

Appendix A

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

Product Name: Orbit TWS Earbud w/Wireless Charging Case

Trade Mark: Gemline

Test Model: 100499-001B

Environmental Conditions

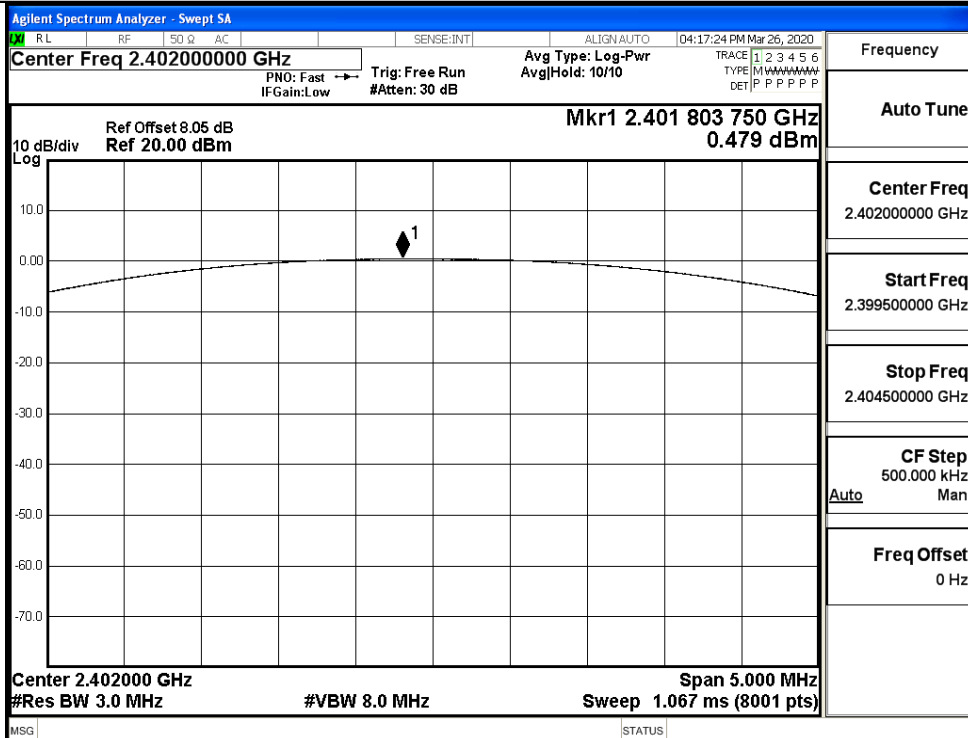
Temperature:	23.3 ° C
Relative Humidity:	53.3%
ATM Pressure:	100.0 kPa
Test Engineer:	David.Luo
Supervised by:	Wang Chuang

A.1 Maximum Conducted Peak Output Power

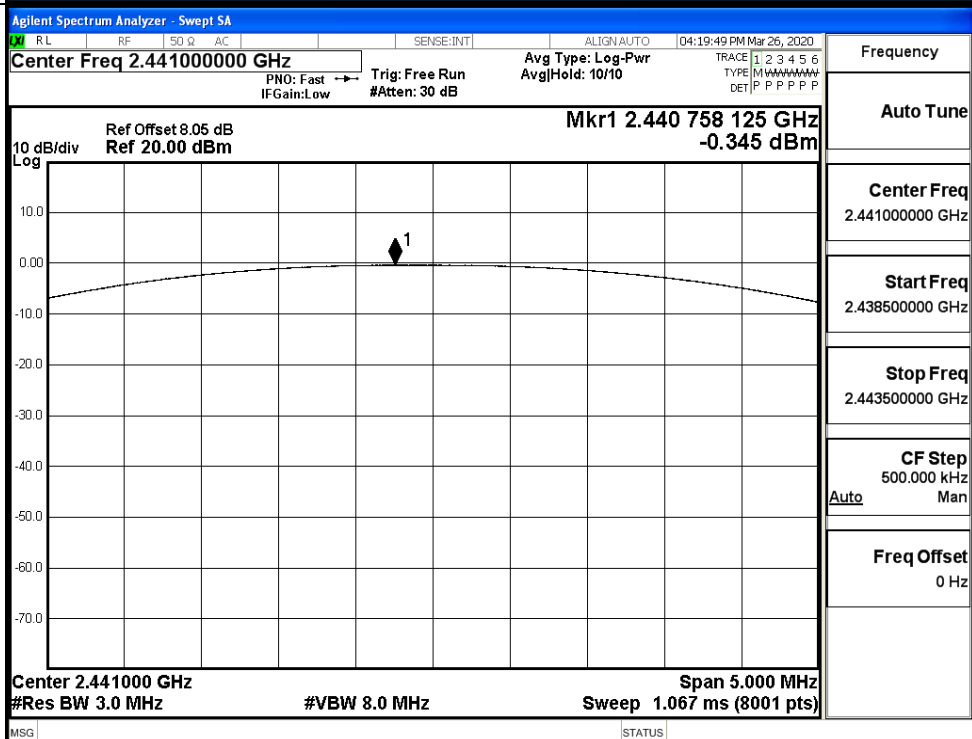
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	0.479	21	PASS
	MCH	-0.345	21	PASS
	HCH	-1.677	21	PASS
$\pi/4$ DQPSK	LCH	-0.749	21	PASS
	MCH	-1.559	21	PASS
	HCH	-2.918	21	PASS
8DPSK	LCH	-0.172	21	PASS
	MCH	-1.002	21	PASS
	HCH	-2.294	21	PASS

Test Graphs

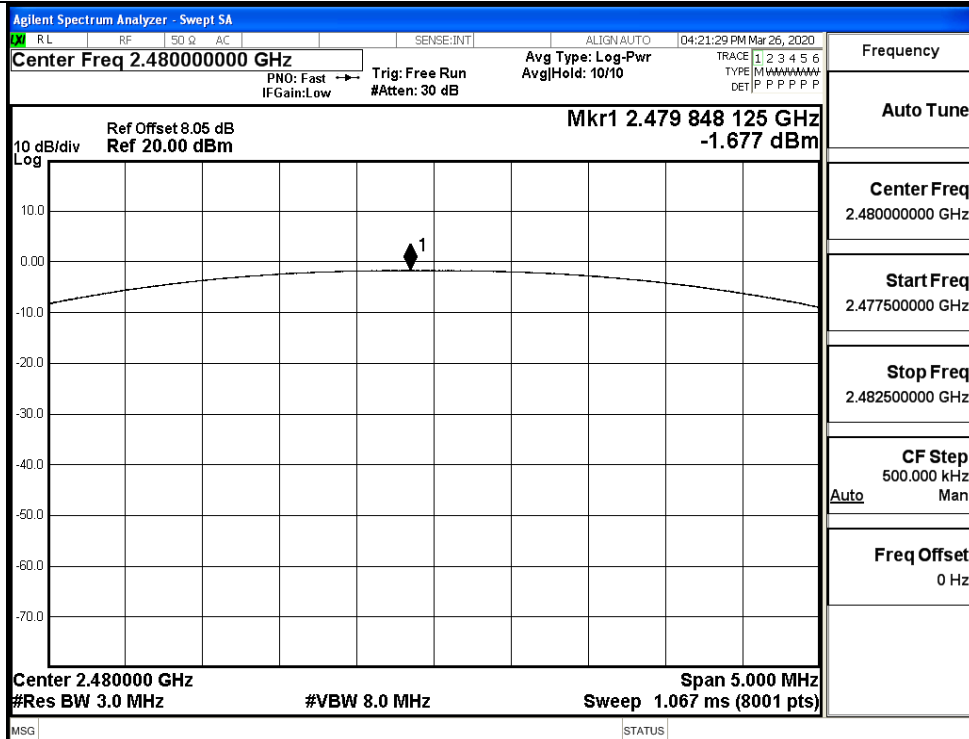
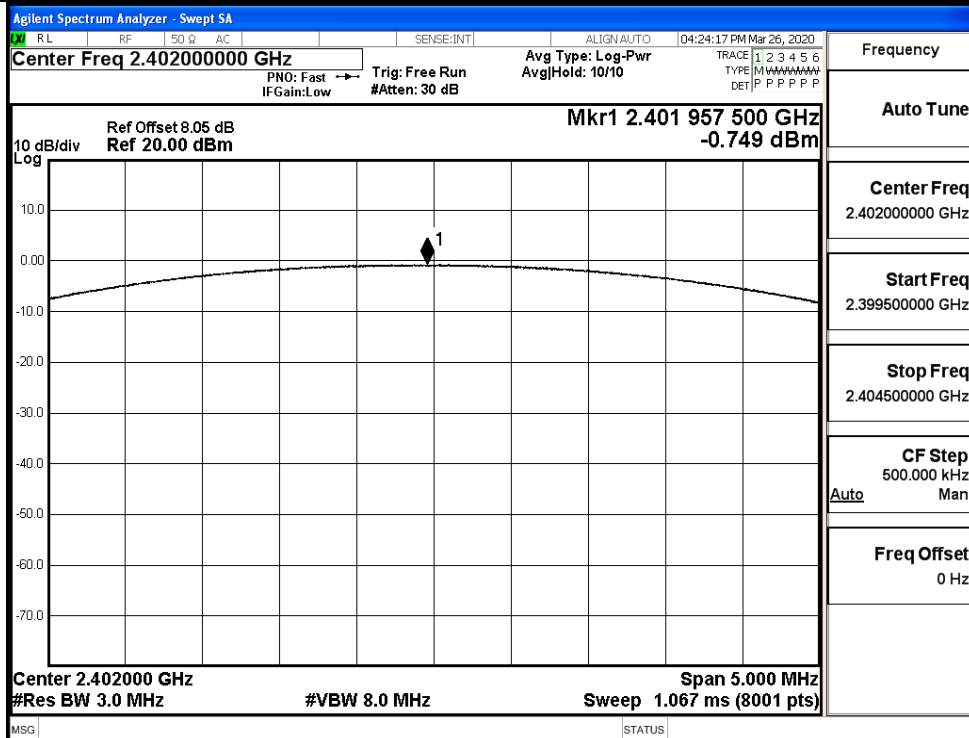
GFSK/LCH

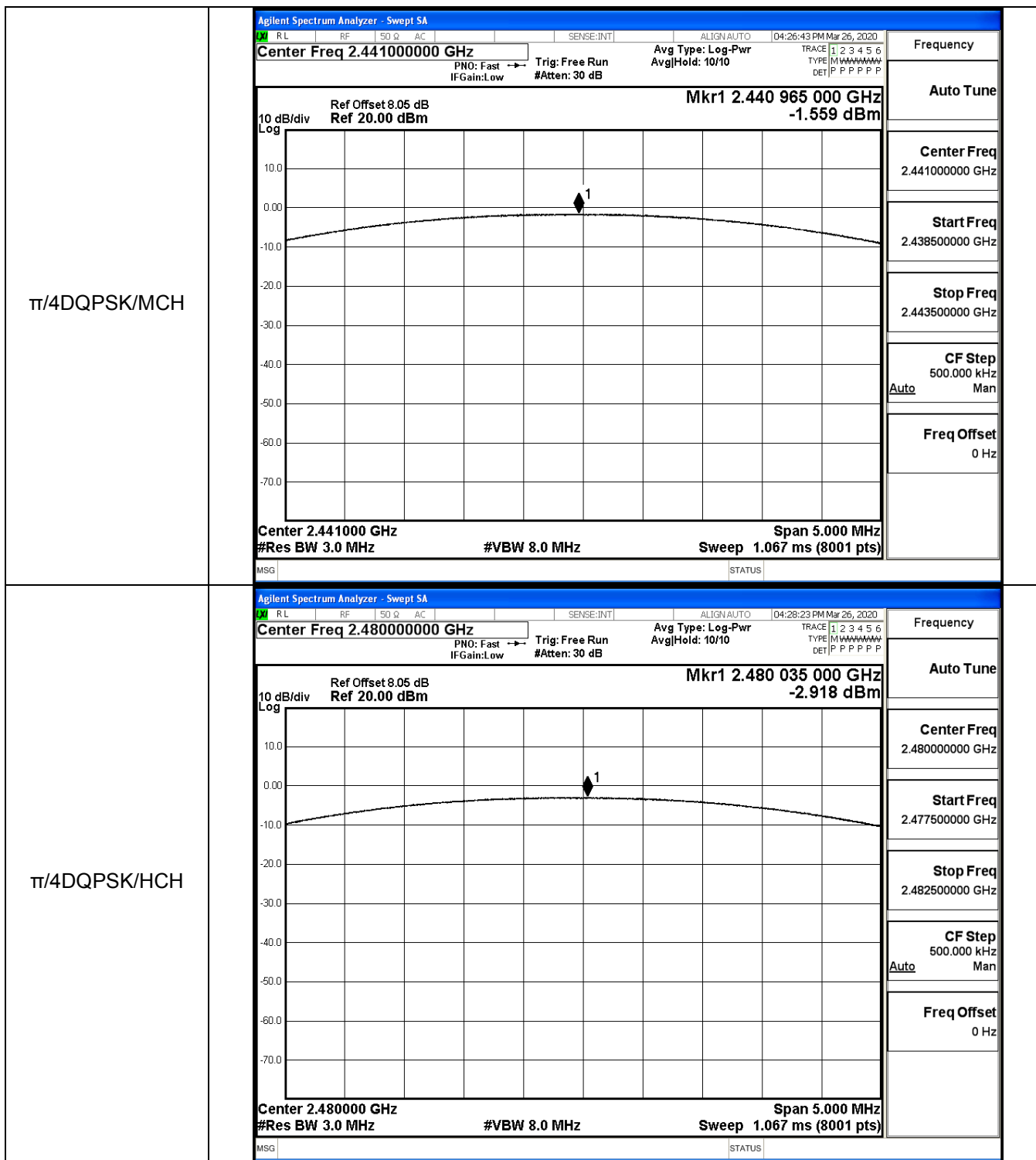


GFSK/MCH

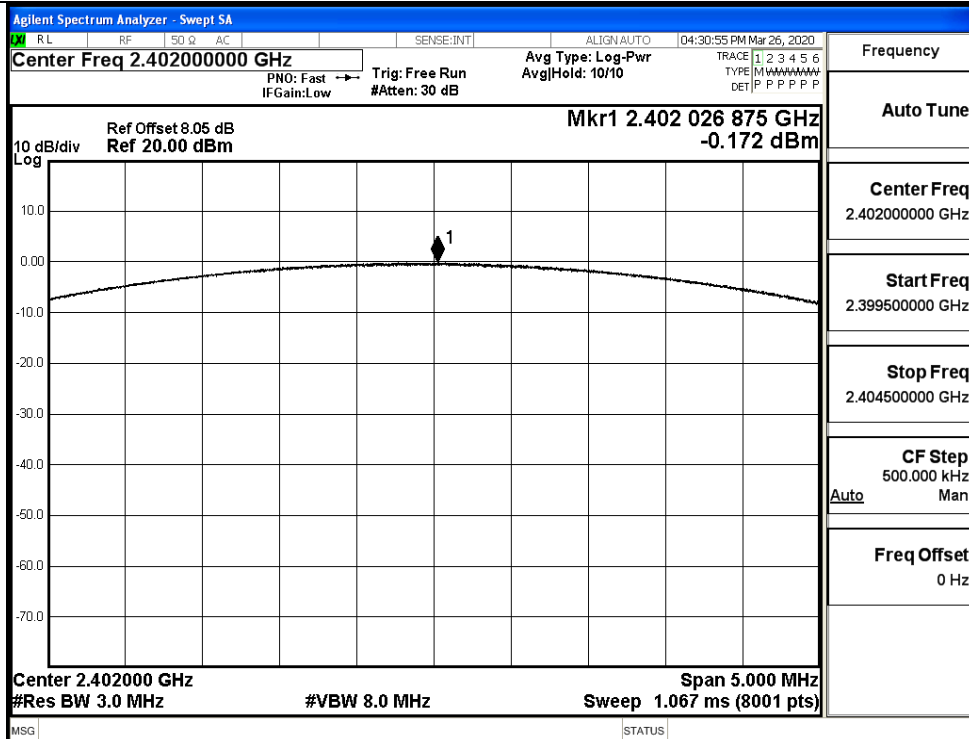


GFSK/HCH

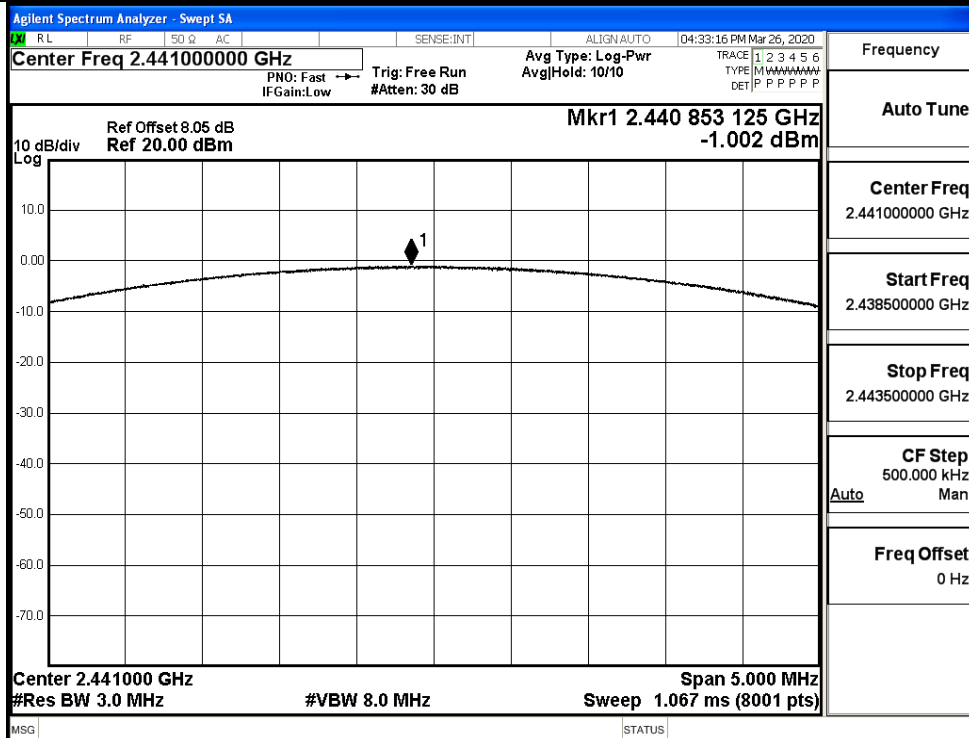
 π /4DQPSK/LCH



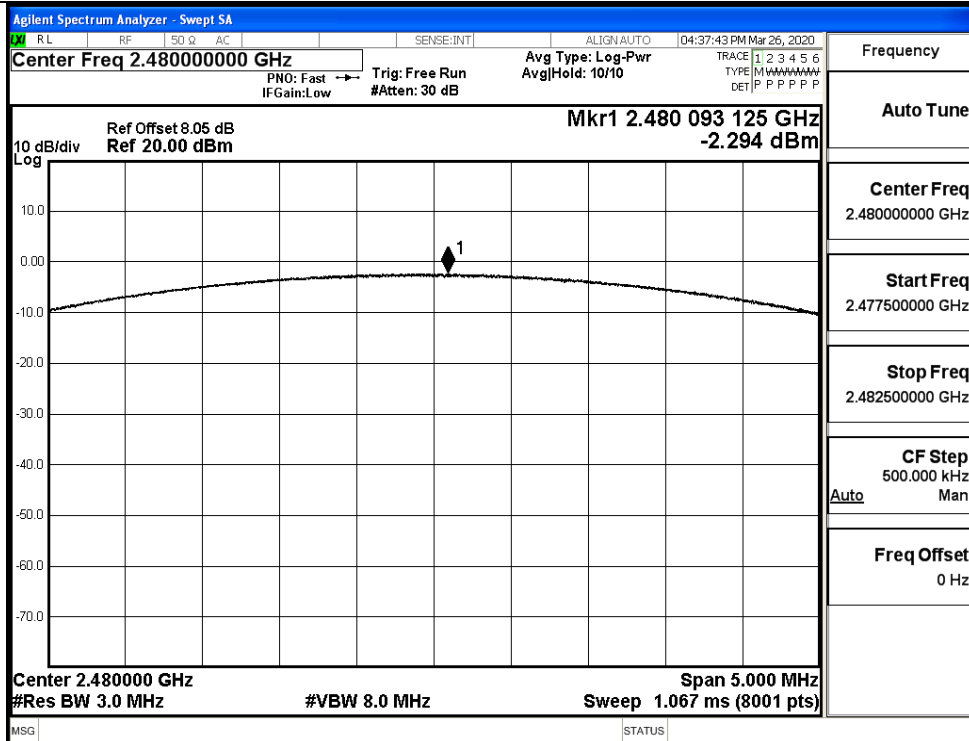
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

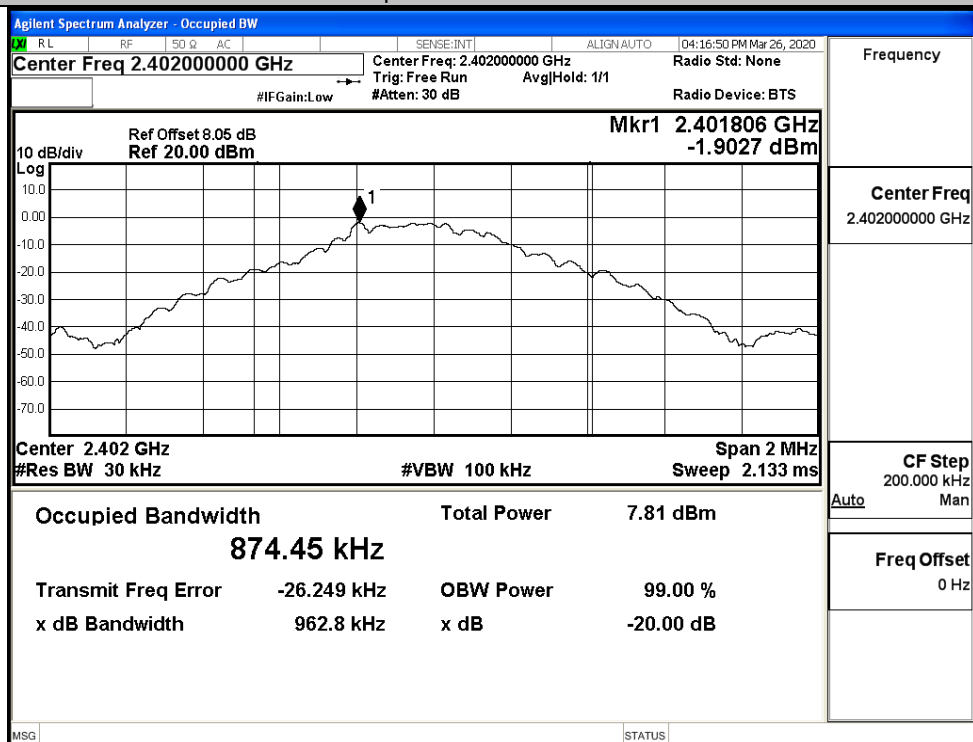


A.2 20dB Bandwidth

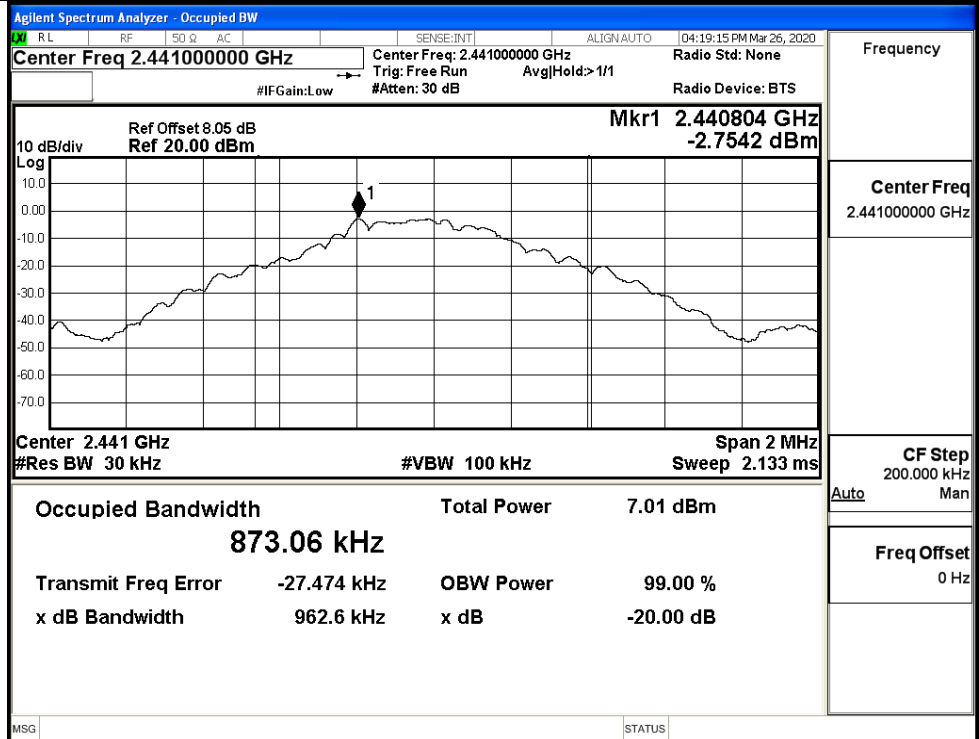
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9628	Not Specified	PASS
	MCH	0.9626	Not Specified	PASS
	HCH	0.9625	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.281	Not Specified	PASS
	MCH	1.282	Not Specified	PASS
	HCH	1.281	Not Specified	PASS
8DPSK	LCH	1.301	Not Specified	PASS
	MCH	1.302	Not Specified	PASS
	HCH	1.302	Not Specified	PASS

Test Graphs

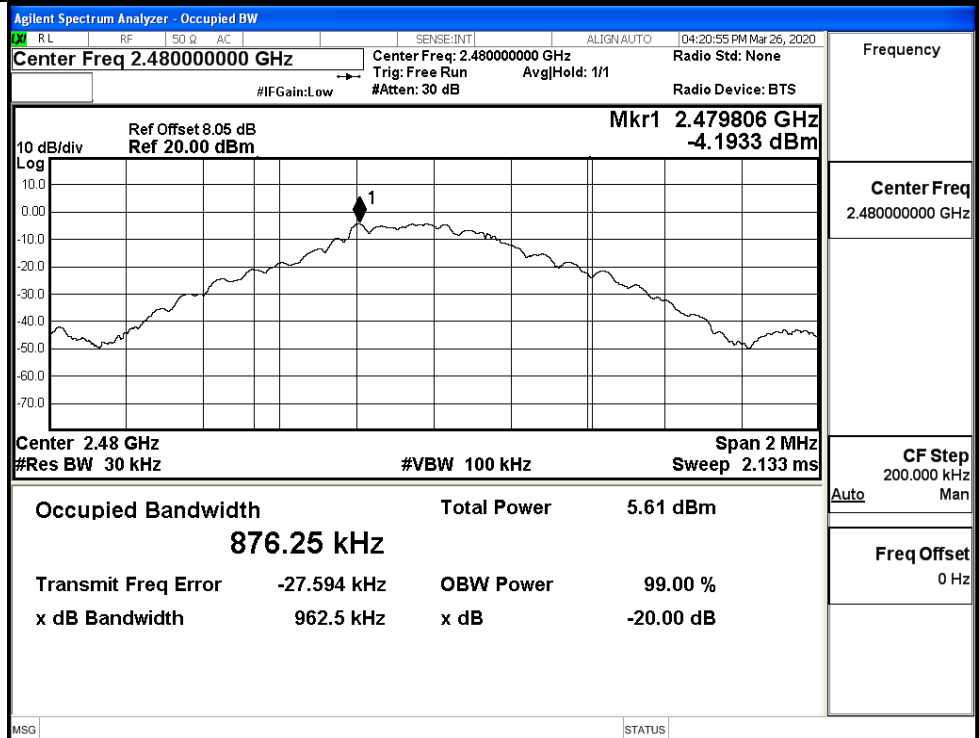
GFSK/LCH

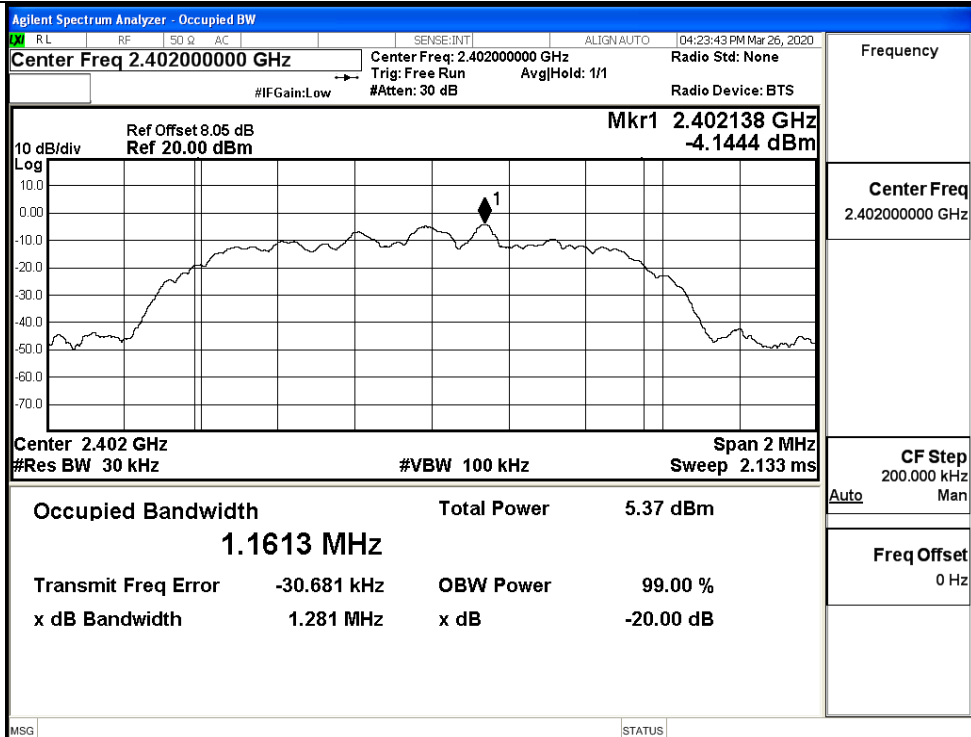
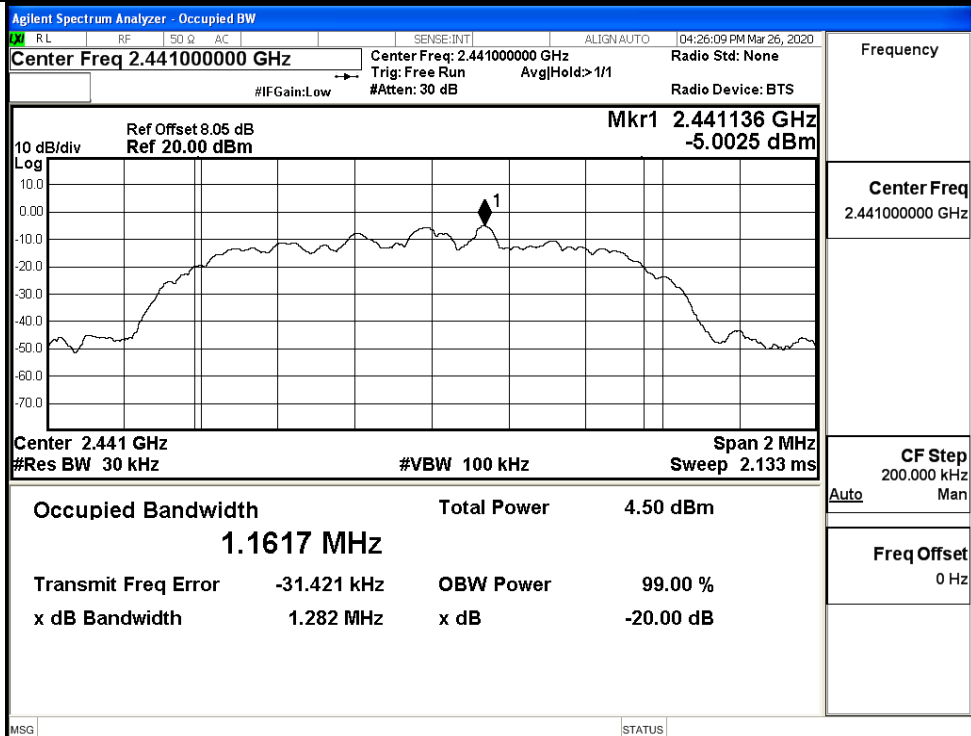


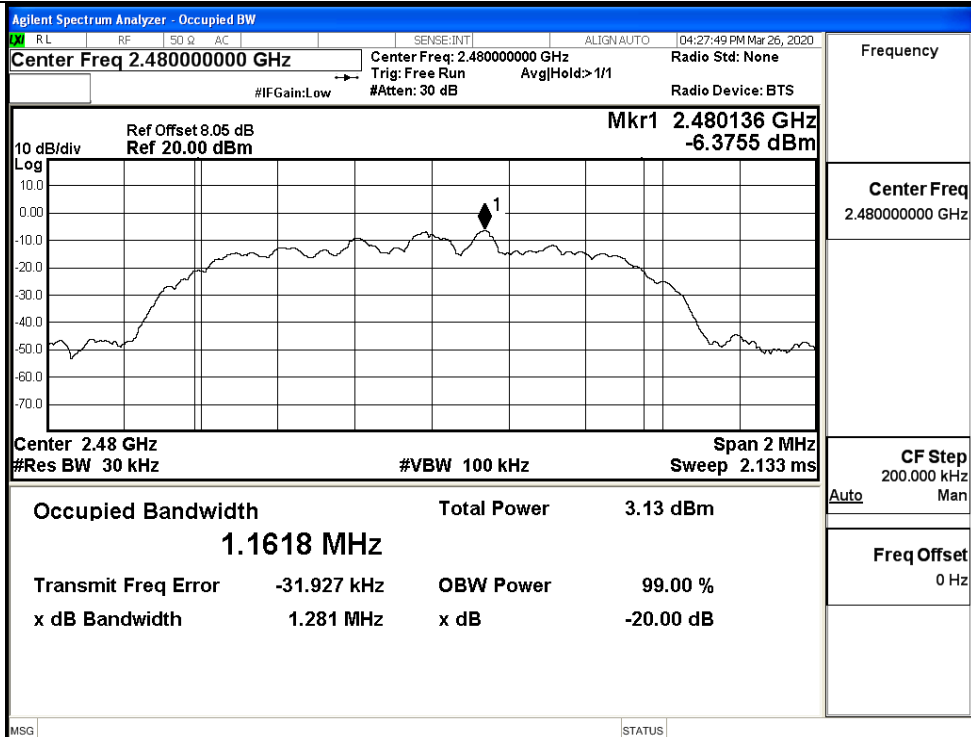
GFSK/MCH



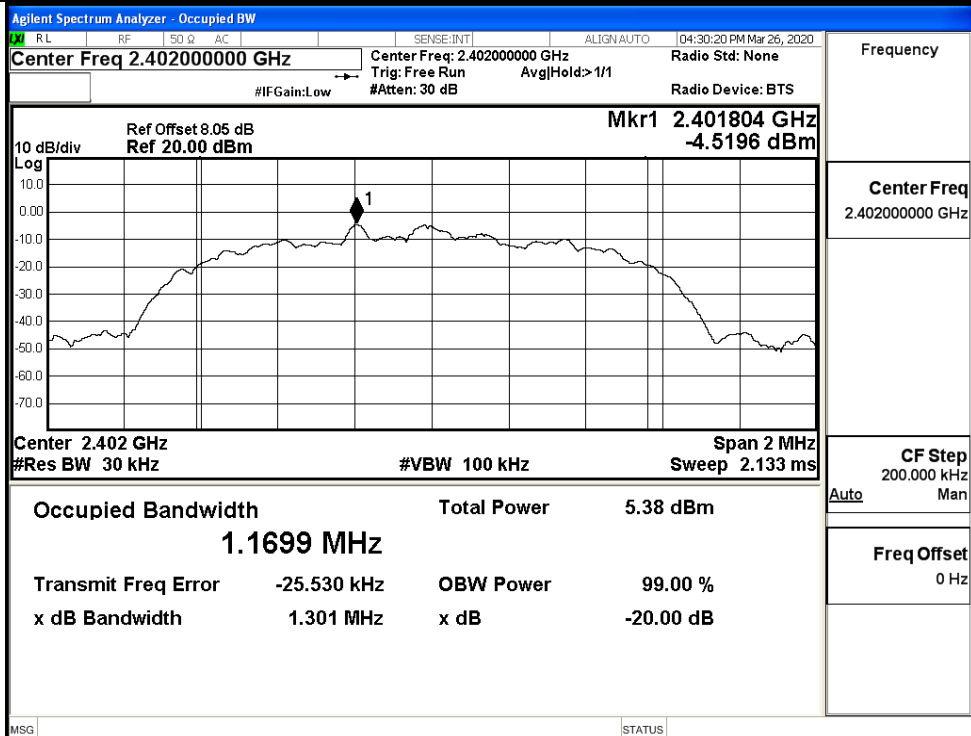
GFSK/HCH



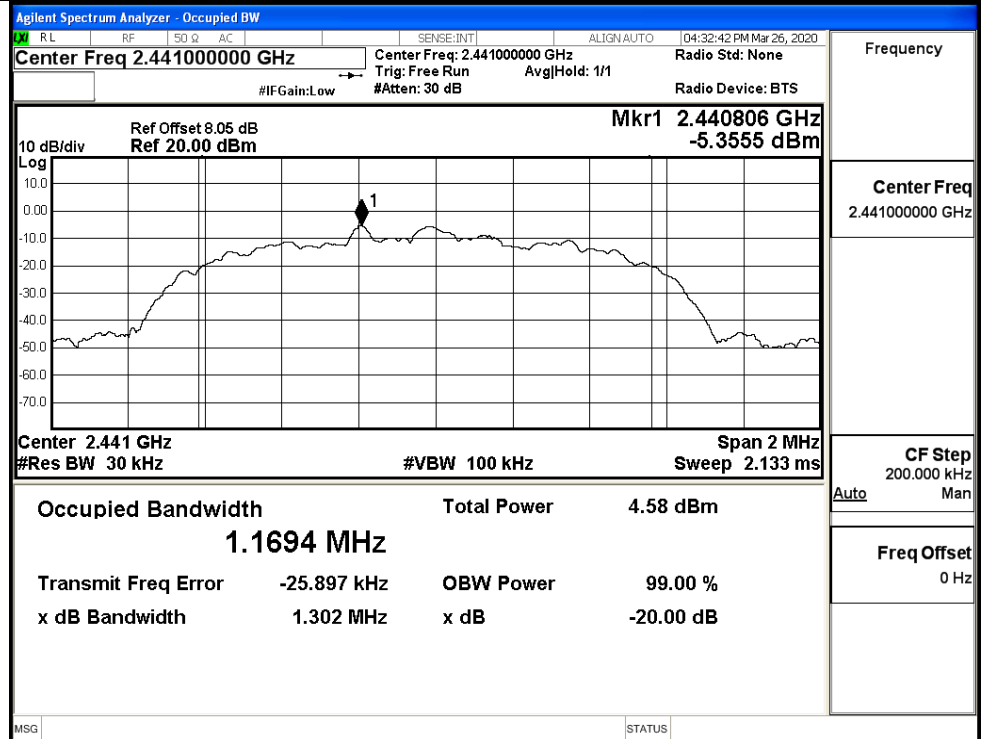
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

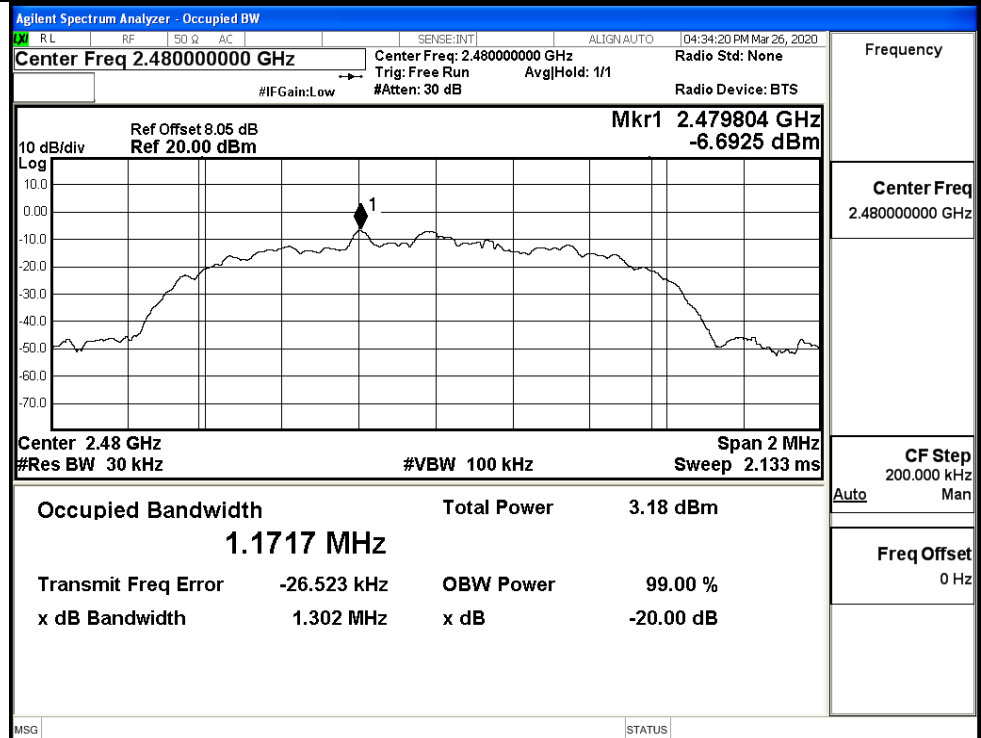
8DPSK/LCH



8DPSK/MCH



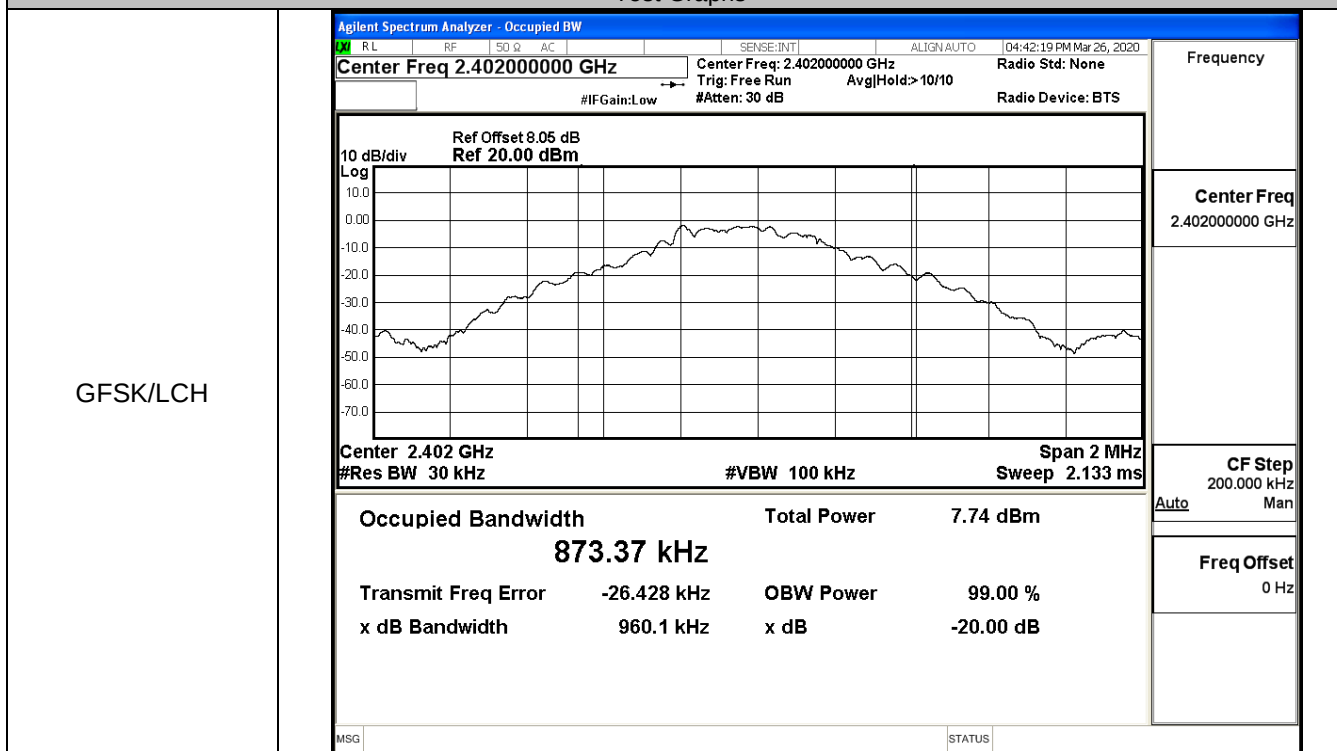
8DPSK/HCH



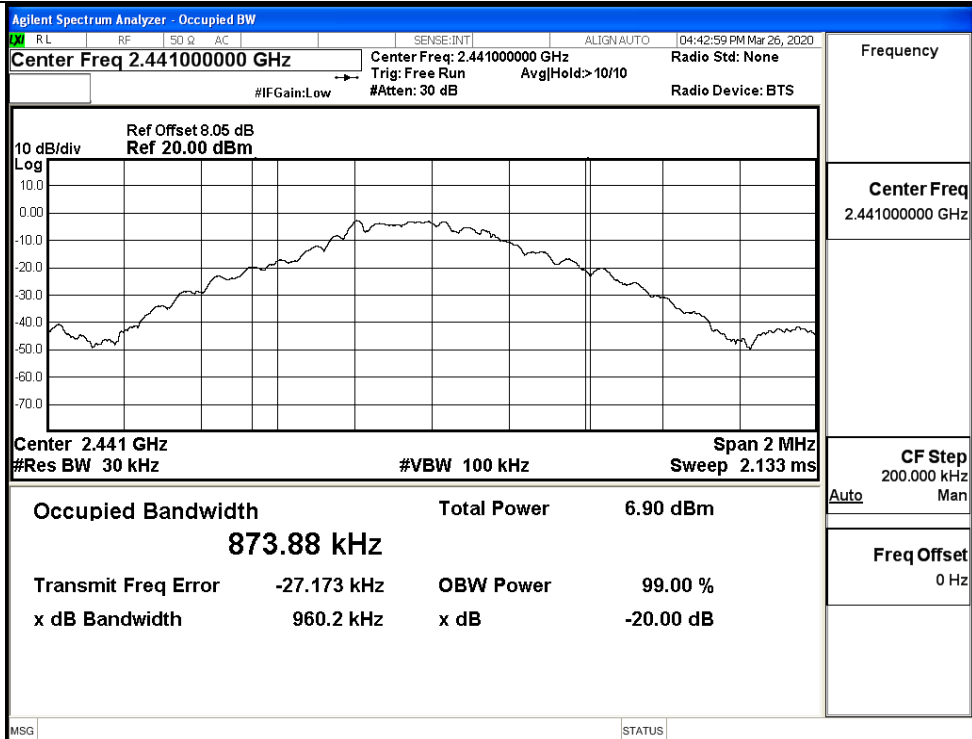
A.3 Occupied Bandwidth

Mode	Channel.	Occupied Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.87337	Not Specified	PASS
	MCH	0.87388	Not Specified	PASS
	HCH	0.87341	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.1613	Not Specified	PASS
	MCH	1.1680	Not Specified	PASS
	HCH	1.1616	Not Specified	PASS
8DPSK	LCH	1.1700	Not Specified	PASS
	MCH	1.1711	Not Specified	PASS
	HCH	1.1708	Not Specified	PASS

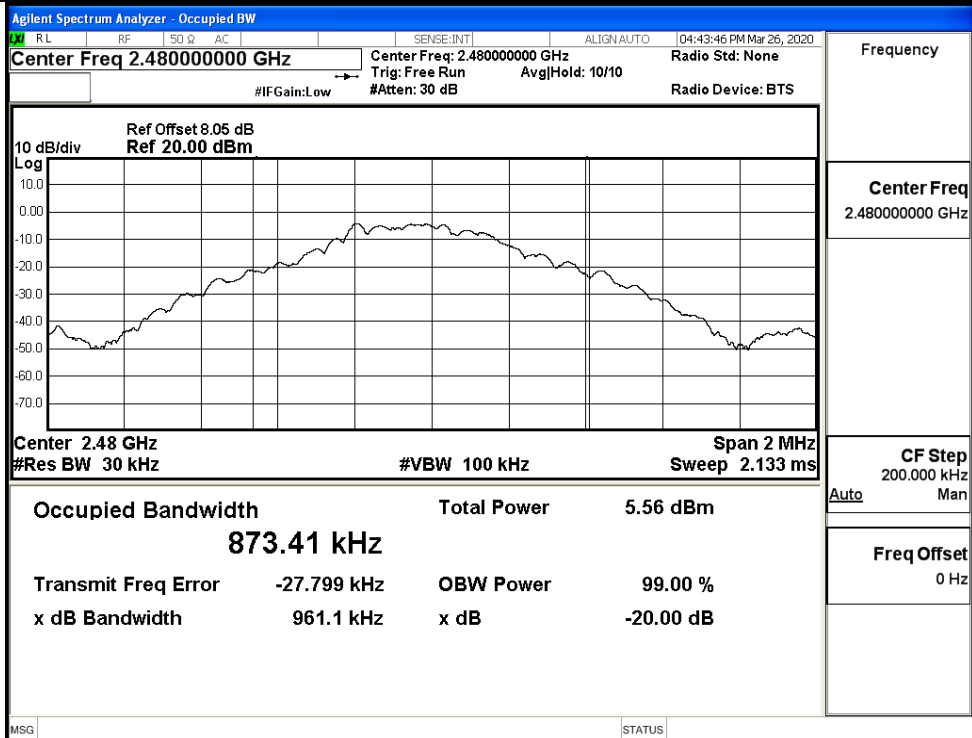
Test Graphs

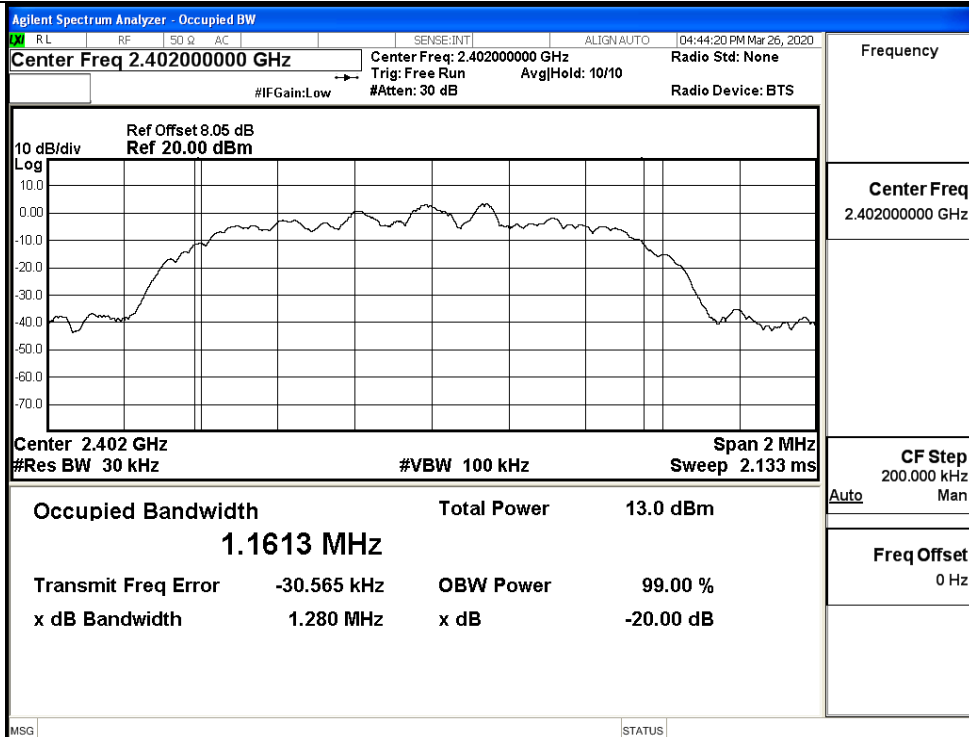
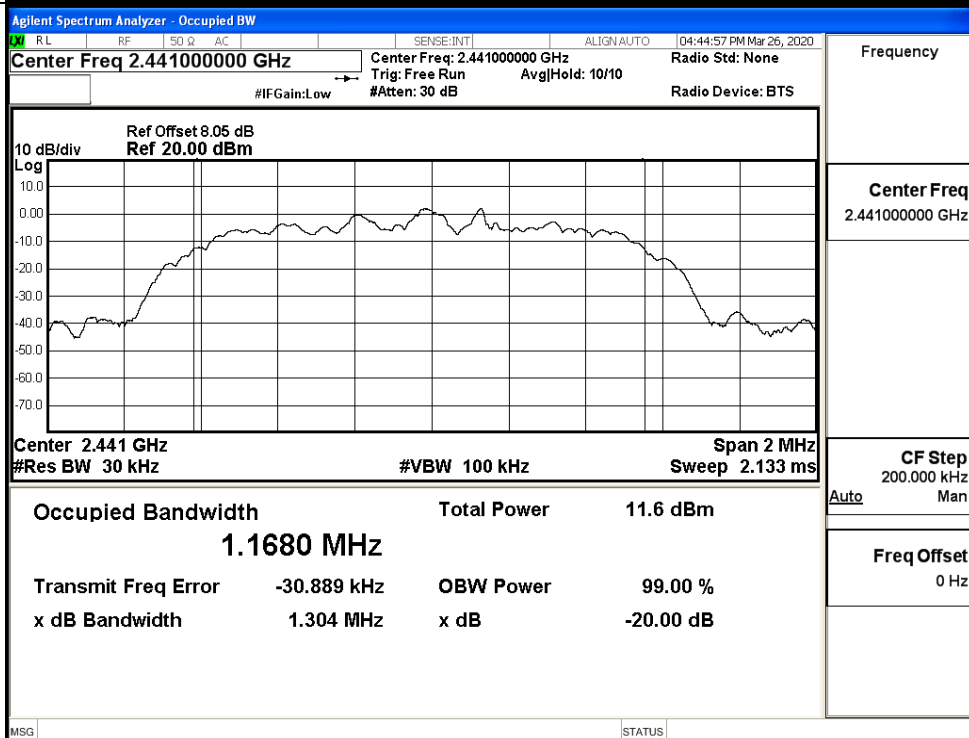


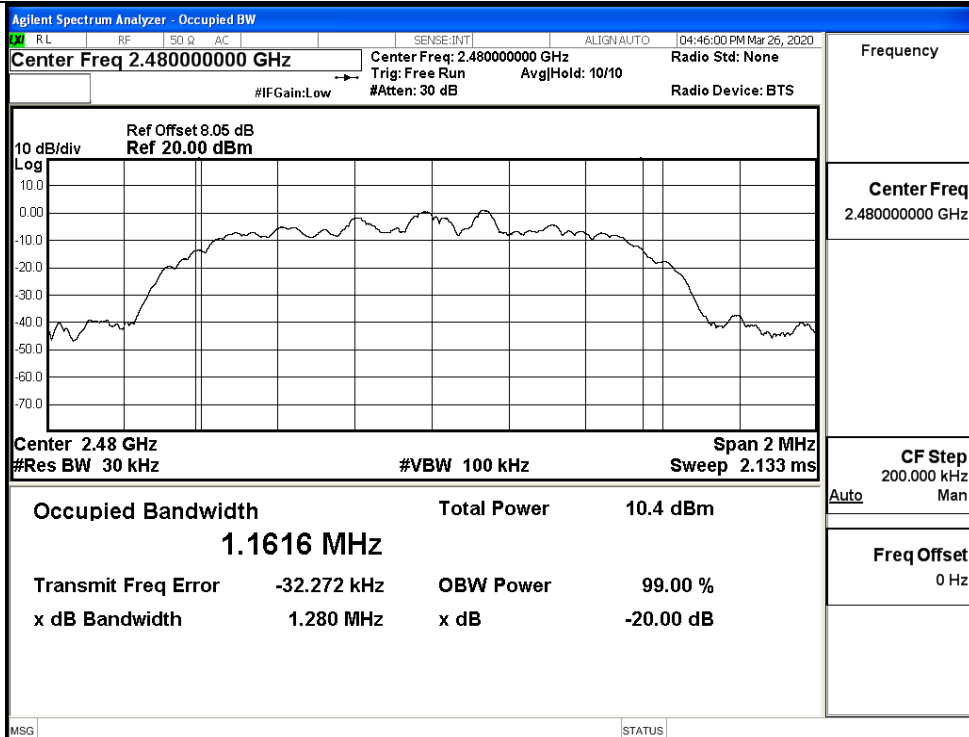
GFSK/MCH



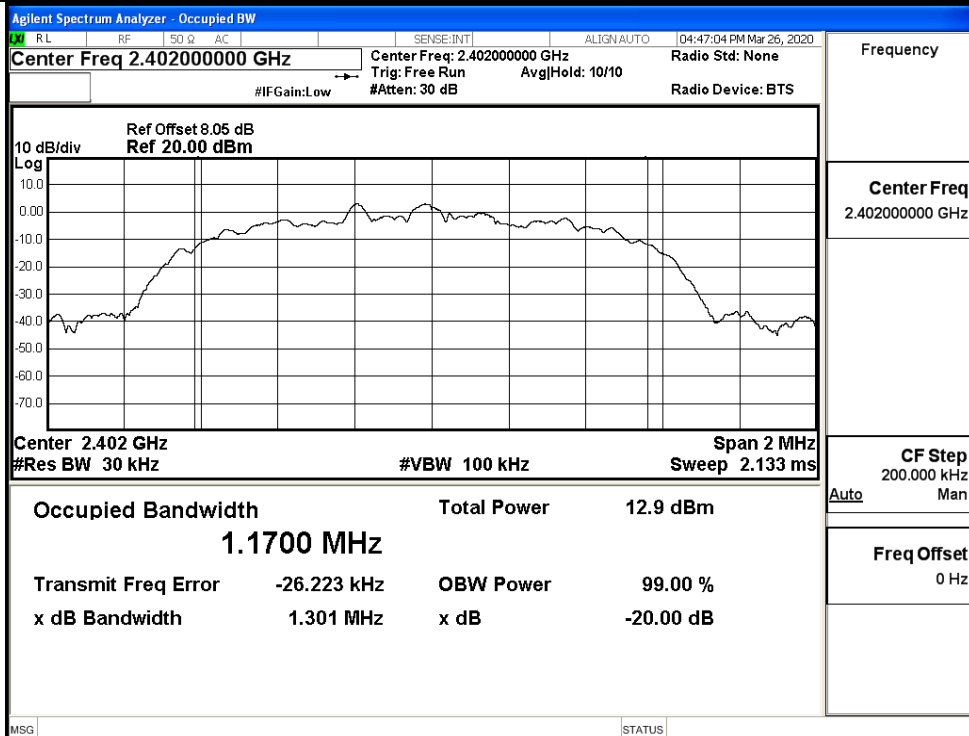
GFSK/HCH



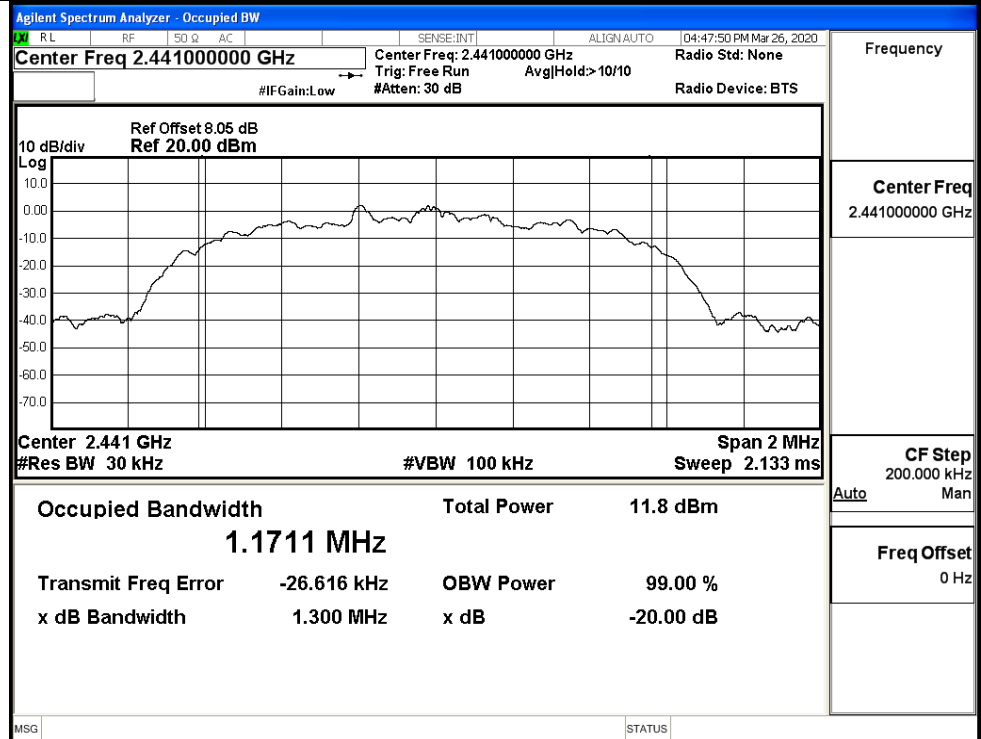
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

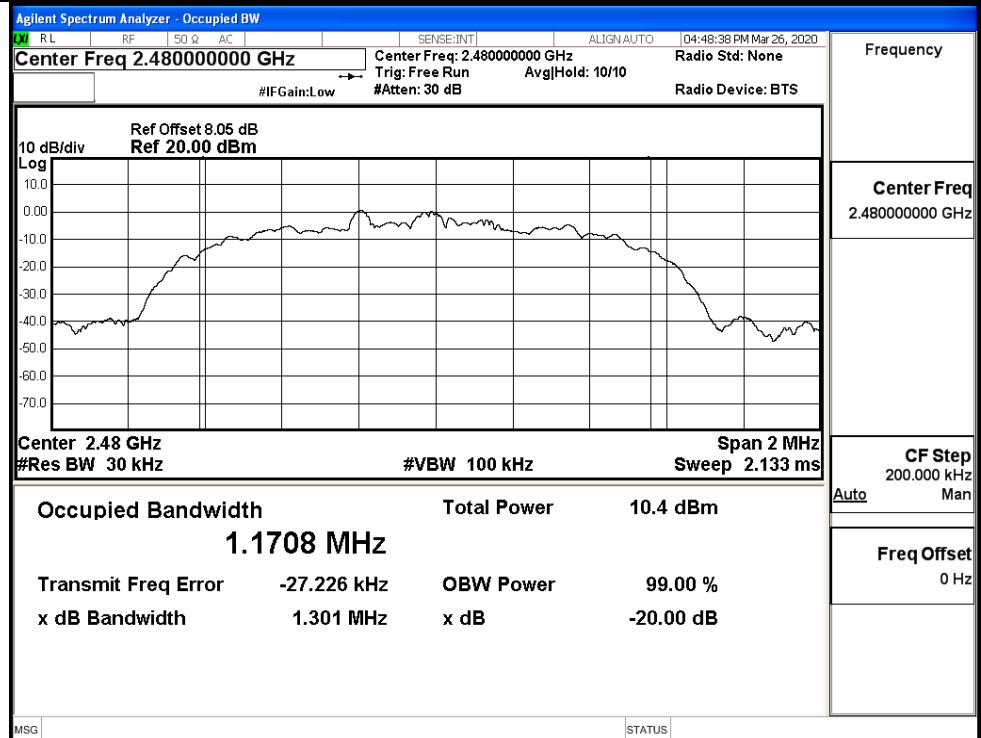
8DPSK/LCH



8DPSK/MCH



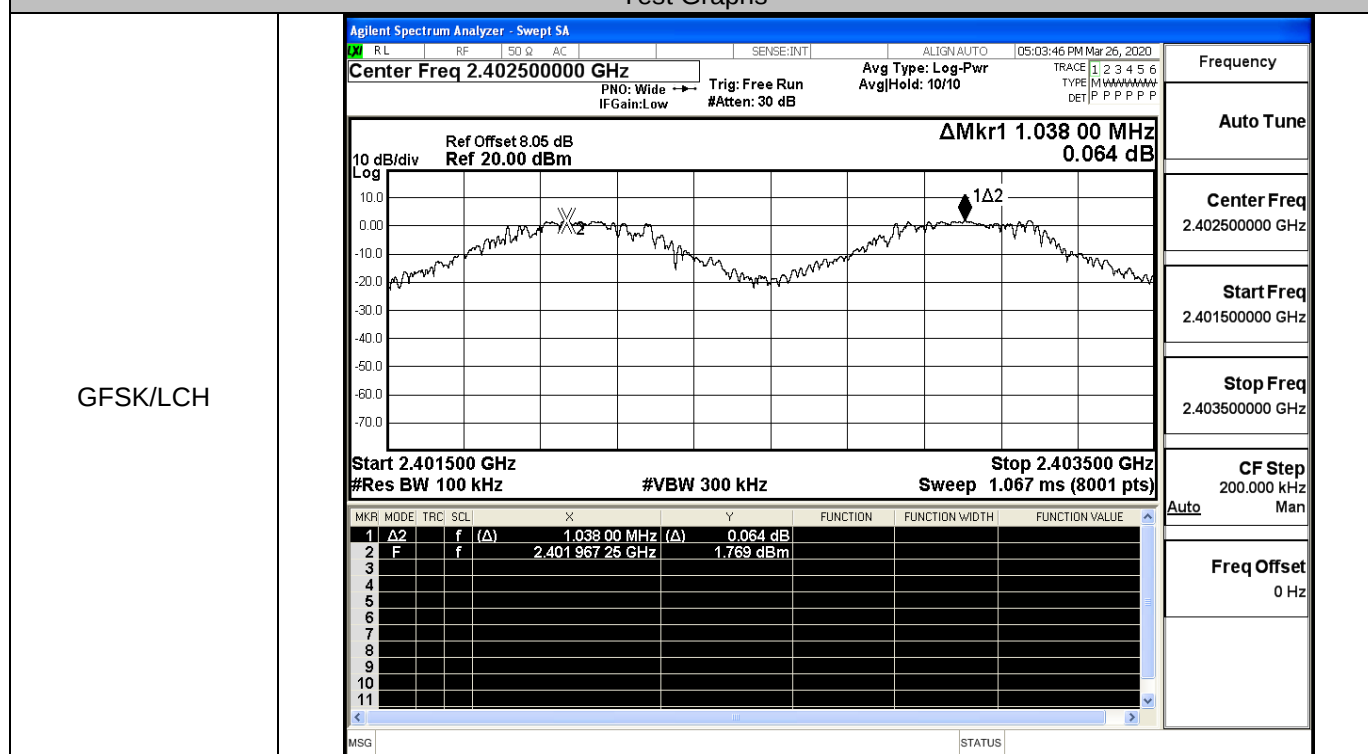
8DPSK/HCH



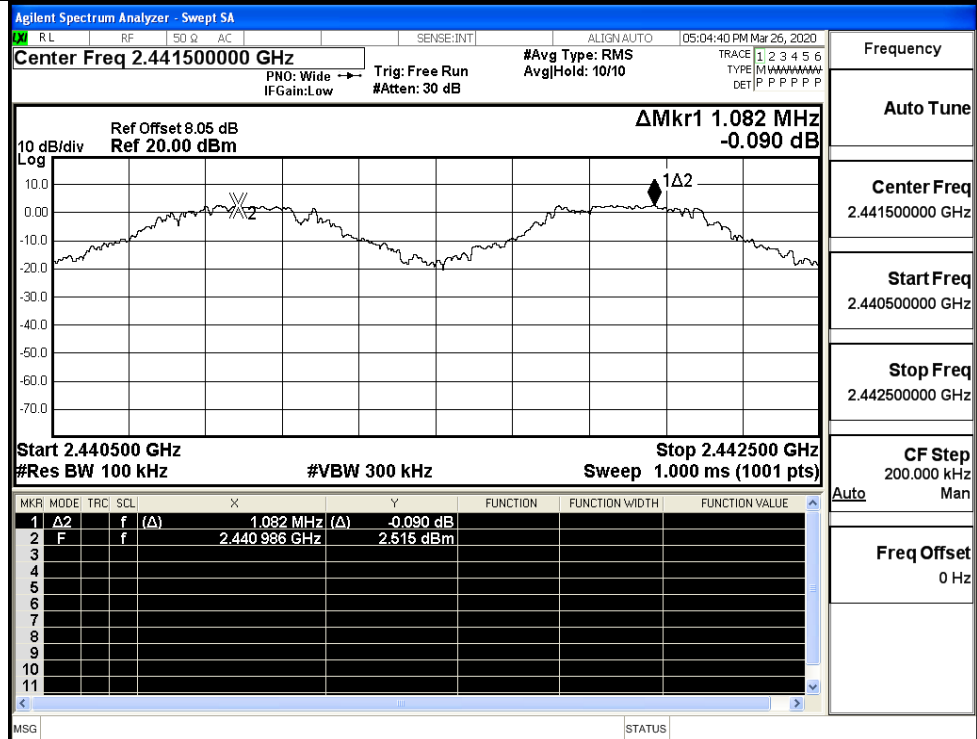
A.4 Carrier Frequency Separation

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.038	0.642	PASS
	MCH	1.082	0.642	PASS
	HCH	0.932	0.642	PASS
$\pi/4$ DQPSK	LCH	1.022	0.855	PASS
	MCH	0.960	0.855	PASS
	HCH	1.010	0.855	PASS
8DPSK	LCH	1.080	0.868	PASS
	MCH	1.118	0.868	PASS
	HCH	0.882	0.868	PASS

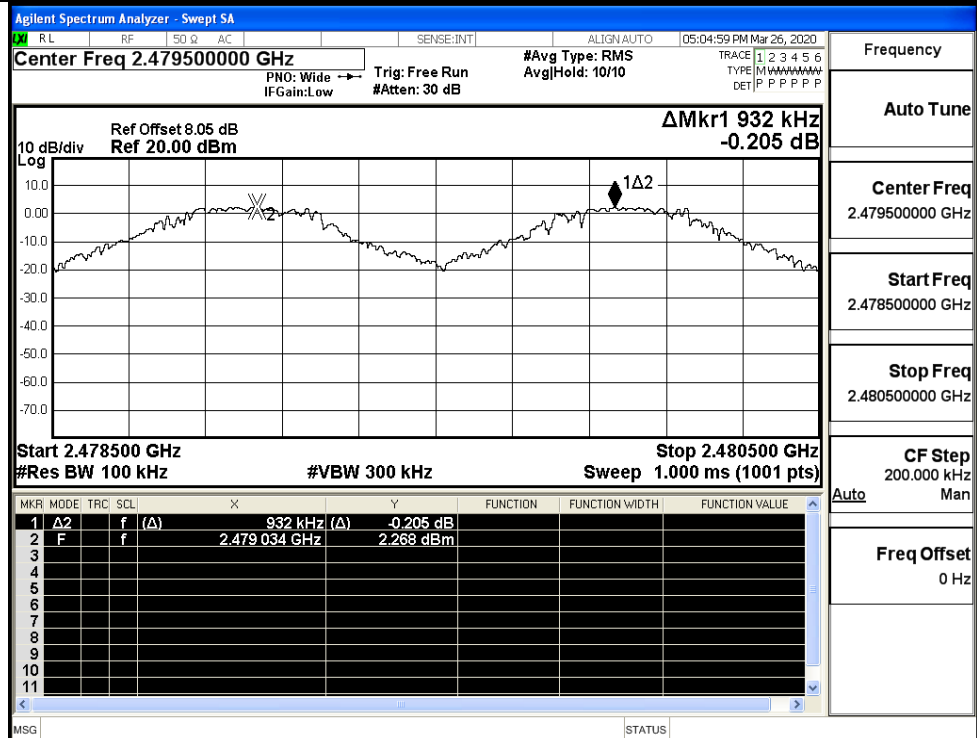
Test Graphs

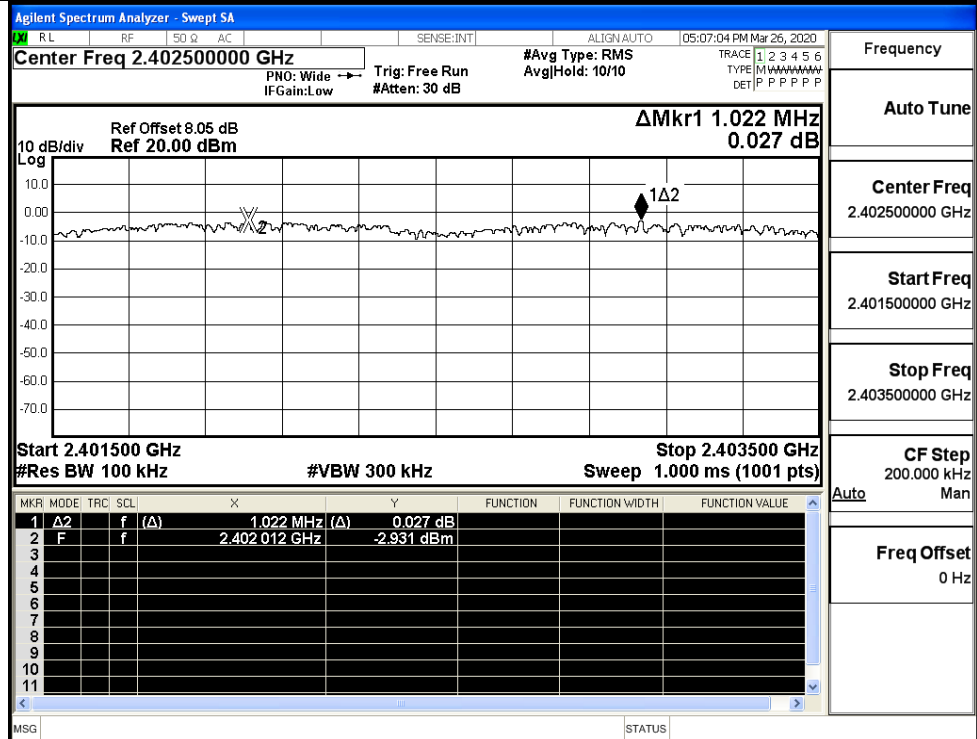
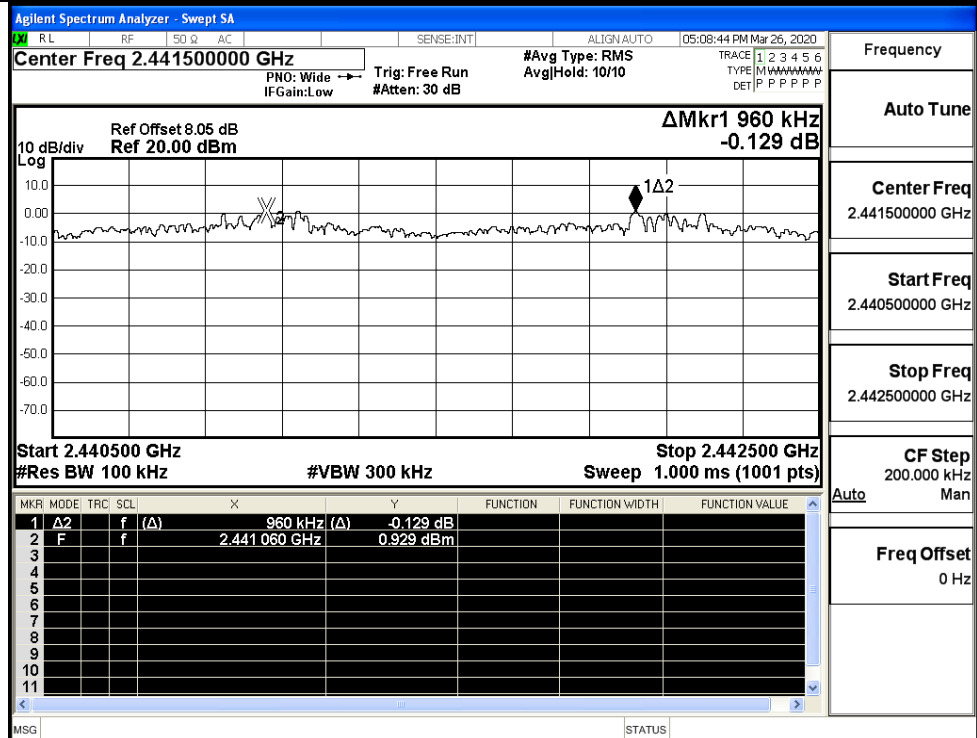


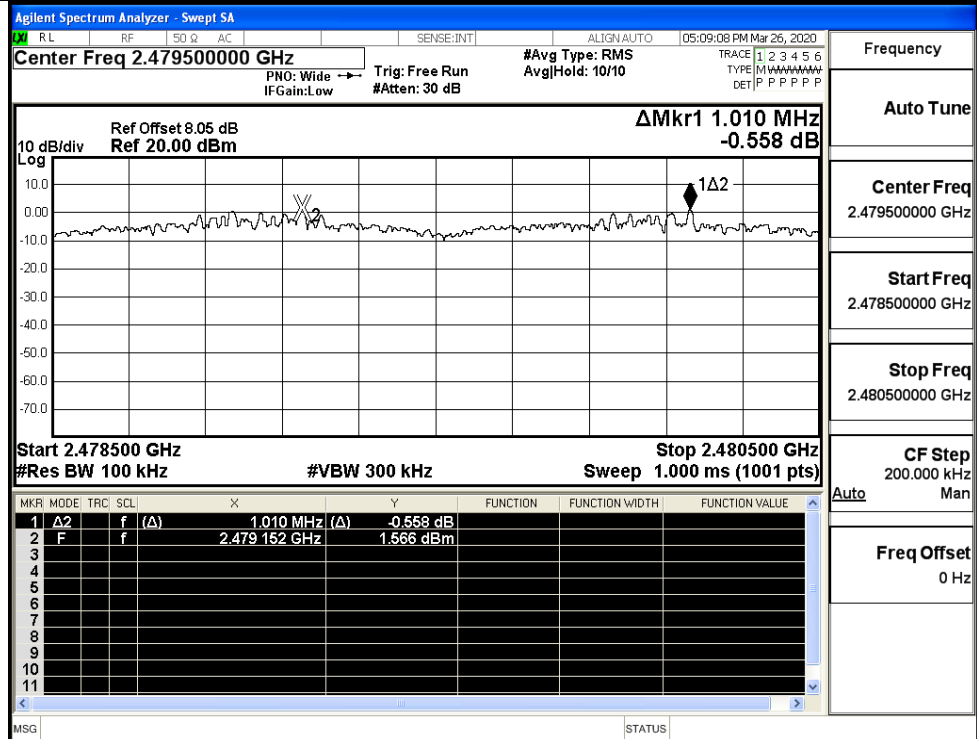
GFSK/MCH



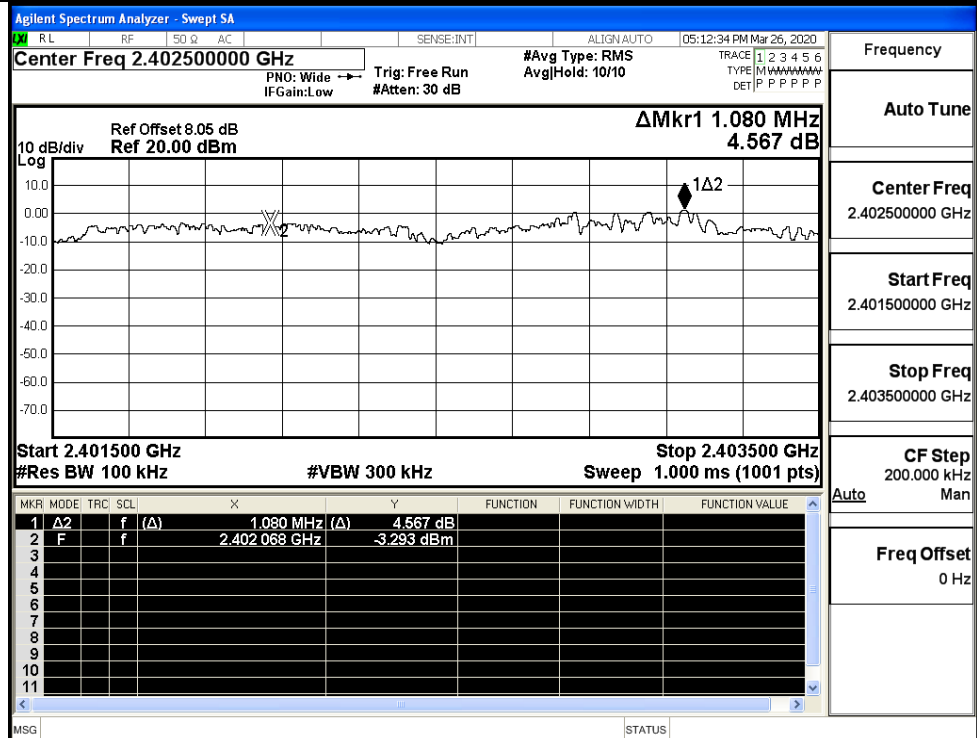
GFSK/HCH



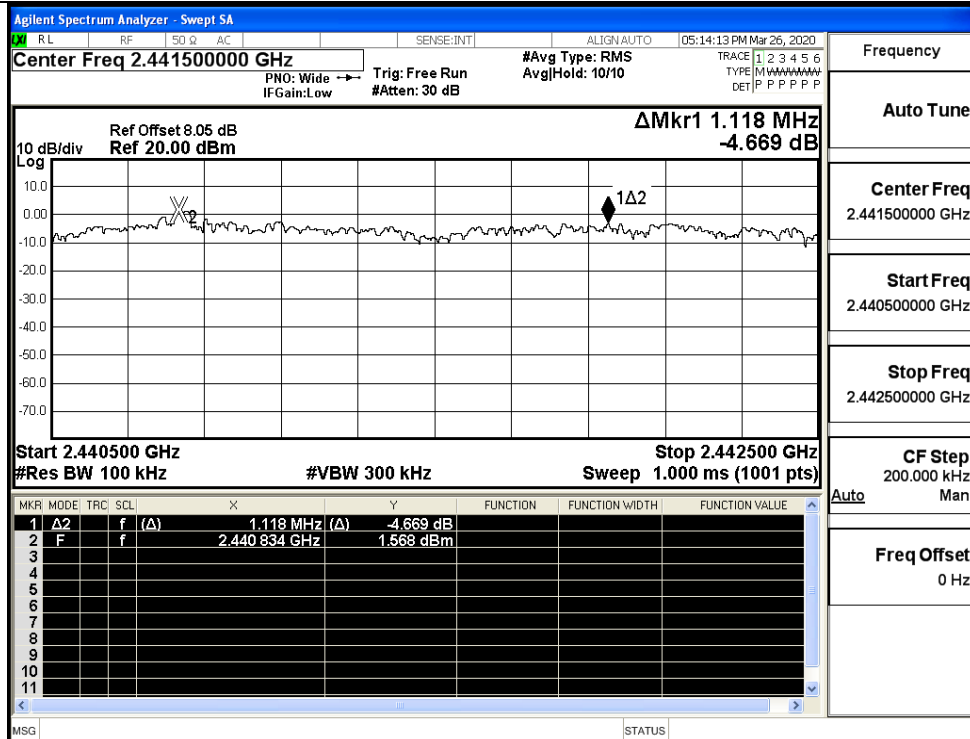
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

π /4DQPSK/HCH

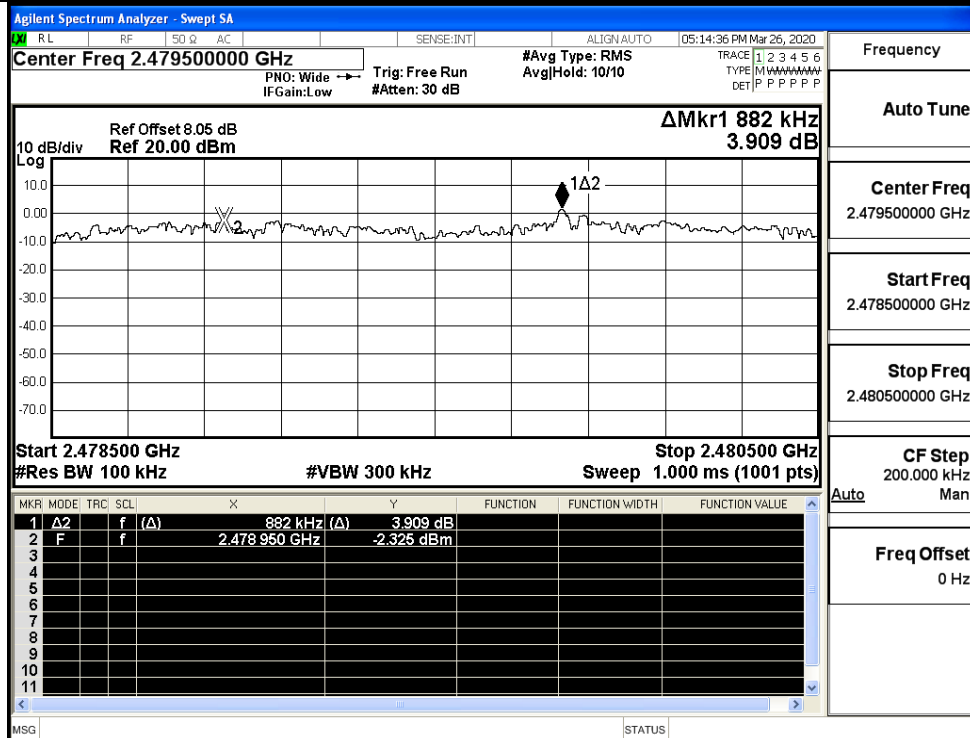
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

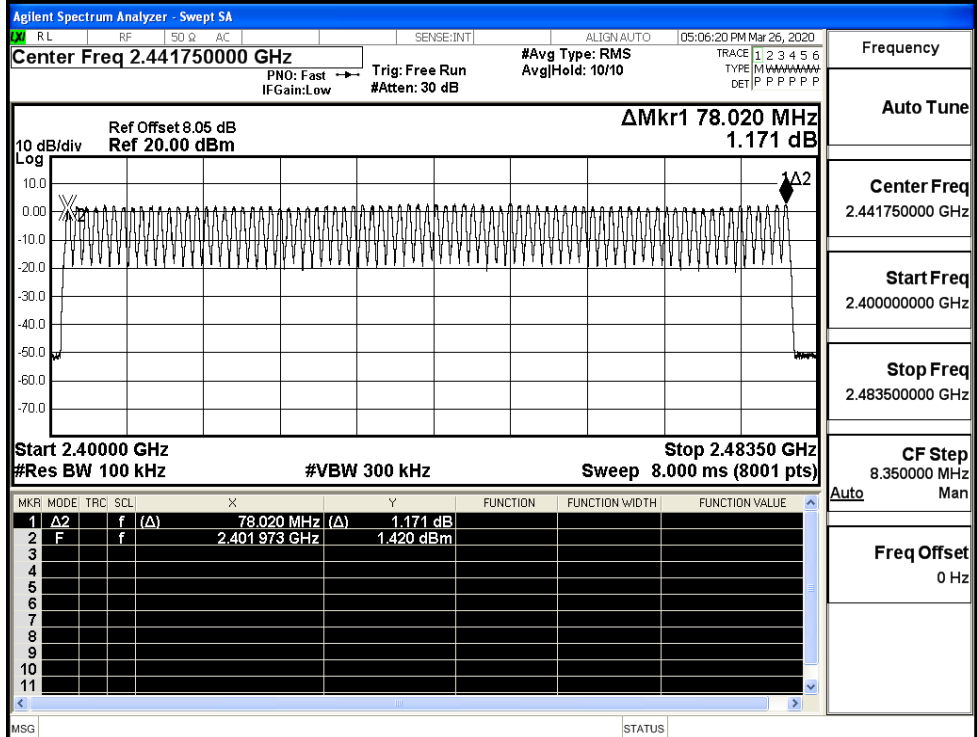
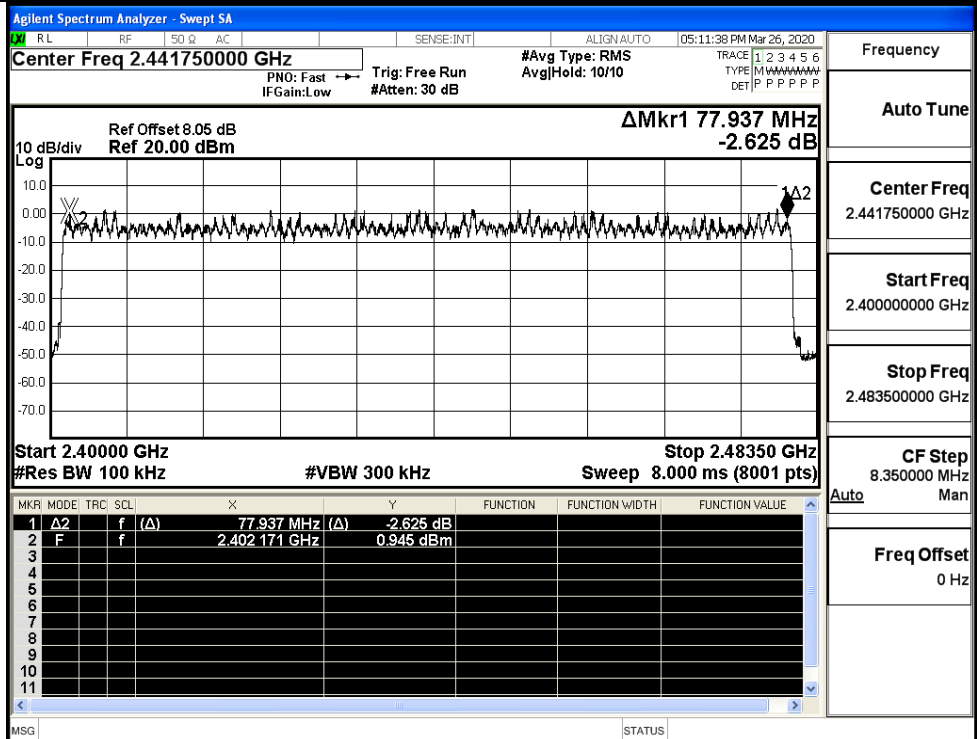


A.5 Hopping Channel Number

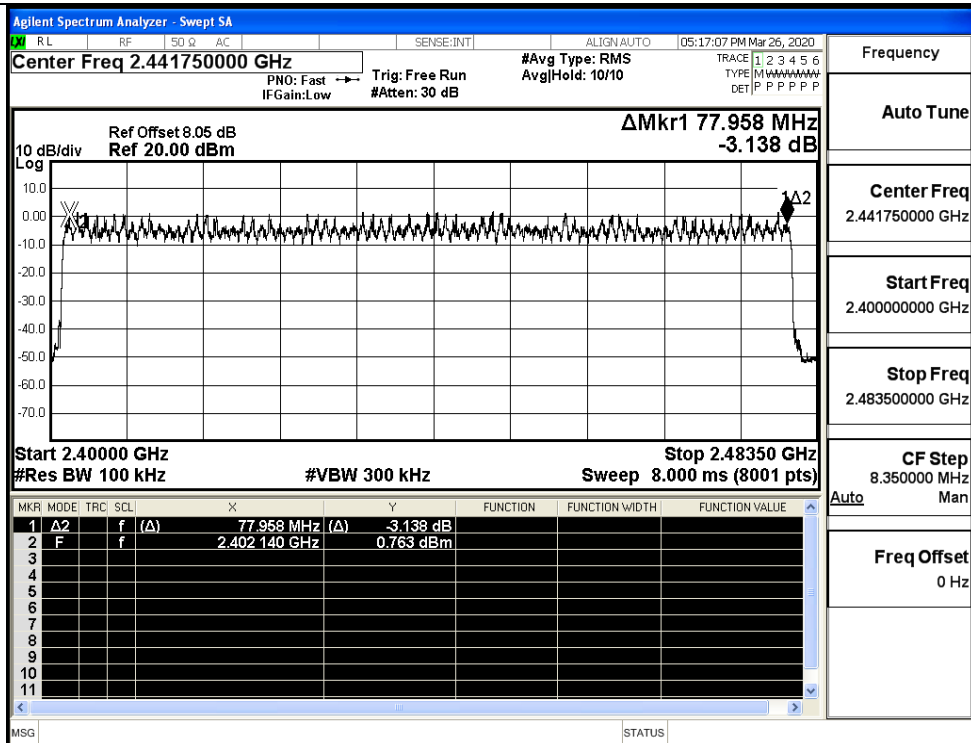
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
$\pi/4$ DQPSK	Hop	79	>=15	PASS
8DPSK	Hop	79	>=15	PASS

Test Graphs

GFSK/Hop

 $\pi/4$ DQPSK/Hop

8DPSK/Hop

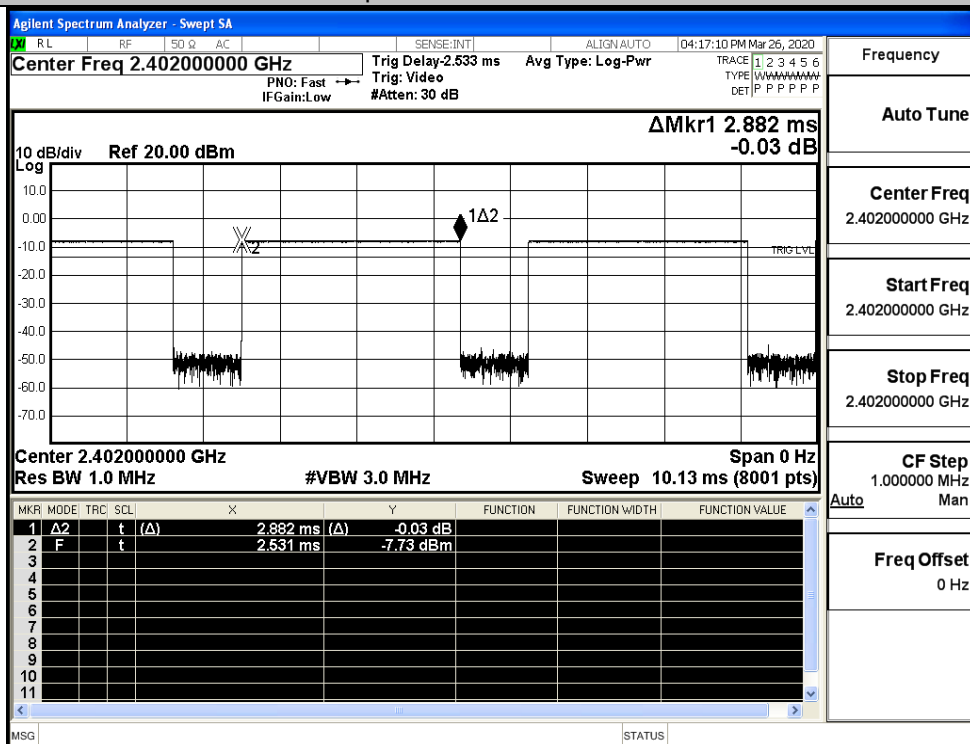


A.6 Dwell Time

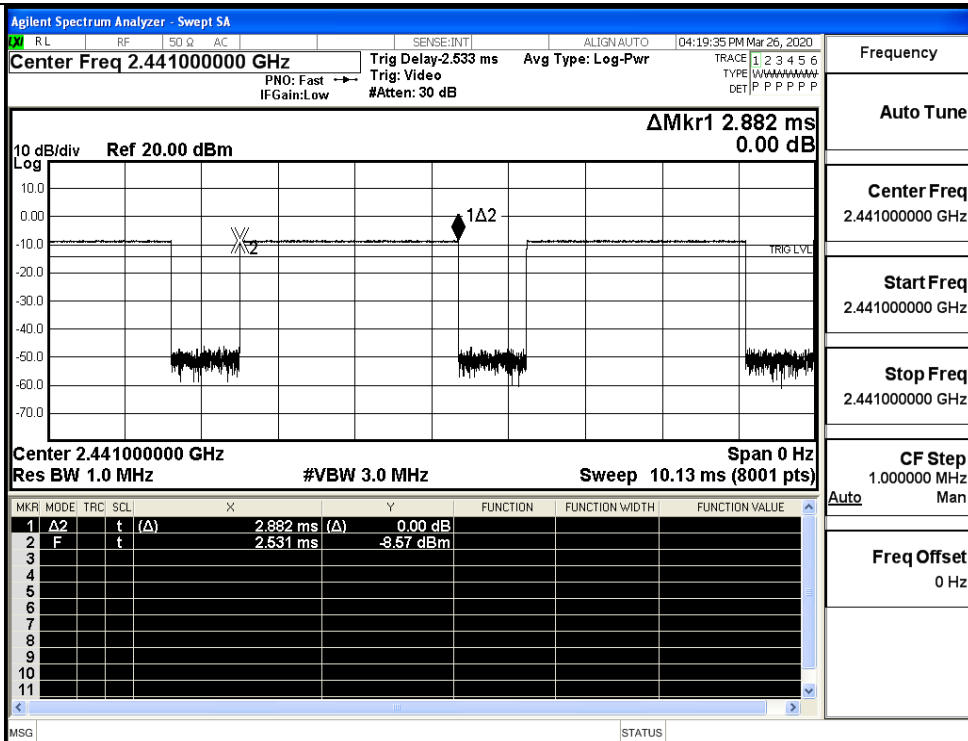
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.88	106.7	0.308	0.4	PASS
	2DH5	MCH	2.88	106.7	0.308	0.4	PASS
	2DH5	HCH	2.88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

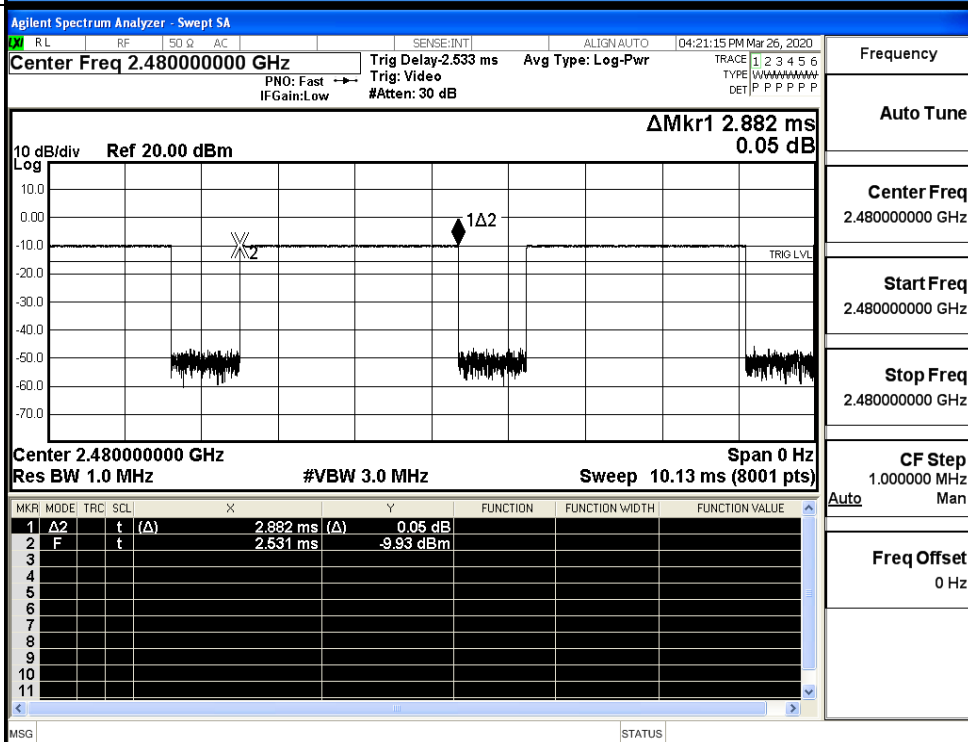
GFSK_DH5/LCH



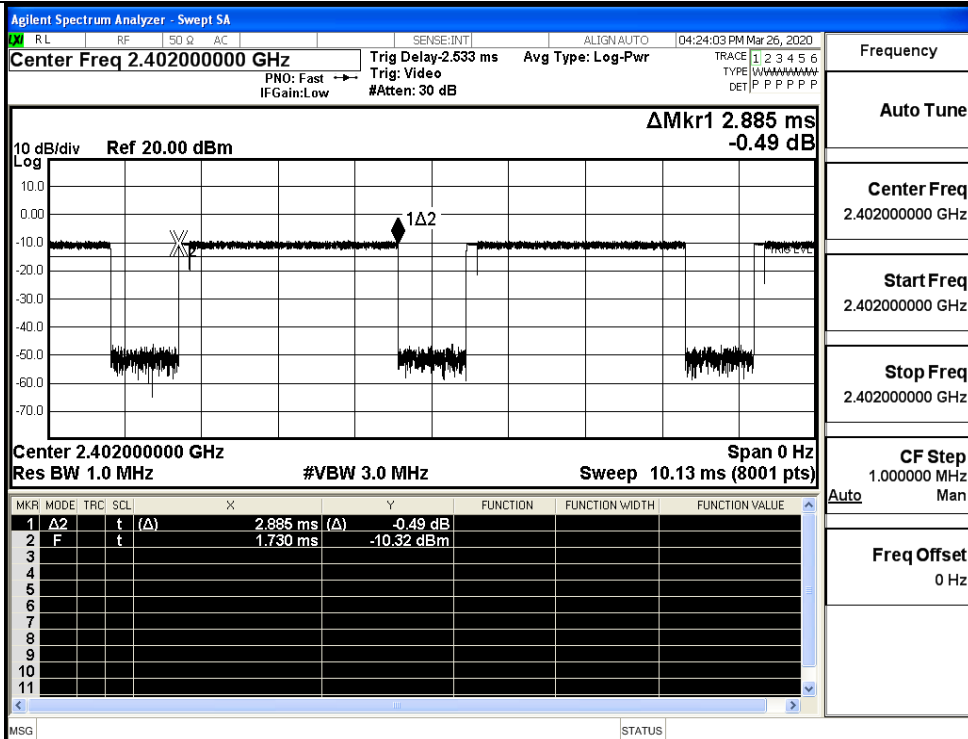
GFSK_DH5/MCH



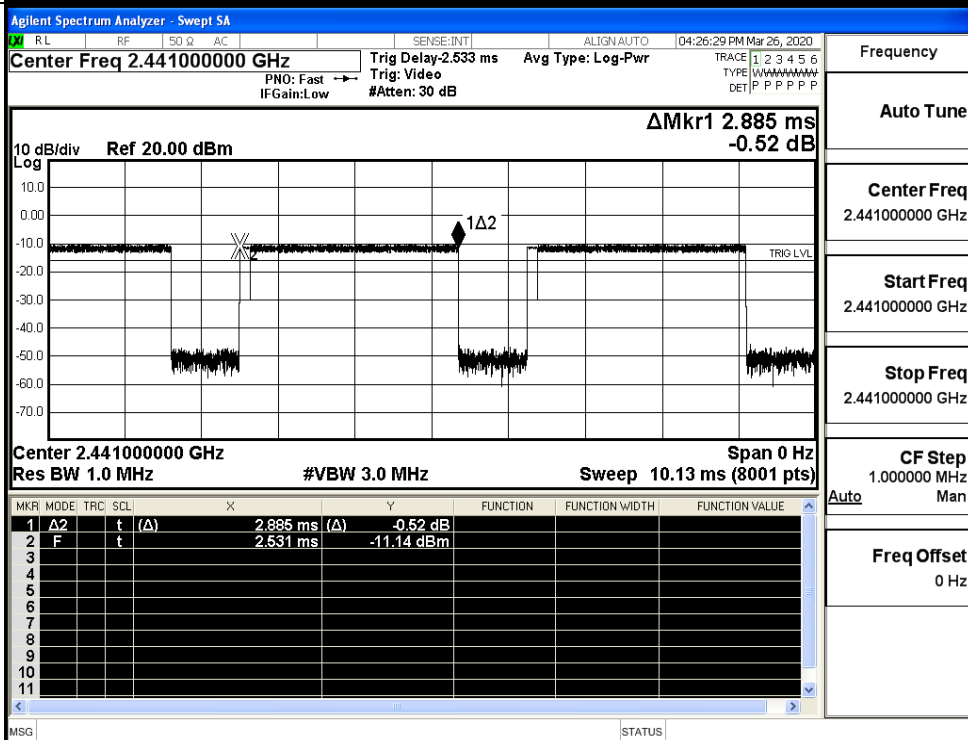
GFSK_DH5/HCH



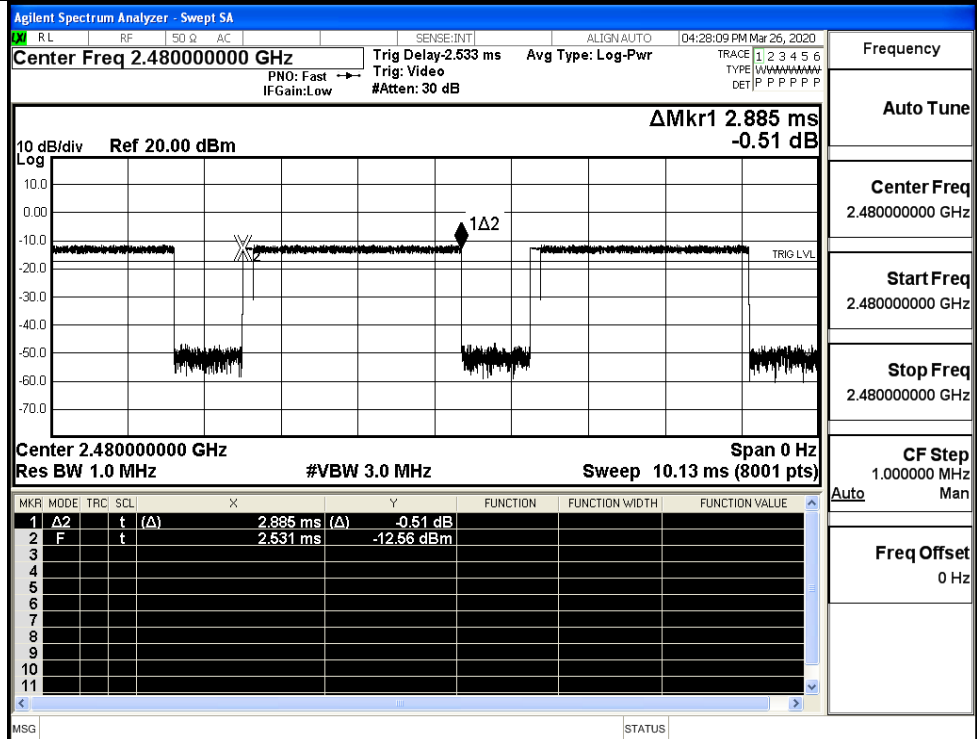
$\pi/4$ DQPSK
_2DH5/LCH



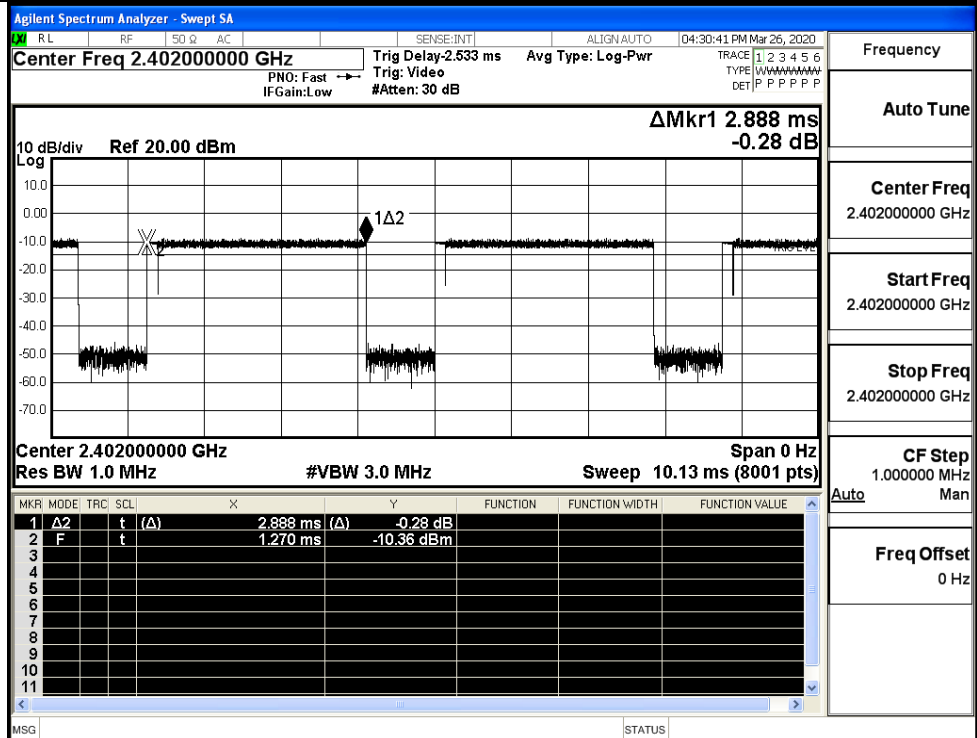
$\pi/4$ DQPSK
_2DH5/MCH



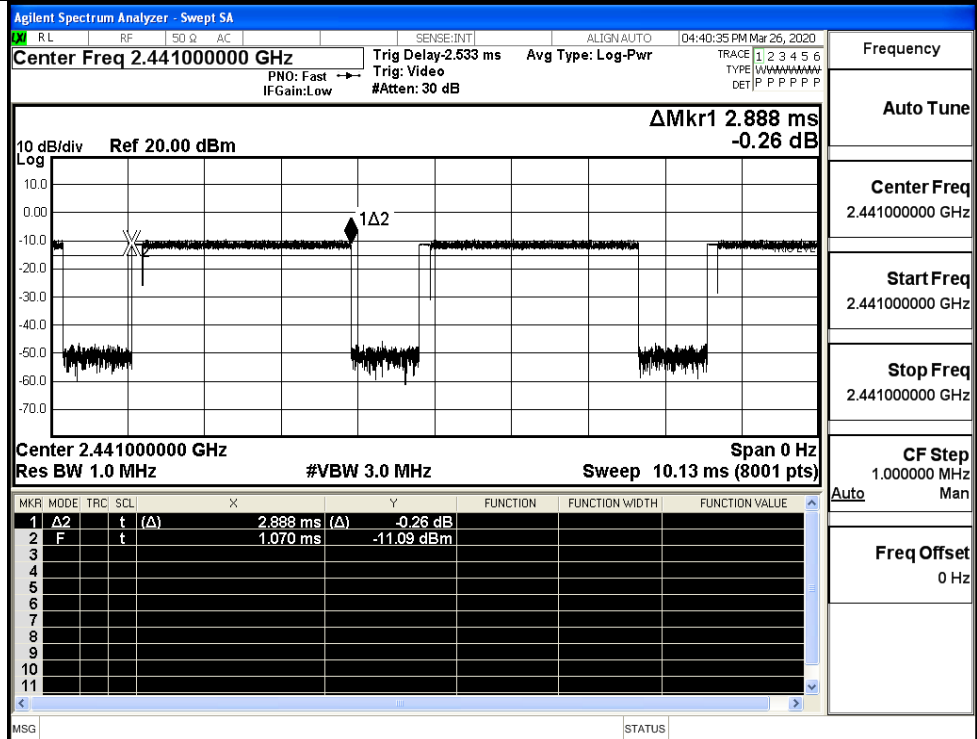
$\pi/4$ DQPSK
_2DH5/HCH



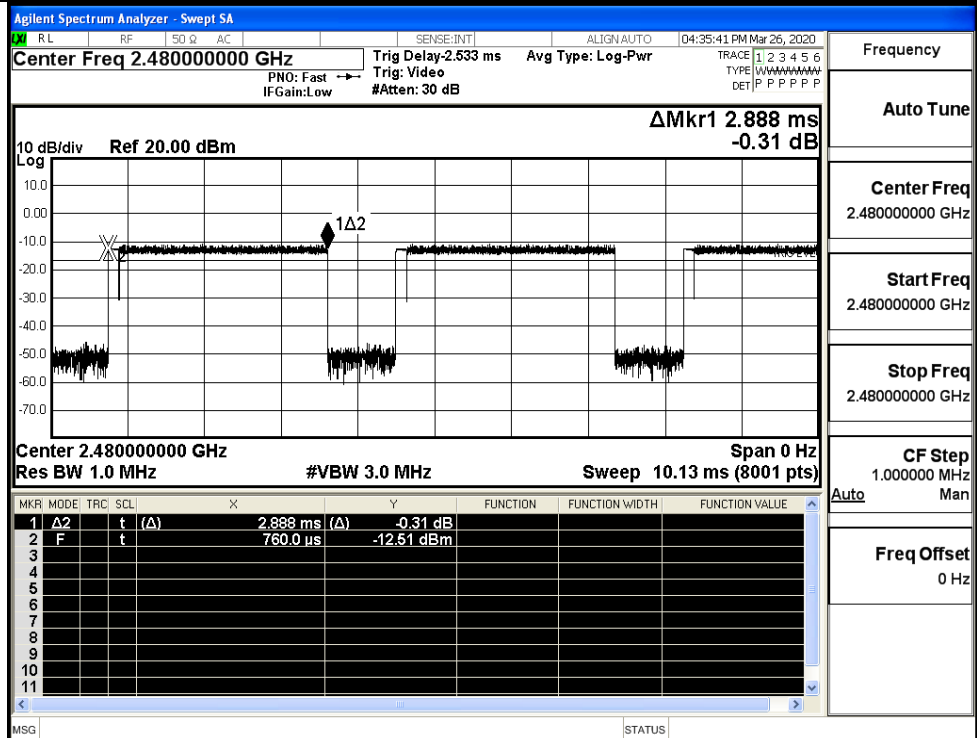
8DPSK _3DH5/LCH



8DPSK_3DH5/MCH



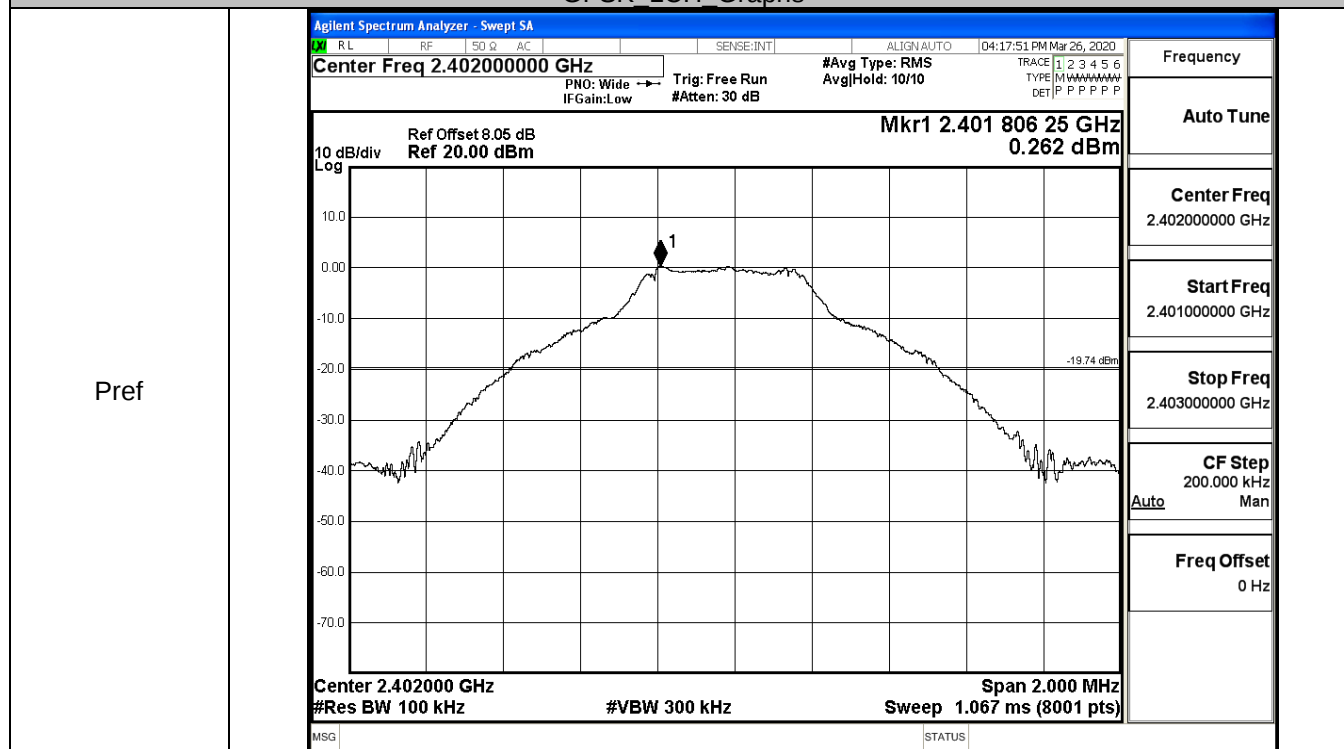
8DPSK_3DH5/HCH

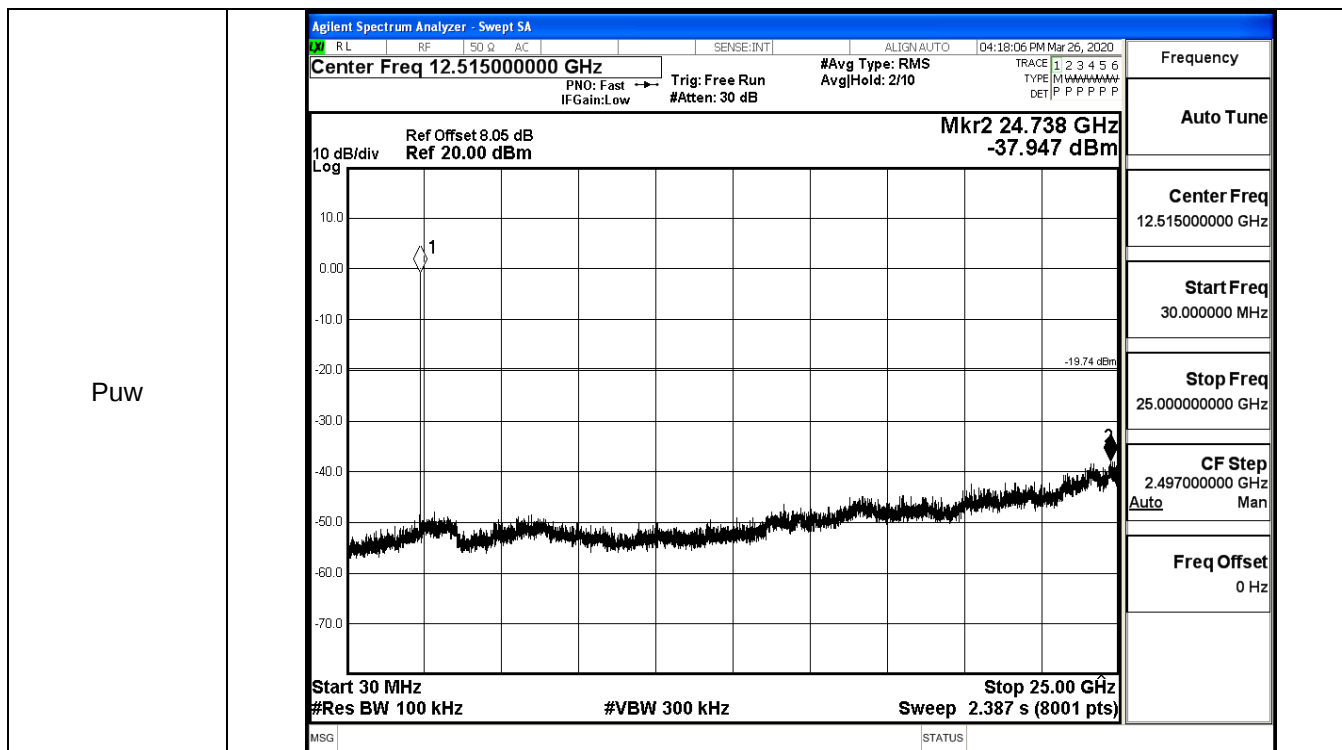


A.7 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	0.262	-37.947	-19.738	PASS
	MCH	-0.558	-37.977	-20.558	PASS
	HCH	-1.943	-37.594	-21.943	PASS
$\pi/4$ DQPSK	LCH	-2.37	-36.952	-22.370	PASS
	MCH	-3.308	-37.658	-23.308	PASS
	HCH	-4.573	-37.935	-24.573	PASS
8DPSK	LCH	-2.316	-36.762	-22.316	PASS
	MCH	-3.158	-37.725	-23.158	PASS
	HCH	-4.52	-37.742	-24.520	PASS

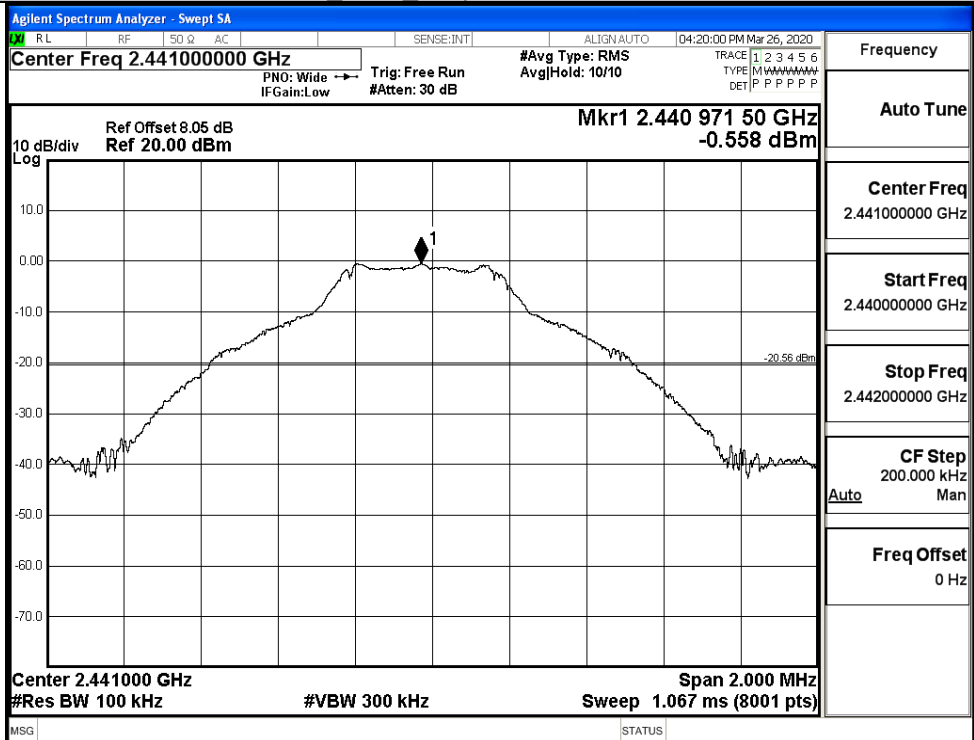
GFSK LCH Graphs



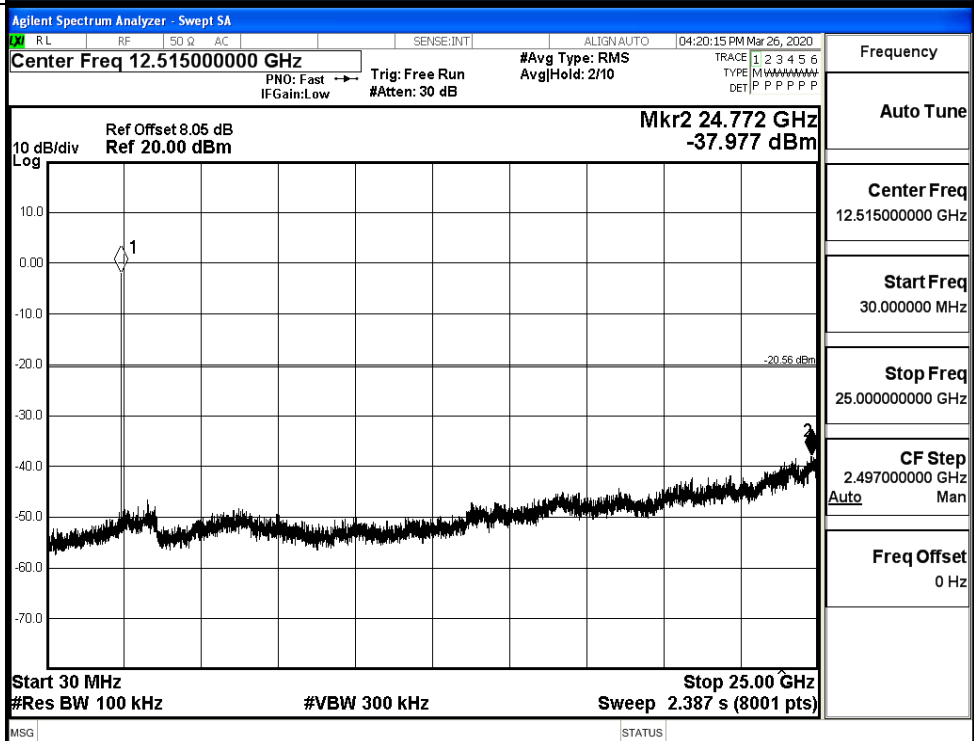


GFSK_MCH_Graphs

Pref

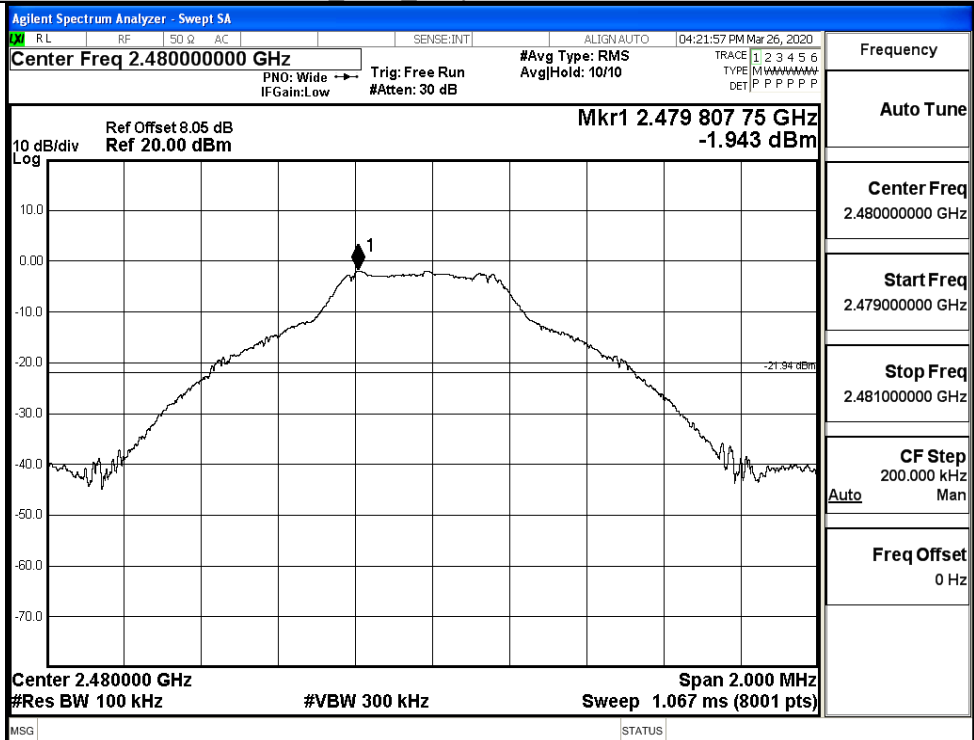


Puw

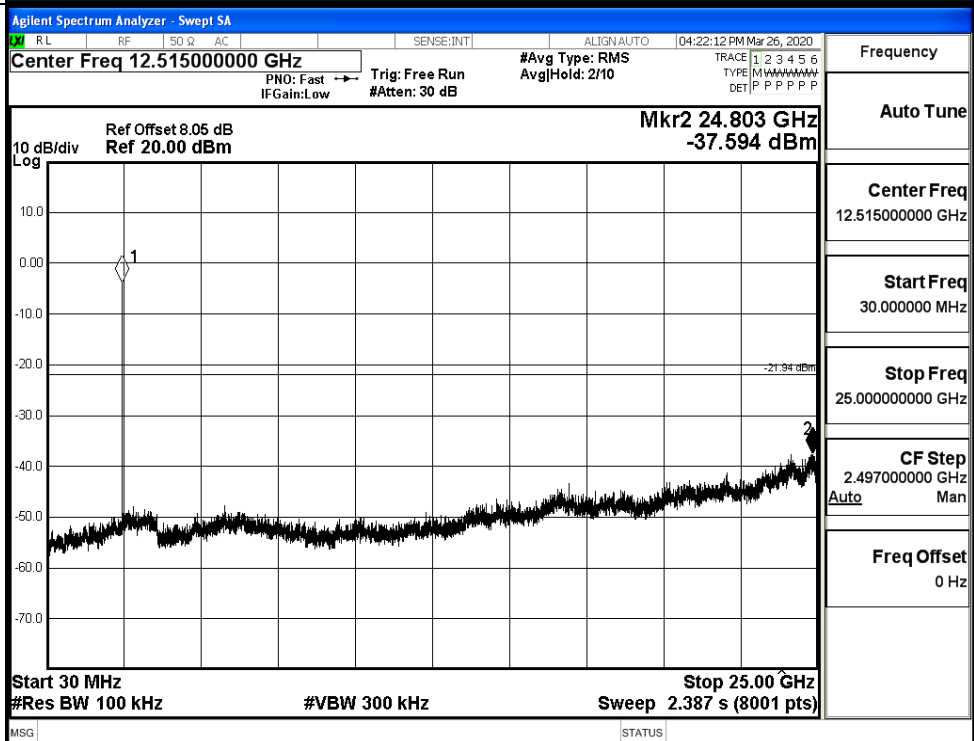


GFSK HCH_Graphs

Pref

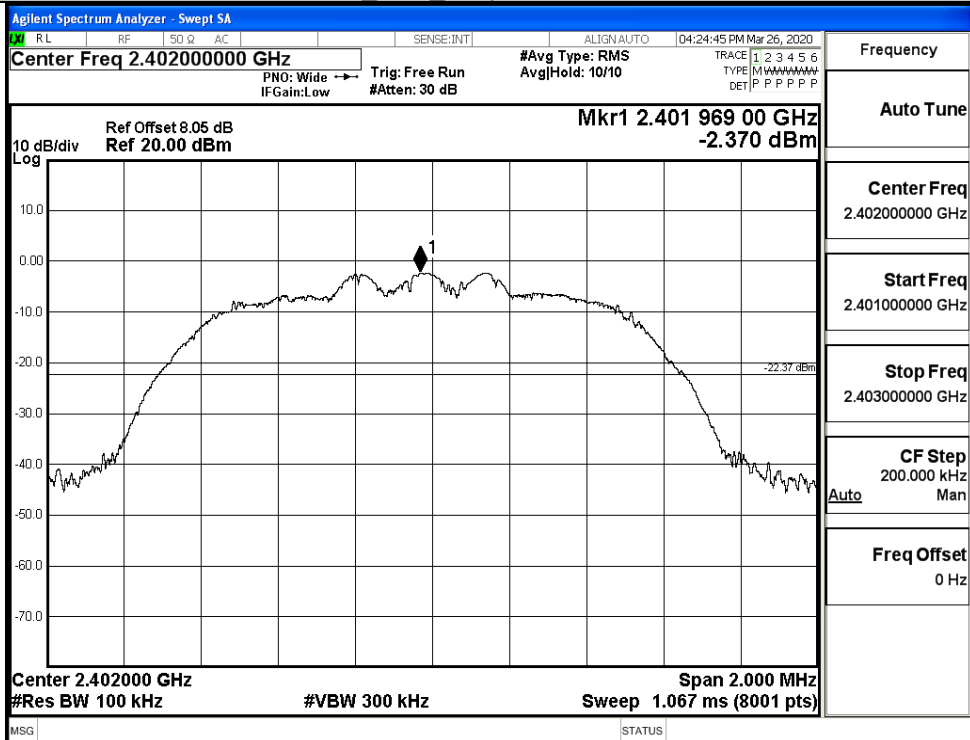


Puw

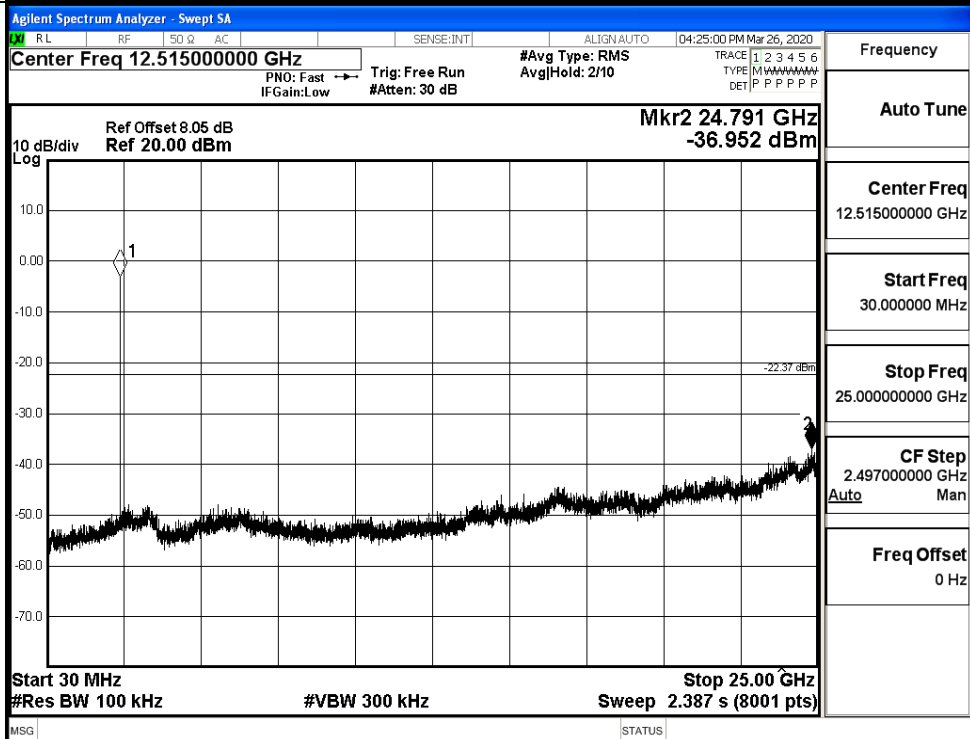


$\pi/4$ DQPSK_LCH_Graphs

Pref

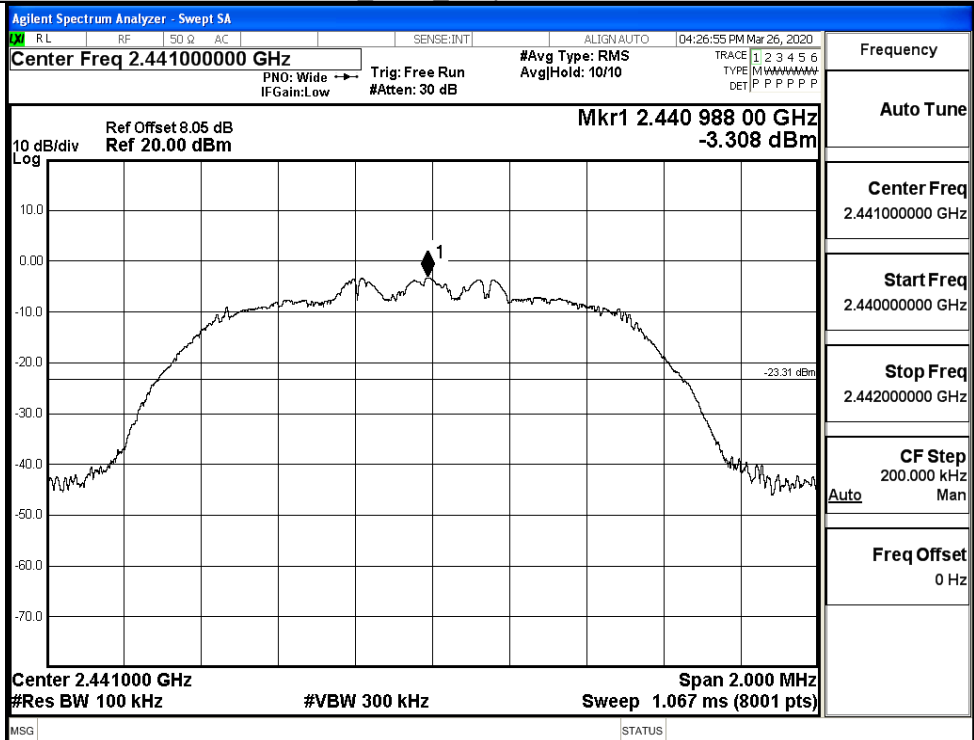


Puw

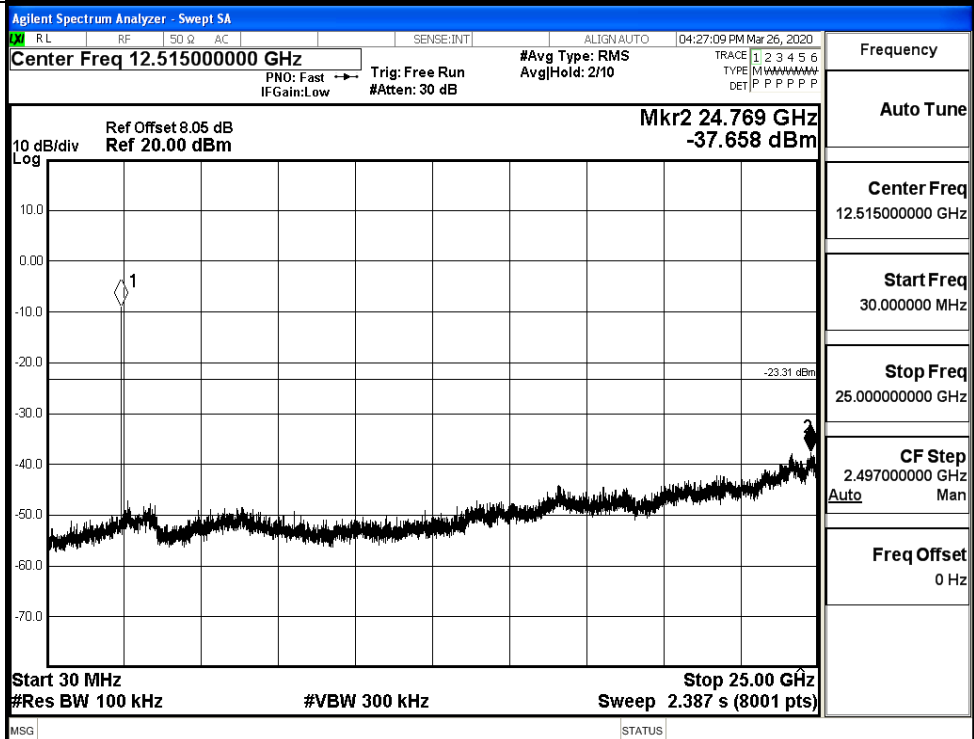


π /4DQPSK_MCH_Graphs

Pref

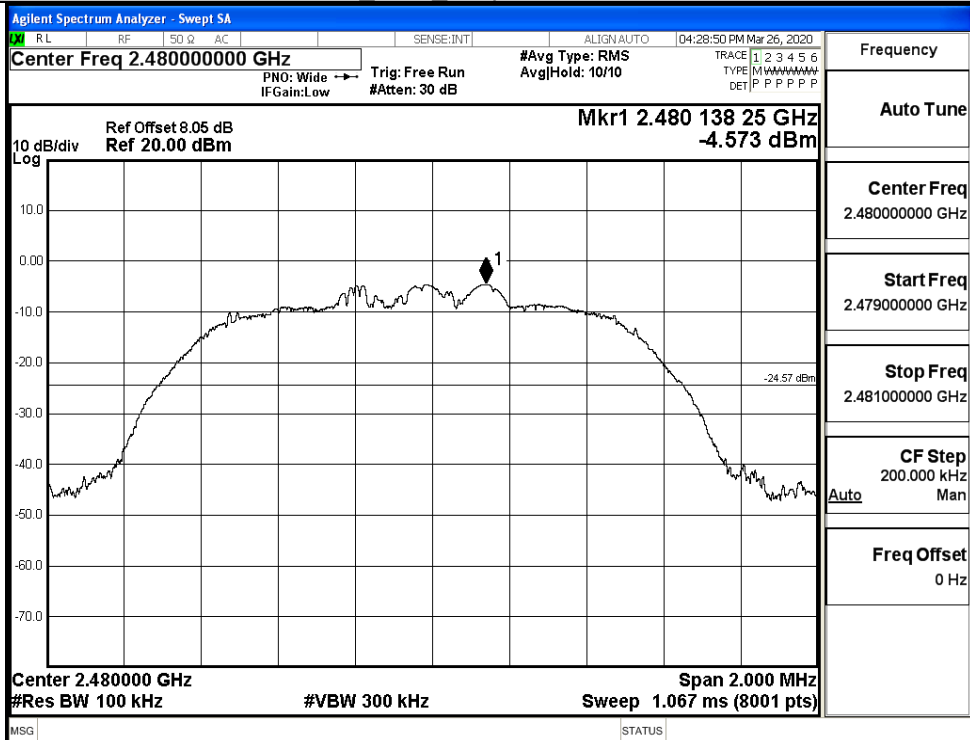


Puw

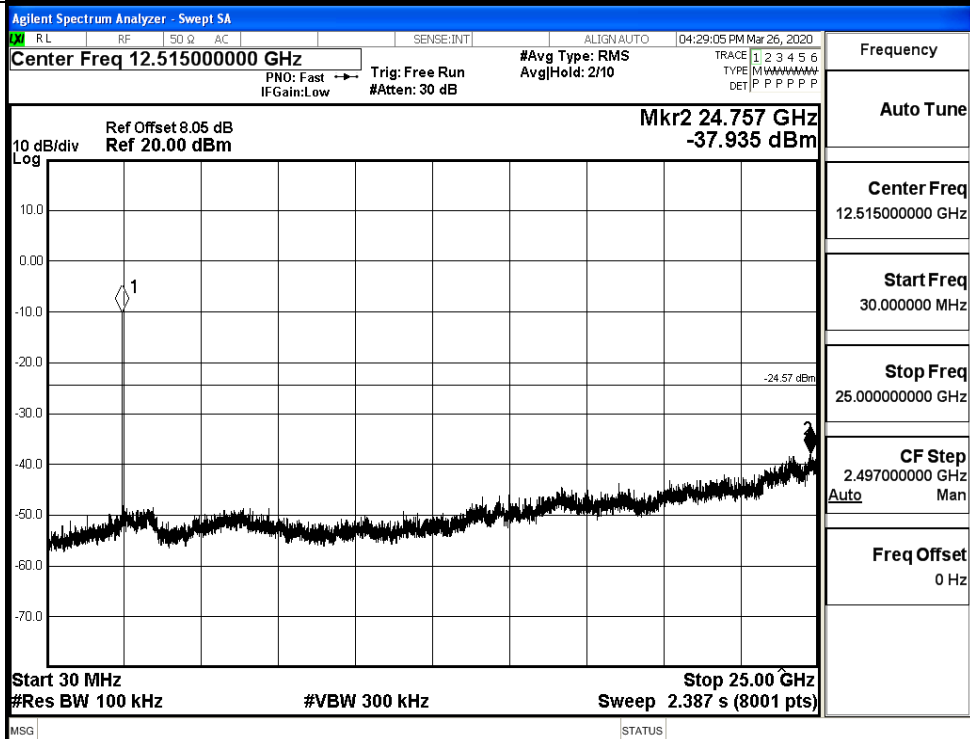


$\pi/4$ DQPSK_HCH_Graphs

Pref

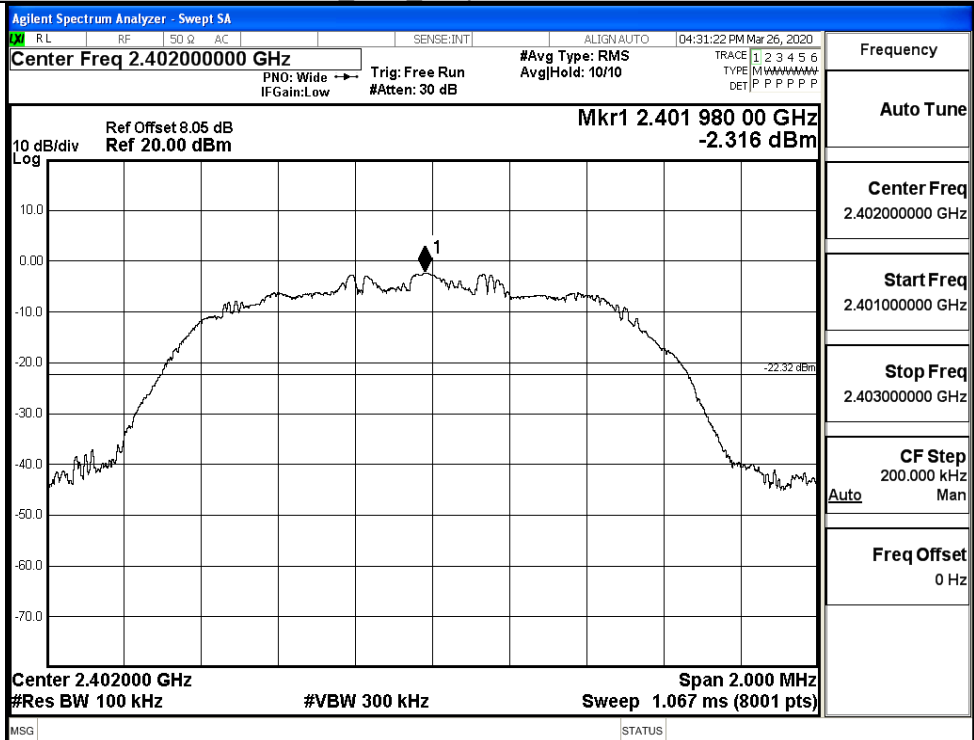


Puw

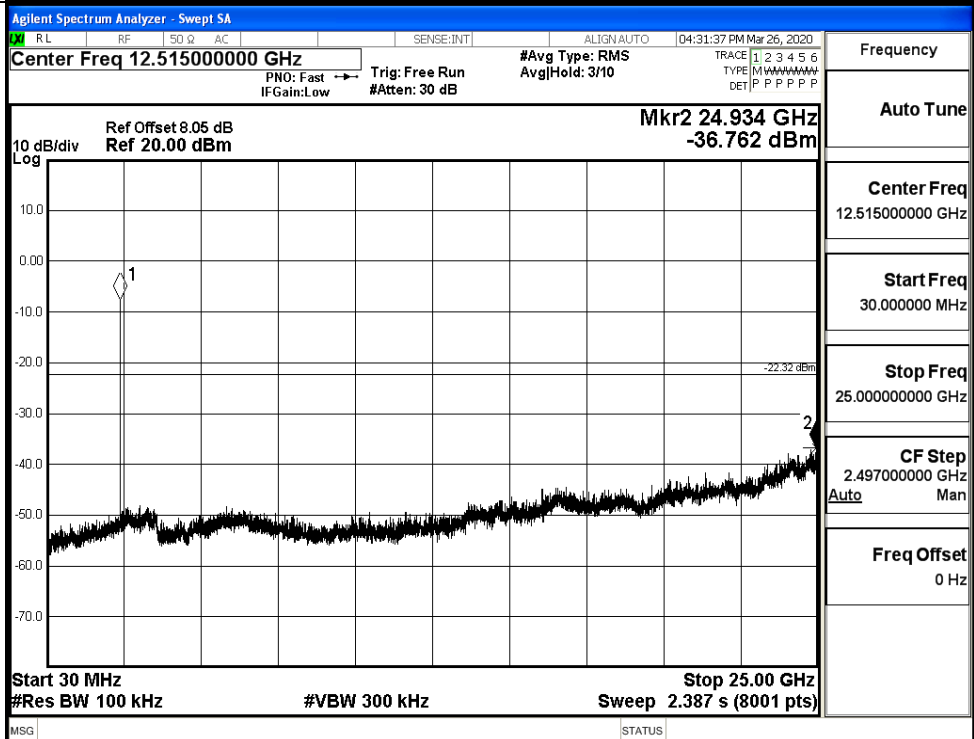


8DPSK_LCH_Graphs

Pref

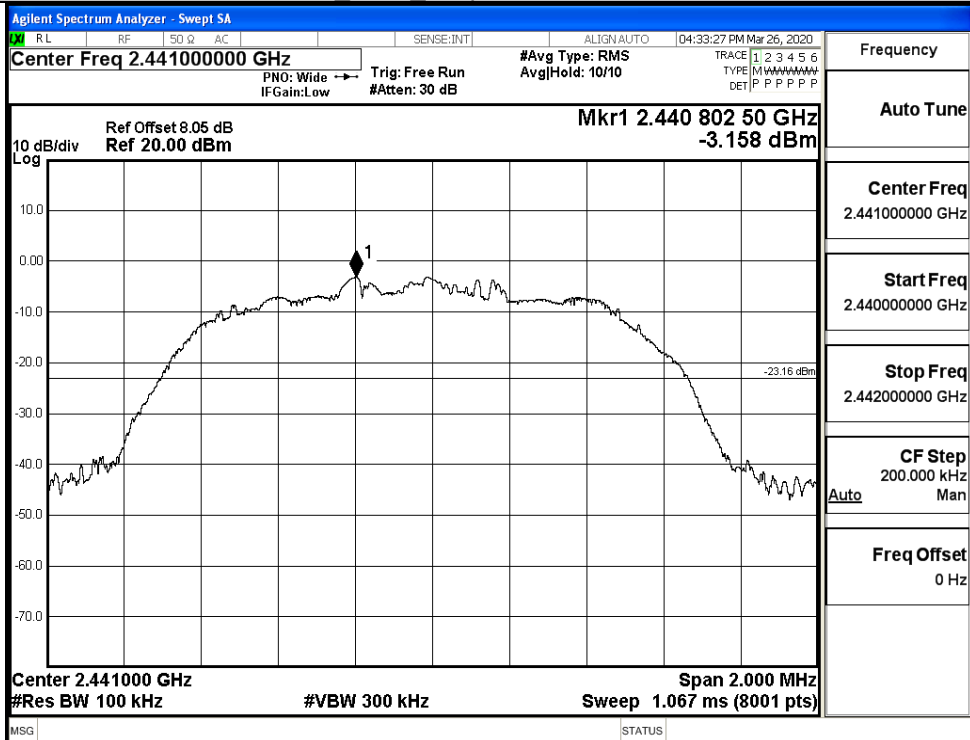


Puw

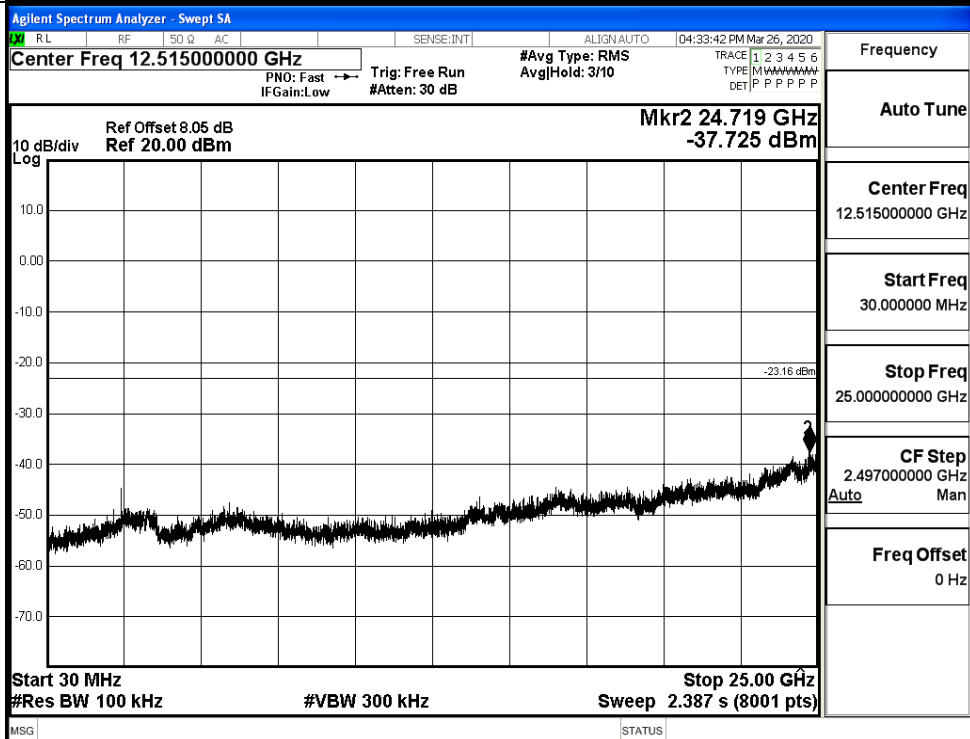


8DPSK_MCH_Graphs

Pref

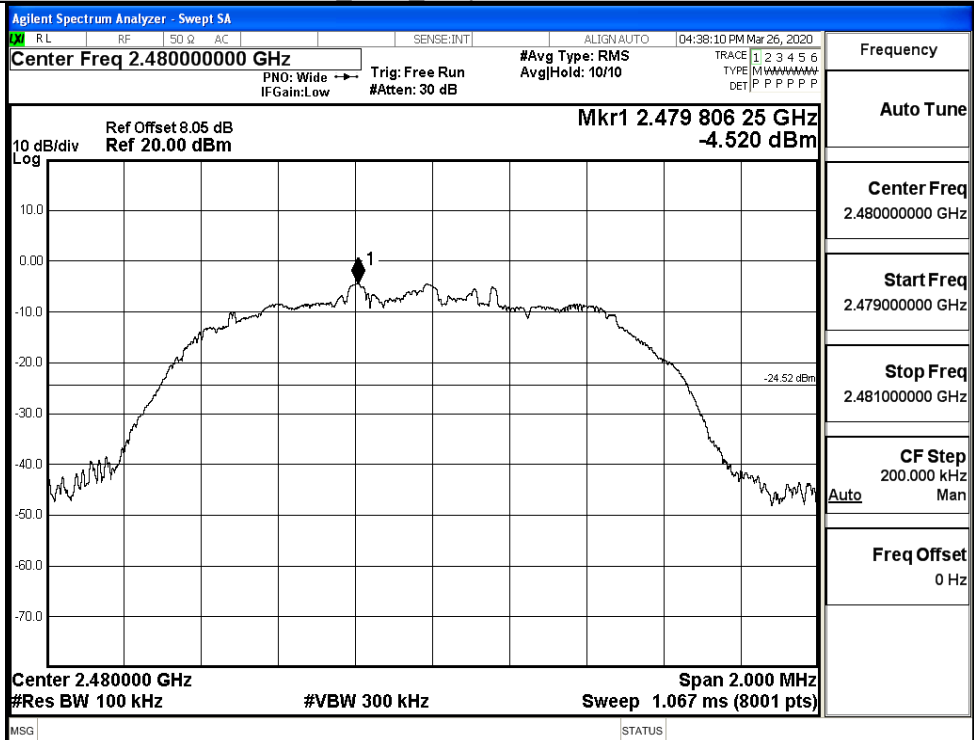


Puw

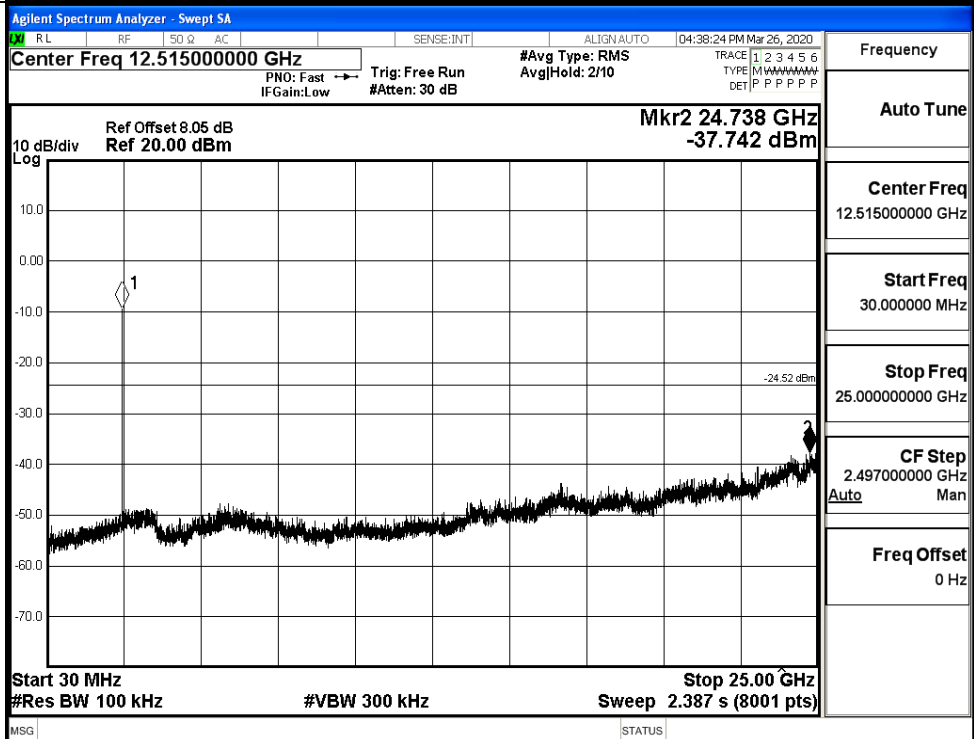


8DPSK_HCH_Graphs

Pref



Puw

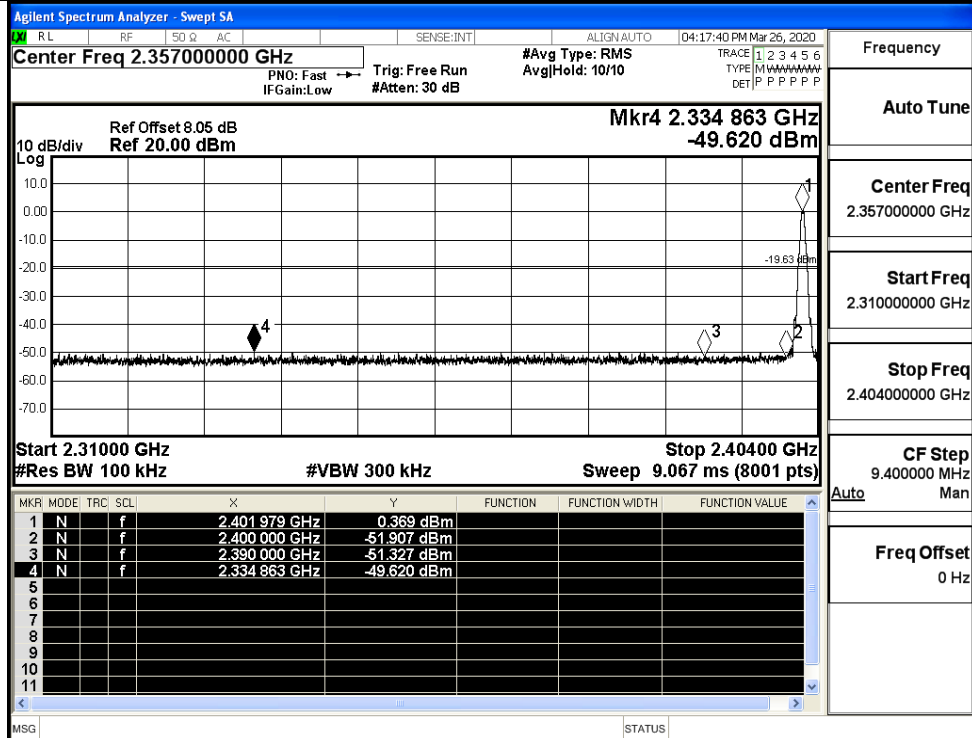


A.8 Band-edge for RF Conducted Emissions

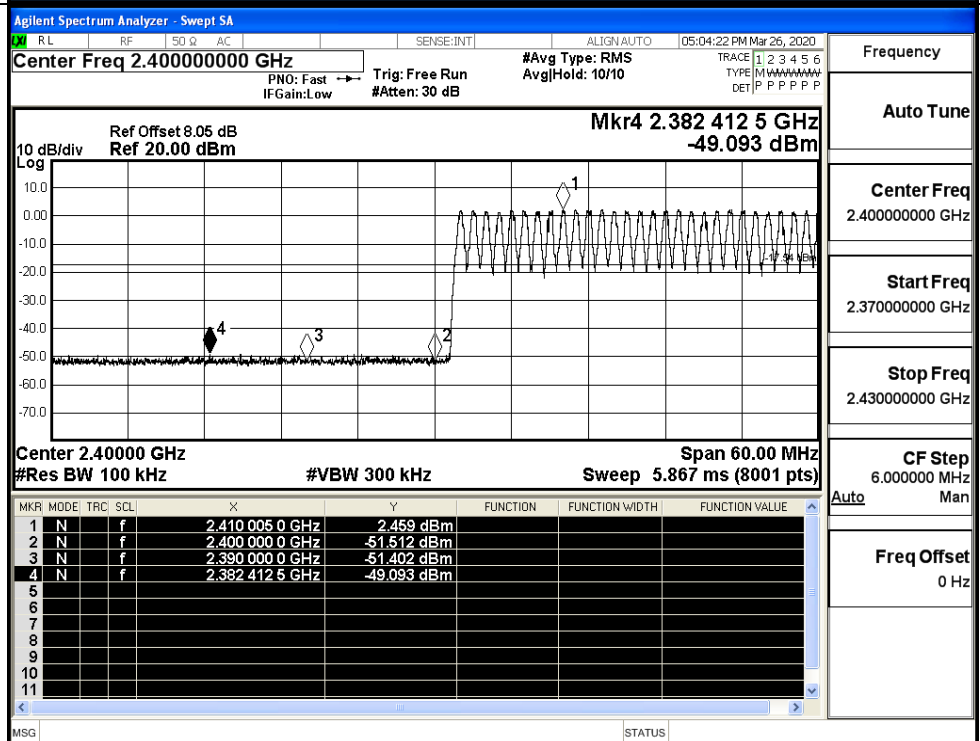
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	0.369	Off	-49.620	-19.63	PASS
			2.459	On	-49.093	-17.54	PASS
	HCH	2480	-2.014	Off	-48.652	-22.01	PASS
			2.432	On	-48.964	-17.57	PASS
$\pi/4$ DQPSK	LCH	2402	-2.183	Off	-49.654	-22.18	PASS
			1.230	On	-48.575	-18.77	PASS
	HCH	2480	-4.493	Off	-48.632	-24.49	PASS
			1.241	On	-48.625	-18.76	PASS
8DPSK	LCH	2402	-2.321	Off	-49.446	-22.32	PASS
			1.263	On	-48.938	-18.74	PASS
	HCH	2480	-4.362	Off	-49.120	-24.36	PASS
			1.636	On	-48.057	-18.36	PASS

Test Graphs

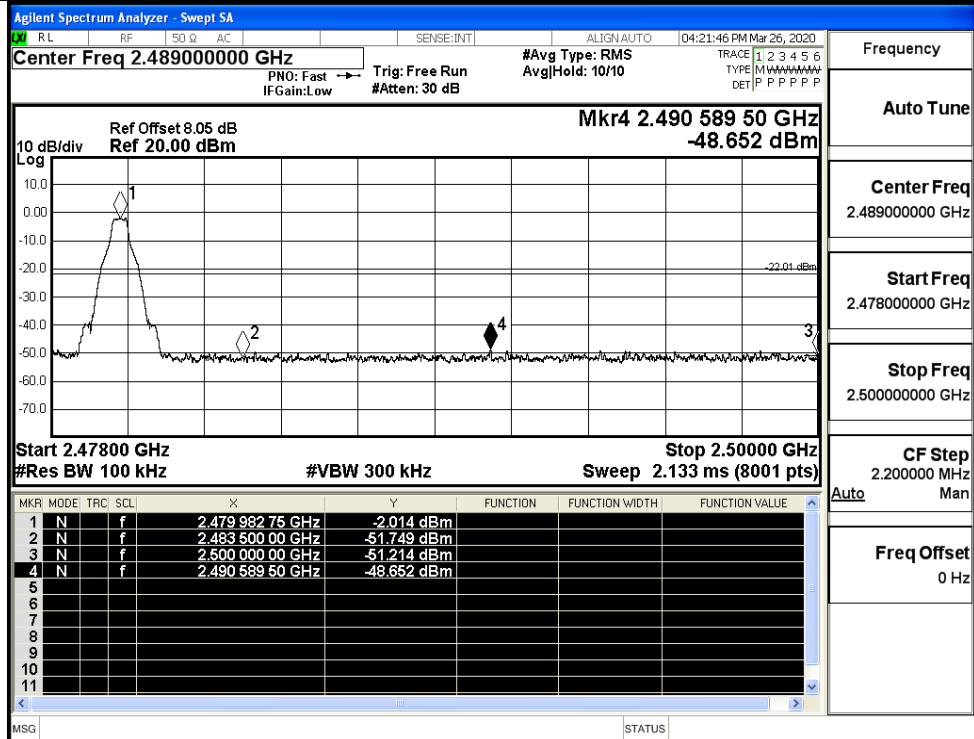
GFSK/LCH/No Hop



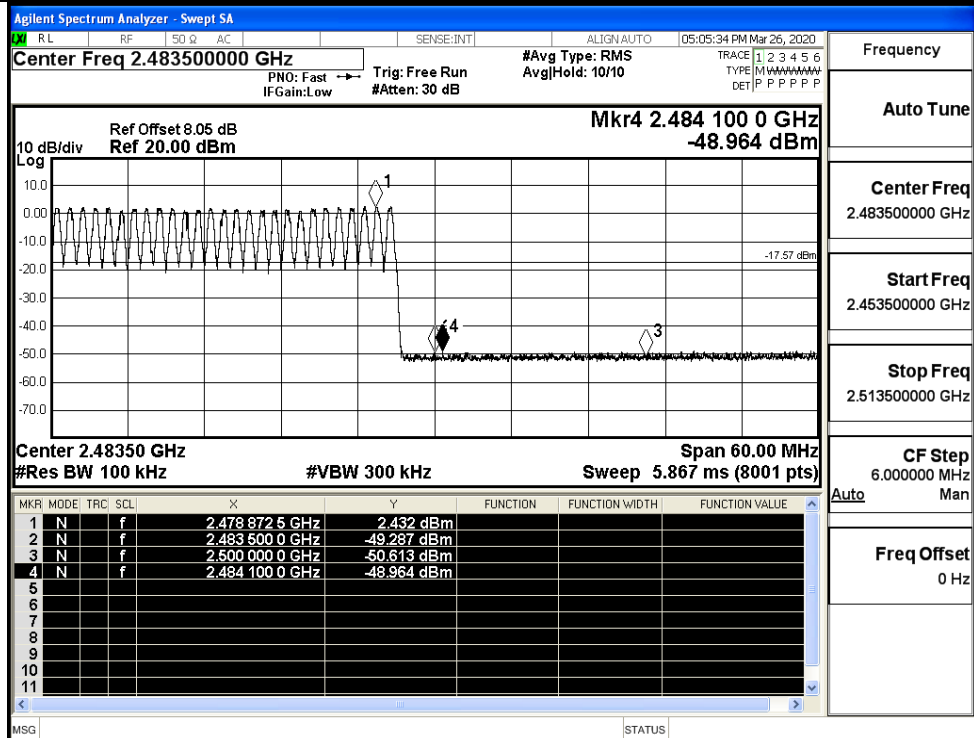
GFSK/LCH/Hop



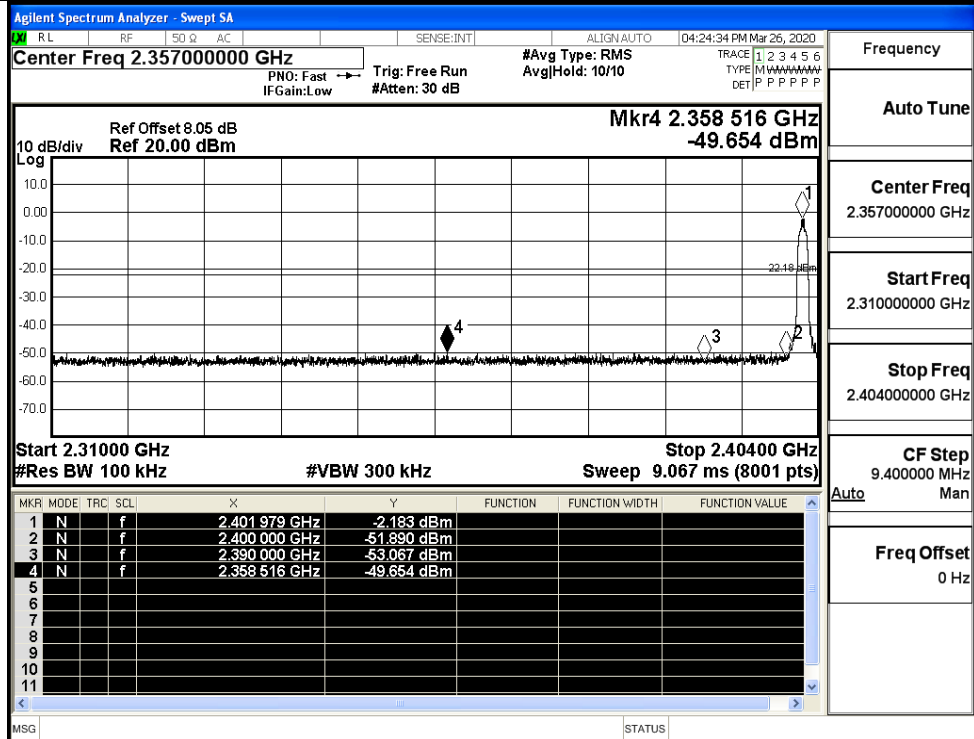
GFSK/HCH/No Hop



GFSK/HCH/Hop



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



Frequency

Auto Tune

Center Freq
2.357000000 GHz

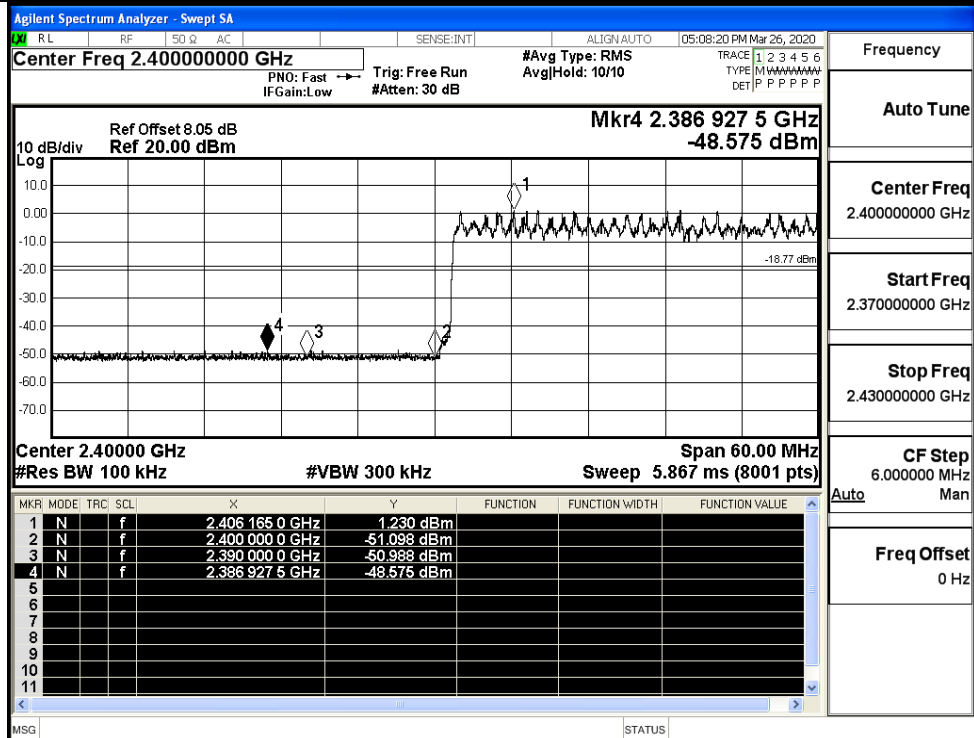
Start Freq
2.310000000 GHz

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

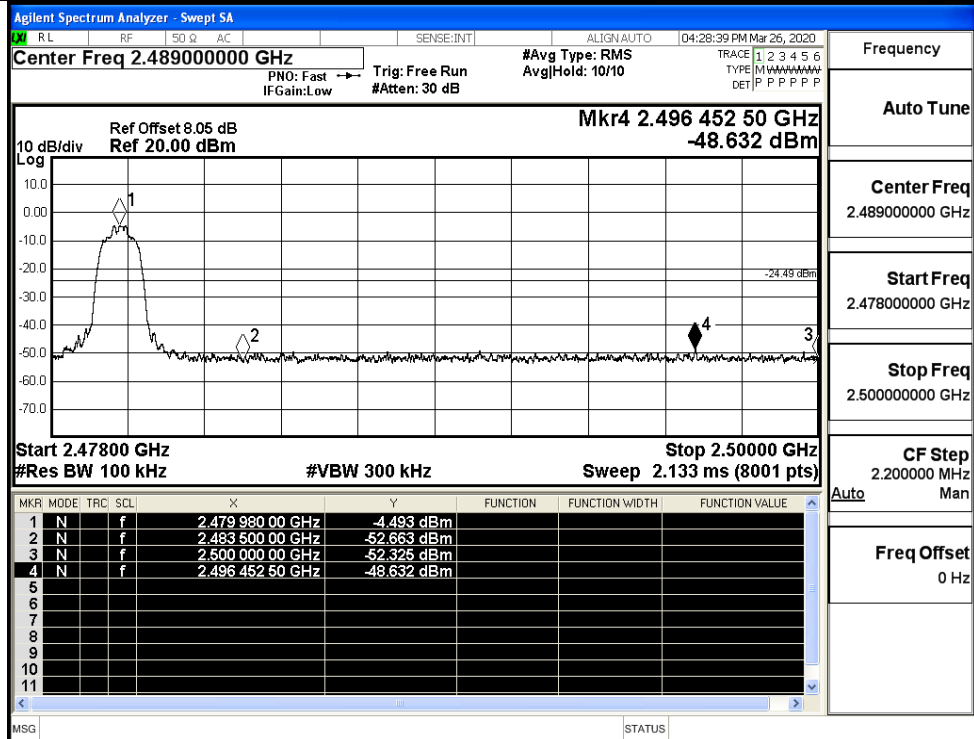
Start Freq
2.370000000 GHz

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 GHz

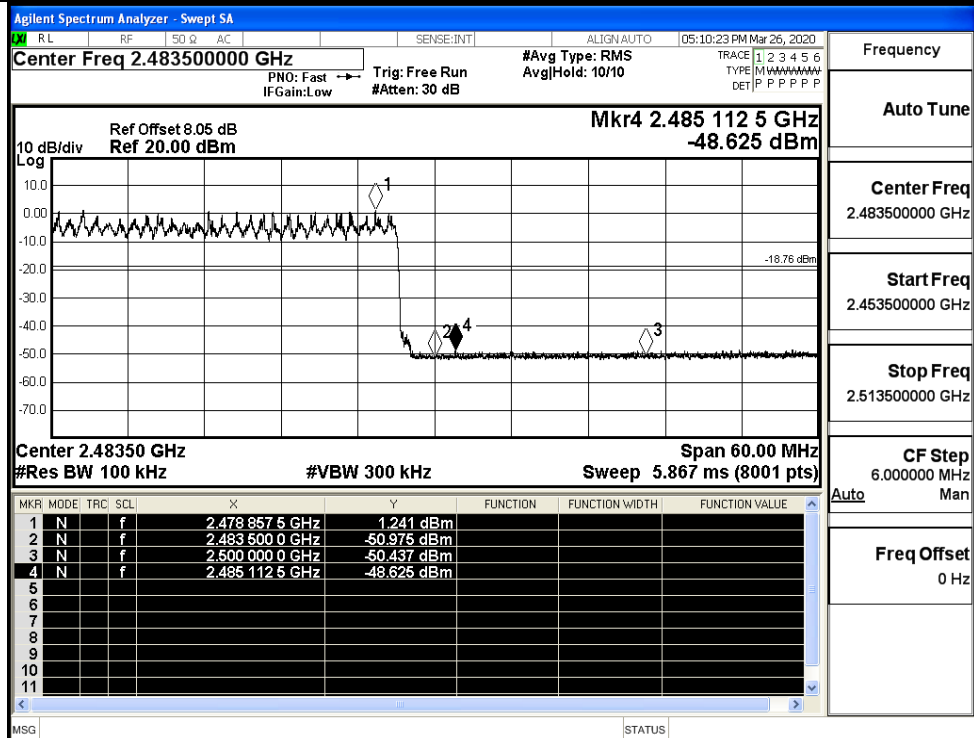
Start Freq
2.478000000 GHz

Stop Freq
2.500000000 GHz

CF Step
2.200000 MHz
Auto Man

Freq Offset
0 Hz

$\pi/4$ DQPSK/HCH/Hop



Frequency

Auto Tune

Center Freq
2.483500000 GHz

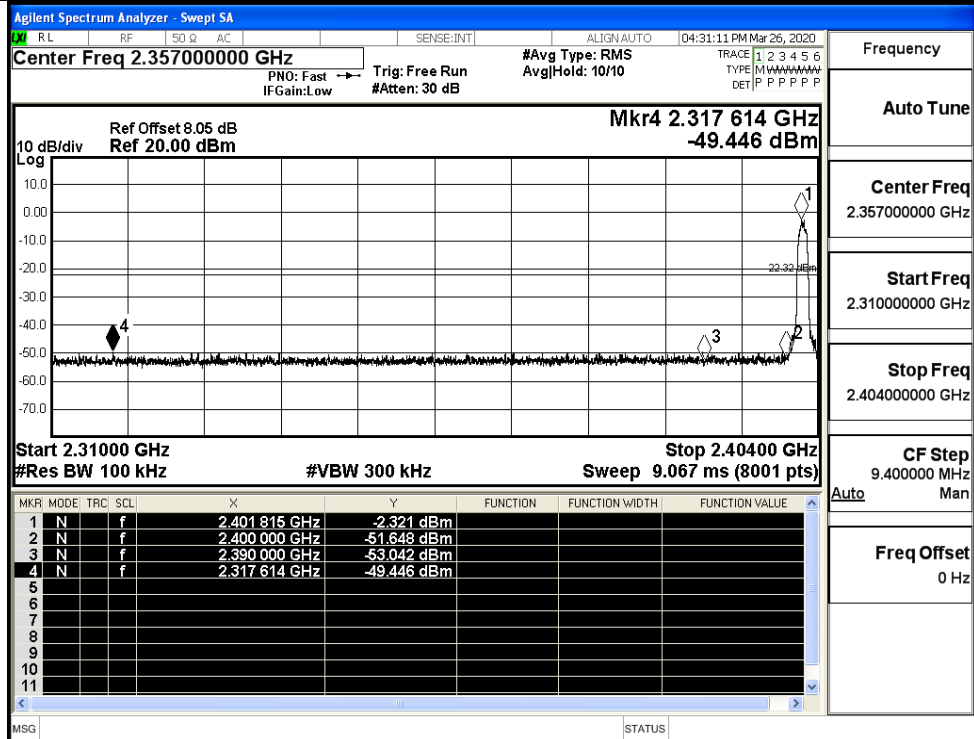
Start Freq
2.453500000 GHz

Stop Freq
2.513500000 GHz

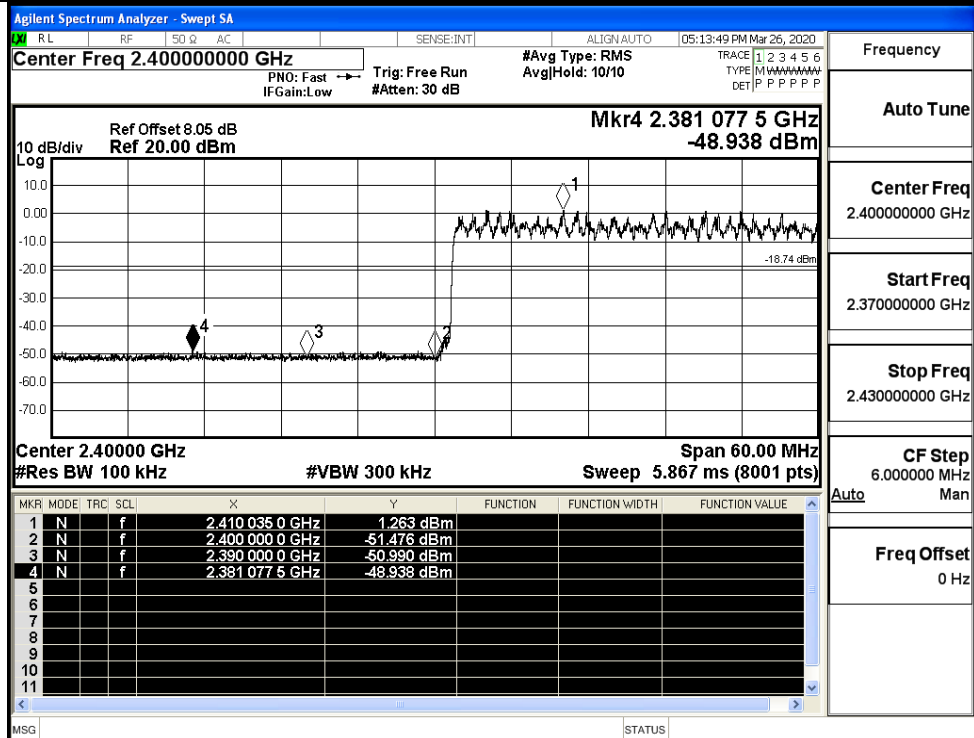
CF Step
6.000000 MHz
Auto Man

Freq Offset
0 Hz

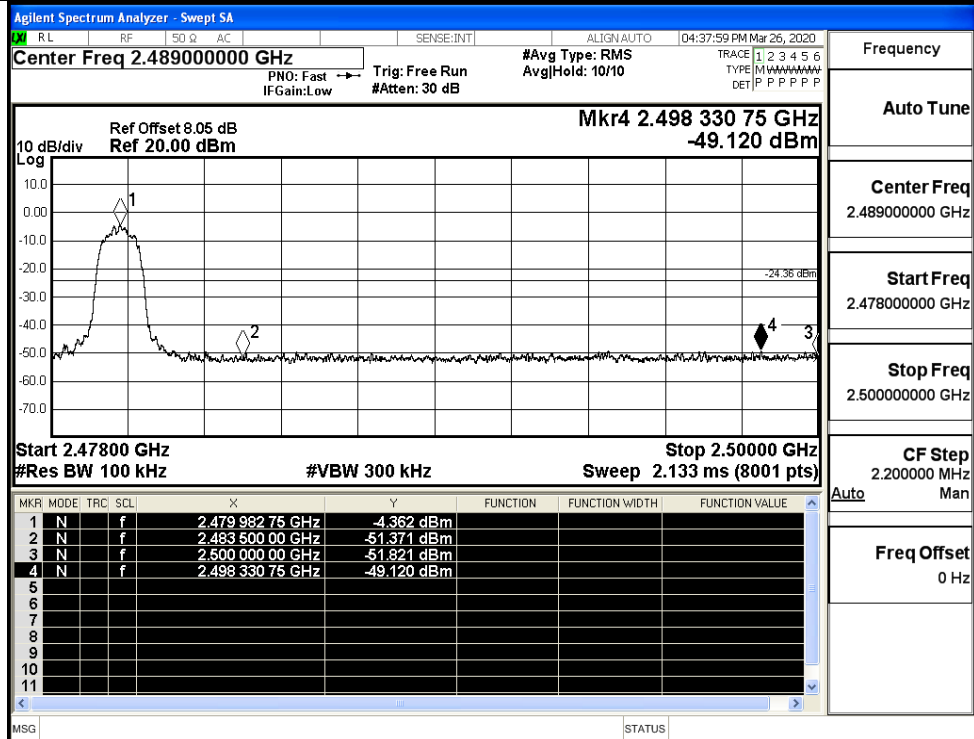
8DPSK/LCH/No Hop



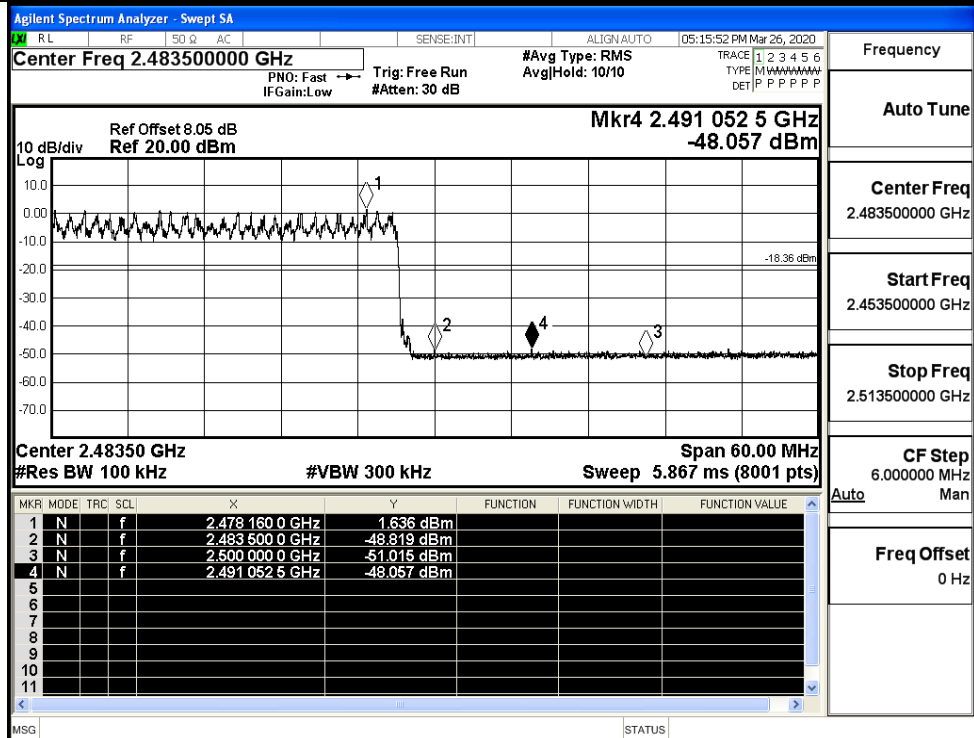
8DPSK/LCH/Hop



8DPSK/HCH/No Hop



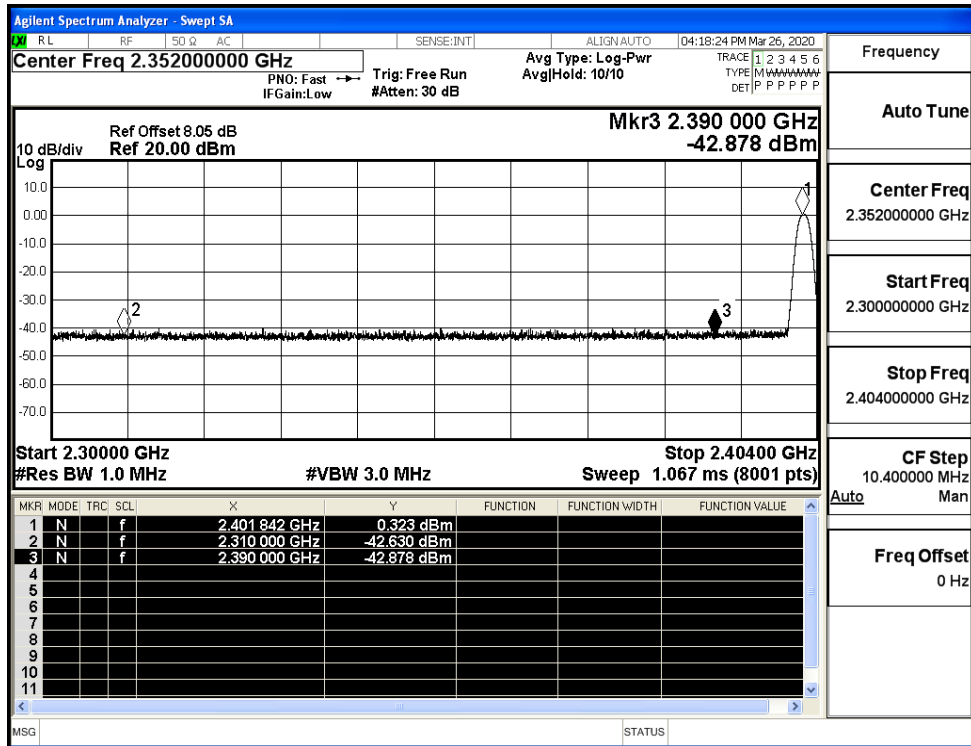
8DPSK/HCH/Hop



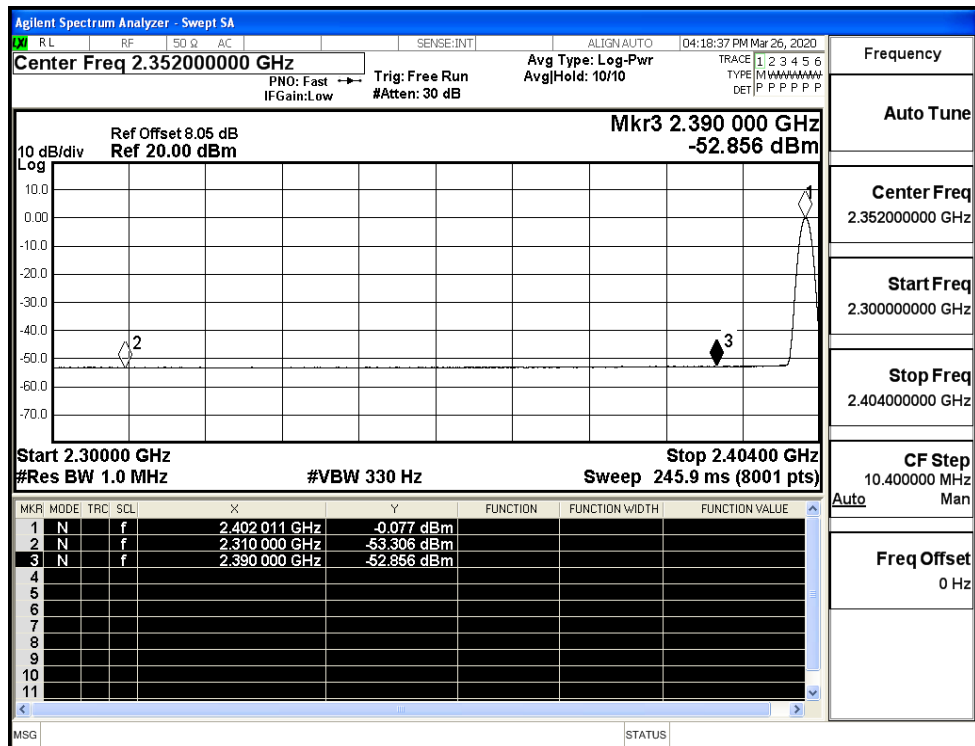
A.9 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-42.63	2.0	0	54.63	PEAK	74	PASS
	Off	2310.0	-53.31	2.0	0	43.95	AV	54	PASS
	Off	2390.0	-42.88	2.0	0	54.38	PEAK	74	PASS
	Off	2390.0	-52.86	2.0	0	44.40	AV	54	PASS
	Off	2483.5	-42.21	2.0	0	55.05	PEAK	74	PASS
	Off	2483.5	-52.31	2.0	0	44.95	AV	54	PASS
	Off	2500.0	-41.71	2.0	0	55.55	PEAK	74	PASS
	Off	2500.0	-52.24	2.0	0	45.02	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-43.18	2.0	0	54.08	PEAK	74	PASS
	Off	2310.0	-53.23	2.0	0	44.03	AV	54	PASS
	Off	2390.0	-40.07	2.0	0	57.19	PEAK	74	PASS
	Off	2390.0	-52.79	2.0	0	44.47	AV	54	PASS
	Off	2483.5	-42.08	2.0	0	55.18	PEAK	74	PASS
	Off	2483.5	-52.31	2.0	0	44.95	AV	54	PASS
	Off	2500.0	-42.56	2.0	0	54.70	PEAK	74	PASS
	Off	2500.0	-52.23	2.0	0	45.03	AV	54	PASS
8DPSK	Off	2310.0	-43.99	2.0	0	53.27	PEAK	74	PASS
	Off	2310.0	-53.24	2.0	0	44.02	AV	54	PASS
	Off	2390.0	-42.99	2.0	0	54.27	PEAK	74	PASS
	Off	2390.0	-52.81	2.0	0	44.45	AV	54	PASS
	Off	2483.5	-42.34	2.0	0	54.92	PEAK	74	PASS
	Off	2483.5	-52.35	2.0	0	44.90	AV	54	PASS
	Off	2500.0	-41.55	2.0	0	55.71	PEAK	74	PASS
	Off	2500.0	-52.27	2.0	0	44.99	AV	54	PASS

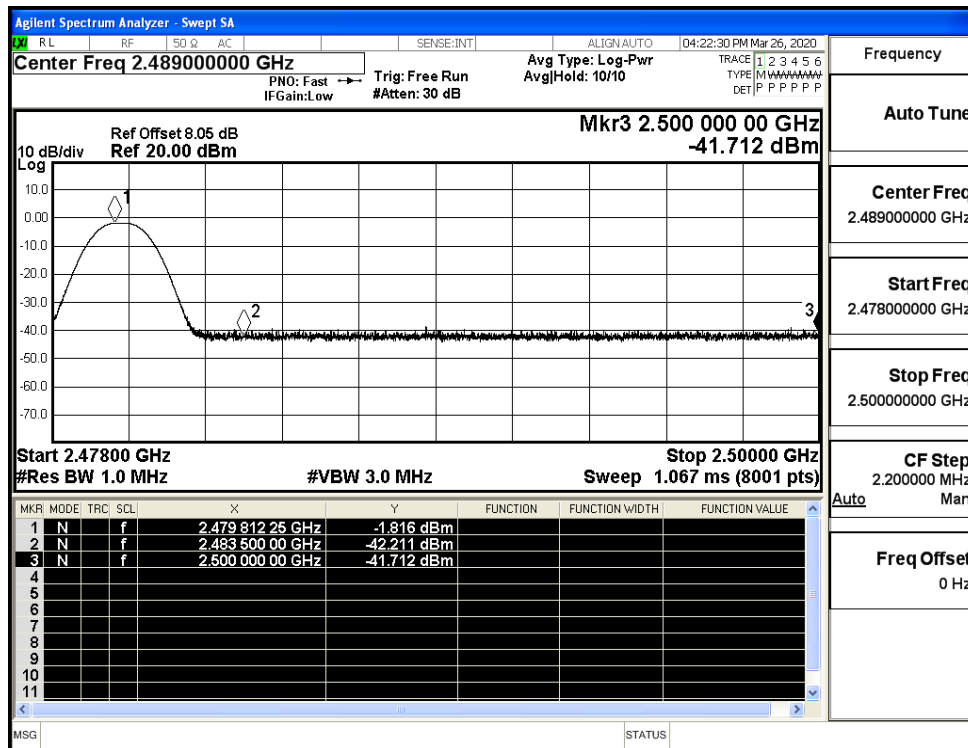
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



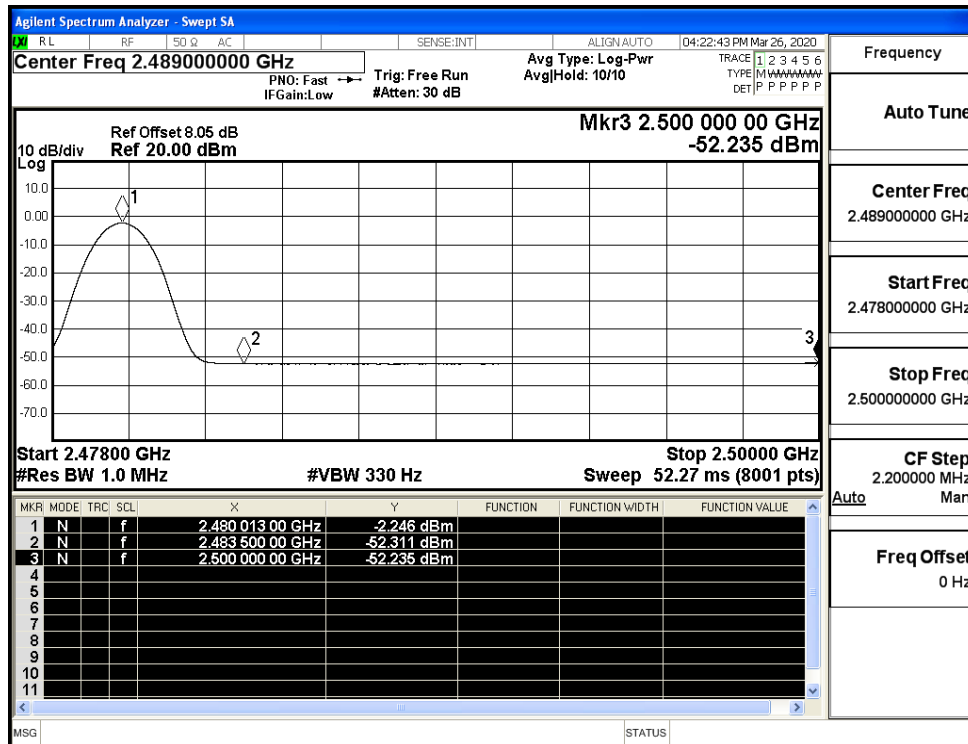
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)

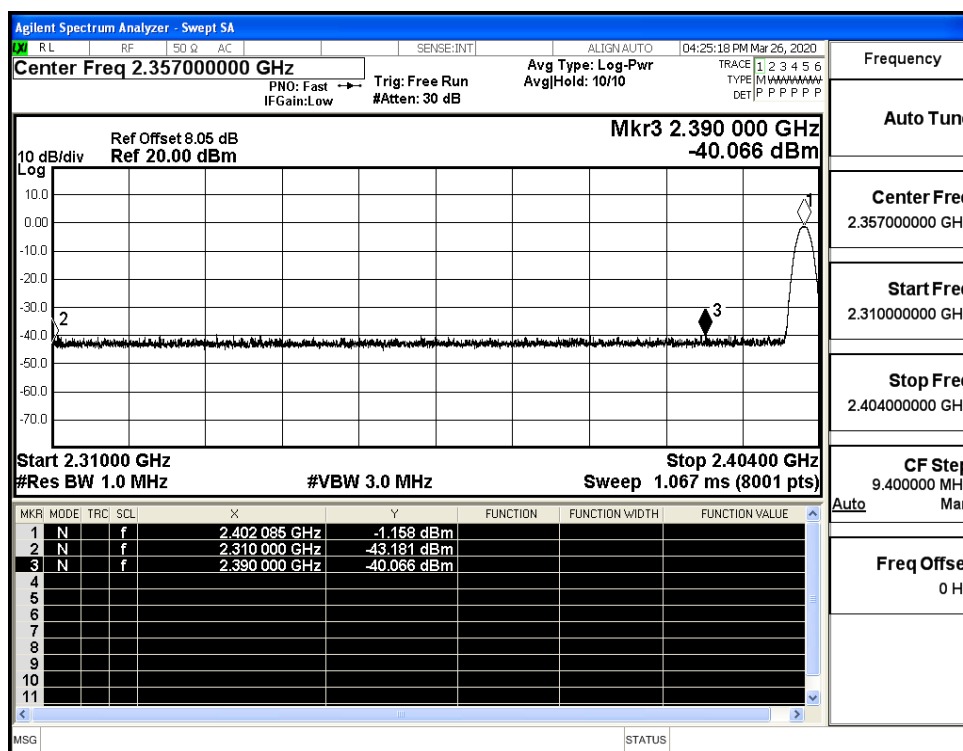
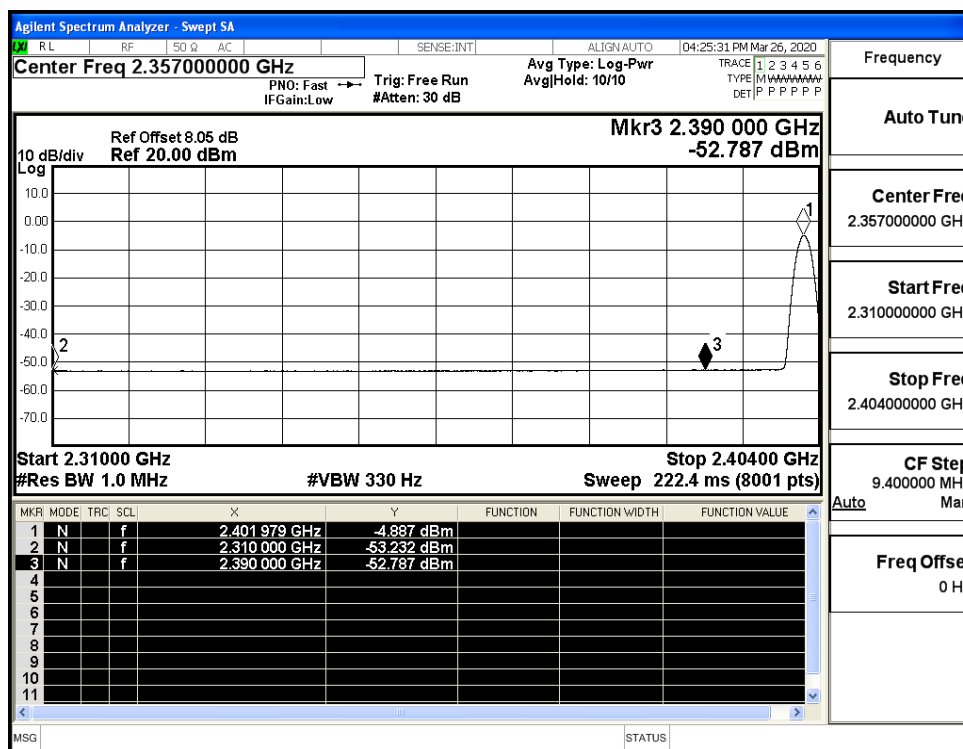


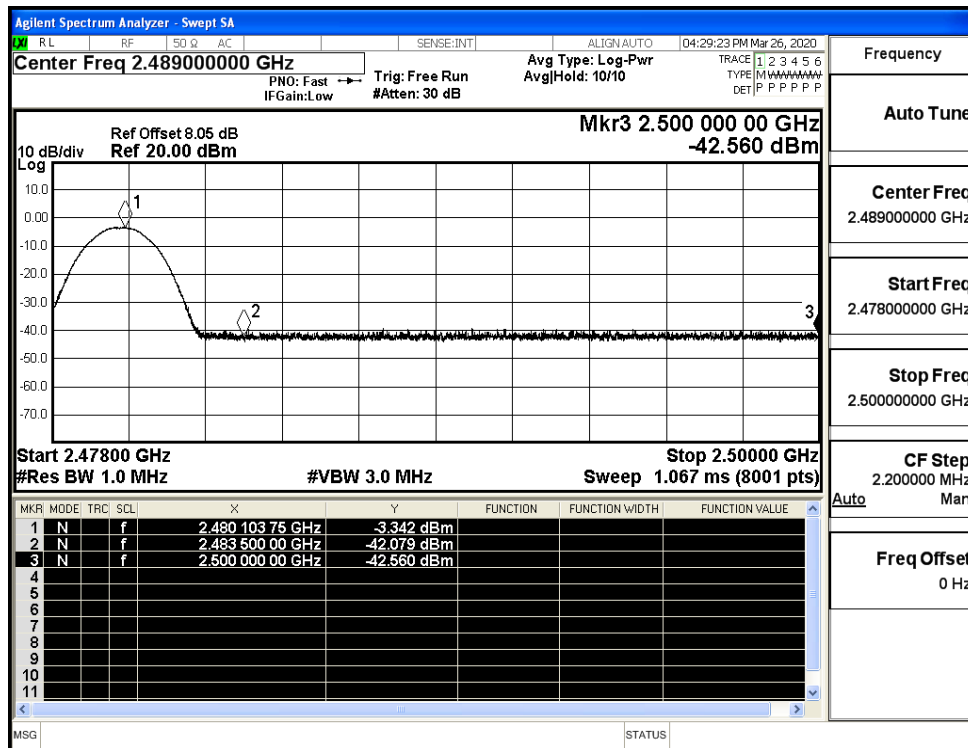
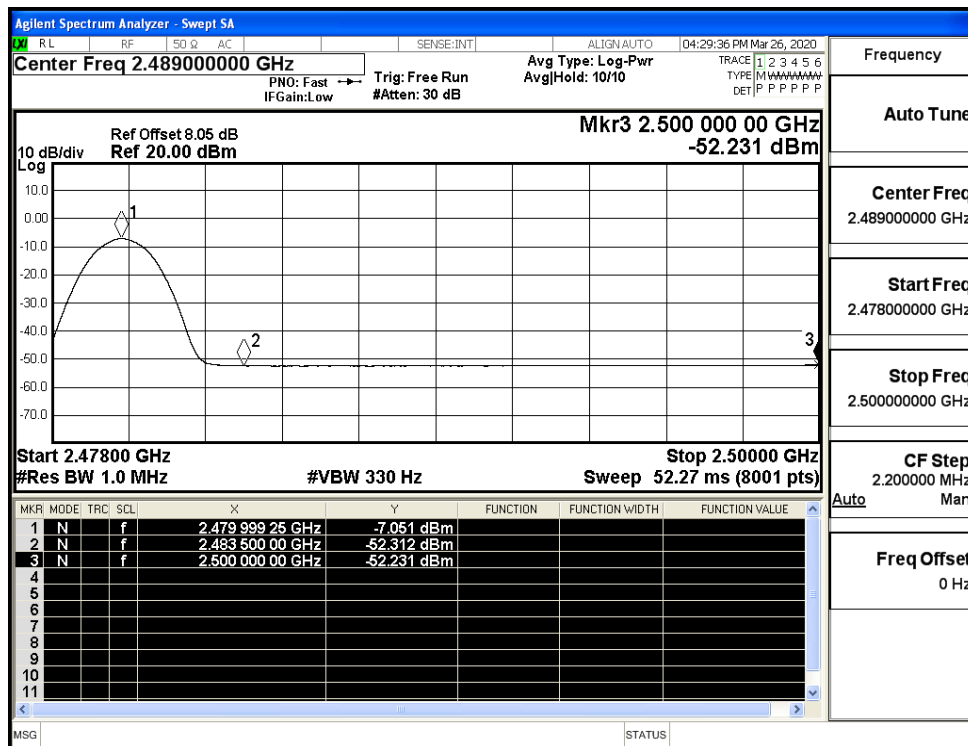
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



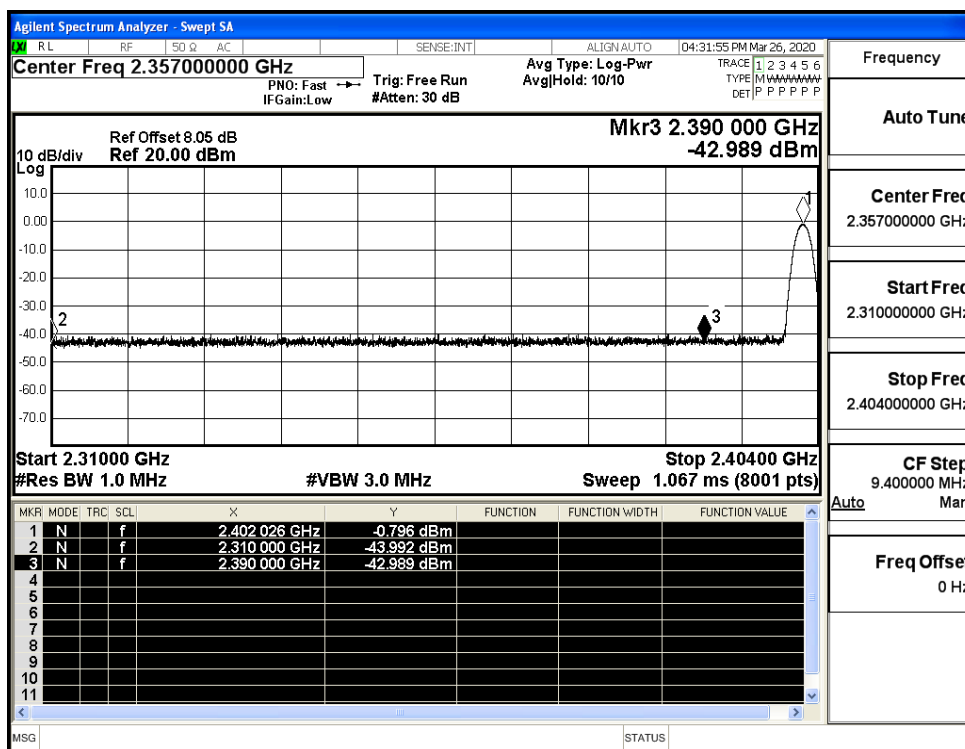
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



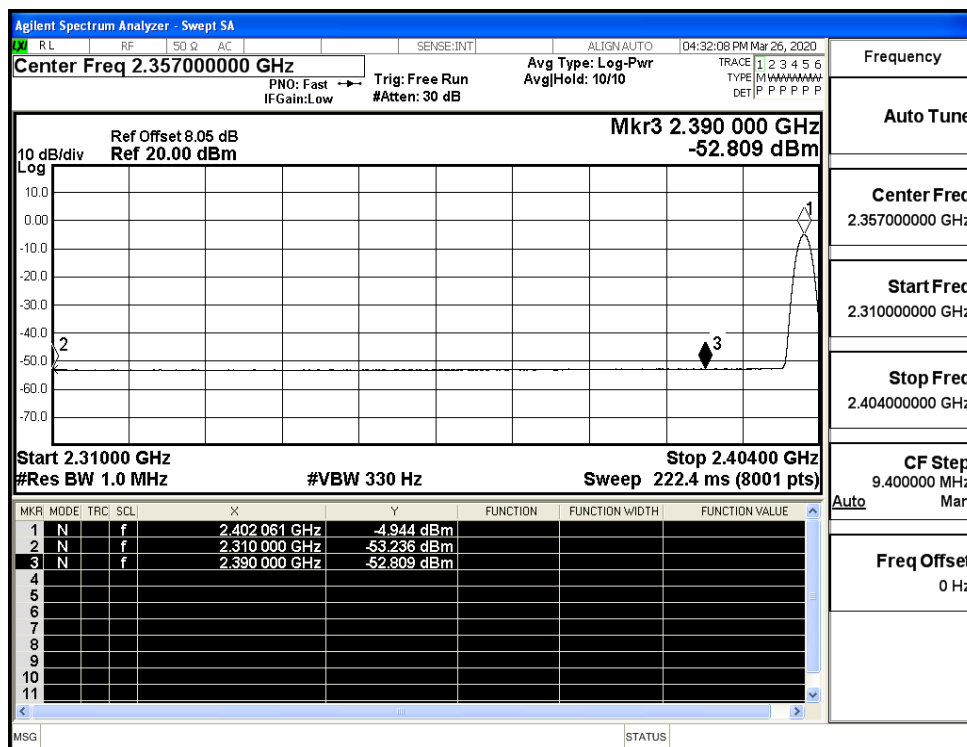
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)

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)

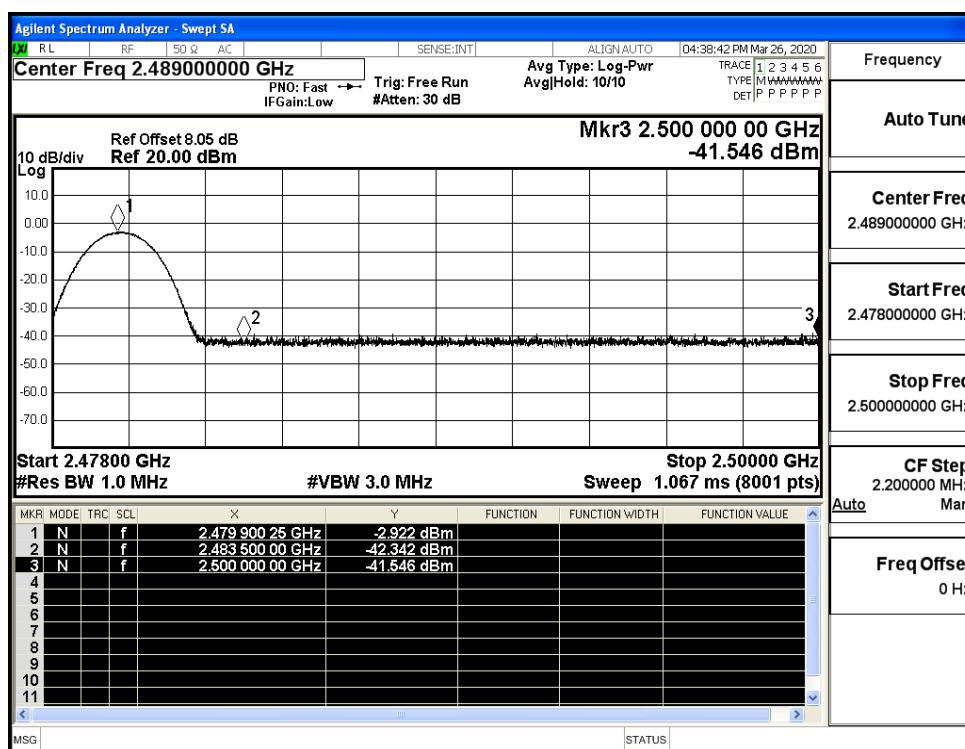
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

