

Appendix A

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

Product Name: Echelon Ear Buds

Trade Mark: ECHELON

Test Model: ECHBUDS

Environmental Conditions

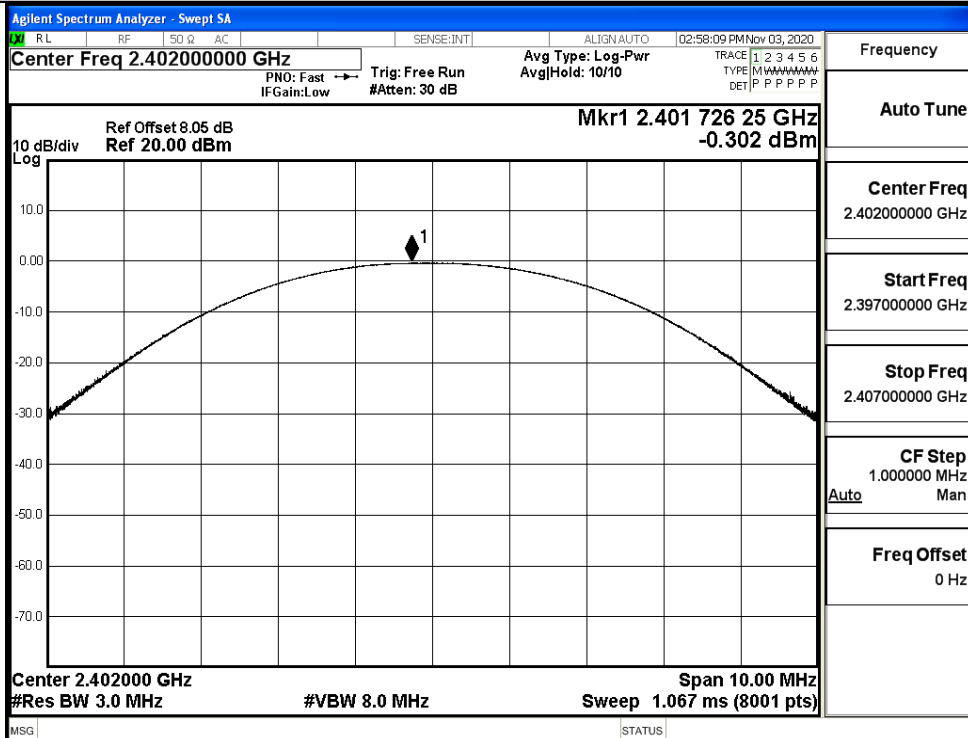
Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.0 kPa
Test Engineer:	Jam Zheng
Supervised by:	Li Huan

A.1 Maximum Conducted Peak Output Power

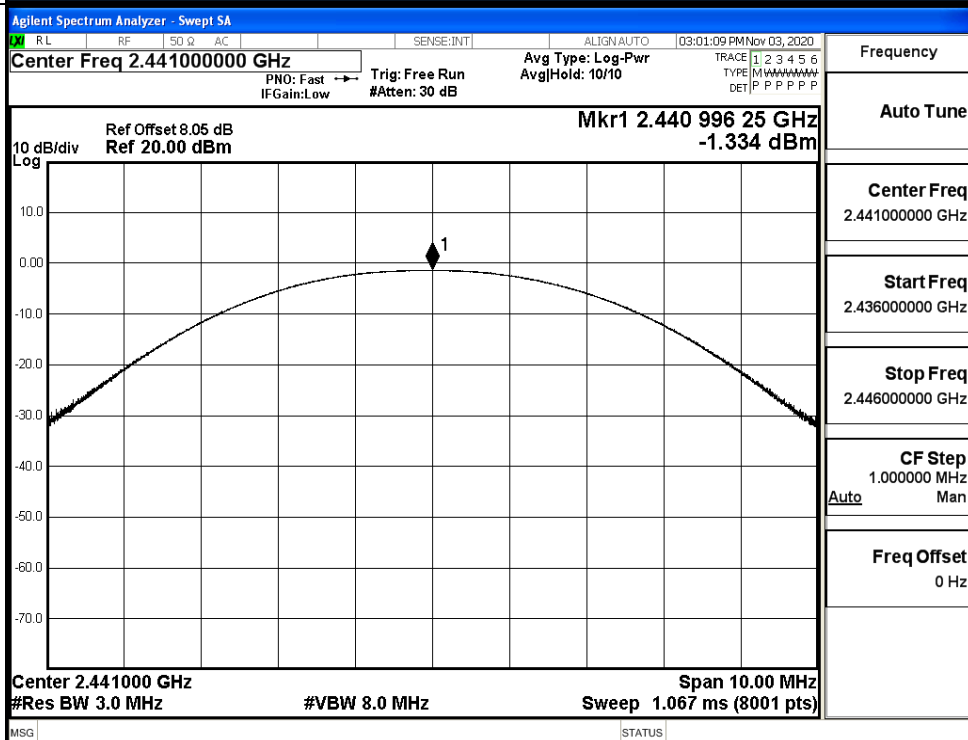
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-0.302	21	PASS
	MCH	-1.334	21	PASS
	HCH	-2.528	21	PASS
$\pi/4$ DQPSK	LCH	2.174	21	PASS
	MCH	1.041	21	PASS
	HCH	-0.166	21	PASS
8DPSK	LCH	2.736	21	PASS
	MCH	1.770	21	PASS
	HCH	0.512	21	PASS

Test Graphs

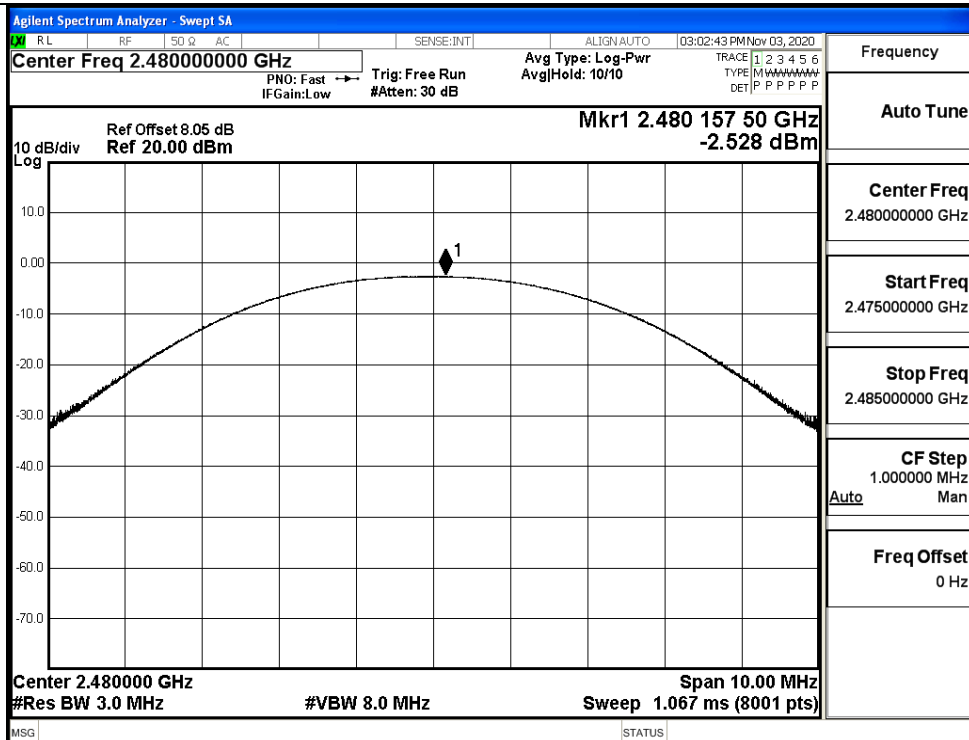
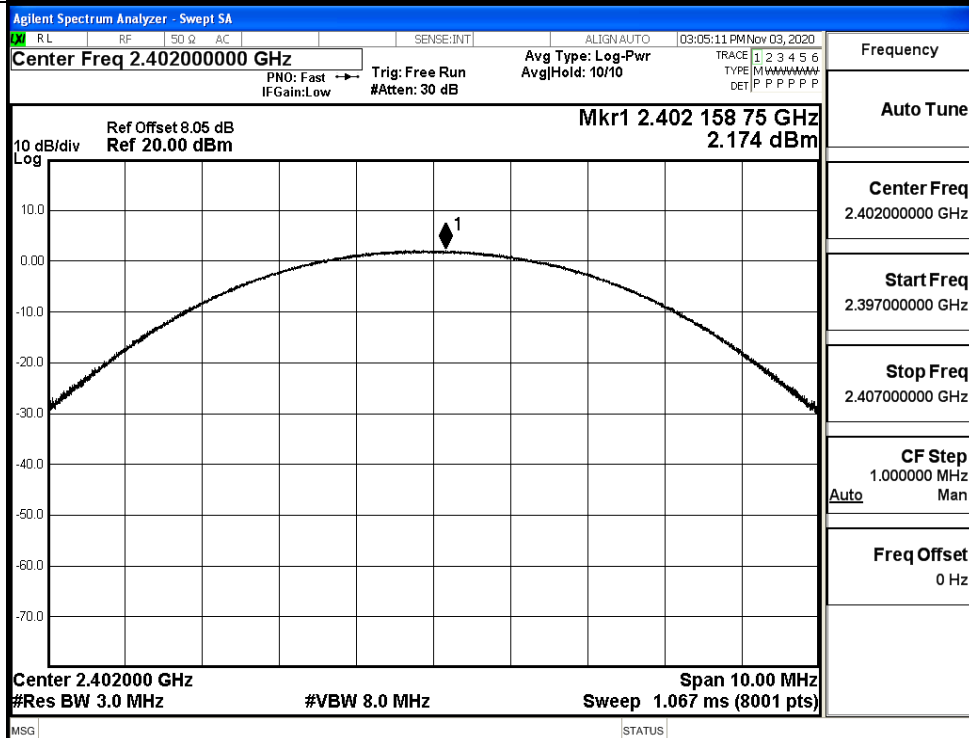
GFSK/LCH

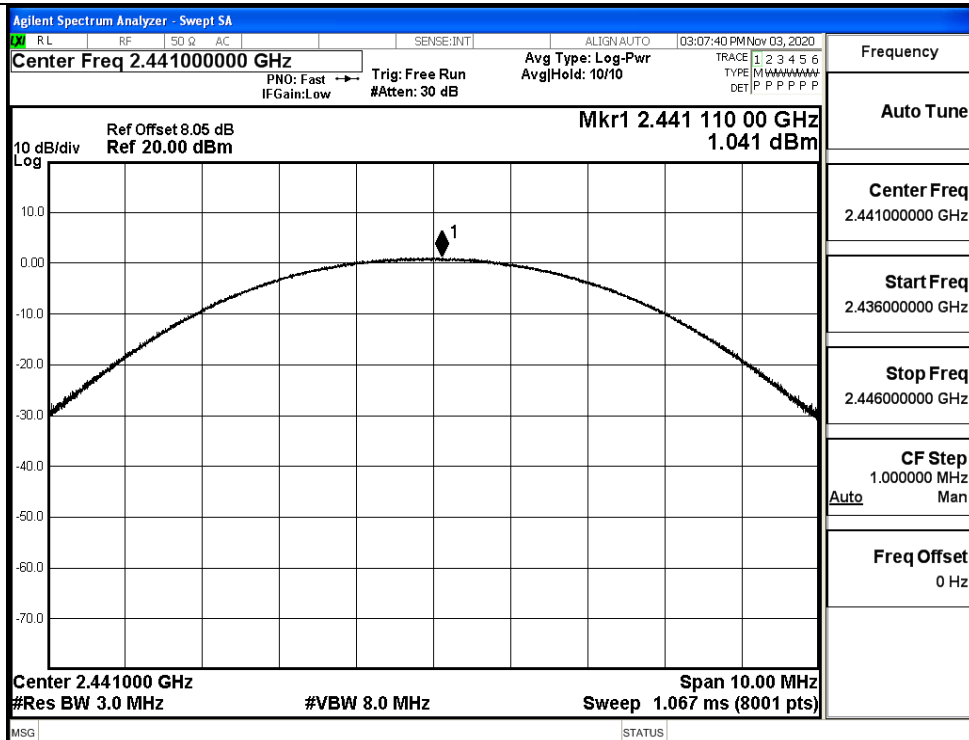
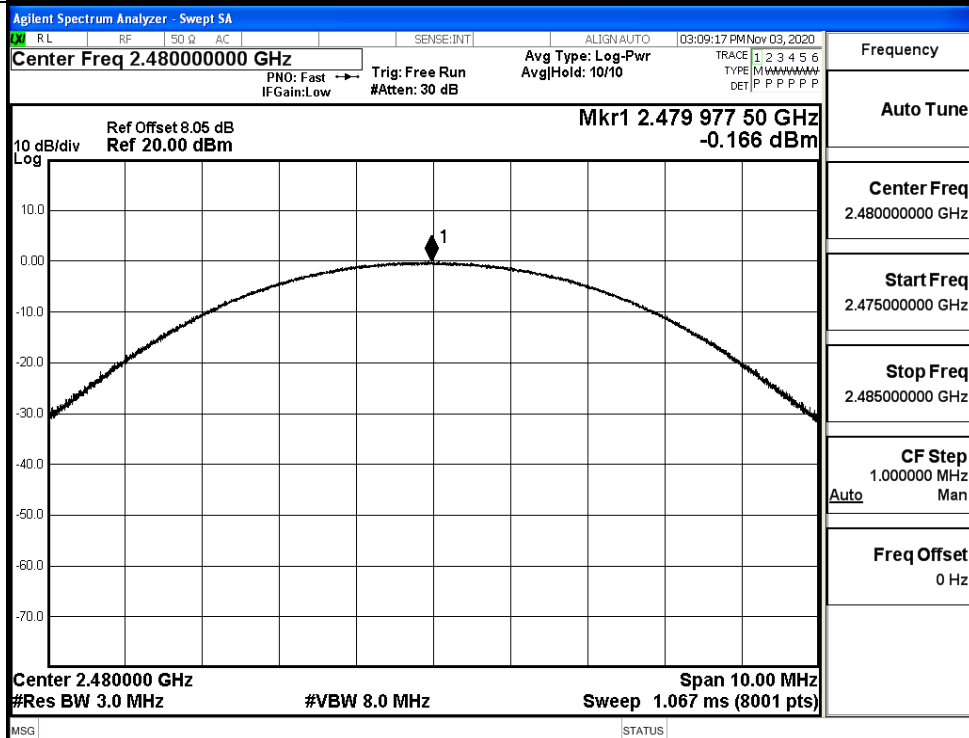


GFSK/MCH

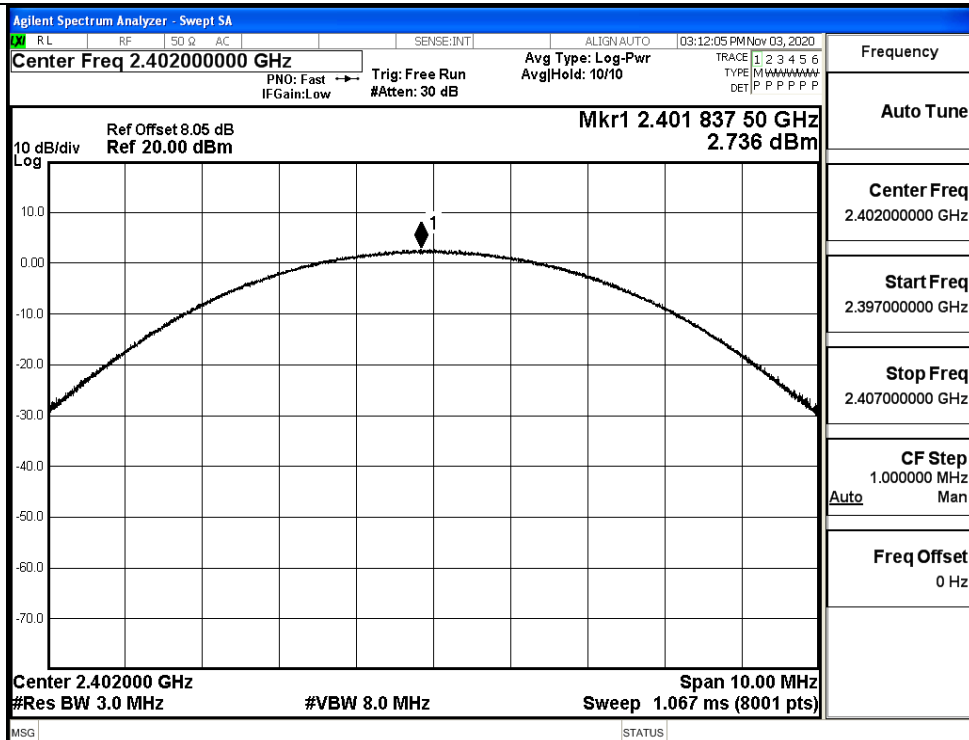


GFSK/HCH

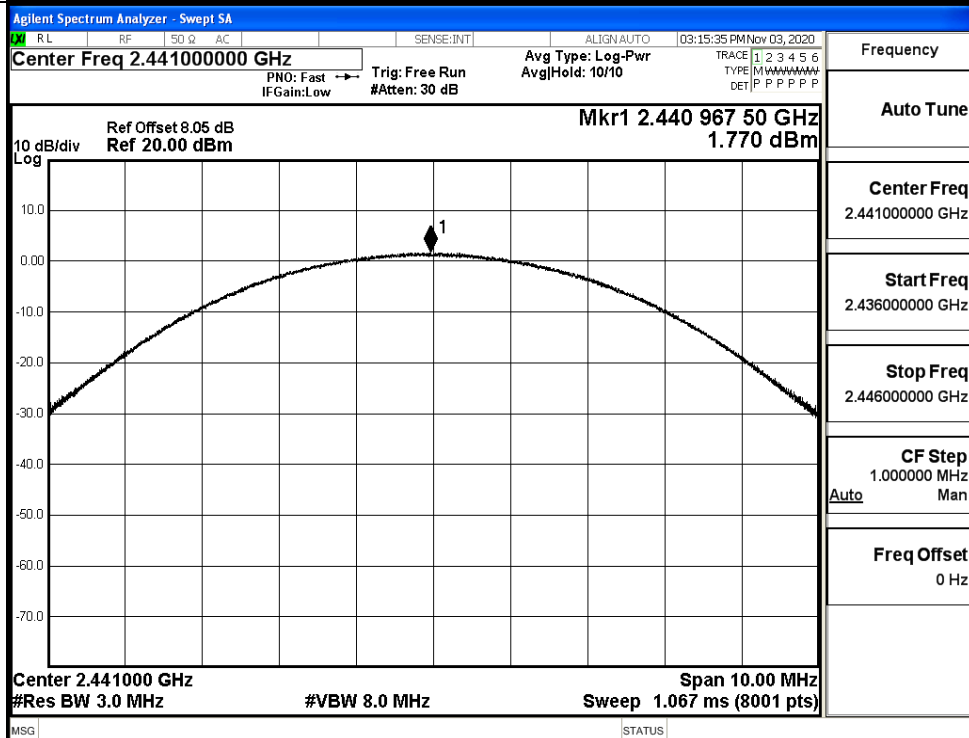
 $\pi/4$ DQPSK/LCH

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

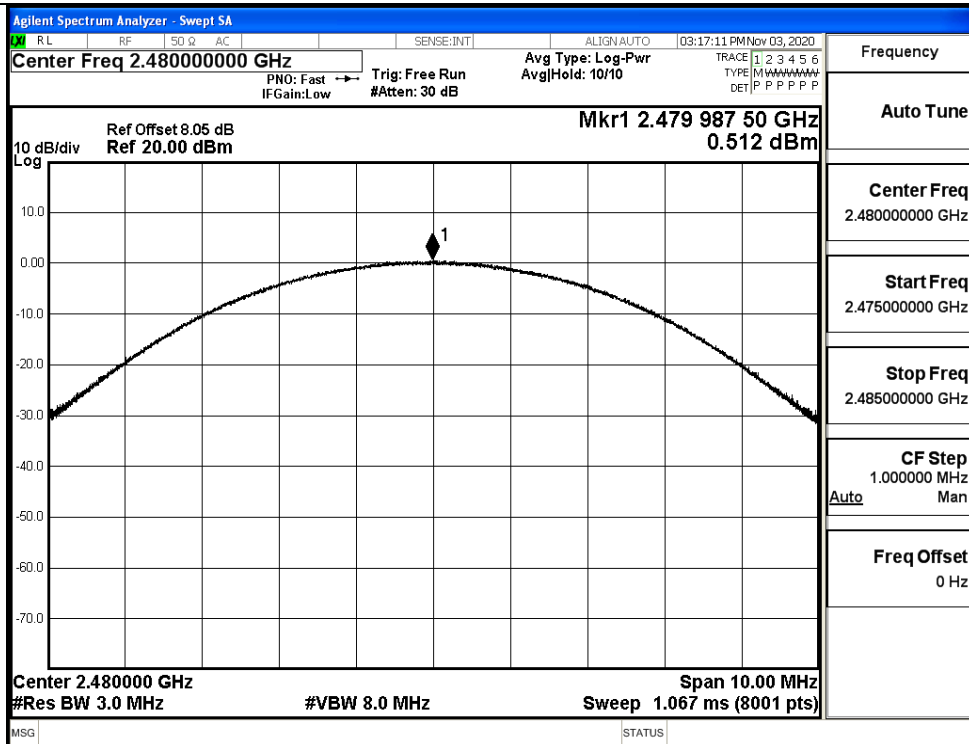
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

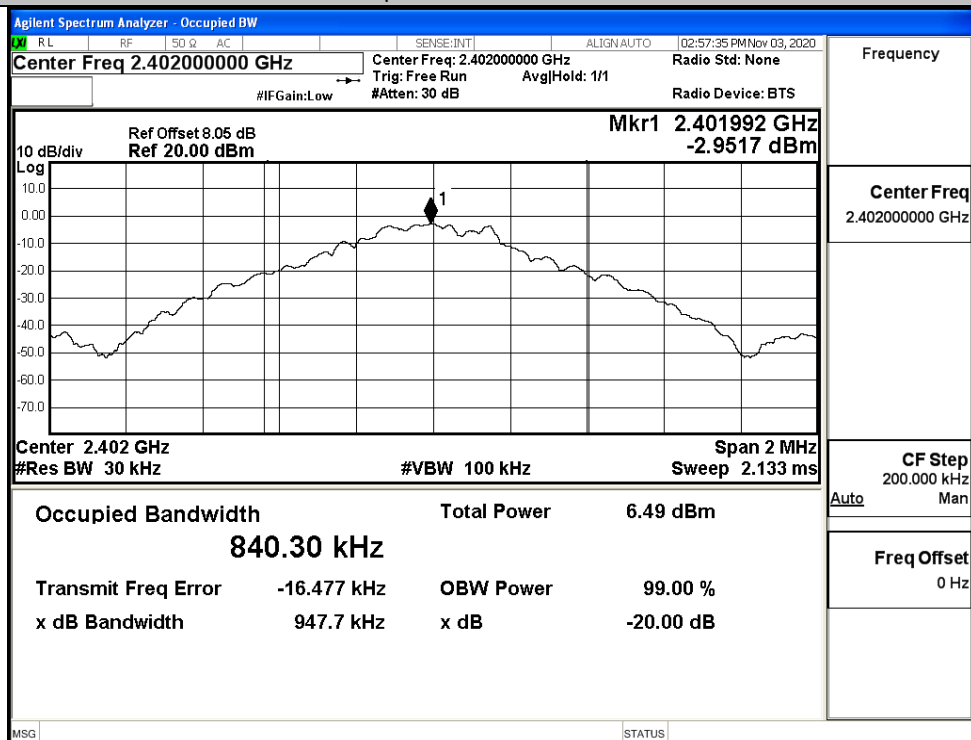


A.2 20dB Bandwidth

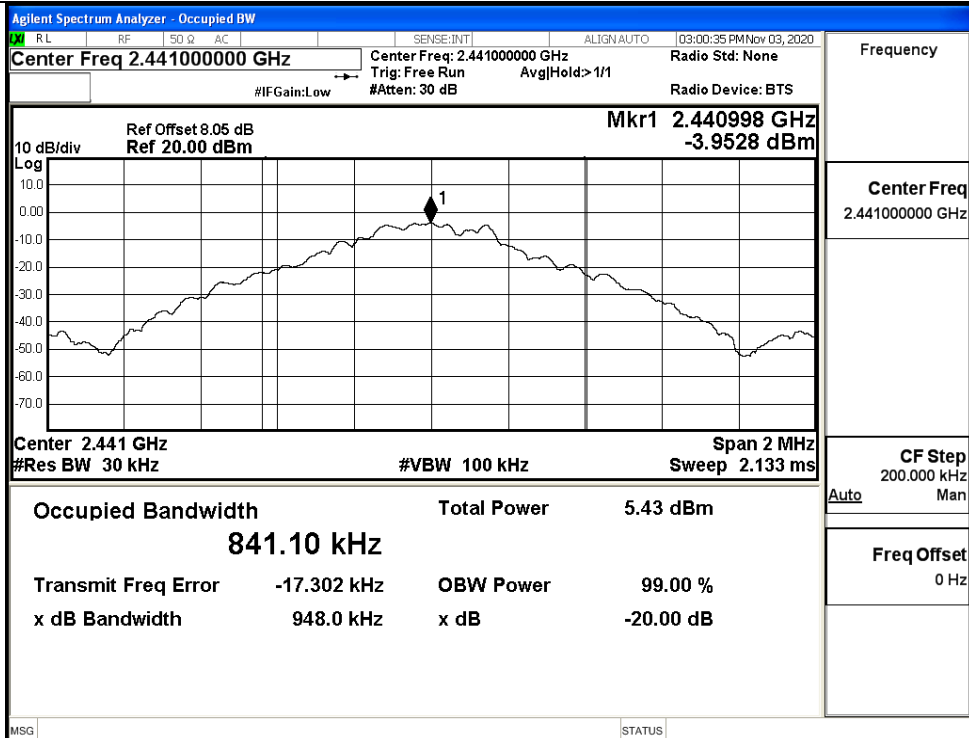
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9477	Not Specified	PASS
	MCH	0.9480	Not Specified	PASS
	HCH	0.9467	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.316	Not Specified	PASS
	MCH	1.318	Not Specified	PASS
	HCH	1.318	Not Specified	PASS
8DPSK	LCH	1.310	Not Specified	PASS
	MCH	1.309	Not Specified	PASS
	HCH	1.308	Not Specified	PASS

Test Graphs

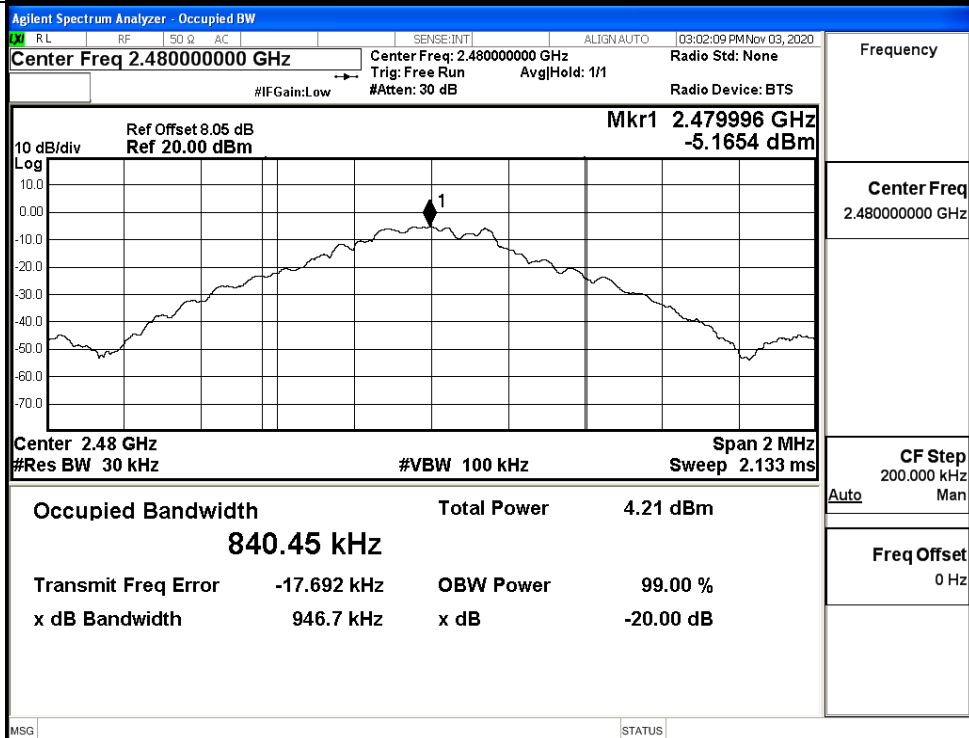
GFSK/LCH

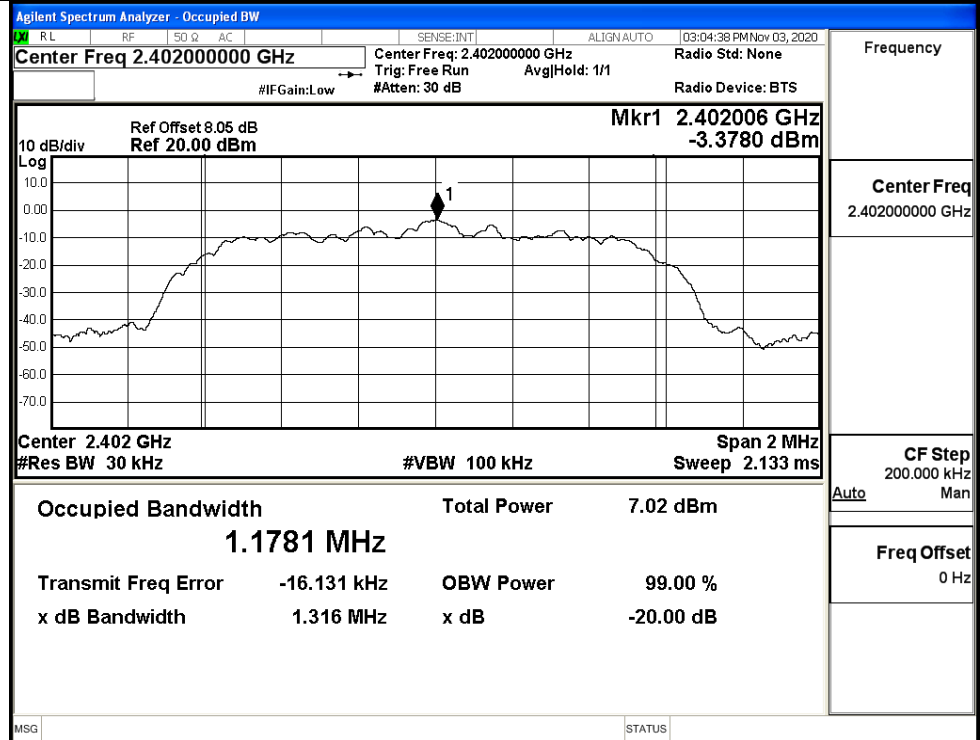
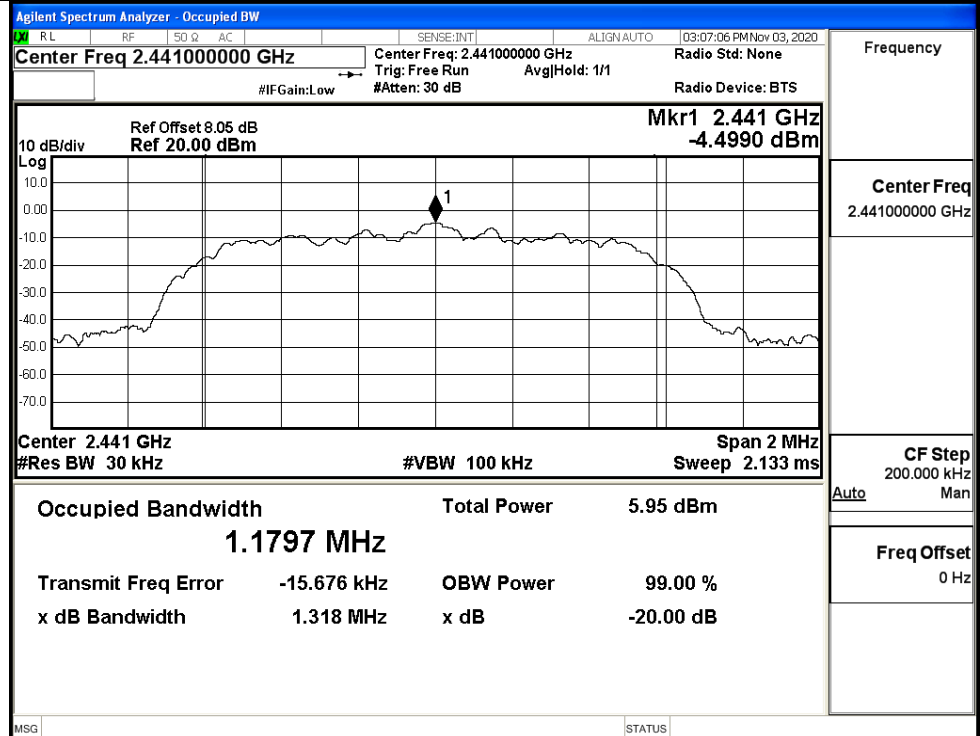


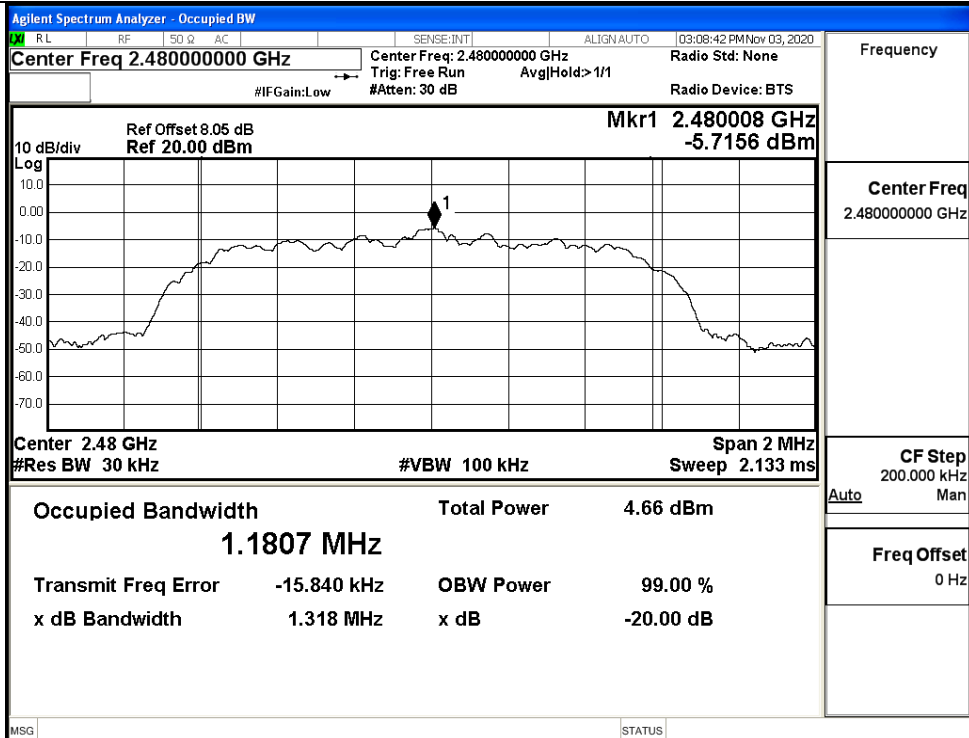
GFSK/MCH



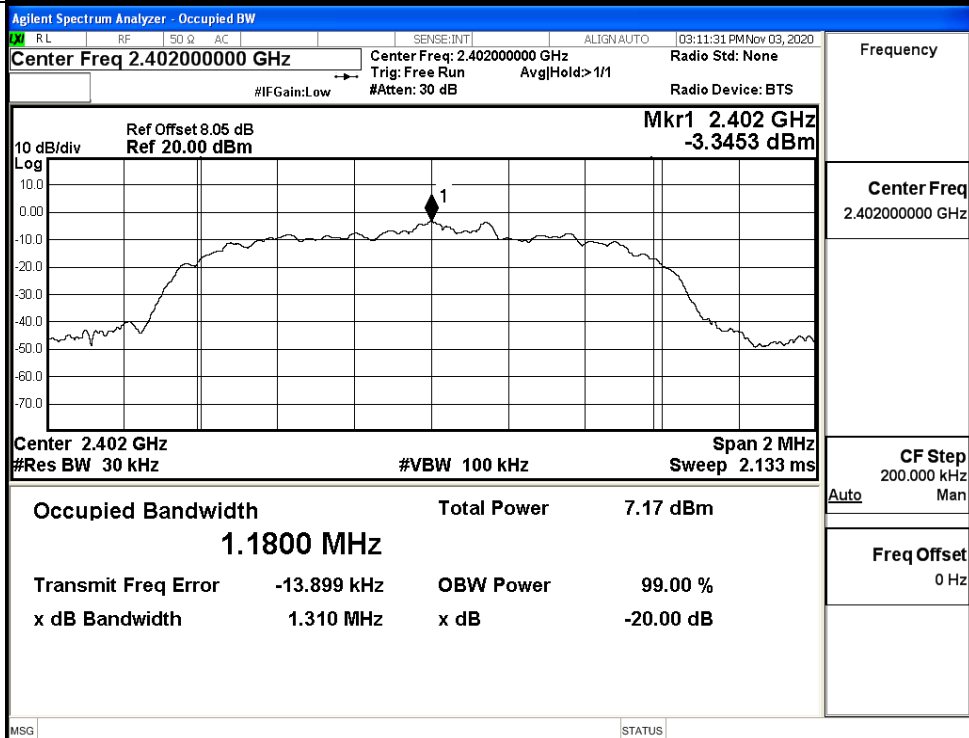
GFSK/HCH



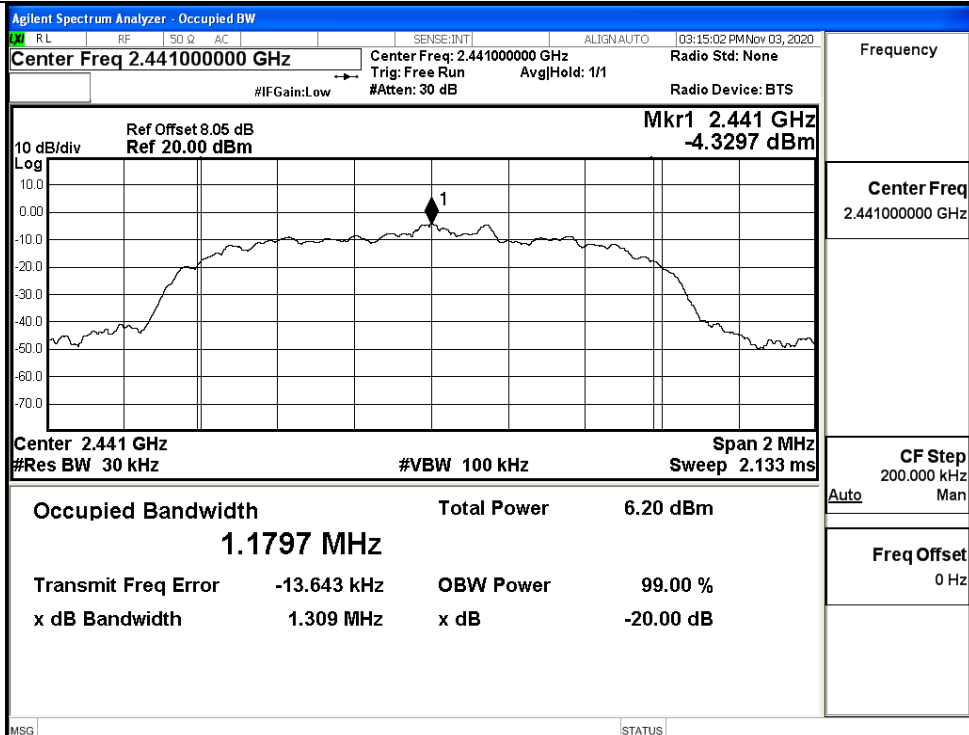
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

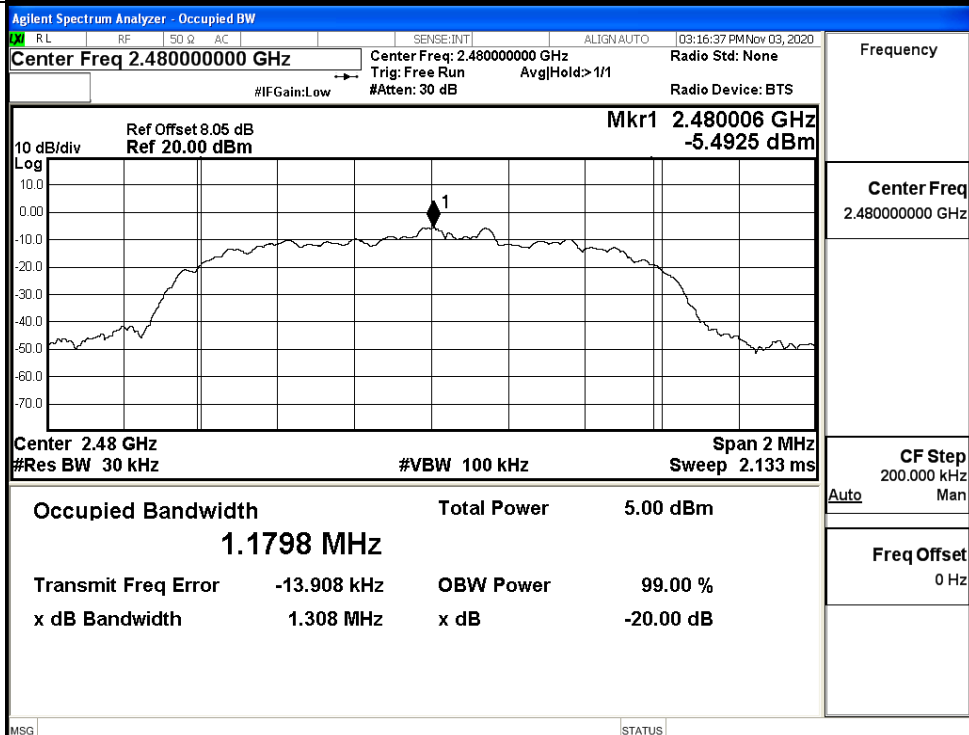
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

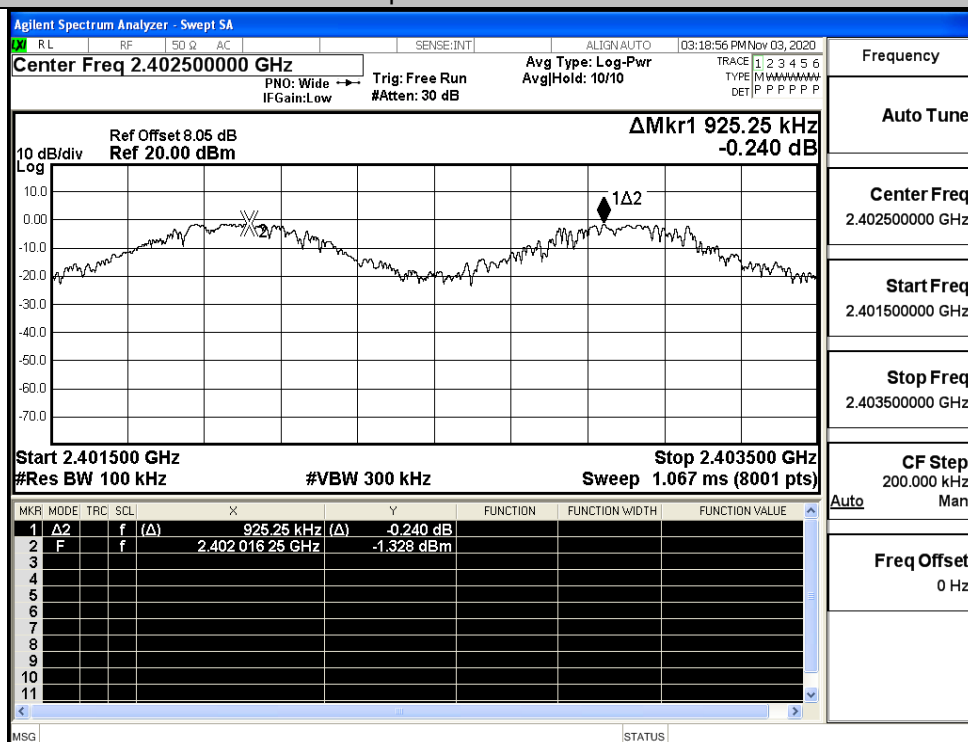


A.3 Carrier Frequency Separation

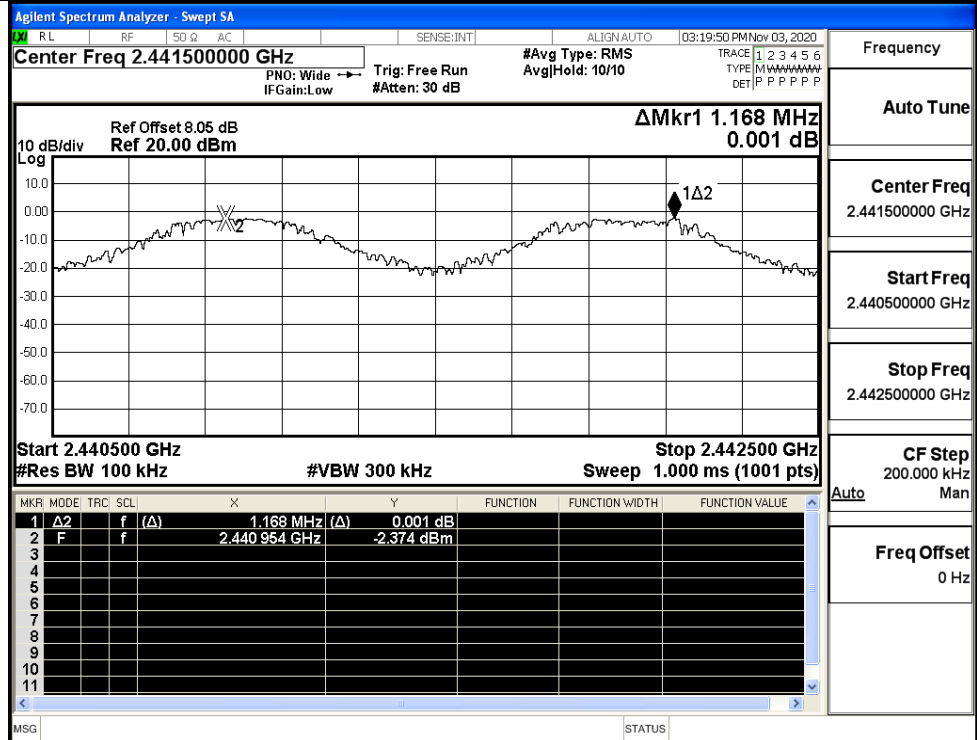
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.925	0.632	PASS
	MCH	1.168	0.632	PASS
	HCH	0.972	0.632	PASS
$\pi/4$ DQPSK	LCH	0.994	0.879	PASS
	MCH	0.908	0.879	PASS
	HCH	0.886	0.879	PASS
8DPSK	LCH	1.062	0.873	PASS
	MCH	1.018	0.873	PASS
	HCH	1.040	0.873	PASS

Test Graphs

GFSK/LCH



GFSK/MCH

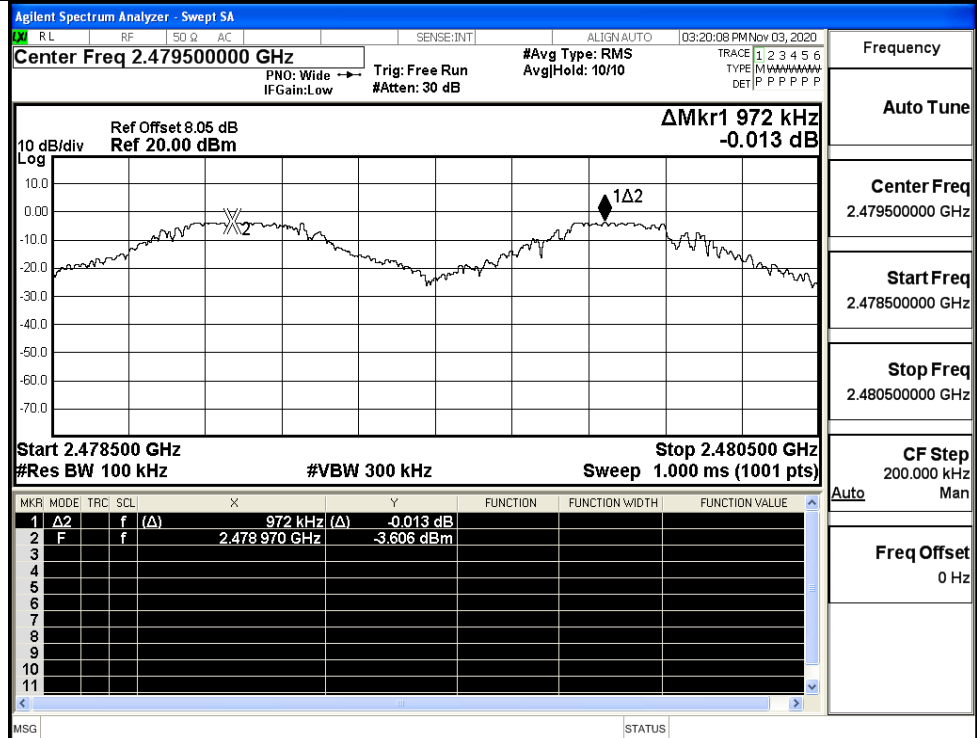


Frequency

Auto Tune

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

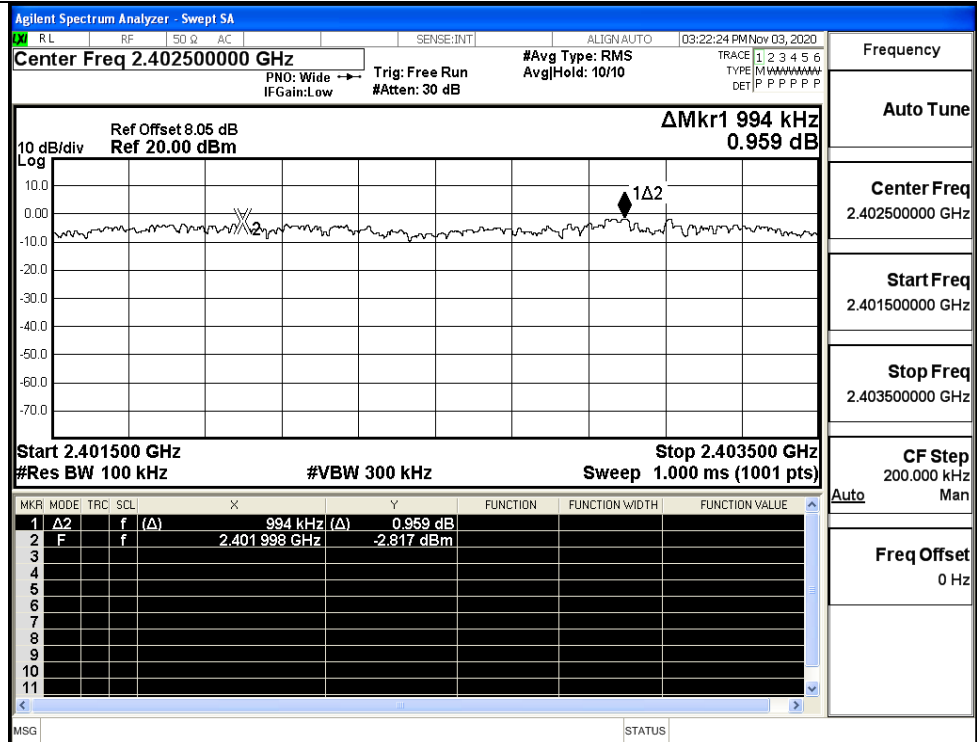
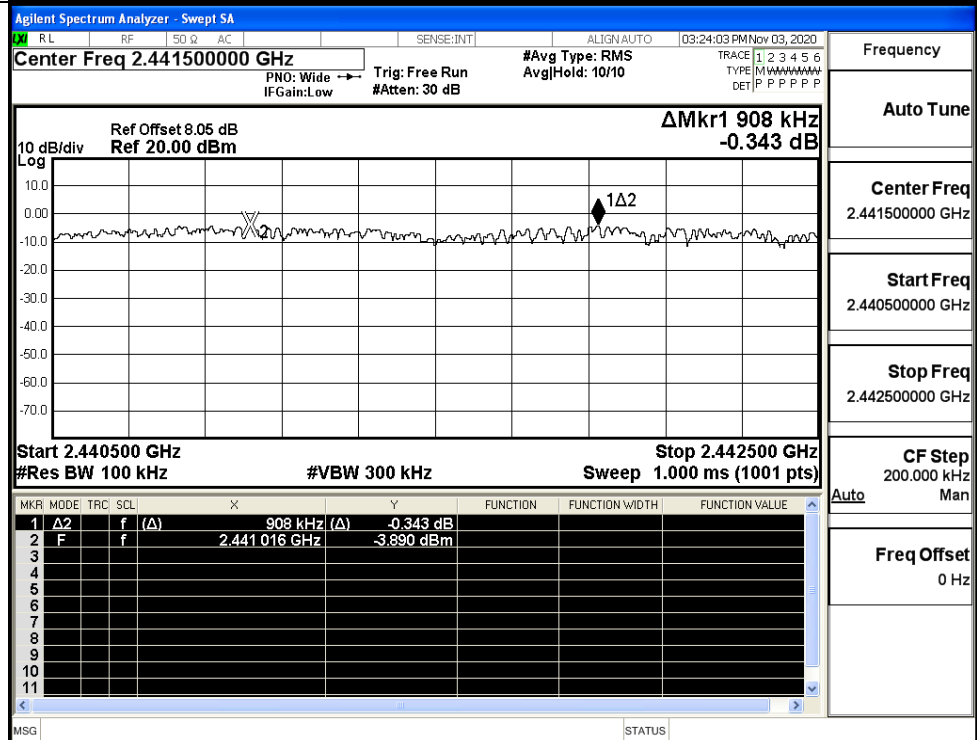
GFSK/HCH

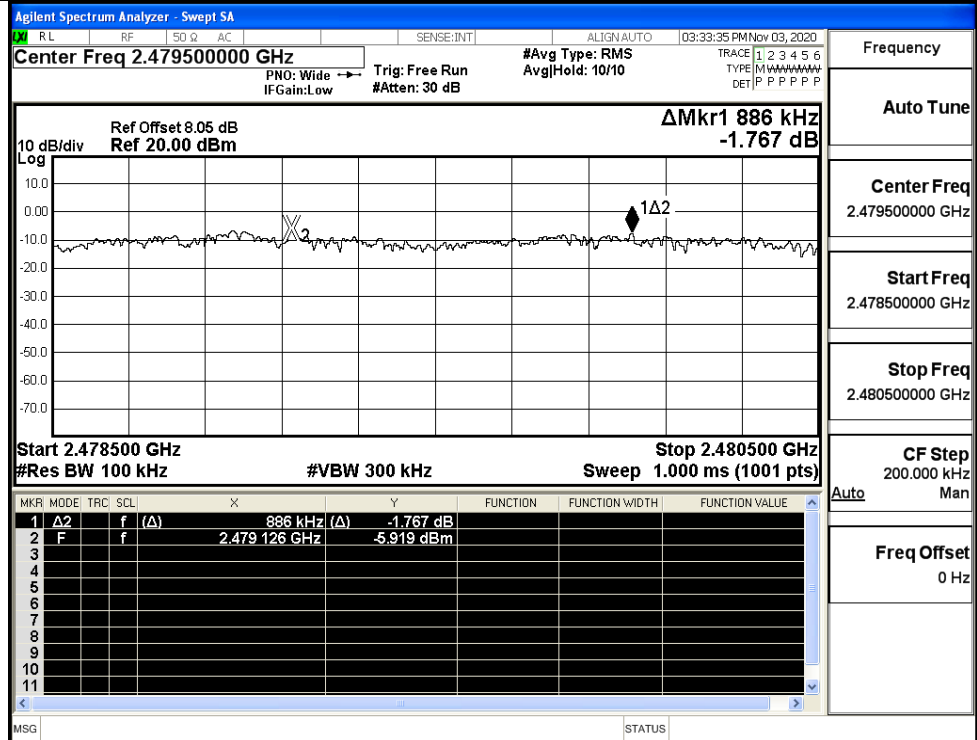


Frequency

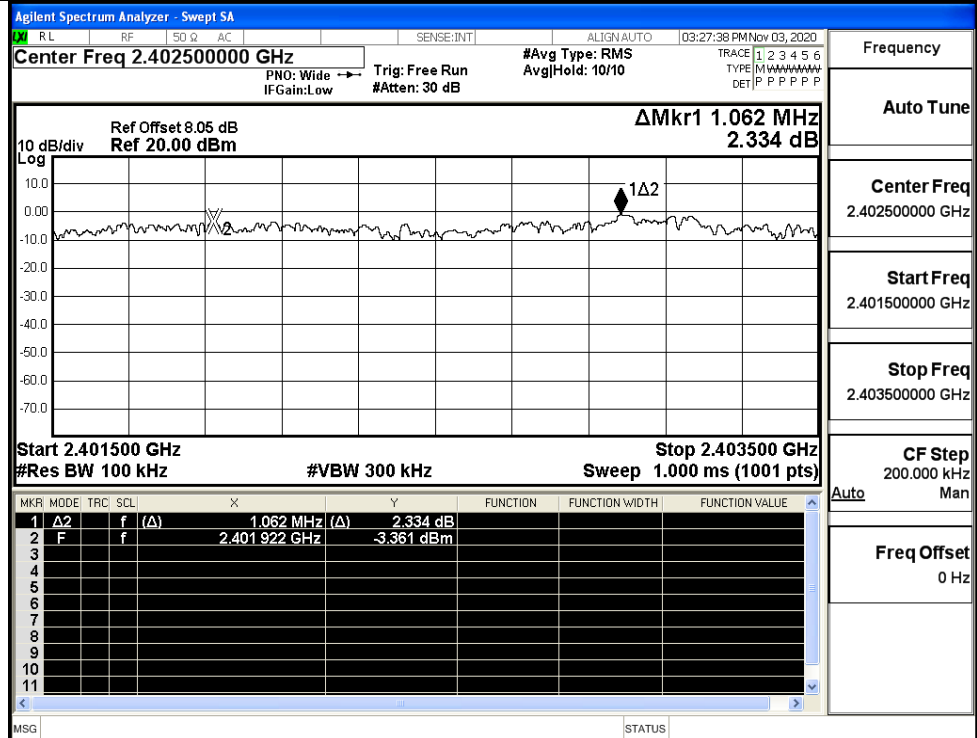
Auto Tune

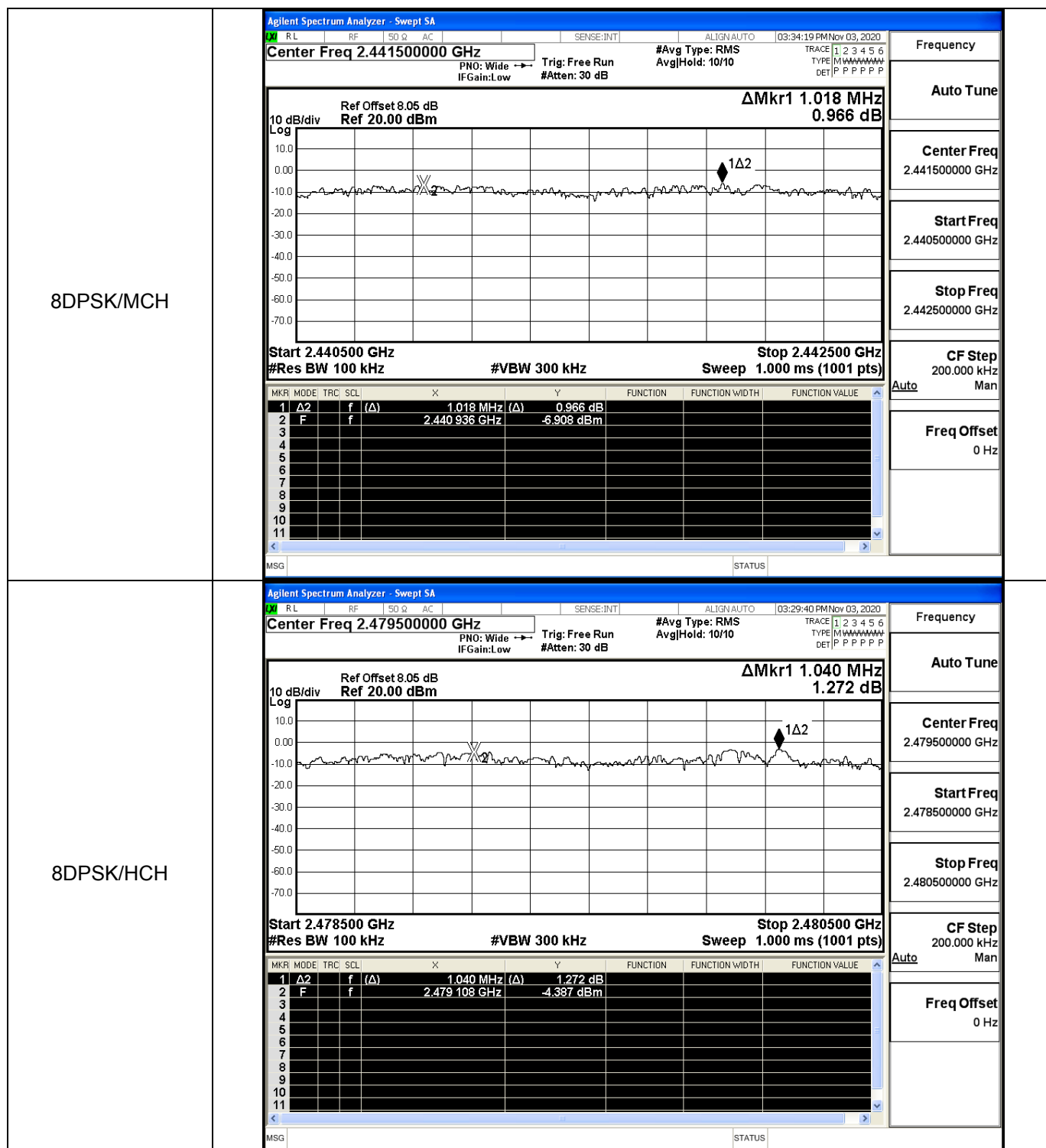
Center Freq
2.479500000 GHzStart Freq
2.478500000 GHzStop Freq
2.480500000 GHzCF Step
200.000 kHz
ManFreq Offset
0 Hz

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

$\pi/4$ DQPSK/HCH

8DPSK/LCH



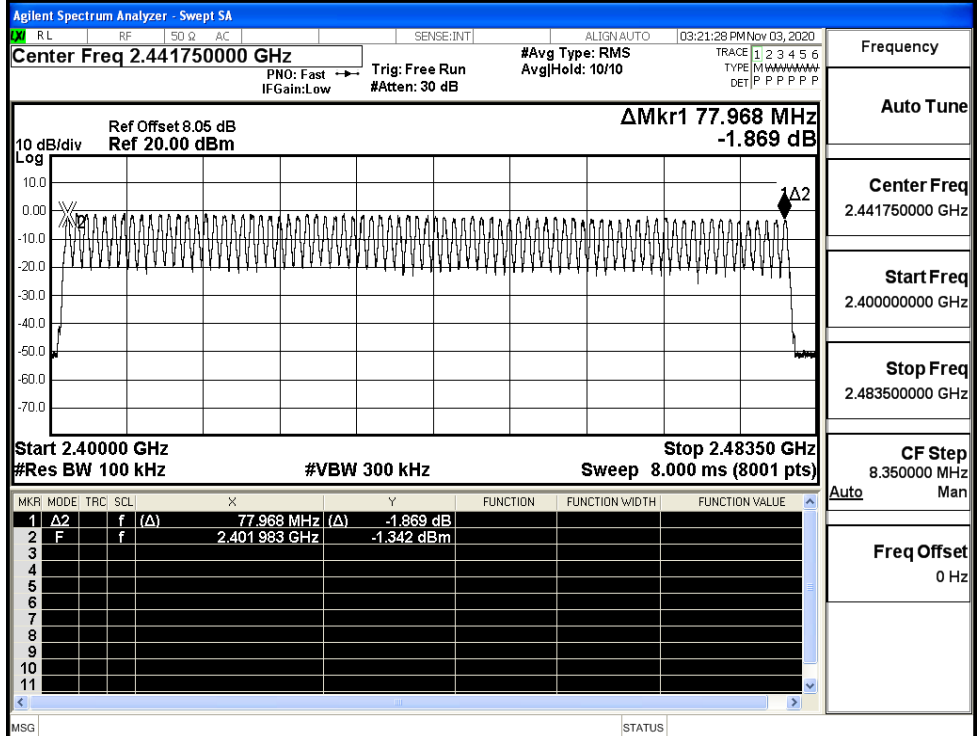
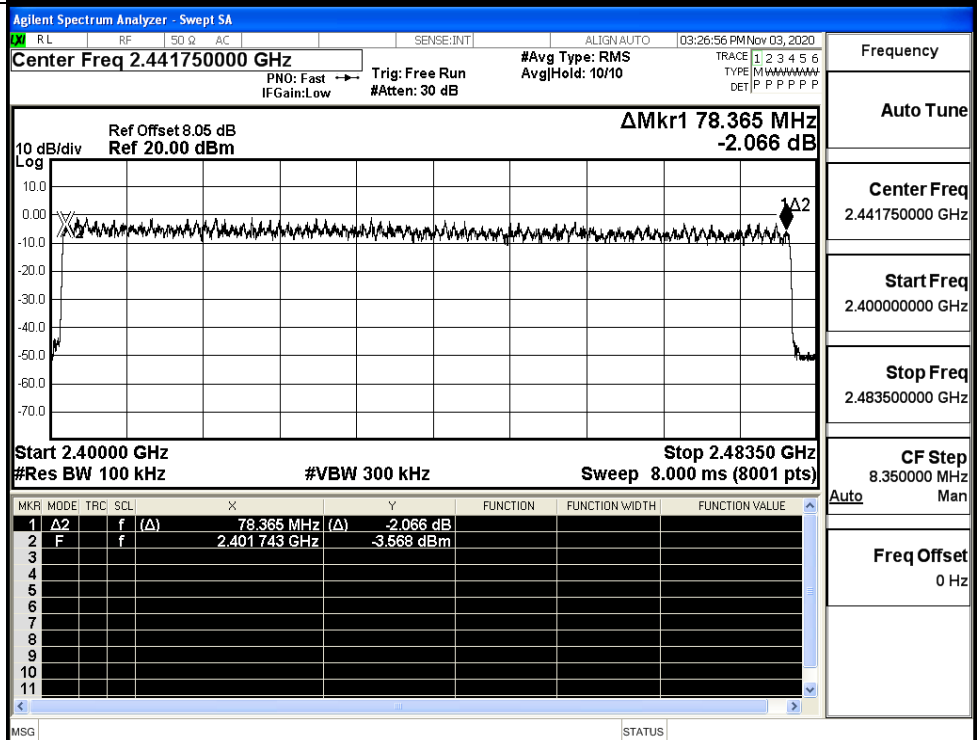


A.4 Hopping Channel Number

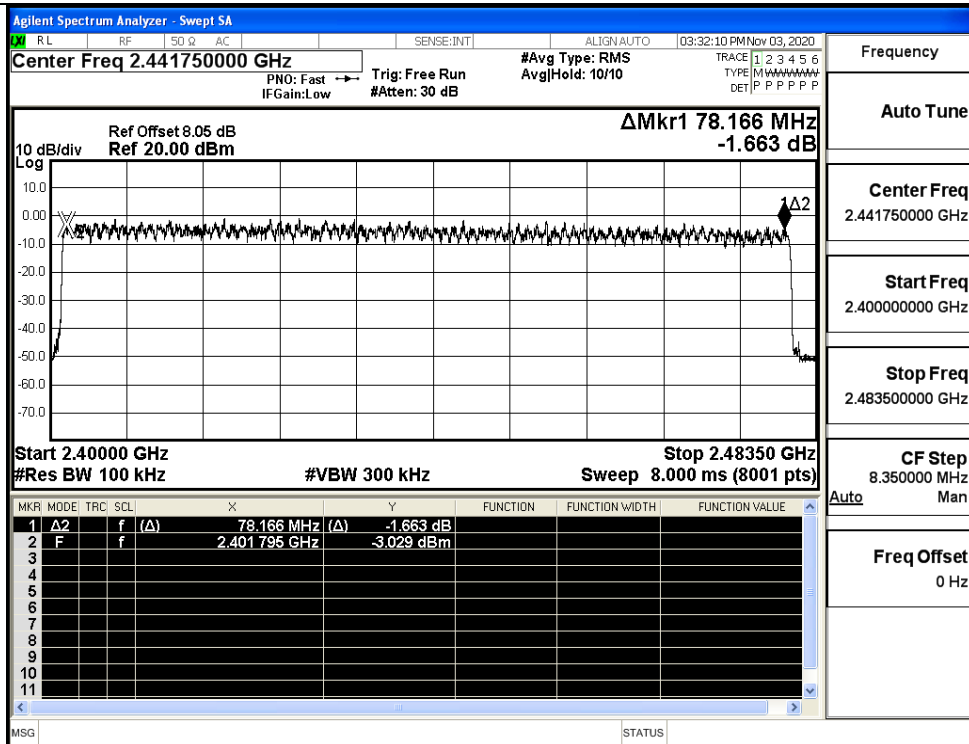
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
$\pi/4$ DQPSK	Hop	79	>=15	PASS
8DPSK	Hop	79	>=15	PASS

Test Graphs

GFSK/Hop

 $\pi/4$ DQPSK/Hop

8DPSK/Hop

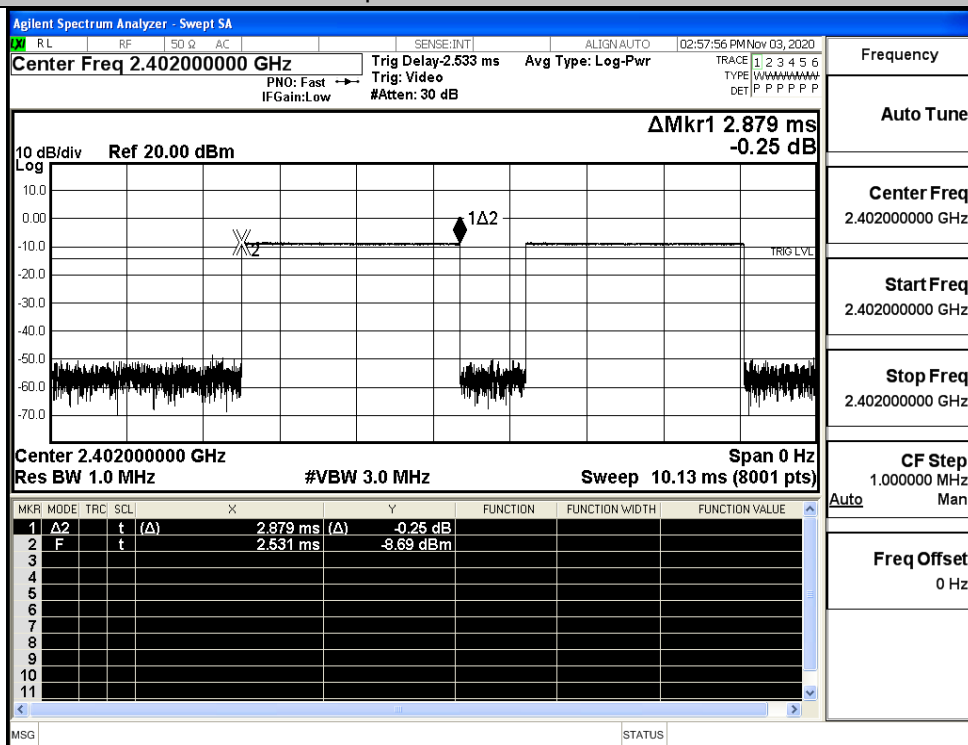


A.5 Dwell Time

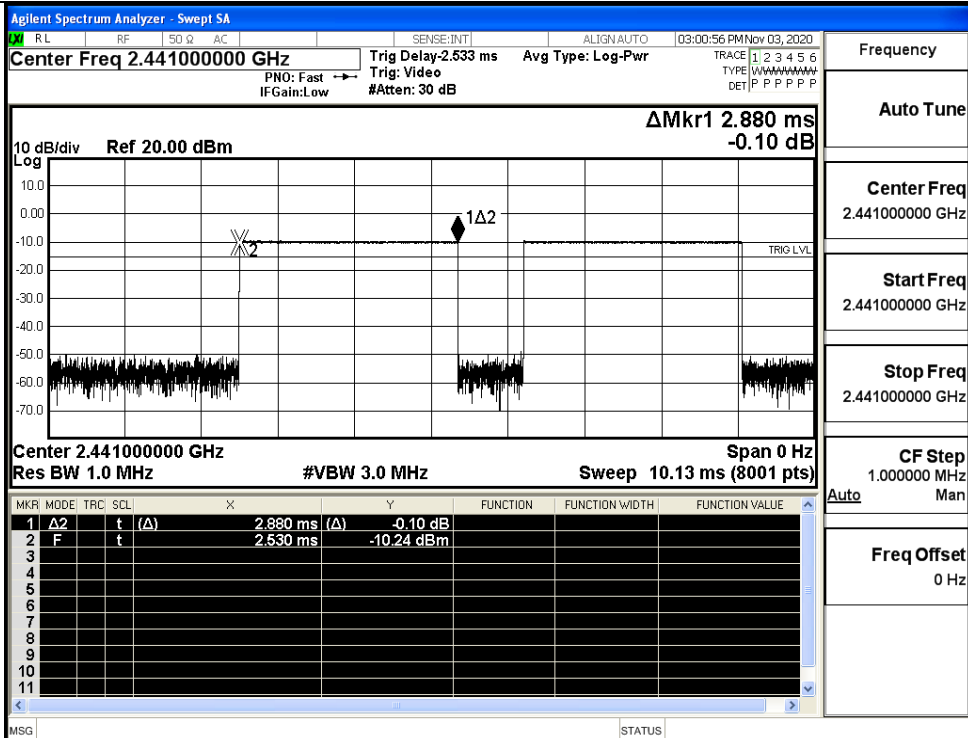
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.88	106.7	0.014	0.4	PASS
	2DH5	MCH	2.88	106.7	0.015	0.4	PASS
	2DH5	HCH	2.88	106.7	0.015	0.4	PASS
8DPSK	3DH5	LCH	2.88	106.7	0.015	0.4	PASS
	3DH5	MCH	2.88	106.7	0.015	0.4	PASS
	3DH5	HCH	2.88	106.7	0.015	0.4	PASS

Test Graphs

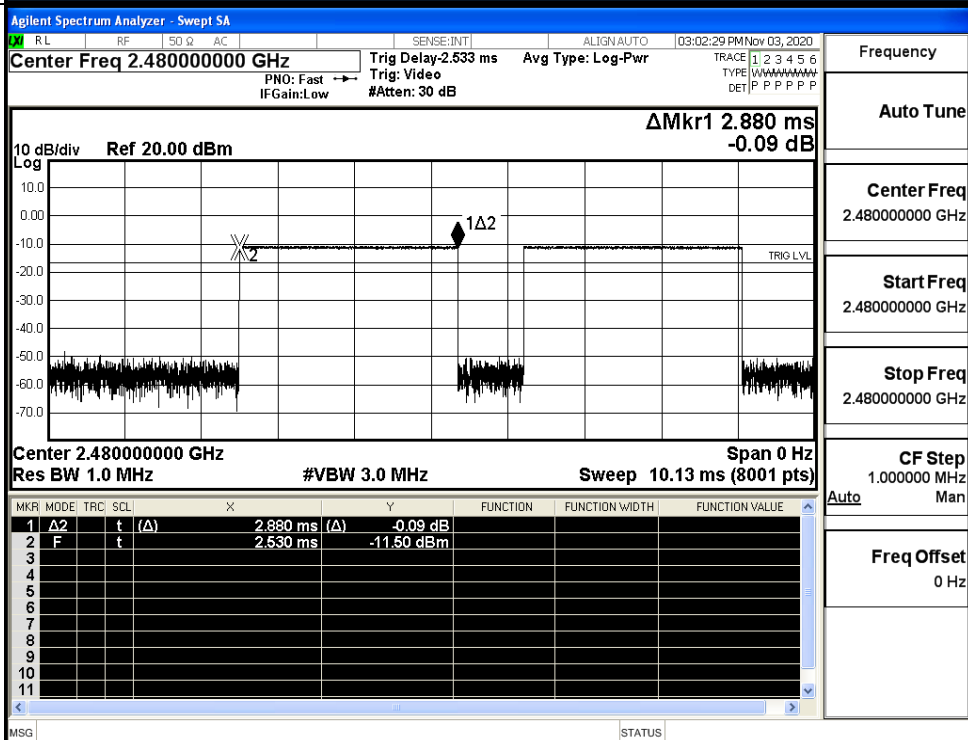
GFSK_DH5/LCH



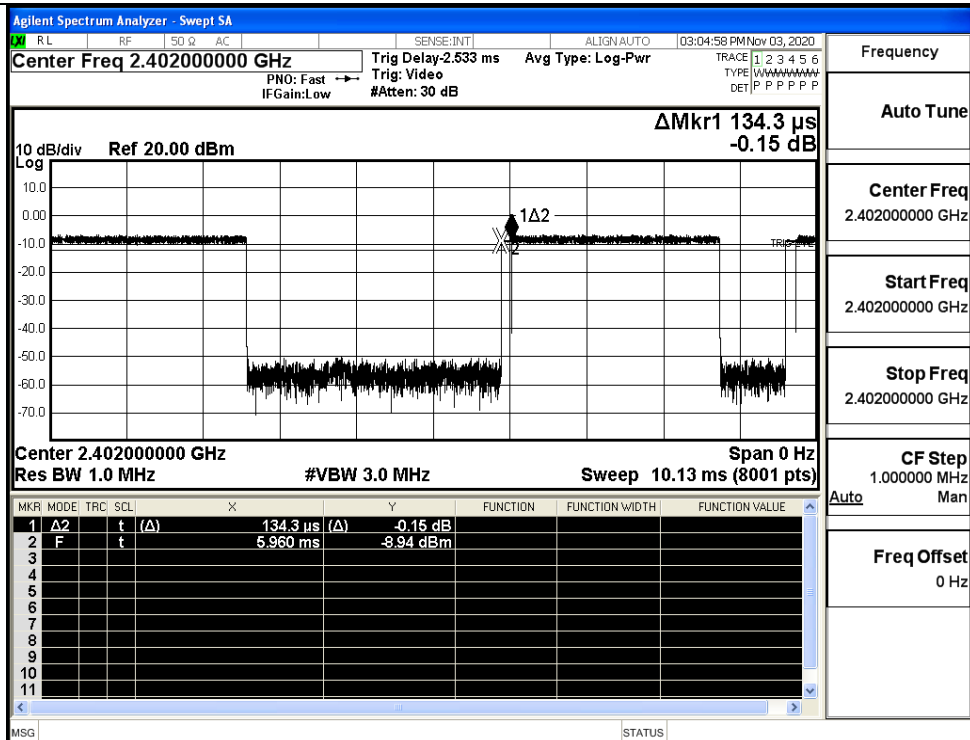
GFSK_DH5/MCH



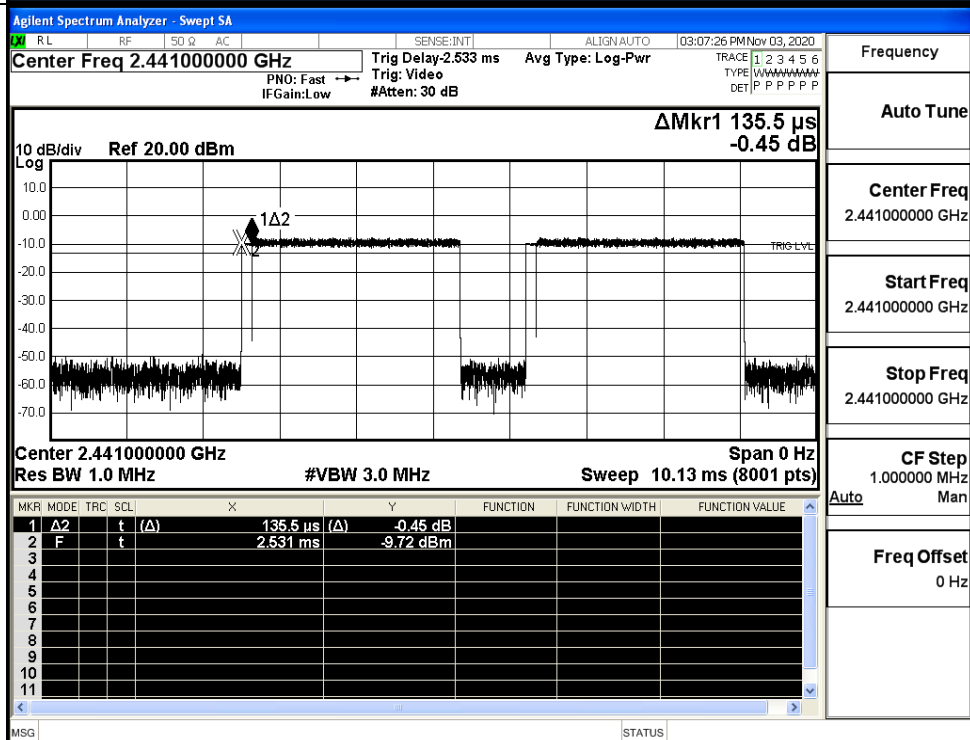
GFSK_DH5/HCH



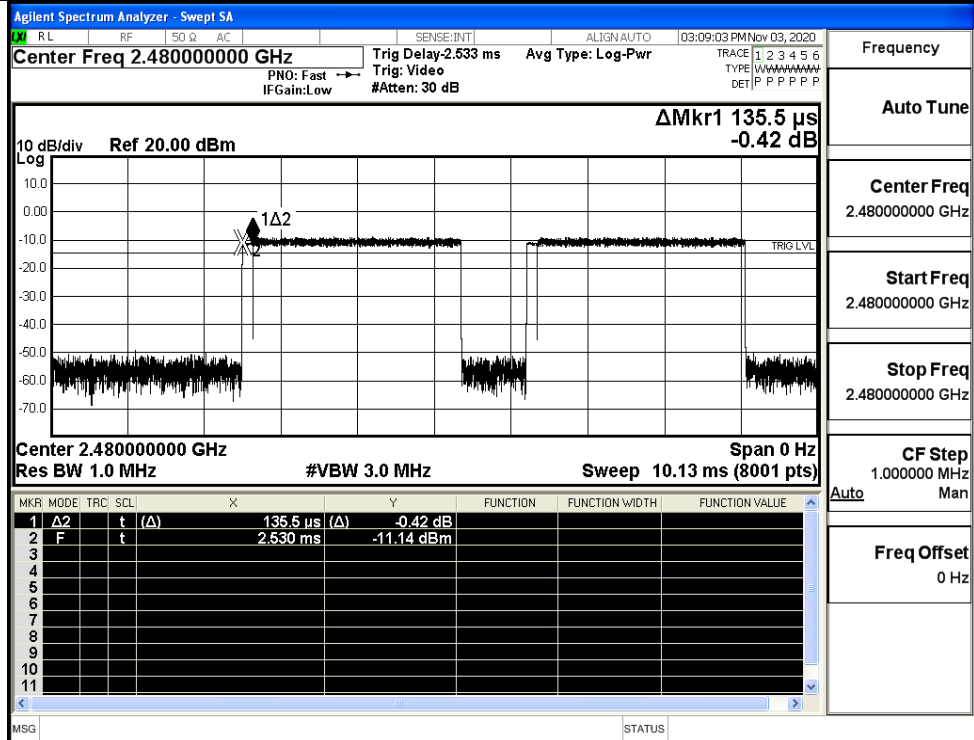
$\pi/4$ DQPSK
_2DH5/LCH



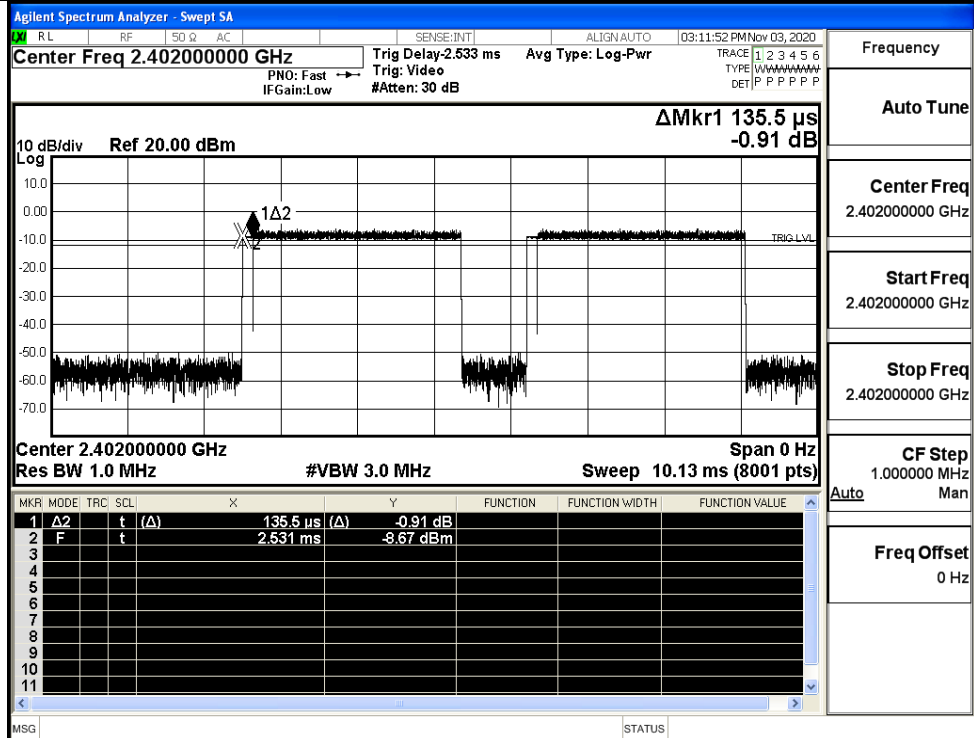
$\pi/4$ DQPSK
_2DH5/MCH



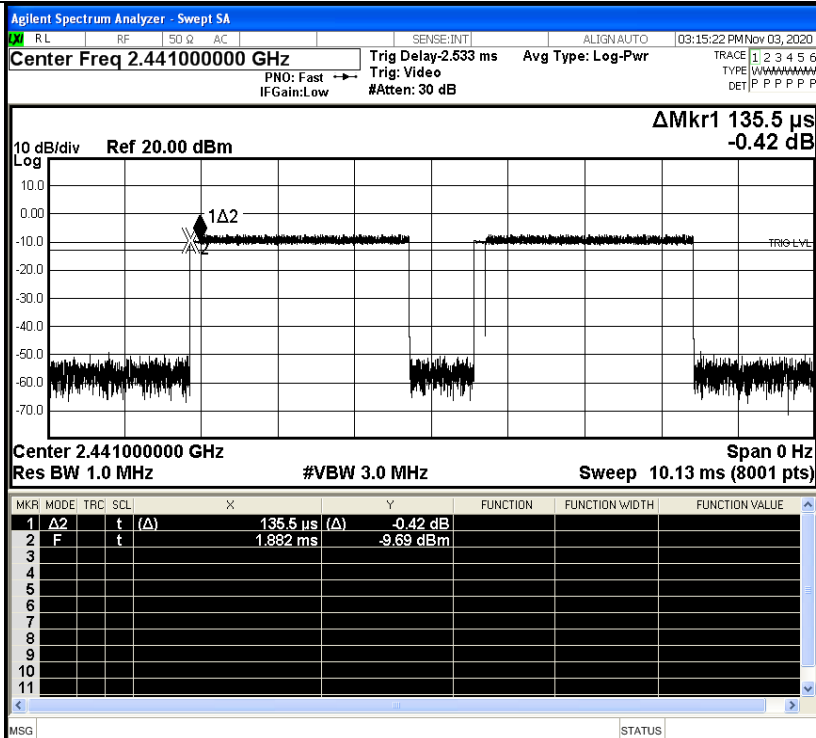
$\pi/4$ DQPSK
_2DH5/HCH



8DPSK _3DH5/LCH



8DPSK_3DH5/MCH

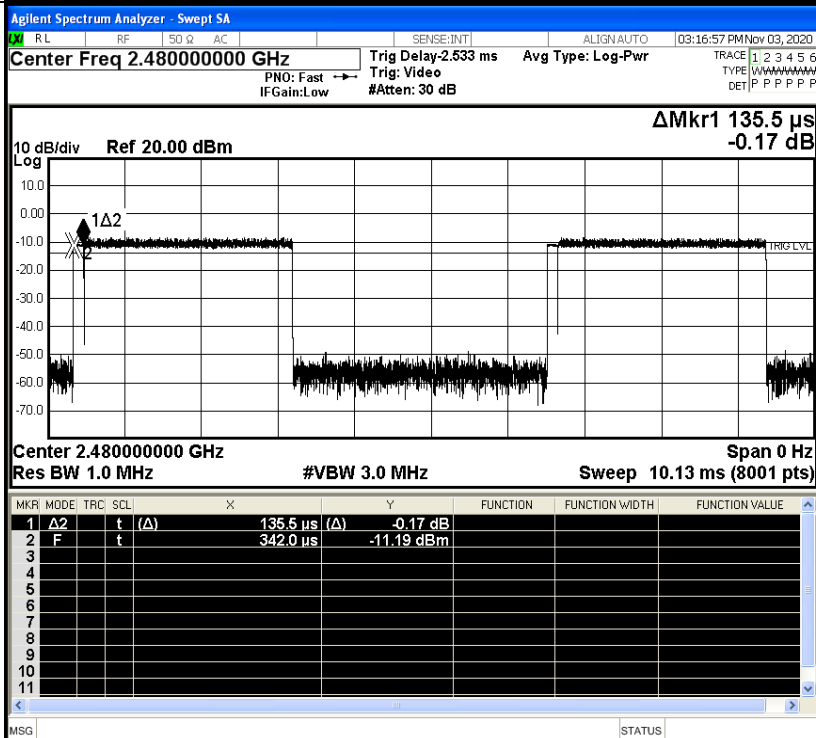


Frequency

Auto Tune

Center Freq
2.441000000 GHzStart Freq
2.441000000 GHzStop Freq
2.441000000 GHzCF Step
1.000000 MHz
Auto ManFreq Offset
0 Hz

8DPSK_3DH5/HCH



Frequency

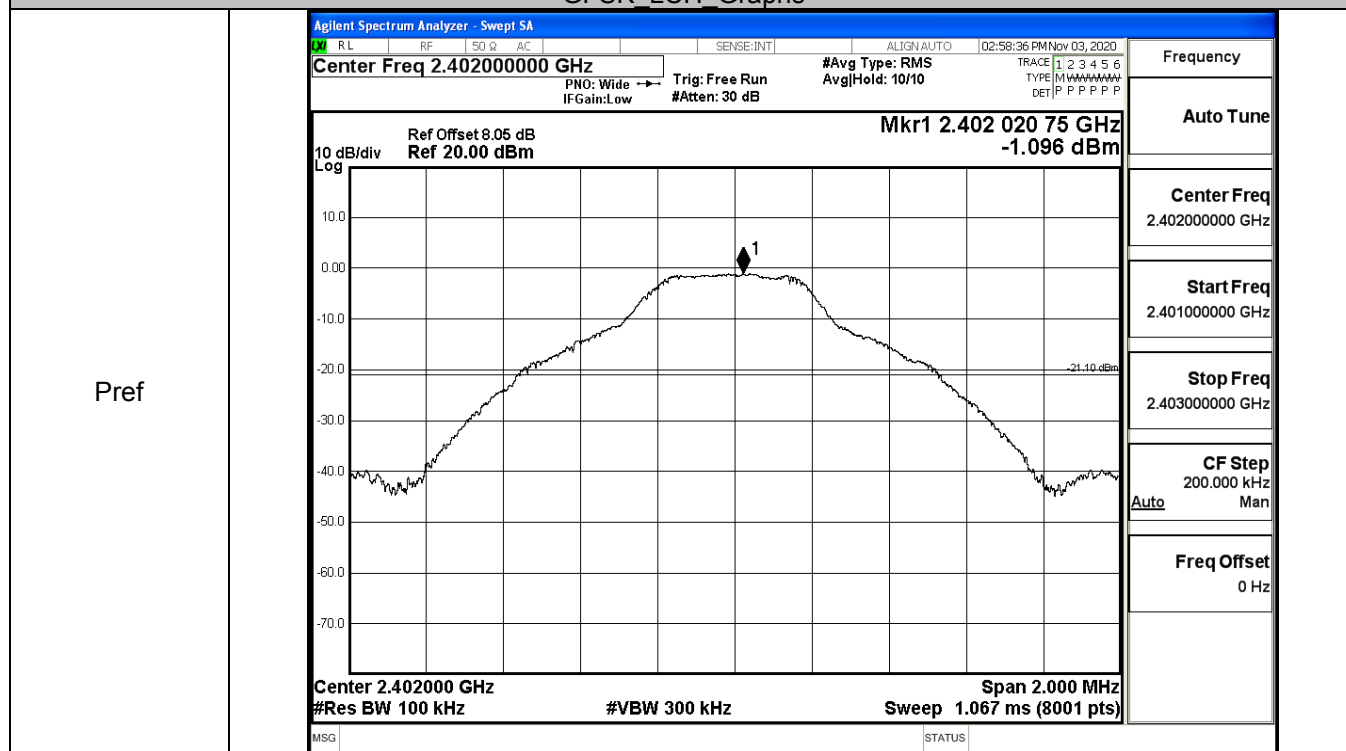
Auto Tune

Center Freq
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2.480000000 GHzStop Freq
2.480000000 GHzCF Step
1.000000 MHz
Auto ManFreq Offset
0 Hz

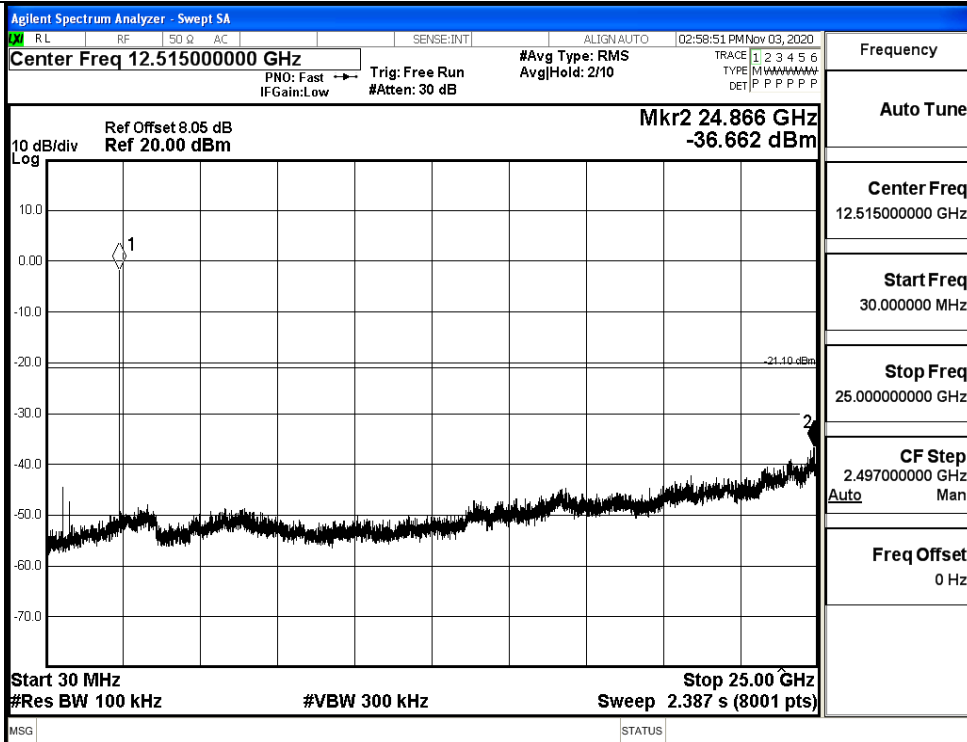
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-1.096	-36.662	-21.096	PASS
	MCH	-1.541	-37.878	-21.541	PASS
	HCH	-3.204	-36.451	-23.204	PASS
$\pi/4$ DQPSK	LCH	-0.957	-38.268	-20.957	PASS
	MCH	-1.723	-37.635	-21.723	PASS
	HCH	-3.384	-37.879	-23.384	PASS
8DPSK	LCH	-0.861	-37.392	-20.861	PASS
	MCH	-2.045	-37.501	-22.045	PASS
	HCH	-3.173	-38.412	-23.173	PASS

GFSK LCH Graphs

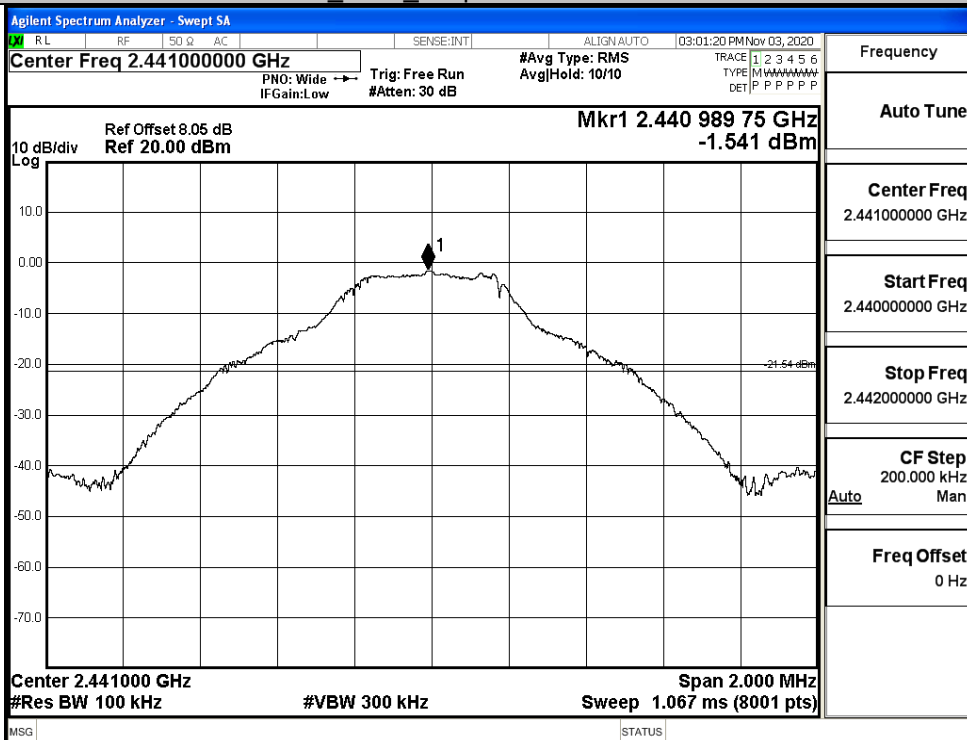


Puw

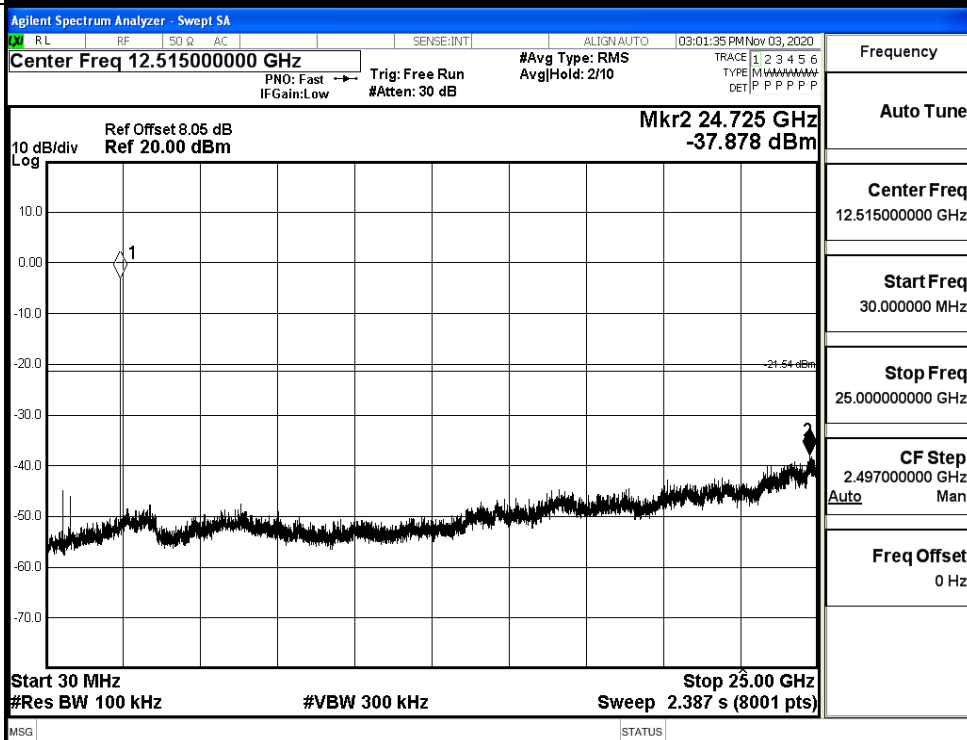


GFSK_MCH_Graphs

Pref

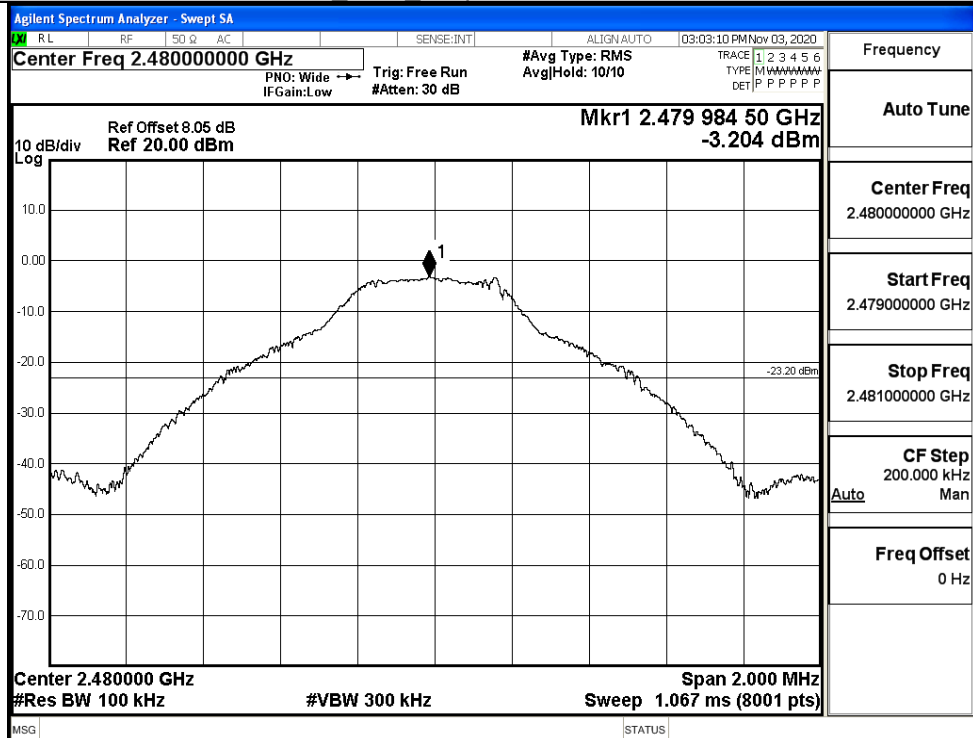


Puw

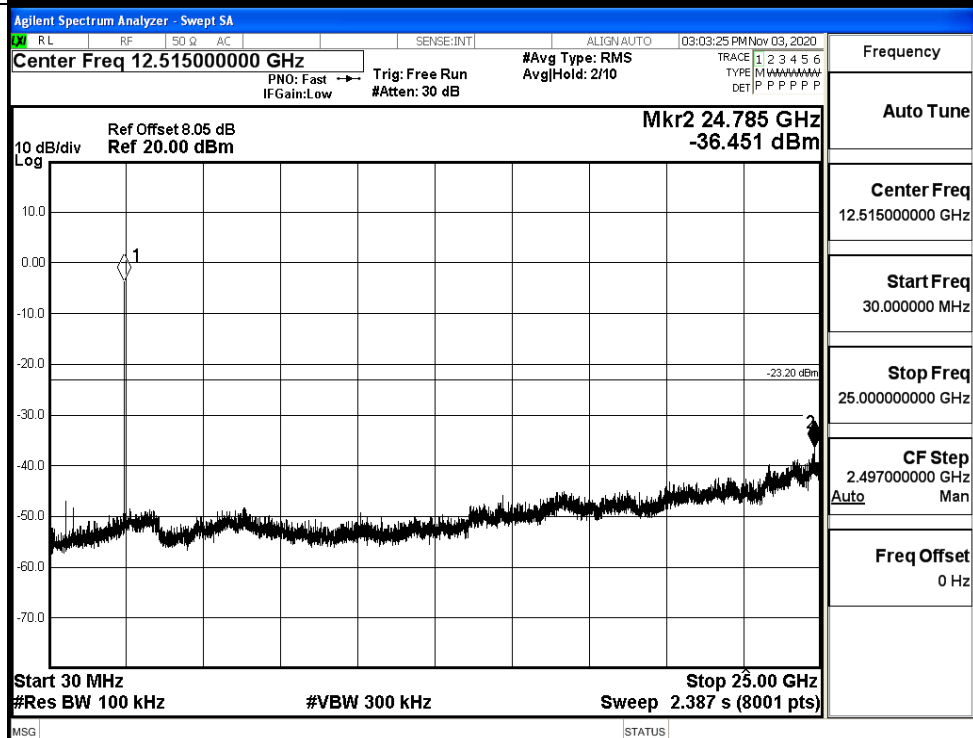


GFSK_HCH_Graphs

Pref

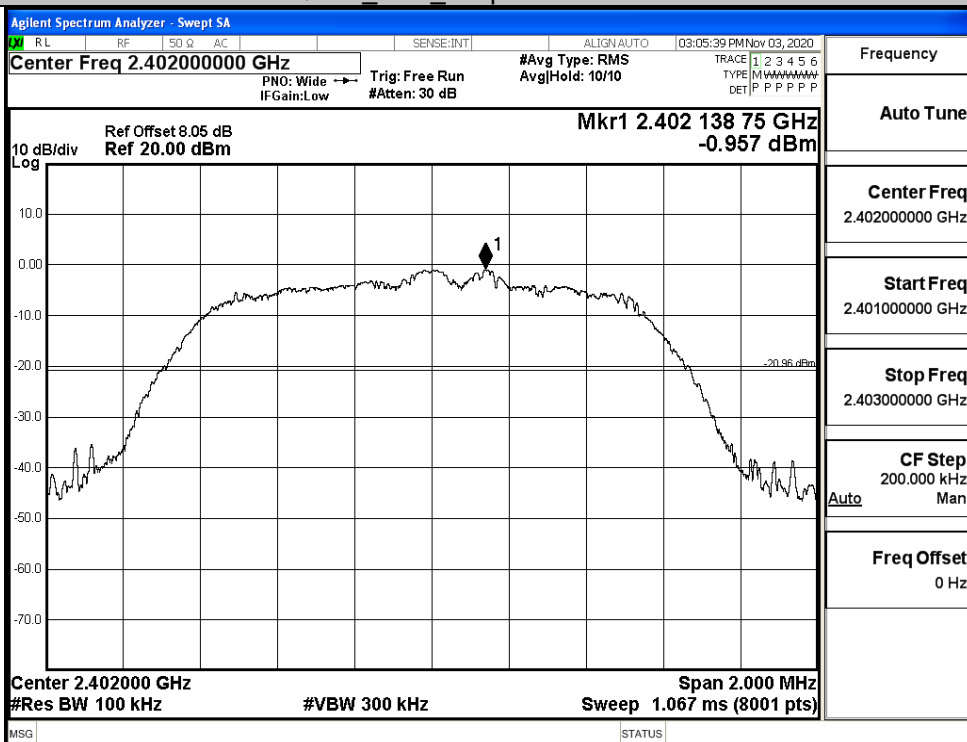


Puw



$\pi/4$ DQPSK_LCH_Graphs

Pref

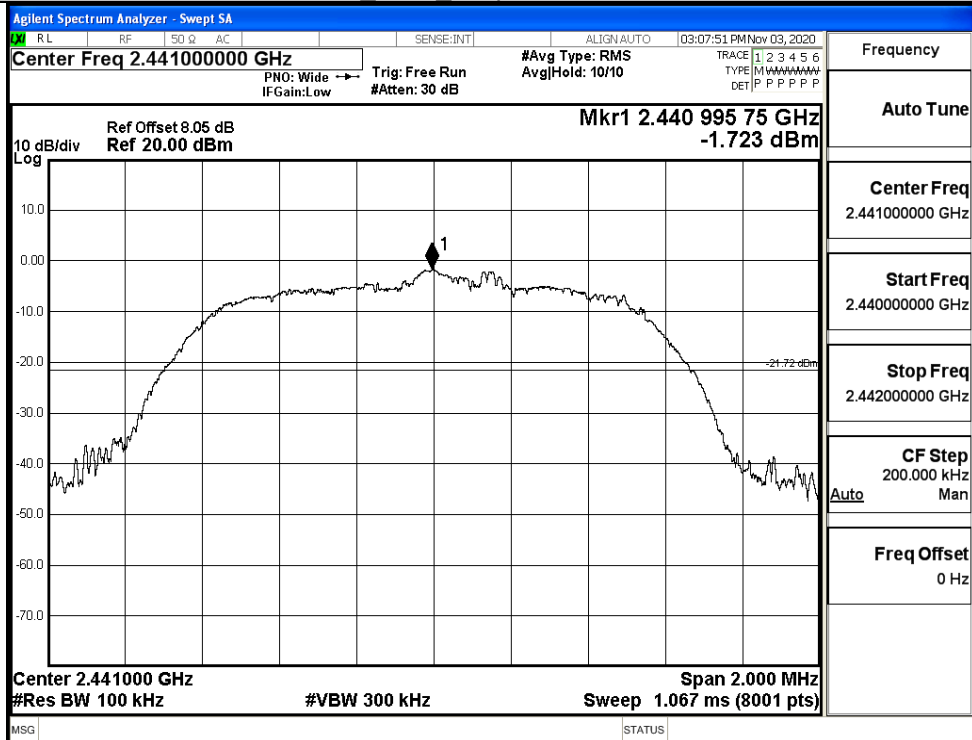


Puw

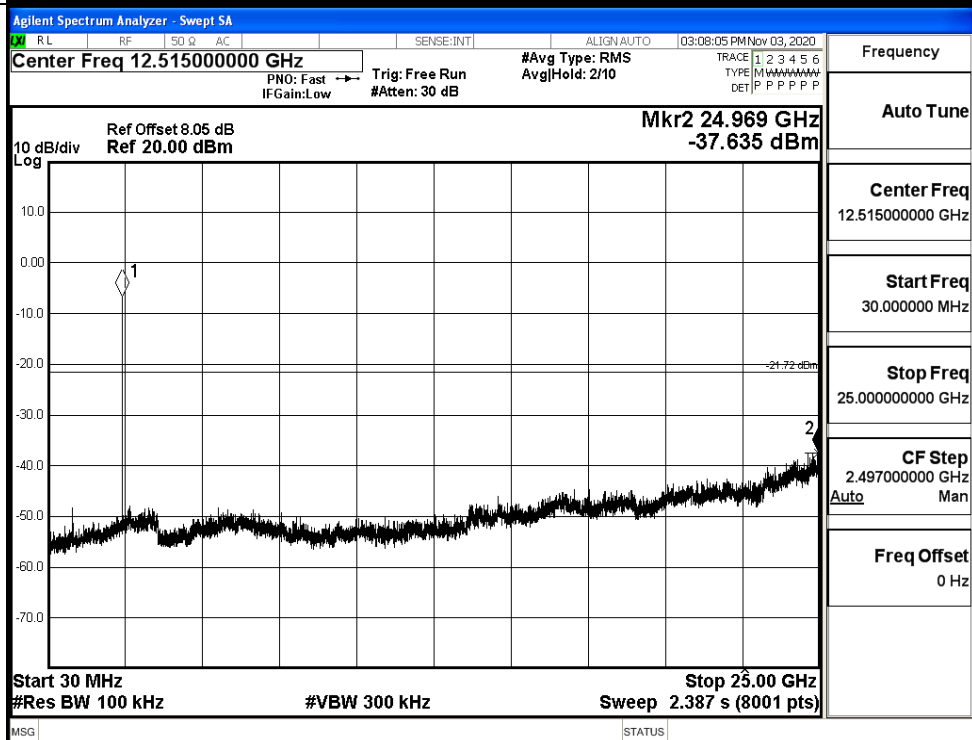


$\pi/4$ DQPSK_MCH_Graphs

Pref

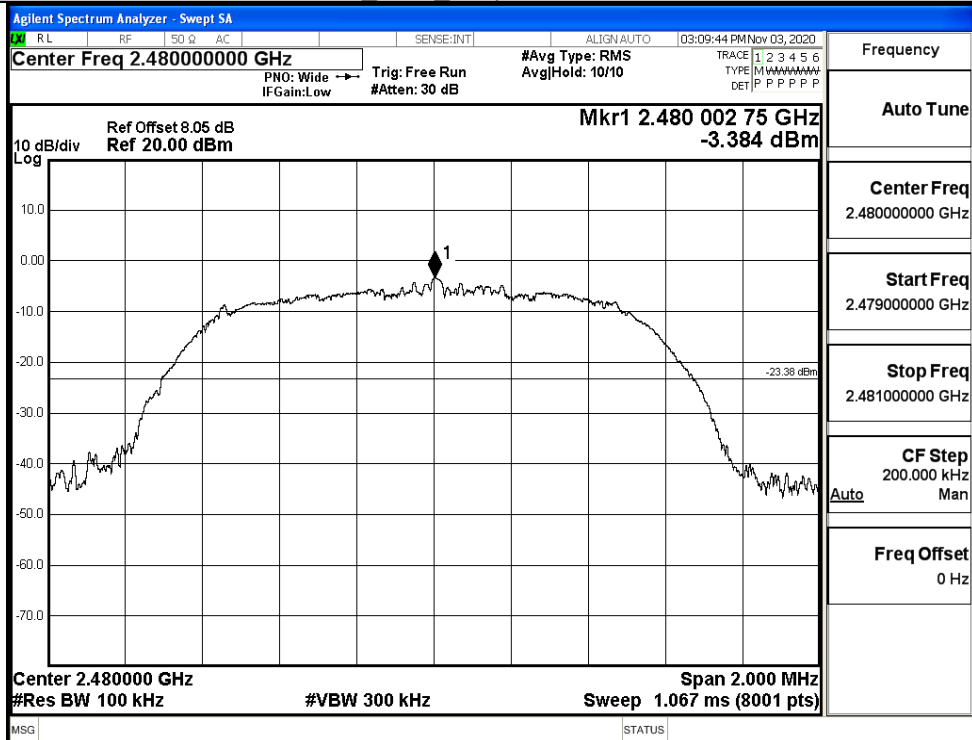


Puw

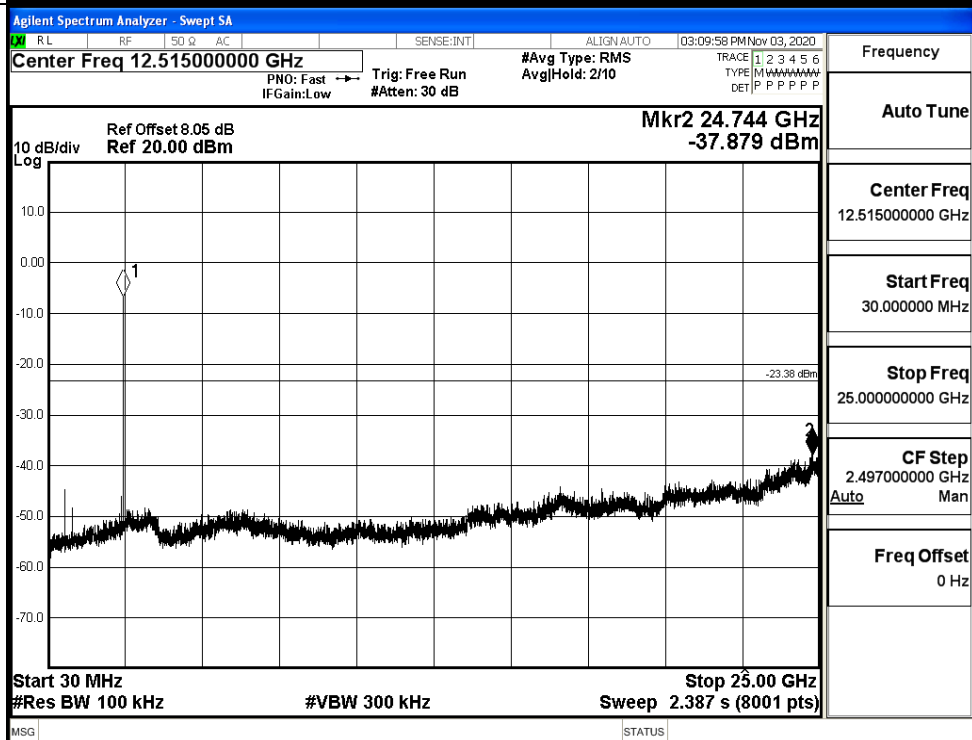


$\pi/4$ DQPSK_HCH_Graphs

Pref

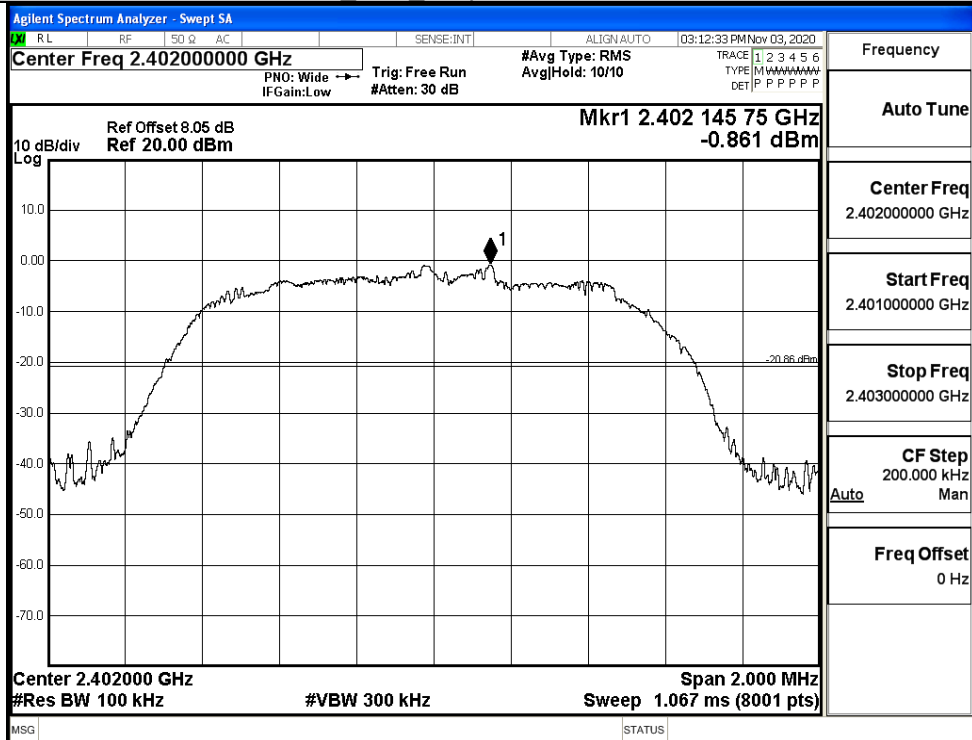


Puw

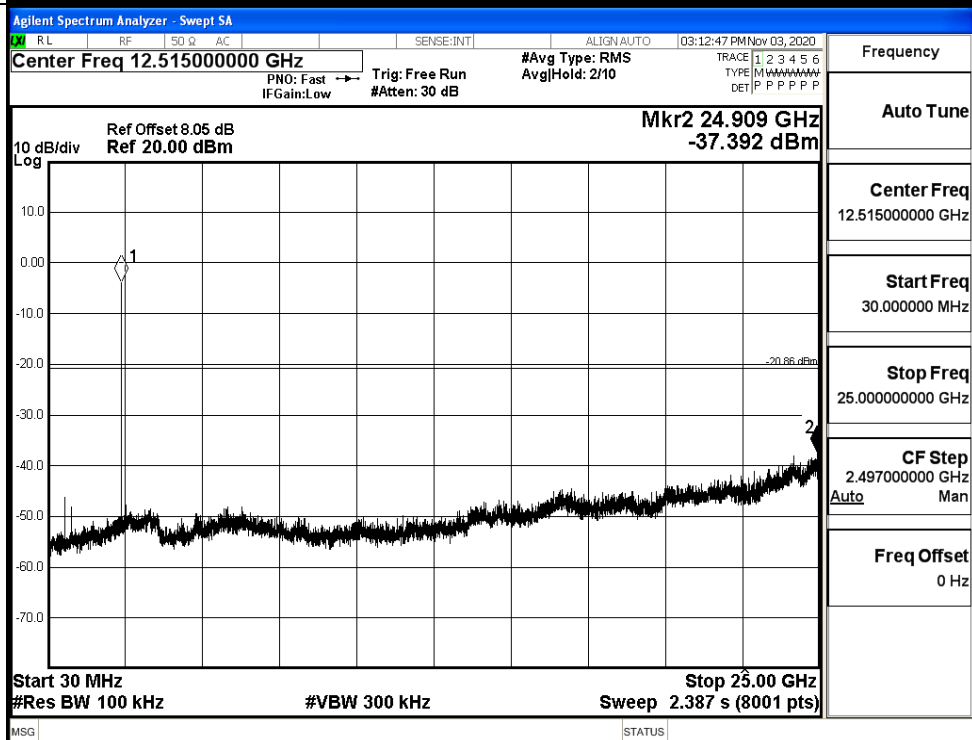


8DPSK_LCH_Graphs

Pref

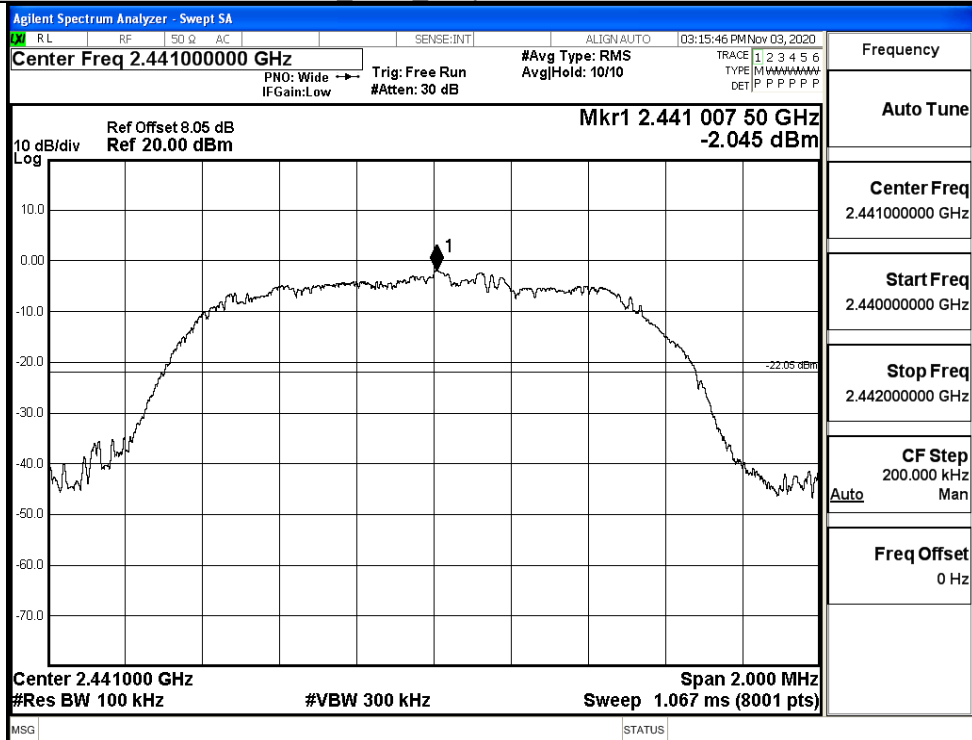


Puw

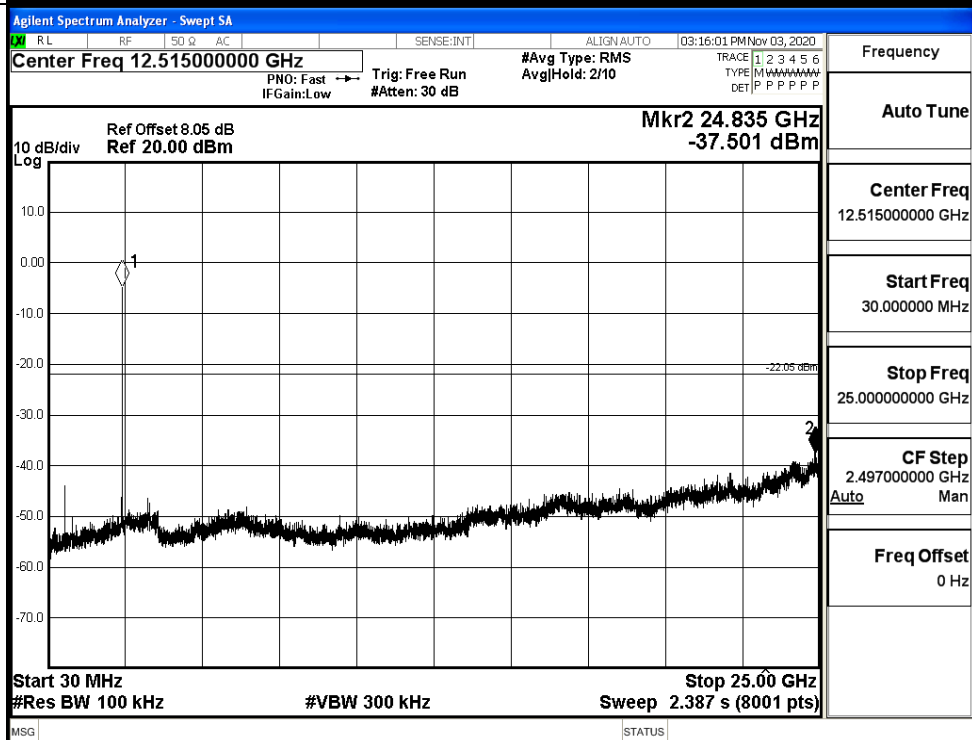


8DPSK_MCH_Graphs

Pref

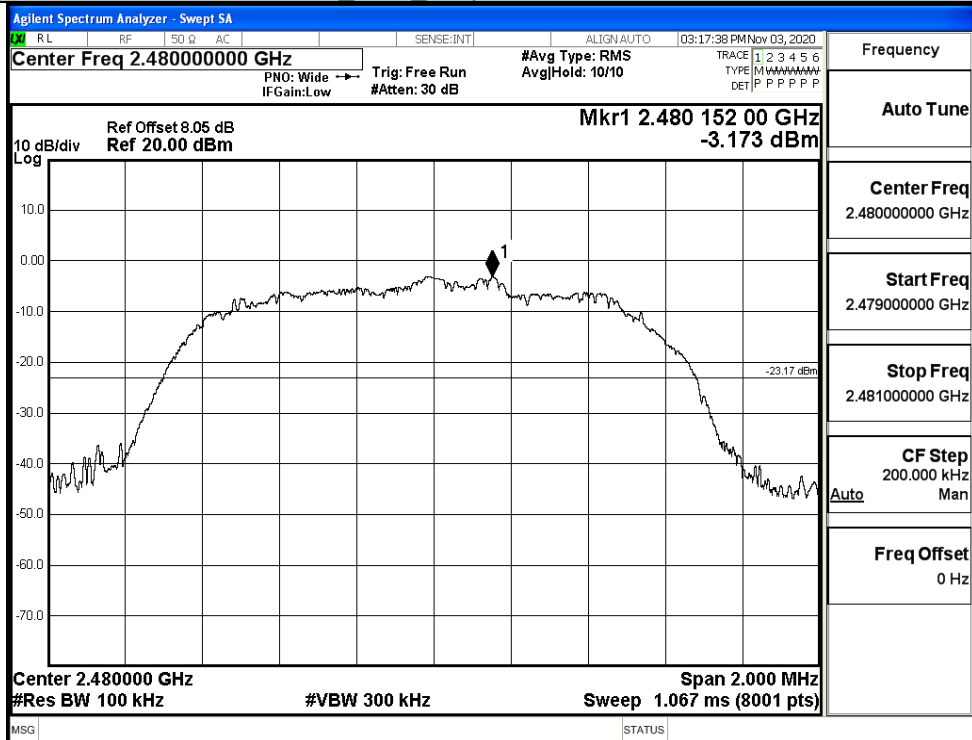


Puw

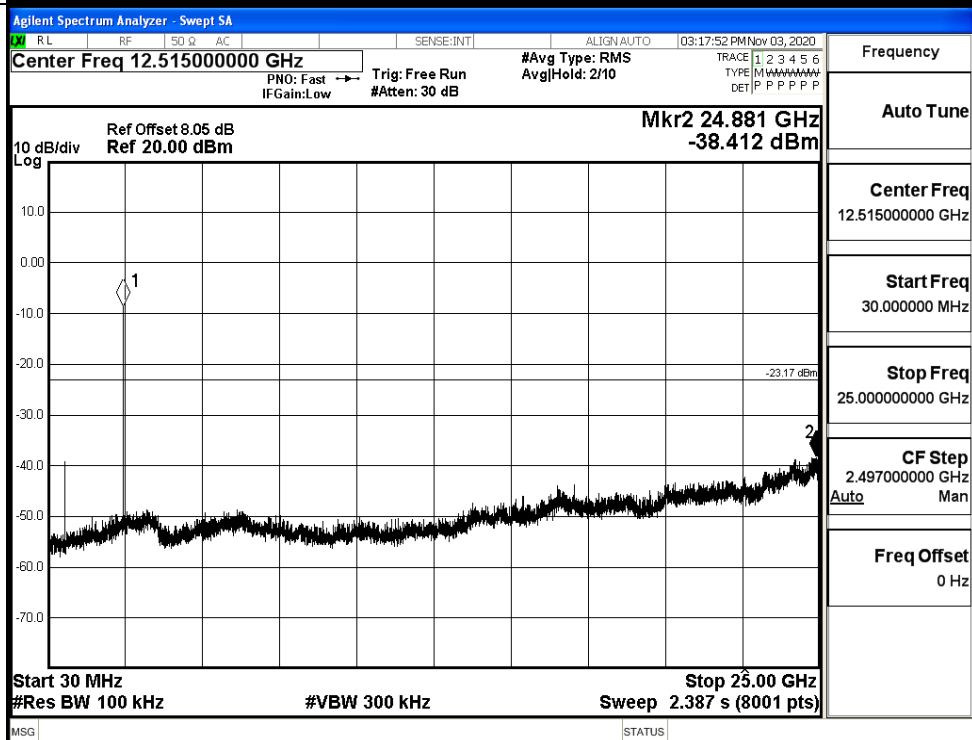


8DPSK_HCH_Graphs

Pref



Puw

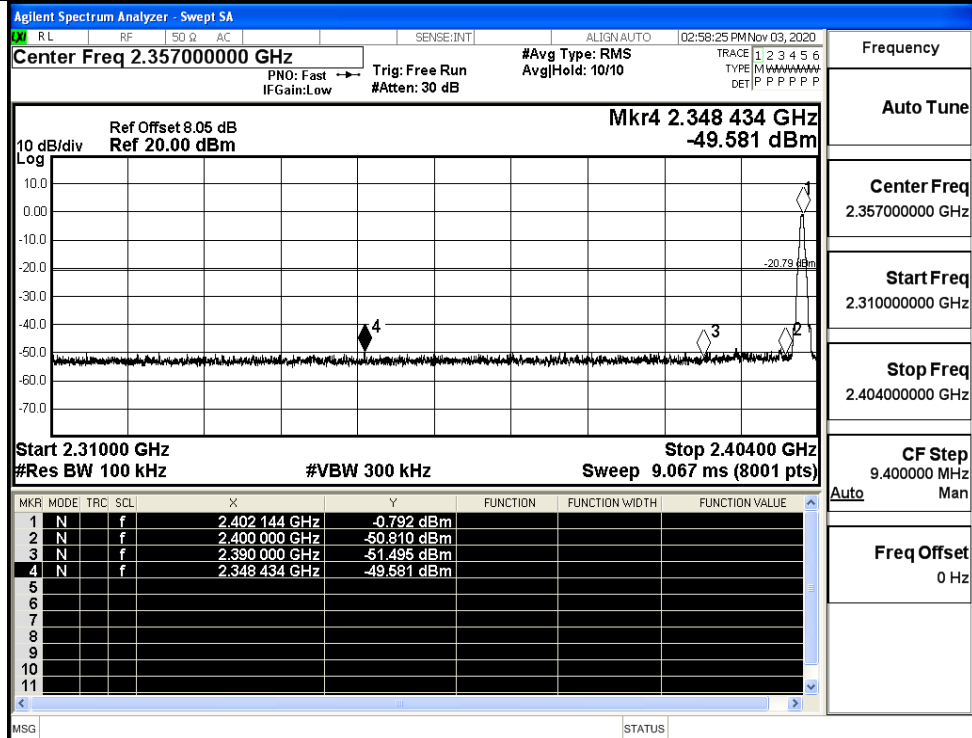


A.7 Band-edge for RF Conducted Emissions

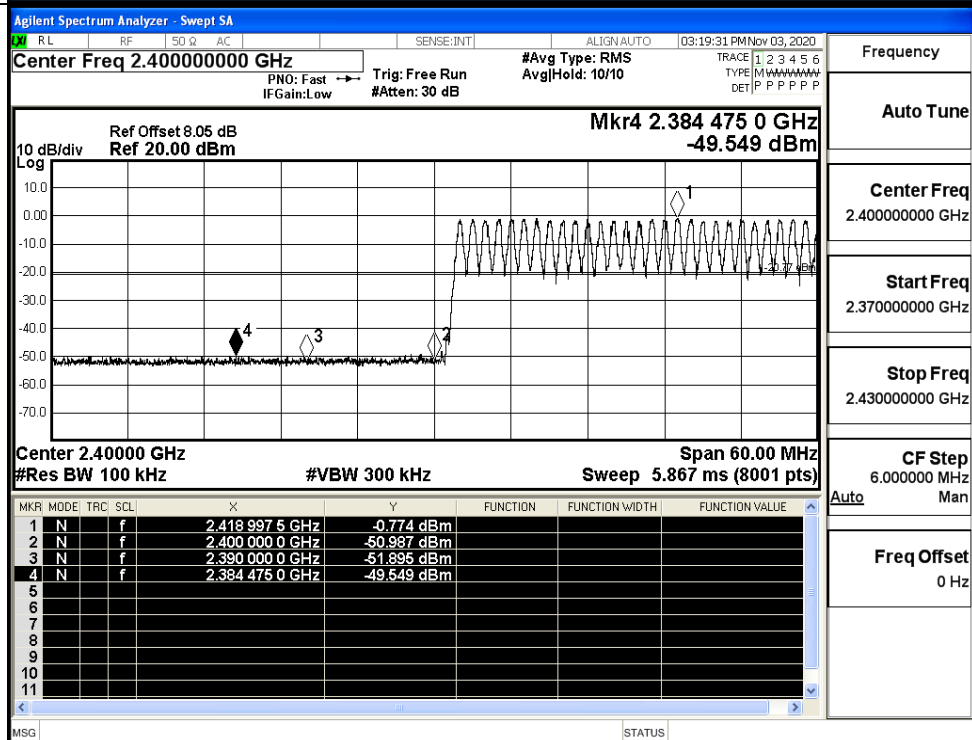
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-0.792	Off	-49.581	-20.79	PASS
			-0.774	On	-49.549	-20.77	PASS
	HCH	2480	-2.992	Off	-48.500	-22.99	PASS
			-2.330	On	-48.796	-22.33	PASS
$\pi/4$ DQPSK	LCH	2402	-2.585	Off	-49.347	-22.59	PASS
			-0.887	On	-49.105	-20.89	PASS
	HCH	2480	-2.881	Off	-49.103	-22.88	PASS
			-2.090	On	-48.269	-22.09	PASS
8DPSK	LCH	2402	-0.775	Off	-48.894	-20.78	PASS
			-0.722	On	-48.883	-20.72	PASS
	HCH	2480	-3.032	Off	-48.672	-23.03	PASS
			-1.926	On	-48.496	-21.93	PASS

Test Graphs

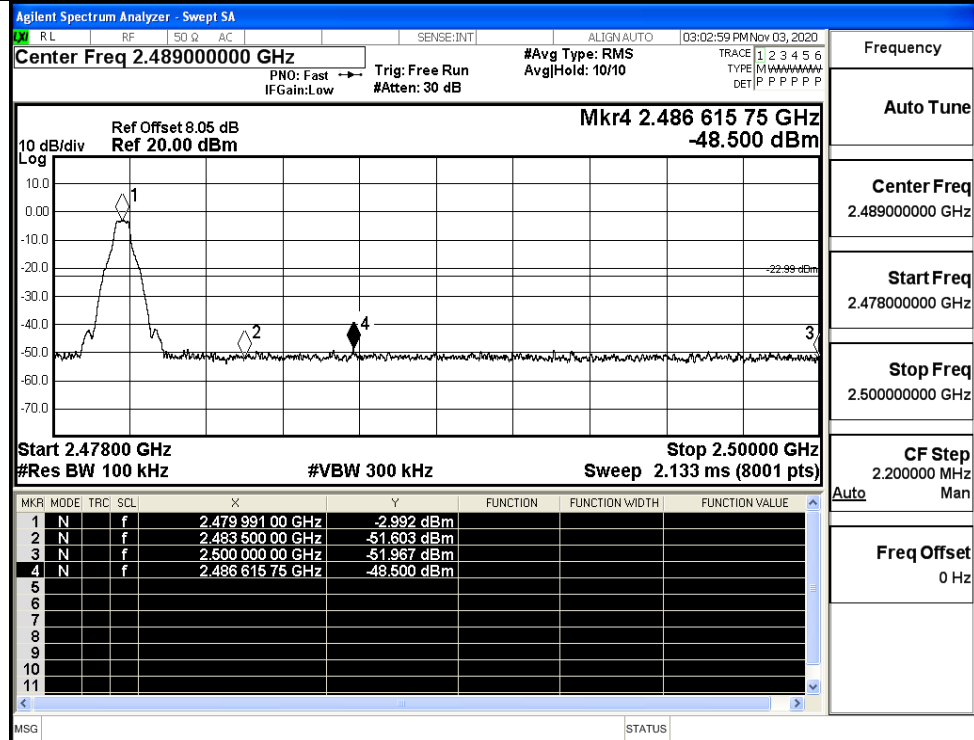
GFSK/LCH/No Hop



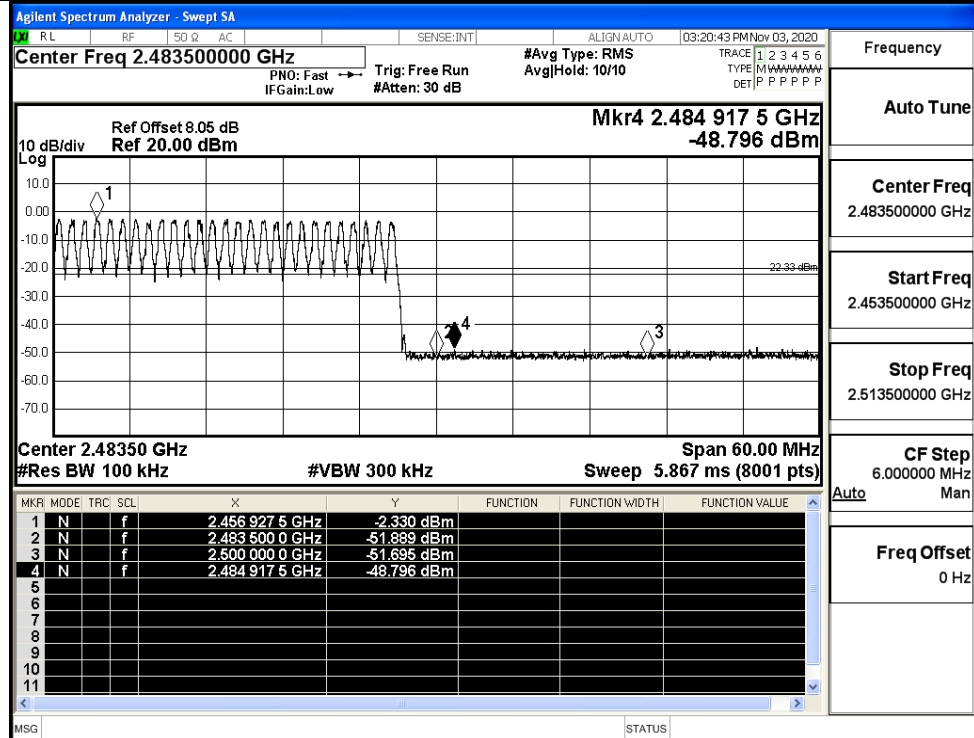
GFSK/LCH/Hop



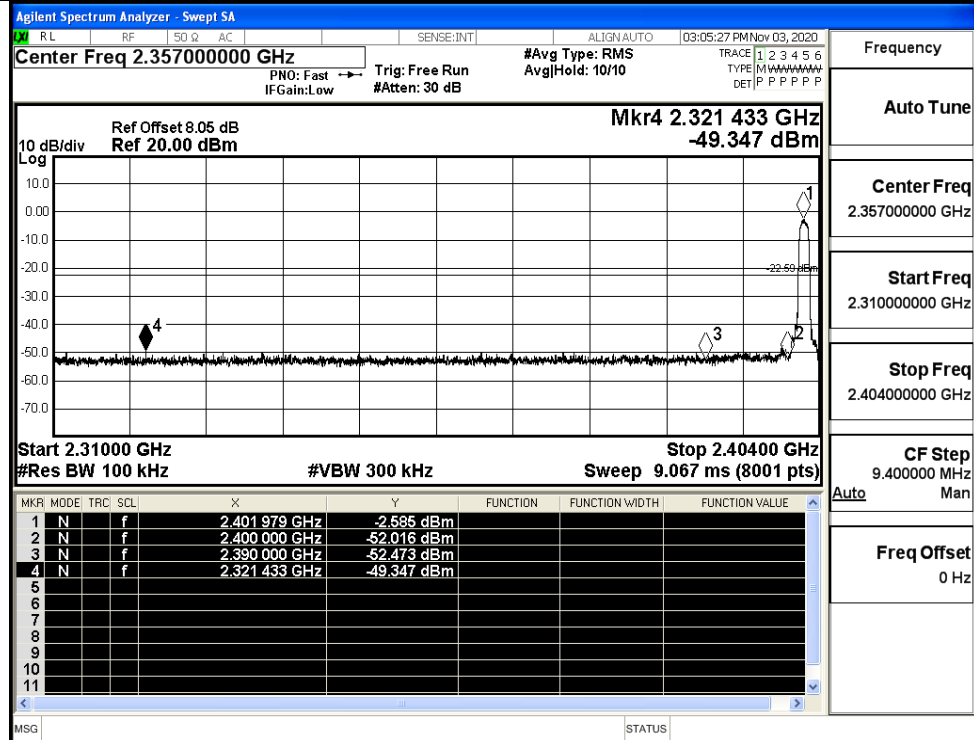
GFSK/HCH/No Hop



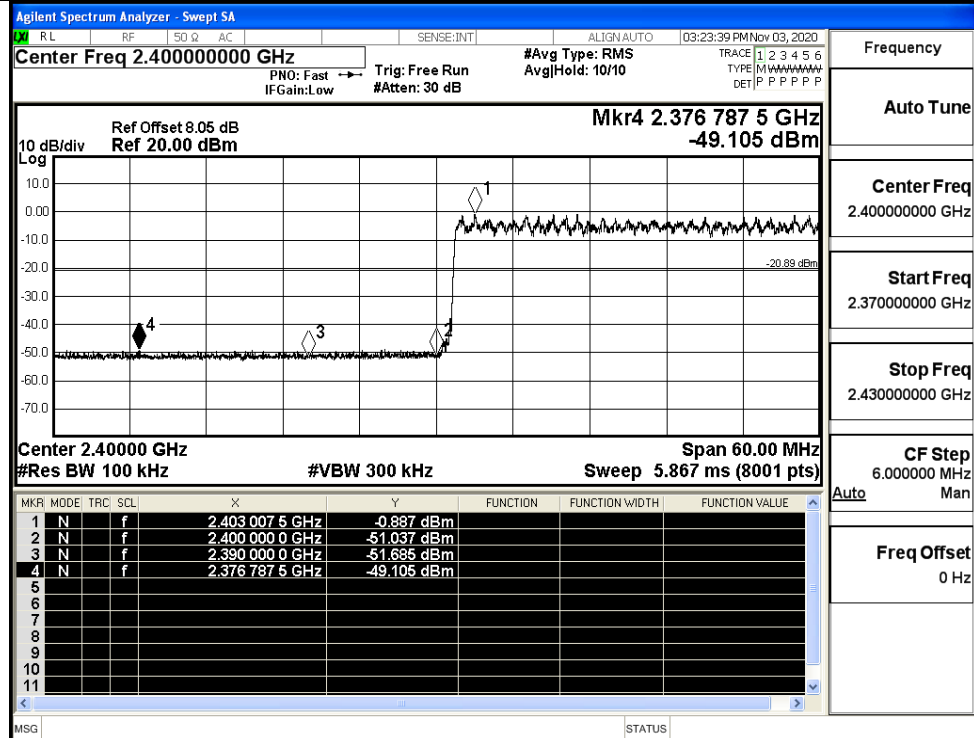
GFSK/HCH/Hop



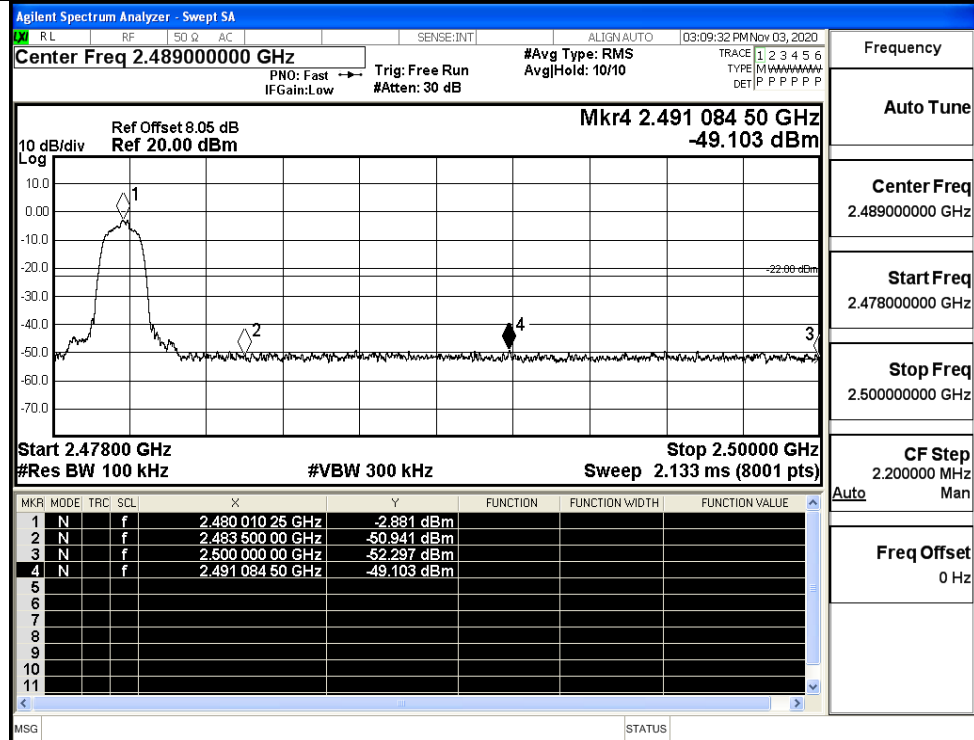
$\pi/4$ DQPSK/LCH/No
Hop



$\pi/4$ DQPSK/LCH/Hop



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

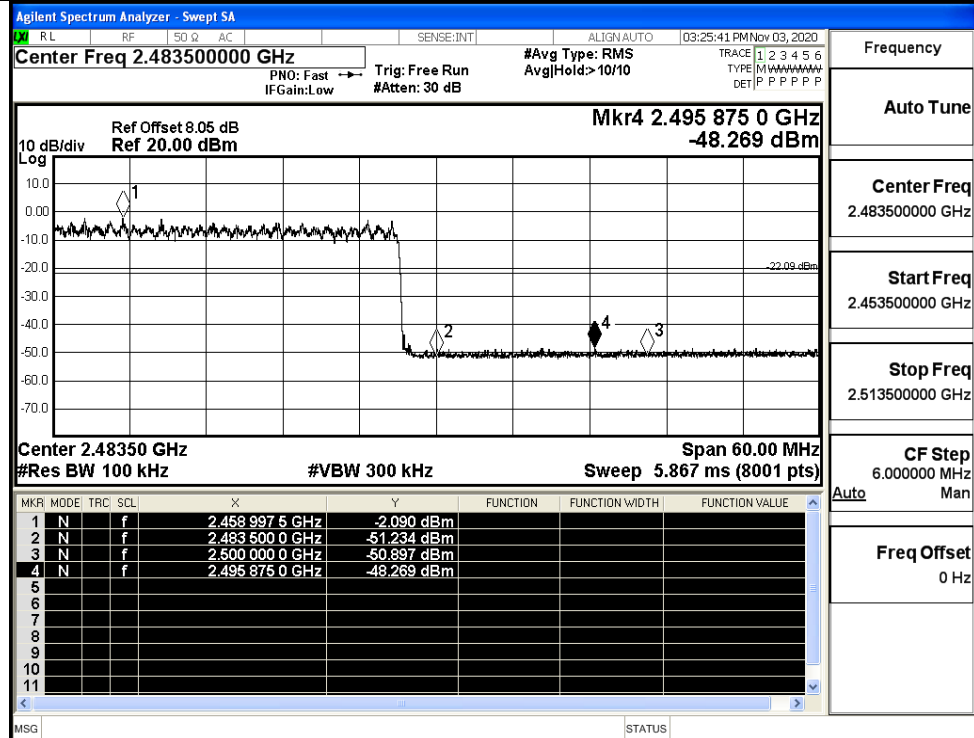


Frequency

Auto Tune

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

$\pi/4$ DQPSK/HCH/Hop

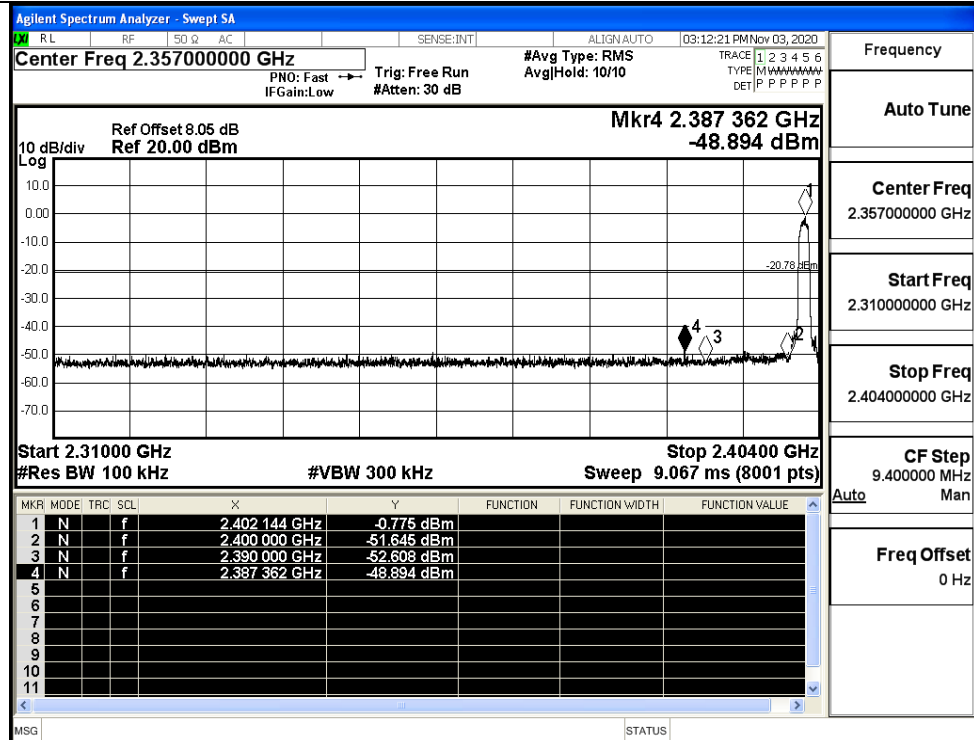


Frequency

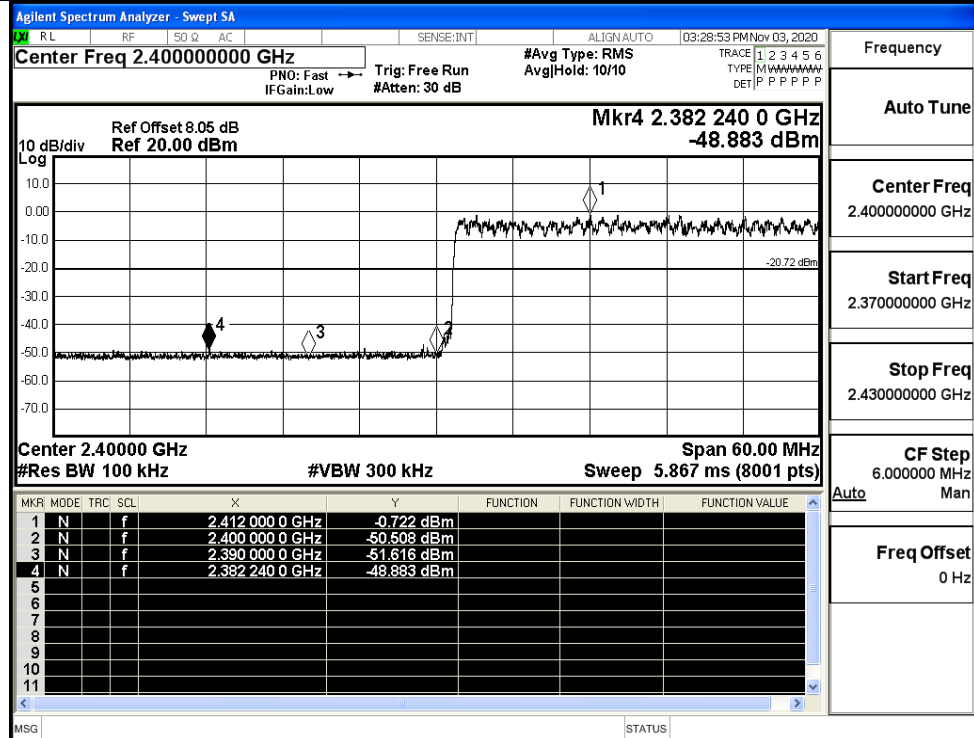
Auto Tune

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

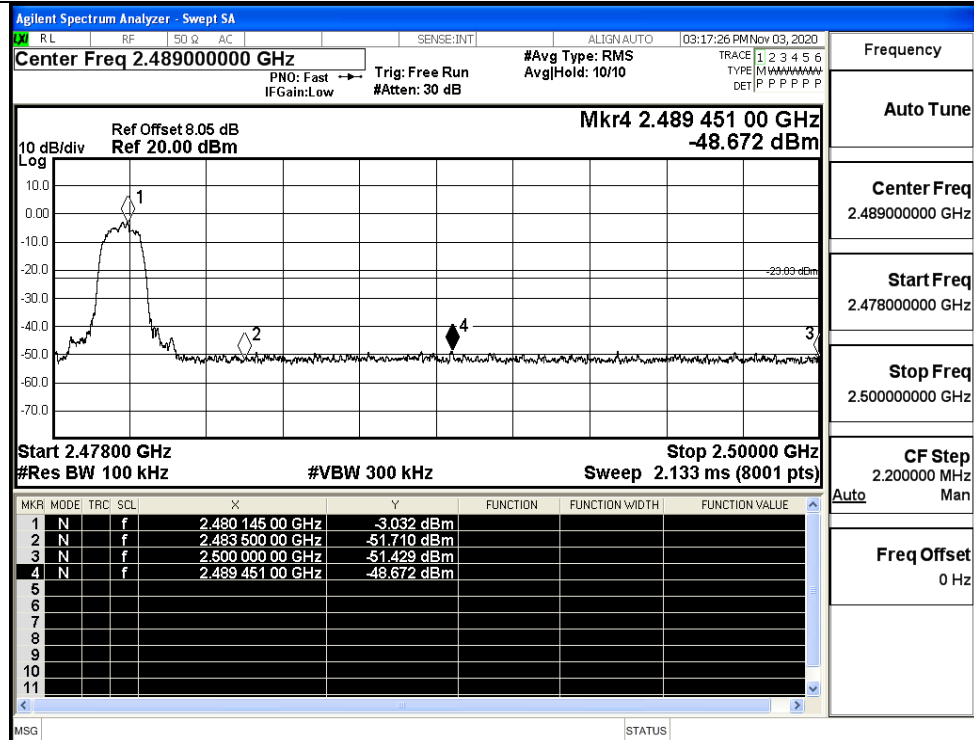
8DPSK/LCH/No Hop



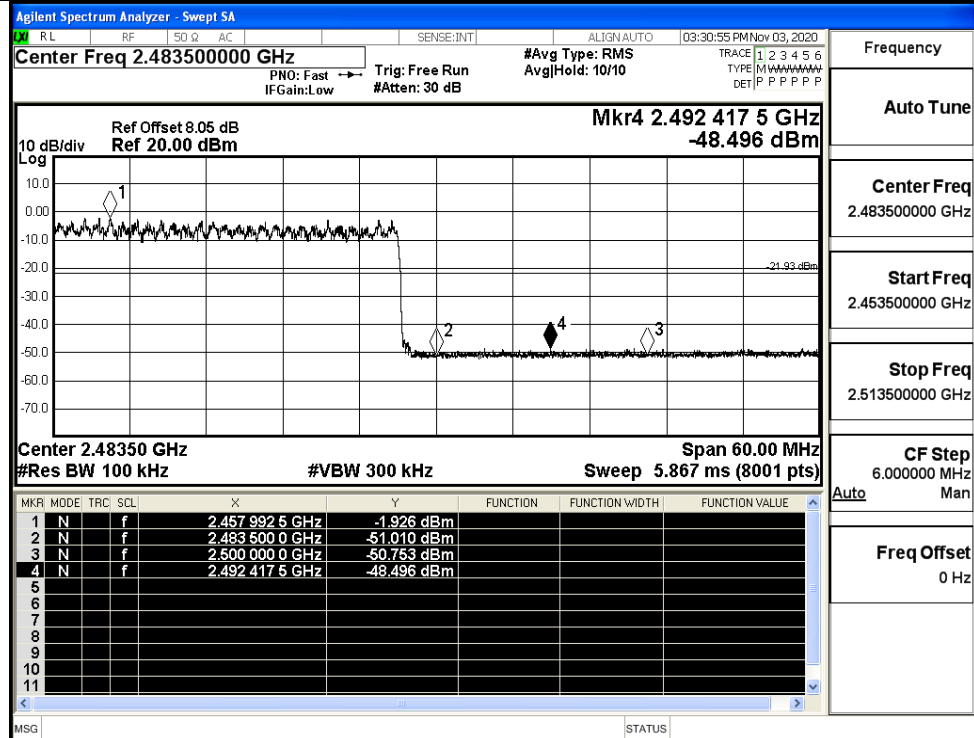
8DPSK/LCH/Hop



8DPSK/HCH/No Hop



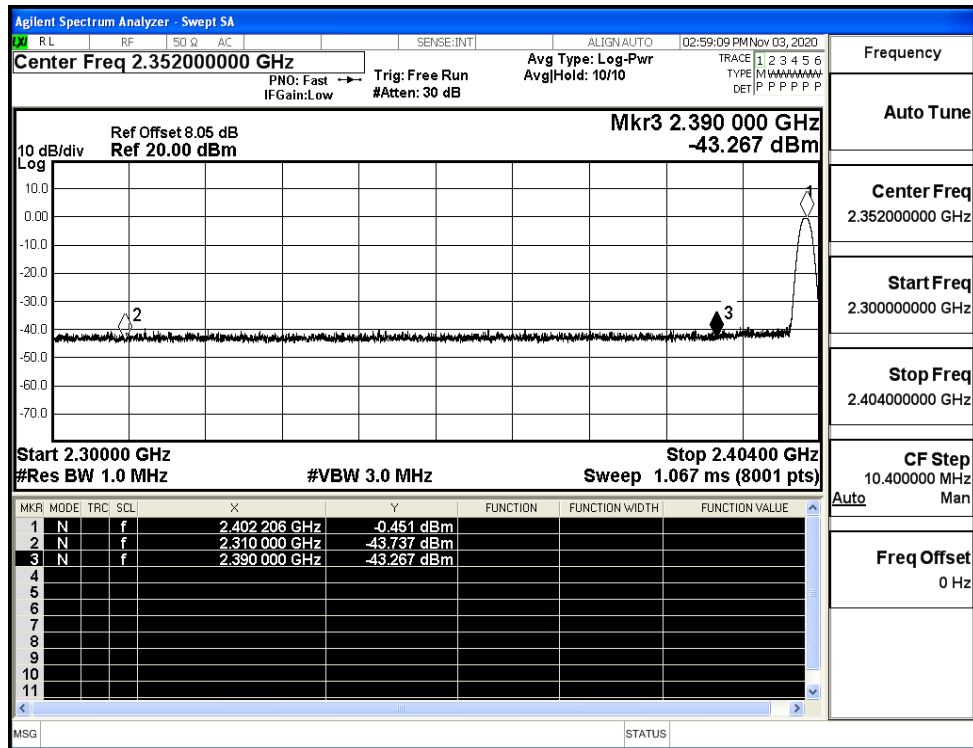
8DPSK/HCH/Hop



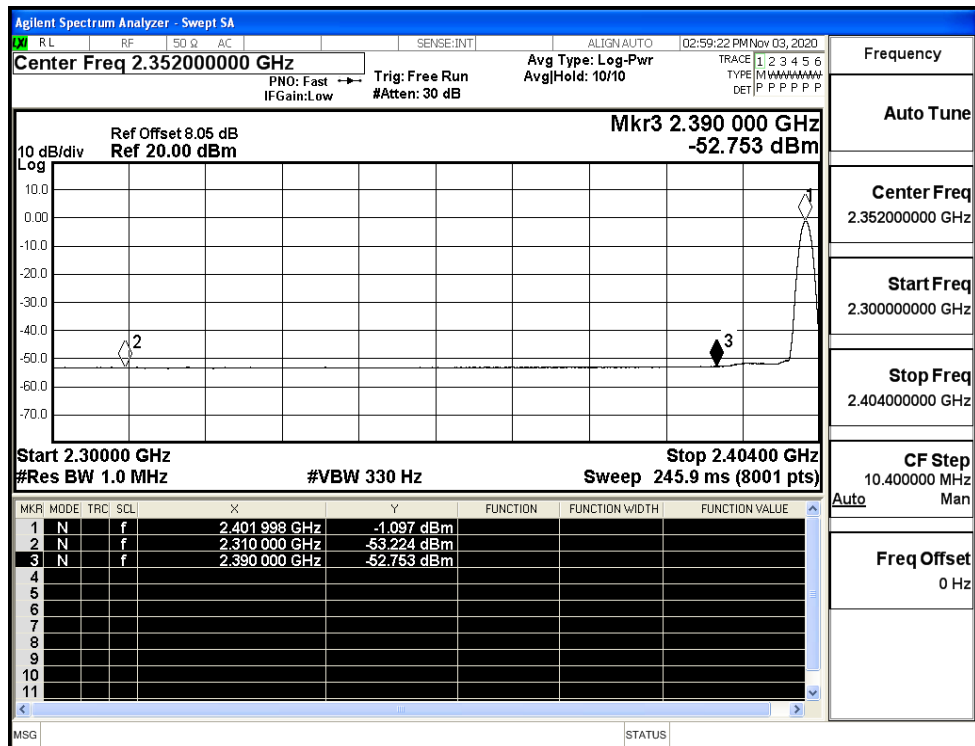
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.74	3.19	0	54.71	PEAK	74	PASS
	Off	2310.0	-53.22	3.19	0	45.23	AV	54	PASS
	Off	2390.0	-43.27	3.19	0	55.18	PEAK	74	PASS
	Off	2390.0	-52.75	3.19	0	45.70	AV	54	PASS
	Off	2483.5	-43.53	3.19	0	54.92	PEAK	74	PASS
	Off	2483.5	-52.05	3.19	0	46.40	AV	54	PASS
	Off	2500.0	-42.83	3.19	0	55.62	PEAK	74	PASS
	Off	2500.0	-52.36	3.19	0	46.09	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-44.43	3.19	0	54.02	PEAK	74	PASS
	Off	2310.0	-53.37	3.19	0	45.08	AV	54	PASS
	Off	2390.0	-41.59	3.19	0	56.86	PEAK	74	PASS
	Off	2390.0	-52.87	3.19	0	45.58	AV	54	PASS
	Off	2483.5	-41.39	3.19	0	57.06	PEAK	74	PASS
	Off	2483.5	-52.02	3.19	0	46.43	AV	54	PASS
	Off	2500.0	-42.44	3.19	0	56.01	PEAK	74	PASS
	Off	2500.0	-52.36	3.19	0	46.09	AV	54	PASS
8DPSK	Off	2310.0	-42.66	3.19	0	55.79	PEAK	74	PASS
	Off	2310.0	-53.31	3.19	0	45.14	AV	54	PASS
	Off	2390.0	-42.59	3.19	0	55.86	PEAK	74	PASS
	Off	2390.0	-52.93	3.19	0	45.52	AV	54	PASS
	Off	2483.5	-41.53	3.19	0	56.92	PEAK	74	PASS
	Off	2483.5	-52.02	3.19	0	46.43	AV	54	PASS
	Off	2500.0	-41.80	3.19	0	56.65	PEAK	74	PASS
	Off	2500.0	-52.32	3.19	0	46.13	AV	54	PASS

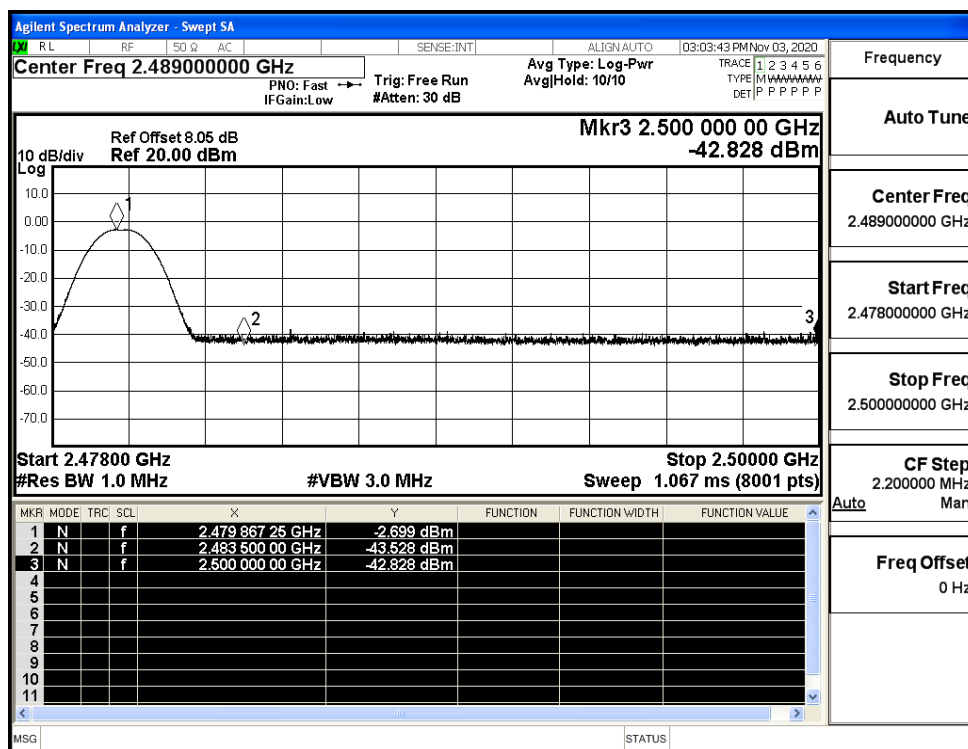
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



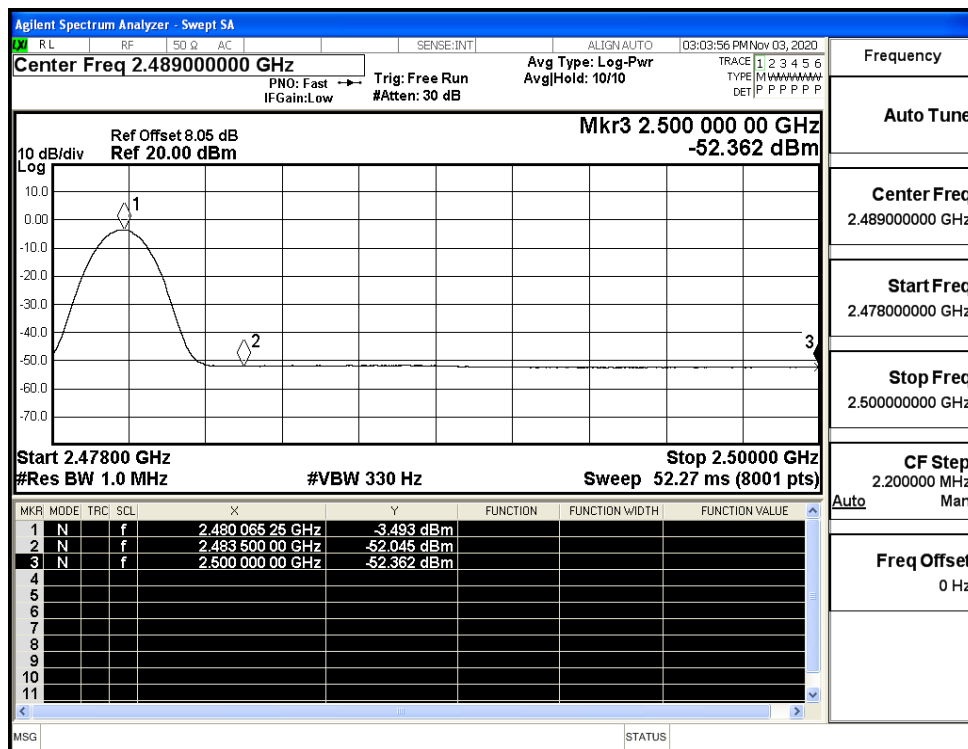
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)

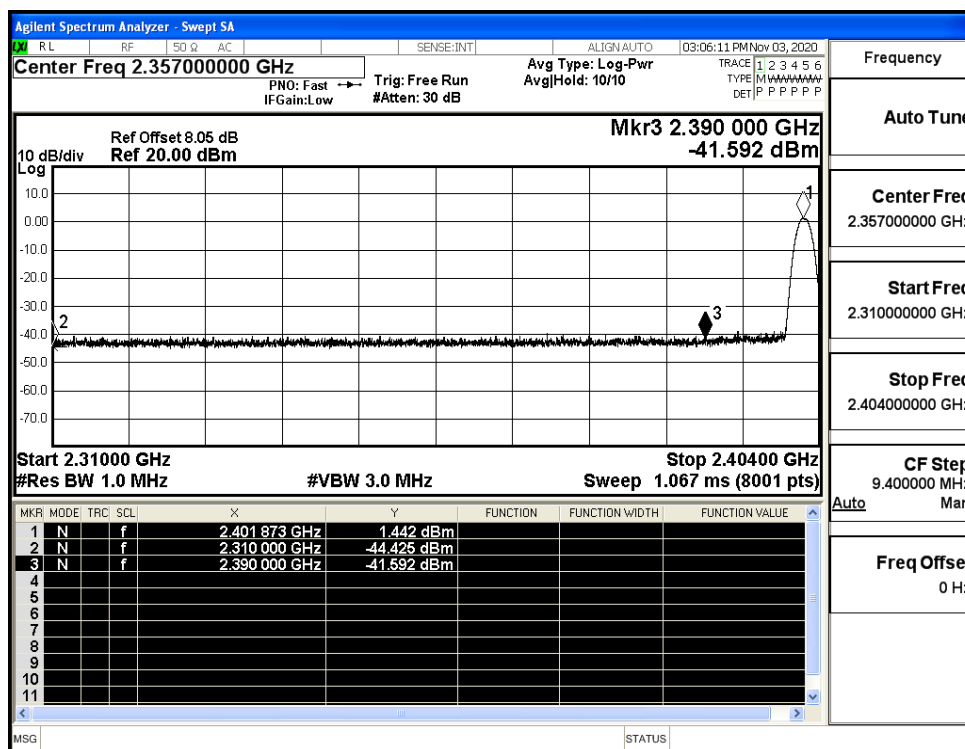
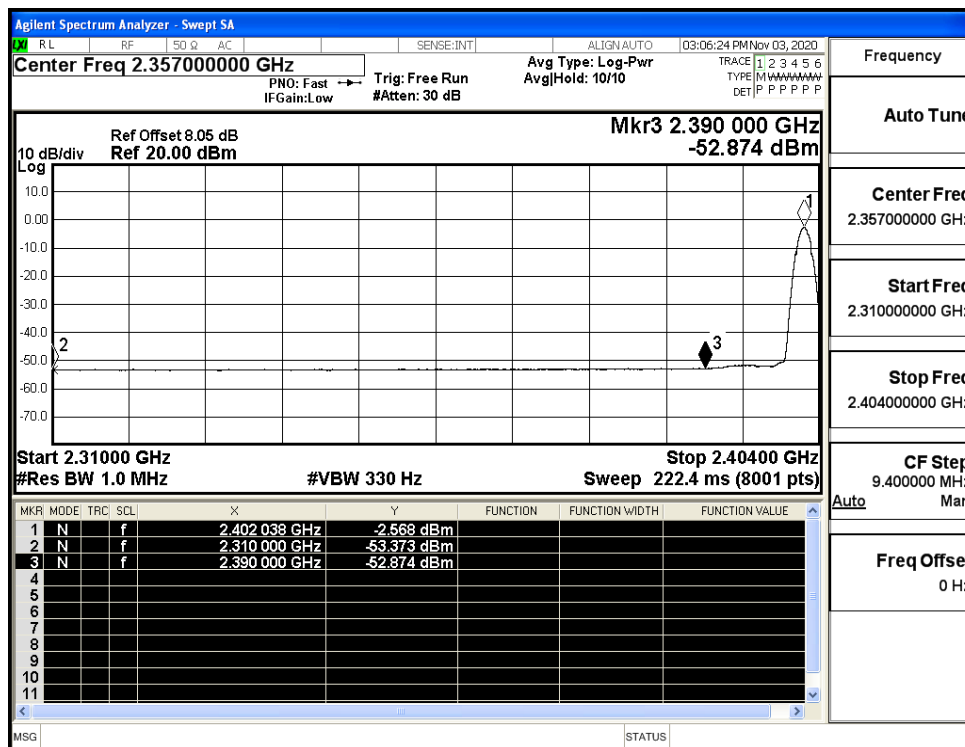


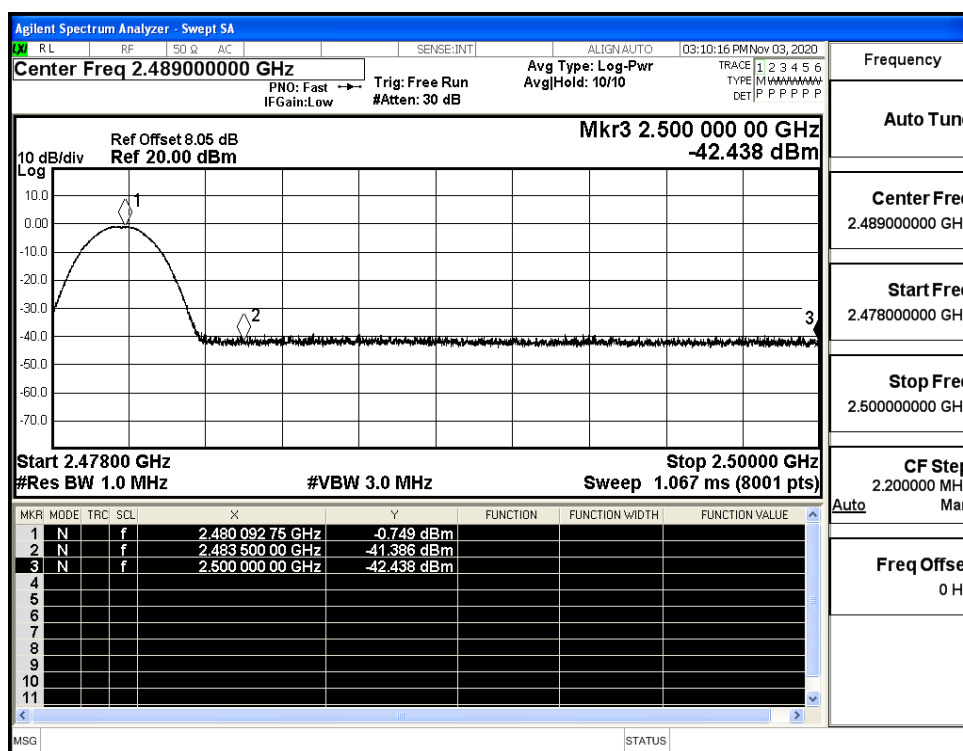
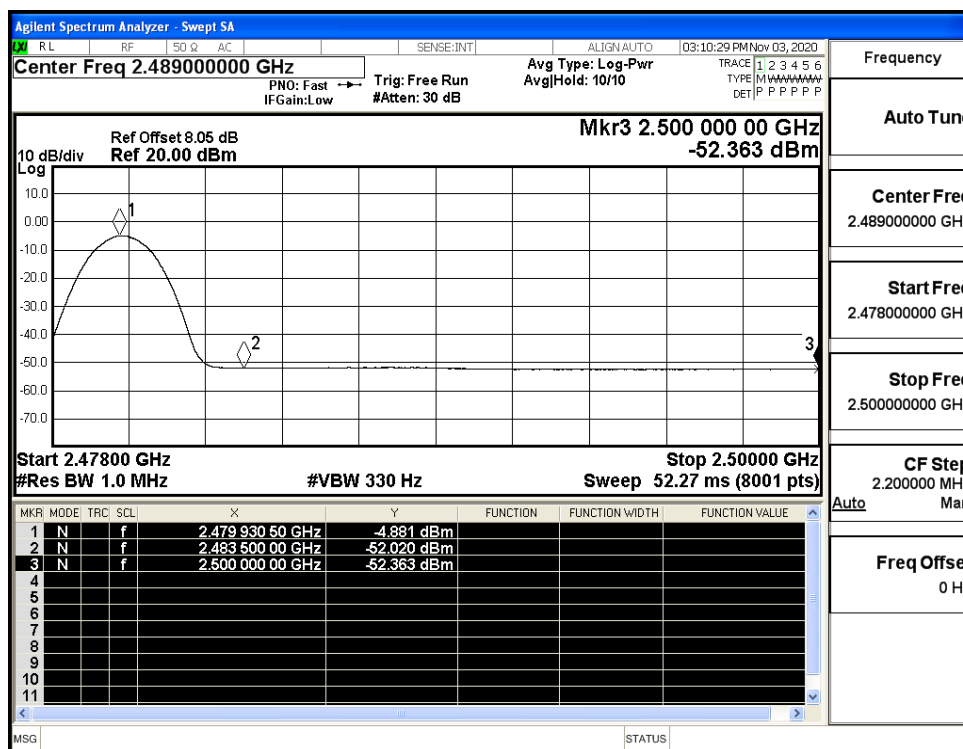
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)



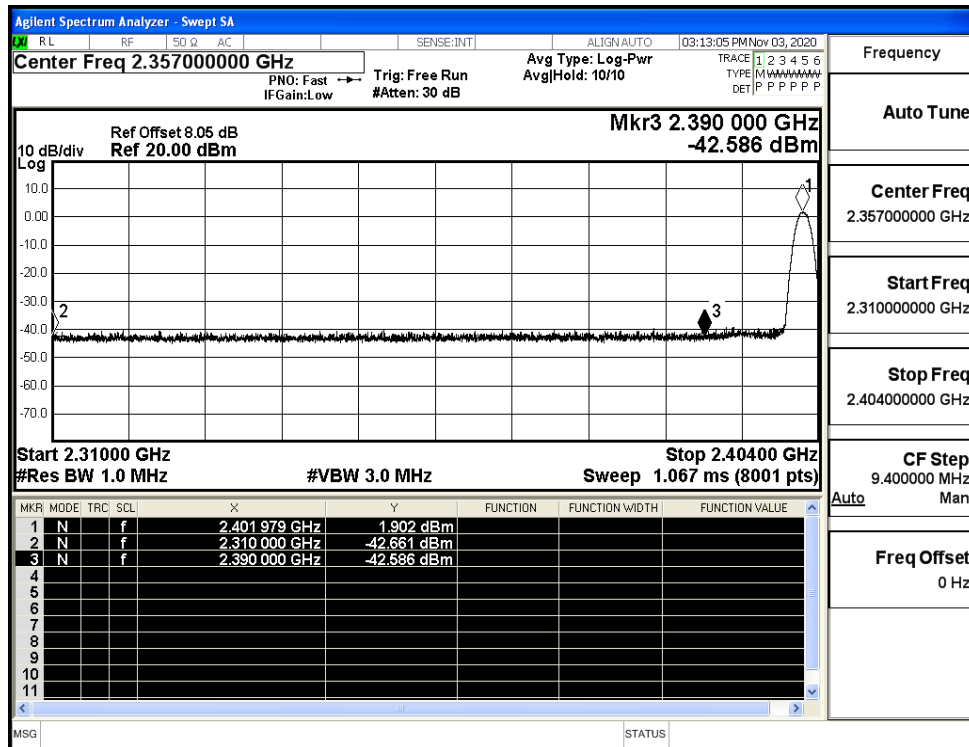
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)



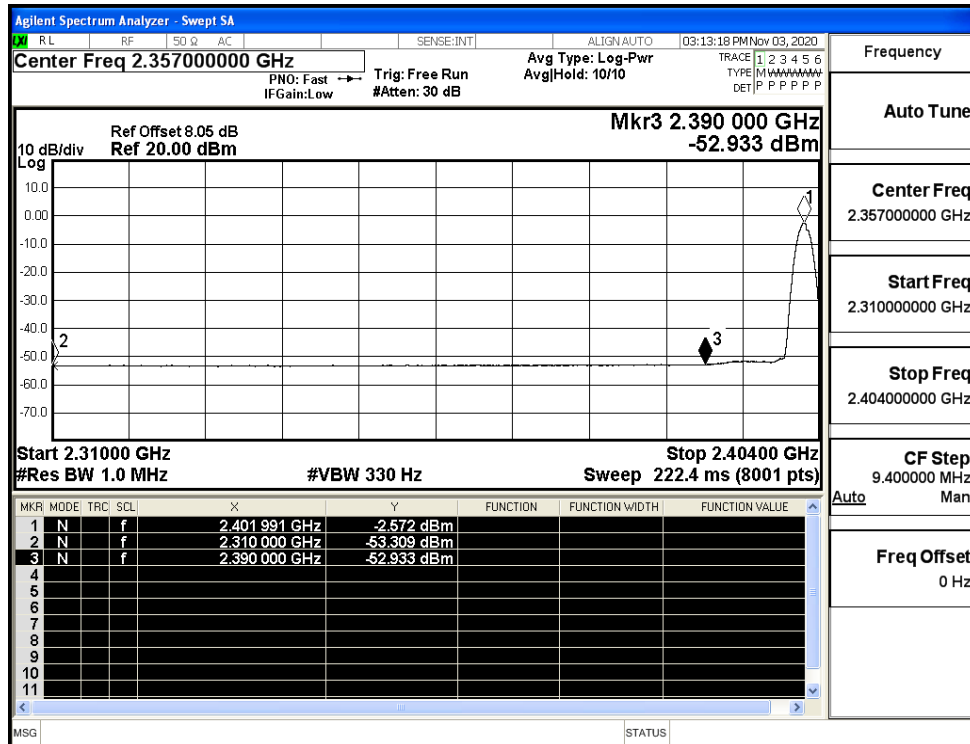
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)

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)

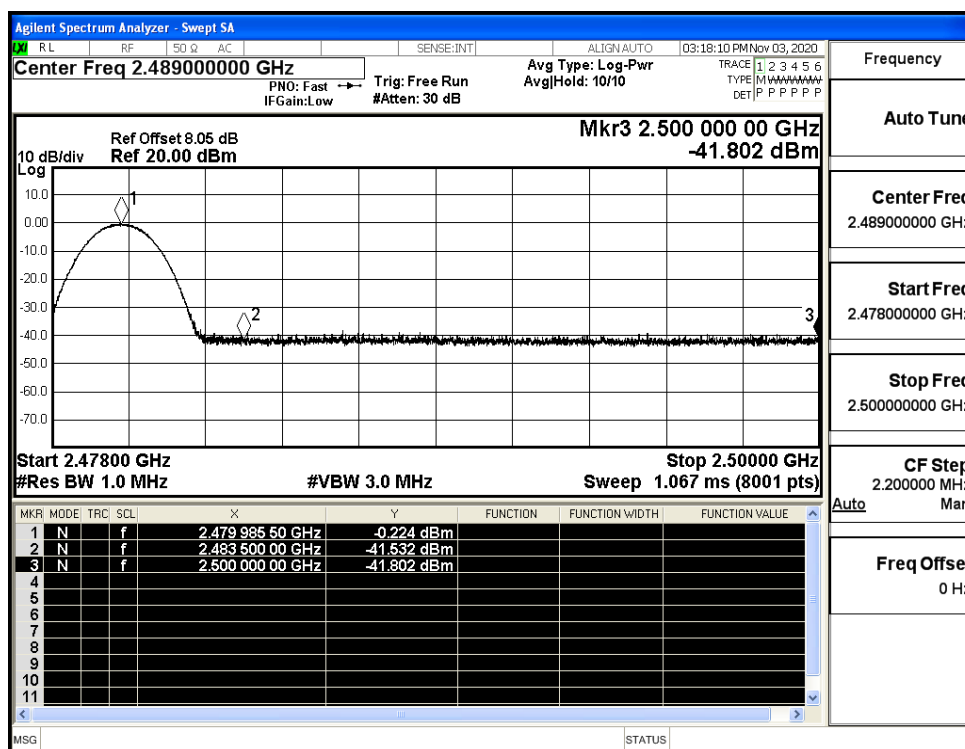
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

