

## Appendix A

### RF Test Data for BT V5.1(BDR/EDR) (Conducted Measurement)

Product Name: Wireless Earbuds

Trade Mark: N/A

Test Model: XO-10028

#### Environmental Conditions

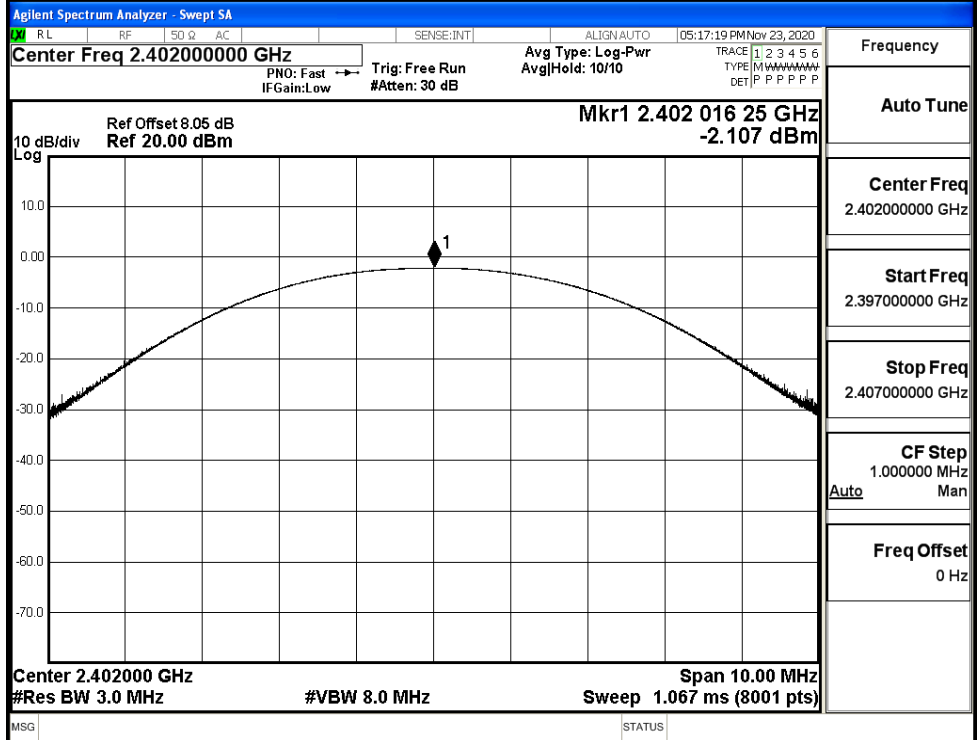
Temperature:	23.3° C
Relative Humidity:	53.7%
ATM Pressure:	100.0 kPa
Test Engineer:	Dancy Chen
Supervised by:	Li Huan

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

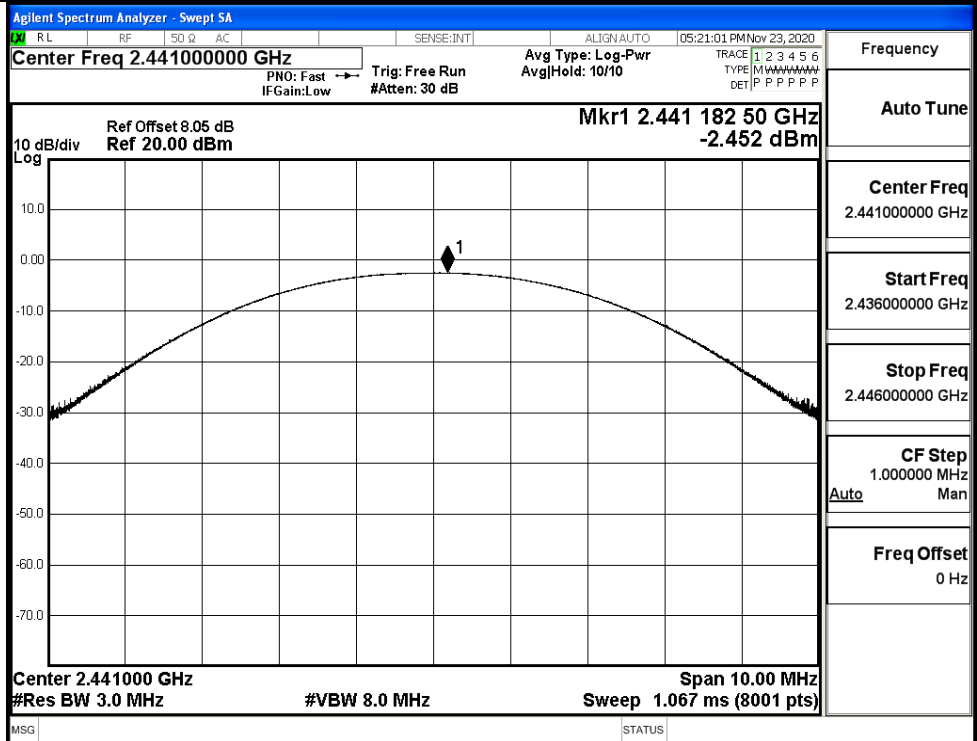
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-2.107	21	PASS
	MCH	-2.452	21	PASS
	HCH	-3.644	21	PASS
$\pi/4$ DQPSK	LCH	-1.440	21	PASS
	MCH	-1.710	21	PASS
	HCH	-2.852	21	PASS

Test Graphs

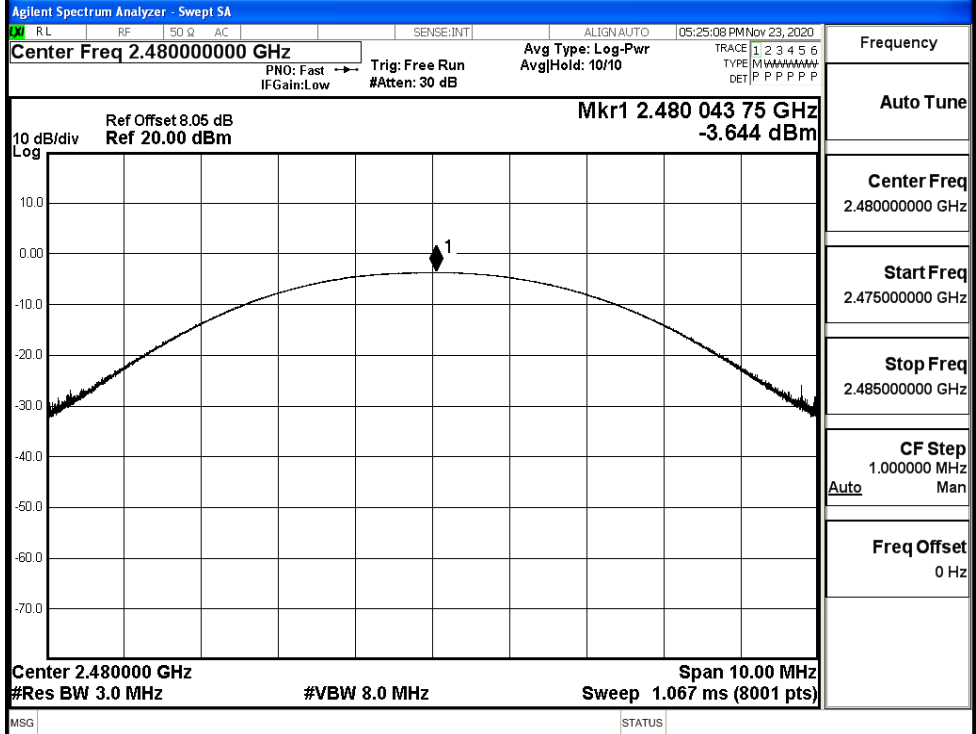
GFSK/LCH



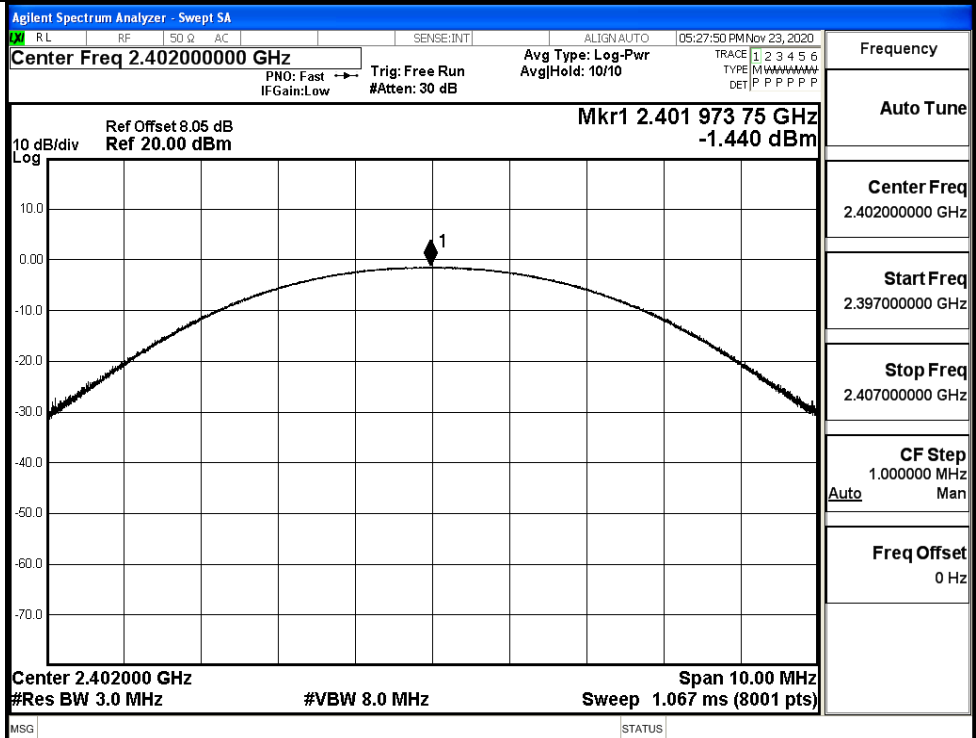
GFSK/MCH



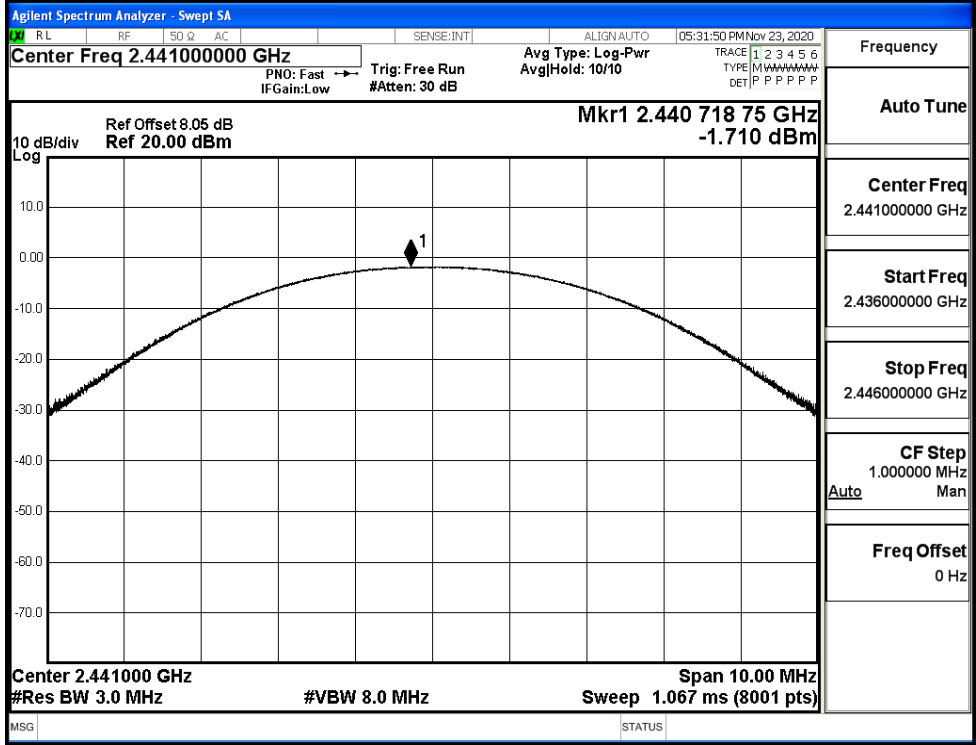
GFSK/HCH



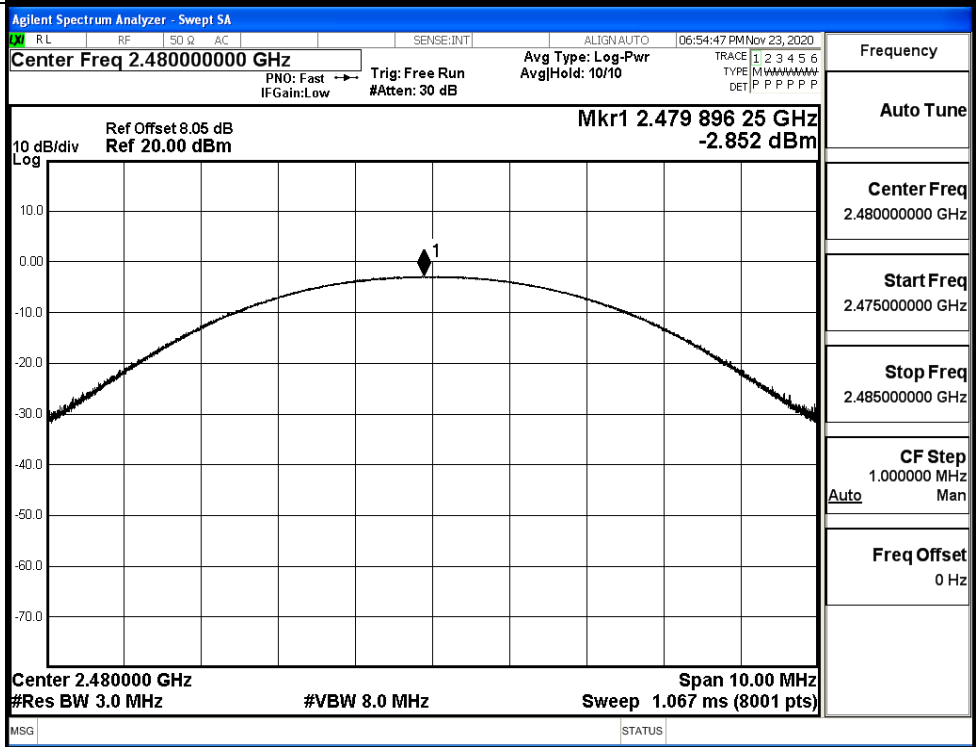
$\pi/4$ DQPSK/LCH



$\pi$ /4DQPSK/MCH

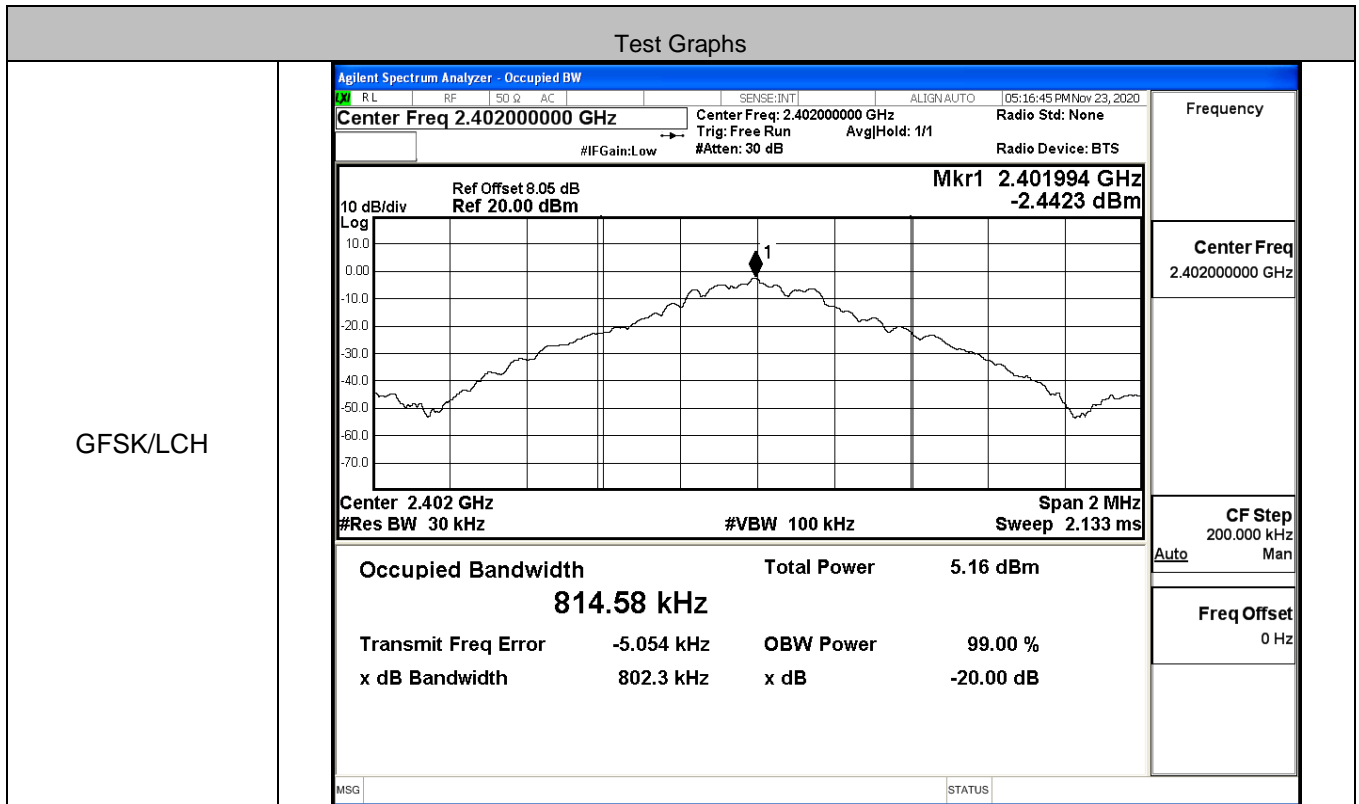


$\pi$ /4DQPSK/HCH

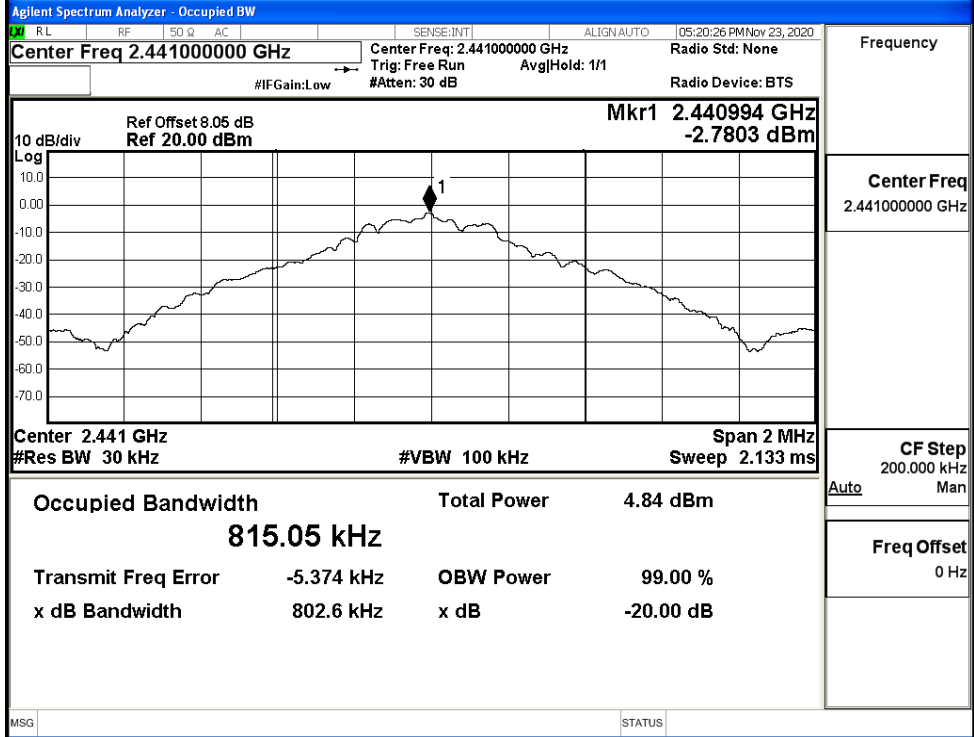


### A.2 20dB Bandwidth

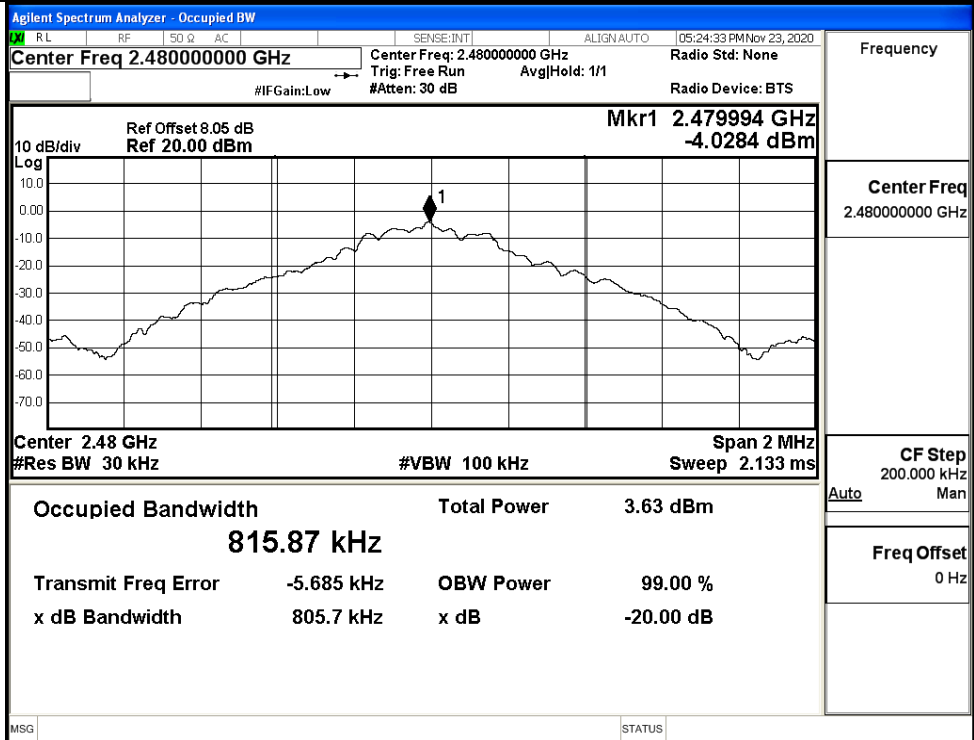
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.8023	Not Specified	PASS
	MCH	0.8026	Not Specified	PASS
	HCH	0.8057	Not Specified	PASS
π/4DQPSK	LCH	1.245	Not Specified	PASS
	MCH	1.241	Not Specified	PASS
	HCH	1.247	Not Specified	PASS



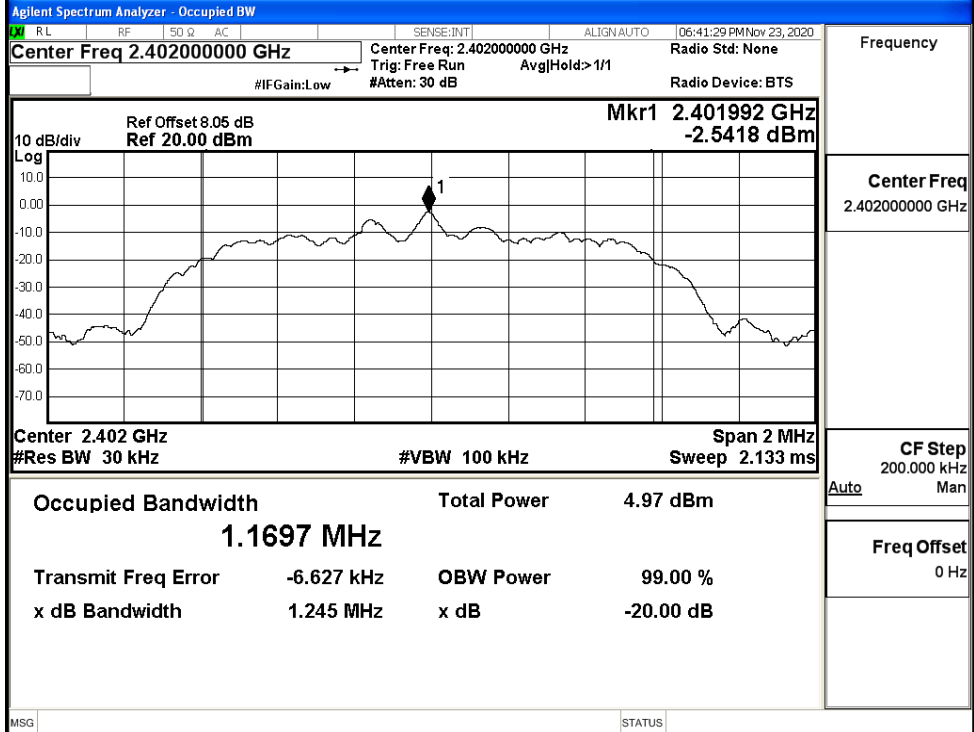
GFSK/MCH



GFSK/HCH

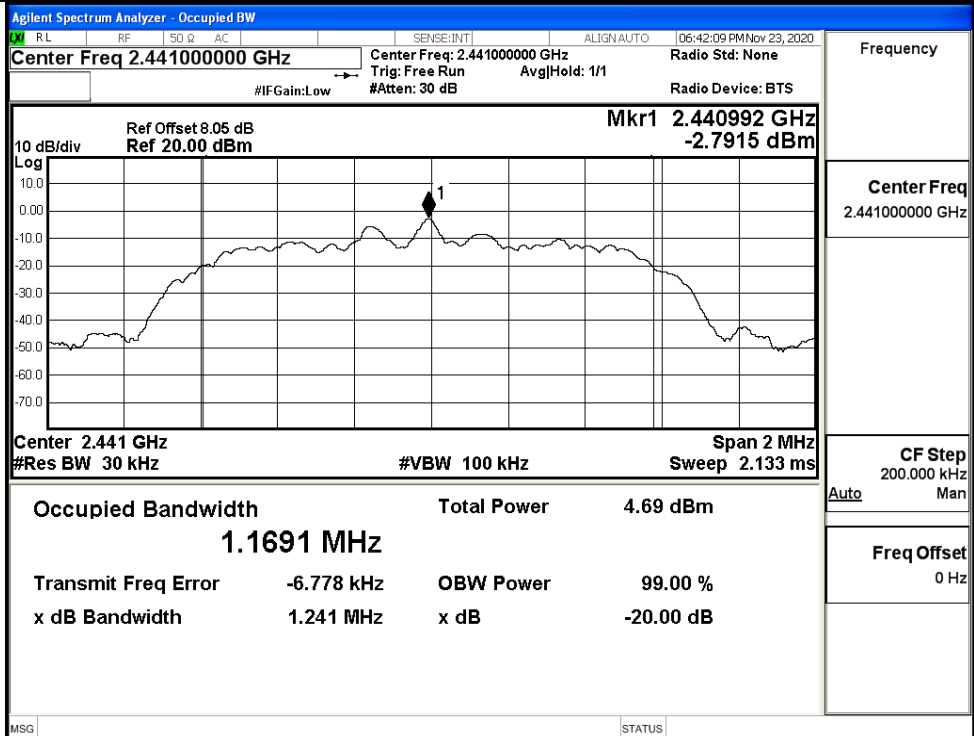


$\pi/4$ DQPSK/LCH



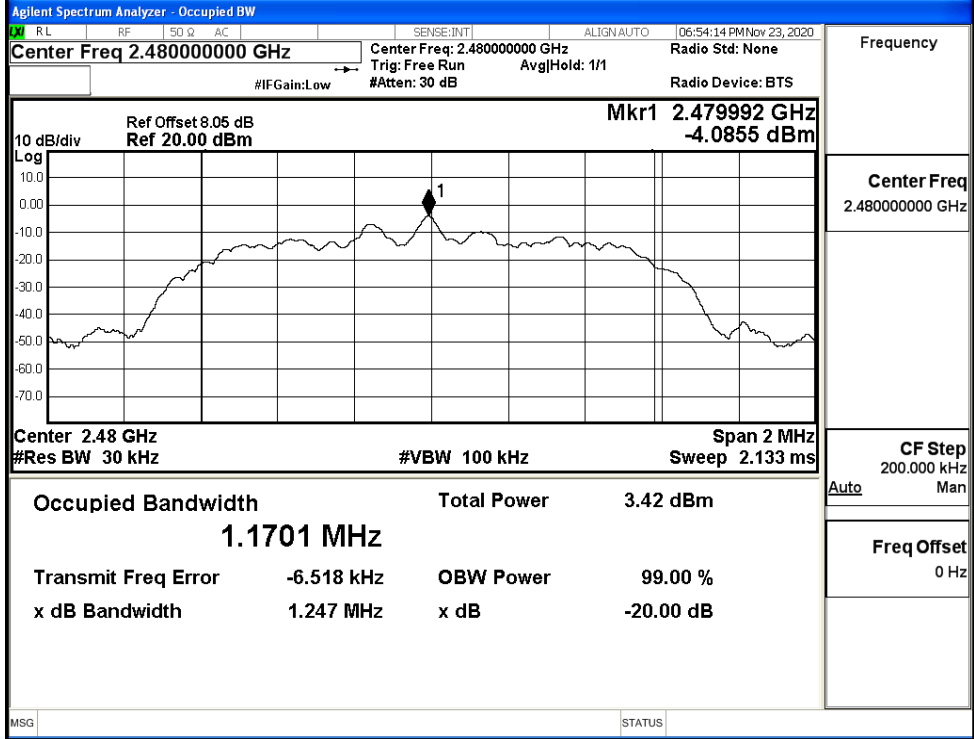
Frequency	2.40200000 GHz
Center Freq	2.40200000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK/MCH



Frequency	2.44100000 GHz
Center Freq	2.44100000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

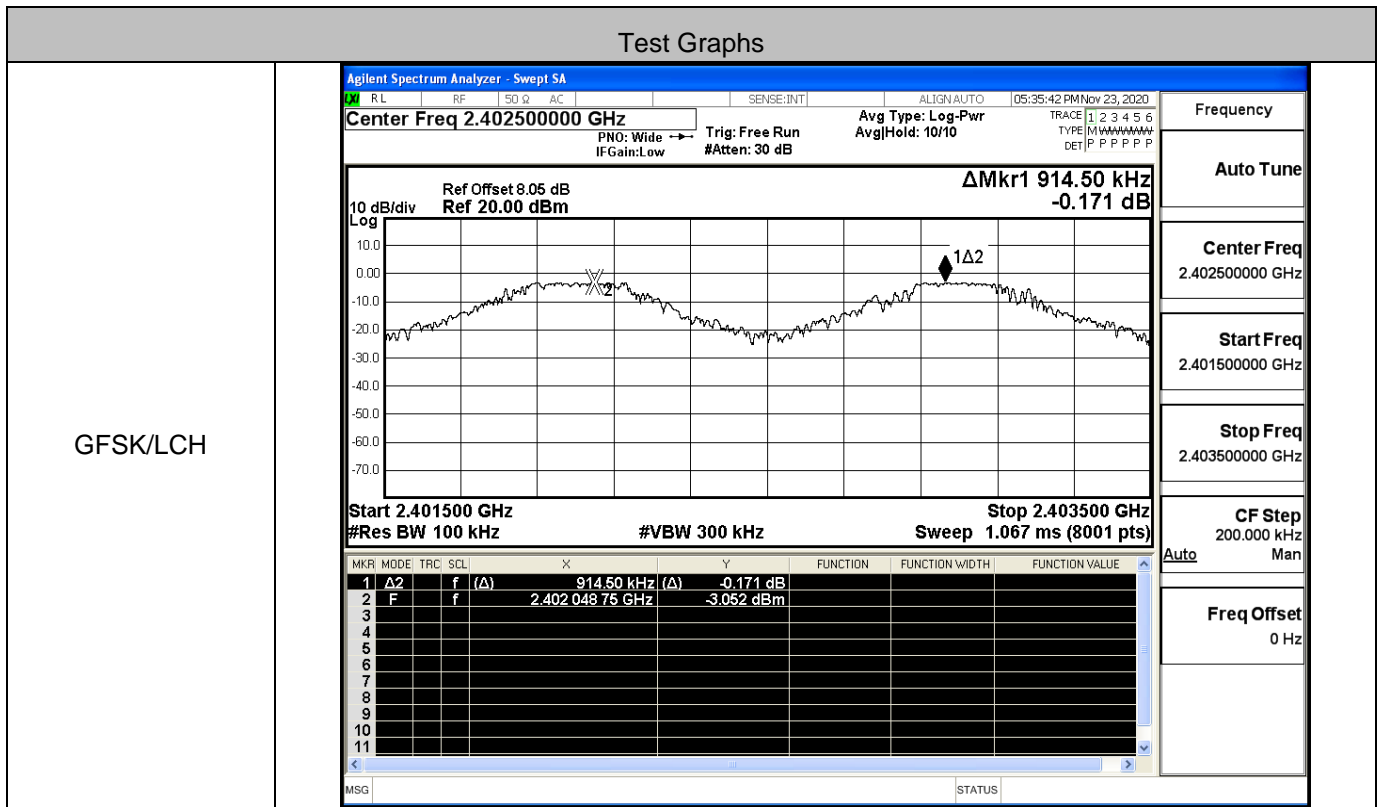
$\pi/4$ DQPSK/HCH



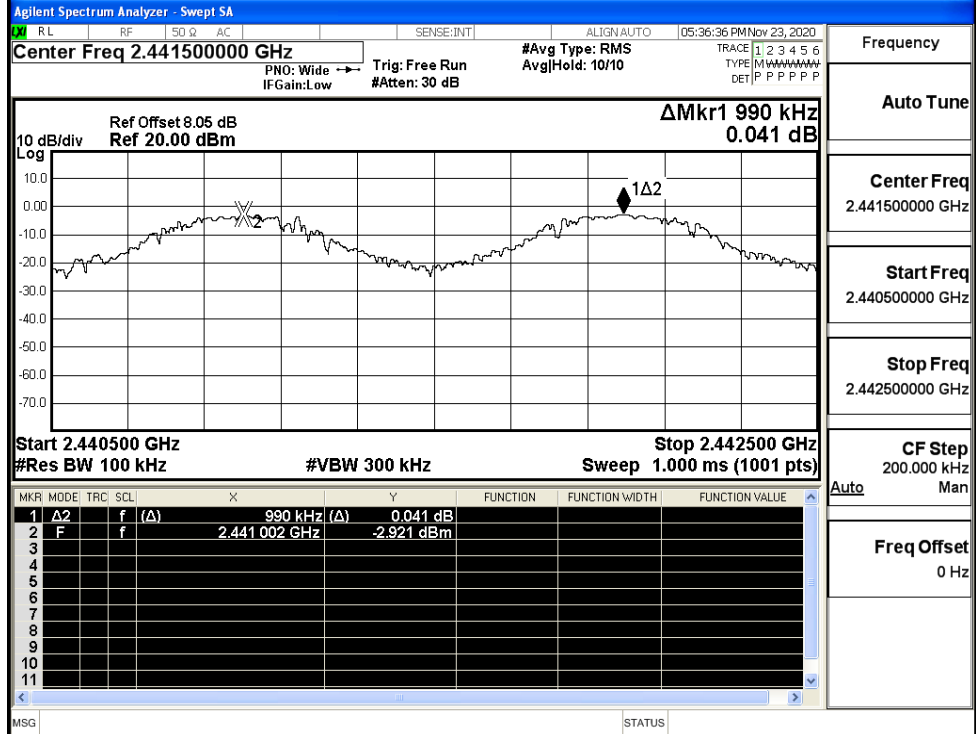


### A.3 Carrier Frequency Separation

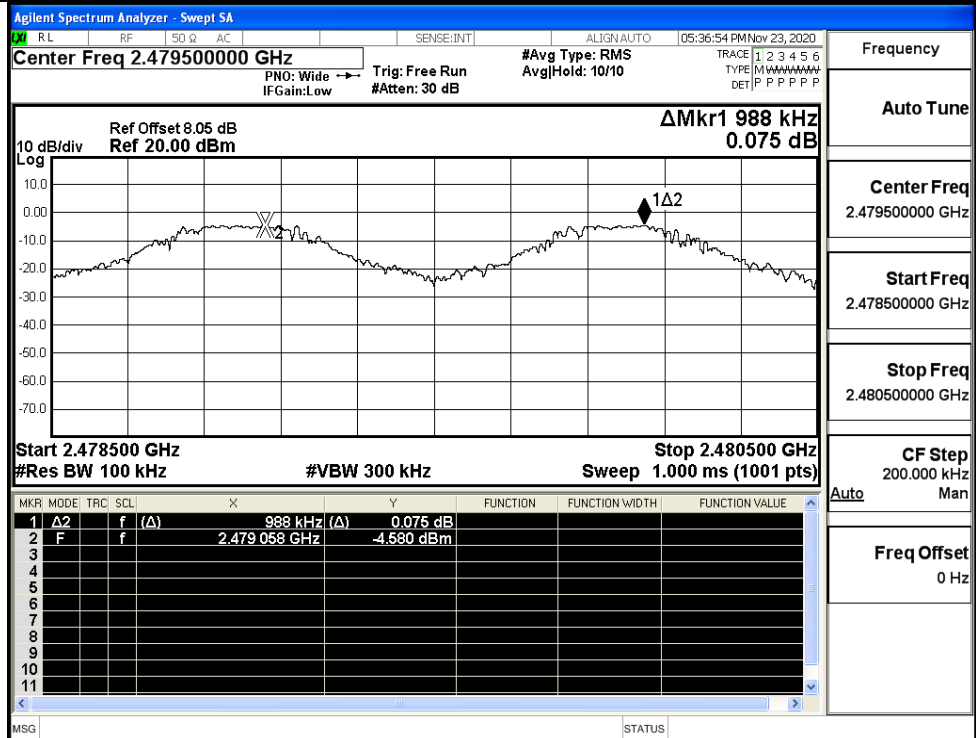
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.914	0.537	PASS
	MCH	0.990	0.537	PASS
	HCH	0.988	0.537	PASS
π/4DQPSK	LCH	1.088	0.831	PASS
	MCH	1.146	0.831	PASS
	HCH	1.184	0.831	PASS



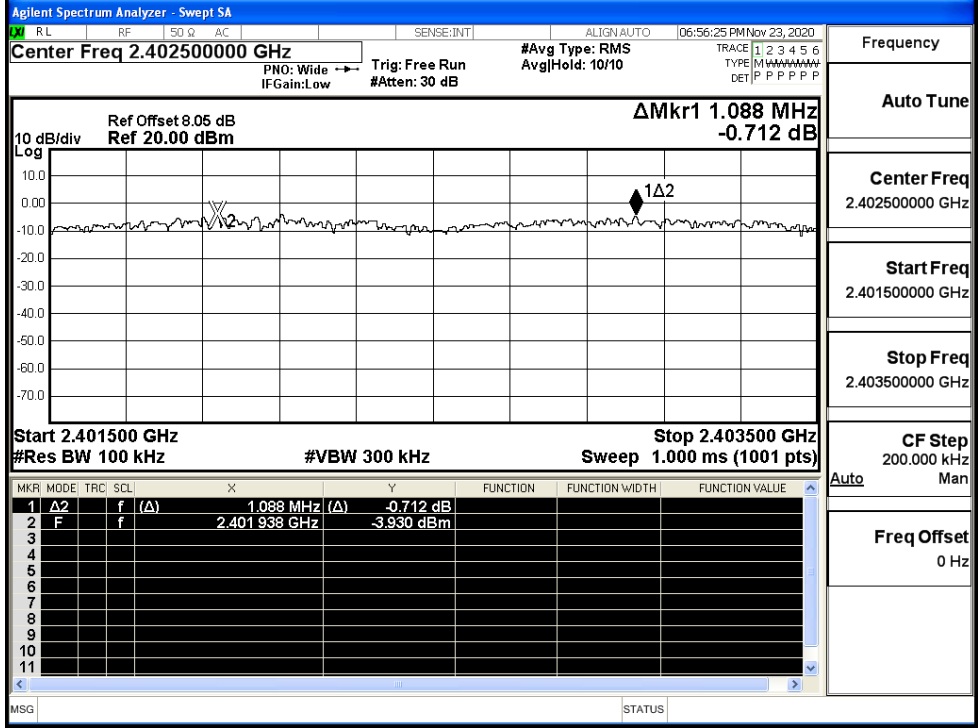
GFSK/MCH



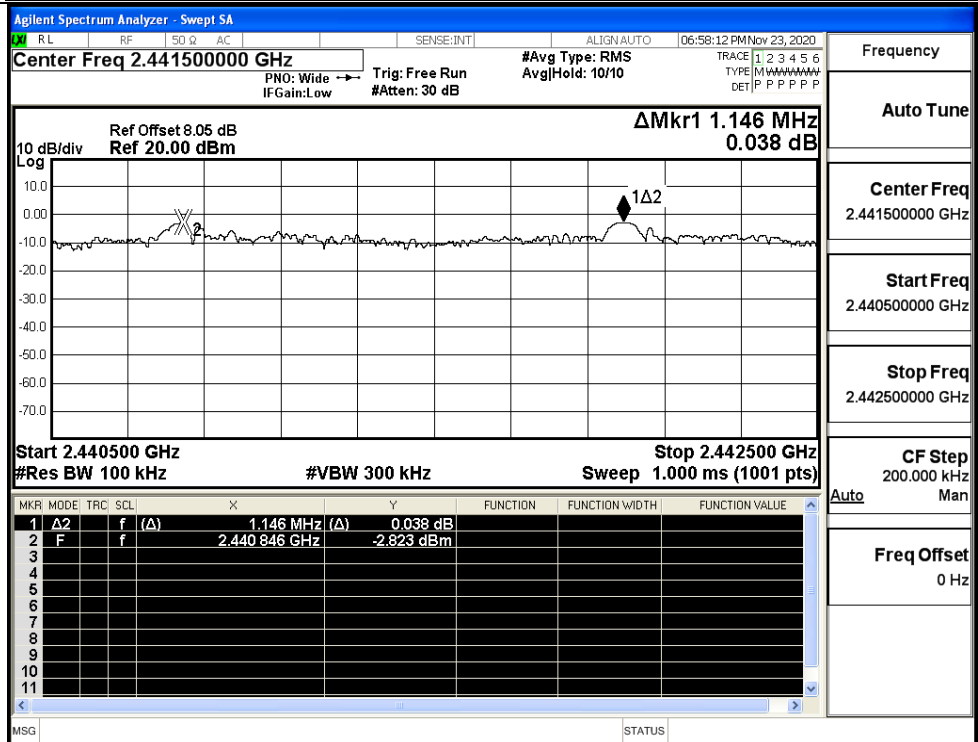
GFSK/HCH



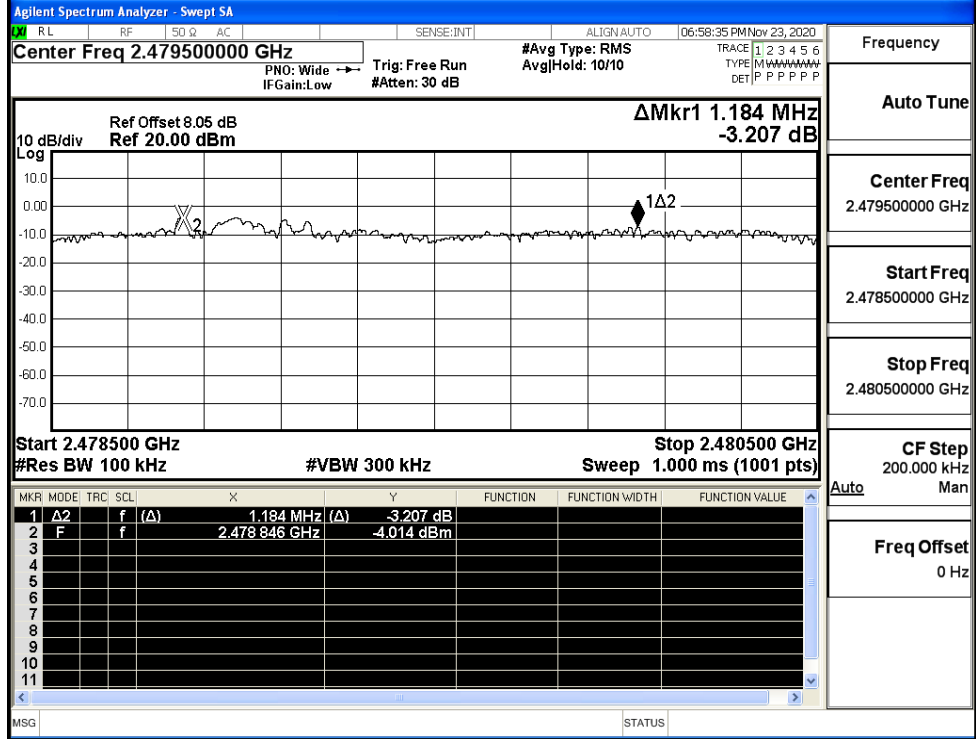
$\pi/4$ DQPSK/LCH



$\pi/4$ 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  
Auto Man

Freq Offset  
0 Hz

### A.4 Hopping Channel Number

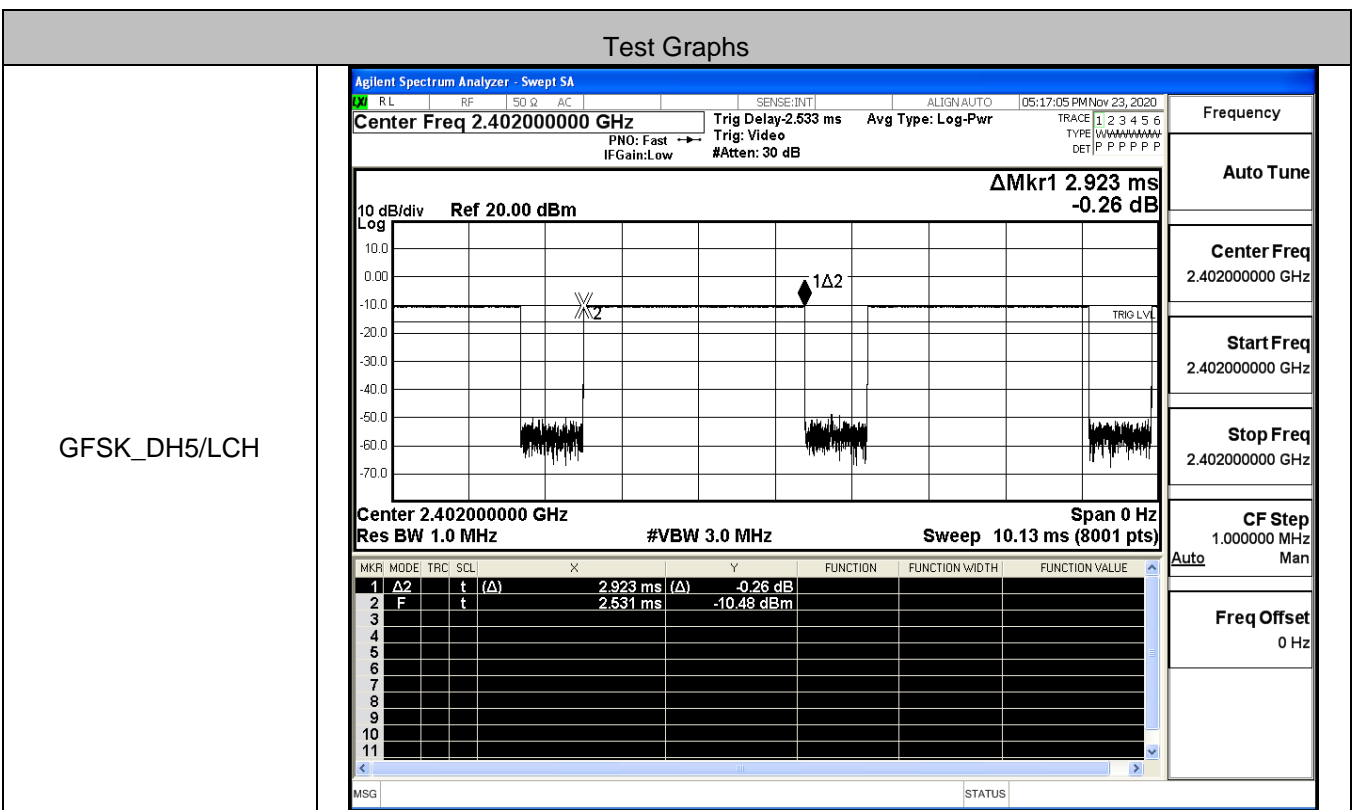
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
$\pi/4$ DQPSK	Hop	79	>=15	PASS

#### Test Graphs

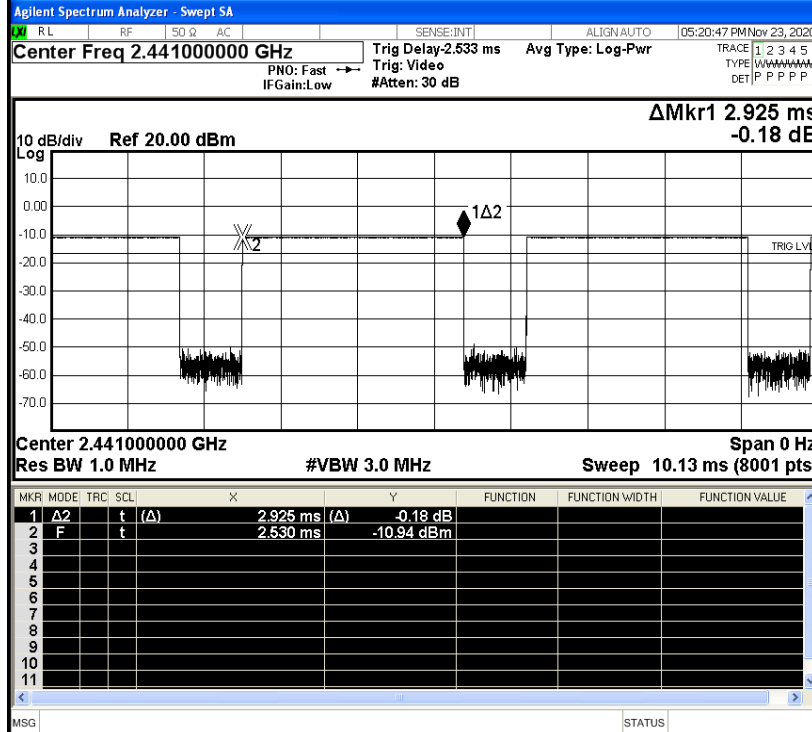
<p>GFSK/Hop</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.441750000 GHz</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm</p> <p><math>\Delta</math>Mkr1 77.770 MHz -2.055 dB</p> <p>Start 2.40000 GHz #Res BW 100 kHz</p> <p>Stop 2.48350 GHz #VBW 300 kHz Sweep 8.000 ms (8001 pts)</p> <table border="1"> <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><math>\Delta</math>2</td> <td>f</td> <td>(<math>\Delta</math>)</td> <td>77.770 MHz (<math>\Delta</math>)</td> <td>-2.055 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.402140 GHz</td> <td>-2.621 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	$\Delta$ 2	f	( $\Delta$ )	77.770 MHz ( $\Delta$ )	-2.055 dB				2	F	f		2.402140 GHz	-2.621 dBm				<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.441750000 GHz</p> <p>Start Freq 2.400000000 GHz</p> <p>Stop Freq 2.483500000 GHz</p> <p>CF Step 8.350000 MHz</p> <p>Freq Offset 0 Hz</p>
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	$\Delta$ 2	f	( $\Delta$ )	77.770 MHz ( $\Delta$ )	-2.055 dB																								
2	F	f		2.402140 GHz	-2.621 dBm																								
<p><math>\pi/4</math>DQPSK/Hop</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.441750000 GHz</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm</p> <p><math>\Delta</math>Mkr1 77.864 MHz -1.574 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><math>\Delta</math>2</td> <td>f</td> <td>(<math>\Delta</math>)</td> <td>77.864 MHz (<math>\Delta</math>)</td> <td>-1.574 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.401994 GHz</td> <td>-2.430 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	$\Delta$ 2	f	( $\Delta$ )	77.864 MHz ( $\Delta$ )	-1.574 dB				2	F	f		2.401994 GHz	-2.430 dBm				<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.441750000 GHz</p> <p>Start Freq 2.400000000 GHz</p> <p>Stop Freq 2.483500000 GHz</p> <p>CF Step 8.350000 MHz</p> <p>Freq Offset 0 Hz</p>
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	$\Delta$ 2	f	( $\Delta$ )	77.864 MHz ( $\Delta$ )	-1.574 dB																								
2	F	f		2.401994 GHz	-2.430 dBm																								

**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	2.92	106.7	0.312	0.4	PASS
	DH5	MCH	2.92	106.7	0.312	0.4	PASS
	DH5	HCH	2.92	106.7	0.312	0.4	PASS
π/4DQPSK	2DH5	LCH	2.92	106.7	0.313	0.4	PASS
	2DH5	MCH	2.92	106.7	0.313	0.4	PASS
	2DH5	HCH	2.92	106.7	0.313	0.4	PASS

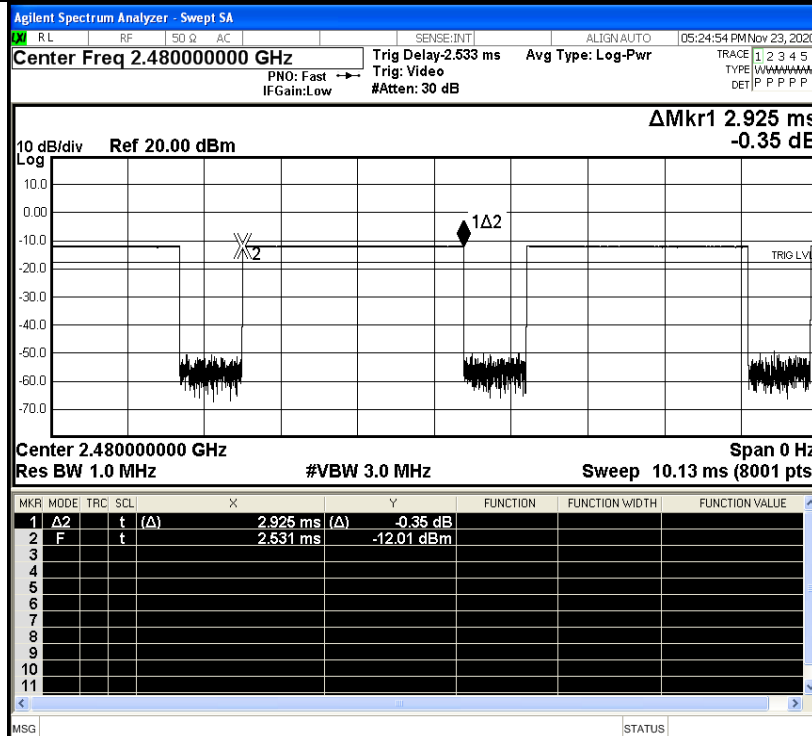


GFSK\_DH5/MCH



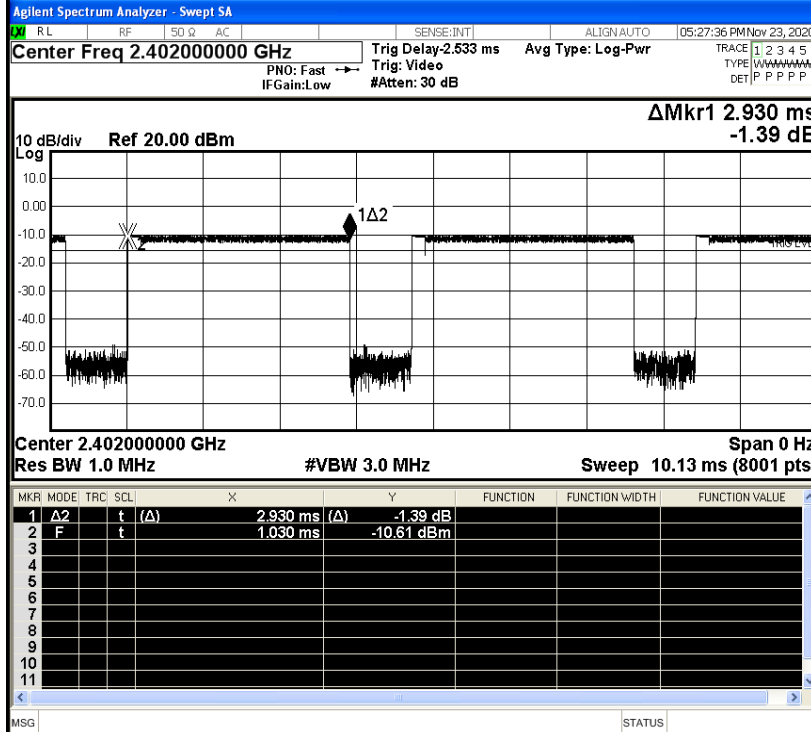
Frequency	
Auto Tune	
Center Freq	2.441000000 GHz
Start Freq	2.441000000 GHz
Stop Freq	2.441000000 GHz
CF Step	1.000000 MHz
Freq Offset	0 Hz

GFSK\_DH5/HCH



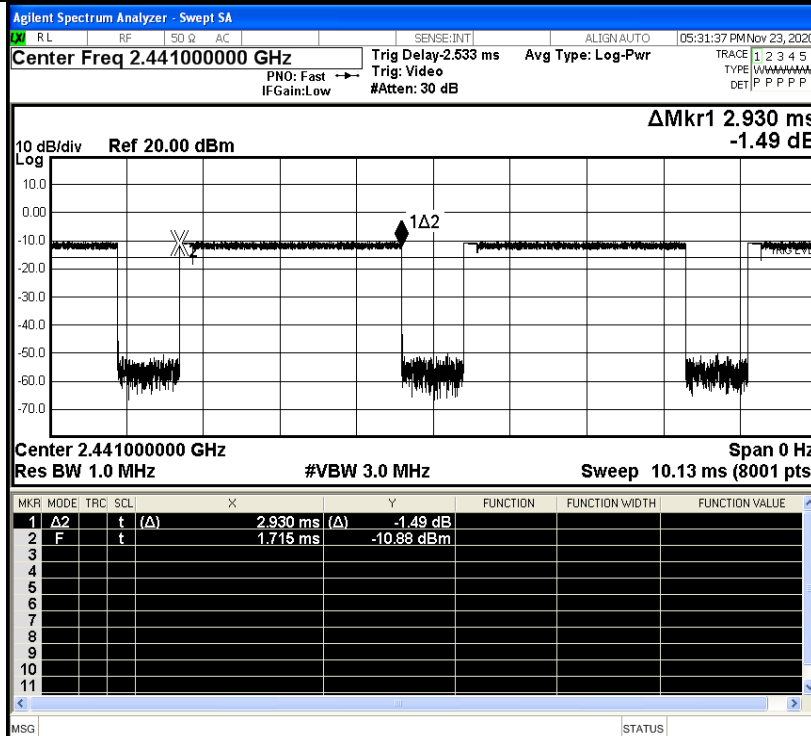
Frequency	
Auto Tune	
Center Freq	2.480000000 GHz
Start Freq	2.480000000 GHz
Stop Freq	2.480000000 GHz
CF Step	1.000000 MHz
Freq Offset	0 Hz

$\pi/4$ 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

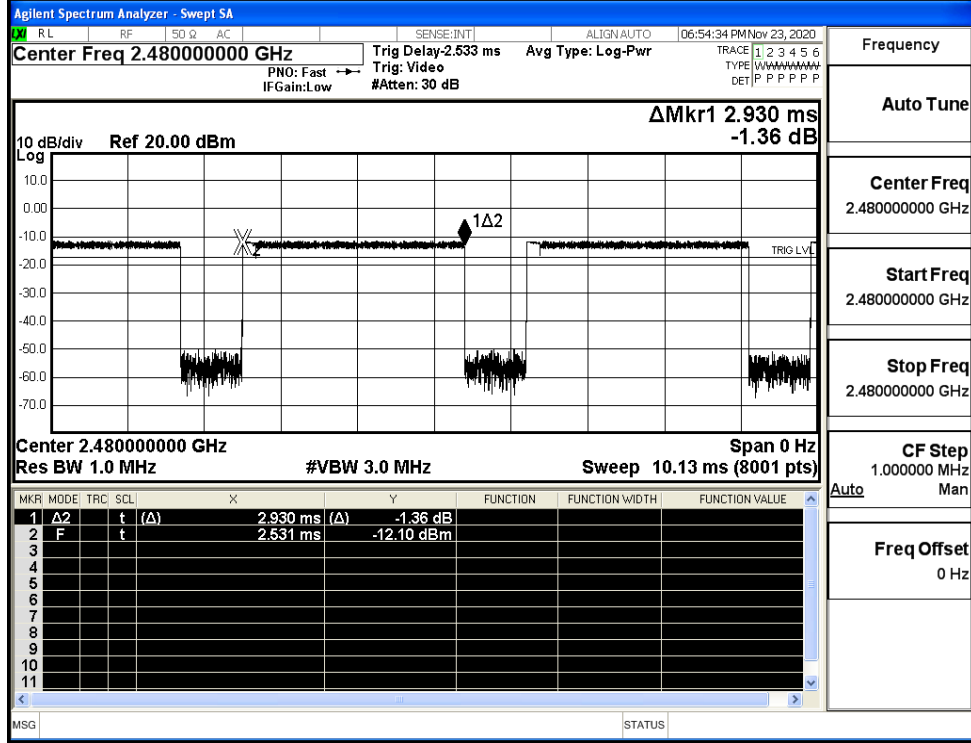
$\pi/4$ DQPSK  
\_2DH5/MCH



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



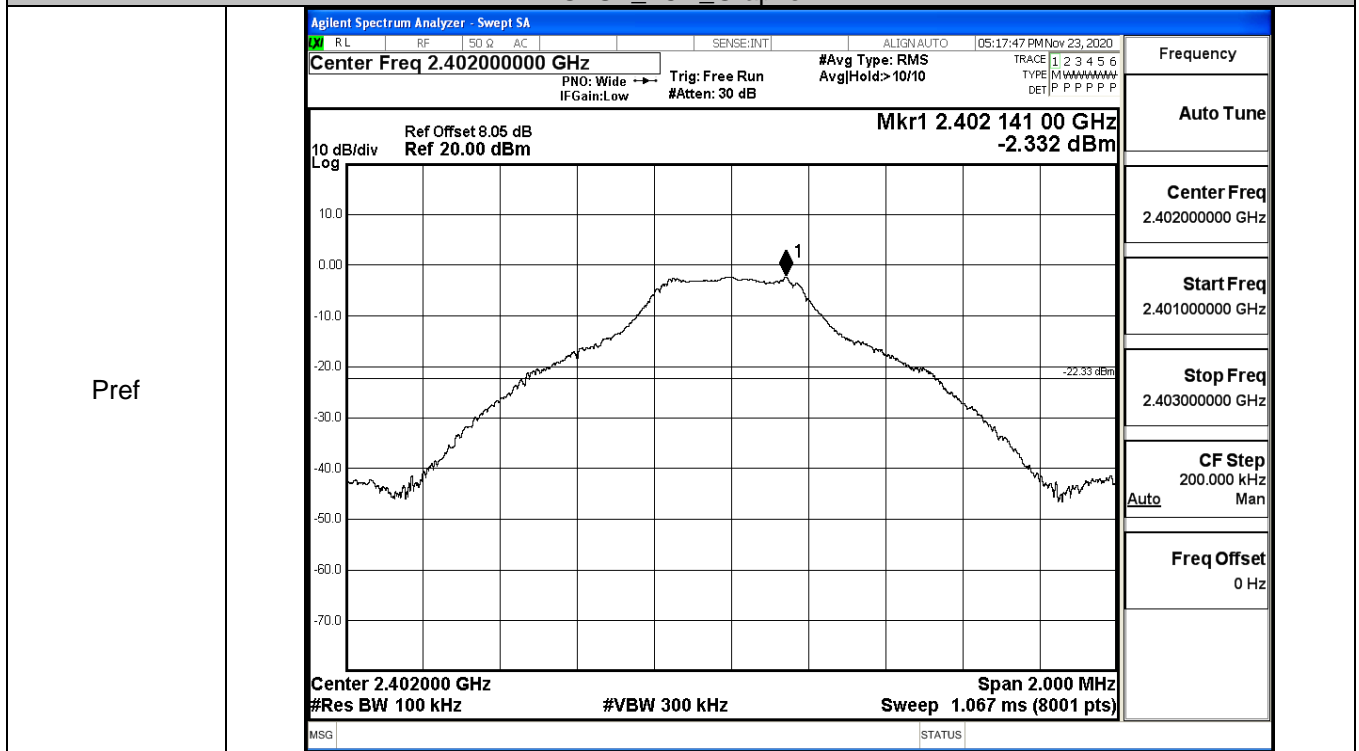
$\pi/4$ DQPSK  
\_2DH5/HCH

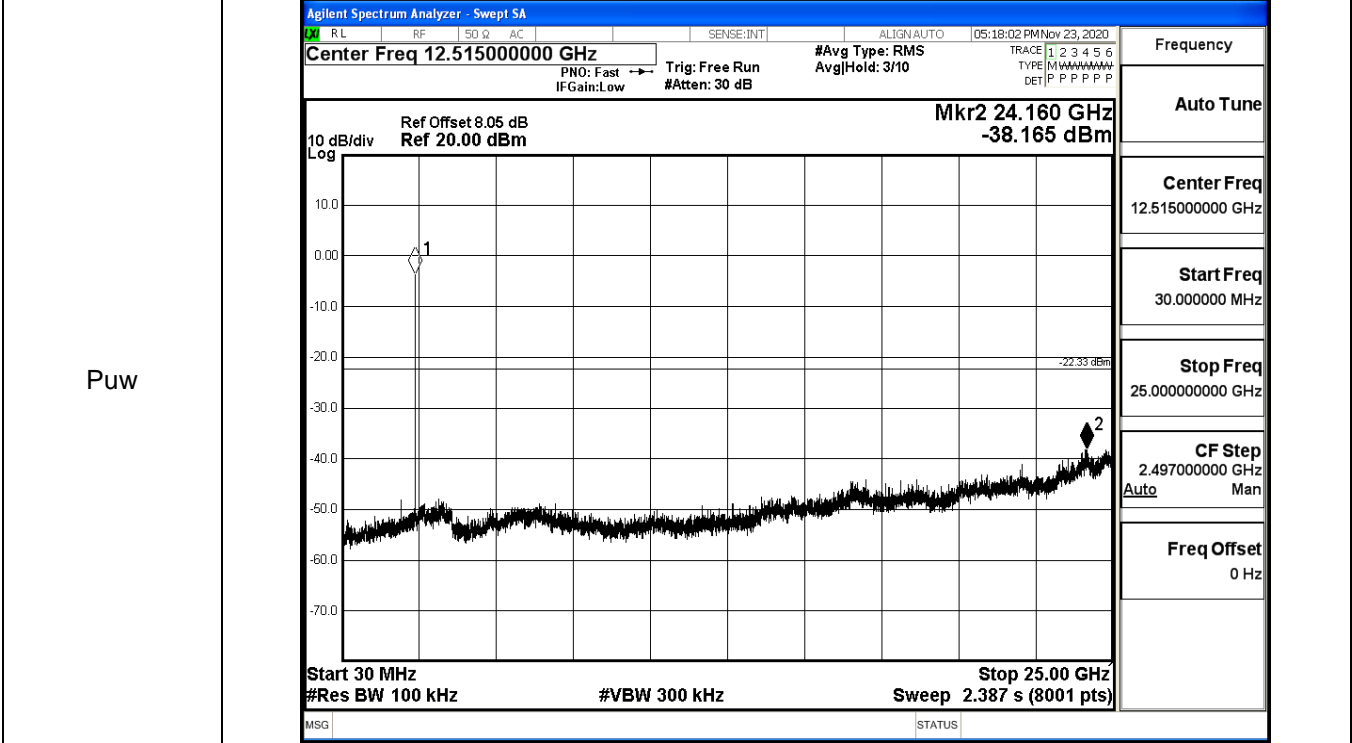


### A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-2.332	-38.165	-22.332	PASS
	MCH	-2.729	-38.612	-22.729	PASS
	HCH	-3.971	-37.931	-23.971	PASS
π/4DQPSK	LCH	-2.528	-38.627	-22.528	PASS
	MCH	-2.802	-37.781	-22.802	PASS
	HCH	-3.967	-37.297	-23.967	PASS

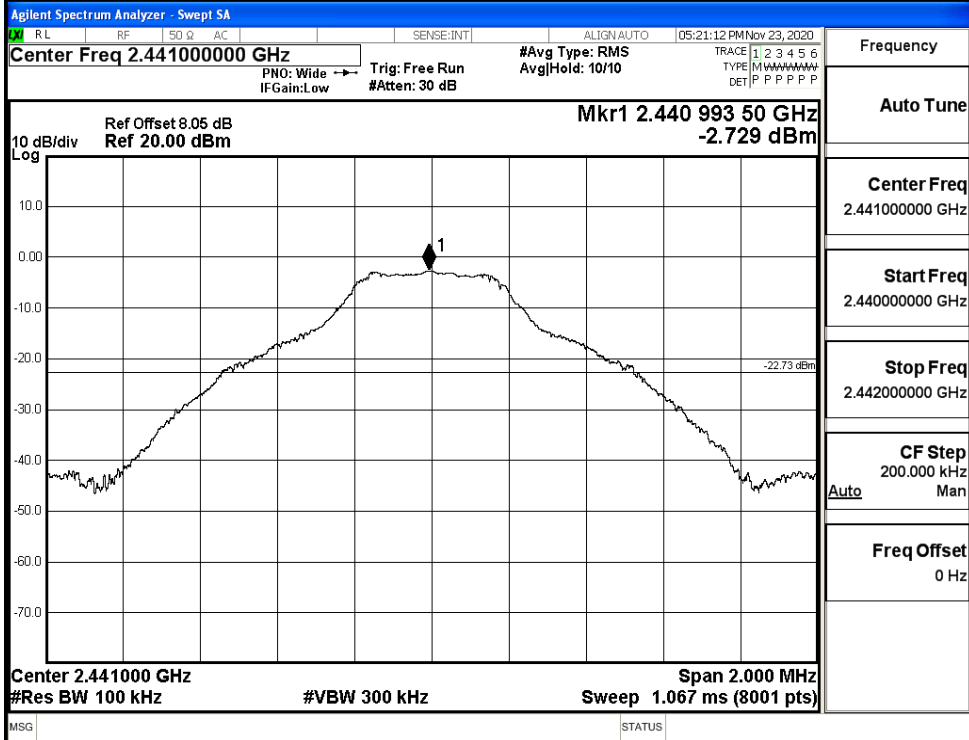
GFSK\_LCH\_Graphs



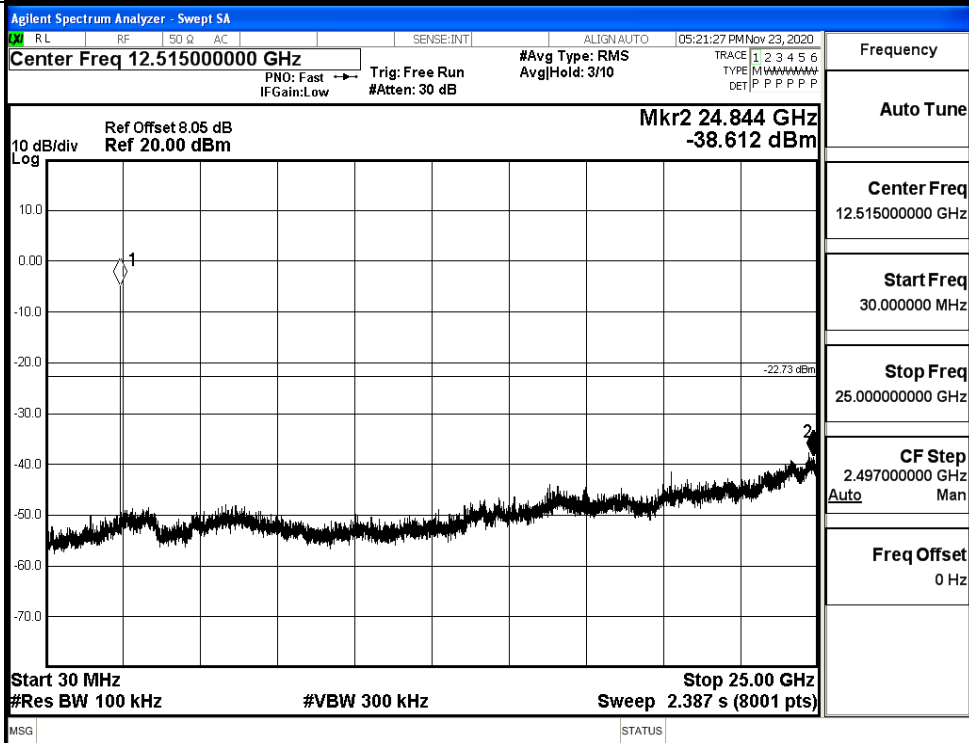


GFSK\_MCH\_Graphs

Pref

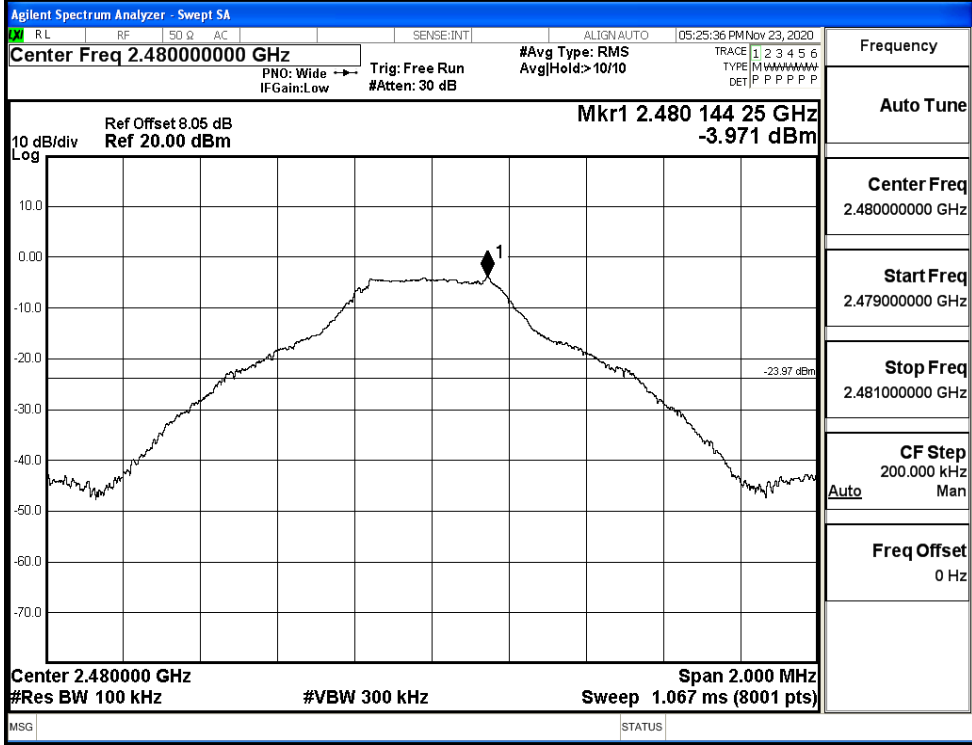


Puw

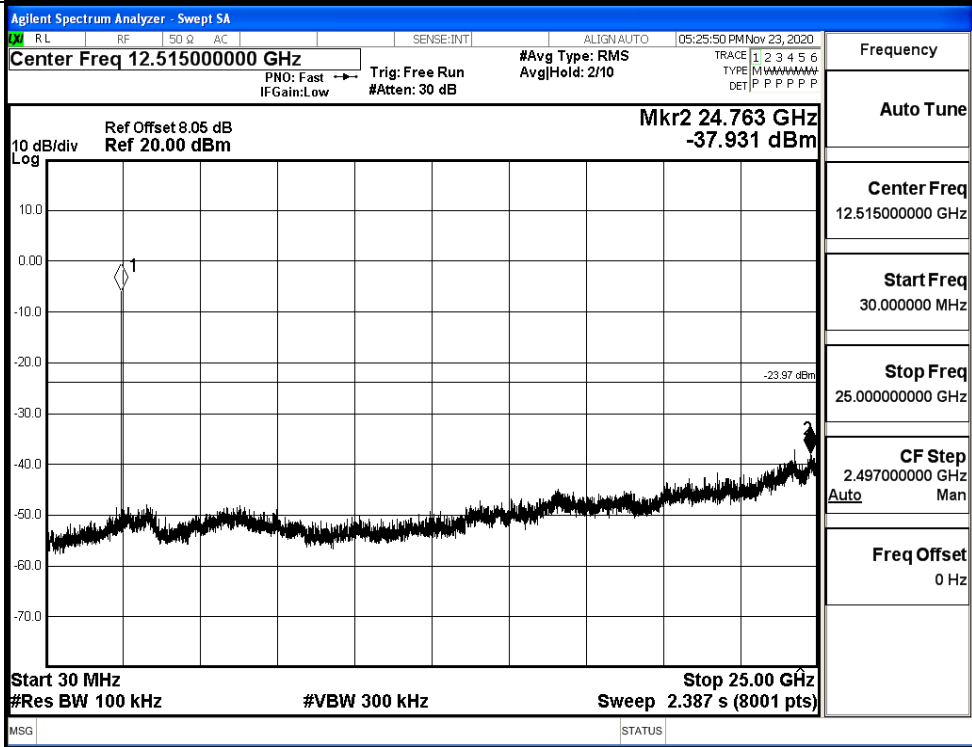


GFSK\_HCH\_Graphs

Pref

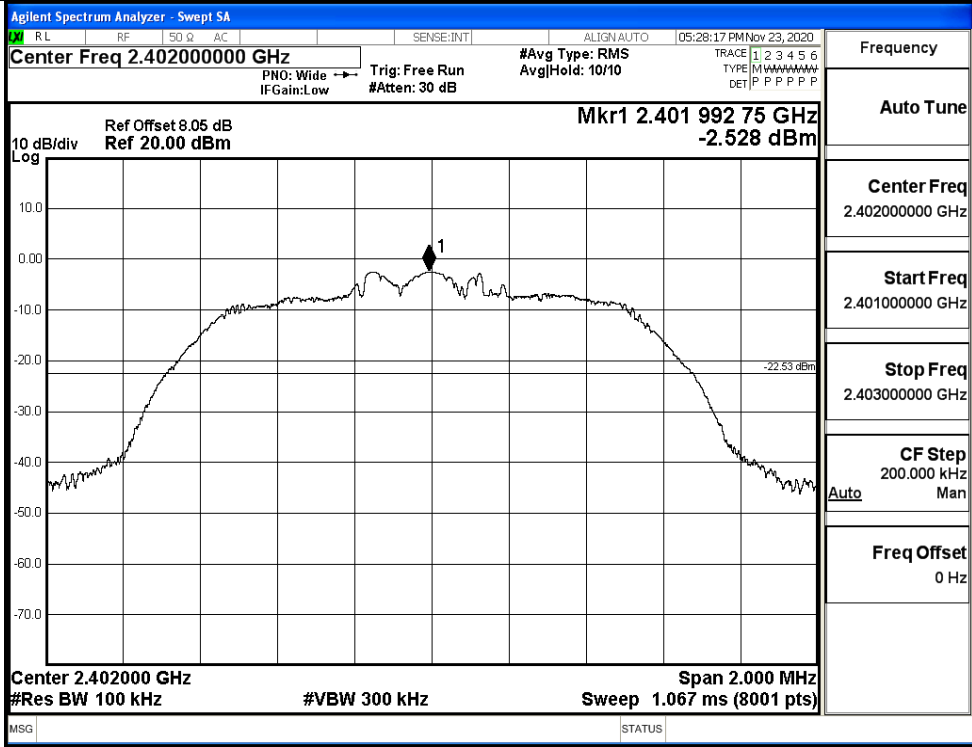


Puw

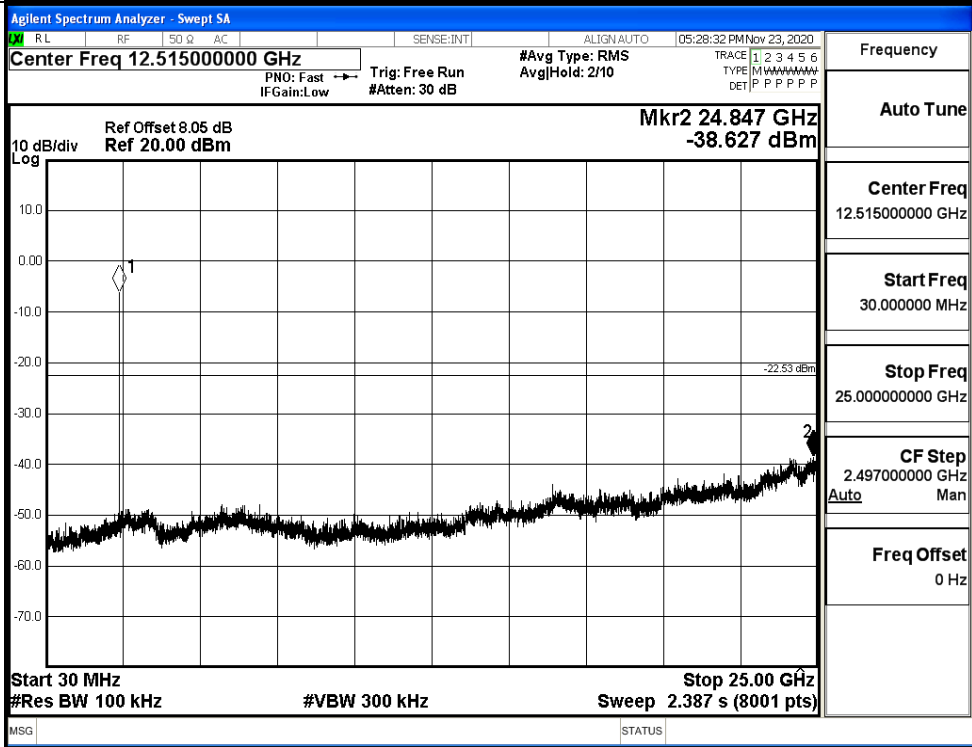


$\pi/4$ DQPSK LCH Graphs

Pref

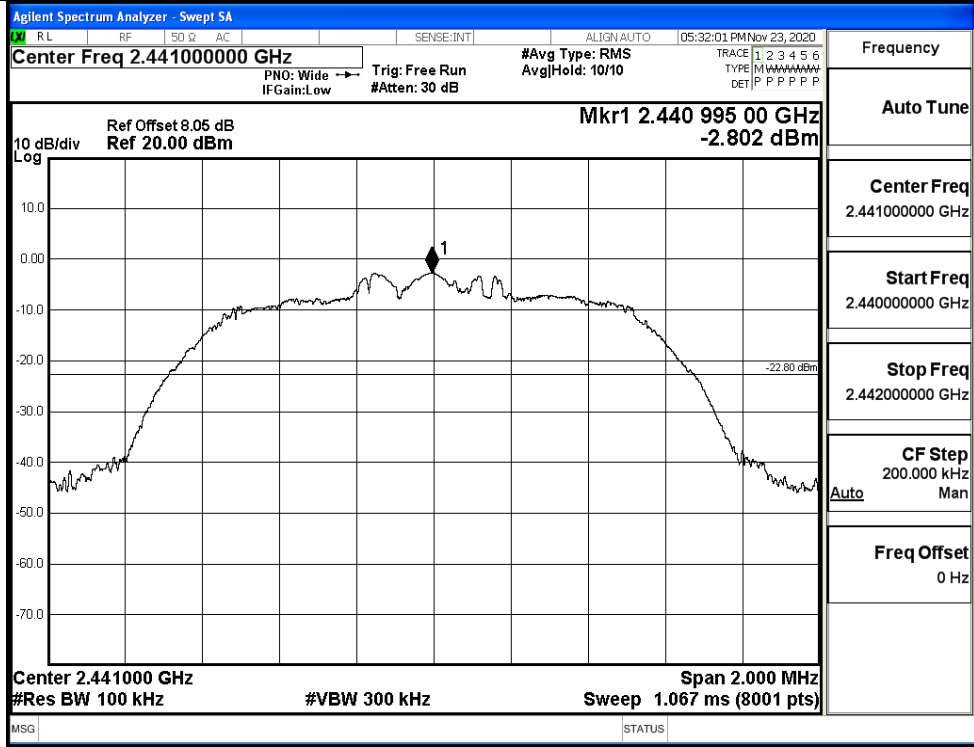


Puw

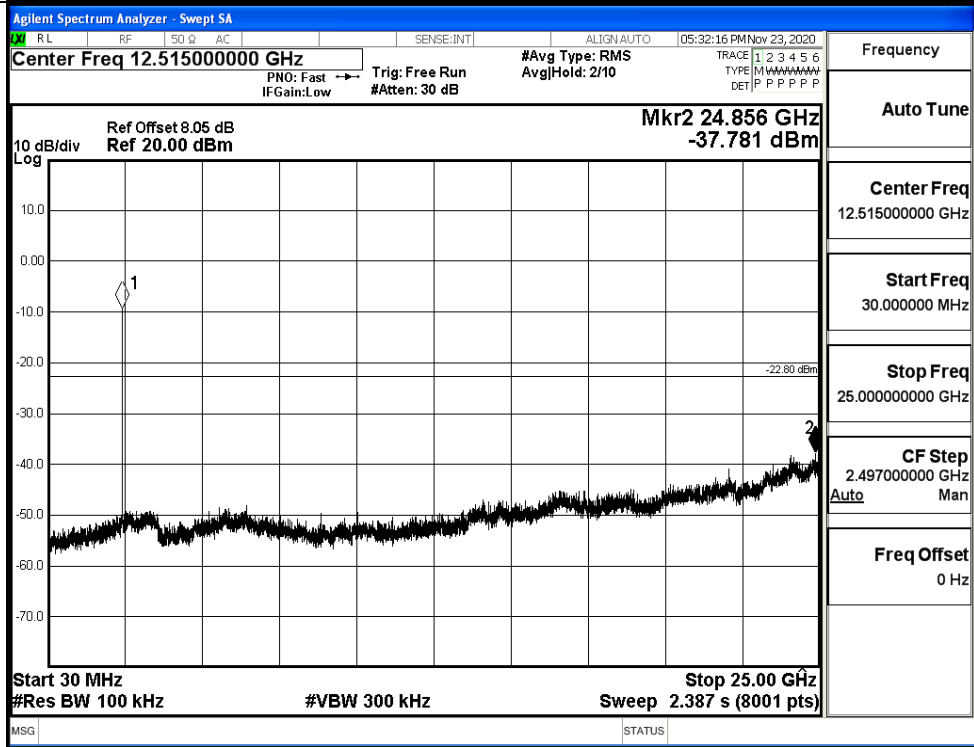


$\pi$ /4DQPSK MCH Graphs

Pref

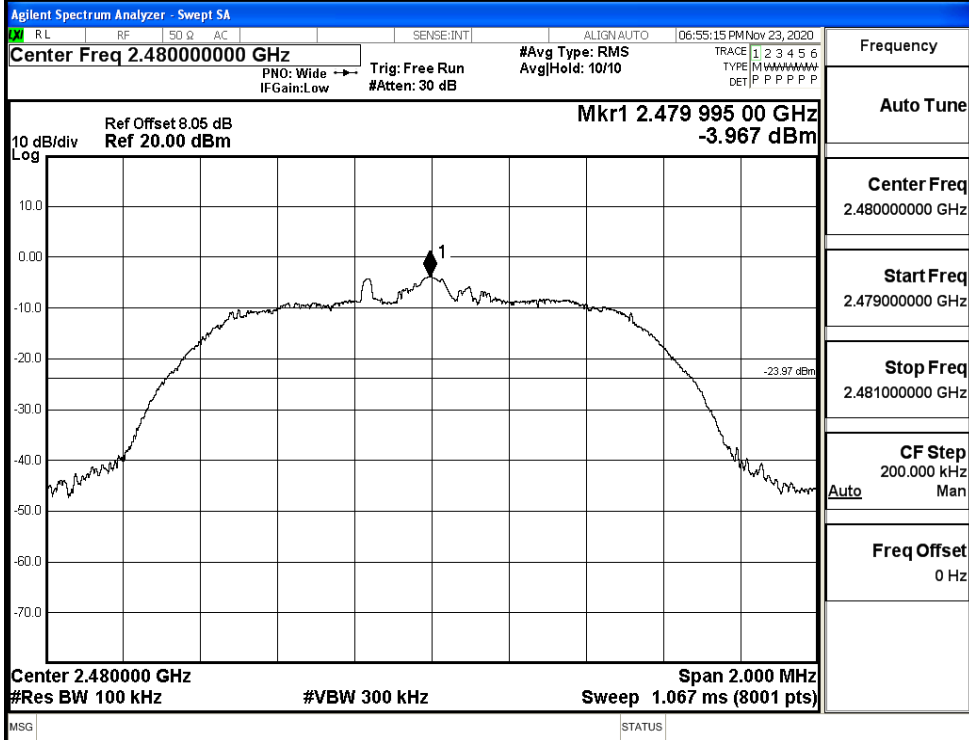


Puw

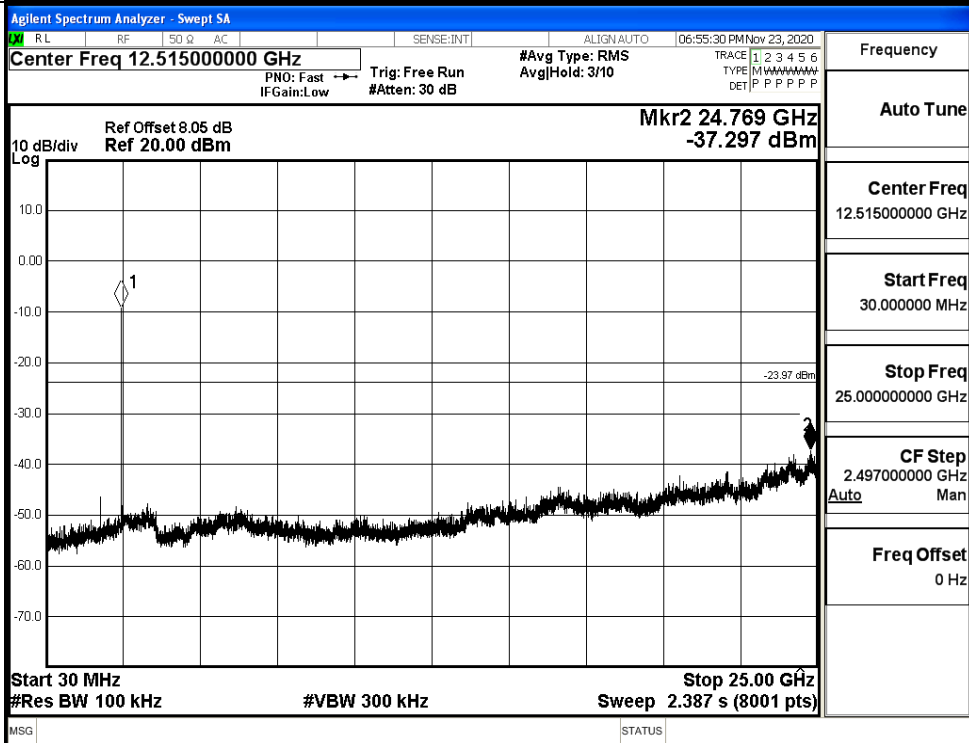


$\pi$ /4DQPSK\_HCH\_Graphs

Pref



Puw



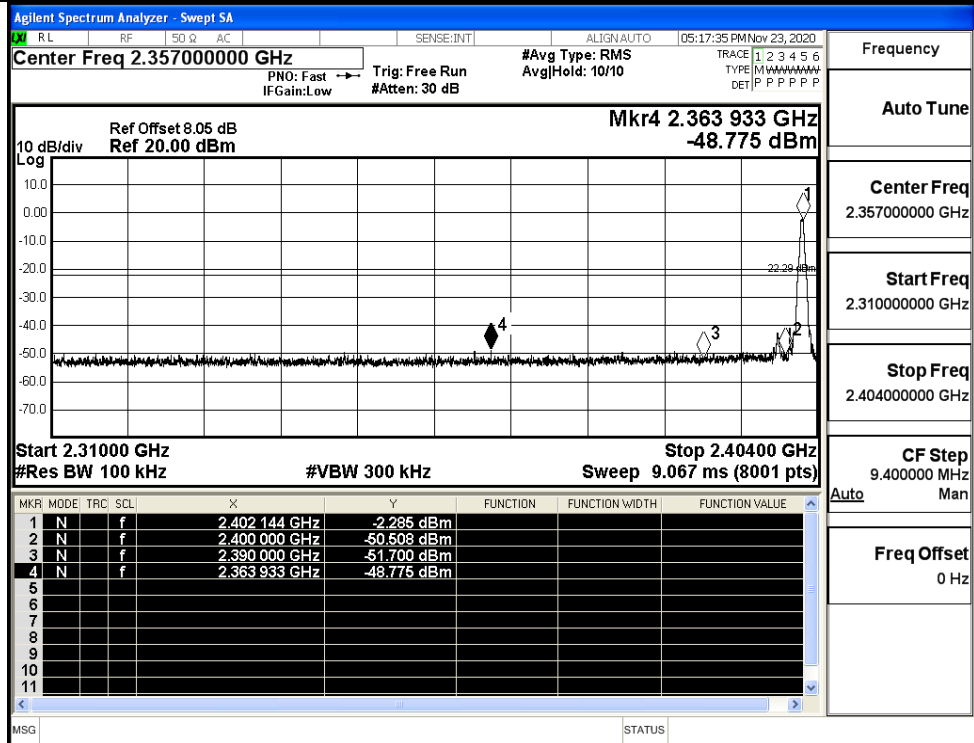


### A.7 Band-edge for RF Conducted Emissions

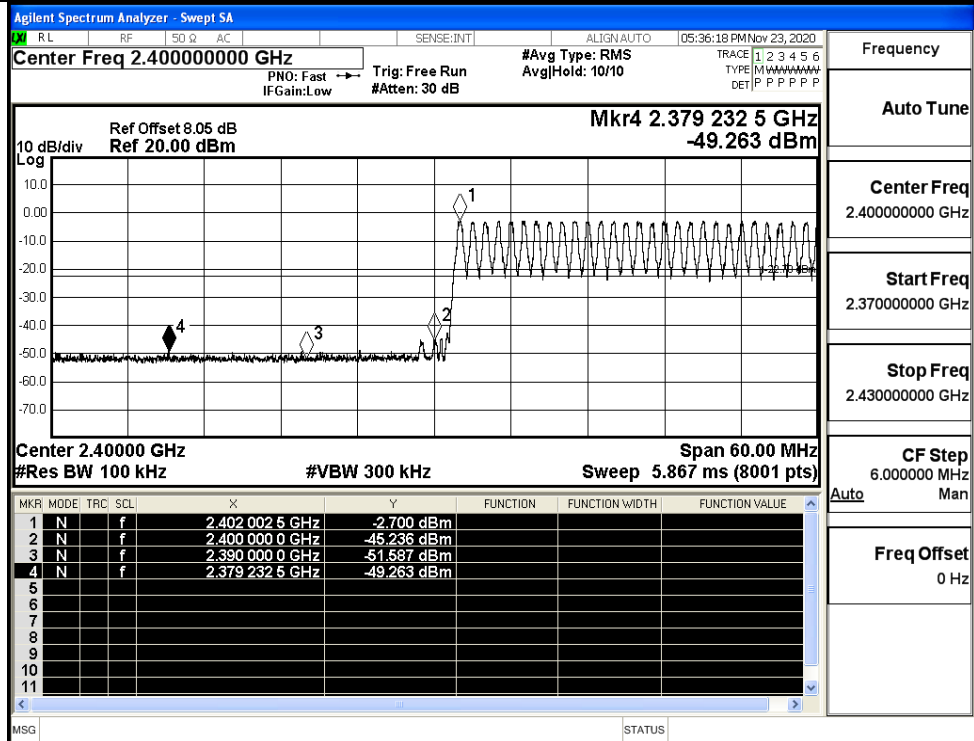
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-2.285	Off	-48.775	-22.29	PASS
			-2.700	On	-49.263	-22.7	PASS
	HCH	2480	-3.905	Off	-45.596	-23.91	PASS
			-3.574	On	-47.686	-23.57	PASS
π/4DQPSK	LCH	2402	-2.513	Off	-48.783	-22.51	PASS
			-2.560	On	-44.397	-22.56	PASS
	HCH	2480	-3.955	Off	-47.032	-23.96	PASS
			-3.372	On	-48.209	-23.37	PASS

Test Graphs

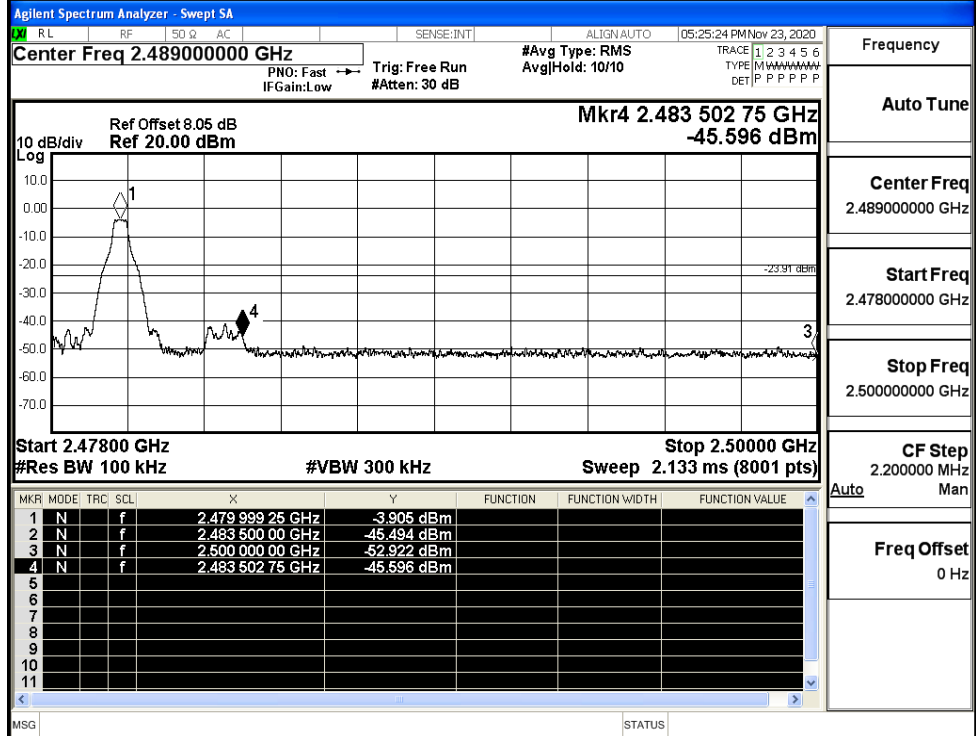
GFSK/LCH/No Hop



GFSK/LCH/Hop

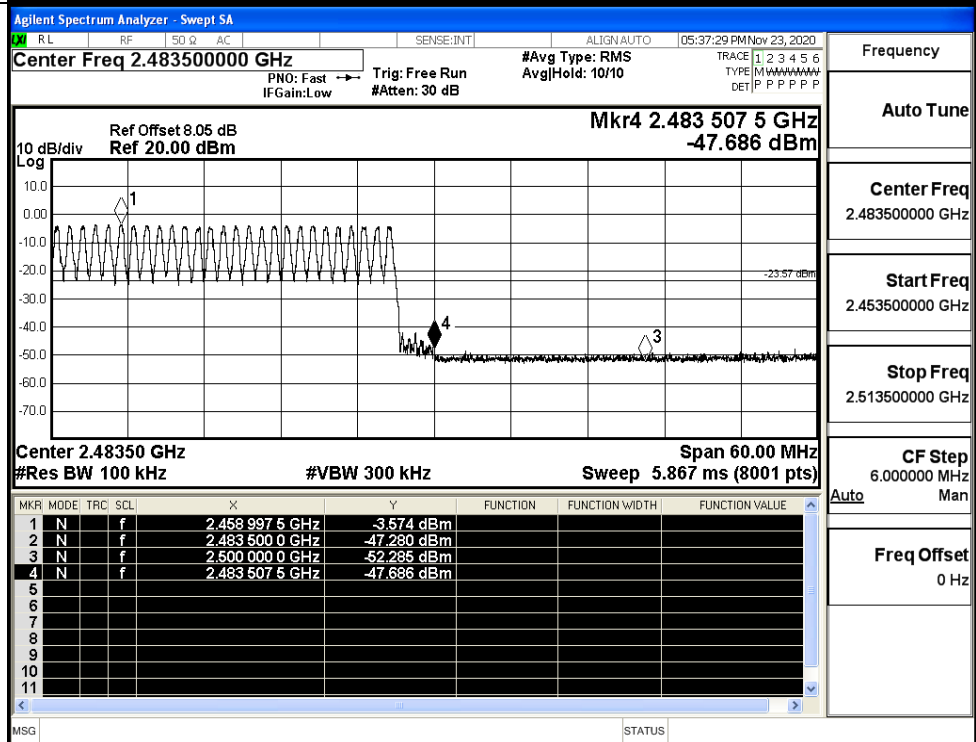


GFSK/HCH/No Hop



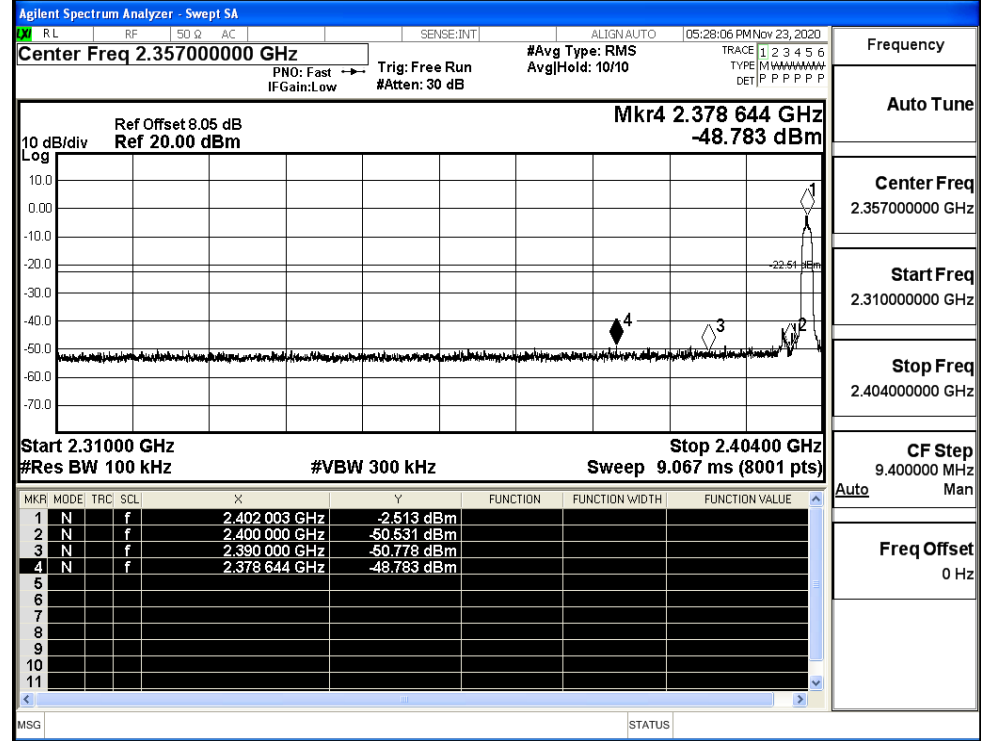
Frequency	2.489000000 GHz
Auto Tune	
Center Freq	2.489000000 GHz
Start Freq	2.478000000 GHz
Stop Freq	2.500000000 GHz
CF Step	2.200000 MHz
Freq Offset	0 Hz

GFSK/HCH/Hop



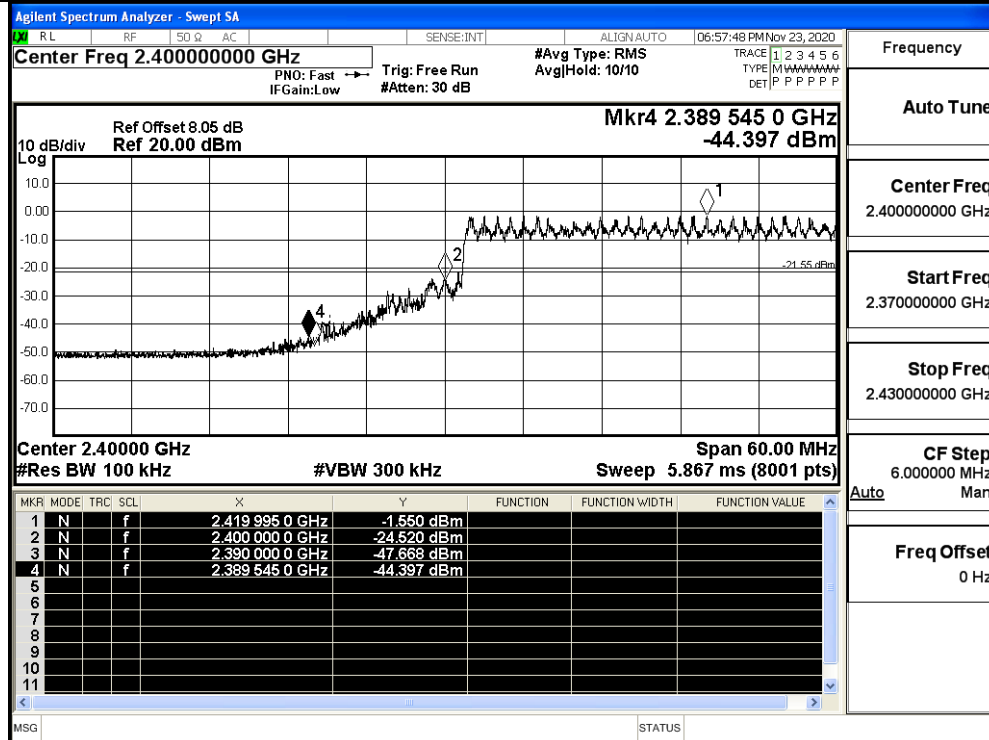
Frequency	2.483500000 GHz
Auto Tune	
Center Freq	2.483500000 GHz
Start Freq	2.453500000 GHz
Stop Freq	2.513500000 GHz
CF Step	6.000000 MHz
Freq Offset	0 Hz

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



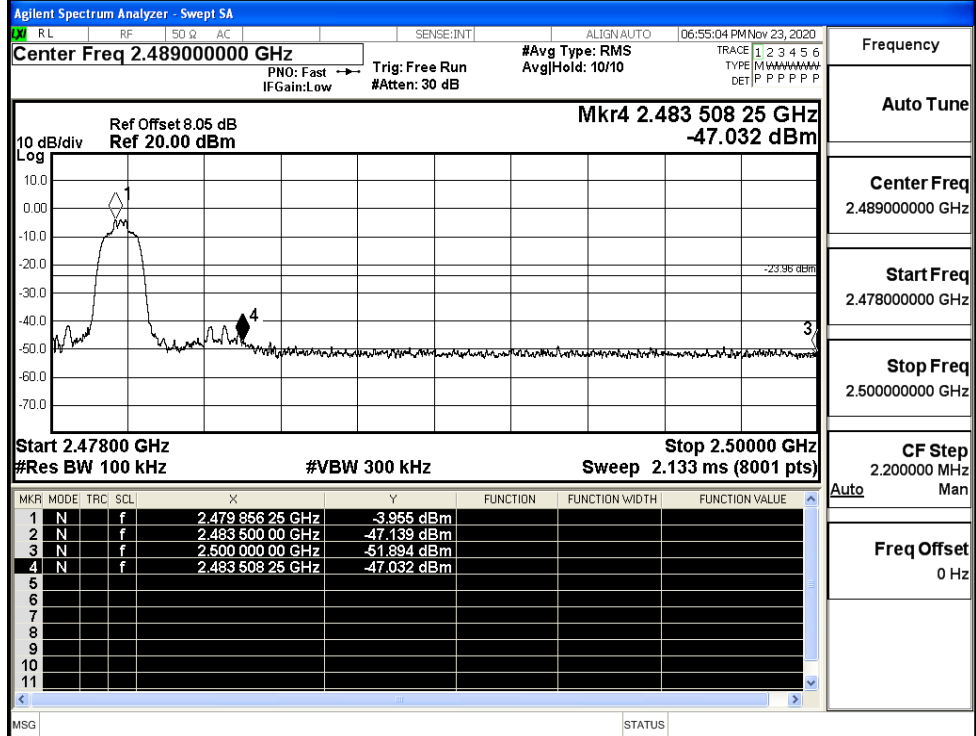
Frequency	
Auto Tune	
Center Freq	2.35700000 GHz
Start Freq	2.31000000 GHz
Stop Freq	2.40400000 GHz
CF Step	9.400000 MHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK/LCH/Hop



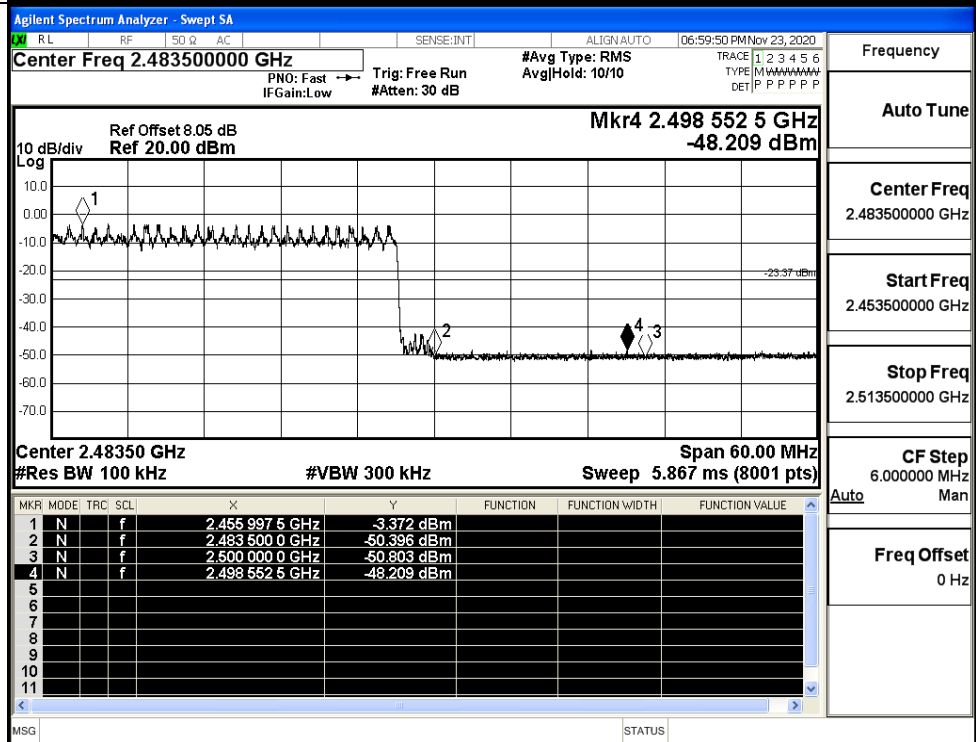
Frequency	
Auto Tune	
Center Freq	2.40000000 GHz
Start Freq	2.37000000 GHz
Stop Freq	2.43000000 GHz
CF Step	6.000000 MHz
Auto	Man
Freq Offset	0 Hz

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



Frequency	2.489000000 GHz
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

$\pi$ /4DQPSK/HCH/Hop

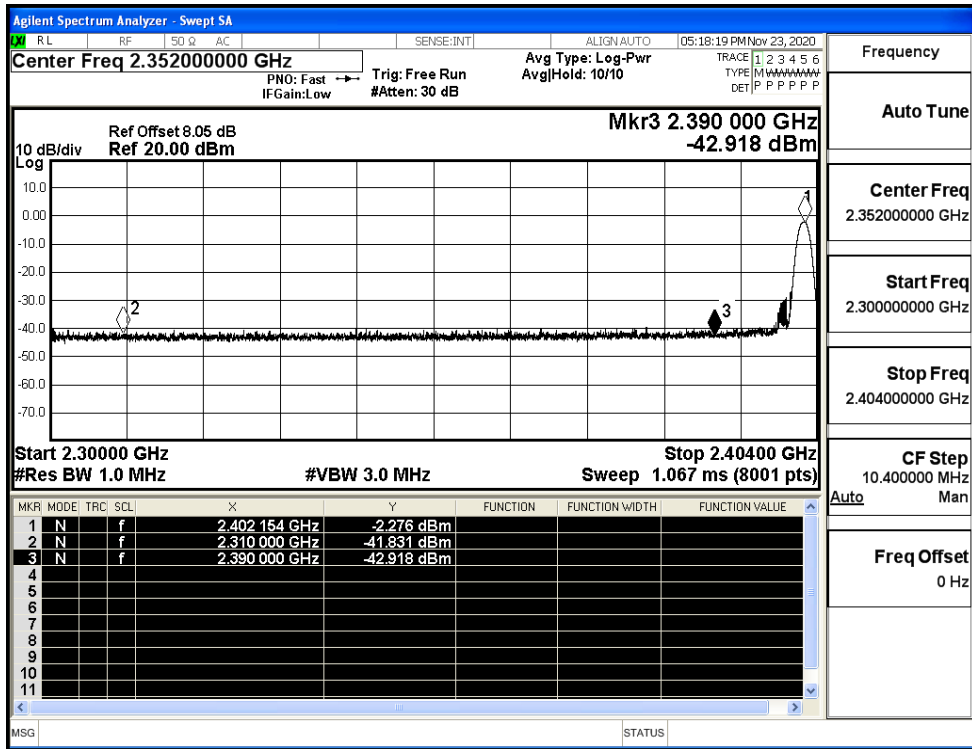


Frequency	2.483500000 GHz
Auto Tune	
Center Freq	2.483500000 GHz
Start Freq	2.453500000 GHz
Stop Freq	2.513500000 GHz
CF Step	6.000000 MHz
Auto	Man
Freq Offset	0 Hz

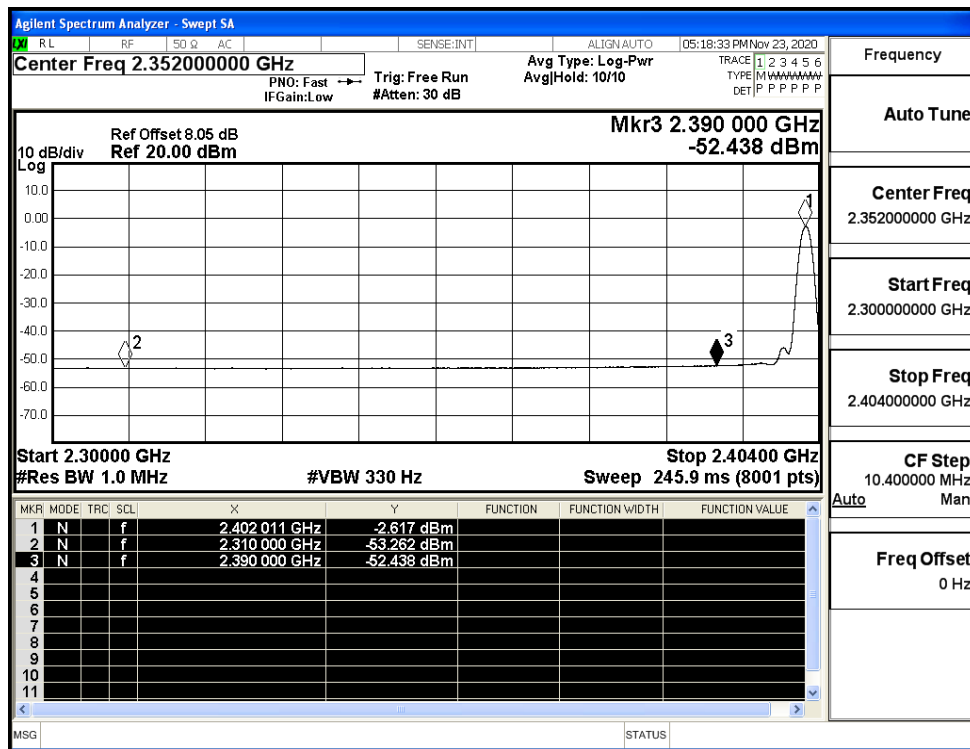
## A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-41.83	2.0	0	55.43	PEAK	74	PASS
	Off	2310.0	-53.26	2.0	0	44.00	AV	54	PASS
	Off	2390.0	-42.92	2.0	0	54.34	PEAK	74	PASS
	Off	2390.0	-52.44	2.0	0	44.82	AV	54	PASS
	Off	2483.5	-38.53	2.0	0	58.73	PEAK	74	PASS
	Off	2483.5	-46.26	2.0	0	50.99	AV	54	PASS
	Off	2500.0	-41.95	2.0	0	55.31	PEAK	74	PASS
	Off	2500.0	-52.30	2.0	0	44.96	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-42.90	2.0	0	54.35	PEAK	74	PASS
	Off	2310.0	-53.46	2.0	0	43.80	AV	54	PASS
	Off	2390.0	-41.68	2.0	0	55.58	PEAK	74	PASS
	Off	2390.0	-52.50	2.0	0	44.76	AV	54	PASS
	Off	2483.5	-38.70	2.0	0	58.56	PEAK	74	PASS
	Off	2483.5	-48.53	2.0	0	48.73	AV	54	PASS
	Off	2500.0	-41.83	2.0	0	55.43	PEAK	74	PASS
	Off	2500.0	-52.18	2.0	0	45.08	AV	54	PASS

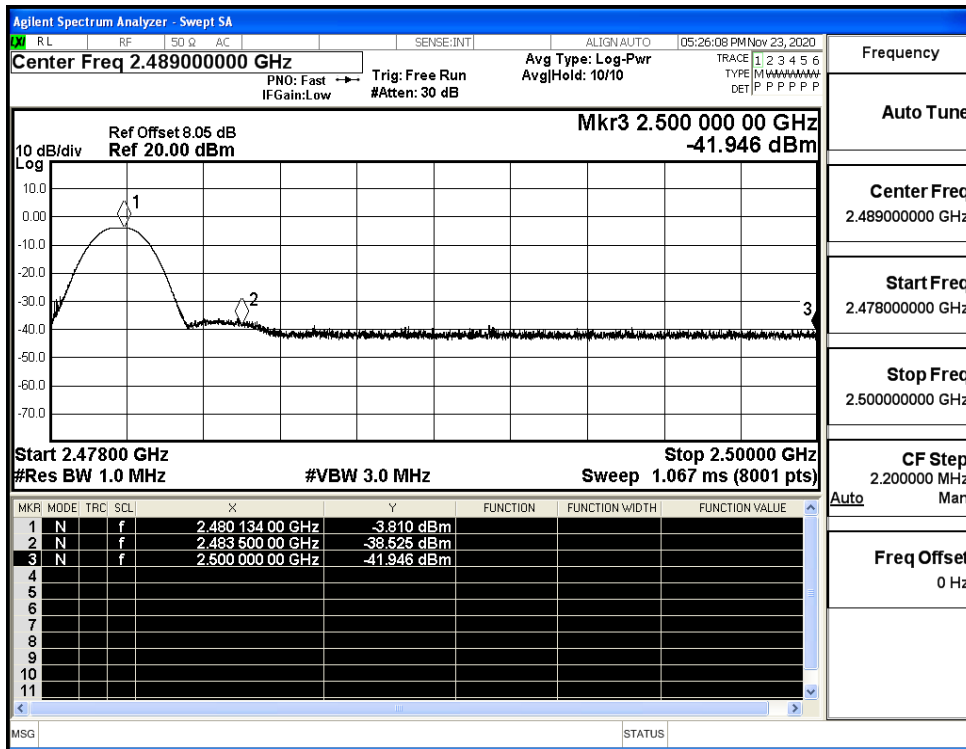
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_PEAK (Low Channel)



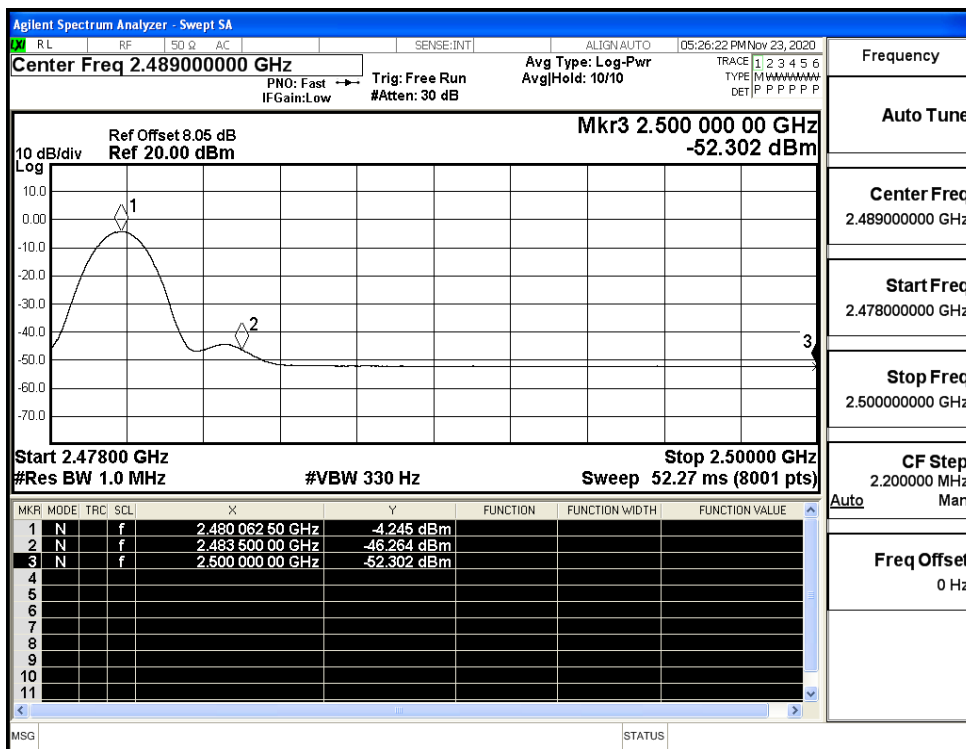
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_Average (Low Channel)



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

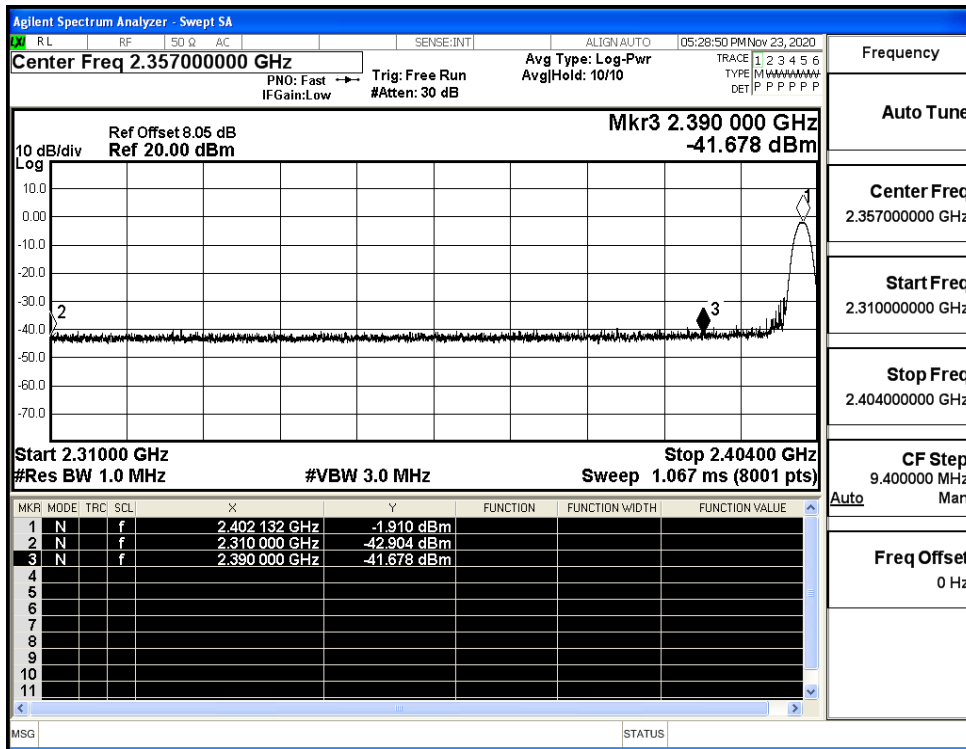


Restrict-band band-edge measurements\_Hopping Off\_GFSK\_Average (High Channel)

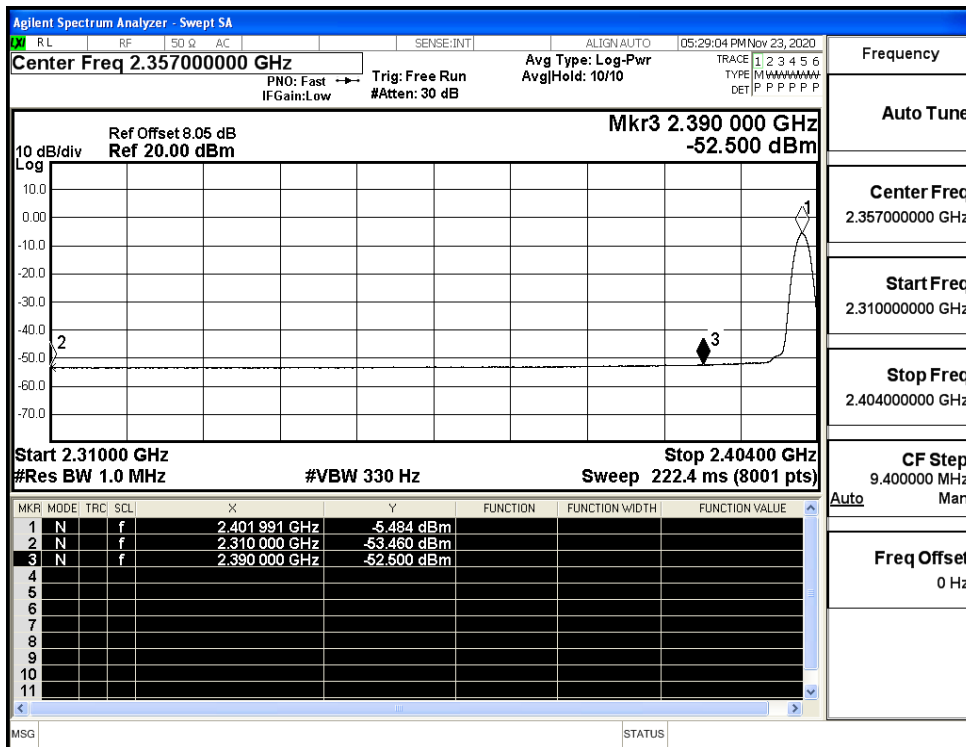


Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_PEAK (Low Channel)

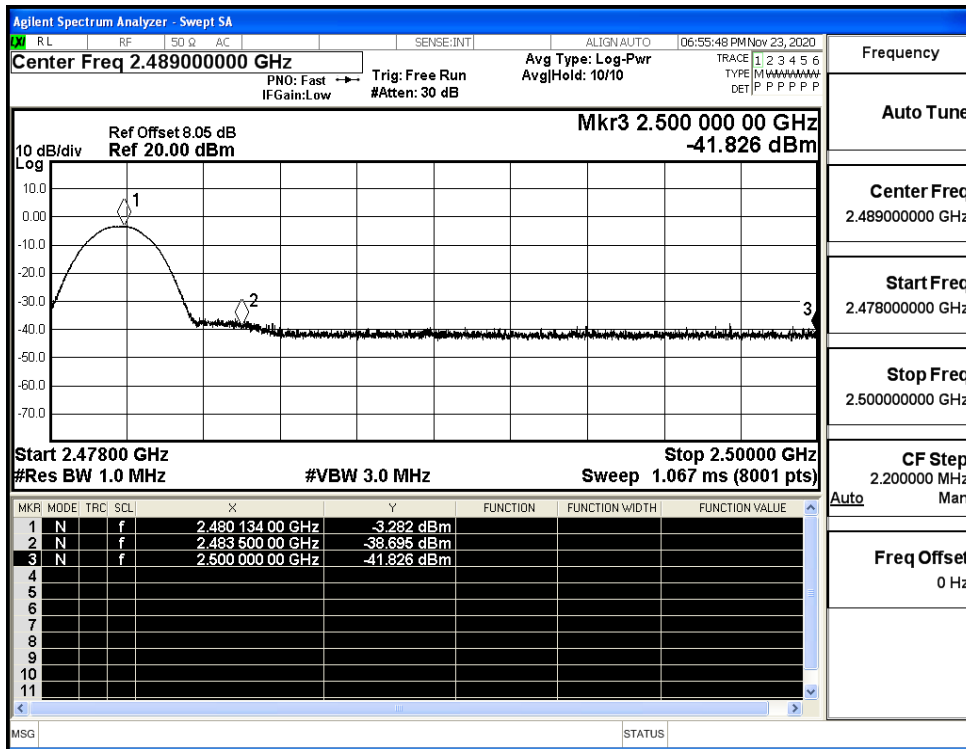




Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_Average (Low Channel)



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)

