

Appendix A
RF Test Data for BT V4.0(BDR/EDR) (Conducted Measurement)
Product Name: Projector
Trade Mark: N/A
Test Model: X88+

Environmental Conditions

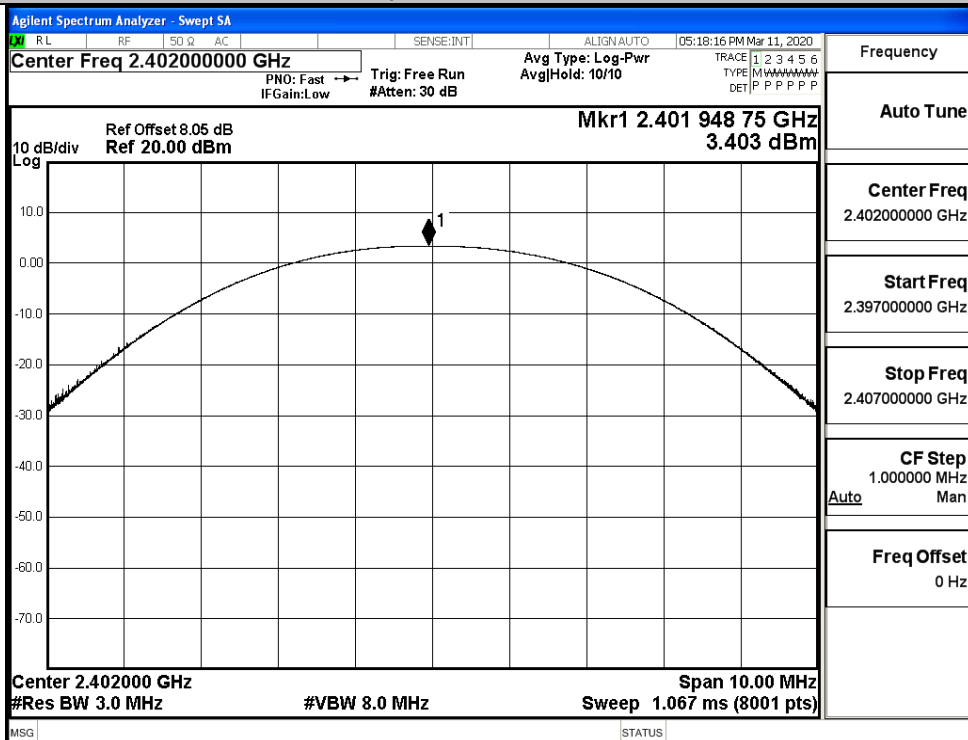
Temperature:	23.1 ° C
Relative Humidity:	52.9%
ATM Pressure:	100.0 kPa
Test Engineer:	Scout Wu
Supervised by:	Tom Liu

A.1 Maxmum Conducted Peak Output Power

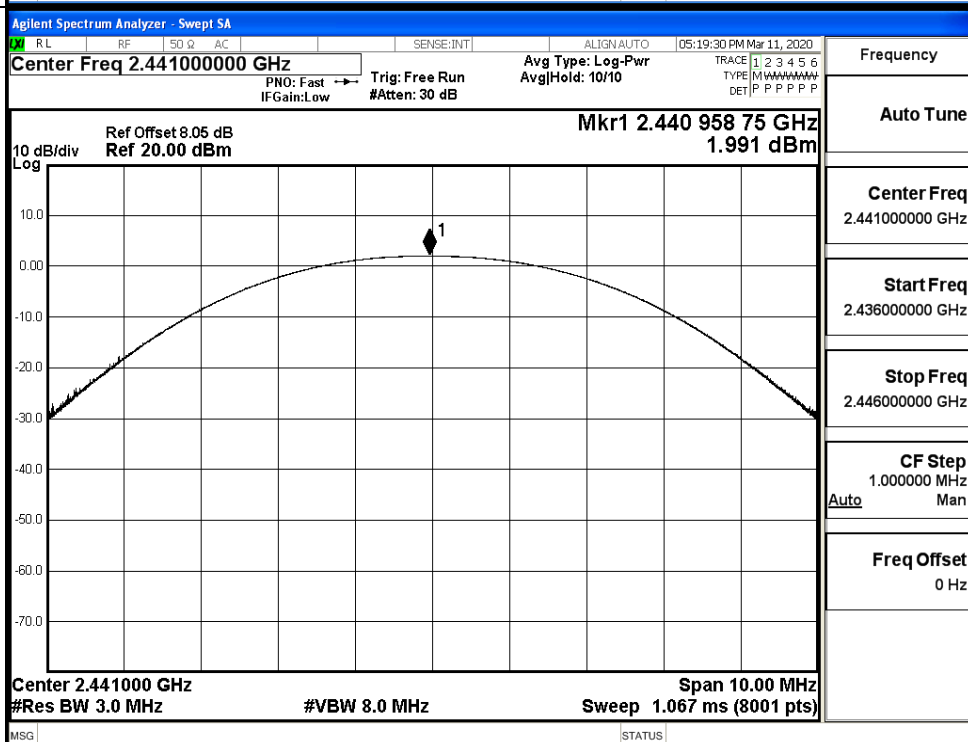
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	3.403	21	PASS
	MCH	1.991	21	PASS
	HCH	0.373	21	PASS
$\pi/4$ DQPSK	LCH	2.882	21	PASS
	MCH	1.432	21	PASS
	HCH	-0.288	21	PASS
8DPSK	LCH	3.298	21	PASS
	MCH	1.848	21	PASS
	HCH	0.120	21	PASS

Test Graphs

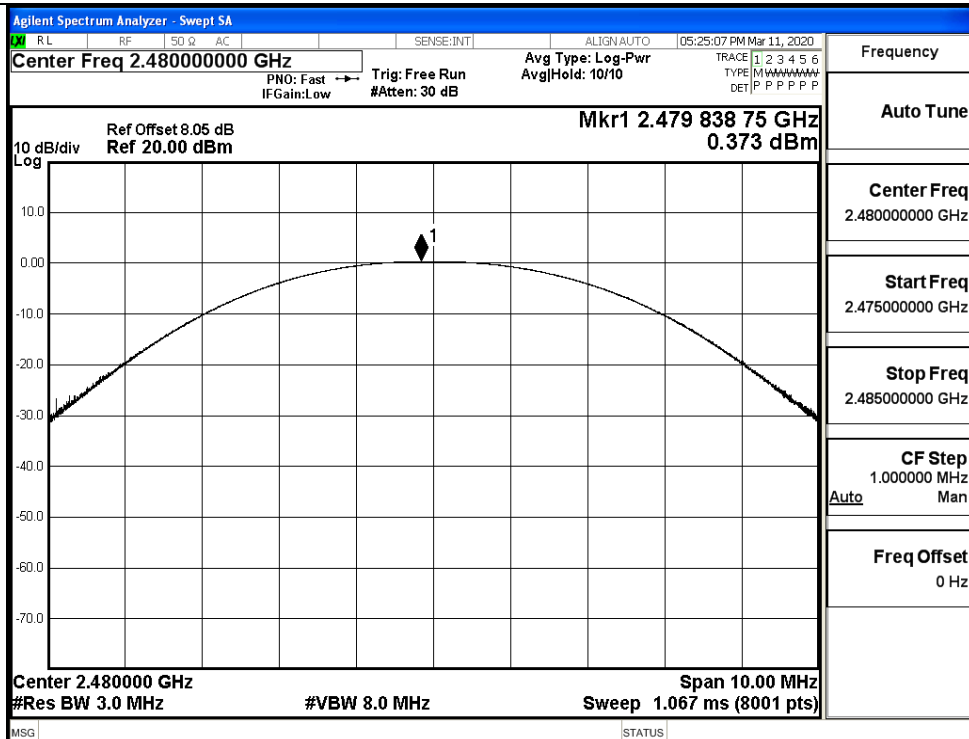
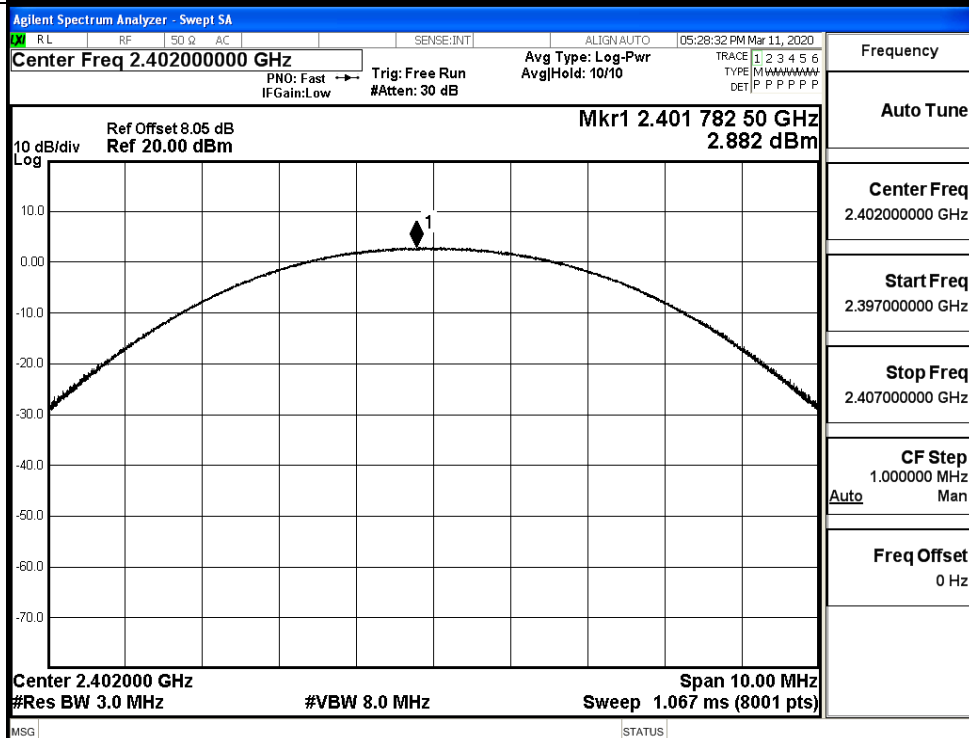
GFSK/LCH

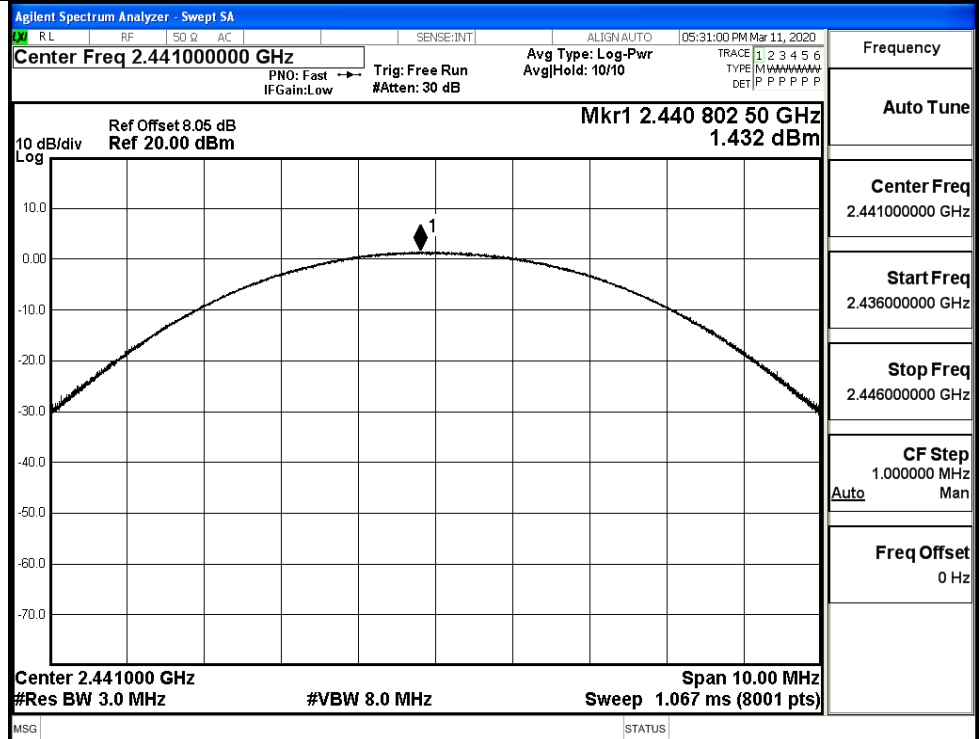
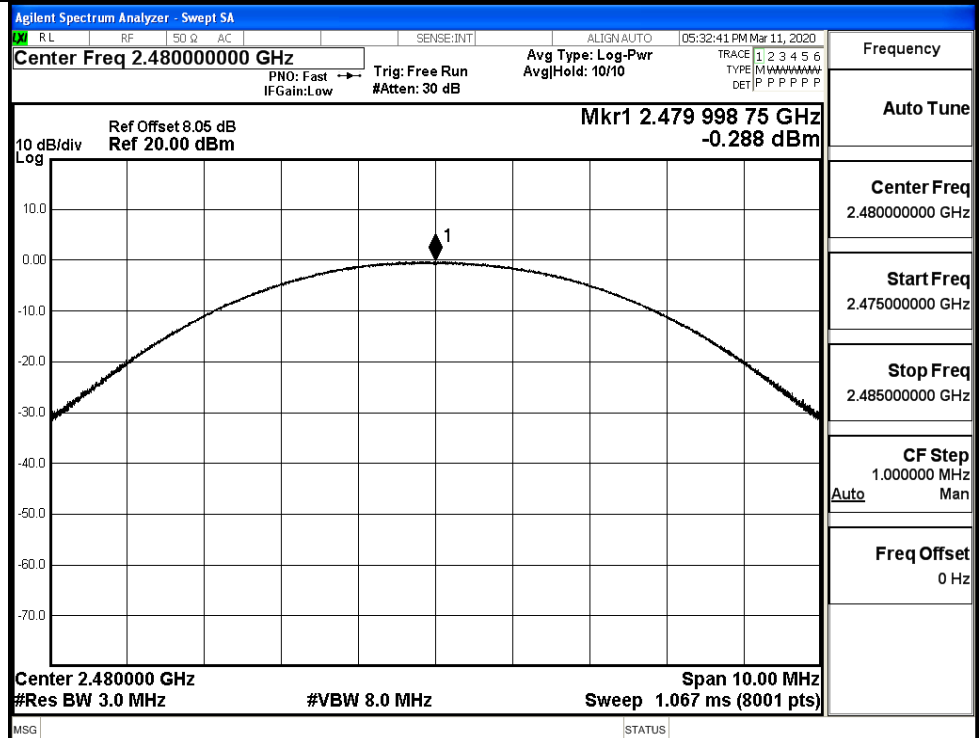


GFSK/MCH

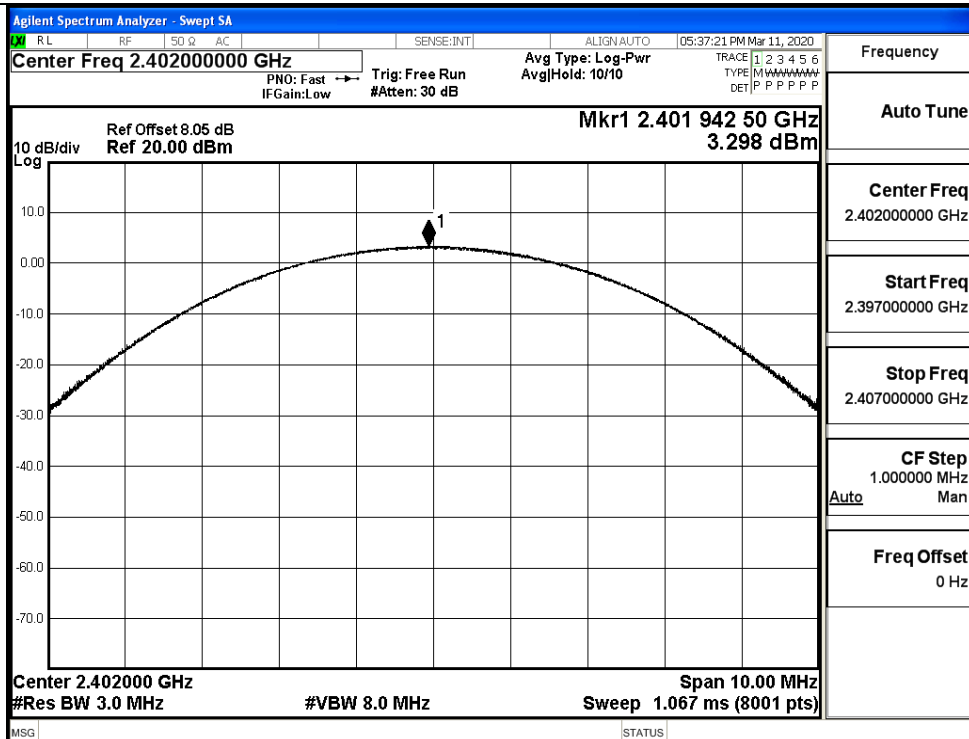


GFSK/HCH

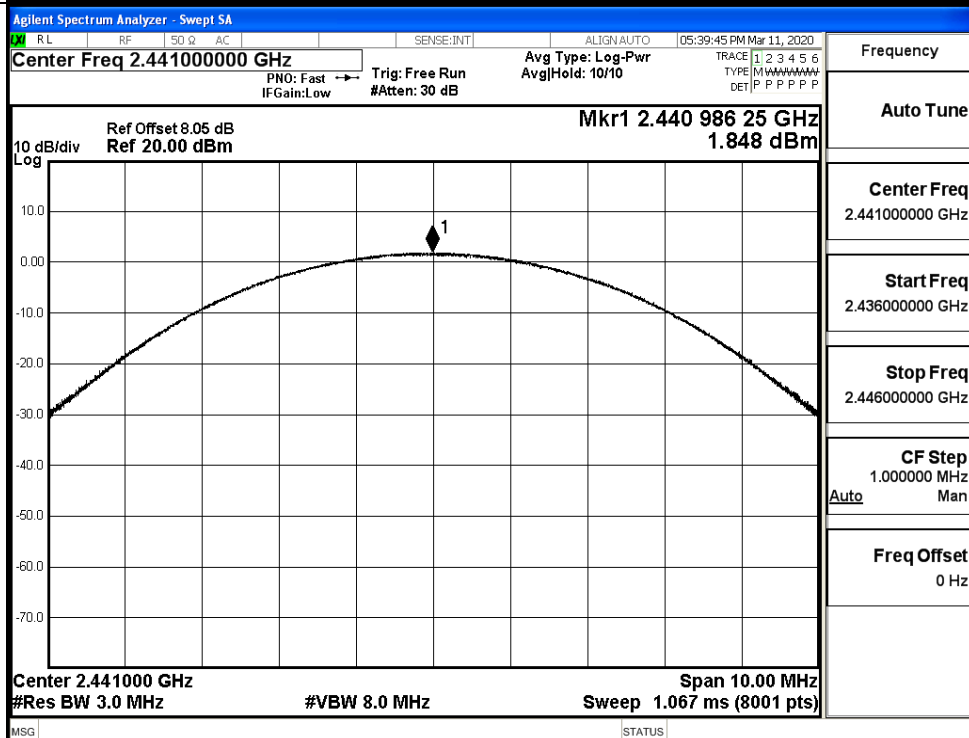
 π /4DQPSK/LCH

$\pi/4$ DQPSK/MCH $\pi/4$ DQPSK/HCH

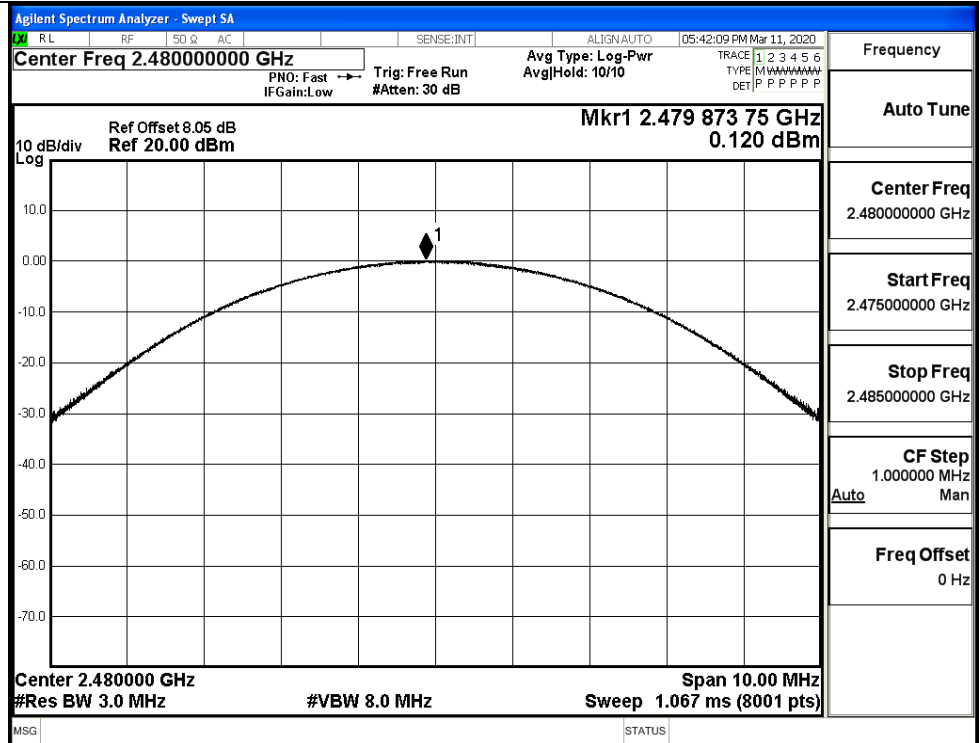
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

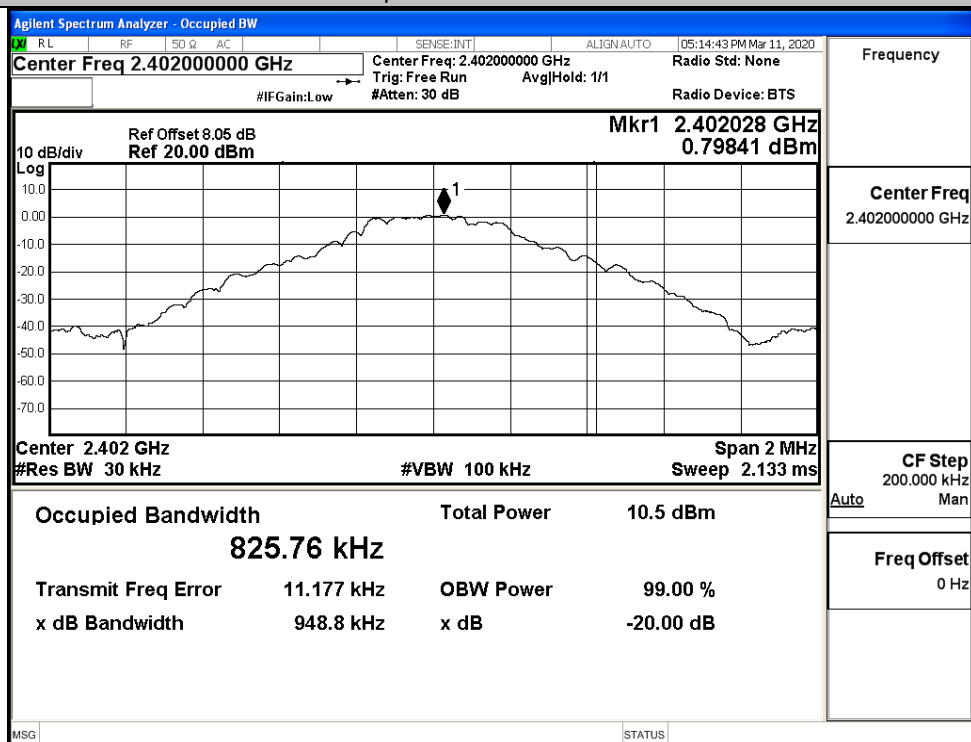


A.2 20dB Bandwidth

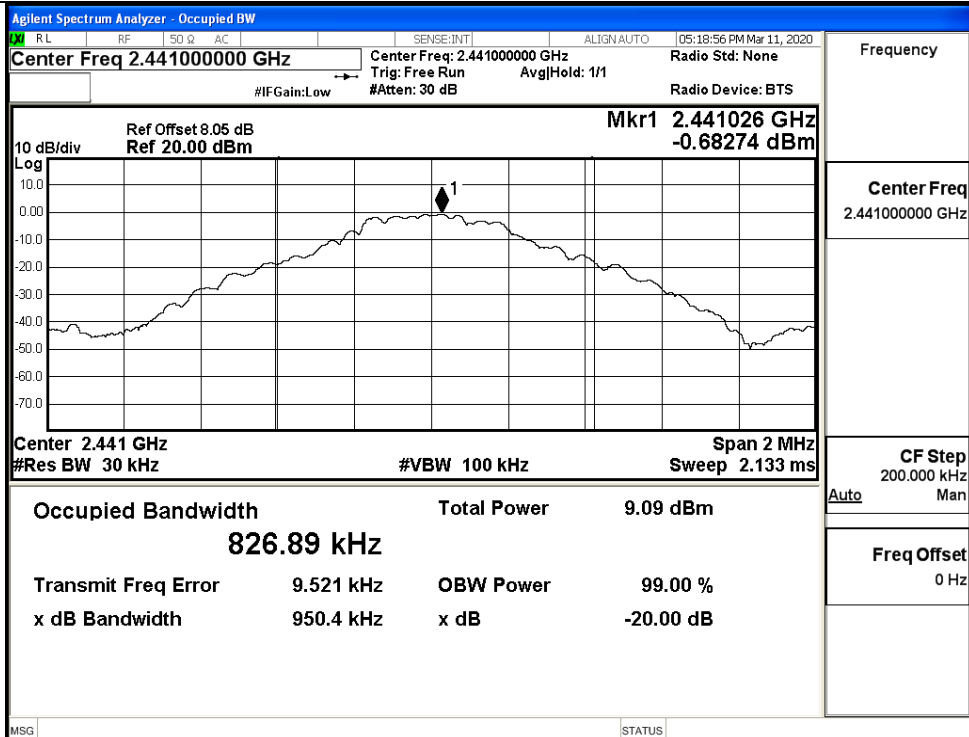
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9488	Not Specified	PASS
	MCH	0.9504	Not Specified	PASS
	HCH	0.9482	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.322	Not Specified	PASS
	MCH	1.324	Not Specified	PASS
	HCH	1.323	Not Specified	PASS
8DPSK	LCH	1.295	Not Specified	PASS
	MCH	1.310	Not Specified	PASS
	HCH	1.307	Not Specified	PASS

Test Graphs

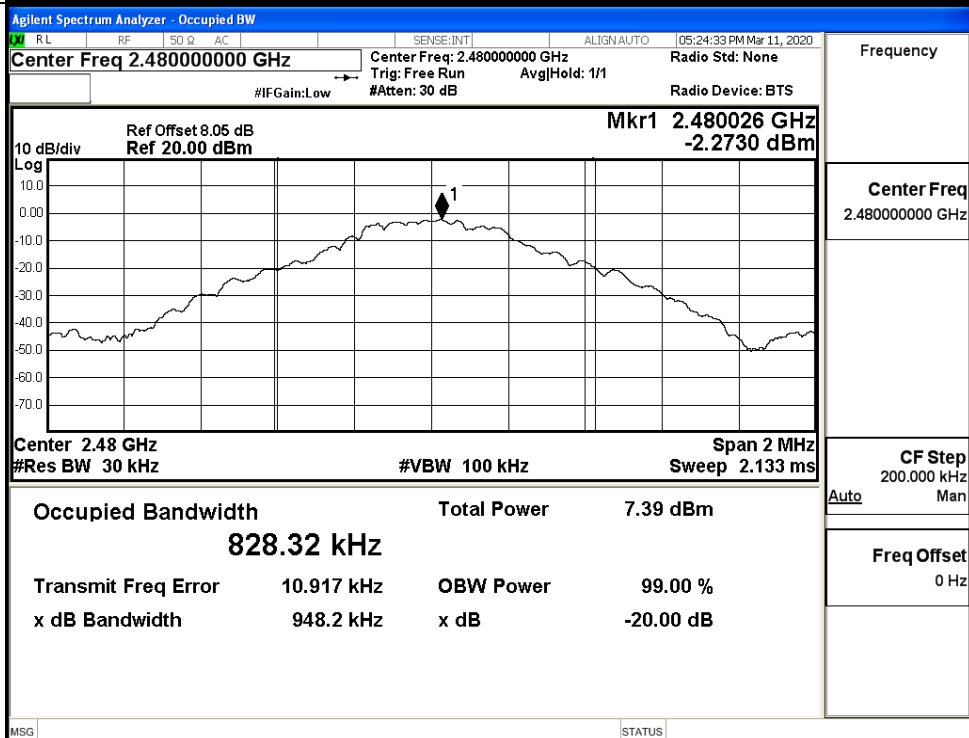
GFSK/LCH

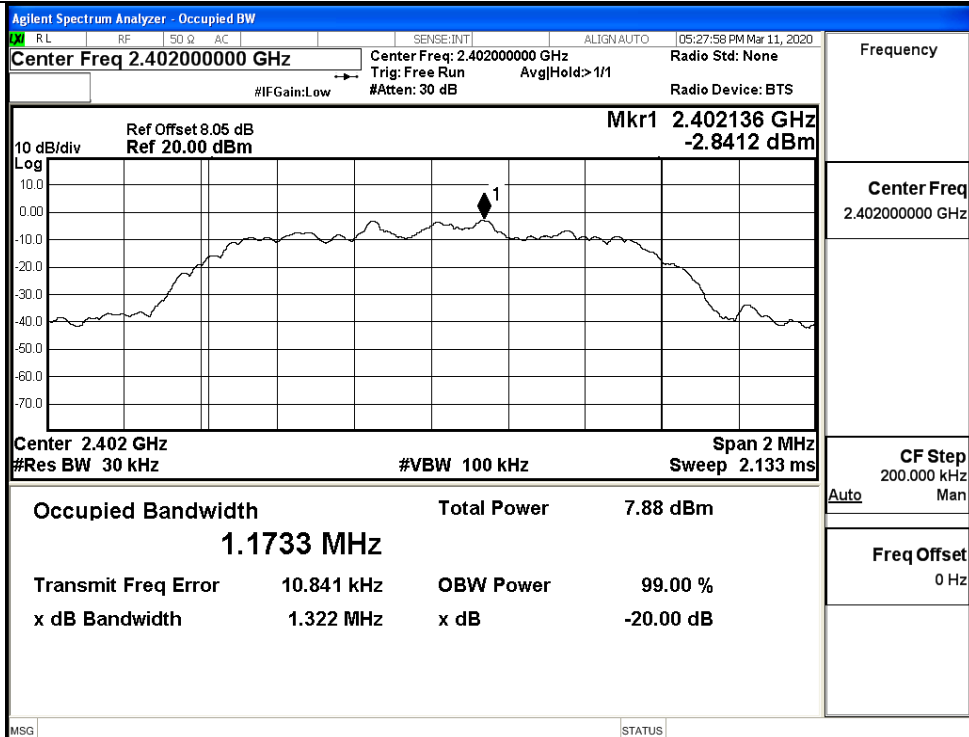
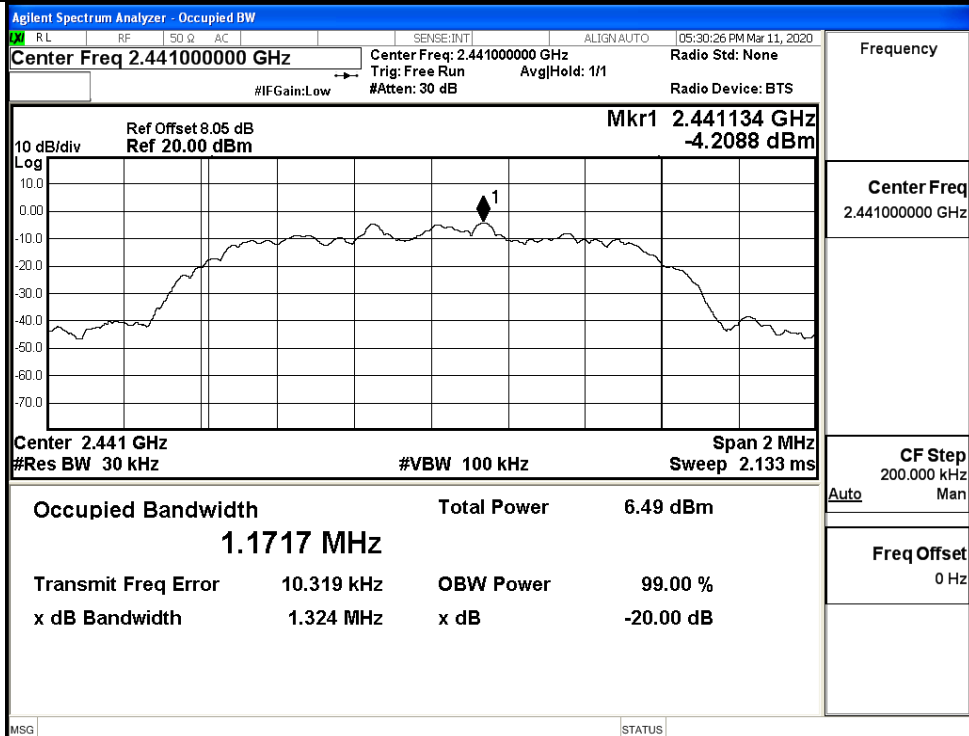


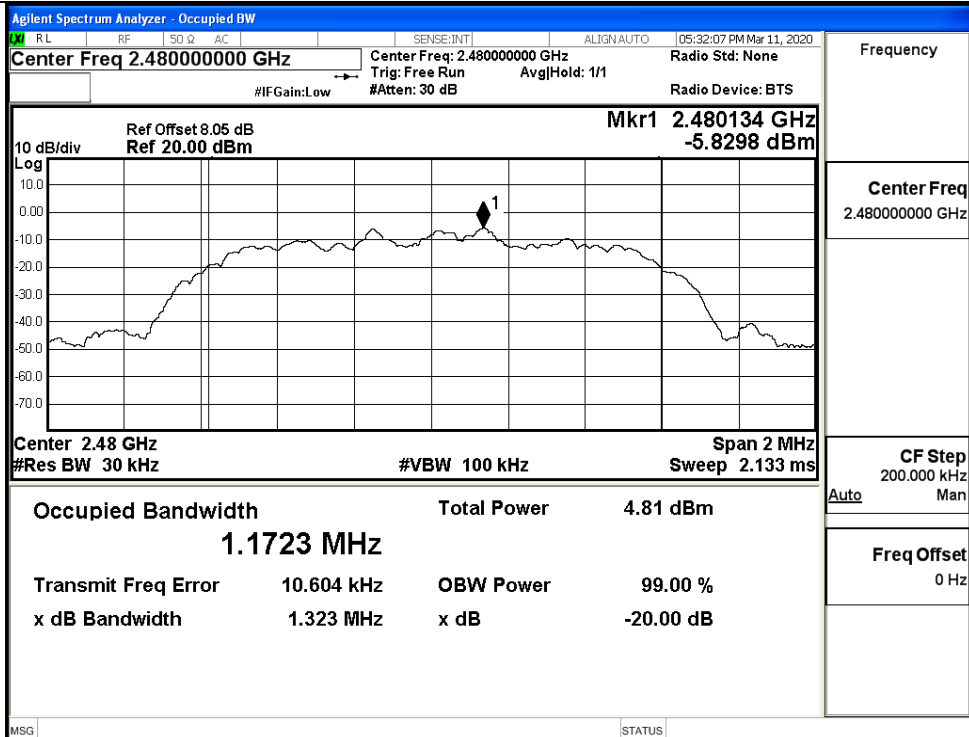
GFSK/MCH



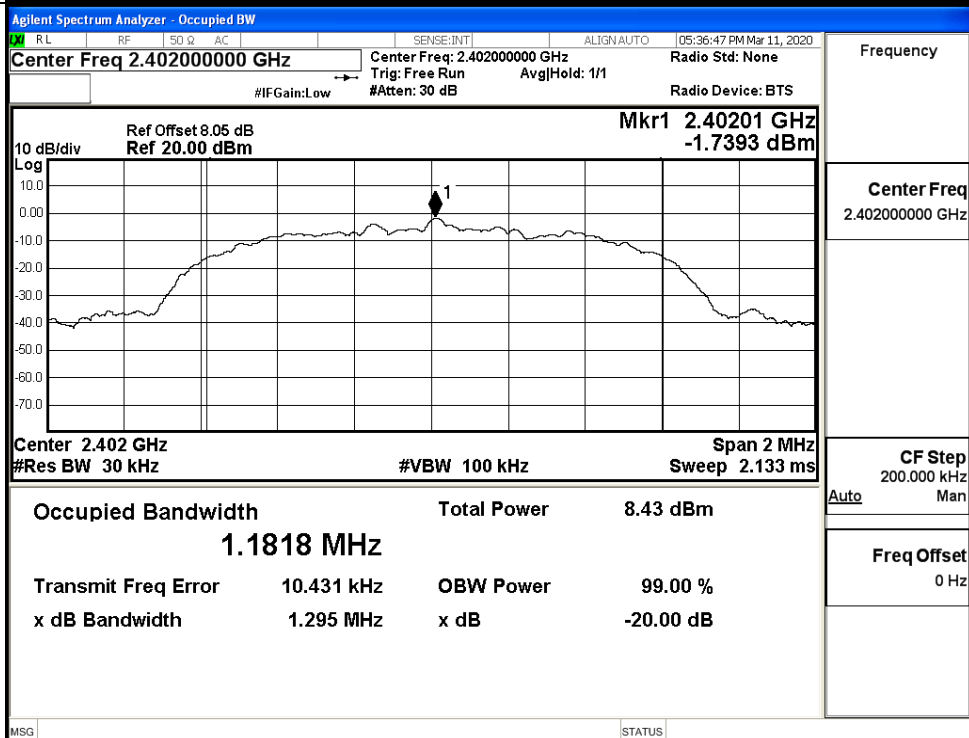
GFSK/HCH



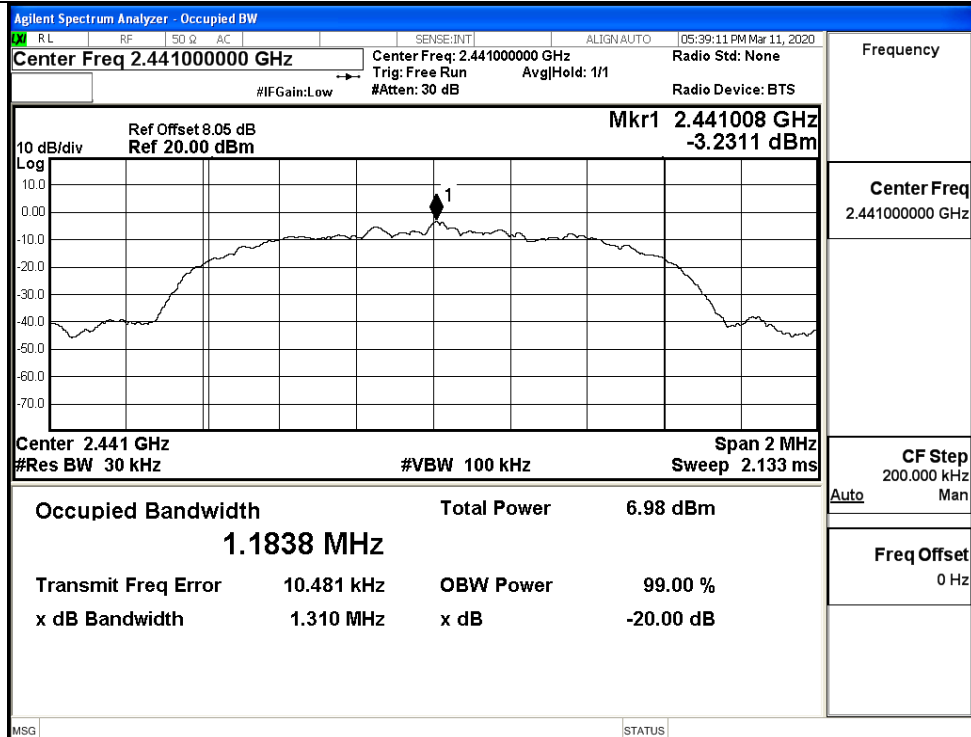
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

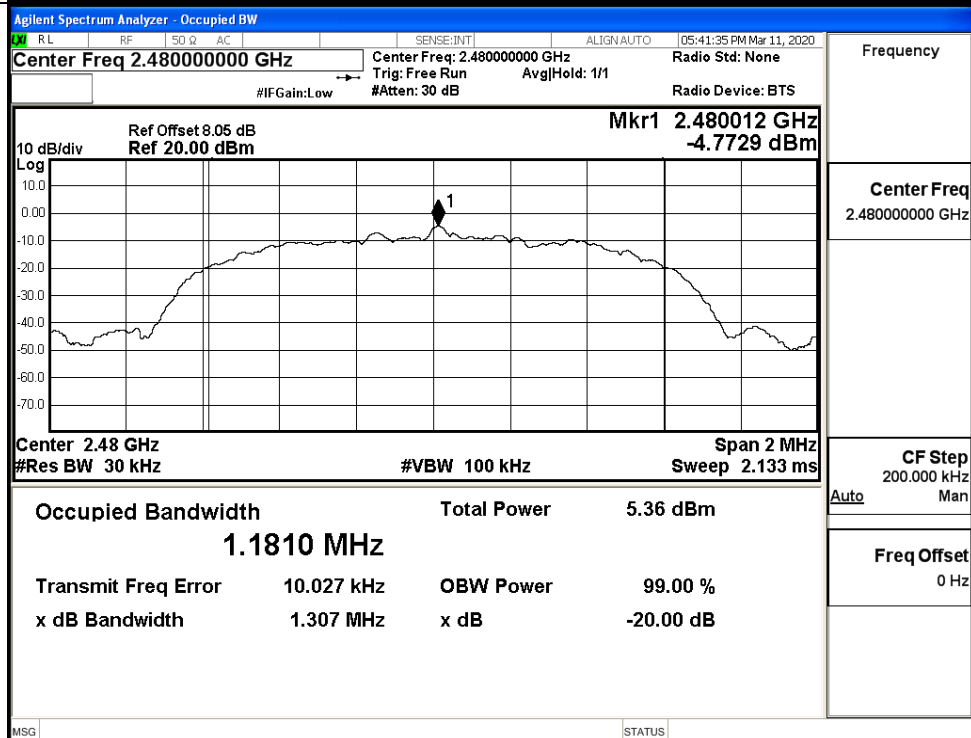
8DPSK/LCH



8DPSK/MCH



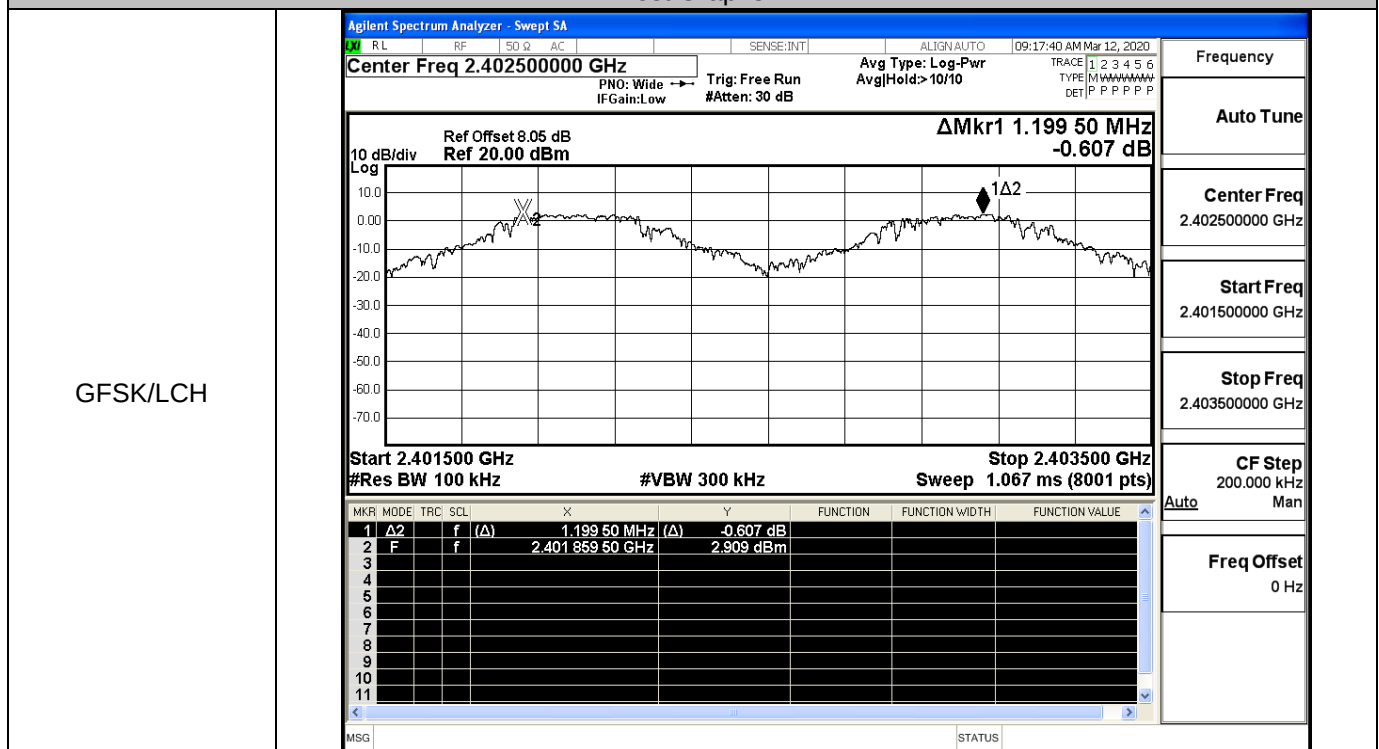
8DPSK/HCH



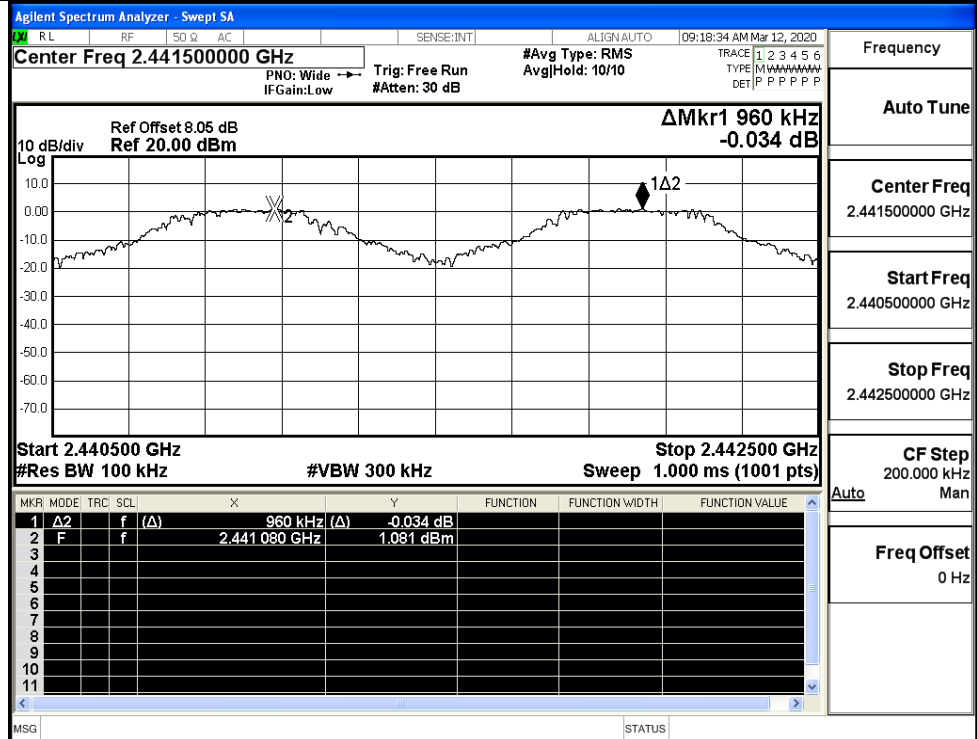
A.3 Carrier Frequency Separation

Mode	Channel	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.200	0.634	PASS
	MCH	0.960	0.634	PASS
	HCH	0.942	0.634	PASS
$\pi/4$ DQPSK	LCH	1.204	0.883	PASS
	MCH	1.120	0.883	PASS
	HCH	0.902	0.883	PASS
8DPSK	LCH	0.888	0.873	PASS
	MCH	1.168	0.873	PASS
	HCH	1.310	0.873	PASS

Test Graphs



GFSK/MCH

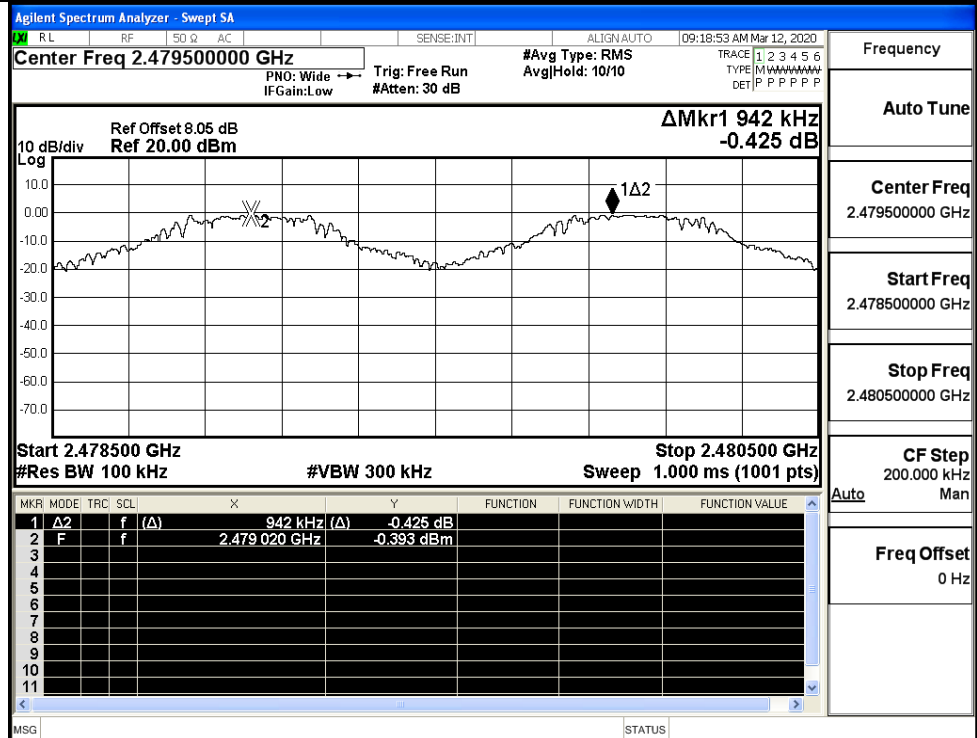


Frequency

Auto Tune

Center Freq
2.441500000 GHzStart Freq
2.440500000 GHzStop Freq
2.442500000 GHzCF Step
200.000 kHz
ManFreq Offset
0 Hz

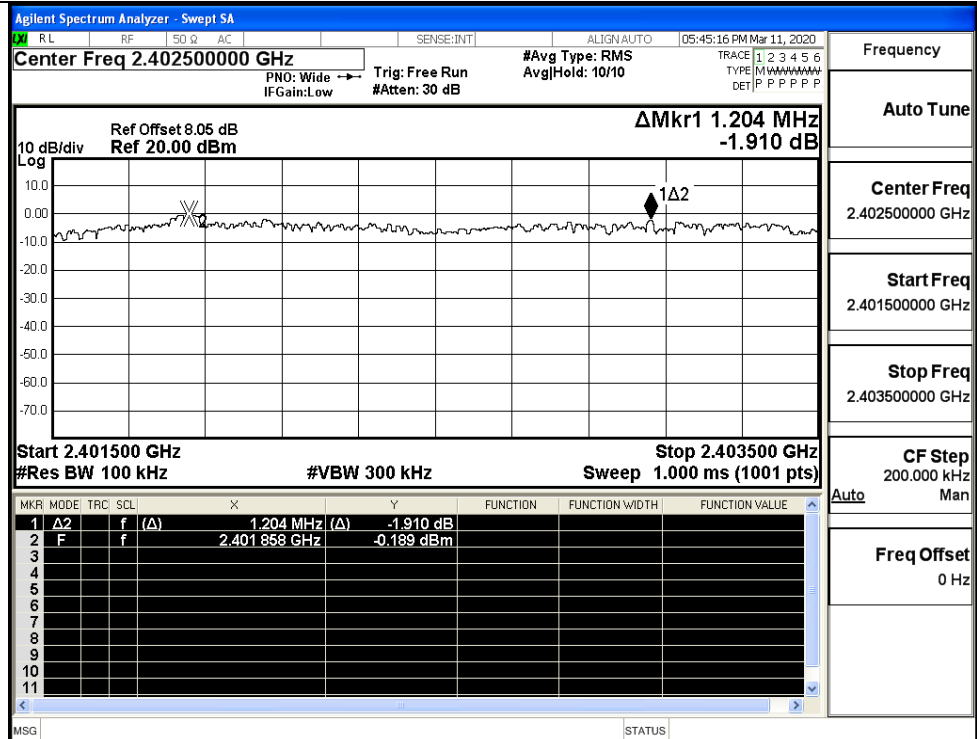
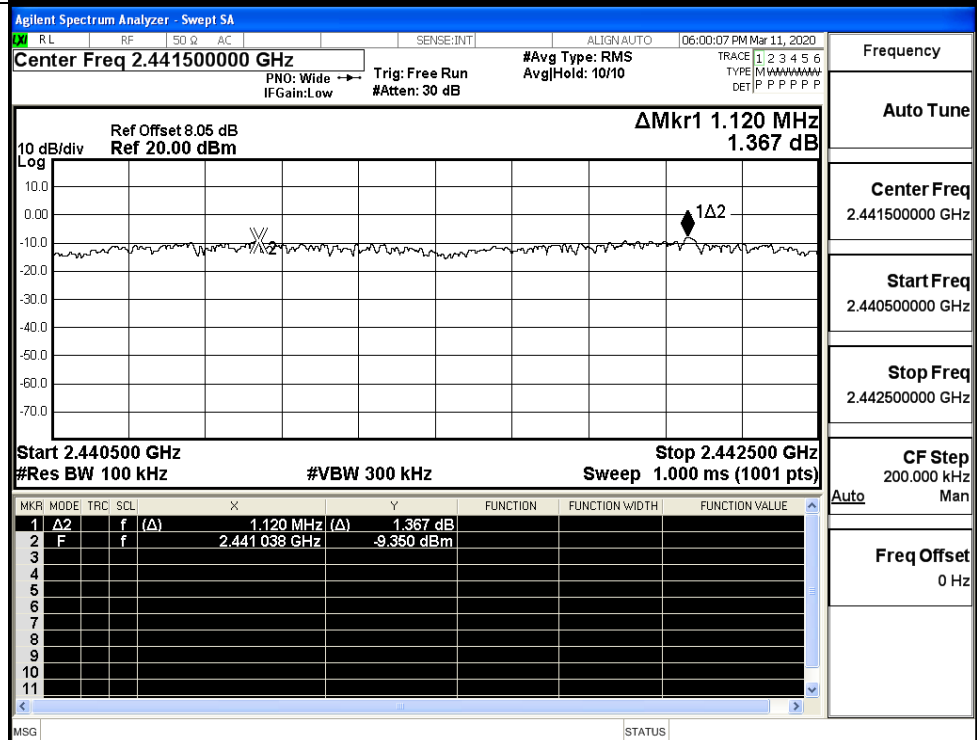
GFSK/HCH

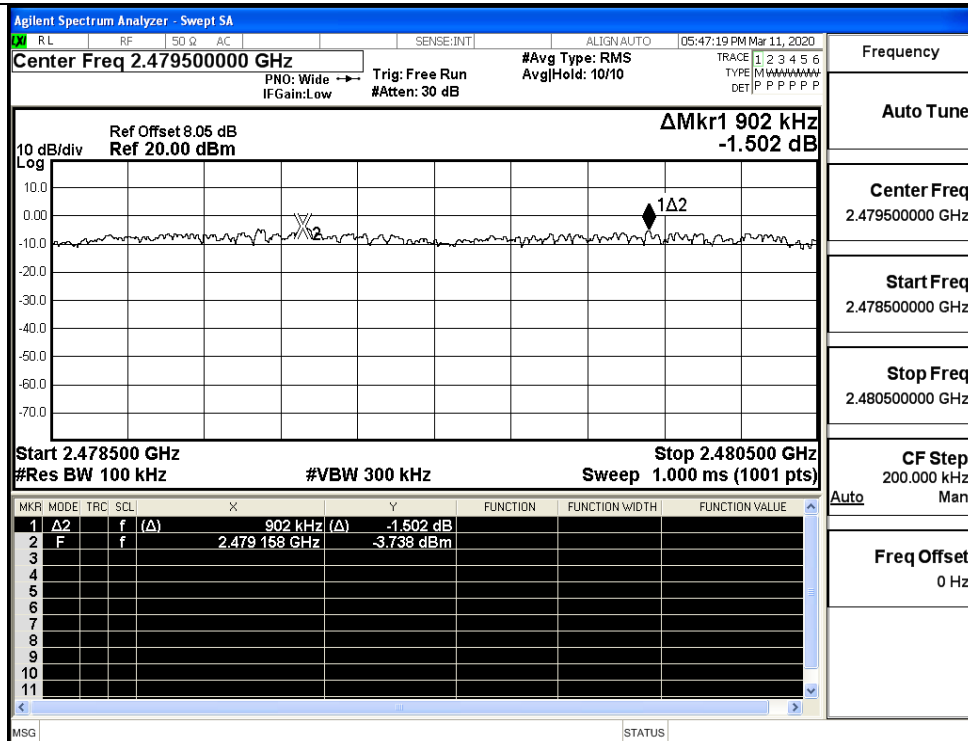


Frequency

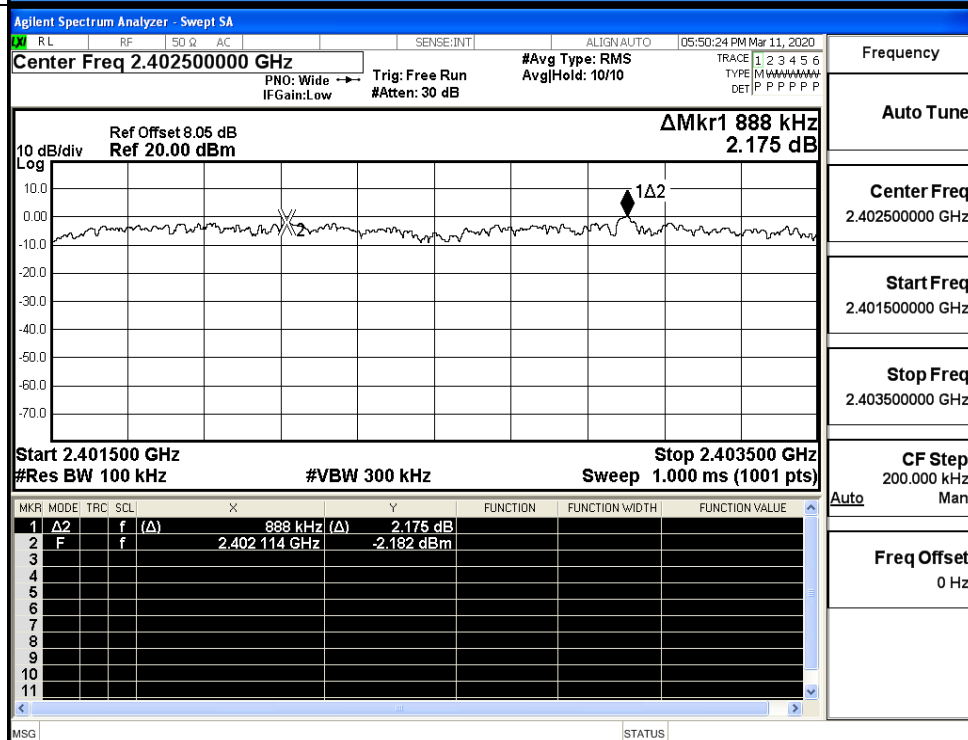
Auto Tune

Center Freq
2.479500000 GHzStart Freq
2.478500000 GHzStop Freq
2.480500000 GHzCF Step
200.000 kHz
ManFreq Offset
0 Hz

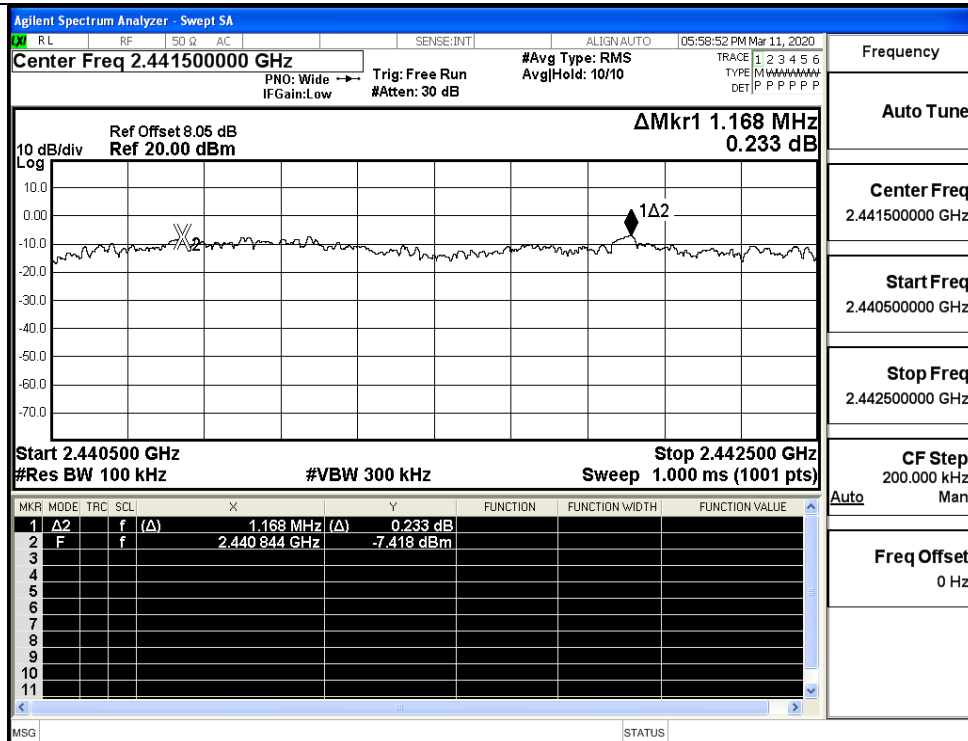
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

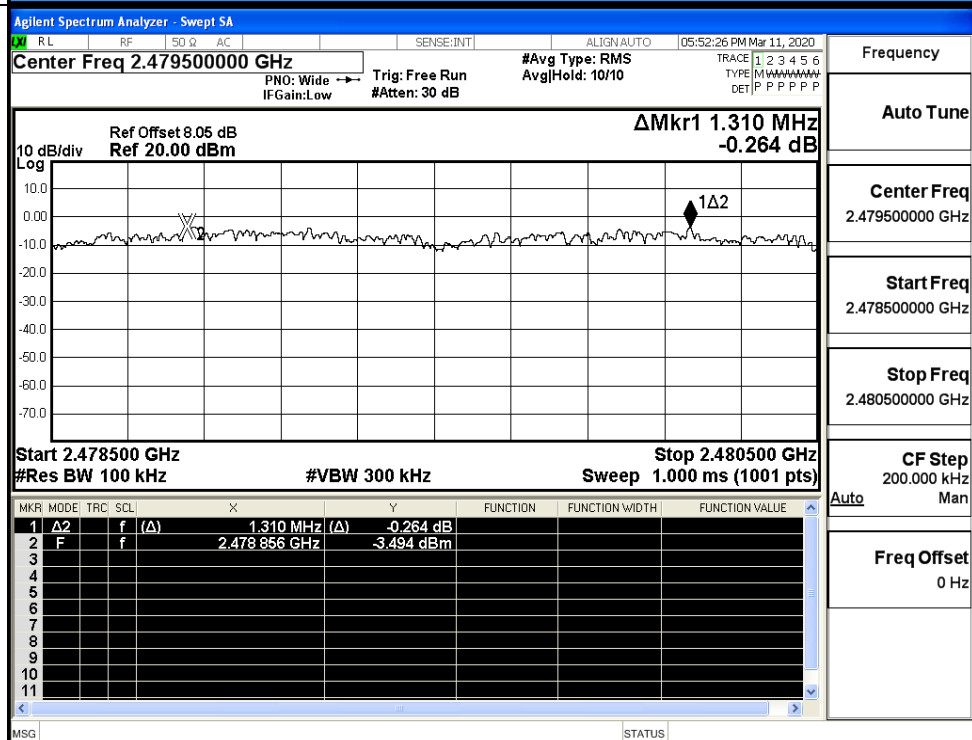
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

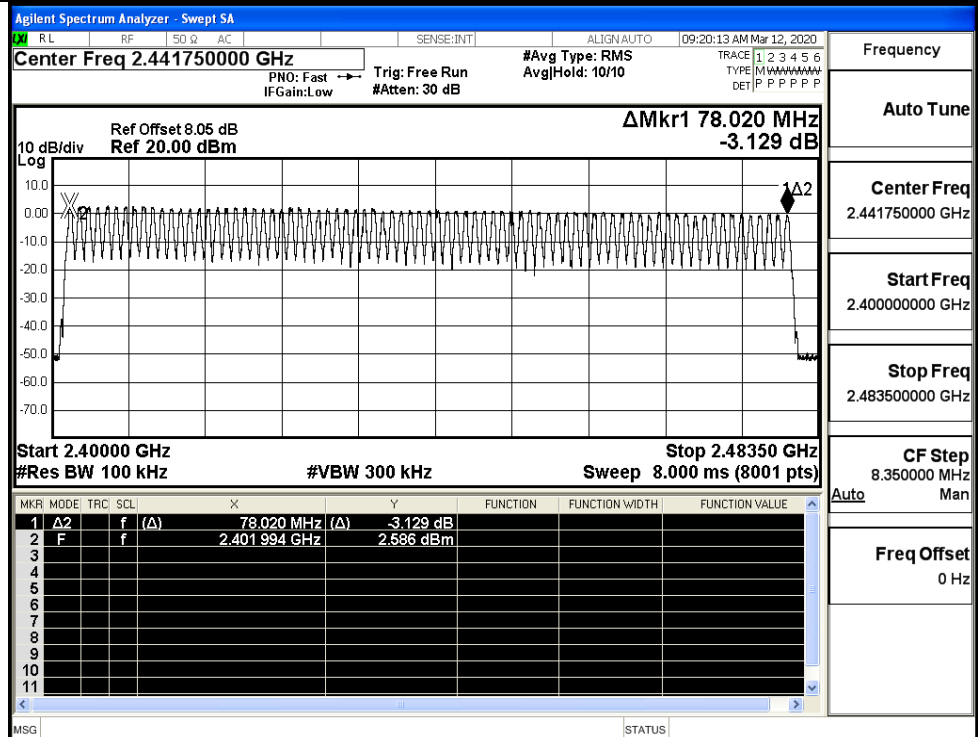
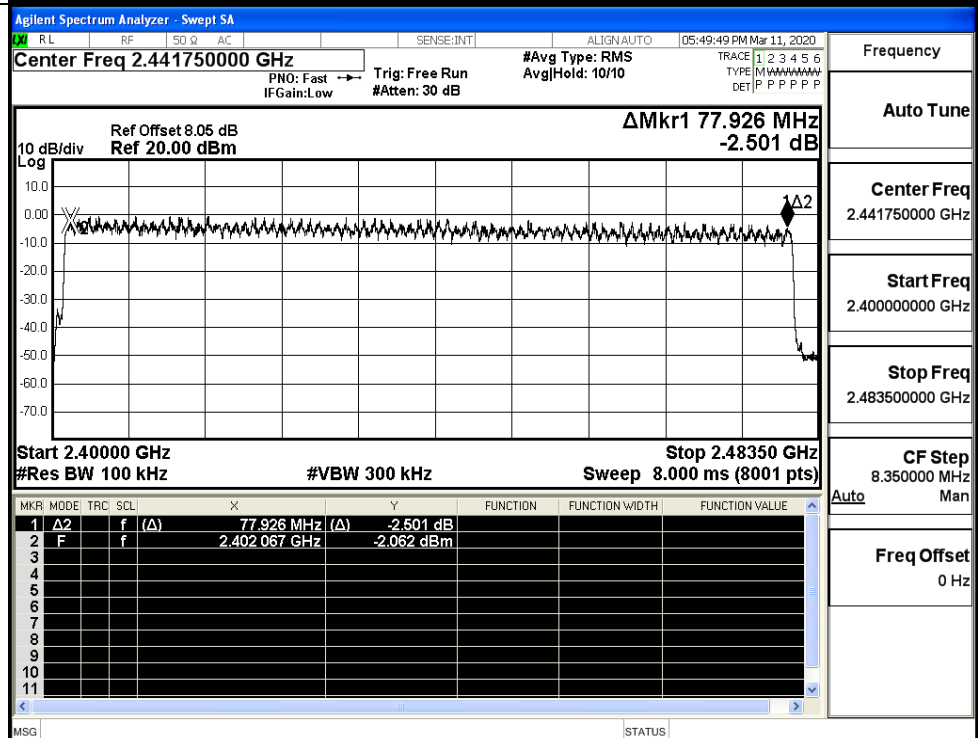


A.4 Hopping Channel Number

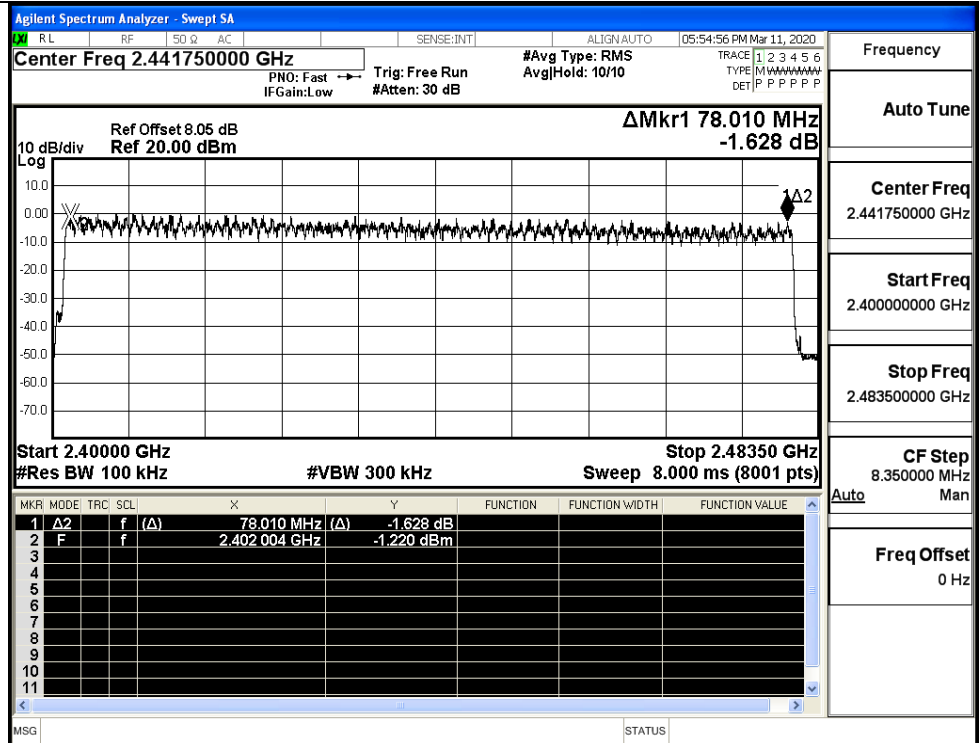
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	≥ 15	PASS
$\pi/4$ DQPSK	Hop	79	≥ 15	PASS
8DPSK	Hop	79	≥ 15	PASS

Test Graphs

GFSK/Hop

 $\pi/4$ DQPSK/Hop

8DPSK/Hop

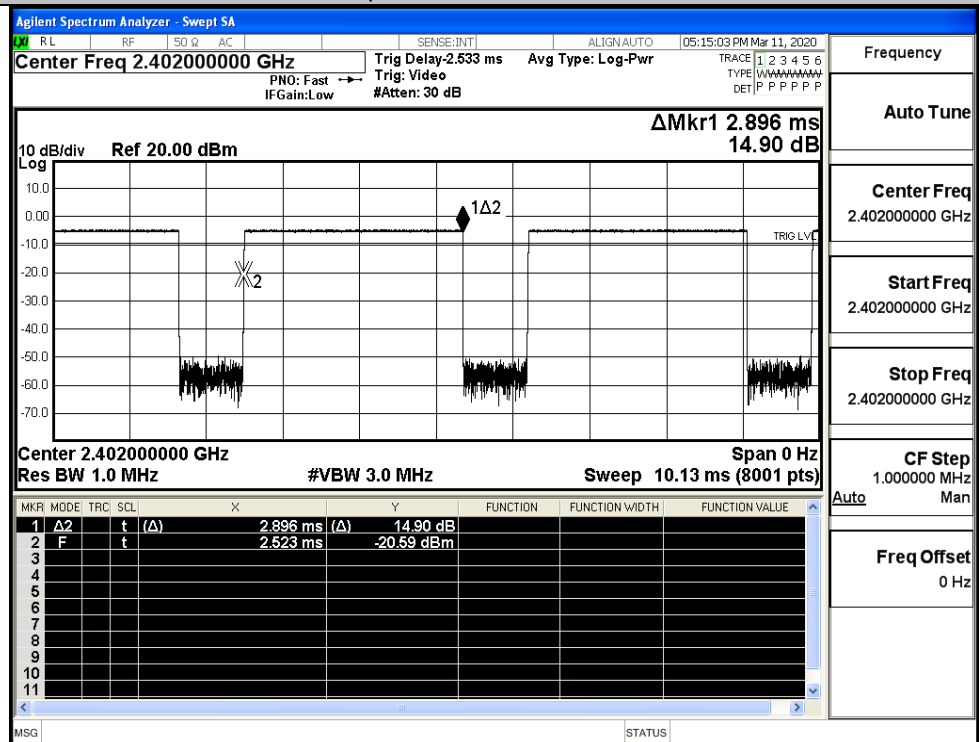


A.5 Dwell Time

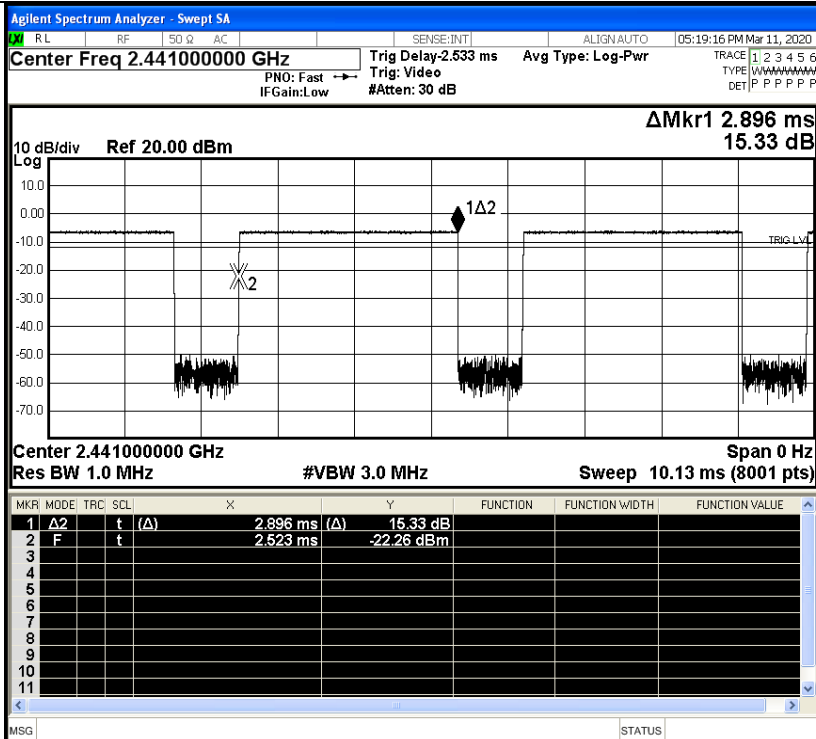
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.9	106.7	0.309	0.4	PASS
	DH5	MCH	2.9	106.7	0.309	0.4	PASS
	DH5	HCH	2.9	106.7	0.309	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.9	106.7	0.309	0.4	PASS
	2DH5	MCH	2.9	106.7	0.309	0.4	PASS
	2DH5	HCH	2.9	106.7	0.309	0.4	PASS
8DPSK	3DH5	LCH	2.9	106.7	0.309	0.4	PASS
	3DH5	MCH	2.9	106.7	0.309	0.4	PASS
	3DH5	HCH	2.9	106.7	0.309	0.4	PASS

Test Graphs

GFSK_DH5/LCH



GFSK_DH5/MCH

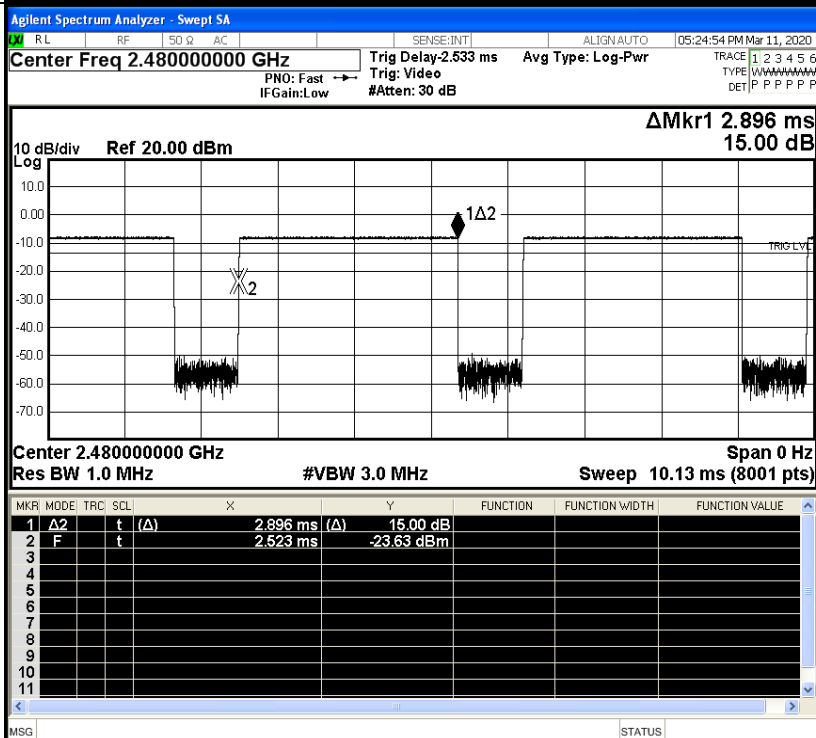


Frequency

Auto Tune

Center Freq
2.441000000 GHzStart Freq
2.441000000 GHzStop Freq
2.441000000 GHzCF Step
1.000000 MHz
Auto ManFreq Offset
0 Hz

GFSK_DH5/HCH



Frequency

Auto Tune

Center Freq
2.480000000 GHzStart Freq
2.480000000 GHzStop Freq
2.480000000 GHzCF Step
1.000000 MHz
Auto ManFreq Offset
0 Hz

[illegible]

Agilent Spectrum Analyzer - Swept SA

UN	RL	RF	50 Ω	AC	SENSE:INT	ALIGN:AUTO	05:30:47 PM Mar 11, 2020
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Center Freq 2.441000000 GHz Trig Delay-2.533 ms Avg Type: Log-Pwr
PNO: Fast → Trig: Video TYPE: WAAAAAAAAA
IF Gain: Low #Atten: 30 dB DET: P P P P P P P

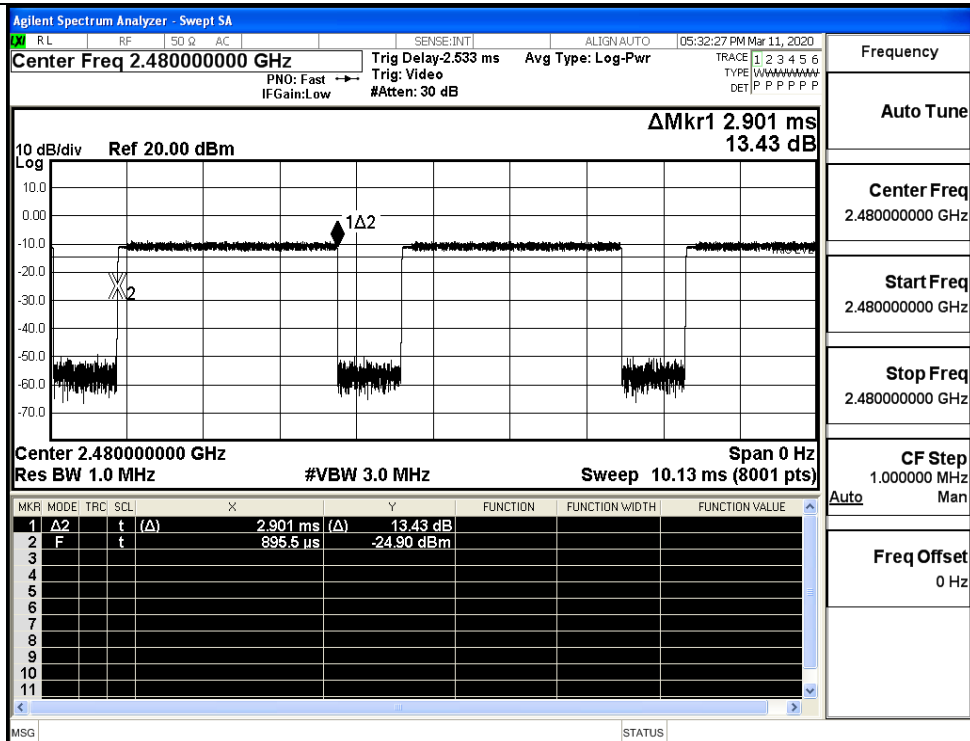
ΔMkr1 2.901 ms
13.65 dB

Center 2.441000000 GHz Span 0 Hz
Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)

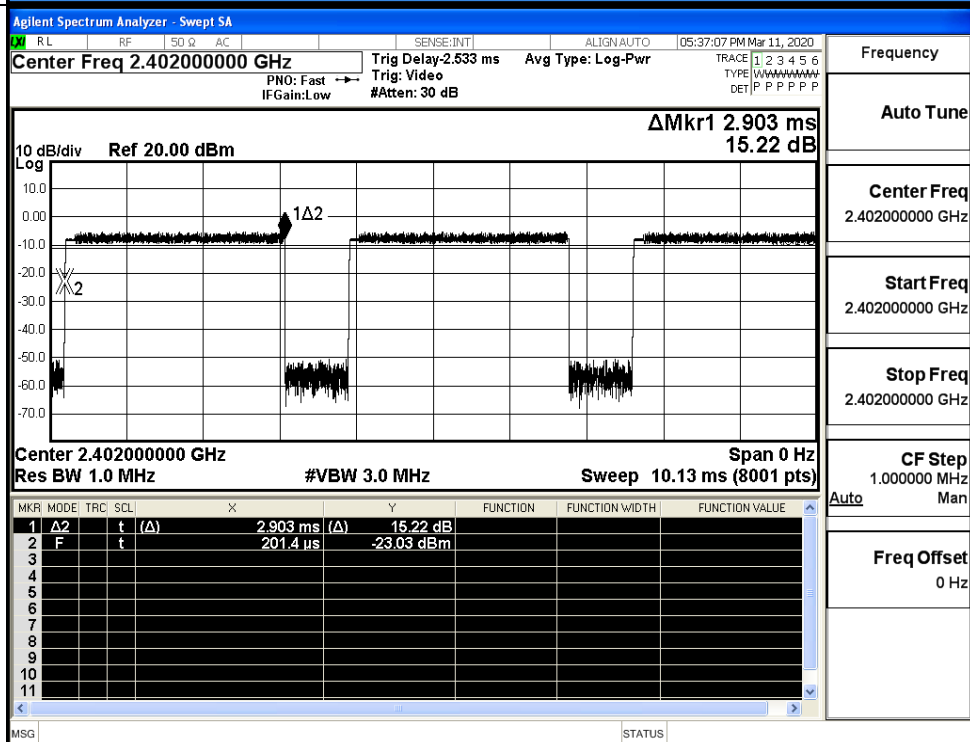
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	t	(Δ)	2.901 ms	(Δ) -13.65 dB			
2	F	t		225.5 μs	-23.46 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

Frequency: Auto Tune
Start Freq: 2.441000000 GHz
Stop Freq: 2.441000000 GHz
CF Step: 1.000000 MHz Man
Freq Offset: 0 Hz

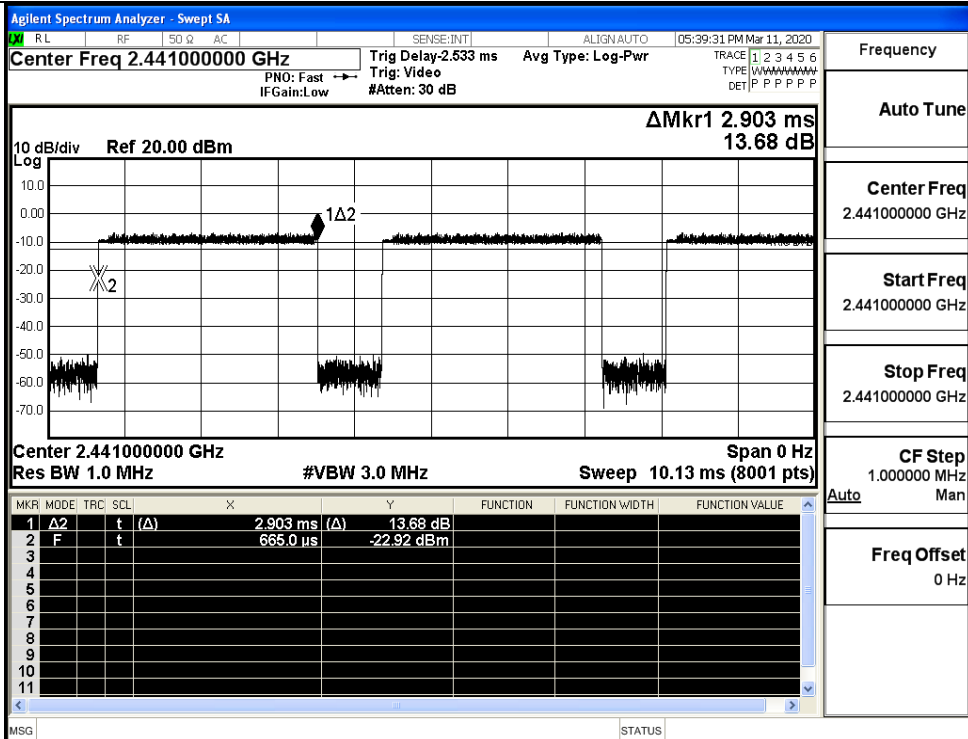
$\pi/4$ DQPSK
_2DH5/HCH



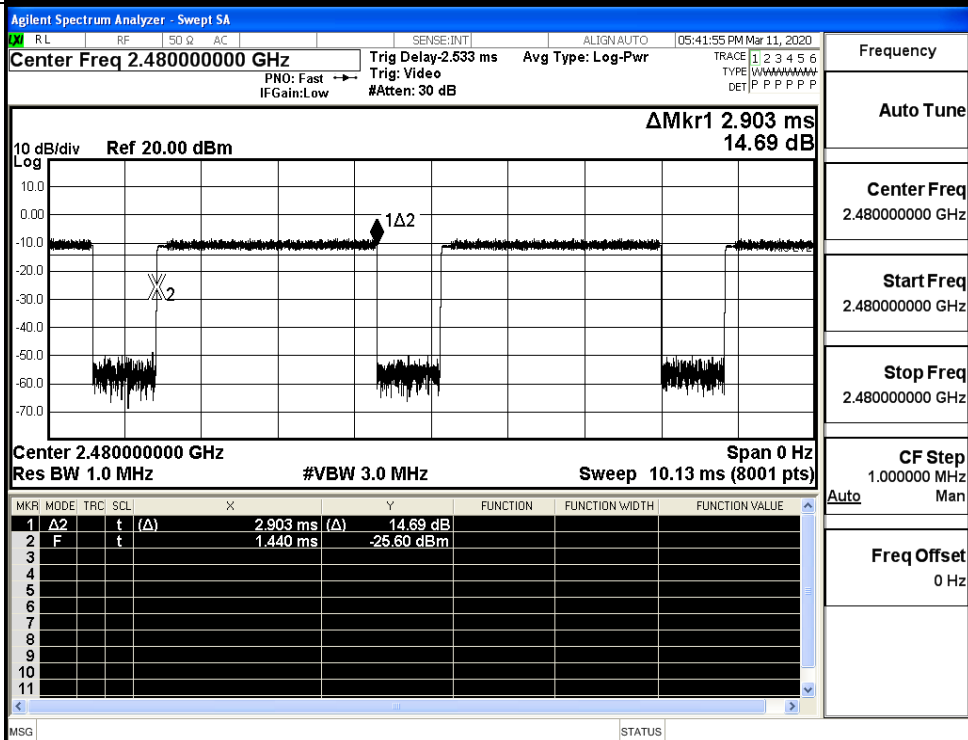
8DPSK _3DH5/LCH



8DPSK_3DH5/MCH



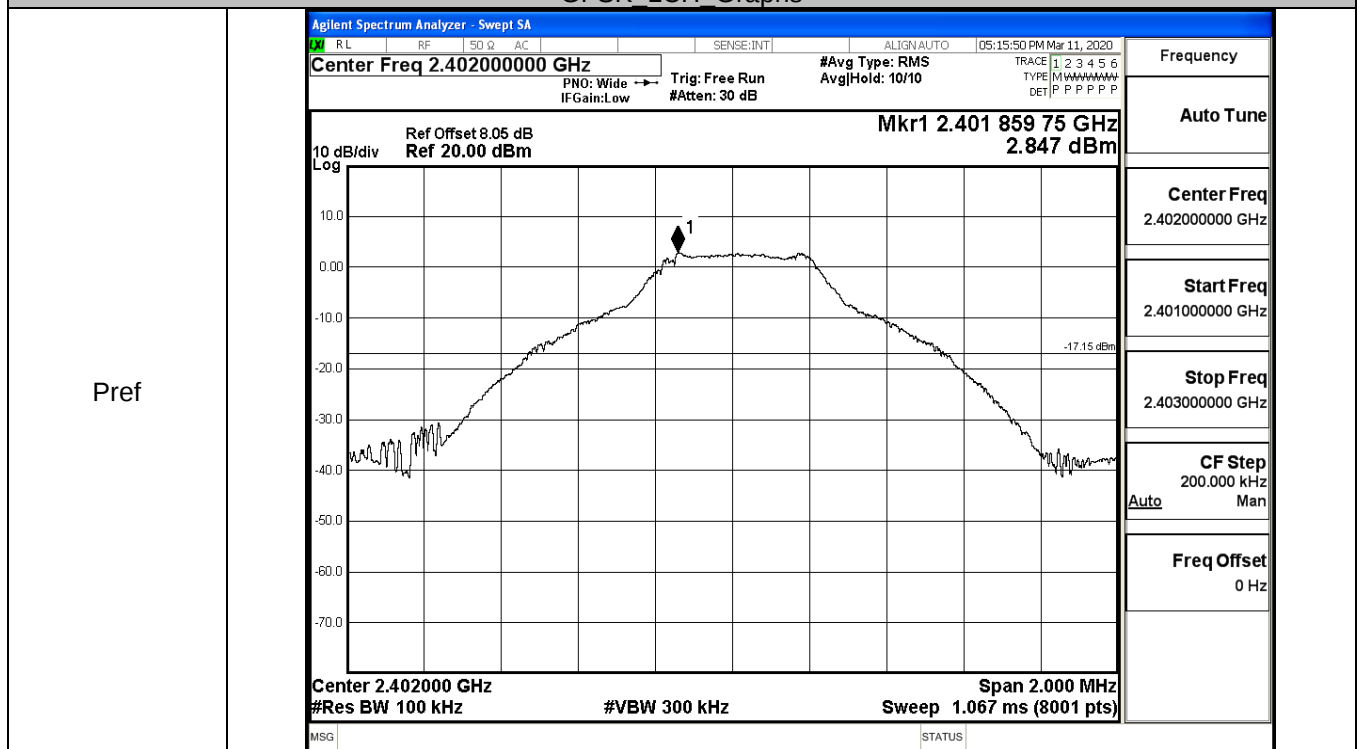
8DPSK_3DH5/HCH

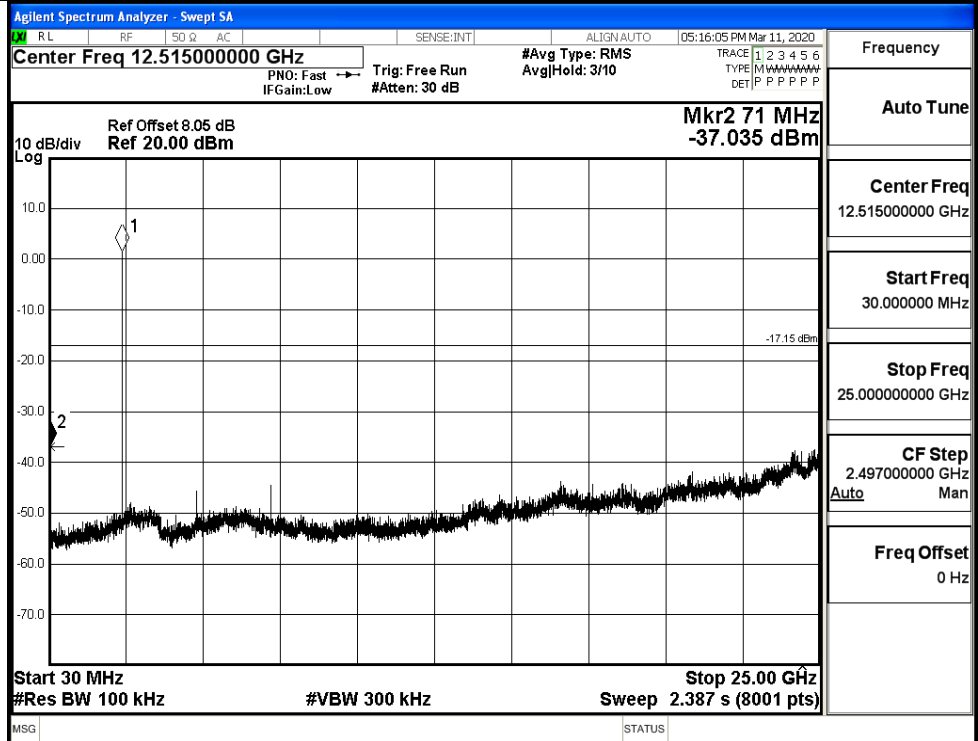


A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2.847	-37.035	-17.153	PASS
	MCH	1.347	-36.901	-18.653	PASS
	HCH	-0.171	-37.358	-20.171	PASS
$\pi/4$ DQPSK	LCH	-0.208	-37.224	-20.208	PASS
	MCH	-1.579	-34.181	-21.579	PASS
	HCH	-3.208	-37.286	-23.208	PASS
8DPSK	LCH	-0.03	-37.919	-20.030	PASS
	MCH	-1.233	-36.867	-21.233	PASS
	HCH	-2.876	-37.504	-22.876	PASS

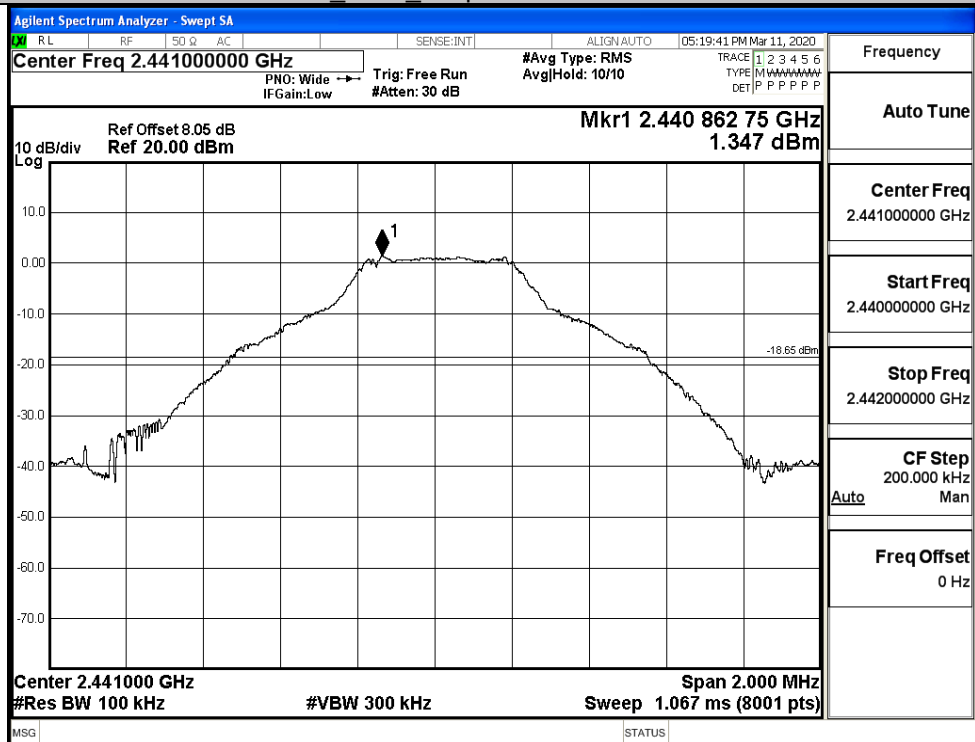
GFSK LCH Graphs



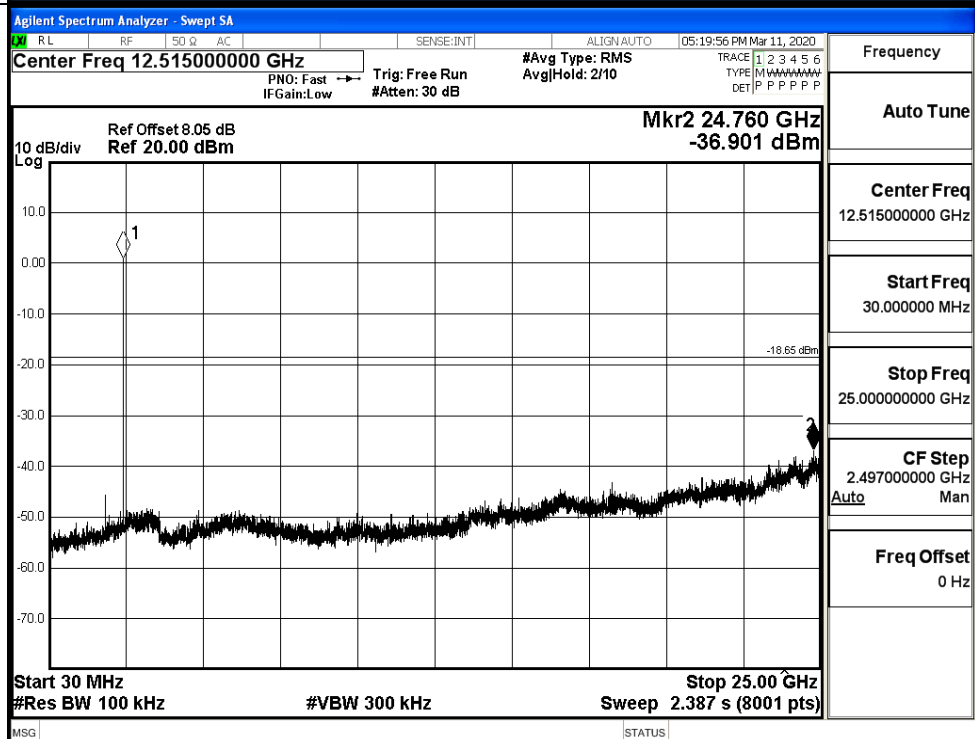
P_uw

GFSK_MCH_Graphs

Pref

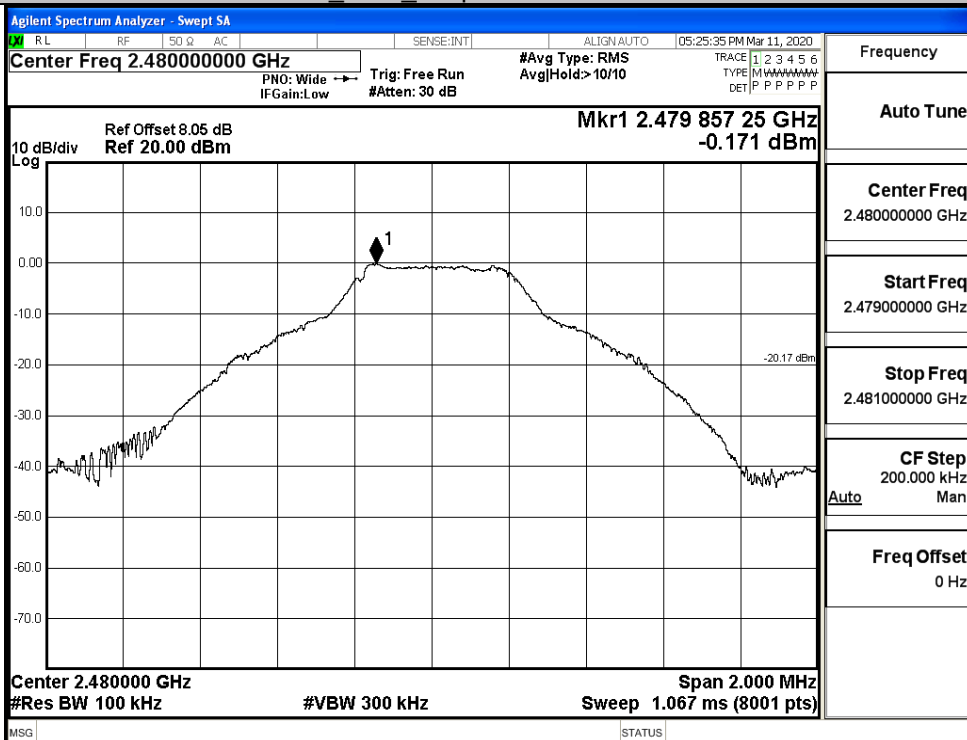


Puw

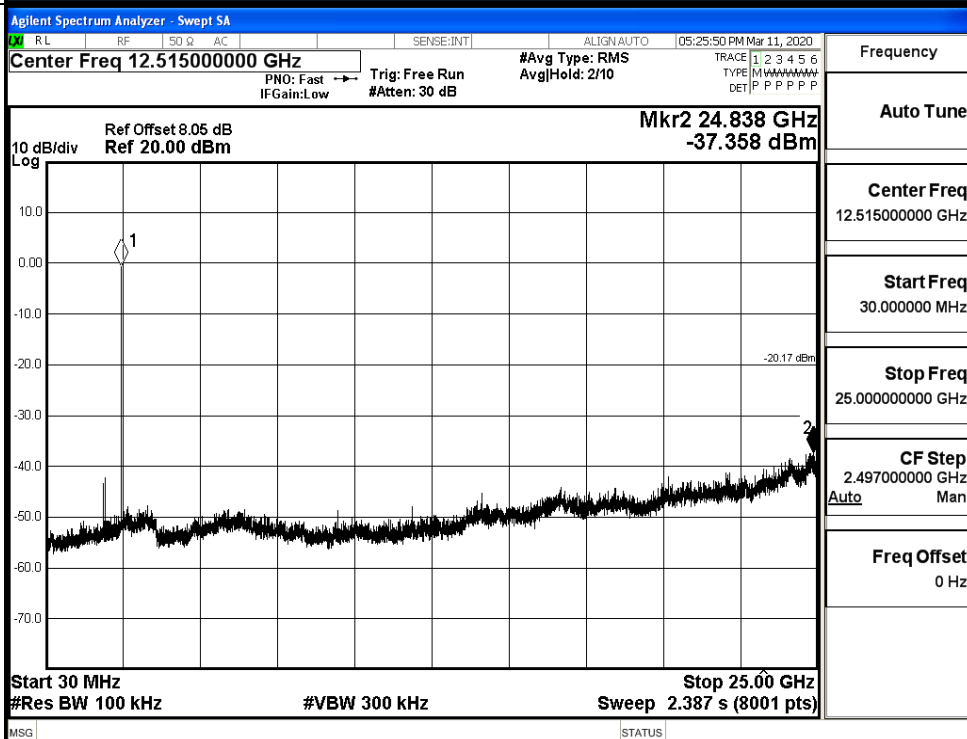


GFSK HCH Graphs

Pref

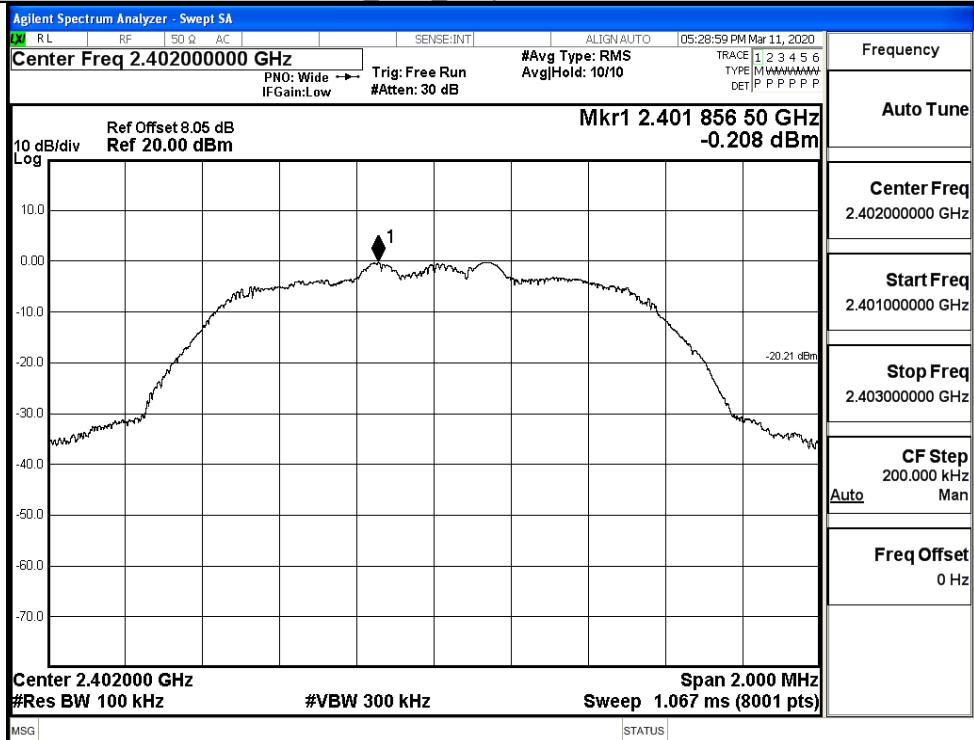


Puw

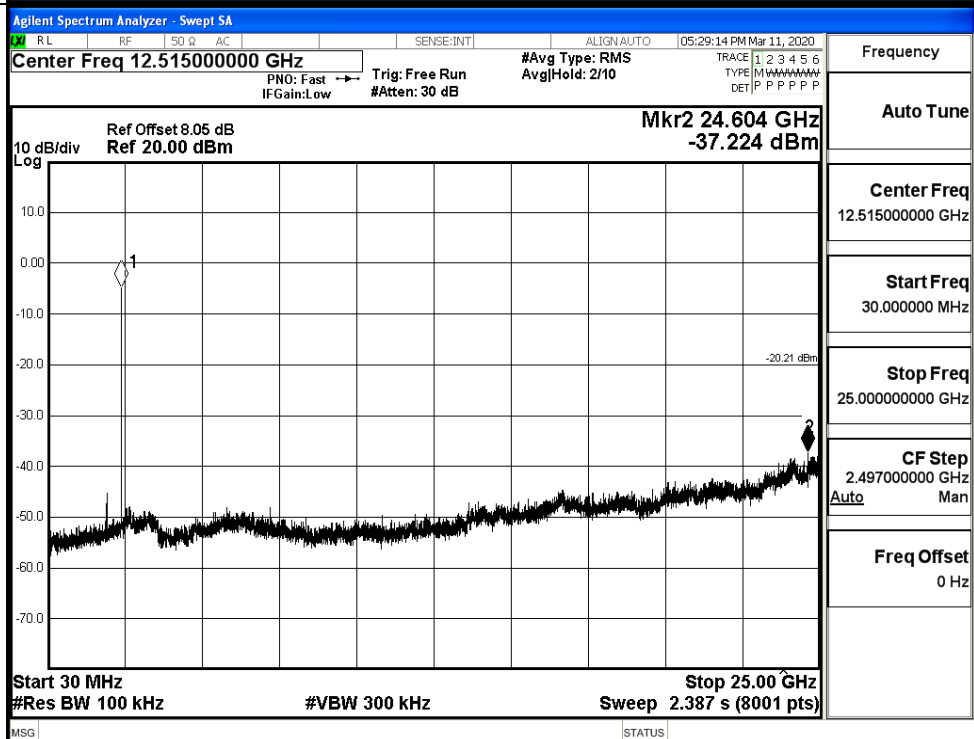


$\pi/4$ DQPSK_LCH_Graphs

Pref

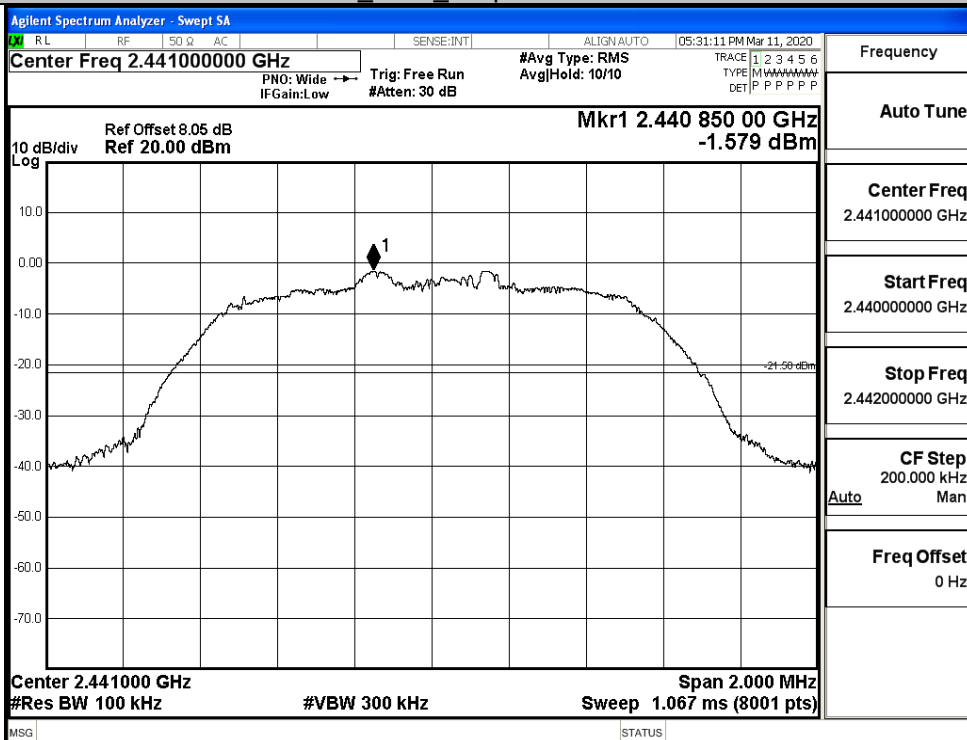


Puw

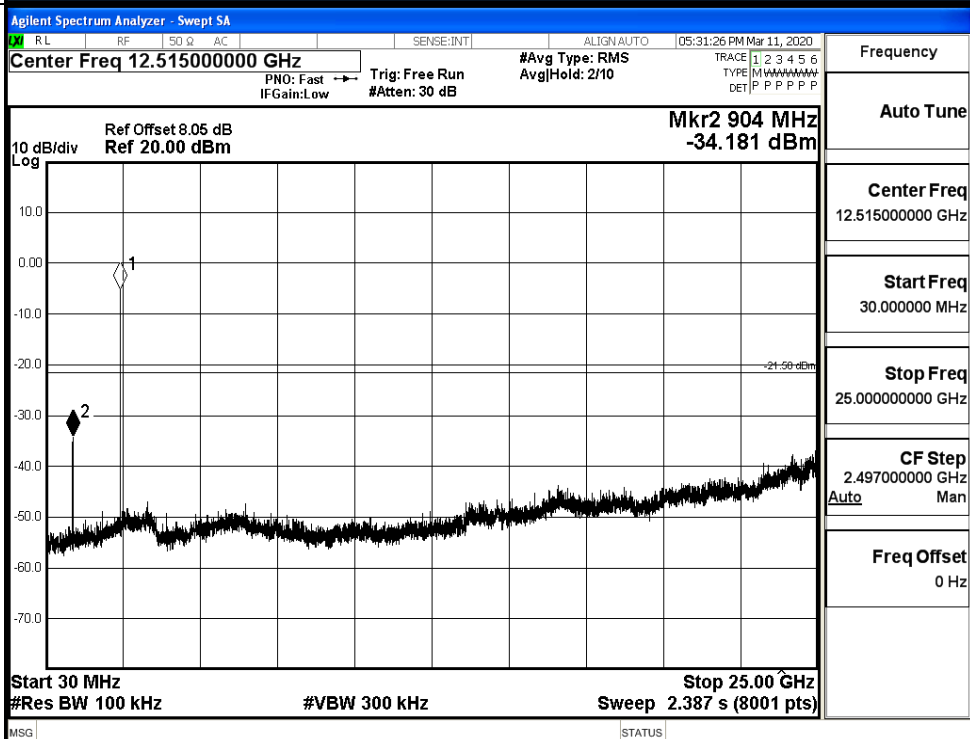


π /4DQPSK_MCH_Graphs

Pref

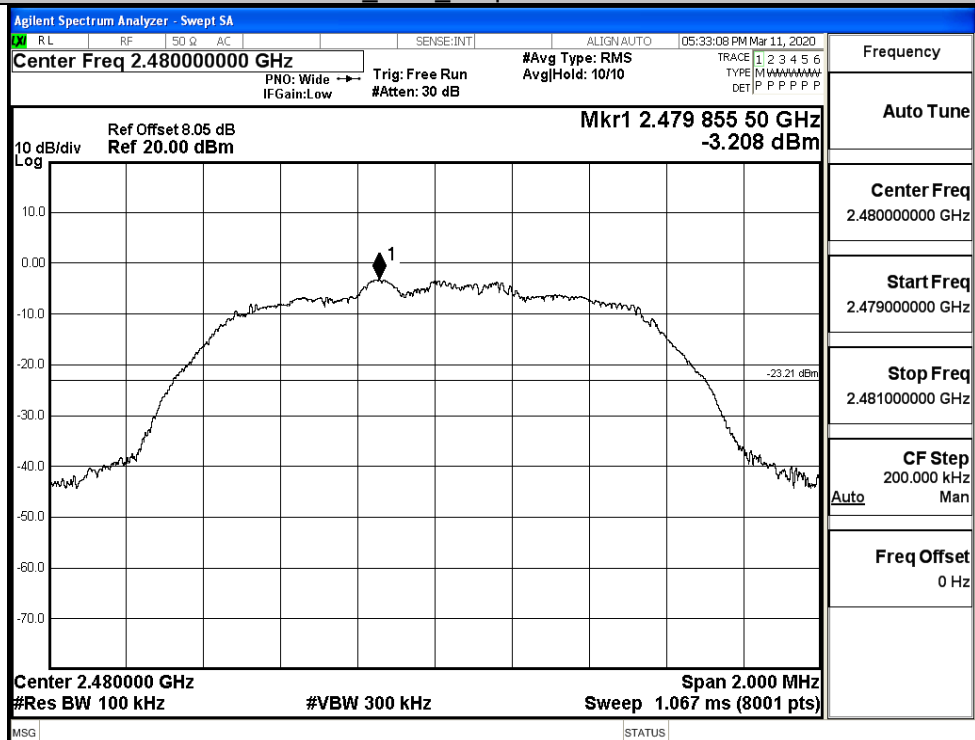


Puw

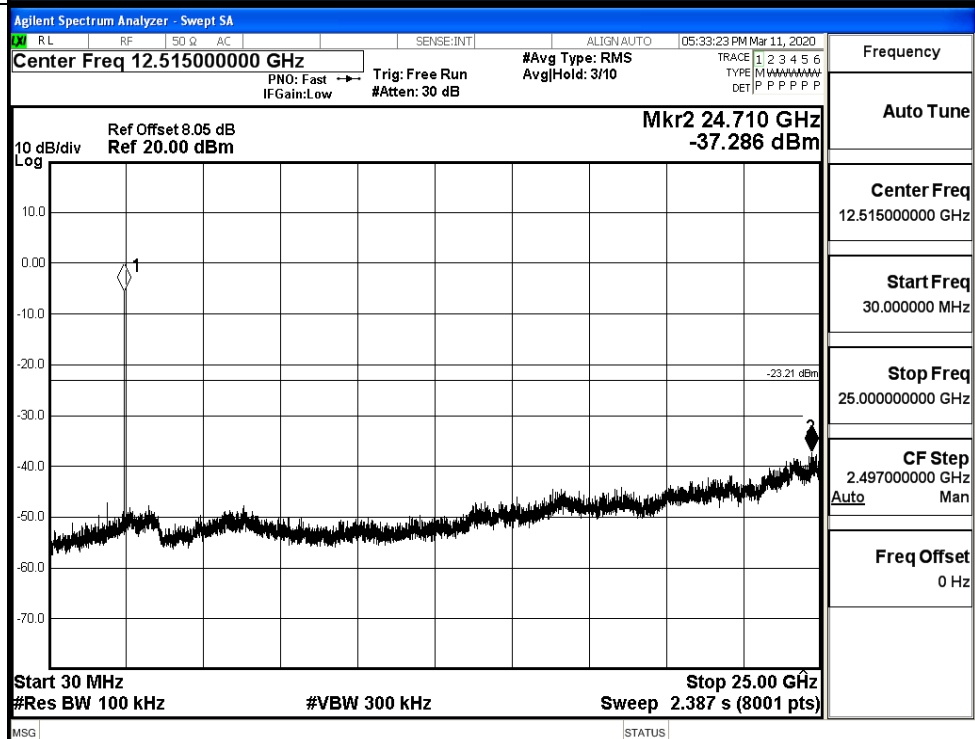


$\pi/4$ DQPSK_HCH_Graphs

Pref

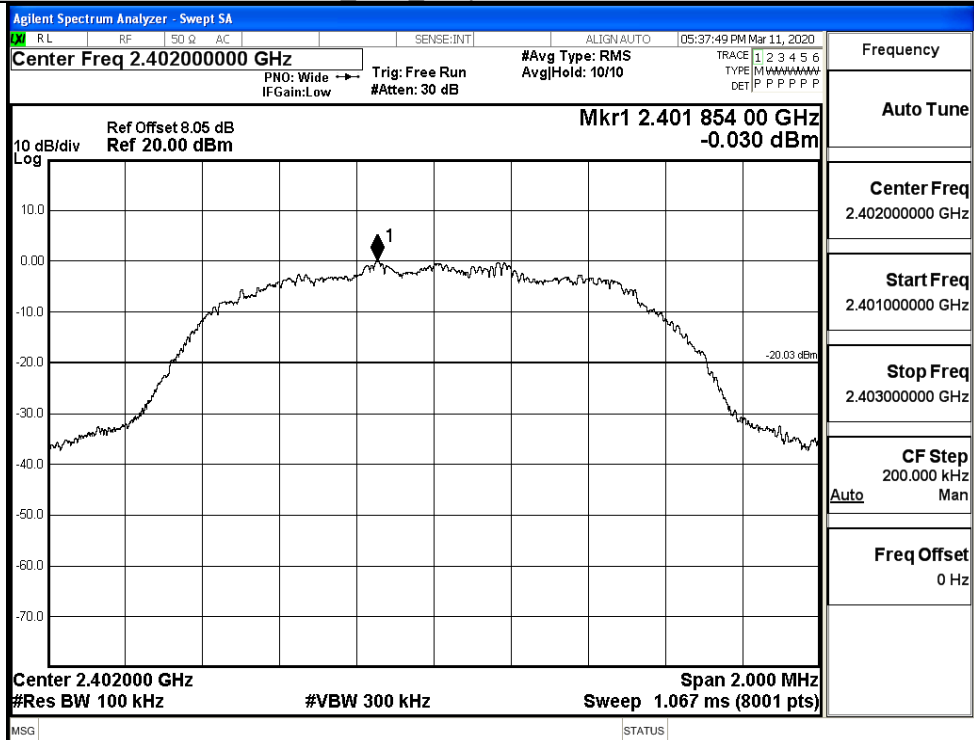


Puw

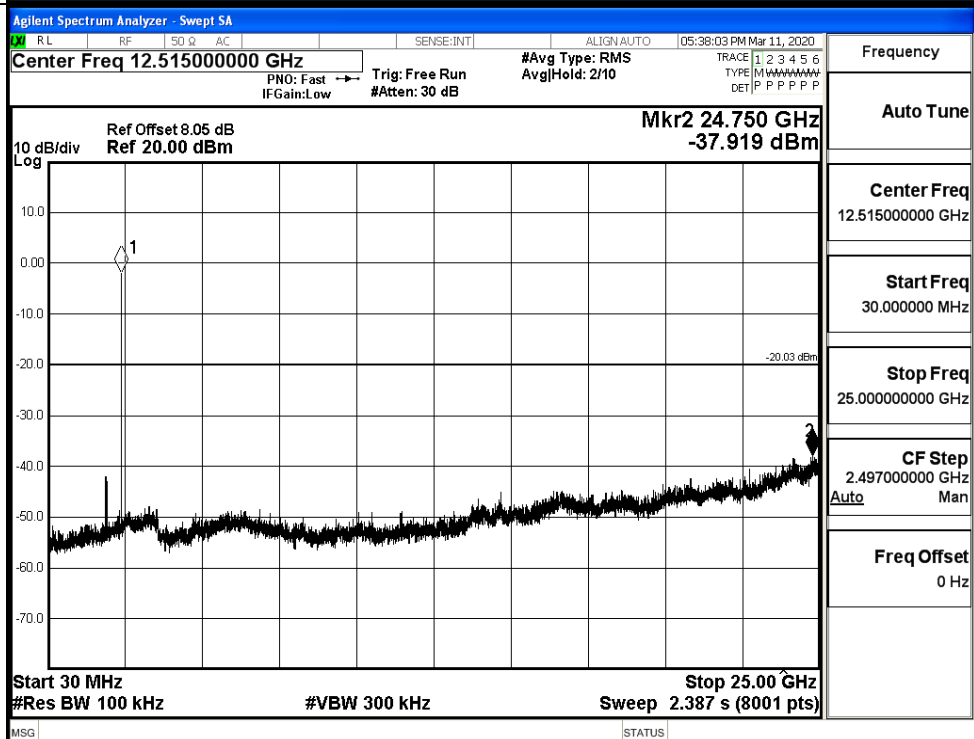


8DPSK_LCH_Graphs

Pref

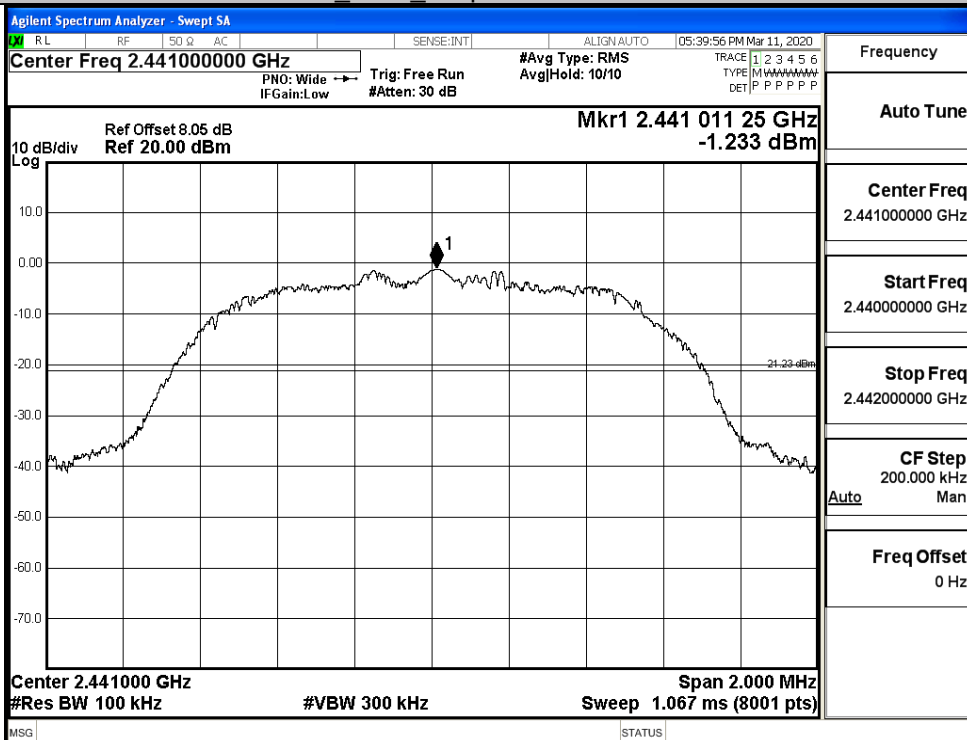


Puw

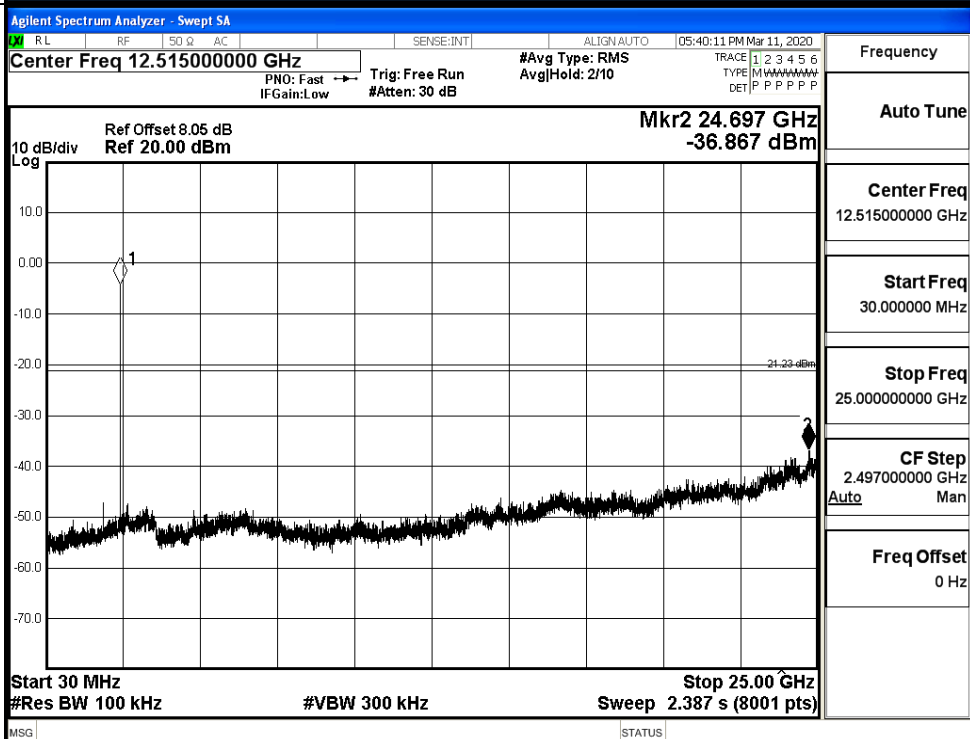


8DPSK_MCH_Graphs

Pref

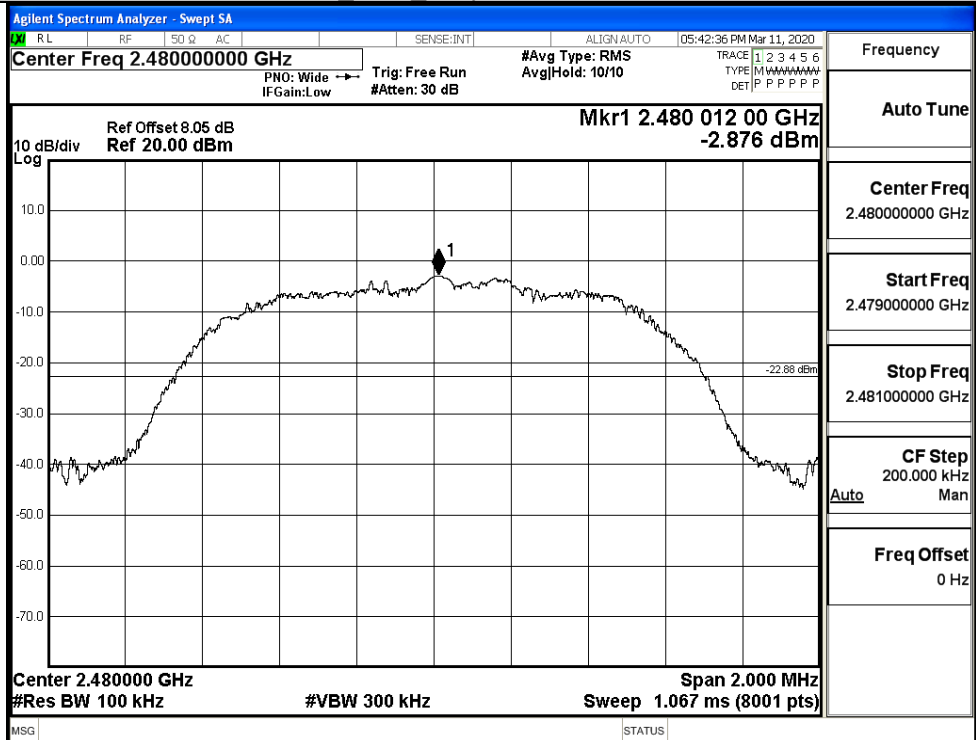


Puw

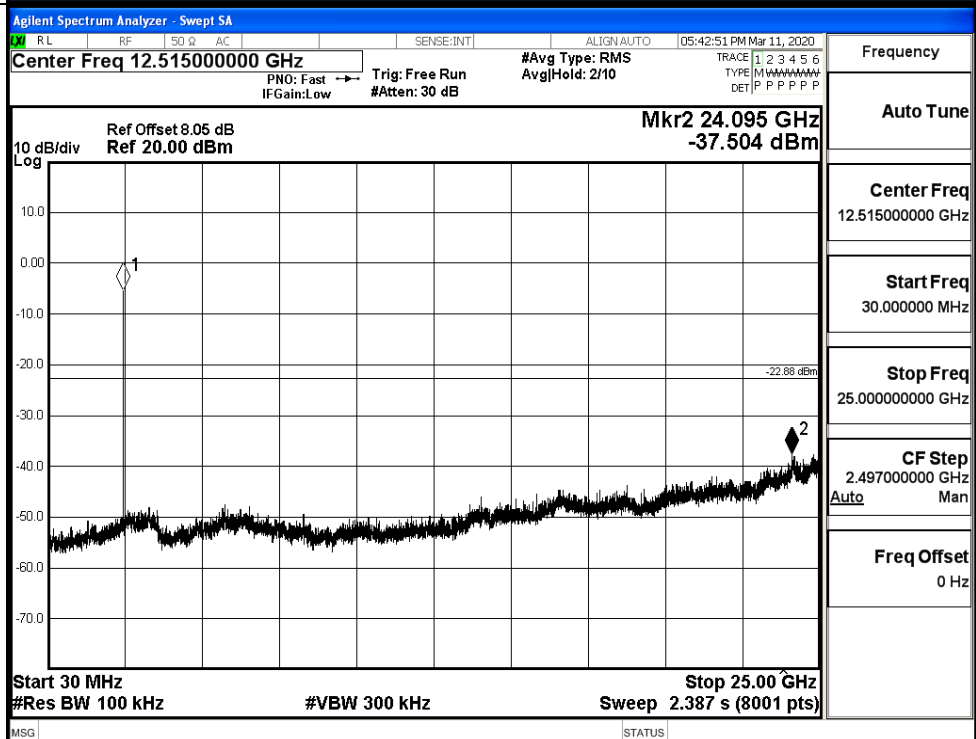


8DPSK_HCH_Graphs

Pref



Puw

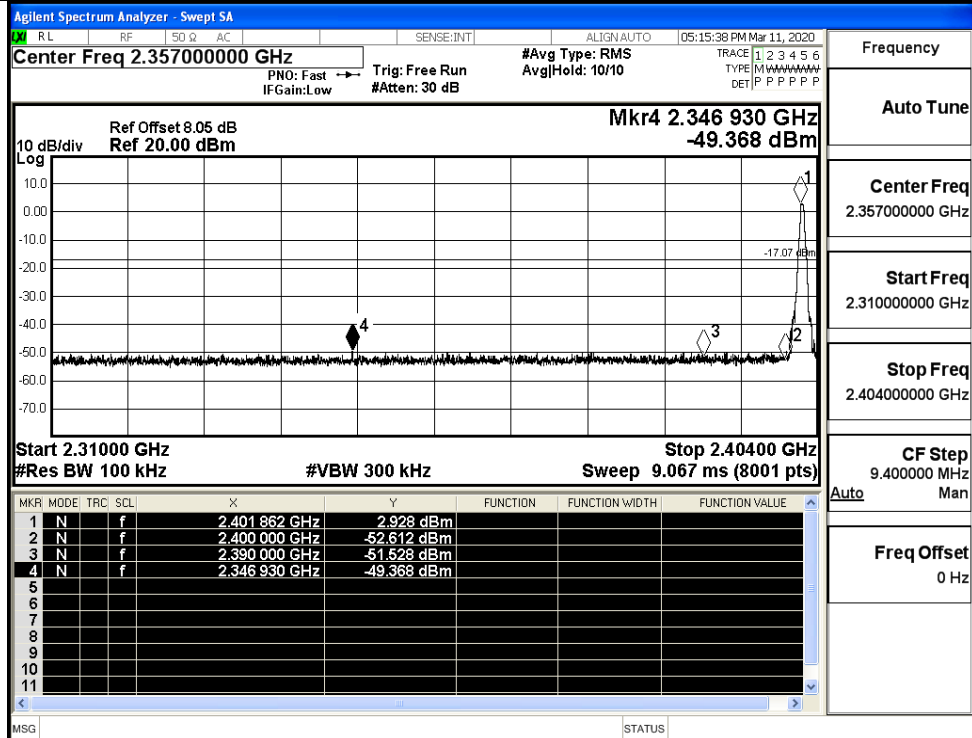


A.7 Band-edge for RF Conducted Emissions

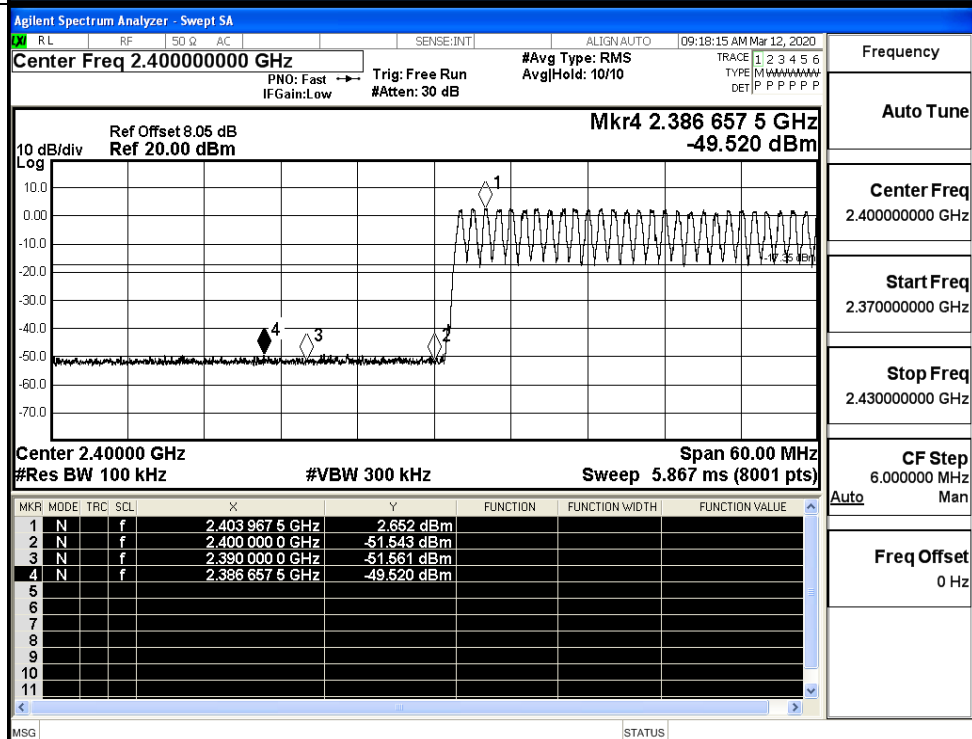
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	2.928	Off	-49.368	-17.07	PASS
			2.652	On	-49.520	-17.35	PASS
	HCH	2480	-0.035	Off	-47.932	-20.04	PASS
			0.644	On	-48.405	-19.36	PASS
$\pi/4$ DQPSK	LCH	2402	-0.076	Off	-49.410	-20.08	PASS
			-0.043	On	-48.973	-20.04	PASS
	HCH	2480	-3.236	Off	-48.718	-23.24	PASS
			-2.164	On	-48.535	-22.16	PASS
8DPSK	LCH	2402	0.177	Off	-49.697	-19.82	PASS
			0.085	On	-49.219	-19.92	PASS
	HCH	2480	-3.086	Off	-49.043	-23.09	PASS
			-2.013	On	-48.153	-22.01	PASS

Test Graphs

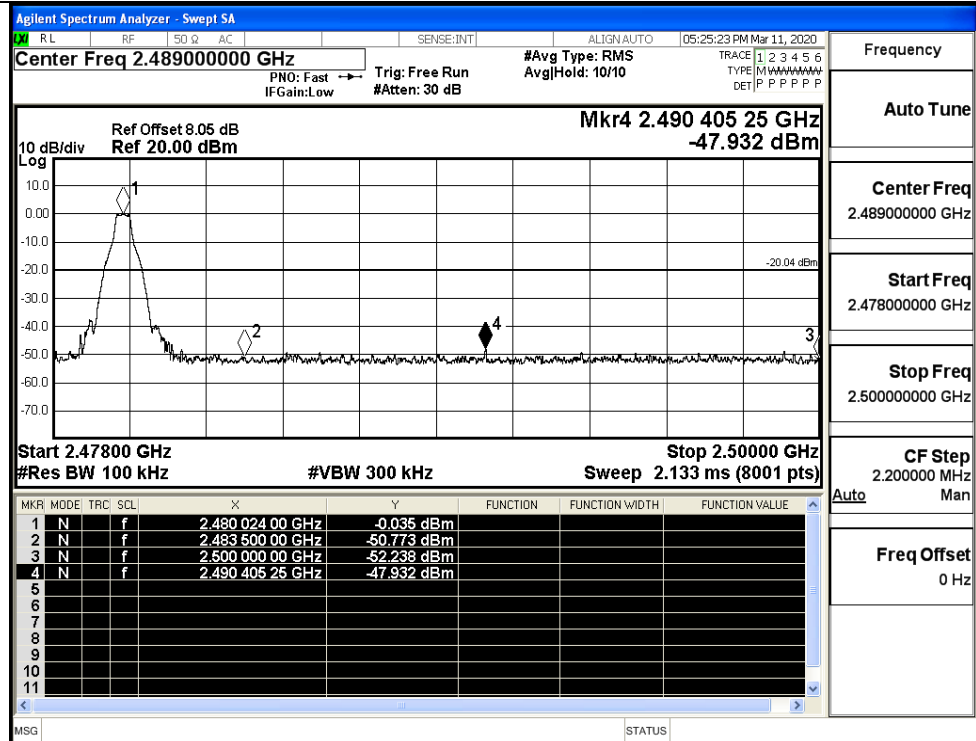
GFSK/LCH/No Hop



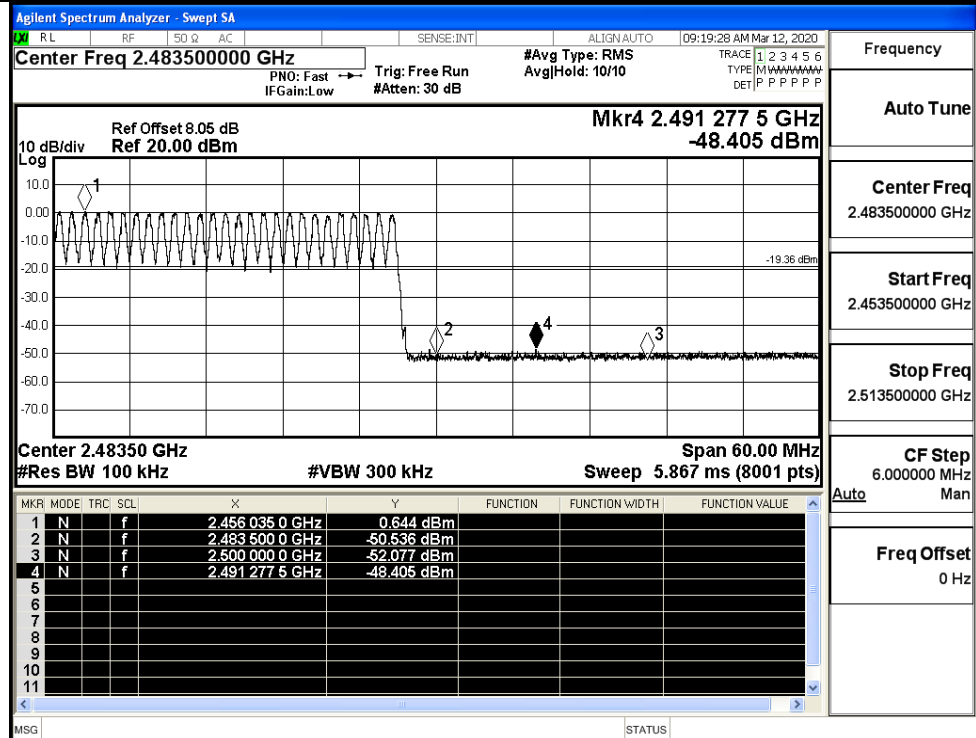
GFSK/LCH/Hop



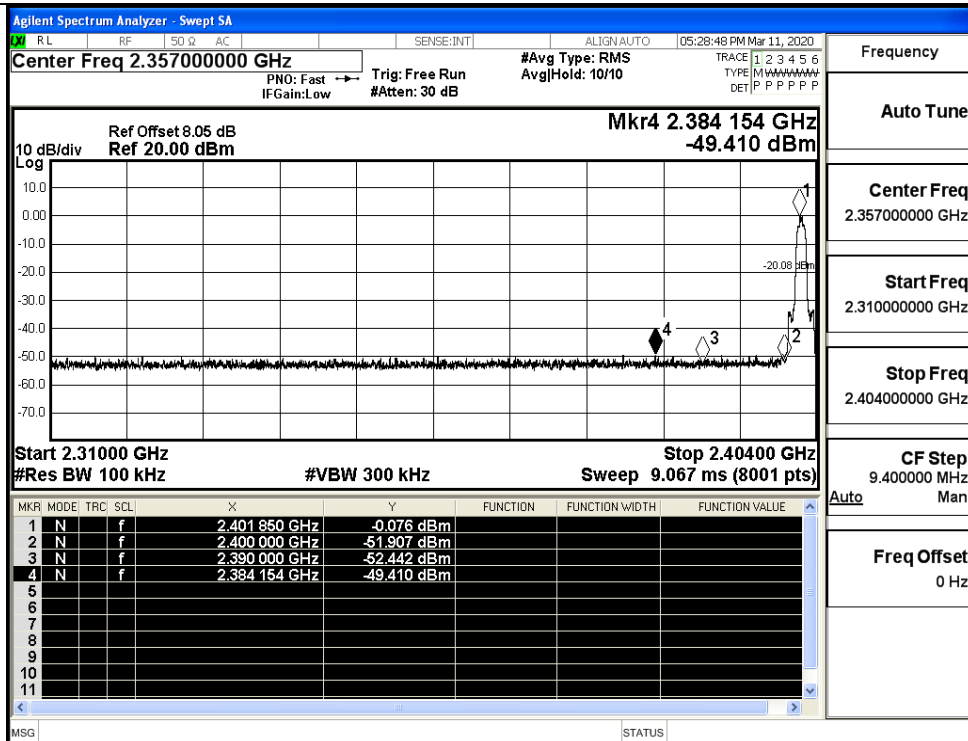
GFSK/HCH/No Hop



GFSK/HCH/Hop



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



Frequency

Auto Tune

Center Freq
2.357000000 GHz

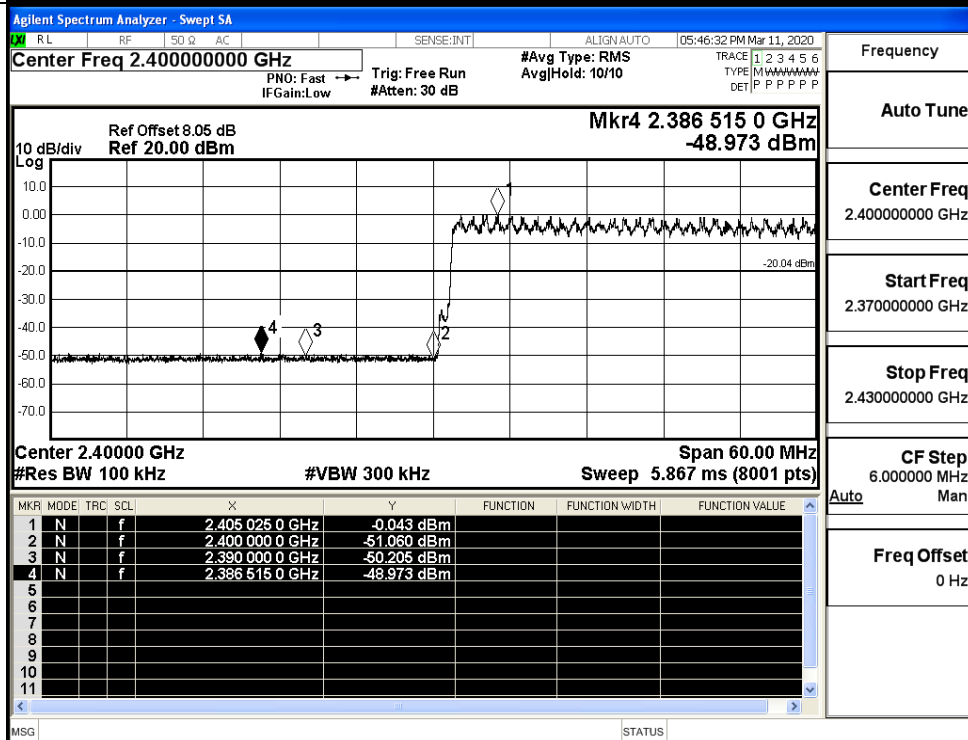
Start Freq
2.310000000 GHz

Stop Freq
2.404000000 GHz

CF Step
9.400000 MHz
Auto Man

Freq Offset
0 Hz

$\pi/4$ DQPSK/LCH/Hop



Frequency

Auto Tune

Center Freq
2.400000000 GHz

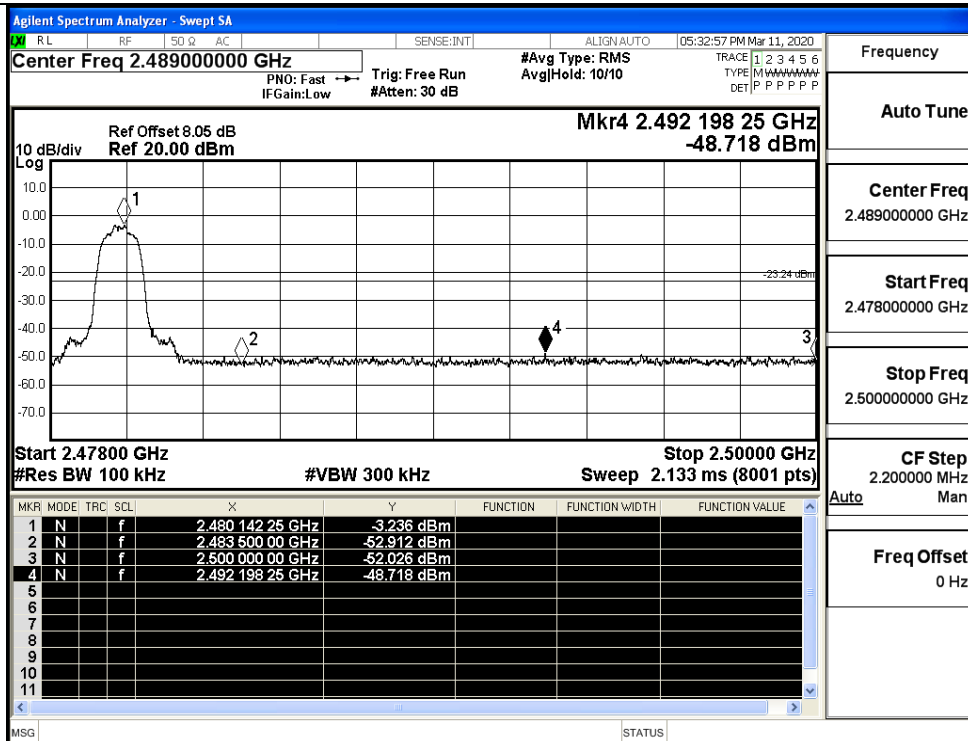
Start Freq
2.370000000 GHz

Stop Freq
2.430000000 GHz

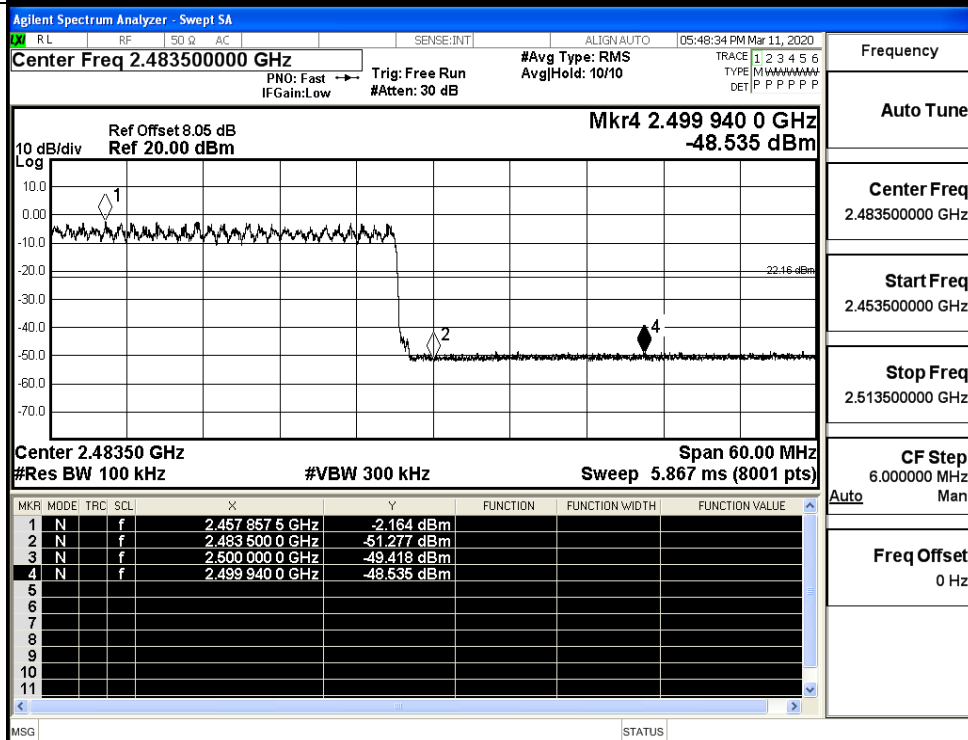
CF Step
6.000000 MHz
Auto Man

Freq Offset
0 Hz

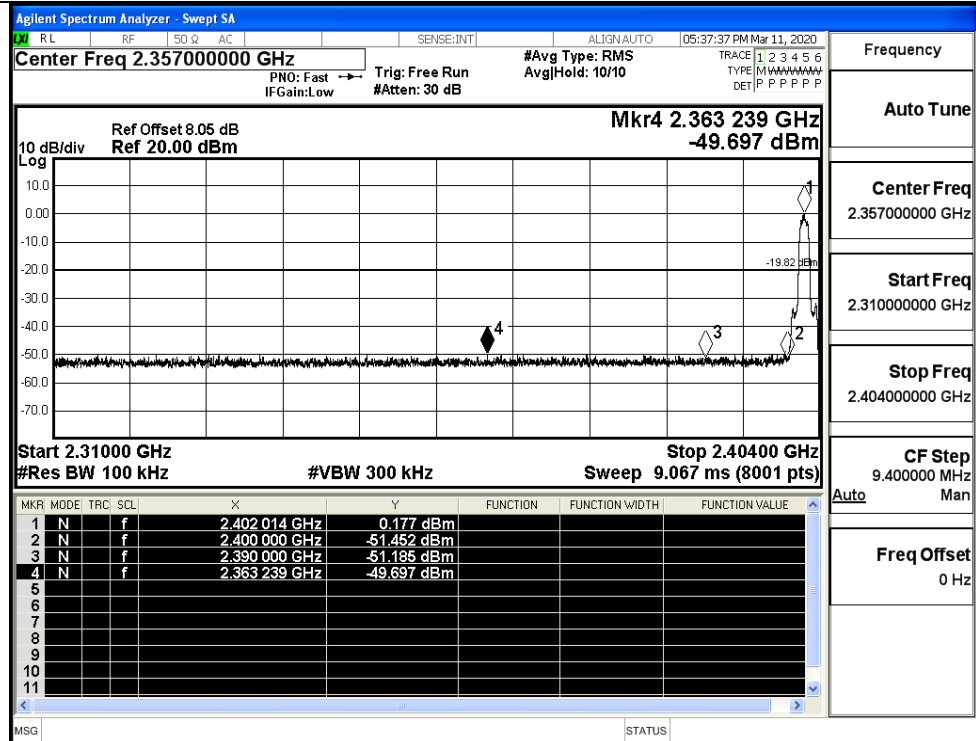
$\pi/4$ DQPSK/HCH/No
Hop



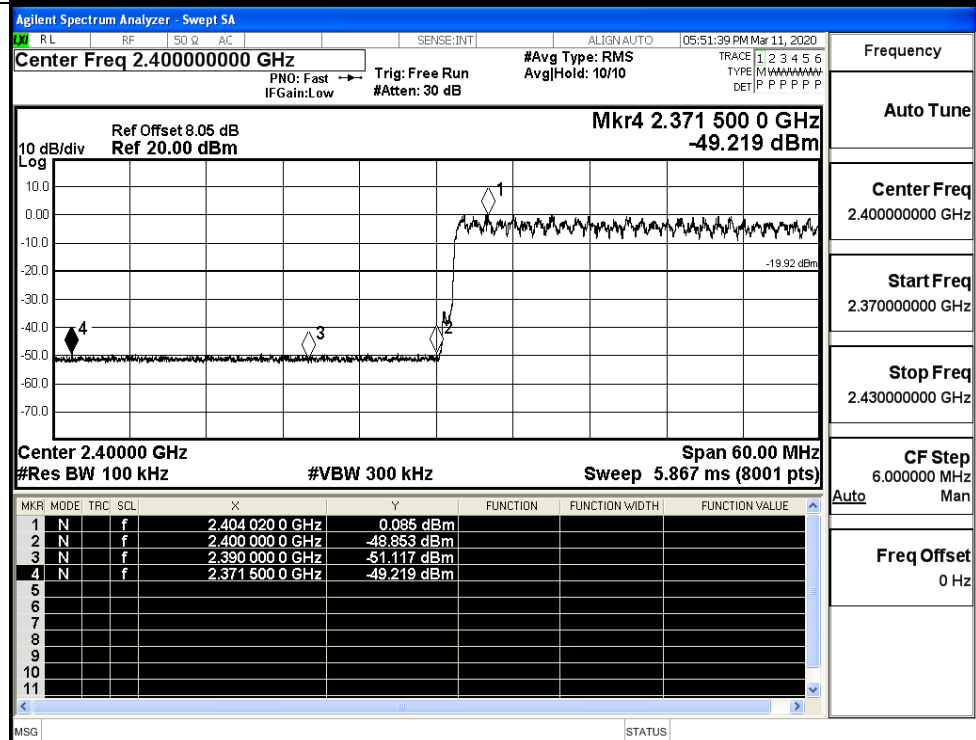
$\pi/4$ DQPSK/HCH/Hop



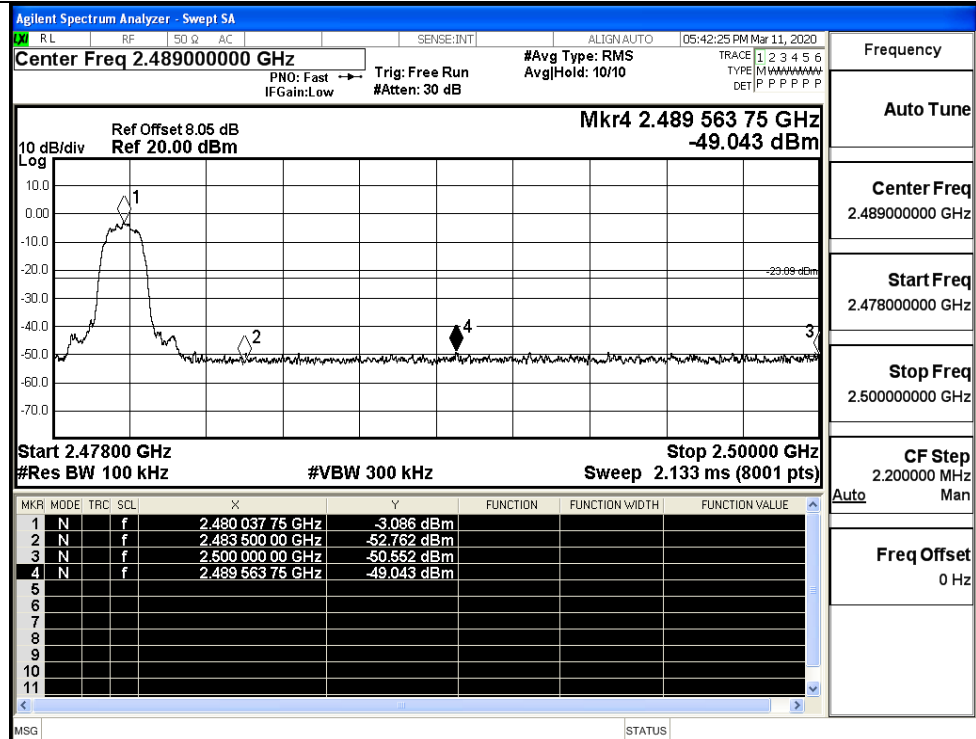
8DPSK/LCH/No Hop



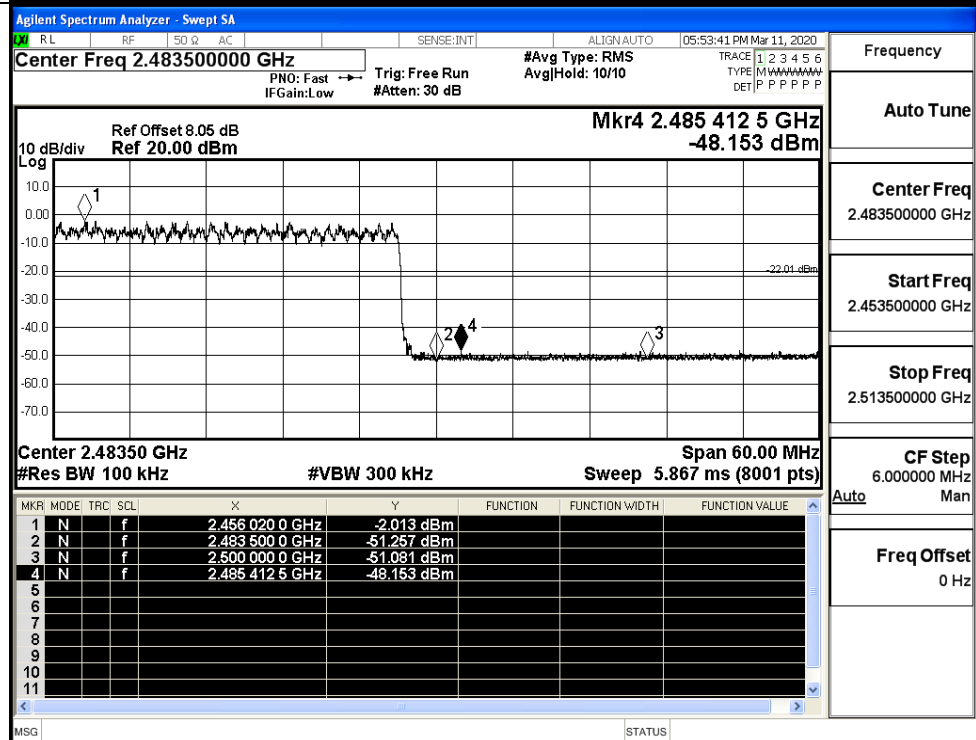
8DPSK/LCH/Hop



8DPSK/HCH/No Hop



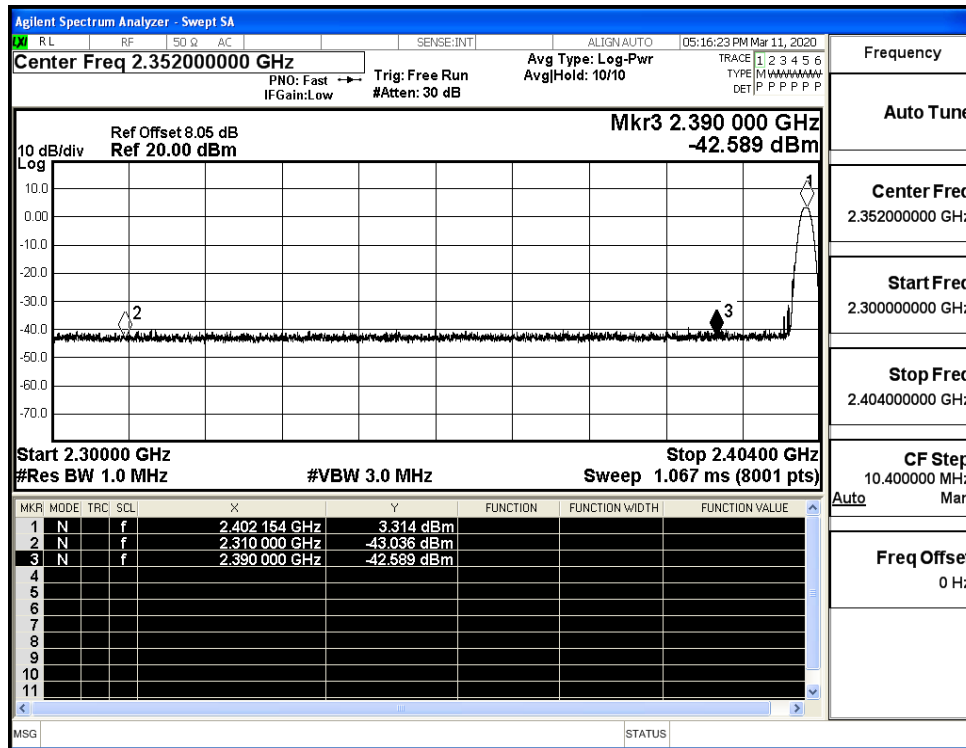
8DPSK/HCH/Hop



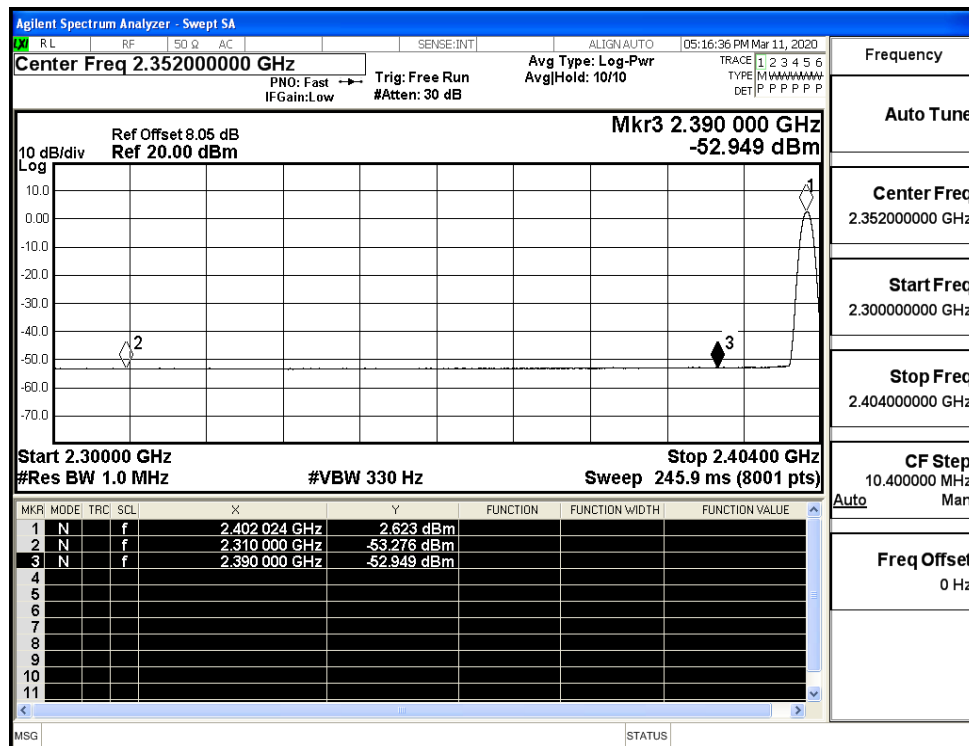
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.04	2.0	0	54.19	PEAK	74	PASS
	Off	2310.0	-53.28	2.0	0	43.95	AV	54	PASS
	Off	2390.0	-42.59	2.0	0	54.64	PEAK	74	PASS
	Off	2390.0	-52.95	2.0	0	44.28	AV	54	PASS
	Off	2483.5	-42.50	2.0	0	54.73	PEAK	74	PASS
	Off	2483.5	-52.29	2.0	0	44.94	AV	54	PASS
	Off	2500.0	-41.06	2.0	0	56.17	PEAK	74	PASS
	Off	2500.0	-52.26	2.0	0	44.97	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-43.77	2.0	0	53.46	PEAK	74	PASS
	Off	2310.0	-53.17	2.0	0	44.06	AV	54	PASS
	Off	2390.0	-42.91	2.0	0	54.32	PEAK	74	PASS
	Off	2390.0	-52.88	2.0	0	44.35	AV	54	PASS
	Off	2483.5	-42.70	2.0	0	54.53	PEAK	74	PASS
	Off	2483.5	-52.46	2.0	0	44.77	AV	54	PASS
	Off	2500.0	-41.92	2.0	0	55.31	PEAK	74	PASS
	Off	2500.0	-52.17	2.0	0	45.06	AV	54	PASS
8DPSK	Off	2310.0	-42.31	2.0	0	54.92	PEAK	74	PASS
	Off	2310.0	-53.26	2.0	0	43.97	AV	54	PASS
	Off	2390.0	-41.10	2.0	0	56.13	PEAK	74	PASS
	Off	2390.0	-53.02	2.0	0	44.21	AV	54	PASS
	Off	2483.5	-42.89	2.0	0	54.34	PEAK	74	PASS
	Off	2483.5	-52.29	2.0	0	44.94	AV	54	PASS
	Off	2500.0	-42.37	2.0	0	54.86	PEAK	74	PASS
	Off	2500.0	-52.33	2.0	0	44.90	AV	54	PASS

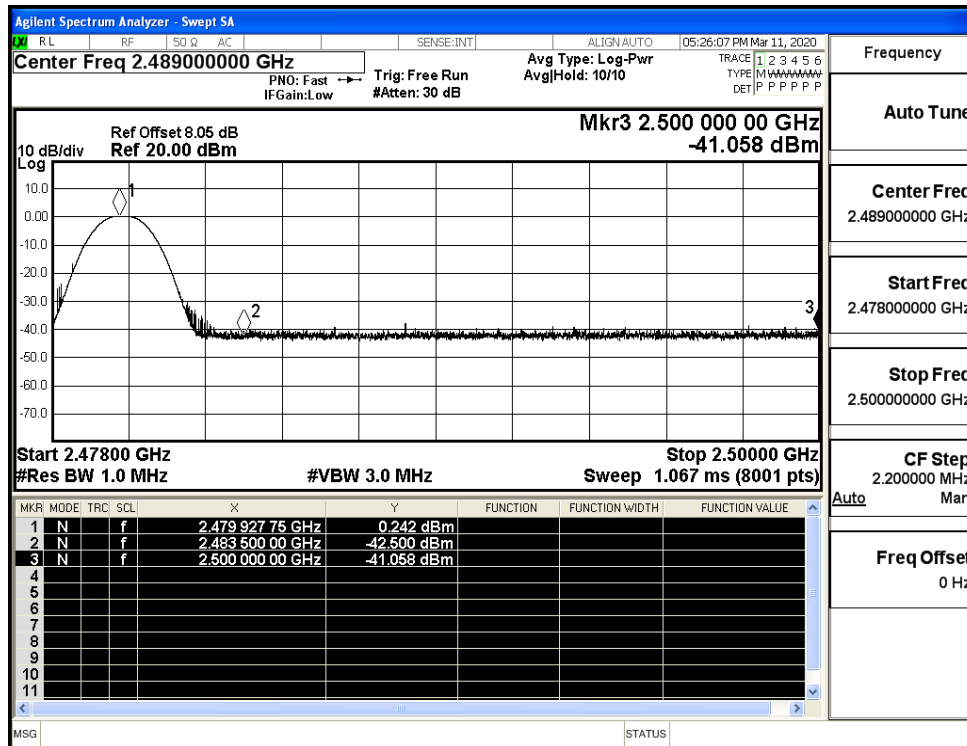
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



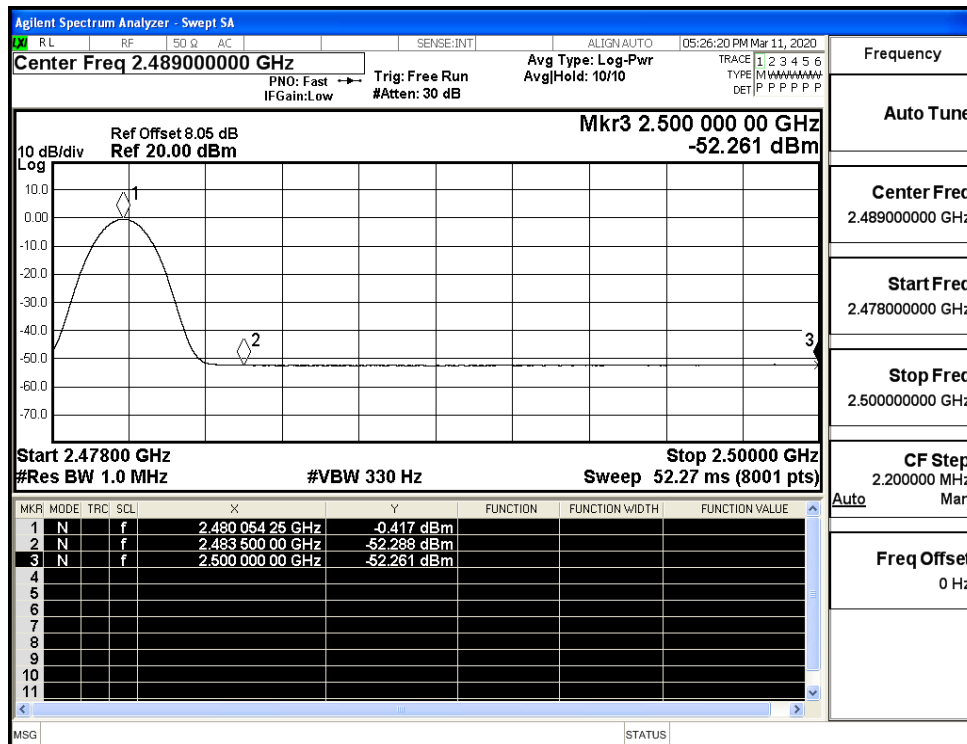
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)

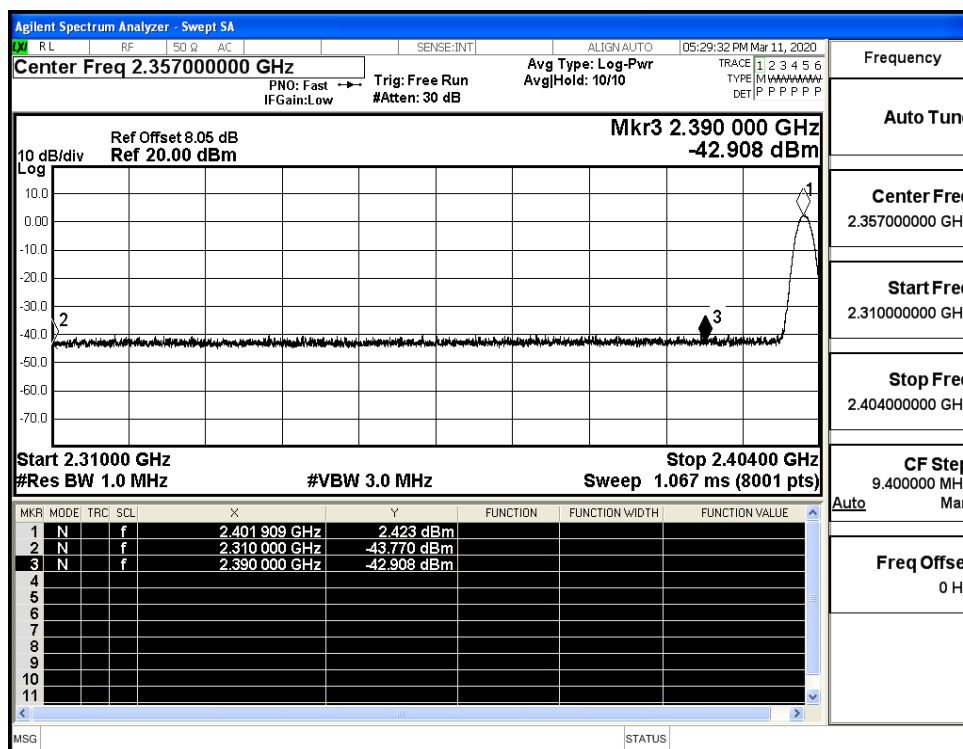
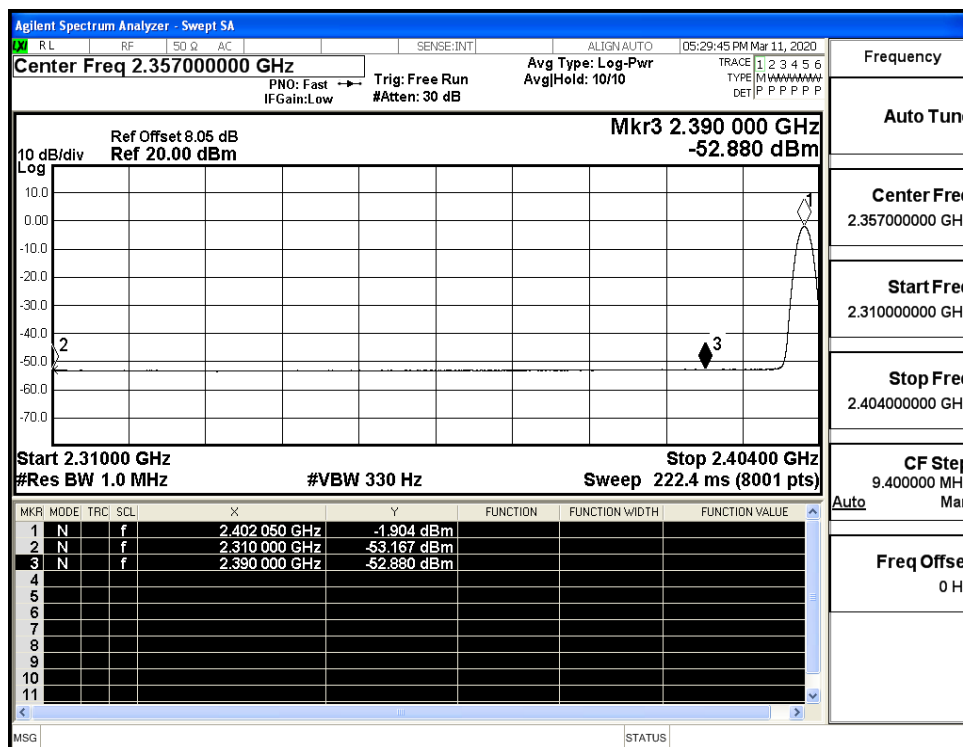


Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)

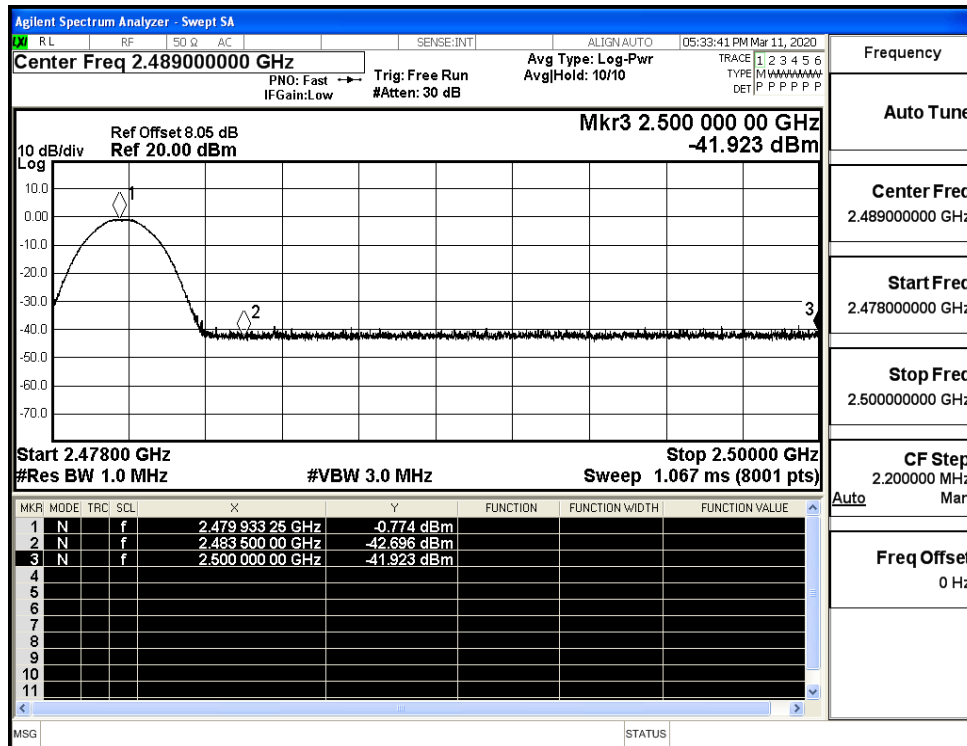


Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)

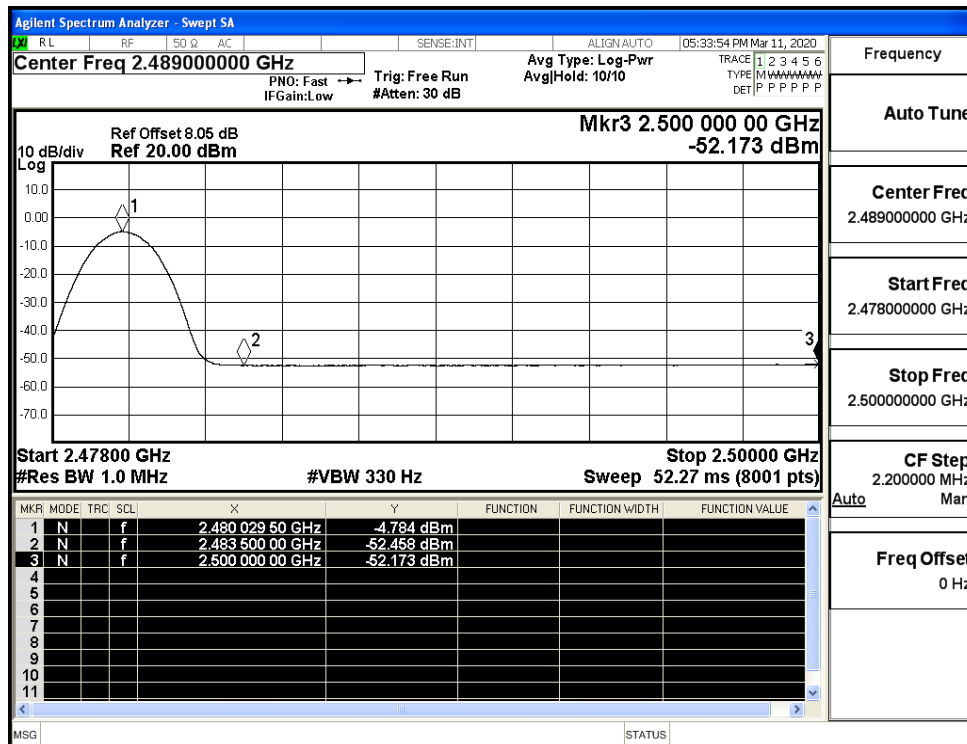


Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)

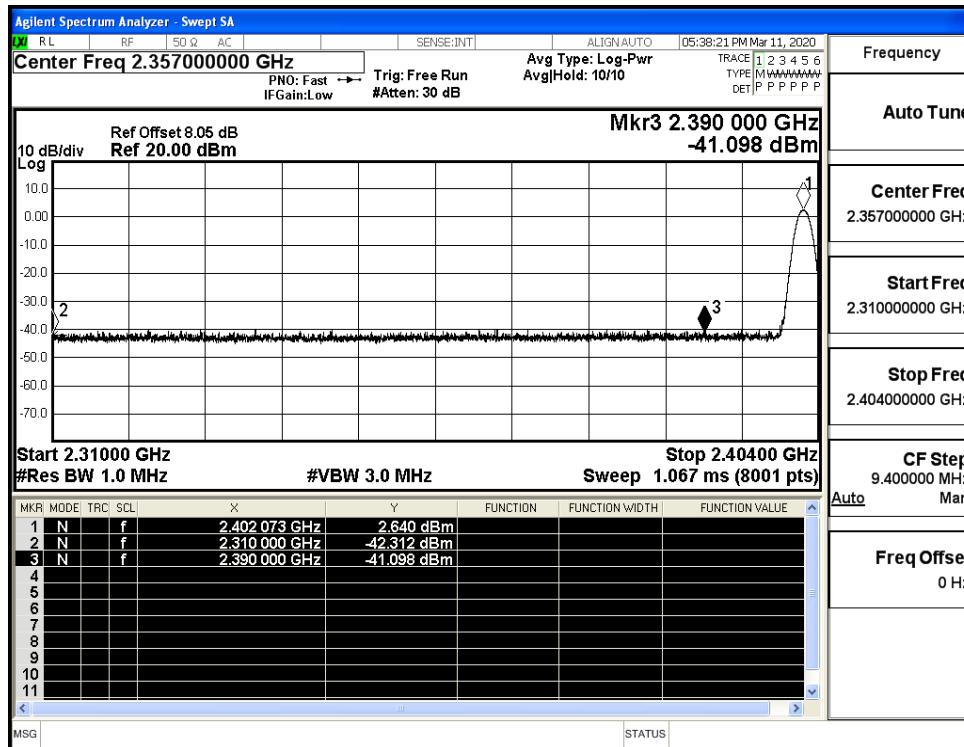
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



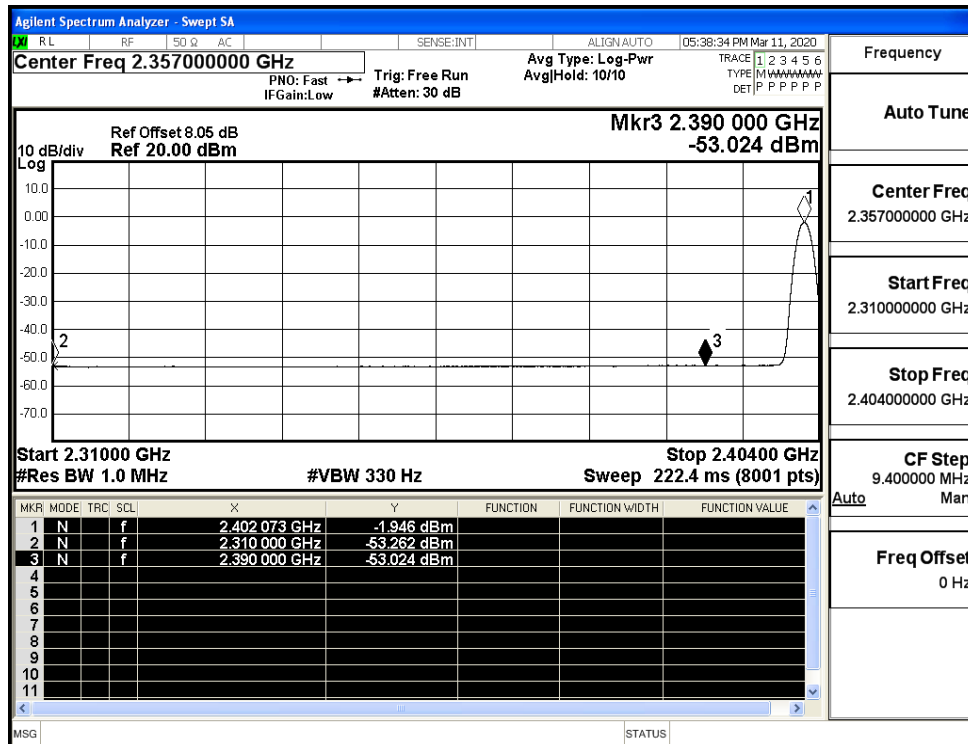
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



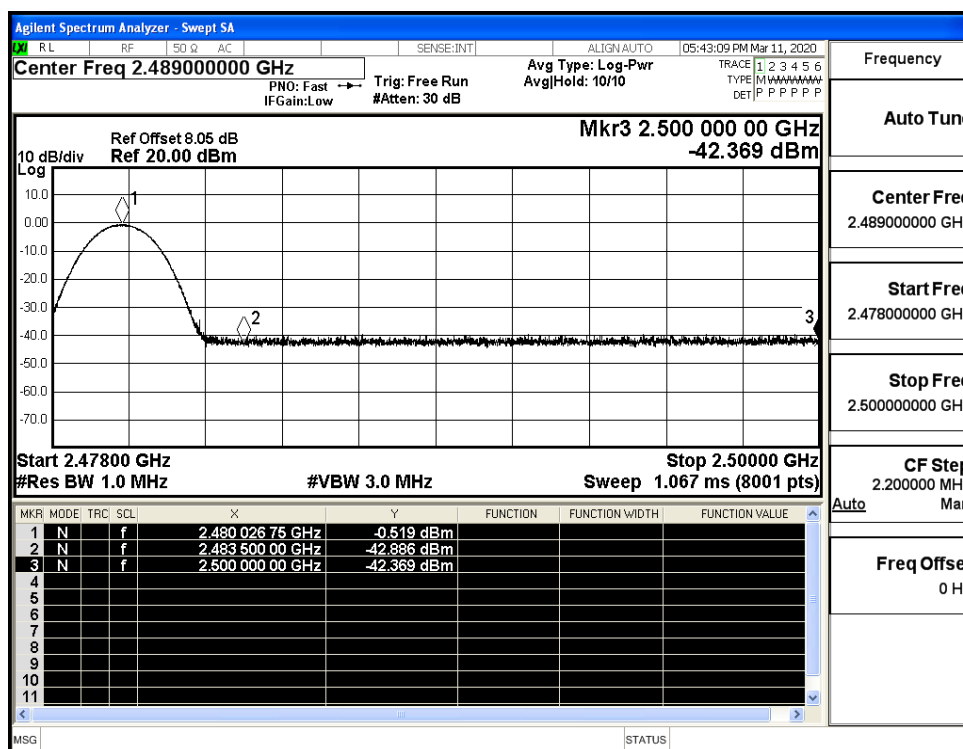
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

