

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

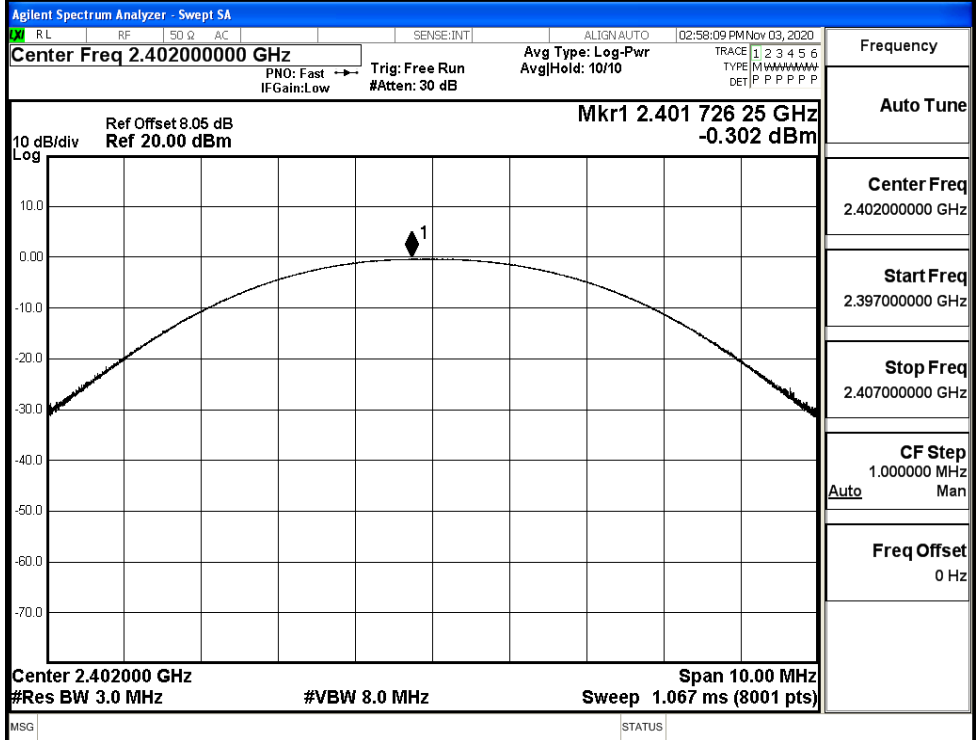
Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.0 kPa
Test Engineer:	Jam Zheng
Supervised by:	Li Huan

A.1 Maxmum Conducted Peak Output Power

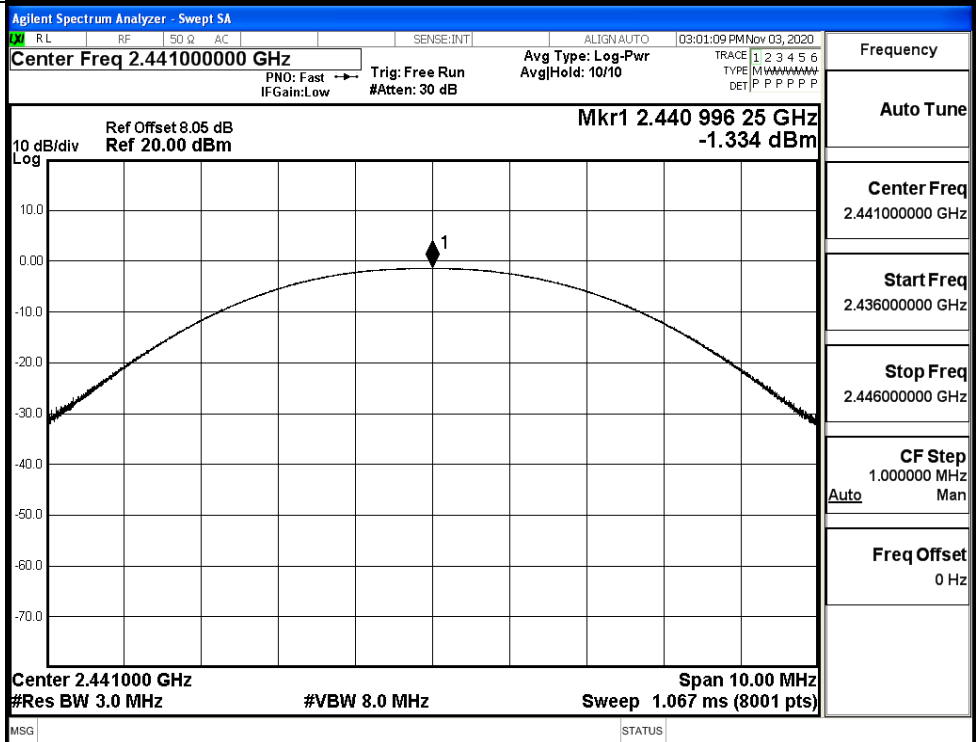
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-0.302	21	PASS
	MCH	-1.334	21	PASS
	HCH	-2.528	21	PASS
π/4DQPSK	LCH	2.174	21	PASS
	MCH	1.041	21	PASS
	HCH	-0.166	21	PASS
8DPSK	LCH	2.736	21	PASS
	MCH	1.770	21	PASS
	HCH	0.512	21	PASS

Test Graphs

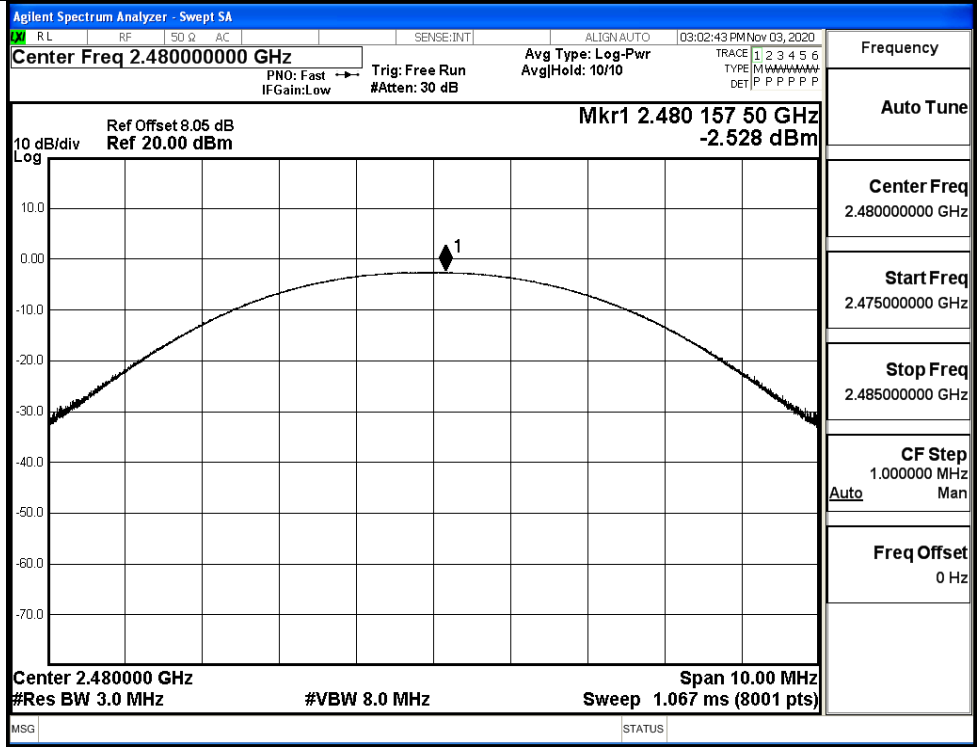
GFSK/LCH



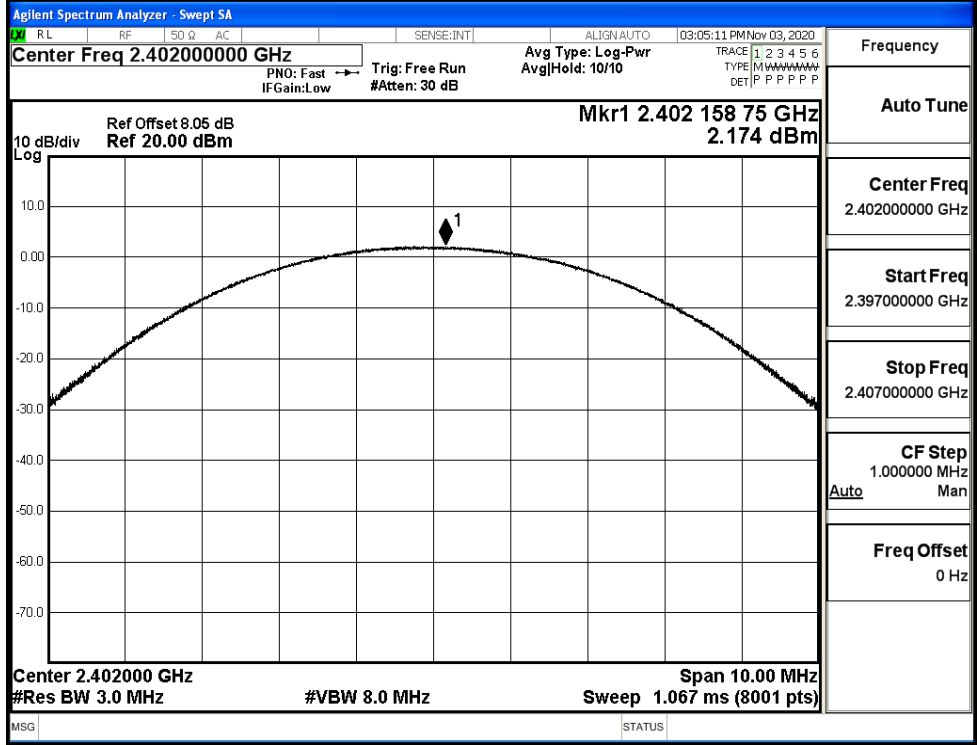
GFSK/MCH



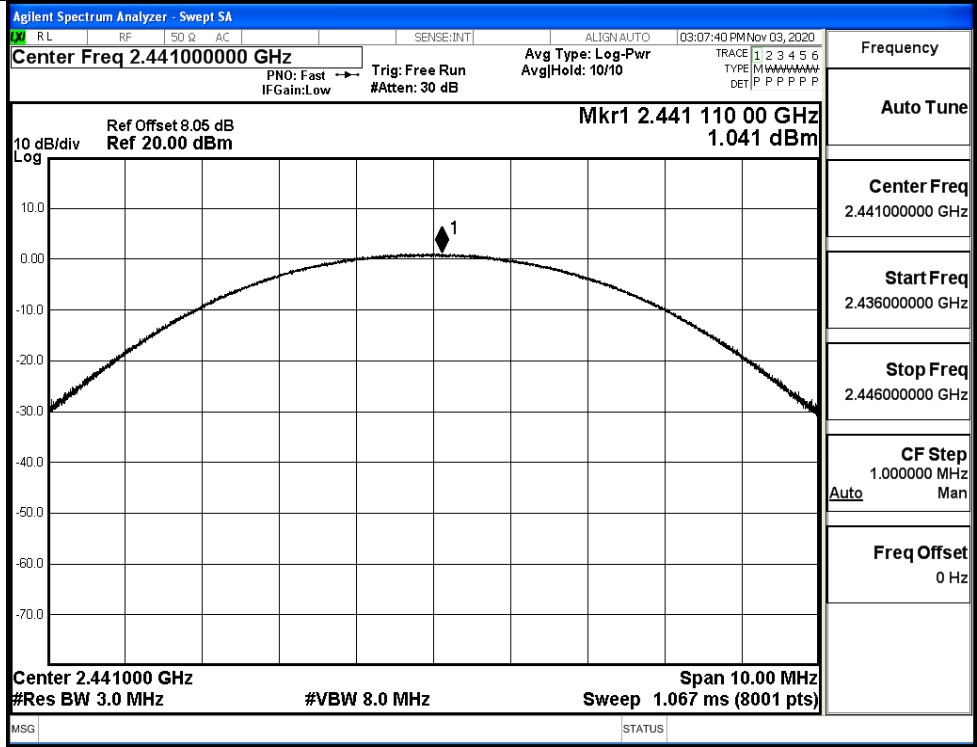
GFSK/HCH



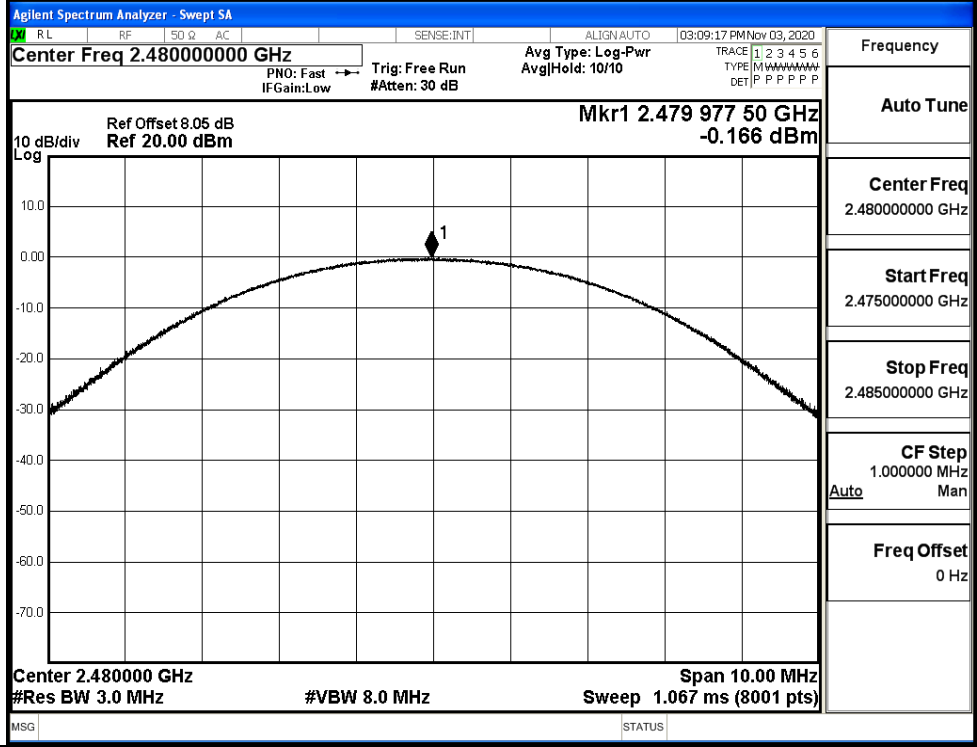
$\pi/4$ DQPSK/LCH



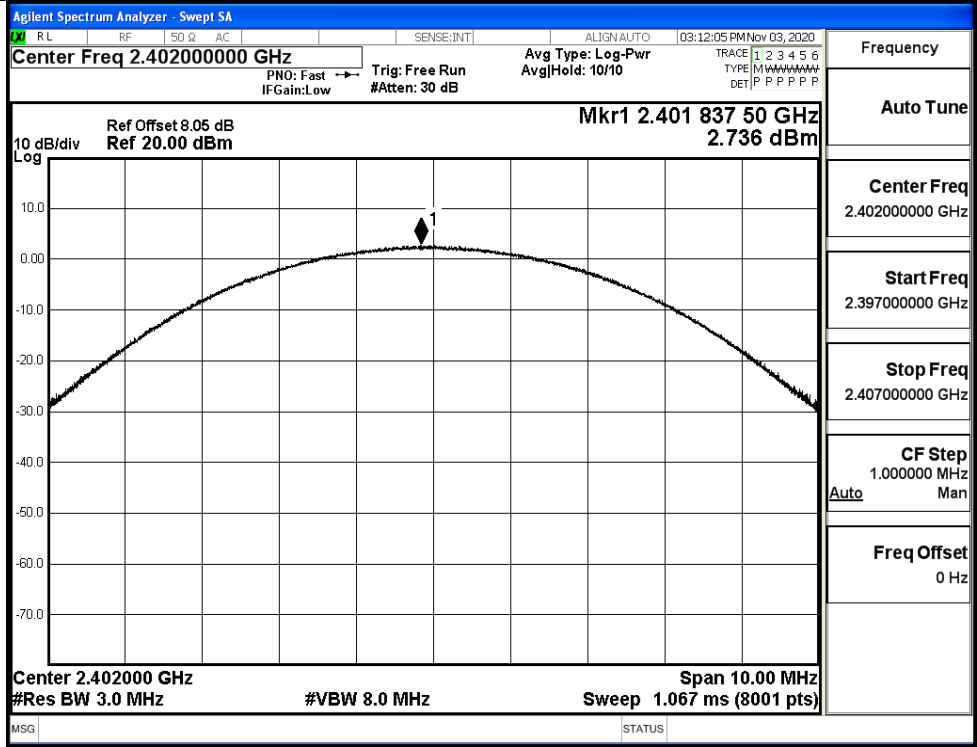
$\pi/4$ DQPSK/MCH



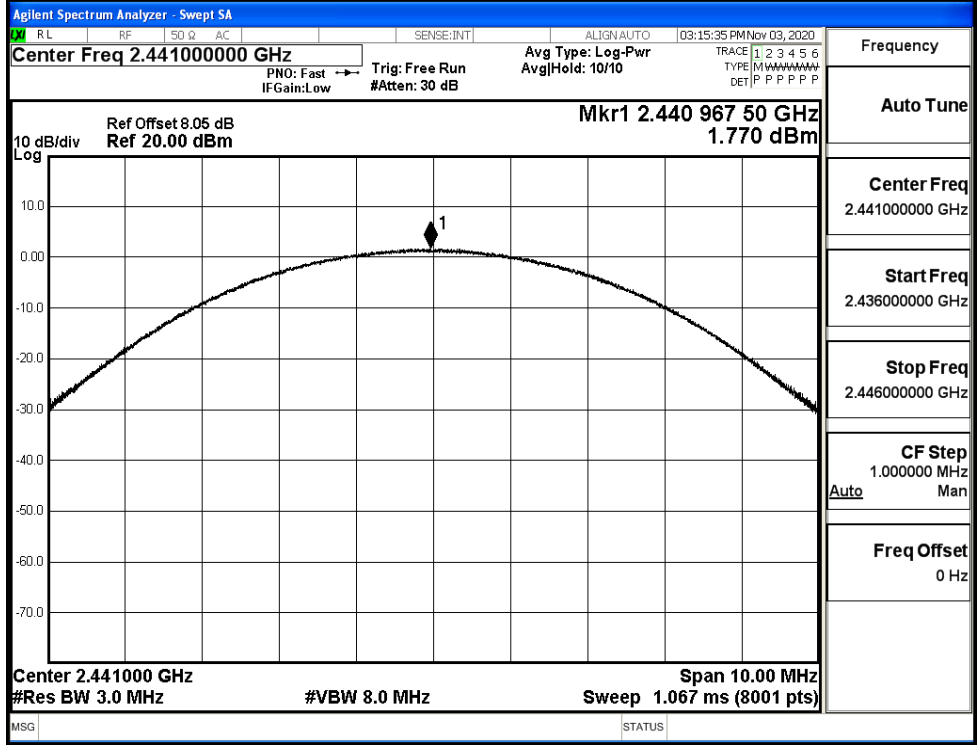
$\pi/4$ DQPSK/HCH



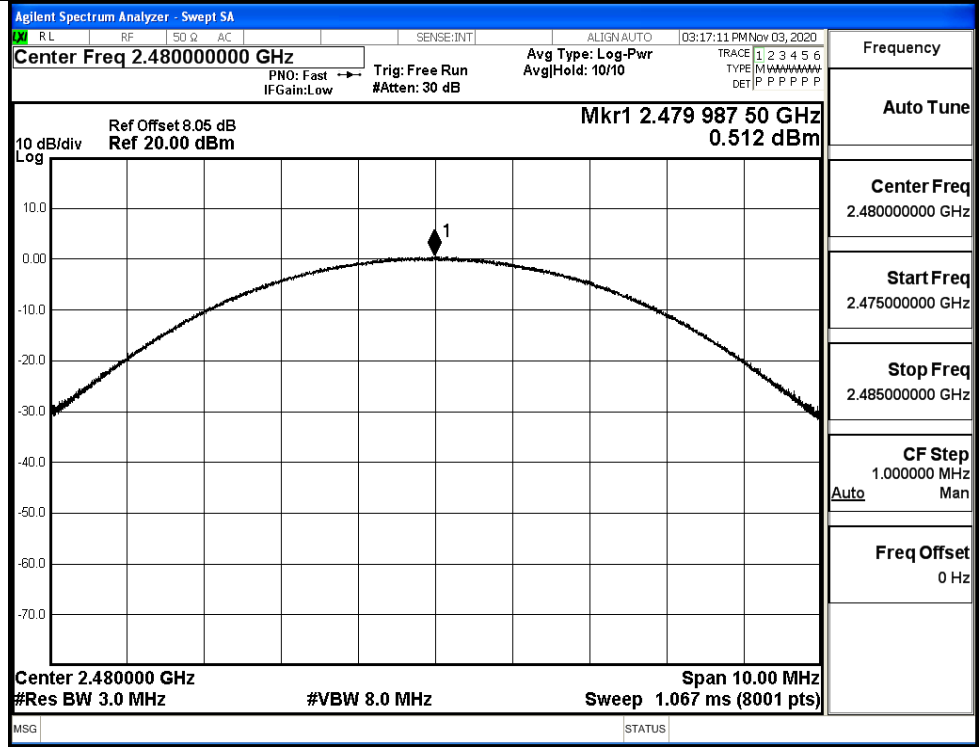
8DPSK/LCH



8DPSK/MCH

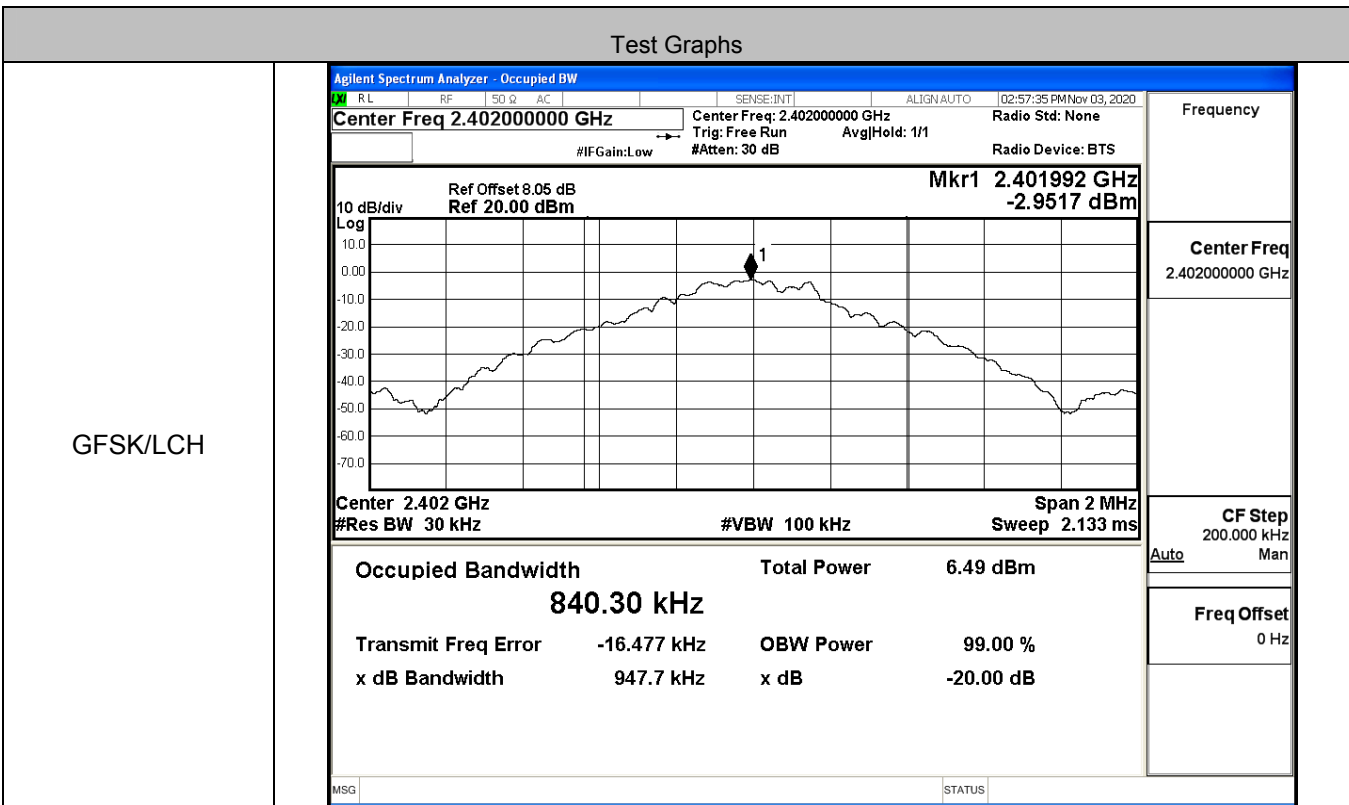


8DPSK/HCH

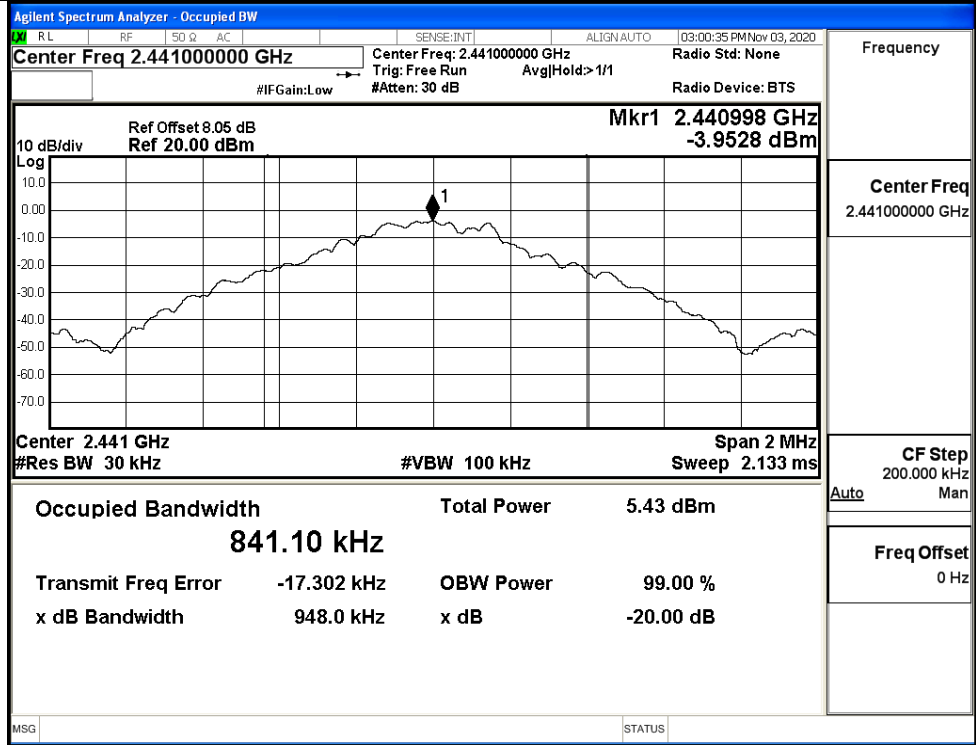


A.2 20dB Bandwidth

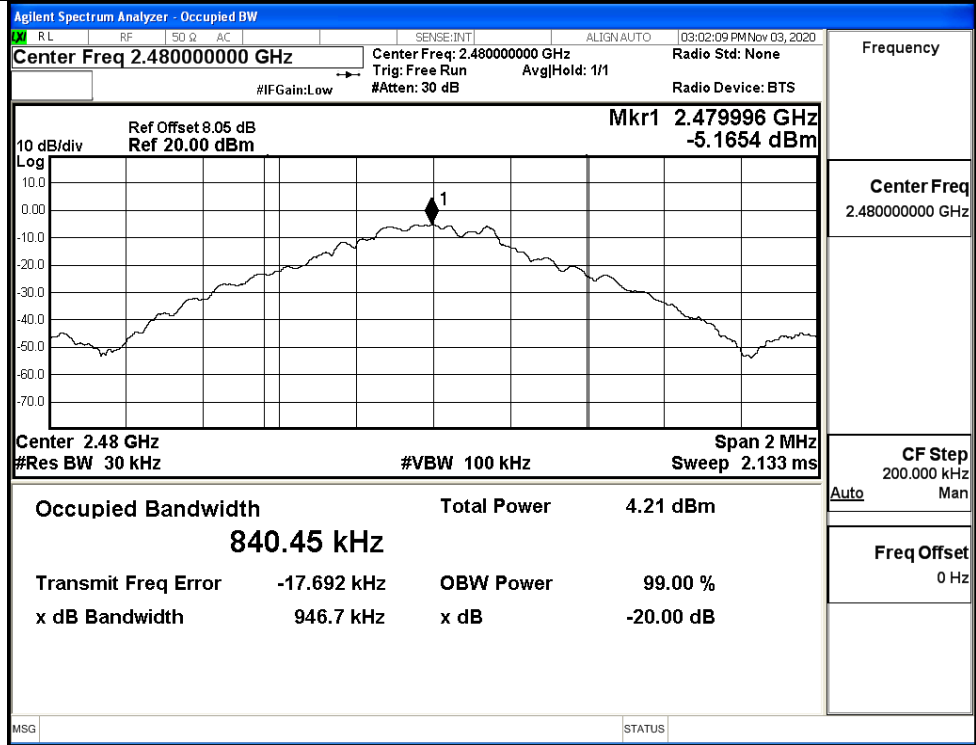
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9477	Not Specified	PASS
	MCH	0.9480	Not Specified	PASS
	HCH	0.9467	Not Specified	PASS
π/4DQPSK	LCH	1.316	Not Specified	PASS
	MCH	1.318	Not Specified	PASS
	HCH	1.318	Not Specified	PASS
8DPSK	LCH	1.310	Not Specified	PASS
	MCH	1.309	Not Specified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



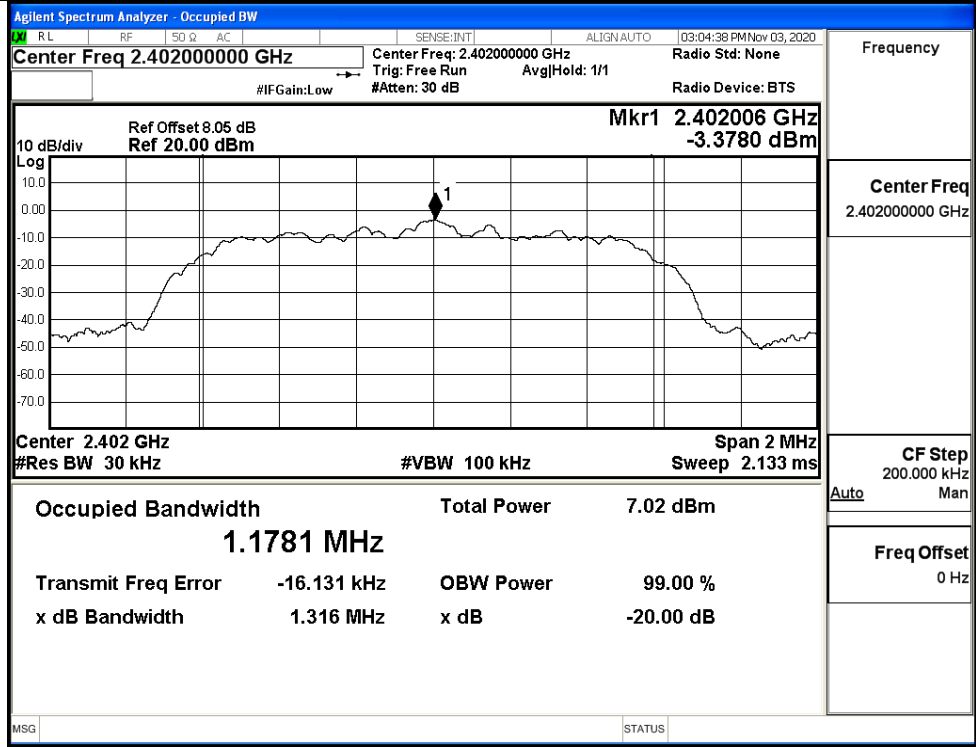
GFSK/MCH



GFSK/HCH

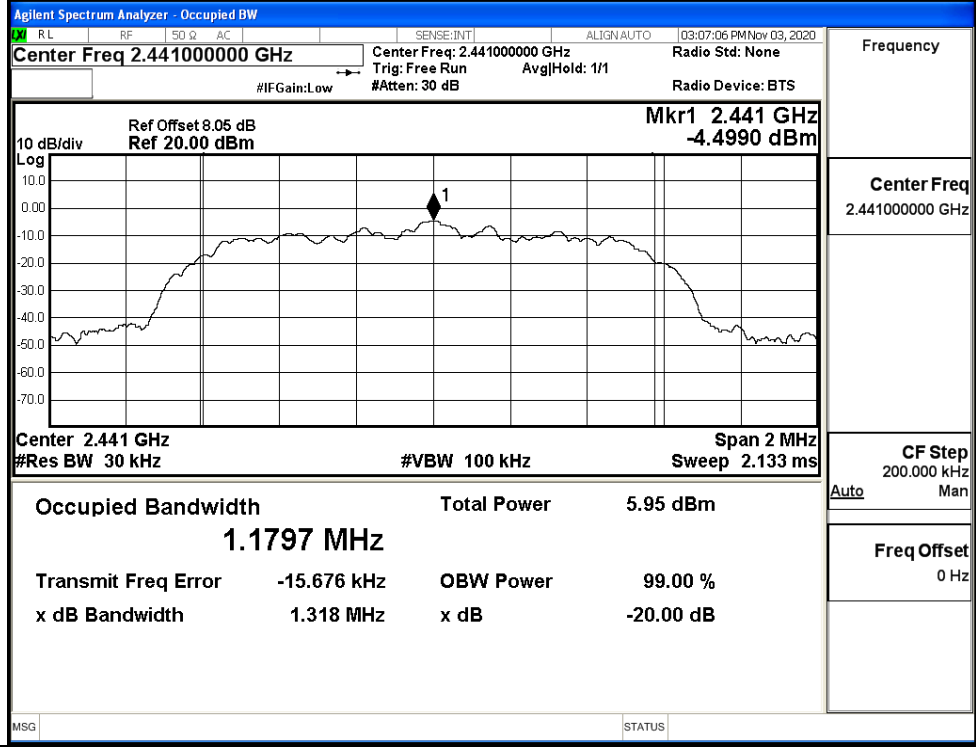


π /4DQPSK/LCH



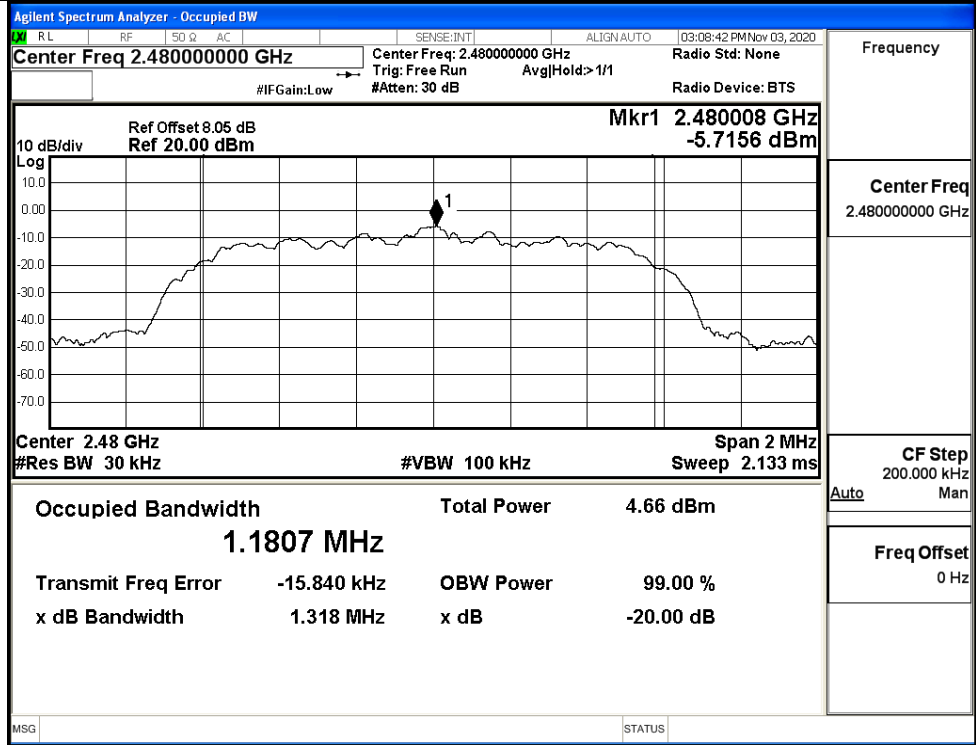
Frequency	2.40200000 GHz
Center Freq	2.40200000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

π /4DQPSK/MCH

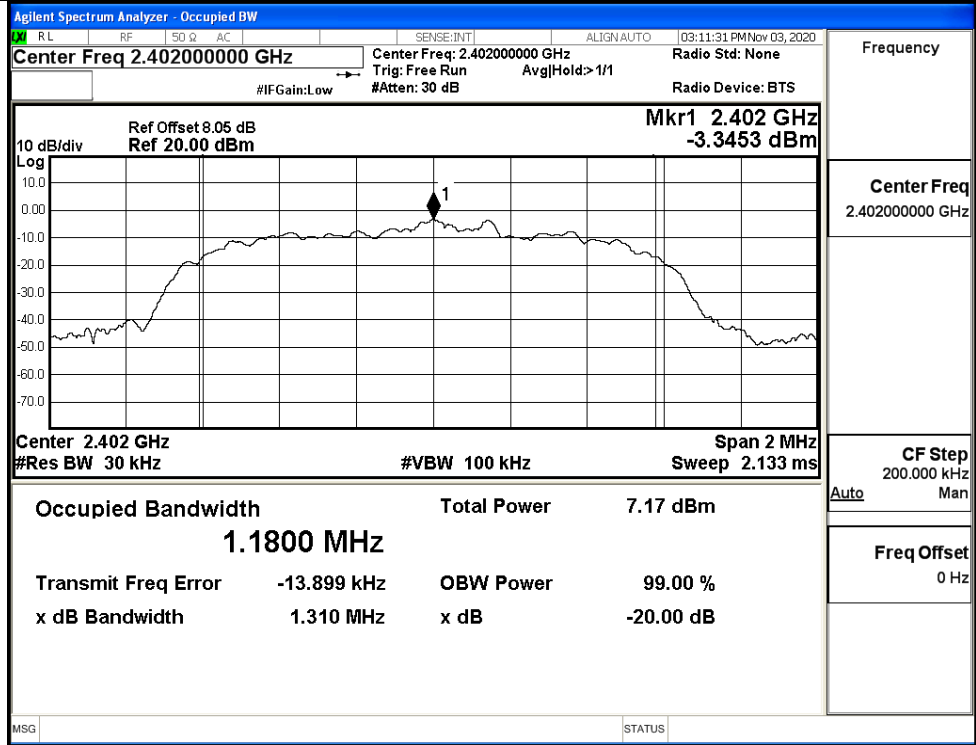


Frequency	2.44100000 GHz
Center Freq	2.44100000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

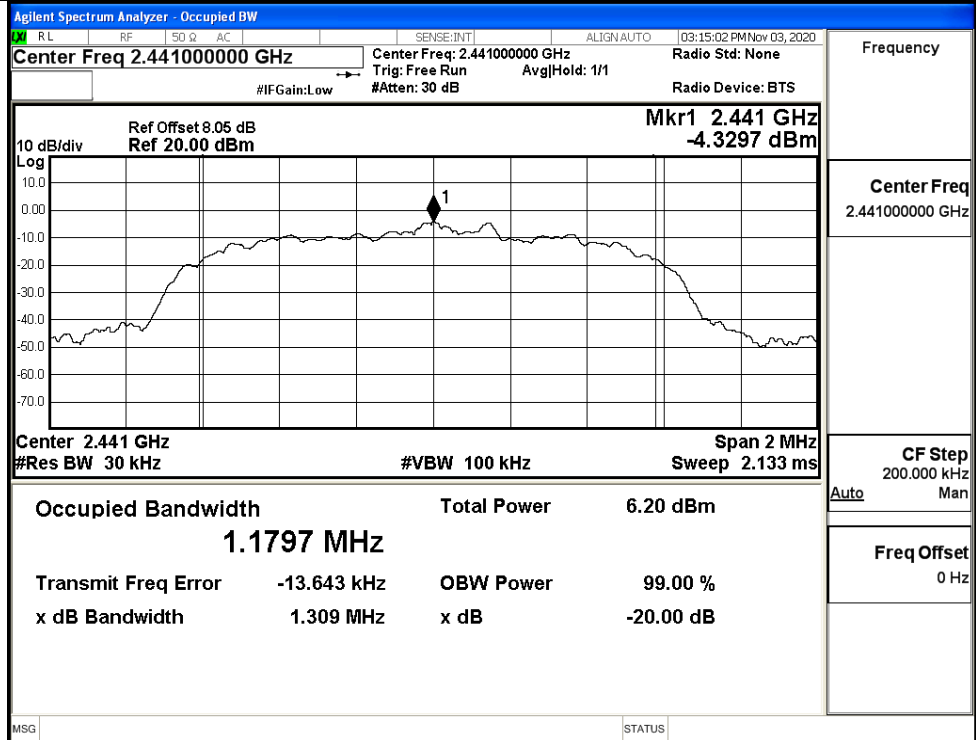
$\pi/4$ DQPSK/HCH



8DPSK/LCH

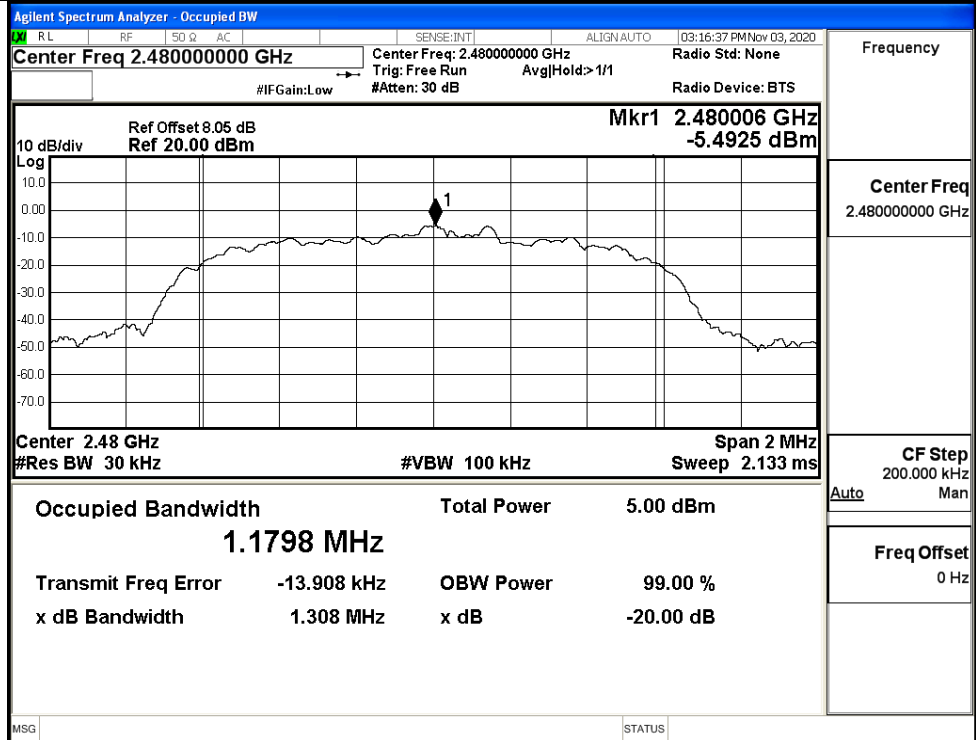


8DPSK/MCH



Frequency	2.441000000 GHz
Center Freq	2.441000000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

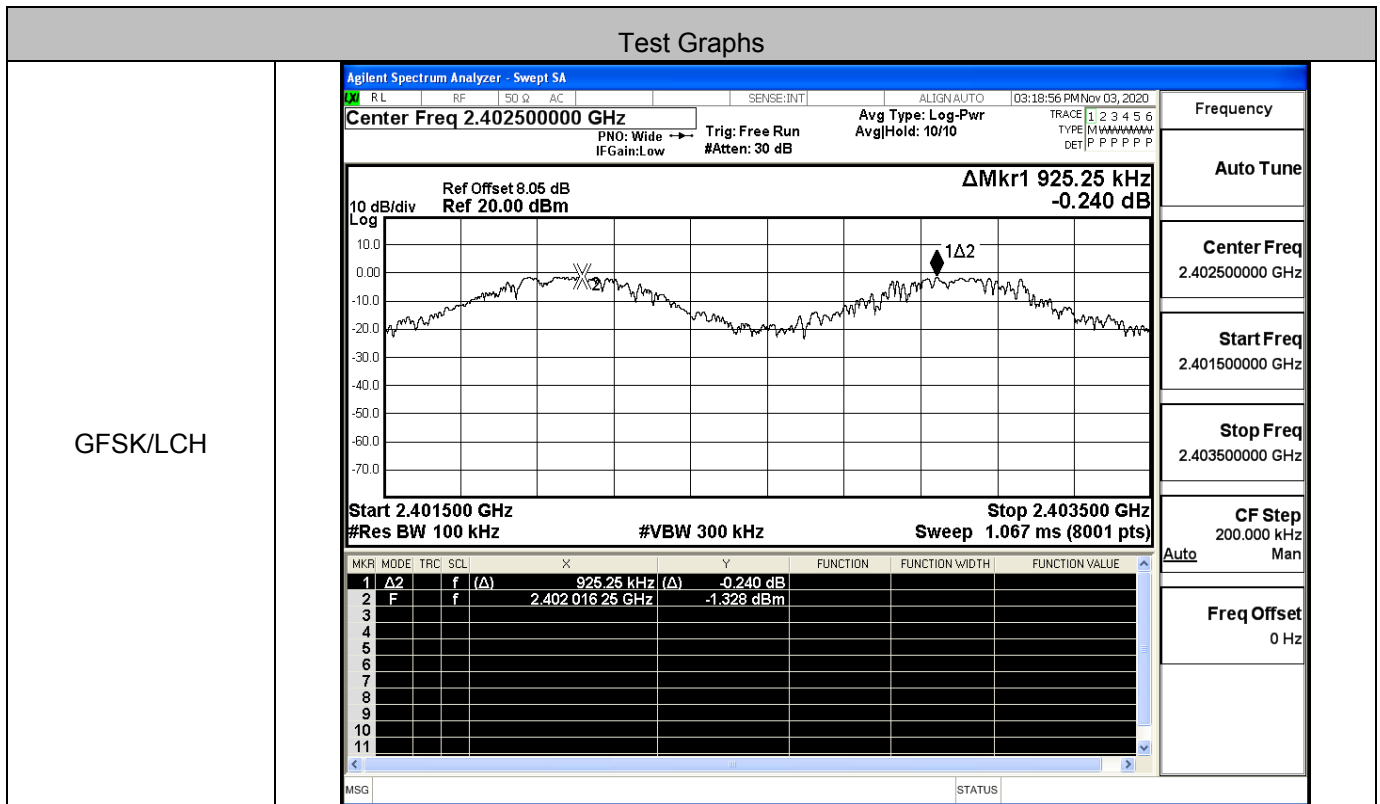
8DPSK/HCH



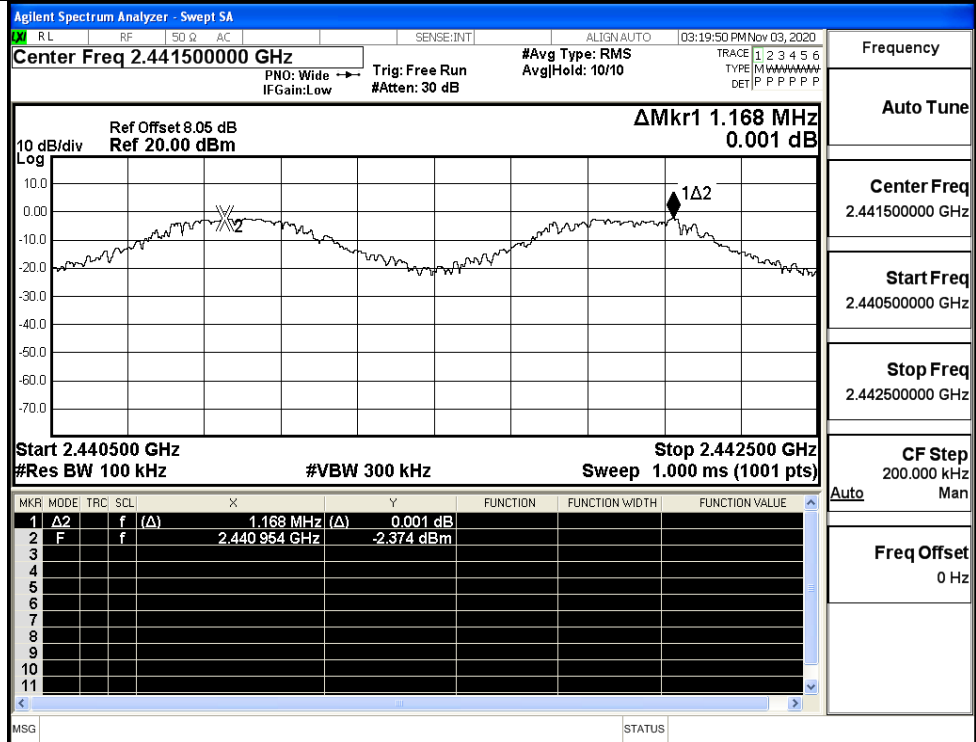
Frequency	2.480000000 GHz
Center Freq	2.480000000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

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
π/4DQPSK	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

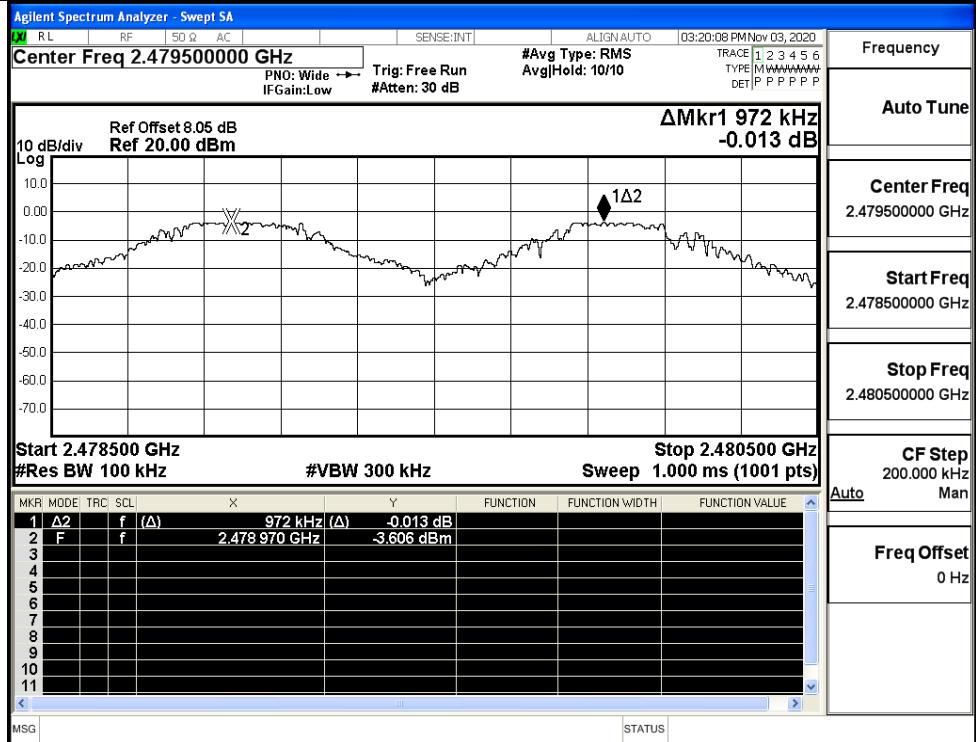


GFSK/MCH



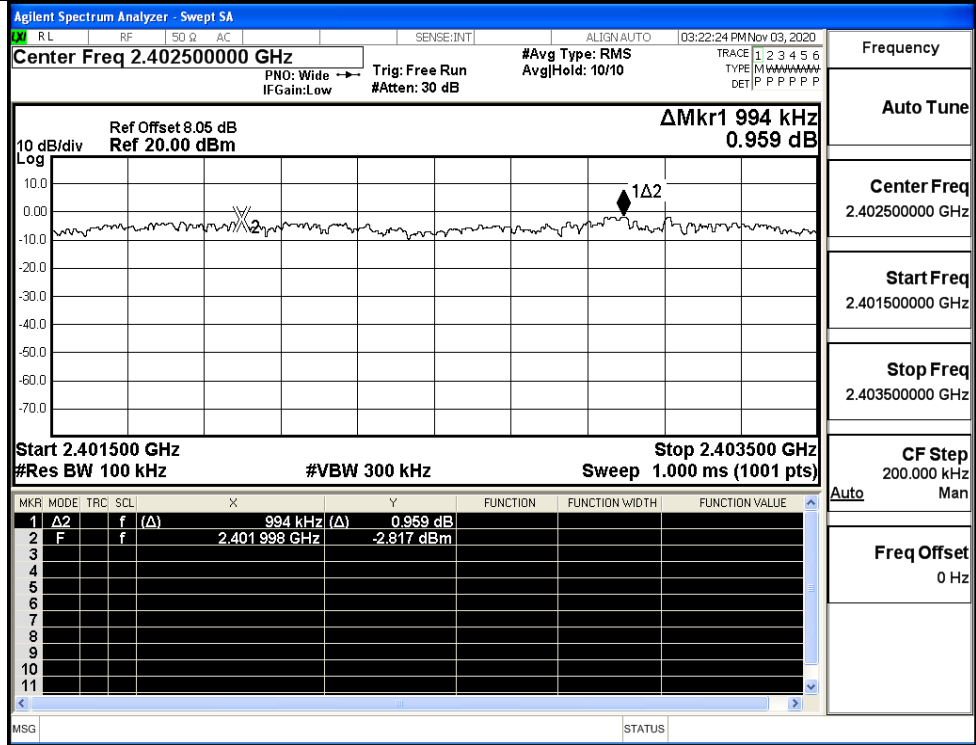
Frequency
Auto Tune
Center Freq
2.441500000 GHz
Start Freq
2.440500000 GHz
Stop Freq
2.442500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

GFSK/HCH

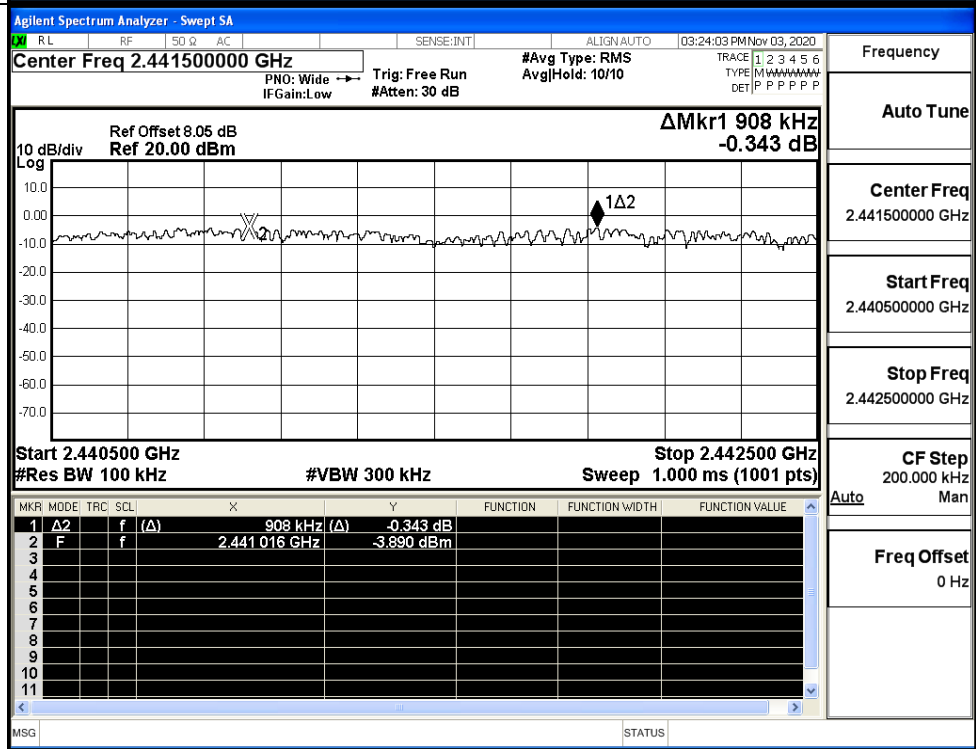


Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

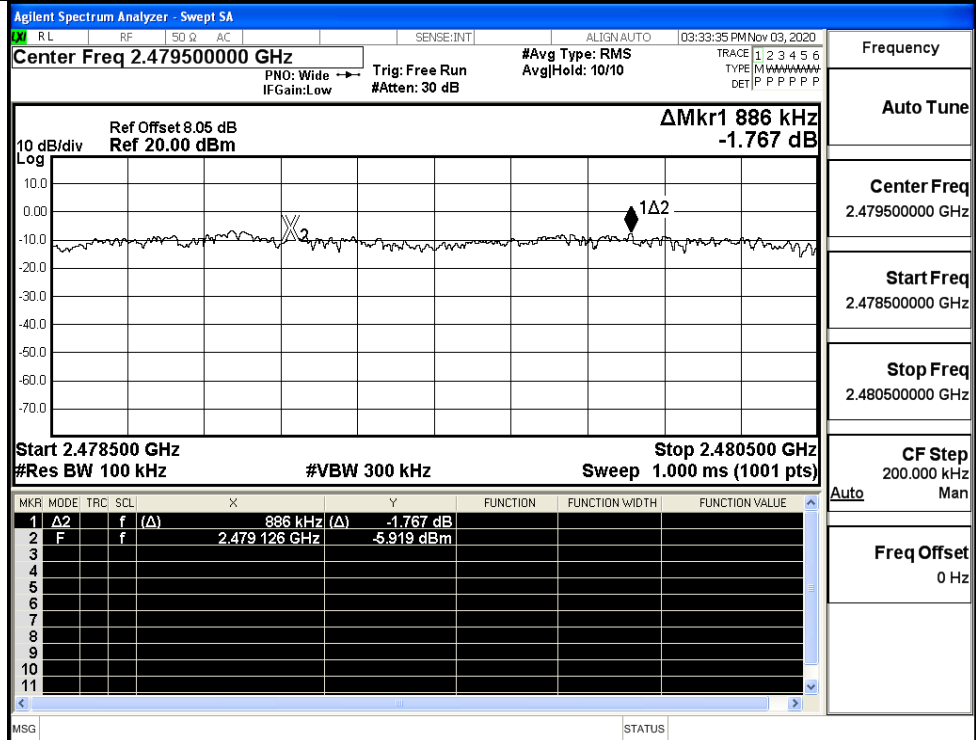
π/4DQPSK/LCH



π/4DQPSK/MCH

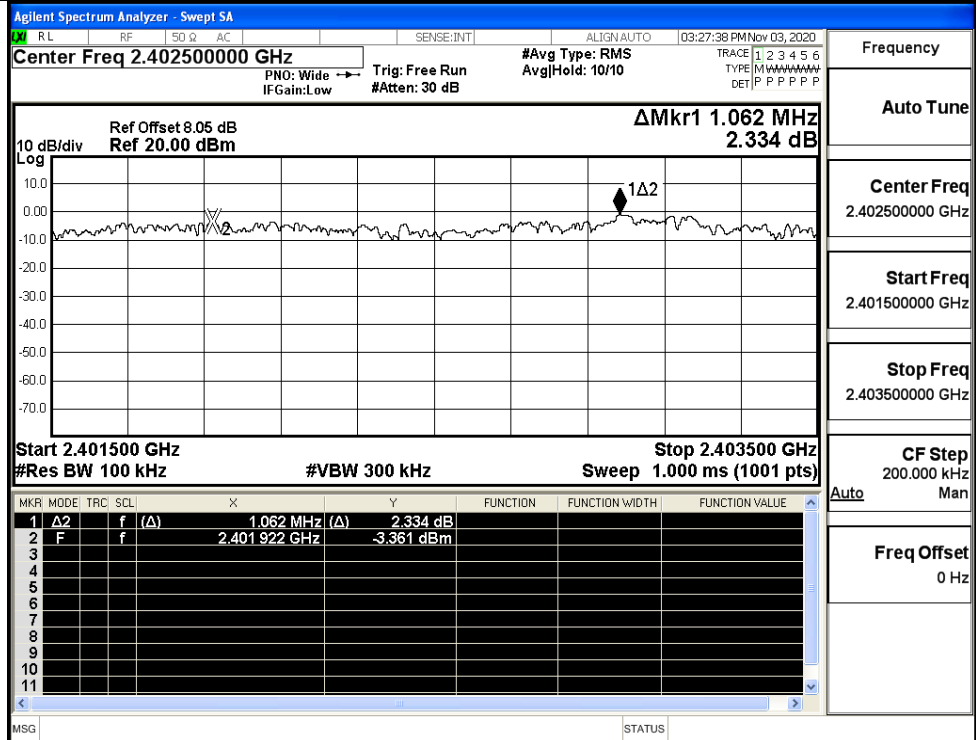


π/4DQPSK/HCH

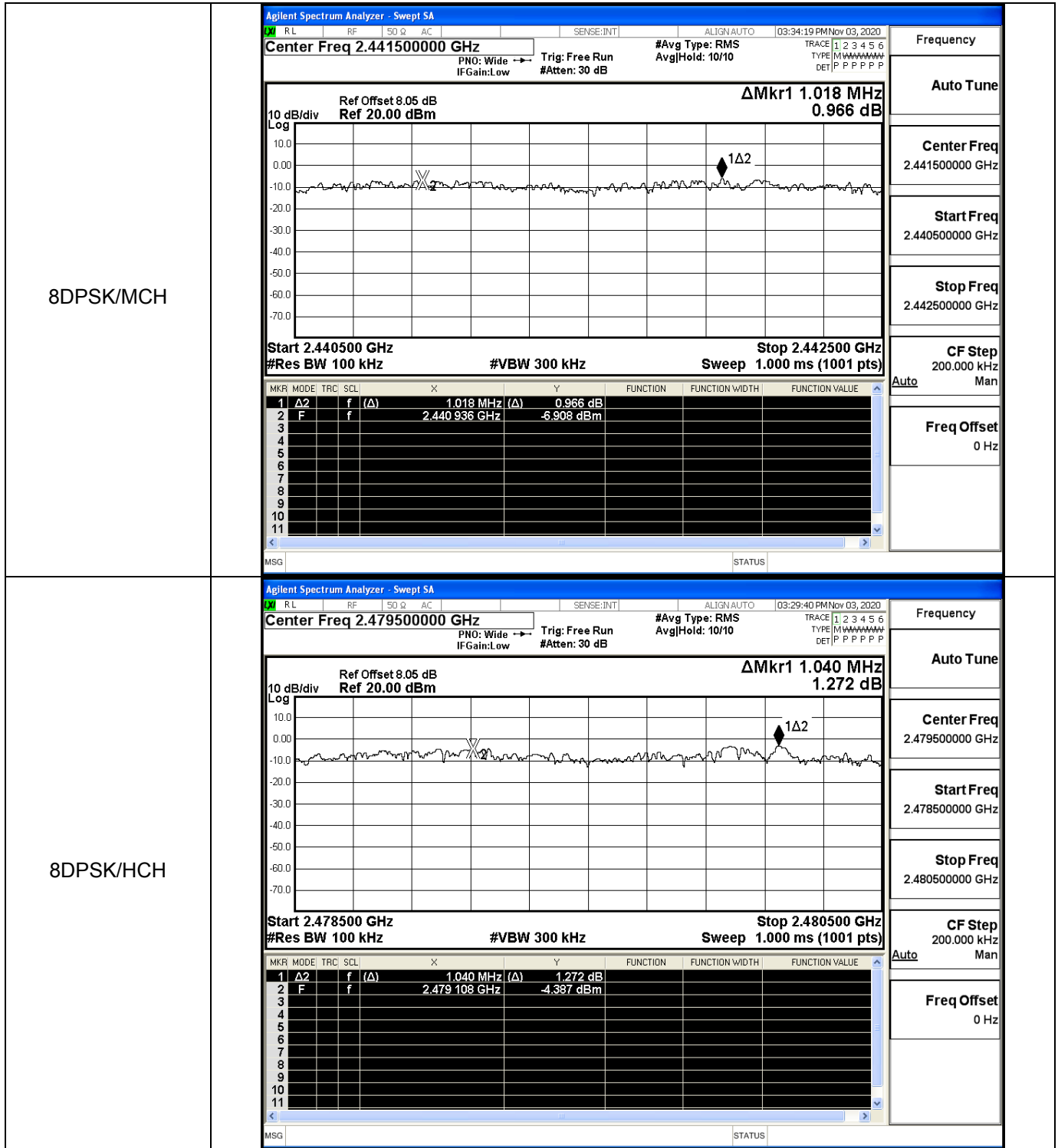


Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto Man
Freq Offset
0 Hz

8DPSK/LCH



Frequency
Auto Tune
Center Freq
2.402500000 GHz
Start Freq
2.401500000 GHz
Stop Freq
2.403500000 GHz
CF Step
200.000 kHz
Auto Man
Freq Offset
0 Hz

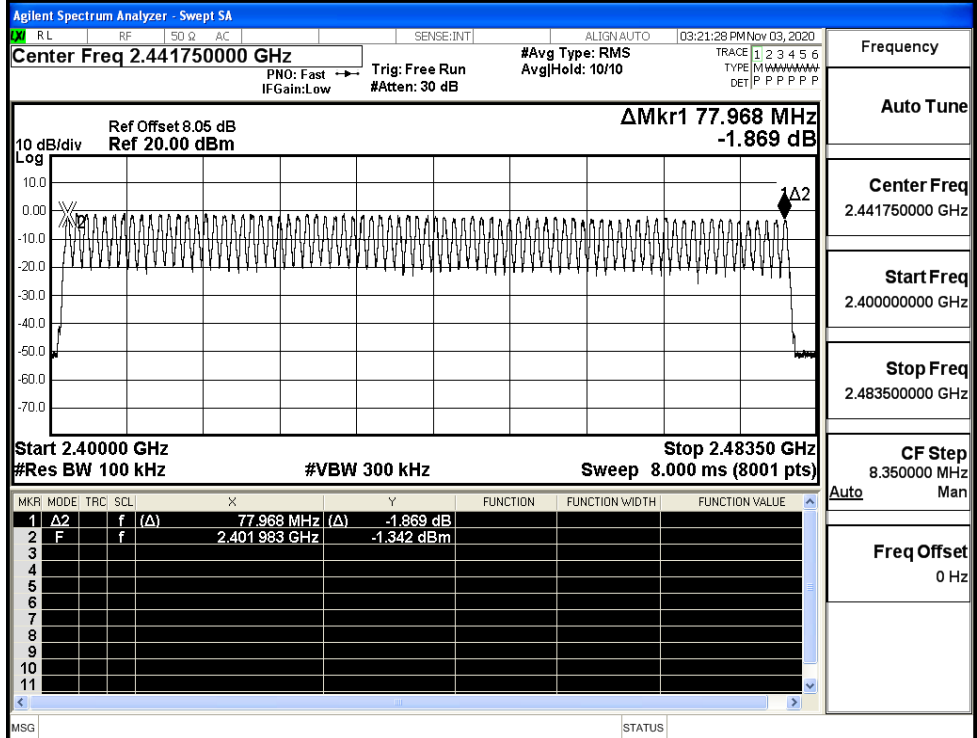


A.4 Hopping Channel Number

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

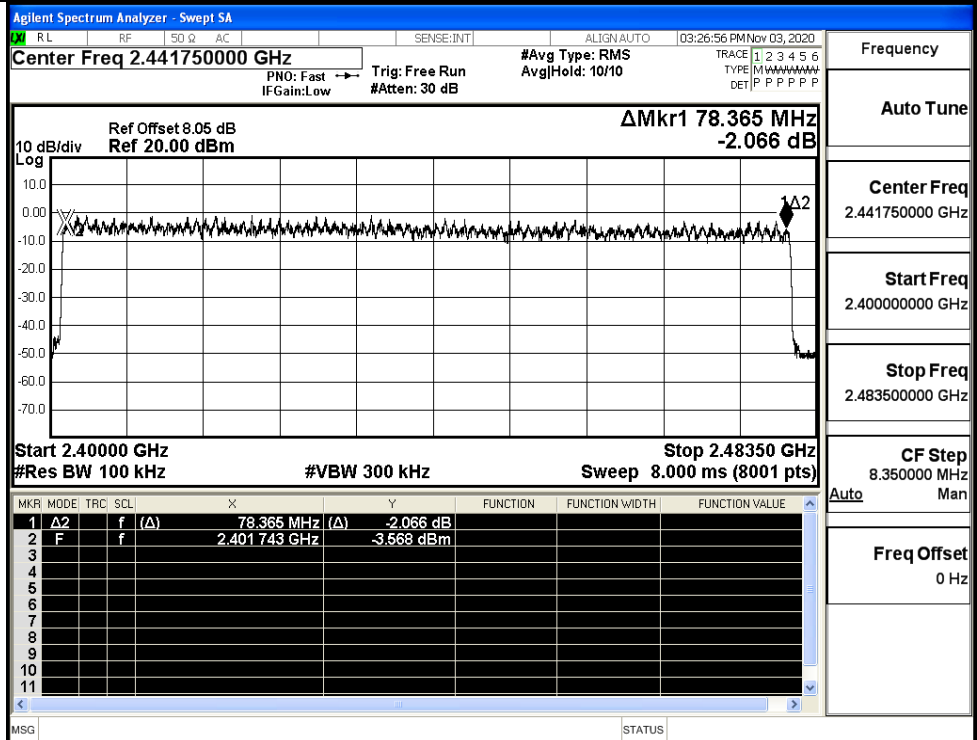
Test Graphs

GFSK/Hop



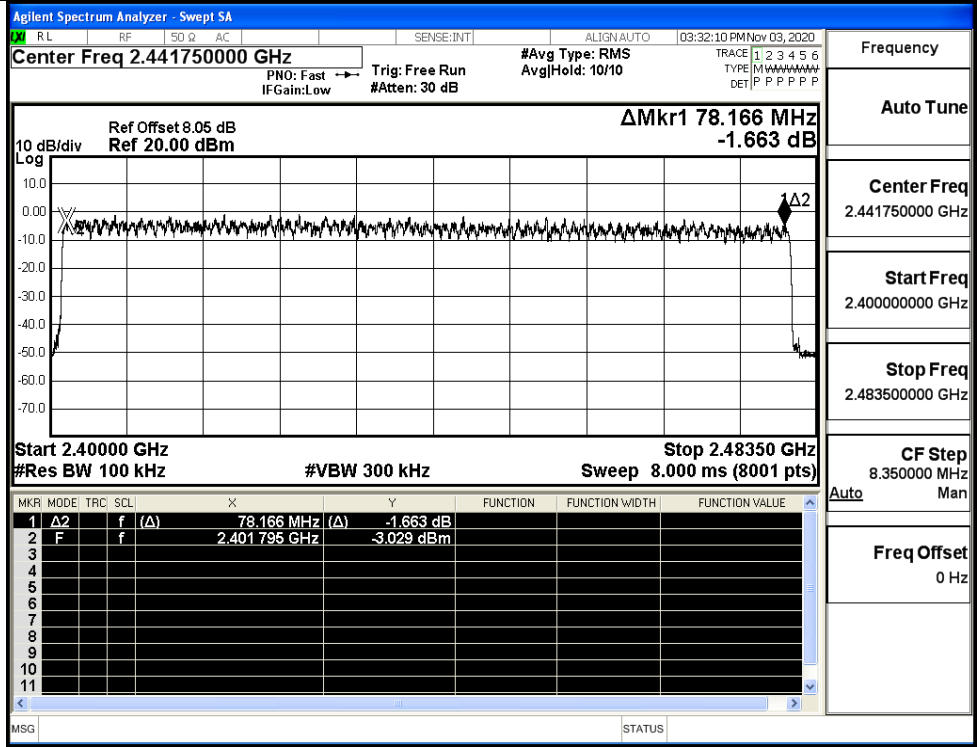
Frequency	
Auto Tune	
Center Freq	2.441750000 GHz
Start Freq	2.400000000 GHz
Stop Freq	2.483500000 GHz
CF Step	8.350000 MHz
Auto	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK/Hop



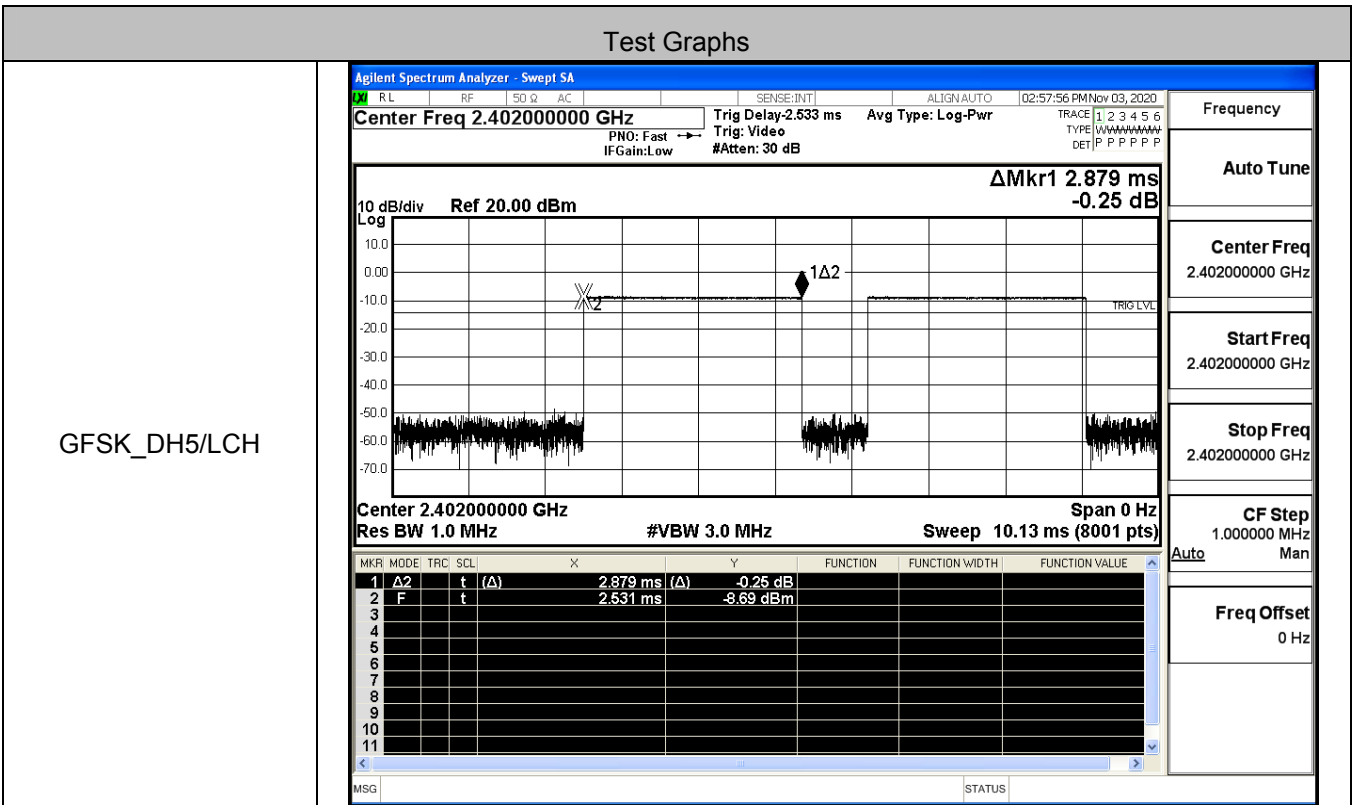
Frequency	
Auto Tune	
Center Freq	2.441750000 GHz
Start Freq	2.400000000 GHz
Stop Freq	2.483500000 GHz
CF Step	8.350000 MHz
Auto	Man
Freq Offset	0 Hz

8DPSK/Hop

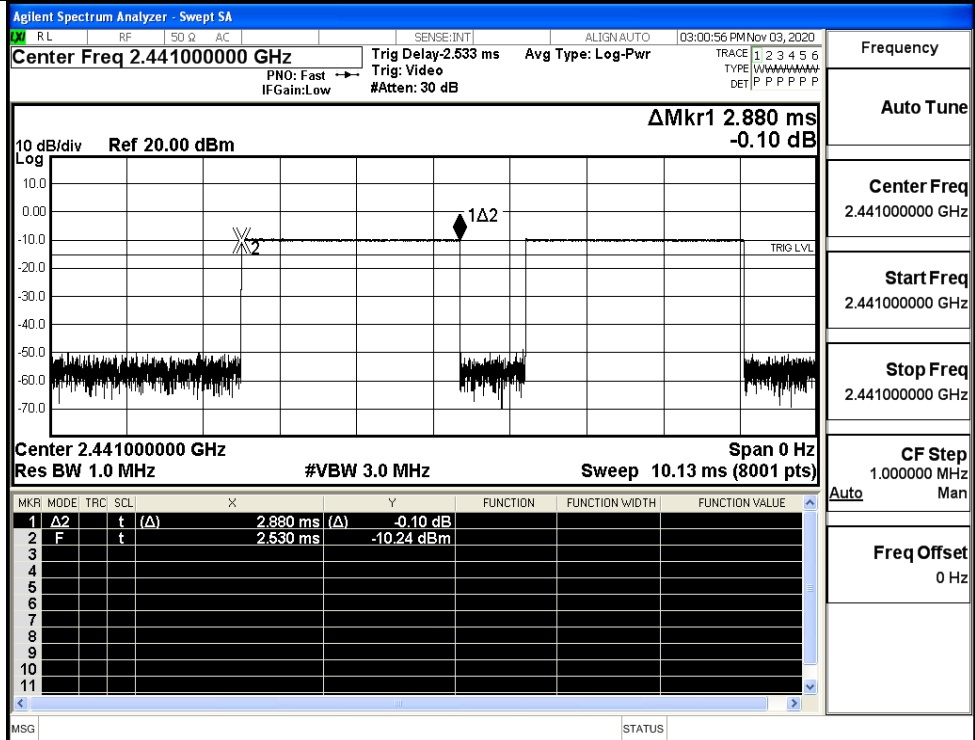


A.5 Dwell Time

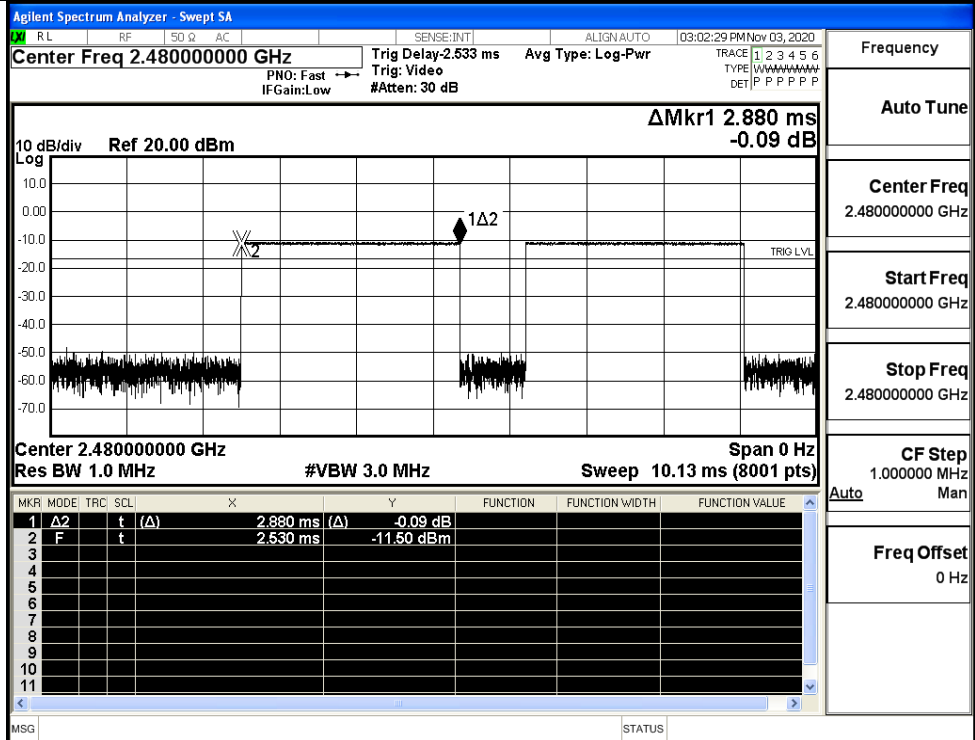
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
π/4DQPSK	2DH5	LCH	2.88	106.7	0.014	0.4	PASS
	2DH5	MCH	2.88	106.7	0.015	0.4	PASS
	2DH5	HCH	2.88	106.7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



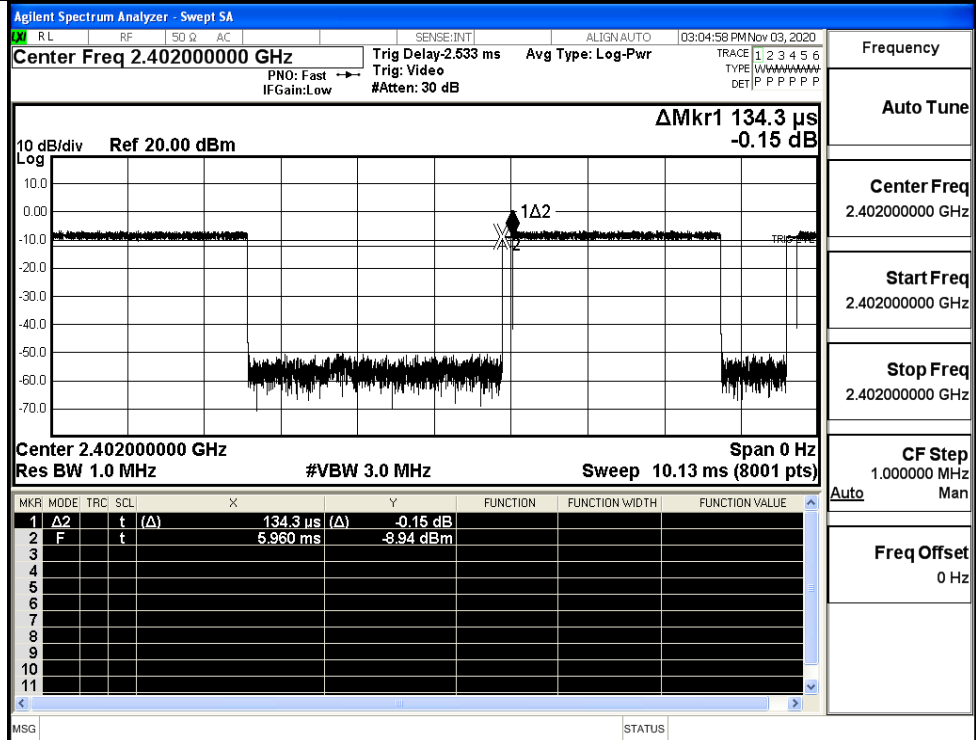
GFSK_DH5/MCH



GFSK_DH5/HCH

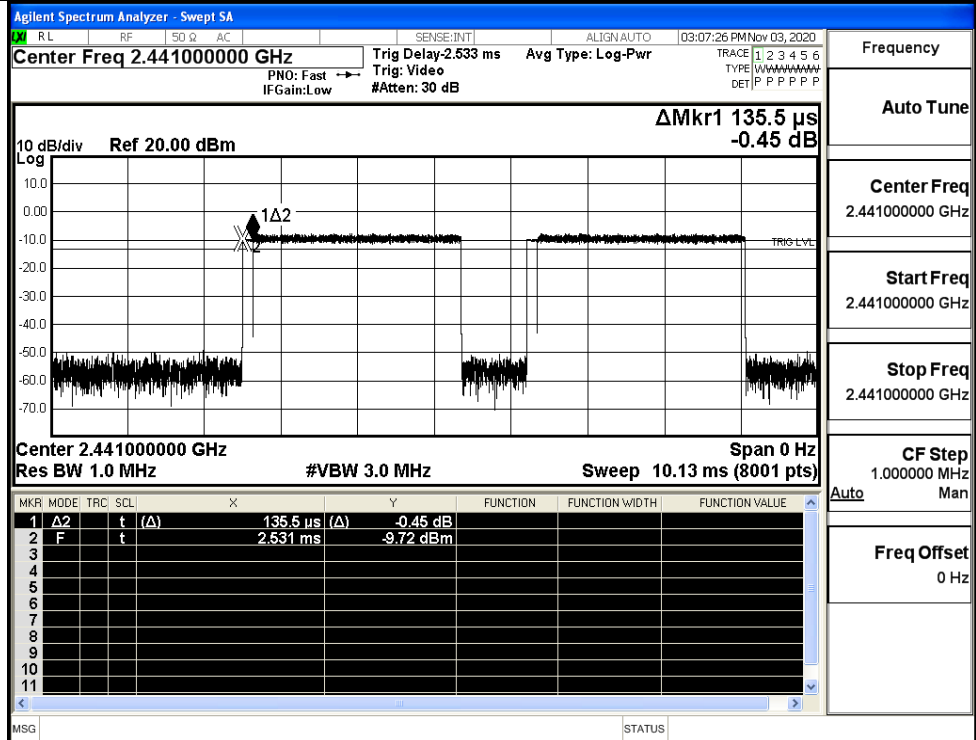


π /4DQPSK
_2DH5/LCH



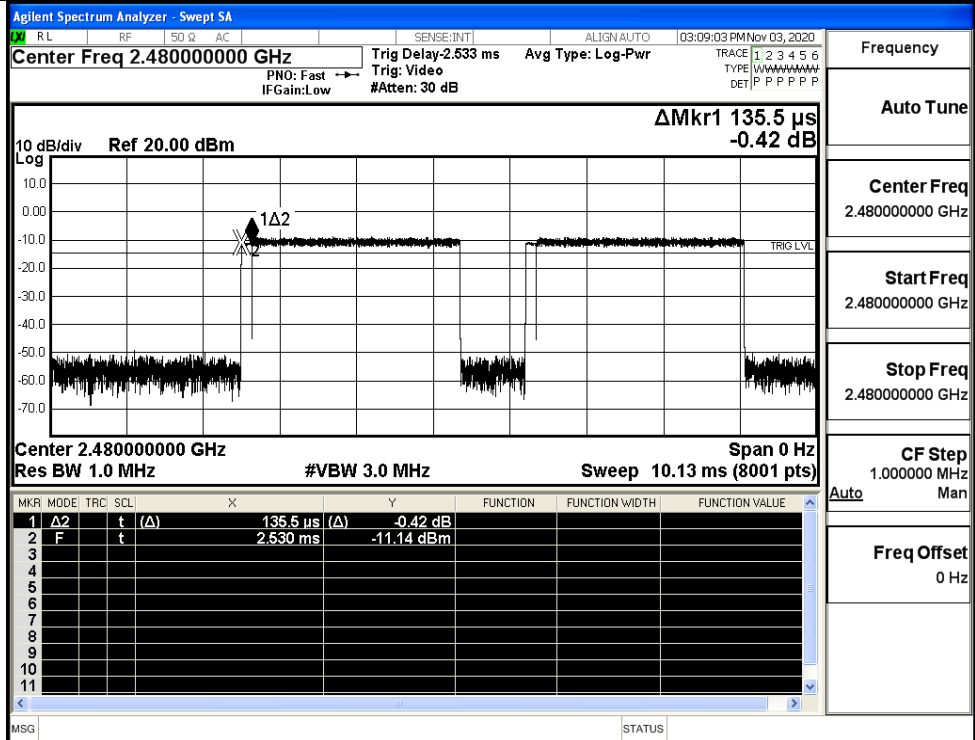
Frequency	2.402000000 GHz
Auto Tune	
Center Freq	2.402000000 GHz
Start Freq	2.402000000 GHz
Stop Freq	2.402000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

π /4DQPSK
_2DH5/MCH

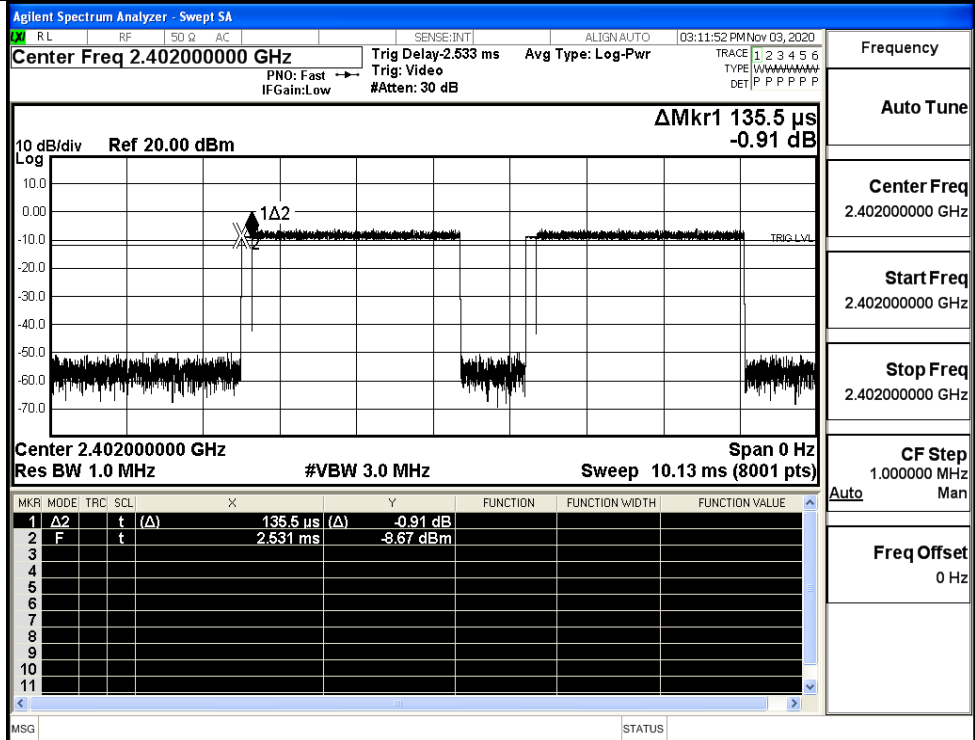


Frequency	2.441000000 GHz
Auto Tune	
Center Freq	2.441000000 GHz
Start Freq	2.441000000 GHz
Stop Freq	2.441000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

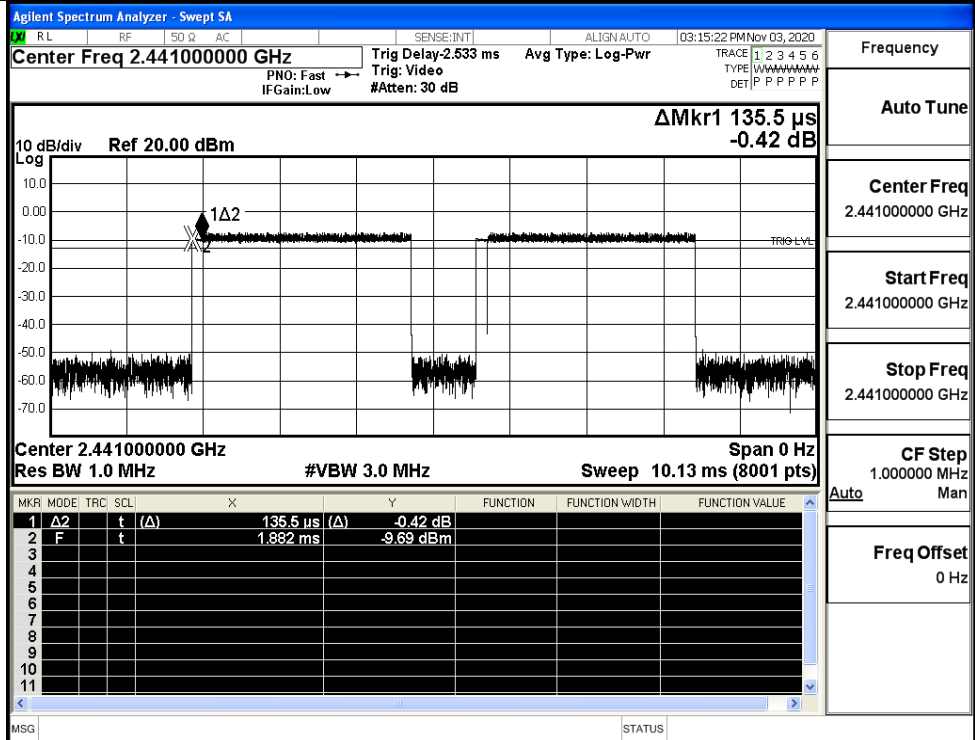
π /4DQPSK
_2DH5/HCH



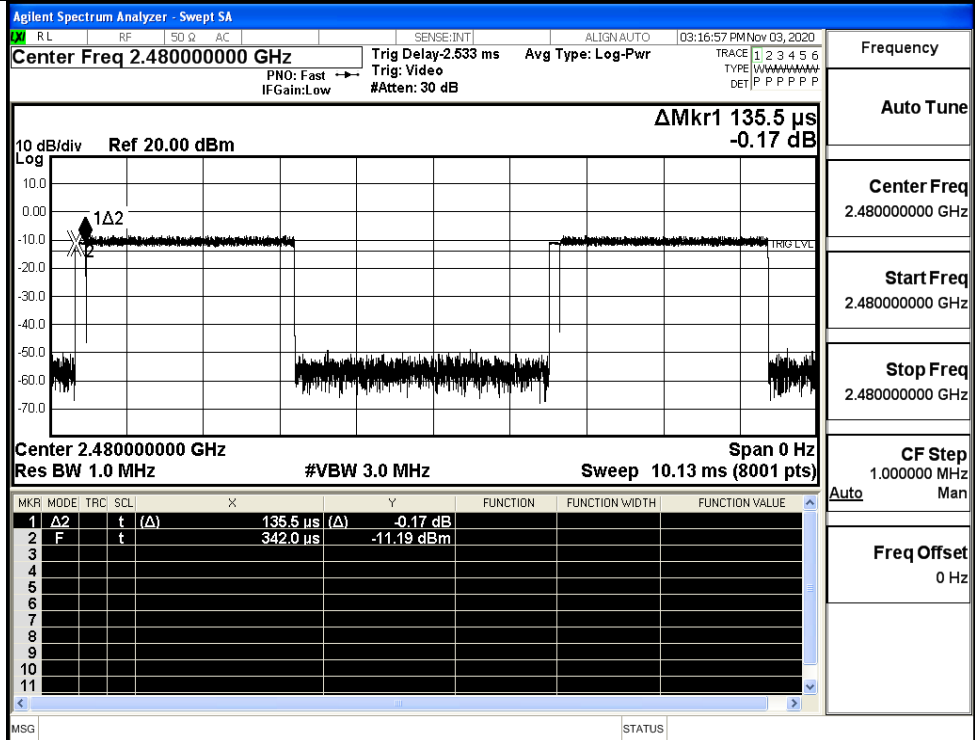
8DPSK_3DH5/LCH



8DPSK_3DH5/MCH



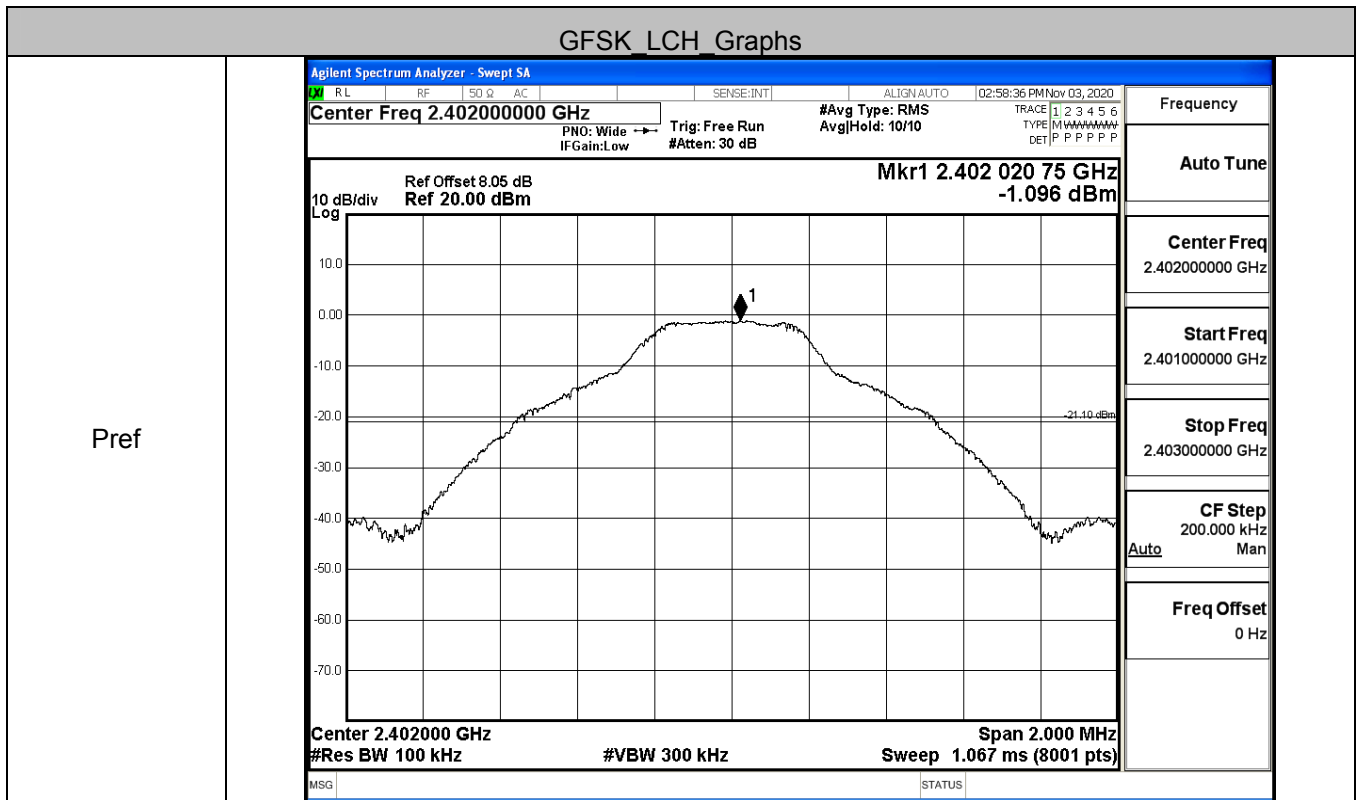
8DPSK_3DH5/HCH



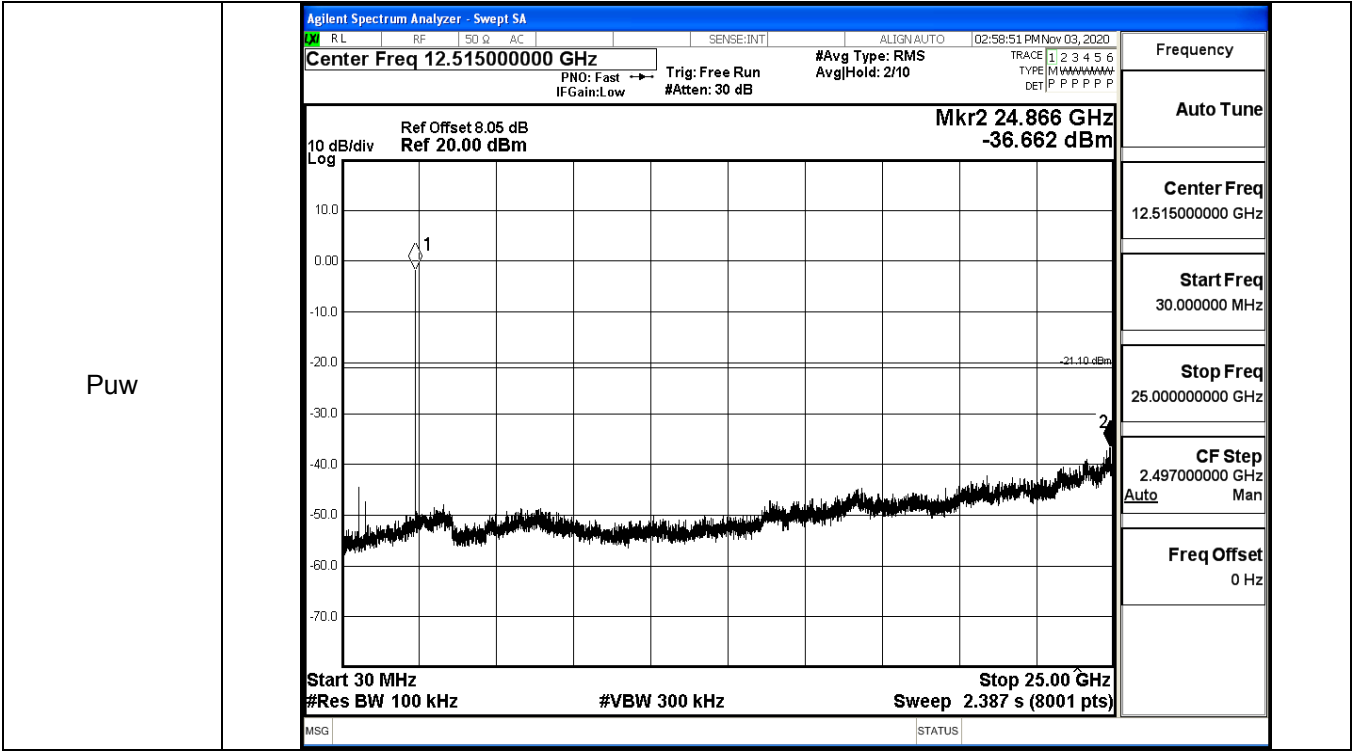
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-1.096	-36.662	-21.096	PASS
	MCH	-1.541	-37.878	-21.541	PASS
	HCH	-3.204	-36.451	-23.204	PASS
π /4DQPSK	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

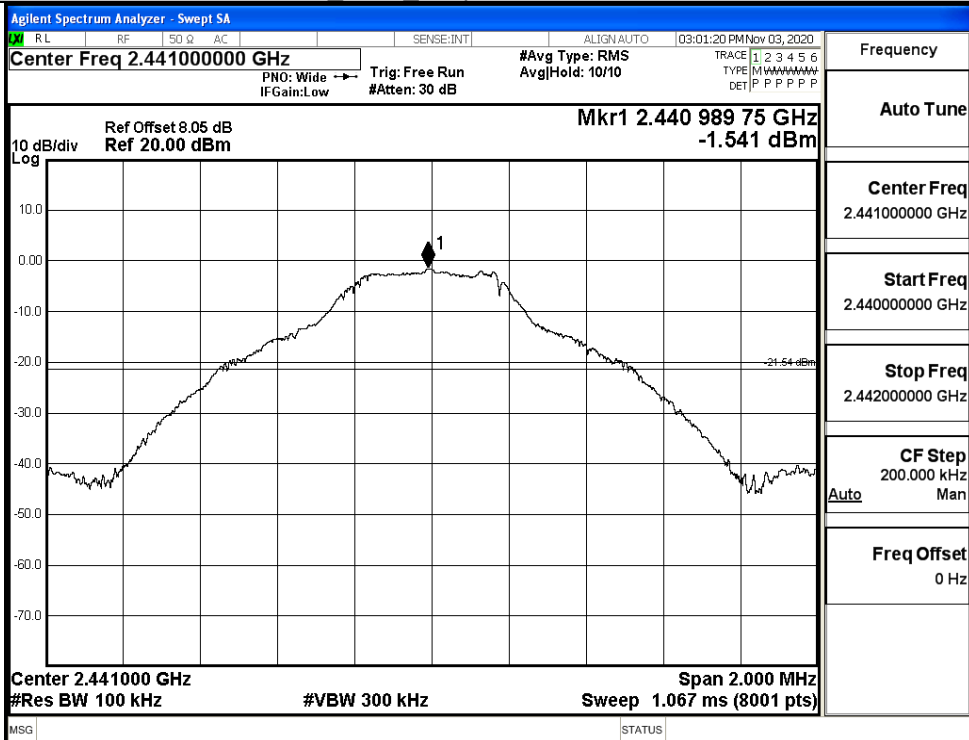


Pref

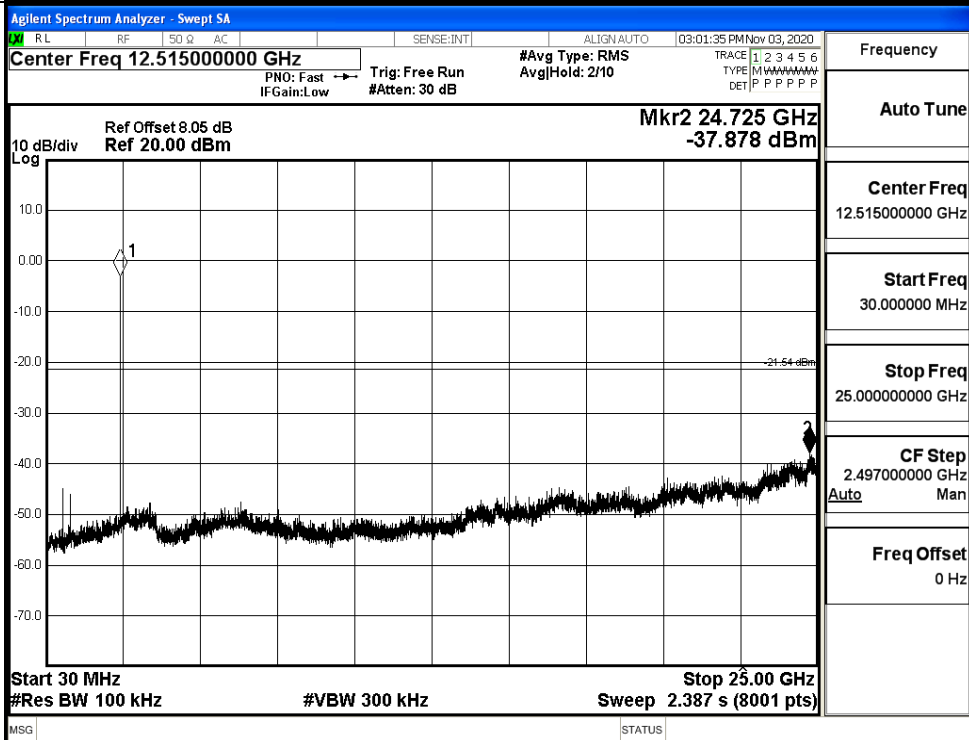


GFSK_MCH_Graphs

Pref

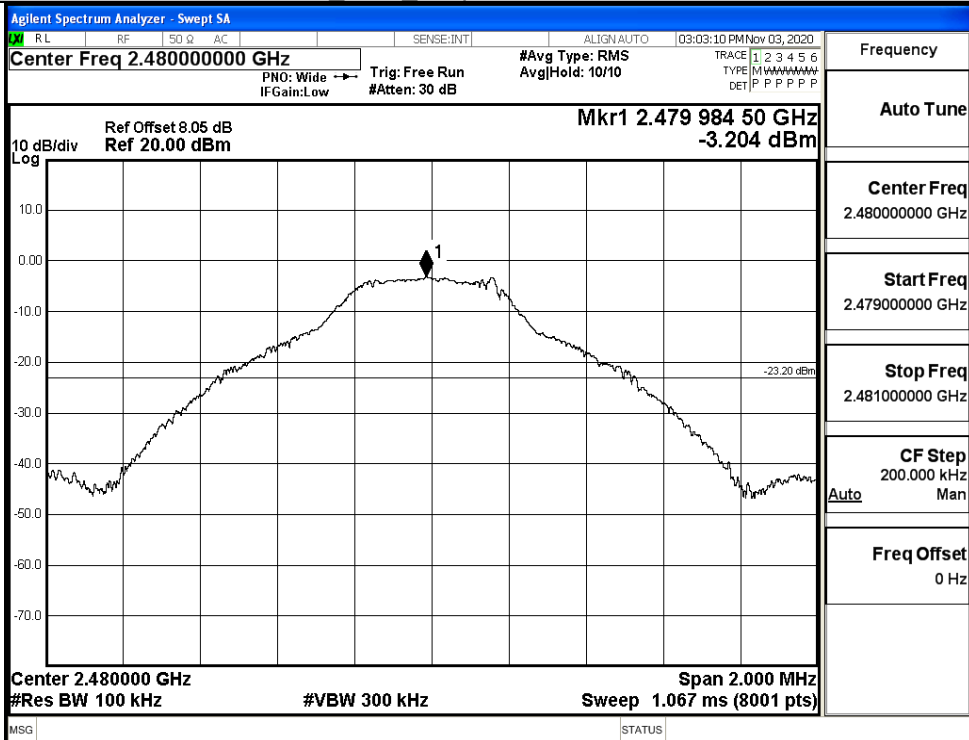


Puw

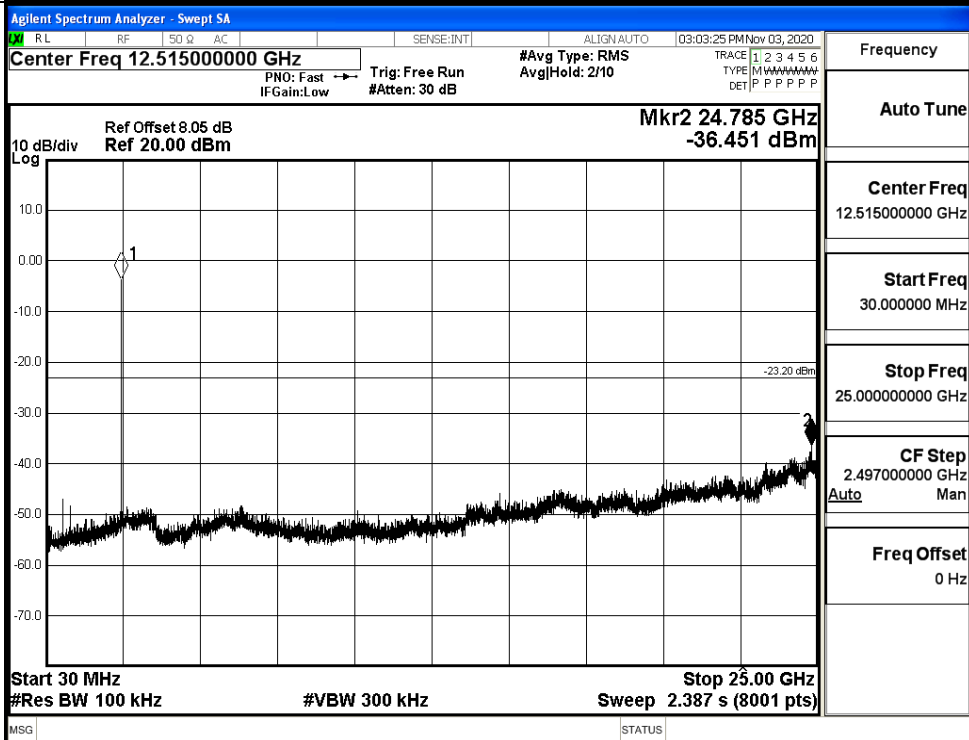


GFSK_HCH_Graphs

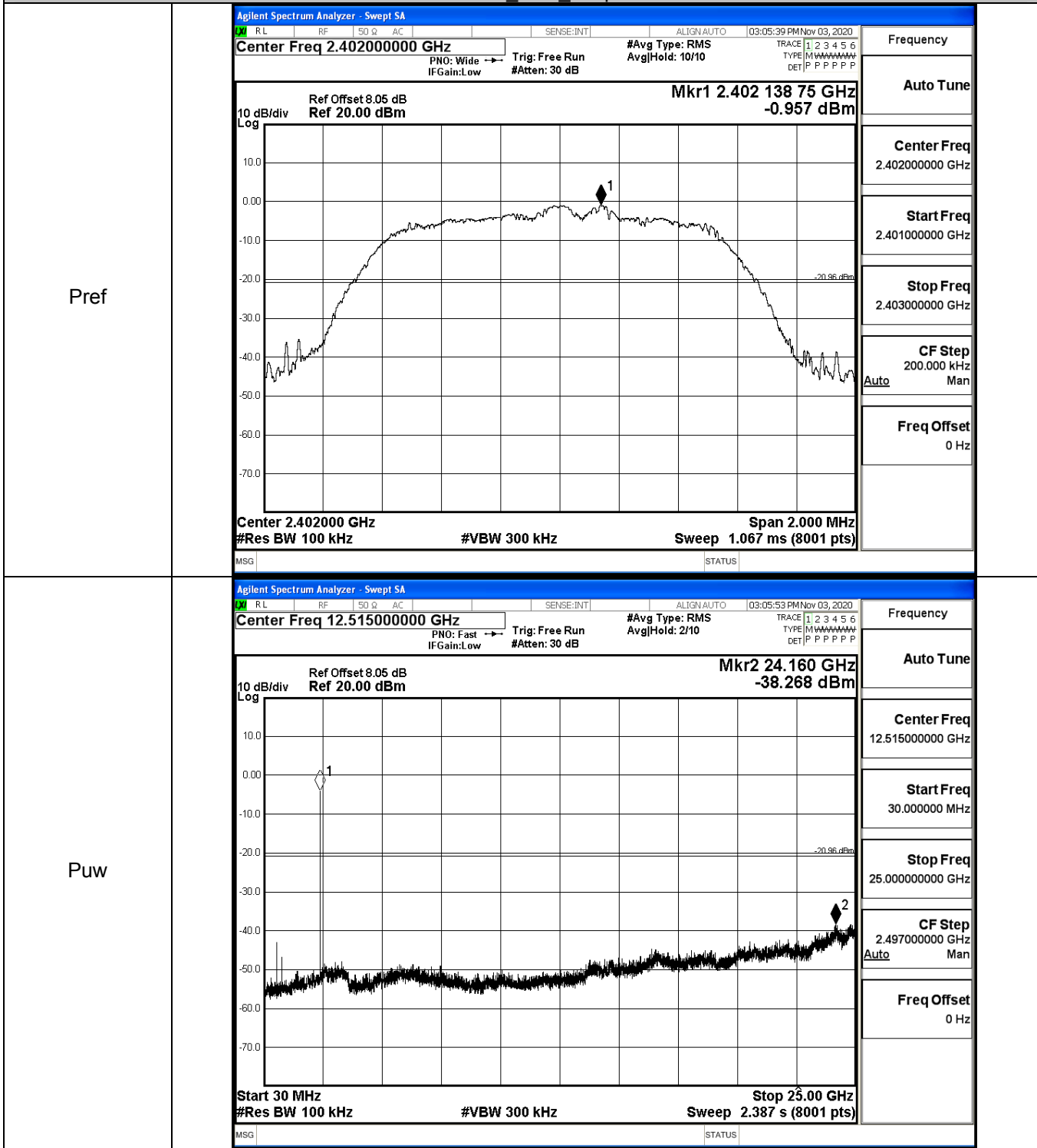
Pref



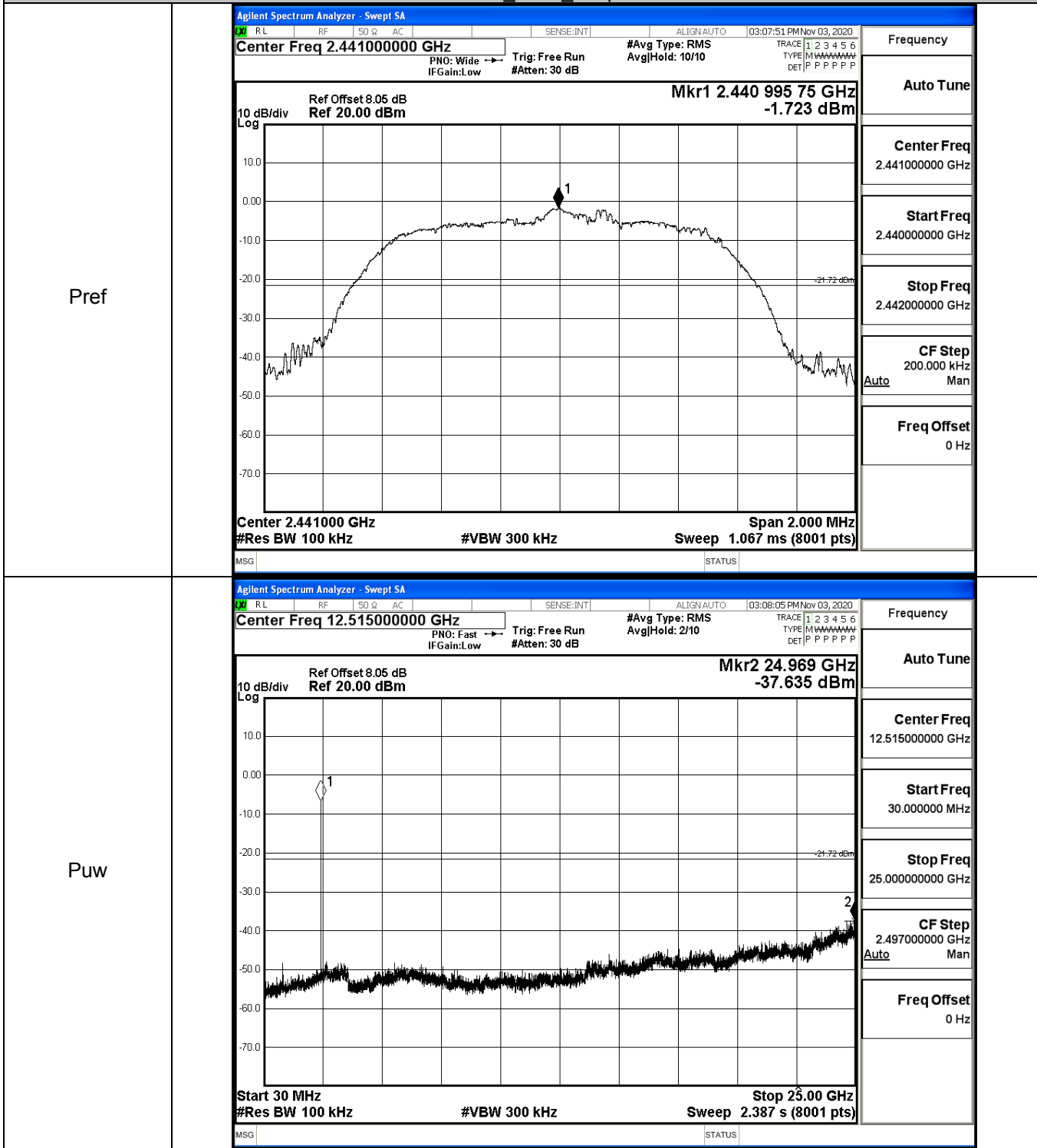
Puw



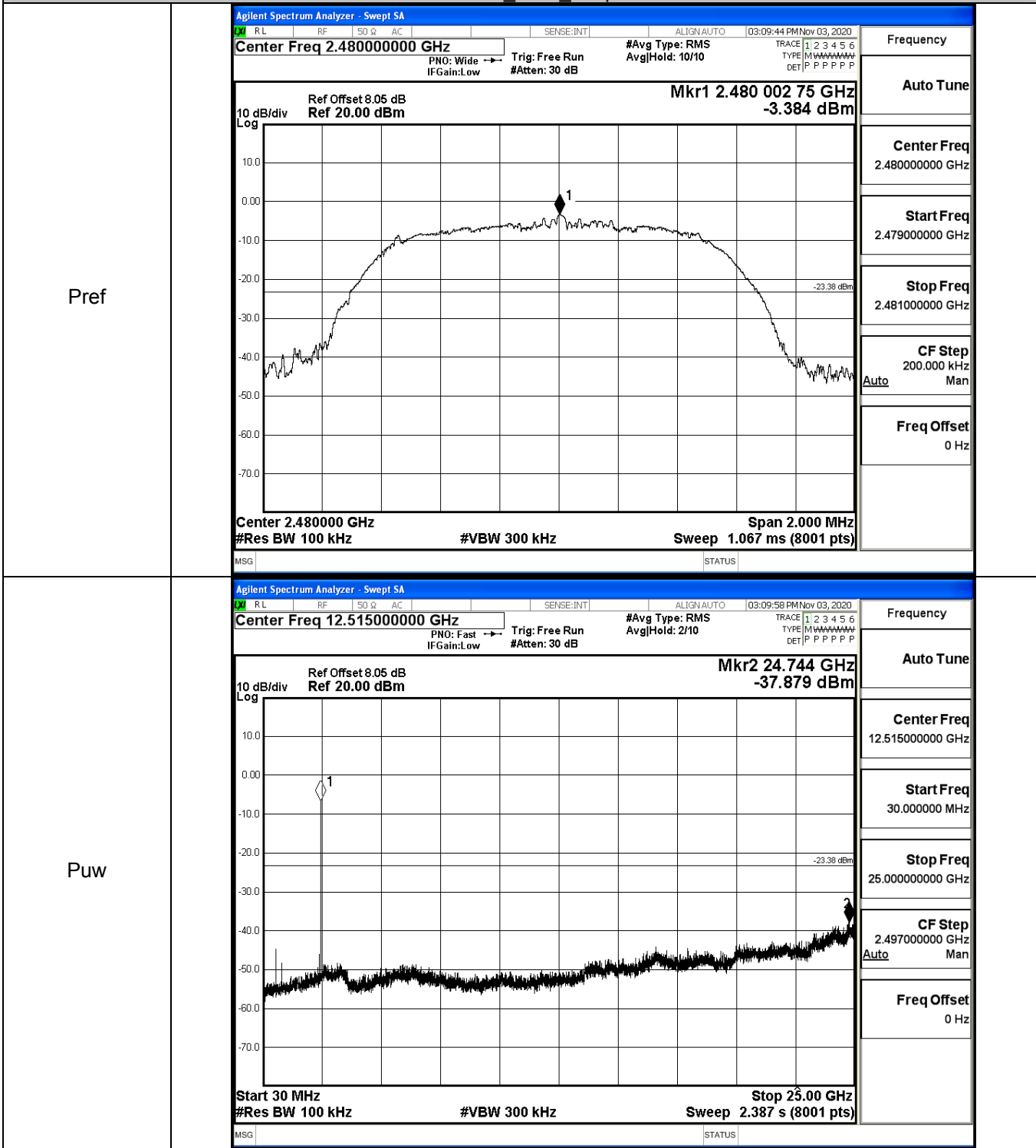
$\pi/4$ DQPSK_LCH_Graphs



$\pi/4$ DQPSK_MCH_Graphs

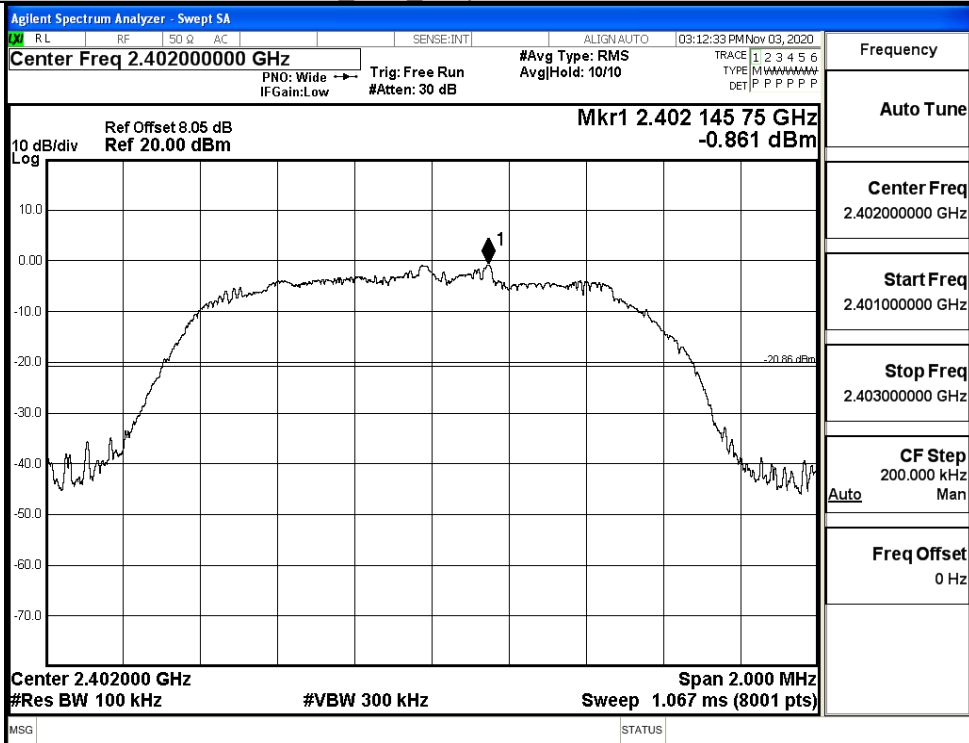


$\pi/4$ DQPSK_HCH_Graphs

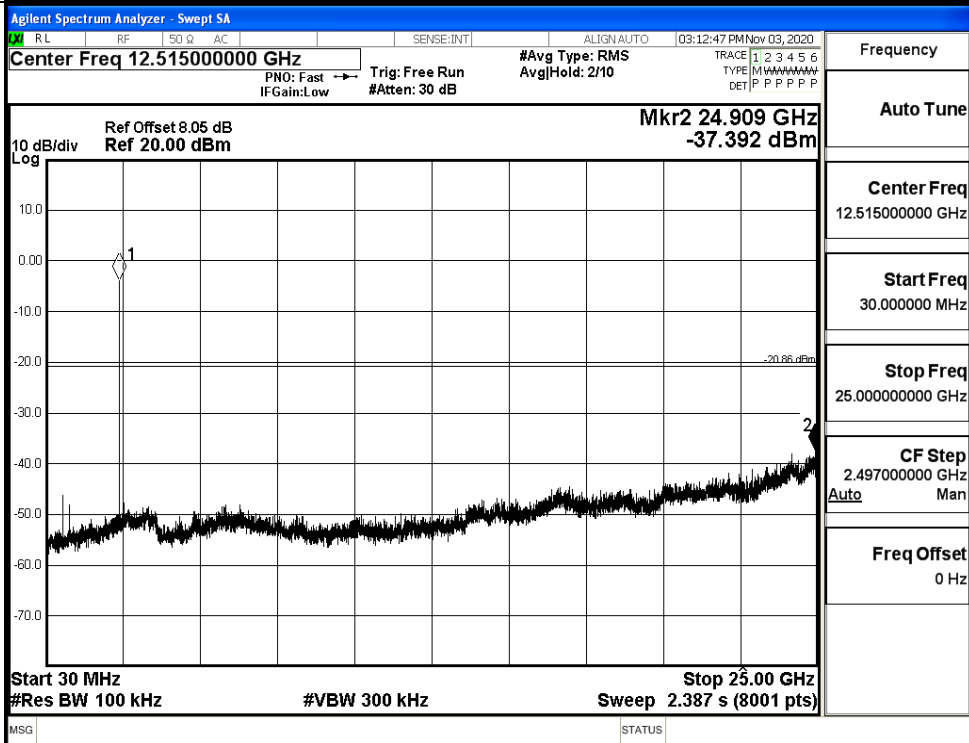


8DPSK_LCH_Graphs

Pref

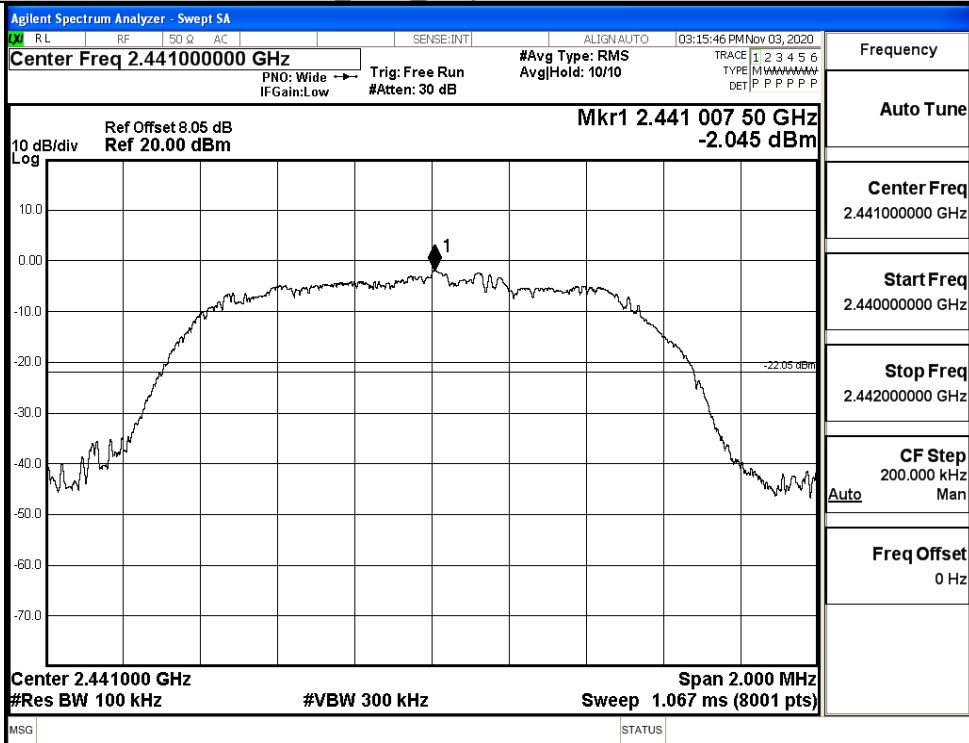


Puw

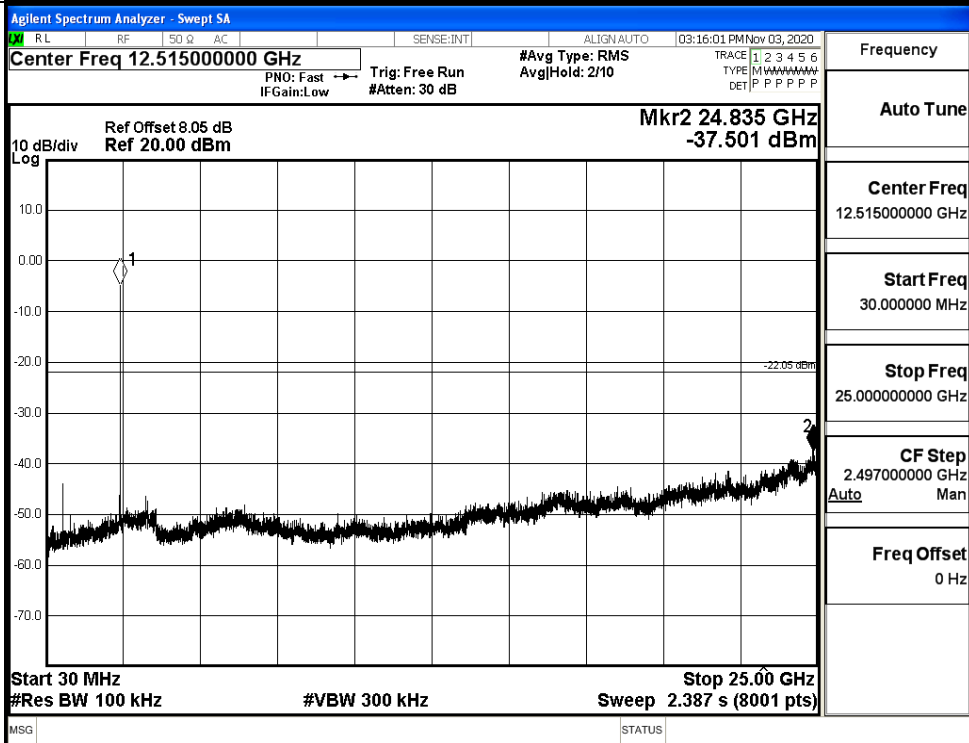


8DPSK_MCH_Graphs

Pref

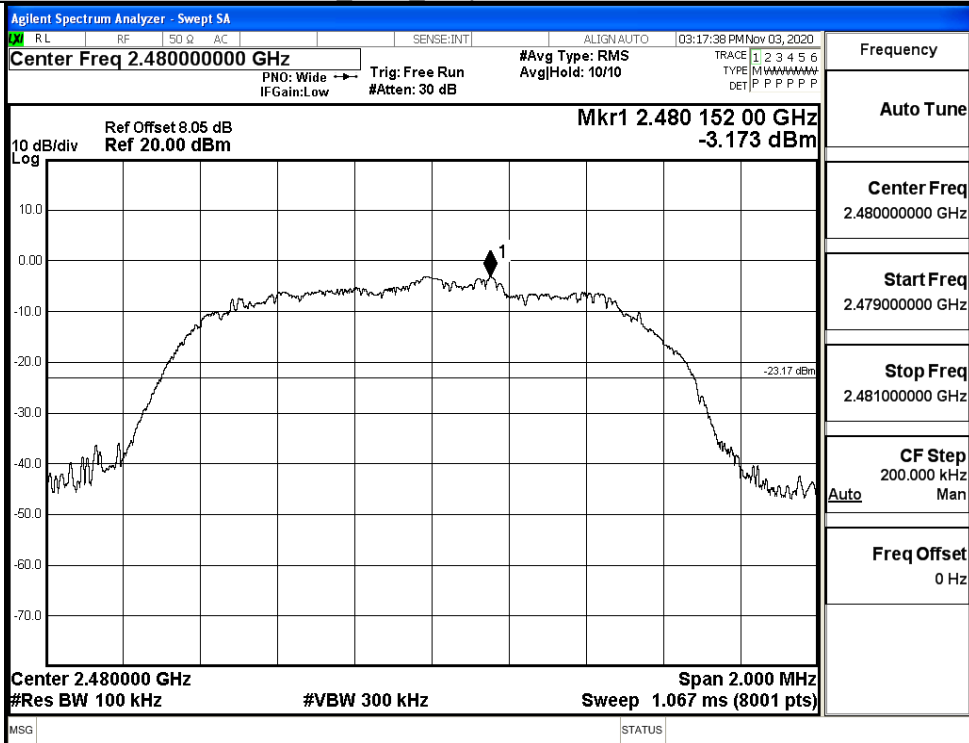


Puw

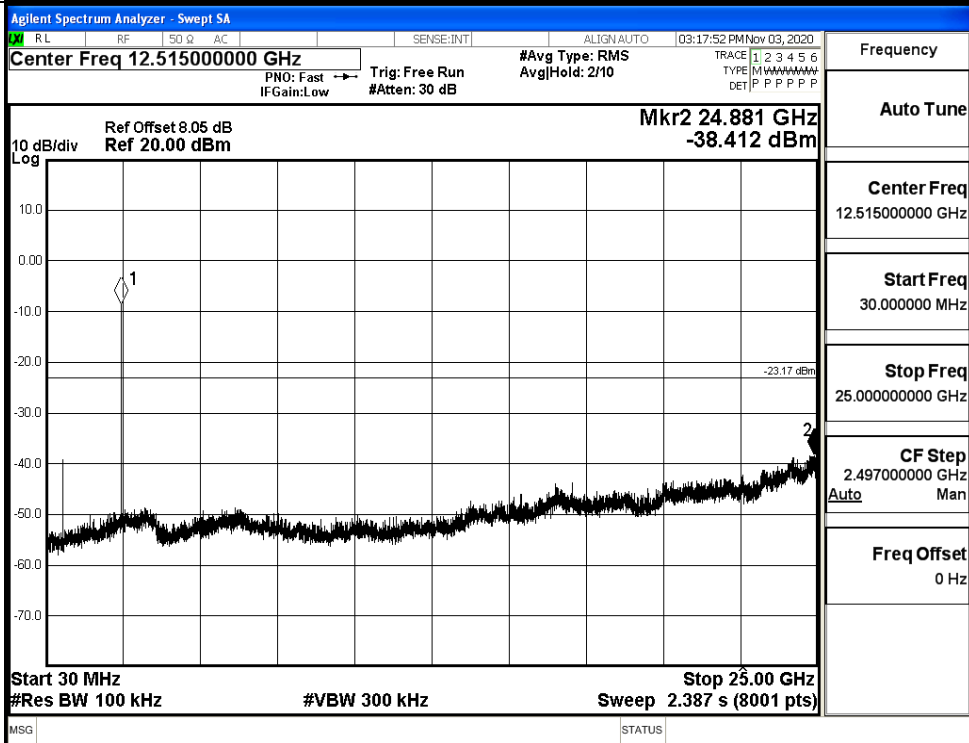


8DPSK_HCH_Graphs

Pref



Puw

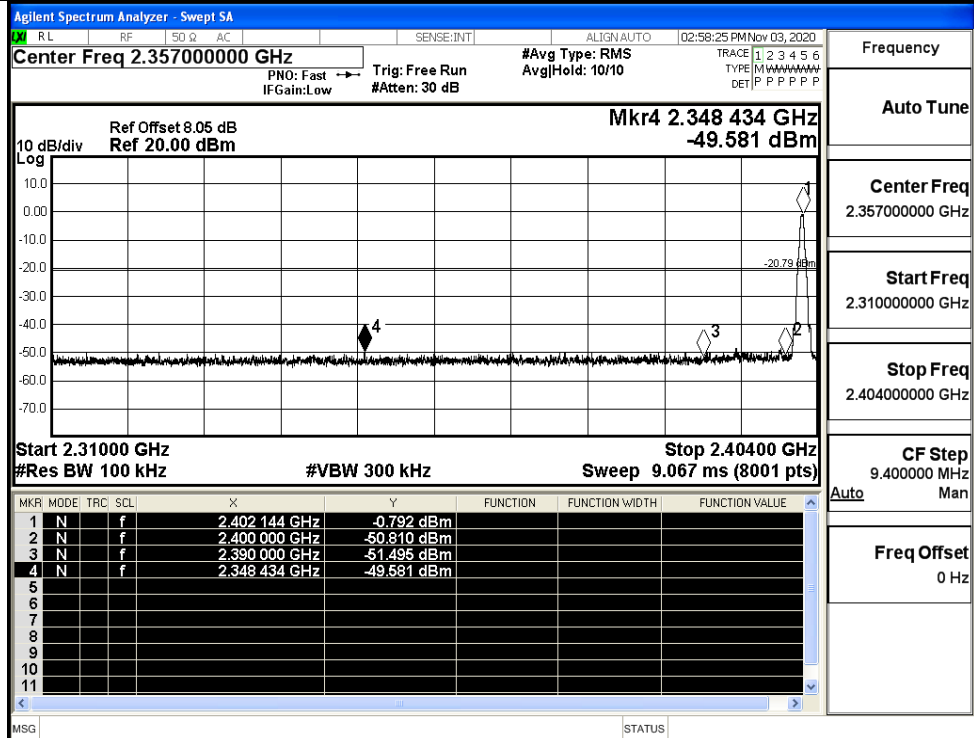


A.7 Band-edge for RF Conducted Emissions

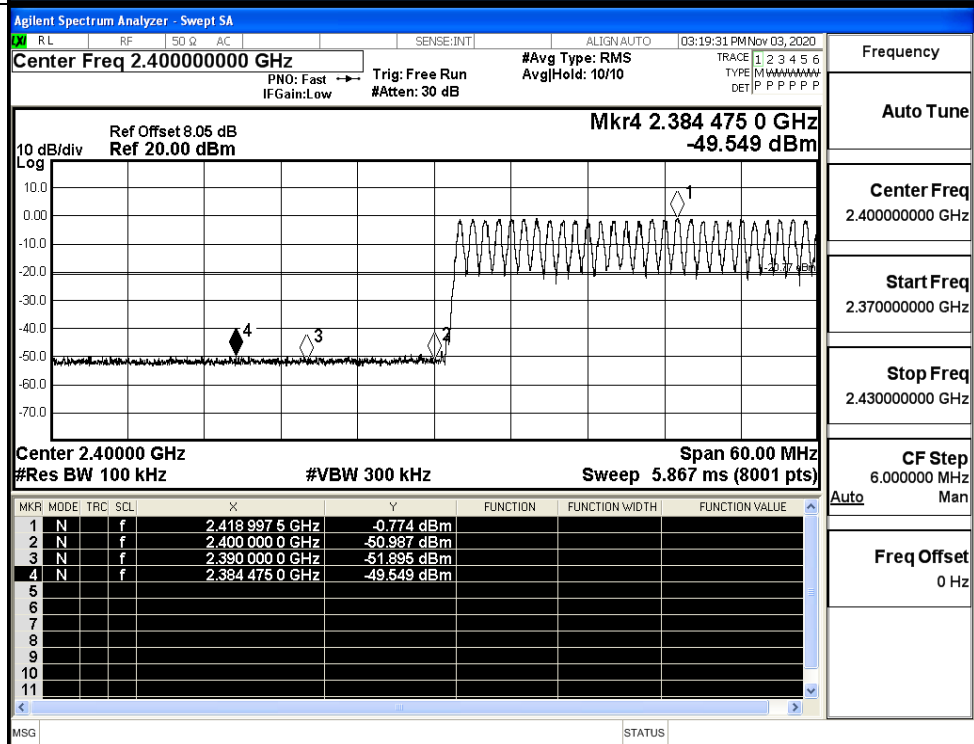
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-0.792	Off	-49.581	-20.79	PASS
			-0.774	On	-49.549	-20.77	PASS
	HCH	2480	-2.992	Off	-48.500	-22.99	PASS
			-2.330	On	-48.796	-22.33	PASS
$\pi/4$ DQPSK	LCH	2402	-2.585	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

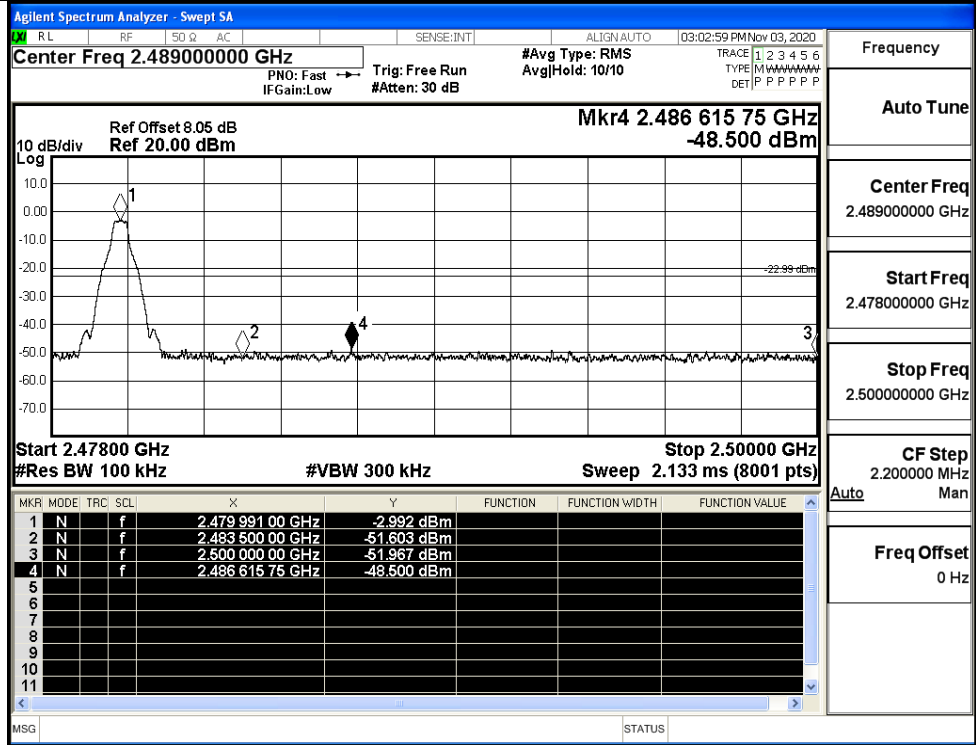
GFSK/LCH/No Hop



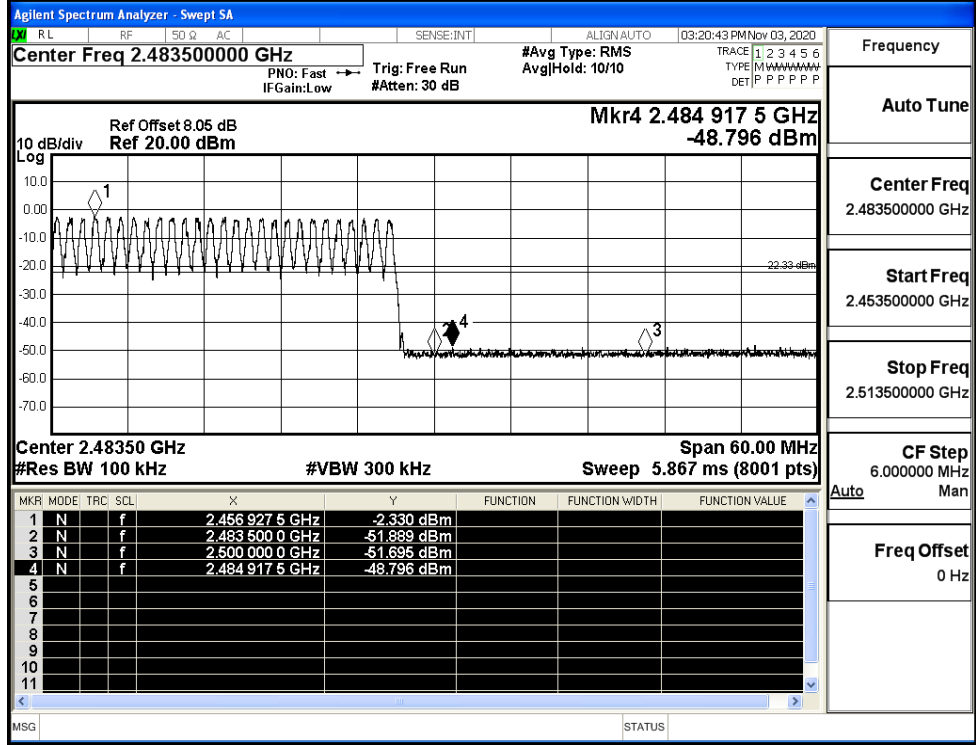
GFSK/LCH/Hop



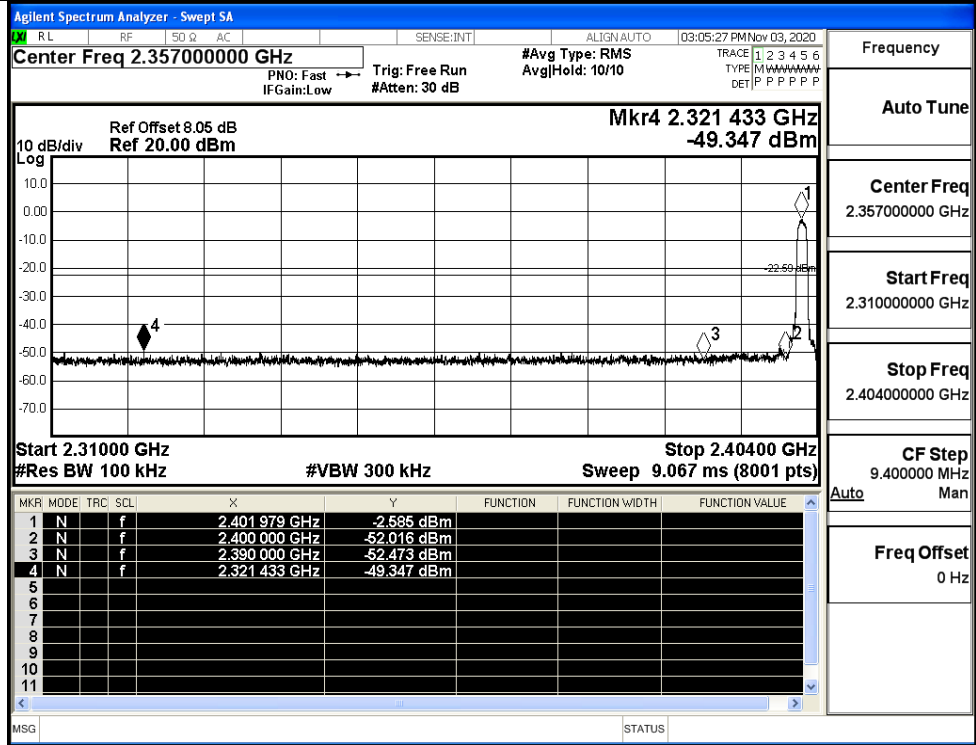
GFSK/HCH/No Hop



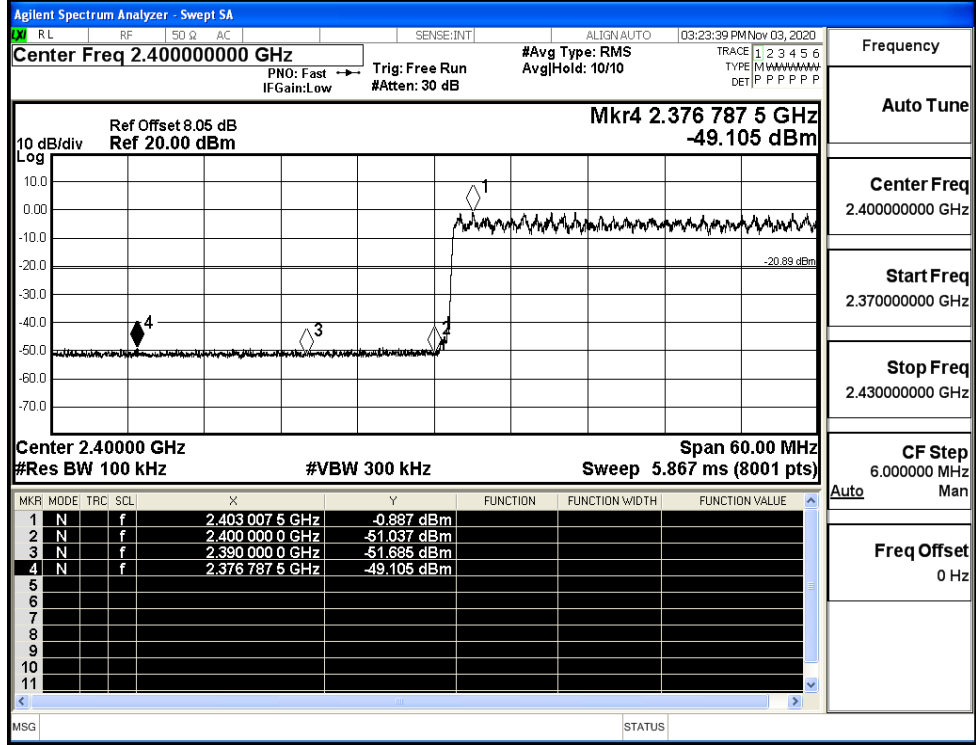
GFSK/HCH/Hop



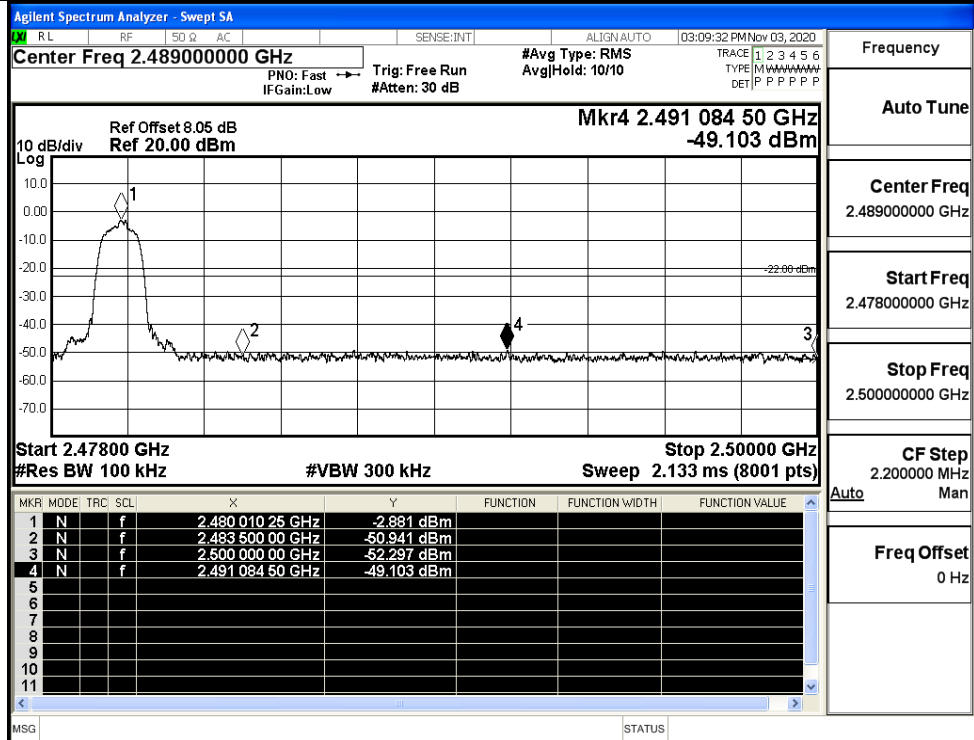
$\pi/4$ DQPSK/LCH/No Hop



$\pi/4$ DQPSK/LCH/Hop

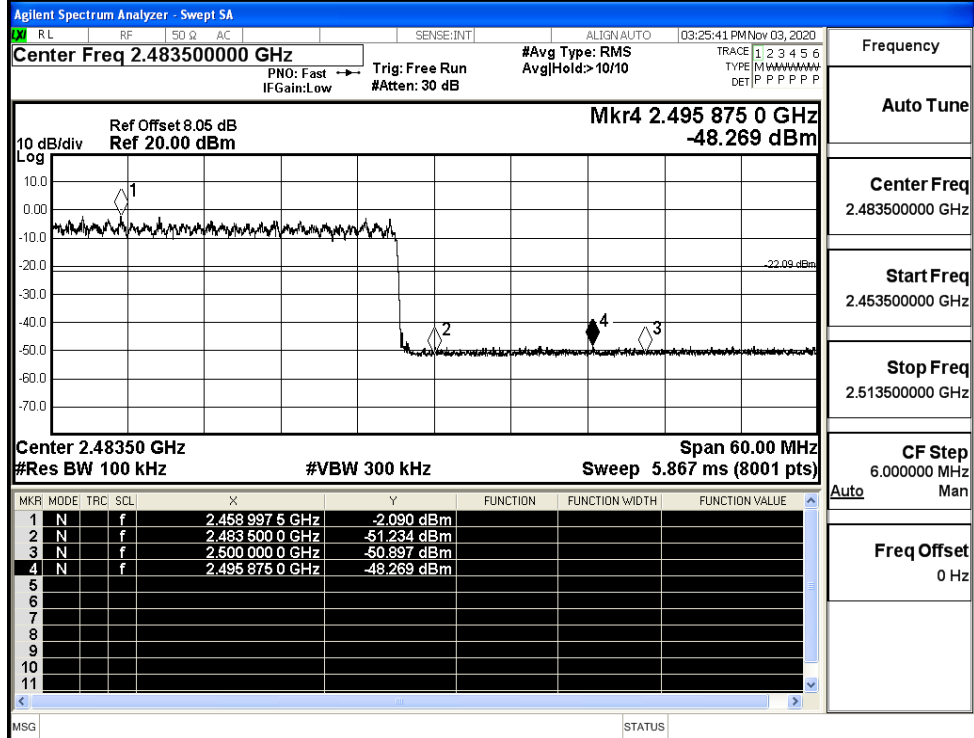


π /4DQPSK/HCH/No
Hop



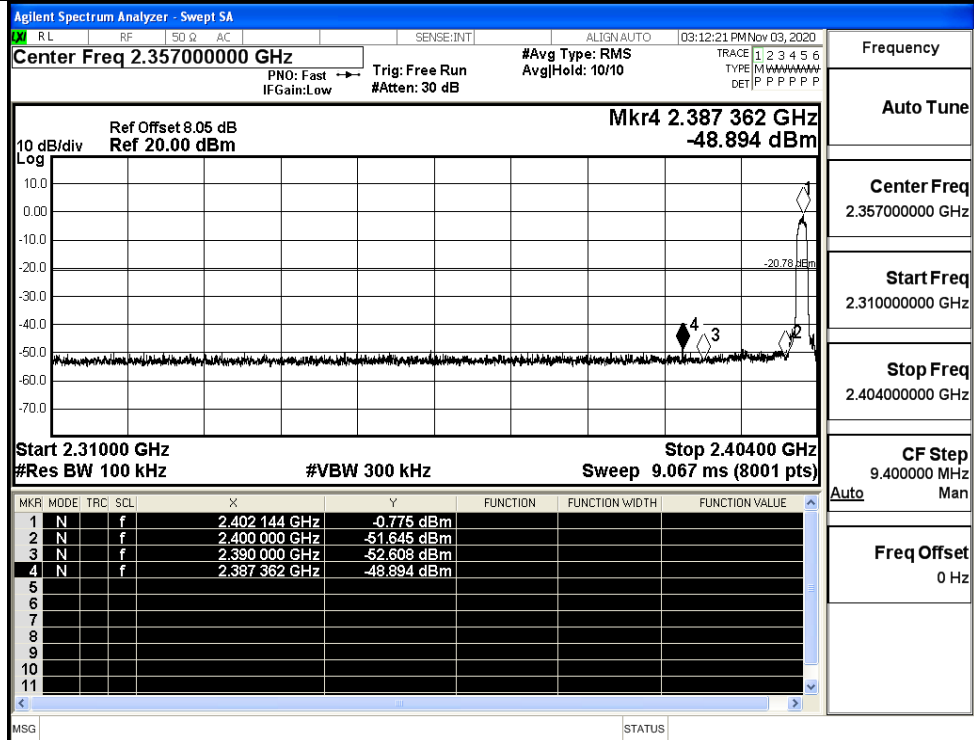
Frequency	2.489000000 GHz
Auto Tune	
Center Freq	2.489000000 GHz
Start Freq	2.478000000 GHz
Stop Freq	2.500000000 GHz
CF Step	2.200000 MHz
Freq Offset	0 Hz

π /4DQPSK/HCH/Hop



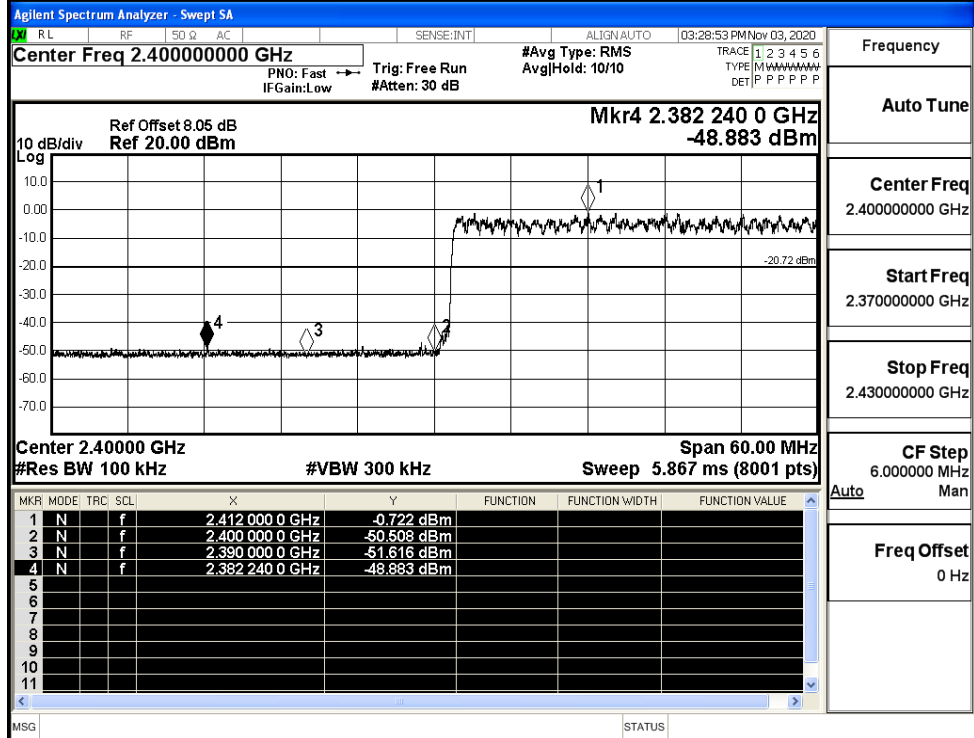
Frequency	2.483500000 GHz
Auto Tune	
Center Freq	2.483500000 GHz
Start Freq	2.453500000 GHz
Stop Freq	2.513500000 GHz
CF Step	6.000000 MHz
Freq Offset	0 Hz

8DPSK/LCH/No Hop



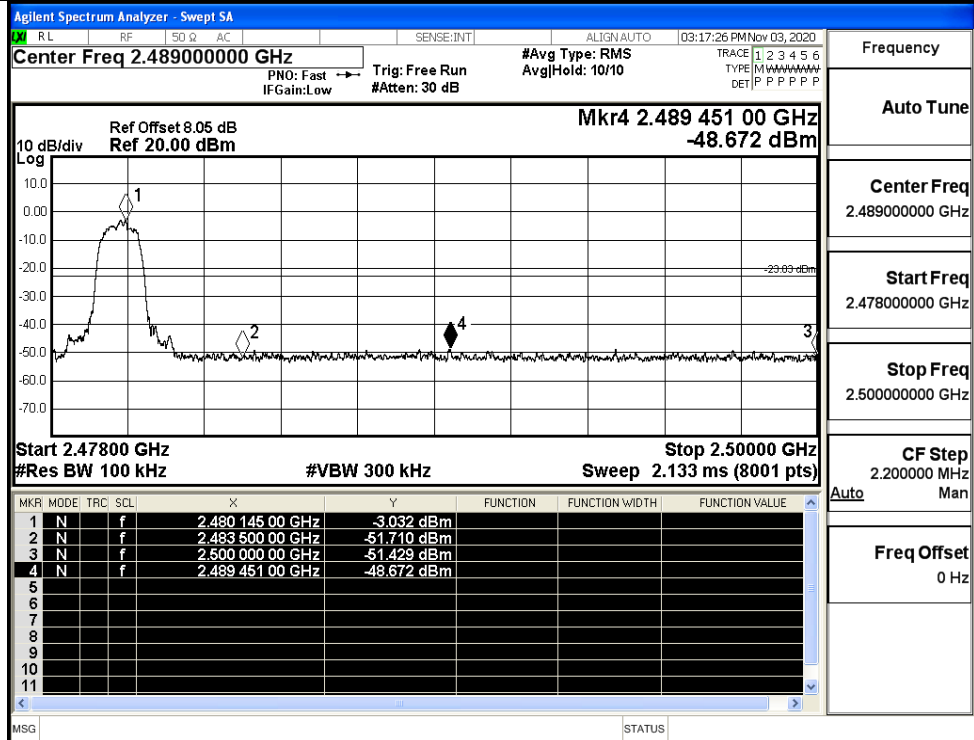
Frequency
Auto Tune
Center Freq
2.357000000 GHz
Start Freq
2.310000000 GHz
Stop Freq
2.404000000 GHz
CF Step
9.400000 MHz
Auto Man
Freq Offset
0 Hz

8DPSK/LCH/Hop



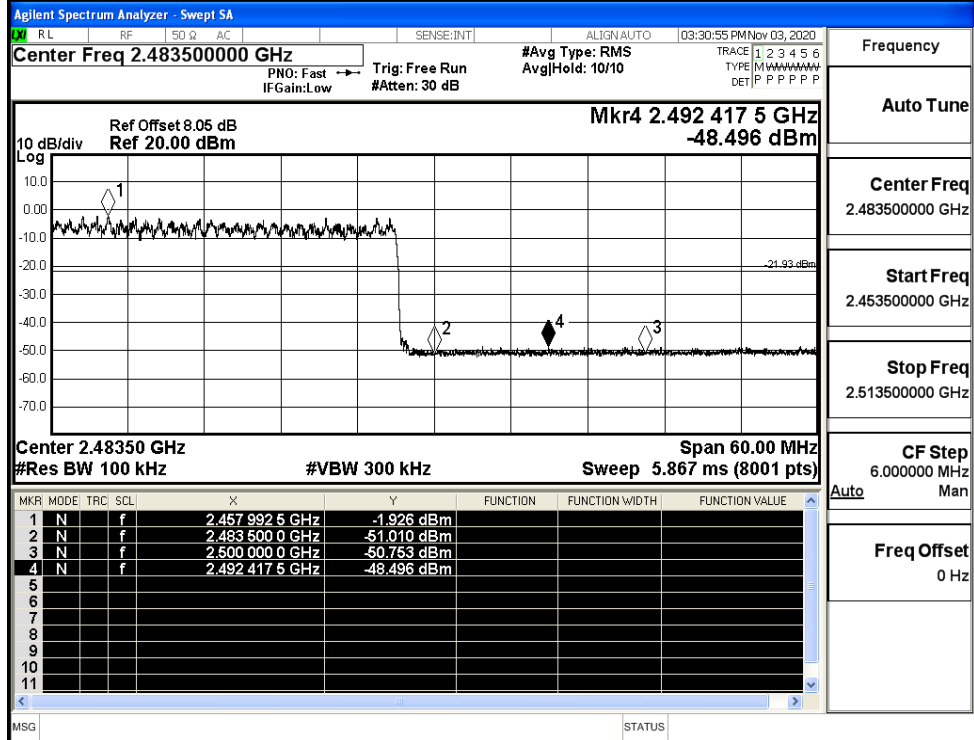
Frequency
Auto Tune
Center Freq
2.400000000 GHz
Start Freq
2.370000000 GHz
Stop Freq
2.430000000 GHz
CF Step
6.000000 MHz
Auto Man
Freq Offset
0 Hz

8DPSK/HCH/No Hop



Frequency	2.489000000 GHz
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

8DPSK/HCH/Hop

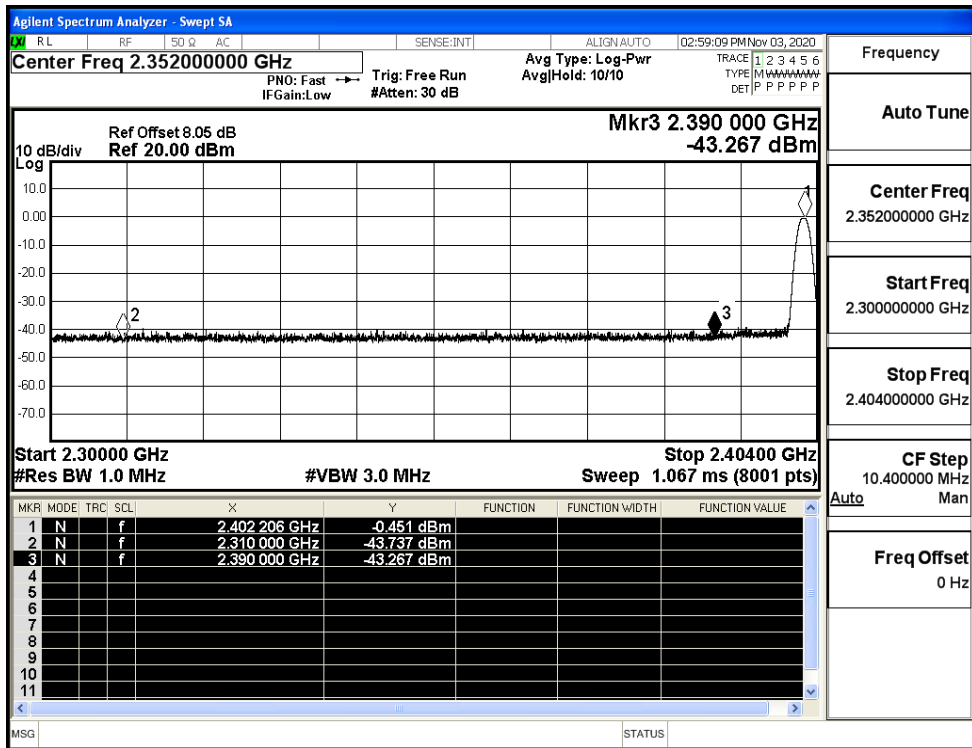


Frequency	2.483500000 GHz
Auto Tune	
Center Freq	2.483500000 GHz
Start Freq	2.453500000 GHz
Stop Freq	2.513500000 GHz
CF Step	6.000000 MHz
Freq Offset	0 Hz

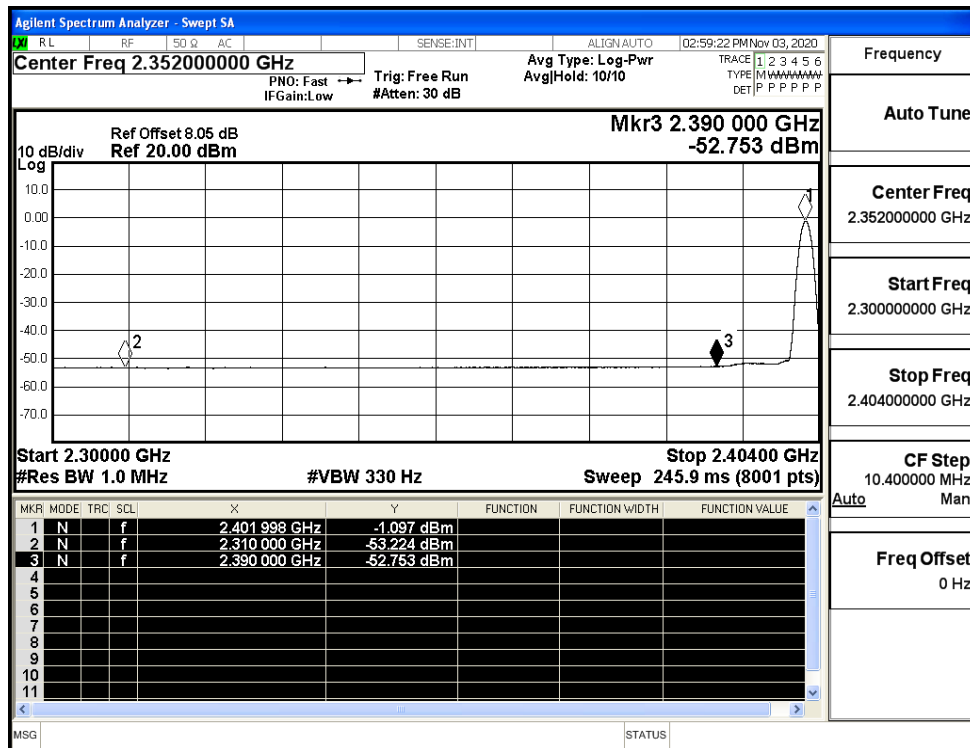
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-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

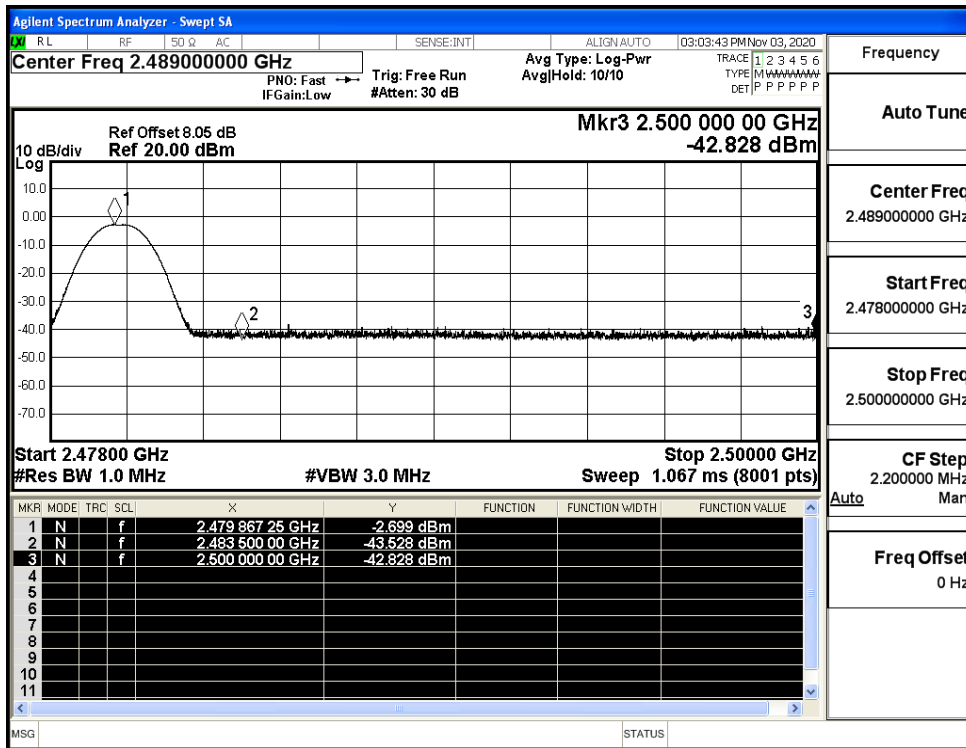
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



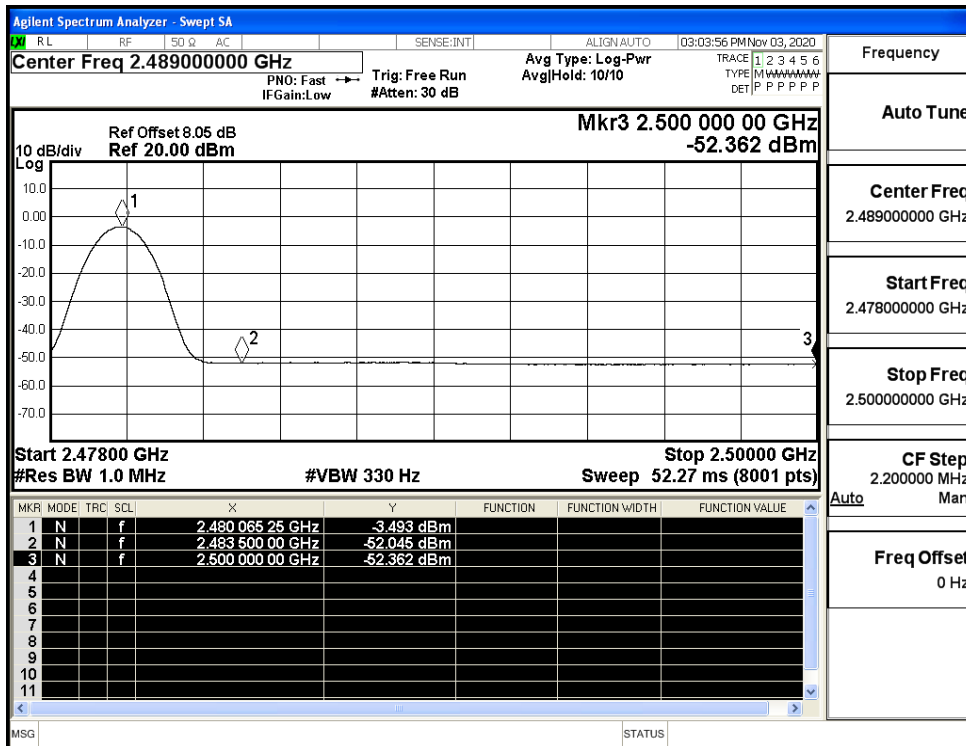
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



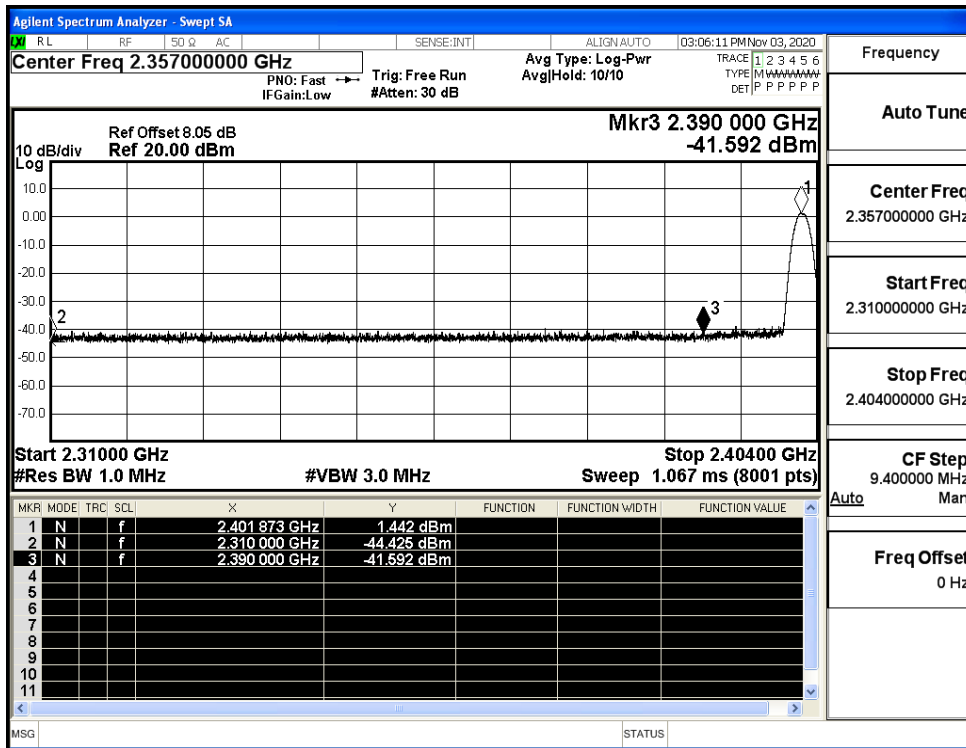
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



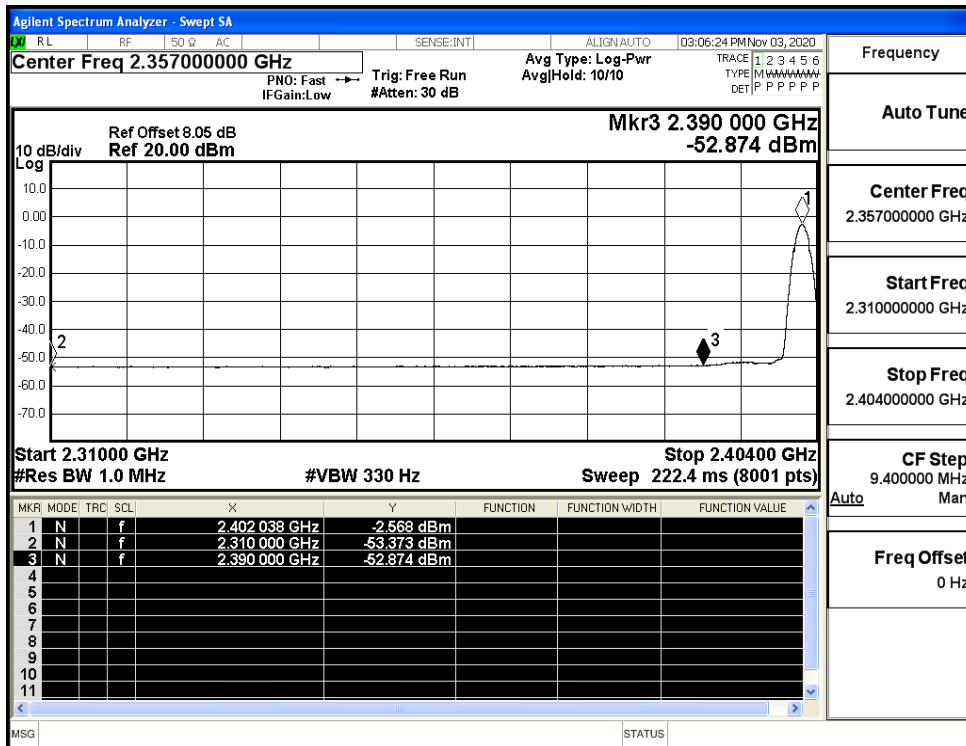
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



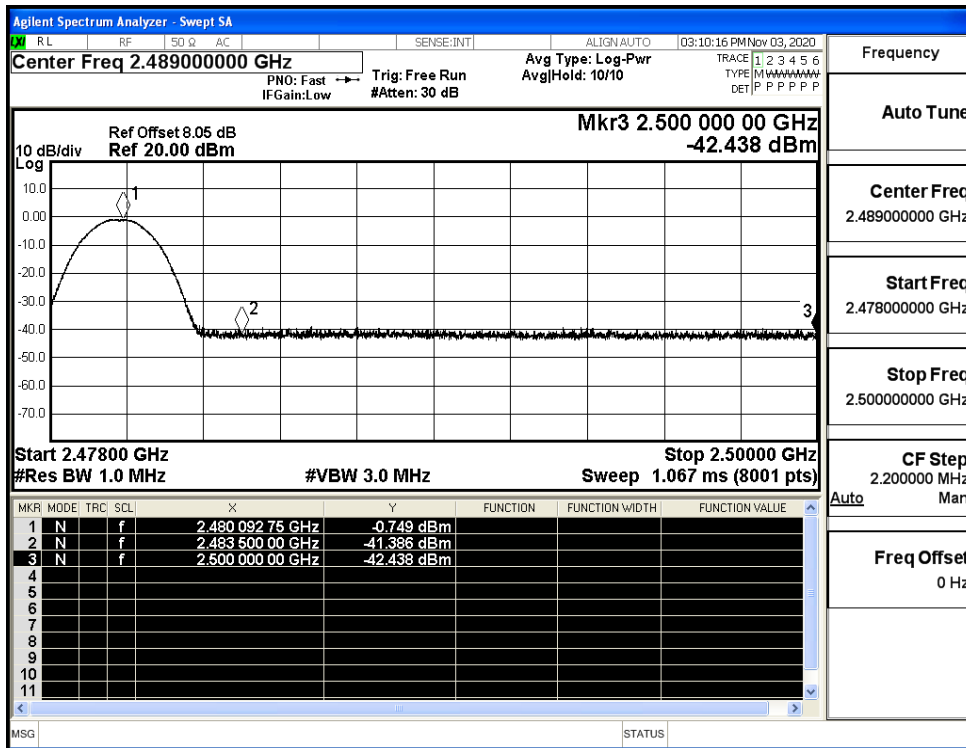
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)



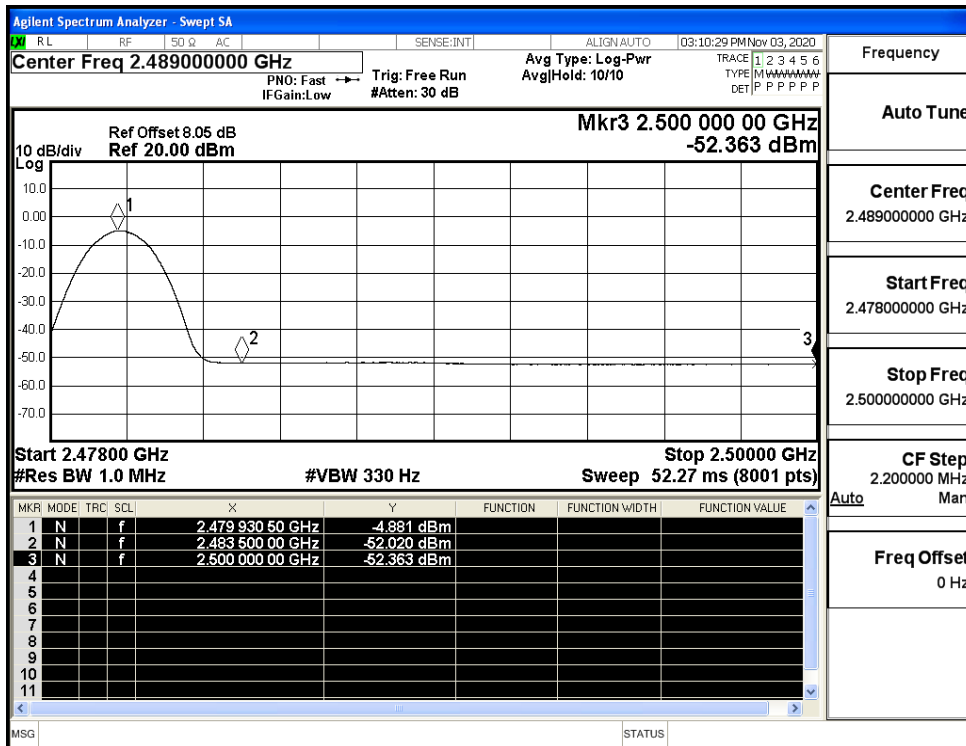
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)



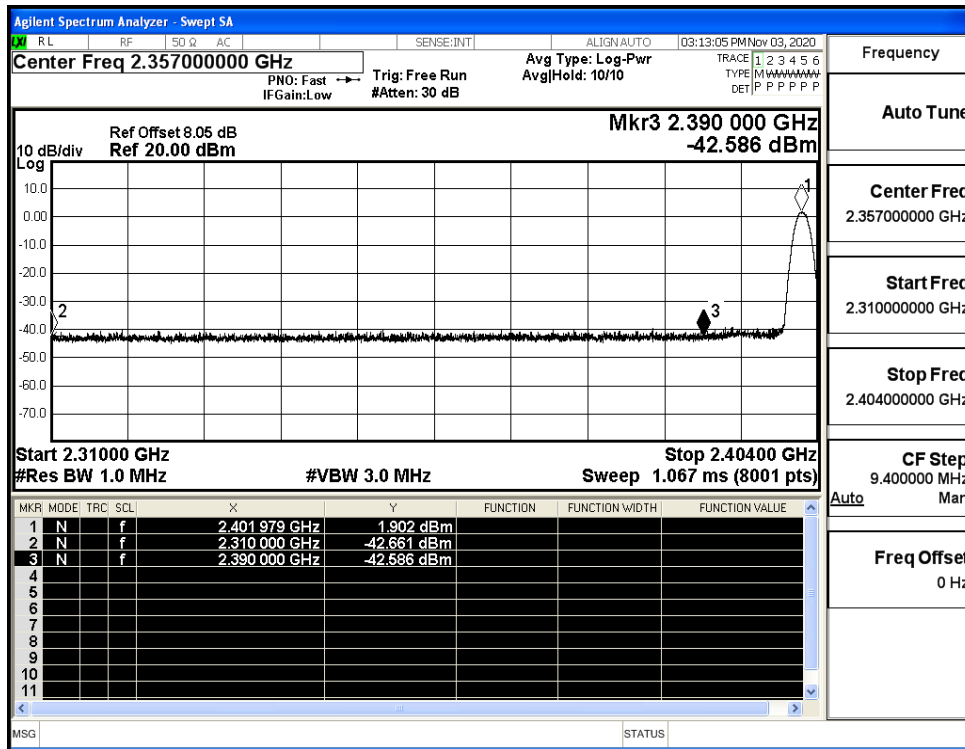
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



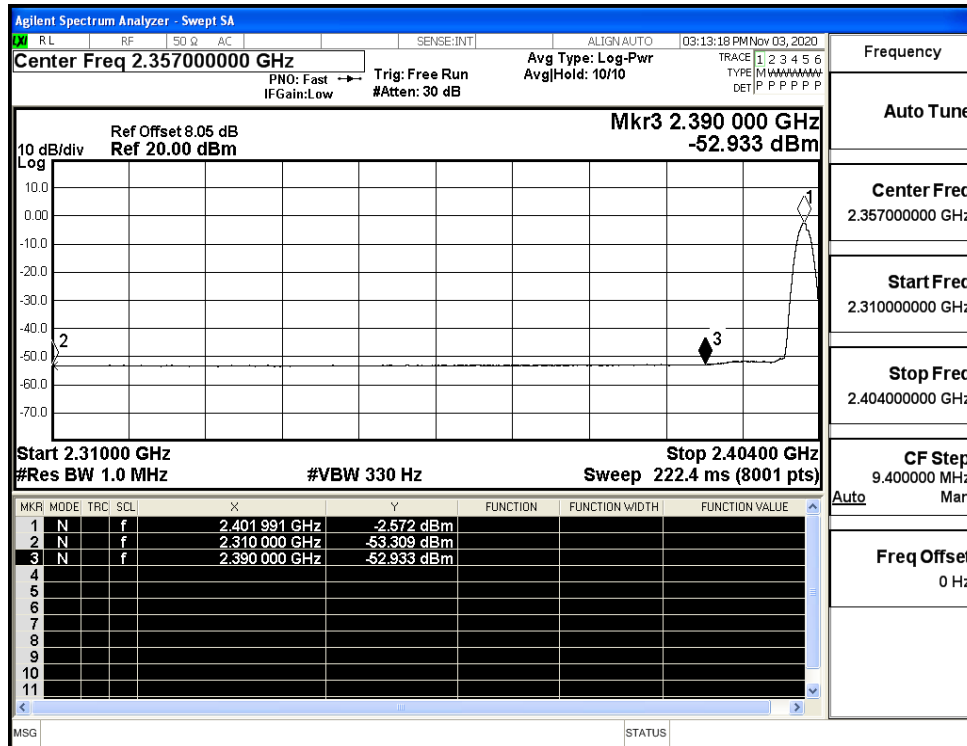
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



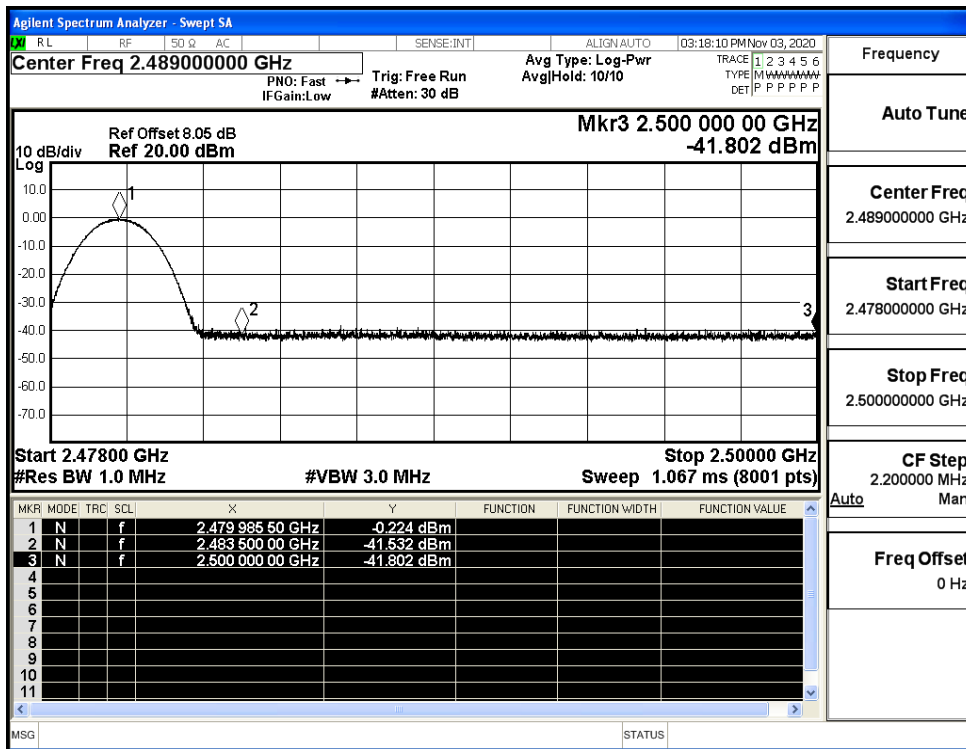
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

