

## Appendix A

### RF Test Data for BT V4.2 (BDR/EDR) (Conducted Measurement)

Product Name: EcoEdge Plus

Trade Mark: ECOXGEAR

Test Model: GDI-EXEGL410

#### Environmental Conditions

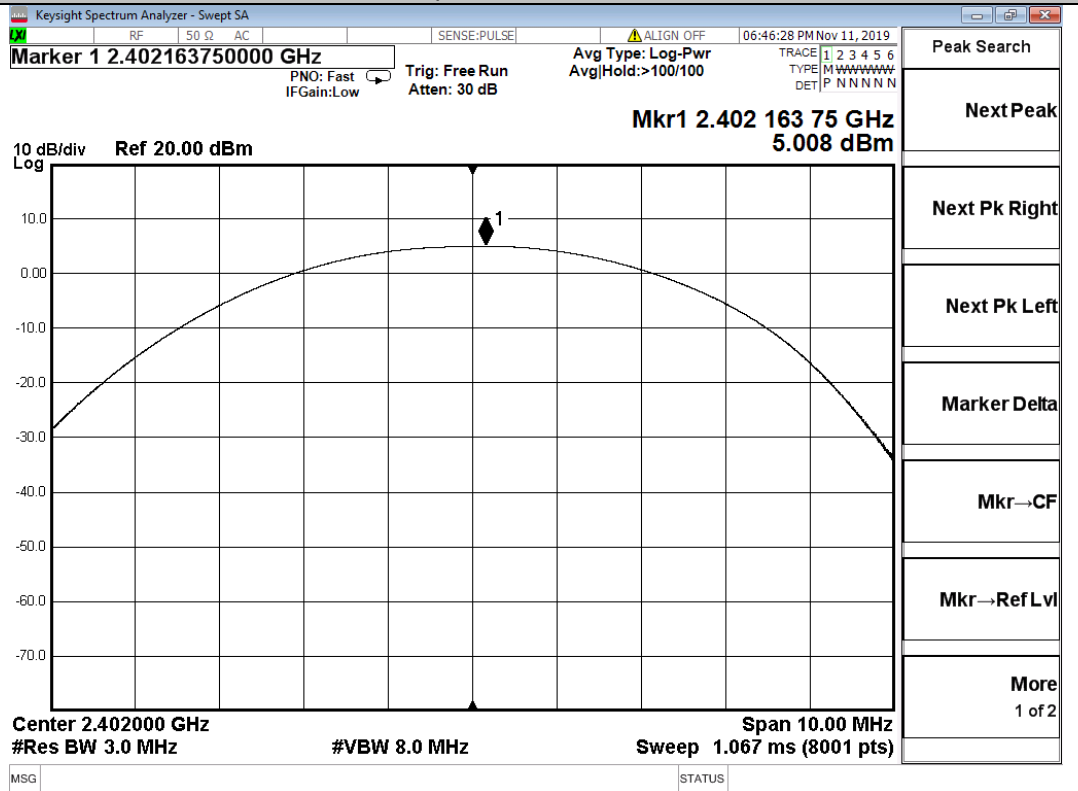
Temperature:	23.2° C
Relative Humidity:	54.1%
ATM Pressure:	100.0 kPa
Test Engineer:	Chuang Wang
Supervised by:	Jayden Zhuo

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

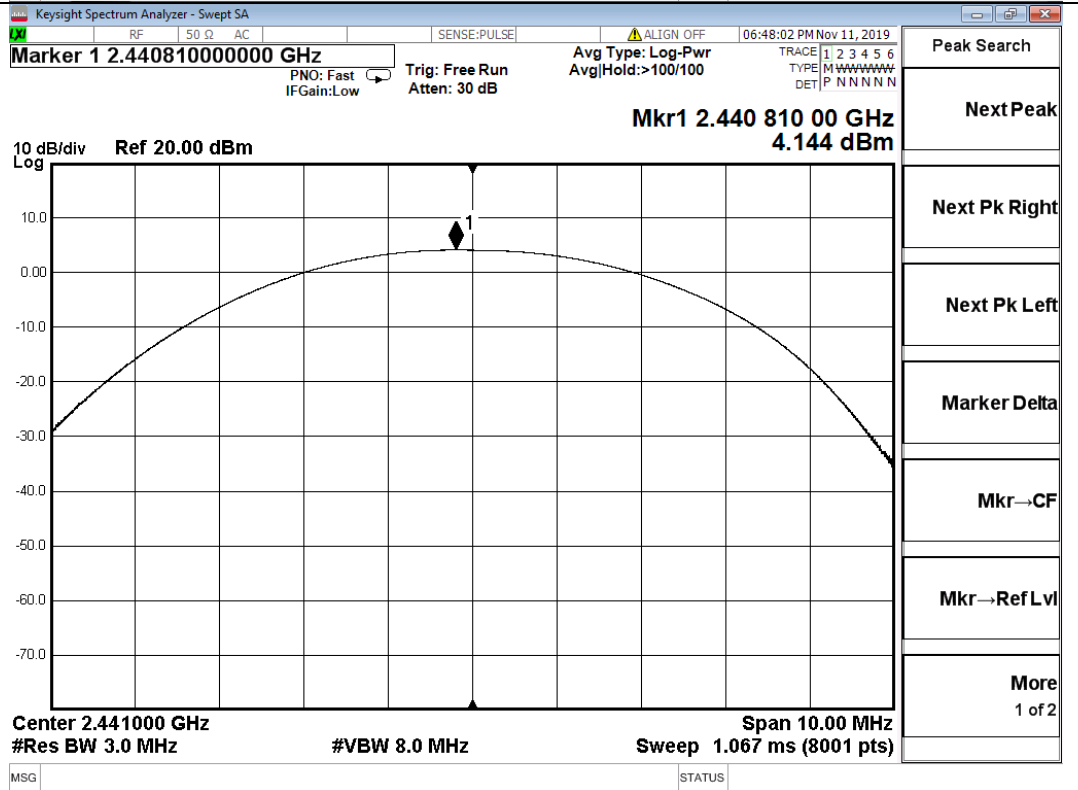
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	5.008	21	PASS
	MCH	4.144	21	PASS
	HCH	3.255	21	PASS
$\pi/4$ DQPSK	LCH	3.450	21	PASS
	MCH	2.938	21	PASS
	HCH	2.389	21	PASS
8DPSK	LCH	3.670	21	PASS
	MCH	4.085	21	PASS
	HCH	3.200	21	PASS

Test Graphs

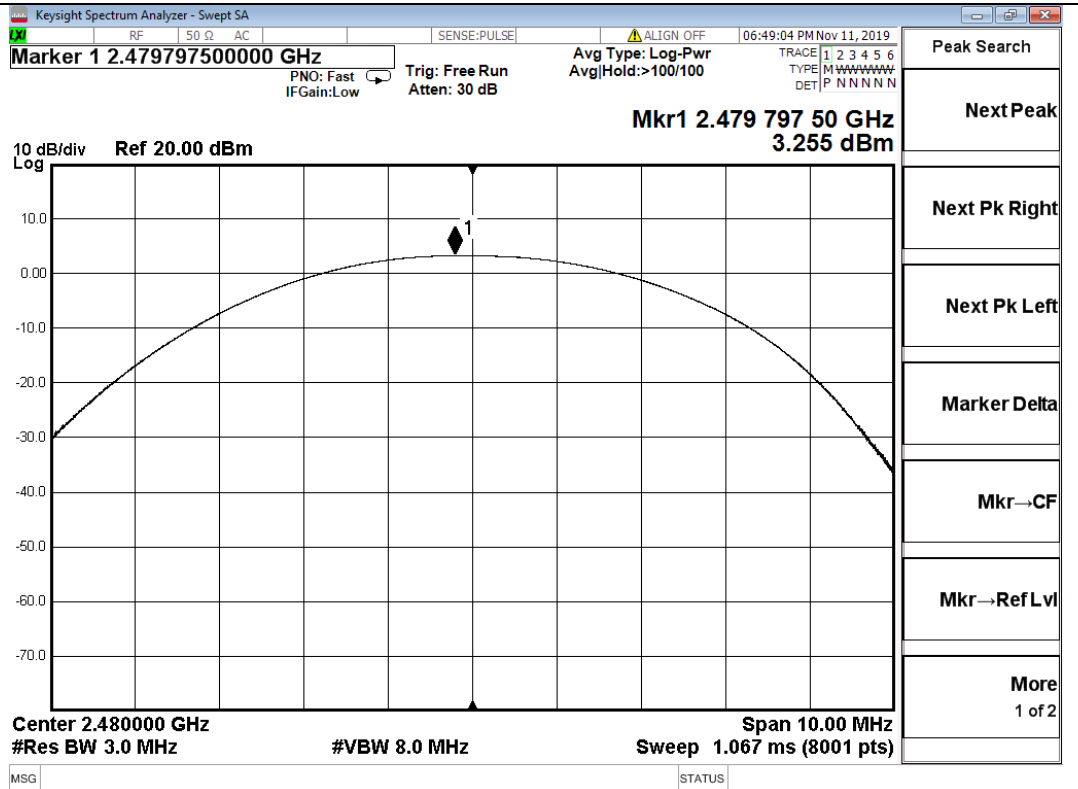
GFSK/LCH



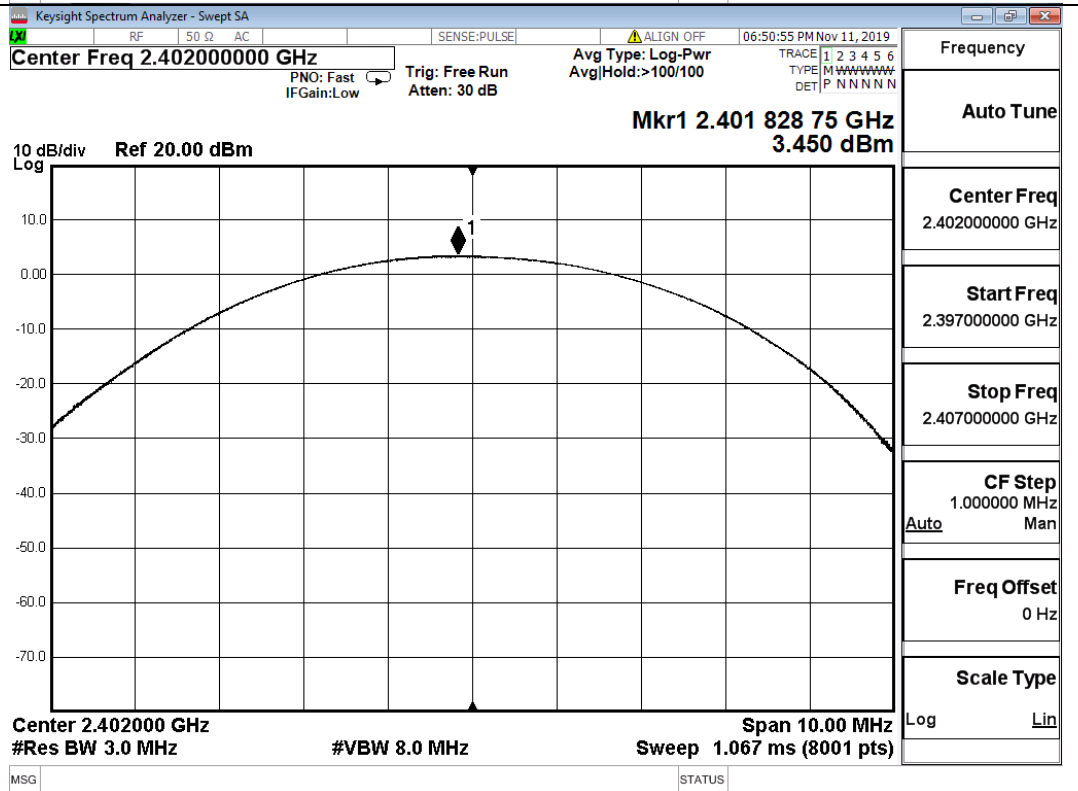
GFSK/MCH

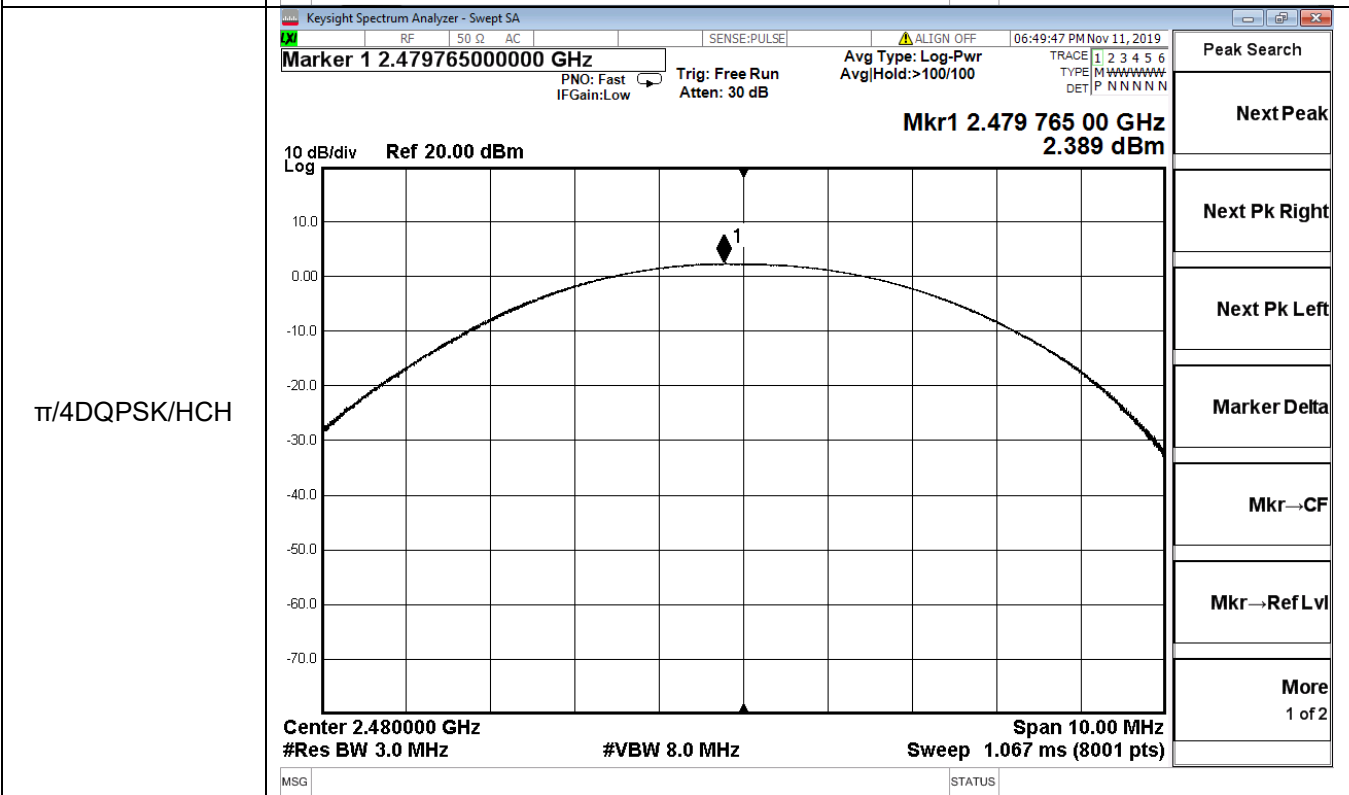
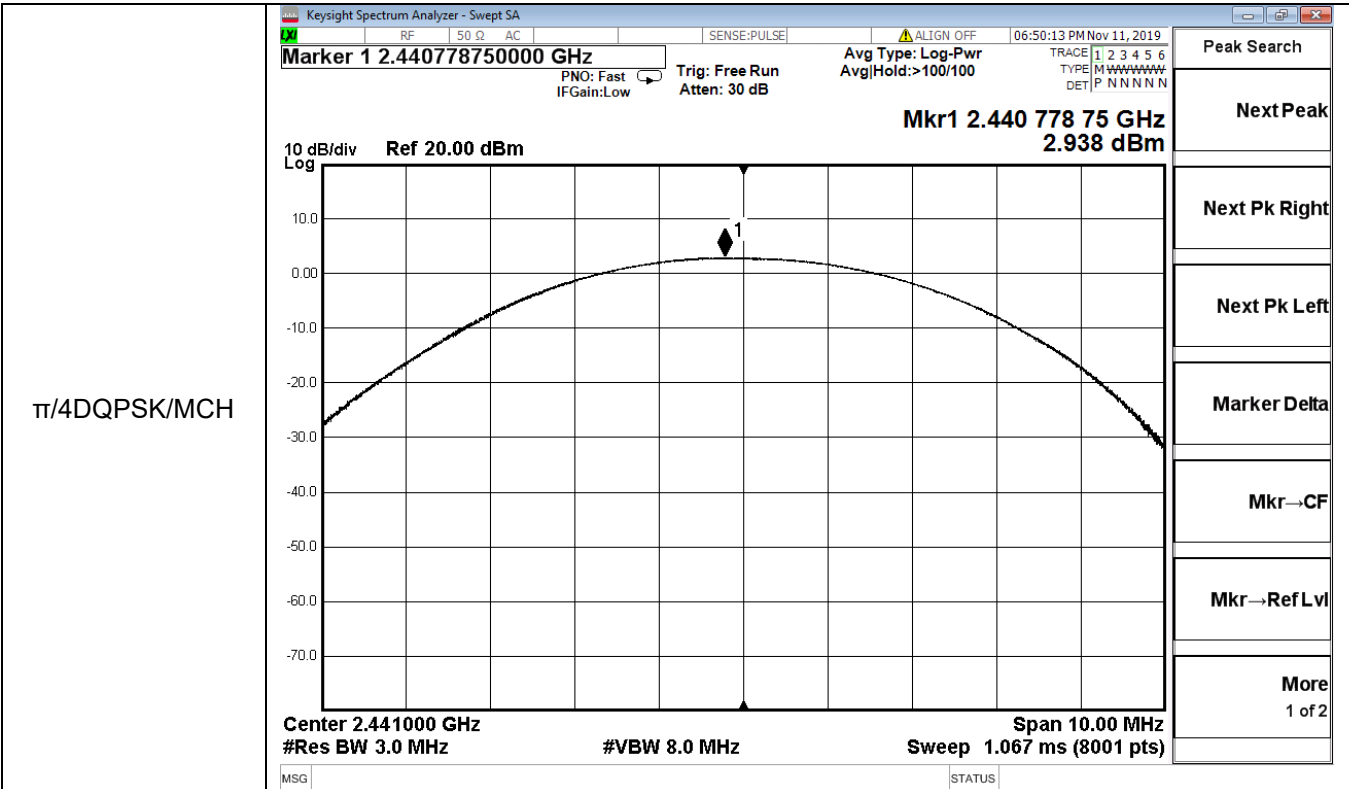


GFSK/HCH

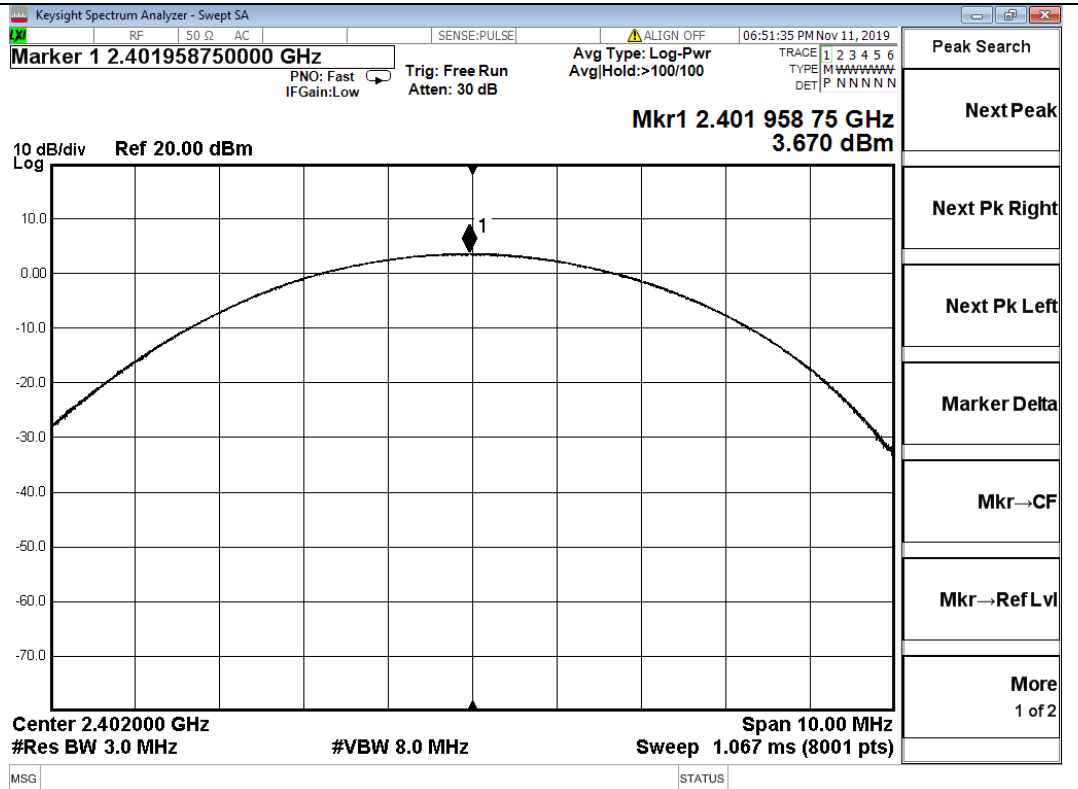


$\pi$ /4DQPSK/LCH

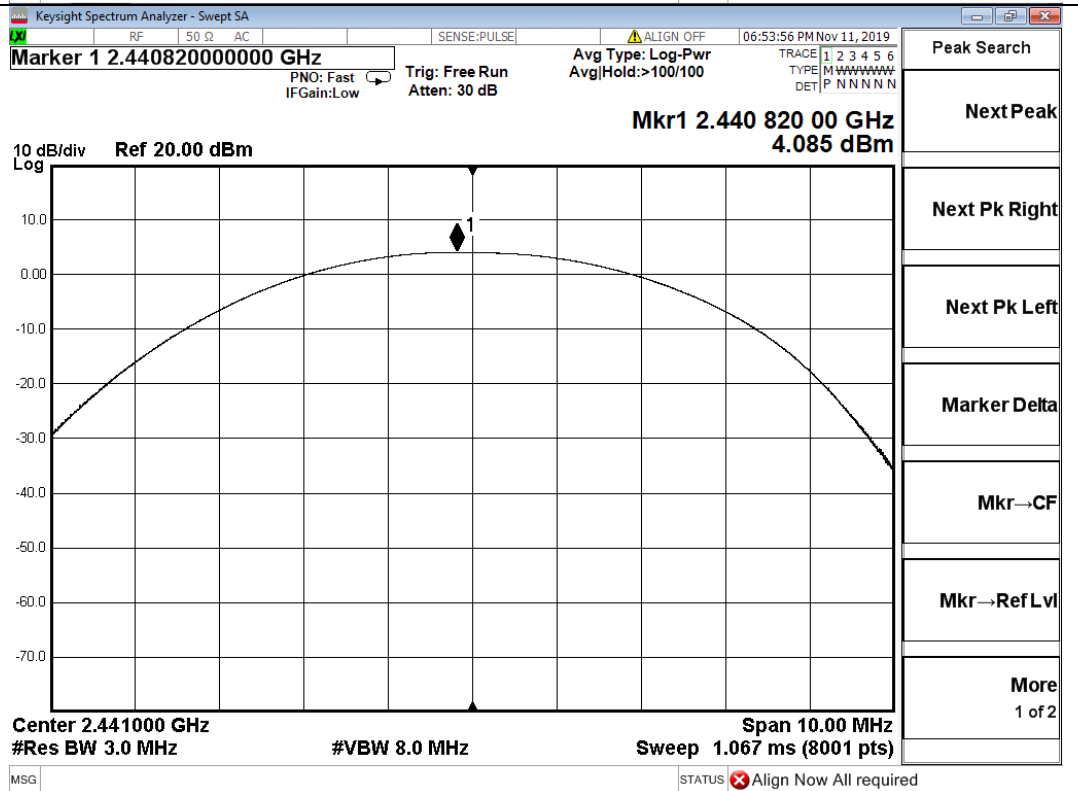


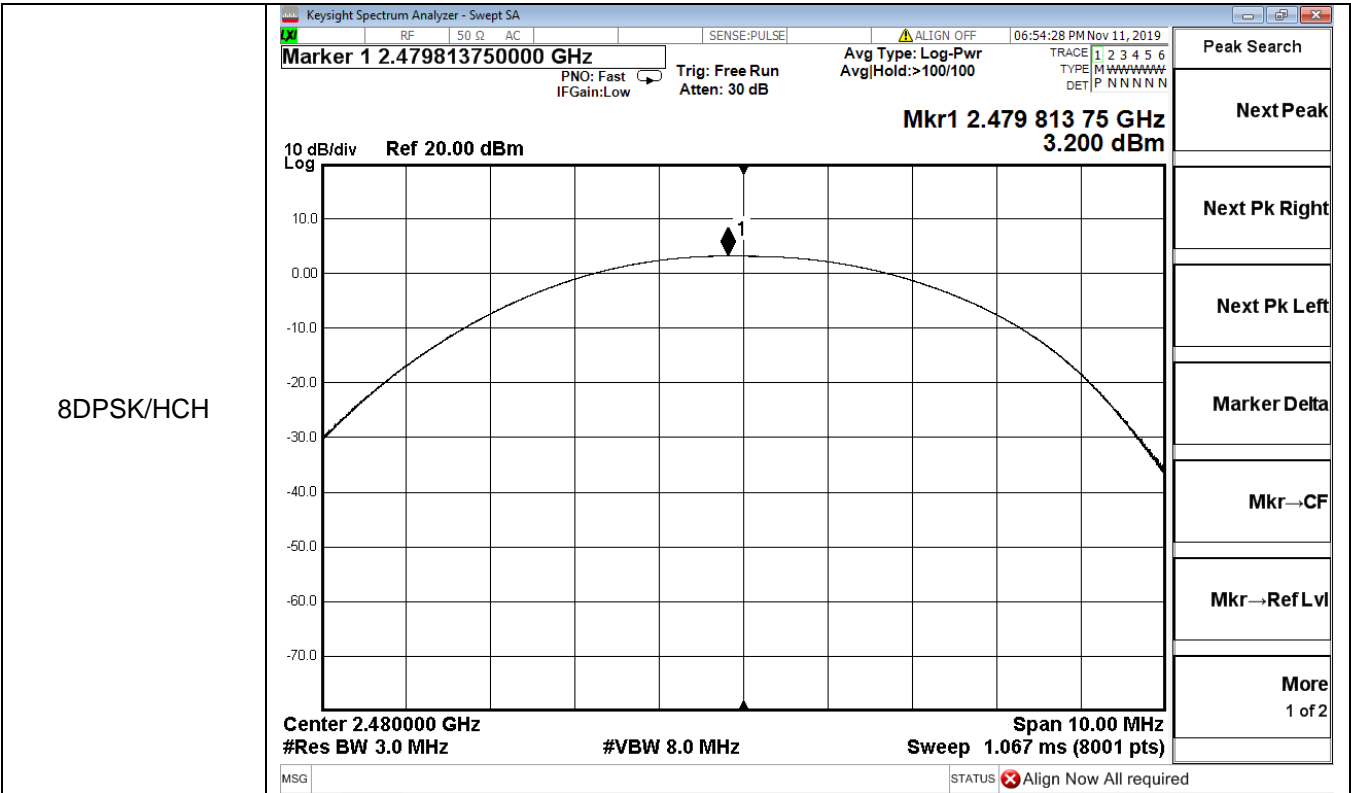


8DPSK/LCH



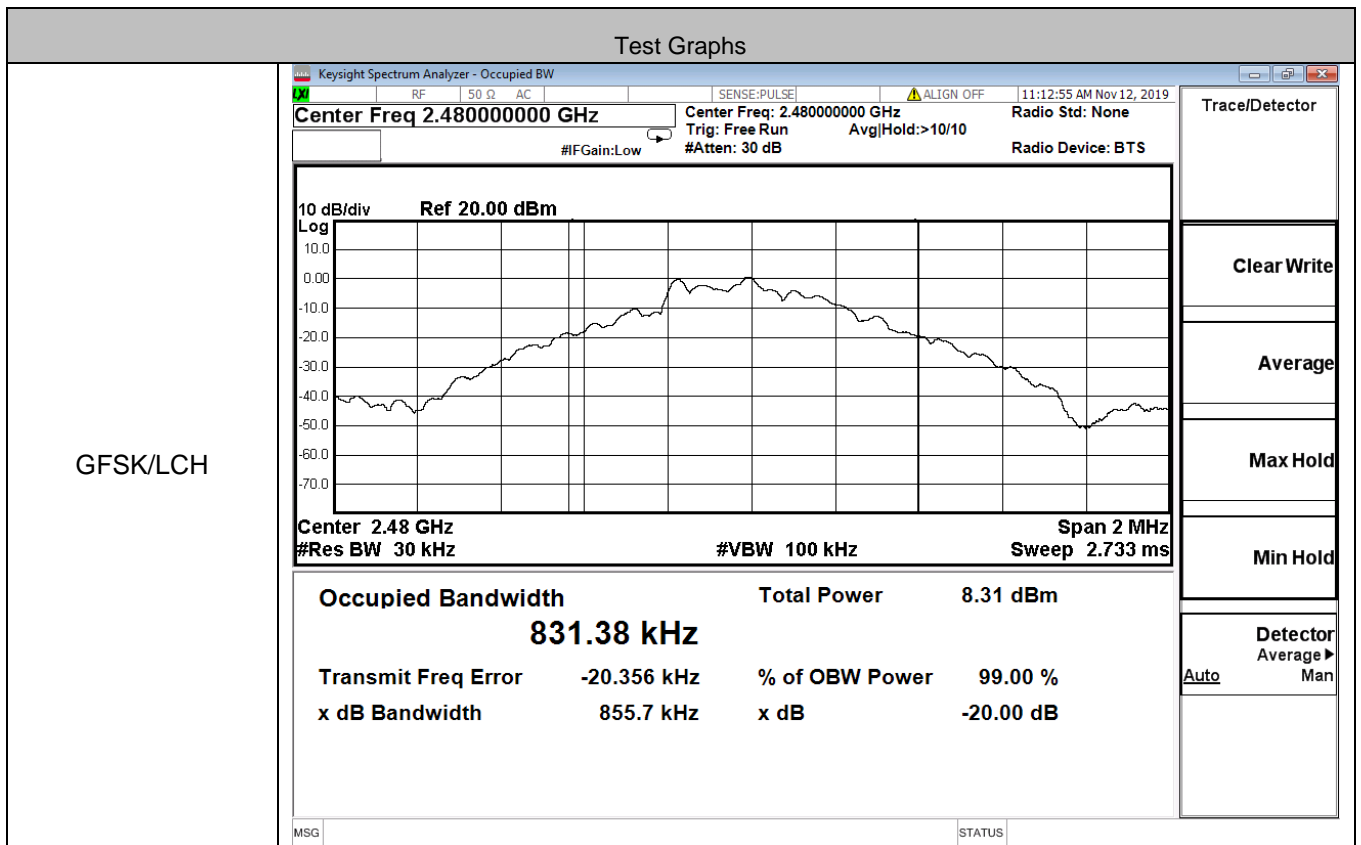
8DPSK/MCH



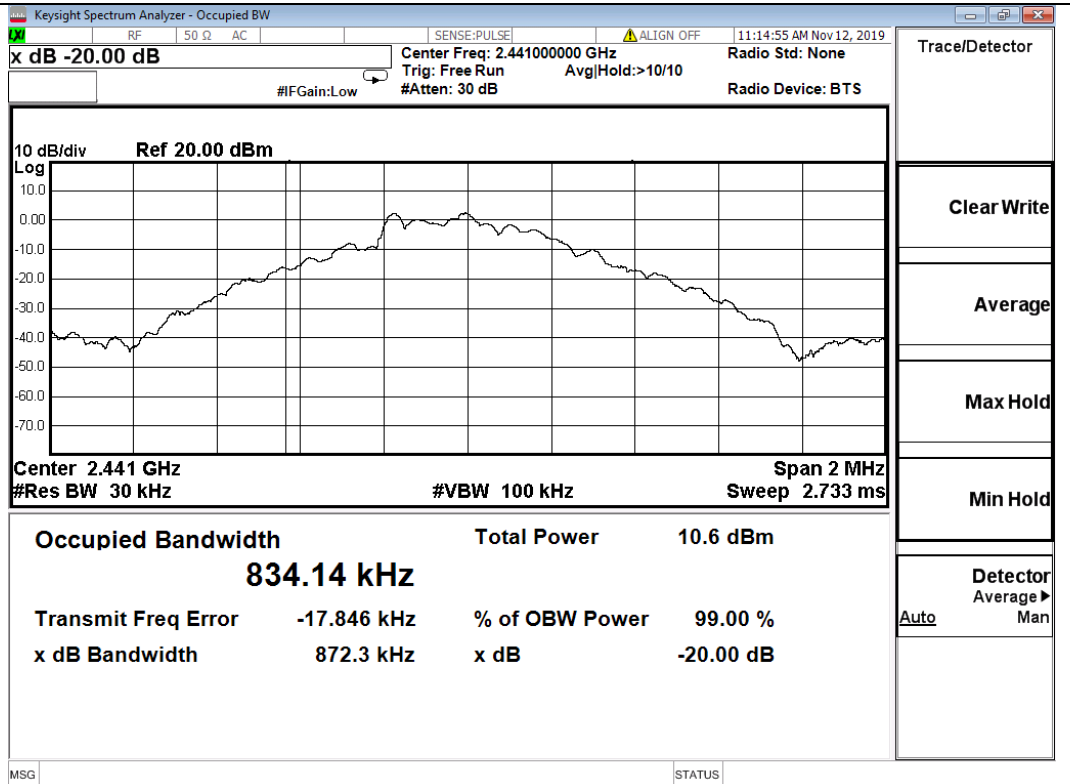


**A.2 99% and 20dB Bandwidth**

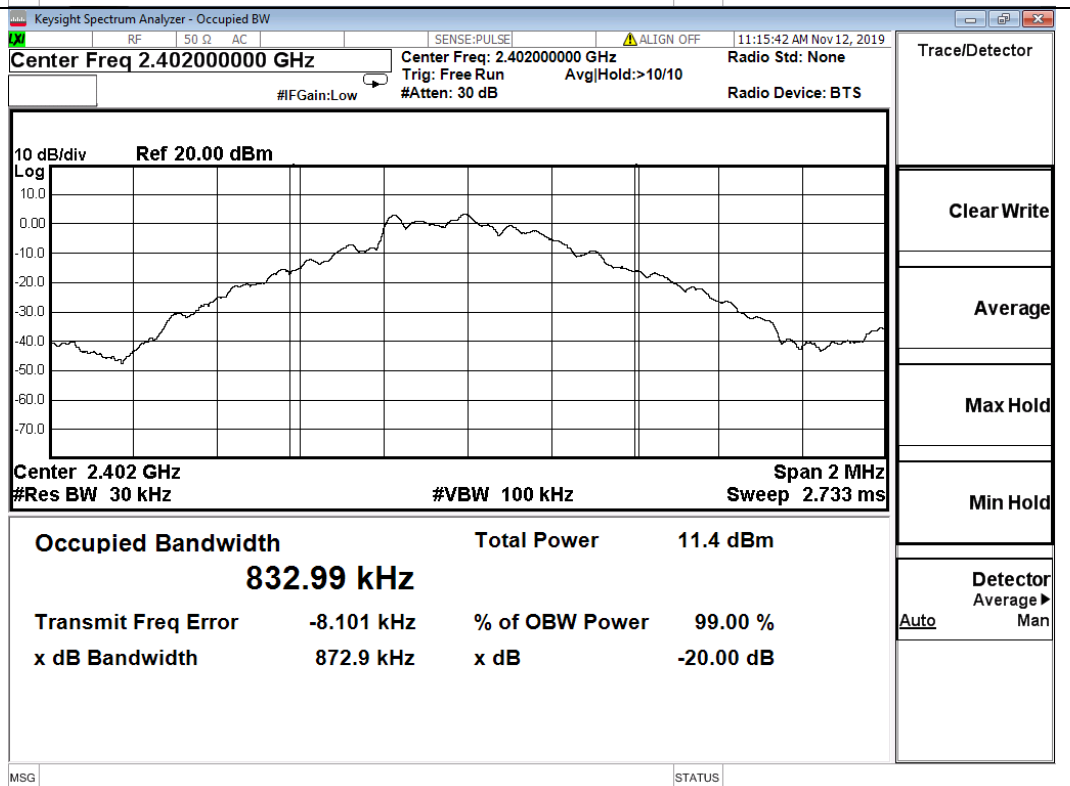
Mode	Channel.	99% Bandwidth [MHz]	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.83138	0.8557	Not Specified	PASS
	MCH	0.83414	0.8723	Not Specified	PASS
	HCH	0.83299	0.8729	Not Specified	PASS
π/4DQPSK	LCH	1.1642	1.218	Not Specified	PASS
	MCH	1.1684	1.223	Not Specified	PASS
	HCH	1.1691	1.222	Not Specified	PASS
8DPSK	LCH	1.1450	1.207	Not Specified	PASS
	MCH	1.1508	1.210	Not Specified	PASS
	HCH	1.1504	1.209	Not Specified	PASS



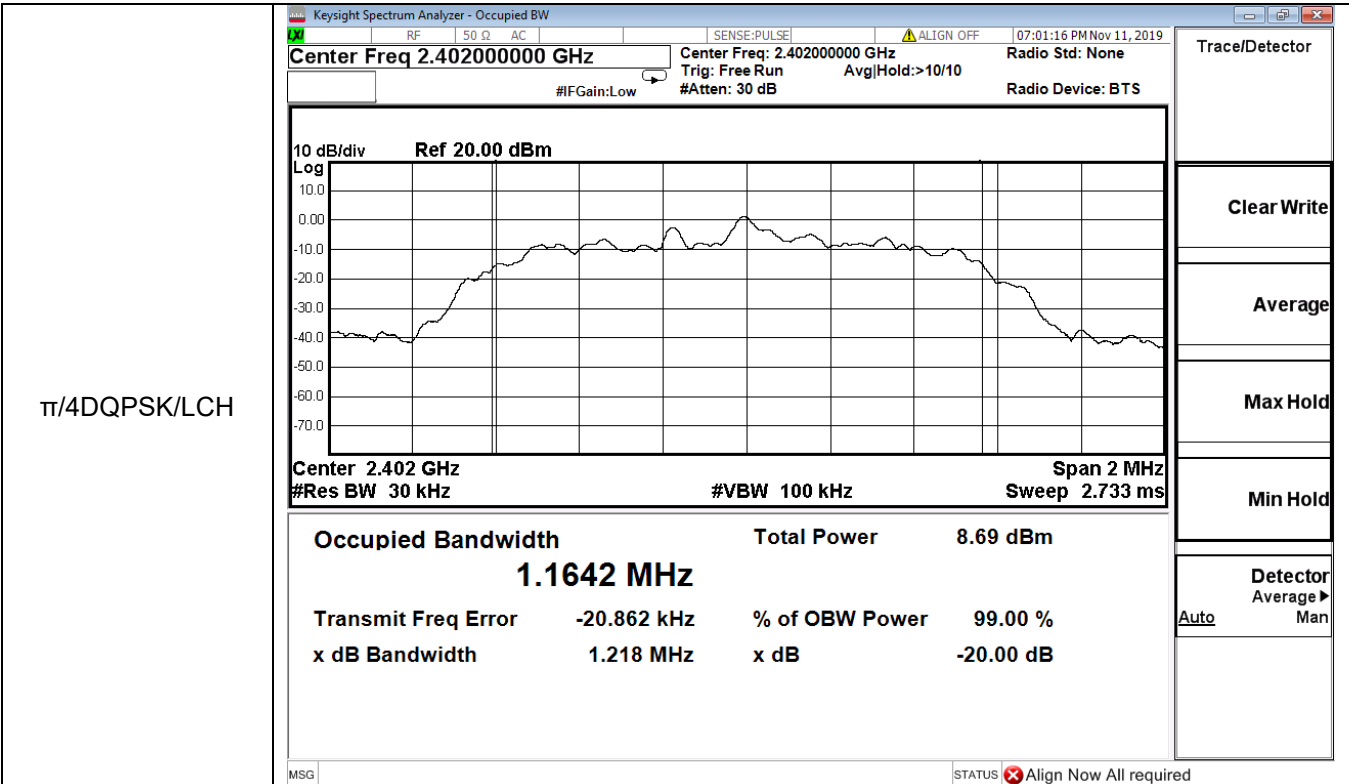
GFSK/MCH



GFSK/HCH







π/4DQPSK/LCH

Trace/Detector

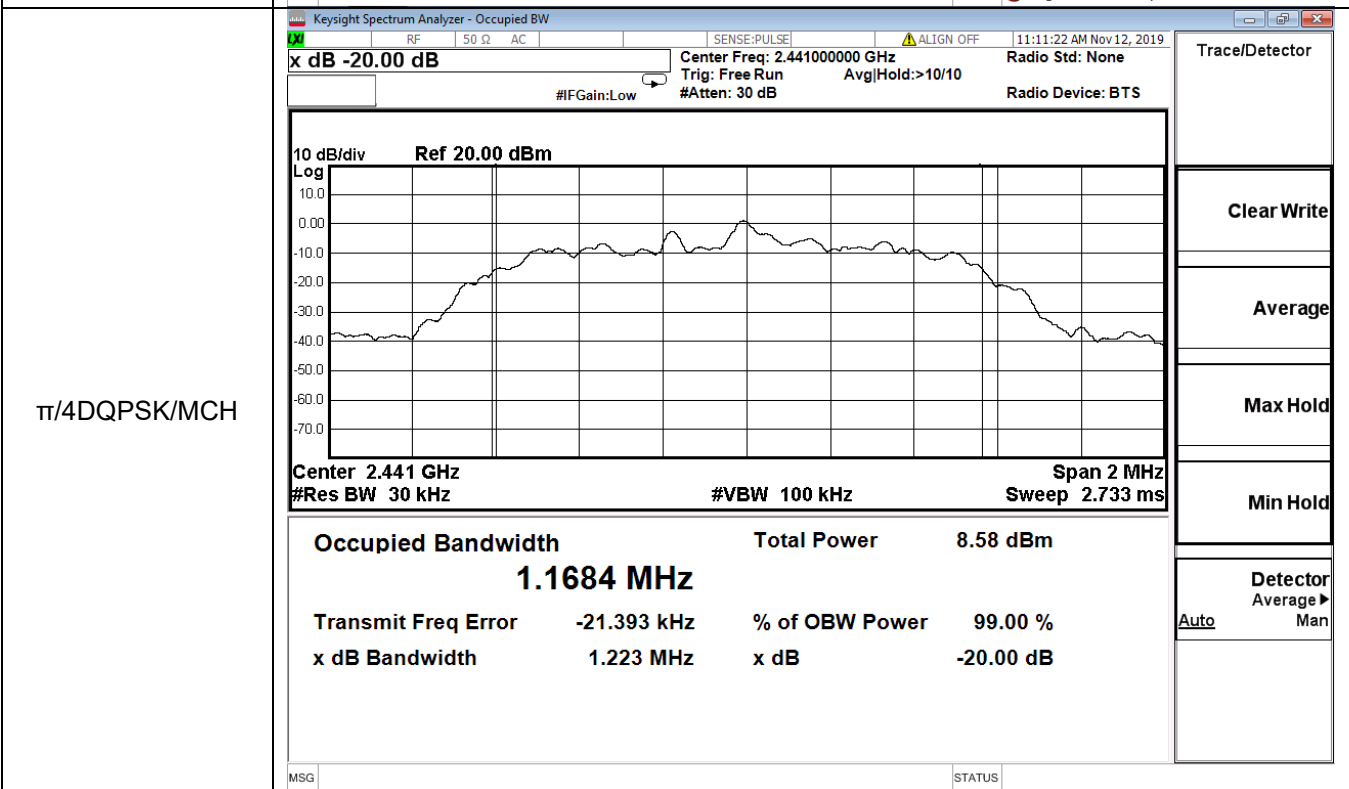
Clear Write

Average

Max Hold

Min Hold

Detector Average  
 Auto Man



π/4DQPSK/MCH

Trace/Detector

Clear Write

Average

Max Hold

Min Hold

Detector Average  
 Auto Man

$\pi/4$ DQPSK/HCH

Center Freq 2.48000000 GHz

Center Freq: 2.48000000 GHz

Trig: Free Run

#Atten: 30 dB

Radio Device: BTS

10 dB/div Ref 20.00 dBm

Center 2.48 GHz Span 2 MHz

#Res BW 30 kHz #VBW 100 kHz Sweep 2.733 ms

Occupied Bandwidth	Total Power		8.13 dBm
<b>1.1691 MHz</b>			
Transmit Freq Error	-21.363 kHz	% of OBW Power	99.00 %
x dB Bandwidth	1.222 MHz	x dB	-20.00 dB

Frequency

Center Freq  
2.480000000 GHz

CF Step  
200.000 kHz

Freq Offset  
0 Hz

8DPSK/LCH

Center Freq 2.40200000 GHz

Center Freq: 2.402000000 GHz

Trig: Free Run

#Atten: 30 dB

Radio Device: BTS

10 dB/div Ref 20.00 dBm

Center 2.402 GHz Span 2 MHz

#Res BW 30 kHz #VBW 100 kHz Sweep 2.733 ms

Occupied Bandwidth	Total Power		8.95 dBm
<b>1.1450 MHz</b>			
Transmit Freq Error	-5.982 kHz	% of OBW Power	99.00 %
x dB Bandwidth	1.207 MHz	x dB	-20.00 dB

Trace/Detector

Clear Write

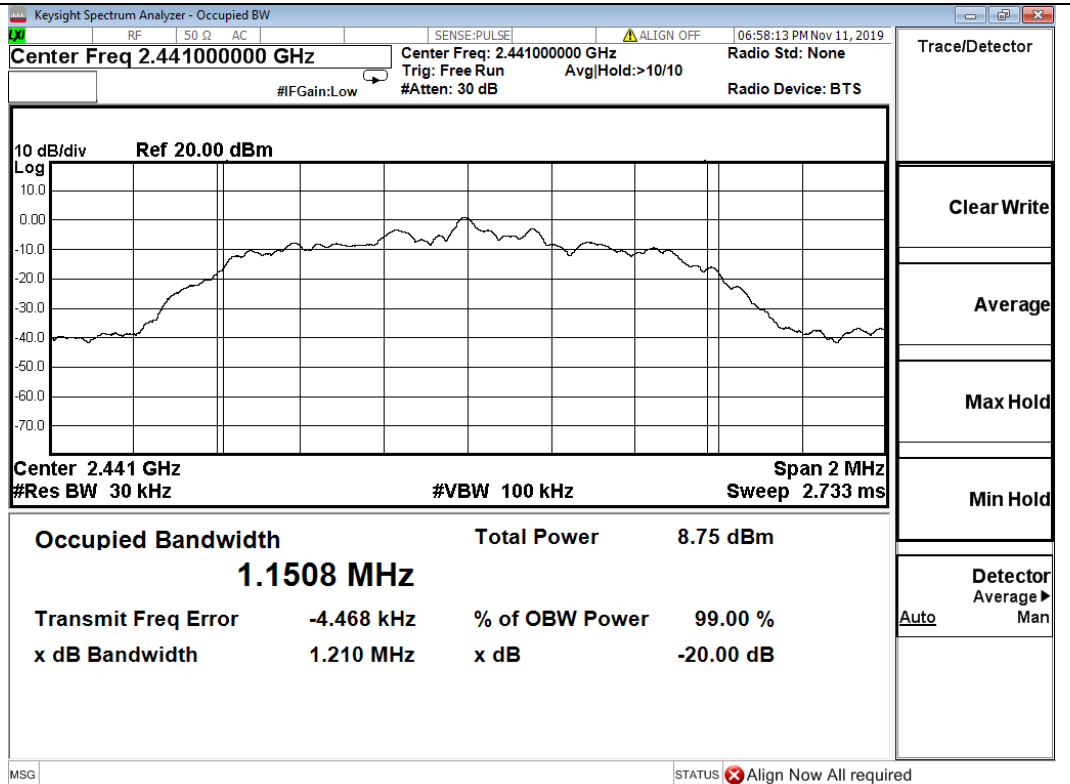
Average

Max Hold

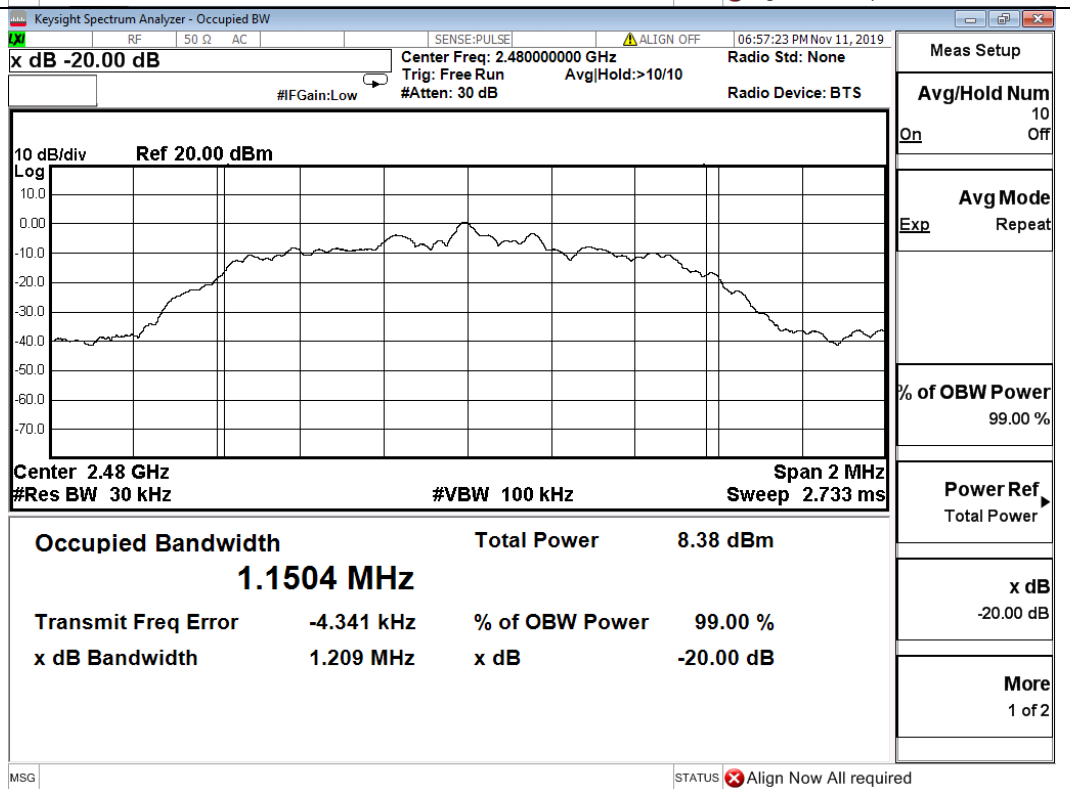
Min Hold

Detector Average

8DPSK/MCH

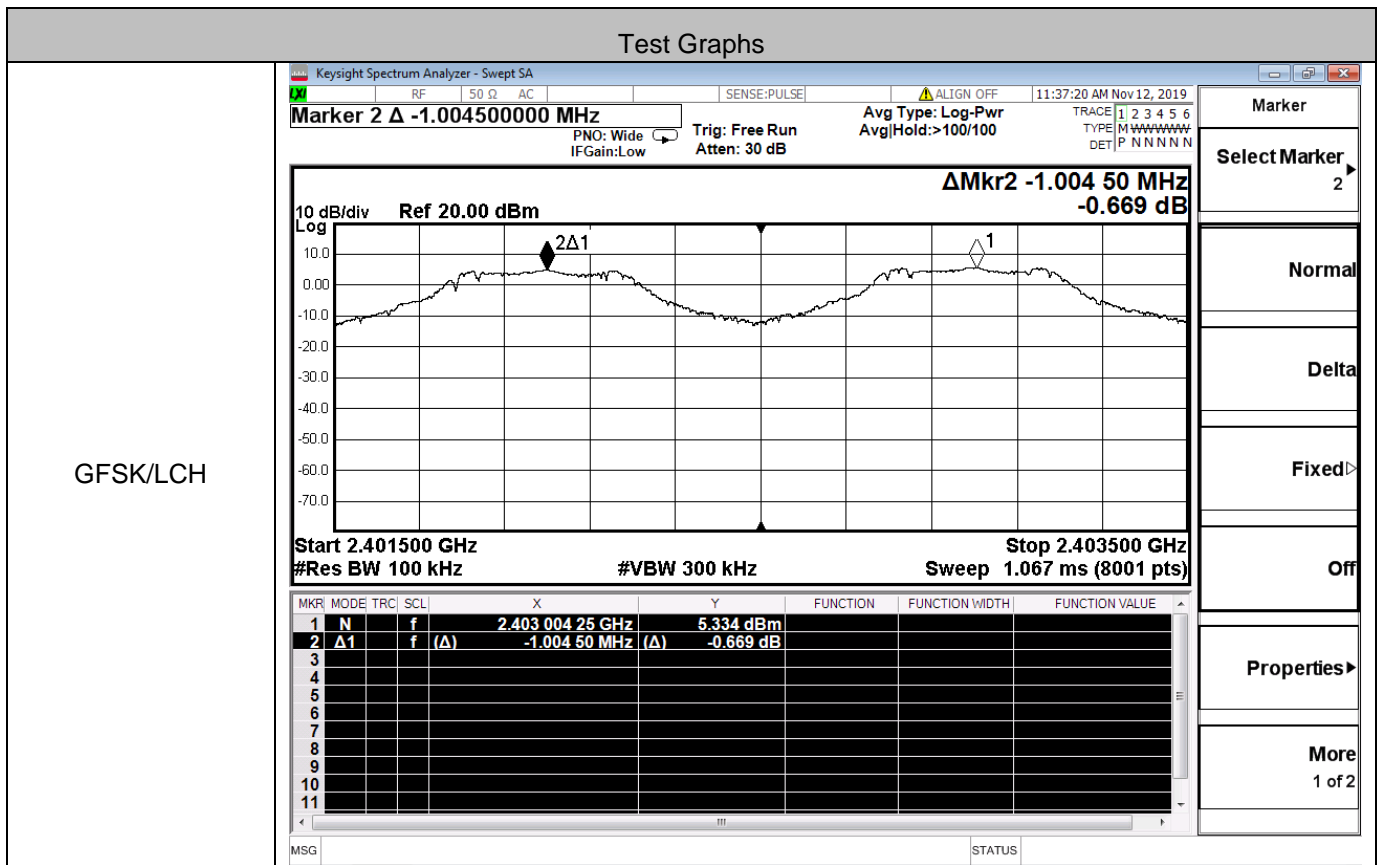


8DPSK/HCH

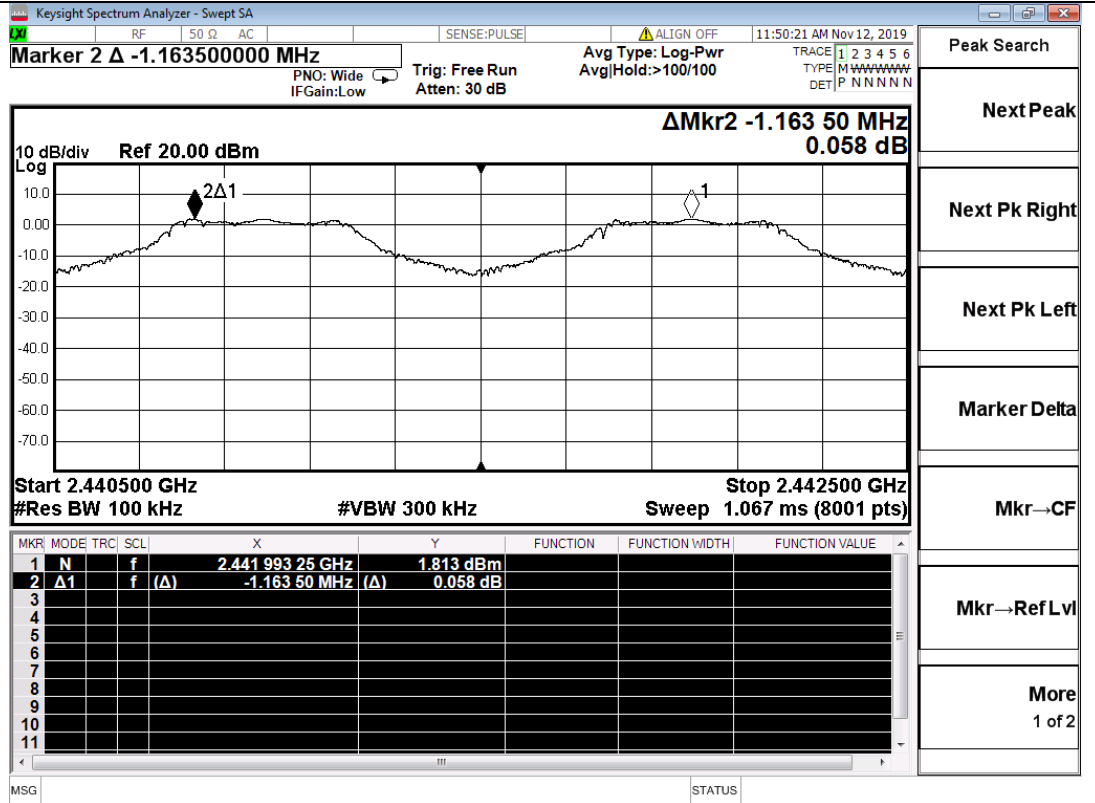


### A.3 Carrier Frequency Separation

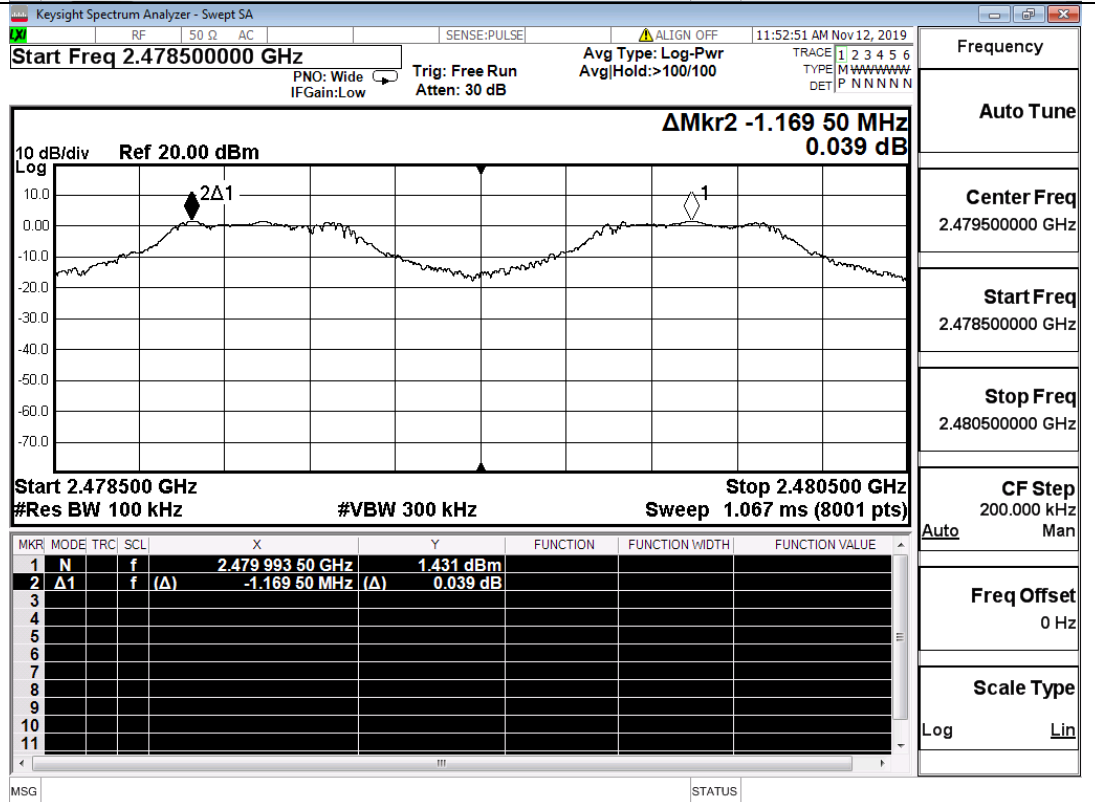
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.0045	0.570	PASS
	MCH	1.1635	0.582	PASS
	HCH	1.1695	0.582	PASS
π/4DQPSK	LCH	1.0115	0.812	PASS
	MCH	1.0043	0.815	PASS
	HCH	1.0020	0.815	PASS
8DPSK	LCH	1.0035	0.805	PASS
	MCH	0.9925	0.807	PASS
	HCH	1.0133	0.806	PASS



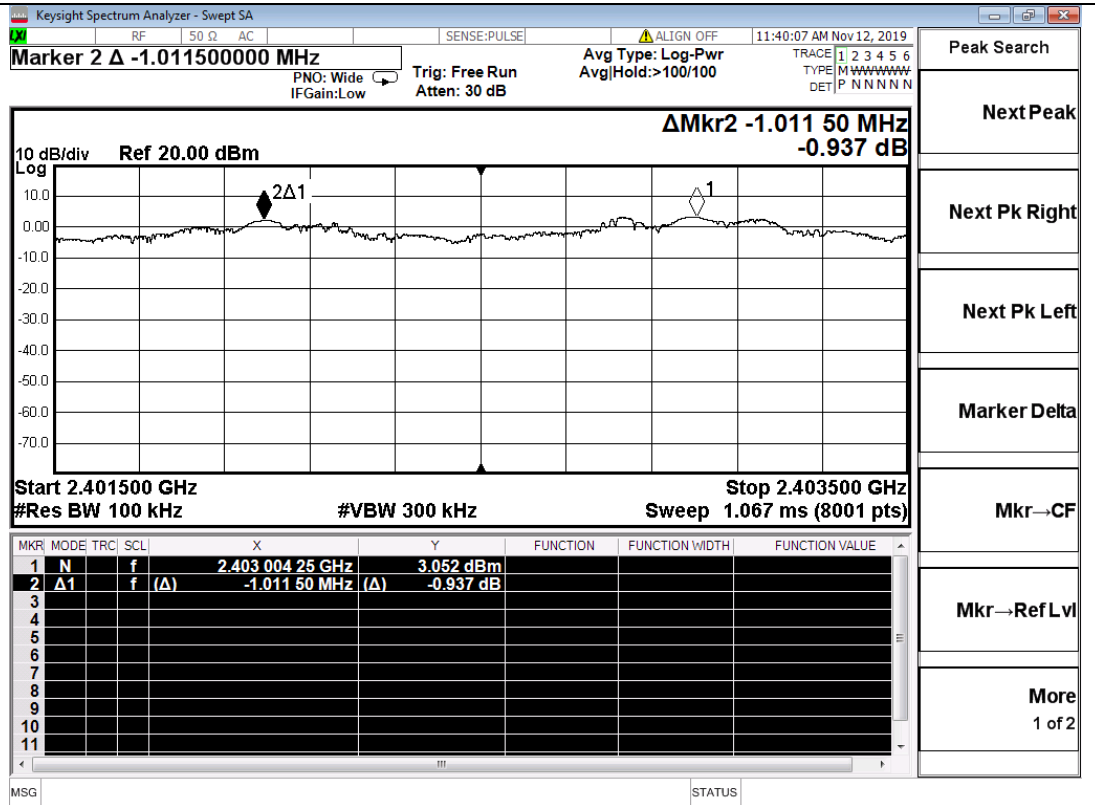
GFSK/MCH



GFSK/HCH

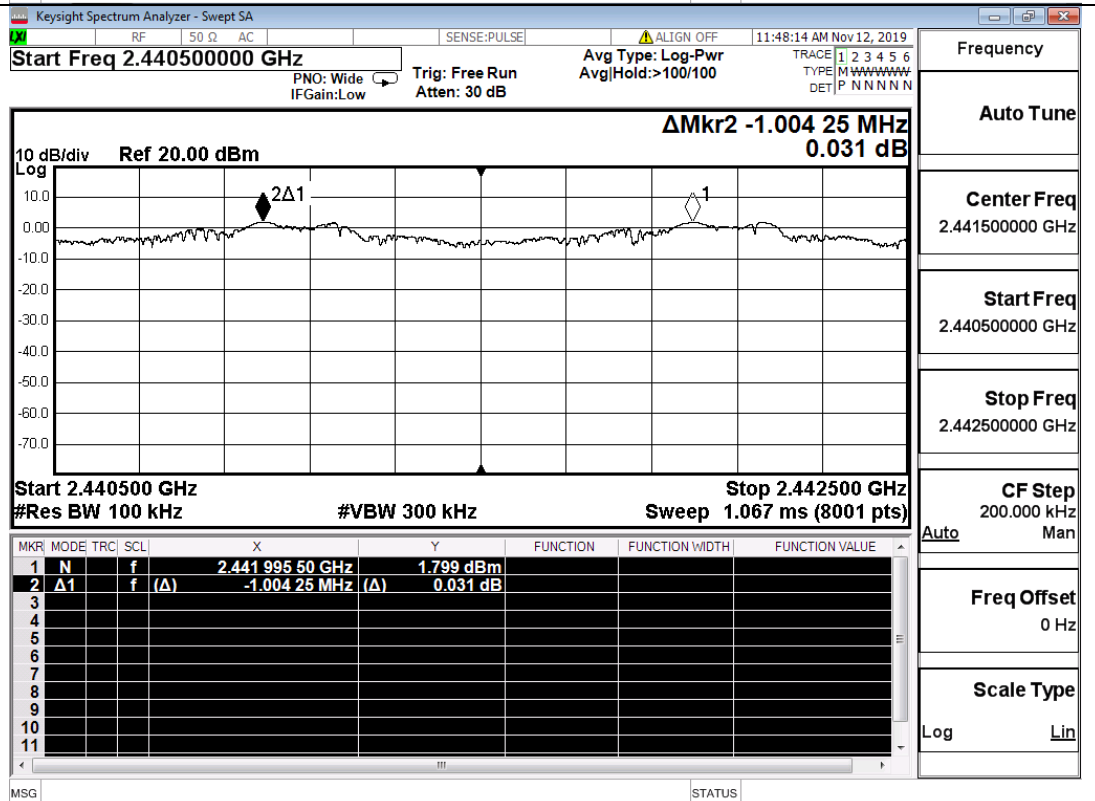


$\pi/4$ DQPSK/LCH



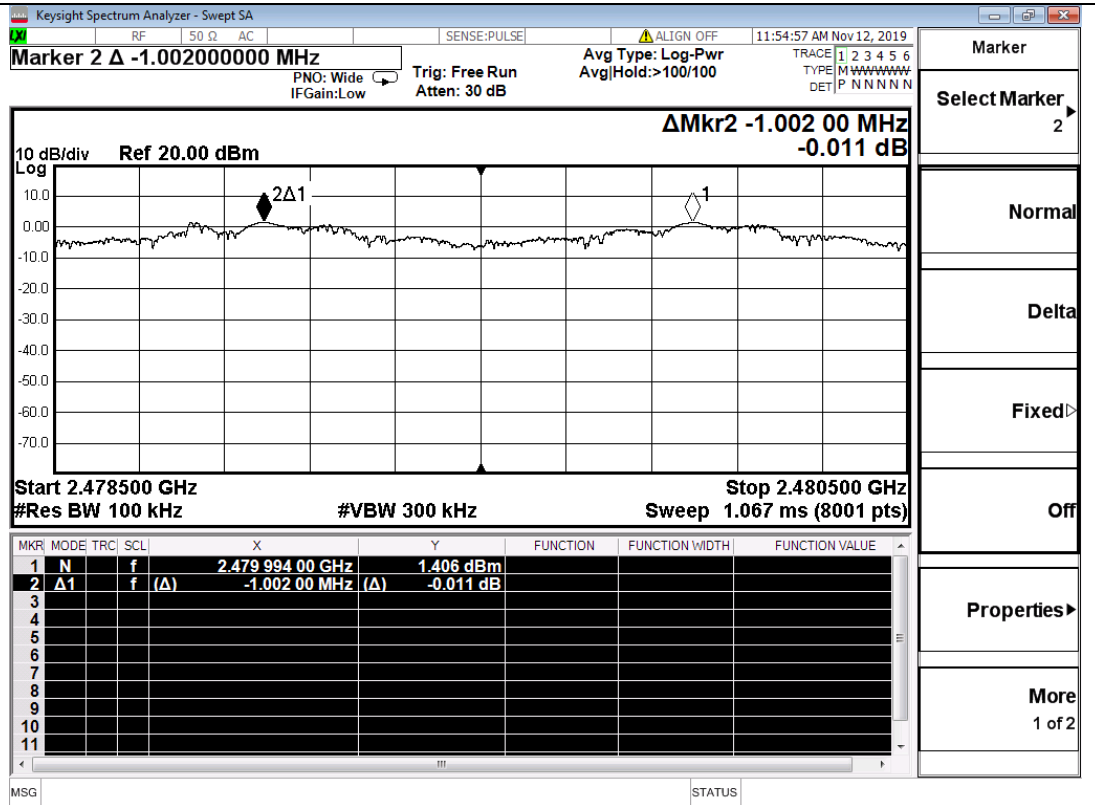
- Peak Search
- Next Peak
- Next Pk Right
- Next Pk Left
- Marker Delta
- Mkr→CF
- Mkr→Ref Lvl
- More  
1 of 2

$\pi/4$ DQPSK/MCH

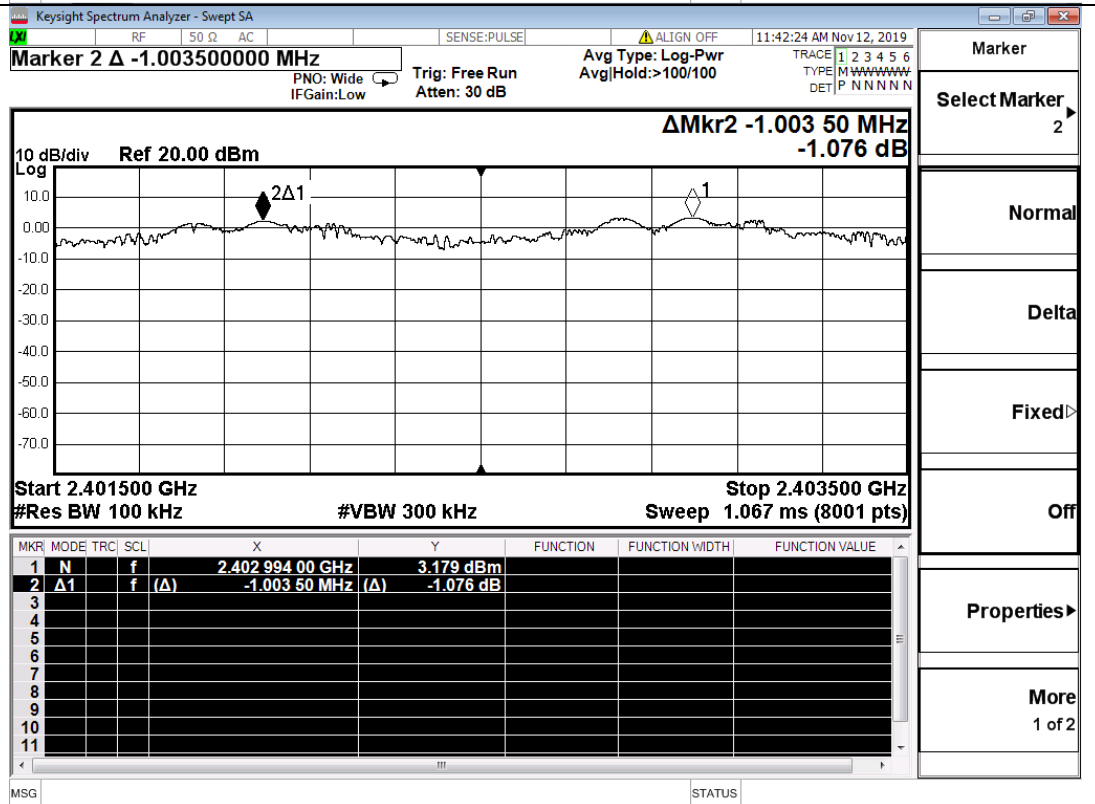


- Frequency
- Auto Tune
- Center Freq  
2.441500000 GHz
- Start Freq  
2.440500000 GHz
- Stop Freq  
2.442500000 GHz
- CF Step  
200.000 kHz  
Auto Man
- Freq Offset  
0 Hz
- Scale Type  
Log Lin

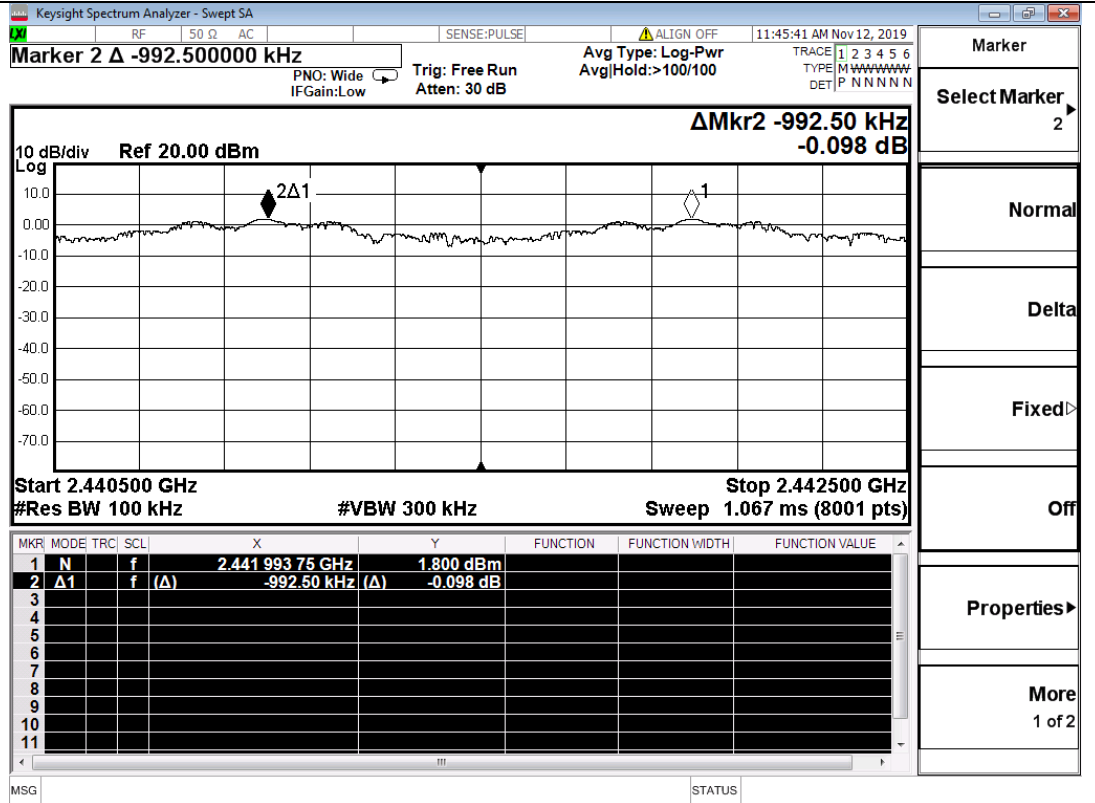
$\pi/4$ DQPSK/HCH



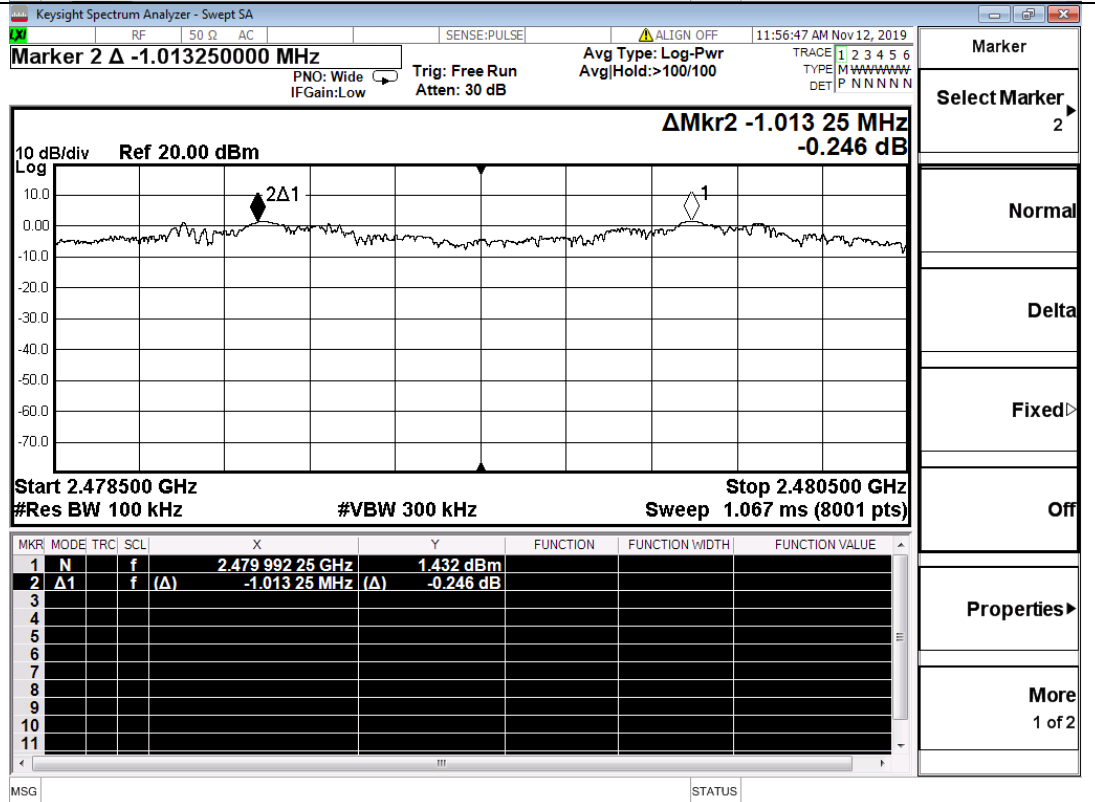
8DPSK/LCH



8DPSK/MCH



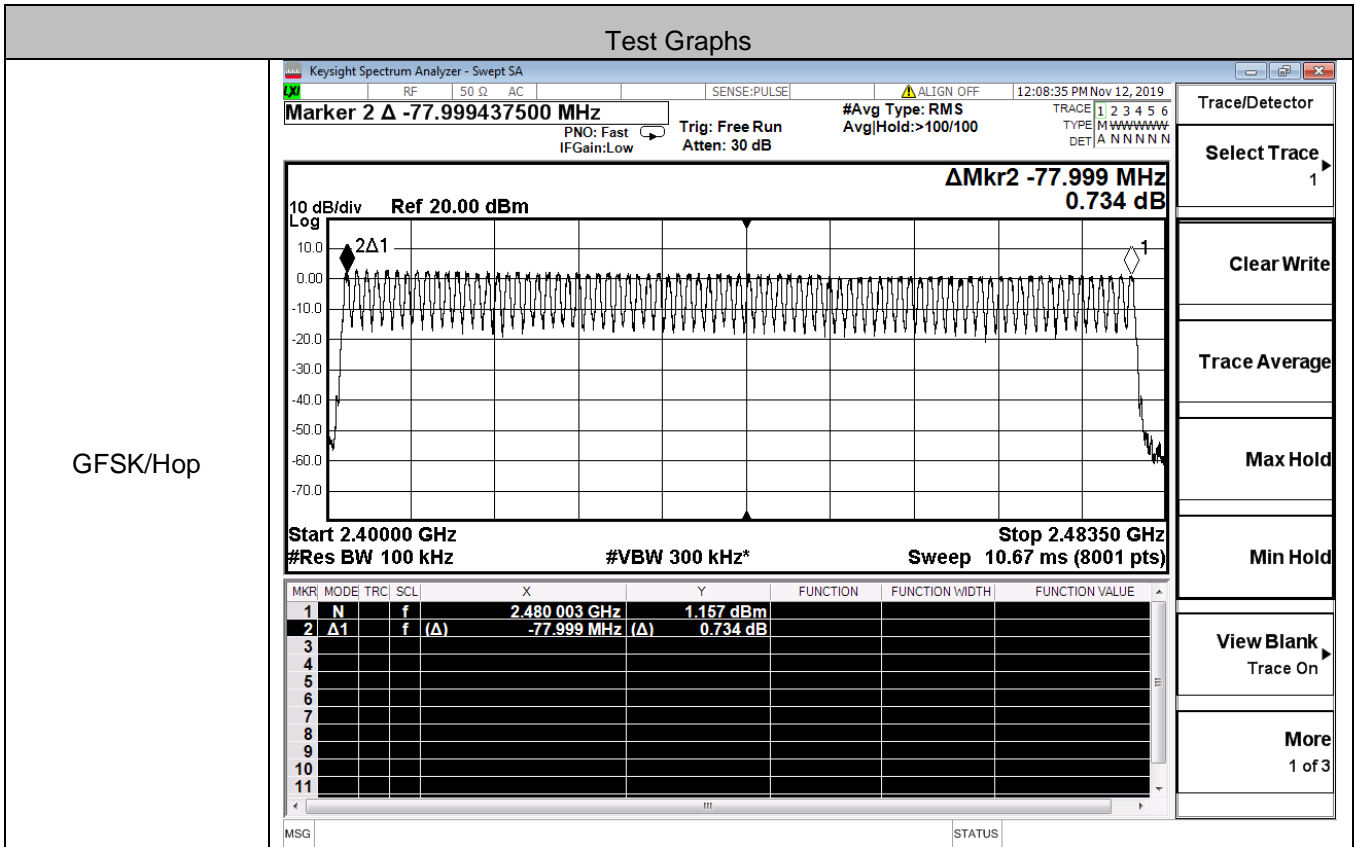
8DPSK/HCH





### 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



$\pi/4$ DQPSK/Hop

Keysight Spectrum Analyzer - Swept SA

Marker 2  $\Delta$  -77.98825000 MHz

RF 50  $\Omega$  AC SENSE:PULSE ALIGN OFF 12:02:57 PM Nov 12, 2019

#Avg Type: RMS AvgHold:>100/100

Trig: Free Run Atten: 30 dB

10 dB/div Ref 20.00 dBm

$\Delta$ Mkr2 -77.988 MHz 0.789 dB

Start 2.40000 GHz Stop 2.48350 GHz

#Res BW 100 kHz #VBW 300 kHz\* Sweep 10.67 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.479 992 25 GHz	1.152 dBm			
2	$\Delta$ 1	f ( $\Delta$ )		-77.988 MHz ( $\Delta$ )	0.789 dB			

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

Mkr→CF

Mkr→Ref Lvl

More 1 of 2

8DPSK/Hop

Keysight Spectrum Analyzer - Swept SA

Marker 2  $\Delta$  -77.999437500 MHz

RF 50  $\Omega$  AC SENSE:PULSE ALIGN OFF 12:06:25 PM Nov 12, 2019

#Avg Type: RMS AvgHold:>100/100

Trig: Free Run Atten: 30 dB

10 dB/div Ref 20.00 dBm

$\Delta$ Mkr2 -77.999 MHz 0.669 dB

Start 2.40000 GHz Stop 2.48350 GHz

#Res BW 100 kHz #VBW 300 kHz\* Sweep 10.67 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.480 003 GHz	1.190 dBm			
2	$\Delta$ 1	f ( $\Delta$ )		-77.999 MHz ( $\Delta$ )	0.669 dB			

Marker

Select Marker 2

Normal

Delta

Fixed

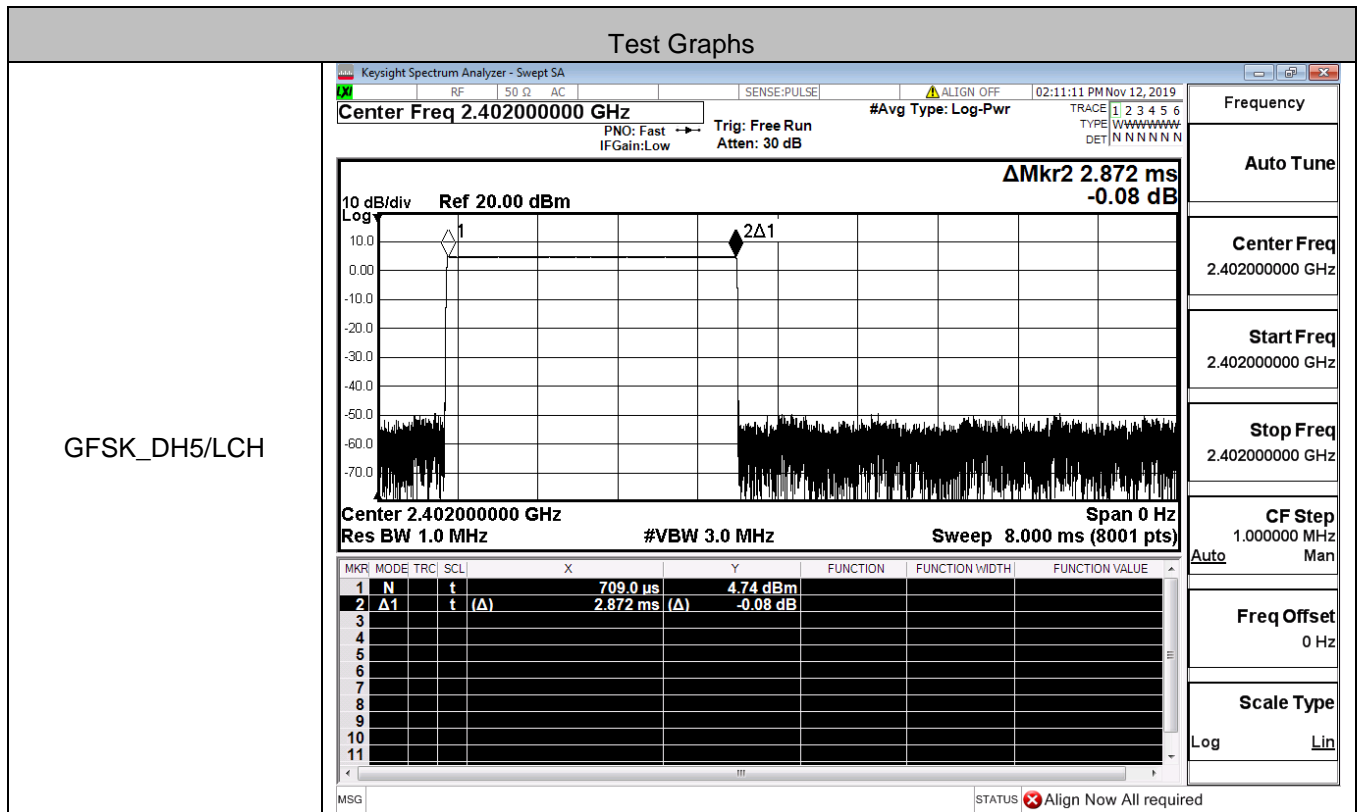
Off

Properties

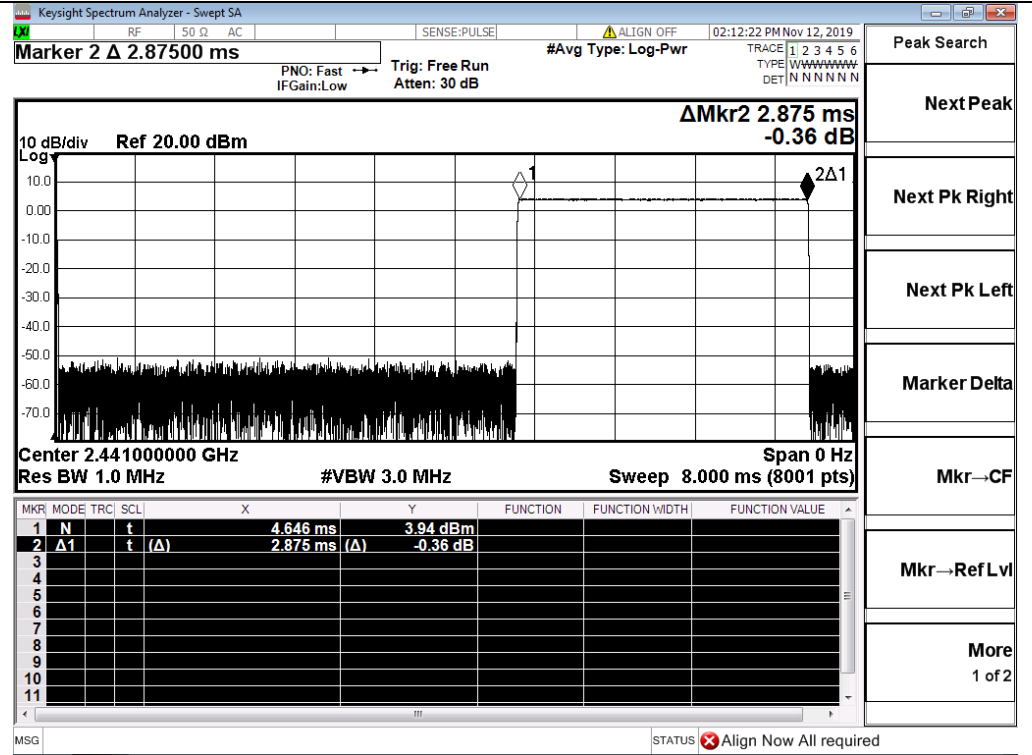
More 1 of 2

### A.5 Dwell Time

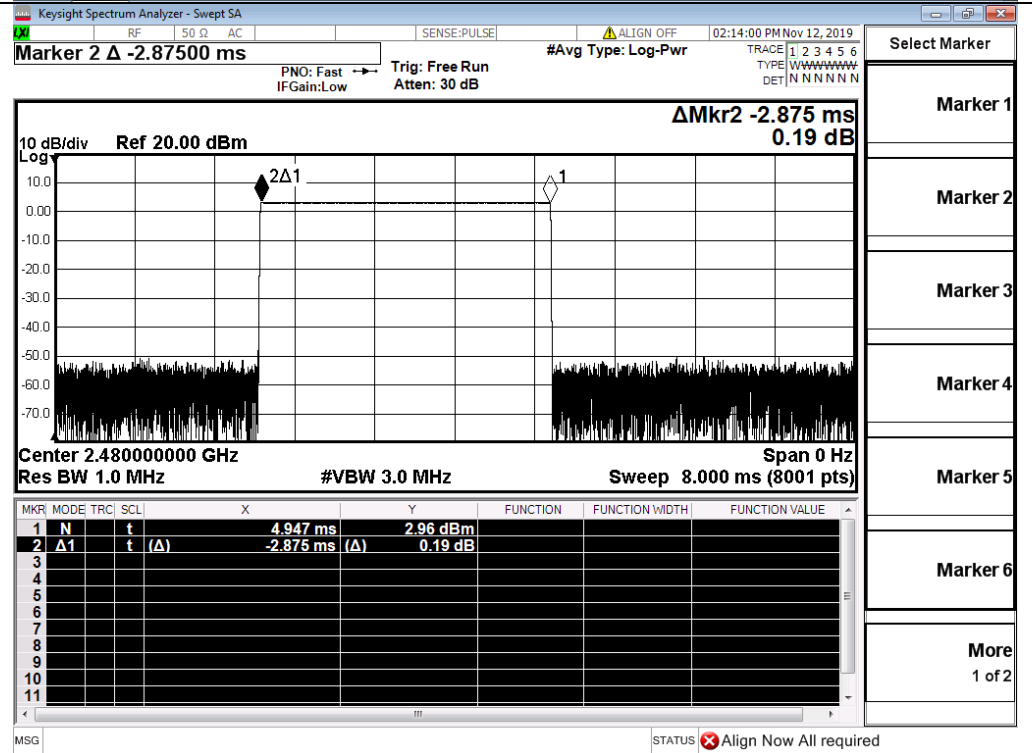
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.872	106.7	0.306	0.4	PASS
	DH5	MCH	2.875	106.7	0.307	0.4	PASS
	DH5	HCH	2.875	106.7	0.307	0.4	PASS
π/4DQPSK	2DH5	LCH	2.885	106.7	0.308	0.4	PASS
	2DH5	MCH	2.883	106.7	0.308	0.4	PASS
	2DH5	HCH	2.895	106.7	0.309	0.4	PASS
8DPSK	3DH5	LCH	2.882	106.7	0.308	0.4	PASS
	3DH5	MCH	2.882	106.7	0.308	0.4	PASS
	3DH5	HCH	2.884	106.7	0.308	0.4	PASS



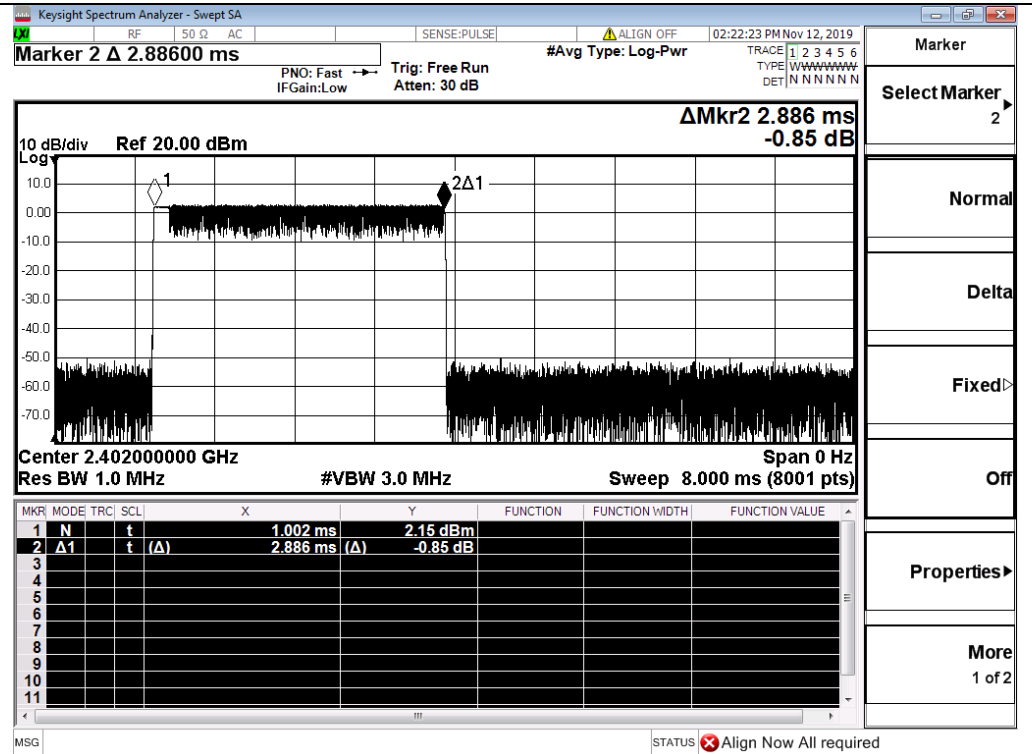
GFSK\_DH5/MCH



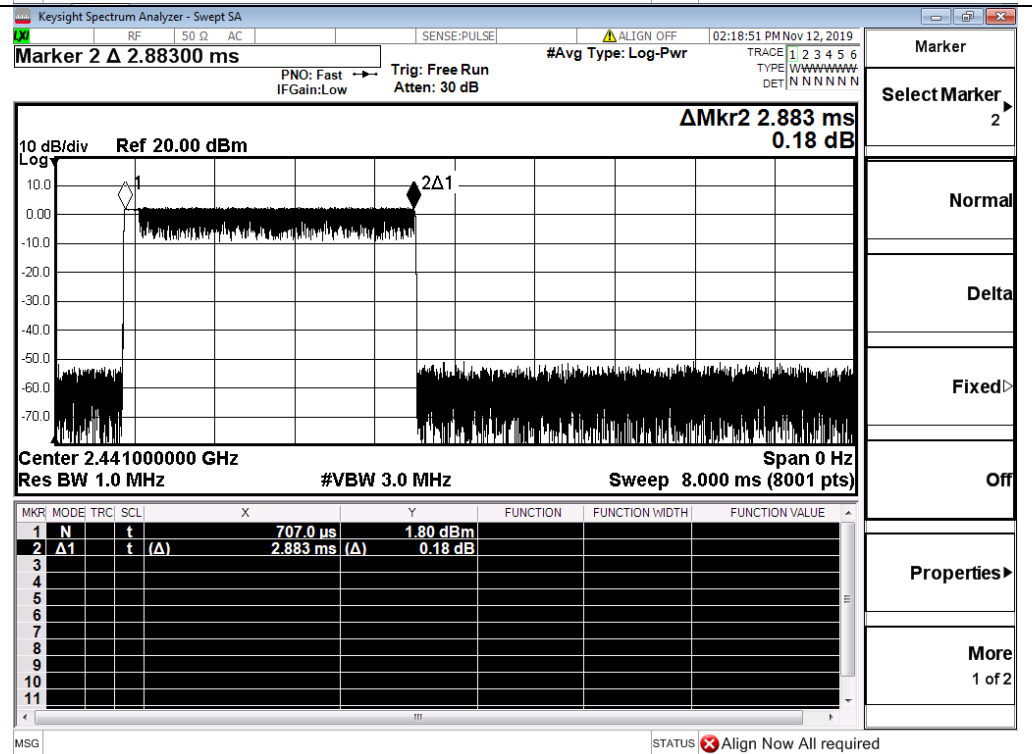
GFSK\_DH5/HCH



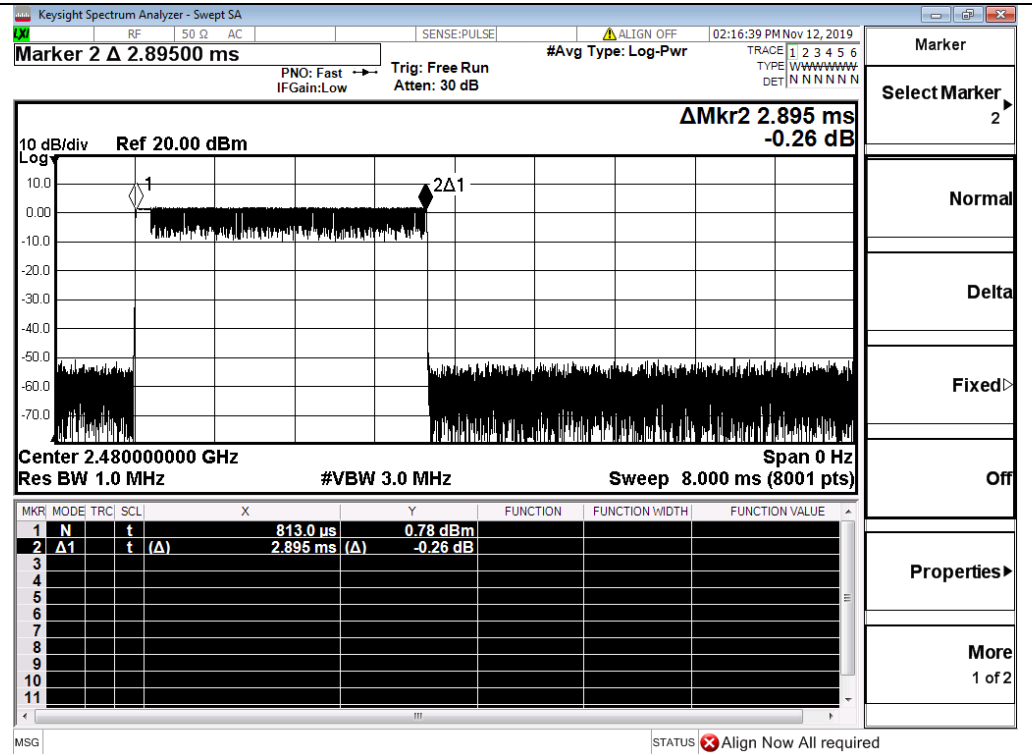
$\pi/4$ DQPSK  
\_2DH5/LCH



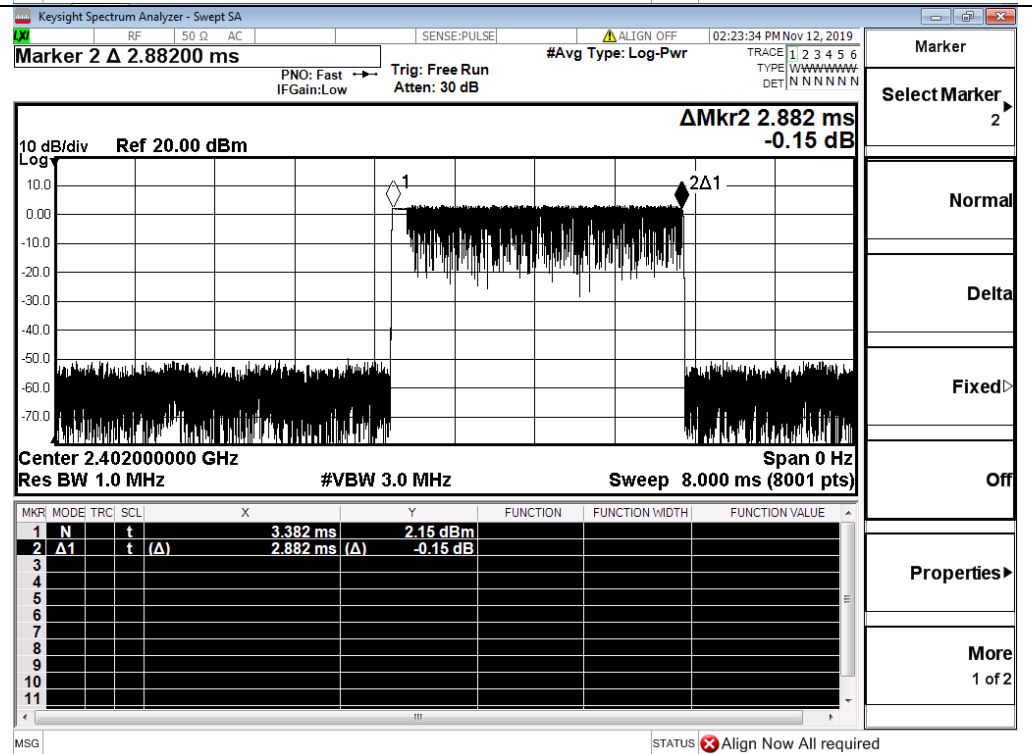
$\pi/4$ DQPSK  
\_2DH5/MCH



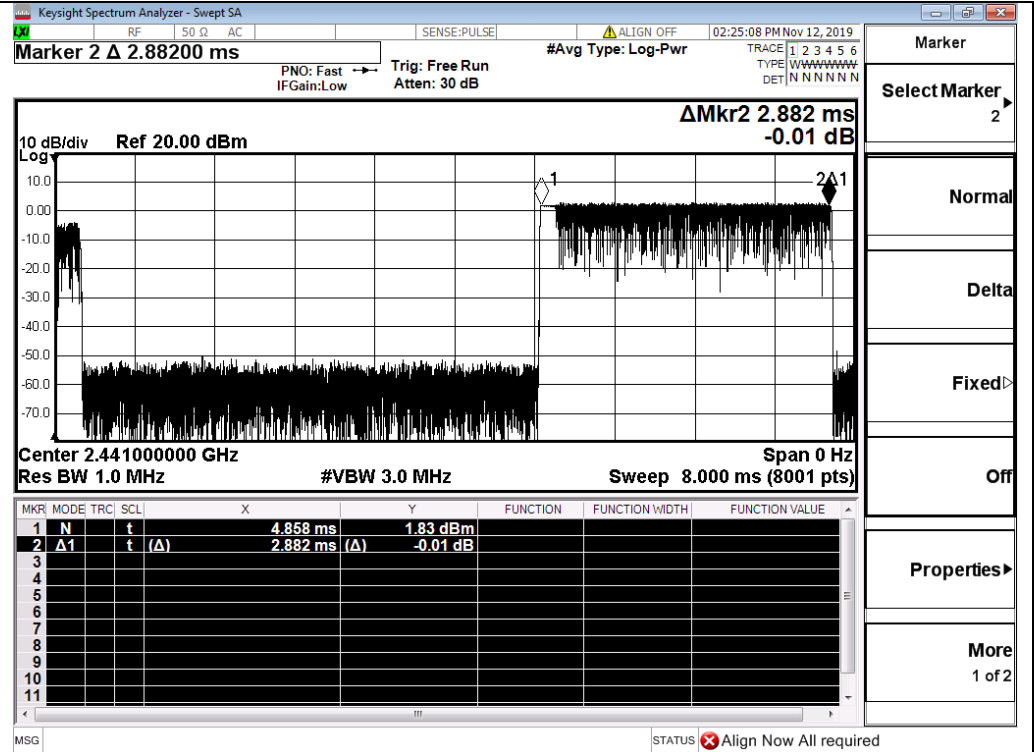
$\pi/4$ DQPSK  
\_2DH5/HCH



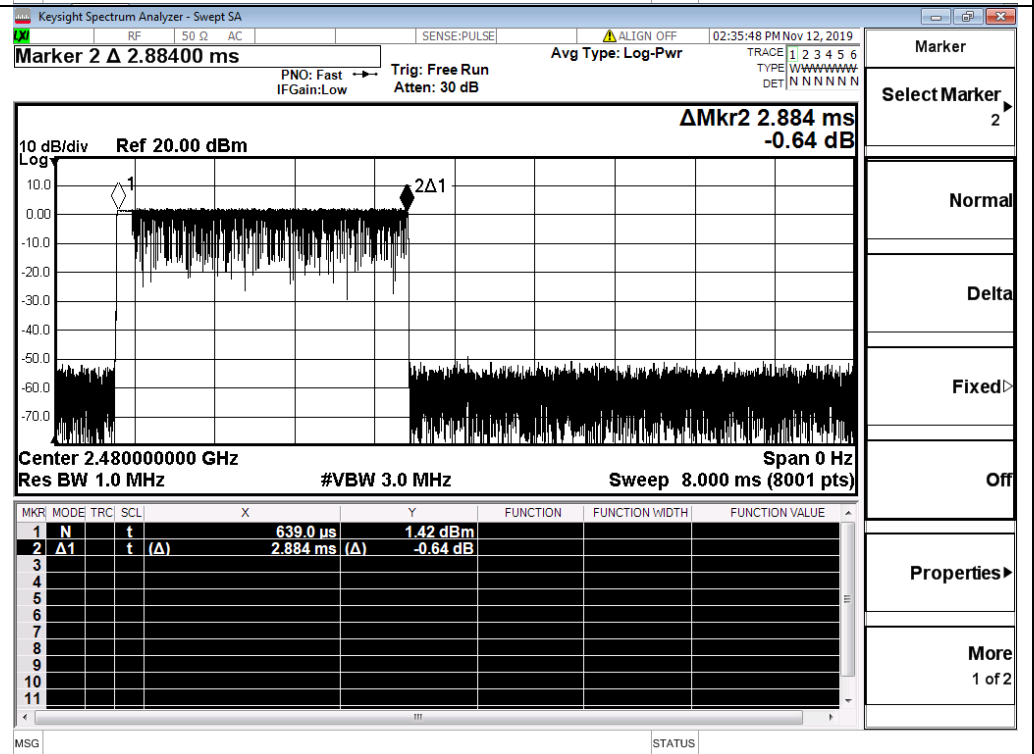
8DPSK \_3DH5/LCH



8DPSK\_3DH5/MCH



8DPSK\_3DH5/HCH



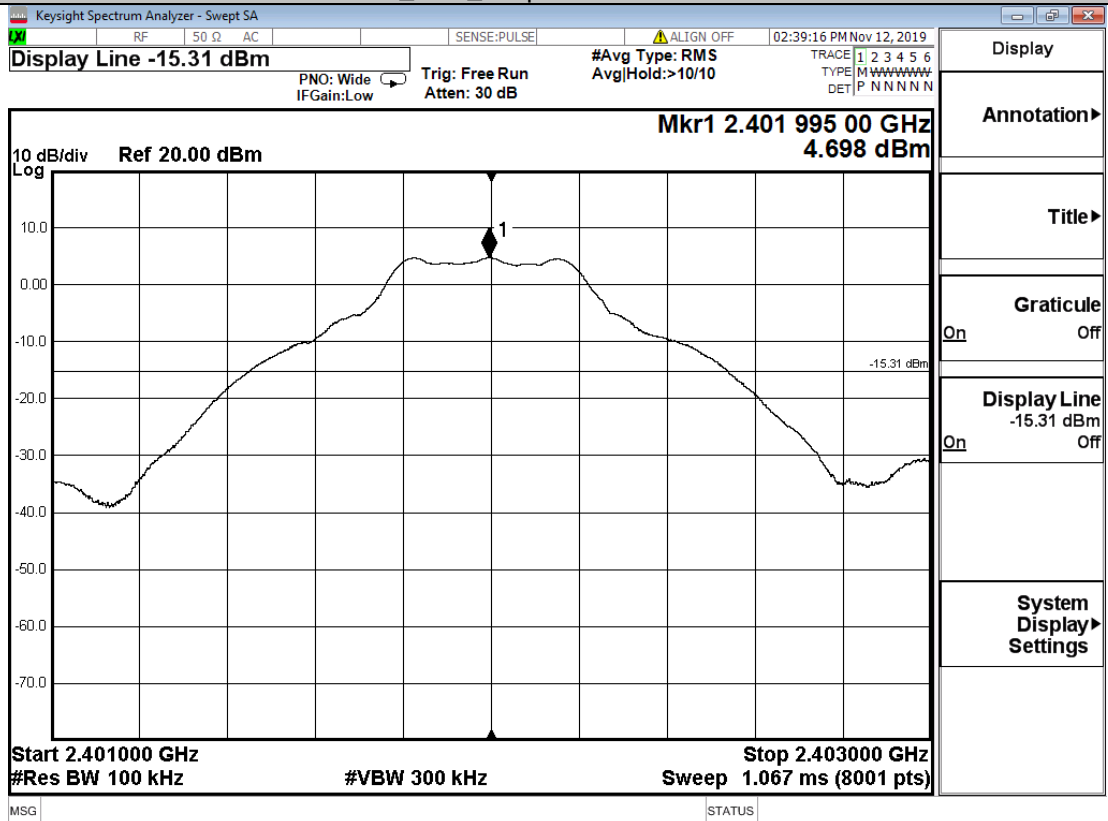
**A.6 RF Conducted Spurious Emissions**

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	4.698	-47.800	-15.30	PASS
	MCH	3.979	-48.745	-16.02	PASS
	HCH	3.145	-48.078	-16.86	PASS
$\pi/4$ DQPSK	LCH	2.139	-48.271	-17.86	PASS
	MCH	1.836	-47.677	-18.16	PASS
	HCH	1.415	-48.968	-18.59	PASS
8DPSK	LCH	2.144	-48.904	-17.86	PASS
	MCH	1.840	-54.235	-18.16	PASS
	HCH	1.431	-48.722	-18.57	PASS

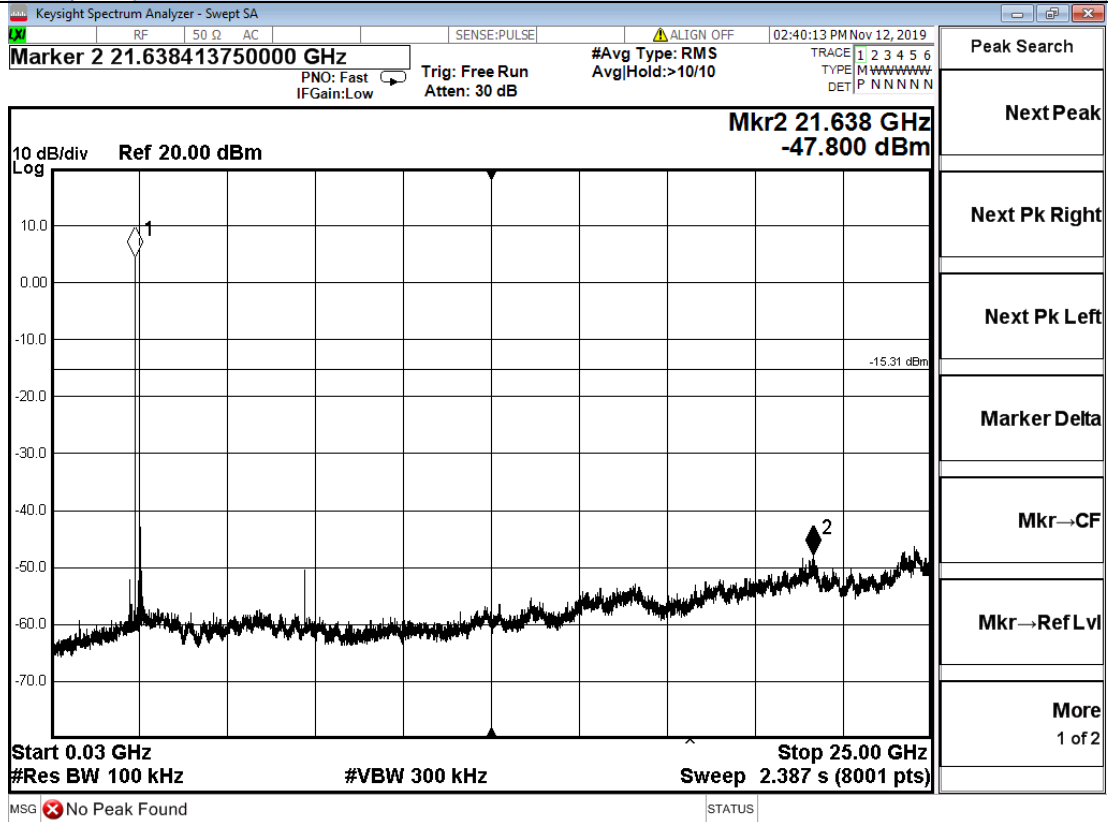


GFSK\_LCH\_Graphs

Pref

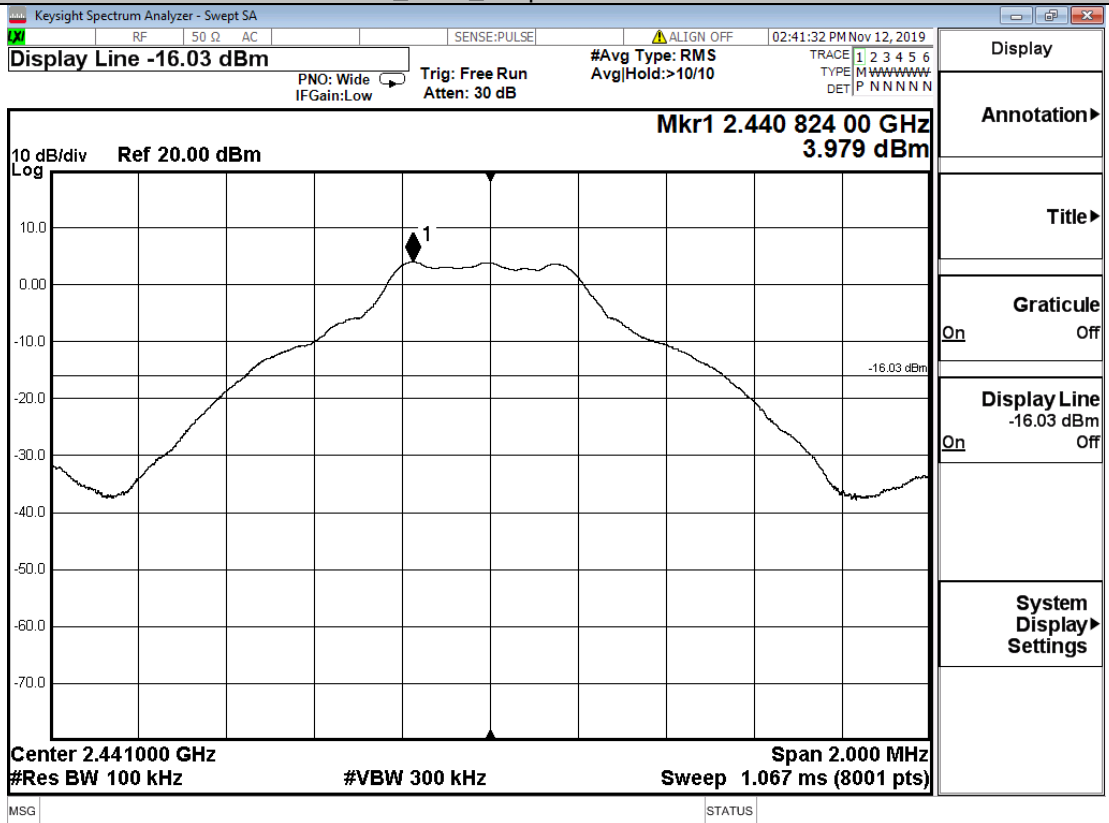


Puw

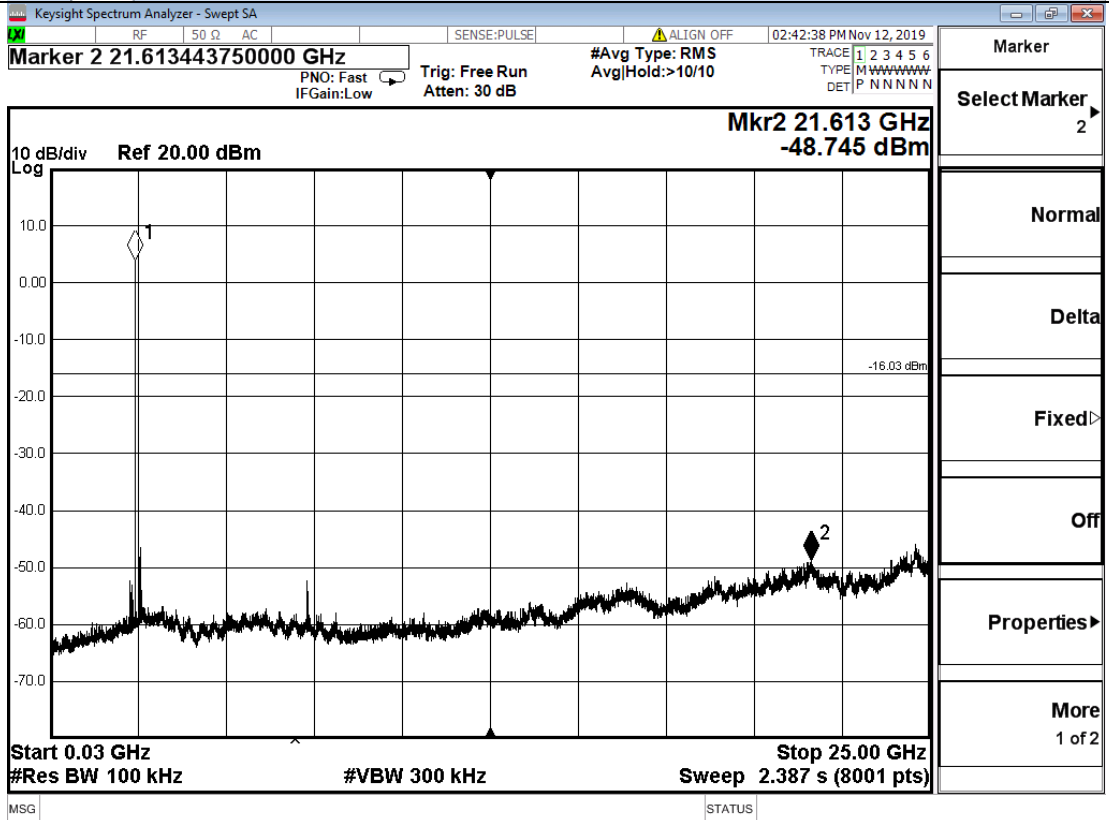


GFSK\_MCH\_Graphs

Pref

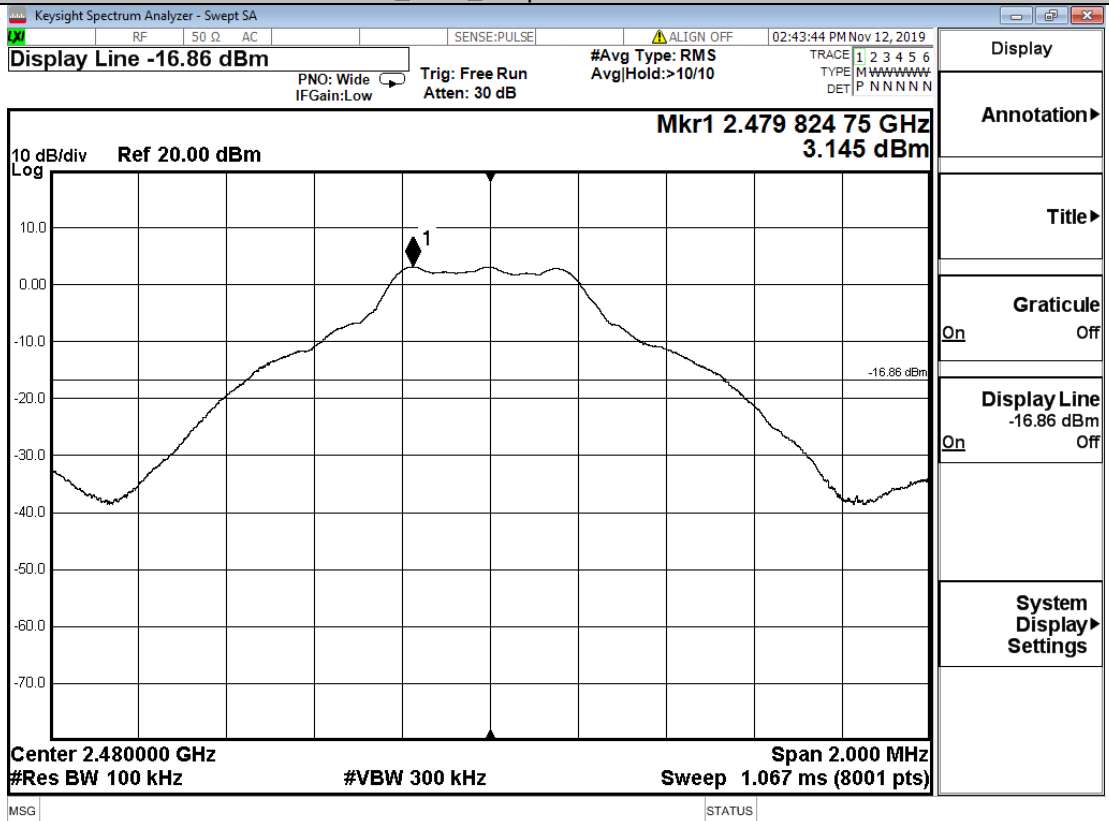


Puw

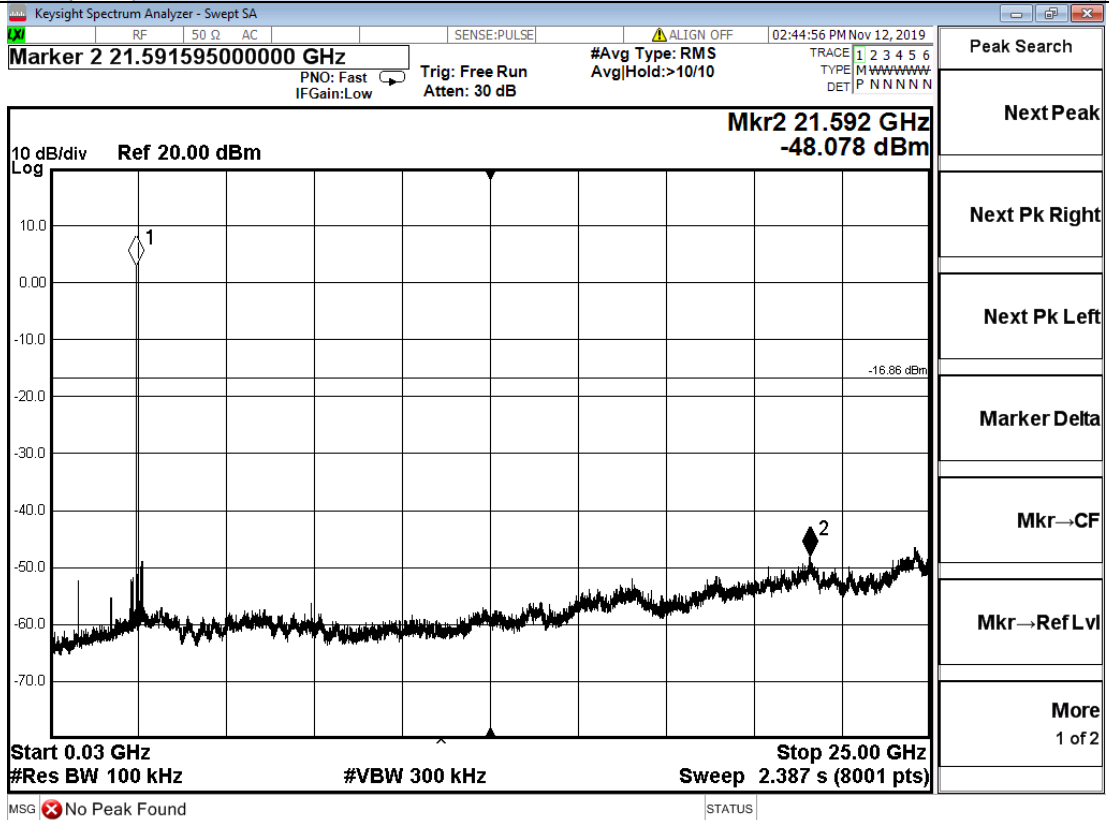


GFSK\_HCH\_Graphs

Pref

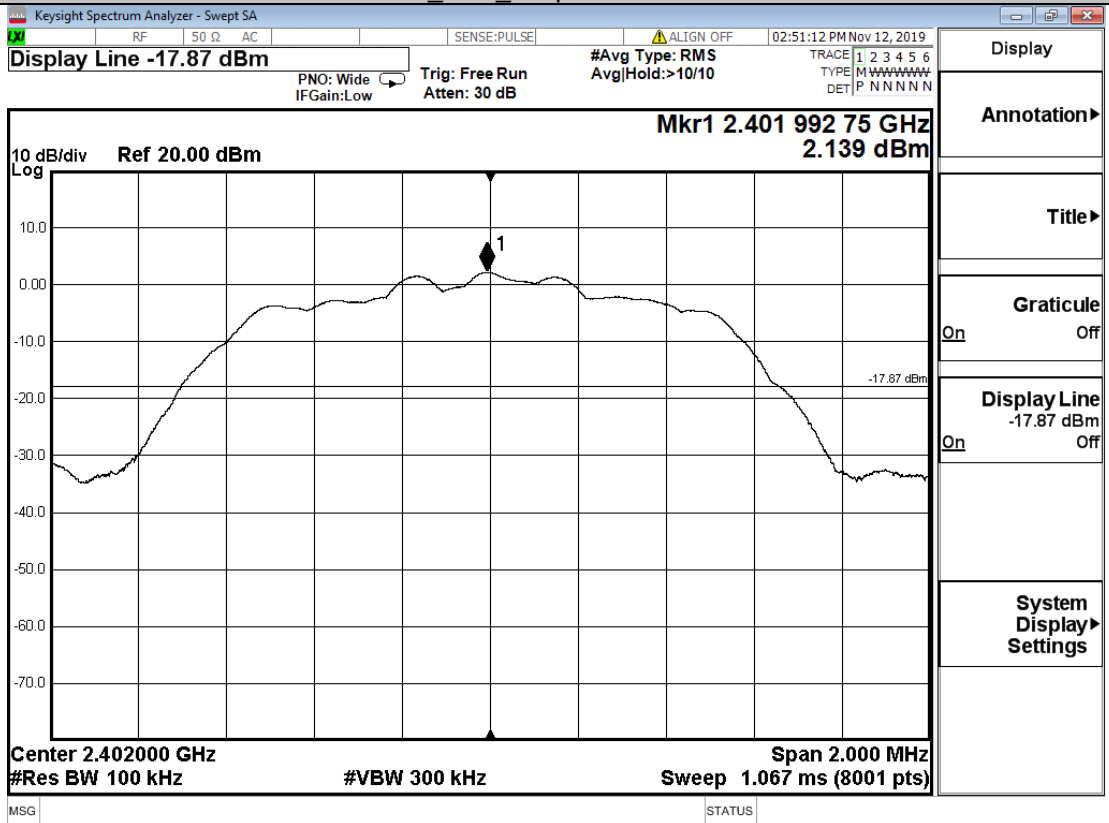


Puw

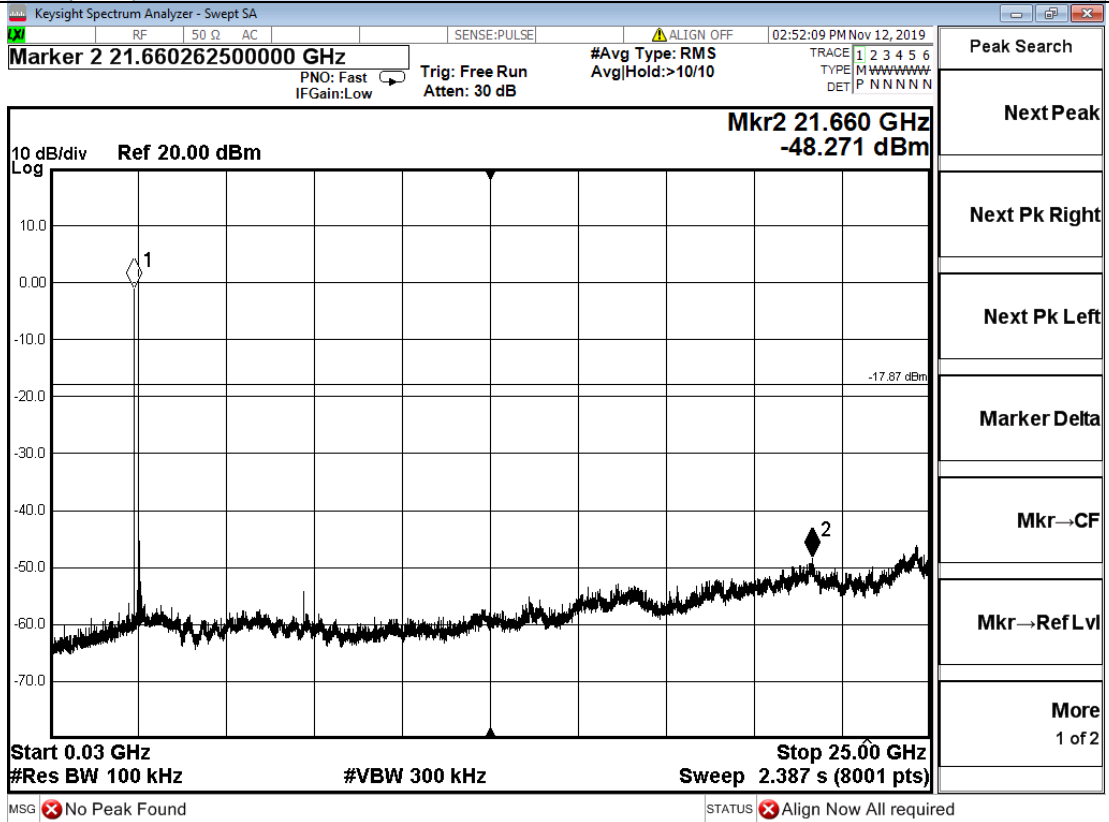


$\pi/4$ DQPSK\_LCH\_Graphs

Pref

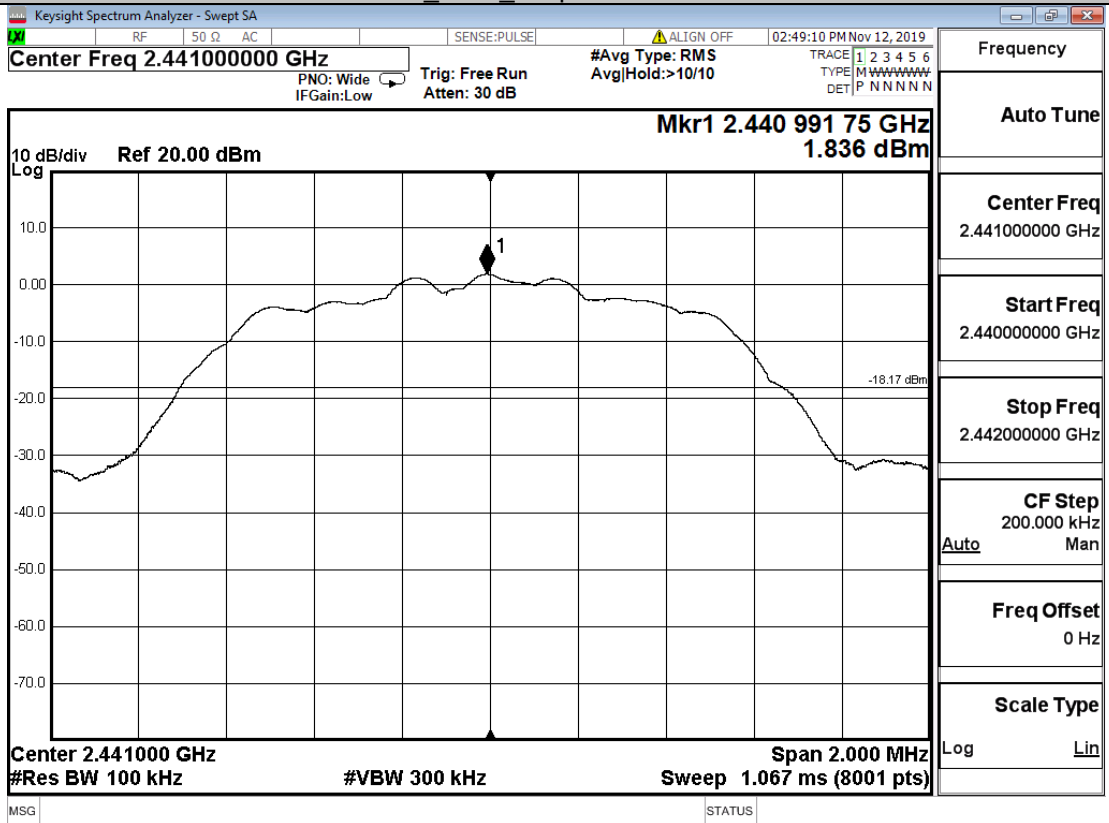


Puw

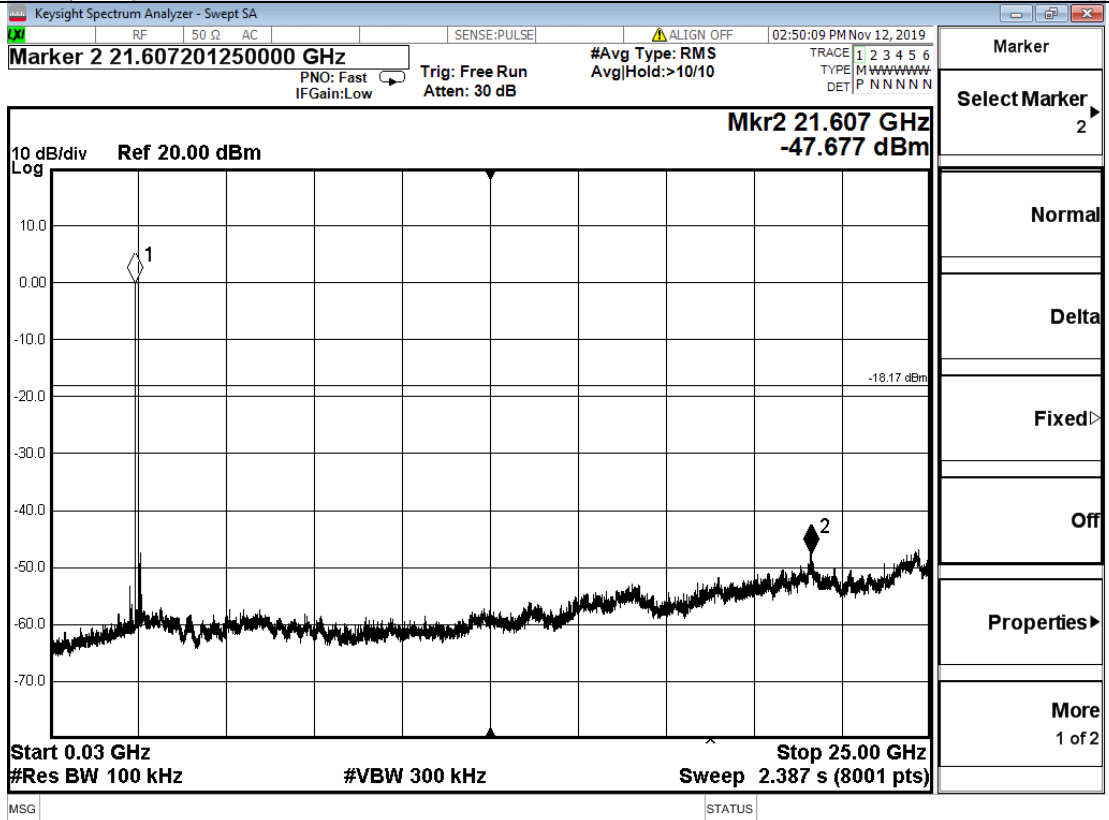


$\pi/4$ DQPSK\_MCH\_Graphs

Pref

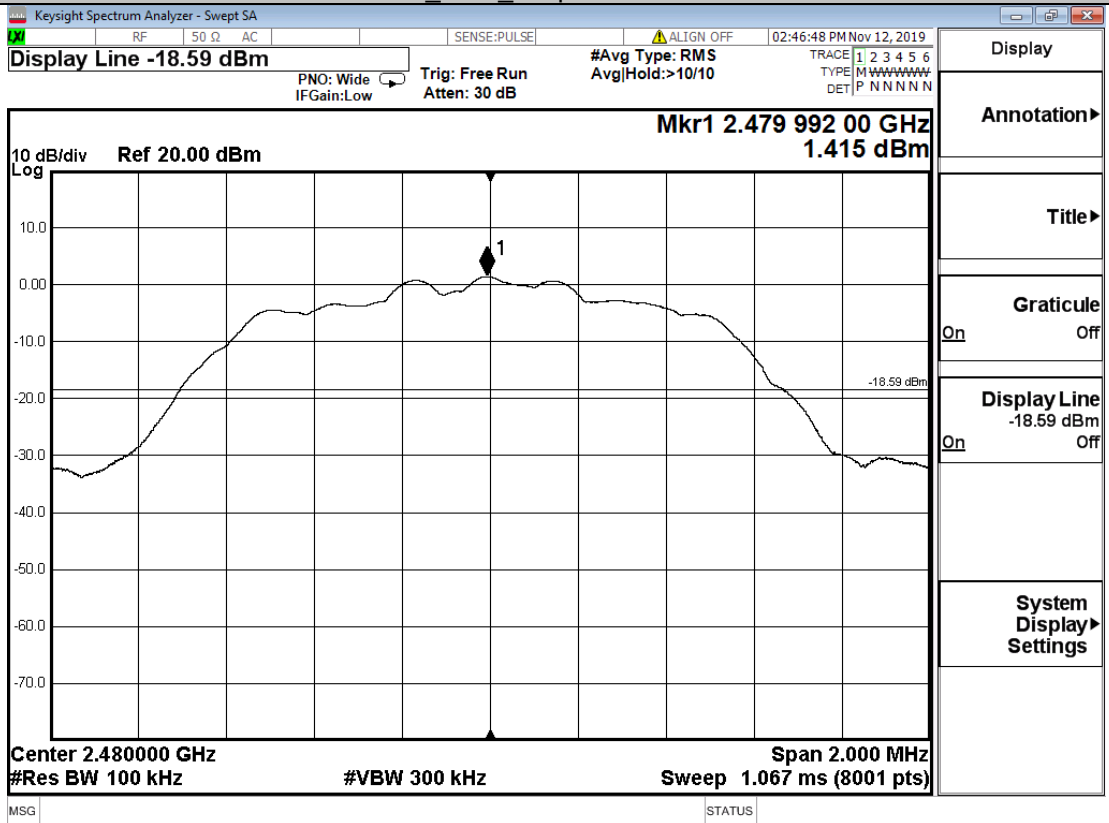


Puw

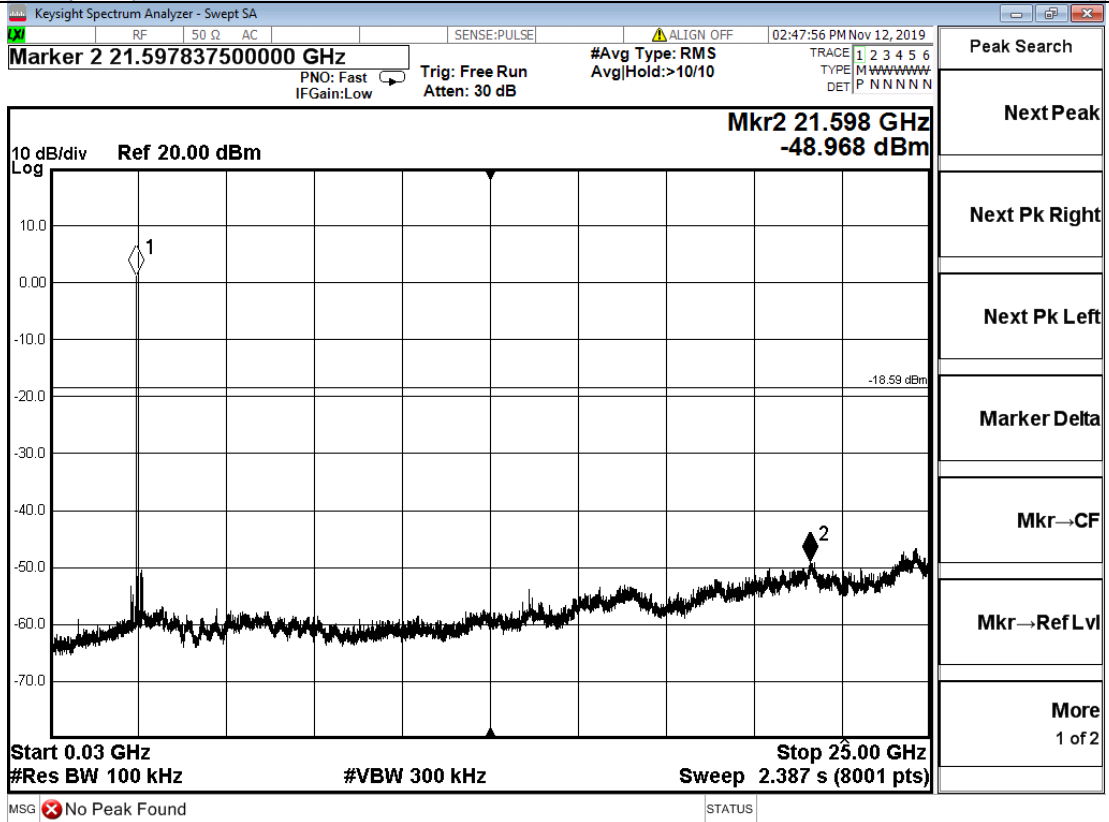


$\pi/4$ DQPSK\_HCH\_Graphs

Pref

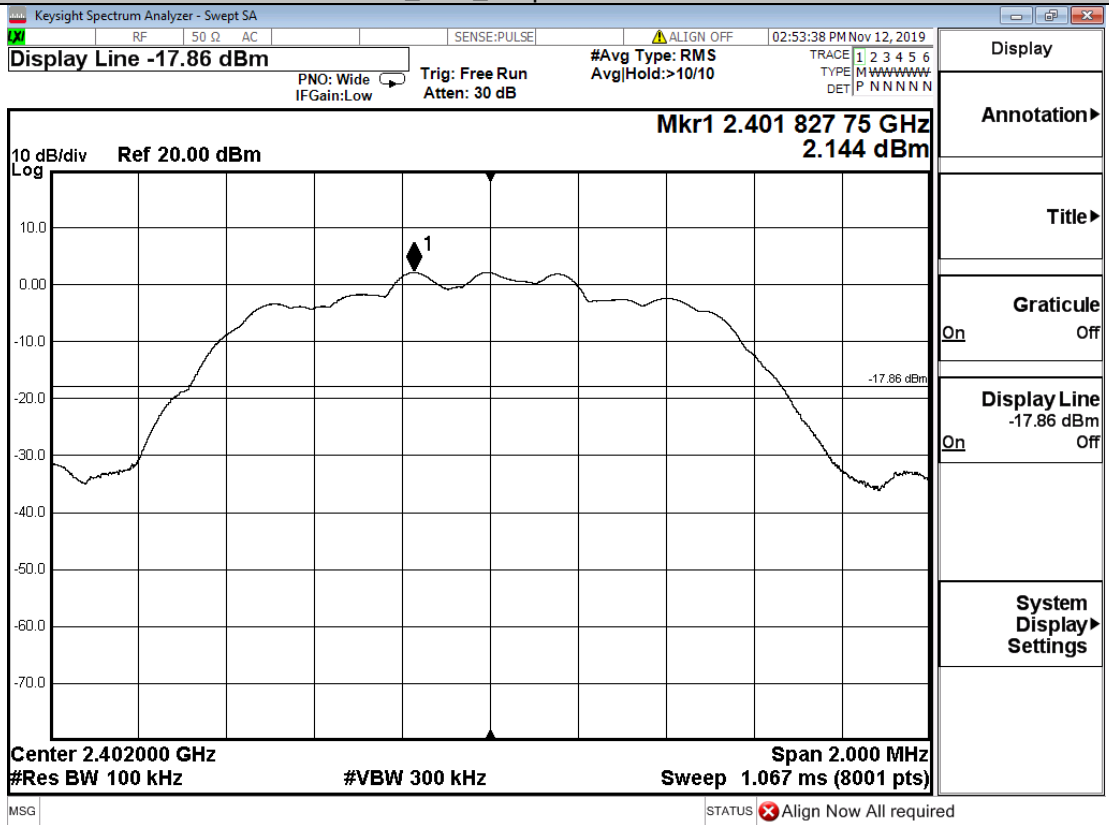


Puw

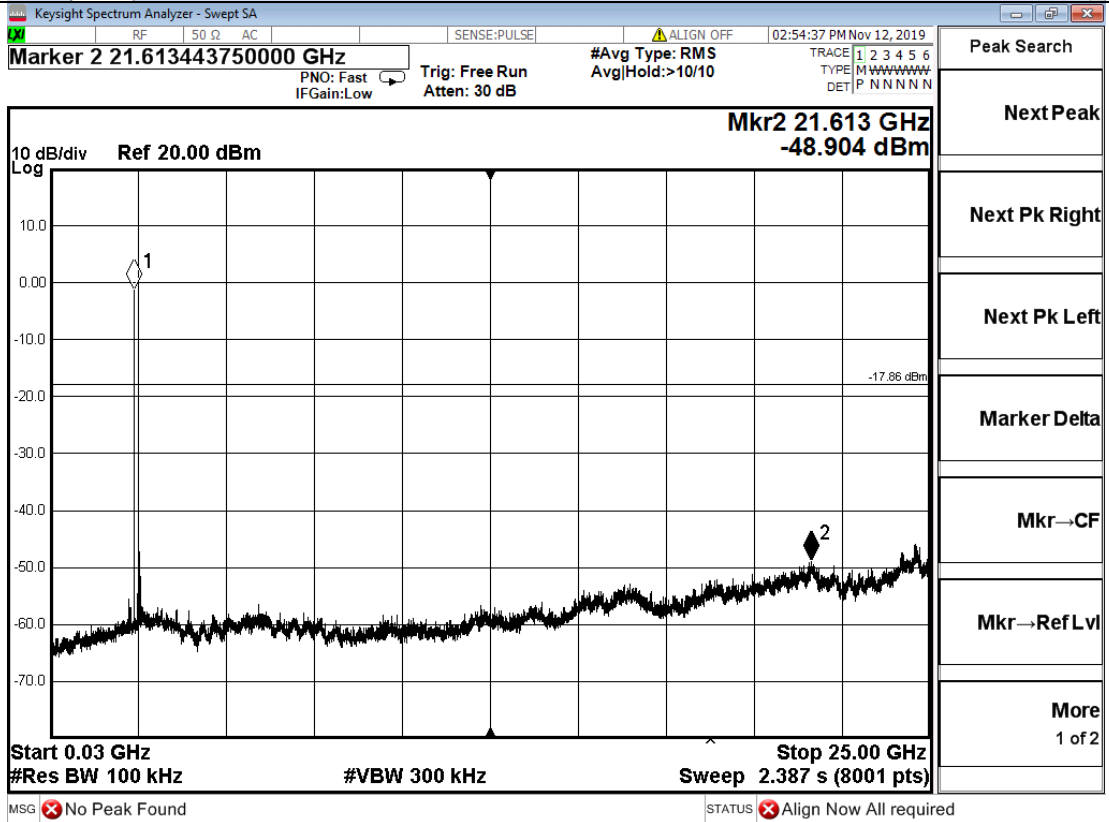


8DPSK\_LCH\_Graphs

Pref

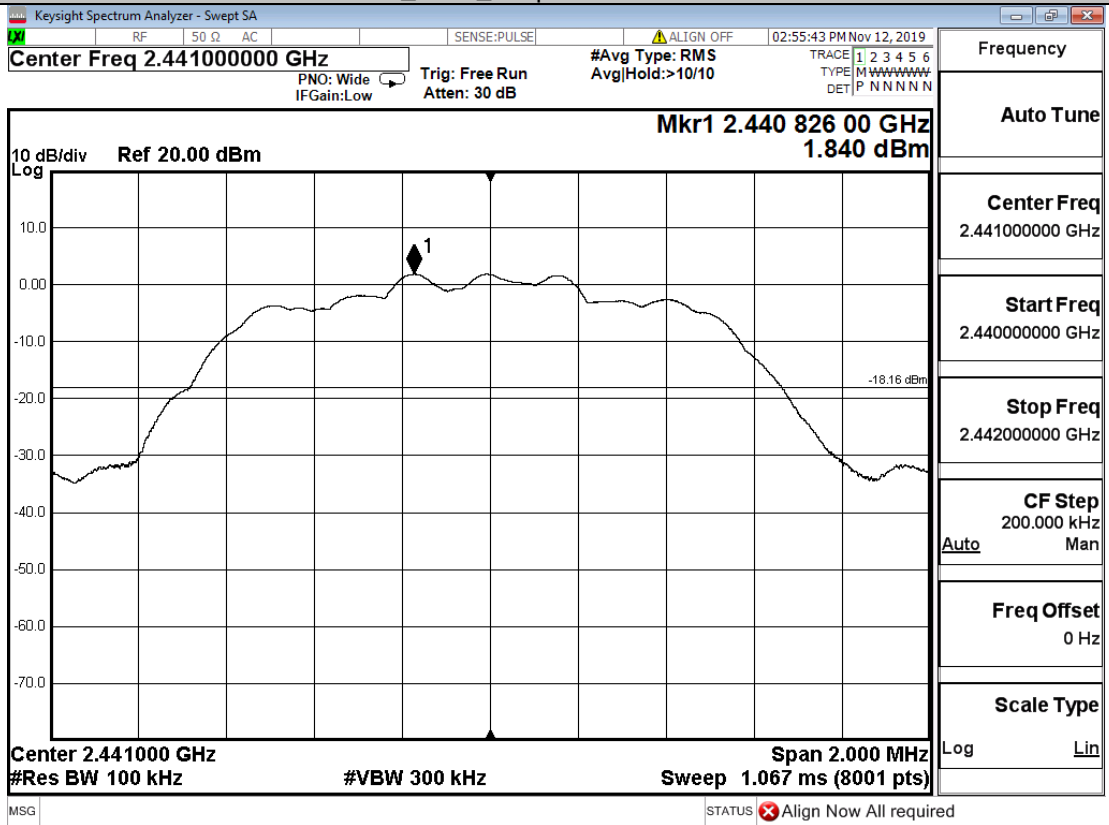


Puw

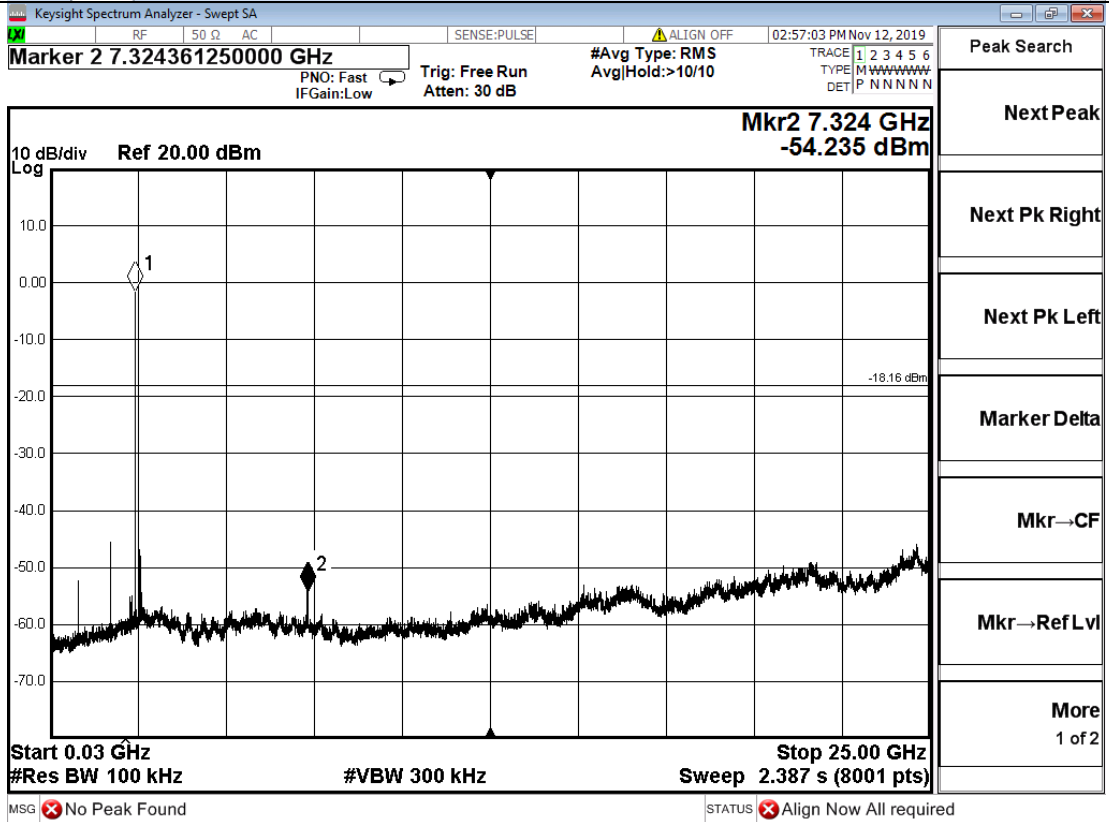


8DPSK\_MCH\_Graphs

Pref



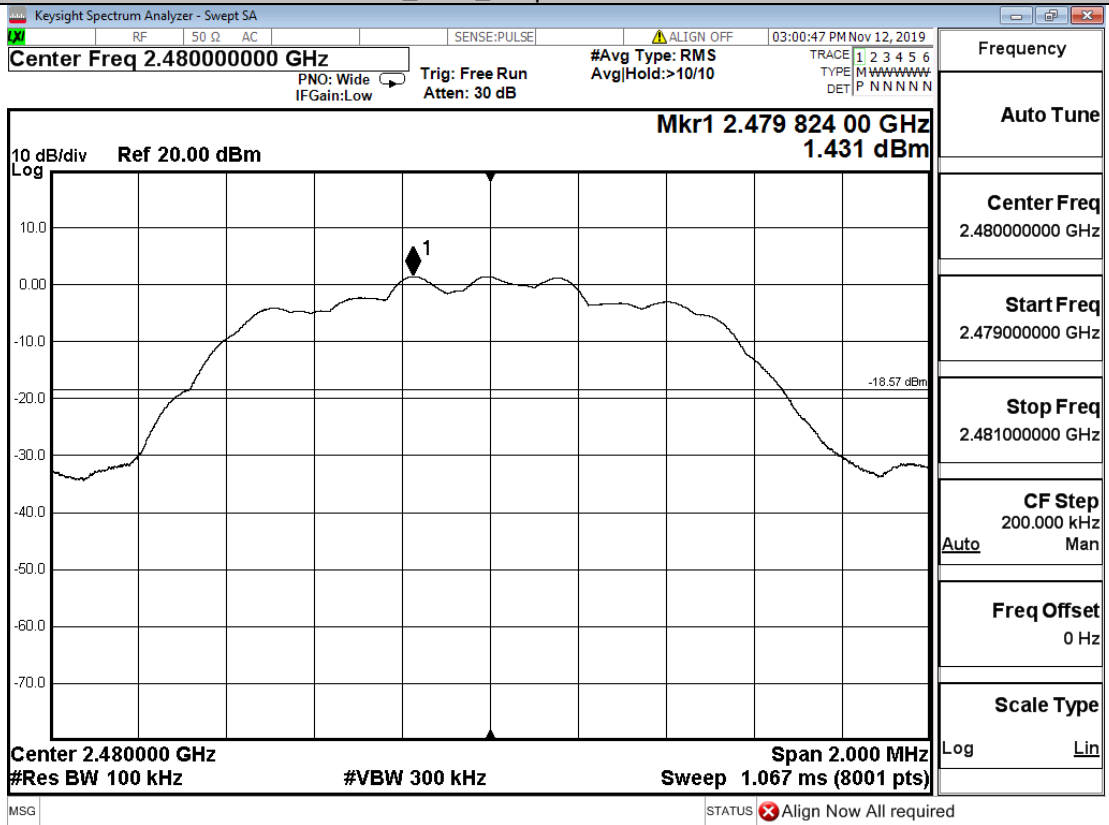
Puw



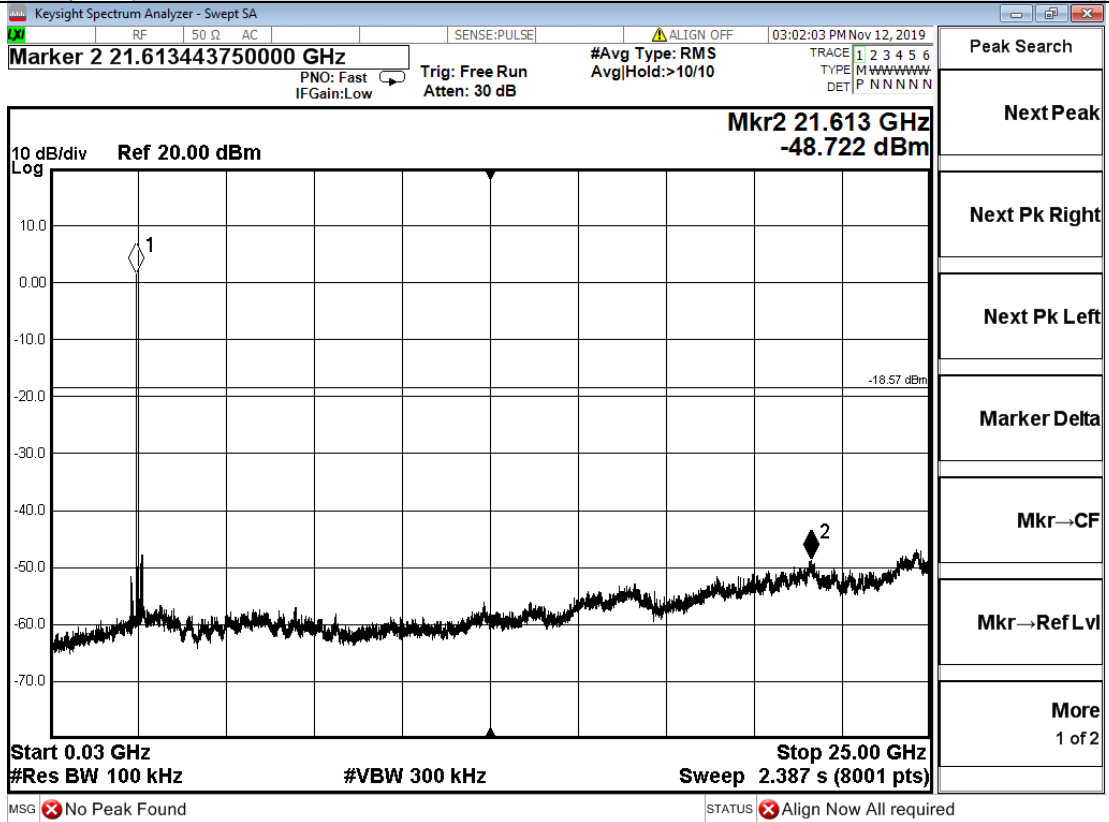


8DPSK\_HCH\_Graphs

Pref



Puw

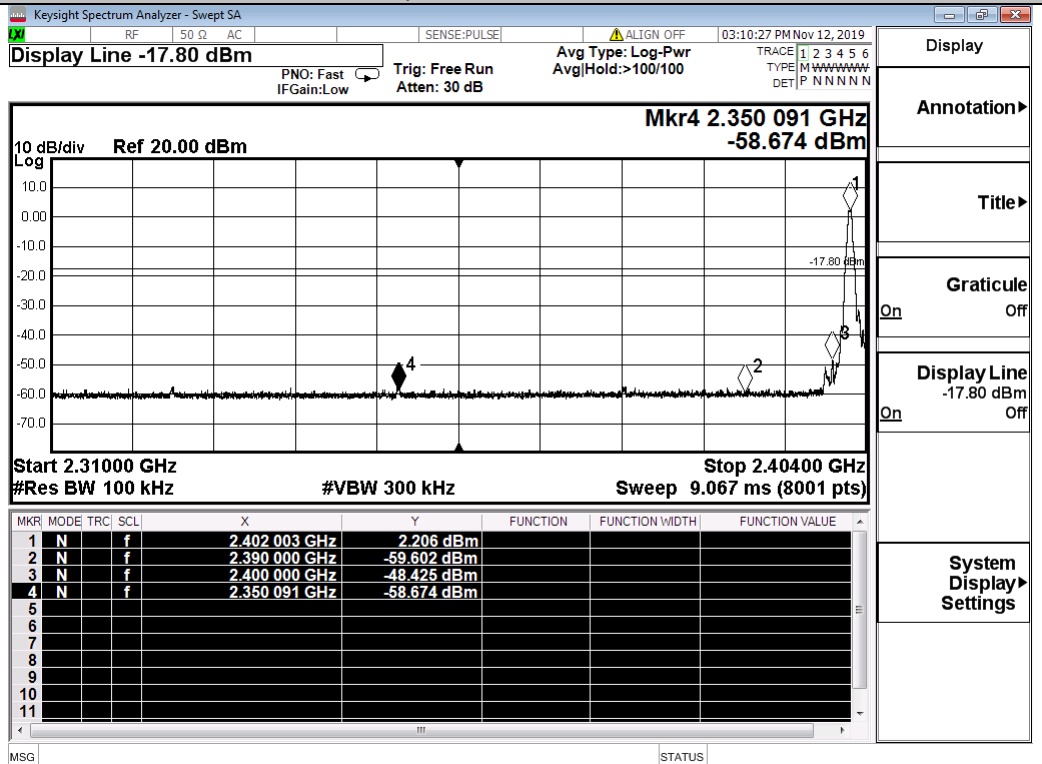


### A.7 Band-edge for RF Conducted Emissions

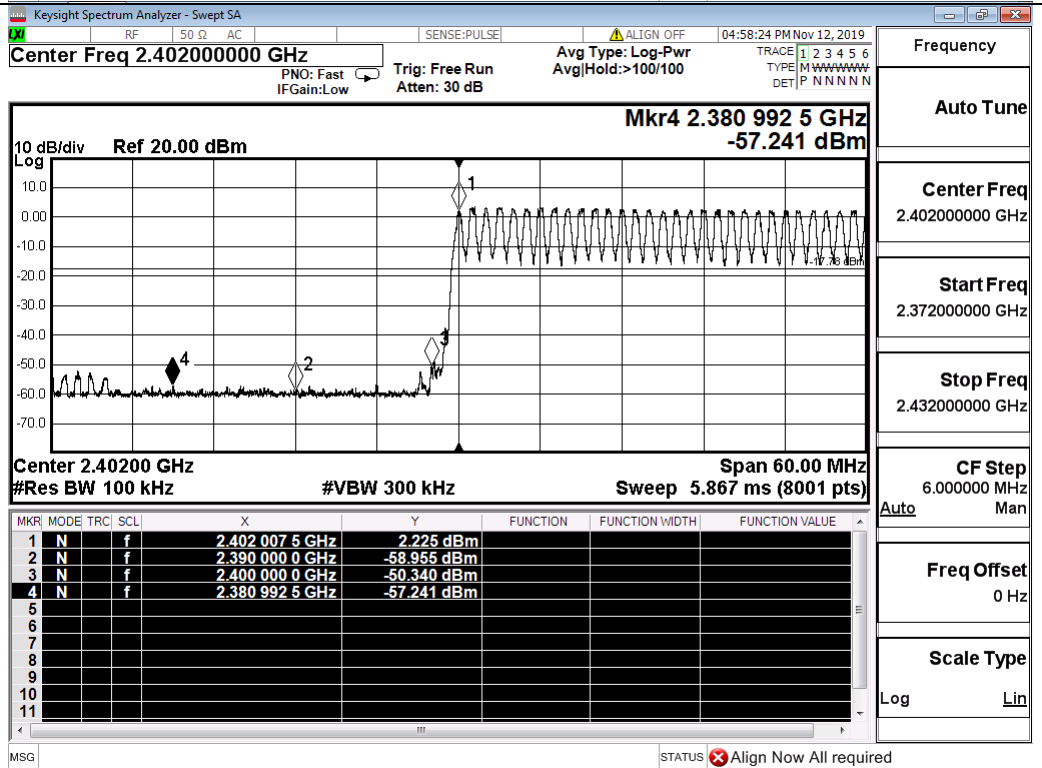
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	2.206	Off	-48.425	-17.79	PASS
			2.225	On	-50.340	-17.78	PASS
	HCH	2480	1.551	Off	-57.673	-18.45	PASS
			3.159	On	-56.319	-16.84	PASS
$\pi/4$ DQPSK	LCH	2402	2.230	Off	-37.652	-17.77	PASS
			2.244	On	-38.083	-17.76	PASS
	HCH	2480	1.528	Off	-57.027	-18.47	PASS
			1.382	On	-57.178	-18.62	PASS
8DPSK	LCH	2402	2.331	Off	-37.597	-17.67	PASS
			2.270	On	-37.881	-17.73	PASS
	HCH	2480	1.538	Off	-54.772	-18.46	PASS
			1.554	On	-57.752	-18.45	PASS

Test Graphs

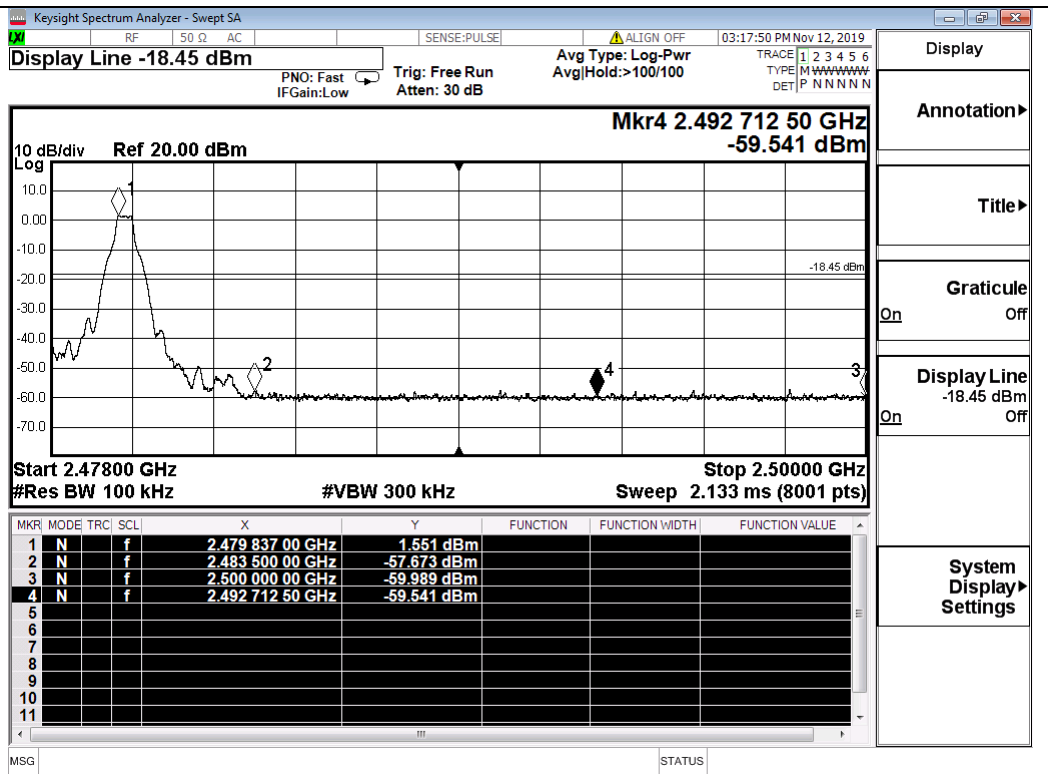
GFSK/LCH/No Hop



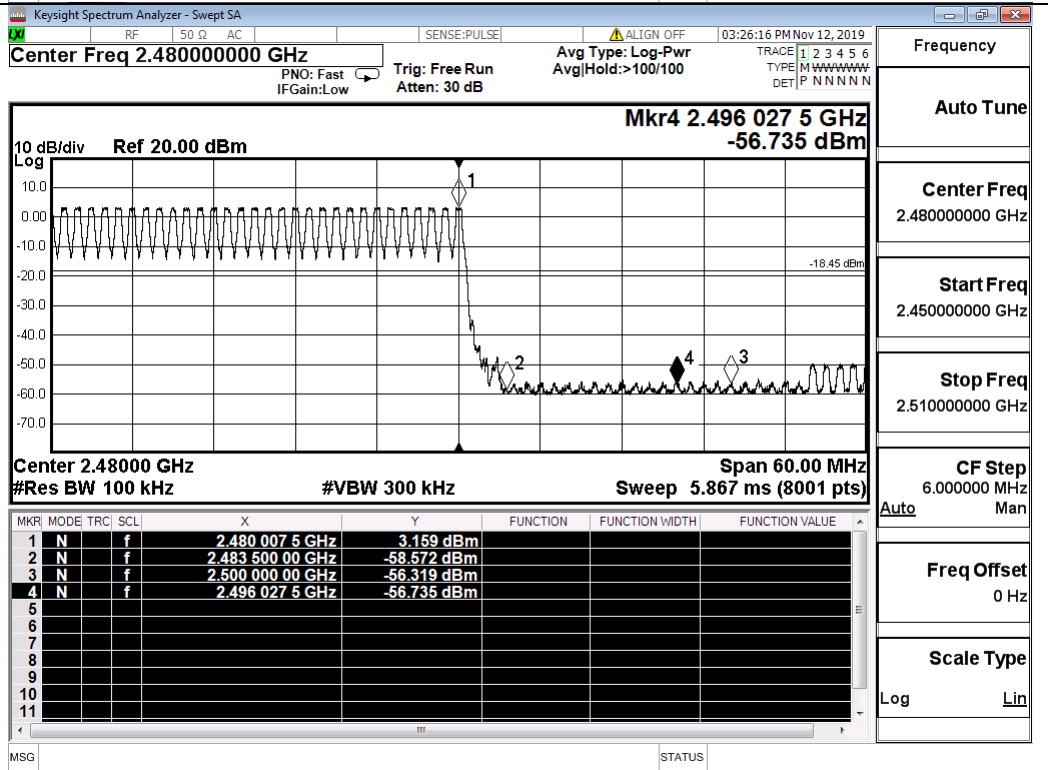
GFSK/LCH/Hop



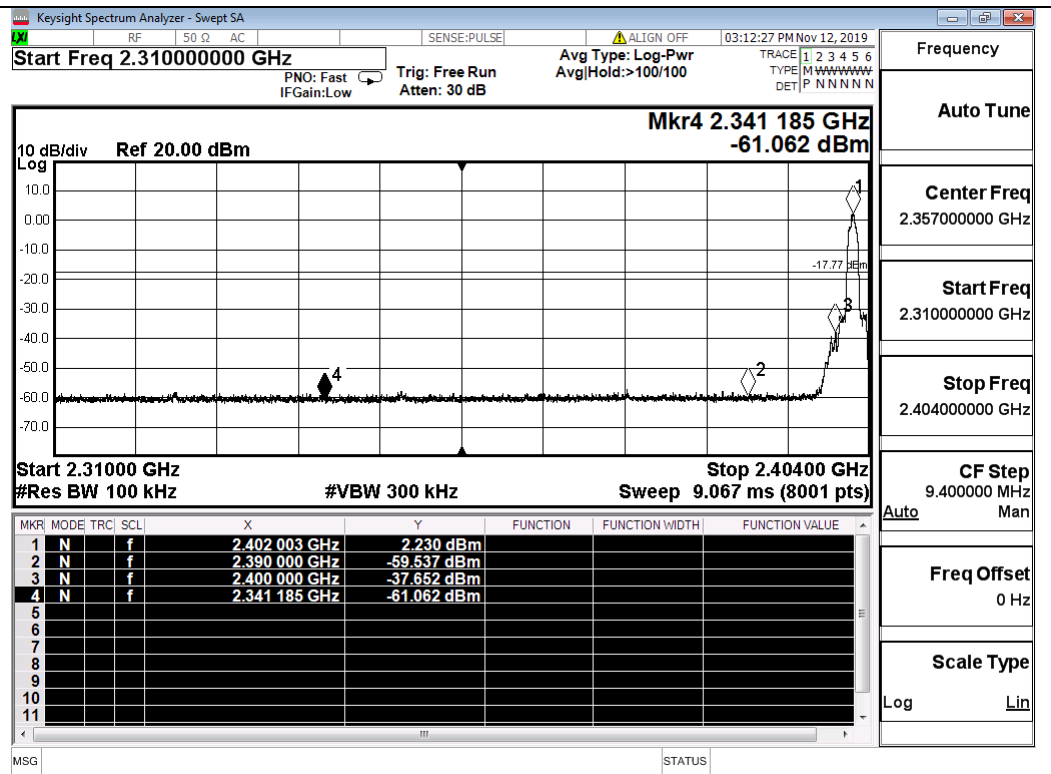
GFSK/HCH/No Hop



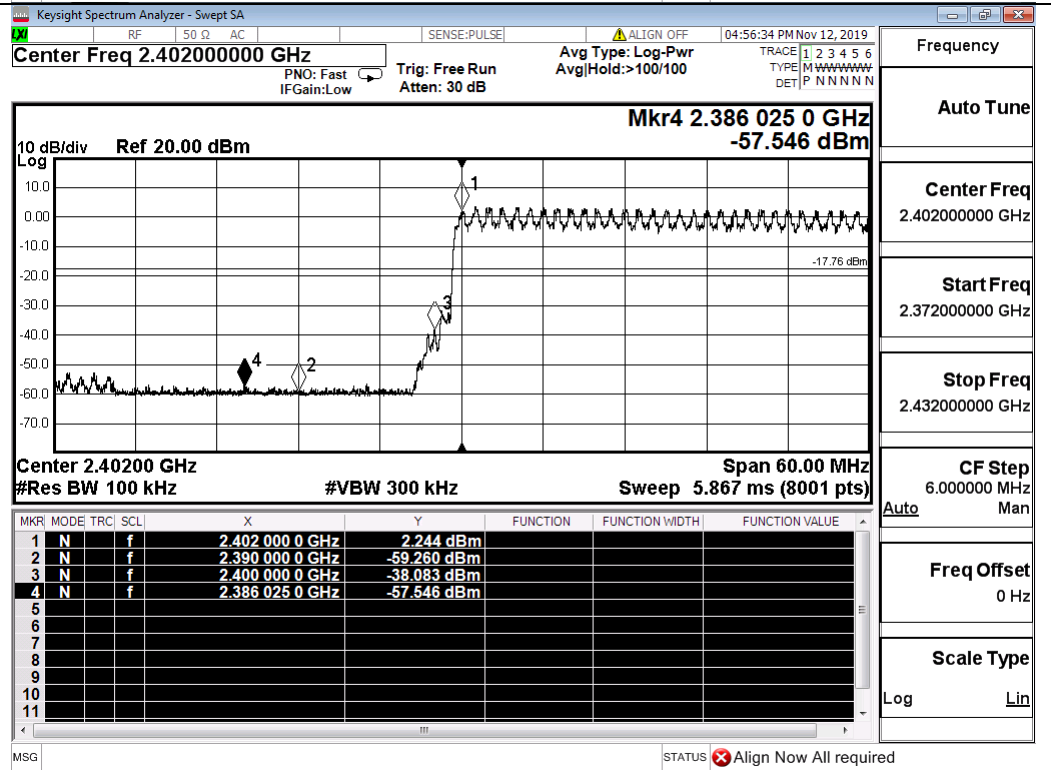
GFSK/HCH/Hop



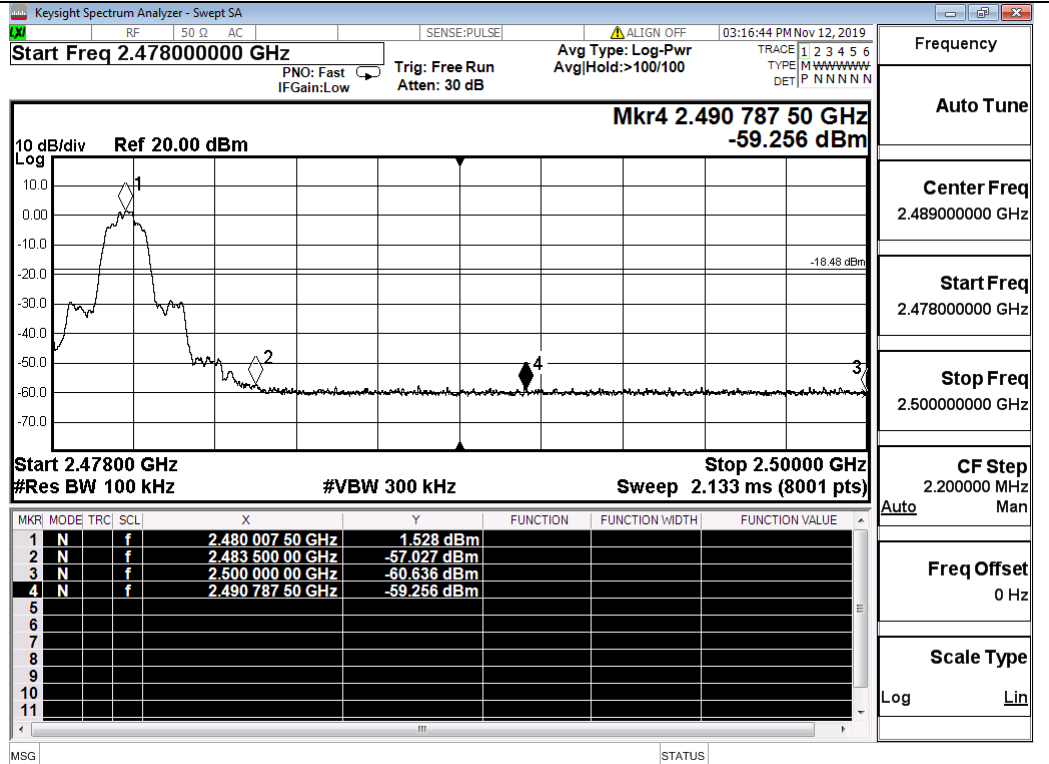
$\pi/4$ DQPSK/LCH/No Hop



$\pi/4$ DQPSK/LCH/Hop

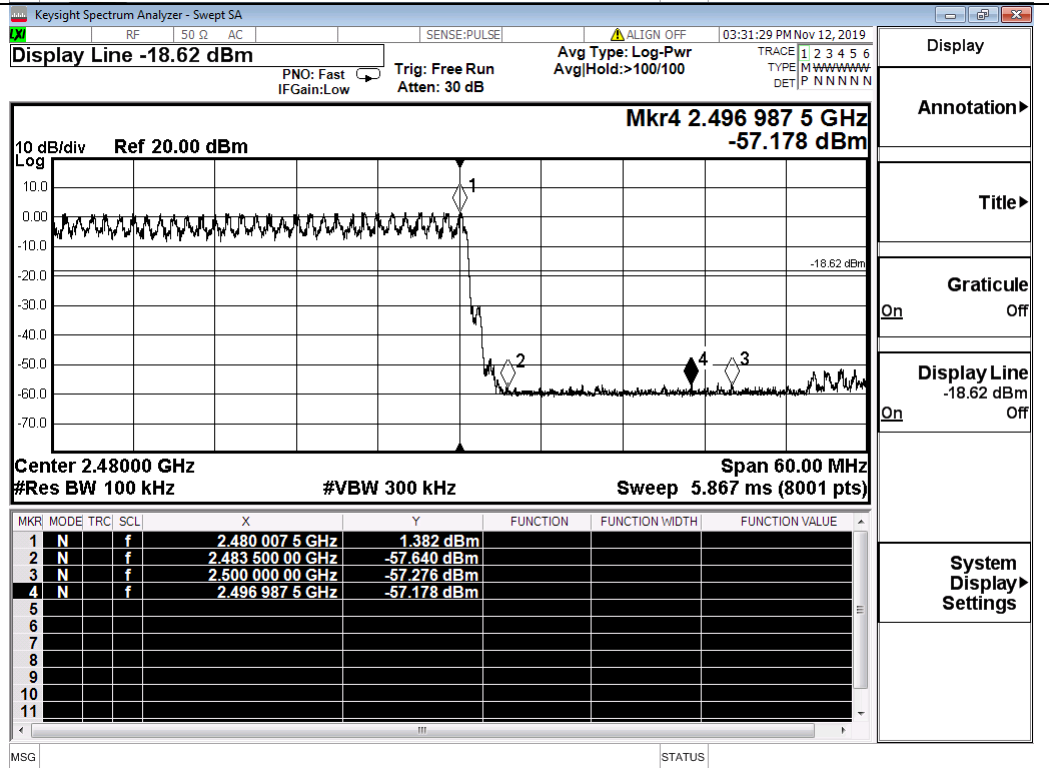


$\pi/4$ DQPSK/HCH/No Hop



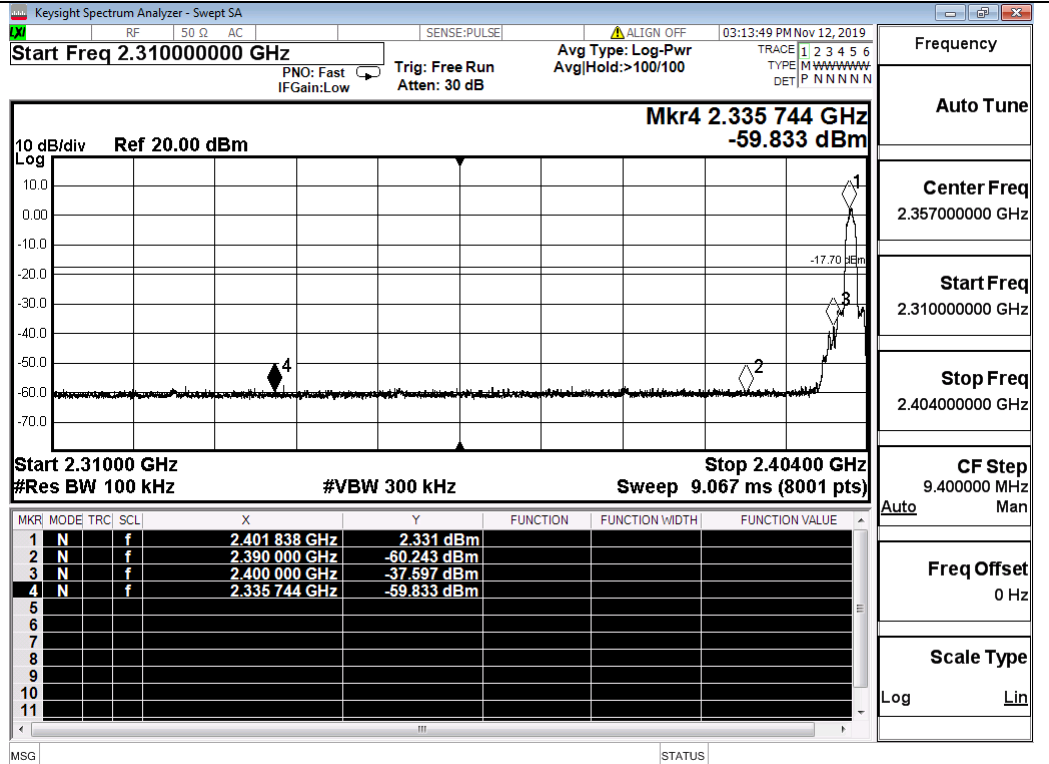
Frequency
Auto Tune
Center Freq 2.489000000 GHz
Start Freq 2.478000000 GHz
Stop Freq 2.500000000 GHz
CF Step 2.200000 MHz
Auto Man
Freq Offset 0 Hz
Scale Type Log Lin

$\pi/4$ DQPSK/HCH/Hop

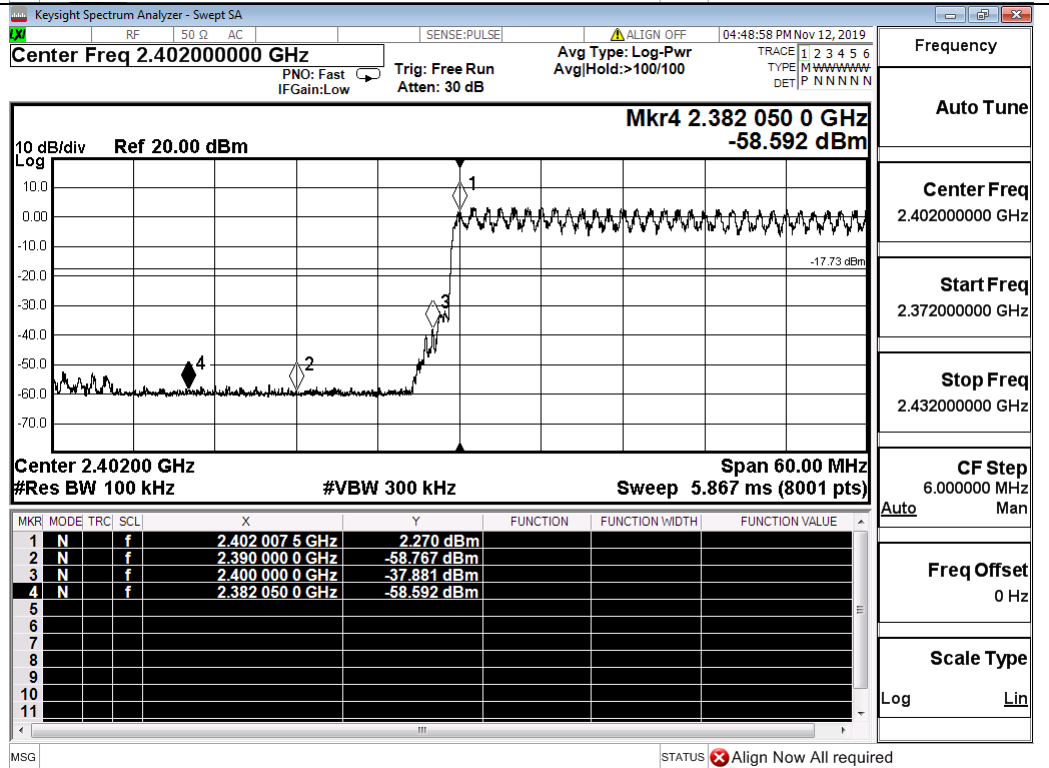


Display
Annotation
Title
Graticule On Off
Display Line -18.62 dBm On Off
System Display Settings

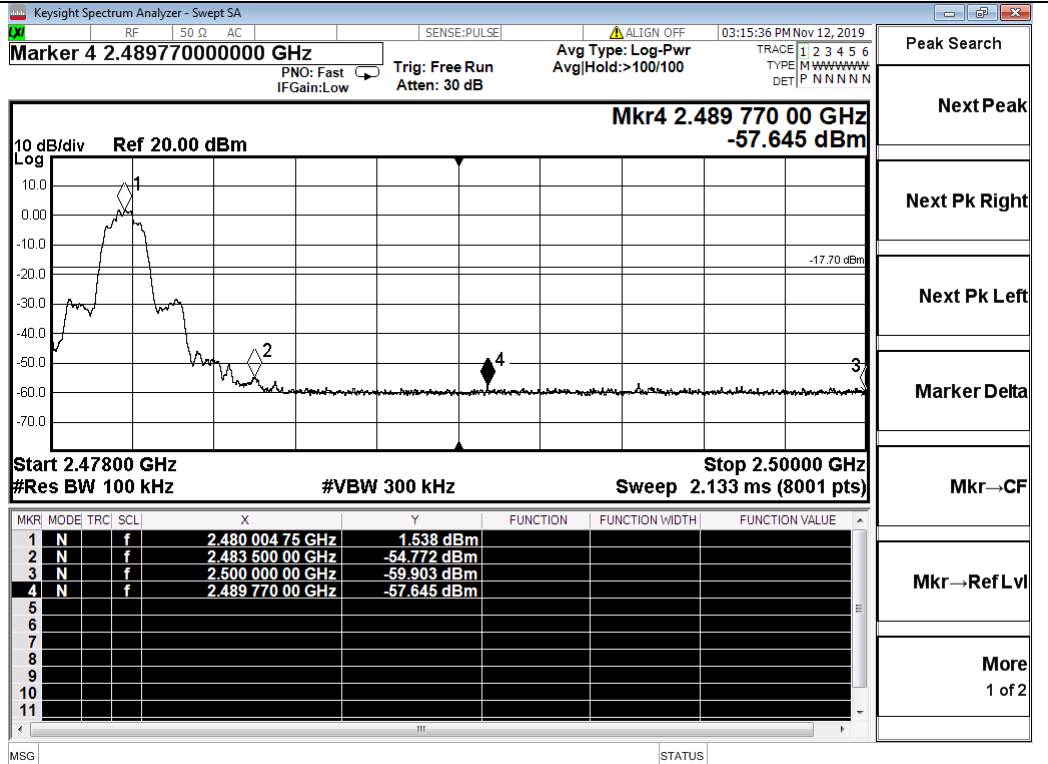
8DPSK/LCH/No Hop



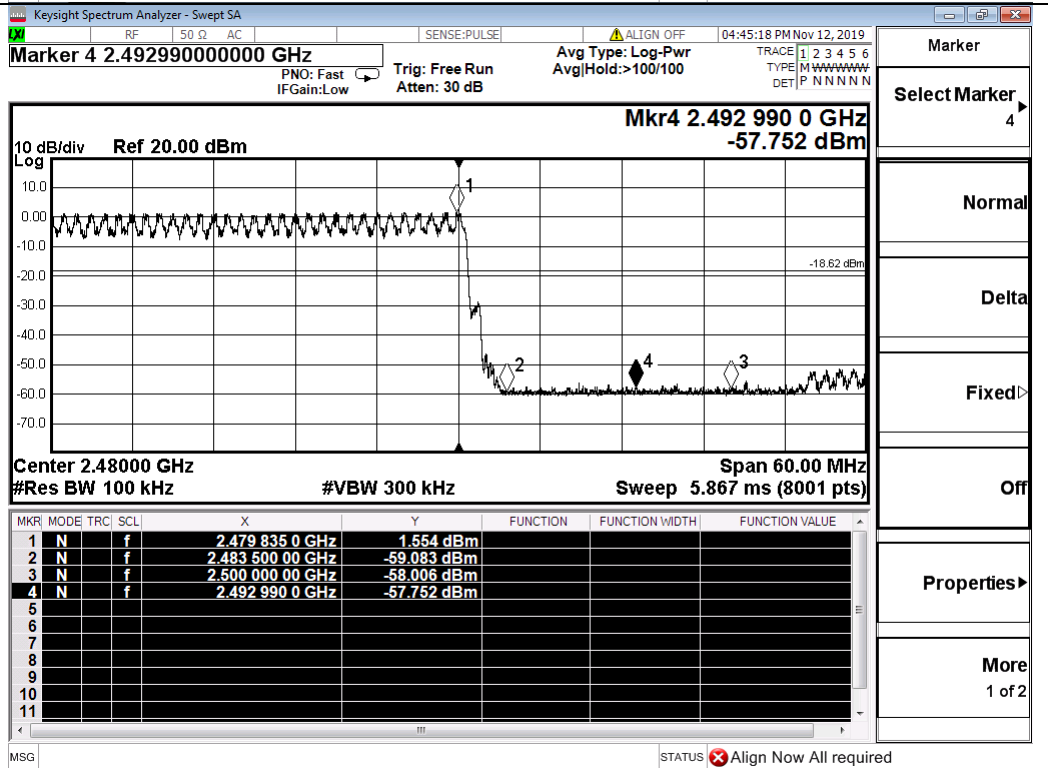
8DPSK/LCH/Hop



8DPSK/HCH/No Hop



8DPSK/HCH/Hop

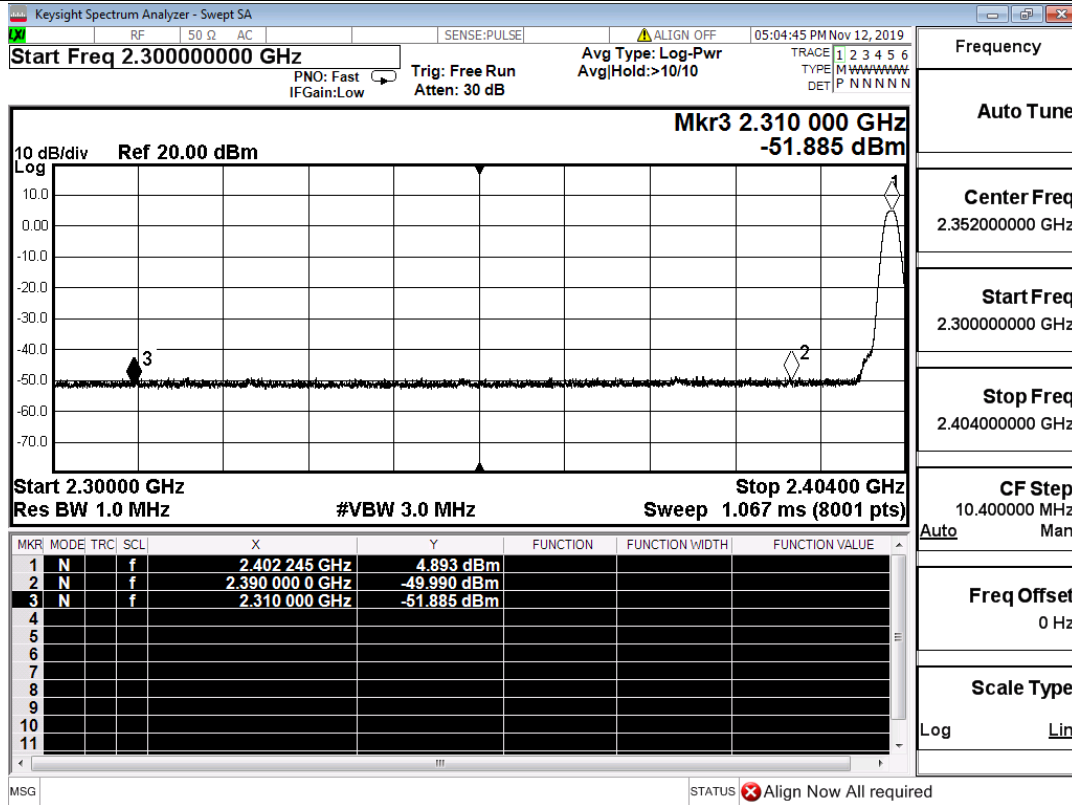




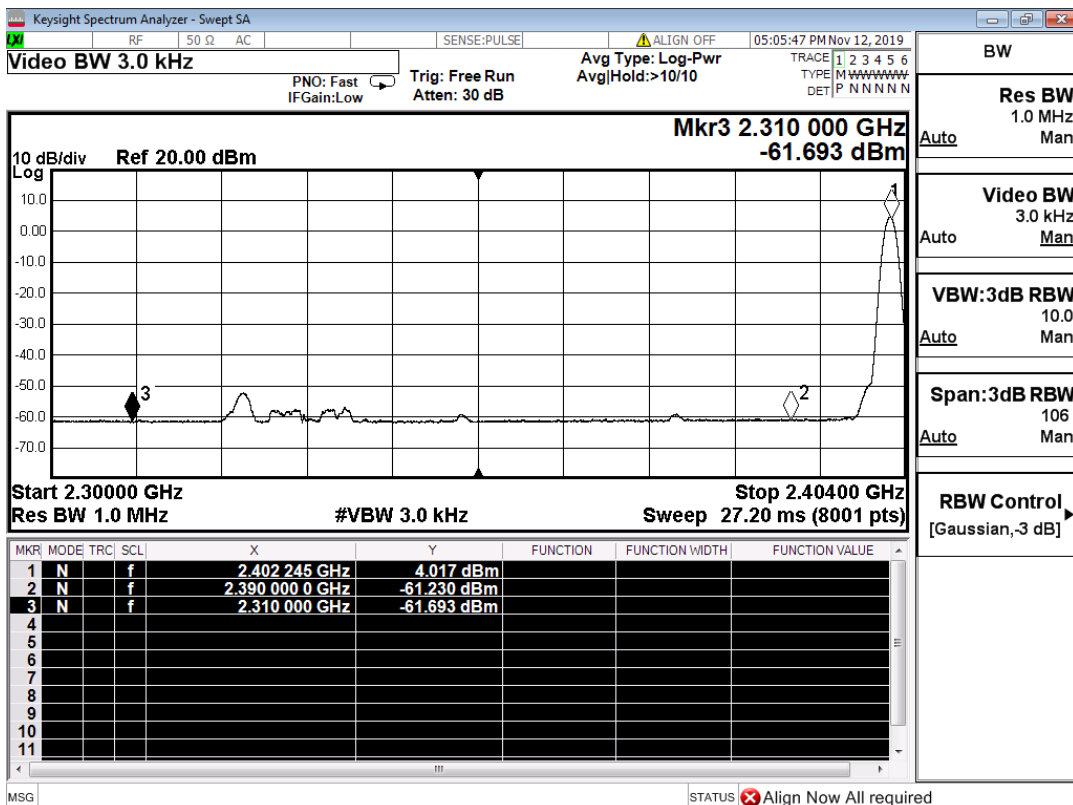
**A.8 Restrict-band band-edge measurements**

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-51.885	2.0	0	45.35	PEAK	74	PASS
	Off	2310.0	-61.693	2.0	0	35.54	AV	54	PASS
	Off	2390.0	-49.990	2.0	0	47.24	PEAK	74	PASS
	Off	2390.0	-61.230	2.0	0	36.00	AV	54	PASS
	Off	2483.5	-47.145	2.0	0	50.09	PEAK	74	PASS
	Off	2483.5	-58.792	2.0	0	38.44	AV	54	PASS
	Off	2500.0	-50.346	2.0	0	46.88	PEAK	74	PASS
	Off	2500.0	-60.899	2.0	0	36.33	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-50.176	2.0	0	47.05	PEAK	74	PASS
	Off	2310.0	-61.619	2.0	0	35.61	AV	54	PASS
	Off	2390.0	-50.684	2.0	0	46.55	PEAK	74	PASS
	Off	2390.0	-61.477	2.0	0	35.75	AV	54	PASS
	Off	2483.5	-47.030	2.0	0	50.20	PEAK	74	PASS
	Off	2483.5	-57.930	2.0	0	39.30	AV	54	PASS
	Off	2500.0	-50.200	2.0	0	47.03	PEAK	74	PASS
	Off	2500.0	-60.650	2.0	0	36.58	AV	54	PASS
8DPSK	Off	2310.0	-50.937	2.0	0	46.29	PEAK	74	PASS
	Off	2310.0	-61.372	2.0	0	35.86	AV	54	PASS
	Off	2390.0	-50.855	2.0	0	46.38	PEAK	74	PASS
	Off	2390.0	-61.056	2.0	0	36.17	AV	54	PASS
	Off	2483.5	-46.747	2.0	0	50.48	PEAK	74	PASS
	Off	2483.5	-57.515	2.0	0	39.72	AV	54	PASS
	Off	2500.0	-50.864	2.0	0	46.37	PEAK	74	PASS
	Off	2500.0	-60.865	2.0	0	36.37	AV	54	PASS

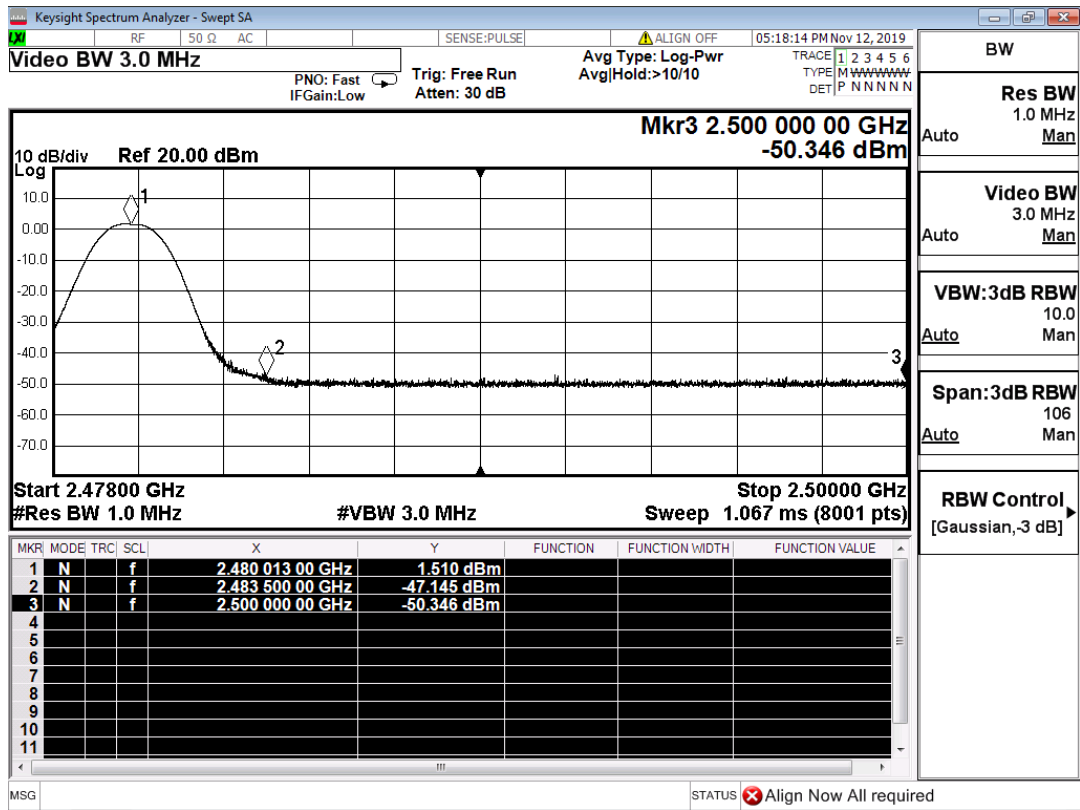
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_PEAK (Low Channel)



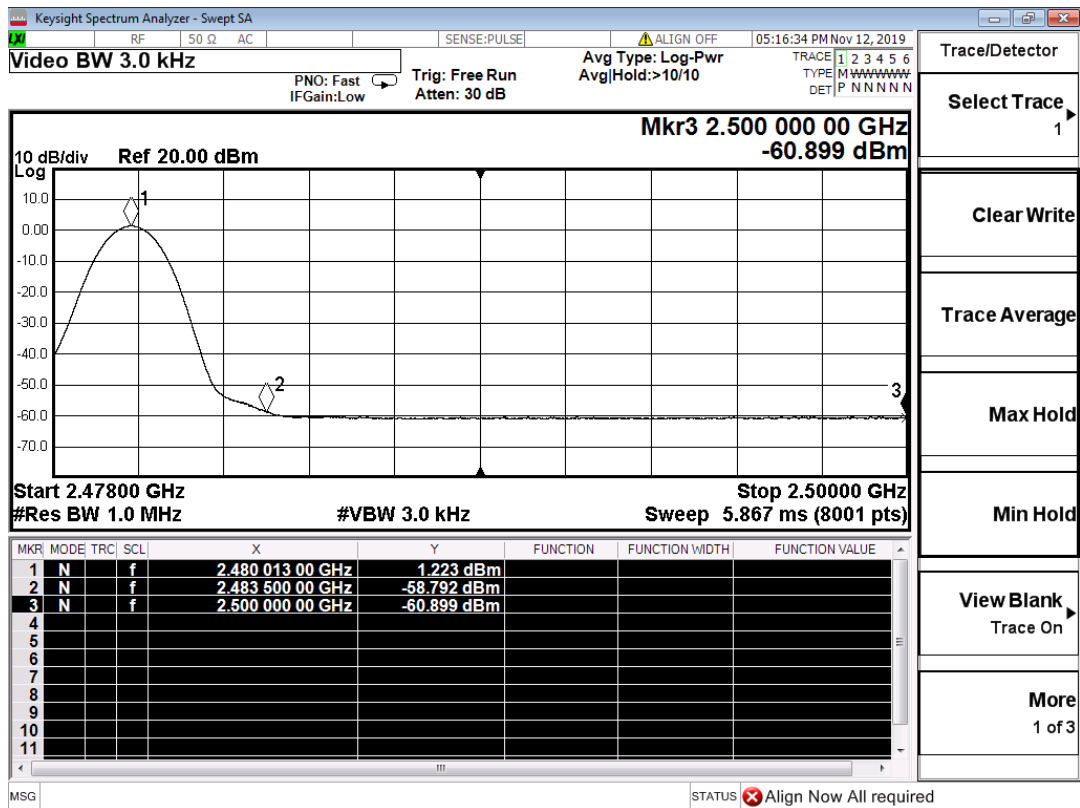
Restrict-band band-edge measurements\_Hopping Off\_GFSK\_Average (Low Channel)



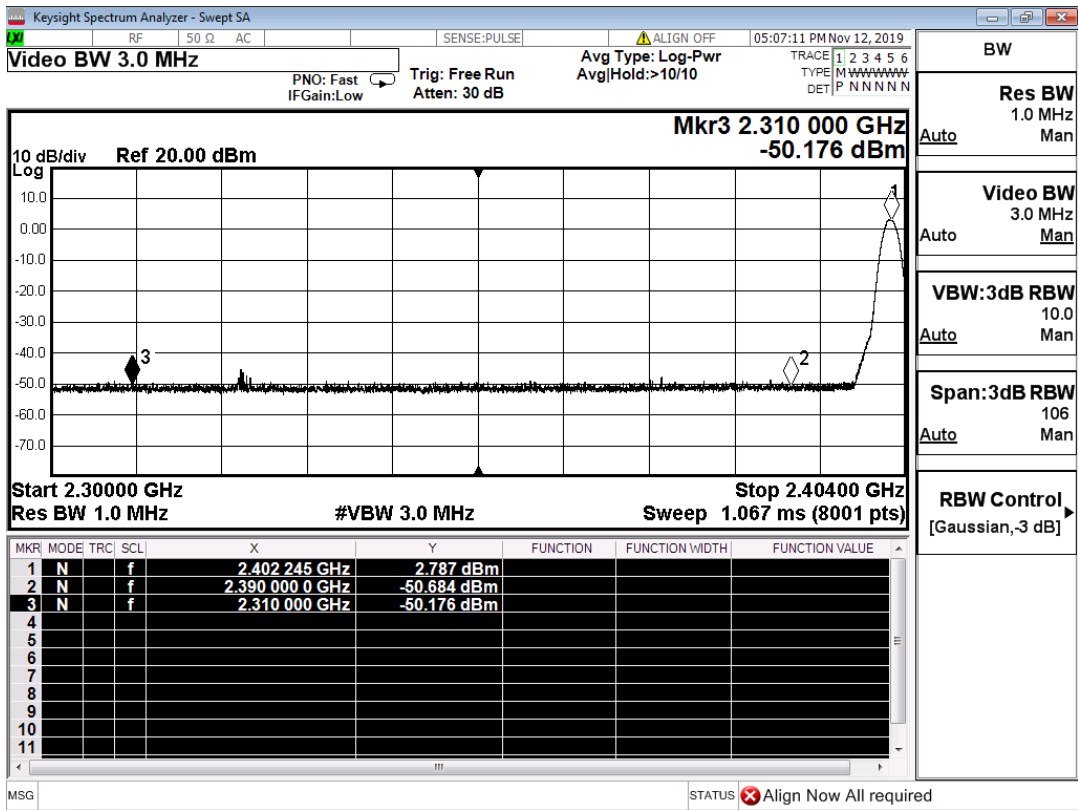
Restrict-band band-edge measurements\_Hopping Off\_ GFSK\_PEAK (High Channel)



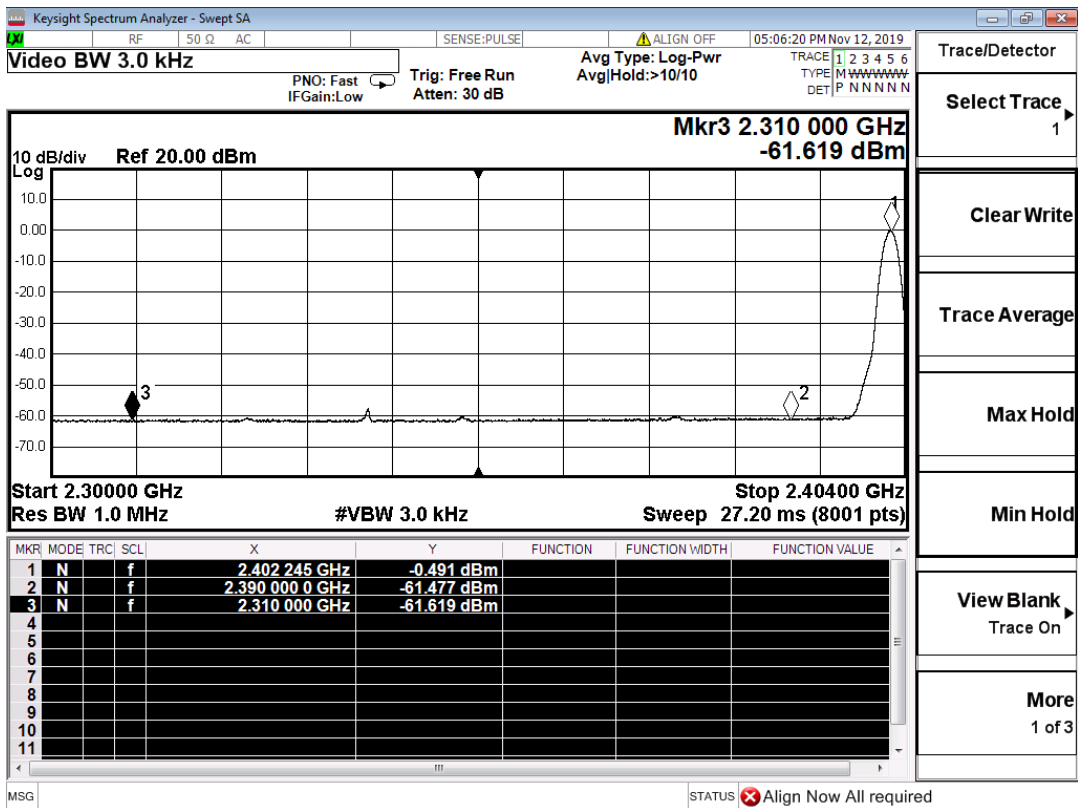
Restrict-band band-edge measurements\_Hopping Off\_ GFSK\_Average (High Channel)



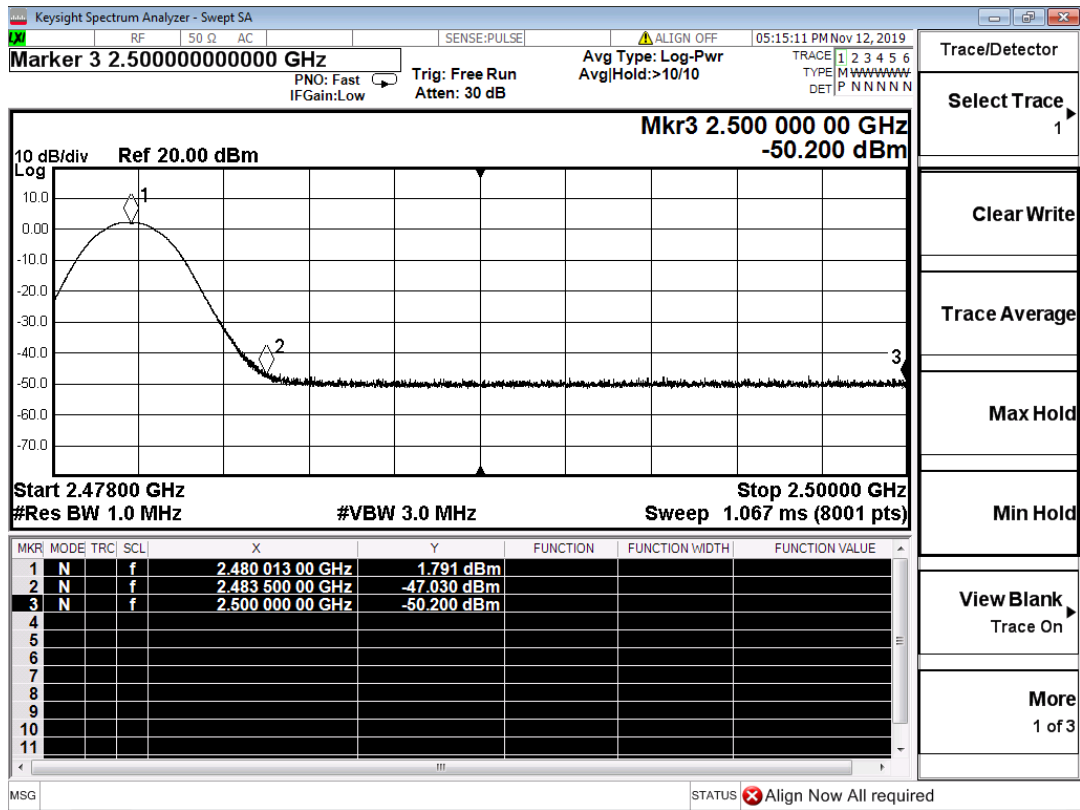
Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_PEAK (Low Channel)



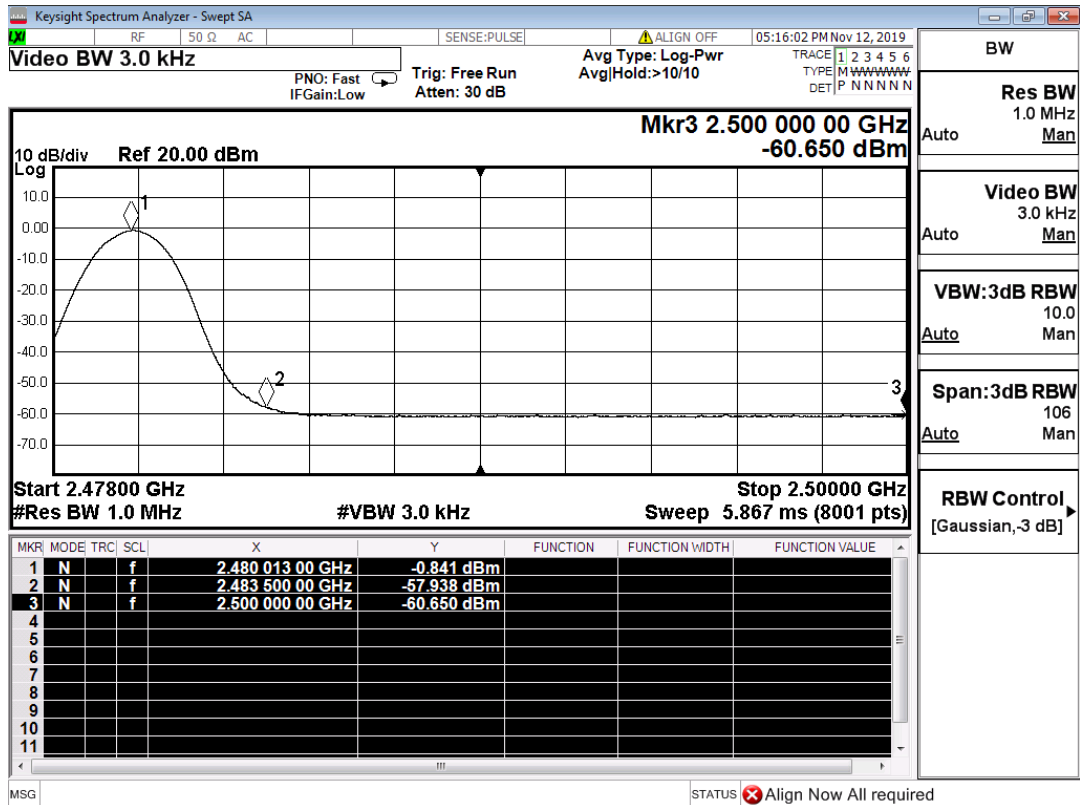
Restrict-band band-edge measurements\_Hopping Off  $\pi/4$ -DQPSK\_Average (Low Channel)



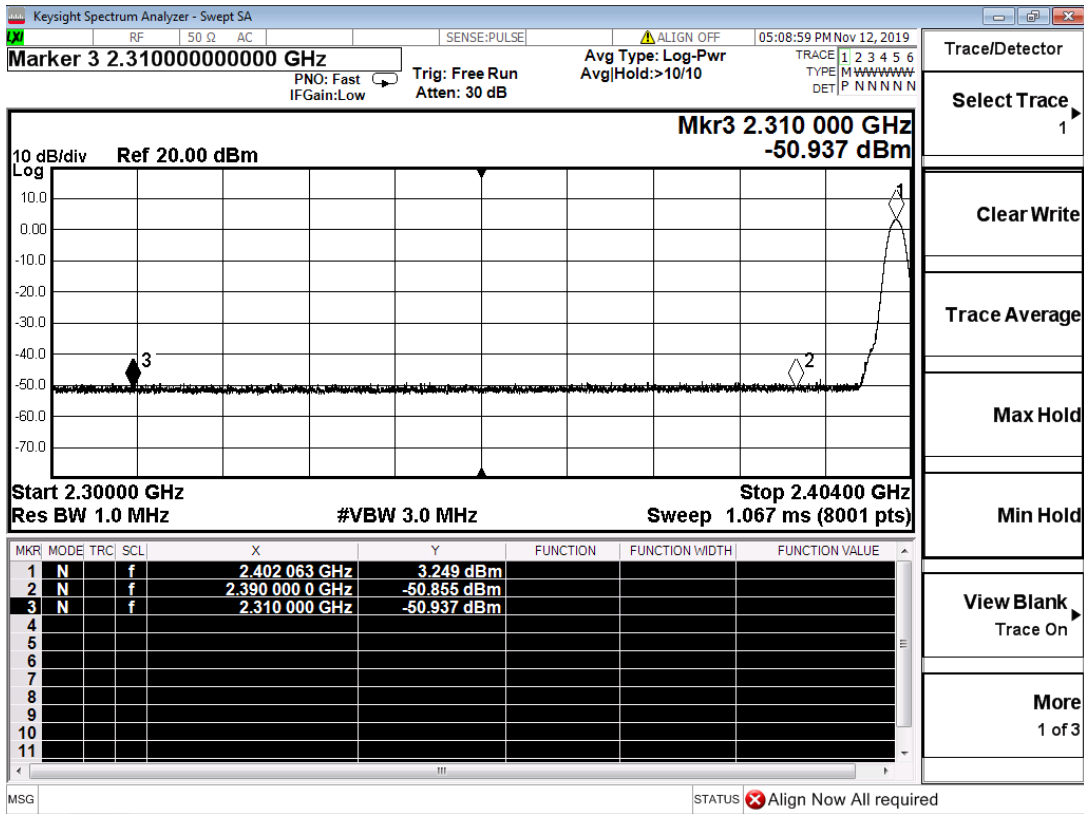
Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_PEAK (High Channel)



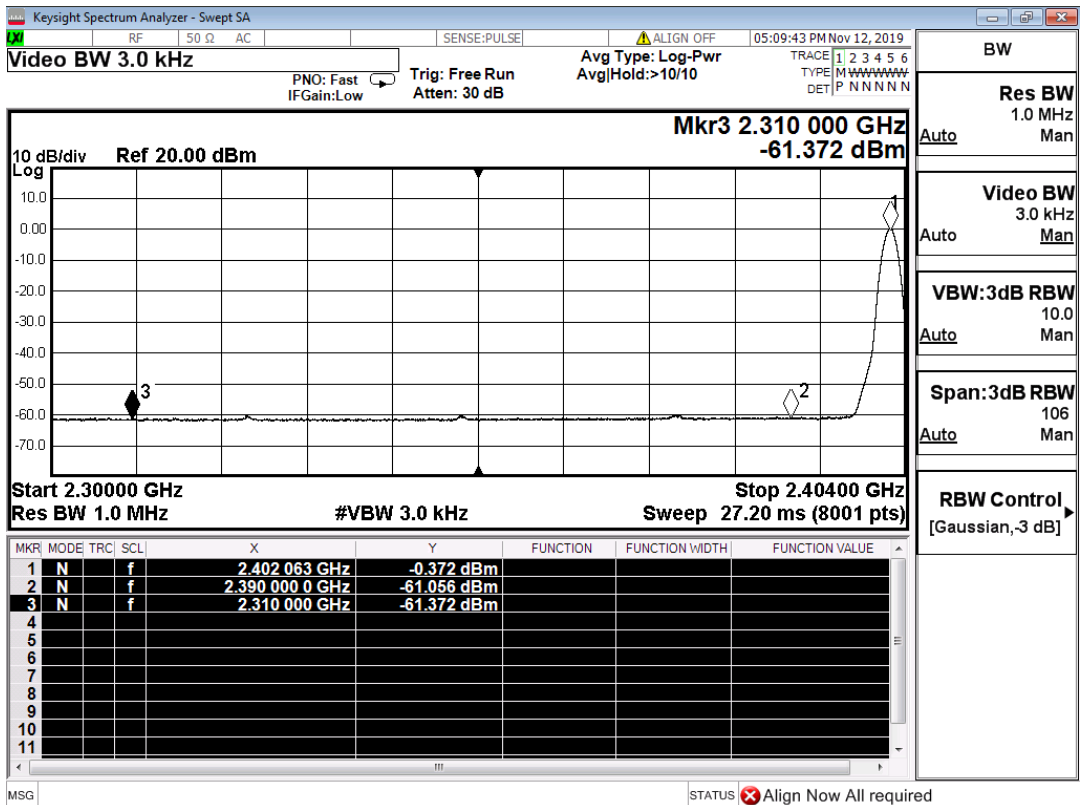
Restrict-band band-edge measurements\_Hopping Off\_π/4-DQPSK\_Average (High Channel)



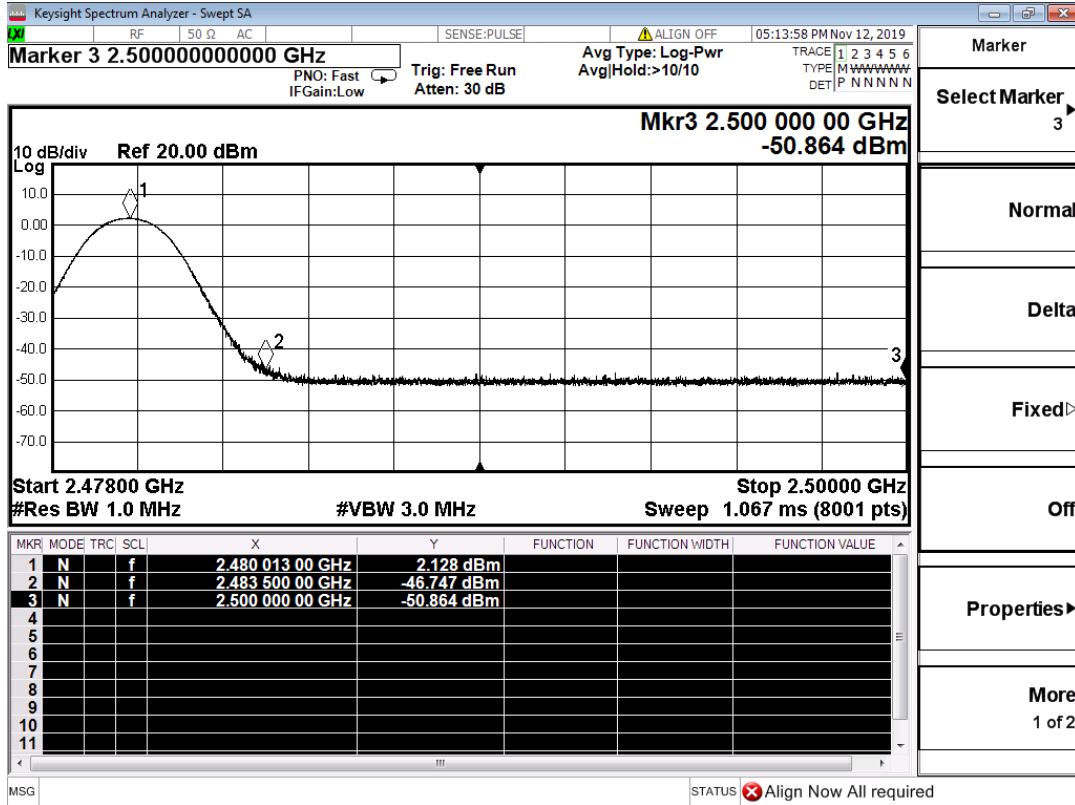
Restrict-band band-edge measurements\_Hopping Off\_8DPSK\_PEAK (Low Channel)



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)

