

Appendix A

RF Test Data for BT V4.1(BDR/EDR) (Conducted Measurement)

Product Name: Scoobe3D

Trade Mark: Scoobe3D

Test Model: Scoobe3D V3.2

Environmental Conditions

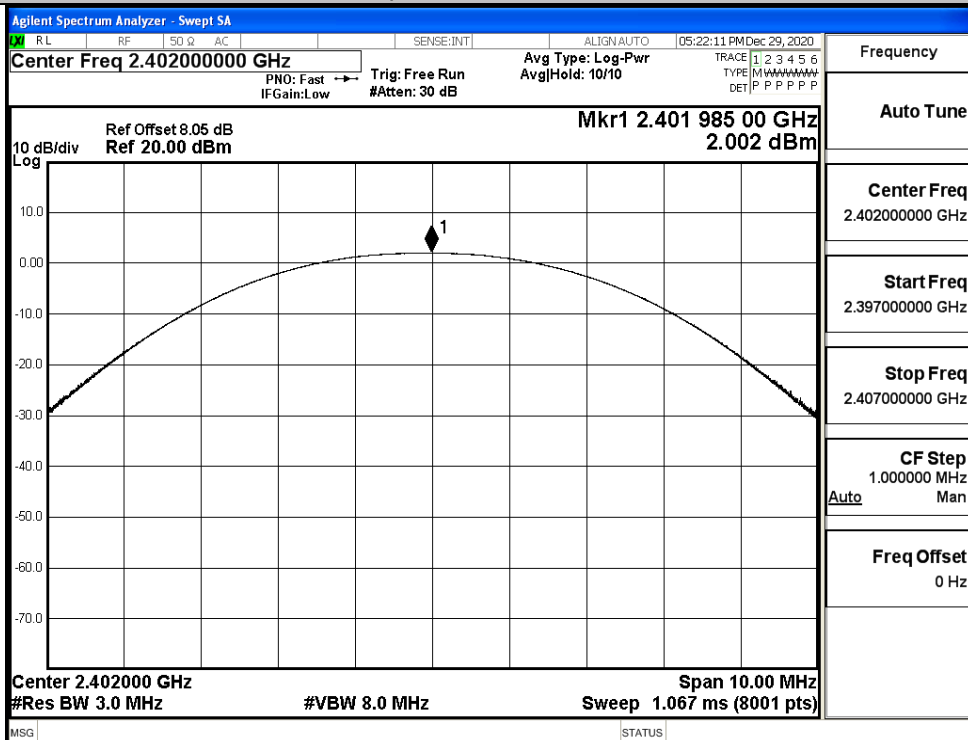
Temperature:	24.6° C
Relative Humidity:	54.1%
ATM Pressure:	100.0 kPa
Test Engineer:	Jay Li
Supervised by:	Li Huan

A.1 Maximum Conducted Peak Output Power

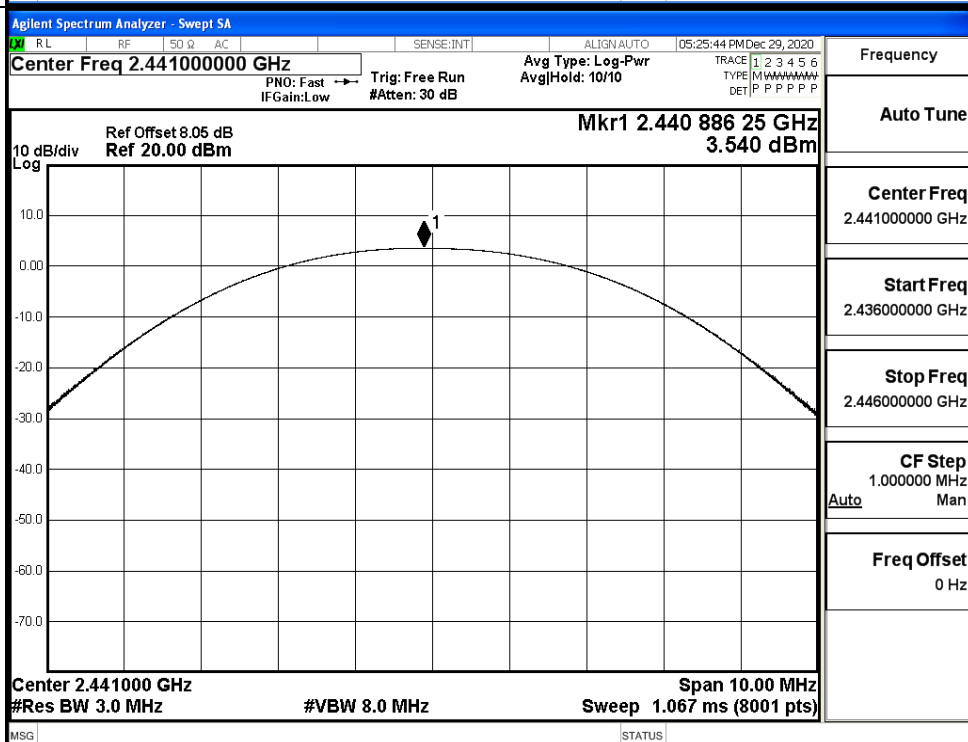
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2.002	21	PASS
	MCH	3.540	21	PASS
	HCH	2.817	21	PASS
$\pi/4$ DQPSK	LCH	2.095	21	PASS
	MCH	3.644	21	PASS
	HCH	3.048	21	PASS
8DPSK	LCH	2.475	21	PASS
	MCH	4.006	21	PASS
	HCH	3.400	21	PASS

Test Graphs

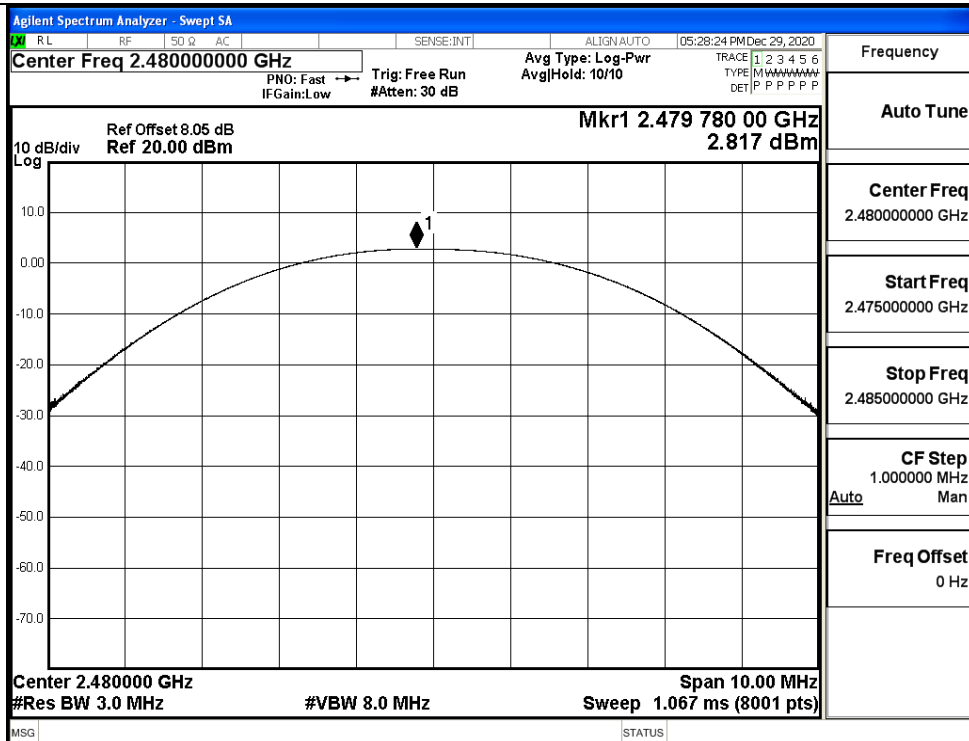
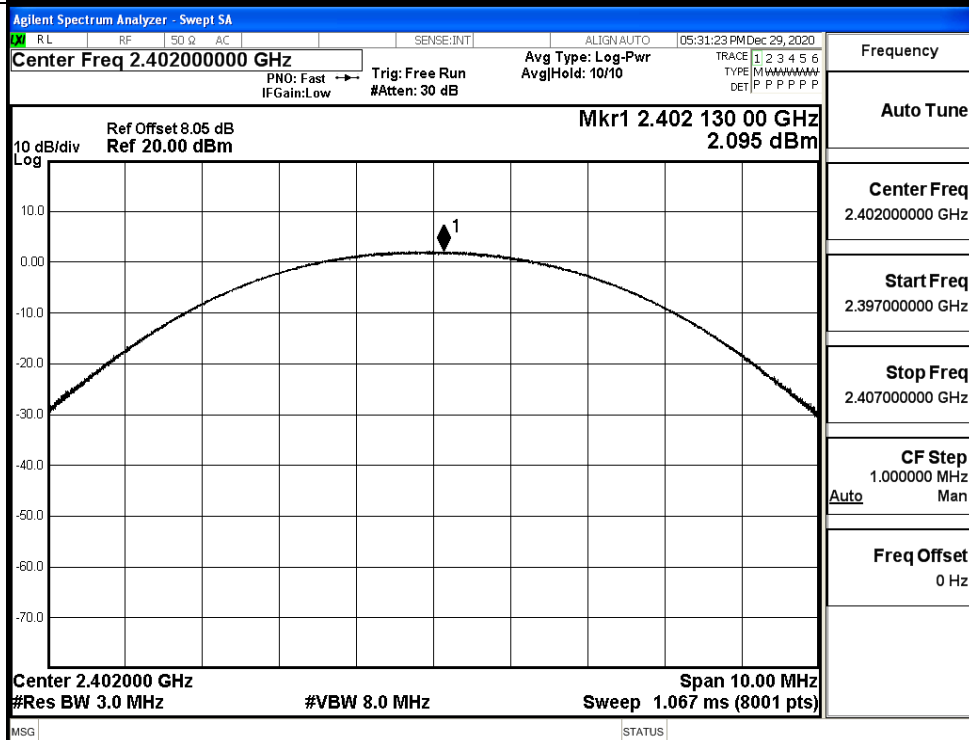
GFSK/LCH

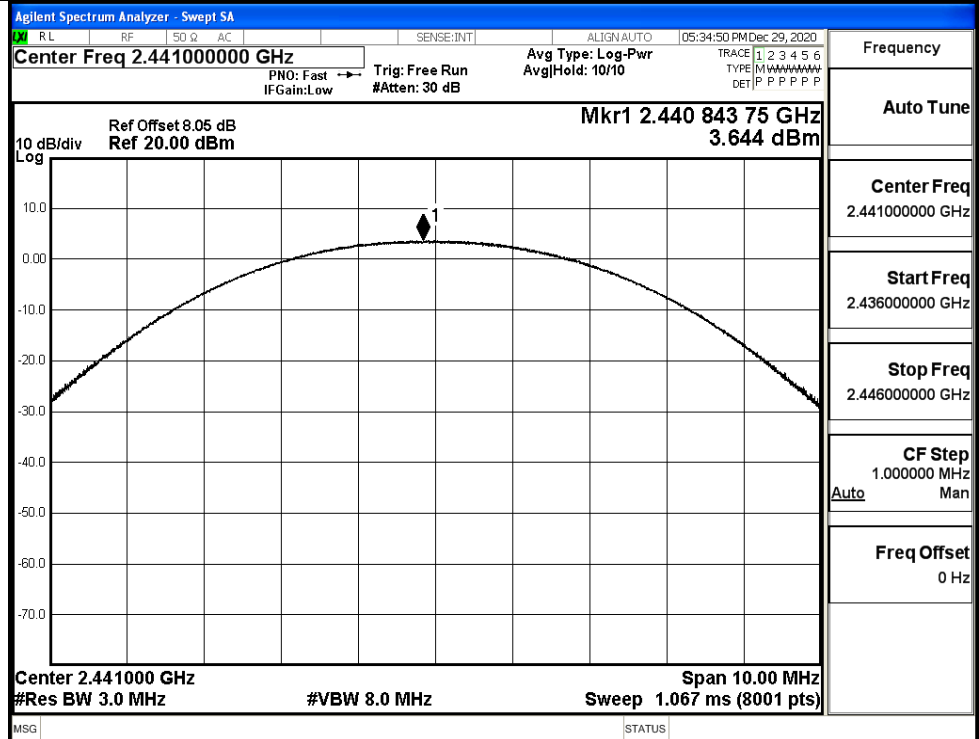
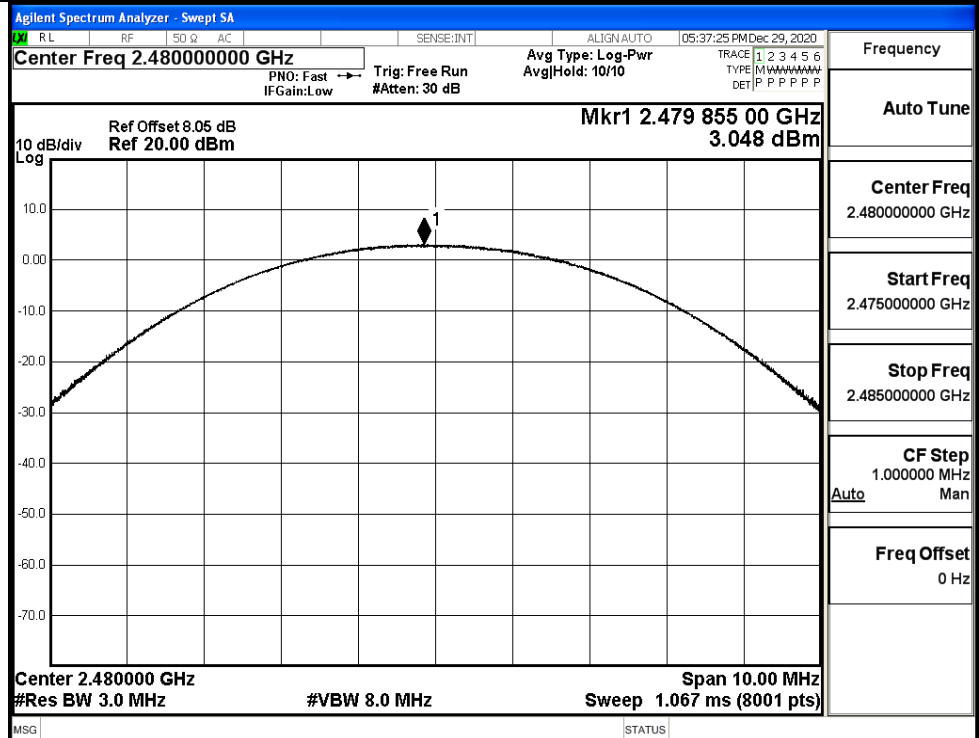


GFSK/MCH

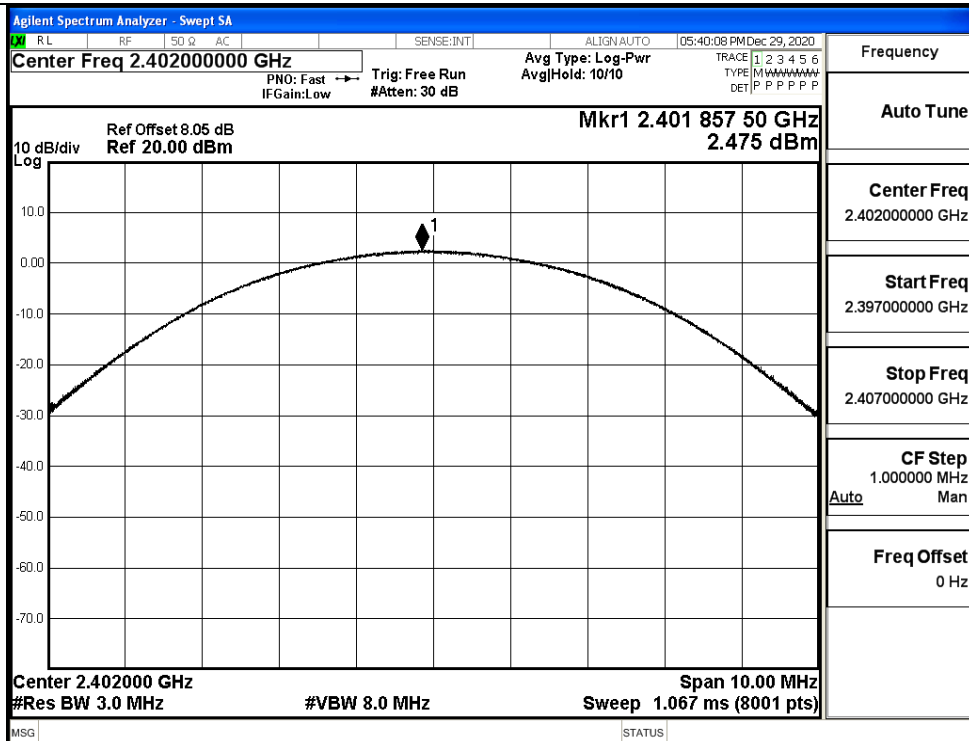


GFSK/HCH

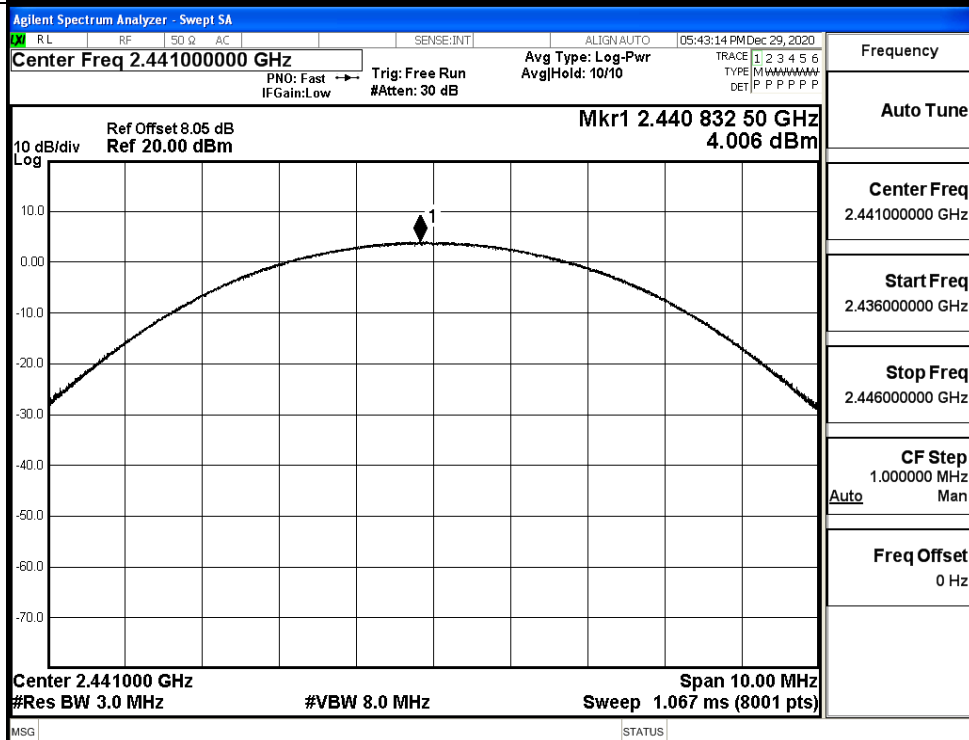
 π /4DQPSK/LCH

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

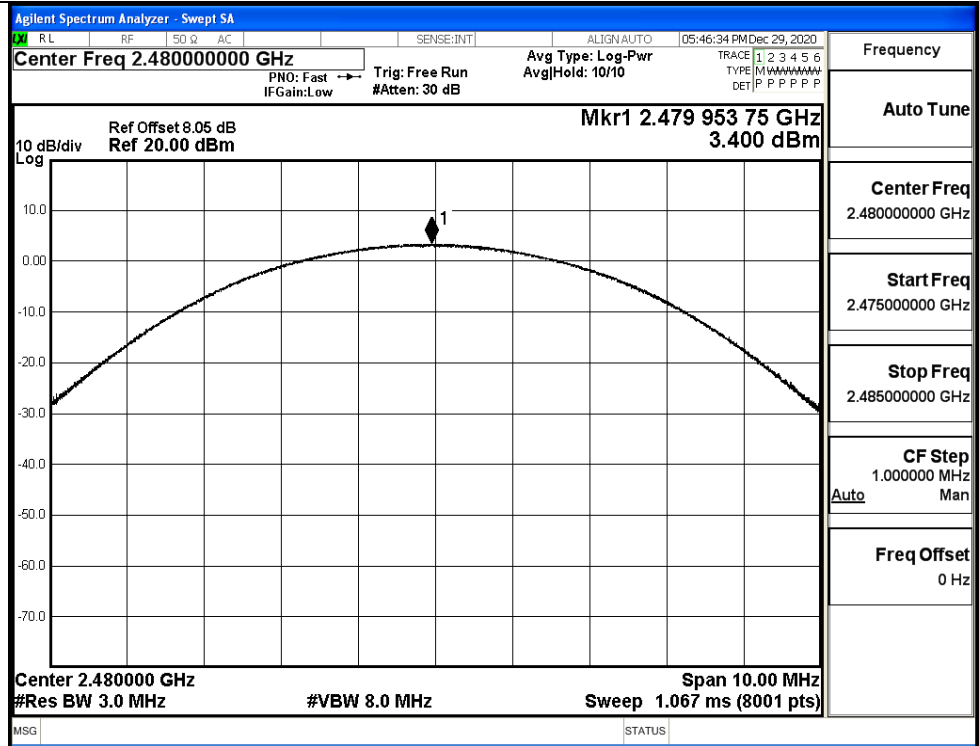
8DPSK/LCH



8DPSK/MCH



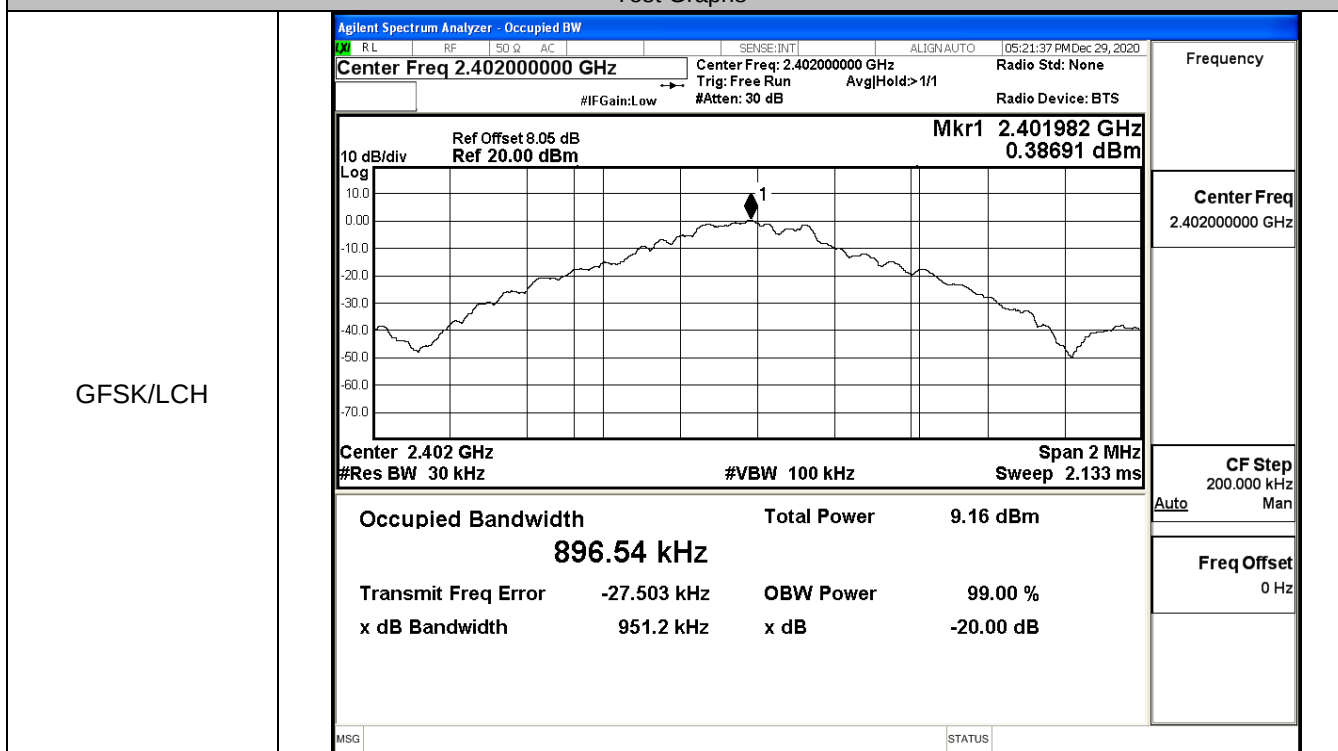
8DPSK/HCH



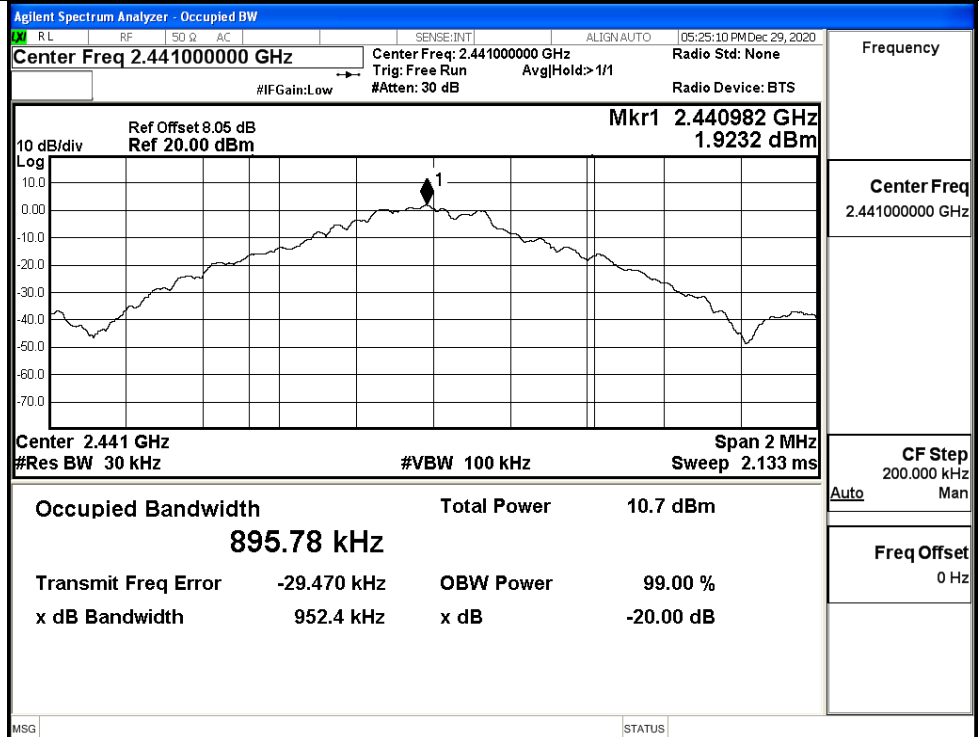
A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9512	Not Specified	PASS
	MCH	0.9524	Not Specified	PASS
	HCH	0.9518	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.278	Not Specified	PASS
	MCH	1.276	Not Specified	PASS
	HCH	1.278	Not Specified	PASS
8DPSK	LCH	1.288	Not Specified	PASS
	MCH	1.289	Not Specified	PASS
	HCH	1.288	Not Specified	PASS

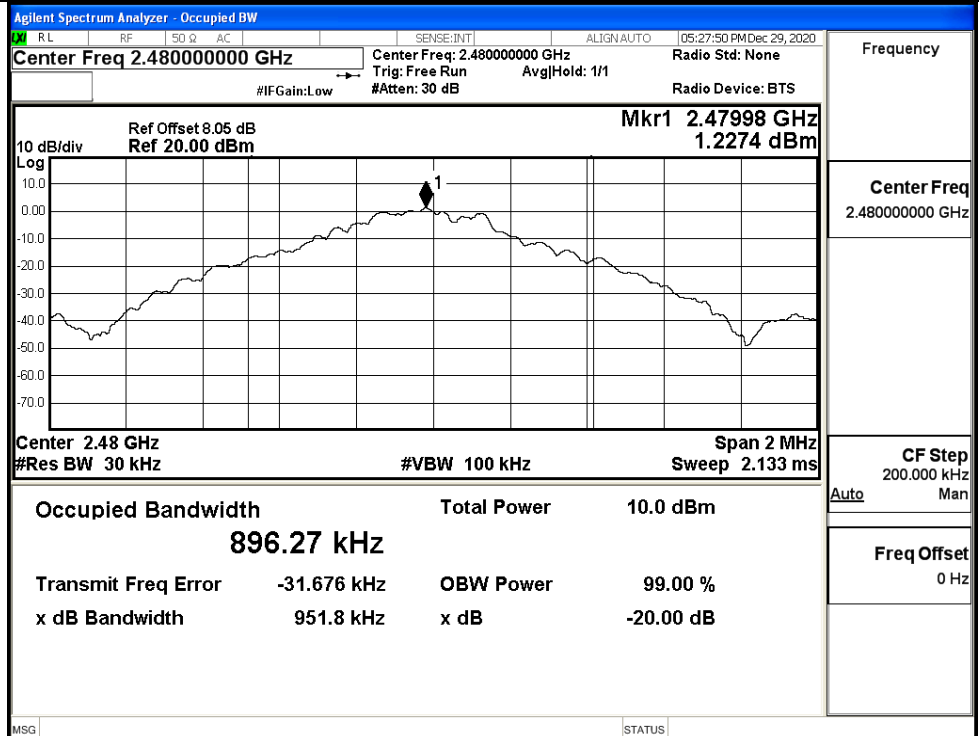
Test Graphs

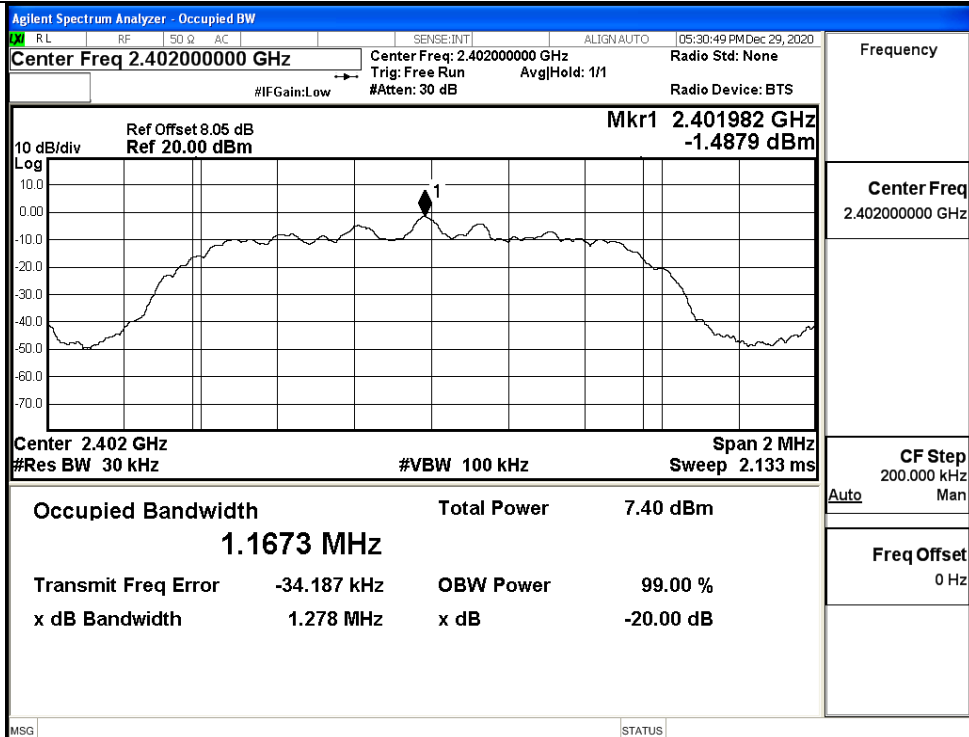


GFSK/MCH



GFSK/HCH

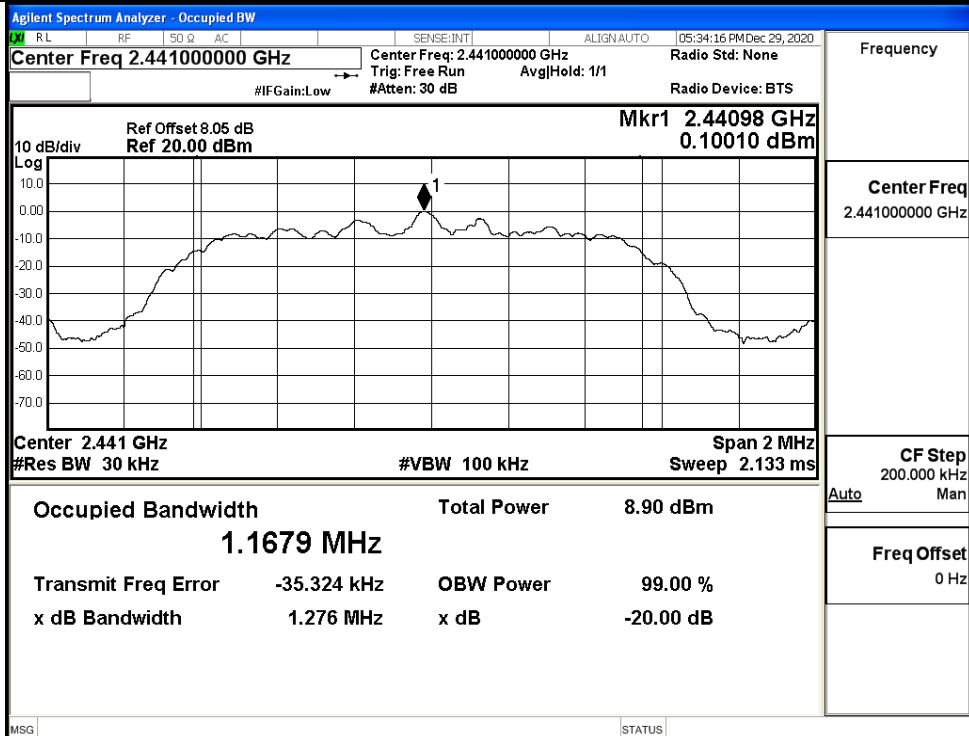


$\pi/4$ DQPSK/LCH

Frequency

Center Freq
2.40200000 GHzCF Step
200.000 kHz
Man

Auto

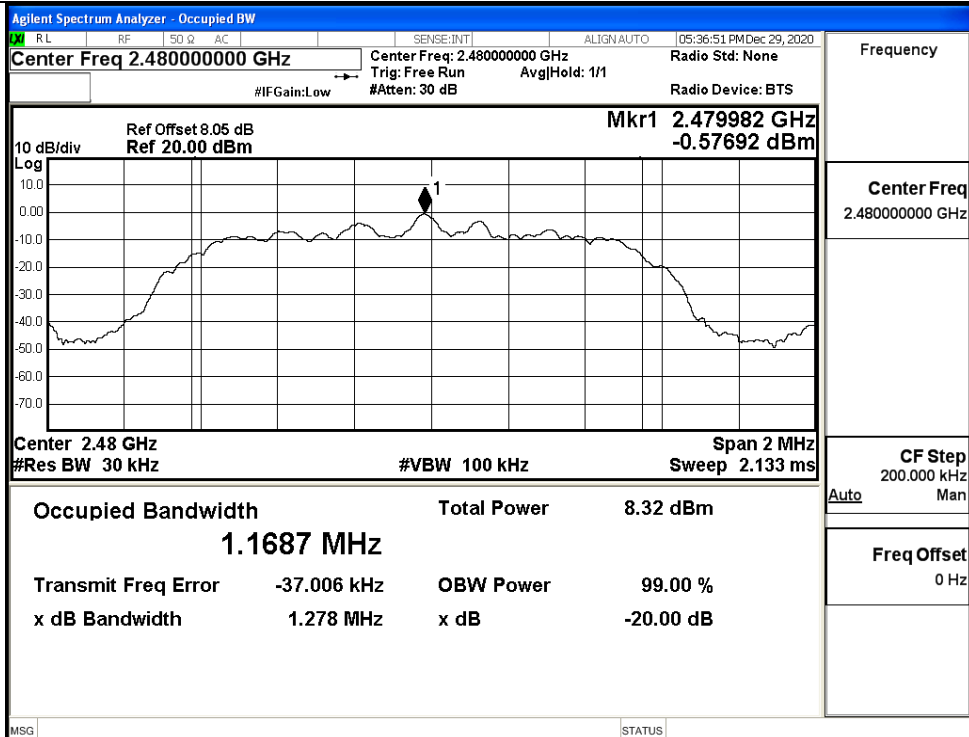
Freq Offset
0 Hz $\pi/4$ DQPSK/MCH

Frequency

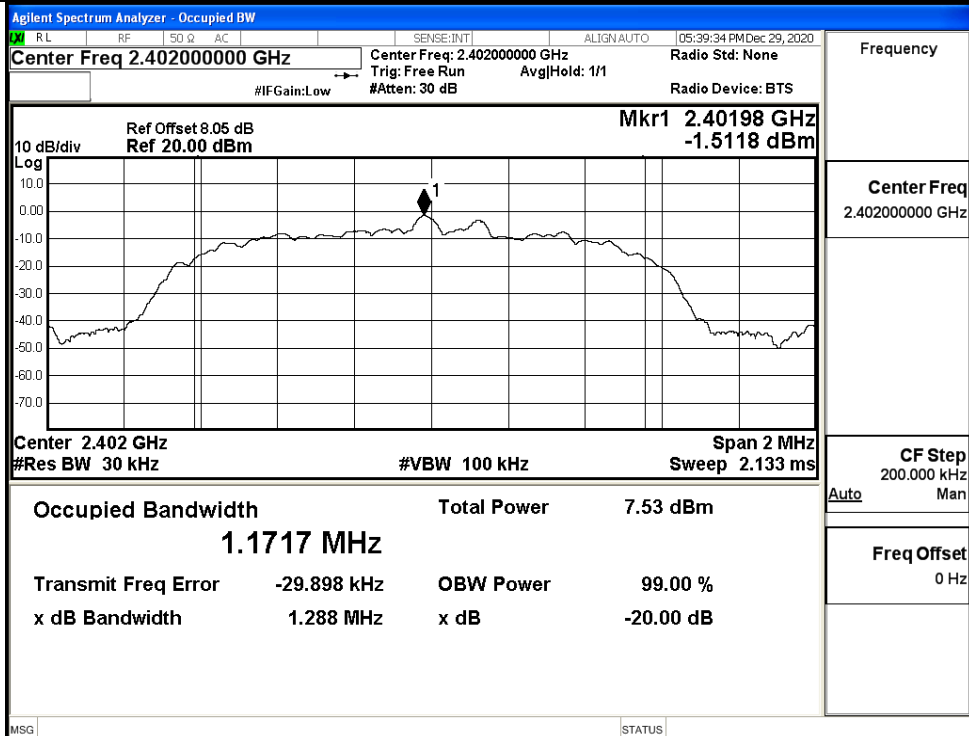
Center Freq
2.44100000 GHzCF Step
200.000 kHz
Man

Auto

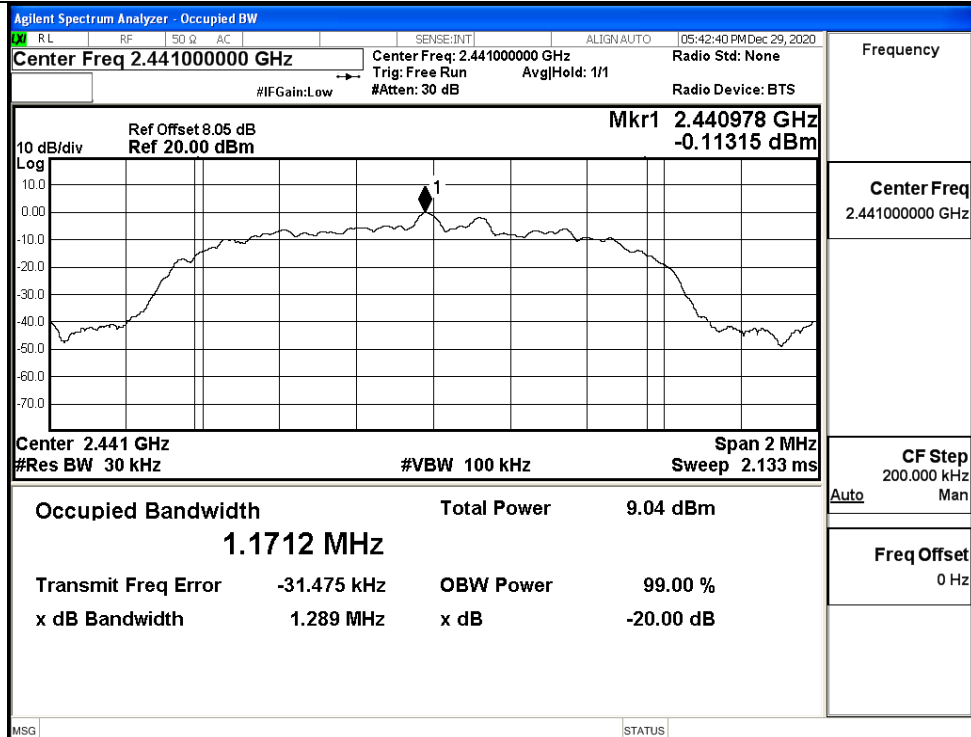
Freq Offset
0 Hz

$\pi/4$ DQPSK/HCH

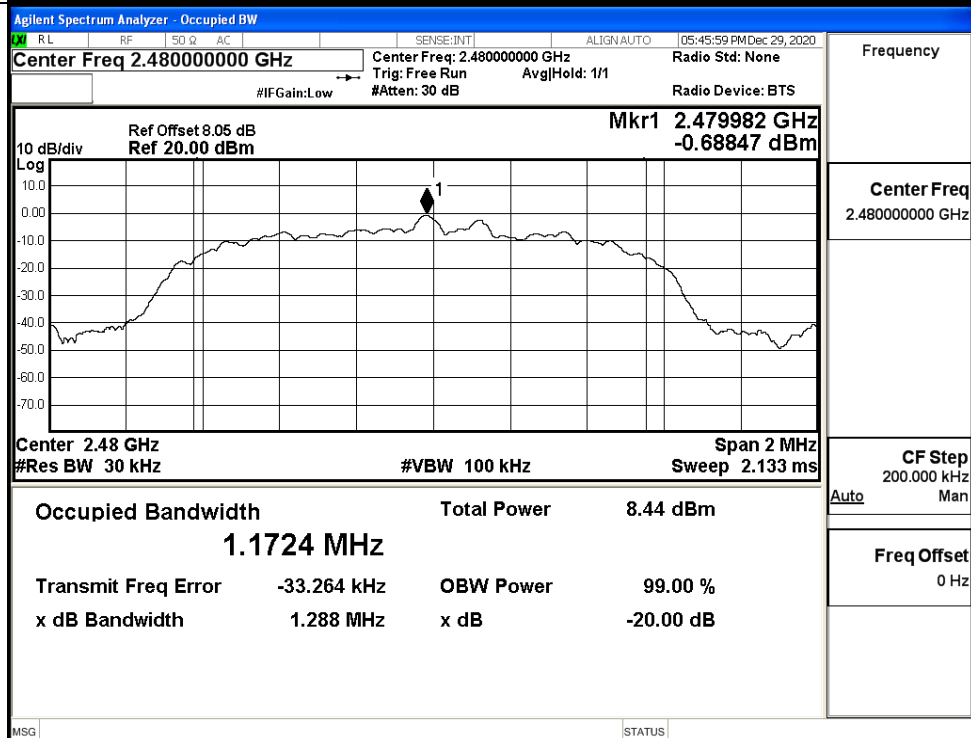
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

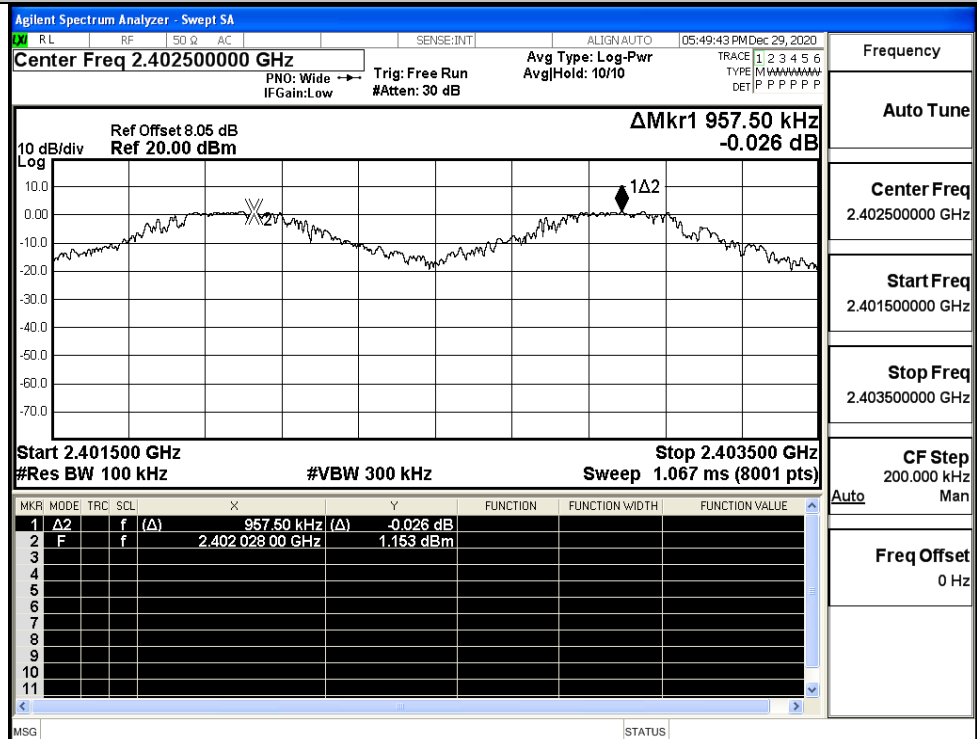


A.3 Carrier Frequency Separation

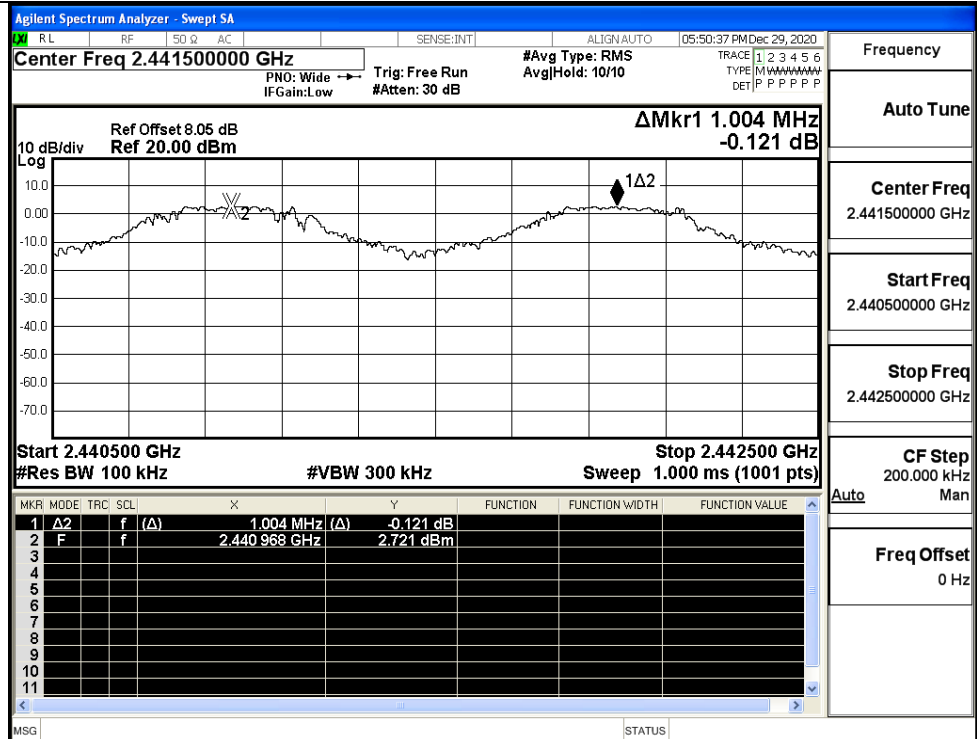
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.957	0.635	PASS
	MCH	1.004	0.635	PASS
	HCH	0.990	0.635	PASS
π /4DQPSK	LCH	0.992	0.852	PASS
	MCH	1.242	0.852	PASS
	HCH	1.012	0.852	PASS
8DPSK	LCH	1.018	0.859	PASS
	MCH	0.884	0.859	PASS
	HCH	0.950	0.859	PASS

Test Graphs

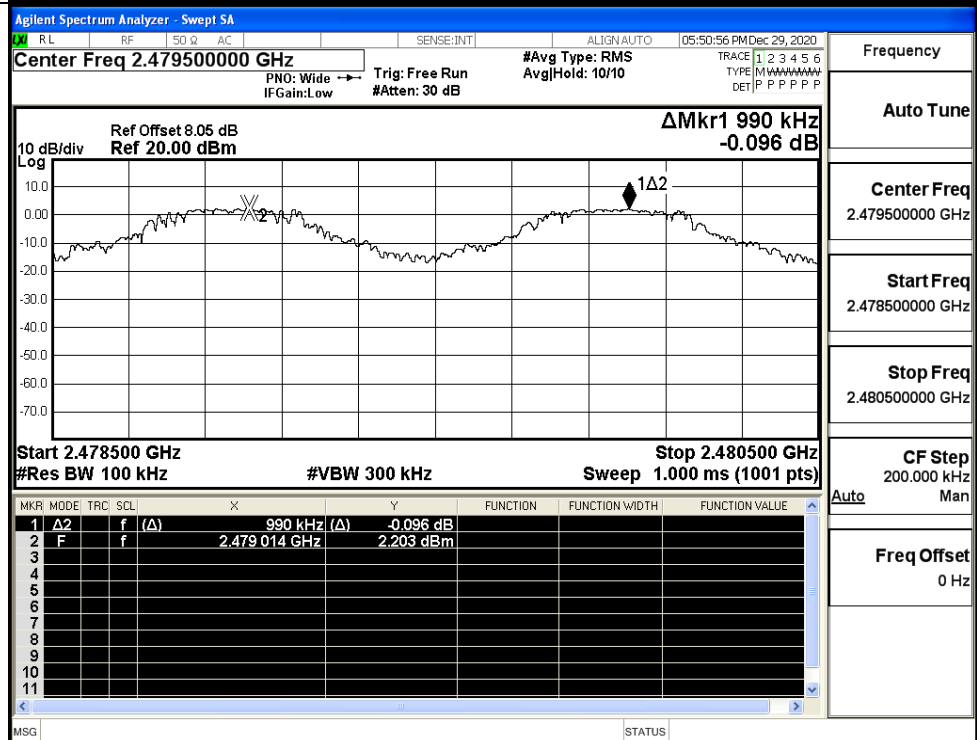
GFSK/LCH

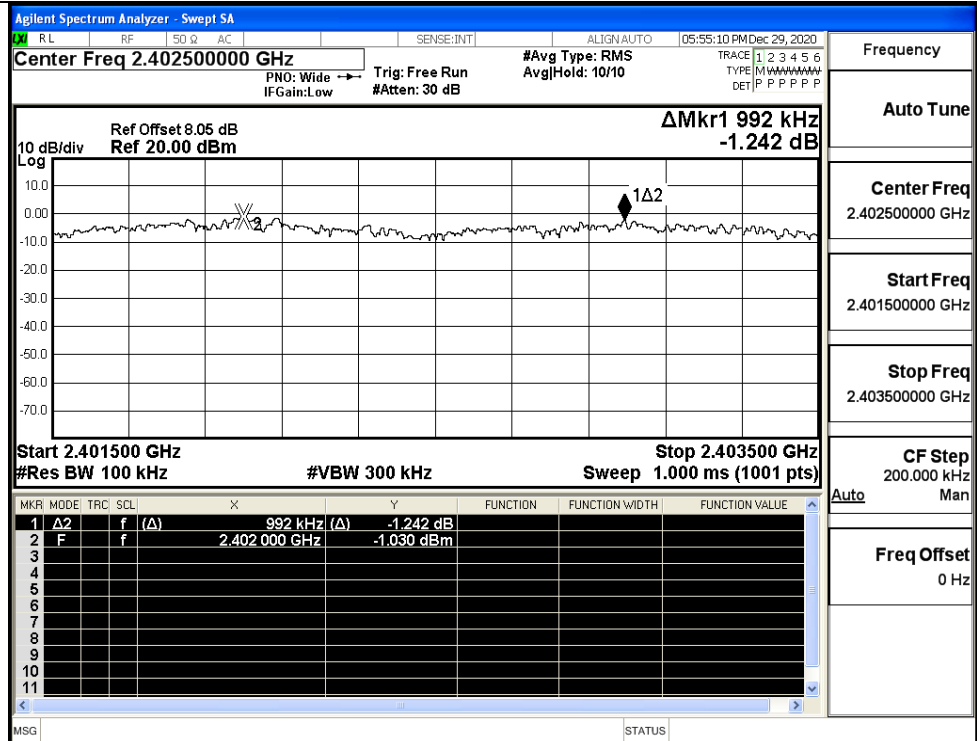
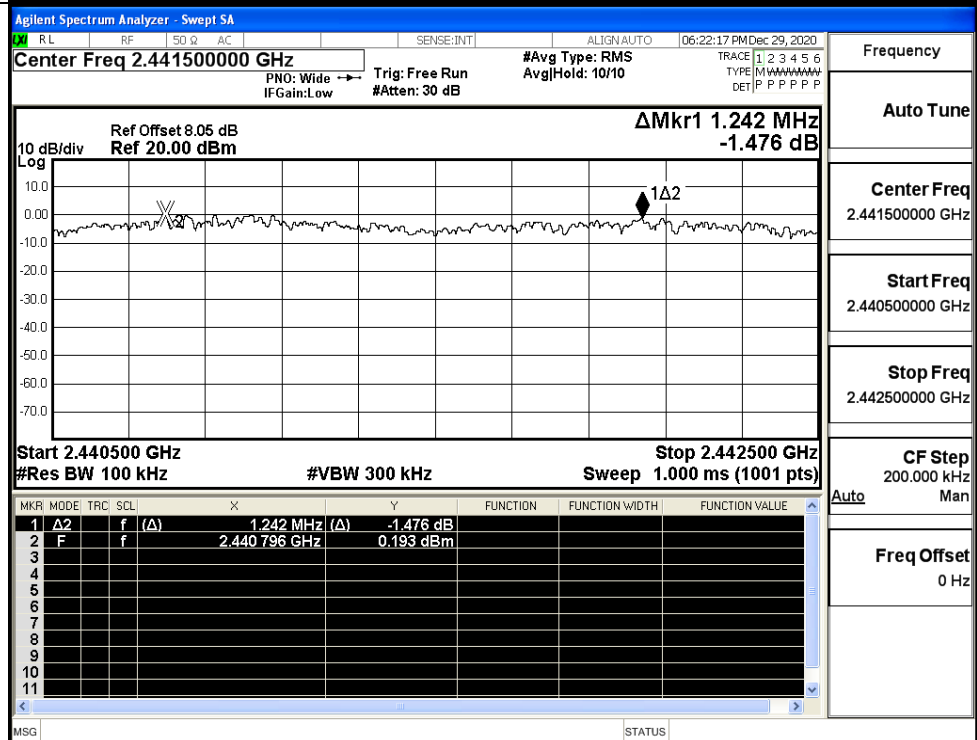


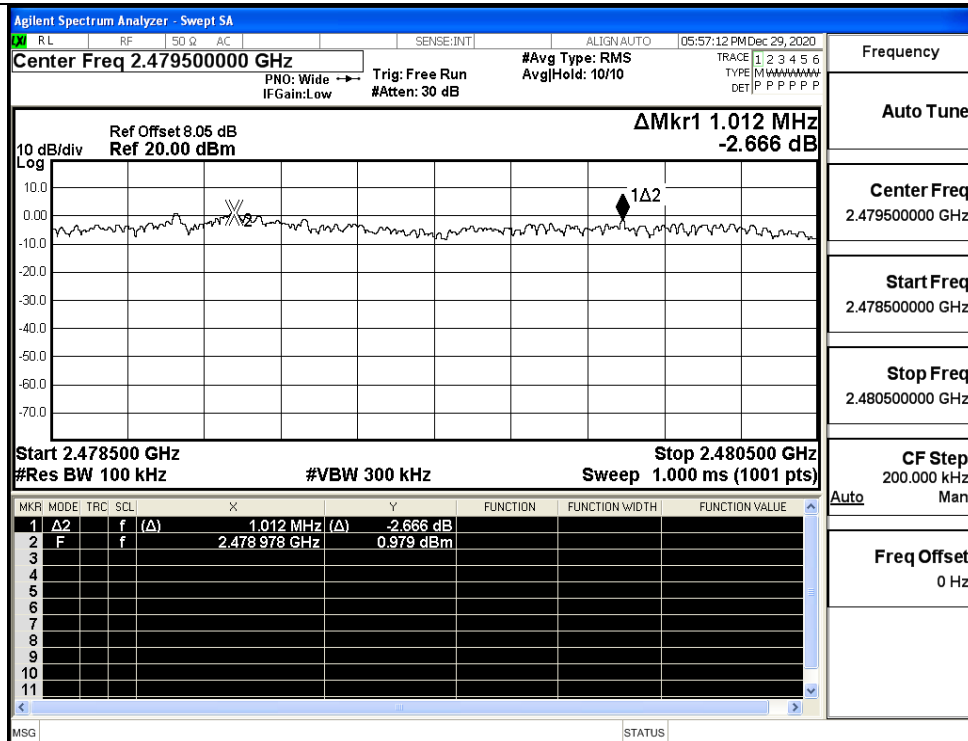
GFSK/MCH



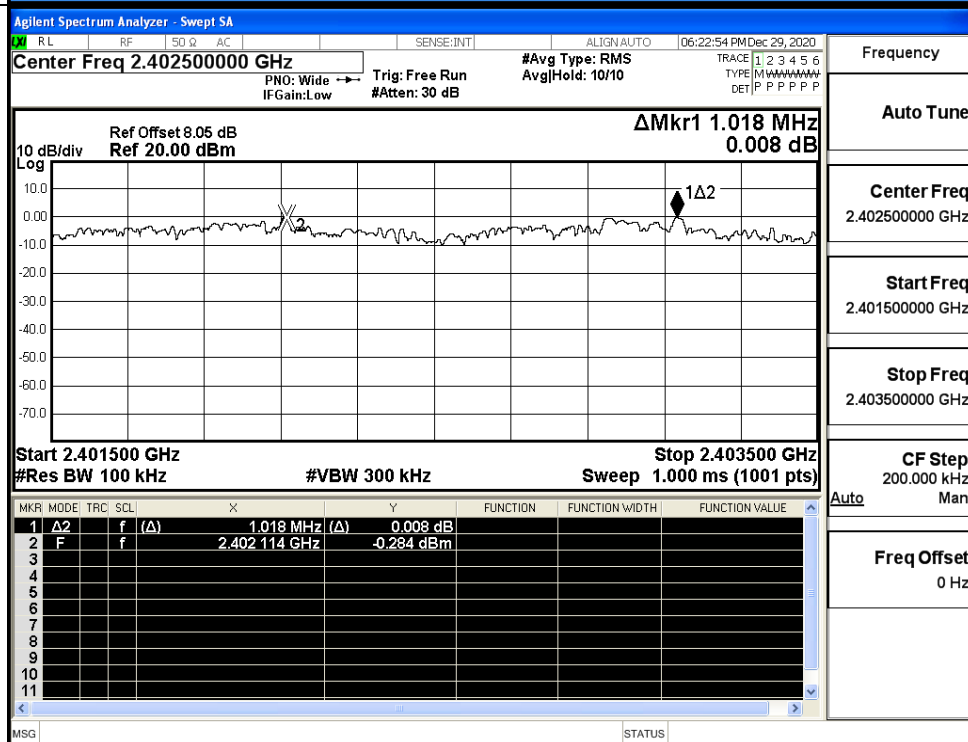
GFSK/HCH



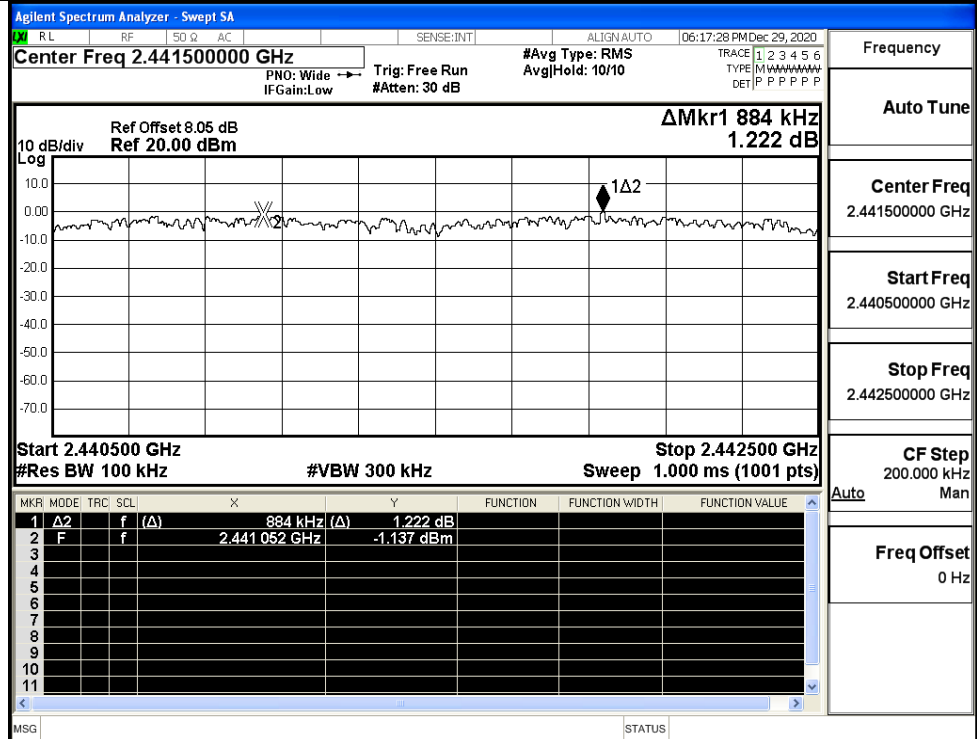
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

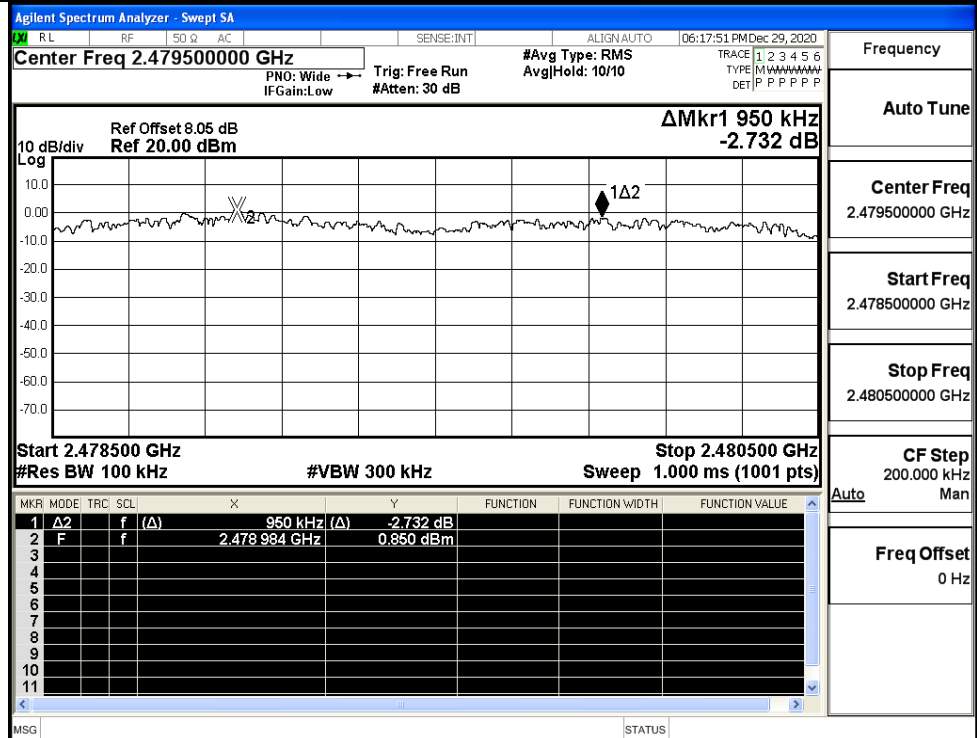
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

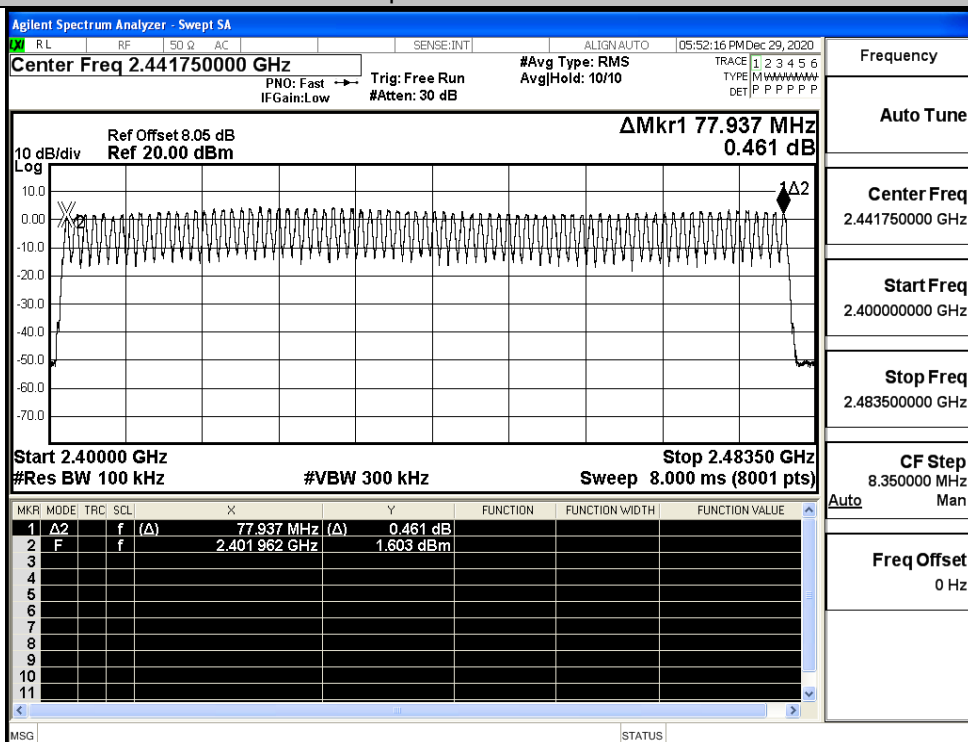


A.4 Hopping Channel Number

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

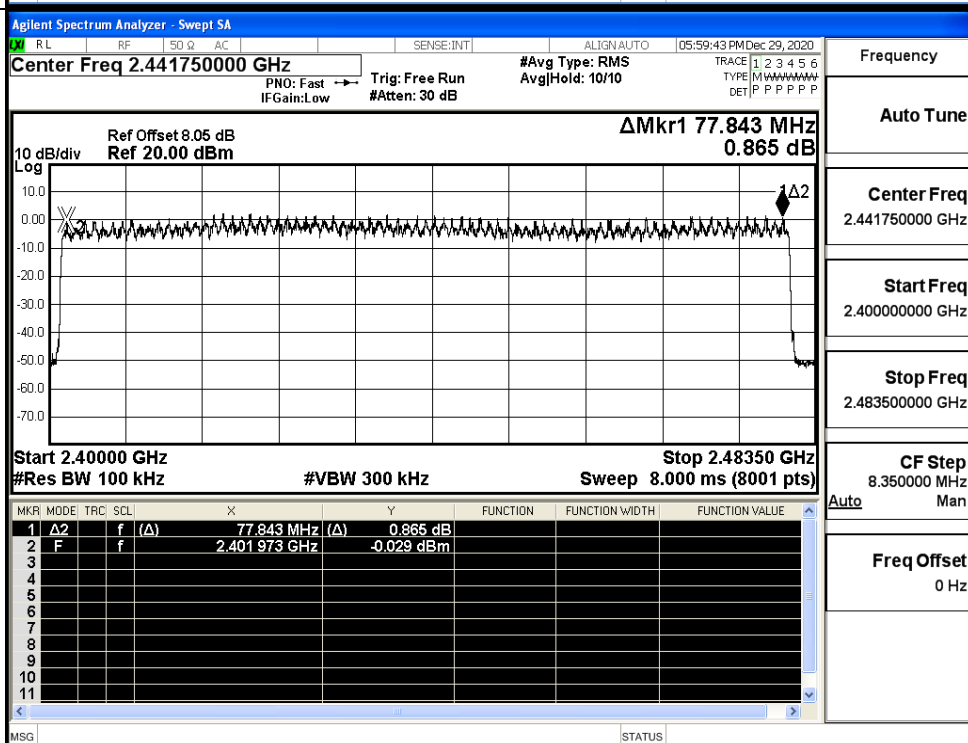
Test Graphs

GFSK/Hop



Frequency

Auto Tune

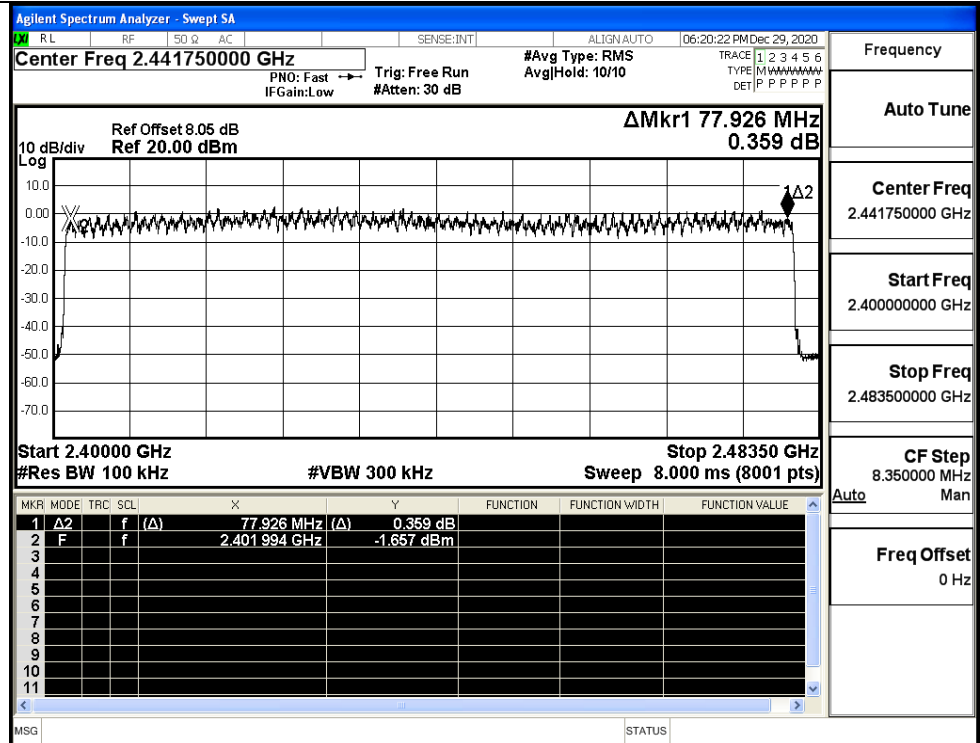
Center Freq
2.441750000 GHzStart Freq
2.400000000 GHzStop Freq
2.483500000 GHzCF Step
8.350000 MHz
ManFreq Offset
0 Hz $\pi/4$ DQPSK/Hop

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

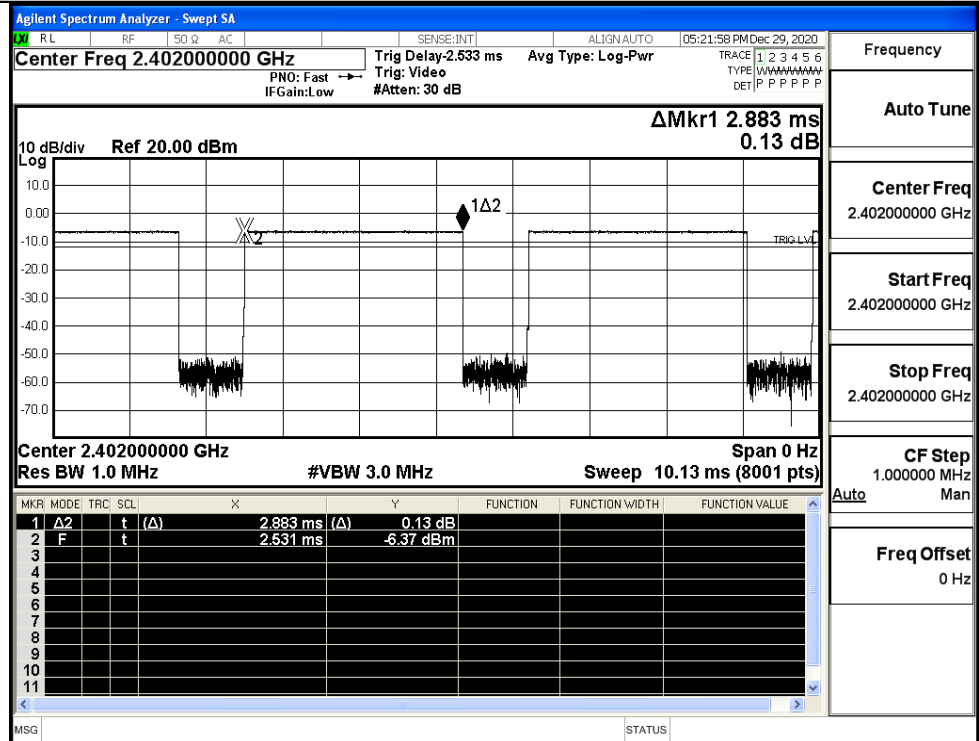


A.5 Dwell Time

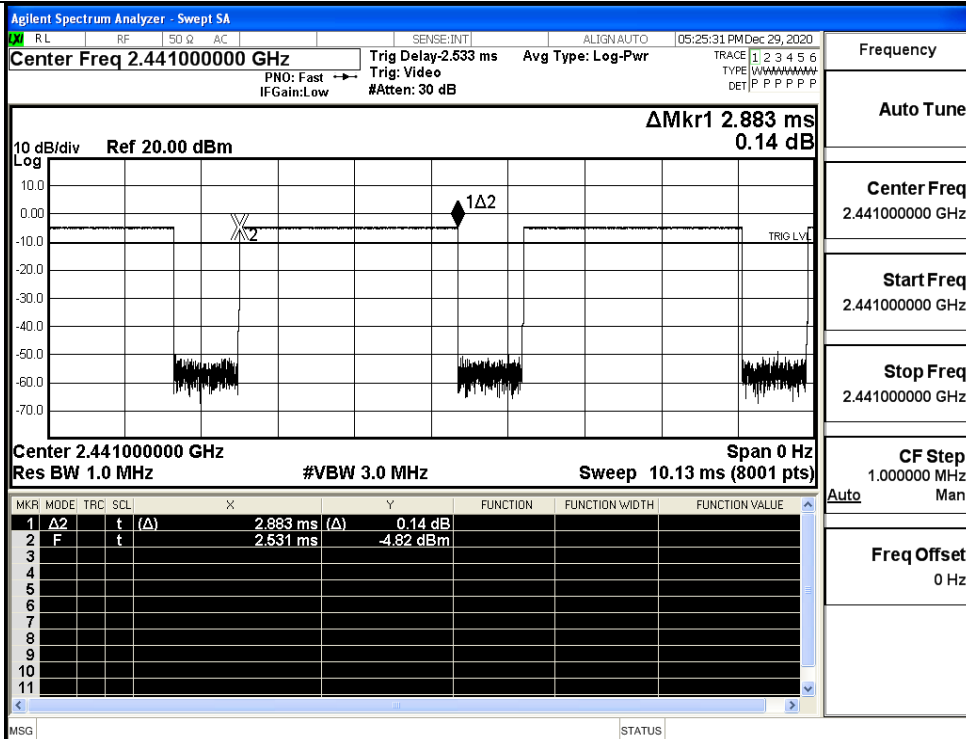
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.88	106.7	0.254	0.4	PASS
	2DH5	MCH	2.88	106.7	0.254	0.4	PASS
	2DH5	HCH	2.88	106.7	0.254	0.4	PASS
8DPSK	3DH5	LCH	2.88	106.7	0.308	0.4	PASS
	3DH5	MCH	2.88	106.7	0.308	0.4	PASS
	3DH5	HCH	2.88	106.7	0.308	0.4	PASS

Test Graphs

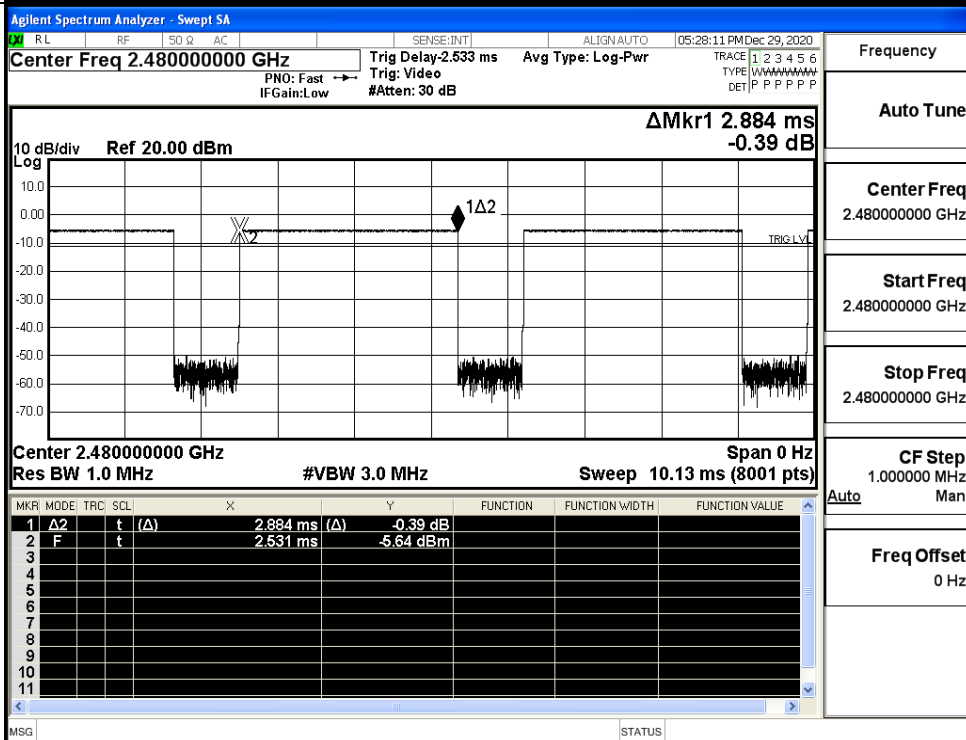
GFSK_DH5/LCH



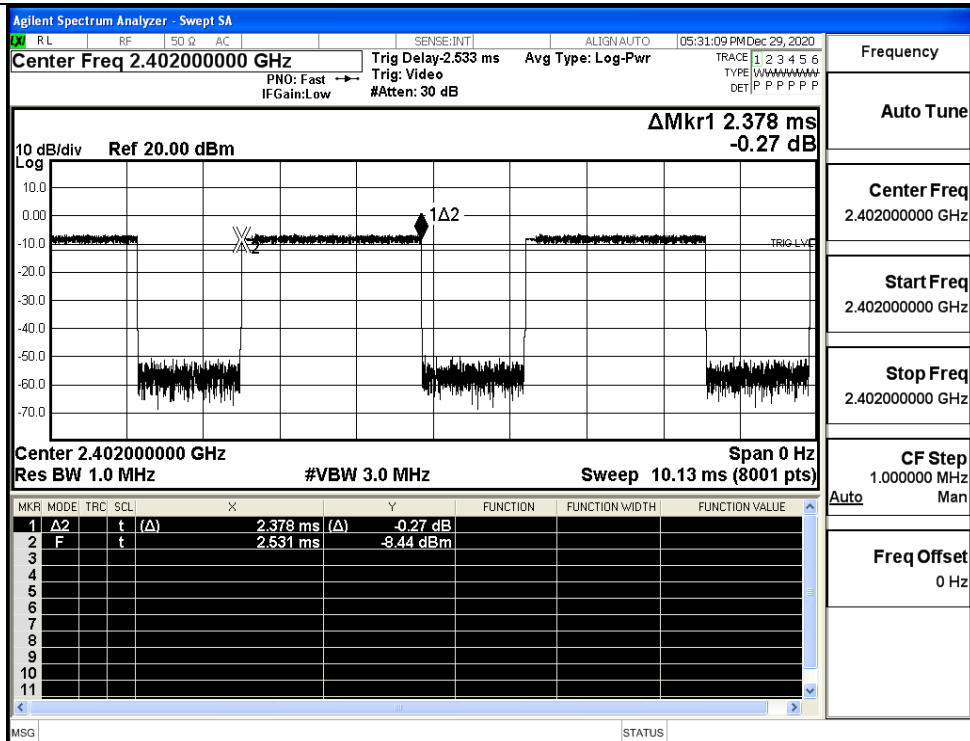
GFSK_DH5/MCH



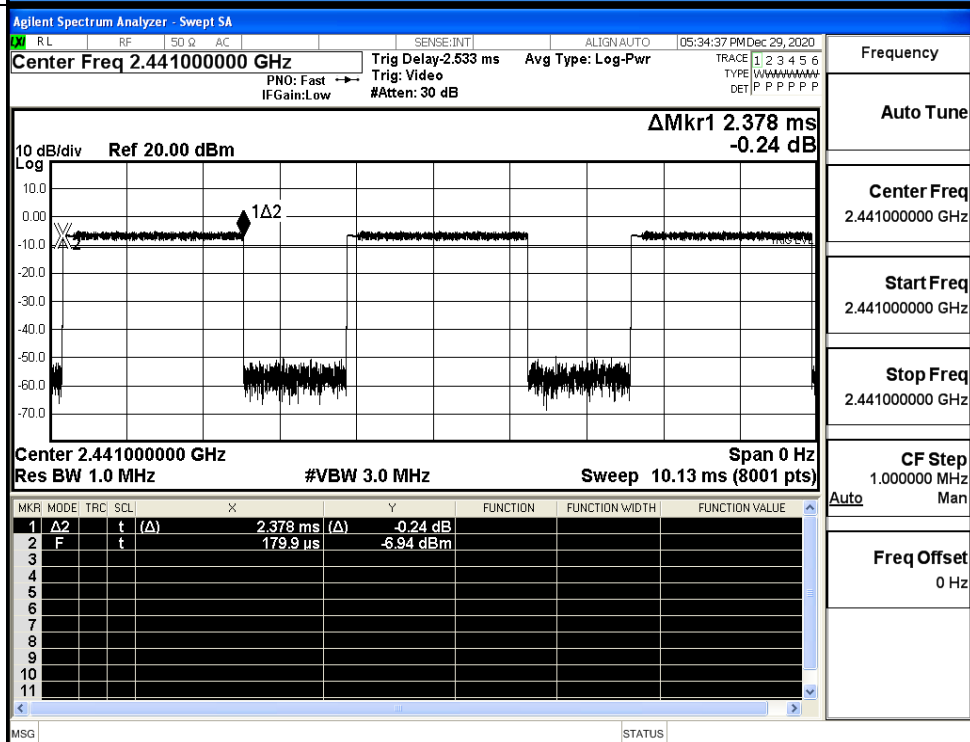
GFSK_DH5/HCH



$\pi/4$ DQPSK
_2DH5/LCH



$\pi/4$ DQPSK
_2DH5/MCH



Agilent Spectrum Analyzer - Sweep SA

RL RF 50 Q AC SENSE:INT ALIGN:AUTO 05:37:11 PM Dec 29, 2020

Center Freq 2.48000000 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

The spectrum plot shows a noise floor around -60 dBm and a distinct signal peak at 2.48 GHz. The peak is labeled $\Delta 2$. The y-axis scale is 10 dB/div, and the x-axis scale is 10 MHz.

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	$\Delta 2$	t	(Δ)	2.378 ms	-0.02 dB			
2	F	t		2.530 ms	-7.75 dBm			

Center 2.48000000 GHz Span 0 Hz
 Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)

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 - Sweep SA

RL RF 50 Q AC SENSE:INT ALIGN:AUTO 05:39:54 PM Dec 29, 2020
Center Freq 2.402000000 GHz Trig Delay: 2.533 ms Avg Type: Log-Pwr PNO: Fast IF Gain: Low Trig: Video #Atten: 30 dB TYPE: P P P P P DET: P P P P P

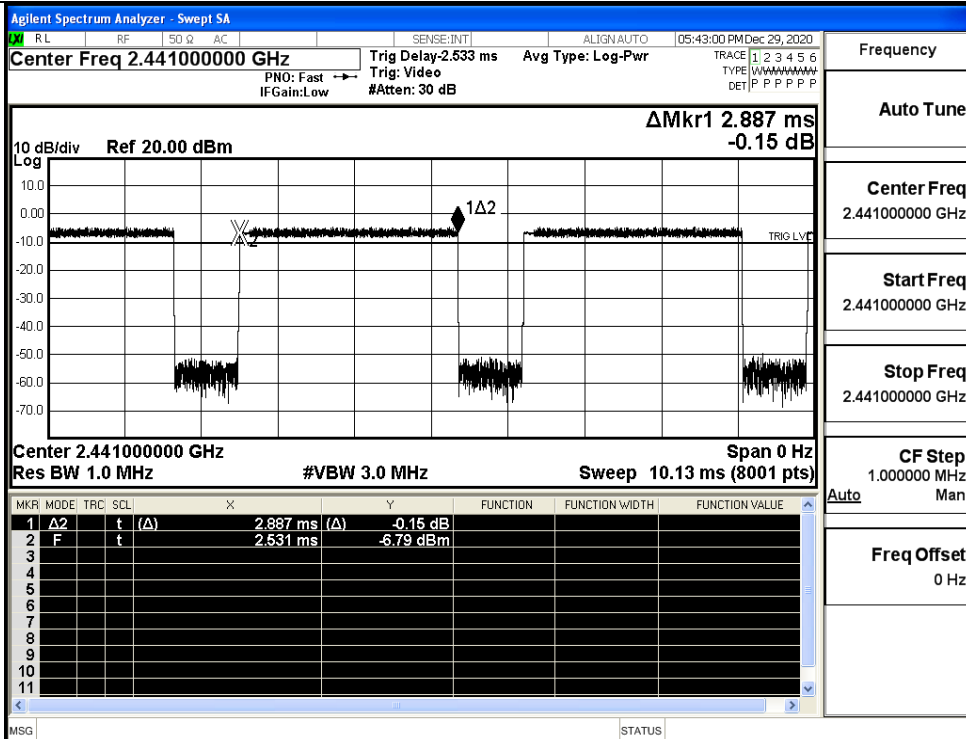
The spectrum plot shows a carrier wave centered at 2.402 GHz. The y-axis is logarithmic power from -70.0 to 10.0 dBm. A peak-to-peak frequency deviation is indicated by two vertical cursors labeled Δf and Δf_{rms}. The measured values are ΔMkr1 = 2.887 ms and -0.15 dB.

MKR MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δf	t	(Δ)	2.887 ms	(Δ)	-0.15 dB	
2	F	t		2.531 ms		-8.26 dBm	
3							
4							
5							
6							
7							
8							
9							
10							
11							

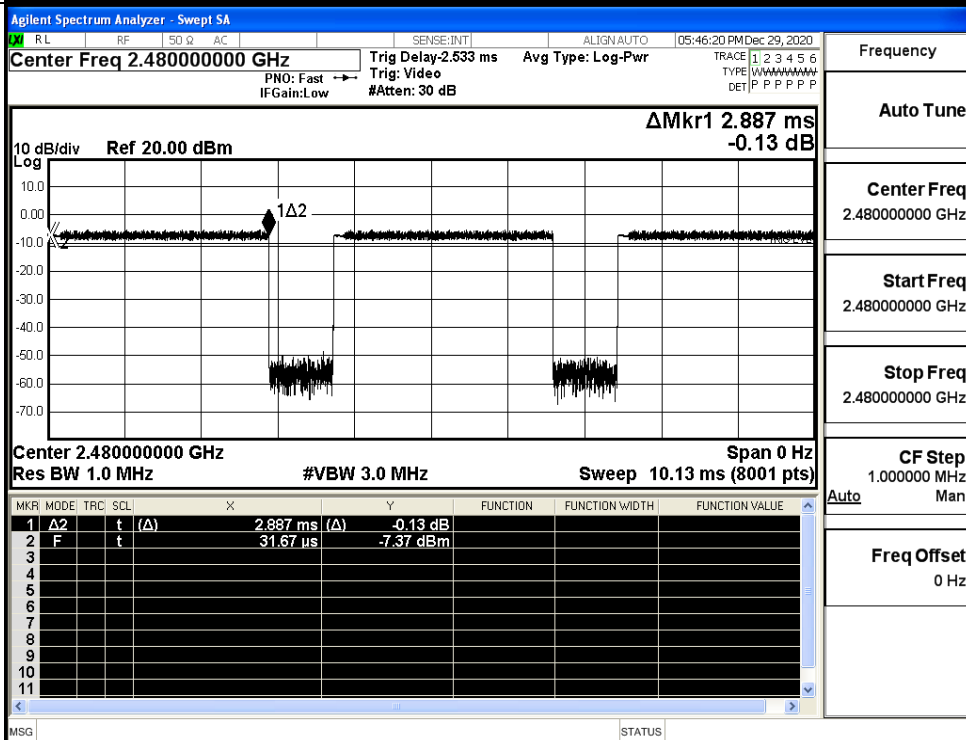
Center 2.402000000 GHz Span 0 Hz
 Res BW 1.0 MHz #VBW 3.0 MHz Sweep 10.13 ms (8001 pts)

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



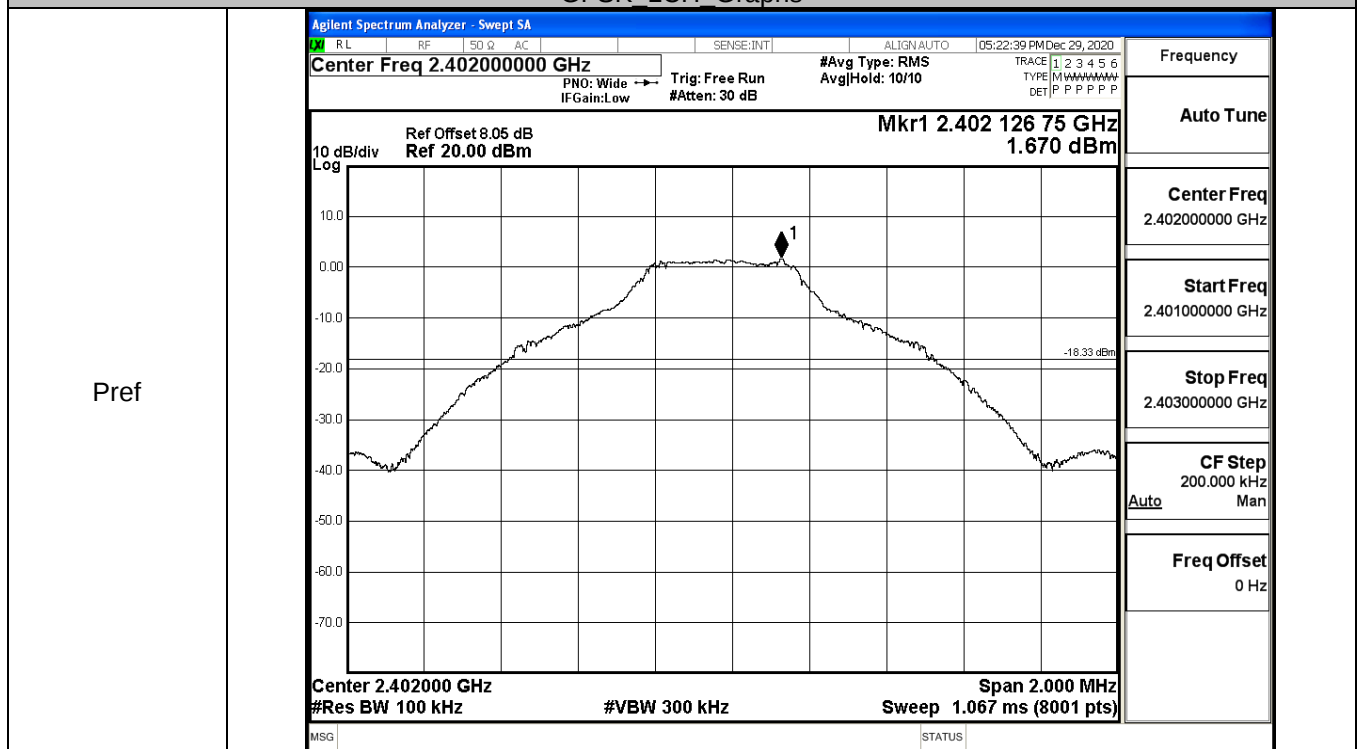
8DPSK_3DH5/HCH



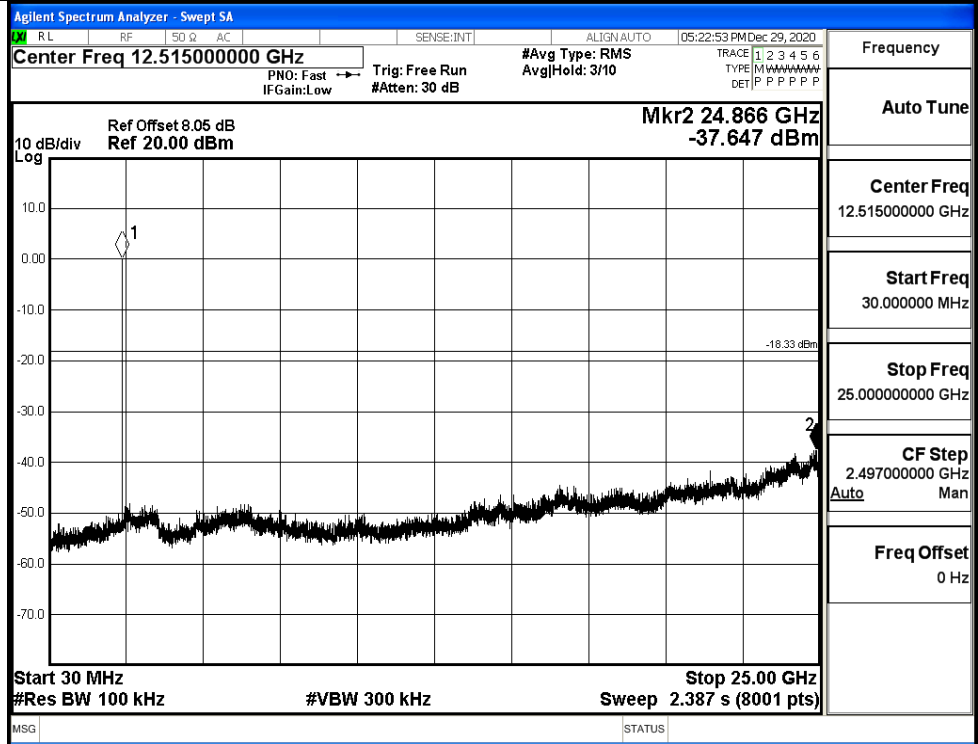
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.67	-37.647	-18.330	PASS
	MCH	2.827	-37.631	-17.173	PASS
	HCH	2.589	-38.124	-17.411	PASS
$\pi/4$ DQPSK	LCH	-0.124	-38.194	-20.124	PASS
	MCH	1.397	-38.500	-18.603	PASS
	HCH	0.809	-37.344	-19.191	PASS
8DPSK	LCH	-0.447	-37.211	-20.447	PASS
	MCH	0.727	-38.123	-19.273	PASS
	HCH	0.669	-38.561	-19.331	PASS

GFSK LCH Graphs

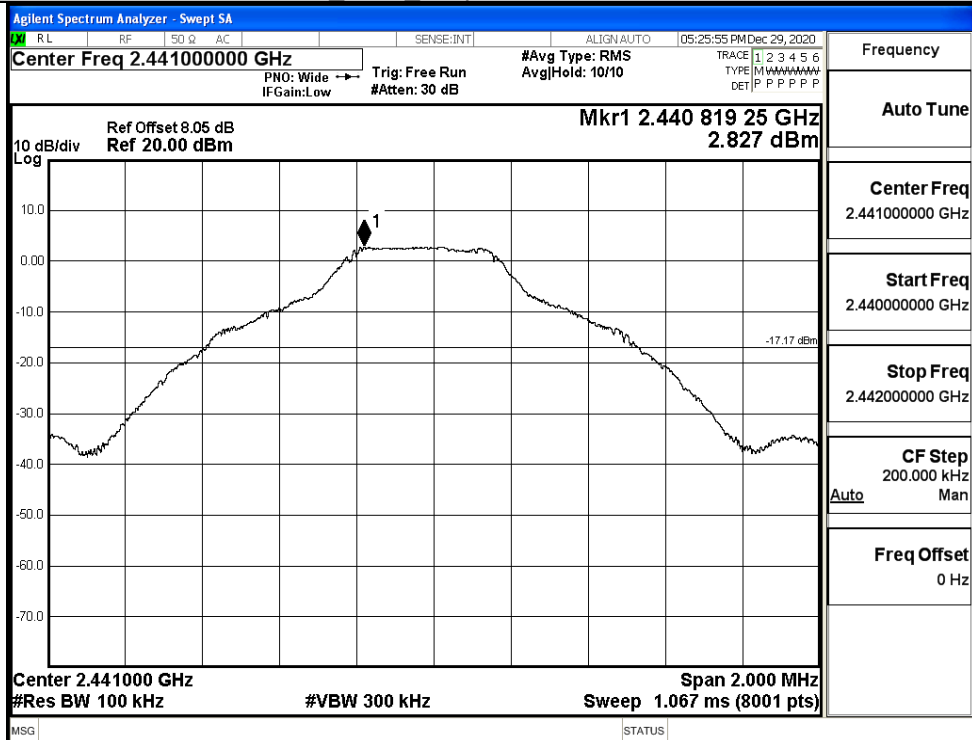


Puw

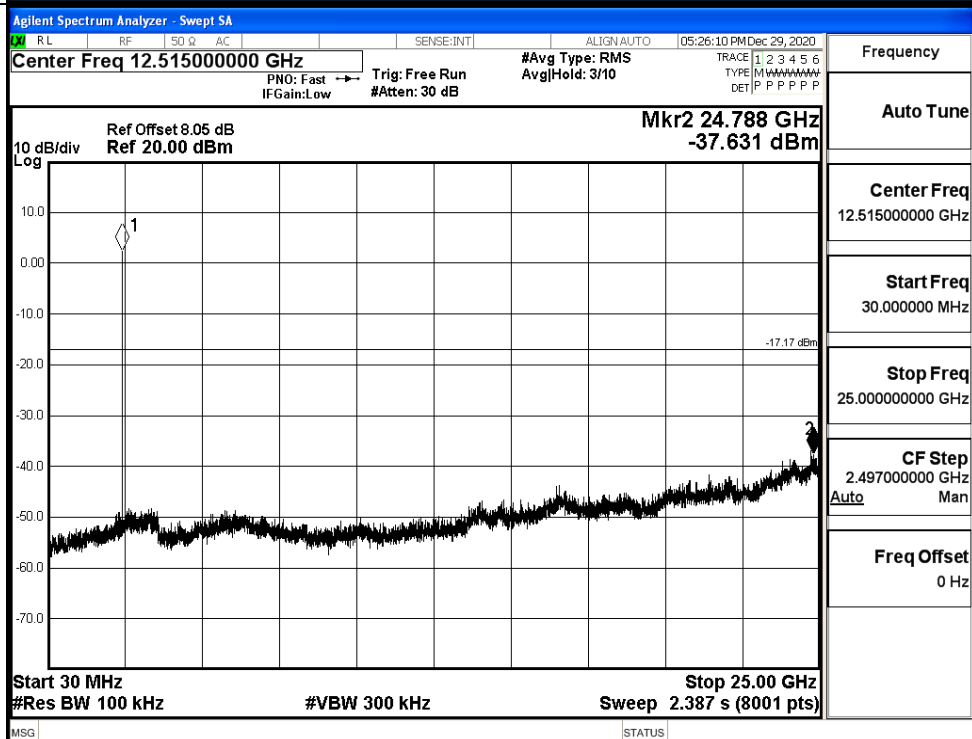


GFSK_MCH_Graphs

Pref

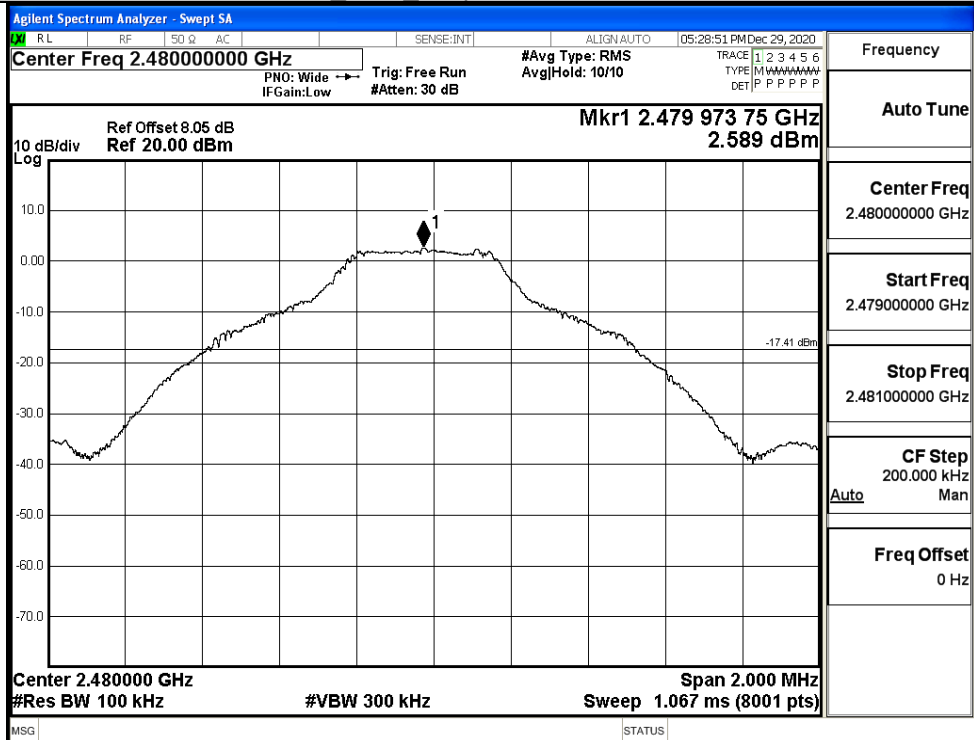


Puw

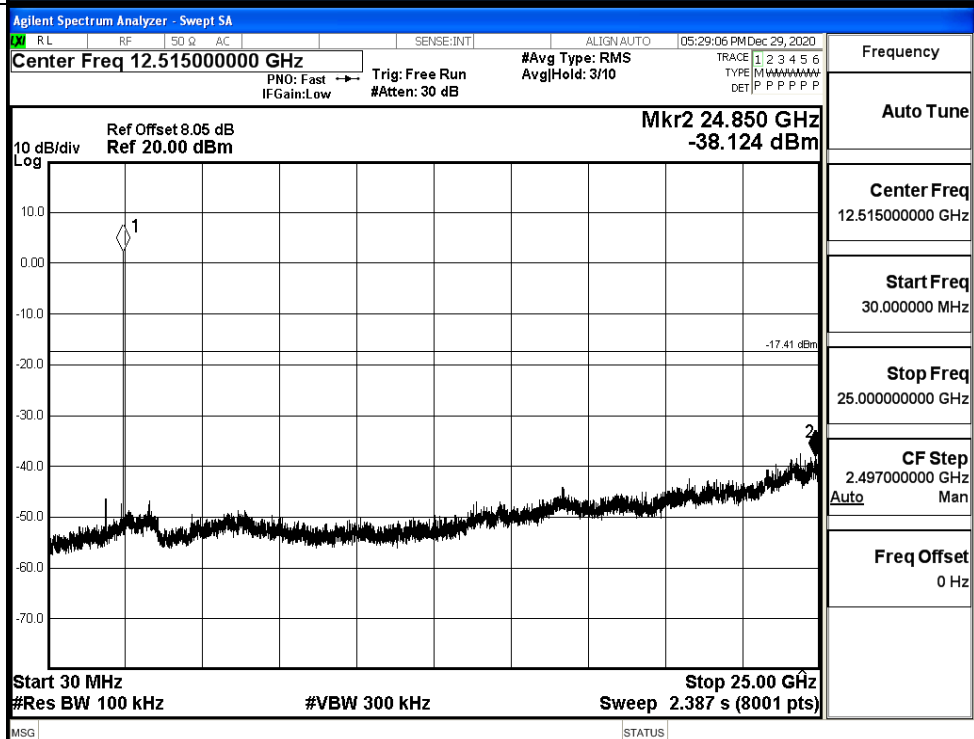


GFSK_HCH_Graphs

Pref

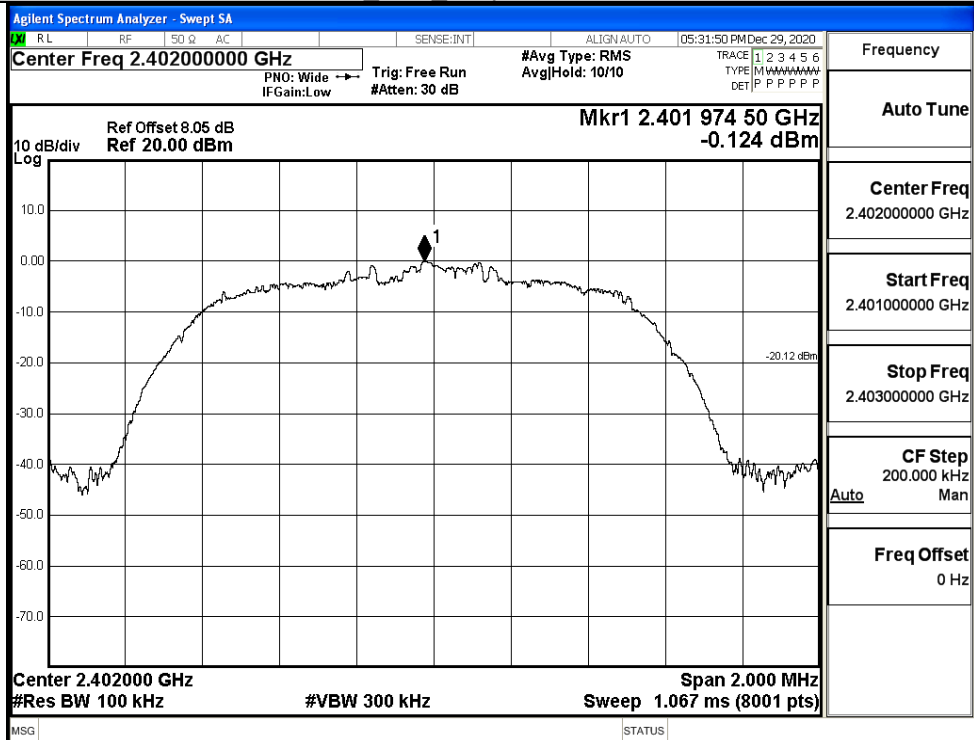


Puw

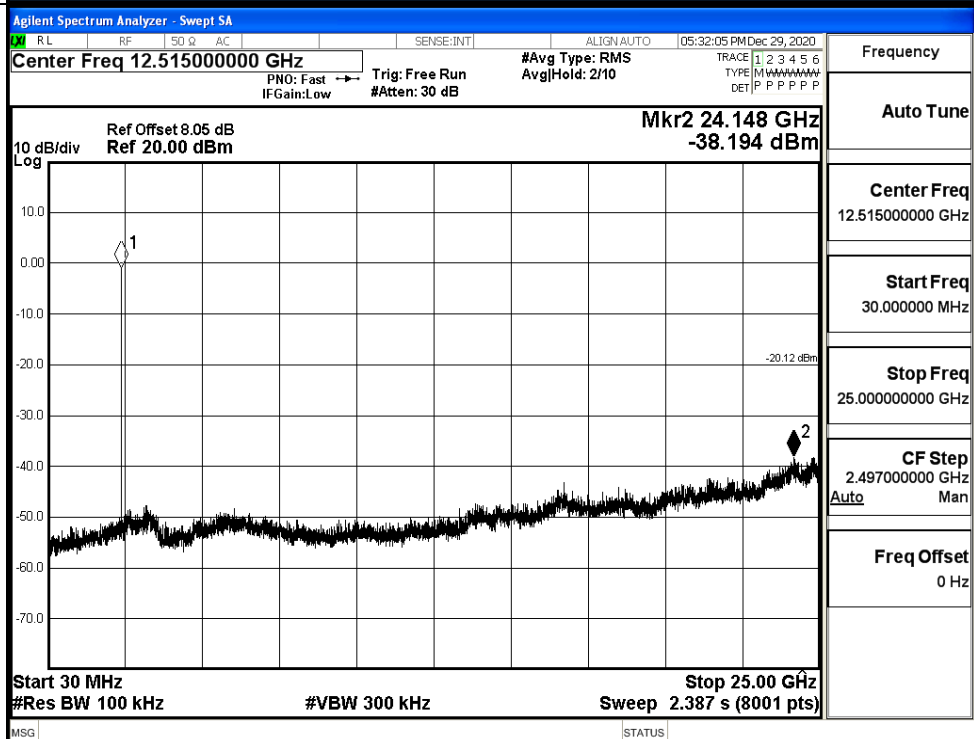


$\pi/4$ DQPSK LCH_Graphs

Pref

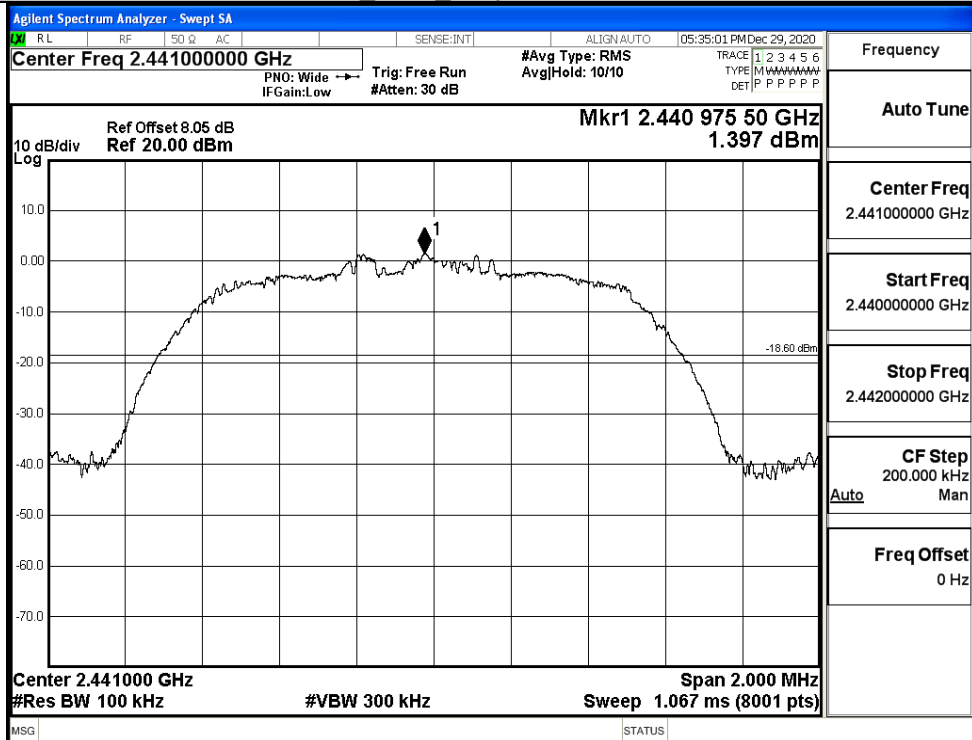


Puw

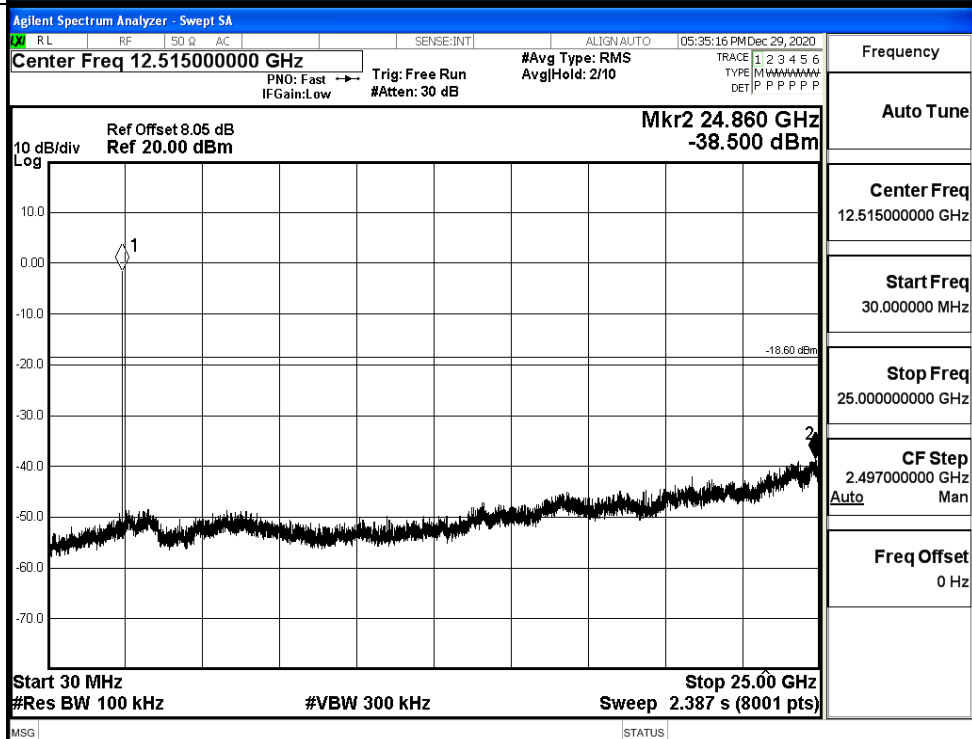


π /4DQPSK_MCH_Graphs

Pref

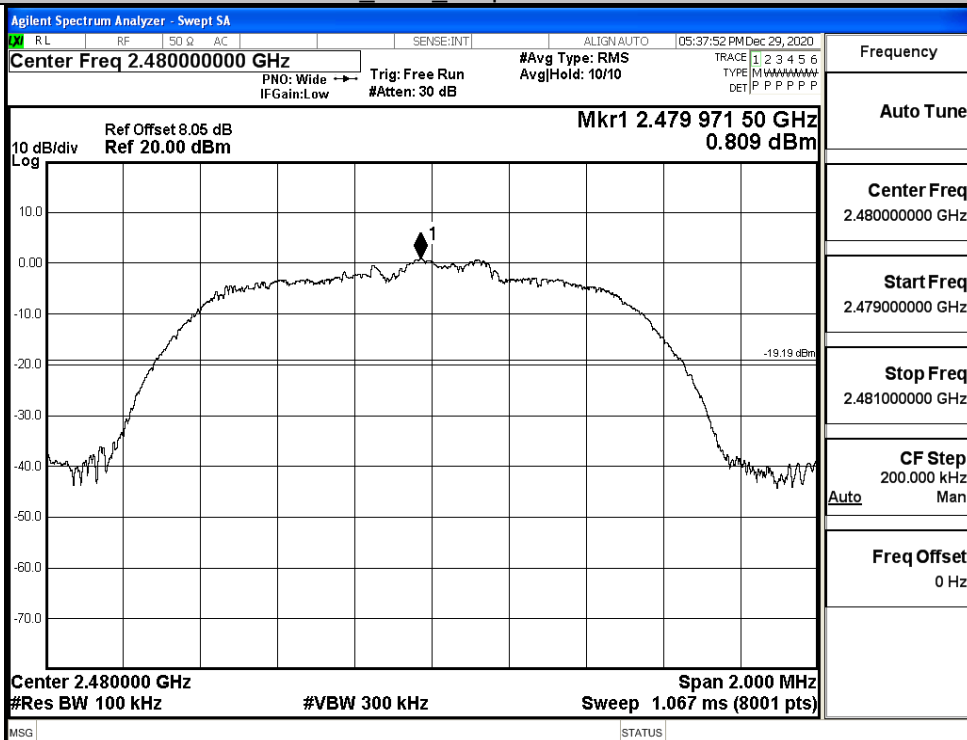


Puw

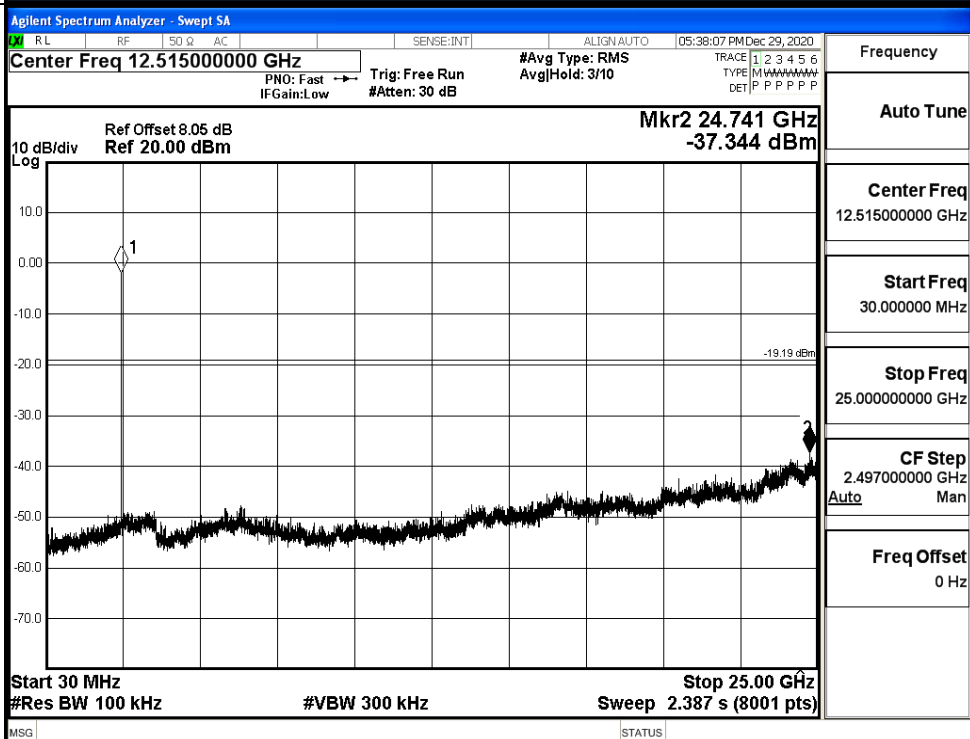


$\pi/4$ DQPSK_HCH_Graphs

Pref

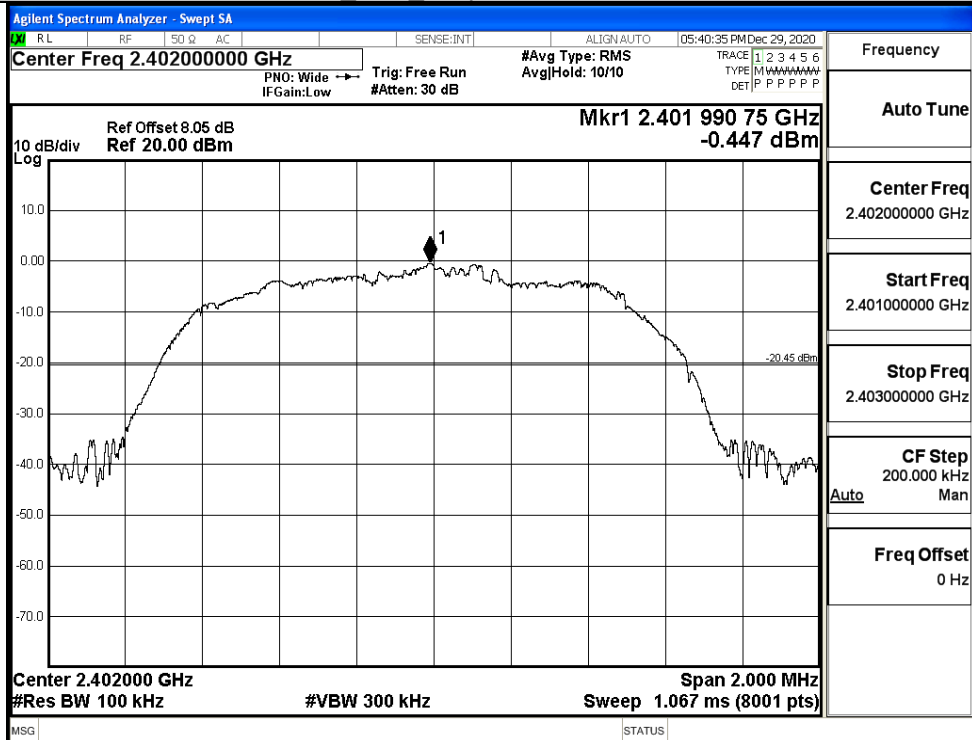


Puw

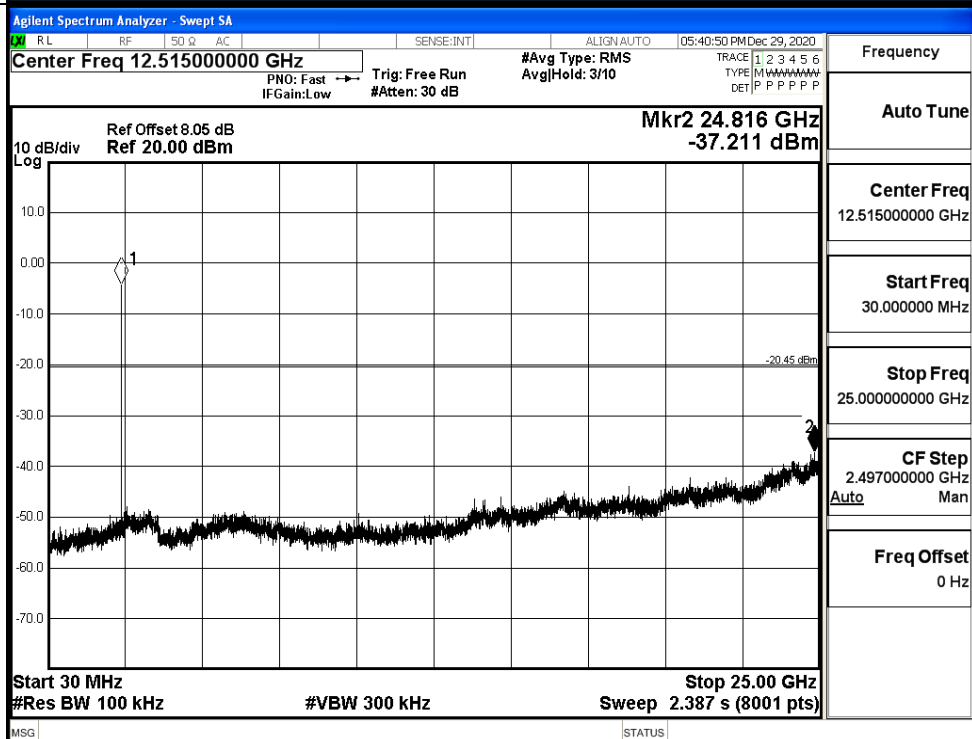


8DPSK_LCH_Graphs

Pref

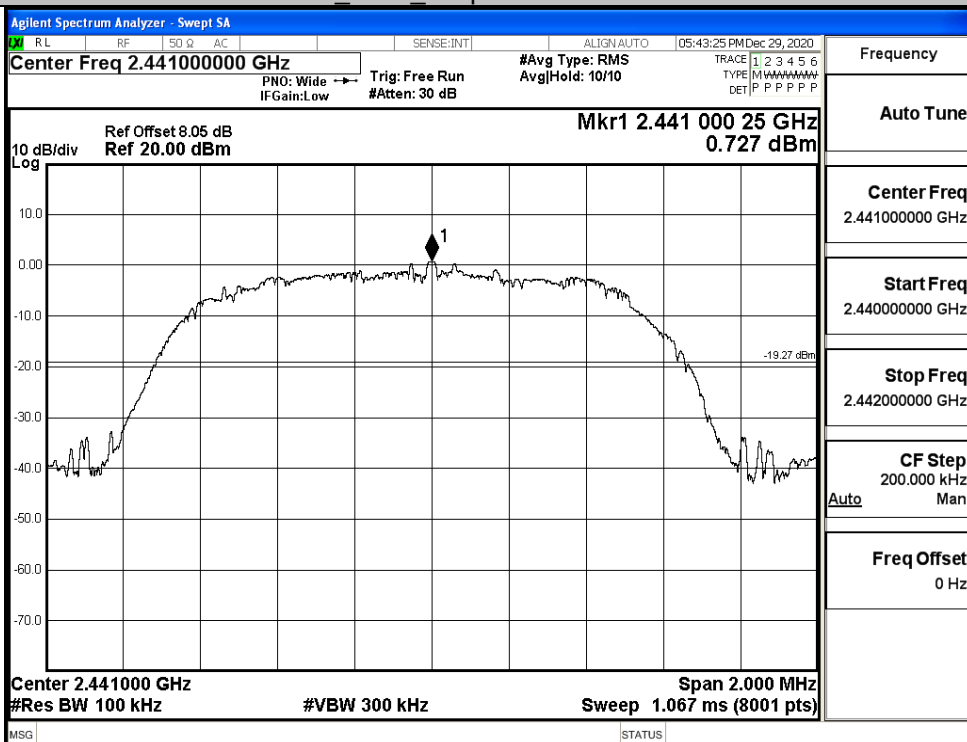


Puw

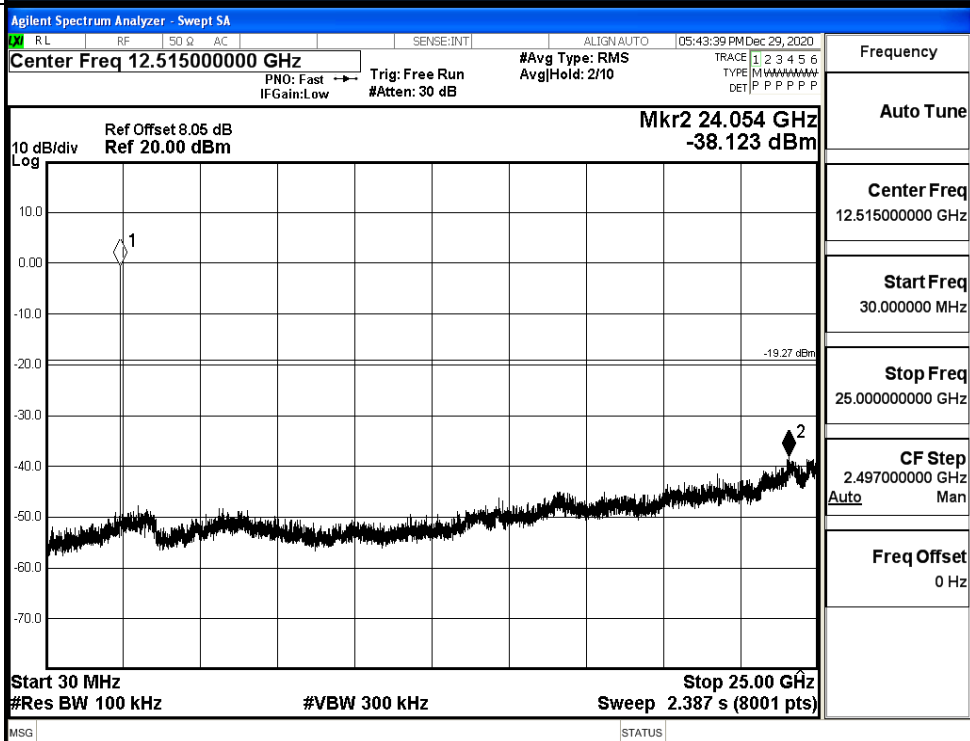


8DPSK_MCH_Graphs

Pref

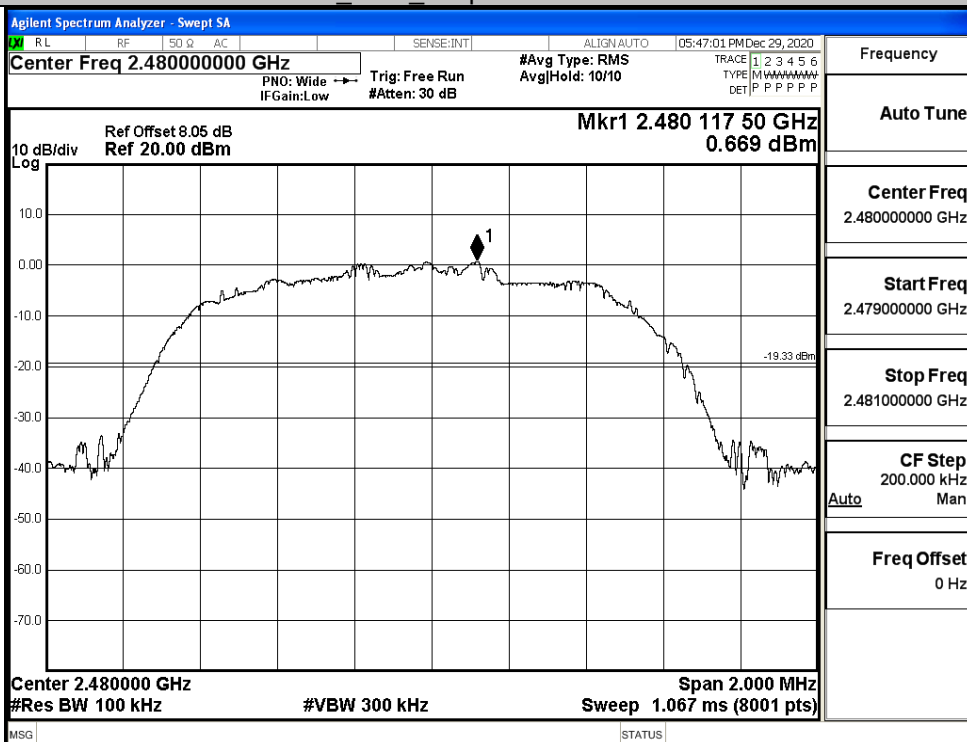


Puw

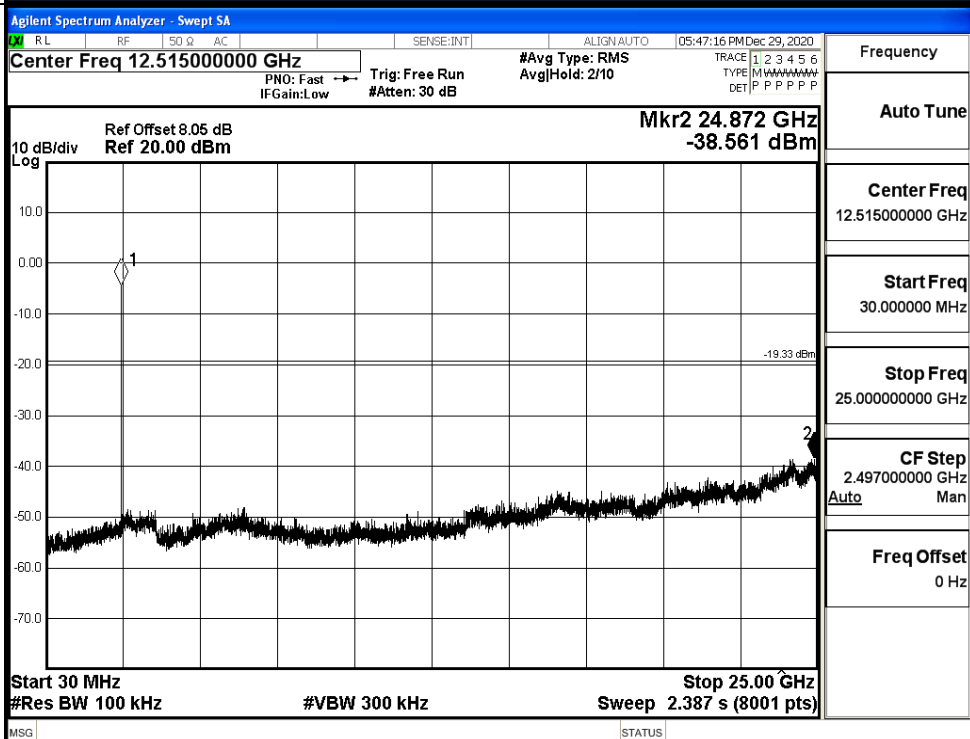


8DPSK_HCH_Graphs

Pref



Puw

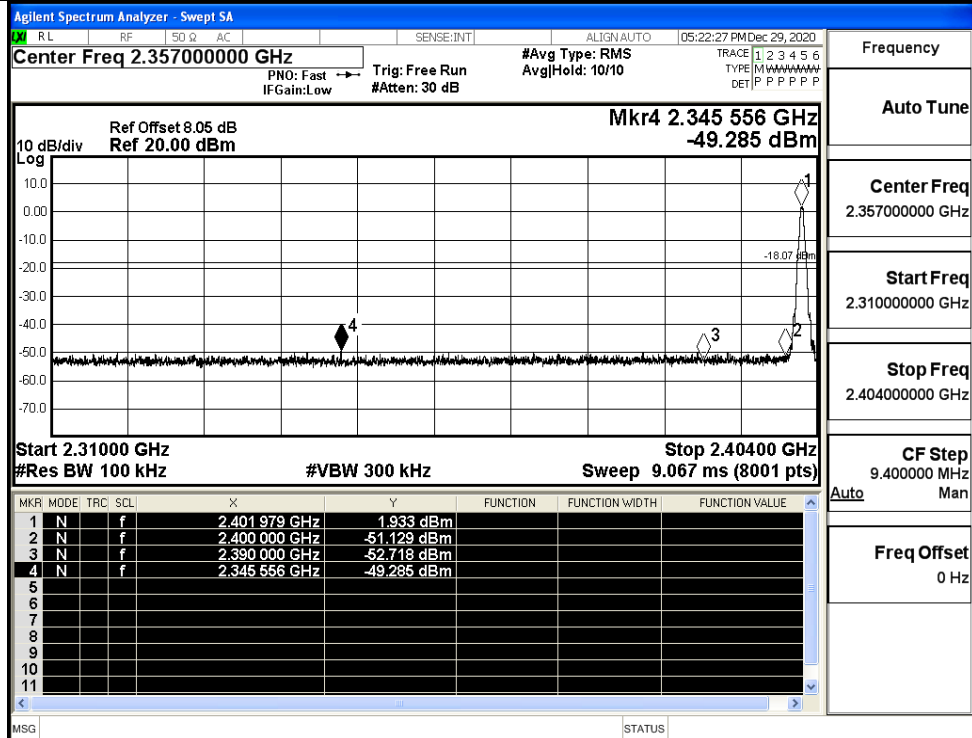


A.7 Band-edge for RF Conducted Emissions

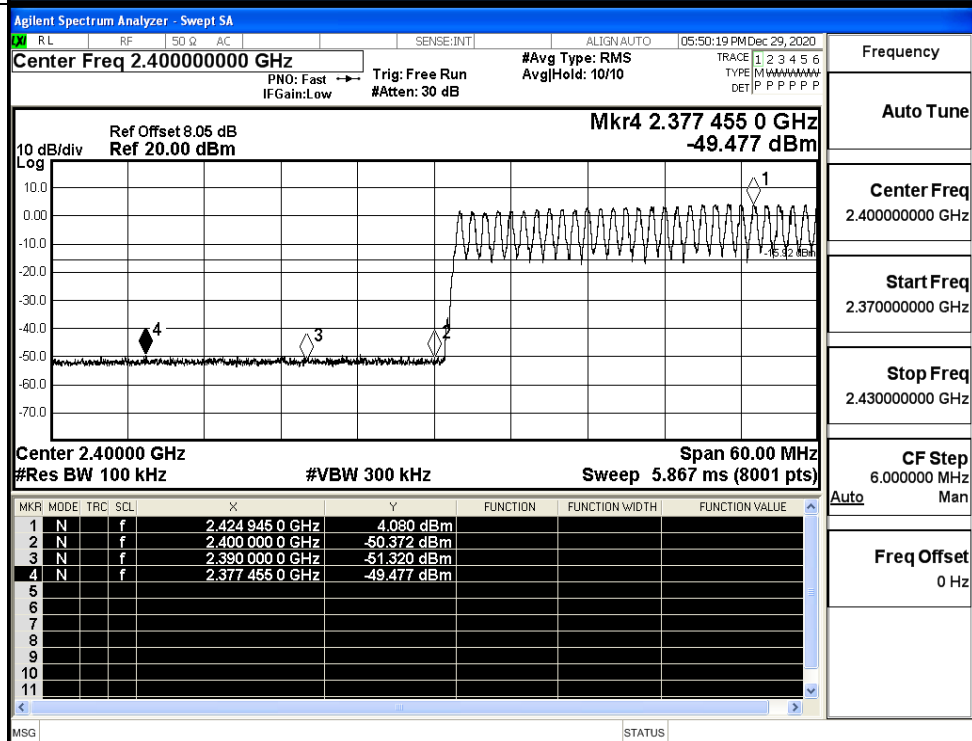
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	1.933	Off	-49.285	-18.07	PASS
			4.080	On	-49.477	-15.92	PASS
	HCH	2480	2.636	Off	-49.112	-17.36	PASS
			3.091	On	-49.013	-16.91	PASS
$\pi/4$ DQPSK	LCH	2402	0.027	Off	-50.225	-19.97	PASS
			2.569	On	-49.047	-17.43	PASS
	HCH	2480	0.962	Off	-49.045	-19.04	PASS
			1.360	On	-48.092	-18.64	PASS
8DPSK	LCH	2402	-1.417	Off	-49.828	-21.42	PASS
			2.612	On	-48.361	-17.39	PASS
	HCH	2480	0.590	Off	-48.420	-19.41	PASS
			1.255	On	-48.724	-18.75	PASS

Test Graphs

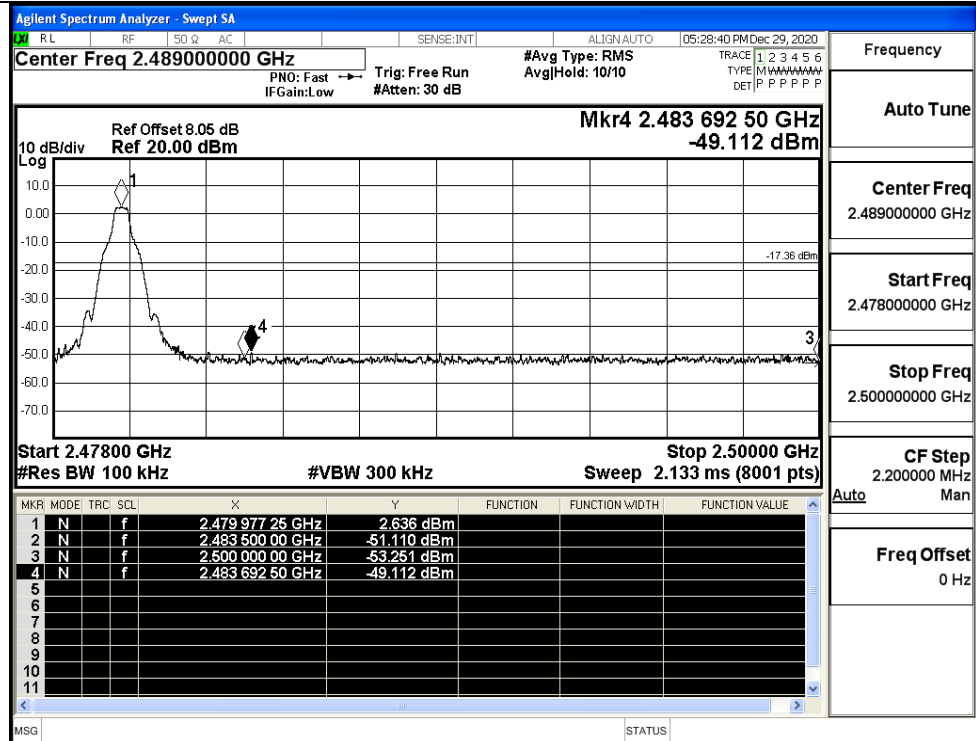
GFSK/LCH/No Hop



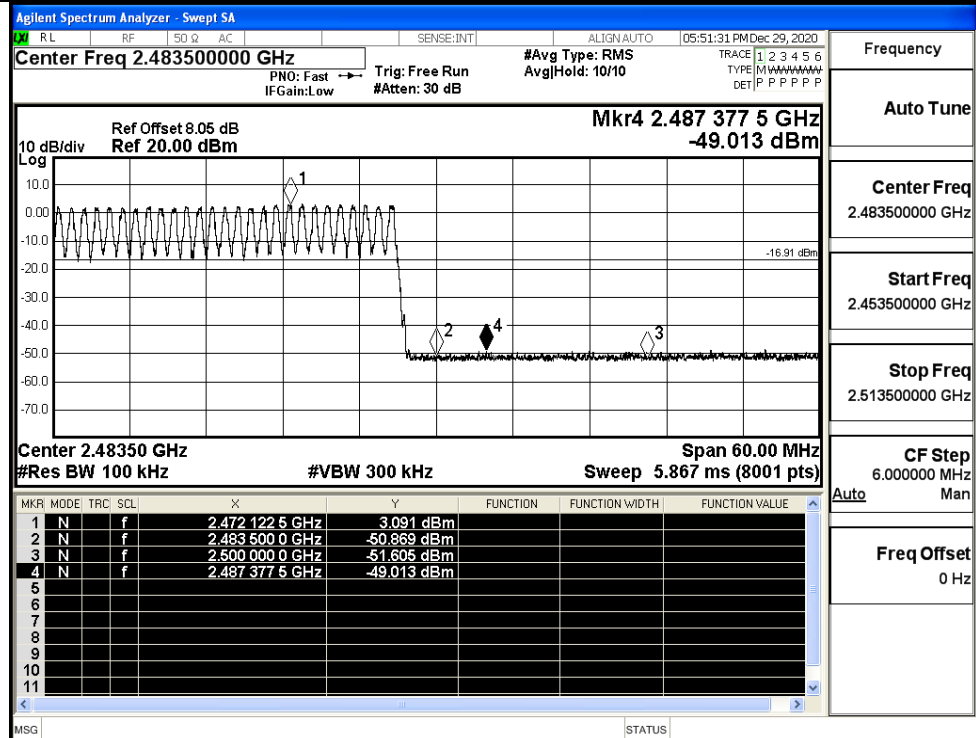
GFSK/LCH/Hop



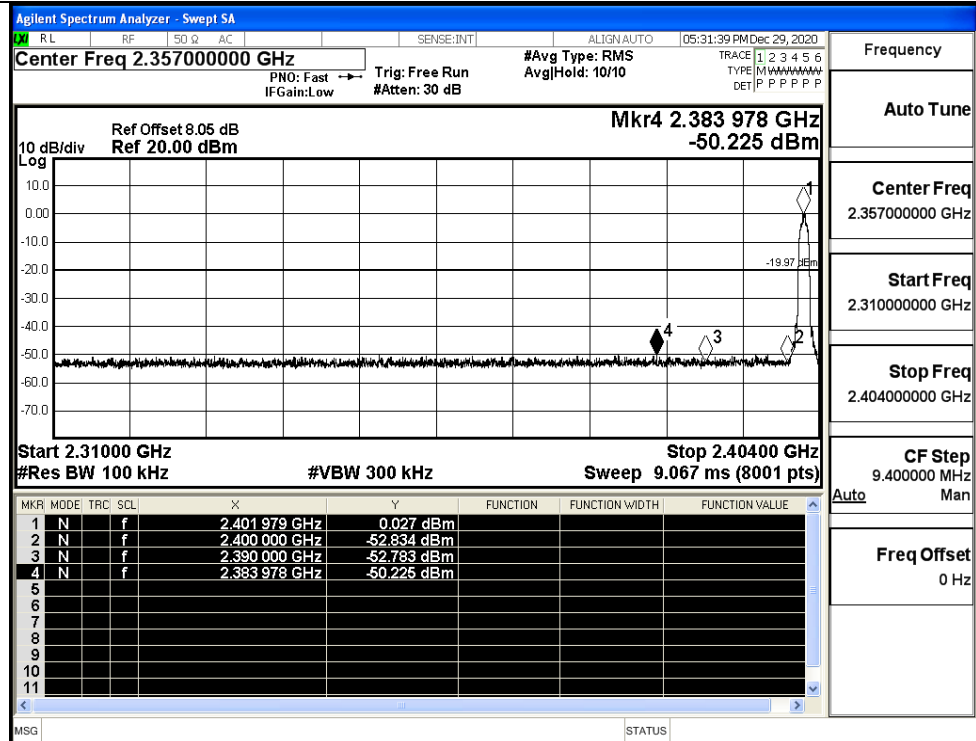
GFSK/HCH/No Hop



GFSK/HCH/Hop



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



Frequency

Auto Tune

Center Freq
2.357000000 GHz

Start Freq
2.310000000 GHz

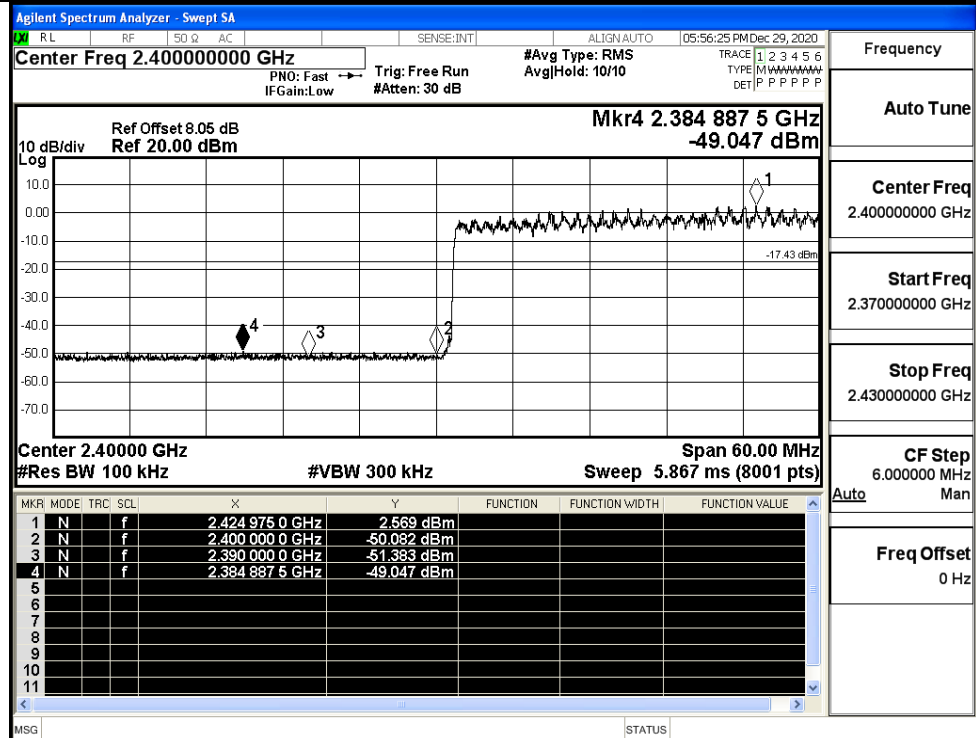
Stop Freq
2.404000000 GHz

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

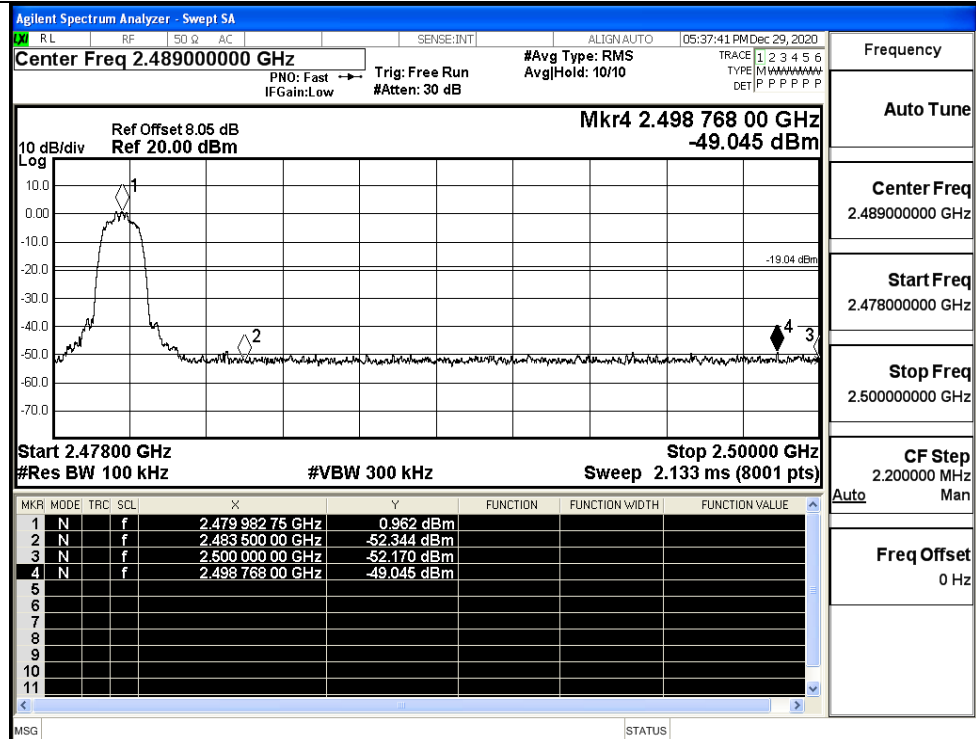
Stop Freq
2.430000000 GHz

CF Step
6.000000 MHz

Auto Man

Freq Offset
0 Hz

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

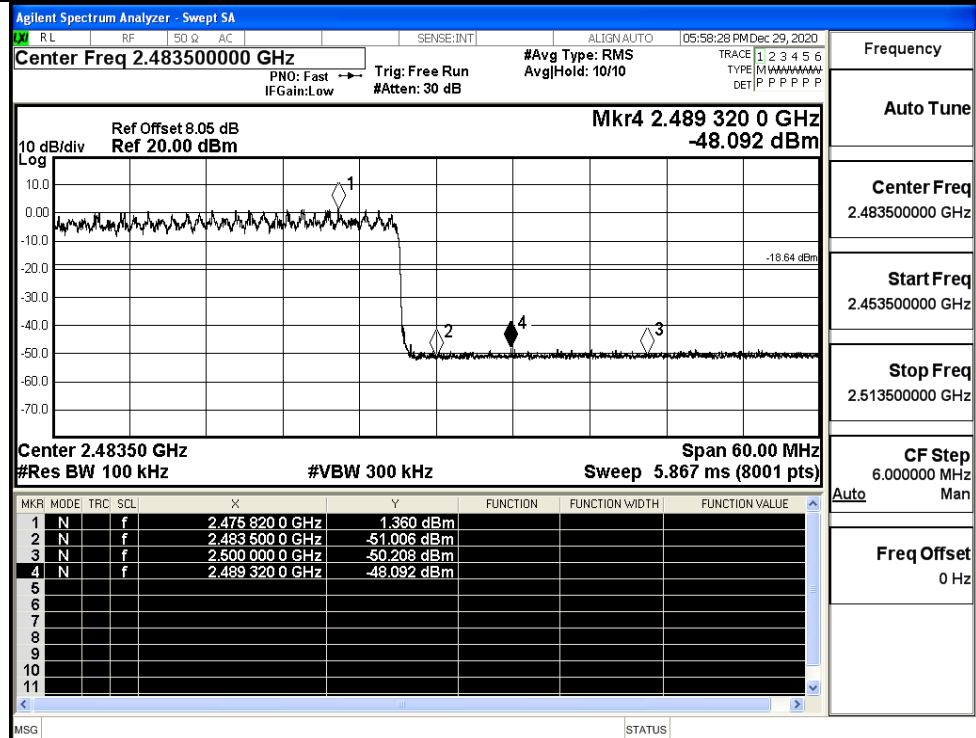


Frequency

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

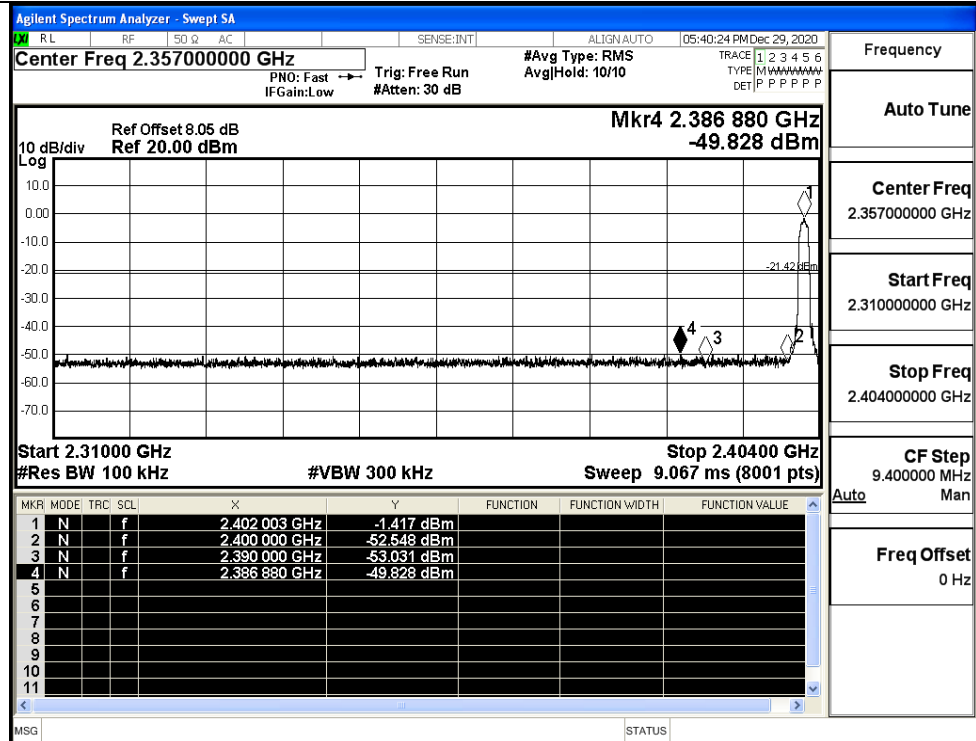


Frequency

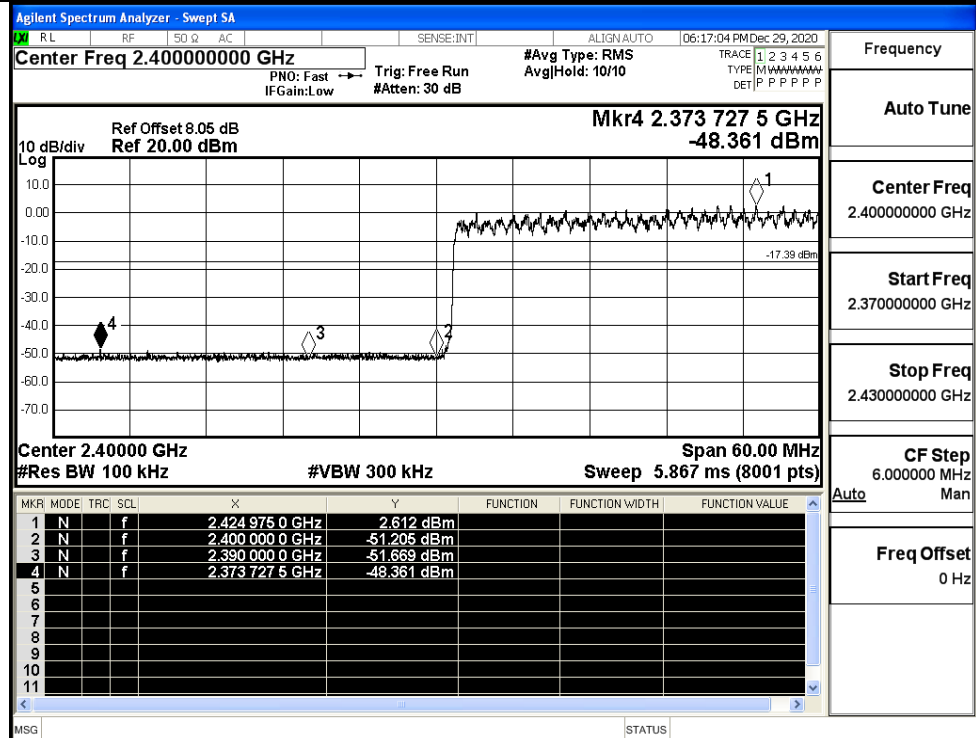
Auto Tune

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

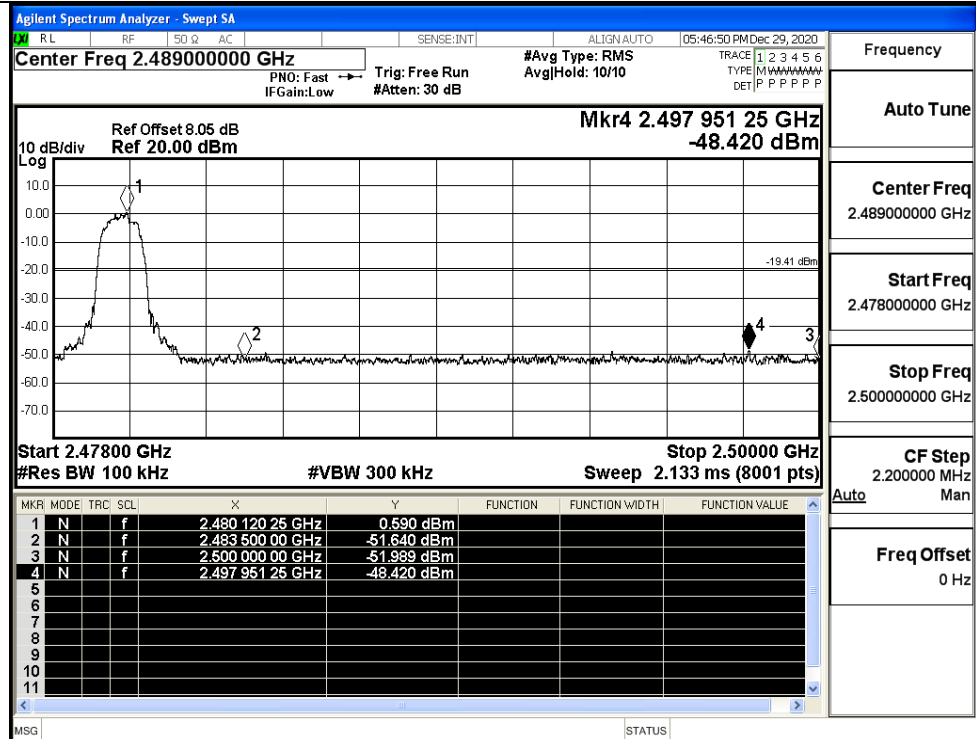
8DPSK/LCH/No Hop



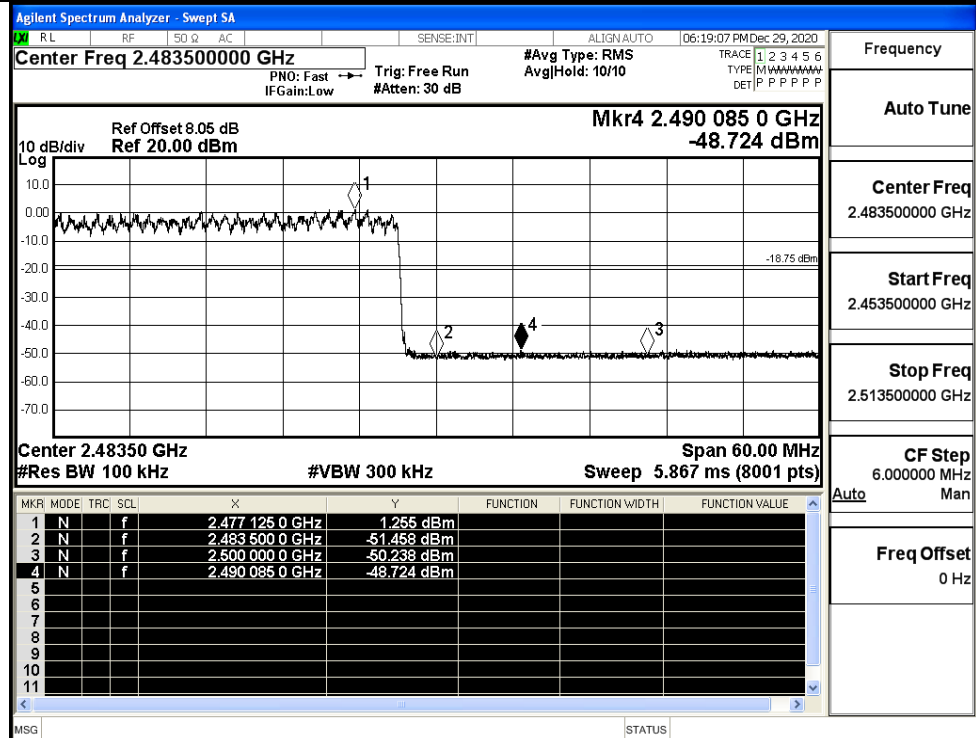
8DPSK/LCH/Hop



8DPSK/HCH/No Hop



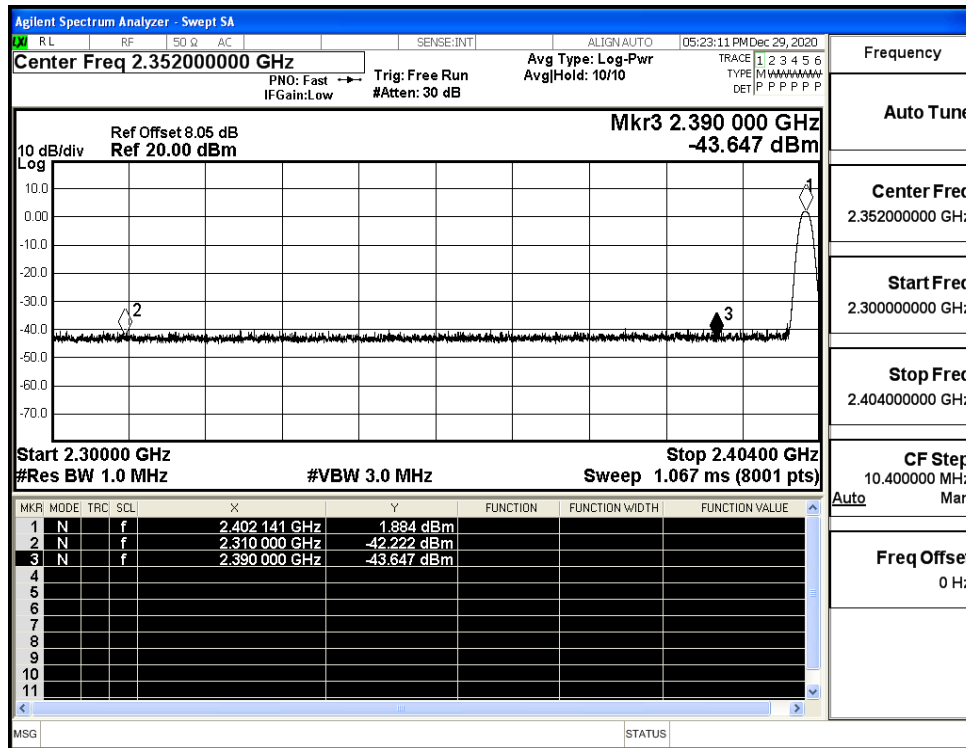
8DPSK/HCH/Hop



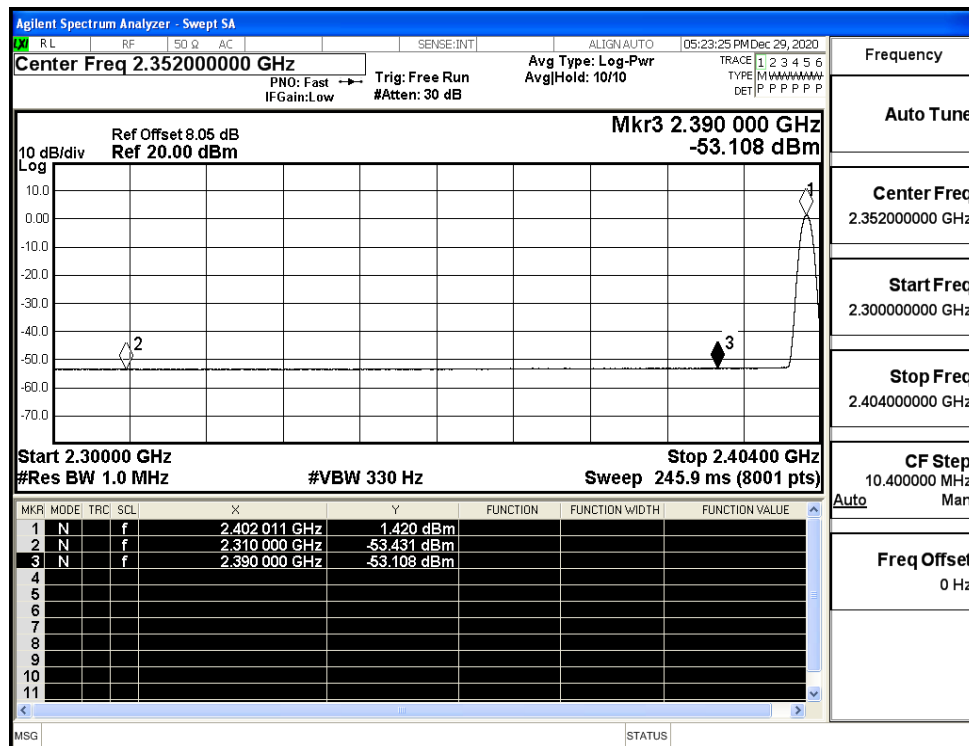
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-42.22	2.0	0	55.04	PEAK	74	PASS
	Off	2310.0	-53.43	2.0	0	43.83	AV	54	PASS
	Off	2390.0	-43.65	2.0	0	53.61	PEAK	74	PASS
	Off	2390.0	-53.11	2.0	0	44.15	AV	54	PASS
	Off	2483.5	-42.07	2.0	0	55.19	PEAK	74	PASS
	Off	2483.5	-52.50	2.0	0	44.76	AV	54	PASS
	Off	2500.0	-42.03	2.0	0	55.23	PEAK	74	PASS
	Off	2500.0	-52.41	2.0	0	44.85	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-42.60	2.0	0	54.66	PEAK	74	PASS
	Off	2310.0	-53.40	2.0	0	43.86	AV	54	PASS
	Off	2390.0	-43.15	2.0	0	54.11	PEAK	74	PASS
	Off	2390.0	-53.08	2.0	0	44.18	AV	54	PASS
	Off	2483.5	-41.86	2.0	0	55.4	PEAK	74	PASS
	Off	2483.5	-52.60	2.0	0	44.66	AV	54	PASS
	Off	2500.0	-42.51	2.0	0	54.75	PEAK	74	PASS
	Off	2500.0	-52.37	2.0	0	44.89	AV	54	PASS
8DPSK	Off	2310.0	-42.94	2.0	0	54.32	PEAK	74	PASS
	Off	2310.0	-53.41	2.0	0	43.85	AV	54	PASS
	Off	2390.0	-43.41	2.0	0	53.85	PEAK	74	PASS
	Off	2390.0	-53.02	2.0	0	44.24	AV	54	PASS
	Off	2483.5	-43.11	2.0	0	54.15	PEAK	74	PASS
	Off	2483.5	-52.64	2.0	0	44.62	AV	54	PASS
	Off	2500.0	-43.53	2.0	0	53.73	PEAK	74	PASS
	Off	2500.0	-52.40	2.0	0	44.86	AV	54	PASS

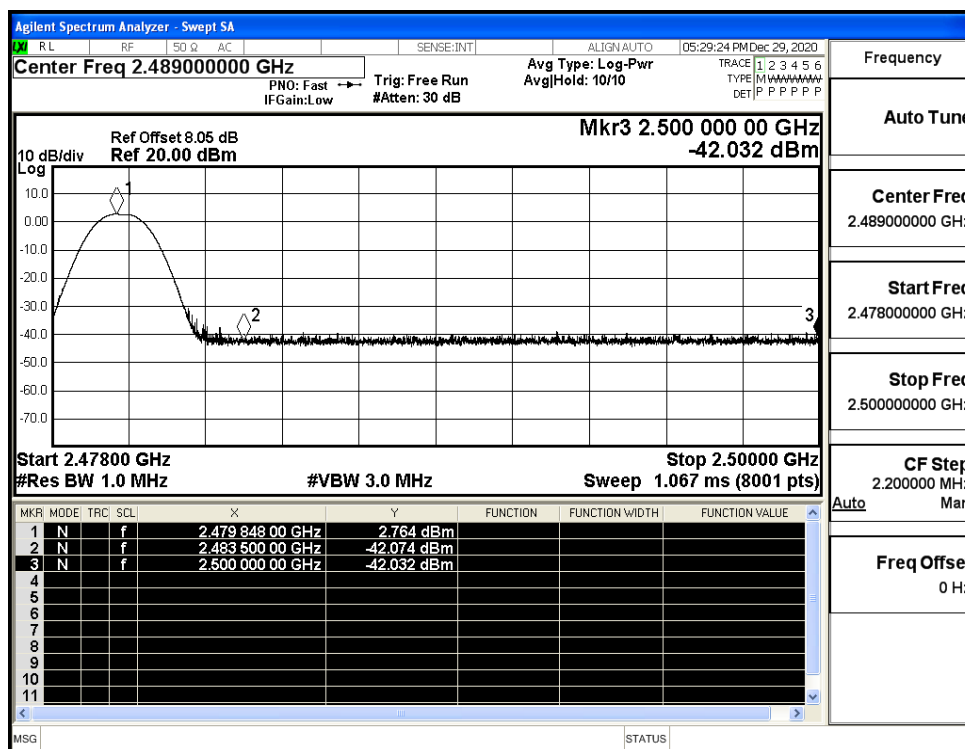
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



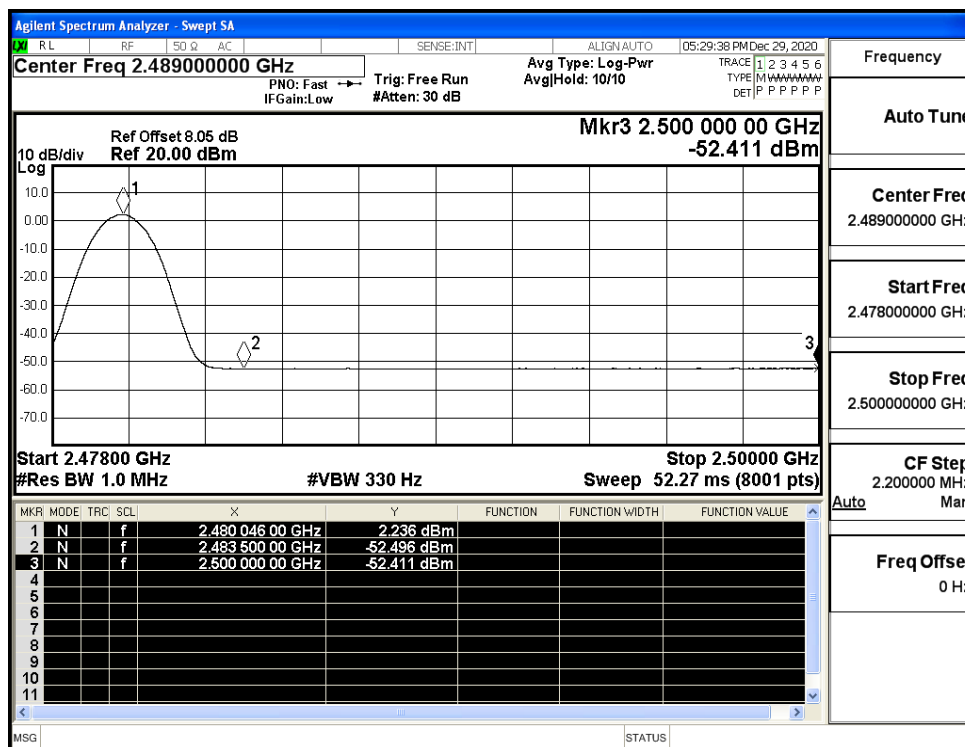
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)

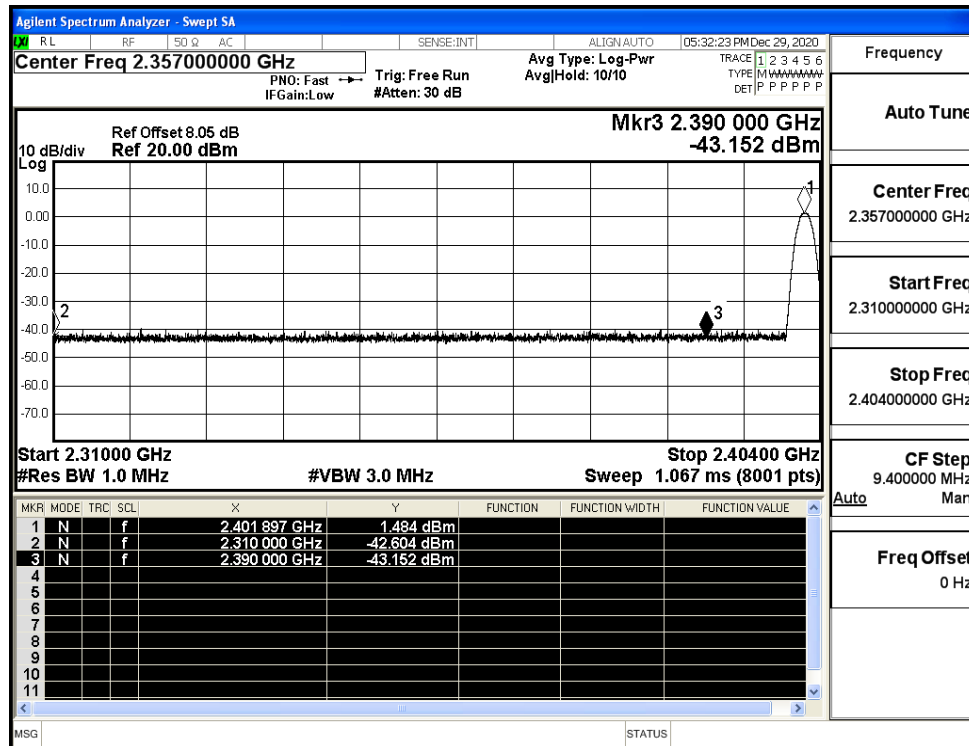
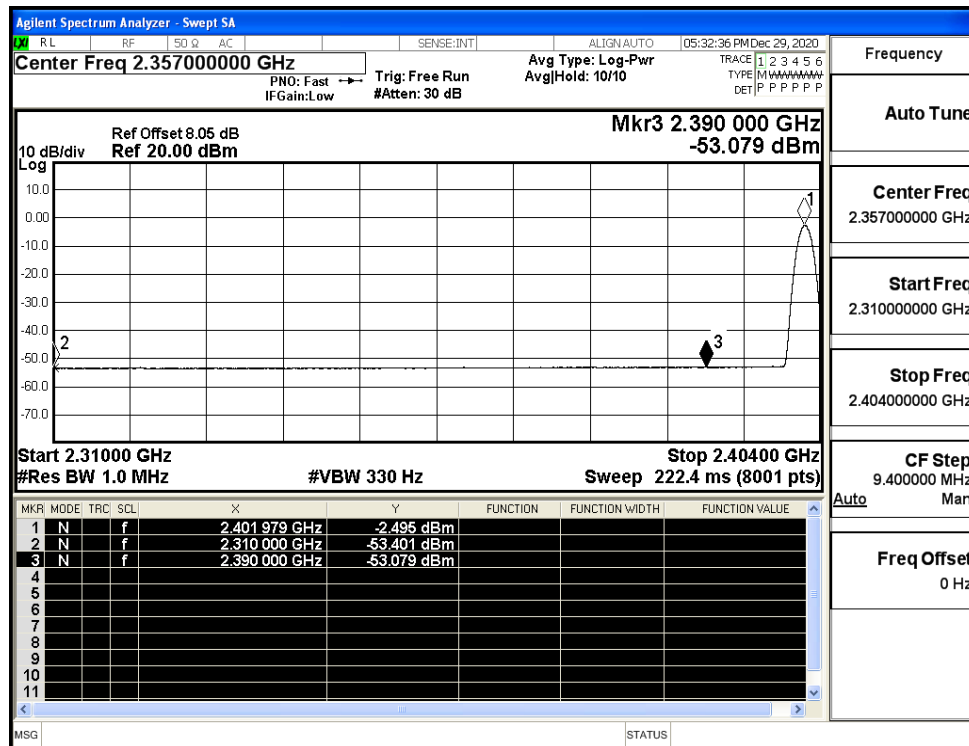


Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)

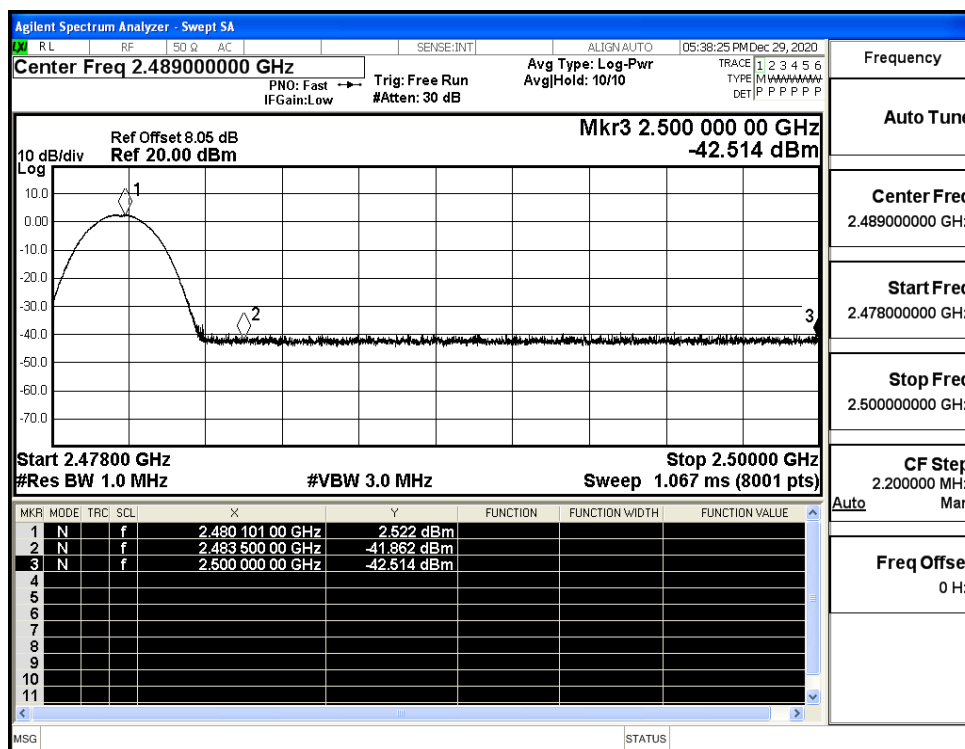


Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)

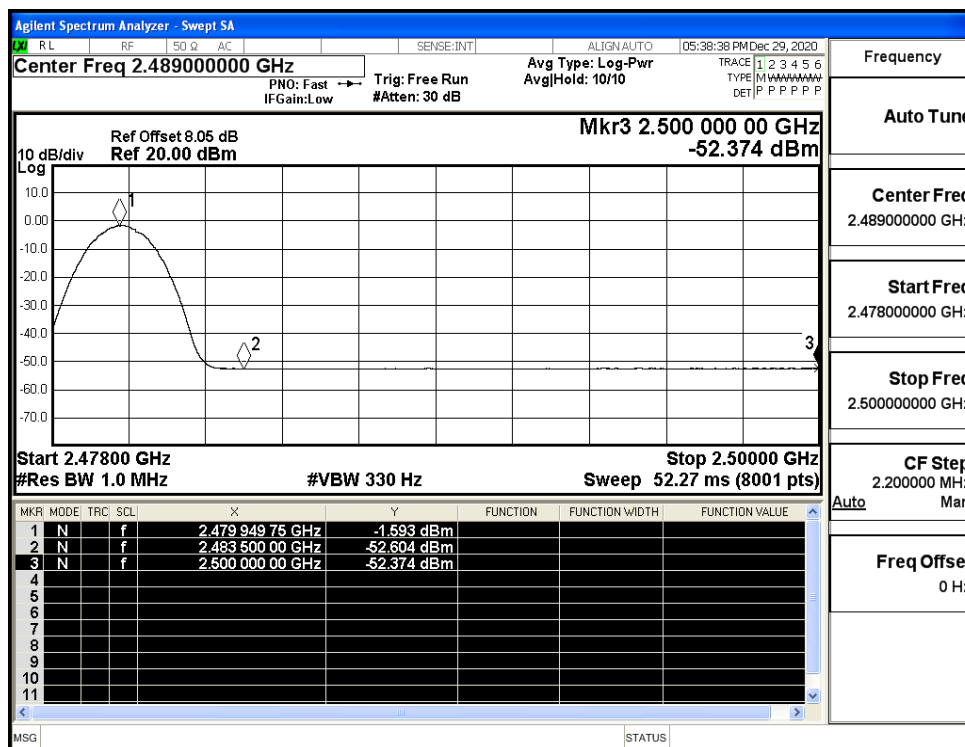


Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)

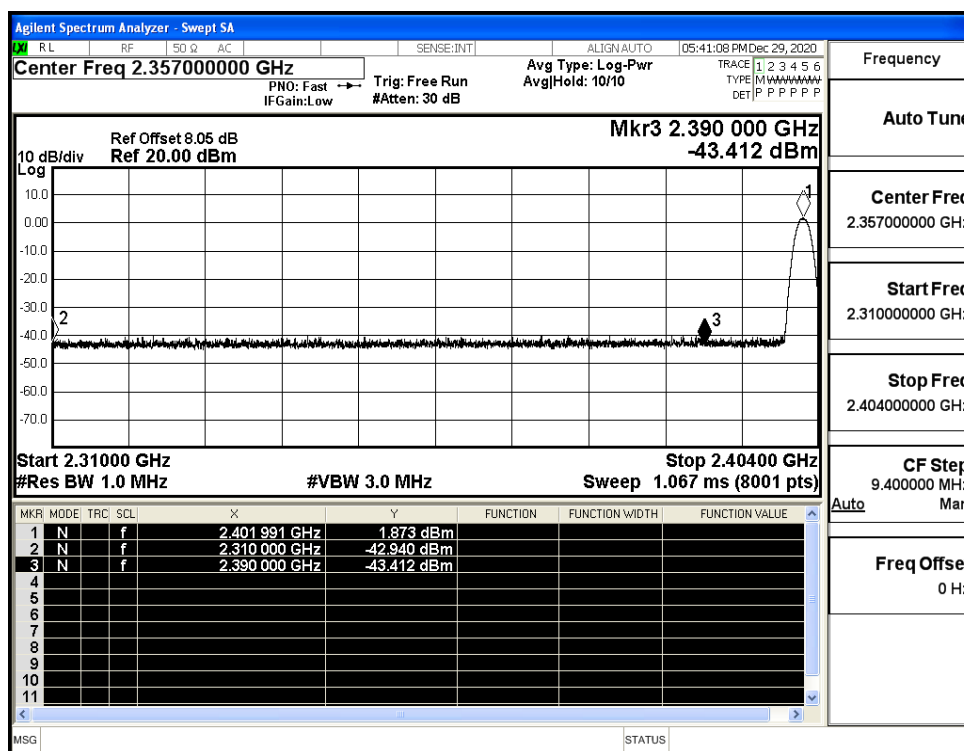
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



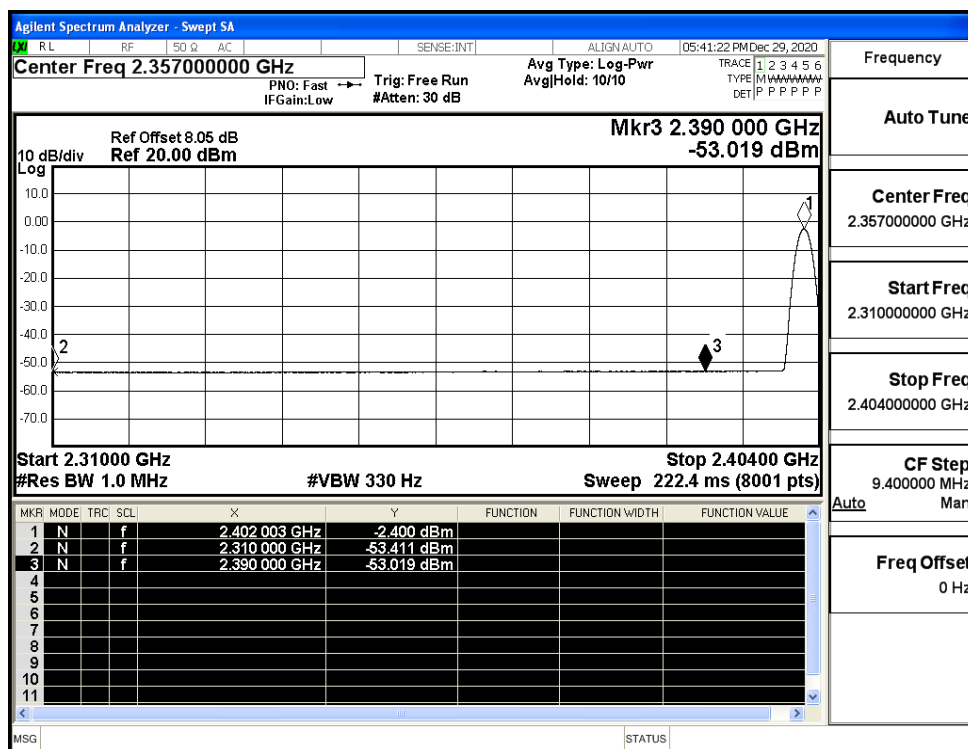
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



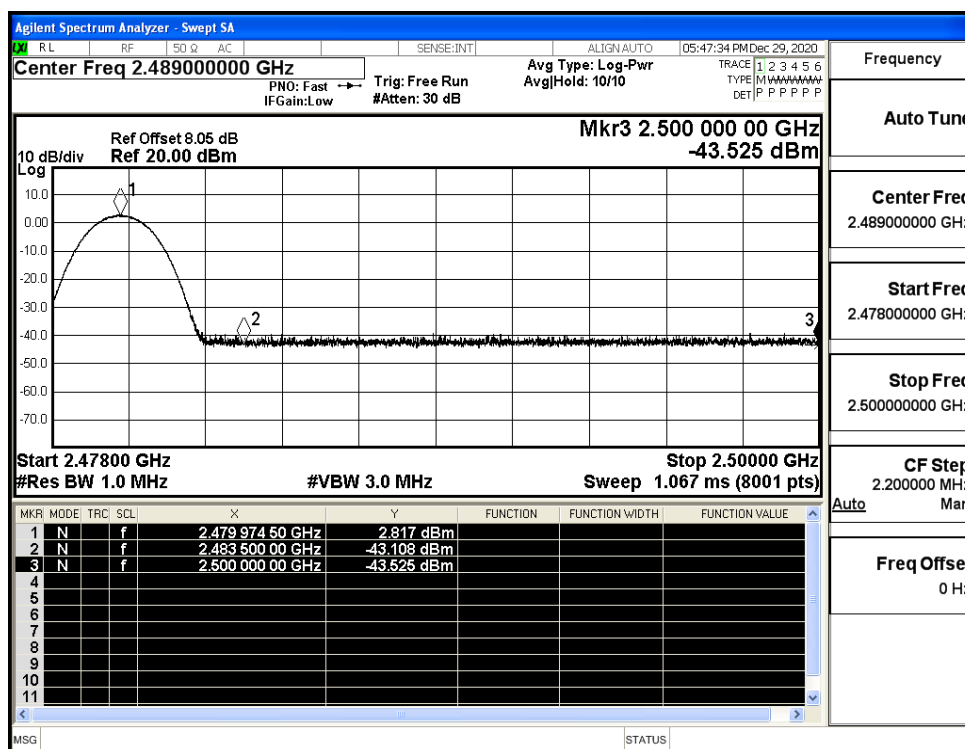
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

