

## Appendix A

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

Product Name: COLLAPSIBLE LANTERN WITH BLUETOOTH SPEAKER

Trade Mark: N/A

Test Model: XO-9936

#### Environmental Conditions

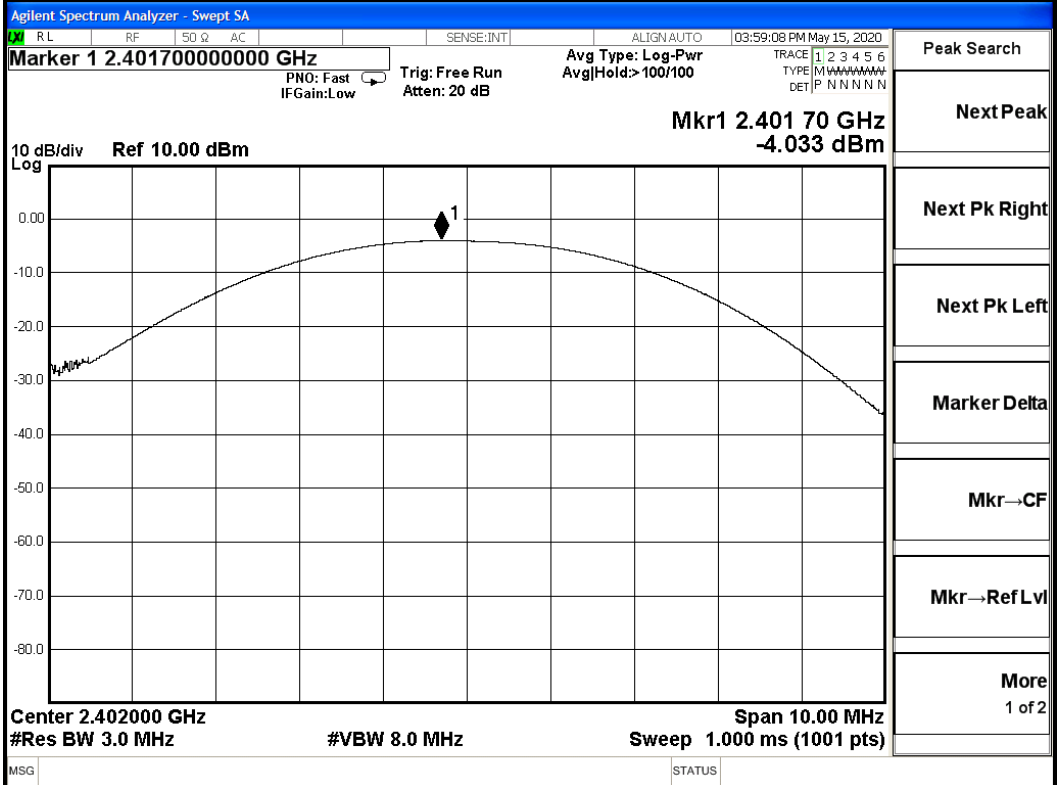
Temperature:	23.4° C
Relative Humidity:	54%
ATM Pressure:	100.0 kPa
Test Engineer:	Jerry Zeng
Supervised by:	Tom Liu

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

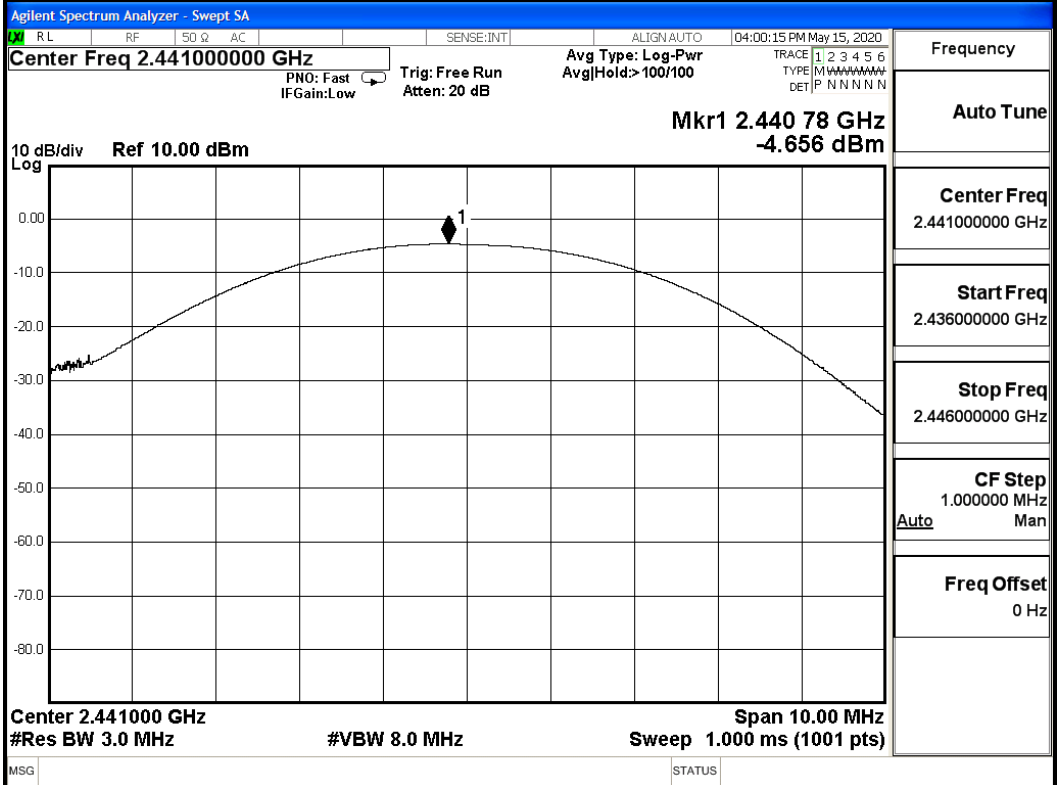
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-4.033	21	PASS
	MCH	-4.656	21	PASS
	HCH	-5.380	21	PASS
$\pi/4$ DQPSK	LCH	-3.337	21	PASS
	MCH	-3.936	21	PASS
	HCH	-4.670	21	PASS

Test Graphs

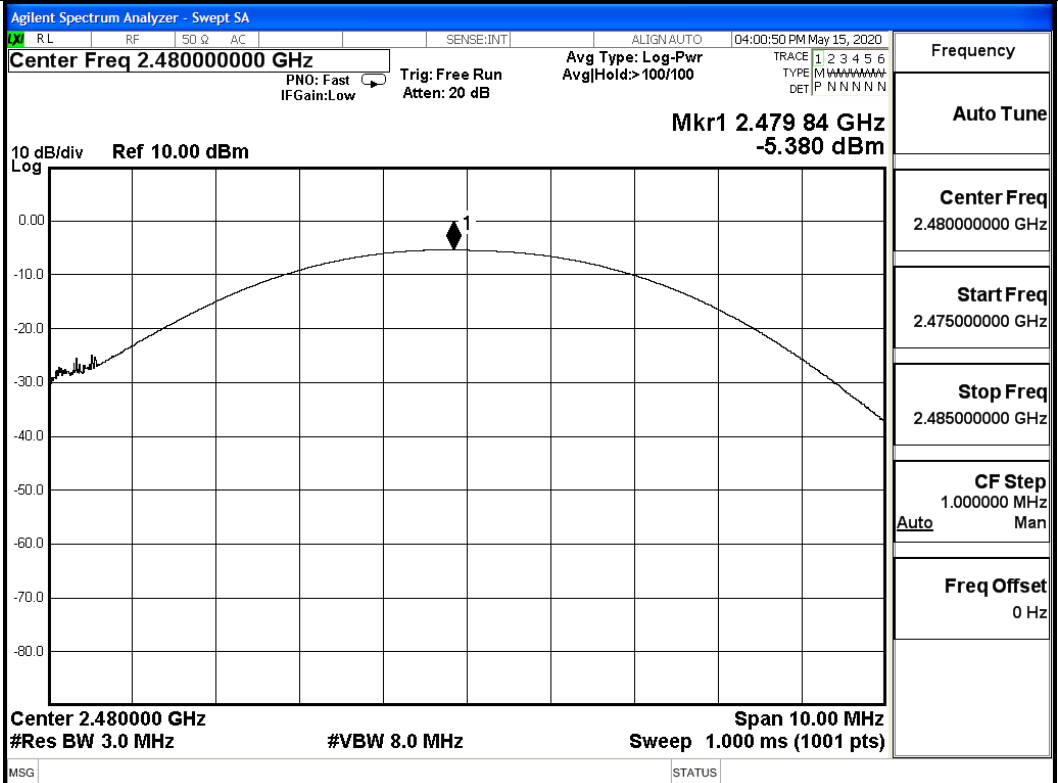
GFSK/LCH



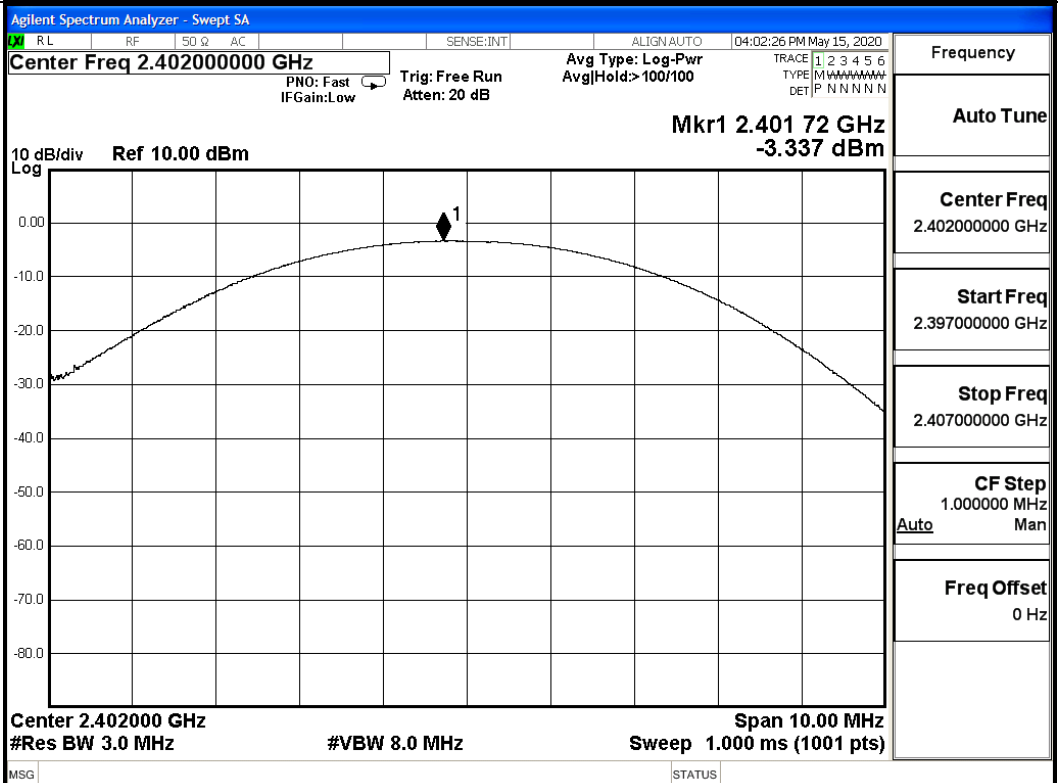
GFSK/MCH

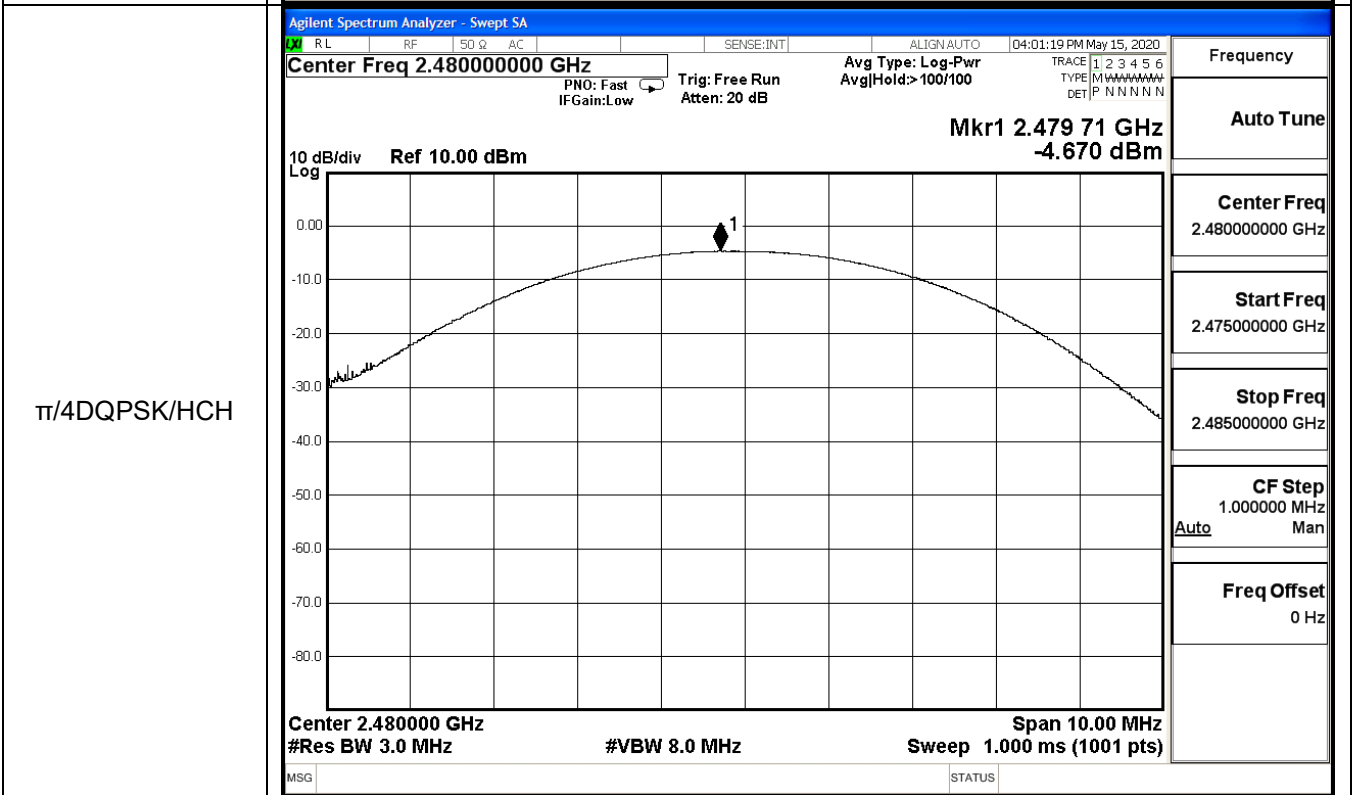
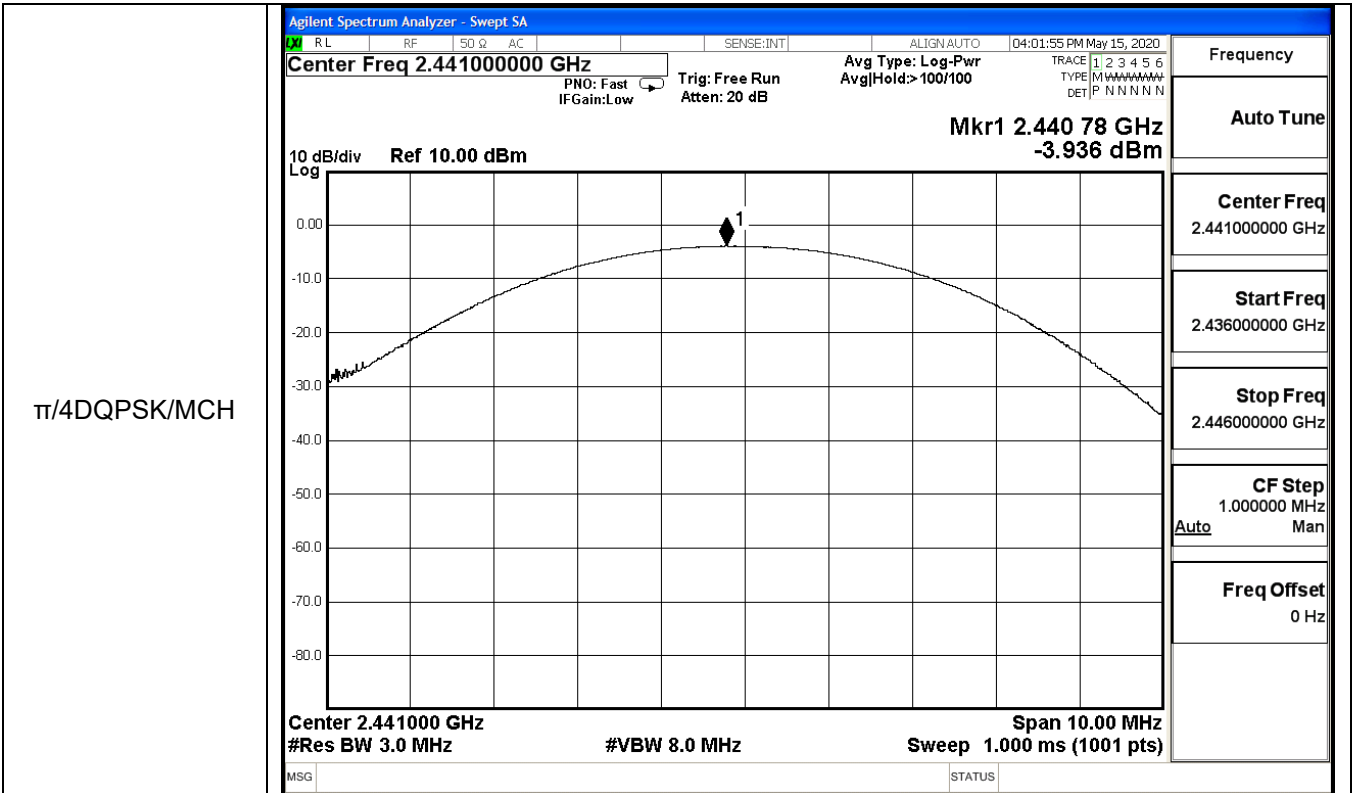


GFSK/HCH



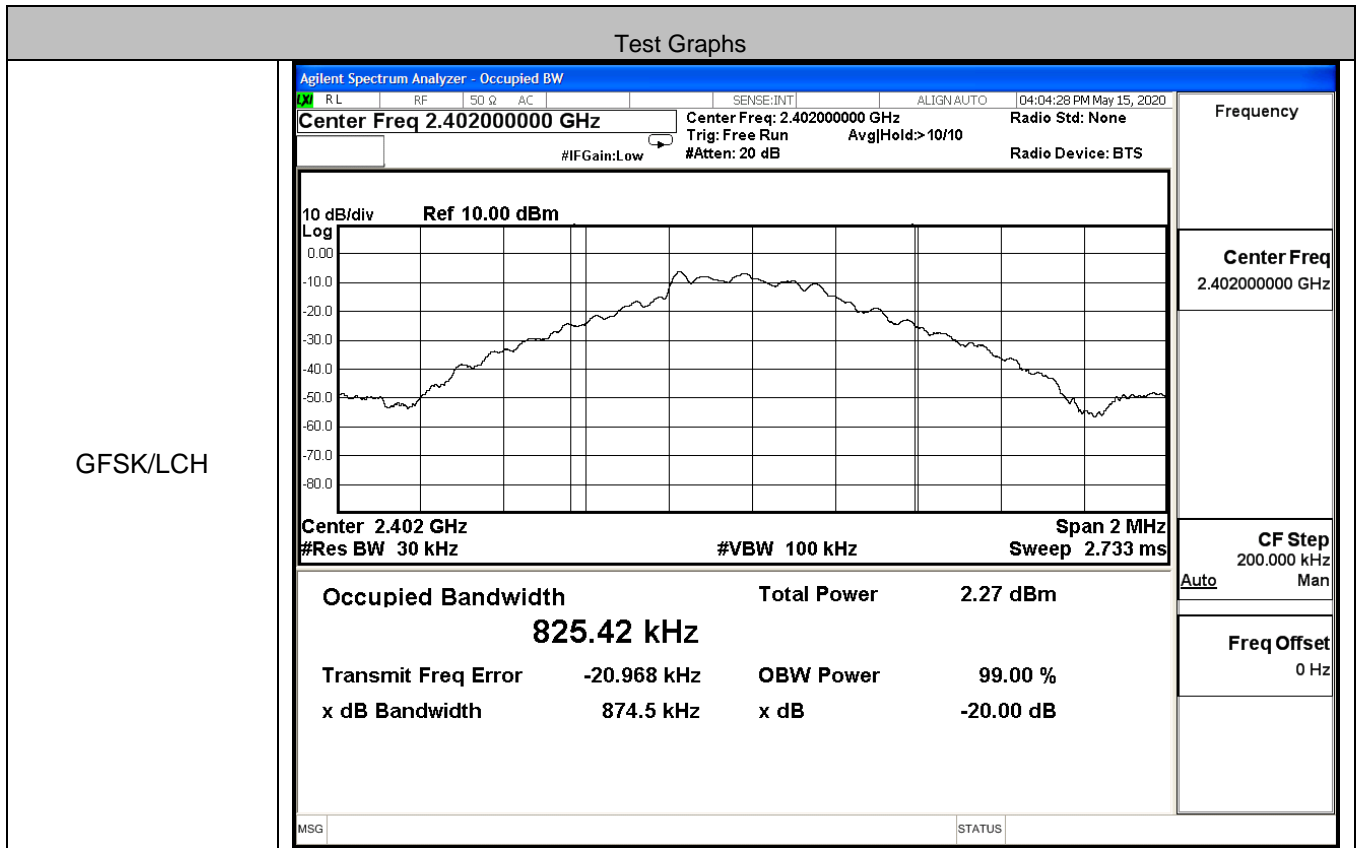
$\pi/4$ DQPSK/LCH





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

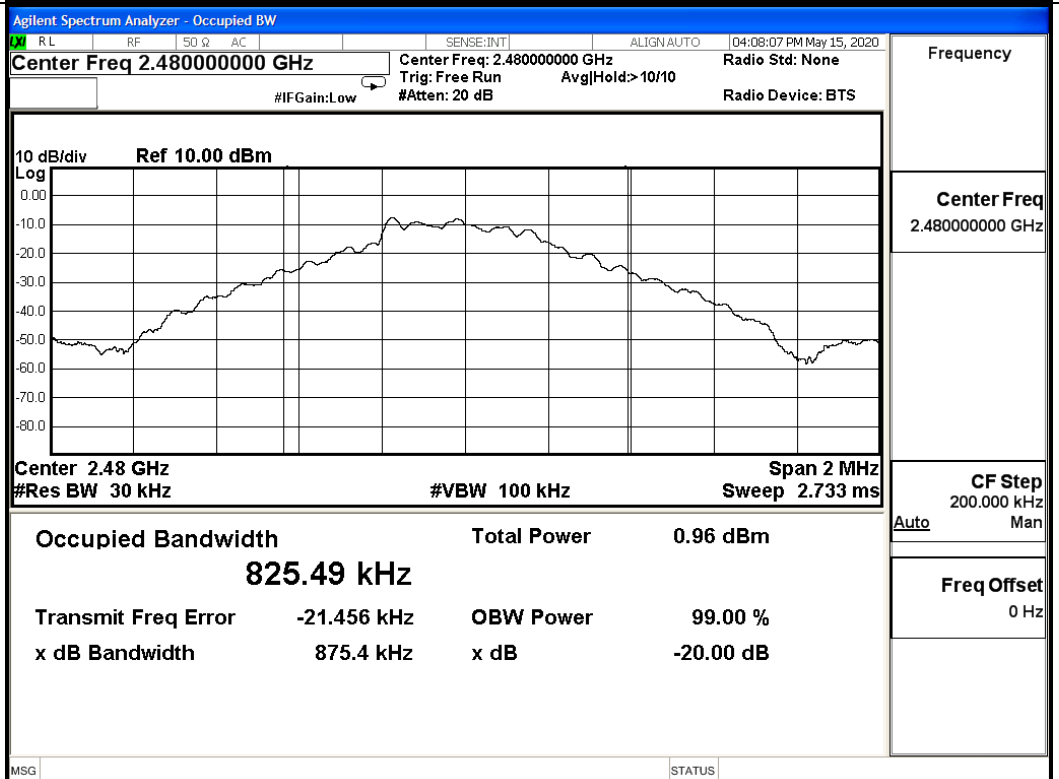
Mode	Channel.	99% Bandwidth [MHz]	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.82542	0.8745	Not Specified	PASS
	MCH	0.82535	0.8738	Not Specified	PASS
	HCH	0.82549	0.8754	Not Specified	PASS
π/4DQPSK	LCH	1.1678	1.230	Not Specified	PASS
	MCH	1.1683	1.254	Not Specified	PASS
	HCH	1.1688	1.253	Not Specified	PASS



GFSK/MCH



GFSK/HCH



π/4DQPSK/LCH

Agilent Spectrum Analyzer - Occupied BW

<input checked="" type="checkbox"/> RL	<input type="checkbox"/> RF	<input type="checkbox"/> 50 Ω	<input type="checkbox"/> AC		SENSE:INT	ALIGN:AUTO	04:03:41 PM May 15, 2020
<b>Center Freq 2.40200000 GHz</b>				Center Freq: 2.40200000 GHz		Radio Std: None	
				Trig: Free Run		AvgHld:> 10/10	
				#IFGain:Low		#Atten: 20 dB	
						Radio Device: BTS	

10 dB/div Ref 10.00 dBm

Center 2.402 GHz	#Res BW 30 kHz	#VBW 100 kHz	Span 2 MHz
		Sweep 2.733 ms	

<b>Occupied Bandwidth</b>	<b>Total Power</b>	<b>2.25 dBm</b>	
<b>1.1678 MHz</b>			
Transmit Freq Error	-22.788 kHz	OBW Power	99.00 %
x dB Bandwidth	1.230 MHz	x dB	-20.00 dB

MSG
STATUS

Frequency

---

Center Freq  
2.40200000 GHz

---

CF Step  
200.000 kHz

Auto  Man

---

Freq Offset  
0 Hz

π/4DQPSK/MCH

Agilent Spectrum Analyzer - Occupied BW

<input checked="" type="checkbox"/> RL	<input type="checkbox"/> RF	<input type="checkbox"/> 50 Ω	<input type="checkbox"/> AC		SENSE:INT	ALIGN:AUTO	04:06:42 PM May 15, 2020
<b>Center Freq 2.44100000 GHz</b>				Center Freq: 2.44100000 GHz		Radio Std: None	
				Trig: Free Run		AvgHld:> 10/10	
				#IFGain:Low		#Atten: 20 dB	
						Radio Device: BTS	

10 dB/div Ref 10.00 dBm

Center 2.441 GHz	#Res BW 30 kHz	#VBW 100 kHz	Span 2 MHz
		Sweep 2.733 ms	

<b>Occupied Bandwidth</b>	<b>Total Power</b>	<b>1.67 dBm</b>	
<b>1.1683 MHz</b>			
Transmit Freq Error	-23.165 kHz	OBW Power	99.00 %
x dB Bandwidth	1.254 MHz	x dB	-20.00 dB

MSG
STATUS

Frequency

---

Center Freq  
2.44100000 GHz

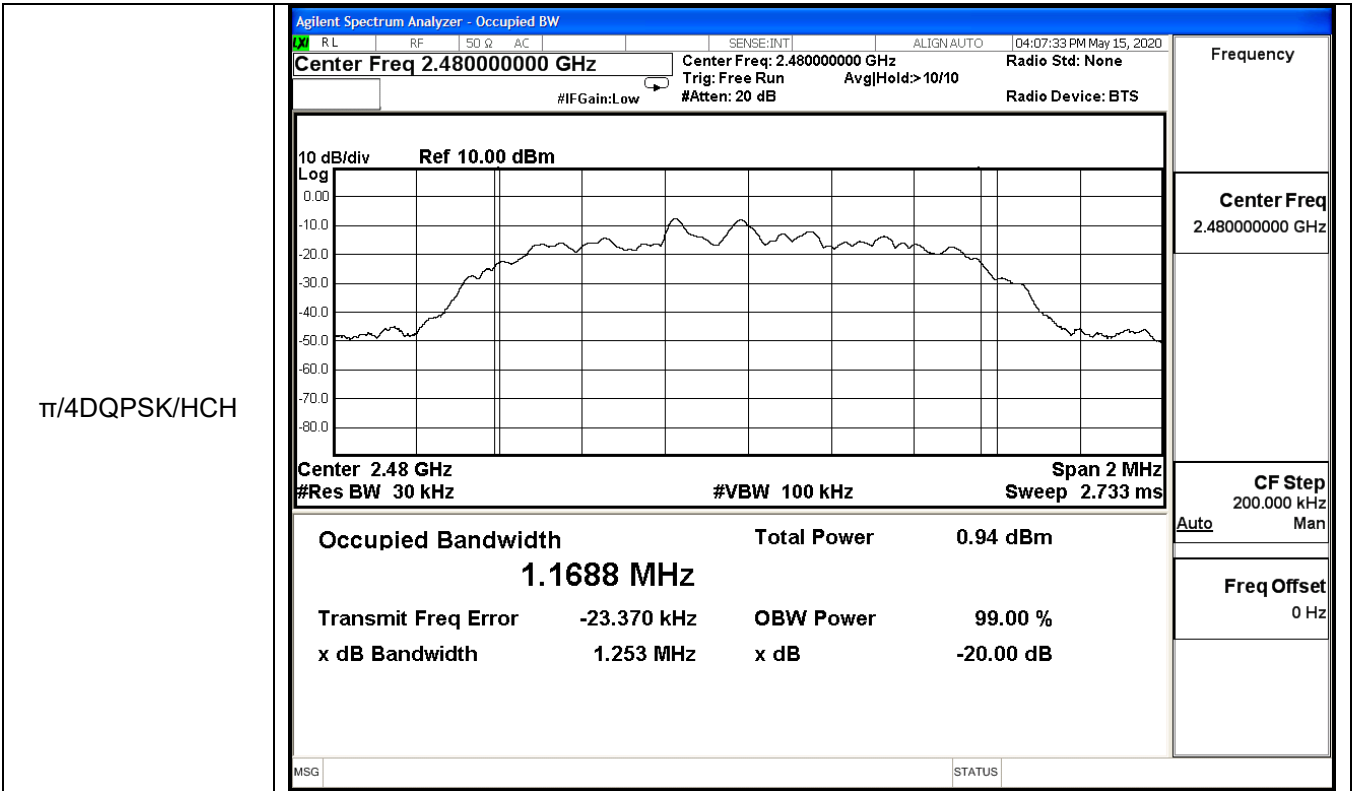
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CF Step  
200.000 kHz

Auto  Man

---

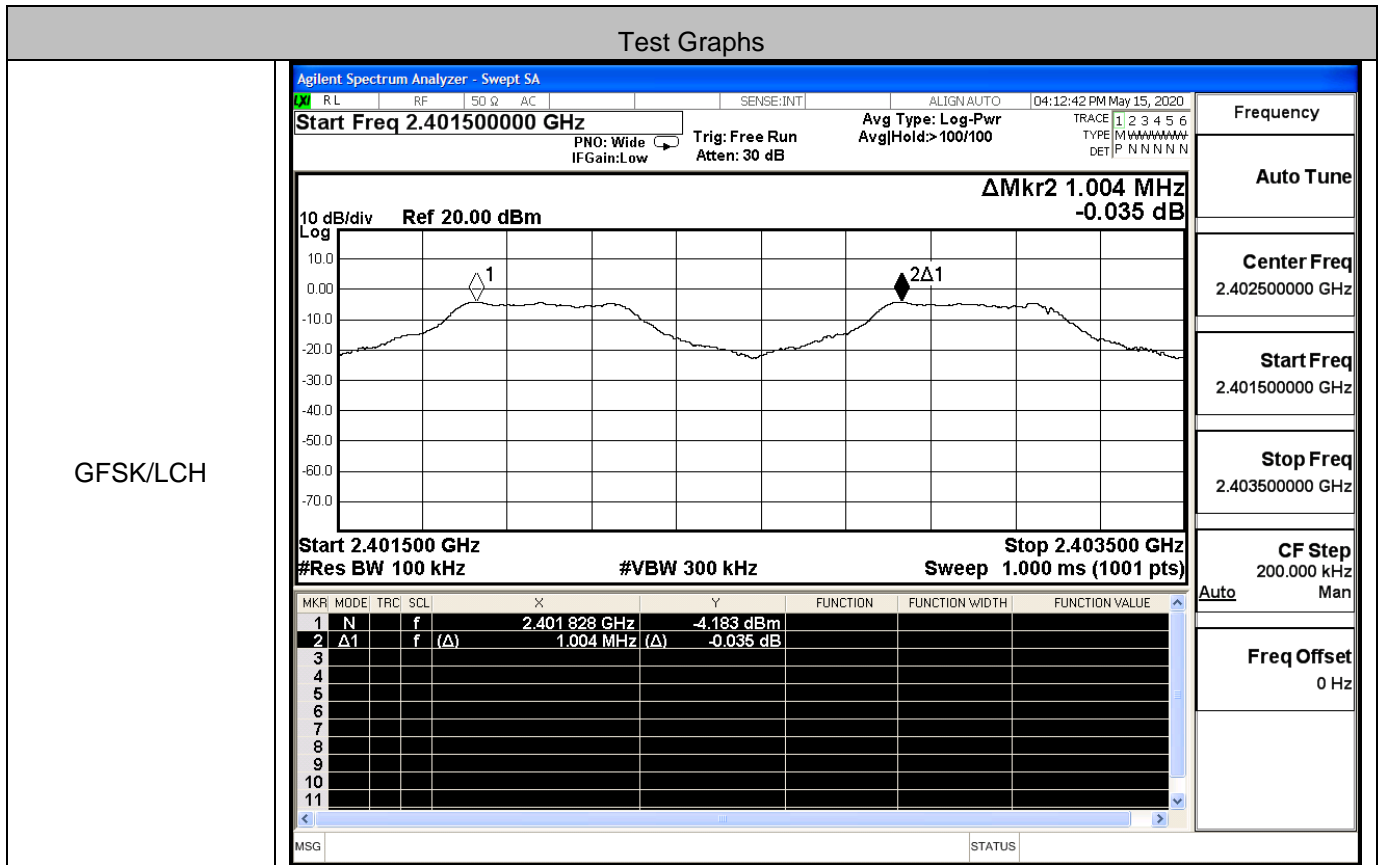
Freq Offset  
0 Hz



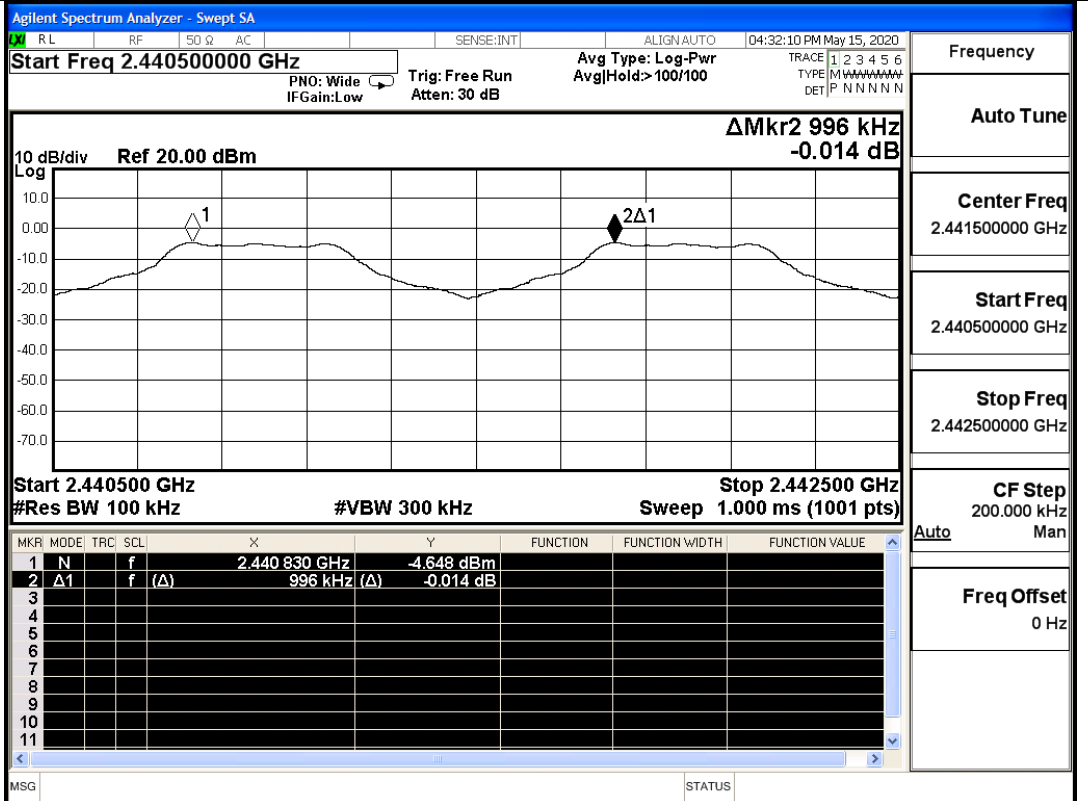


### A.3 Carrier Frequency Separation

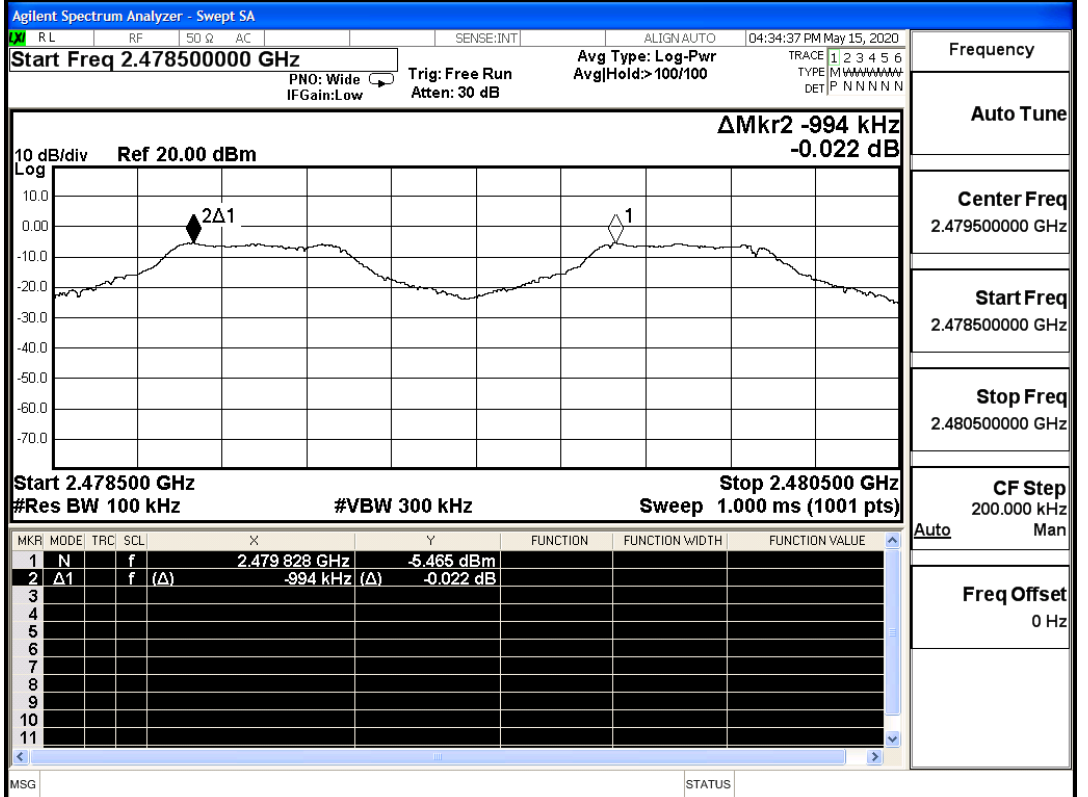
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.004	0.583	PASS
	MCH	0.996	0.583	PASS
	HCH	0.994	0.584	PASS
π/4DQPSK	LCH	1.000	0.820	PASS
	MCH	1.002	0.836	PASS
	HCH	1.000	0.835	PASS



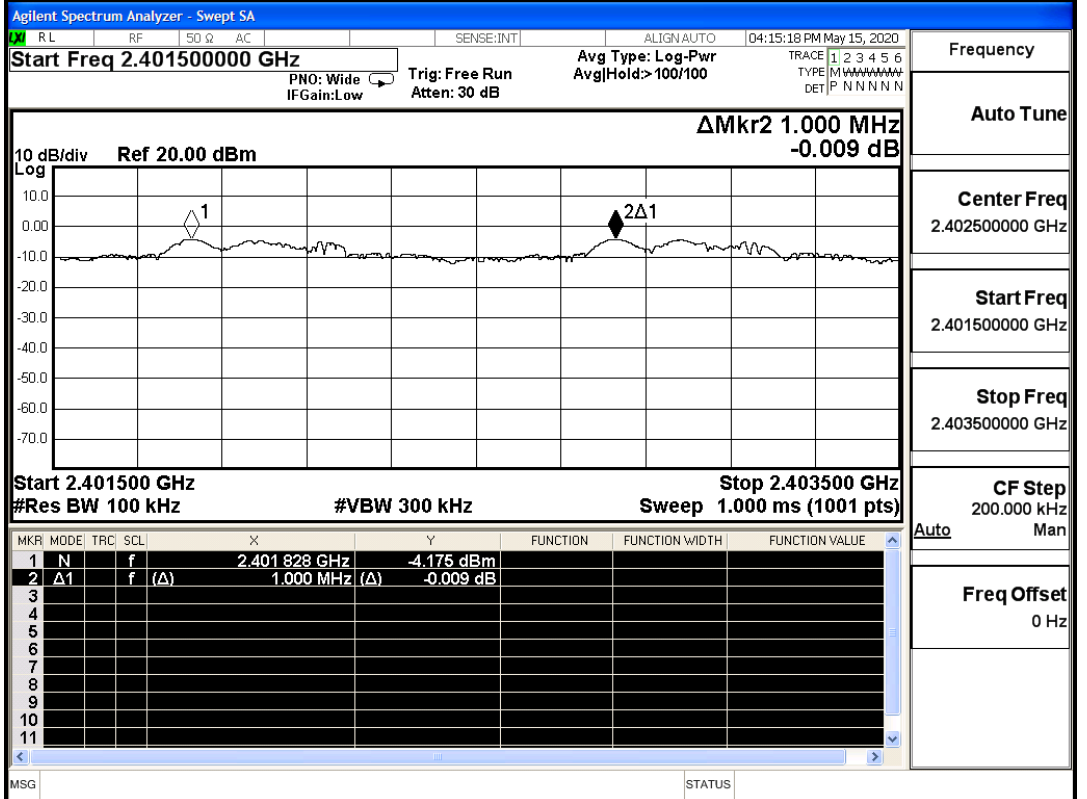
GFSK/MCH



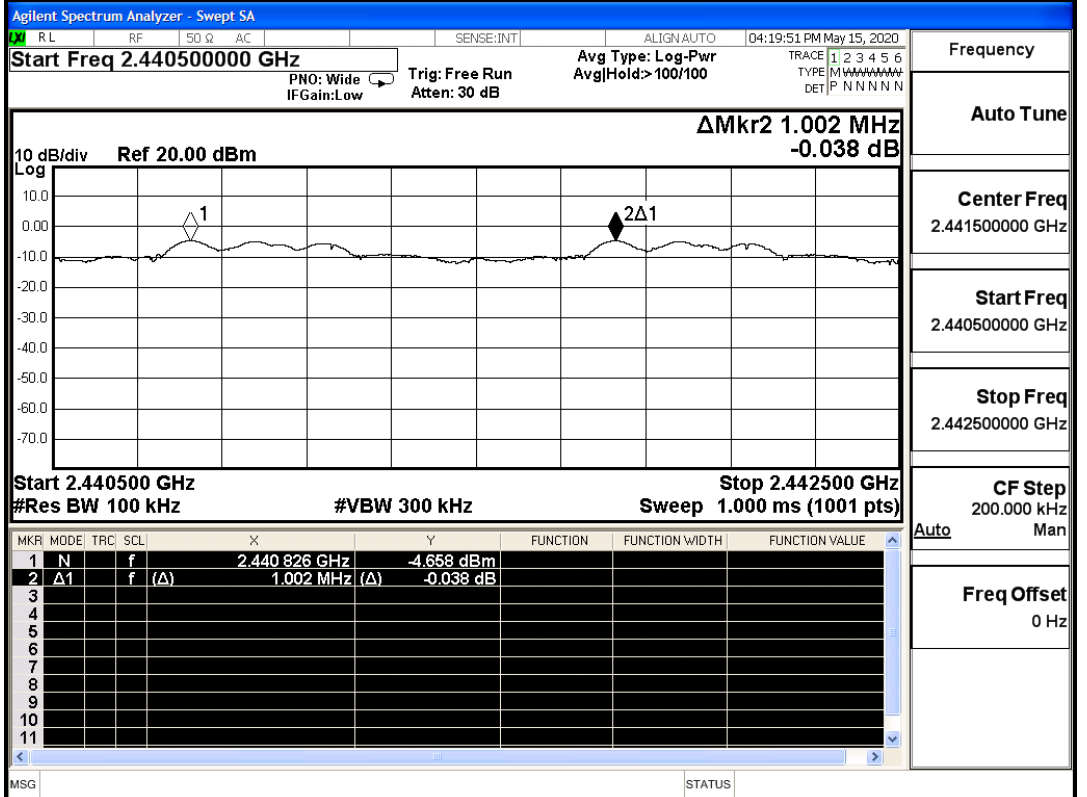
GFSK/HCH



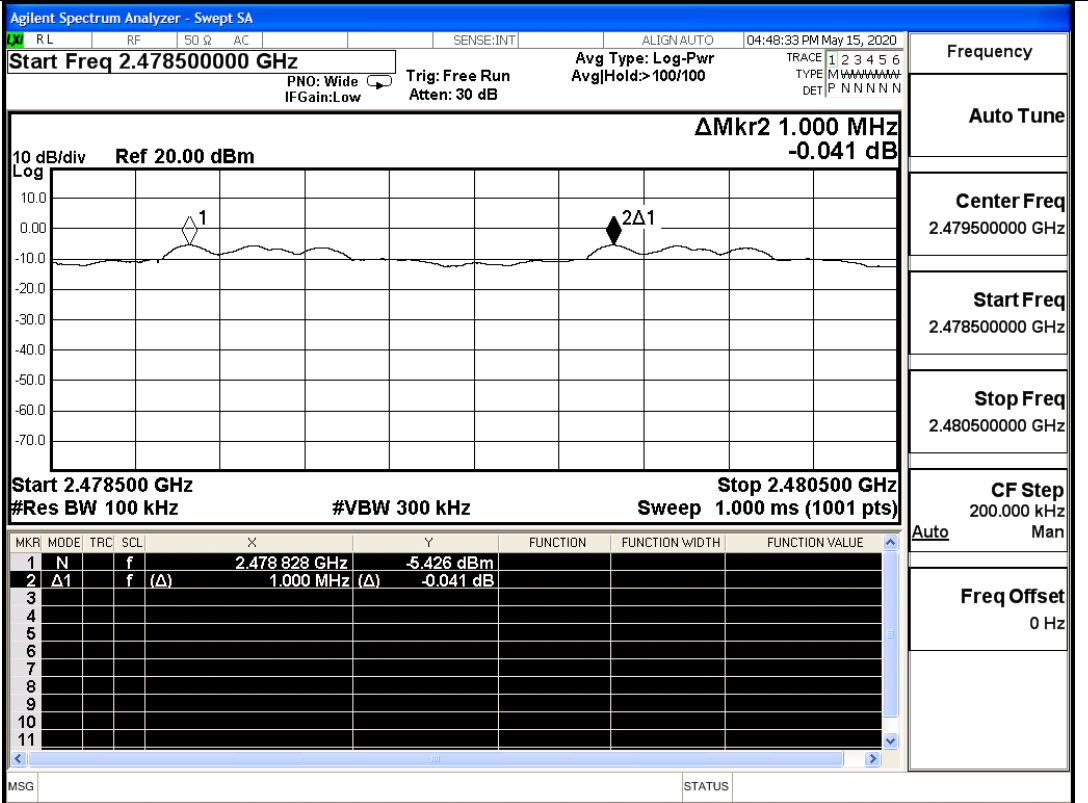
$\pi/4$ DQPSK/LCH



$\pi/4$ DQPSK/MCH

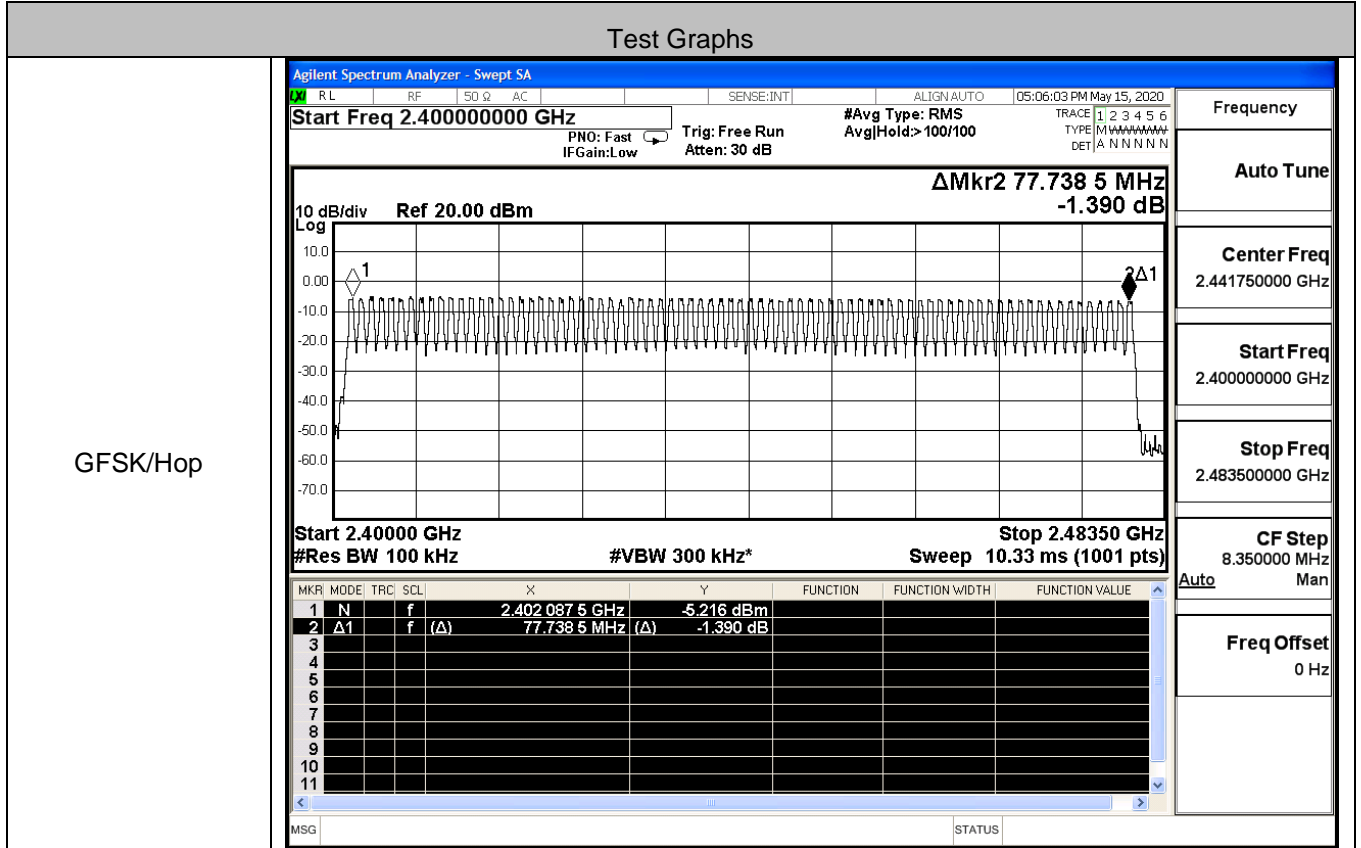


$\pi/4$ DQPSK/HCH

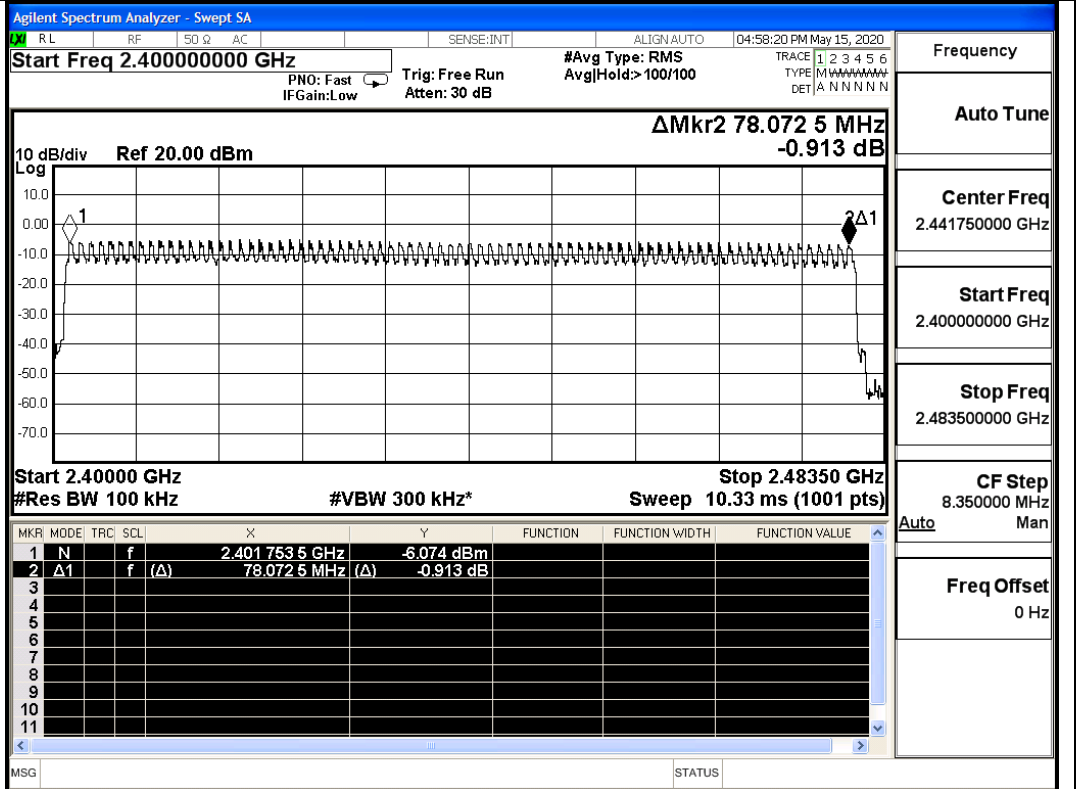


### A.4 Hopping Channel Number

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

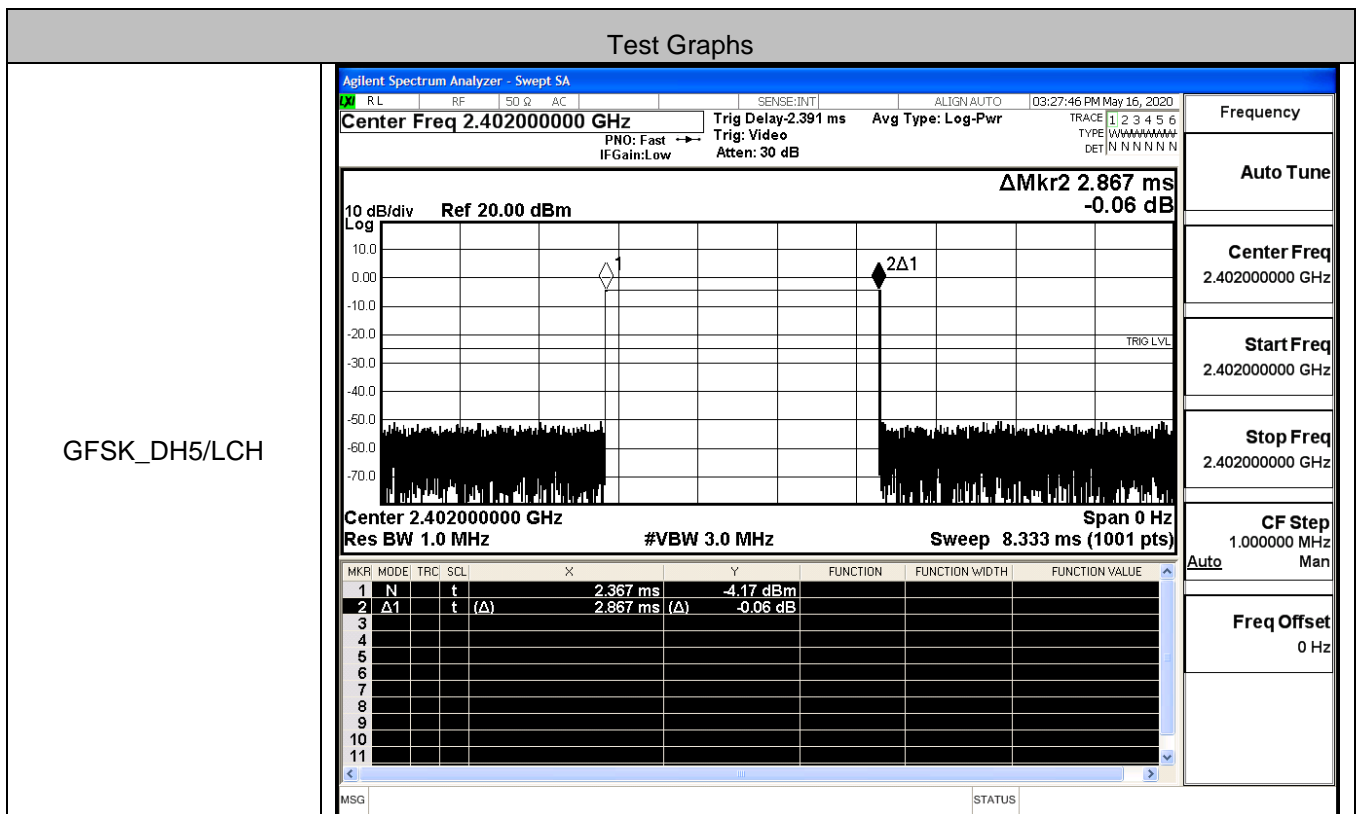


$\pi/4$ DQPSK/Hop

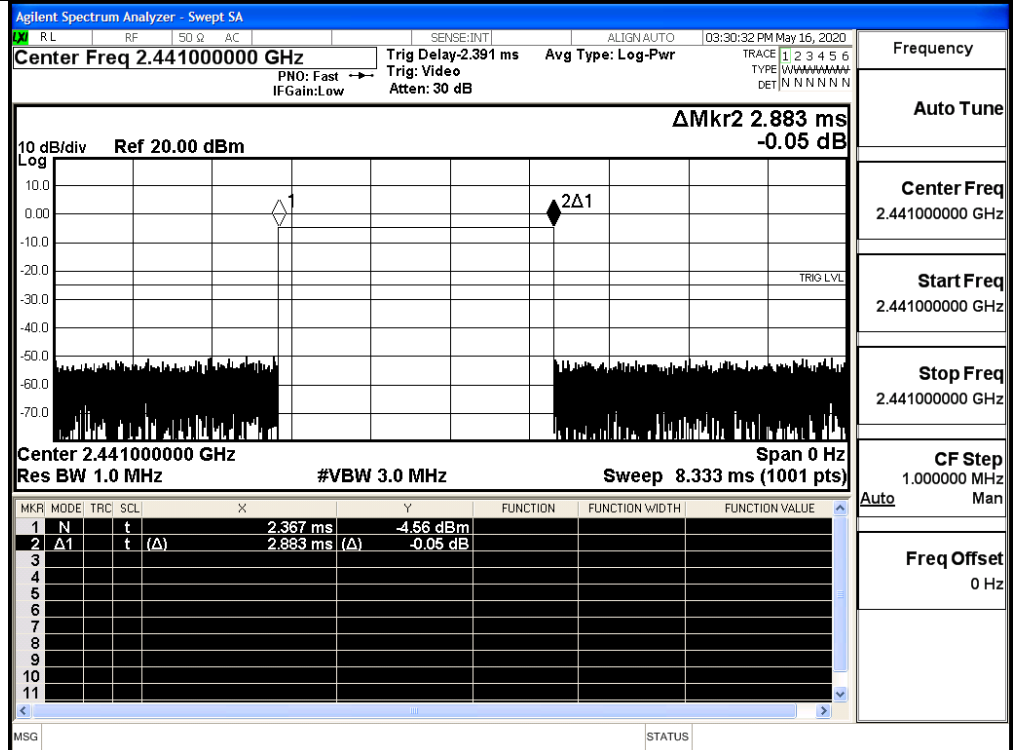


**A.5 Dwell Time**

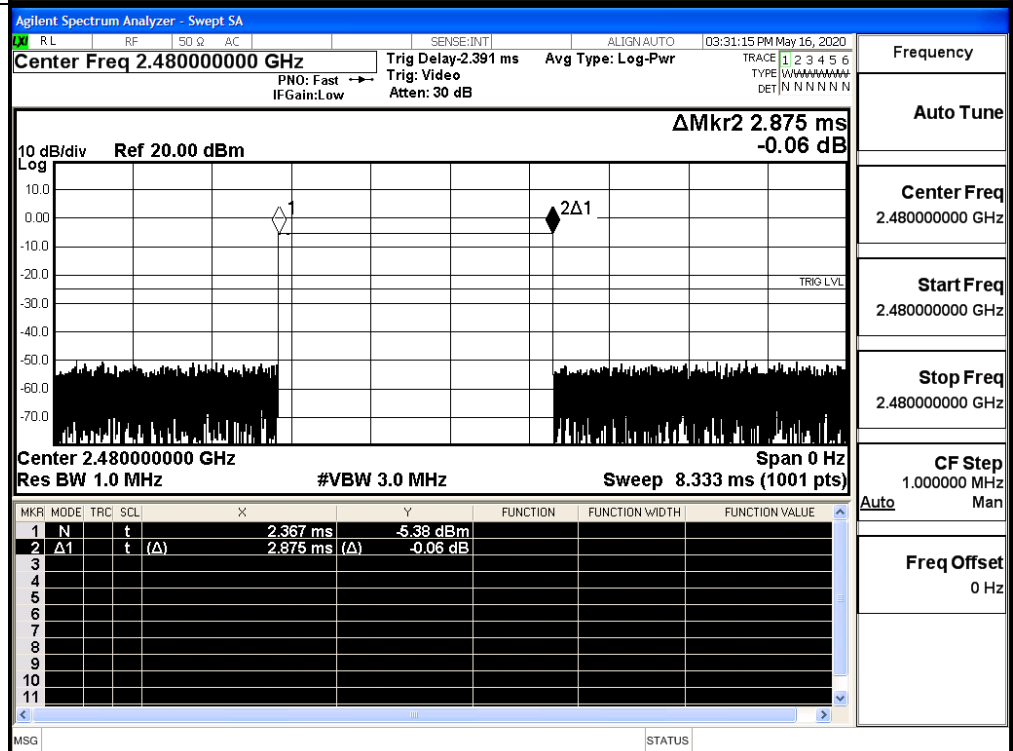
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.867	106.7	0.306	0.4	PASS
	DH5	MCH	2.883	106.7	0.308	0.4	PASS
	DH5	HCH	2.875	106.7	0.307	0.4	PASS
π/4DQPSK	2DH5	LCH	2.883	106.7	0.308	0.4	PASS
	2DH5	MCH	2.883	106.7	0.308	0.4	PASS
	2DH5	HCH	2.900	106.7	0.309	0.4	PASS



GFSK\_DH5/MCH

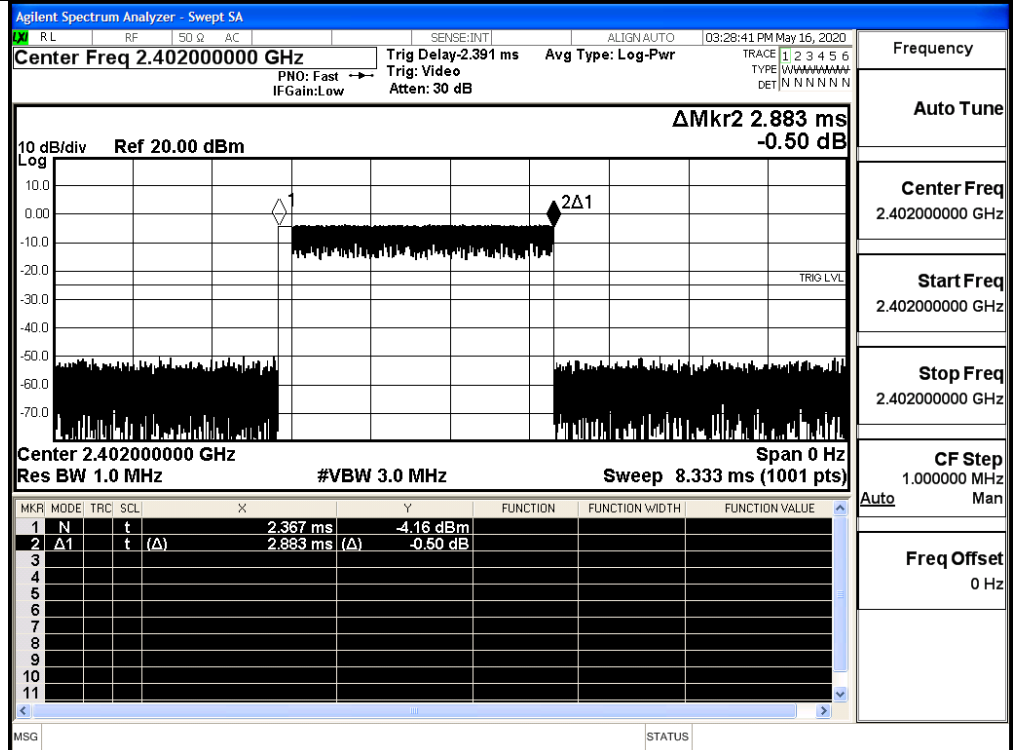


GFSK\_DH5/HCH

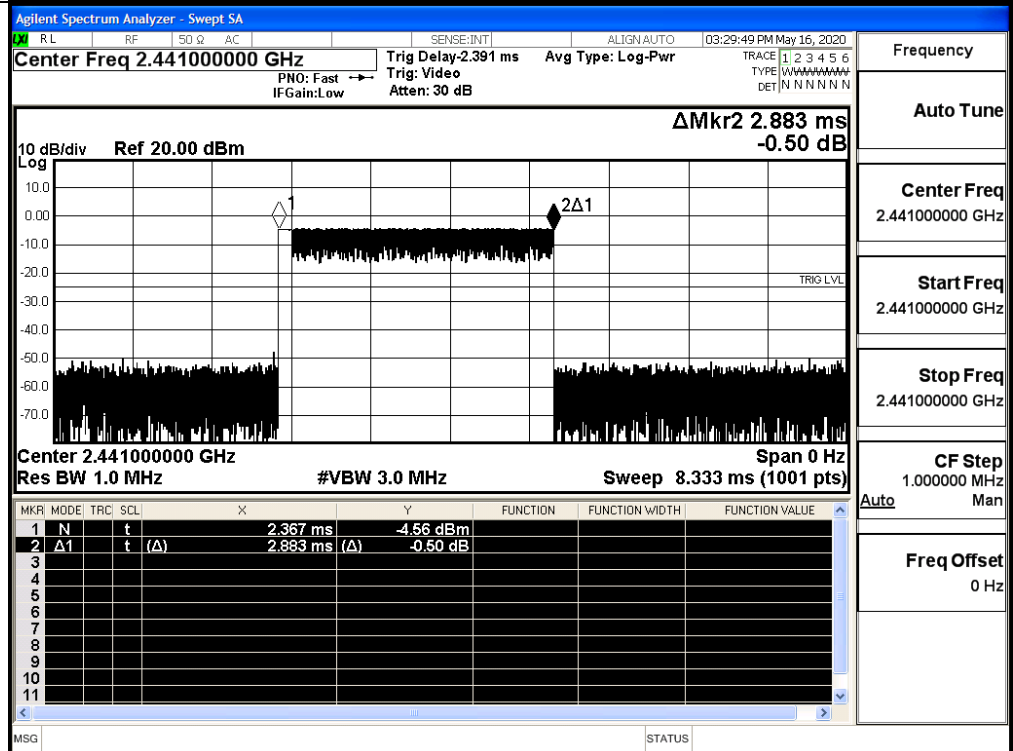




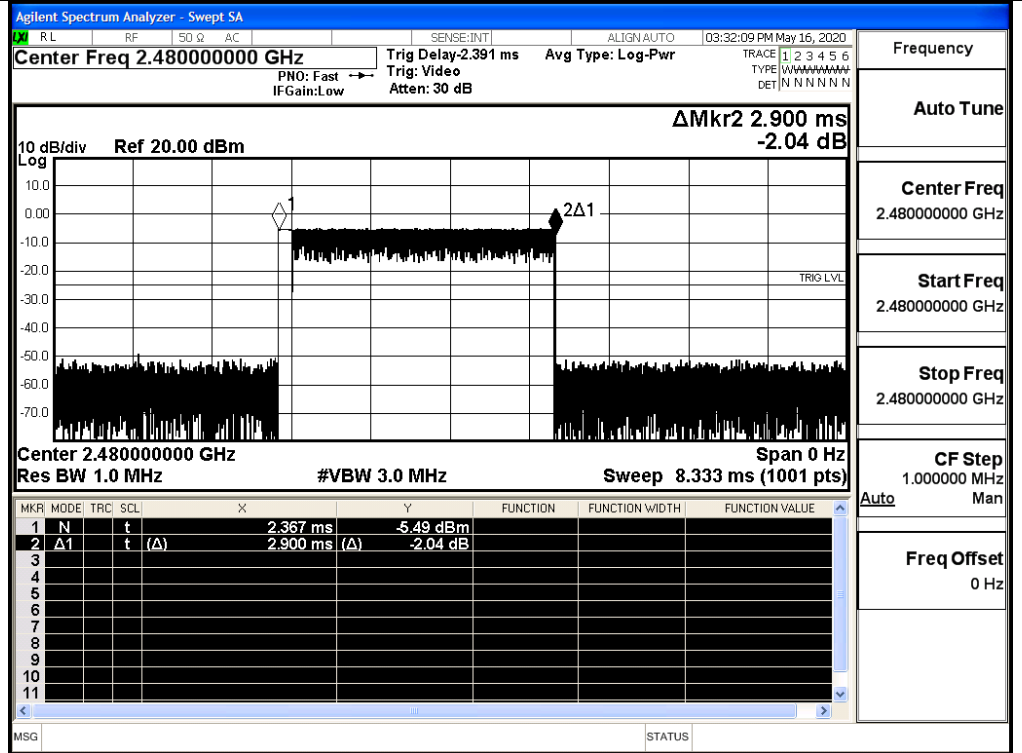
$\pi/4$ DQPSK  
\_2DH5/LCH



$\pi/4$ DQPSK  
\_2DH5/MCH



$\pi/4$ DQPSK  
\_2DH5/HCH

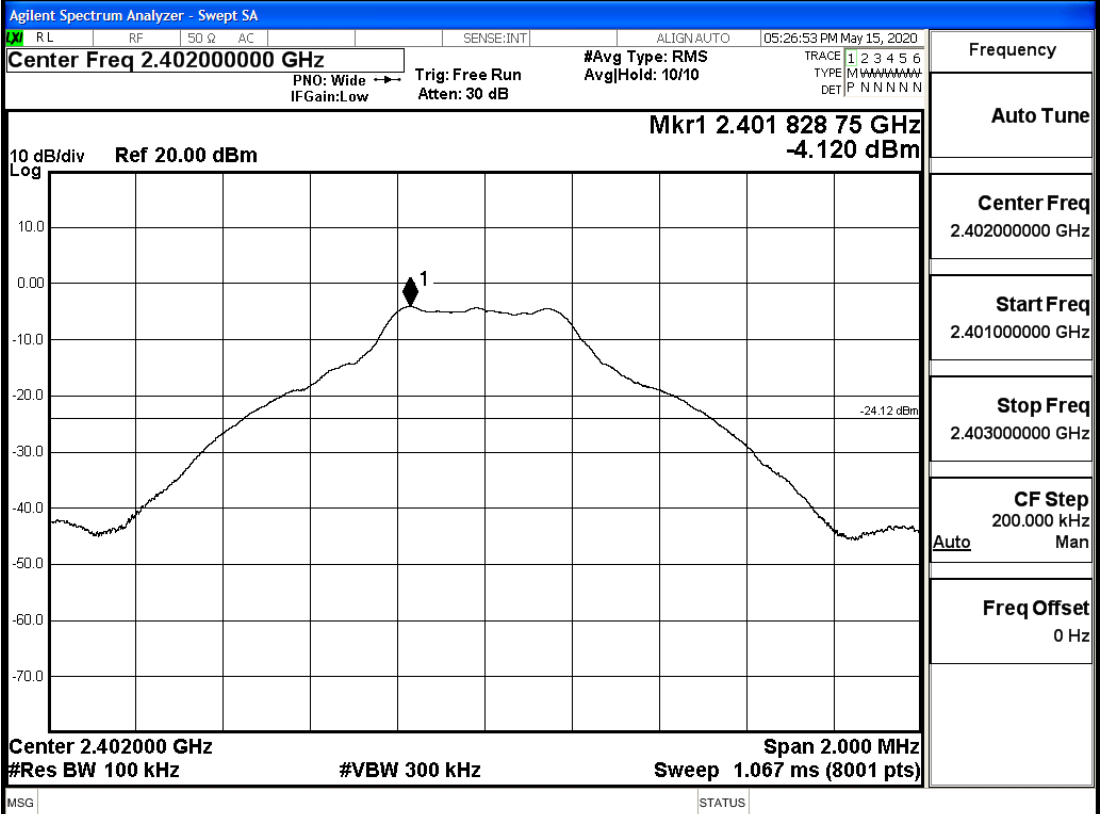


**A.6 RF Conducted Spurious Emissions**

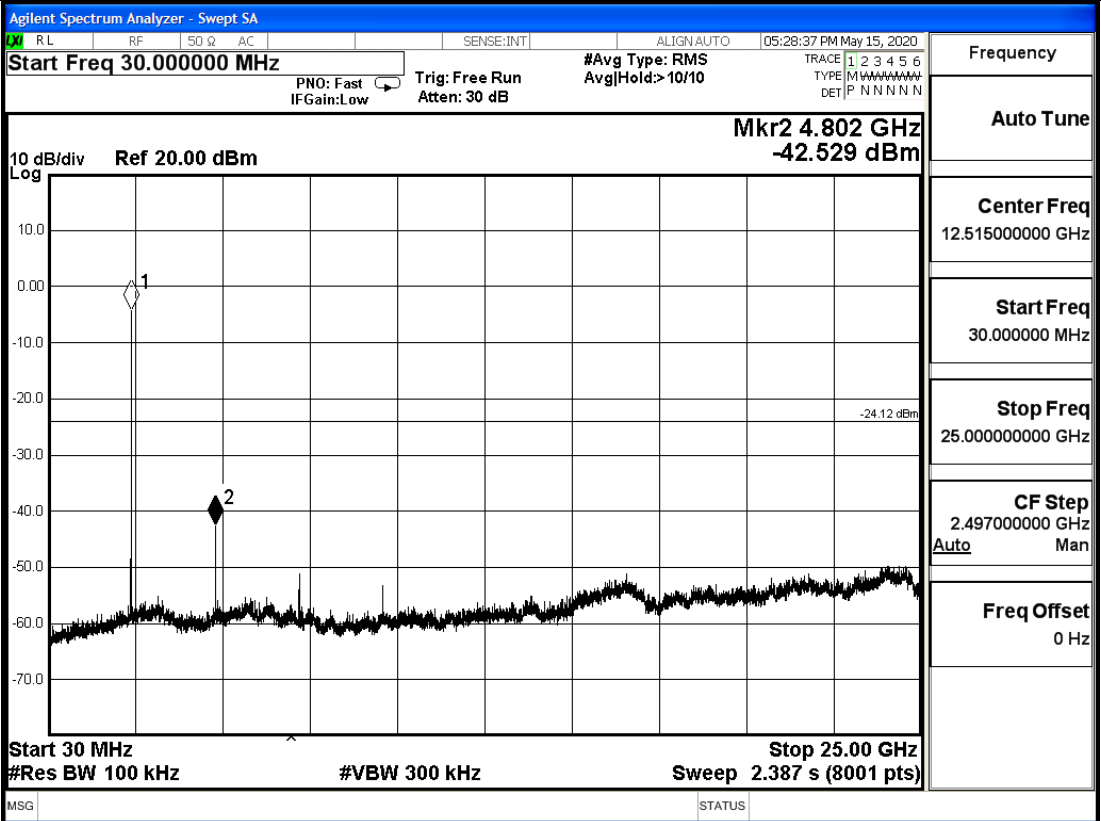
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-4.120	-42.529	-24.12	PASS
	MCH	-4.581	-44.139	-24.58	PASS
	HCH	-5.350	-45.999	-25.35	PASS
$\pi/4$ DQPSK	LCH	-3.985	-42.292	-23.99	PASS
	MCH	-4.486	-43.223	-24.49	PASS
	HCH	-5.369	-45.222	-25.37	PASS

GFSK\_LCH\_Graphs

Pref

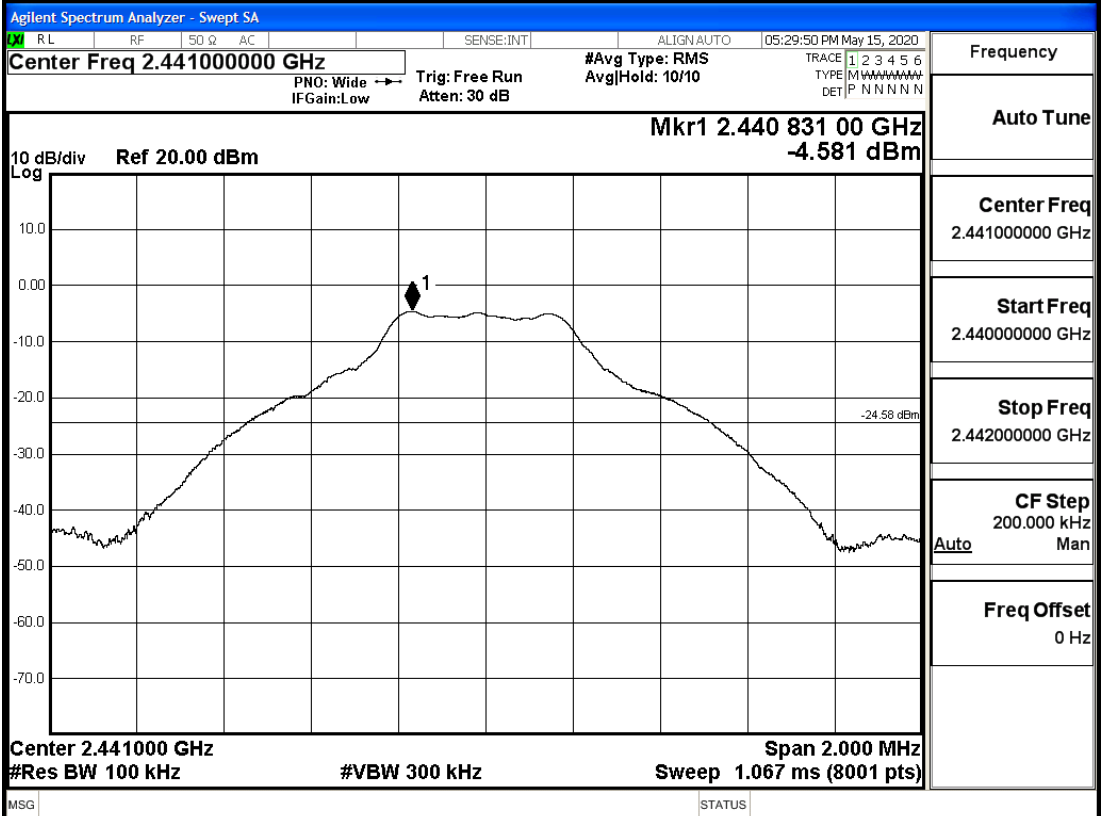


Puw

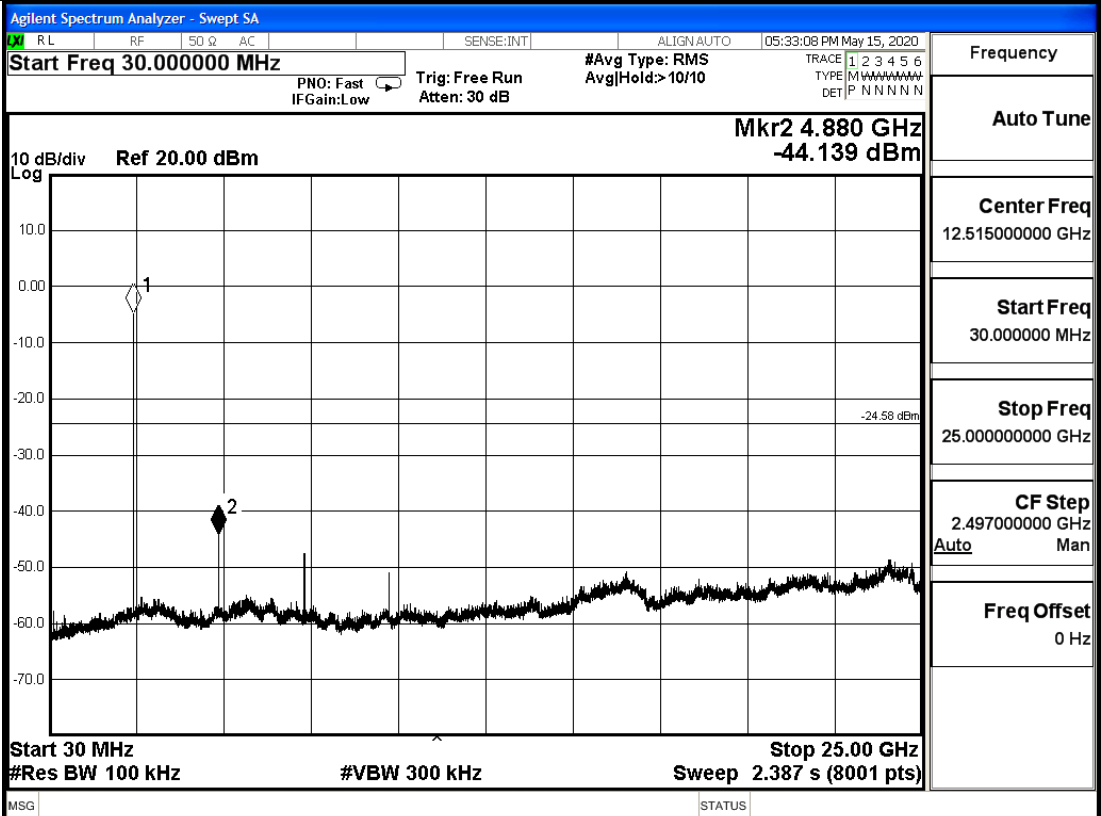


GFSK\_MCH\_Graphs

Pref

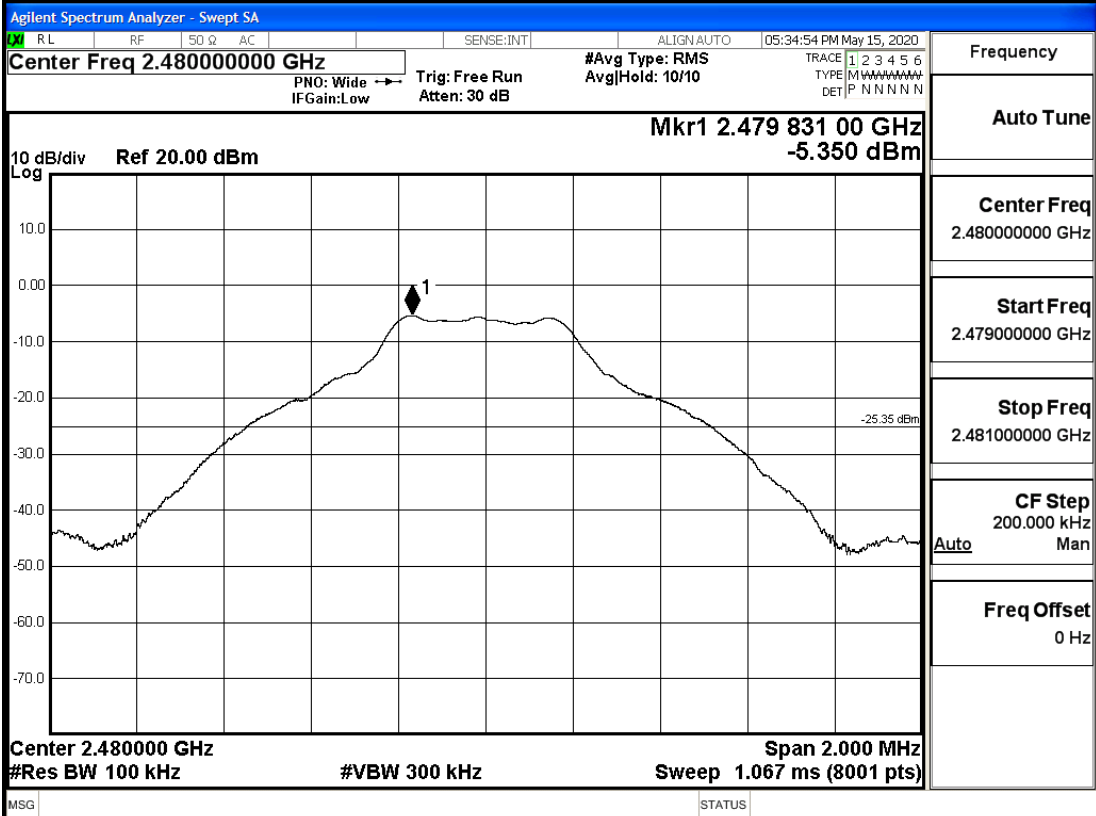


Puw

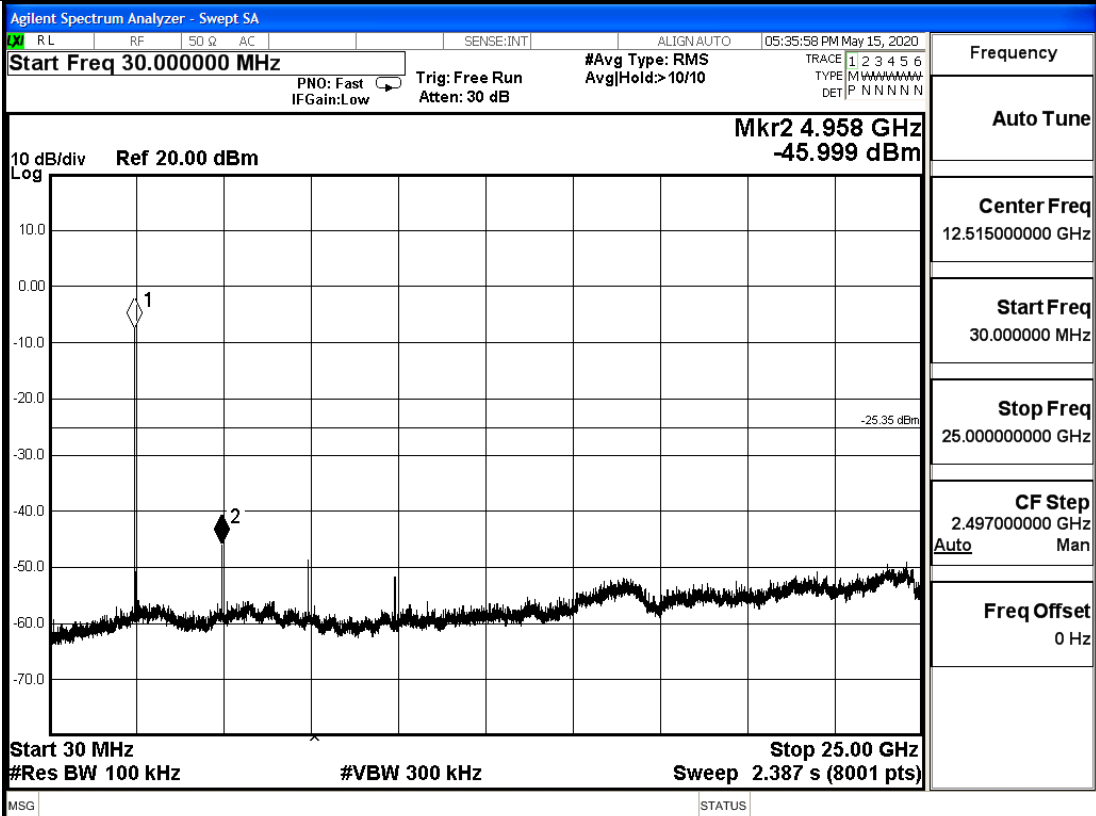


GFSK\_HCH\_Graphs

Pref

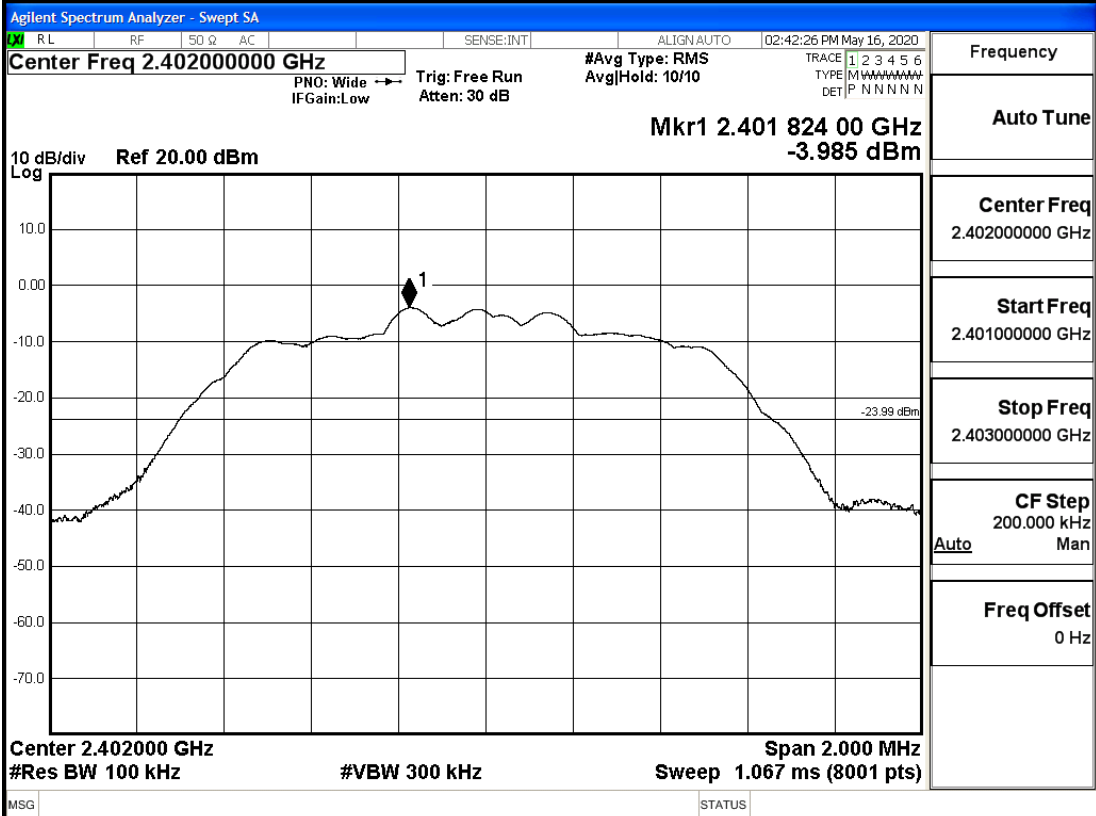


Puw

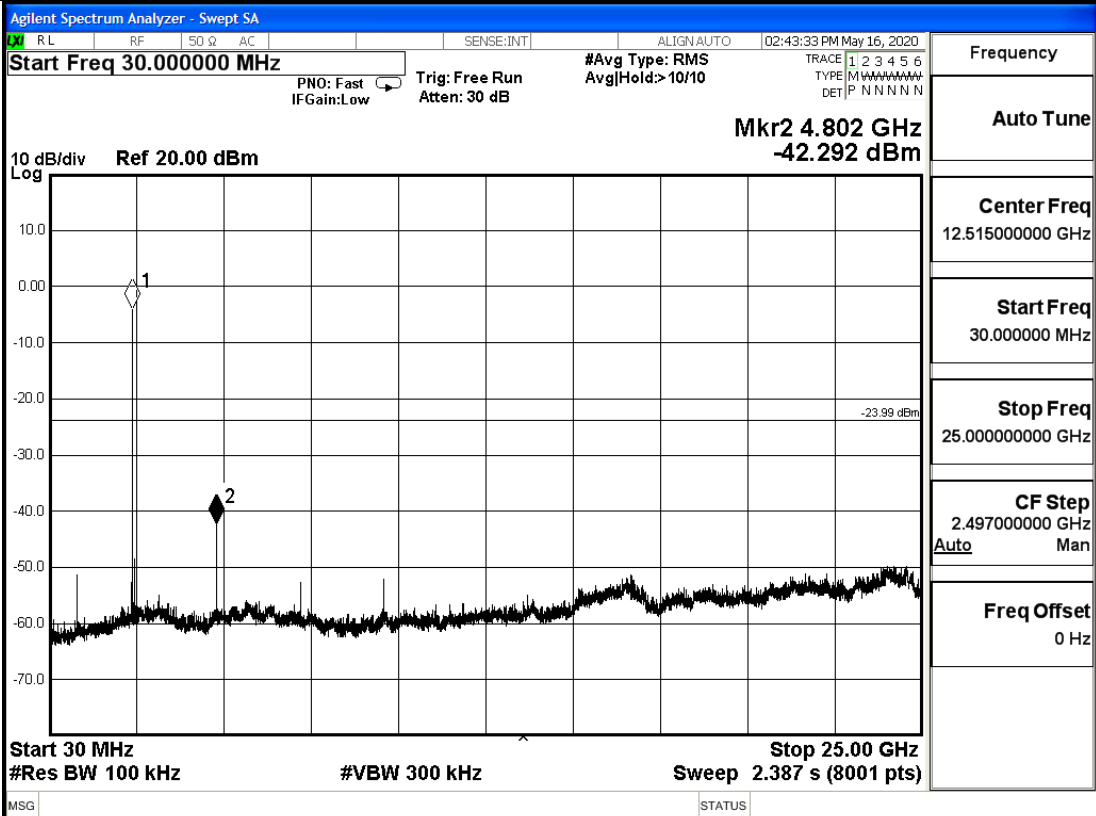


$\pi/4$ DQPSK\_LCH\_Graphs

Pref

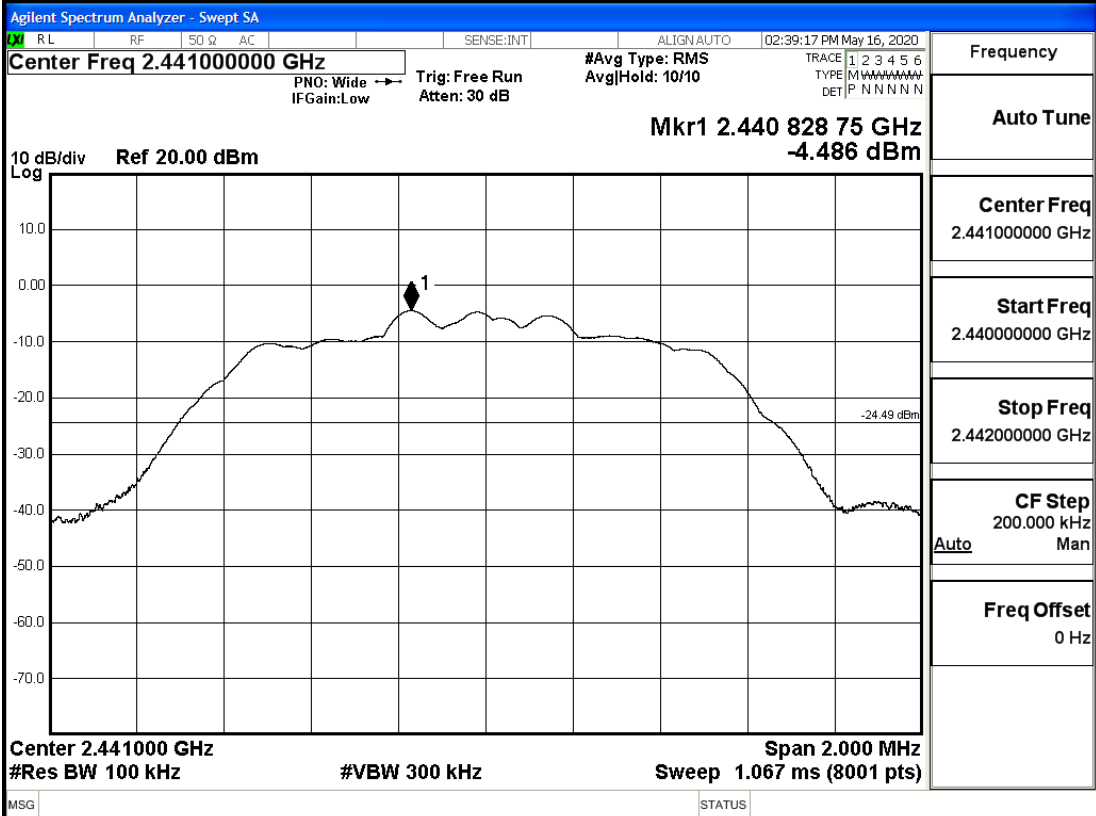


Puw

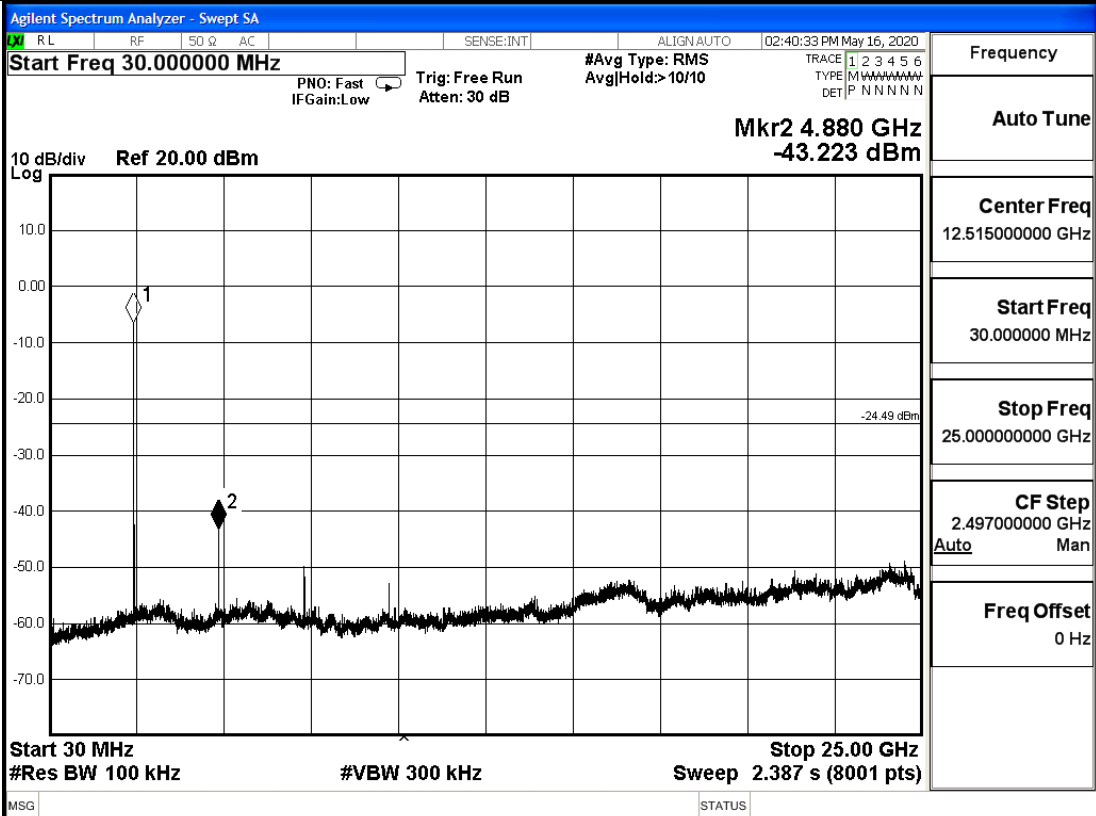


$\pi/4$ DQPSK\_MCH\_Graphs

Pref



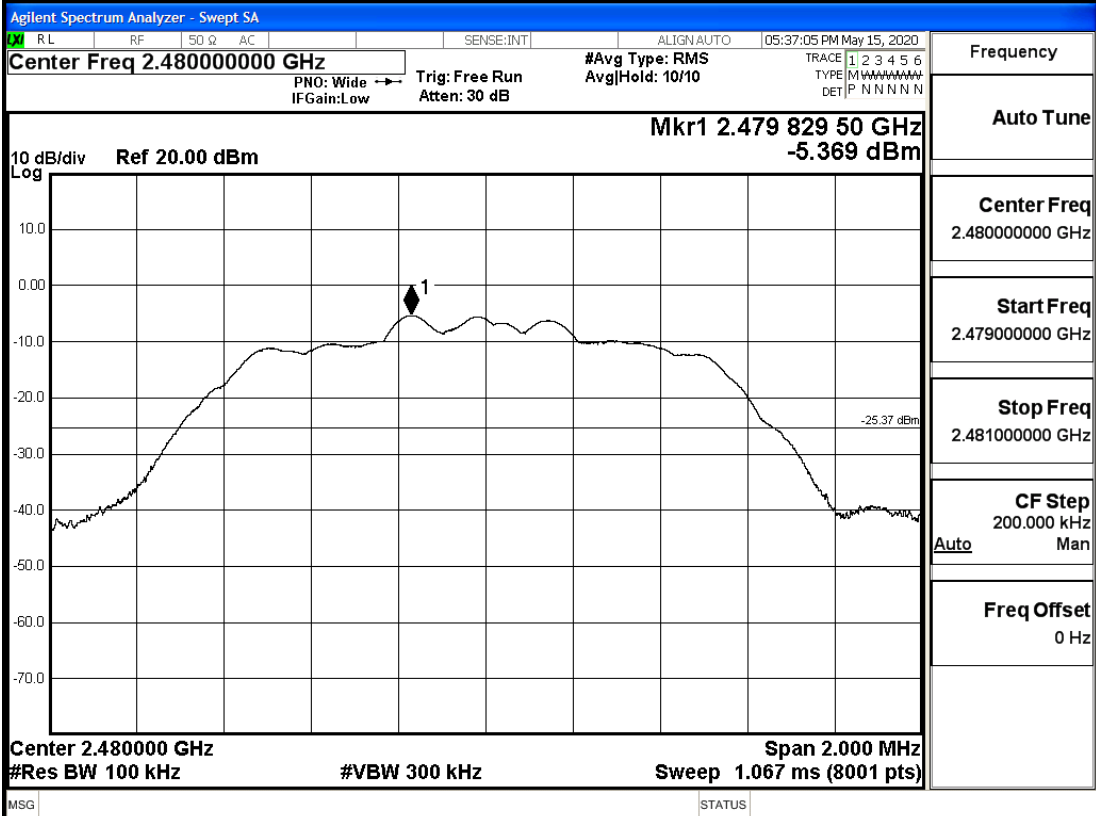
Puw



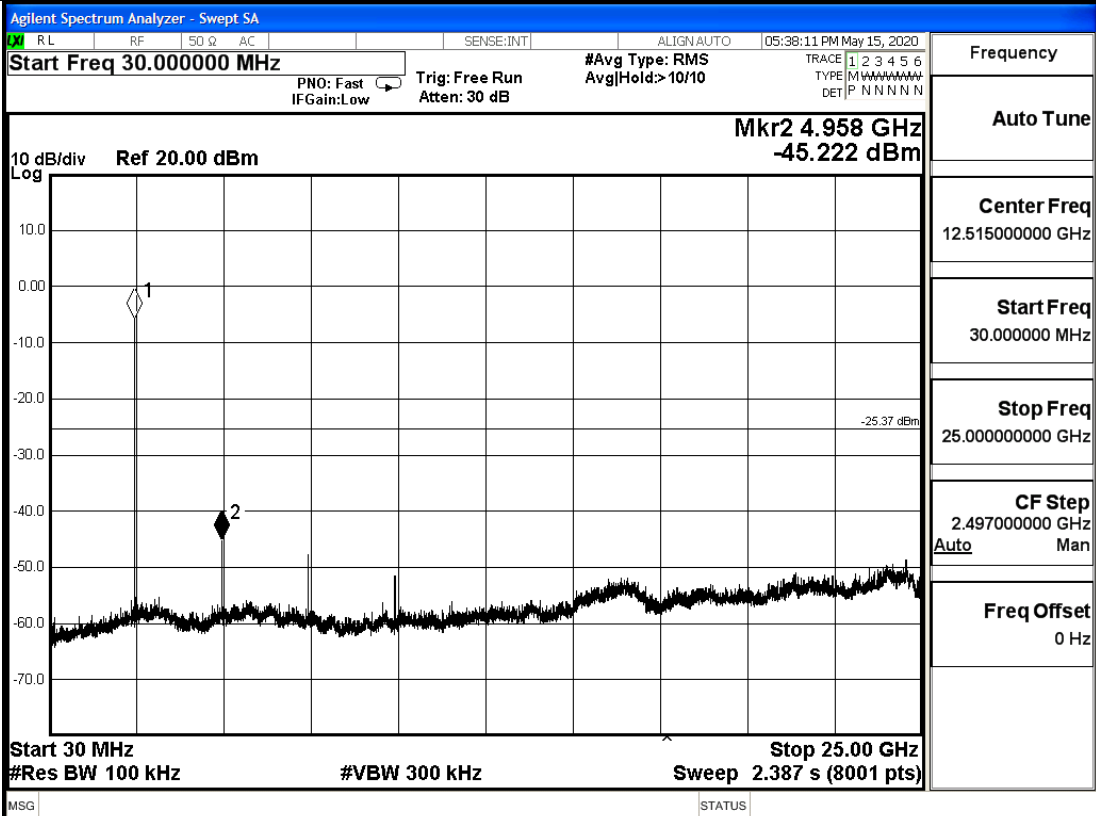


$\pi/4$ DQPSK\_HCH\_Graphs

Pref



Puw

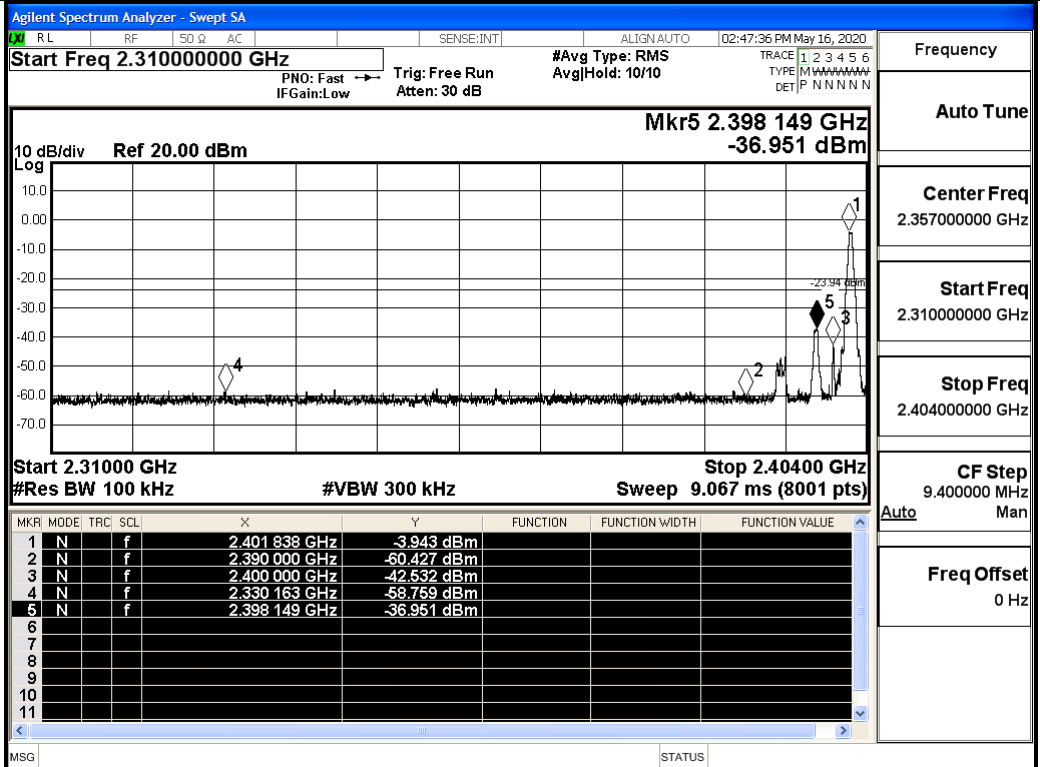


## A.7 Band-edge for RF Conducted Emissions

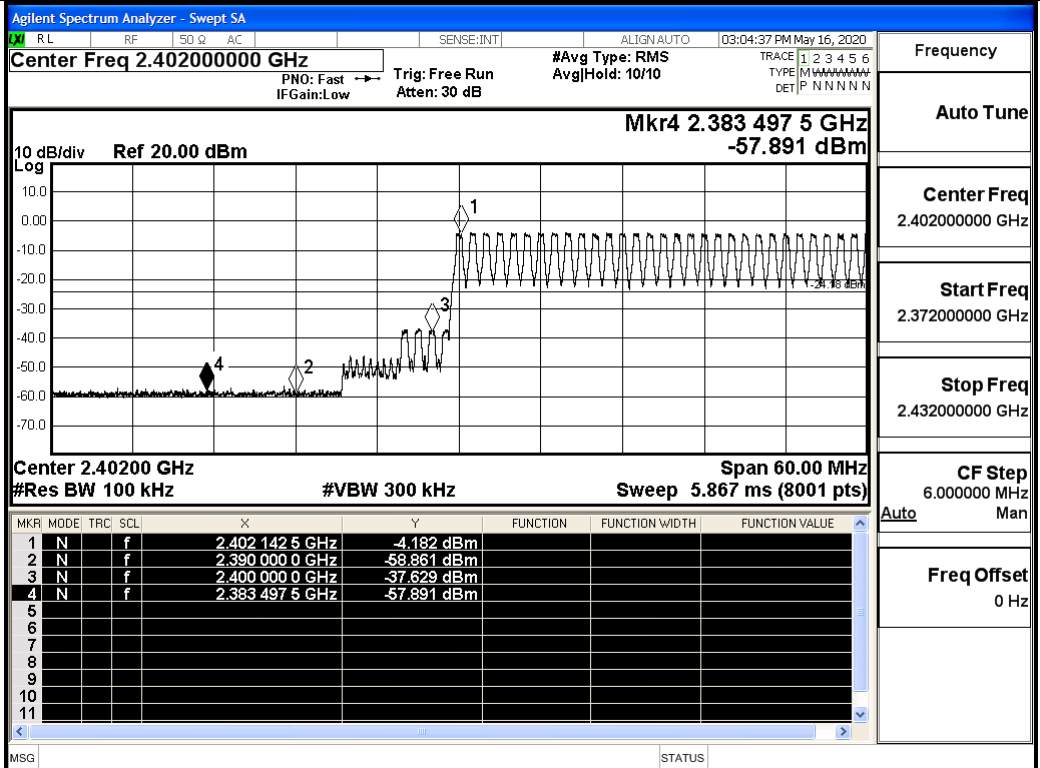
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-3.943	Off	-36.951	-23.94	PASS
			-4.182	On	-37.629	-24.18	PASS
	HCH	2480	-5.237	Off	-49.345	-25.24	PASS
			-5.283	On	-50.035	-25.28	PASS
$\pi/4$ DQPSK	LCH	2402	-3.888	Off	-36.877	-23.89	PASS
			-4.008	On	-37.675	-24.01	PASS
	HCH	2480	-5.277	Off	-49.399	-25.28	PASS
			-5.293	On	-50.456	-25.29	PASS

Test Graphs

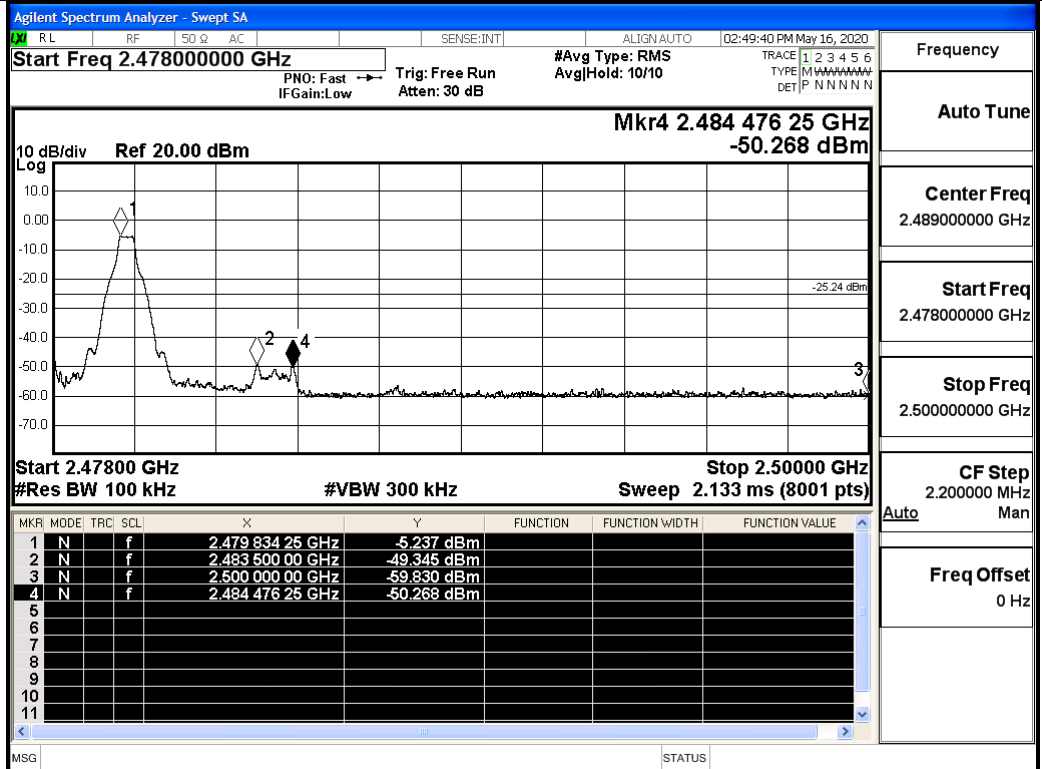
GFSK/LCH/No Hop



GFSK/LCH/Hop

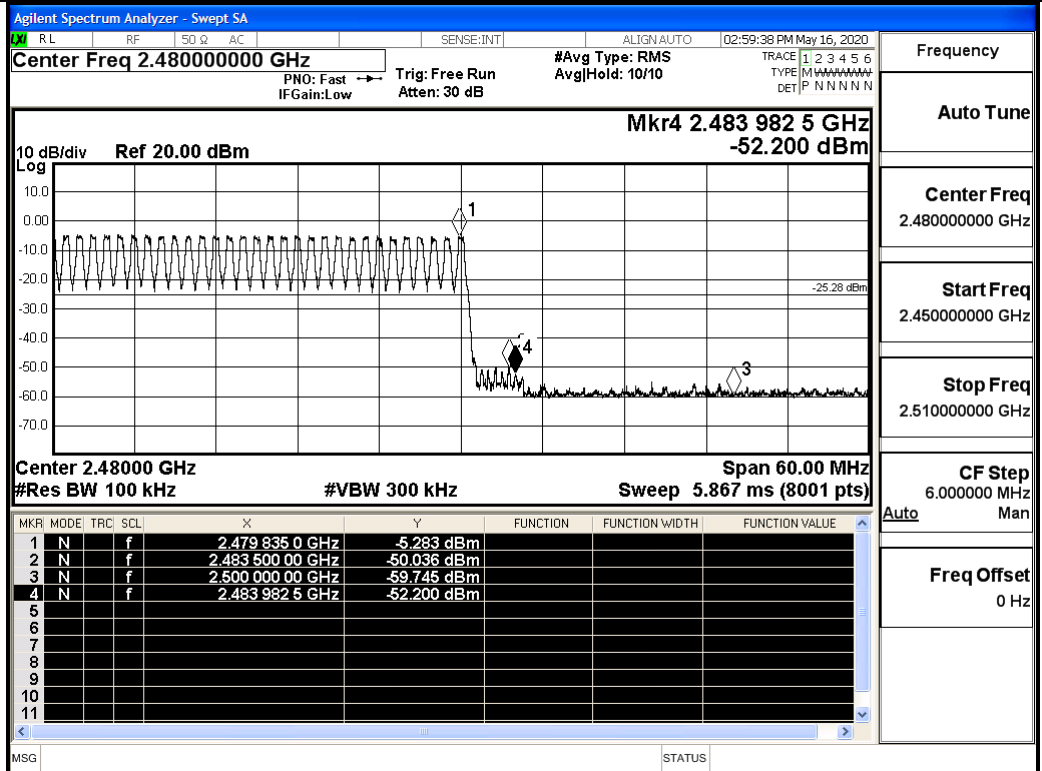


GFSK/HCH/No Hop



Frequency	
Auto Tune	
Center Freq	2.489000000 GHz
Start Freq	2.478000000 GHz
Stop Freq	2.500000000 GHz
CF Step	2.2000000 MHz
Auto	Man
Freq Offset	0 Hz

GFSK/HCH/Hop



Frequency	
Auto Tune	
Center Freq	2.480000000 GHz
Start Freq	2.450000000 GHz
Stop Freq	2.510000000 GHz
CF Step	6.0000000 MHz
Auto	Man
Freq Offset	0 Hz

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

Agilent Spectrum Analyzer - Swept SA  
 Start Freq 2.31000000 GHz  
 #Avg Type: RMS  
 AvgHold: 10/10  
 Mkr5 2.398 149 GHz  
 -36.877 dBm  
 10 dB/div Ref 20.00 dBm  
 Start 2.31000 GHz Stop 2.40400 GHz  
 #Res BW 100 kHz #VBW 300 kHz Sweep 9.067 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.401 838 GHz	-3.888 dBm			
2	N	f		2.390 000 GHz	-60.524 dBm			
3	N	f		2.400 000 GHz	-42.493 dBm			
4	N	f		2.332 701 GHz	-52.700 dBm			
5	N	f		2.398 149 GHz	-36.877 dBm			

Frequency  
Auto Tune  
Center Freq  
2.357000000 GHz  
Start Freq  
2.310000000 GHz  
Stop Freq  
2.404000000 GHz  
CF Step  
9.4000000 MHz  
Auto Man  
Freq Offset  
0 Hz

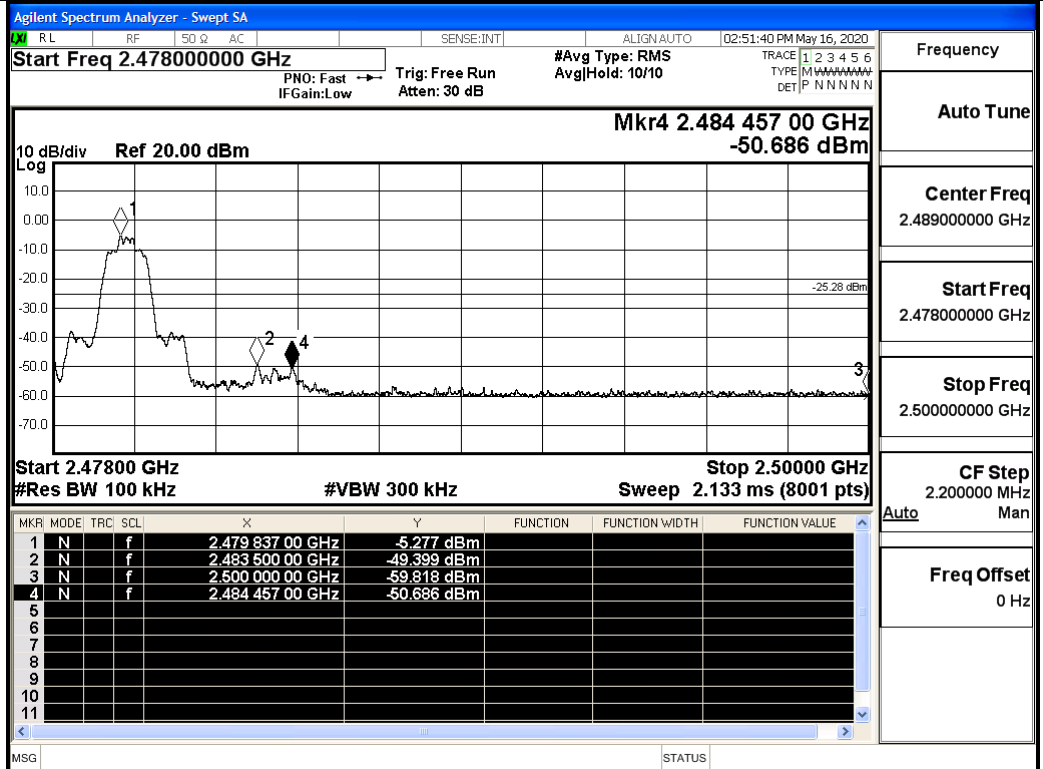
$\pi/4$ DQPSK/LCH/Hop

Agilent Spectrum Analyzer - Swept SA  
 Center Freq 2.40200000 GHz  
 #Avg Type: RMS  
 AvgHold: 10/10  
 Mkr4 2.381 757 5 GHz  
 -58.637 dBm  
 10 dB/div Ref 20.00 dBm  
 Center 2.40200 GHz Span 60.00 MHz  
 #Res BW 100 kHz #VBW 300 kHz Sweep 5.867 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.401 835 0 GHz	-4.008 dBm			
2	N	f		2.390 000 0 GHz	-59.268 dBm			
3	N	f		2.400 000 0 GHz	-37.675 dBm			
4	N	f		2.381 757 5 GHz	-58.637 dBm			

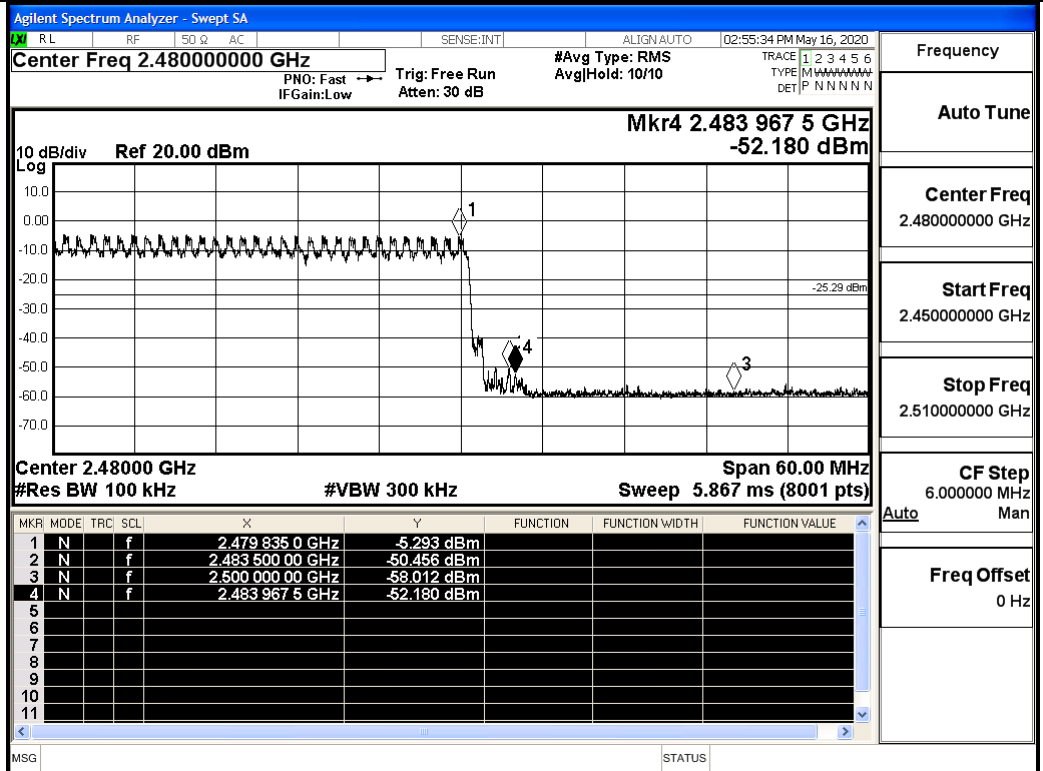
Frequency  
Auto Tune  
Center Freq  
2.402000000 GHz  
Start Freq  
2.372000000 GHz  
Stop Freq  
2.432000000 GHz  
CF Step  
6.0000000 MHz  
Auto Man  
Freq Offset  
0 Hz

$\pi/4$ DQPSK/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

$\pi/4$ DQPSK/HCH/Hop

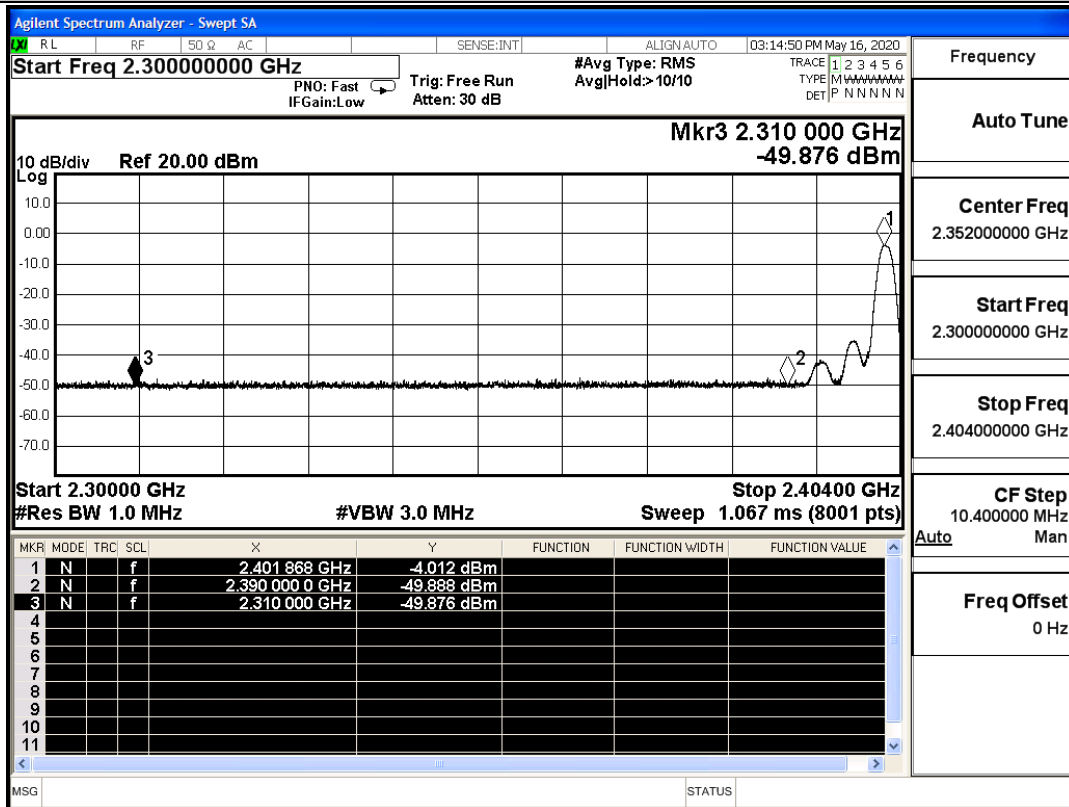


Frequency
Auto Tune
Center Freq 2.480000000 GHz
Start Freq 2.450000000 GHz
Stop Freq 2.510000000 GHz
CF Step 6.000000 MHz
Auto Man
Freq Offset 0 Hz

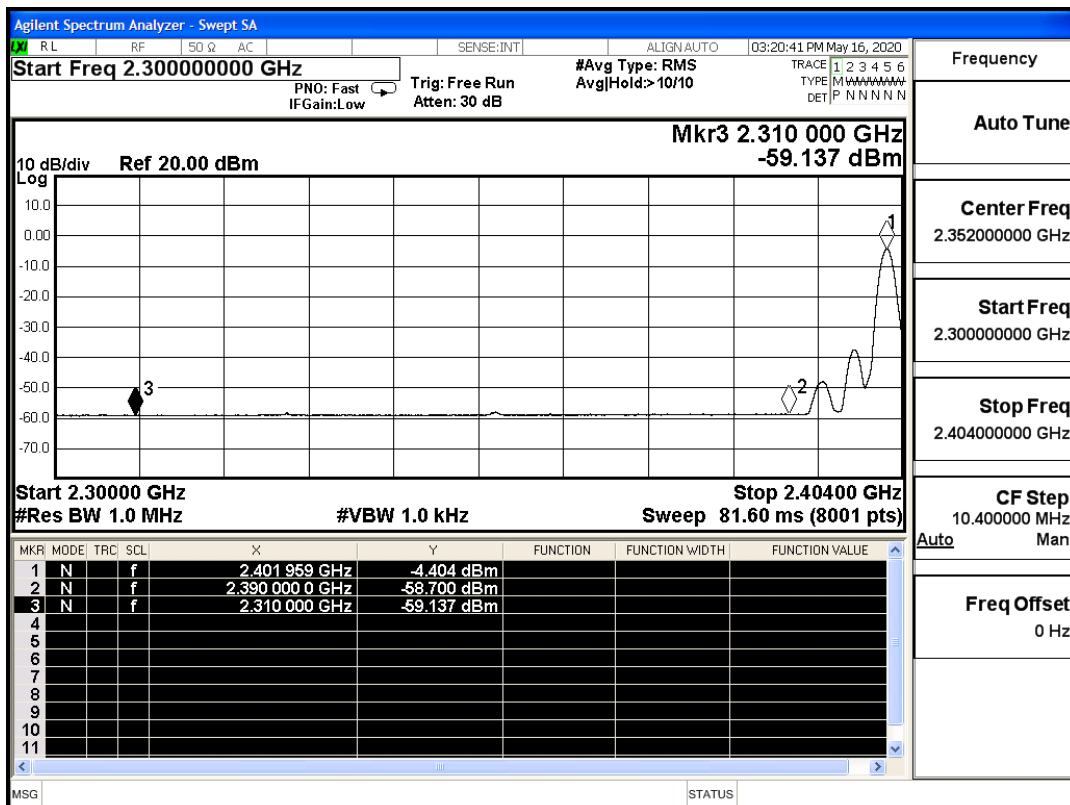
## A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-49.876	2.0	0	47.35	PEAK	74	PASS
	Off	2310.0	-59.137	2.0	0	38.09	AV	54	PASS
	Off	2390.0	-49.880	2.0	0	47.35	PEAK	74	PASS
	Off	2390.0	-58.700	2.0	0	38.53	AV	54	PASS
	Off	2483.5	-45.041	2.0	0	52.19	PEAK	74	PASS
	Off	2483.5	-51.626	2.0	0	45.60	AV	54	PASS
	Off	2500.0	-49.271	2.0	0	47.96	PEAK	74	PASS
	Off	2500.0	-58.658	2.0	0	38.57	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-51.831	2.0	0	45.40	PEAK	74	PASS
	Off	2310.0	-59.077	2.0	0	38.15	AV	54	PASS
	Off	2390.0	-52.011	2.0	0	45.22	PEAK	74	PASS
	Off	2390.0	-58.694	2.0	0	38.54	AV	54	PASS
	Off	2483.5	-44.439	2.0	0	52.79	PEAK	74	PASS
	Off	2483.5	-53.262	2.0	0	43.97	AV	54	PASS
	Off	2500.0	-50.249	2.0	0	46.98	PEAK	74	PASS
	Off	2500.0	-58.381	2.0	0	38.85	AV	54	PASS

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

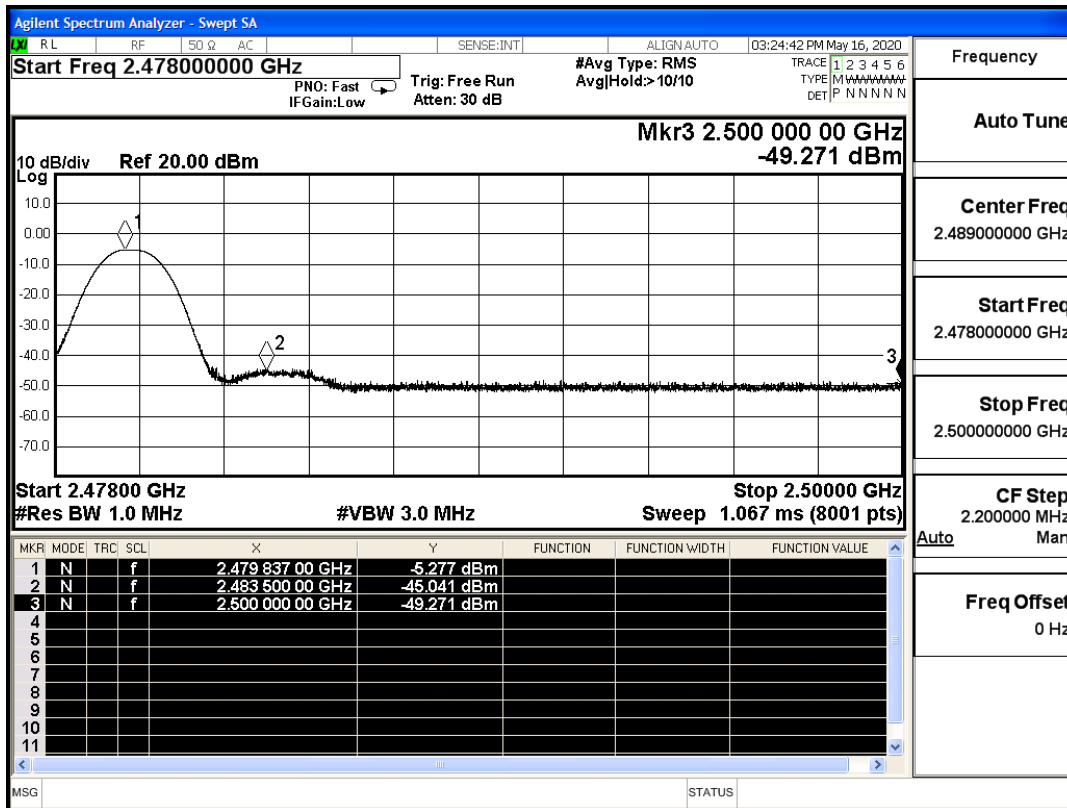


Restrict-band band-edge measurements\_Hopping Off\_GFSK\_Average (Low Channel)

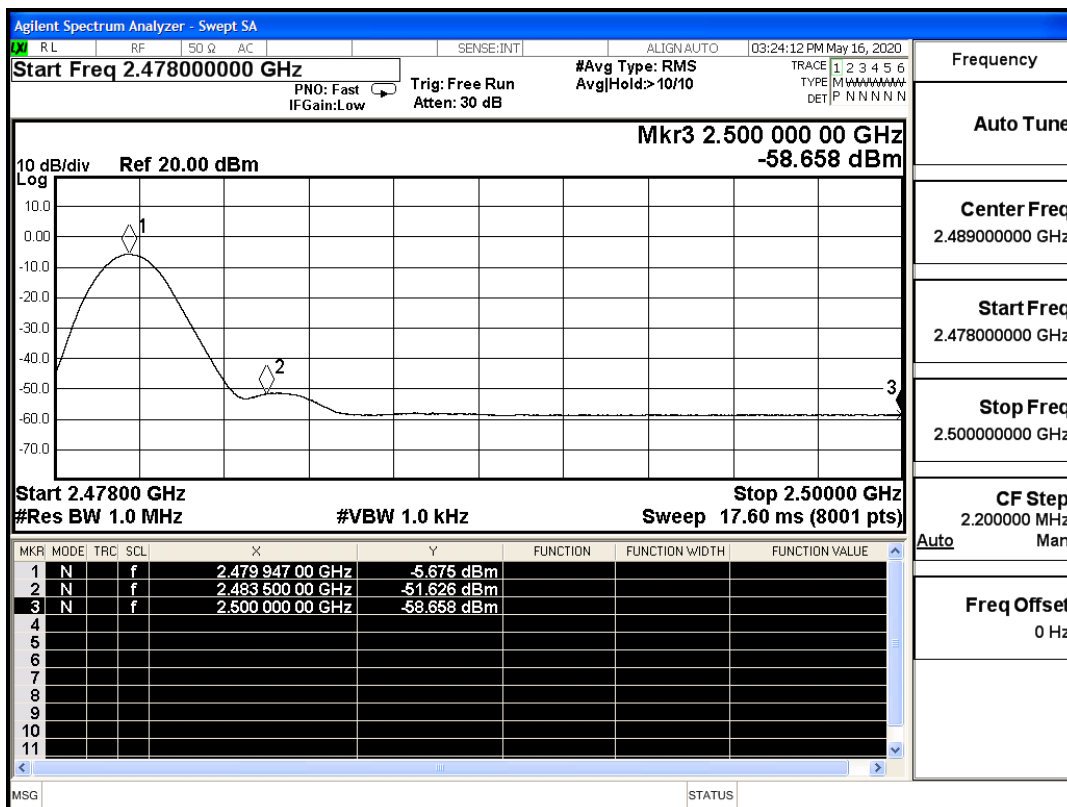




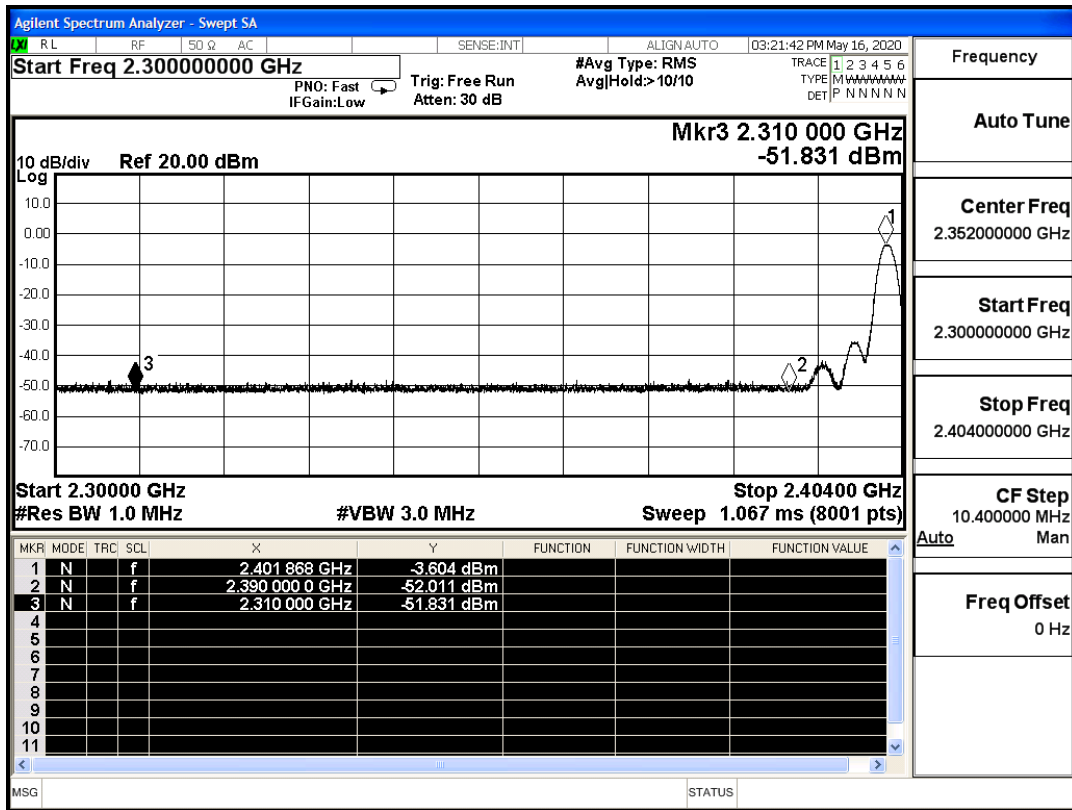
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_PEAK (High Channel)



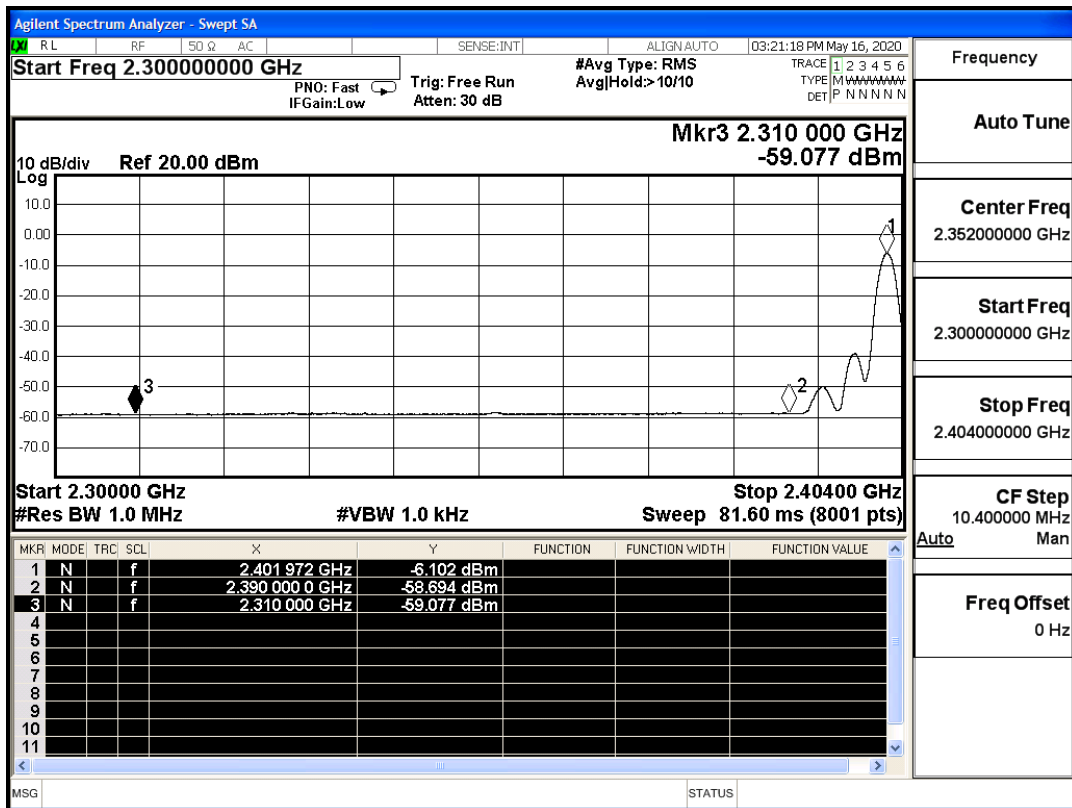
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_Average (High Channel)



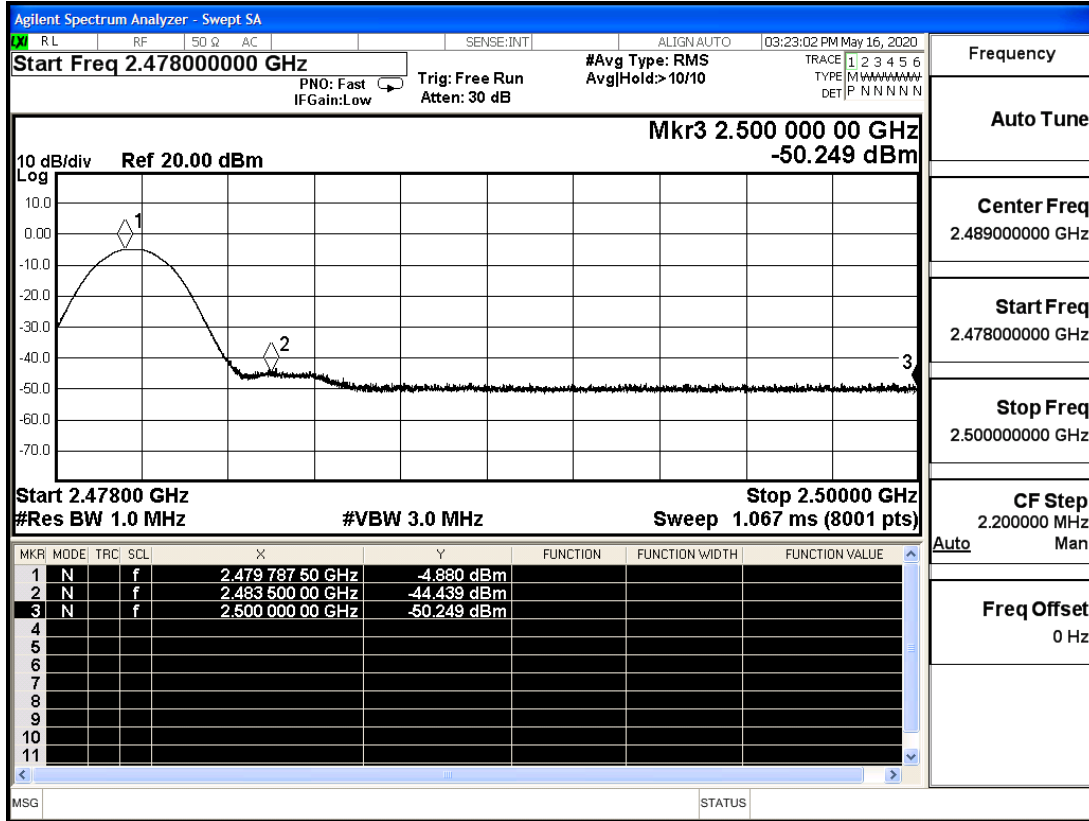
Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_PEAK (Low Channel)



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)

