

Appendix A
RF Test Data for BT V5.0(BDR/EDR) (Conducted Measurement)
Product Name: ULTRA THIN TWS EARPHONE

Trade Mark: YOBYBO

Test Model: note 20

Environmental Conditions

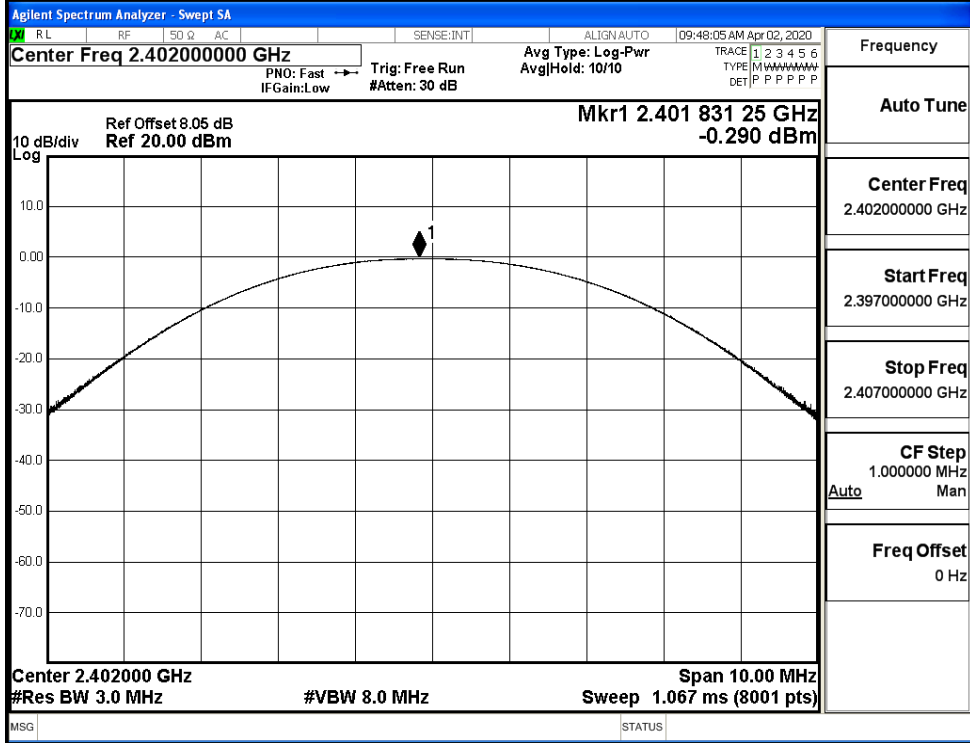
Temperature:	23.5 ° C
Relative Humidity:	52.6%
ATM Pressure:	100.0 kPa
Test Engineer:	David Luo
Supervised by:	Li Huan

A.1 Maxmum Conducted Peak Output Power

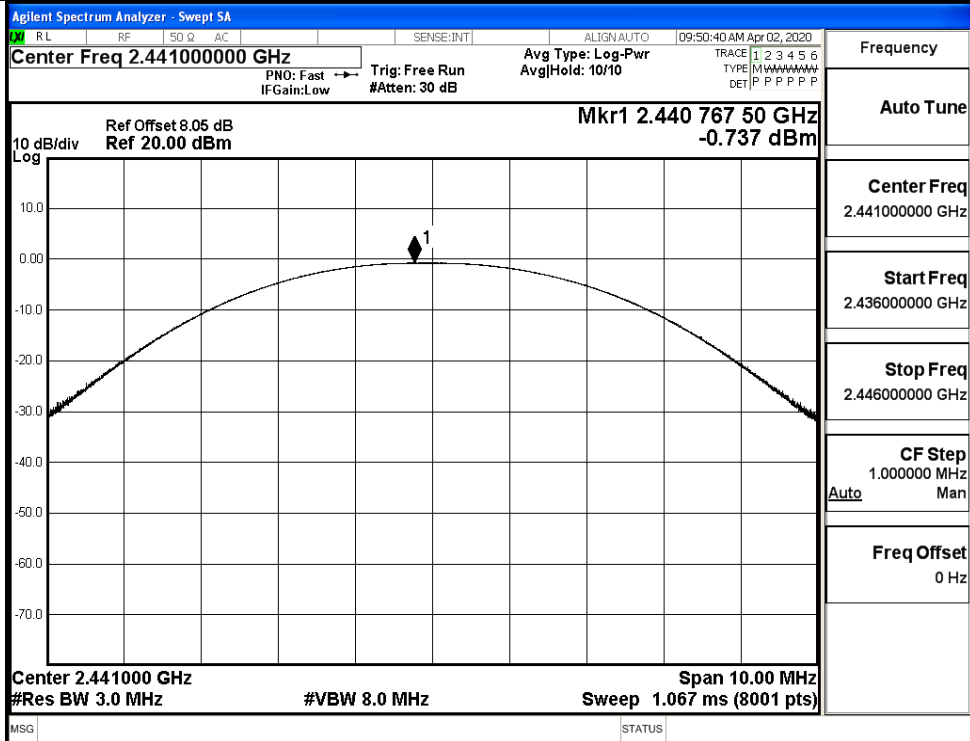
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-0.290	21	PASS
	MCH	-0.737	21	PASS
	HCH	-2.192	21	PASS
$\pi/4$ DQPSK	LCH	-1.515	21	PASS
	MCH	-1.836	21	PASS
	HCH	-3.446	21	PASS
8DPSK	LCH	-0.944	21	PASS
	MCH	-1.264	21	PASS
	HCH	-2.813	21	PASS

Test Graphs

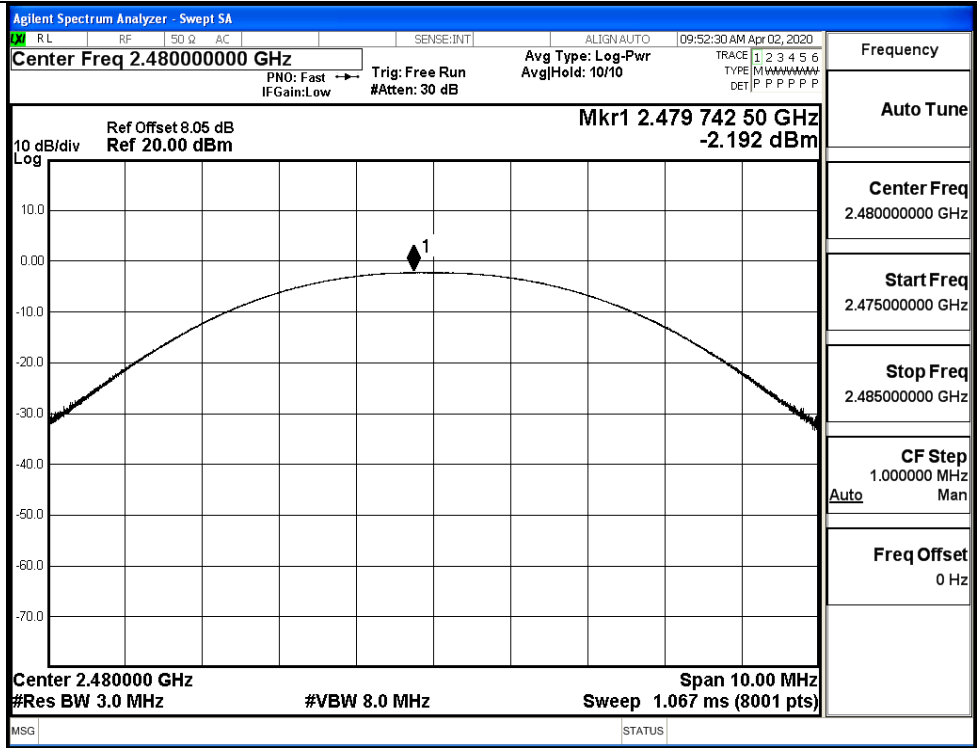
GFSK/LCH



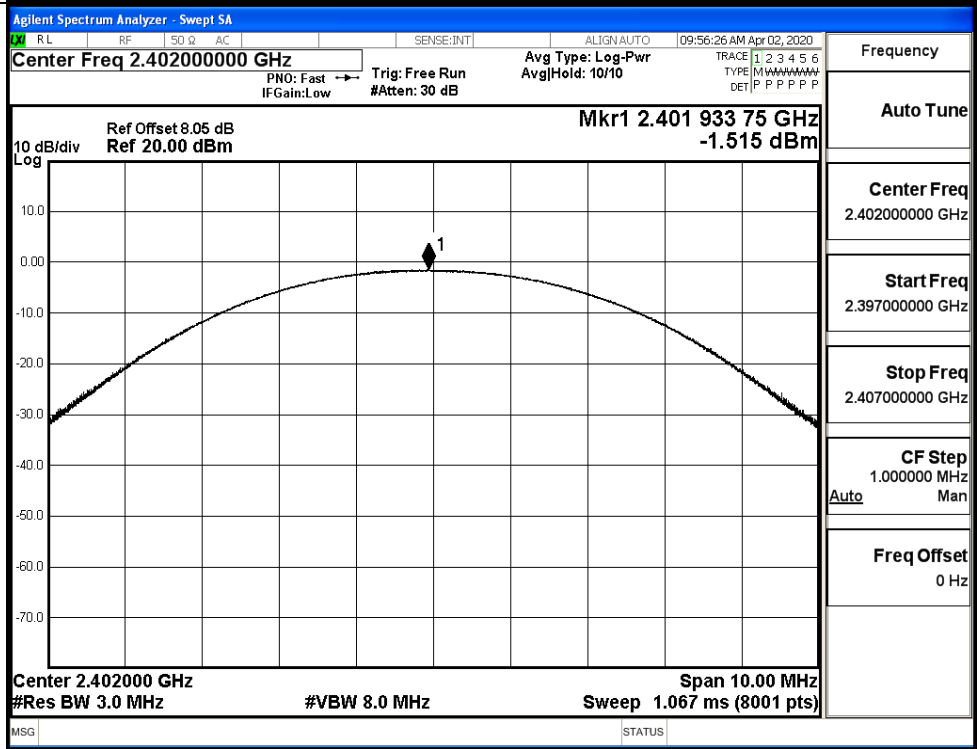
GFSK/MCH

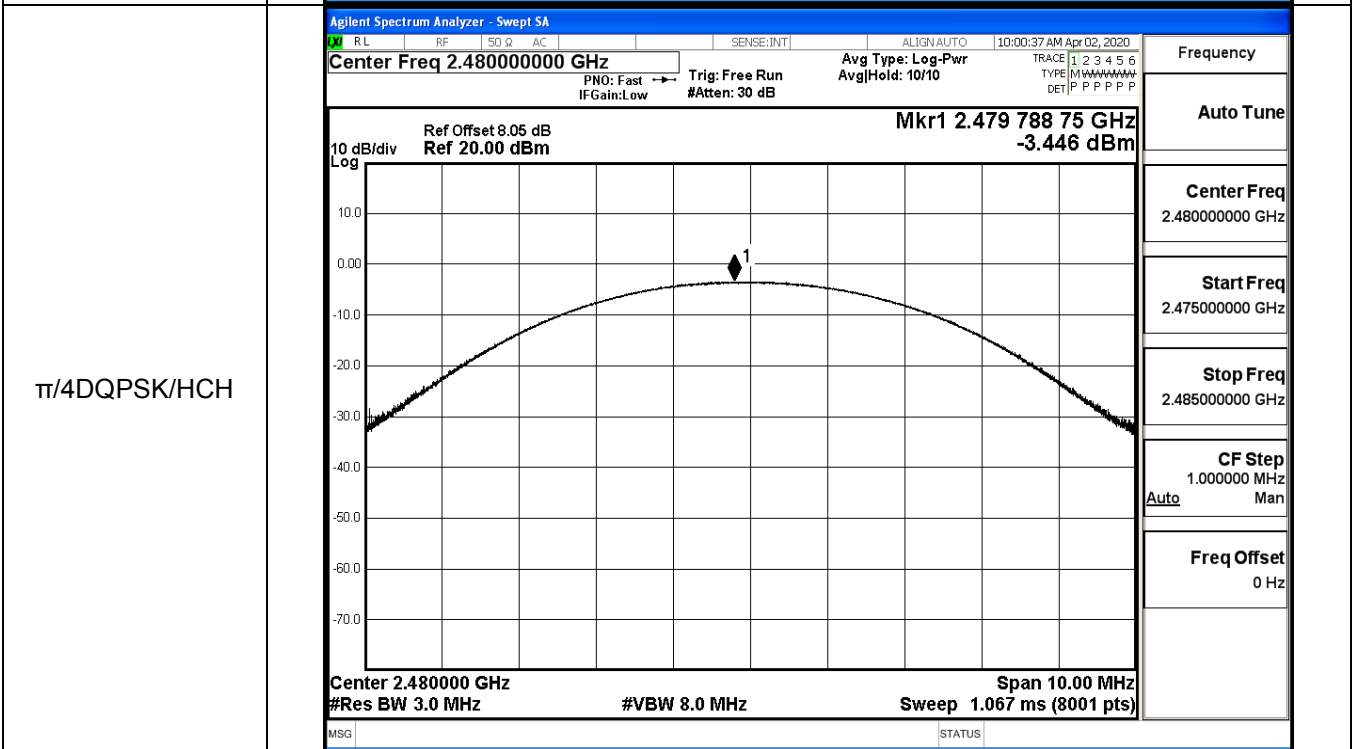
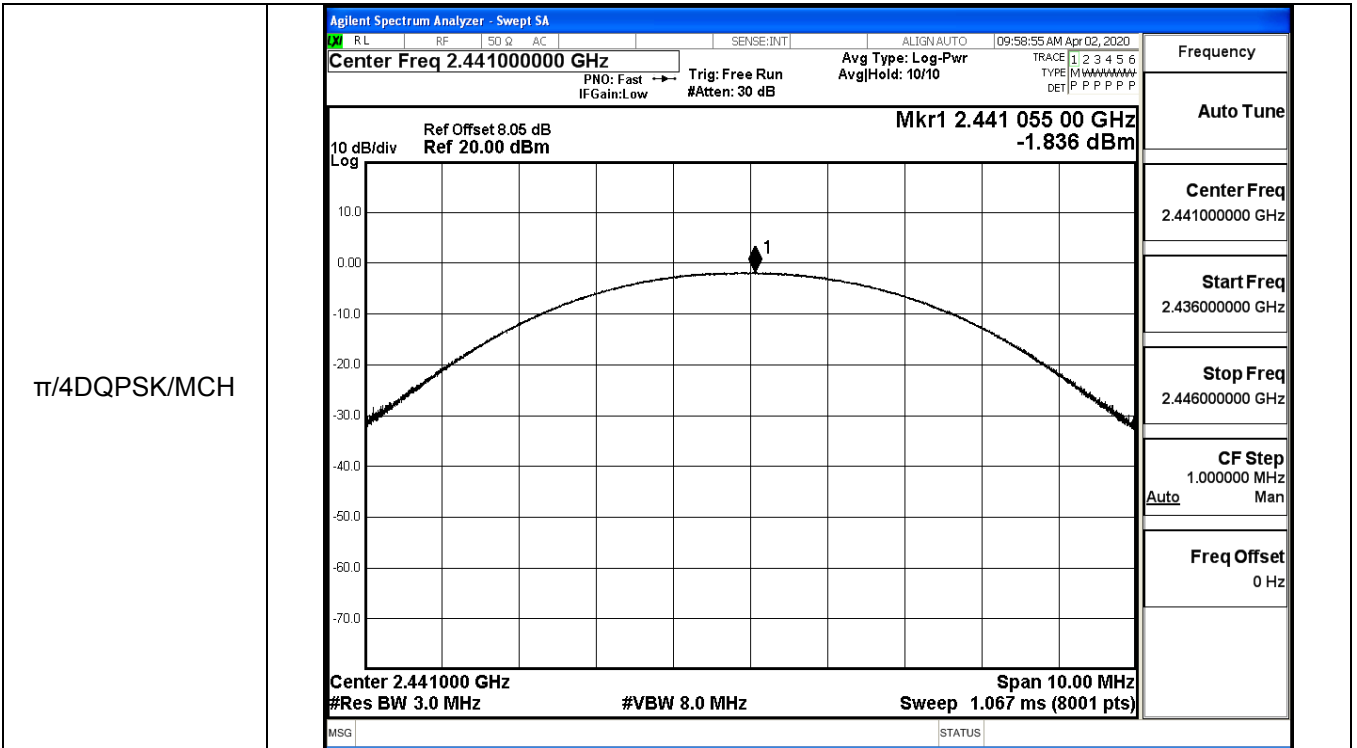


GFSK/HCH

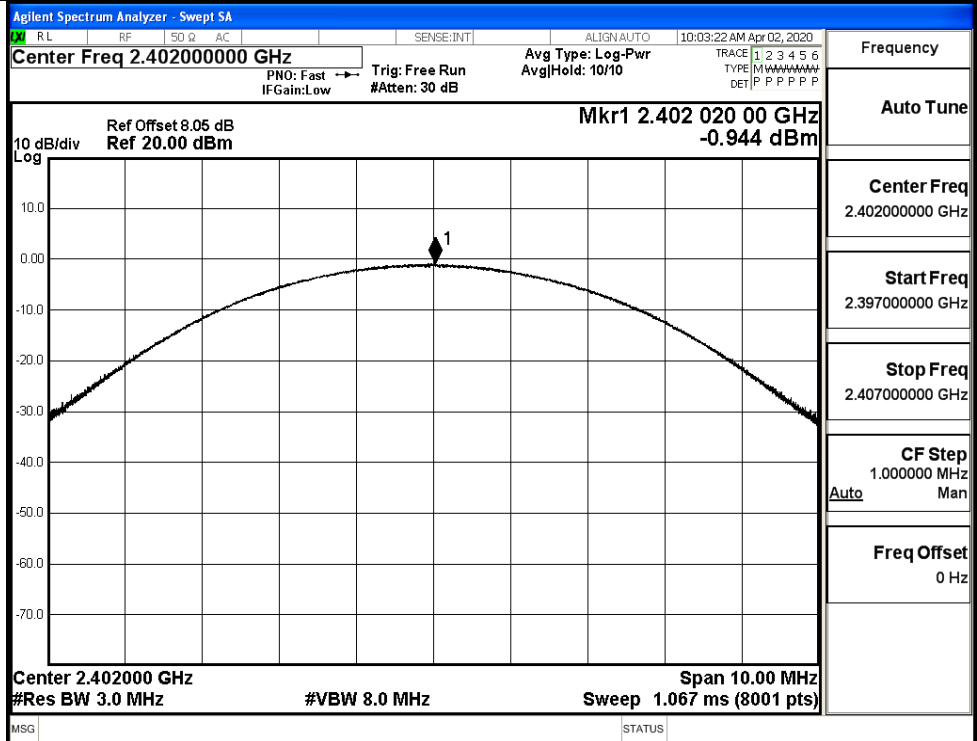


π /4DQPSK/LCH

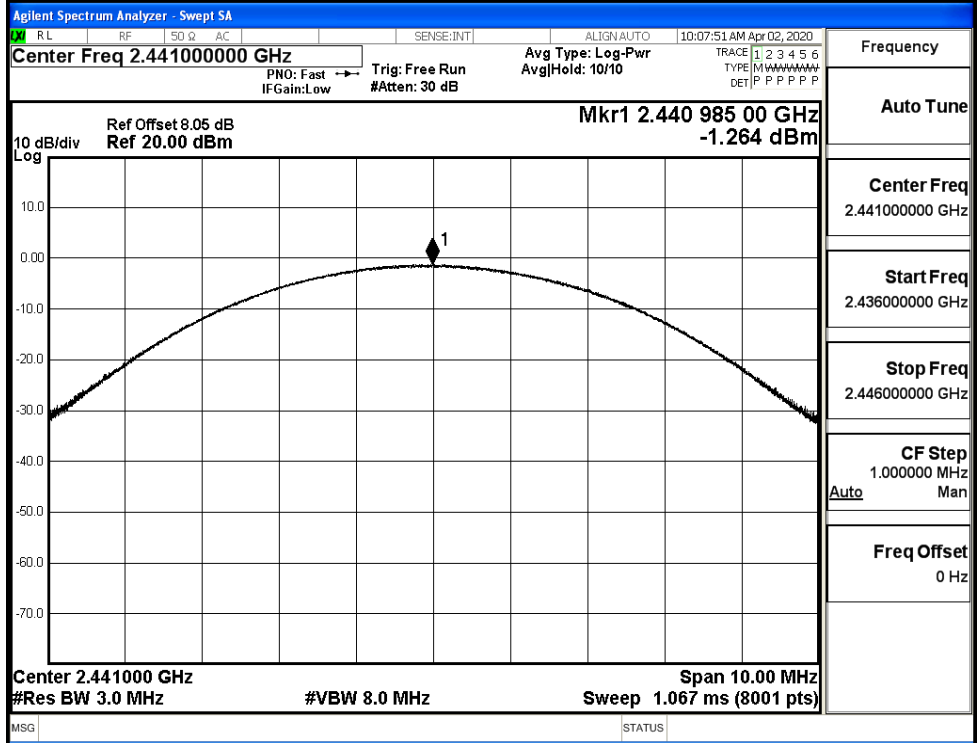




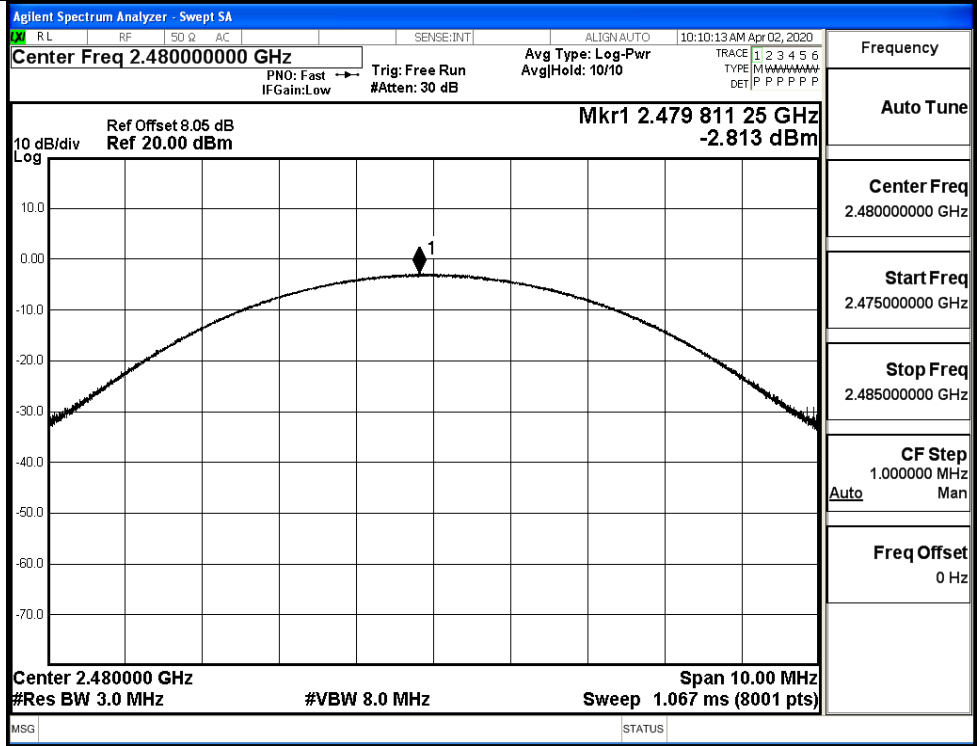
8DPSK/LCH



8DPSK/MCH

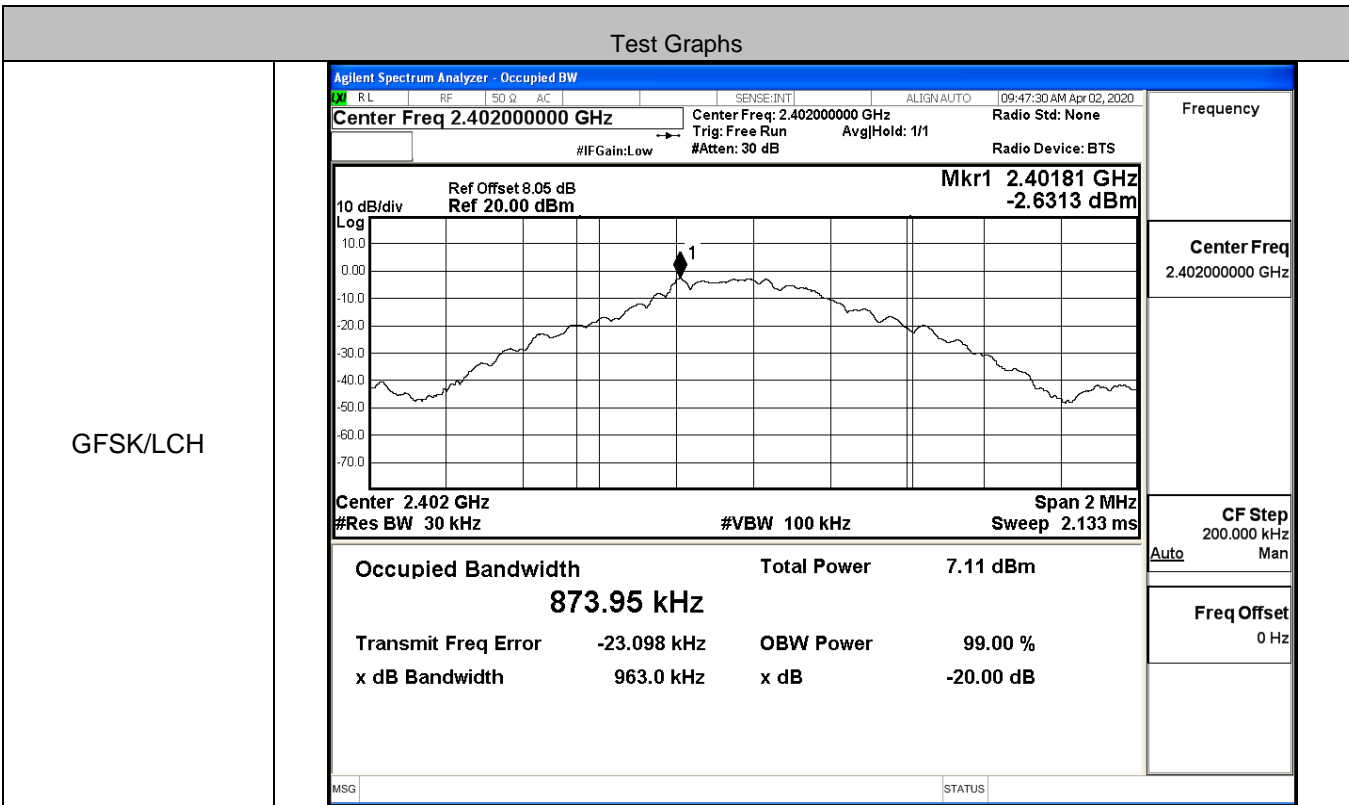


8DPSK/HCH

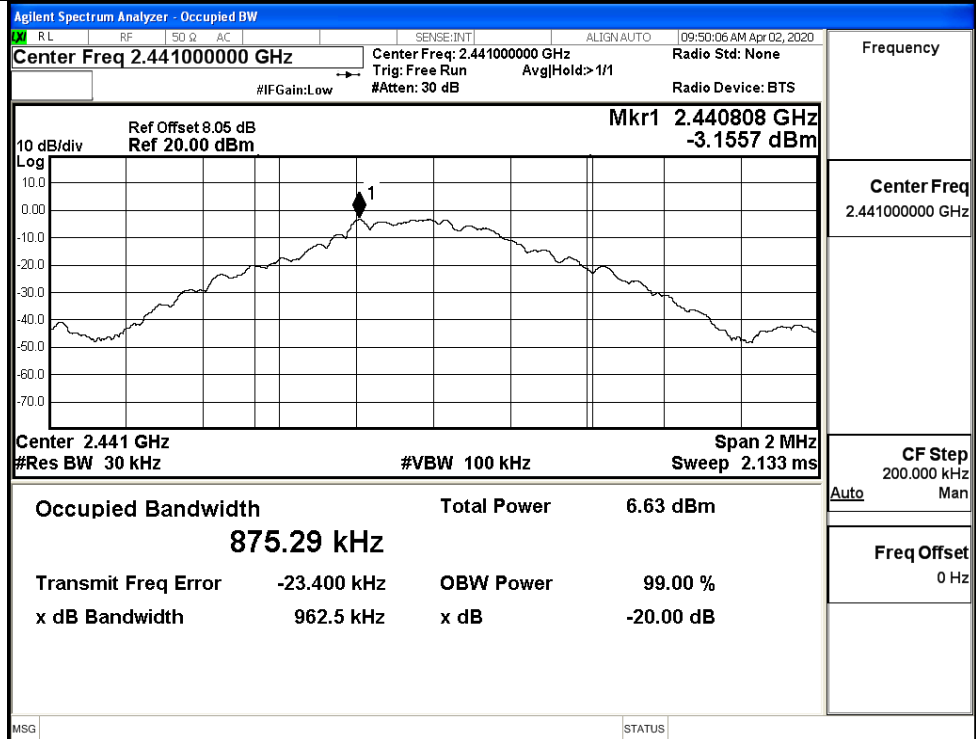


A.2 20dB Bandwidth

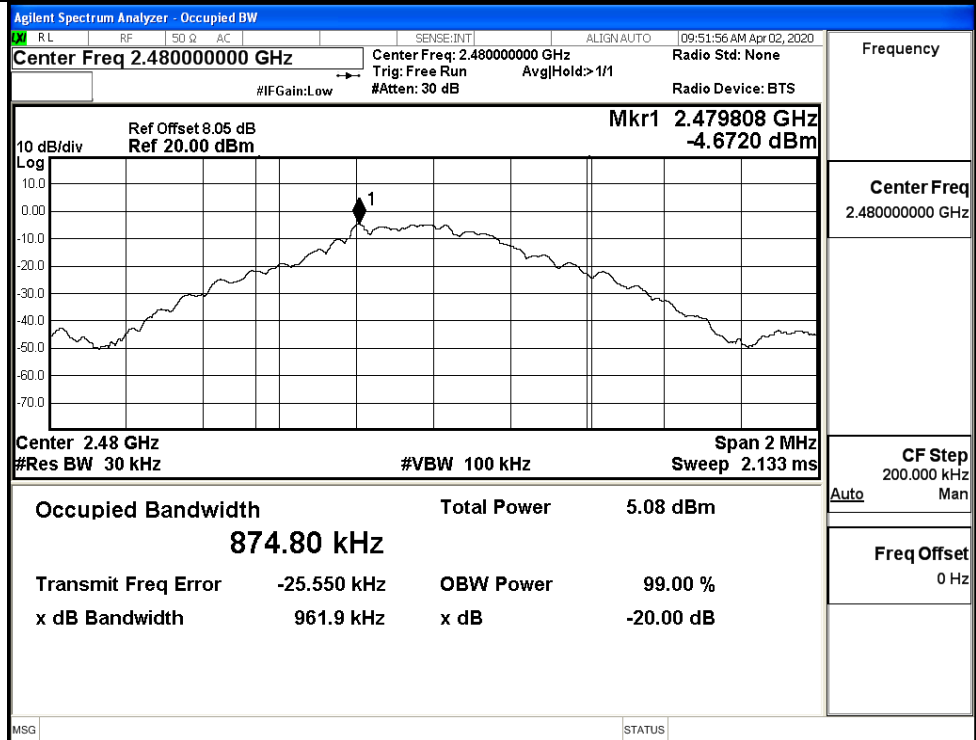
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9630	Not Specified	PASS
	MCH	0.9625	Not Specified	PASS
	HCH	0.9619	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.282	Not Specified	PASS
	MCH	1.284	Not Specified	PASS
	HCH	1.281	Not Specified	PASS
8DPSK	LCH	1.303	Not Specified	PASS
	MCH	1.301	Not Specified	PASS
	HCH	1.303	Not Specified	PASS



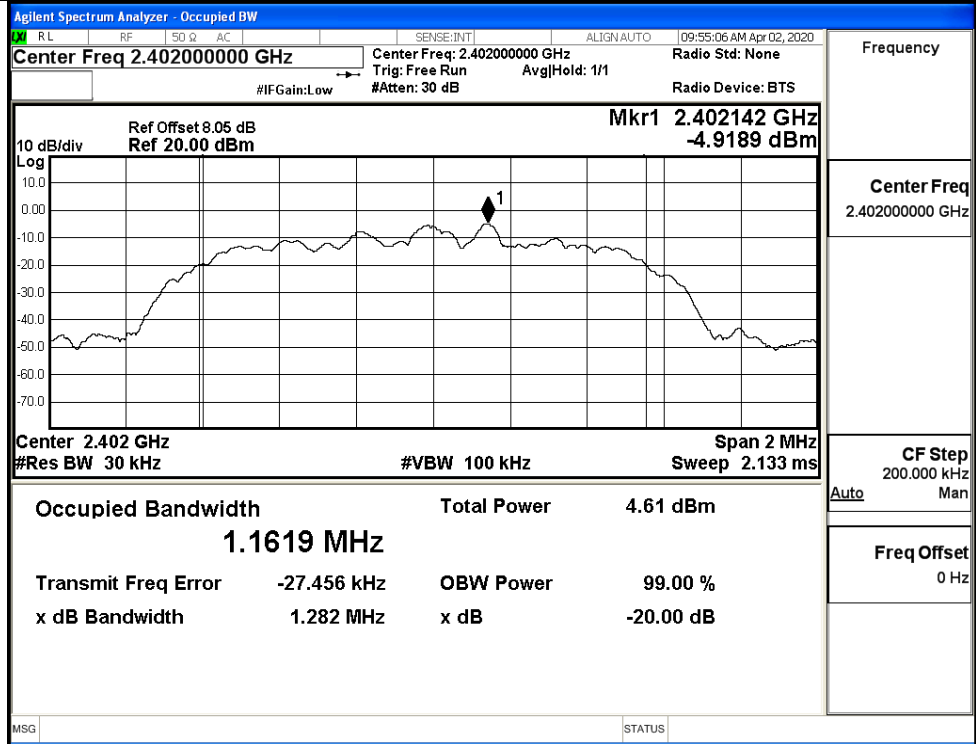
GFSK/MCH



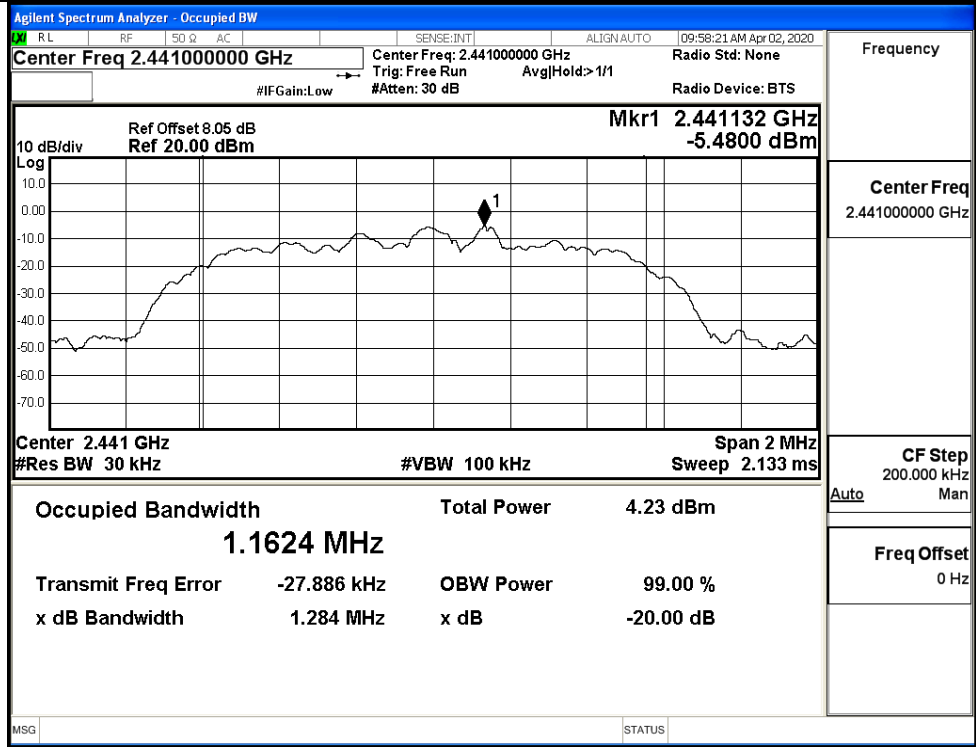
GFSK/HCH



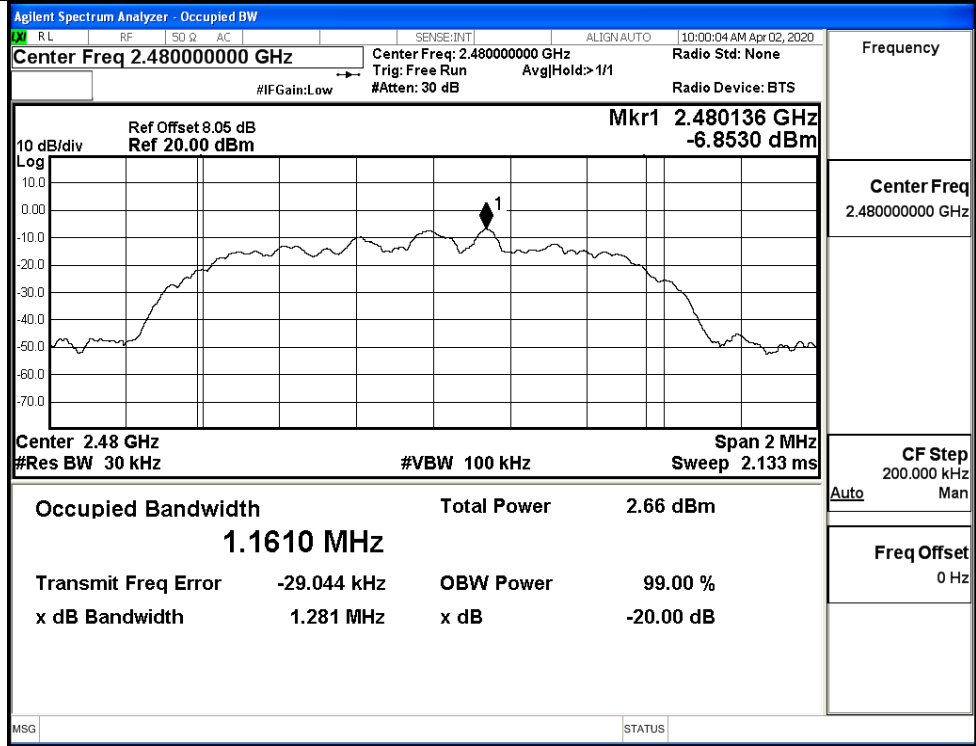
$\pi/4$ DQPSK/LCH



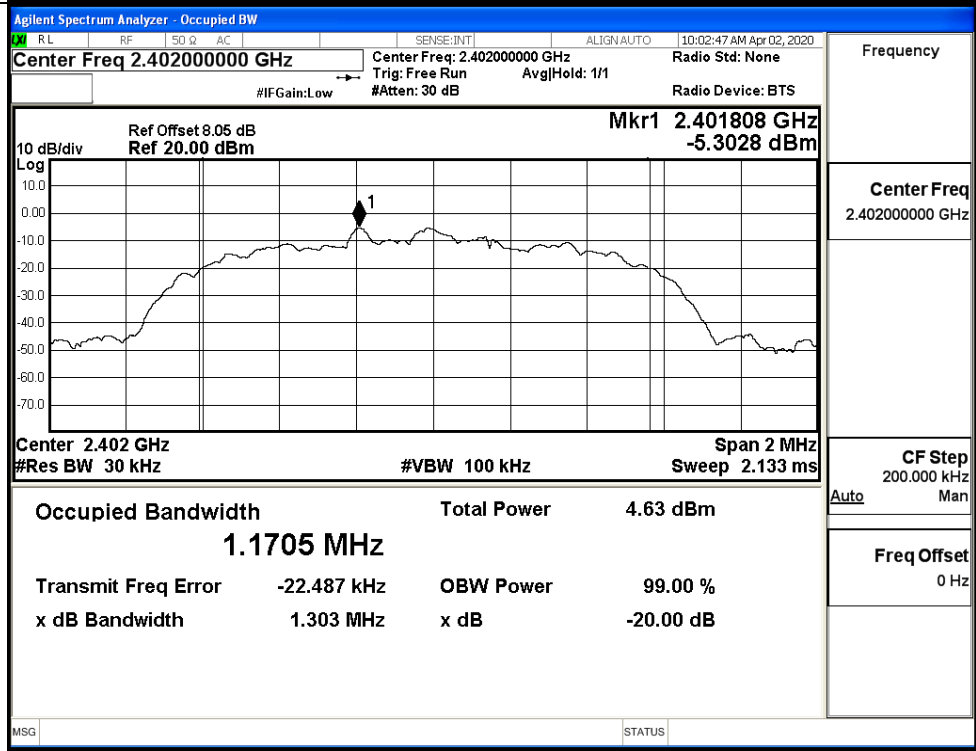
$\pi/4$ DQPSK/MCH



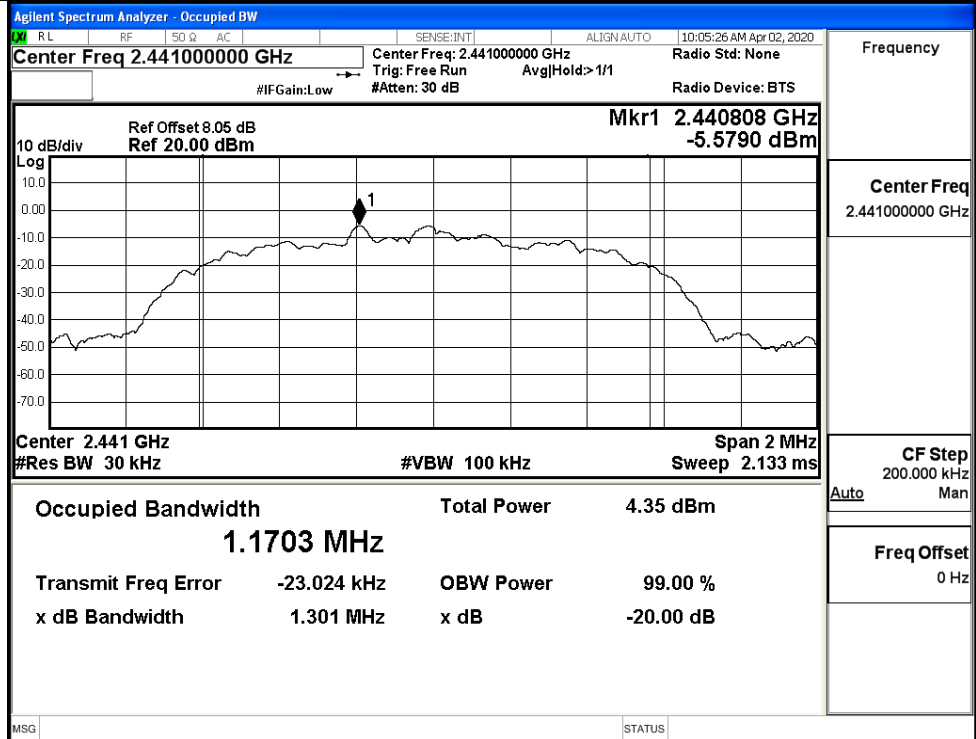
$\pi/4$ DQPSK/HCH



8DPSK/LCH

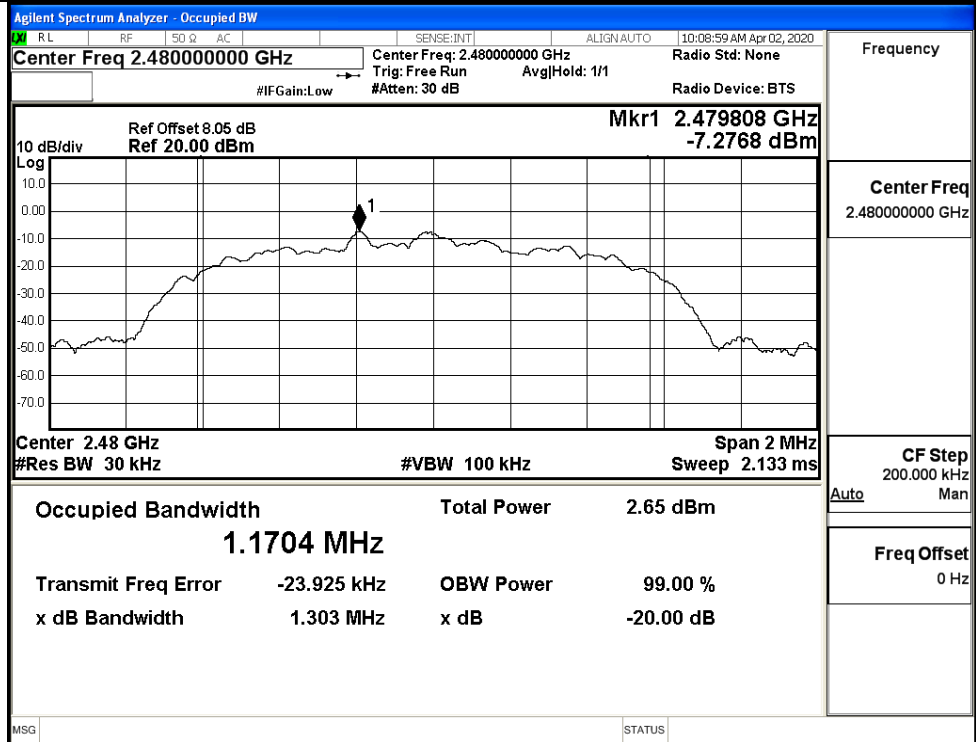


8DPSK/MCH



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

8DPSK/HCH



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

A.3 Carrier Frequency Separation

Mode	Channel	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.688	0.642	PASS
	MCH	1.174	0.642	PASS
	HCH	1.120	0.642	PASS
π/4DQPSK	LCH	1.084	0.856	PASS
	MCH	0.984	0.856	PASS
	HCH	1.006	0.856	PASS
8DPSK	LCH	0.934	0.869	PASS
	MCH	1.154	0.869	PASS
	HCH	1.154	0.869	PASS

Test Graphs

GFSK/LCH

Agilent Spectrum Analyzer - Swept SA

Center Freq 2.402500000 GHz

Ref Offset 8.05 dB
Ref 20.00 dBm

ΔMkr1 688.00 kHz
0.304 dB

Start 2.401500 GHz
#Res BW 100 kHz

Stop 2.403500 GHz
#VBW 300 kHz
Sweep 1.067 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	f	(Δ)	688.00 kHz (Δ)	0.304 dB			
2	F	f		2.40215200 GHz	2.375 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

Frequency

Auto Tune

Center Freq
2.402500000 GHz

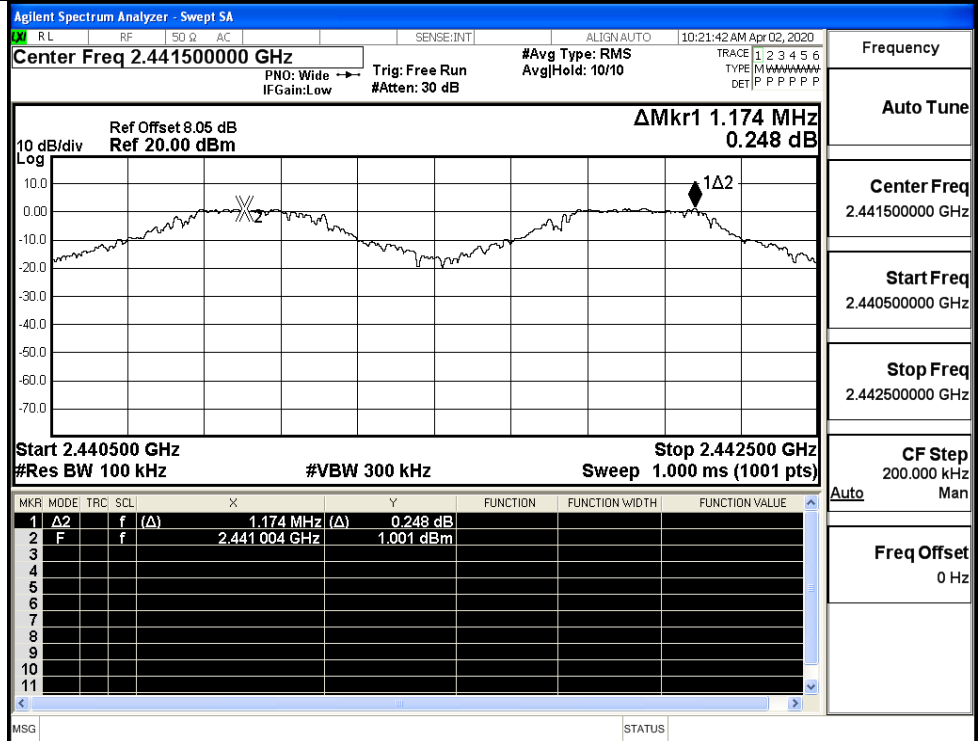
Start Freq
2.401500000 GHz

Stop Freq
2.403500000 GHz

CF Step
200.000 kHz
Auto Man

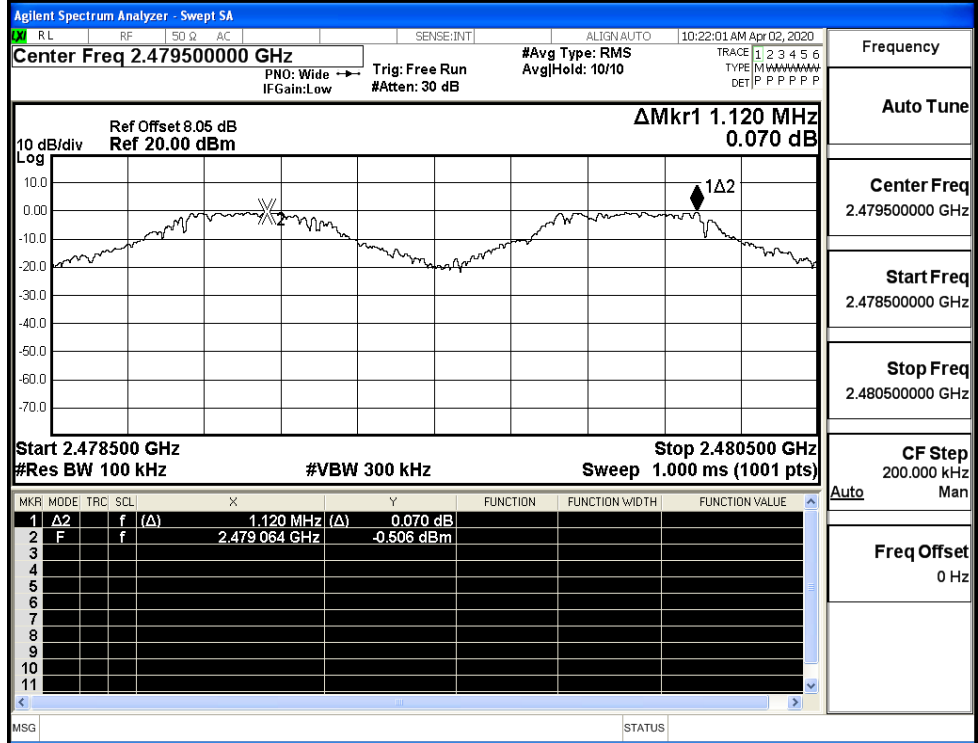
Freq Offset
0 Hz

GFSK/MCH



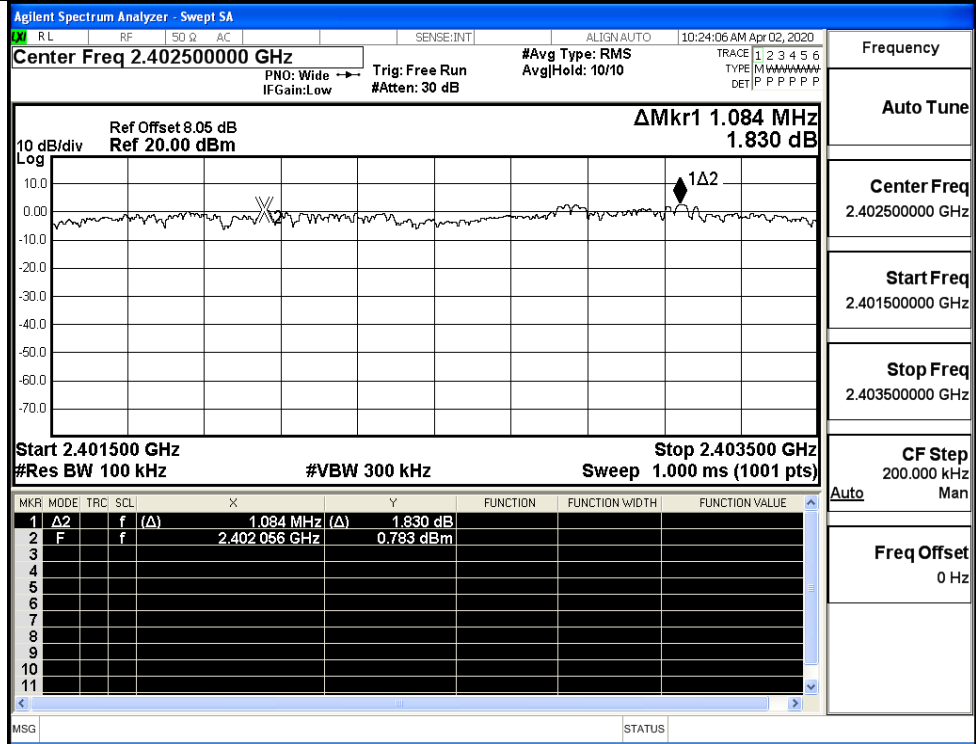
Frequency
Auto Tune
Center Freq
2.441500000 GHz
Start Freq
2.440500000 GHz
Stop Freq
2.442500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

GFSK/HCH



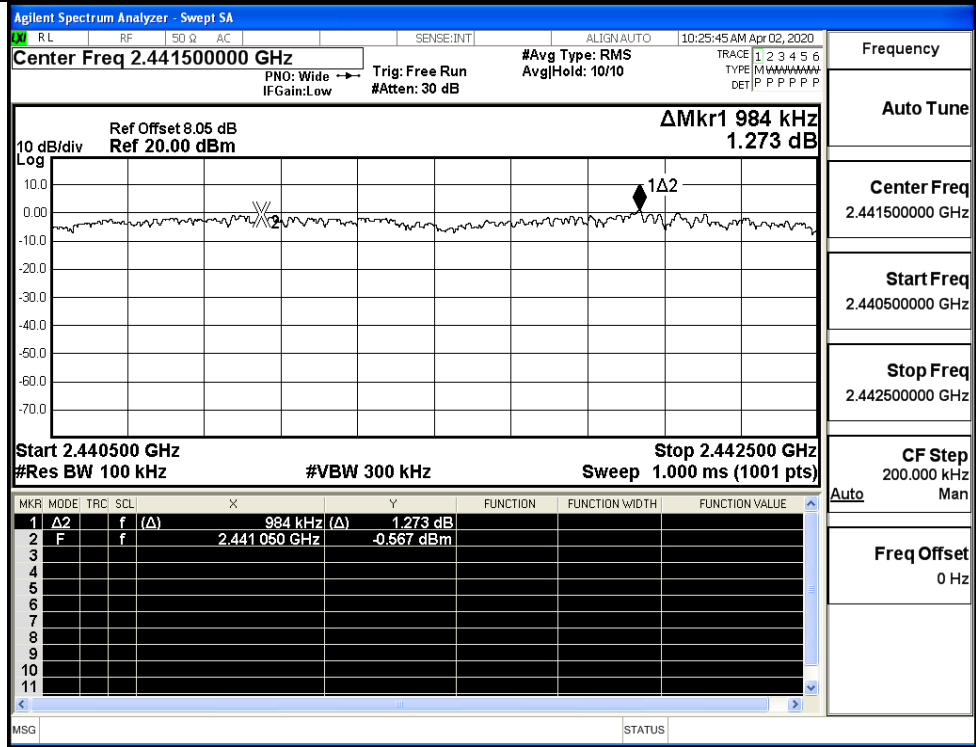
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

$\pi/4$ DQPSK/LCH



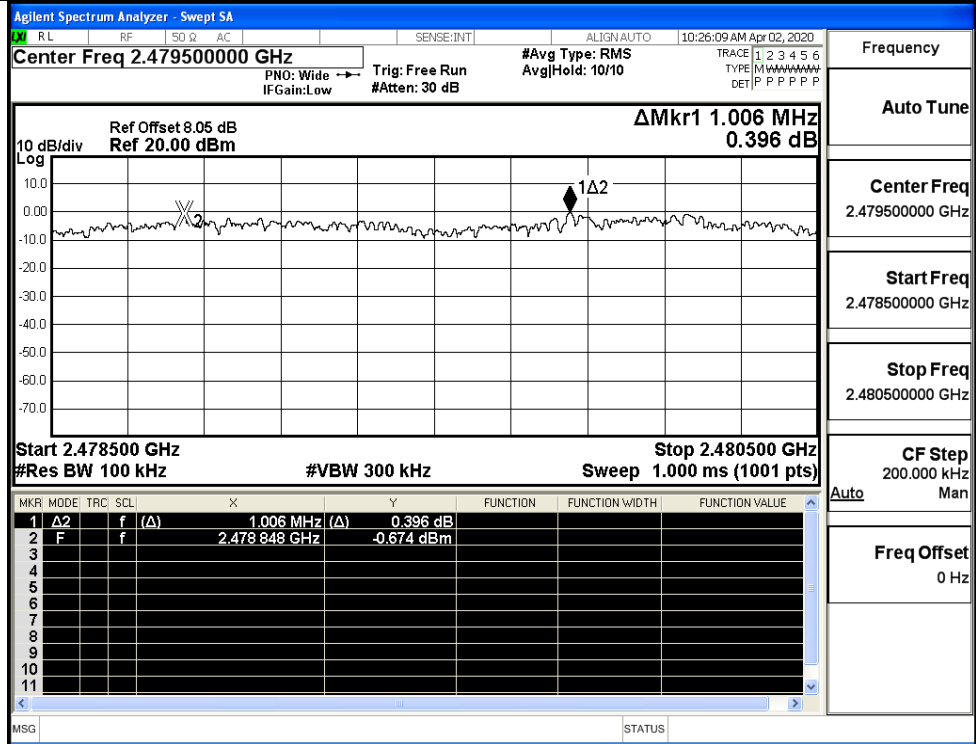
Frequency	2.402500000 GHz
Auto Tune	
Center Freq	2.402500000 GHz
Start Freq	2.401500000 GHz
Stop Freq	2.403500000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK/MCH

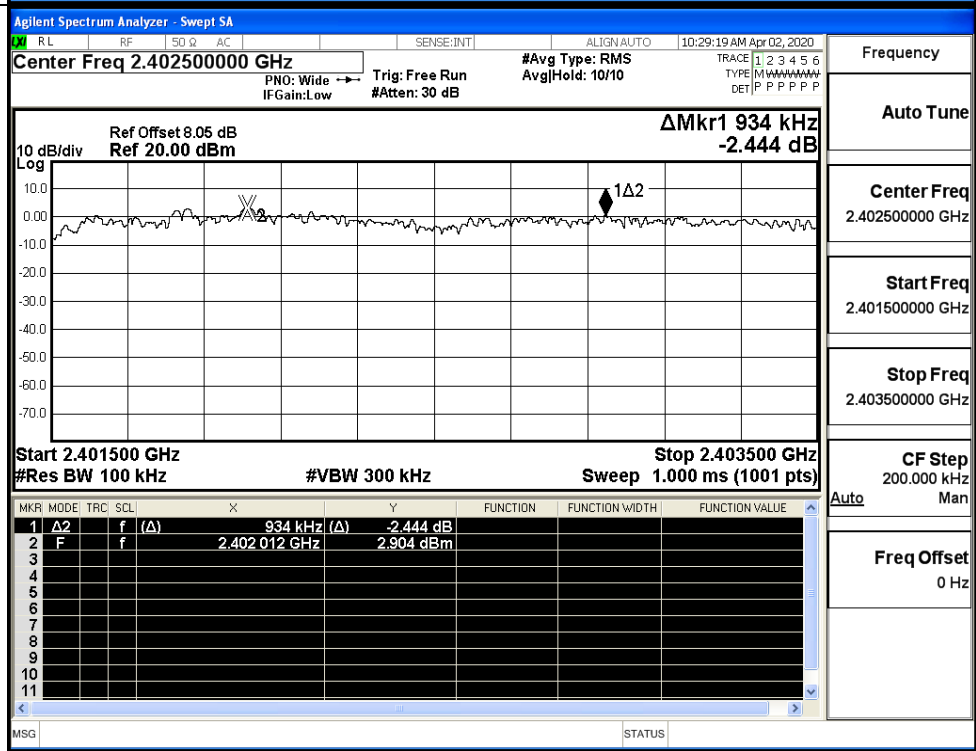


Frequency	2.441500000 GHz
Auto Tune	
Center Freq	2.441500000 GHz
Start Freq	2.440500000 GHz
Stop Freq	2.442500000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

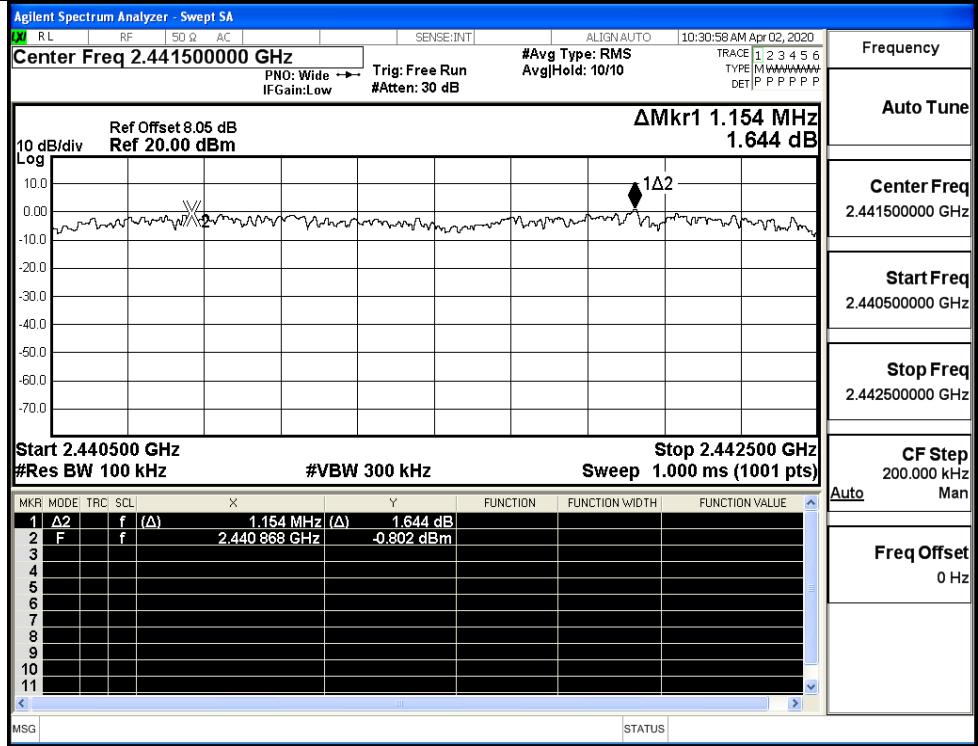
π/4DQPSK/HCH



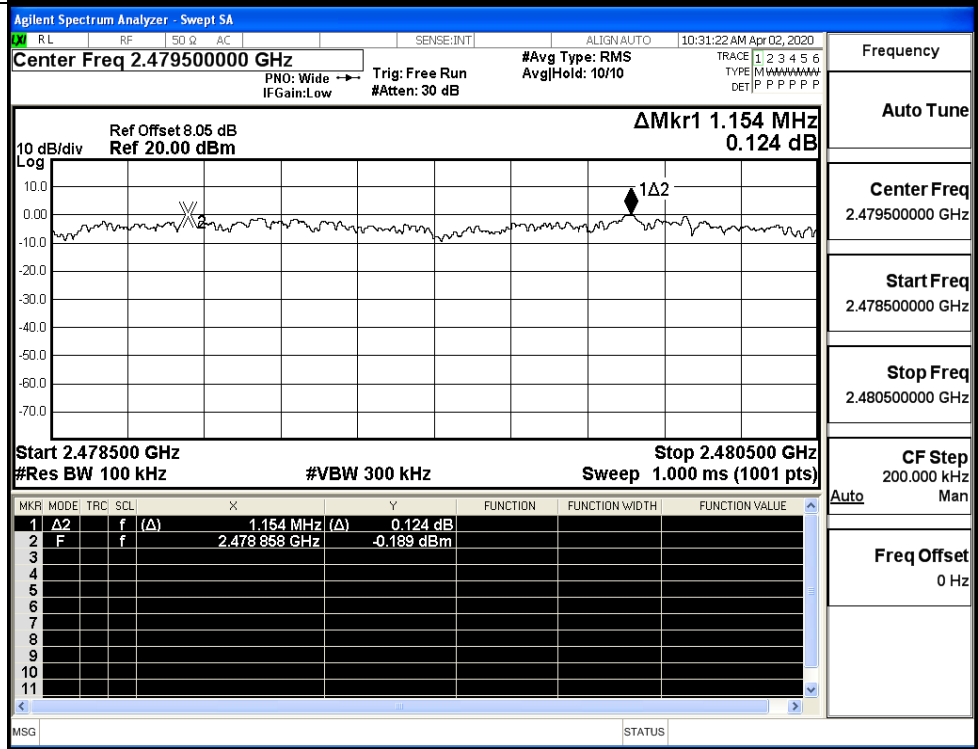
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH



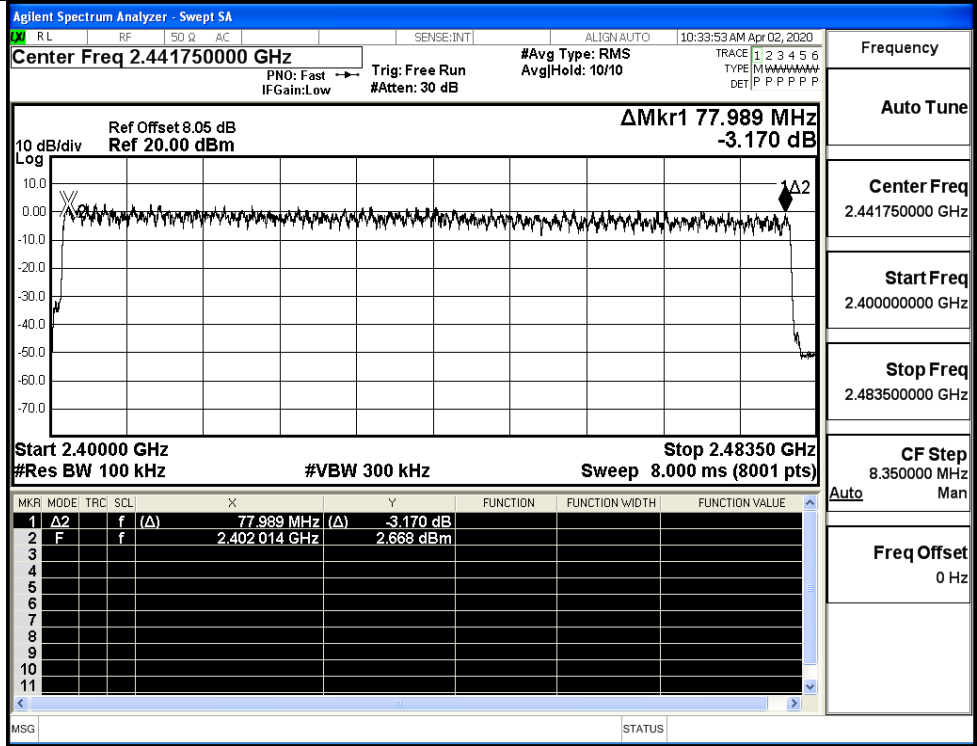
A.4 Hopping Channel Number

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

Test Graphs

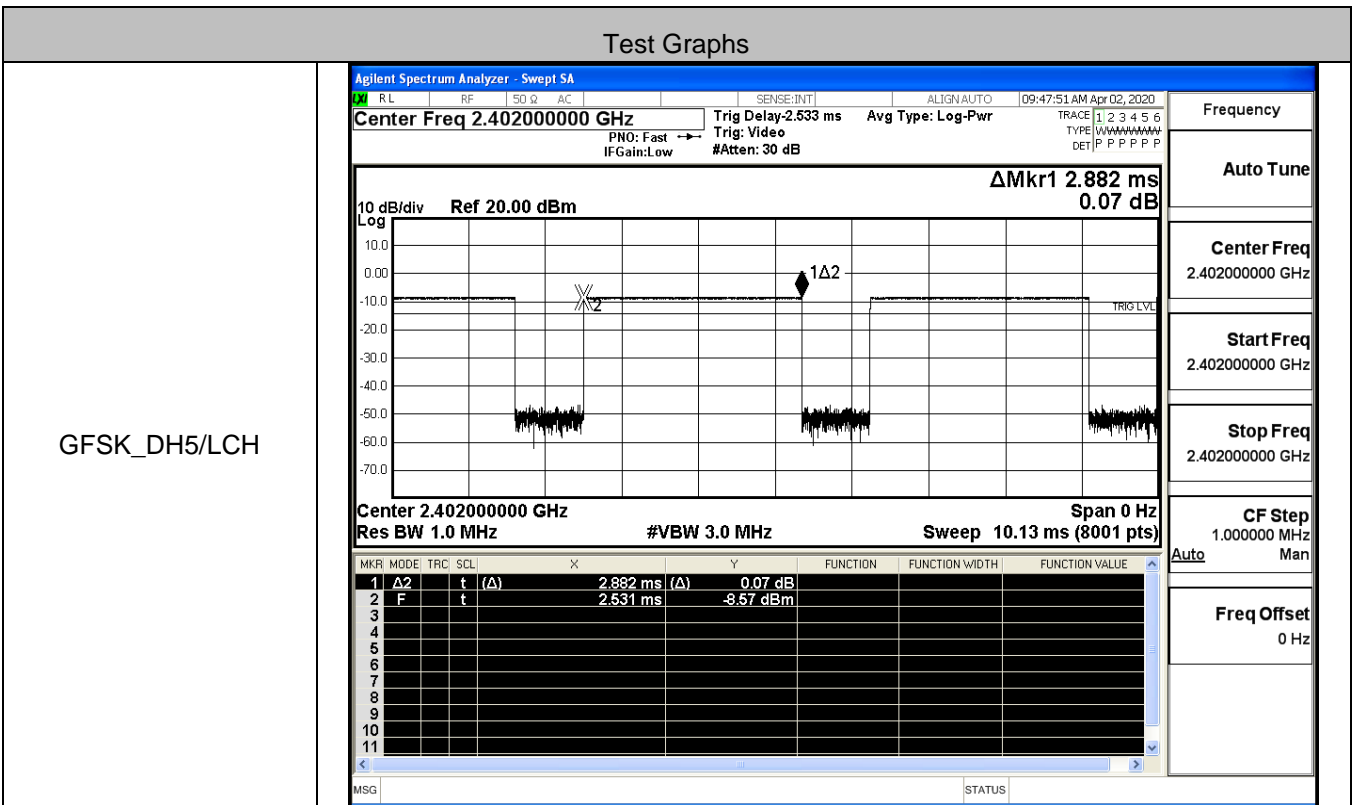
GFSK/Hop	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.441750000 GHz Ref Offset 8.05 dB Ref 20.00 dBm ΔMkr1 78.062 MHz -3.059 dB Start 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.48350 GHz Sweep 8.000 ms (8001 pts)</p> <table border="1"> <thead> <tr> <th>MKR</th> <th>MODE</th> <th>TRC</th> <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>78.062 MHz (Δ)</td> <td>-3.059 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.401 900 GHz</td> <td>2.728 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)	78.062 MHz (Δ)	-3.059 dB				2	F	f		2.401 900 GHz	2.728 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																				
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2	F	f		2.401 900 GHz	2.728 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 ΔMkr1 77.989 MHz -2.717 dB Start 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.48350 GHz 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>77.989 MHz (Δ)</td> <td>-2.717 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.401 847 GHz</td> <td>0.401 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)	77.989 MHz (Δ)	-2.717 dB				2	F	f		2.401 847 GHz	0.401 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)	-2.717 dB																								
2	F	f		2.401 847 GHz	0.401 dBm																								

8DPSK/Hop

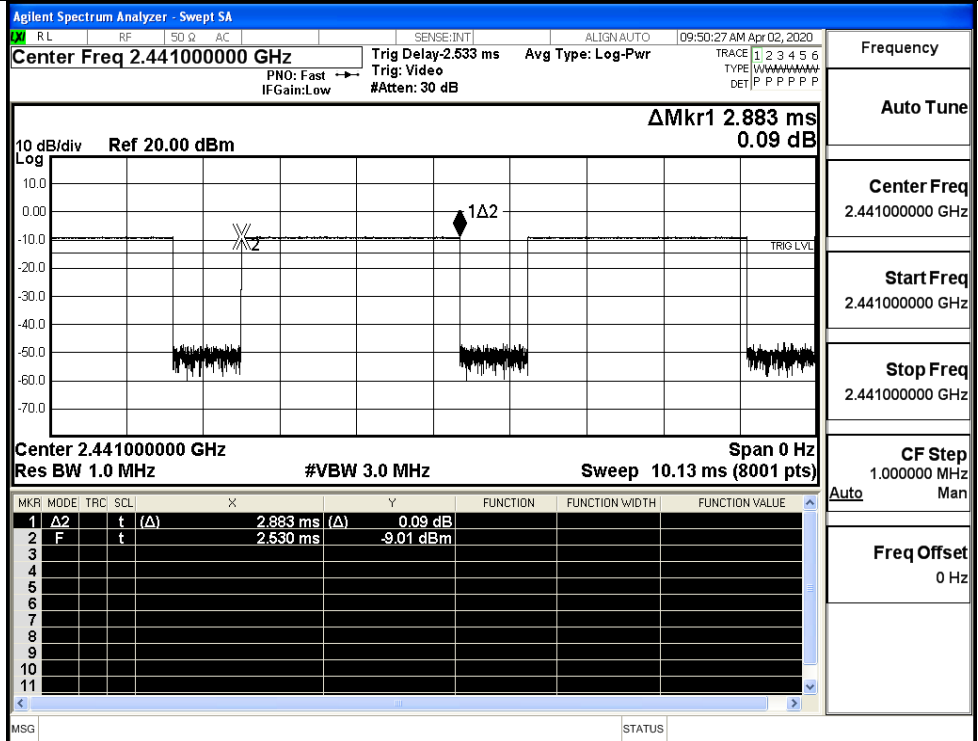


A.5 Dwell Time

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

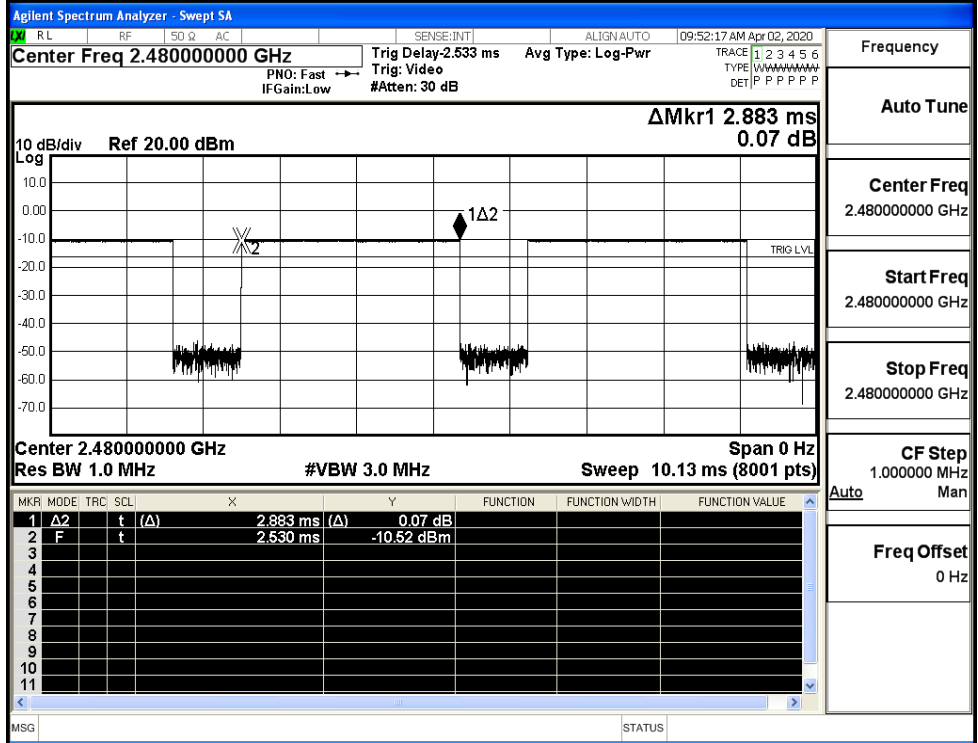


GFSK_DH5/MCH



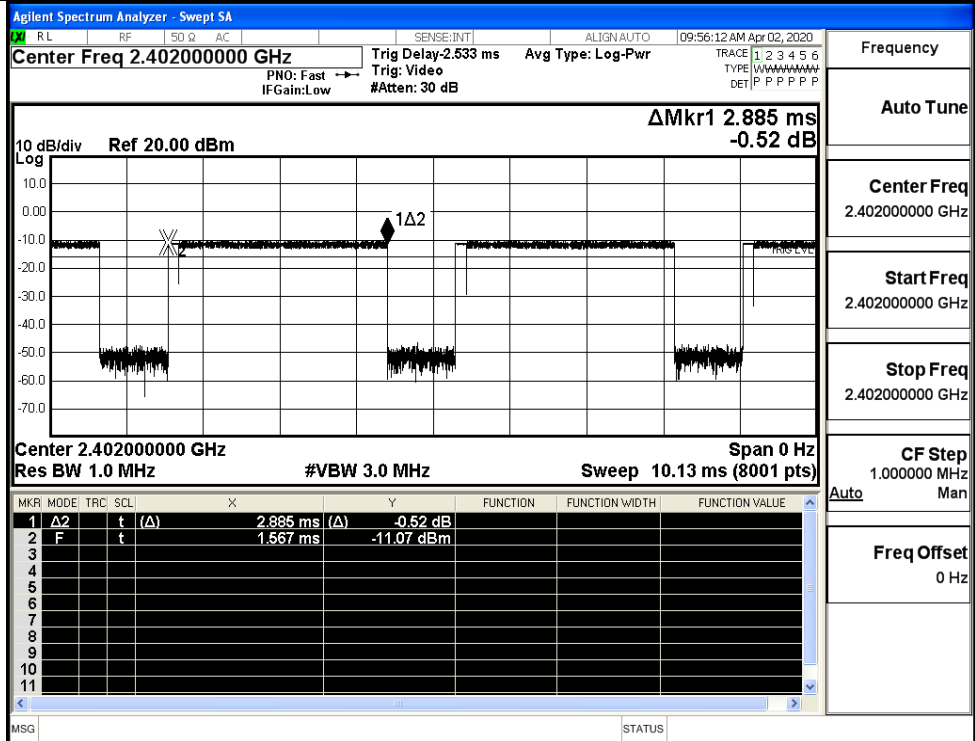
Frequency	
Auto Tune	
Center Freq	2.441000000 GHz
Start Freq	2.441000000 GHz
Stop Freq	2.441000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

GFSK_DH5/HCH



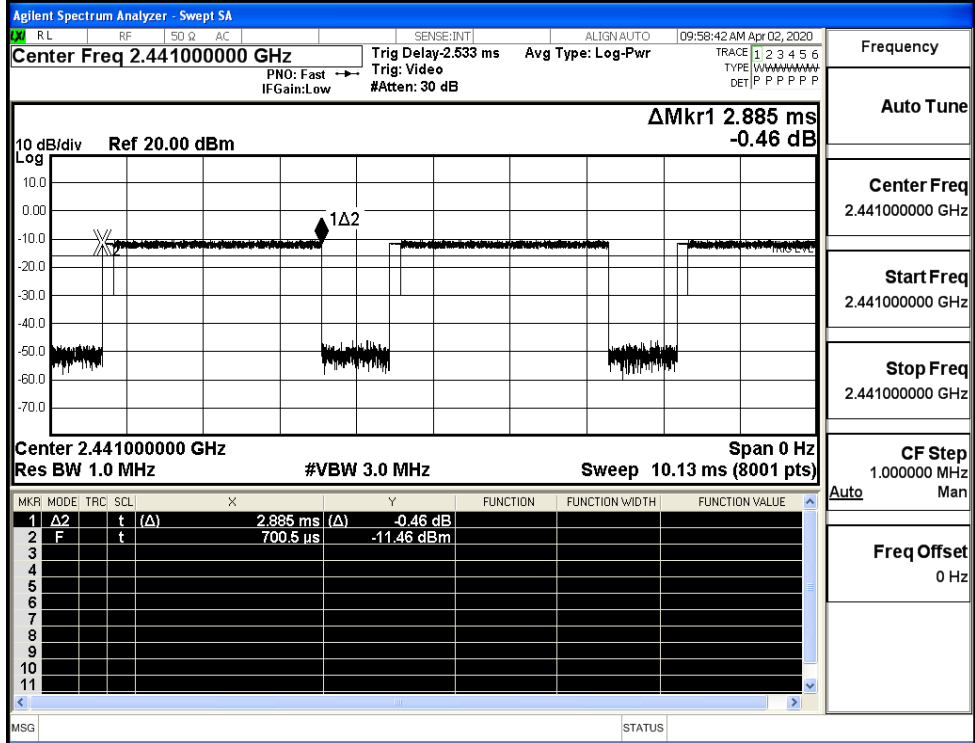
Frequency	
Auto Tune	
Center Freq	2.480000000 GHz
Start Freq	2.480000000 GHz
Stop Freq	2.480000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK
_2DH5/LCH



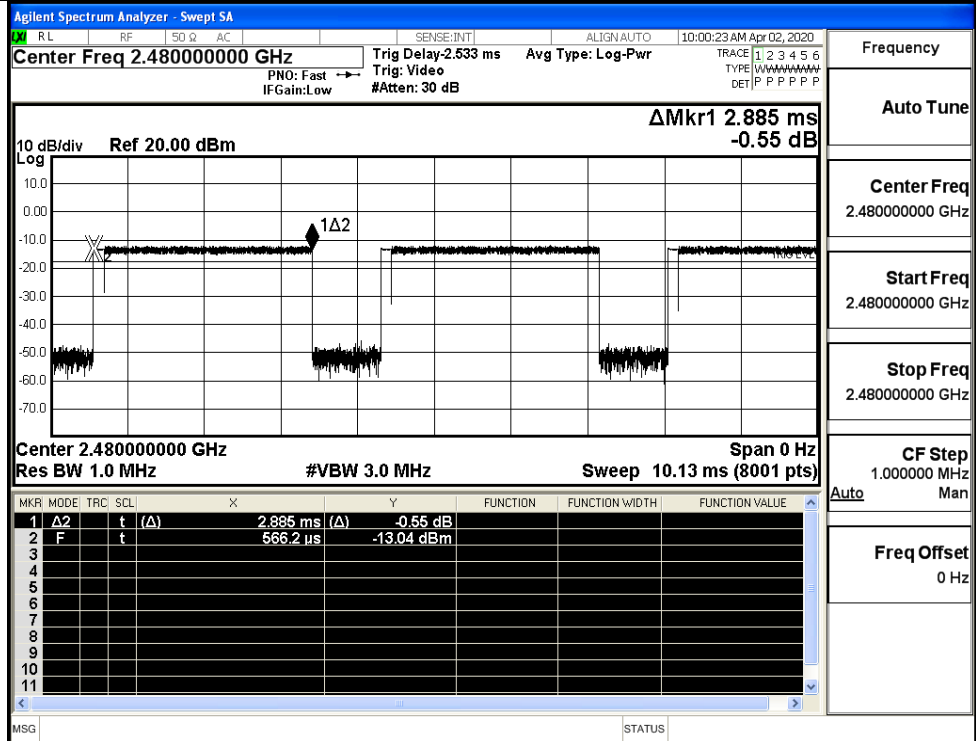
Frequency	2.402000000 GHz
Auto Tune	
Center Freq	2.402000000 GHz
Start Freq	2.402000000 GHz
Stop Freq	2.402000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK
_2DH5/MCH

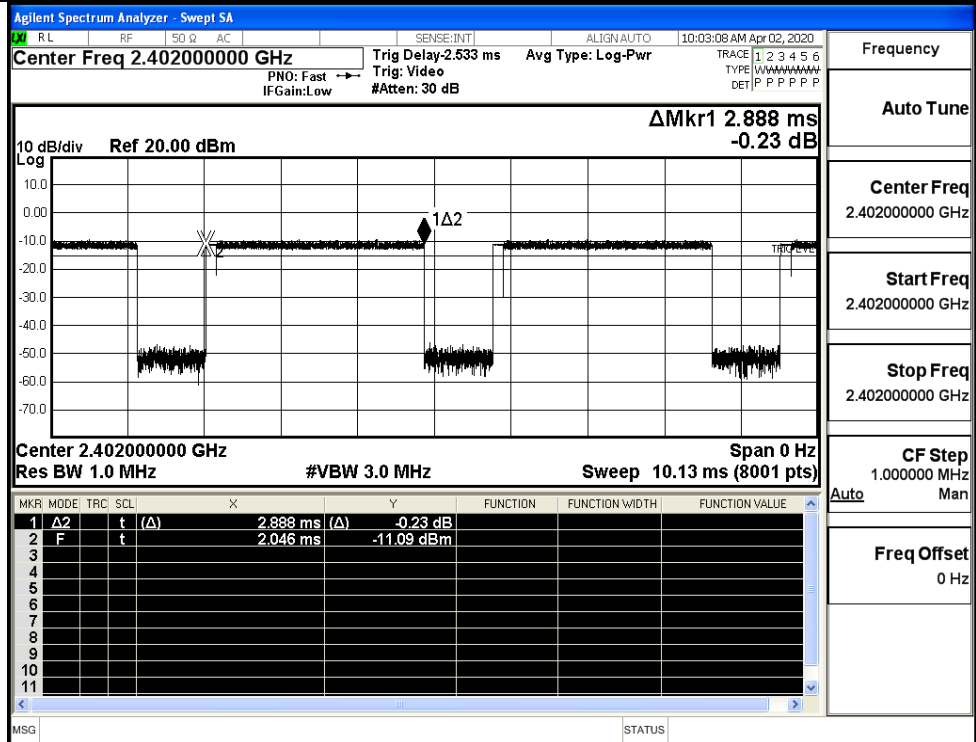


Frequency	2.441000000 GHz
Auto Tune	
Center Freq	2.441000000 GHz
Start Freq	2.441000000 GHz
Stop Freq	2.441000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

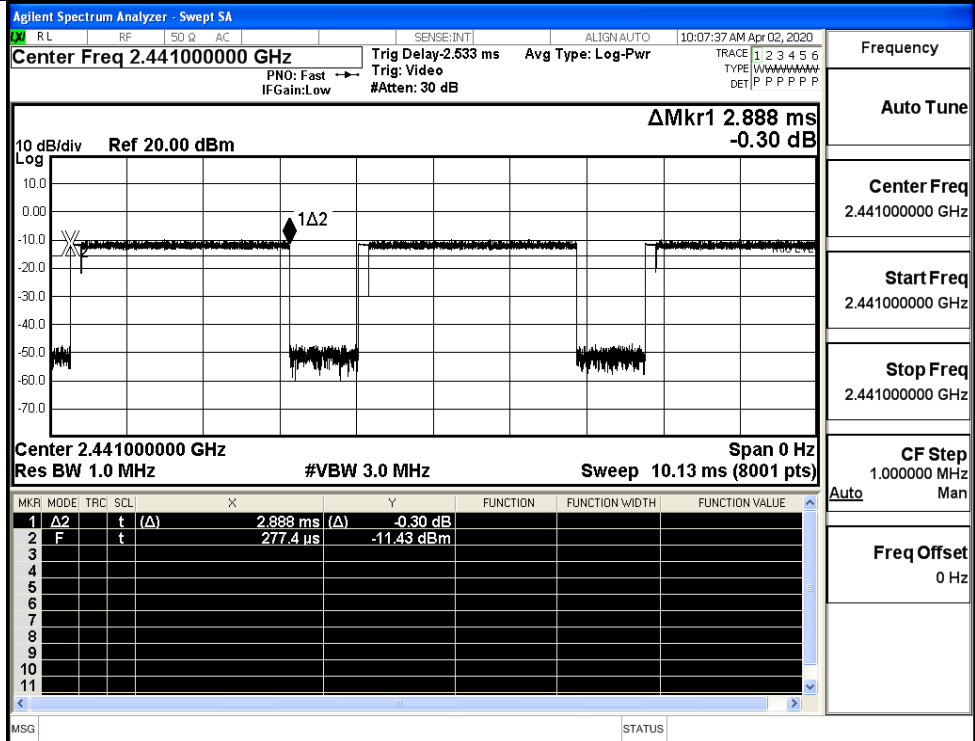
$\pi/4$ DQPSK
_2DH5/HCH



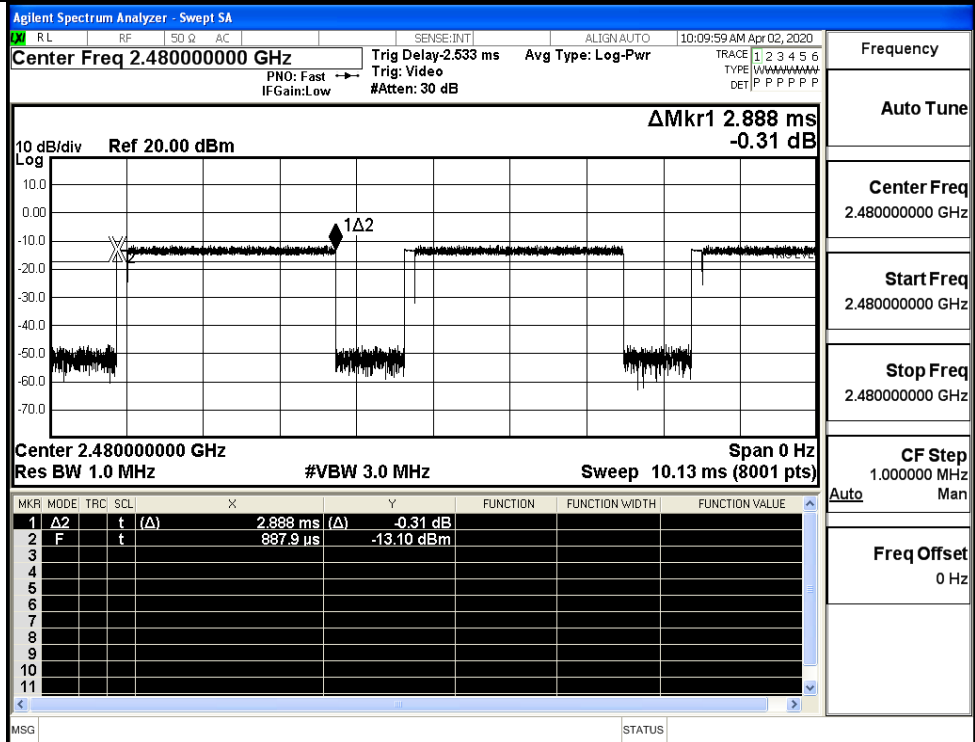
8DPSK_3DH5/LCH



8DPSK_3DH5/MCH



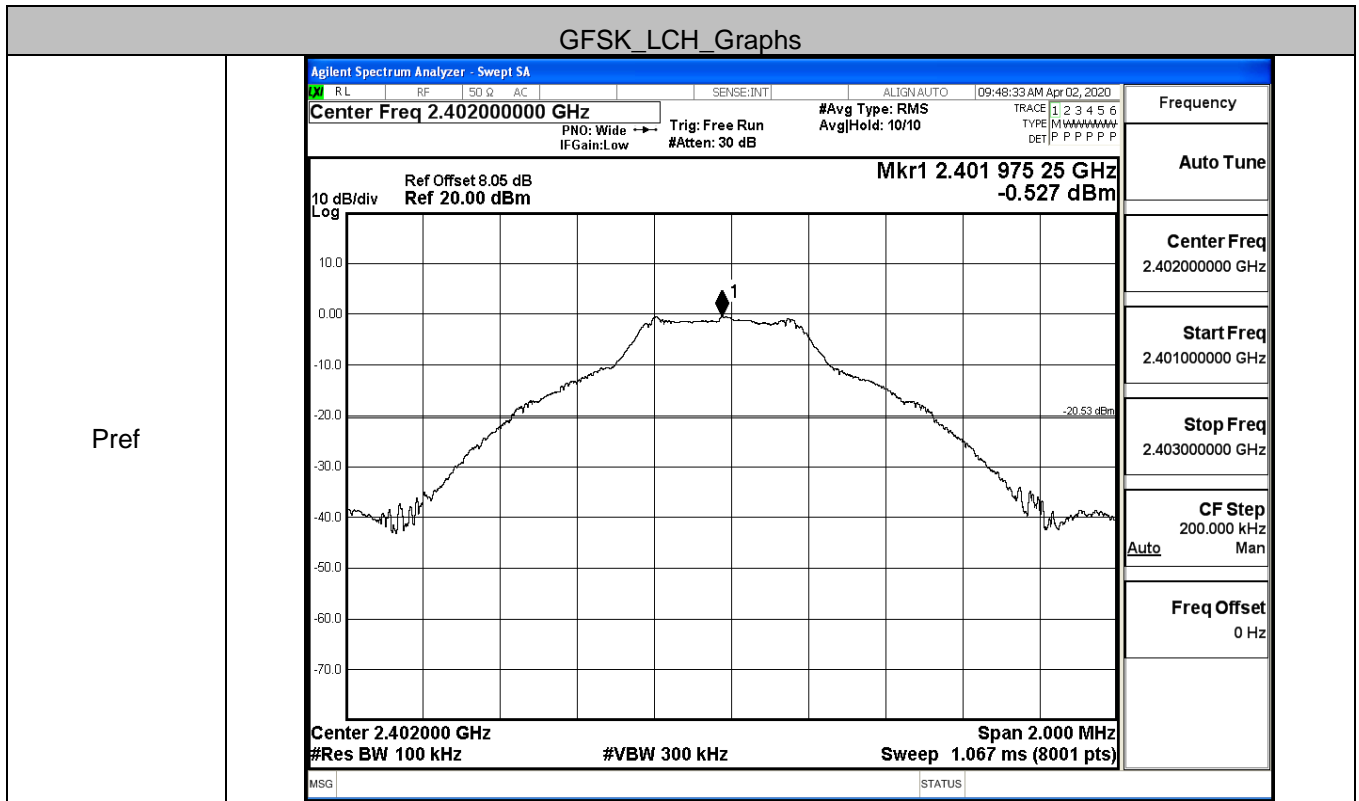
8DPSK_3DH5/HCH

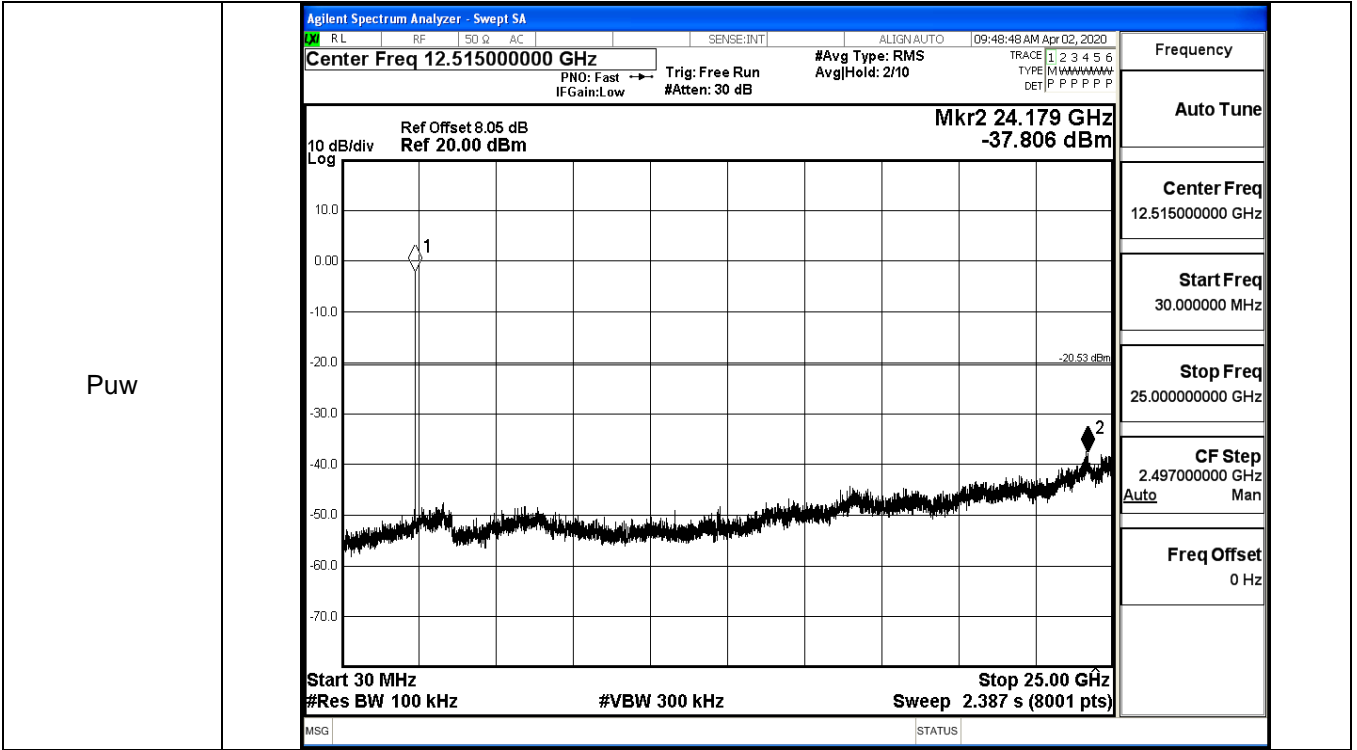


A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-0.527	-37.806	-20.527	PASS
	MCH	-0.916	-37.402	-20.916	PASS
	HCH	-2.464	-36.816	-22.464	PASS
$\pi/4$ DQPSK	LCH	-3.141	-37.632	-23.141	PASS
	MCH	-3.414	-37.576	-23.414	PASS
	HCH	-5.065	-37.779	-25.065	PASS
8DPSK	LCH	-3.065	-37.501	-23.065	PASS
	MCH	-3.427	-37.868	-23.427	PASS
	HCH	-5.055	-37.967	-25.055	PASS

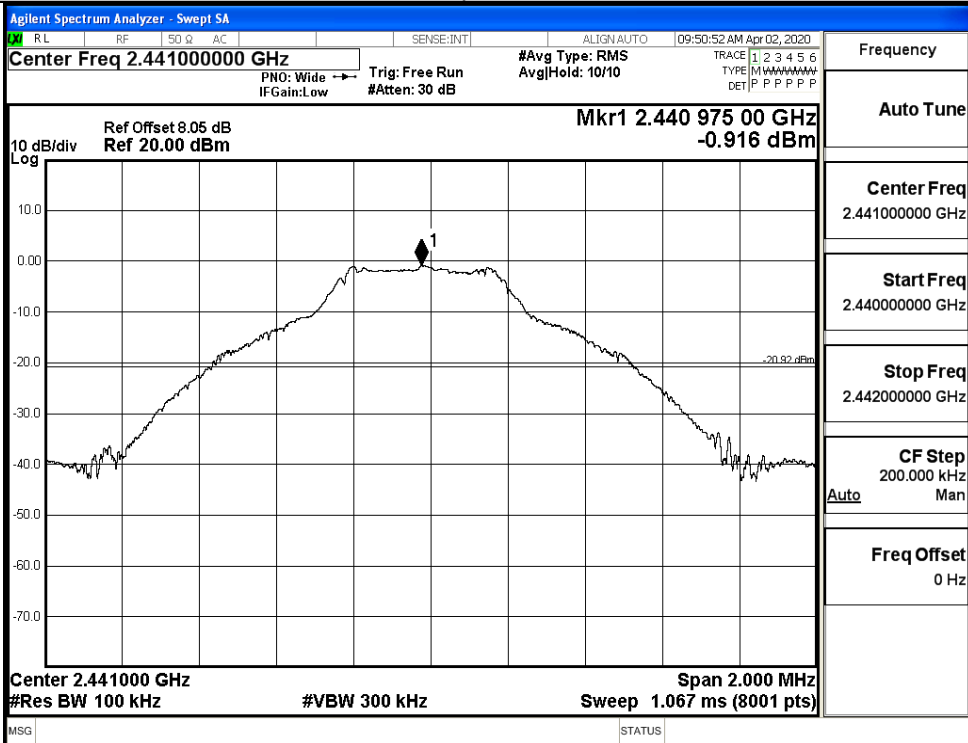
GFSK_LCH_Graphs



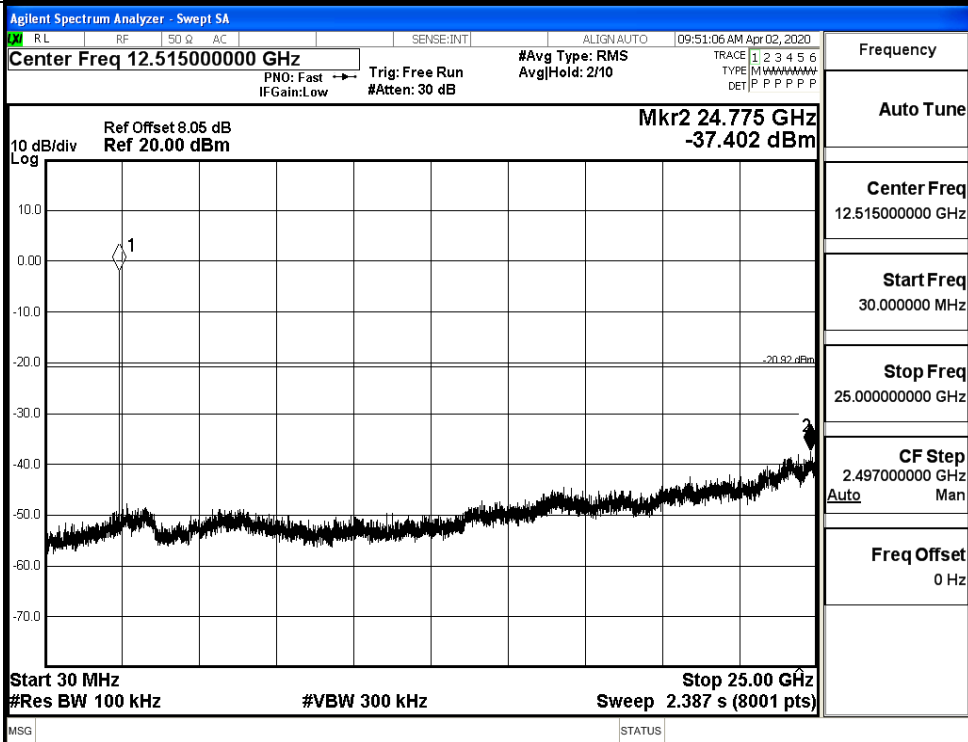


GFSK_MCH_Graphs

Pref

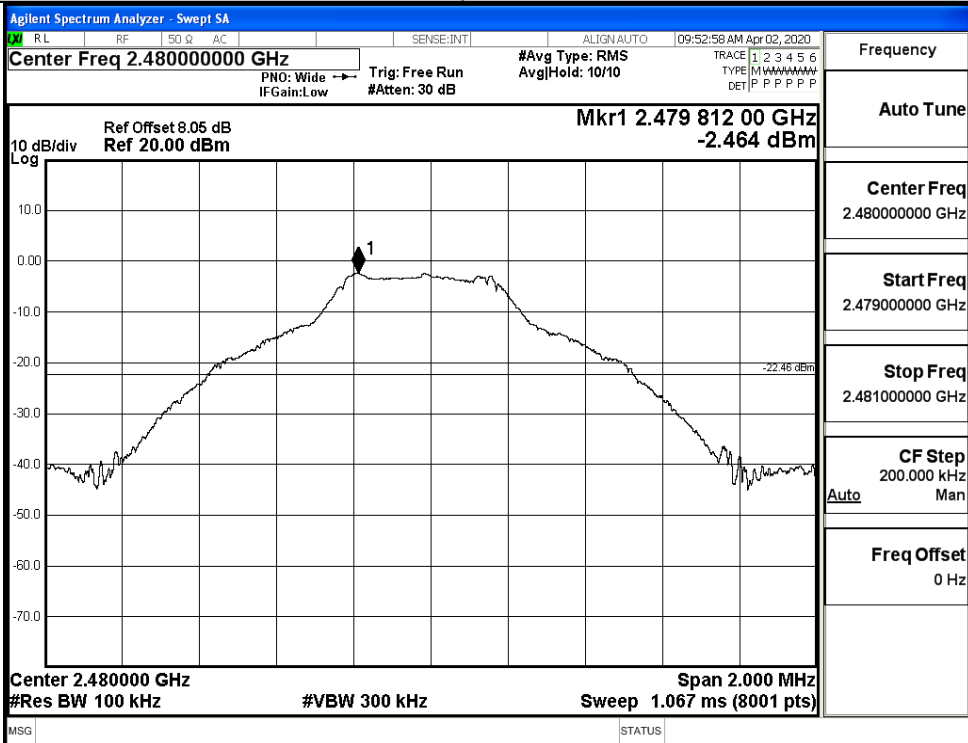


Puw

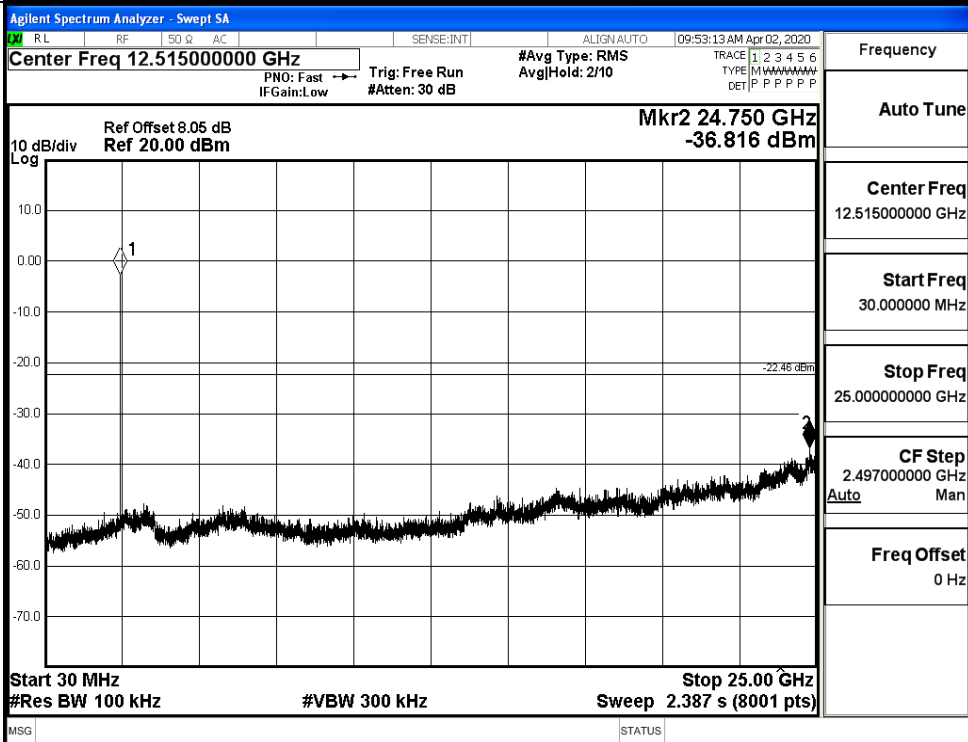


GFSK_HCH_Graphs

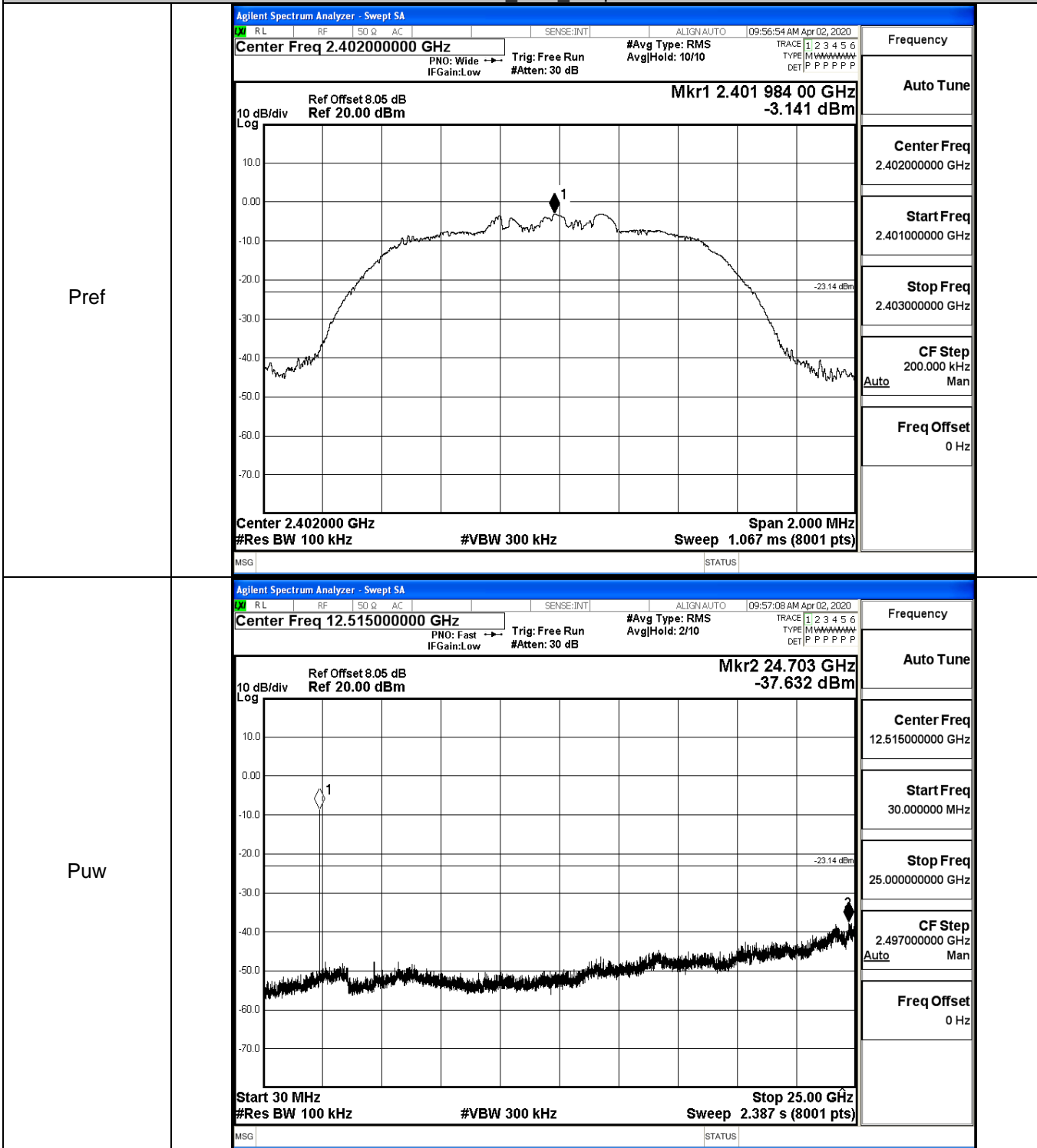
Pref



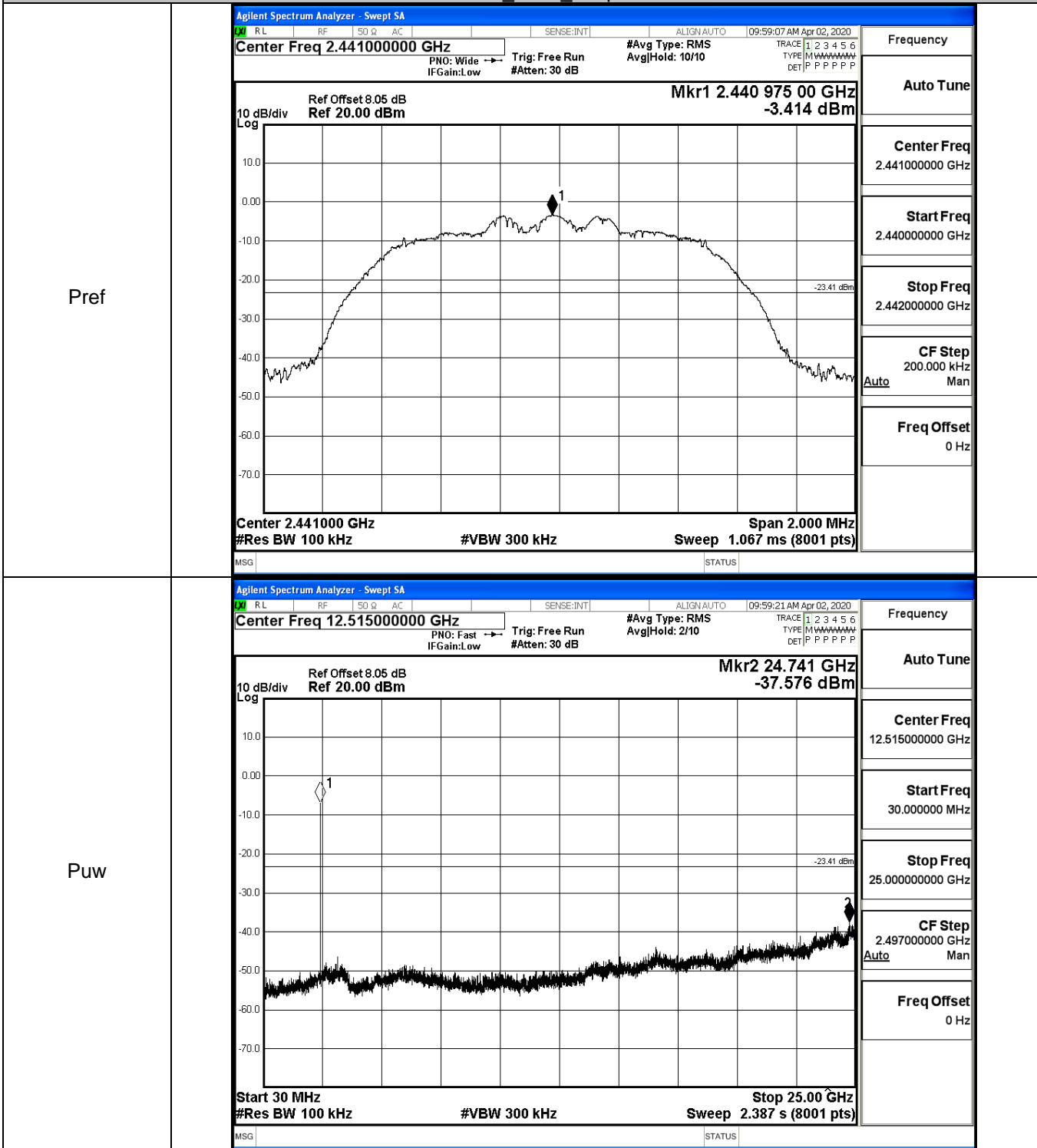
Puw



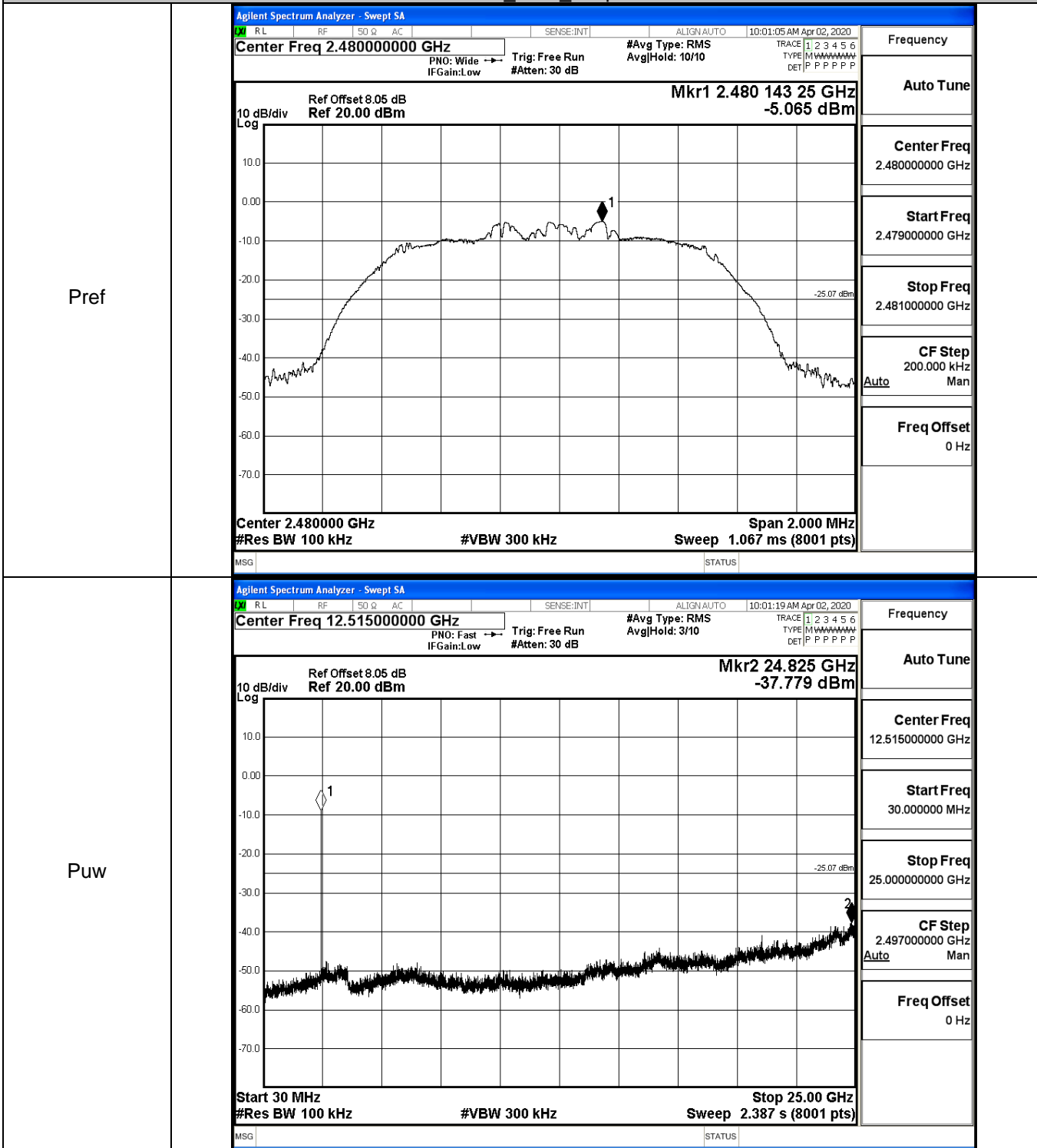
$\pi/4$ DQPSK_LCH_Graphs



$\pi/4$ DQPSK_MCH_Graphs

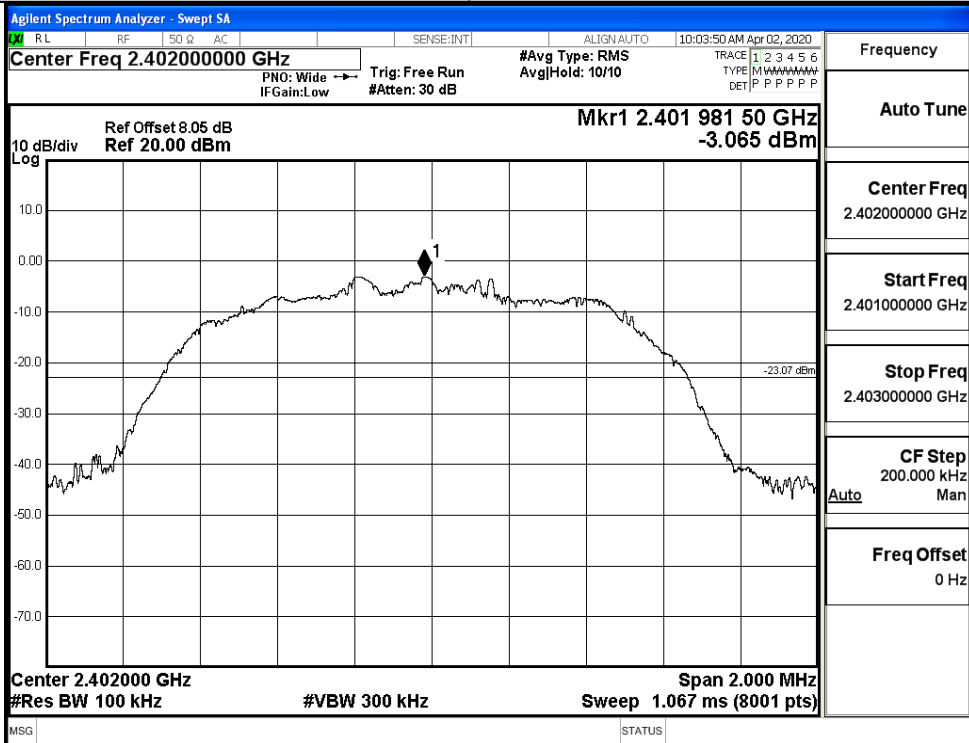


$\pi/4$ DQPSK_HCH_Graphs

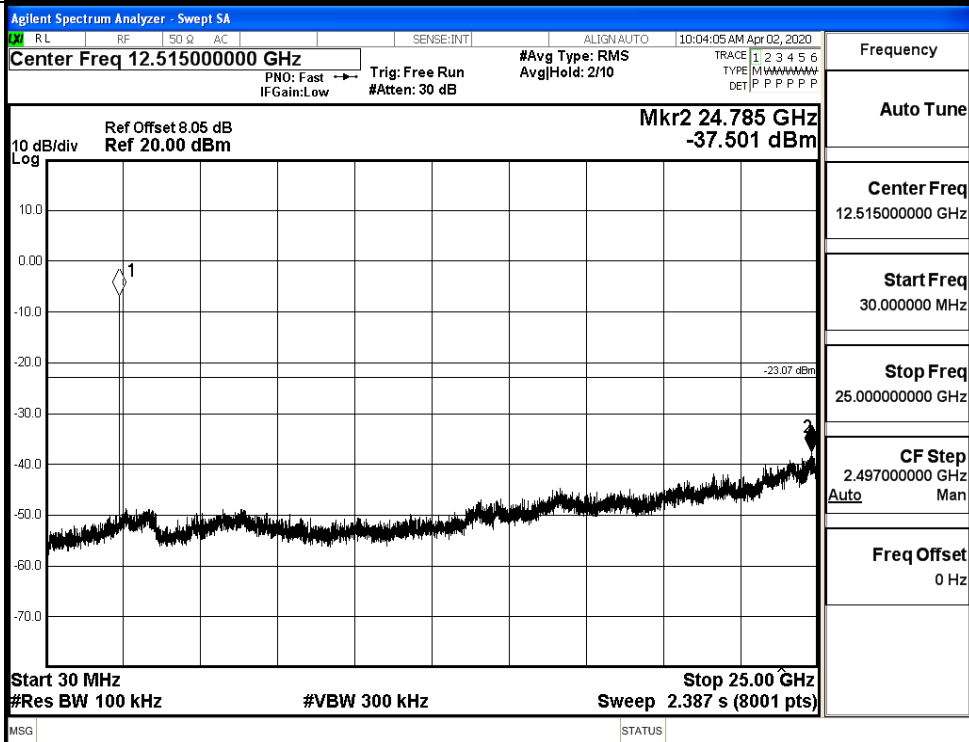


8DPSK_LCH_Graphs

Pref

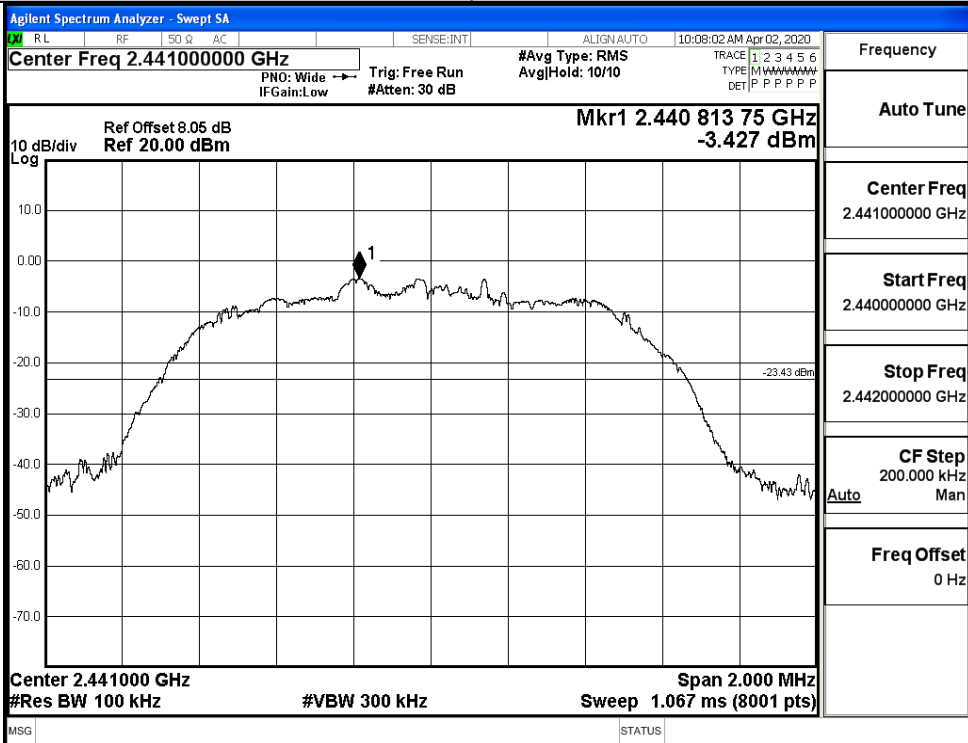


Puw

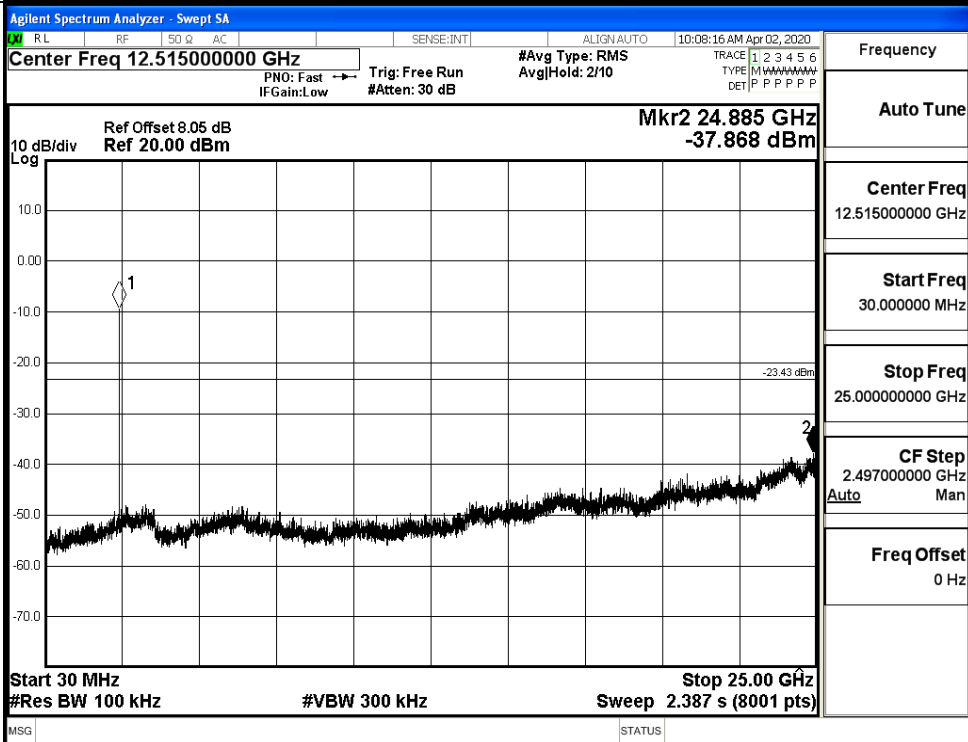


8DPSK_MCH_Graphs

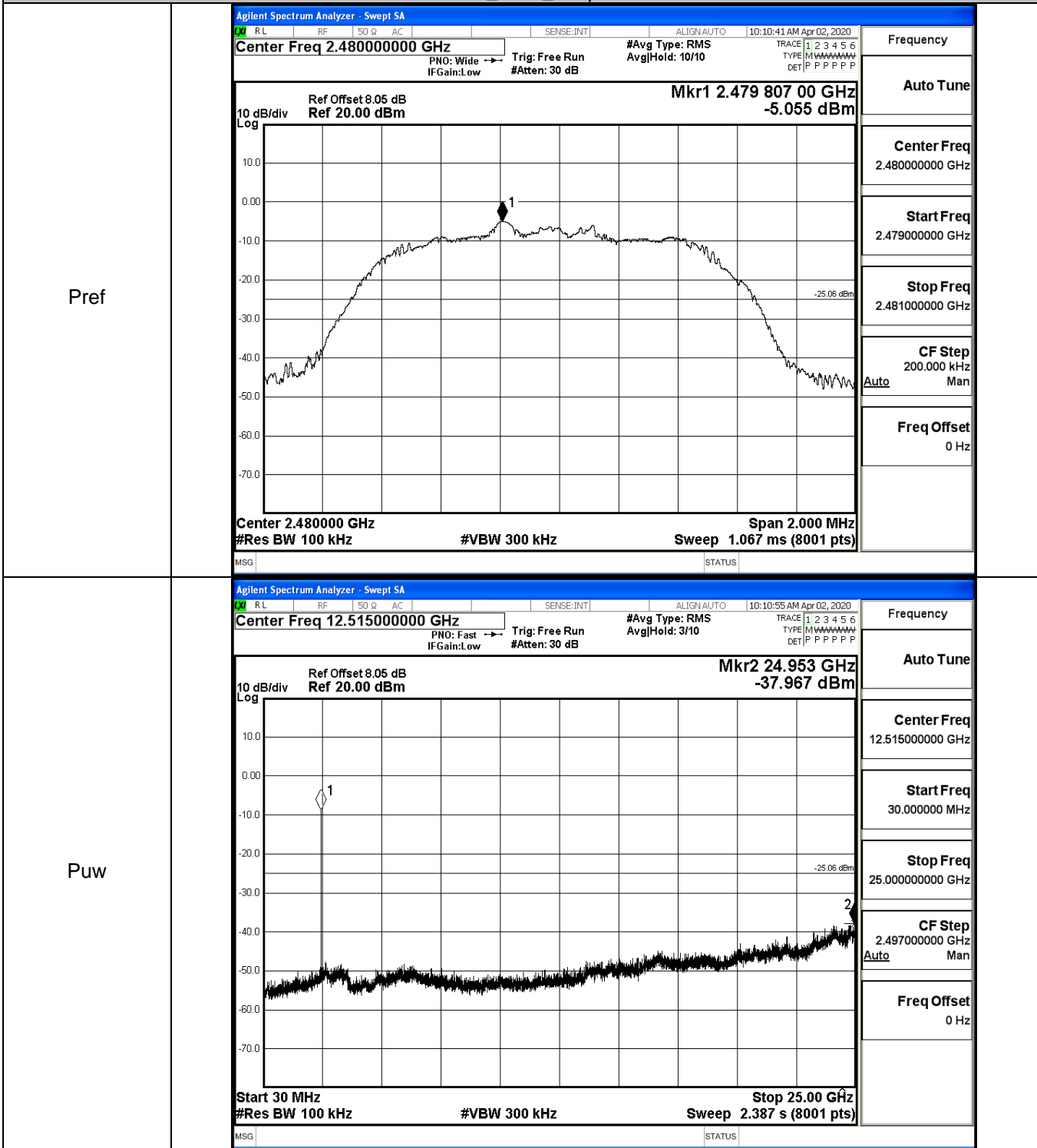
Pref



Puw



8DPSK_HCH_Graphs

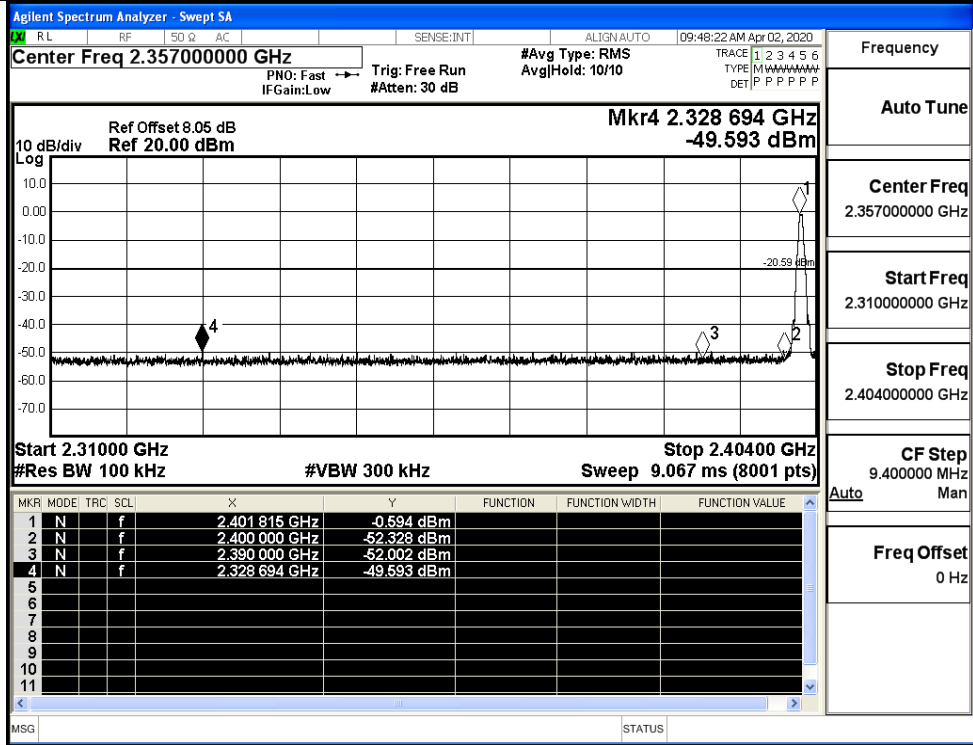


A.7 Band-edge for RF Conducted Emissions

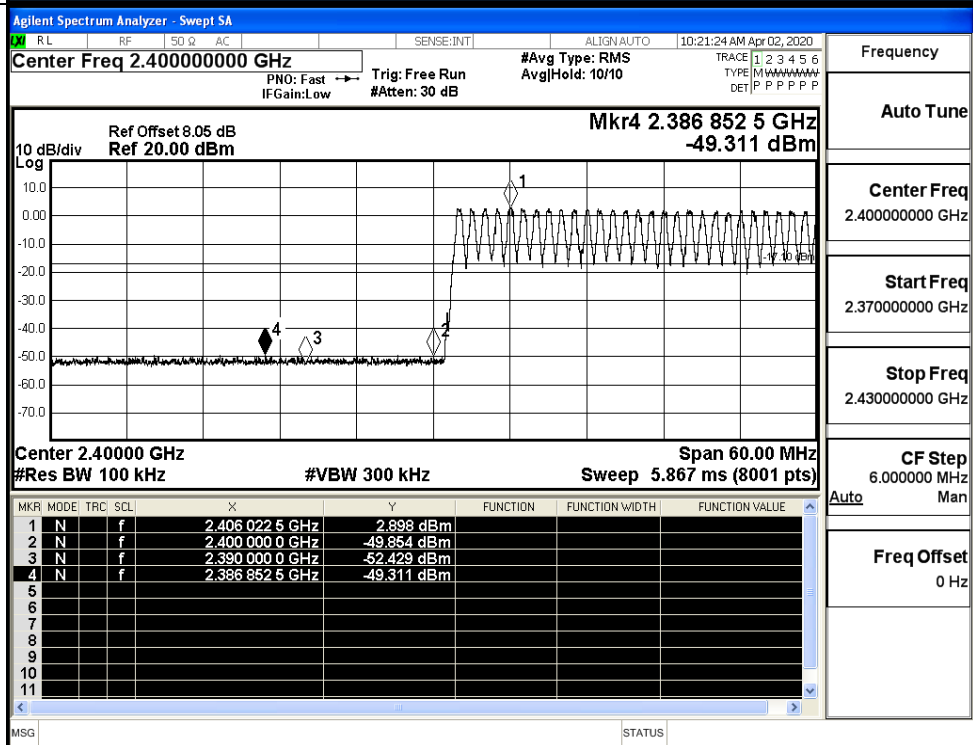
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-0.594	Off	-49.593	-20.59	PASS
			2.898	On	-49.311	-17.1	PASS
	HCH	2480	-2.301	Off	-48.585	-22.3	PASS
			0.871	On	-48.408	-19.13	PASS
$\pi/4$ DQPSK	LCH	2402	-3.132	Off	-49.233	-23.13	PASS
			2.580	On	-48.828	-17.42	PASS
	HCH	2480	-4.921	Off	-48.493	-24.92	PASS
			0.928	On	-48.468	-19.07	PASS
8DPSK	LCH	2402	-3.188	Off	-49.232	-23.19	PASS
			2.804	On	-48.967	-17.2	PASS
	HCH	2480	-5.029	Off	-49.132	-25.03	PASS
			0.883	On	-48.084	-19.12	PASS

Test Graphs

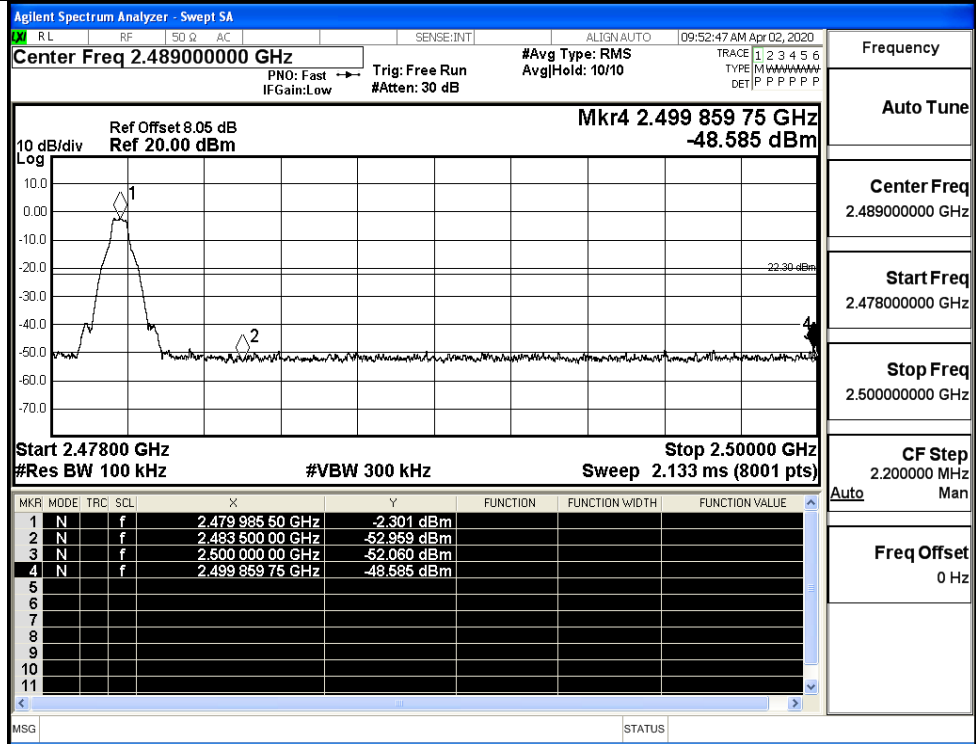
GFSK/LCH/No Hop



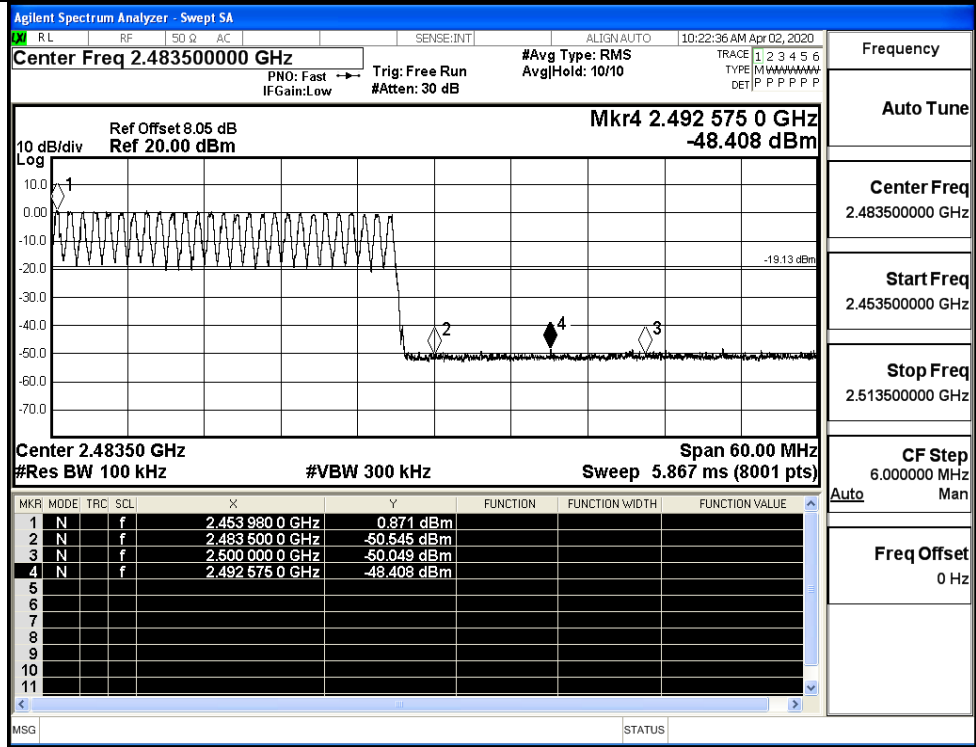
GFSK/LCH/Hop



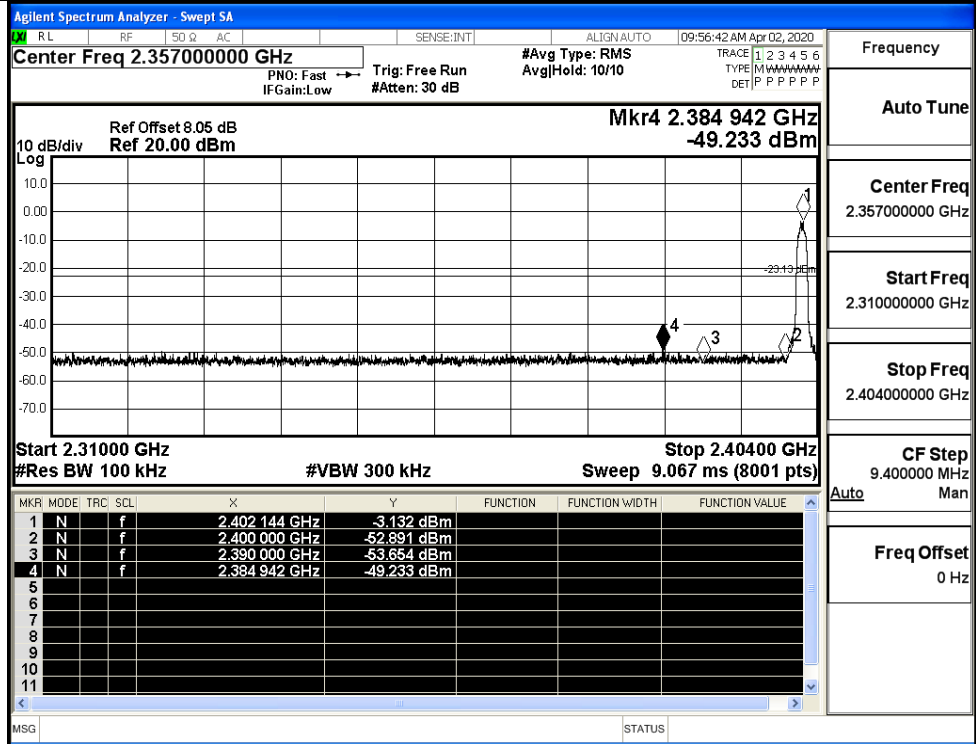
GFSK/HCH/No Hop



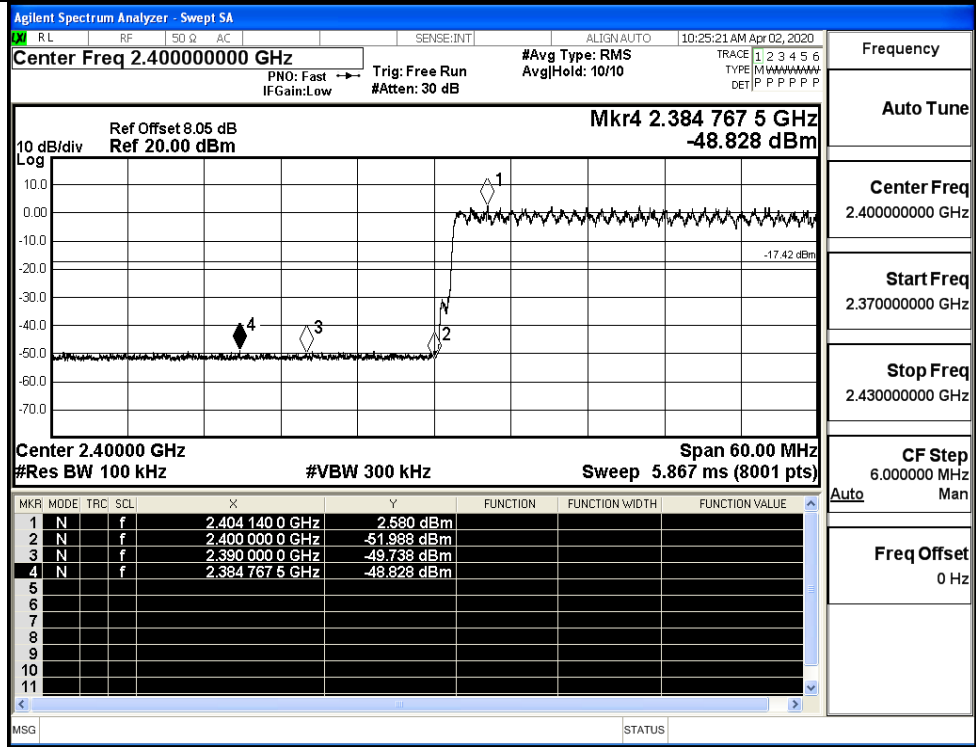
GFSK/HCH/Hop



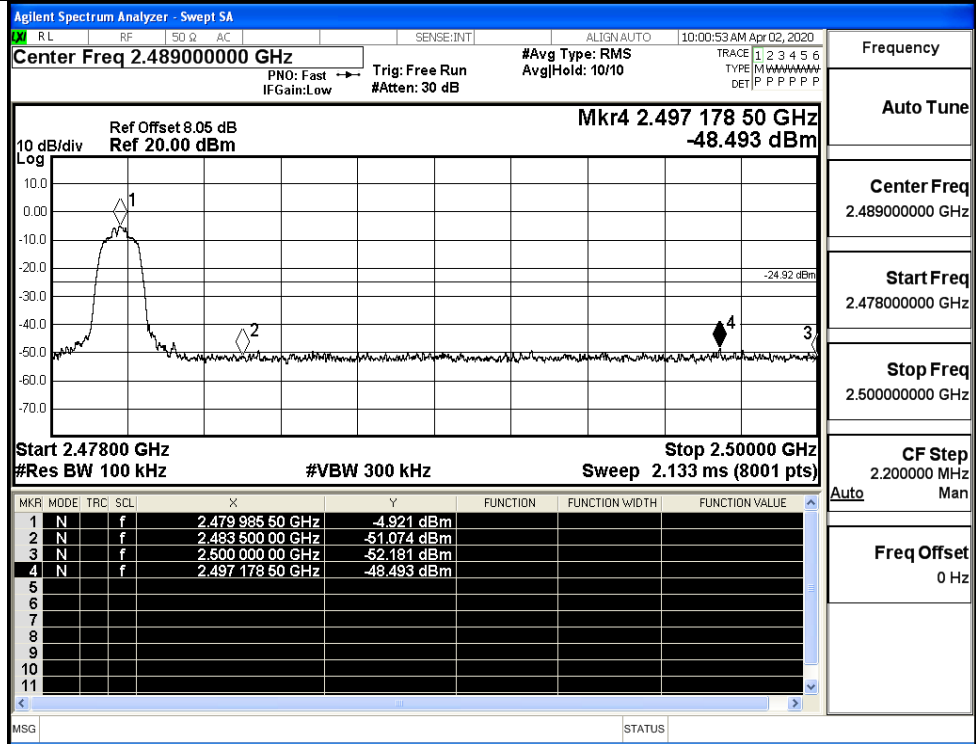
$\pi/4$ DQPSK/LCH/No
Hop



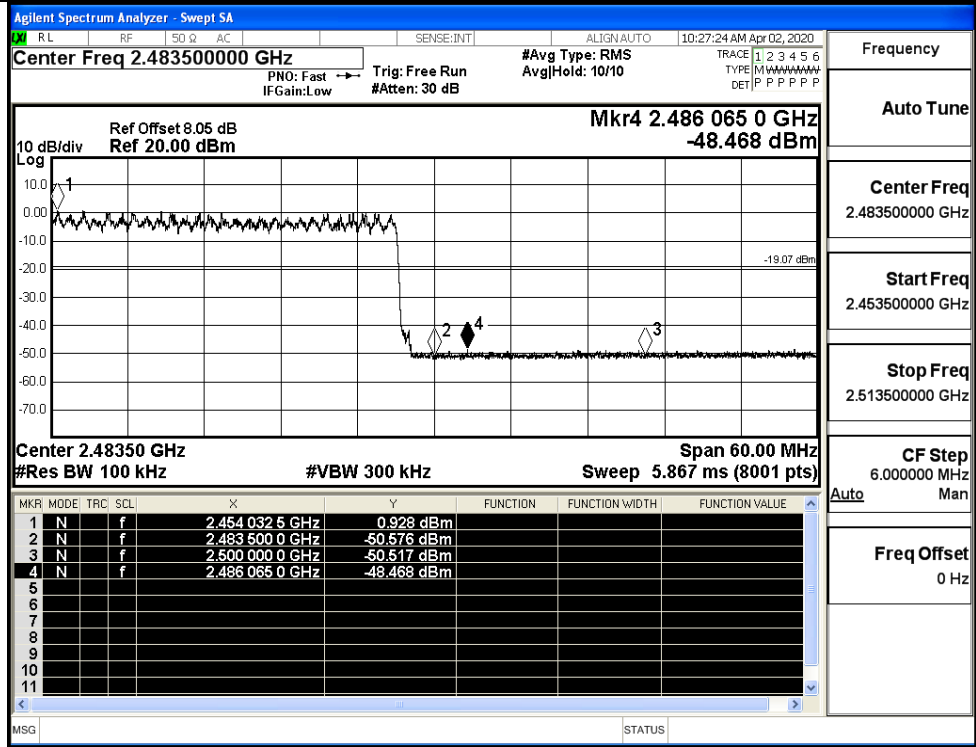
$\pi/4$ DQPSK/LCH/Hop



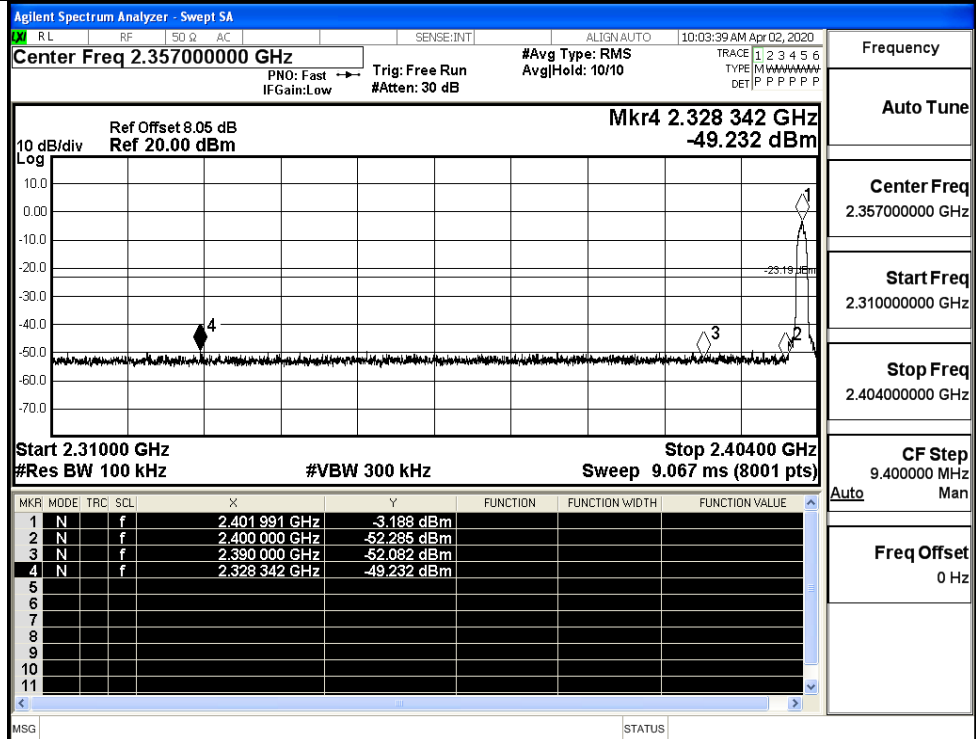
$\pi/4$ DQPSK/HCH/No
Hop



$\pi/4$ DQPSK/HCH/Hop

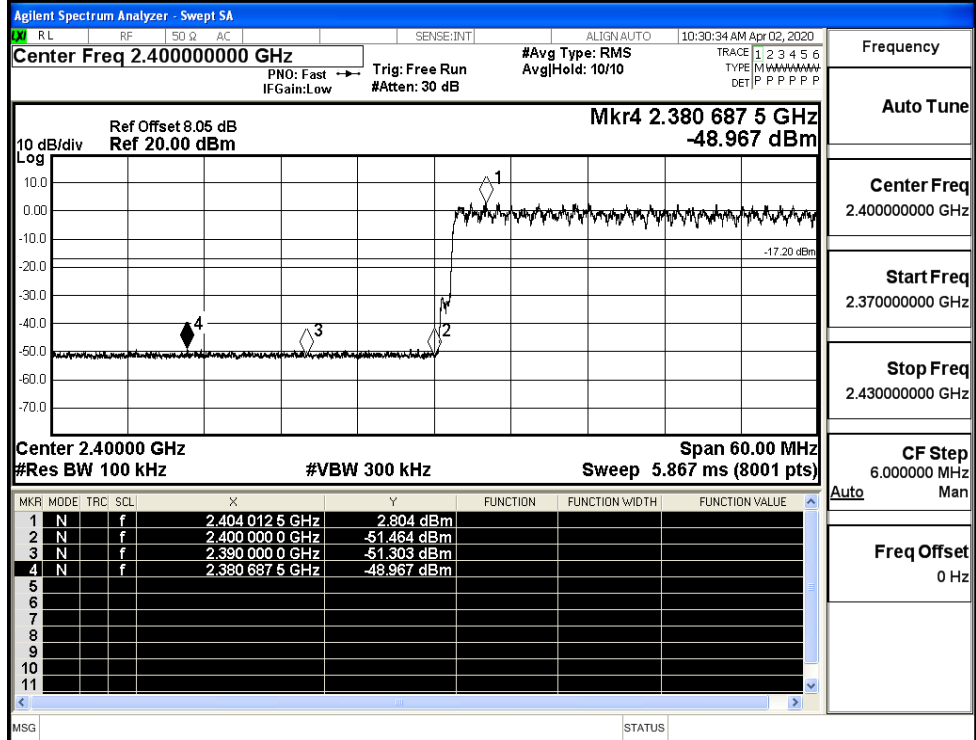


8DPSK/LCH/No Hop



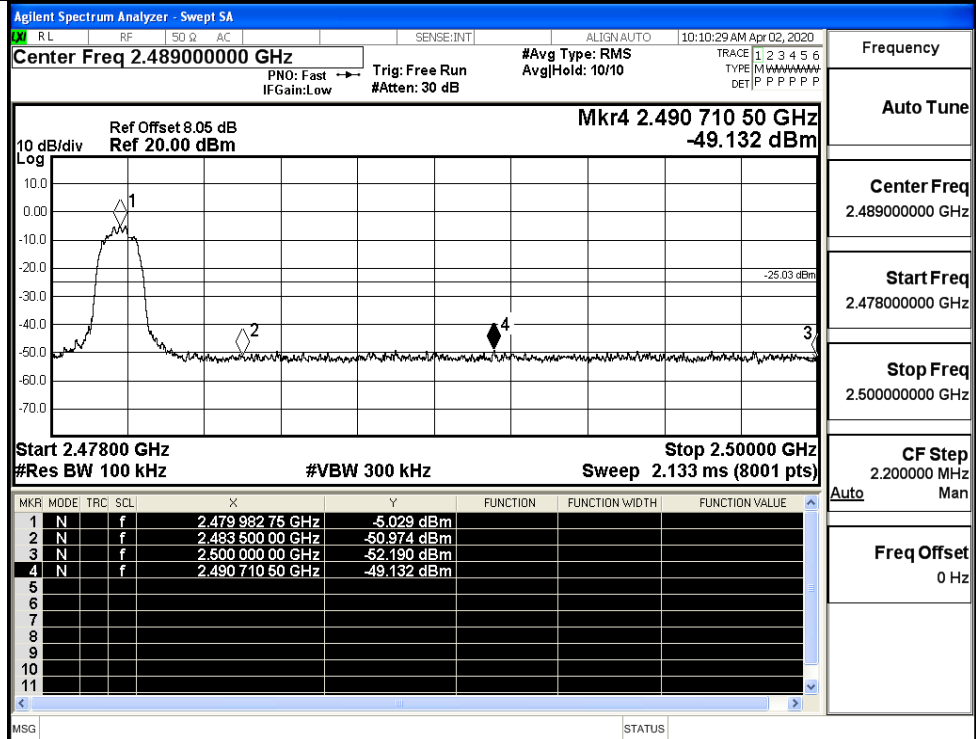
Frequency
Auto Tune
Center Freq
2.357000000 GHz
Start Freq
2.310000000 GHz
Stop Freq
2.404000000 GHz
CF Step
9.400000 MHz
Auto Man
Freq Offset
0 Hz

8DPSK/LCH/Hop



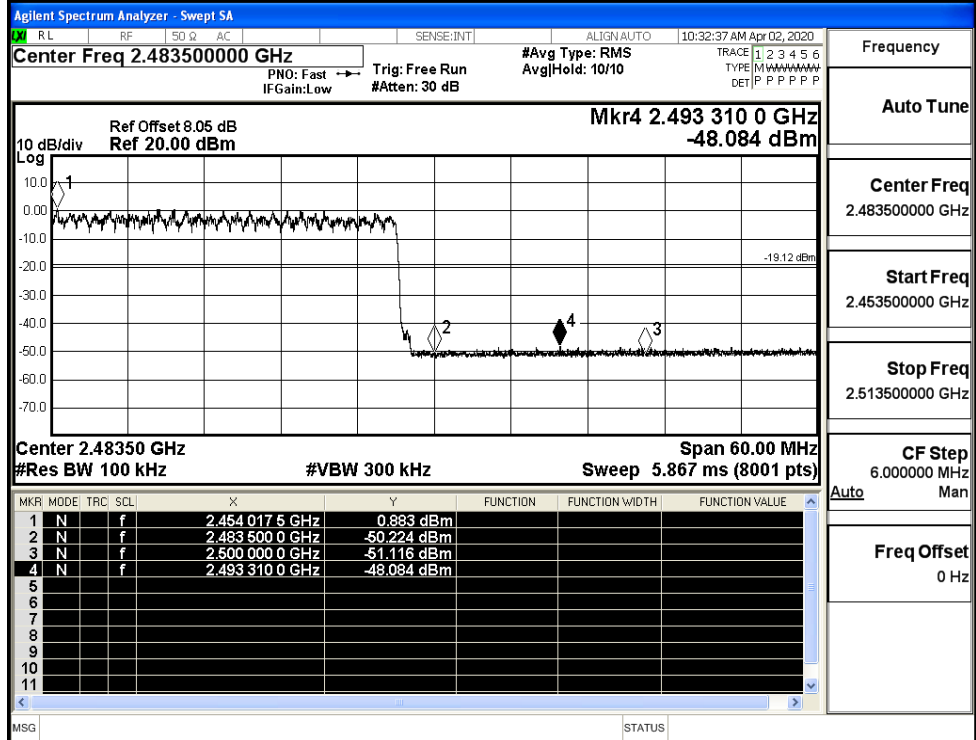
Frequency
Auto Tune
Center Freq
2.400000000 GHz
Start Freq
2.370000000 GHz
Stop Freq
2.430000000 GHz
CF Step
6.000000 MHz
Auto Man
Freq Offset
0 Hz

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

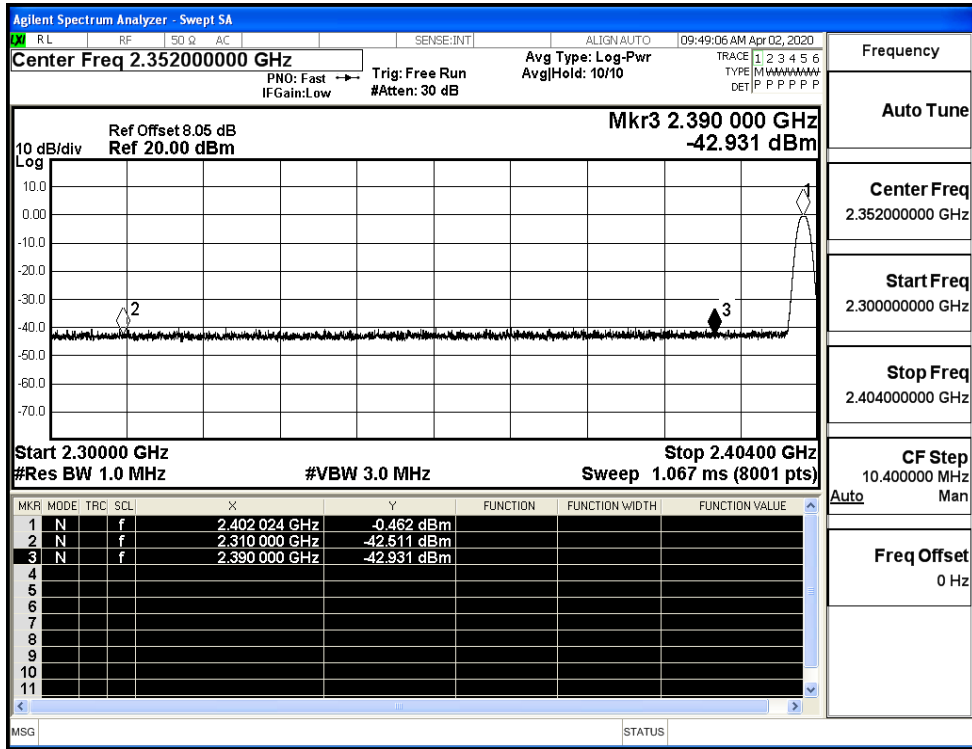


Frequency
Auto Tune
Center Freq
2.483500000 GHz
Start Freq
2.453500000 GHz
Stop Freq
2.513500000 GHz
CF Step
6.000000 MHz
Freq Offset
0 Hz

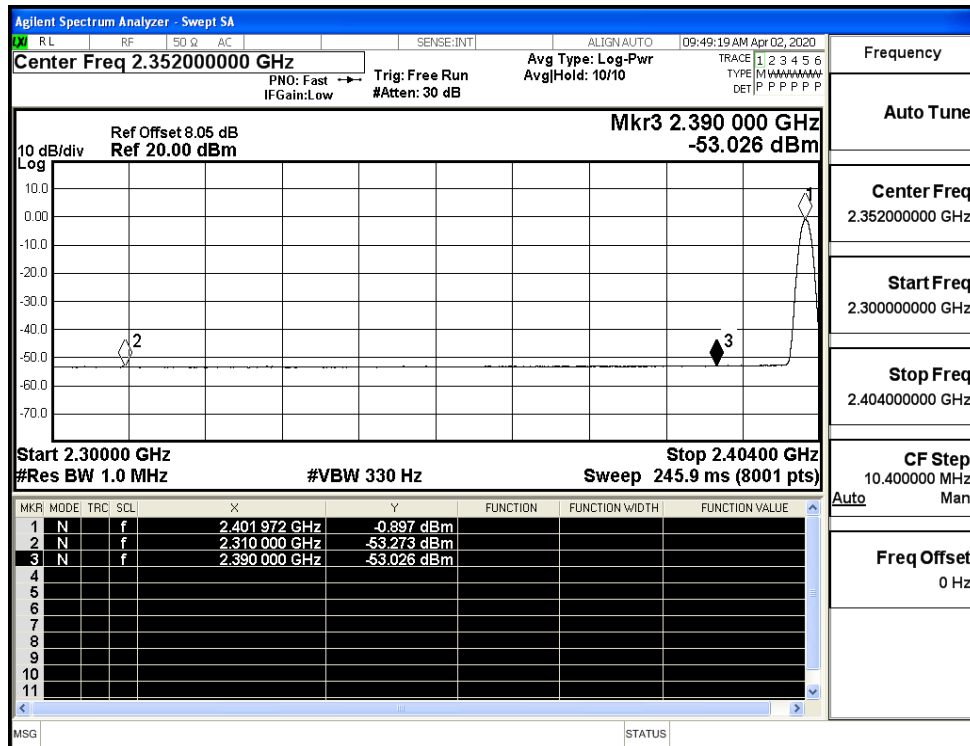
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-42.51	2.0	0	54.72	PEAK	74	PASS
	Off	2310.0	-53.27	2.0	0	43.96	AV	54	PASS
	Off	2390.0	-42.93	2.0	0	54.30	PEAK	74	PASS
	Off	2390.0	-53.03	2.0	0	44.20	AV	54	PASS
	Off	2483.5	-42.72	2.0	0	54.51	PEAK	74	PASS
	Off	2483.5	-52.48	2.0	0	44.75	AV	54	PASS
	Off	2500.0	-43.24	2.0	0	53.99	PEAK	74	PASS
	Off	2500.0	-52.36	2.0	0	44.87	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-43.69	2.0	0	53.54	PEAK	74	PASS
	Off	2310.0	-53.33	2.0	0	43.90	AV	54	PASS
	Off	2390.0	-42.37	2.0	0	54.86	PEAK	74	PASS
	Off	2390.0	-53.03	2.0	0	44.20	AV	54	PASS
	Off	2483.5	-42.39	2.0	0	54.84	PEAK	74	PASS
	Off	2483.5	-52.57	2.0	0	44.66	AV	54	PASS
	Off	2500.0	-39.62	2.0	0	57.61	PEAK	74	PASS
	Off	2500.0	-52.36	2.0	0	44.87	AV	54	PASS
8DPSK	Off	2310.0	-41.69	2.0	0	55.54	PEAK	74	PASS
	Off	2310.0	-53.32	2.0	0	43.91	AV	54	PASS
	Off	2390.0	-42.41	2.0	0	54.82	PEAK	74	PASS
	Off	2390.0	-53.01	2.0	0	44.22	AV	54	PASS
	Off	2483.5	-41.24	2.0	0	55.99	PEAK	74	PASS
	Off	2483.5	-52.50	2.0	0	44.73	AV	54	PASS
	Off	2500.0	-42.90	2.0	0	54.33	PEAK	74	PASS
	Off	2500.0	-52.36	2.0	0	44.87	AV	54	PASS

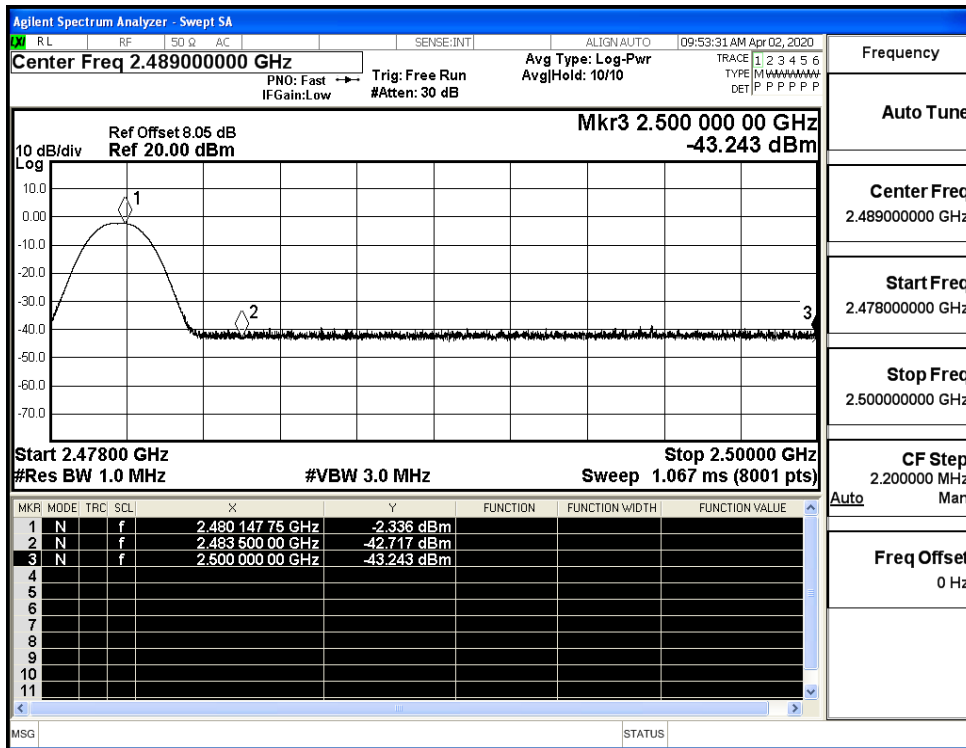
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



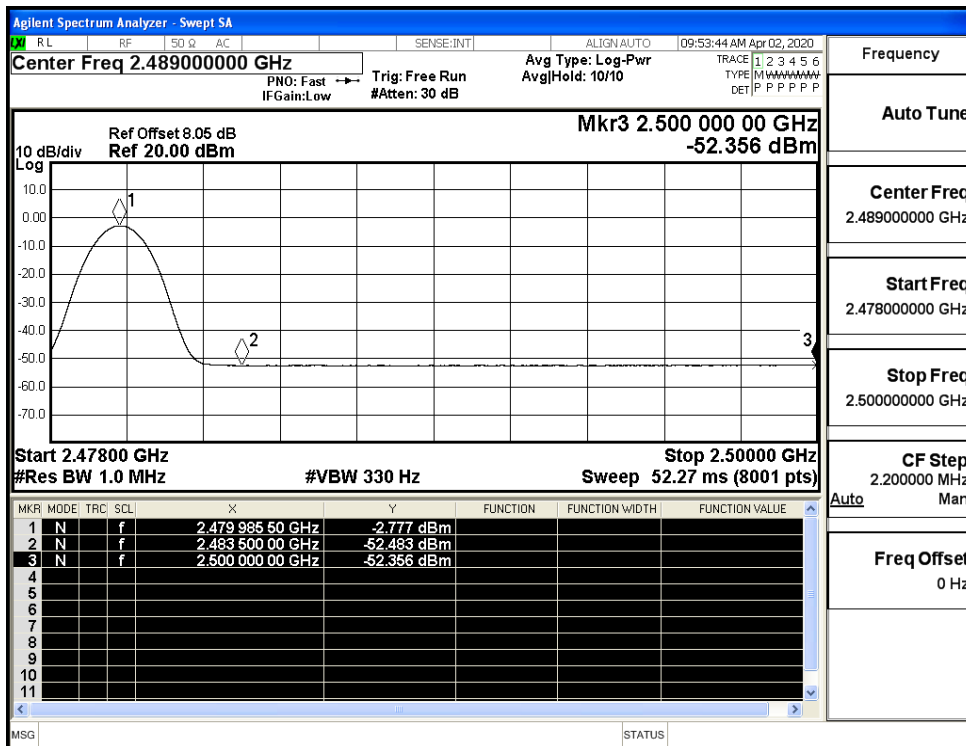
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



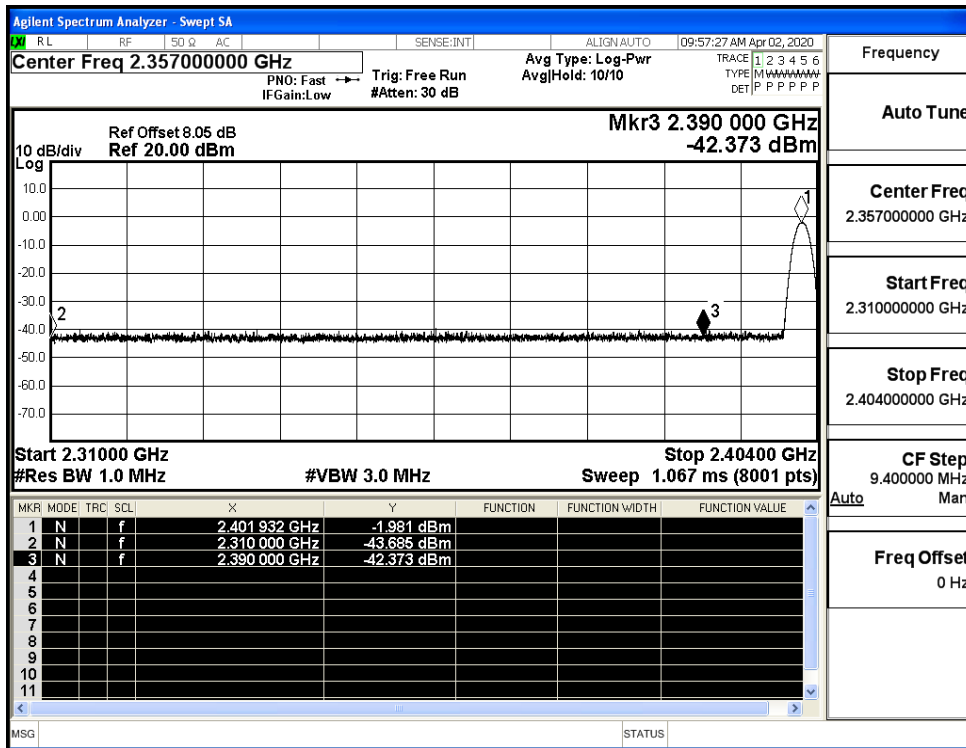
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)



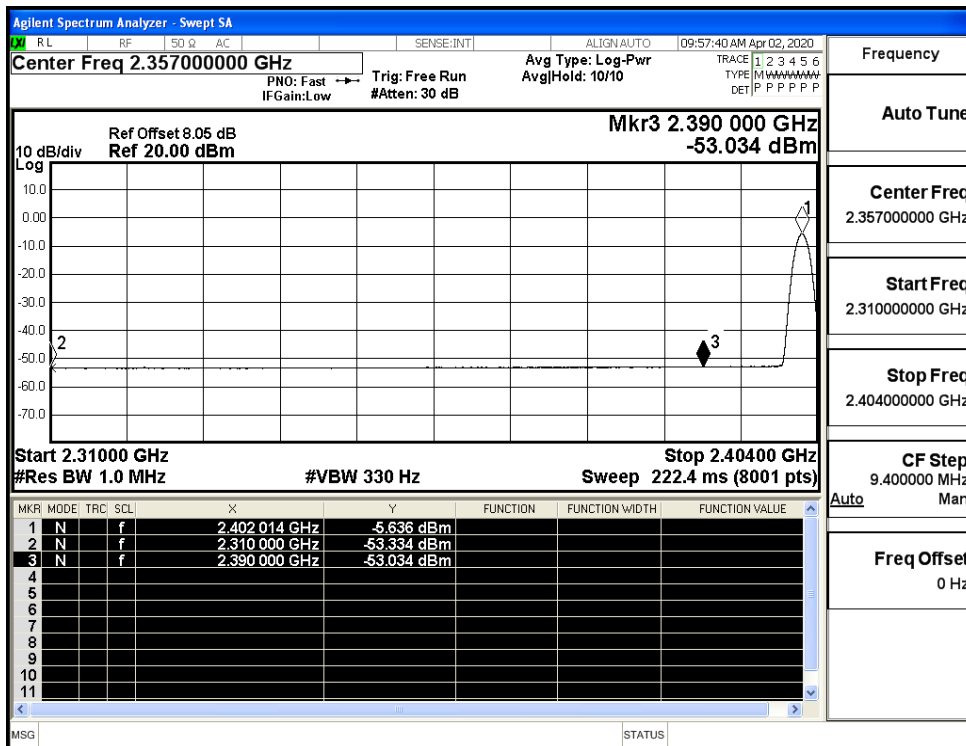
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)



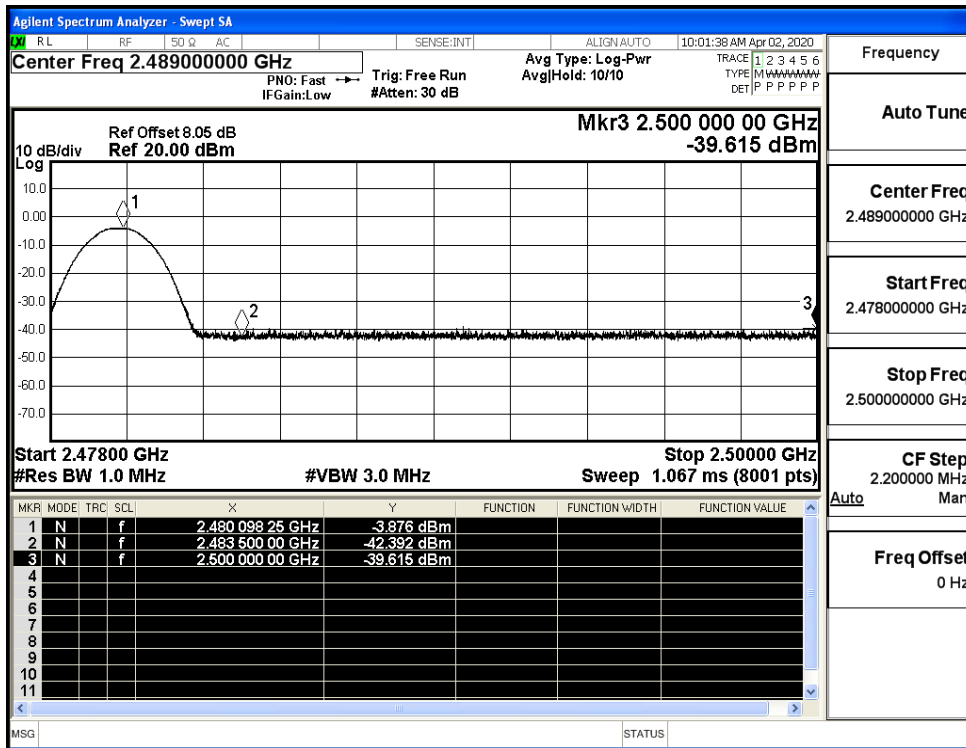
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)



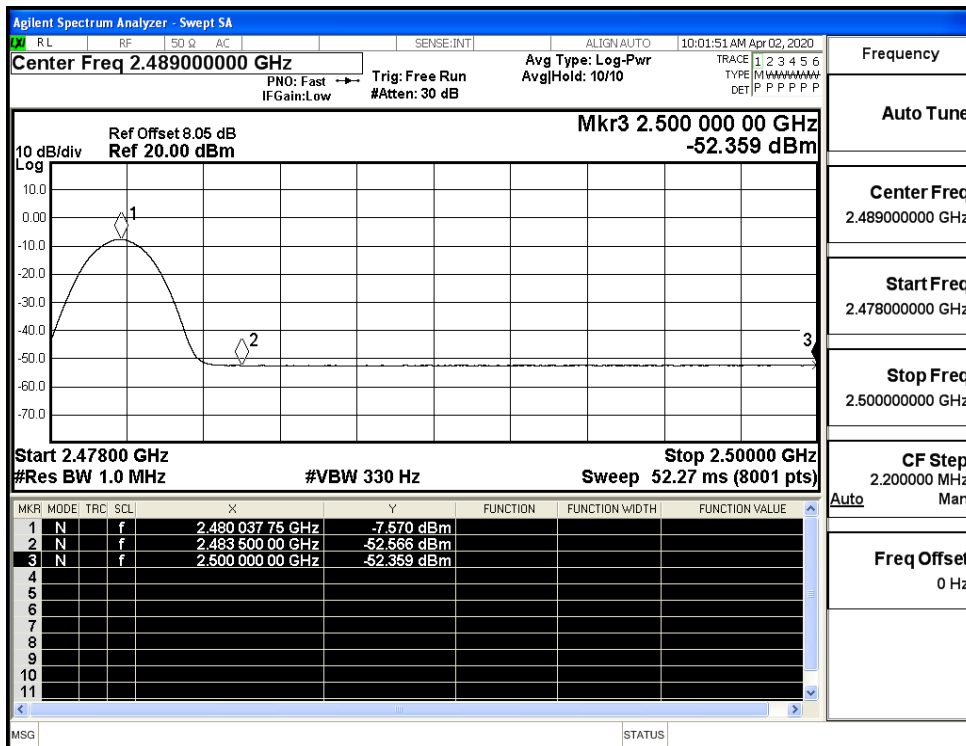
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)



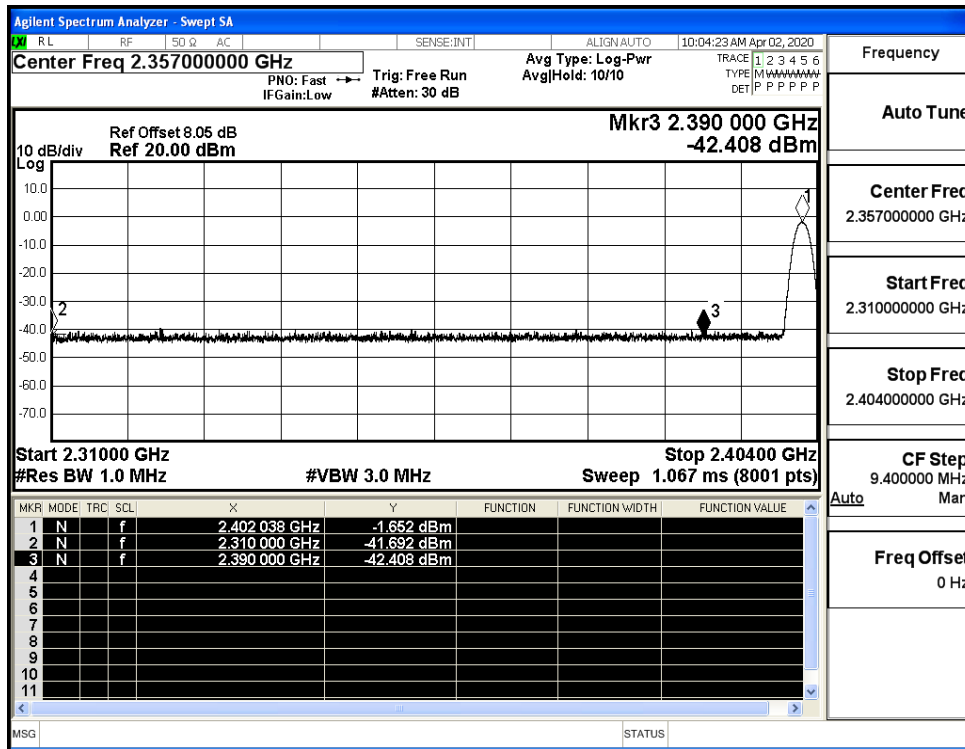
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



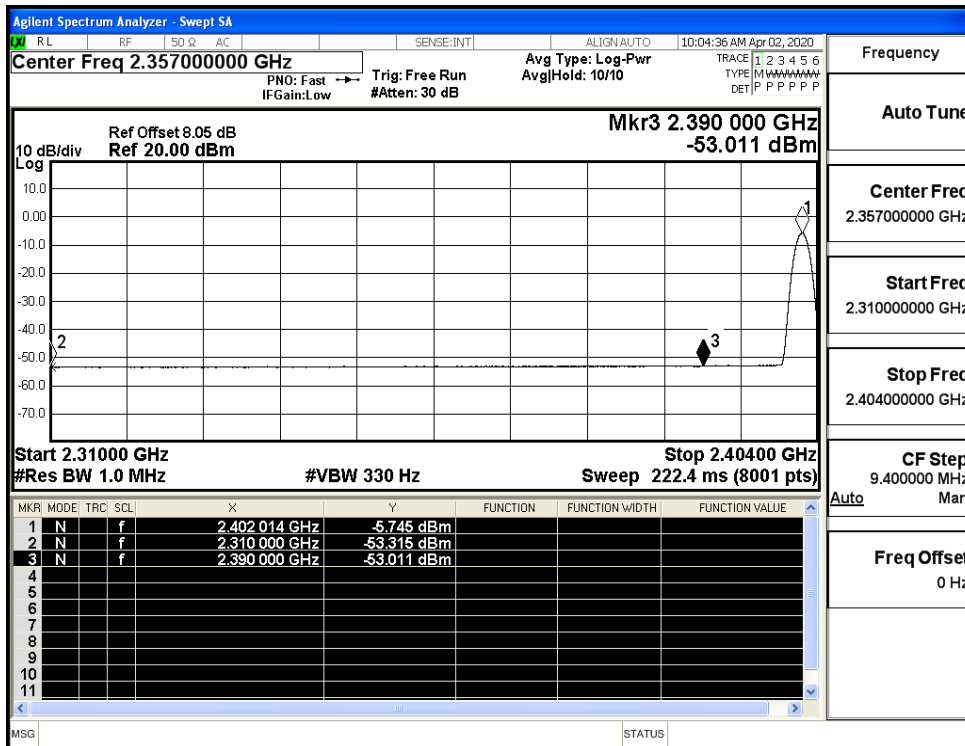
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



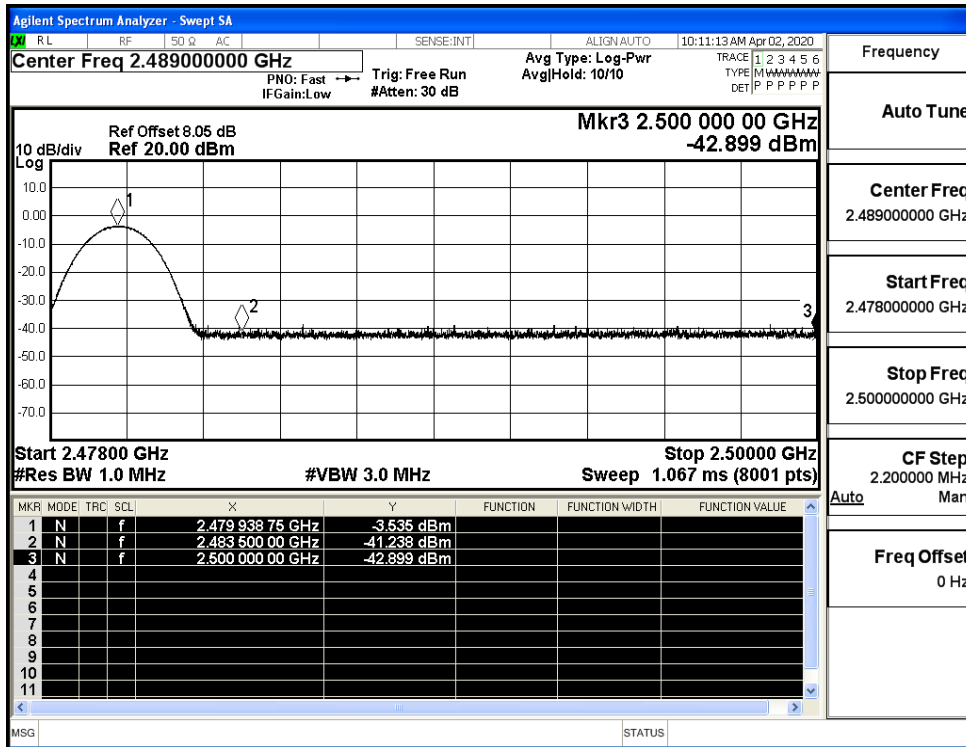
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

