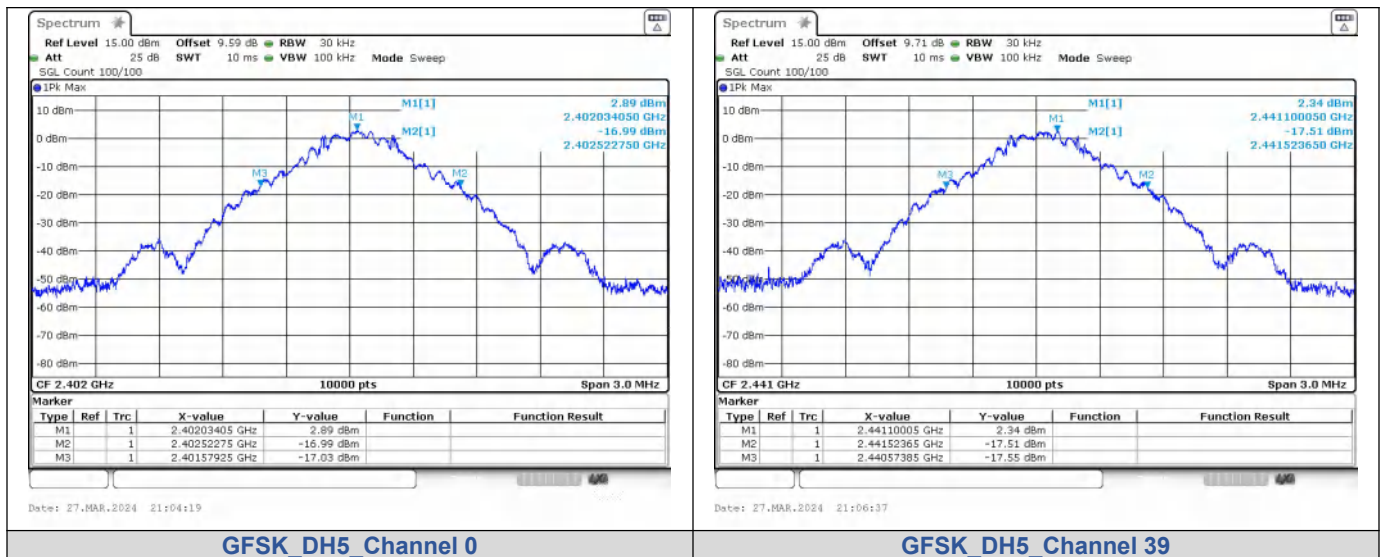
20dB Bandwidth

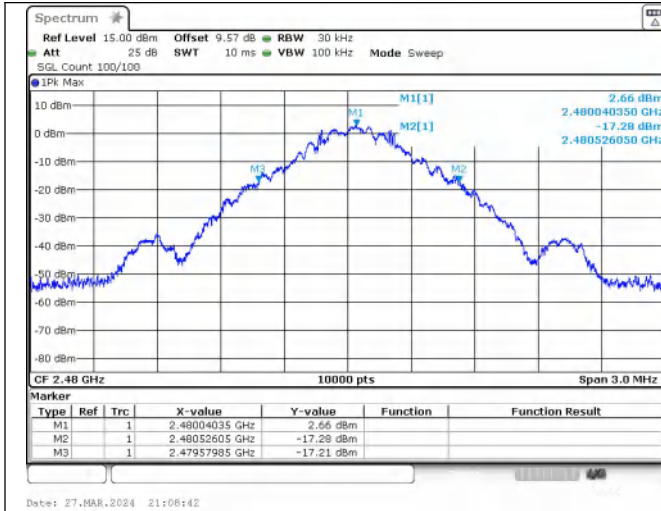
Test Result

Left

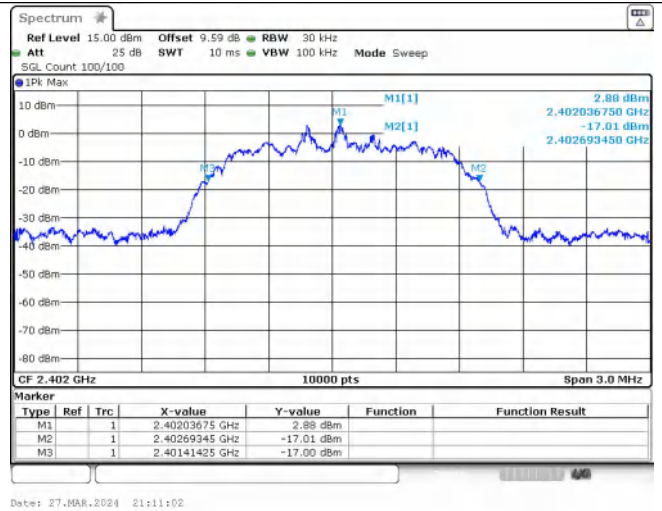
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	0.9400
	39	2441 MHz	0.9500
	78	2480 MHz	0.9500
$\pi/4$ DQPSK	0	2402 MHz	1.280
	39	2441 MHz	1.310
	78	2480 MHz	1.310
8DPSK	0	2402 MHz	1.290
	39	2441 MHz	1.300
	78	2480 MHz	1.300

Test Graphs

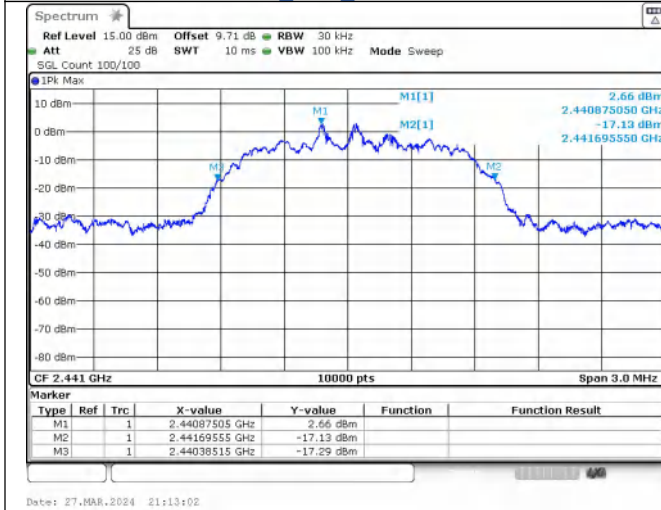




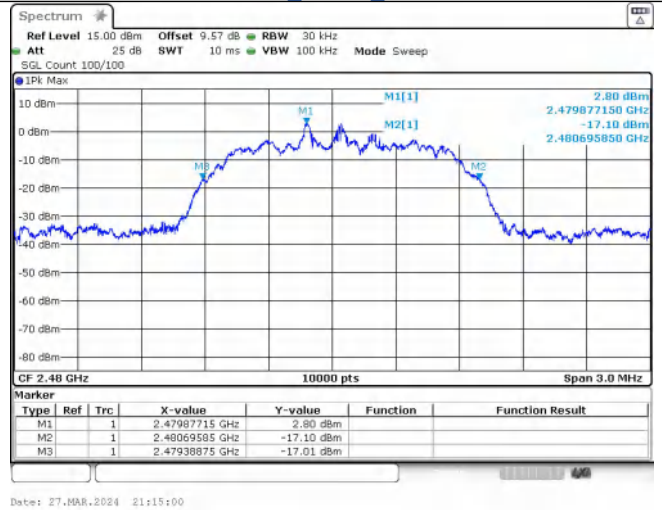
GFSK_DH5_Channel 78



$\pi/4$ DQPSK_2-DH5_Channel 0



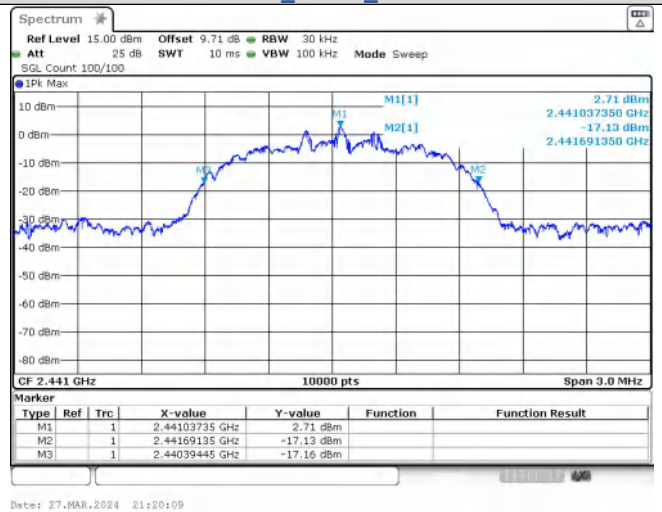
$\pi/4$ DQPSK_2-DH5_Channel 39



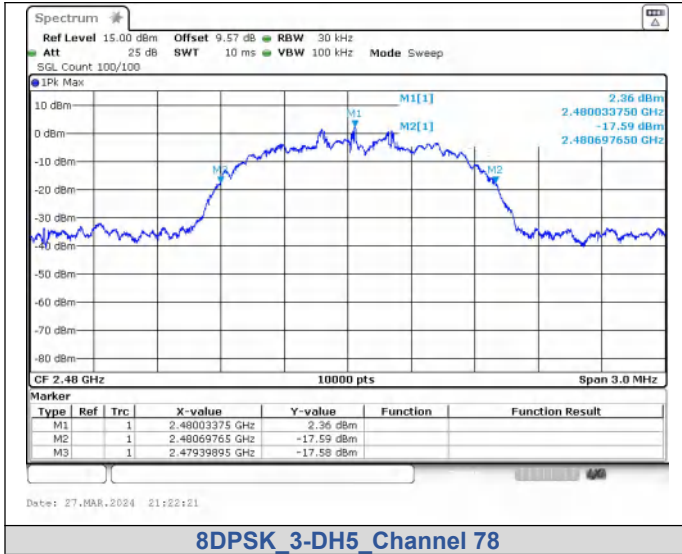
$\pi/4$ DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39

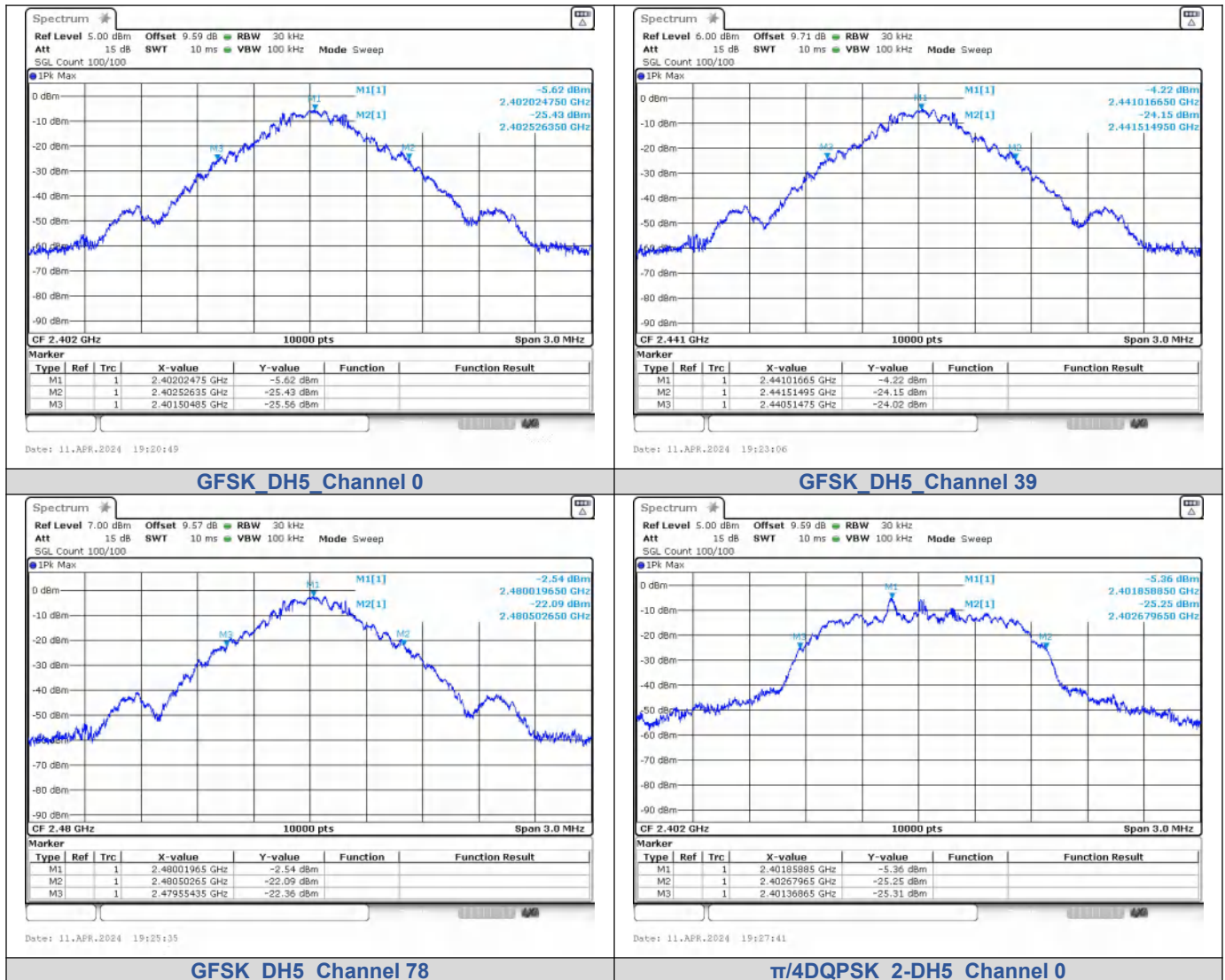


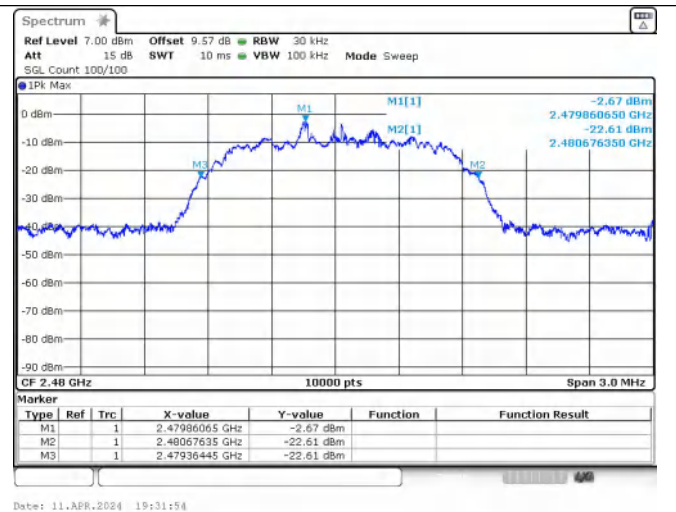
Right

Test Result

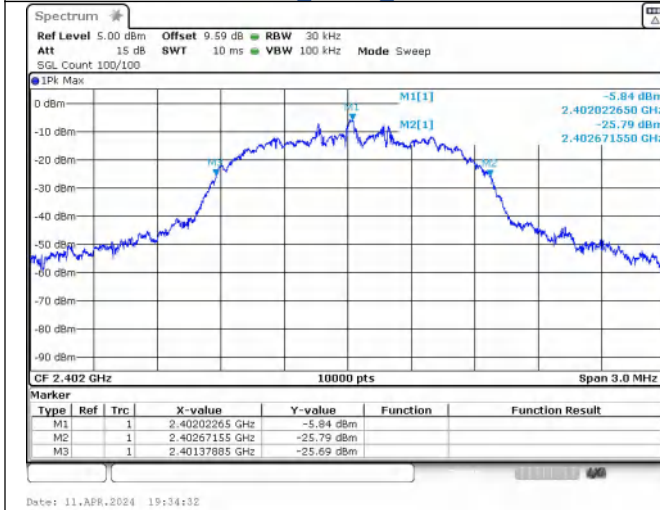
Modulation	Channel	Center Frequency (MHz)	20 dB Bandwidth (MHz)
GFSK	0	2402 MHz	1.030
	39	2441 MHz	1.000
	78	2480 MHz	0.9500
$\pi/4$ DQPSK	0	2402 MHz	1.310
	39	2441 MHz	1.320
	78	2480 MHz	1.320
8DPSK	0	2402 MHz	1.290
	39	2441 MHz	1.290
	78	2480 MHz	1.300

Test Graphs

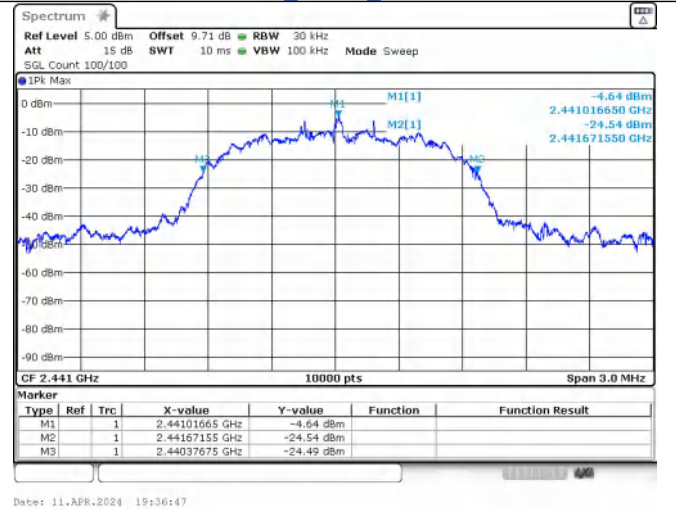




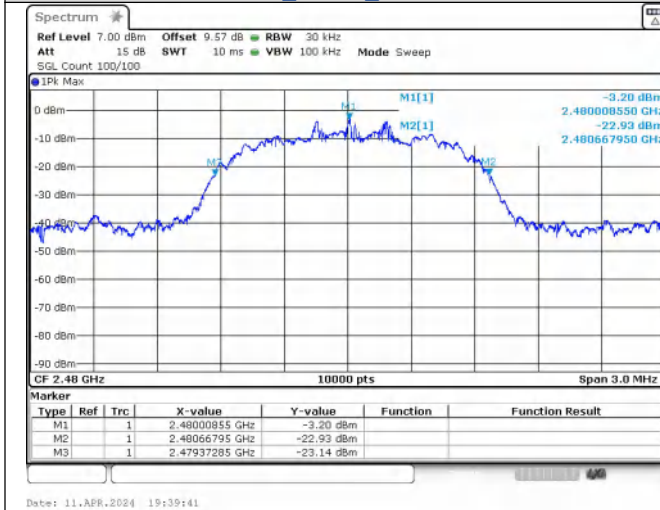
$\pi/4$ DQPSK_2-DH5_Channel 39



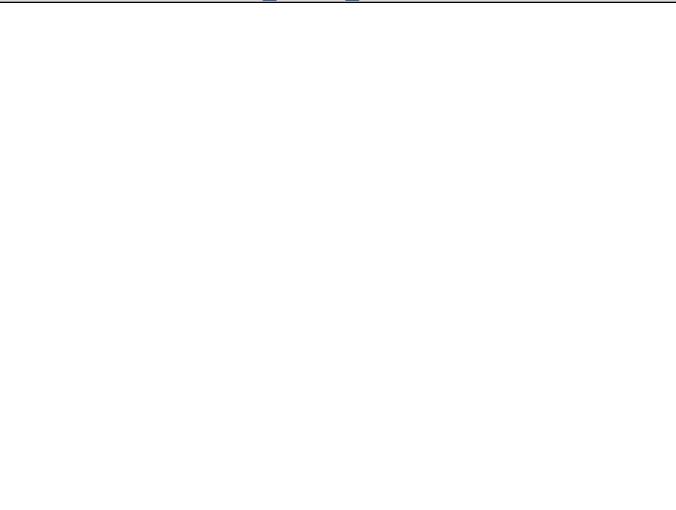
$\pi/4$ DQPSK_2-DH5_Channel 78



8DPSK_3-DH5_Channel 0



8DPSK_3-DH5_Channel 39



8DPSK_3-DH5_Channel 78



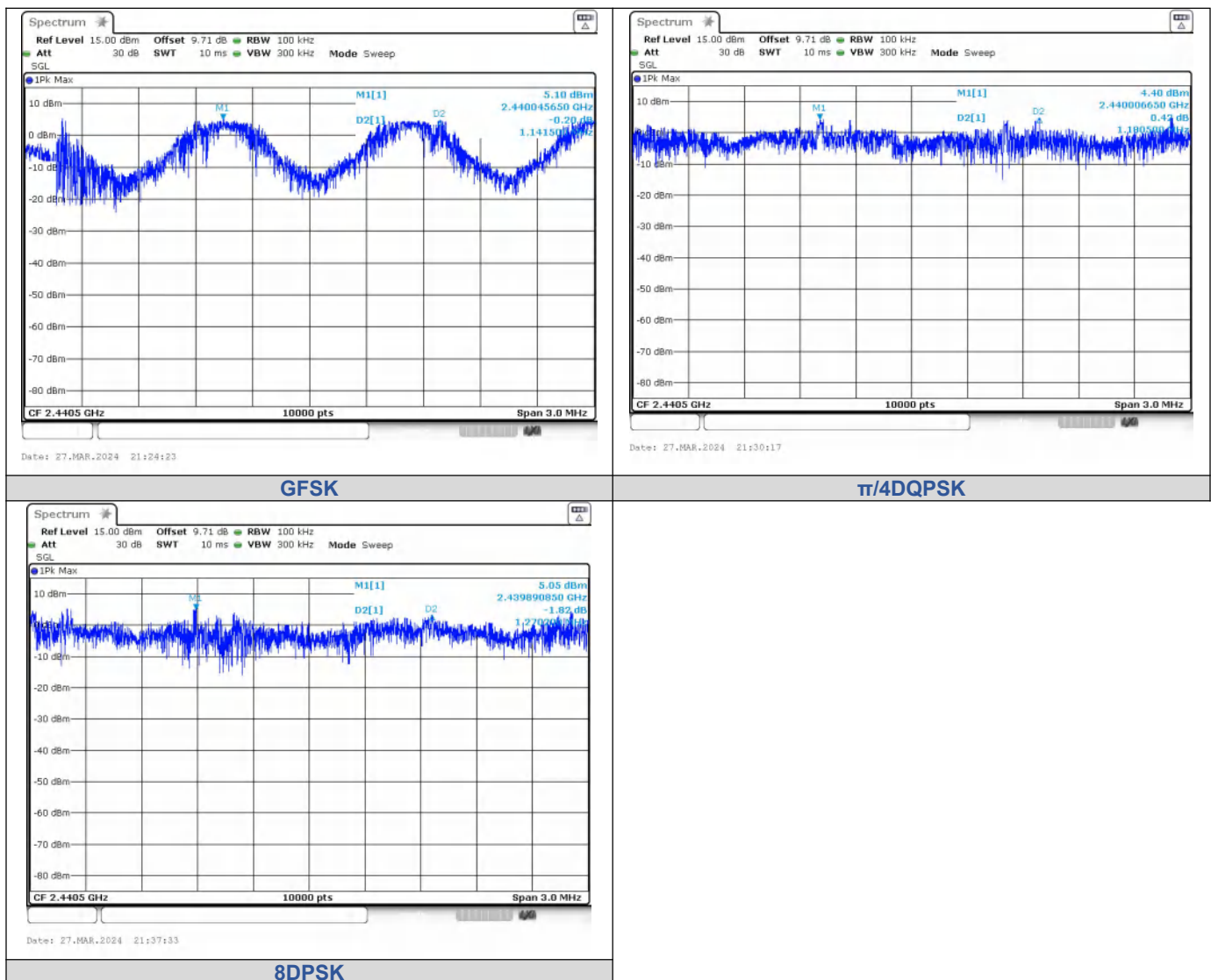
Carrier Frequencies Separation

Test Result

Left

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.0457	2441.1872	1.1415	0.627	PASS
$\pi/4$ DQPSK	2-DH5	2440.0066	2441.1872	1.1805	0.853	PASS
8DPSK	3-DH5	2439.8908	2441.1611	1.2702	0.86	PASS

Test Graphs

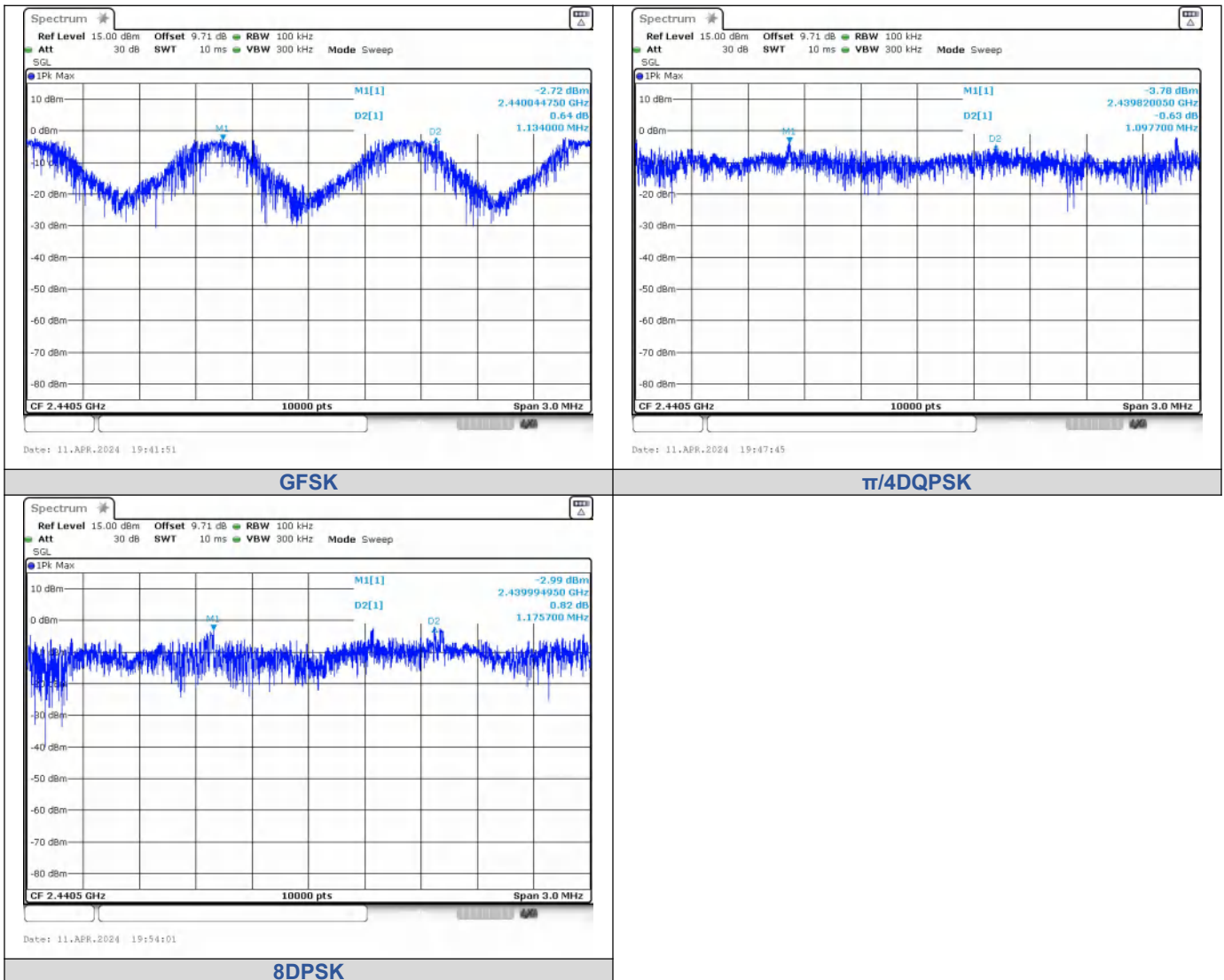


Right

Test Result

Modulation	Packet	Left Center frequency (MHz)	Right Center frequency (MHz)	Hopping Frequency Separation (MHz)	Limit (MHz)	Result
GFSK	DH5	2440.0448	2441.1788	1.1340	0.687	PASS
$\pi/4$ DQPSK	2-DH5	2439.82	2440.9178	1.0977	0.873	PASS
8DPSK	3-DH5	2439.9949	2441.1707	1.1757	0.86	PASS

Test Graphs



Conducted Out Of Band Emission

Test Result

Left

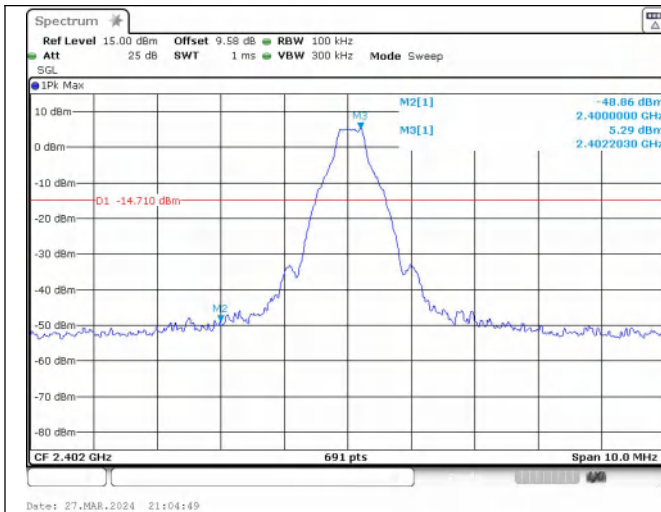
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-48.860	-14.71	-34.150	PASS
			7205.96	-37.743	-14.71	-23.033	PASS
		39	7323.32	-37.336	-14.95	-22.386	PASS
		78	2483.50	-51.047	-14.82	-36.227	PASS
			7439.85	-38.381	-14.82	-23.561	PASS
$\pi/4$ DQPSK	2-DH5	0	2400.00	-45.223	-14.68	-30.543	PASS
			7205.96	-42.515	-14.68	-27.835	PASS
		39	9764.55	-38.192	-14.9	-23.292	PASS
		78	2483.50	-52.315	-14.96	-37.355	PASS
			9920.20	-40.148	-14.96	-25.188	PASS
8DPSK	3-DH5	0	2400.00	-46.805	-15.06	-31.745	PASS
			7206.79	-37.142	-15.06	-22.082	PASS
		39	7323.32	-38.520	-14.91	-23.610	PASS
		78	2483.50	-51.164	-14.91	-36.254	PASS
			9920.20	-40.582	-14.91	-25.672	PASS

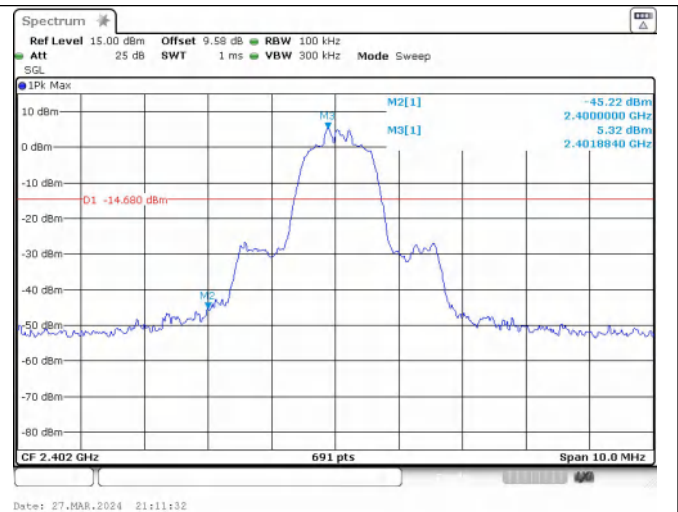
Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2398.22	-50.004	-14.9	-35.104	PASS
			2400.00	-52.216	-14.9	-37.316	PASS
			2483.50	-51.792	-14.91	-36.882	PASS
			2397.32	-49.651	-14.79	-34.861	PASS
			2400.00	-52.036	-14.79	-37.246	PASS
			2483.50	-51.633	-14.88	-36.753	PASS
π/4DQPSK	2-DH5		2395.66	-49.734	-14.75	-34.984	PASS
			2400.00	-51.421	-14.75	-36.671	PASS
			2483.50	-51.345	-14.92	-36.425	PASS
			2397.66	-48.525	-15.07	-33.455	PASS
			2400.00	-49.881	-15.07	-34.811	PASS
			2483.50	-50.478	-14.9	-35.578	PASS
8DPSK	3-DH5		2398.13	-49.513	-15.34	-34.173	PASS
			2400.00	-50.138	-15.34	-34.798	PASS
			2483.50	-51.904	-16.34	-35.564	PASS
			2397.21	-49.962	-15.05	-34.912	PASS
			2400.00	-51.587	-15.05	-36.537	PASS
			2483.50	-51.246	-14.78	-36.466	PASS

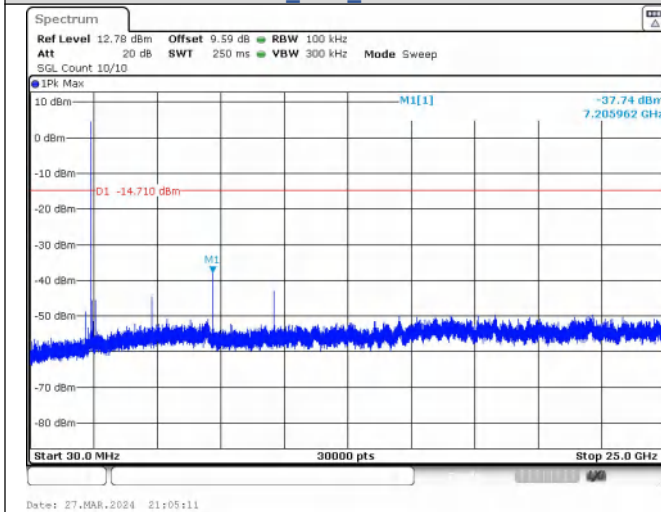
Test Graphs



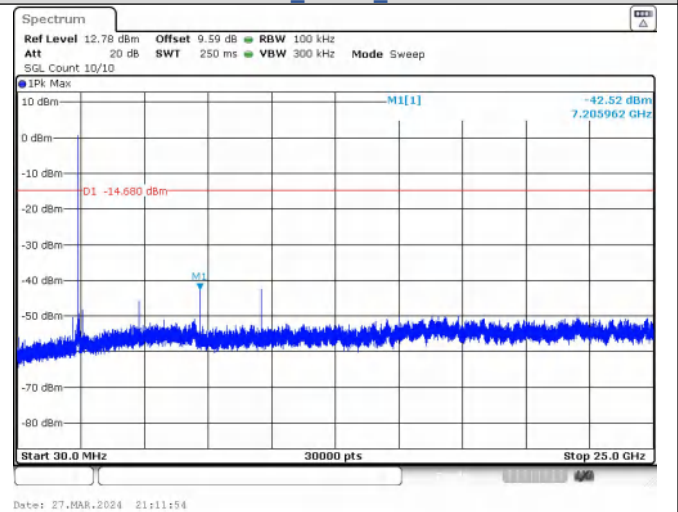
**Out Of Band Emission
GFSK_DH5_Channel 0**



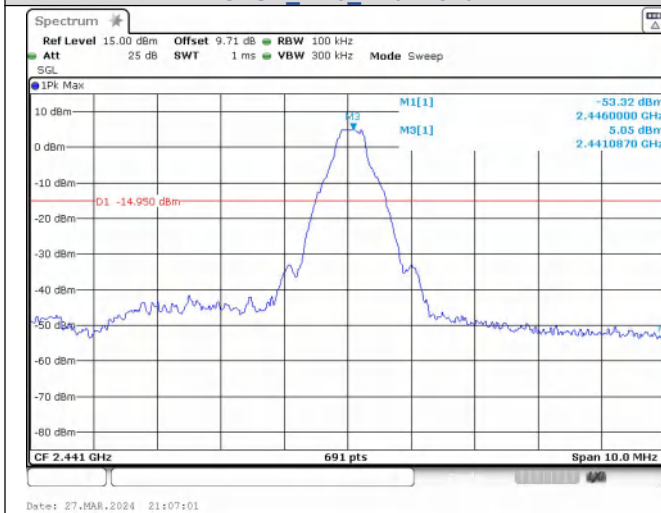
**Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 0**



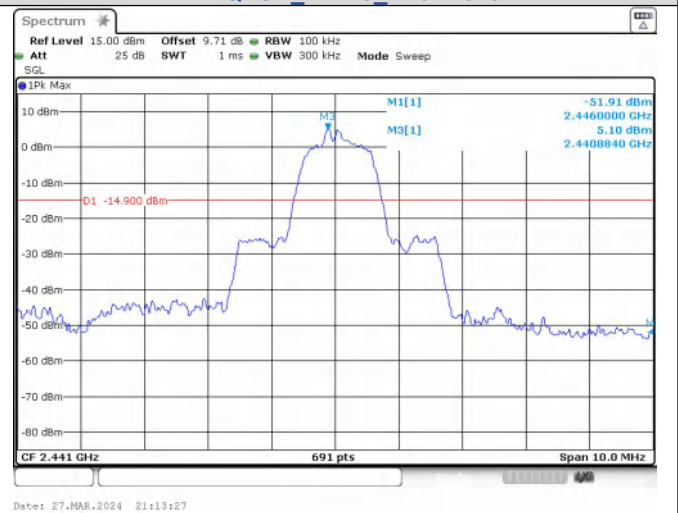
**Spurious Emission
GFSK_DH5_Channel 0**



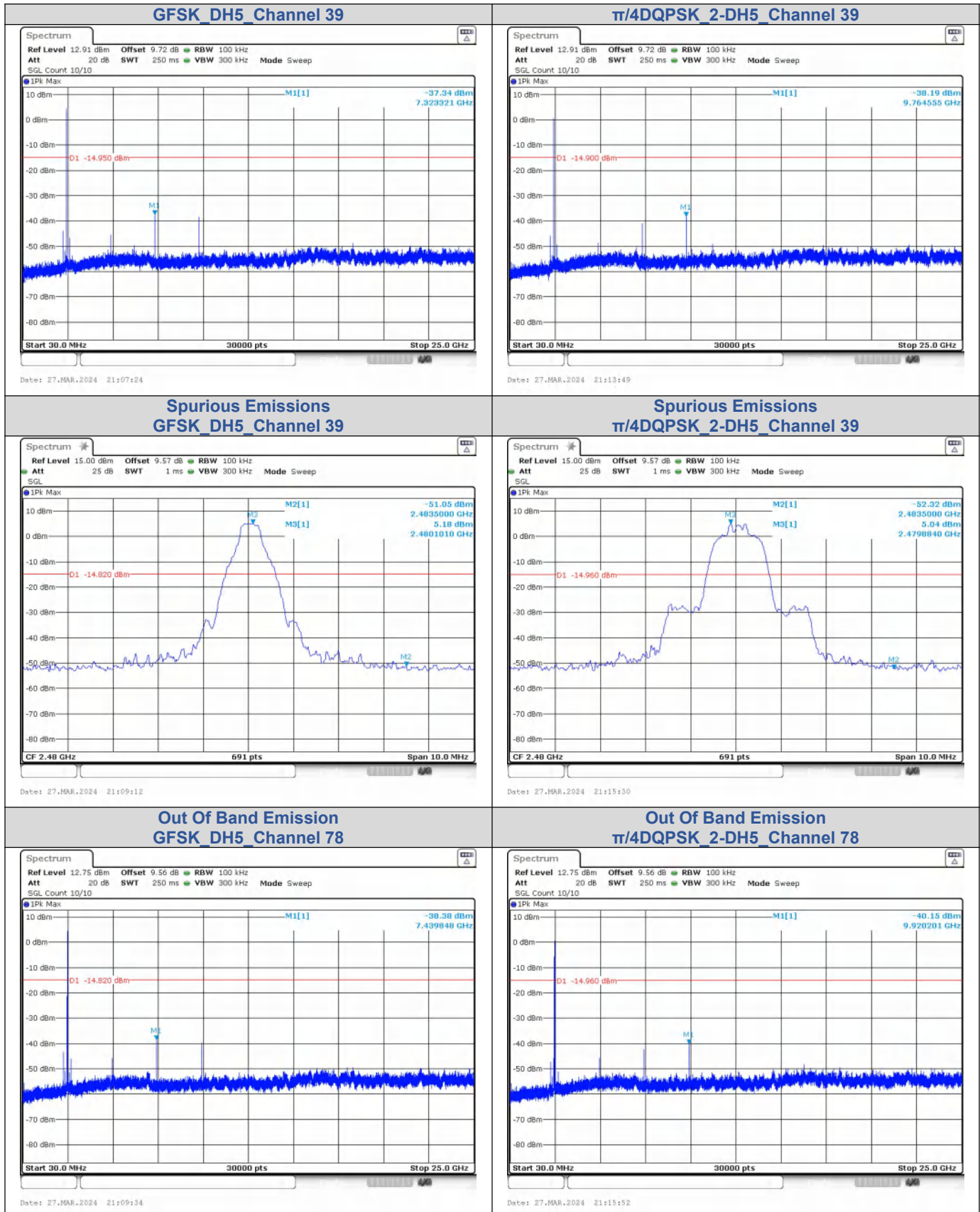
**Spurious Emission
 $\pi/4$ DQPSK_2-DH5_Channel 0**



Out Of Band Emission

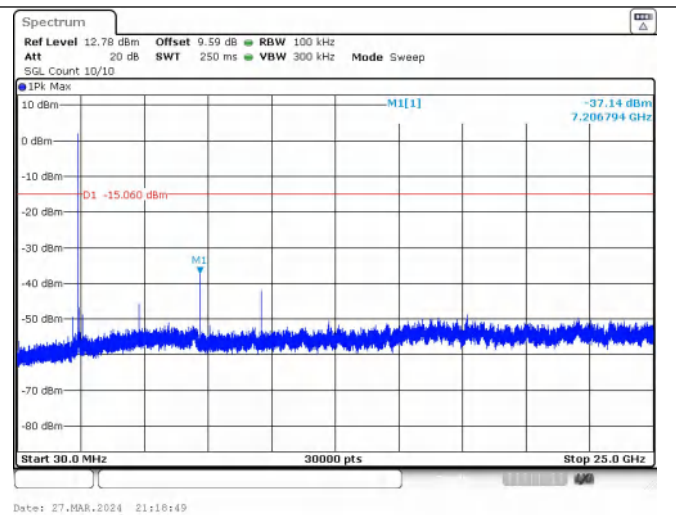
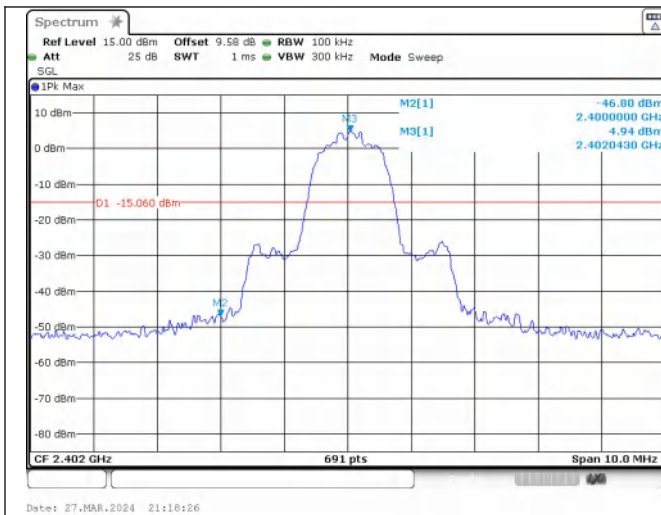


Out Of Band Emission



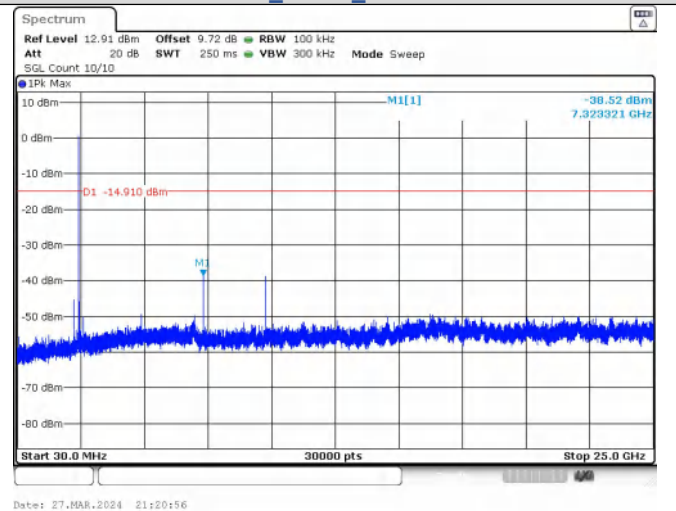
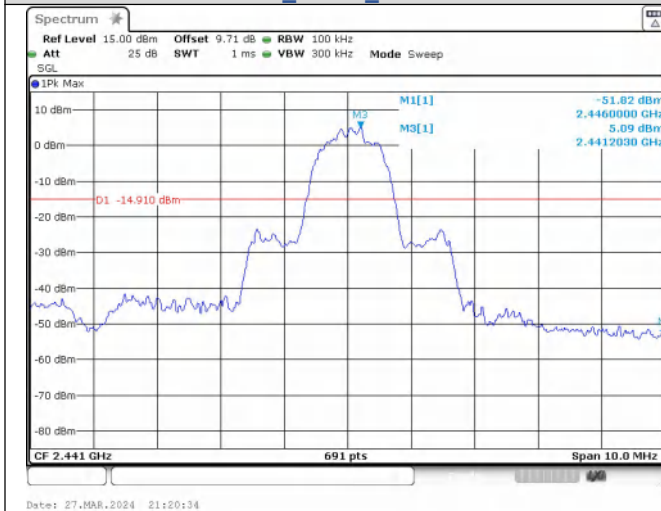
Spurious Emission
GFSK_DH5_Channel 78

Spurious Emission
 $\pi/4$ DQPSK_2-DH5_Channel 78



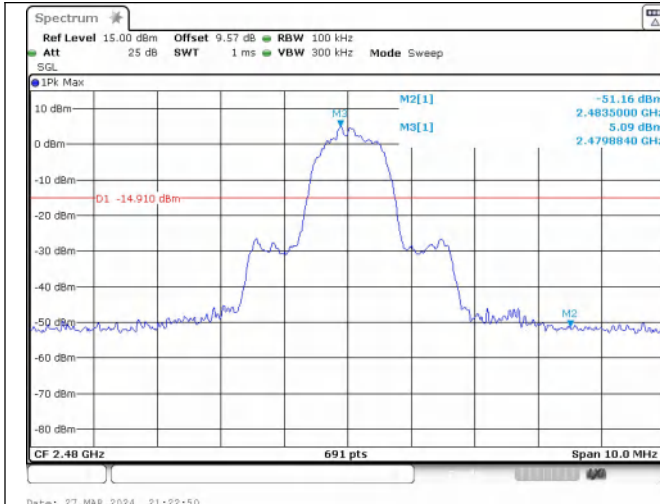
Out Of Band Emission
8DPSK_3-DH5_Channel 0

Spurious Emission
8DPSK_3-DH5_Channel 0

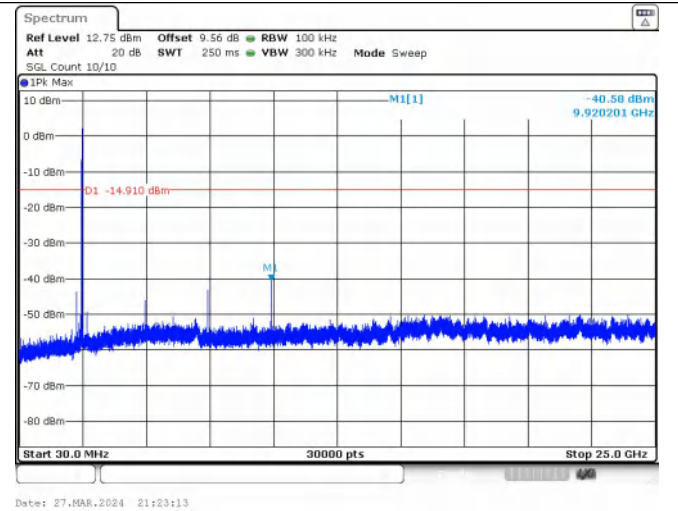


Out Of Band Emission
8DPSK_3-DH5_Channel 39

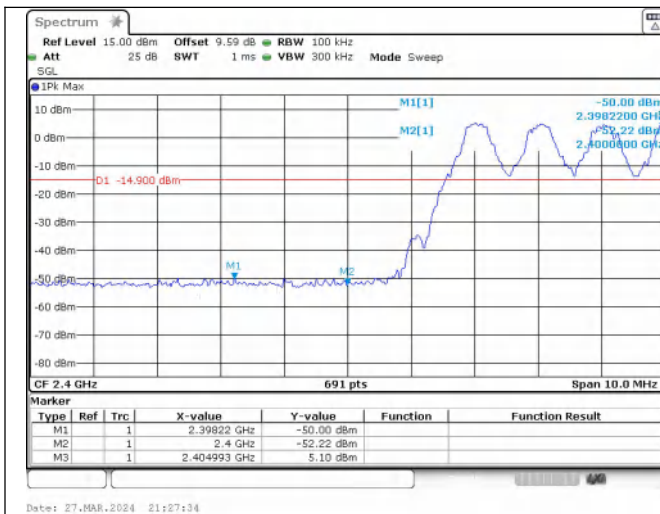
Spurious Emissions
8DPSK_3-DH5_Channel 39



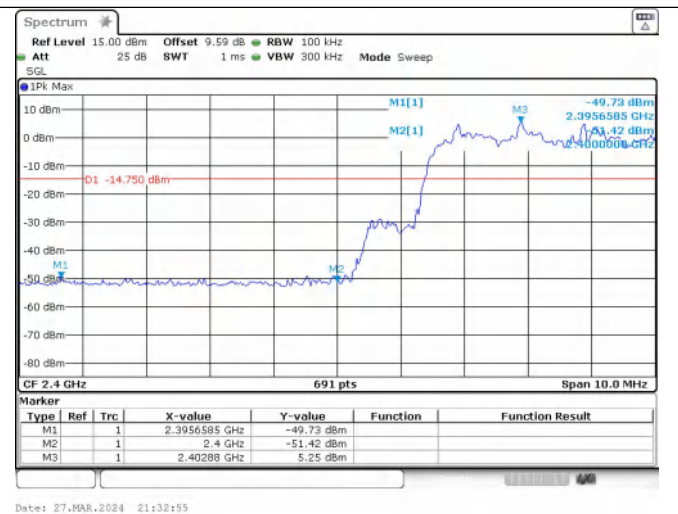
**Out Of Band Emission
8DPSK_3-DH5_Channel 78**



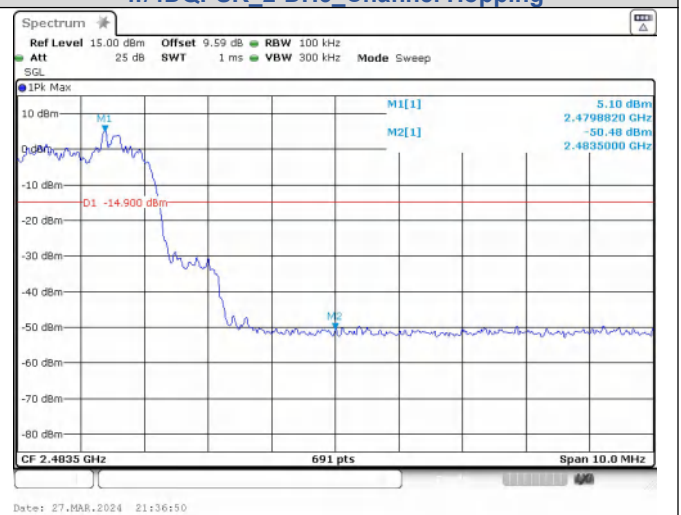
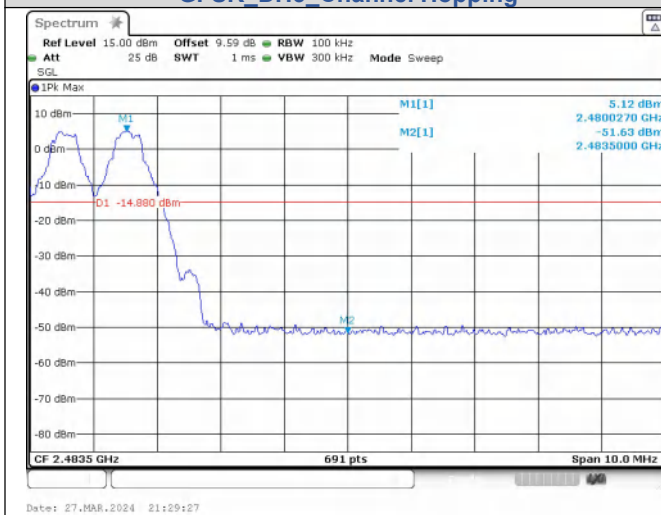
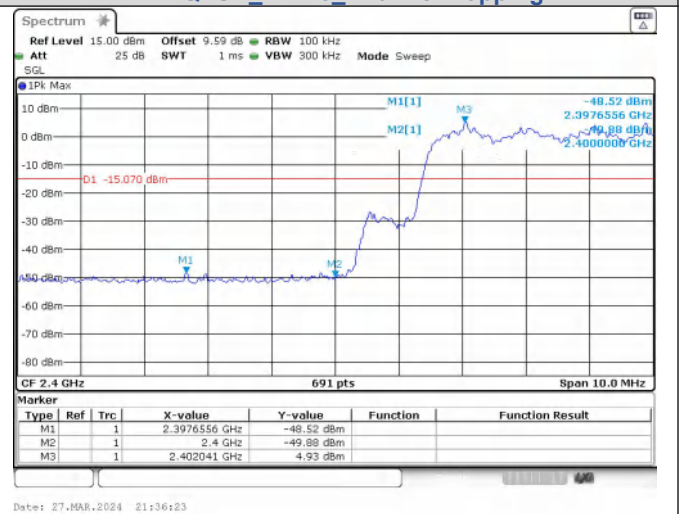
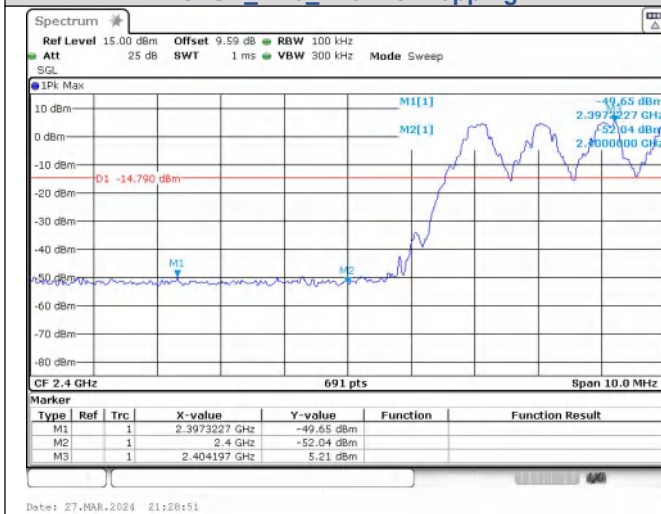
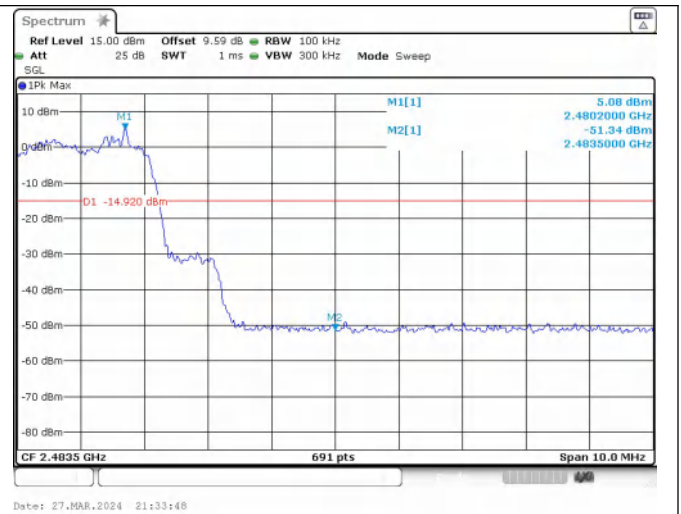
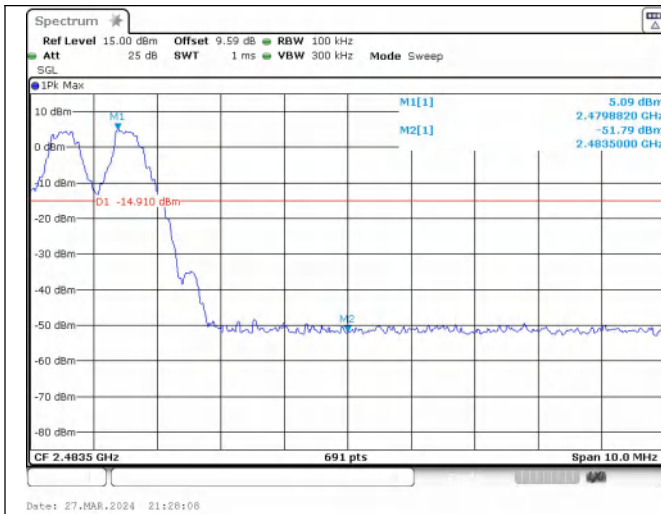
**Spurious Emission
8DPSK_3-DH5_Channel 78**



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



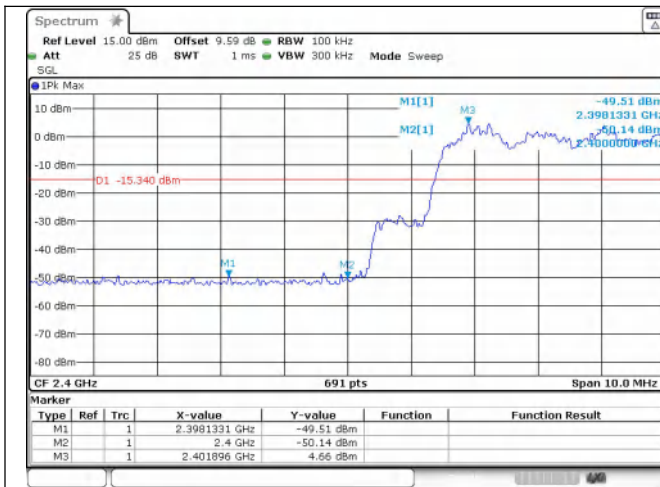
**Out Of Band Emission(Left)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping**



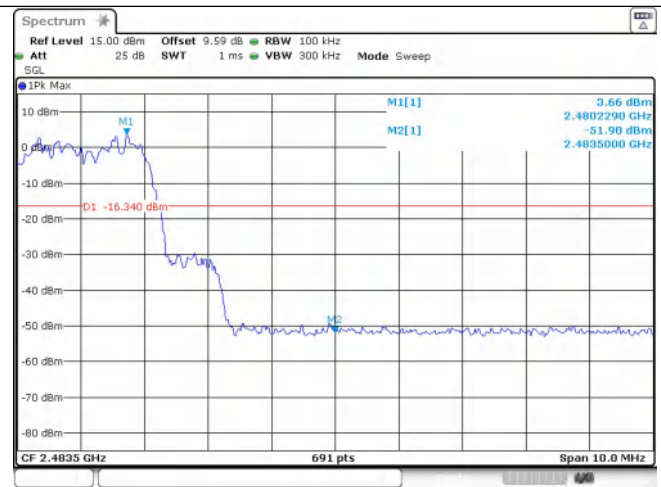
Out Of Band Emission(Right)

Out Of Band Emission(Right)

GFSK_DH5_Channel Hopping

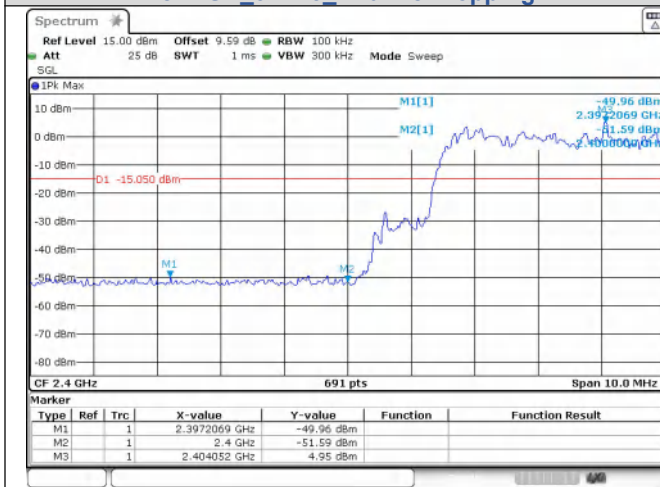
 $\pi/4$ DQPSK_2-DH5_Channel Hopping


Date: 27.MAR.2024 21:40:49

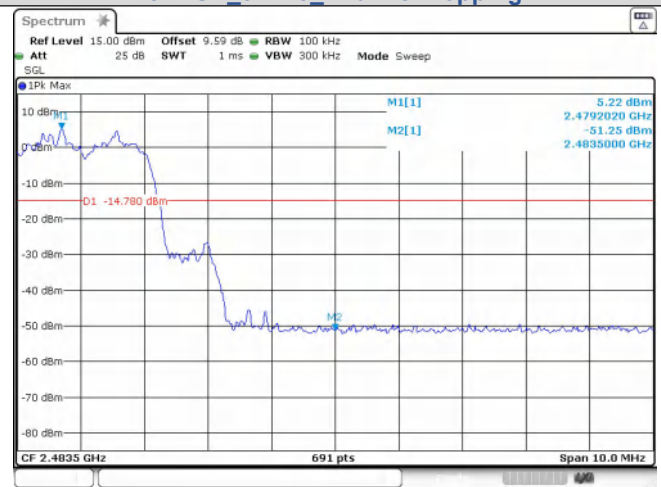


Date: 27.MAR.2024 21:41:12

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

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


Date: 27.MAR.2024 21:42:27



Date: 27.MAR.2024 21:43:23

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

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

Right

Test Result

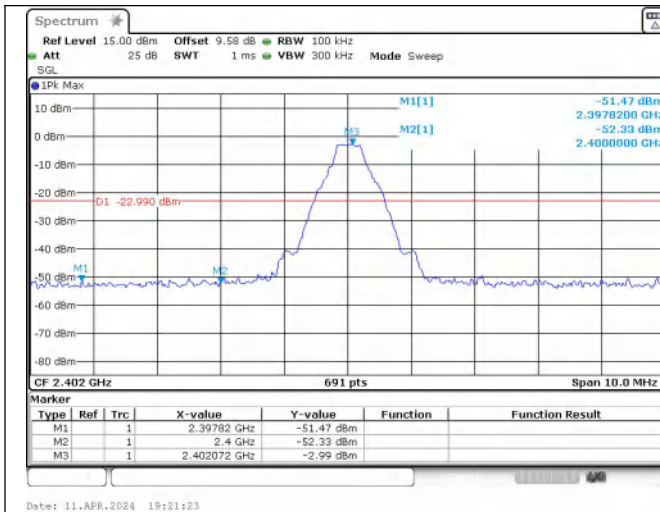
Non-Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	0	2400.00	-52.328	-22.99	-29.338	PASS
			2397.82	-51.473	-22.99	-28.483	PASS
			9608.10	-40.674	-22.99	-17.684	PASS
		39	9763.72	-40.119	-21.73	-18.389	PASS
		78	2483.50	-52.154	-19.91	-32.244	PASS
			9920.20	-39.935	-19.91	-20.025	PASS
$\pi/4$ DQPSK	2-DH5	0	2400.00	-51.537	-23.05	-28.487	PASS
			9608.08	-40.824	-23.05	-17.774	PASS
		39	9763.72	-40.147	-21.97	-18.177	PASS
		78	2483.50	-51.943	-20.17	-31.773	PASS
			9920.20	-40.416	-20.17	-20.246	PASS
8DPSK	3-DH5	0	2400.00	-52.343	-23.25	-29.093	PASS
			2398.57	-50.333	-23.25	-27.083	PASS
			9608.10	-41.308	-23.25	-18.058	PASS
		39	9763.72	-40.219	-22.17	-18.049	PASS
		78	2483.50	-50.985	-20.3	-30.685	PASS
			9920.20	-40.384	-20.3	-20.084	PASS

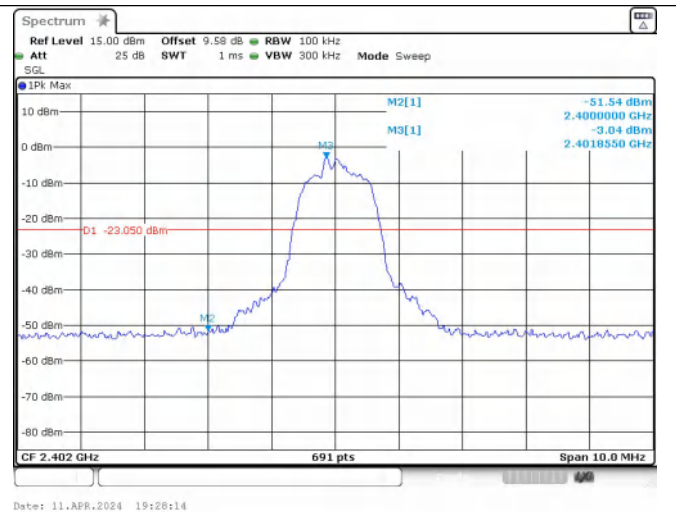
Hopping

Modulation	Packet	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
GFSK	DH5	Hopping	2398.58	-50.698	-23.02	-27.678	PASS
			2400.00	-51.172	-23.02	-28.152	PASS
			2483.50	-51.533	-20.4	-31.133	PASS
			2397.13	-48.817	-22.98	-25.837	PASS
			2400.00	-51.246	-22.98	-28.266	PASS
			2483.50	-52.004	-20.35	-31.654	PASS
π/4DQPSK	2-DH5		2396.64	-49.683	-23.16	-26.523	PASS
			2400.00	-51.714	-23.16	-28.554	PASS
			2483.50	-51.992	-21.76	-30.232	PASS
			2397.74	-50.861	-24.35	-26.511	PASS
			2400.00	-50.891	-24.35	-26.541	PASS
			2483.50	-52.036	-20.9	-31.136	PASS
8DPSK	3-DH5		2396.51	-50.278	-26.18	-24.098	PASS
			2400.00	-50.605	-26.18	-24.425	PASS
			2483.50	-50.712	-22.77	-27.942	PASS
			2398.00	-49.364	-25.25	-24.114	PASS
			2400.00	-52.621	-25.25	-27.371	PASS
			2483.50	-51.870	-20.74	-31.130	PASS

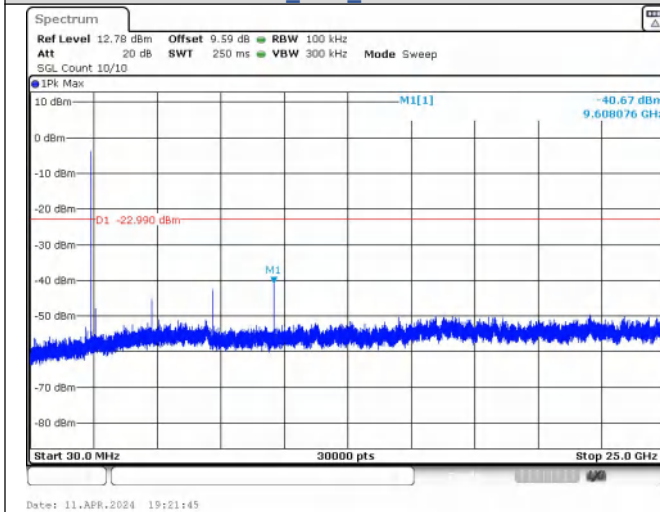
Test Graphs



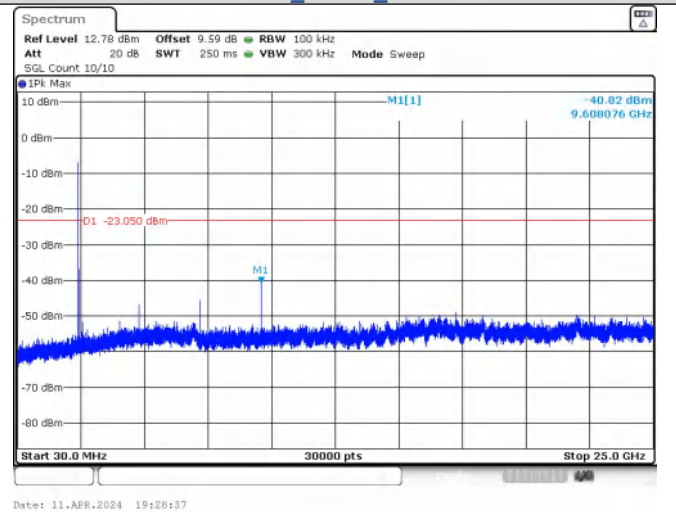
**Out Of Band Emission
GFSK_DH5_Channel 0**



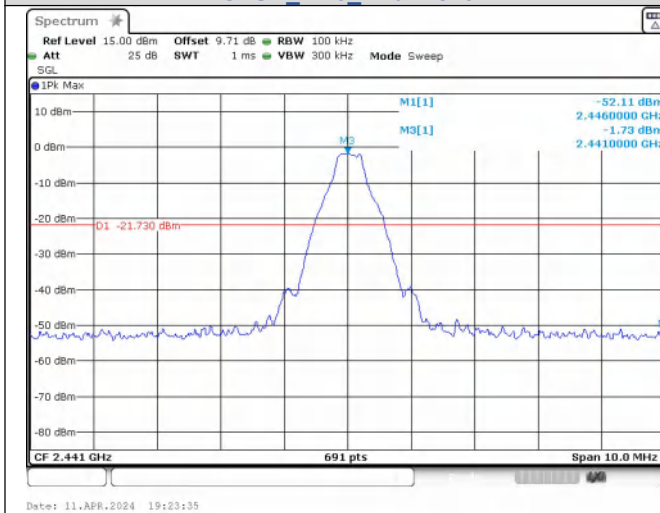
**Out Of Band Emission
 $\pi/4$ DQPSK_2-DH5_Channel 0**



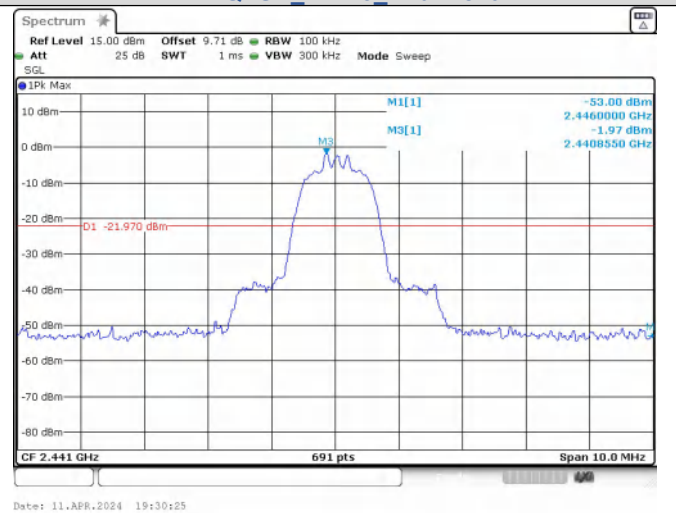
**Spurious Emission
GFSK_DH5_Channel 0**



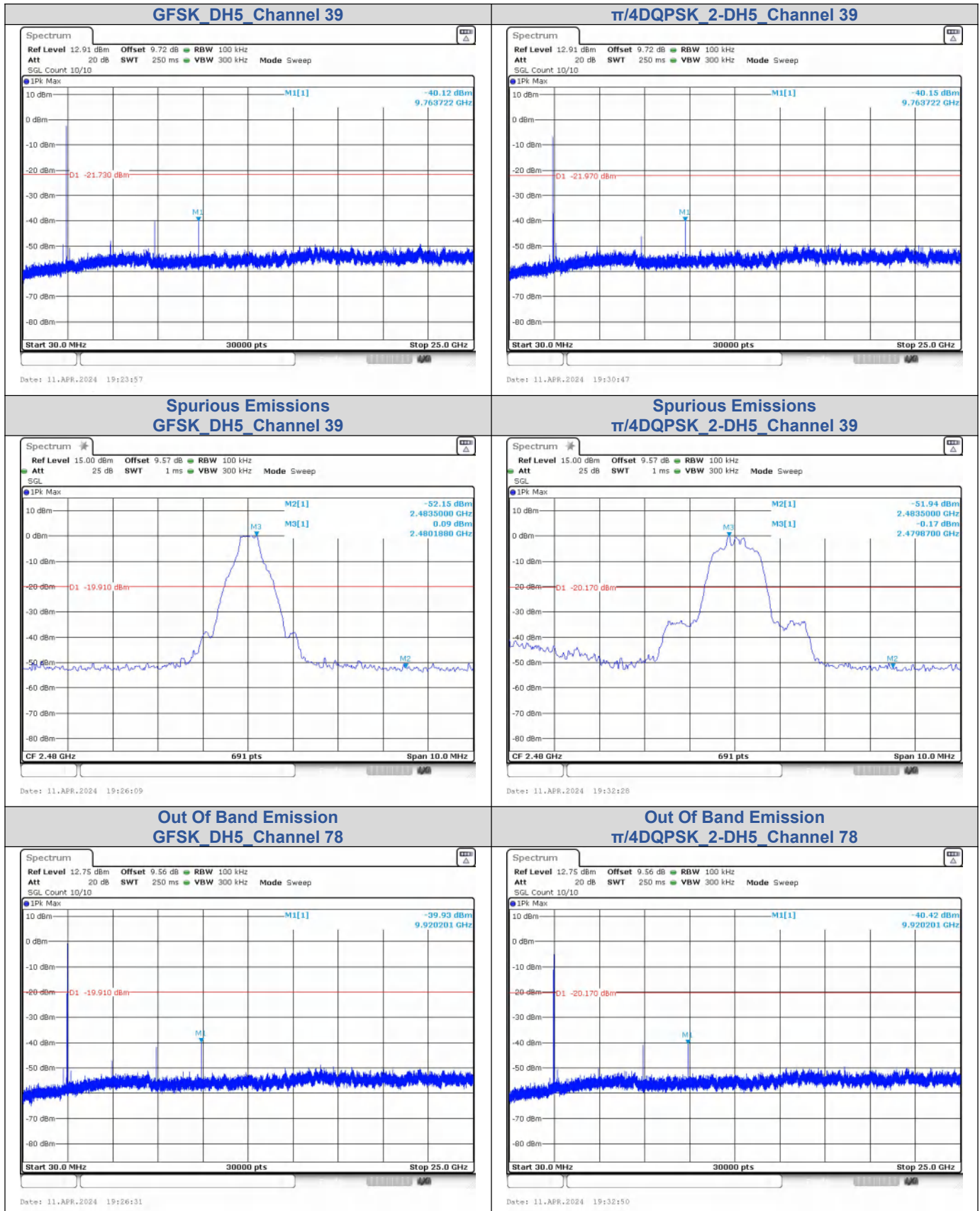
**Spurious Emission
 $\pi/4$ DQPSK_2-DH5_Channel 0**



Out Of Band Emission

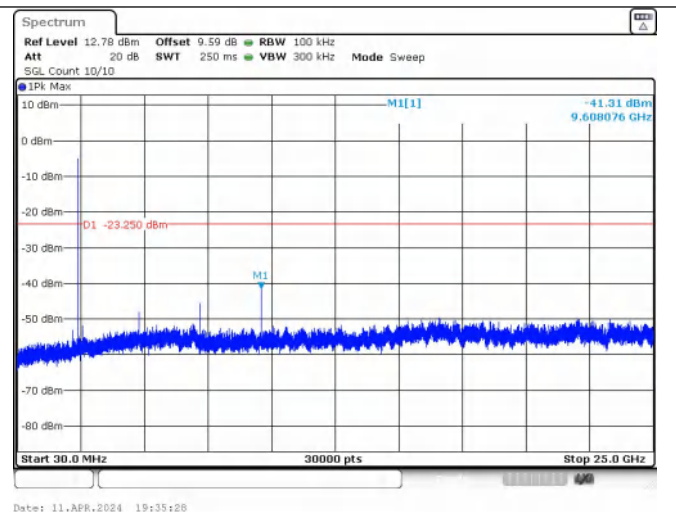
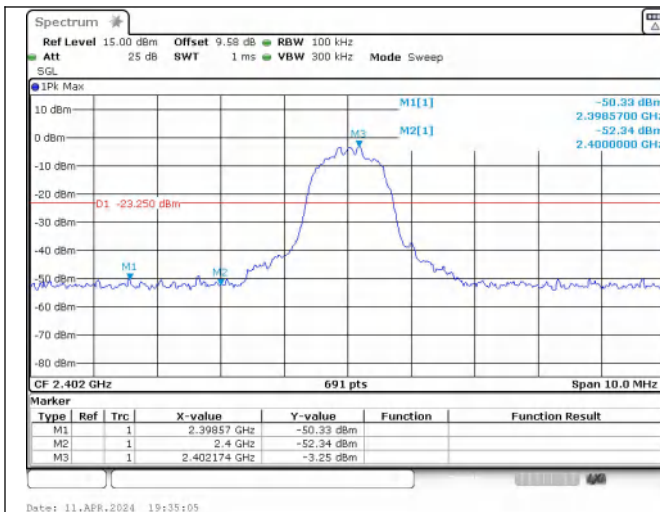


Out Of Band Emission



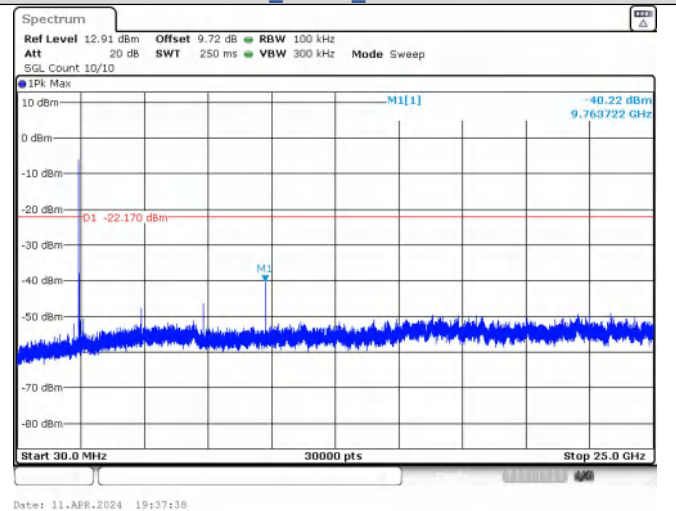
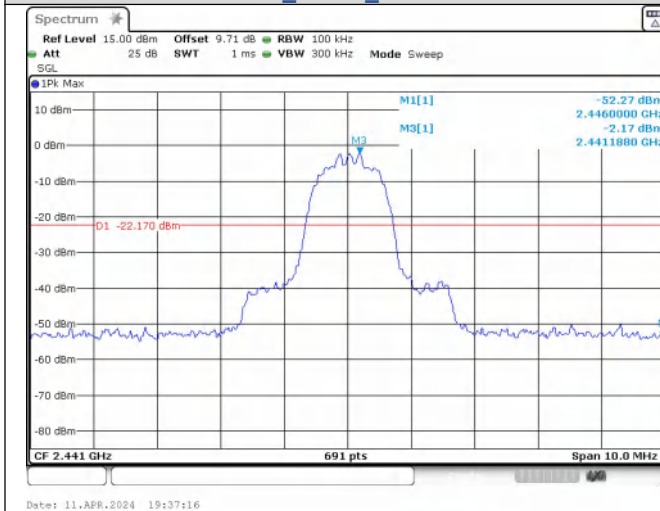
Spurious Emission GFSK_DH5_Channel 78

Spurious Emission $\pi/4$ DQPSK_2-DH5_Channel 78



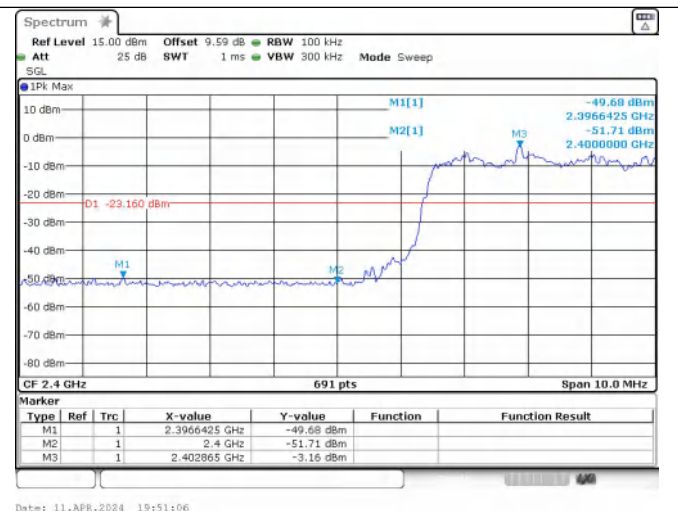
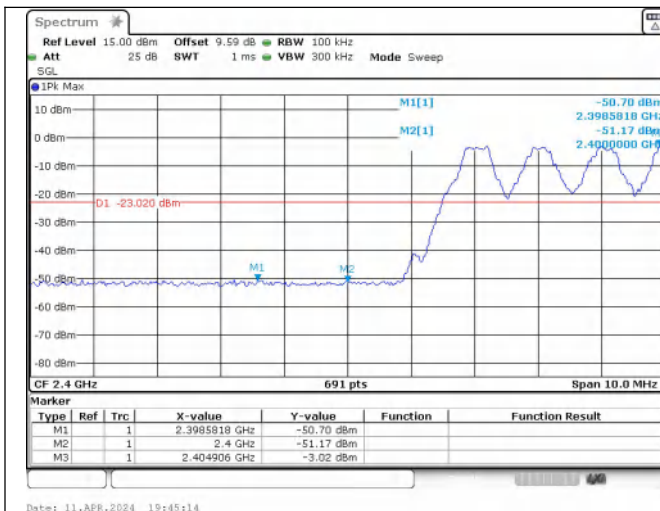
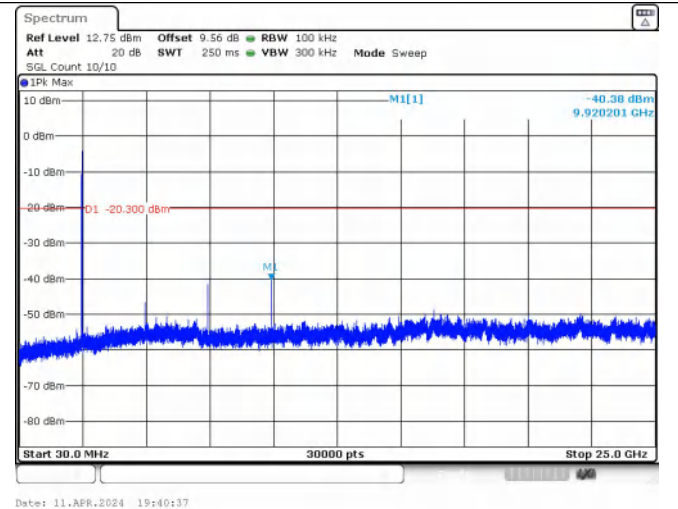
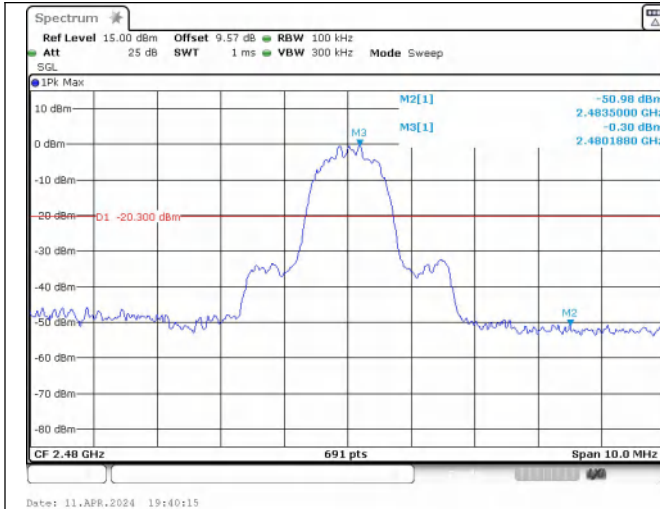
Out Of Band Emission 8DPSK_3-DH5_Channel 0

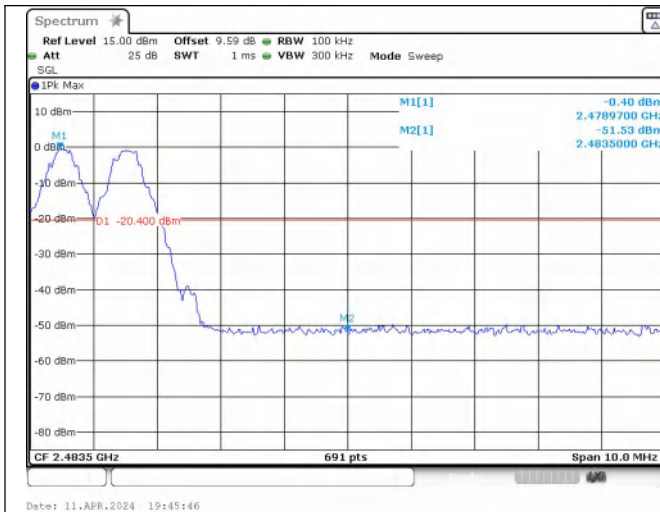
Spurious Emission 8DPSK_3-DH5_Channel 0



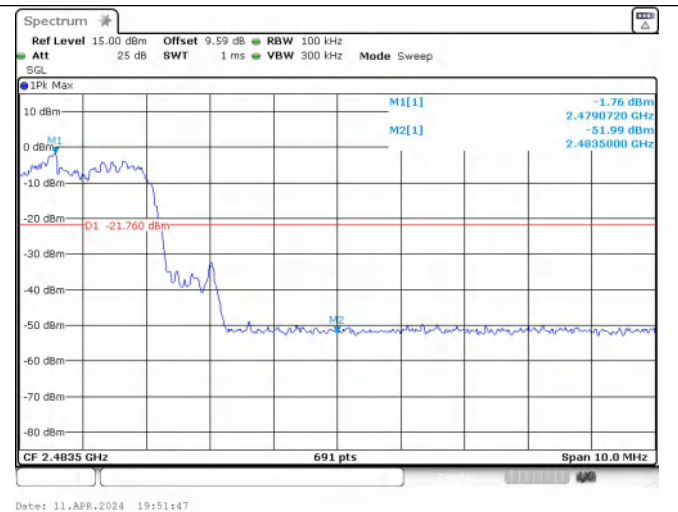
Out Of Band Emission 8DPSK_3-DH5_Channel 39

Spurious Emissions 8DPSK_3-DH5_Channel 39

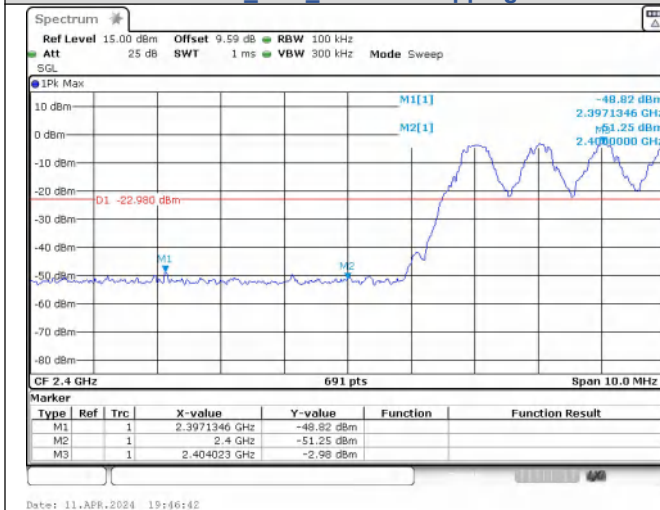




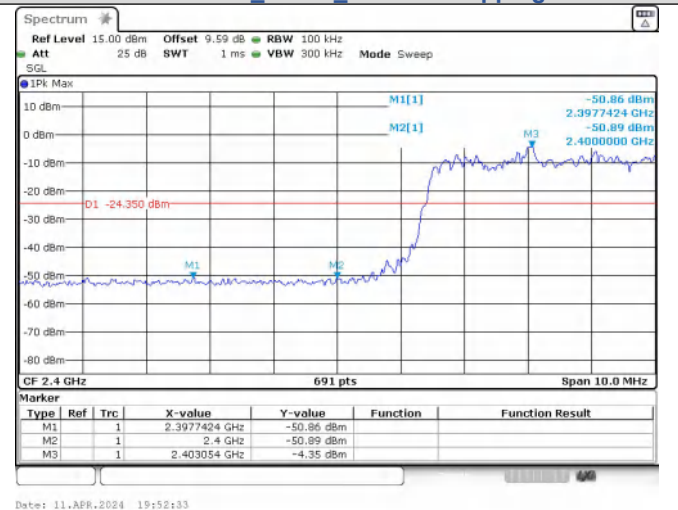
Out Of Band Emission(Right)
GFSK_DH5_Channel Hopping



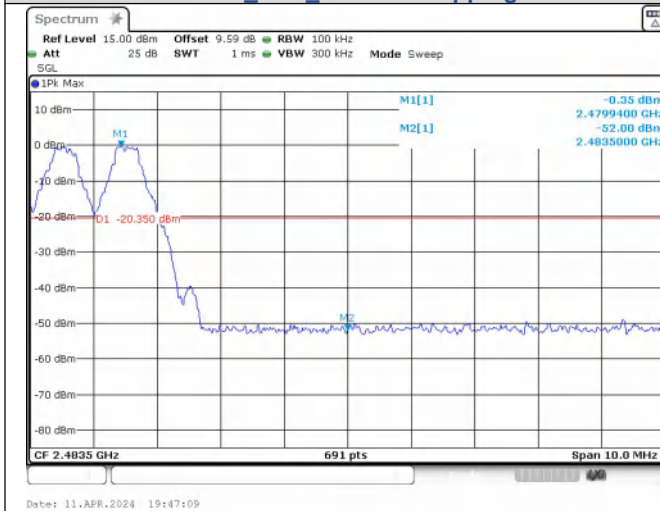
Out Of Band Emission(Right)
 $\pi/4$ DQPSK_2-DH5_Channel Hopping



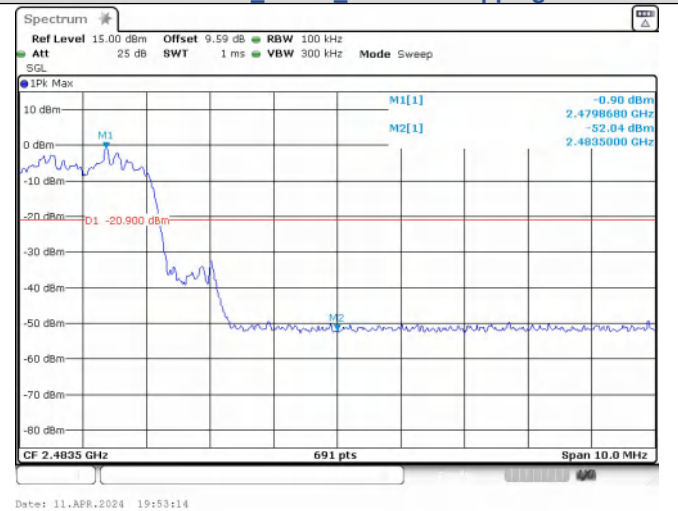
Out Of Band Emission(Left)
GFSK_DH5_Channel Hopping



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



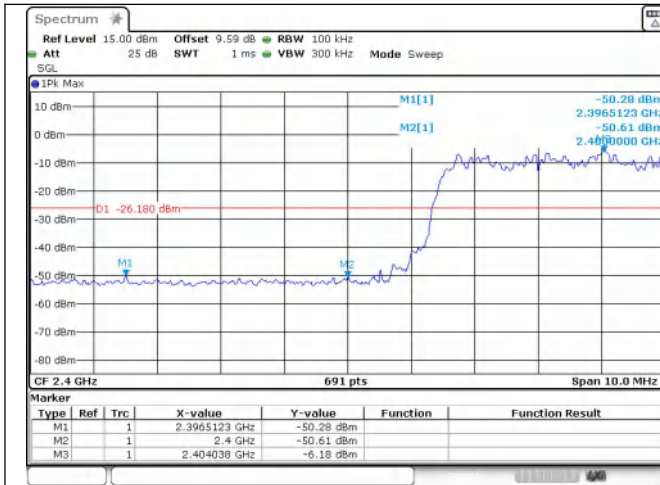
Out Of Band Emission(Right)



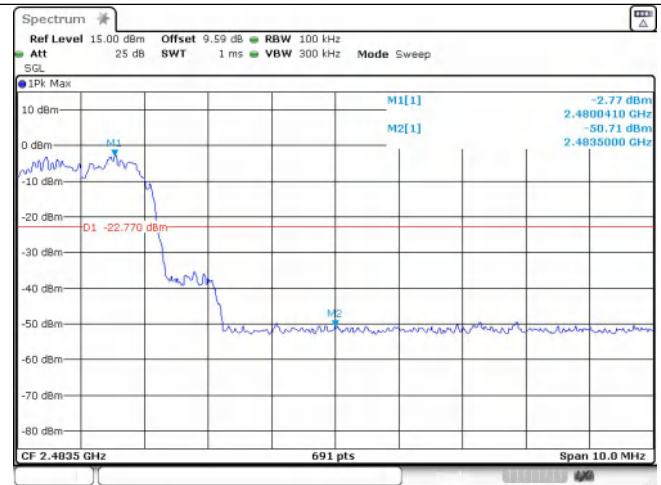
Out Of Band Emission(Right)

GFSK_DH5_Channel Hopping

π /4DQPSK_2-DH5_Channel Hopping



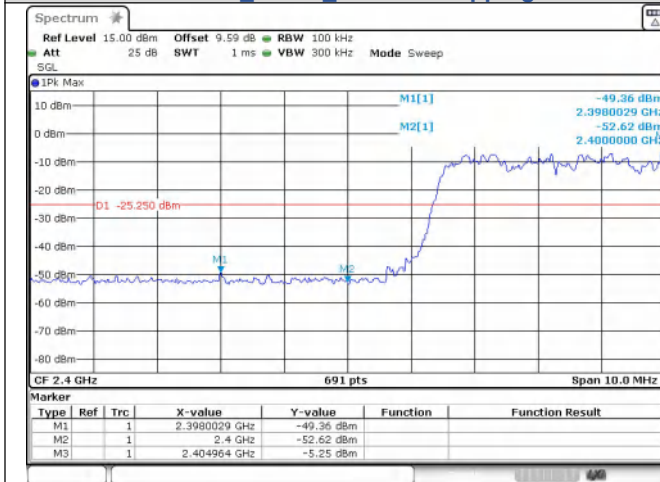
Date: 11.APR.2024 19:56:52



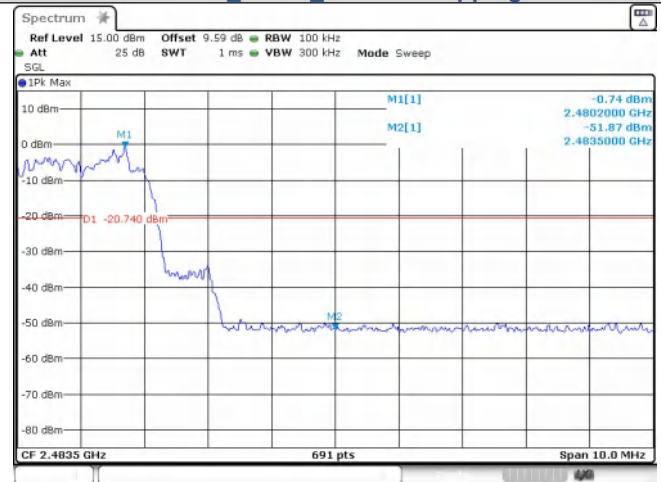
Date: 11.APR.2024 19:57:20

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

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



Date: 11.APR.2024 19:58:24



Date: 11.APR.2024 19:58:57

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

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

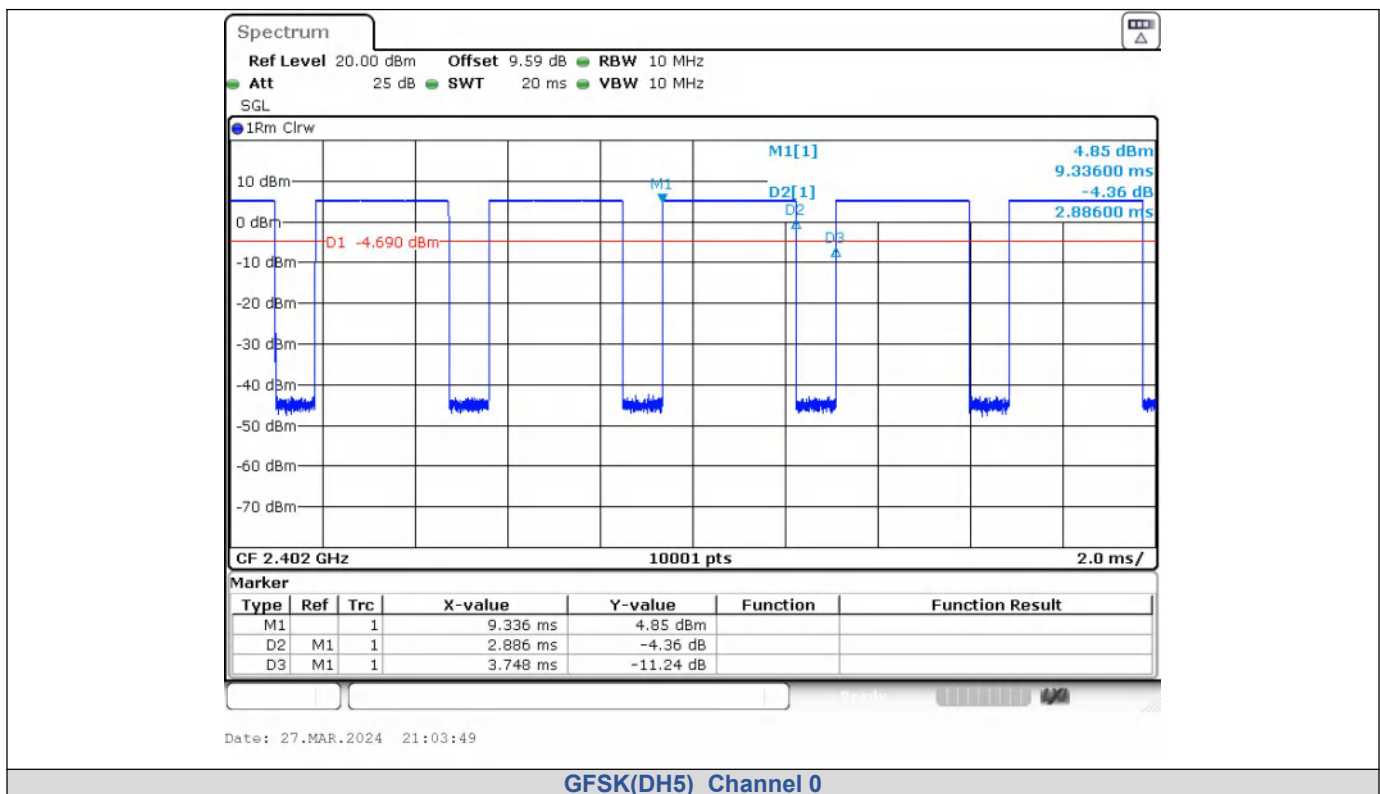
Duty Cycle

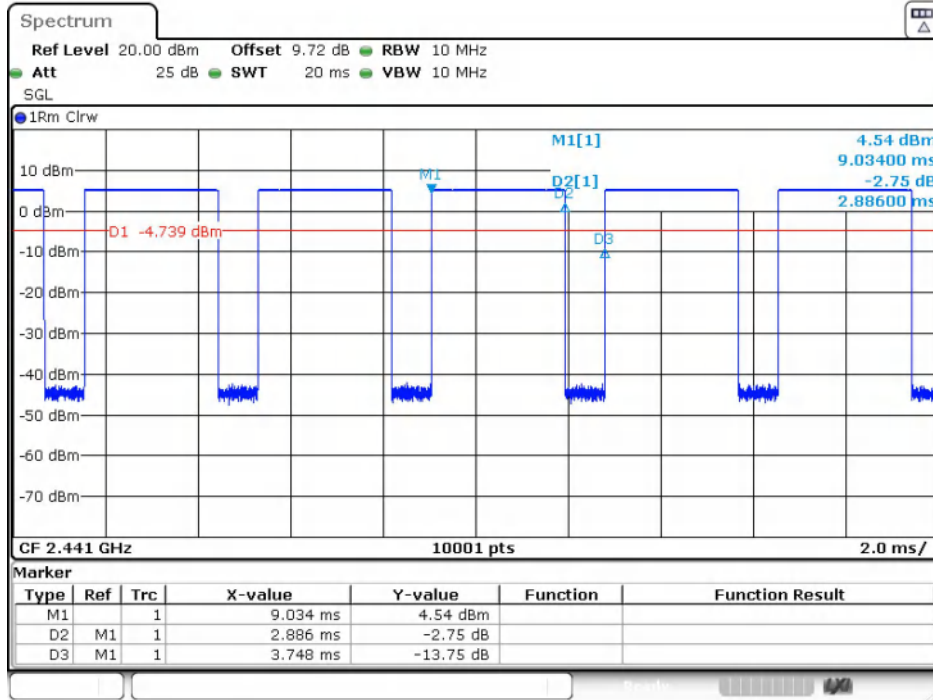
Left

Test Result

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	0.35
		39	2.886	3.748	77.00	0.7700	1.1351	0.35
		78	2.886	3.748	77.00	0.7700	1.1351	0.35
$\pi/4$ DQPSK	2-DH5	0	2.892	3.748	77.16	0.7716	1.1261	0.35
		39	2.890	3.748	77.11	0.7711	1.1289	0.35
		78	2.892	3.748	77.16	0.7716	1.1261	0.35
8DPSK	3-DH5	0	2.894	3.748	77.21	0.7721	1.1233	0.35
		39	2.894	3.748	77.21	0.7721	1.1233	0.35
		78	2.892	3.748	77.16	0.7716	1.1261	0.35

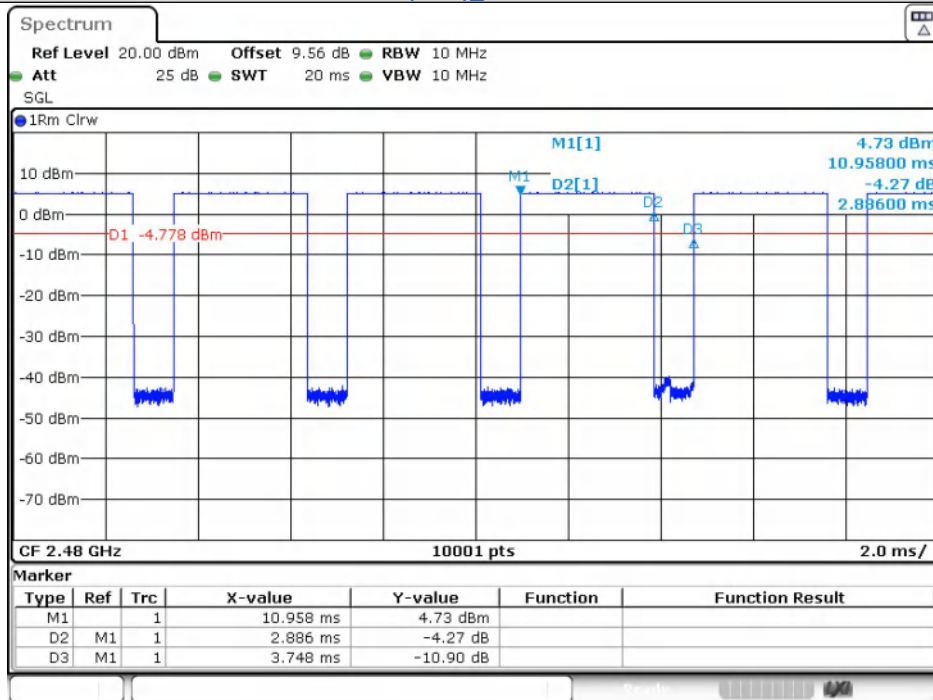
Test Graphs





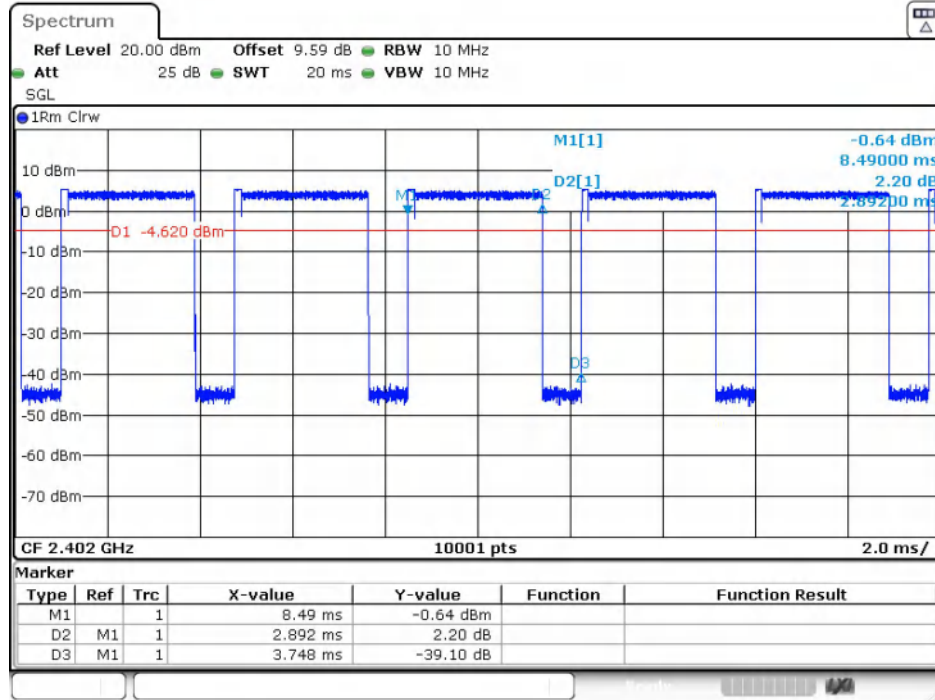
Date: 27.MAR.2024 21:06:07

GFSK(DH5)_Channel 39



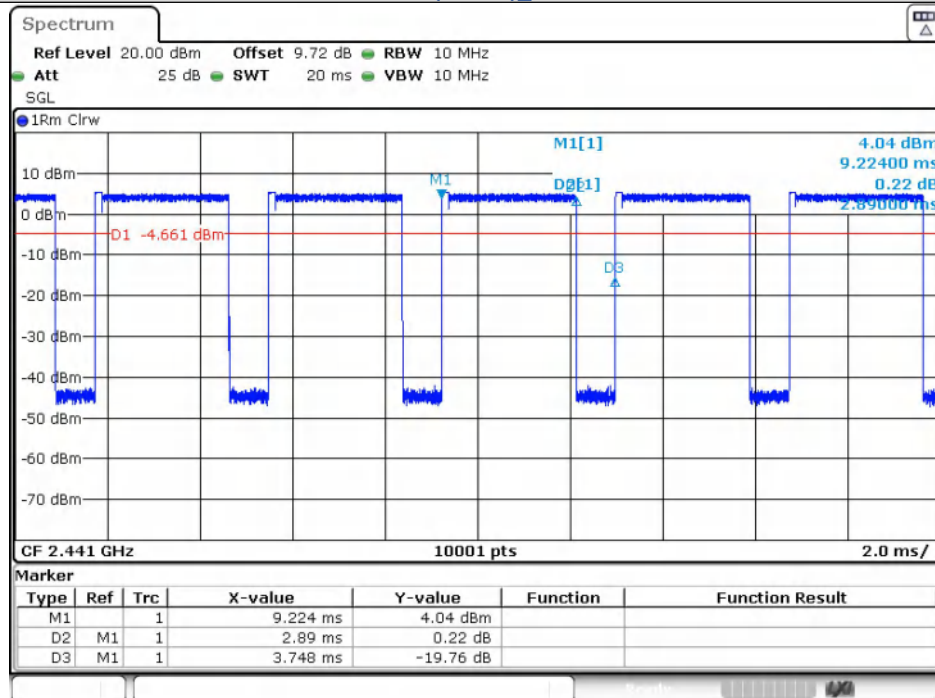
Date: 27.MAR.2024 21:08:12

GFSK(DH5)_Channel 78



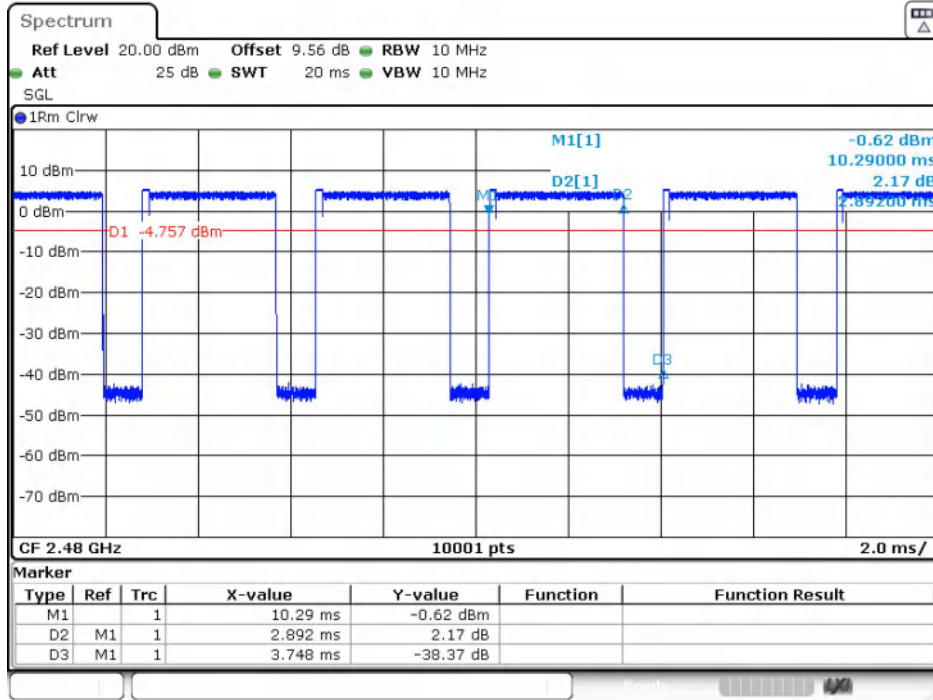
Date: 27.MAR.2024 21:10:32

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



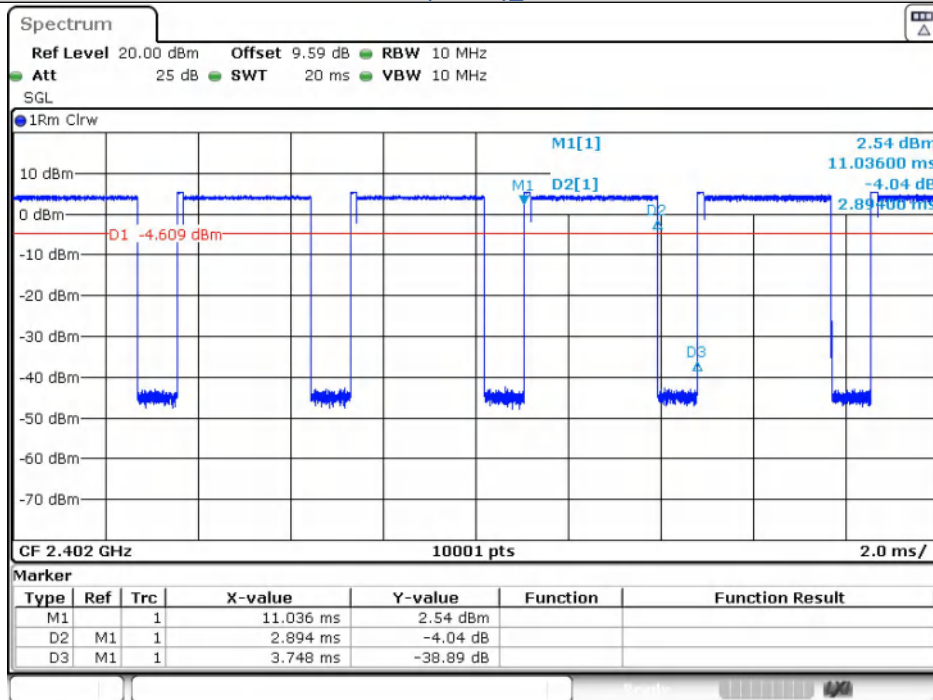
Date: 27.MAR.2024 21:12:32

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



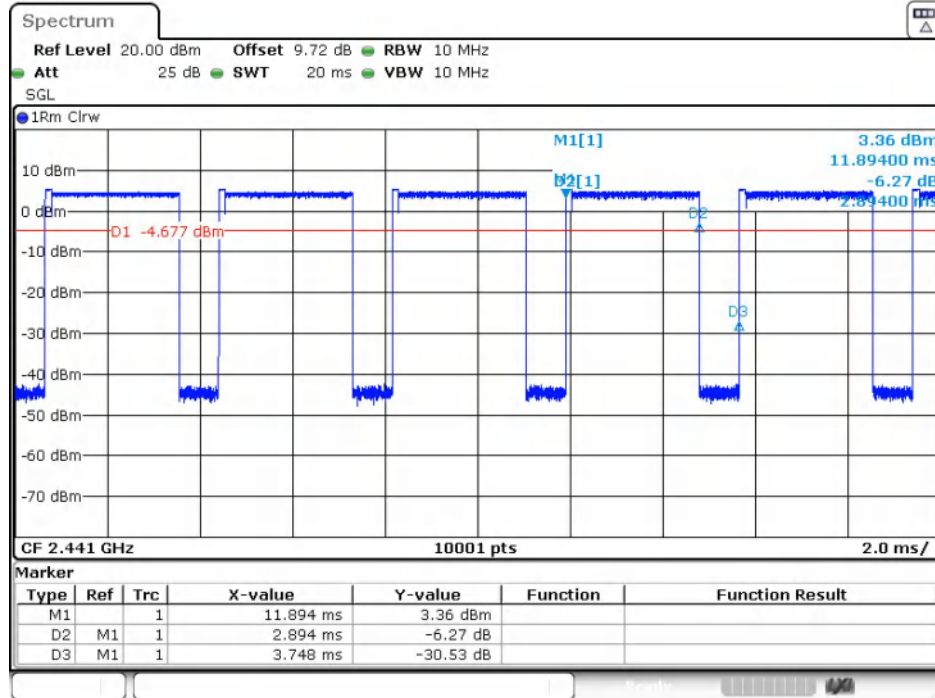
Date: 27.MAR.2024 21:14:30

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



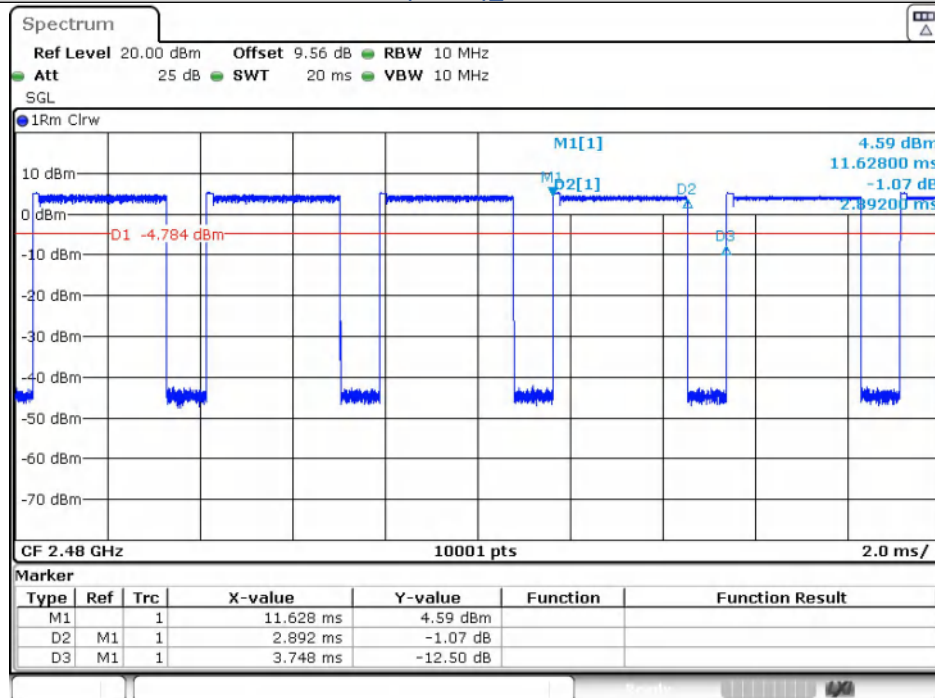
Date: 27.MAR.2024 21:17:27

8DPSK(3-DH5)_Channel 0



Date: 27.MAR.2024 21:19:39

8DPSK(3-DH5)_Channel 39



Date: 27.MAR.2024 21:21:50

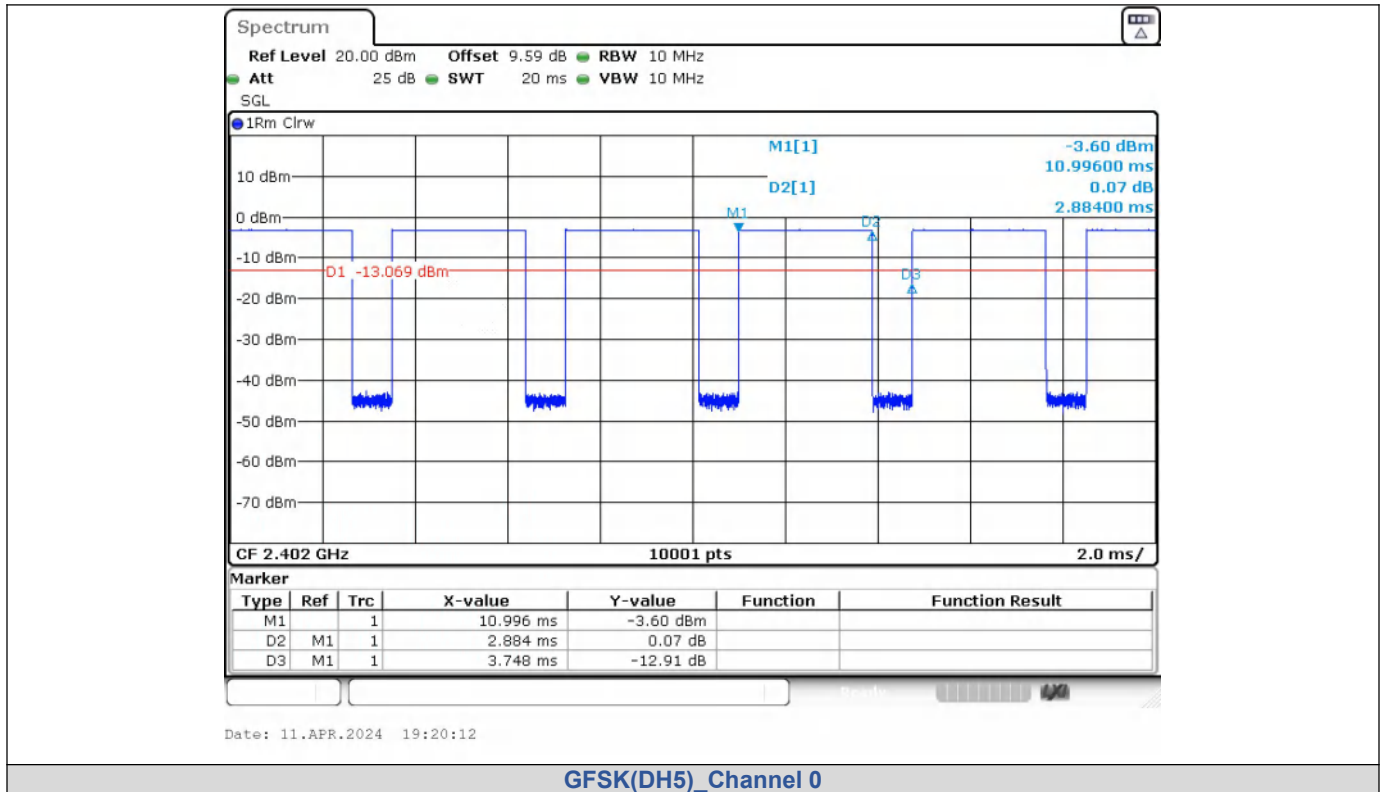
8DPSK(3-DH5)_Channel 78

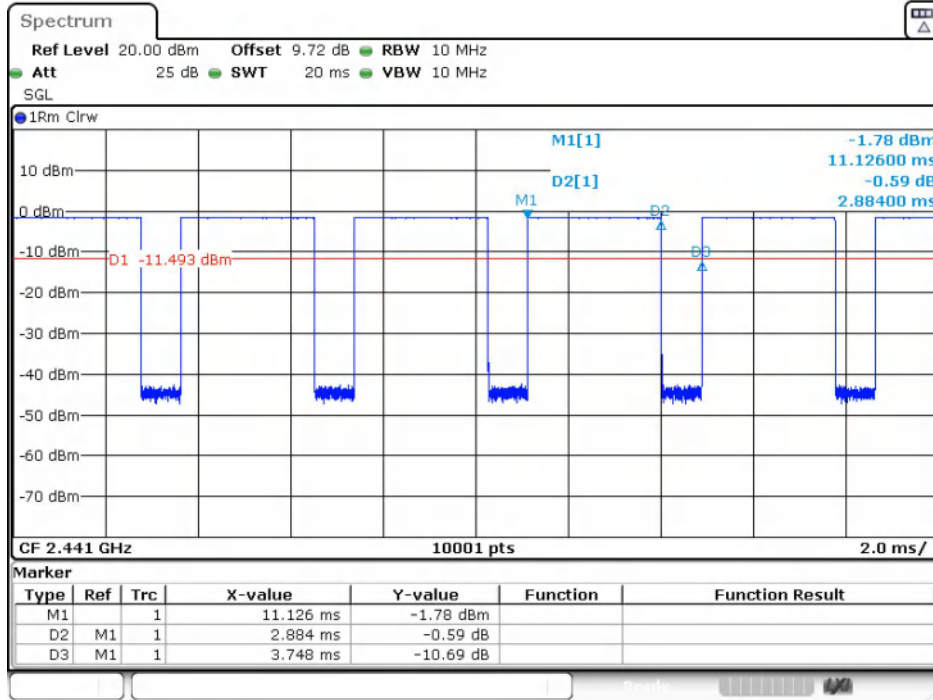
Right

Test Result

Modulation	Packets	Channel	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle (linear)	Duty Cycle Factor (dB)	1/T
GFSK	DH5	0	2.884	3.748	76.95	0.7695	1.1379	0.35
		39	2.884	3.748	76.95	0.7695	1.1379	0.35
		78	2.886	3.748	77.00	0.7700	1.1351	0.35
$\pi/4$ DQPSK	2-DH5	0	2.890	3.748	77.11	0.7711	1.1289	0.35
		39	2.890	3.748	77.11	0.7711	1.1289	0.35
		78	2.890	3.748	77.11	0.7711	1.1289	0.35
8DPSK	3-DH5	0	2.892	3.748	77.16	0.7716	1.1261	0.35
		39	2.892	3.748	77.16	0.7716	1.1261	0.35
		78	2.894	3.748	77.21	0.7721	1.1233	0.35

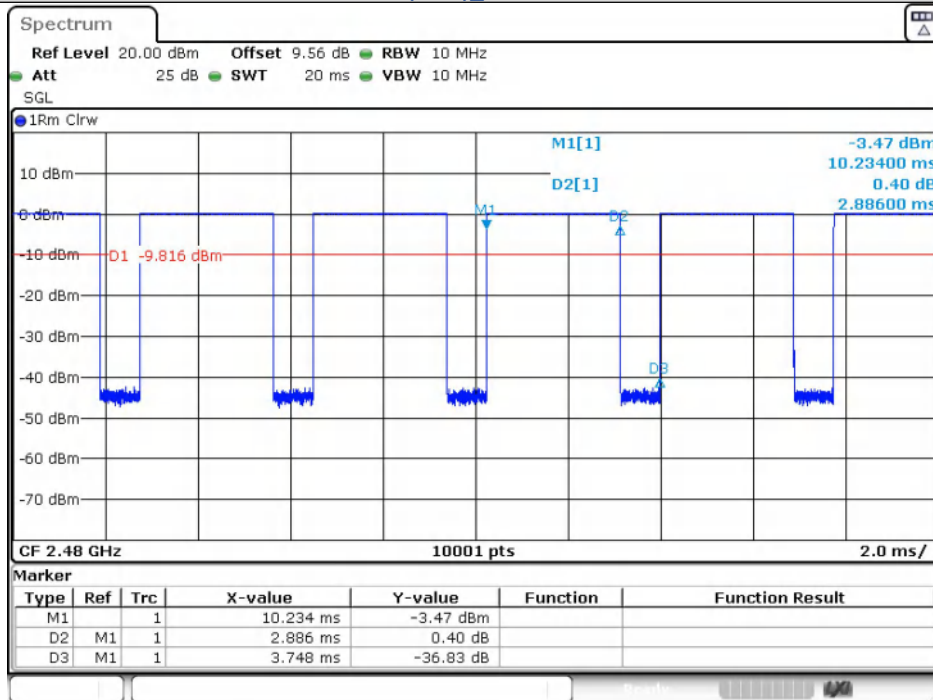
Test Graphs





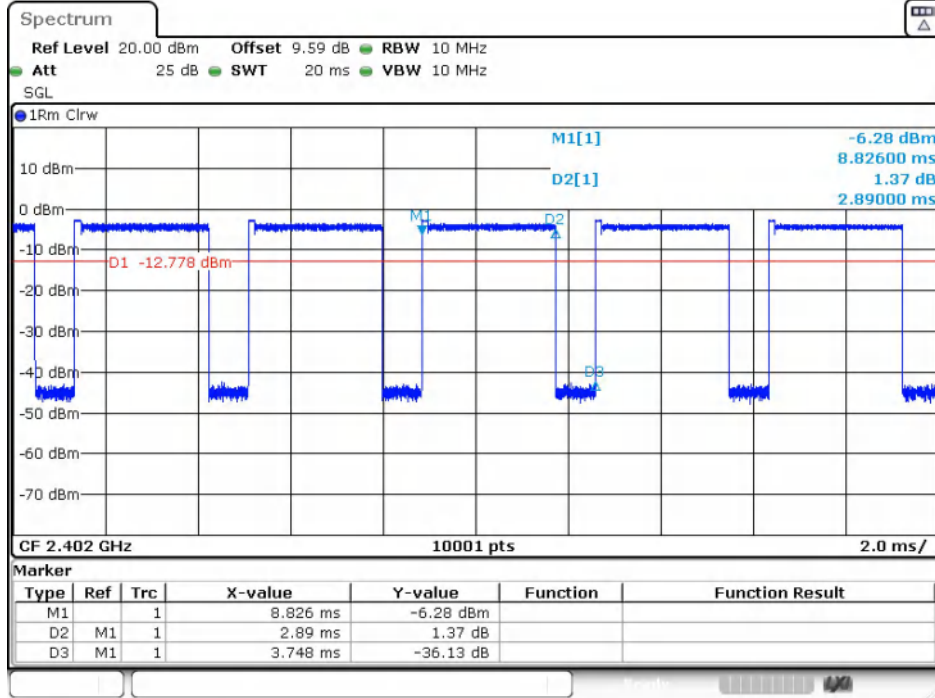
Date: 11.APR.2024 19:22:29

GFSK(DH5)_Channel 39



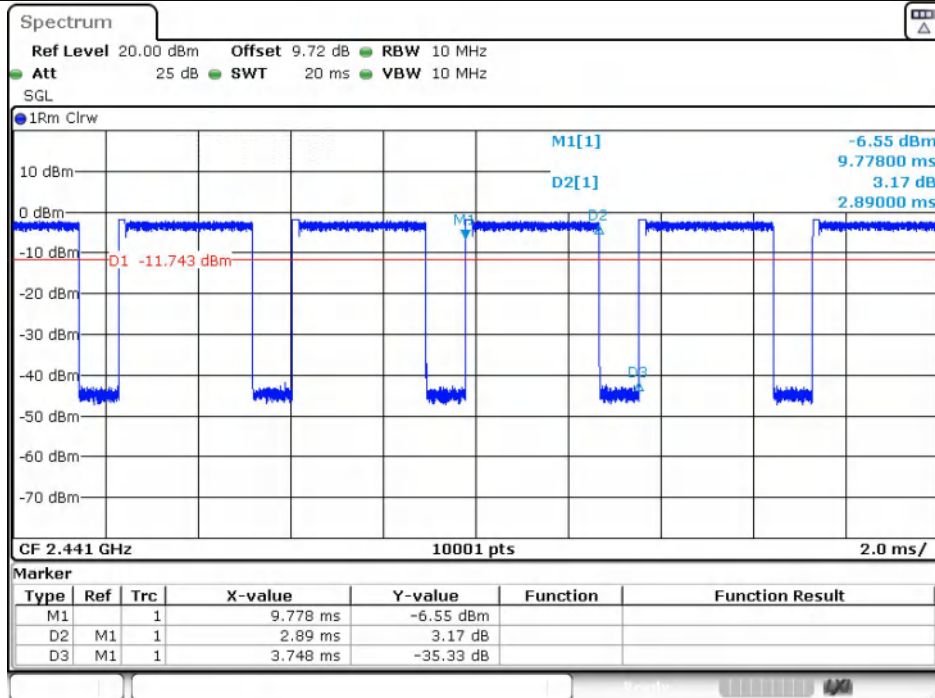
Date: 11.APR.2024 19:24:59

GFSK(DH5)_Channel 78



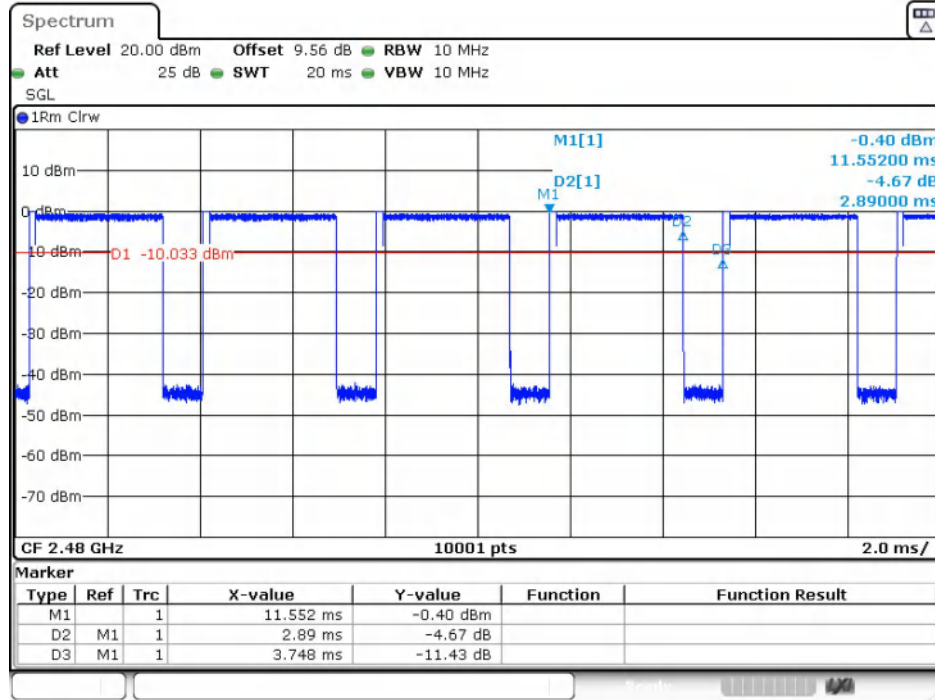
Date: 11.APR.2024 19:27:04

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



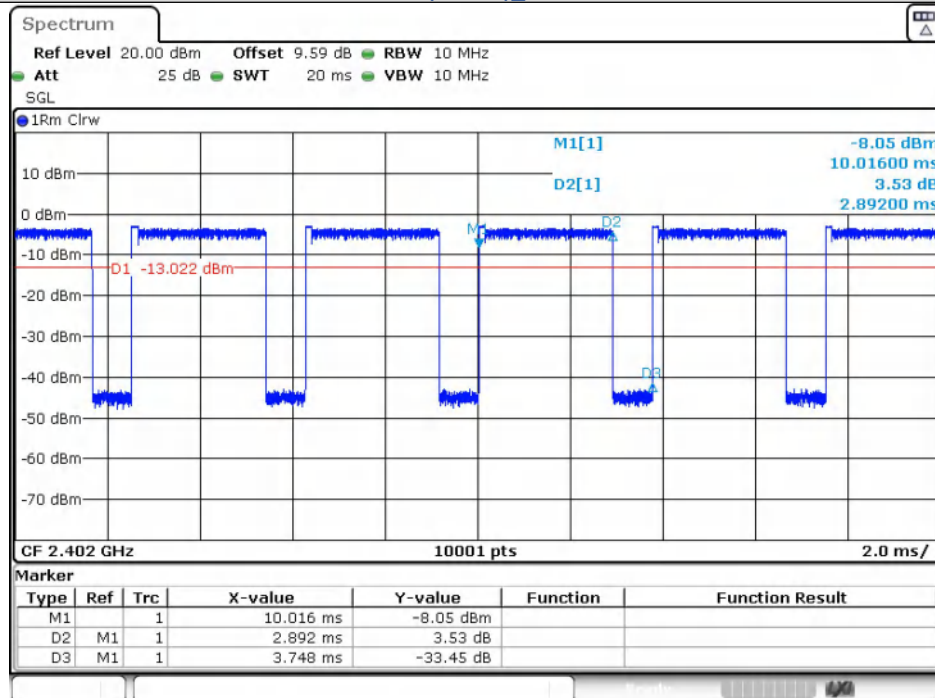
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$\pi/4$ DQPSK(2-DH5)_Channel 39



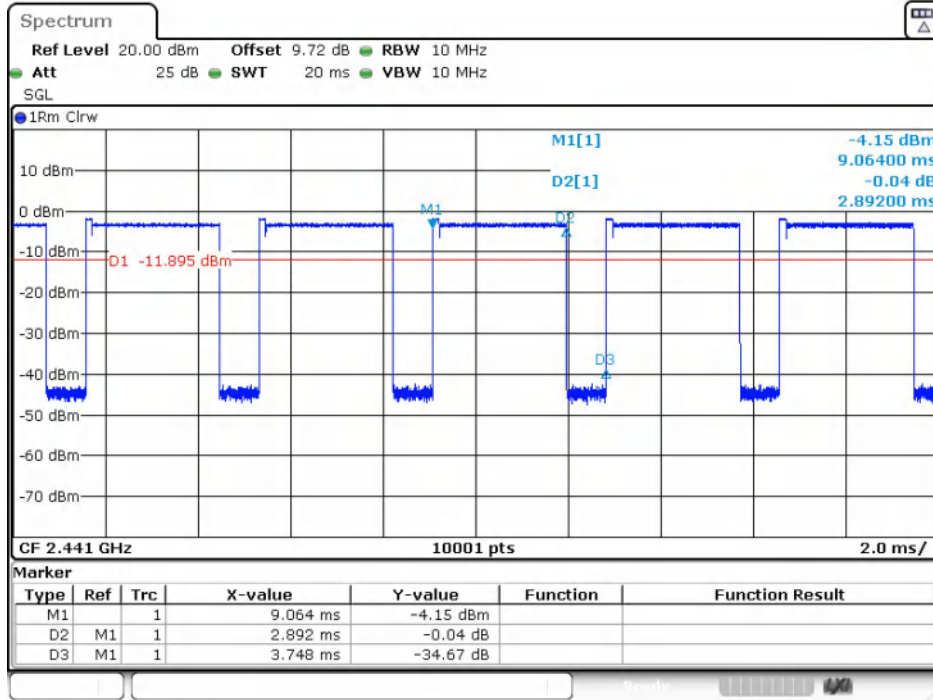
Date: 11.APR.2024 19:31:17

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



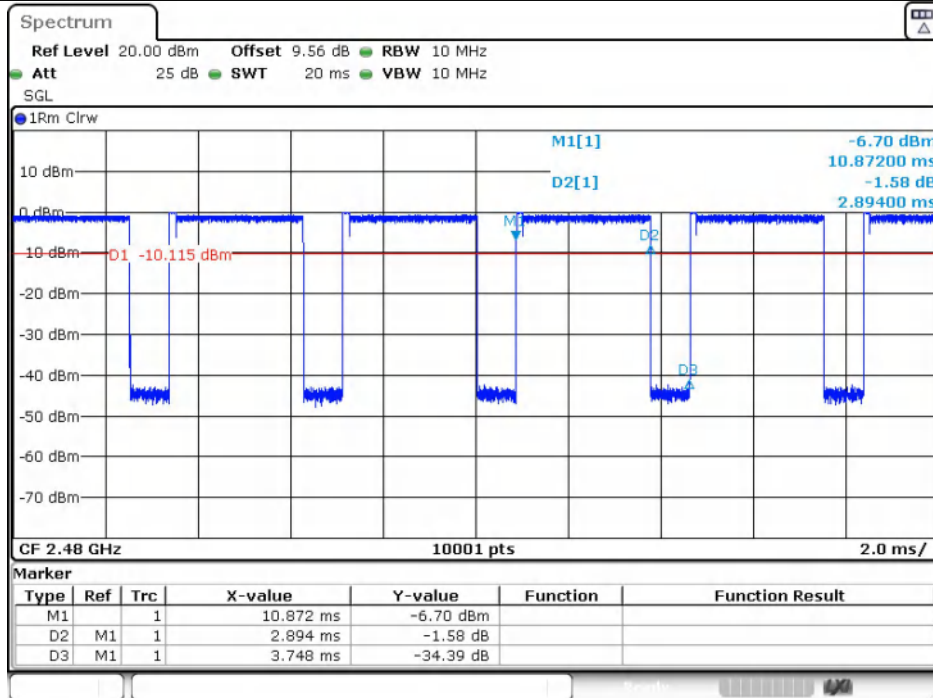
Date: 11.APR.2024 19:33:55

8DPSK(3-DH5)_Channel 0



Date: 11.APR.2024 19:36:10

8DPSK(3-DH5)_Channel 39



Date: 11.APR.2024 19:39:04

8DPSK(3-DH5)_Channel 78

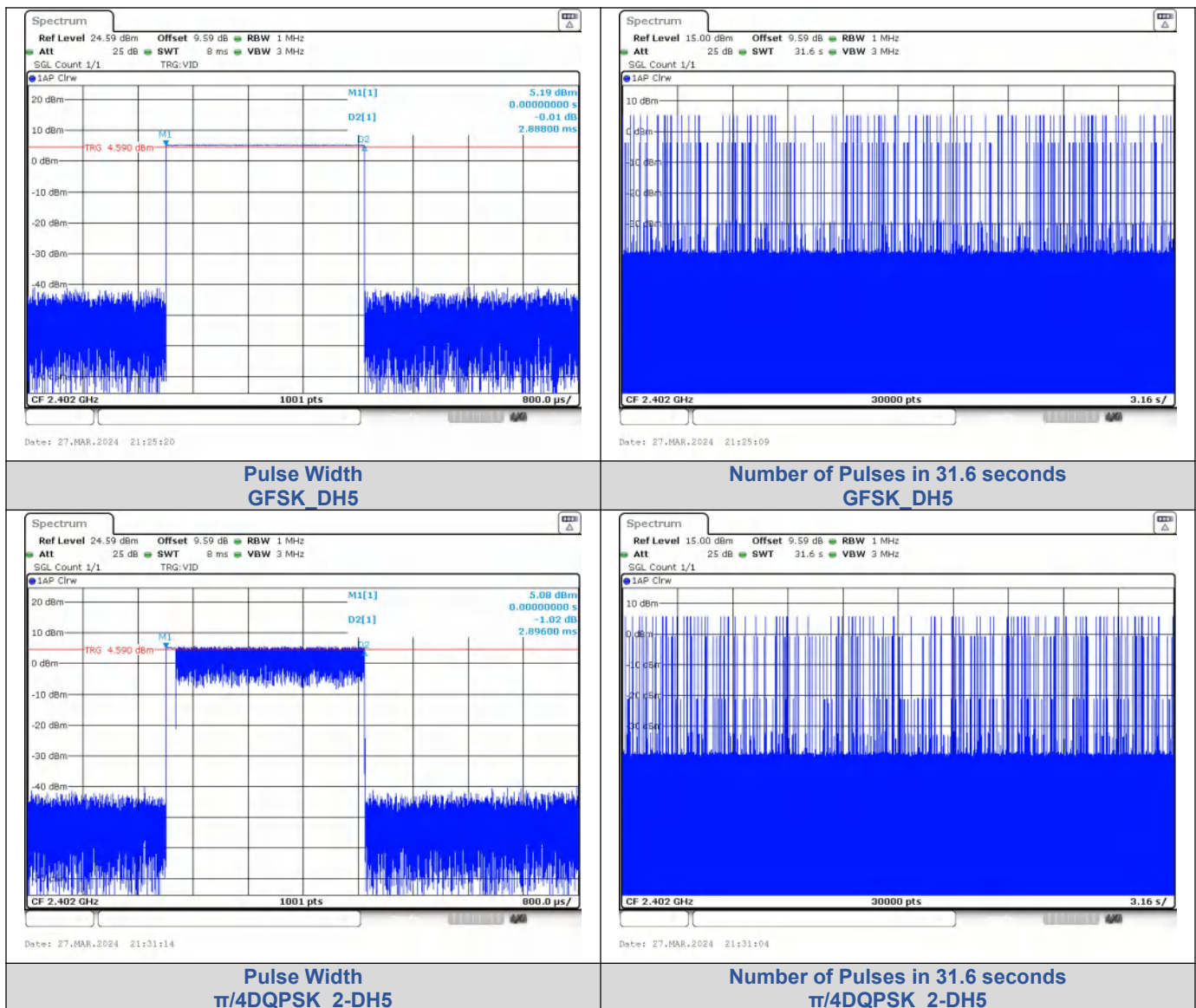
Dwell Time

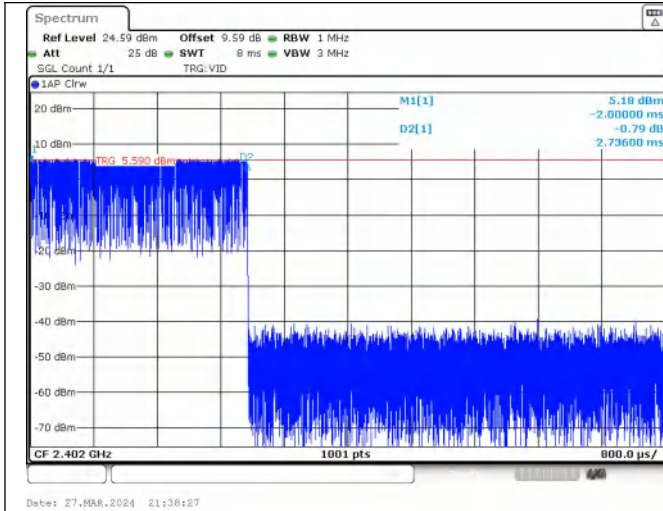
Left

Test Result

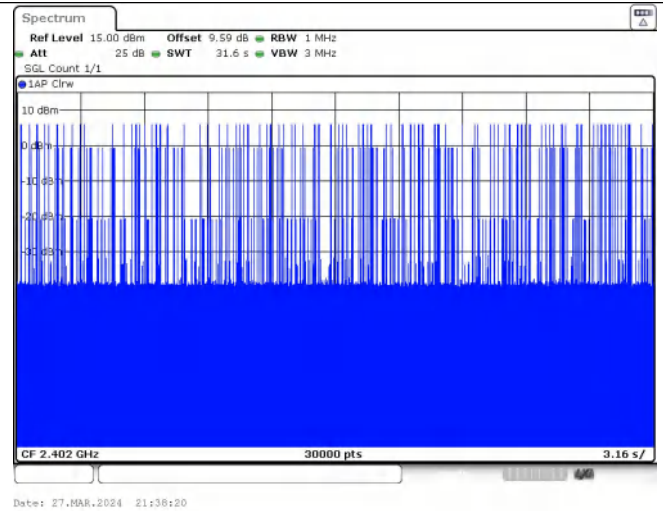
Modulation	Packet	Channel	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Result
GFSK	DH5	CH0 (2402MHz)	2.888	102	294.58	< 400	PASS
$\pi/4$ DQPSK	2-DH5		2.896	106	306.98		PASS
8DPSK	3-DH5		2.736	115	314.64		PASS

Test Graphs





Pulse Width
8DPSK_3-DH5

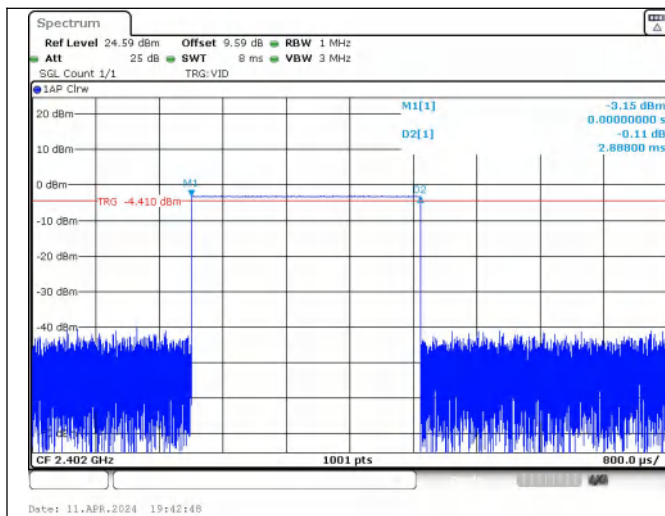


Number of Pulses in 31.6 seconds
8DPSK_3-DH5

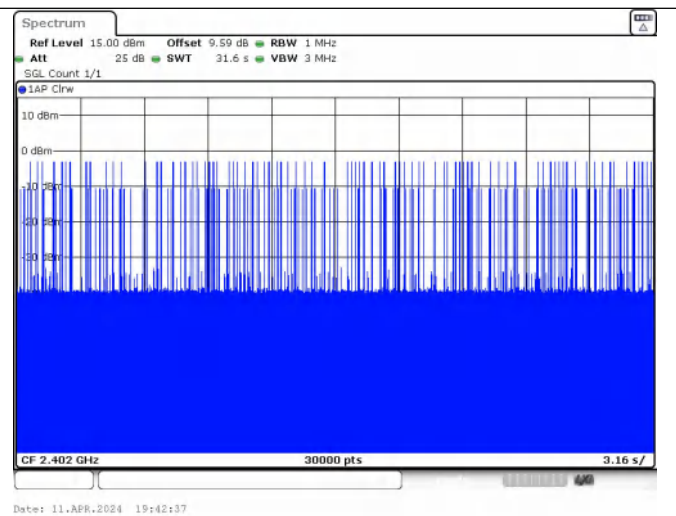
Test Result

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	111	320.57	< 400	PASS
π/4DQPSK	2-DH5		2.896	119	344.62		PASS
8DPSK	3-DH5		2.896	114	330.14		PASS

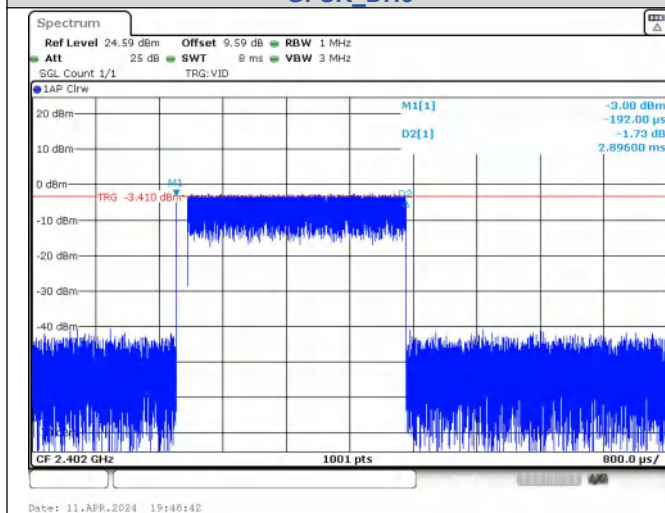
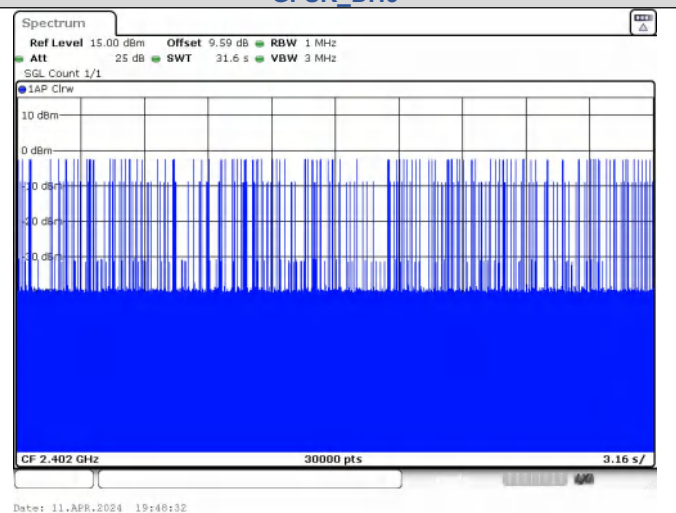
Test Graphs



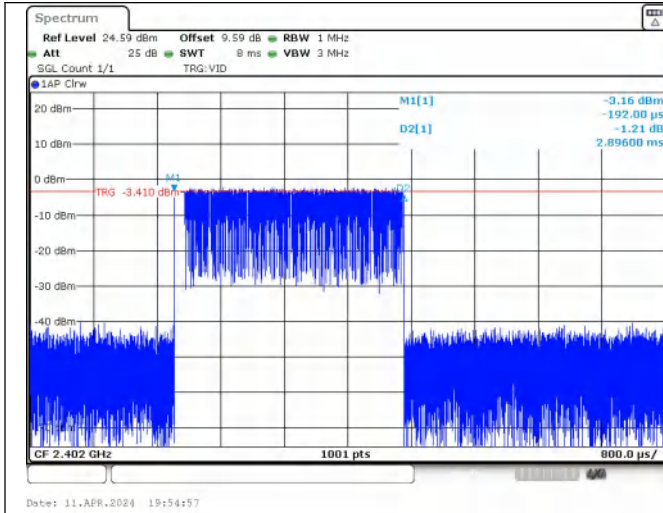
Pulse Width GFSK_DH5



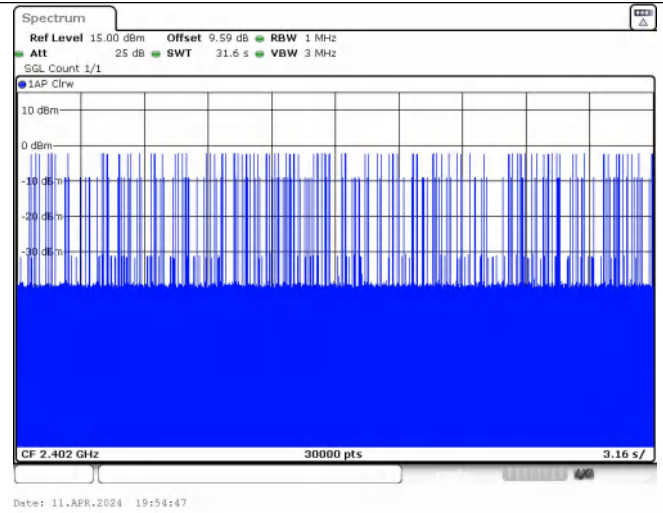
Number of Pulses in 31.6 seconds
GFSK_DH5

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

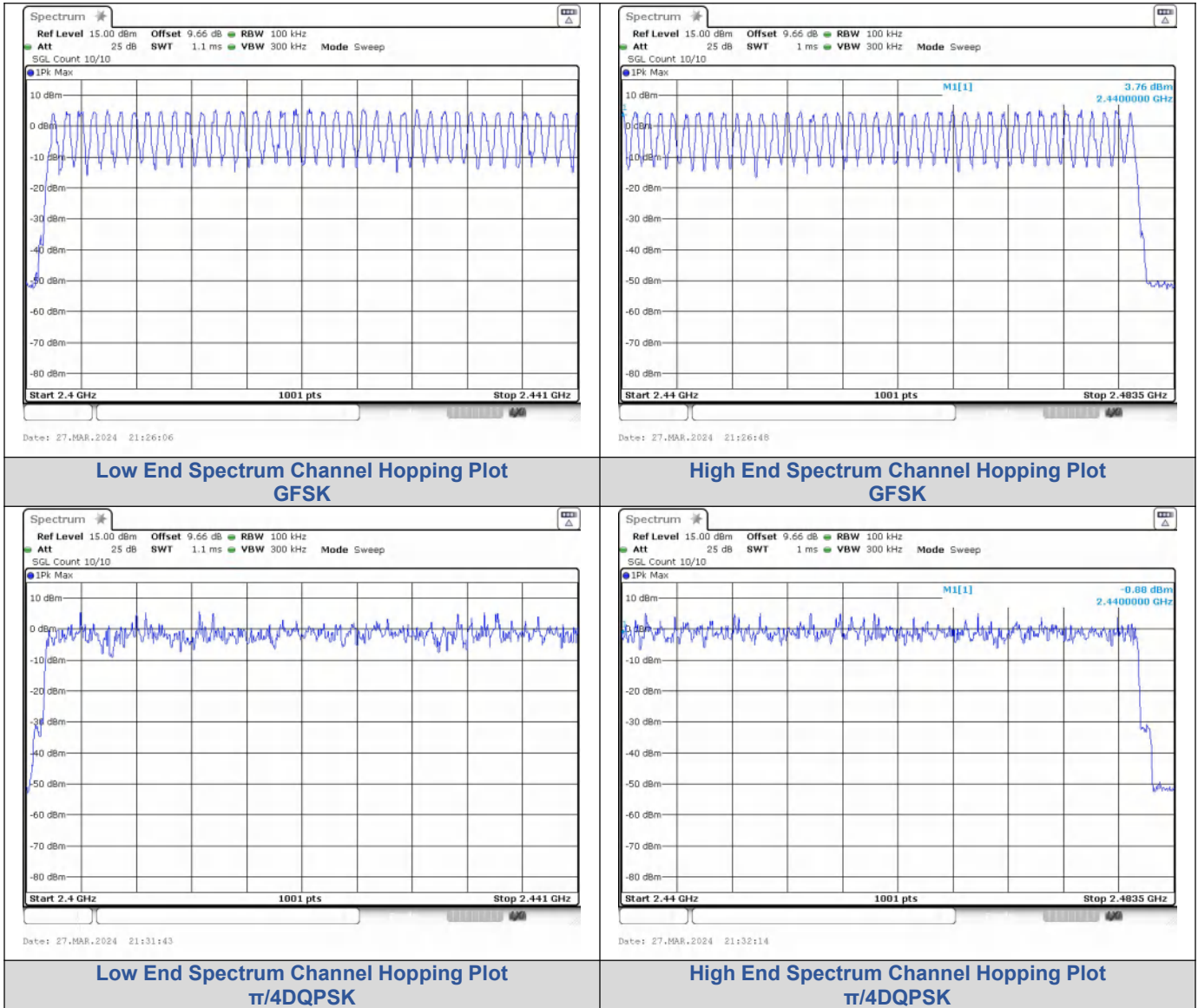
Number Of Hopping Channel

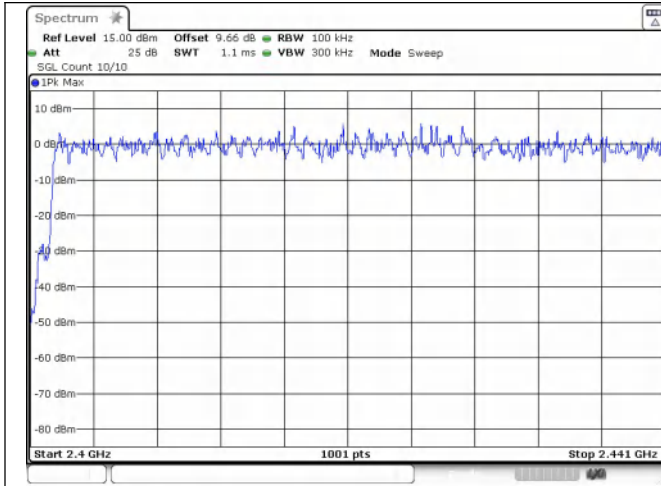
Left

Test Result

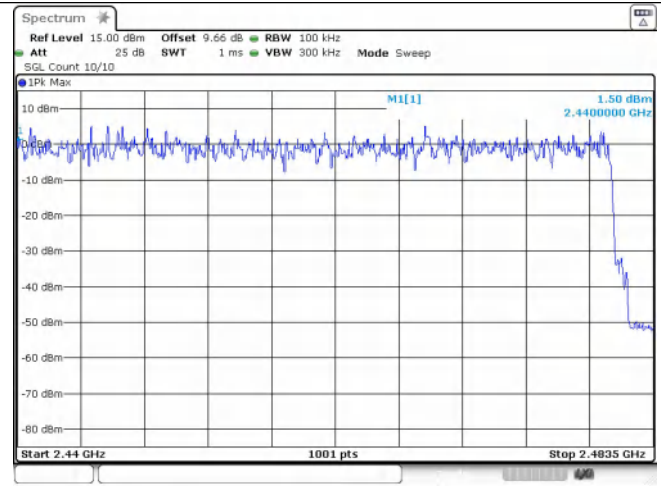
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
$\pi/4$ DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

Test Graphs





**Low End Spectrum Channel Hopping Plot
8DPSK**

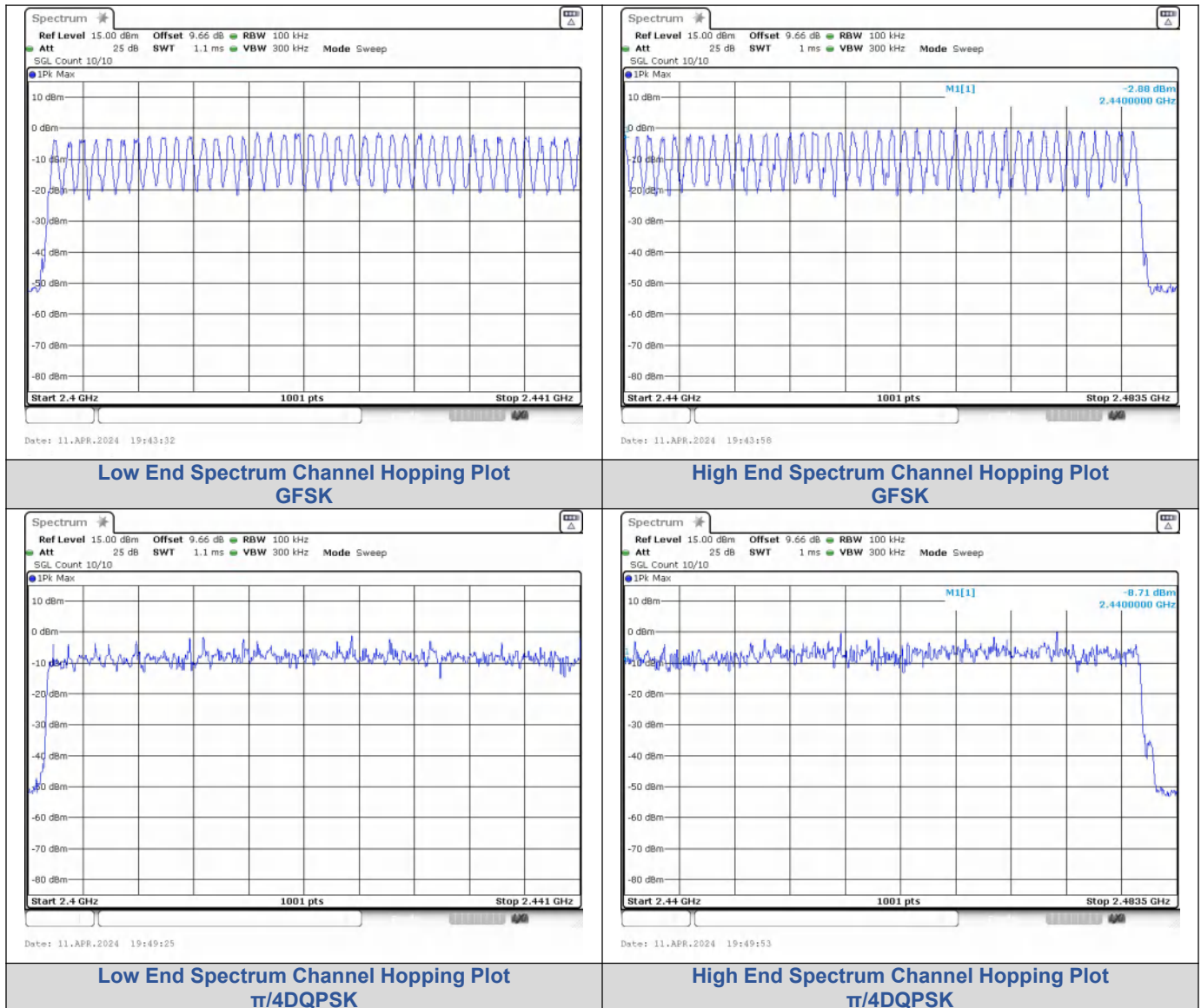


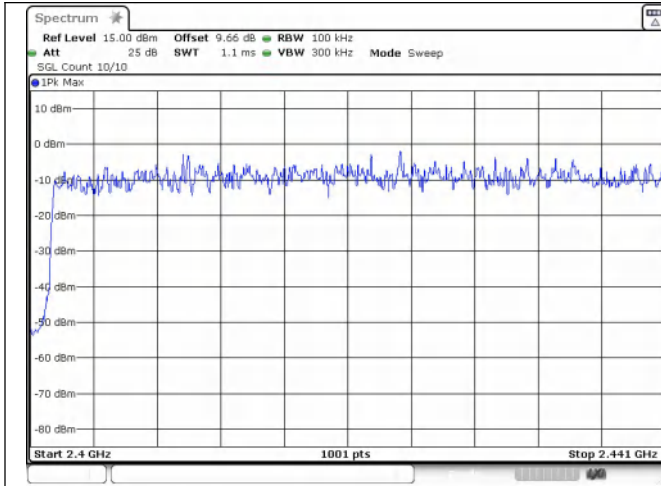
**High End Spectrum Channel Hopping Plot
8DPSK**

Right Test Result

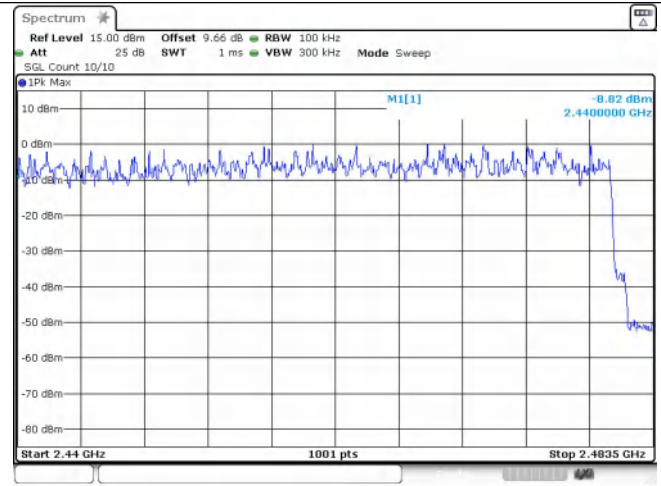
Modulation	Packet	Number of Hopping Channel	Limit	Result
GFSK	DH5	79	15	PASS
$\pi/4$ DQPSK	2-DH5	79	15	PASS
8DPSK	3-DH5	79	15	PASS

Test Graphs





**Low End Spectrum Channel Hopping Plot
8DPSK**



**High End Spectrum Channel Hopping Plot
8DPSK**