


Appendix A

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

Product Name: SPEAKER

Trade Mark:  beFree
the freedom of sound...

Test Model: bfs-12t

Environmental Conditions

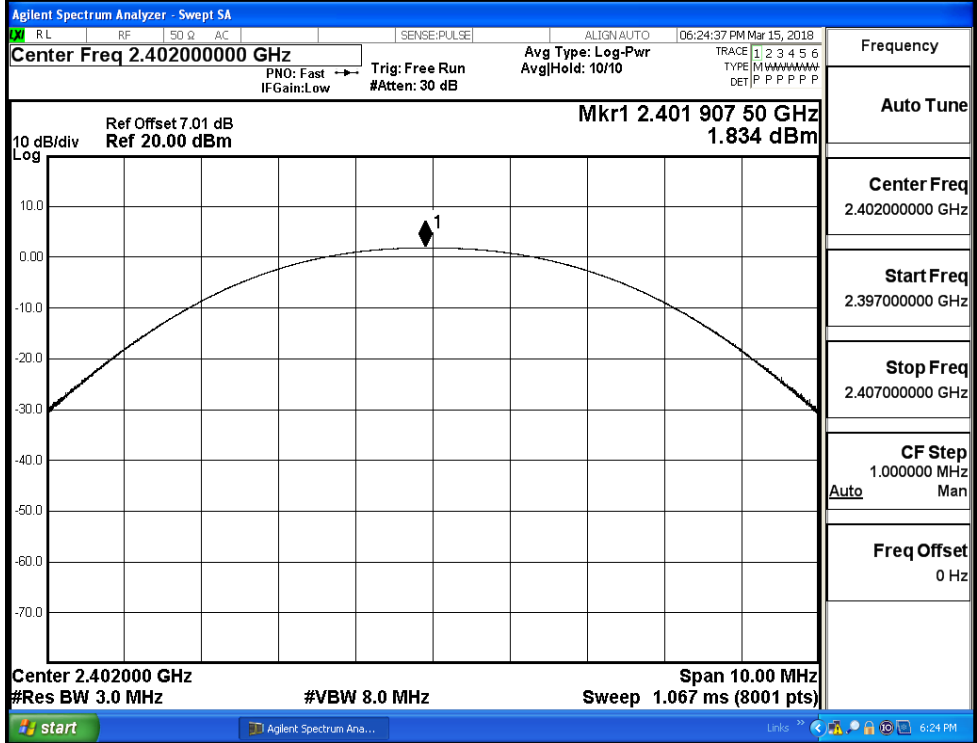
Temperature:	22.5 ° C
Relative Humidity:	52.1%
ATM Pressure:	100.0 kPa
Test Engineer:	WC Wang
Supervised by:	Tom.Liu

A.1 Maxmum Conducted Peak Output Power

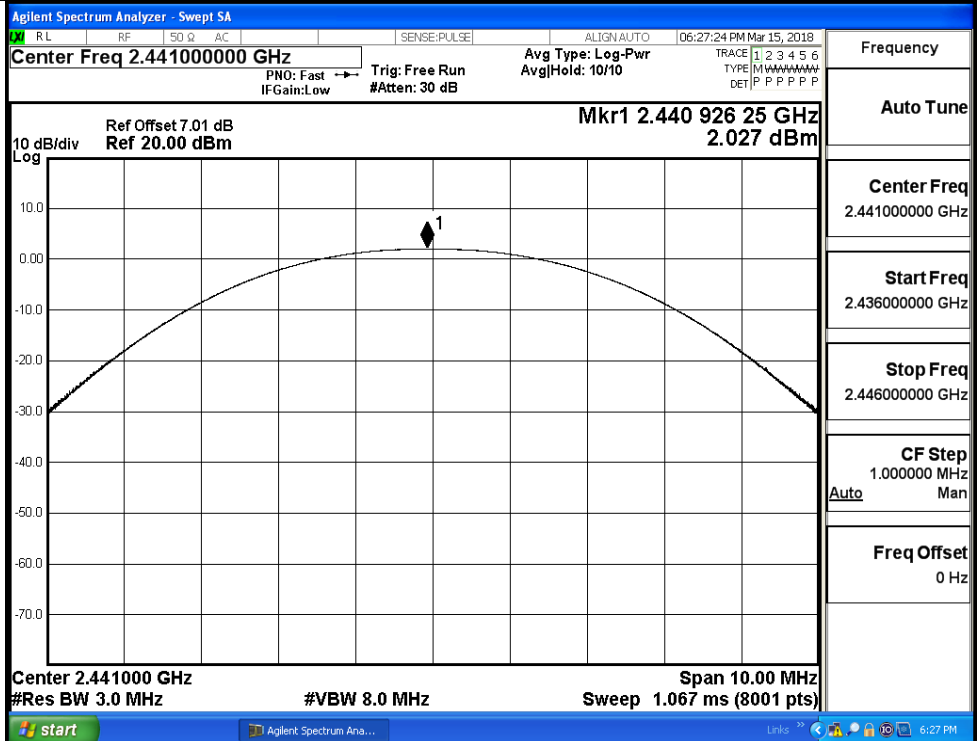
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.834	21	PASS
	MCH	2.027	21	PASS
	HCH	1.915	21	PASS
$\pi/4$ DQPSK	LCH	1.769	21	PASS
	MCH	1.527	21	PASS
	HCH	1.402	21	PASS
8DPSK	LCH	1.654	21	PASS
	MCH	1.797	21	PASS
	HCH	1.648	21	PASS

Test Graphs

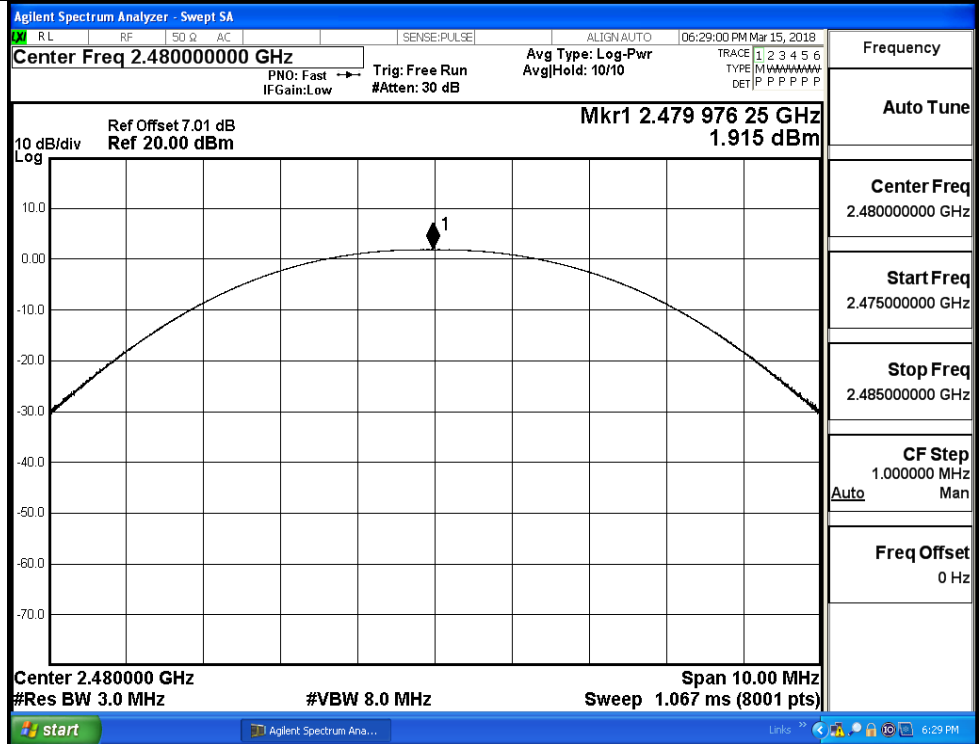
GFSK/LCH



GFSK/MCH

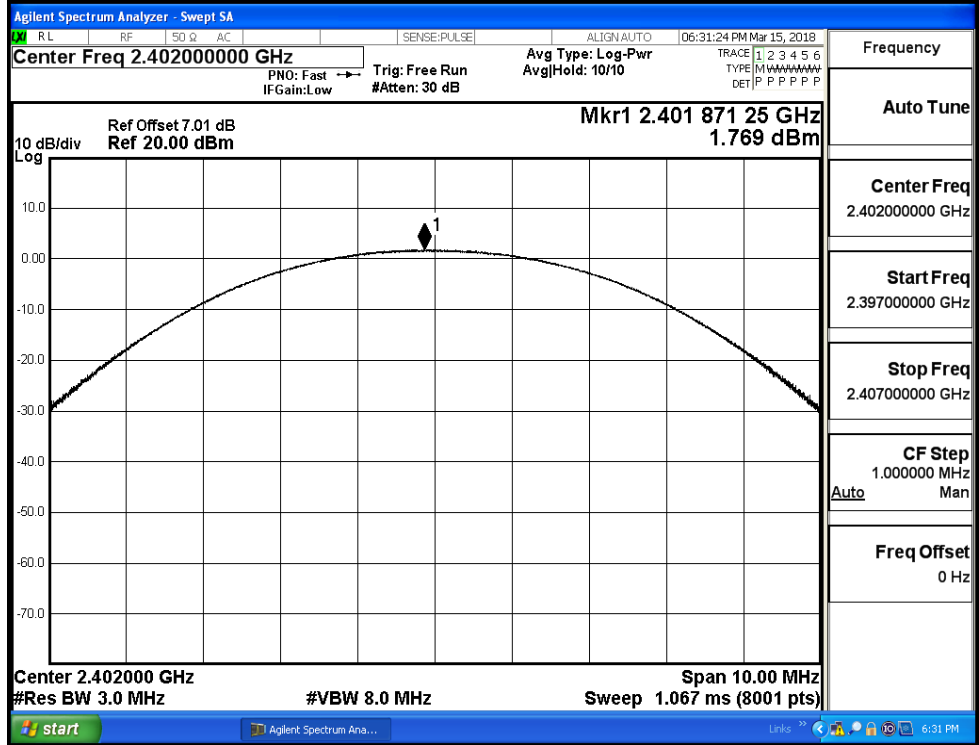


GFSK/HCH



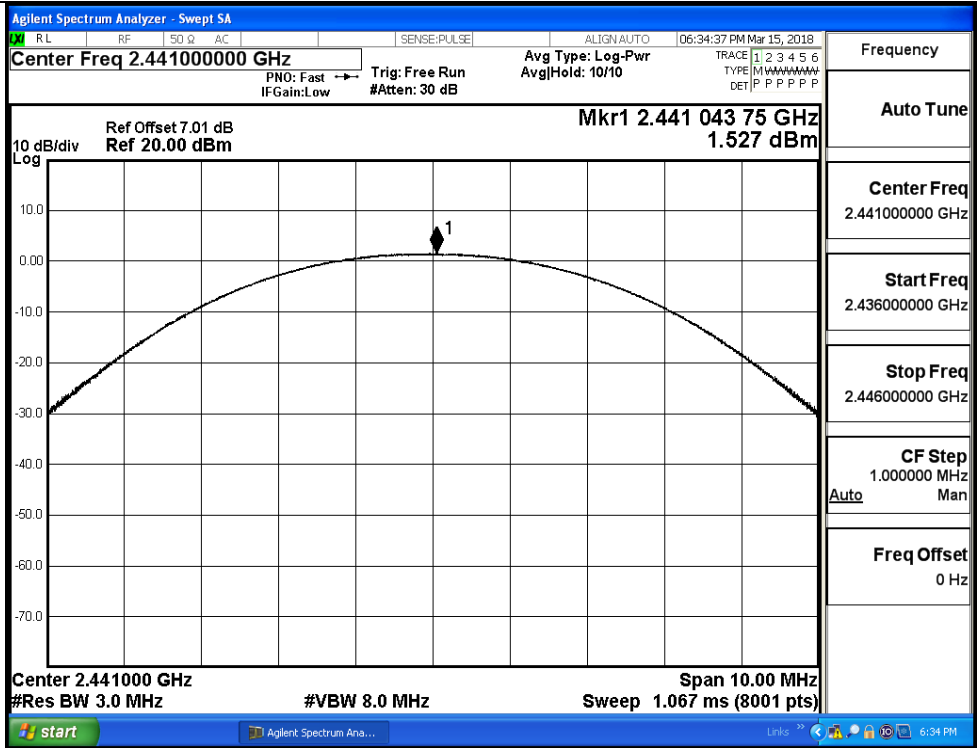
Frequency	
Auto Tune	
Center Freq	2.480000000 GHz
Start Freq	2.475000000 GHz
Stop Freq	2.485000000 GHz
CF Step	1.000000 MHz Auto Man
Freq Offset	0 Hz

π /4DQPSK/LCH

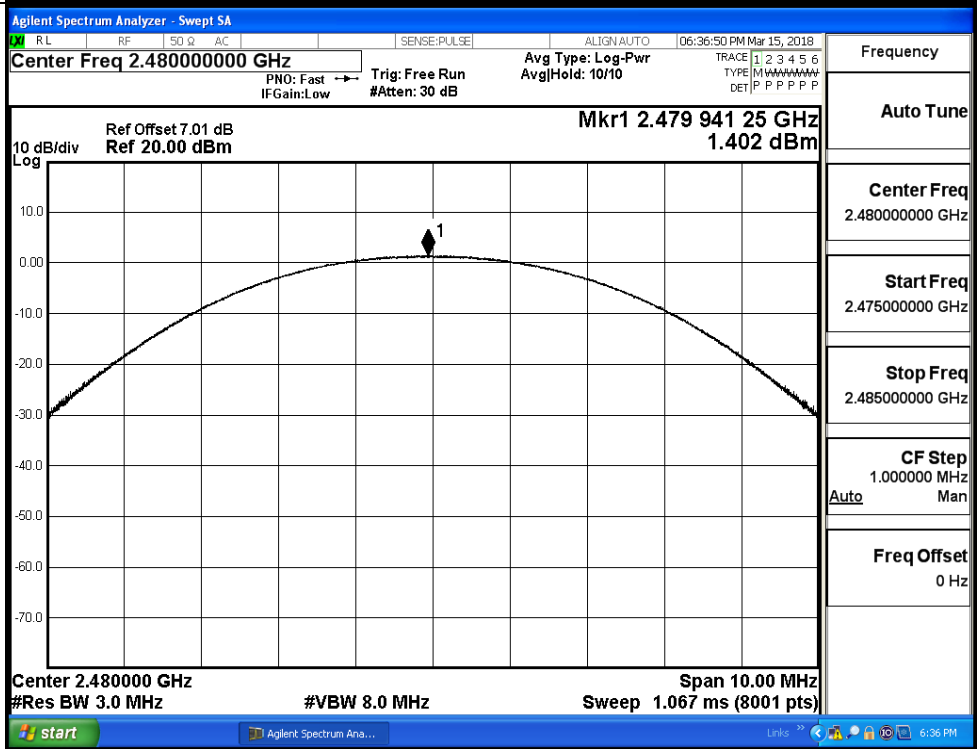


Frequency	
Auto Tune	
Center Freq	2.402000000 GHz
Start Freq	2.397000000 GHz
Stop Freq	2.407000000 GHz
CF Step	1.000000 MHz Auto Man
Freq Offset	0 Hz

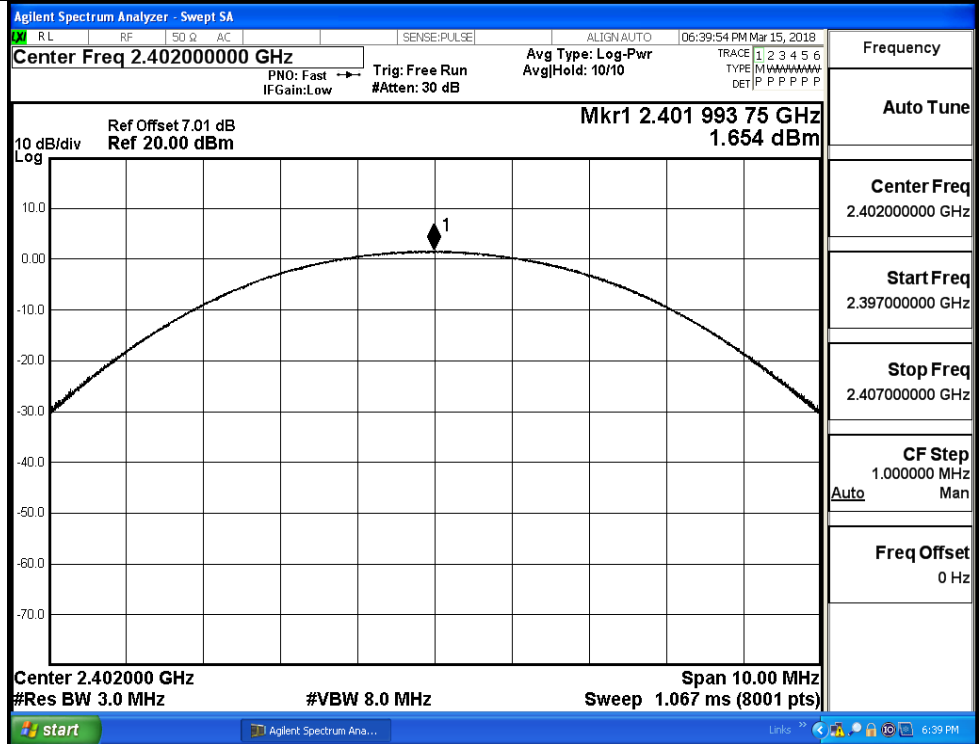
π /4DQPSK/MCH



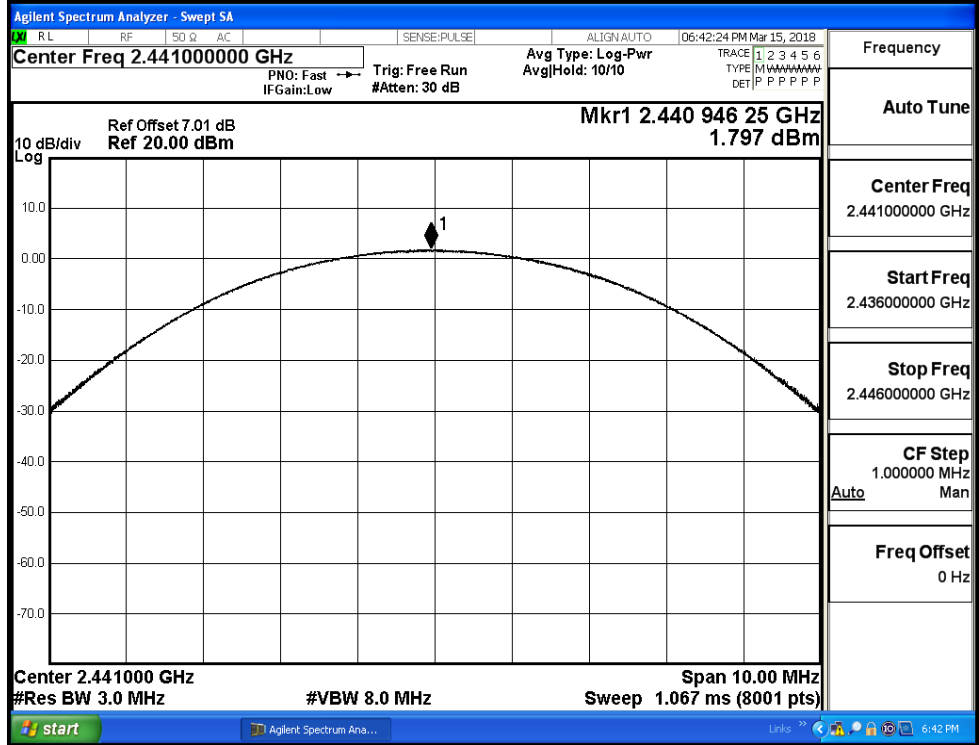
π /4DQPSK/HCH



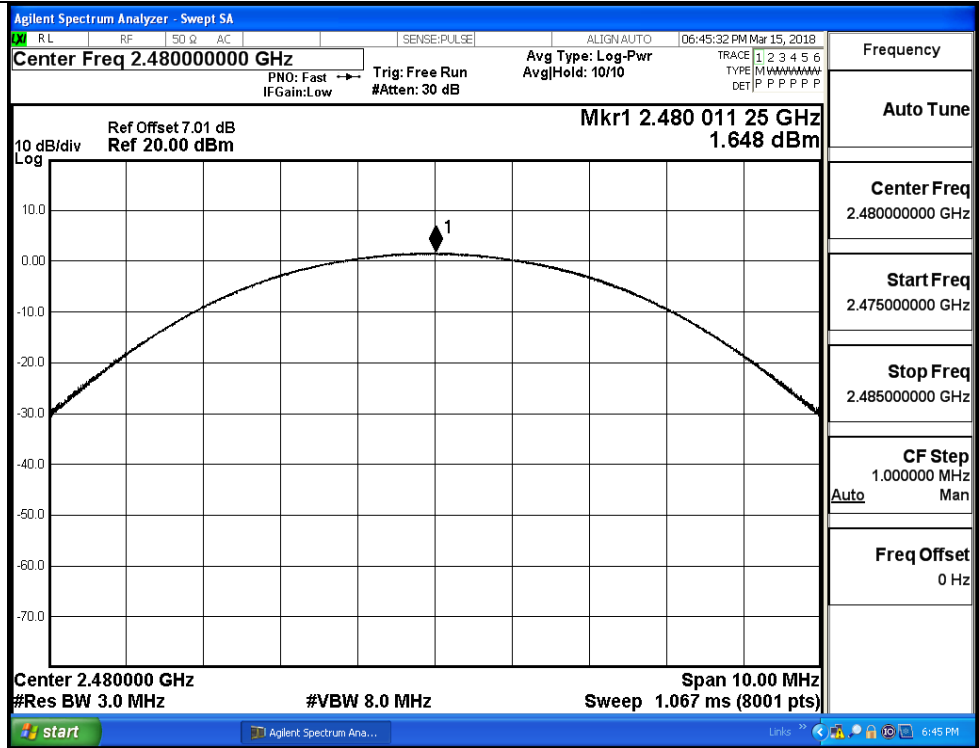
8DPSK/LCH



8DPSK/MCH

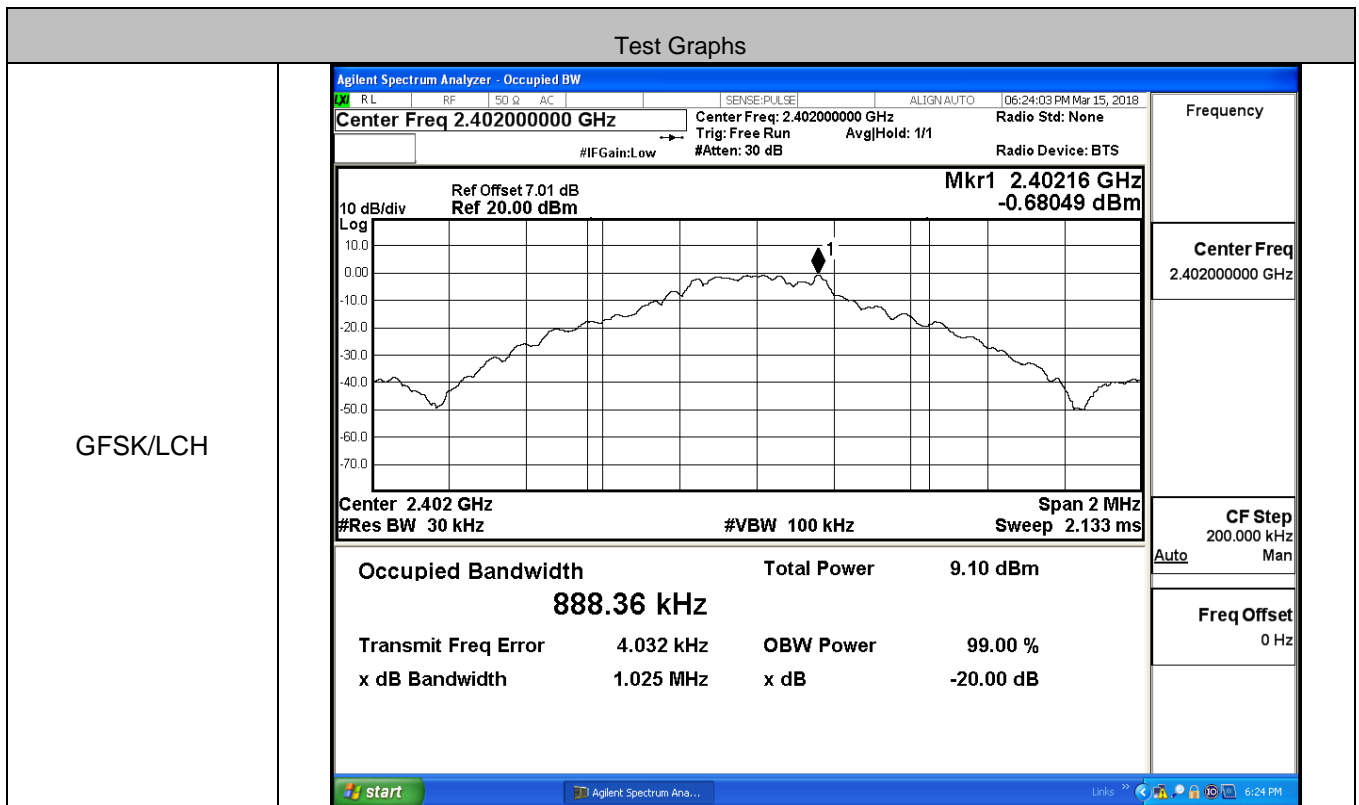


8DPSK/HCH

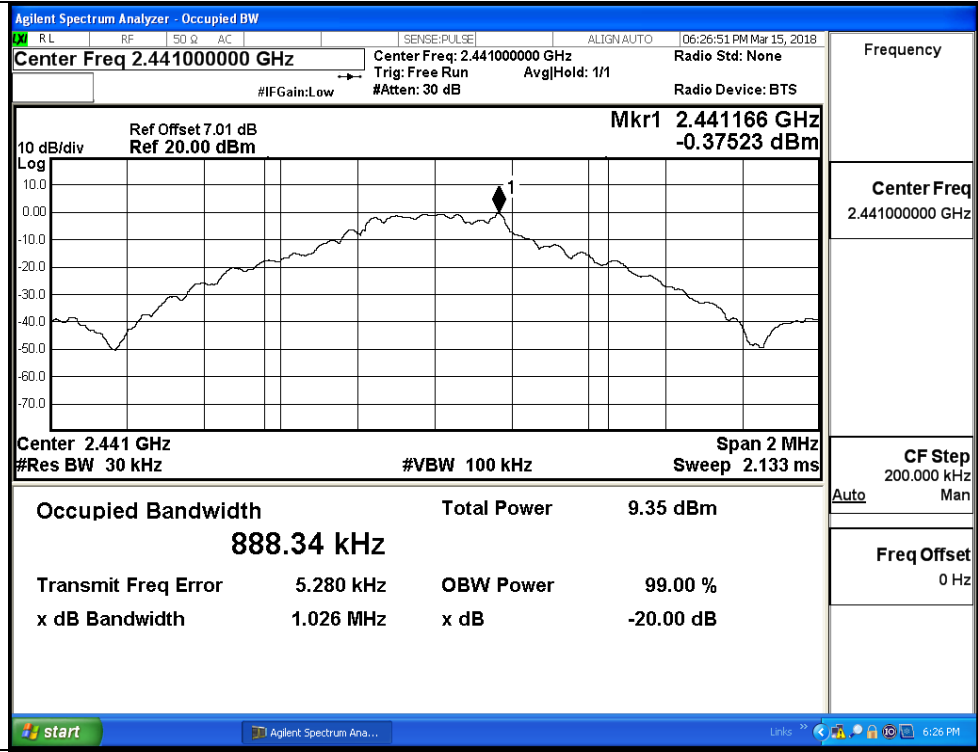


A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.025	Not Specified	PASS
	MCH	1.026	Not Specified	PASS
	HCH	0.9690	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.288	Not Specified	PASS
	MCH	1.289	Not Specified	PASS
	HCH	1.309	Not Specified	PASS
8DPSK	LCH	1.292	Not Specified	PASS
	MCH	1.290	Not Specified	PASS
	HCH	1.291	Not Specified	PASS

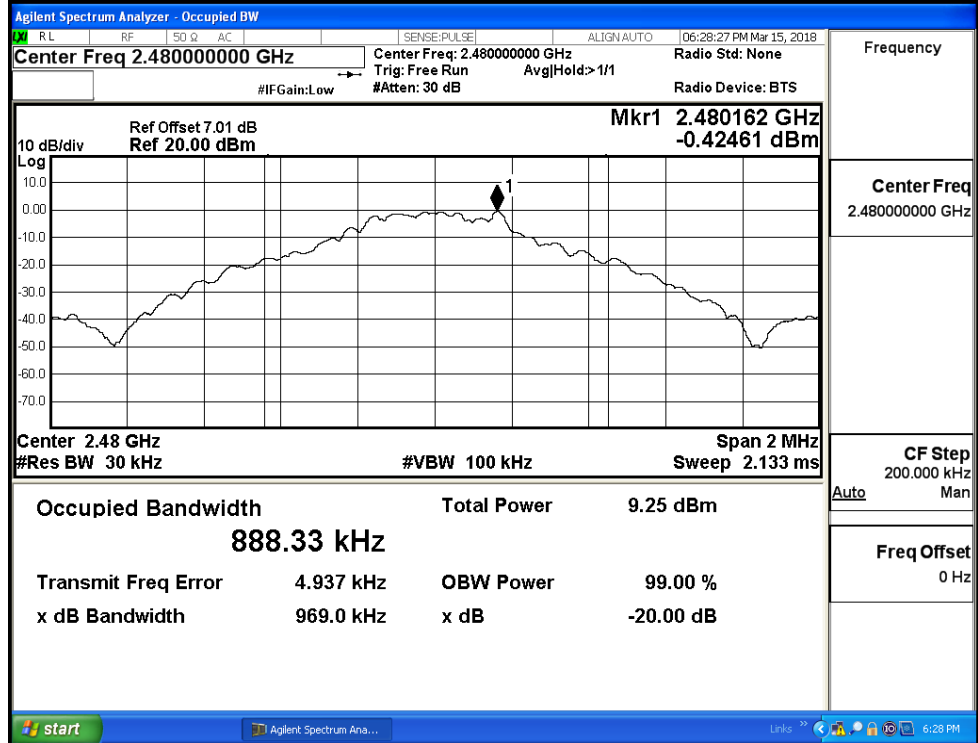


GFSK/MCH



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

GFSK/HCH

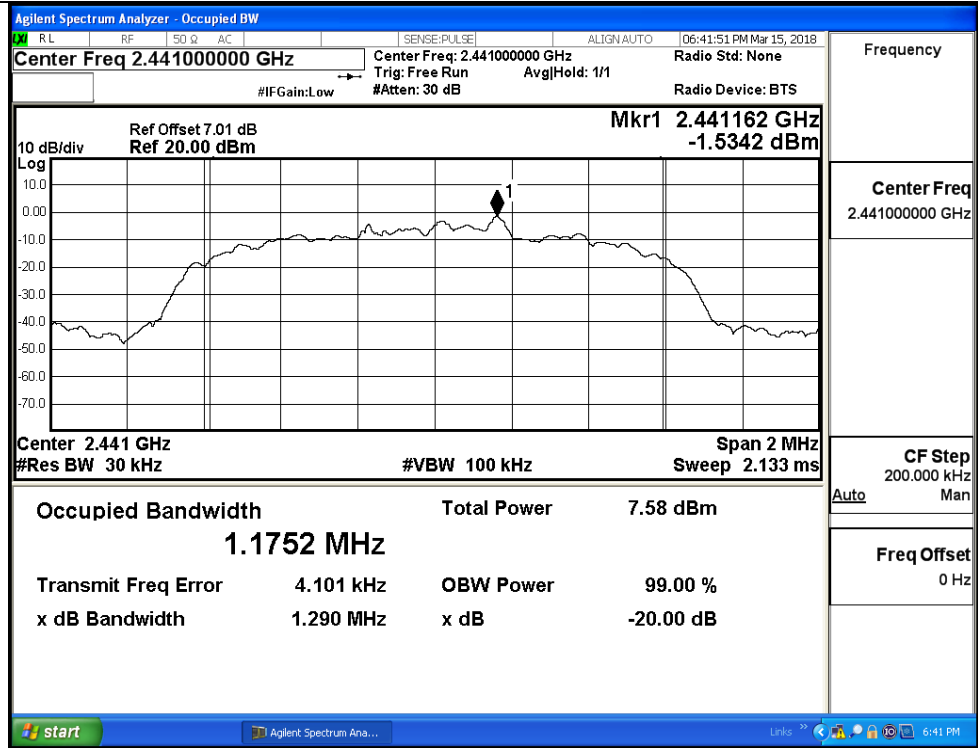


Frequency	2.480000000 GHz
Center Freq	2.480000000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

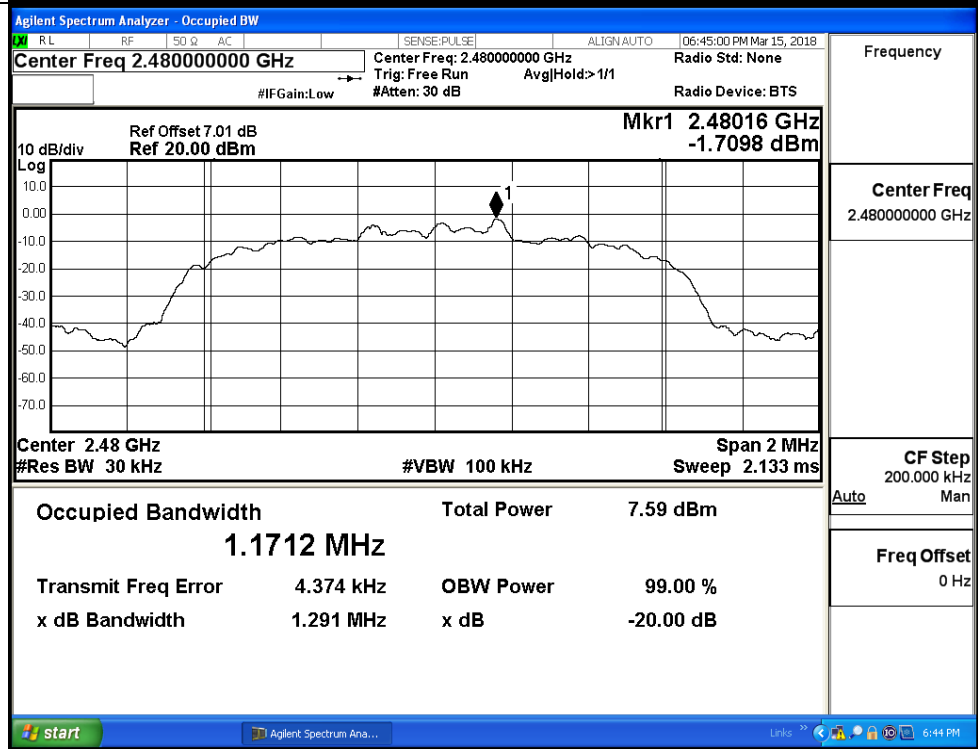
<p>π/4DQPSK/LCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.40200000 GHz</p> <p>Mkr1 2.402166 GHz -1.9397 dBm</p> <p>Occupied Bandwidth 1.1677 MHz</p> <p>Total Power 8.11 dBm</p> <p>Transmit Freq Error 192 Hz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.288 MHz</p> <p>x dB -20.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.40200000 GHz</p> <p>CF Step 200.000 kHz</p> <p>Freq Offset 0 Hz</p>
<p>π/4DQPSK/MCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.44100000 GHz</p> <p>Mkr1 2.441164 GHz -2.2169 dBm</p> <p>Occupied Bandwidth 1.1683 MHz</p> <p>Total Power 7.95 dBm</p> <p>Transmit Freq Error 86 Hz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.289 MHz</p> <p>x dB -20.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.44100000 GHz</p> <p>CF Step 200.000 kHz</p> <p>Freq Offset 0 Hz</p>

<p>π/4DQPSK/HCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.48000000 GHz</p> <p>Mkr1 2.48002 GHz -2.7651 dBm</p> <p>Occupied Bandwidth 1.1674 MHz</p> <p>Total Power 7.82 dBm</p> <p>Transmit Freq Error 583 Hz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.309 MHz</p> <p>x dB -20.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.48000000 GHz</p> <p>CF Step 200.000 kHz</p> <p>Freq Offset 0 Hz</p>
<p>8DPSK/LCH</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.40200000 GHz</p> <p>Mkr1 2.40216 GHz -1.6810 dBm</p> <p>Occupied Bandwidth 1.1731 MHz</p> <p>Total Power 7.63 dBm</p> <p>Transmit Freq Error 4.030 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.292 MHz</p> <p>x dB -20.00 dB</p>	<p>Frequency</p> <p>Center Freq 2.40200000 GHz</p> <p>CF Step 200.000 kHz</p> <p>Freq Offset 0 Hz</p>

8DPSK/MCH

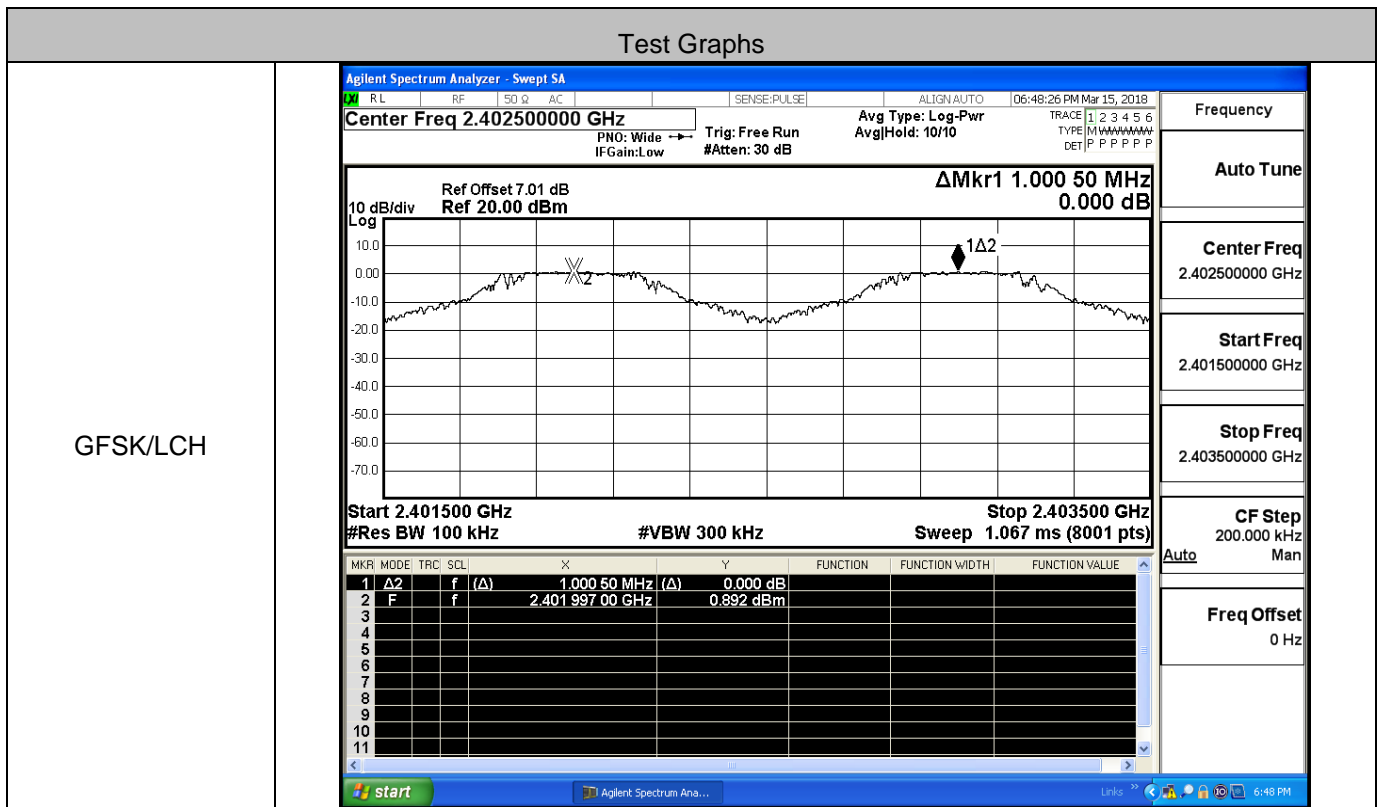


8DPSK/HCH

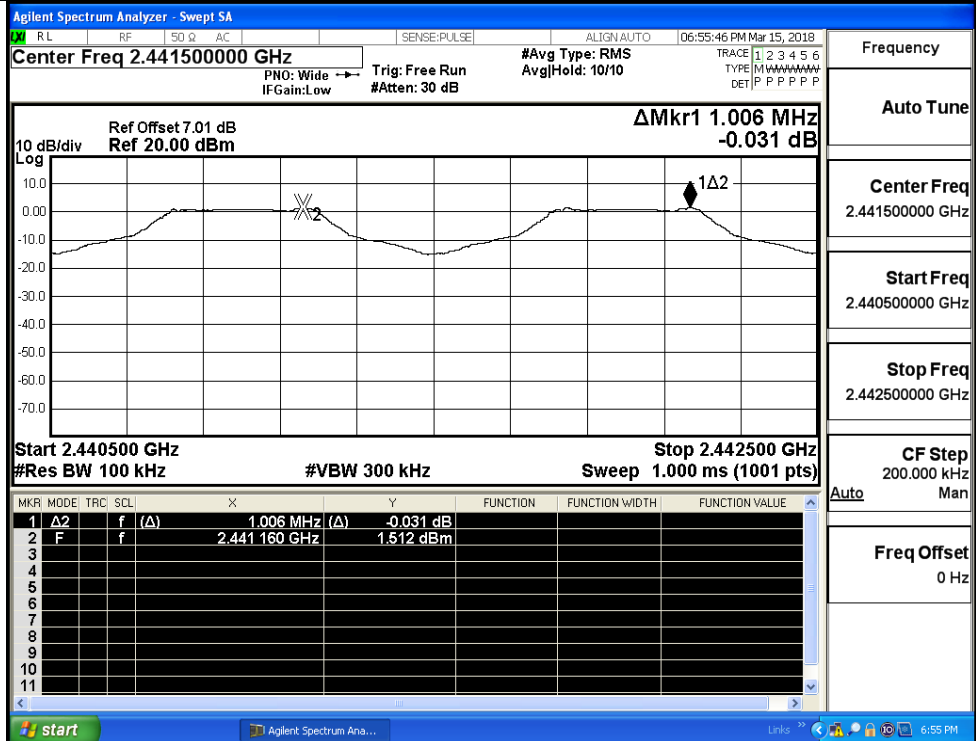


A.3 Carrier Frequency Separation

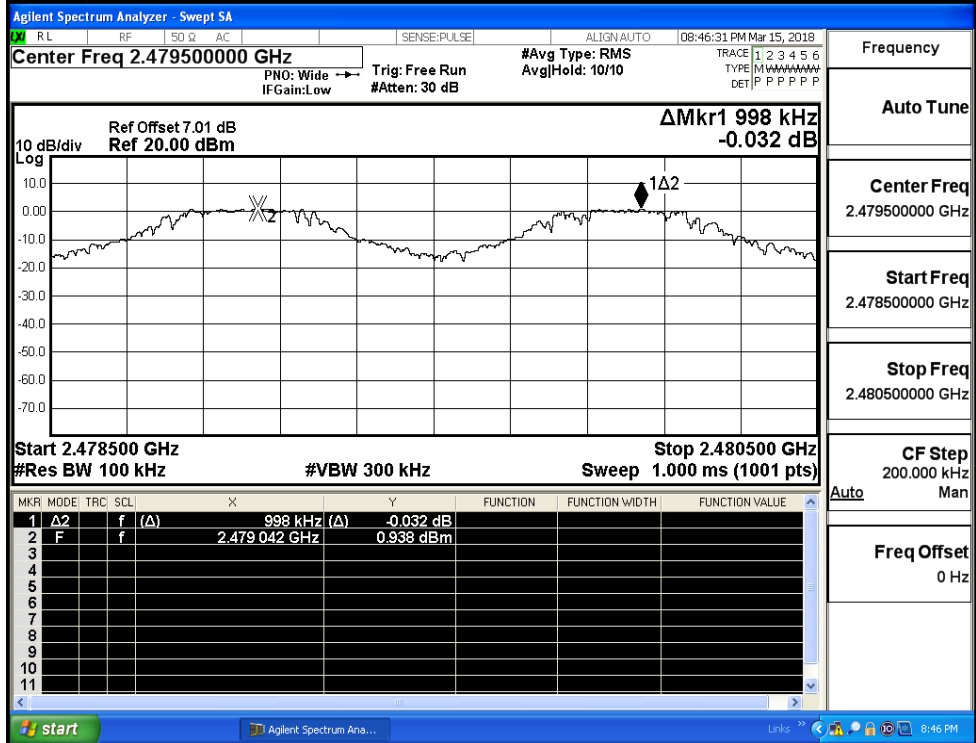
Mode	Channel	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.001	0.684	PASS
	MCH	1.006	0.684	PASS
	HCH	0.998	0.684	PASS
π/4DQPSK	LCH	1.012	0.873	PASS
	MCH	1.346	0.873	PASS
	HCH	1.270	0.873	PASS
8DPSK	LCH	1.000	0.861	PASS
	MCH	1.056	0.861	PASS
	HCH	1.076	0.861	PASS



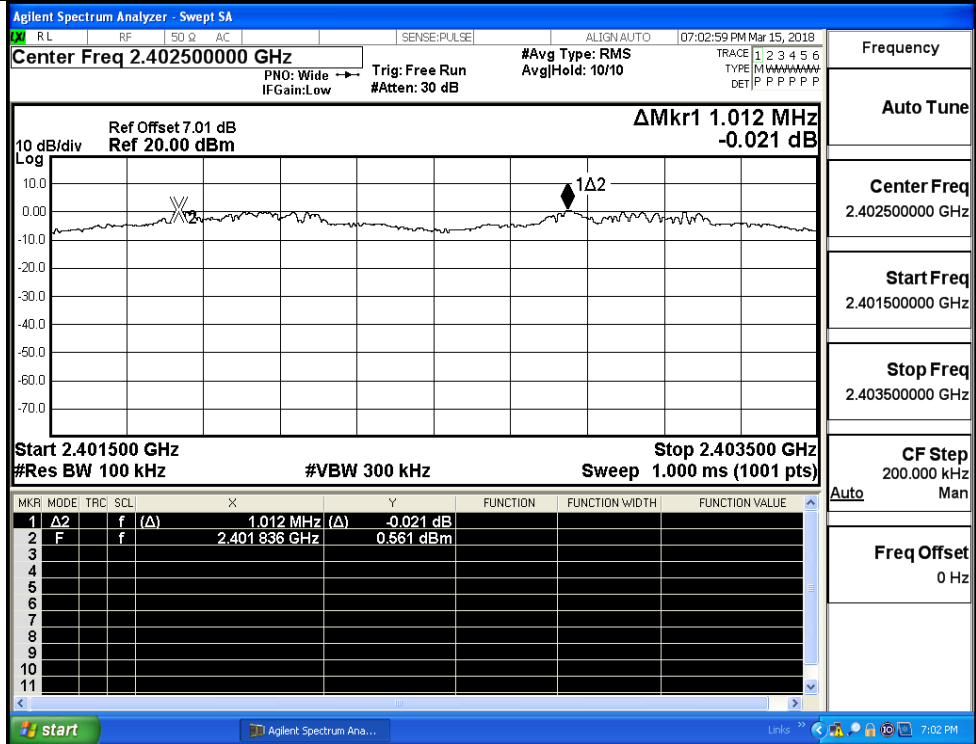
GFSK/MCH



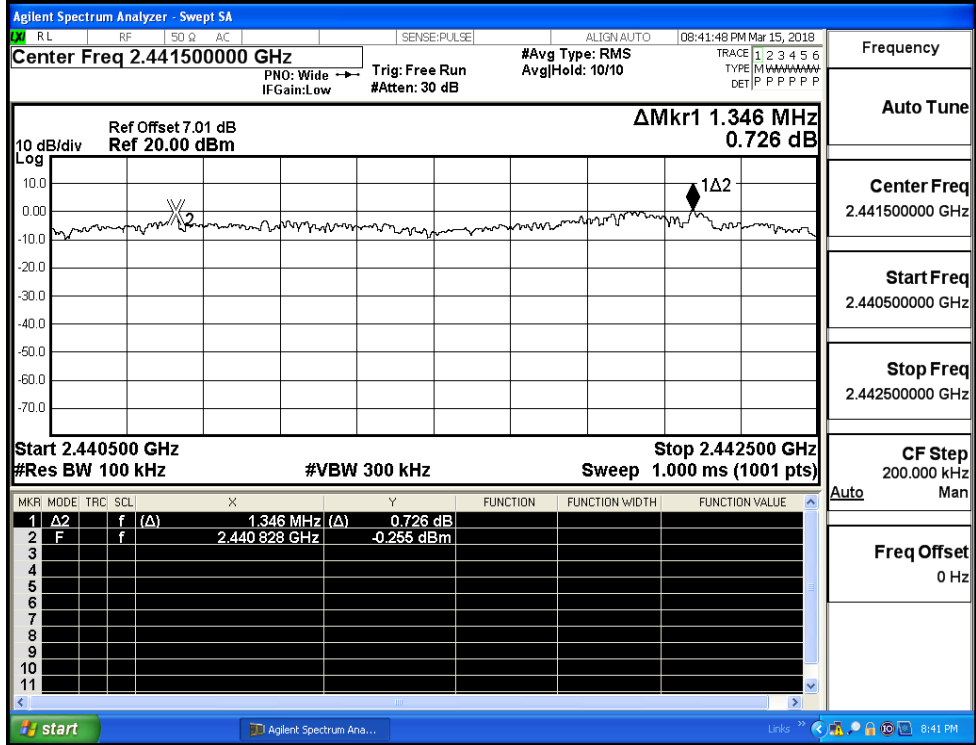
GFSK/HCH



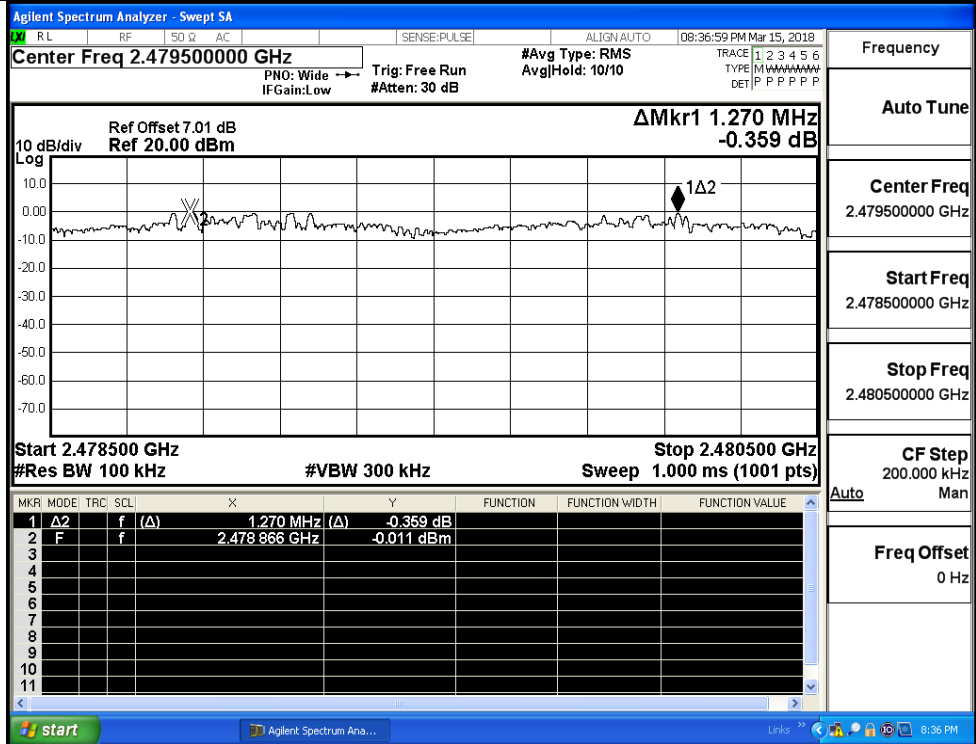
$\pi/4$ DQPSK/LCH



$\pi/4$ DQPSK/MCH



π/4DQPSK/HCH



Frequency

Auto Tune

Center Freq
2.479500000 GHz

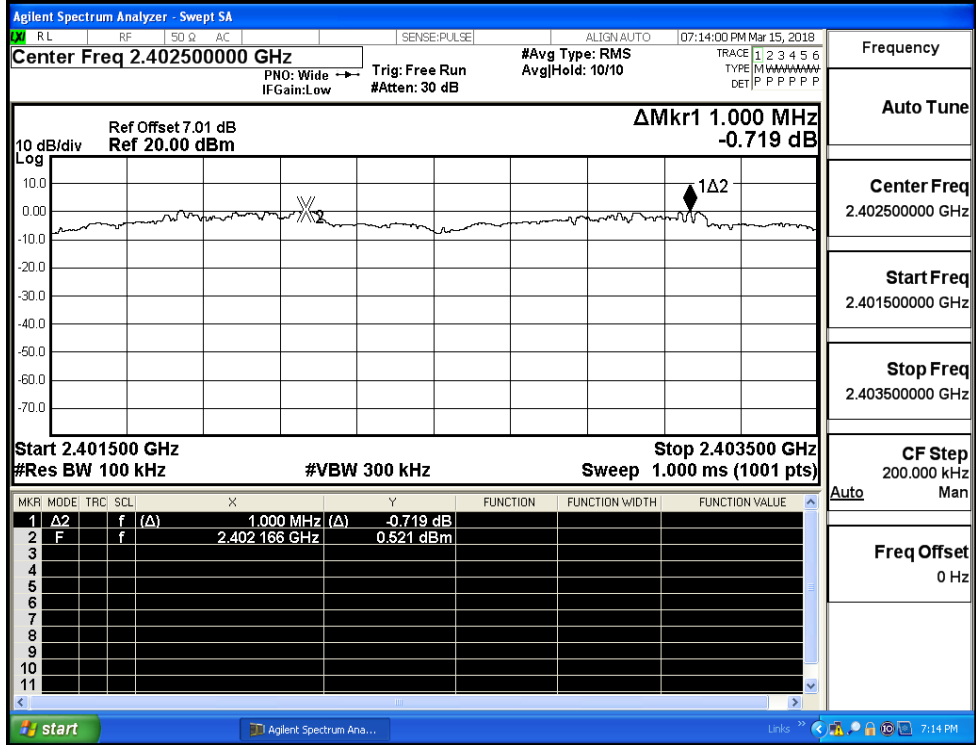
Start Freq
2.478500000 GHz

Stop Freq
2.480500000 GHz

CF Step
200.000 kHz
Man

Freq Offset
0 Hz

8DPSK/LCH



Frequency

Auto Tune

Center Freq
2.402500000 GHz

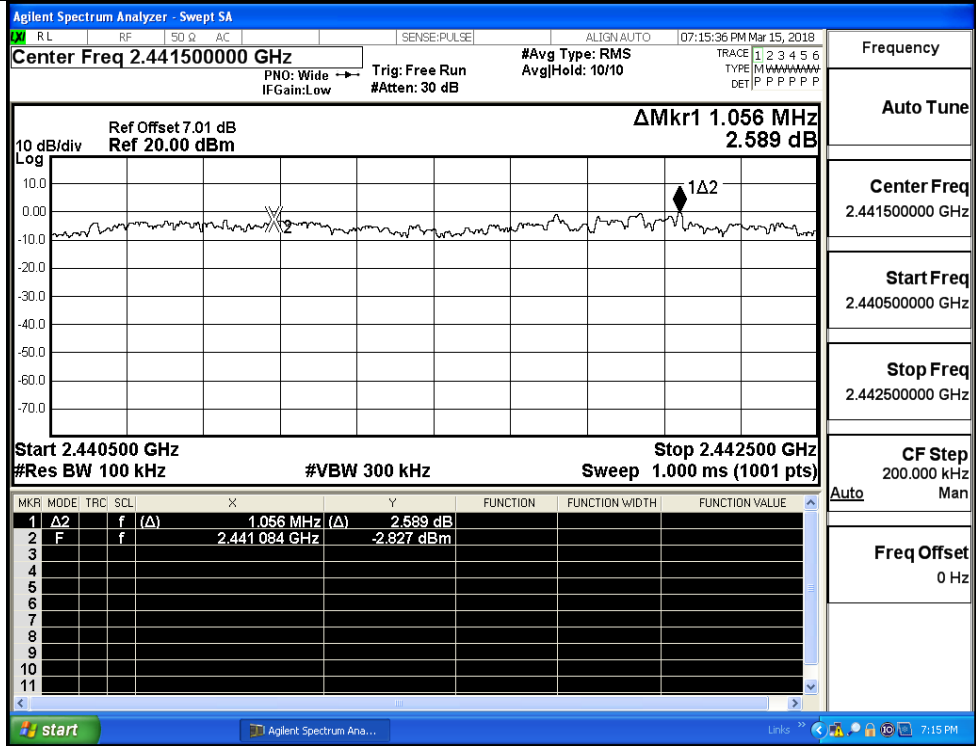
Start Freq
2.401500000 GHz

Stop Freq
2.403500000 GHz

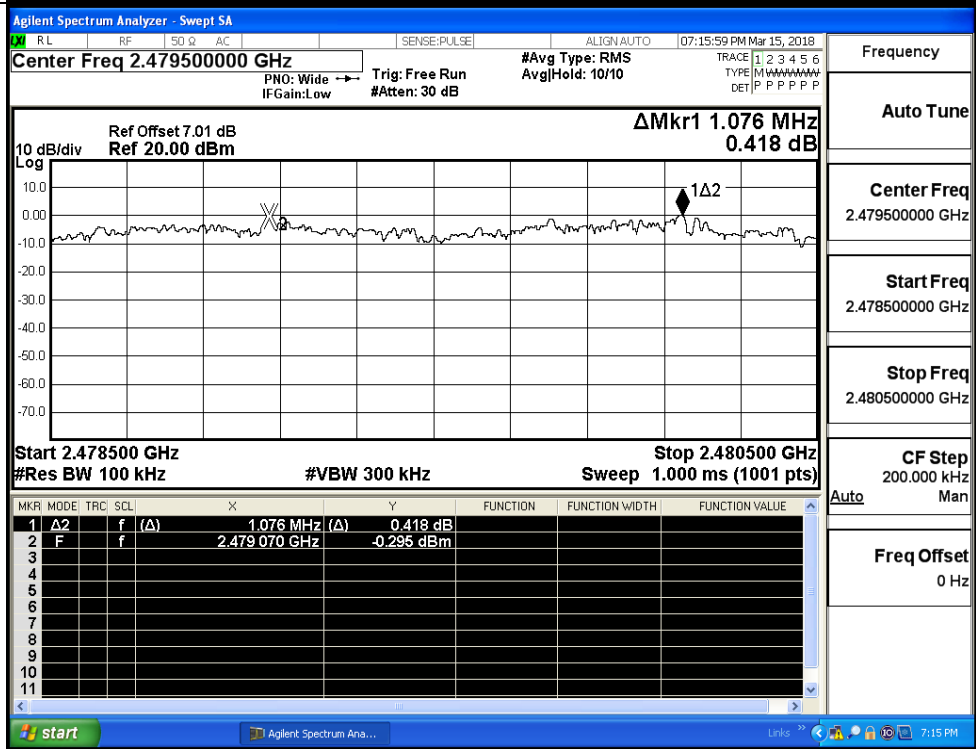
CF Step
200.000 kHz
Man

Freq Offset
0 Hz

8DPSK/MCH



8DPSK/HCH



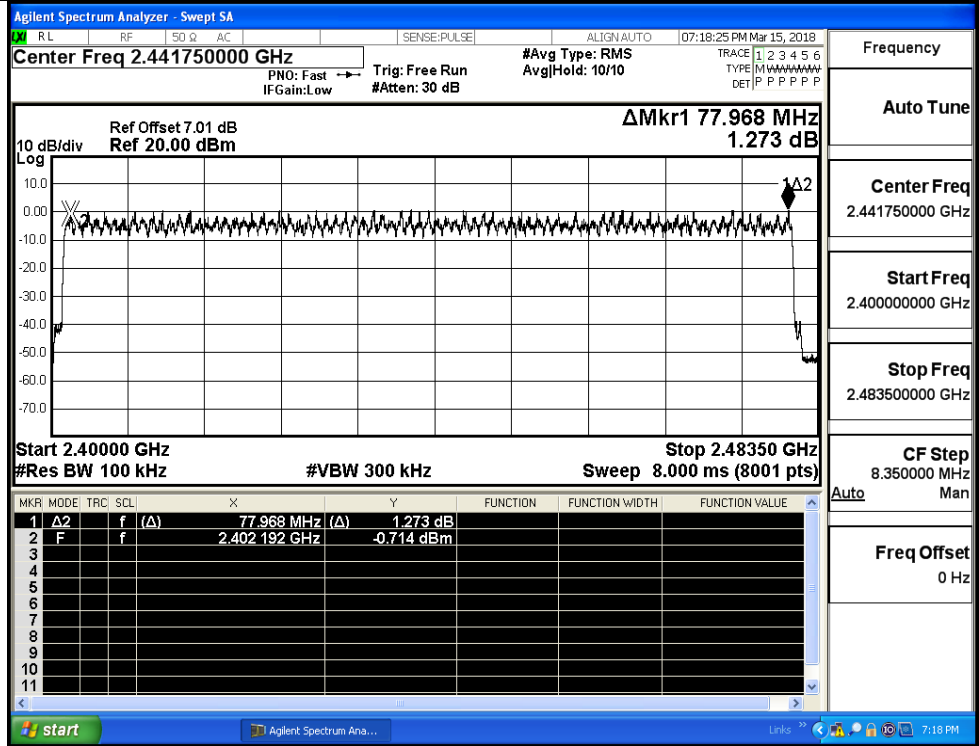
A.4 Hopping Channel Number

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

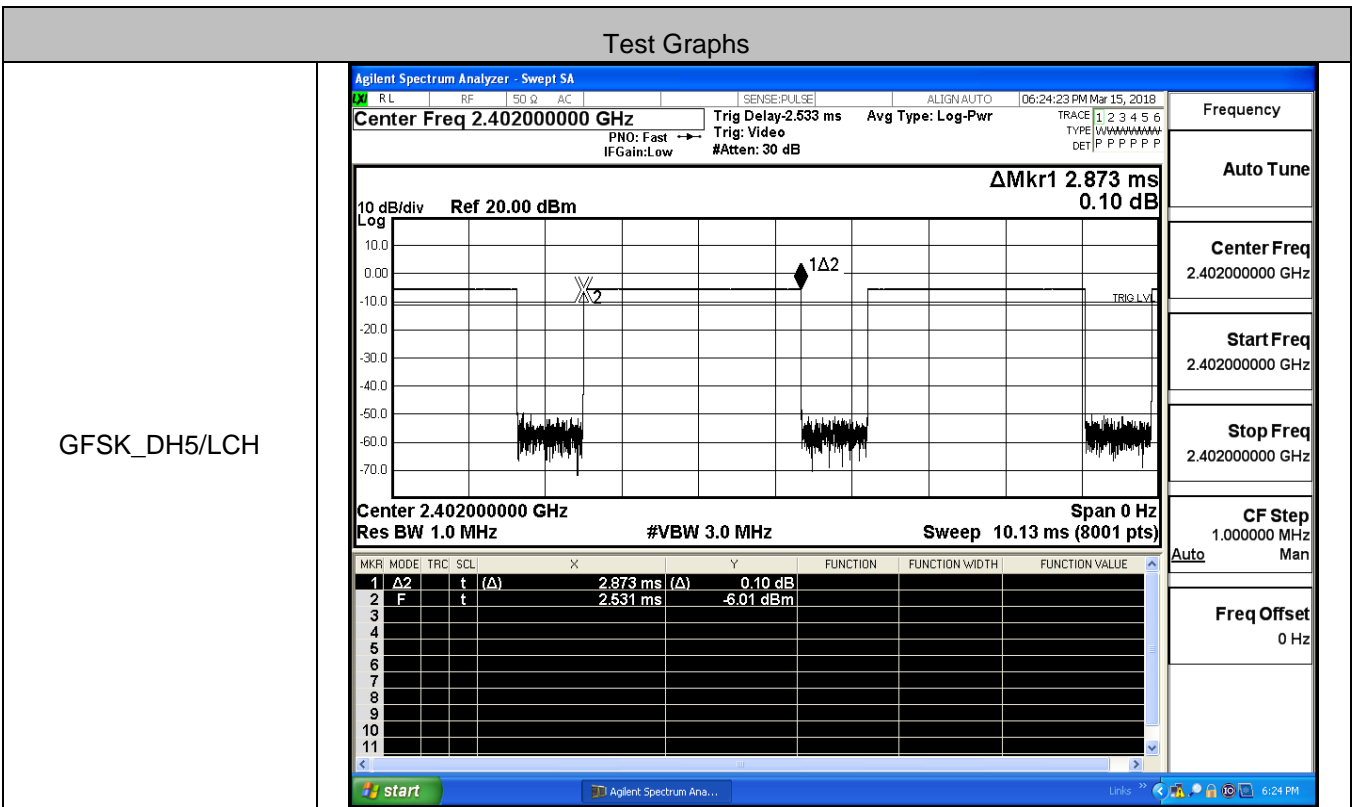
<p>GFSK/Hop</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.441750000 GHz</p> <p>Ref Offset 7.01 dB Ref 20.00 dBm</p> <p>ΔMkr1 78.041 MHz 0.144 dB</p> <p>Start 2.40000 GHz #Res BW 100 kHz</p> <p>Stop 2.48350 GHz #VBW 300 kHz Sweep 8.000 ms (8001 pts)</p> <table border="1"> <thead> <tr> <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>78.041 MHz (Δ)</td> <td>0.144 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.401962 GHz</td> <td>1.151 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	78.041 MHz (Δ)	0.144 dB				2	F	f		2.401962 GHz	1.151 dBm			
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	Δ 2	f	(Δ)	78.041 MHz (Δ)	0.144 dB																							
2	F	f		2.401962 GHz	1.151 dBm																							
<p>$\pi/4$DQPSK/Hop</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.441750000 GHz</p> <p>Ref Offset 7.01 dB Ref 20.00 dBm</p> <p>ΔMkr1 77.999 MHz -0.066 dB</p> <p>Start 2.40000 GHz #Res BW 100 kHz</p> <p>Stop 2.48350 GHz #VBW 300 kHz Sweep 8.000 ms (8001 pts)</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>77.999 MHz (Δ)</td> <td>-0.066 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.401853 GHz</td> <td>0.264 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	77.999 MHz (Δ)	-0.066 dB				2	F	f		2.401853 GHz	0.264 dBm			
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	Δ 2	f	(Δ)	77.999 MHz (Δ)	-0.066 dB																							
2	F	f		2.401853 GHz	0.264 dBm																							

8DPSK/Hop

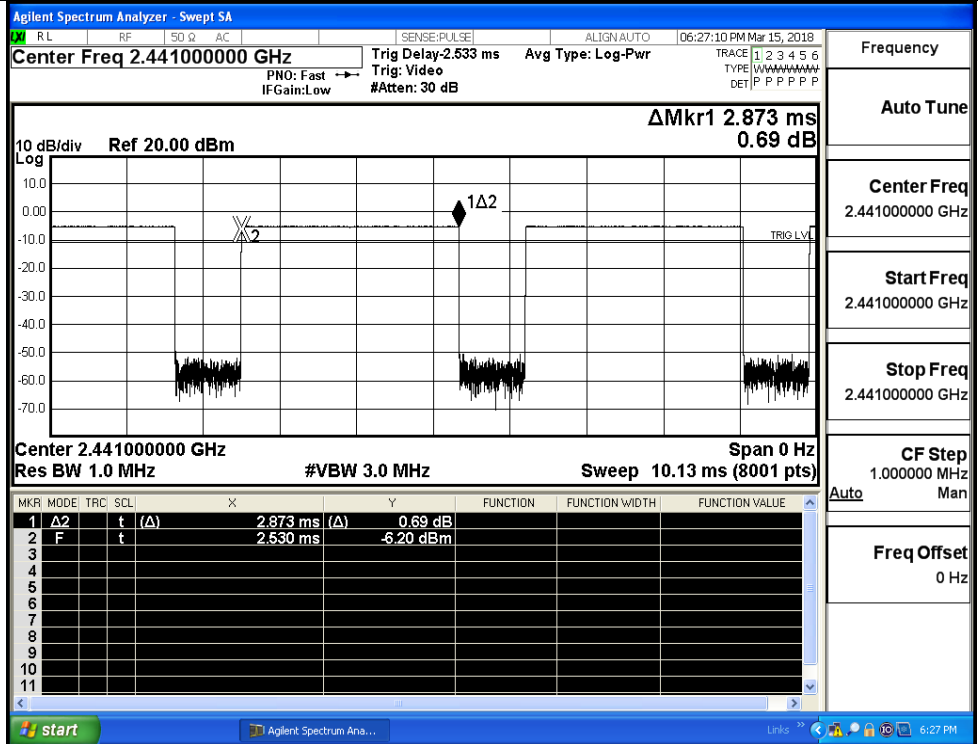


A.5 Dwell Time

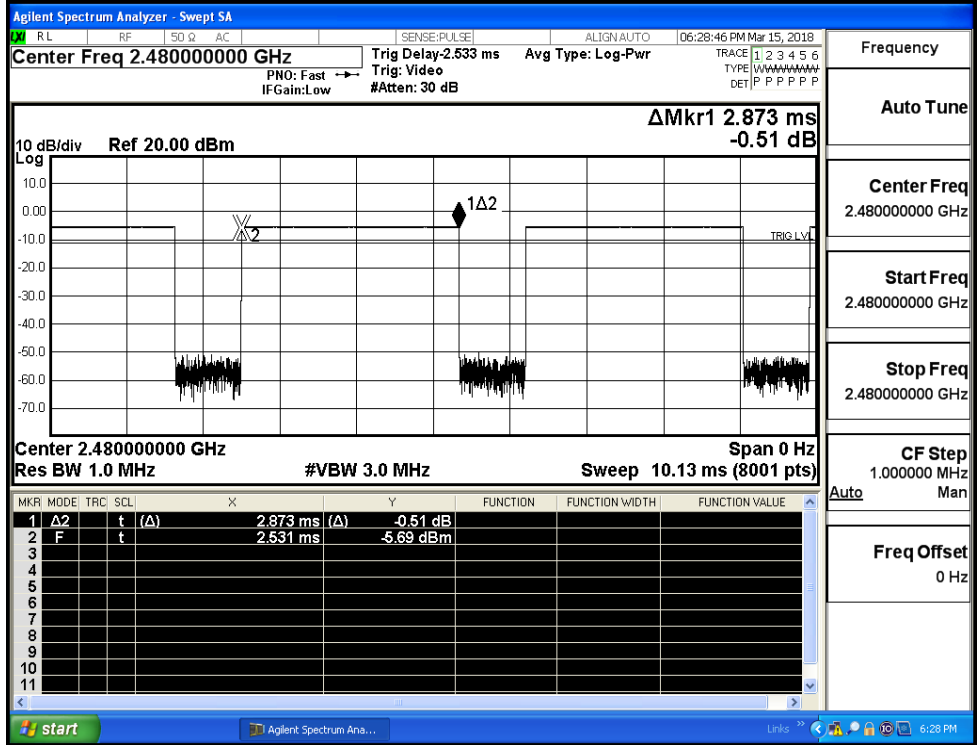
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.87	106.7	0.306	0.4	PASS
	DH5	MCH	2.87	106.7	0.306	0.4	PASS
	DH5	HCH	2.87	106.7	0.306	0.4	PASS
π/4DQPSK	2DH5	LCH	2.87	106.7	0.307	0.4	PASS
	2DH5	MCH	2.87	106.7	0.307	0.4	PASS
	2DH5	HCH	2.87	106.7	0.307	0.4	PASS
8DPSK	3DH5	LCH	2.87	106.7	0.307	0.4	PASS
	3DH5	MCH	2.87	106.7	0.307	0.4	PASS
	3DH5	HCH	2.87	106.7 </td <td>0.307</td> <td>0.4</td> <td>PASS</td>	0.307	0.4	PASS



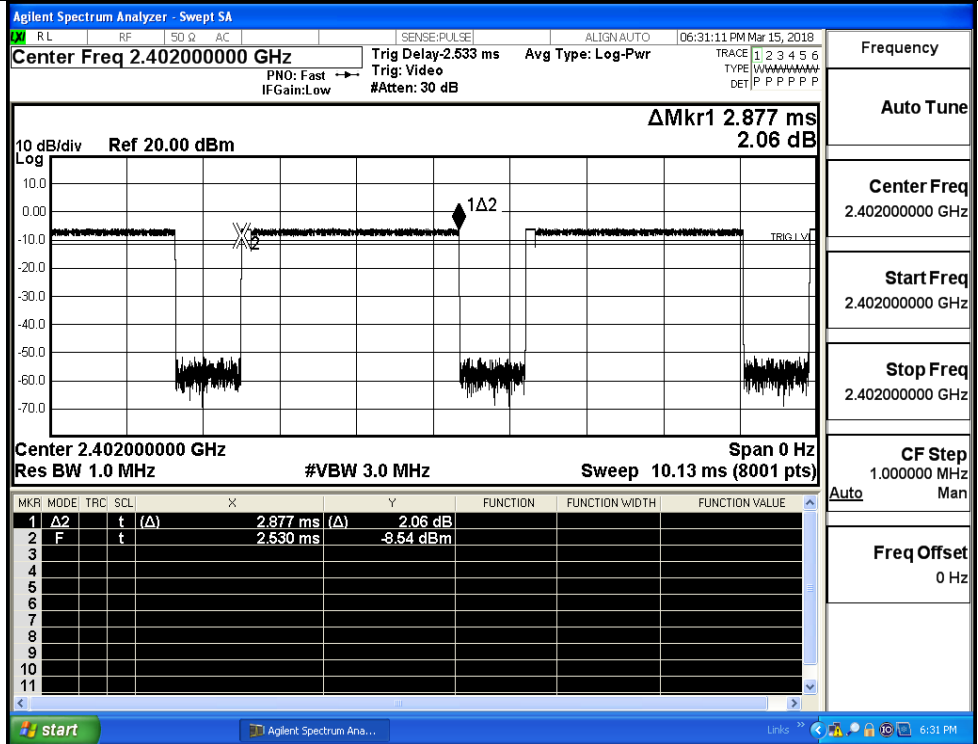
GFSK_DH5/MCH



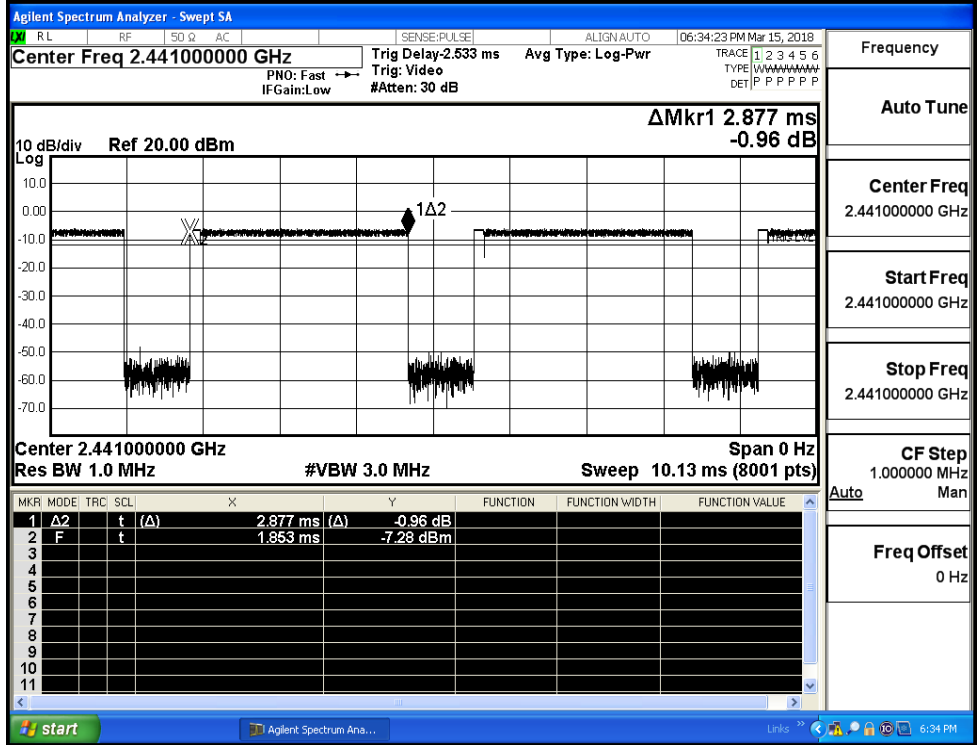
GFSK_DH5/HCH



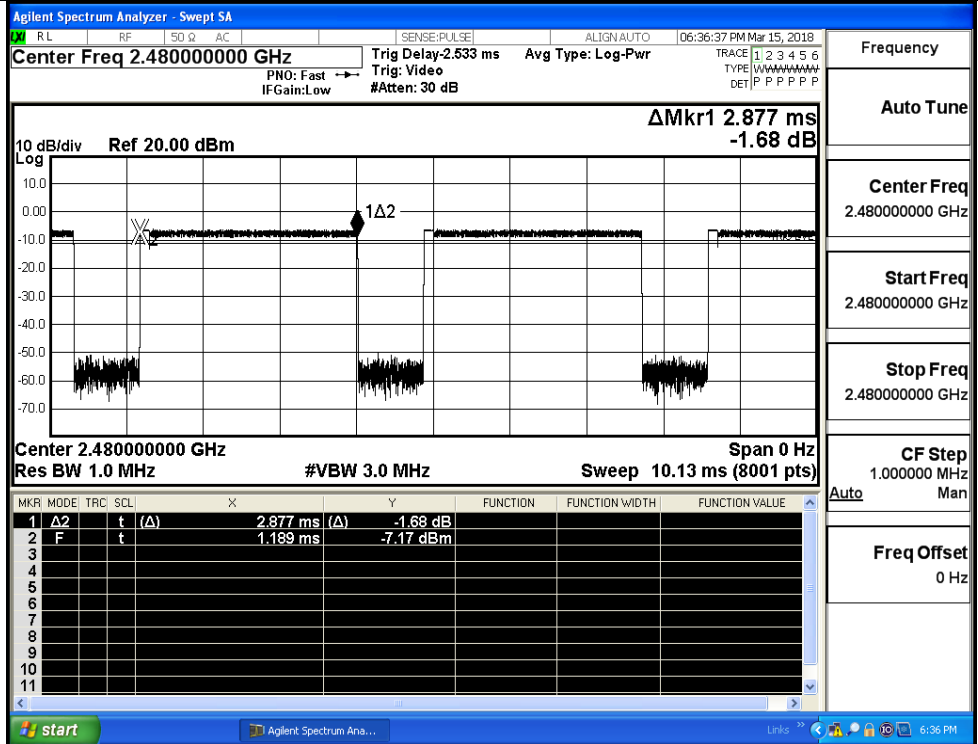
$\pi/4$ DQPSK
_2DH5/LCH



$\pi/4$ DQPSK
_2DH5/MCH

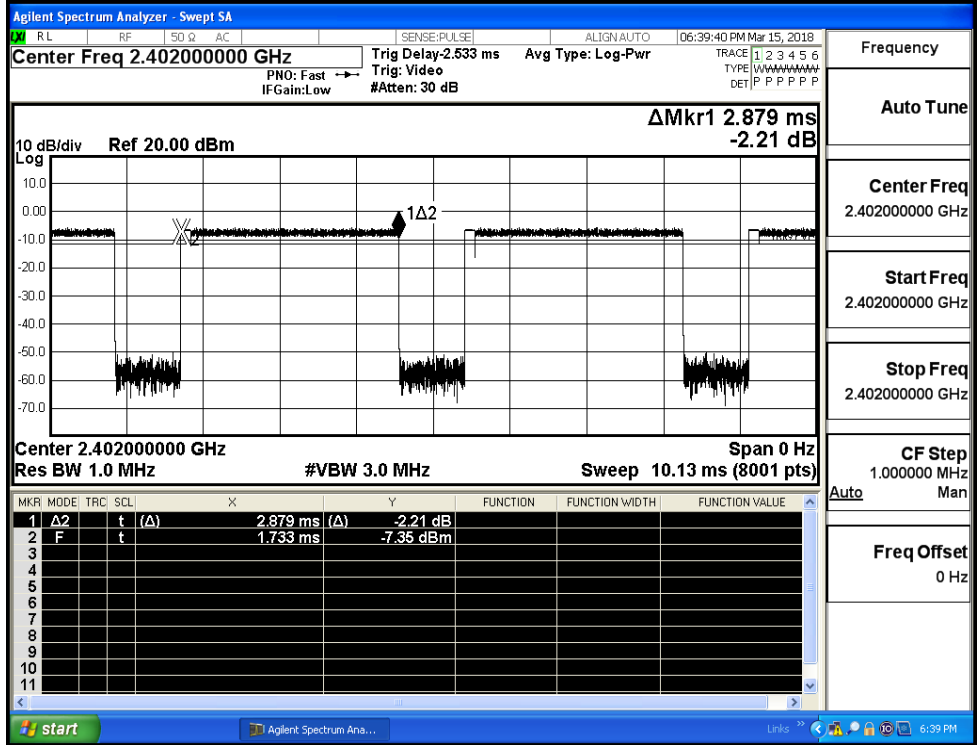


$\pi/4$ DQPSK
_2DH5/HCH



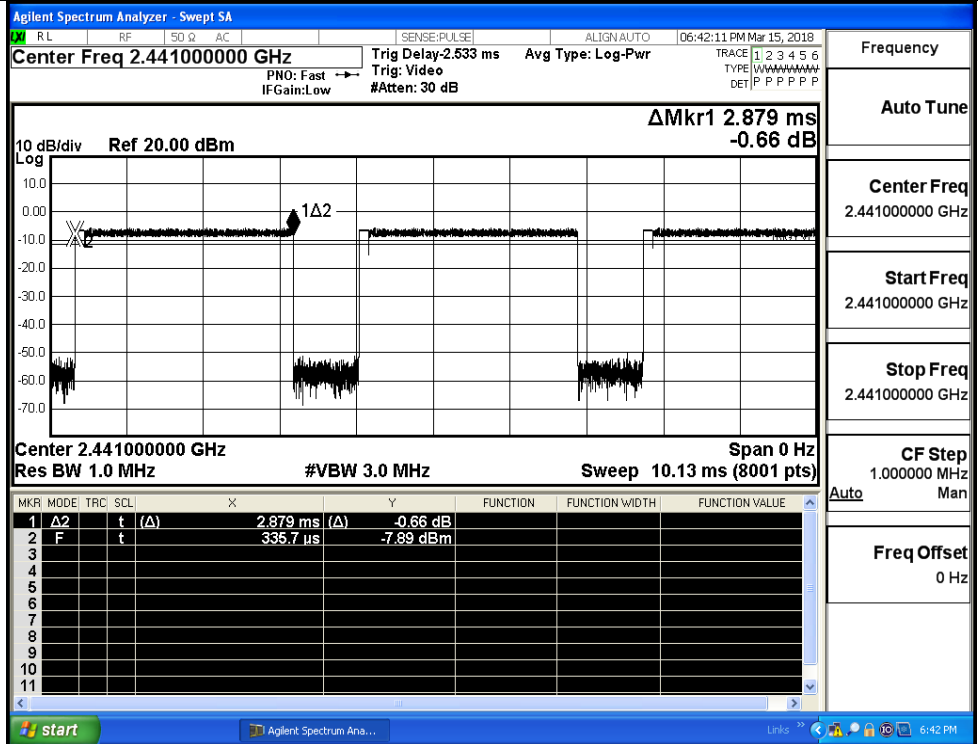
Frequency	2.480000000 GHz
Auto Tune	Auto
Center Freq	2.480000000 GHz
Start Freq	2.480000000 GHz
Stop Freq	2.480000000 GHz
CF Step	1.000000 MHz
Freq Offset	0 Hz

8DPSK_3DH5/LCH

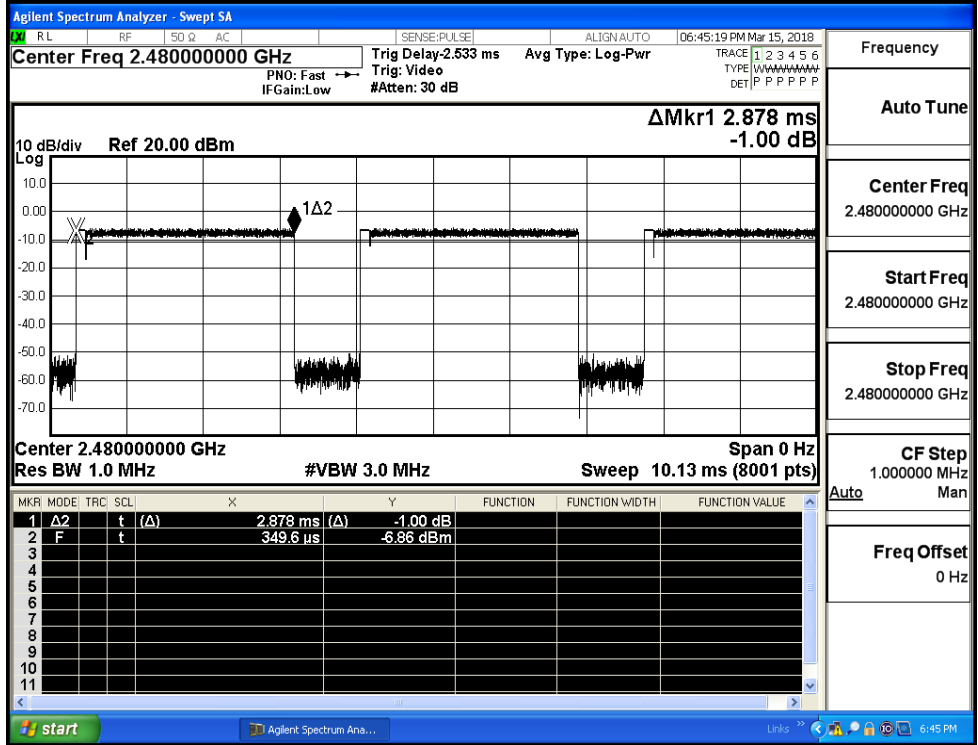


Frequency	2.402000000 GHz
Auto Tune	Auto
Center Freq	2.402000000 GHz
Start Freq	2.402000000 GHz
Stop Freq	2.402000000 GHz
CF Step	1.000000 MHz
Freq Offset	0 Hz

8DPSK_3DH5/MCH

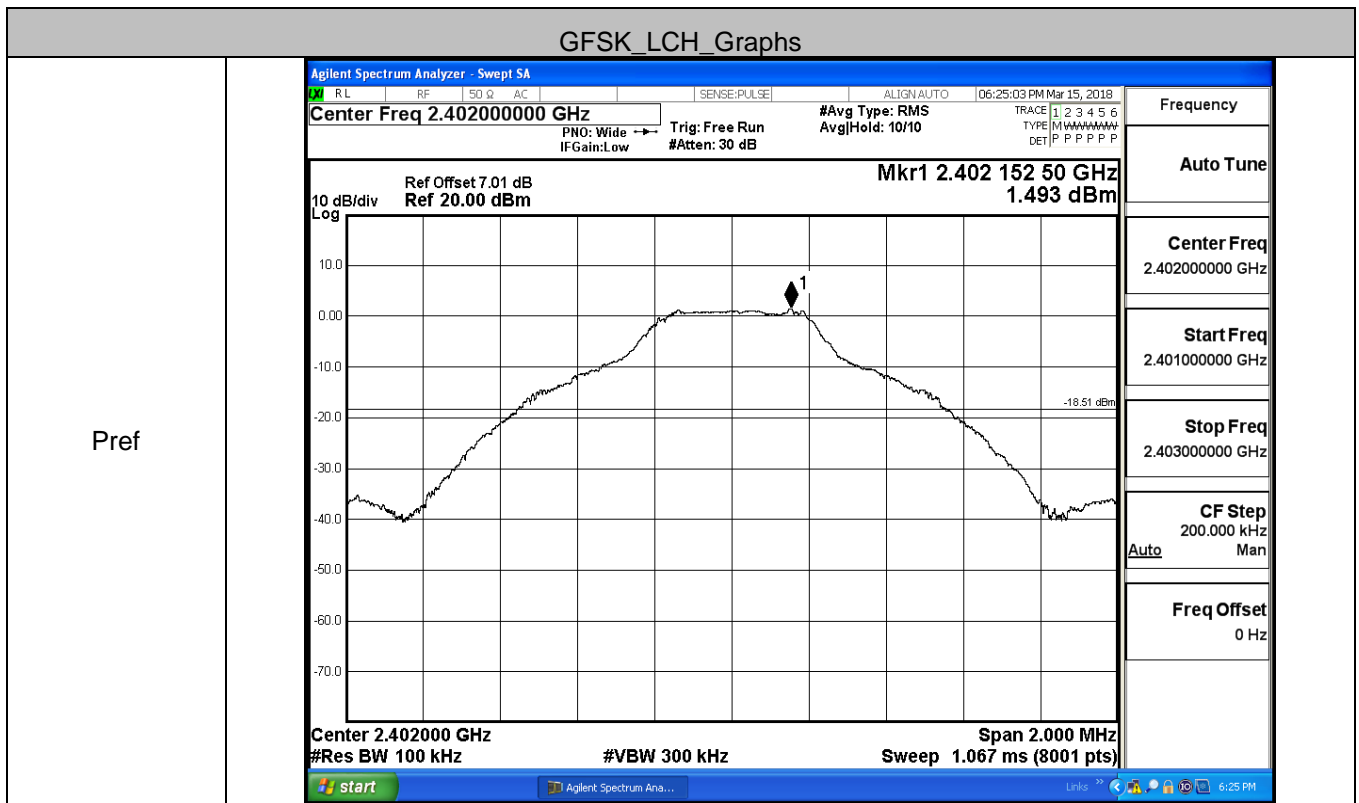


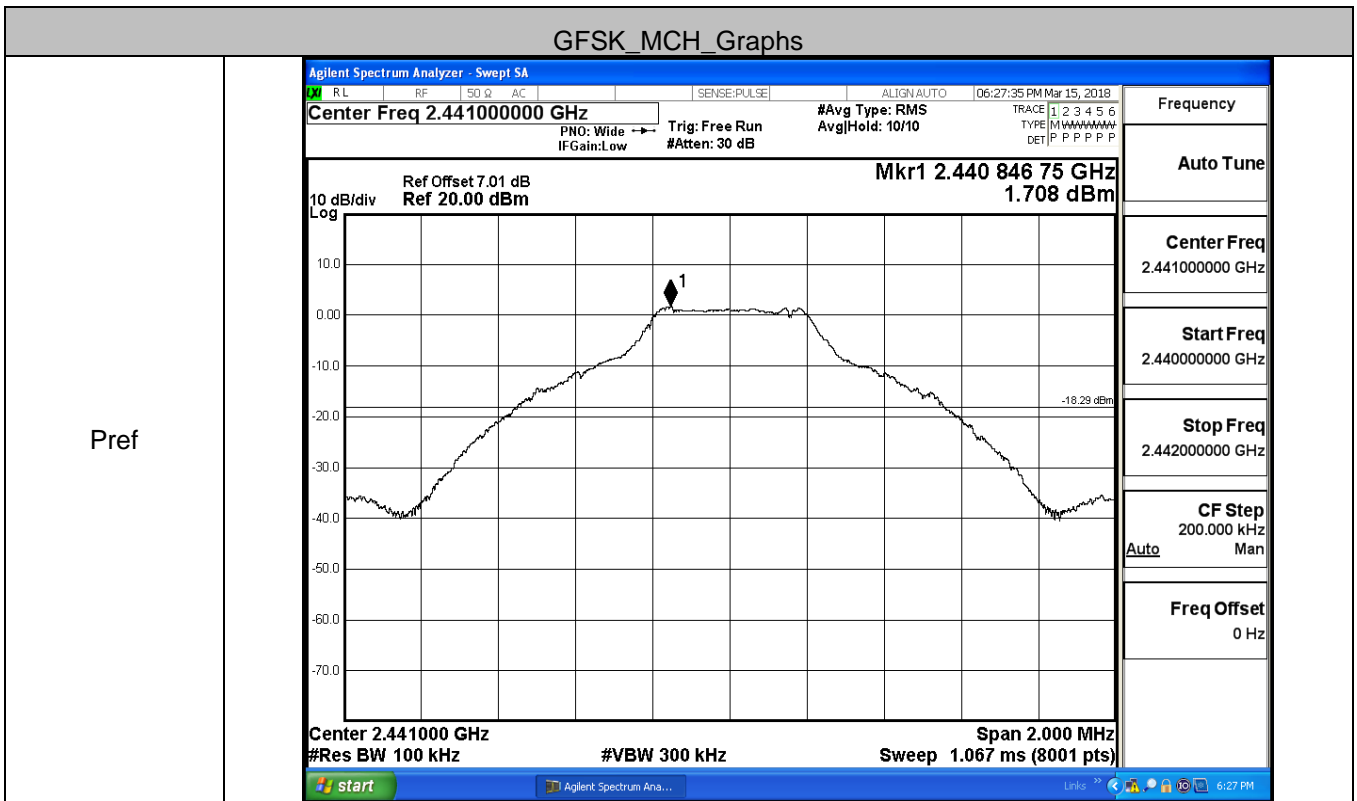
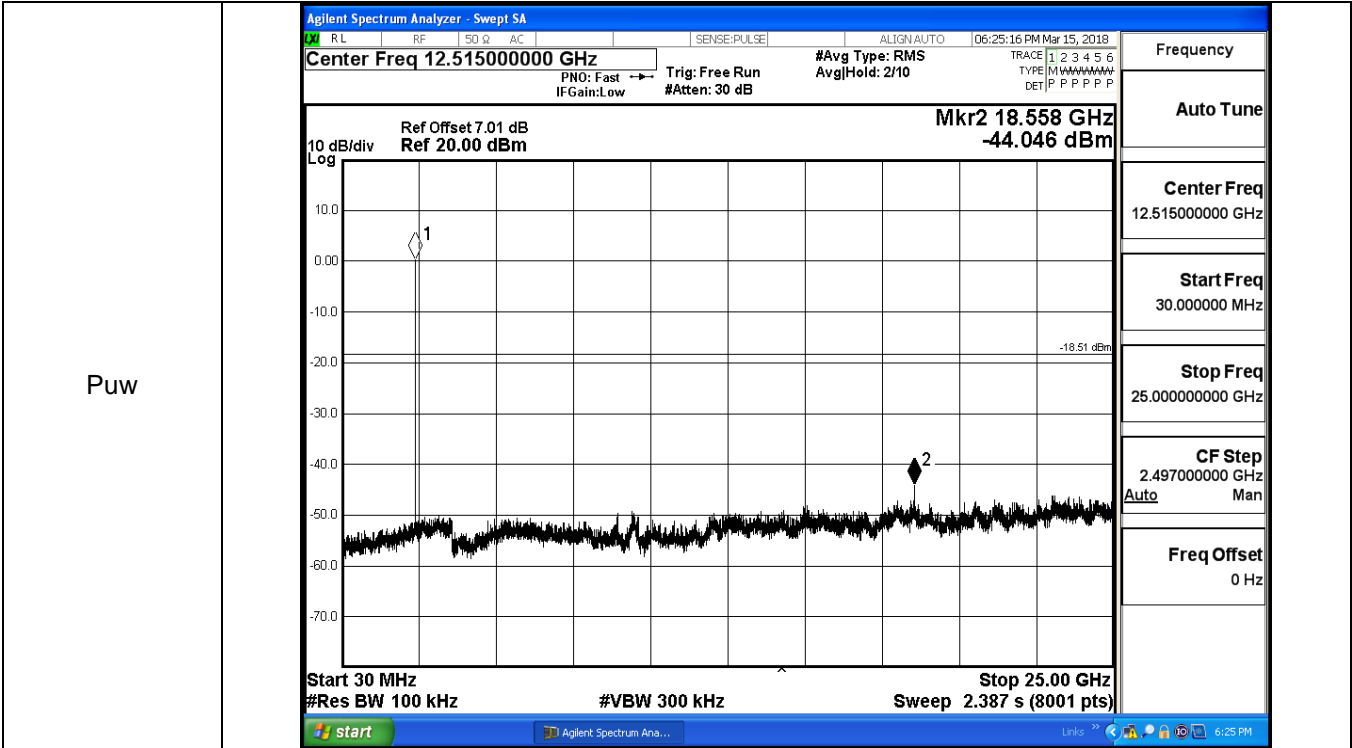
8DPSK_3DH5/HCH

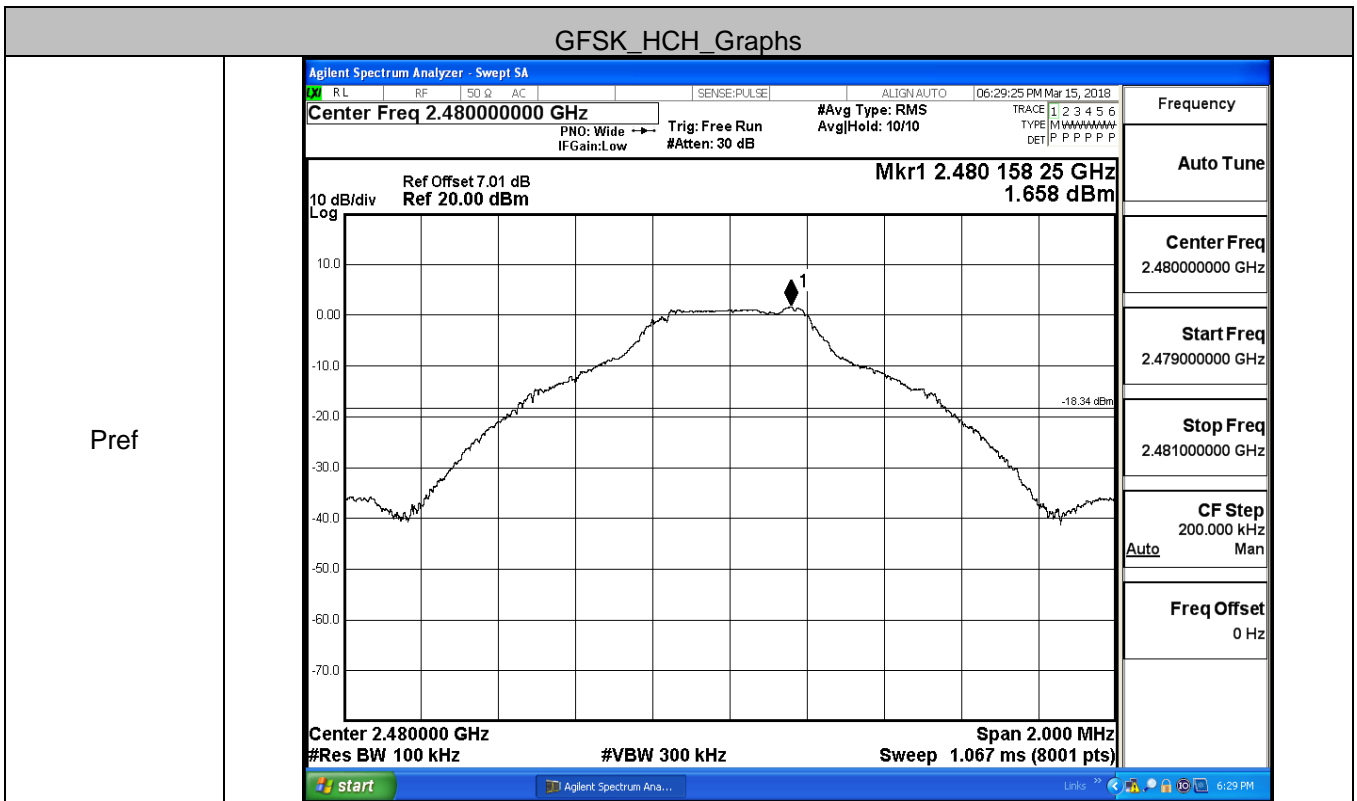
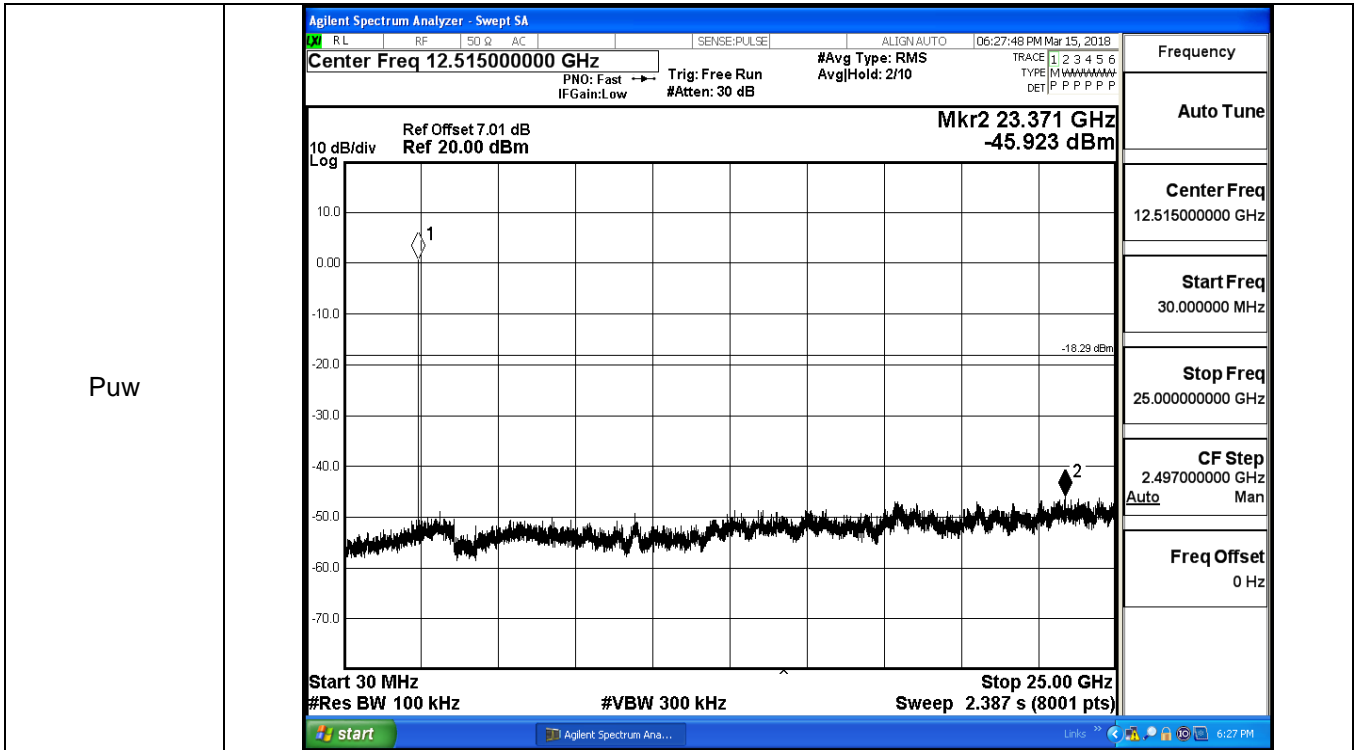


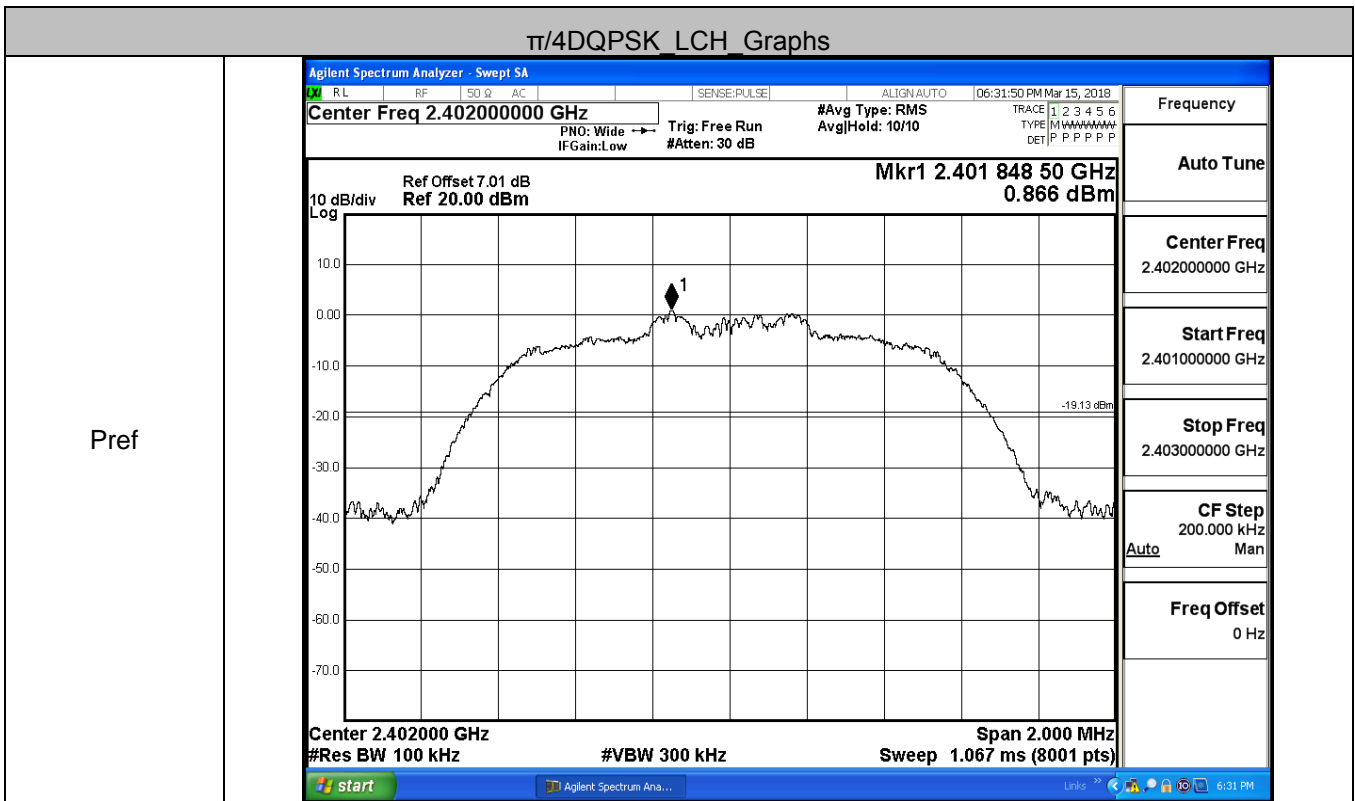
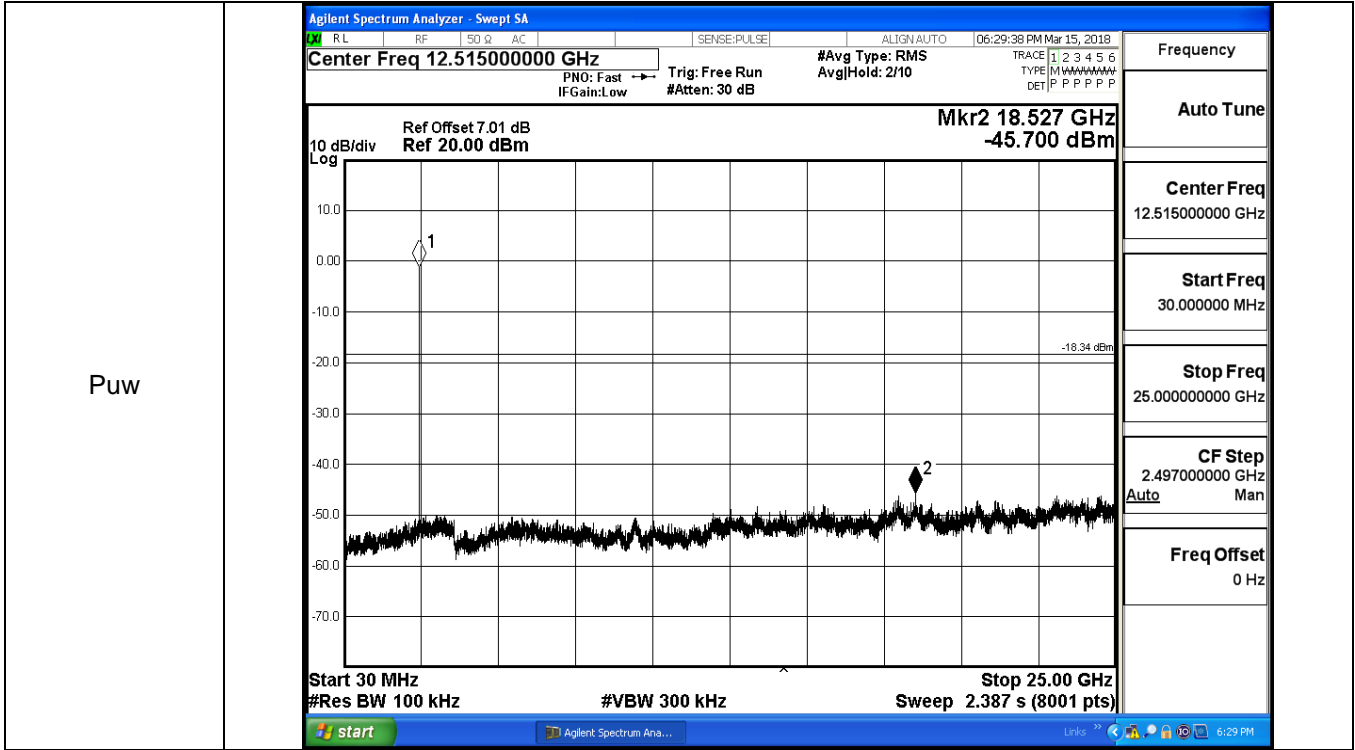
A.6 RF Conducted Spurious Emissions

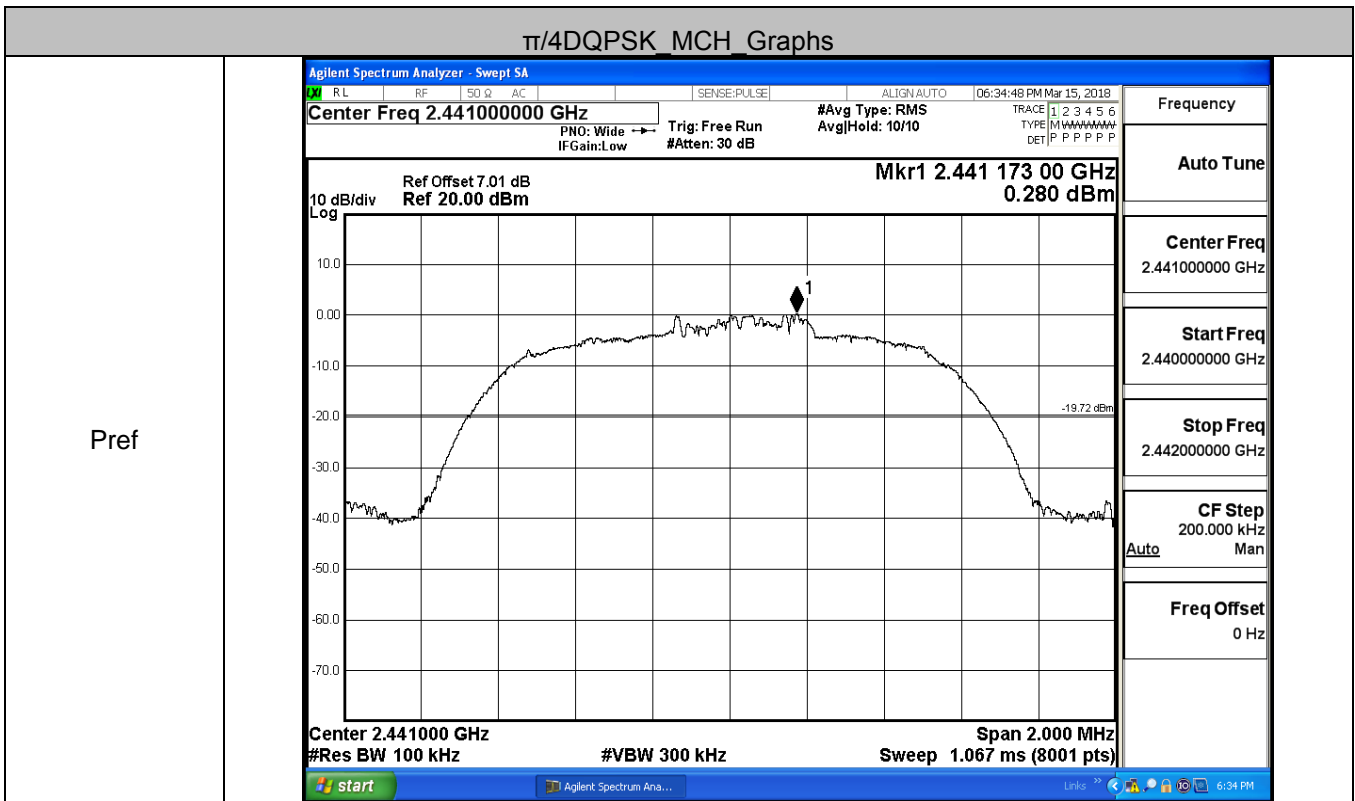
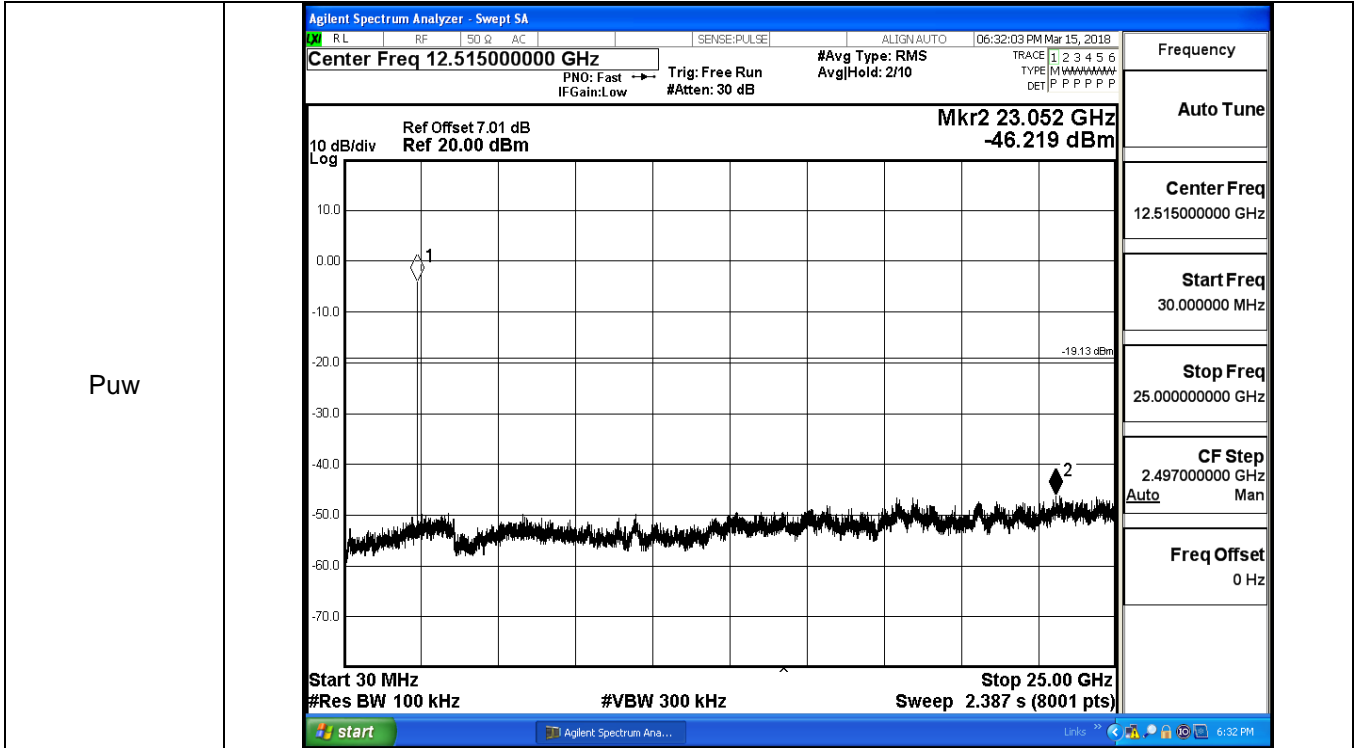
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.493	-44.046	-18.507	PASS
	MCH	1.708	-45.923	-18.292	PASS
	HCH	1.658	-45.700	-18.342	PASS
π /4DQPSK	LCH	0.866	-46.219	-19.134	PASS
	MCH	0.28	-45.408	-19.720	PASS
	HCH	0.326	-45.017	-19.674	PASS
8DPSK	LCH	0.494	-46.210	-19.506	PASS
	MCH	0.607	-46.076	-19.393	PASS
	HCH	0.46	-46.073	-19.540	PASS

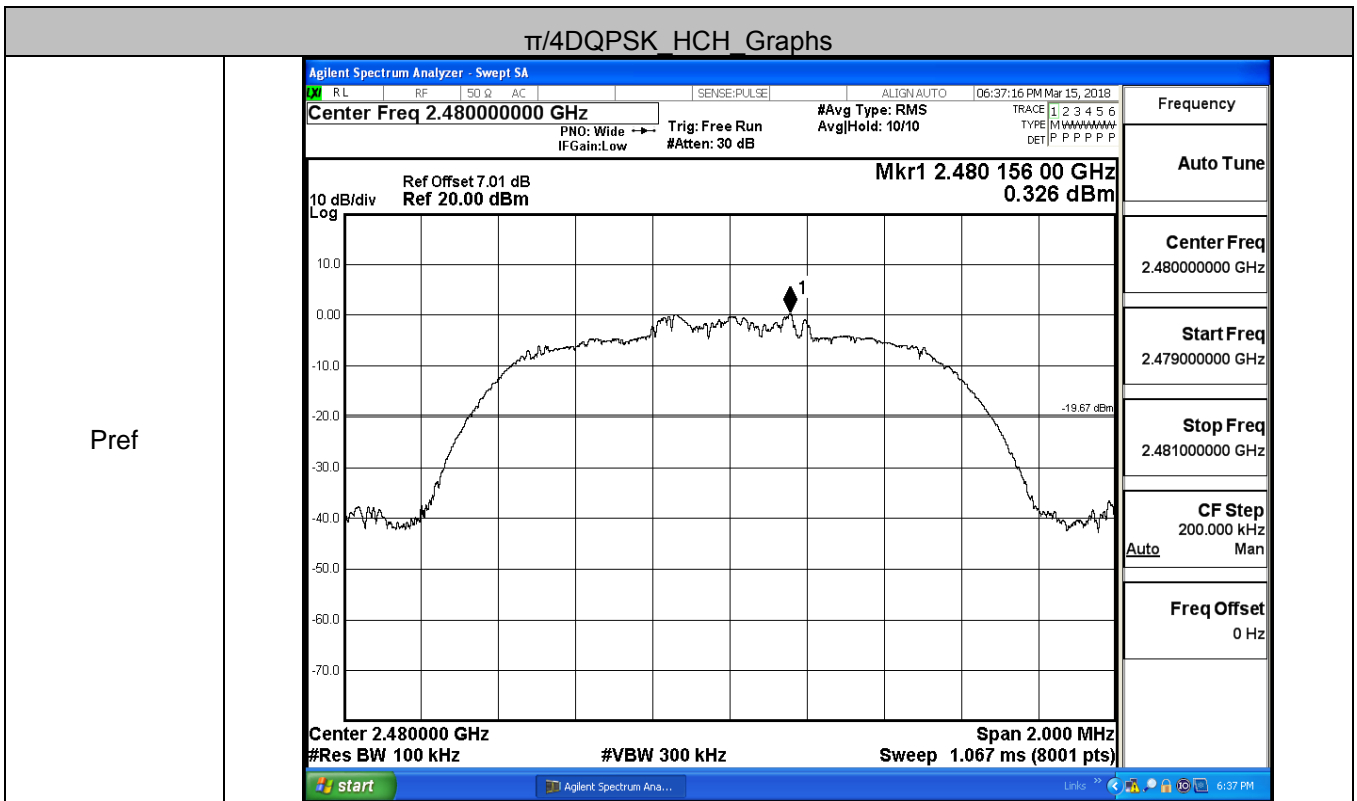
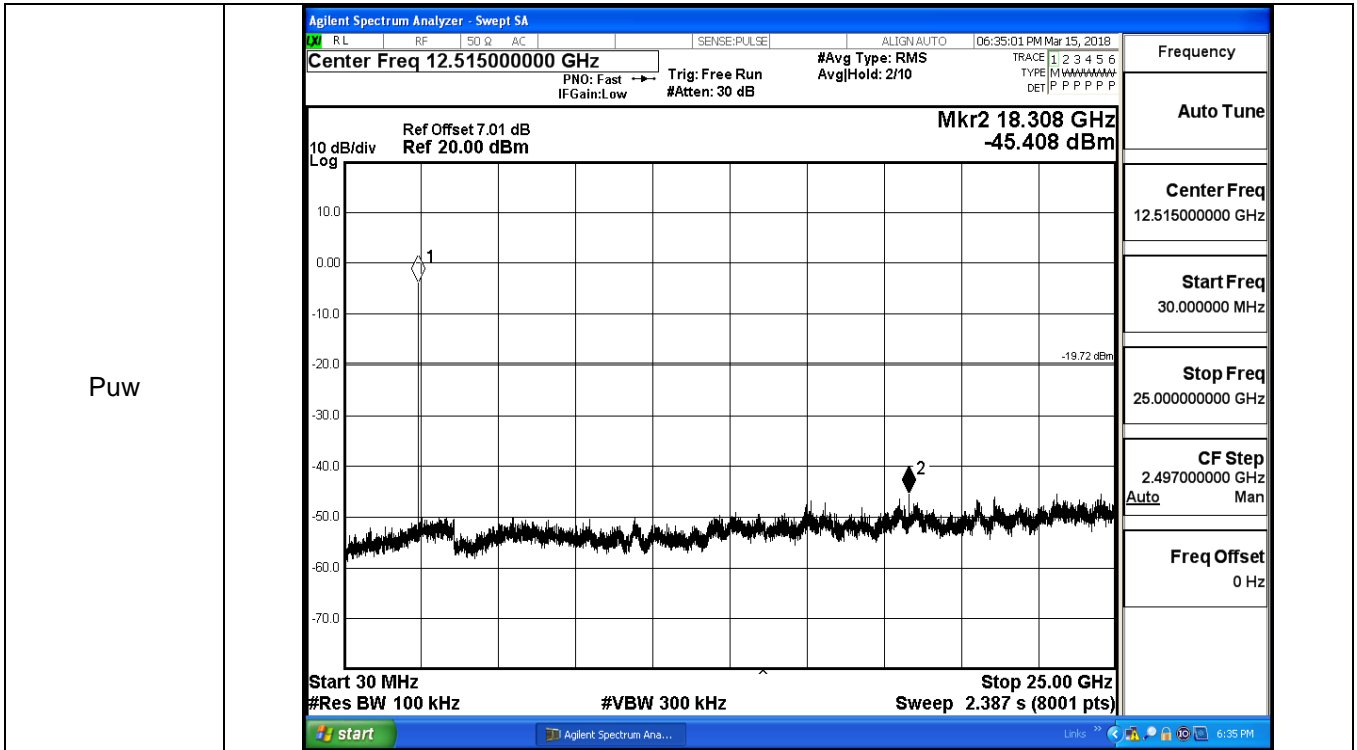


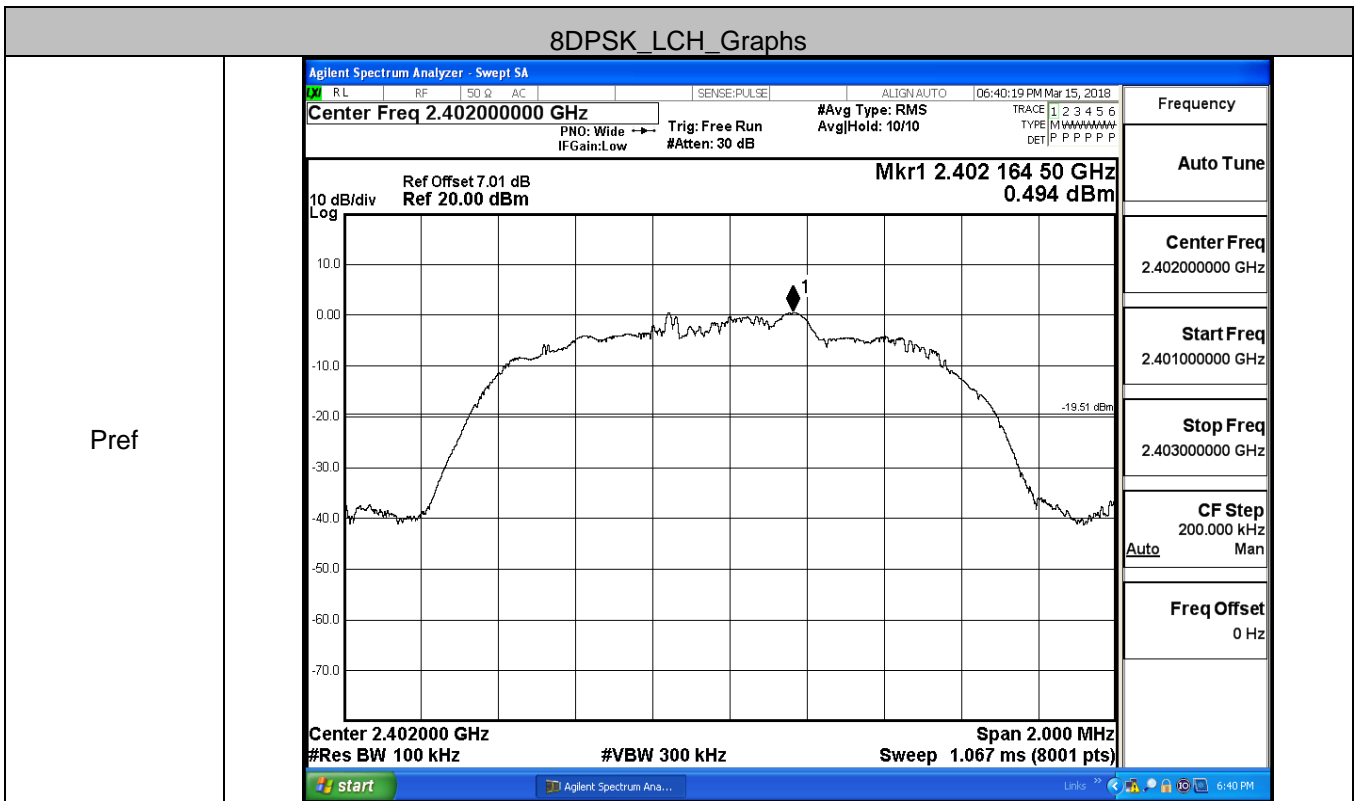
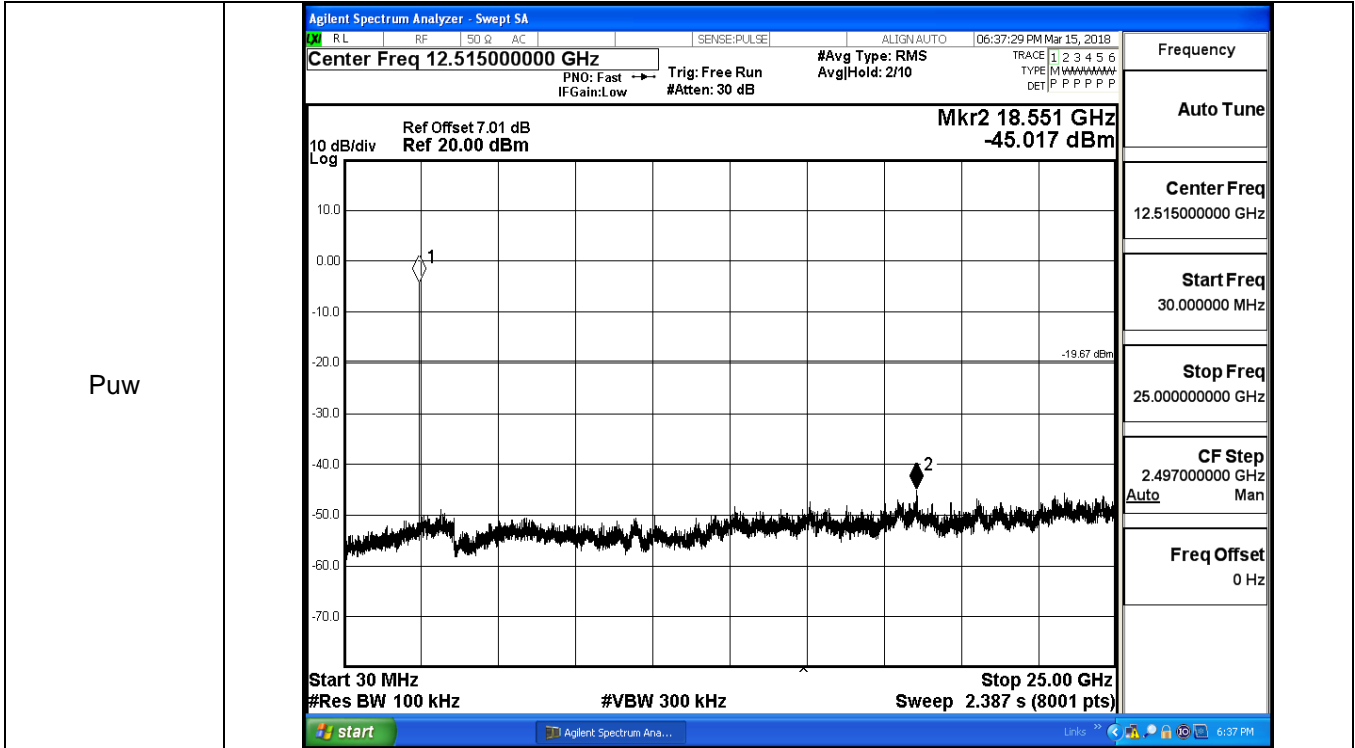


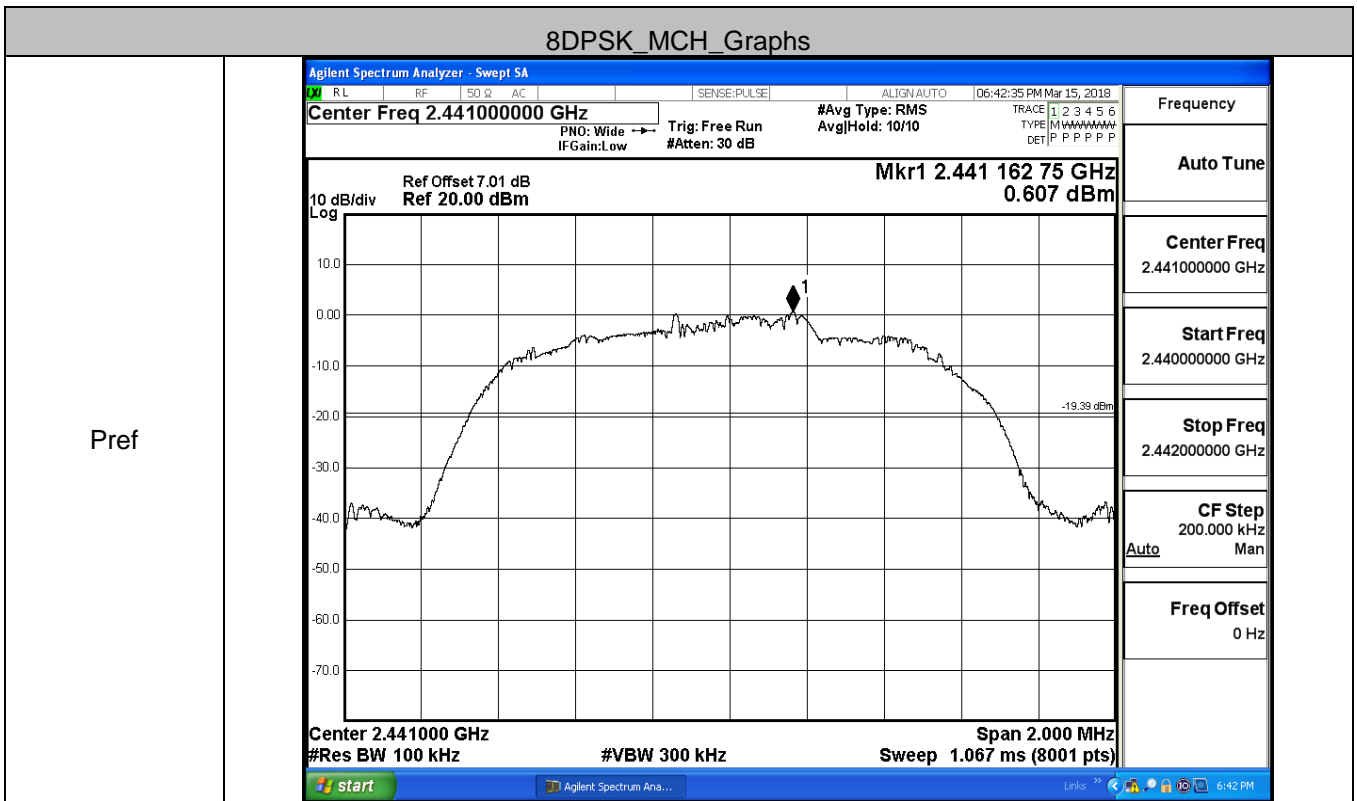
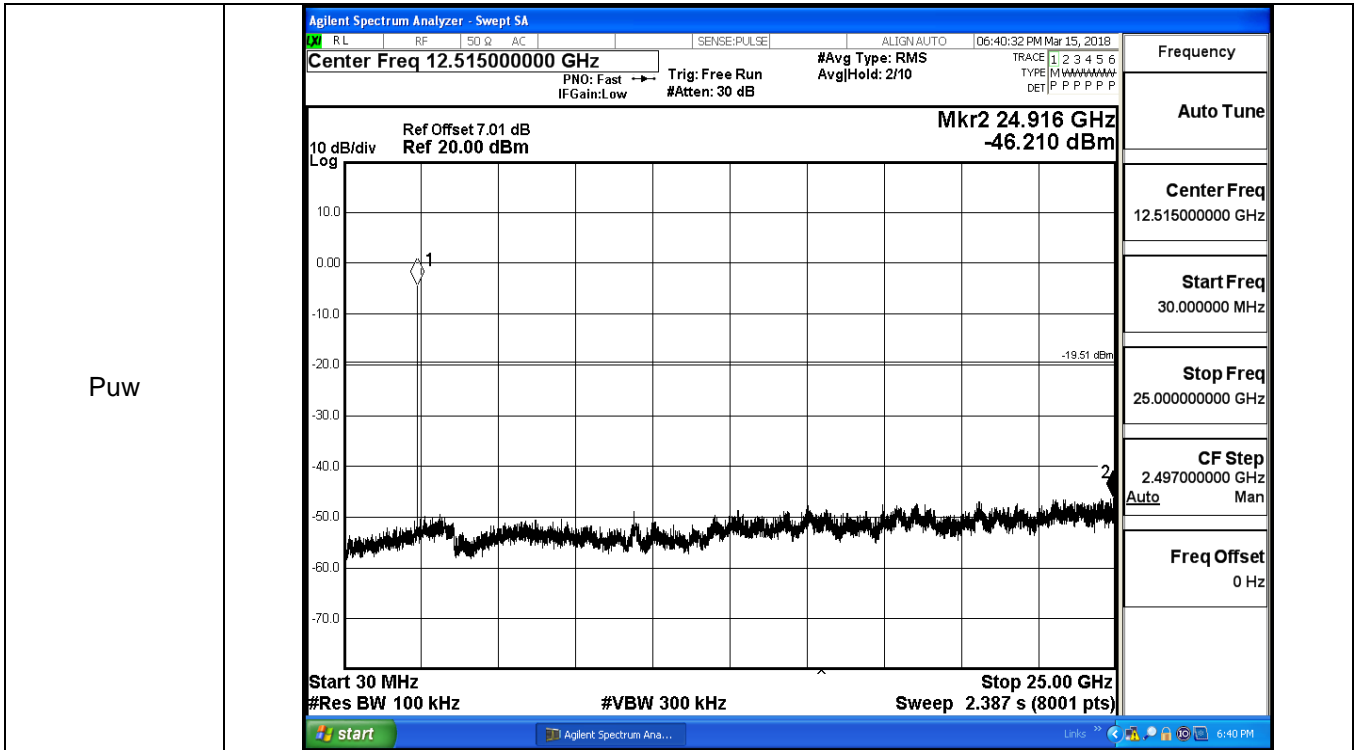


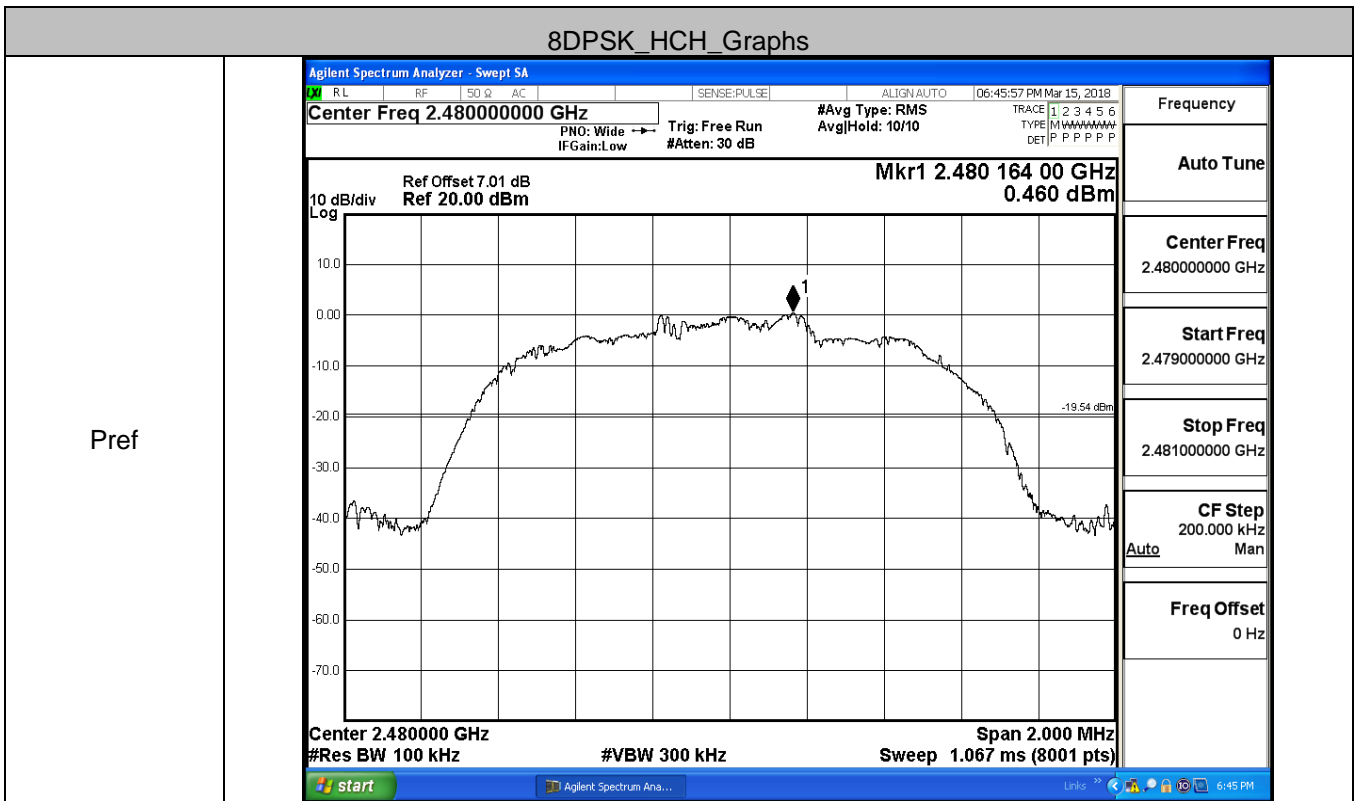
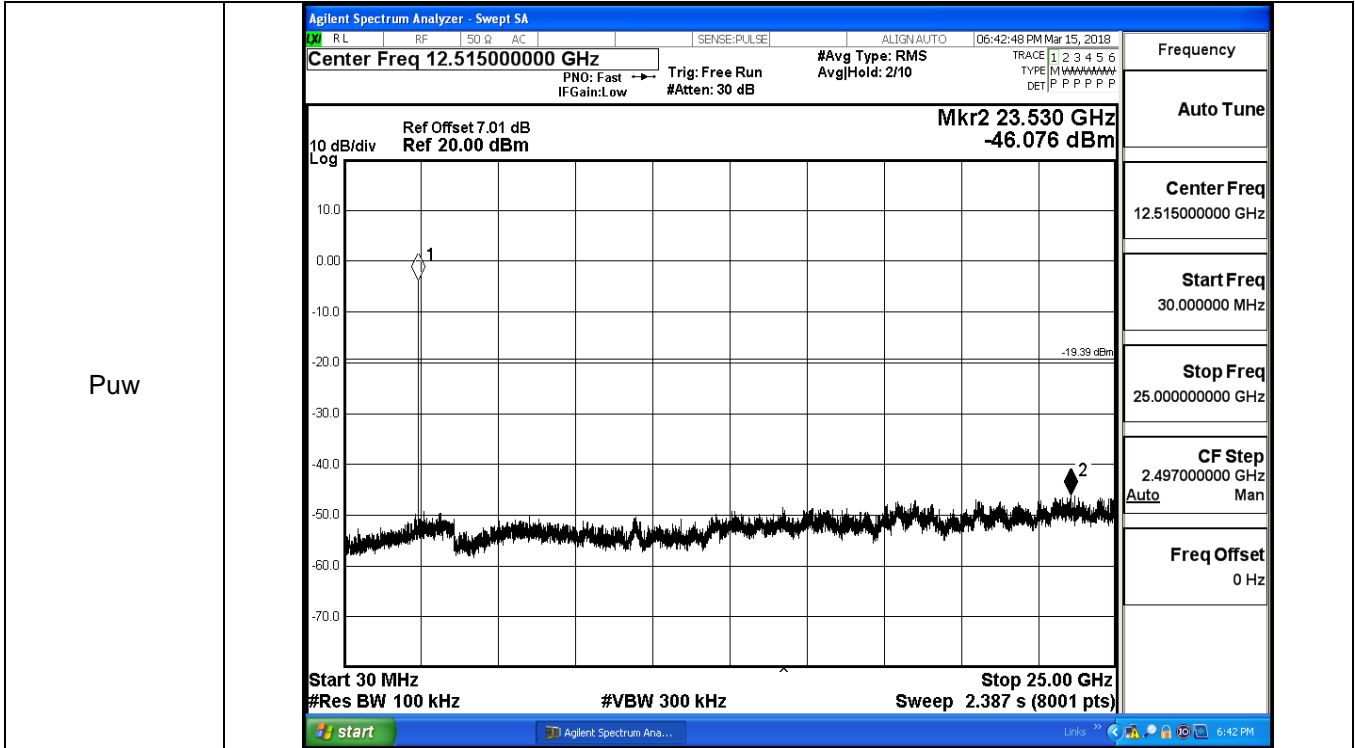




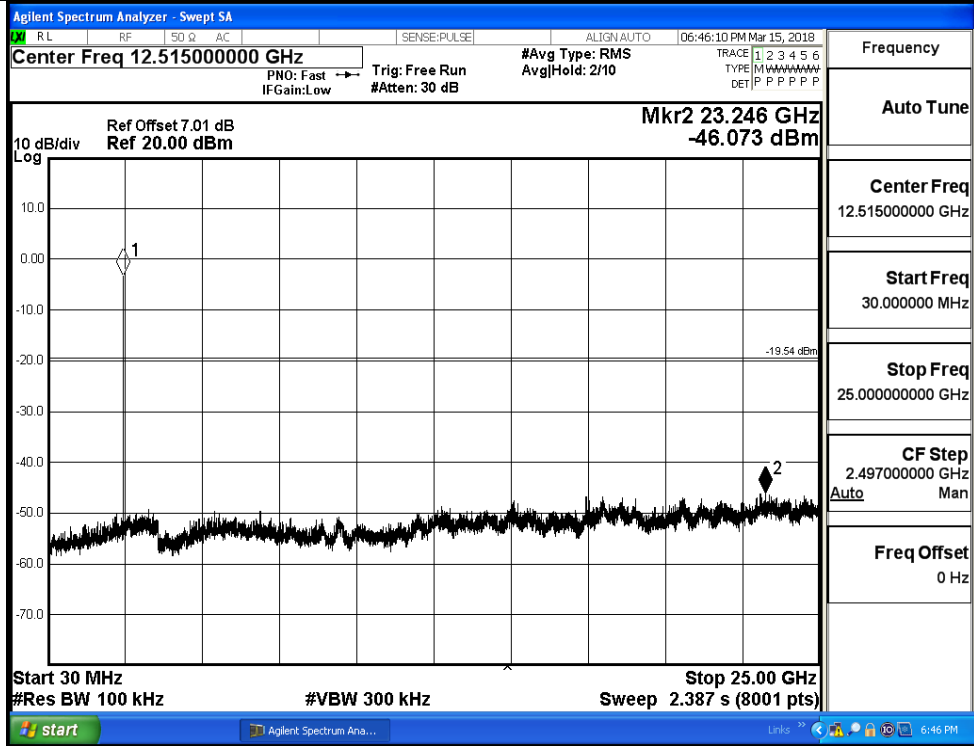








Puw

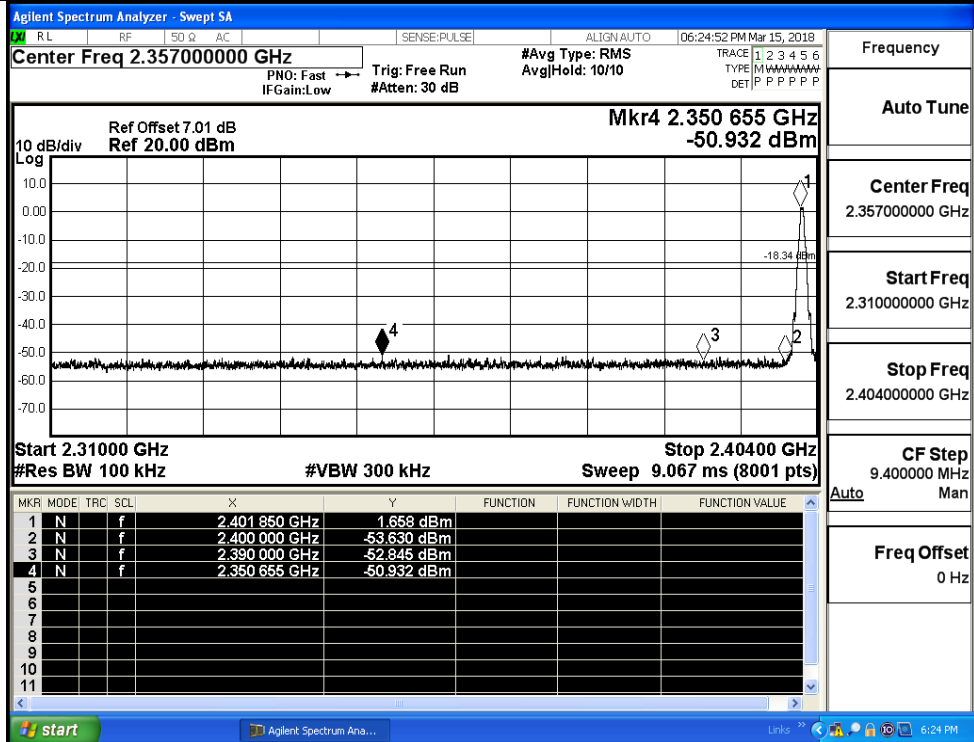


A.7 Band-edge for RF Conducted Emissions

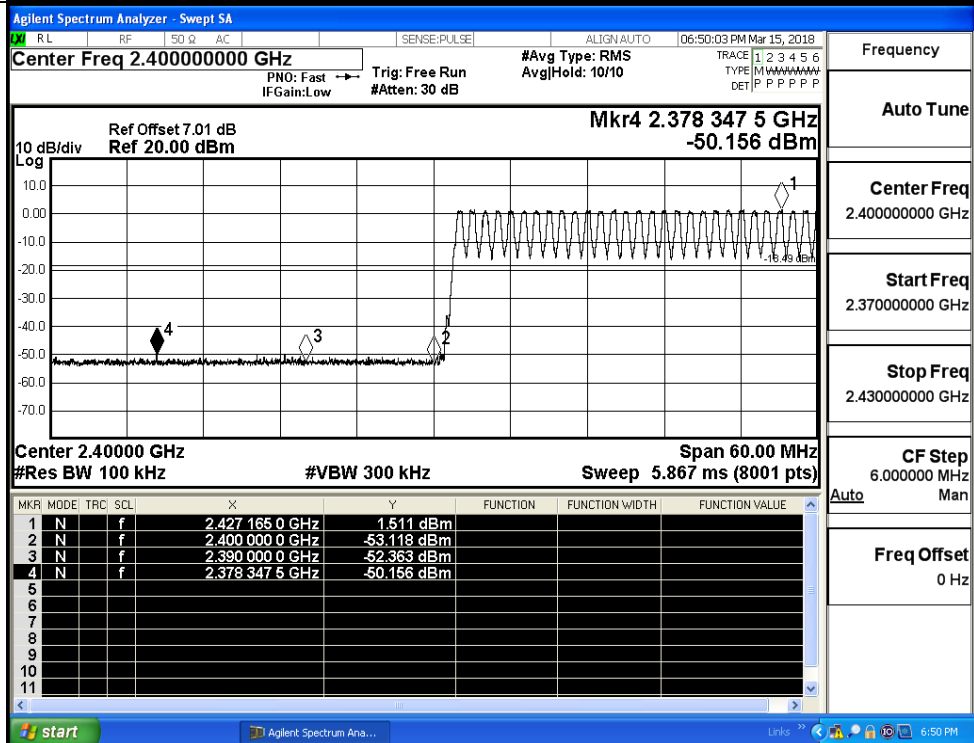
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	1.658	Off	-50.932	-18.34	PASS
			1.511	On	-50.156	-18.49	PASS
	HCH	2480	1.750	Off	-51.009	-18.25	PASS
			1.300	On	-50.713	-18.7	PASS
$\pi/4$ DQPSK	LCH	2402	0.774	Off	-51.133	-19.23	PASS
			0.631	On	-50.574	-19.37	PASS
	HCH	2480	-0.018	Off	-50.480	-20.02	PASS
			0.554	On	-49.812	-19.45	PASS
8DPSK	LCH	2402	0.375	Off	-50.762	-19.63	PASS
			0.628	On	-50.997	-19.37	PASS
	HCH	2480	0.388	Off	-51.030	-19.61	PASS
			0.645	On	-49.919	-19.36	PASS

Test Graphs

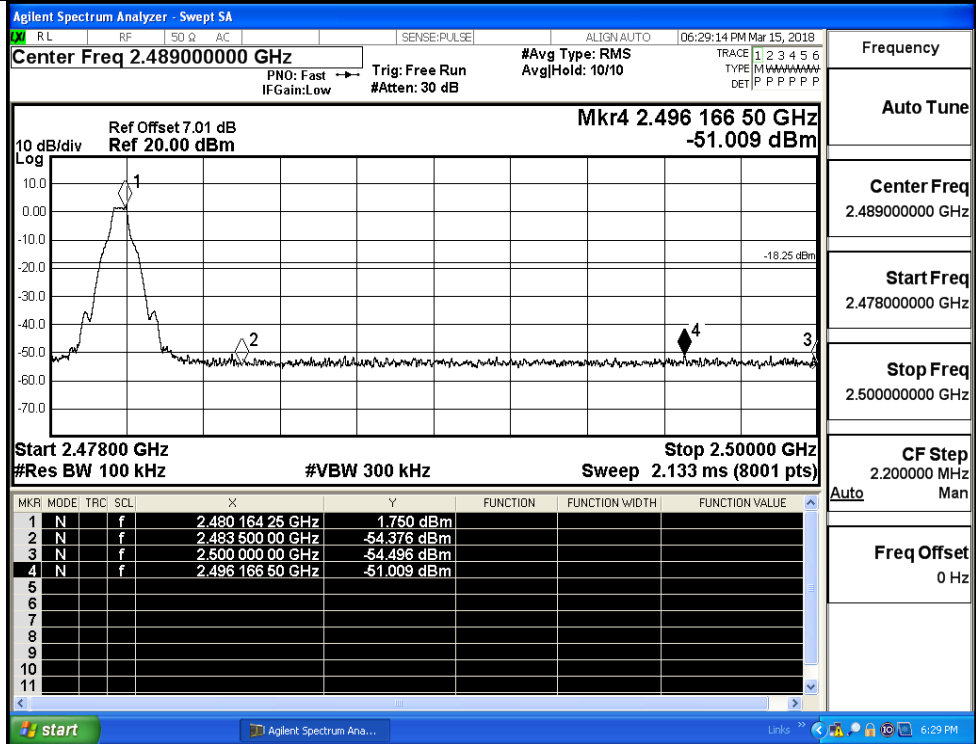
GFSK/LCH/No Hop



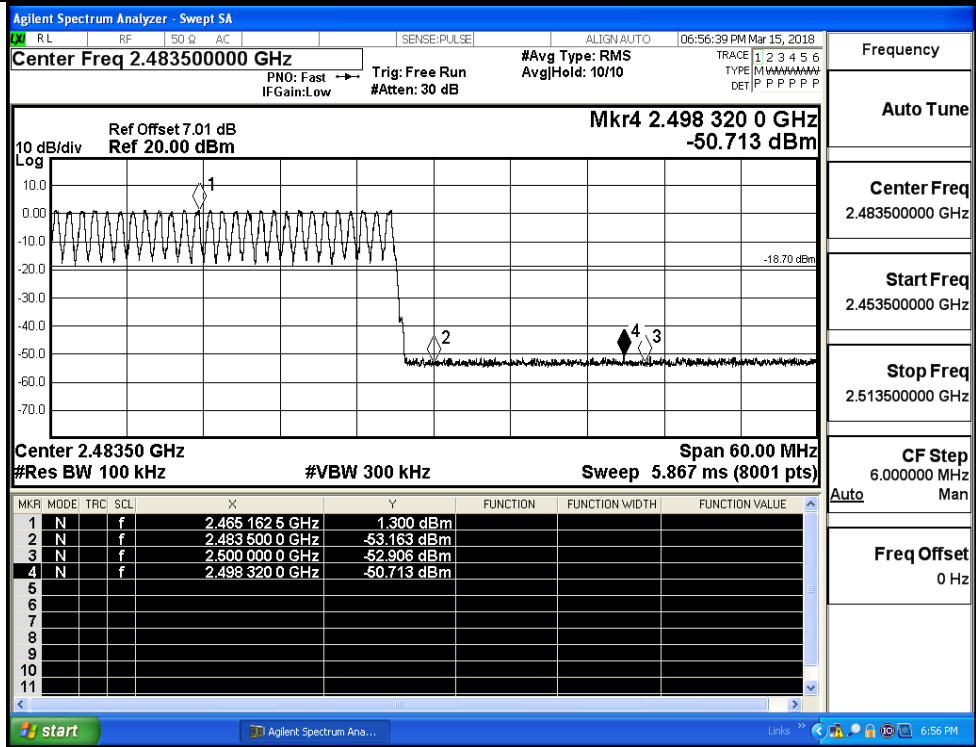
GFSK/LCH/Hop



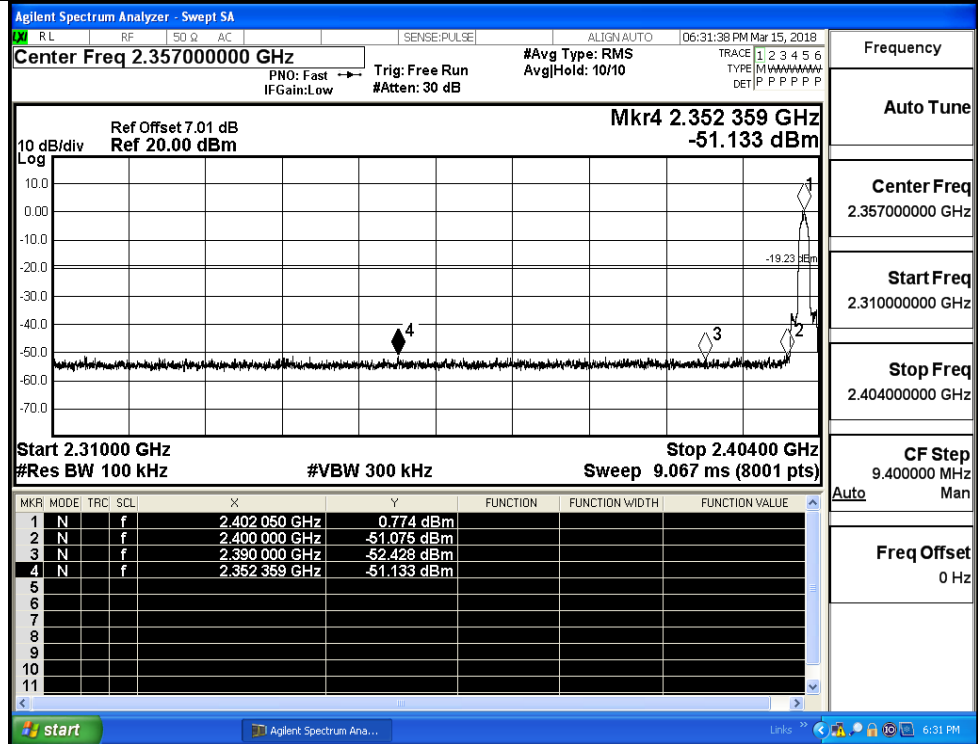
GFSK/HCH/No Hop



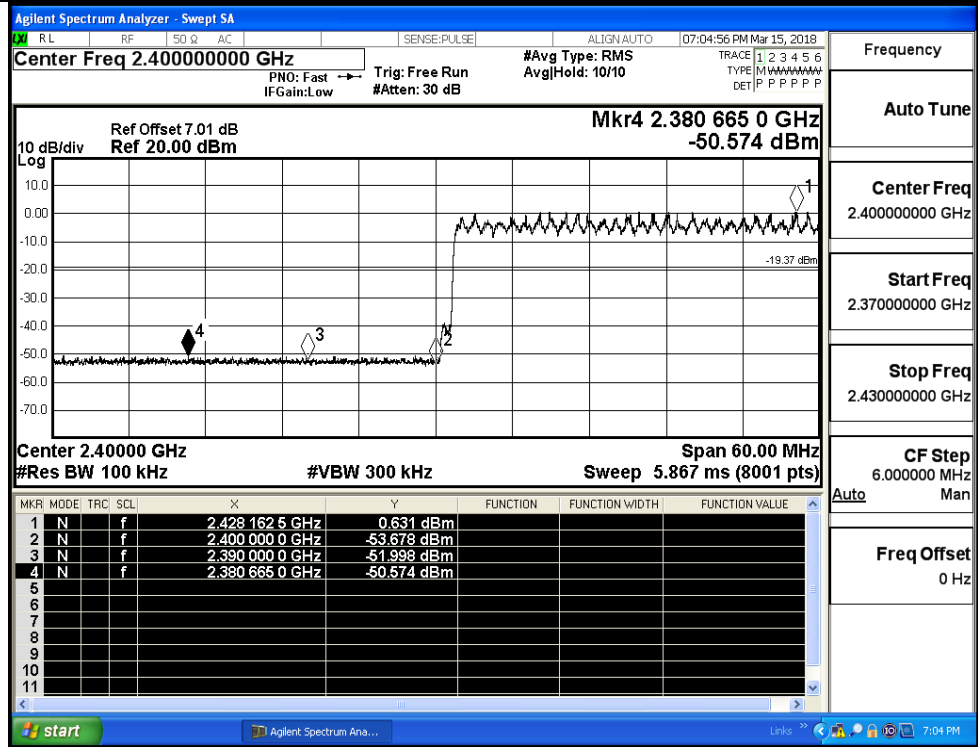
GFSK/HCH/Hop



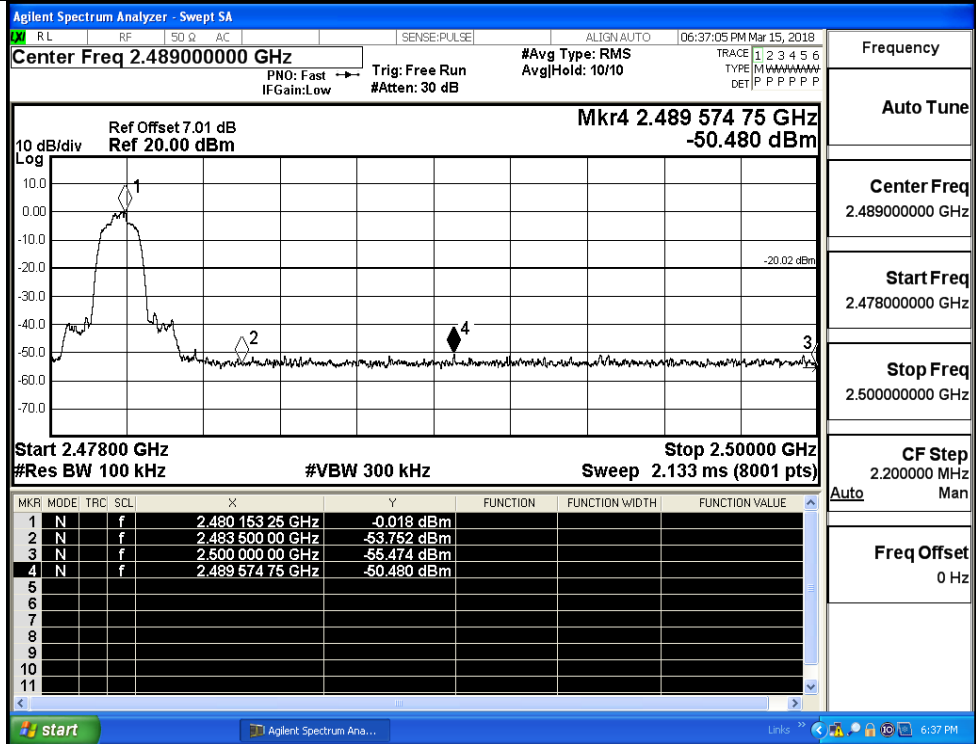
$\pi/4$ DQPSK/LCH/No
Hop



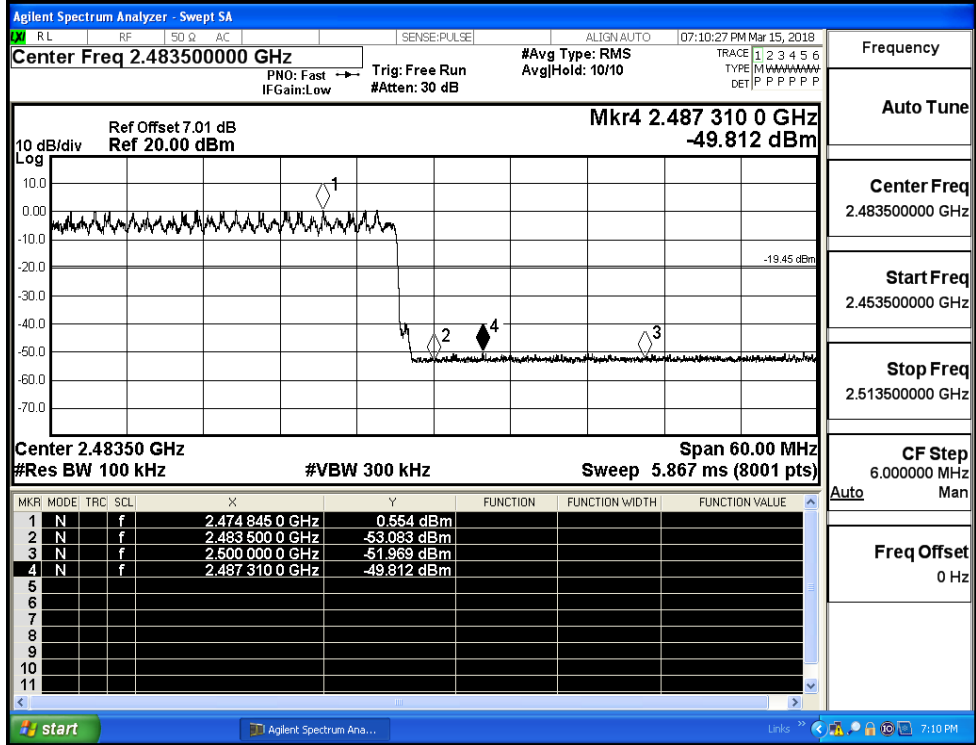
$\pi/4$ DQPSK/LCH/Hop



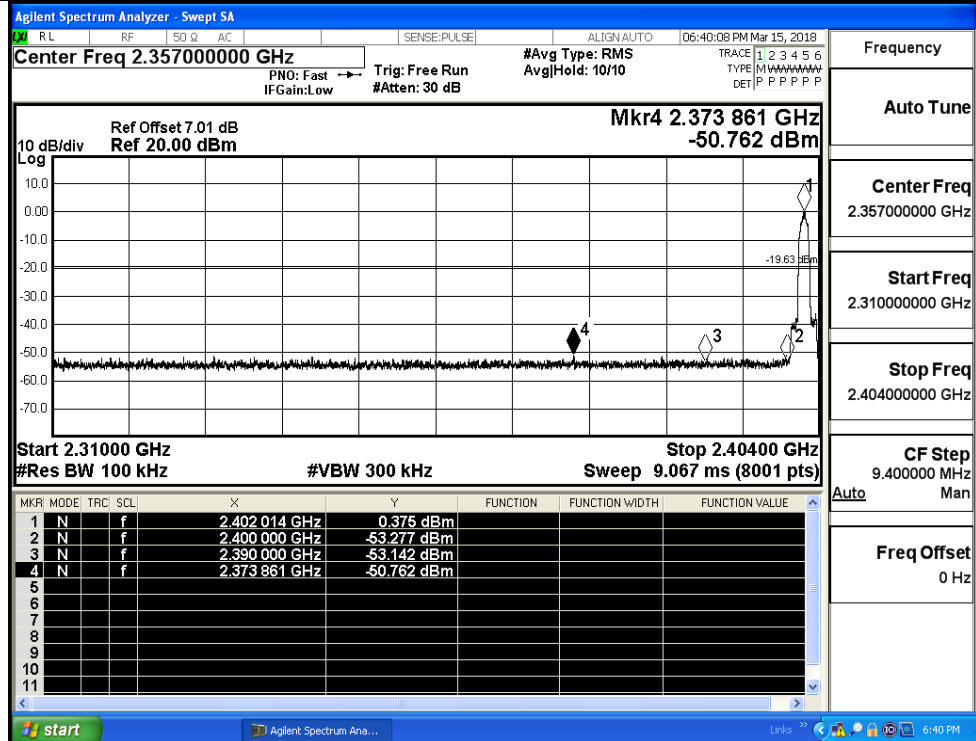
$\pi/4$ DQPSK/HCH/No
Hop



$\pi/4$ DQPSK/HCH/Hop

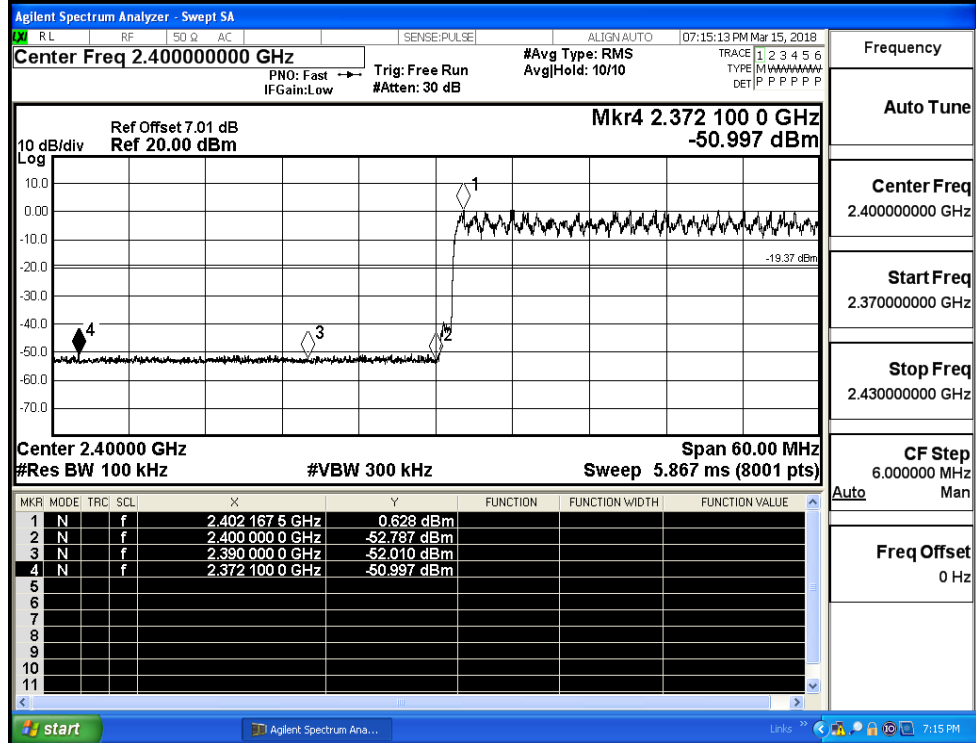


8DPSK/LCH/No Hop



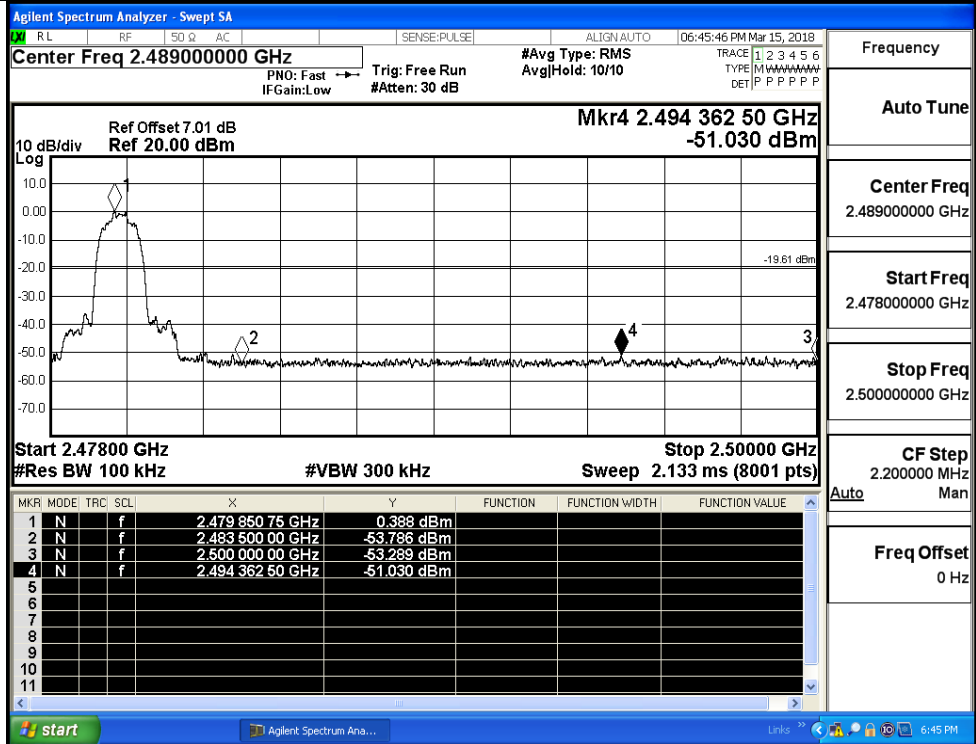
Frequency
Auto Tune
Center Freq
2.357000000 GHz
Start Freq
2.310000000 GHz
Stop Freq
2.404000000 GHz
CF Step
9.400000 MHz
Auto Man
Freq Offset
0 Hz

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



Frequency

Auto Tune

Center Freq
2.489000000 GHz

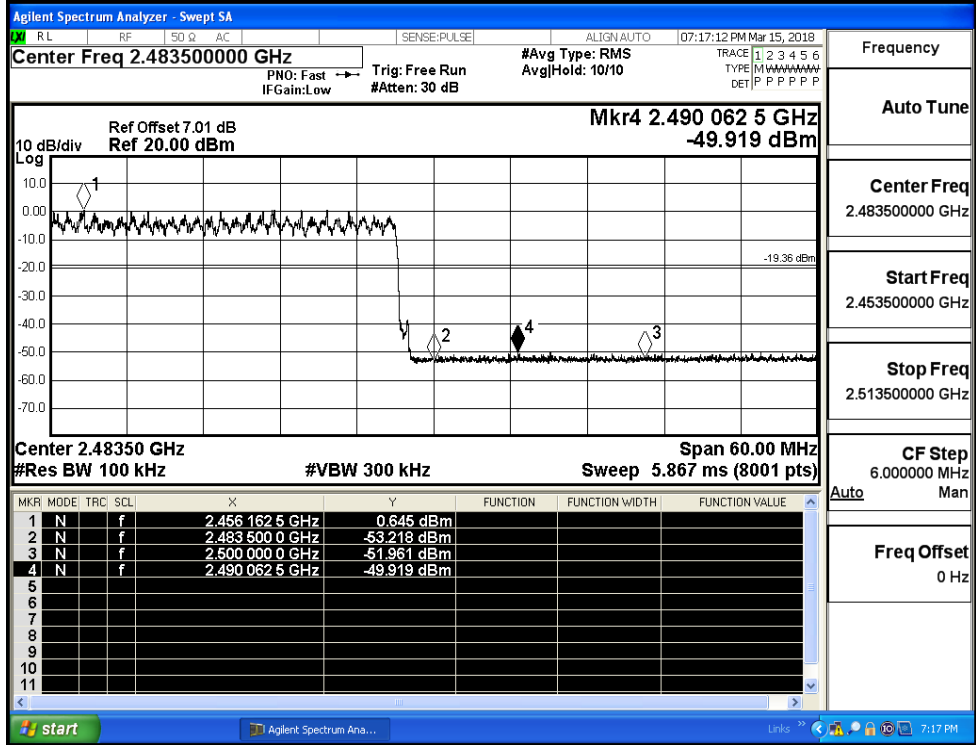
Start Freq
2.478000000 GHz

Stop Freq
2.500000000 GHz

CF Step
2.200000 MHz

Freq Offset
0 Hz

8DPSK/HCH/Hop



Frequency

Auto Tune

Center Freq
2.483500000 GHz

Start Freq
2.453500000 GHz

Stop Freq
2.513500000 GHz

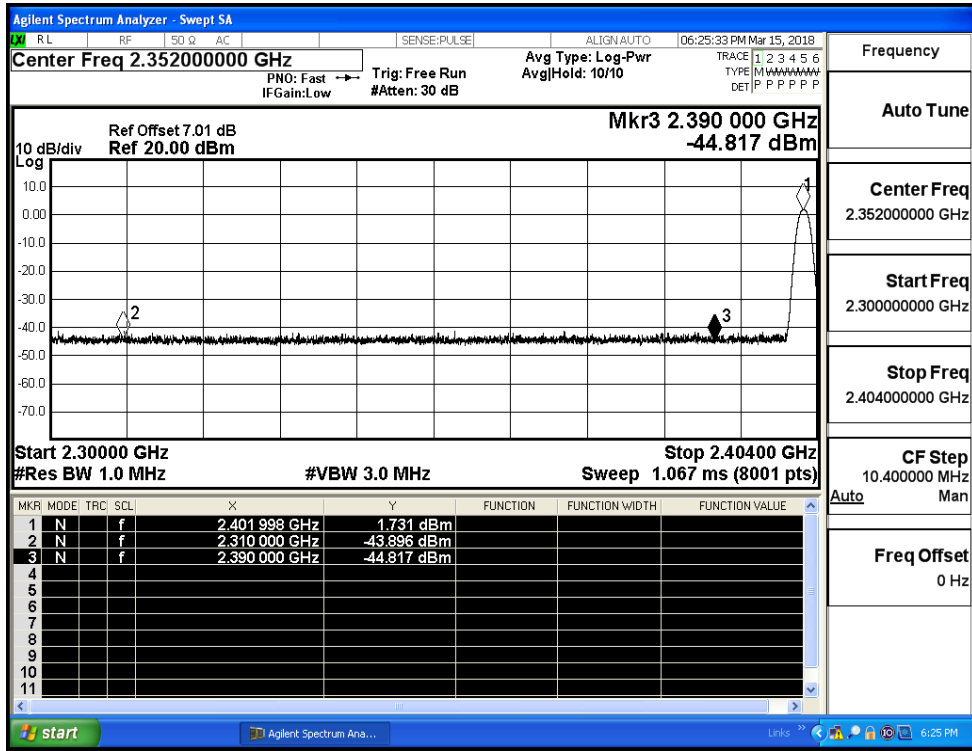
CF Step
6.000000 MHz

Freq Offset
0 Hz

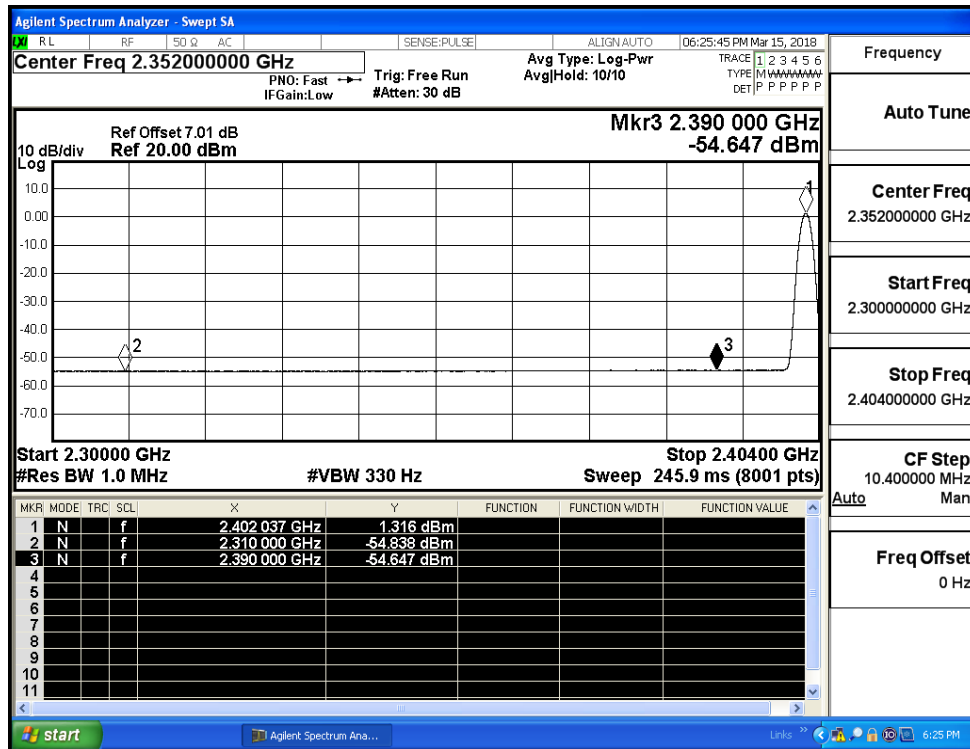
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.90	3.0	0	54.36	PEAK	74	PASS
	Off	2310.0	-54.84	3.0	0	43.42	AV	54	PASS
	Off	2390.0	-44.82	3.0	0	53.44	PEAK	74	PASS
	Off	2390.0	-54.65	3.0	0	43.61	AV	54	PASS
	Off	2483.5	-44.55	3.0	0	53.71	PEAK	74	PASS
	Off	2483.5	-54.07	3.0	0	44.19	AV	54	PASS
	Off	2500.0	-43.89	3.0	0	54.37	PEAK	74	PASS
	Off	2500.0	-54.17	3.0	0	44.09	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-42.87	3.0	0	55.39	PEAK	74	PASS
	Off	2310.0	-54.75	3.0	0	43.51	AV	54	PASS
	Off	2390.0	-44.31	3.0	0	53.95	PEAK	74	PASS
	Off	2390.0	-54.60	3.0	0	43.66	AV	54	PASS
	Off	2483.5	-44.95	3.0	0	53.31	PEAK	74	PASS
	Off	2483.5	-53.98	3.0	0	44.28	AV	54	PASS
	Off	2500.0	-43.84	3.0	0	54.42	PEAK	74	PASS
	Off	2500.0	-54.20	3.0	0	44.06	AV	54	PASS
8DPSK	Off	2310.0	-45.04	3.0	0	53.22	PEAK	74	PASS
	Off	2310.0	-54.77	3.0	0	43.49	AV	54	PASS
	Off	2390.0	-44.35	3.0	0	53.91	PEAK	74	PASS
	Off	2390.0	-54.58	3.0	0	43.68	AV	54	PASS
	Off	2483.5	-44.89	3.0	0	53.37	PEAK	74	PASS
	Off	2483.5	-54.27	3.0	0	43.99	AV	54	PASS
	Off	2500.0	-39.59	3.0	0	58.67	PEAK	74	PASS
	Off	2500.0	-54.11	3.0	0	44.15	AV	54	PASS

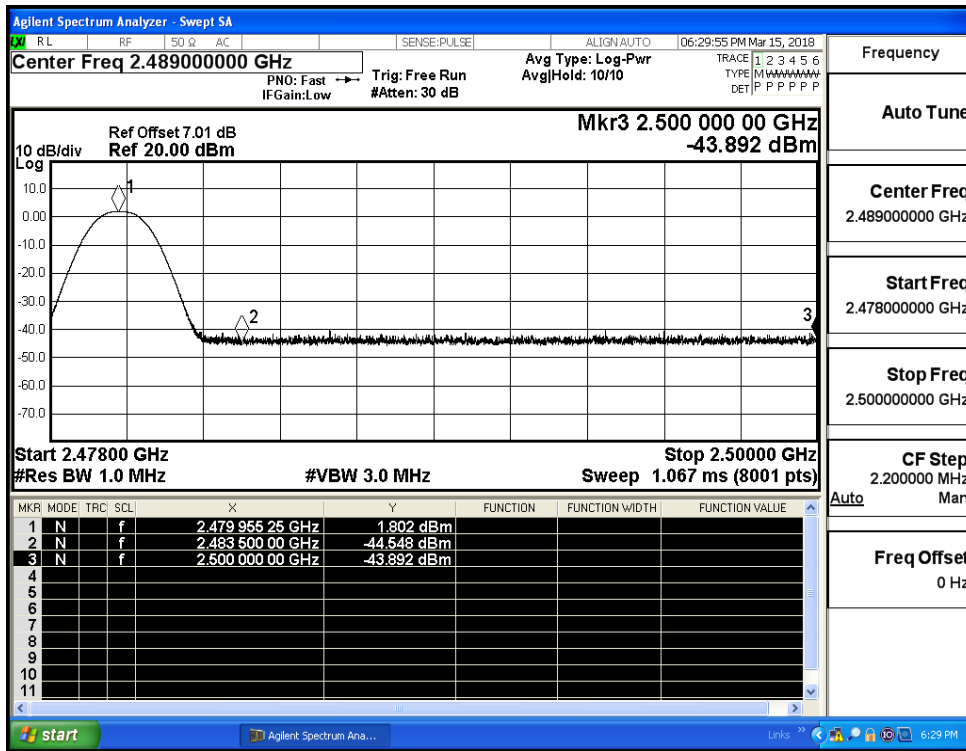
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



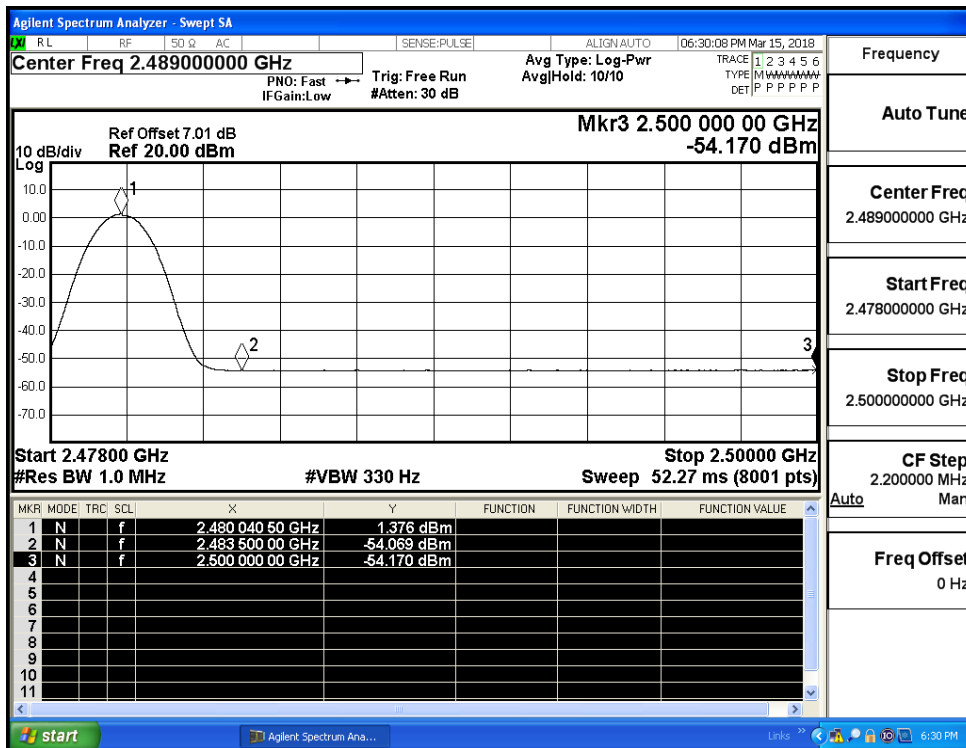
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



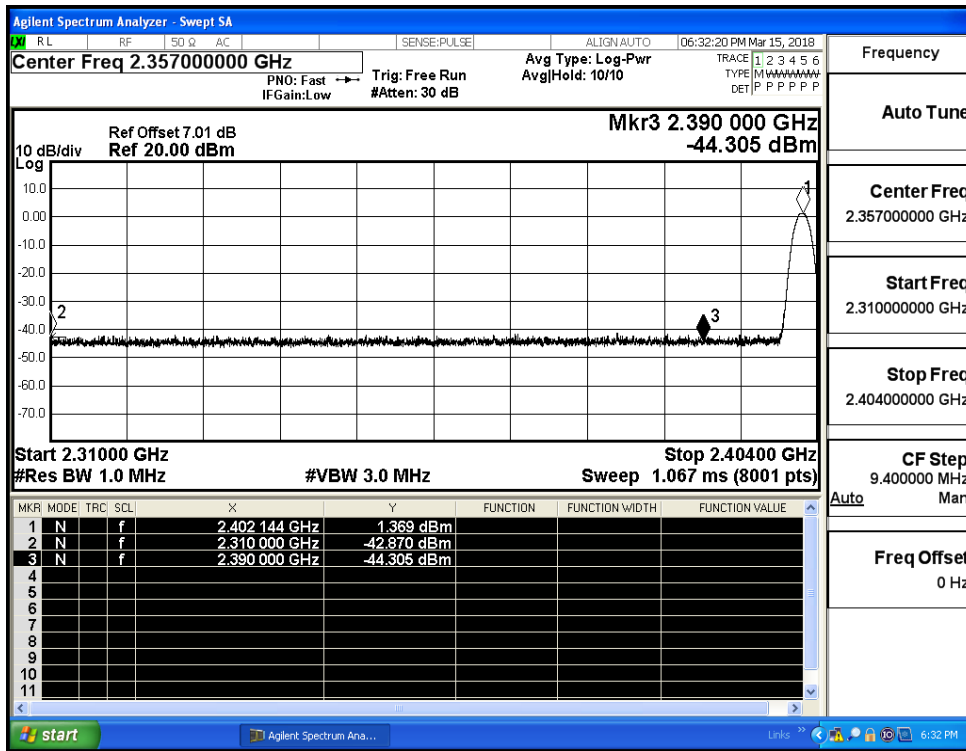
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



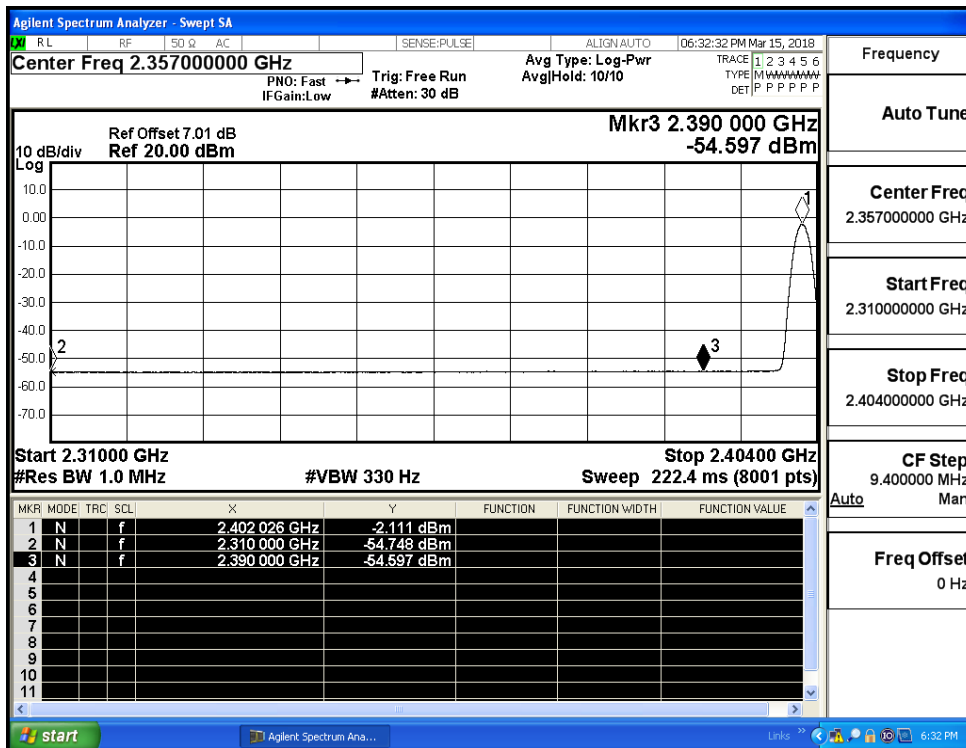
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



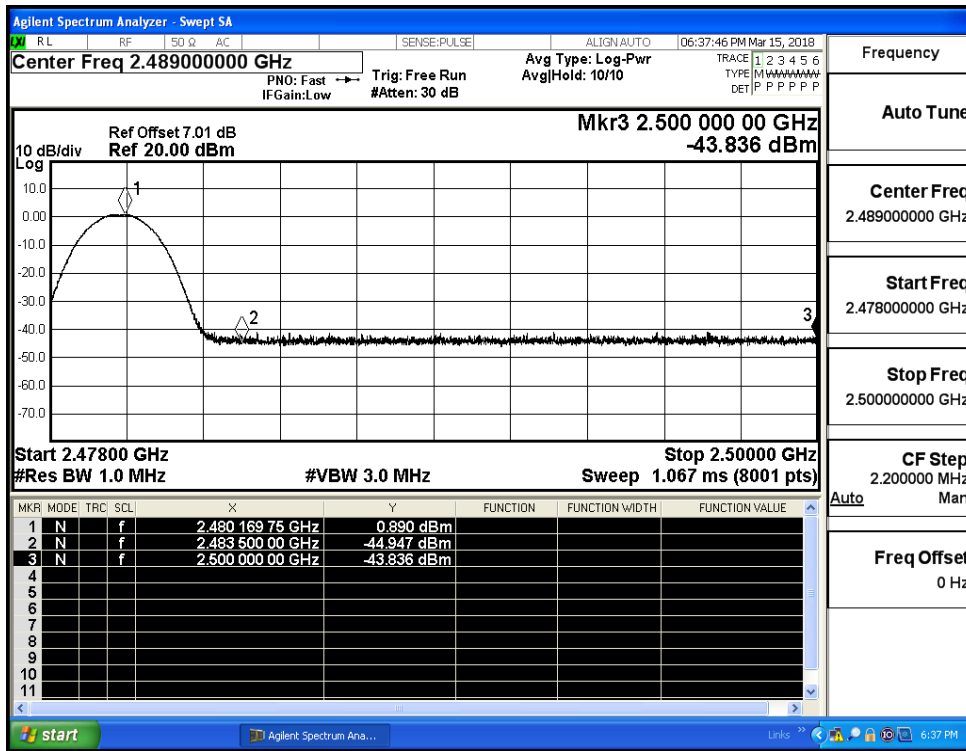
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)



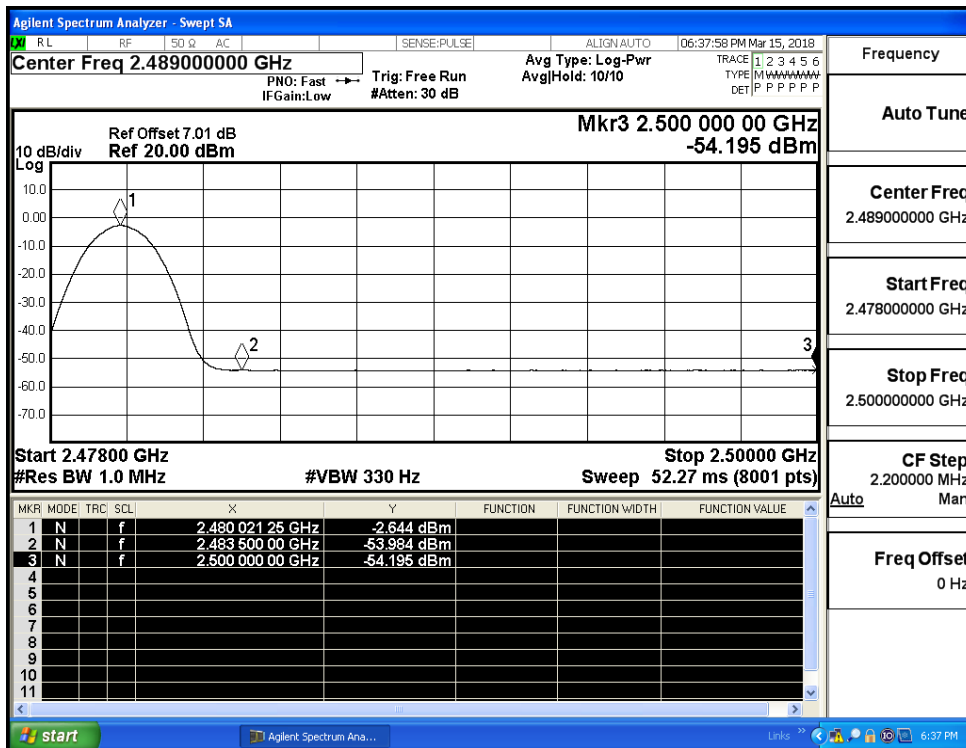
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)



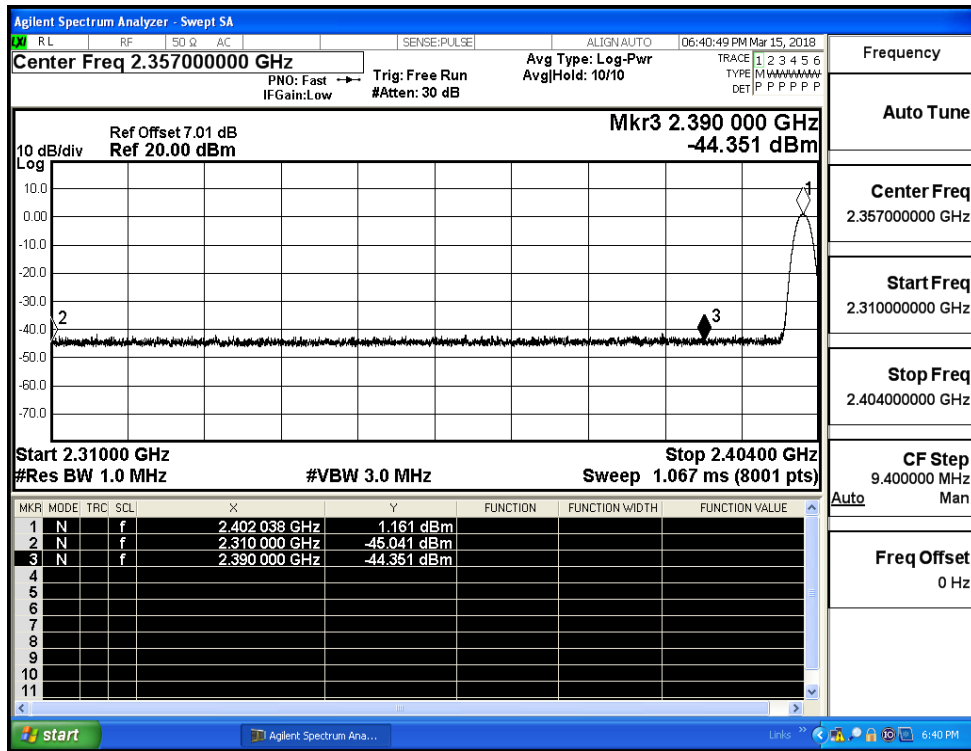
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



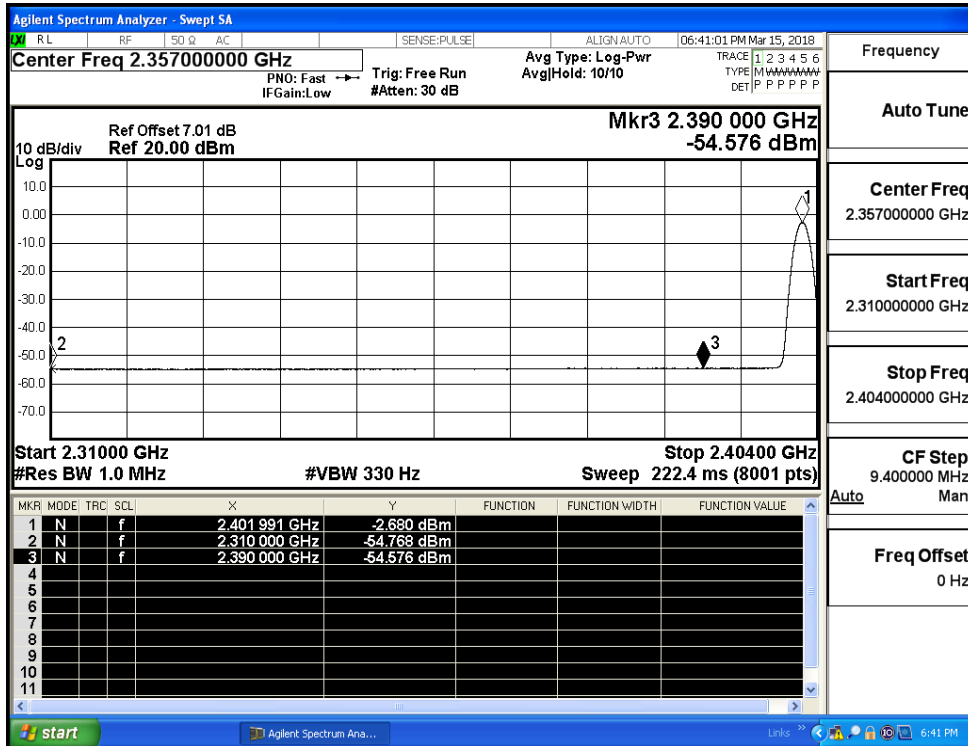
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



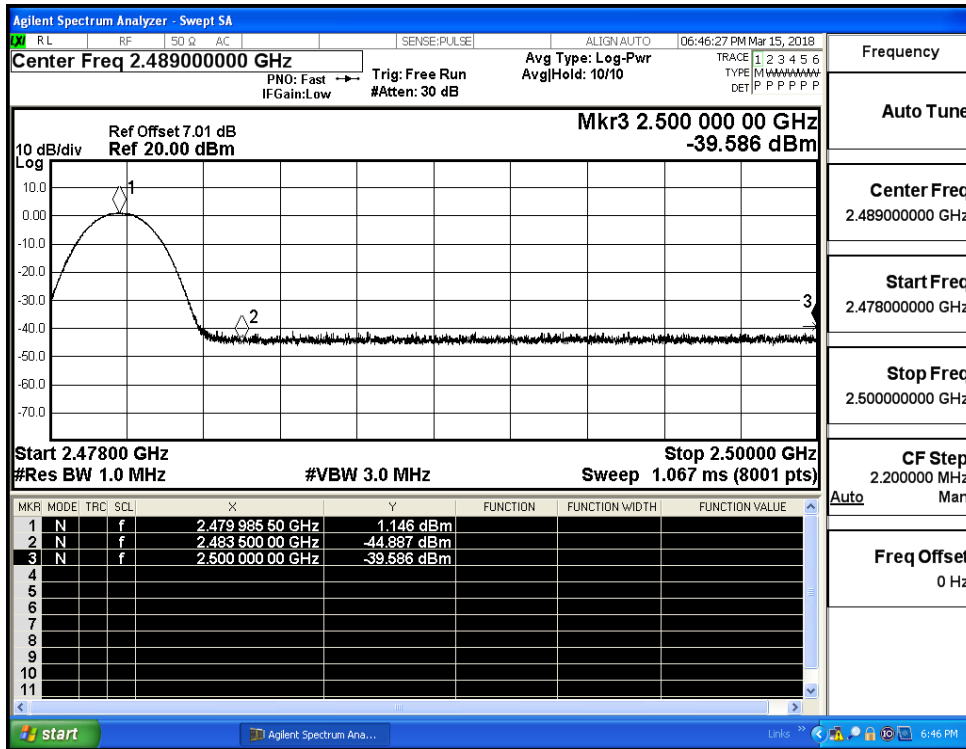
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

