

Appendix A

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

Product Name: Bluetooth Speaker

Trade Mark: Origaudio

Test Model: Hydrobump

Environmental Conditions

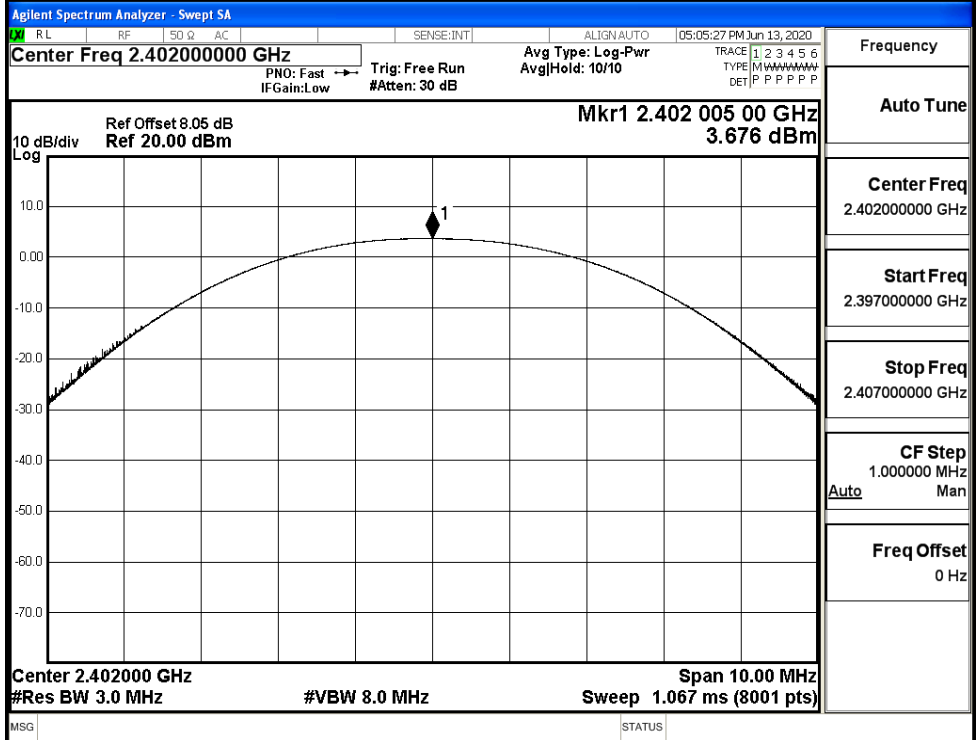
Temperature:	23.5 ° C
Relative Humidity:	53.1%
ATM Pressure:	100.0 kPa
Test Engineer:	Scout Wu
Supervised by:	Li Huan

A.1 Maxmum Conducted Peak Output Power

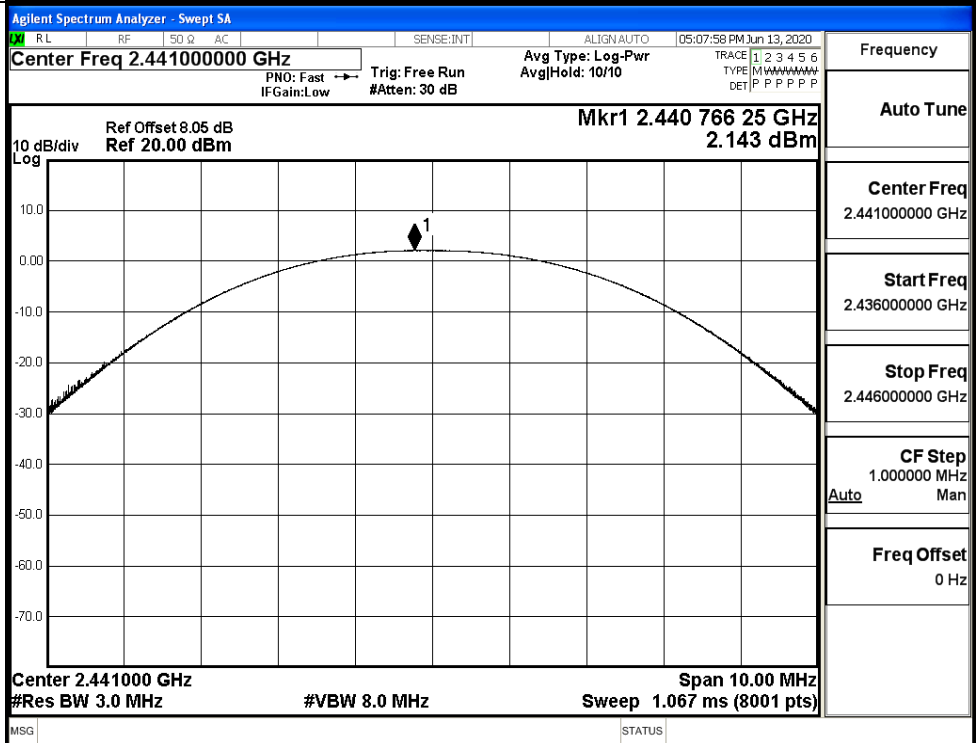
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	3.676	30	PASS
	MCH	2.143	30	PASS
	HCH	0.422	30	PASS
π/4DQPSK	LCH	3.094	30	PASS
	MCH	1.529	30	PASS
	HCH	-0.247	30	PASS
8DPSK	LCH	3.479	30	PASS
	MCH	1.932	30	PASS
	HCH	0.189	30	PASS

Test Graphs

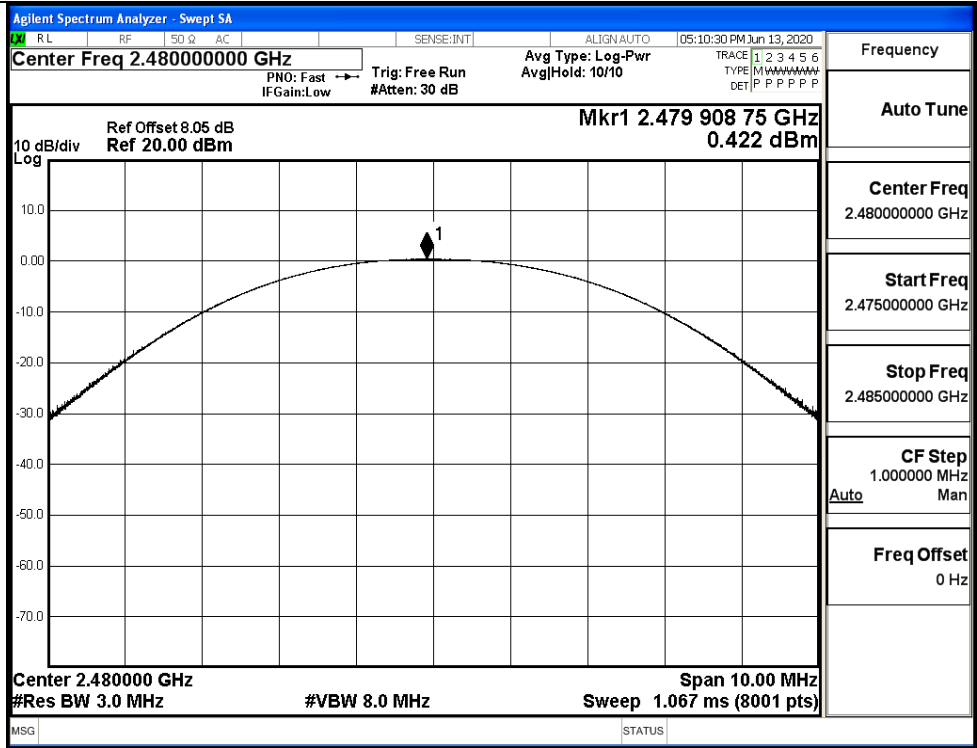
GFSK/LCH



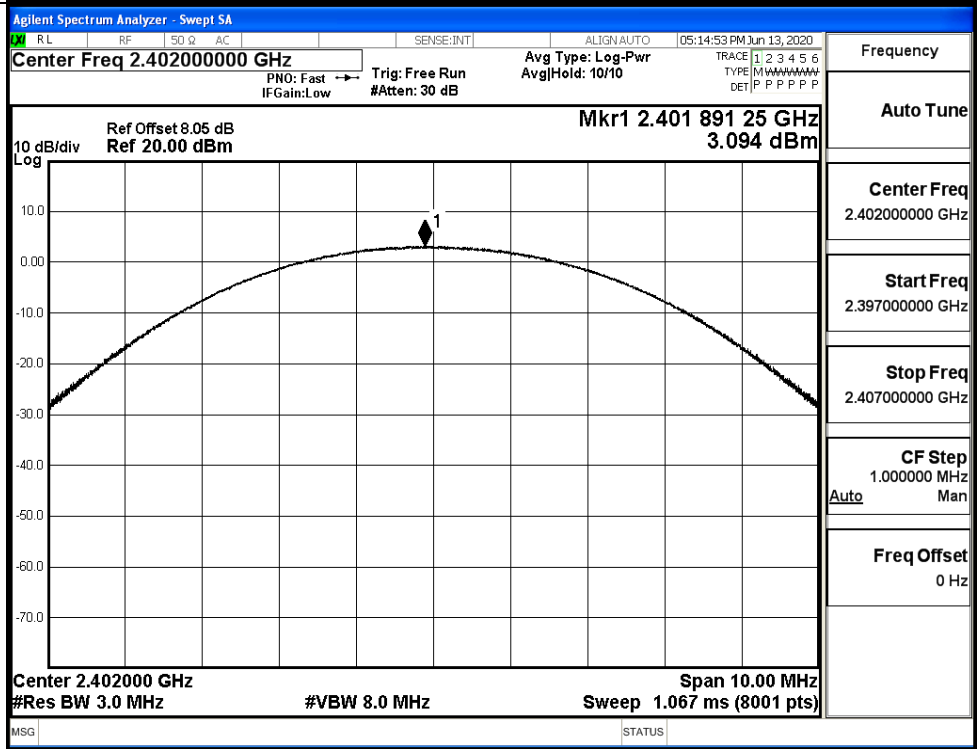
GFSK/MCH

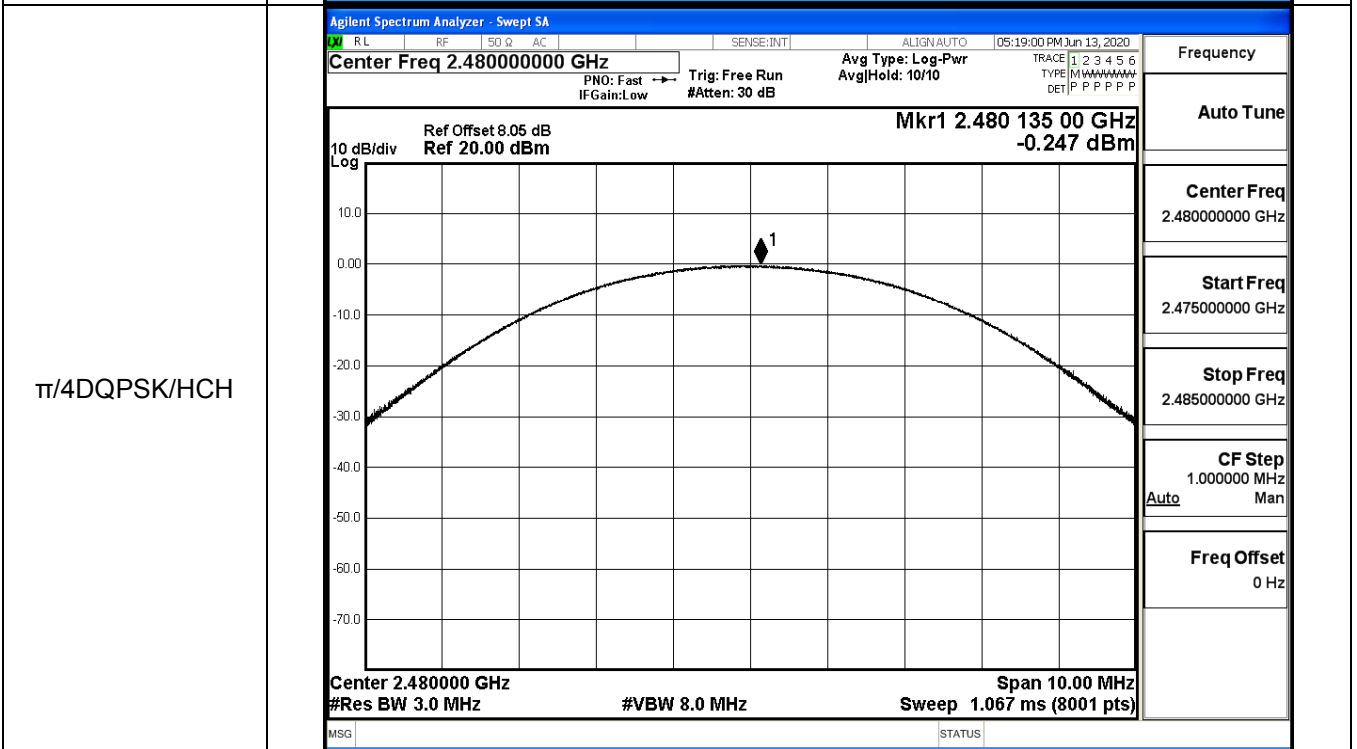
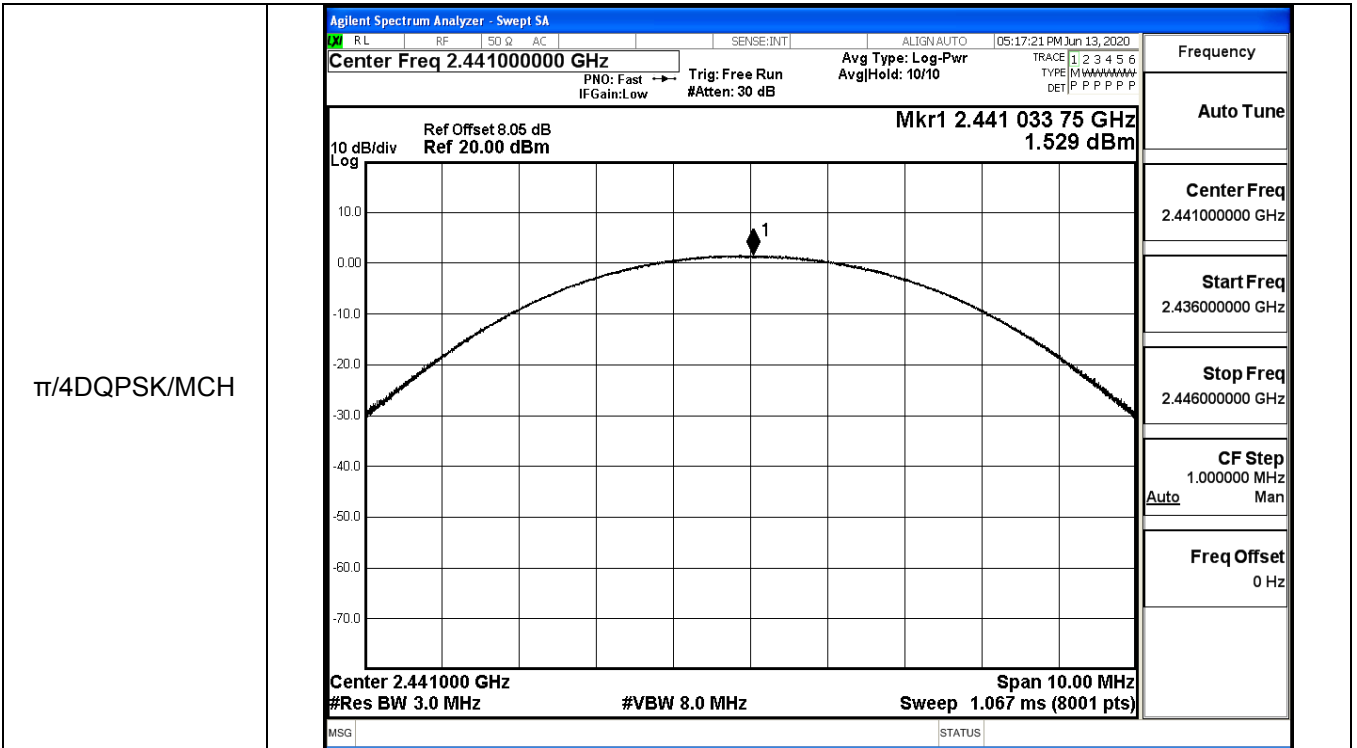


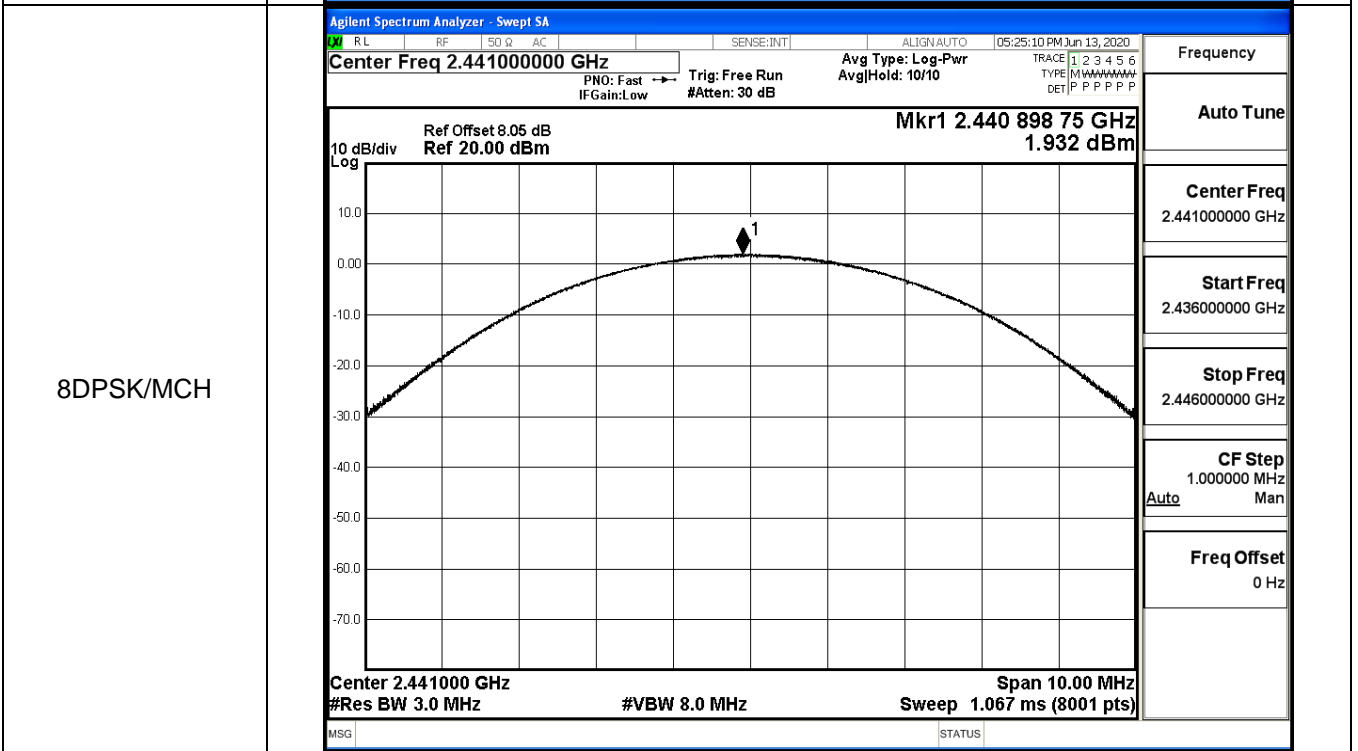
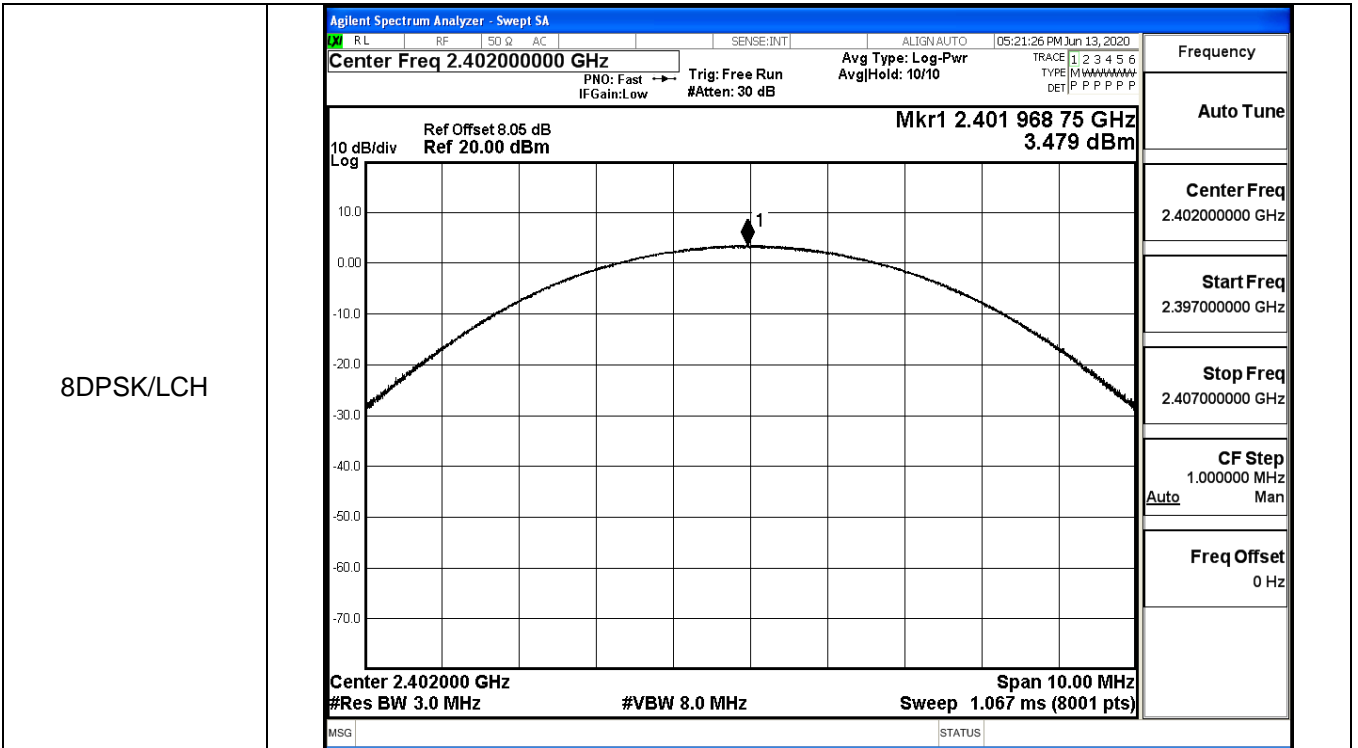
GFSK/HCH



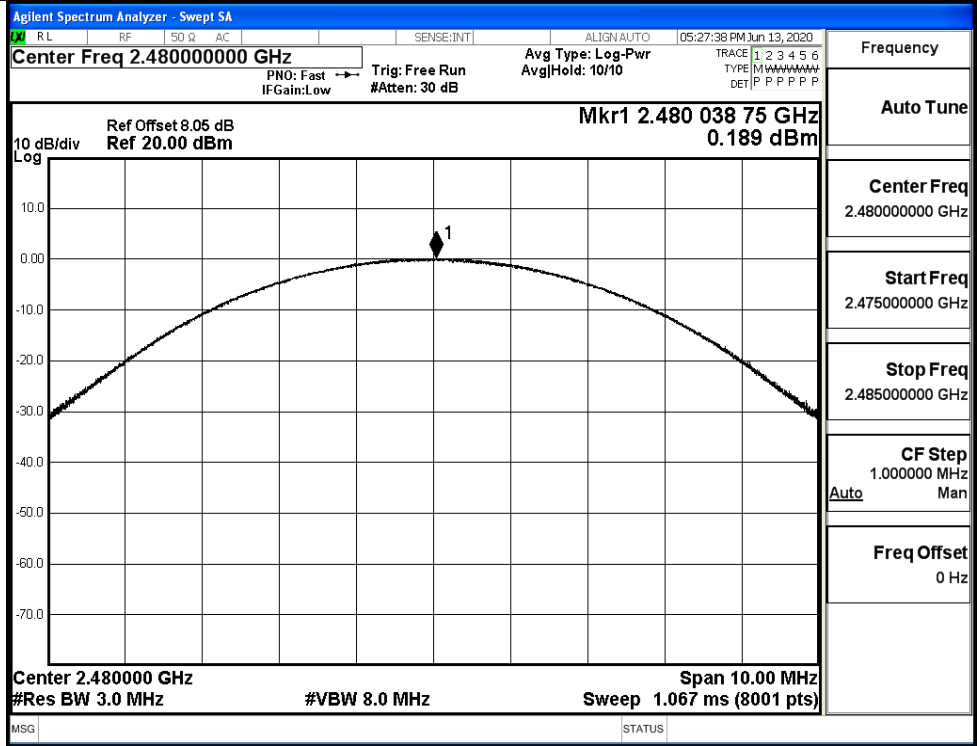
$\pi/4$ DQPSK/LCH





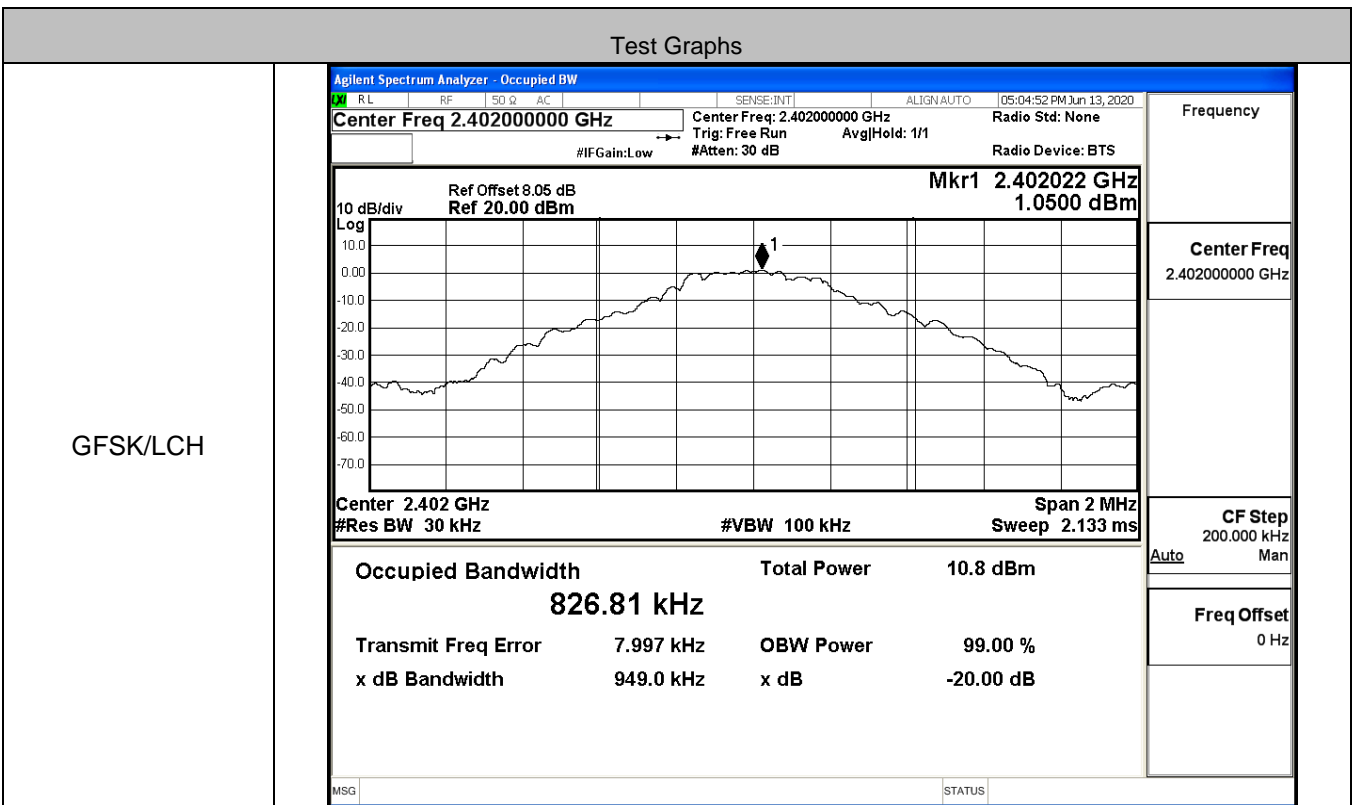


8DPSK/HCH

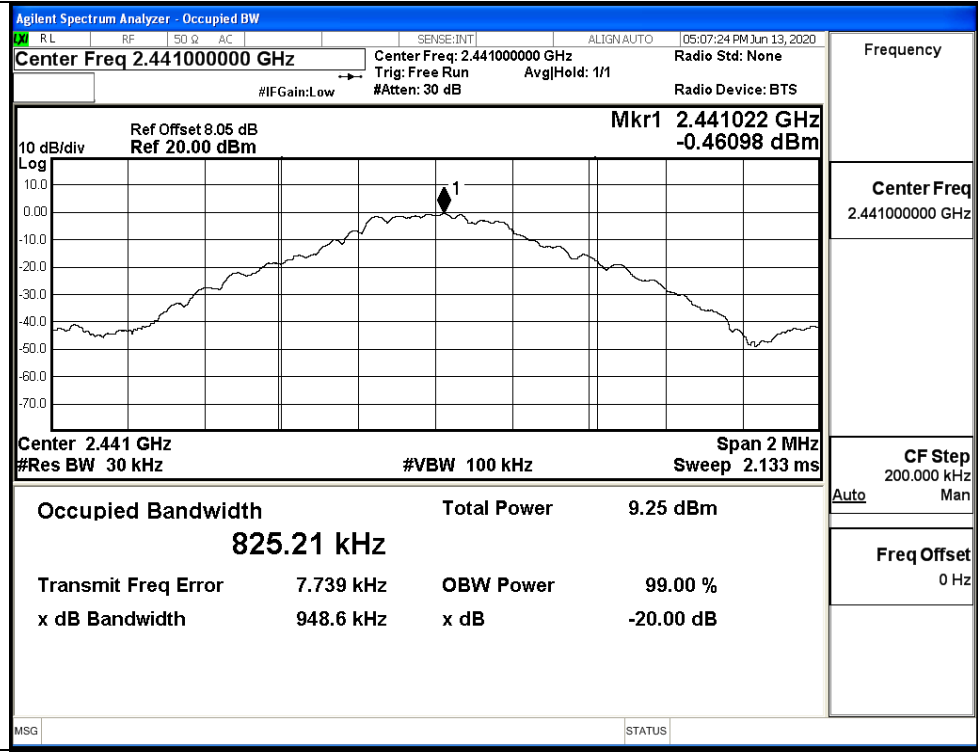


A.2 20dB Bandwidth

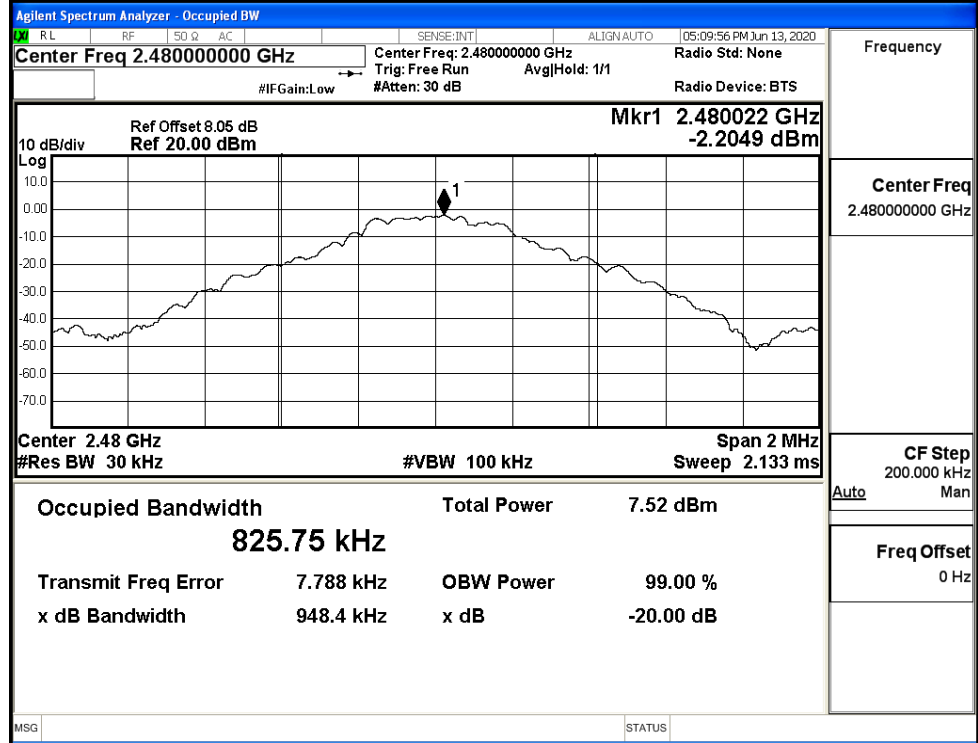
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9490	Not Specified	PASS
	MCH	0.9486	Not Specified	PASS
	HCH	0.9484	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.324	Not Specified	PASS
	MCH	1.324	Not Specified	PASS
	HCH	1.324	Not Specified	PASS
8DPSK	LCH	1.313	Not Specified	PASS
	MCH	1.313	Not Specified	PASS
	HCH	1.322	Not Specified	PASS

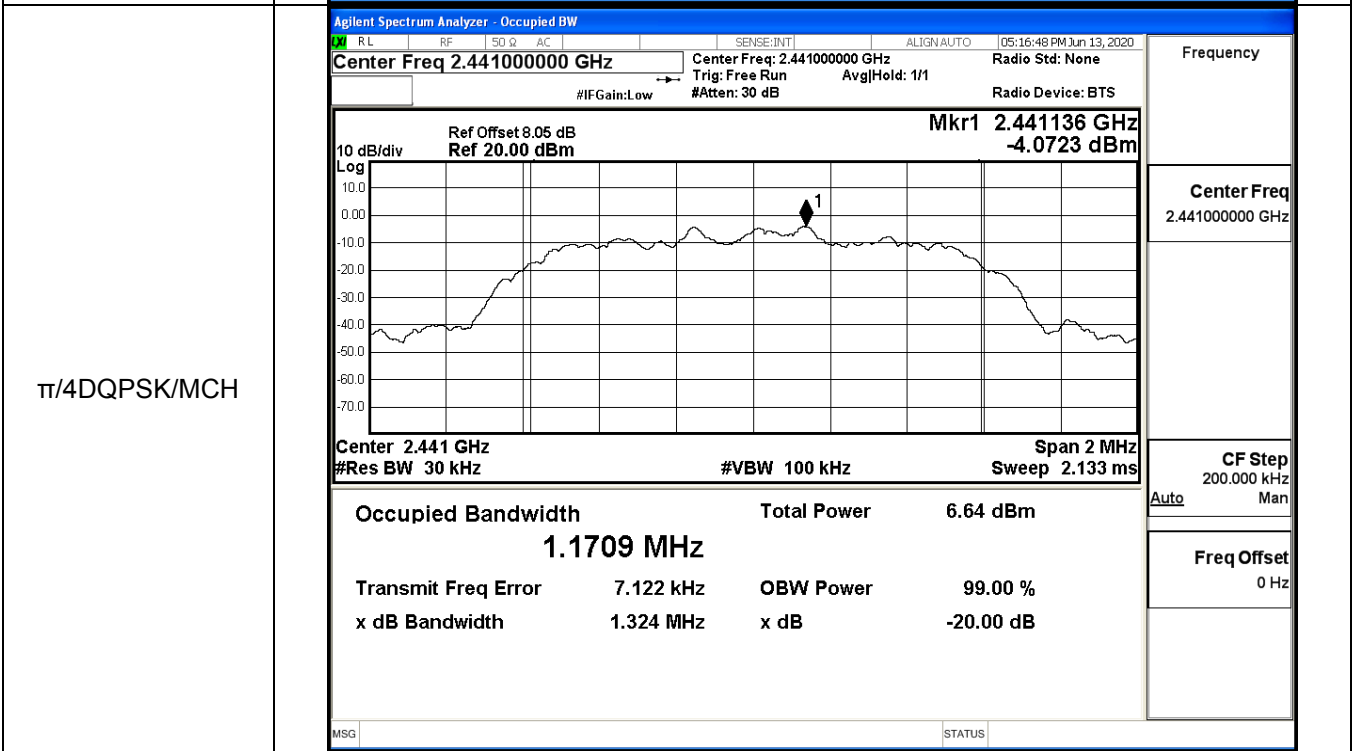
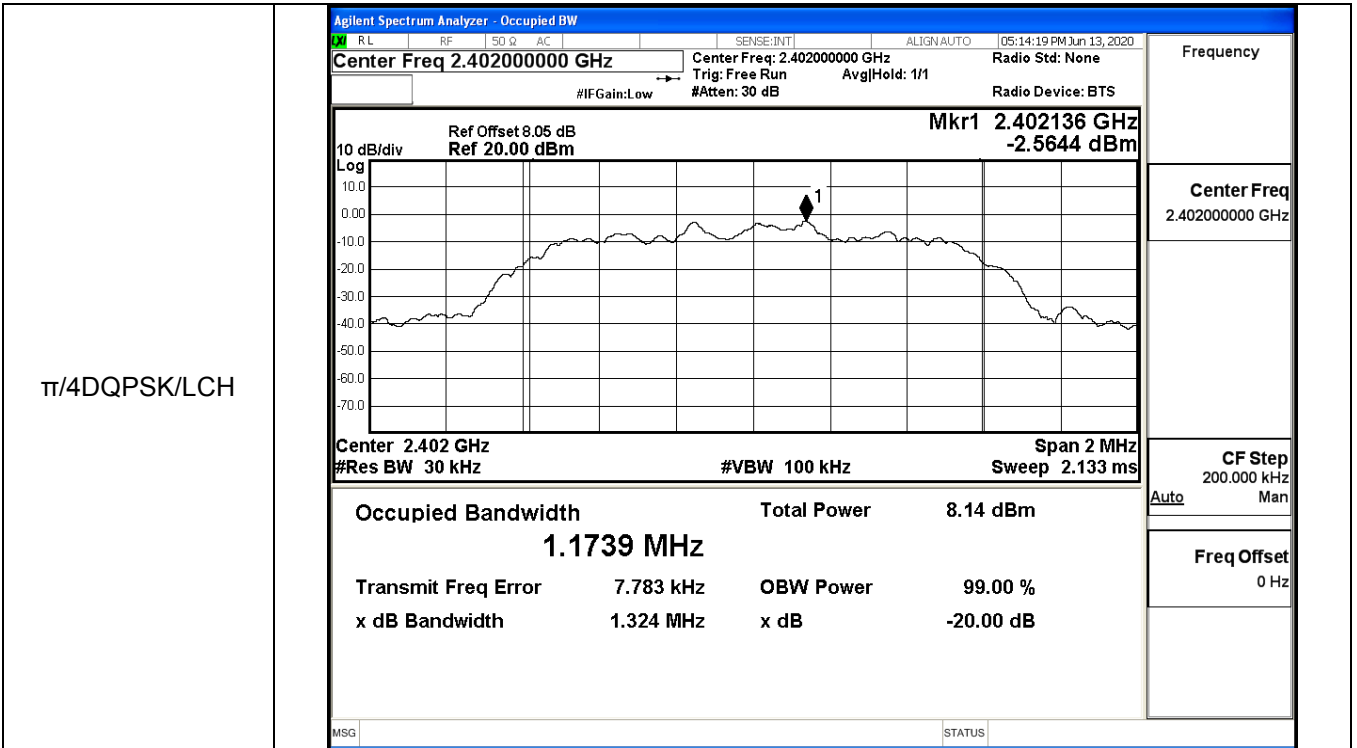


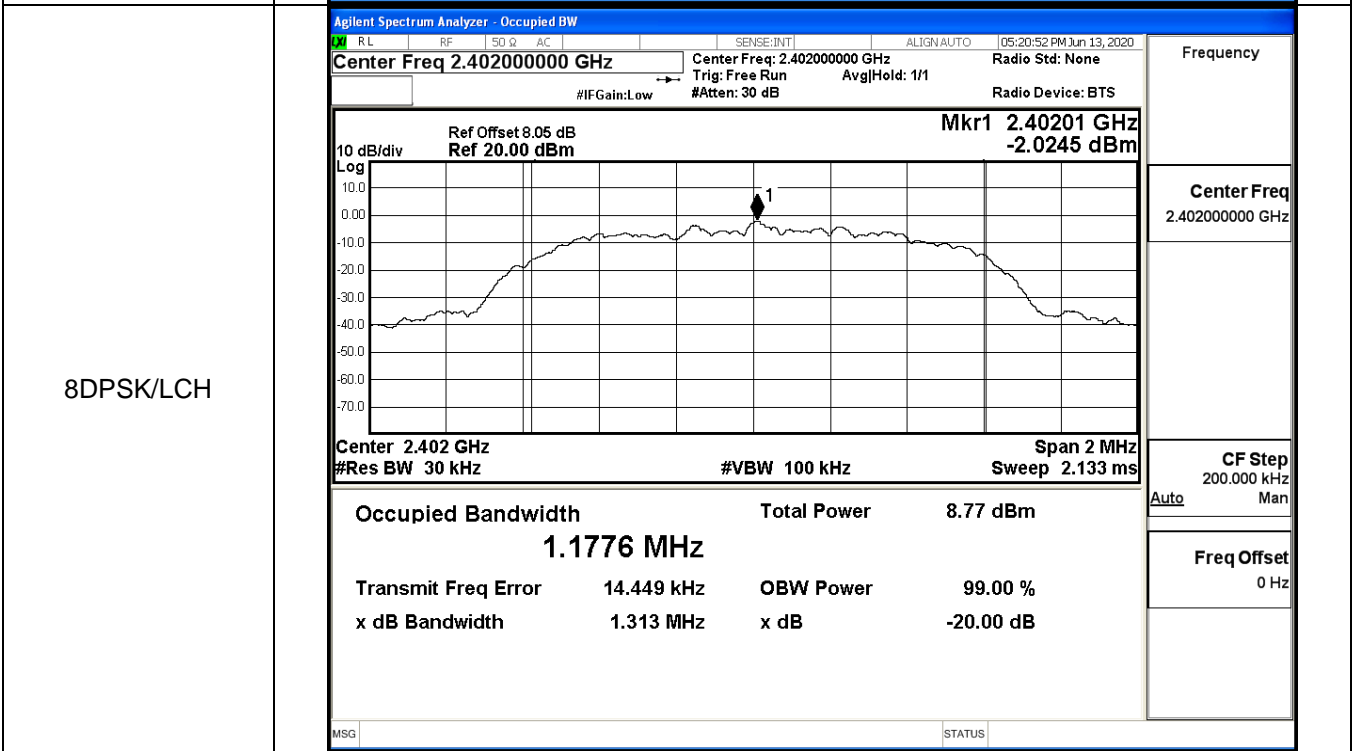
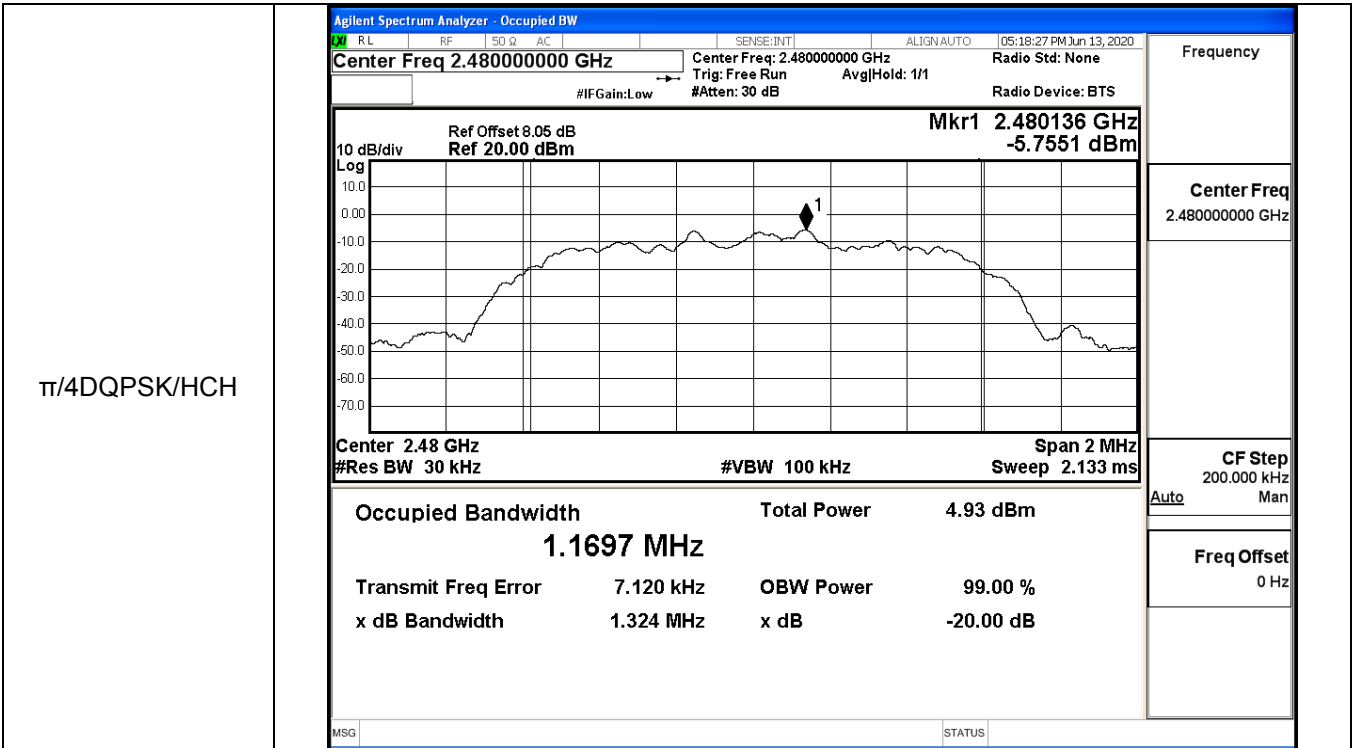
GFSK/MCH



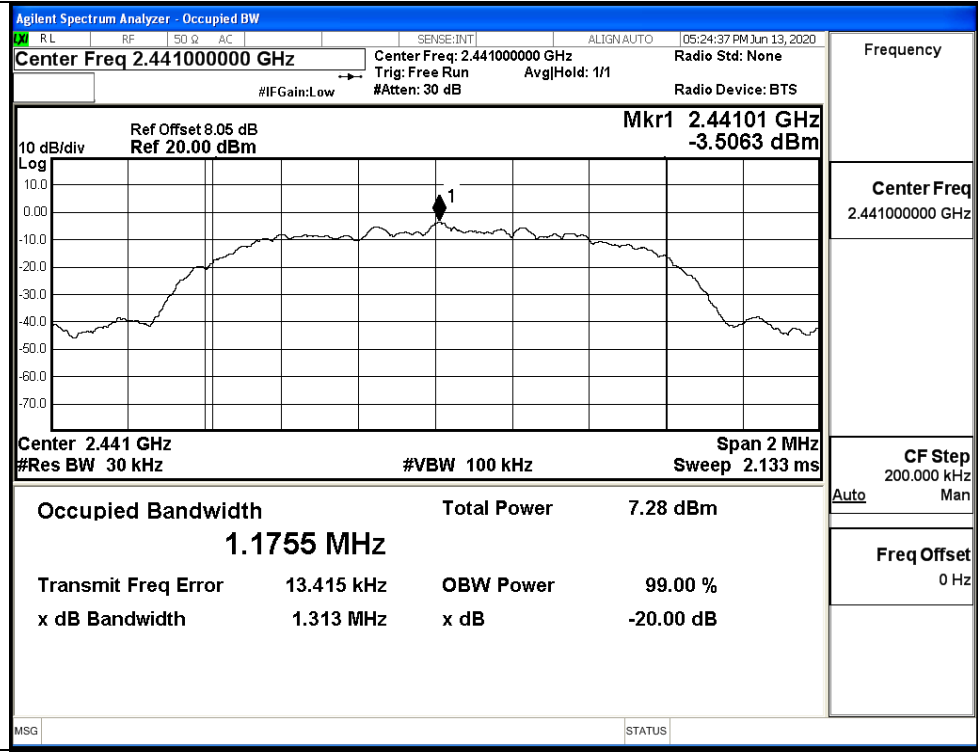
GFSK/HCH



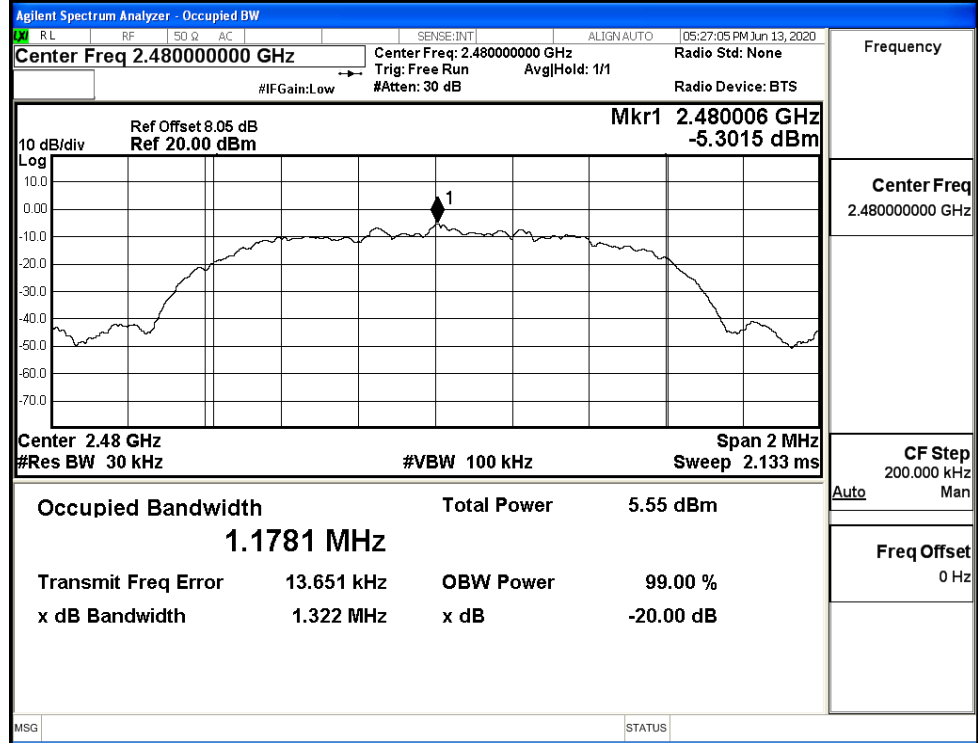




8DPSK/MCH

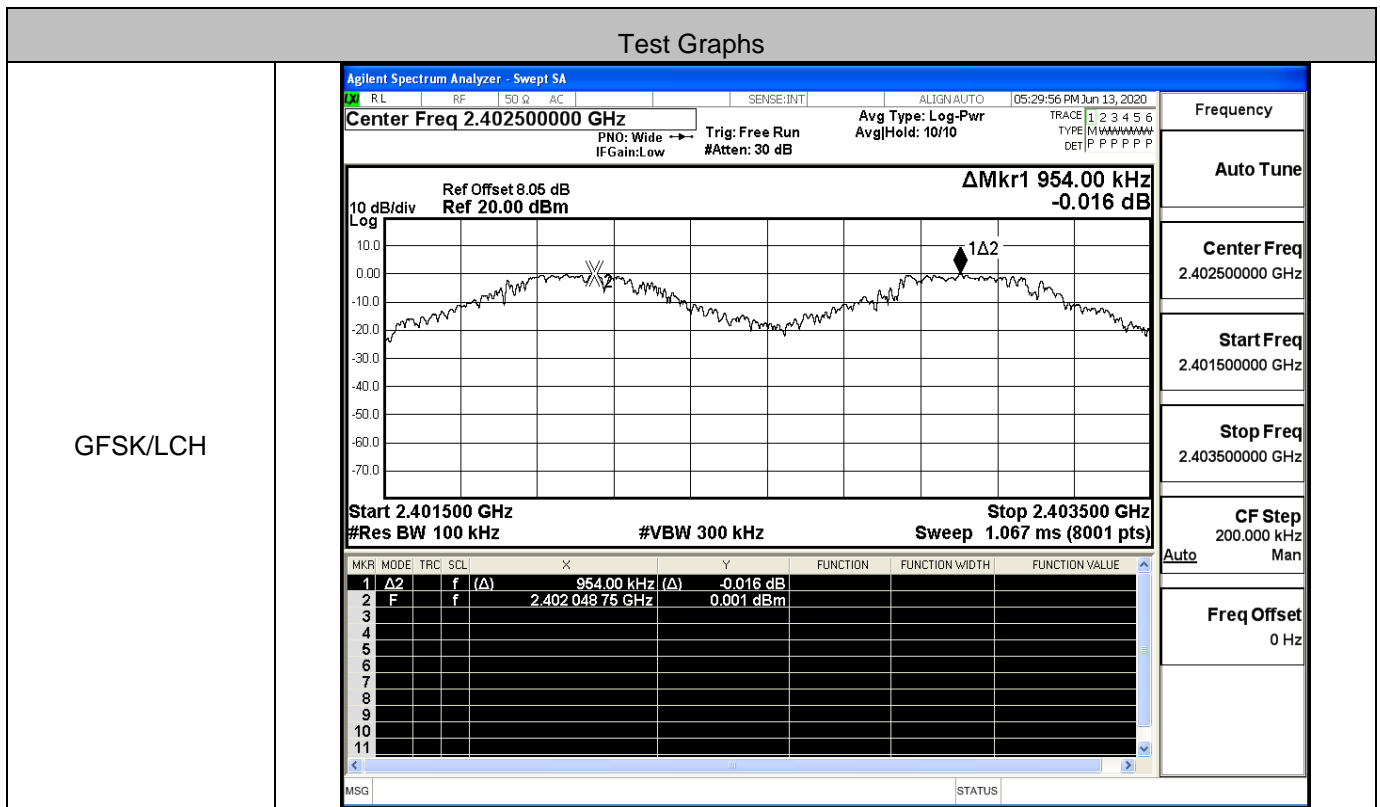


8DPSK/HCH

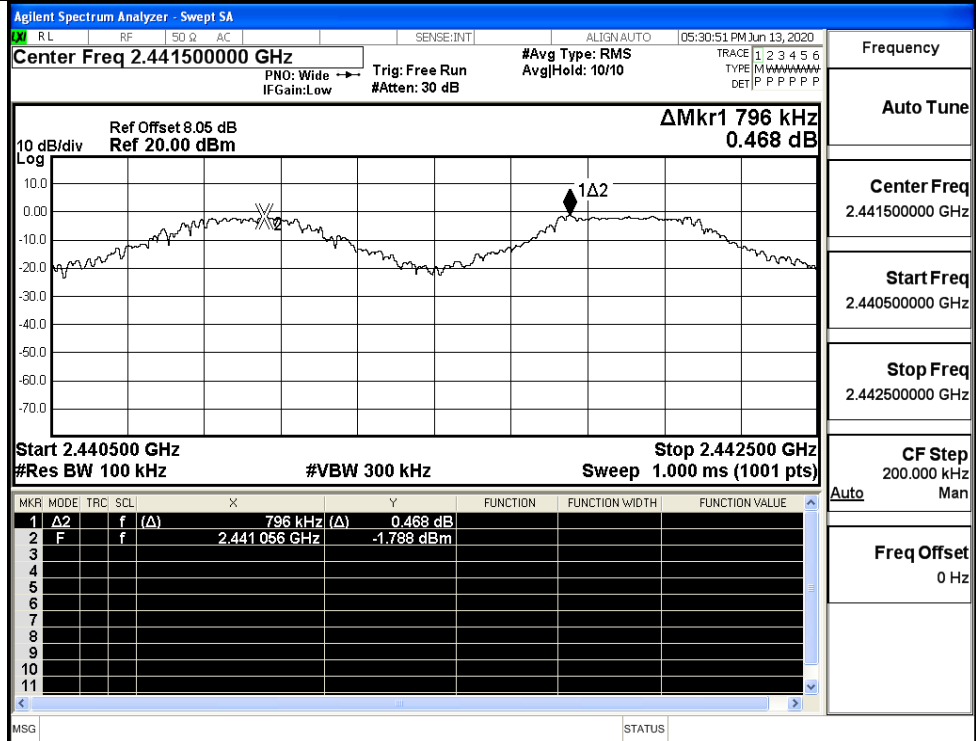


A.3 Carrier Frequency Separation

Mode	Channel	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.954	0.633	PASS
	MCH	0.796	0.633	PASS
	HCH	0.984	0.633	PASS
π/4DQPSK	LCH	1.022	0.883	PASS
	MCH	1.166	0.883	PASS
	HCH	1.016	0.883	PASS
8DPSK	LCH	0.914	0.881	PASS
	MCH	1.022	0.881	PASS
	HCH	1.136	0.881	PASS



GFSK/MCH



Frequency

Auto Tune

Center Freq
2.441500000 GHz

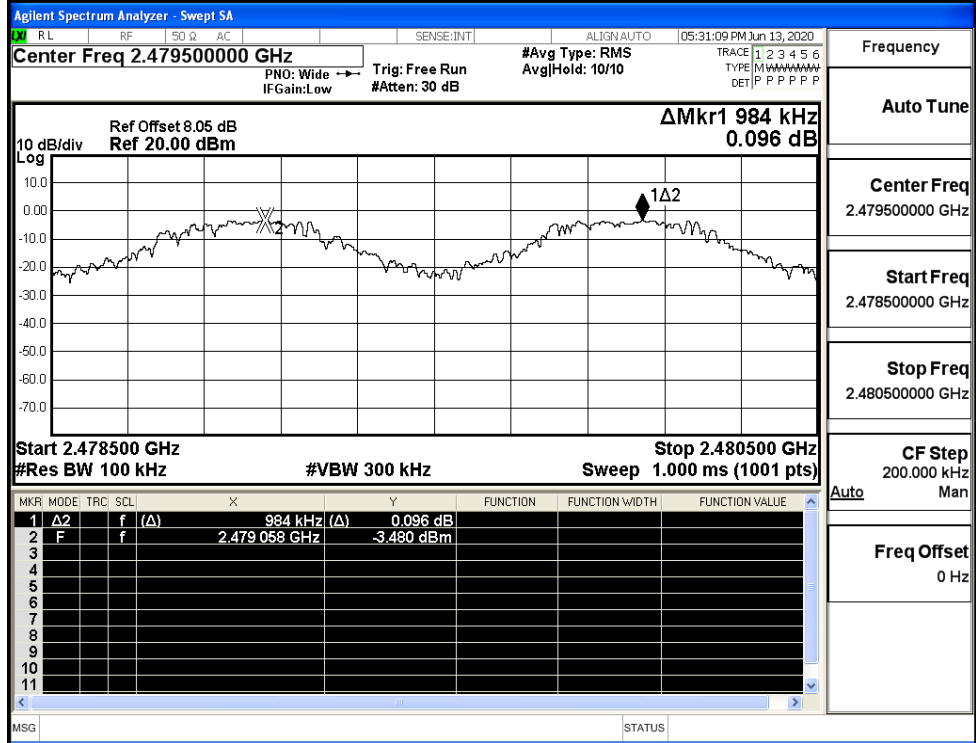
Start Freq
2.440500000 GHz

Stop Freq
2.442500000 GHz

CF Step
200.000 kHz

Freq Offset
0 Hz

GFSK/HCH



Frequency

Auto Tune

Center Freq
2.479500000 GHz

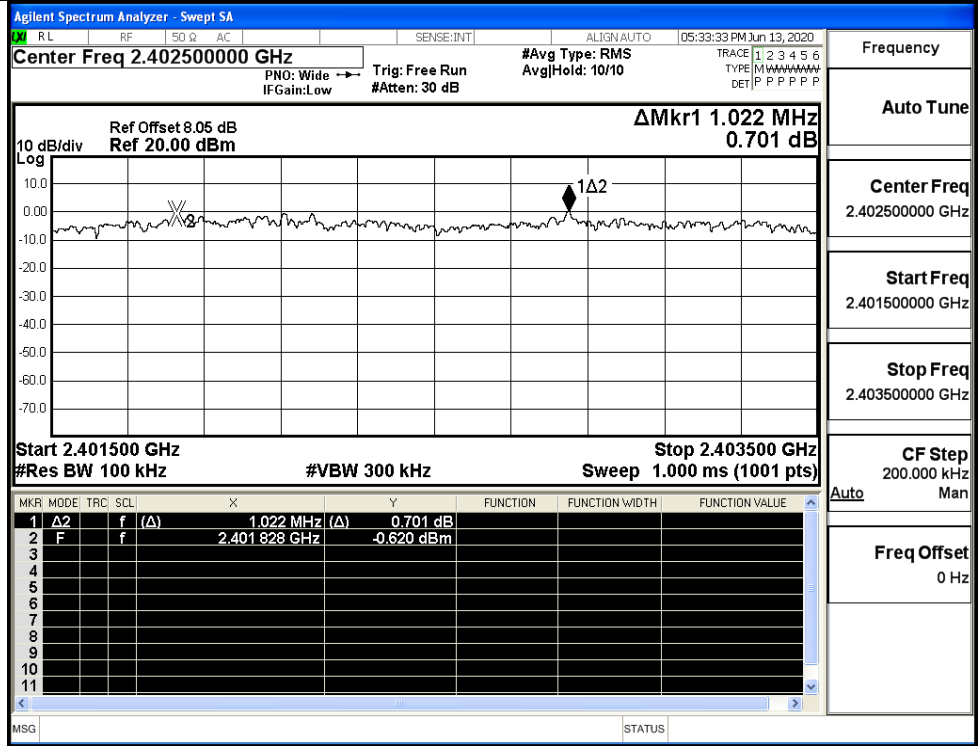
Start Freq
2.478500000 GHz

Stop Freq
2.480500000 GHz

CF Step
200.000 kHz

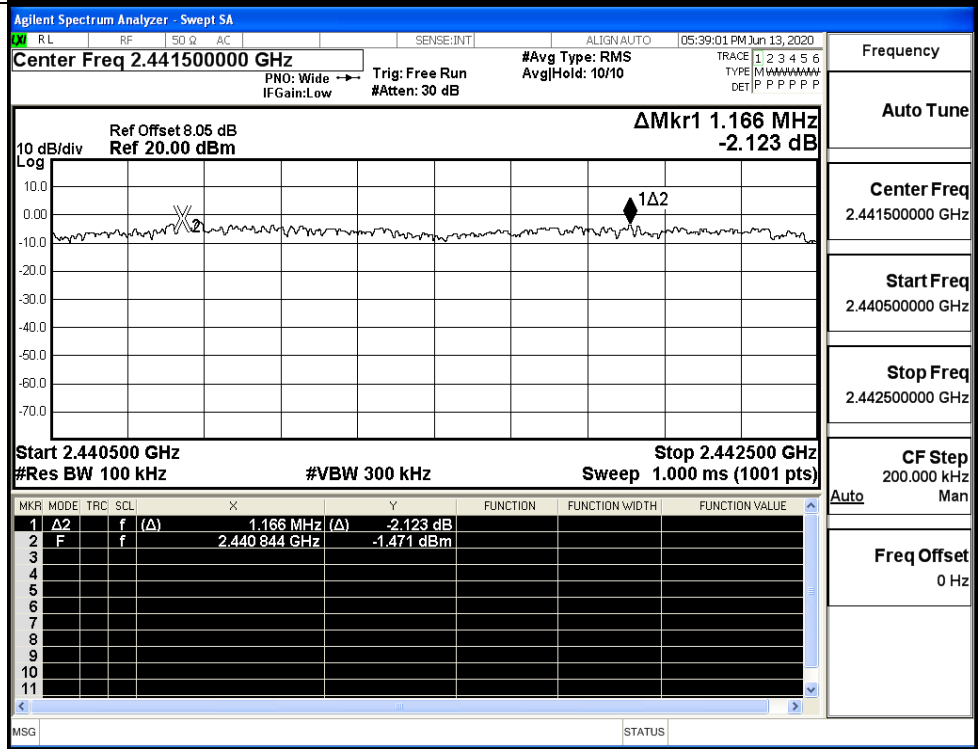
Freq Offset
0 Hz

$\pi/4$ DQPSK/LCH



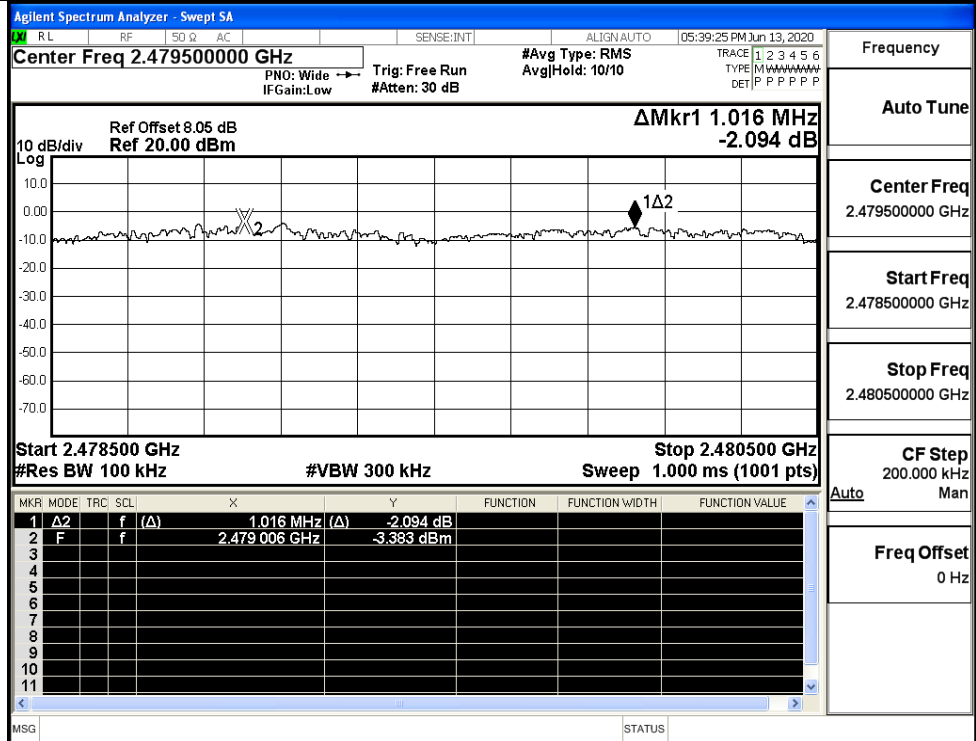
Frequency
Auto Tune
Center Freq 2.402500000 GHz
Start Freq 2.401500000 GHz
Stop Freq 2.403500000 GHz
CF Step 200.000 kHz Auto
Freq Offset 0 Hz

$\pi/4$ DQPSK/MCH



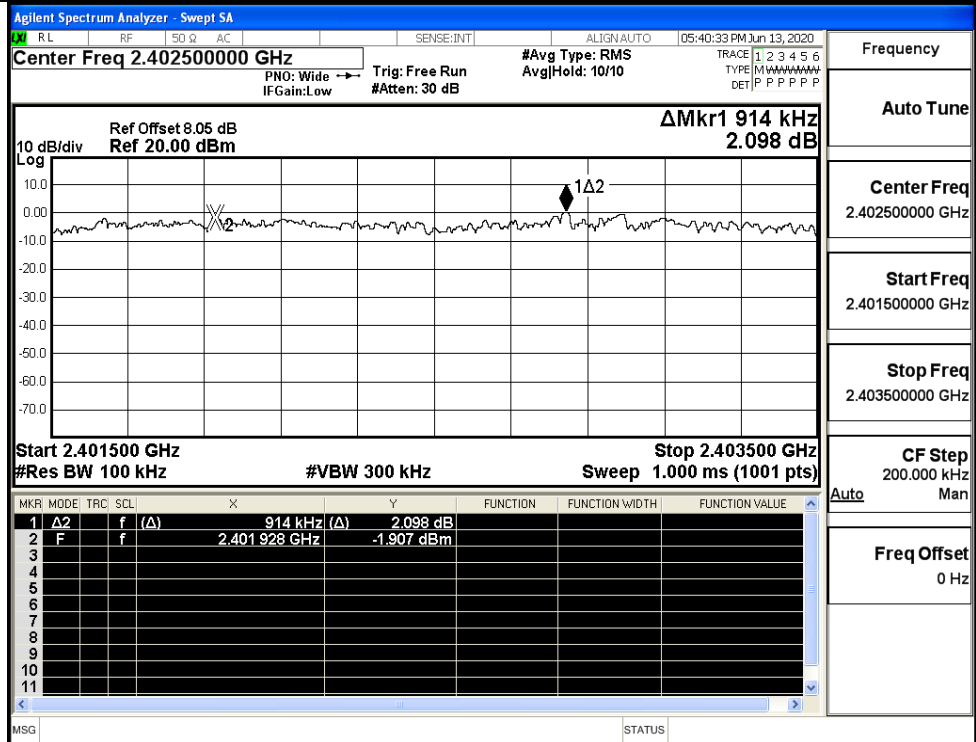
Frequency
Auto Tune
Center Freq 2.441500000 GHz
Start Freq 2.440500000 GHz
Stop Freq 2.442500000 GHz
CF Step 200.000 kHz Auto
Freq Offset 0 Hz

π/4DQPSK/HCH



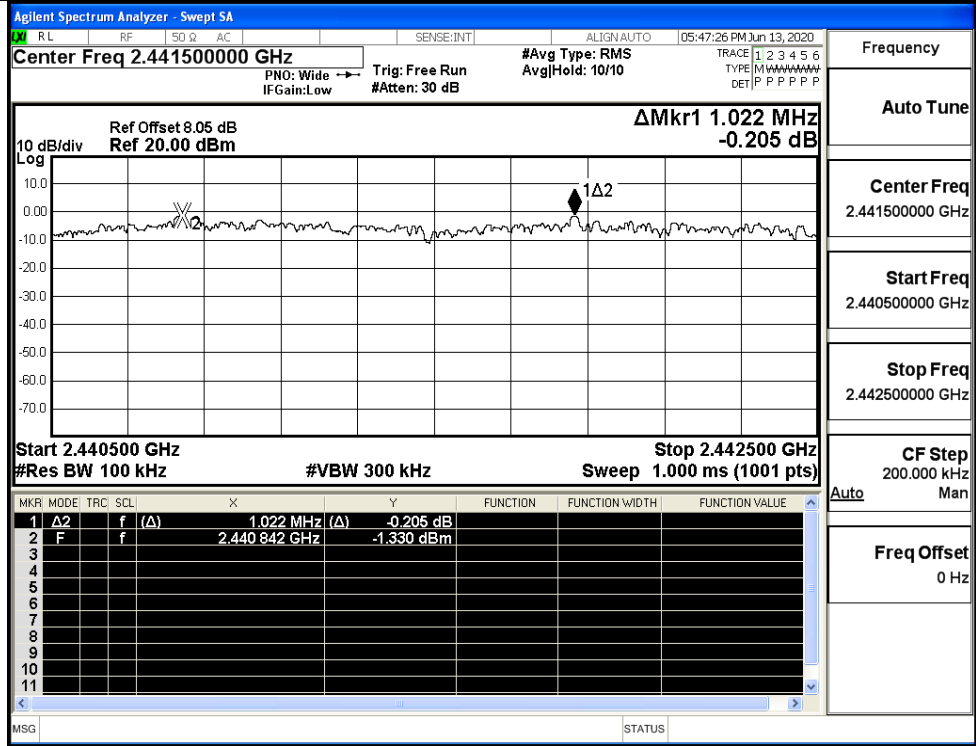
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto Man
Freq Offset
0 Hz

8DPSK/LCH



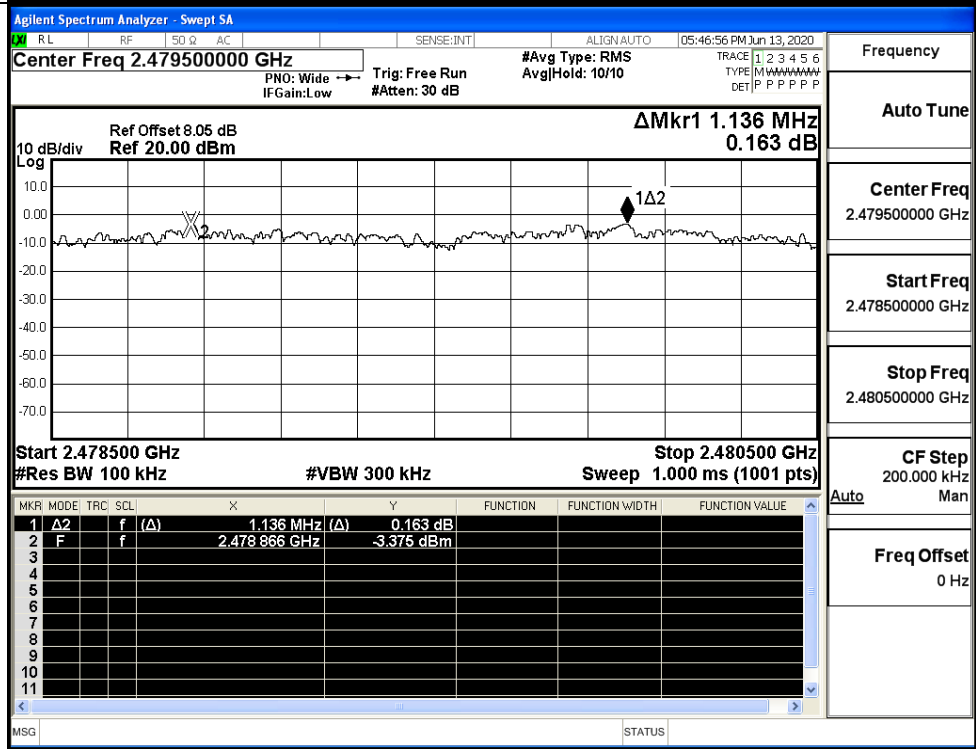
Frequency
Auto Tune
Center Freq
2.402500000 GHz
Start Freq
2.401500000 GHz
Stop Freq
2.403500000 GHz
CF Step
200.000 kHz
Auto Man
Freq Offset
0 Hz

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

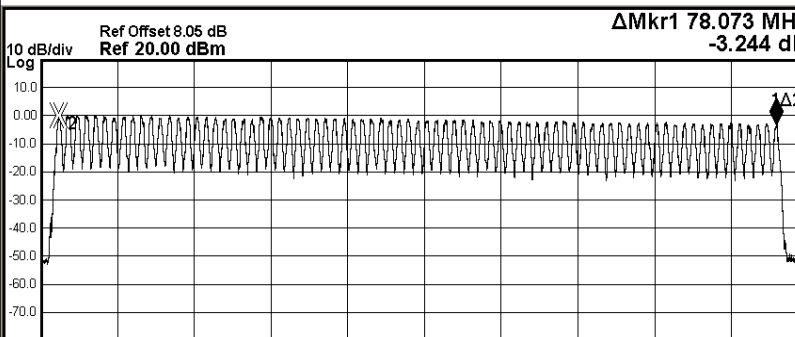
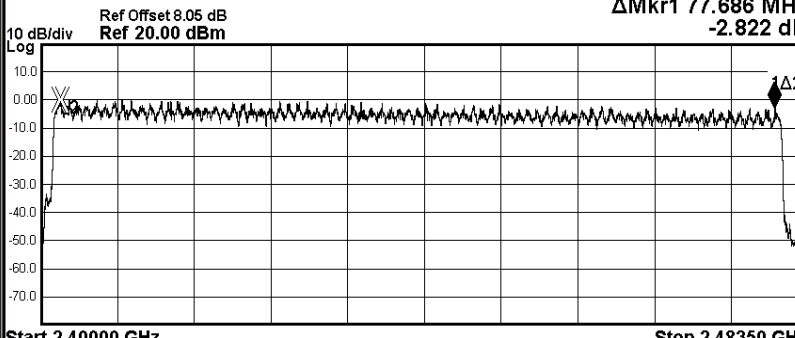


Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

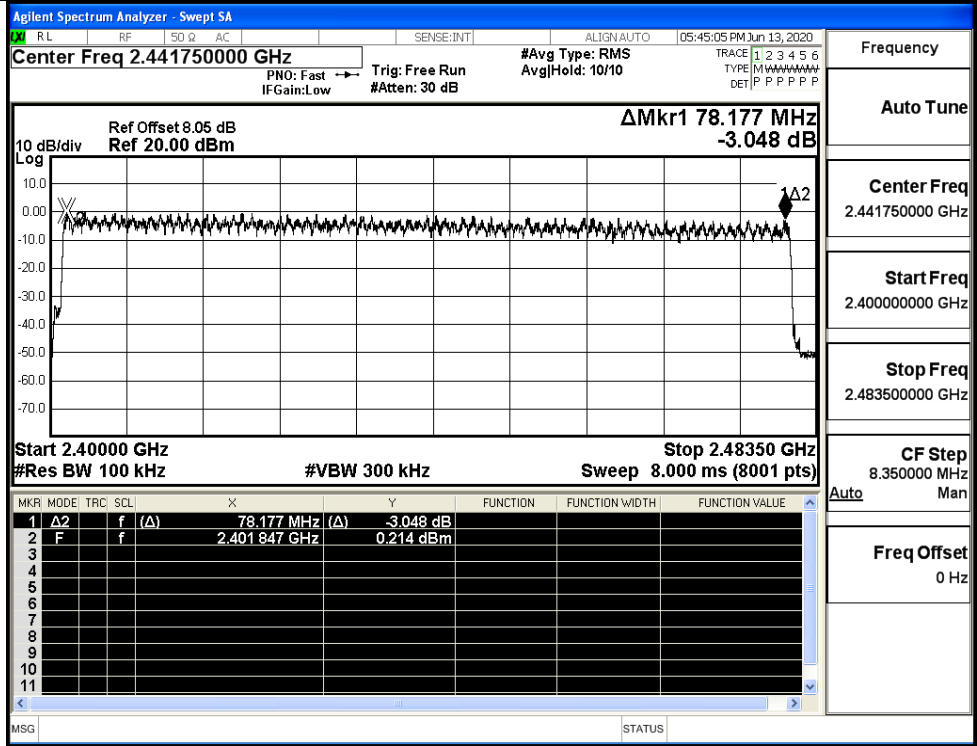
A.4 Hopping Channel Number

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

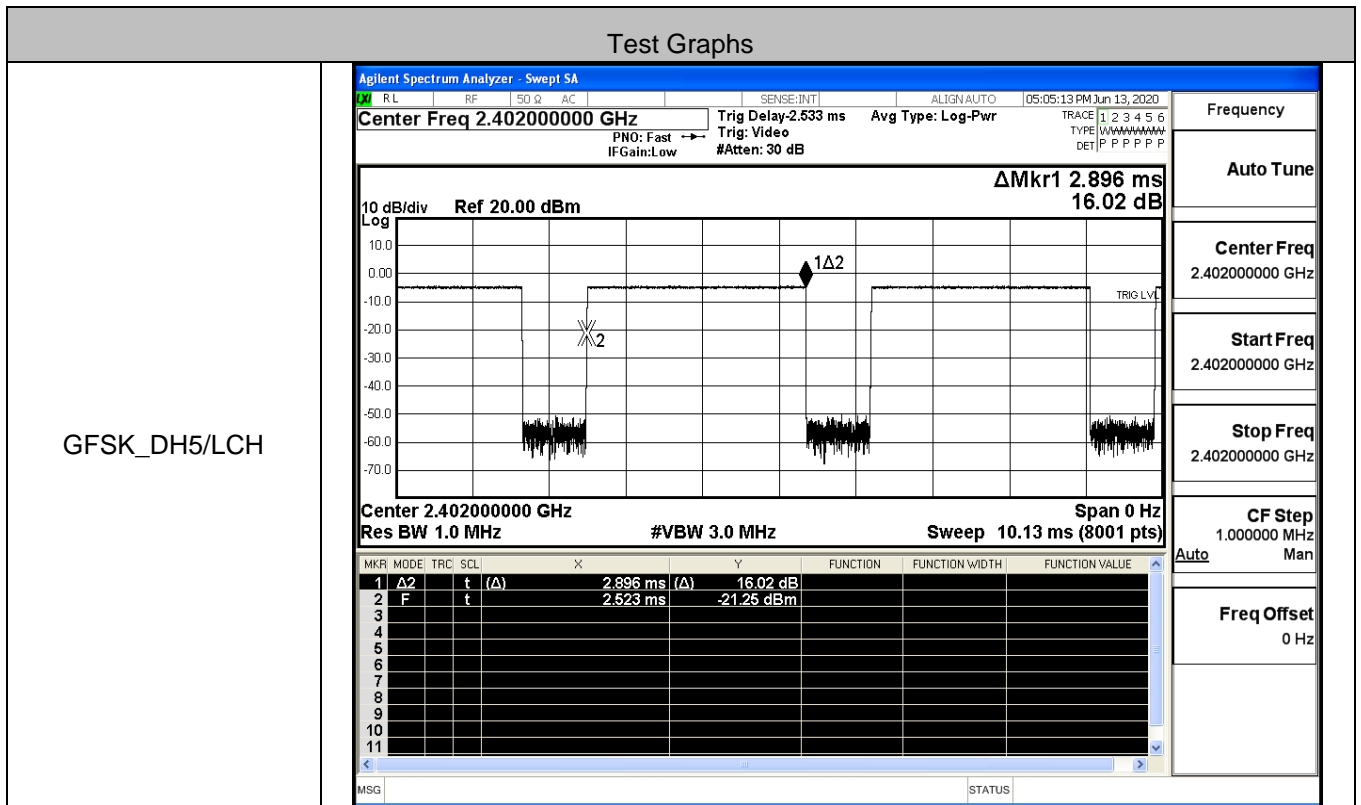
GFSK/Hop	<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: 0.8em; margin: 0;">Agilent Spectrum Analyzer - Swept SA</p> <p style="font-size: 0.7em; margin: 0;">RL RF SQ Q AC SENSE:INT ALIGN AUTO 05:32:29 PM Jun 13, 2020</p> <p style="font-size: 0.8em; margin: 0;">Center Freq 2.441750000 GHz #Avg Type: RMS #Attenu: 30 dB</p> <p style="font-size: 0.7em; margin: 0;">PNO: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB</p> <p style="font-size: 0.7em; margin: 0;">Ref Offset 8.05 dB Ref 20.00 dBm ΔMkr1 78.073 MHz -3.244 dB</p>  <p style="font-size: 0.7em; margin: 0;">Start 2.40000 GHz Stop 2.48350 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 8.000 ms (8001 pts)</p> <table border="1" style="width: 100%; font-size: 0.6em; border-collapse: collapse;"> <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>78.073 MHz (Δ)</td> <td>-3.244 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td>(Δ)</td> <td>2.401983 GHz</td> <td>-0.127 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> </div>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	78.073 MHz (Δ)	-3.244 dB				2	F	f	(Δ)	2.401983 GHz	-0.127 dBm			
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	Δ 2	f	(Δ)	78.073 MHz (Δ)	-3.244 dB																							
2	F	f	(Δ)	2.401983 GHz	-0.127 dBm																							
$\pi/4$ DQPSK/Hop	<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: 0.8em; margin: 0;">Agilent Spectrum Analyzer - Swept SA</p> <p style="font-size: 0.7em; margin: 0;">RL RF SQ Q AC SENSE:INT ALIGN AUTO 05:38:06 PM Jun 13, 2020</p> <p style="font-size: 0.8em; margin: 0;">Center Freq 2.441750000 GHz #Avg Type: RMS #Attenu: 30 dB</p> <p style="font-size: 0.7em; margin: 0;">PNO: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB</p> <p style="font-size: 0.7em; margin: 0;">Ref Offset 8.05 dB Ref 20.00 dBm ΔMkr1 77.686 MHz -2.822 dB</p>  <p style="font-size: 0.7em; margin: 0;">Start 2.40000 GHz Stop 2.48350 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 8.000 ms (8001 pts)</p> <table border="1" style="width: 100%; font-size: 0.6em; border-collapse: collapse;"> <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>77.686 MHz (Δ)</td> <td>-2.822 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td>(Δ)</td> <td>2.402171 GHz</td> <td>-0.174 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> </div>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	77.686 MHz (Δ)	-2.822 dB				2	F	f	(Δ)	2.402171 GHz	-0.174 dBm			
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	Δ 2	f	(Δ)	77.686 MHz (Δ)	-2.822 dB																							
2	F	f	(Δ)	2.402171 GHz	-0.174 dBm																							

8DPSK/Hop

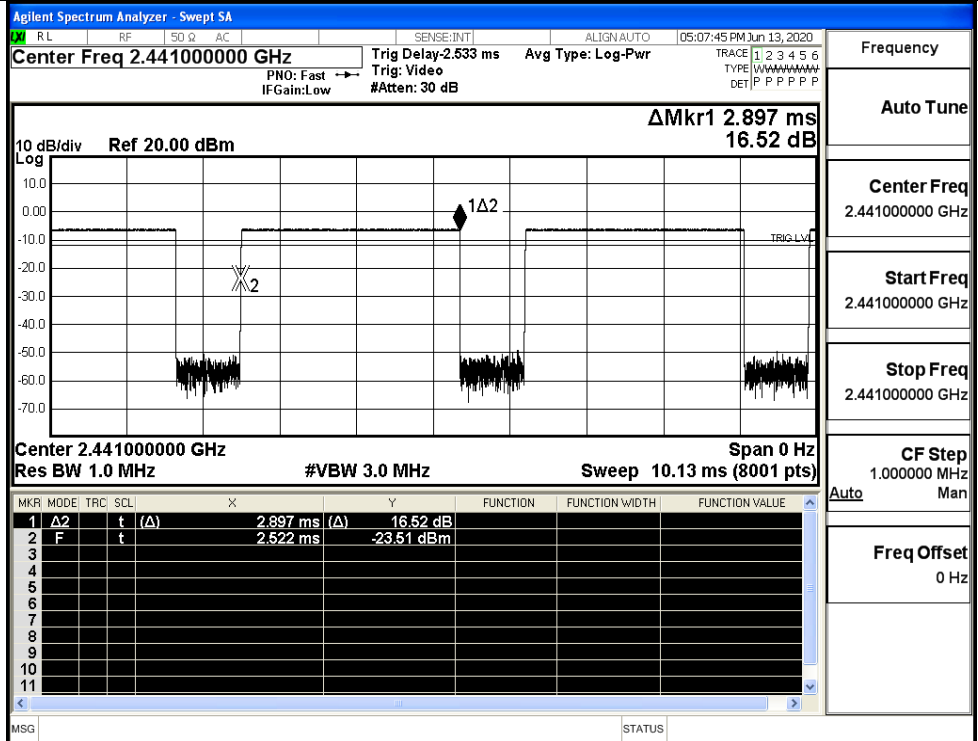


A.5 Dwell Time

Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.9	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
π/4DQPSK	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



GFSK_DH5/MCH



Frequency

Auto Tune

Center Freq 2.441000000 GHz

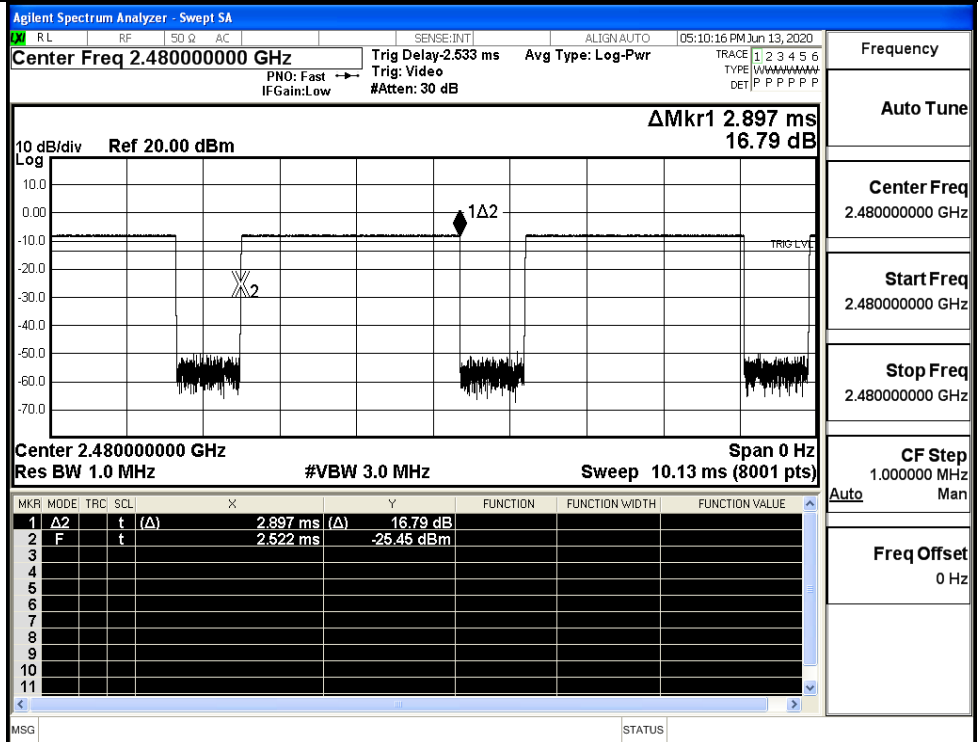
Start Freq 2.441000000 GHz

Stop Freq 2.441000000 GHz

CF Step 1.000000 MHz

Freq Offset 0 Hz

GFSK_DH5/HCH



Frequency

Auto Tune

Center Freq 2.480000000 GHz

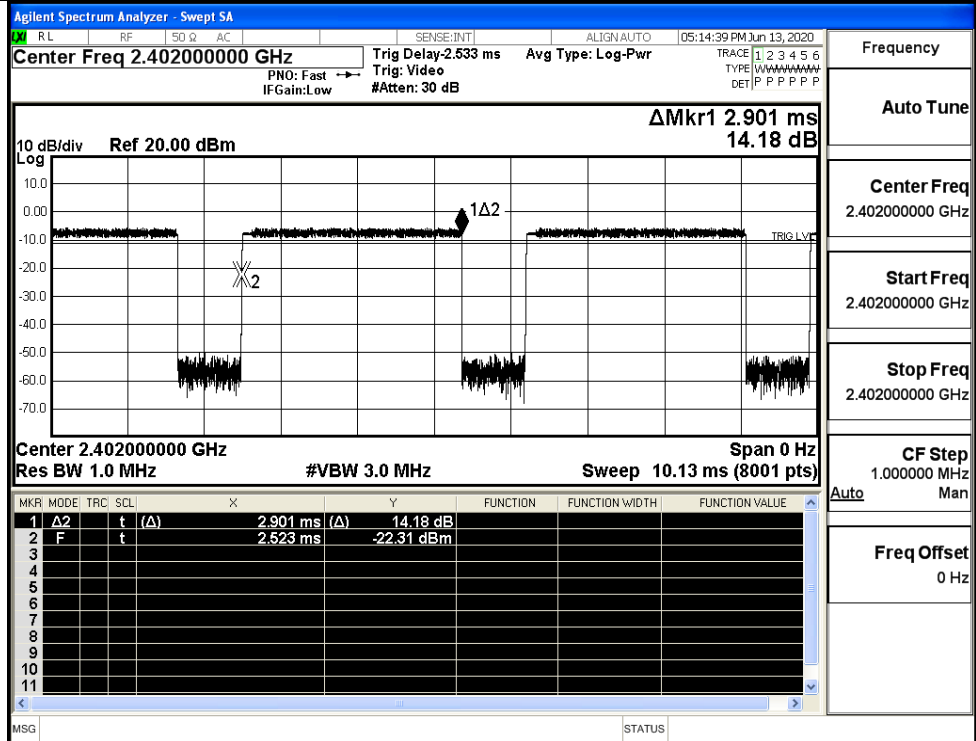
Start Freq 2.480000000 GHz

Stop Freq 2.480000000 GHz

CF Step 1.000000 MHz

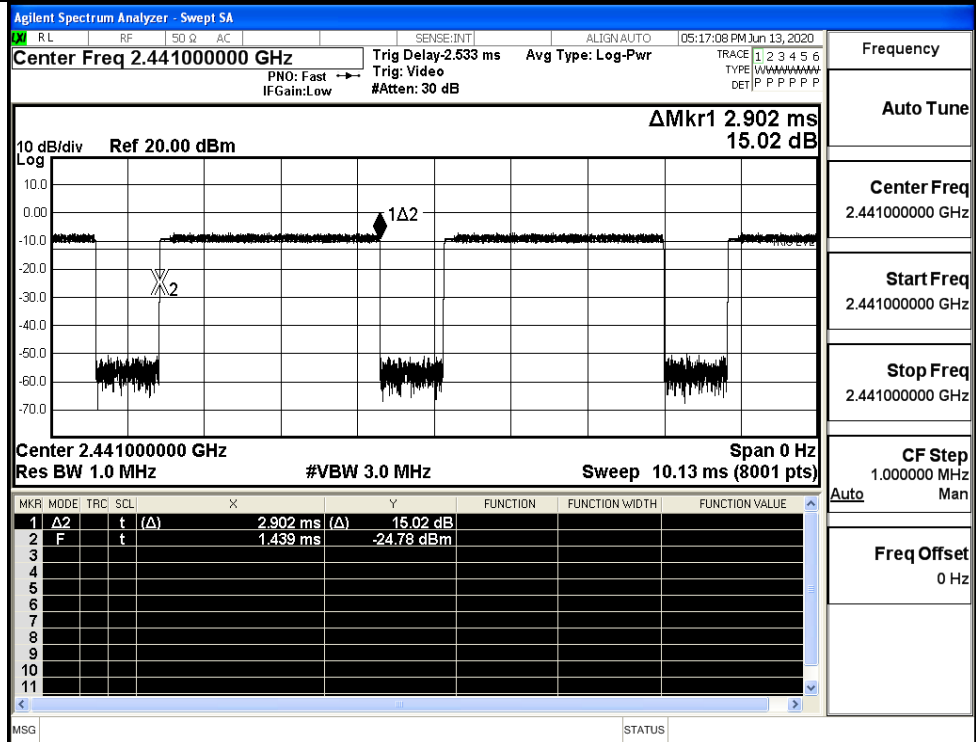
Freq Offset 0 Hz

$\pi/4$ DQPSK
_2DH5/LCH



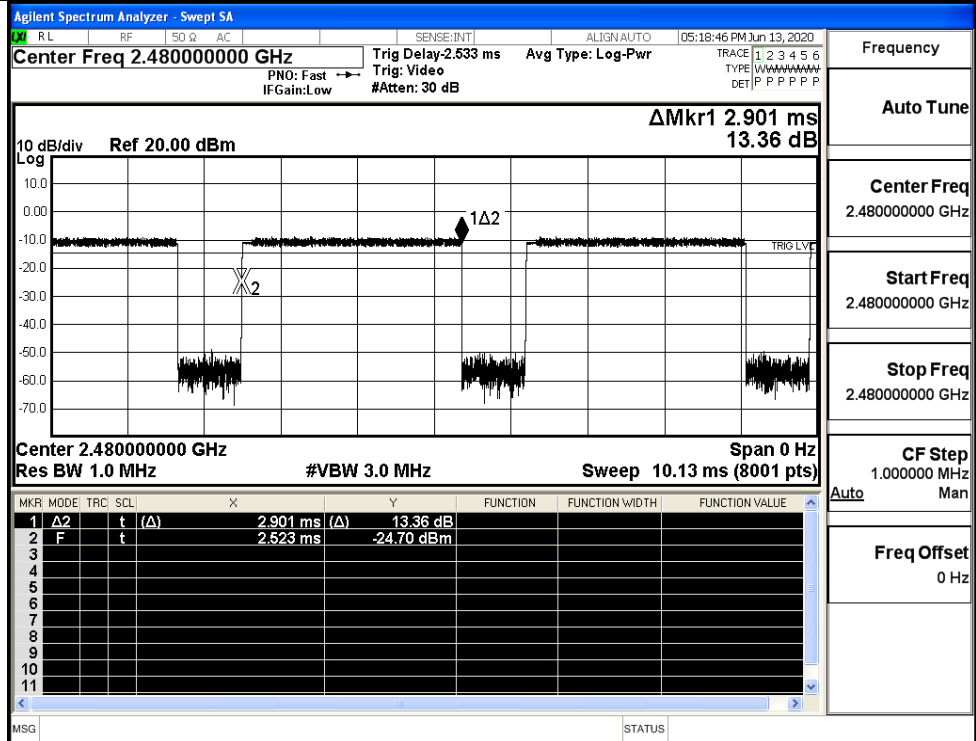
Frequency	2.402000000 GHz
Auto Tune	
Center Freq	2.402000000 GHz
Start Freq	2.402000000 GHz
Stop Freq	2.402000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK
_2DH5/MCH

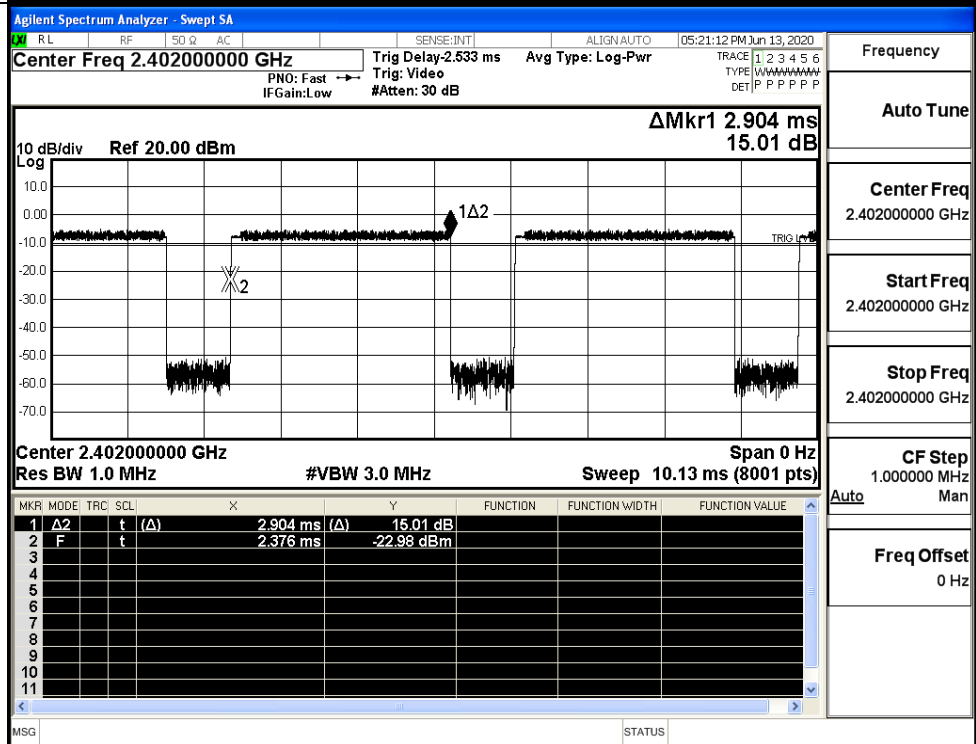


Frequency	2.441000000 GHz
Auto Tune	
Center Freq	2.441000000 GHz
Start Freq	2.441000000 GHz
Stop Freq	2.441000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

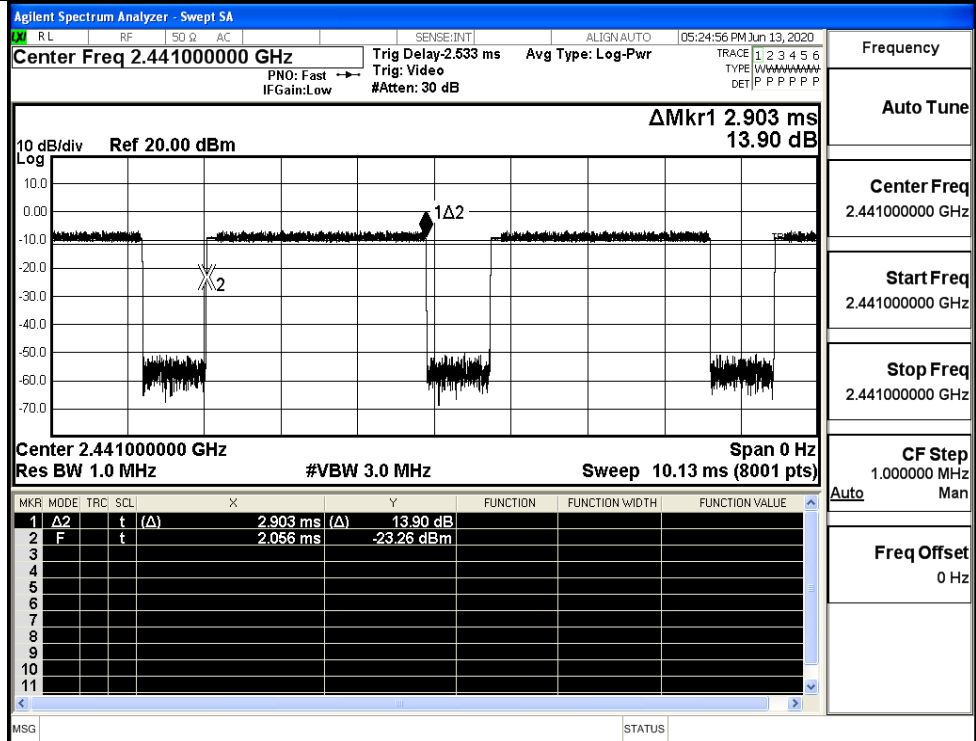
$\pi/4$ DQPSK
_2DH5/HCH



8DPSK_3DH5/LCH



8DPSK_3DH5/MCH



Frequency

Auto Tune

Center Freq 2.441000000 GHz

Start Freq 2.441000000 GHz

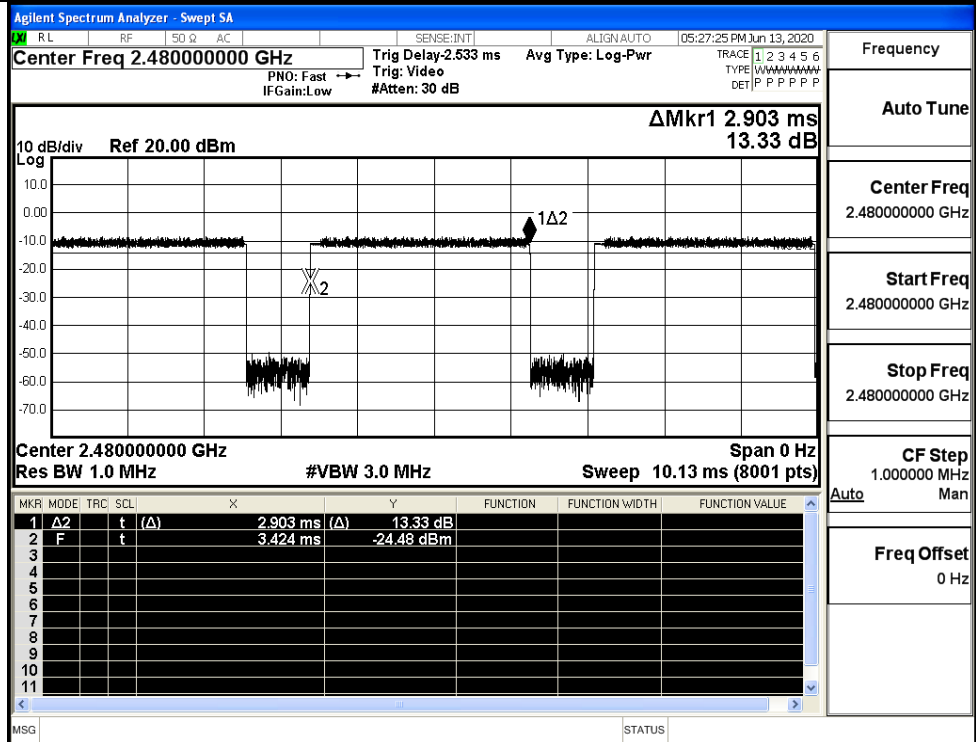
Stop Freq 2.441000000 GHz

CF Step 1.000000 MHz

Auto Man

Freq Offset 0 Hz

8DPSK_3DH5/HCH



Frequency

Auto Tune

Center Freq 2.480000000 GHz

Start Freq 2.480000000 GHz

Stop Freq 2.480000000 GHz

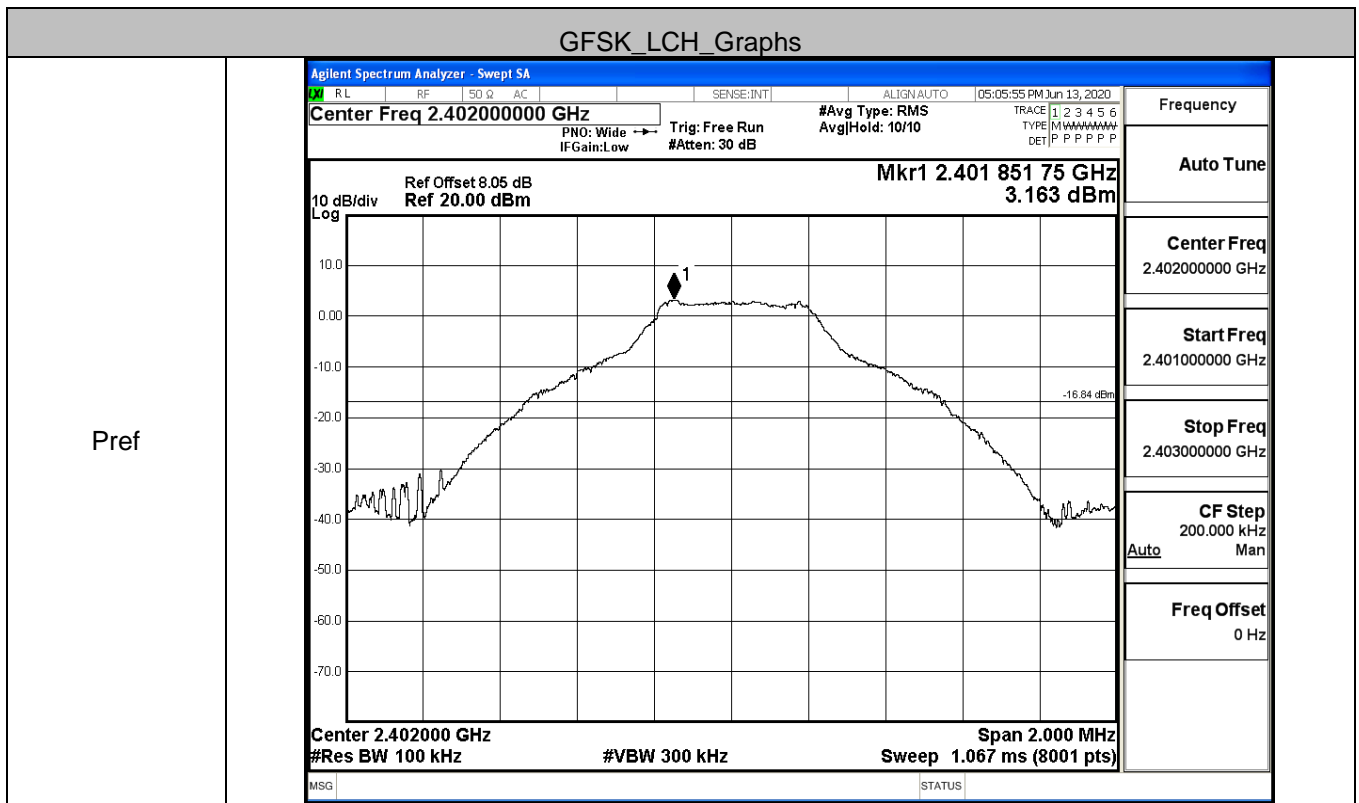
CF Step 1.000000 MHz

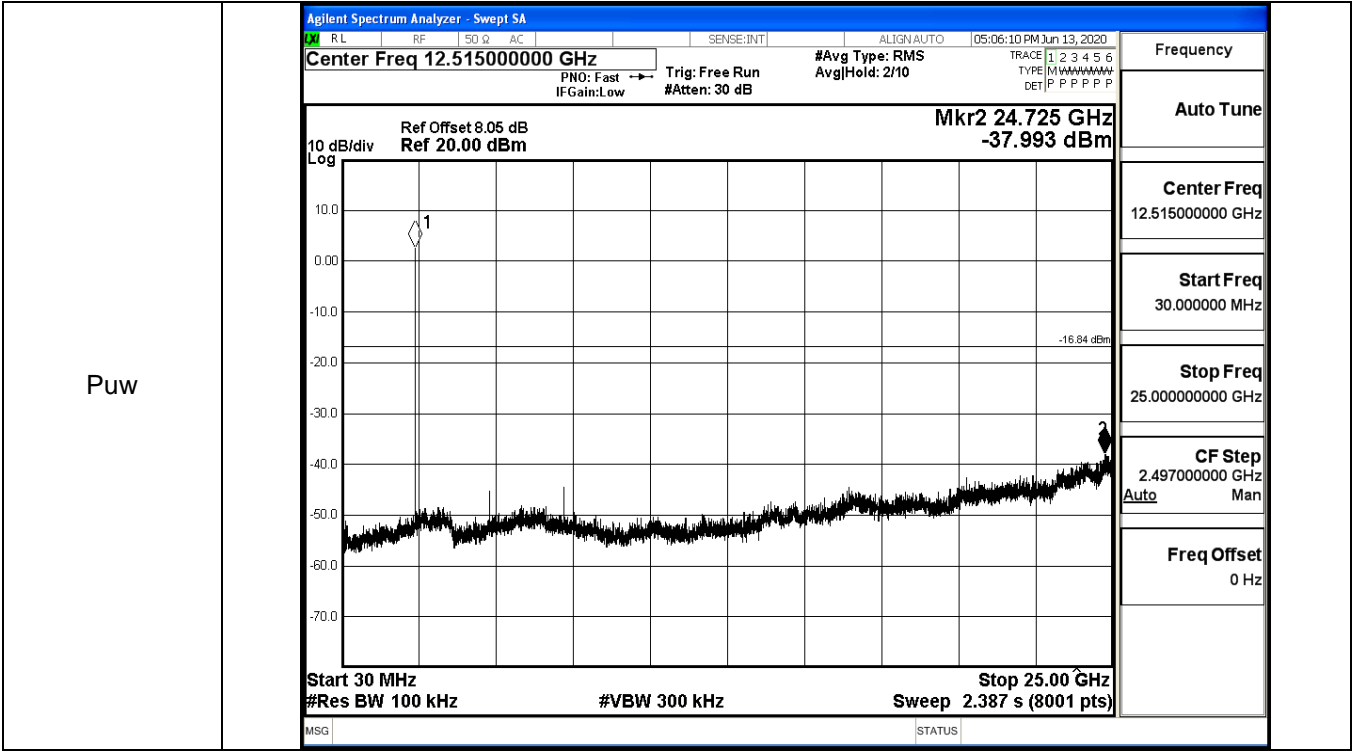
Auto Man

Freq Offset 0 Hz

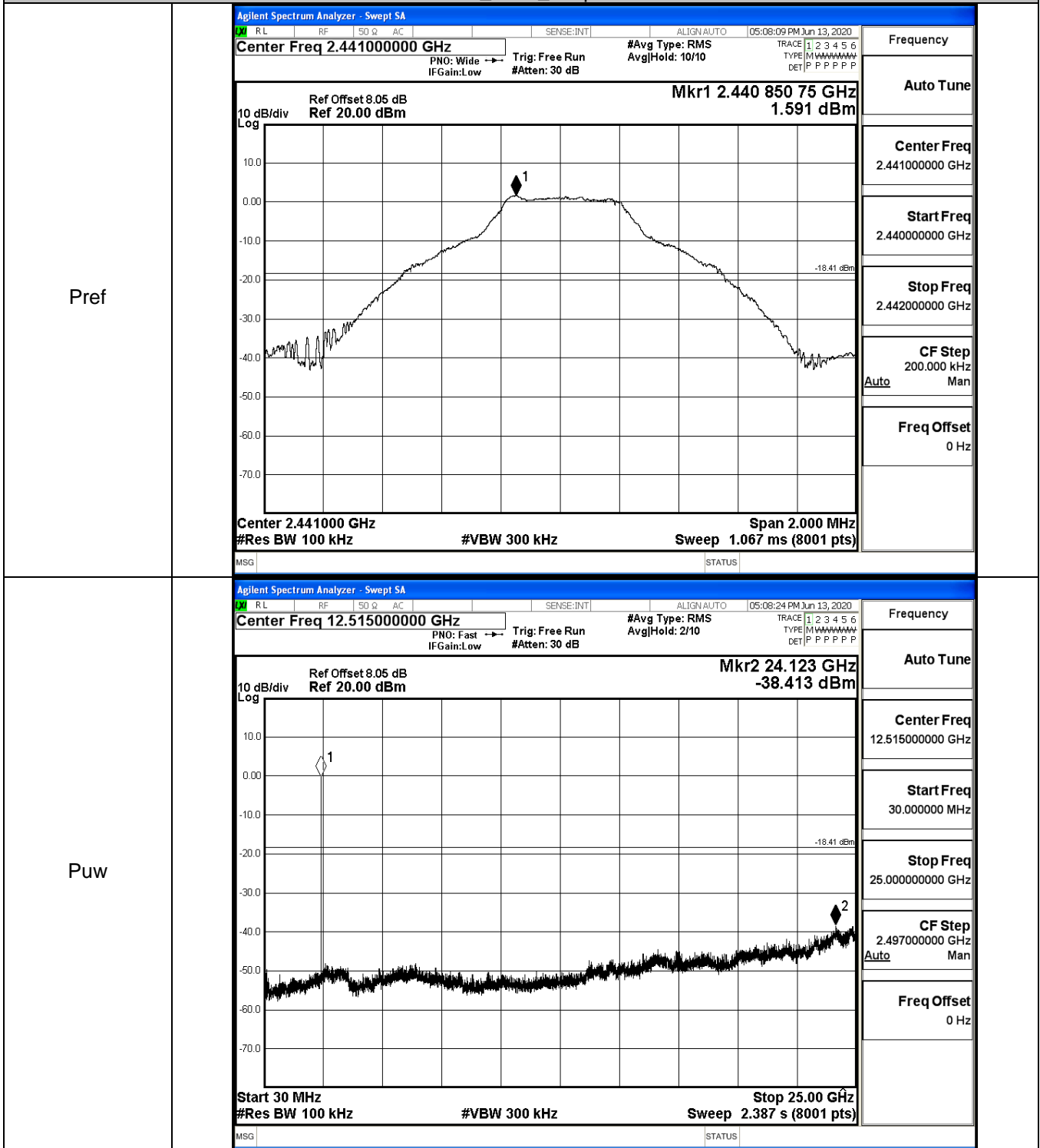
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	3.163	-37.993	-16.837	PASS
	MCH	1.591	-38.413	-18.409	PASS
	HCH	-0.089	-38.258	-20.089	PASS
π /4DQPSK	LCH	0.07	-38.112	-19.930	PASS
	MCH	-1.496	-37.175	-21.496	PASS
	HCH	-3.177	-38.639	-23.177	PASS
8DPSK	LCH	0.25	-37.021	-19.750	PASS
	MCH	-1.27	-37.616	-21.270	PASS
	HCH	-3.043	-36.814	-23.043	PASS

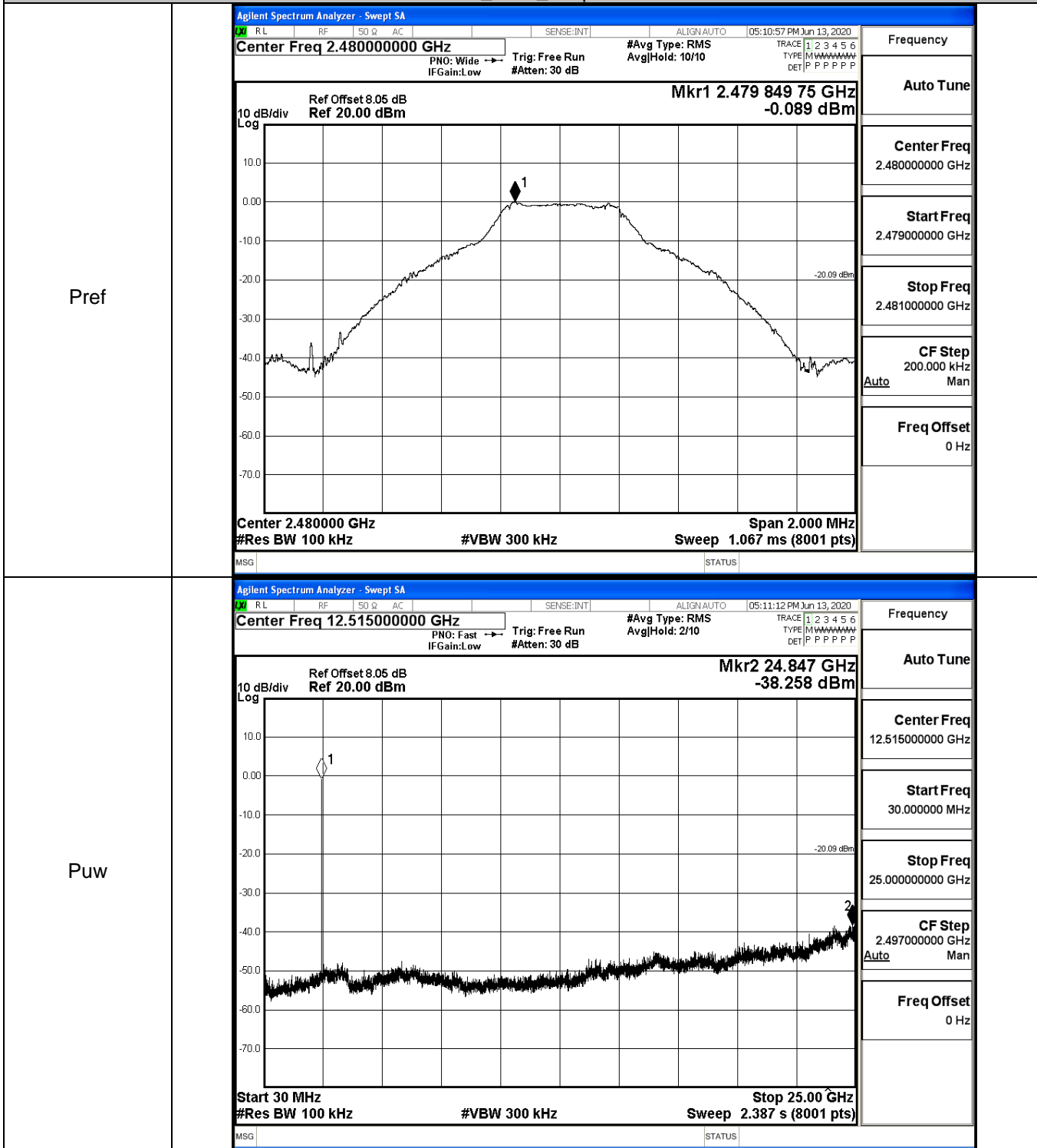




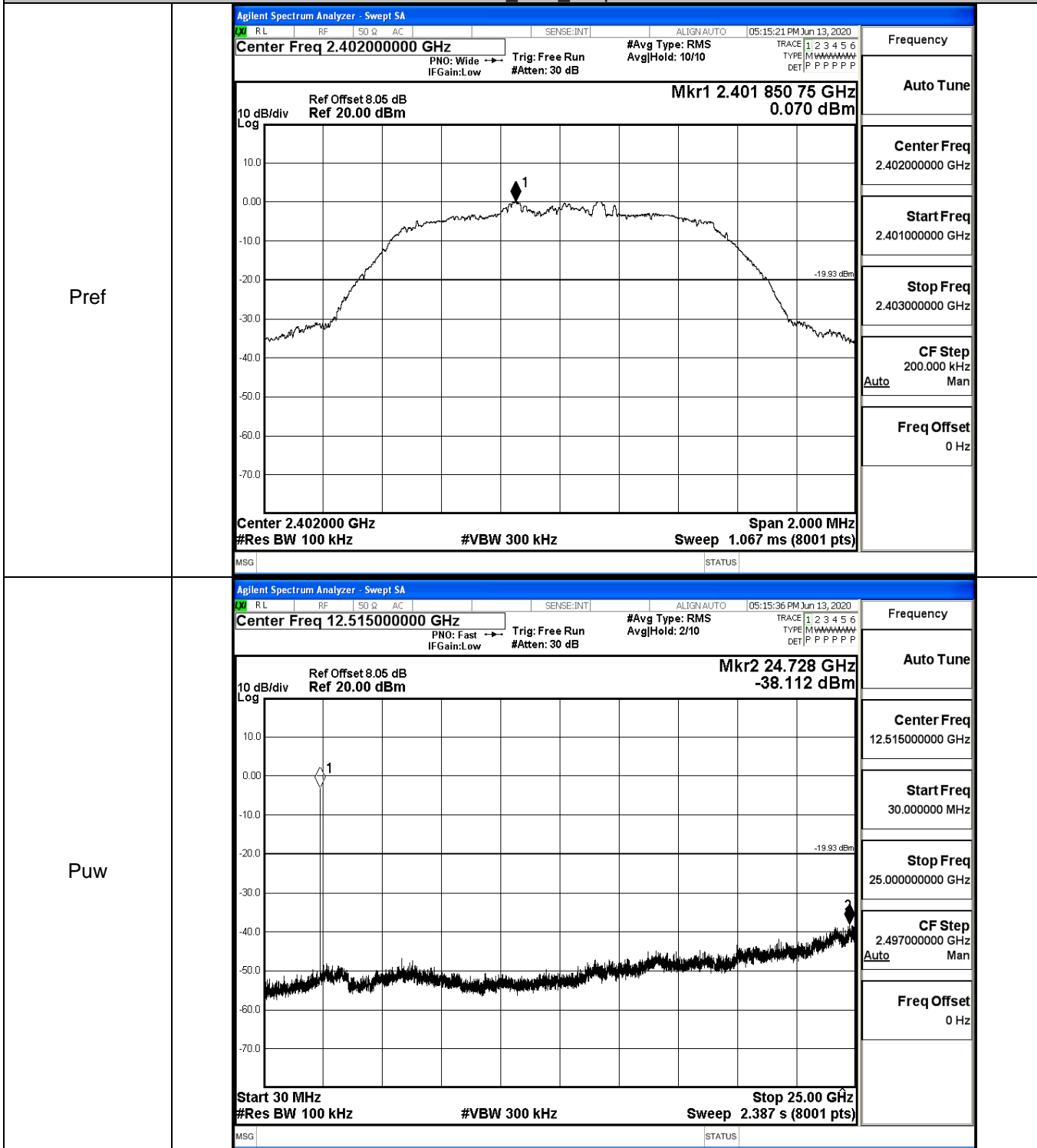
GFSK_MCH_Graphs



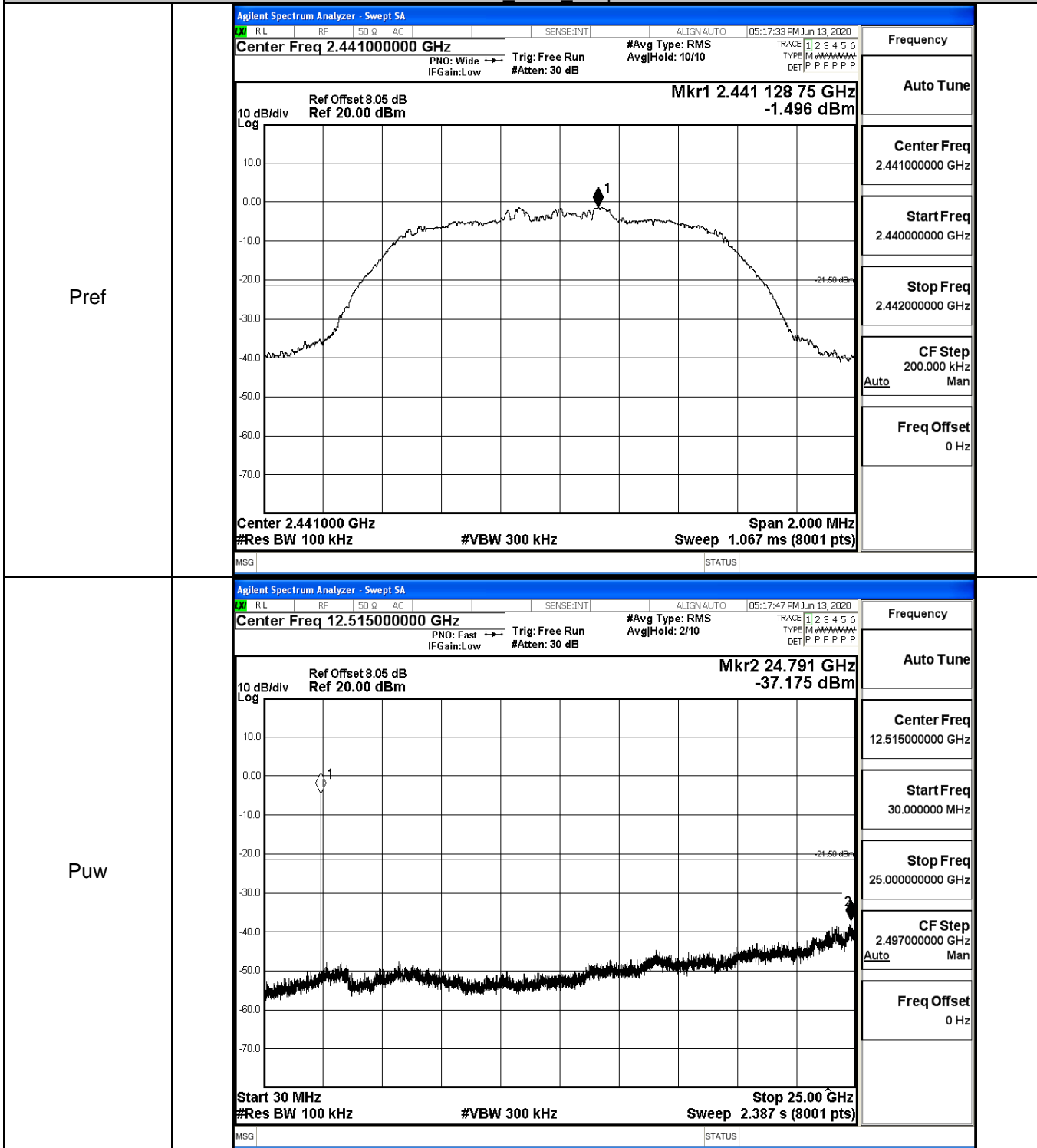
GFSK_HCH_Graphs



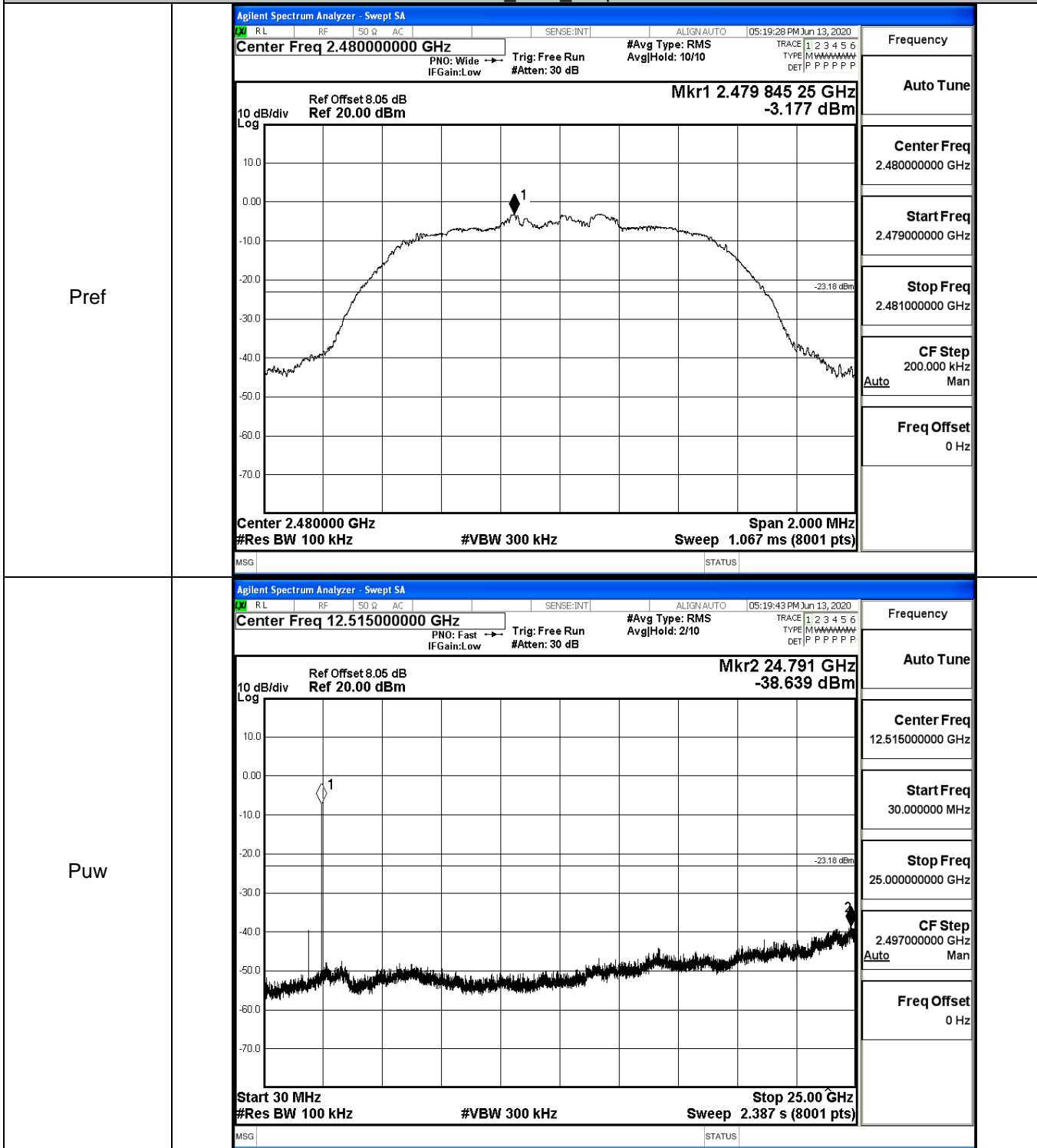
$\pi/4$ DQPSK_LCH_Graphs



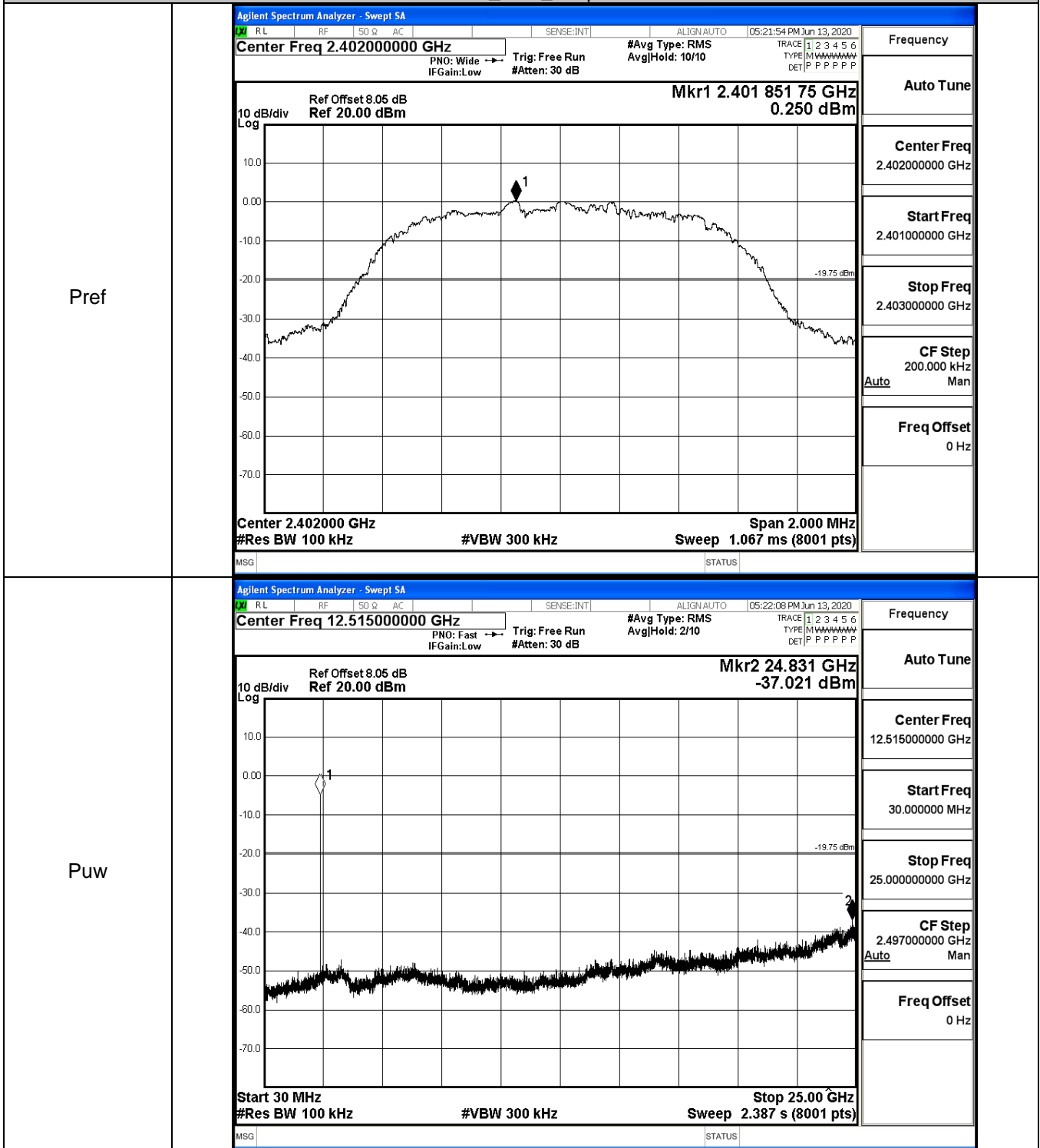
$\pi/4$ DQPSK_MCH_Graphs



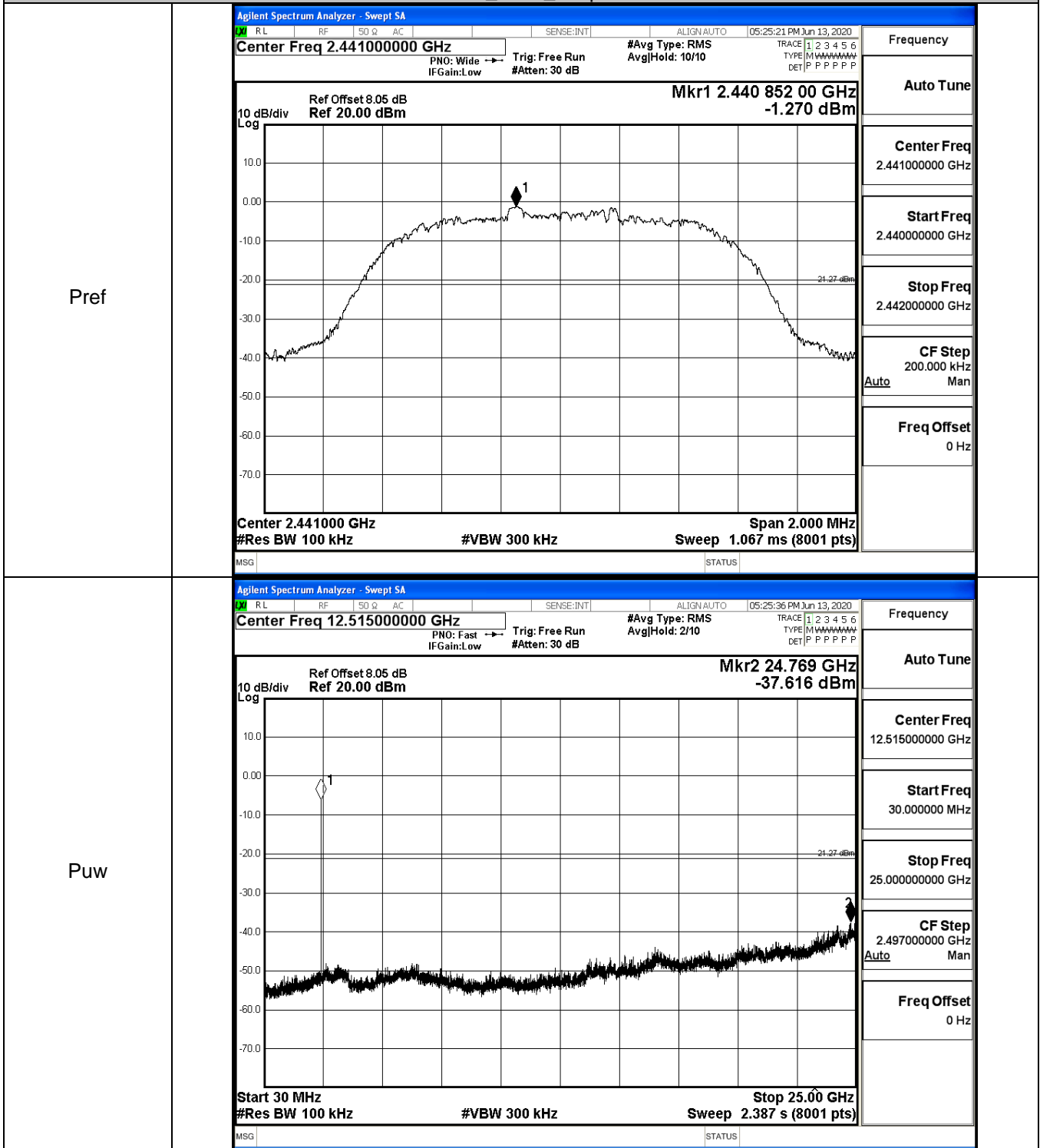
$\pi/4$ DQPSK_HCH_Graphs



8DPSK_LCH_Graphs

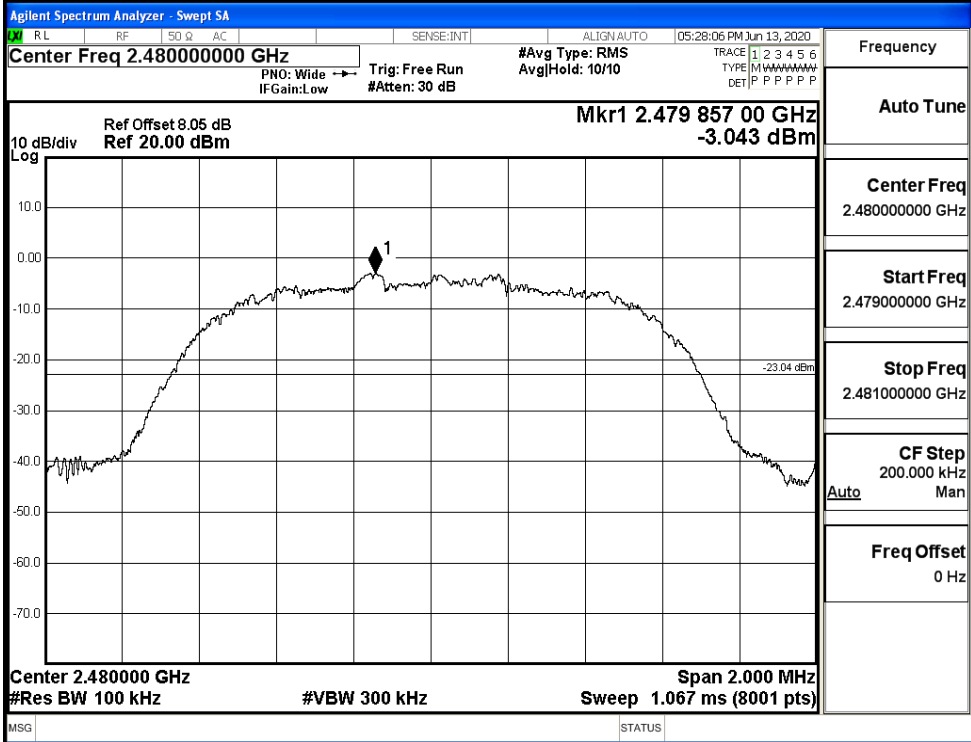


8DPSK_MCH_Graphs

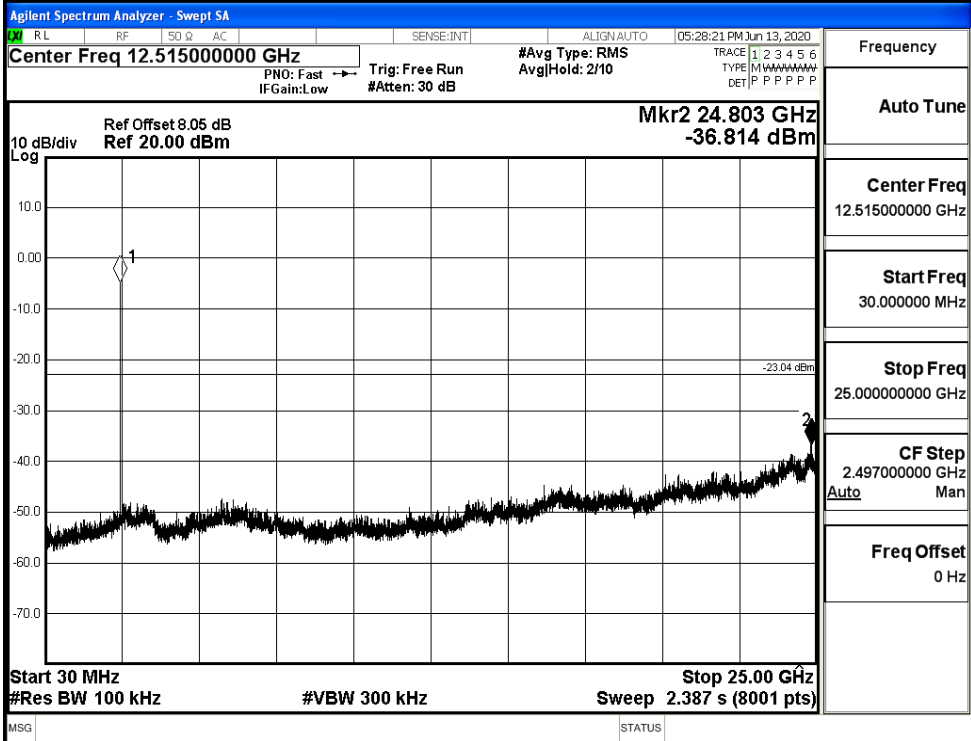


8DPSK_HCH_Graphs

Pref



Puw

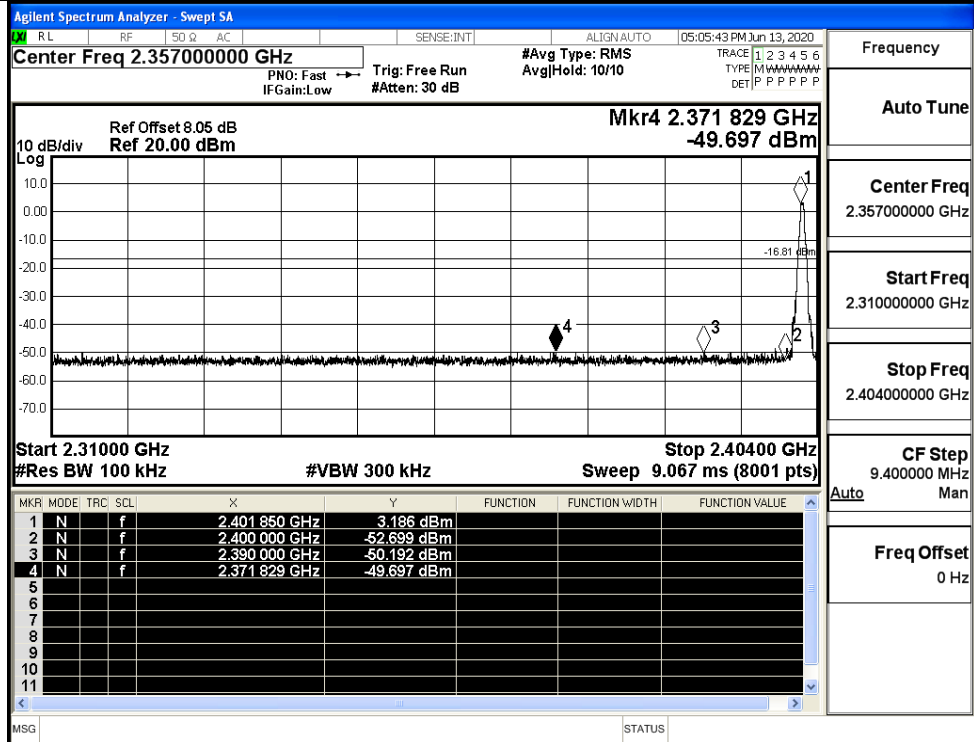


A.7 Band-edge for RF Conducted Emissions

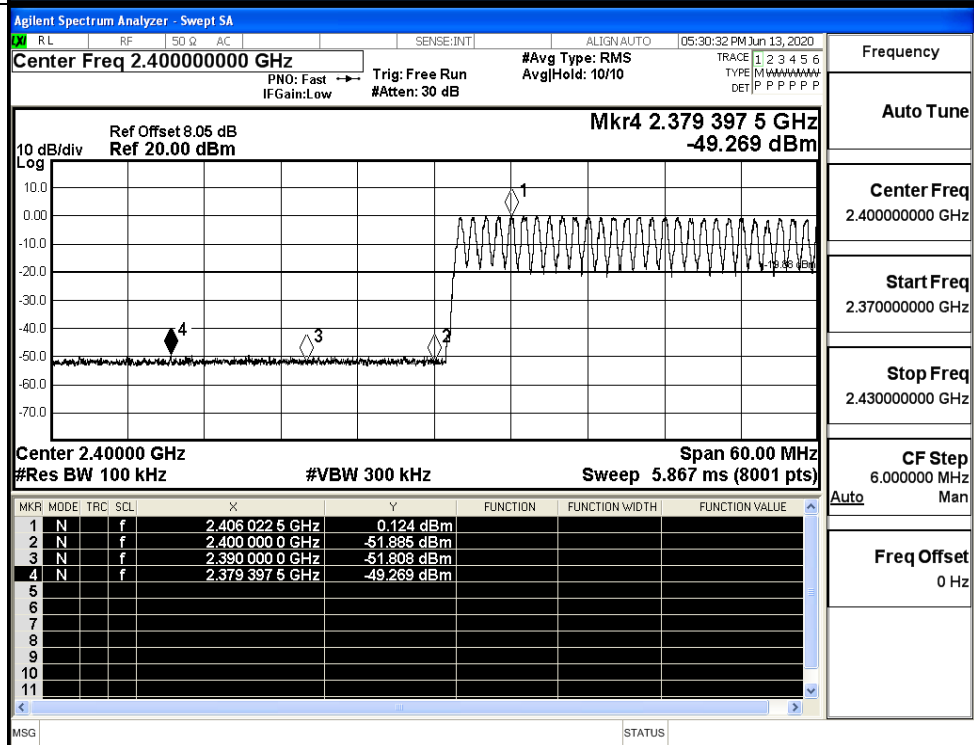
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	3.186	Off	-49.697	-16.81	PASS
			0.124	On	-49.269	-19.88	PASS
	HCH	2480	-0.046	Off	-49.409	-20.05	PASS
			-1.946	On	-48.964	-21.95	PASS
π/4DQPSK	LCH	2402	0.340	Off	-49.172	-19.66	PASS
			0.074	On	-47.881	-19.93	PASS
	HCH	2480	-2.969	Off	-49.149	-22.97	PASS
			-1.988	On	-48.355	-21.99	PASS
8DPSK	LCH	2402	0.082	Off	-49.372	-19.92	PASS
			0.095	On	-48.962	-19.91	PASS
	HCH	2480	-2.879	Off	-49.226	-22.88	PASS
			-2.077	On	-48.334	-22.08	PASS

Test Graphs

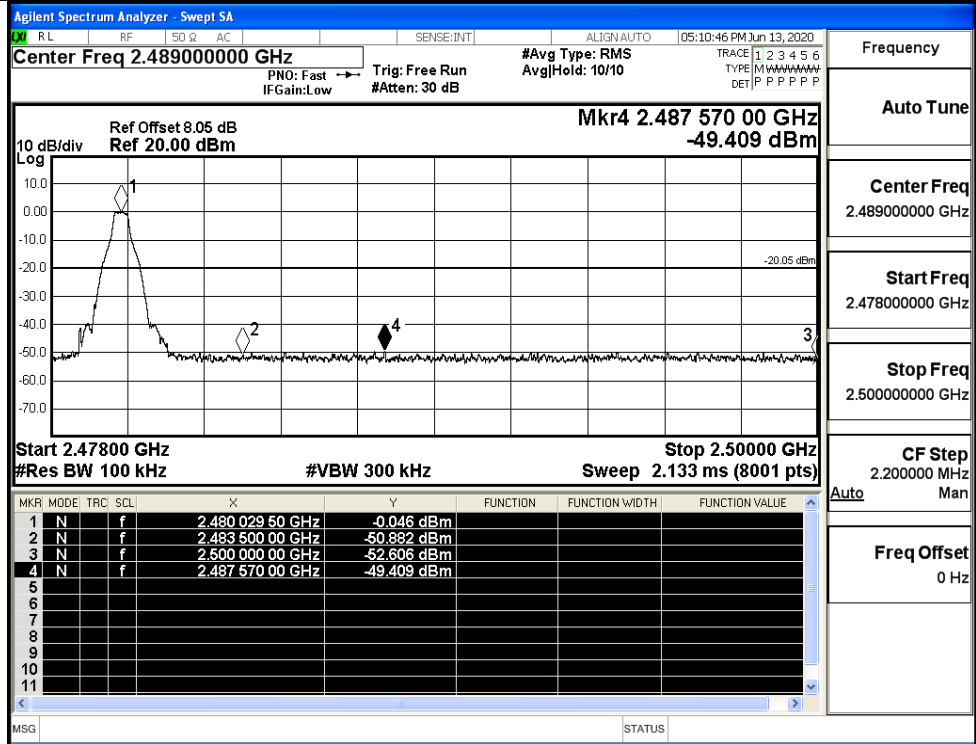
GFSK/LCH/No Hop



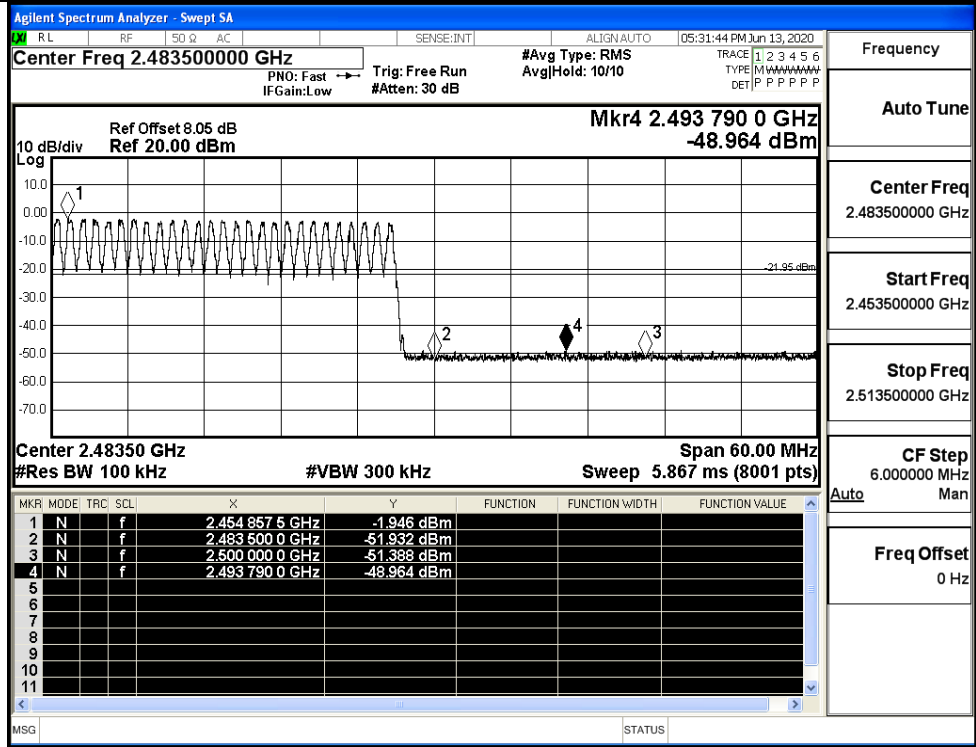
GFSK/LCH/Hop



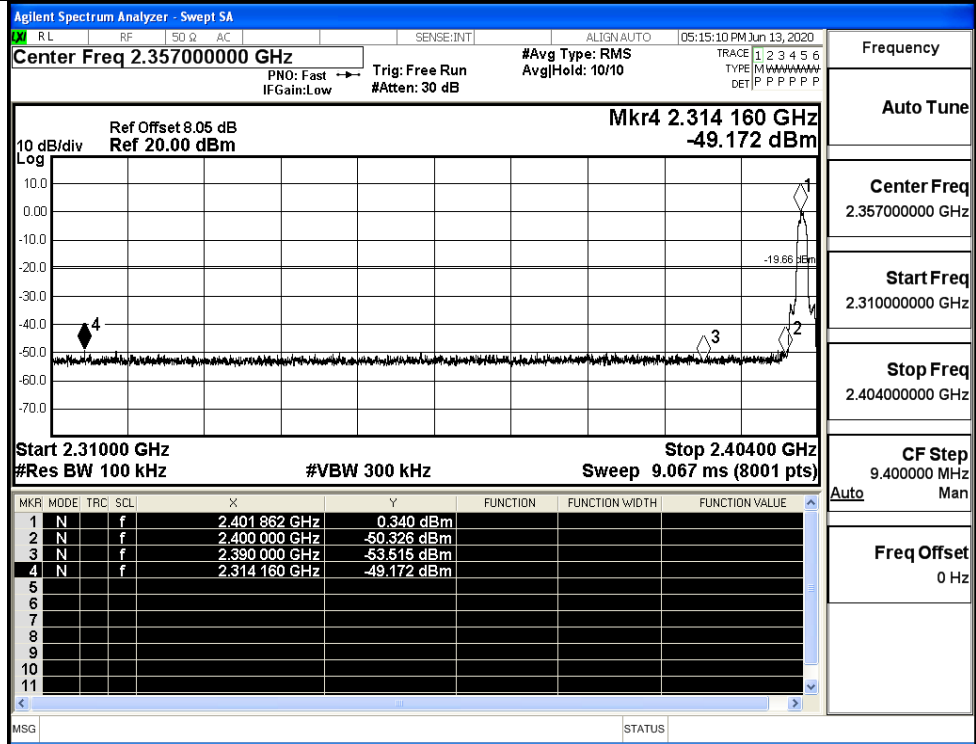
GFSK/HCH/No Hop



GFSK/HCH/Hop

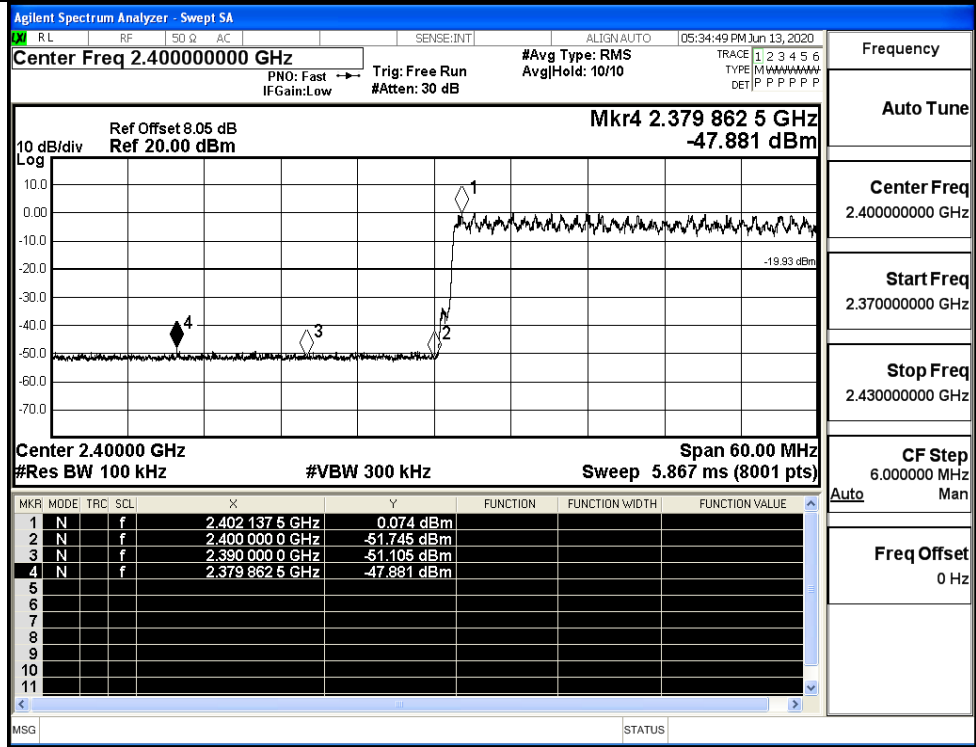


$\pi/4$ DQPSK/LCH/No
Hop



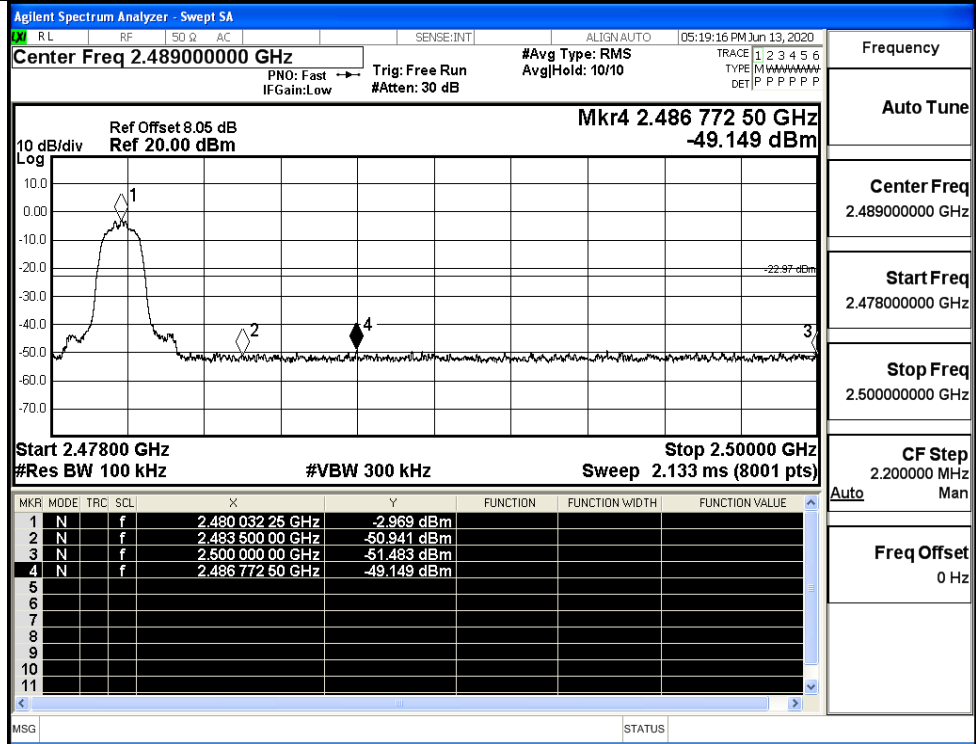
Frequency	
Auto Tune	
Center Freq	2.357000000 GHz
Start Freq	2.310000000 GHz
Stop Freq	2.404000000 GHz
CF Step	9.400000 MHz
Freq Offset	0 Hz

$\pi/4$ 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
Freq Offset	0 Hz

π /4DQPSK/HCH/No
Hop



Frequency

Auto Tune

Center Freq
2.489000000 GHz

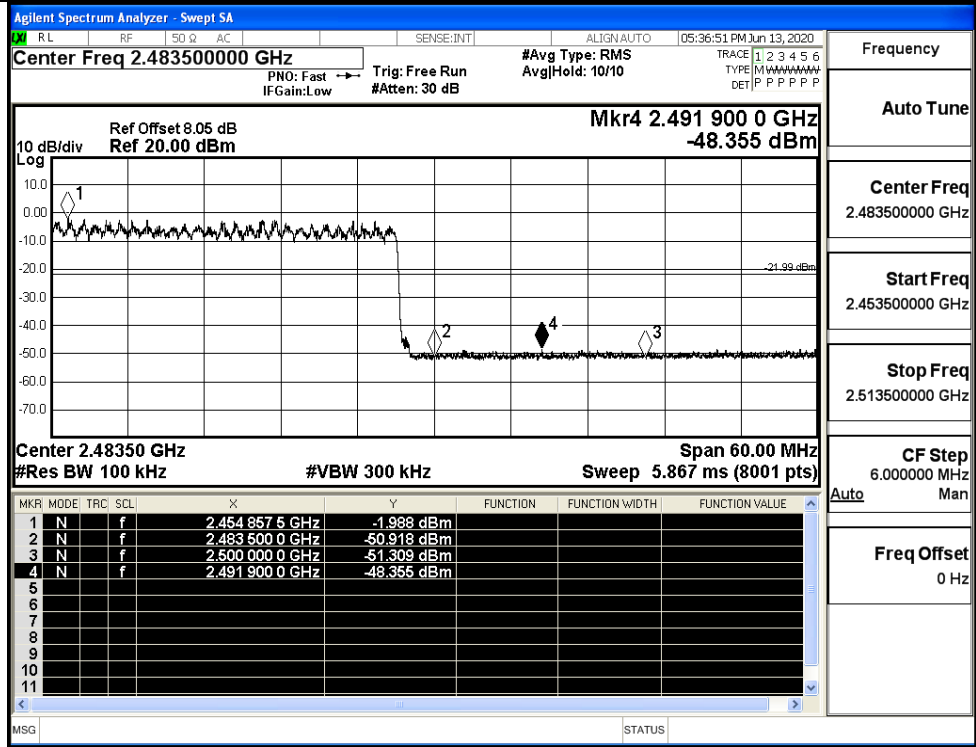
Start Freq
2.478000000 GHz

Stop Freq
2.500000000 GHz

CF Step
2.200000 MHz

Freq Offset
0 Hz

π /4DQPSK/HCH/Hop



Frequency

Auto Tune

Center Freq
2.483500000 GHz

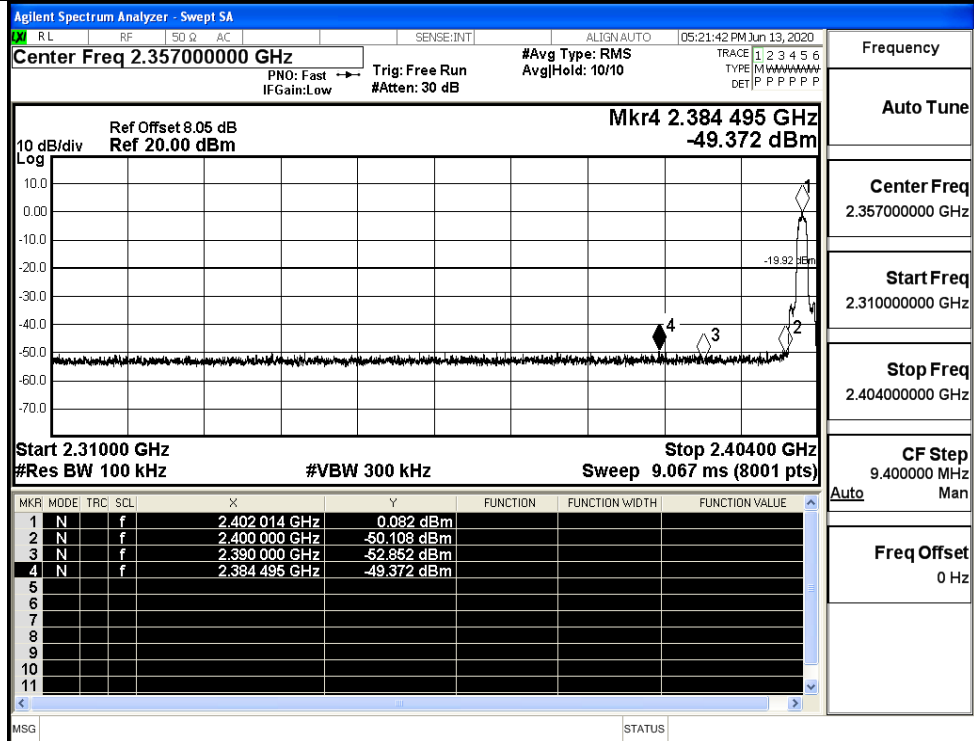
Start Freq
2.453500000 GHz

Stop Freq
2.513500000 GHz

CF Step
6.000000 MHz

Freq Offset
0 Hz

8DPSK/LCH/No Hop



Frequency

Auto Tune

Center Freq
2.357000000 GHz

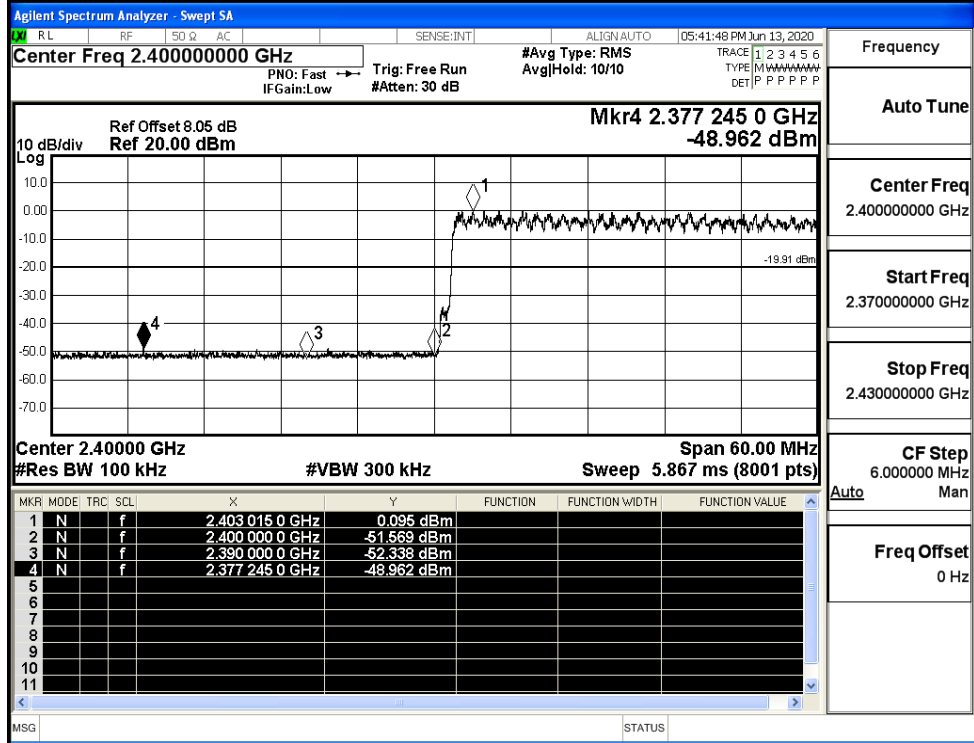
Start Freq
2.310000000 GHz

Stop Freq
2.404000000 GHz

CF Step
9.400000 MHz

Freq Offset
0 Hz

8DPSK/LCH/Hop



Frequency

Auto Tune

Center Freq
2.400000000 GHz

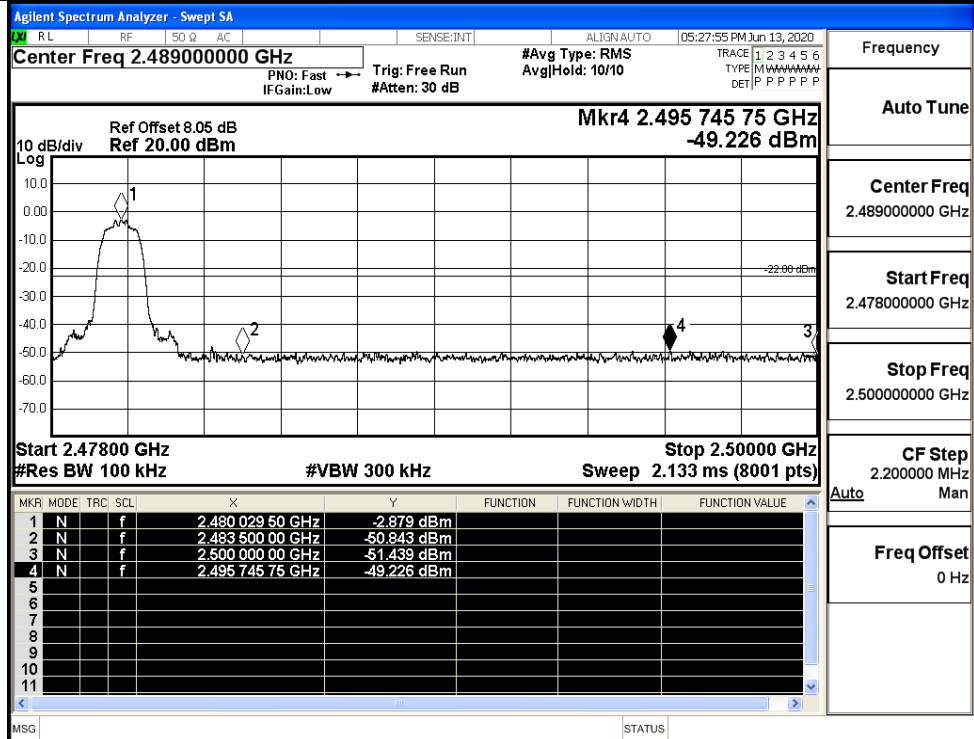
Start Freq
2.370000000 GHz

Stop Freq
2.430000000 GHz

CF Step
6.000000 MHz

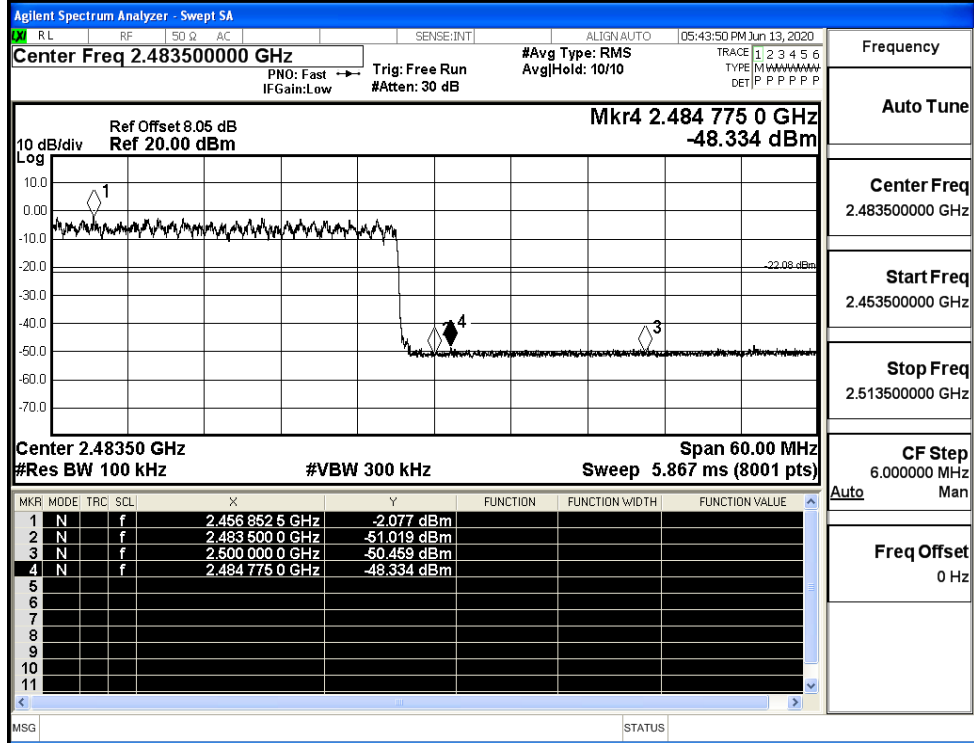
Freq Offset
0 Hz

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

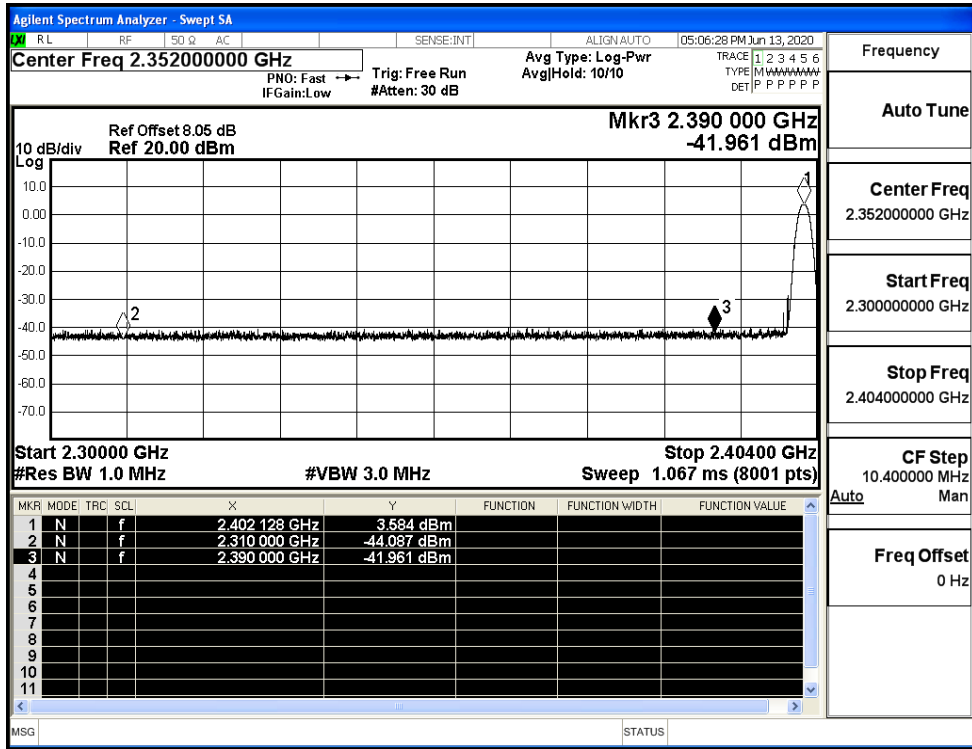


Frequency	
Auto Tune	
Center Freq	2.483500000 GHz
Start Freq	2.453500000 GHz
Stop Freq	2.513500000 GHz
CF Step	6.000000 MHz
Freq Offset	0 Hz

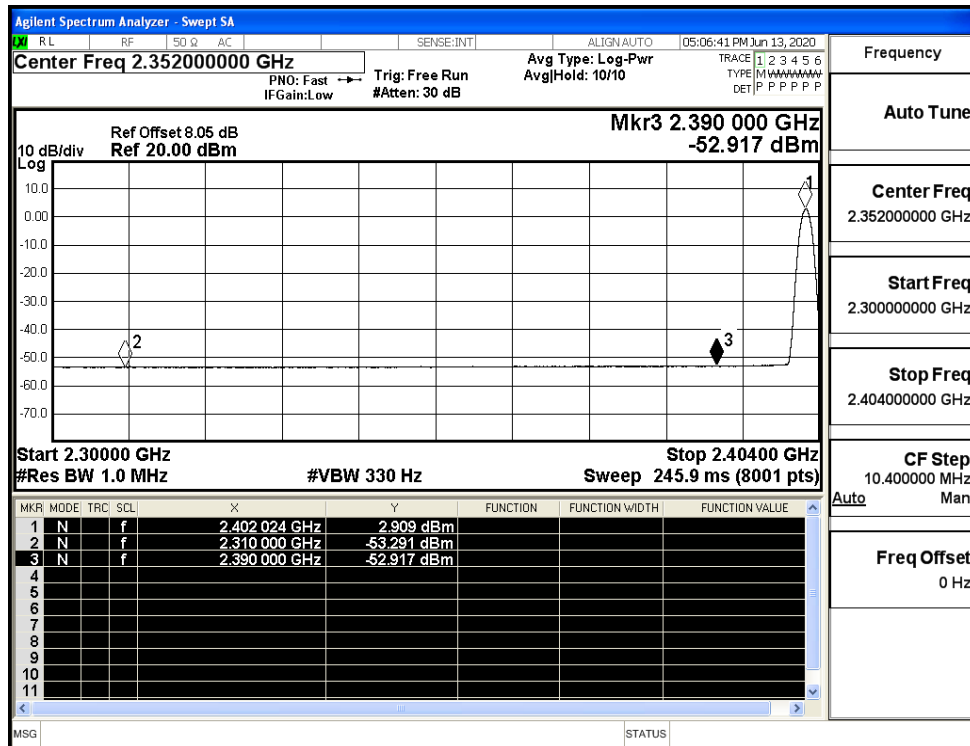
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-44.09	2.0	0	53.17	PEAK	74	PASS
	Off	2310.0	-53.29	2.0	0	43.97	AV	54	PASS
	Off	2390.0	-41.96	2.0	0	55.3	PEAK	74	PASS
	Off	2390.0	-52.92	2.0	0	44.34	AV	54	PASS
	Off	2483.5	-42.27	2.0	0	54.99	PEAK	74	PASS
	Off	2483.5	-52.46	2.0	0	44.8	AV	54	PASS
	Off	2500.0	-42.31	2.0	0	54.95	PEAK	74	PASS
	Off	2500.0	-52.37	2.0	0	44.89	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-42.38	2.0	0	54.88	PEAK	74	PASS
	Off	2310.0	-53.37	2.0	0	43.89	AV	54	PASS
	Off	2390.0	-42.84	2.0	0	54.42	PEAK	74	PASS
	Off	2390.0	-53.00	2.0	0	44.26	AV	54	PASS
	Off	2483.5	-42.48	2.0	0	54.78	PEAK	74	PASS
	Off	2483.5	-52.56	2.0	0	44.7	AV	54	PASS
	Off	2500.0	-42.62	2.0	0	54.64	PEAK	74	PASS
	Off	2500.0	-52.34	2.0	0	44.92	AV	54	PASS
8DPSK	Off	2310.0	-43.70	2.0	0	53.56	PEAK	74	PASS
	Off	2310.0	-53.36	2.0	0	43.9	AV	54	PASS
	Off	2390.0	-42.36	2.0	0	54.9	PEAK	74	PASS
	Off	2390.0	-52.98	2.0	0	44.28	AV	54	PASS
	Off	2483.5	-41.46	2.0	0	55.8	PEAK	74	PASS
	Off	2483.5	-52.57	2.0	0	44.69	AV	54	PASS
	Off	2500.0	-41.99	2.0	0	55.27	PEAK	74	PASS
	Off	2500.0	-52.39	2.0	0	44.87	AV	54	PASS

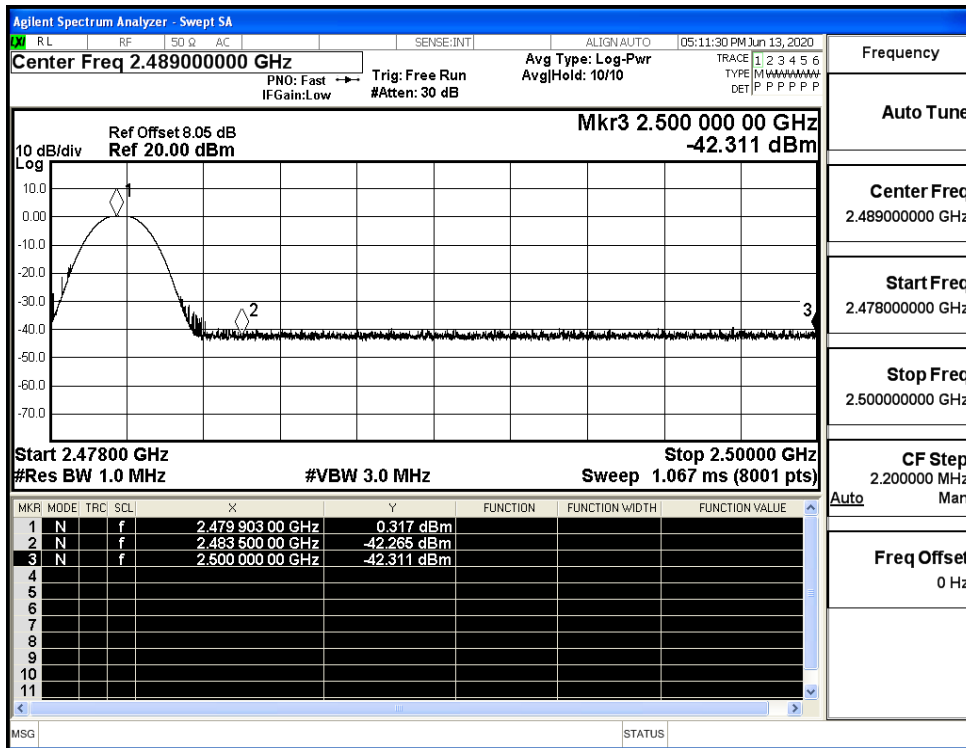
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



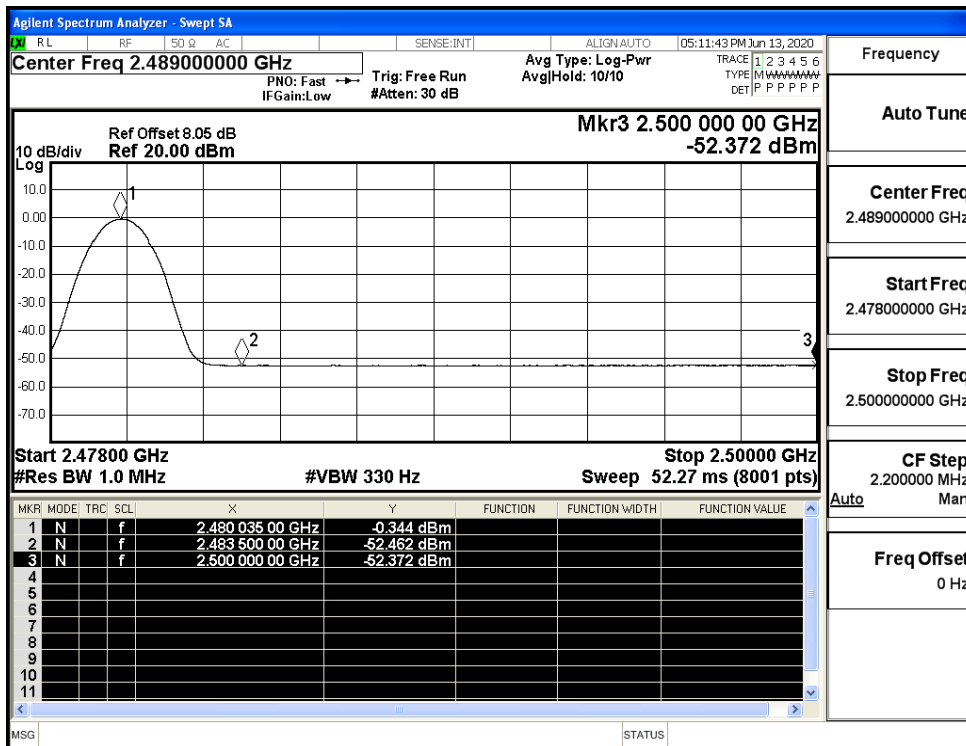
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



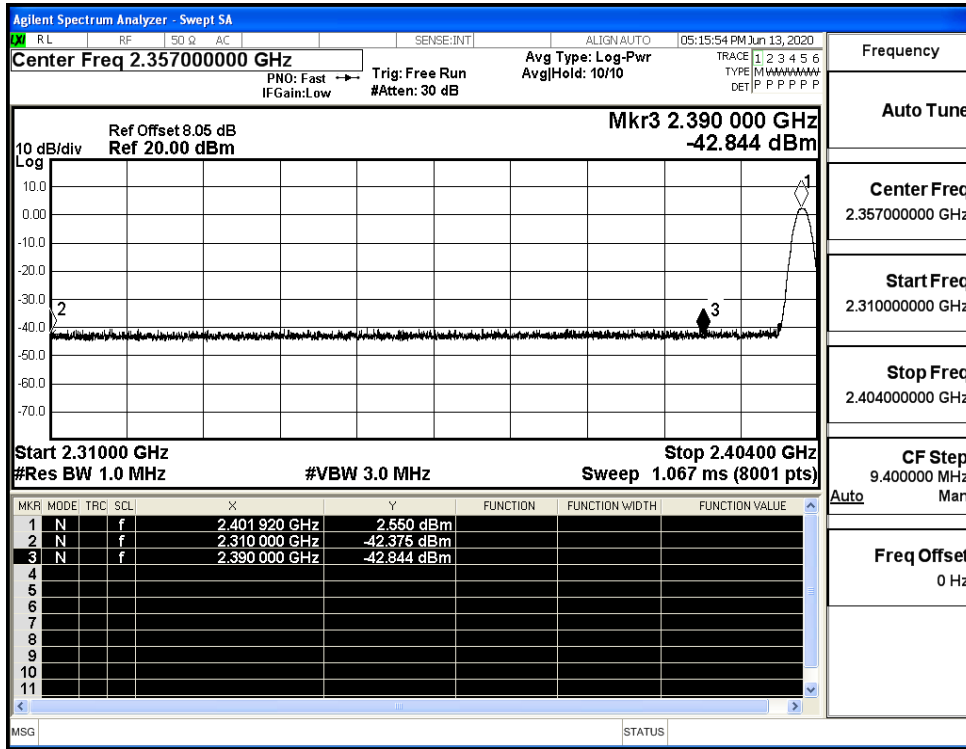
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



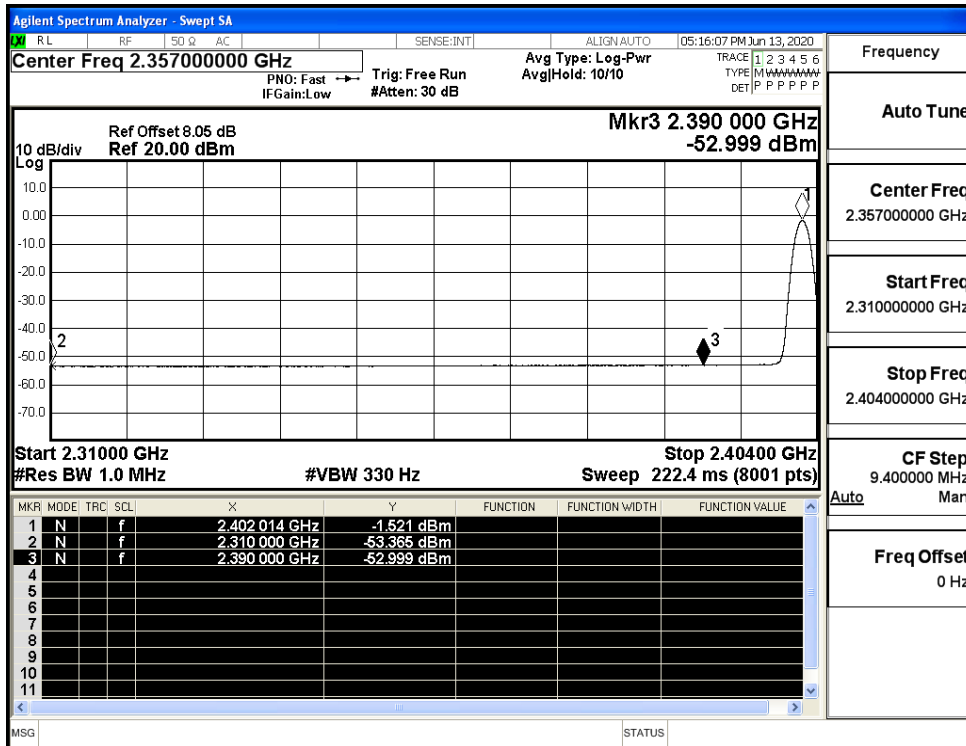
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



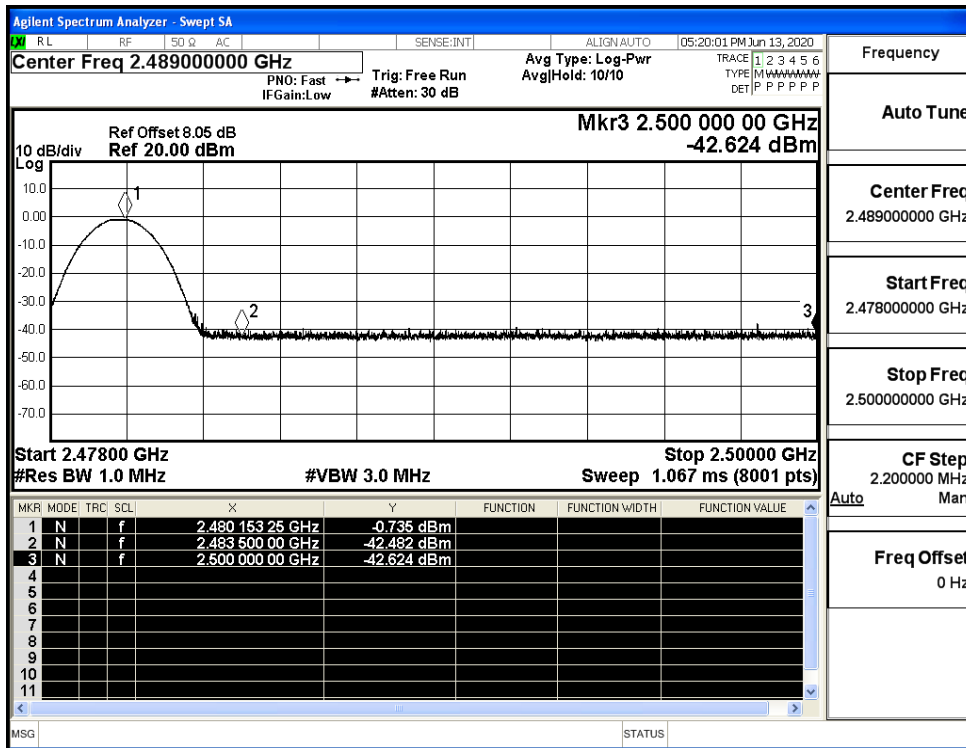
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)



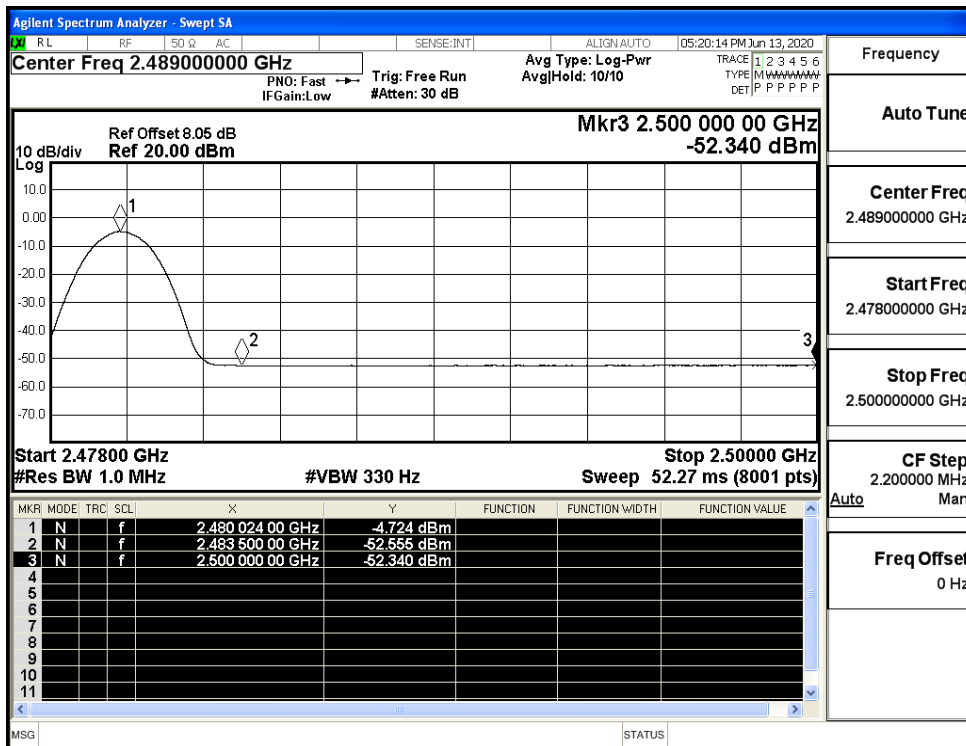
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)



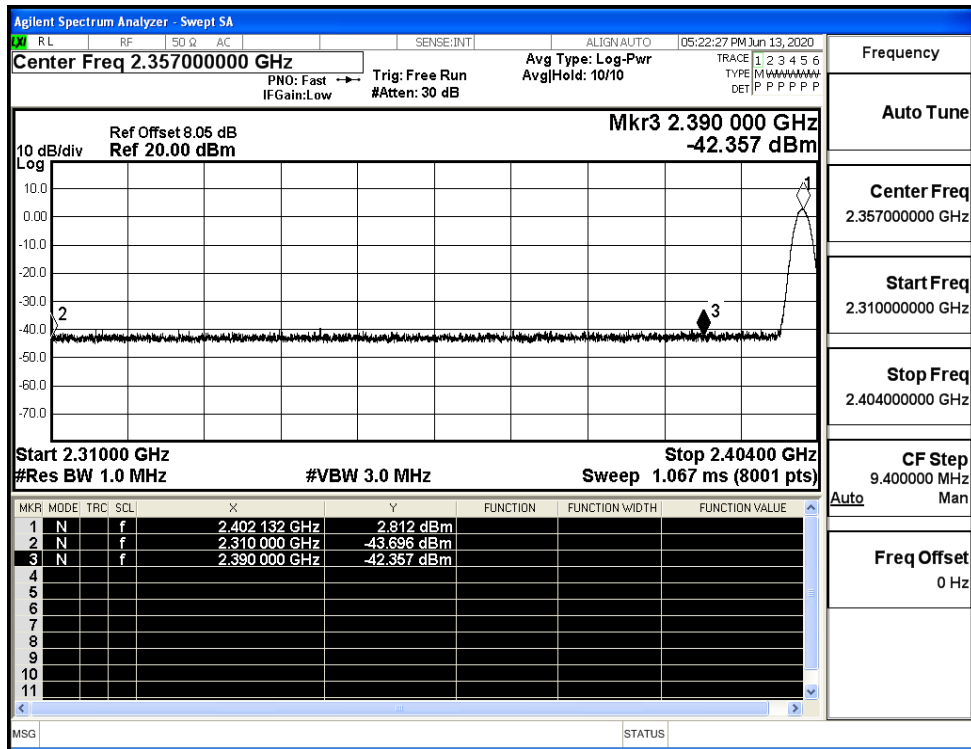
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



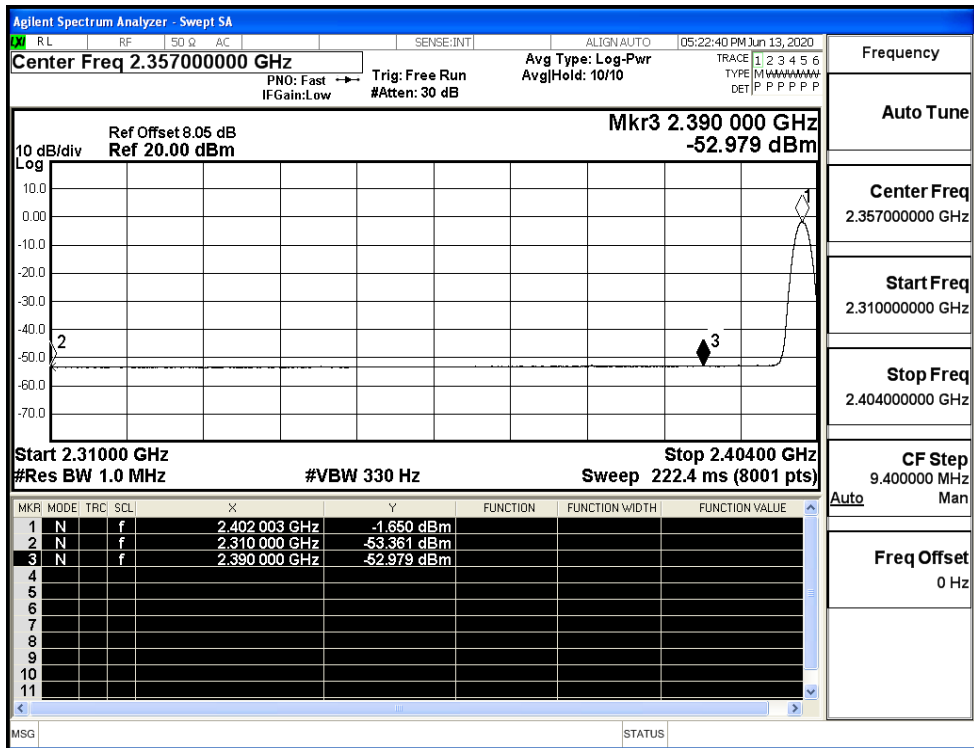
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



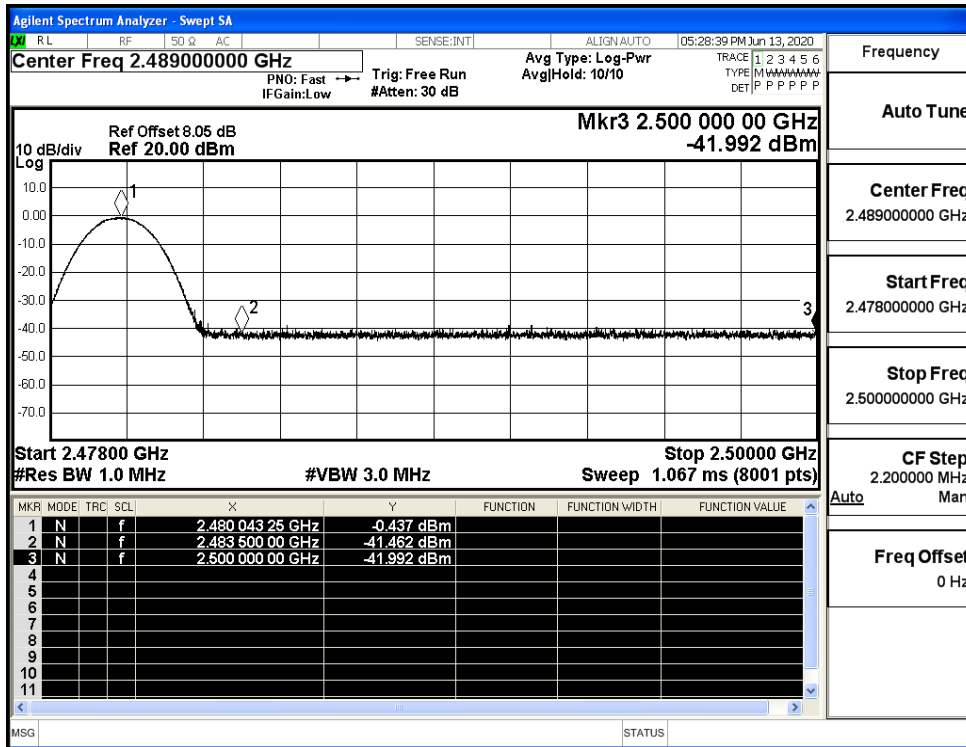
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

