

Appendix A

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

Product Name: HYUNDAI Mini PC

Trade Mark: HYUNDAI

Test Model: HTN4020MPC

Environmental Conditions

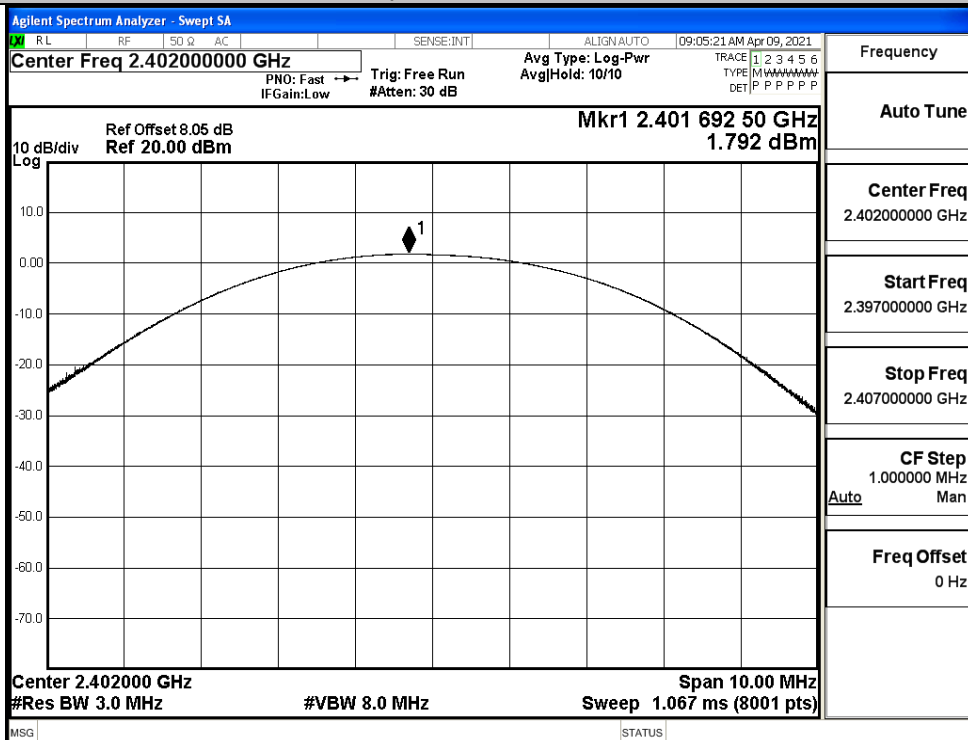
Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.0 kPa
Test Engineer:	Kay Hu
Supervised by:	Li Huan

A.1 Maximum Conducted Peak Output Power

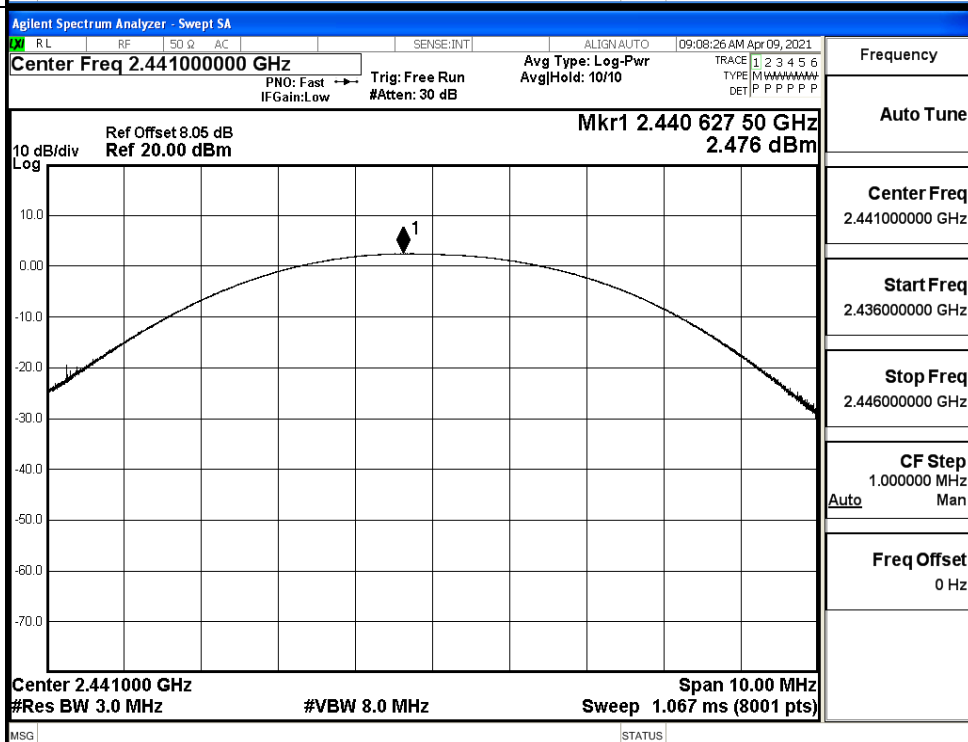
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.792	21	PASS
	MCH	2.476	21	PASS
	HCH	2.257	21	PASS
$\pi/4$ DQPSK	LCH	2.685	21	PASS
	MCH	3.118	21	PASS
	HCH	2.855	21	PASS
8DPSK	LCH	2.705	21	PASS
	MCH	3.140	21	PASS
	HCH	2.857	21	PASS

Test Graphs

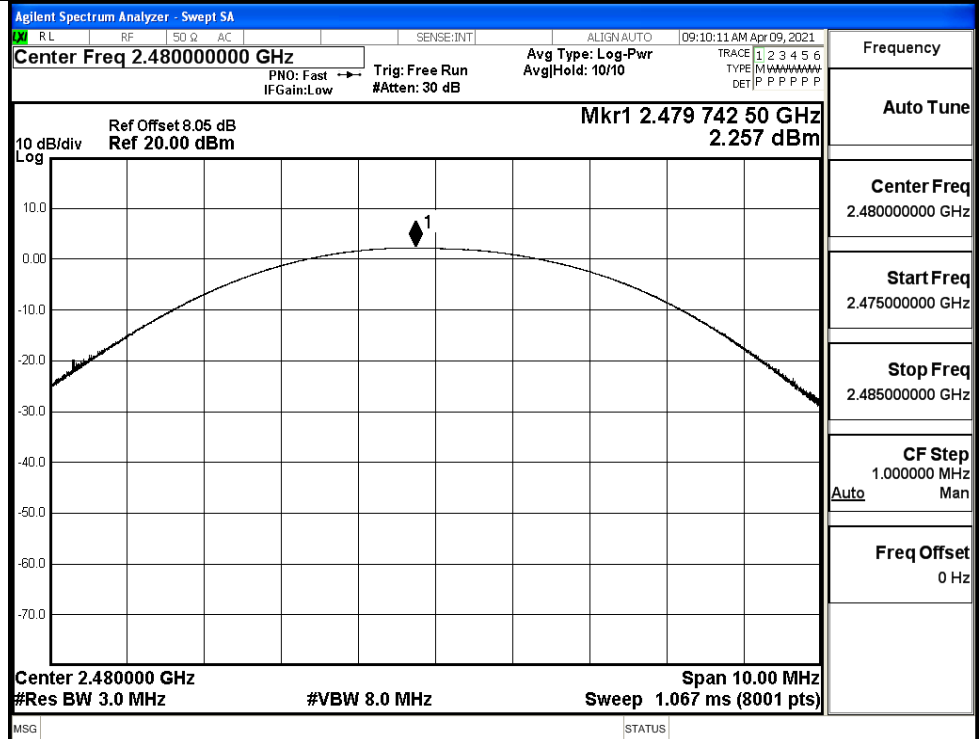
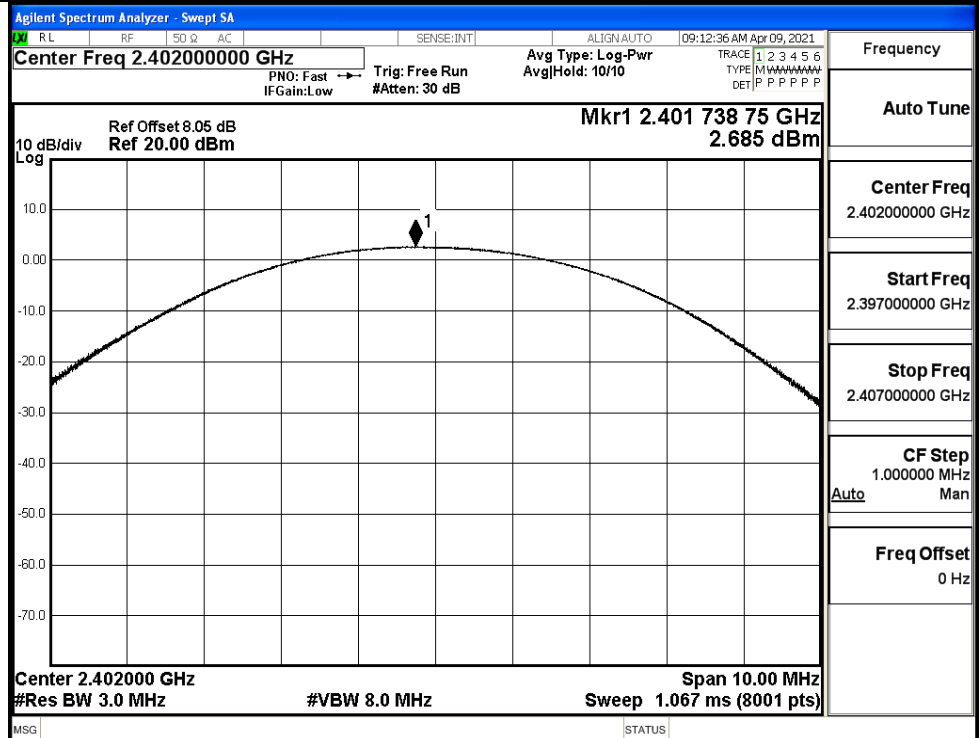
GFSK/LCH

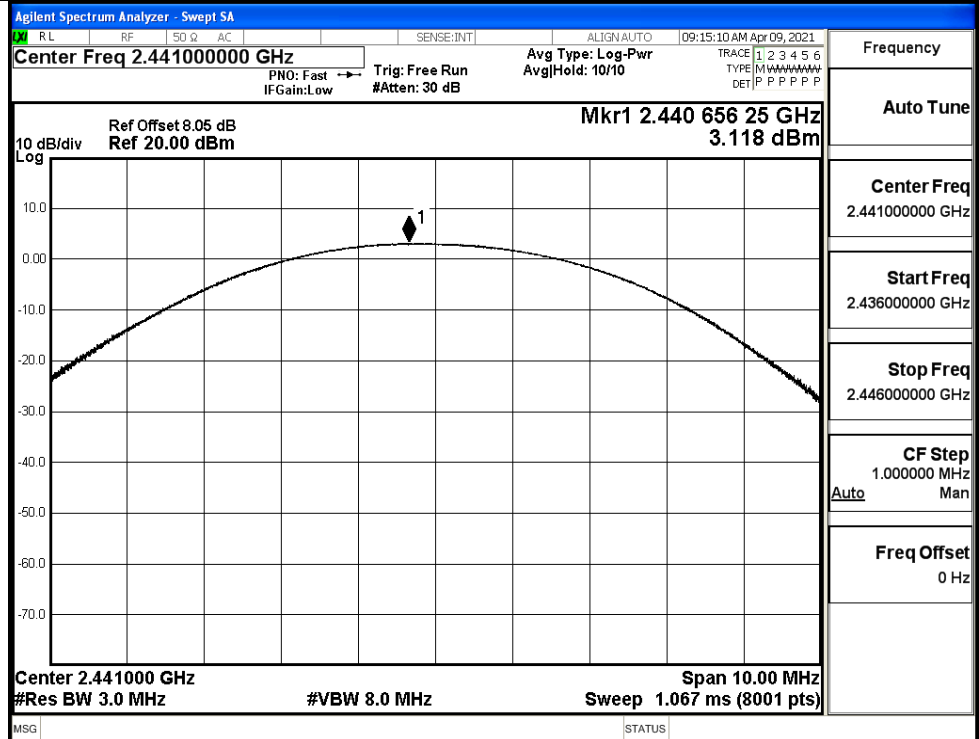
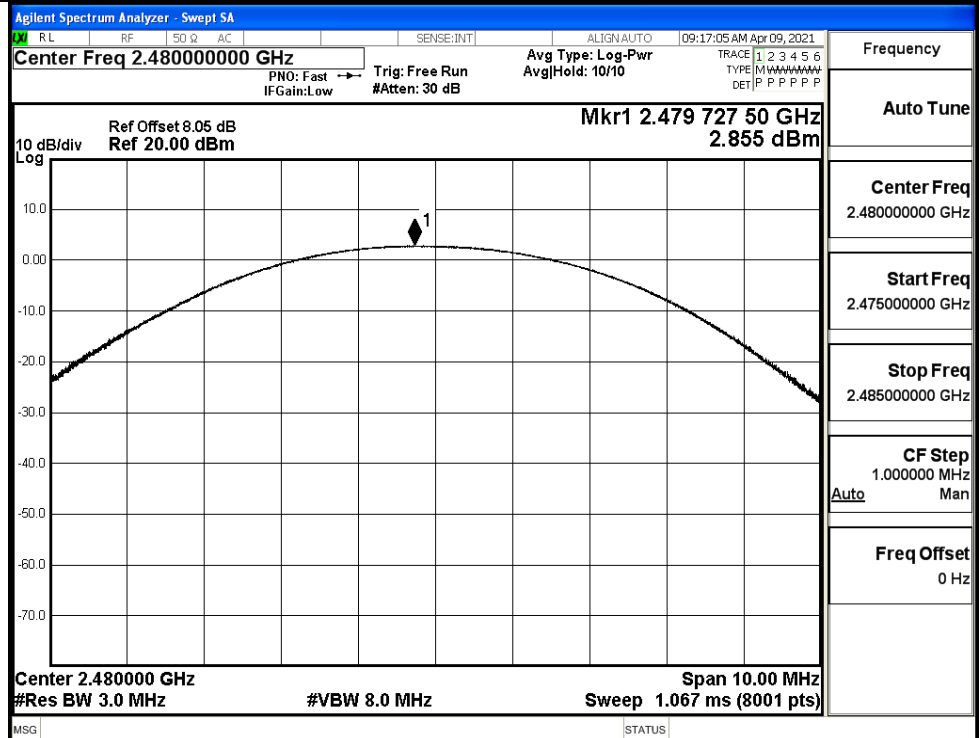


GFSK/MCH

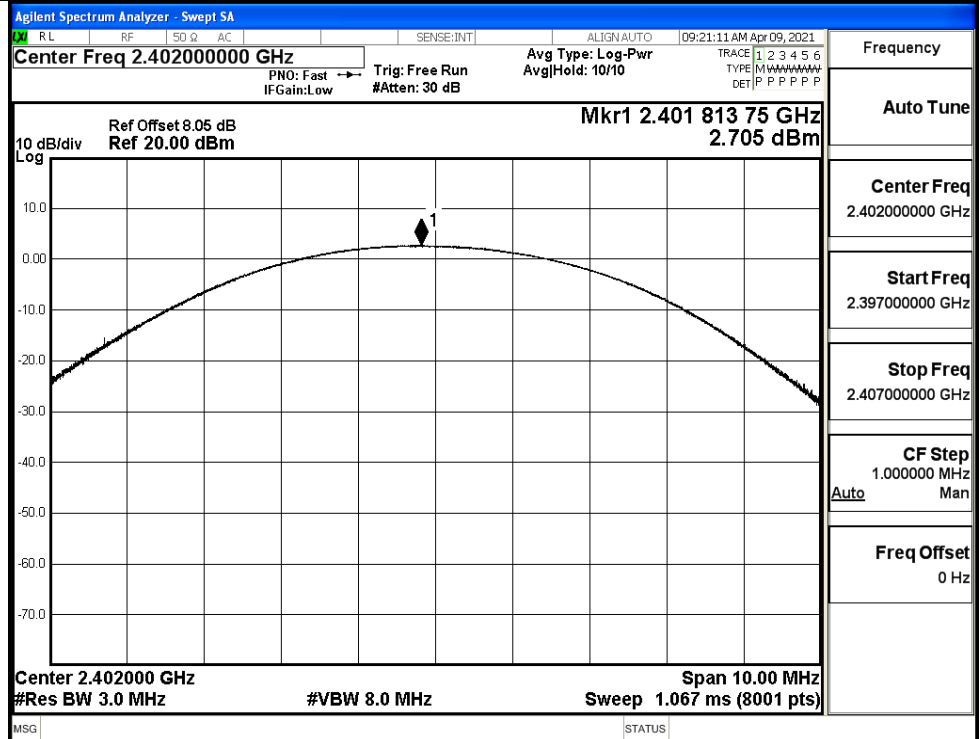


GFSK/HCH

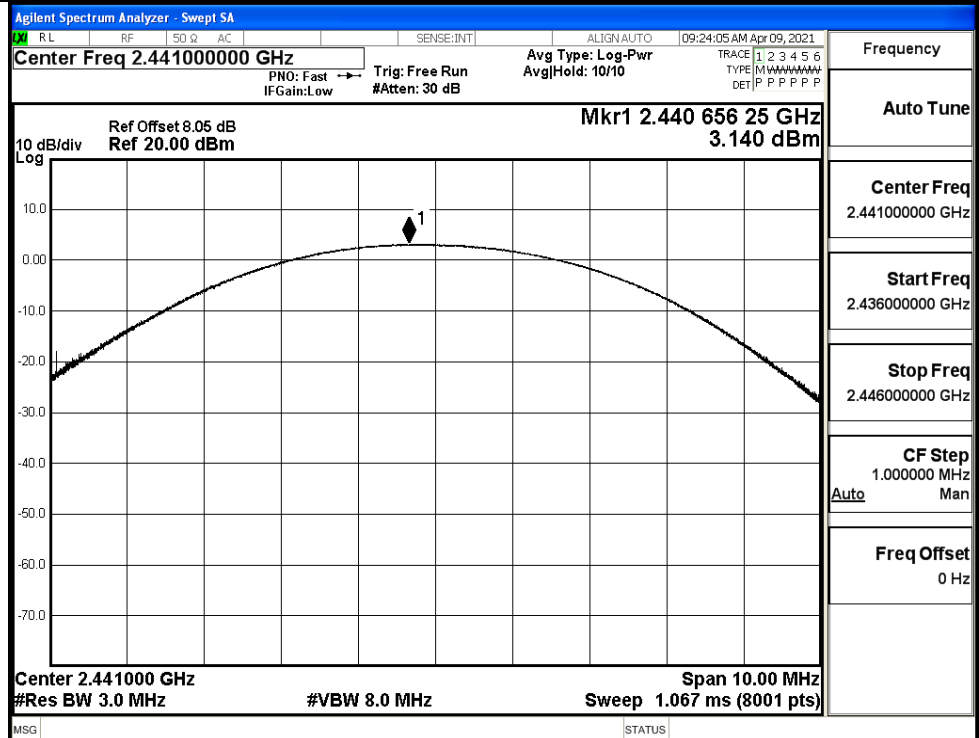
 $\pi/4$ DQPSK/LCH

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

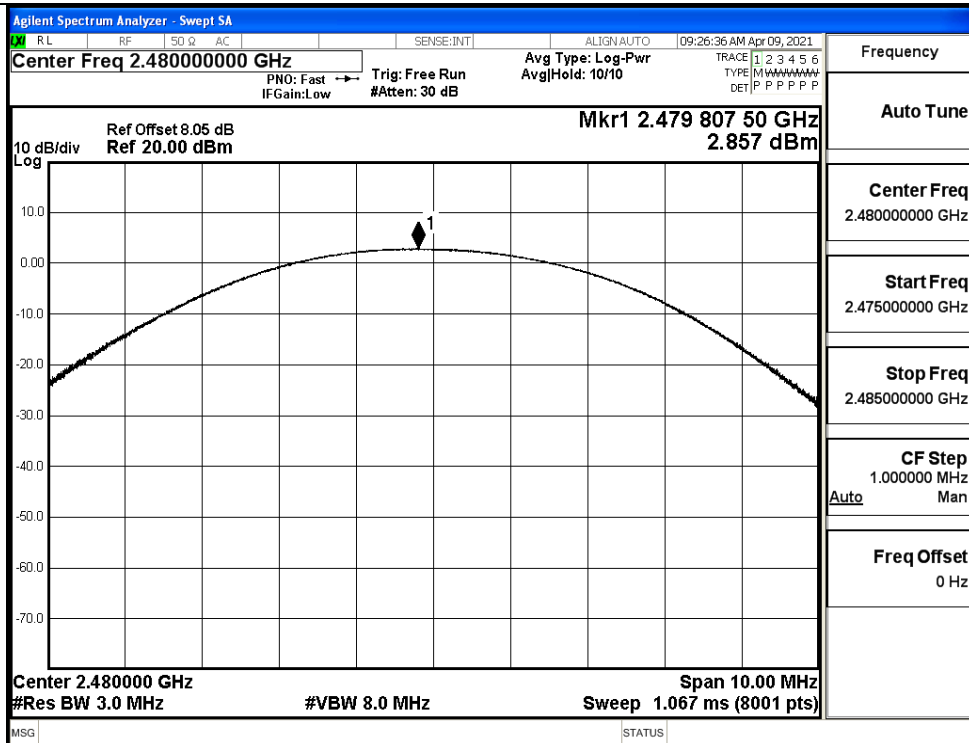
8DPSK/LCH



8DPSK/MCH



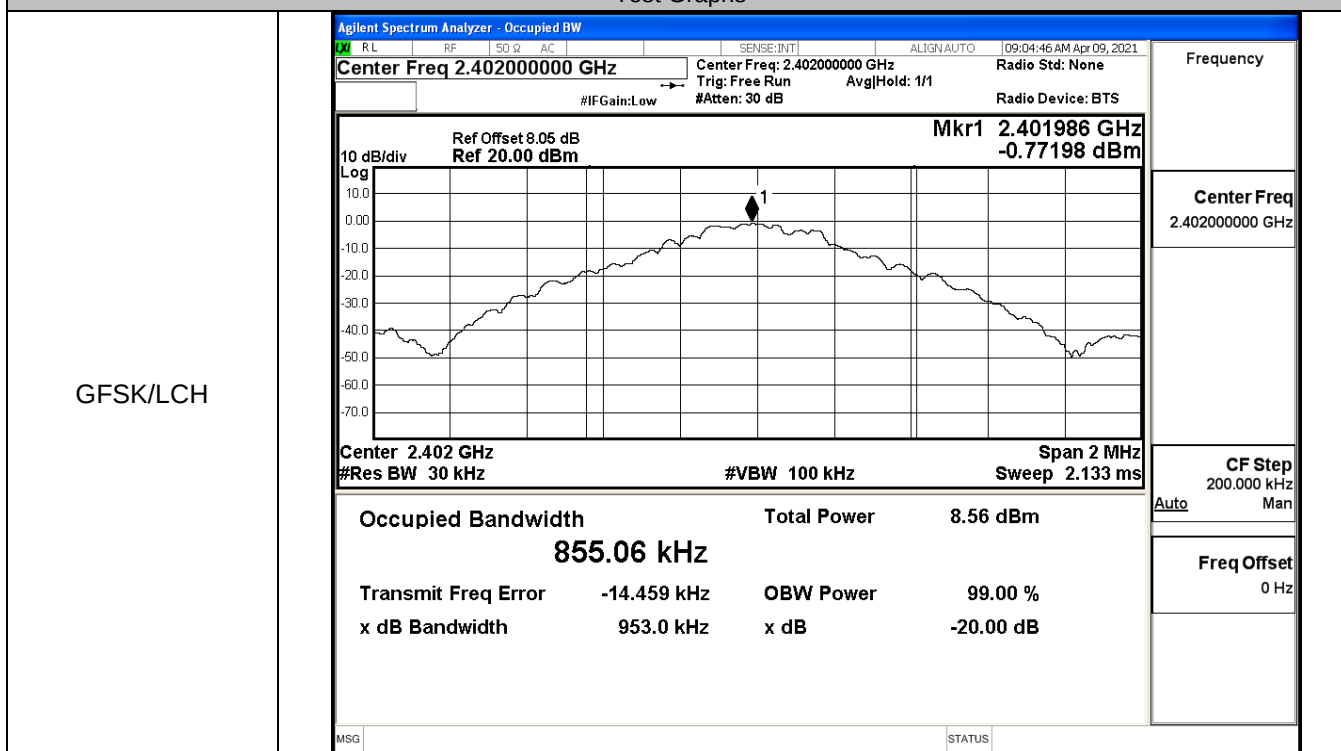
8DPSK/HCH



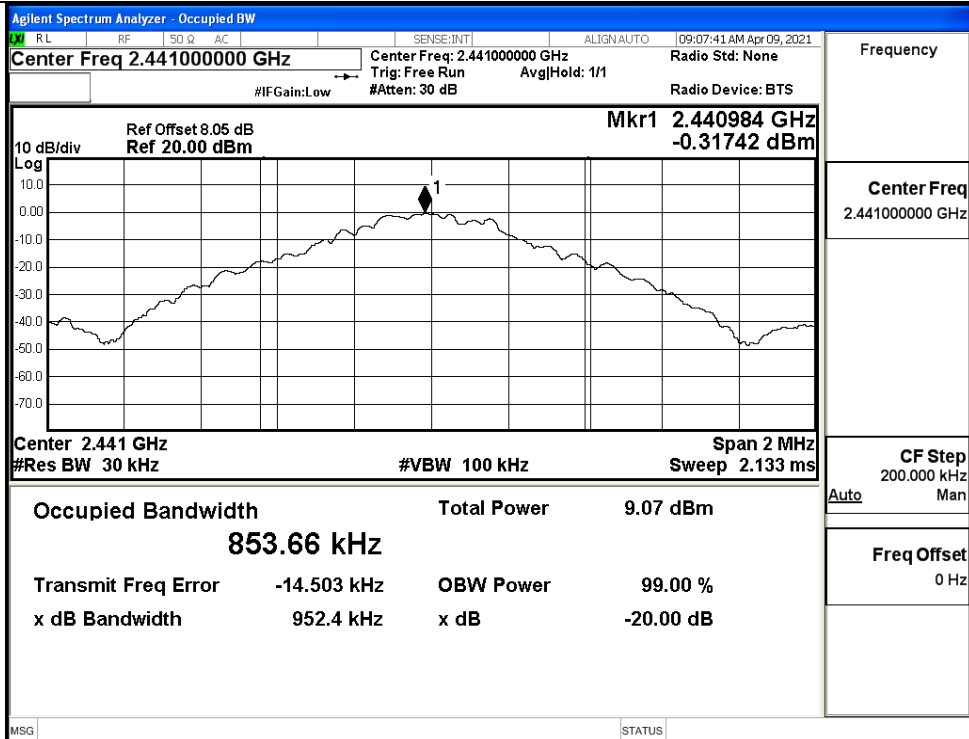
A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9530	Not Specified	PASS
	MCH	0.9524	Not Specified	PASS
	HCH	0.9517	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.313	Not Specified	PASS
	MCH	1.312	Not Specified	PASS
	HCH	1.313	Not Specified	PASS
8DPSK	LCH	1.310	Not Specified	PASS
	MCH	1.312	Not Specified	PASS
	HCH	1.315	Not Specified	PASS

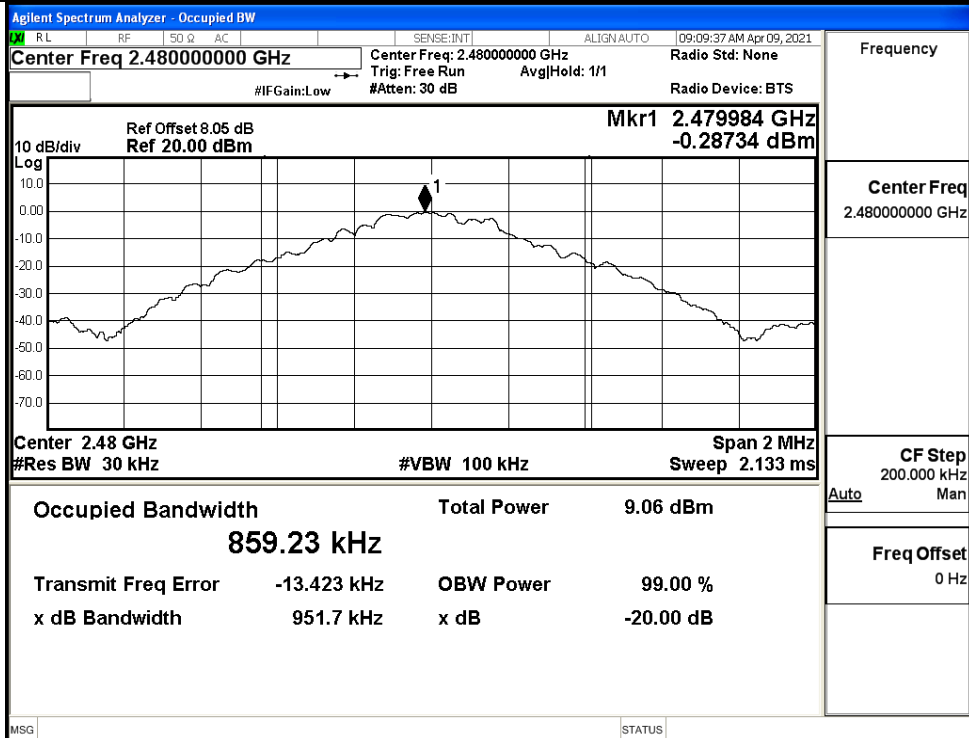
Test Graphs

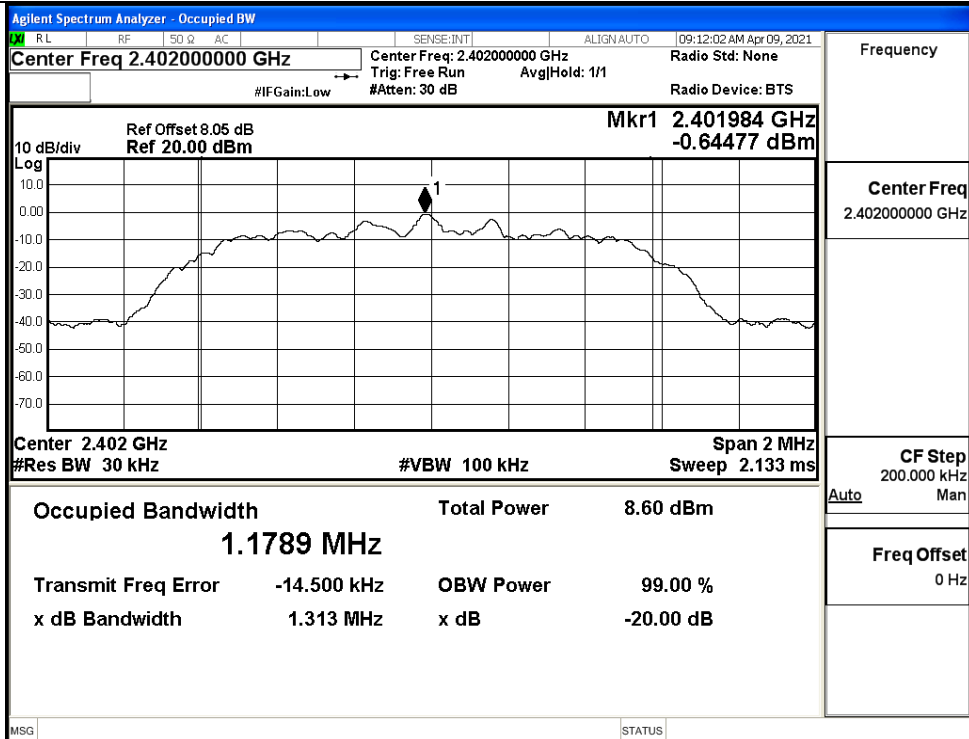
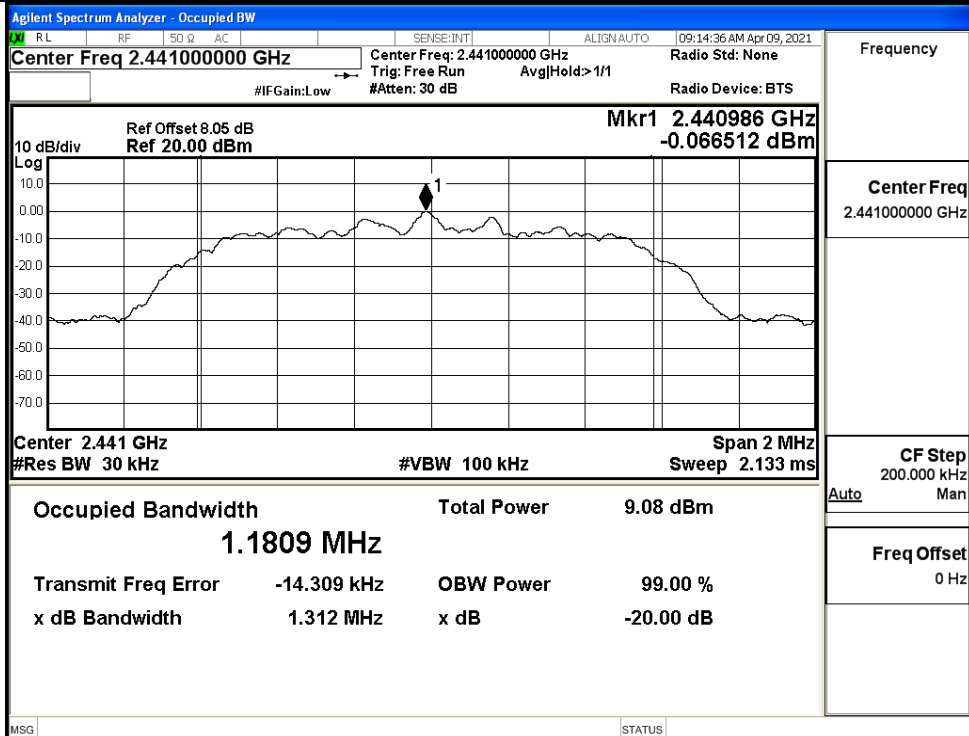


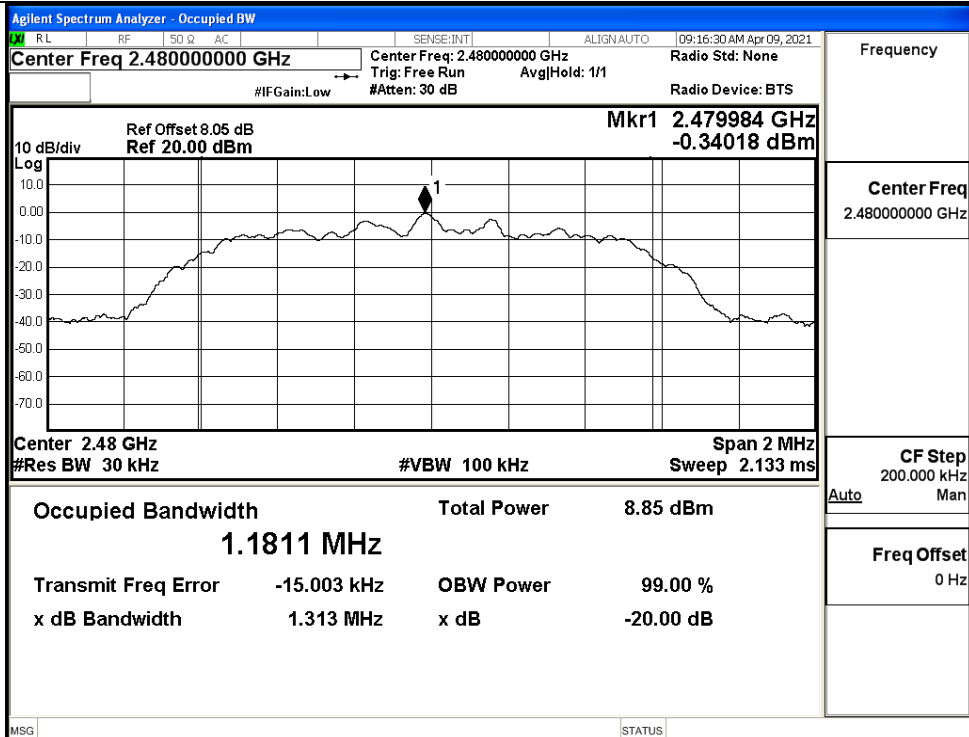
GFSK/MCH



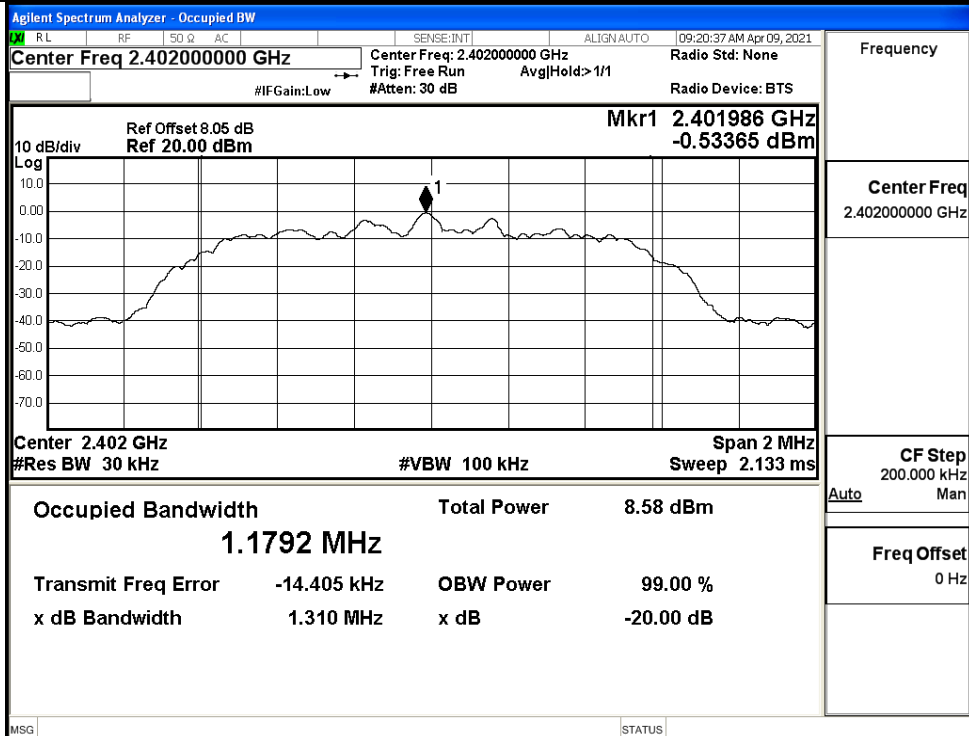
GFSK/HCH



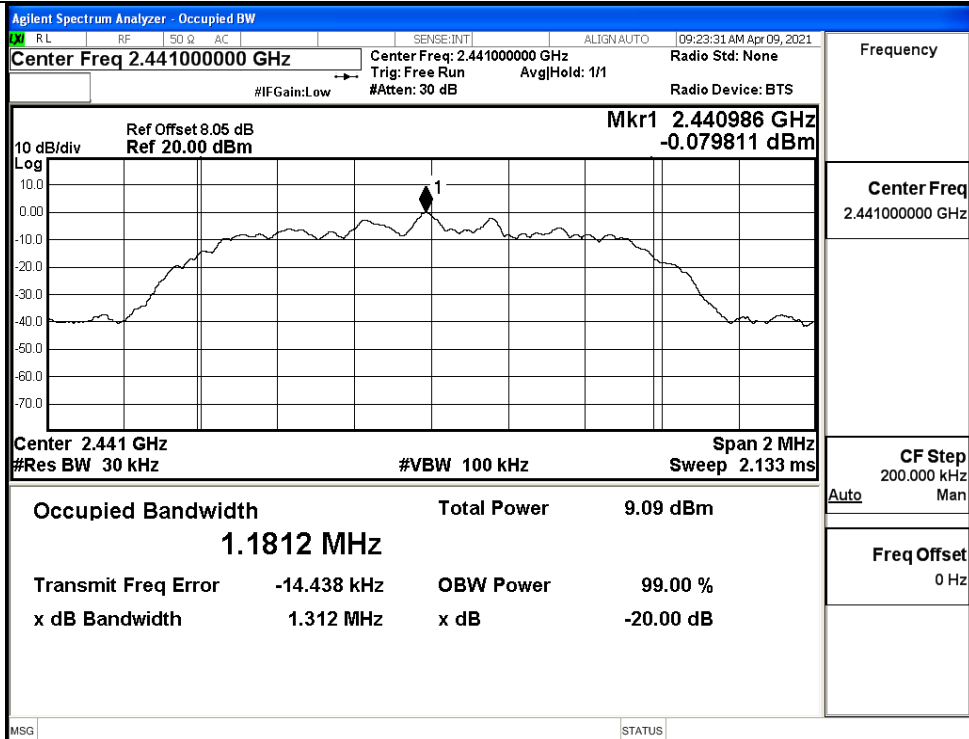
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

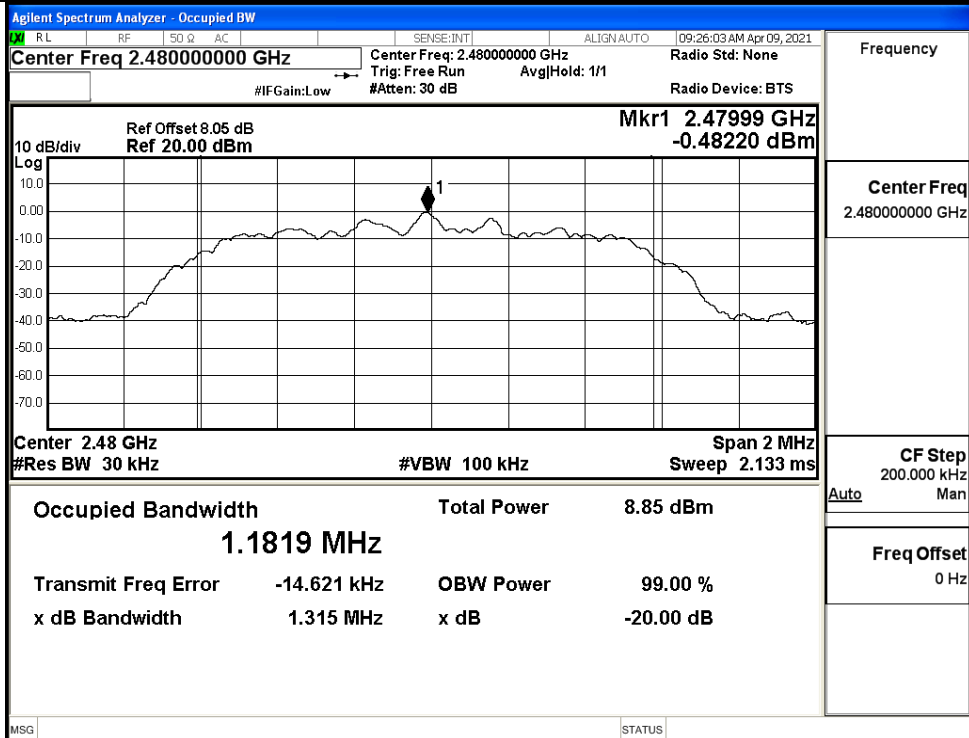
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

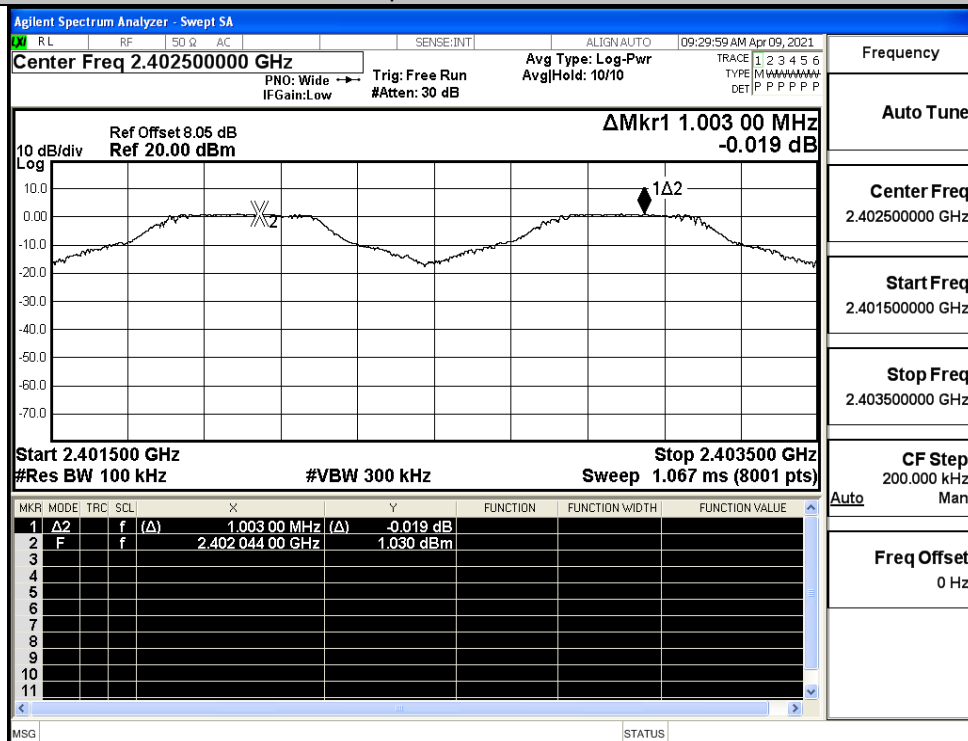


A.3 Carrier Frequency Separation

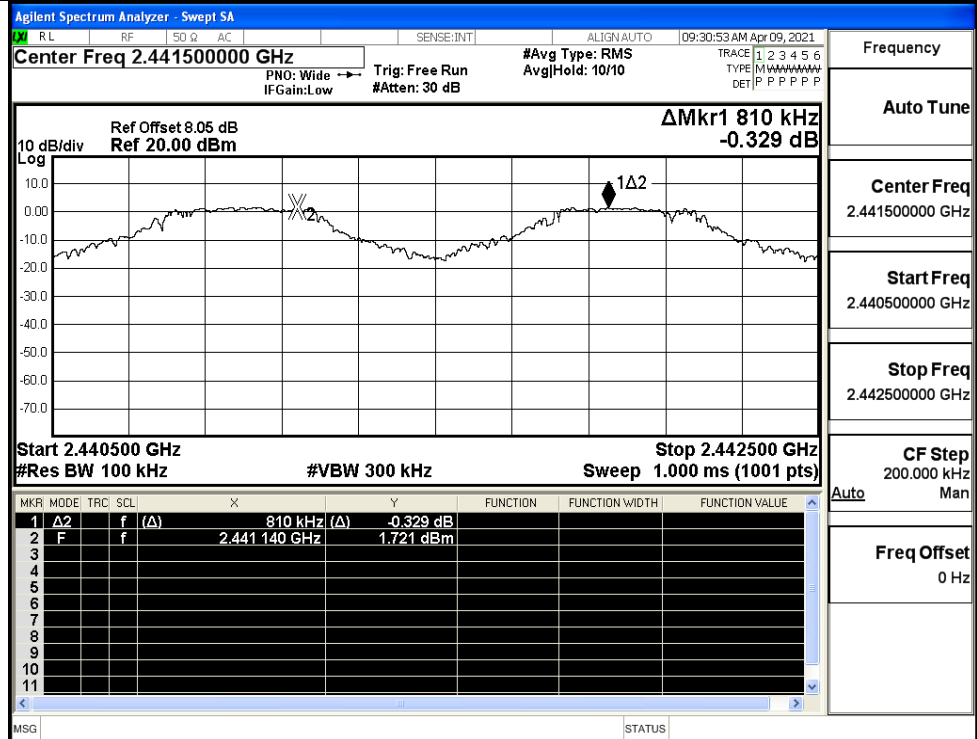
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.003	0.635	PASS
	MCH	0.810	0.635	PASS
	HCH	0.976	0.635	PASS
$\pi/4$ DQPSK	LCH	1.094	0.875	PASS
	MCH	1.150	0.875	PASS
	HCH	1.004	0.875	PASS
8DPSK	LCH	1.002	0.877	PASS
	MCH	0.982	0.877	PASS
	HCH	1.214	0.877	PASS

Test Graphs

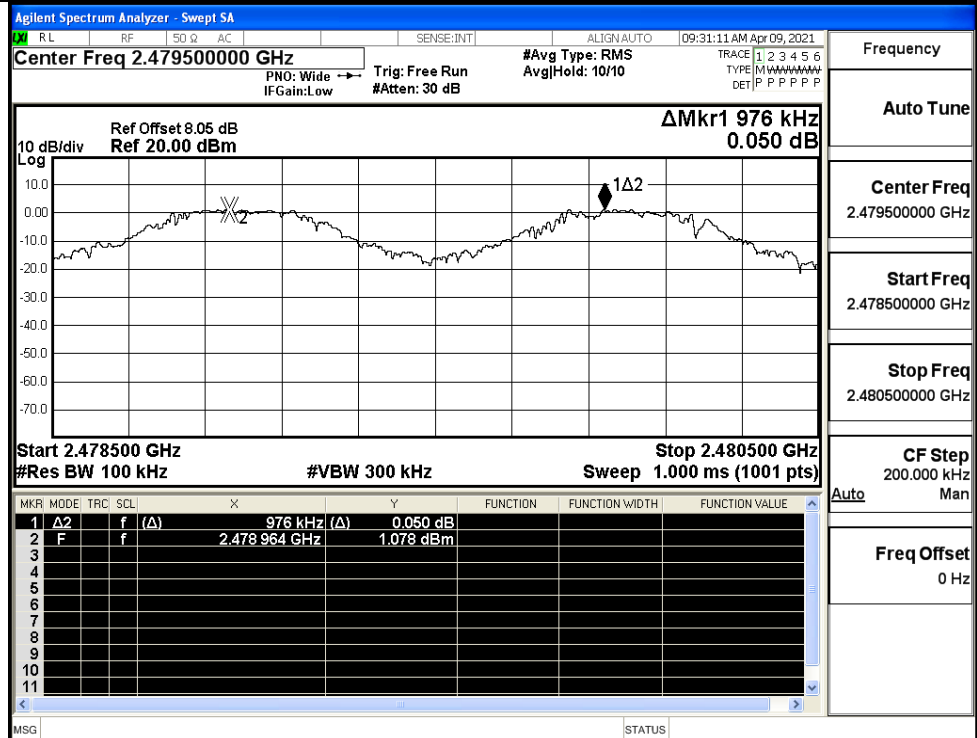
GFSK/LCH

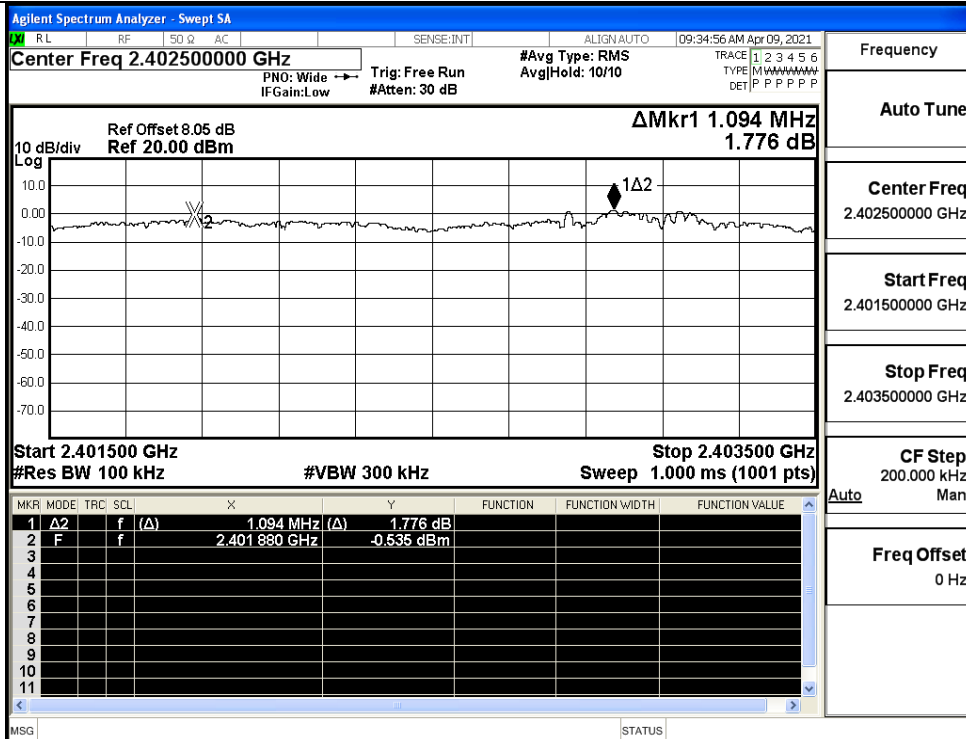
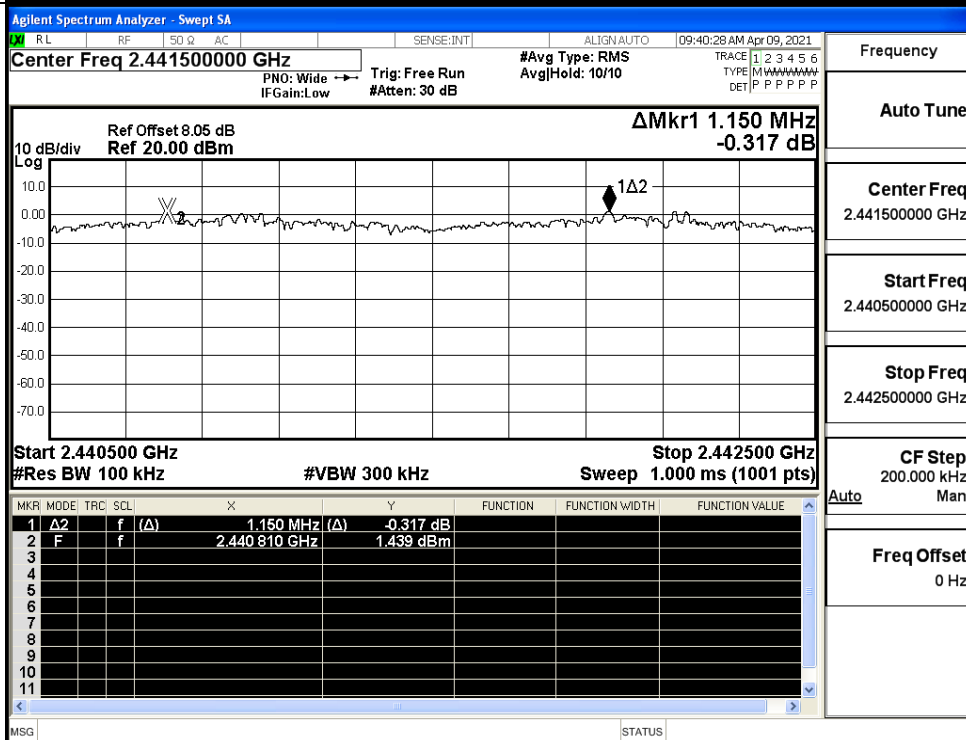


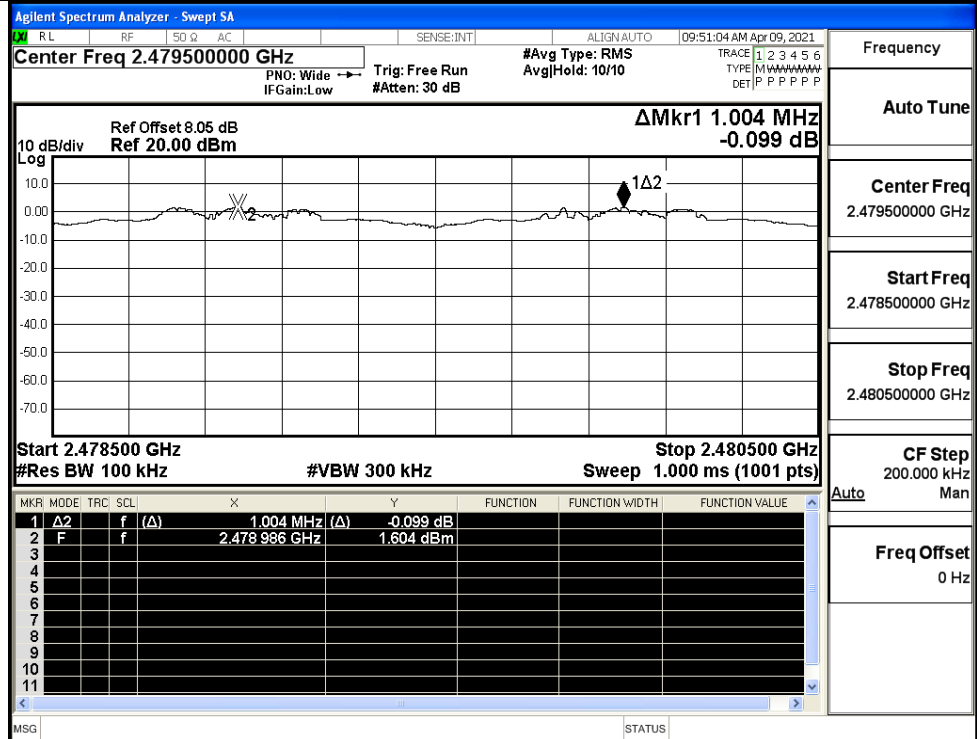
GFSK/MCH



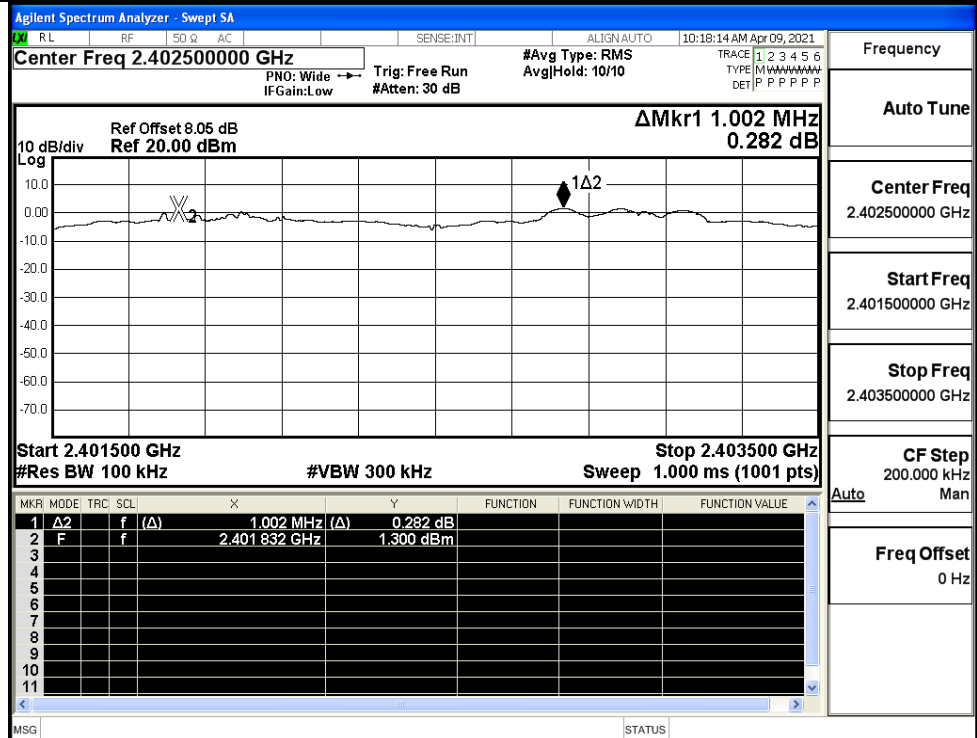
GFSK/HCH



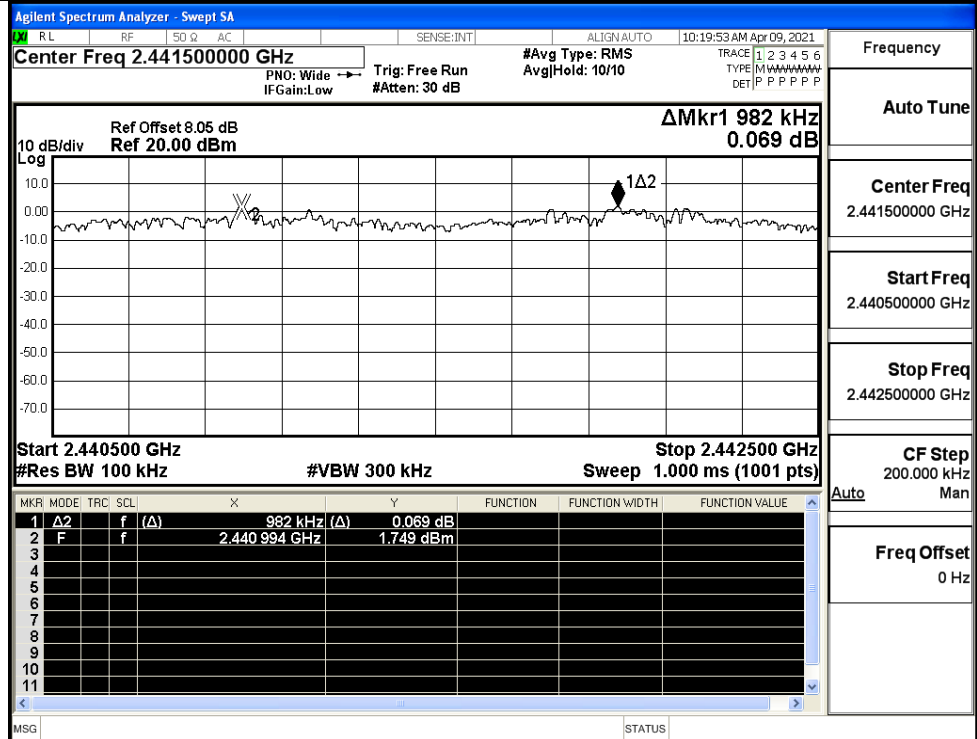
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

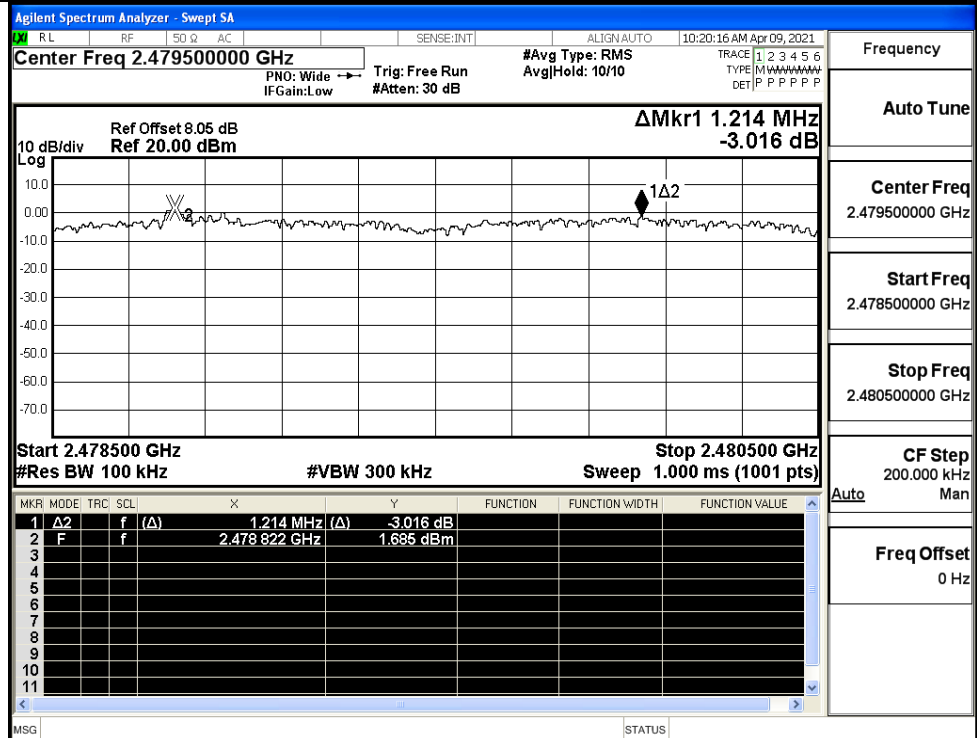
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

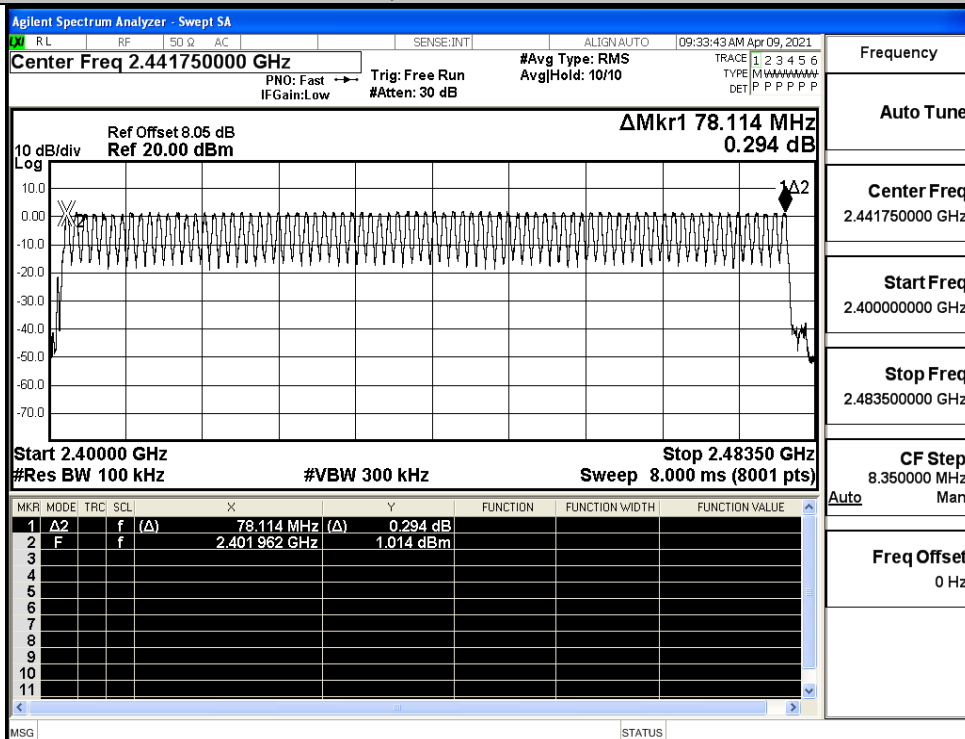
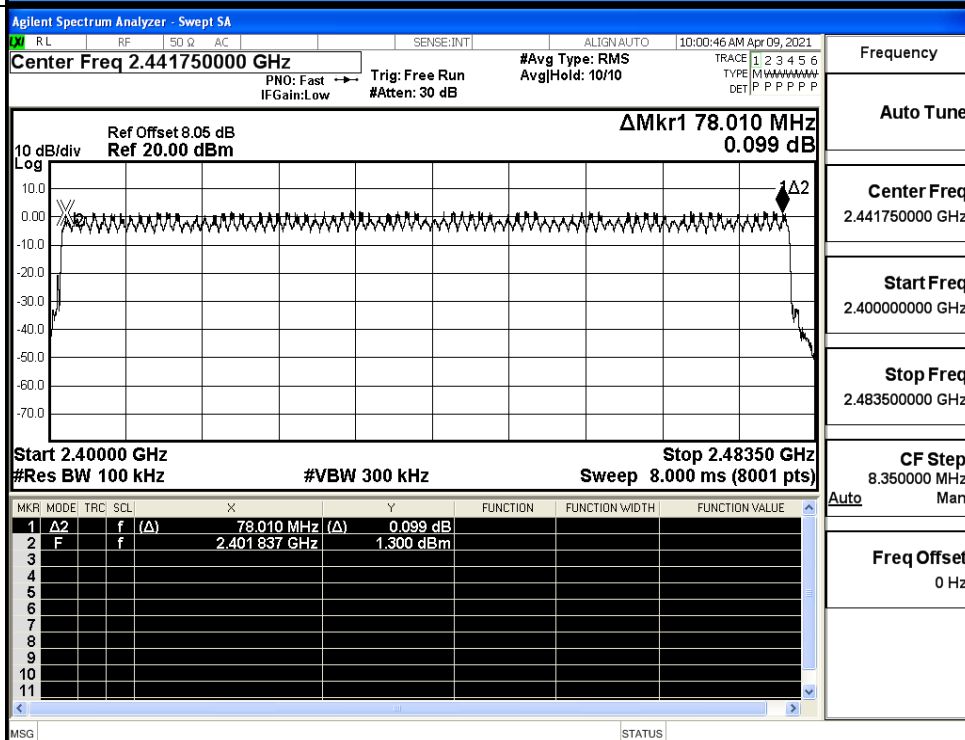


A.4 Hopping Channel Number

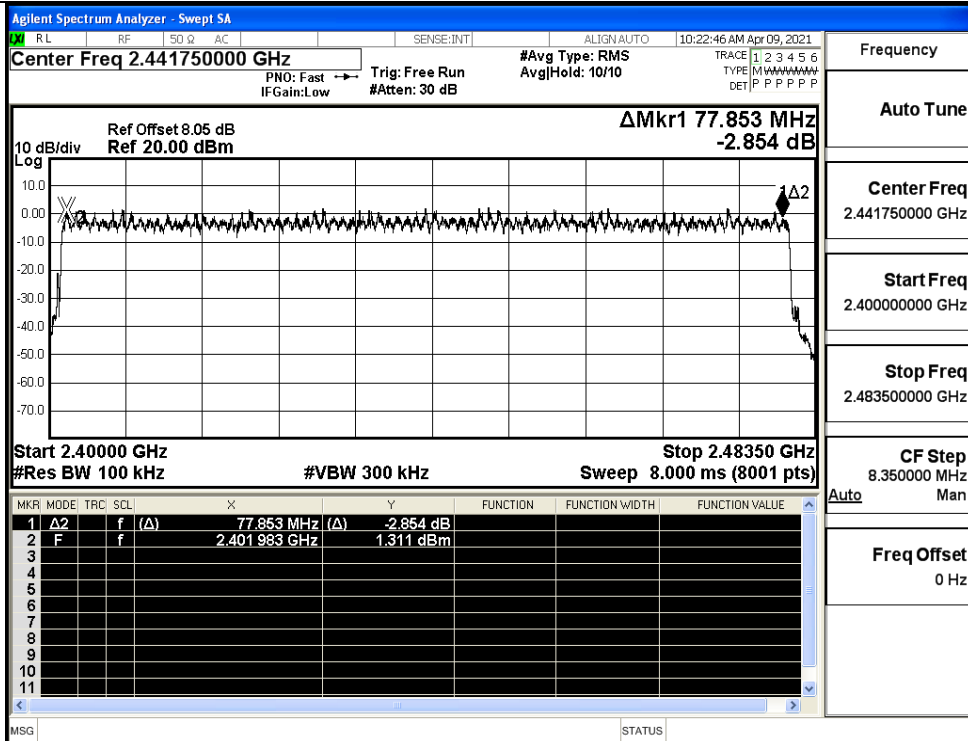
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
$\pi/4$ DQPSK	Hop	79	>=15	PASS
8DPSK	Hop	79	>=15	PASS

Test Graphs

GFSK/Hop

 $\pi/4$ DQPSK/Hop

8DPSK/Hop

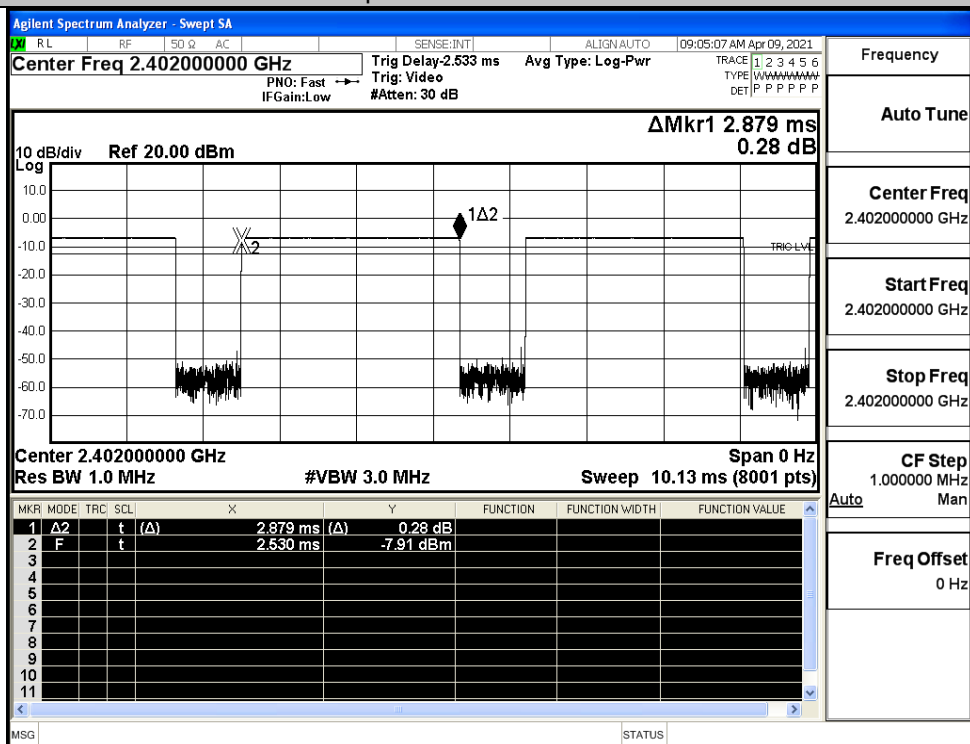


A.5 Dwell Time

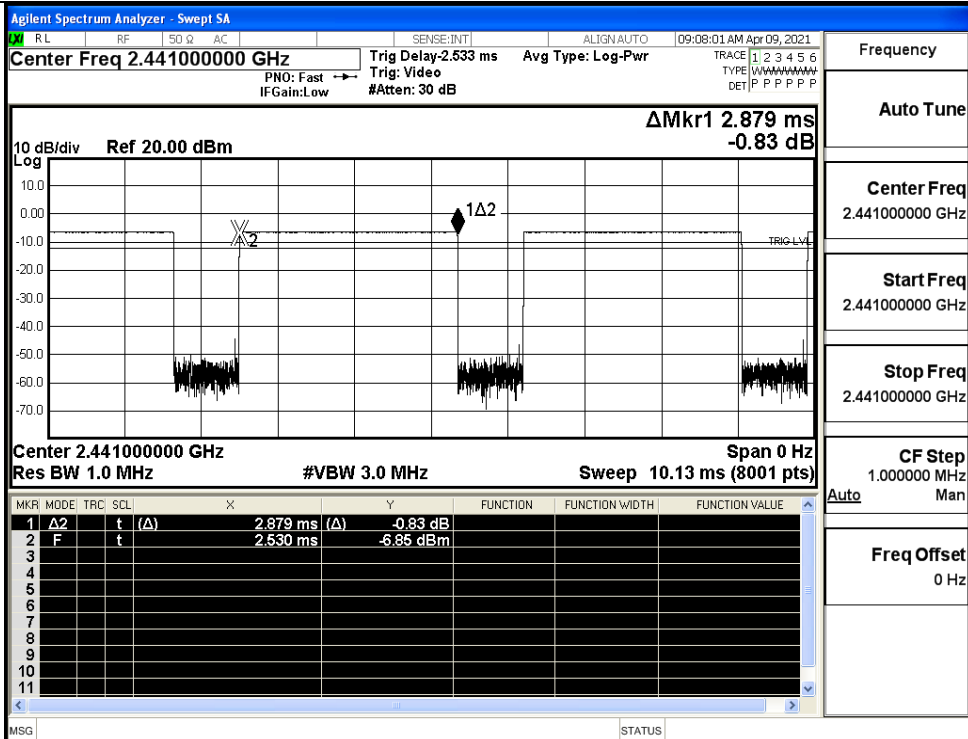
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.88	106.7	0.307	0.4	PASS
	2DH5	MCH	2.88	106.7	0.307	0.4	PASS
	2DH5	HCH	2.88	106.7	0.307	0.4	PASS
8DPSK	3DH5	LCH	2.88	106.7	0.308	0.4	PASS
	3DH5	MCH	2.88	106.7	0.307	0.4	PASS
	3DH5	HCH	2.88	106.7	0.307	0.4	PASS

Test Graphs

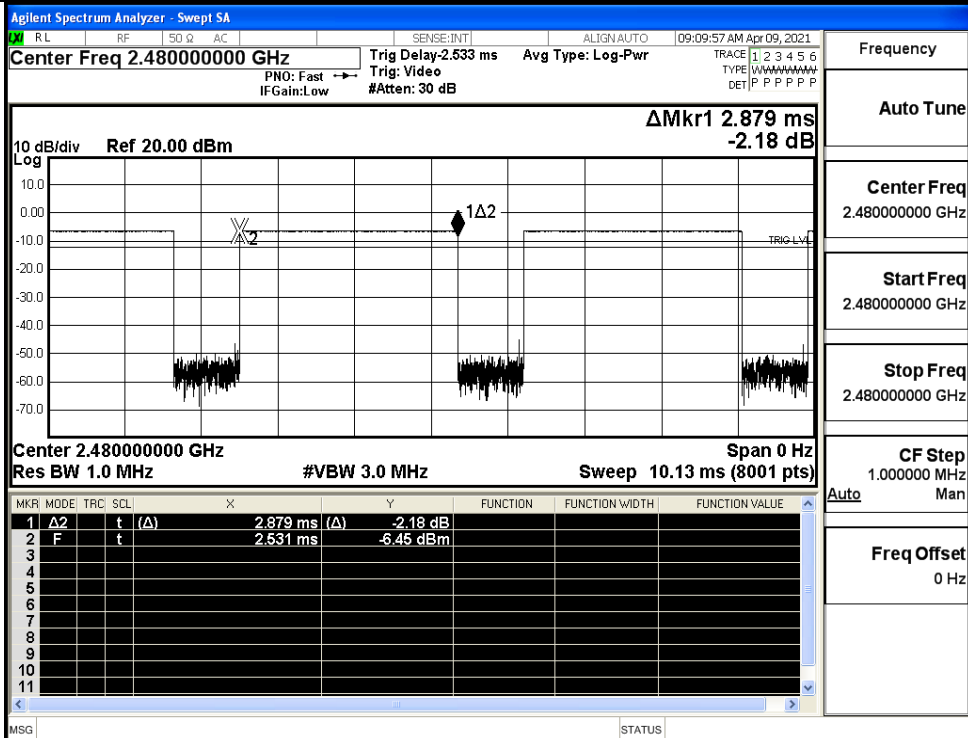
GFSK_DH5/LCH



GFSK_DH5/MCH



GFSK_DH5/HCH



Agilent Spectrum Analyzer - Swept SA

RL RF 50 Q AC

SENSE:INT

ALIGN:AUTO

09:12:22 AM Apr 09, 2021

Center Freq 2.402000000 GHz

Trig Delay: 2.533 ms

Avg Type: Log-Pwr

Trace 1 2 3 4 5 6

TYPE P P P P P P

DET P P P P P P

PNO: Fast

IF Gain: Low

#Atten: 30 dB

Frequency

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

10 dB/div

Ref 20.00 dBm

Δ Mkr1 2.884 ms

-0.85 dB

Log

10.0

0.00

-10.0

-20.0

-30.0

-40.0

-50.0

-60.0

-70.0

1Δ2

TRIG LVL

Center 2.402000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 10.13 ms (8001 pts)

Span 0 Hz

MRK	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	t	(Δ)	2.884 ms	(Δ)	-0.85 dB		
2	F	t		2.393 ms		-6.95 dBm		
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG

STATUS

Agilent Spectrum Analyzer - Swept SA

RL RF 50 Ω AC SENSE:INT ALIGN:AUTO 09:14:56 AM Apr 09, 2021

Center Freq 2.441000000 GHz Trig Delay: 2.533 ms Avg Type: Log-Pwr PNO: Fast IF Gain: Low Trig: Video #Atten: 30 dB TRACE 1 2 3 4 5 6 TYPE P P P P P P DET P P P P P P

ΔMkr1 2.884 ms -1.48 dB

The spectrum analyzer displays a frequency range from 2.435 GHz to 2.447 GHz. The vertical axis shows power in dBm, ranging from -70.0 to 10.0. A significant signal is visible around -55 dBm. A marker labeled ΔMkr1 is placed on the signal at 2.884 ms and -1.48 dB. The resolution bandwidth (Res BW) is 1.0 MHz, and the sweep time is 10.13 ms.

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ2	t	(Δ)	2.884 ms	-1.48 dB			
2	F	t		2.531 ms	-6.03 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

Center 2.441000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts) Span 0 Hz

Auto Man

Freq Offset 0 Hz

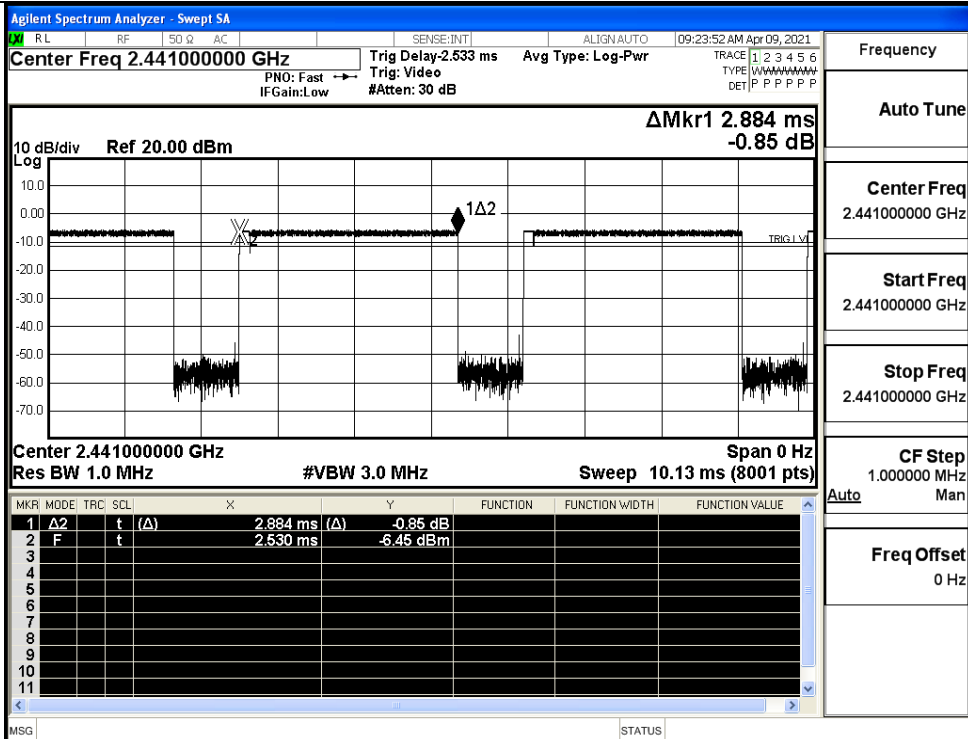
[illegible]

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

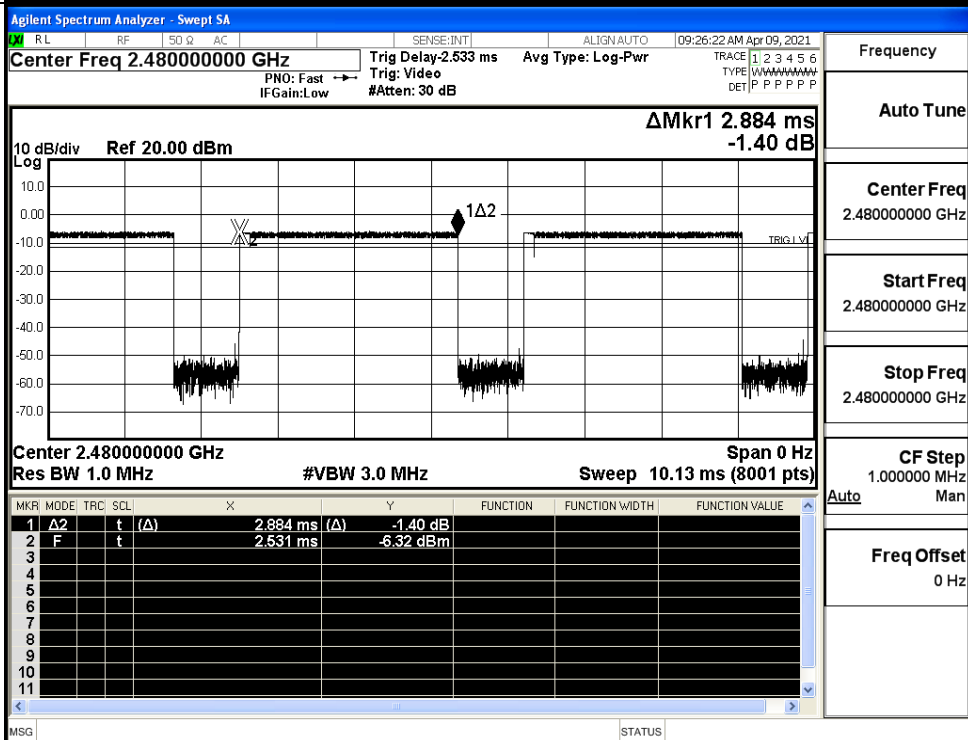
[illegible]

Frequency	
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

8DPSK_3DH5/MCH



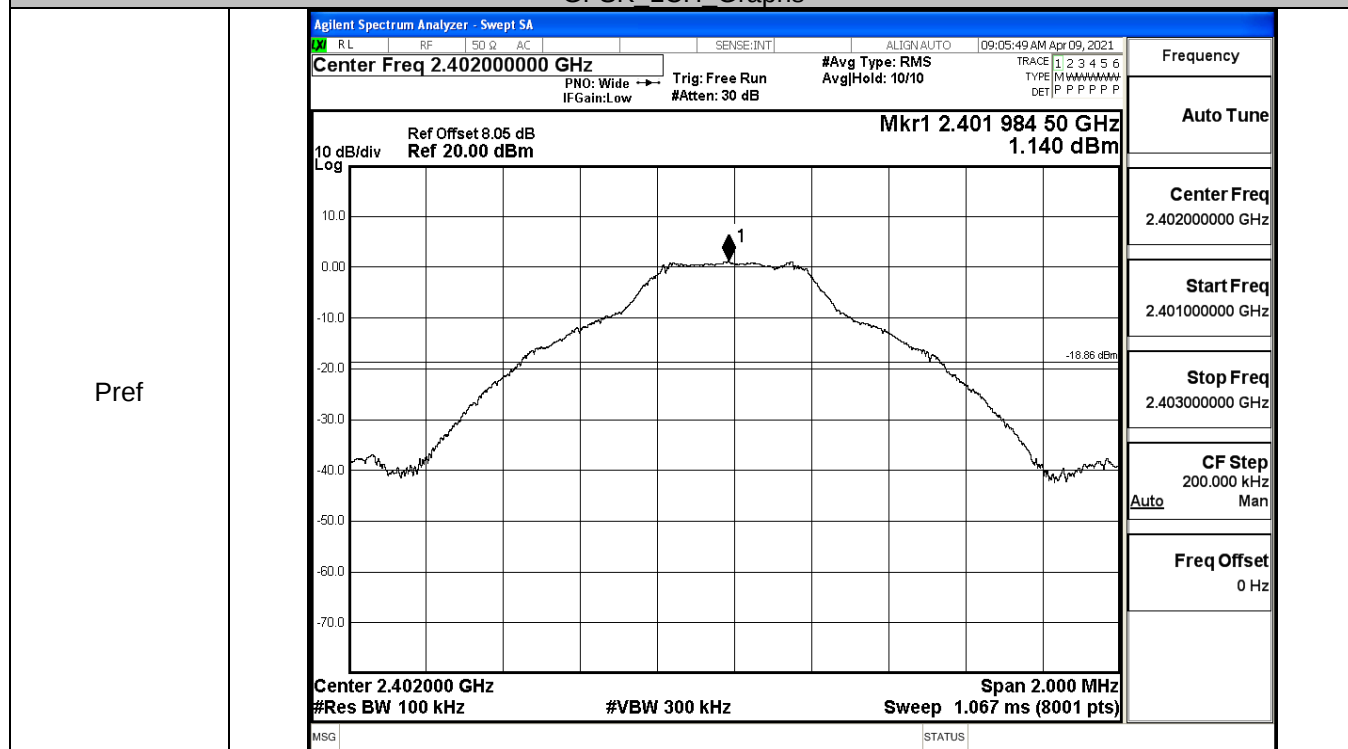
8DPSK_3DH5/HCH



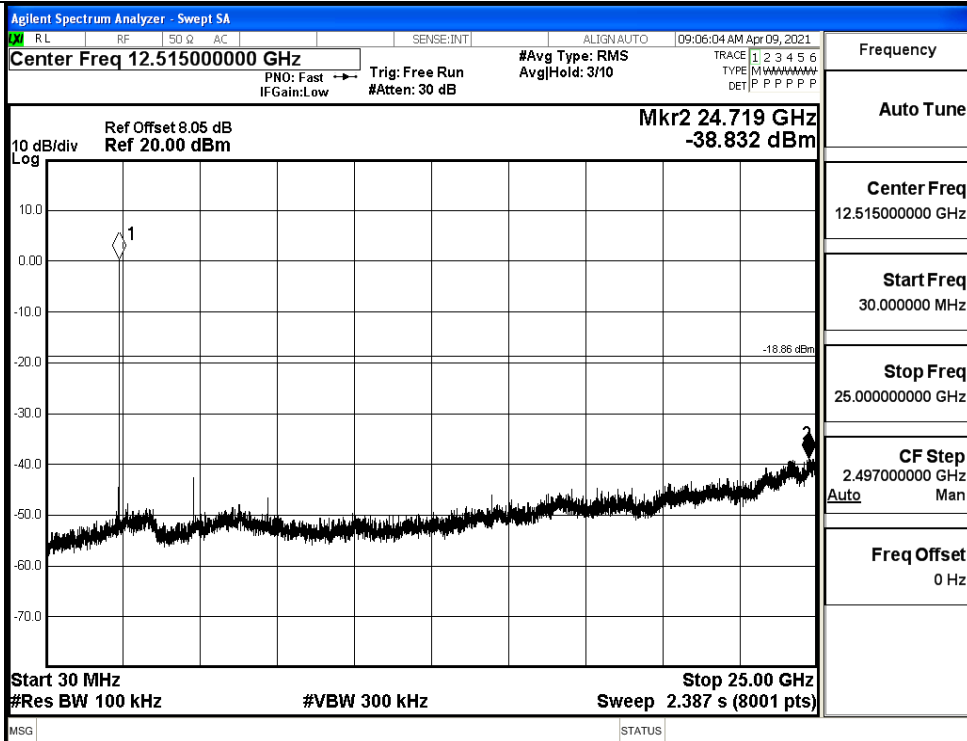
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.14	-38.832	-18.860	PASS
	MCH	1.814	-38.158	-18.186	PASS
	HCH	1.266	-36.709	-18.734	PASS
$\pi/4$ DQPSK	LCH	1.489	-37.854	-18.511	PASS
	MCH	1.845	-37.292	-18.155	PASS
	HCH	1.76	-36.395	-18.240	PASS
8DPSK	LCH	1.382	-37.507	-18.618	PASS
	MCH	1.908	-38.040	-18.092	PASS
	HCH	0.292	-38.717	-19.708	PASS

GFSK LCH Graphs

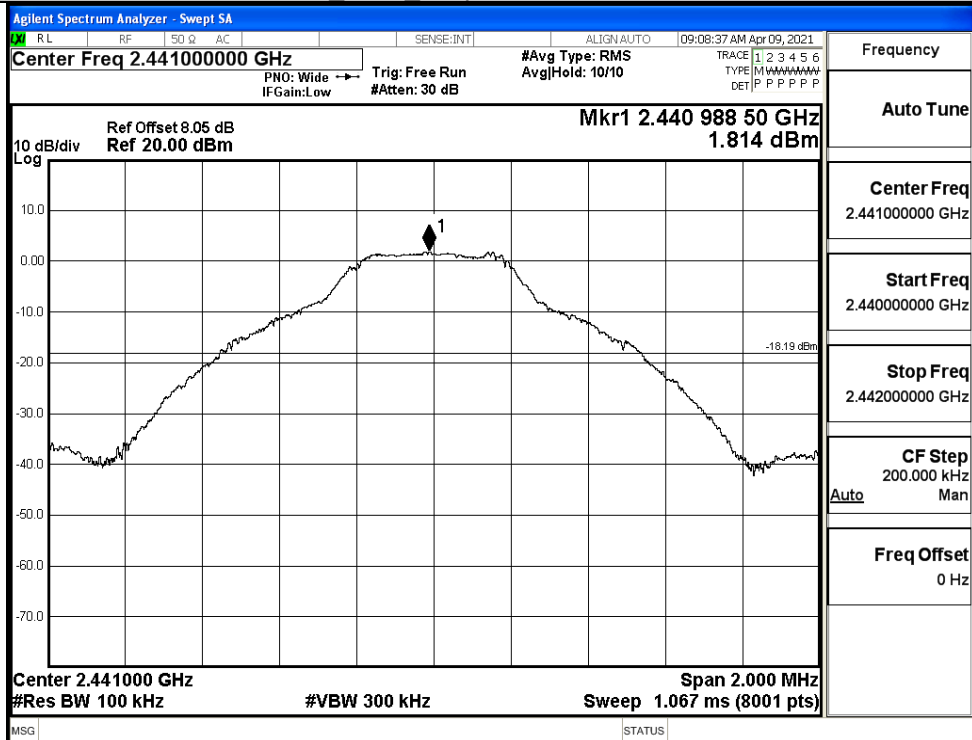


Puw

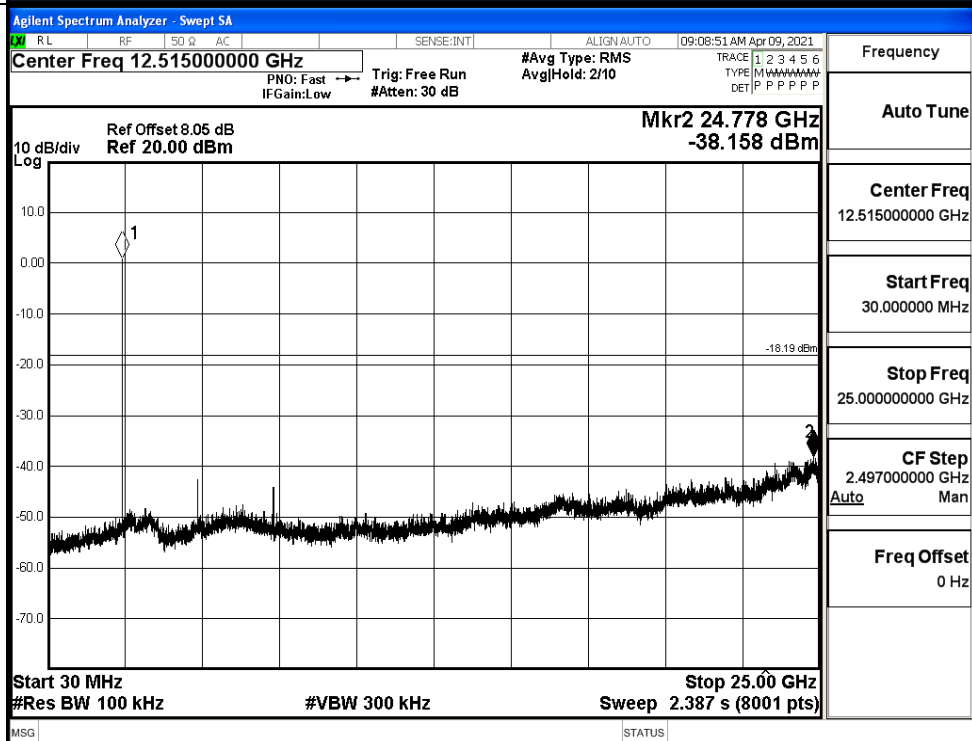


GFSK_MCH_Graphs

Pref

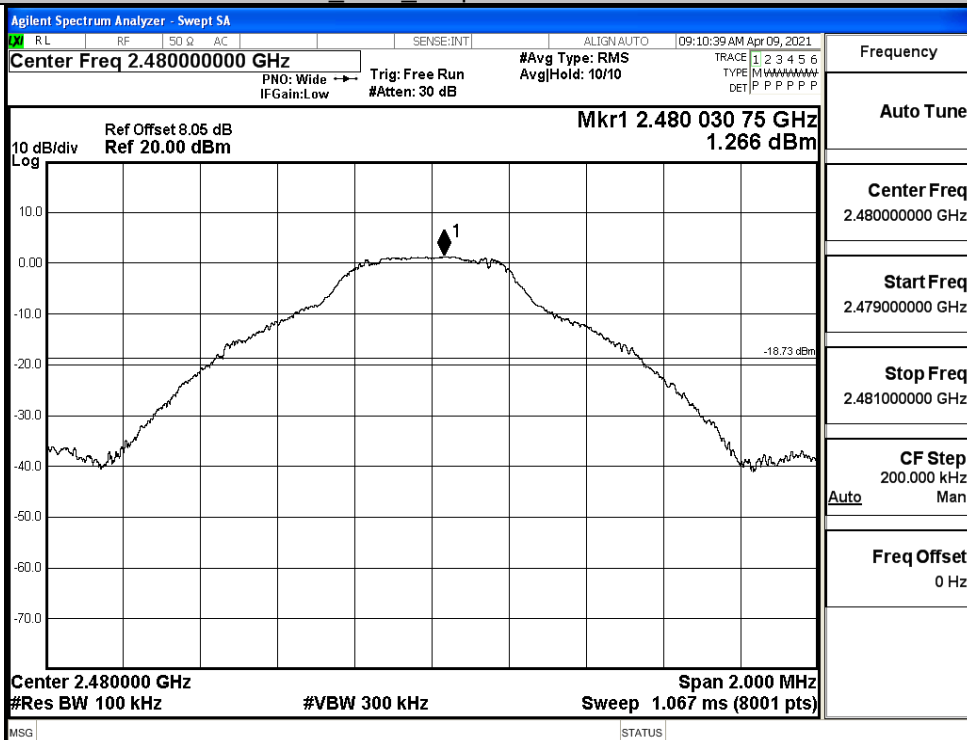


Puw

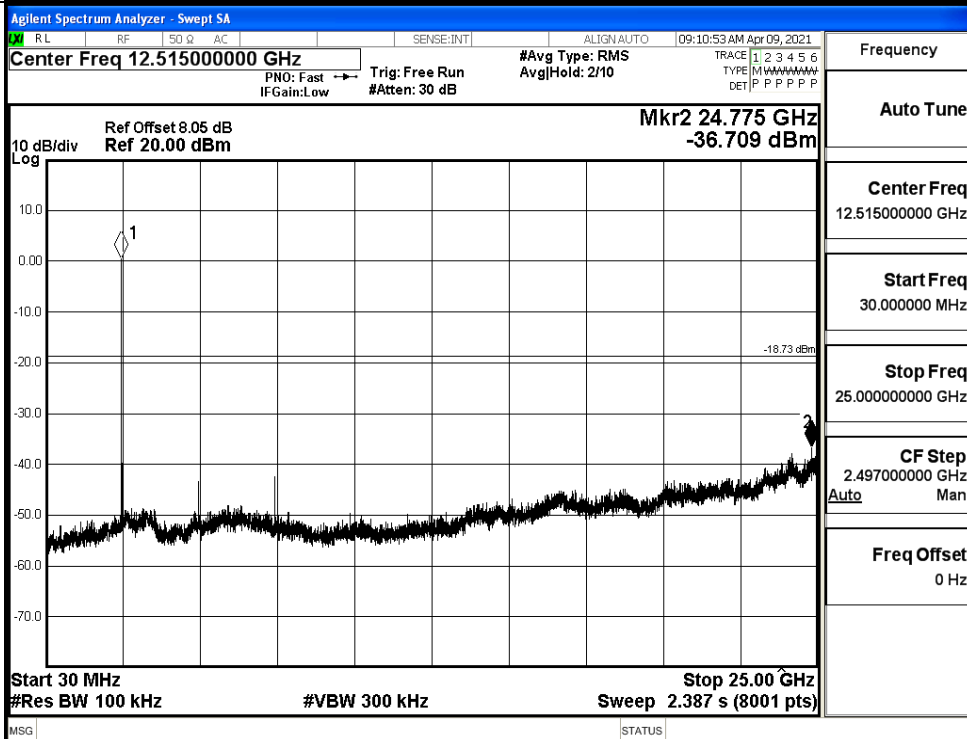


GFSK HCH Graphs

Pref

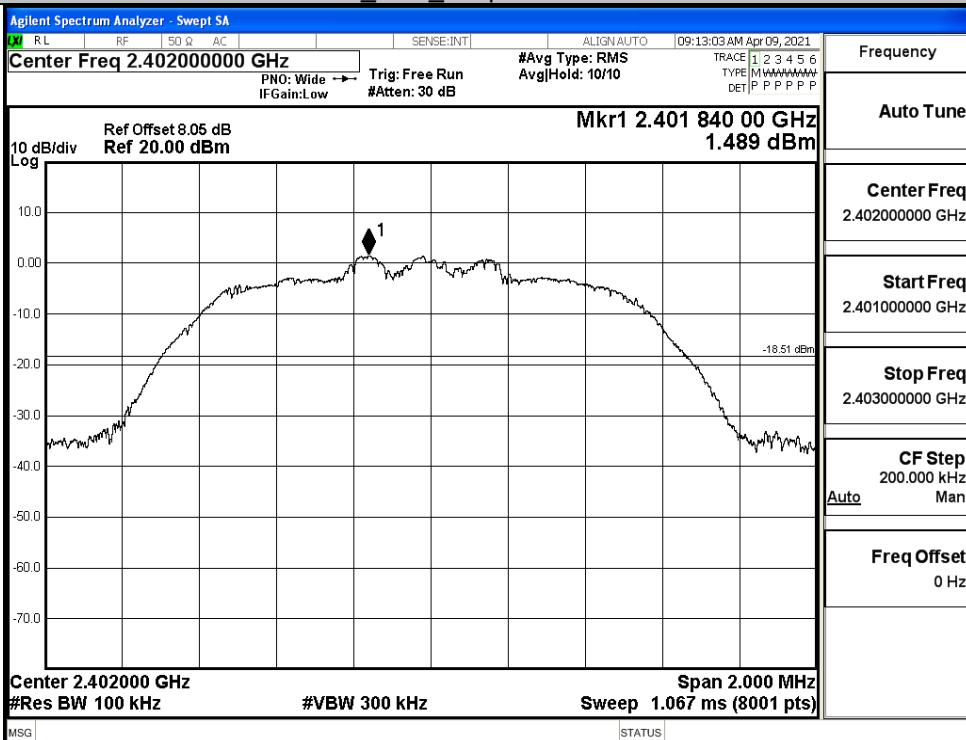


Puw

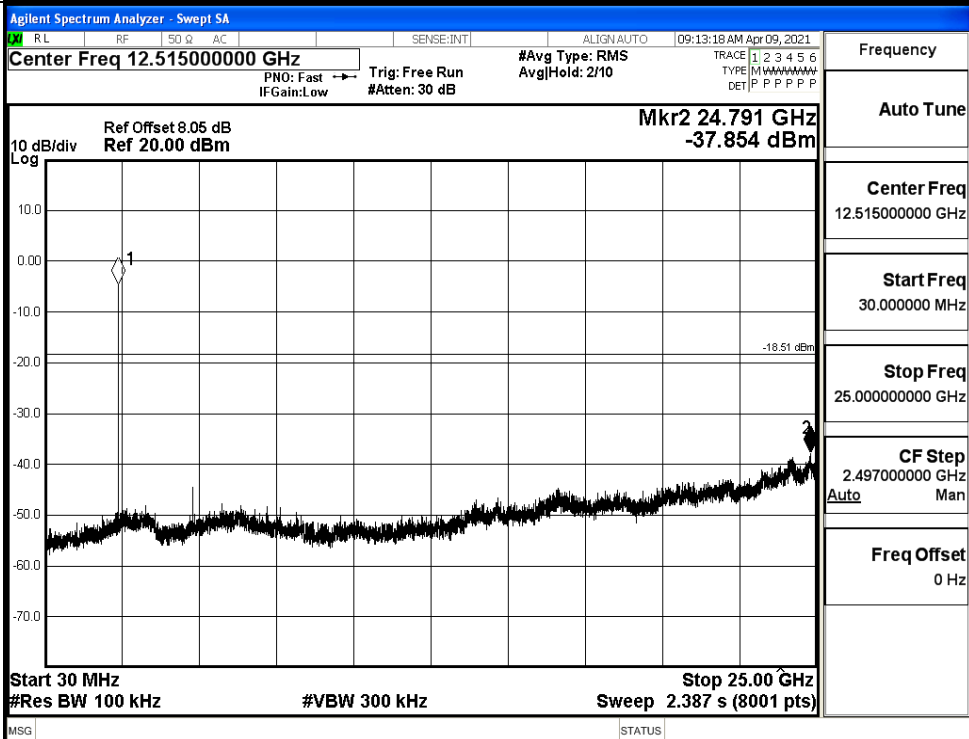


π /4DQPSK_LCH_Graphs

Pref

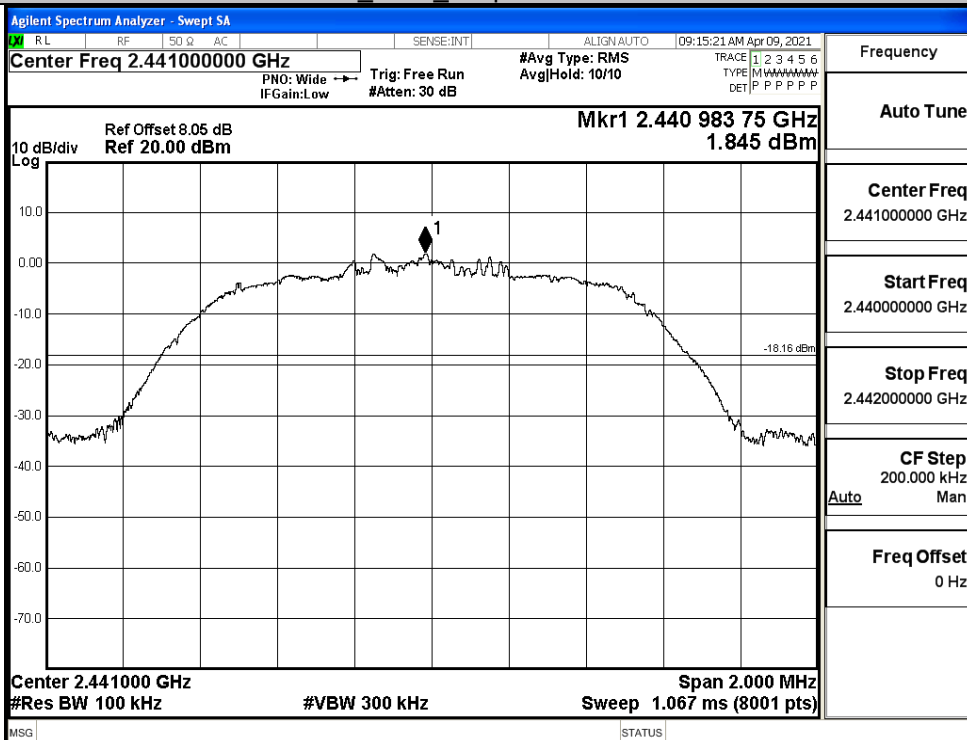


Puw

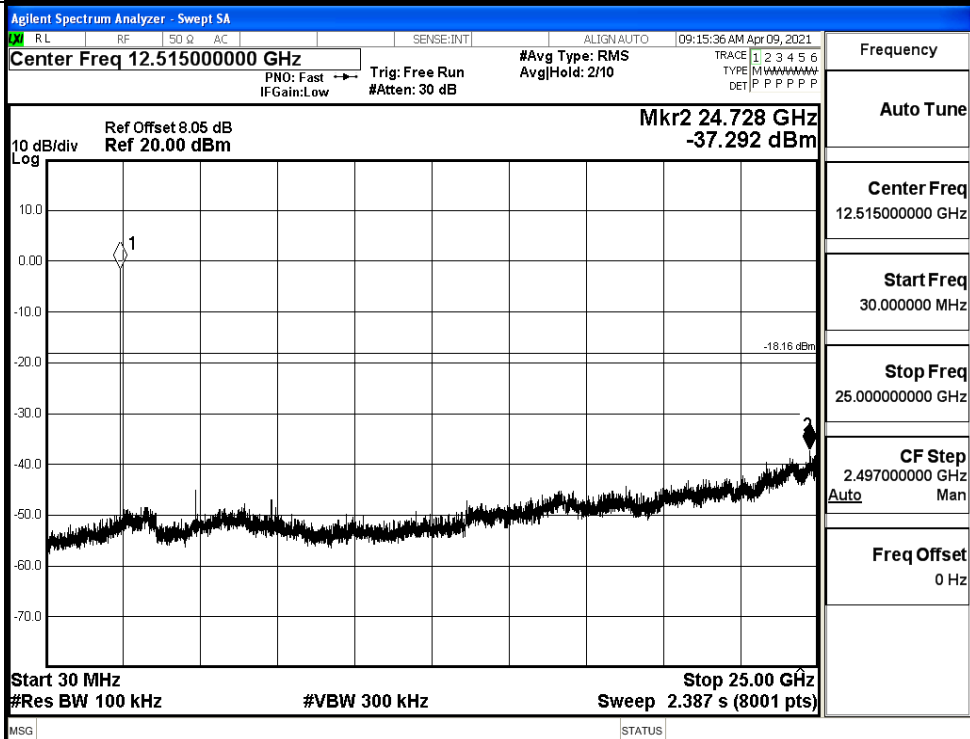


$\pi/4$ DQPSK_MCH_Graphs

Pref

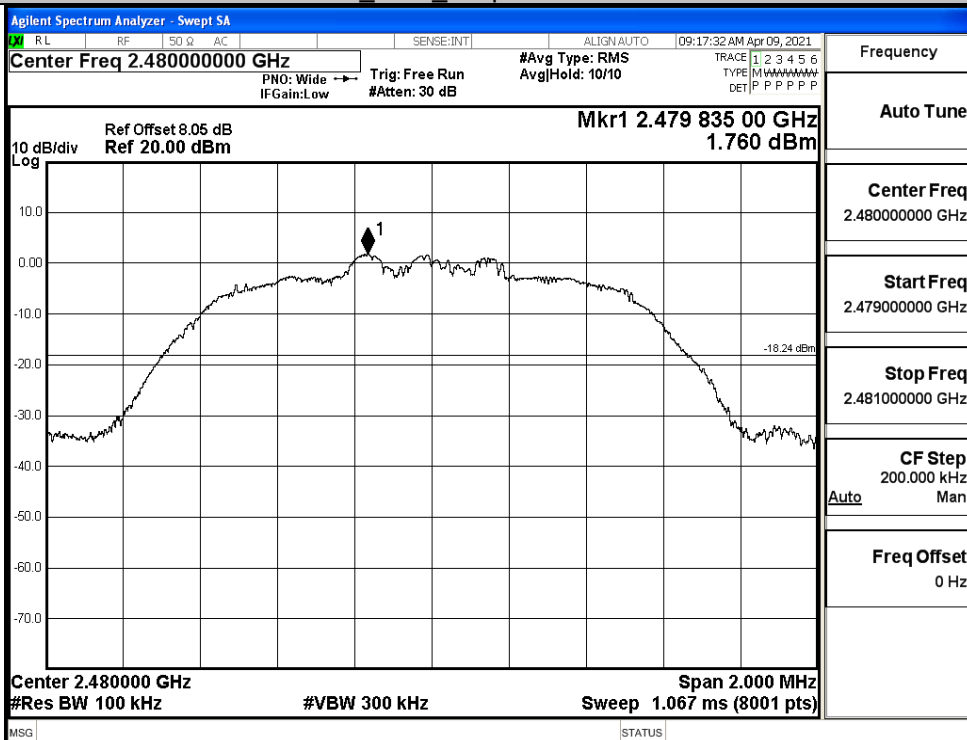


Puw

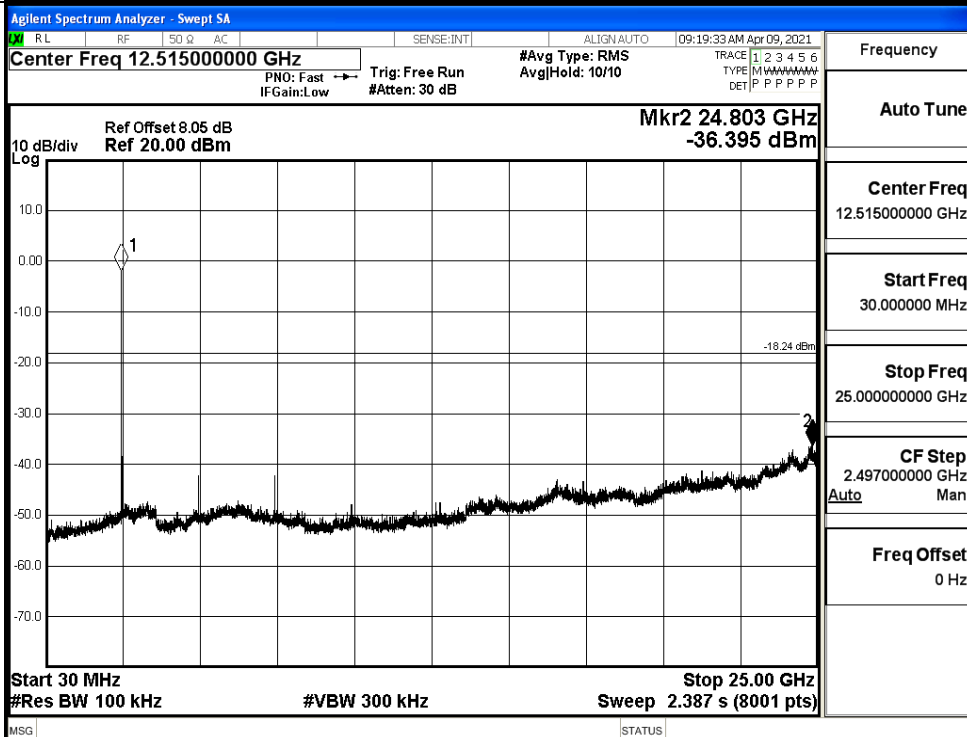


$\pi/4$ DQPSK_HCH_Graphs

Pref

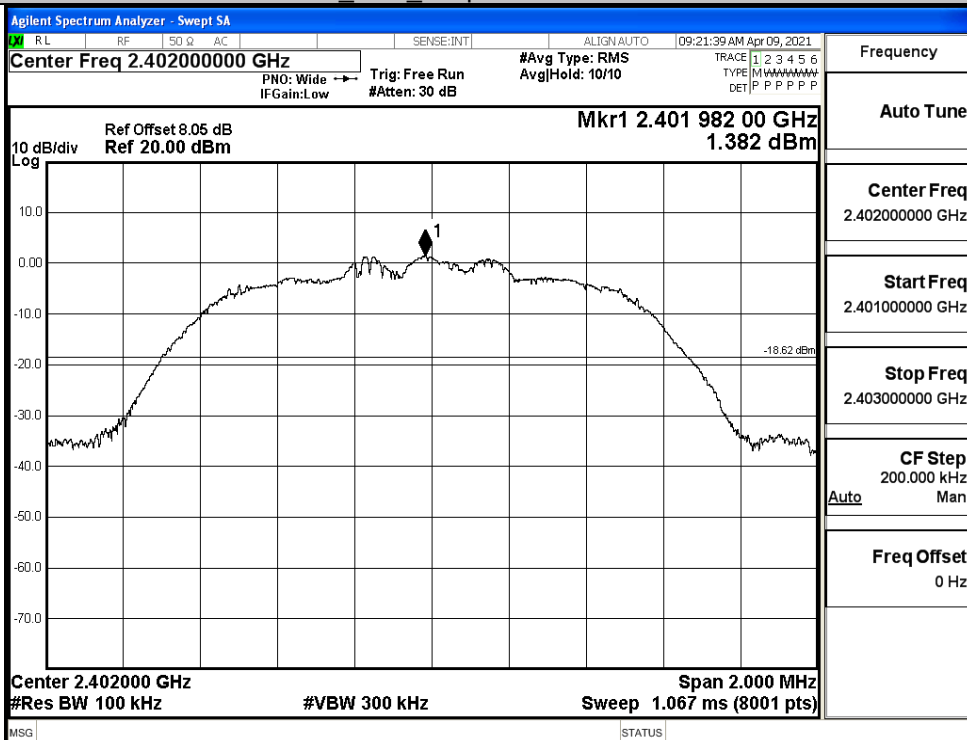


Puw

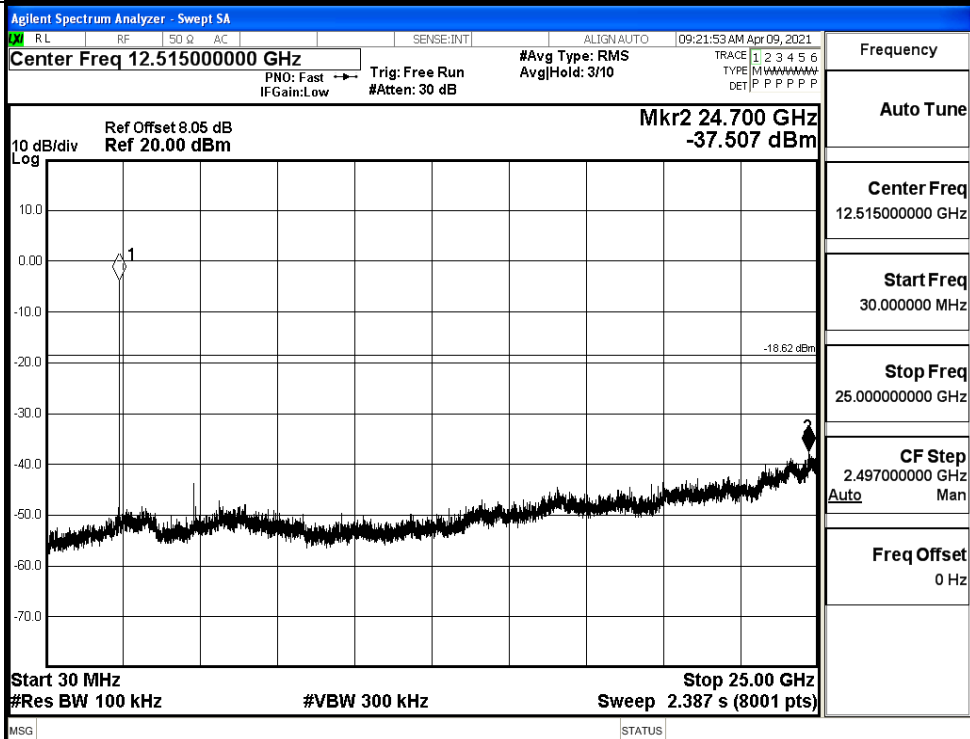


8DPSK_LCH_Graphs

Pref

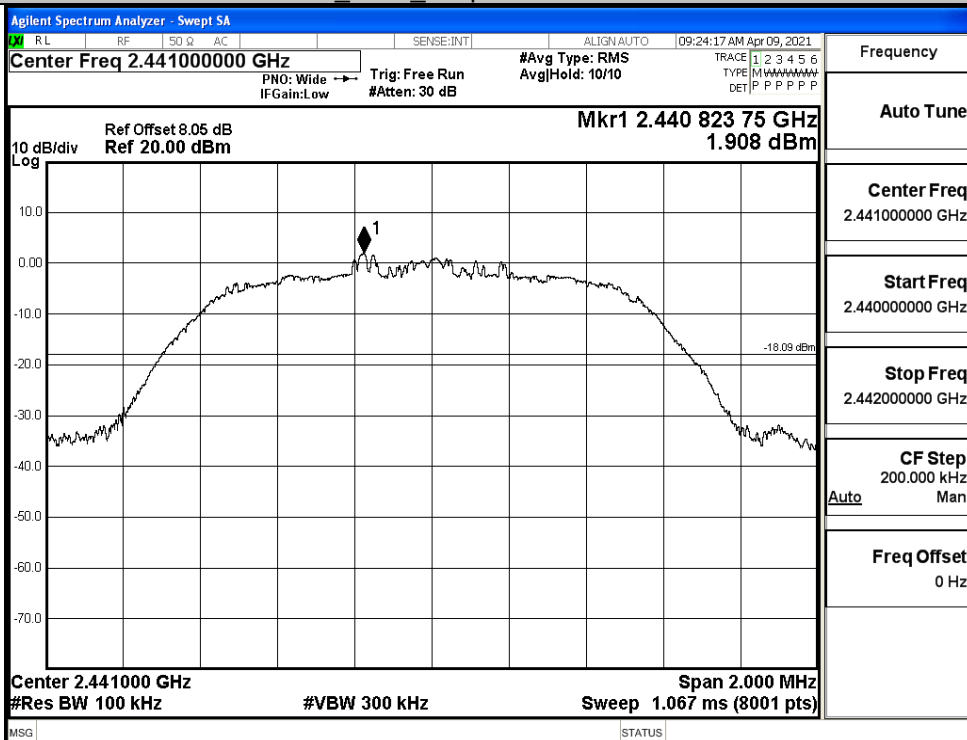


Puw

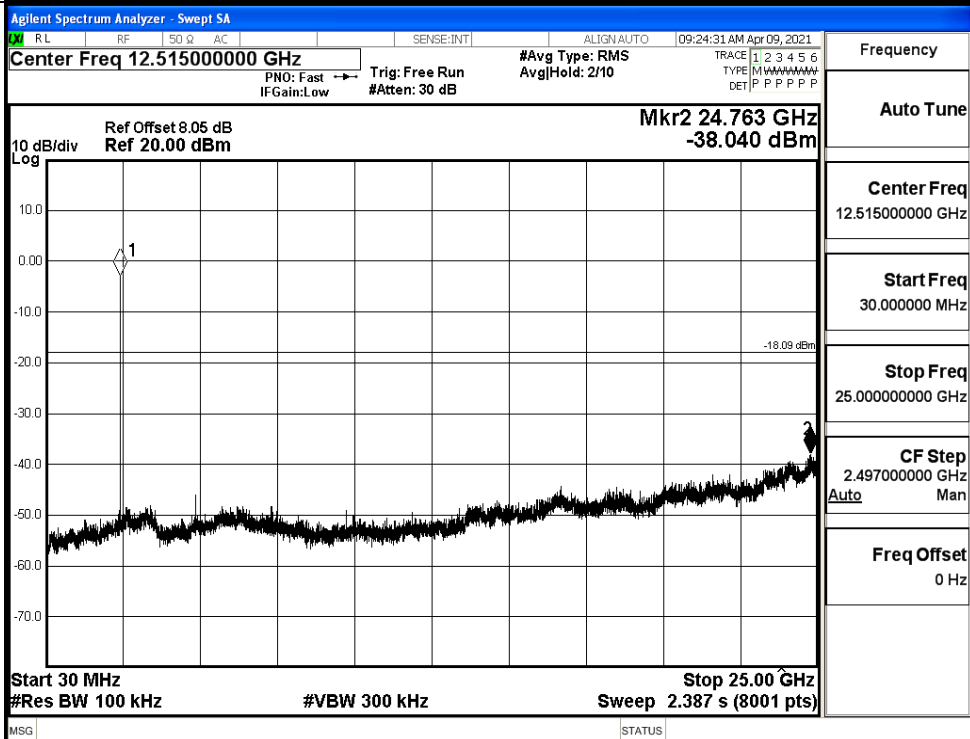


8DPSK_MCH_Graphs

Pref

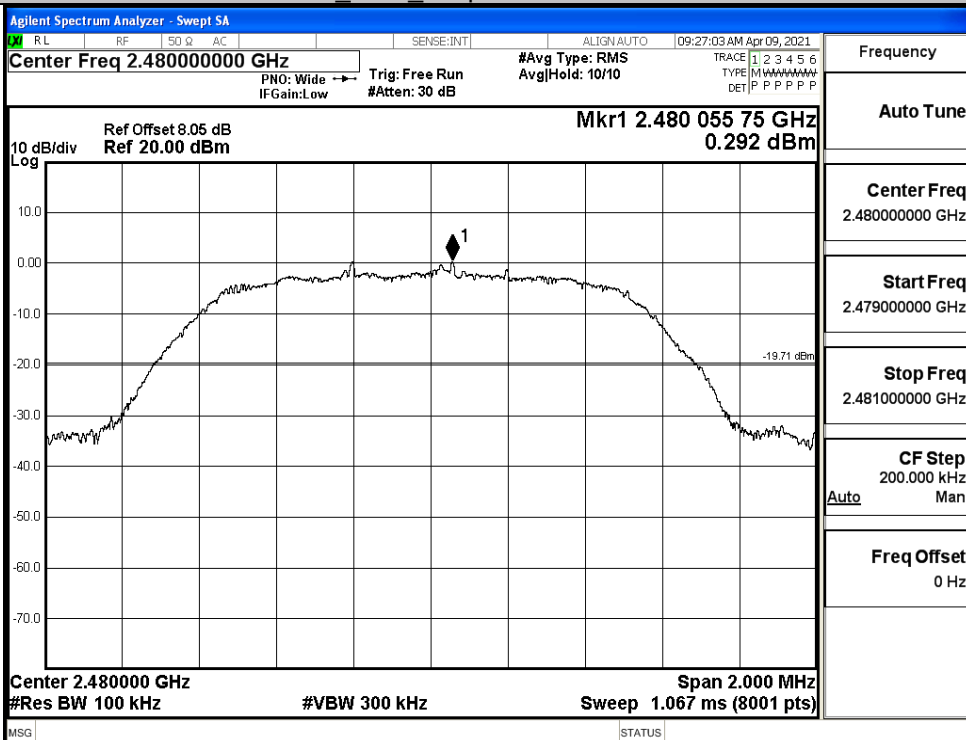


Puw

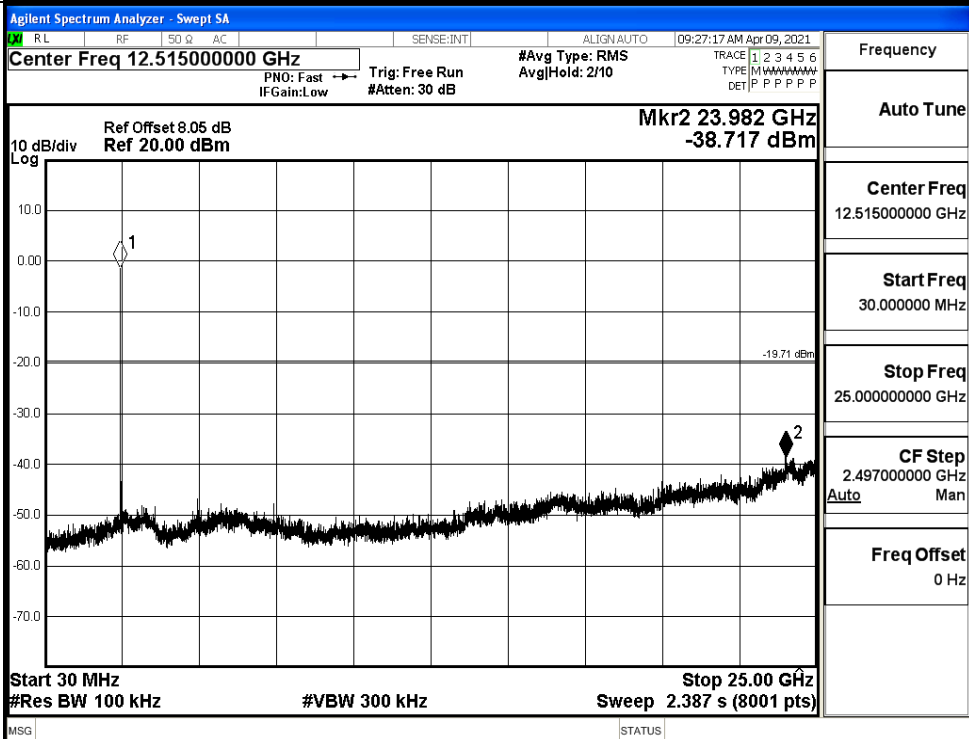


8DPSK_HCH_Graphs

Pref



Puw

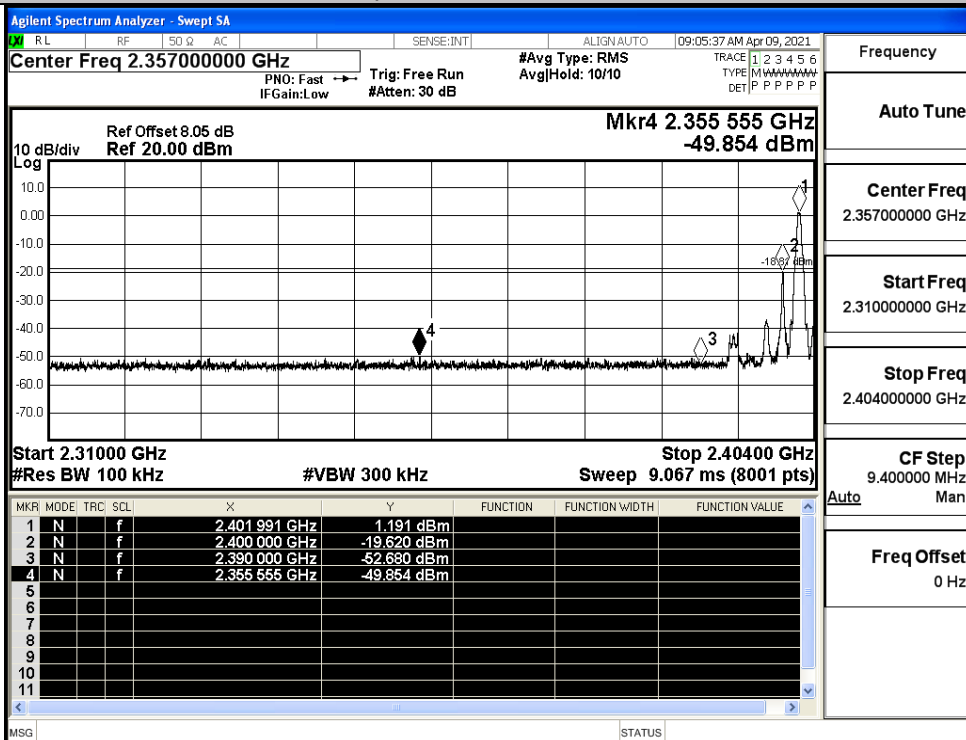


A.7 Band-edge for RF Conducted Emissions

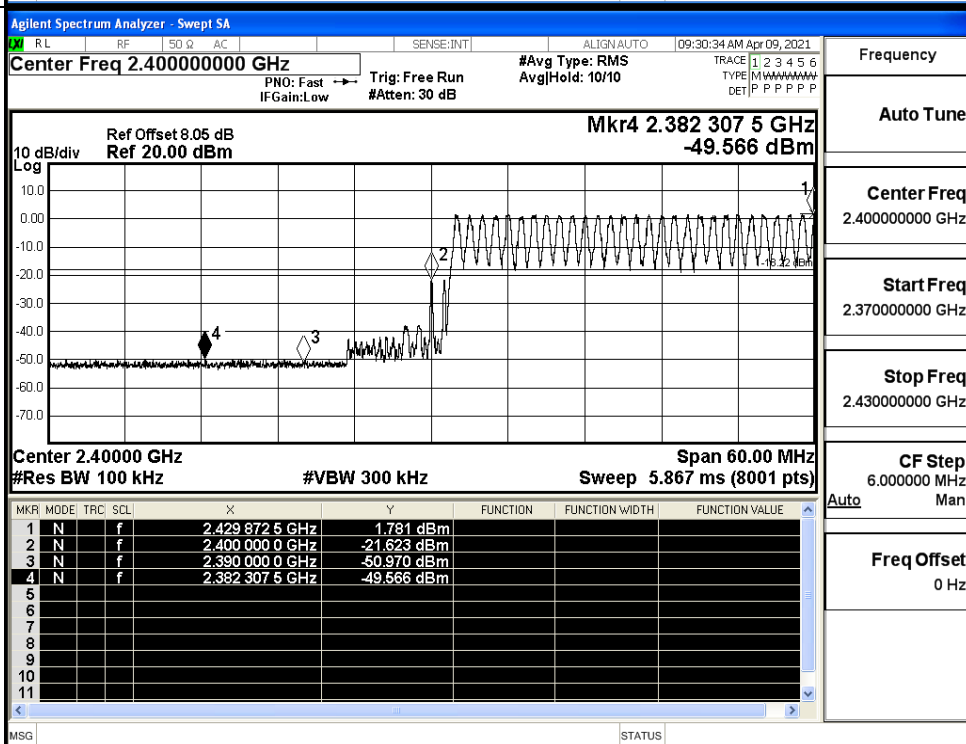
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	1.191	Off	-49.854	-18.81	PASS
			1.781	On	-49.566	-18.22	PASS
	HCH	2480	1.650	Off	-47.358	-18.35	PASS
			1.627	On	-48.109	-18.37	PASS
$\pi/4$ DQPSK	LCH	2402	1.365	Off	-49.891	-18.64	PASS
			1.907	On	-48.416	-18.09	PASS
	HCH	2480	1.669	Off	-48.413	-18.33	PASS
			1.794	On	-48.756	-18.21	PASS
8DPSK	LCH	2402	1.306	Off	-49.429	-18.69	PASS
			1.722	On	-47.160	-18.28	PASS
	HCH	2480	1.849	Off	-47.888	-18.15	PASS
			1.826	On	-48.344	-18.17	PASS

Test Graphs

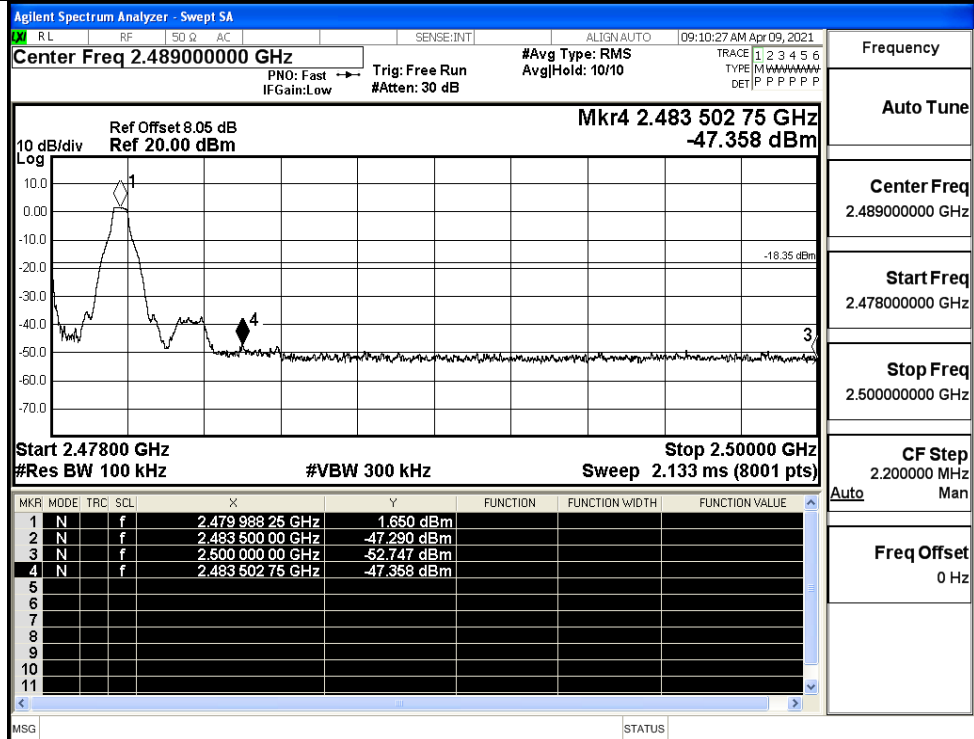
GFSK/LCH/No Hop



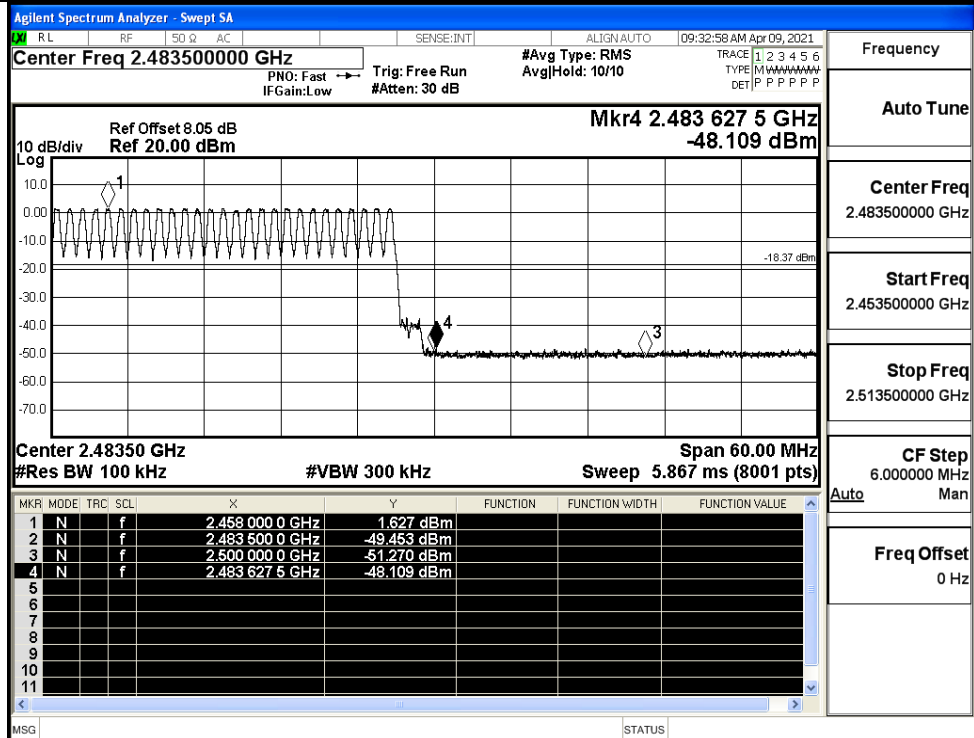
GFSK/LCH/Hop



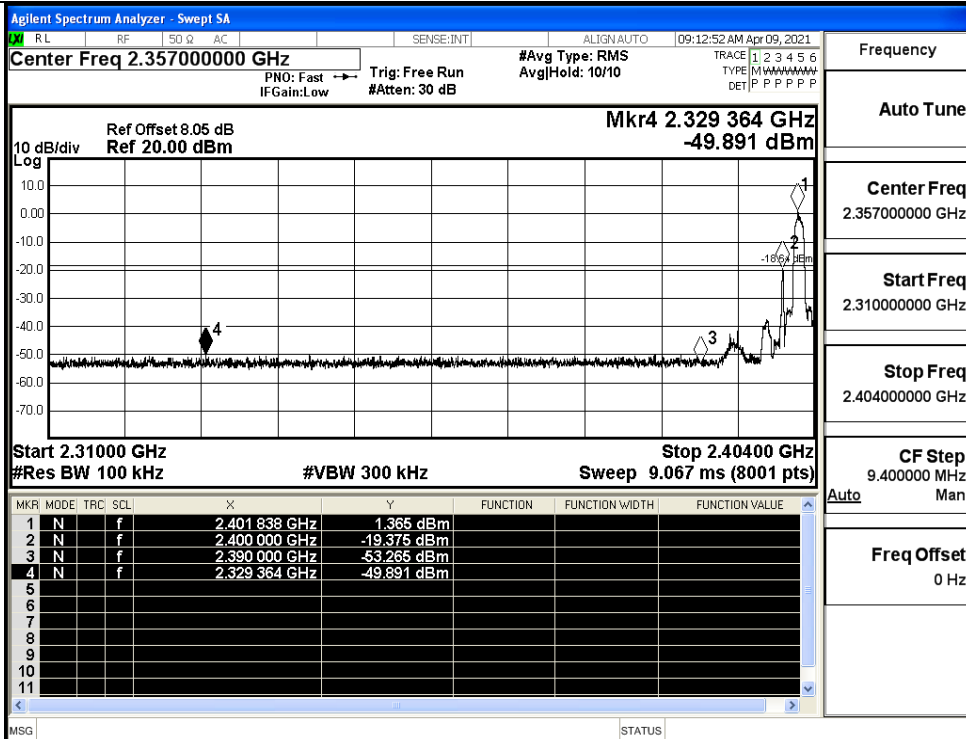
GFSK/HCH/No Hop



GFSK/HCH/Hop



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

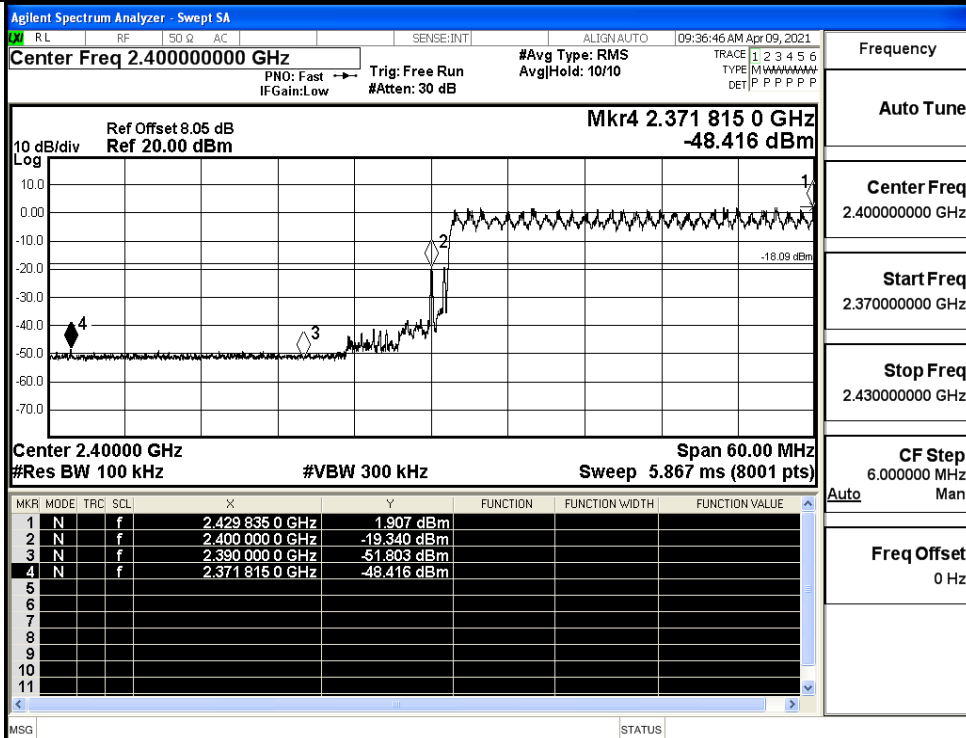


Frequency

Auto Tune

Center Freq
2.357000000 GHzStart Freq
2.310000000 GHzStop Freq
2.404000000 GHzCF Step
9.400000 MHz
Auto ManFreq Offset
0 Hz

$\pi/4$ DQPSK/LCH/Hop

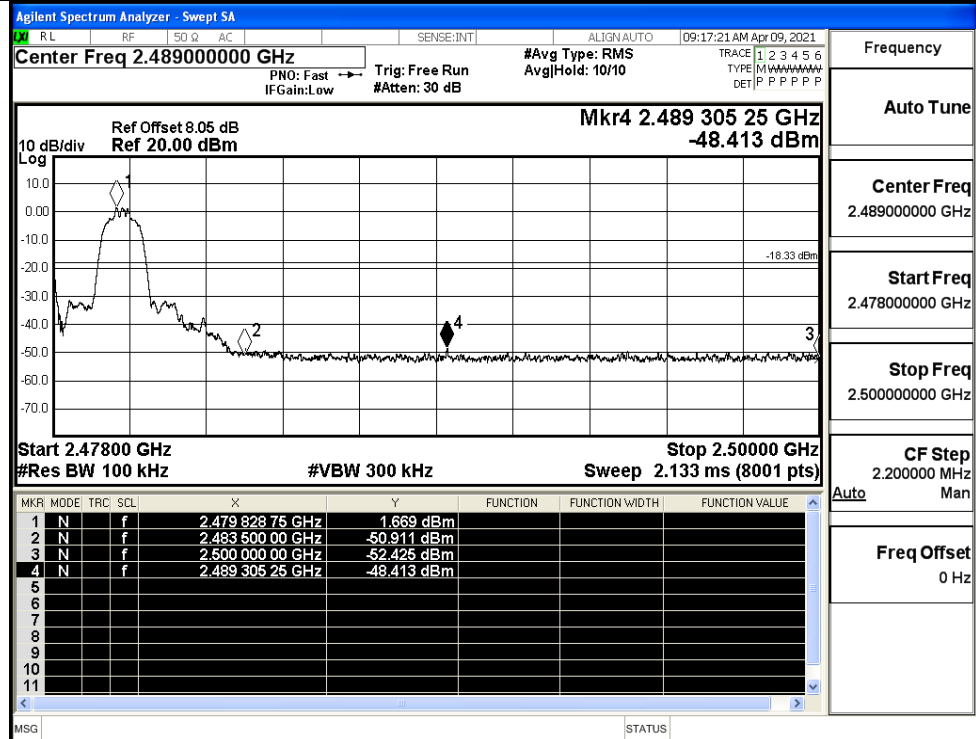


Frequency

Auto Tune

Center Freq
2.400000000 GHzStart Freq
2.370000000 GHzStop Freq
2.430000000 GHzCF Step
6.000000 MHz
Auto ManFreq Offset
0 Hz

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



Frequency

Auto Tune

Center Freq
2.489000000 GHz

Start Freq
2.478000000 GHz

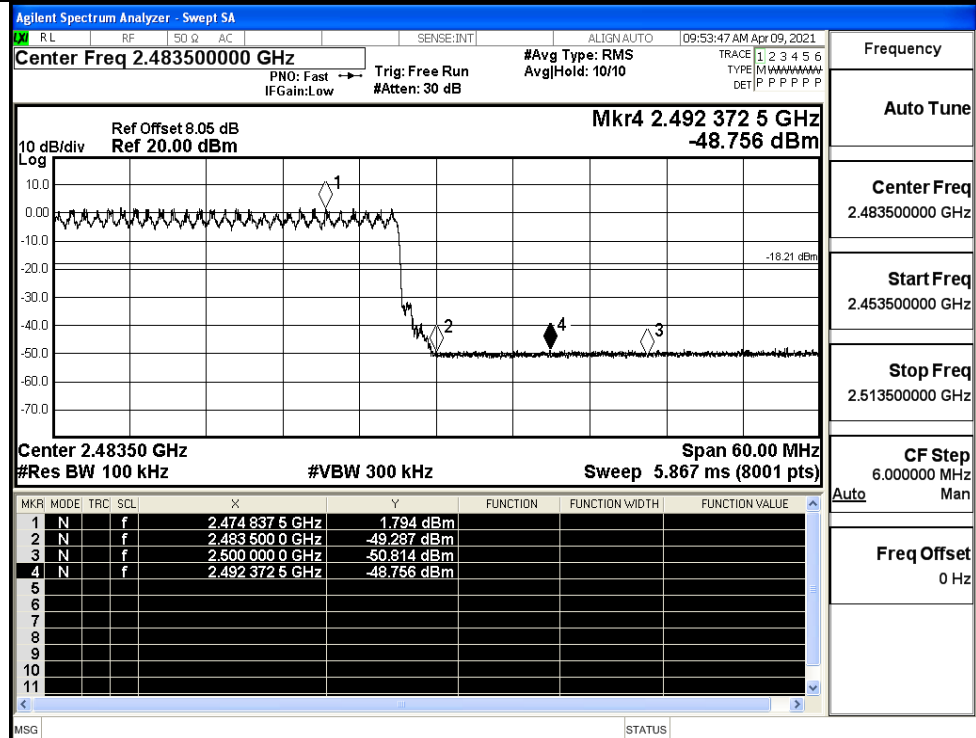
Stop Freq
2.500000000 GHz

CF Step
2.200000 MHz

Auto Man

Freq Offset
0 Hz

$\pi/4$ DQPSK/HCH/Hop



Frequency

Auto Tune

Center Freq
2.483500000 GHz

Start Freq
2.453500000 GHz

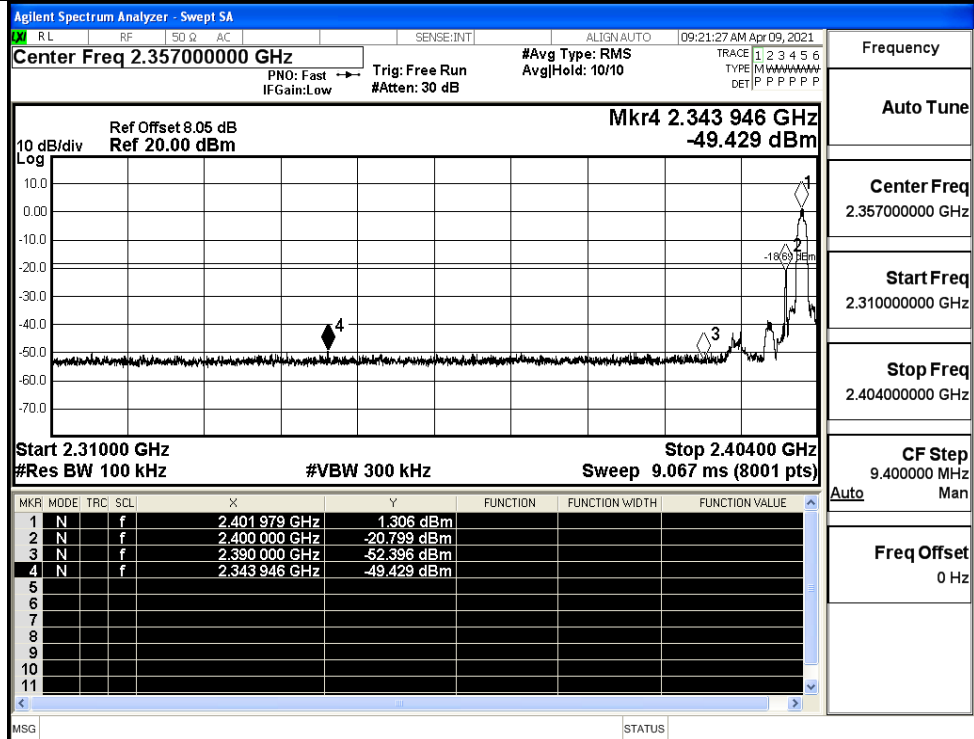
Stop Freq
2.513500000 GHz

CF Step
6.000000 MHz

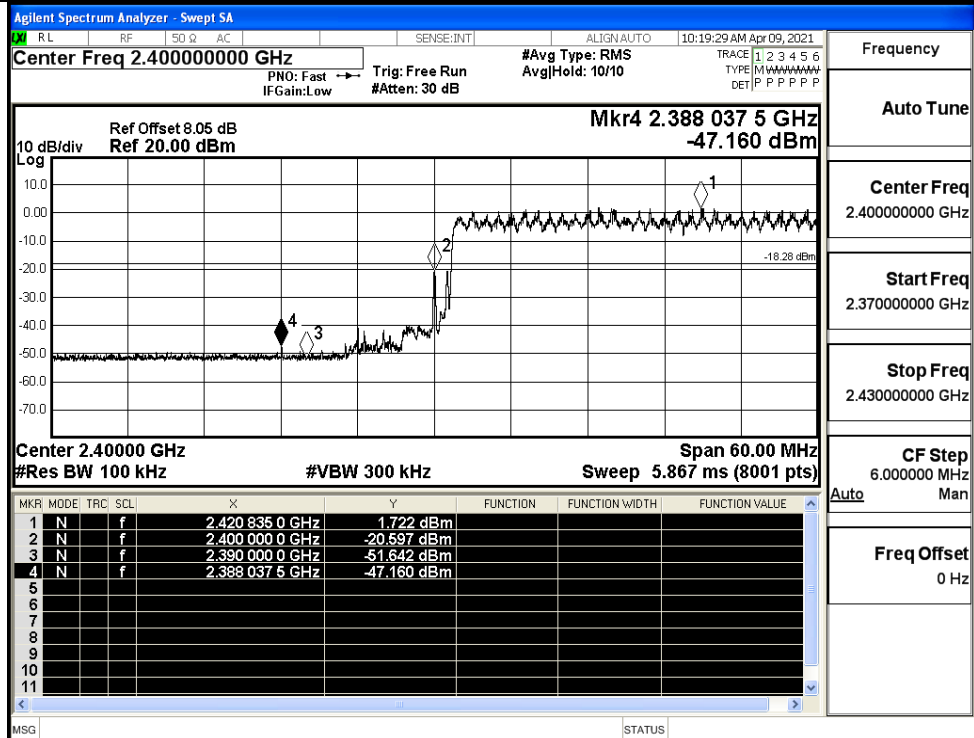
Auto Man

Freq Offset
0 Hz

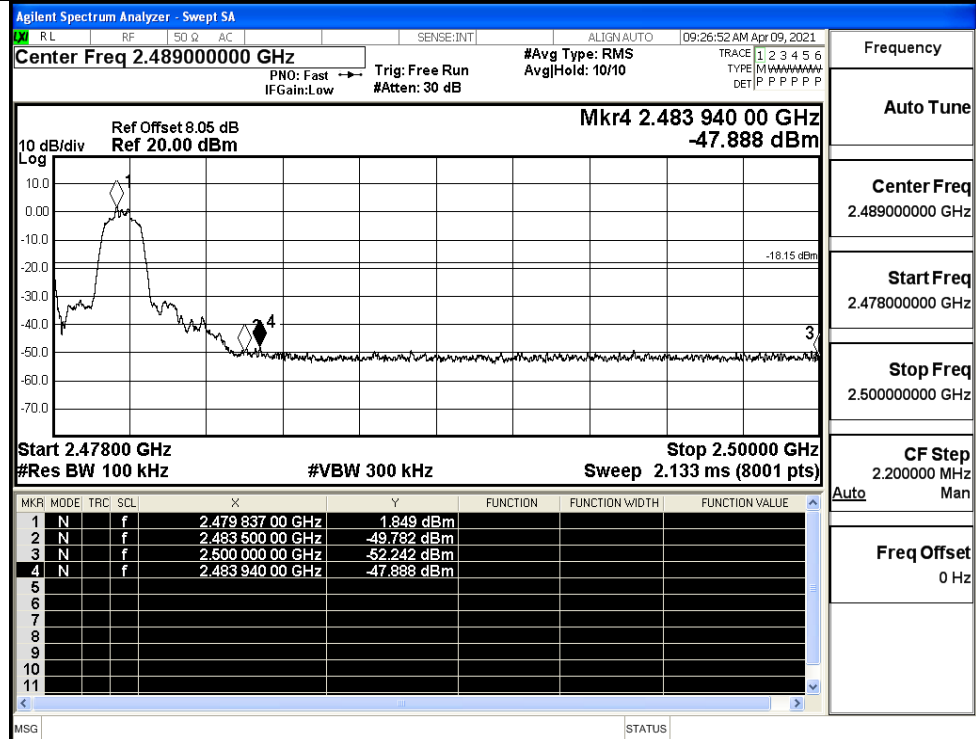
8DPSK/LCH/No Hop



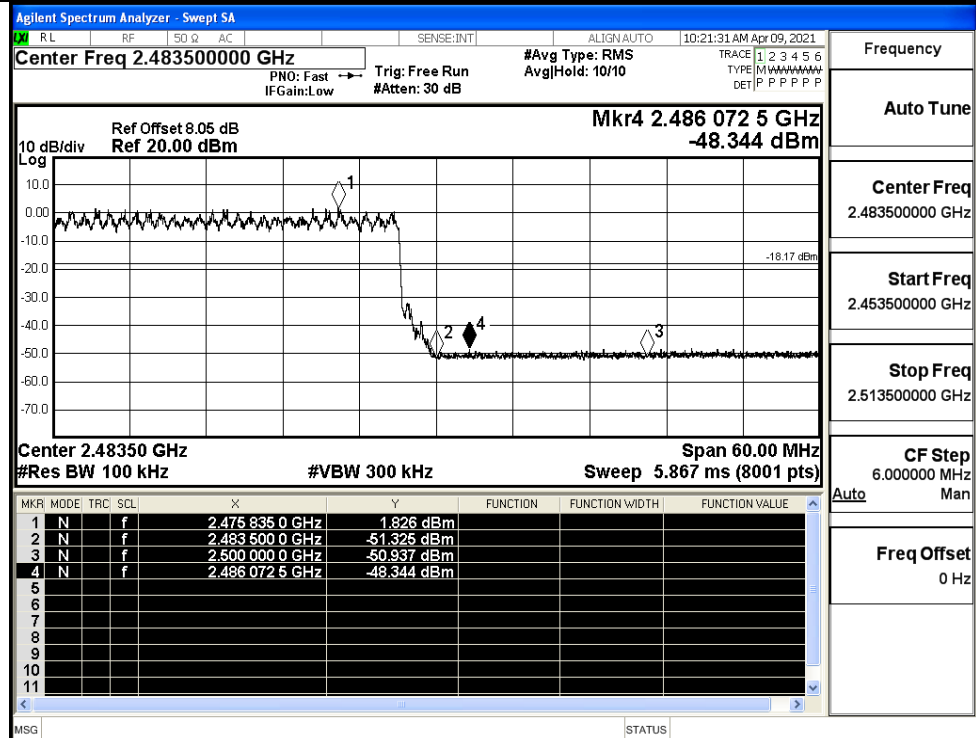
8DPSK/LCH/Hop



8DPSK/HCH/No Hop



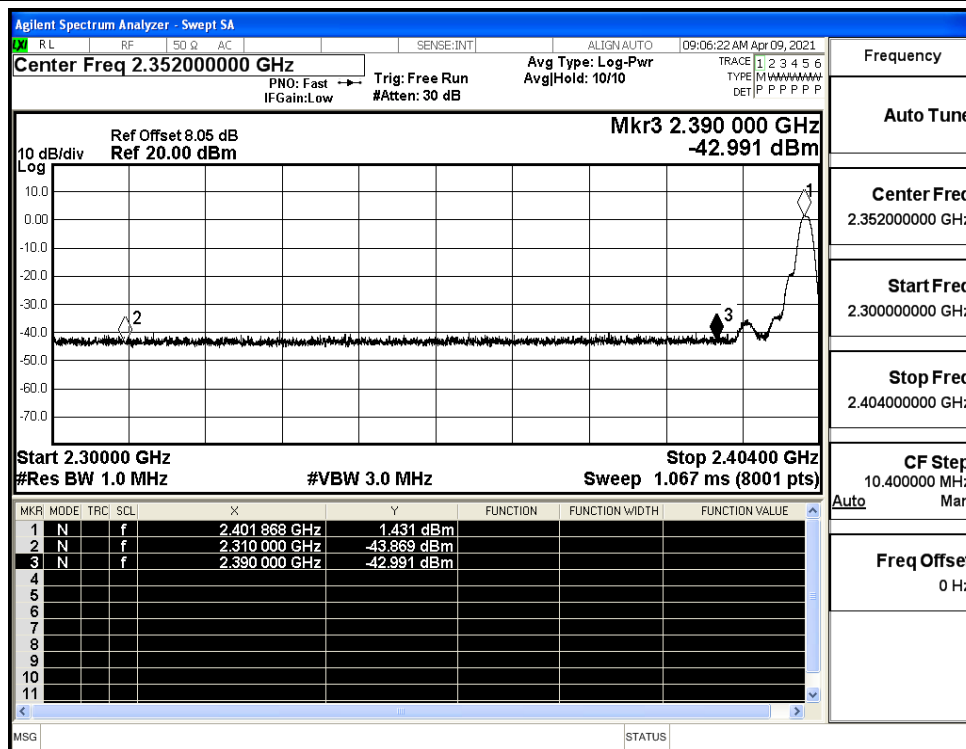
8DPSK/HCH/Hop



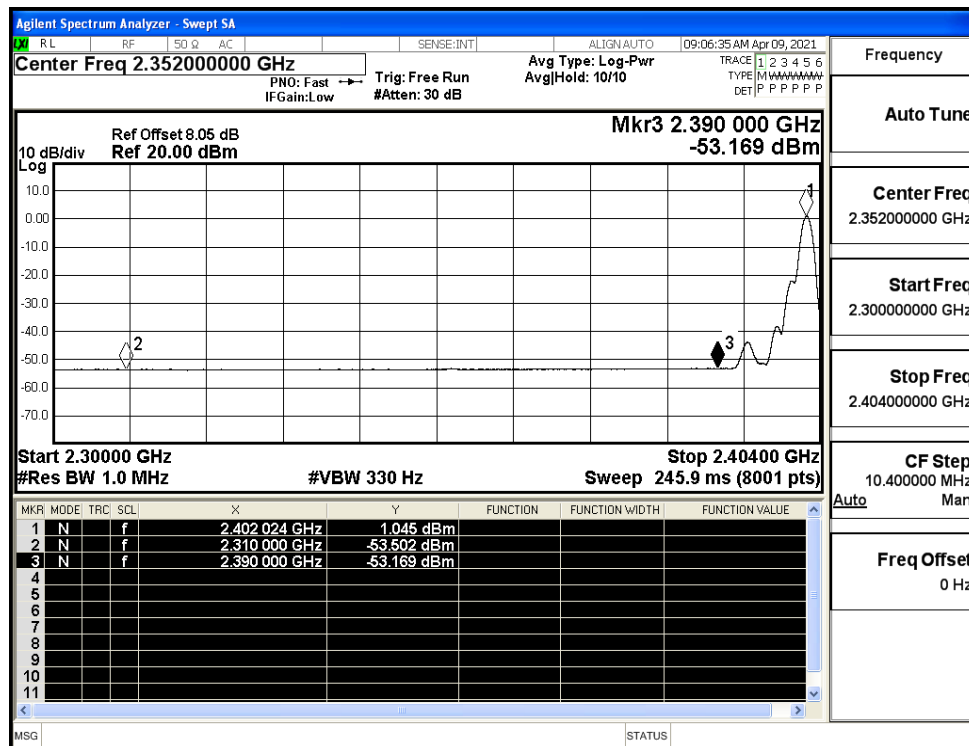
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.87	2.0	0	53.36	PEAK	74	PASS
	Off	2310.0	-53.50	2.0	0	43.73	AV	54	PASS
	Off	2390.0	-42.99	2.0	0	54.24	PEAK	74	PASS
	Off	2390.0	-53.17	2.0	0	44.06	AV	54	PASS
	Off	2483.5	-39.81	2.0	0	57.42	PEAK	74	PASS
	Off	2483.5	-49.45	2.0	0	47.78	AV	54	PASS
	Off	2500.0	-42.23	2.0	0	55.00	PEAK	74	PASS
	Off	2500.0	-52.38	2.0	0	44.85	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-42.02	2.0	0	55.21	PEAK	74	PASS
	Off	2310.0	-53.51	2.0	0	43.72	AV	54	PASS
	Off	2390.0	-43.03	2.0	0	54.20	PEAK	74	PASS
	Off	2390.0	-53.07	2.0	0	44.16	AV	54	PASS
	Off	2483.5	-40.37	2.0	0	56.86	PEAK	74	PASS
	Off	2483.5	-49.46	2.0	0	47.77	AV	54	PASS
	Off	2500.0	-41.75	2.0	0	55.48	PEAK	74	PASS
	Off	2500.0	-52.32	2.0	0	44.91	AV	54	PASS
8DPSK	Off	2310.0	-43.12	2.0	0	54.11	PEAK	74	PASS
	Off	2310.0	-53.28	2.0	0	43.95	AV	54	PASS
	Off	2390.0	-42.83	2.0	0	54.40	PEAK	74	PASS
	Off	2390.0	-53.03	2.0	0	44.20	AV	54	PASS
	Off	2483.5	-39.38	2.0	0	57.85	PEAK	74	PASS
	Off	2483.5	-49.34	2.0	0	47.89	AV	54	PASS
	Off	2500.0	-41.94	2.0	0	55.29	PEAK	74	PASS
	Off	2500.0	-52.40	2.0	0	44.83	AV	54	PASS

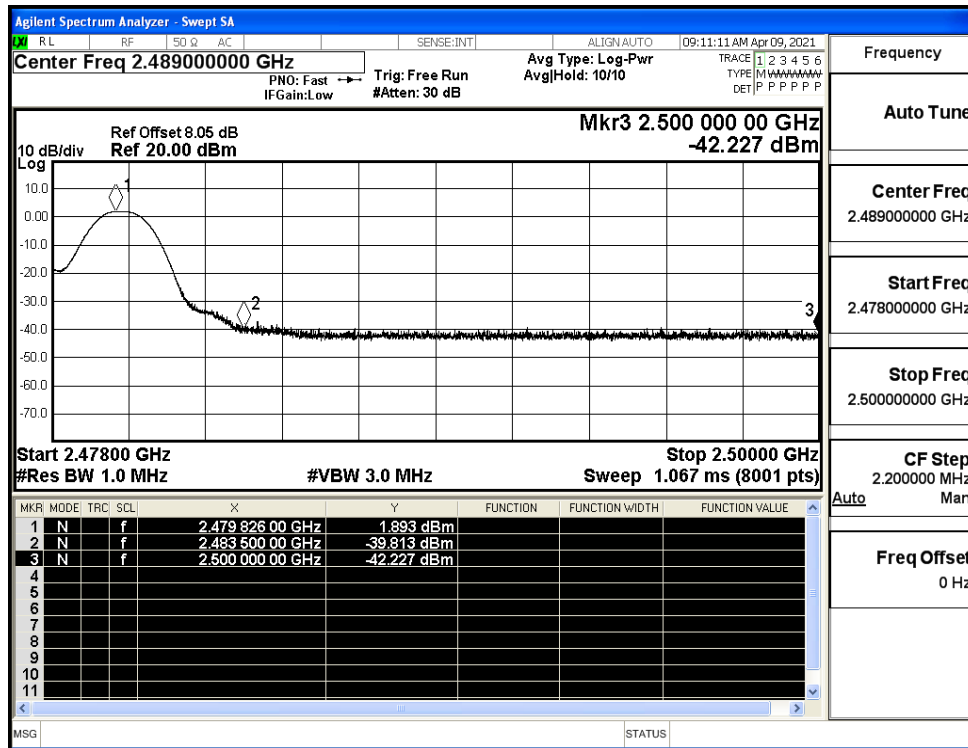
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



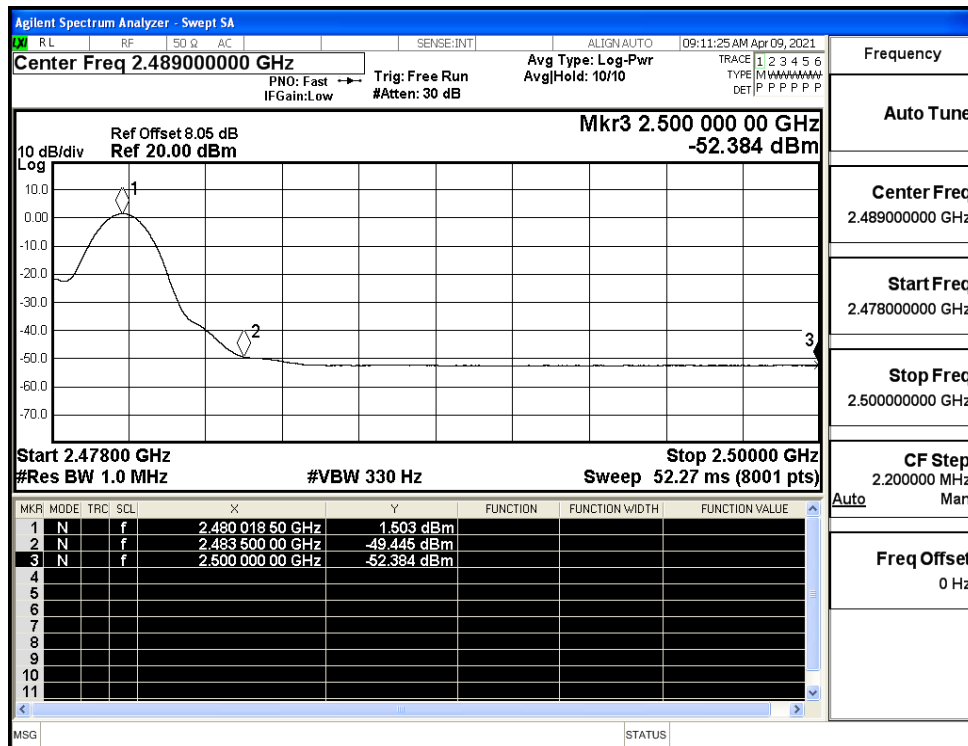
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)

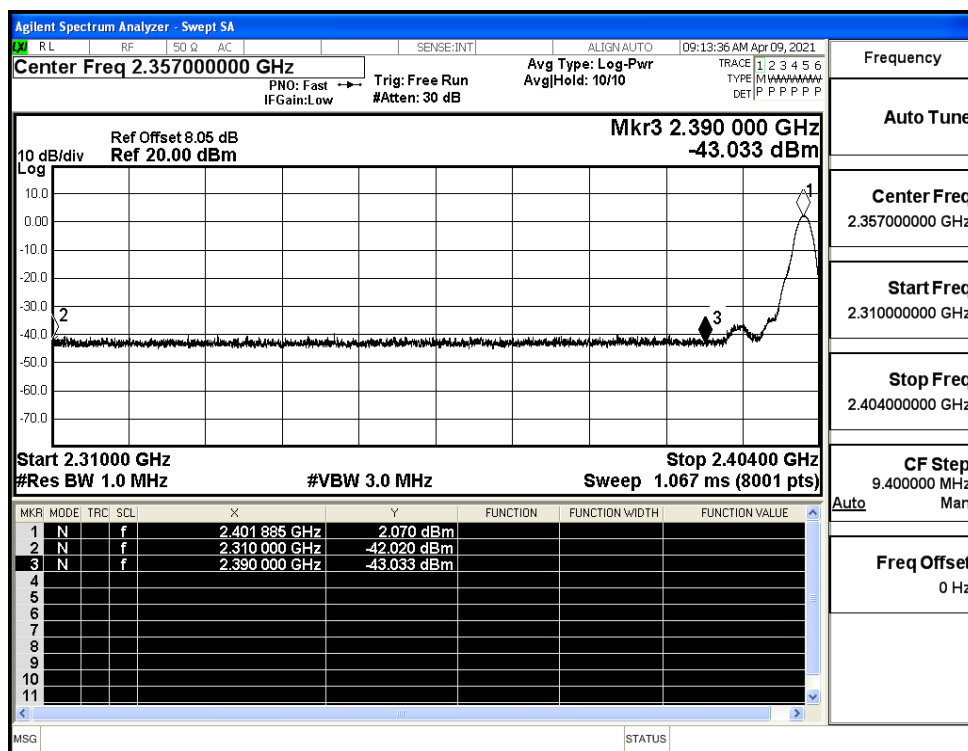
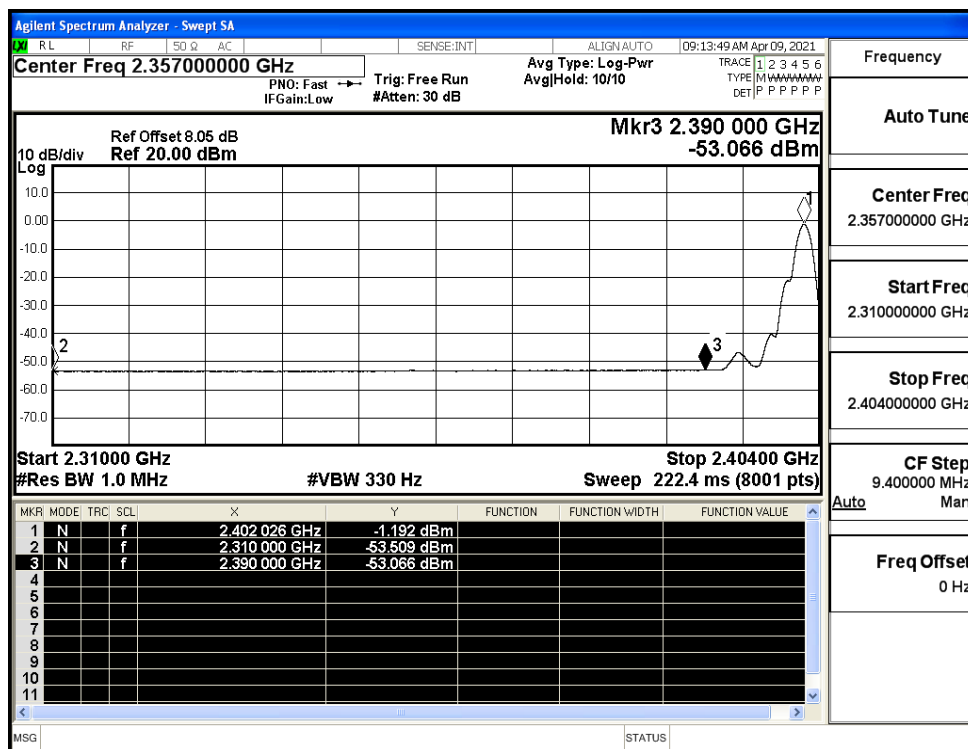


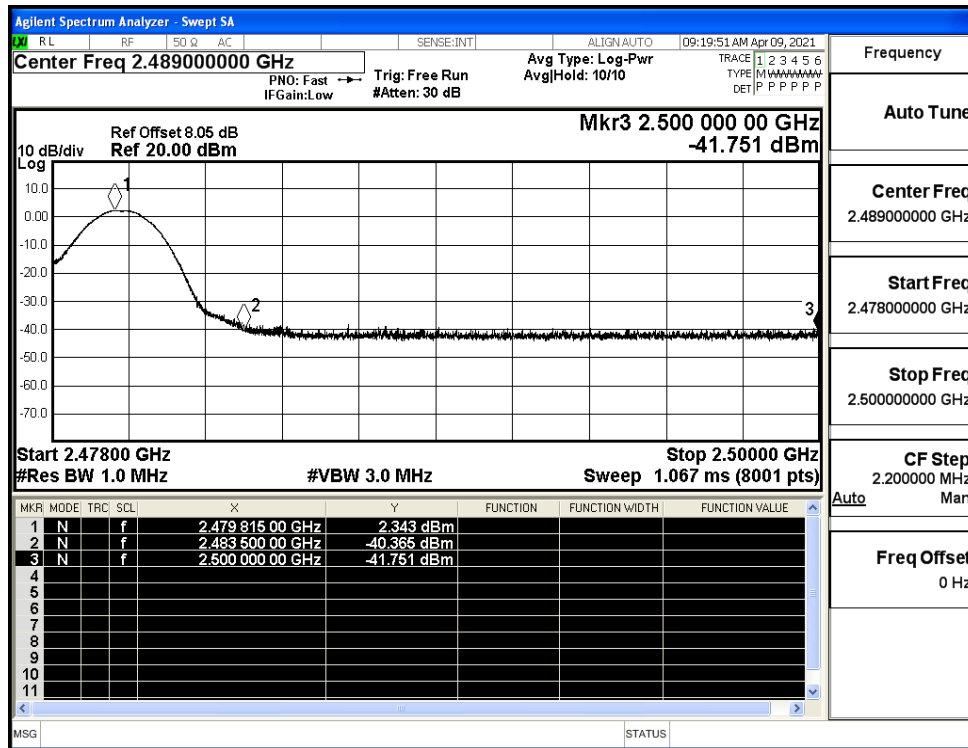
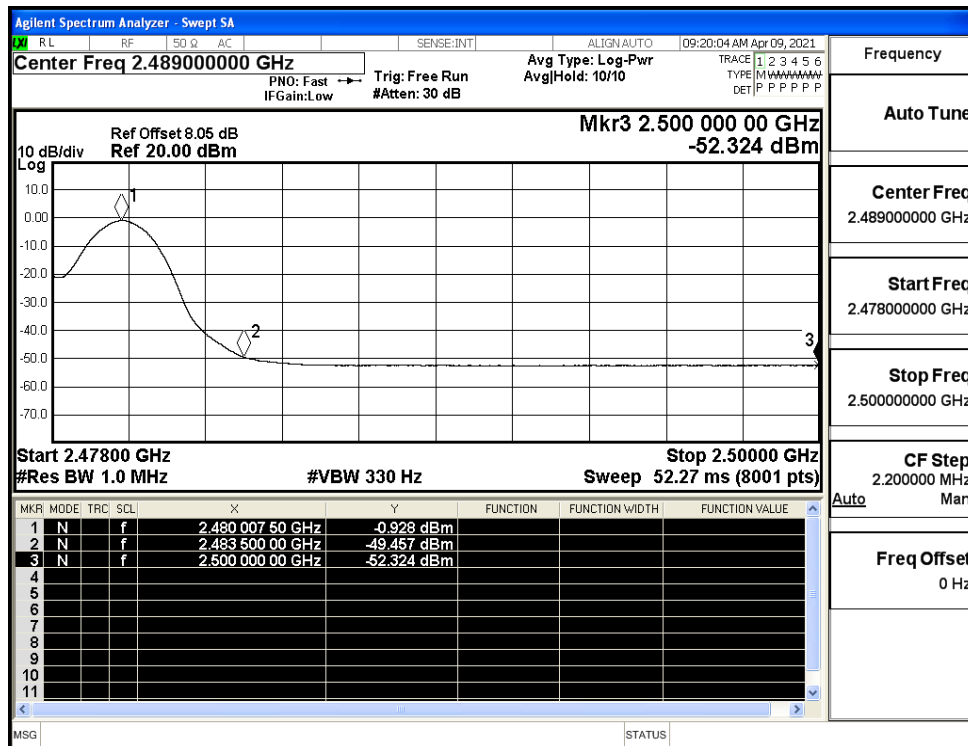
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



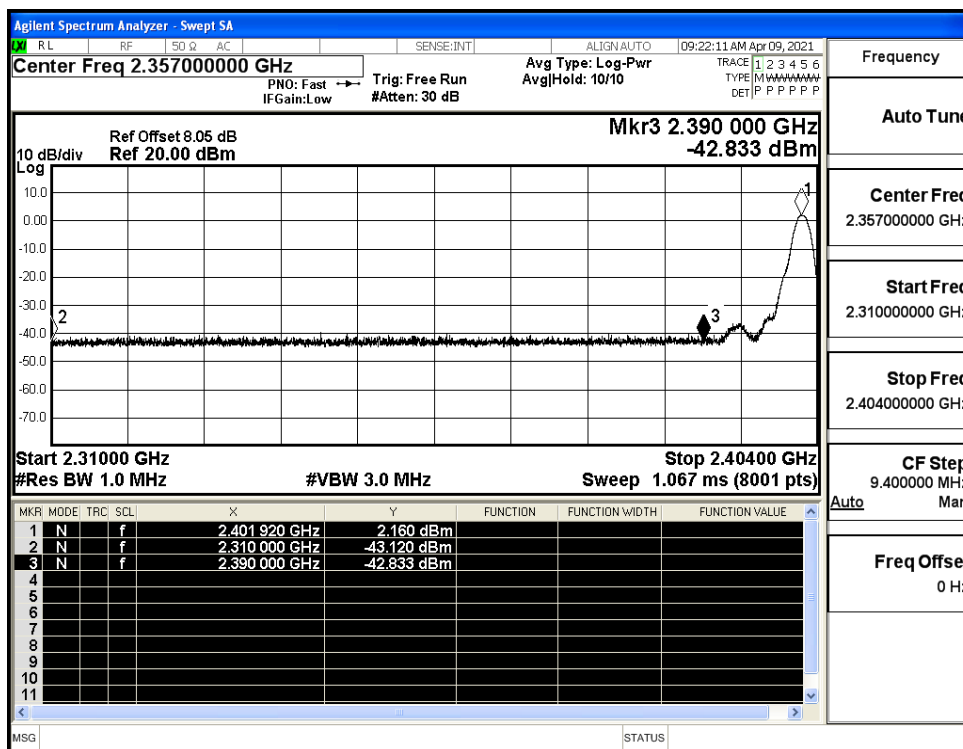
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



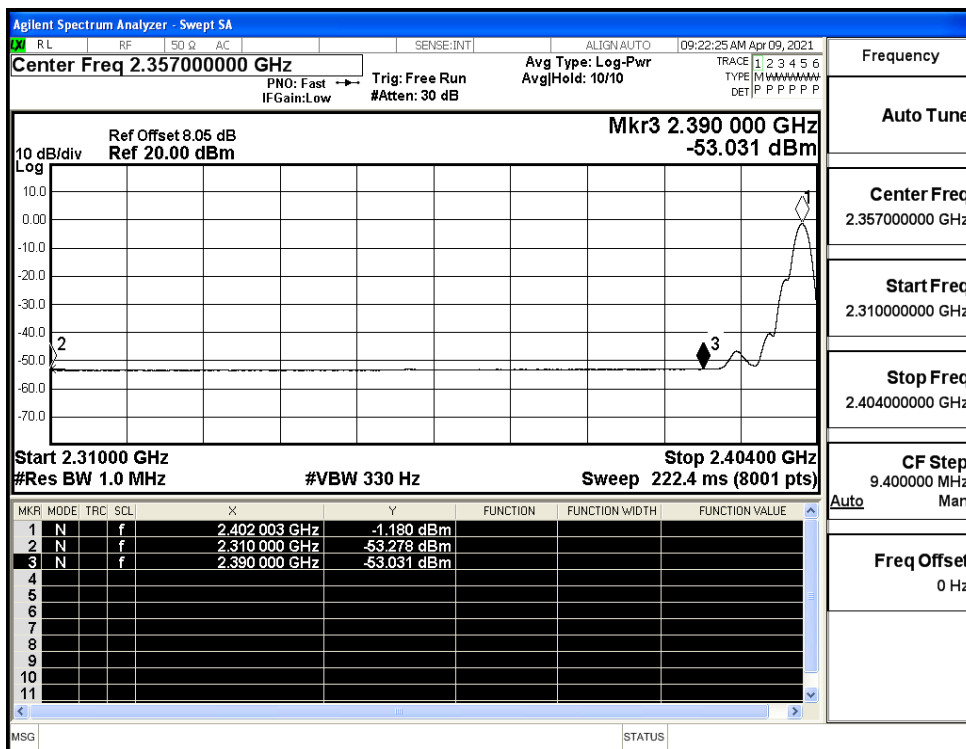
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)

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)

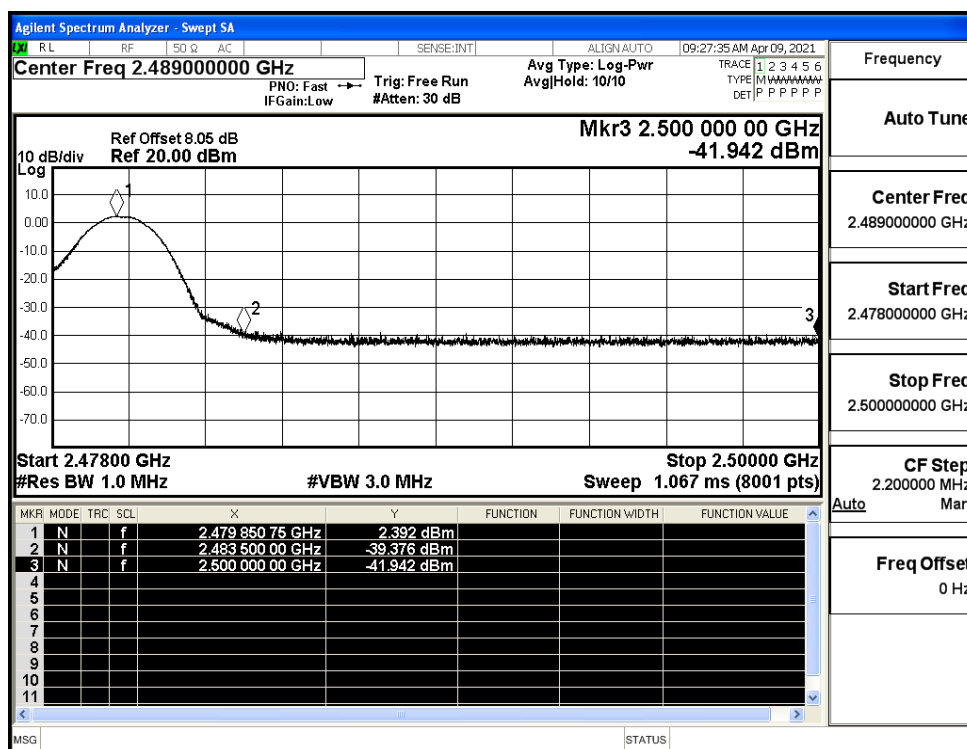
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

