



Appendix A

RF Test Data for BT(BDR/EDR) (Conducted Measurement)

Product Name: TWS Earbuds

Trade Mark: N/A

Test Model: EBT4-21167

Environmental Conditions

Temperature:	25.6℃
Relative Humidity:	51.2%
ATM Pressure:	101Kpa
Test Engineer:	Simba Huang
Supervised by:	Seal Chen

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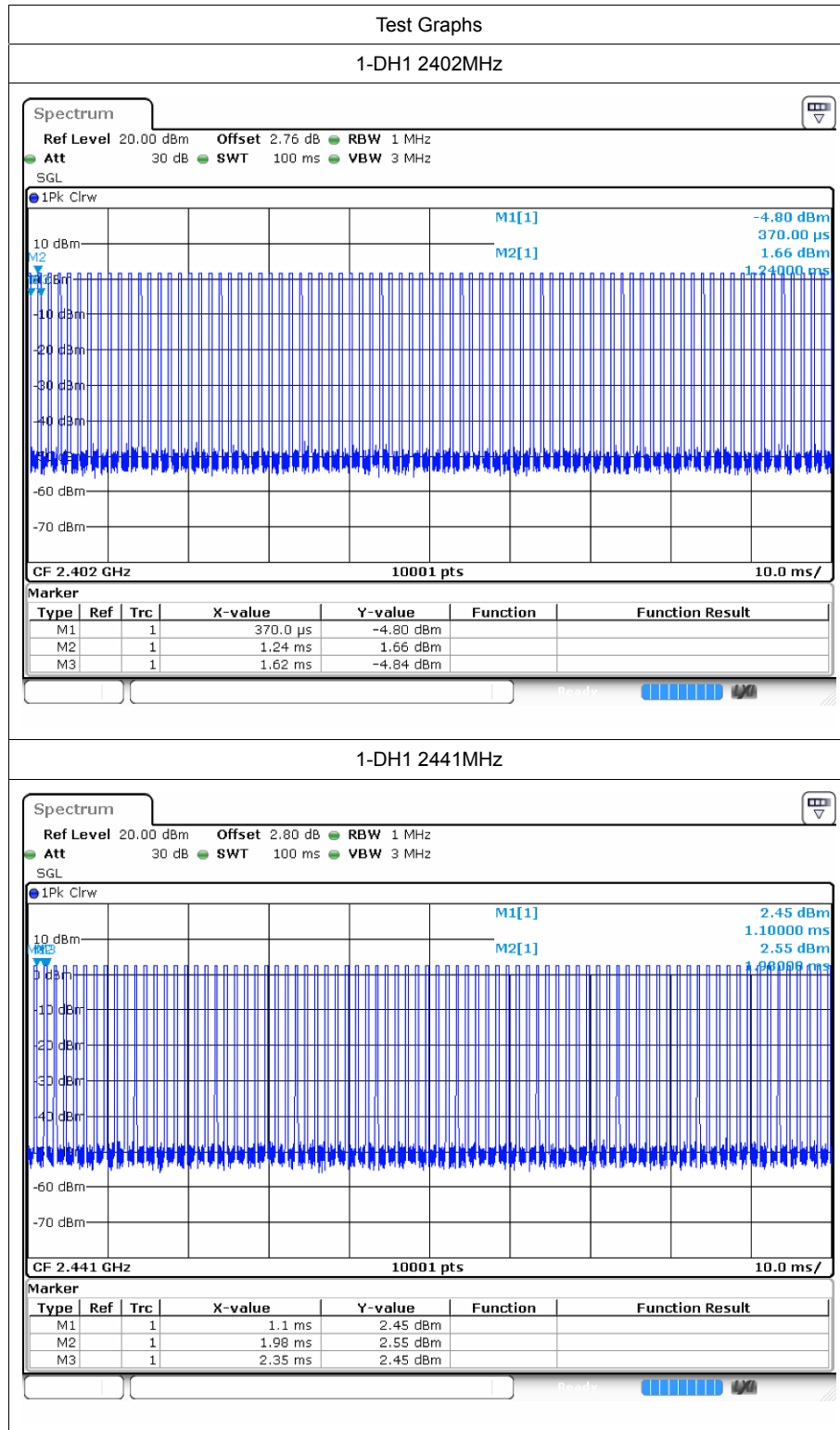
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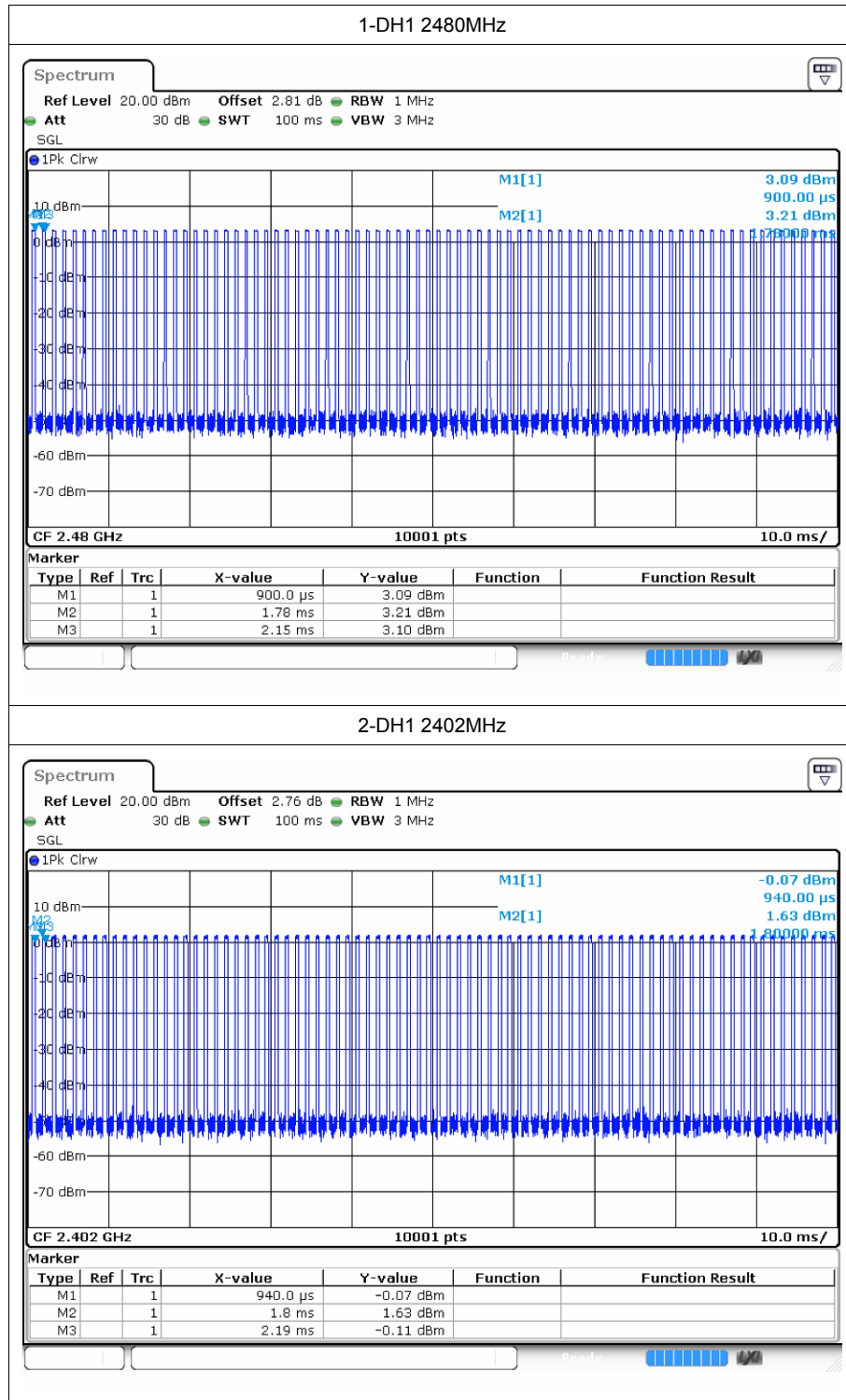
1 Duty Cycle

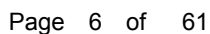
1.1 Test Result

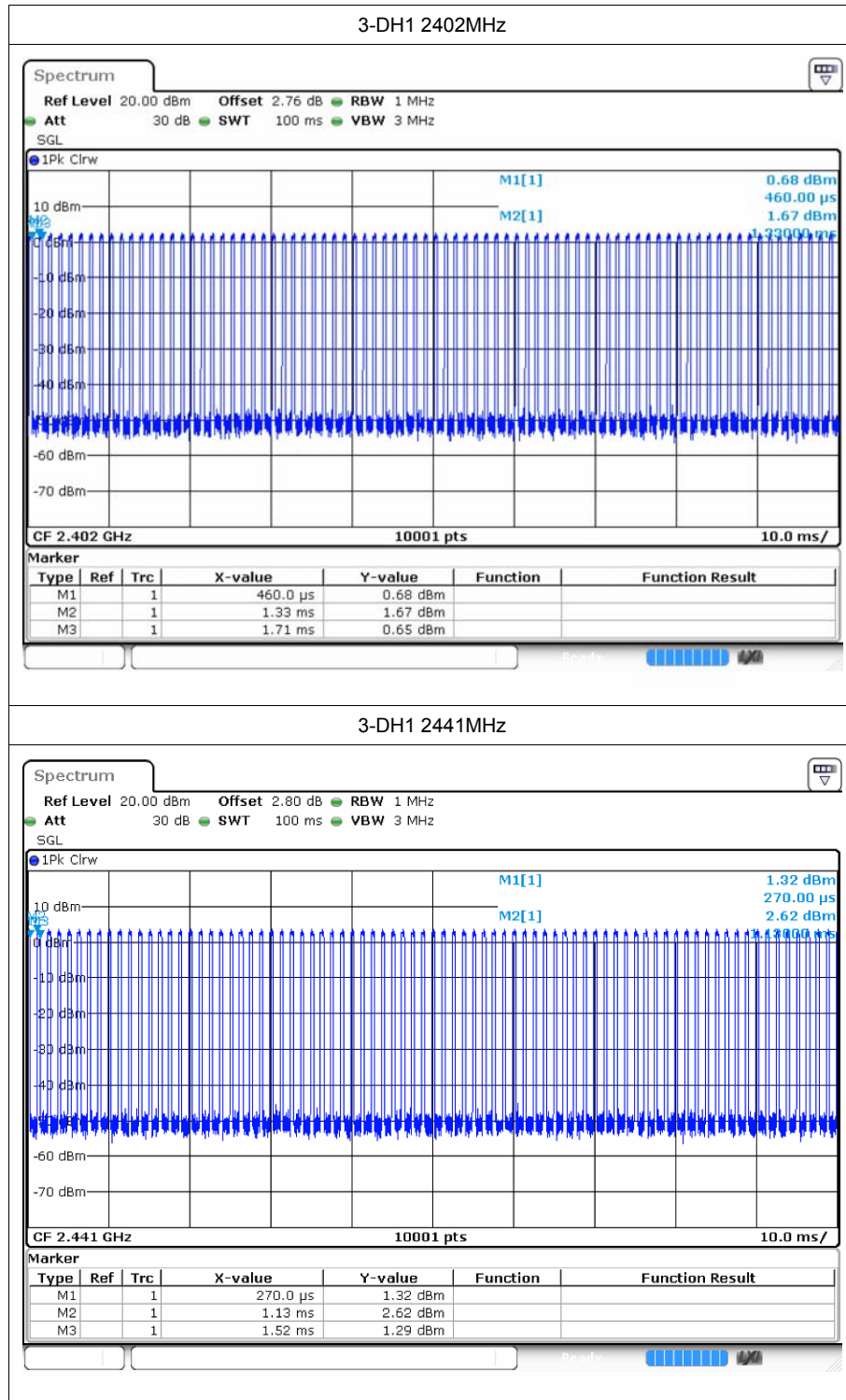
Mode	Frequency (MHz)	Duty Cycle (%)	1/T (kHz)
1-DH1	2402	31.21	2.63
1-DH1	2441	30.4	2.7
1-DH1	2480	30.4	2.7
2-DH1	2402	32	2.56
2-DH1	2441	32	2.56
2-DH1	2480	32	2.56
3-DH1	2402	31.2	2.63
3-DH1	2441	32.01	2.56
3-DH1	2480	31.99	2.56

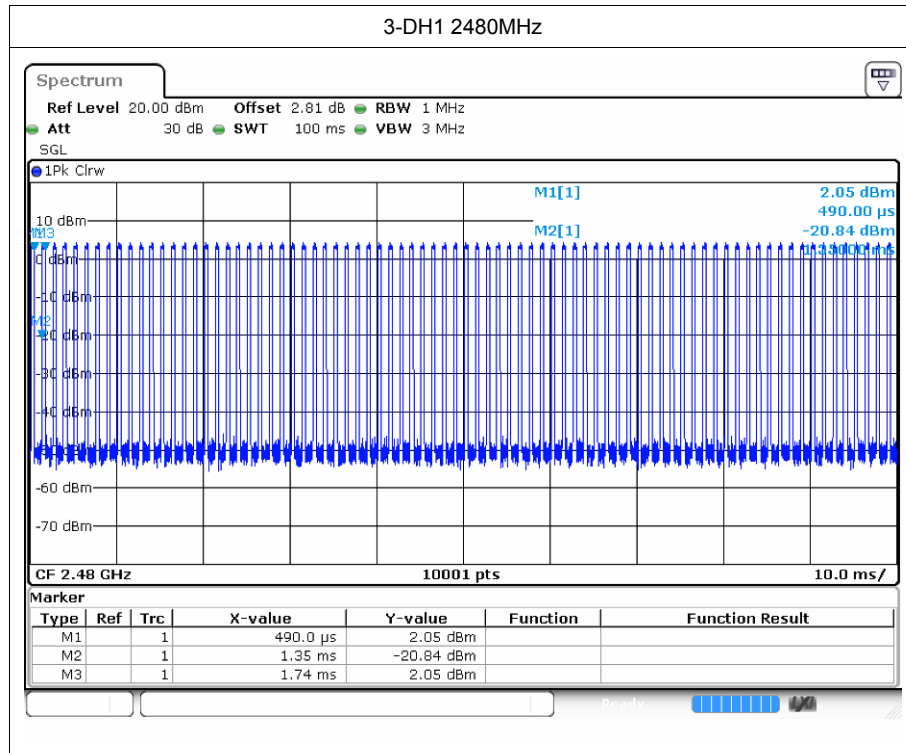
1.2 Test Graphs









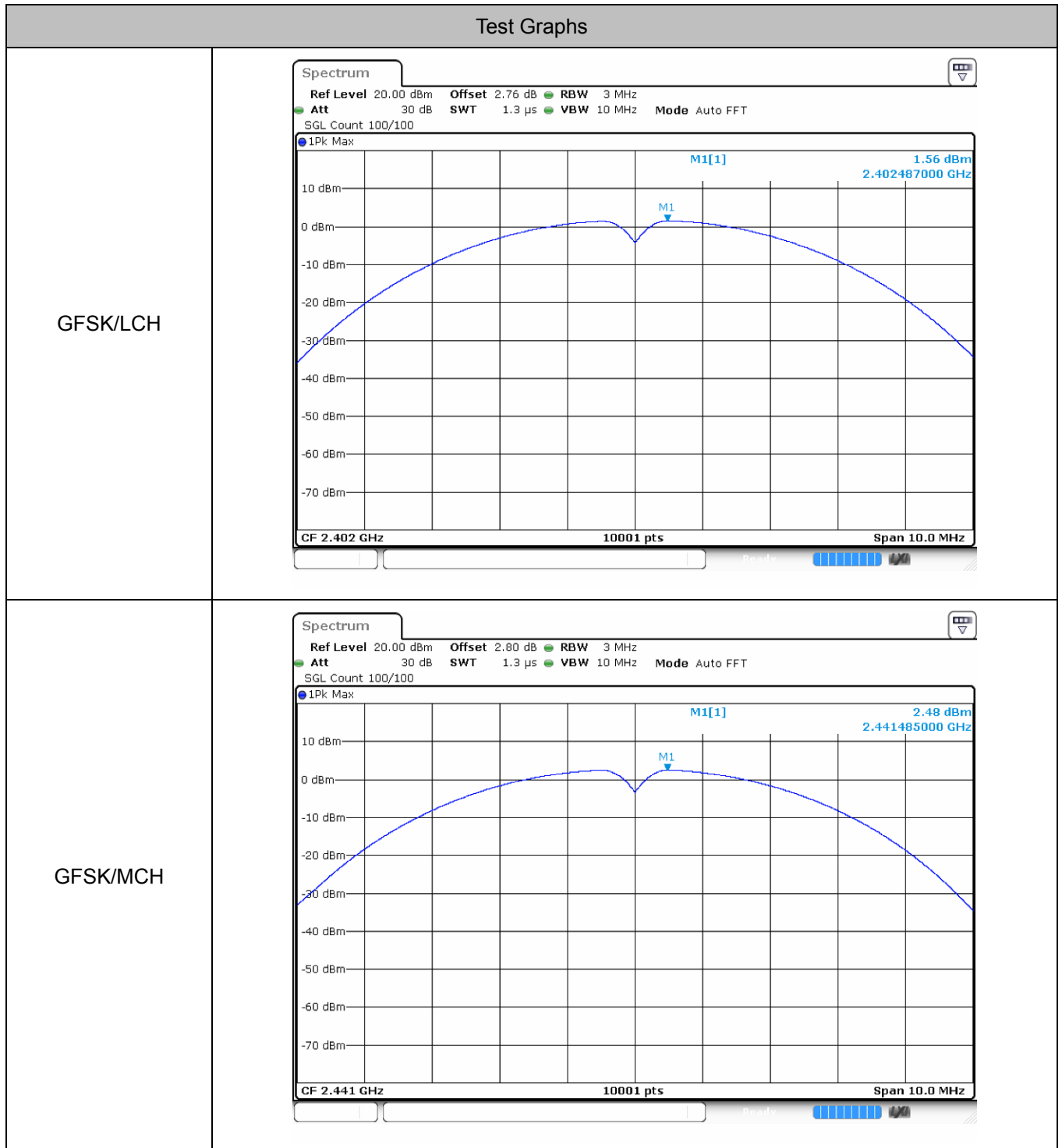


2 Maximum Conducted Peak Output Power

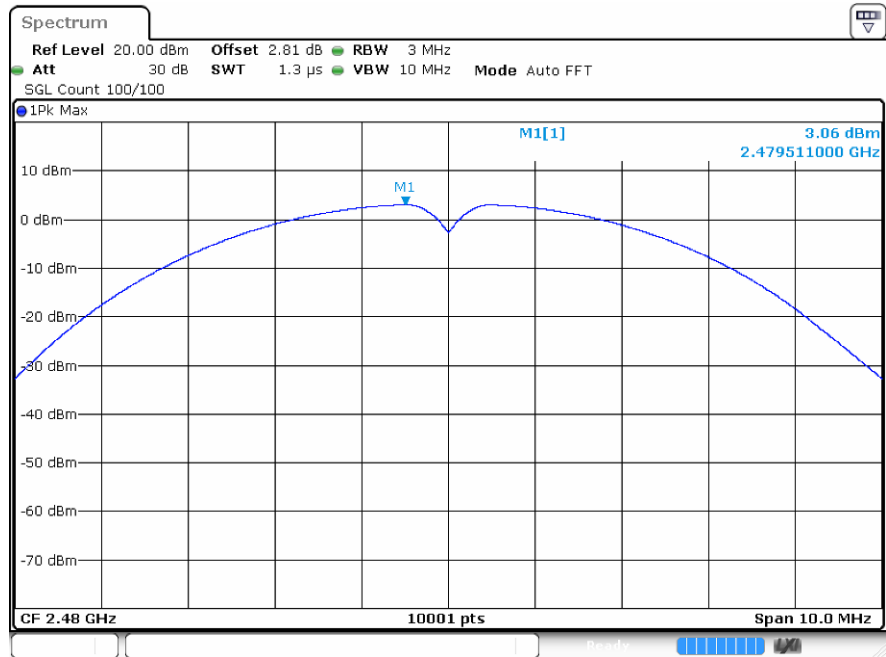
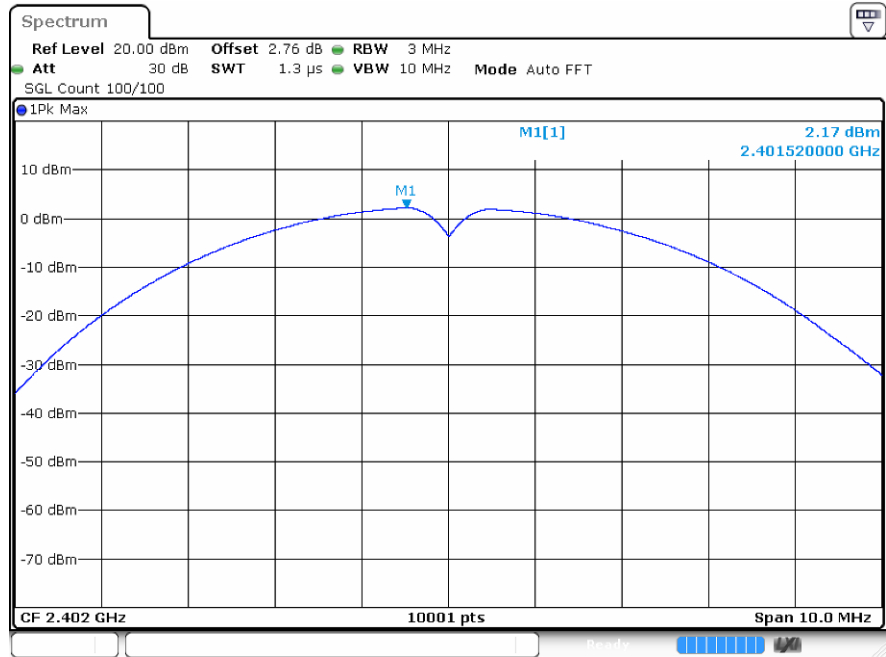
2.1 Test Result

Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.56	21	Pass
	MCH	2.48	21	Pass
	HCH	3.06	21	Pass
$\pi/4$ DQPSK	LCH	2.17	21	Pass
	MCH	3.01	21	Pass
	HCH	3.49	21	Pass
8DPSK	LCH	1.7	21	Pass
	MCH	2.82	21	Pass
	HCH	3.42	21	Pass

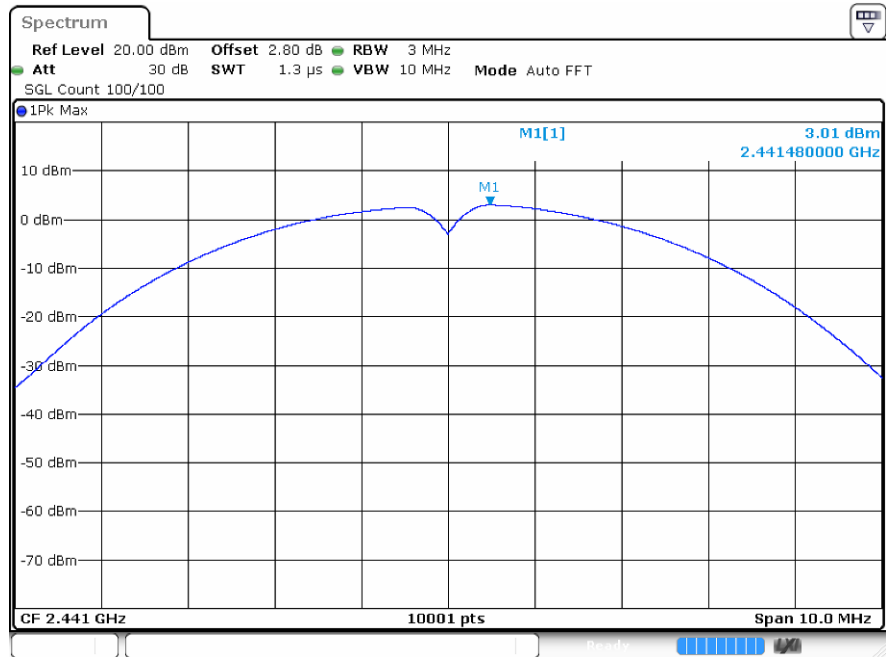
2.2 Test Graphs



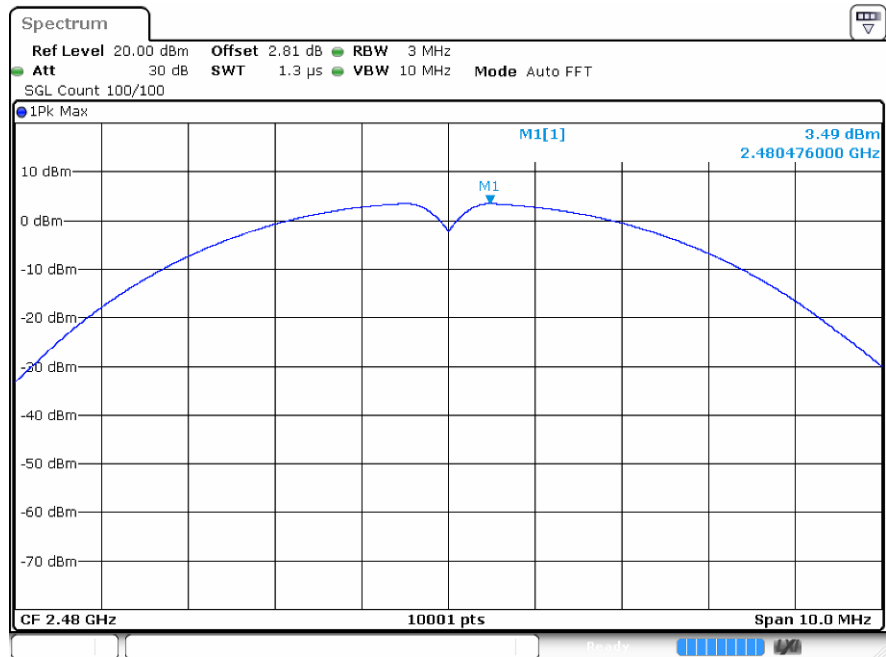
GFSK/HCH


 $\pi/4$ DQPSK/LCH


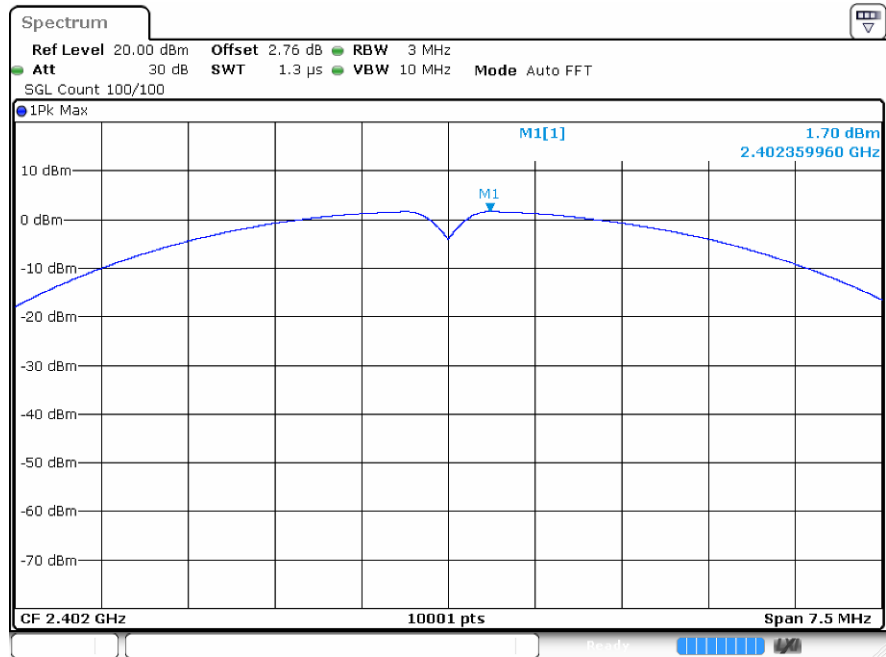
$\pi/4$ DQPSK/MCH



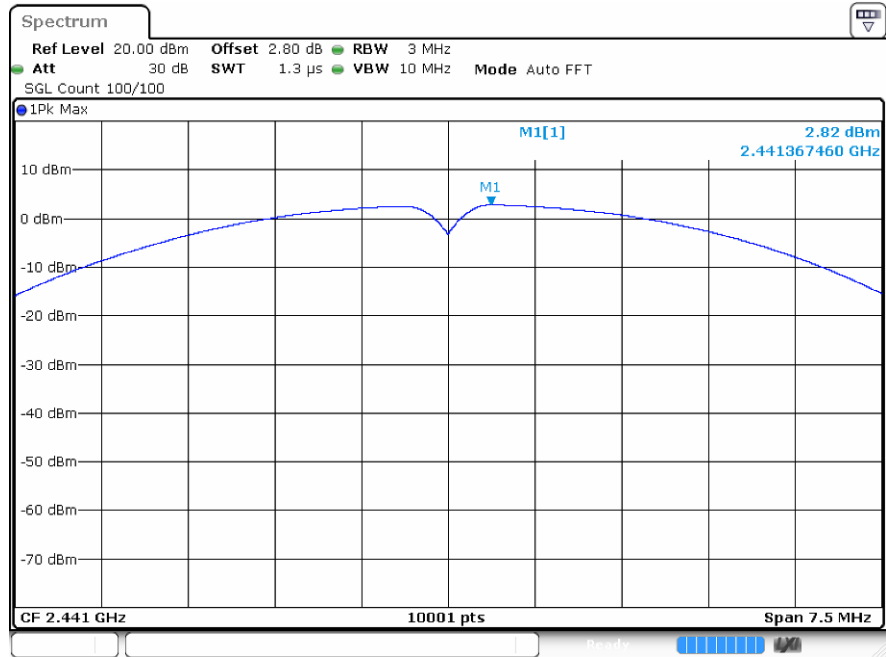
$\pi/4$ DQPSK/HCH



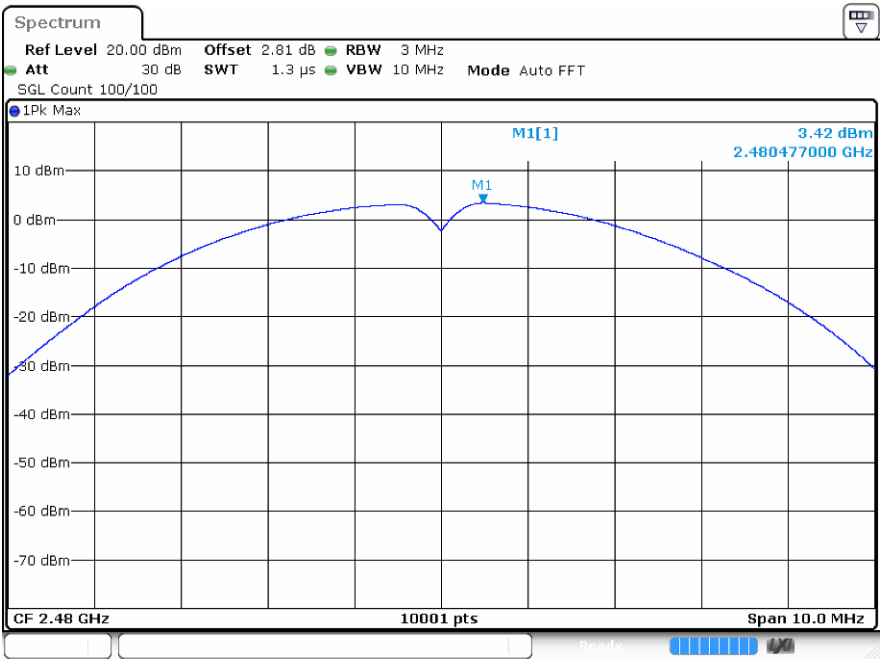
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

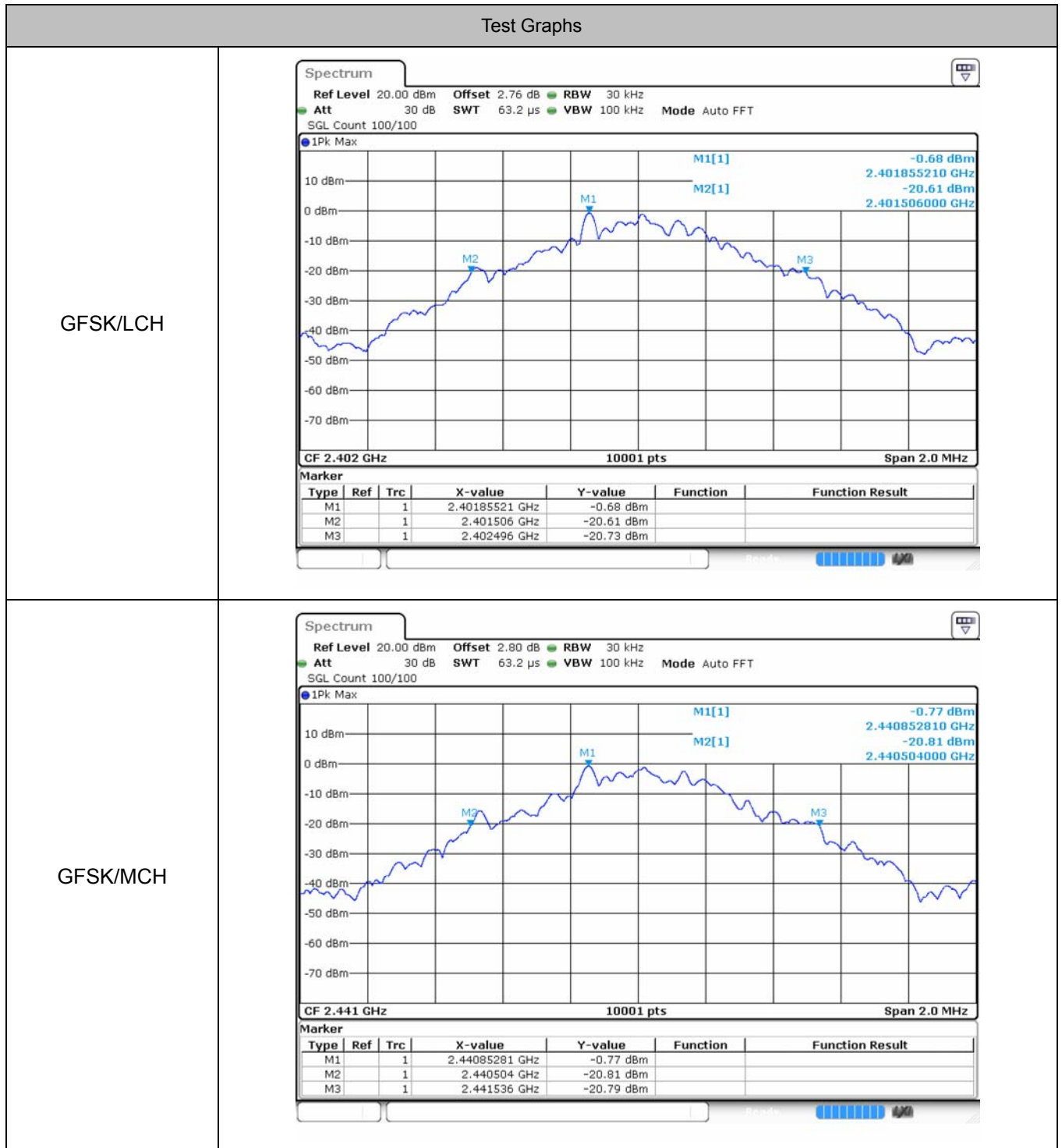


3 20dB Bandwidth

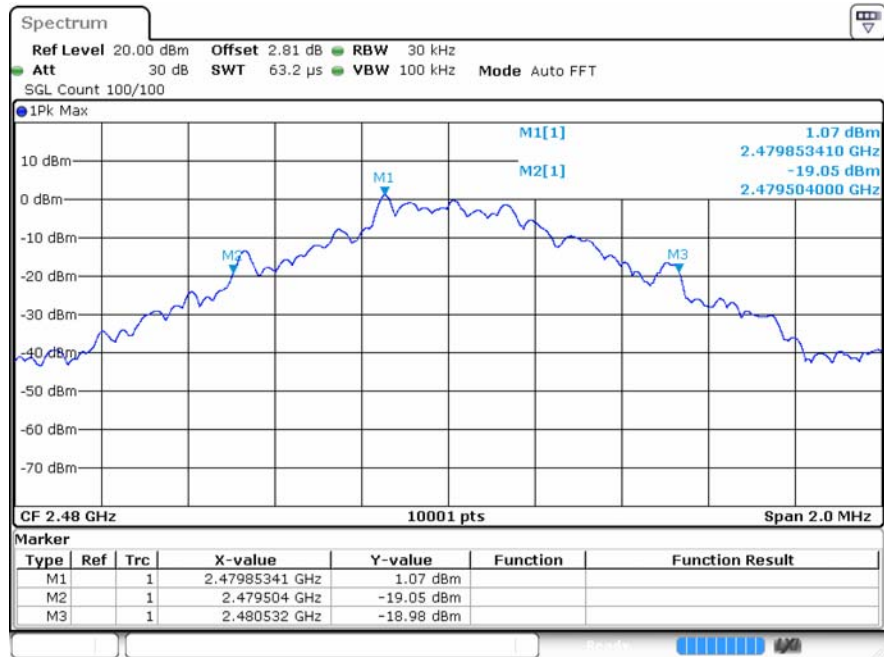
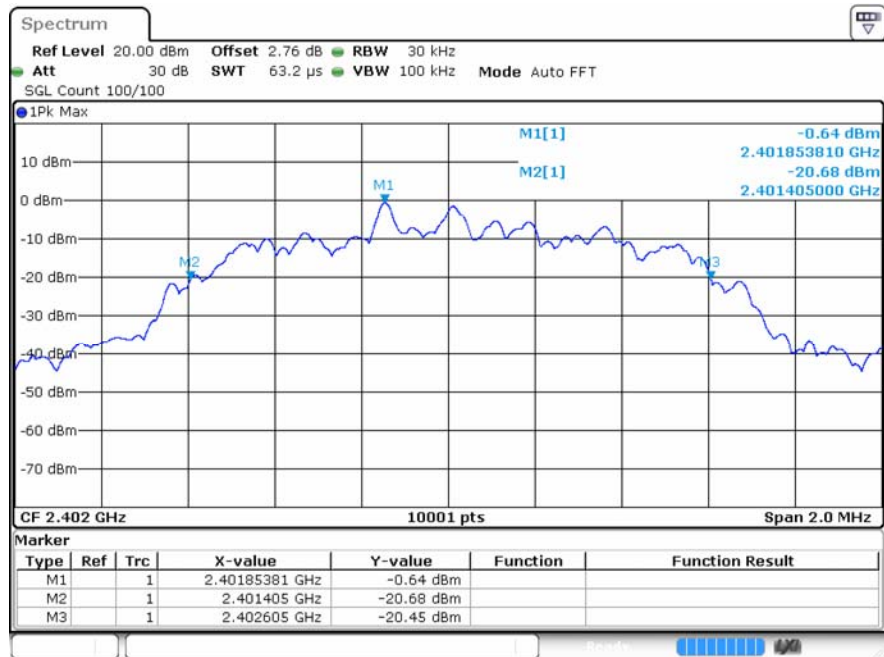
3.1 Test Result

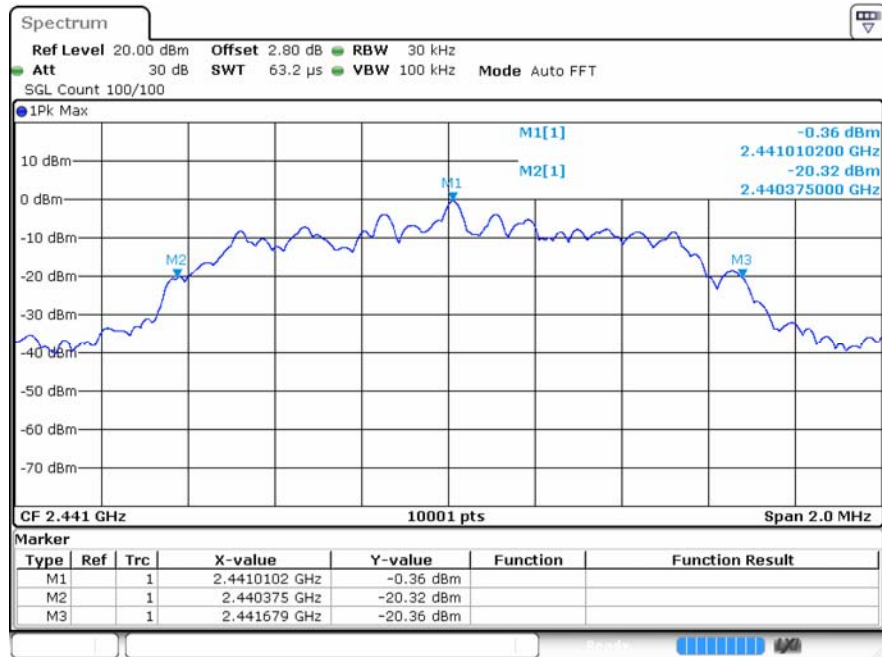
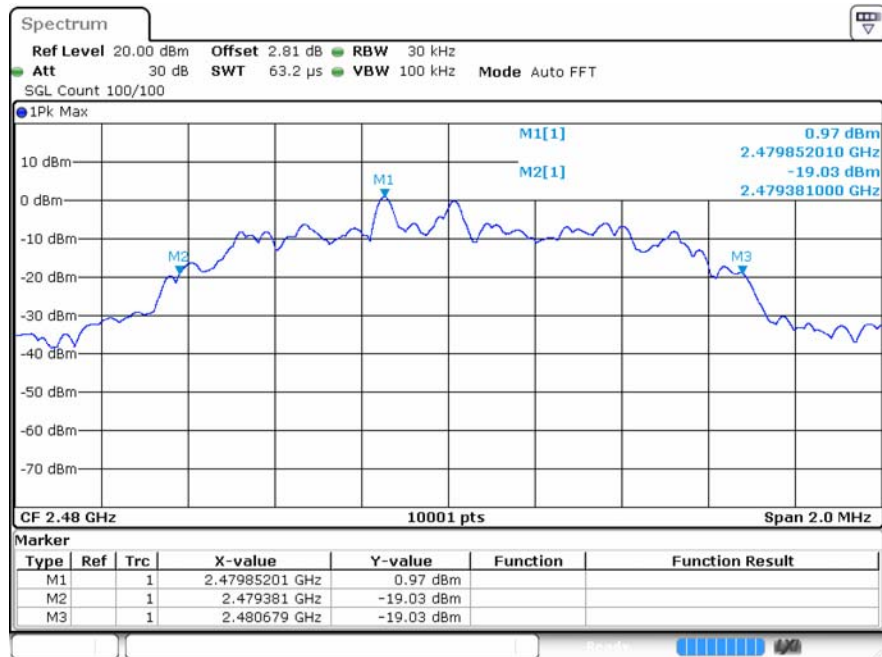
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.99	Not Specified	Pass
	MCH	1.031	Not Specified	Pass
	HCH	1.027	Not Specified	Pass
$\pi/4$ DQPSK	LCH	1.2	Not Specified	Pass
	MCH	1.304	Not Specified	Pass
	HCH	1.298	Not Specified	Pass
8DPSK	LCH	1.217	Not Specified	Pass
	MCH	1.259	Not Specified	Pass
	HCH	1.258	Not Specified	Pass

3.2 Test Graphs

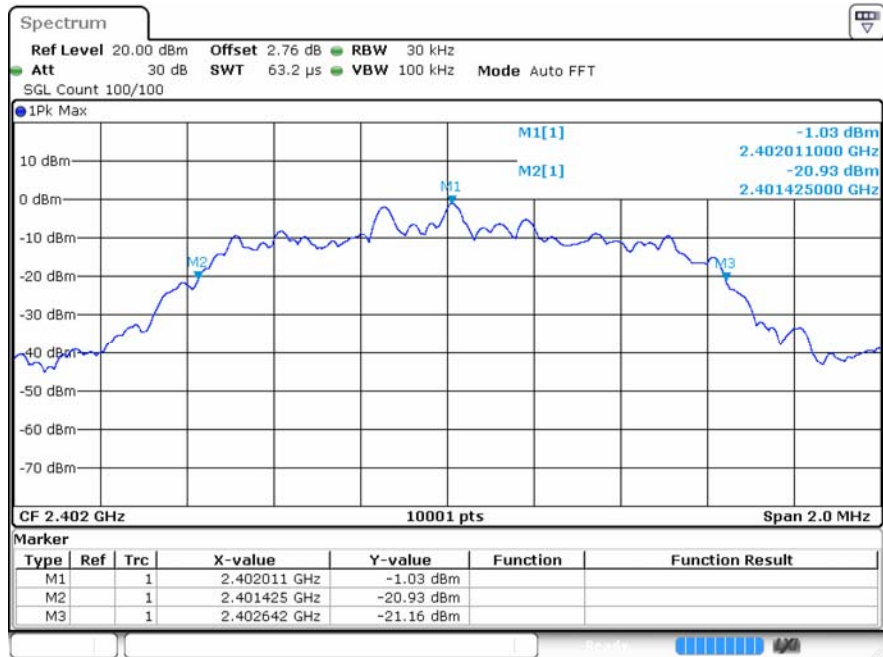


GFSK/HCH

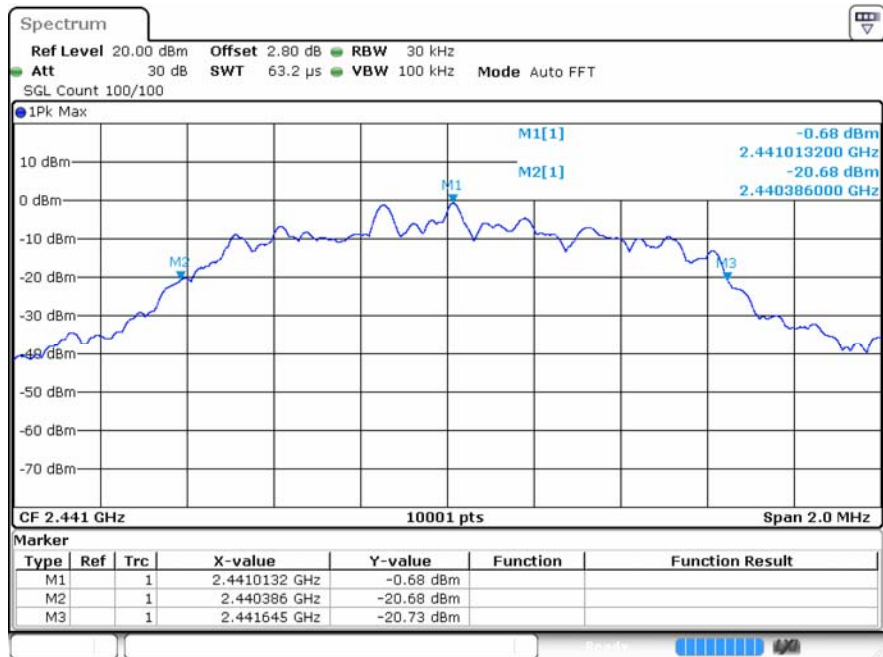

 $\pi/4$ DQPSK/LCH


$\pi/4$ DQPSK/MCH

 $\pi/4$ DQPSK/HCH


8DPSK/LCH

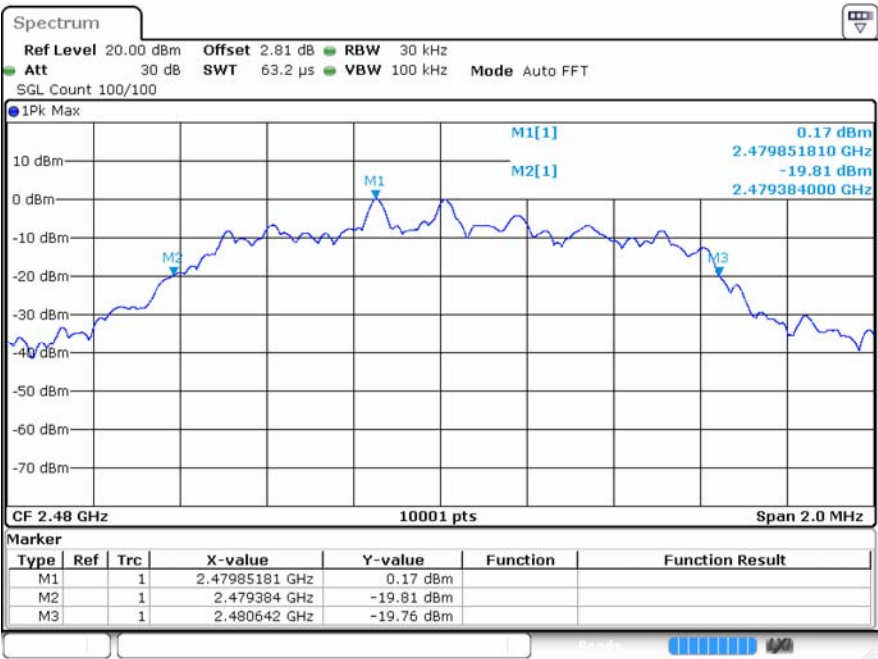


8DPSK/MCH





8DPSK/HCH

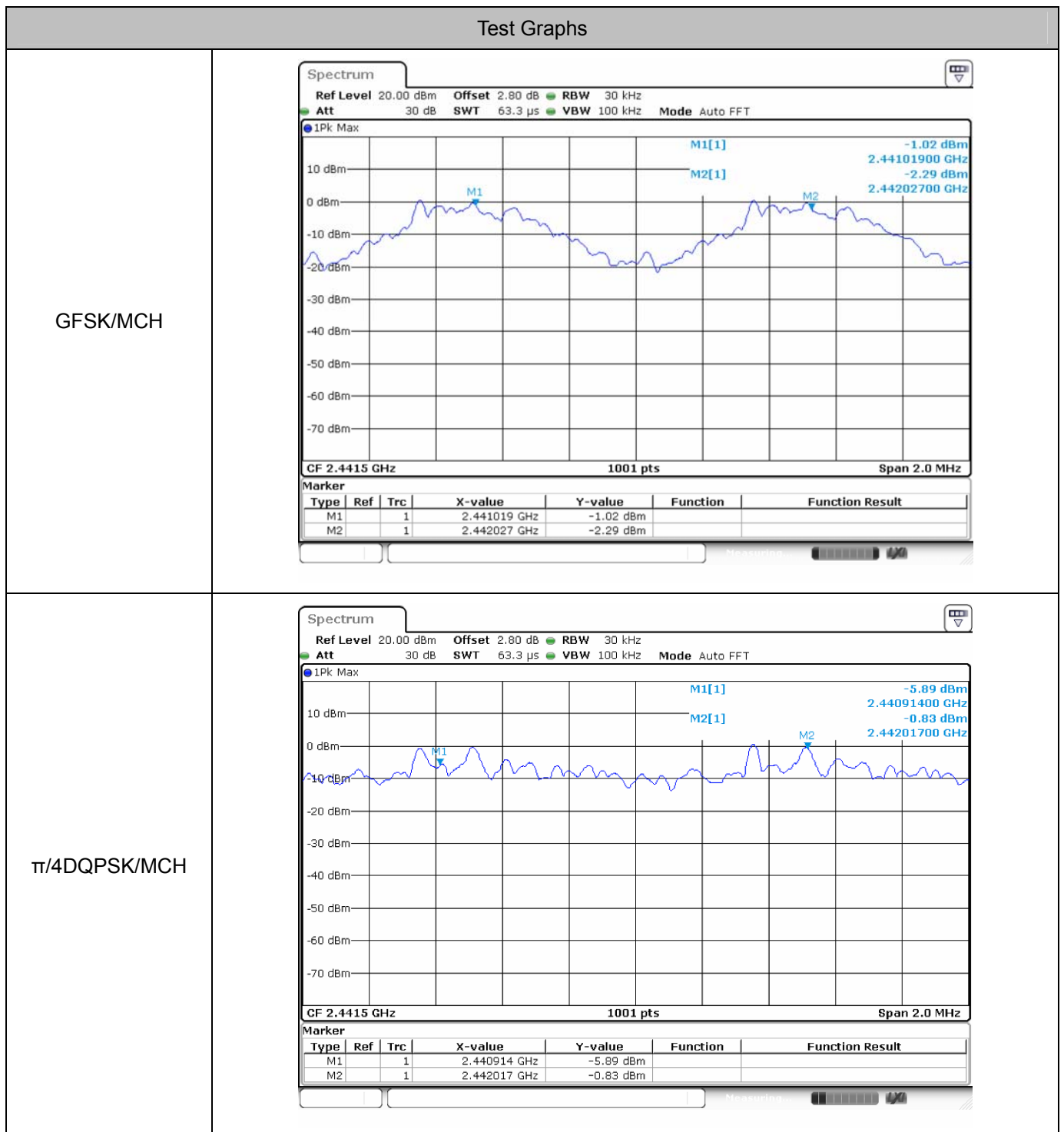


4 Carrier Frequency Separation

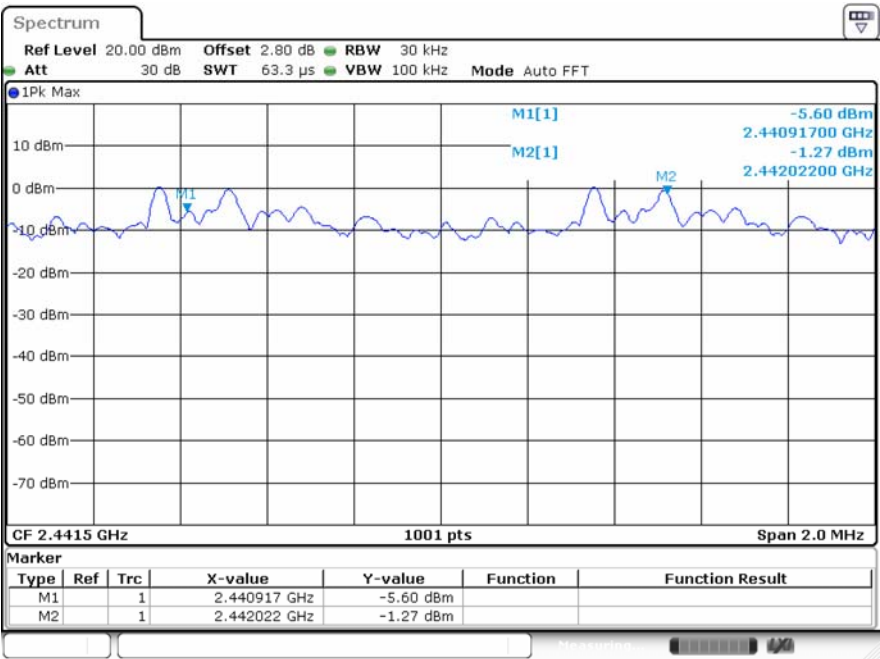
4.1 Test Result

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	MCH	1.008	0.687	Pass
$\pi/4$ DQPSK	MCH	1.103	0.869	Pass
8DPSK	MCH	1.105	0.839	Pass

4.2 Test Graphs



8DPSK/MCH

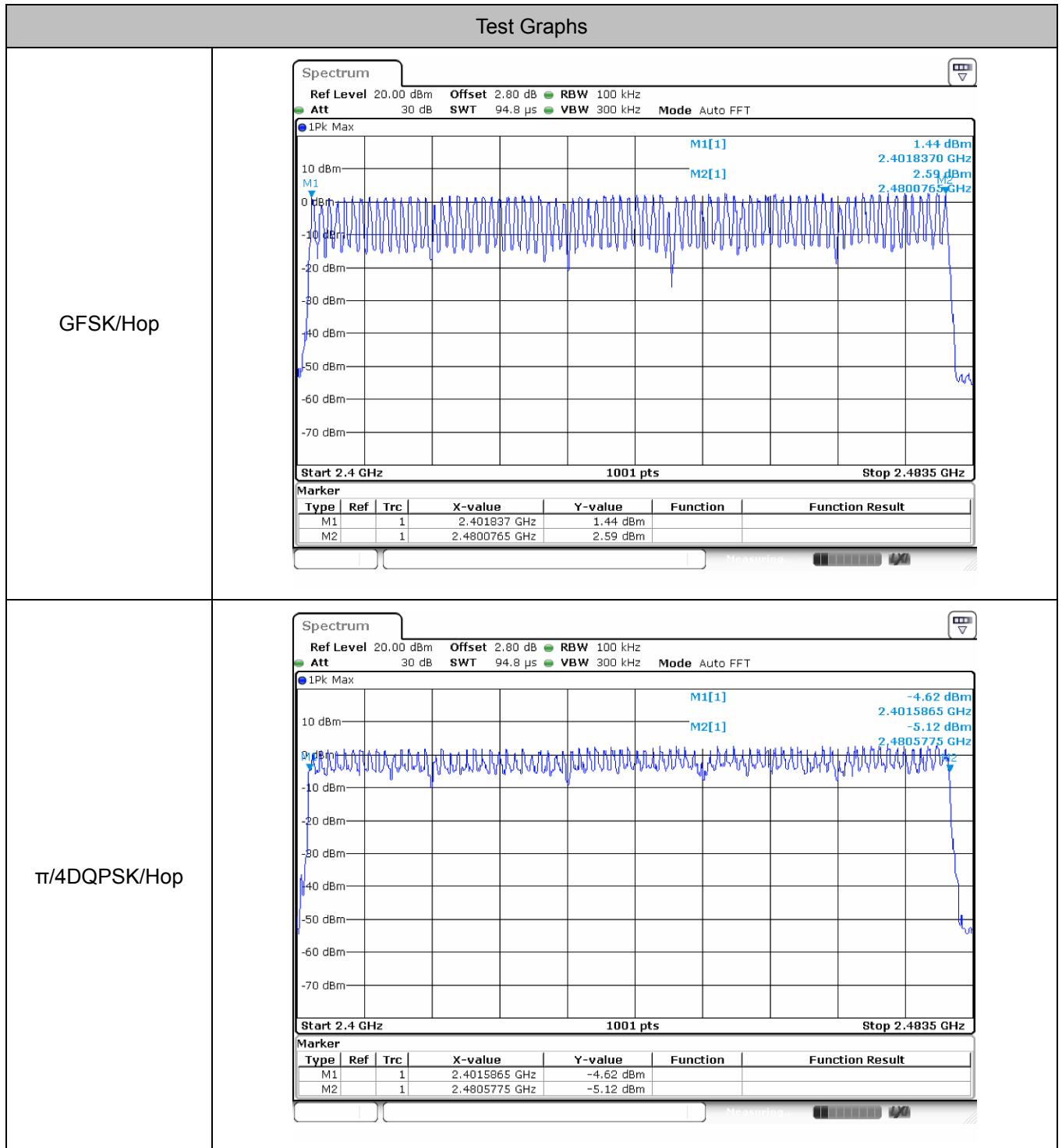


5 Hopping Channel Number

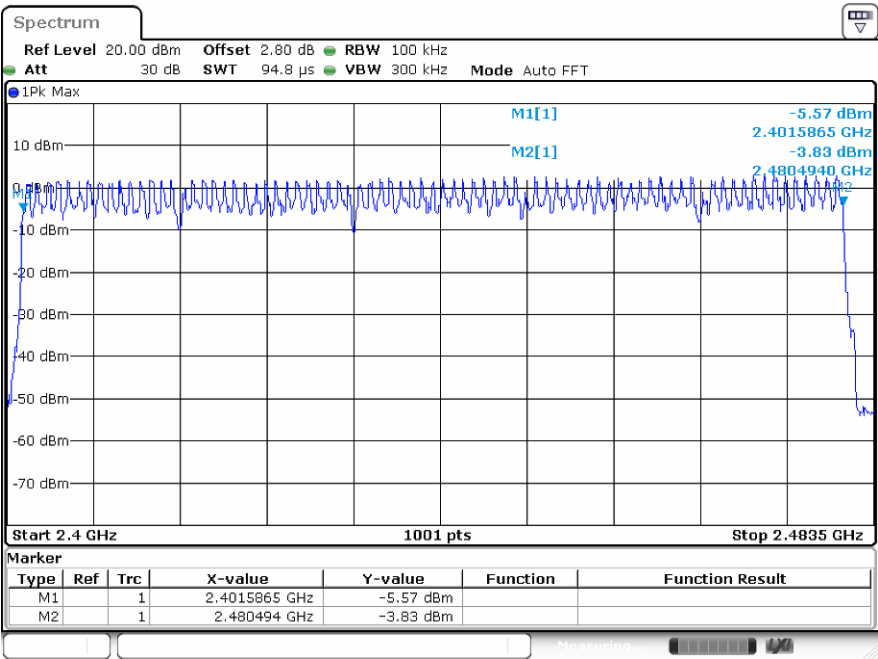
5.1 Test Result

Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	≥ 15	PASS
$\pi/4$ DQPSK	Hop	79	≥ 15	PASS
8DPSK	Hop	79	≥ 15	PASS

5.2 Test Graphs



8DPSK/Hop

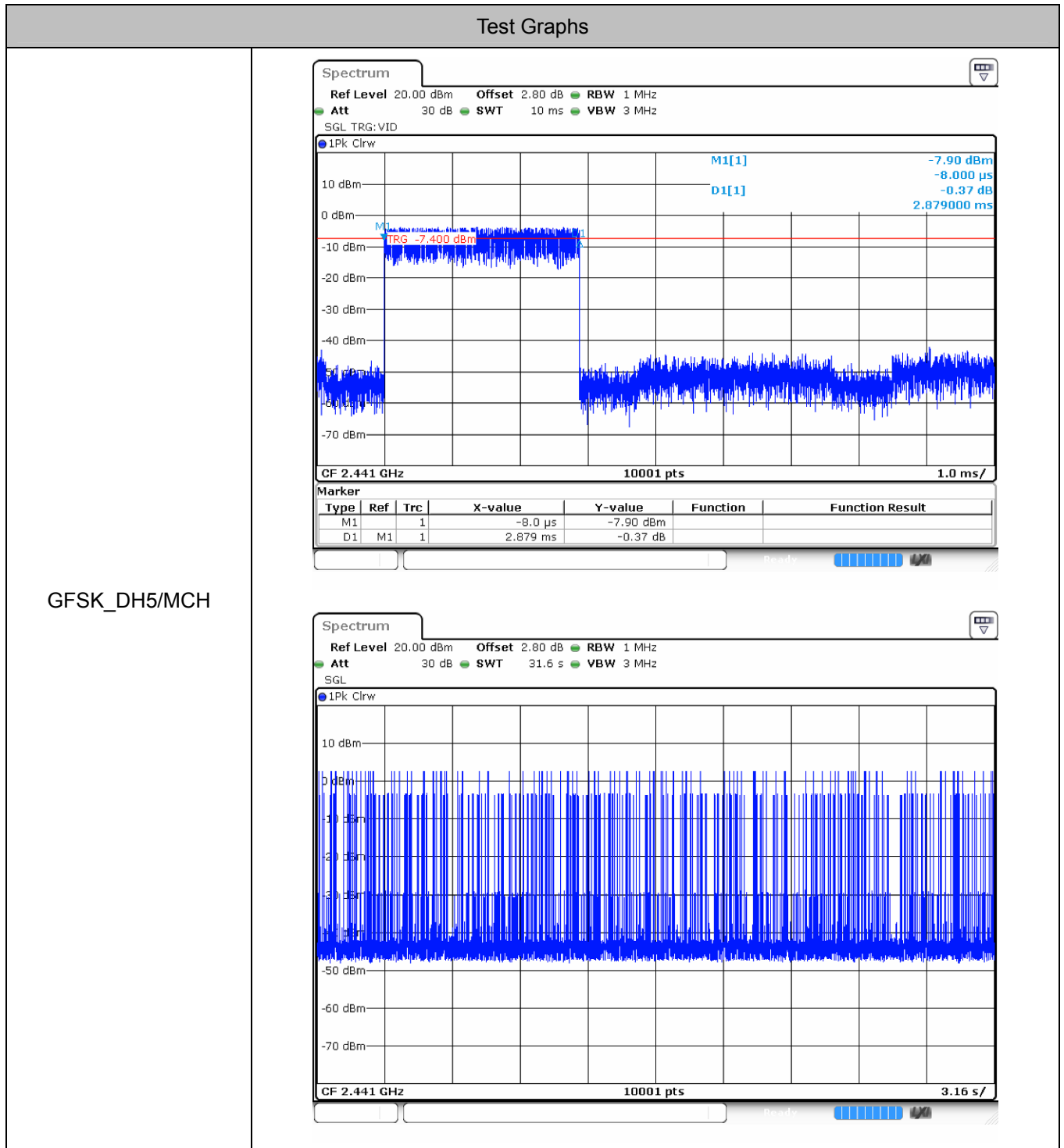


6 Dwell Time

6.1 Test Result

Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[ms]	Limit [s]	Verdict
GFSK	DH5	MCH	2.879	116	333.964	0.4	Pass
$\pi/4$ DQPSK	2DH5	MCH	2.883	97	279.651	0.4	Pass
8DPSK	3DH5	MCH	2.887	104	300.248	0.4	Pass

6.2 Test Graphs



Spectrum

Ref Level 20.00 dBm Offset 2.80 dB RBW 1 MHz

Att 30 dB SWT 31.6 s VBW 3 MHz

SGL

1Pk Clrw

10 dBm

0 dBm

-10 dBm

-20 dBm

-30 dBm

-40 dBm

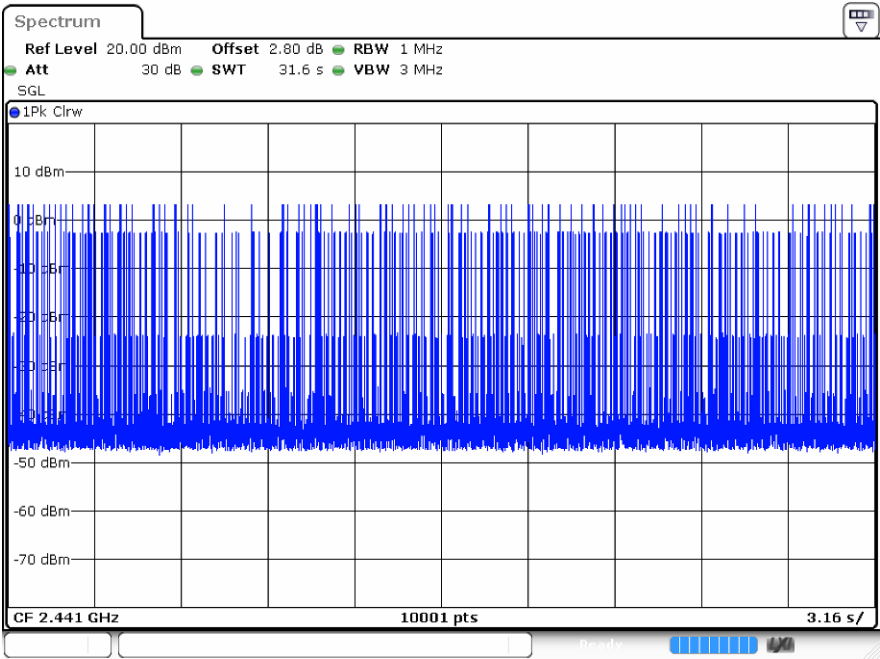
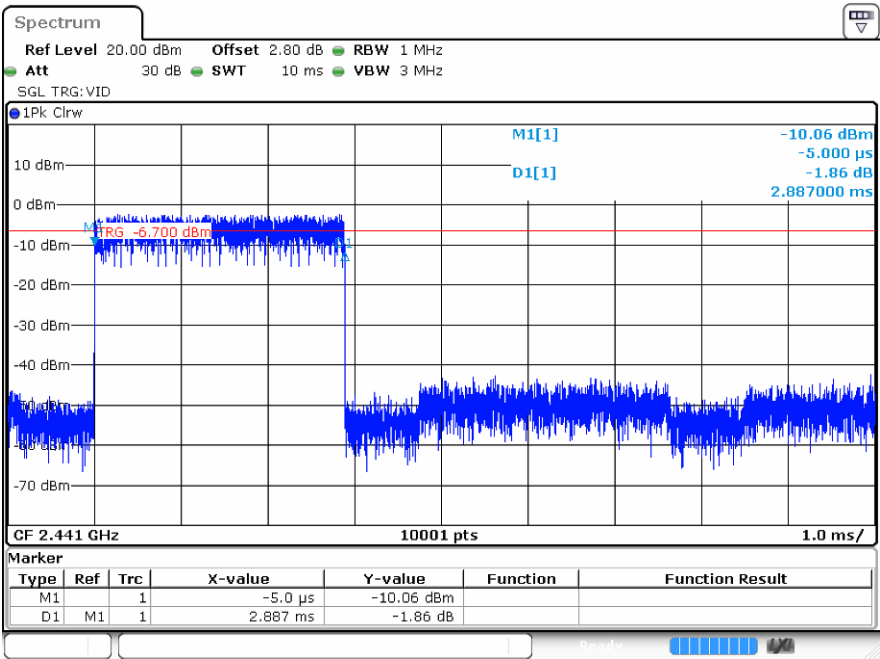
-50 dBm

-60 dBm

-70 dBm

CF 2.441 GHz 10001 pts 3.16 s/

8DPSK_3DH5/MCH

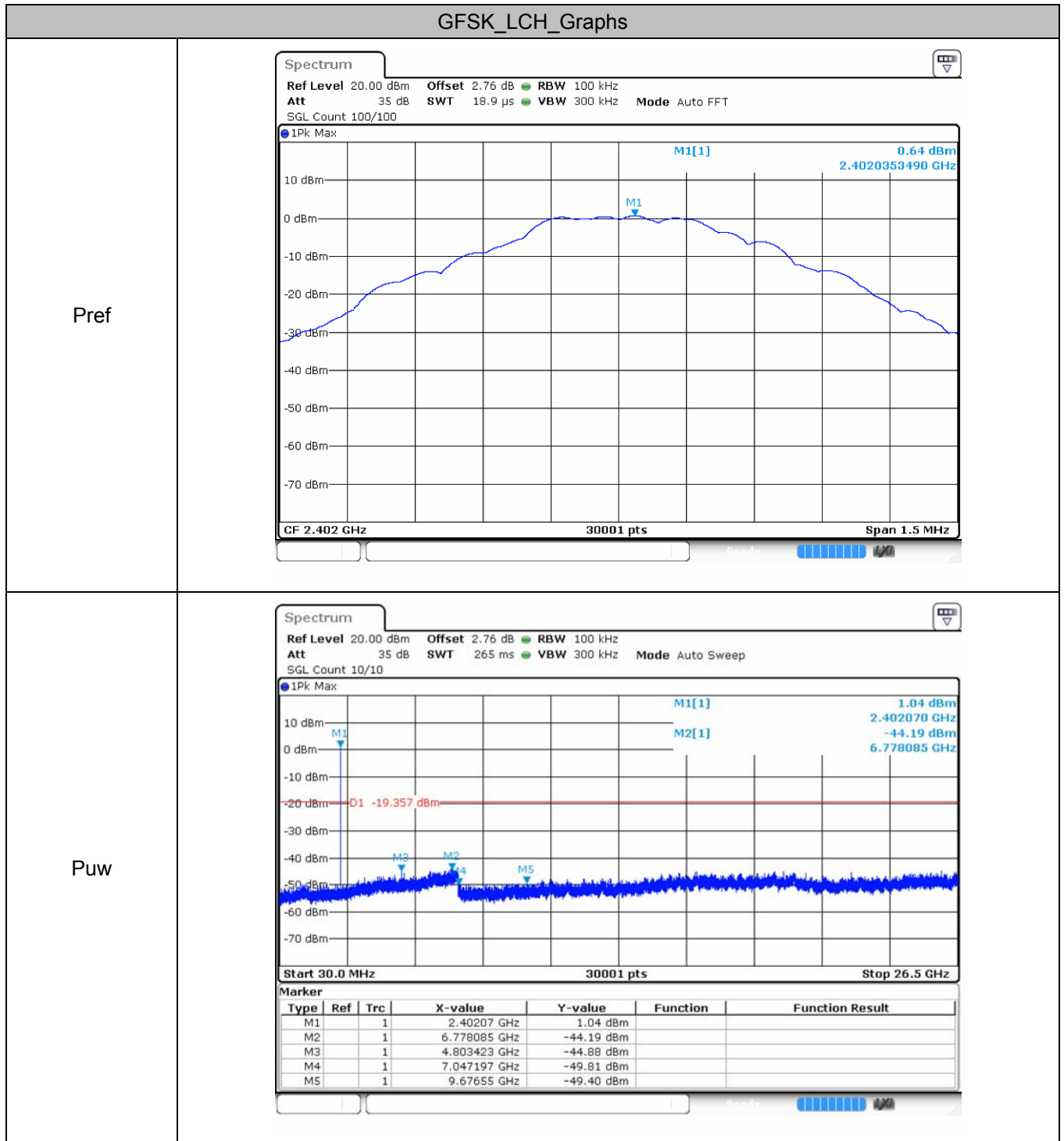


7 RF Conducted Spurious Emissions

7.1 Test Result

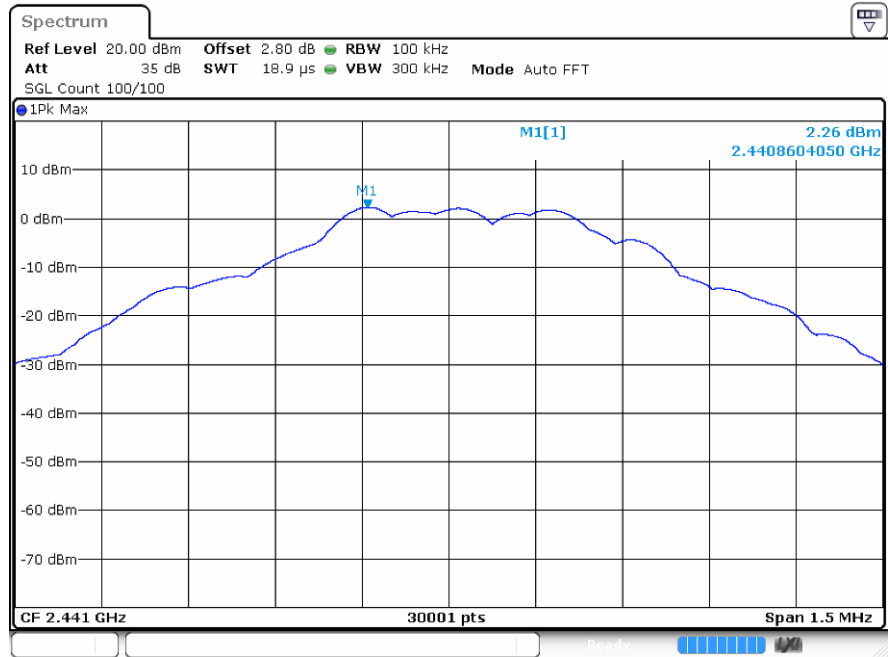
Mode	Channel	Max. Level [dBc]	Limit [dBc]	Verdict
GFSK	LCH	-44.83	-20	Pass
	MCH	-46.25	-20	Pass
	HCH	-45.72	-20	Pass
$\pi/4$ DQPSK	LCH	-44.56	-20	Pass
	MCH	-46.05	-20	Pass
	HCH	-46.09	-20	Pass
8DPSK	LCH	-43.93	-20	Pass
	MCH	-44.91	-20	Pass
	HCH	-45.91	-20	Pass

7.2 Test Graphs

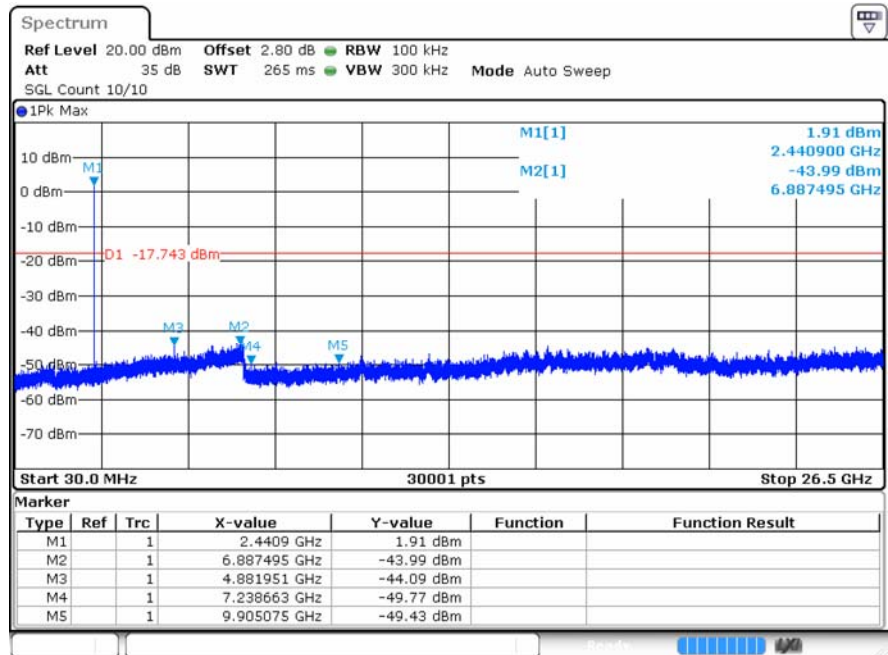


GFSK_MCH_Graphs

Pref

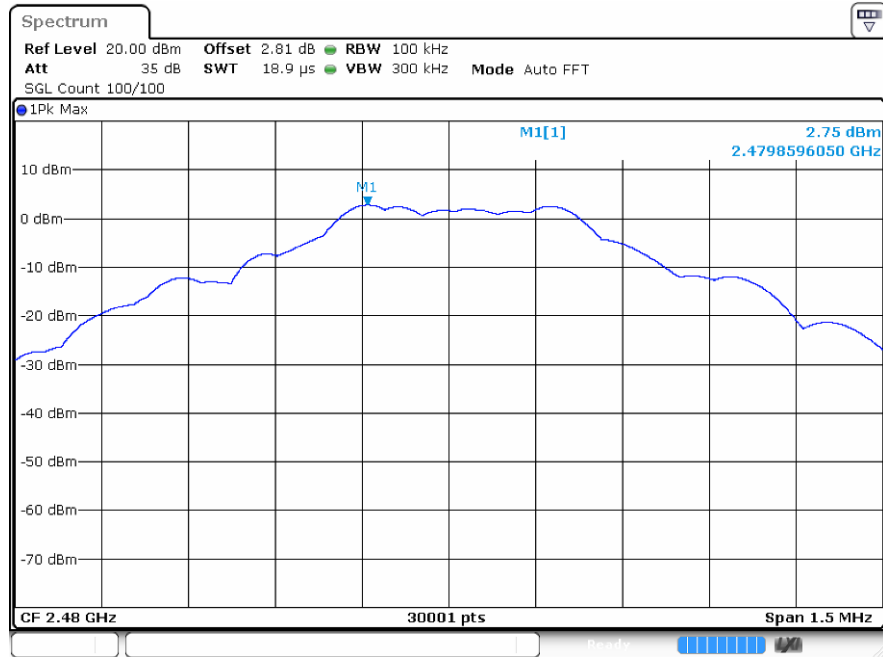


Puw

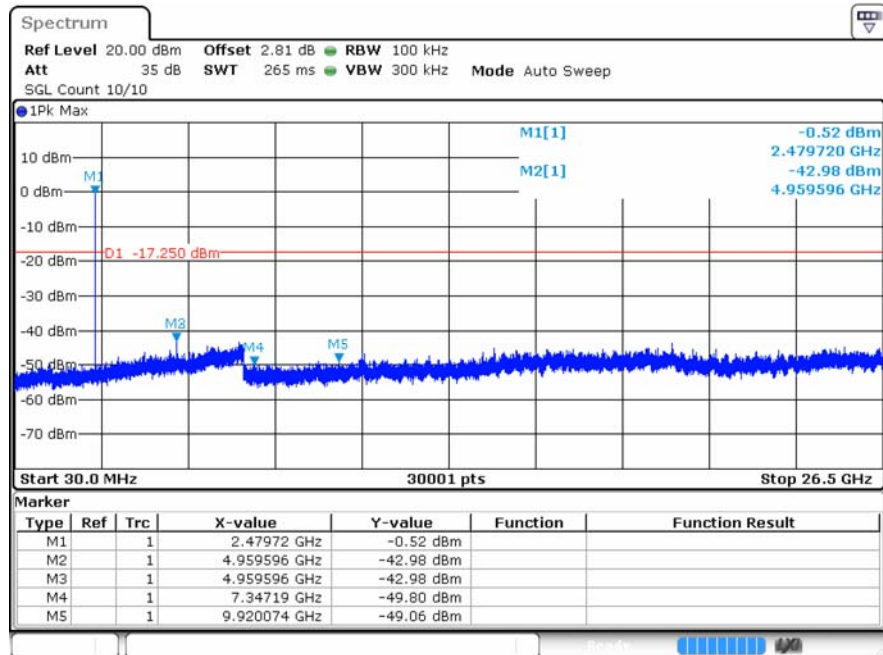


GFSK_HCH_Graphs

Pref

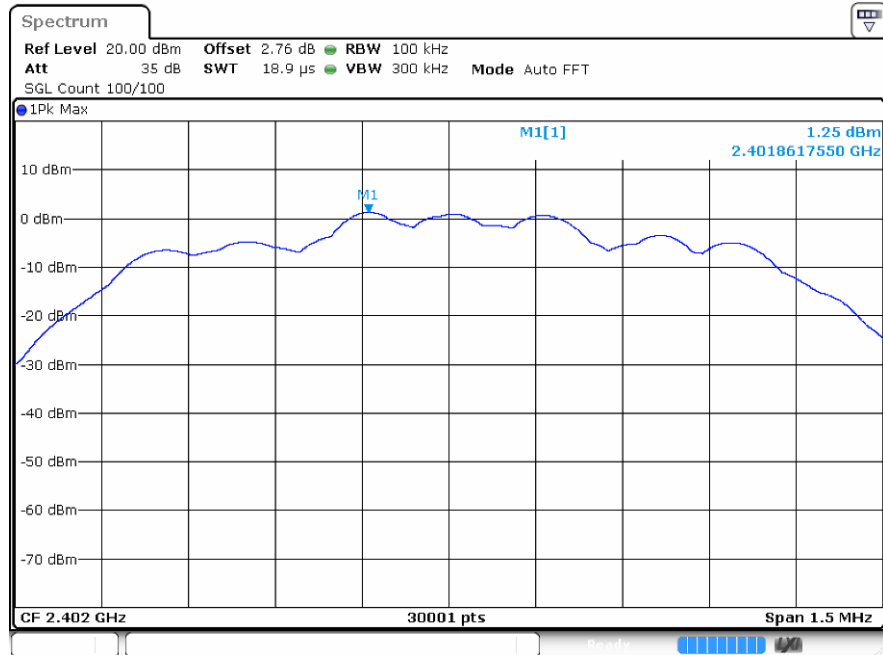


Puw

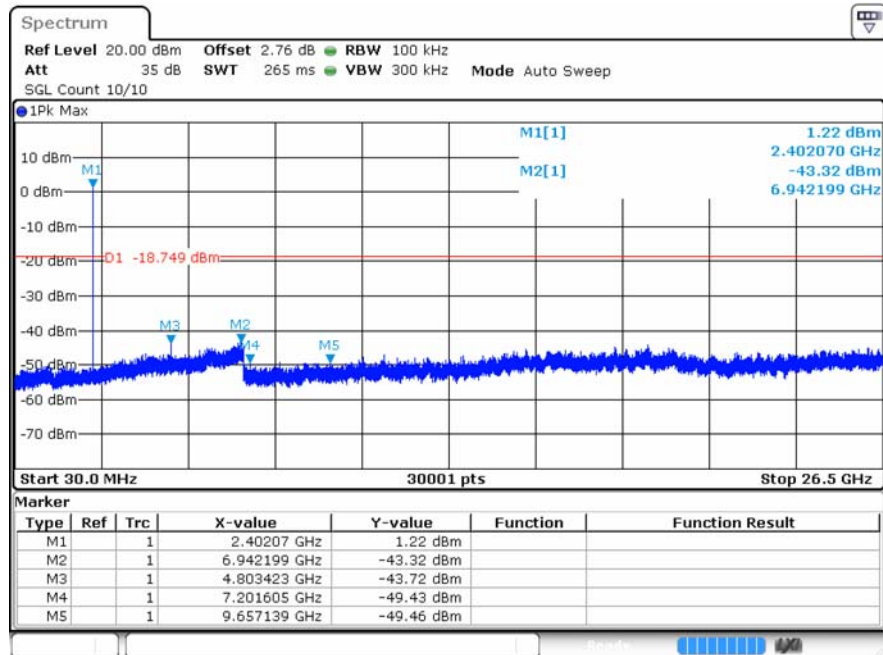


$\pi/4$ DQPSK_LCH_Graphs

Pref

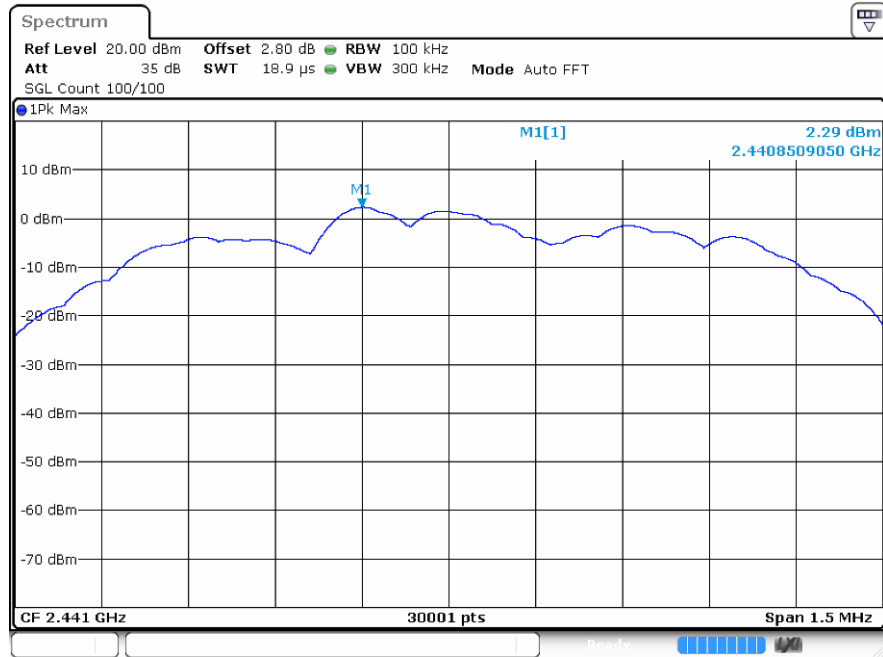


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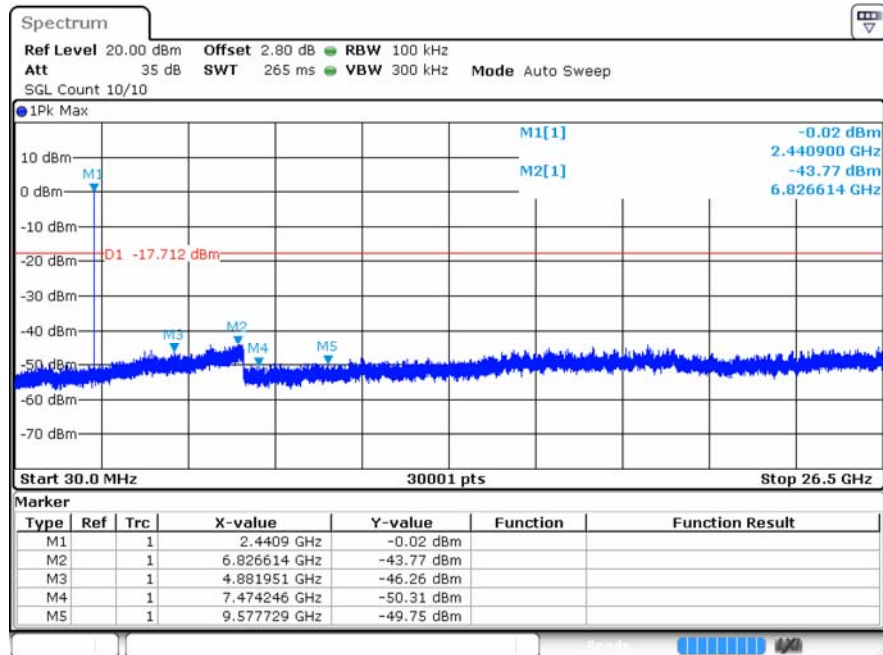


$\pi/4$ DQPSK_MCH_Graphs

Pref

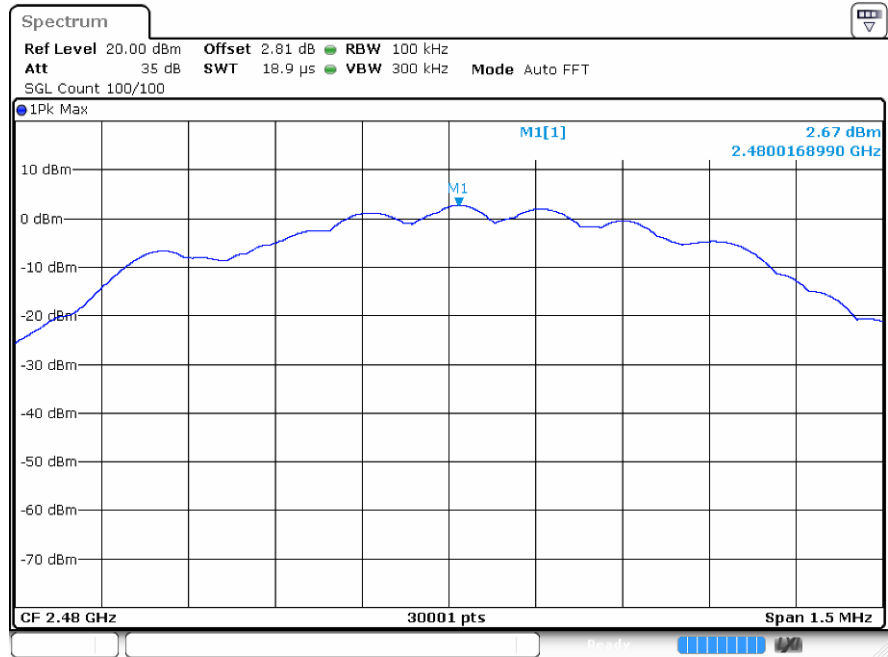


Puw

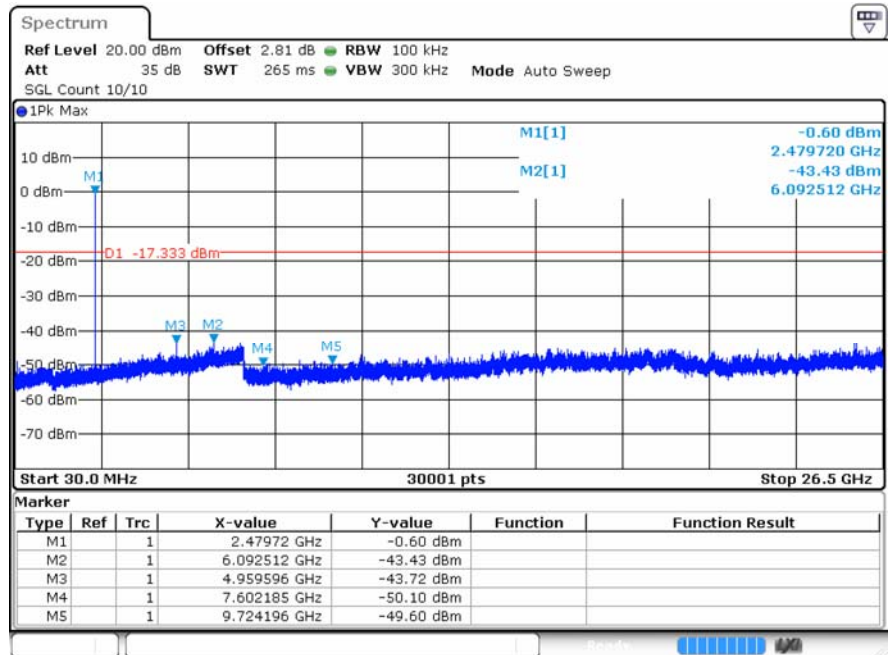


$\pi/4$ DQPSK_HCH_Graphs

Pref

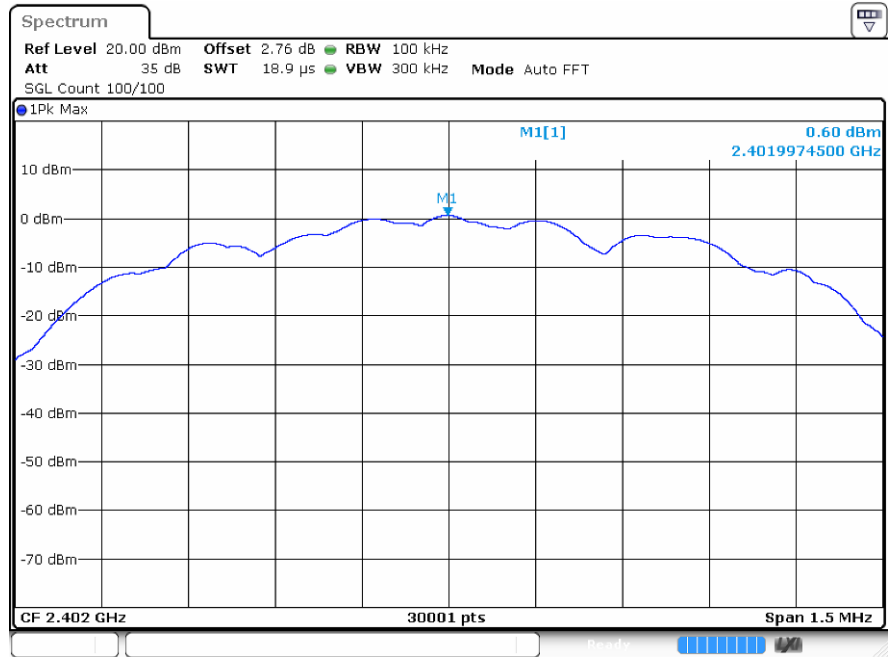


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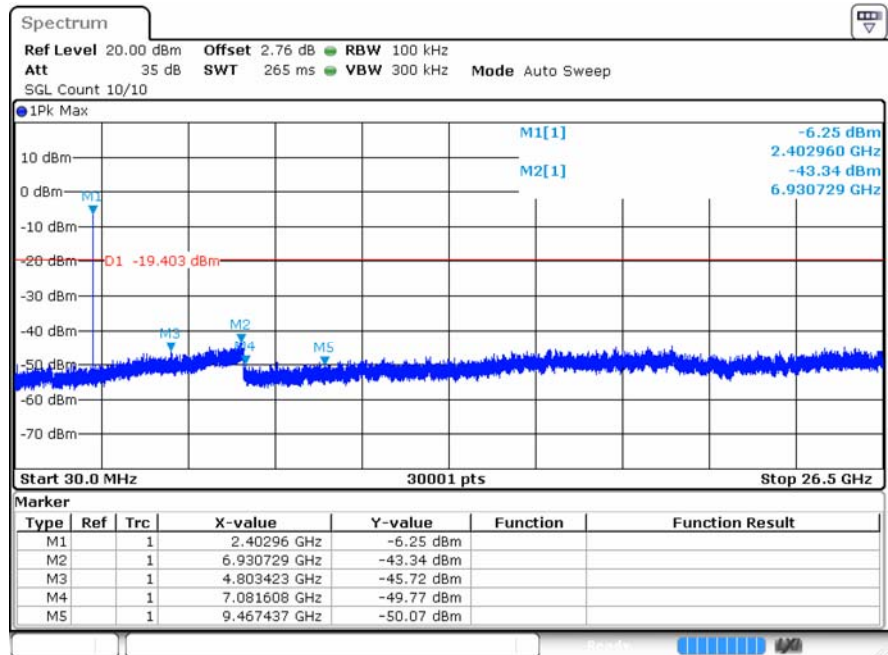


8DPSK_LCH_Graphs

Pref

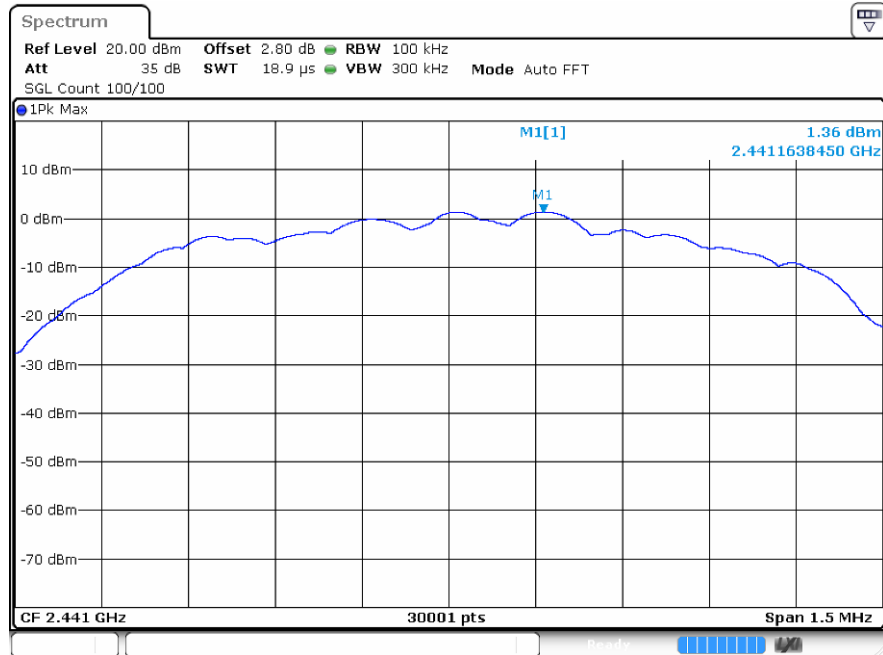


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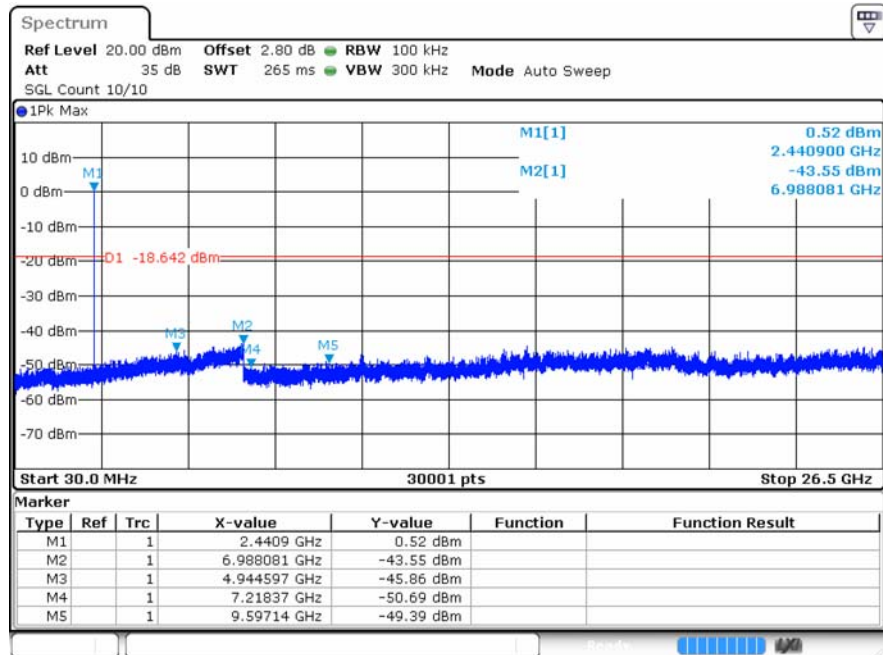


8DPSK_MCH_Graphs

Pref

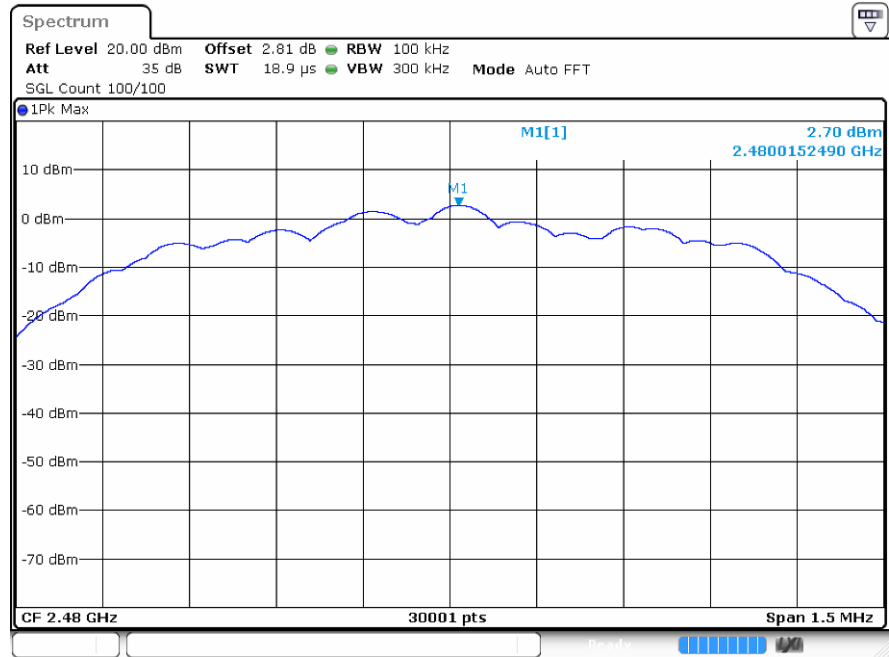


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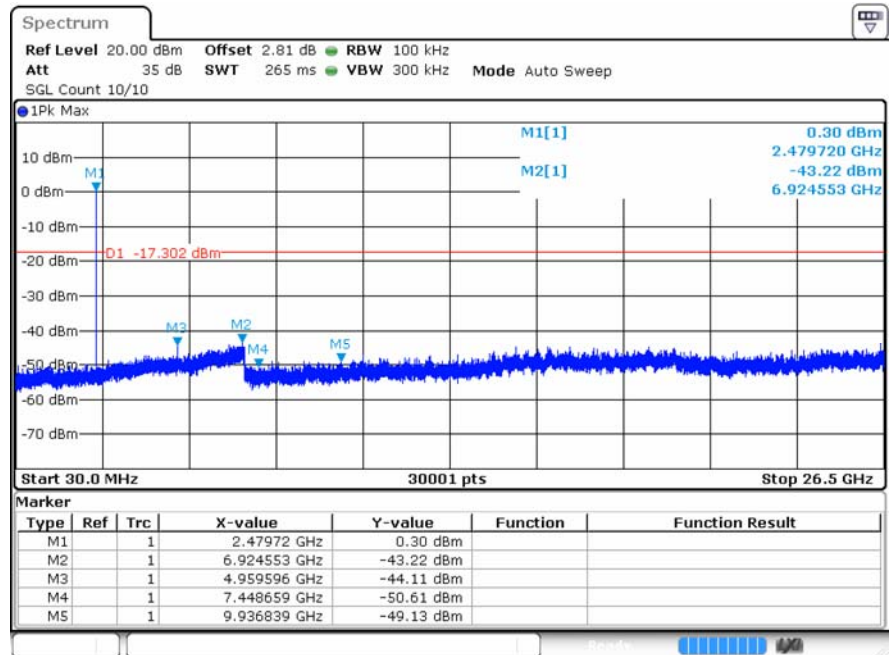


8DPSK_HCH_Graphs

Pref



Puw

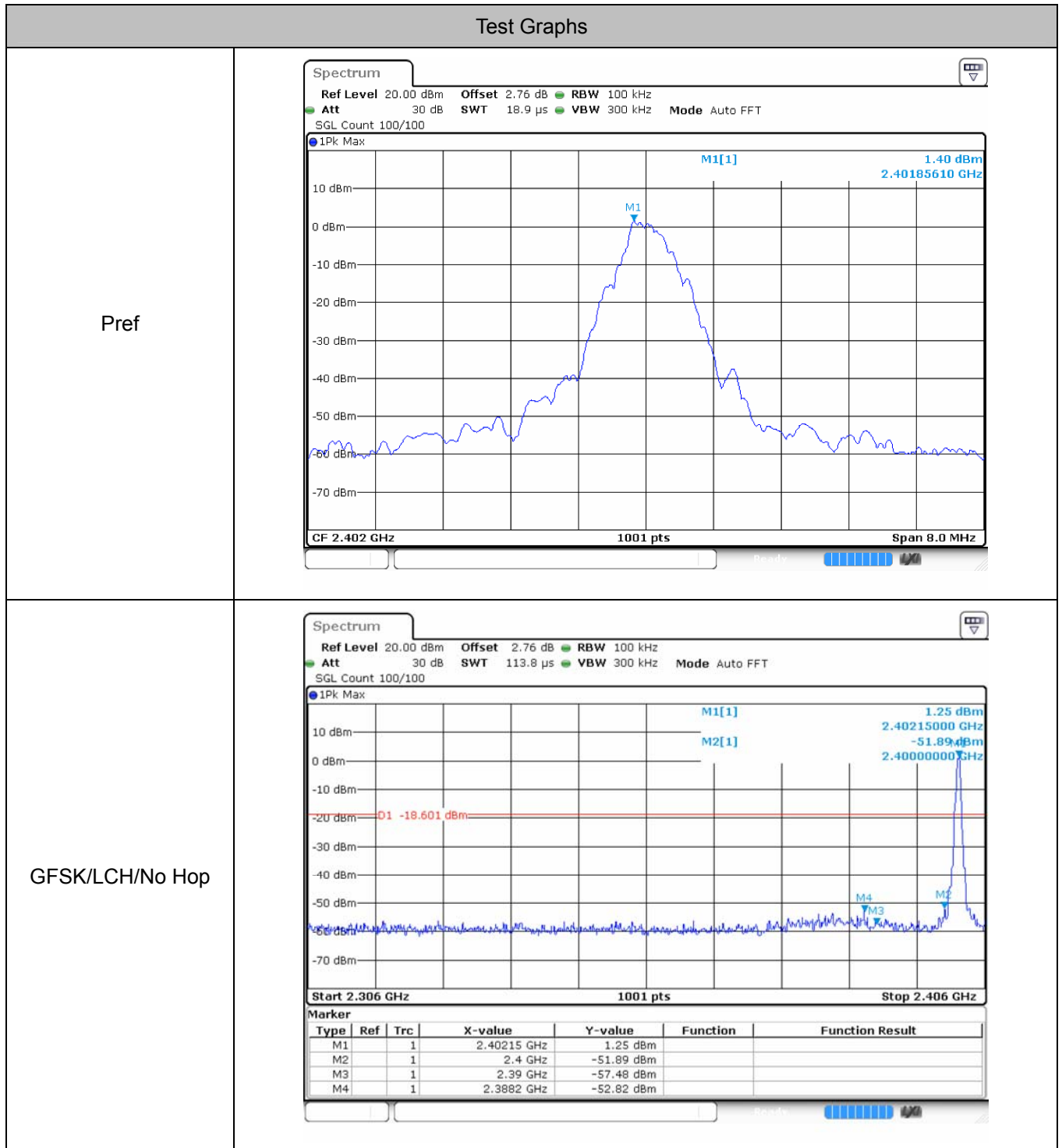


8 Band-edge for RF Conducted Emissions

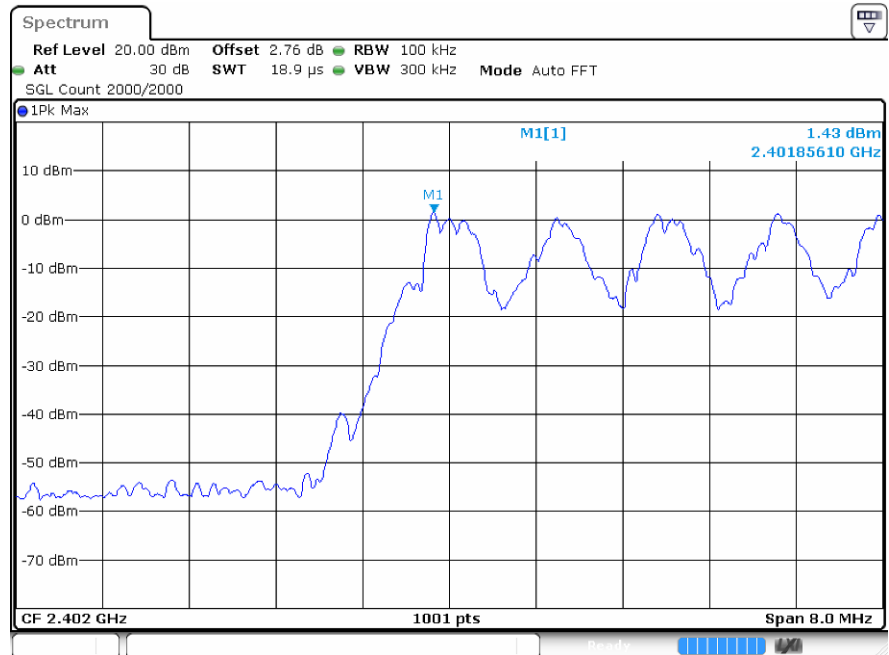
8.1 Test Result

Mode	Channel	Carrier Frequency [MHz]	Frequency Hopping	Max Spurious Level [dBc]	Limit [dBc]	Verdict
GFSK	LCH	2402	Off	-54.22	-20	Pass
			On	-53.47	-20	Pass
	HCH	2480	Off	-55.37	-20	Pass
			On	-54.58	-20	Pass
$\pi/4$ DQPSK	LCH	2402	Off	-53.78	-20	Pass
			On	-53.91	-20	Pass
	HCH	2480	Off	-55.47	-20	Pass
			On	-54.28	-20	Pass
8DPSK	LCH	2402	Off	-55.31	-20	Pass
			On	-54.16	-20	Pass
	HCH	2480	Off	-54.38	-20	Pass
			On	-53.23	-20	Pass

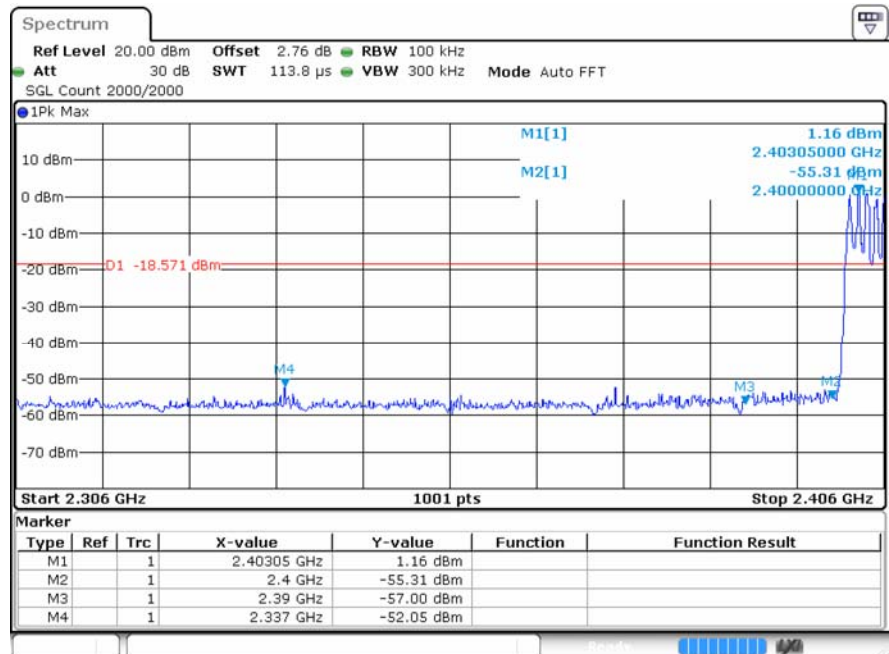
8.2 Test Graphs



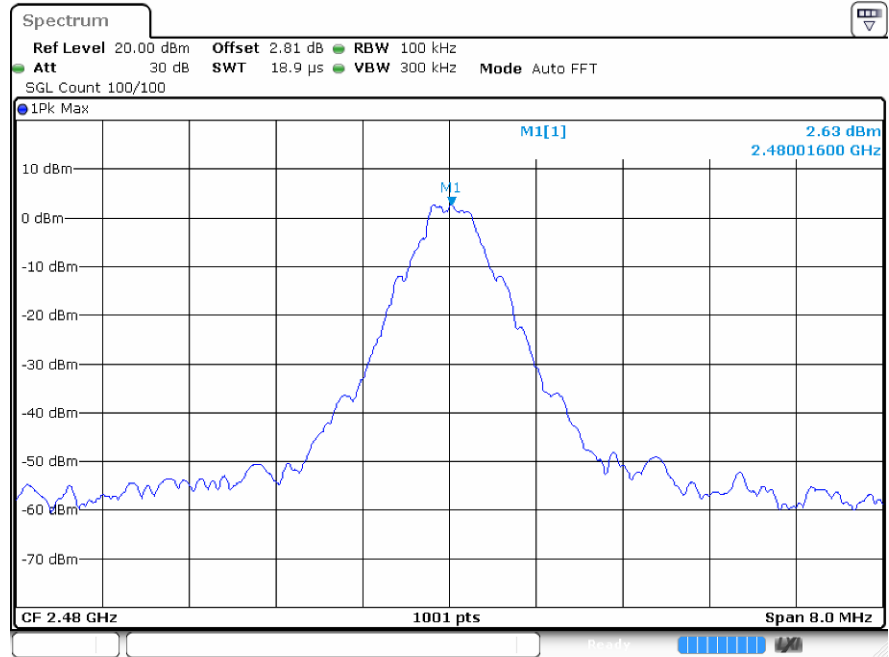
Ref



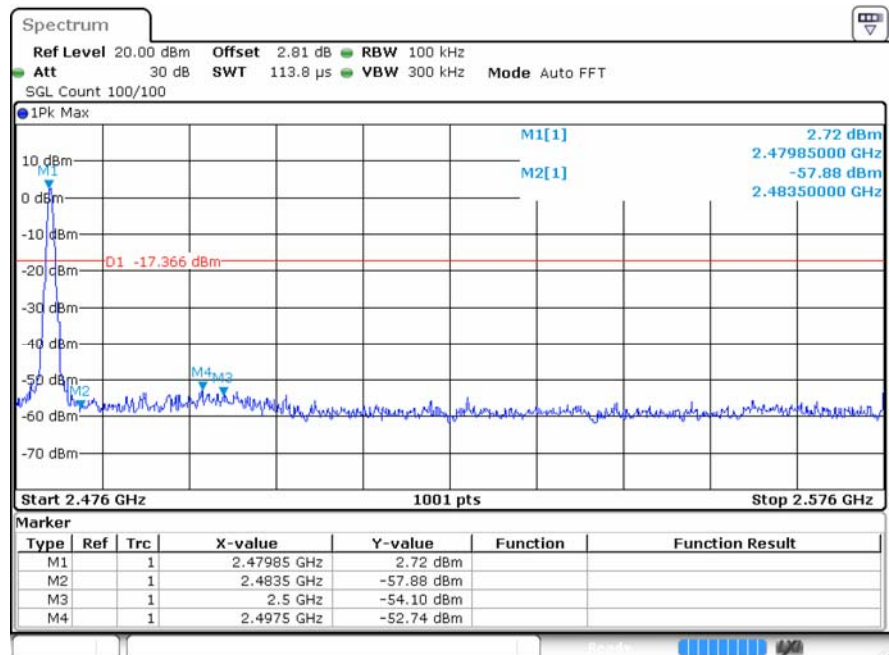
GFSK/LCH/Hop



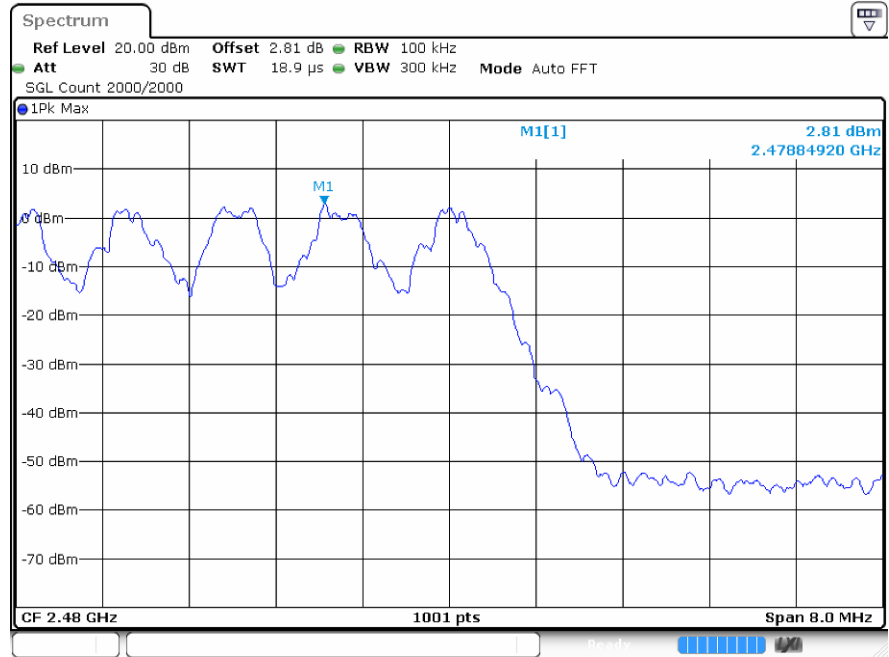
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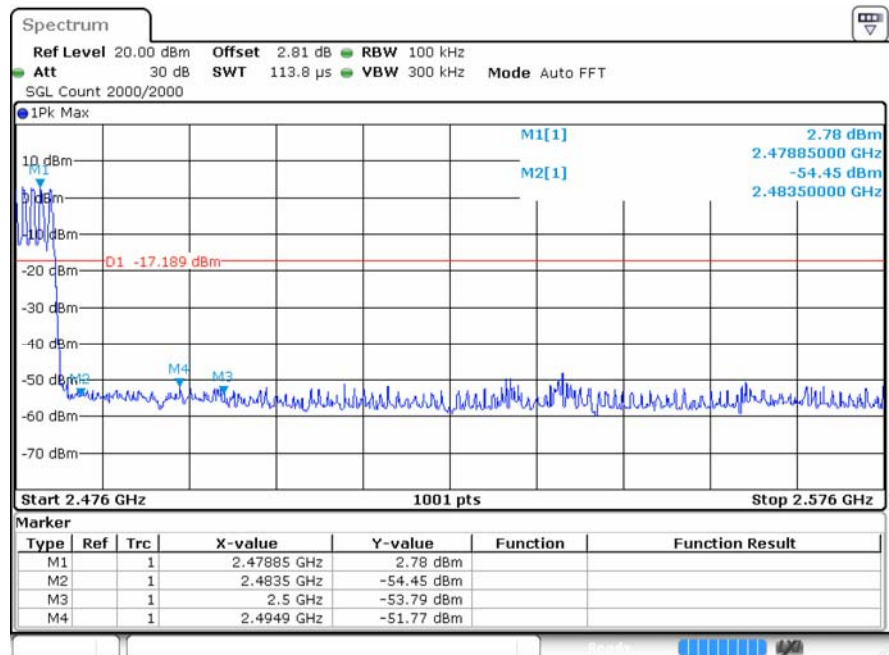
GFSK/HCH/No Hop



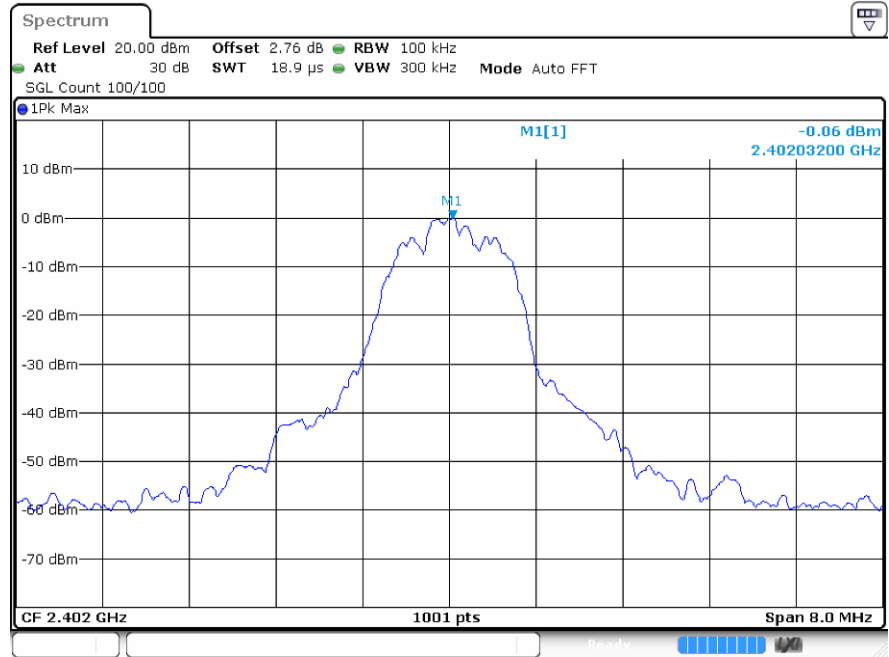
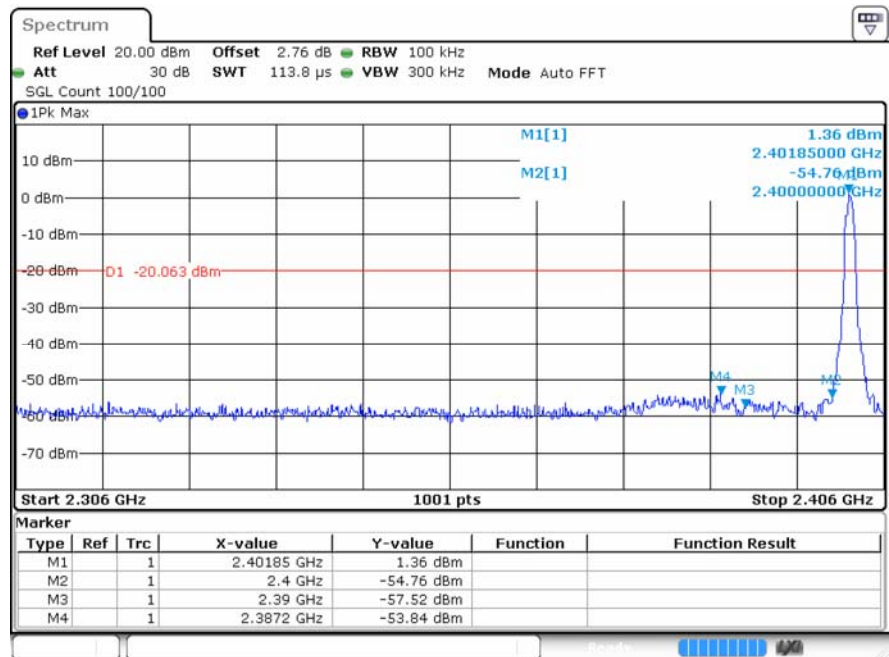
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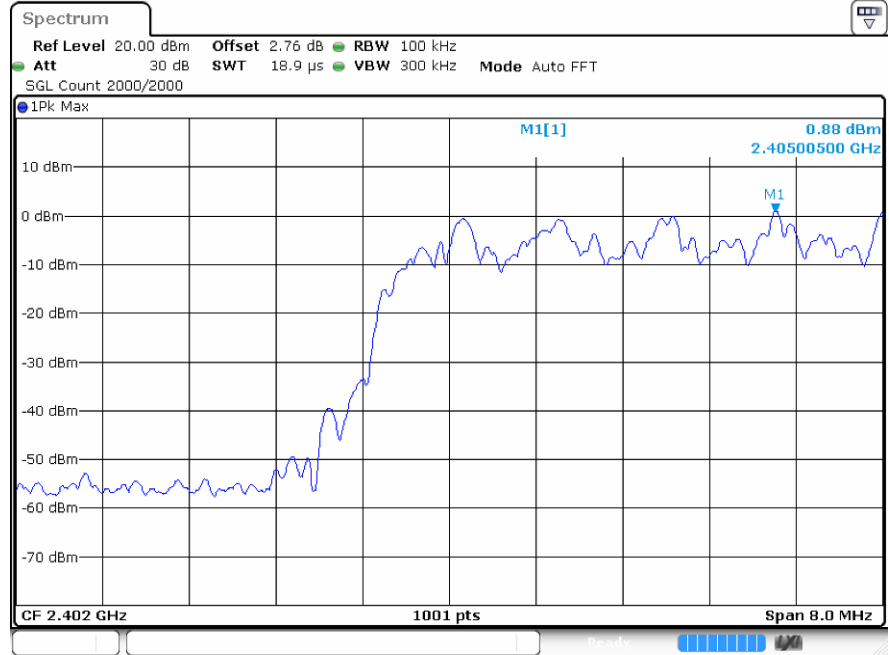
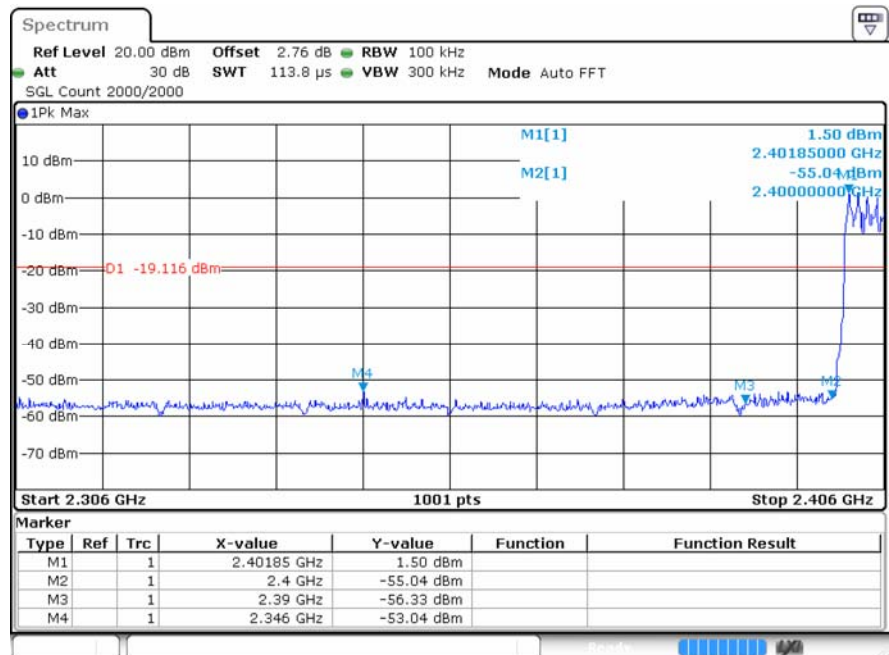
GFSK/HCH/Hop



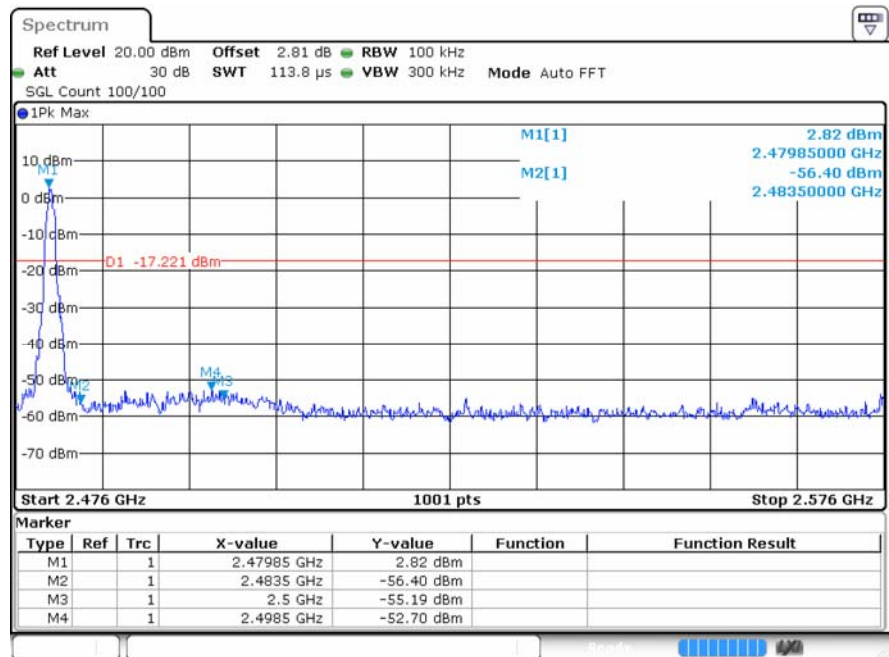
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 $\pi/4$ DQPSK/LCH/No
Hop


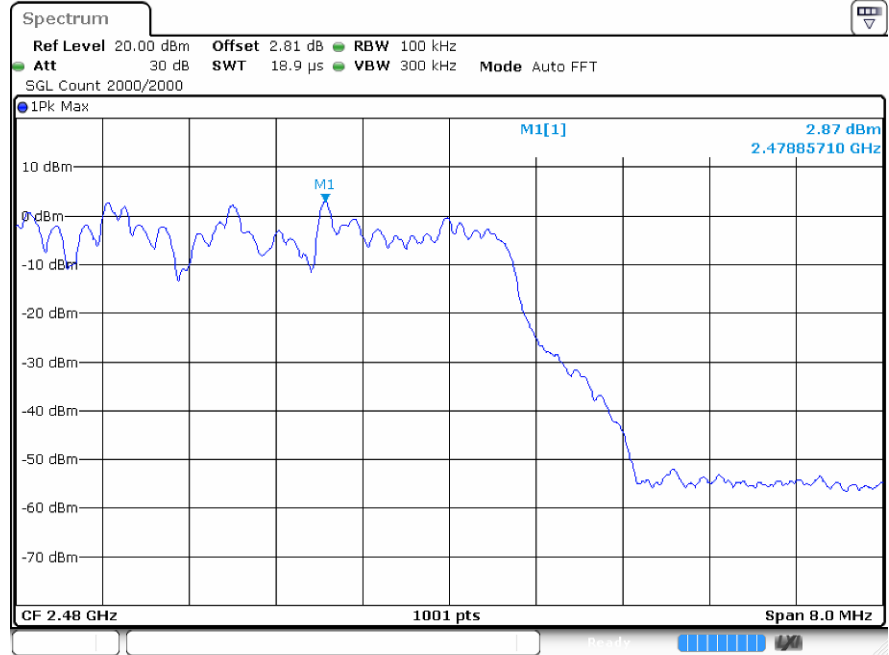
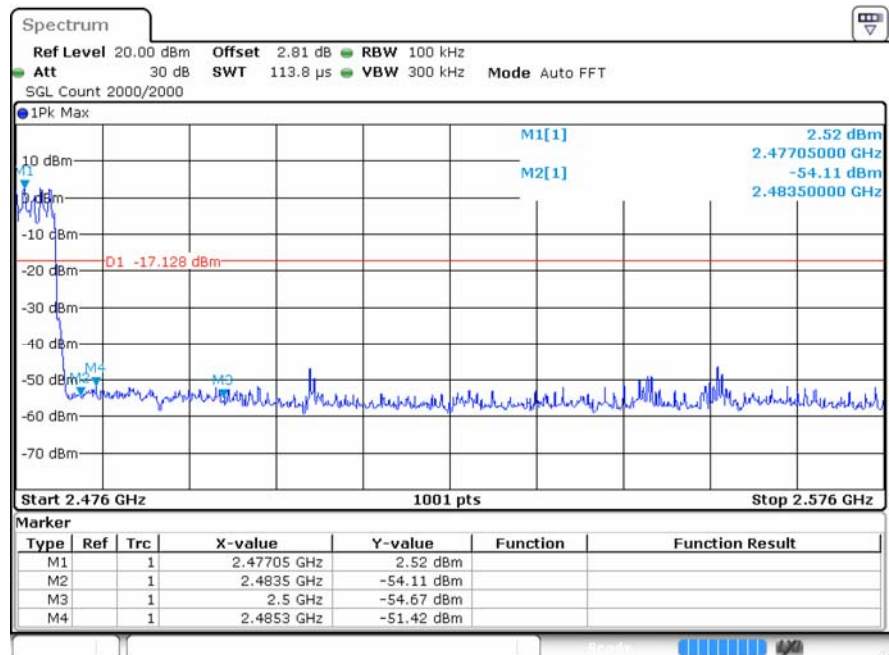
Ref


 $\pi/4$ DQPSK/LCH/Hop


Ref


 $\pi/4$ DQPSK/HCH/No
Hop


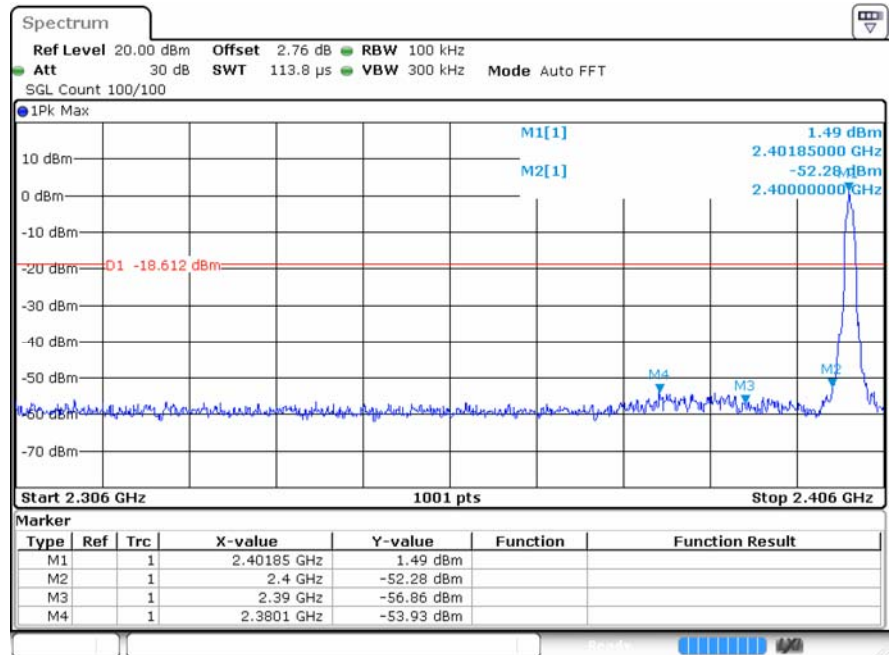
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 $\pi/4$ DQPSK/HCH/Hop


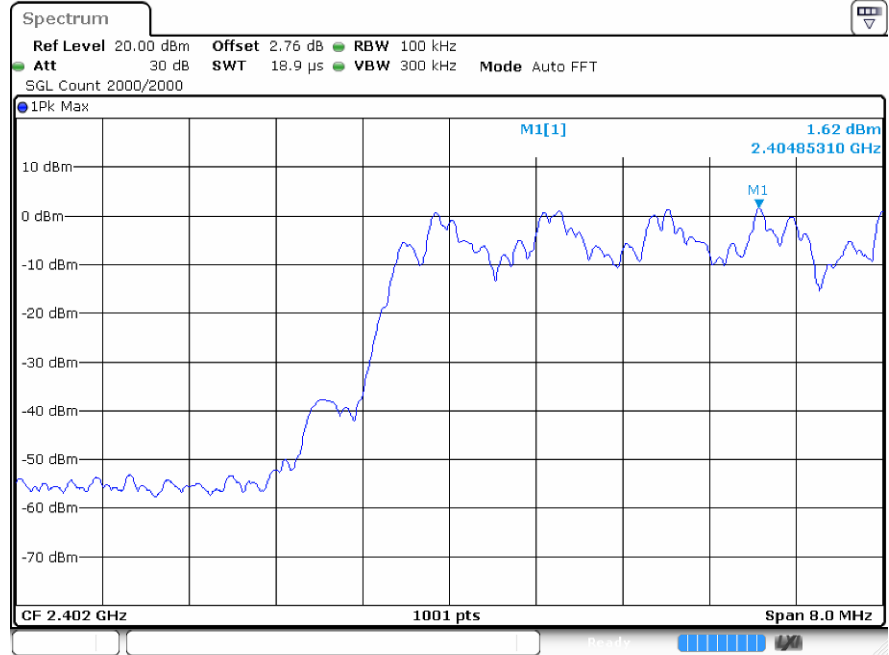
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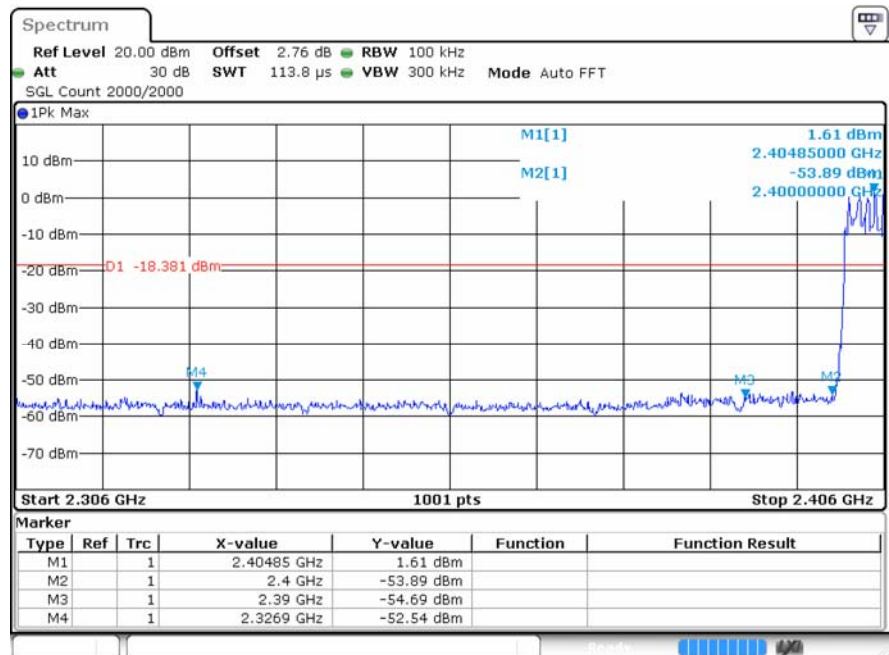
8DPSK/LCH/No Hop



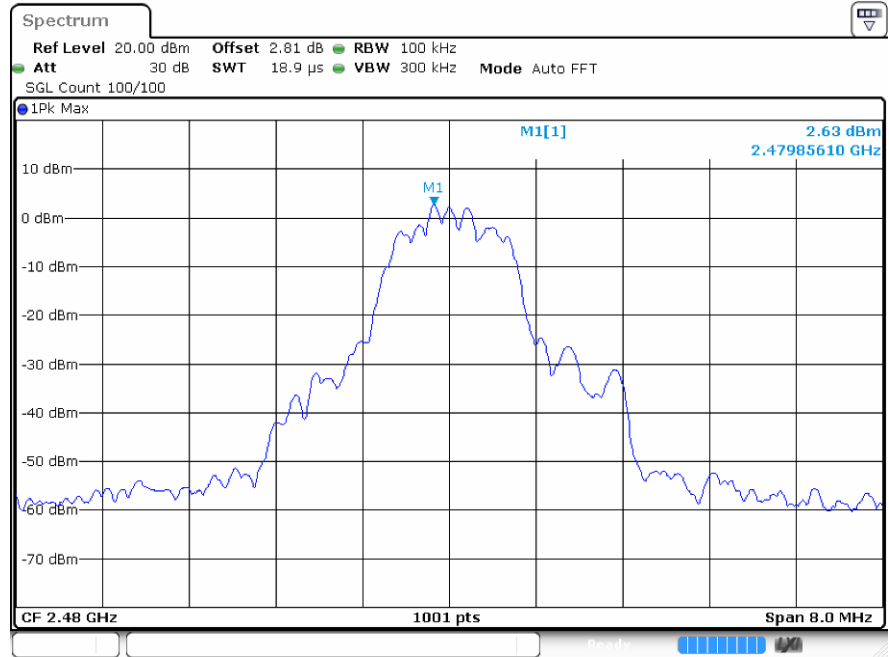
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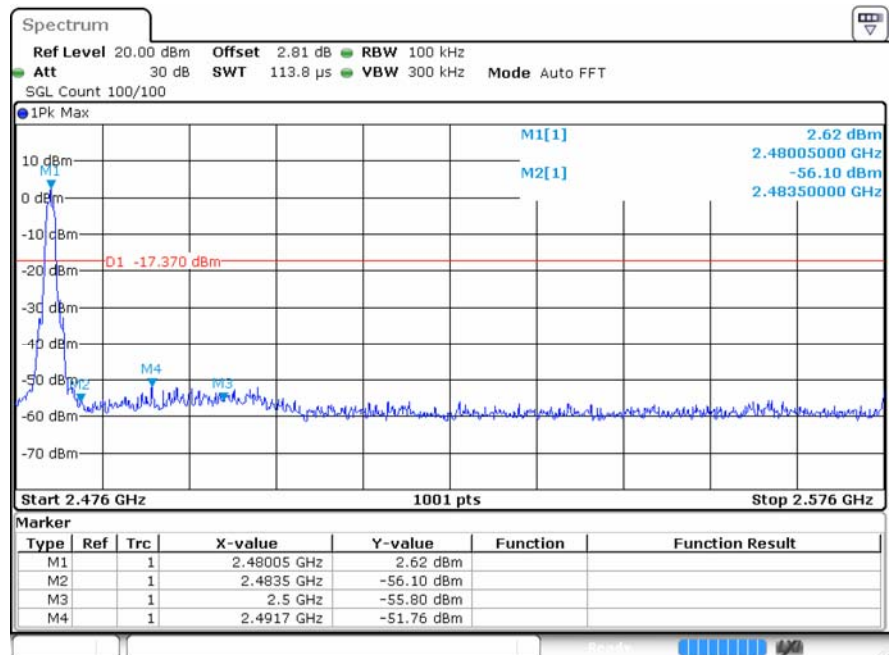
8DPSK/LCH/Hop



Ref



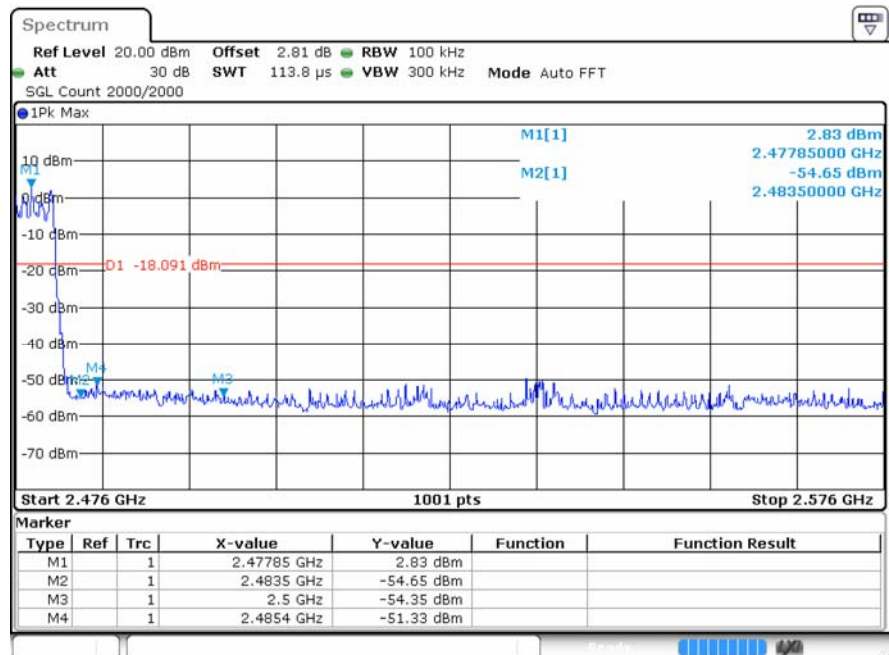
8DPSK/HCH/No Hop



Ref



8DPSK/HCH/Hop



9 Restrict-band band-edge measurements

9.1 Test Result

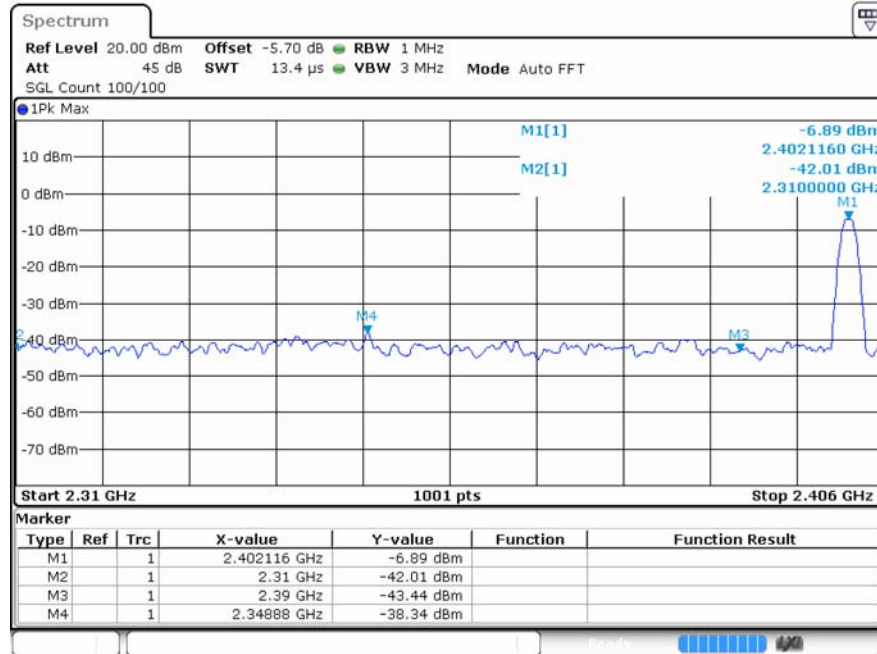
Test Mode	Hopping	Freq.	Power [dBm]	Gain	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-42	2	55.26	PEAK	74	Pass
	Off	2310.0	-50.53	2	46.73	AV	54	Pass
	Off	2348.88	-38.33	2	58.93	PEAK	74	Pass
	Off	2338.416	-48.61	2	48.65	AV	54	Pass
	Off	2390.0	-43.43	2	53.83	PEAK	74	Pass
	Off	2390.0	-50.81	2	46.45	AV	54	Pass
	Off	2483.5	-40.51	2	56.75	PEAK	74	Pass
	Off	2483.5	-50.32	2	46.94	AV	54	Pass
	Off	2492.008	-39.02	2	58.24	PEAK	74	Pass
	Off	2490.448	-49.72	2	47.54	AV	54	Pass
	Off	2500.0	-41.46	2	55.8	PEAK	74	Pass
	Off	2500.0	-50.08	2	47.18	AV	54	Pass
$\pi/4$ DQPSK	Off	2310.0	-43.53	2	53.73	PEAK	74	Pass
	Off	2310.0	-50.63	2	46.63	AV	54	Pass
	Off	2338.416	-38.51	2	58.75	PEAK	74	Pass
	Off	2339.184	-48.18	2	49.08	AV	54	Pass
	Off	2390.0	-41.85	2	55.41	PEAK	74	Pass
	Off	2390.0	-50.88	2	46.38	AV	54	Pass
	Off	2483.5	-41.57	2	55.69	PEAK	74	Pass
	Off	2483.5	-49.5	2	47.76	AV	54	Pass
	Off	2495.392	-38.64	2	58.62	PEAK	74	Pass
	Off	2483.584	-49.44	2	47.82	AV	54	Pass
	Off	2500.0	-42.23	2	55.03	PEAK	74	Pass
	Off	2500.0	-50.34	2	46.92	AV	54	Pass
8DPSK	Off	2310.0	-42.23	2	55.03	PEAK	74	Pass
	Off	2310.0	-50.28	2	46.98	AV	54	Pass
	Off	2345.232	-38.53	2	58.73	PEAK	74	Pass
	Off	2338.416	-48.73	2	48.53	AV	54	Pass



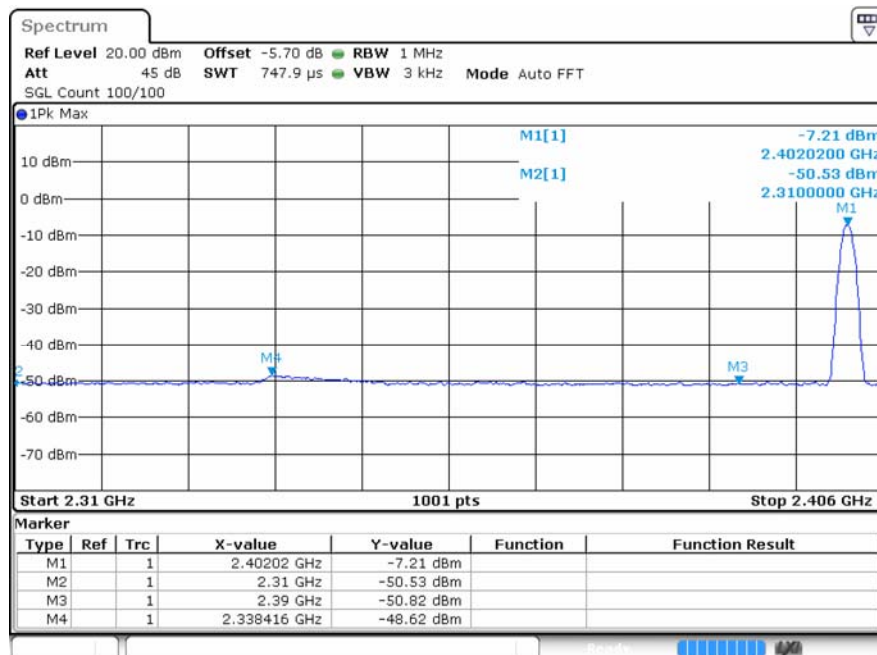
	Off	2390.0	-43.34	2	53.92	PEAK	74	Pass
	Off	2390.0	-50.65	2	46.61	AV	54	Pass
	Off	2483.5	-41.55	2	55.71	PEAK	74	Pass
	Off	2483.5	-50.26	2	47	AV	54	Pass
	Off	2488.768	-38.74	2	58.52	PEAK	74	Pass
	Off	2497.312	-49.79	2	47.47	AV	54	Pass
	Off	2500.0	-43.19	2	54.07	PEAK	74	Pass
	Off	2500.0	-50.25	2	47.01	AV	54	Pass

9.2 Test Graphs

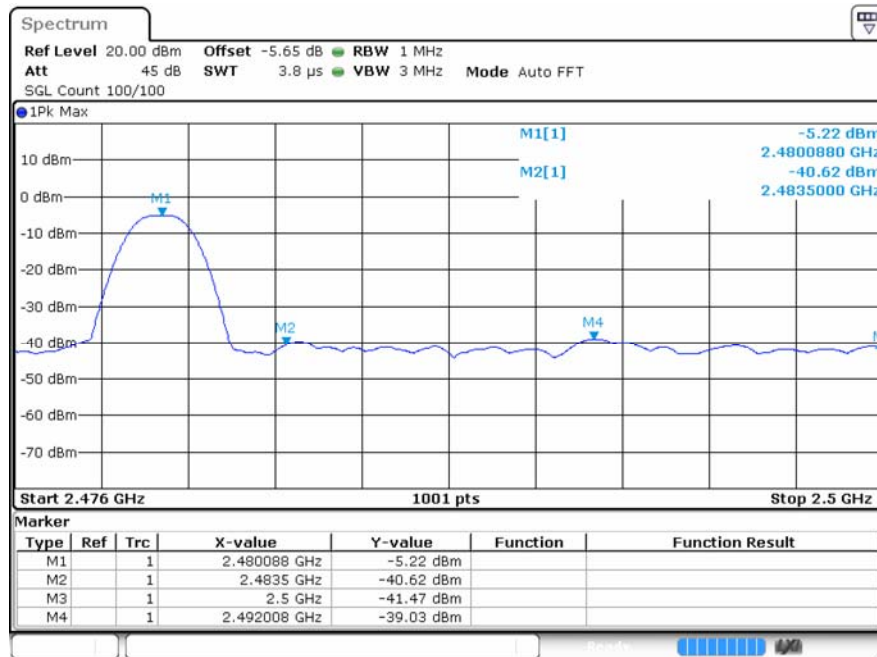
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (Low Channel)



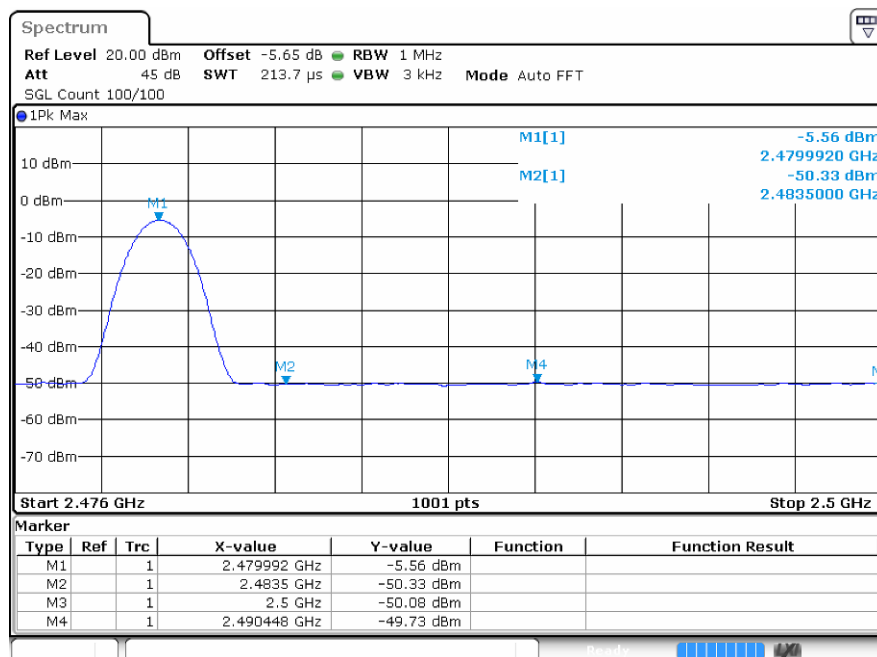
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (Low Channel)



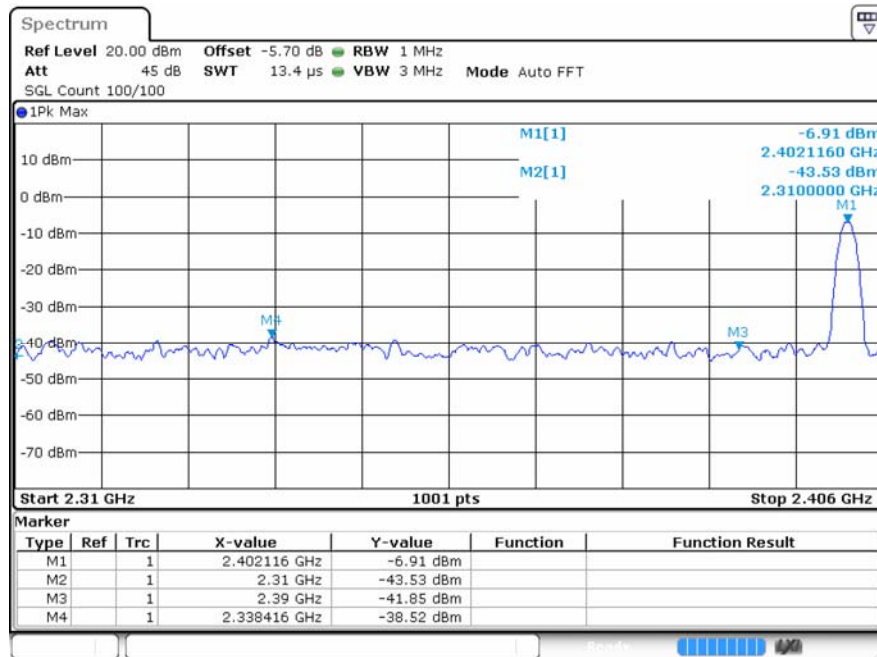
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)



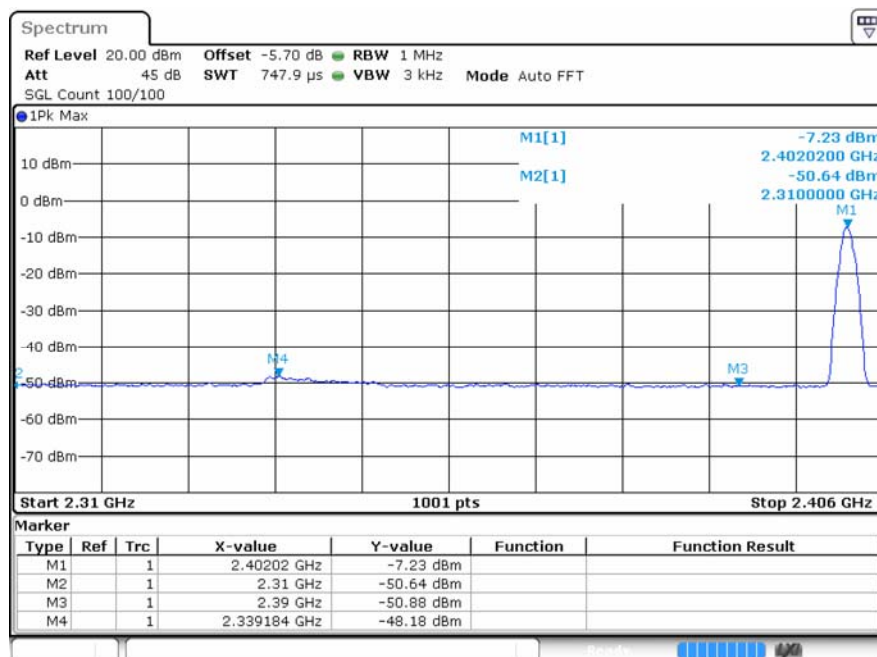
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)



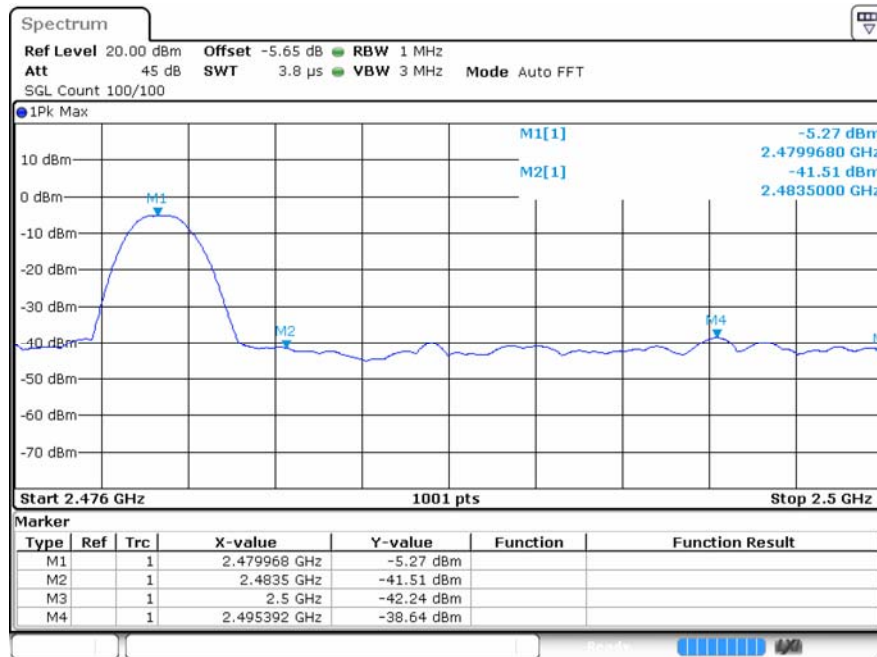
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (Low Channel)



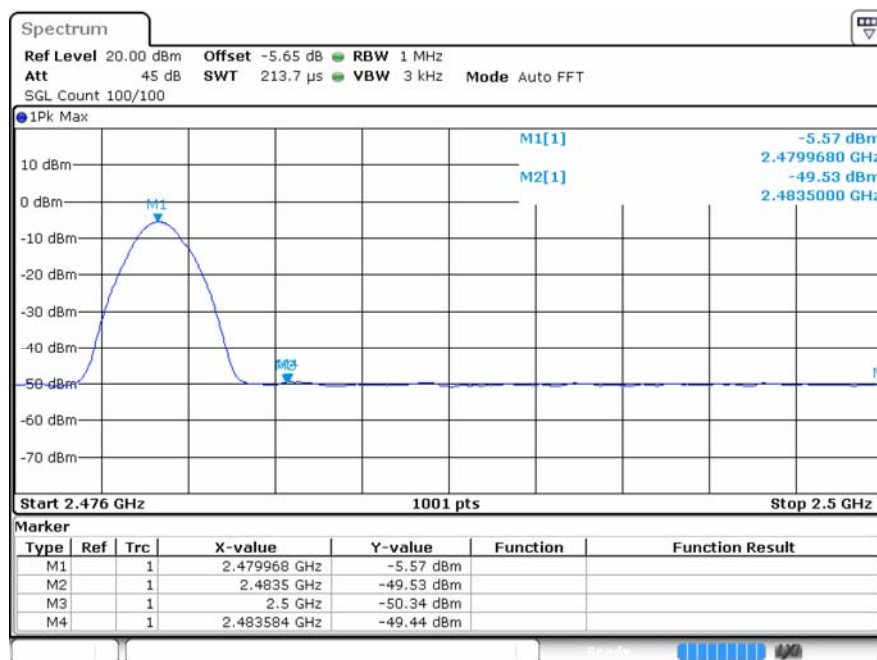
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (Low Channel)



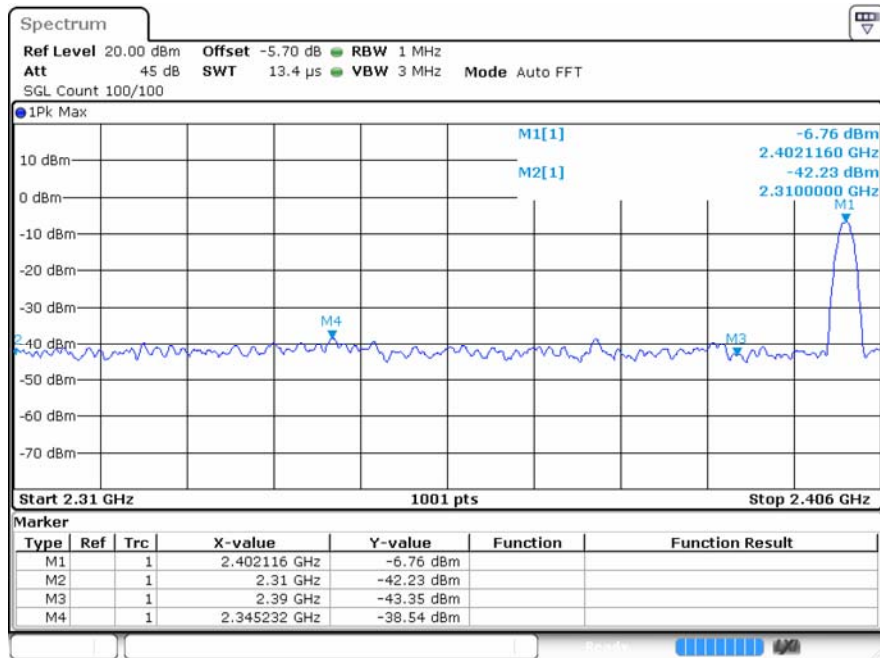
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



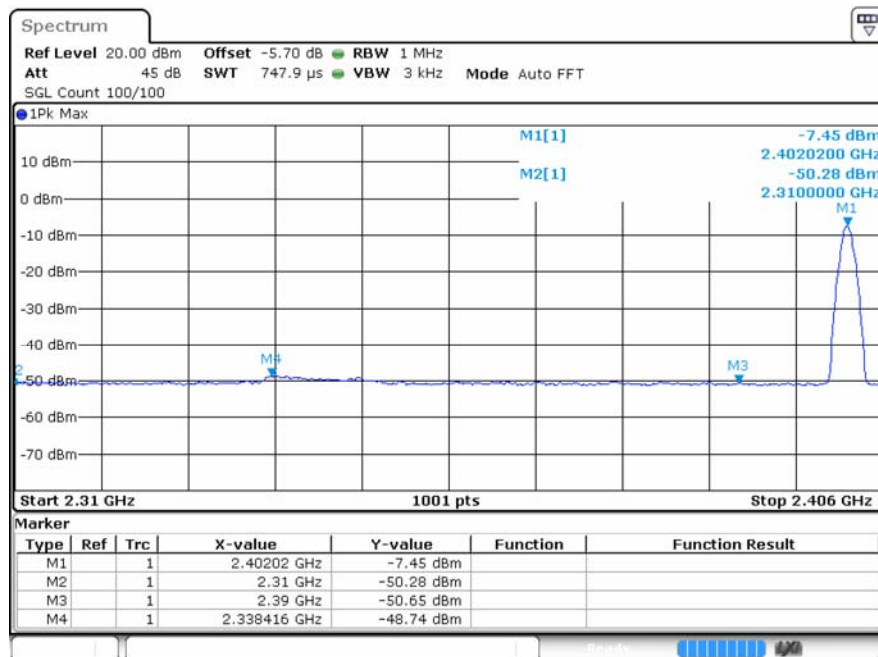
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



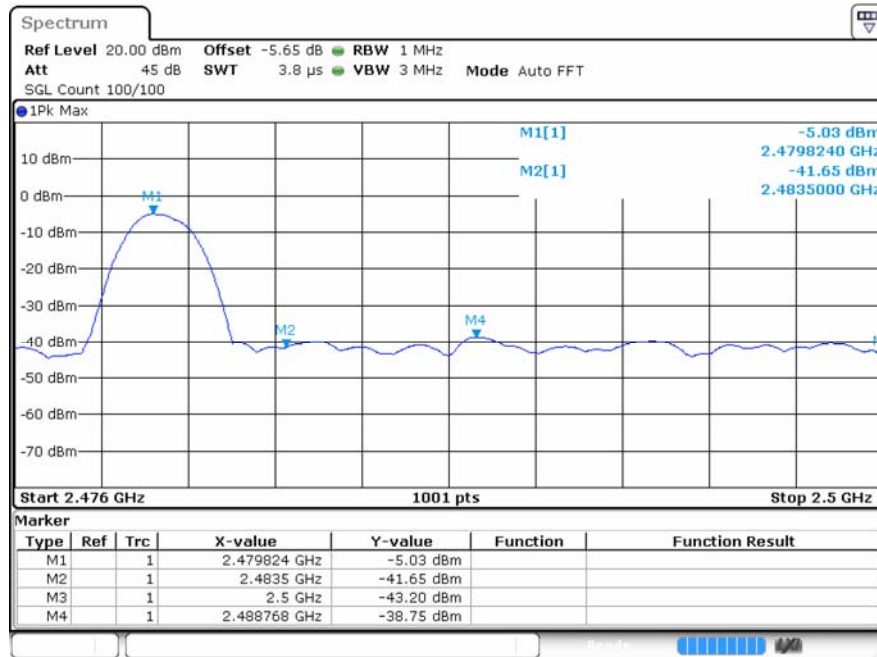
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



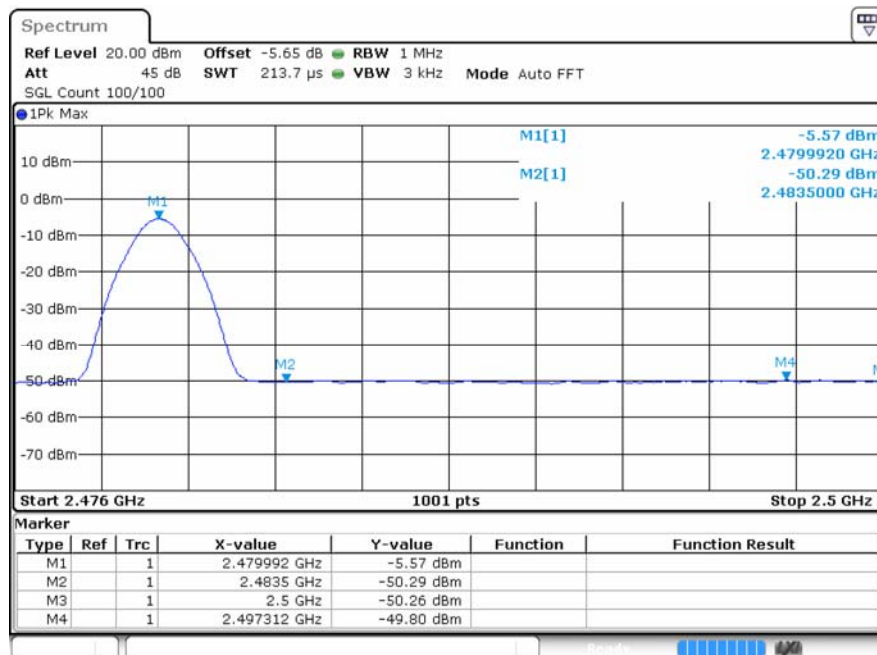
Restrict-band band-edge measurements_Hopping Off_8DPSK_Average (Low Channel)



Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (High Channel)



Restrict-band band-edge measurements_Hopping Off_8DPSK_Average (High Channel)



---The End---