

## Appendix A

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

Product Name: Wireless headphone

Trade Mark: N/A

Test Model: boAt Rockerz 440

#### Environmental Conditions

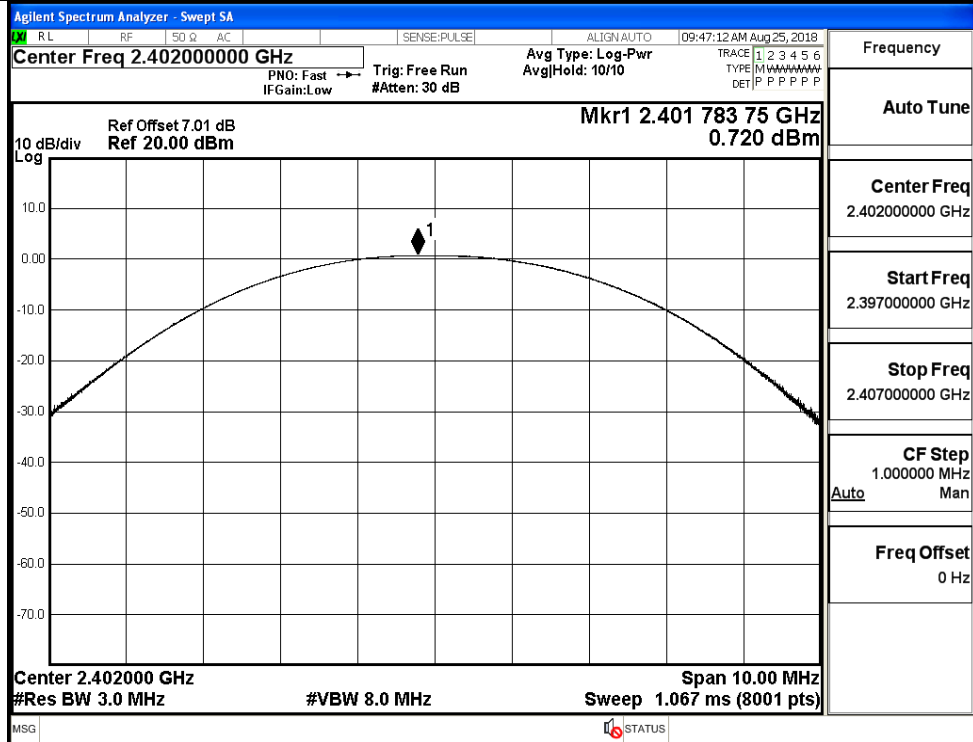
Temperature:	23.5 °C
Relative Humidity:	53.6%
ATM Pressure:	100.0 kPa
Test Engineer:	WangChuang
Supervised by:	Jayden.Zhuo

#### A.1 Maximum Conducted Peak Output Power

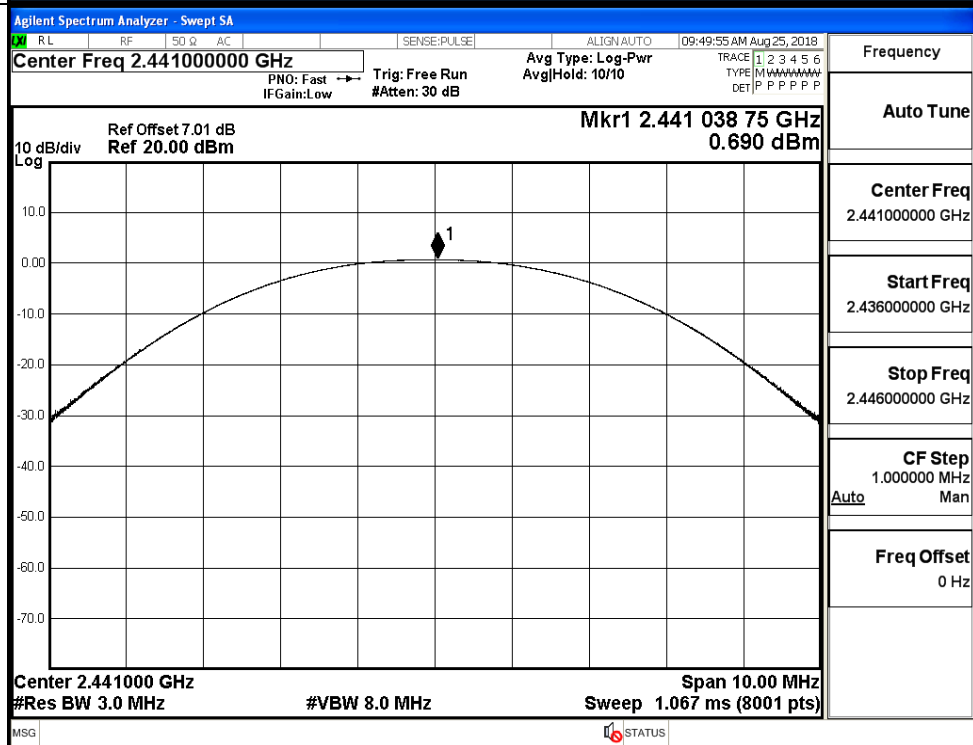
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	0.720	21	PASS
	MCH	0.690	21	PASS
	HCH	0.507	21	PASS
$\pi/4$ DQPSK	LCH	0.561	21	PASS
	MCH	0.106	21	PASS
	HCH	-0.111	21	PASS
8DPSK	LCH	0.117	21	PASS
	MCH	-0.002	21	PASS
	HCH	-0.100	21	PASS

Test Graphs

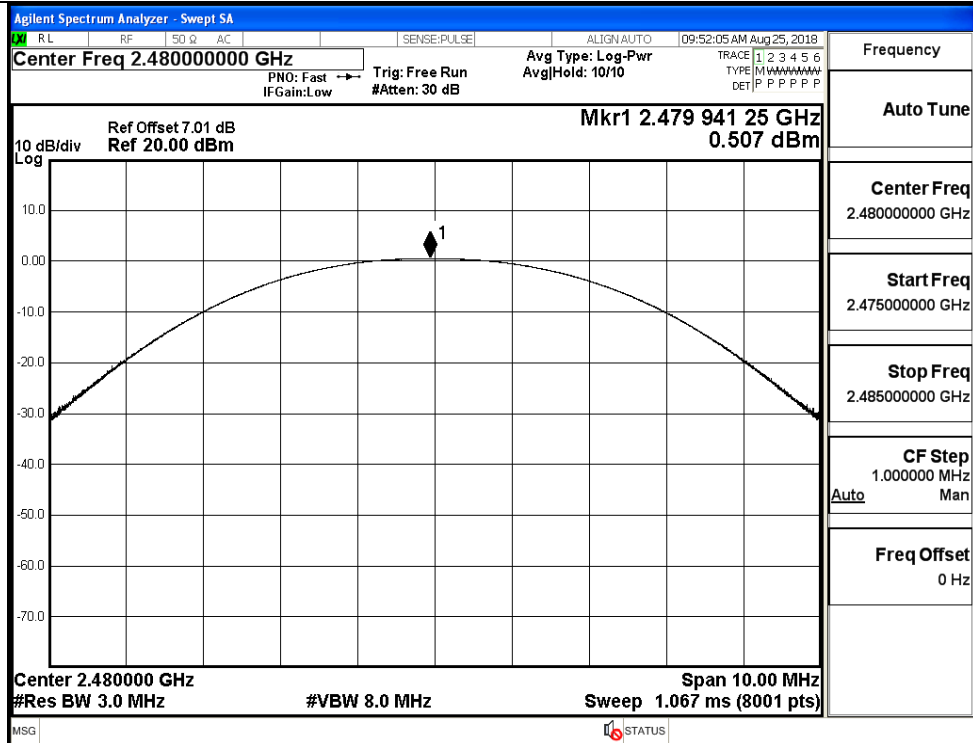
GFSK/LCH



GFSK/MCH

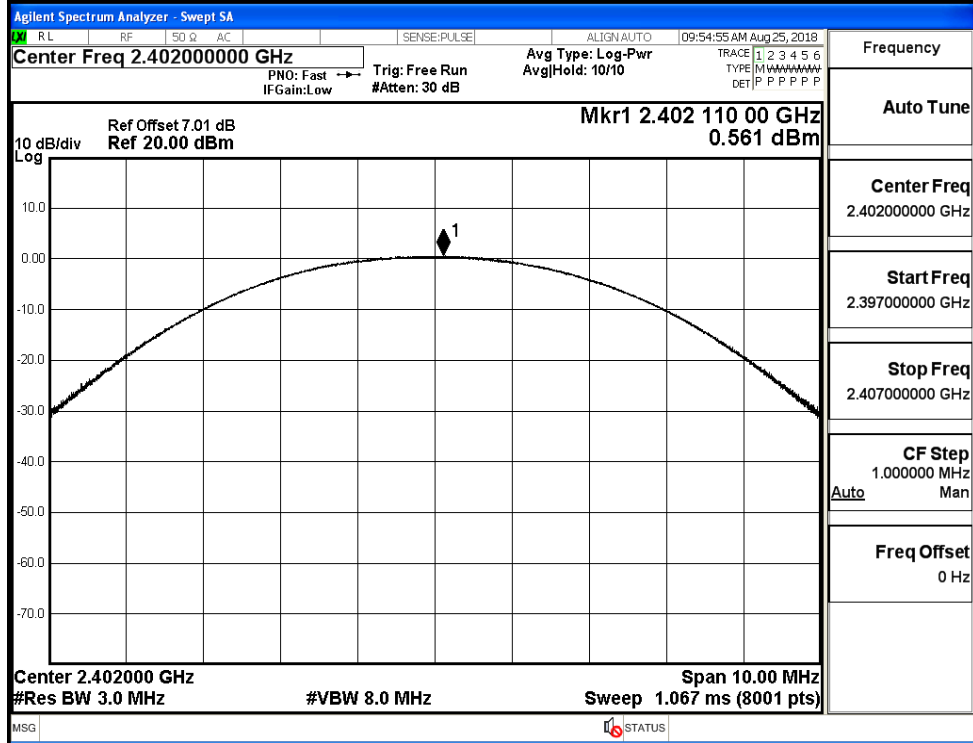


GFSK/HCH



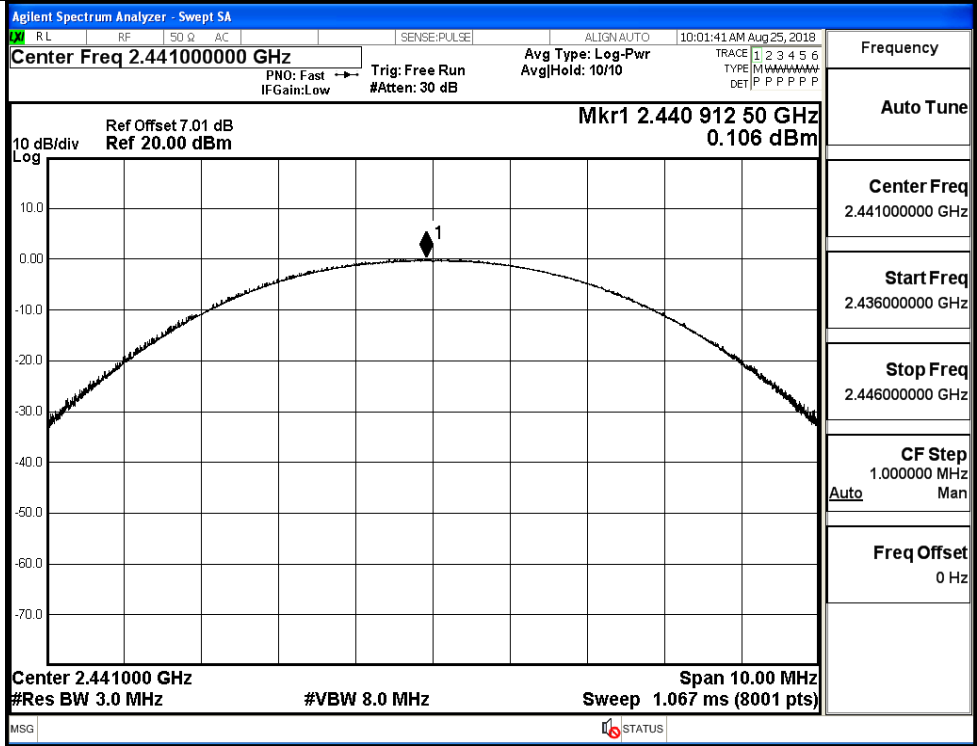
Frequency	Auto Tune
Center Freq	2.480000000 GHz
Start Freq	2.475000000 GHz
Stop Freq	2.485000000 GHz
CF Step	1.000000 MHz Auto Man
Freq Offset	0 Hz

$\pi$ /4DQPSK/LCH

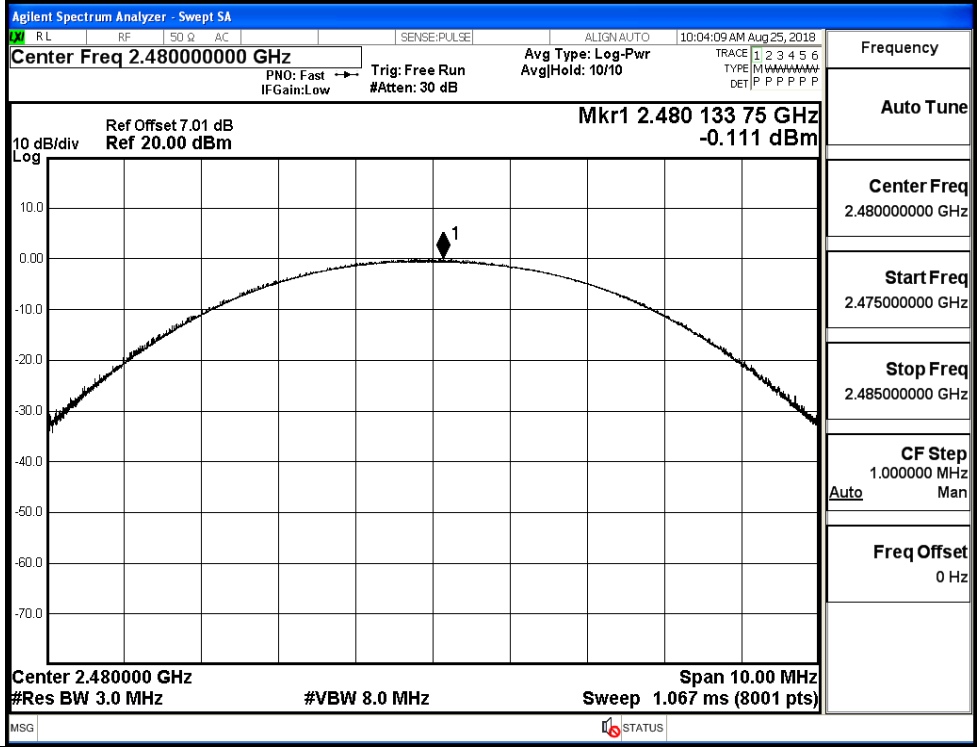


Frequency	Auto Tune
Center Freq	2.402000000 GHz
Start Freq	2.397000000 GHz
Stop Freq	2.407000000 GHz
CF Step	1.000000 MHz Auto Man
Freq Offset	0 Hz

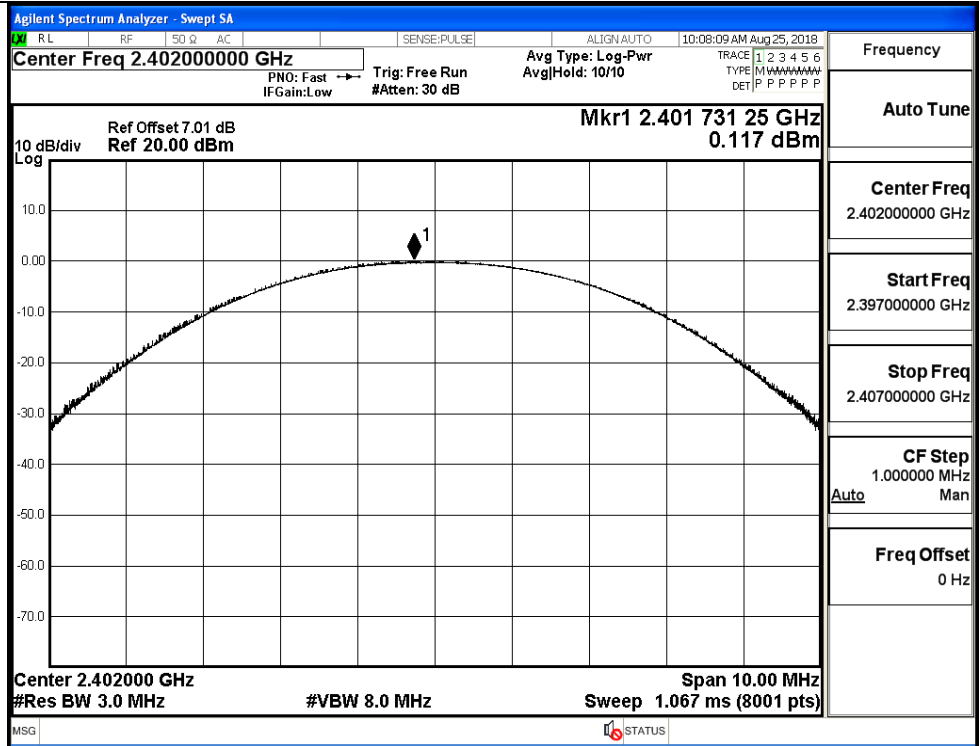
$\pi$ /4DQPSK/MCH



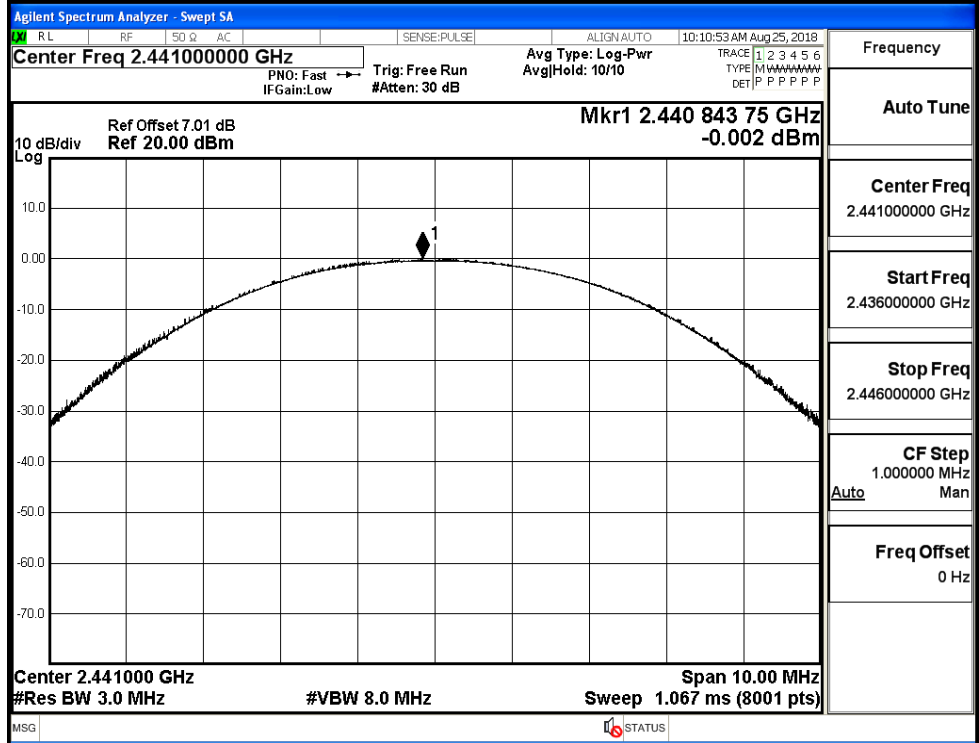
$\pi$ /4DQPSK/HCH



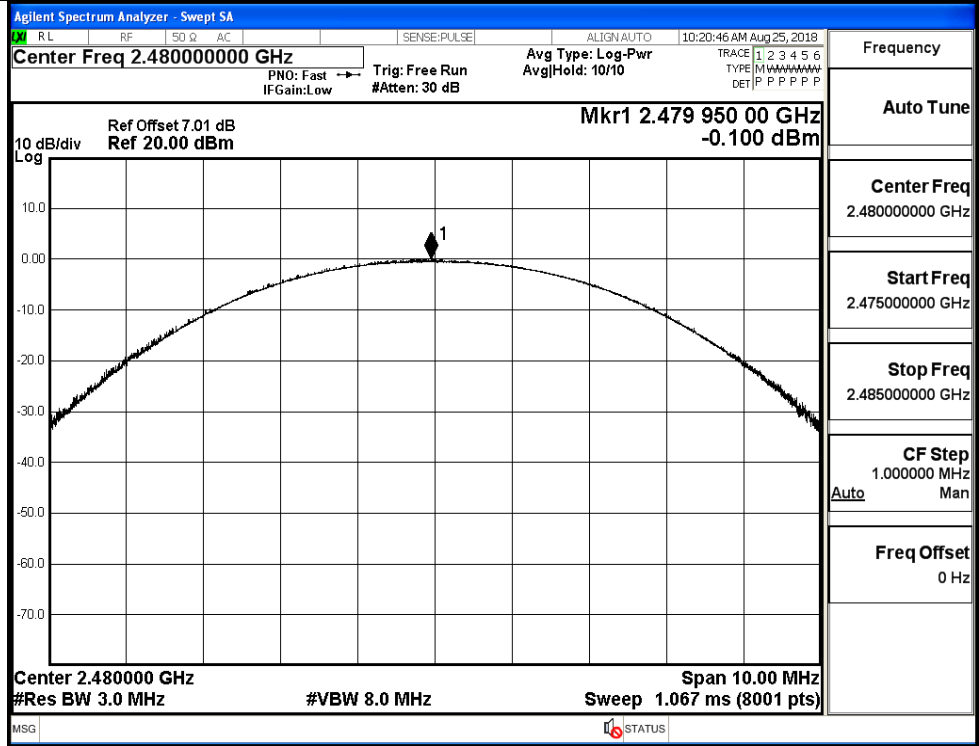
8DPSK/LCH



8DPSK/MCH

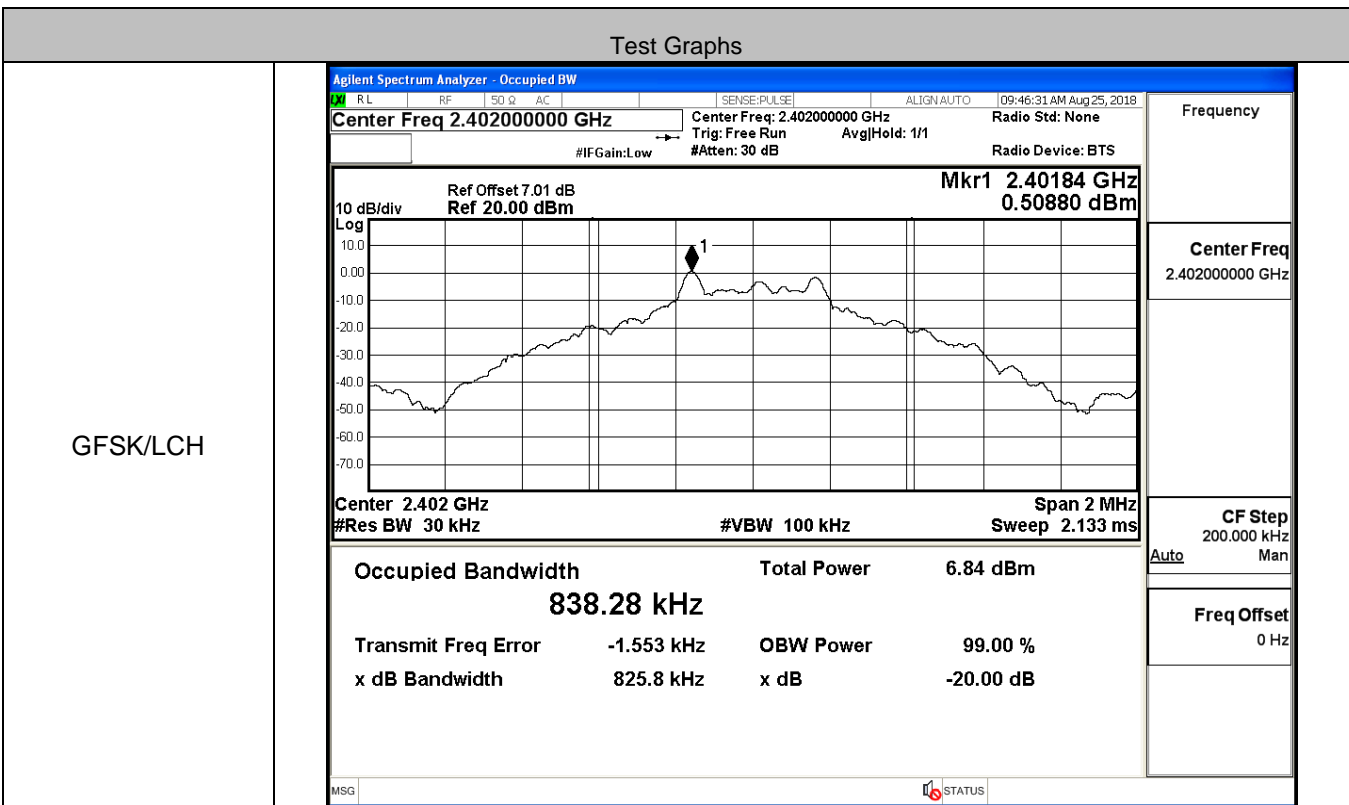


8DPSK/HCH

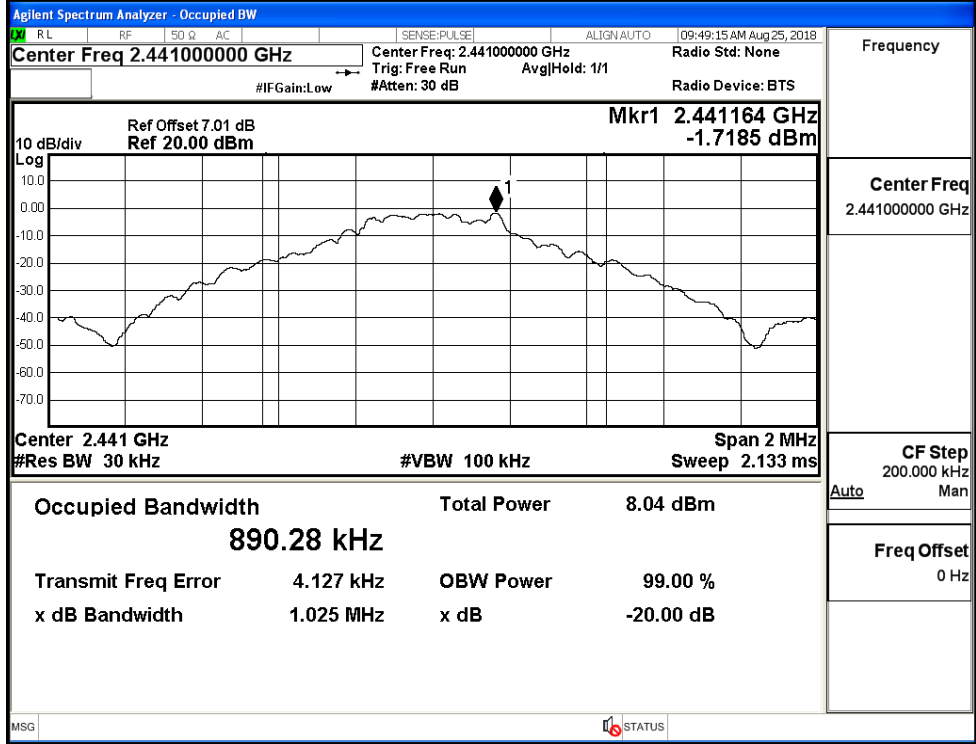


**A.2 99% and 20dB Bandwidth**

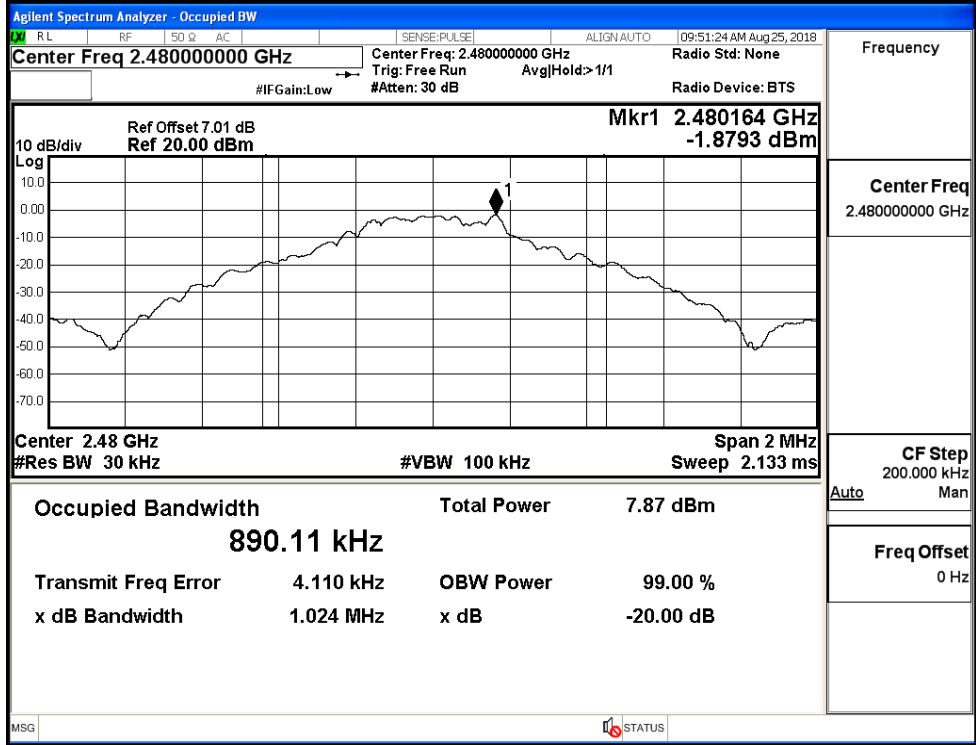
Mode	Channel.	99% Bandwidth [MHz]	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.83828	0.826	Not Specified	PASS
	MCH	0.89028	1.025	Not Specified	PASS
	HCH	0.89011	1.024	Not Specified	PASS
π/4DQPSK	LCH	1.1652	1.288	Not Specified	PASS
	MCH	1.1671	1.287	Not Specified	PASS
	HCH	1.0707	1.131	Not Specified	PASS
8DPSK	LCH	1.0707	1.143	Not Specified	PASS
	MCH	1.0719	1.140	Not Specified	PASS
	HCH	1.0690	1.150	Not Specified	PASS



GFSK/MCH

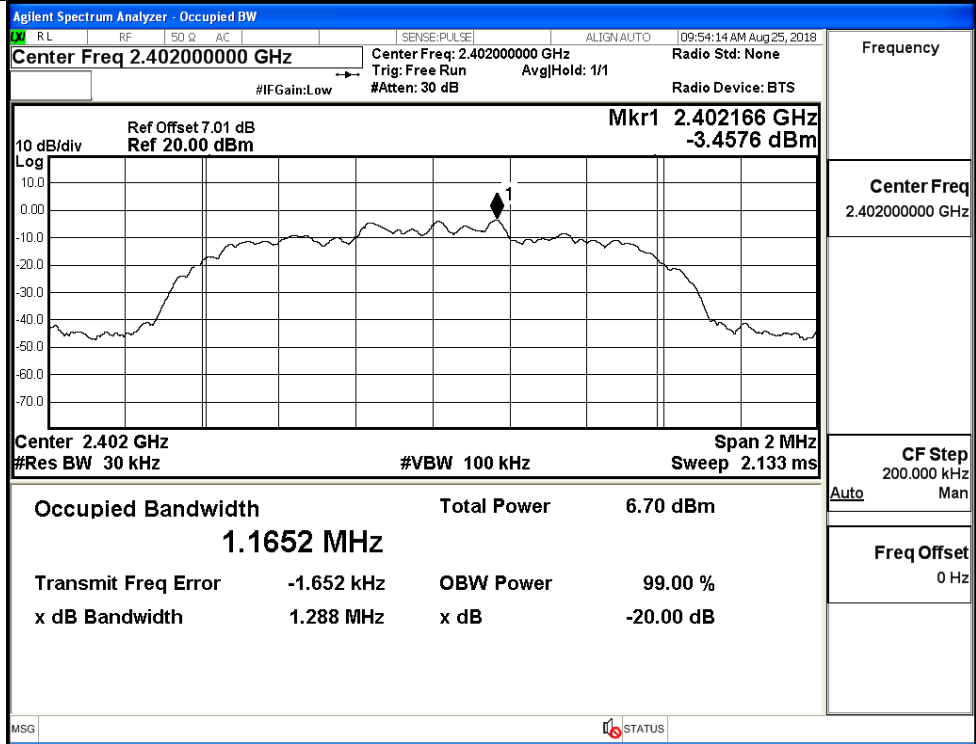


GFSK/HCH

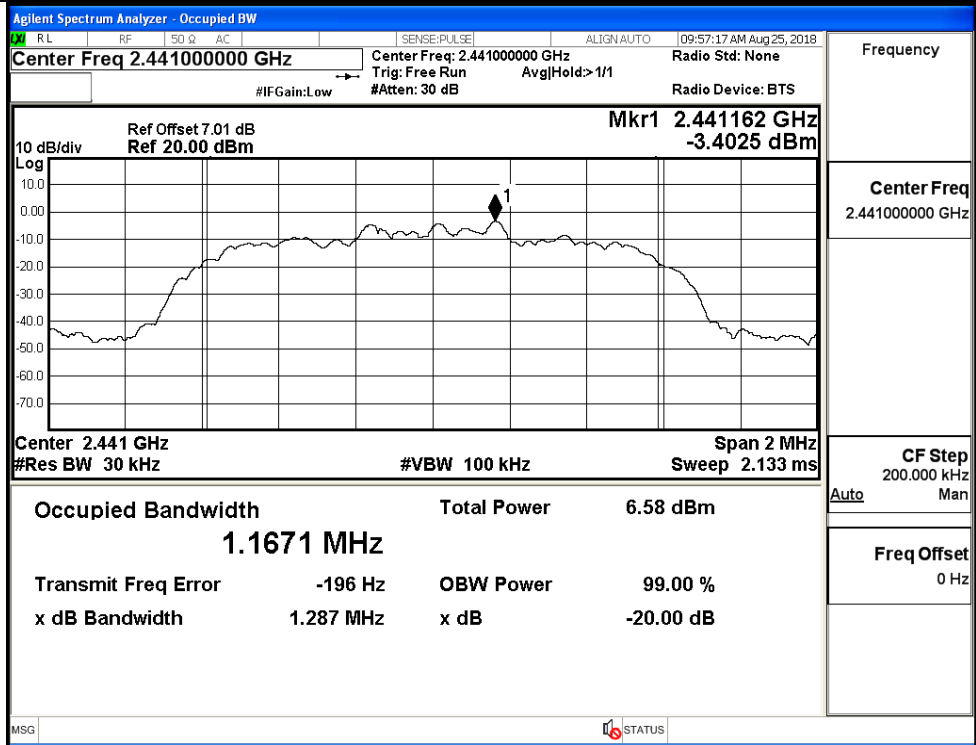




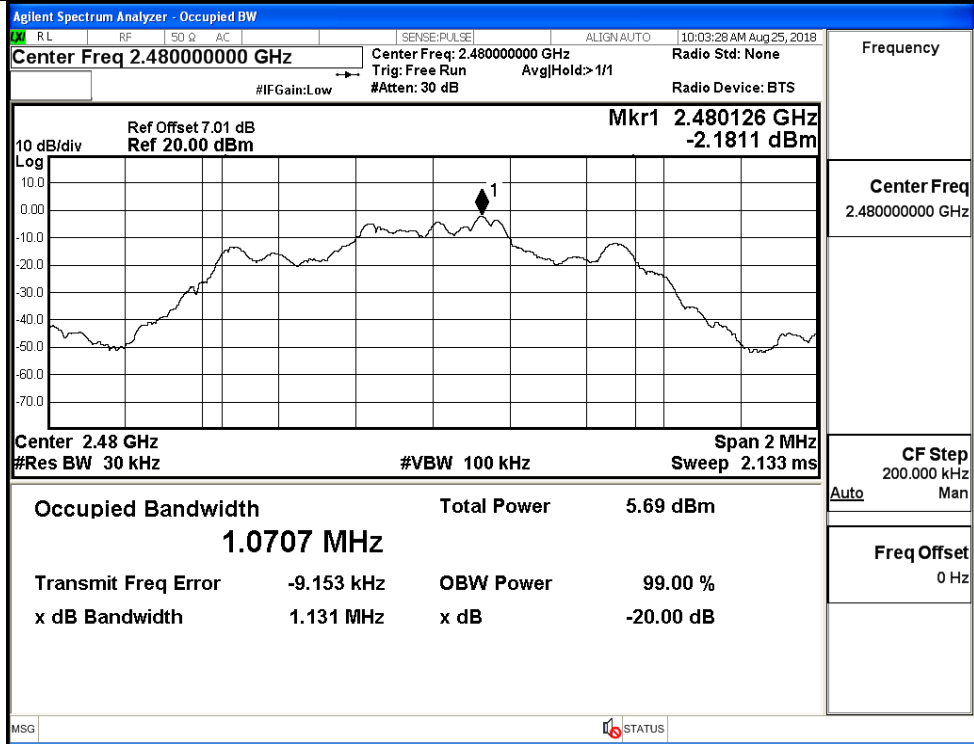
$\pi/4$ DQPSK/LCH



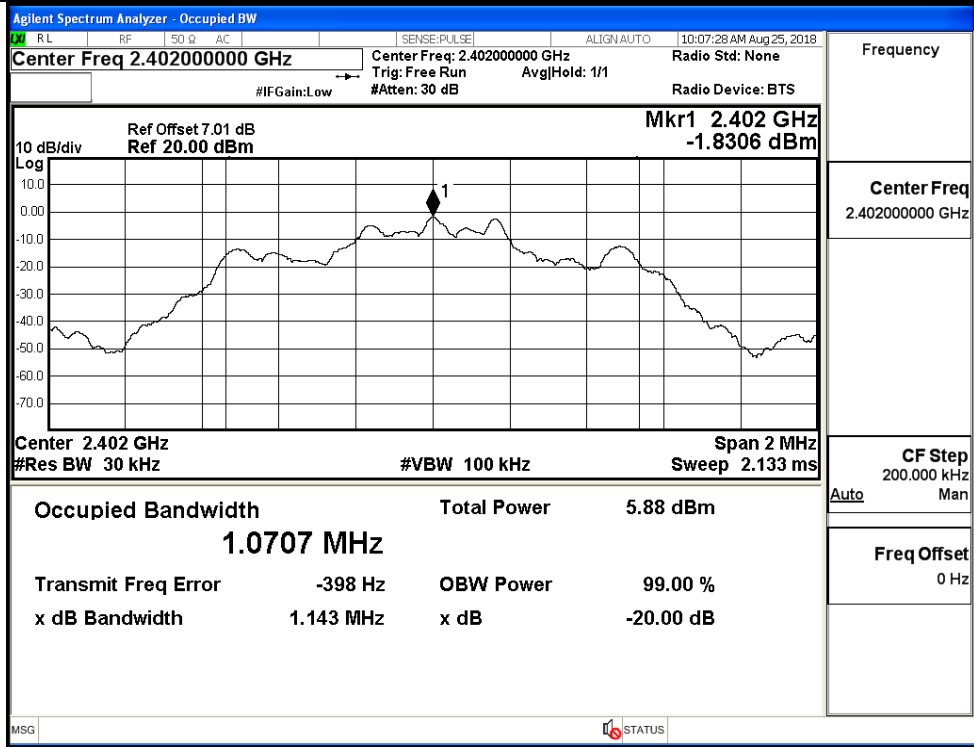
$\pi/4$ DQPSK/MCH



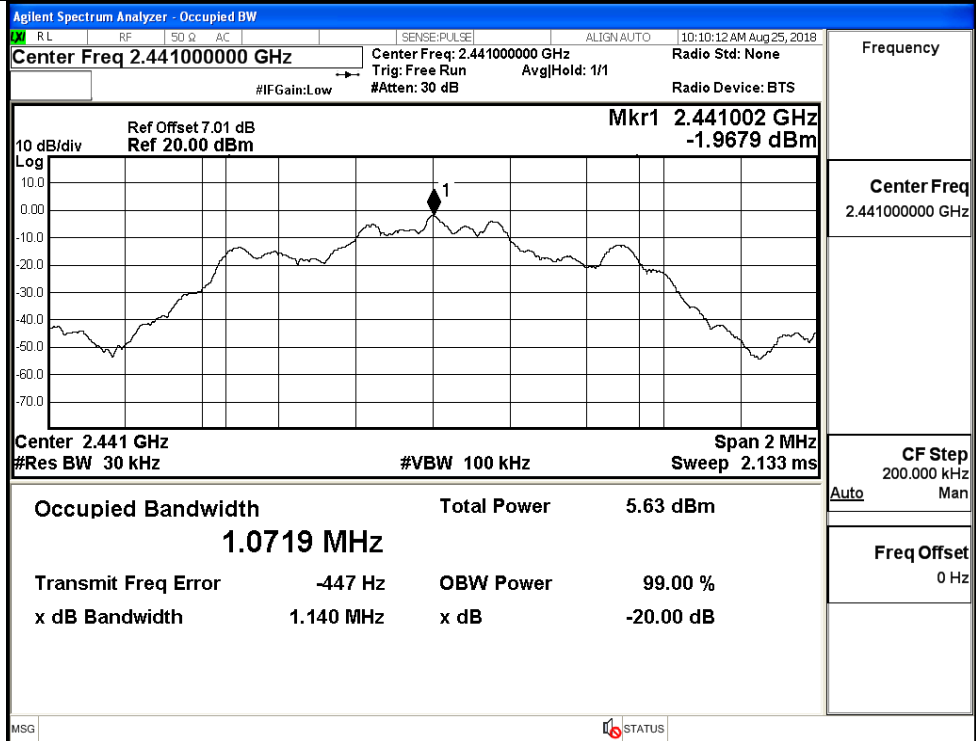
$\pi/4$ DQPSK/HCH



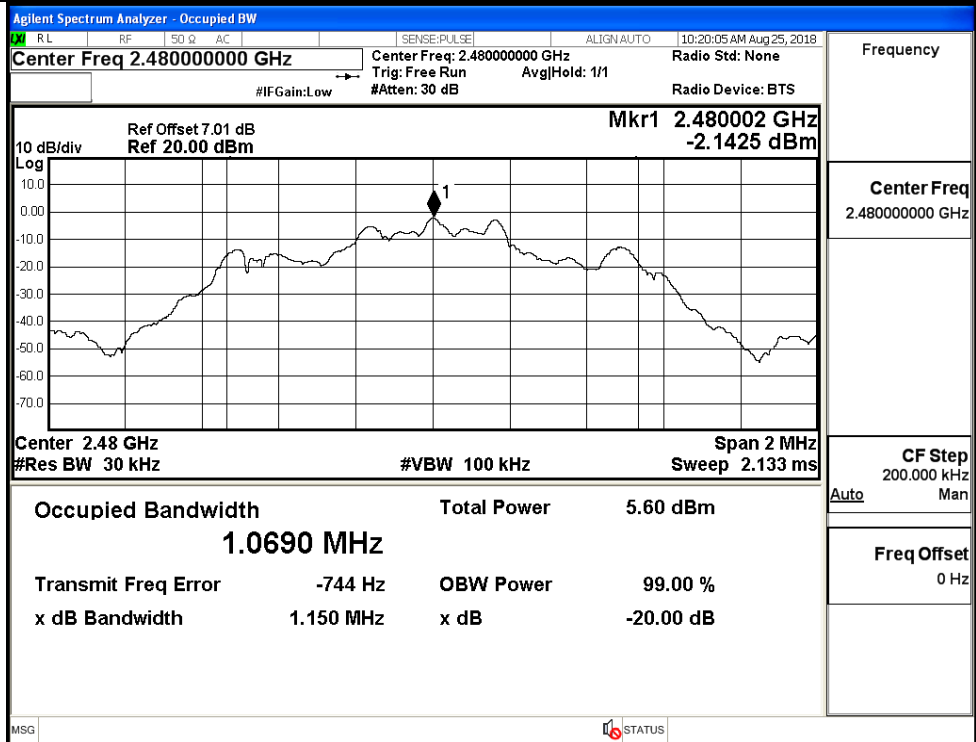
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH



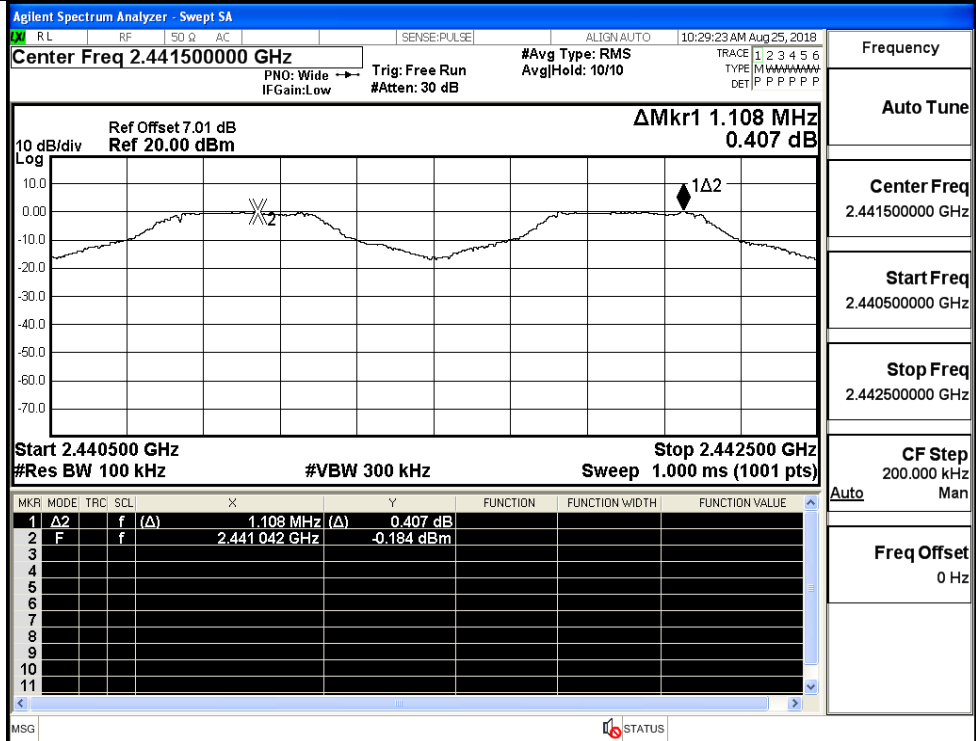
### A.3 Carrier Frequency Separation

Mode	Channel	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.837	0.683	PASS
	MCH	1.108	0.683	PASS
	HCH	0.980	0.683	PASS
π/4DQPSK	LCH	1.350	0.859	PASS
	MCH	1.036	0.859	PASS
	HCH	1.272	0.859	PASS
8DPSK	LCH	1.012	0.767	PASS
	MCH	1.172	0.767	PASS
	HCH	1.096	0.767	PASS

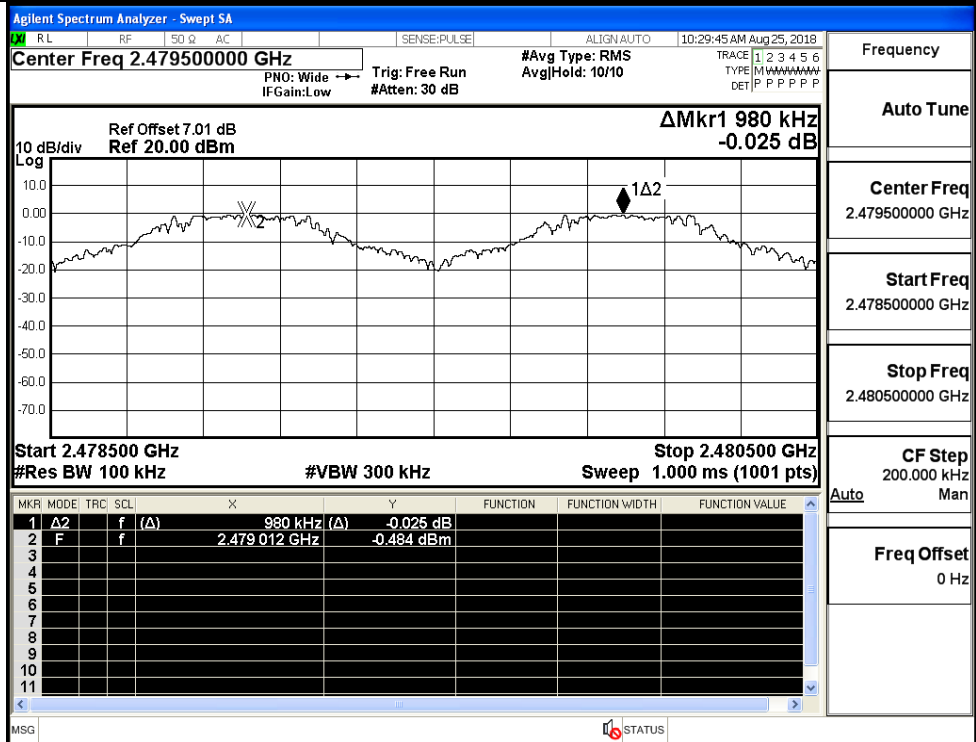
**Test Graphs**

GFSK/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																																																																																																												
	Agilent Spectrum Analyzer - Swept SA Center Freq 2.402500000 GHz PNO: Wide → Trig: Free Run Avg Type: Log-Pwr IFGain: Low #Atten: 30 dB AvgHold: 10/10																																																																																																													
	Ref Offset 7.01 dB ΔMkr1 837.00 kHz Ref 20.00 dBm 0.429 dBm																																																																																																													
	Start 2.401500 GHz Stop 2.403500 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.067 ms (8001 pts)																																																																																																													
	<table border="1" style="width: 100%; border-collapse: collapse; font-size: 0.8em;"> <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>837.00 kHz (Δ)</td> <td>0.429 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.40200350 GHz</td> <td>-0.061 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>9</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>11</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ2	f	(Δ)	837.00 kHz (Δ)	0.429 dB				2	F	f		2.40200350 GHz	-0.061 dBm				3									4									5									6									7									8									9									10									11									
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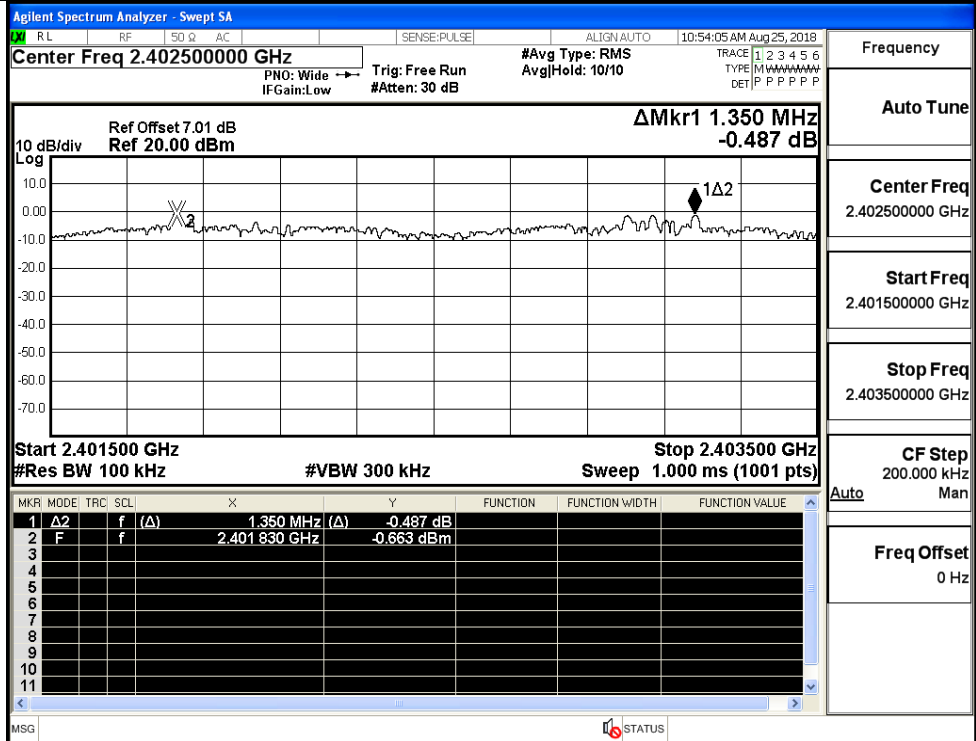
GFSK/MCH



GFSK/HCH

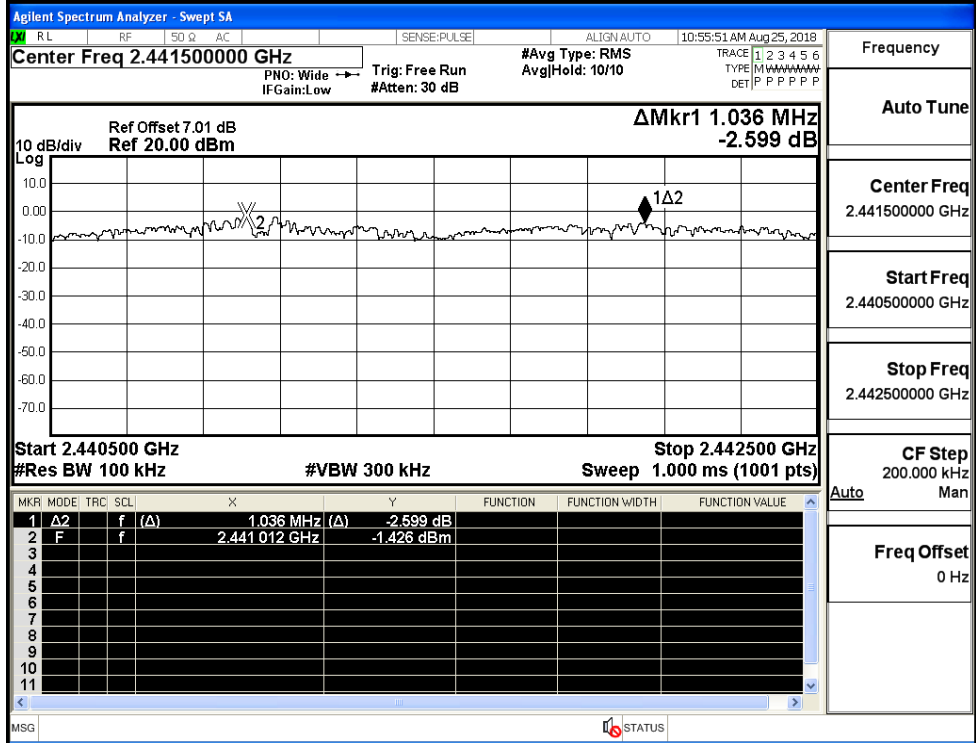


$\pi/4$ DQPSK/LCH



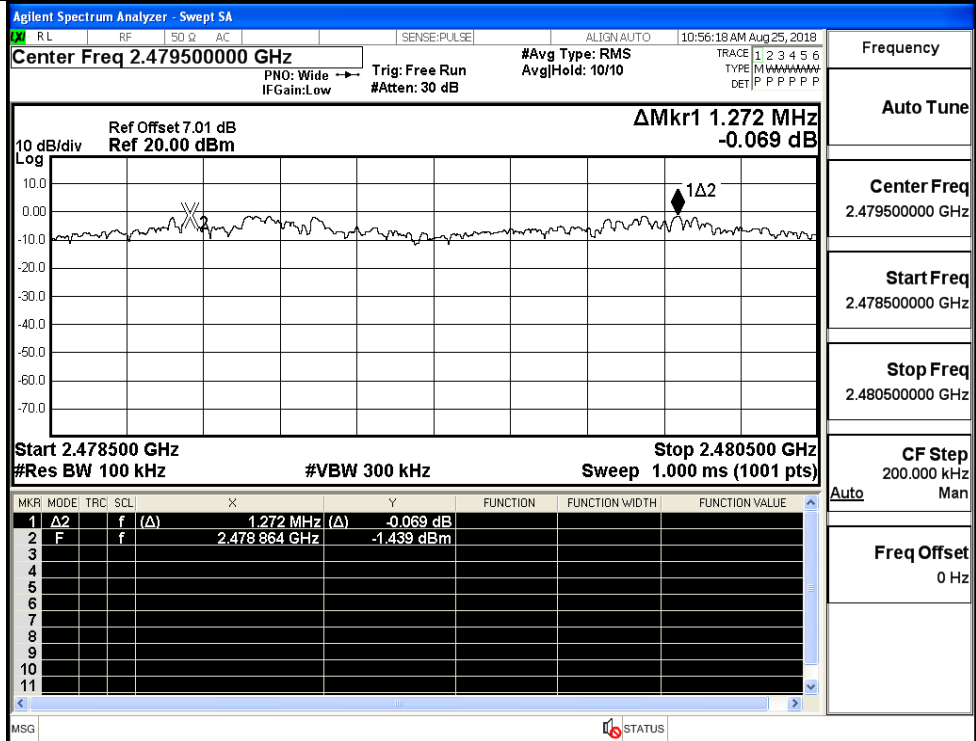
Frequency  
Auto Tune  
Center Freq  
2.402500000 GHz  
Start Freq  
2.401500000 GHz  
Stop Freq  
2.403500000 GHz  
CF Step  
200.000 kHz  
Auto  
Man  
Freq Offset  
0 Hz

$\pi/4$ 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  
Man  
Freq Offset  
0 Hz

π/4DQPSK/HCH



Frequency

Auto Tune

Center Freq  
2.479500000 GHz

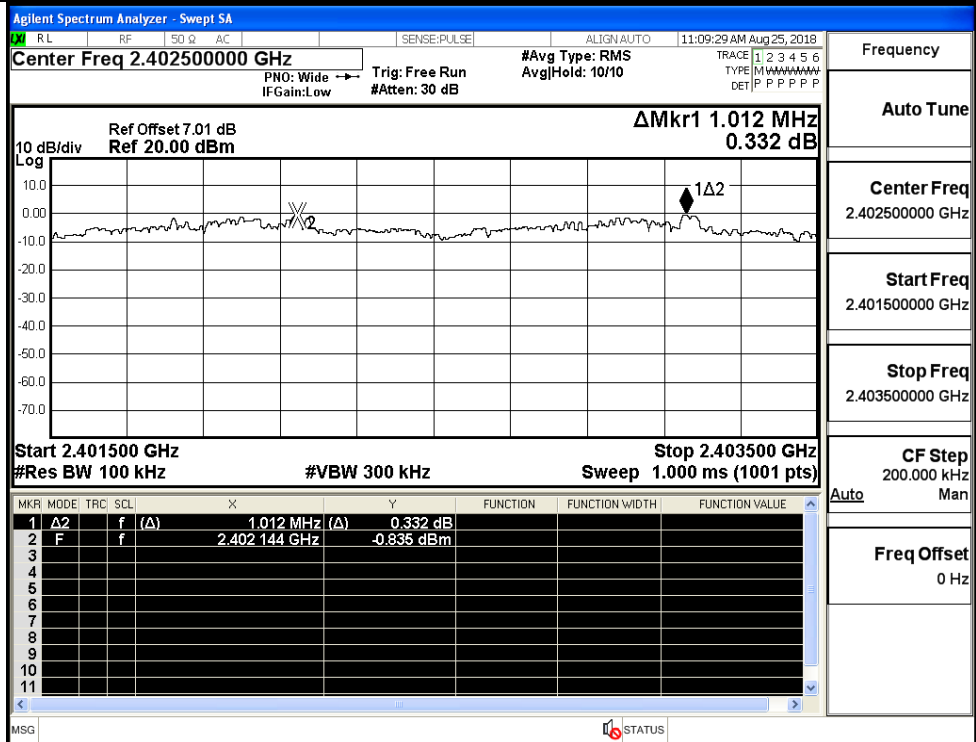
Start Freq  
2.478500000 GHz

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

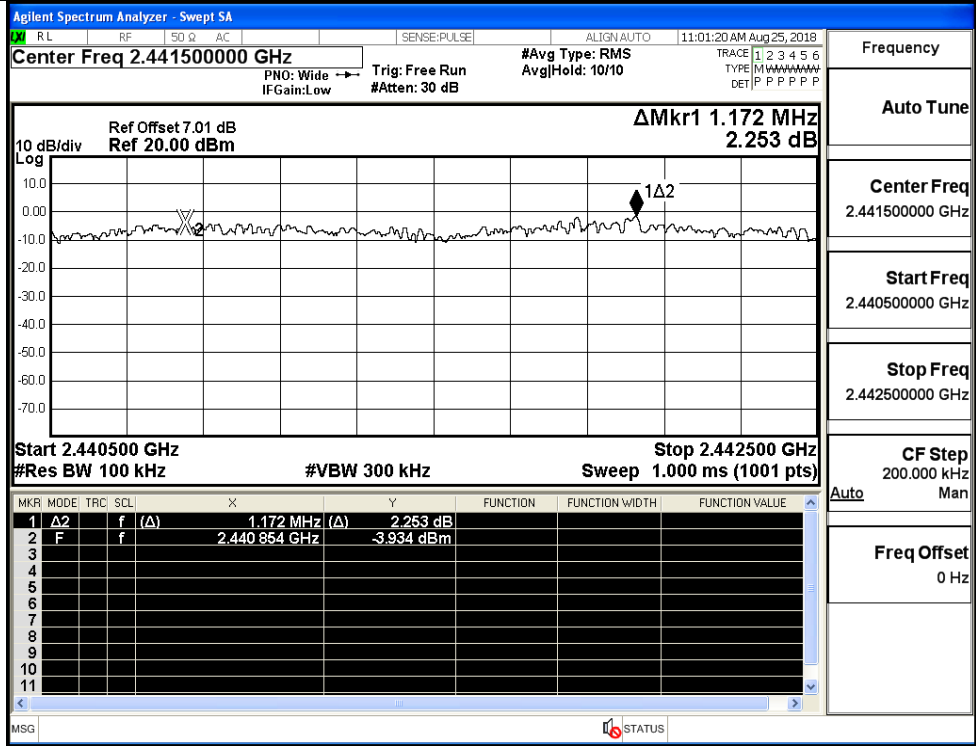
Start Freq  
2.401500000 GHz

Stop Freq  
2.403500000 GHz

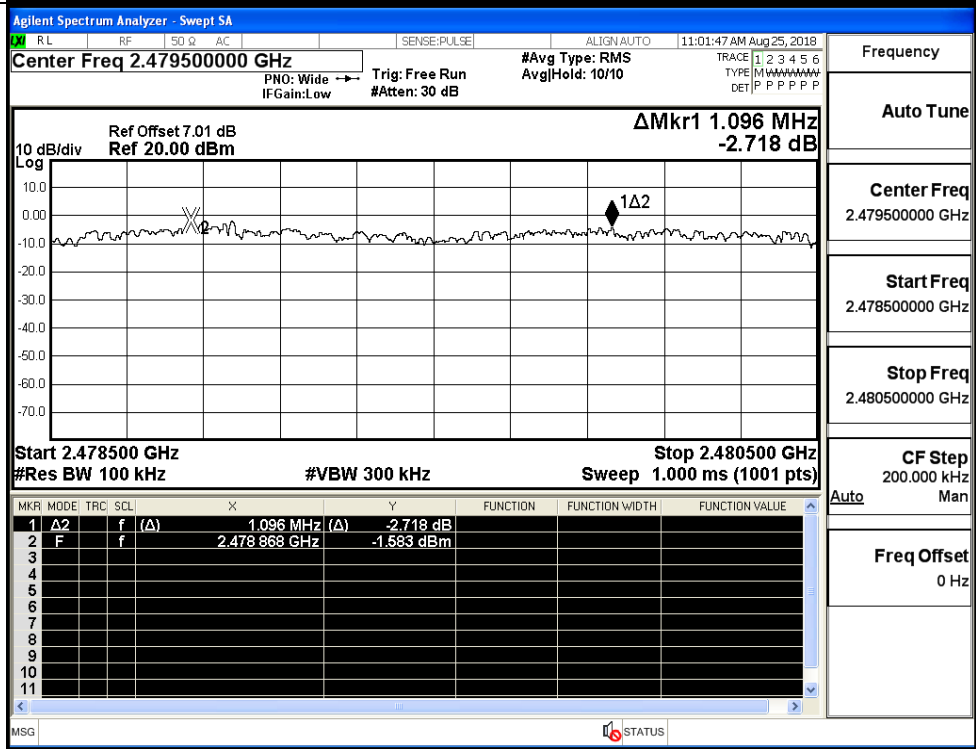
CF Step  
200.000 kHz  
Auto Man

Freq Offset  
0 Hz

8DPSK/MCH



8DPSK/HCH



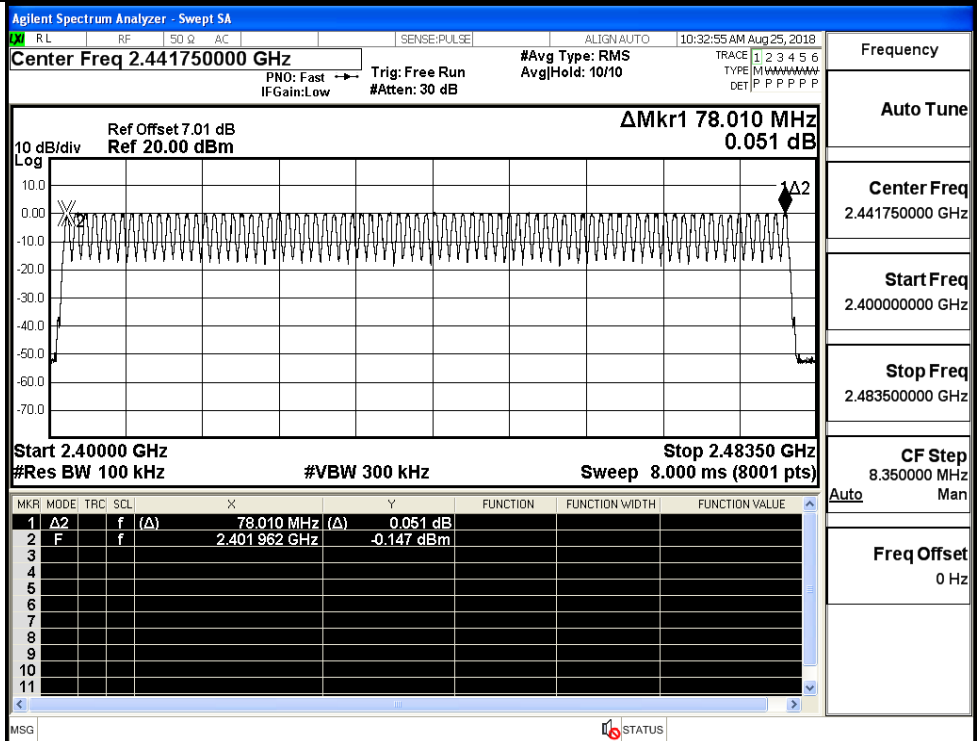


### A.4 Hopping Channel Number

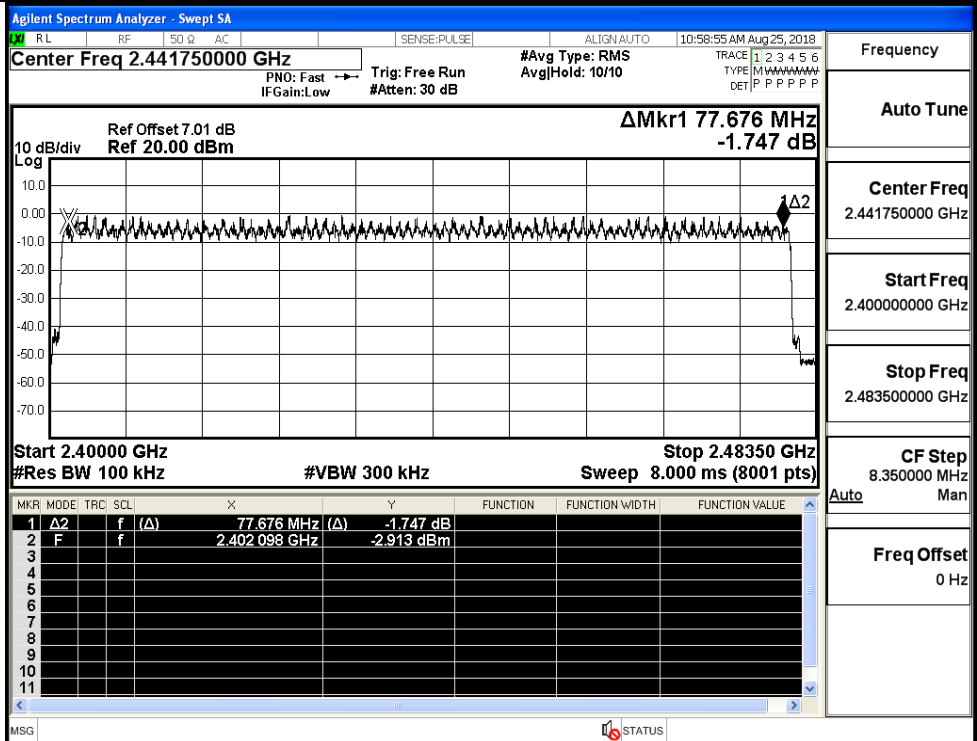
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
$\pi/4$ DQPSK	Hop	79	>=15	PASS
8DPSK	Hop	79	>=15	PASS

#### Test Graphs

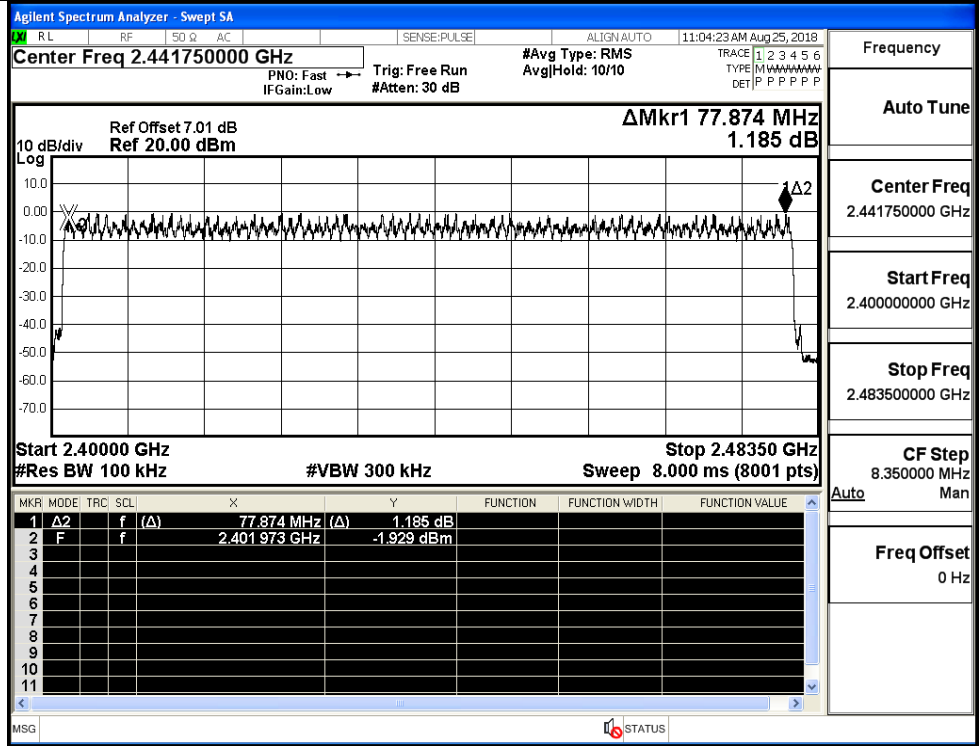
GFSK/Hop



$\pi/4$ DQPSK/Hop

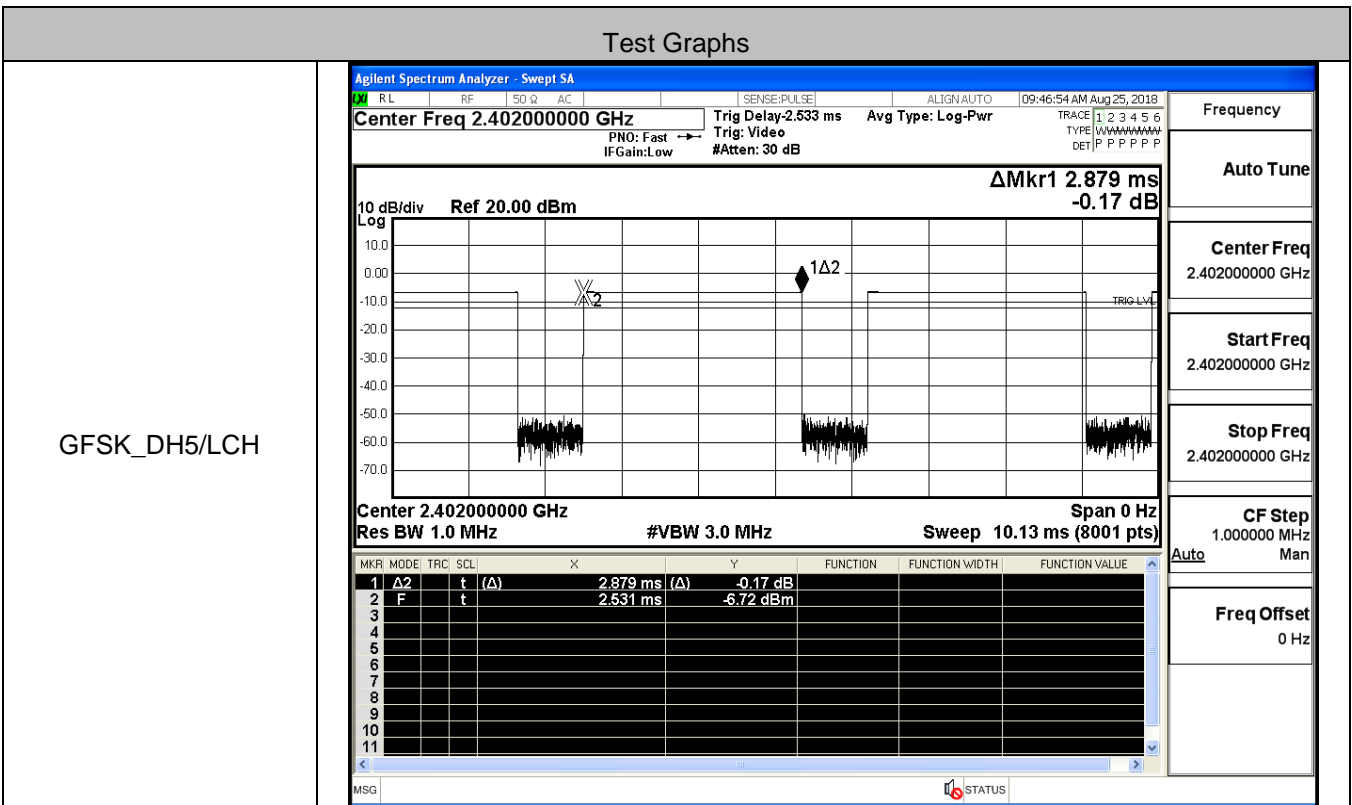


8DPSK/Hop

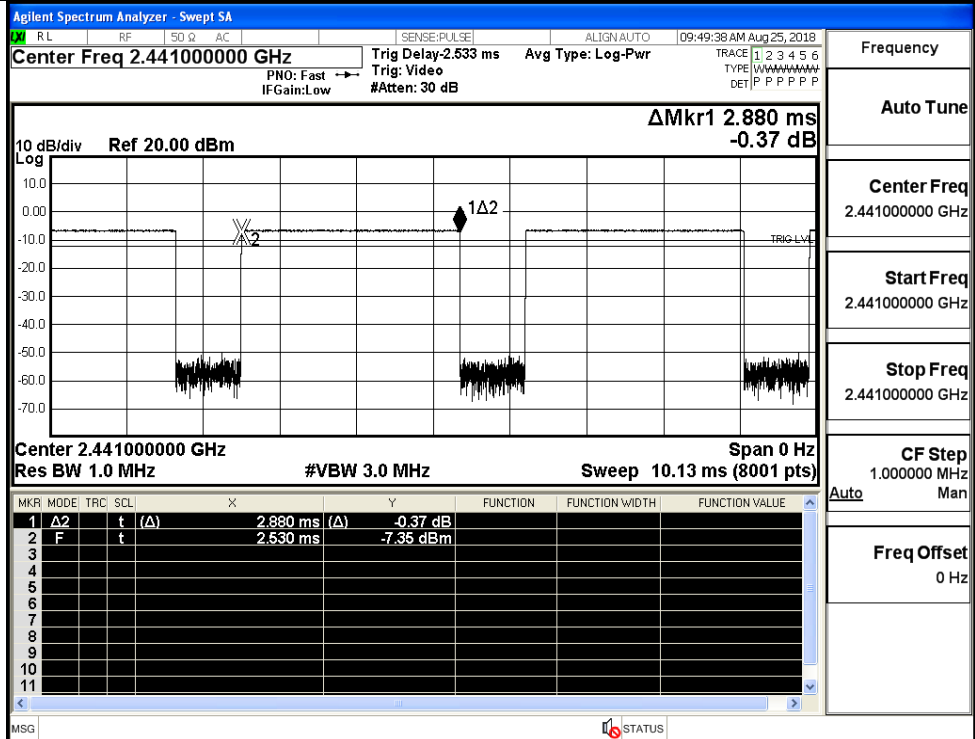


### A.5 Dwell Time

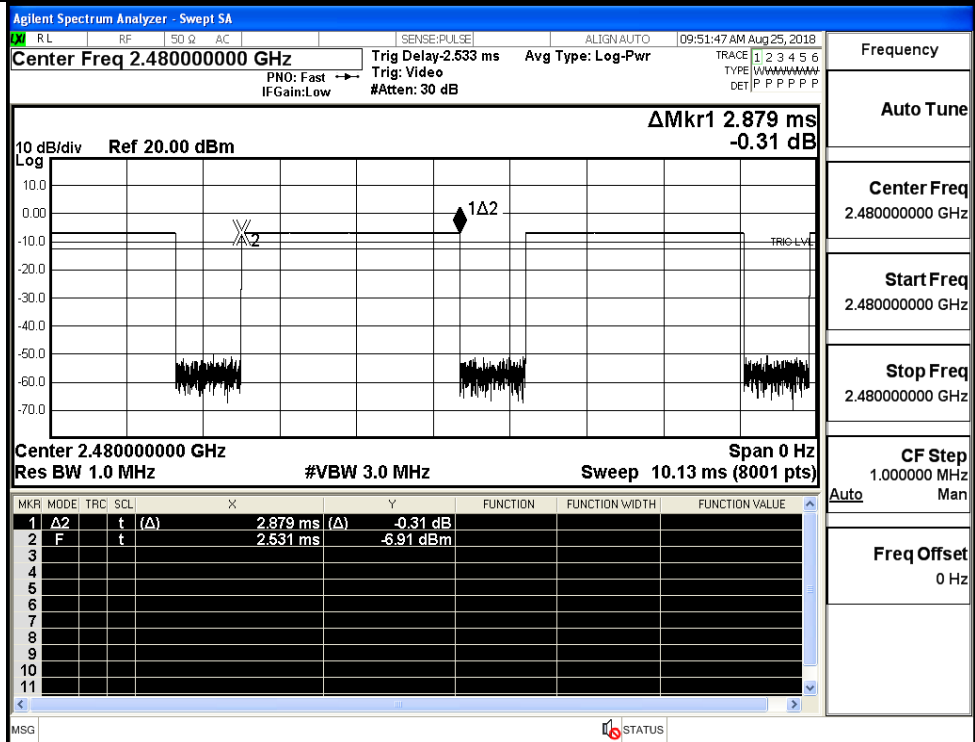
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
π/4DQPSK	2DH5	LCH	2.88	106.7	0.307	0.4	PASS
	2DH5	MCH	2.88	106.7	0.307	0.4	PASS
	2DH5	HCH	2.88	106.7	0.307	0.4	PASS
8DPSK	3DH5	LCH	2.89	106.7	0.308	0.4	PASS
	3DH5	MCH	2.89	106.7	0.308	0.4	PASS
	3DH5	HCH	2.89	106.7	0.308	0.4	PASS



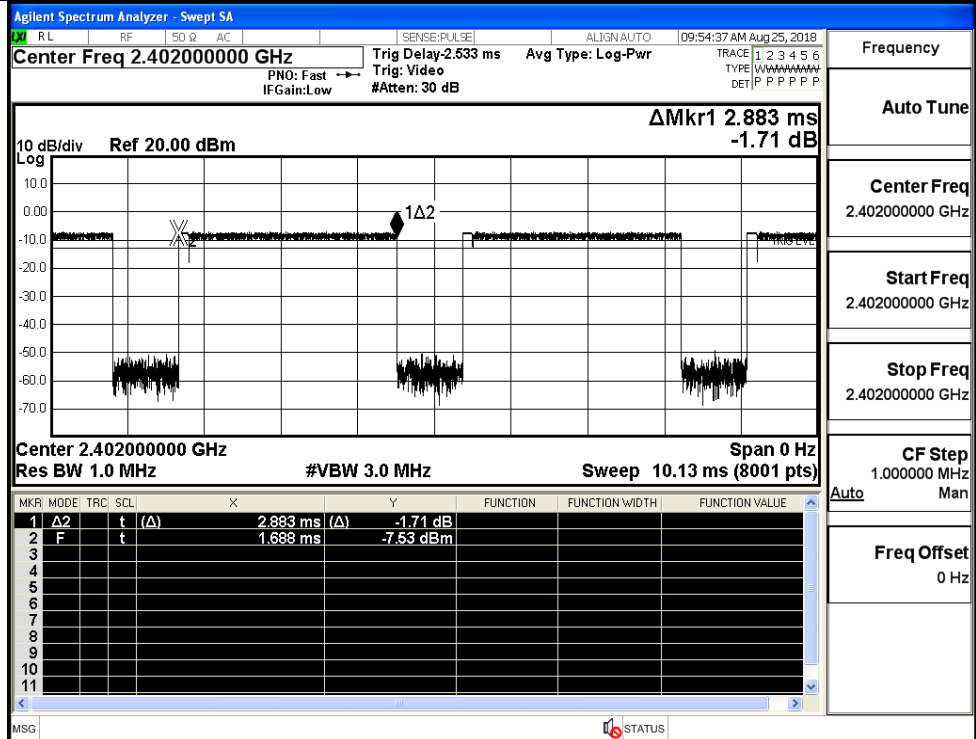
GFSK\_DH5/MCH



GFSK\_DH5/HCH

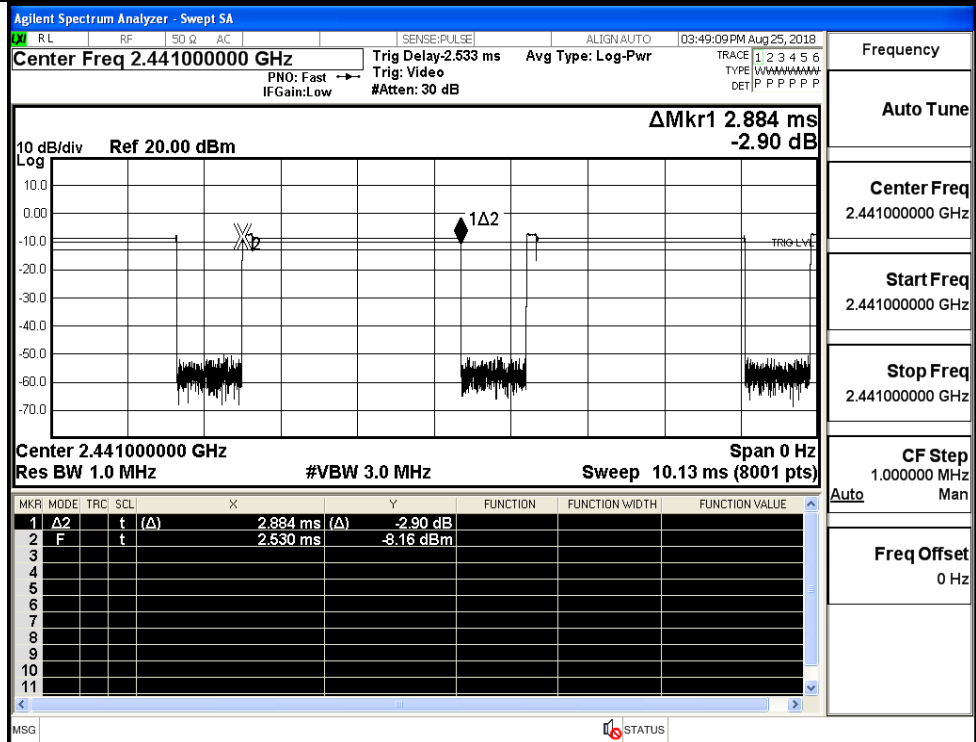


$\pi/4$ DQPSK  
\_2DH5/LCH



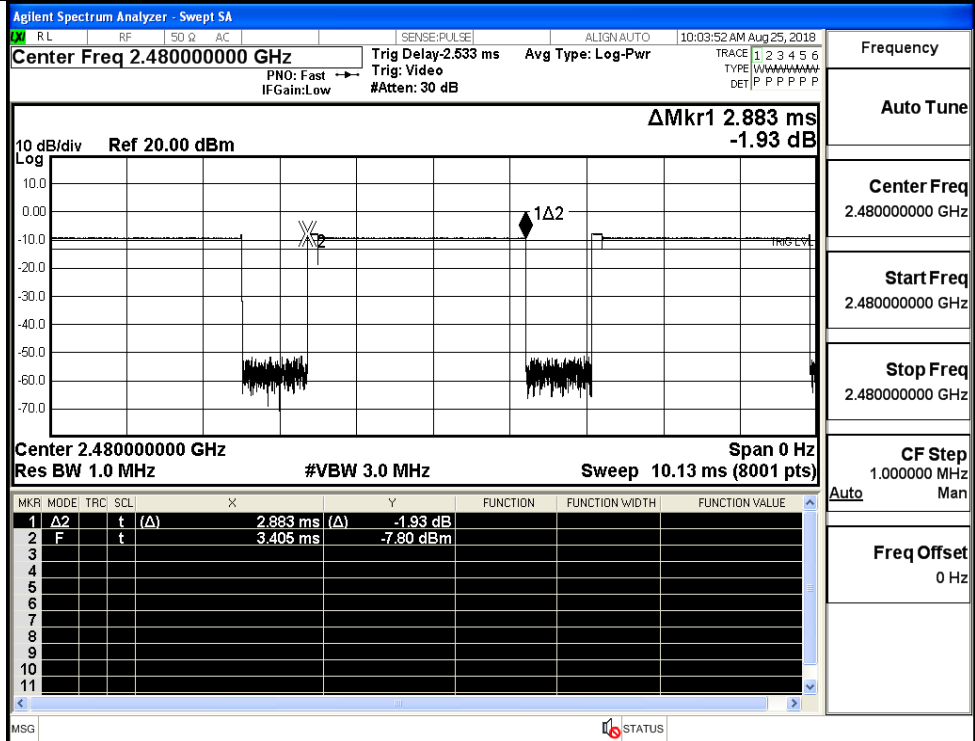
Frequency	2.402000000 GHz
Auto Tune	
Center Freq	2.402000000 GHz
Start Freq	2.402000000 GHz
Stop Freq	2.402000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK  
\_2DH5/MCH

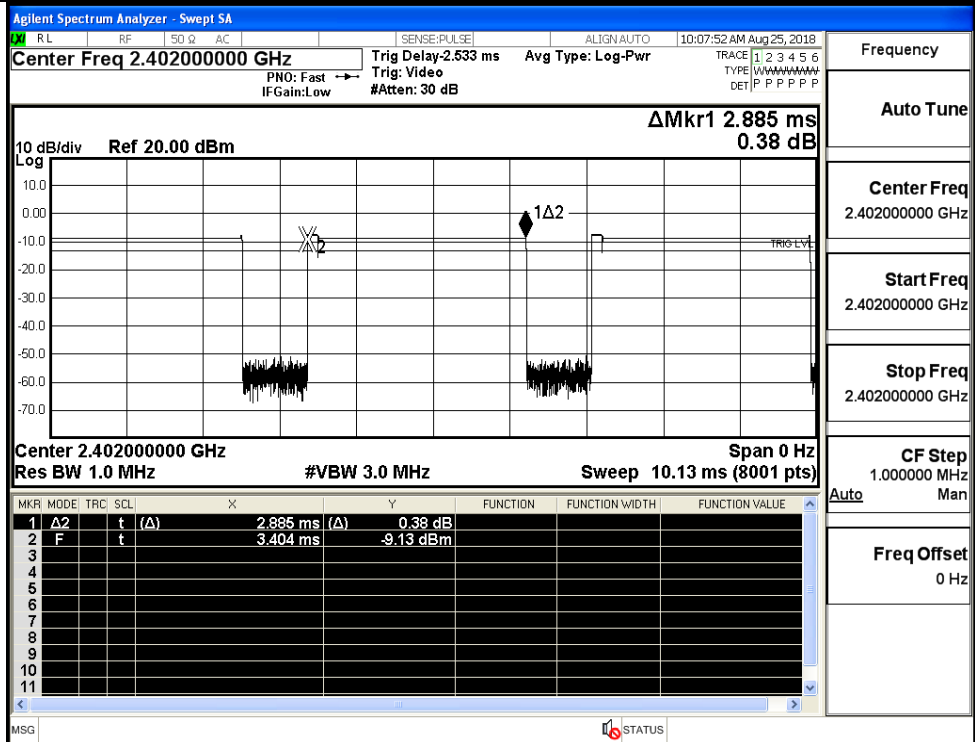


Frequency	2.441000000 GHz
Auto Tune	
Center Freq	2.441000000 GHz
Start Freq	2.441000000 GHz
Stop Freq	2.441000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

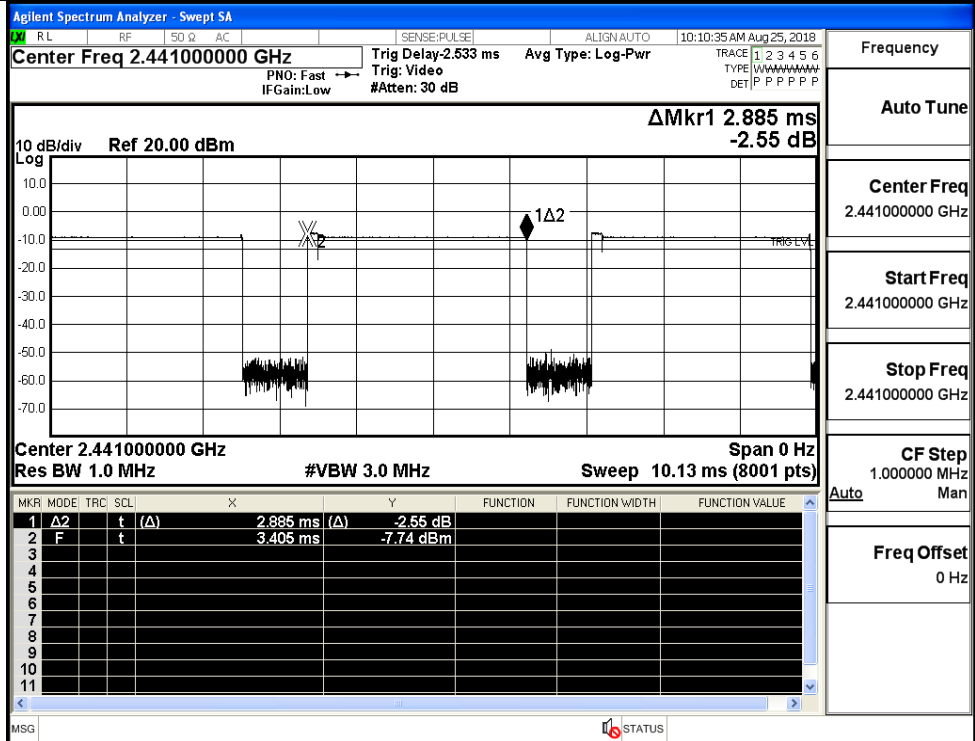
$\pi/4$ DQPSK  
\_2DH5/HCH



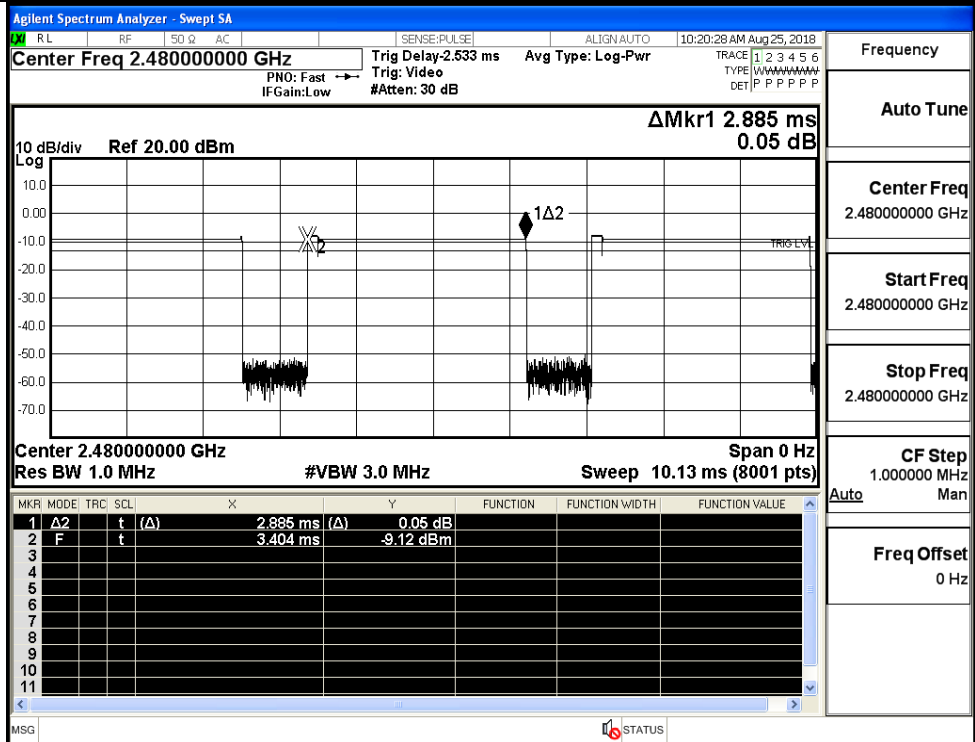
8DPSK\_3DH5/LCH



8DPSK\_3DH5/MCH



8DPSK\_3DH5/HCH

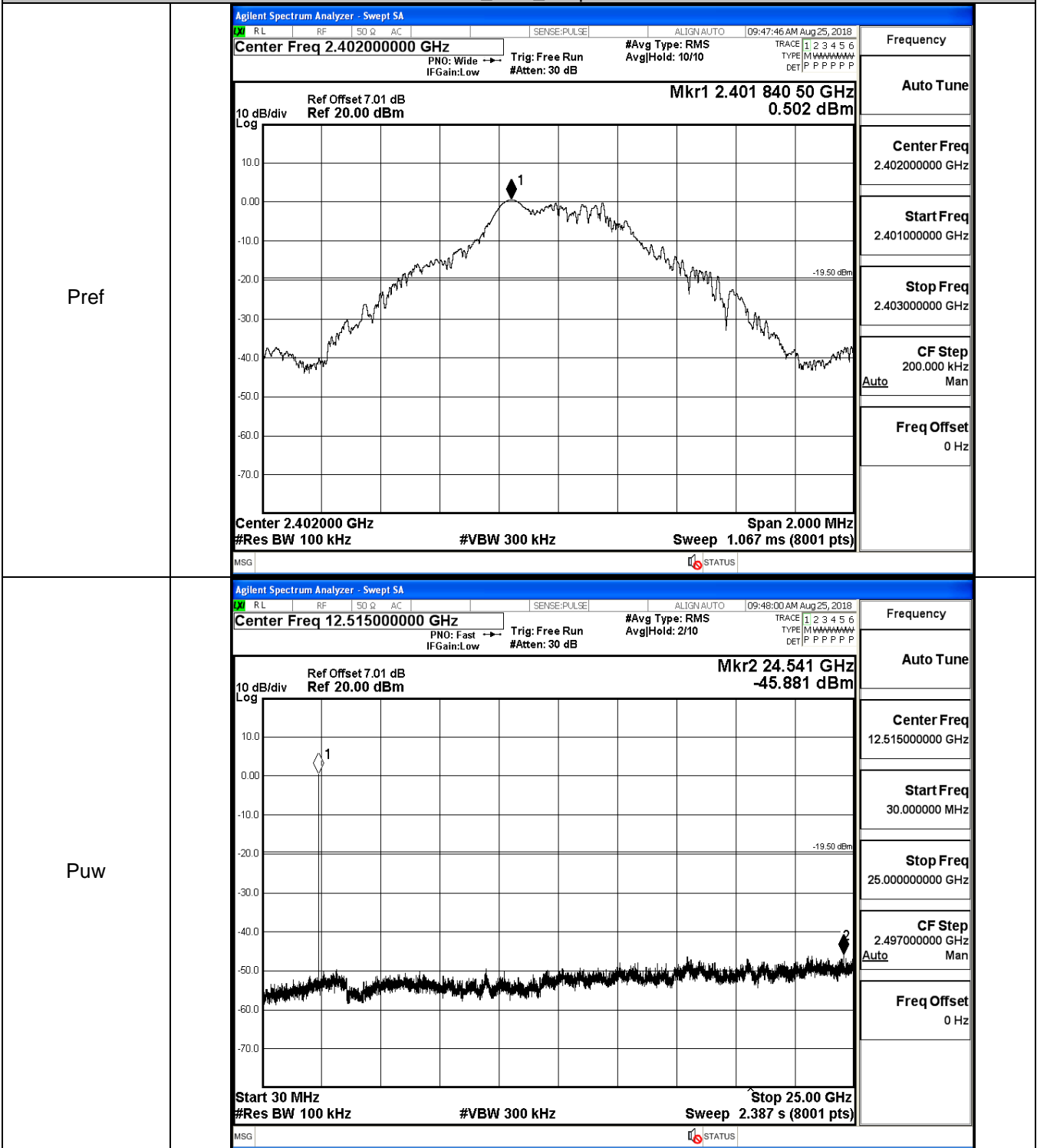


**A.6 RF Conducted Spurious Emissions**

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	0.502	-45.881	-19.498	PASS
	MCH	0.4	-45.841	-19.600	PASS
	HCH	0.219	-45.977	-19.781	PASS
$\pi/4$ DQPSK	LCH	-1.238	-45.305	-21.238	PASS
	MCH	-1.054	-46.206	-21.054	PASS
	HCH	-0.885	-46.070	-20.885	PASS
8DPSK	LCH	-0.53	-45.785	-20.530	PASS
	MCH	-0.581	-46.405	-20.581	PASS
	HCH	-0.76	-45.313	-20.760	PASS

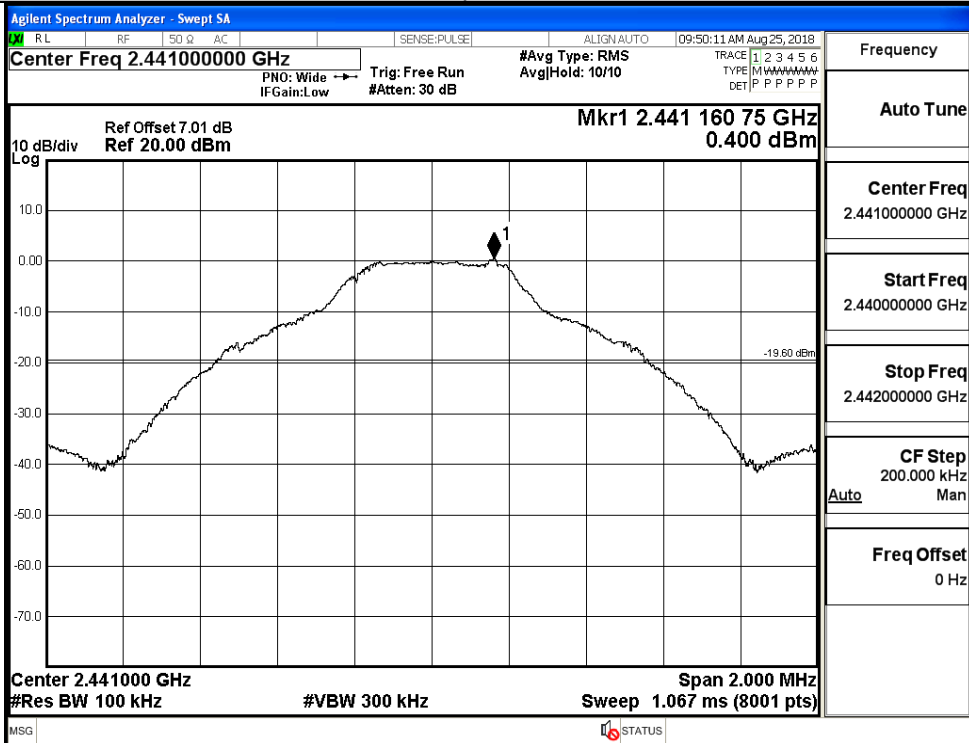


GFSK\_LCH\_Graphs

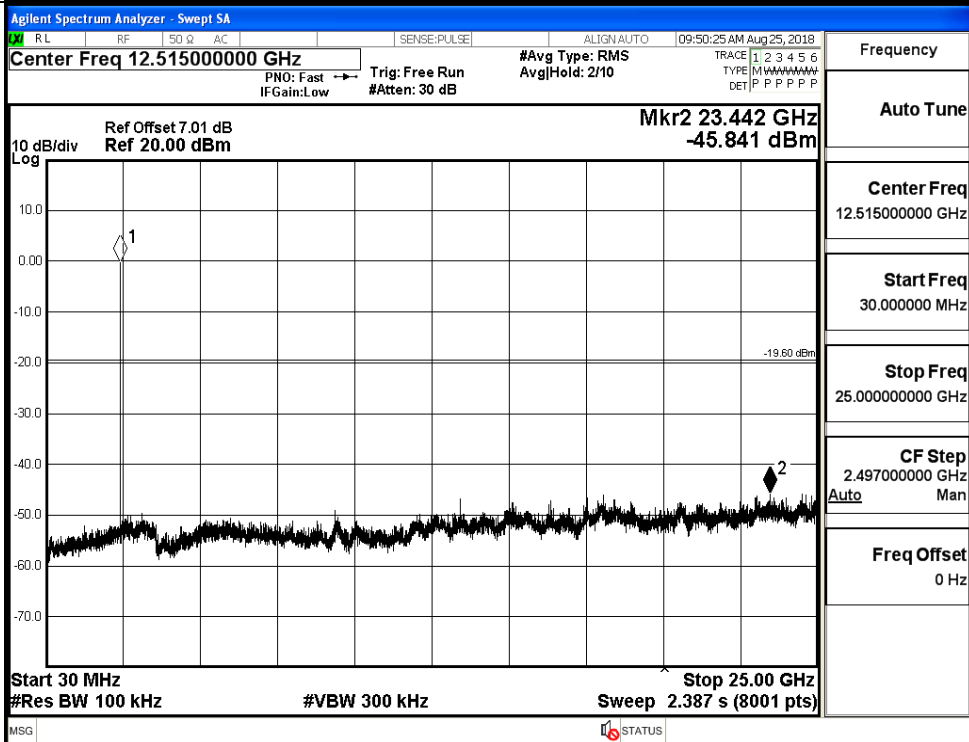


GFSK\_MCH\_Graphs

Pref

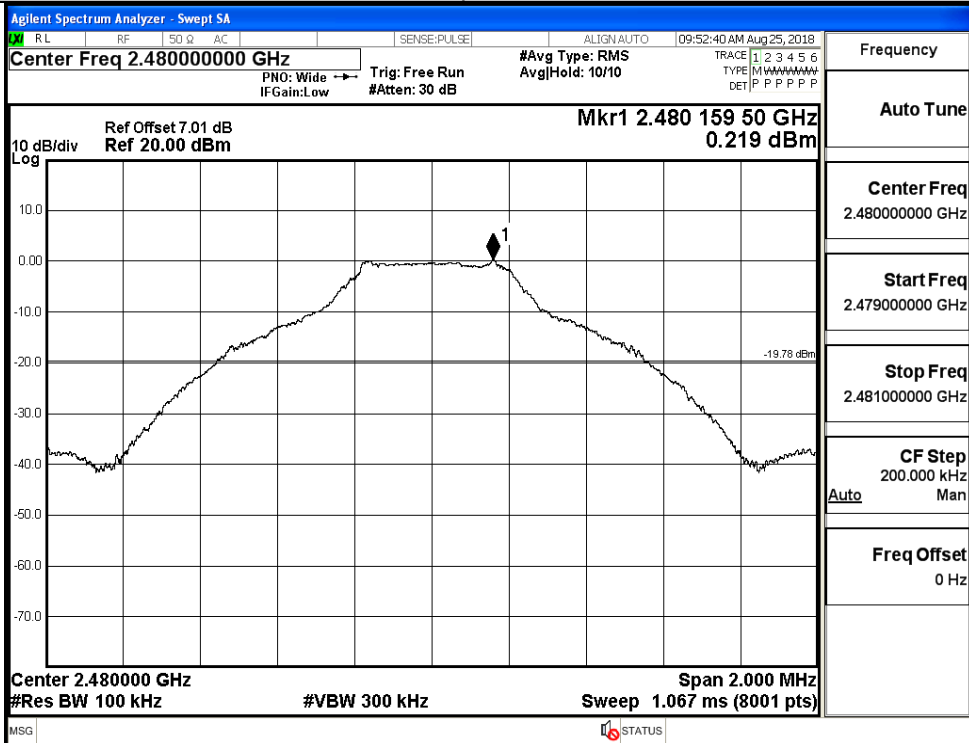


Puw

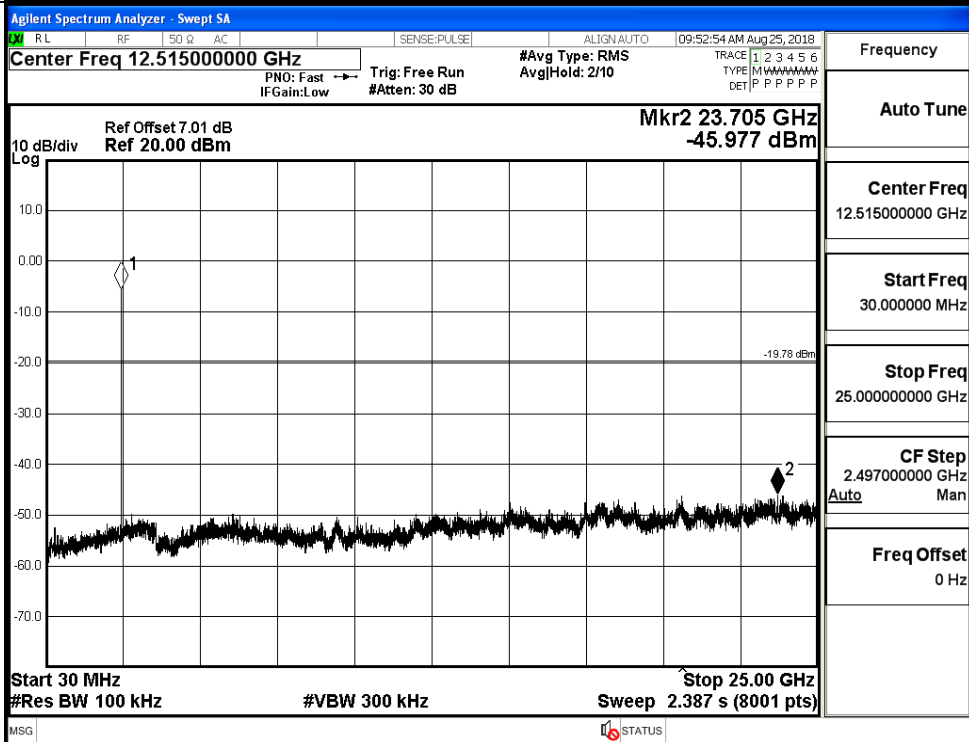


GFSK\_HCH\_Graphs

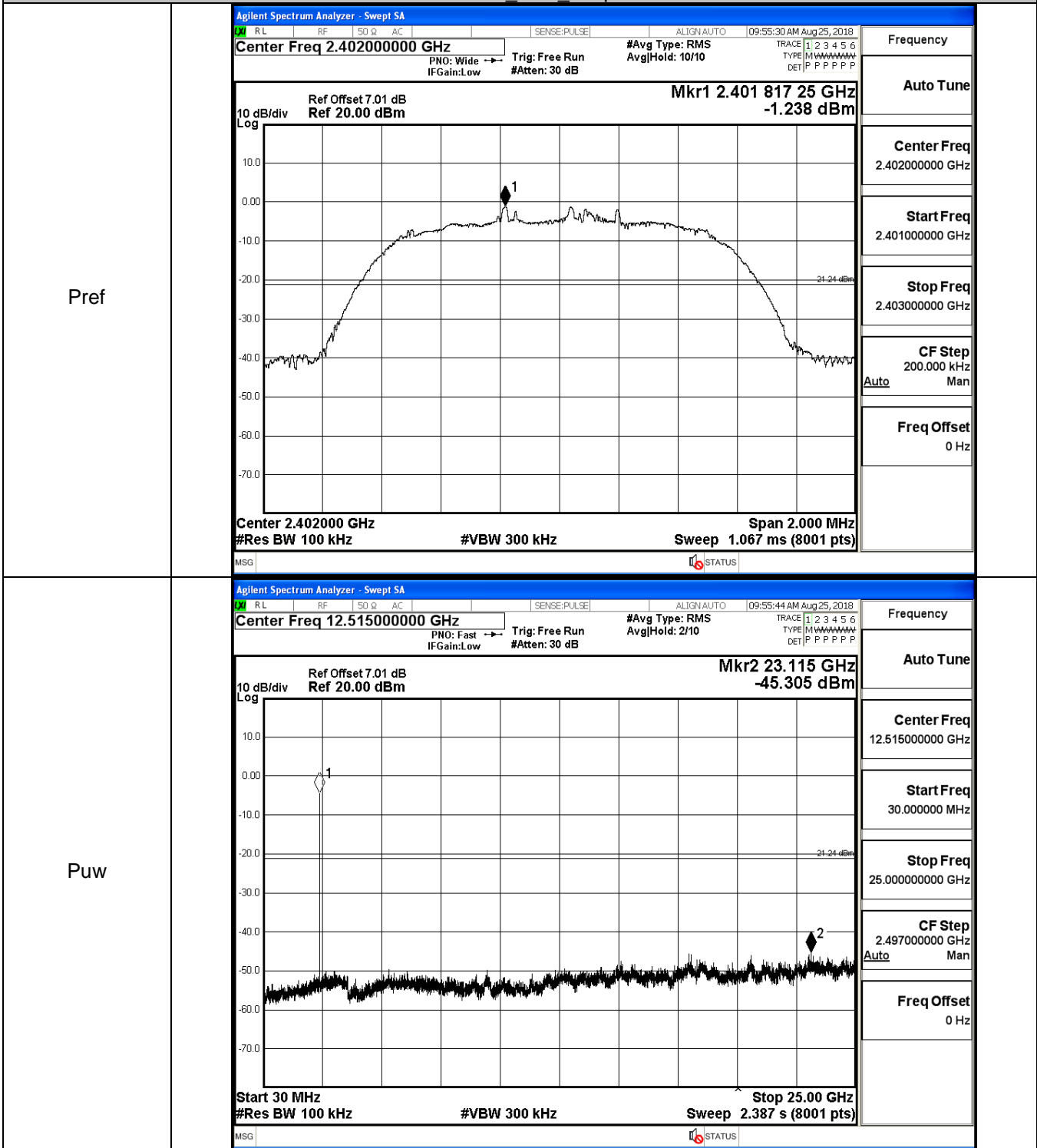
Pref



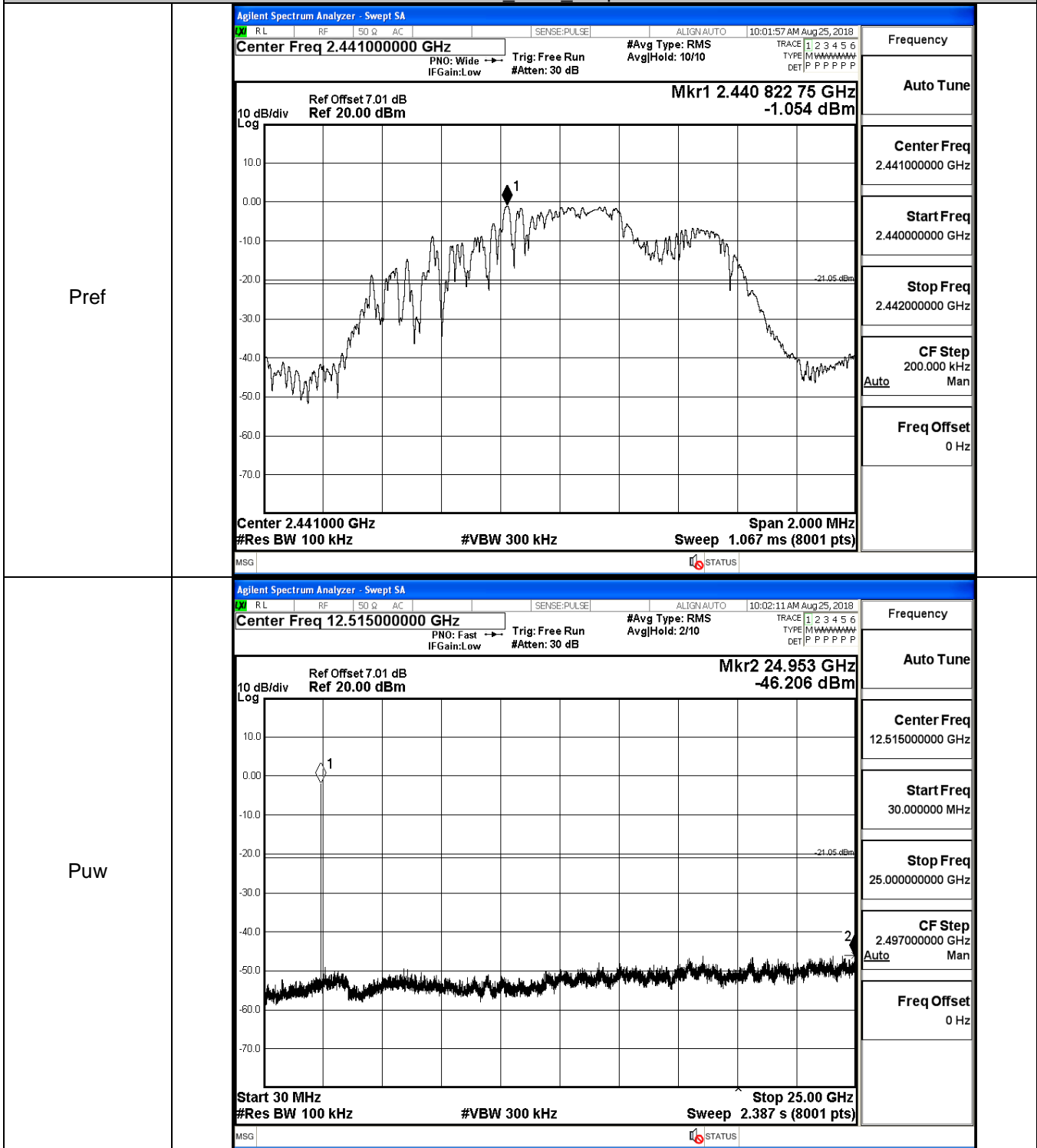
Puw



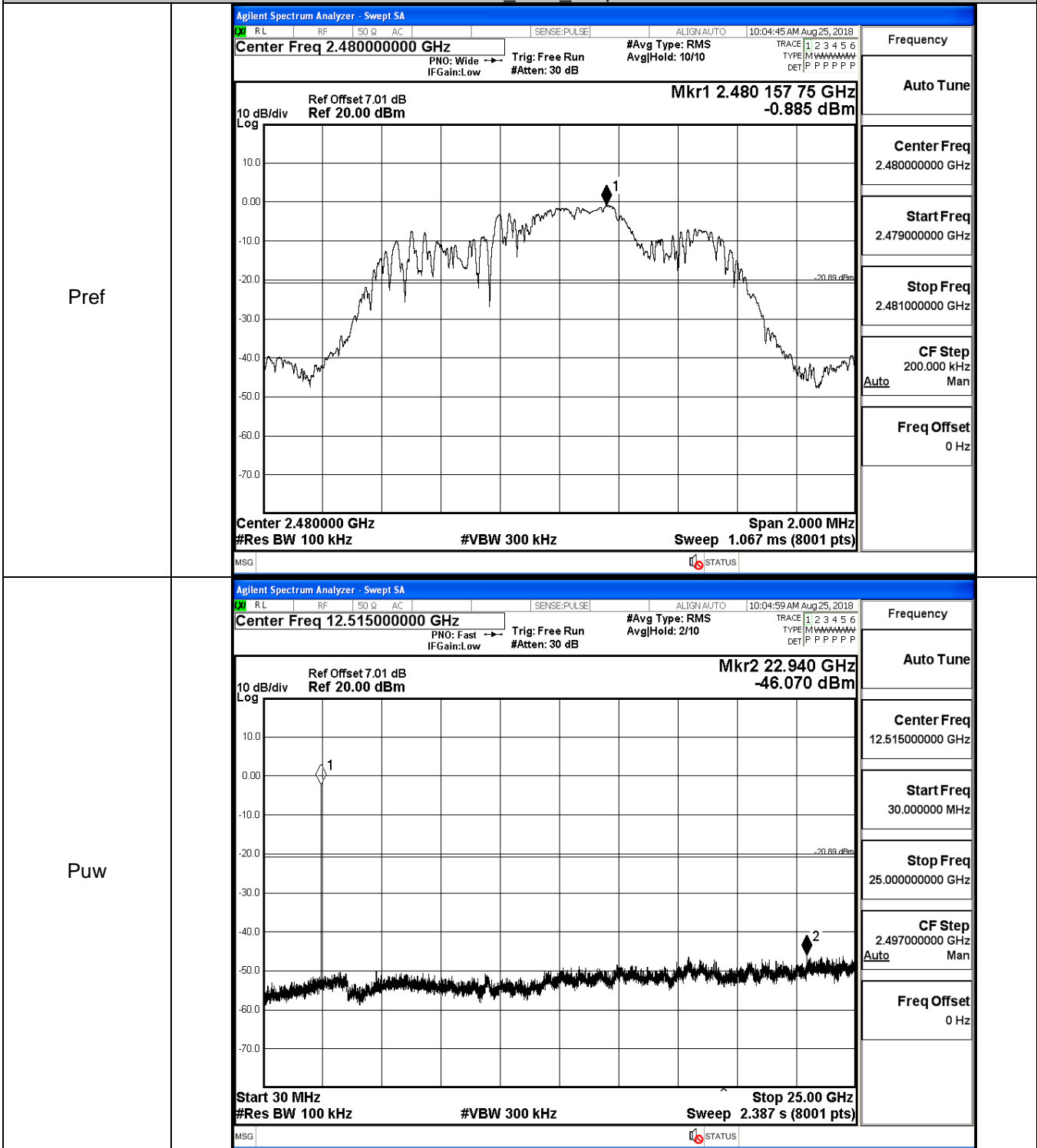
$\pi/4$ DQPSK LCH\_Graphs



$\pi/4$ DQPSK\_MCH\_Graphs

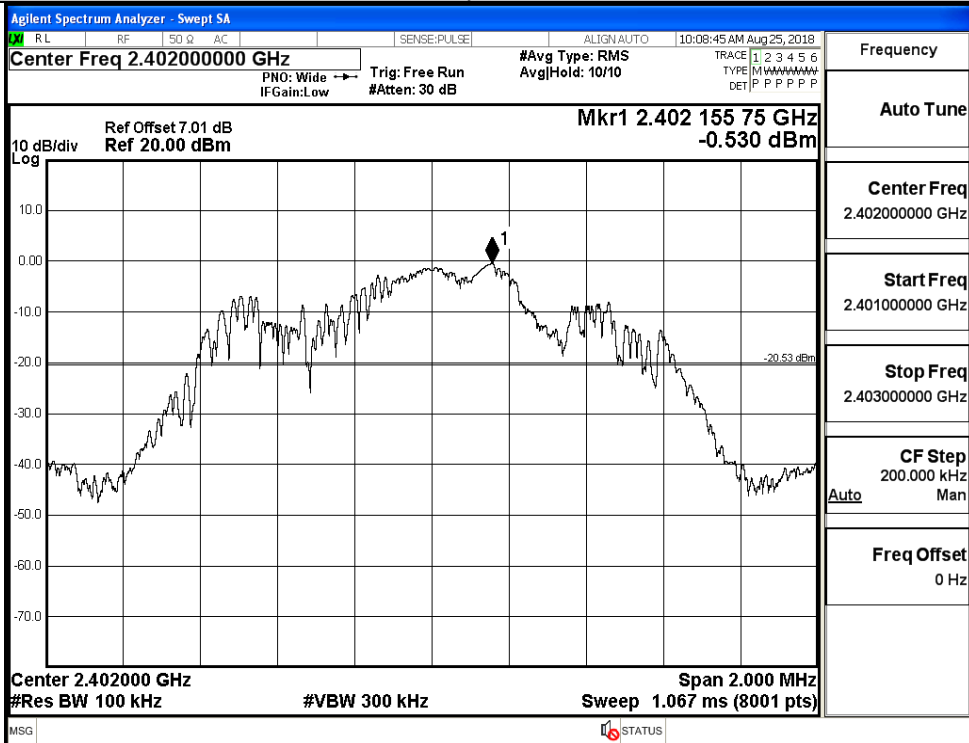


$\pi/4$ DQPSK\_HCH\_Graphs

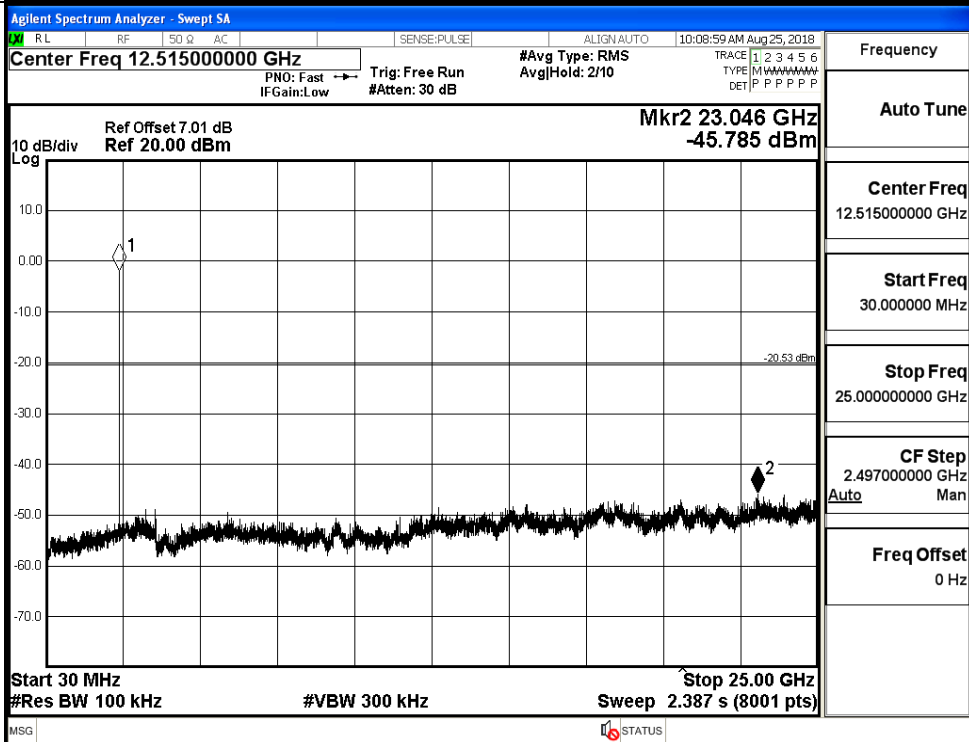


8DPSK\_LCH\_Graphs

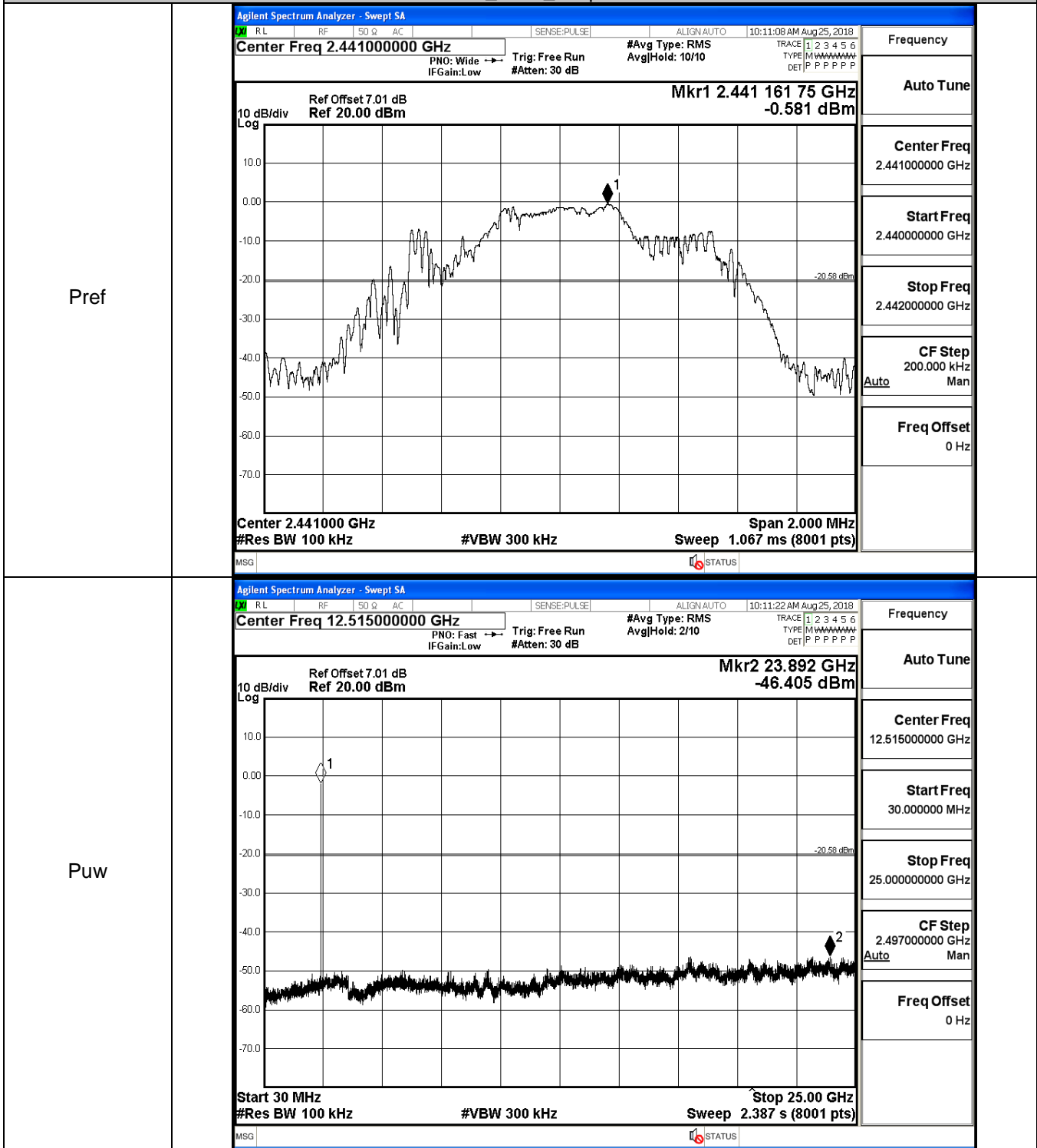
Pref



Puw

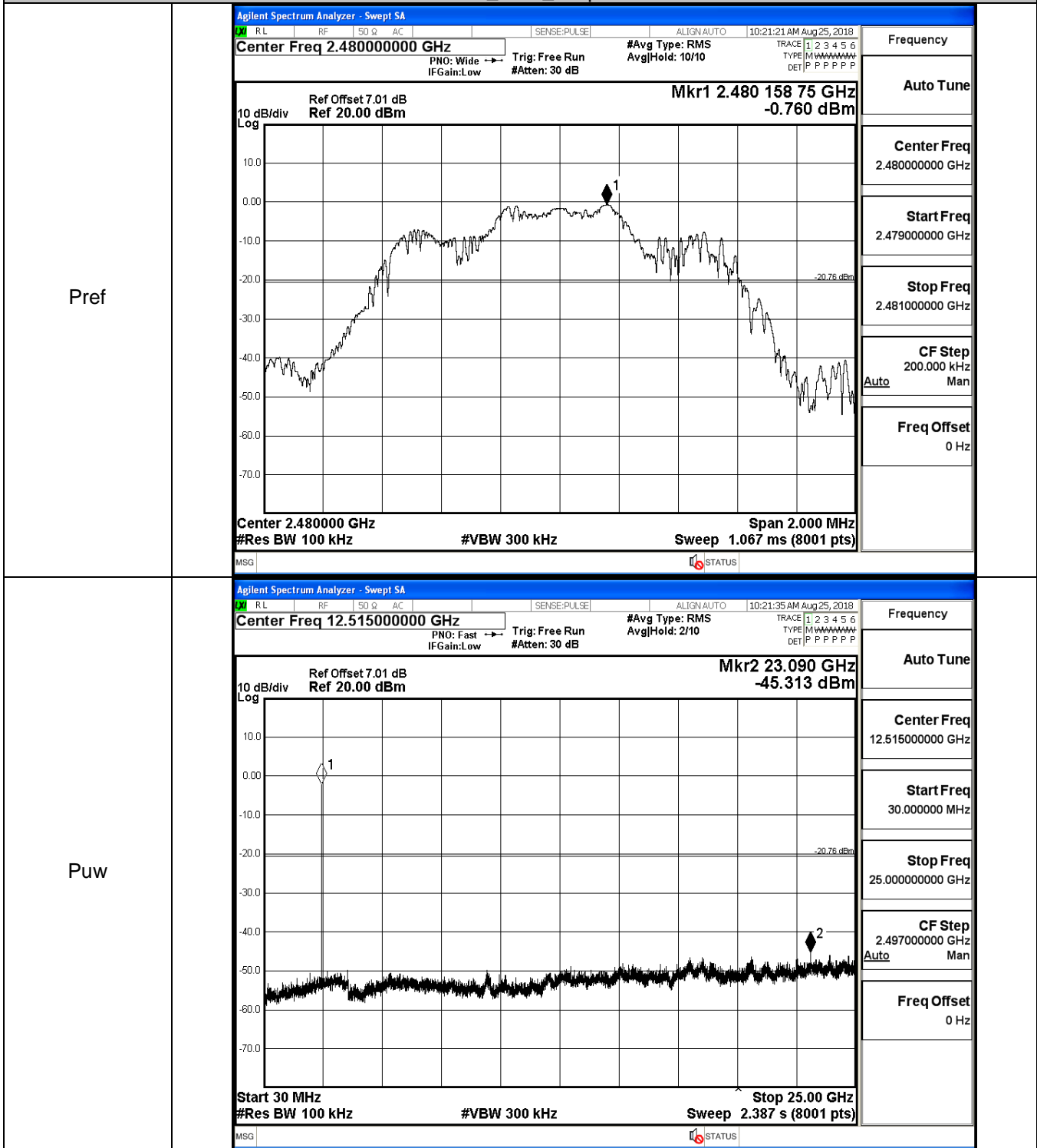


8DPSK\_MCH\_Graphs





8DPSK\_HCH\_Graphs

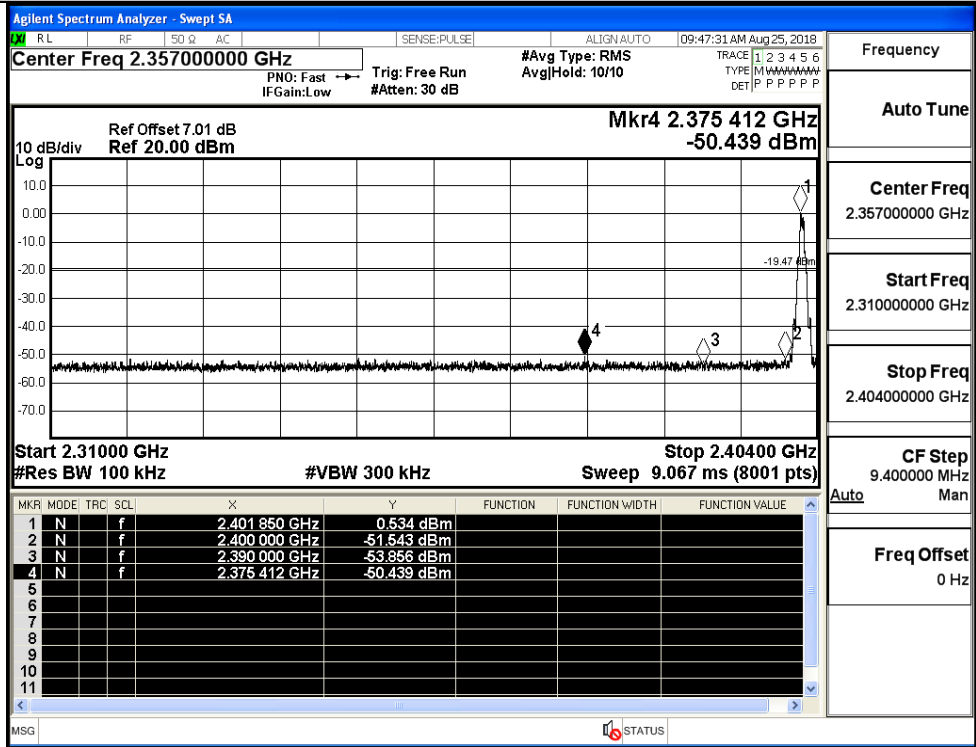


## A.7 Band-edge for RF Conducted Emissions

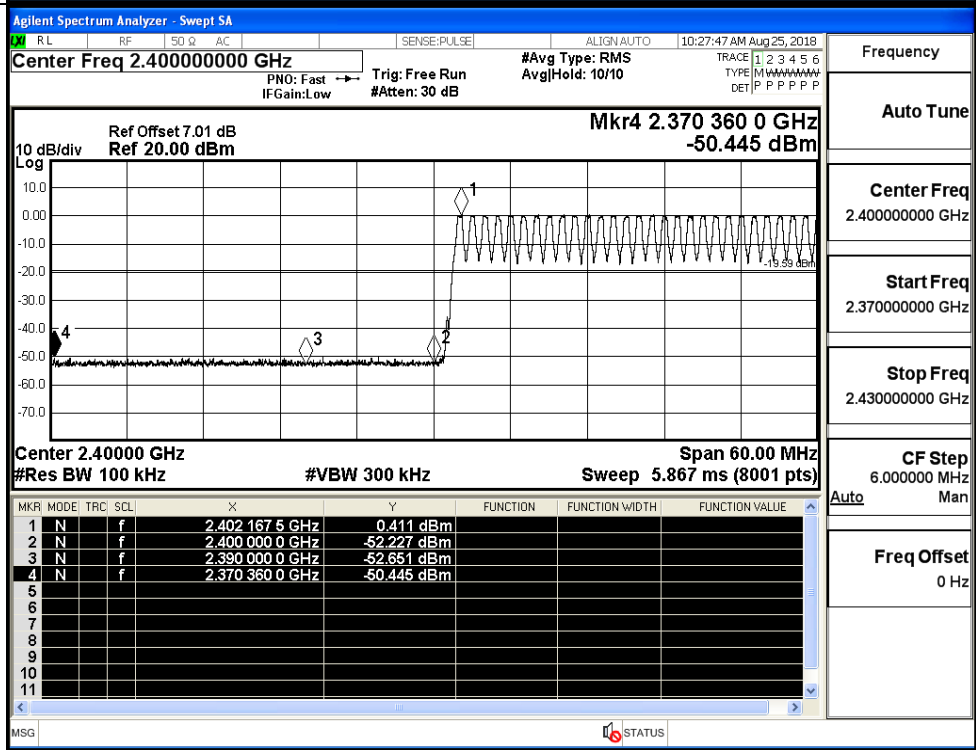
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	0.534	Off	-50.439	-19.47	PASS
			0.411	On	-50.445	-19.59	PASS
	HCH	2480	0.306	Off	-51.045	-19.69	PASS
			0.260	On	-50.275	-19.74	PASS
$\pi/4$ DQPSK	LCH	2402	-0.934	Off	-50.279	-20.93	PASS
			-0.590	On	-50.426	-20.59	PASS
	HCH	2480	-0.763	Off	-51.008	-20.76	PASS
			-0.681	On	-50.266	-20.68	PASS
8DPSK	LCH	2402	-0.396	Off	-50.982	-20.4	PASS
			-0.509	On	-50.160	-20.51	PASS
	HCH	2480	-0.663	Off	-50.898	-20.66	PASS
			-0.742	On	-50.297	-20.74	PASS

Test Graphs

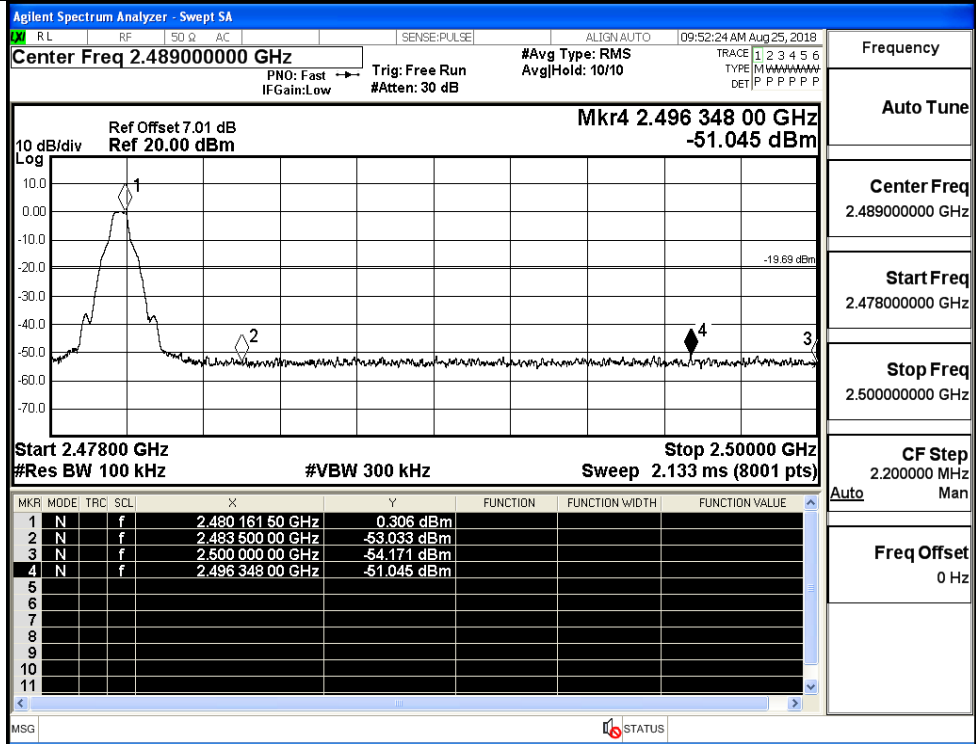
GFSK/LCH/No Hop



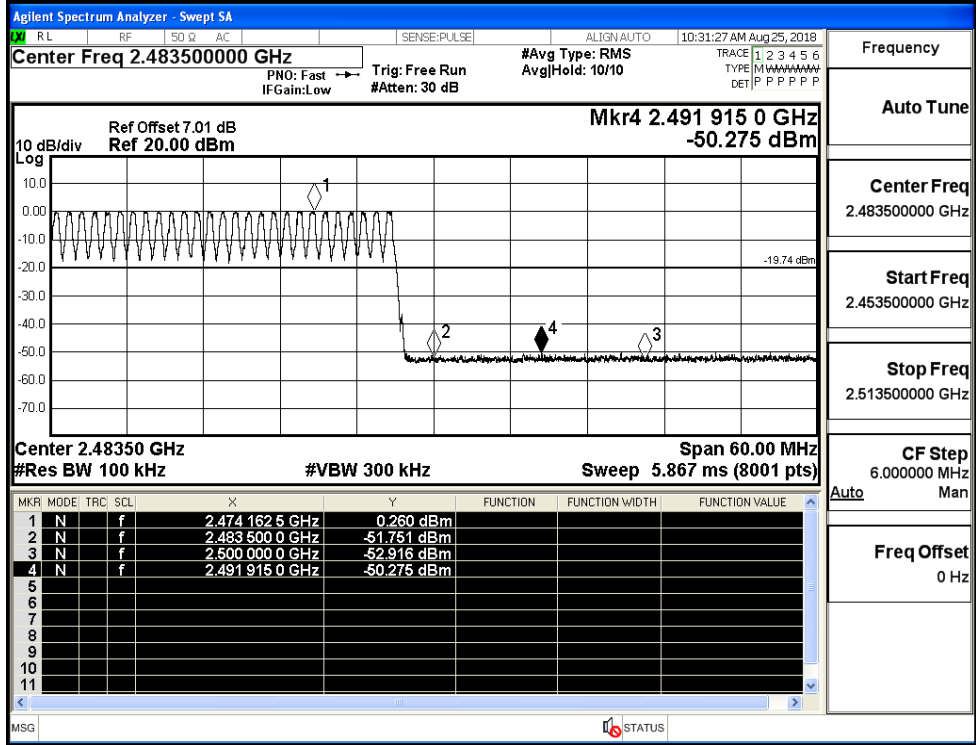
GFSK/LCH/Hop



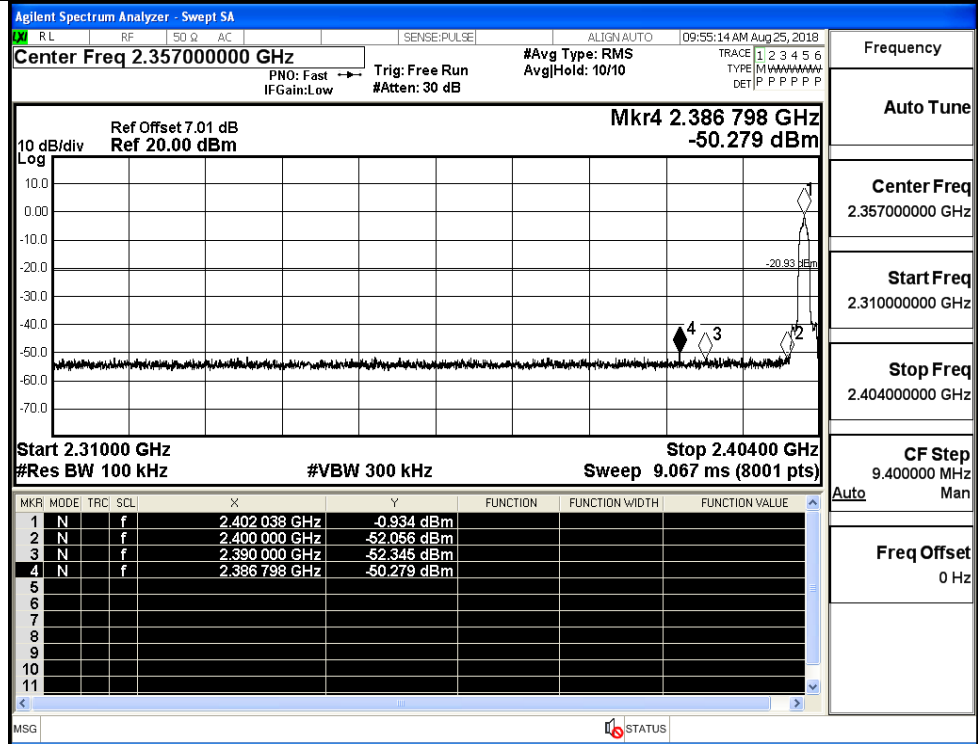
GFSK/HCH/No Hop



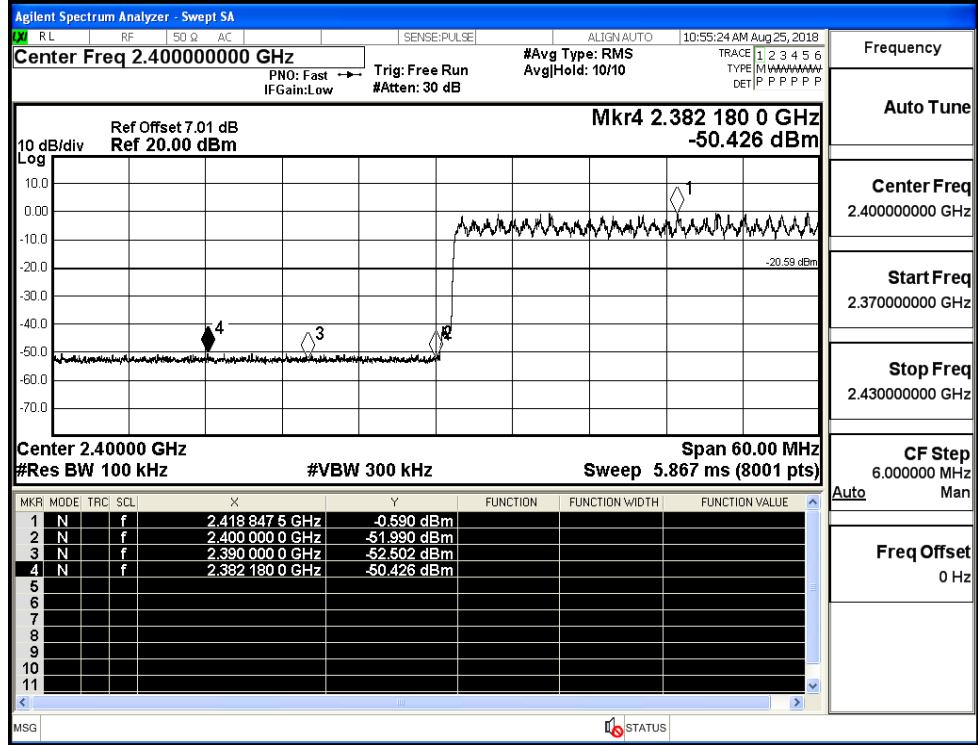
GFSK/HCH/Hop



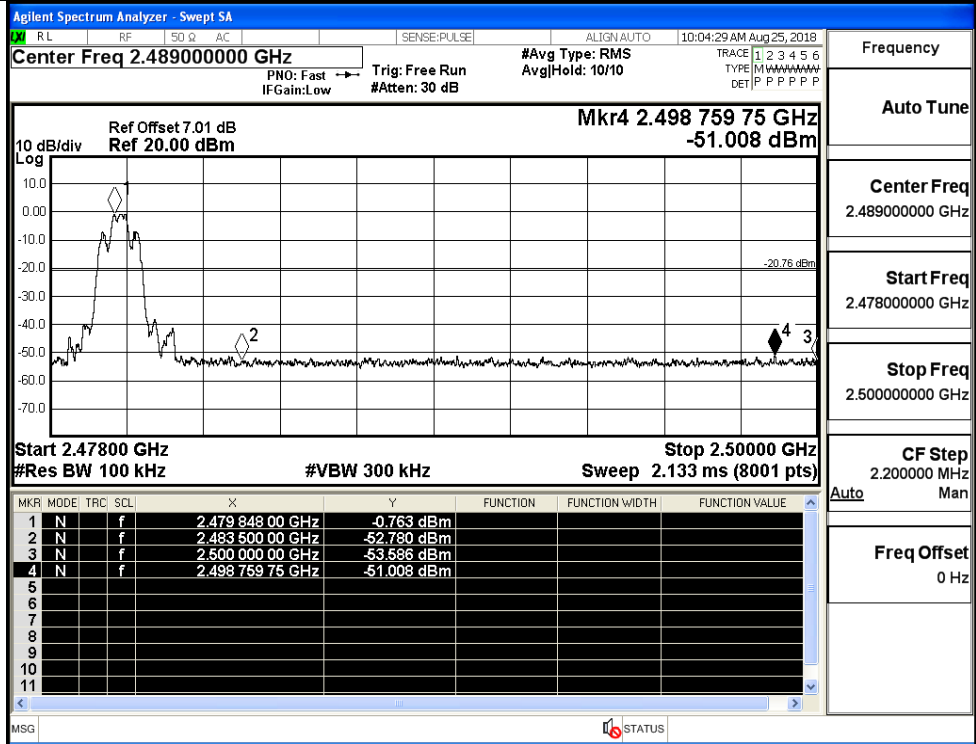
$\pi/4$ DQPSK/LCH/No  
Hop



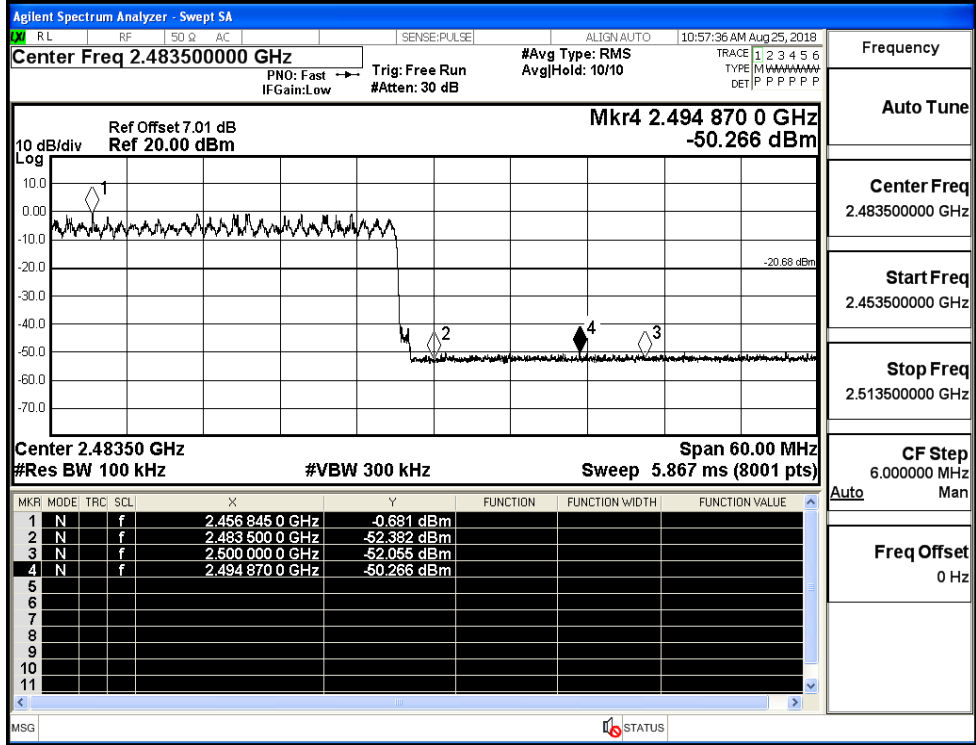
$\pi/4$ DQPSK/LCH/Hop



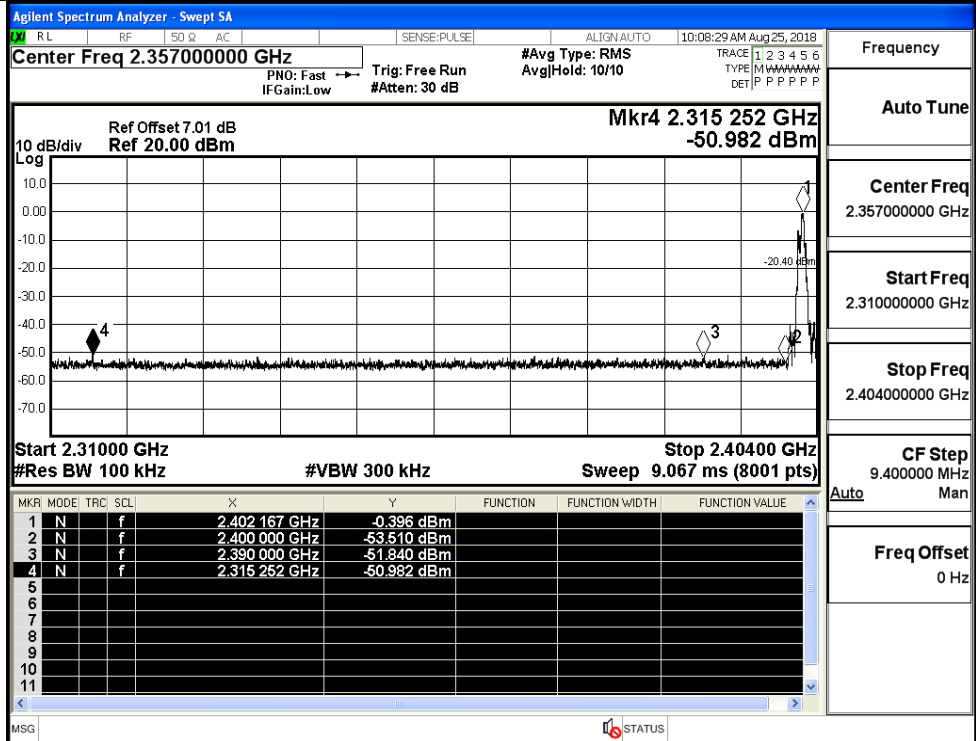
$\pi$ /4DQPSK/HCH/No  
Hop



$\pi$ /4DQPSK/HCH/Hop

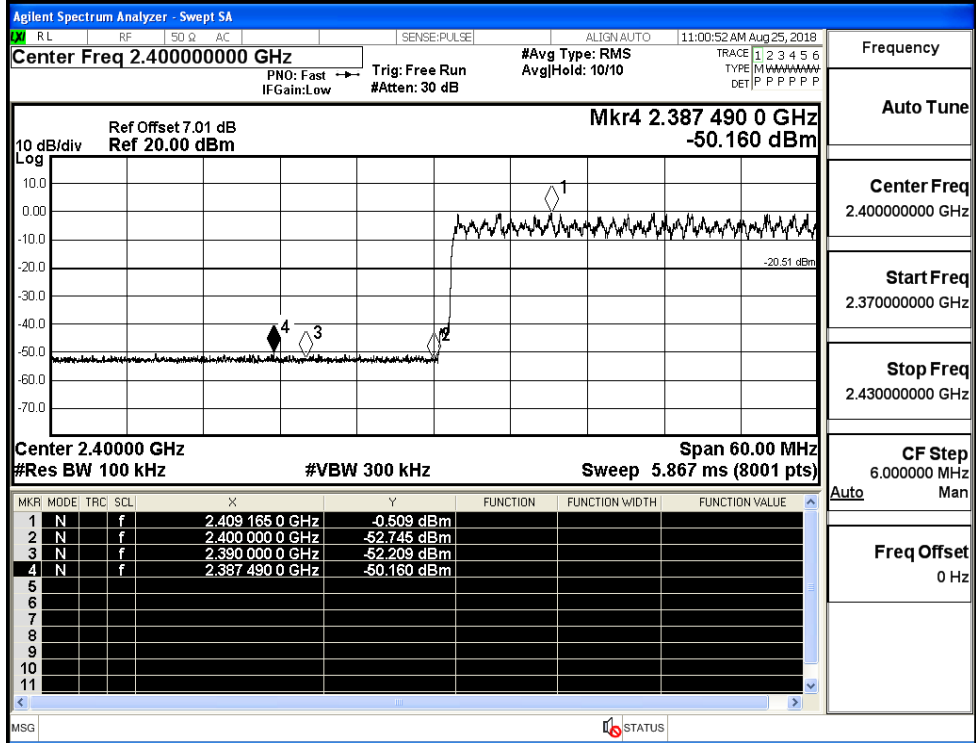


8DPSK/LCH/No Hop



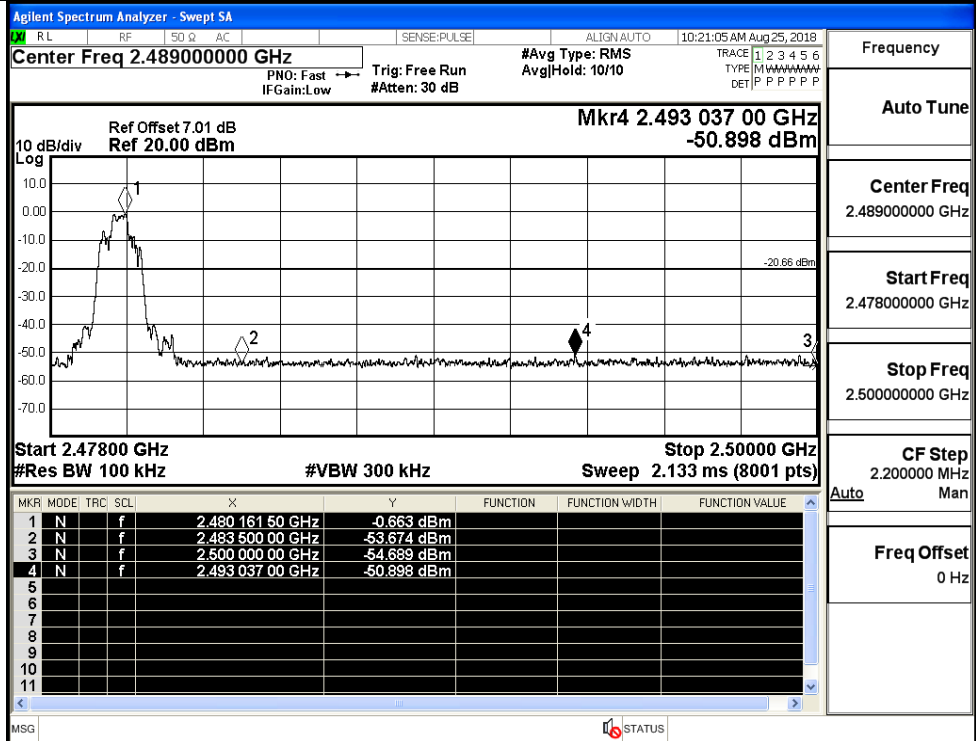
Frequency  
Auto Tune  
Center Freq  
2.357000000 GHz  
Start Freq  
2.310000000 GHz  
Stop Freq  
2.404000000 GHz  
CF Step  
9.400000 MHz  
Auto Man  
Freq Offset  
0 Hz

8DPSK/LCH/Hop



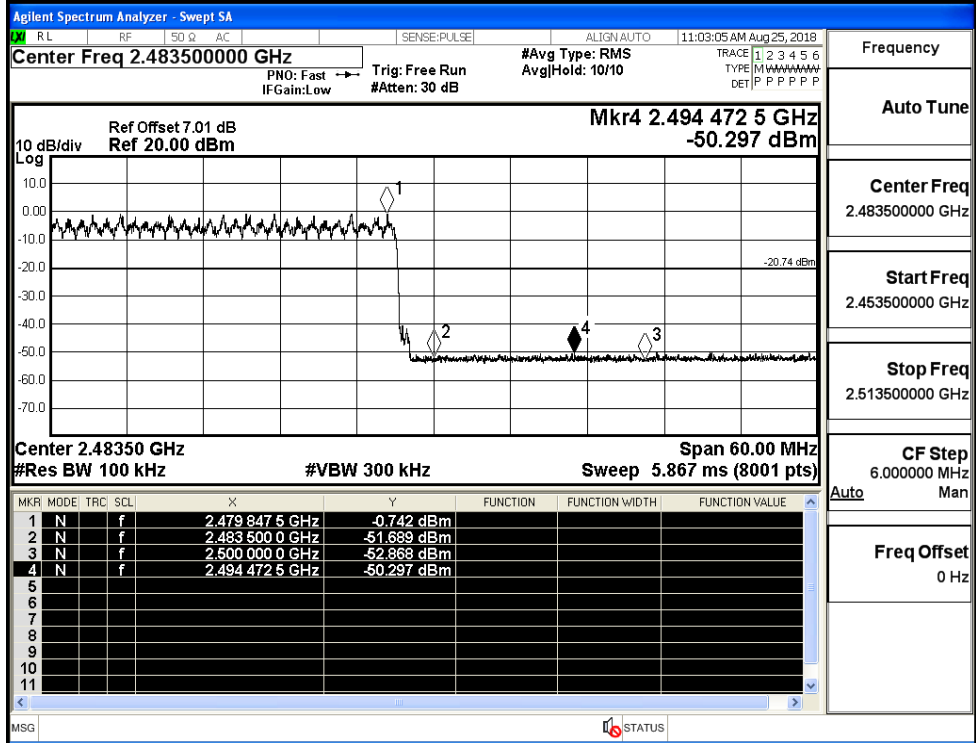
Frequency  
Auto Tune  
Center Freq  
2.400000000 GHz  
Start Freq  
2.370000000 GHz  
Stop Freq  
2.430000000 GHz  
CF Step  
6.000000 MHz  
Auto Man  
Freq Offset  
0 Hz

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
Auto Man
Freq Offset 0 Hz

8DPSK/HCH/Hop



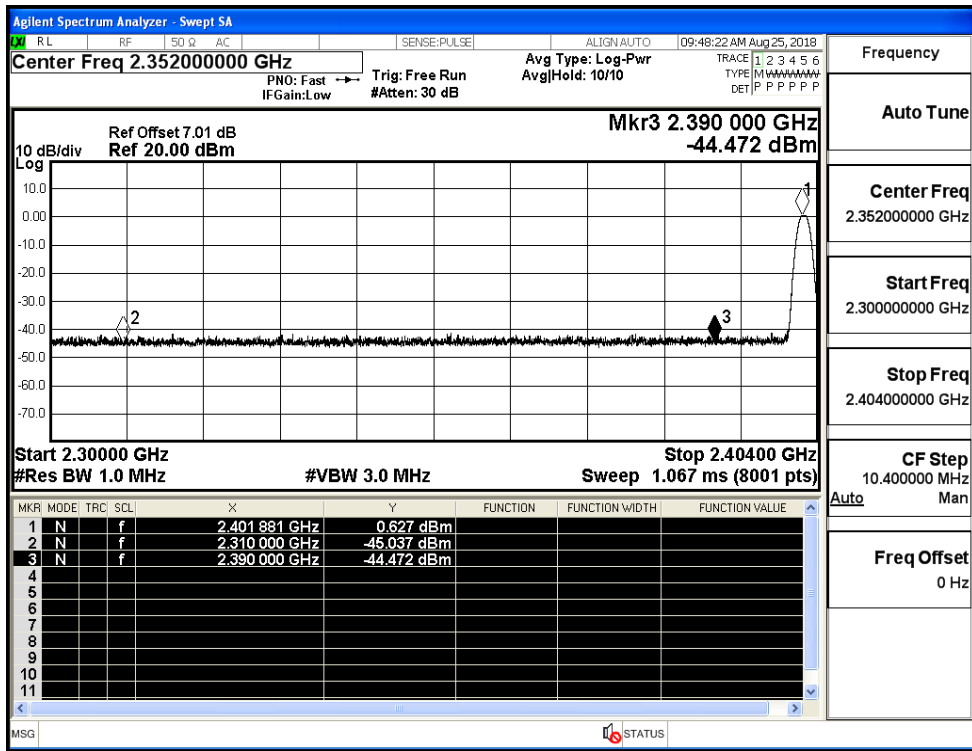
Frequency
Auto Tune
Center Freq 2.483500000 GHz
Start Freq 2.453500000 GHz
Stop Freq 2.513500000 GHz
CF Step 6.000000 MHz
Auto Man
Freq Offset 0 Hz



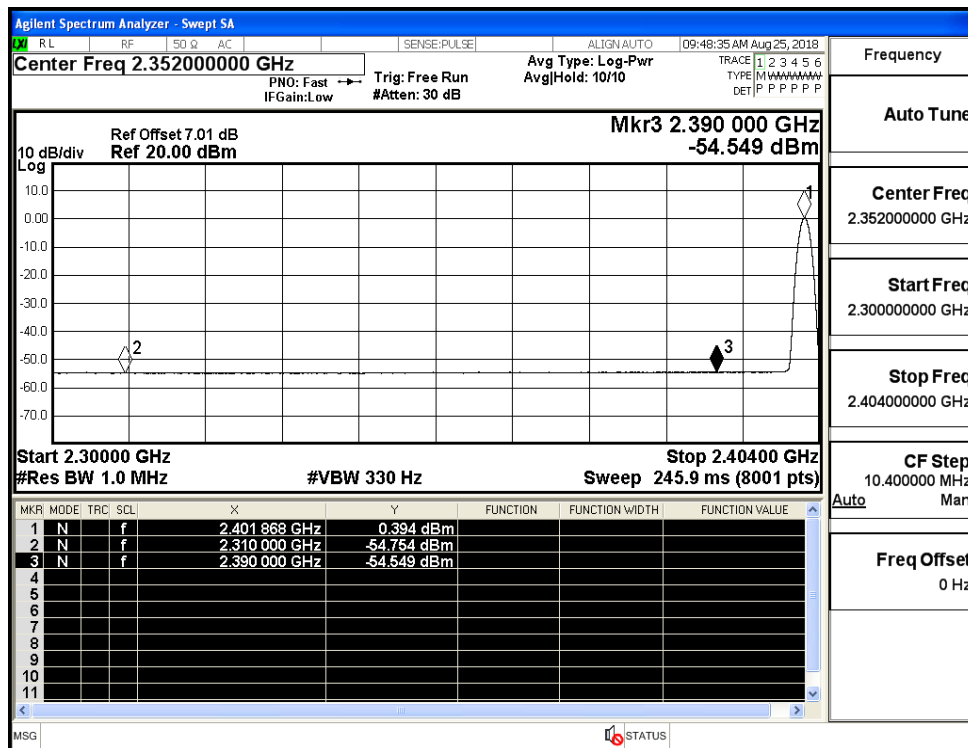
## A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-45.04	2.0	0	50.22	PEAK	74	PASS
	Off	2310.0	-54.75	2.0	0	40.50	AV	54	PASS
	Off	2390.0	-44.47	2.0	0	50.79	PEAK	74	PASS
	Off	2390.0	-54.55	2.0	0	40.71	AV	54	PASS
	Off	2483.5	-44.07	2.0	0	51.19	PEAK	74	PASS
	Off	2483.5	-54.17	2.0	0	41.09	AV	54	PASS
	Off	2500.0	-43.45	2.0	0	51.81	PEAK	74	PASS
	Off	2500.0	-54.12	2.0	0	41.14	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-45.15	2.0	0	50.11	PEAK	74	PASS
	Off	2310.0	-54.75	2.0	0	40.51	AV	54	PASS
	Off	2390.0	-44.18	2.0	0	51.08	PEAK	74	PASS
	Off	2390.0	-54.46	2.0	0	40.80	AV	54	PASS
	Off	2483.5	-44.28	2.0	0	50.98	PEAK	74	PASS
	Off	2483.5	-54.20	2.0	0	41.06	AV	54	PASS
	Off	2500.0	-44.56	2.0	0	50.70	PEAK	74	PASS
	Off	2500.0	-54.04	2.0	0	41.22	AV	54	PASS
8DPSK	Off	2310.0	-46.02	2.0	0	49.24	PEAK	74	PASS
	Off	2310.0	-54.81	2.0	0	40.45	AV	54	PASS
	Off	2390.0	-44.88	2.0	0	50.37	PEAK	74	PASS
	Off	2390.0	-54.54	2.0	0	40.72	AV	54	PASS
	Off	2483.5	-44.20	2.0	0	51.06	PEAK	74	PASS
	Off	2483.5	-54.21	2.0	0	41.05	AV	54	PASS
	Off	2500.0	-43.63	2.0	0	51.63	PEAK	74	PASS
	Off	2500.0	-54.04	2.0	0	41.22	AV	54	PASS

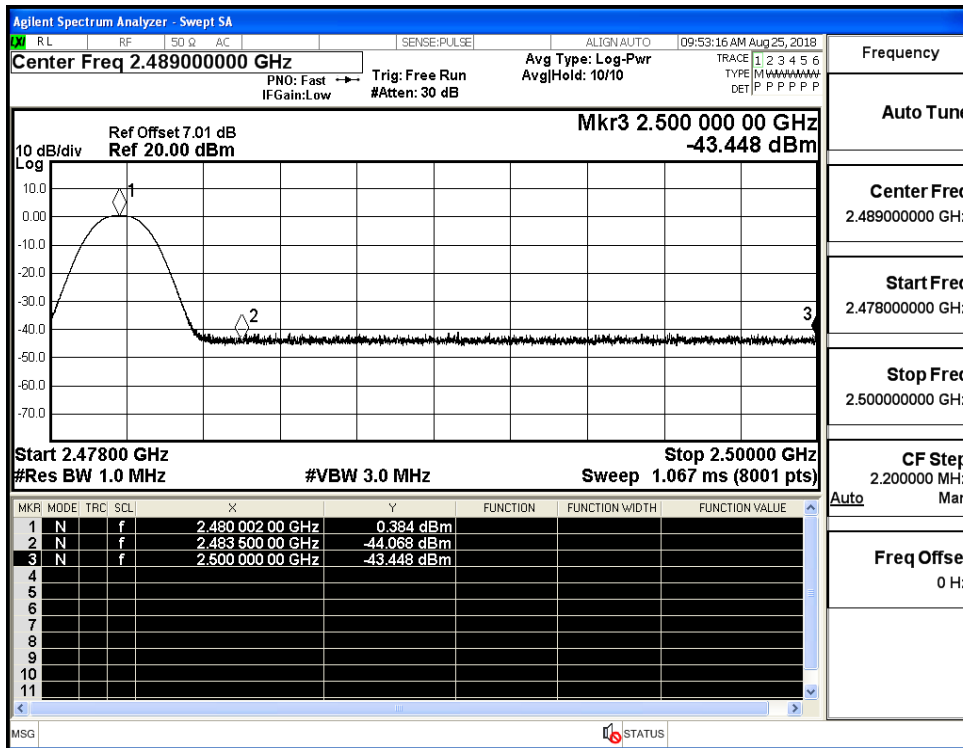
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_PEAK (Low Channel)



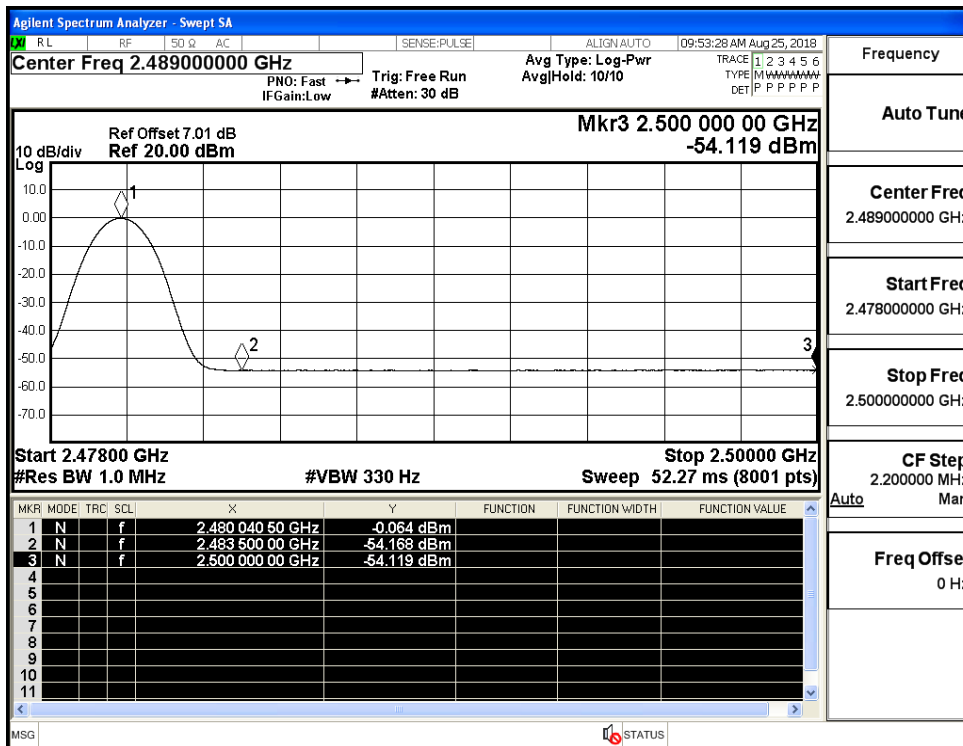
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_Average (Low Channel)



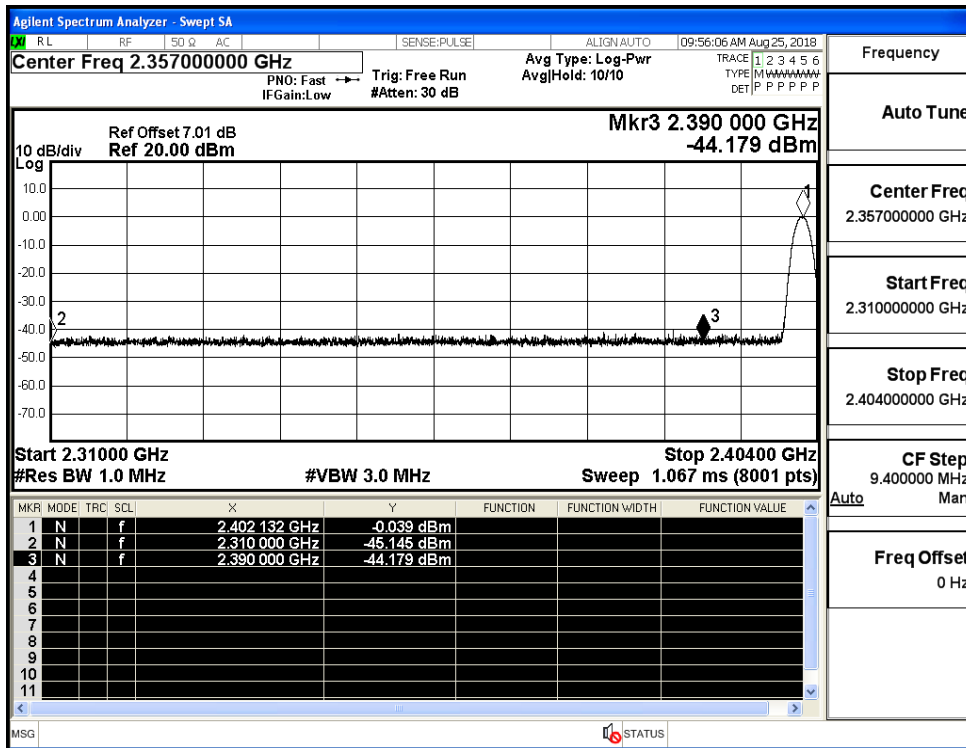
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_PEAK (High Channel)



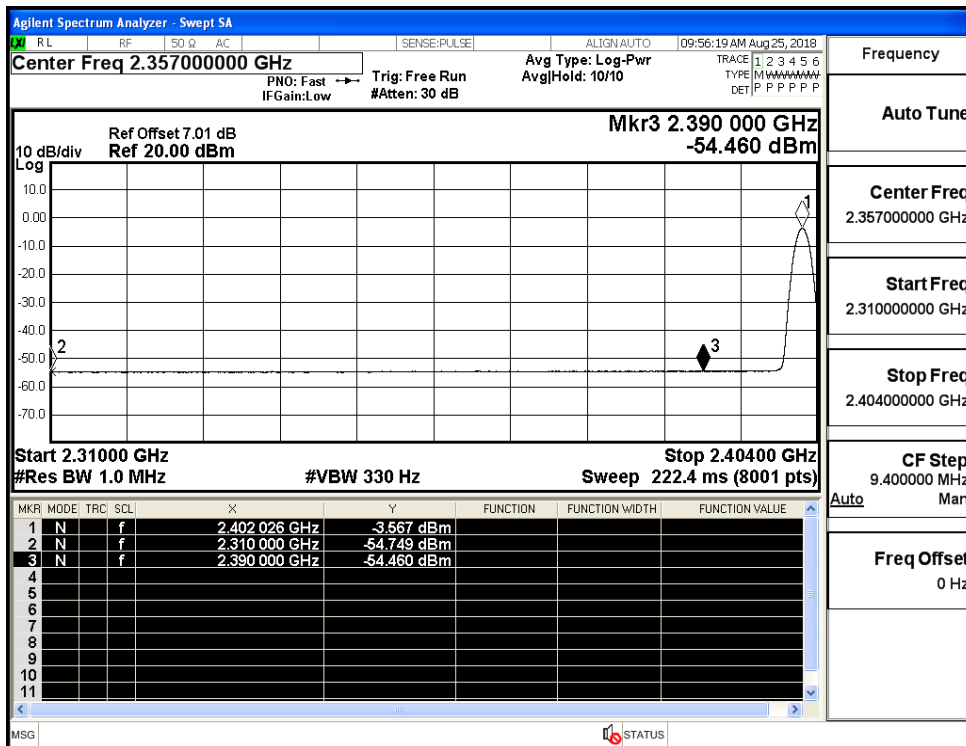
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_Average (High Channel)



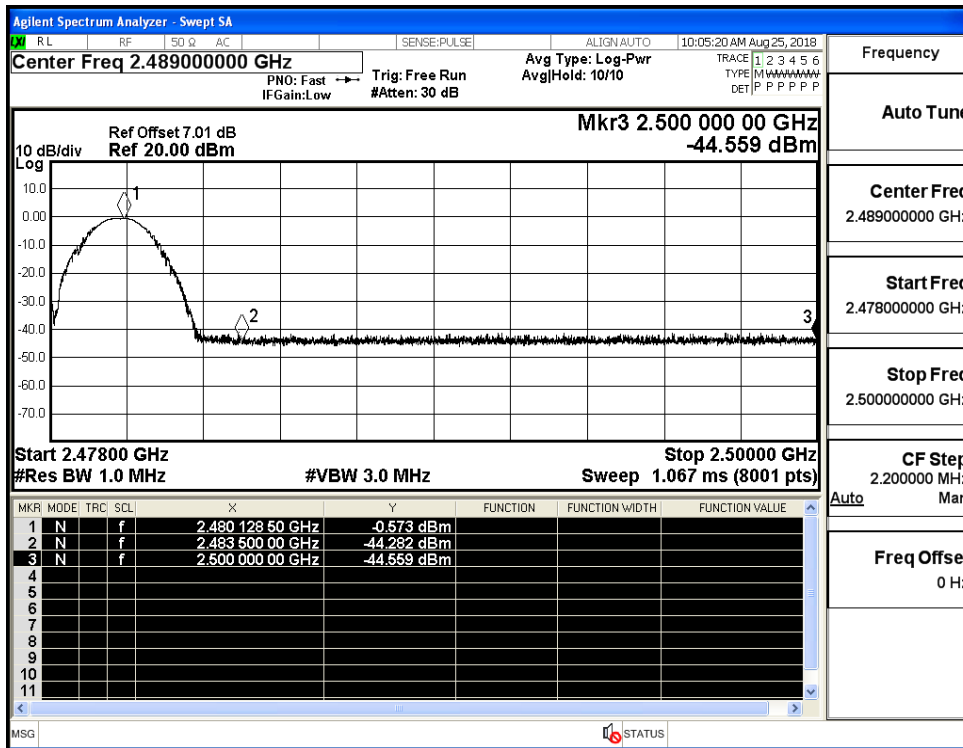
Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_PEAK (Low Channel)



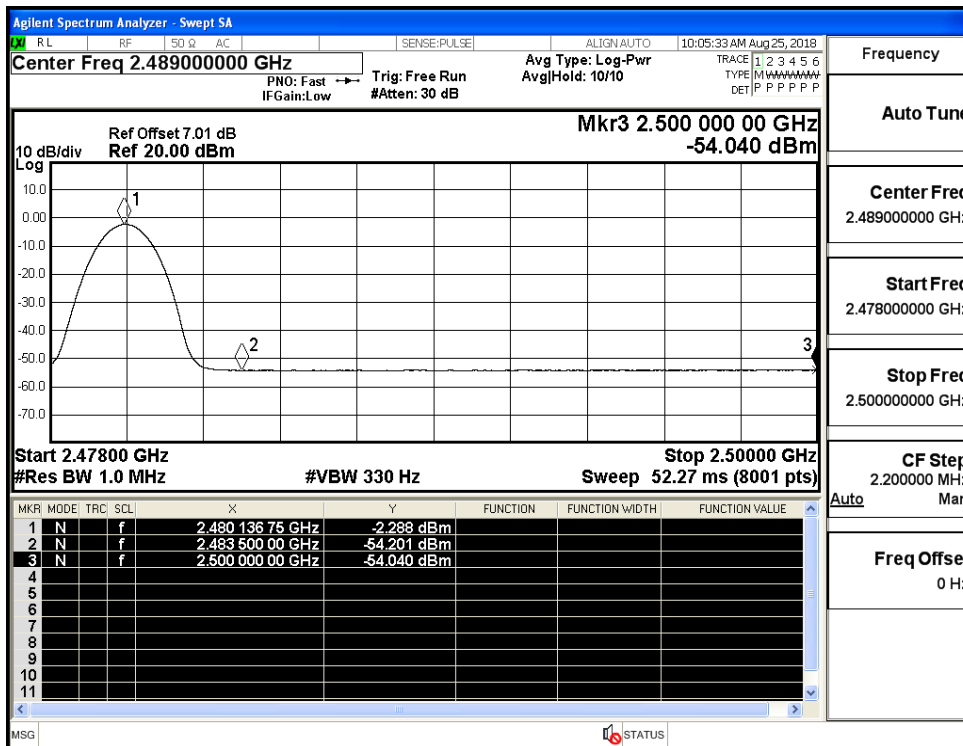
Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_Average (Low Channel)



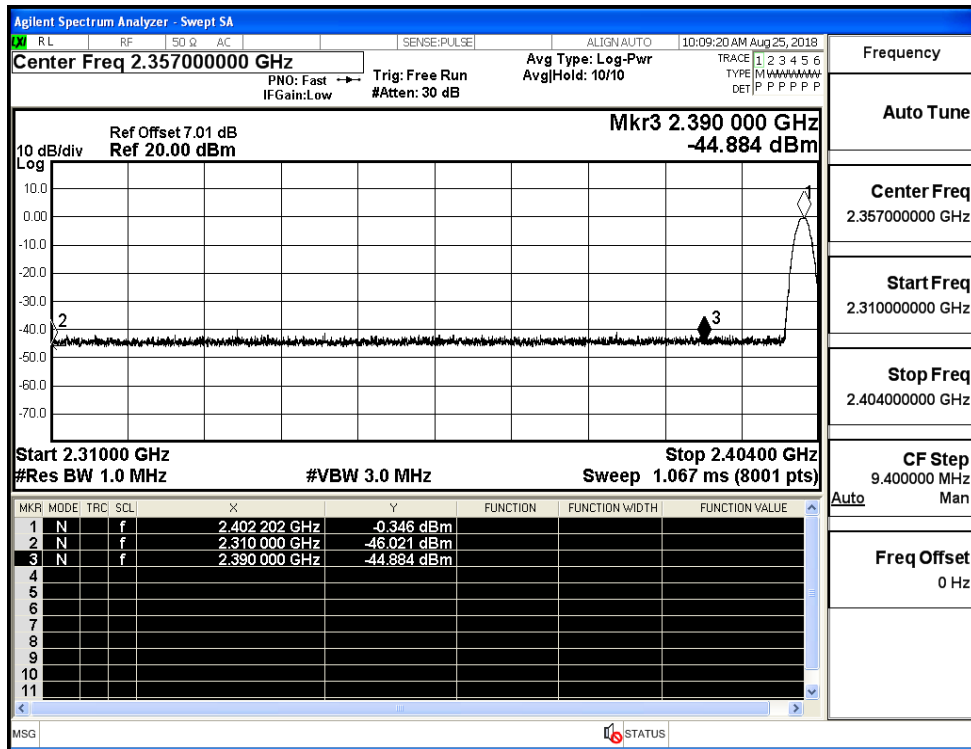
Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_PEAK (High Channel)



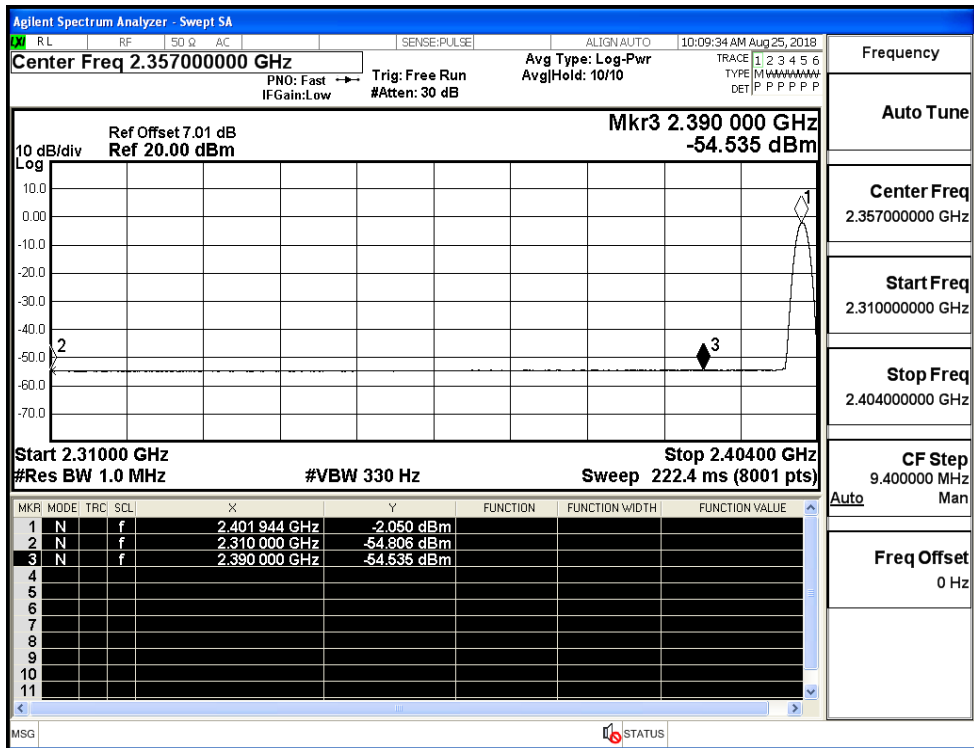
Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_Average (High Channel)



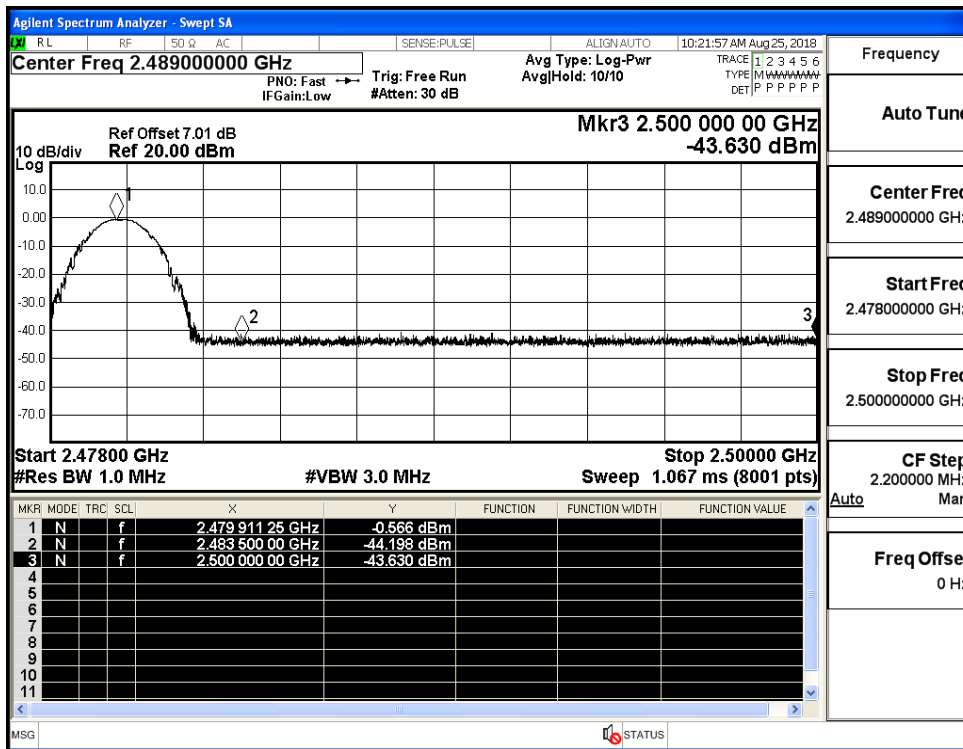
Restrict-band band-edge measurements\_Hopping Off\_8DPSK\_PEAK (Low Channel)



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)

