

Appendix A

RF Test Data for BT V5.0(BDR/EDR) (Conducted Measurement)

Product Name: Wireless Speaker

Trade Mark: Billboard

Test Model: BB2833

Environmental Conditions

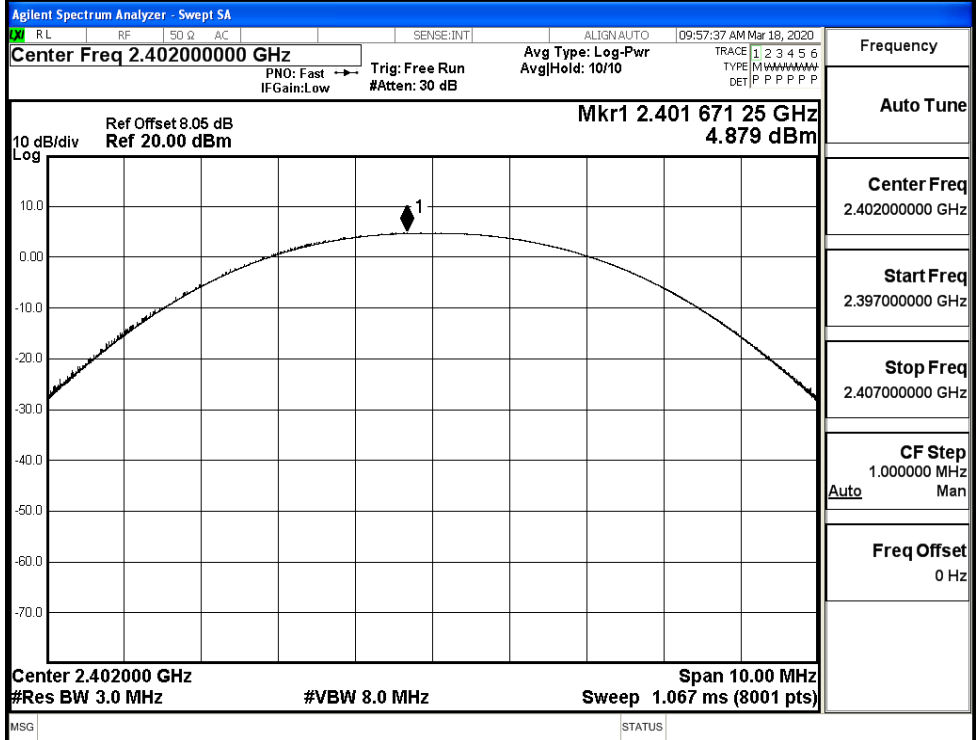
Temperature:	25 °C
Relative Humidity:	50%
ATM Pressure:	100.0 kPa
Test Engineer:	Li Huan
Supervised by:	Tom.Liu

A.1 Maxmum Conducted Peak Output Power

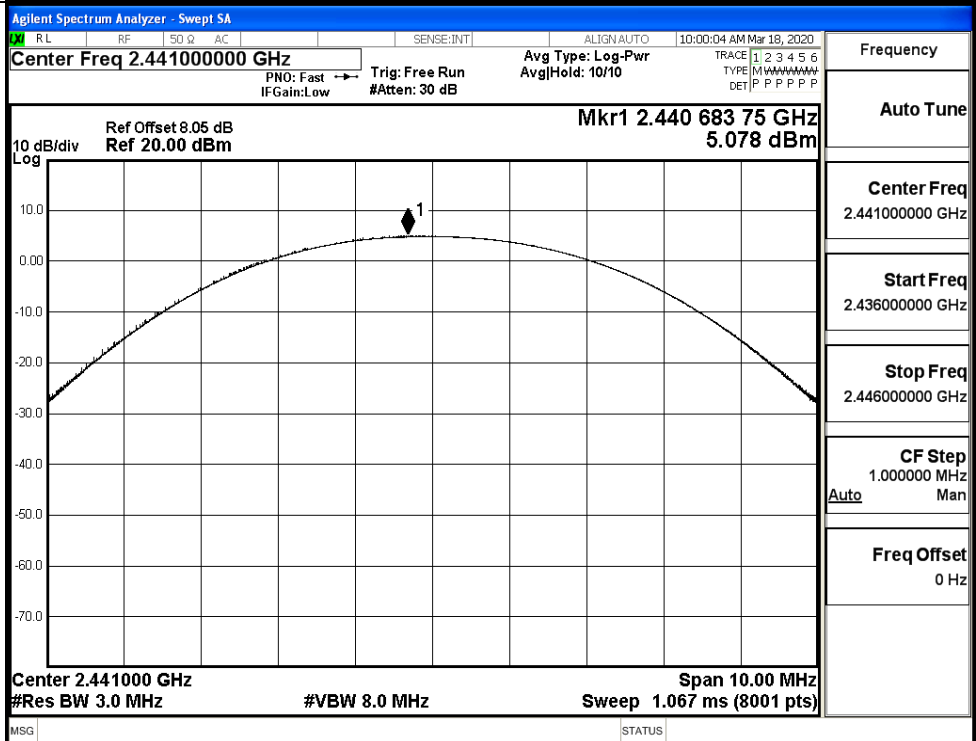
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	4.879	21	PASS
	MCH	5.078	21	PASS
	HCH	3.883	21	PASS
$\pi/4$ DQPSK	LCH	5.145	21	PASS
	MCH	5.416	21	PASS
	HCH	4.204	21	PASS
8DPSK	LCH	5.419	21	PASS
	MCH	5.718	21	PASS
	HCH	4.471	21	PASS

Test Graphs

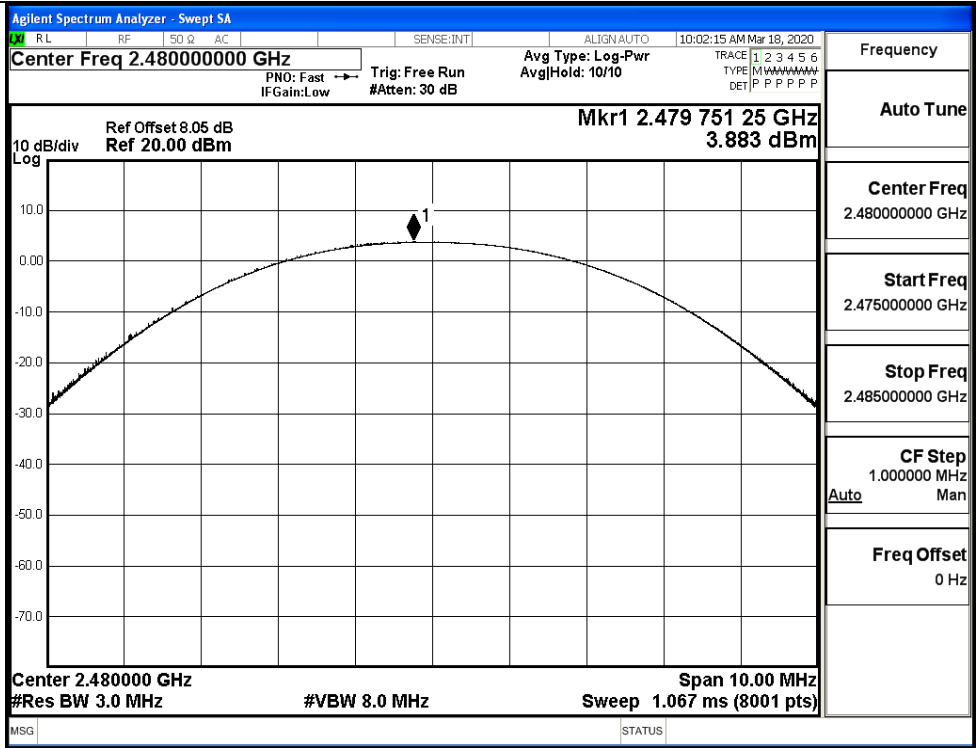
GFSK/LCH



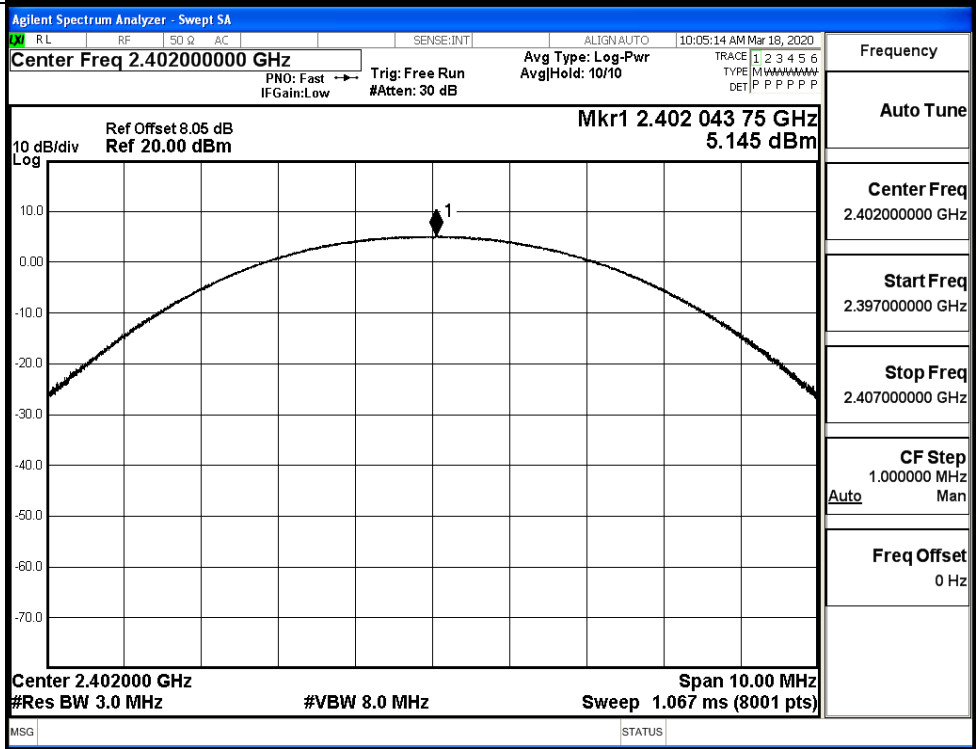
GFSK/MCH



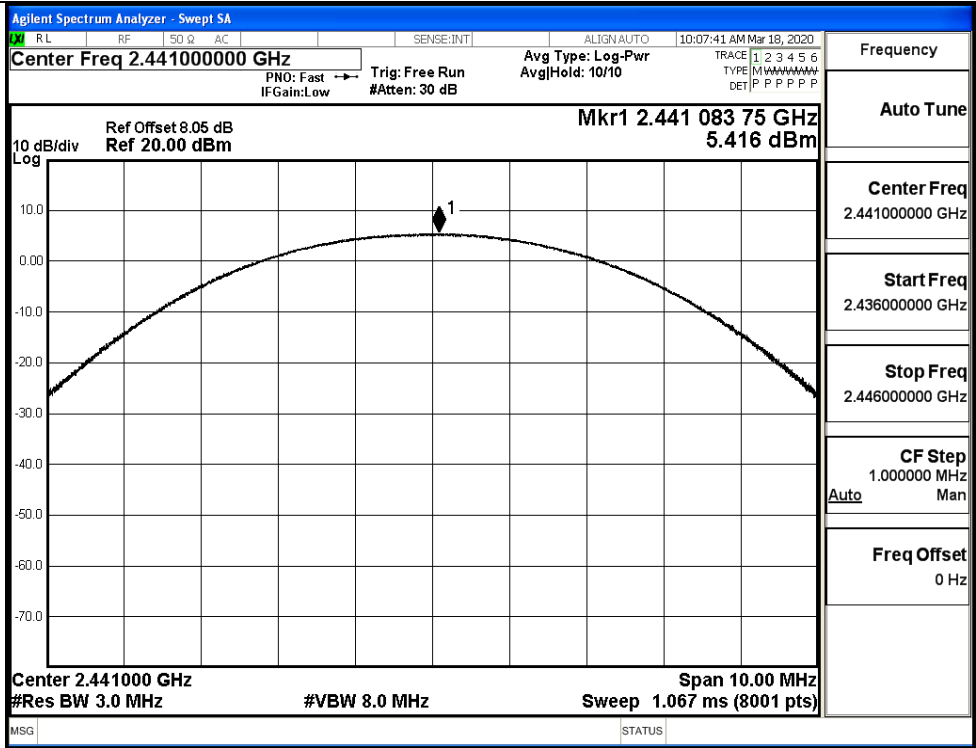
GFSK/HCH



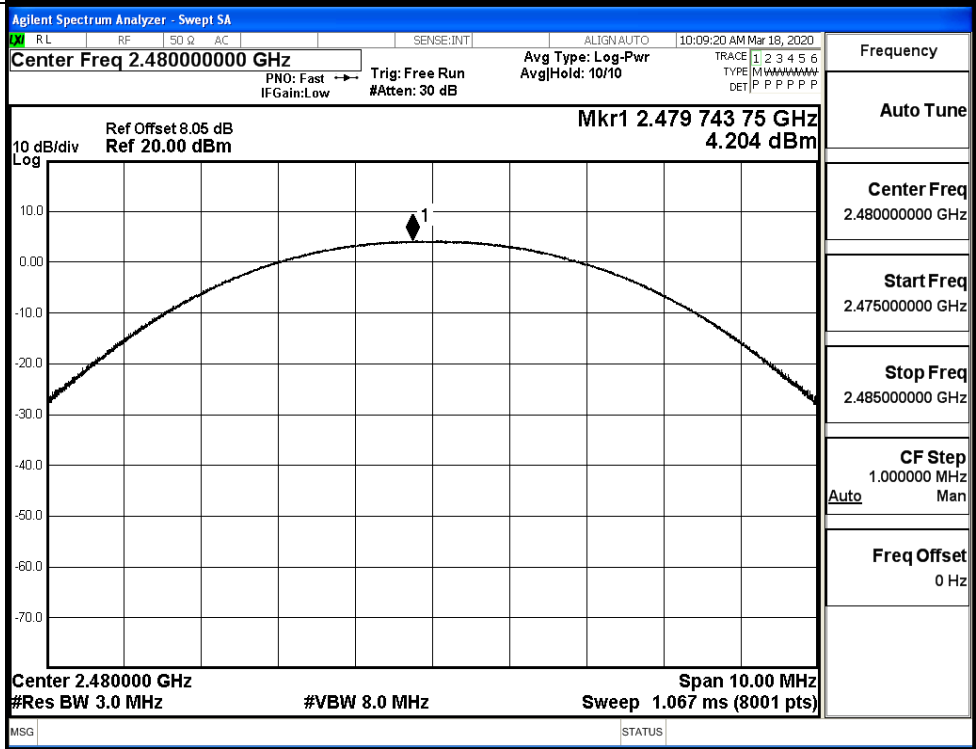
$\pi/4$ DQPSK/LCH



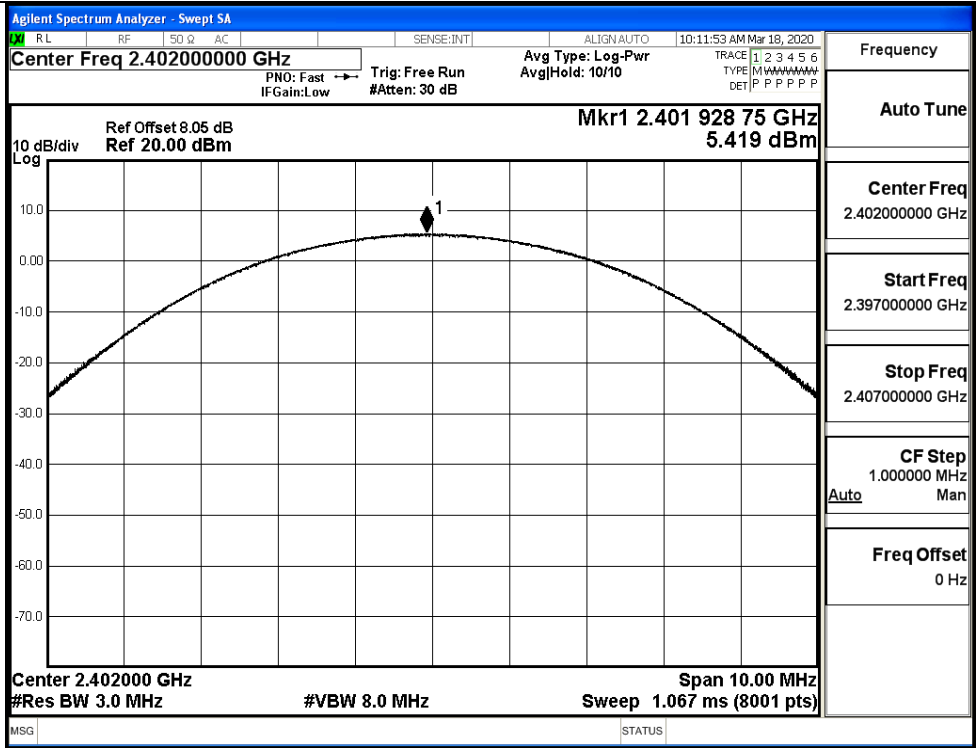
π /4DQPSK/MCH



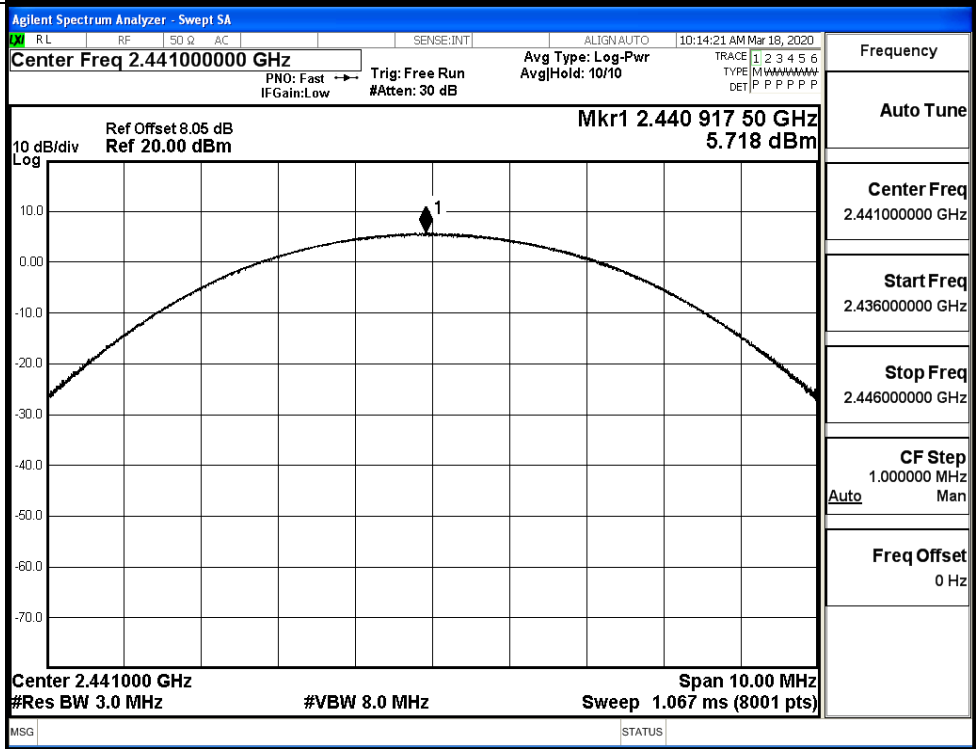
π /4DQPSK/HCH



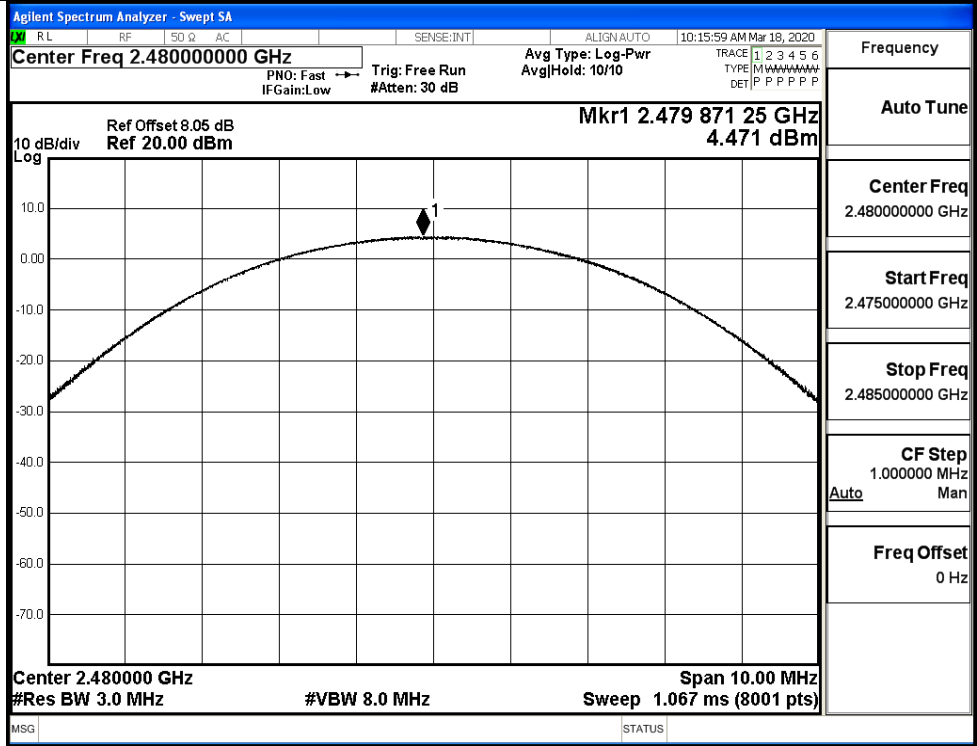
8DPSK/LCH



8DPSK/MCH

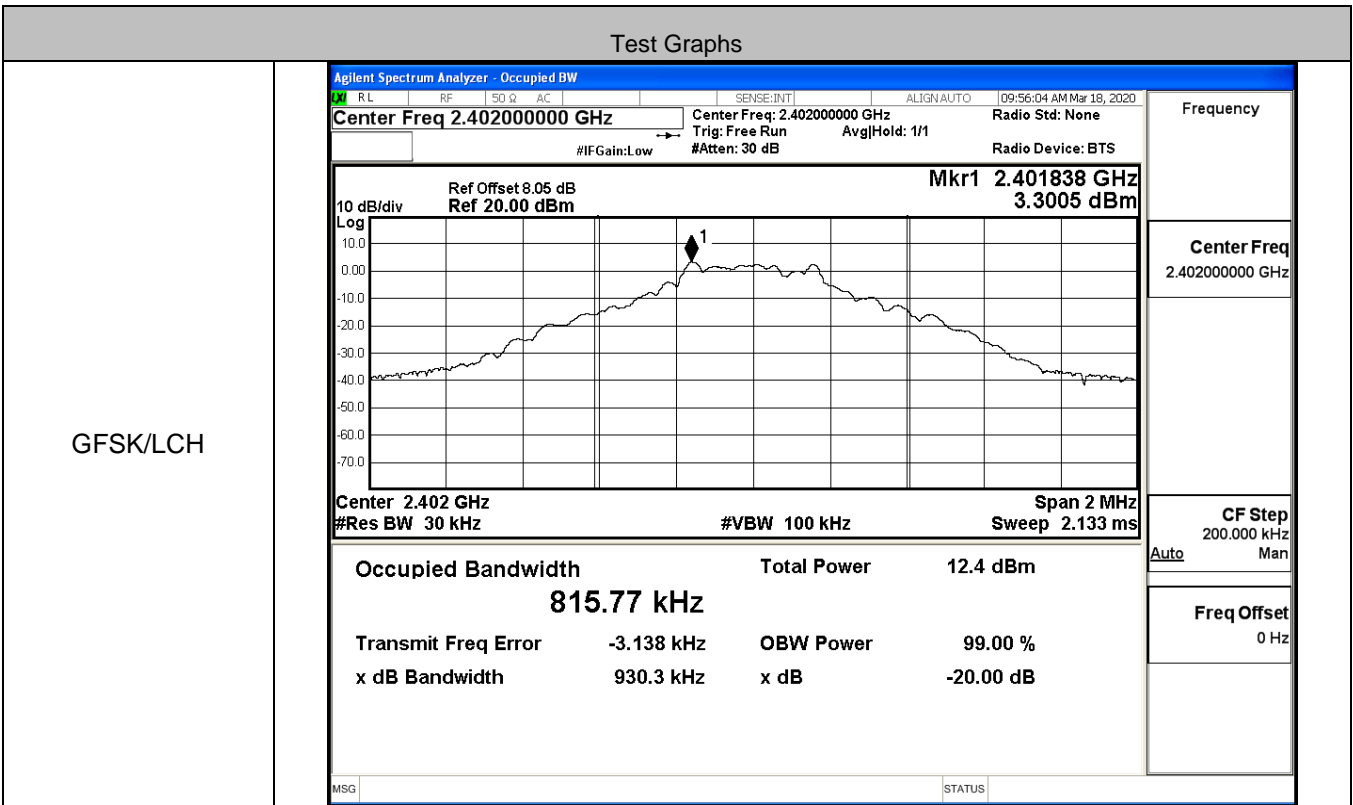


8DPSK/HCH

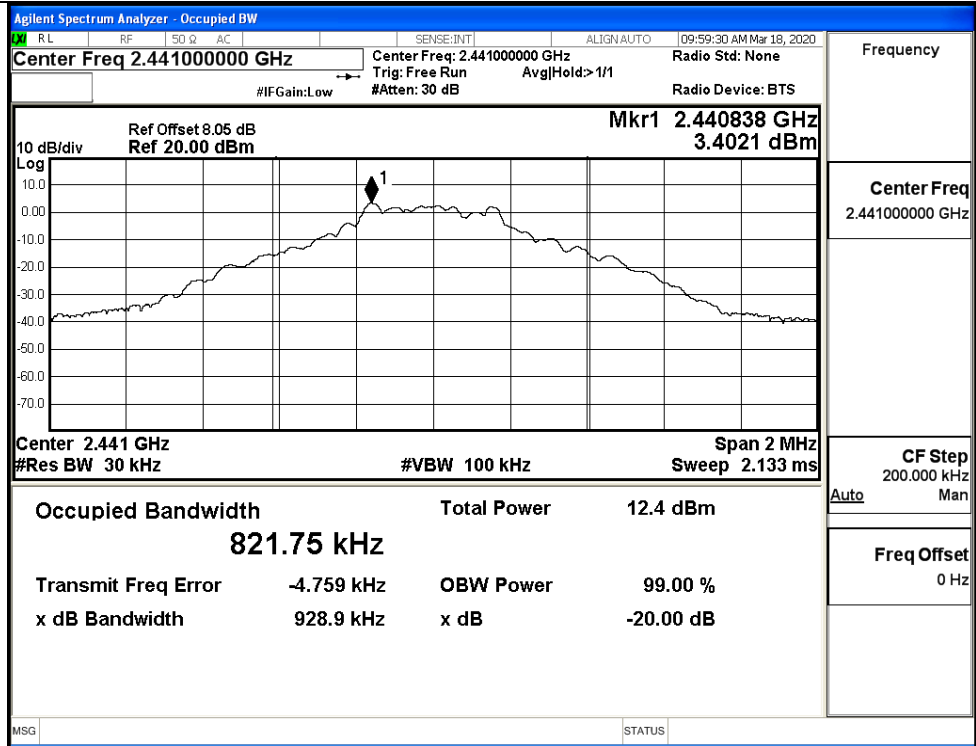


A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9303	Not Specified	PASS
	MCH	0.9289	Not Specified	PASS
	HCH	0.9248	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.288	Not Specified	PASS
	MCH	1.282	Not Specified	PASS
	HCH	1.279	Not Specified	PASS
8DPSK	LCH	1.287	Not Specified	PASS
	MCH	1.291	Not Specified	PASS
	HCH	1.290	Not Specified	PASS

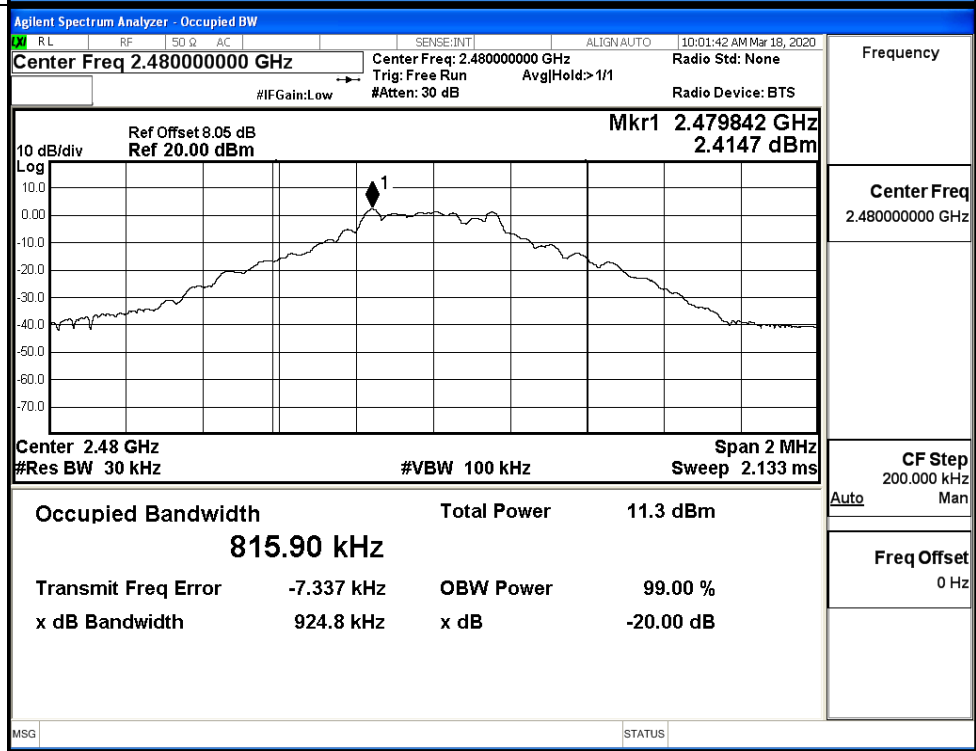


GFSK/MCH

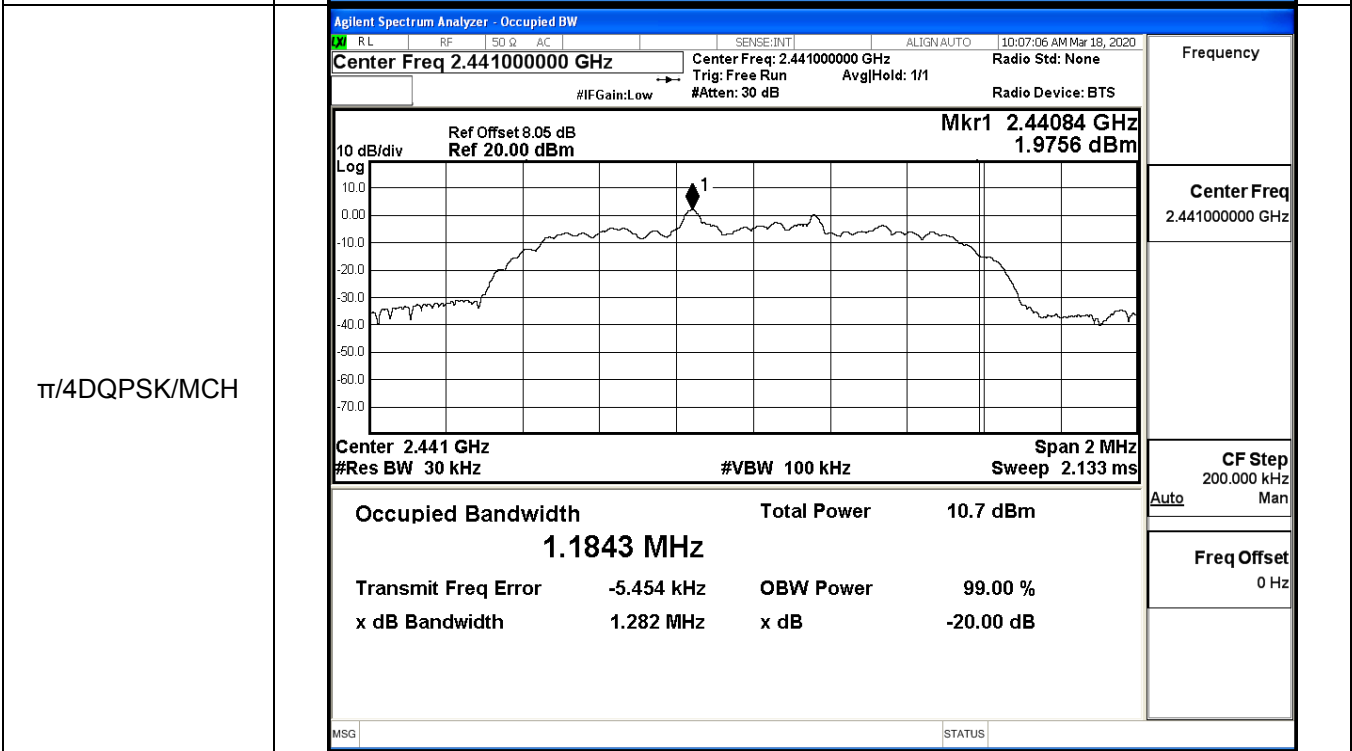
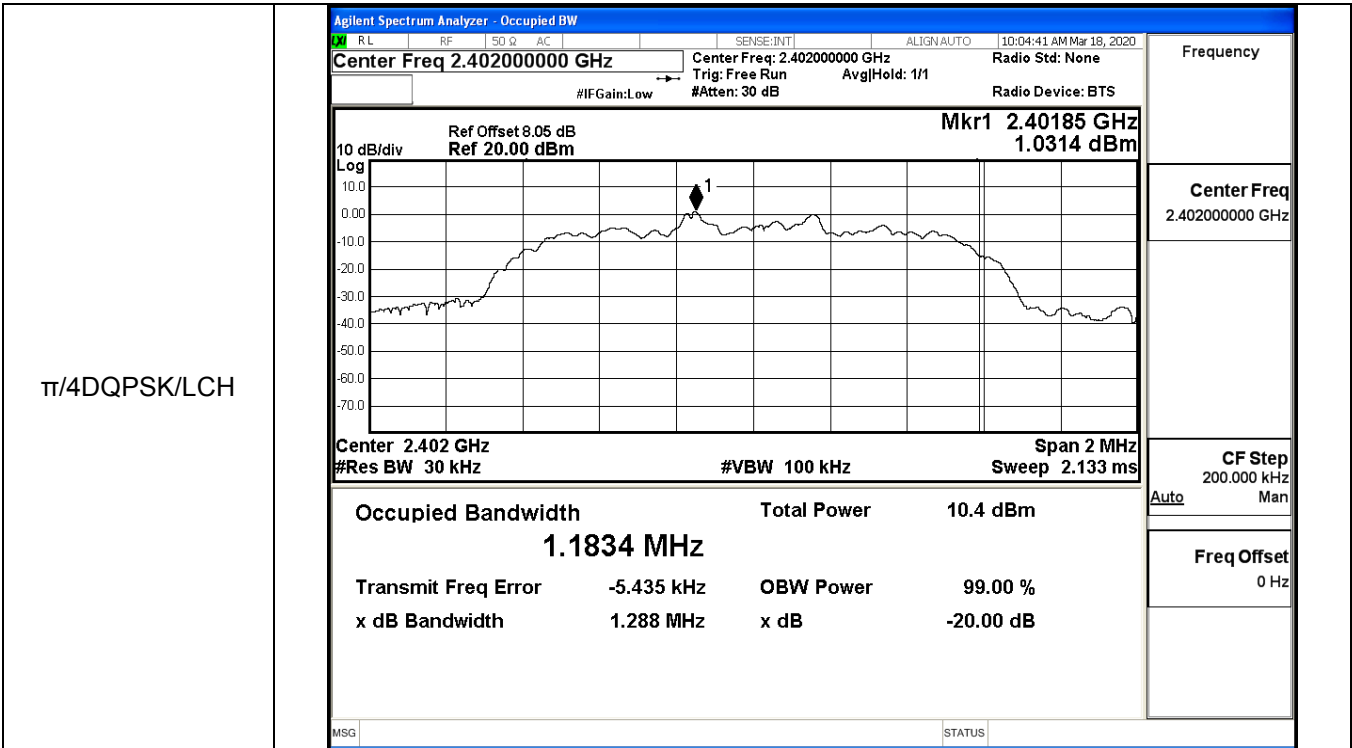


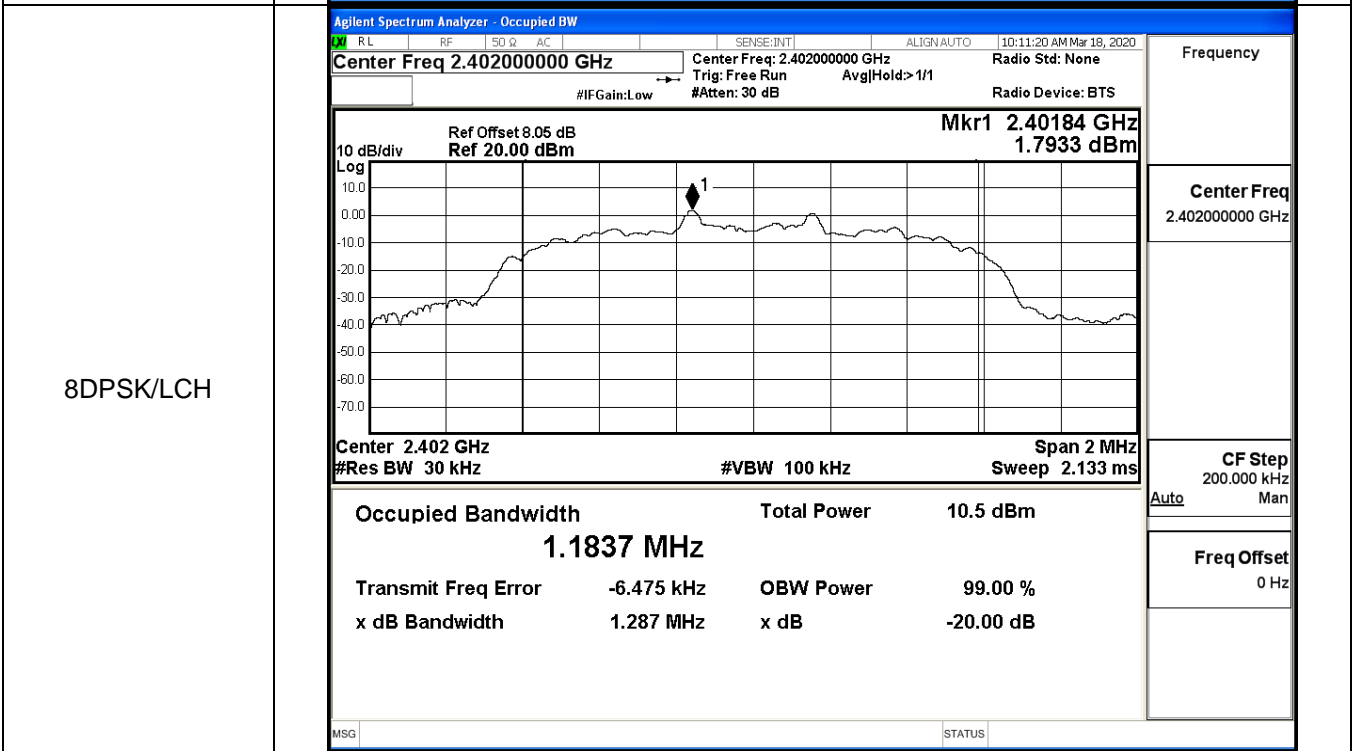
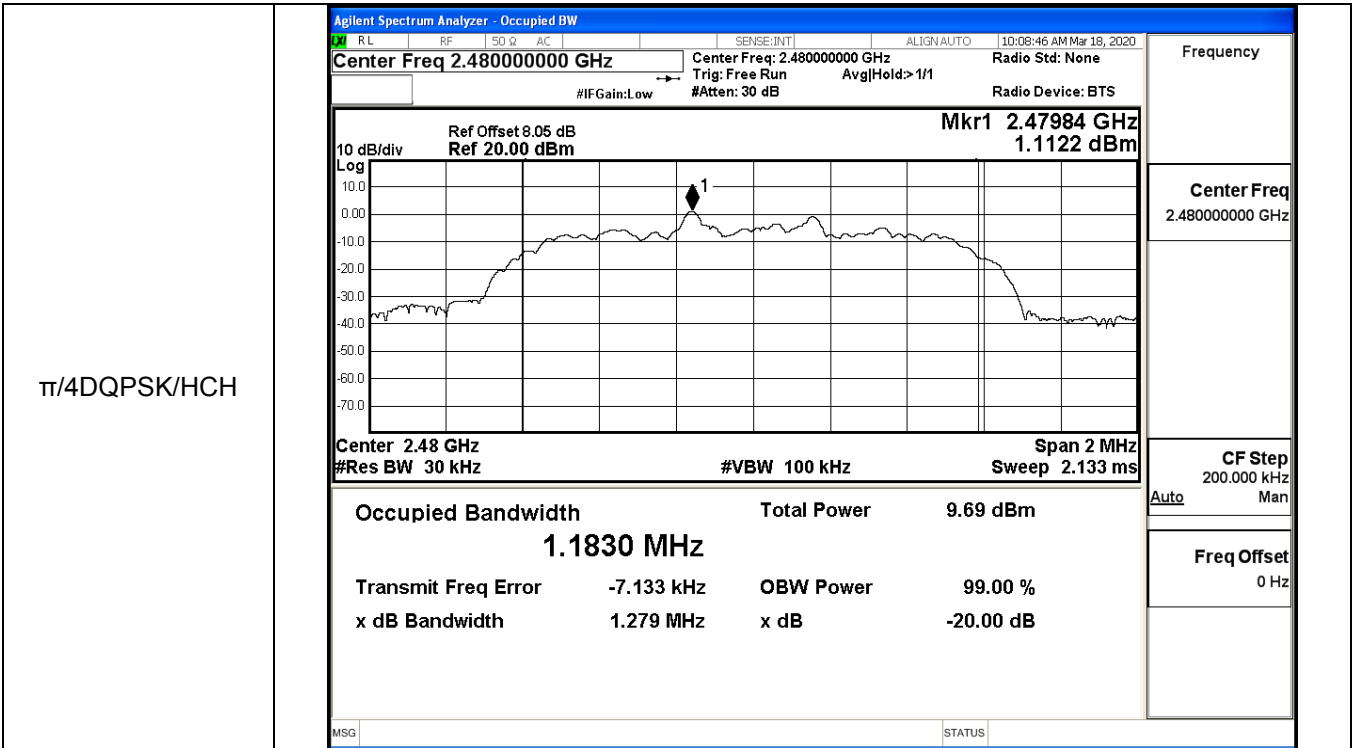
Frequency	2.441000000 GHz
Center Freq	2.441000000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

GFSK/HCH

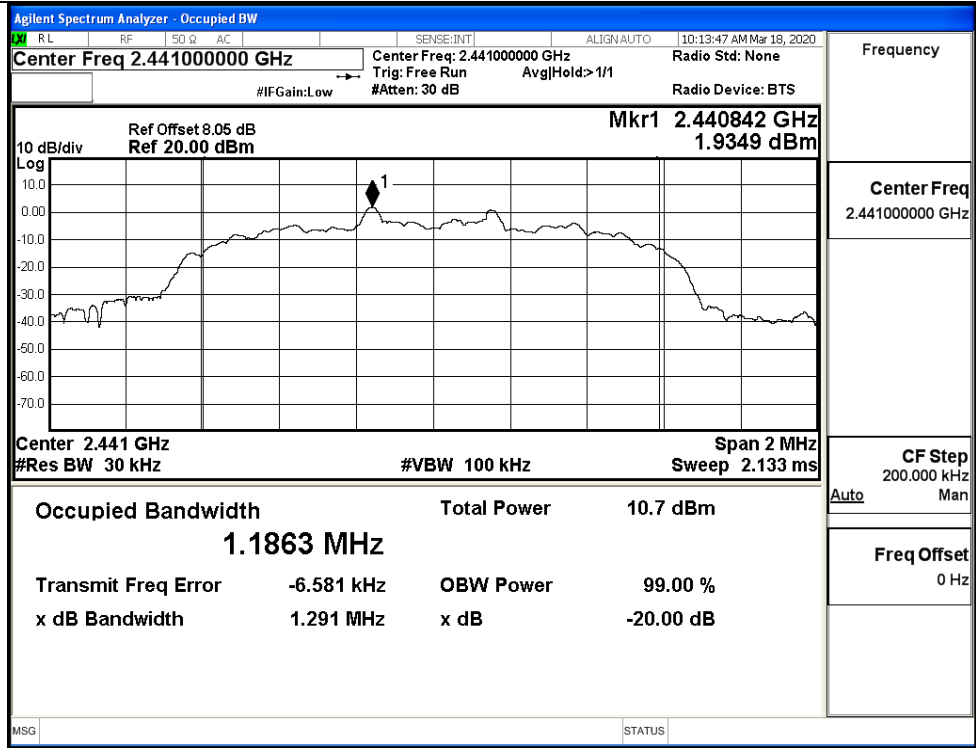


Frequency	2.480000000 GHz
Center Freq	2.480000000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

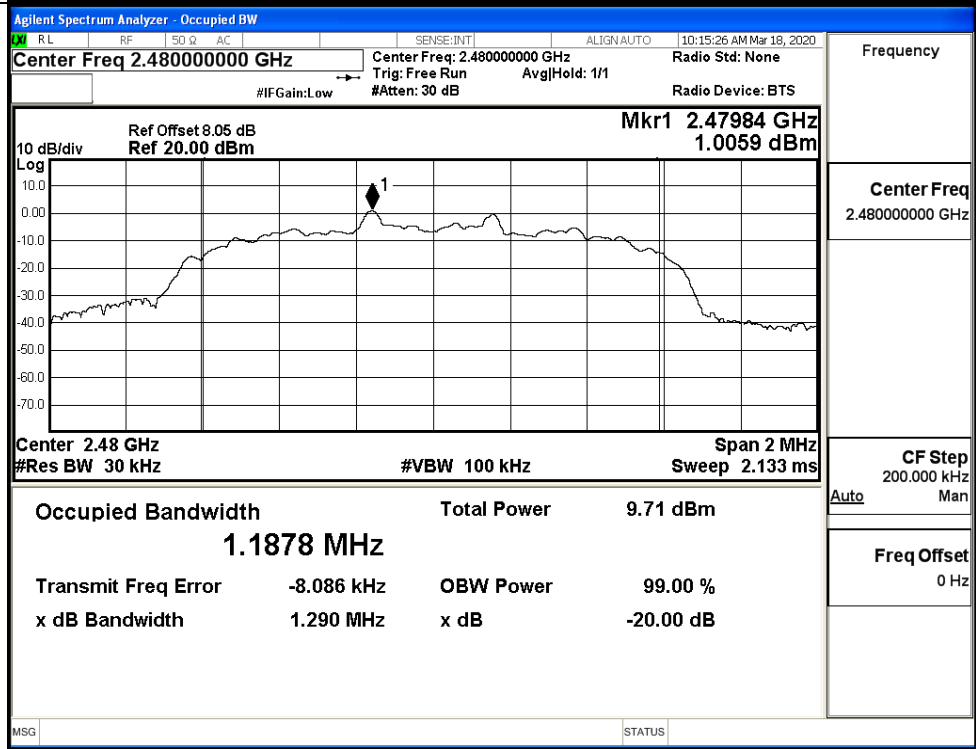




8DPSK/MCH

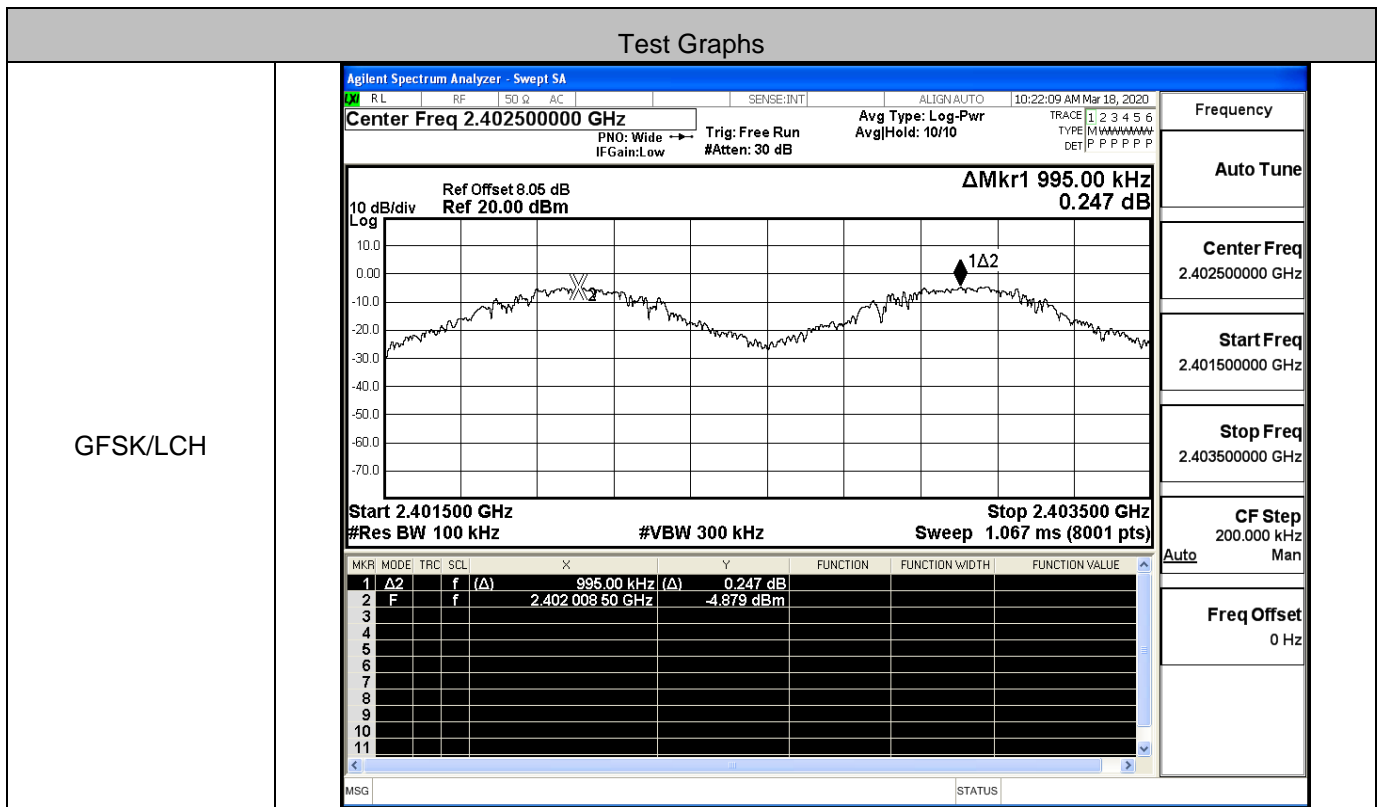


8DPSK/HCH

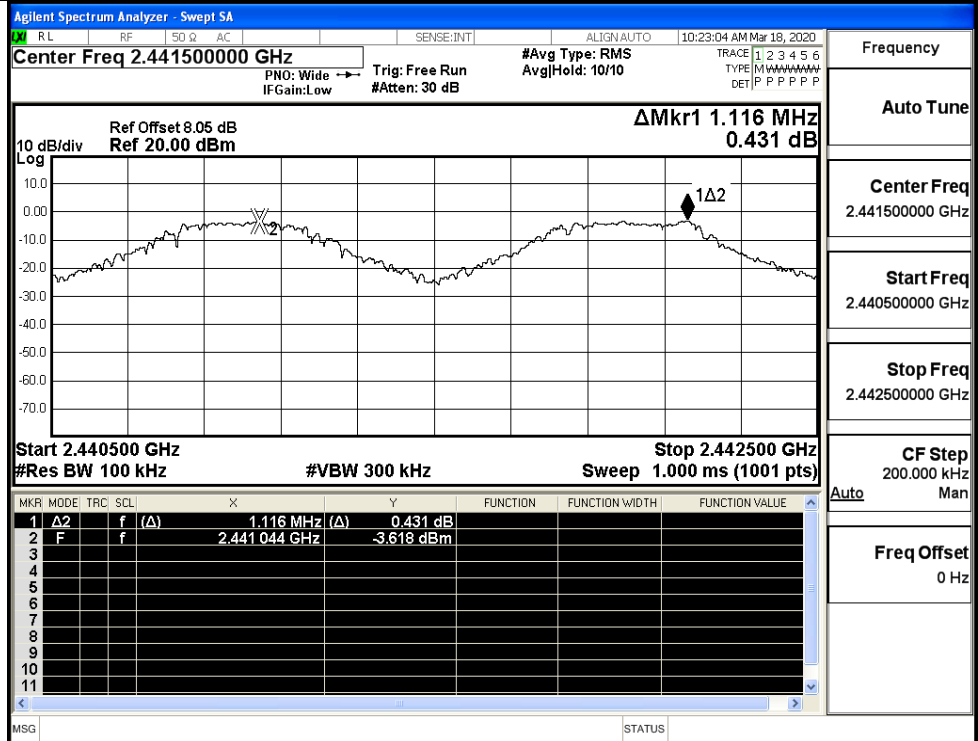


A.3 Carrier Frequency Separation

Mode	Channel	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.995	0.620	PASS
	MCH	1.116	0.620	PASS
	HCH	0.854	0.620	PASS
π/4DQPSK	LCH	1.130	0.859	PASS
	MCH	1.000	0.859	PASS
	HCH	1.168	0.859	PASS
8DPSK	LCH	0.890	0.861	PASS
	MCH	0.942	0.861	PASS
	HCH	1.022	0.861	PASS

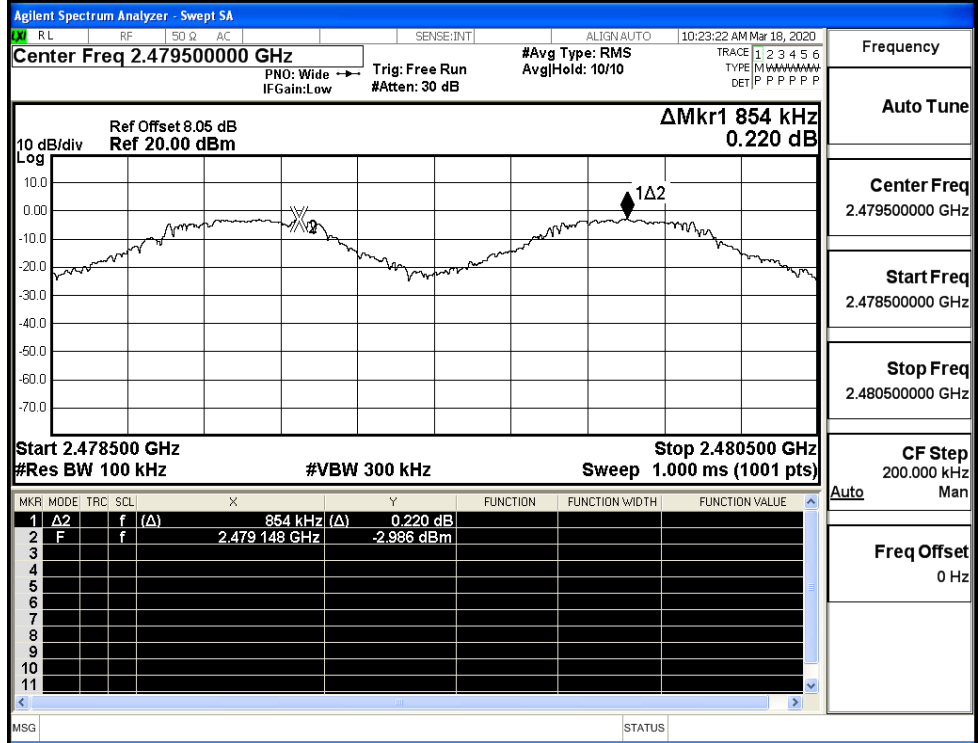


GFSK/MCH



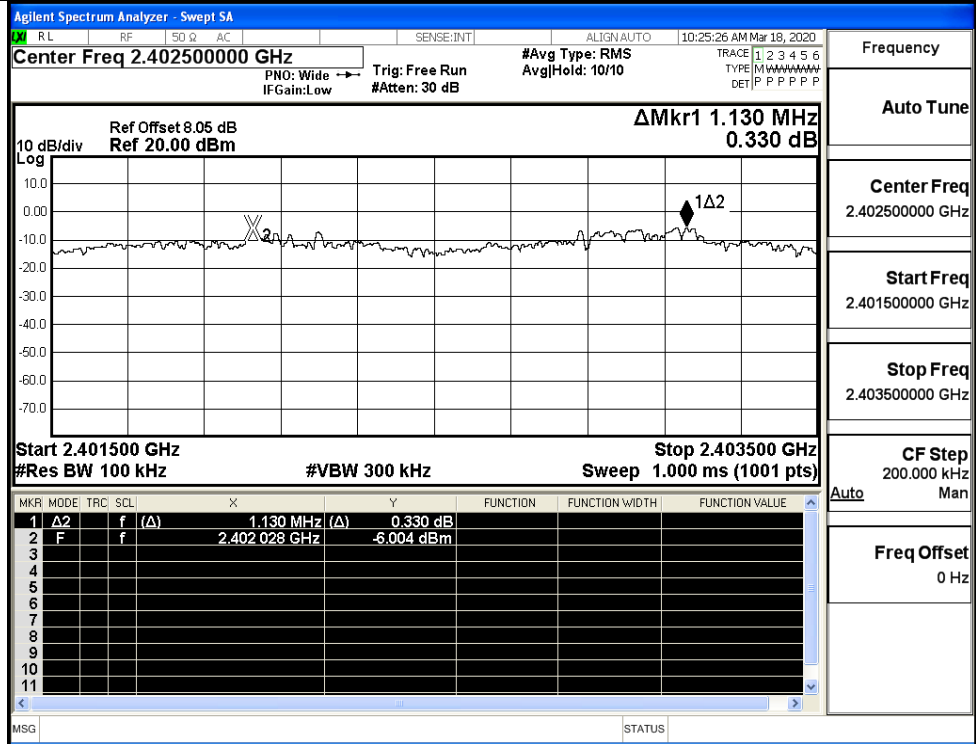
Frequency
Auto Tune
Center Freq
2.441500000 GHz
Start Freq
2.440500000 GHz
Stop Freq
2.442500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

GFSK/HCH



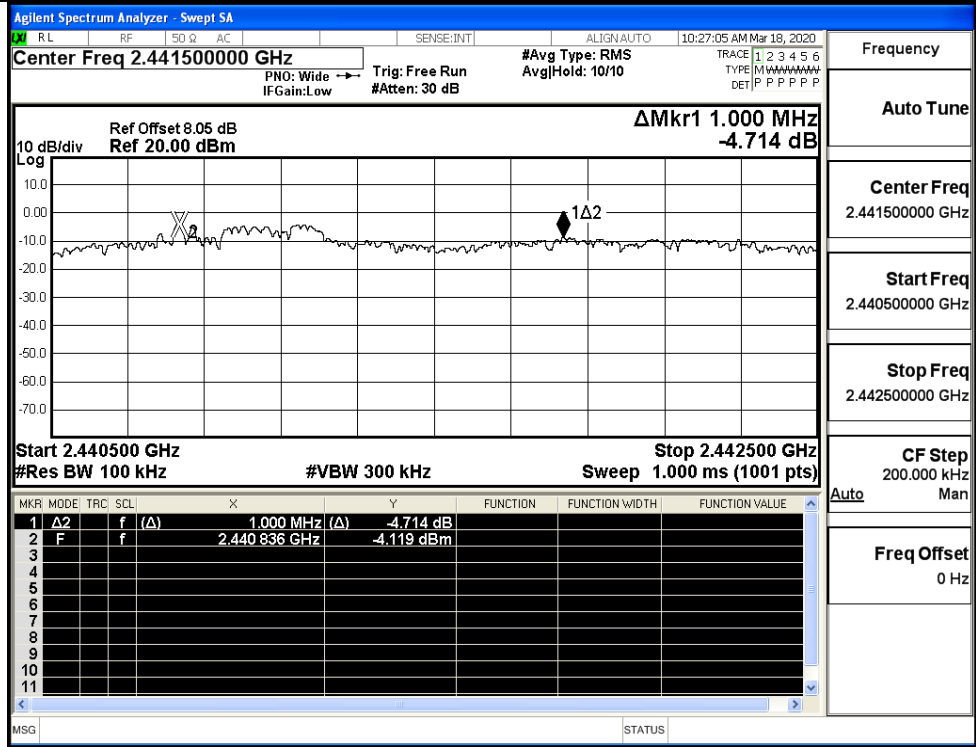
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

$\pi/4$ DQPSK/LCH



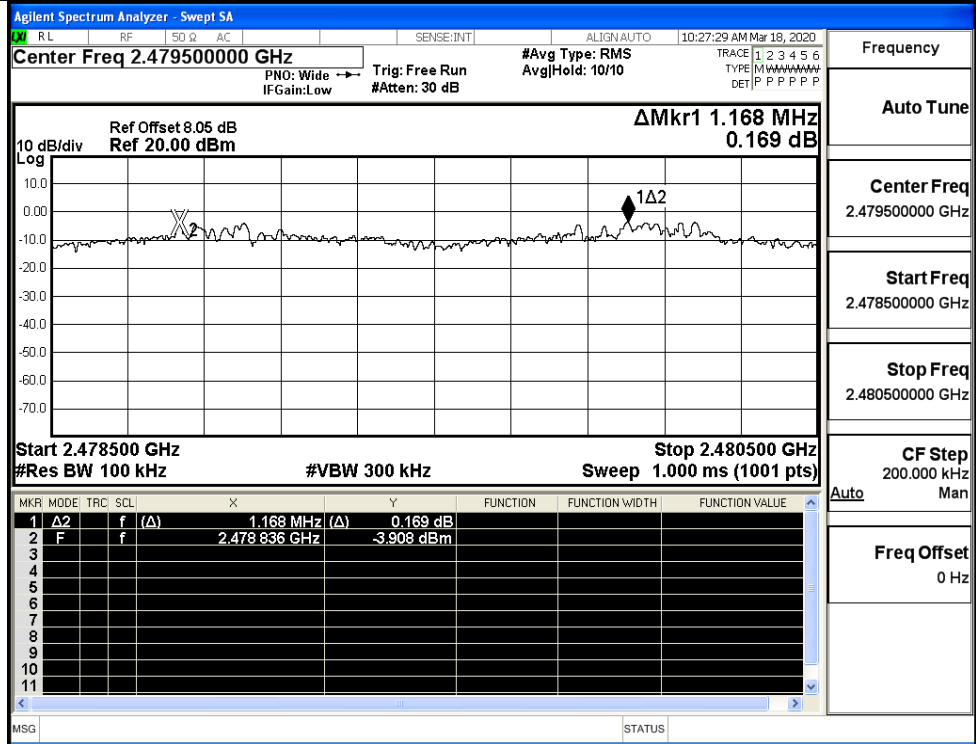
Frequency	2.402500000 GHz
Auto Tune	
Center Freq	2.402500000 GHz
Start Freq	2.401500000 GHz
Stop Freq	2.403500000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK/MCH



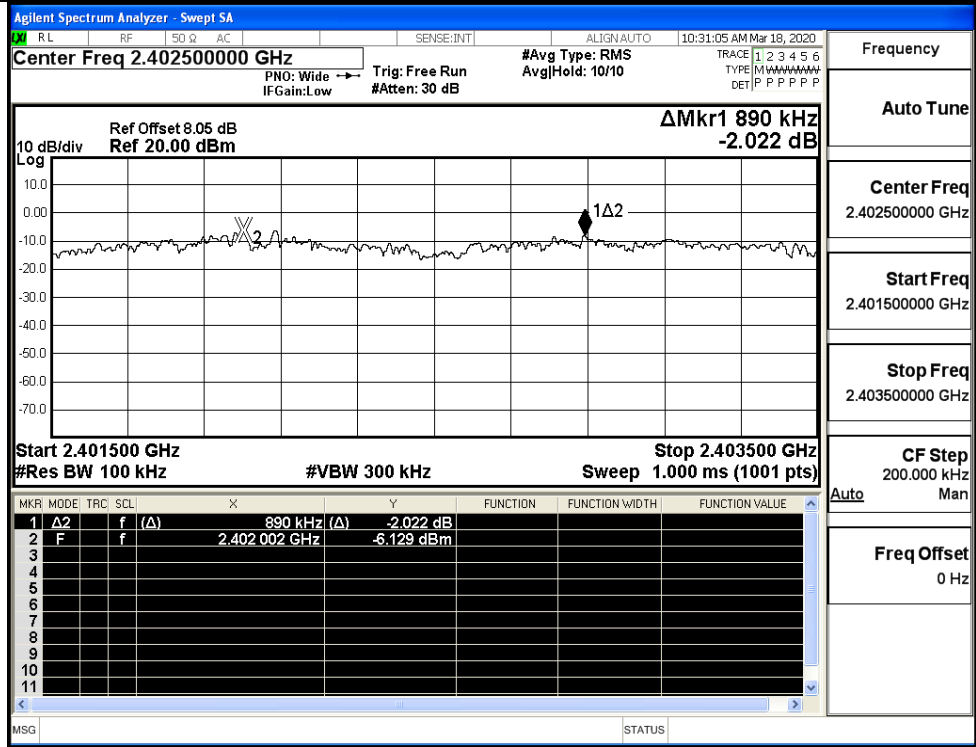
Frequency	2.441500000 GHz
Auto Tune	
Center Freq	2.441500000 GHz
Start Freq	2.440500000 GHz
Stop Freq	2.442500000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

π/4DQPSK/HCH



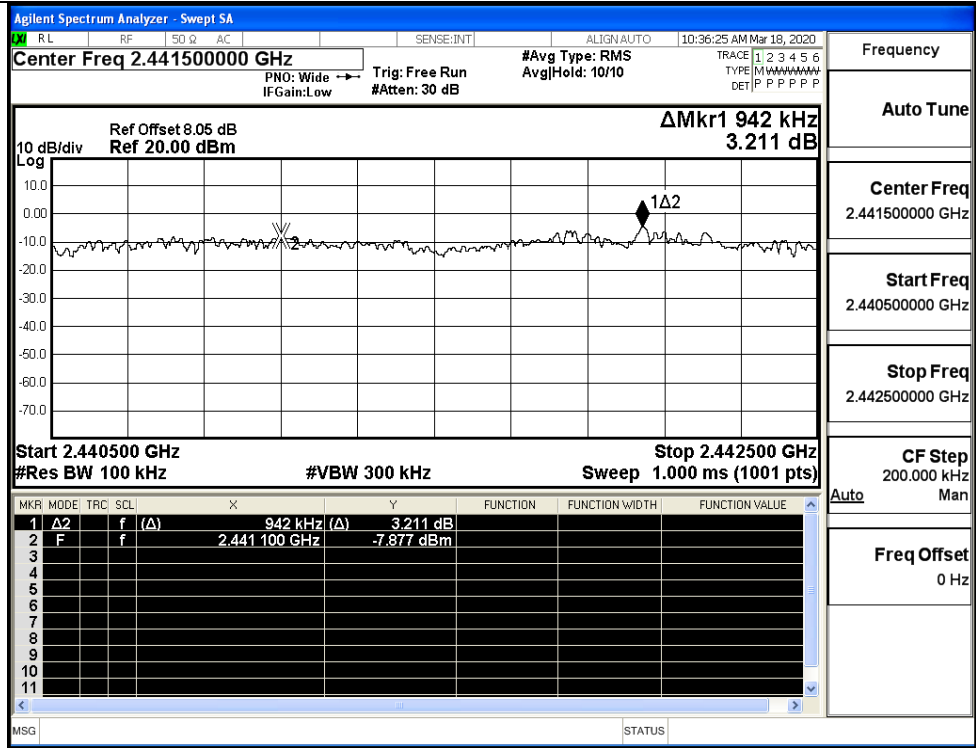
Frequency	2.479500000 GHz
Auto Tune	
Center Freq	2.479500000 GHz
Start Freq	2.478500000 GHz
Stop Freq	2.480500000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

8DPSK/LCH



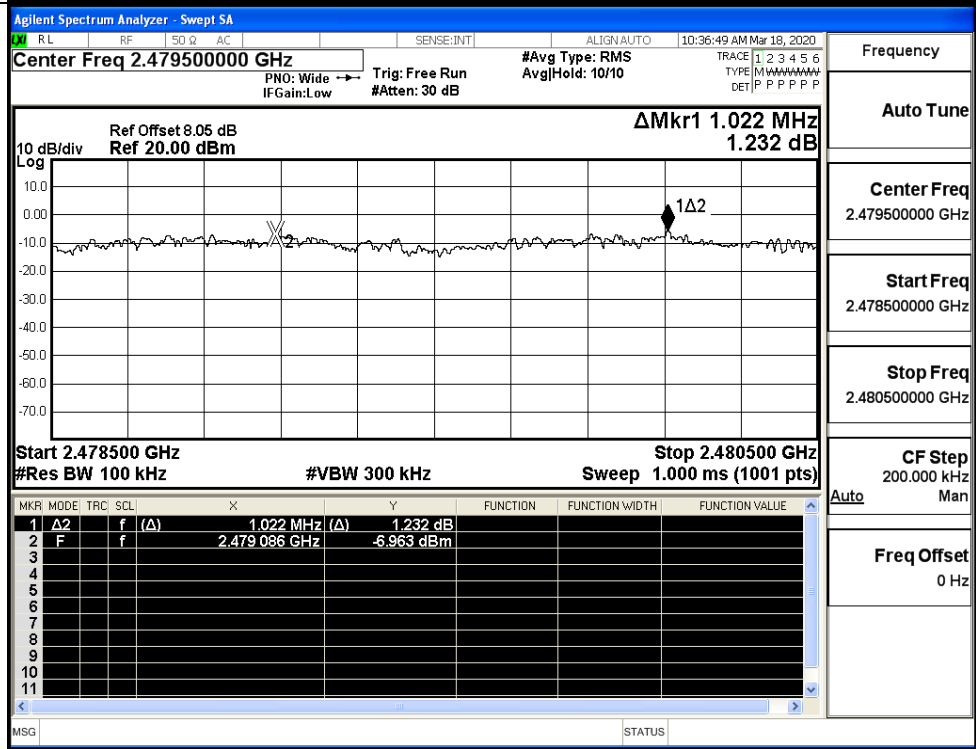
Frequency	2.402500000 GHz
Auto Tune	
Center Freq	2.402500000 GHz
Start Freq	2.401500000 GHz
Stop Freq	2.403500000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

8DPSK/MCH



Frequency
Auto Tune
Center Freq
2.441500000 GHz
Start Freq
2.440500000 GHz
Stop Freq
2.442500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

8DPSK/HCH



Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

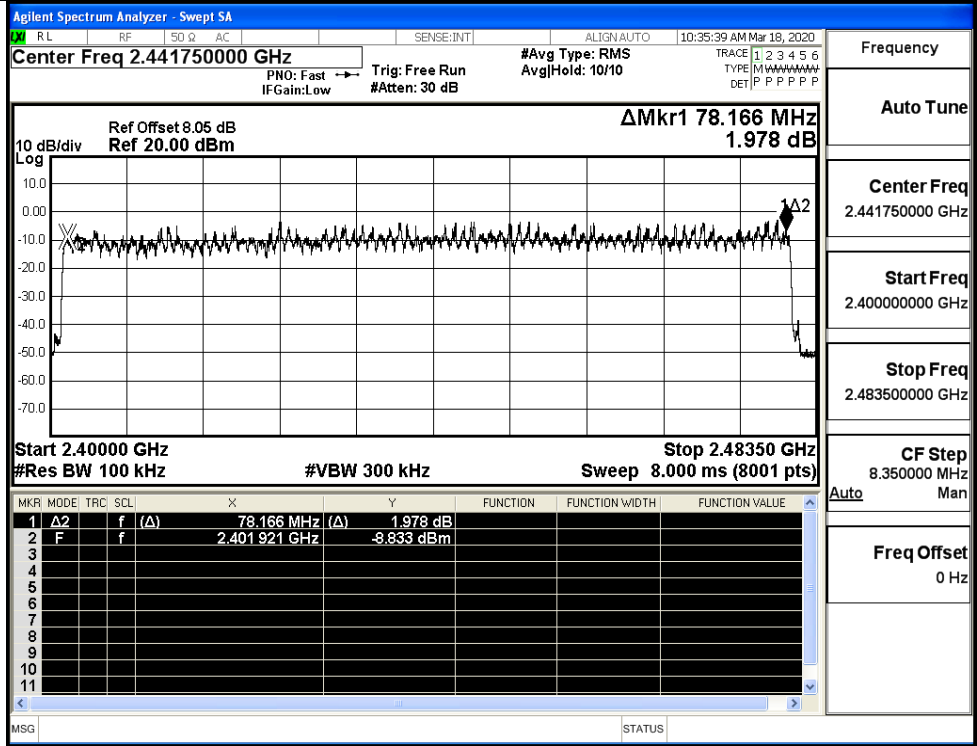
A.4 Hopping Channel Number

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

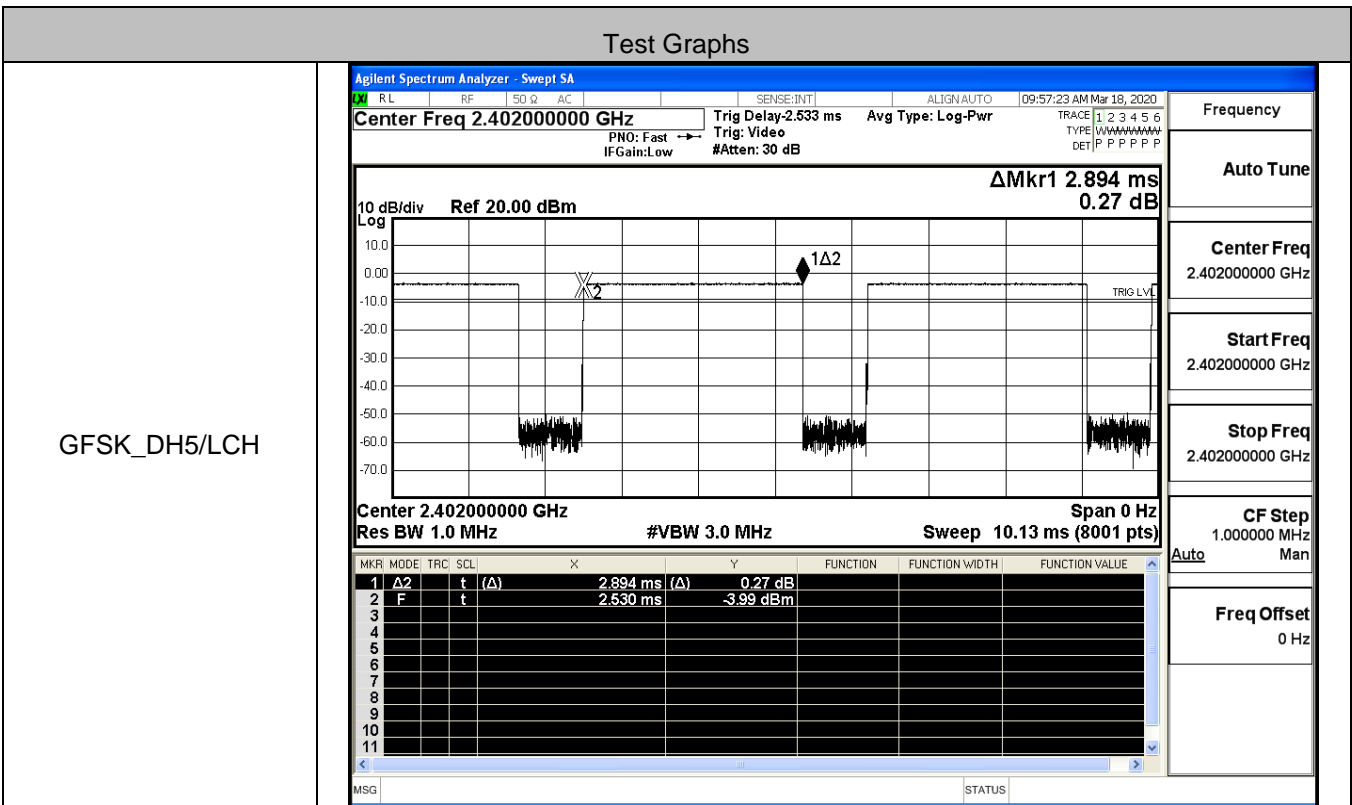
GFSK/Hop	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.441750000 GHz Ref Offset 8.05 dB Ref 20.00 dBm #Res BW 100 kHz #VBW 300 kHz Sweep 8.000 ms (8001 pts) Start 2.40000 GHz Stop 2.48350 GHz #Avg Type: RMS AvgHold: 10/10 PNO: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB 10 dB/div Log ΔMkr1 77.989 MHz 1.680 dB 2.401 983 GHz -4.426 dBm</p> <table border="1"> <thead> <tr> <th>MKR</th> <th>MODE</th> <th>TRC</th> <th>SCL</th> <th>X</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>f</td> <td>(Δ)</td> <td>77.989 MHz</td> <td>(Δ)</td> <td>1.680 dB</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.401 983 GHz</td> <td></td> <td>-4.426 dBm</td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	77.989 MHz	(Δ)	1.680 dB			2	F	f		2.401 983 GHz		-4.426 dBm			Frequency Auto Tune Center Freq 2.441750000 GHz Start Freq 2.400000000 GHz Stop Freq 2.483500000 GHz CF Step 8.350000 MHz Man Freq Offset 0 Hz
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	Δ 2	f	(Δ)	77.989 MHz	(Δ)	1.680 dB																							
2	F	f		2.401 983 GHz		-4.426 dBm																							
$\pi/4$ DQPSK/Hop	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.441750000 GHz Ref Offset 8.05 dB Ref 20.00 dBm #Res BW 100 kHz #VBW 300 kHz Sweep 8.000 ms (8001 pts) Start 2.40000 GHz Stop 2.48350 GHz #Avg Type: RMS AvgHold: 10/10 PNO: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB 10 dB/div Log ΔMkr1 78.062 MHz 1.713 dB 2.402 046 GHz -9.000 dBm</p> <table border="1"> <thead> <tr> <th>MKR</th> <th>MODE</th> <th>TRC</th> <th>SCL</th> <th>X</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>f</td> <td>(Δ)</td> <td>78.062 MHz</td> <td>(Δ)</td> <td>1.713 dB</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.402 046 GHz</td> <td></td> <td>-9.000 dBm</td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	78.062 MHz	(Δ)	1.713 dB			2	F	f		2.402 046 GHz		-9.000 dBm			Frequency Auto Tune Center Freq 2.441750000 GHz Start Freq 2.400000000 GHz Stop Freq 2.483500000 GHz CF Step 8.350000 MHz Man Freq Offset 0 Hz
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	Δ 2	f	(Δ)	78.062 MHz	(Δ)	1.713 dB																							
2	F	f		2.402 046 GHz		-9.000 dBm																							

8DPSK/Hop

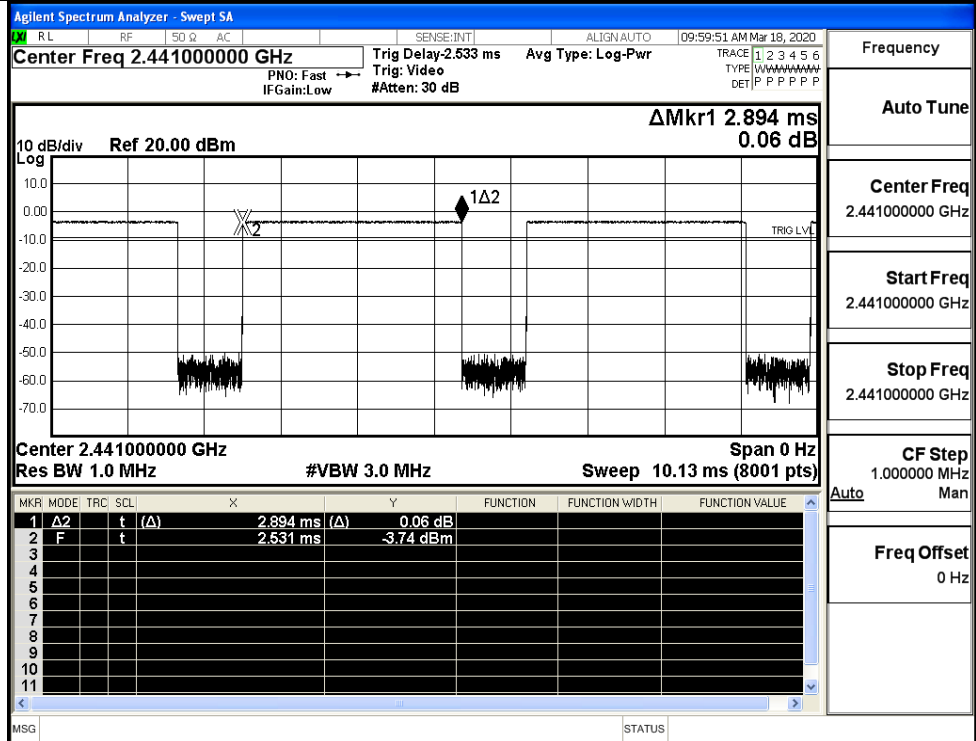


A.5 Dwell Time

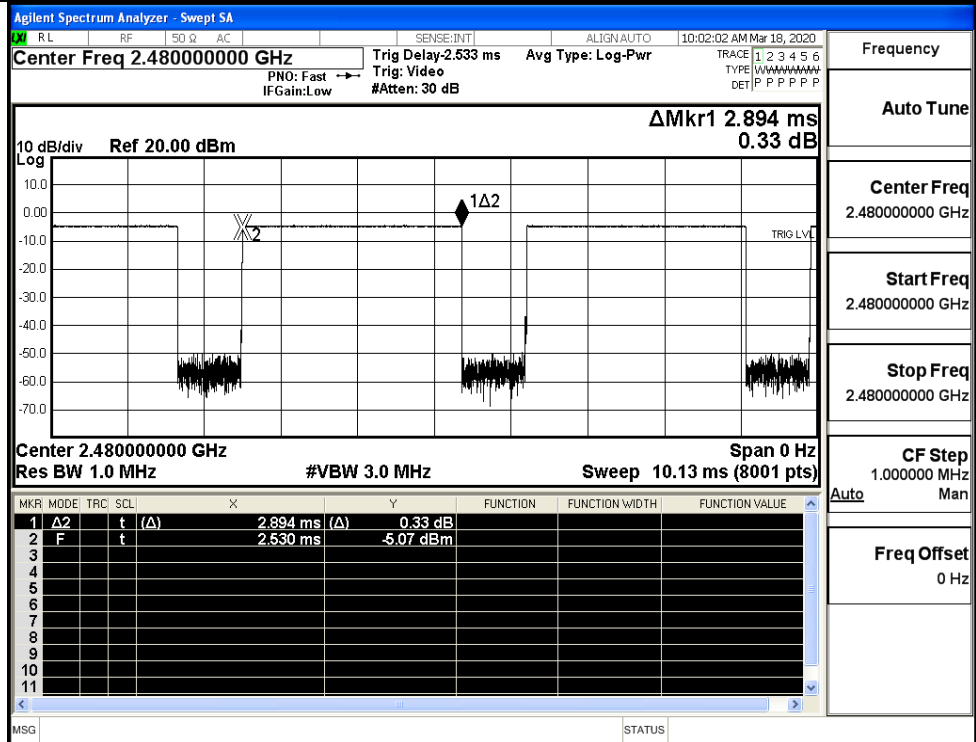
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.89	106.7	0.308	0.4	PASS
	DH5	MCH	2.89	106.7	0.308	0.4	PASS
	DH5	HCH	2.89	106.7	0.308	0.4	PASS
π/4DQPSK	2DH5	LCH	2.89	106.7	0.307	0.4	PASS
	2DH5	MCH	2.89	106.7	0.307	0.4	PASS
	2DH5	HCH	2.89	106.7	0.307	0.4	PASS
8DPSK	3DH5	LCH	2.89	106.7	0.307	0.4	PASS
	3DH5	MCH	2.89	106.7	0.307	0.4	PASS
	3DH5	HCH	2.89	106.7	0.307	0.4	PASS



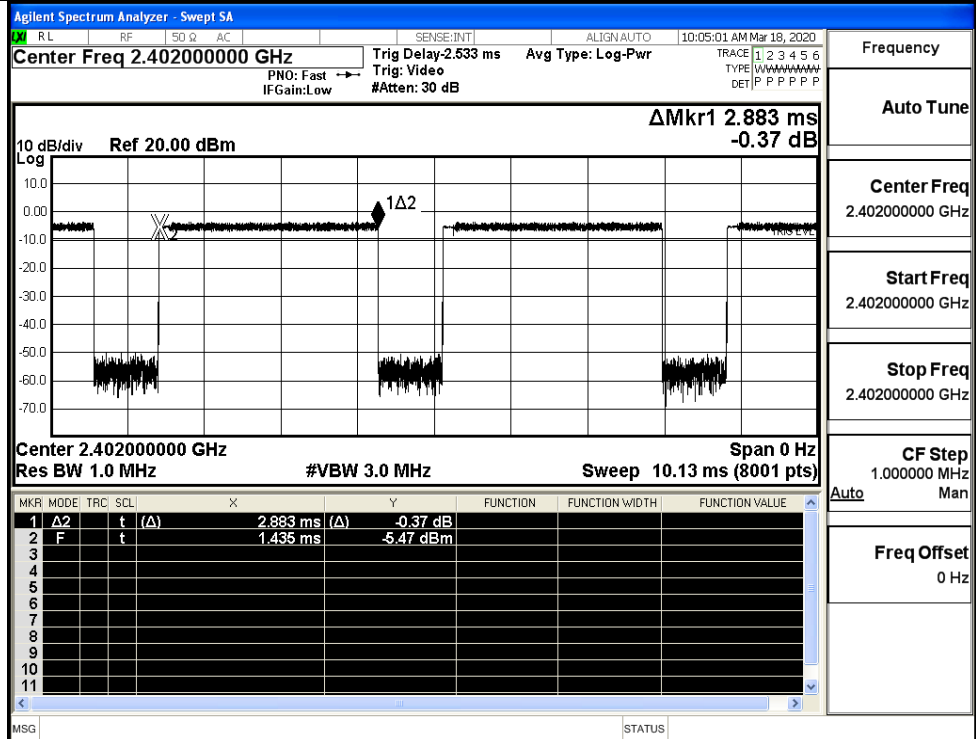
GFSK_DH5/MCH



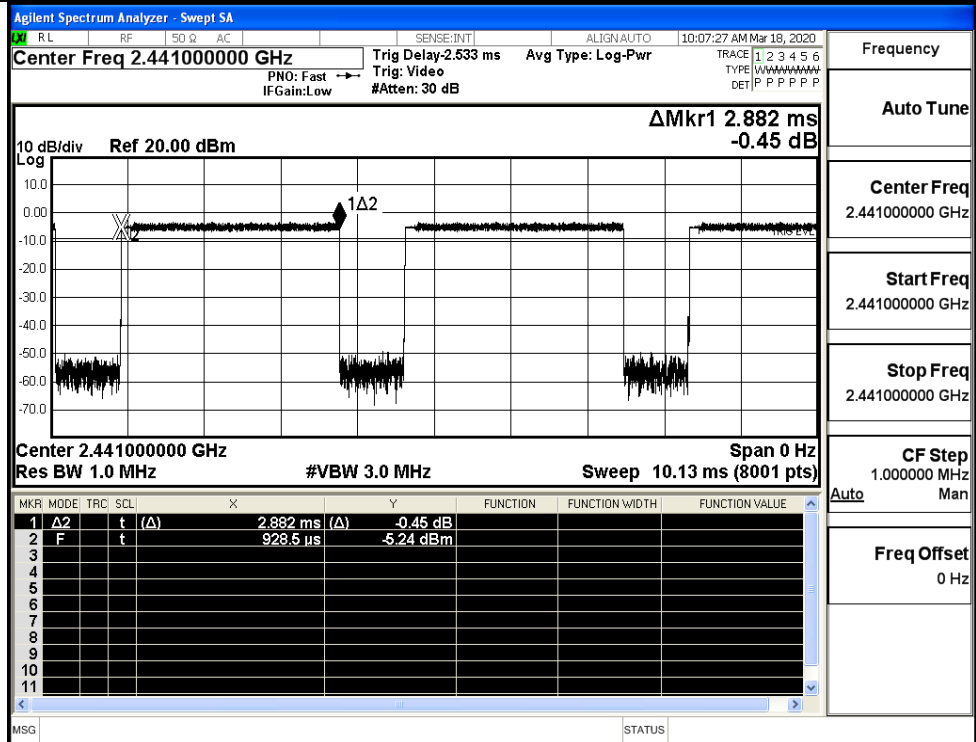
GFSK_DH5/HCH



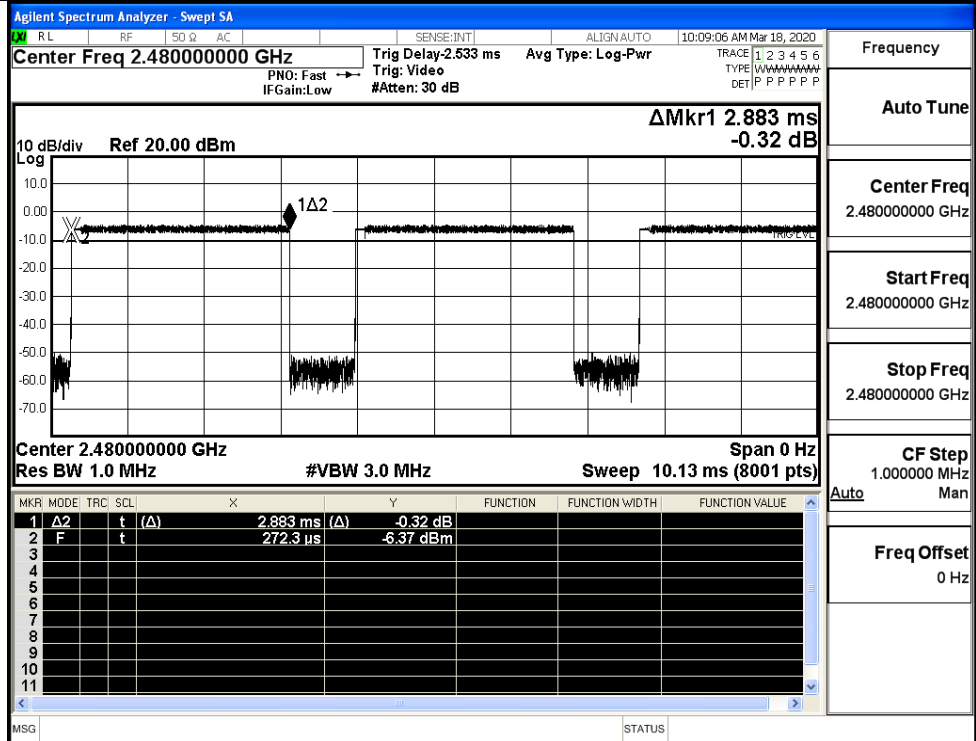
$\pi/4$ DQPSK
_2DH5/LCH



$\pi/4$ DQPSK
_2DH5/MCH

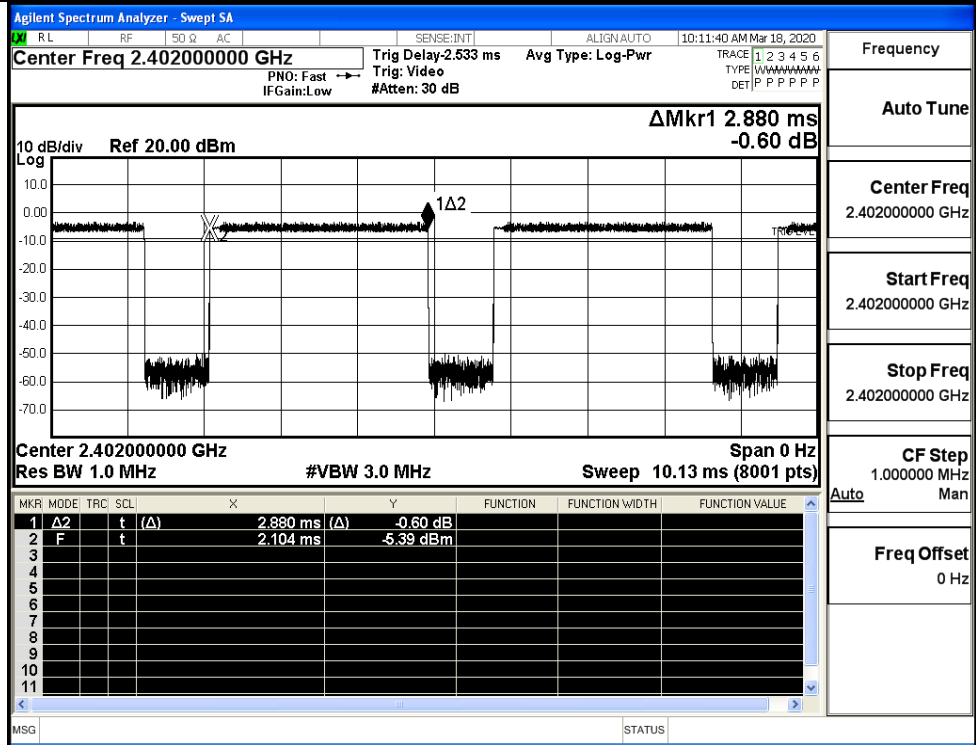


$\pi/4$ DQPSK
_2DH5/HCH



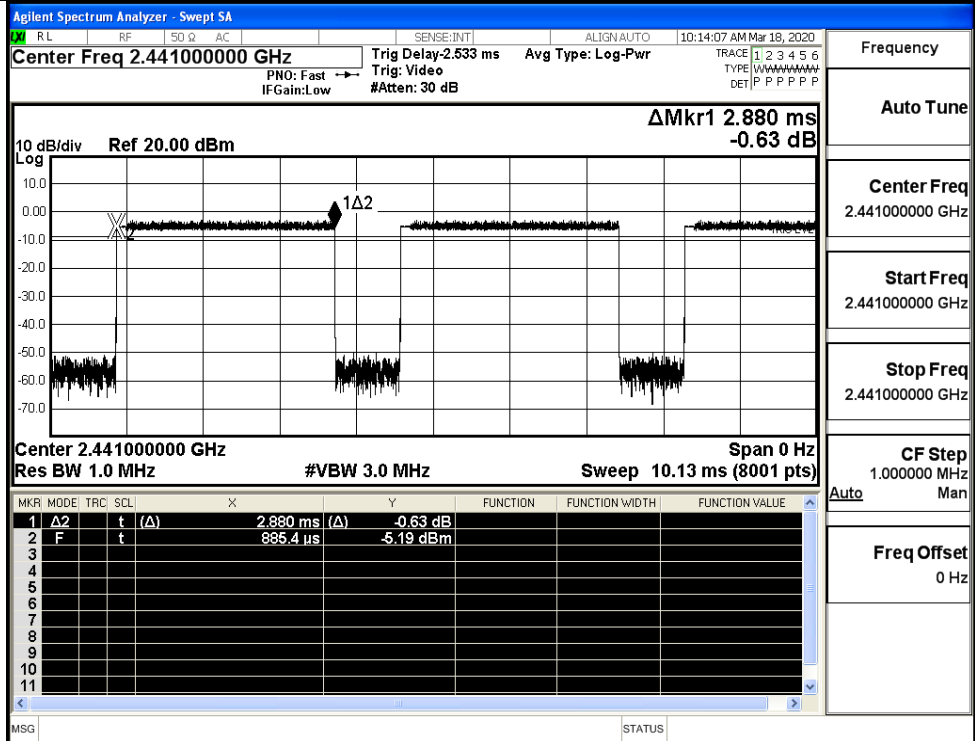
Frequency	2.480000000 GHz
Auto Tune	
Center Freq	2.480000000 GHz
Start Freq	2.480000000 GHz
Stop Freq	2.480000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

8DPSK_3DH5/LCH

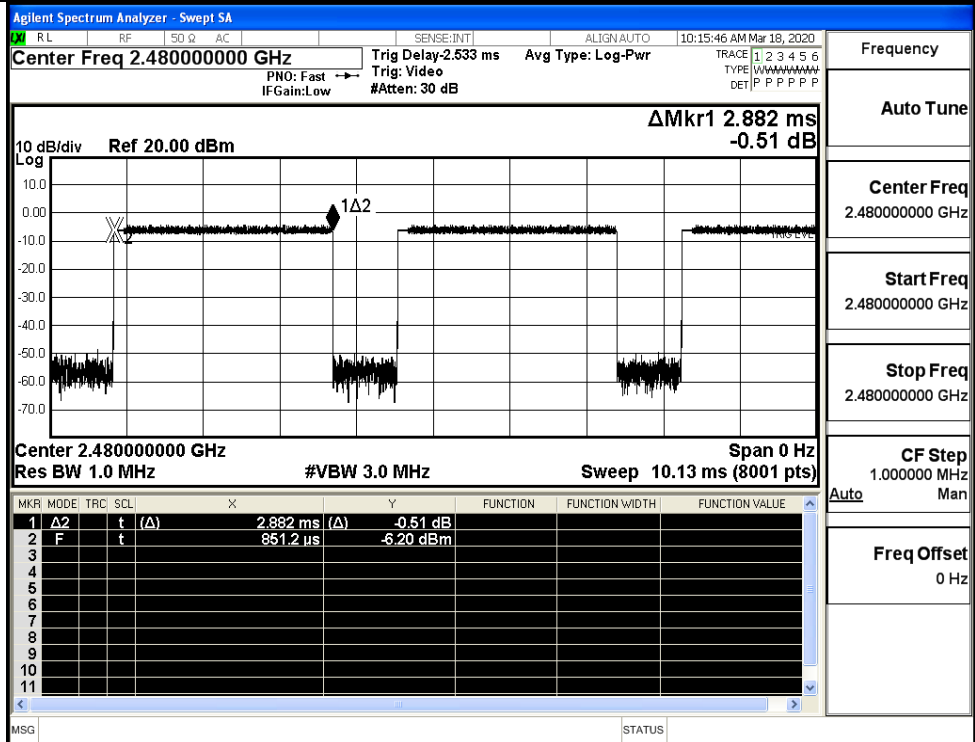


Frequency	2.402000000 GHz
Auto Tune	
Center Freq	2.402000000 GHz
Start Freq	2.402000000 GHz
Stop Freq	2.402000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

8DPSK_3DH5/MCH

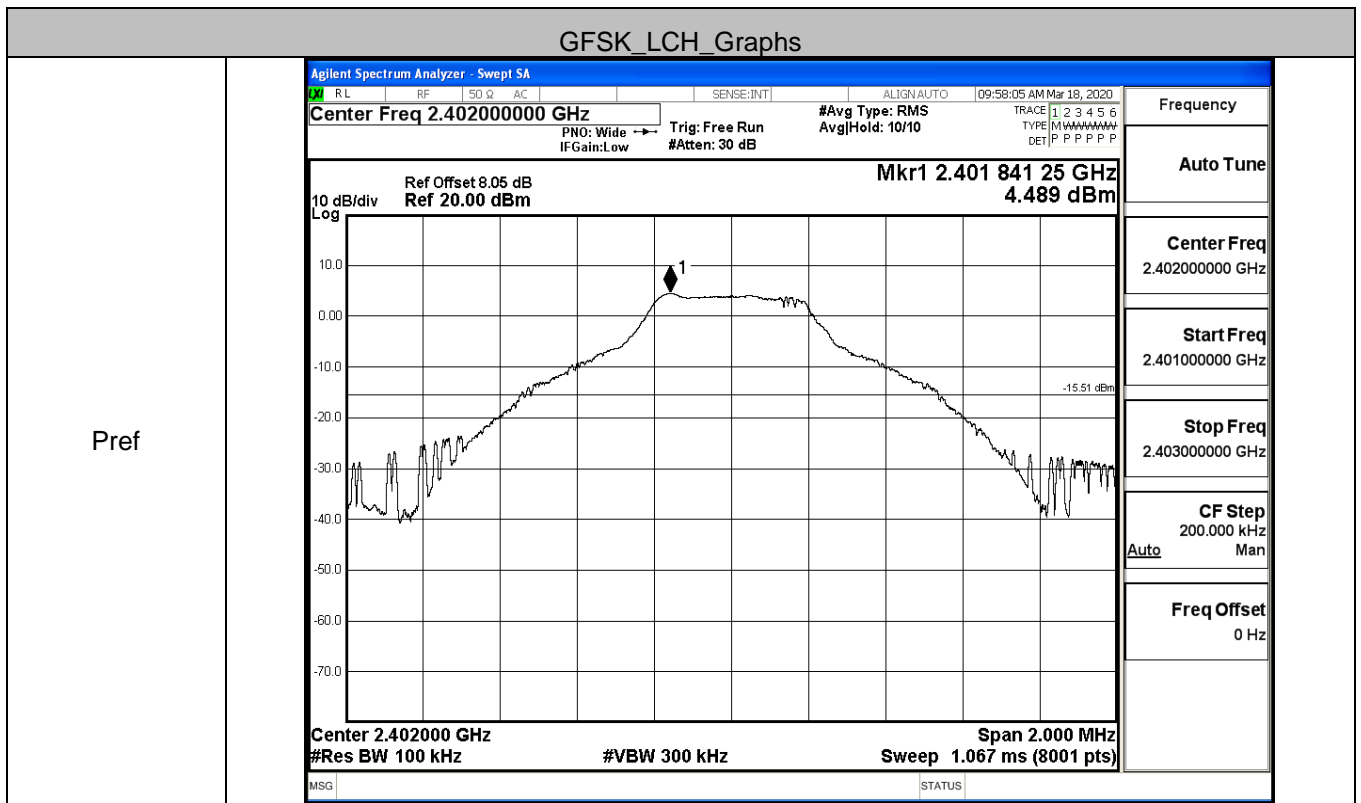


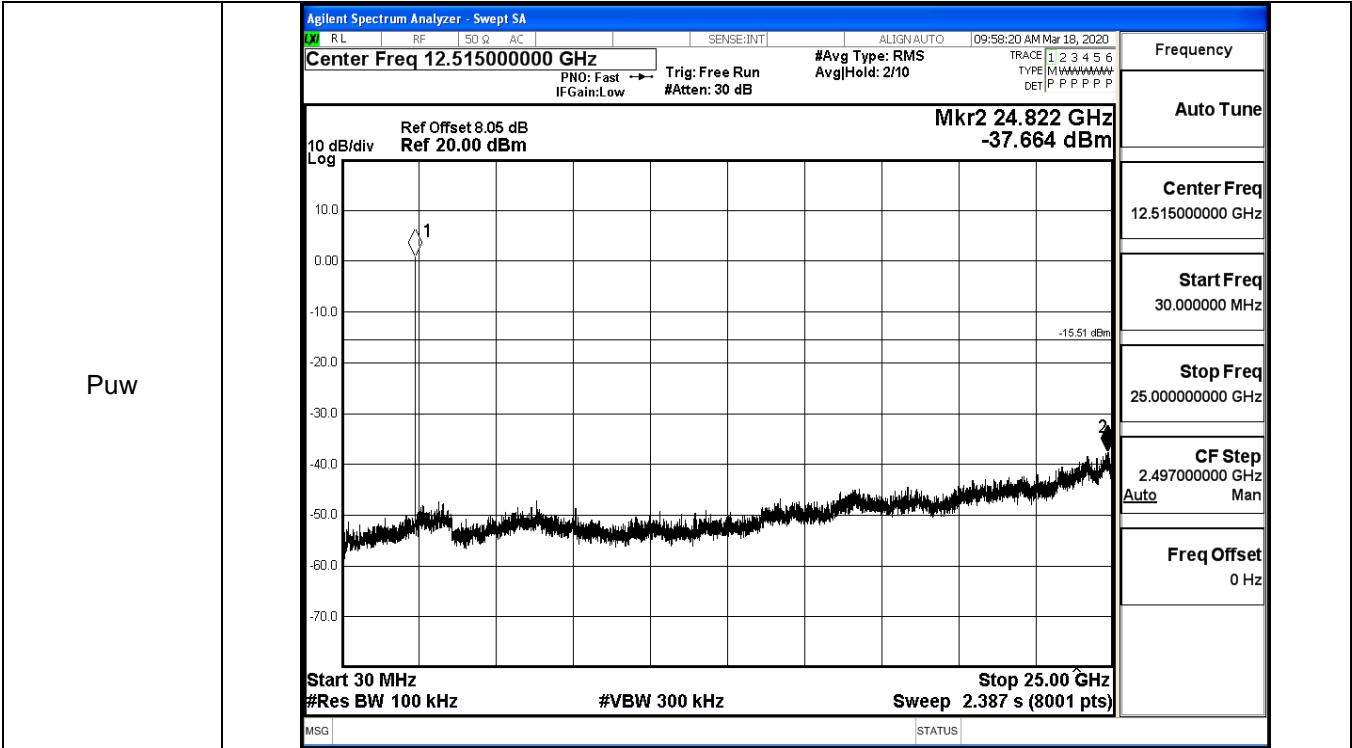
8DPSK_3DH5/HCH



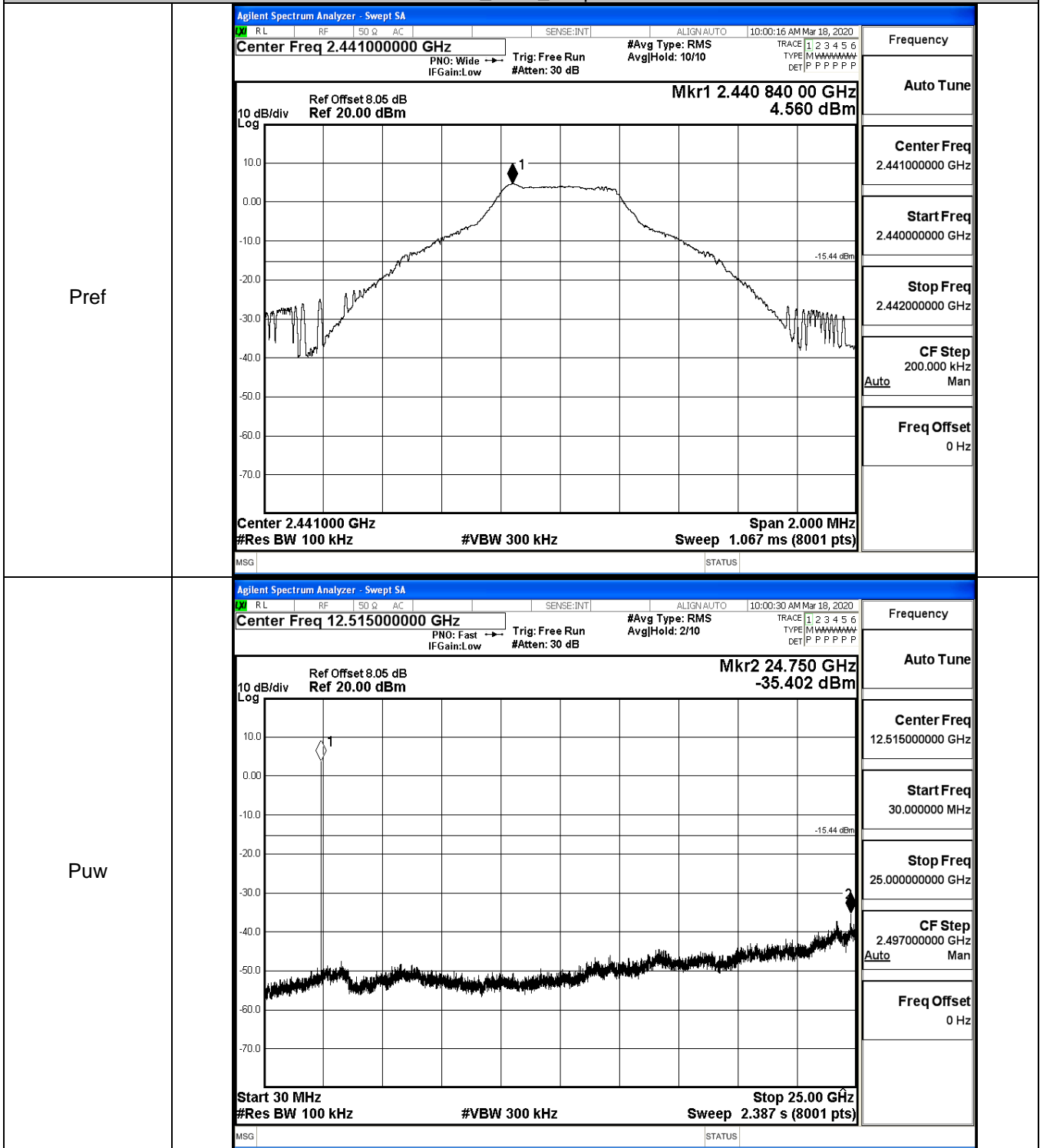
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	4.489	-37.664	-15.511	PASS
	MCH	4.56	-35.402	-15.440	PASS
	HCH	3.472	-38.051	-16.528	PASS
π /4DQPSK	LCH	2.899	-37.656	-17.101	PASS
	MCH	2.885	-37.680	-17.115	PASS
	HCH	2.126	-37.646	-17.874	PASS
8DPSK	LCH	2.83	-37.343	-17.170	PASS
	MCH	2.942	-37.510	-17.058	PASS
	HCH	2.035	-37.661	-17.965	PASS

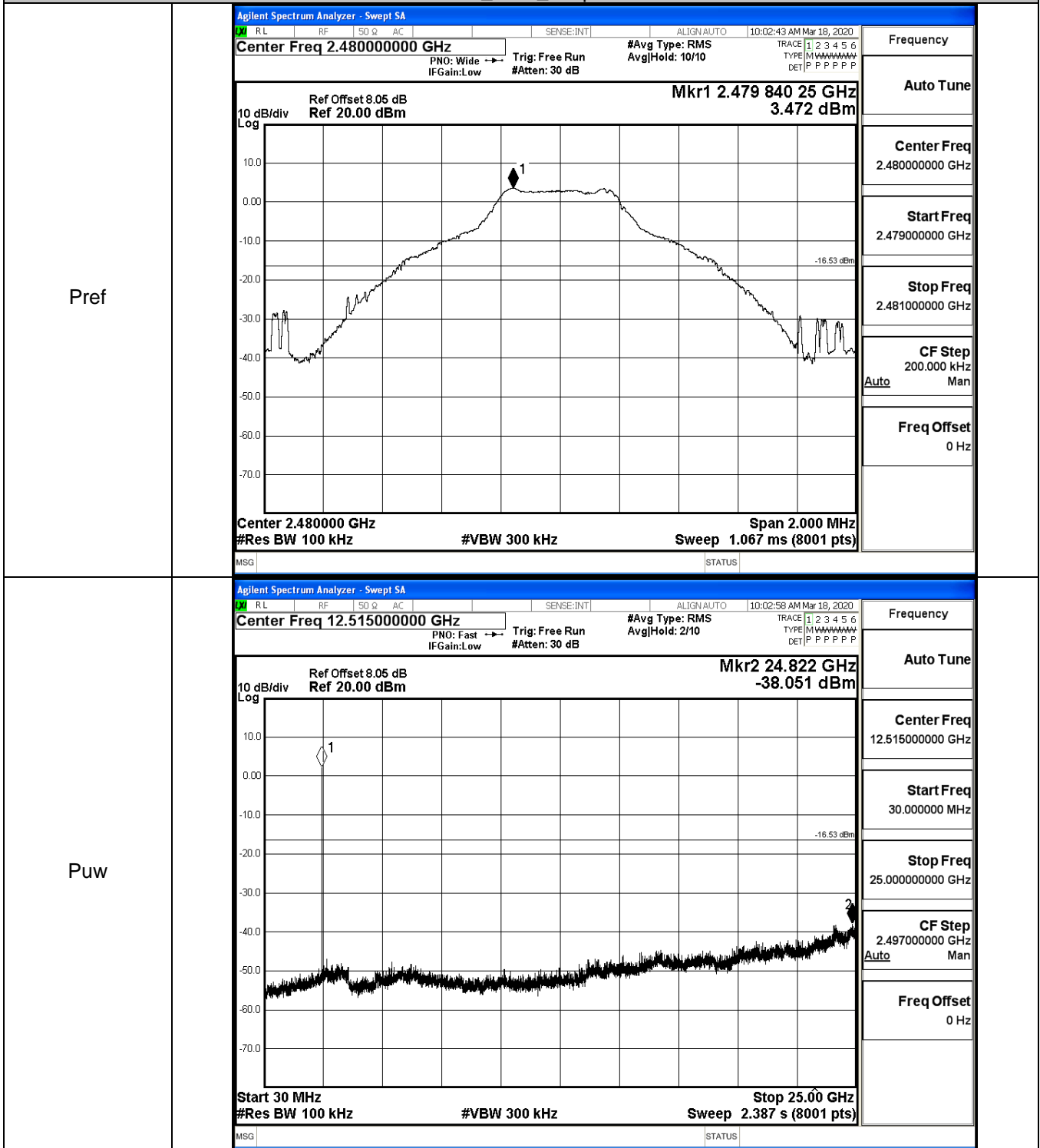




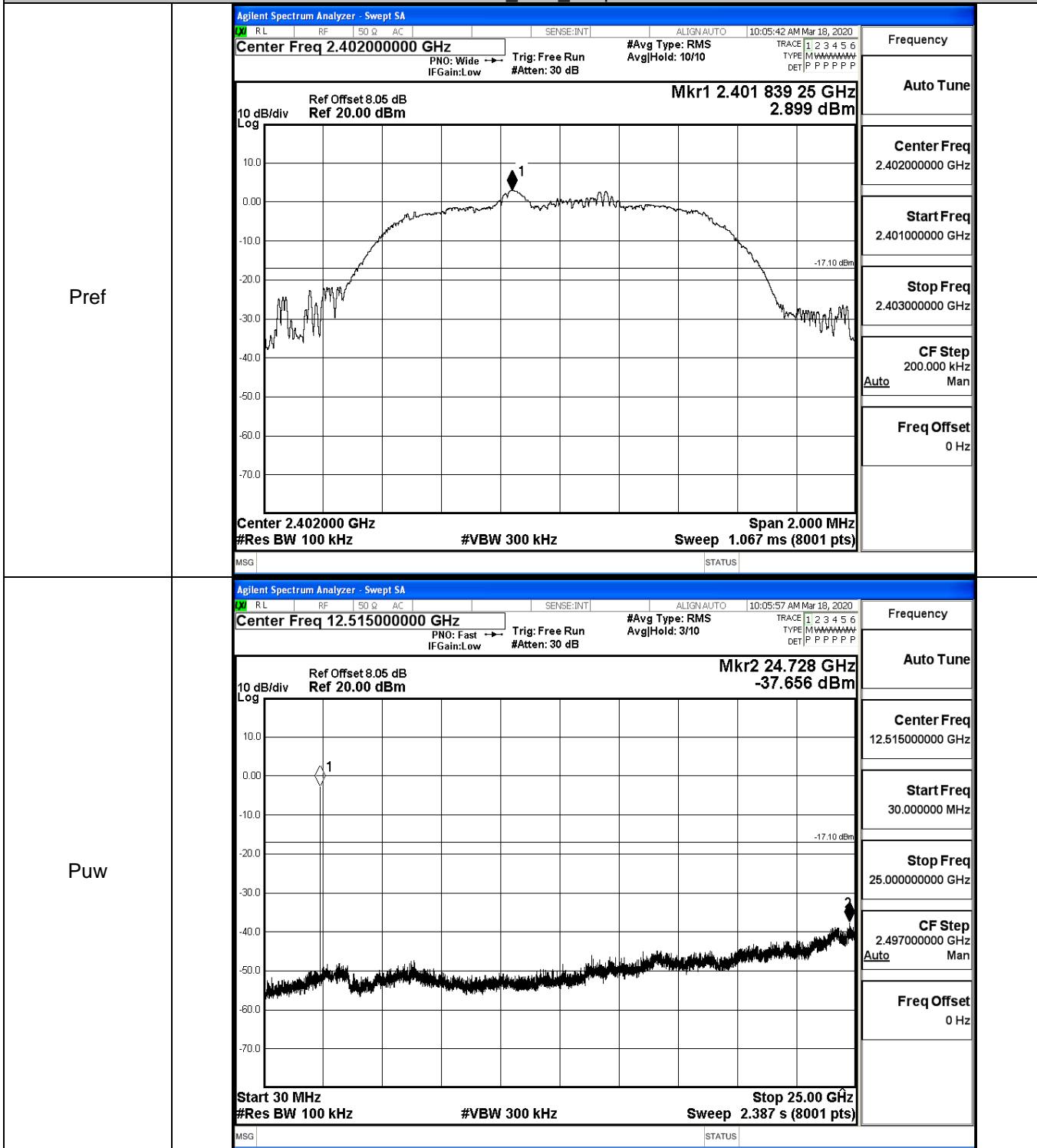
GFSK_MCH_Graphs



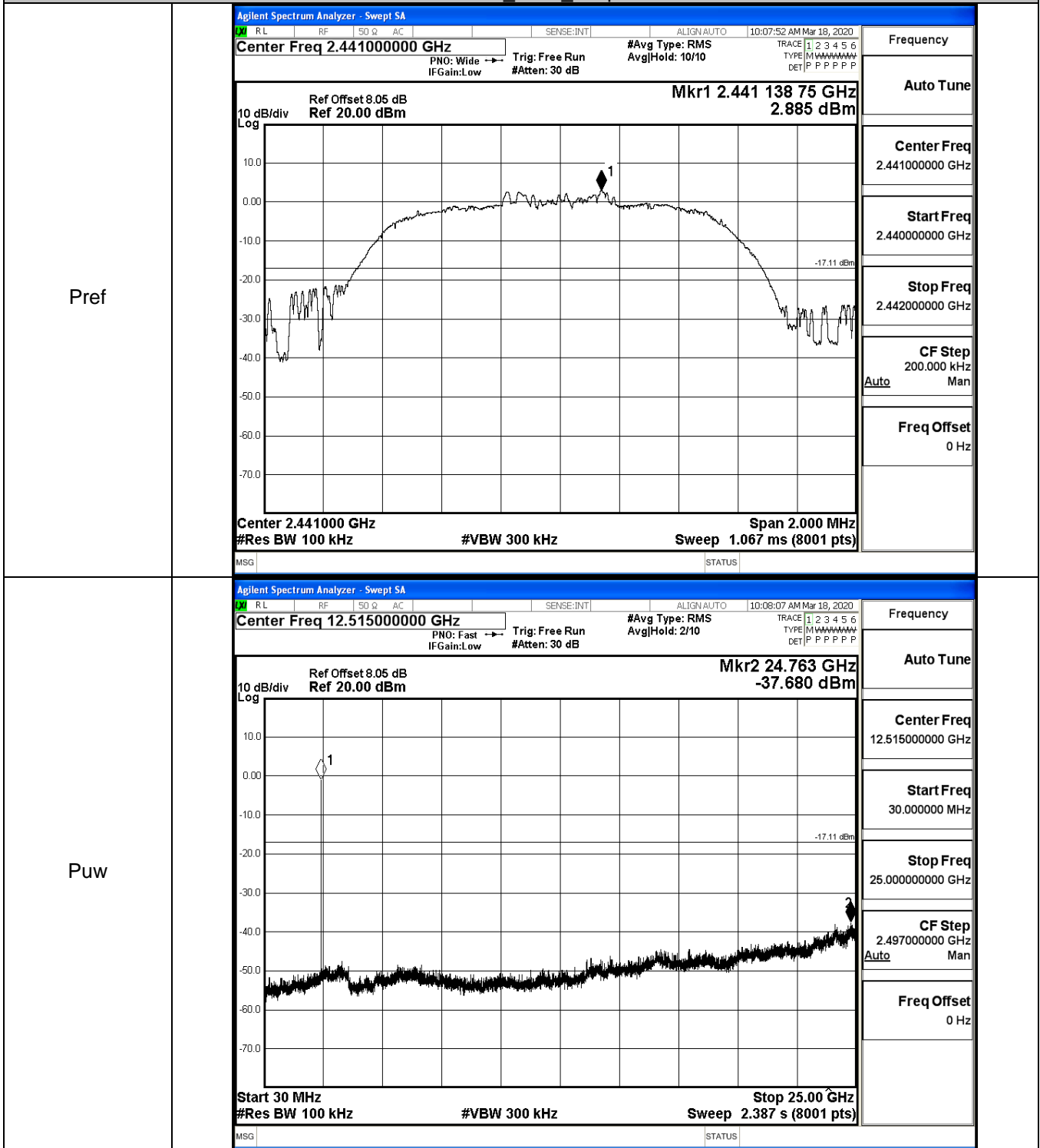
GFSK_HCH_Graphs



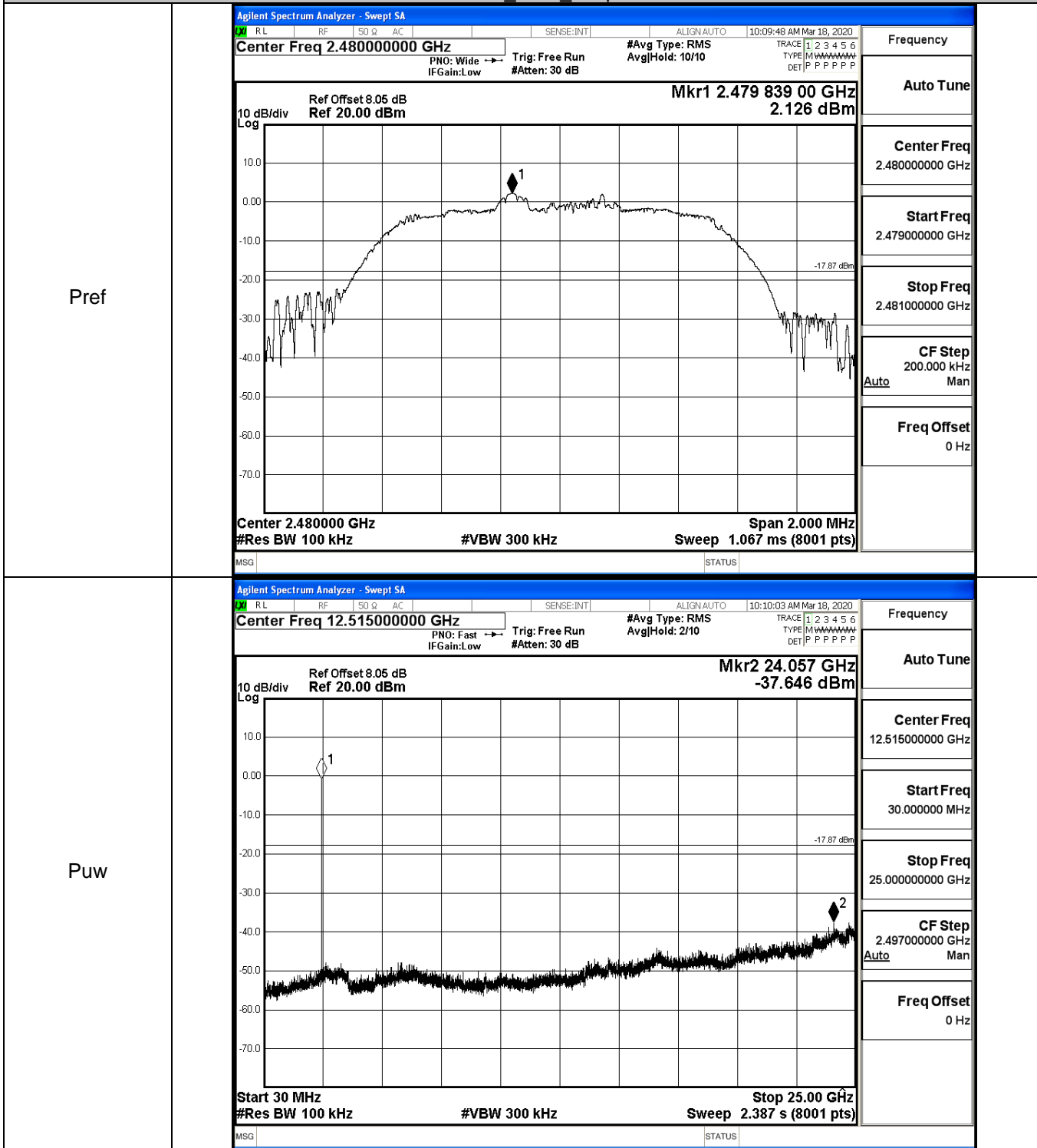
$\pi/4$ DQPSK_LCH_Graphs



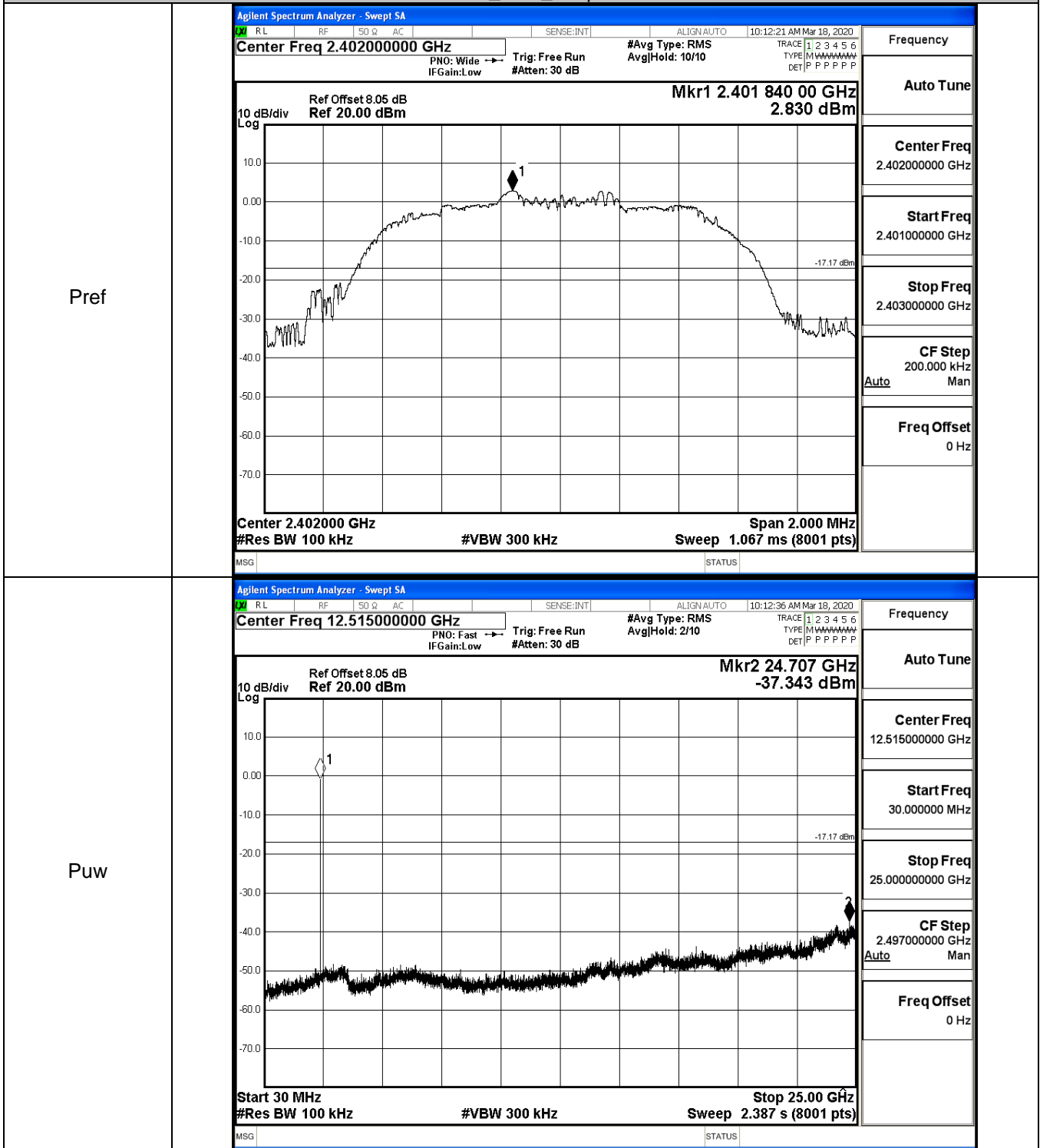
$\pi/4$ DQPSK_MCH_Graphs



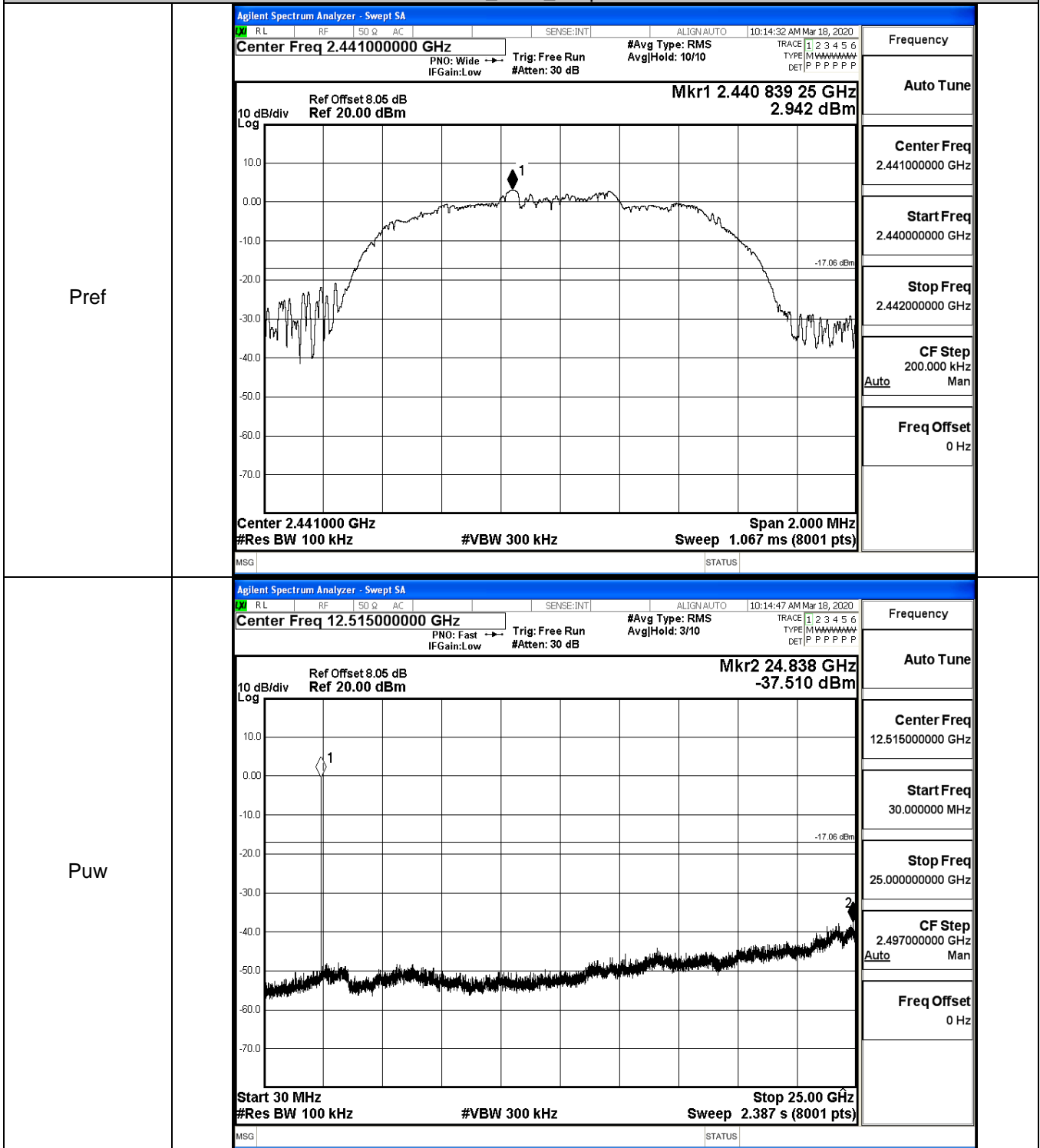
$\pi/4$ DQPSK_HCH_Graphs



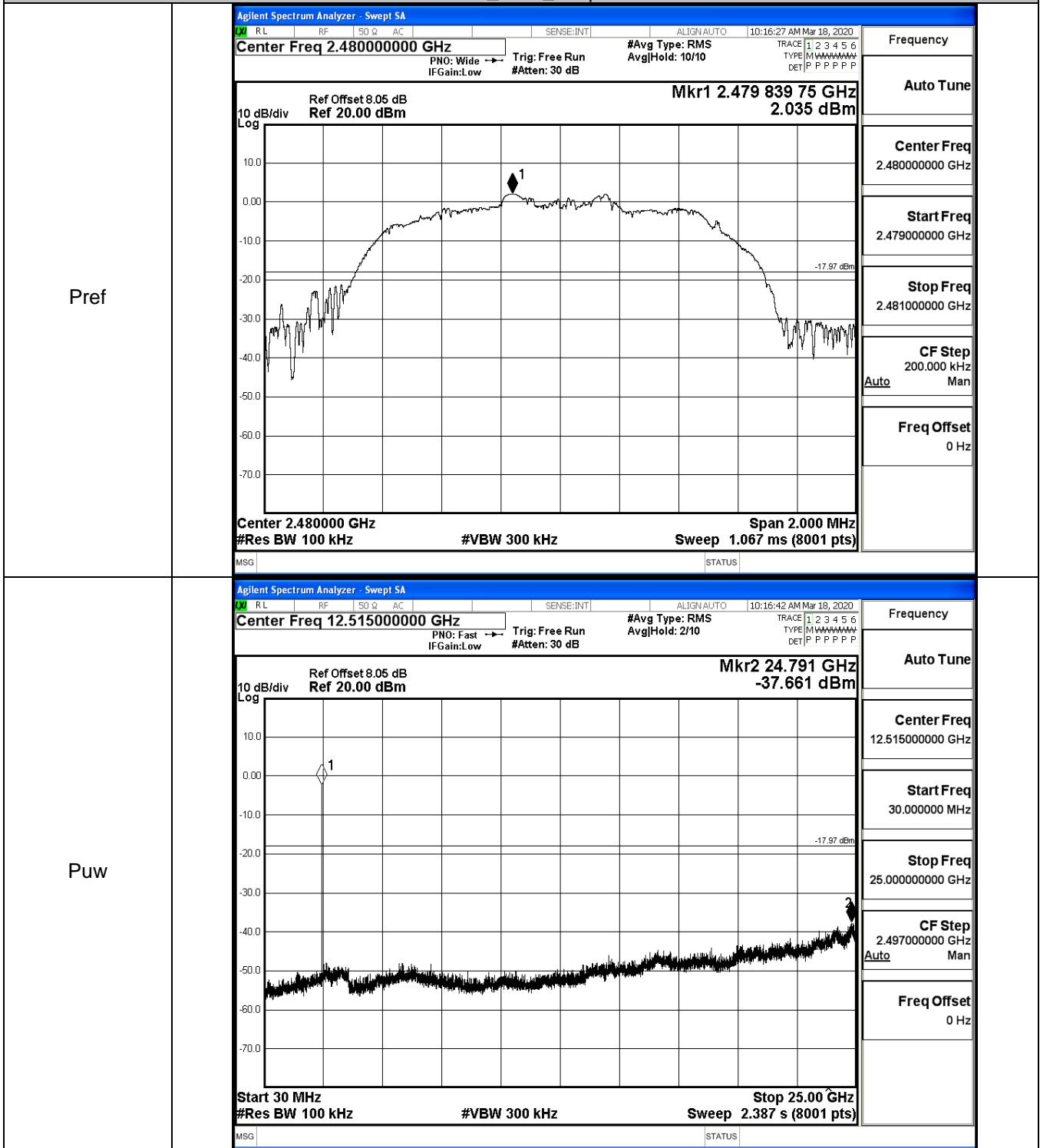
8DPSK_LCH_Graphs



8DPSK_MCH_Graphs



8DPSK_HCH_Graphs

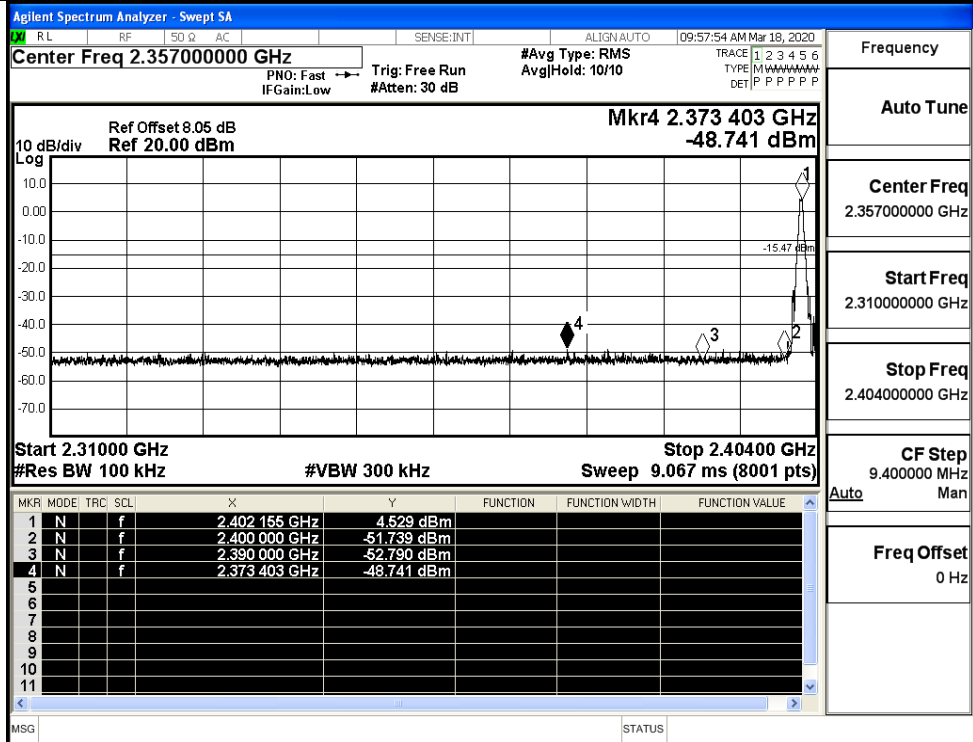


A.7 Band-edge for RF Conducted Emissions

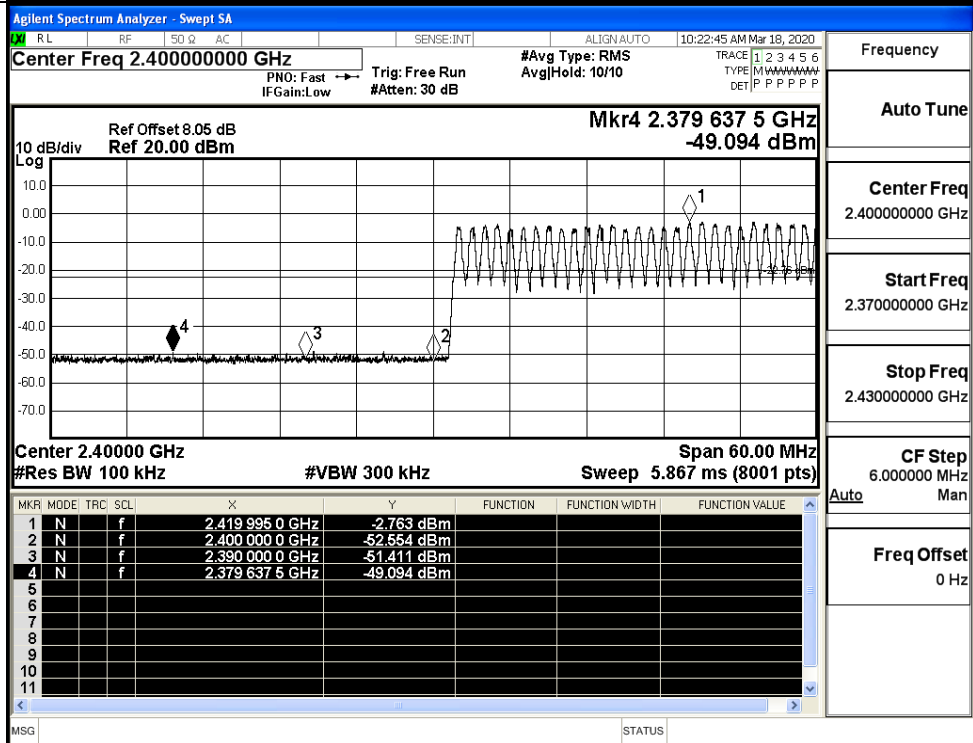
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	4.529	Off	-48.741	-15.47	PASS
			-2.763	On	-49.094	-22.76	PASS
	HCH	2480	3.526	Off	-49.047	-16.47	PASS
			-2.227	On	-48.513	-22.23	PASS
π/4DQPSK	LCH	2402	1.983	Off	-48.722	-18.02	PASS
			-4.013	On	-48.193	-24.01	PASS
	HCH	2480	2.125	Off	-48.839	-17.88	PASS
			-2.863	On	-48.618	-22.86	PASS
8DPSK	LCH	2402	2.819	Off	-48.450	-17.18	PASS
			-4.277	On	-49.248	-24.28	PASS
	HCH	2480	1.602	Off	-49.318	-18.4	PASS
			-3.067	On	-47.688	-23.07	PASS

Test Graphs

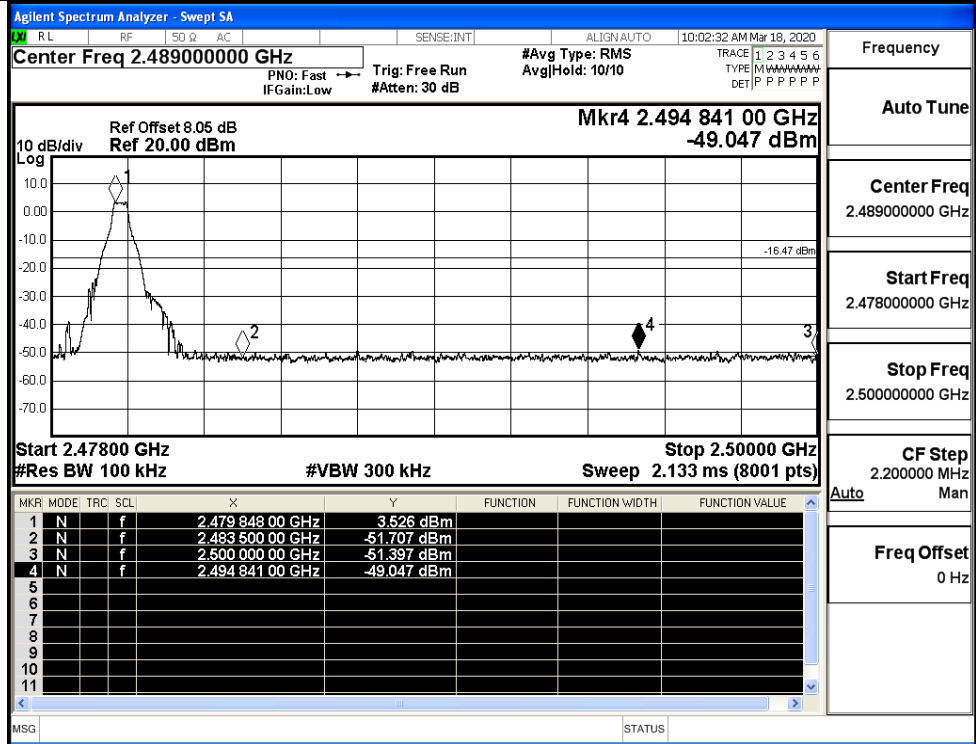
GFSK/LCH/No Hop



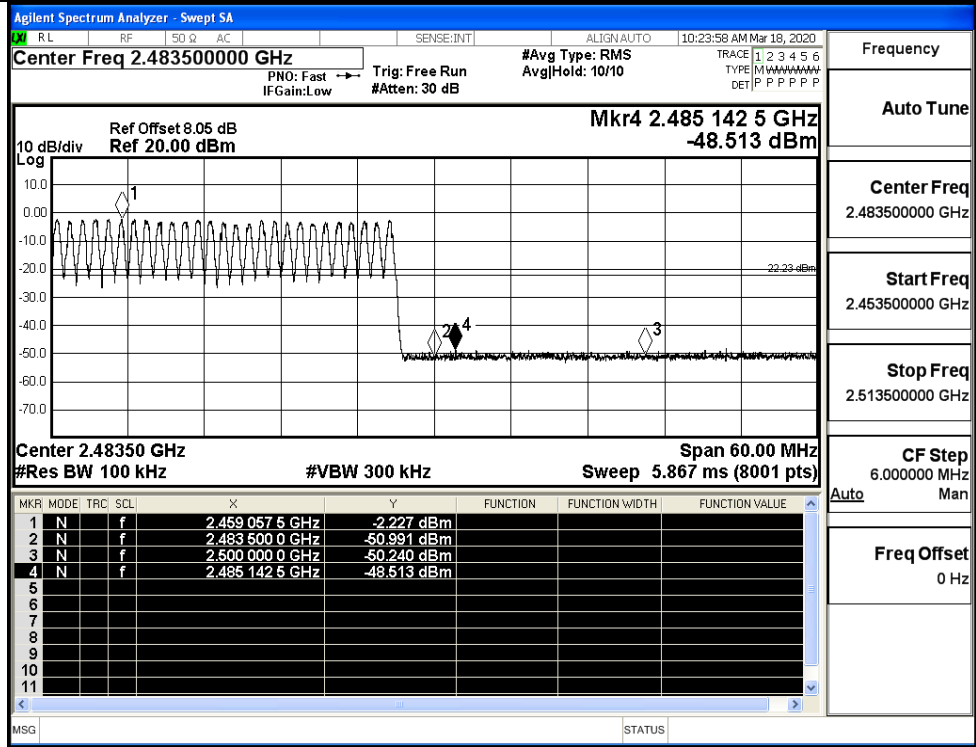
GFSK/LCH/Hop



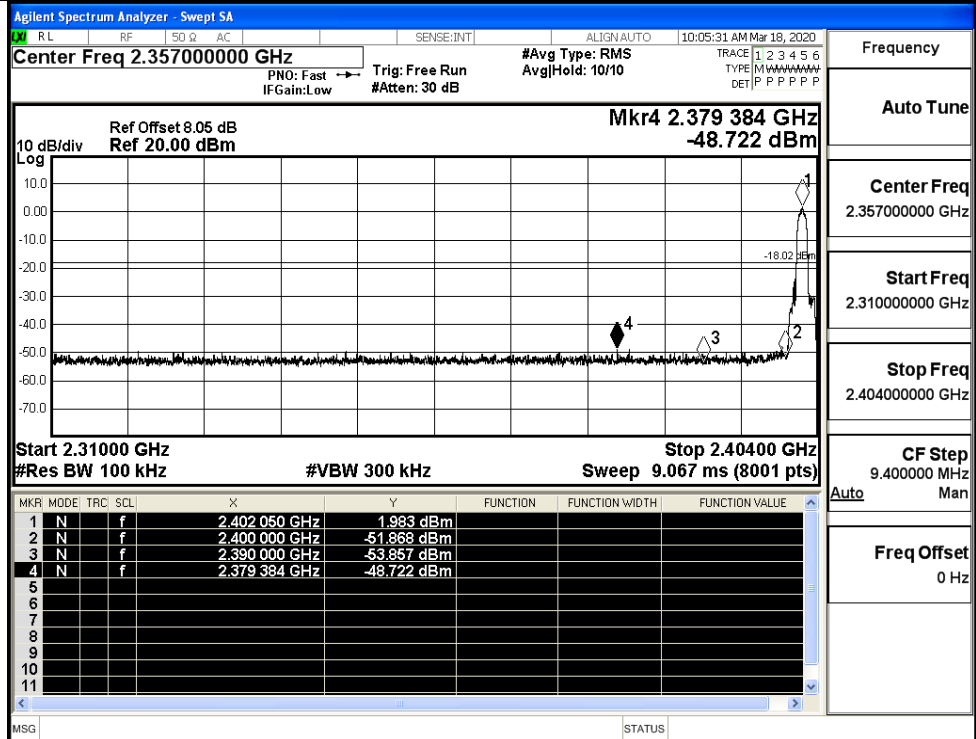
GFSK/HCH/No Hop



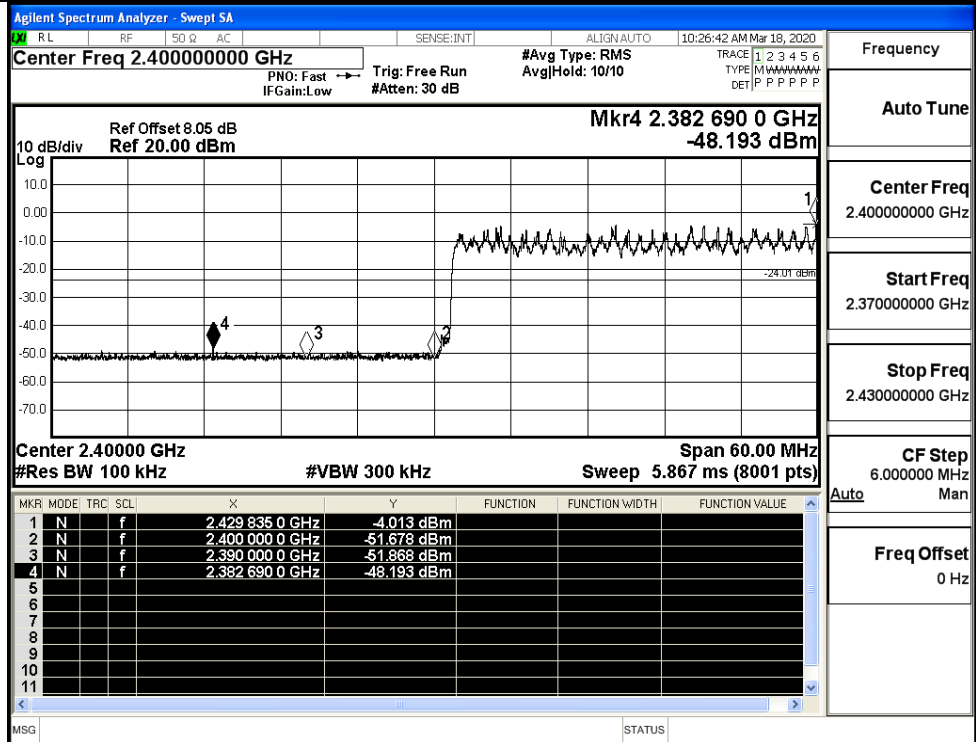
GFSK/HCH/Hop



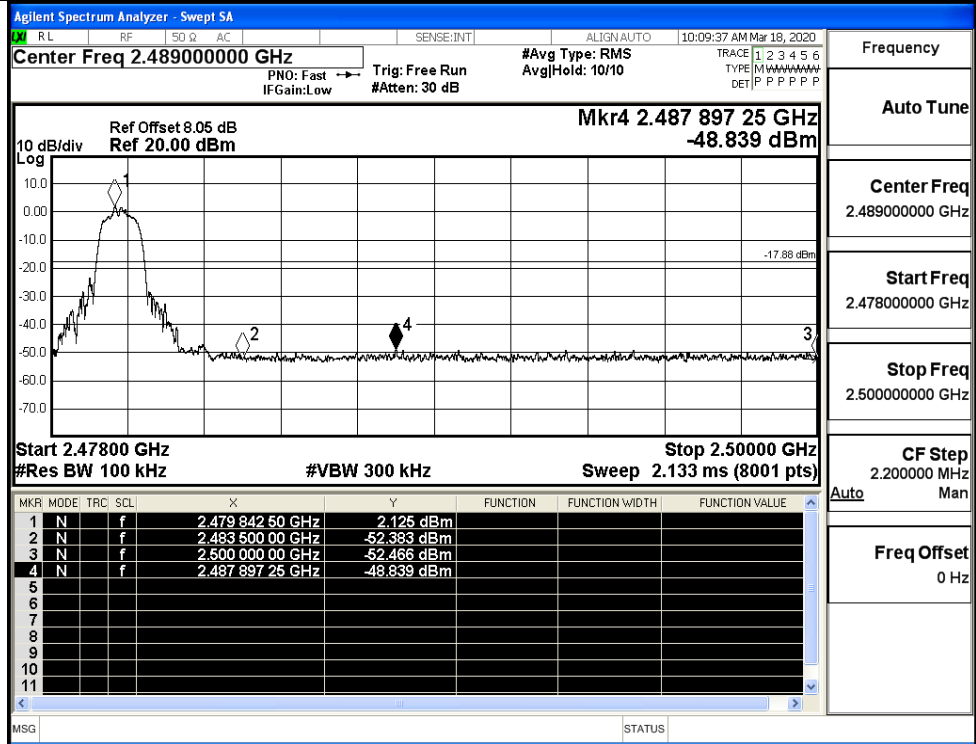
$\pi/4$ DQPSK/LCH/No
Hop



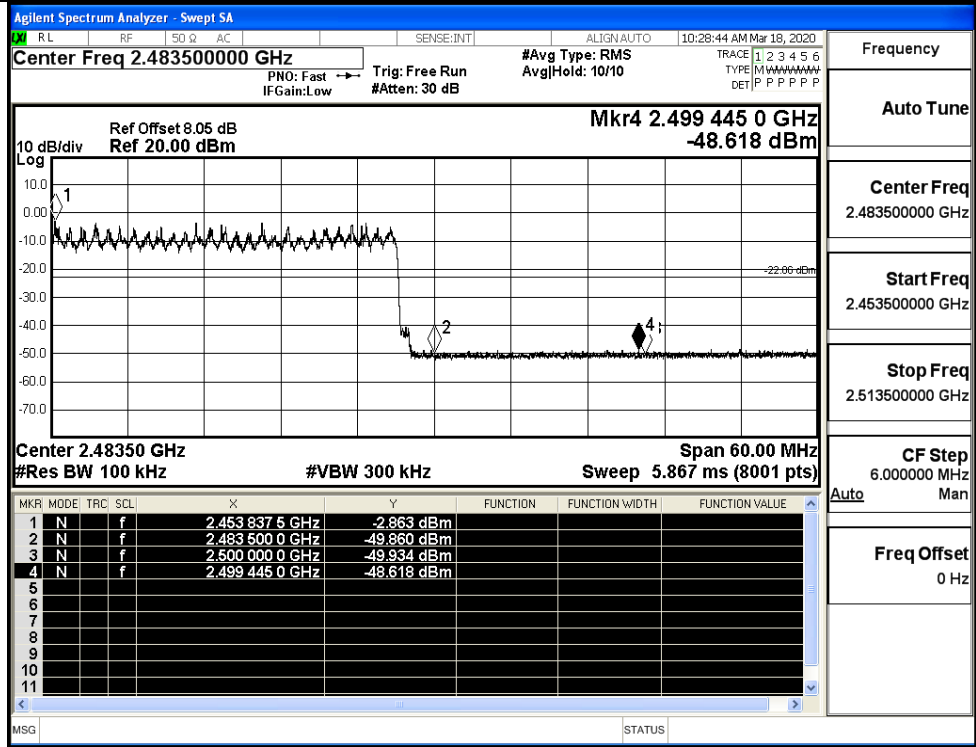
$\pi/4$ DQPSK/LCH/Hop



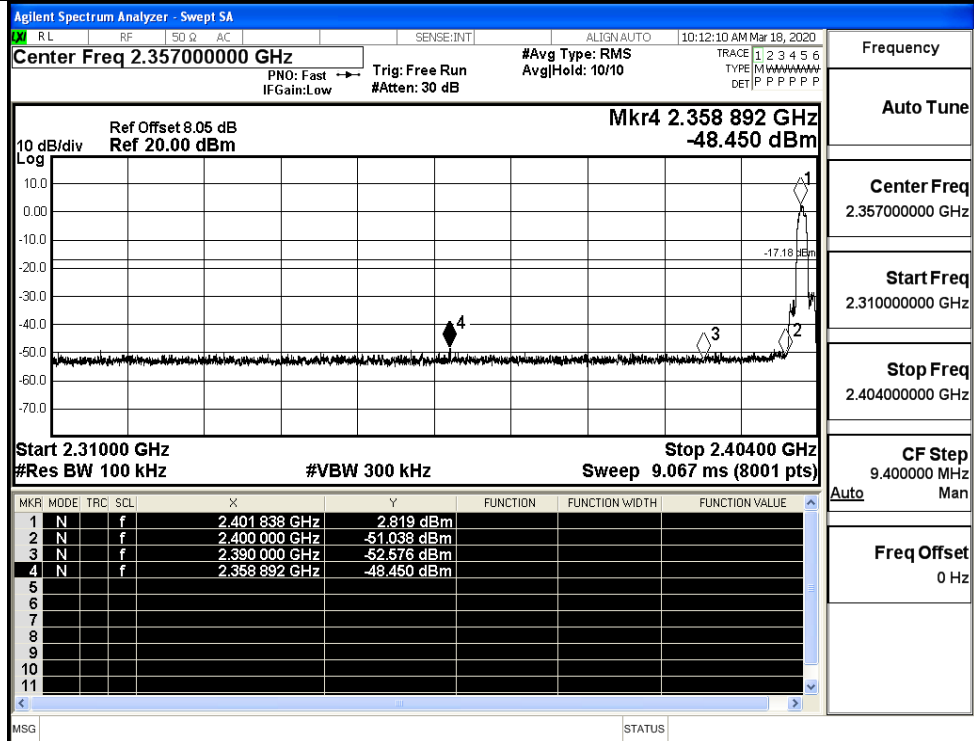
$\pi/4$ DQPSK/HCH/No Hop



$\pi/4$ DQPSK/HCH/Hop

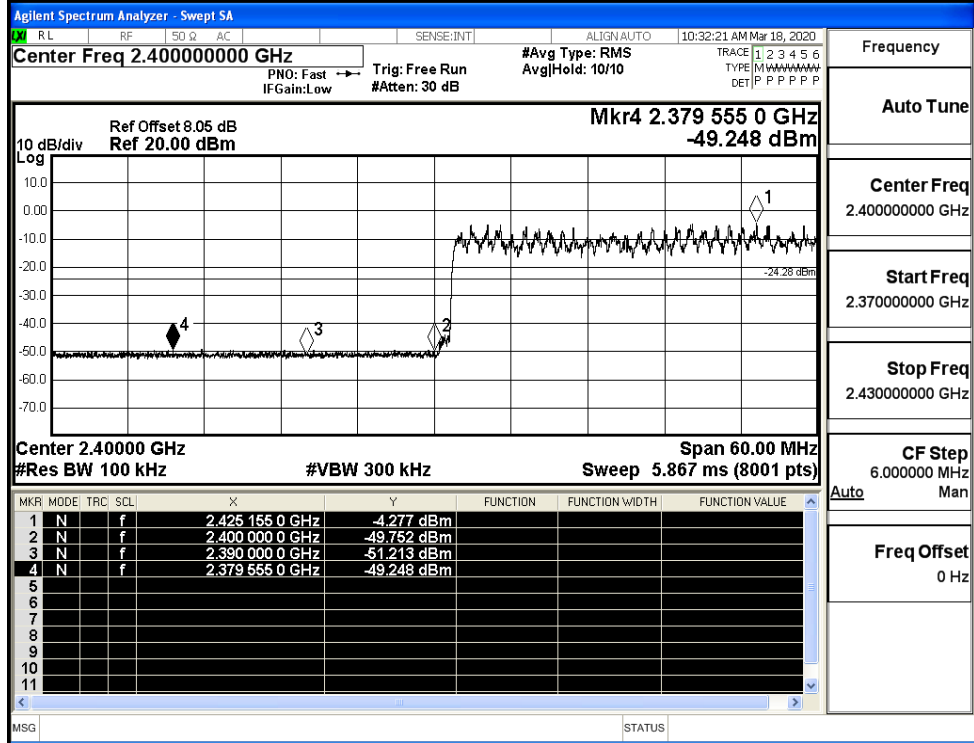


8DPSK/LCH/No Hop



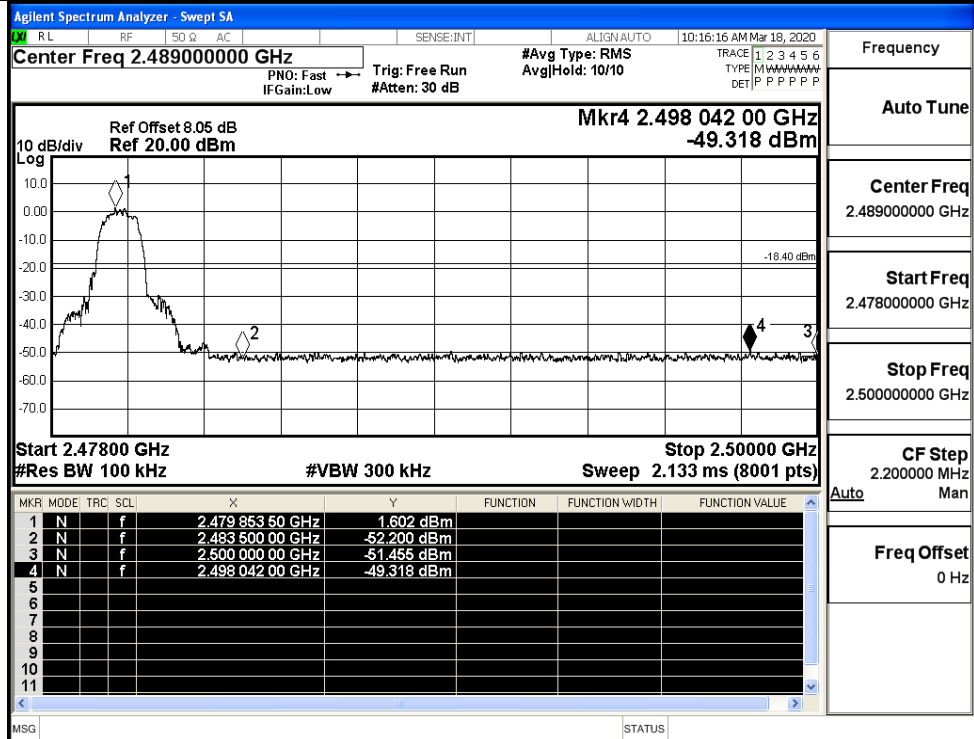
Frequency
Auto Tune
Center Freq
2.357000000 GHz
Start Freq
2.310000000 GHz
Stop Freq
2.404000000 GHz
CF Step
9.400000 MHz
Auto Man
Freq Offset
0 Hz

8DPSK/LCH/Hop



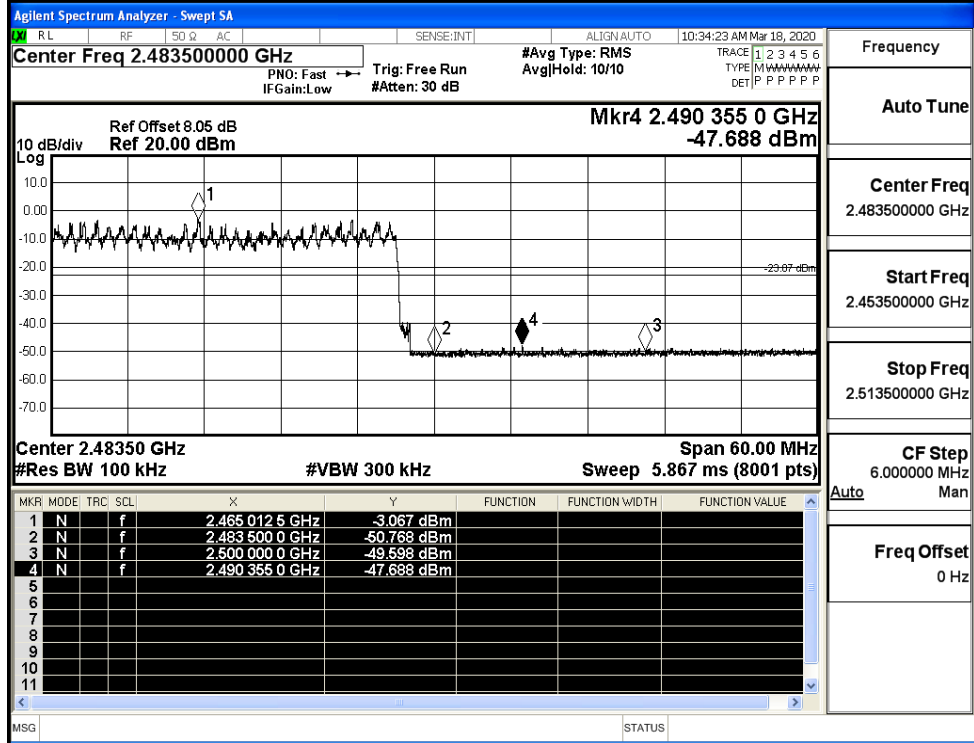
Frequency
Auto Tune
Center Freq
2.400000000 GHz
Start Freq
2.370000000 GHz
Stop Freq
2.430000000 GHz
CF Step
6.000000 MHz
Auto Man
Freq Offset
0 Hz

8DPSK/HCH/No Hop



Agilent Spectrum Analyzer - Swept SA
 Center Freq 2.489000000 GHz
 Auto Tune
 Start Freq 2.478000000 GHz
 Stop Freq 2.500000000 GHz
 CF Step 2.200000 MHz
 Freq Offset 0 Hz

8DPSK/HCH/Hop

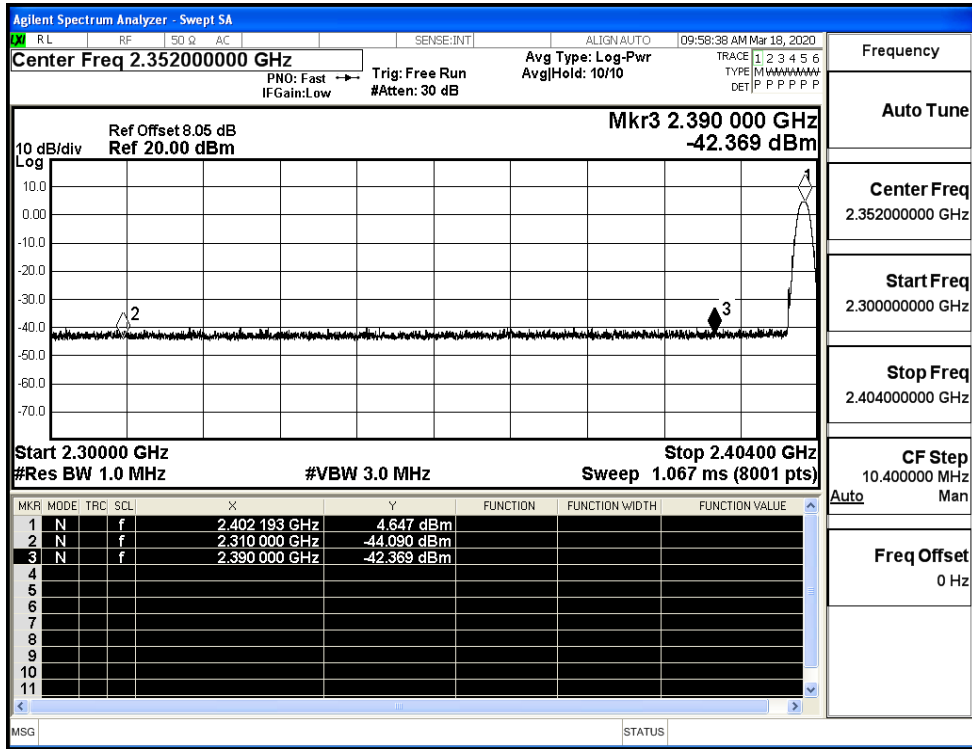


Agilent Spectrum Analyzer - Swept SA
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 Auto Tune
 Start Freq 2.453500000 GHz
 Stop Freq 2.513500000 GHz
 CF Step 6.000000 MHz
 Freq Offset 0 Hz

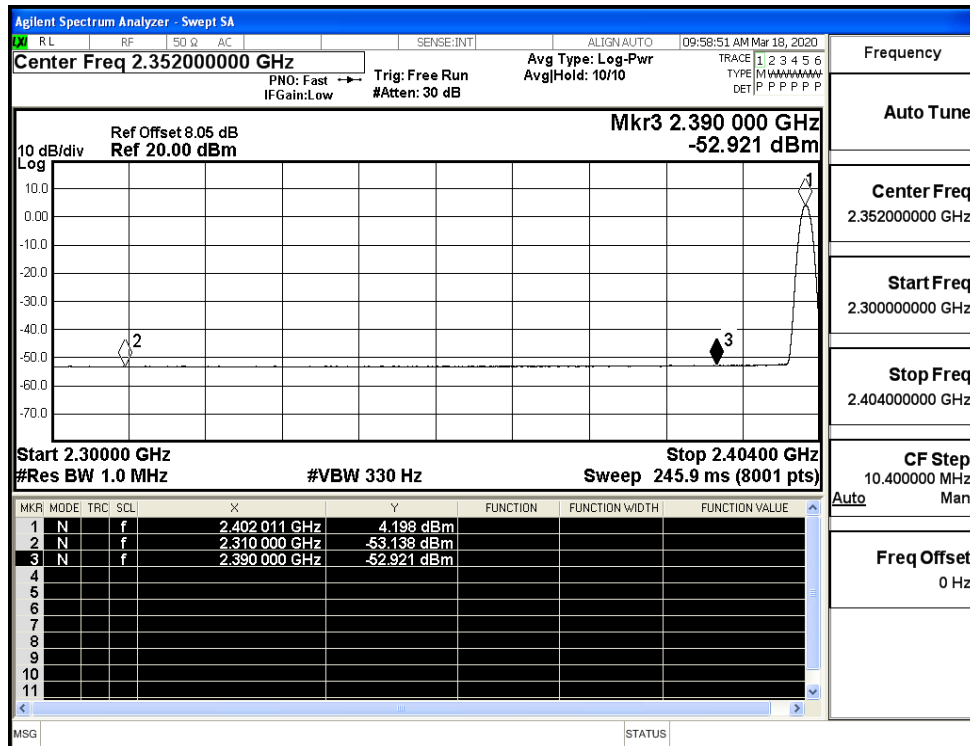
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-44.09	2.0	0	51.17	PEAK	74	PASS
	Off	2310.0	-53.14	2.0	0	42.12	AV	54	PASS
	Off	2390.0	-42.37	2.0	0	52.89	PEAK	74	PASS
	Off	2390.0	-52.92	2.0	0	42.34	AV	54	PASS
	Off	2483.5	-40.75	2.0	0	54.50	PEAK	74	PASS
	Off	2483.5	-52.21	2.0	0	43.04	AV	54	PASS
	Off	2500.0	-41.08	2.0	0	54.18	PEAK	74	PASS
	Off	2500.0	-52.29	2.0	0	42.97	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-43.47	2.0	0	51.79	PEAK	74	PASS
	Off	2310.0	-53.22	2.0	0	42.04	AV	54	PASS
	Off	2390.0	-43.19	2.0	0	52.07	PEAK	74	PASS
	Off	2390.0	-52.97	2.0	0	42.28	AV	54	PASS
	Off	2483.5	-40.34	2.0	0	54.92	PEAK	74	PASS
	Off	2483.5	-52.14	2.0	0	43.12	AV	54	PASS
	Off	2500.0	-41.74	2.0	0	53.52	PEAK	74	PASS
	Off	2500.0	-52.30	2.0	0	42.96	AV	54	PASS
8DPSK	Off	2310.0	-43.80	2.0	0	51.46	PEAK	74	PASS
	Off	2310.0	-53.23	2.0	0	42.03	AV	54	PASS
	Off	2390.0	-43.15	2.0	0	52.11	PEAK	74	PASS
	Off	2390.0	-52.93	2.0	0	42.33	AV	54	PASS
	Off	2483.5	-40.85	2.0	0	54.41	PEAK	74	PASS
	Off	2483.5	-52.15	2.0	0	43.11	AV	54	PASS
	Off	2500.0	-41.75	2.0	0	53.51	PEAK	74	PASS
	Off	2500.0	-52.17	2.0	0	43.09	AV	54	PASS

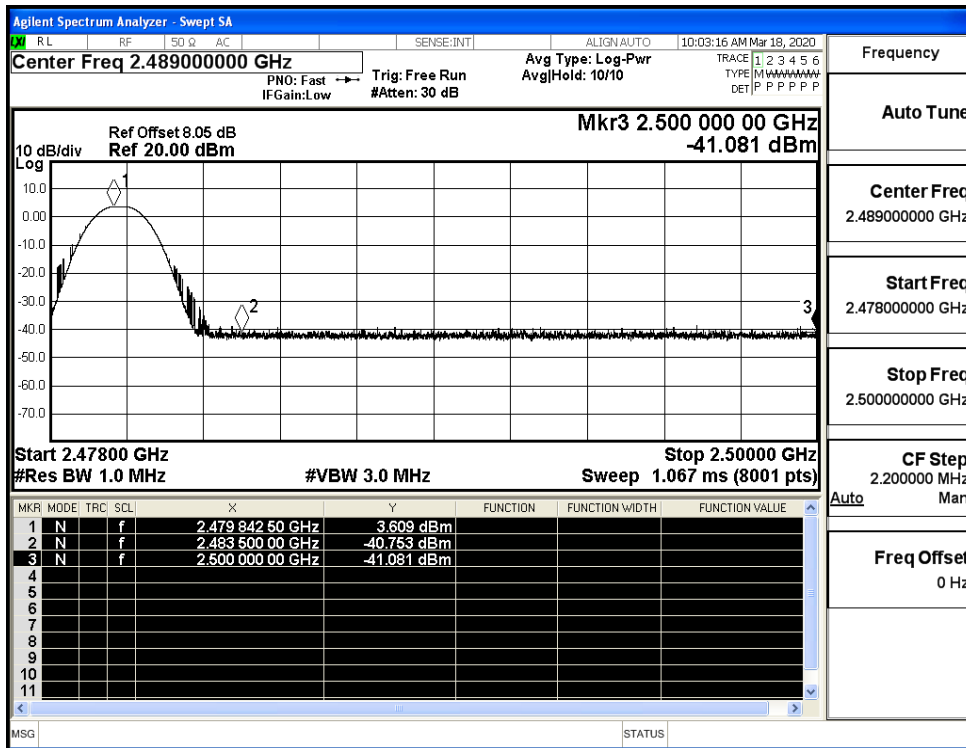
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



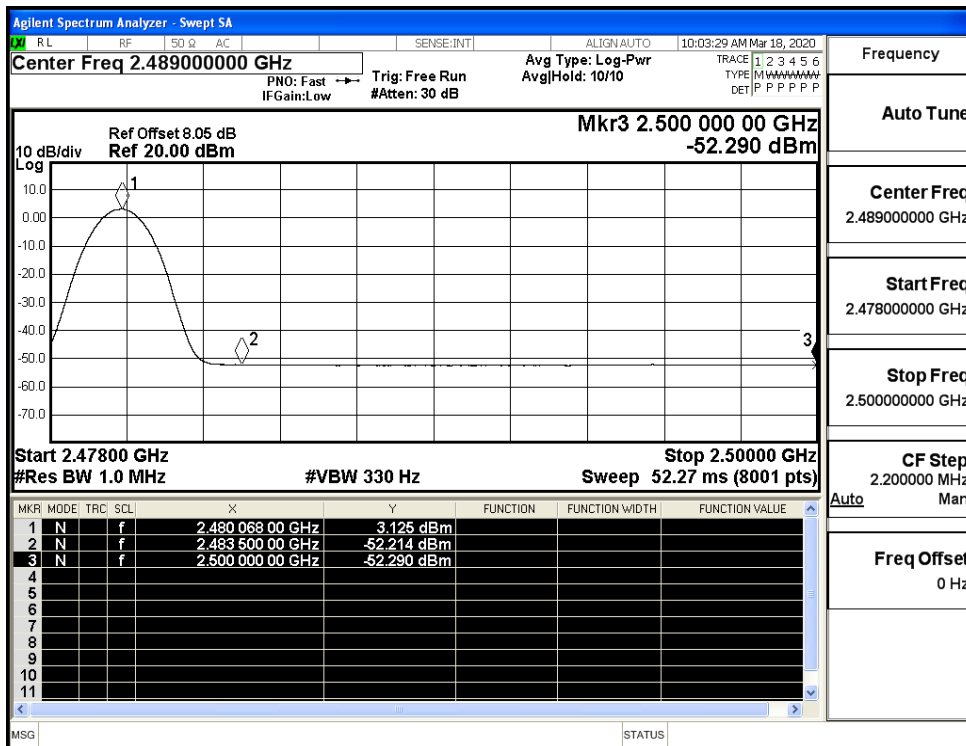
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



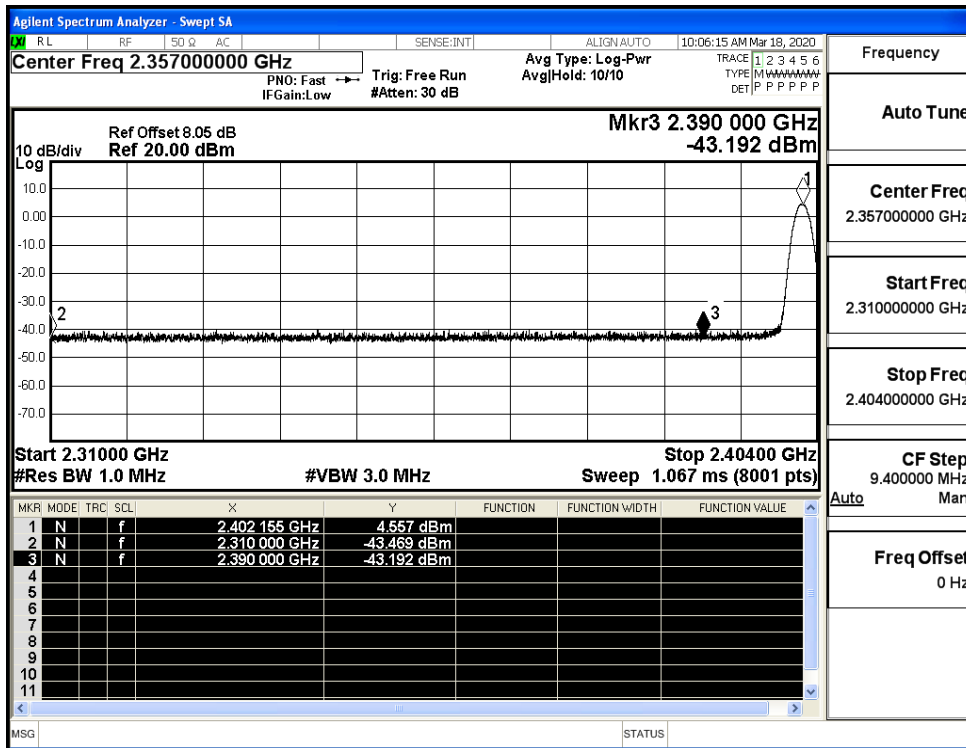
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



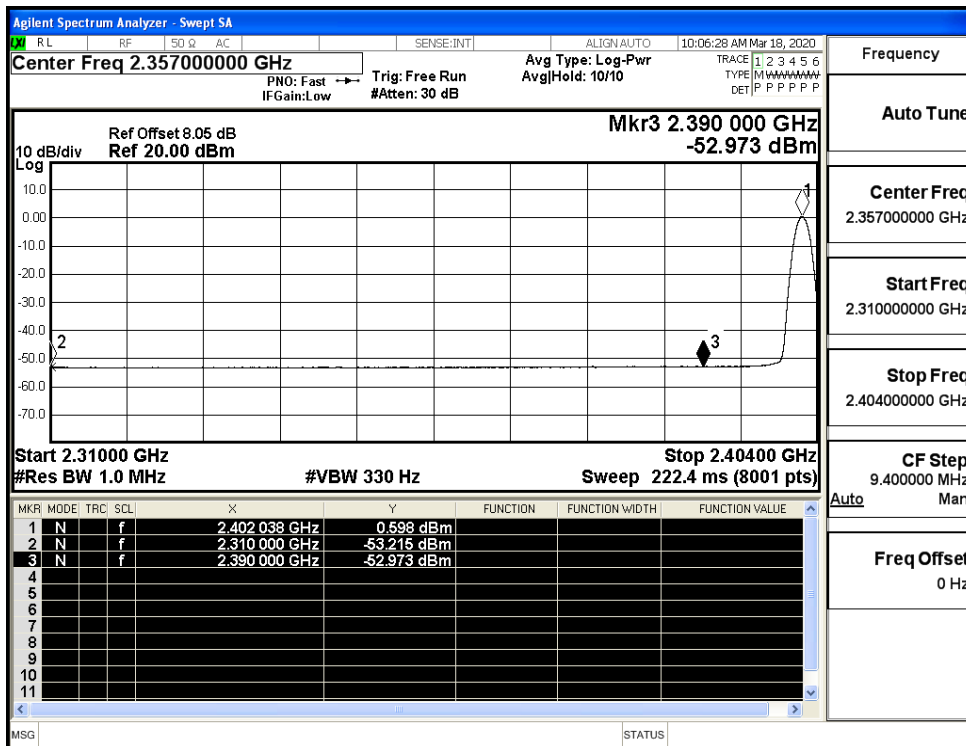
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



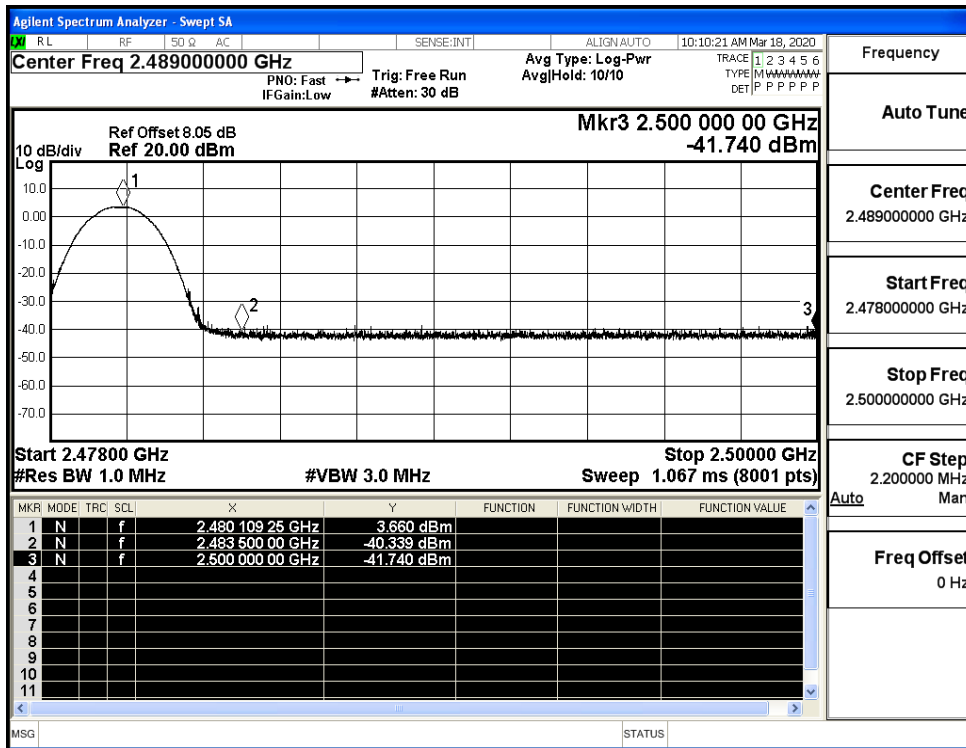
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)



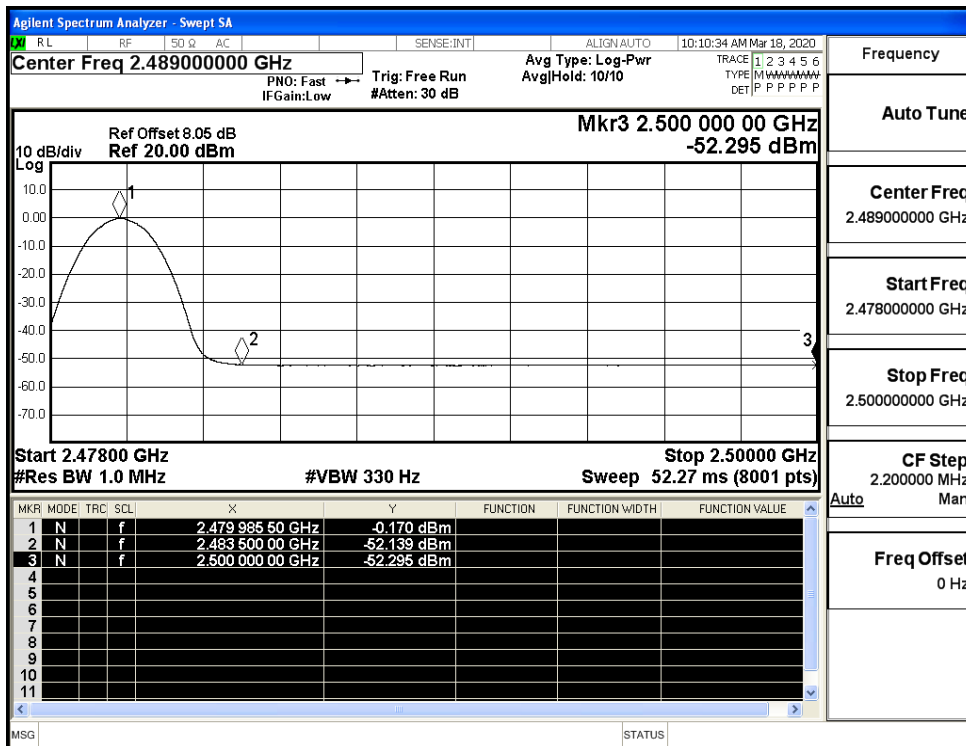
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)



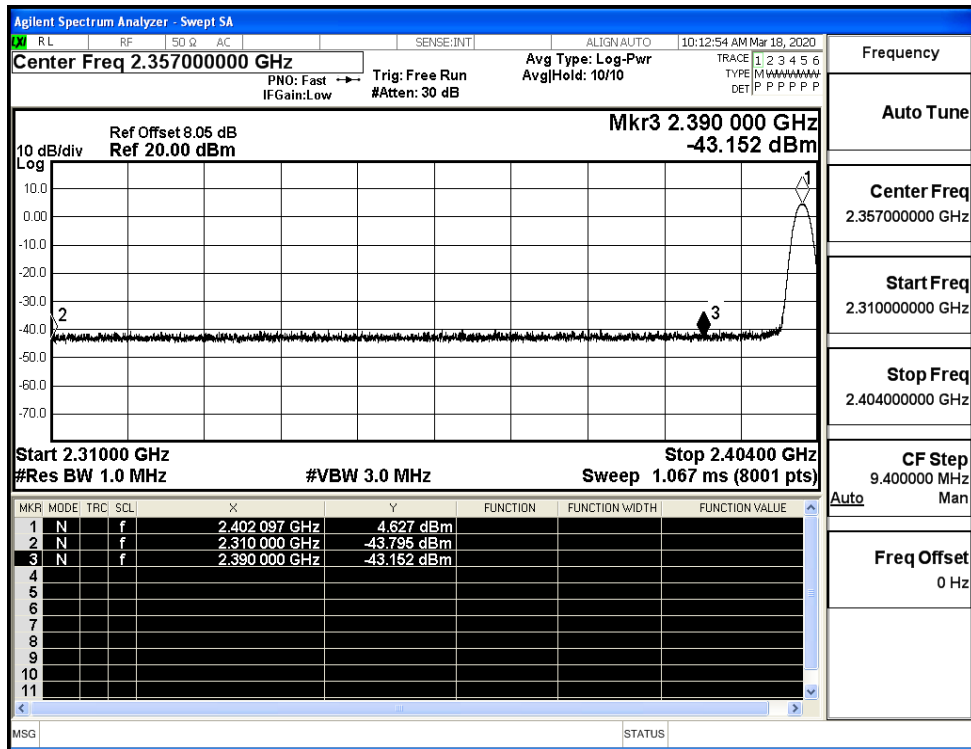
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



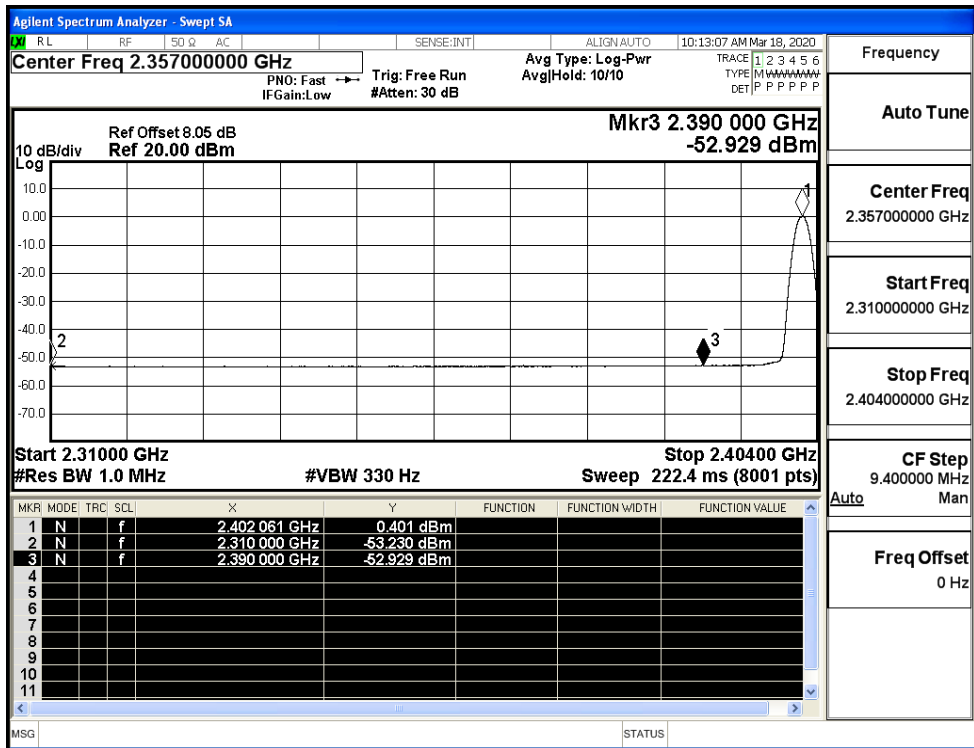
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



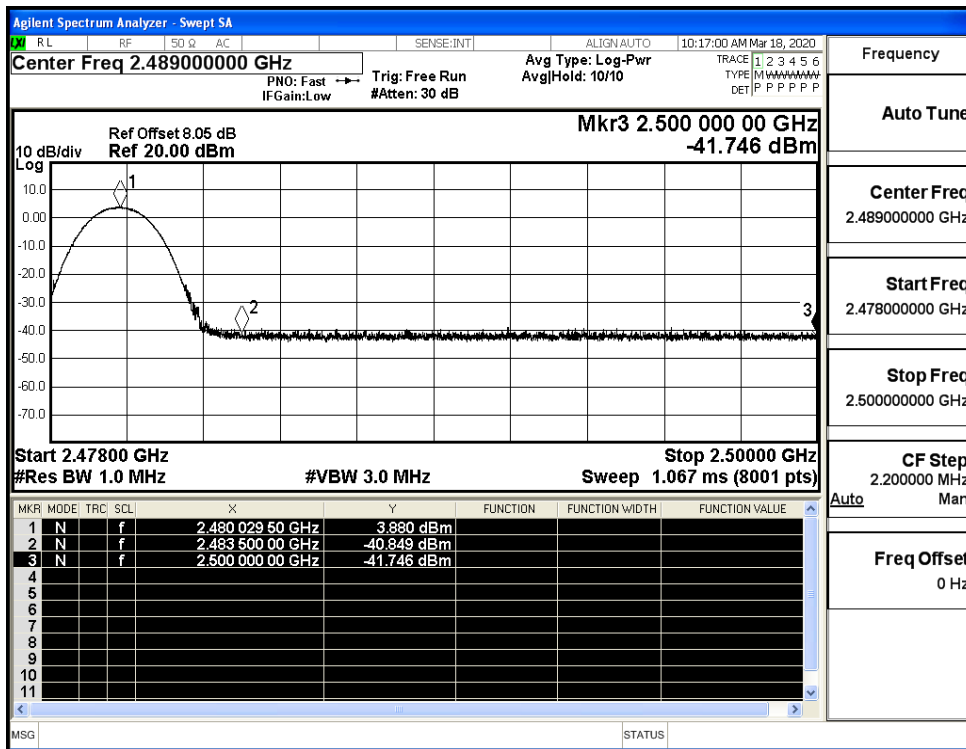
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

