

Appendix A

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

Product Name: True Wireless Earbuds

Trade Mark: iWorld, Prime Audio, Macbeth Collection, Kodak, CoreAudio

Test Model: PATW-1001-WH

Environmental Conditions

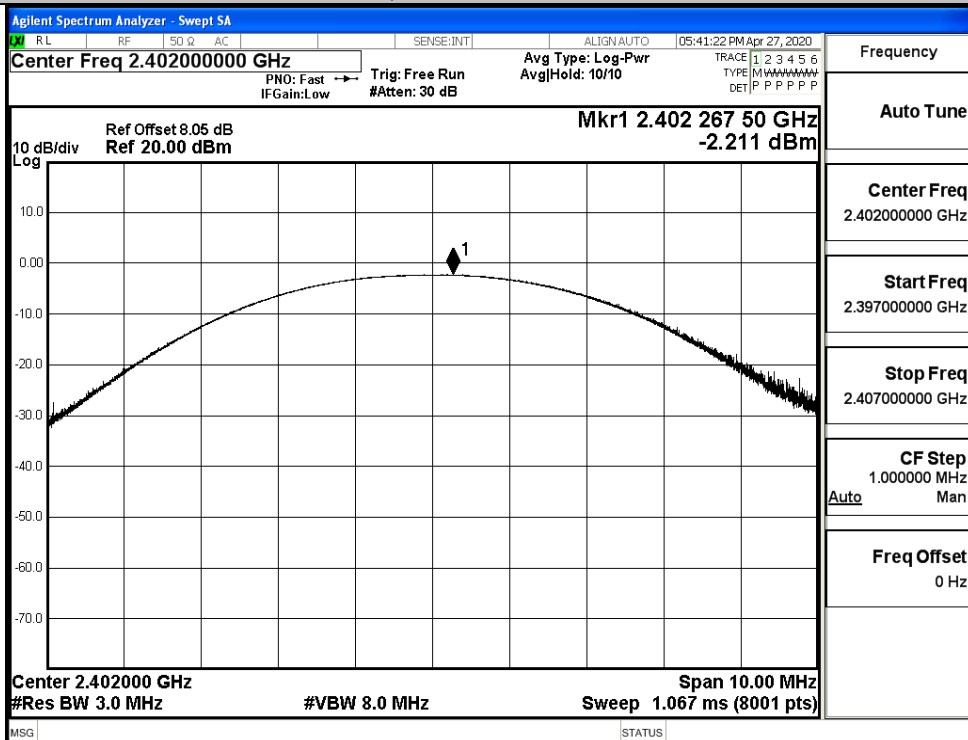
Temperature:	23.6 ° C
Relative Humidity:	53.6%
ATM Pressure:	100.0 kPa
Test Engineer:	Alisa Huang
Supervised by:	Li Huan

A.1 Maximum Conducted Peak Output Power

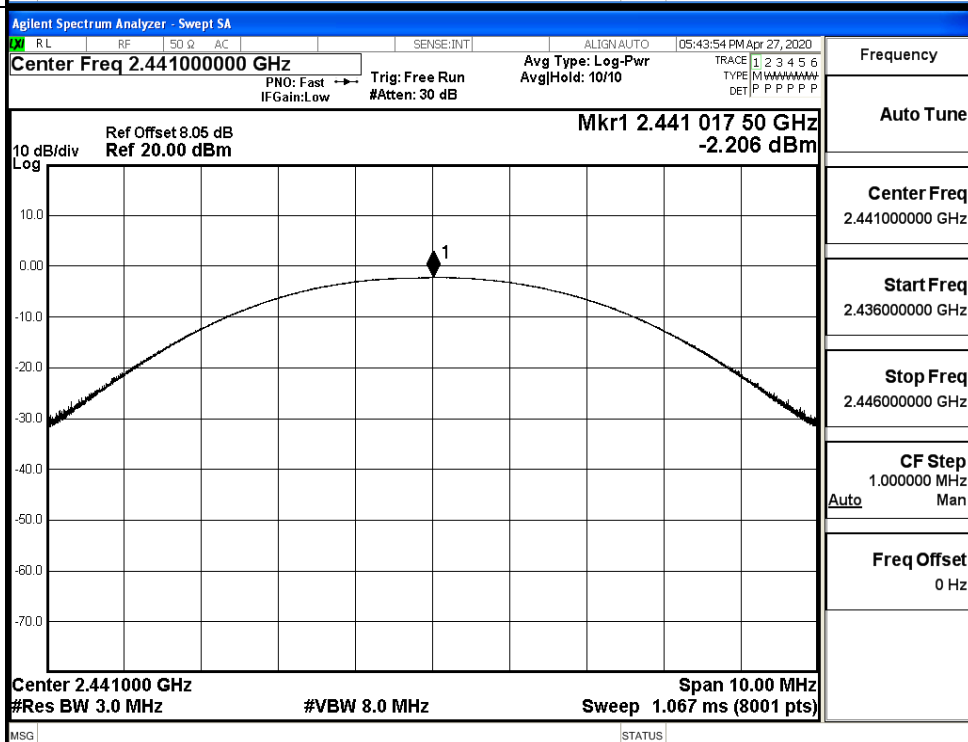
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-2.211	30	PASS
	MCH	-2.206	30	PASS
	HCH	-2.597	30	PASS
$\pi/4$ DQPSK	LCH	-1.321	21	PASS
	MCH	-1.237	21	PASS
	HCH	-1.667	21	PASS

Test Graphs

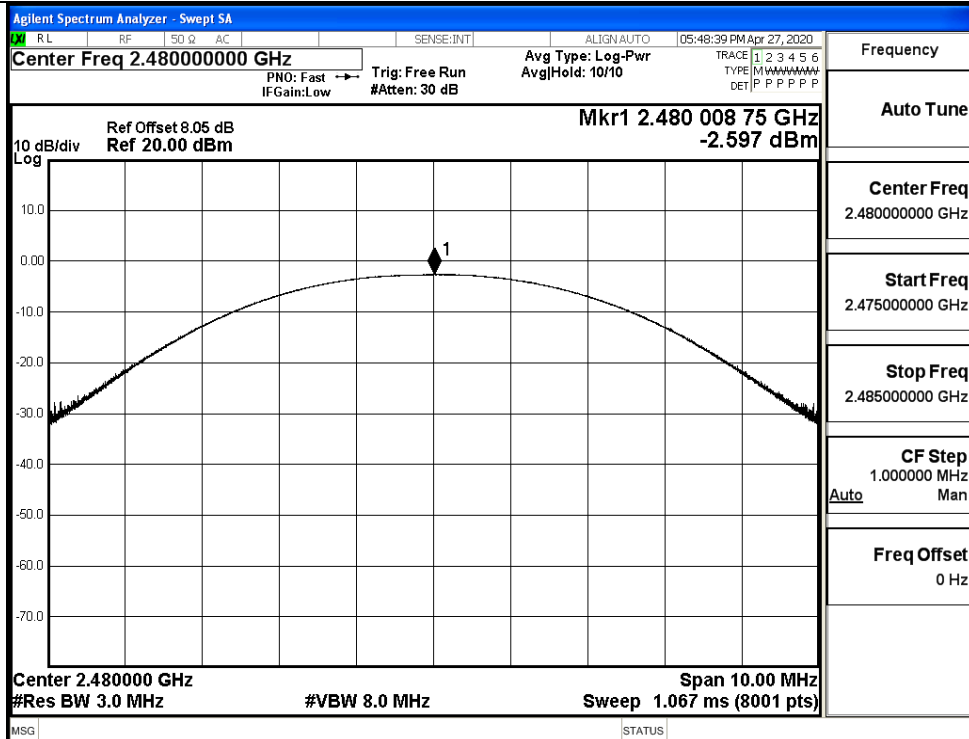
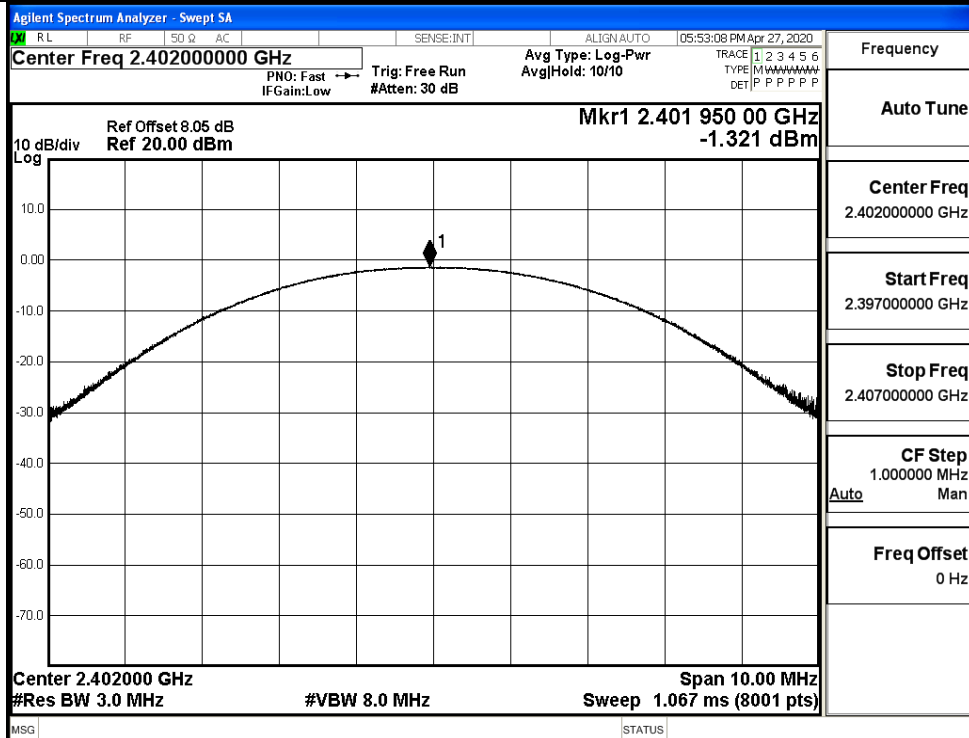
GFSK/LCH

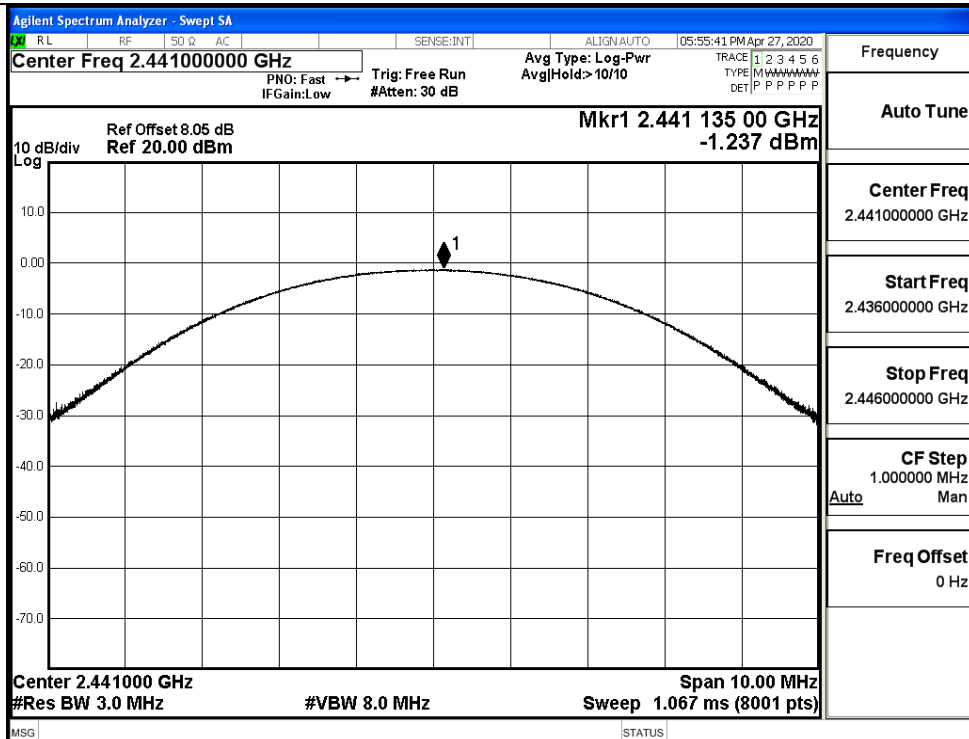
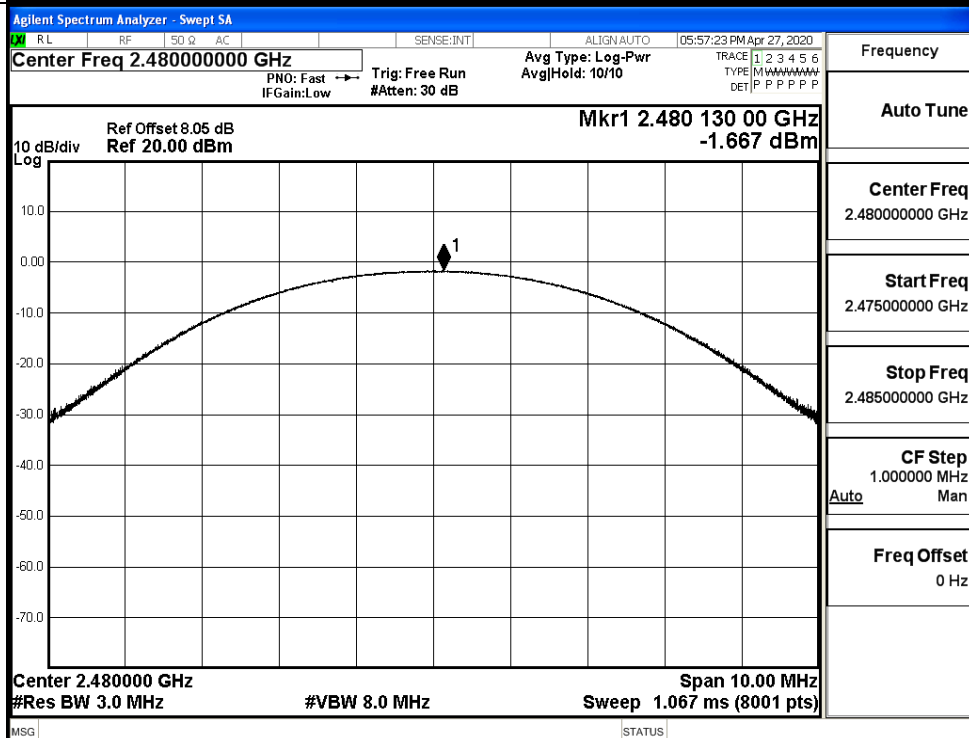


GFSK/MCH



GFSK/HCH

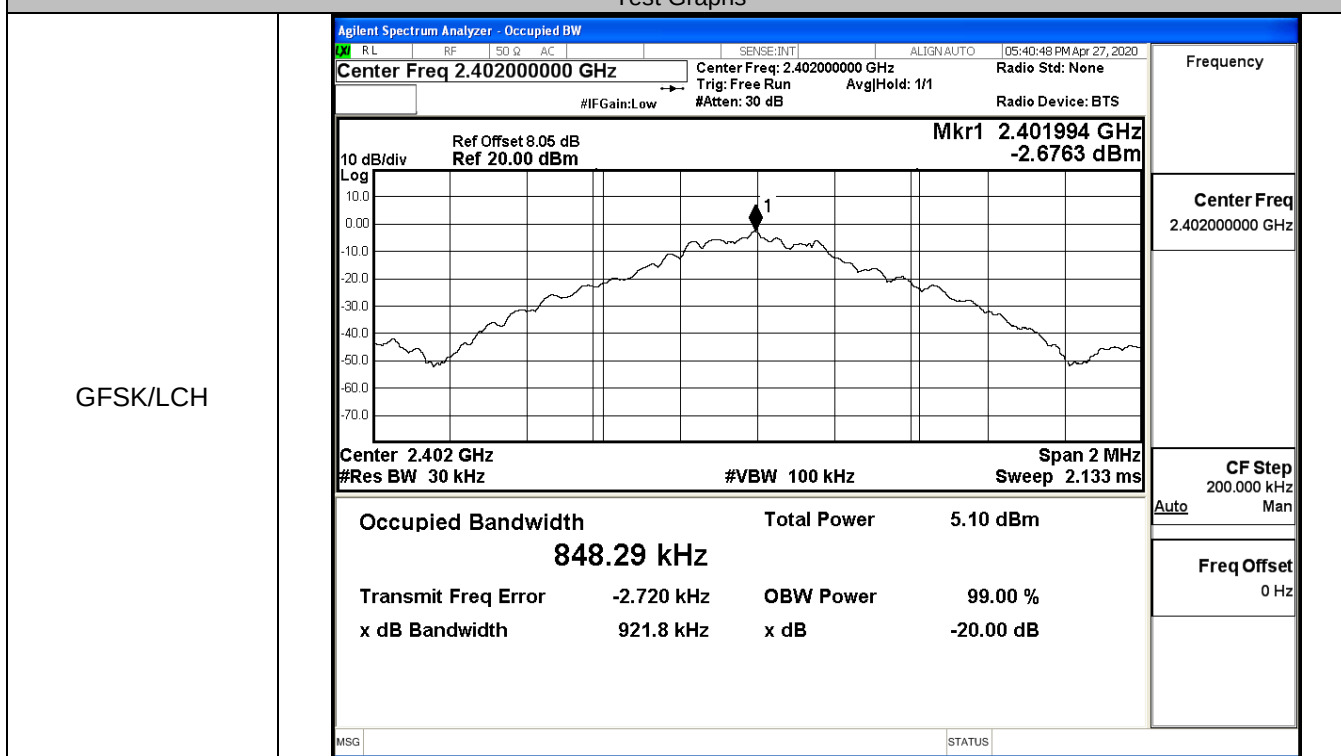
 $\pi/4$ DQPSK/LCH

$\pi/4$ DQPSK/MCH $\pi/4$ DQPSK/HCH

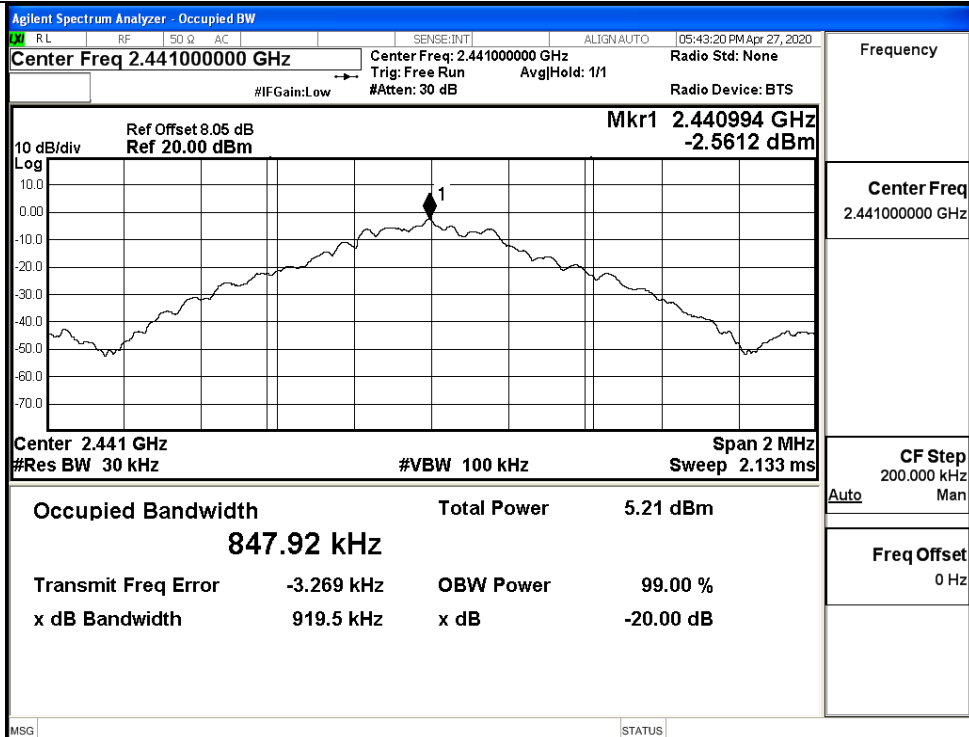
A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9218	Not Specified	PASS
	MCH	0.9195	Not Specified	PASS
	HCH	0.9151	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.244	Not Specified	PASS
	MCH	1.248	Not Specified	PASS
	HCH	1.241	Not Specified	PASS

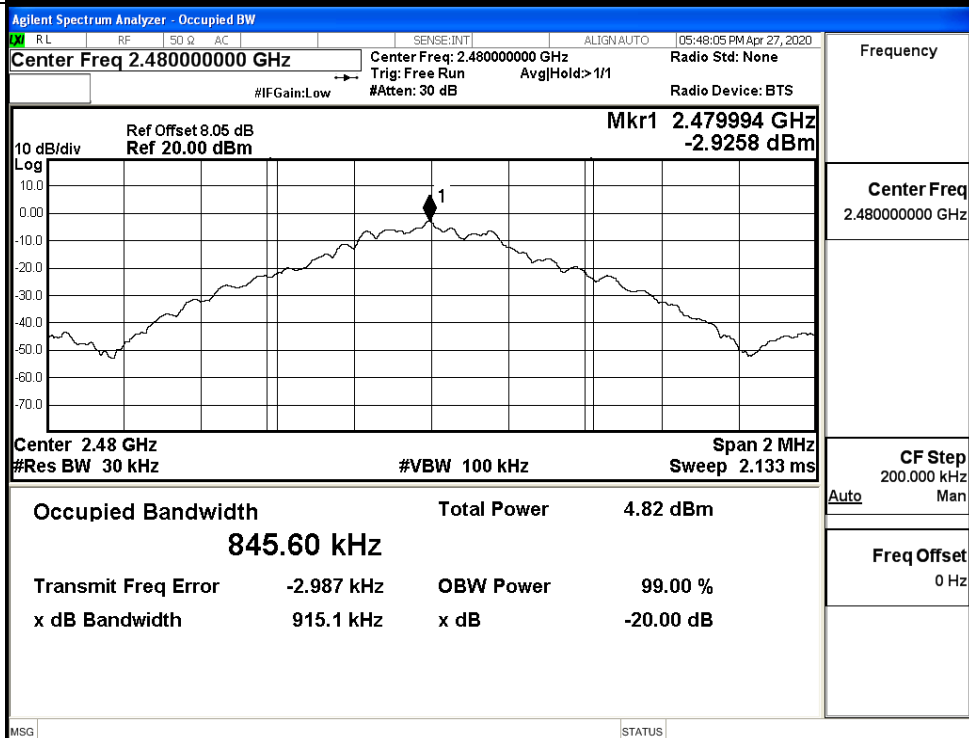
Test Graphs

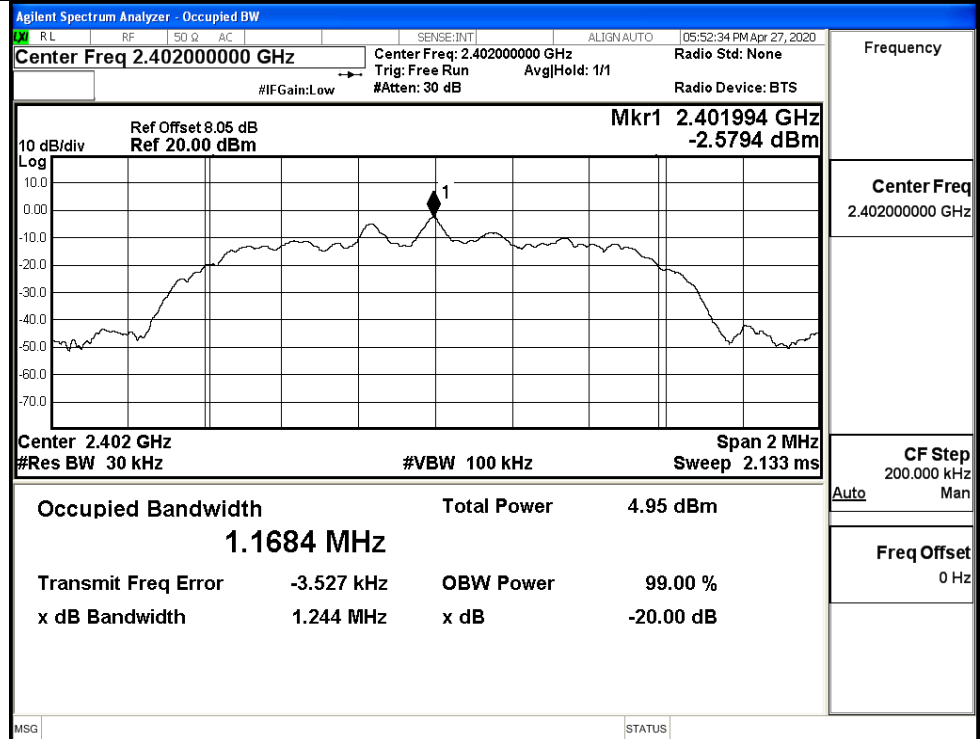
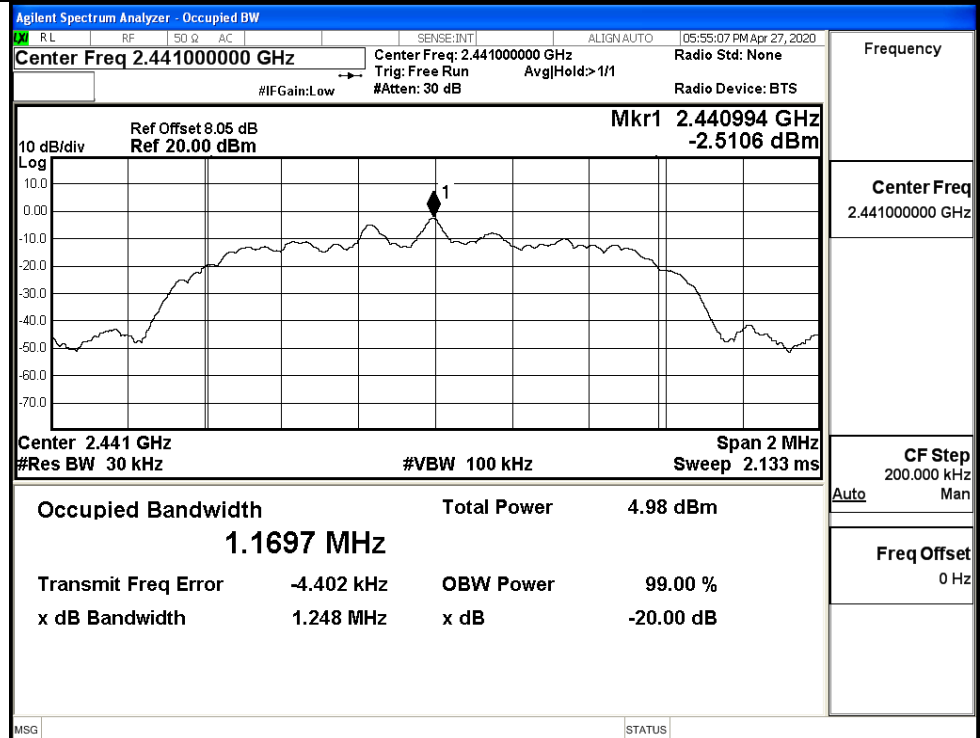


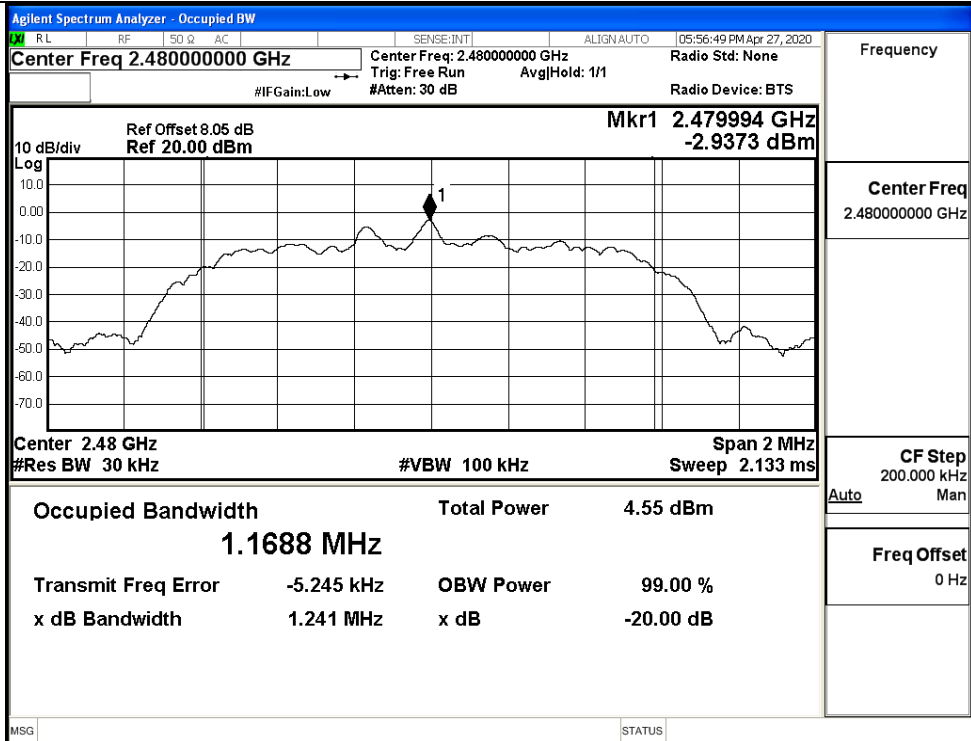
GFSK/MCH



GFSK/HCH



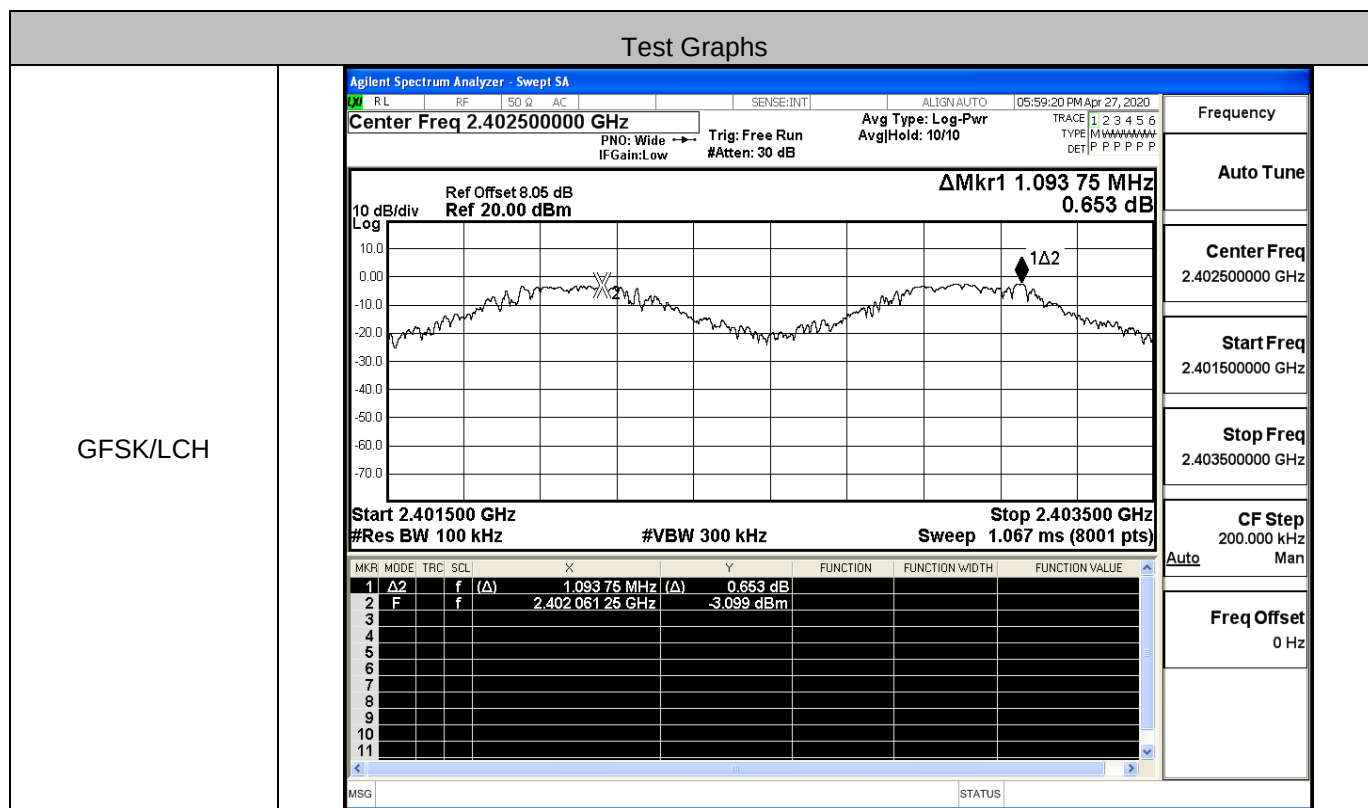
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

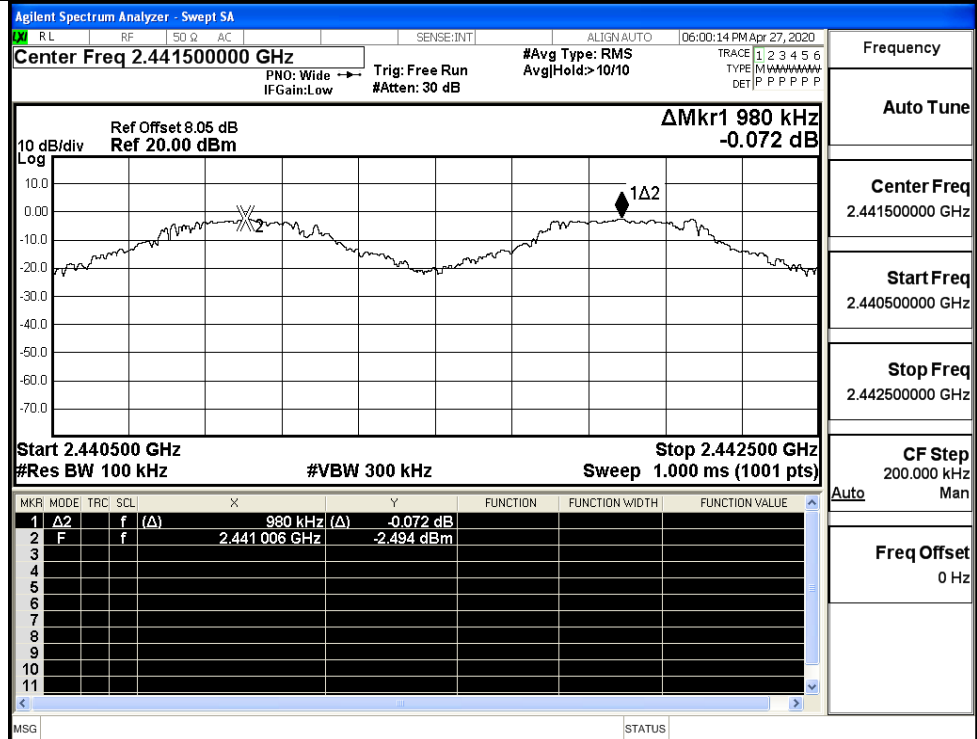
A.3 Carrier Frequency Separation

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.094	0.615	PASS
	MCH	0.980	0.615	PASS
	HCH	0.838	0.615	PASS
$\pi/4$ DQPSK	LCH	0.858	0.832	PASS
	MCH	1.162	0.832	PASS
	HCH	0.894	0.832	PASS

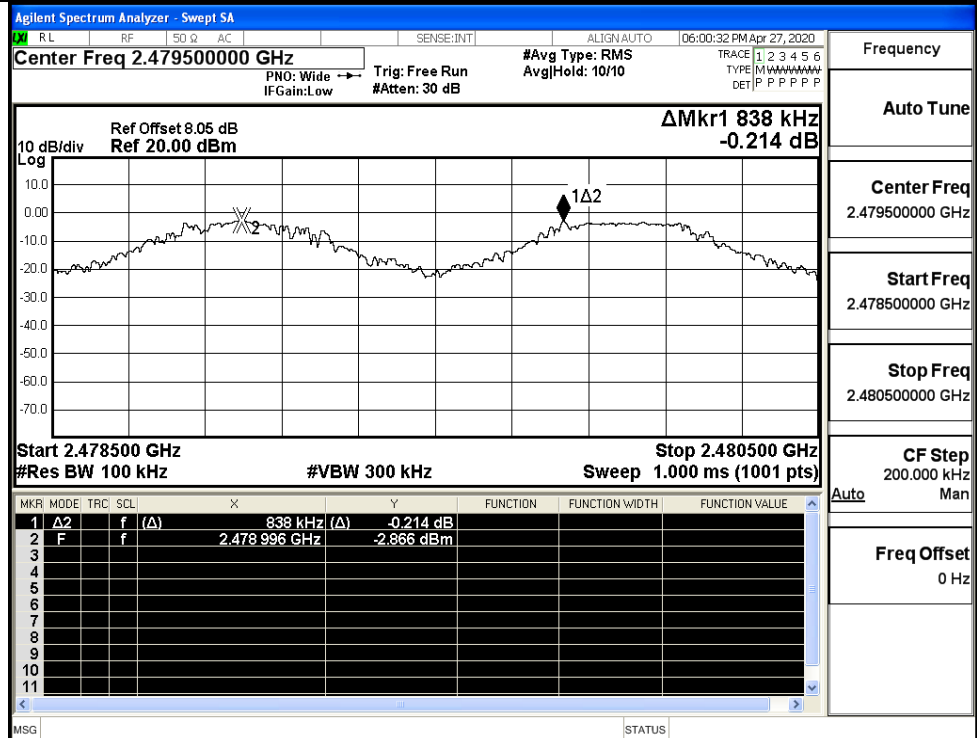
Test Graphs

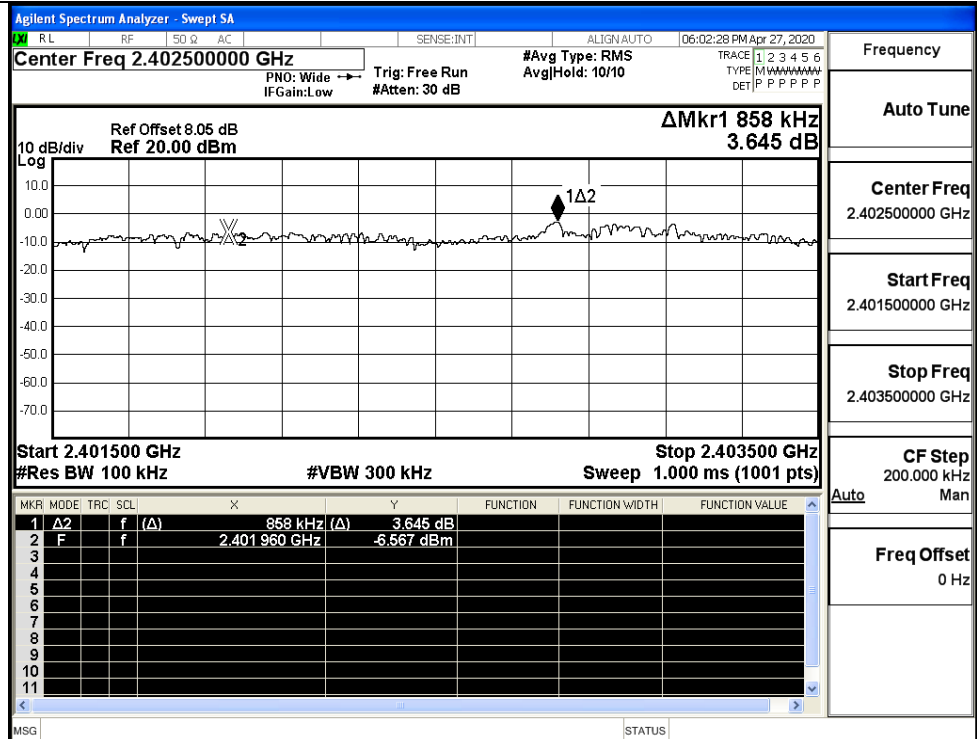
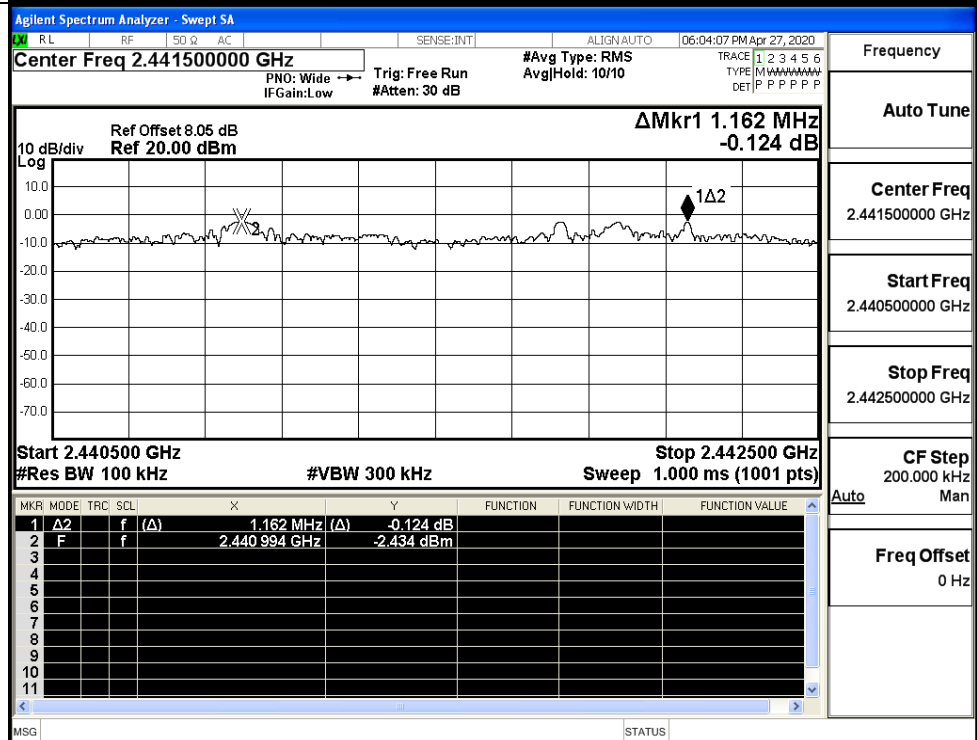


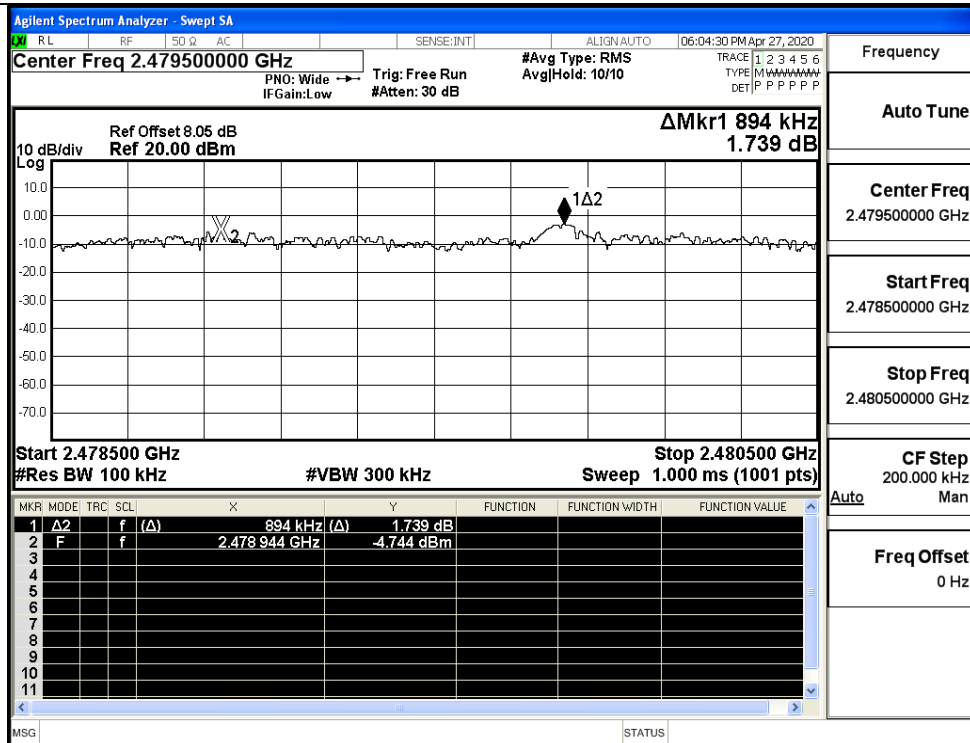
GFSK/MCH



GFSK/HCH



$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

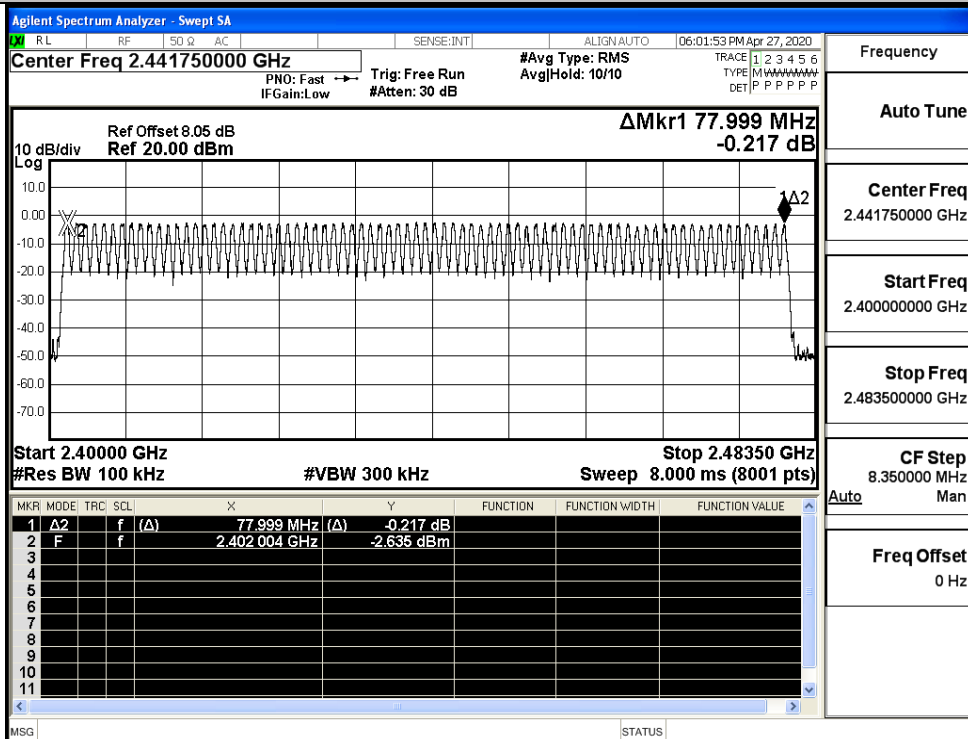
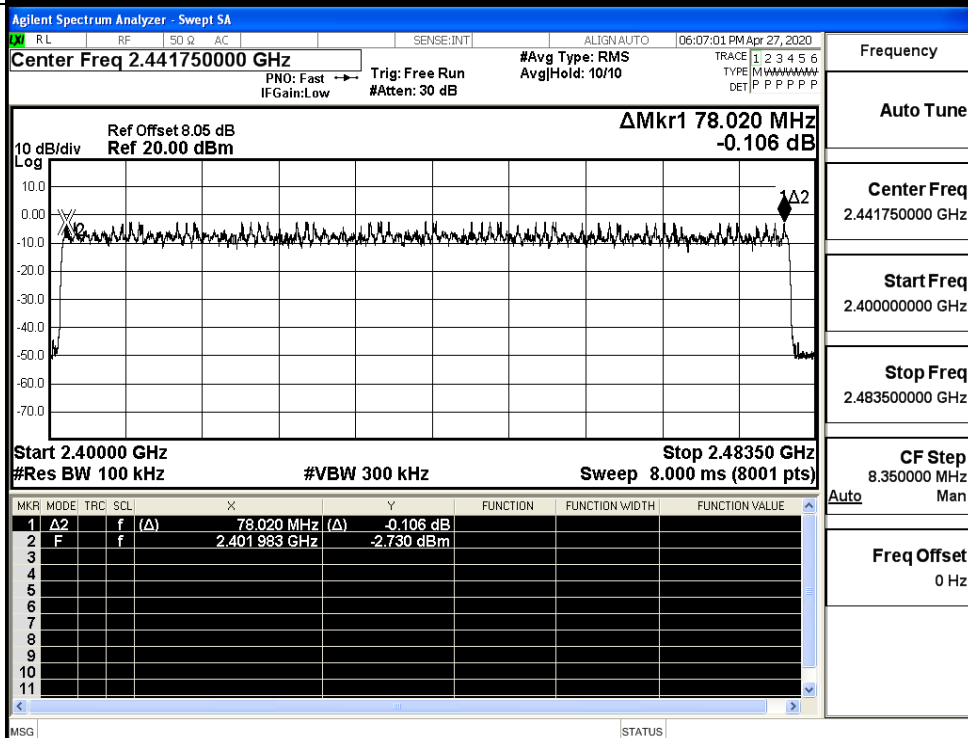
$\pi/4$ DQPSK/HCH

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
8DPSK	Hop	79	≥ 15	PASS

Test Graphs

GFSK/Hop

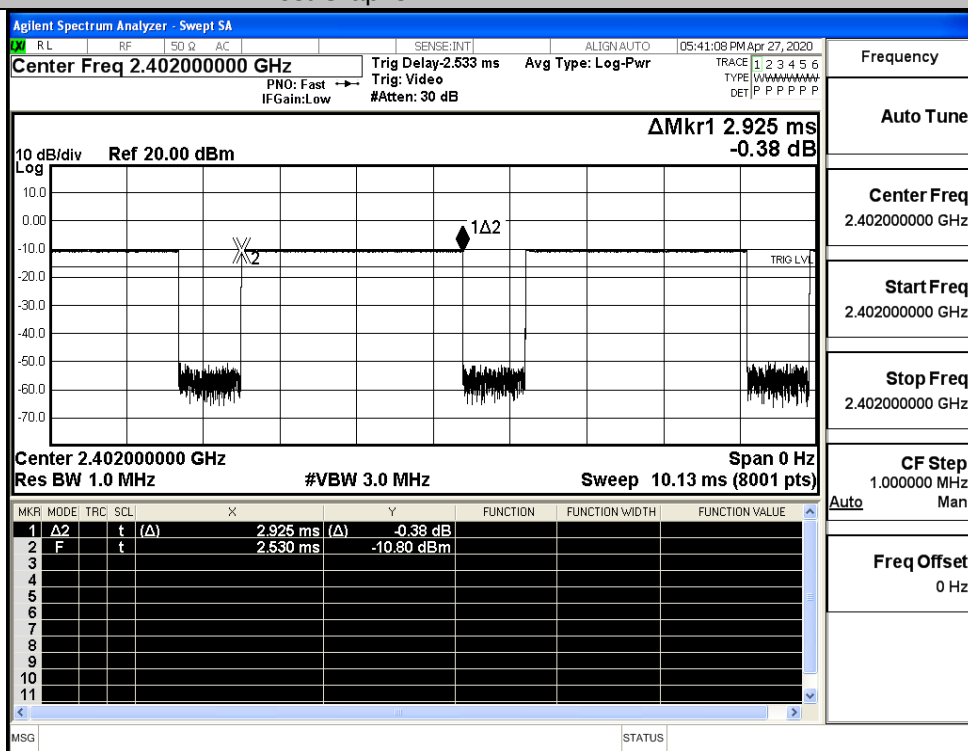
 $\pi/4$ DQPSK/Hop

A.5 Dwell Time

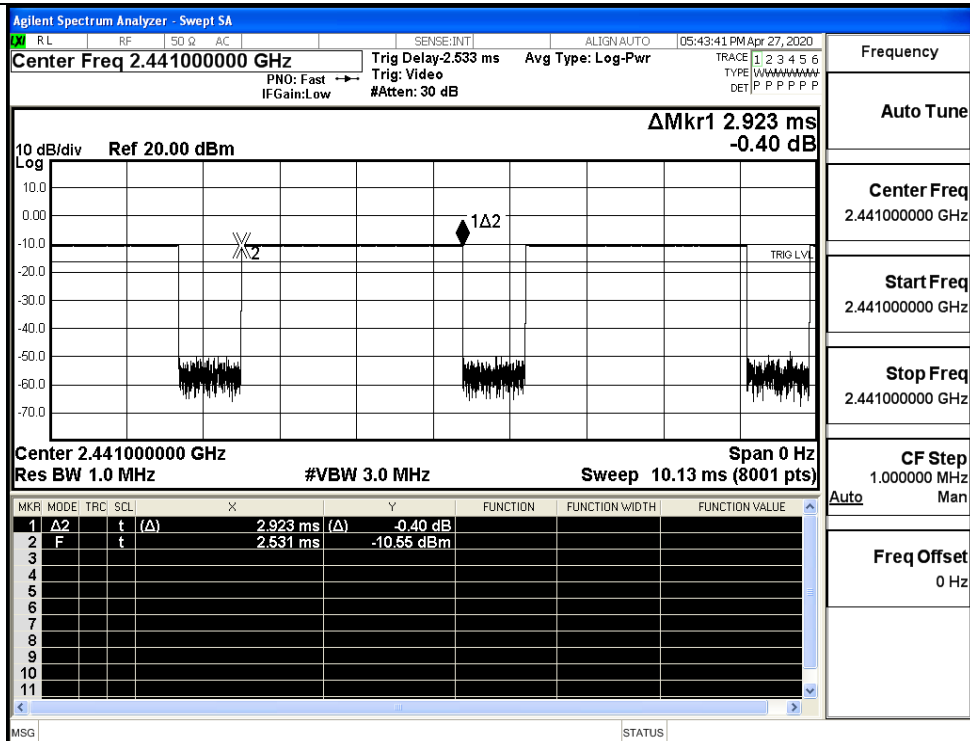
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.92	106.7	0.312	0.4	PASS
	DH5	MCH	2.92	106.7	0.312	0.4	PASS
	DH5	HCH	2.92	106.7	0.312	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.92	106.7	0.313	0.4	PASS
	2DH5	MCH	2.92	106.7	0.313	0.4	PASS
	2DH5	HCH	2.92	106.7	0.313	0.4	PASS

Test Graphs

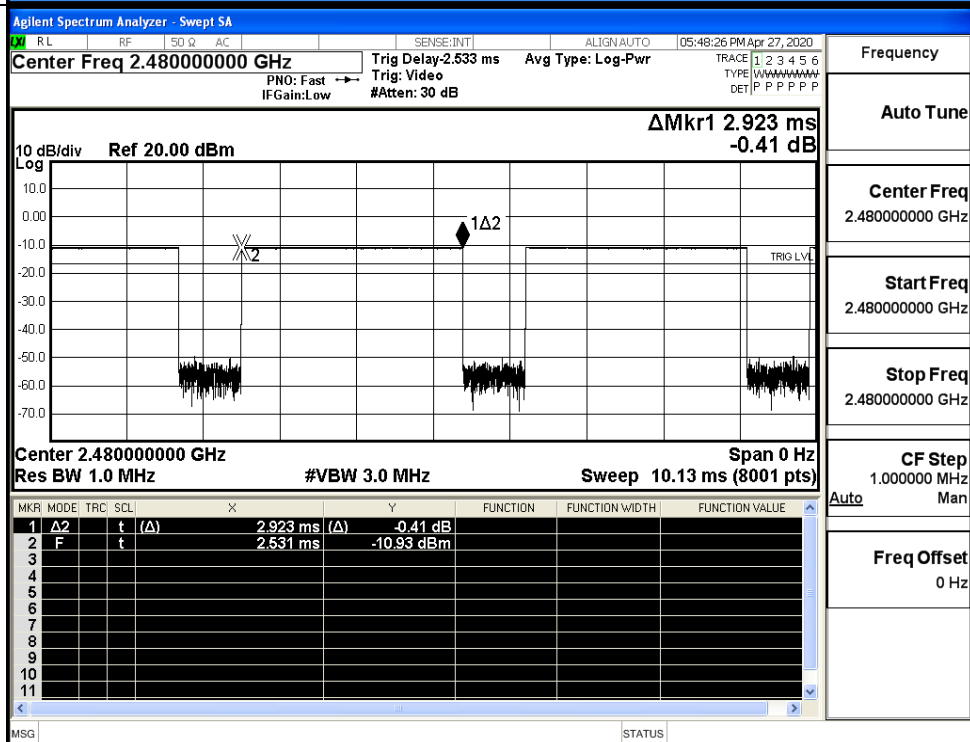
GFSK_DH5/LCH



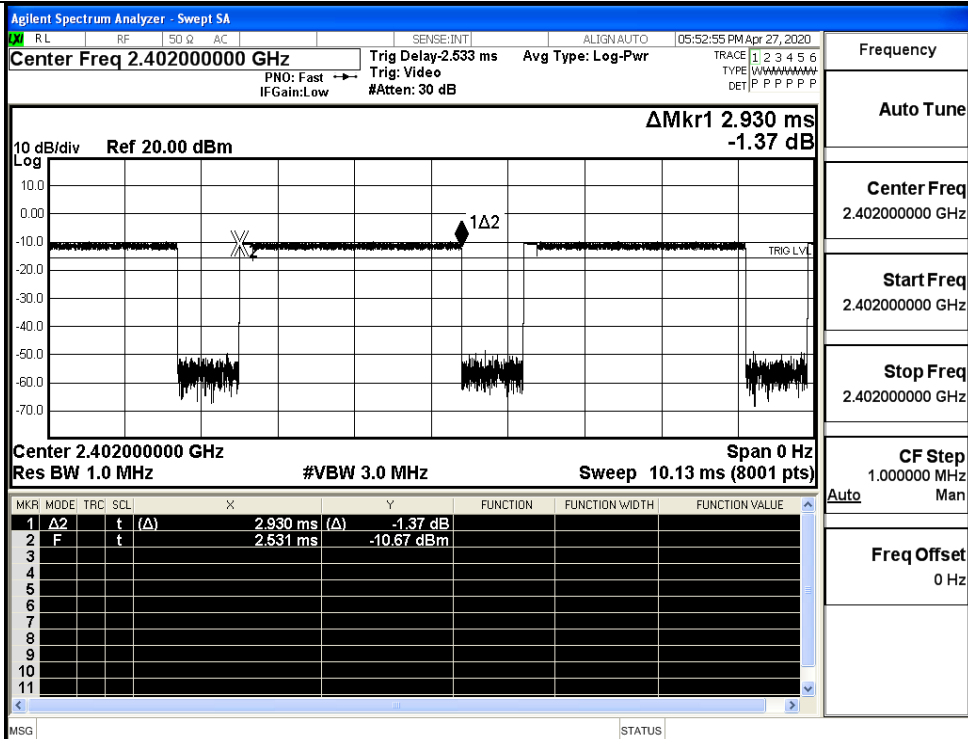
GFSK_DH5/MCH



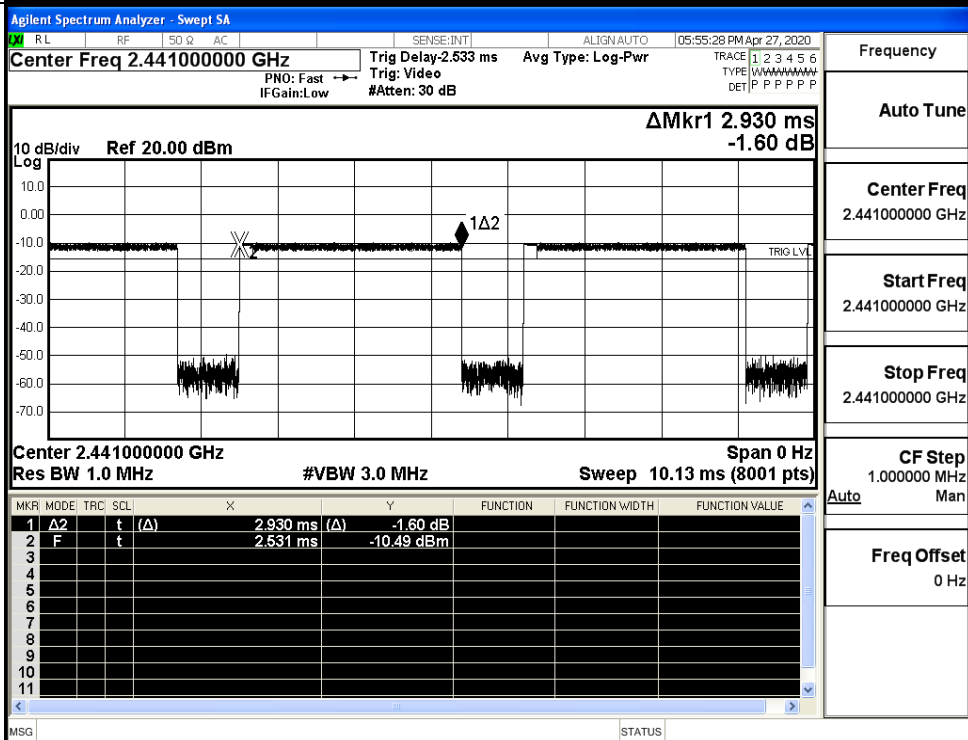
GFSK_DH5/HCH



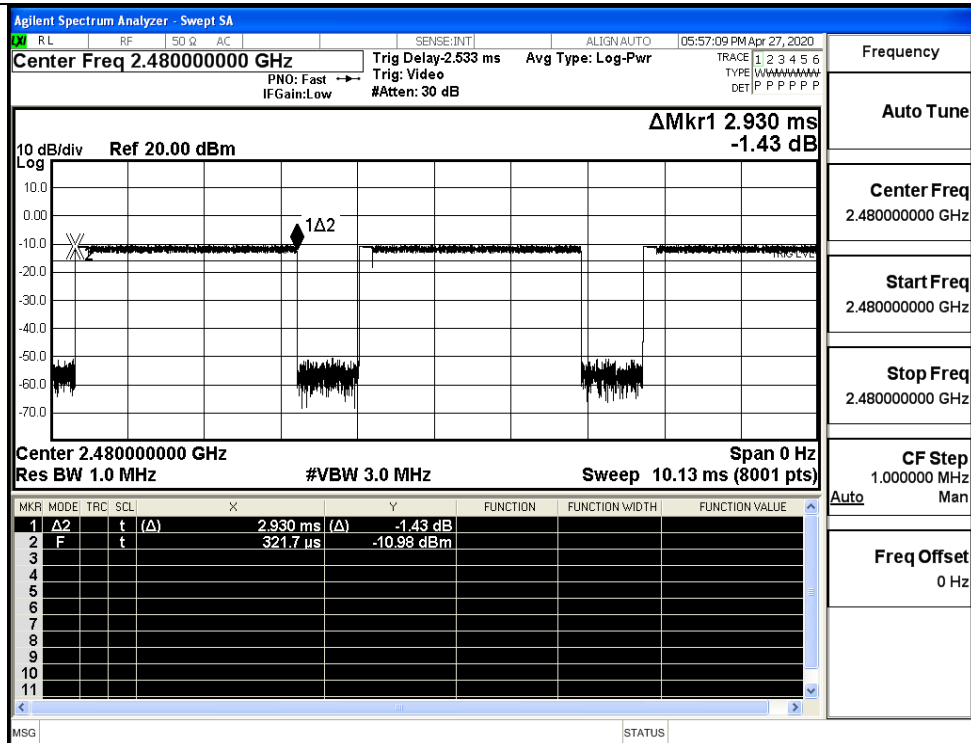
$\pi/4$ DQPSK
_2DH5/LCH



$\pi/4$ DQPSK
_2DH5/MCH

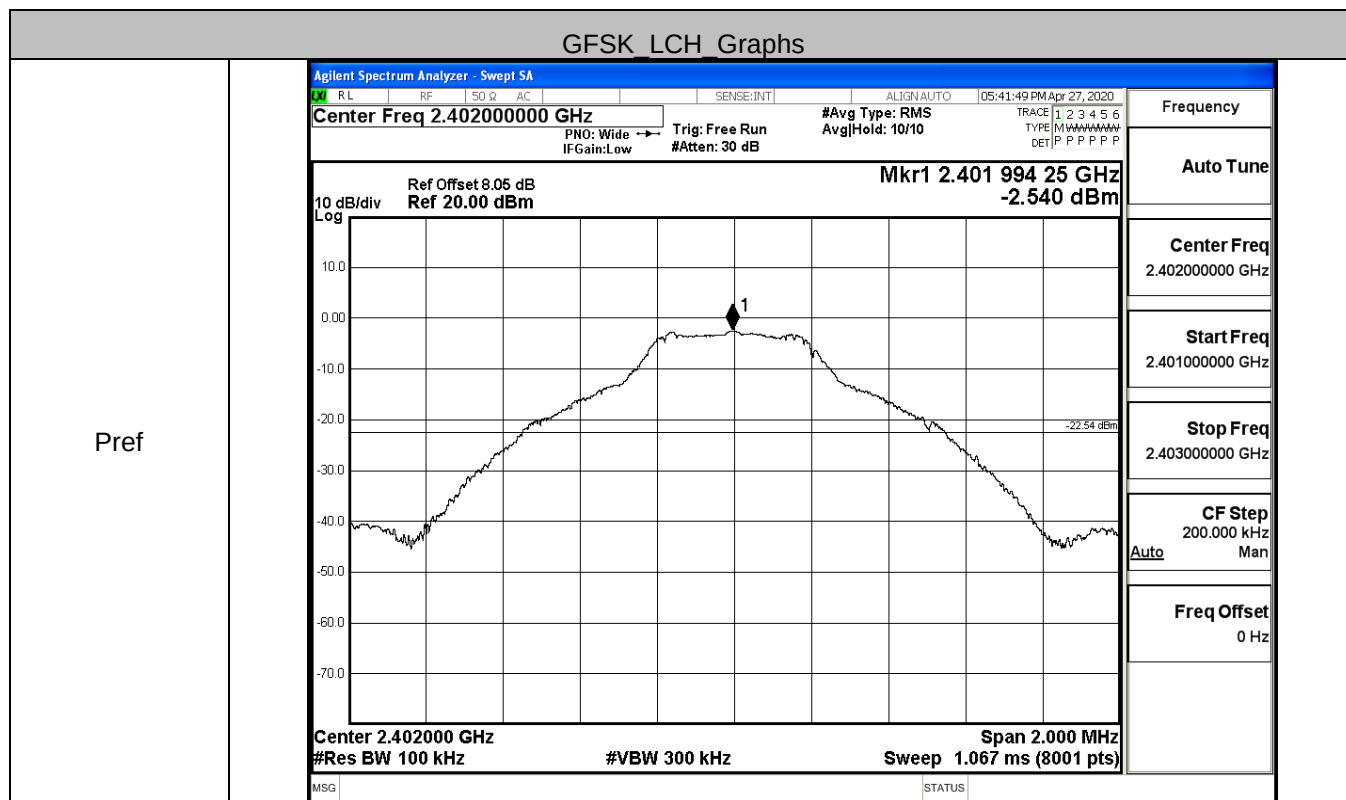


π/4DQPSK
_2DH5/HCH

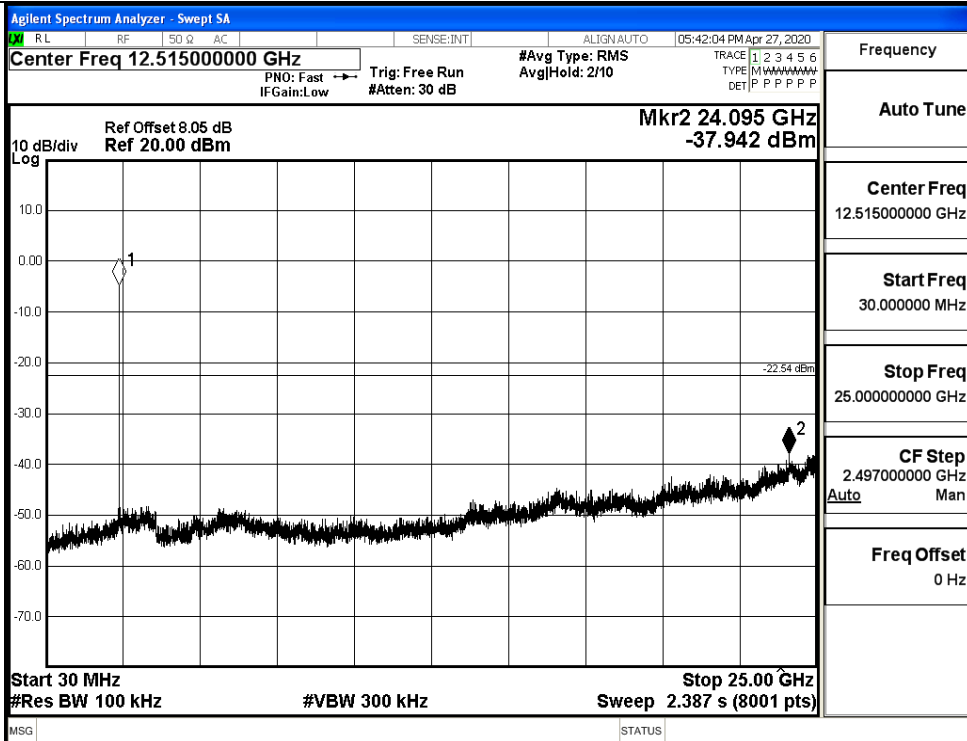


A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-2.54	-37.942	-22.540	PASS
	MCH	-2.457	-38.076	-22.457	PASS
	HCH	-2.846	-38.059	-22.846	PASS
$\pi/4$ DQPSK	LCH	-2.577	-37.781	-22.577	PASS
	MCH	-2.43	-37.871	-22.430	PASS
	HCH	-2.832	-37.980	-22.832	PASS

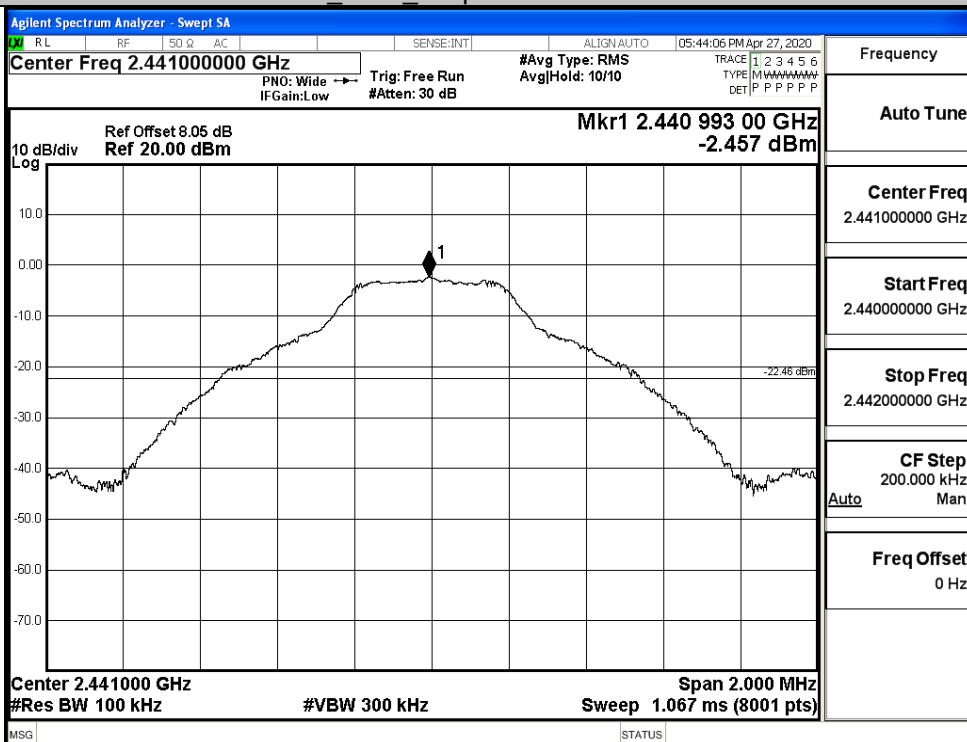


Puw

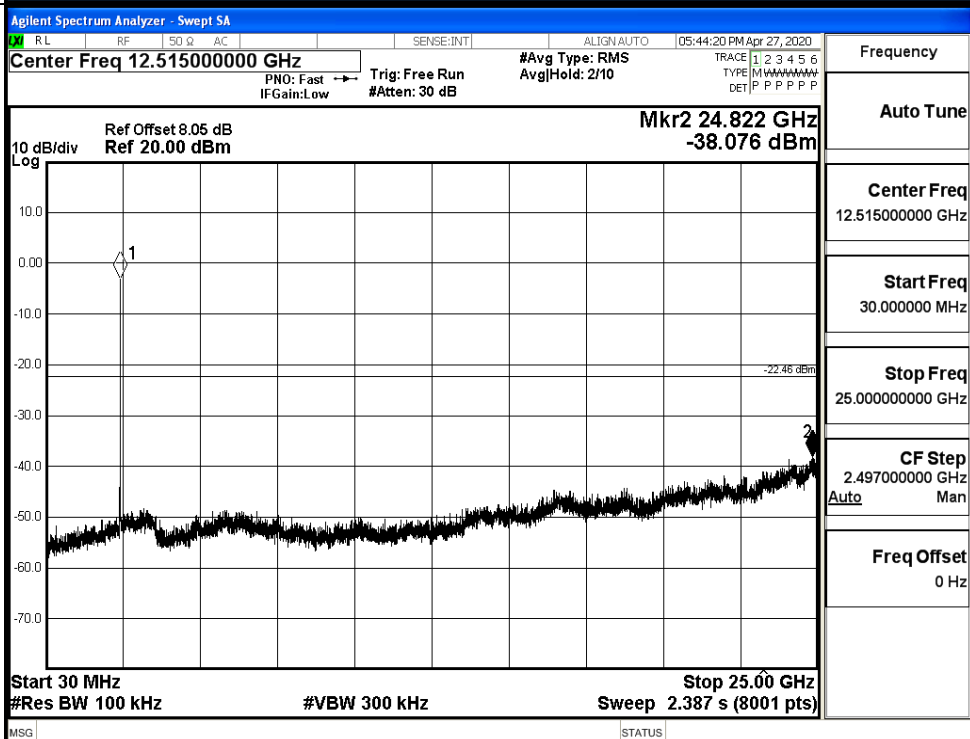


GFSK_MCH_Graphs

Pref

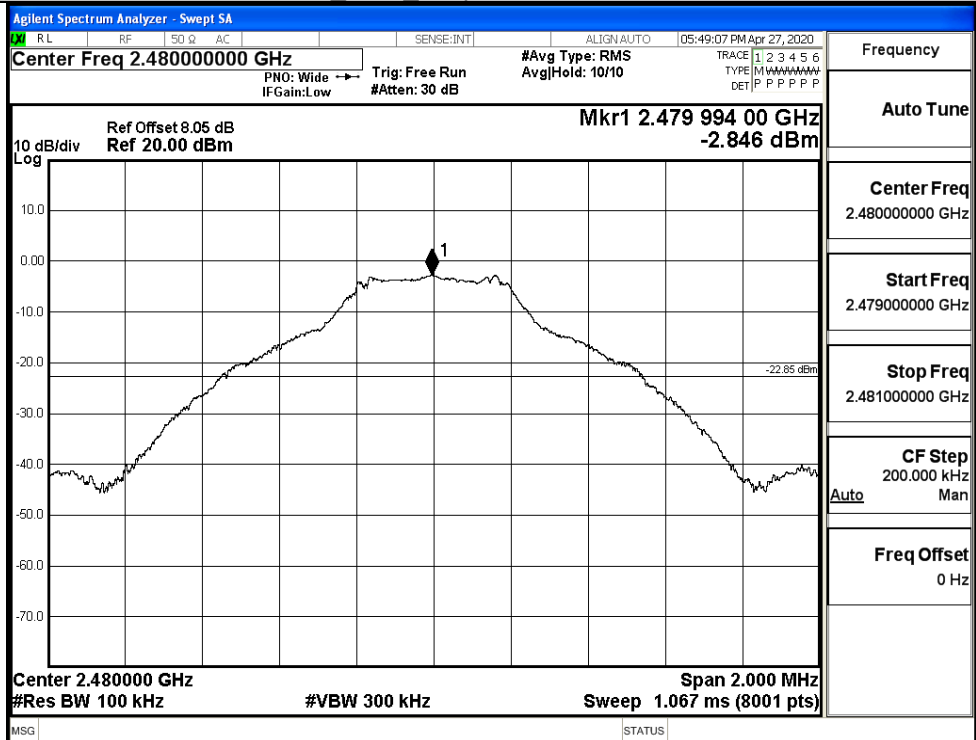


Puw



GFSK HCH Graphs

Pref

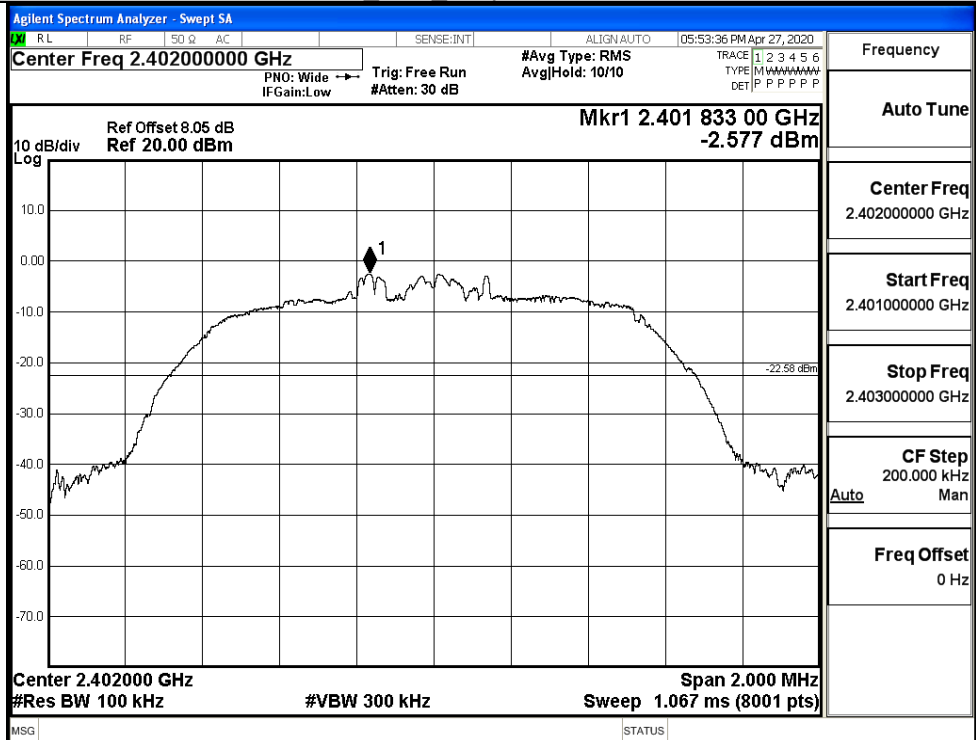


Puw

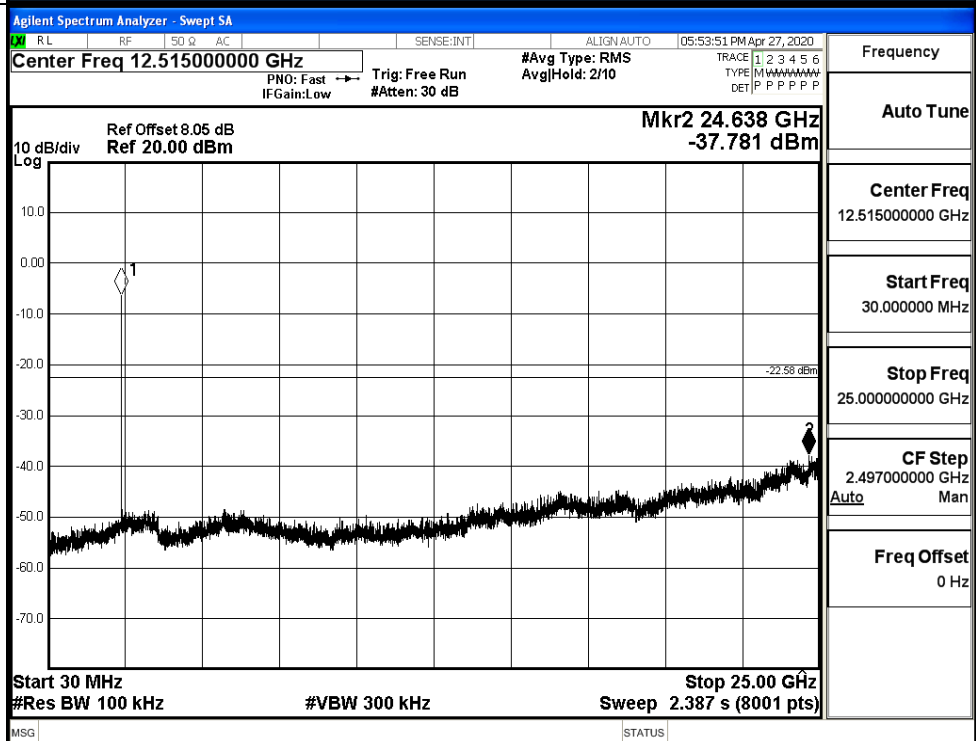


$\pi/4$ DQPSK_LCH_Graphs

Pref

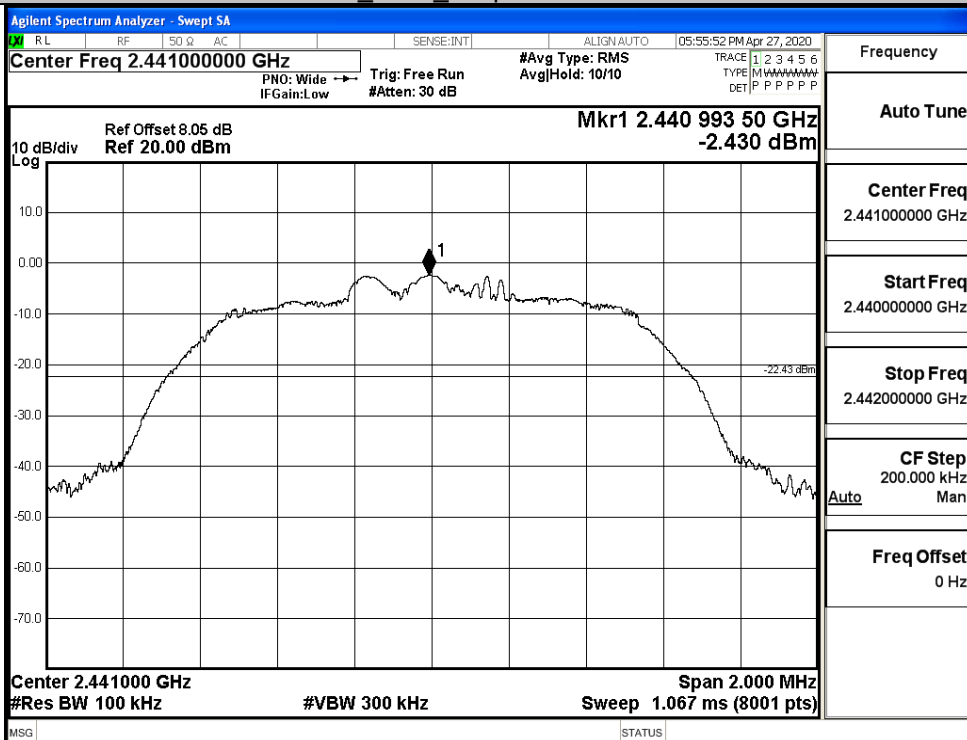


Puw

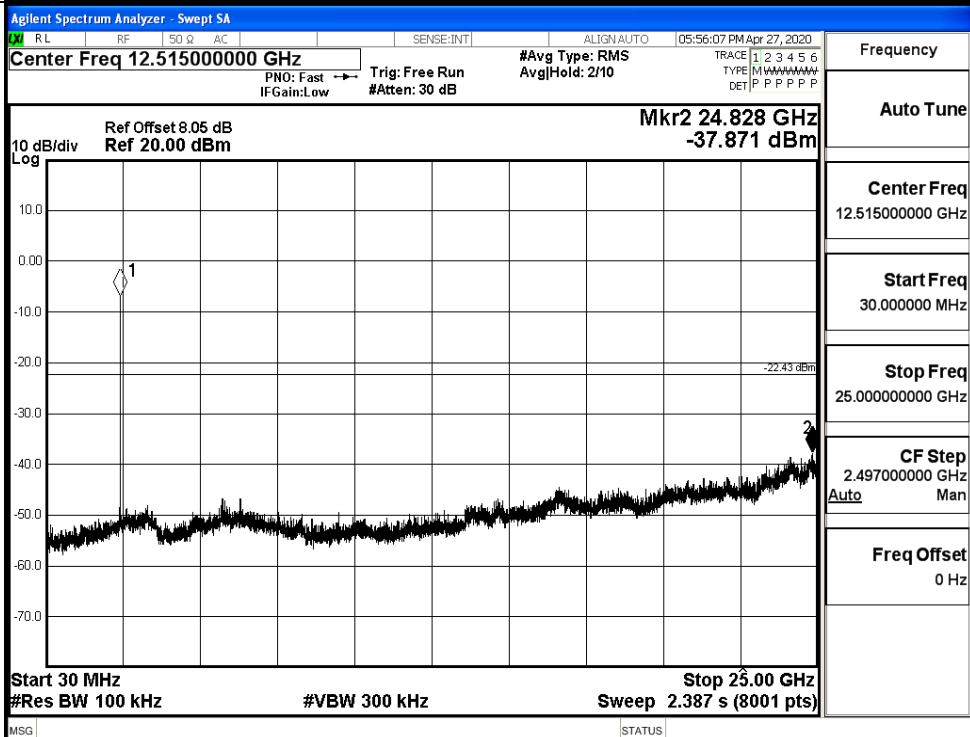


π /4DQPSK_MCH_Graphs

Pref

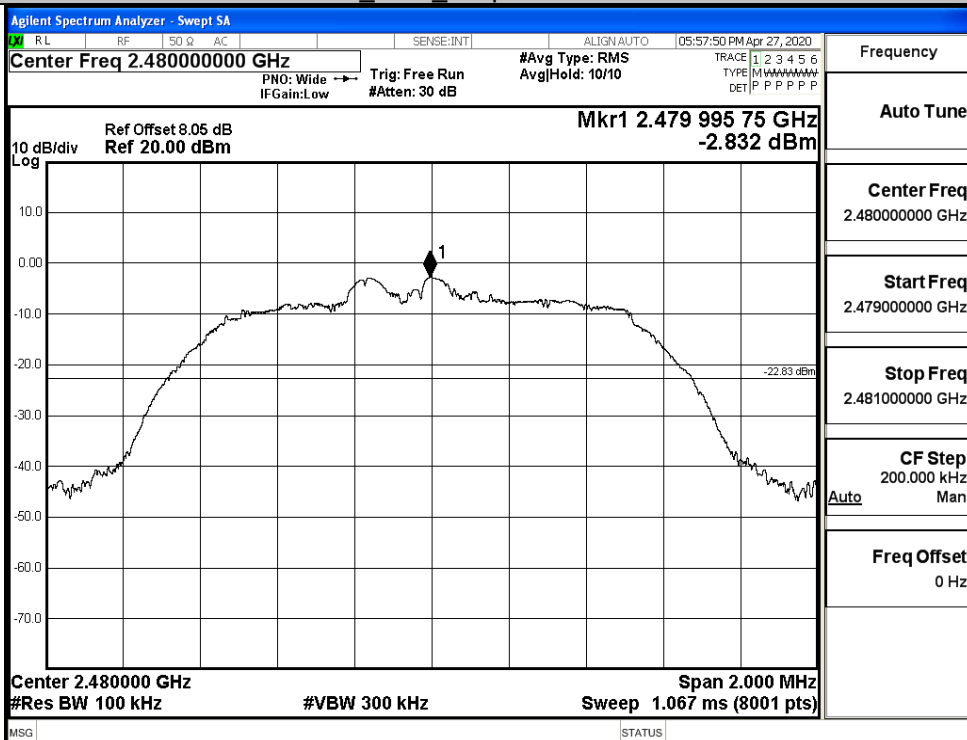


Puw

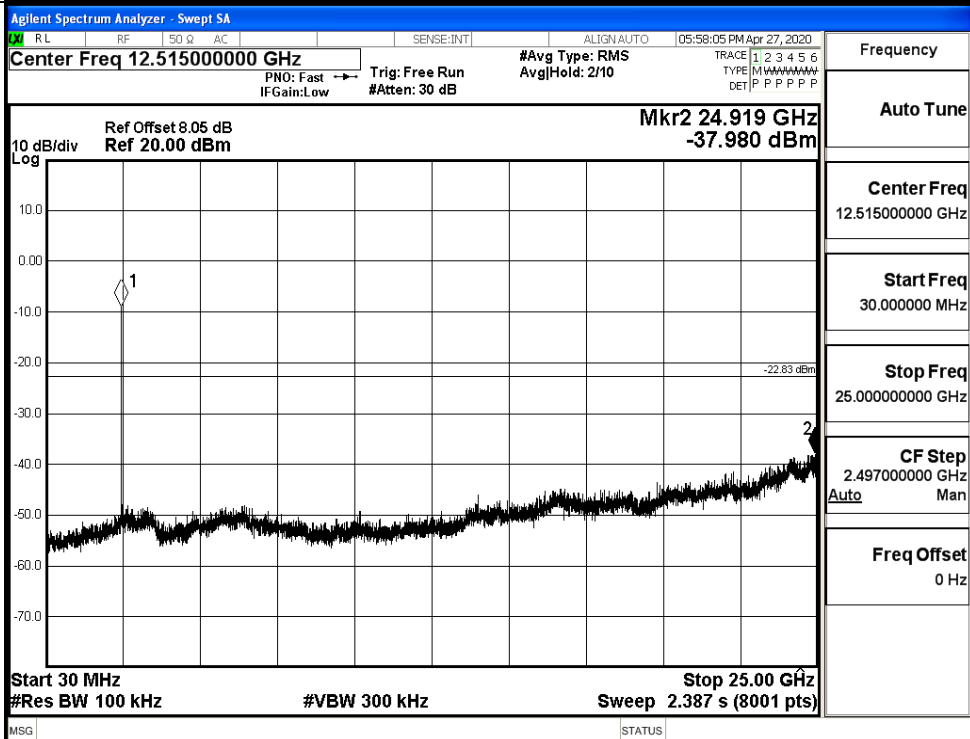


$\pi/4$ DQPSK_HCH_Graphs

Pref



Puw

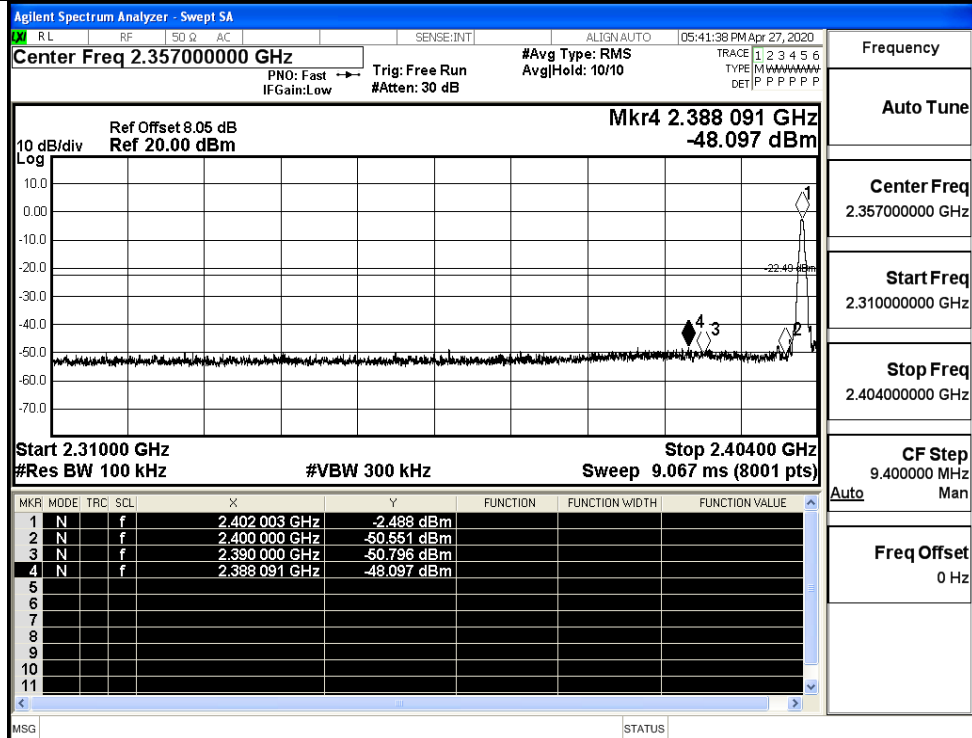


A.7 Band-edge for RF Conducted Emissions

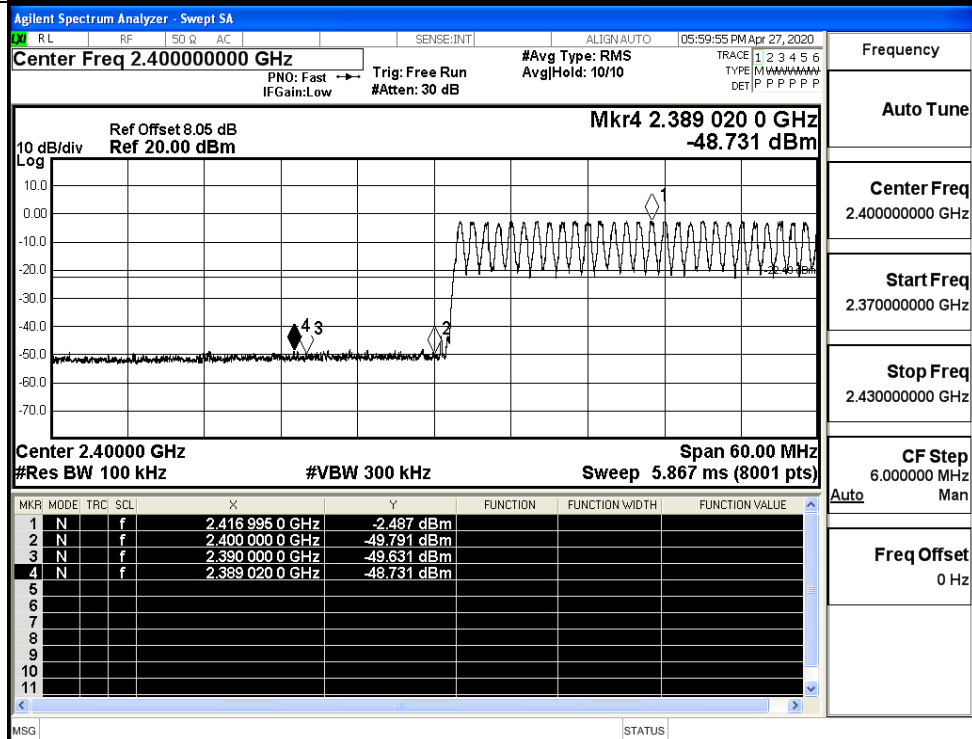
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-2.488	Off	-48.097	-22.49	PASS
			-2.487	On	-48.731	-22.49	PASS
	HCH	2480	-2.777	Off	-45.267	-22.78	PASS
			-2.618	On	-46.812	-22.62	PASS
$\pi/4$ DQPSK	LCH	2402	-2.462	Off	-47.907	-22.46	PASS
			-2.442	On	-48.114	-22.44	PASS
	HCH	2480	-2.824	Off	-46.741	-22.82	PASS
			-2.567	On	-47.690	-22.57	PASS

Test Graphs

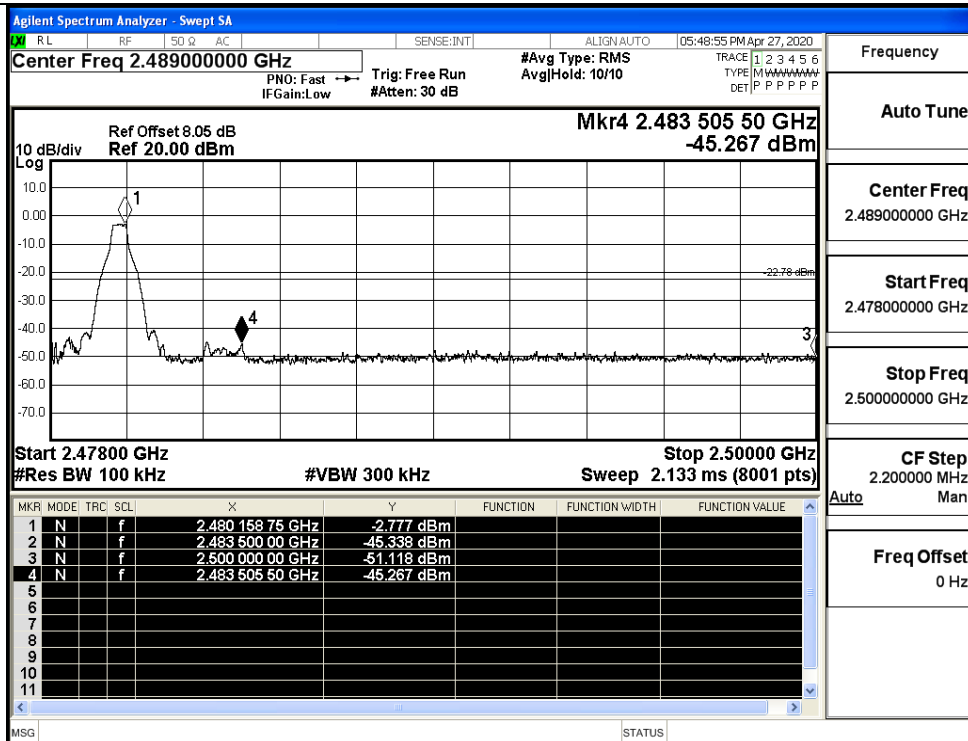
GFSK/LCH/No Hop



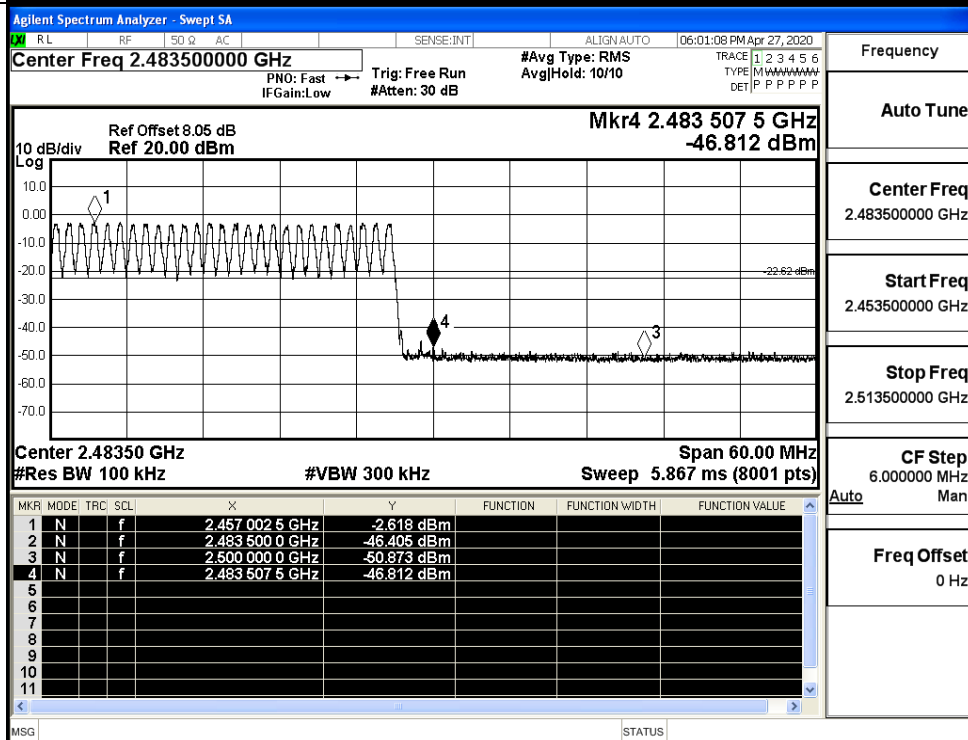
GFSK/LCH/Hop



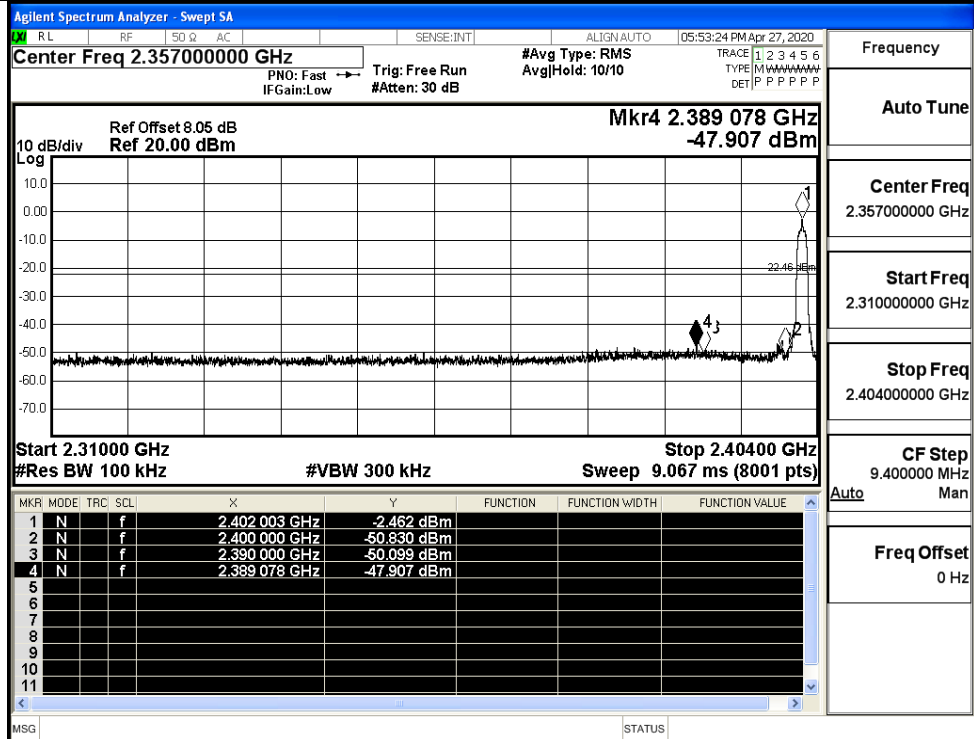
GFSK/HCH/No Hop



GFSK/HCH/Hop



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



Frequency

Auto Tune

Center Freq
2.357000000 GHz

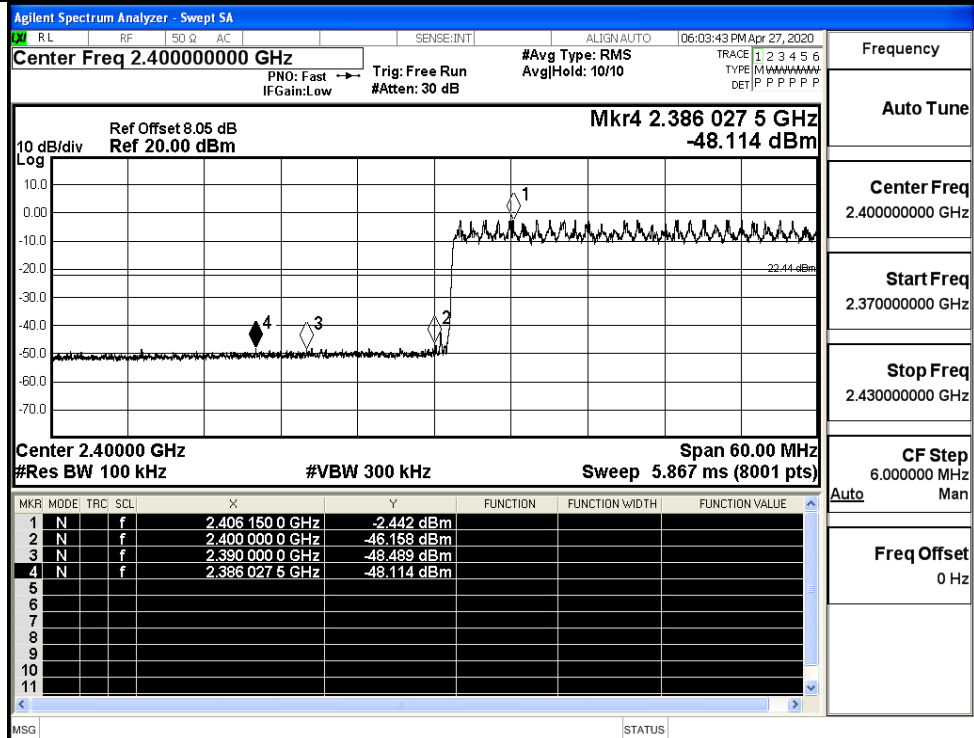
Start Freq
2.310000000 GHz

Stop Freq
2.404000000 GHz

CF Step
9.400000 MHz
Auto Man

Freq Offset
0 Hz

$\pi/4$ DQPSK/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

Agilent Spectrum Analyzer - Swept SA

RL RF 50 Ω AC SENSE:INT ALIGN:AUTO 05:57:39 PM Apr 27, 2020

Center Freq 2.489000000 GHz PNO: Fast Trg: Free Run Avg Type: RMS Avg Hold: 10/10

Ref Offset 8.05 dB Ref 20.00 dBm

Mkr4 2.493 688 75 GHz -46.741 dBm

10 dB/div Log

Start 2.47800 GHz Stop 2.50000 GHz

#Res BW 100 kHz #VBW 300 kHz Sweep 2.133 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.479 999 25 GHz	-2.824 dBm			
2	N	f		2.483 500 00 GHz	-49.468 dBm			
3	N	f		2.500 000 00 GHz	-50.493 dBm			
4	N	f		2.493 688 75 GHz	-46.741 dBm			
5								
6								
7								
8								
9								
10								
11								

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

MSG STATUS

Agilent Spectrum Analyzer - Swept SA

X1 R L RF 50 Ω AC SENSE:INT ALIGN AUTO 06:05:46 PM Apr 27, 2020
Center Freq 2.483500000 GHz #Avg Type: RMS AvgHold: 10/10 TRACE 1 2 3 4 5 6
 PNO: Fast IF Gain: Low Trig: Free Run #Atten: 30 dB TYPE M W W W W W W W W W
 DET P P P P P P P

Mkr4 2.484 842 5 GHz
-47.690 dBm

Ref Offset 8.05 dB
 Ref 20.00 dBm

10 dB/div
 Log
 10.0
 0.00
 -10.0
 -20.0
 -30.0
 -40.0
 -50.0
 -60.0
 -70.0

-20.57 dBm

Center 2.48350 GHz **Span 60.00 MHz**
#Res BW 100 kHz **#VBW 300 kHz** **Sweep 5.867 ms (8001 pts)**

MRK	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.453 837 5 GHz	-2.567 dBm			
2	N	f		2.483 500 0 GHz	-48.233 dBm			
3	N	f		2.500 000 0 GHz	-50.693 dBm			
4	N	f		2.484 842 5 GHz	-47.690 dBm			
5								
6								
7								
8								
9								
10								
11								

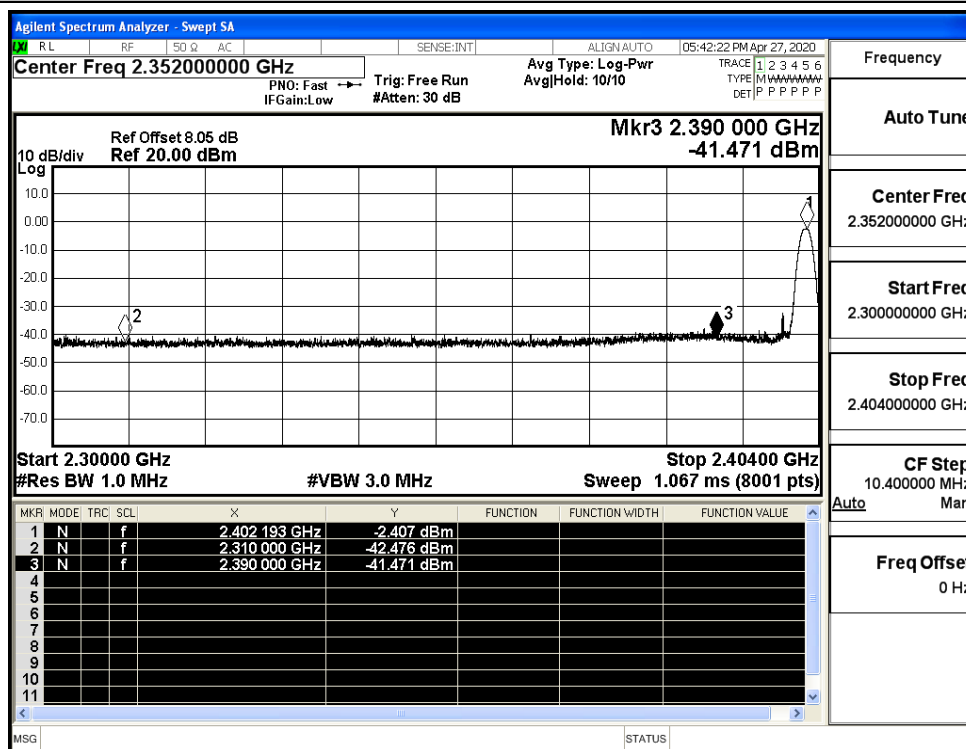
MSG STATUS

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

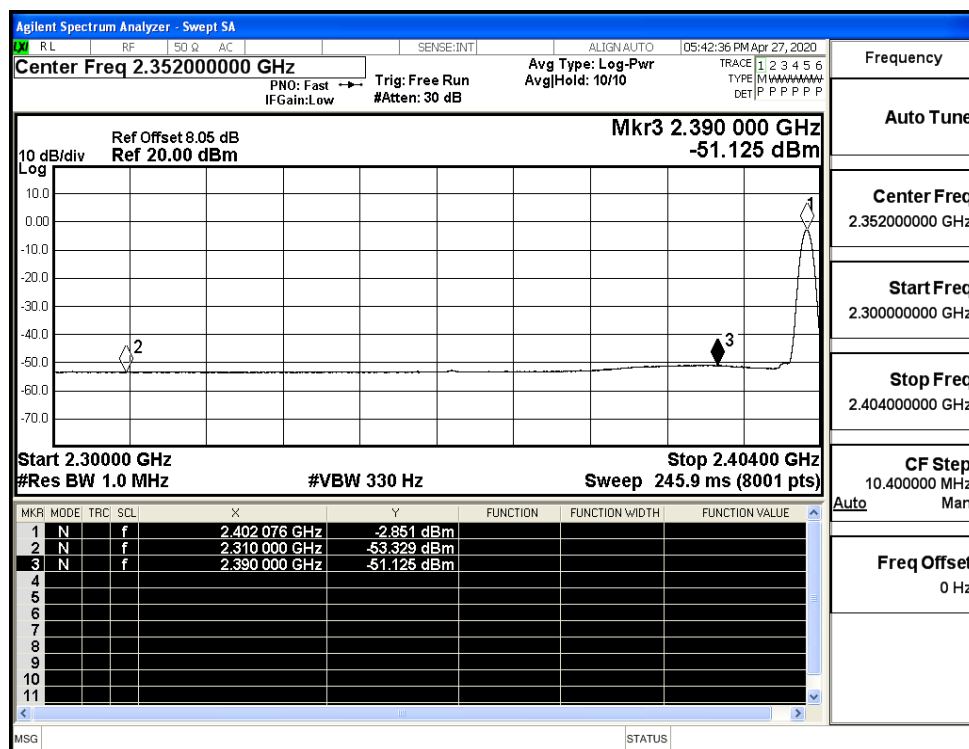
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-42.48	2.0	0	54.78	PEAK	74	PASS
	Off	2310.0	-53.33	2.0	0	43.93	AV	54	PASS
	Off	2390.0	-41.47	2.0	0	55.79	PEAK	74	PASS
	Off	2390.0	-51.13	2.0	0	46.13	AV	54	PASS
	Off	2483.5	-40.05	2.0	0	57.21	PEAK	74	PASS
	Off	2483.5	-49.06	2.0	0	48.20	AV	54	PASS
	Off	2500.0	-41.65	2.0	0	55.61	PEAK	74	PASS
	Off	2500.0	-51.27	2.0	0	45.99	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-43.39	2.0	0	53.87	PEAK	74	PASS
	Off	2310.0	-53.39	2.0	0	43.86	AV	54	PASS
	Off	2390.0	-41.59	2.0	0	55.67	PEAK	74	PASS
	Off	2390.0	-51.04	2.0	0	46.21	AV	54	PASS
	Off	2483.5	-39.83	2.0	0	57.42	PEAK	74	PASS
	Off	2483.5	-50.15	2.0	0	47.10	AV	54	PASS
	Off	2500.0	-41.70	2.0	0	55.56	PEAK	74	PASS
	Off	2500.0	-51.25	2.0	0	46.01	AV	54	PASS

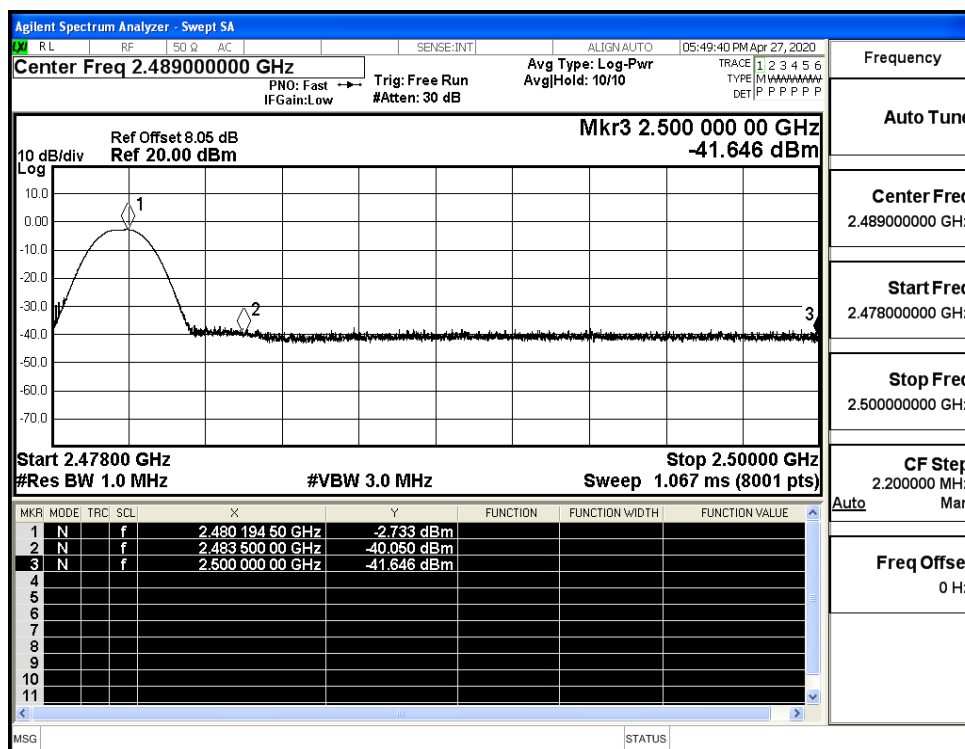
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



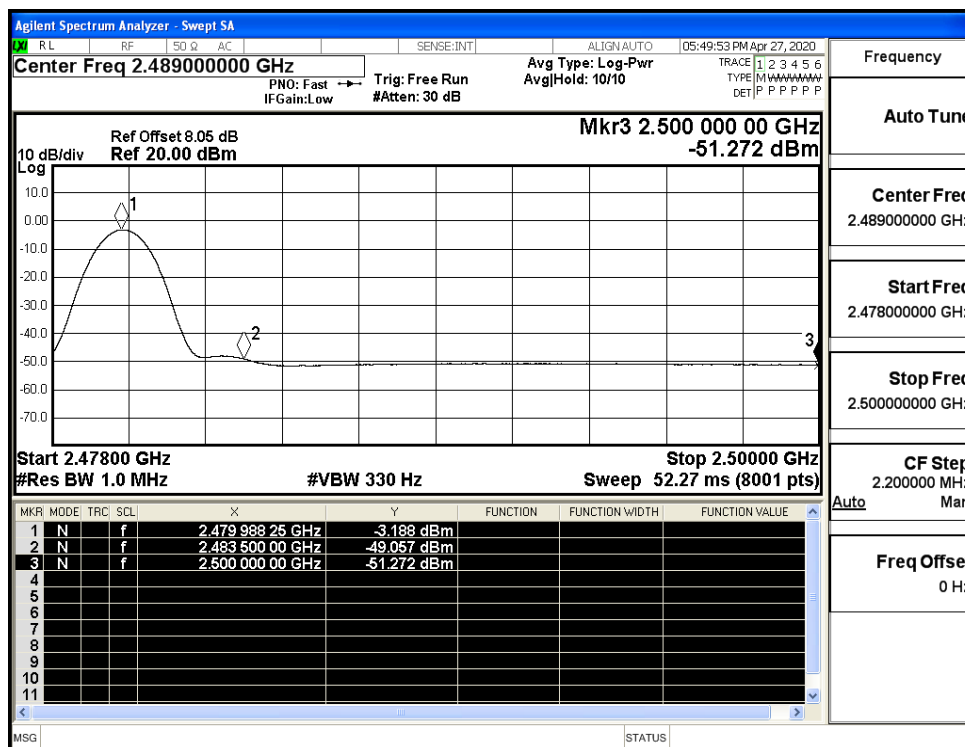
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)

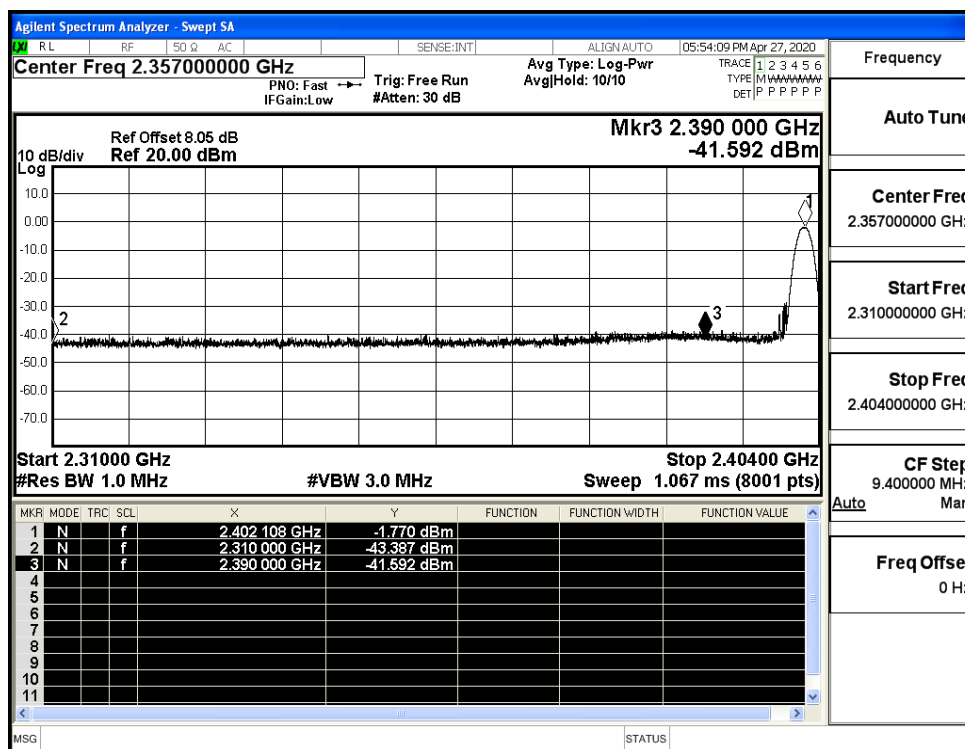
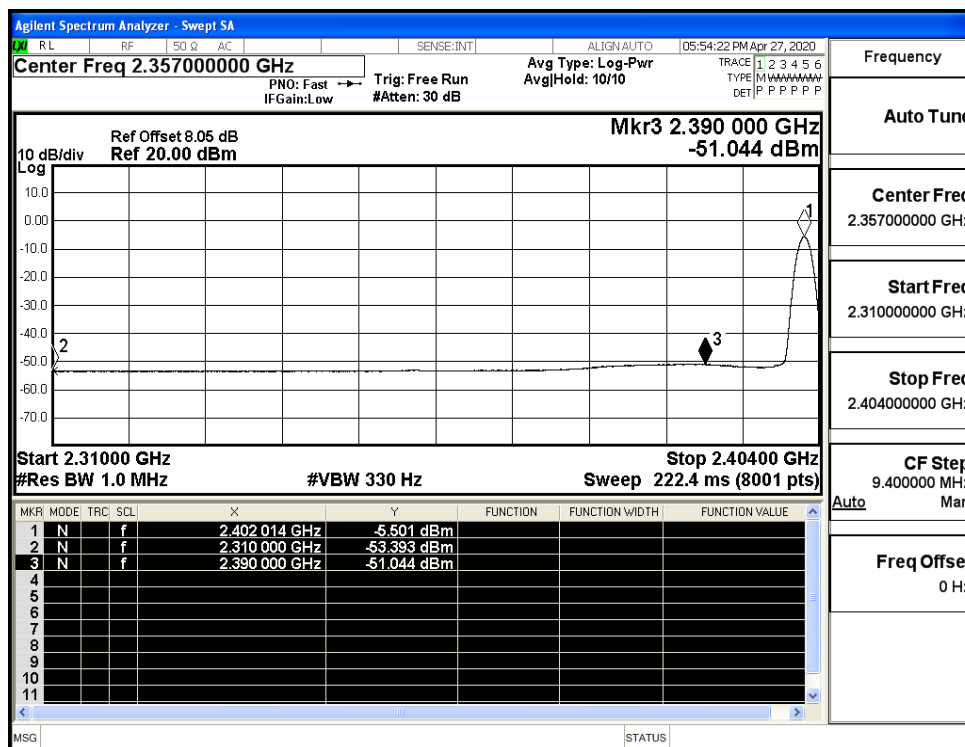


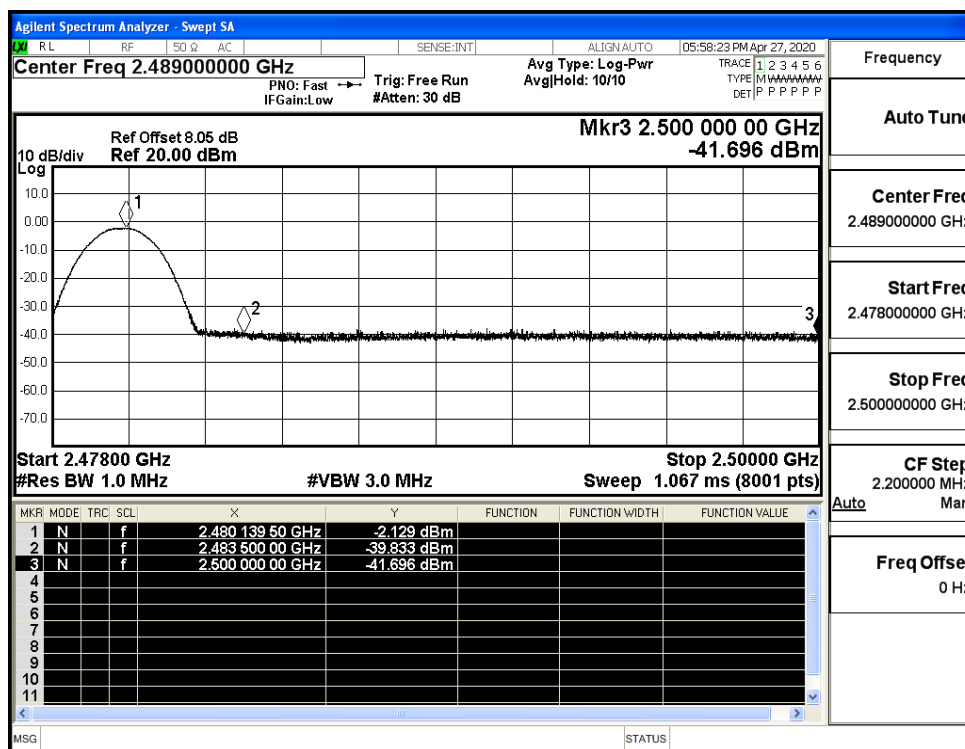
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



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



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

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