

Appendix A

RF Test Data for BT V5.0(DSS) (Conducted Measurement)

Product Name: Wireless Sport Earbuds

Trade Mark: N/A

Test Model: X181

Environmental Conditions

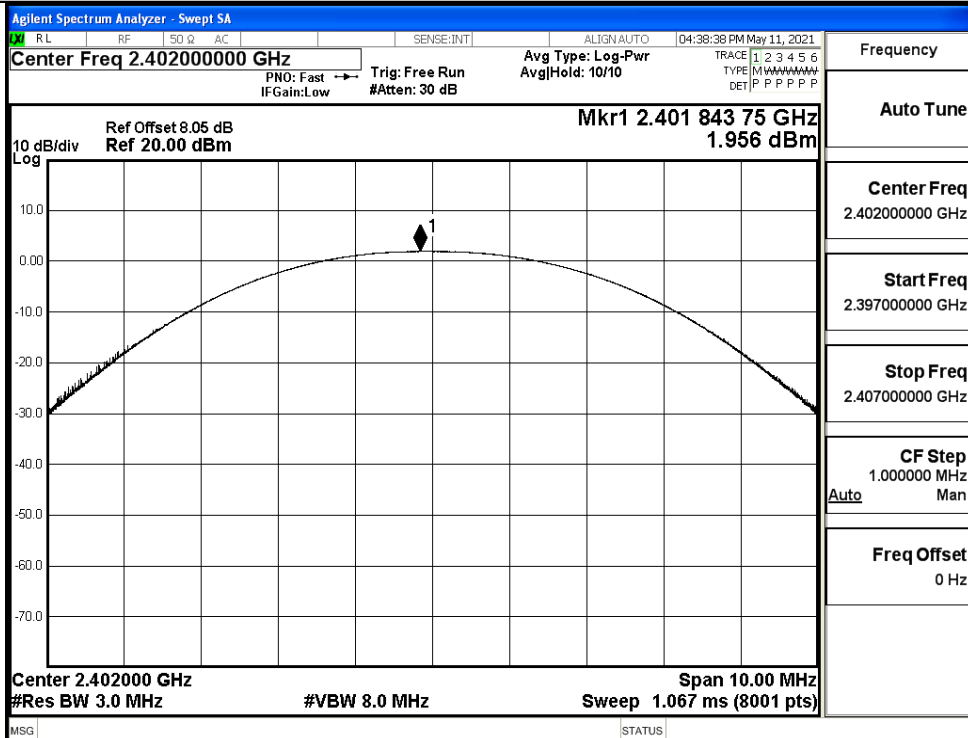
Temperature:	24.6 ° C
Relative Humidity:	54.1%
ATM Pressure:	100.0 kPa
Test Engineer:	Jay Li
Supervised by:	Li Huan

A.1 Maximum Conducted Peak Output Power

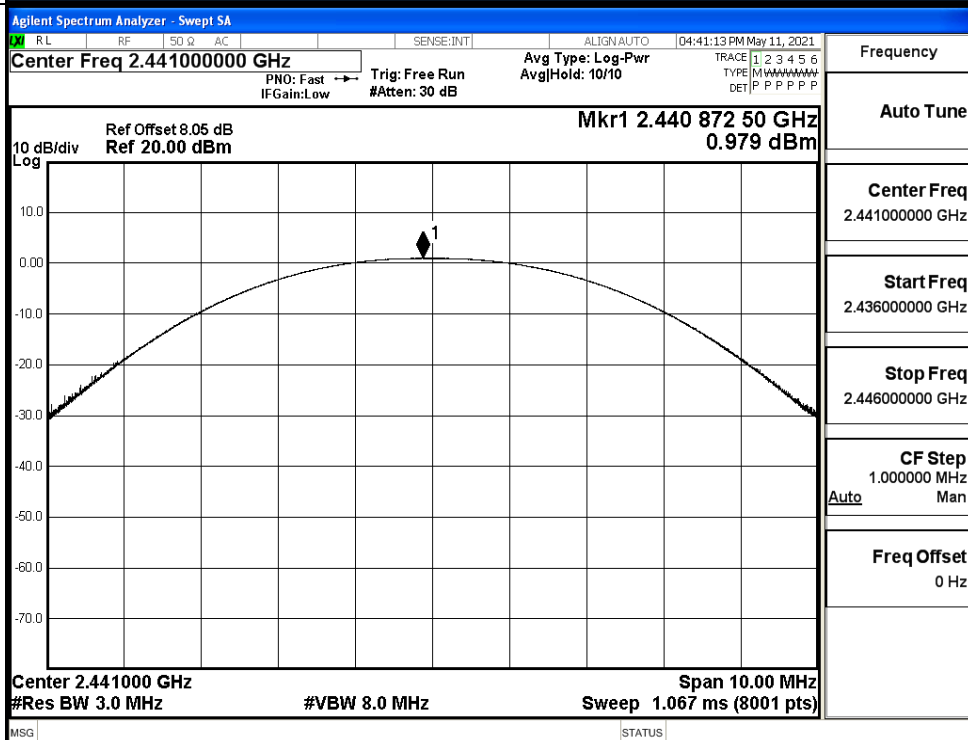
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.956	21	PASS
	MCH	0.979	21	PASS
	HCH	-0.218	21	PASS
$\pi/4$ DQPSK	LCH	4.156	21	PASS
	MCH	3.296	21	PASS
	HCH	2.051	21	PASS
8DPSK	LCH	4.690	21	PASS
	MCH	3.834	21	PASS
	HCH	2.589	21	PASS

Test Graphs

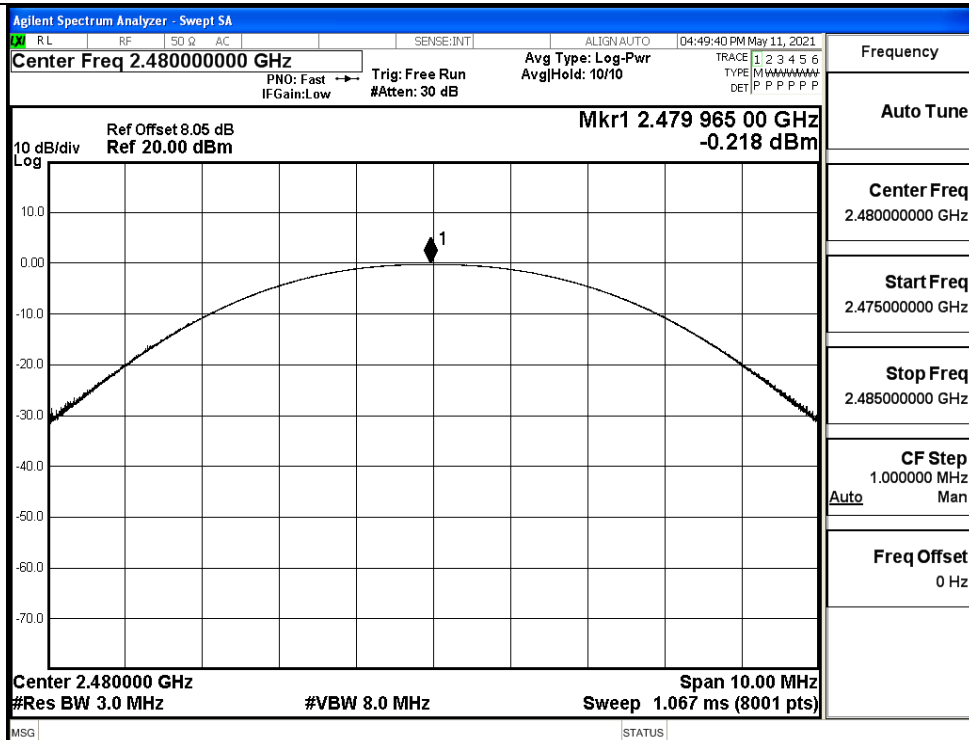
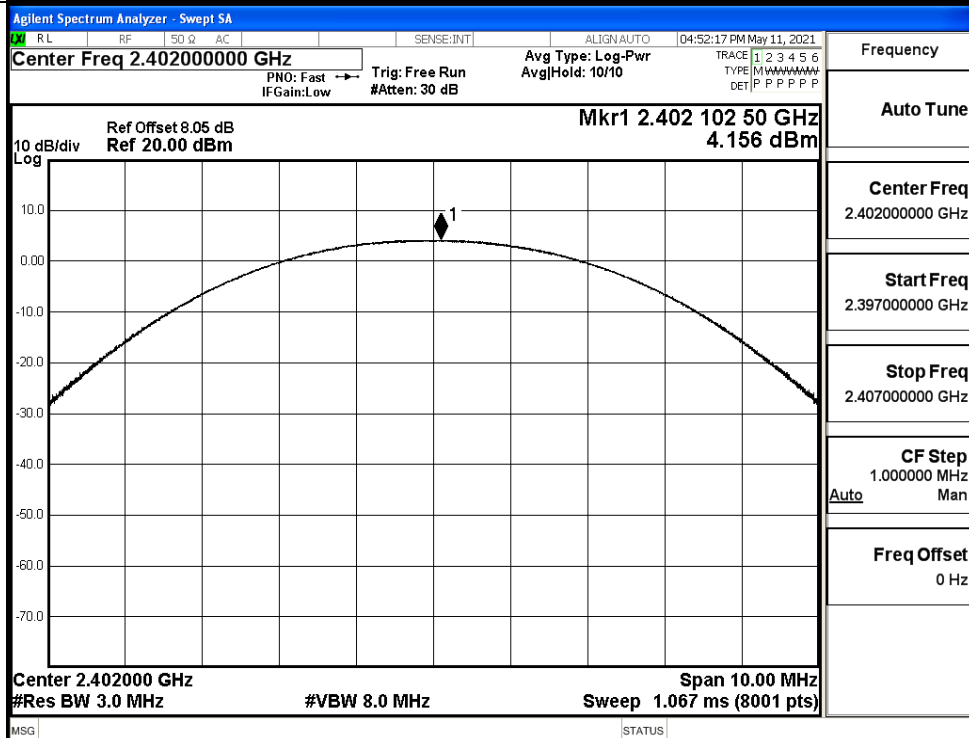
GFSK/LCH

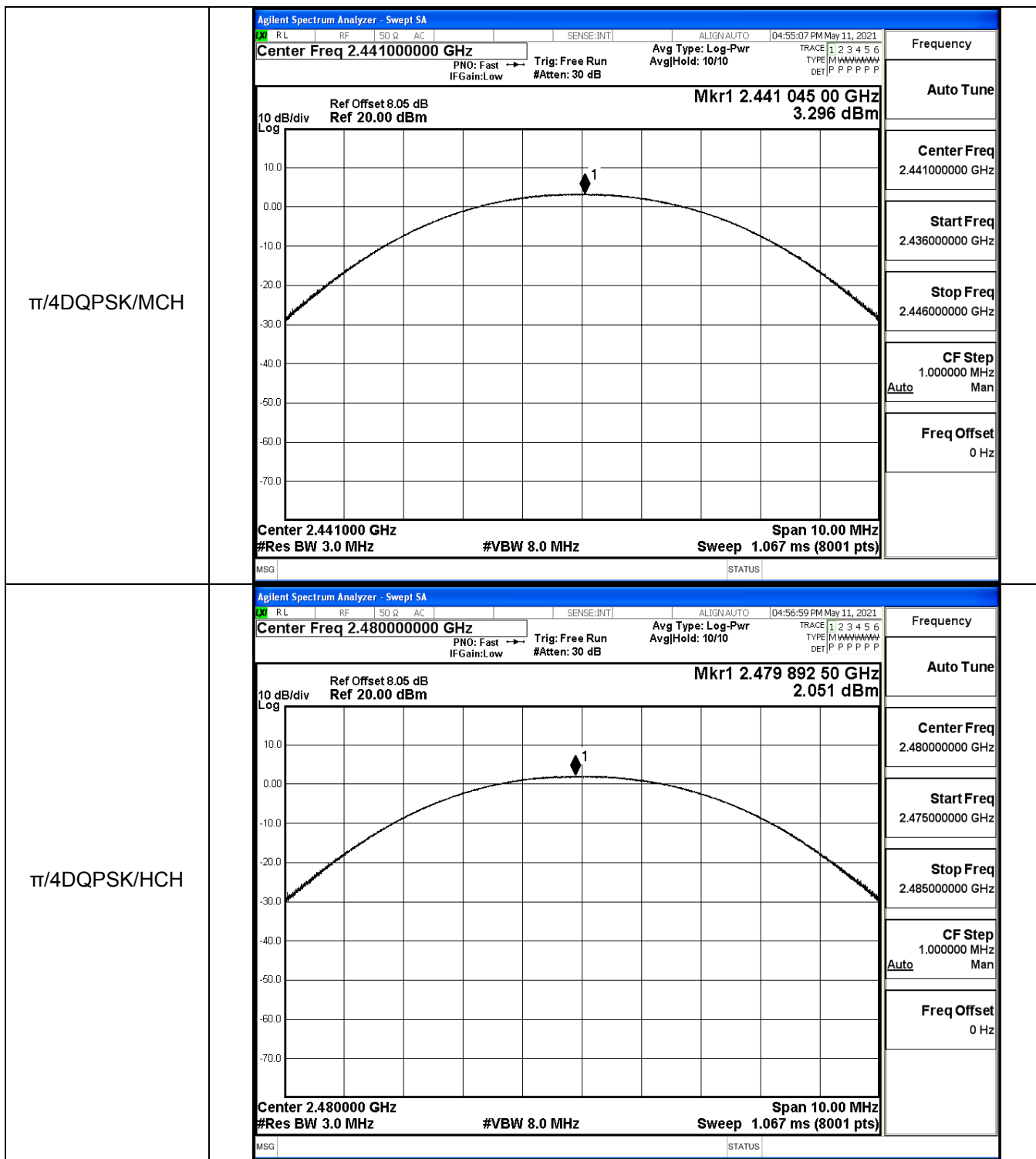


GFSK/MCH

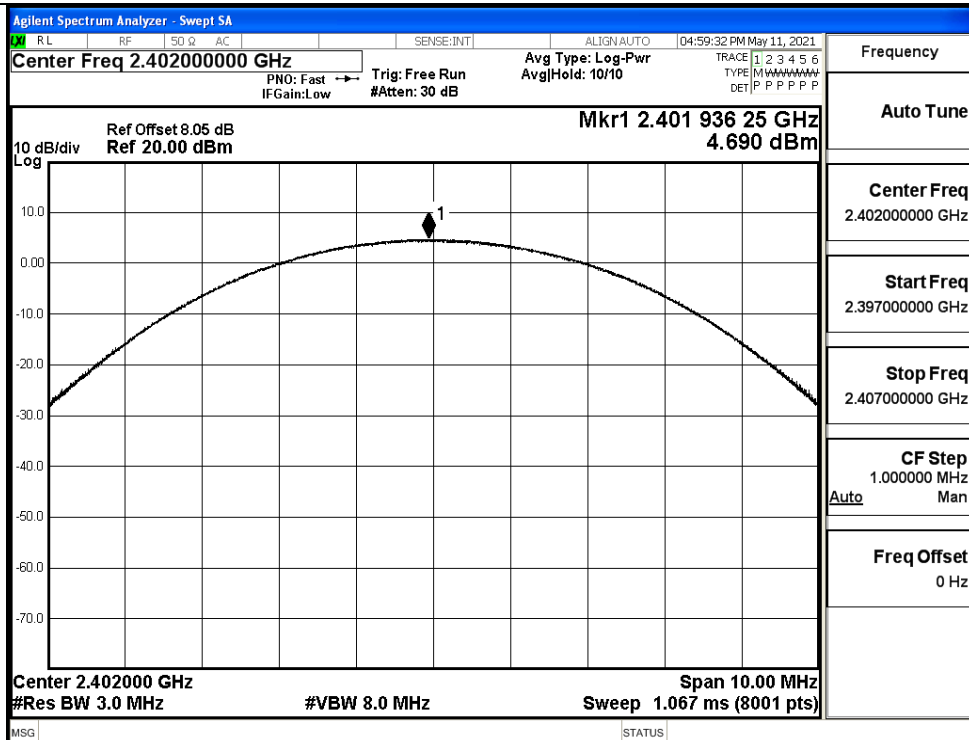


GFSK/HCH

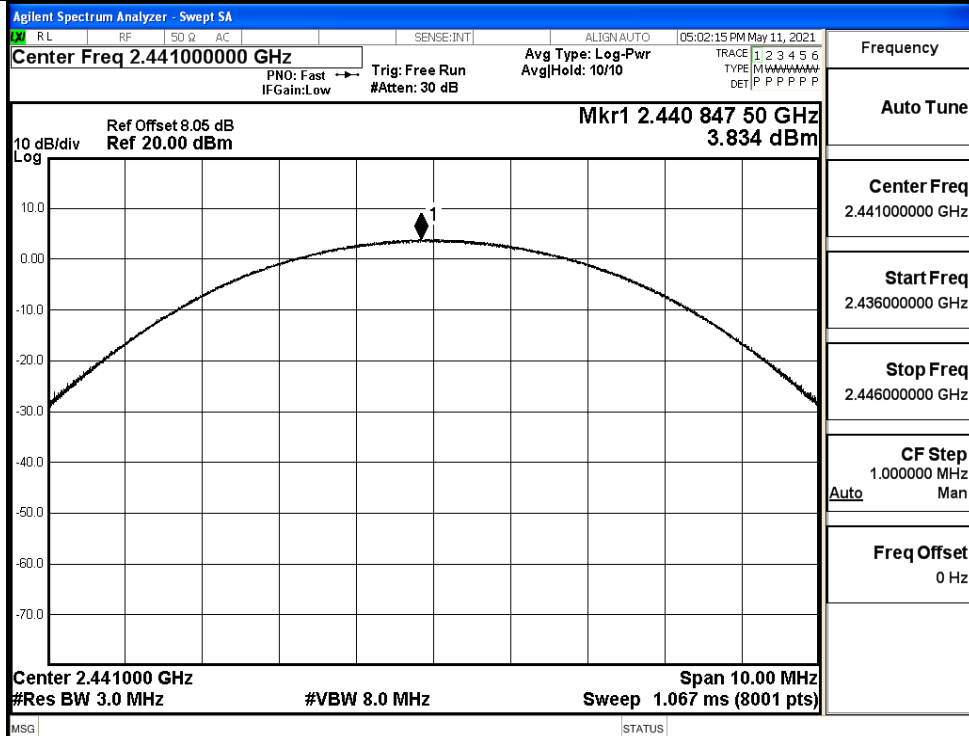
 $\pi/4$ DQPSK/LCH



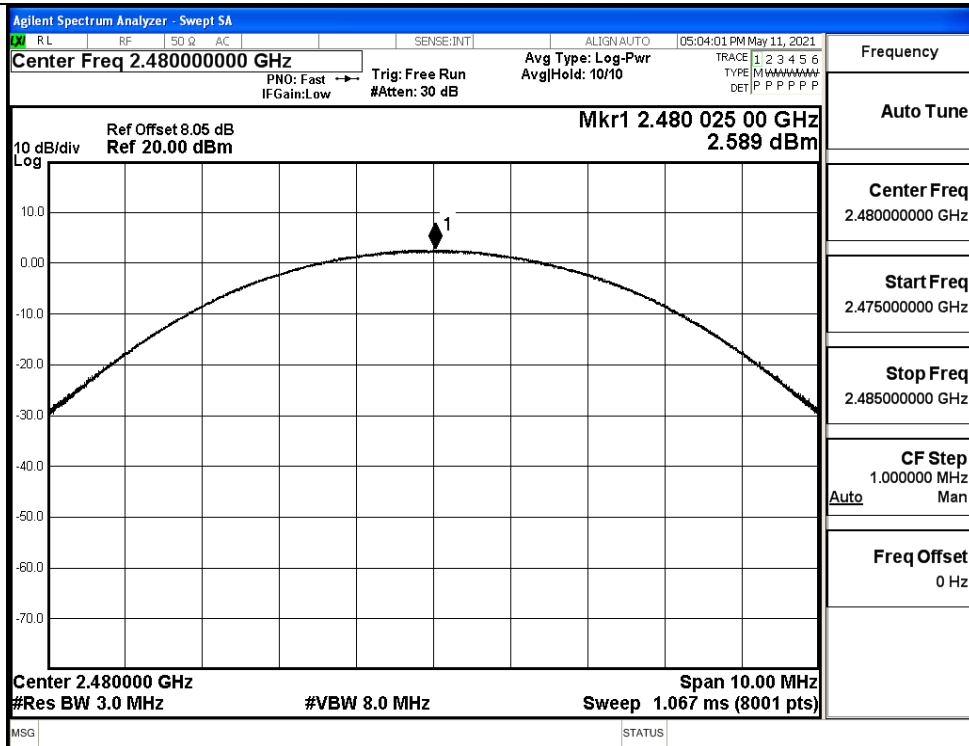
8DPSK/LCH



8DPSK/MCH



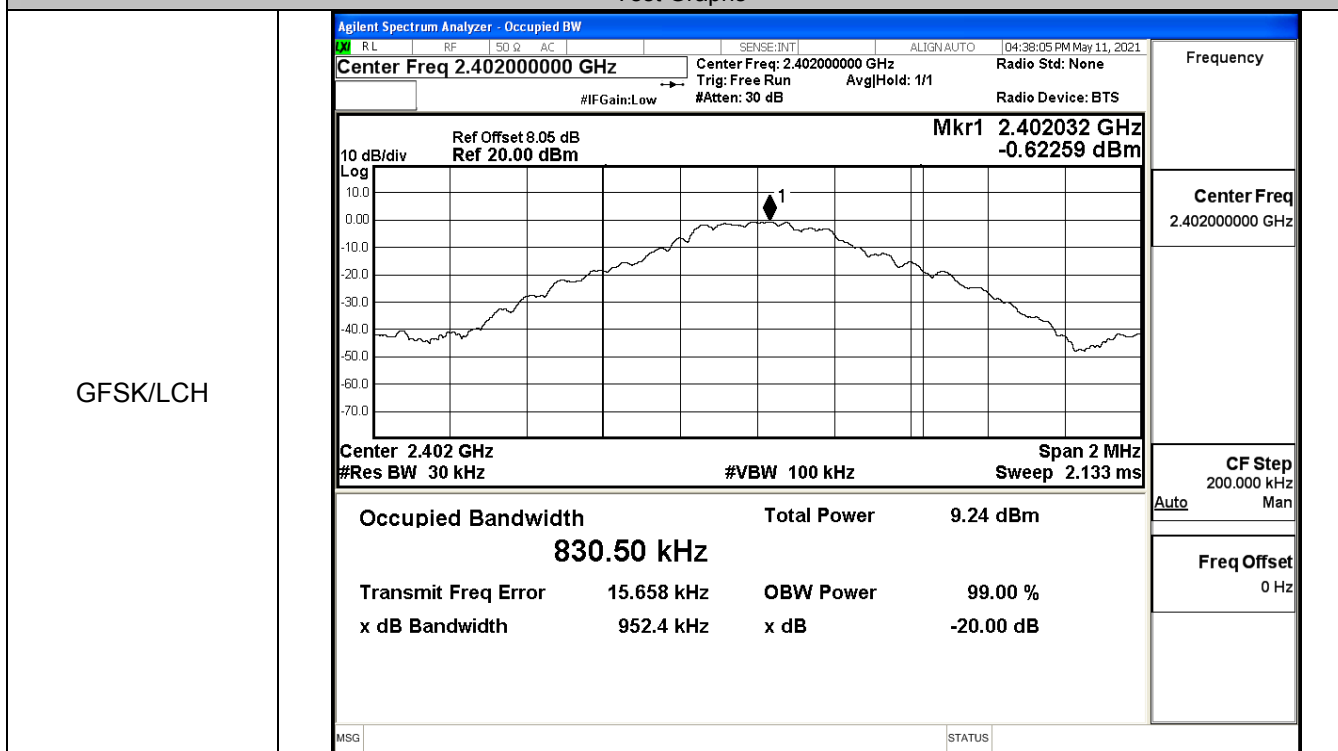
8DPSK/HCH



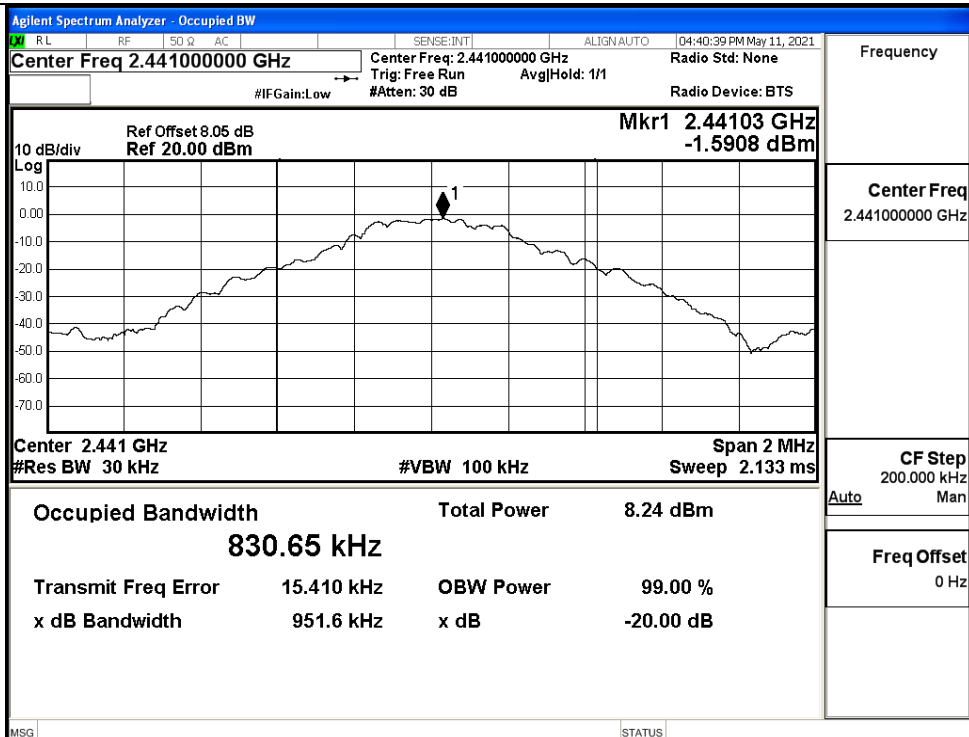
A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9524	Not Specified	PASS
	MCH	0.9516	Not Specified	PASS
	HCH	0.9505	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.332	Not Specified	PASS
	MCH	1.332	Not Specified	PASS
	HCH	1.334	Not Specified	PASS
8DPSK	LCH	1.309	Not Specified	PASS
	MCH	1.308	Not Specified	PASS
	HCH	1.308	Not Specified	PASS

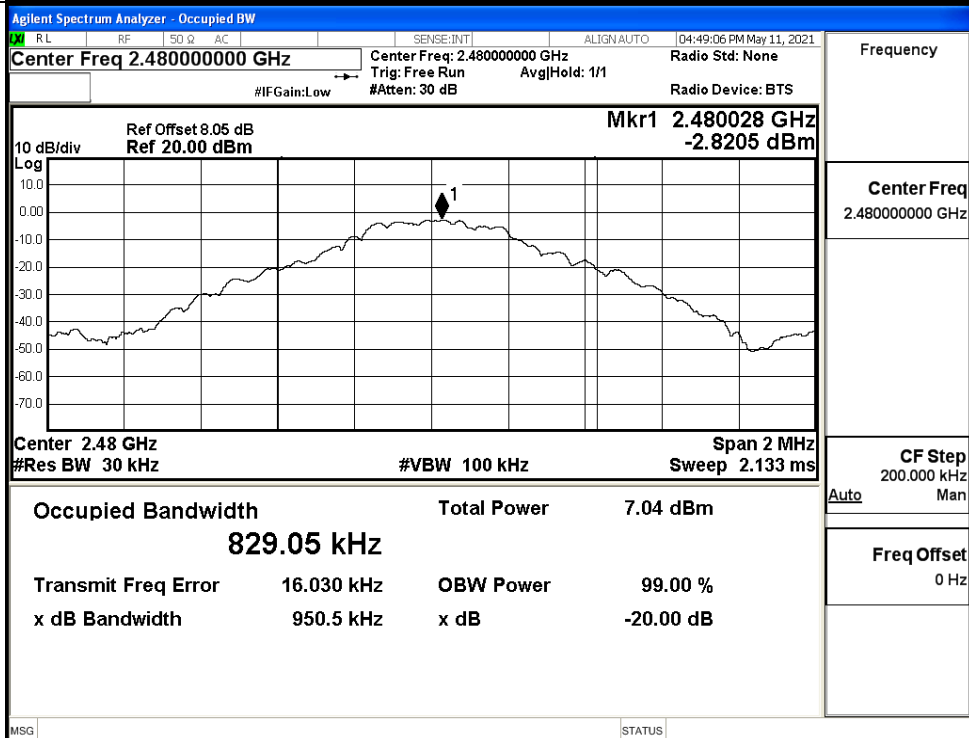
Test Graphs

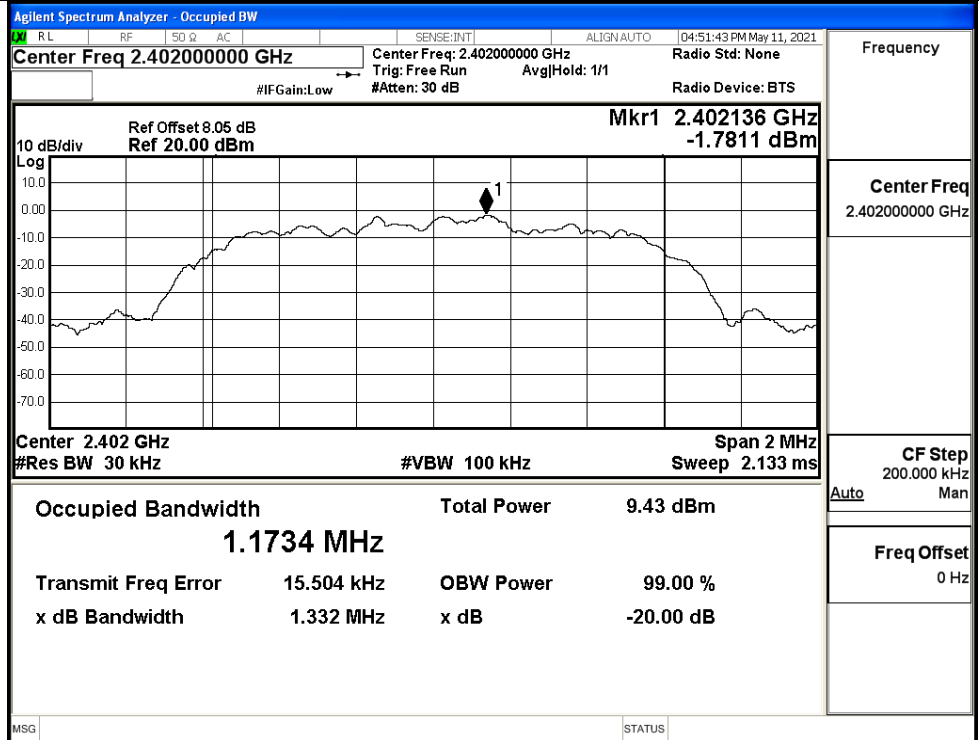
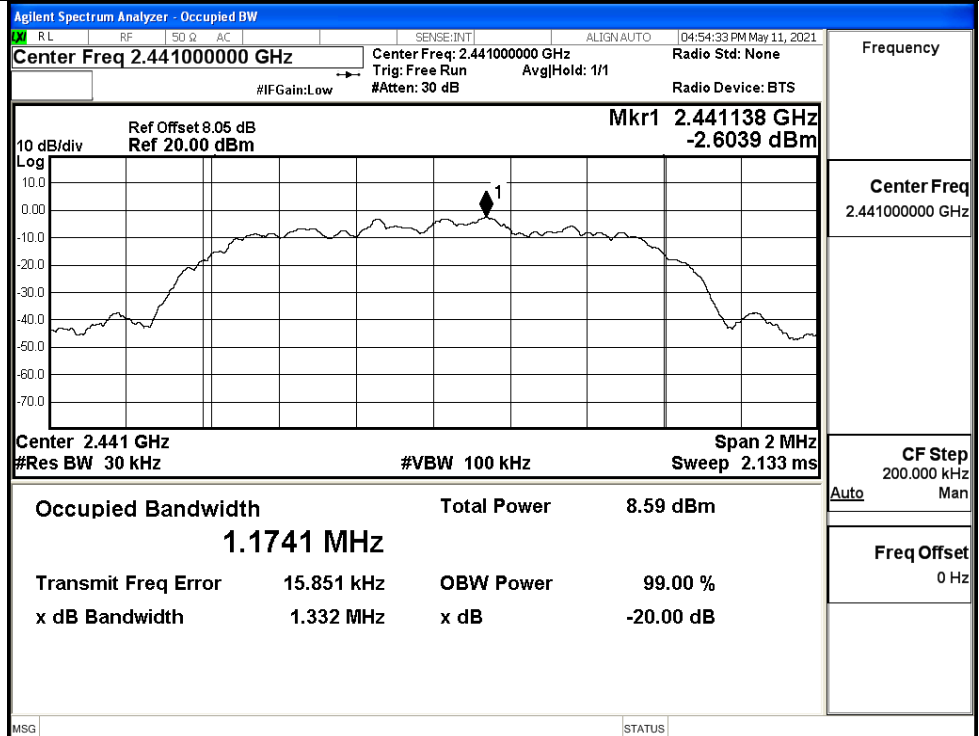


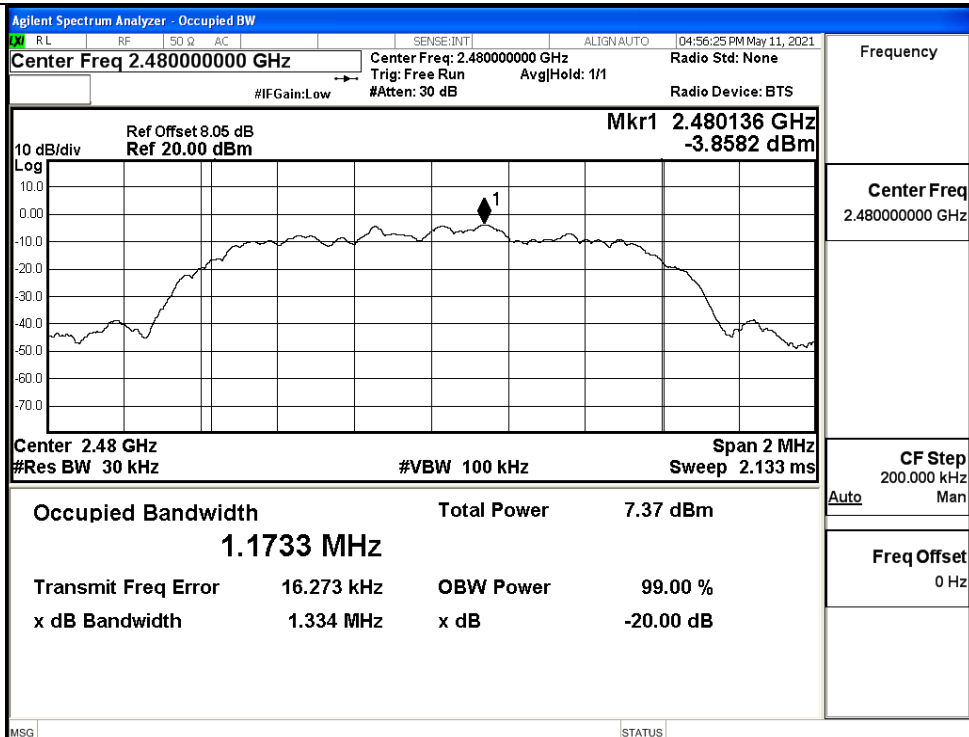
GFSK/MCH



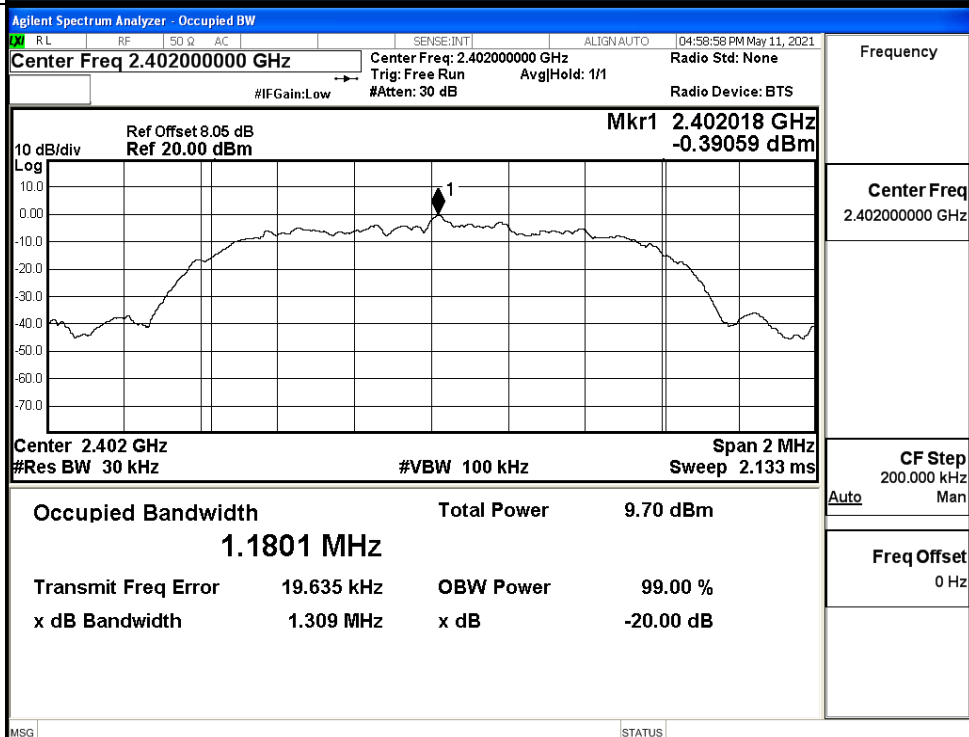
GFSK/HCH



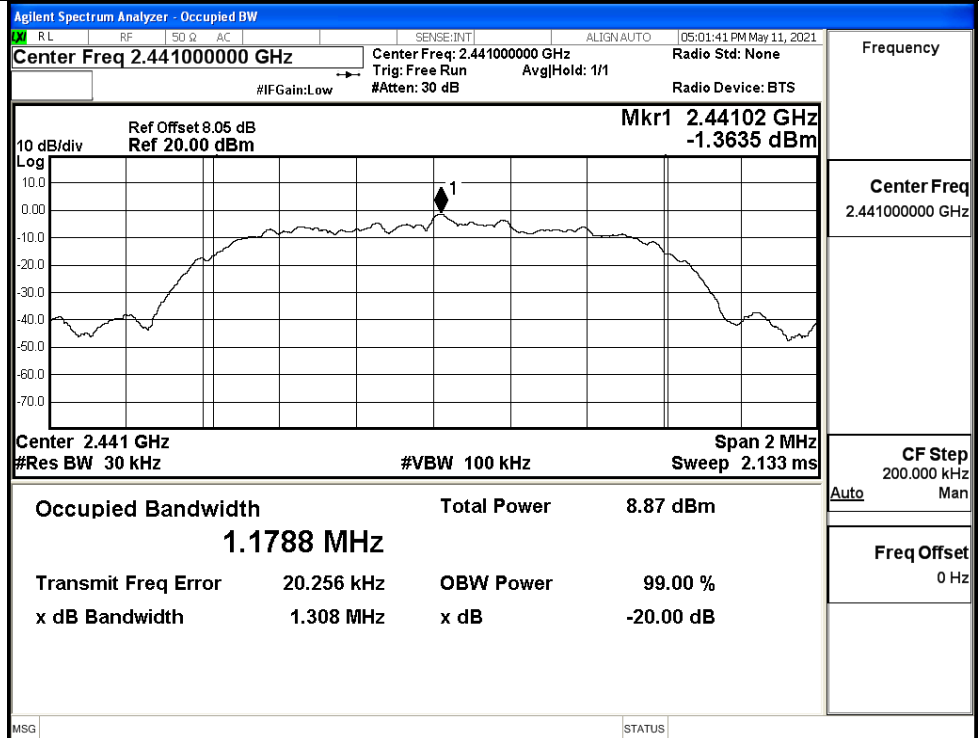
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

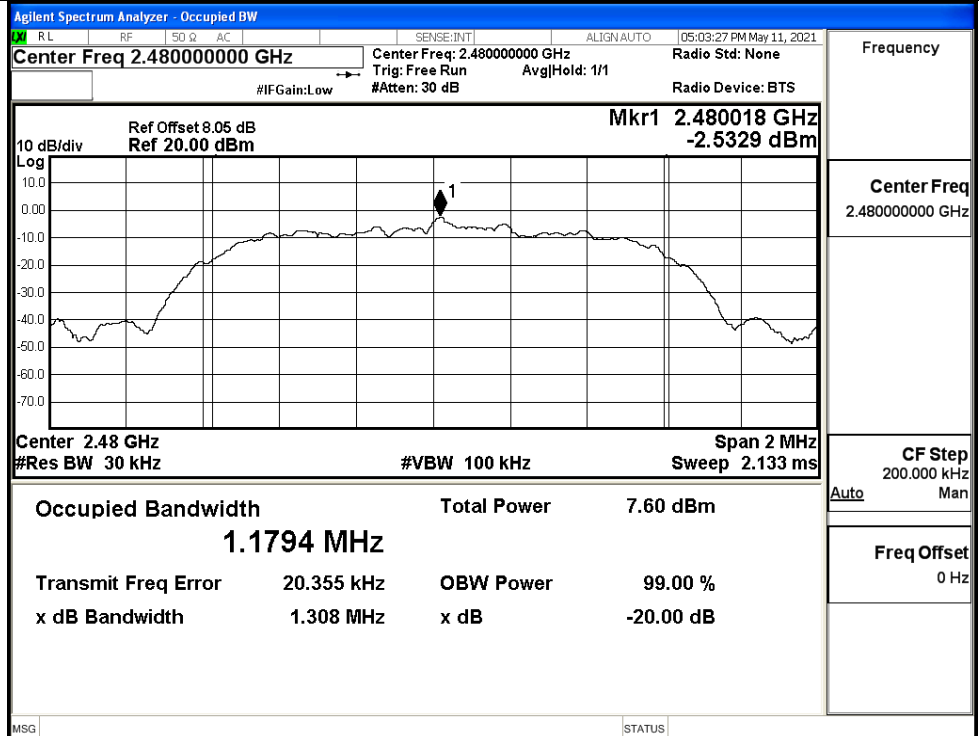
8DPSK/LCH



8DPSK/MCH



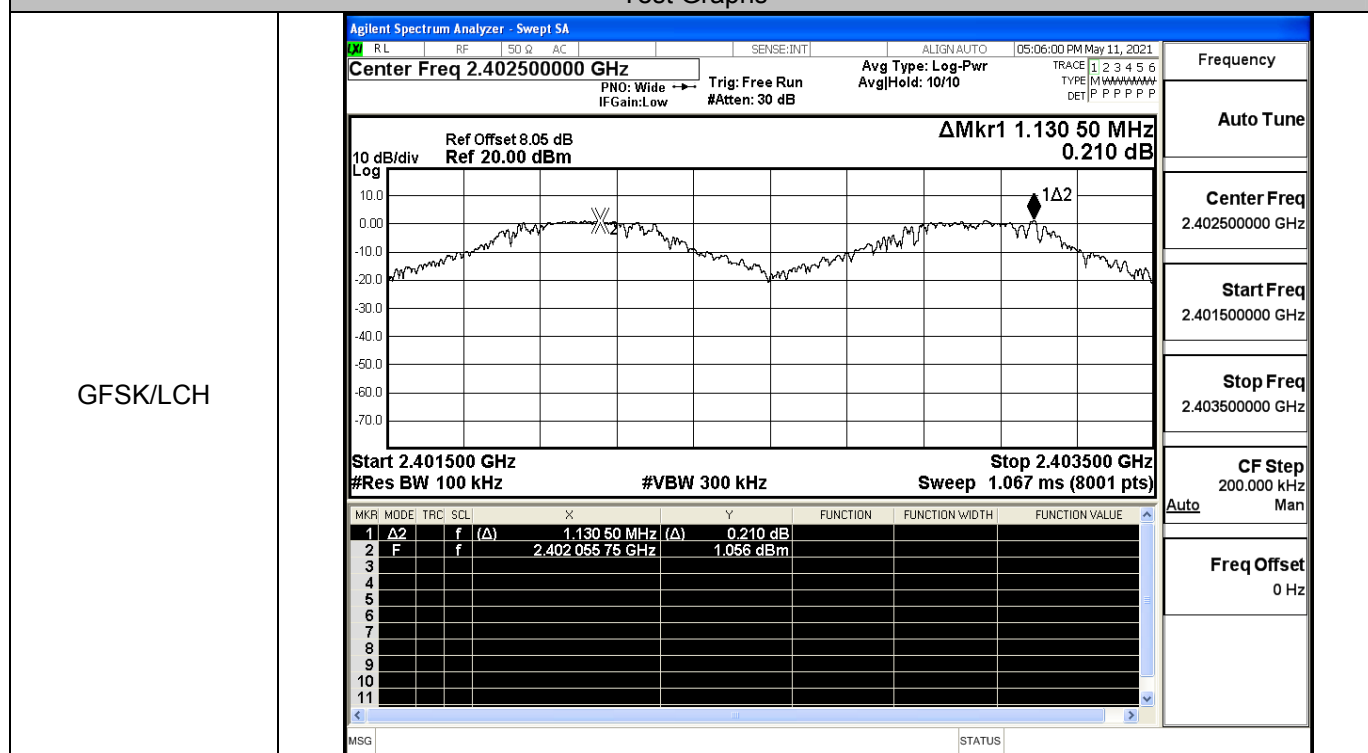
8DPSK/HCH



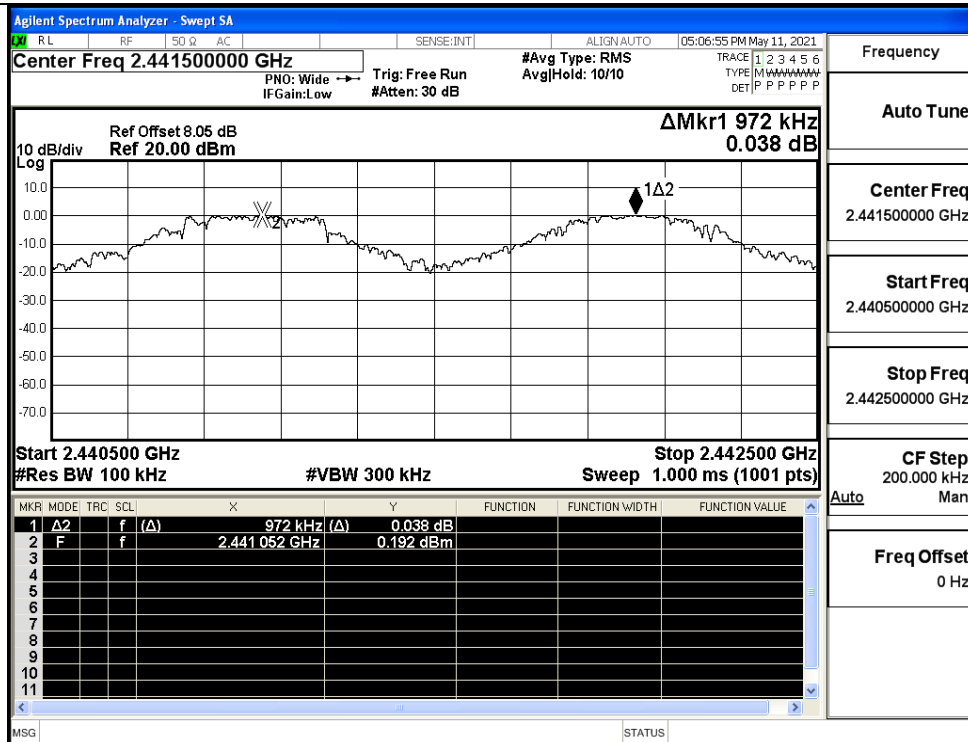
A.3 Carrier Frequency Separation

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.131	0.635	PASS
	MCH	0.972	0.635	PASS
	HCH	0.672	0.635	PASS
$\pi/4$ DQPSK	LCH	1.096	0.889	PASS
	MCH	1.294	0.889	PASS
	HCH	1.106	0.889	PASS
8DPSK	LCH	1.082	0.873	PASS
	MCH	0.910	0.873	PASS
	HCH	1.008	0.873	PASS

Test Graphs



GFSK/MCH

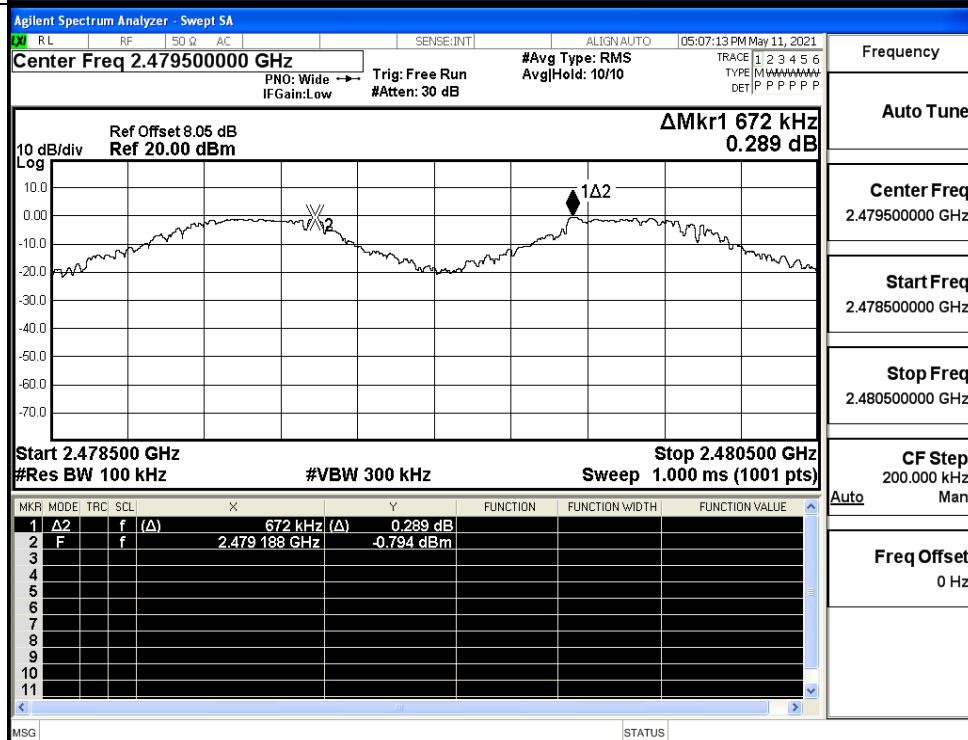


Frequency

Auto Tune

Center Freq
2.441500000 GHzStart Freq
2.440500000 GHzStop Freq
2.442500000 GHzCF Step
200.000 kHz
ManFreq Offset
0 Hz

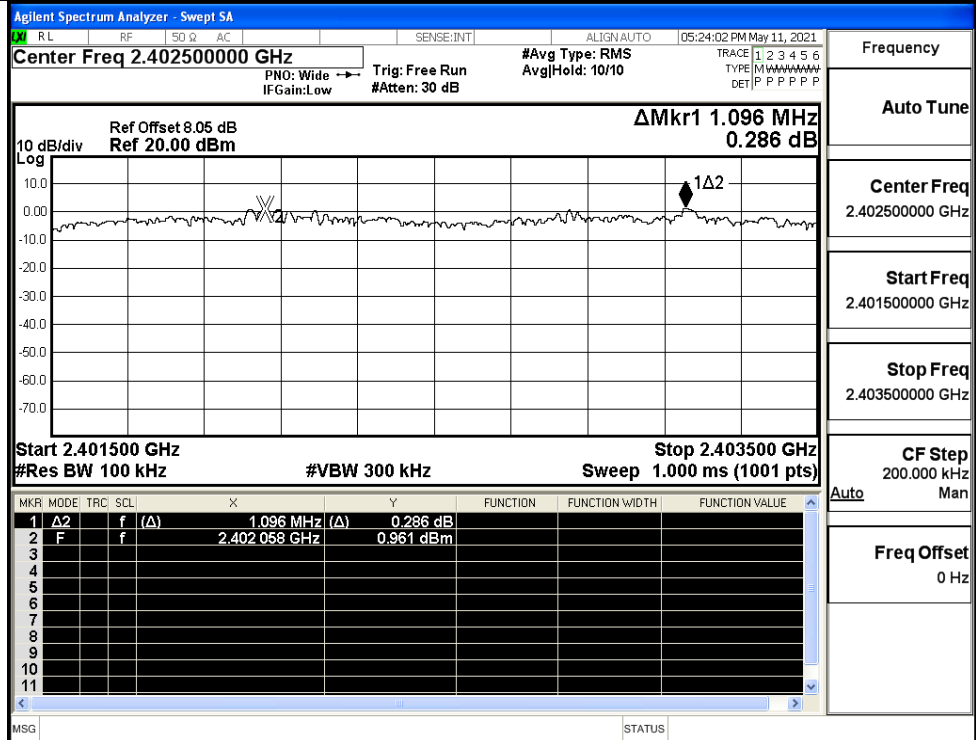
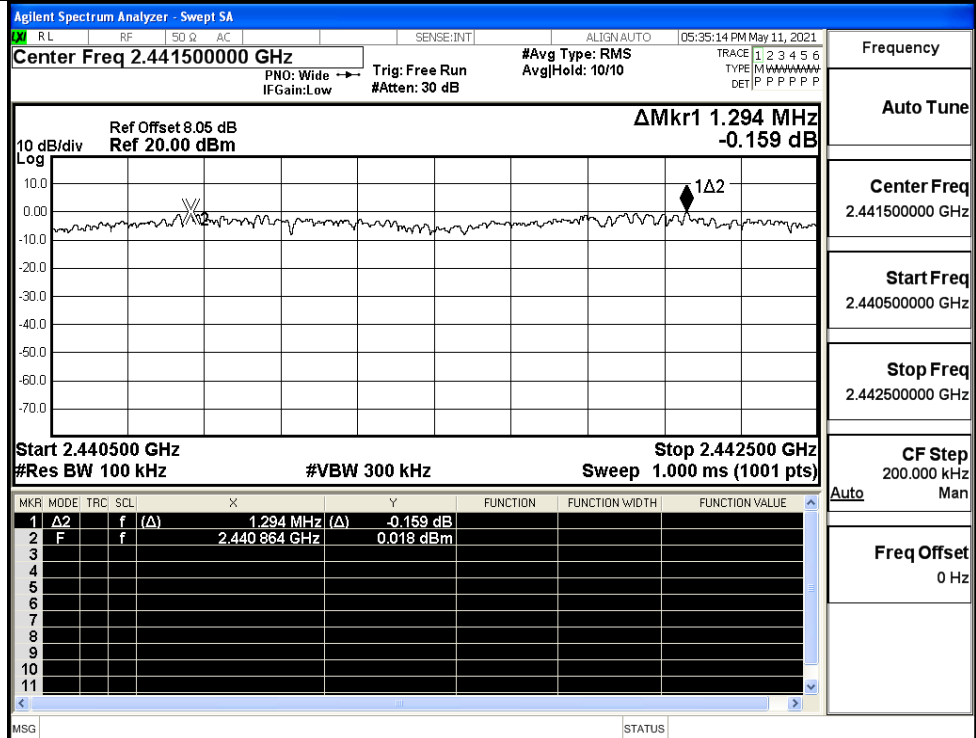
GFSK/HCH

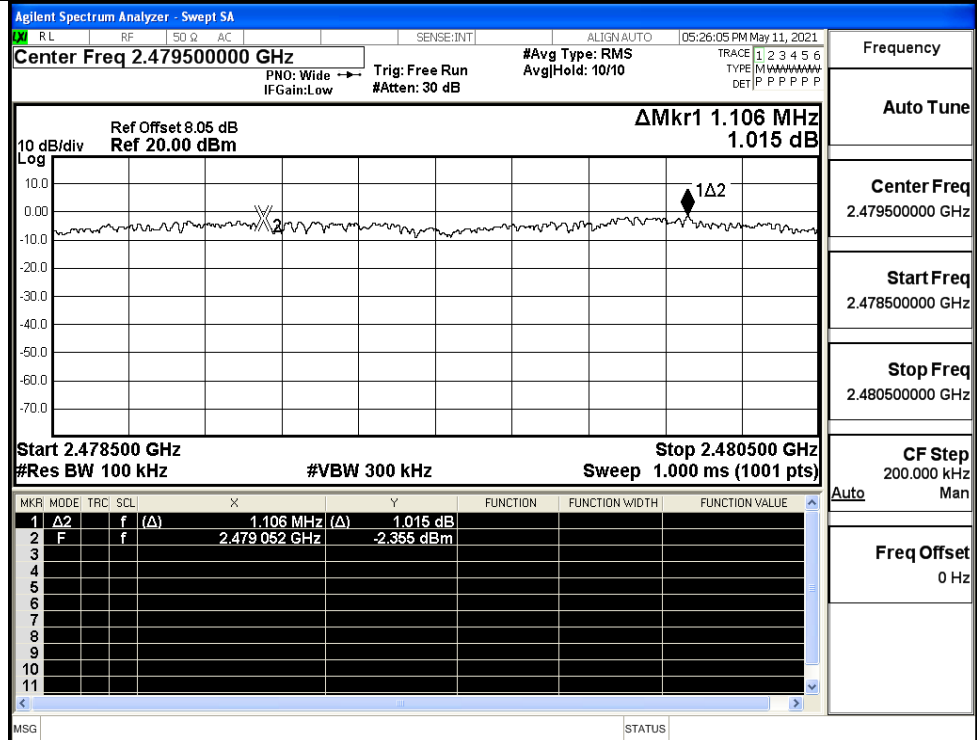


Frequency

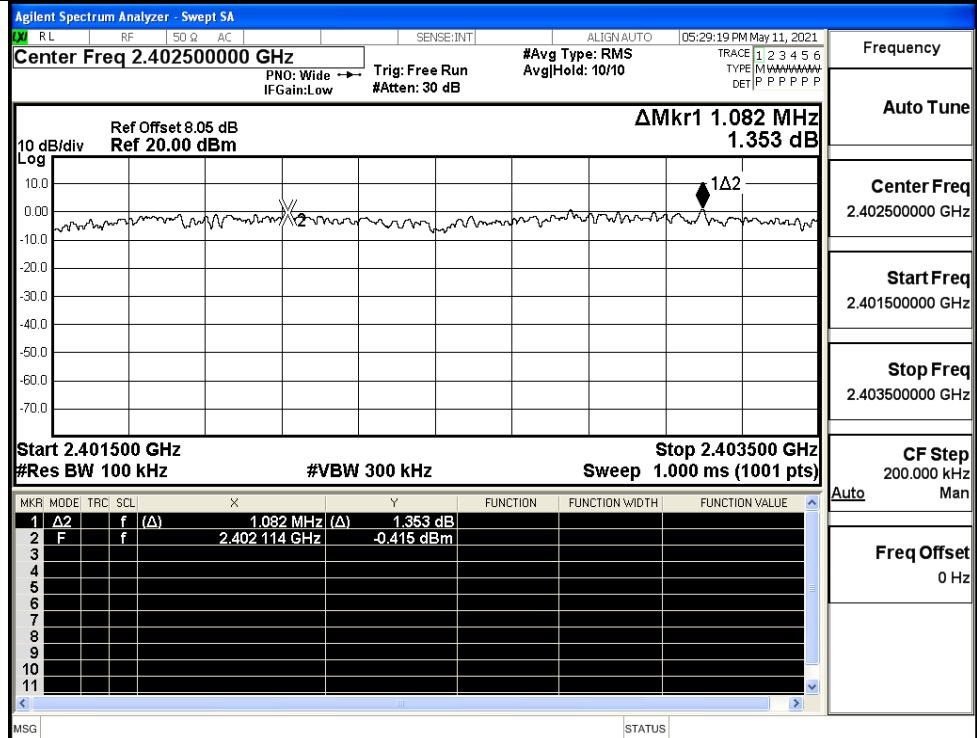
Auto Tune

Center Freq
2.479500000 GHzStart Freq
2.478500000 GHzStop Freq
2.480500000 GHzCF Step
200.000 kHz
ManFreq Offset
0 Hz

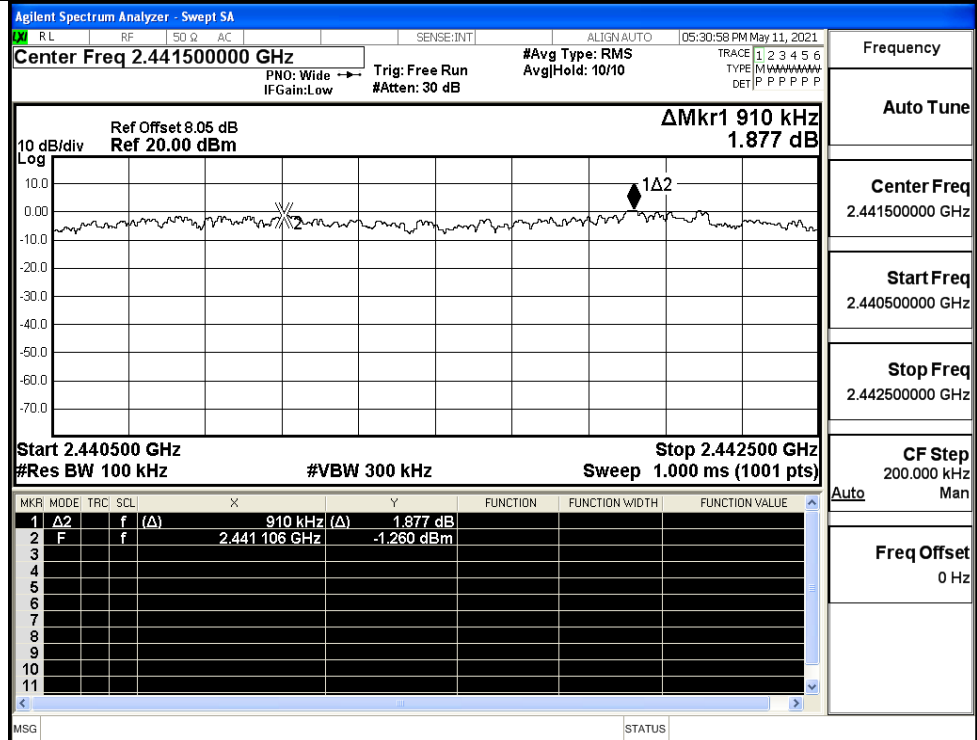
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

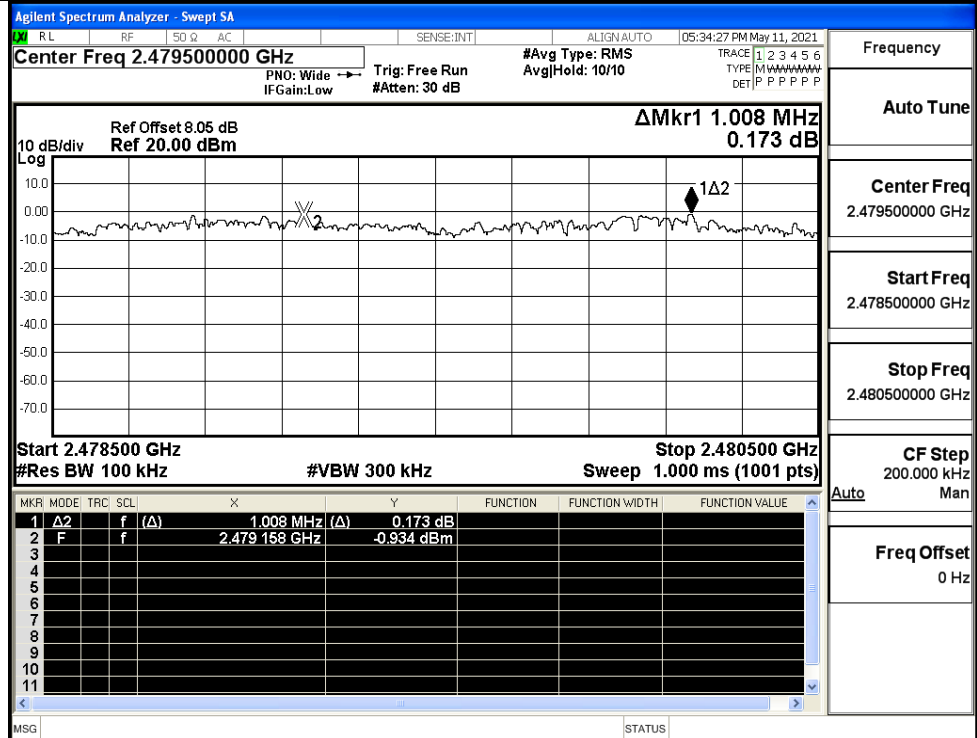
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

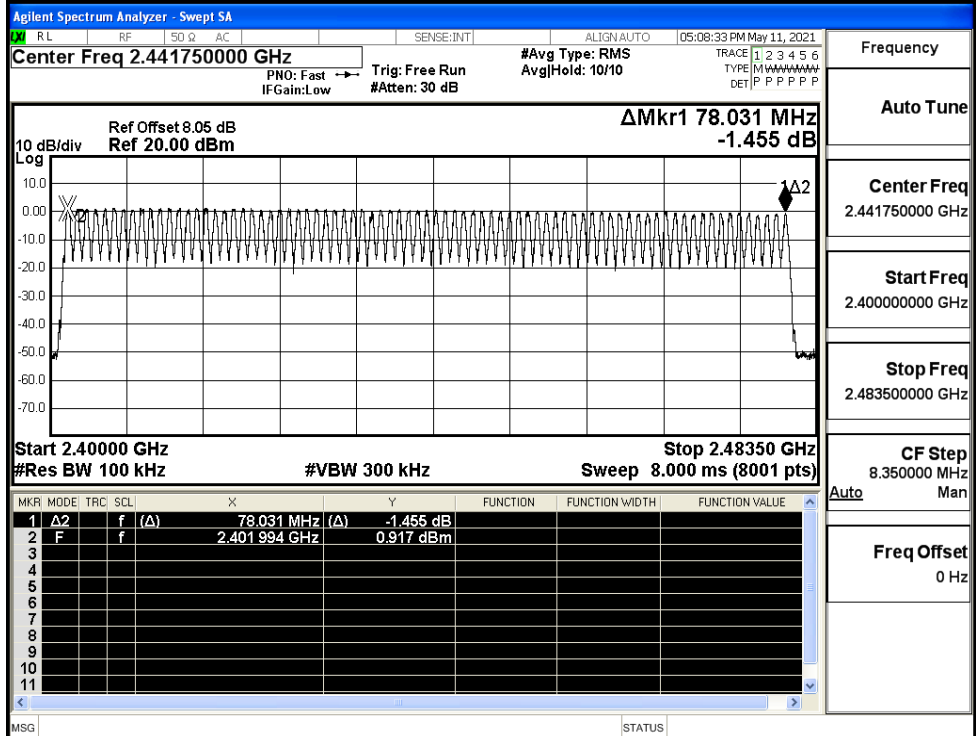


A.4 Hopping Channel Number

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

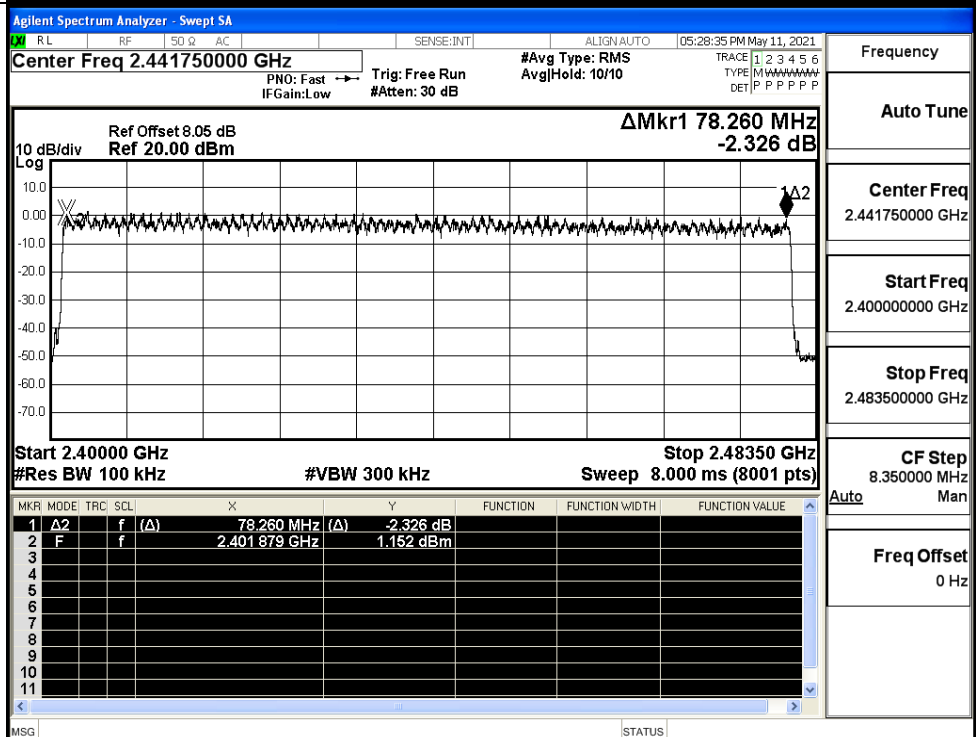
Test Graphs

GFSK/Hop



Frequency

Auto Tune

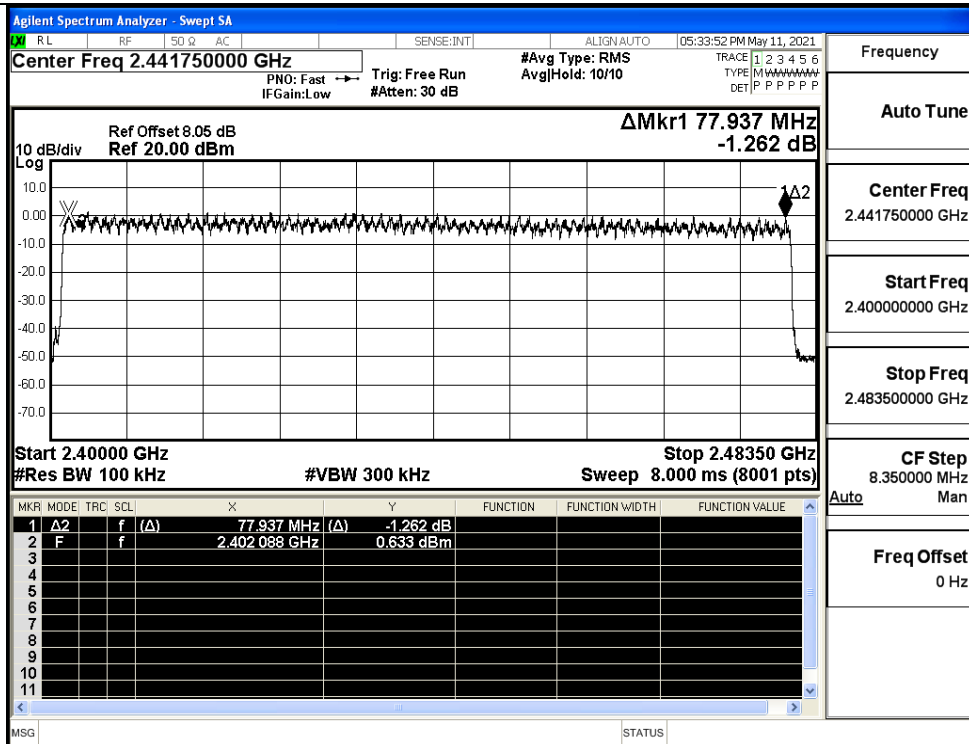
Center Freq
2.441750000 GHzStart Freq
2.400000000 GHzStop Freq
2.483500000 GHzCF Step
8.350000 MHz
ManFreq Offset
0 Hz $\pi/4$ DQPSK/Hop

Frequency

Auto Tune

Center Freq
2.441750000 GHzStart Freq
2.400000000 GHzStop Freq
2.483500000 GHzCF Step
8.350000 MHz
ManFreq Offset
0 Hz

8DPSK/Hop

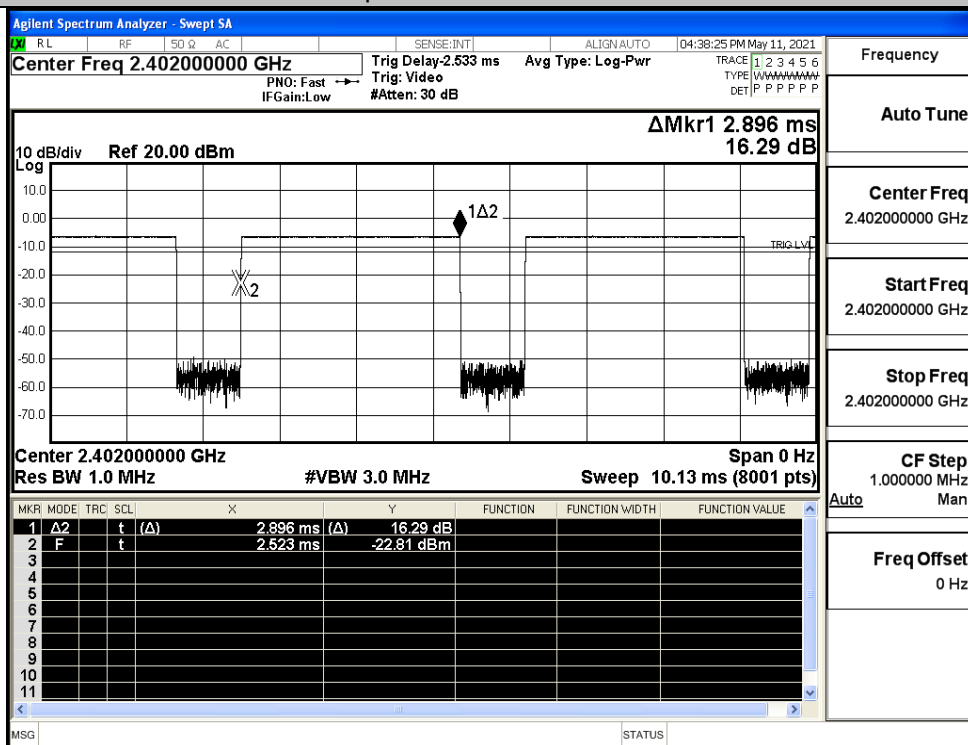


A.5 Dwell Time

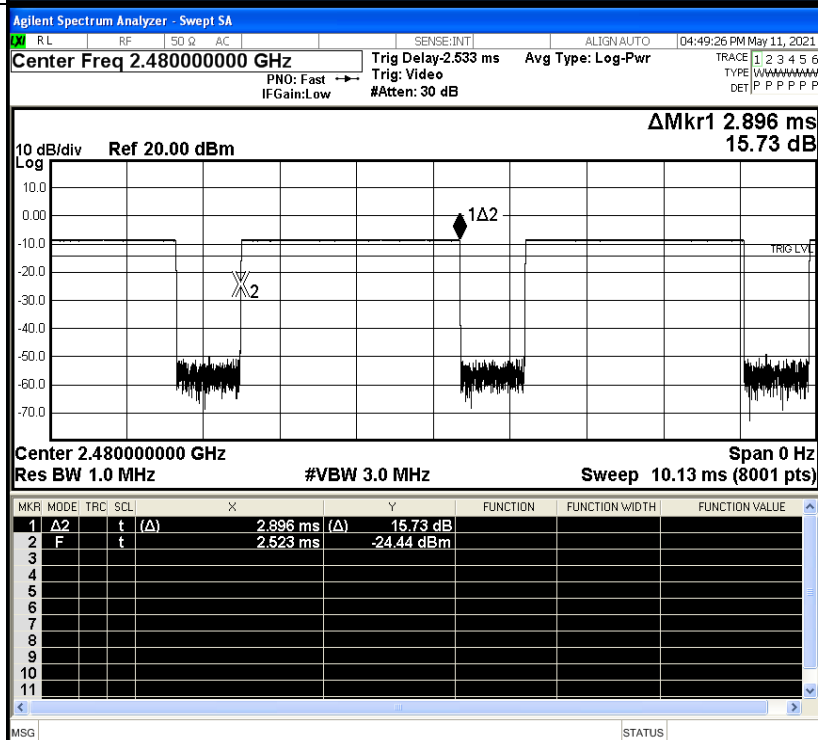
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.9	106.7	0.309	0.4	PASS
	DH5	MCH	2.9	106.7	0.309	0.4	PASS
	DH5	HCH	2.9	106.7	0.309	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.9	106.7	0.309	0.4	PASS
	2DH5	MCH	2.9	106.7	0.309	0.4	PASS
	2DH5	HCH	2.9	106.7	0.309	0.4	PASS
8DPSK	3DH5	LCH	2.9	106.7	0.309	0.4	PASS
	3DH5	MCH	2.9	106.7	0.309	0.4	PASS
	3DH5	HCH	2.9	106.7	0.309	0.4	PASS

Test Graphs

GFSK_DH5/LCH



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
Auto	Man
Freq Offset	0 Hz

Agilent Spectrum Analyzer - Swept SA

RL RF SO Q AC SENSE:INT ALIGN AUTO 04:52:04 PM May 11, 2021

Center Freq 2.402000000 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 P DET P P P P P P P

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 2.901 ms 13.66 dB

Log

10.0 0.00 -10.0 -20.0 -30.0 -40.0 -50.0 -60.0 -70.0

10 20 30 40 50 60 70 80 90 100

Center 2.402000000 GHz Span 0 Hz

Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ 2	t	(Δ)	2.901 ms	(Δ) 13.66 dB			
2	F	t		1.759 ms	-20.49 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS

Agilent Spectrum Analyzer - Swept SA

R L	RF	SQ Z	AC	SENSE: INT	ALIGN AUTO	[04:54:54 PM May 11, 2021]
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Center Freq 2.441000000 GHz Trig Delay: 2.533 ms Avg Type: Log-Pwr PNO: Fast → IF Gain: Low #Atten: 30 dB

TRACE 1 2 3 4 5 6
TYPE WWWWWWWW
DET PPPPPP

10 dB/div Ref 20.00 dBm

ΔMkr1 2.902 ms
15.18 dB

X2

Δ2

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

MKR MODE	TRC SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1 Δ2	t (Δ)	2.902 ms (Δ)	15.18 dB			
2 F	t	3.493 ms	-22.90 dBm			
3						
4						
5						
6						
7						
8						
9						
10						
11						

Frequency

Auto Tune

Center Freq
2.441000000 GHz

Start Freq
2.441000000 GHz

Stop Freq
2.441000000 GHz

CF Step
1.000000 MHz
Man

Freq Offset
0 Hz

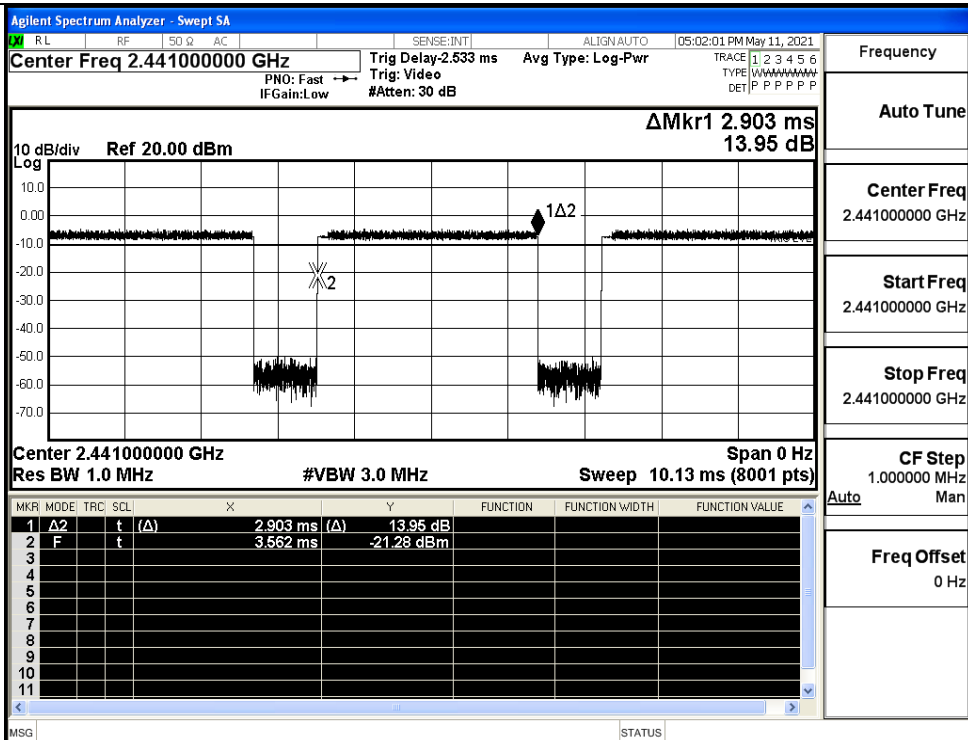
[illegible]

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

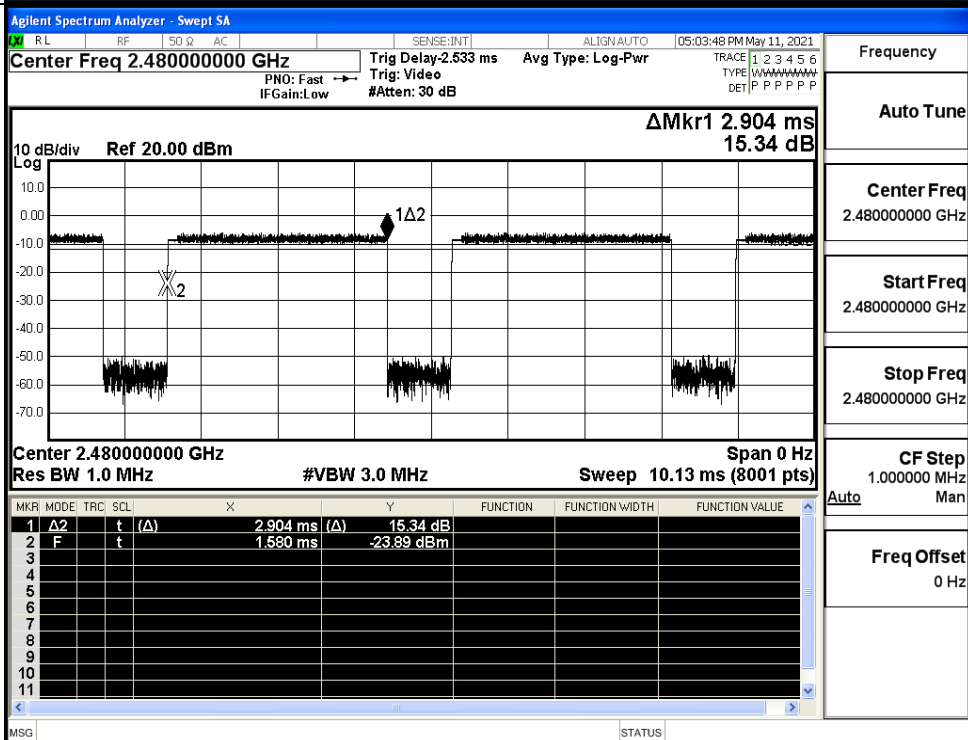
[illegible]

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



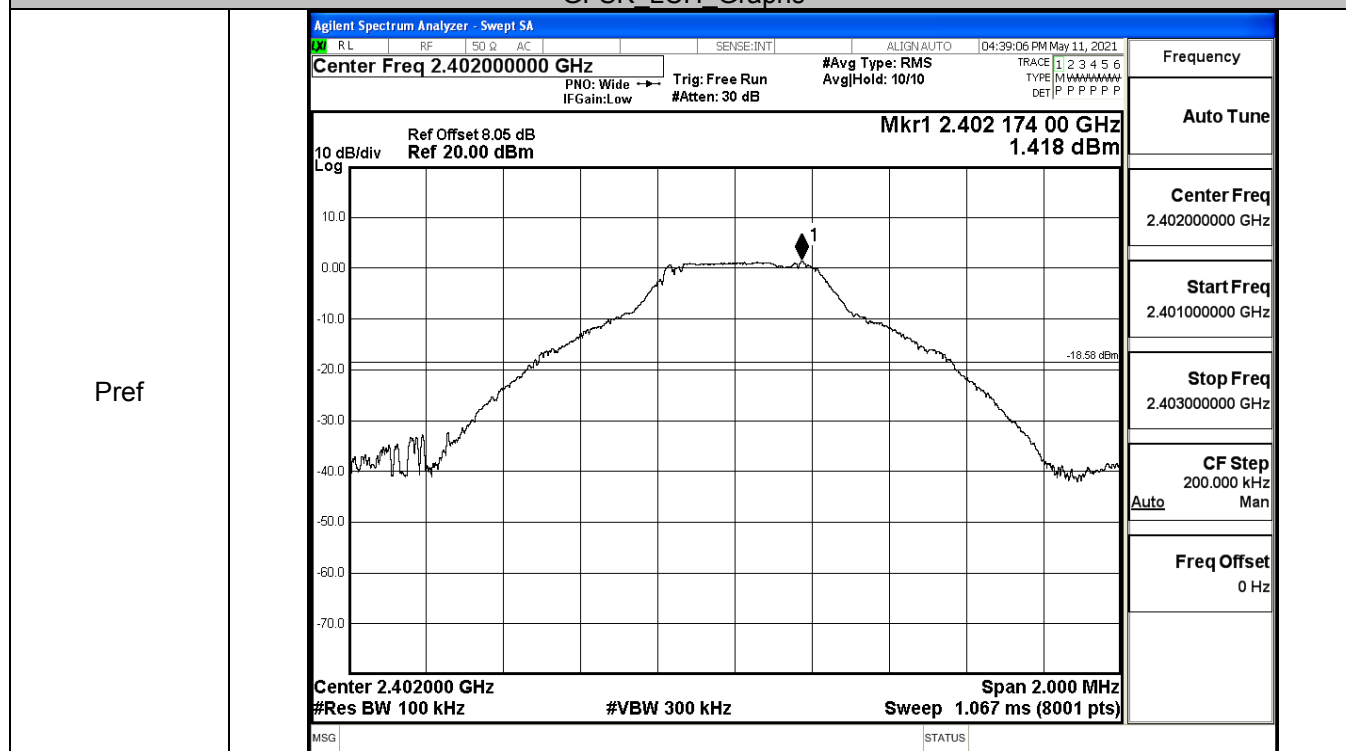
8DPSK_3DH5/HCH



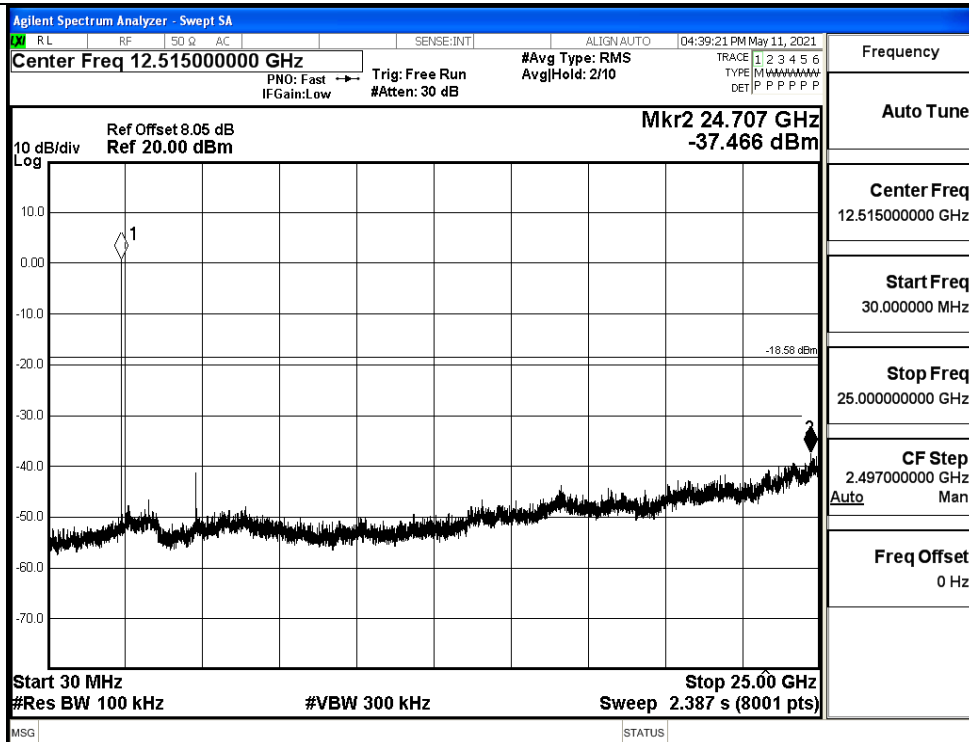
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.418	-37.466	-18.582	PASS
	MCH	0.727	-37.964	-19.273	PASS
	HCH	-0.57	-38.242	-20.570	PASS
$\pi/4$ DQPSK	LCH	0.864	-36.348	-19.136	PASS
	MCH	0.001	-37.772	-19.999	PASS
	HCH	-0.661	-38.199	-20.661	PASS
8DPSK	LCH	1.45	-37.175	-18.550	PASS
	MCH	0.663	-30.495	-19.337	PASS
	HCH	-0.561	-38.187	-20.561	PASS

GFSK LCH Graphs

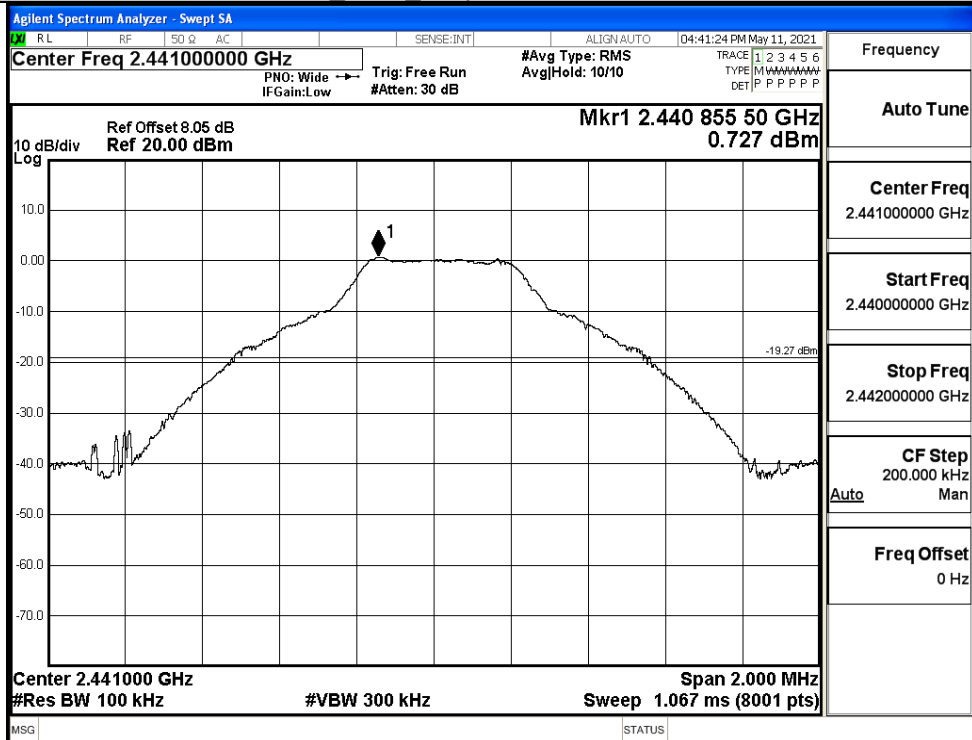


Puw

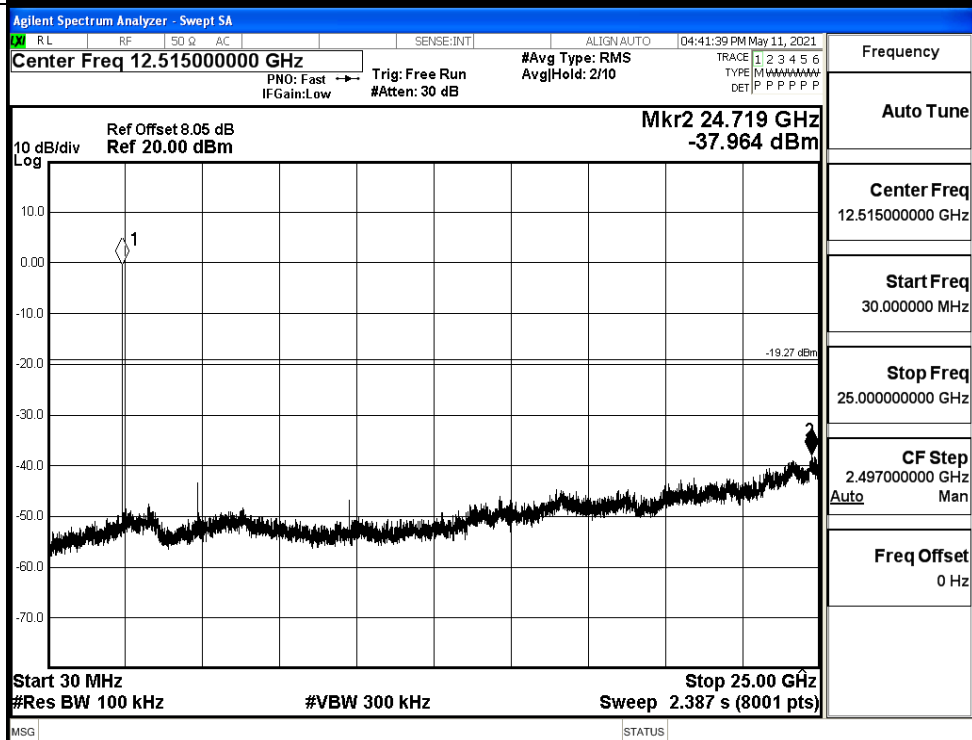


GFSK_MCH_Graphs

Pref

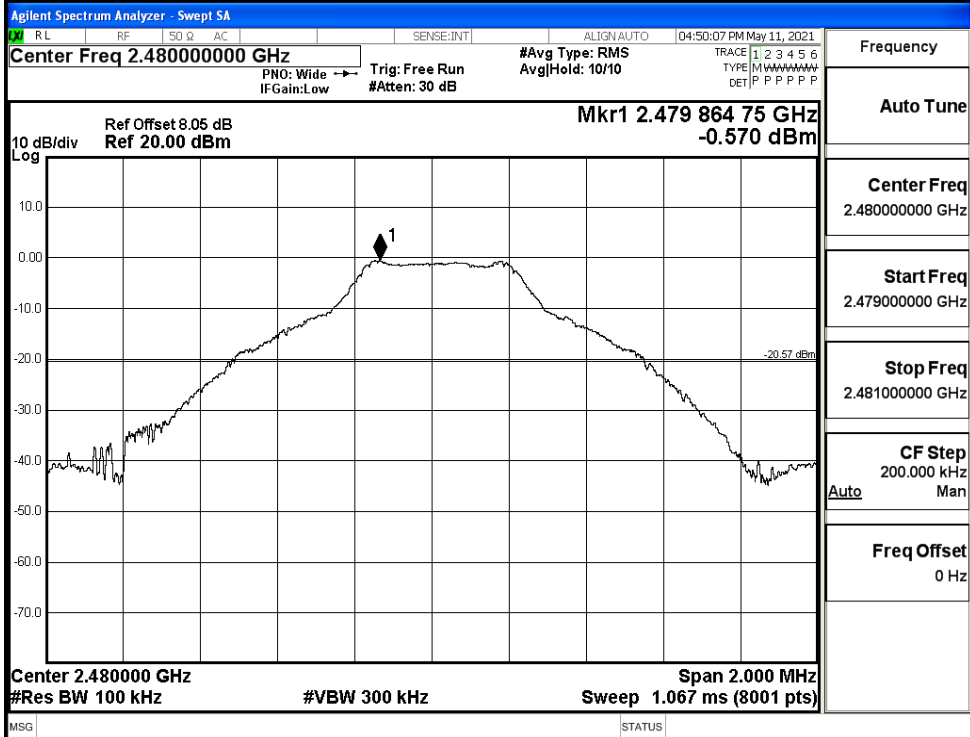


Puw

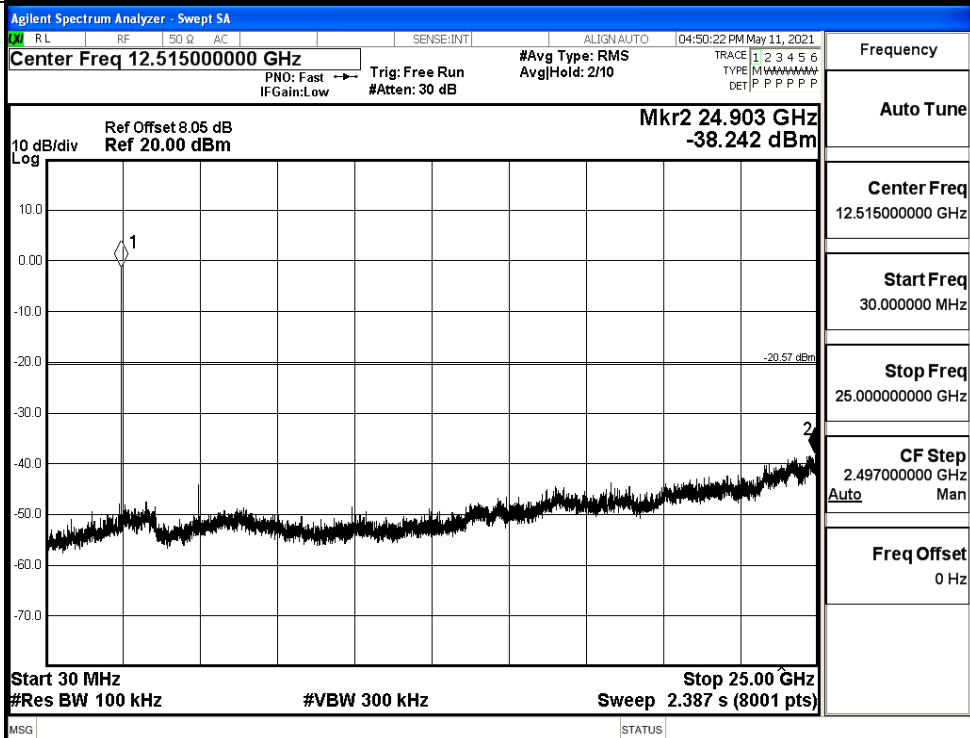


GFSK_HCH_Graphs

Pref

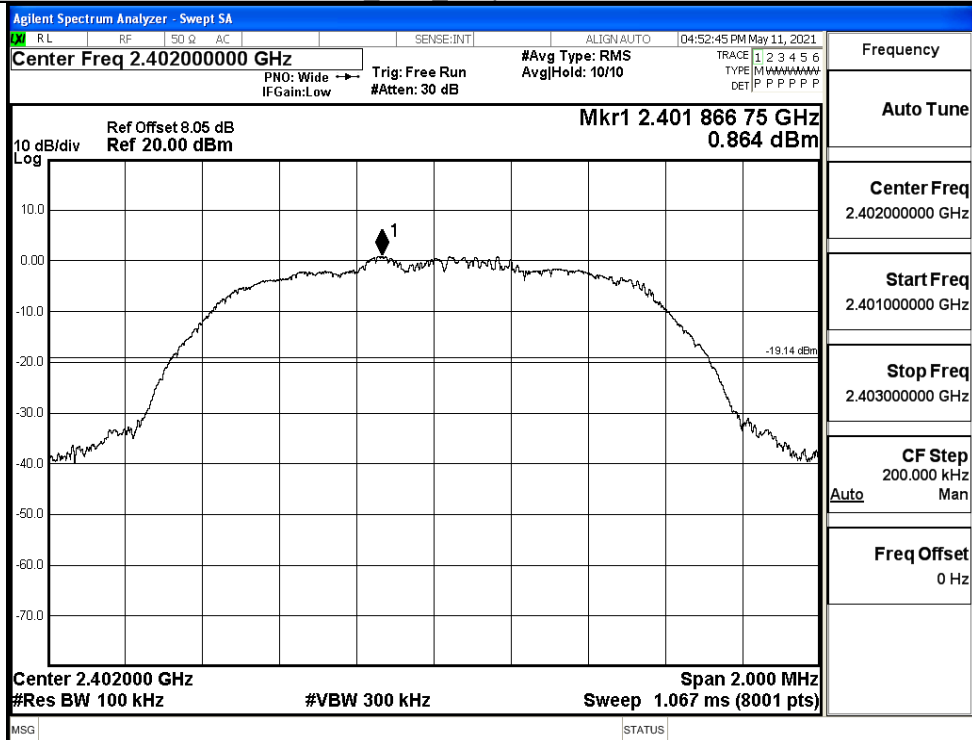


Puw

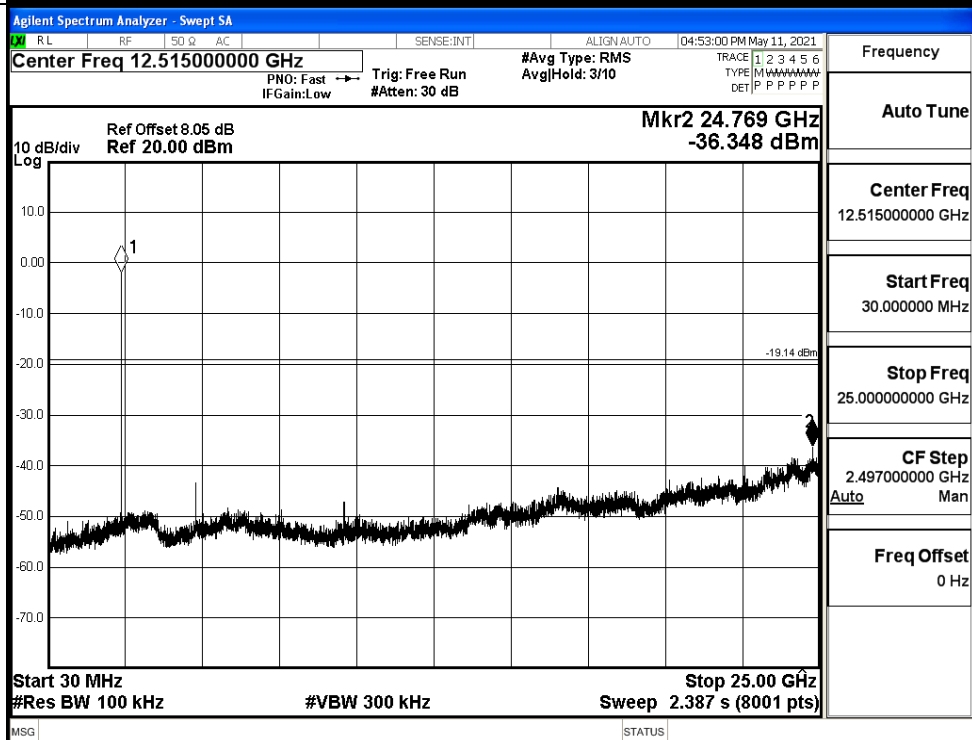


$\pi/4$ DQPSK_LCH_Graphs

Pref

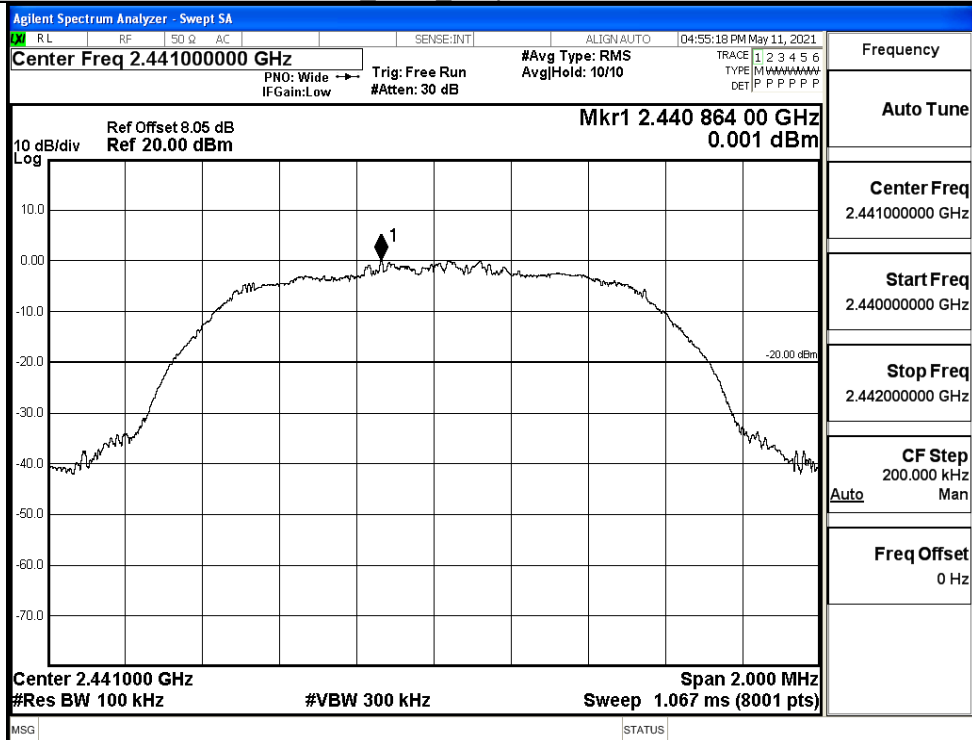


Puw

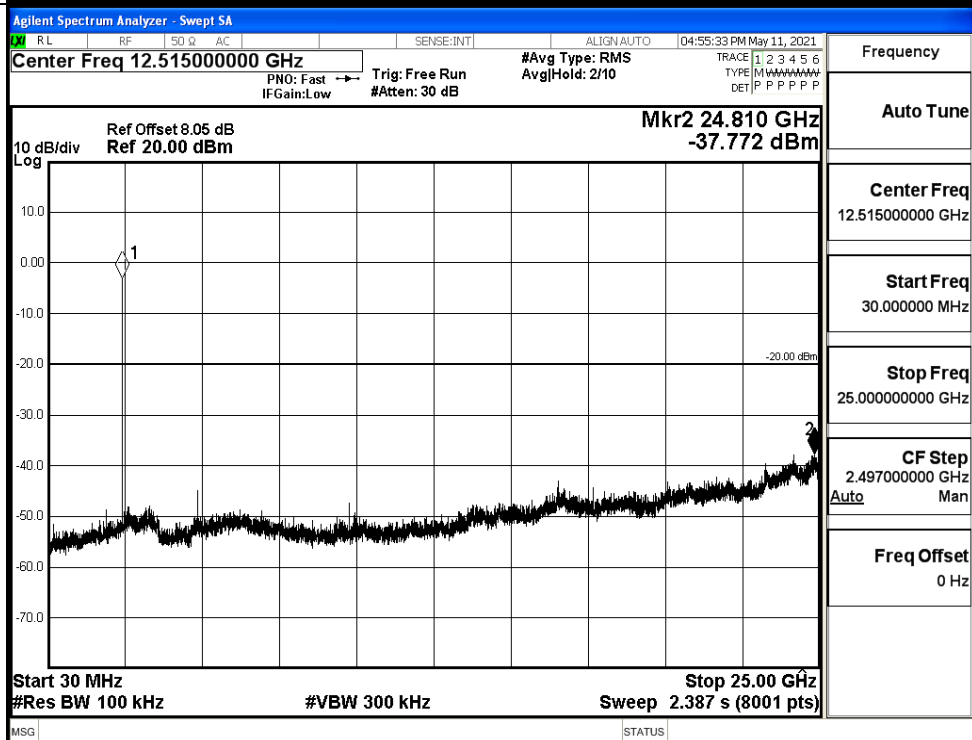


$\pi/4$ DQPSK_MCH_Graphs

Pref

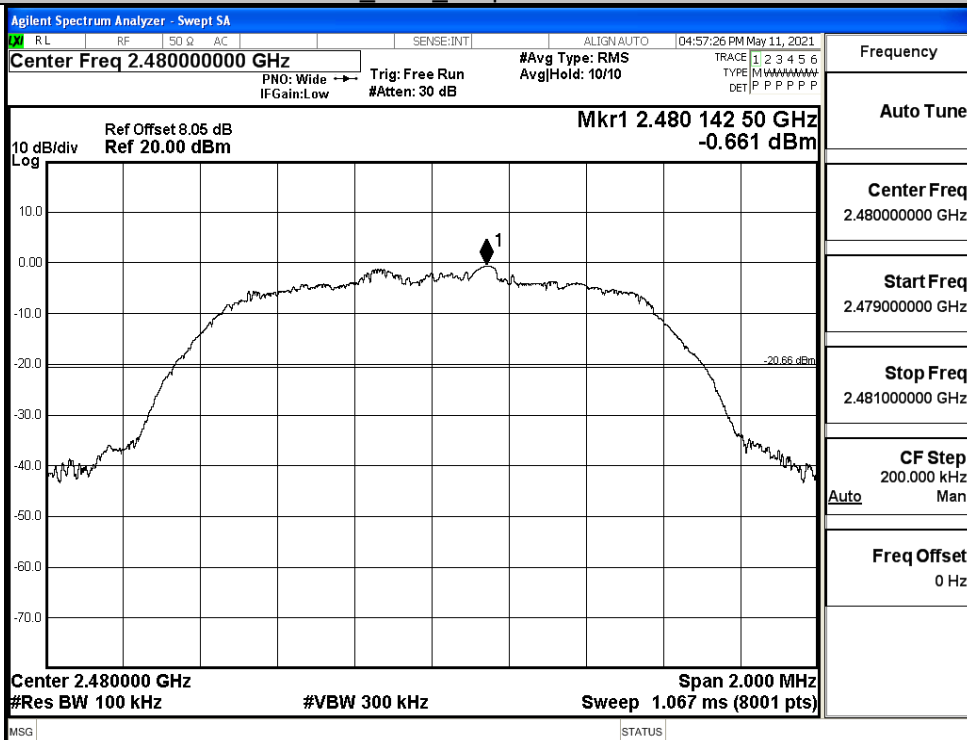


Puw

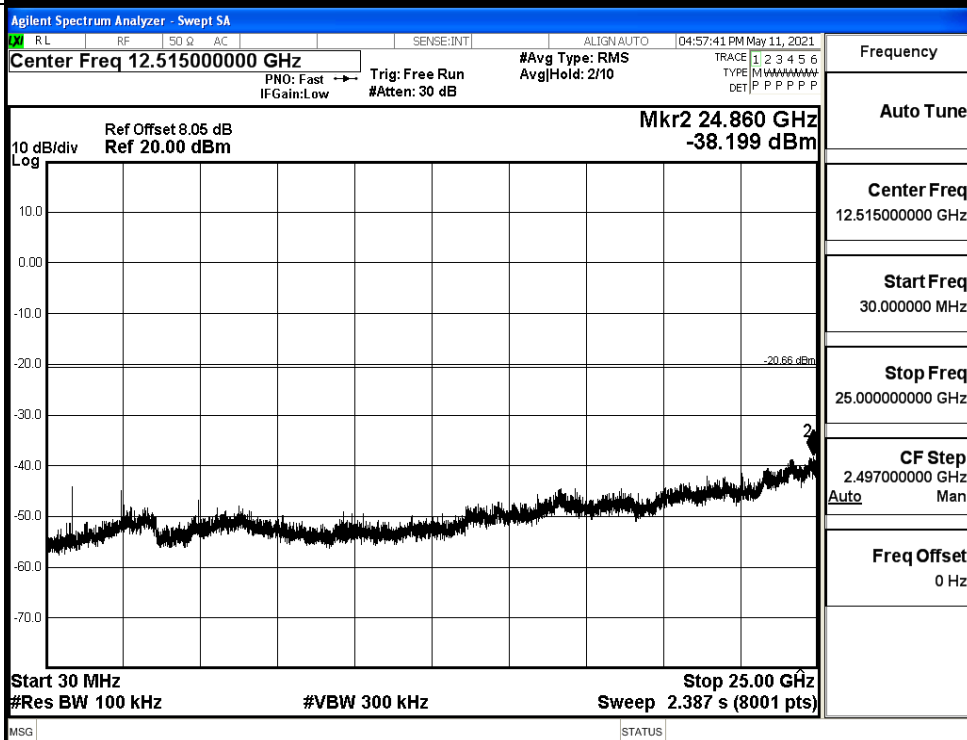


$\pi/4$ DQPSK_HCH_Graphs

Pref

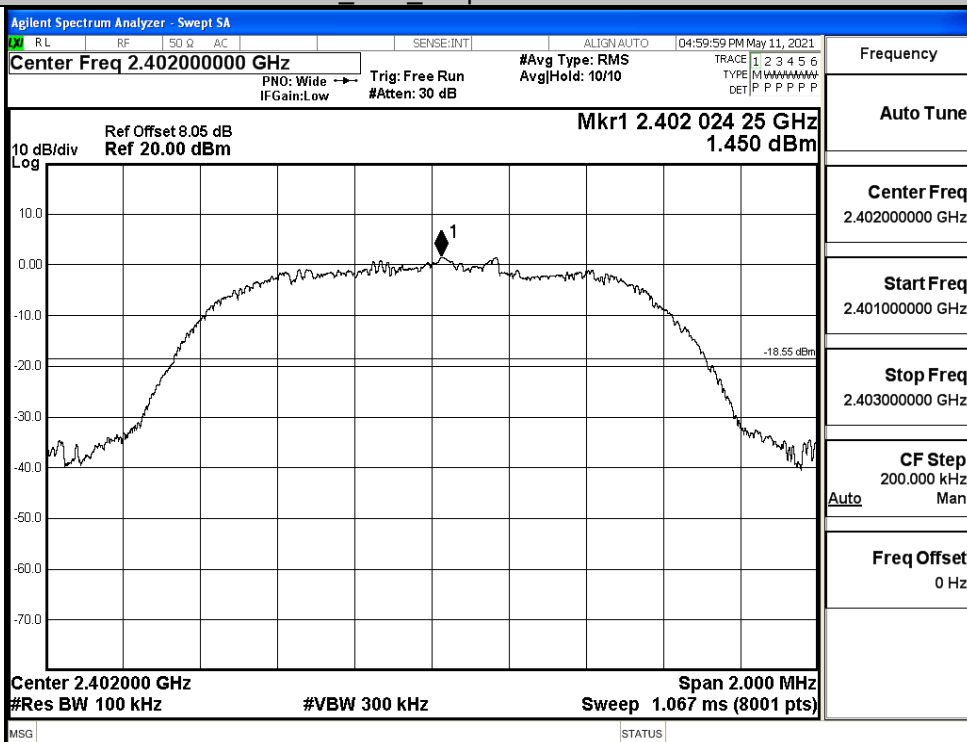


Puw

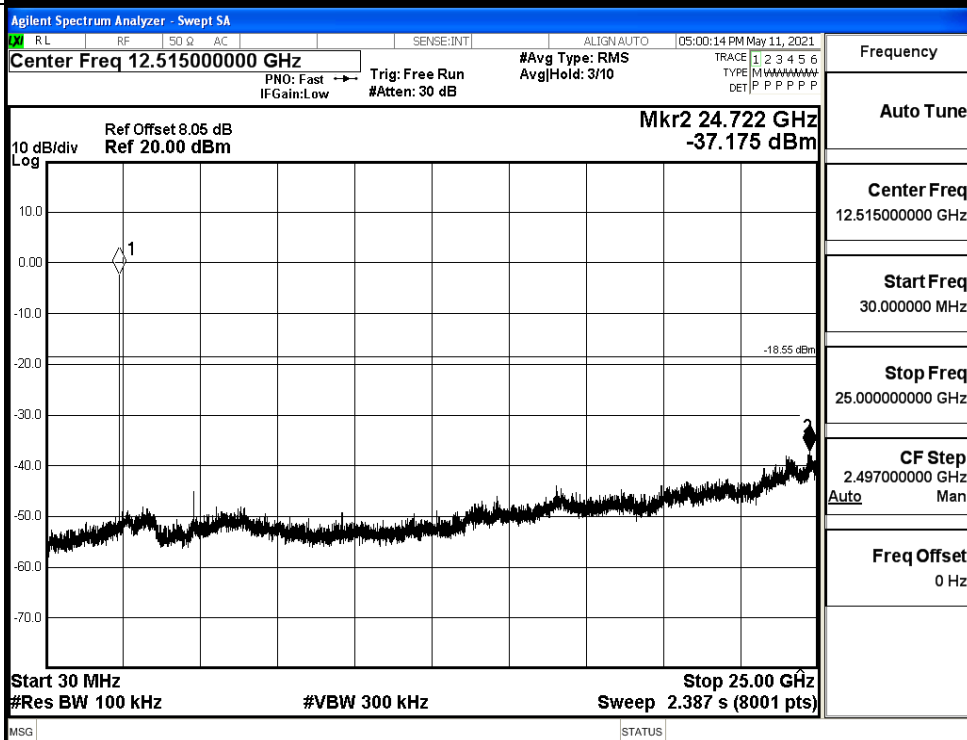


8DPSK_LCH_Graphs

Pref

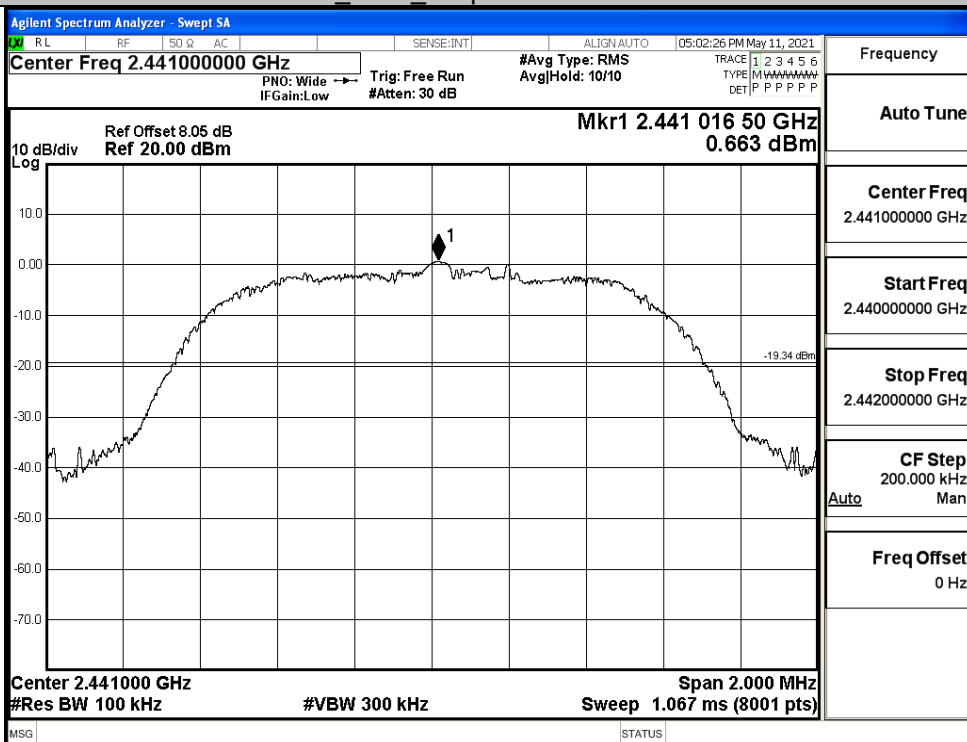


Puw

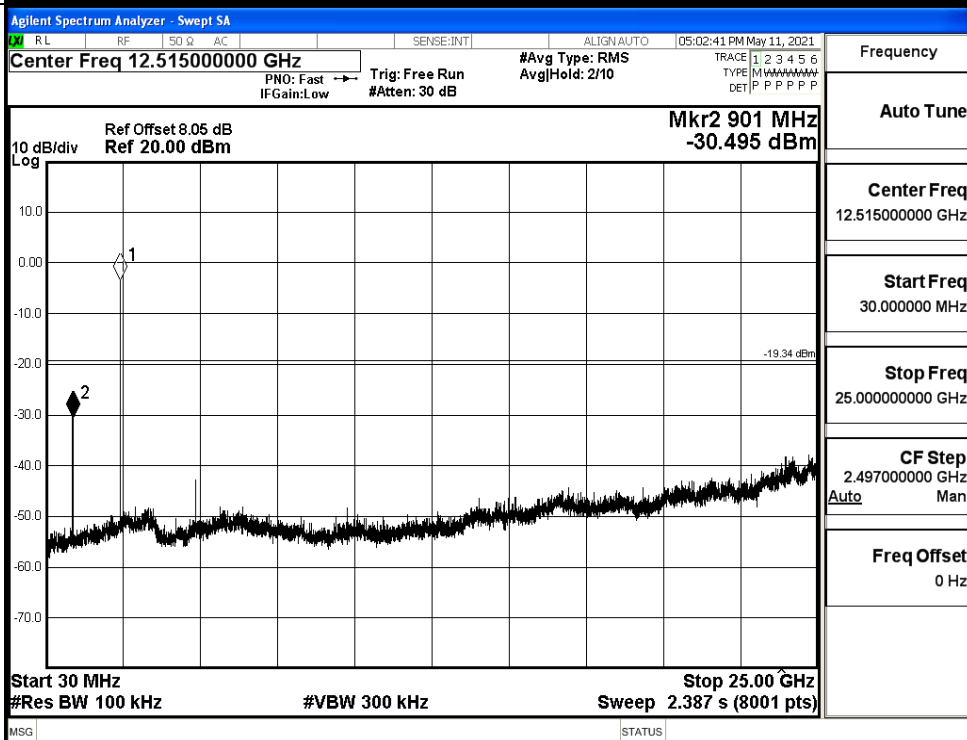


8DPSK_MCH_Graphs

Pref

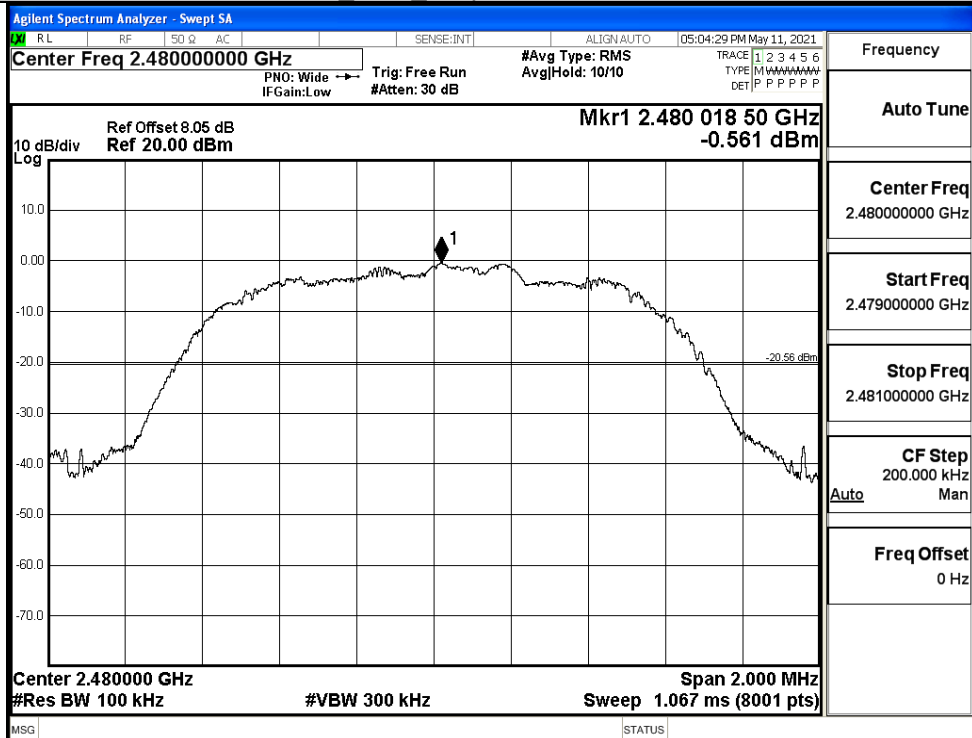


Puw

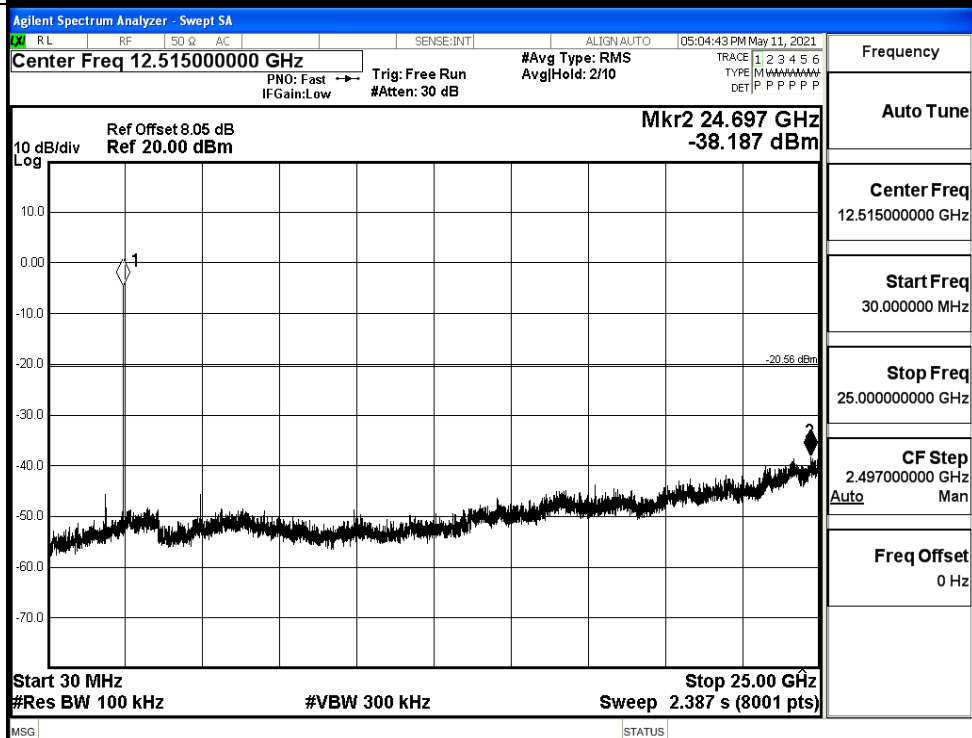


8DPSK_HCH_Graphs

Pref



Puw

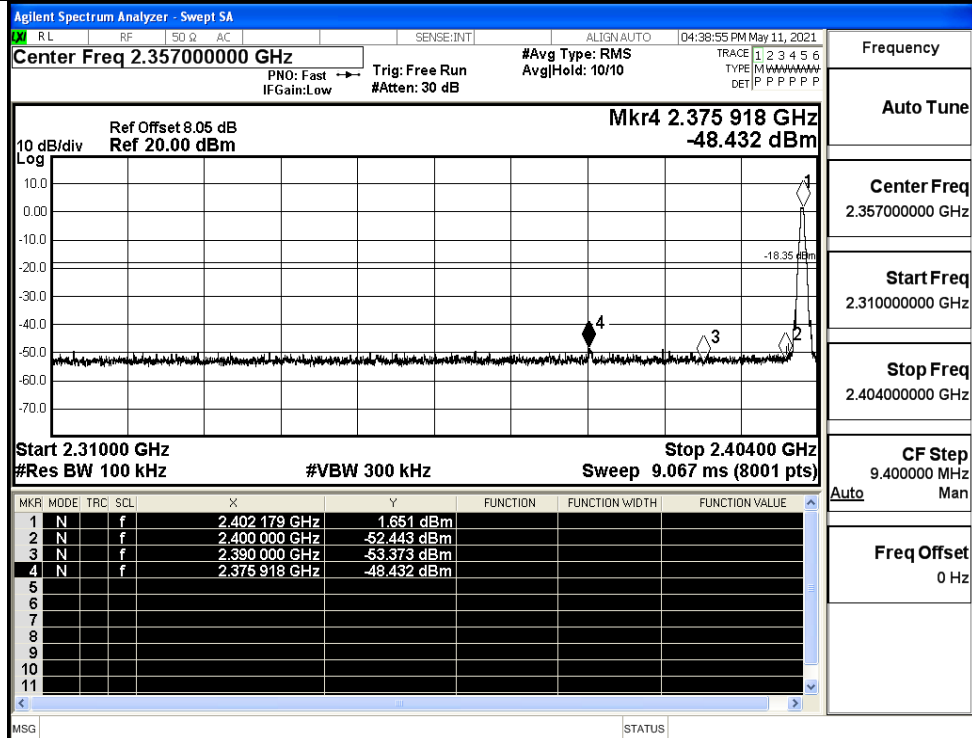


A.7 Band-edge for RF Conducted Emissions

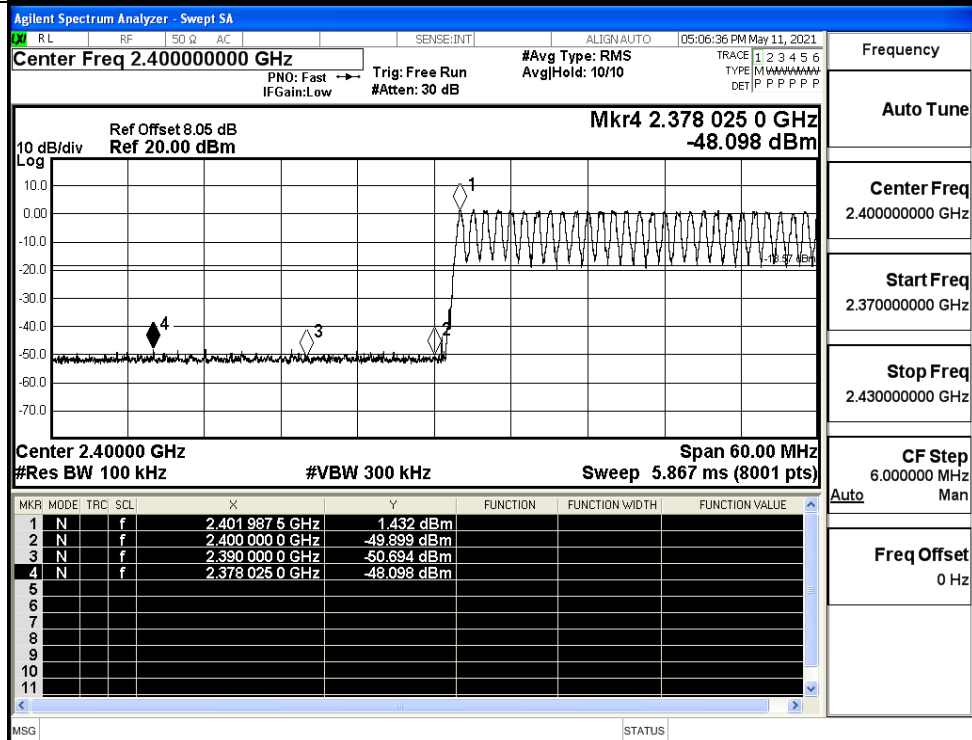
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	1.651	Off	-48.432	-18.35	PASS
			1.432	On	-48.098	-18.57	PASS
	HCH	2480	-0.487	Off	-49.202	-20.49	PASS
			0.104	On	-48.192	-19.9	PASS
$\pi/4$ DQPSK	LCH	2402	1.166	Off	-48.812	-18.83	PASS
			1.117	On	-48.795	-18.88	PASS
	HCH	2480	-0.639	Off	-49.174	-20.64	PASS
			0.090	On	-48.572	-19.91	PASS
8DPSK	LCH	2402	1.553	Off	-45.546	-18.45	PASS
			1.469	On	-48.567	-18.53	PASS
	HCH	2480	-0.585	Off	-49.243	-20.59	PASS
			0.207	On	-48.448	-19.79	PASS

Test Graphs

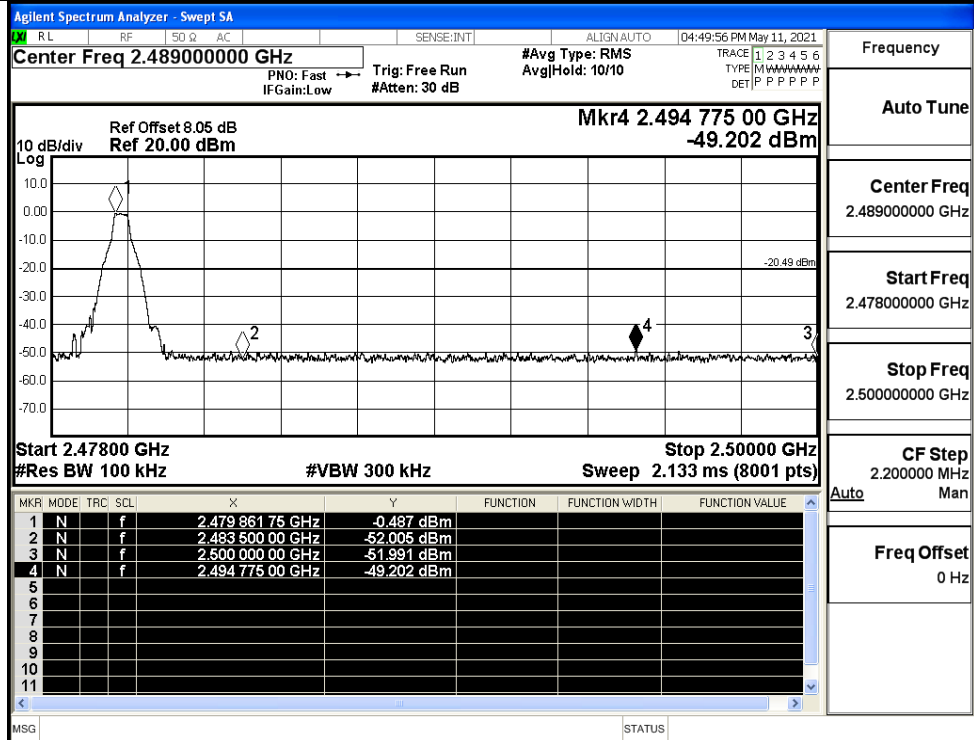
GFSK/LCH/No Hop



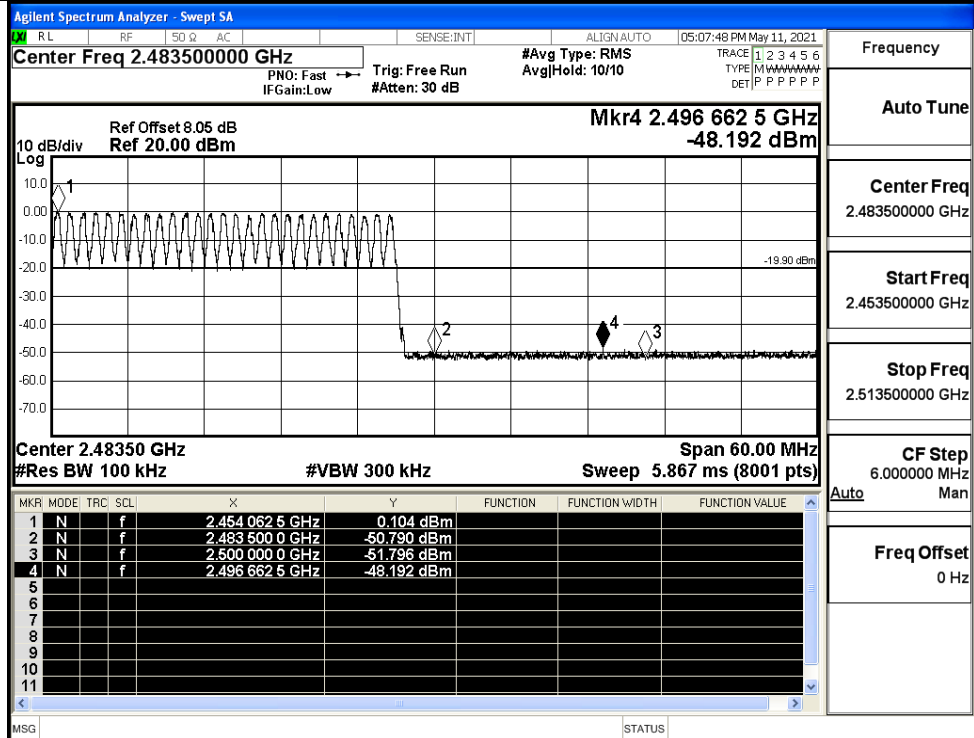
GFSK/LCH/Hop



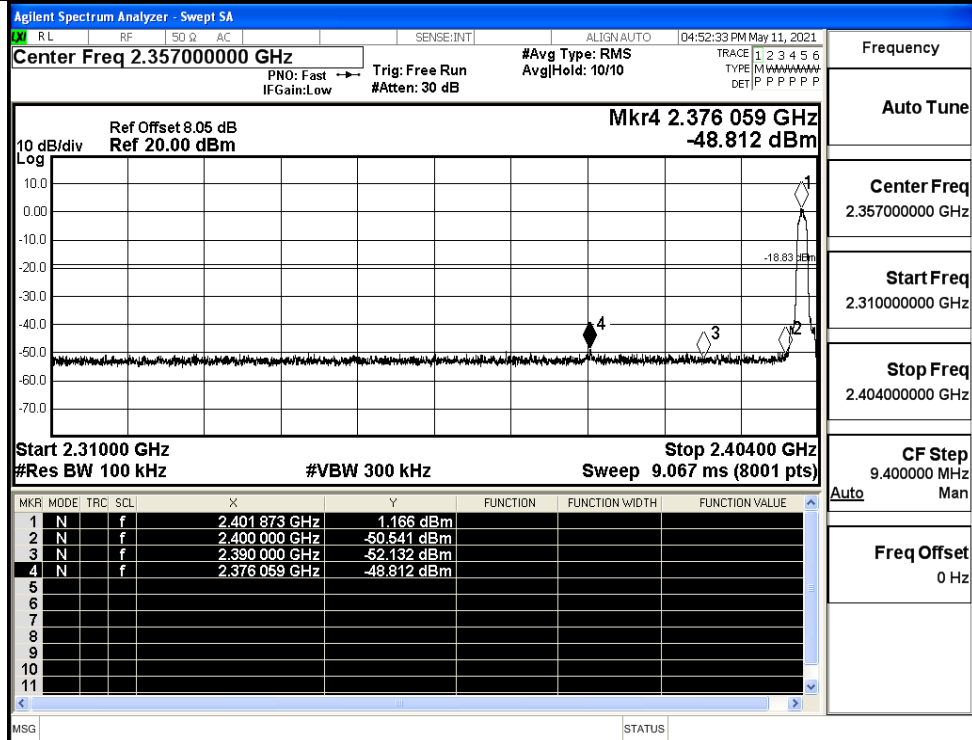
GFSK/HCH/No Hop



GFSK/HCH/Hop



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



Frequency

Auto Tune

Center Freq
2.357000000 GHz

Start Freq
2.310000000 GHz

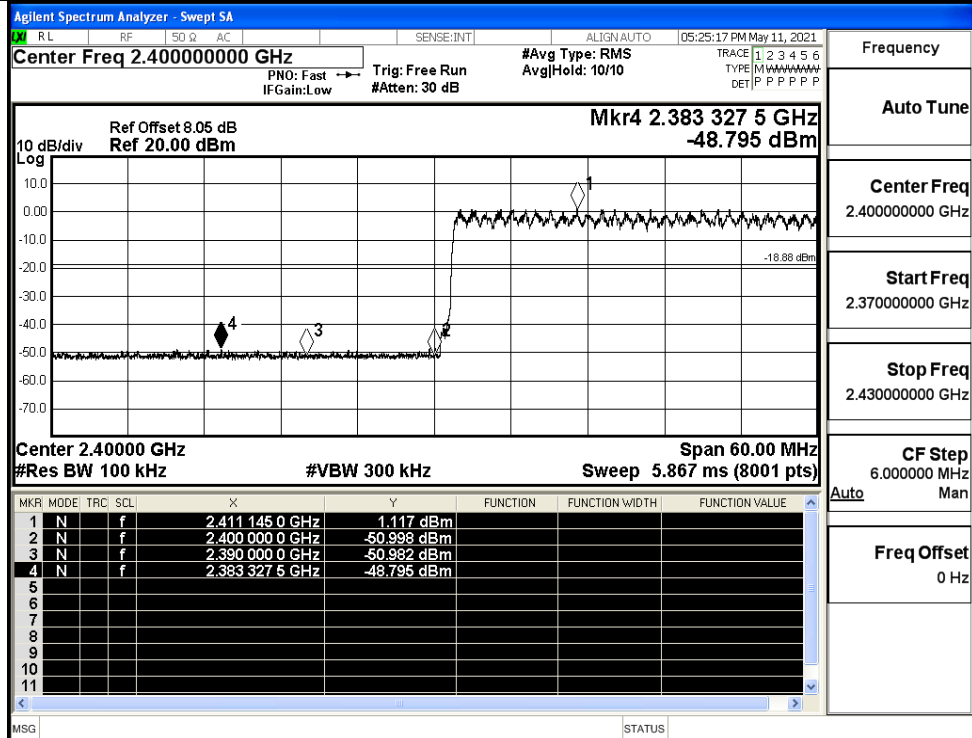
Stop Freq
2.404000000 GHz

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

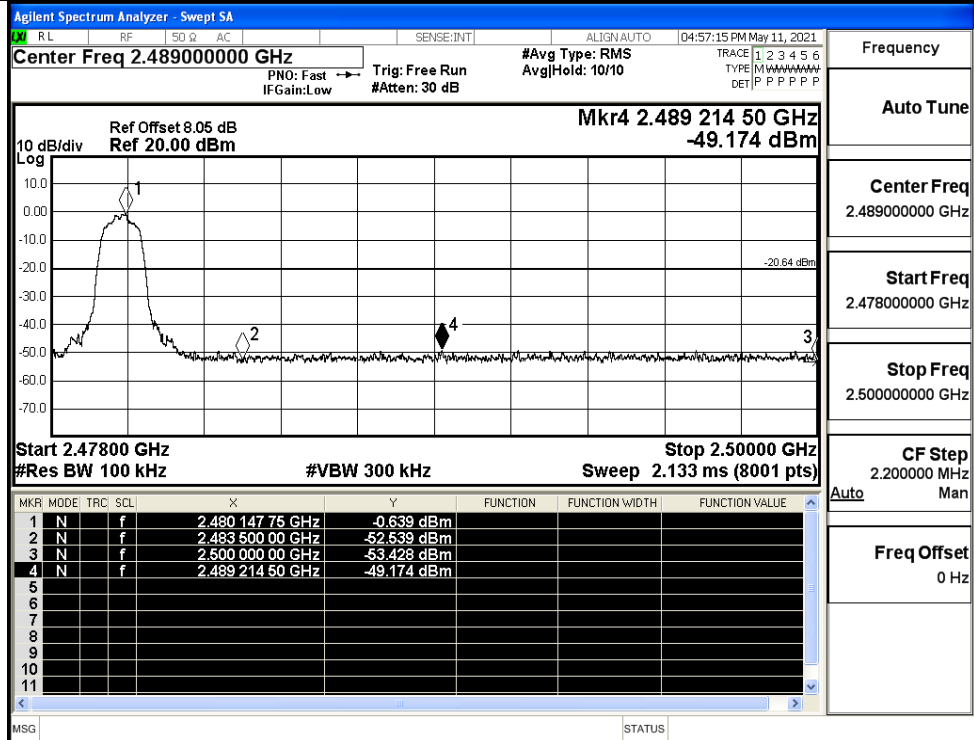
Stop Freq
2.430000000 GHz

CF Step
6.000000 MHz

Auto Man

Freq Offset
0 Hz

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

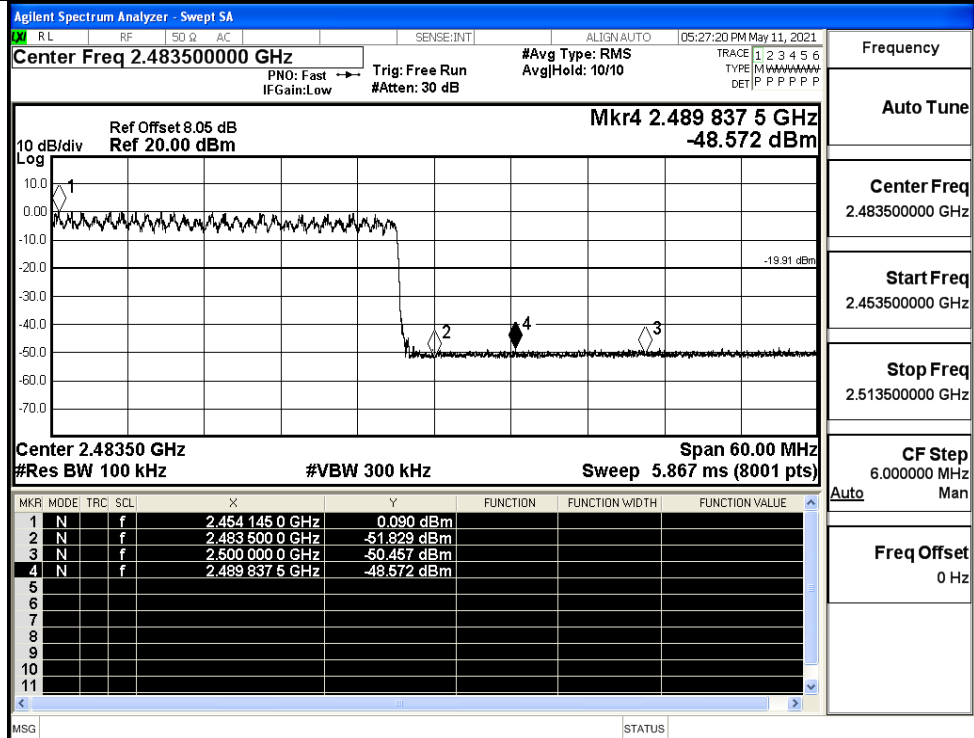


Frequency

Auto Tune

Center Freq
2.489000000 GHzStart Freq
2.478000000 GHzStop Freq
2.500000000 GHzCF Step
2.200000 MHz
Auto ManFreq Offset
0 Hz

$\pi/4$ DQPSK/HCH/Hop

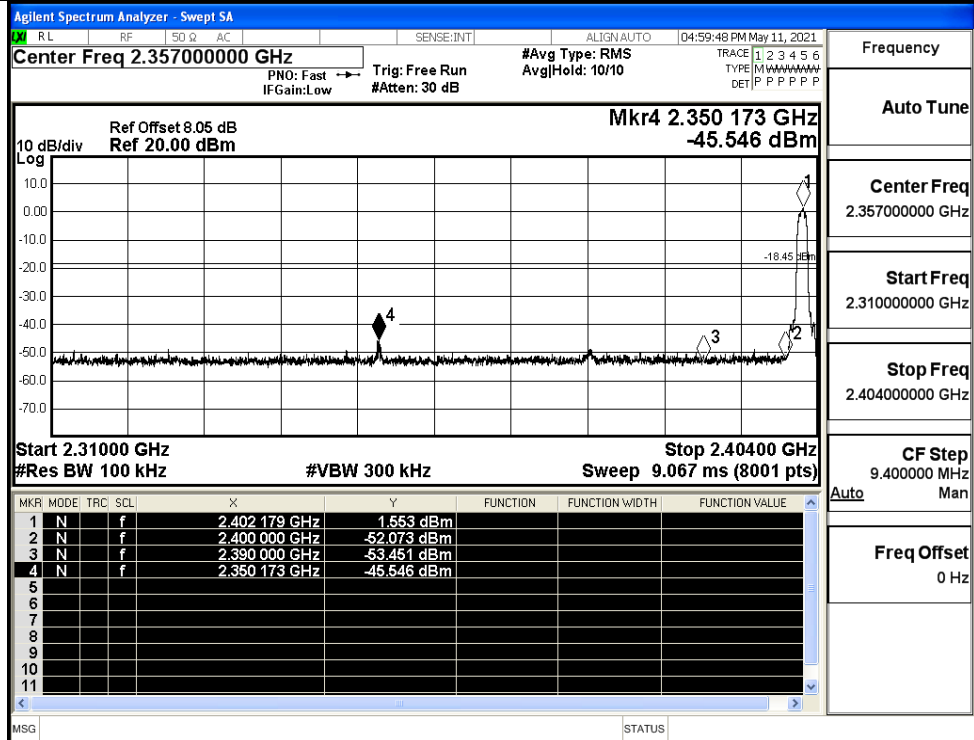


Frequency

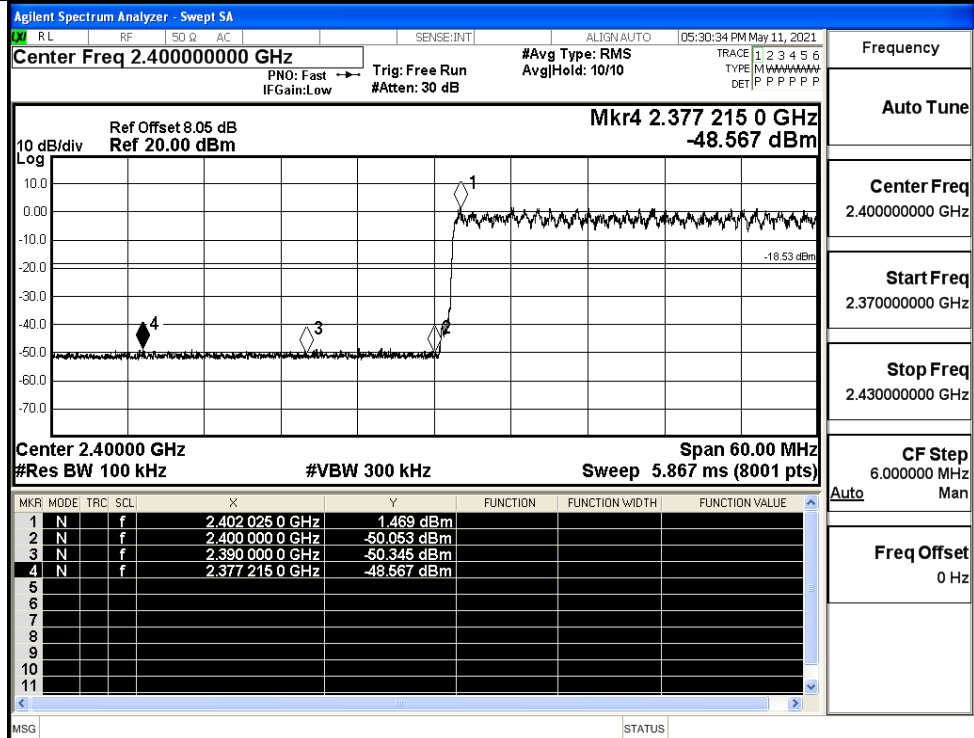
Auto Tune

Center Freq
2.483500000 GHzStart Freq
2.453500000 GHzStop Freq
2.513500000 GHzCF Step
6.000000 MHz
Auto ManFreq Offset
0 Hz

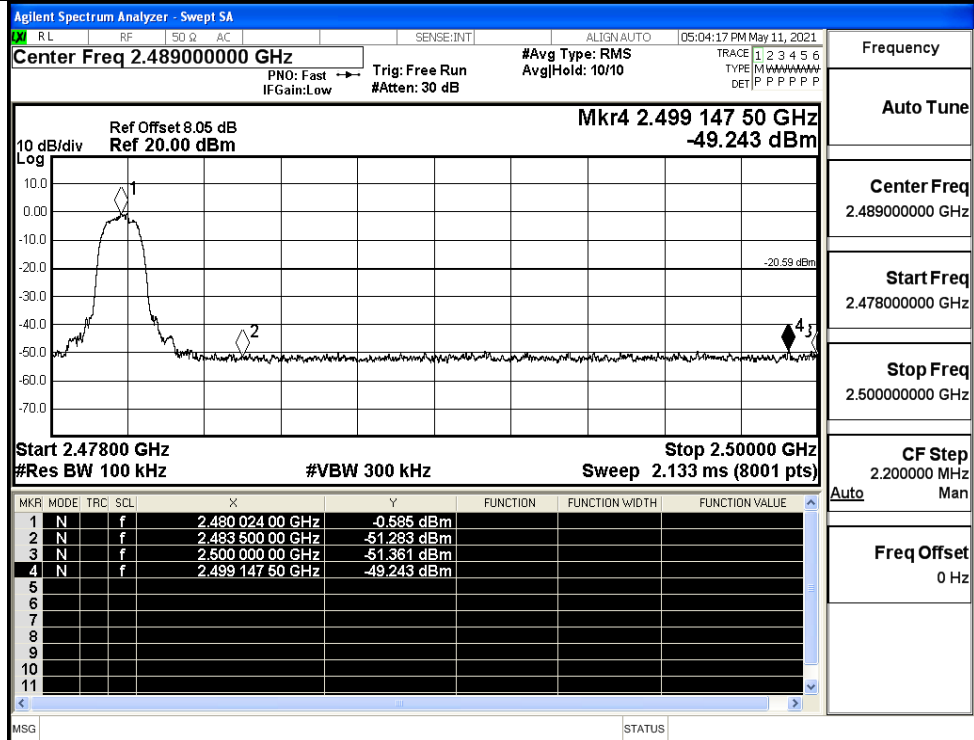
8DPSK/LCH/No Hop



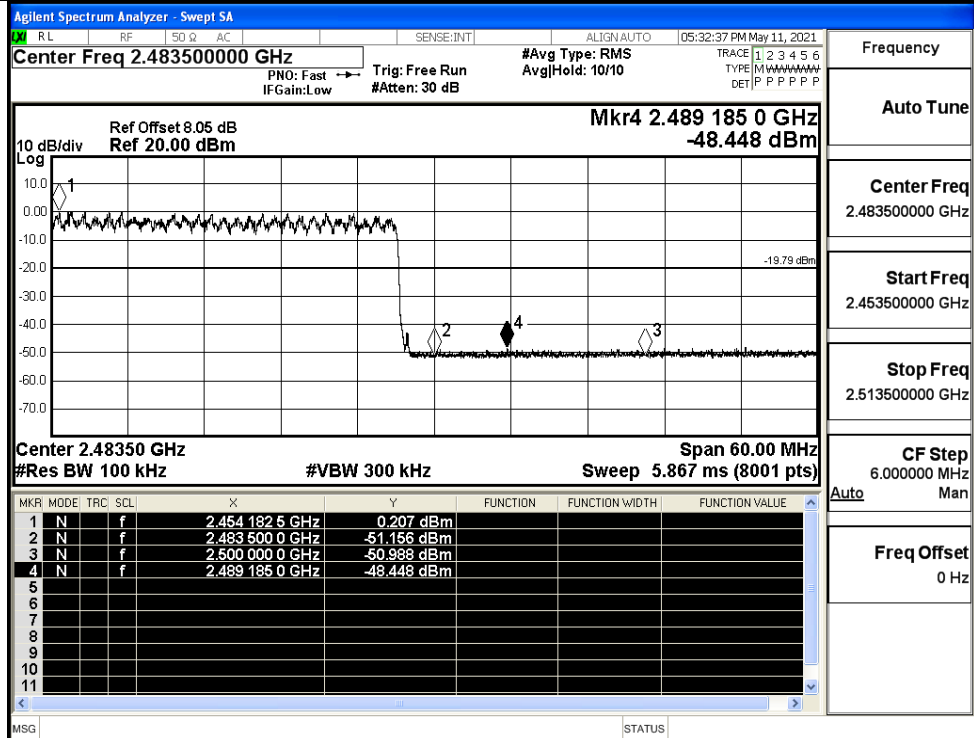
8DPSK/LCH/Hop



8DPSK/HCH/No Hop



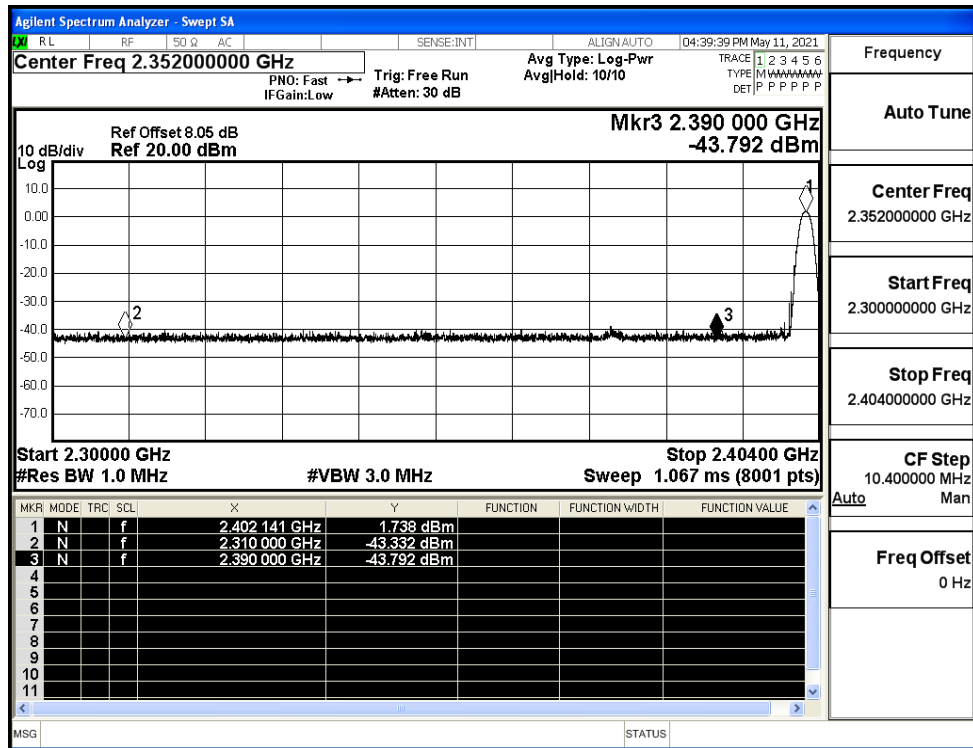
8DPSK/HCH/Hop



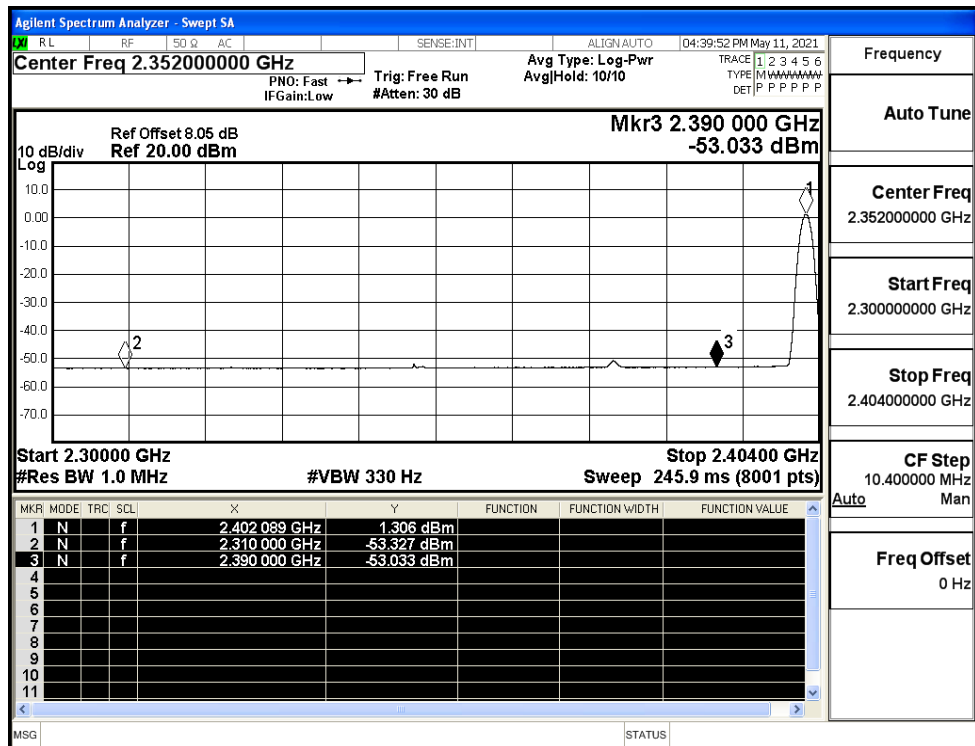
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.33	2.0	0	51.93	PEAK	74	PASS
	Off	2310.0	-53.33	2.0	0	41.93	AV	54	PASS
	Off	2390.0	-43.79	2.0	0	51.47	PEAK	74	PASS
	Off	2390.0	-53.03	2.0	0	42.22	AV	54	PASS
	Off	2483.5	-42.99	2.0	0	52.27	PEAK	74	PASS
	Off	2483.5	-52.48	2.0	0	42.77	AV	54	PASS
	Off	2500.0	-42.08	2.0	0	53.18	PEAK	74	PASS
	Off	2500.0	-52.35	2.0	0	42.91	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-43.16	2.0	0	52.10	PEAK	74	PASS
	Off	2310.0	-53.32	2.0	0	41.94	AV	54	PASS
	Off	2390.0	-42.09	2.0	0	53.17	PEAK	74	PASS
	Off	2390.0	-53.03	2.0	0	42.23	AV	54	PASS
	Off	2483.5	-41.22	2.0	0	54.03	PEAK	74	PASS
	Off	2483.5	-52.39	2.0	0	42.87	AV	54	PASS
	Off	2500.0	-42.00	2.0	0	53.26	PEAK	74	PASS
	Off	2500.0	-52.33	2.0	0	42.93	AV	54	PASS
8DPSK	Off	2310.0	-42.92	2.0	0	52.34	PEAK	74	PASS
	Off	2310.0	-53.36	2.0	0	41.90	AV	54	PASS
	Off	2390.0	-43.24	2.0	0	52.02	PEAK	74	PASS
	Off	2390.0	-52.99	2.0	0	42.26	AV	54	PASS
	Off	2483.5	-42.42	2.0	0	52.83	PEAK	74	PASS
	Off	2483.5	-52.44	2.0	0	42.82	AV	54	PASS
	Off	2500.0	-42.41	2.0	0	52.85	PEAK	74	PASS
	Off	2500.0	-52.41	2.0	0	42.85	AV	54	PASS

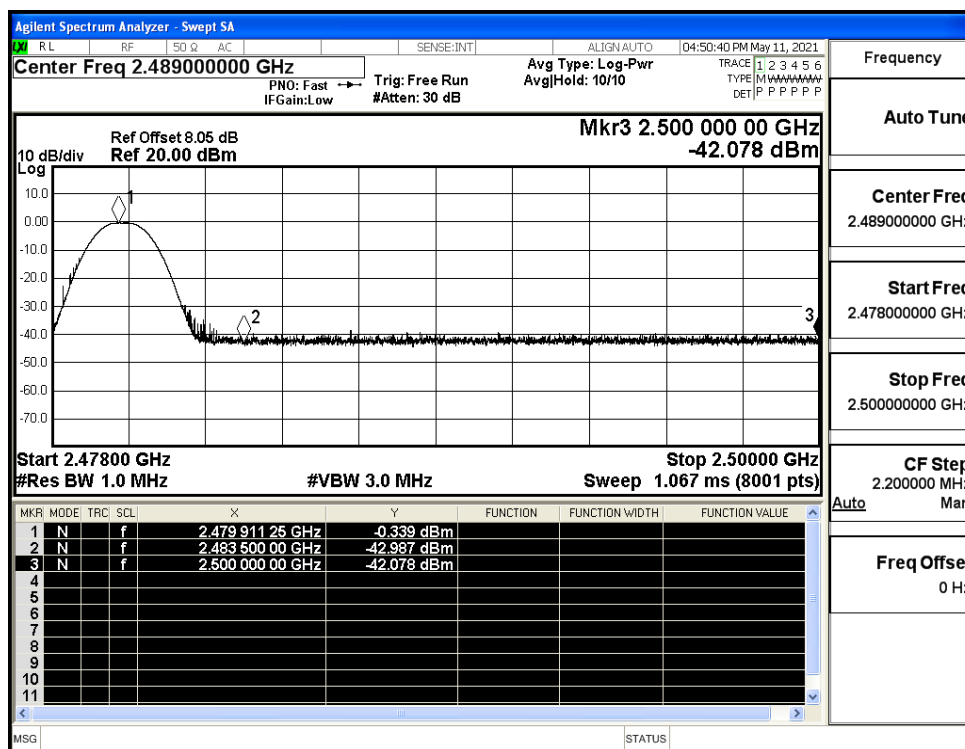
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



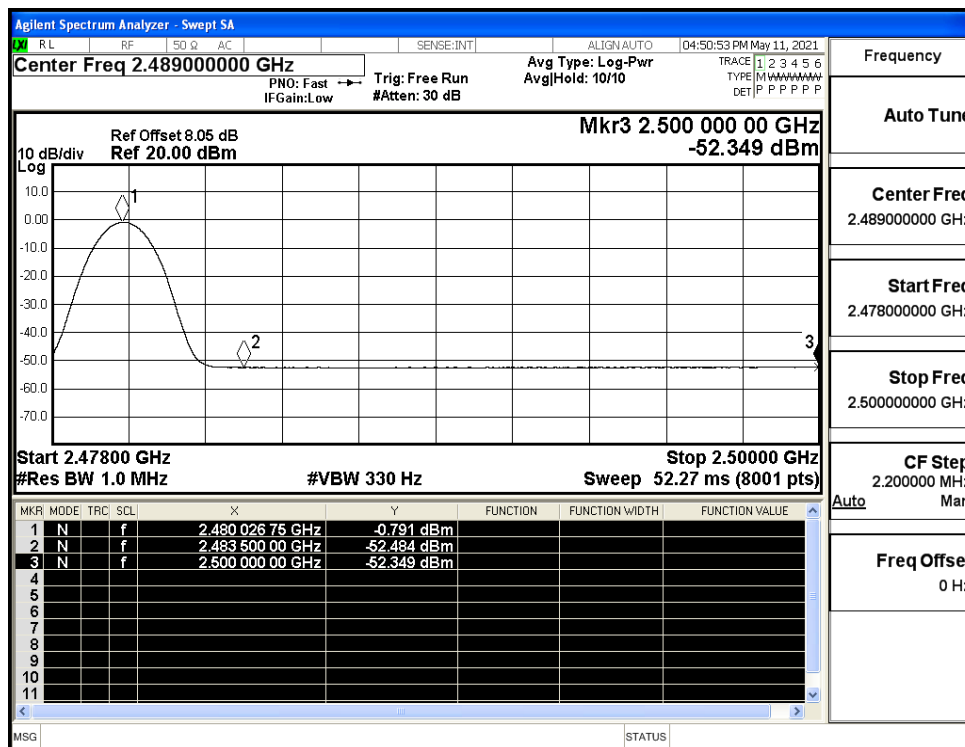
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)

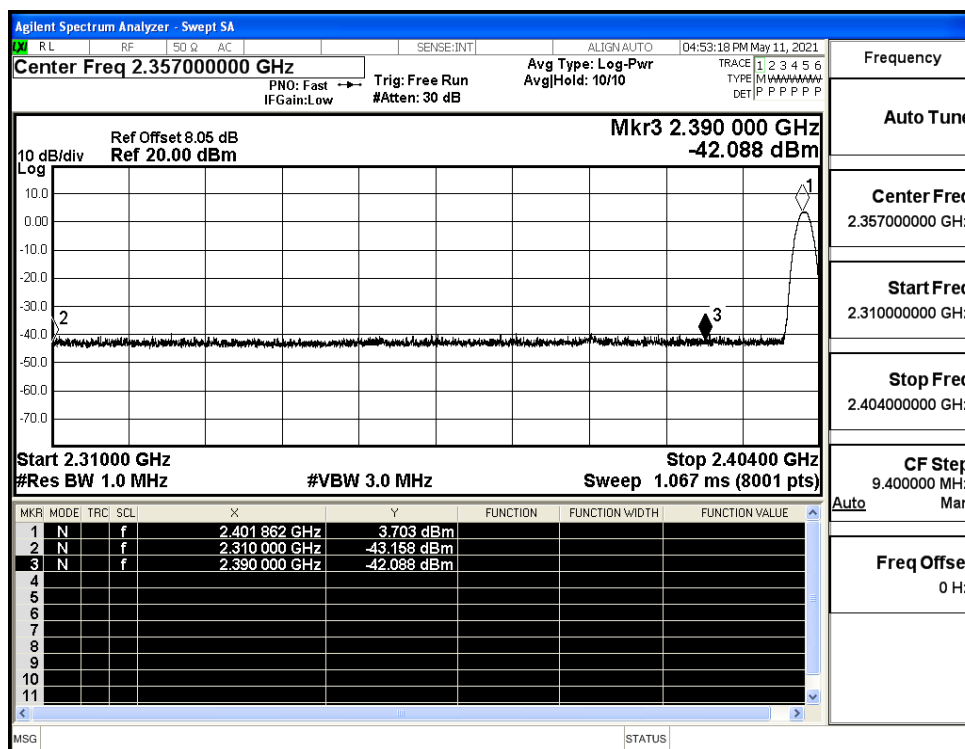
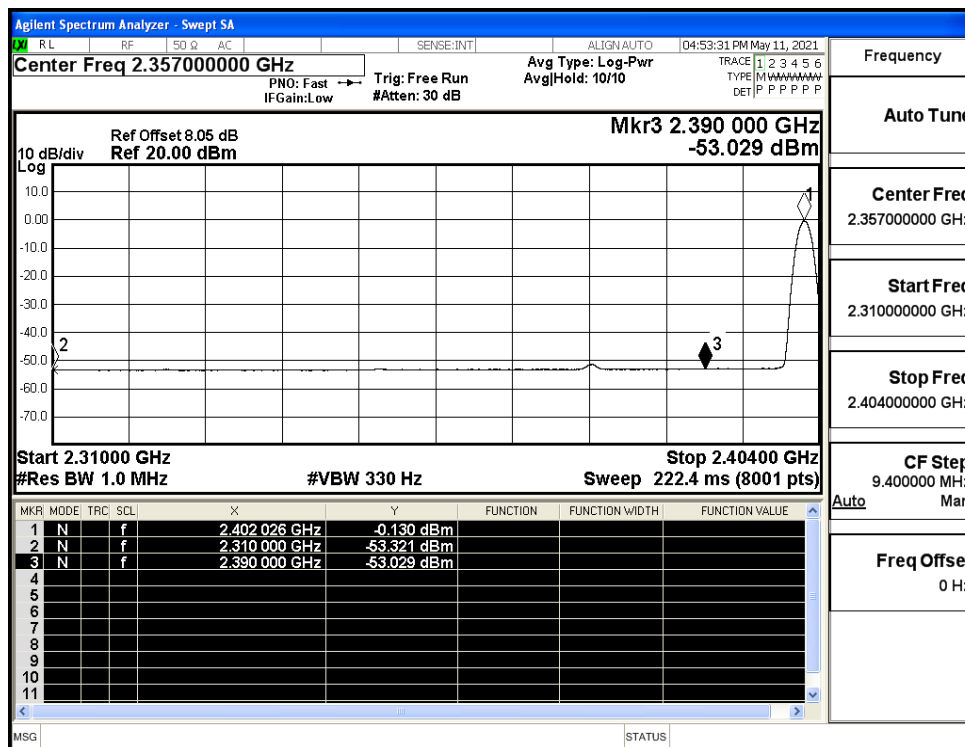


Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)

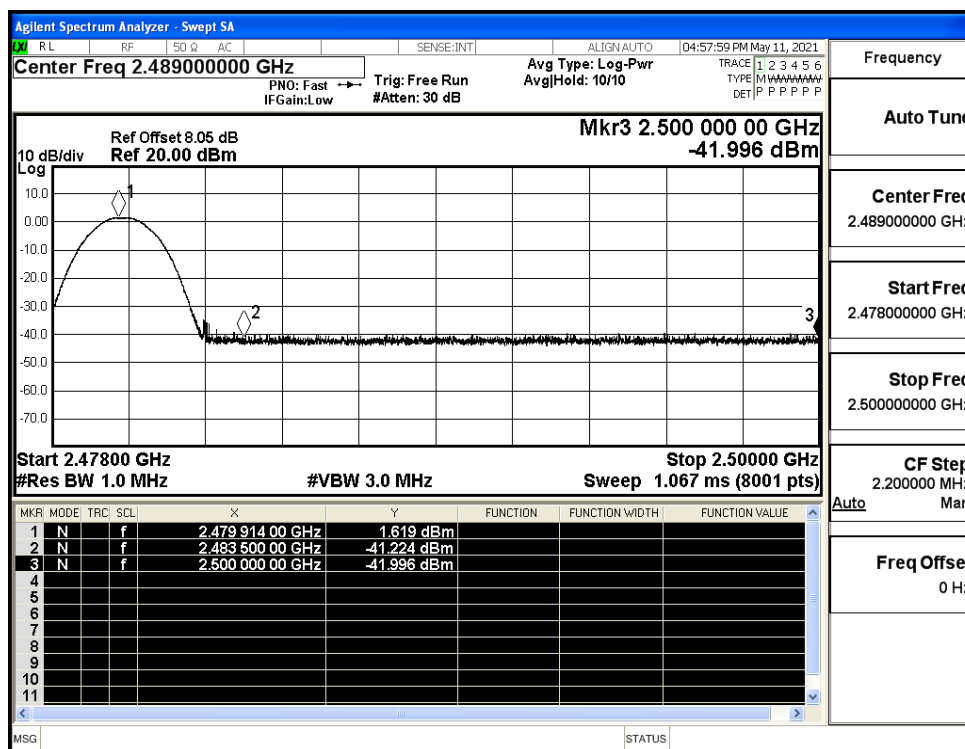


Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)

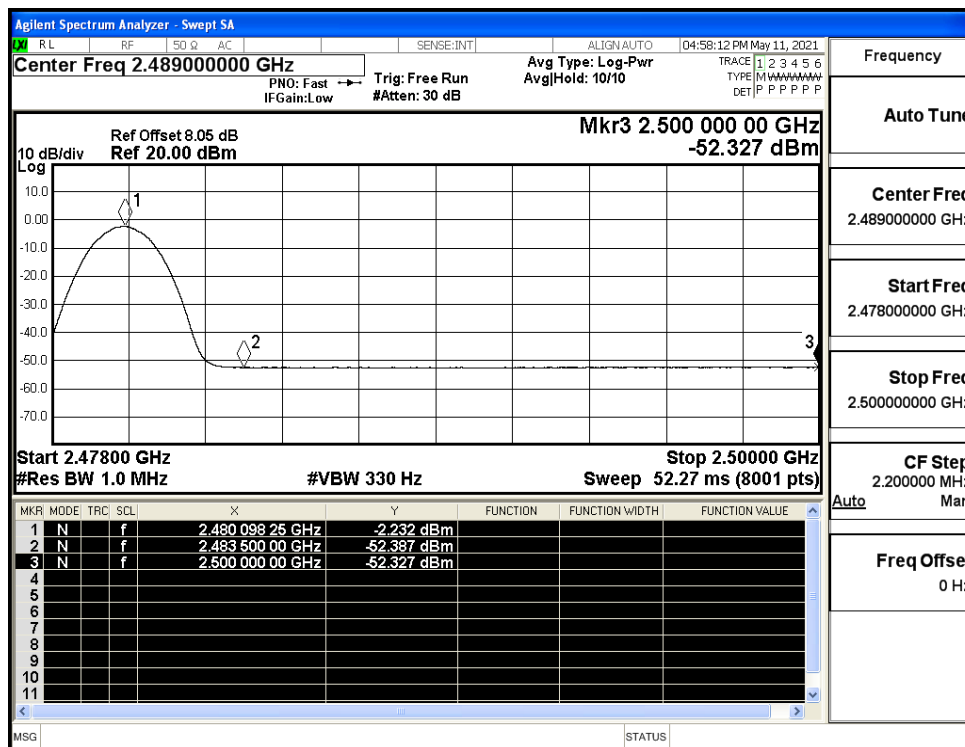


Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)

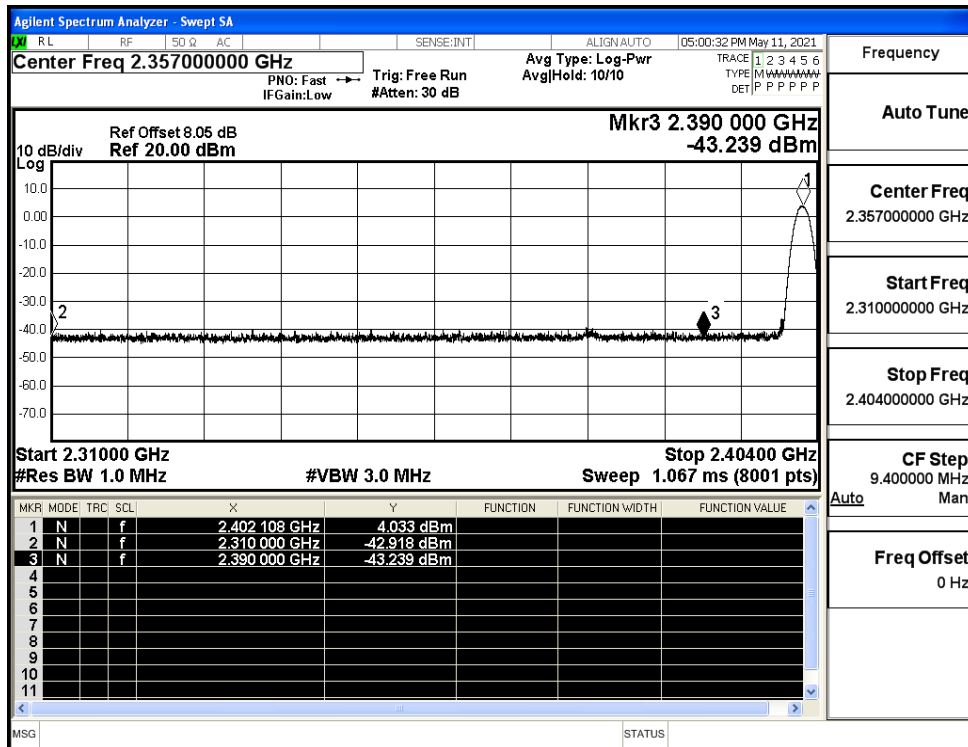
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



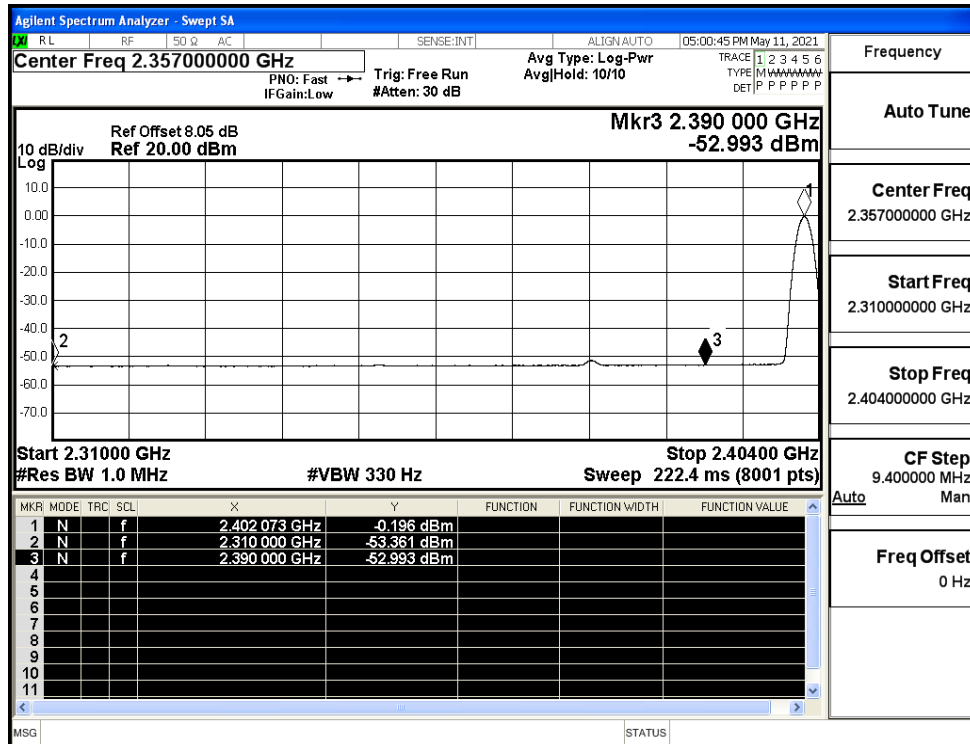
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



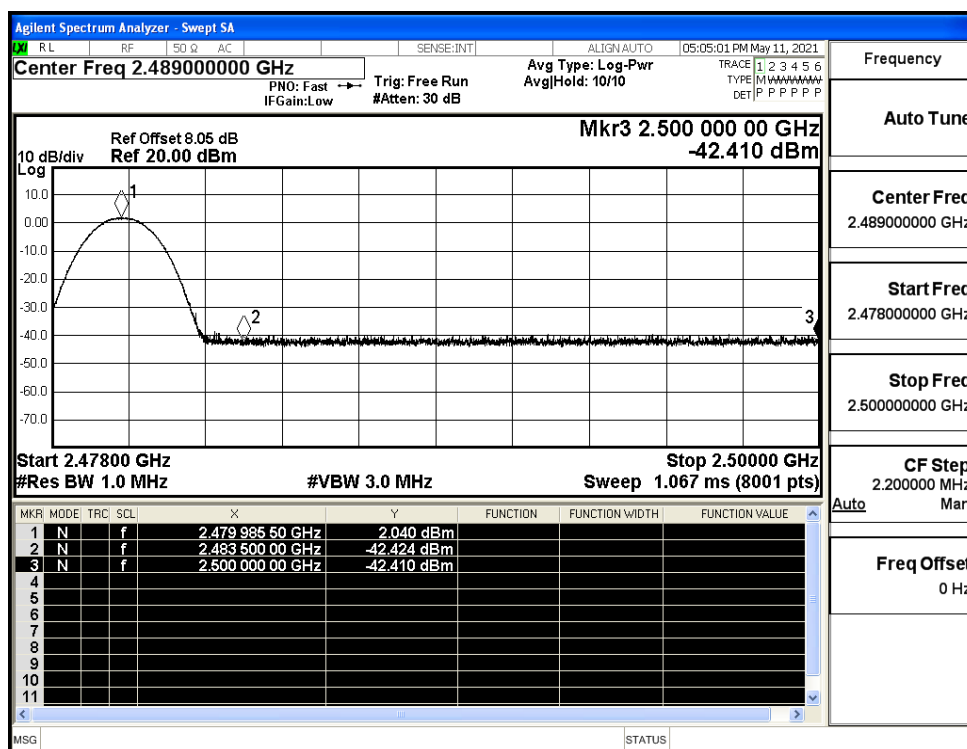
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

