

Appendix A

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

Product Name: Formuler CC

Trade Mark: FORMULER

Test Model: CC (US)

Environmental Conditions

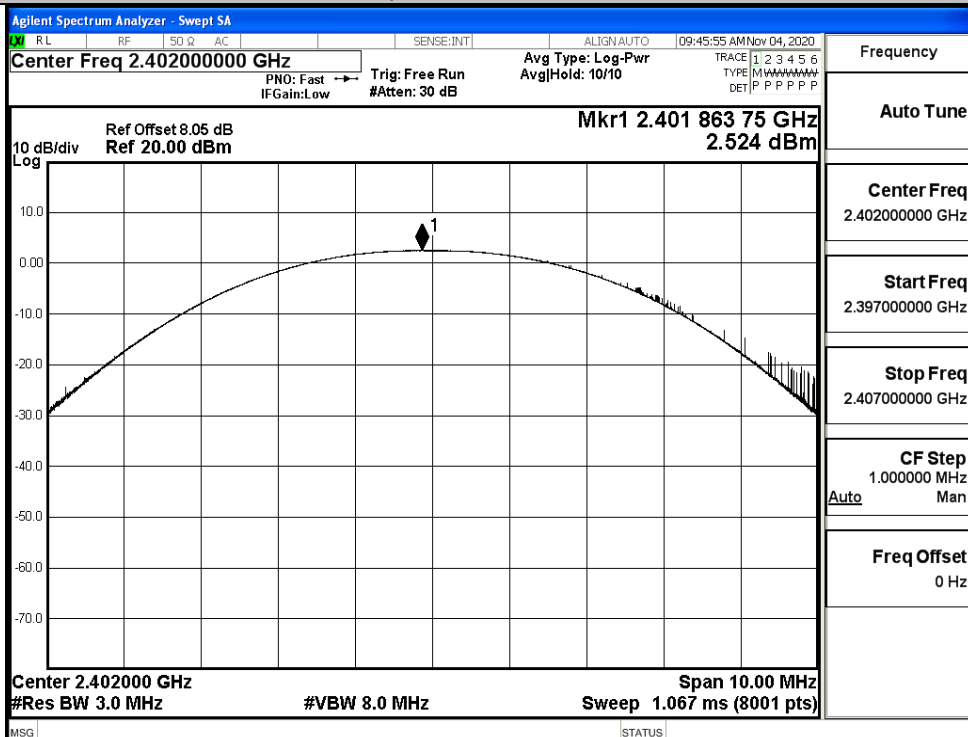
Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.0 kPa
Test Engineer:	Ken Hu
Supervised by:	Tom.Liu

D.1 Maximum Conducted Peak Output Power

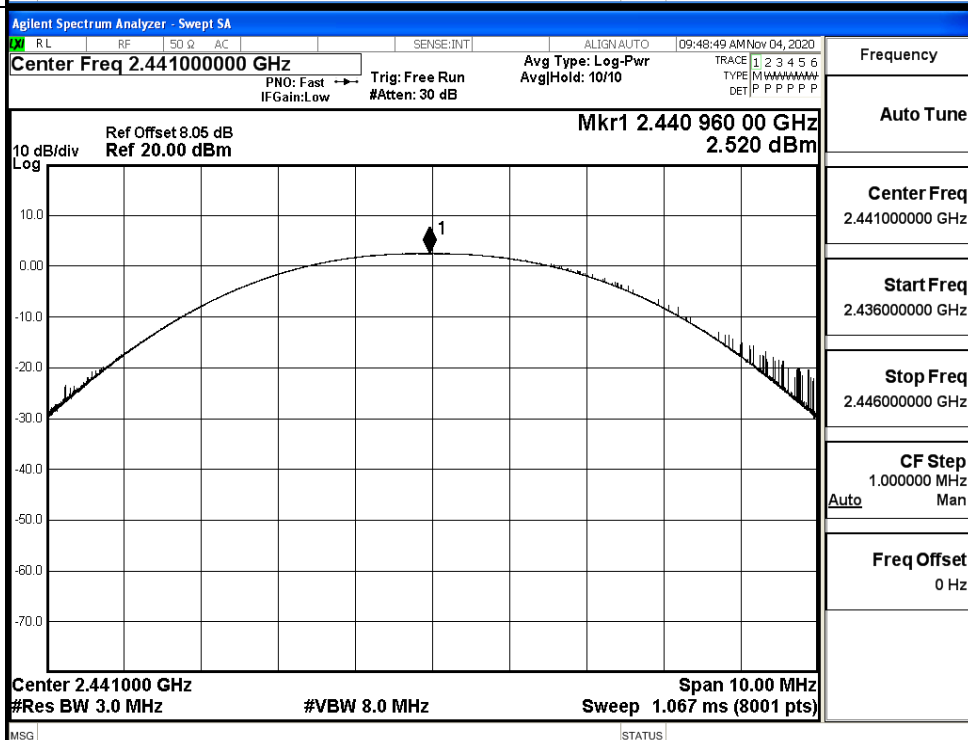
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2.524	21	PASS
	MCH	2.520	21	PASS
	HCH	2.094	21	PASS
$\pi/4$ DQPSK	LCH	2.590	21	PASS
	MCH	2.590	21	PASS
	HCH	2.139	21	PASS
8DPSK	LCH	2.637	21	PASS
	MCH	2.618	21	PASS
	HCH	2.281	21	PASS

Test Graphs

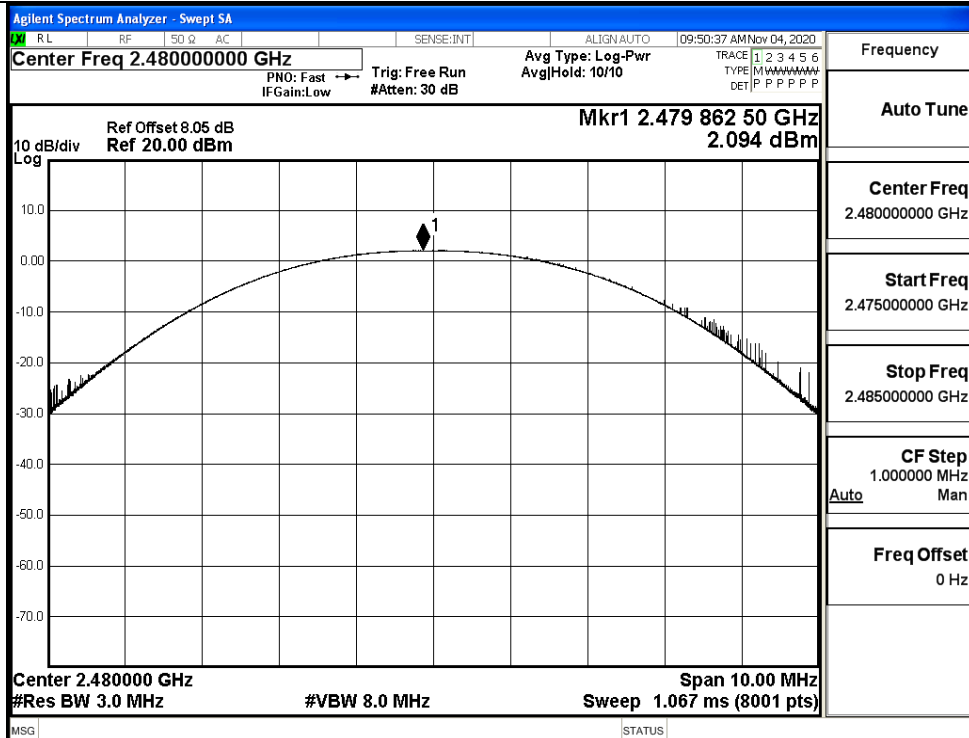
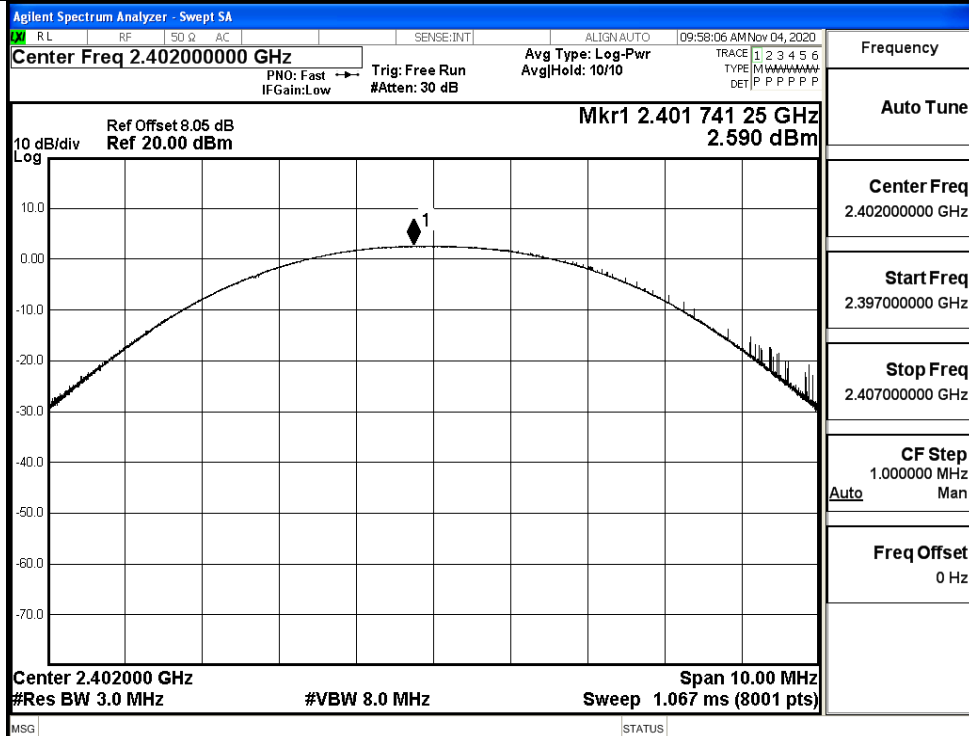
GFSK/LCH

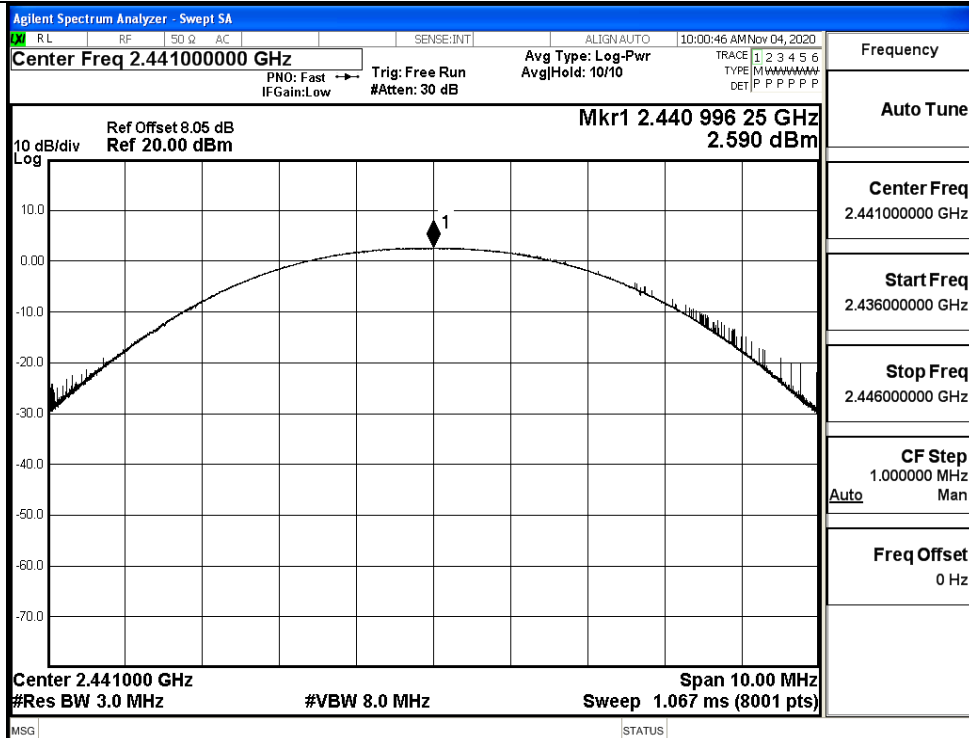
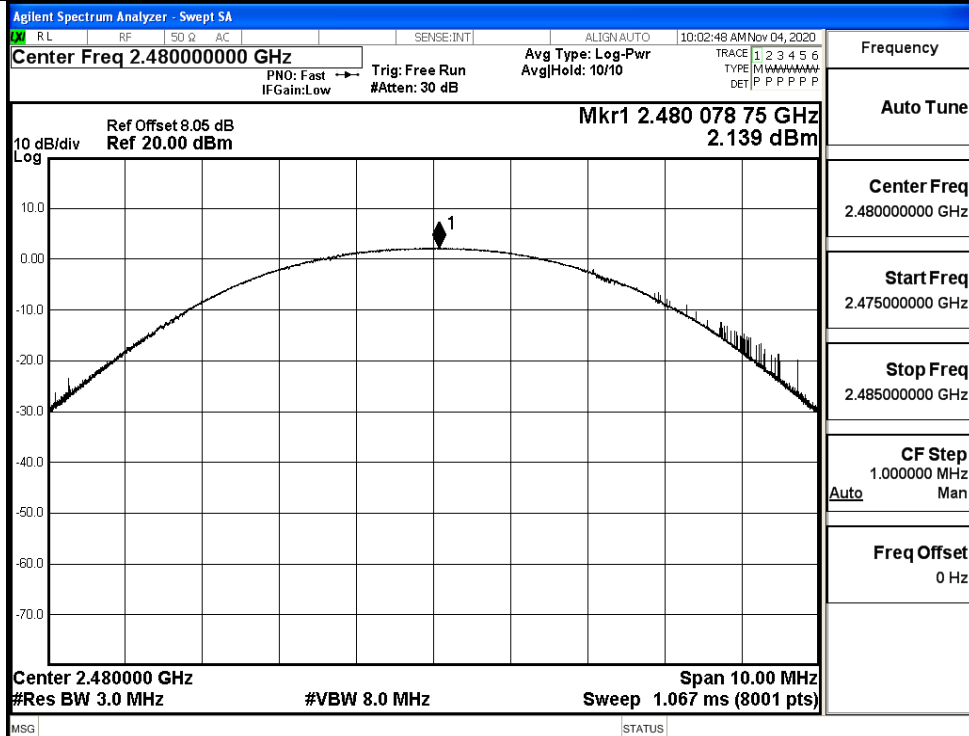


GFSK/MCH

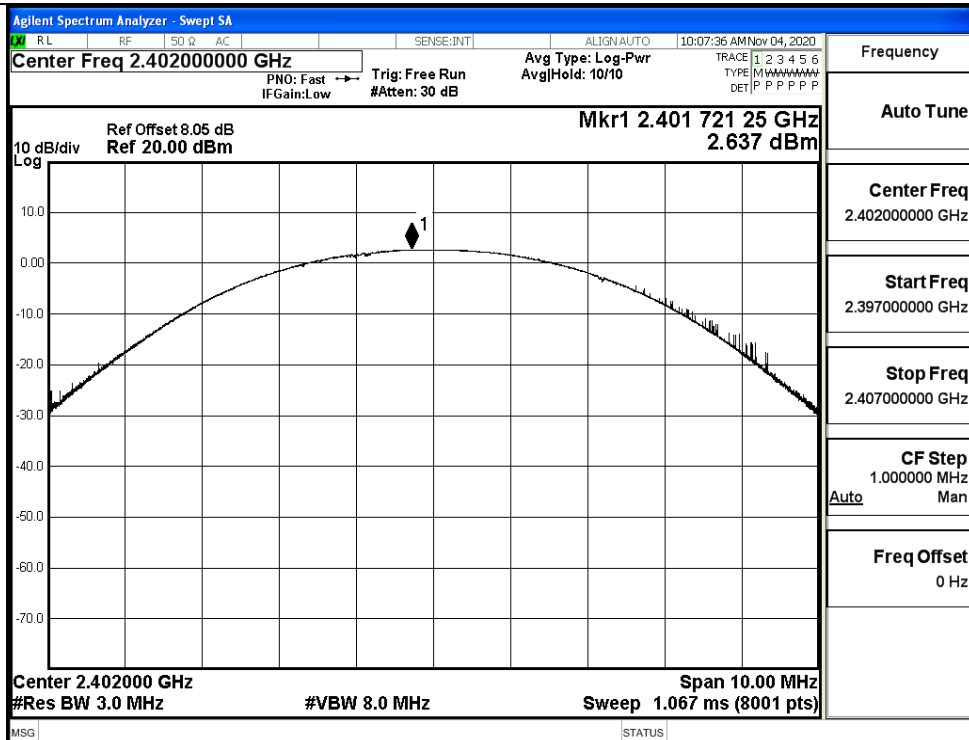


GFSK/HCH

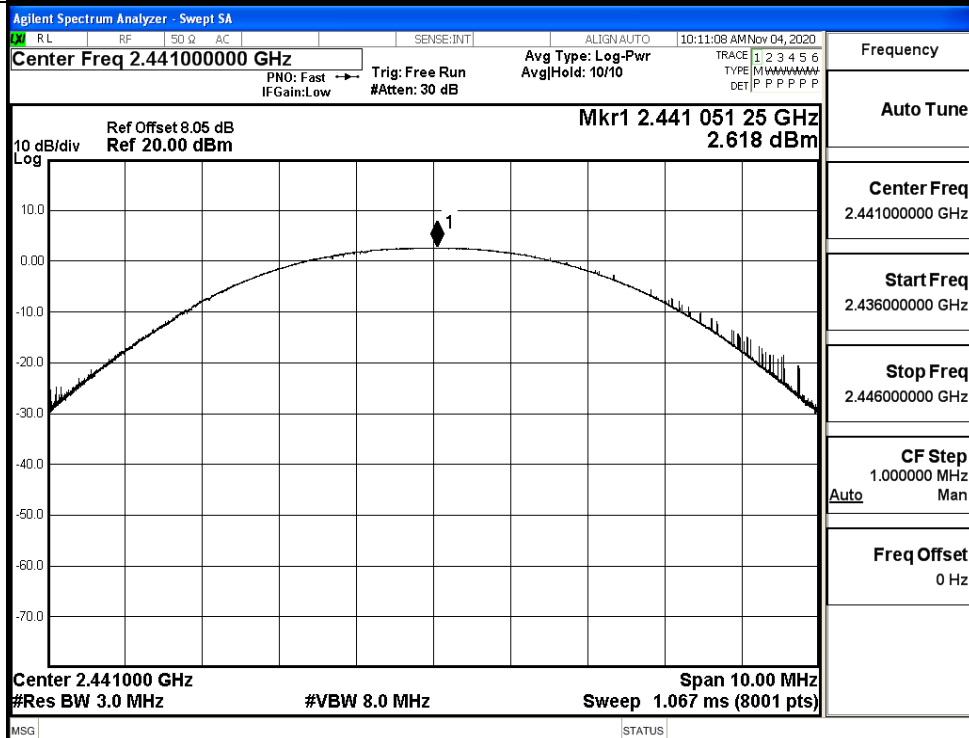
 π /4DQPSK/LCH

π /4DQPSK/MCH π /4DQPSK/HCH

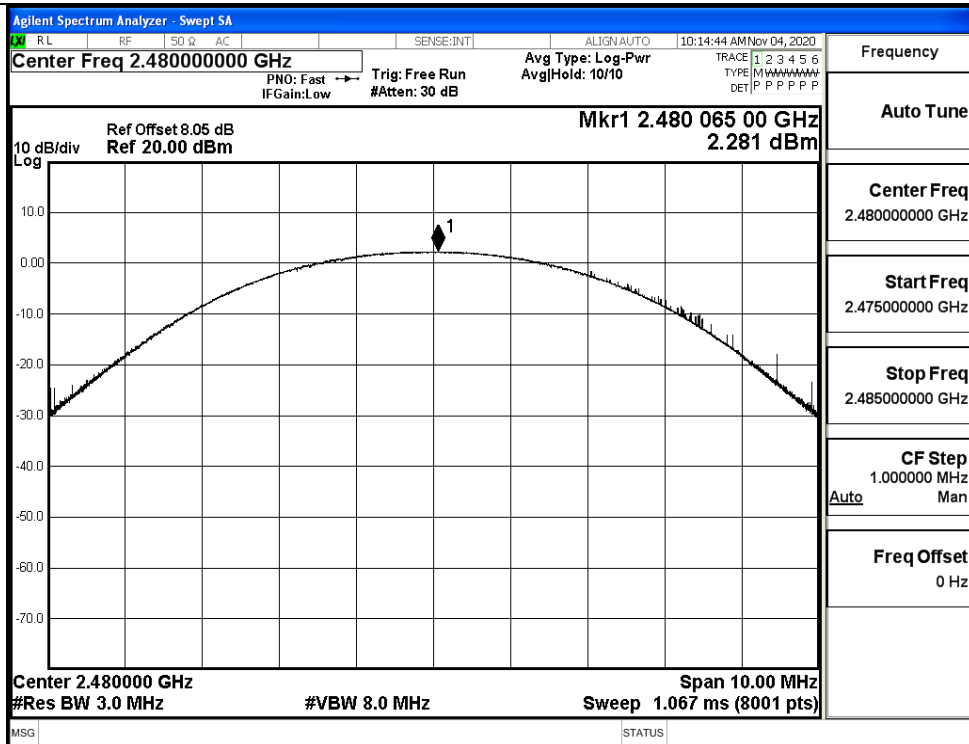
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

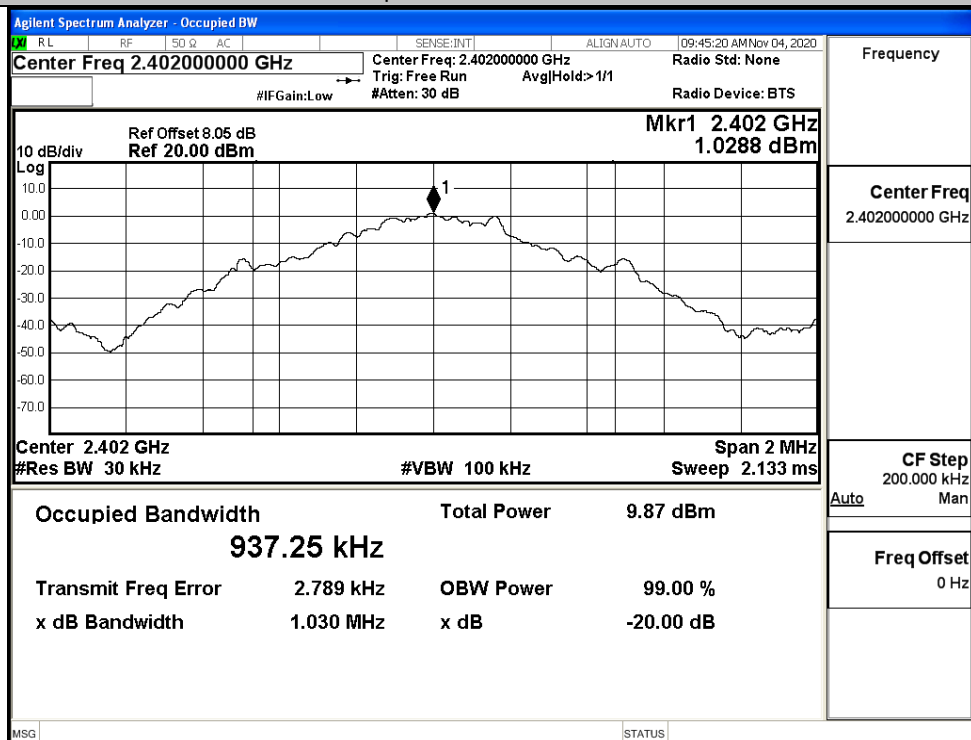


D.2 20dB Bandwidth

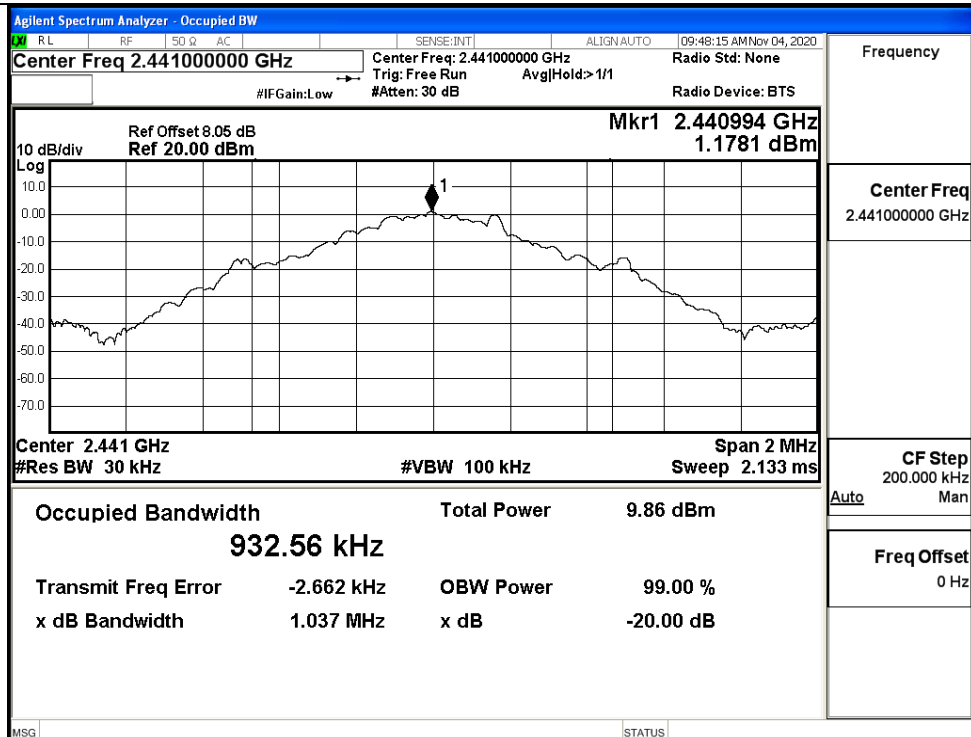
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.030	Not Specified	PASS
	MCH	1.037	Not Specified	PASS
	HCH	1.044	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.203	Not Specified	PASS
	MCH	1.195	Not Specified	PASS
	HCH	1.191	Not Specified	PASS
8DPSK	LCH	1.249	Not Specified	PASS
	MCH	1.243	Not Specified	PASS
	HCH	1.202	Not Specified	PASS

Test Graphs

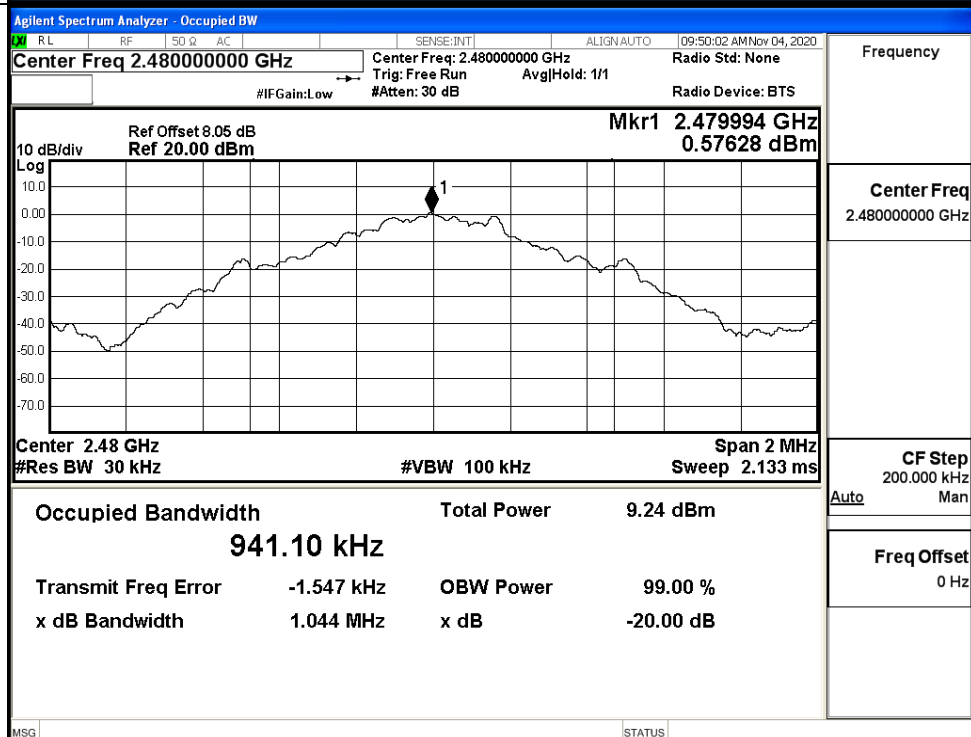
GFSK/LCH

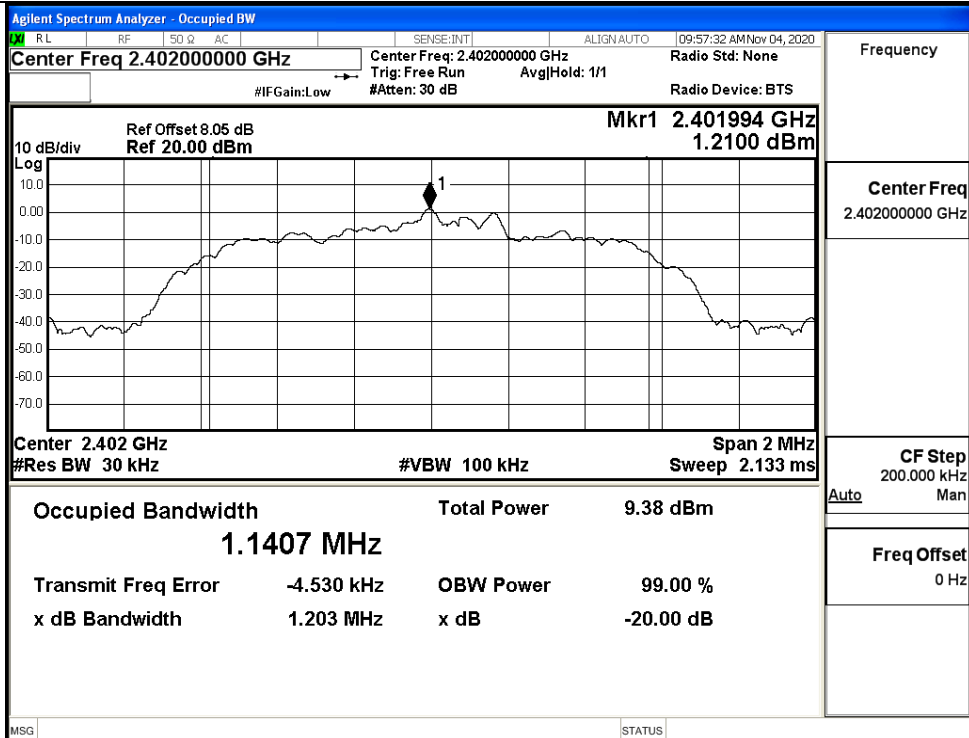
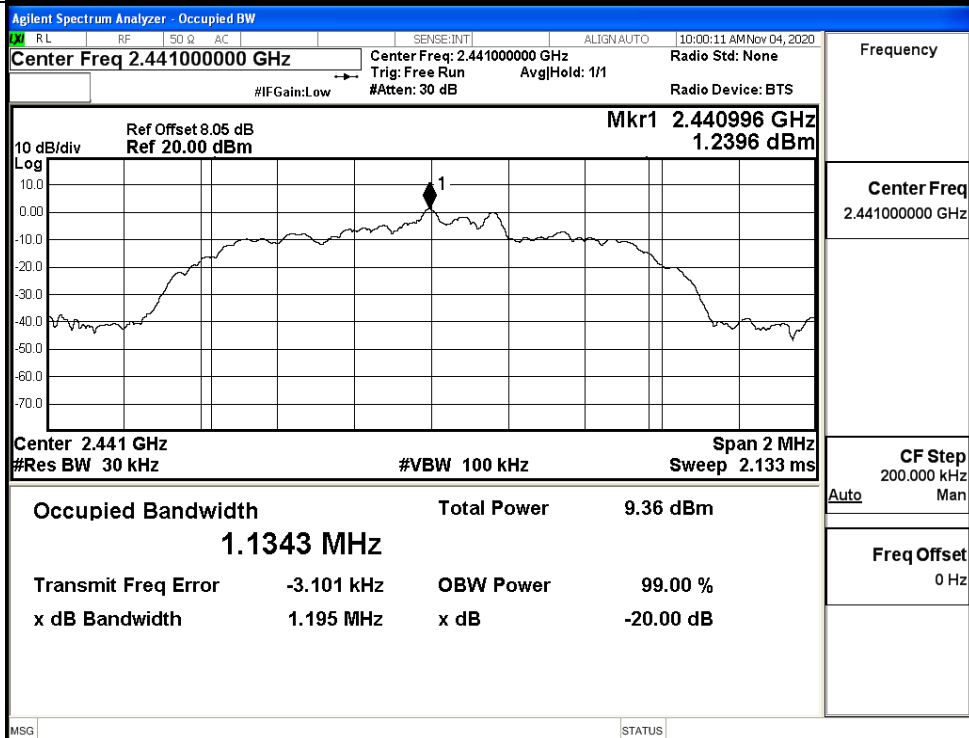


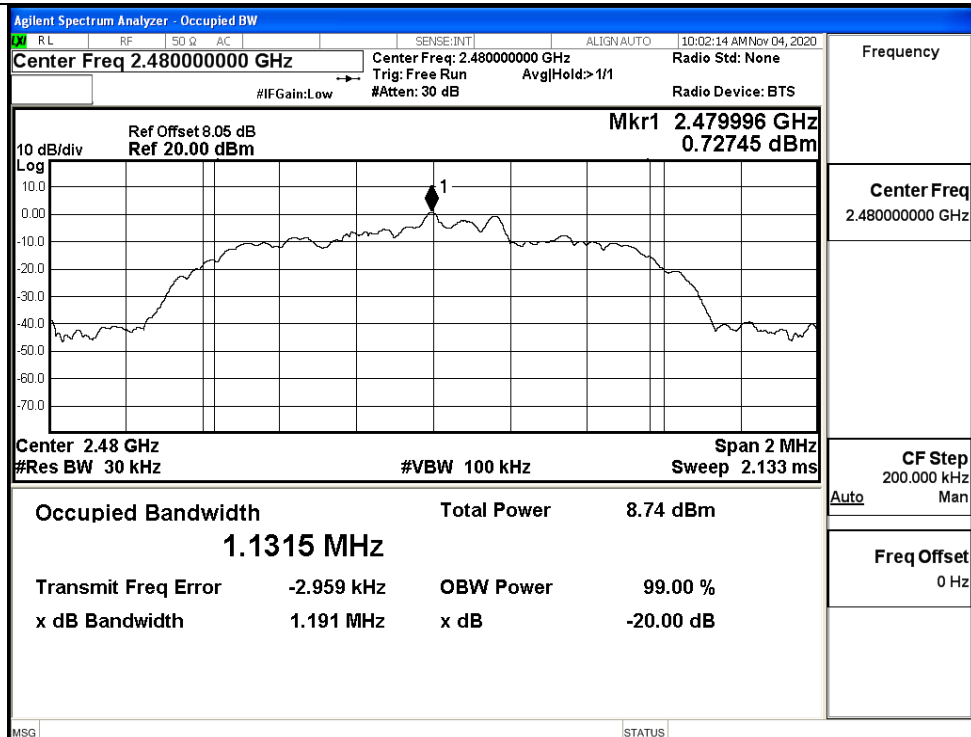
GFSK/MCH



GFSK/HCH



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

$\pi/4$ DQPSK/HCH

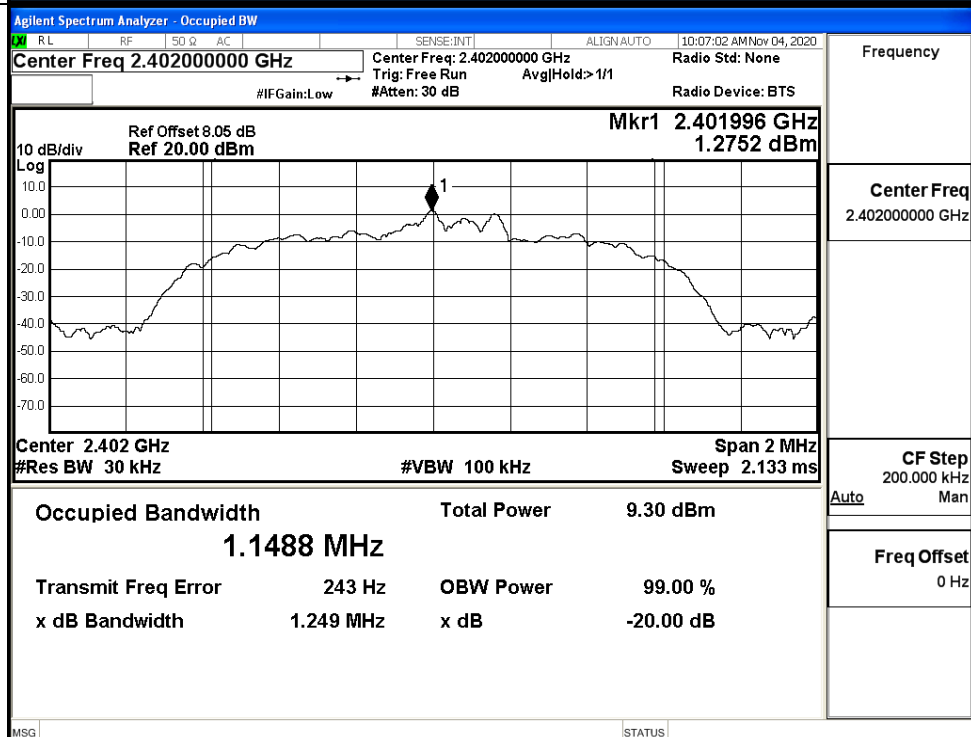
Frequency

Center Freq
2.48000000 GHzCF Step
200.000 kHz
Man

Auto

Freq Offset
0 Hz

8DPSK/LCH



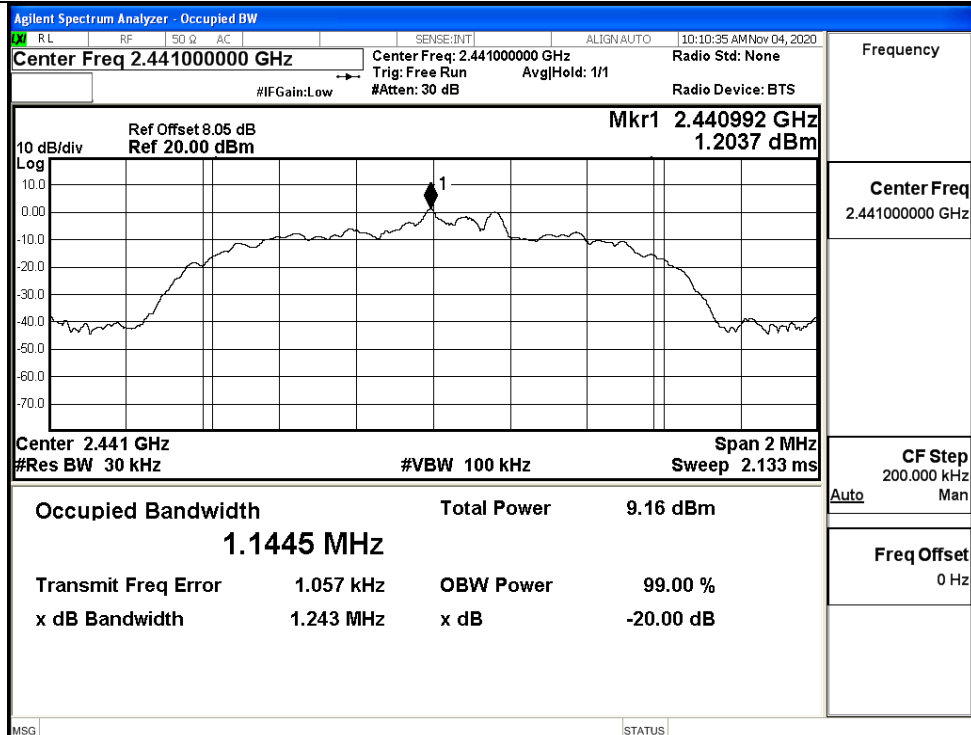
Frequency

Center Freq
2.40200000 GHzCF Step
200.000 kHz
Man

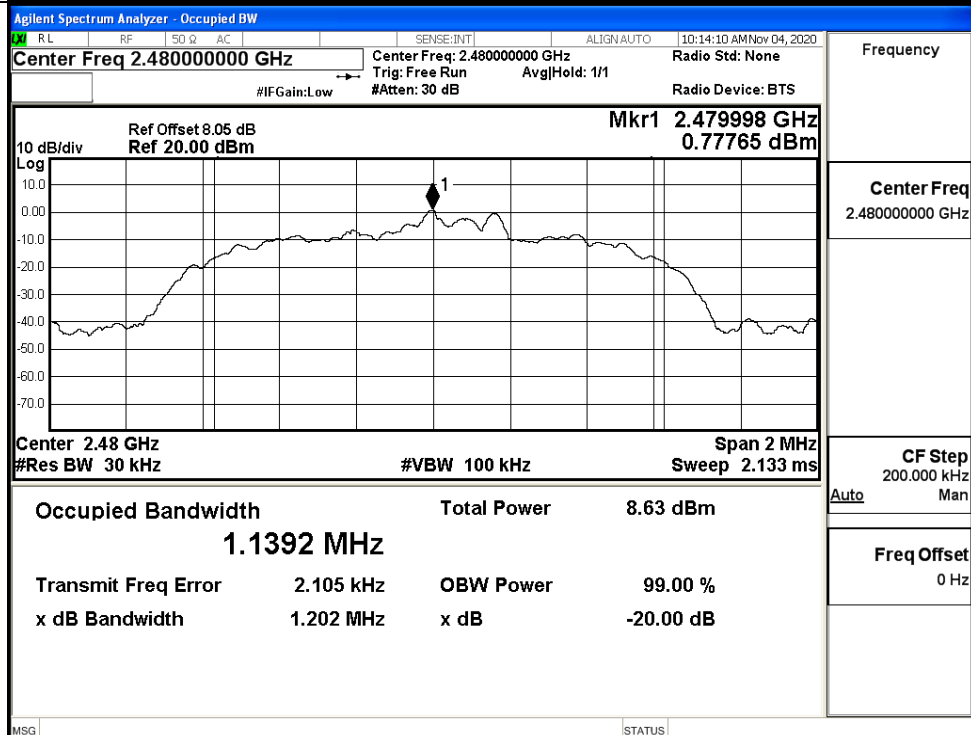
Auto

Freq Offset
0 Hz

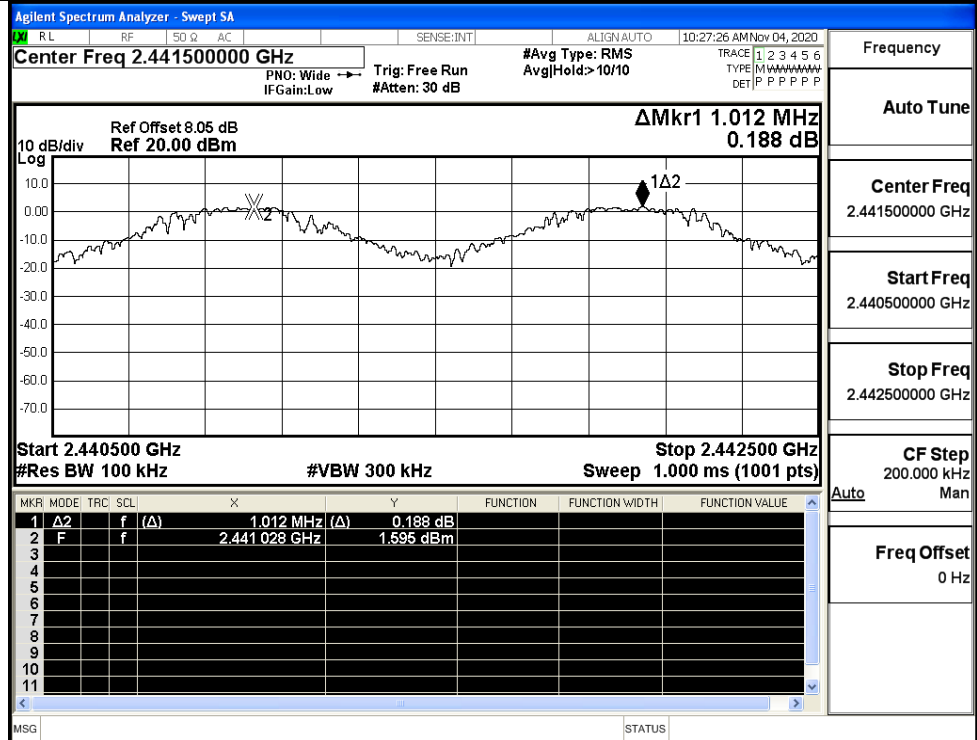
8DPSK/MCH



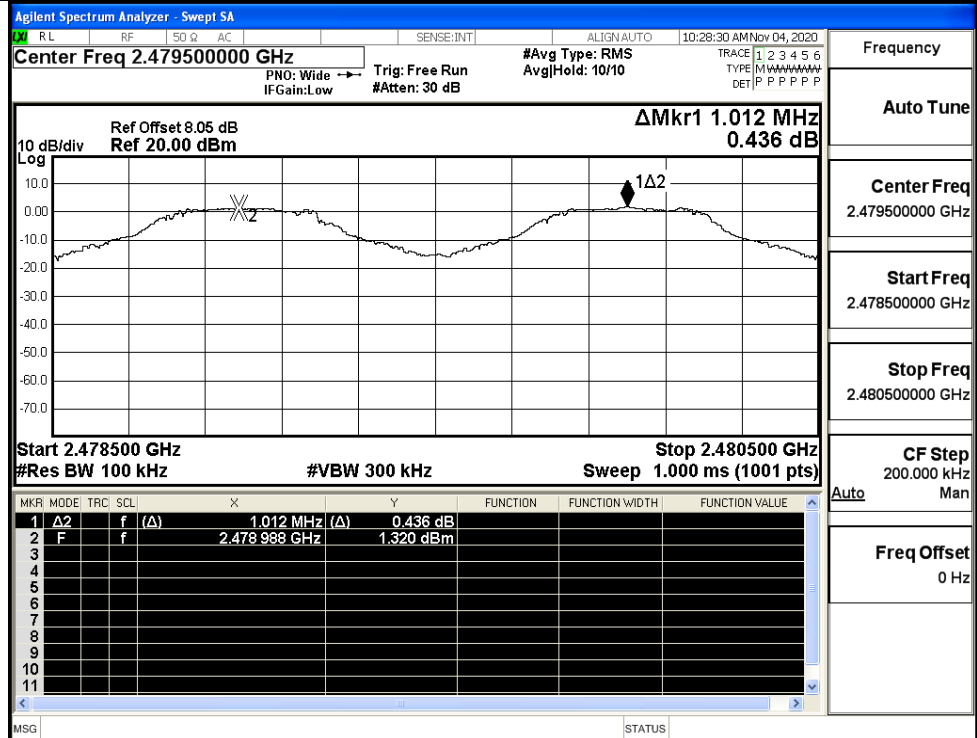
8DPSK/HCH

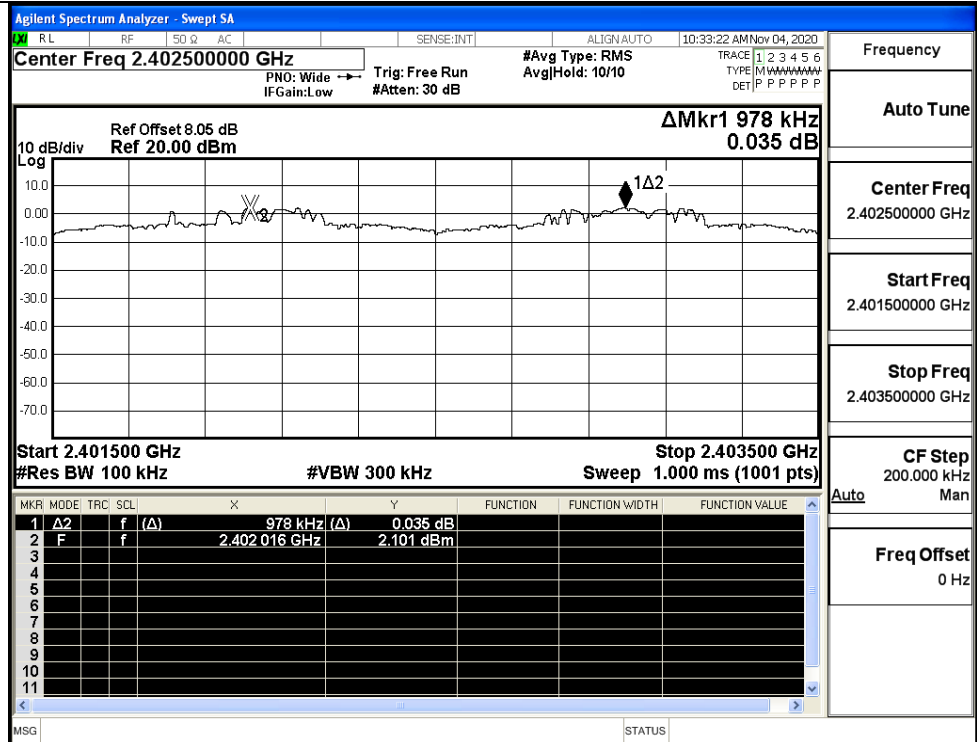
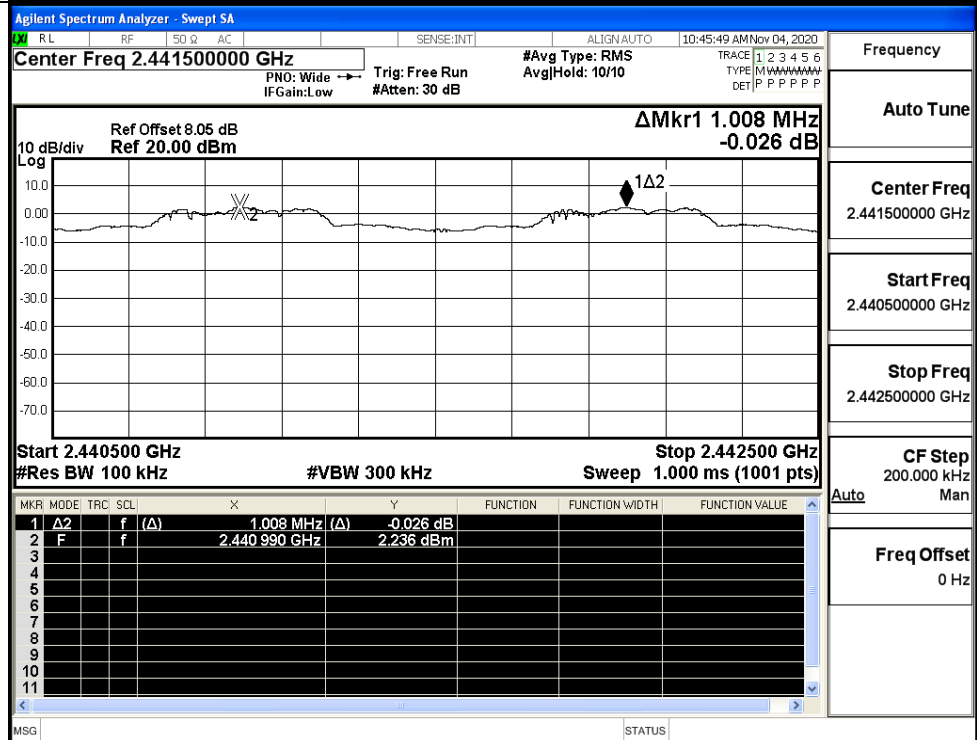


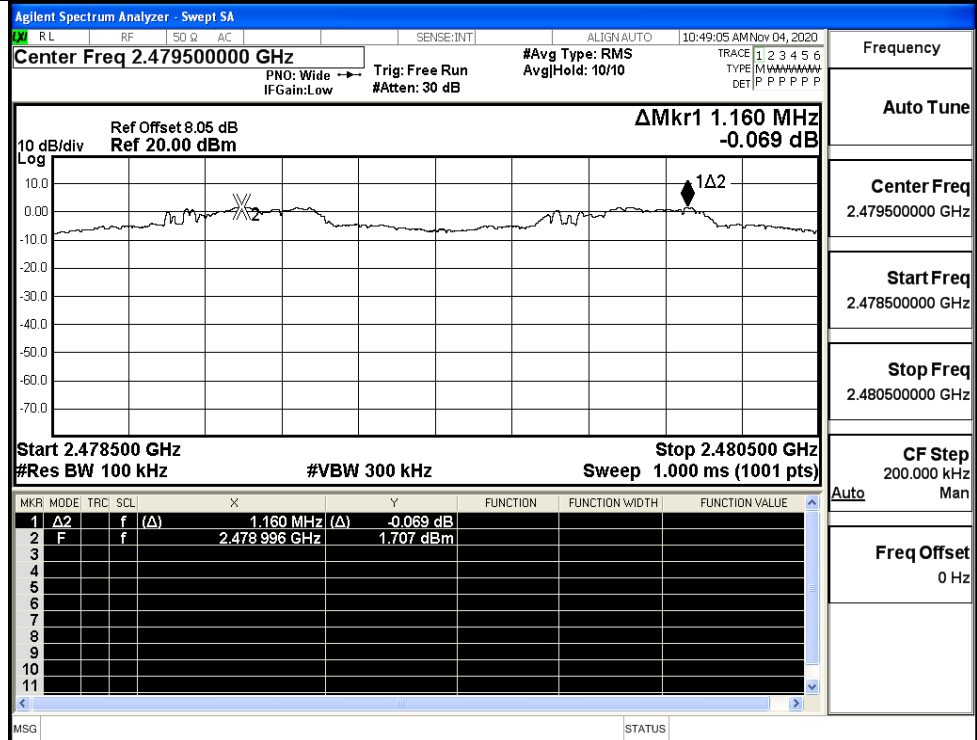
GFSK/MCH



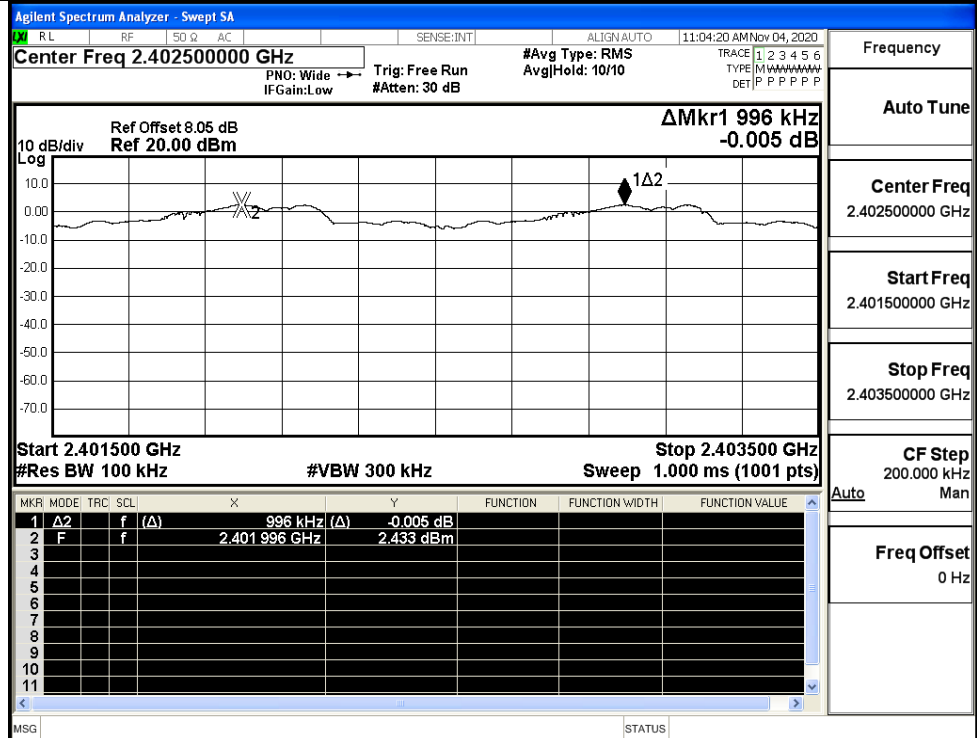
GFSK/HCH



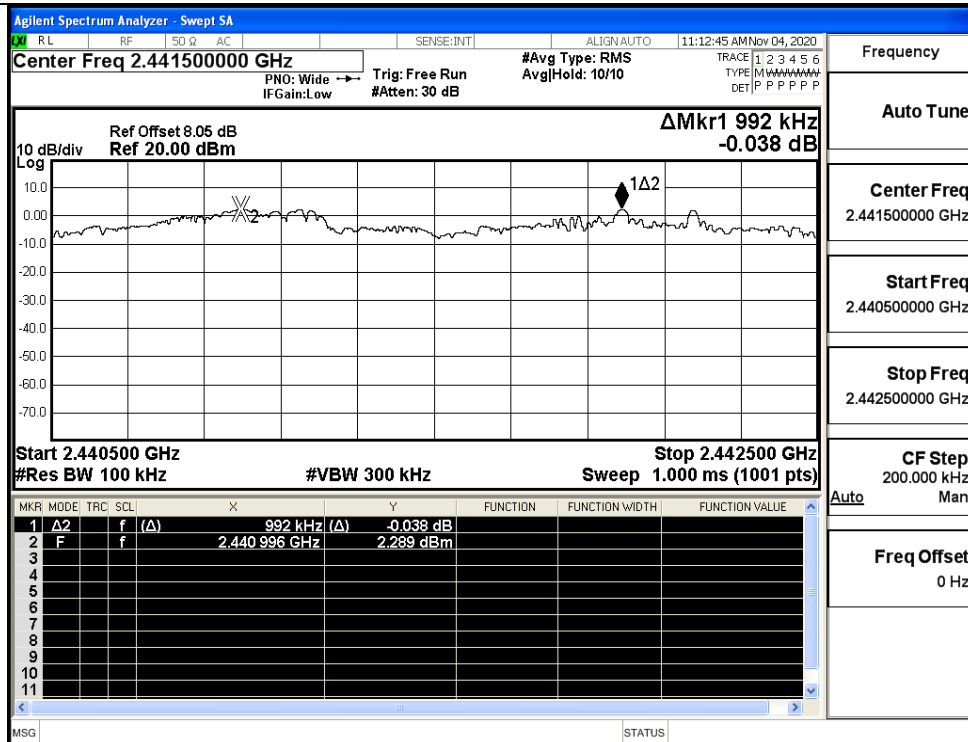
$\pi/4$ DQPSK/LCH $\pi/4$ DQPSK/MCH

$\pi/4$ DQPSK/HCH

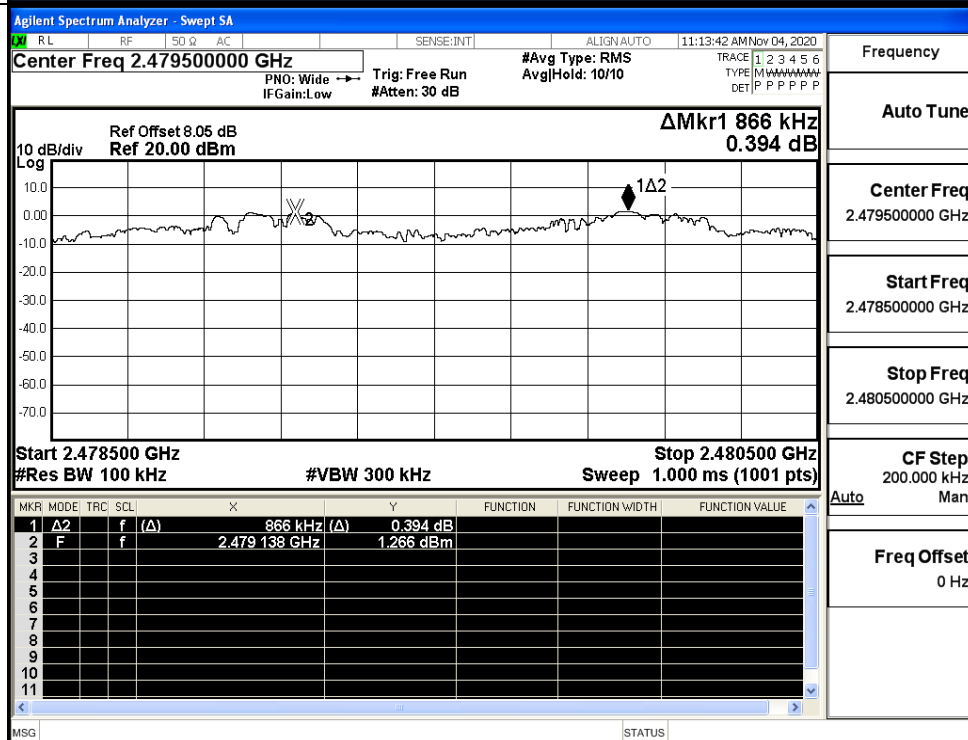
8DPSK/LCH



8DPSK/MCH



8DPSK/HCH

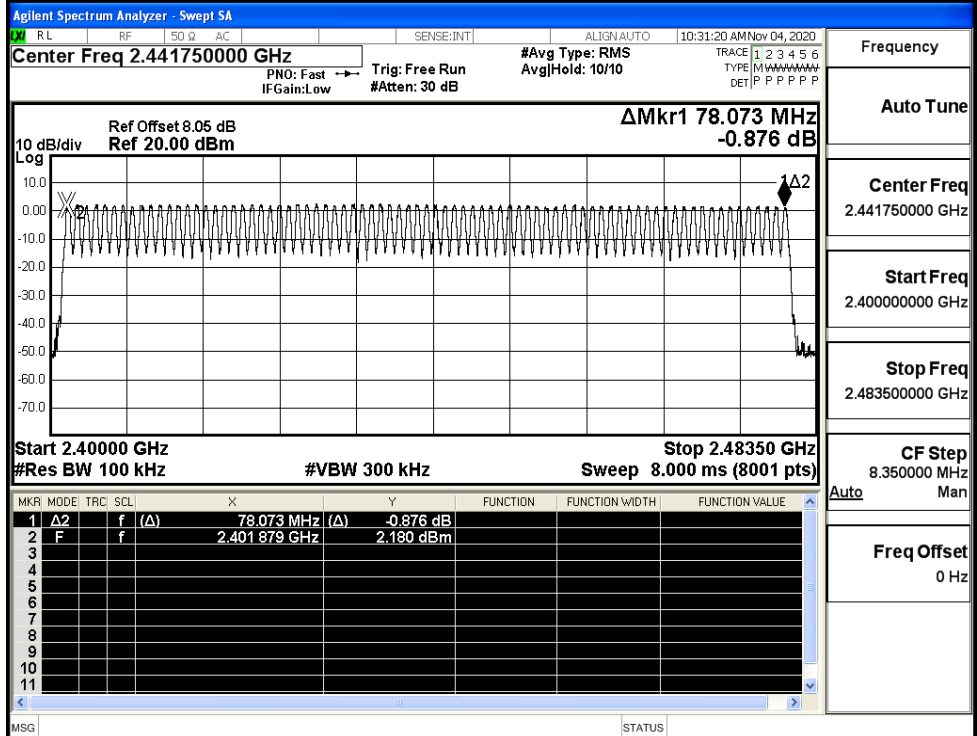
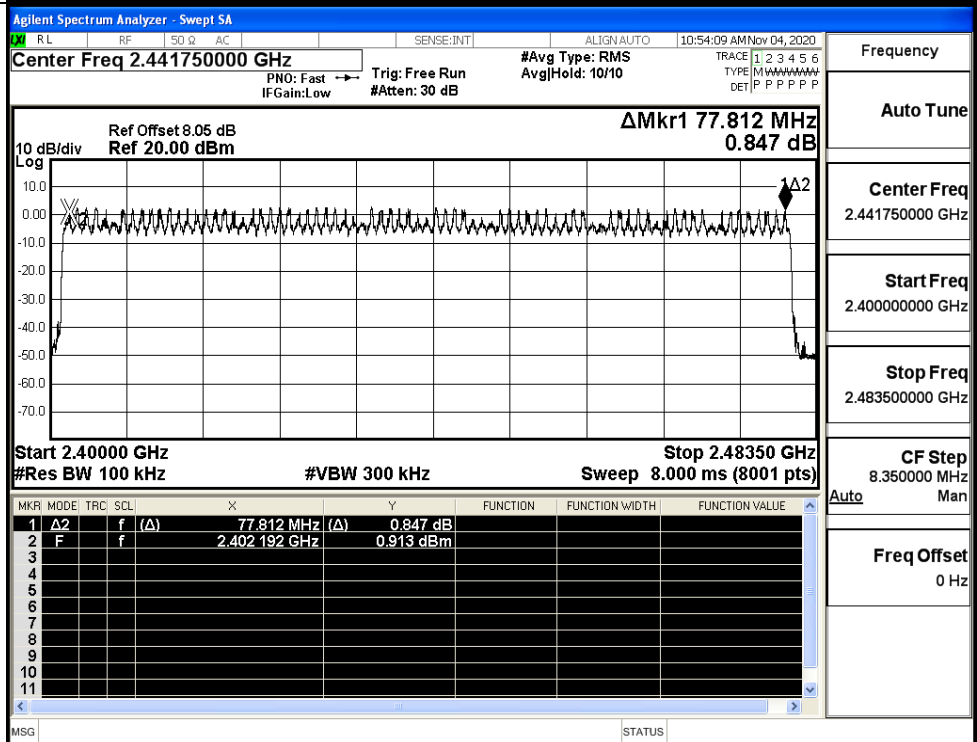


D.4 Hopping Channel Number

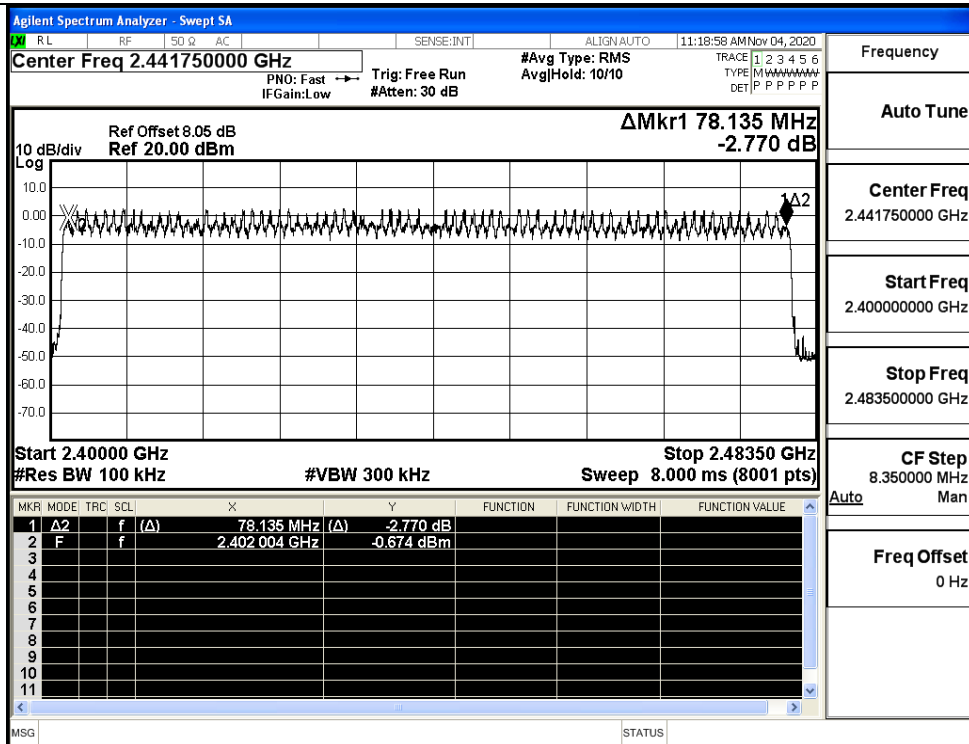
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
π/4DQPSK	Hop	79	>=15	PASS
8DPSK	Hop	79	>=15	PASS

Test Graphs

GFSK/Hop

 $\pi/4$ DQPSK/Hop

8DPSK/Hop

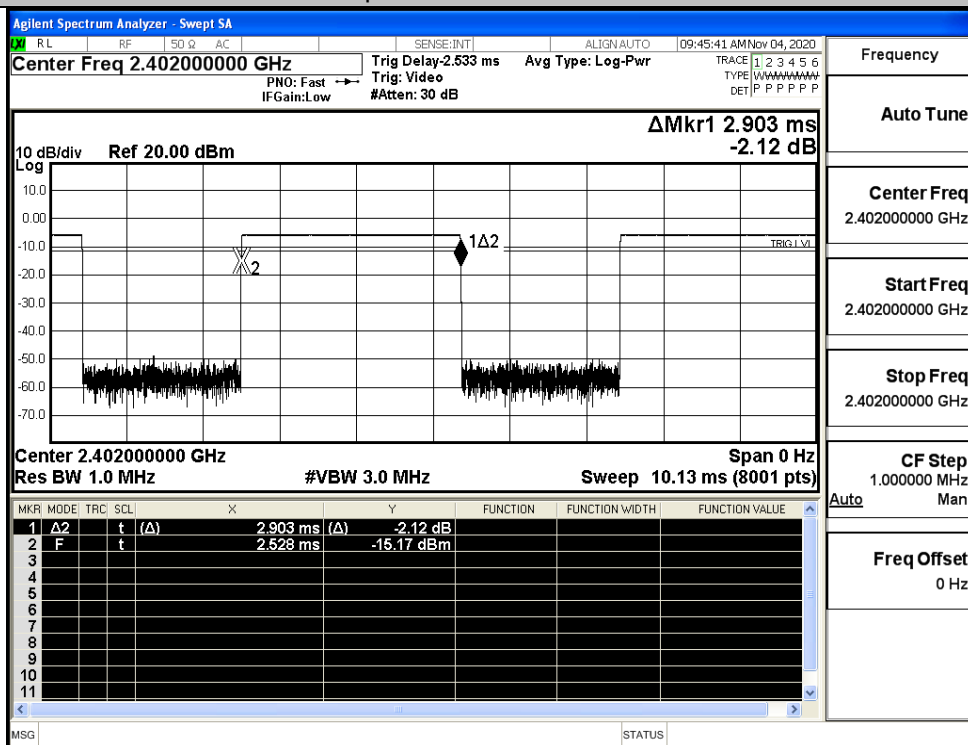


D.5 Dwell Time

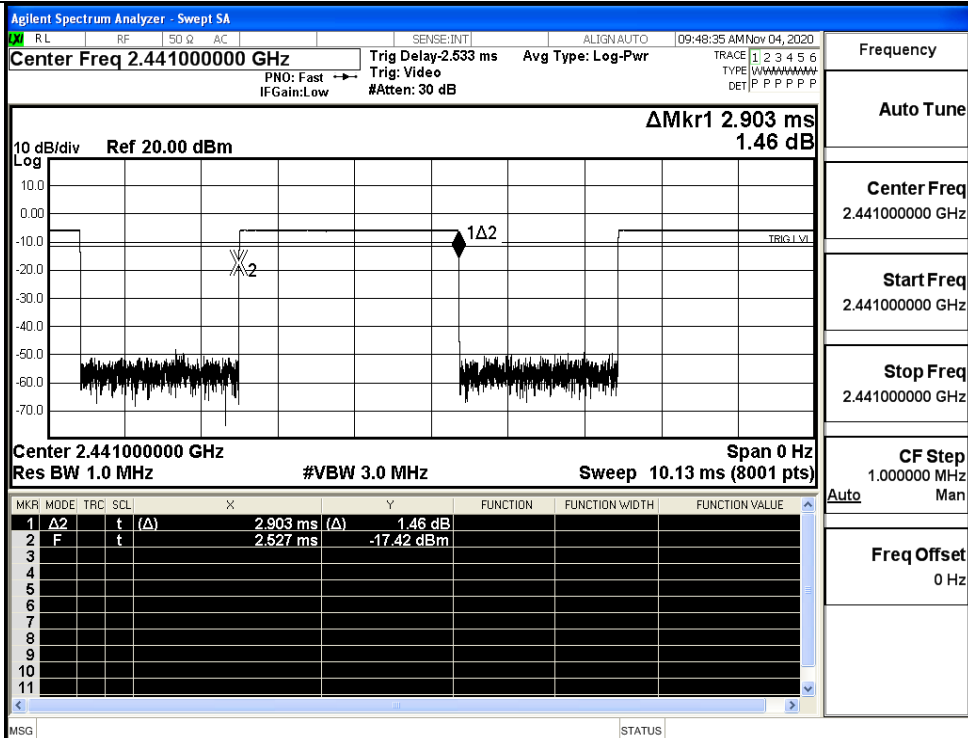
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.9	106.7	0.309	0.4	PASS
	DH5	MCH	2.9	106.7	0.309	0.4	PASS
	DH5	HCH	2.9	106.7	0.309	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.9	106.7	0.31	0.4	PASS
	2DH5	MCH	2.9	106.7	0.31	0.4	PASS
	2DH5	HCH	2.9	106.7	0.31	0.4	PASS
8DPSK	3DH5	LCH	2.9	106.7	0.31	0.4	PASS
	3DH5	MCH	2.9	106.7	0.31	0.4	PASS
	3DH5	HCH	2.9	106.7	0.31	0.4	PASS

Test Graphs

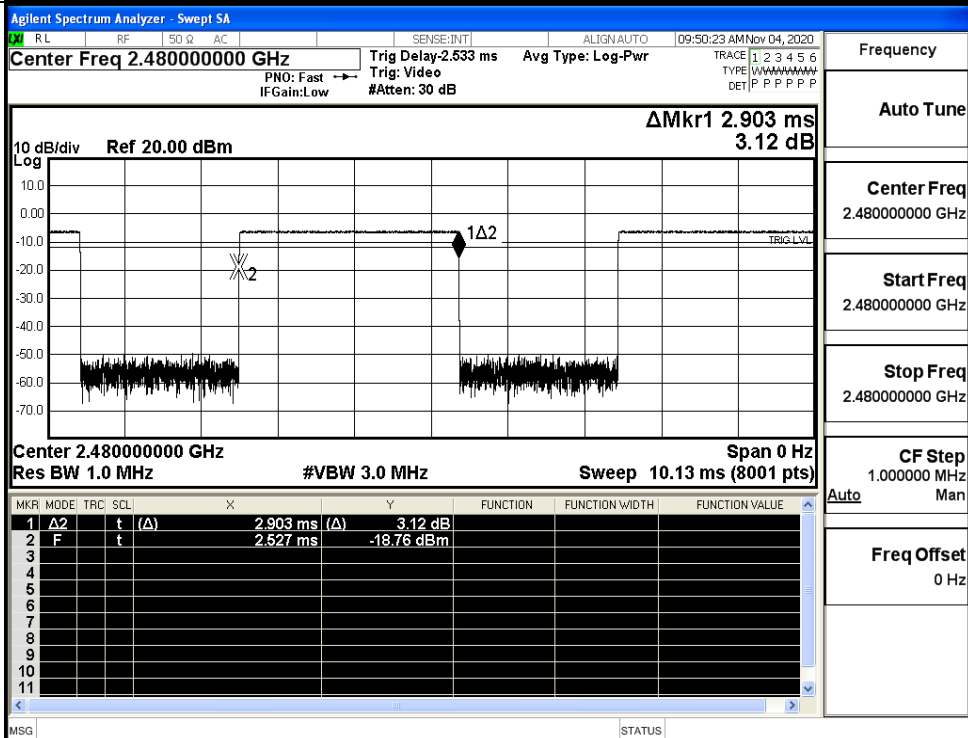
GFSK_DH5/LCH



GFSK_DH5/MCH



GFSK_DH5/HCH



Agilent Spectrum Analyzer - Swept SA

RL RF 50 Q AC SENSE:INT ALIGN:AUTO 09:57:52 AM Nov 04, 2020

Center Freq 2.402000000 GHz Trg Delay: 2.533 ms Avg Type: Log-Pwr

PNO: Fast Trg: Video TYPE 1 2 3 4 5 6
IF Gain: Low #Atten: 30 dB DET P P P P P P

10 dB/div Ref 20.00 dBm Δ Mkr1 2.908 ms
Log 0.64 dB

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

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ 2	t	(Δ)	2.908 ms	(Δ) 0.64 dB			
2	F	t		2.527 ms	-16.42 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS

Auto Man

Freq Offset 0 Hz

Agilent Spectrum Analyzer - Swept SA

RL RF 50 Ω AC SENSE:INT ALIGN:AUTO 10:00:32 AM Nov 04, 2020

Center Freq 2.441000000 GHz Trig Delay: 2.533 ms Avg Type: Log-Pwr PNO: Fast IF Gain: Low Trig: Video #Atten: 30 dB TRACE 1 2 3 4 5 6 TYPE P P P P P P P DET P P P P P P P

10 dB/div Ref 20.00 dBm Δ Mkr1 2.908 ms -2.87 dB

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

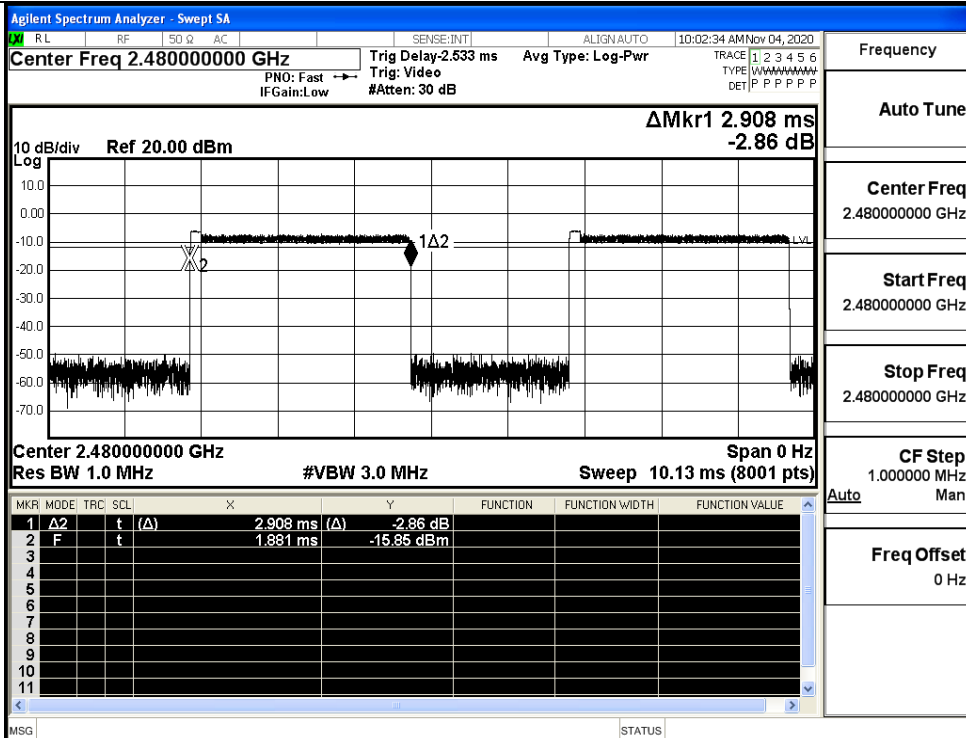
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ 2	t	(Δ)	2.908 ms	(Δ) -2.87 dB			
2	F	t		4.915 ms	-14.75 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS

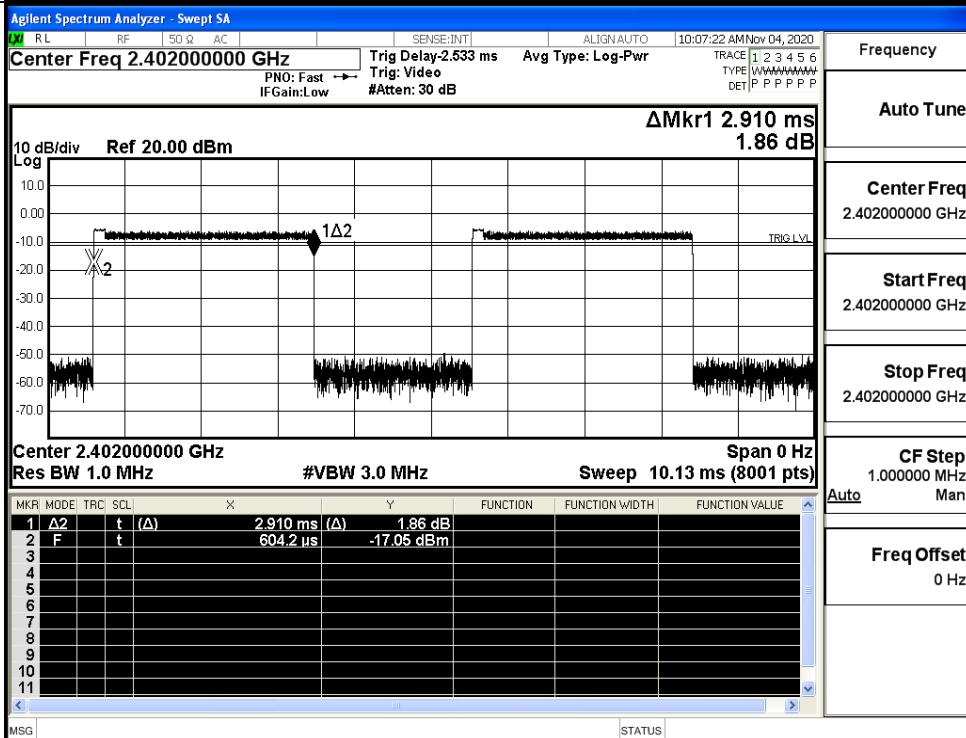
Auto Man

Freq Offset 0 Hz

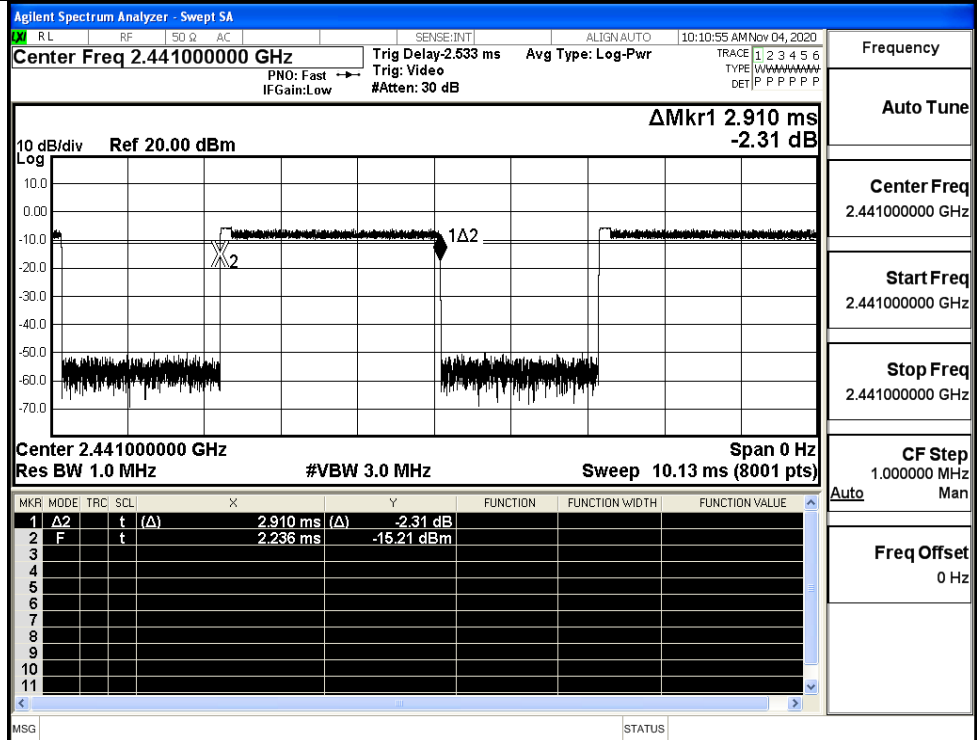
$\pi/4$ DQPSK
_2DH5/HCH



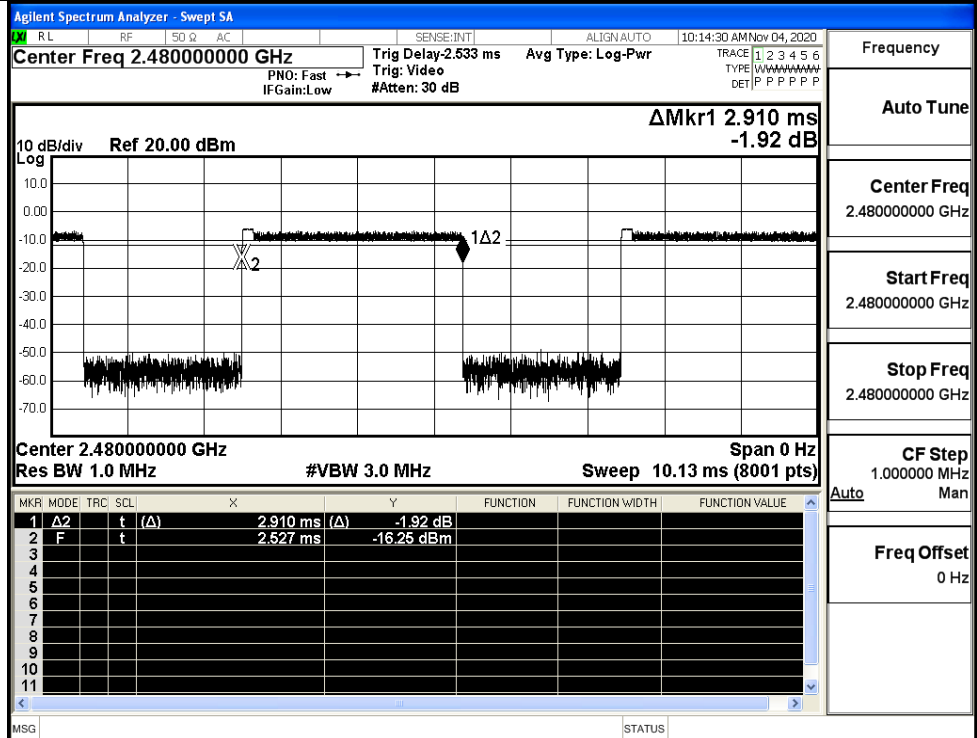
8DPSK _3DH5/LCH



8DPSK_3DH5/MCH



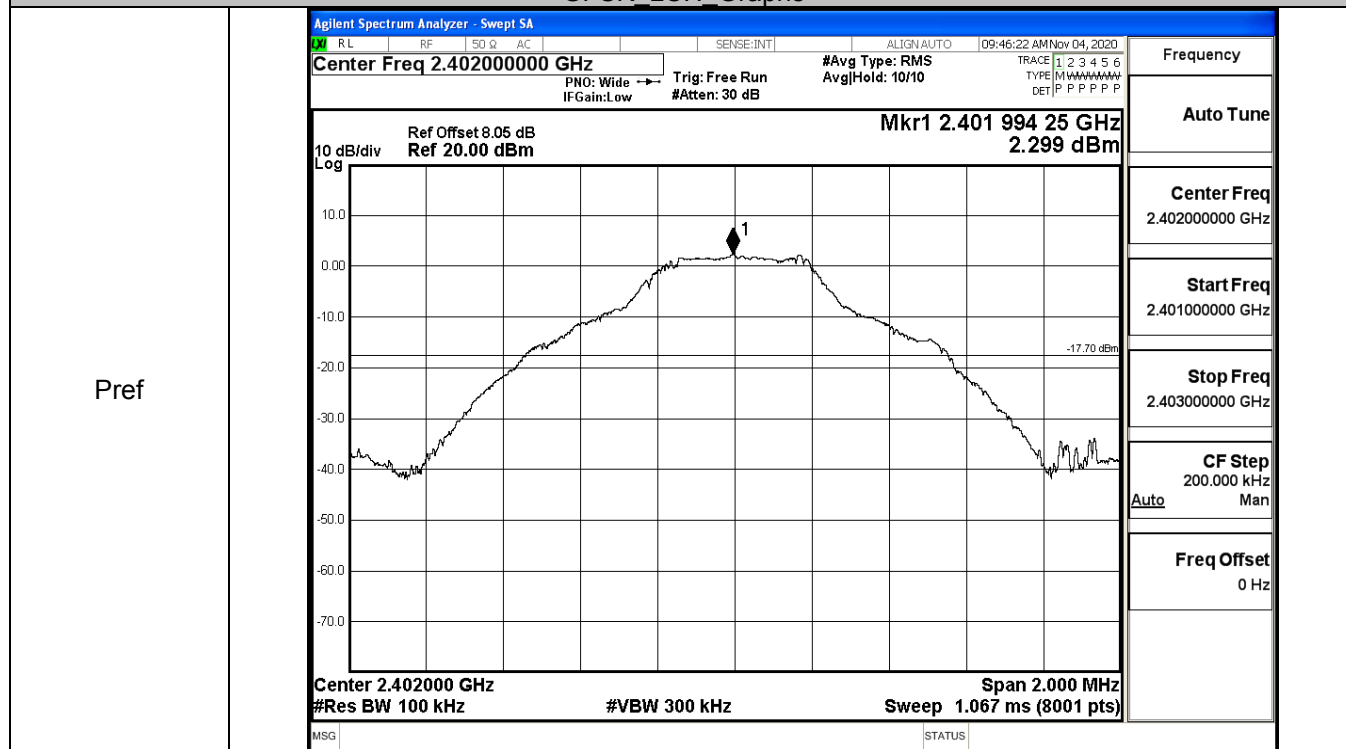
8DPSK_3DH5/HCH

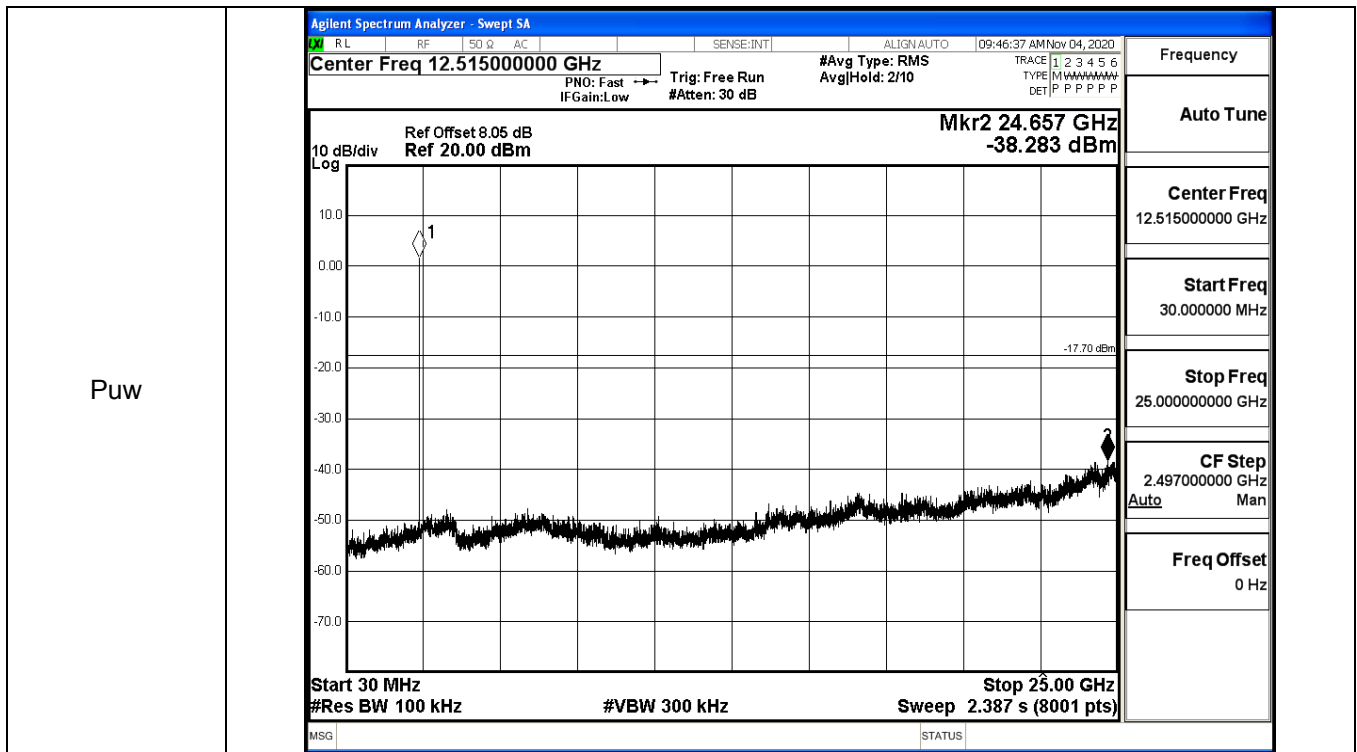


D.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2.299	-38.283	-17.701	PASS
	MCH	2.246	-37.801	-17.754	PASS
	HCH	1.732	-38.006	-18.268	PASS
$\pi/4$ DQPSK	LCH	2.182	-36.870	-17.818	PASS
	MCH	2.332	-38.385	-17.668	PASS
	HCH	1.721	-37.676	-18.279	PASS
8DPSK	LCH	2.269	-37.966	-17.731	PASS
	MCH	2.435	-38.235	-17.565	PASS
	HCH	1.823	-38.167	-18.177	PASS

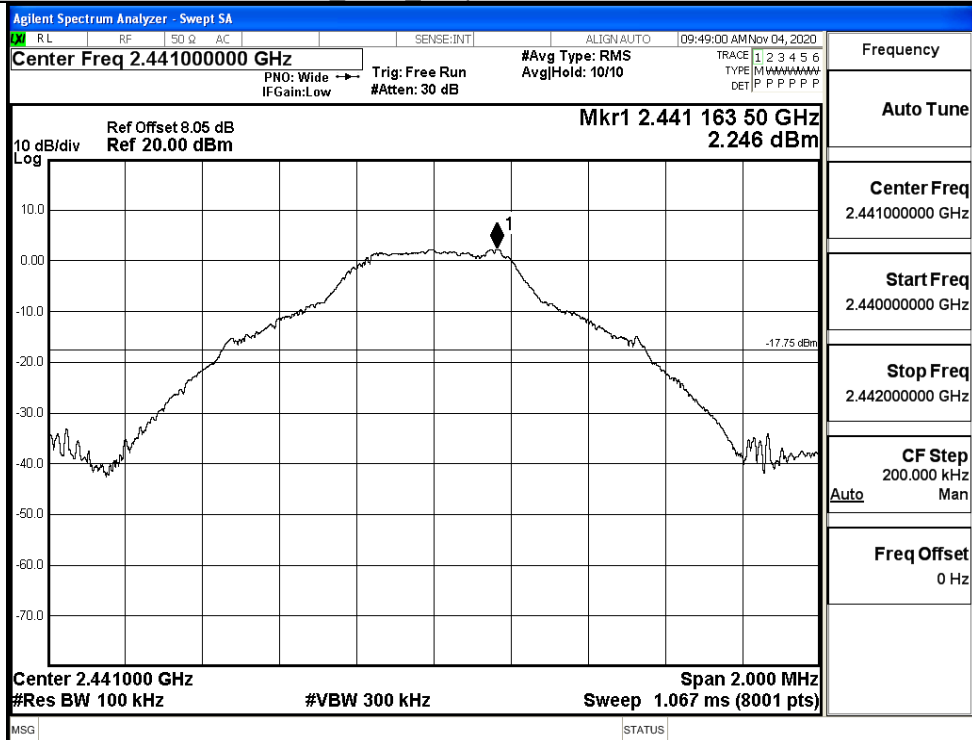
GFSK LCH Graphs



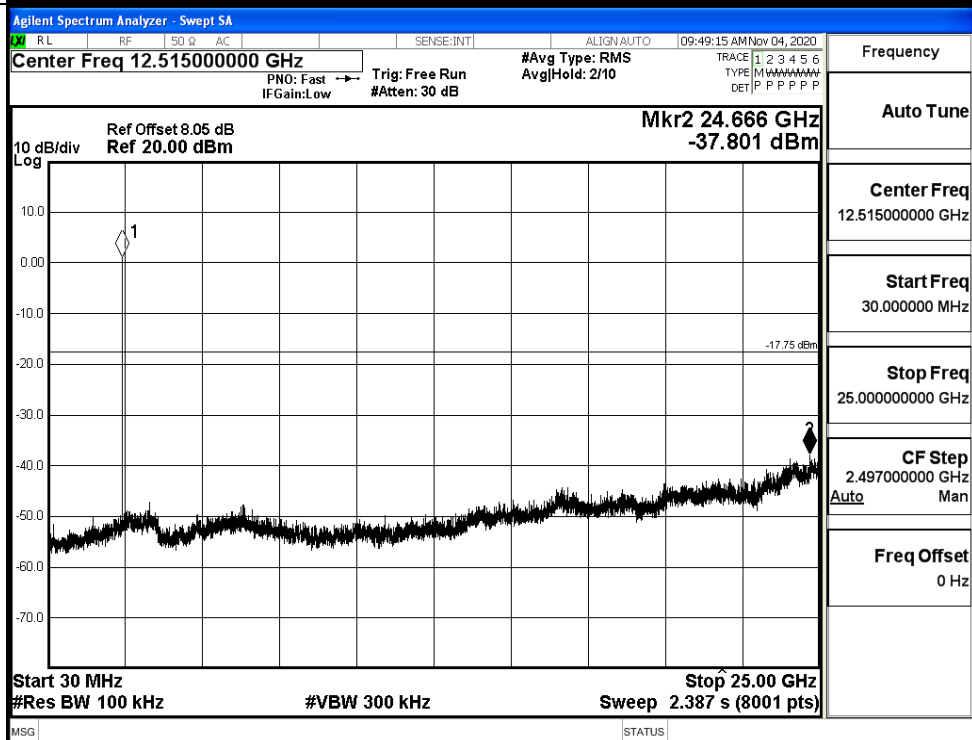


GFSK_MCH_Graphs

Pref

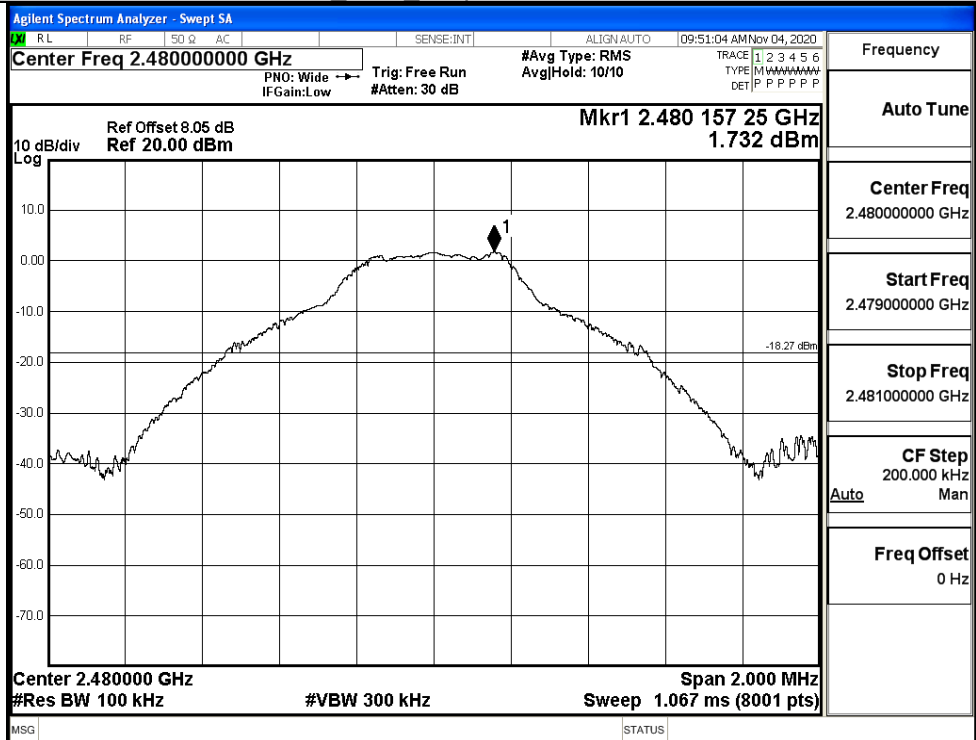


Puw

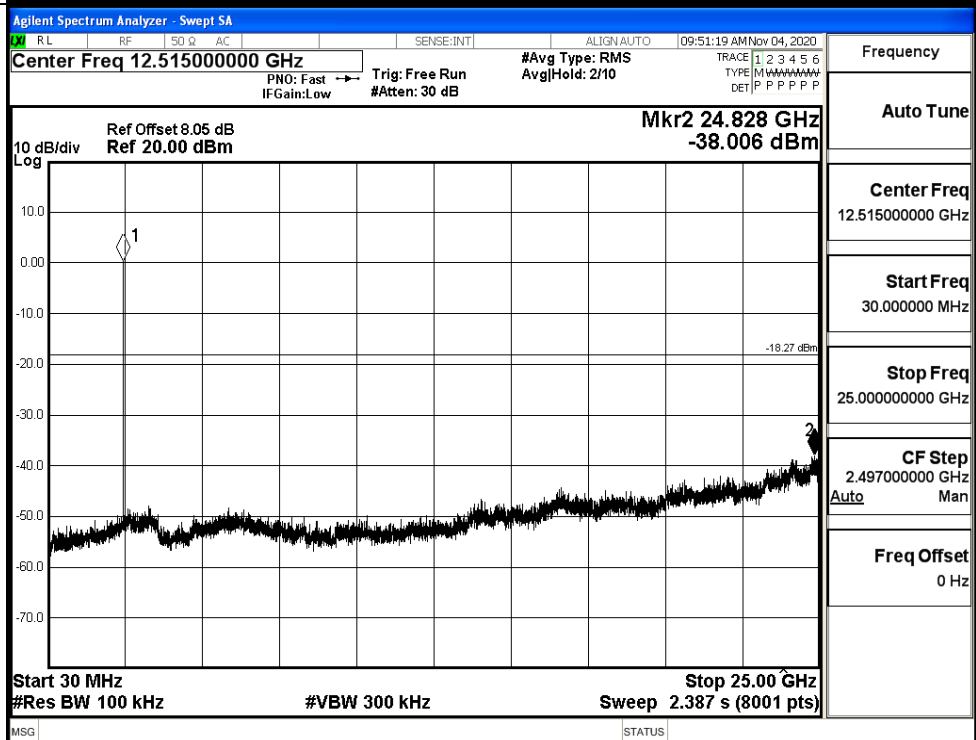


GFSK_HCH_Graphs

Pref

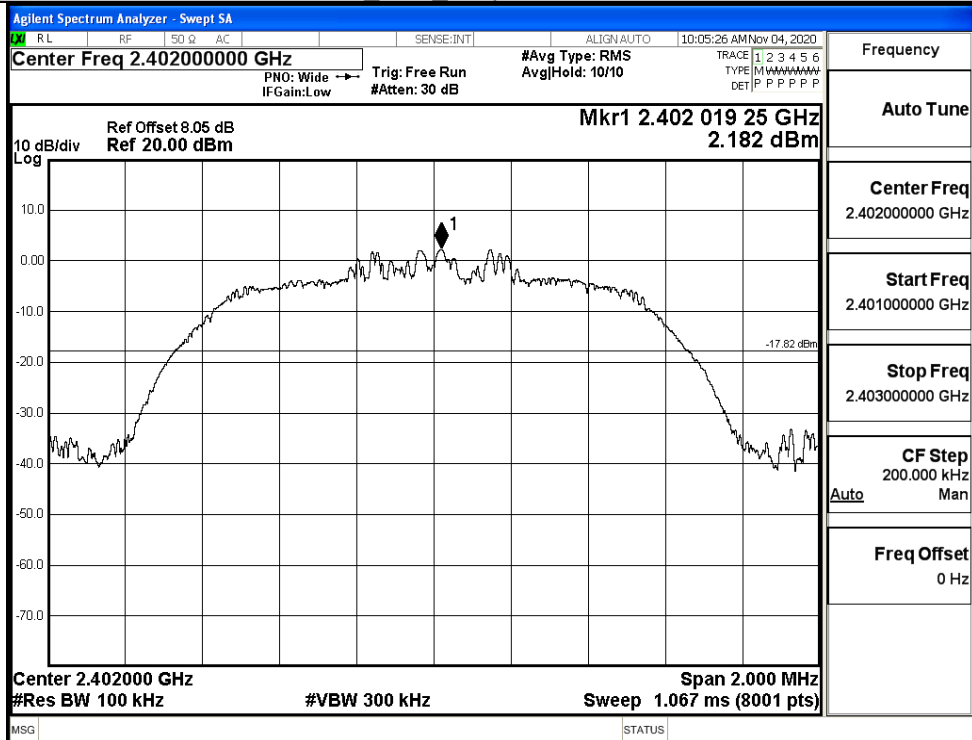


Puw

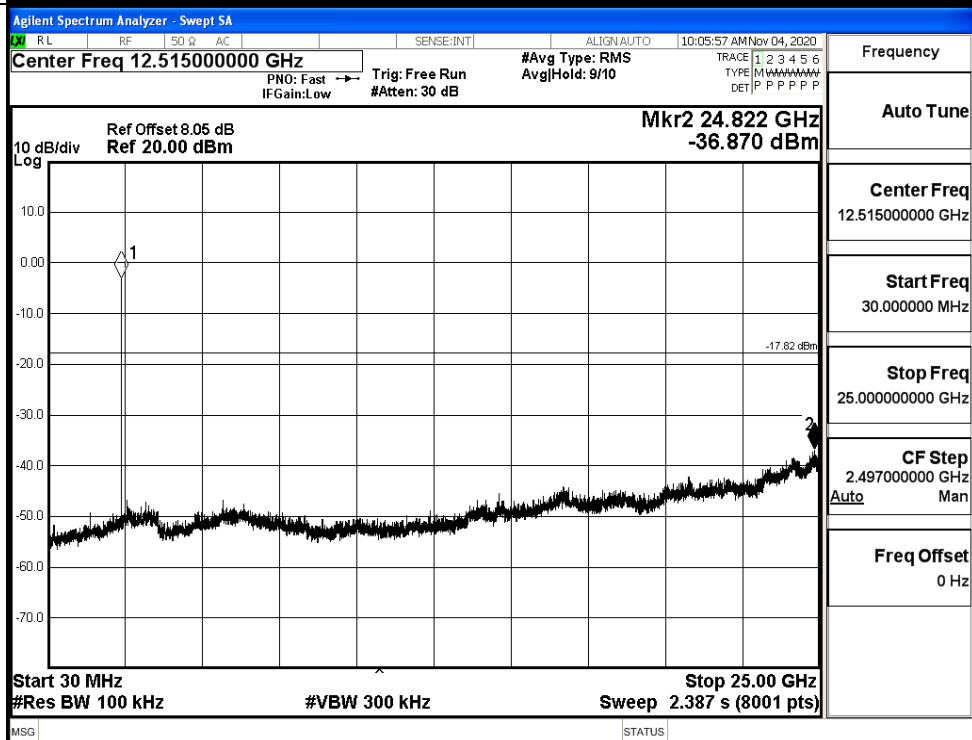


$\pi/4$ DQPSK_LCH_Graphs

Pref

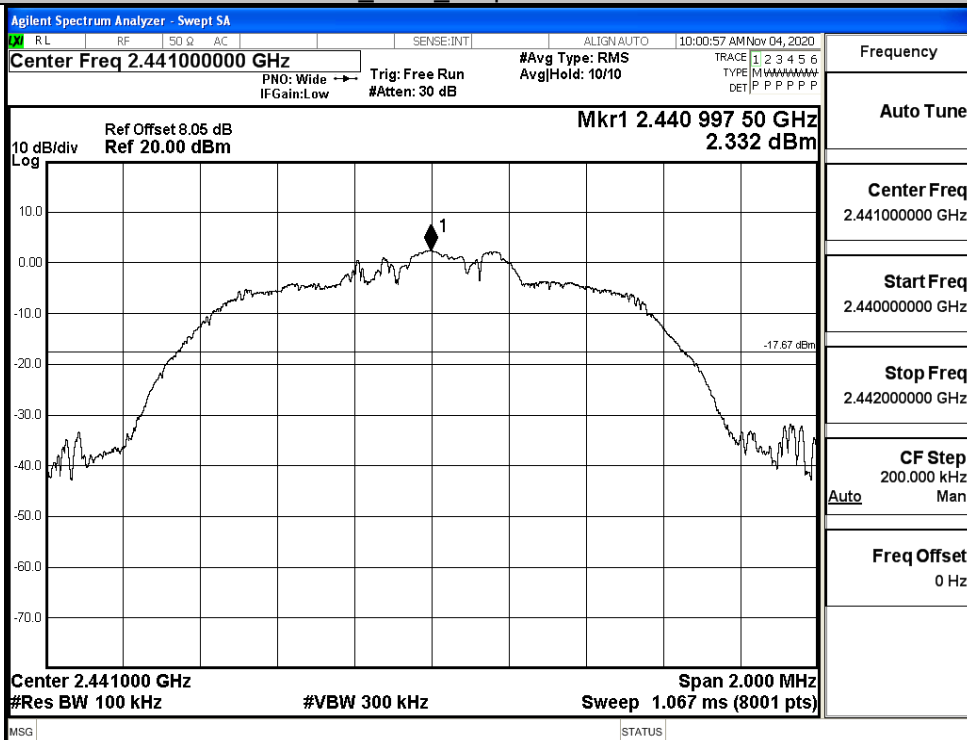


Puw

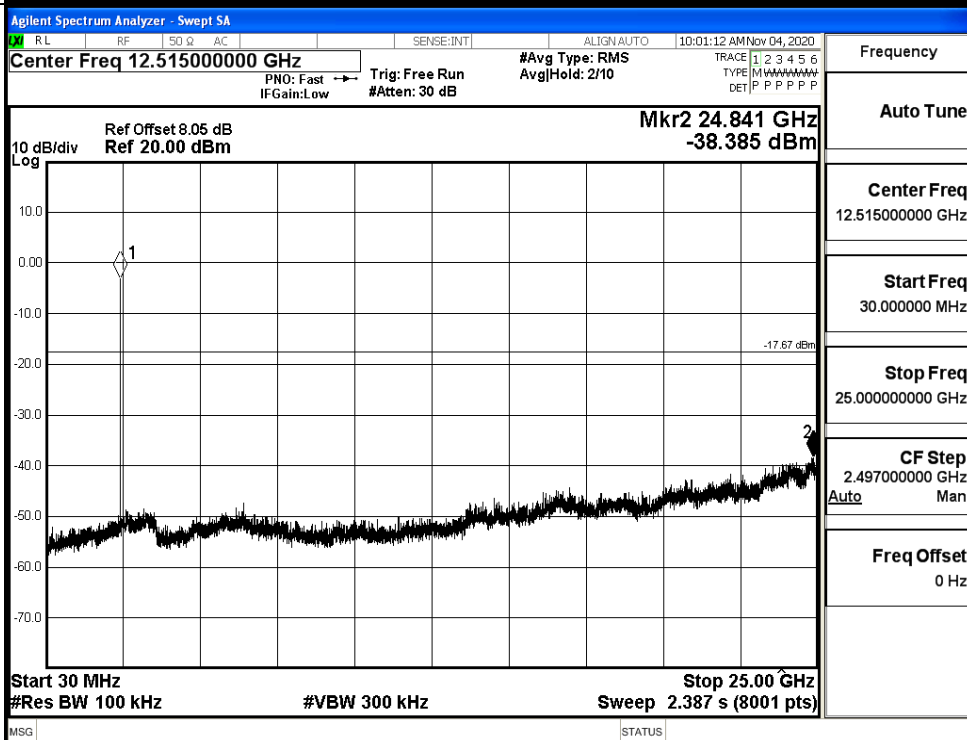


π /4DQPSK_MCH_Graphs

Pref

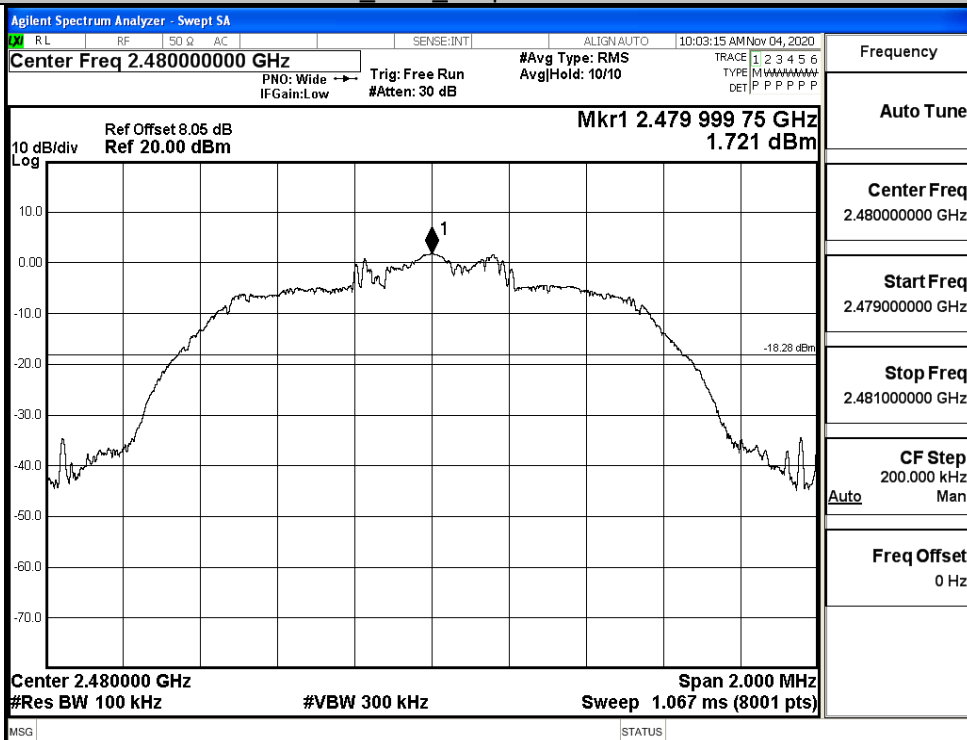


Puw

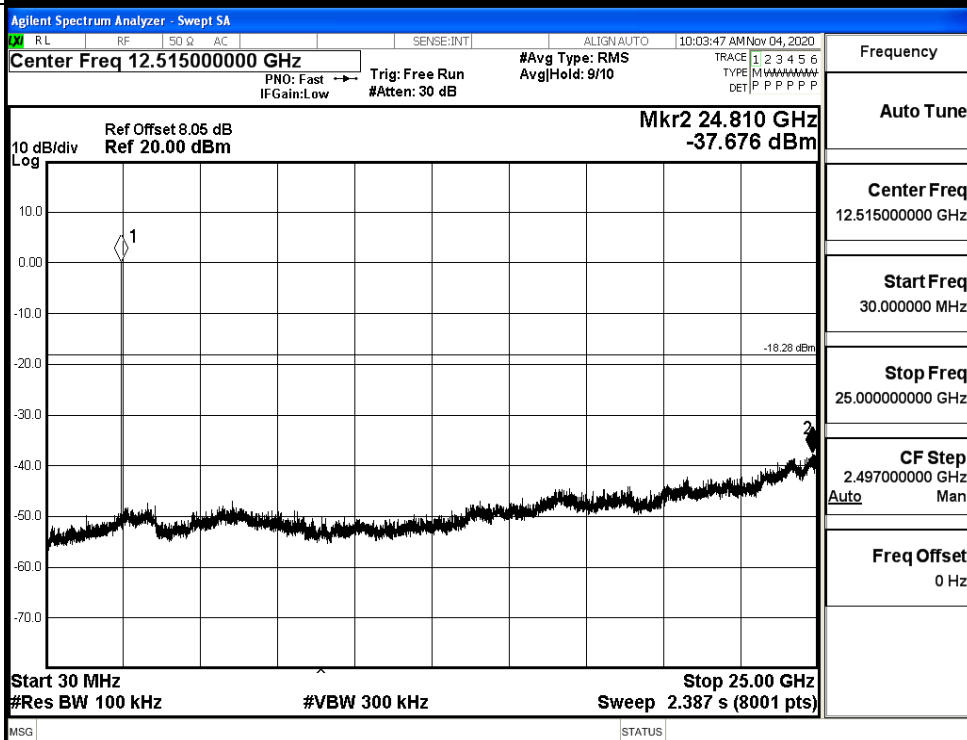


$\pi/4$ DQPSK_HCH_Graphs

Pref

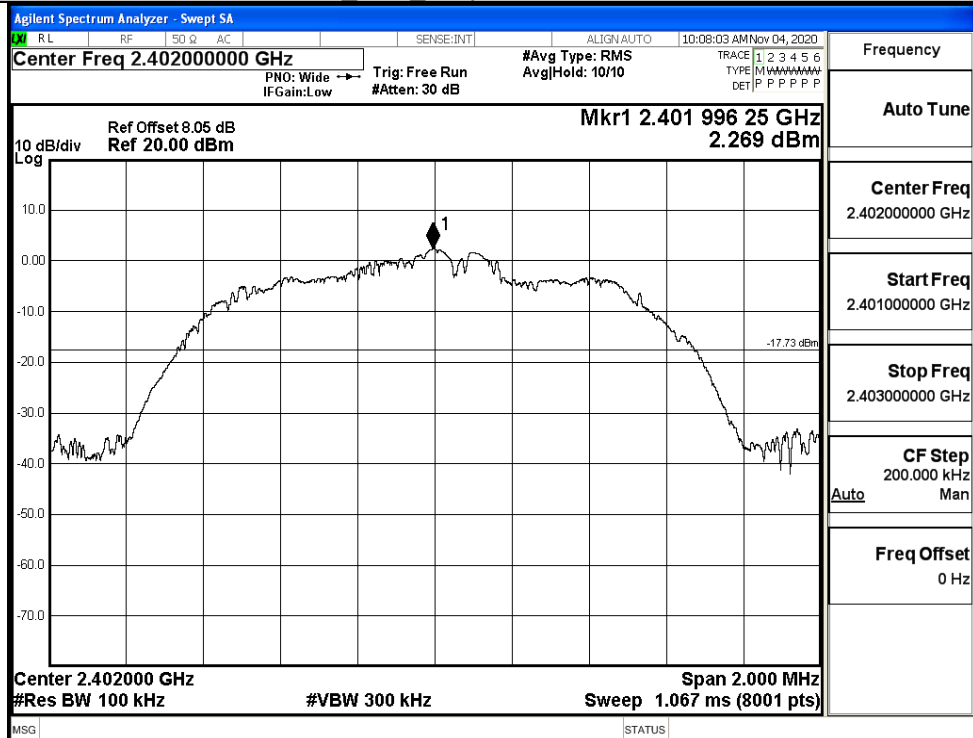


Puw

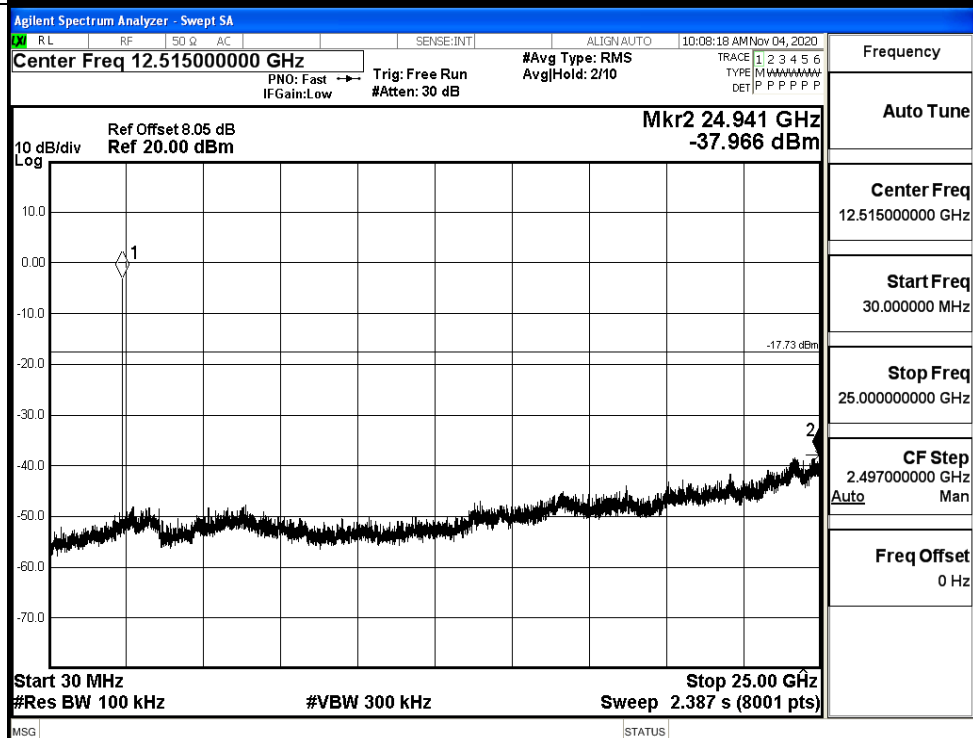


8DPSK_LCH_Graphs

Pref

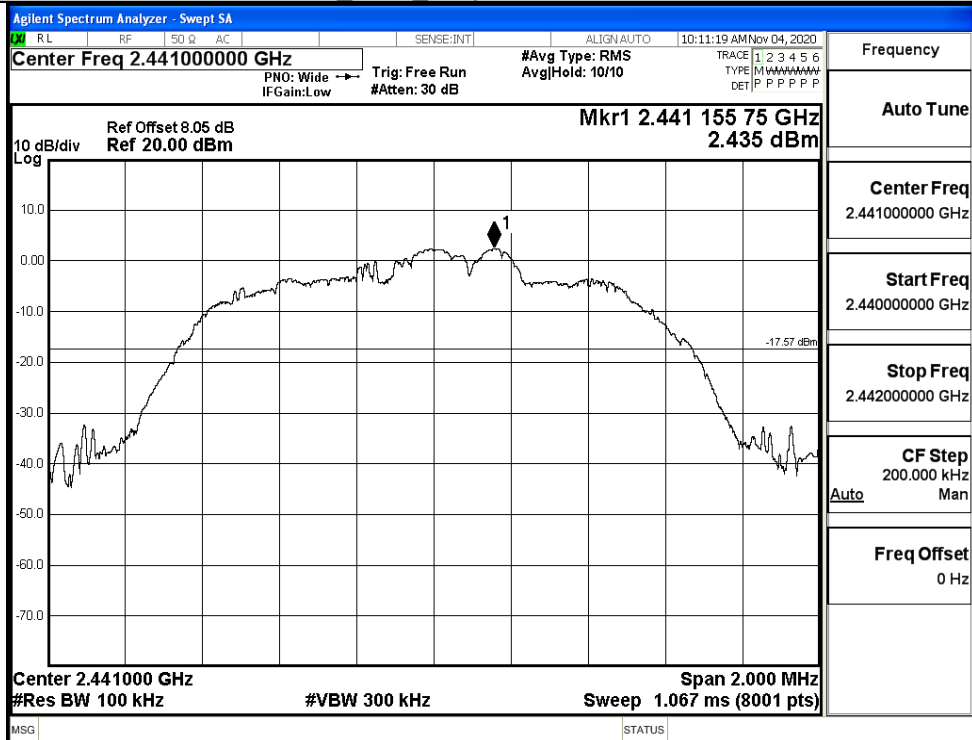


Puw

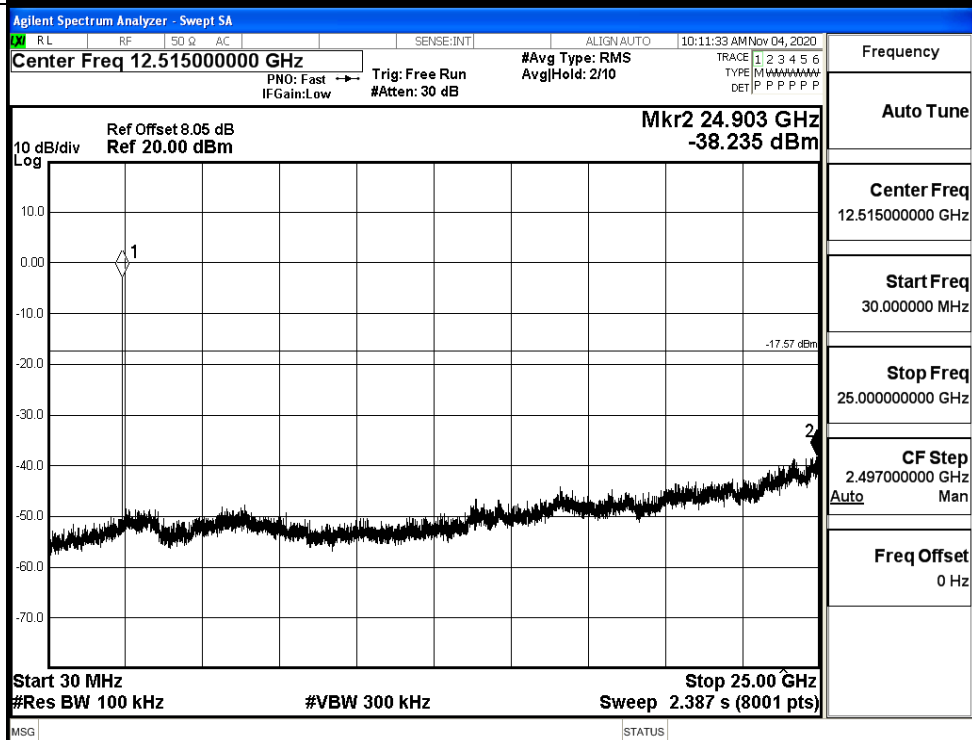


8DPSK_MCH_Graphs

Pref

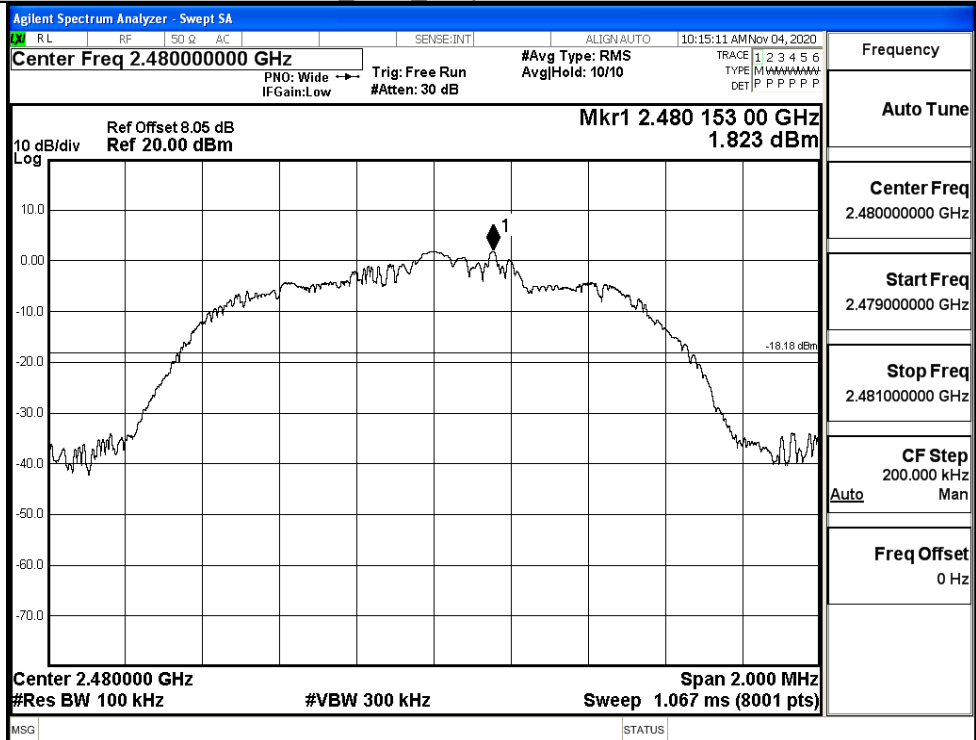


Puw

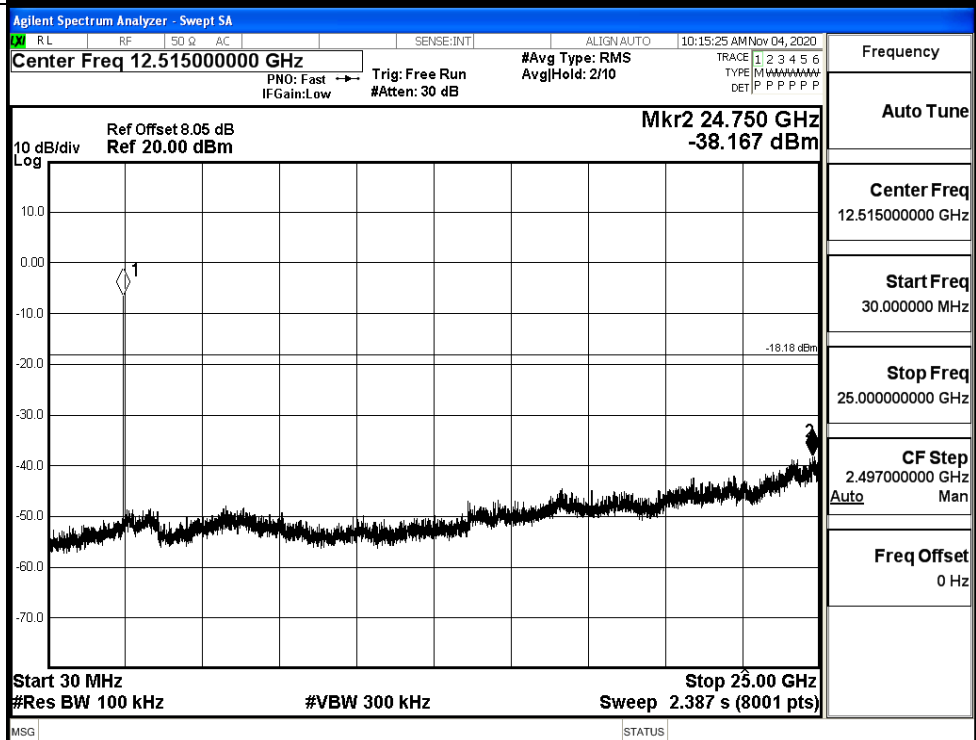


8DPSK_HCH_Graphs

Pref



Puw

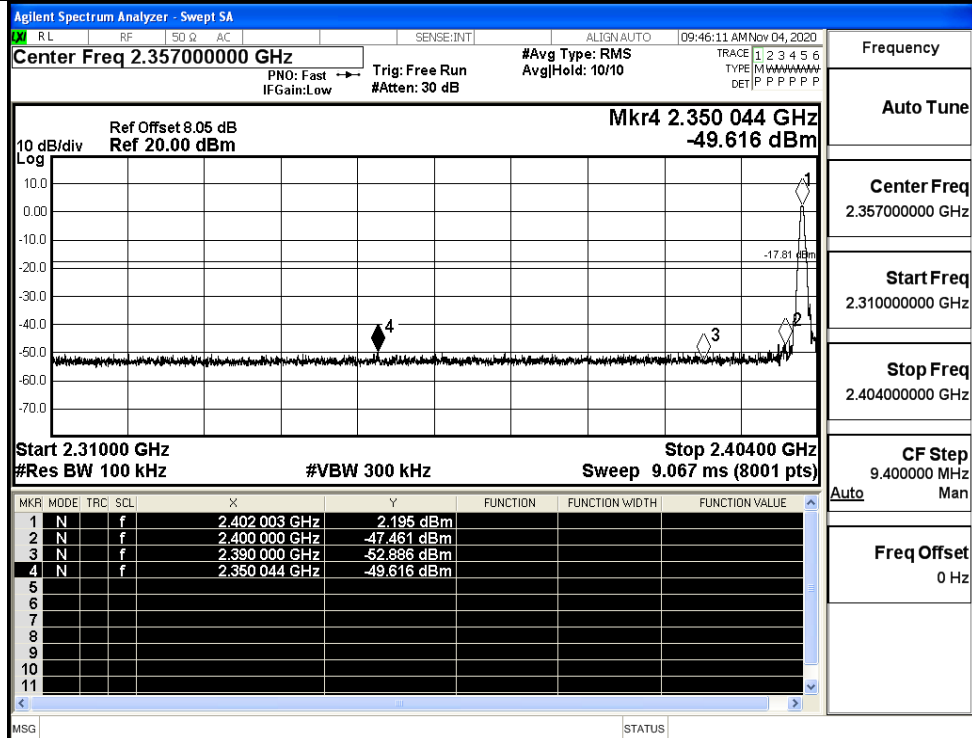


D.7 Band-edge for RF Conducted Emissions

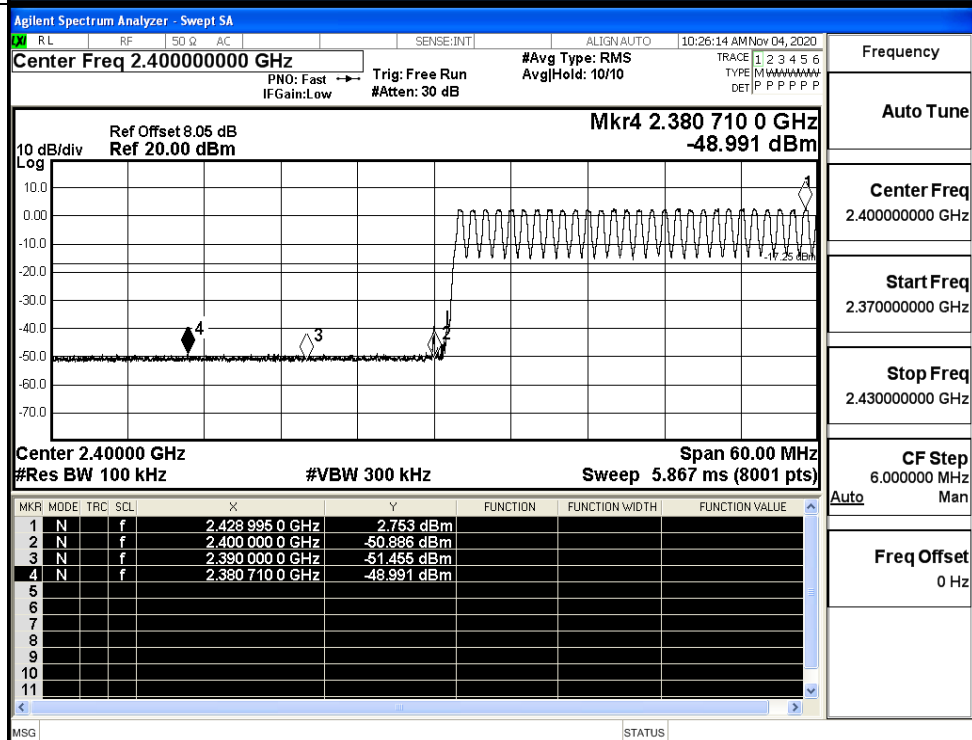
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	2.195	Off	-49.616	-17.81	PASS
			2.753	On	-48.991	-17.25	PASS
	HCH	2480	1.794	Off	-49.629	-18.21	PASS
			2.073	On	-48.704	-17.93	PASS
$\pi/4$ DQPSK	LCH	2402	1.456	Off	-49.527	-18.54	PASS
			2.584	On	-48.850	-17.42	PASS
	HCH	2480	1.624	Off	-49.424	-18.38	PASS
			2.312	On	-48.232	-17.69	PASS
8DPSK	LCH	2402	2.314	Off	-49.763	-17.69	PASS
			2.752	On	-48.331	-17.25	PASS
	HCH	2480	1.978	Off	-48.928	-18.02	PASS
			2.219	On	-47.760	-17.78	PASS

Test Graphs

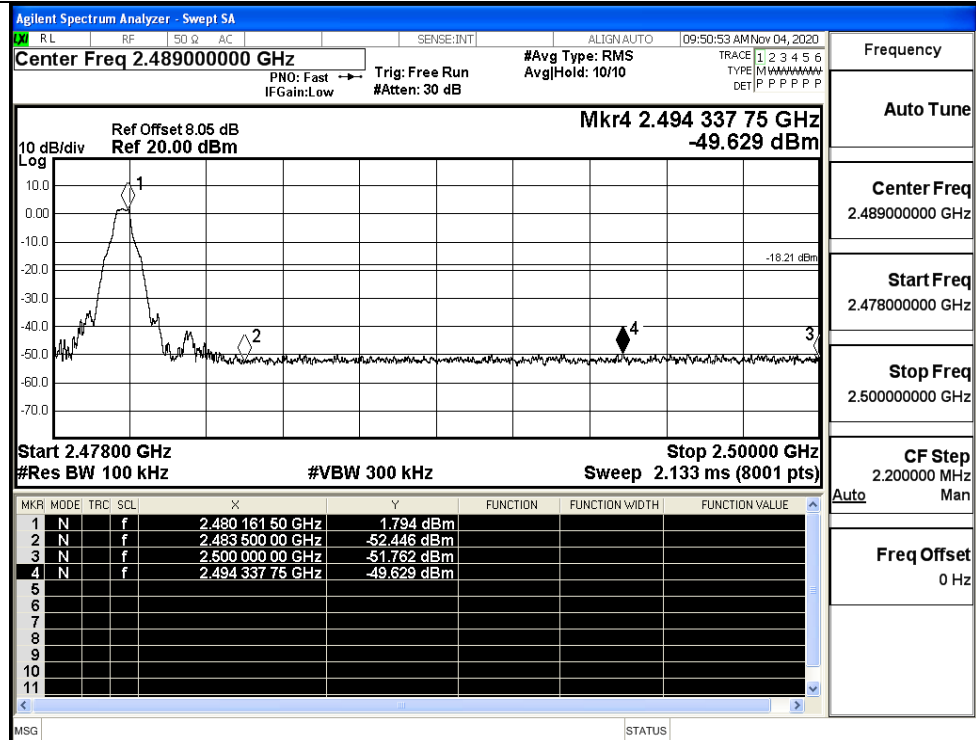
GFSK/LCH/No Hop



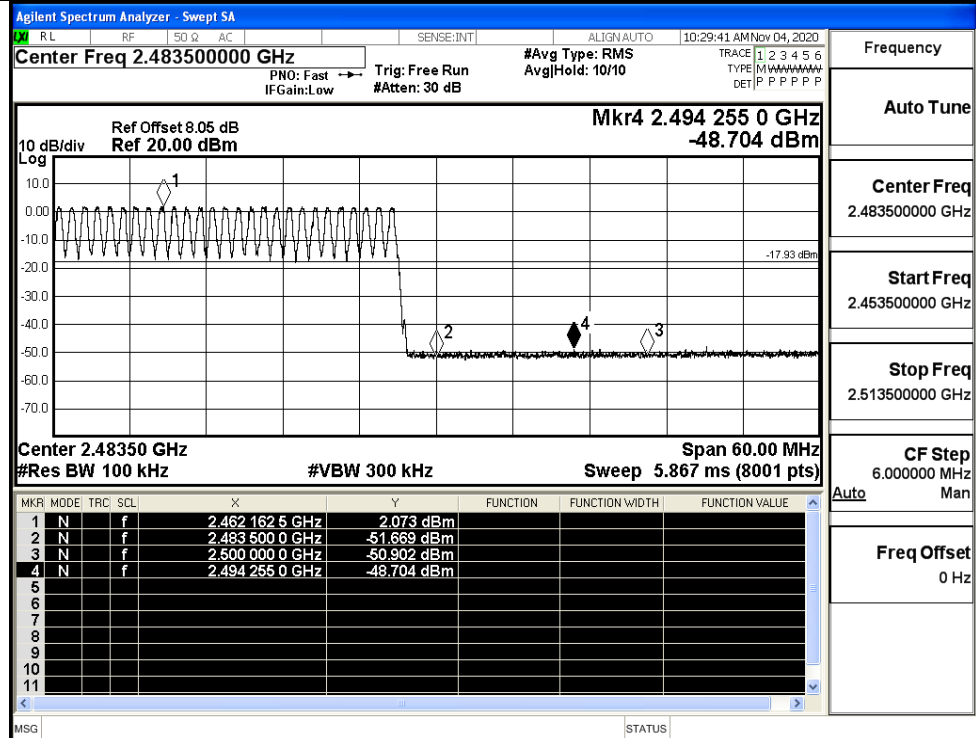
GFSK/LCH/Hop



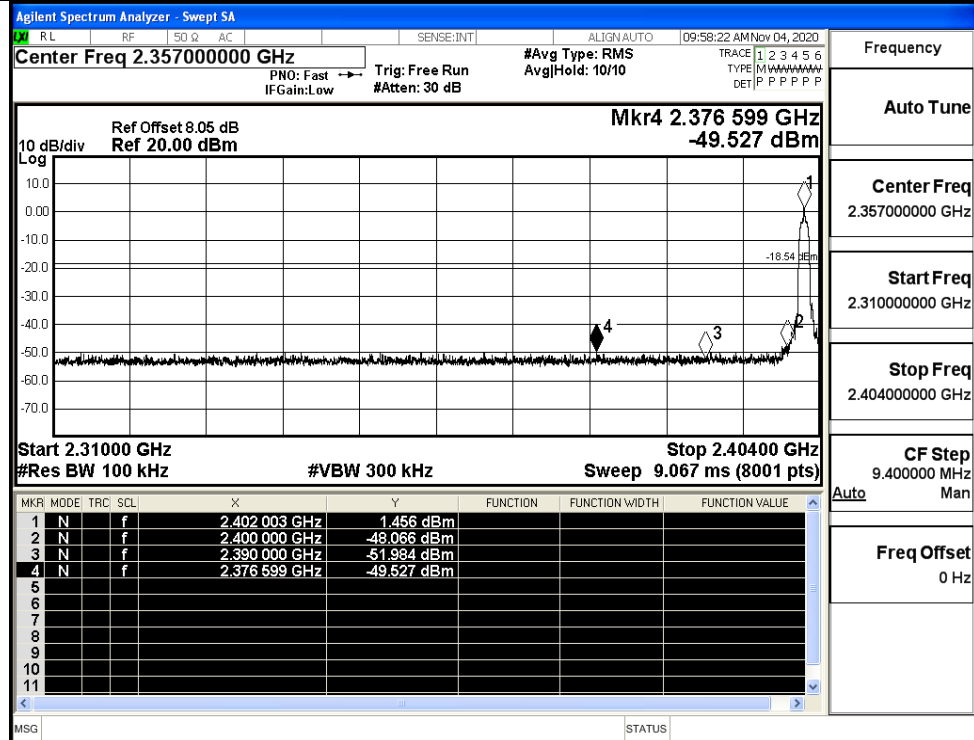
GFSK/HCH/No Hop



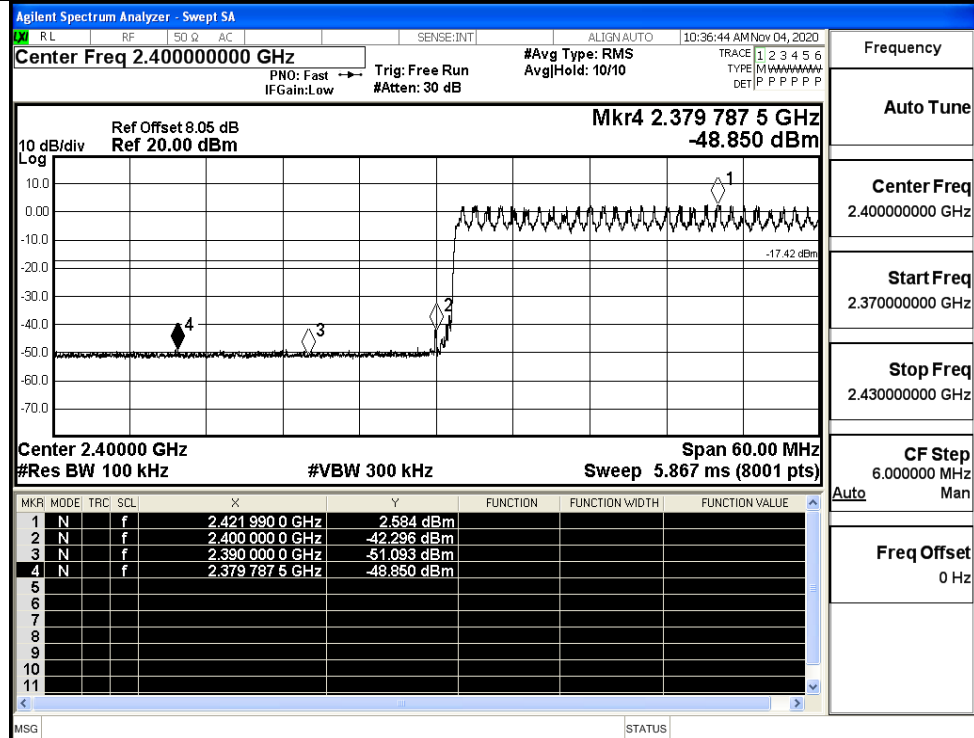
GFSK/HCH/Hop



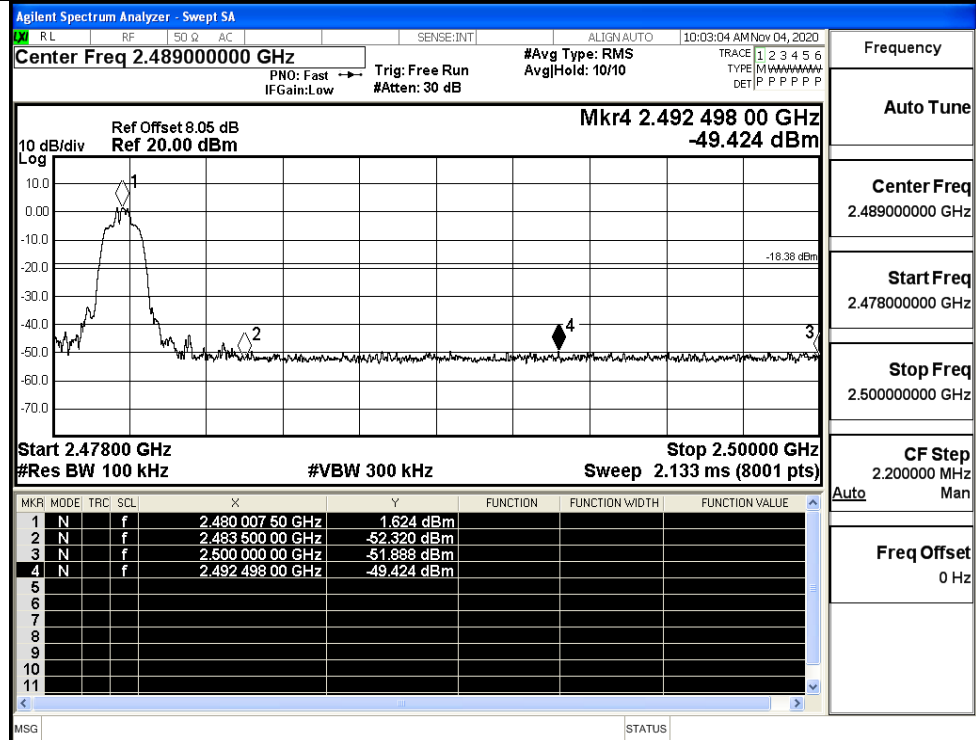
$\pi/4$ DQPSK/LCH/No
Hop



$\pi/4$ DQPSK/LCH/Hop



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

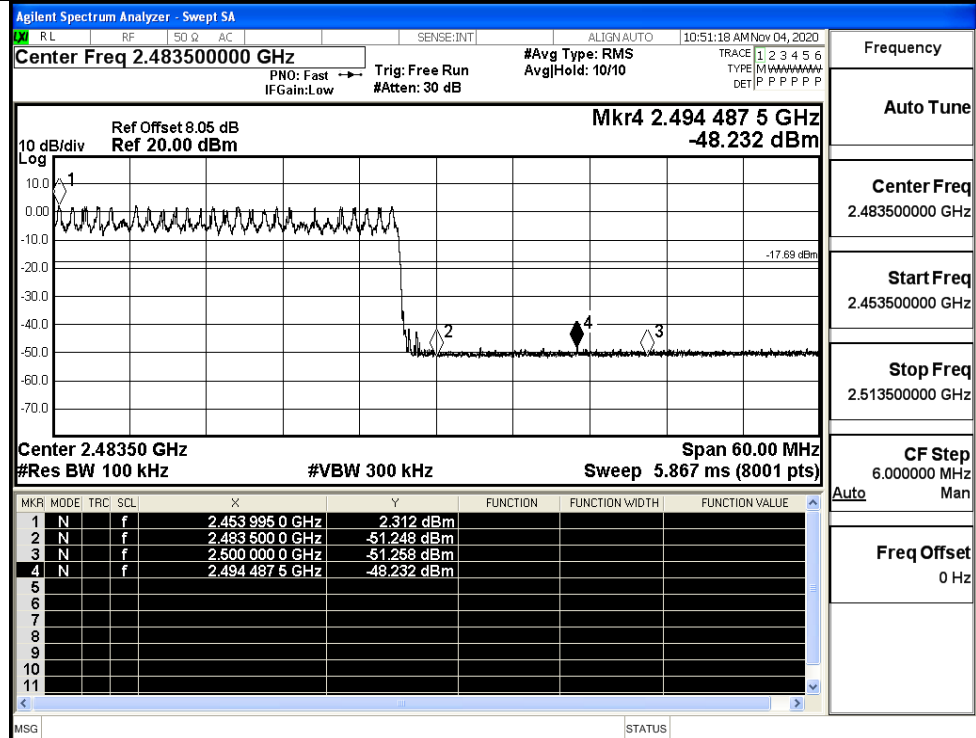


Frequency

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

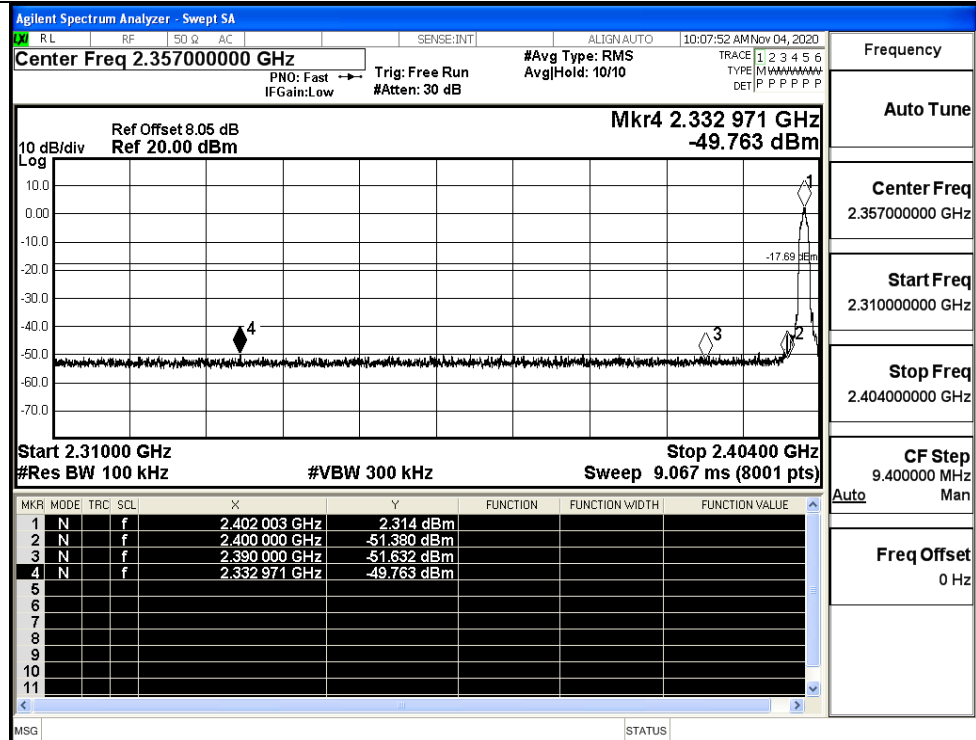


Frequency

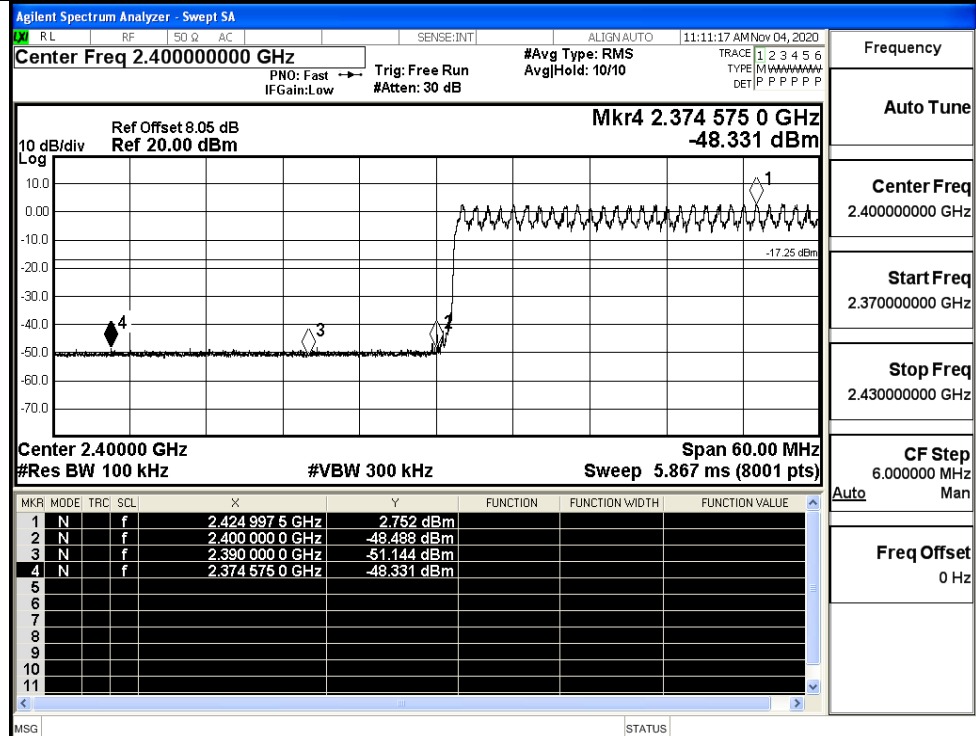
Auto Tune

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

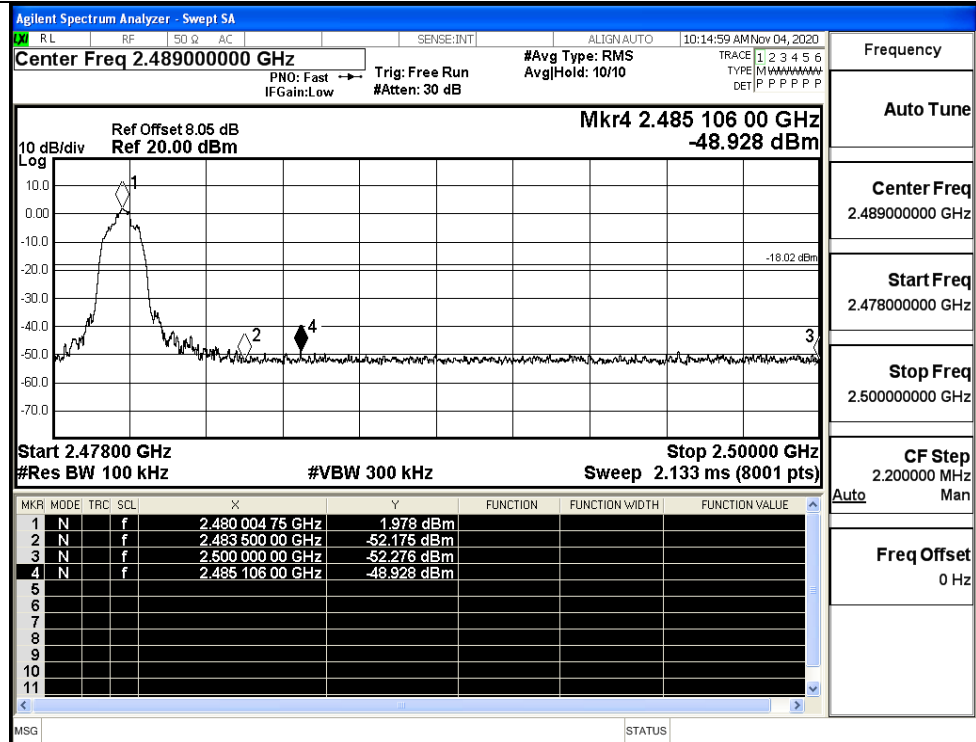
8DPSK/LCH/No Hop



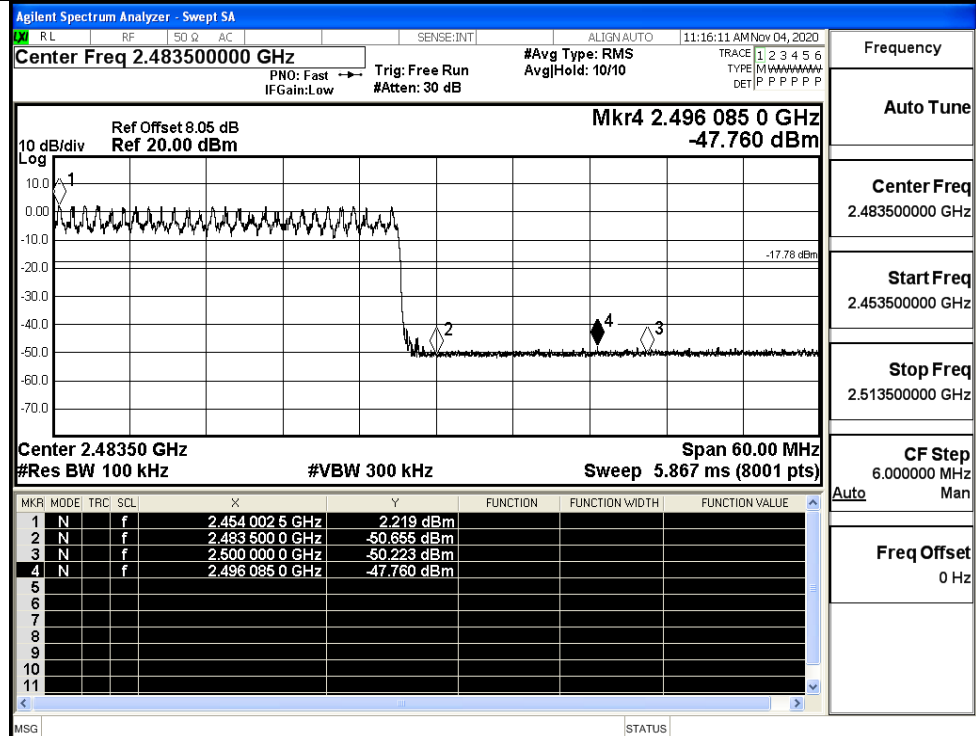
8DPSK/LCH/Hop



8DPSK/HCH/No Hop



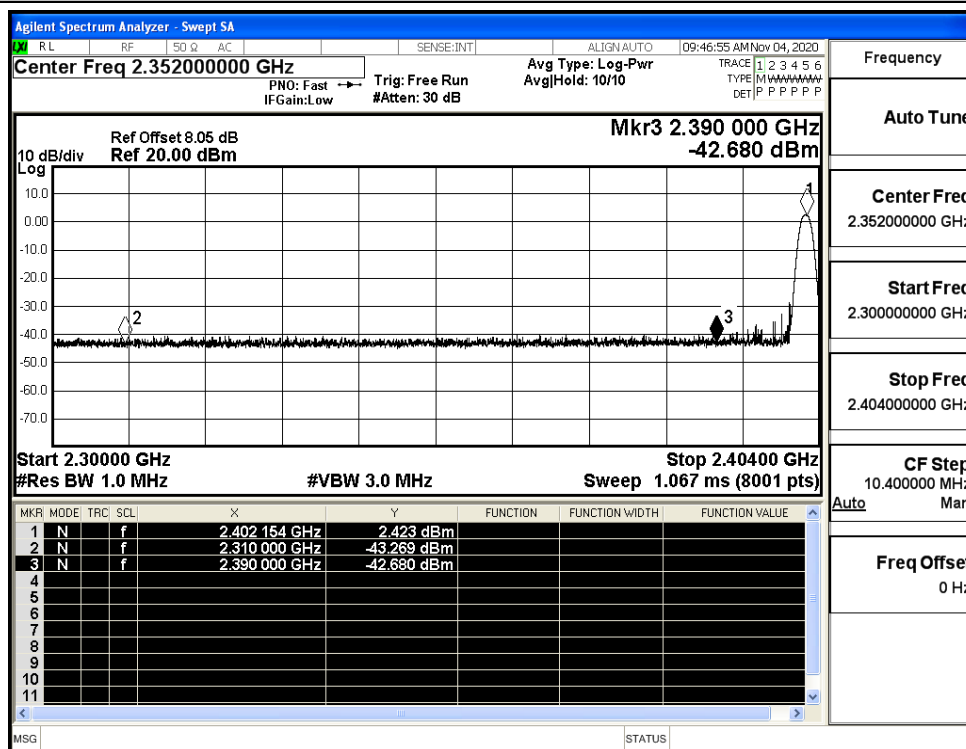
8DPSK/HCH/Hop



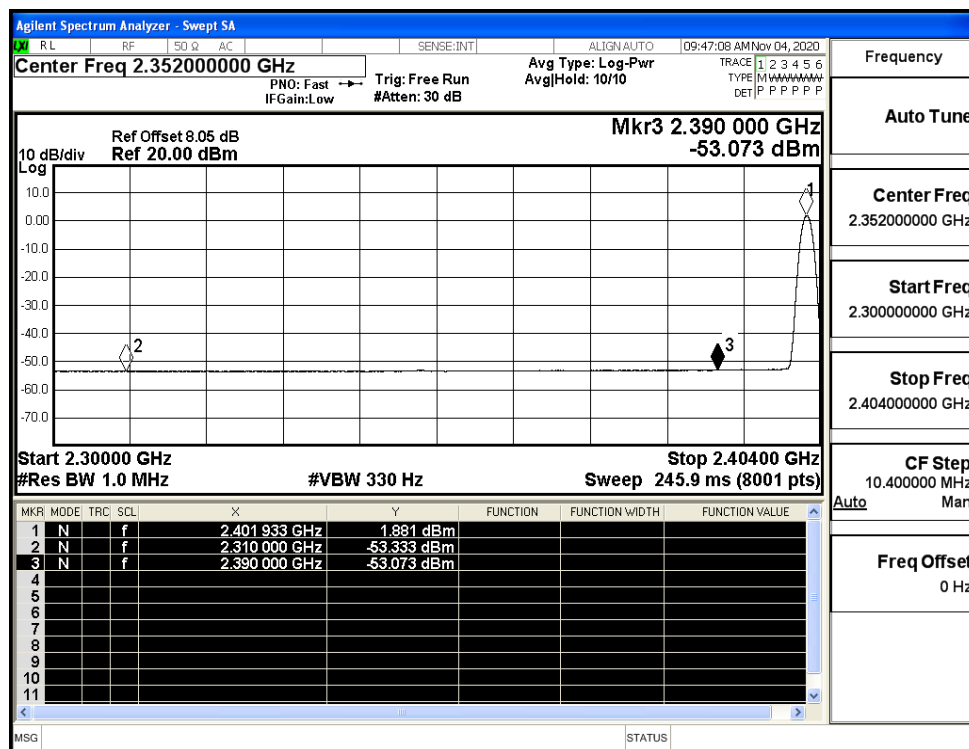
D.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.27	2.0	0	51.99	PEAK	74	PASS
	Off	2310.0	-53.33	2.0	0	41.92	AV	54	PASS
	Off	2390.0	-42.68	2.0	0	52.58	PEAK	74	PASS
	Off	2390.0	-53.07	2.0	0	42.18	AV	54	PASS
	Off	2483.5	-34.13	2.0	0	61.13	PEAK	74	PASS
	Off	2483.5	-52.47	2.0	0	42.79	AV	54	PASS
	Off	2500.0	-43.17	2.0	0	52.08	PEAK	74	PASS
	Off	2500.0	-52.32	2.0	0	42.94	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-43.98	2.0	0	51.27	PEAK	74	PASS
	Off	2310.0	-53.46	2.0	0	41.80	AV	54	PASS
	Off	2390.0	-40.53	2.0	0	54.72	PEAK	74	PASS
	Off	2390.0	-53.05	2.0	0	42.20	AV	54	PASS
	Off	2483.5	-42.48	2.0	0	52.77	PEAK	74	PASS
	Off	2483.5	-52.44	2.0	0	42.82	AV	54	PASS
	Off	2500.0	-42.71	2.0	0	52.55	PEAK	74	PASS
	Off	2500.0	-52.42	2.0	0	42.83	AV	54	PASS
8DPSK	Off	2310.0	-42.22	2.0	0	53.04	PEAK	74	PASS
	Off	2310.0	-53.44	2.0	0	41.82	AV	54	PASS
	Off	2390.0	-43.59	2.0	0	51.67	PEAK	74	PASS
	Off	2390.0	-53.03	2.0	0	42.23	AV	54	PASS
	Off	2483.5	-42.66	2.0	0	52.60	PEAK	74	PASS
	Off	2483.5	-52.52	2.0	0	42.74	AV	54	PASS
	Off	2500.0	-42.21	2.0	0	53.05	PEAK	74	PASS
	Off	2500.0	-52.23	2.0	0	43.03	AV	54	PASS

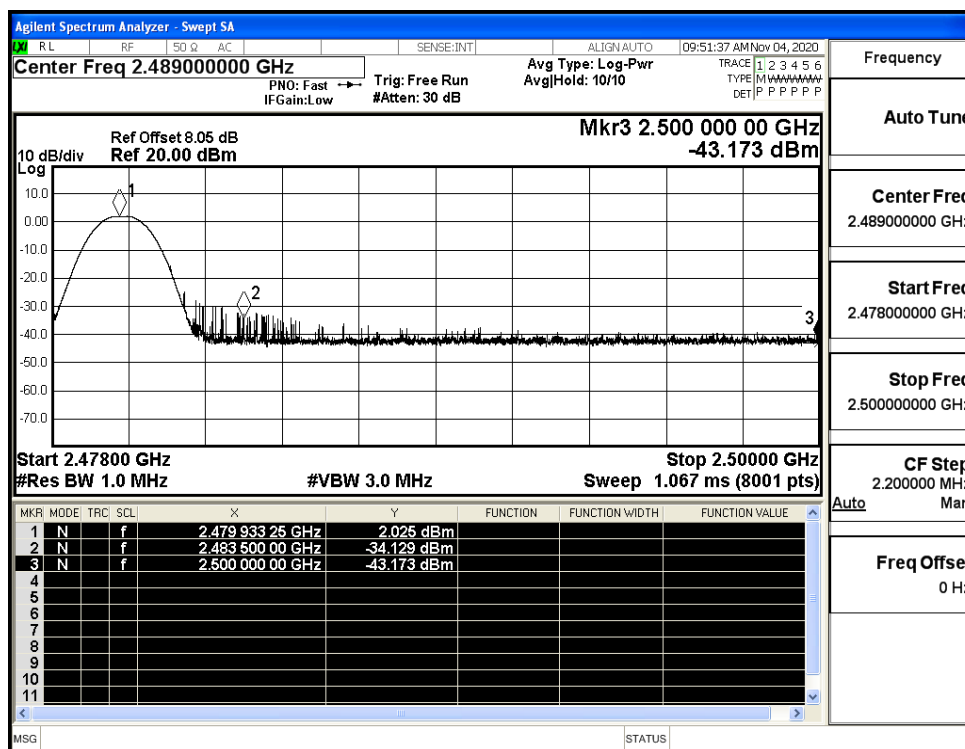
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



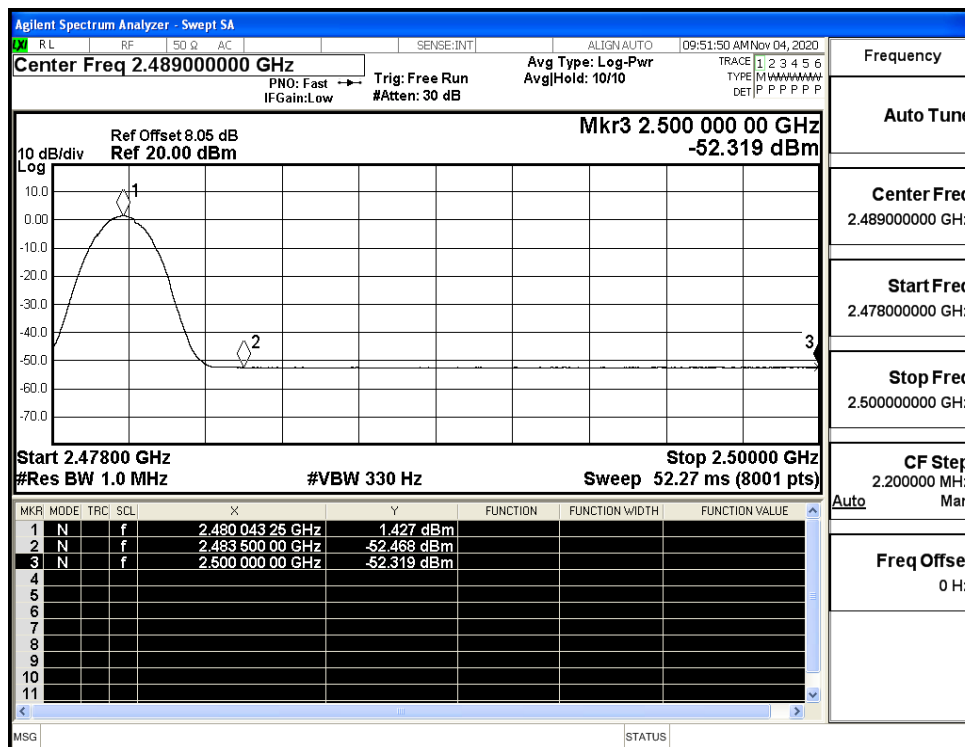
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)

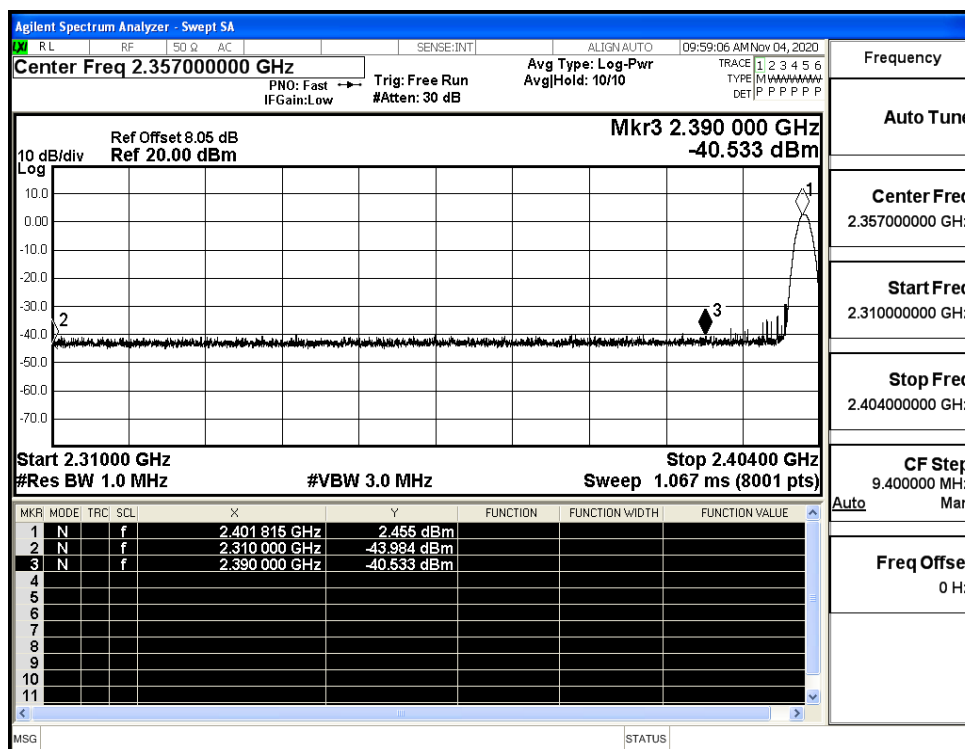
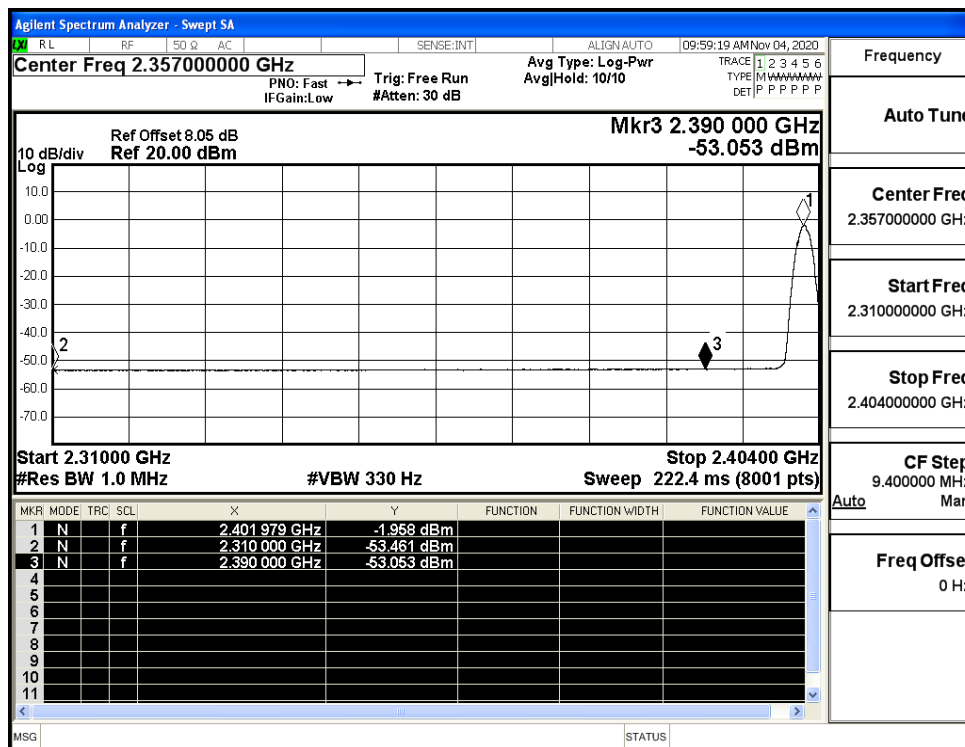


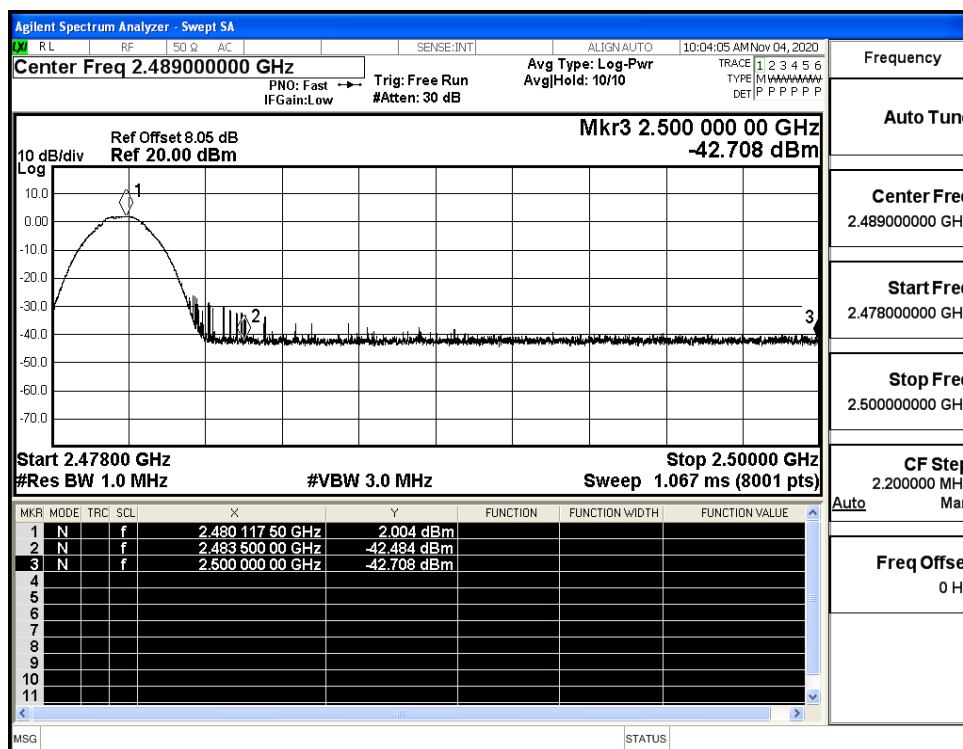
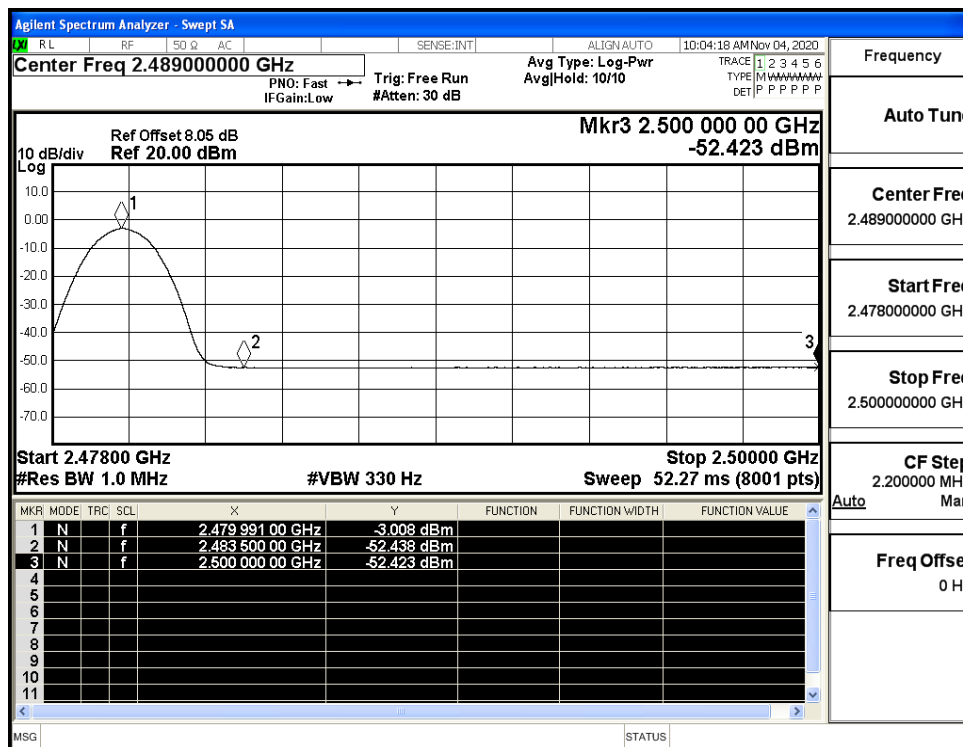
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)



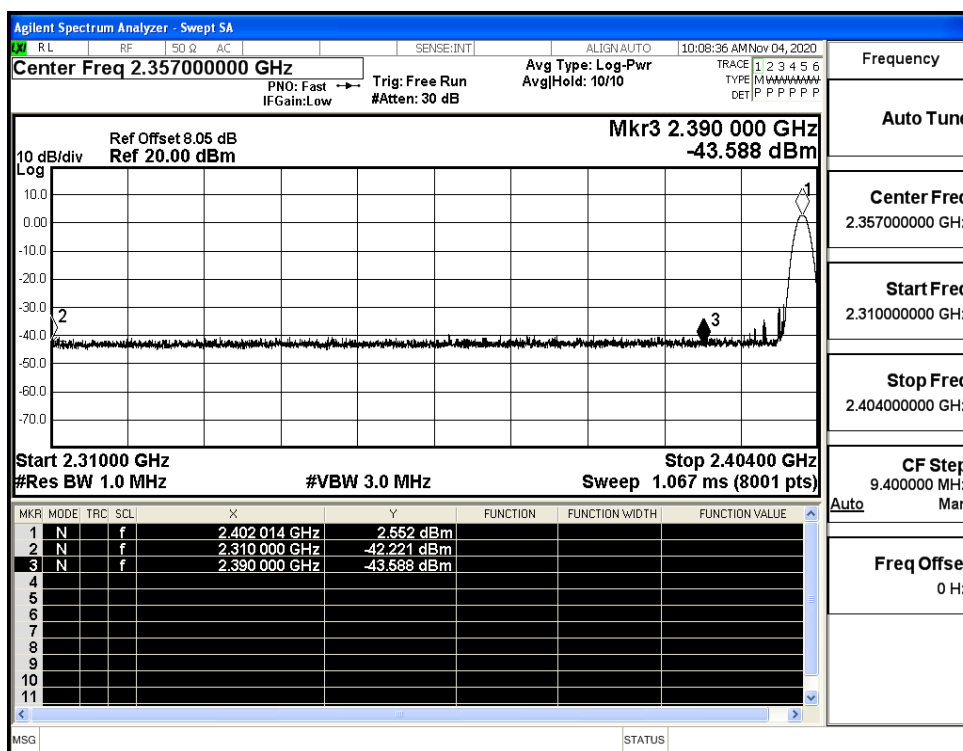
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)



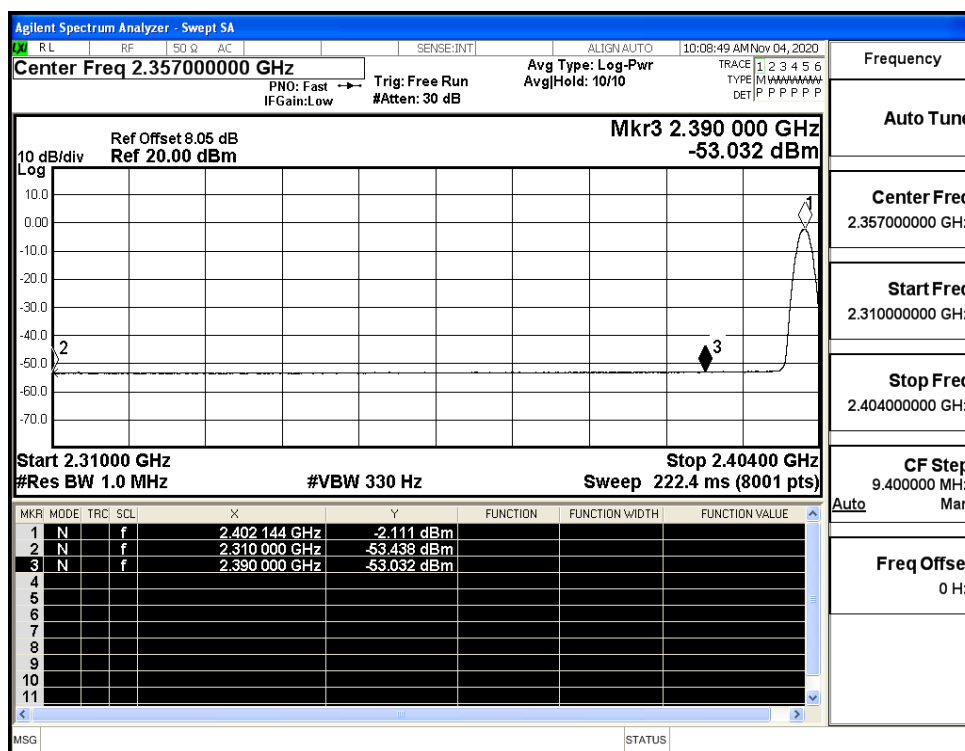
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)

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)

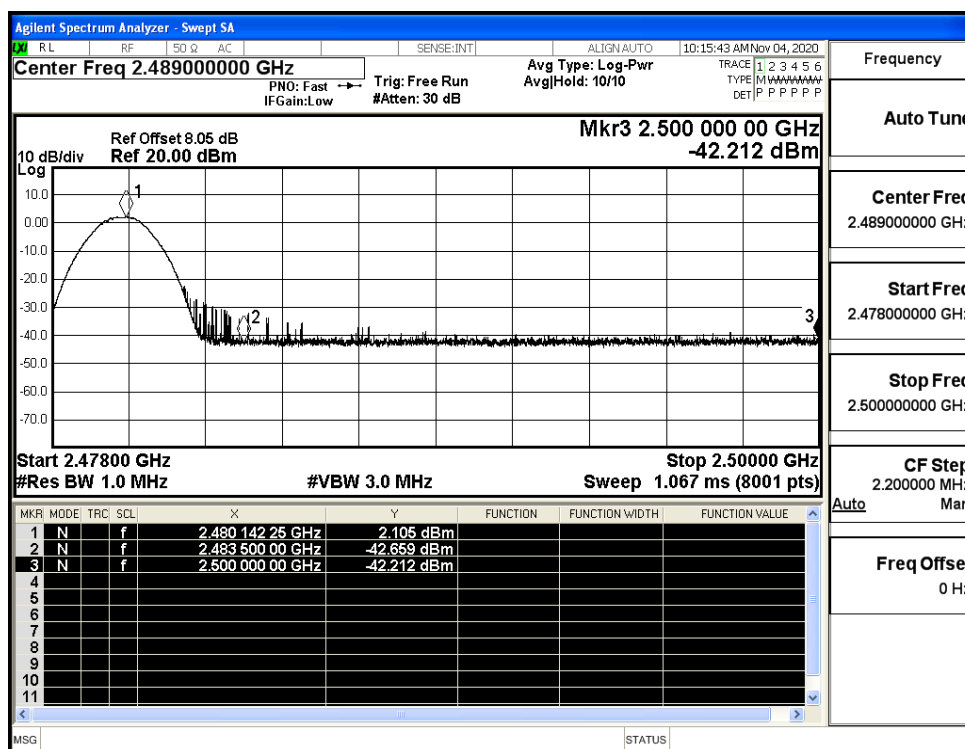
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)

