Appendix A

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

Product Name: Firewalla Purple

Trade Mark: Firewalla

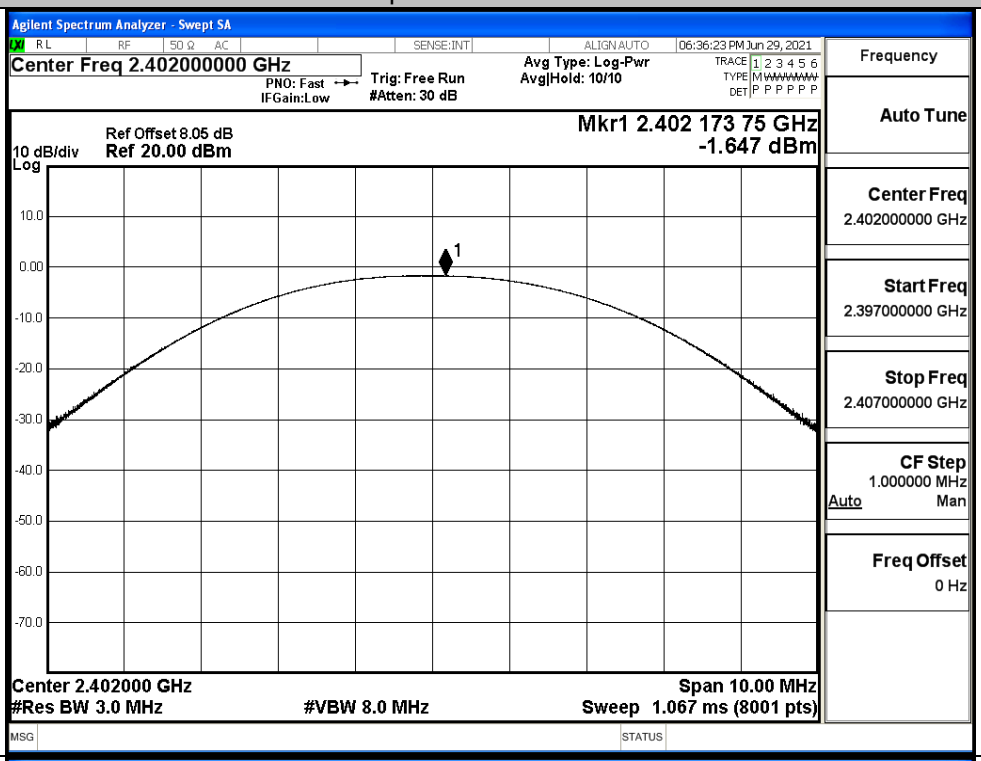
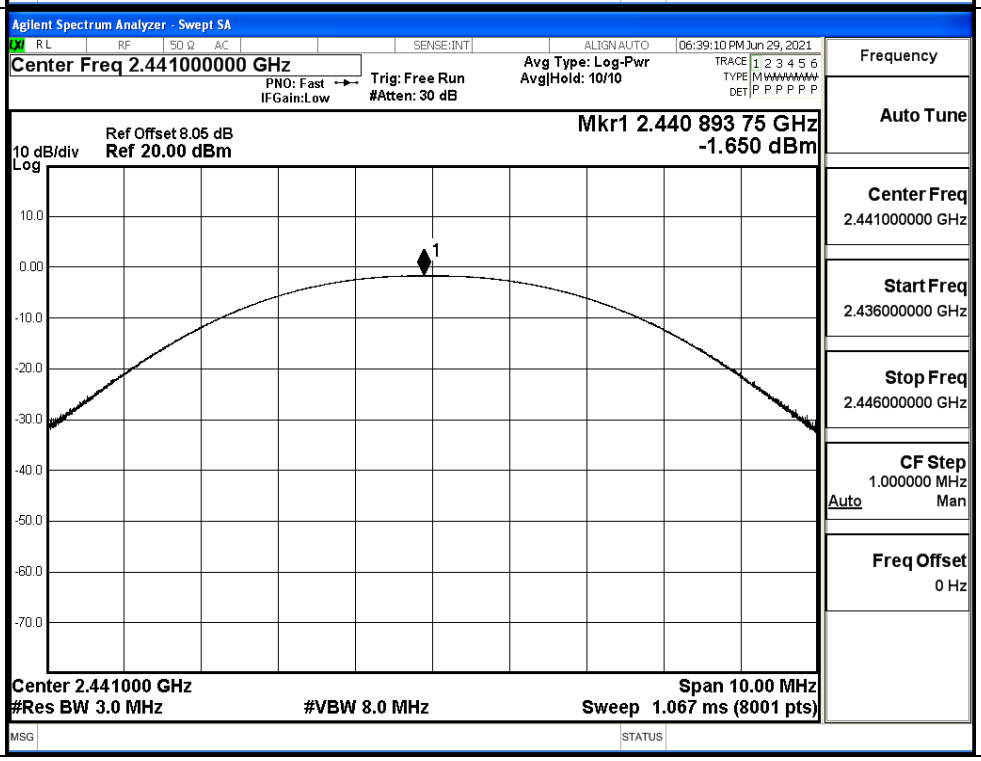
Test Model: Firewalla Purple

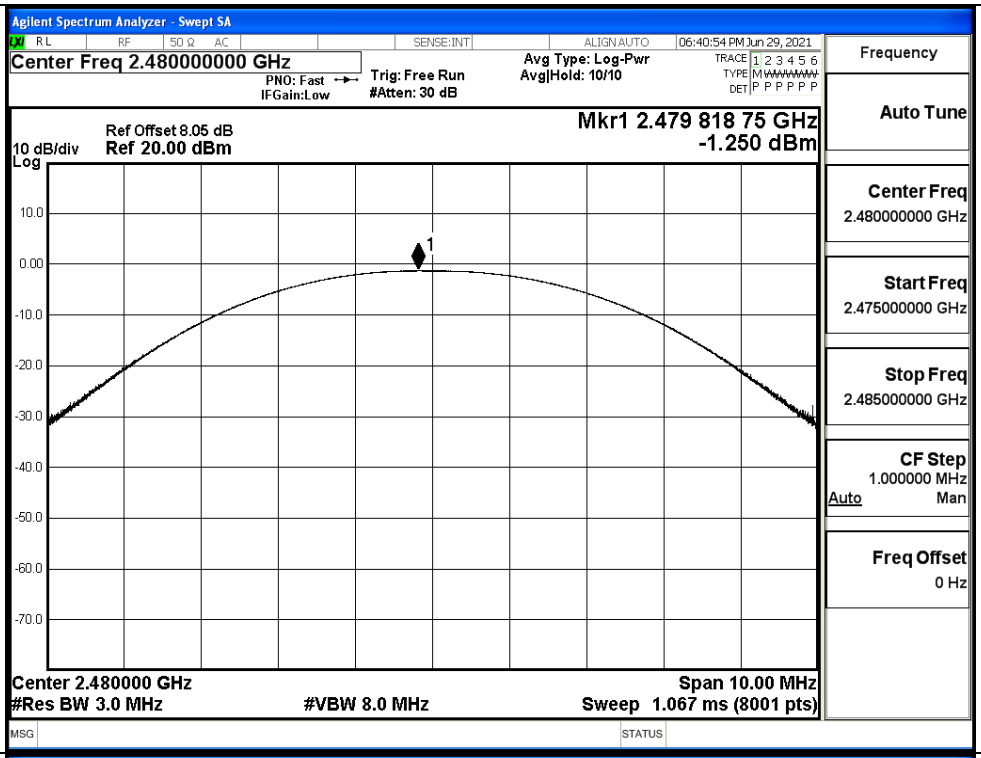
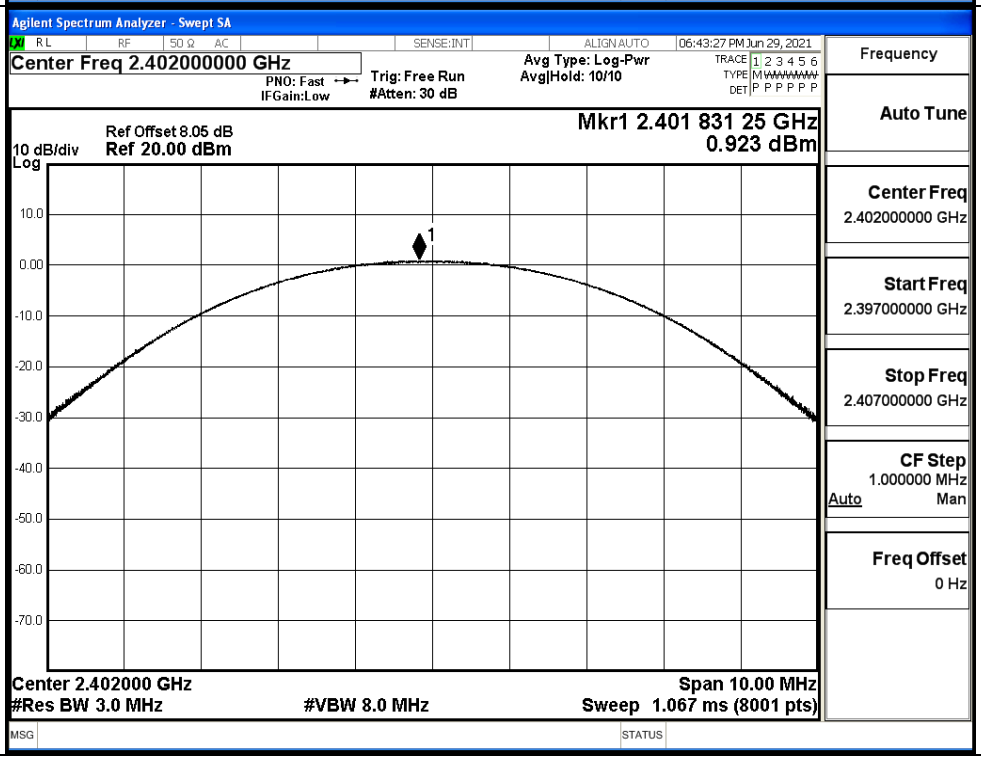
Environmental Conditions

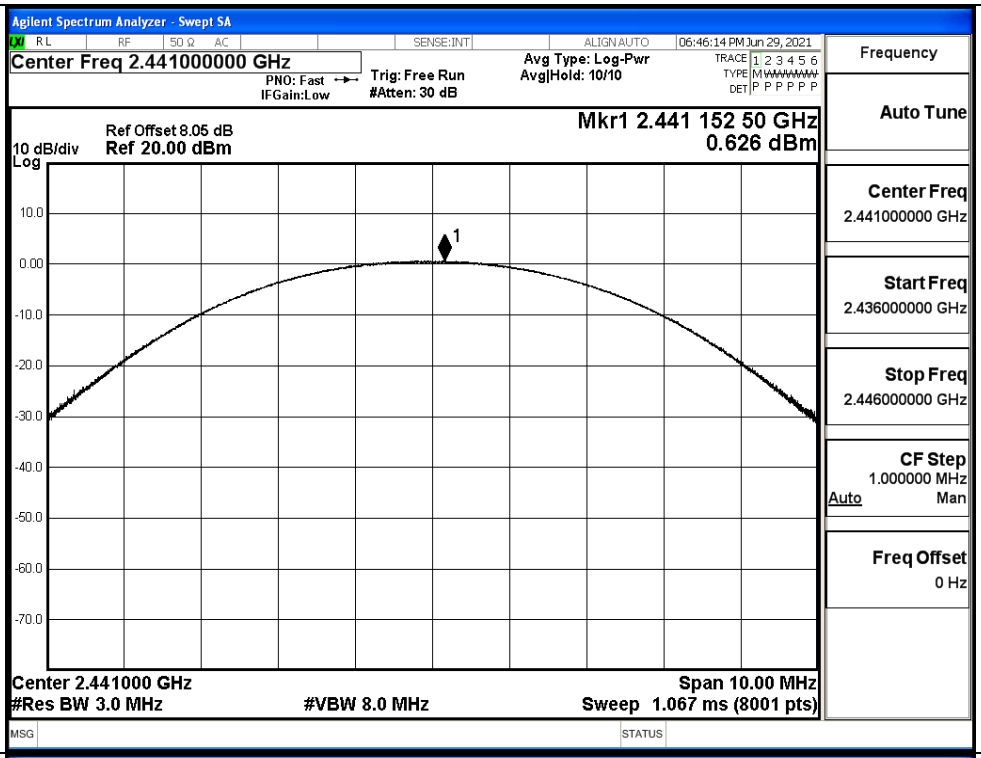
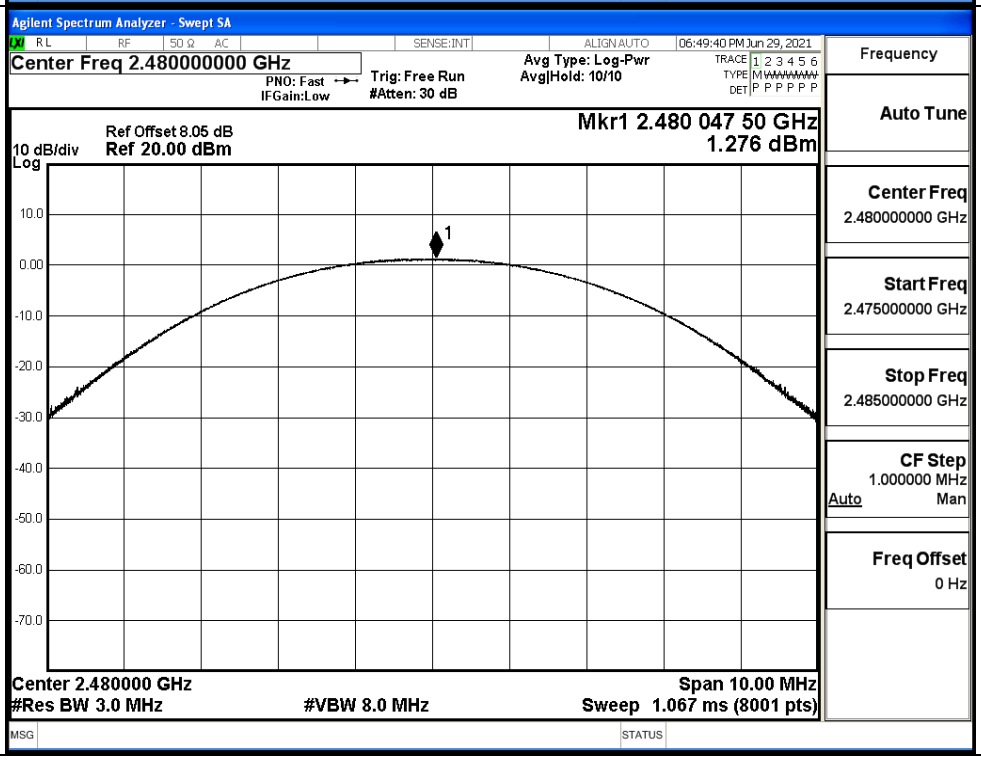
Temperature:	21.6° C
Relative Humidity:	52.7%
ATM Pressure:	100.0 kPa
Test Engineer:	Carl Fu
Supervised by:	Li Huan

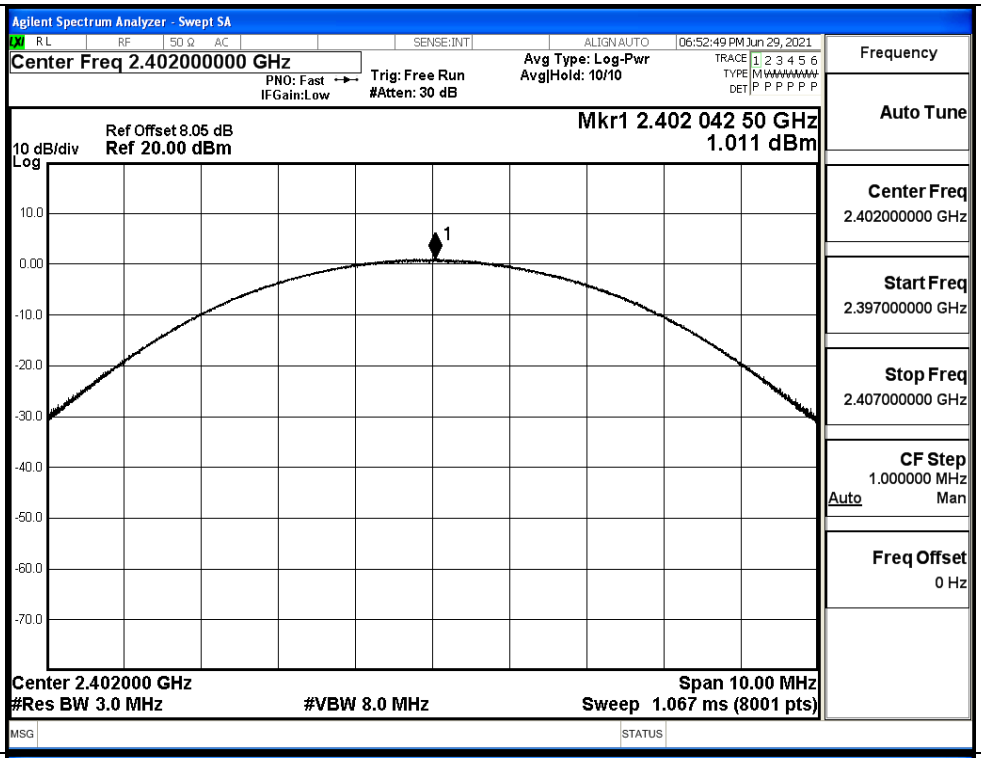
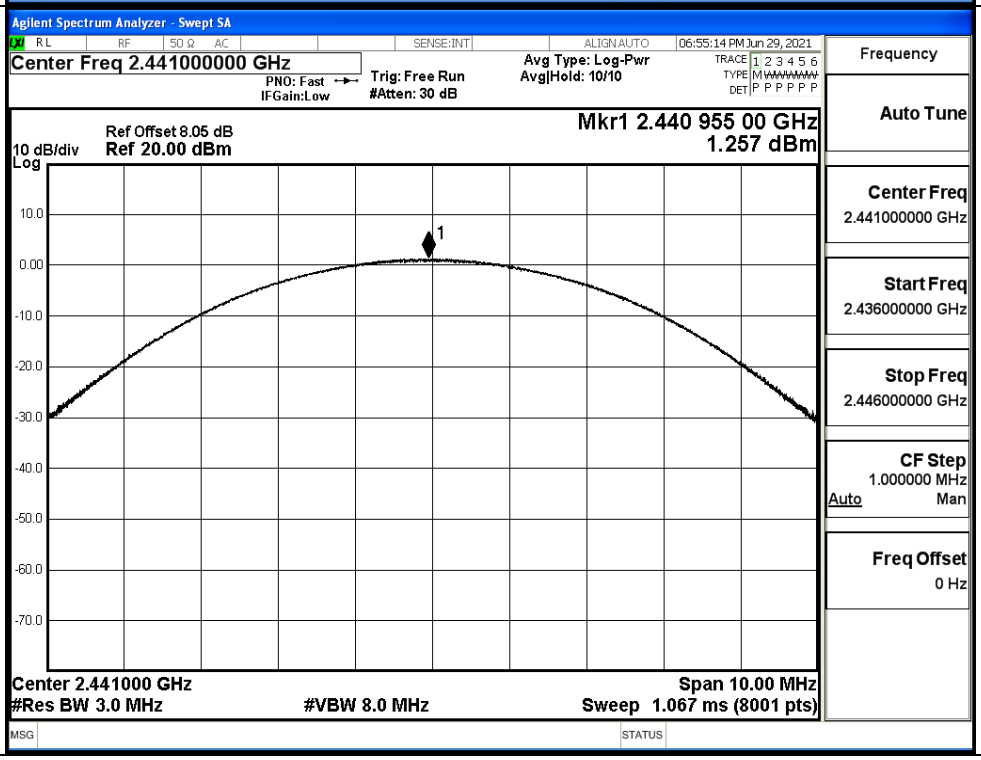
A.1 Maxmum Conducted Peak Output Power

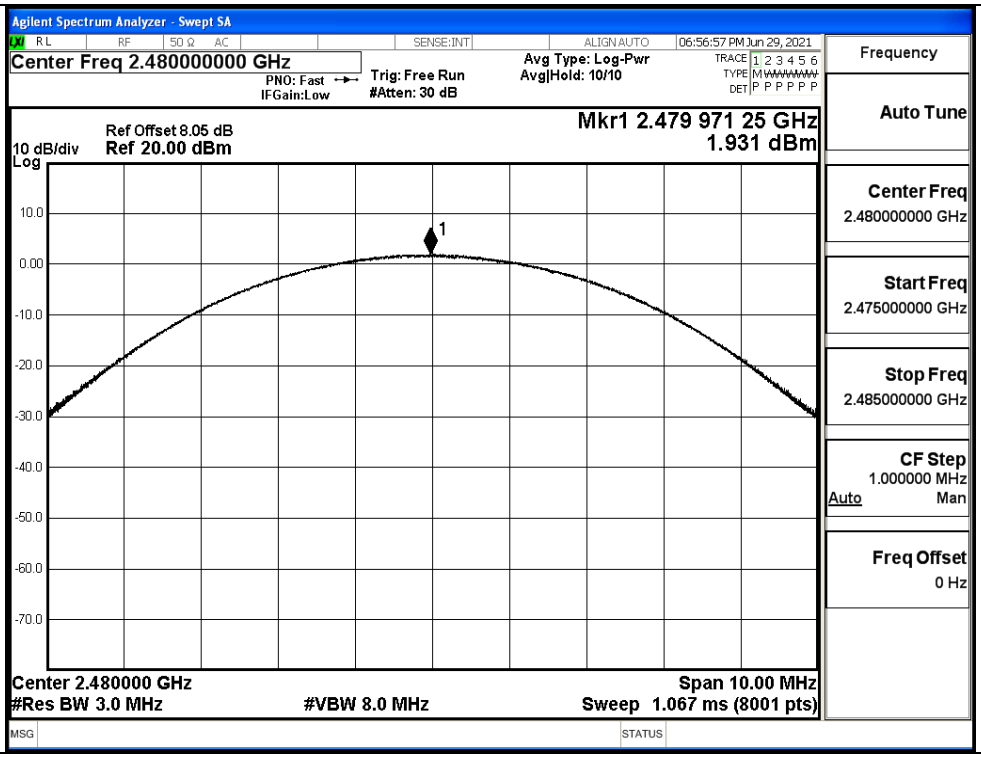
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-1.647	21	PASS
	MCH	-1.650	21	PASS
	HCH	-1.250	21	PASS
π/4DQPSK	LCH	0.923	21	PASS
	MCH	0.626	21	PASS
	HCH	1.276	21	PASS
8DPSK	LCH	1.011	21	PASS
	MCH	1.257	21	PASS
	HCH	1.931	21	PASS

Test Graphs		
GFSK/LCH		
GFSK/MCH		

GFSK/HCH	
π/4DQPSK/LCH	

π/4DQPSK/MCH	
π/4DQPSK/HCH	

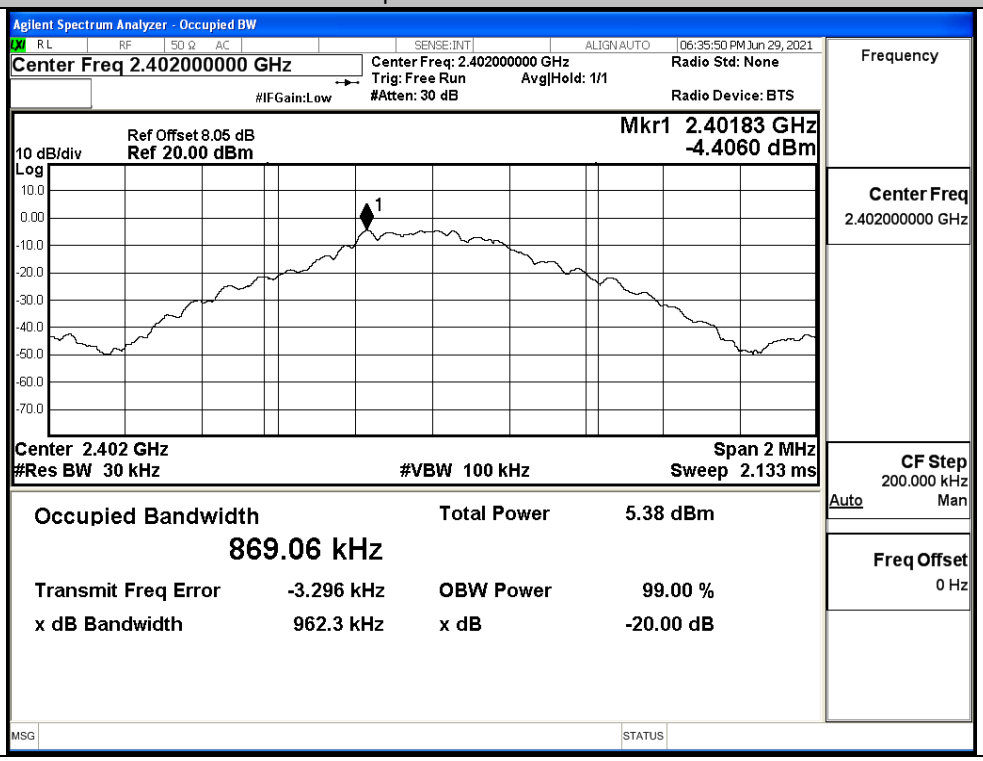
8DPSK/LCH	
8DPSK/MCH	

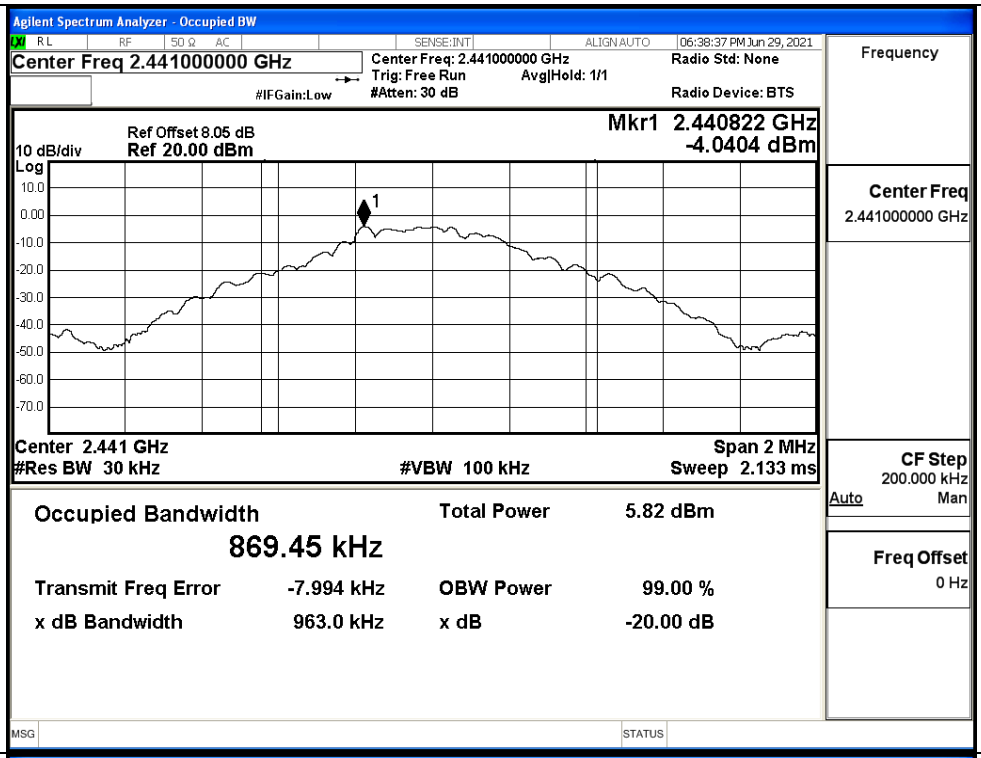
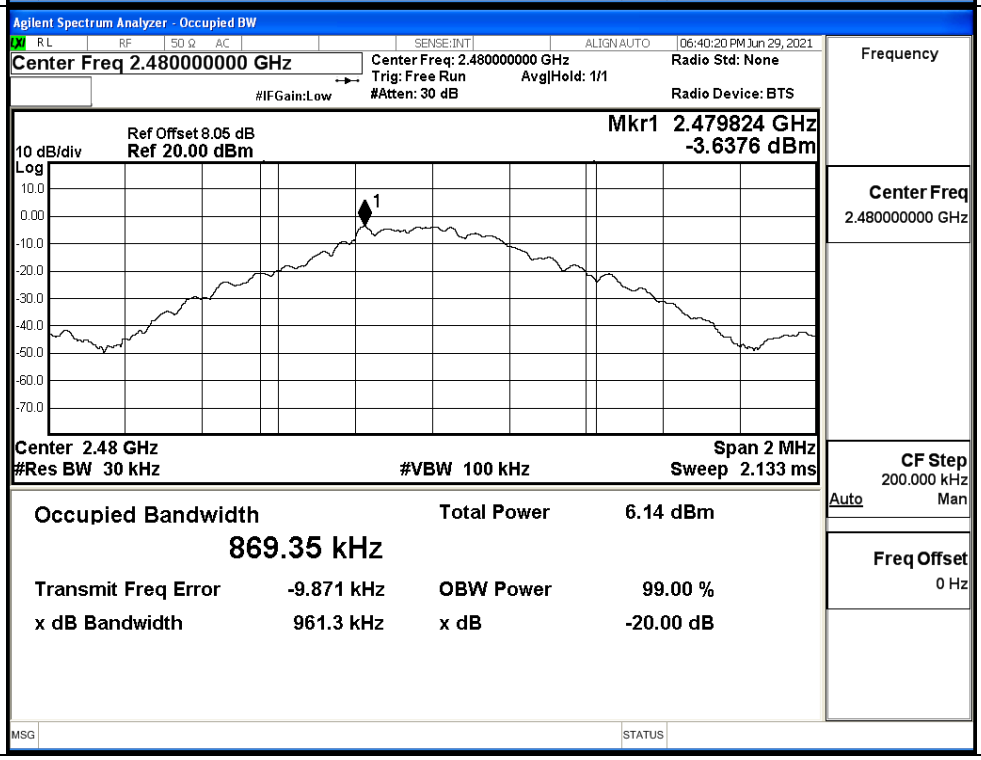
8DPSK/HCH	

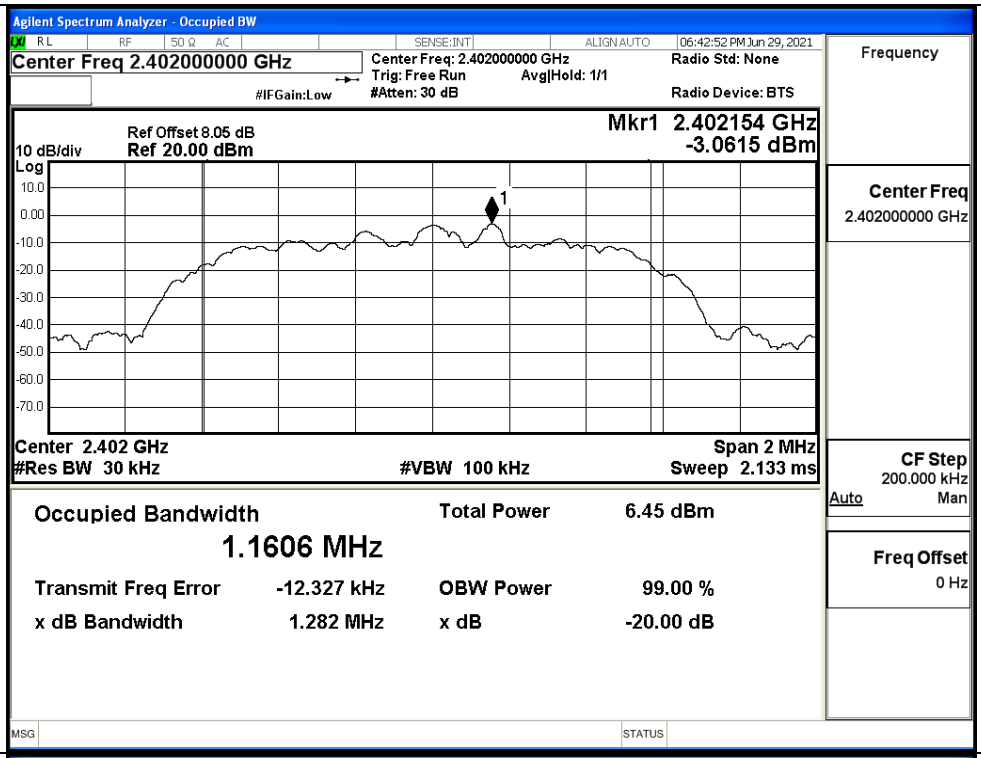
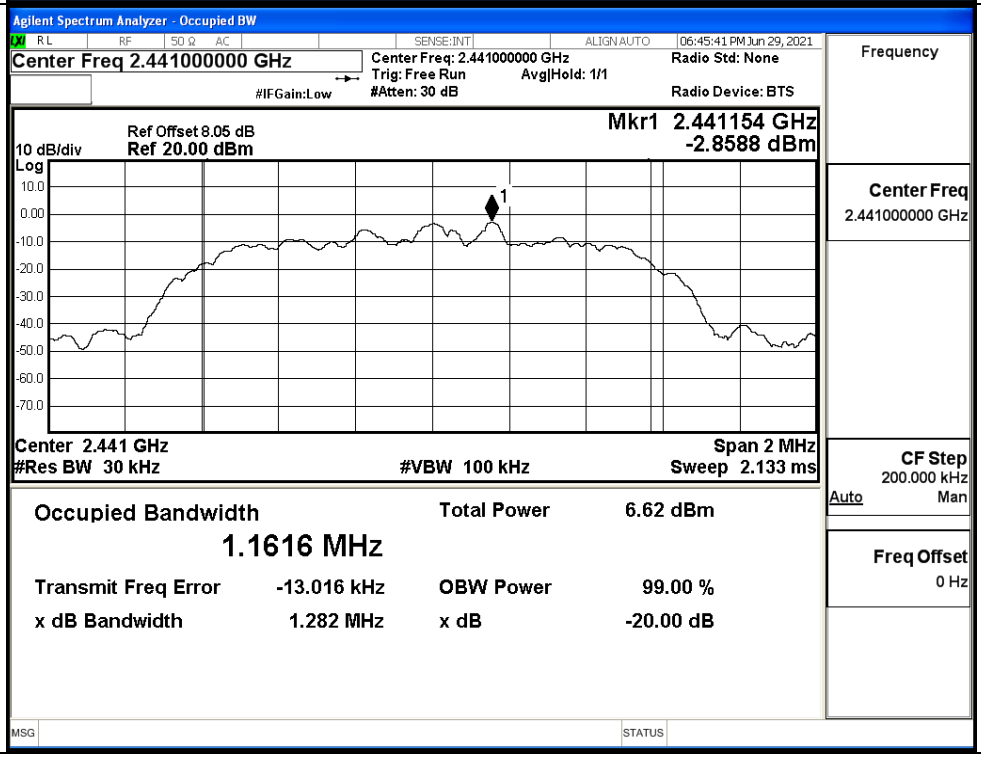
Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
06:56:57 PM Jun 29, 2021
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
TRACE 1 2 3 4 5 6
TYPE M
DET P P P P P
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.479 971 25 GHz
1.931 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 10.00 MHz
Sweep 1.067 ms (8001 pts)
MSG
STATUS
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.475000000 GHz
Stop Freq
2.485000000 GHz
CF Step
1.000000 MHz
Auto
Man
Freq Offset
0 Hz

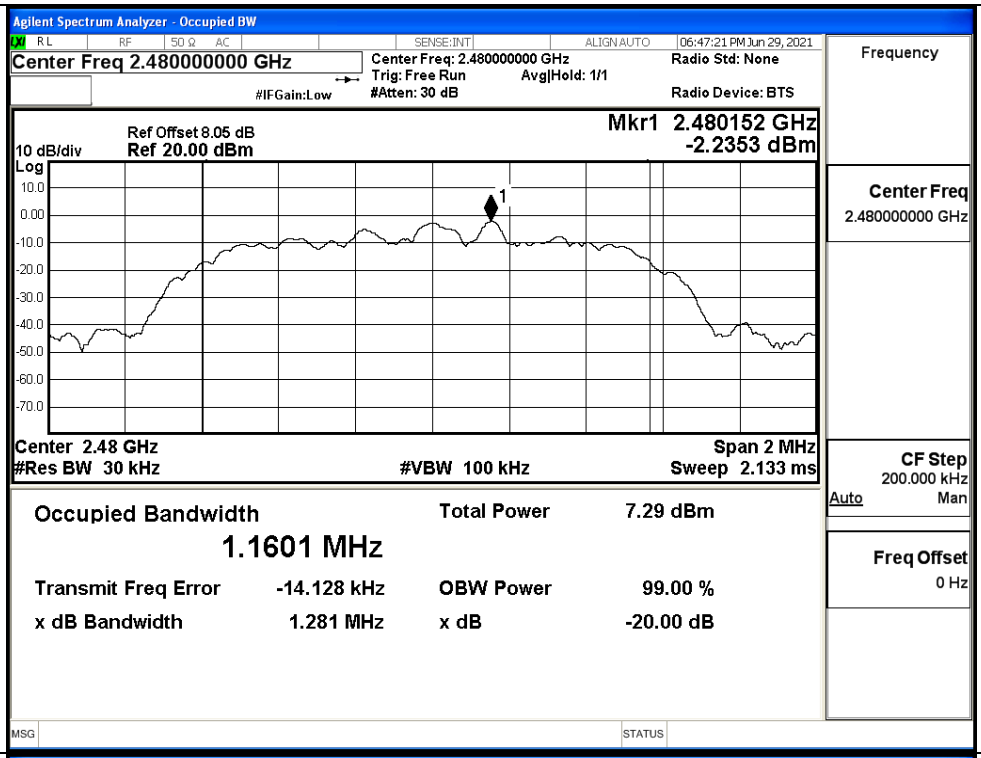
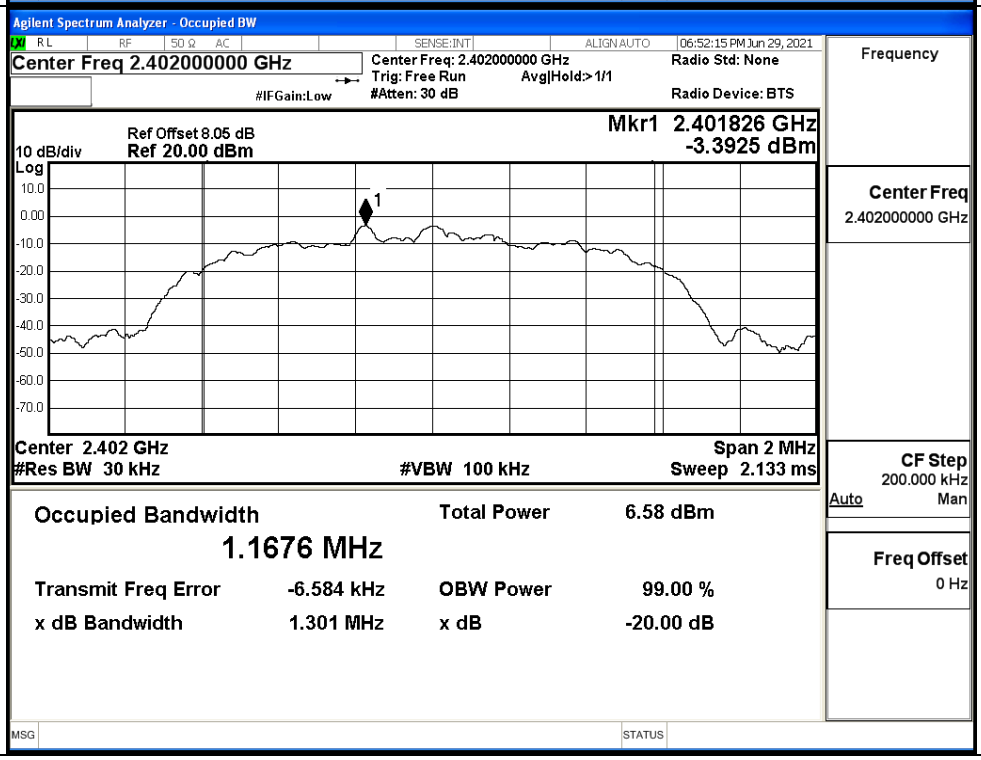
A.2 20dB Bandwidth

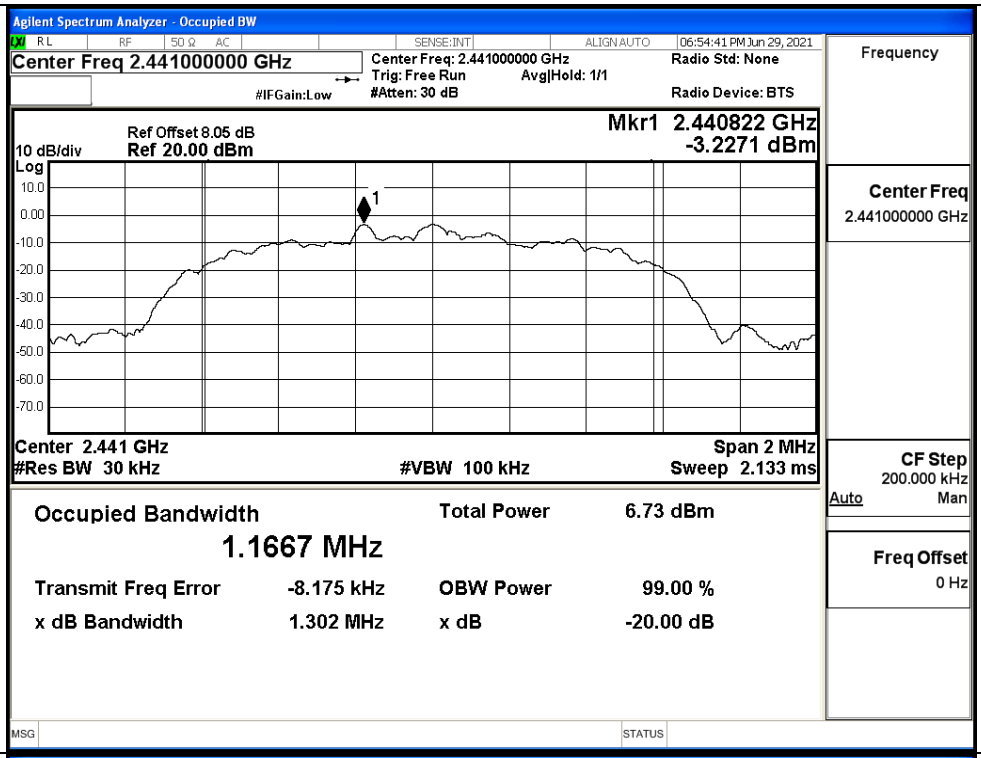
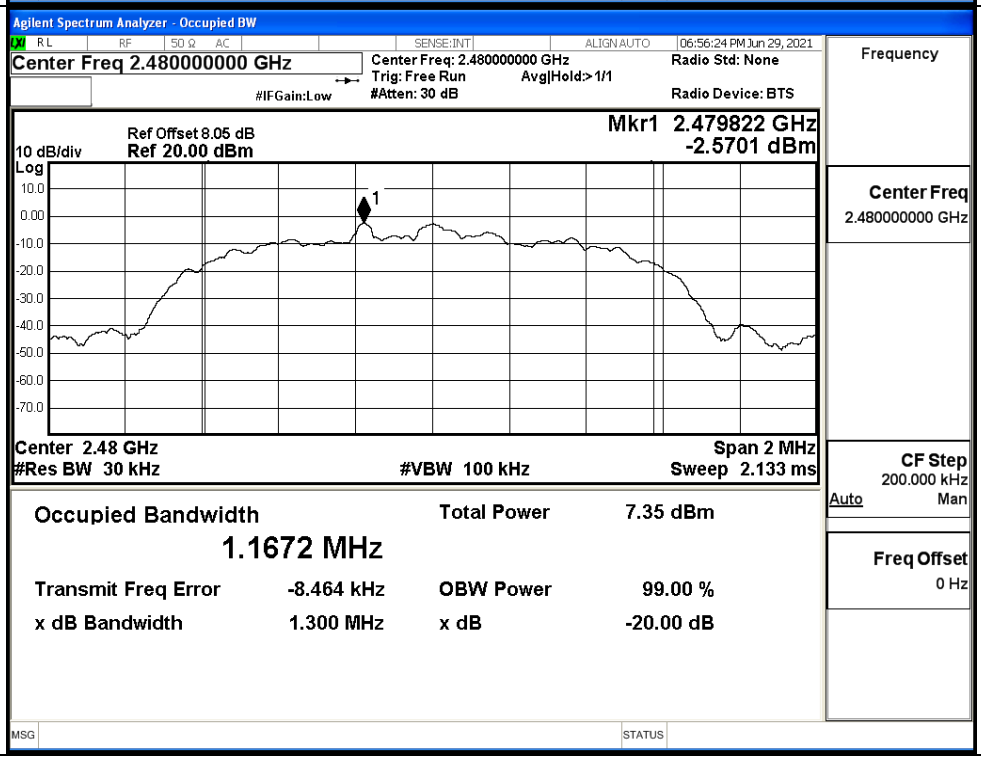
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9623	Not Specified	PASS
	MCH	0.9630	Not Specified	PASS
	HCH	0.9613	Not Specified	PASS
π/4DQPSK	LCH	1.282	Not Specified	PASS
	MCH	1.282	Not Specified	PASS
	HCH	1.281	Not Specified	PASS
8DPSK	LCH	1.301	Not Specified	PASS
	MCH	1.302	Not Specified	PASS
	HCH	1.300	Not Specified	PASS

Test Graphs	
GFSK/LCH	

GFSK/MCH	
GFSK/HCH	

π/4DQPSK/LCH	
π/4DQPSK/MCH	

π/4DQPSK/HCH	
8DPSK/LCH	

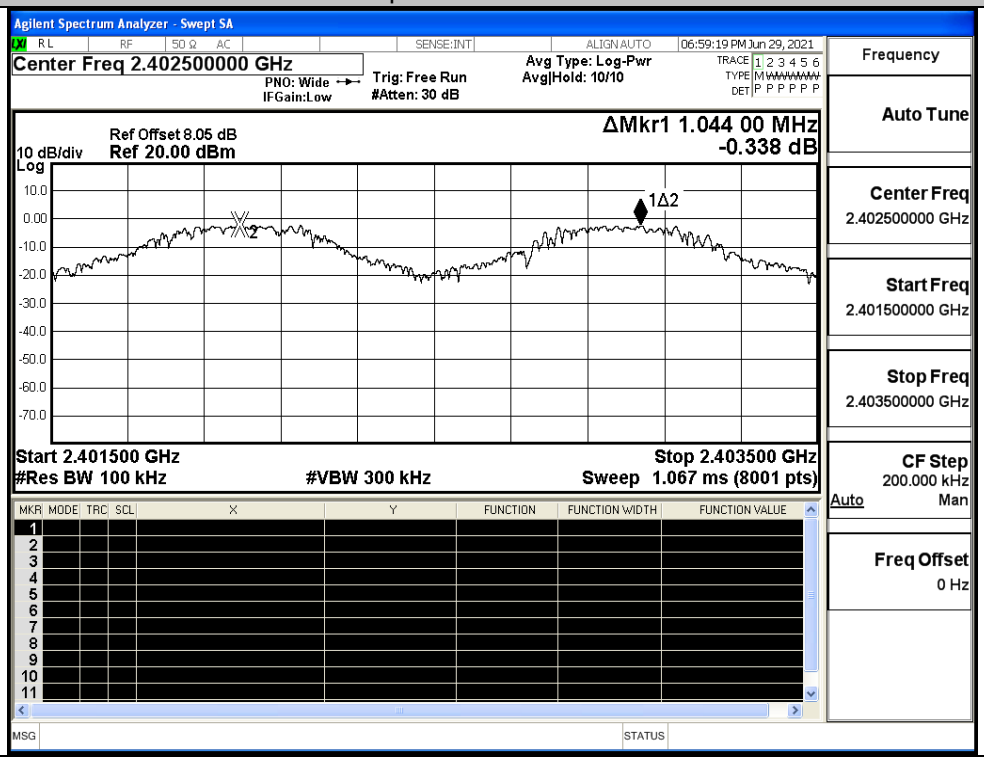
8DPSK/MCH	
8DPSK/HCH	

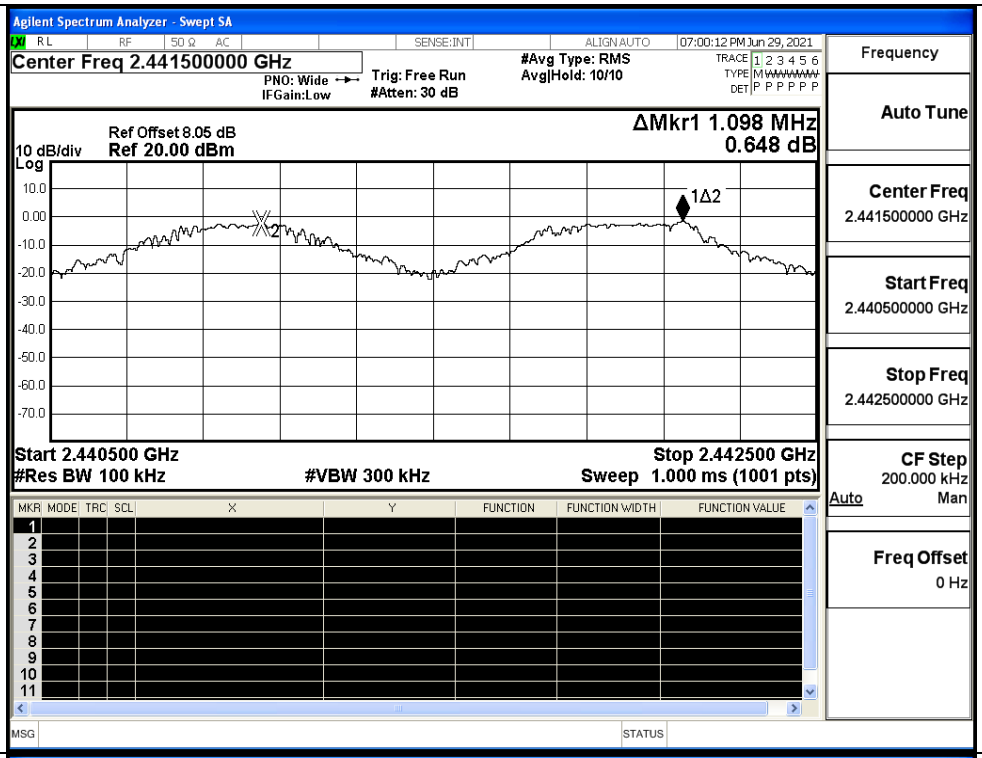
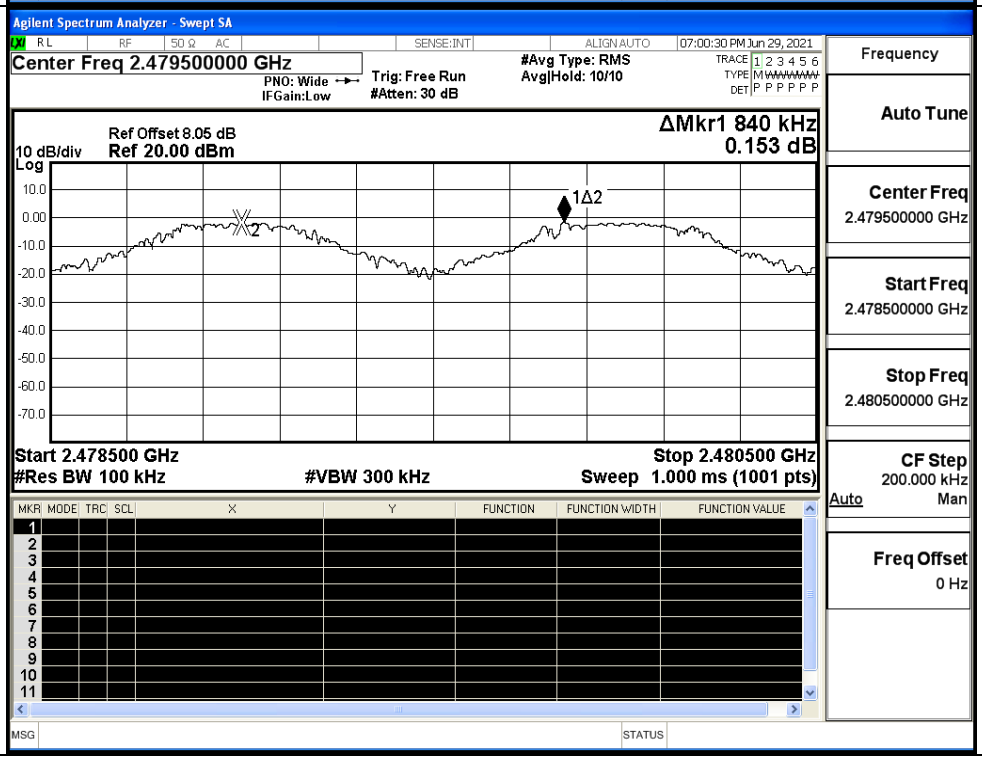
A.3 Carrier Frequency Separation

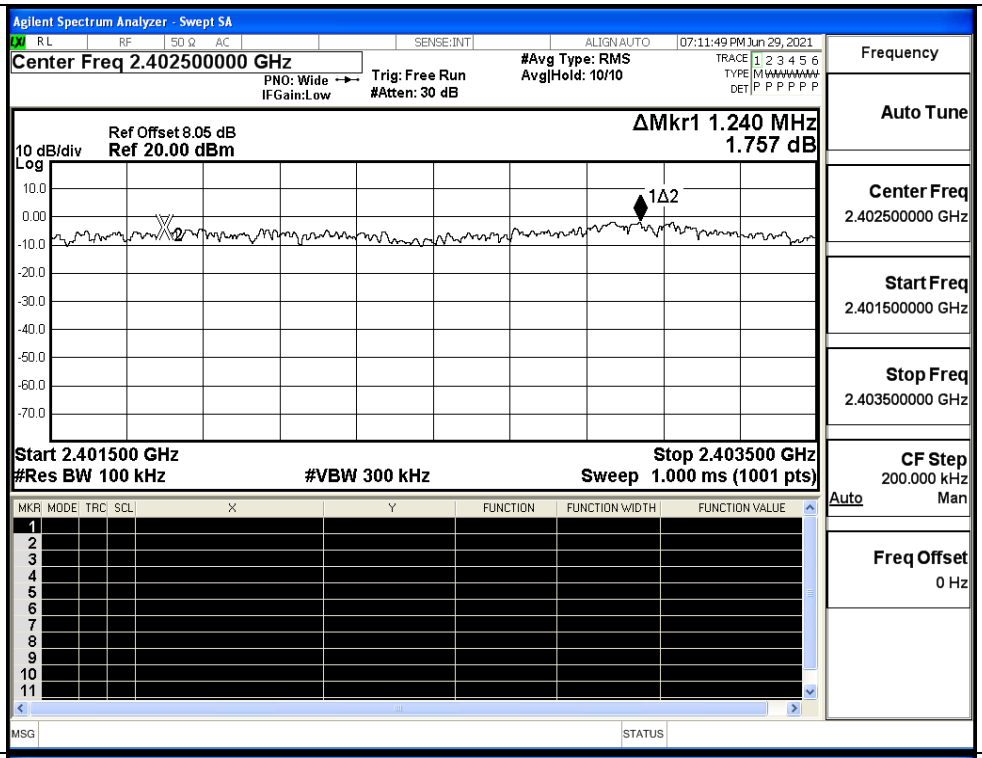
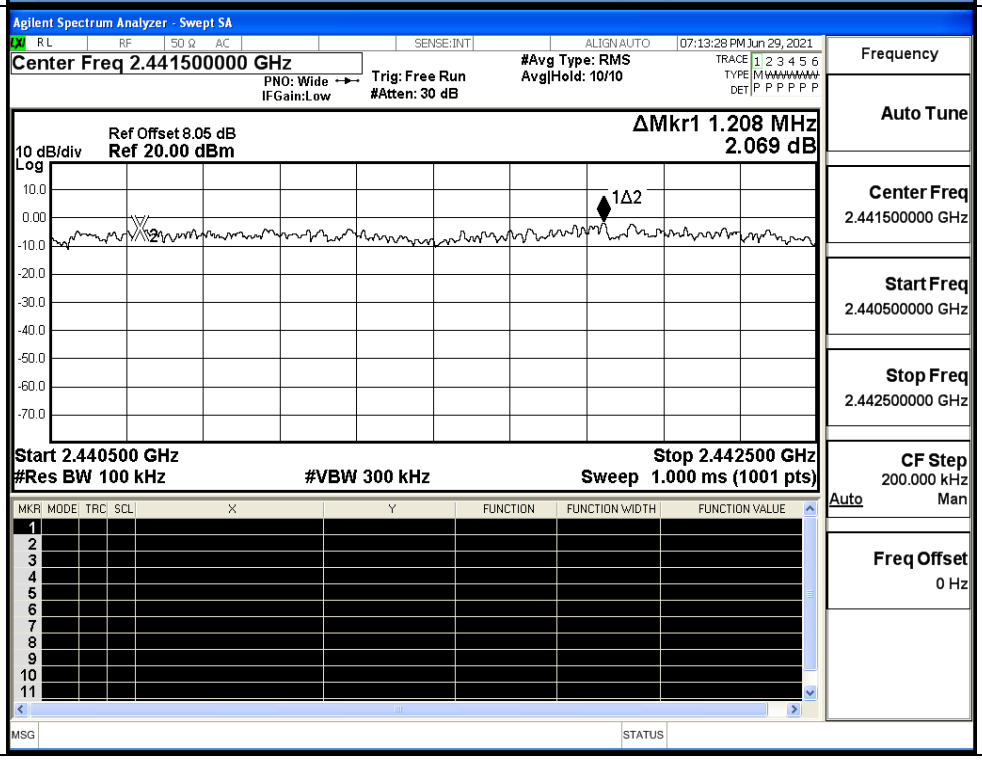
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.044	0.642	PASS
	MCH	1.098	0.642	PASS
	HCH	0.840	0.642	PASS
π/4DQPSK	LCH	1.240	0.855	PASS
	MCH	1.208	0.855	PASS
	HCH	1.044	0.855	PASS
8DPSK	LCH	1.340	0.868	PASS
	MCH	0.970	0.868	PASS
	HCH	1.224	0.868	PASS

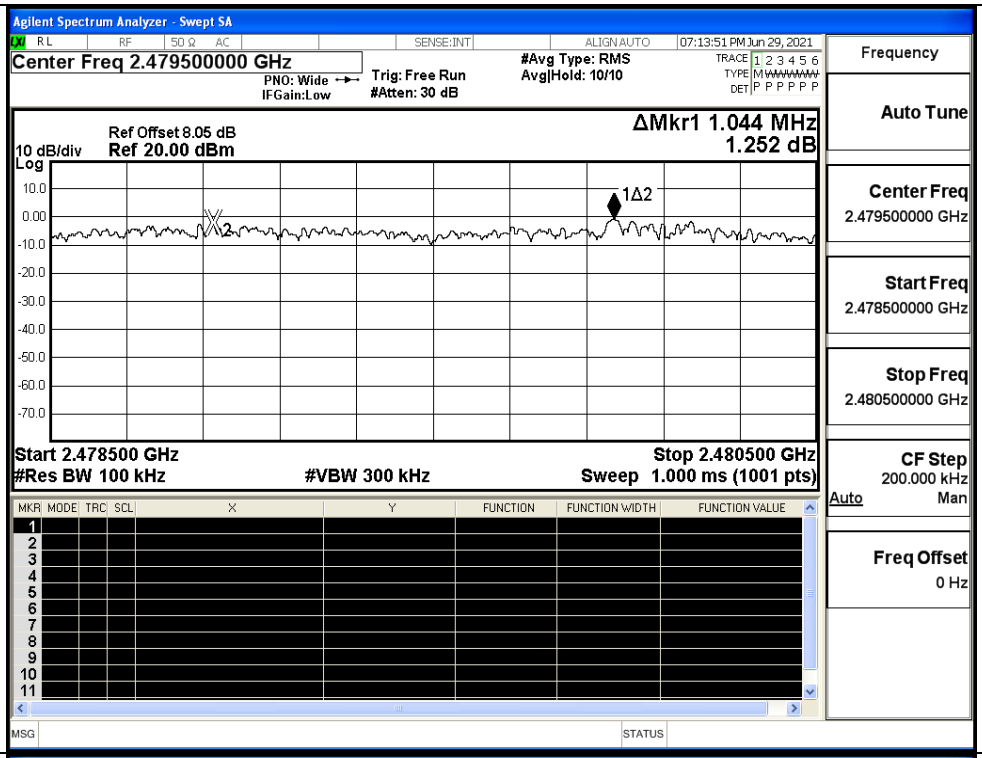
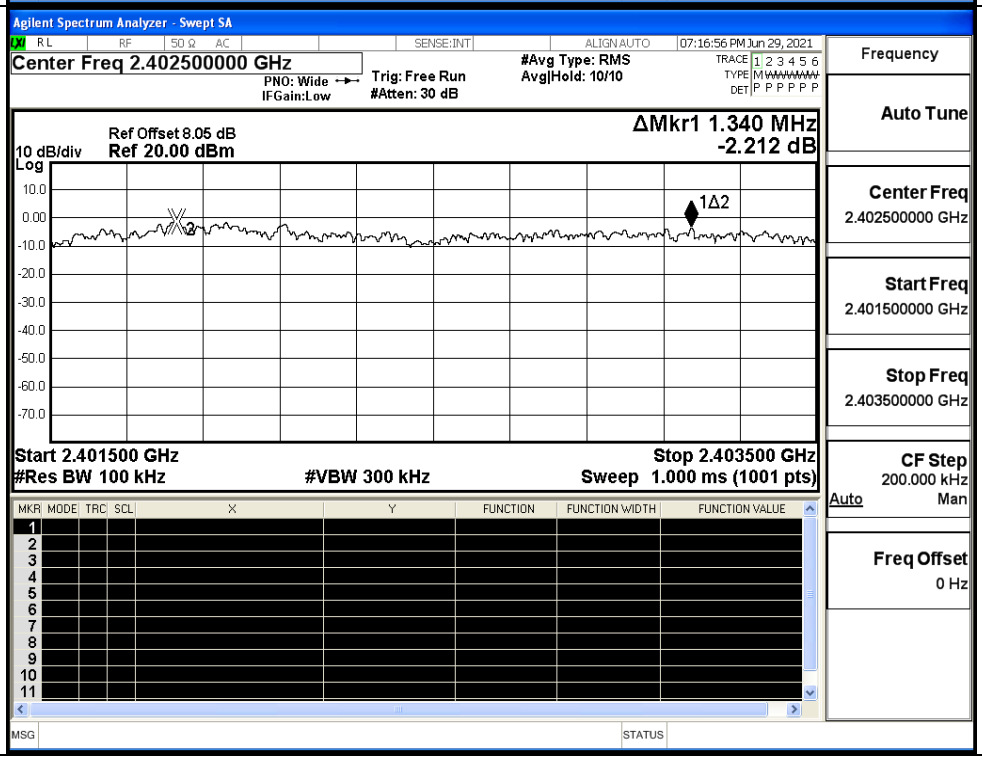
Test Graphs

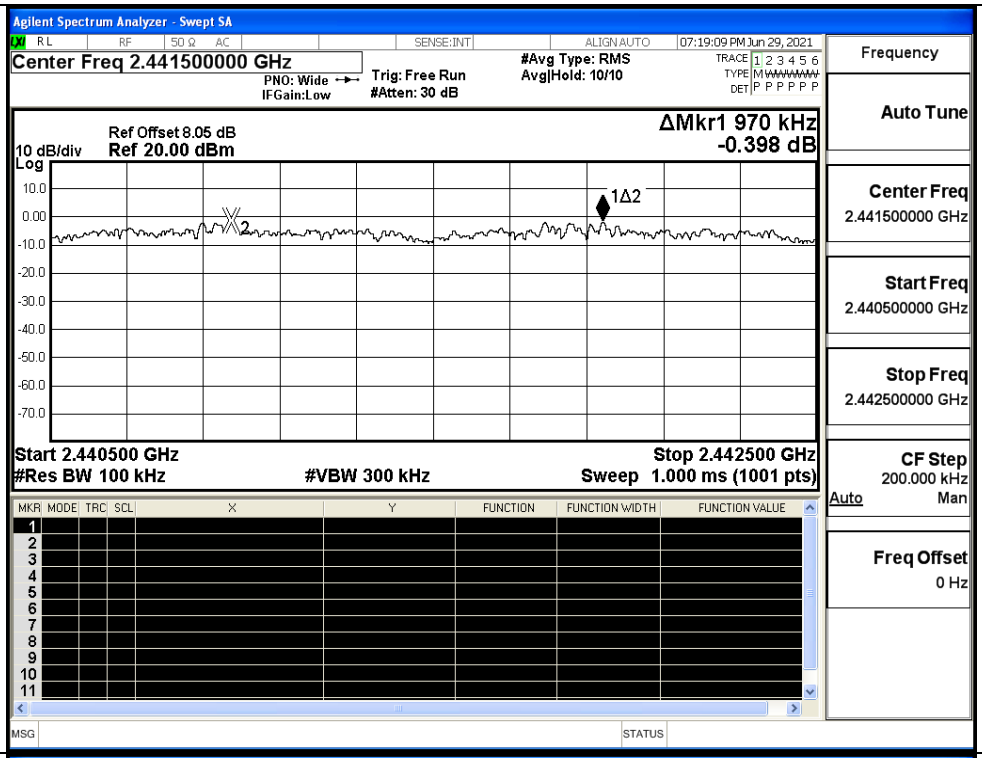
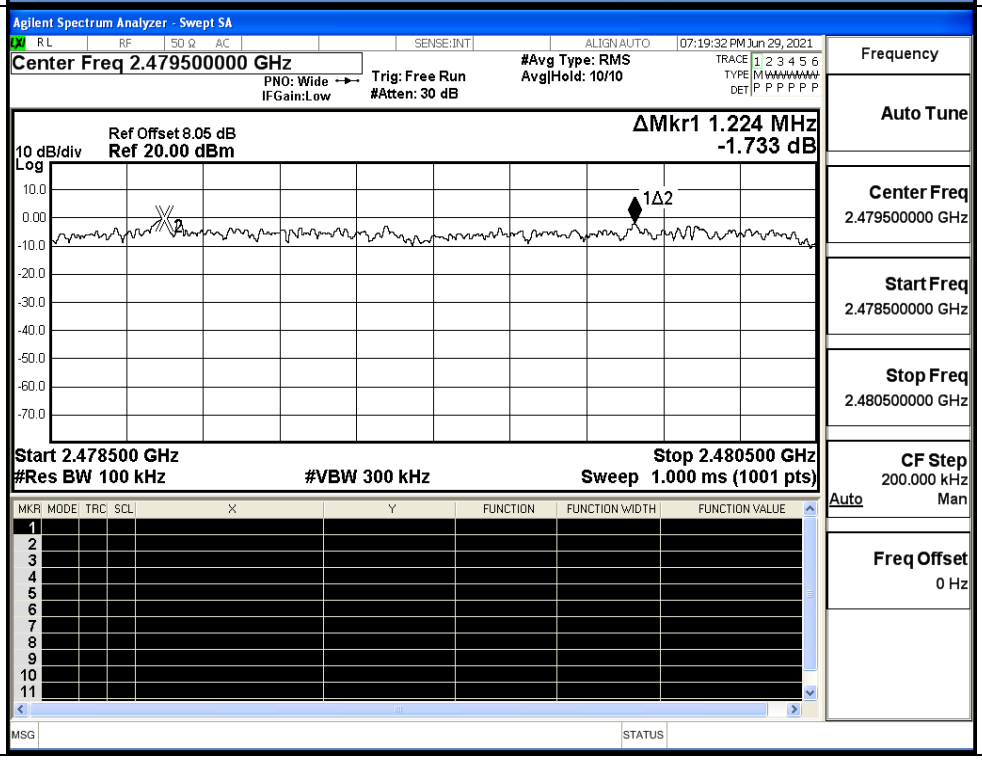
GFSK/LCH



GFSK/MCH	
GFSK/HCH	

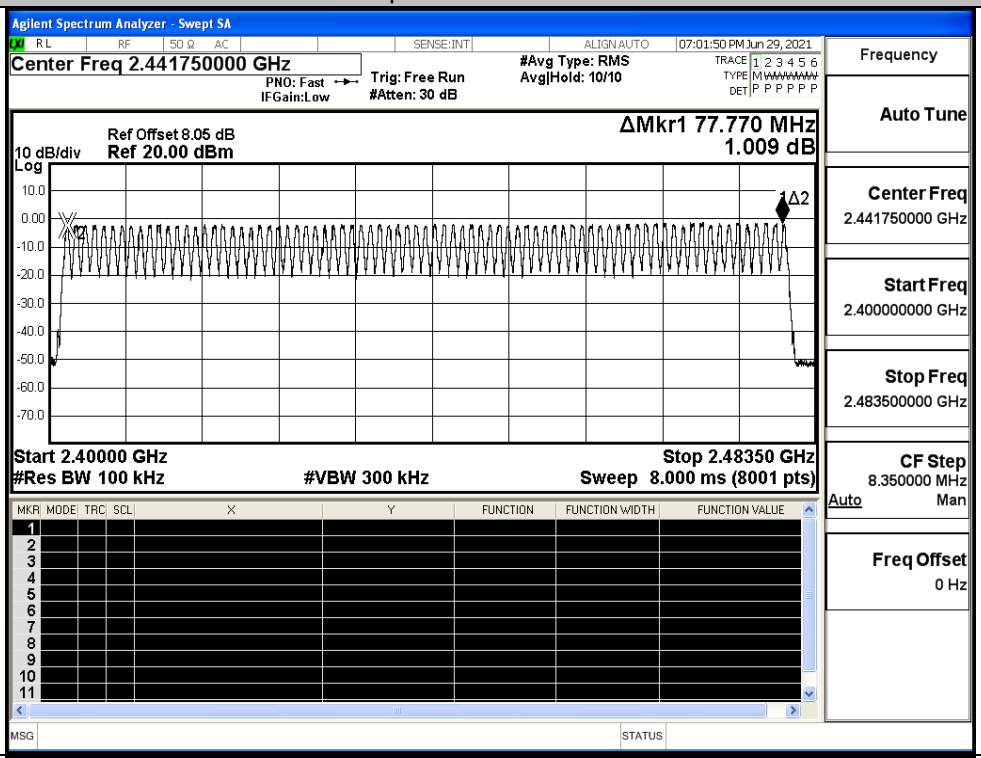
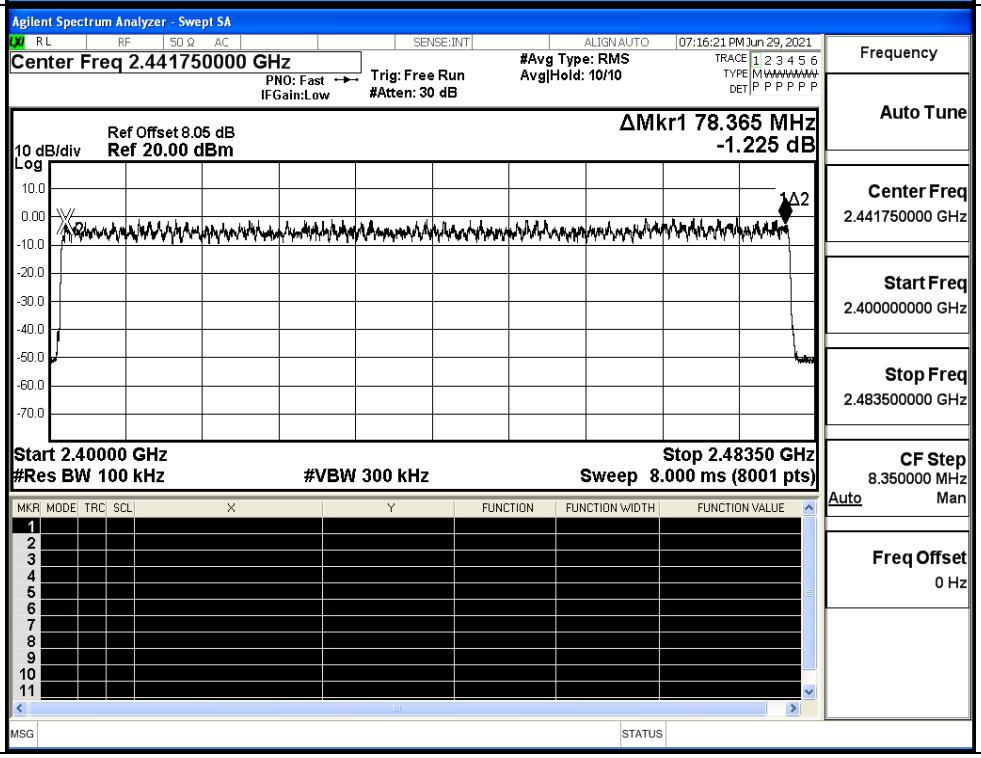
π/4DQPSK/LCH	
π/4DQPSK/MCH	

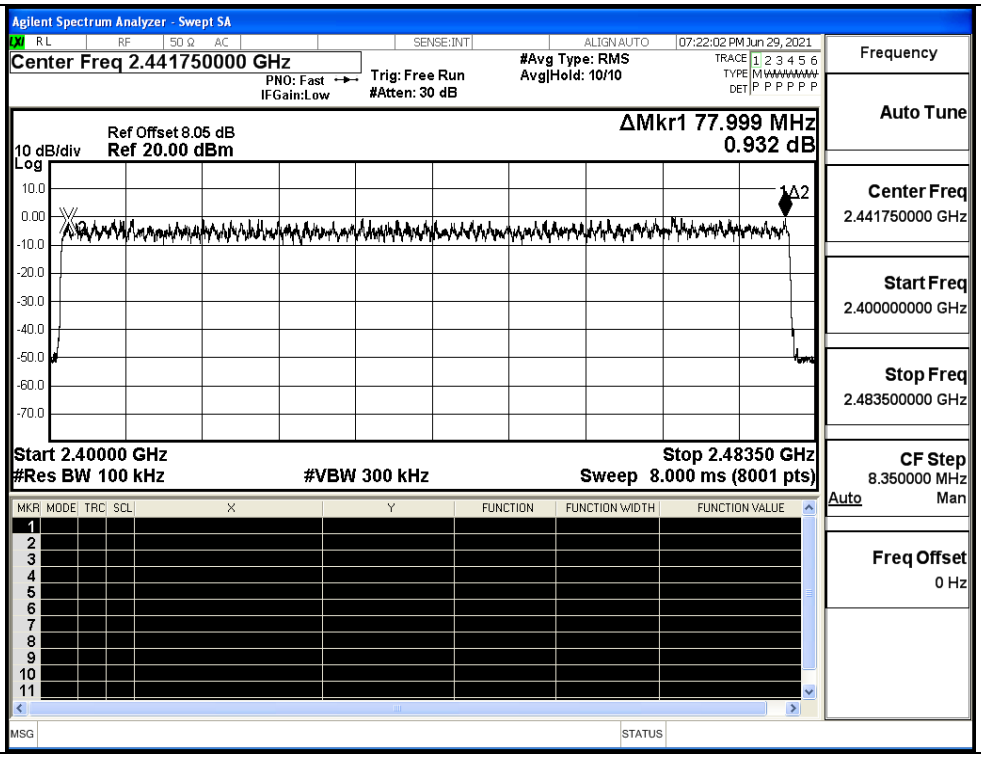
π/4DQPSK/HCH	
8DPSK/LCH	

8DPSK/MCH	
8DPSK/HCH	

A.4 Hopping Channel Number

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

Test Graphs		
GFSK/Hop		
π/4DQPSK/Hop		

8DPSK/Hop	

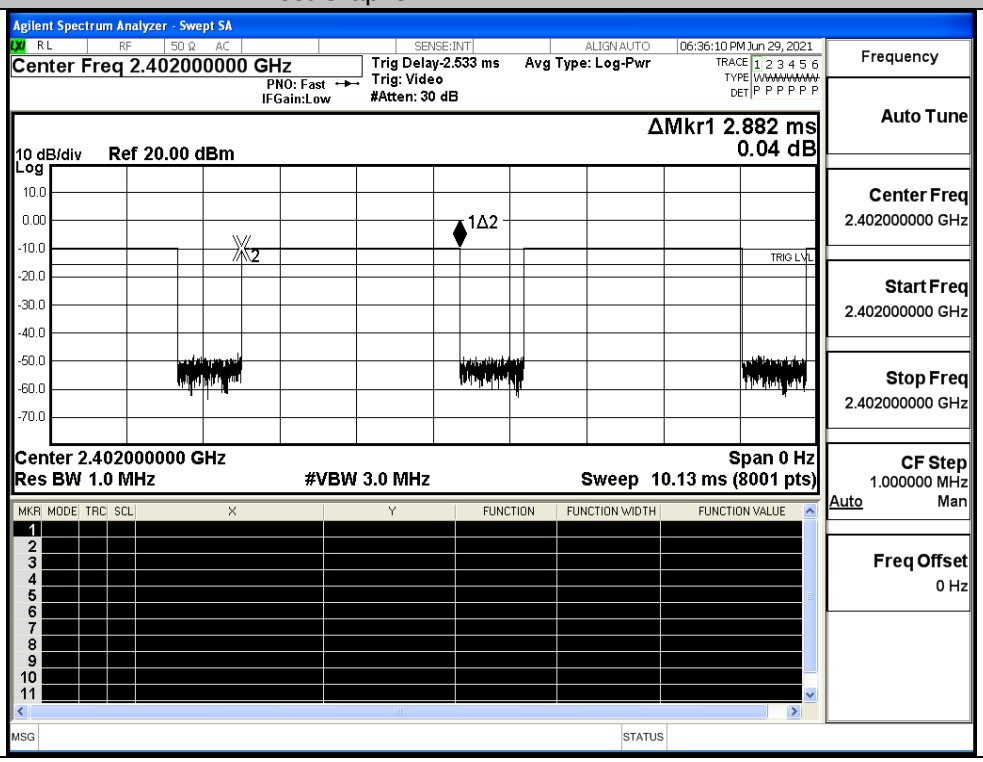
Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441750000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 10/10
07:22:02 PM Jun 29, 2021
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
ΔMkr1 77.999 MHz
0.932 dB
Start 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 8.000 ms (8001 pts)
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
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
MSG
STATUS

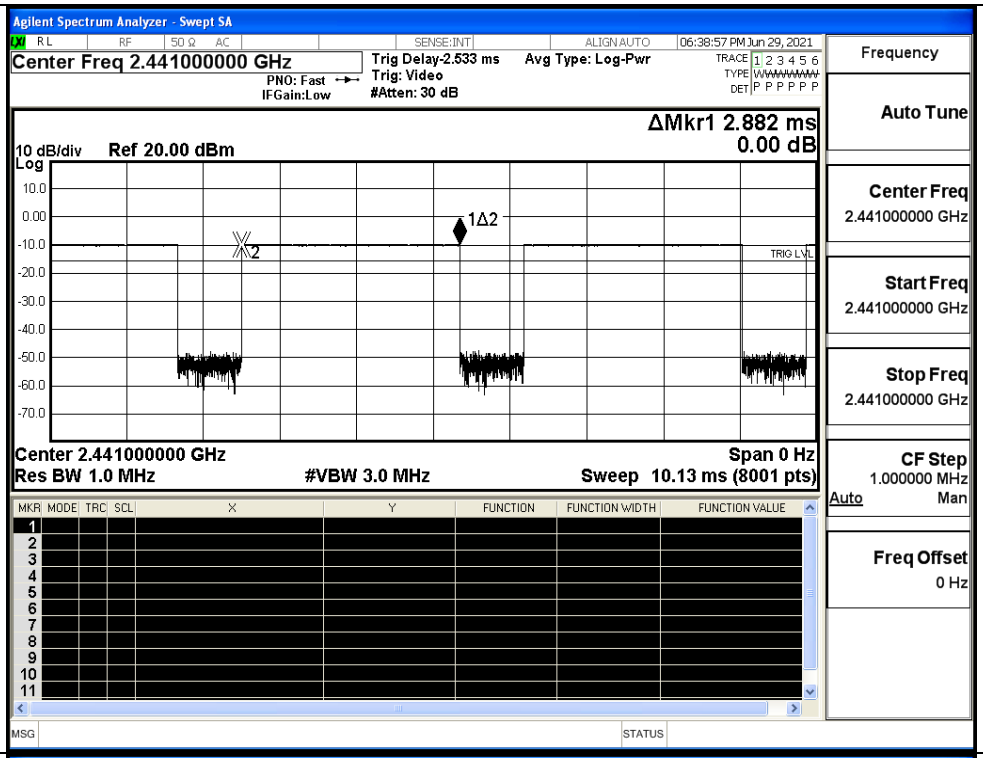
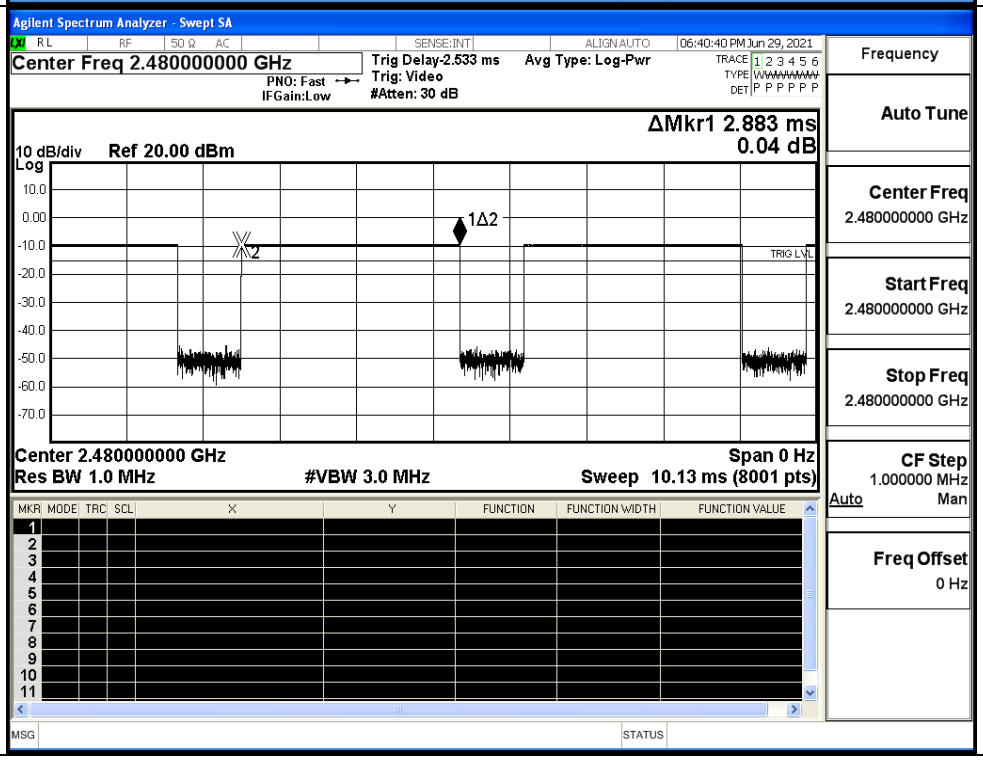
A.5 Dwell Time

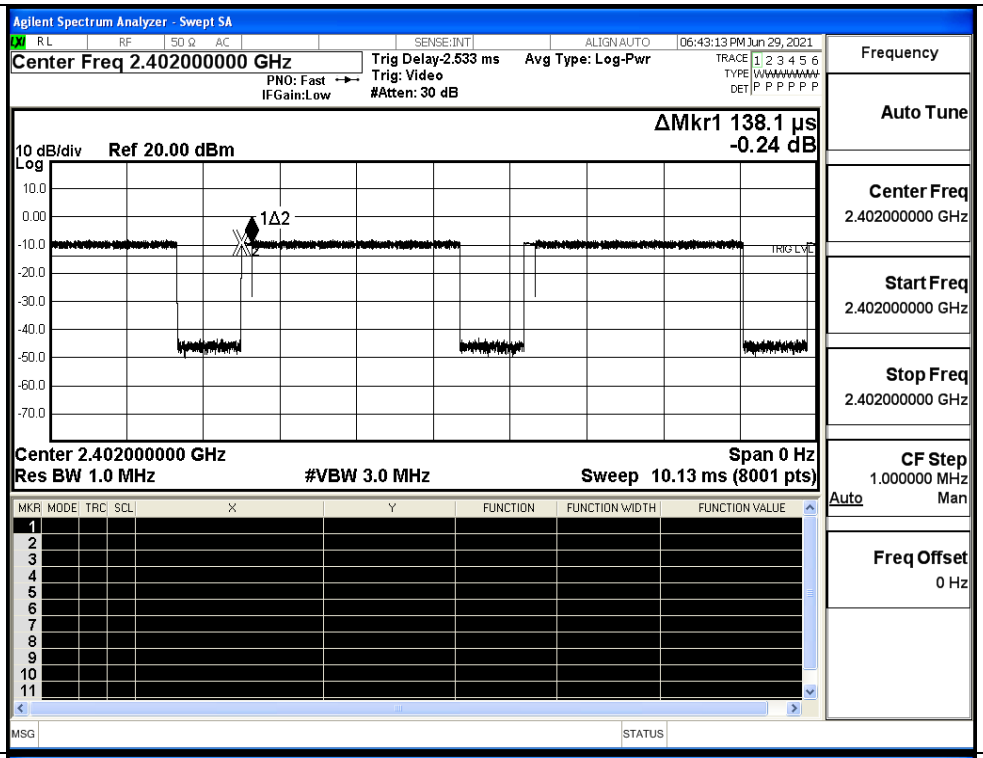
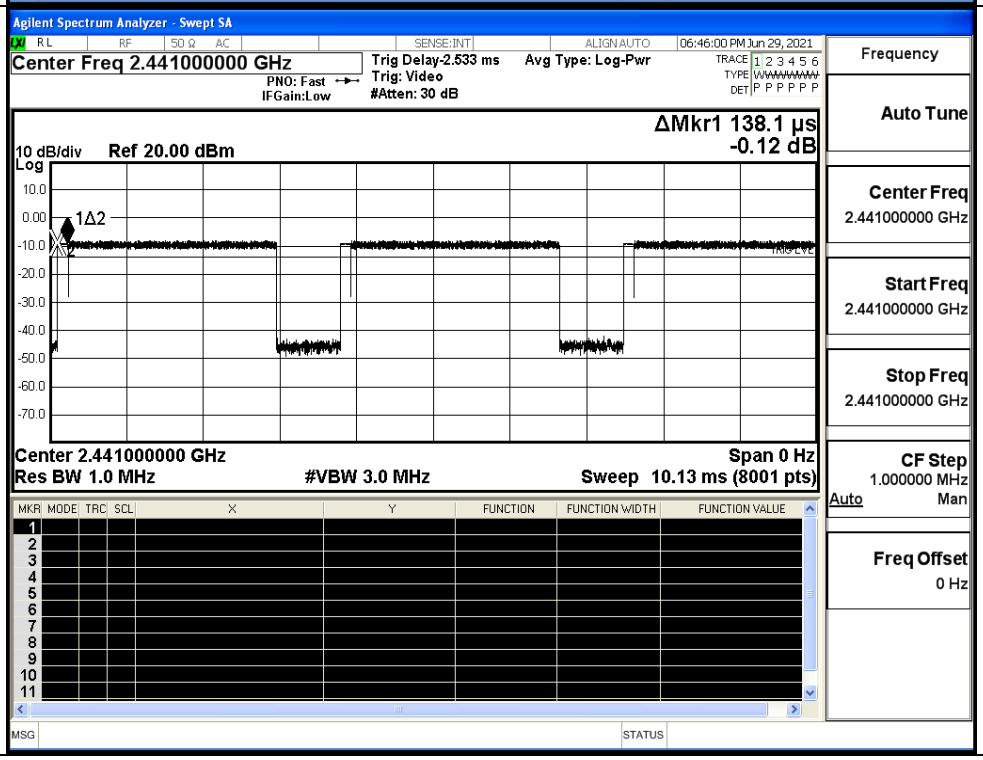
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
π/4DQPSK	2DH5	LCH	2.88	106.7	0.015	0.4	PASS
	2DH5	MCH	2.88	106.7	0.015	0.4	PASS
	2DH5	HCH	2.88	106.7	0.015	0.4	PASS
8DPSK	3DH5	LCH	2.88	106.7	0.308	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

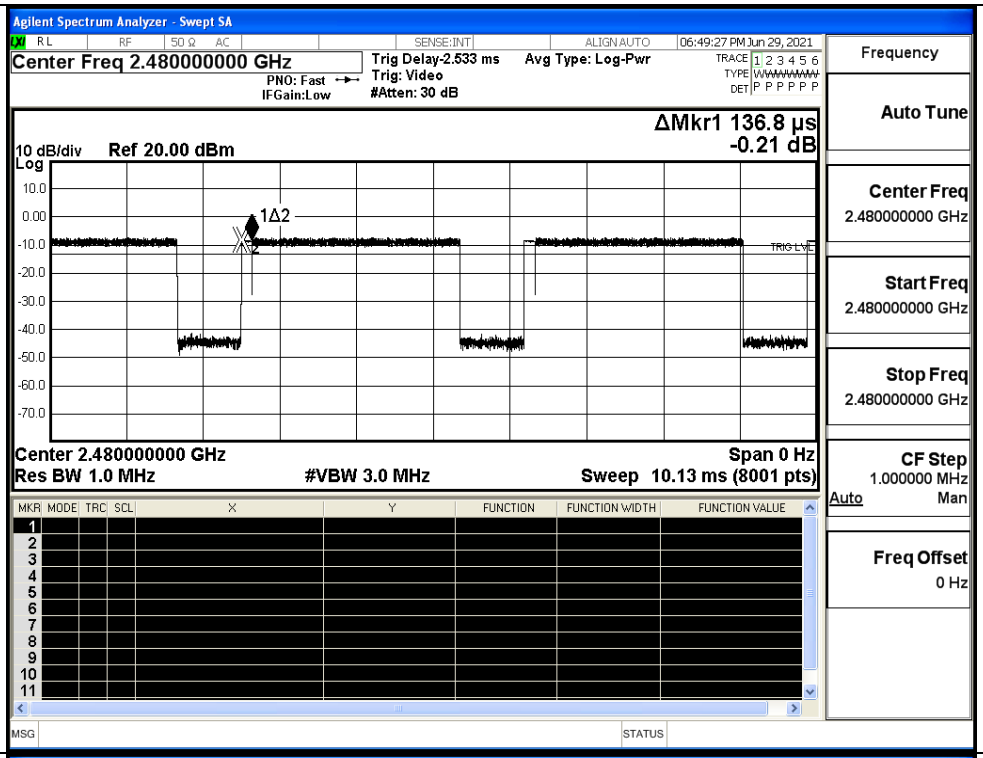
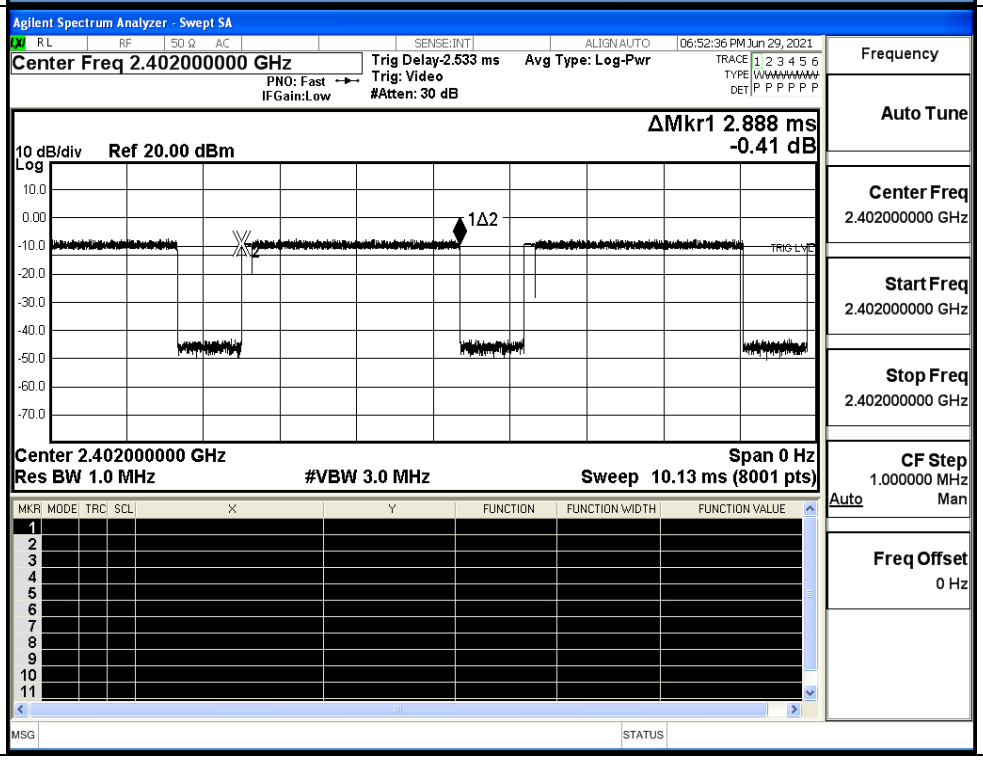
Test Graphs

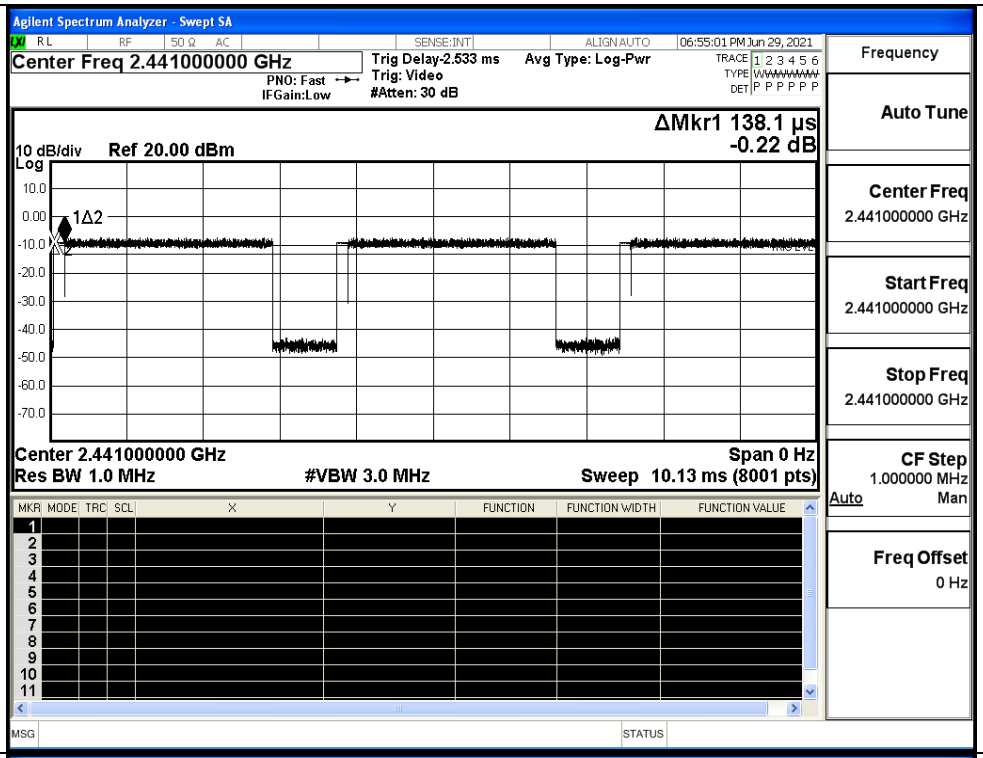
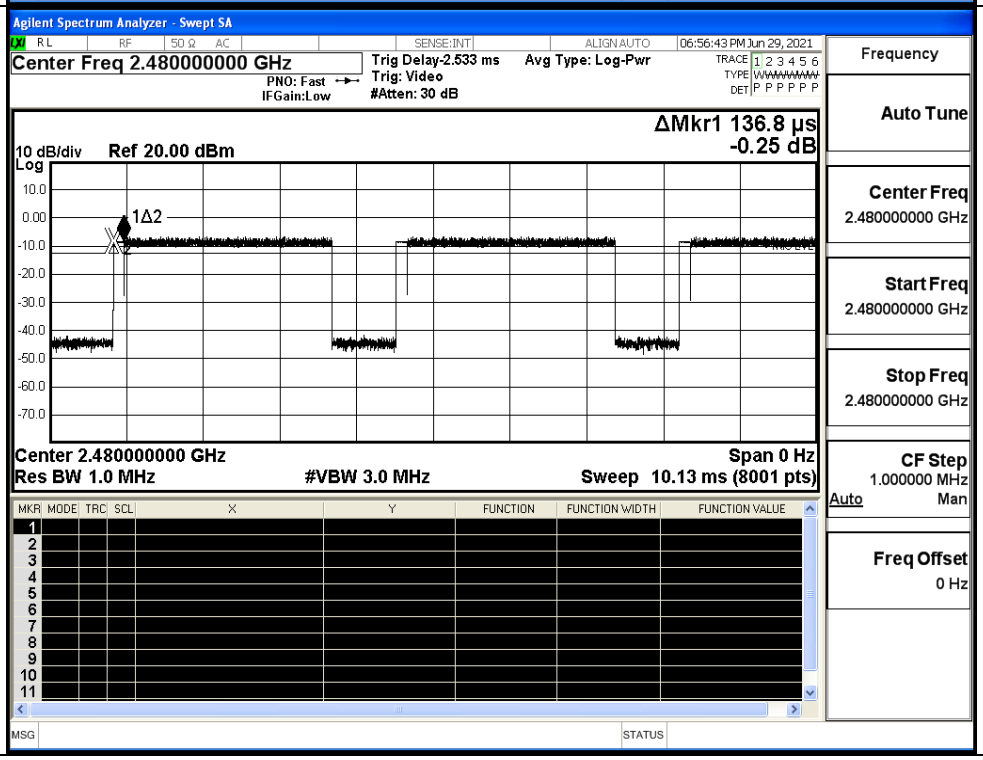
GFSK_DH5/LCH



GFSK_DH5/MCH	
GFSK_DH5/HCH	

π/4DQPSK _2DH5/LCH	
π/4DQPSK _2DH5/MCH	

π/4DQPSK _2DH5/HCH	
8DPSK _3DH5/LCH	

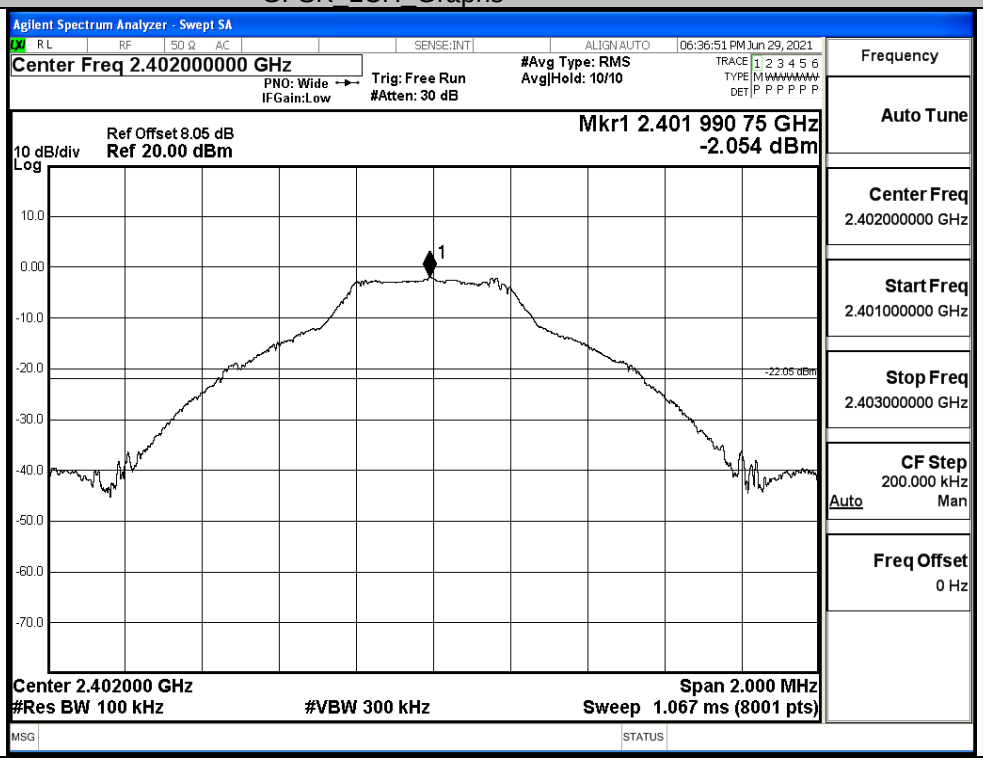
8DPSK _3DH5/MCH	
8DPSK _3DH5/HCH	

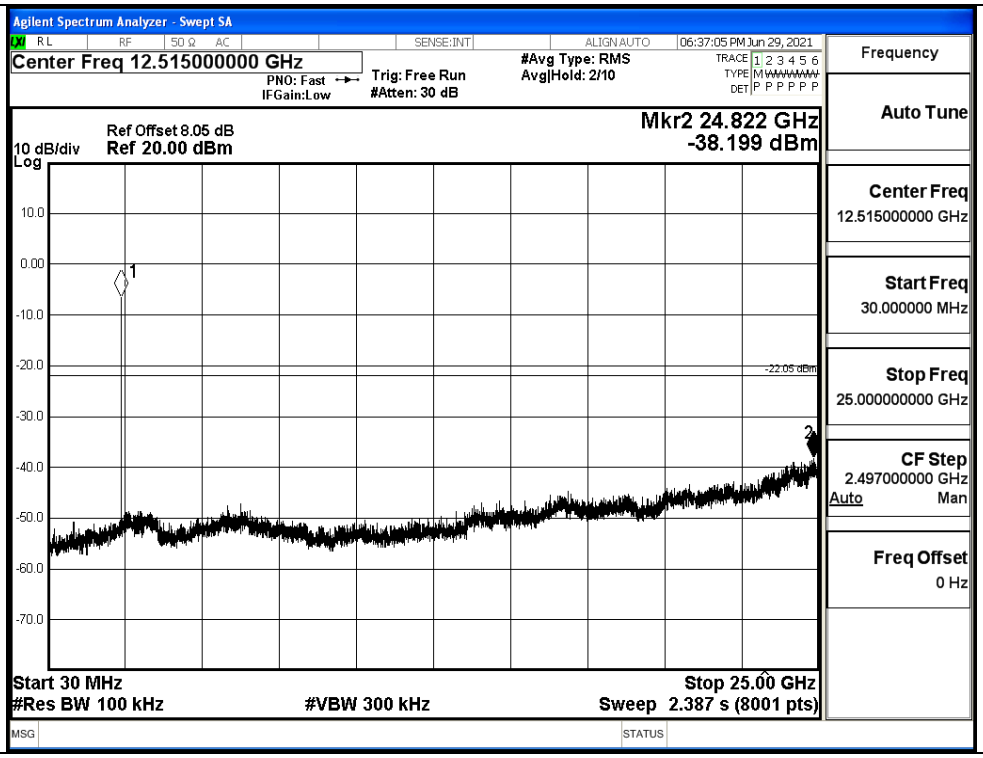
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-2.054	-38.199	-22.054	PASS
	MCH	-1.911	-37.288	-21.911	PASS
	HCH	-1.526	-37.302	-21.526	PASS
π/4DQPSK	LCH	-1.325	-38.440	-21.325	PASS
	MCH	-1.115	-37.562	-21.115	PASS
	HCH	-0.449	-37.903	-20.449	PASS
8DPSK	LCH	-1.423	-38.449	-21.423	PASS
	MCH	-1.012	-37.520	-21.012	PASS
	HCH	-0.551	-37.920	-20.551	PASS

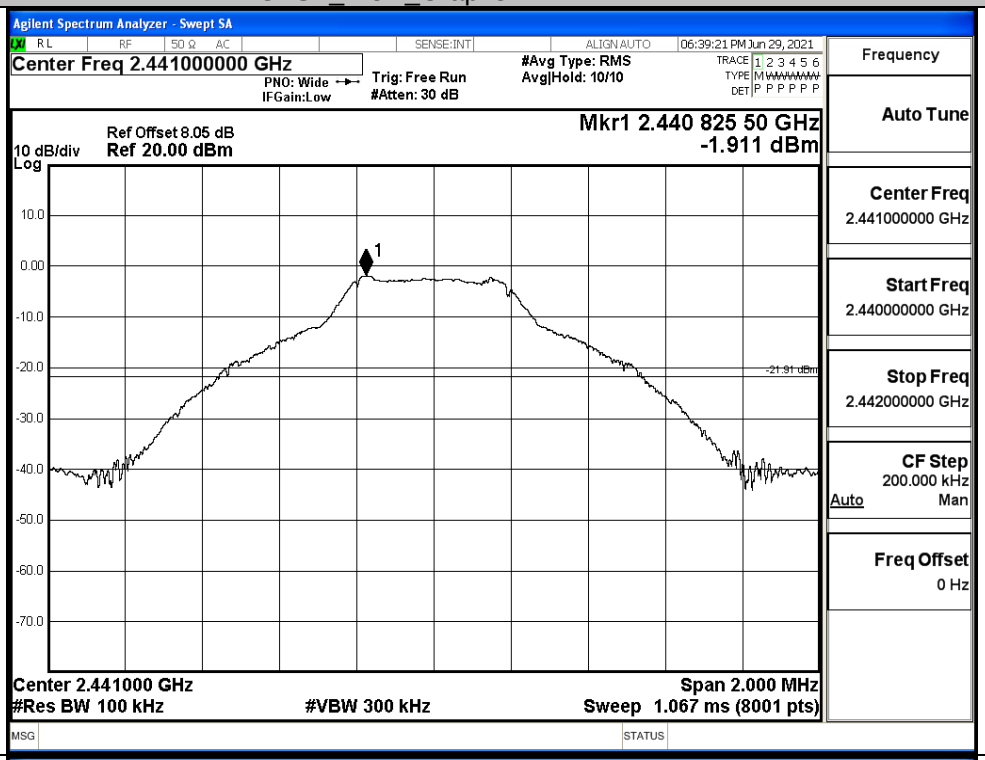
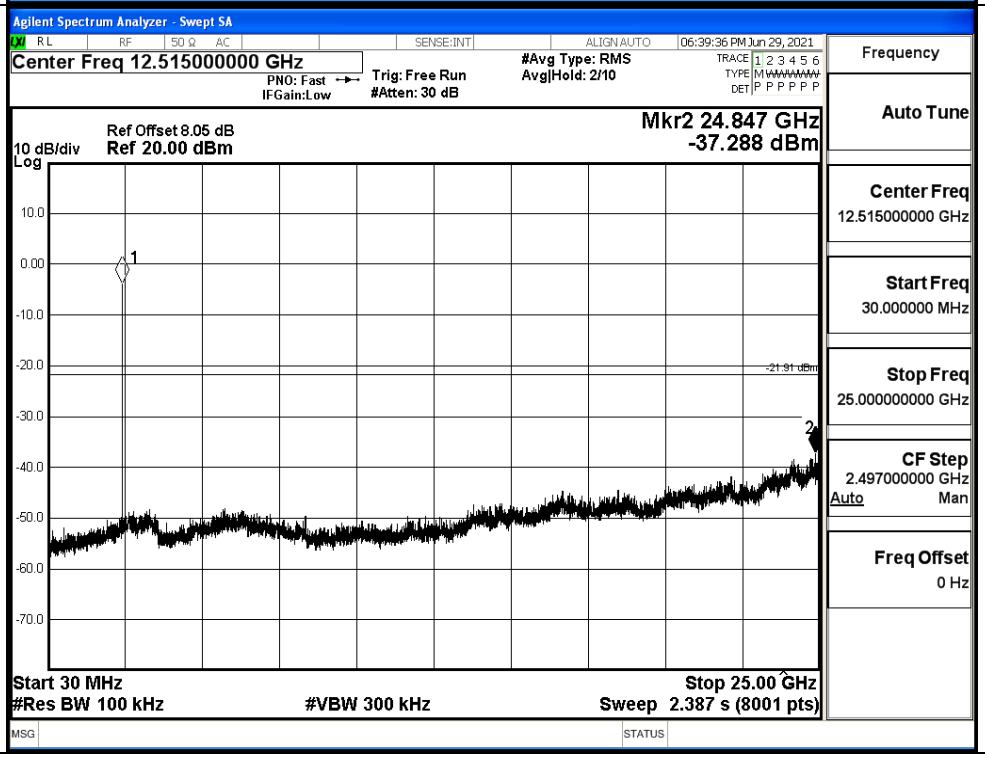
GFSK_LCH_Graphs

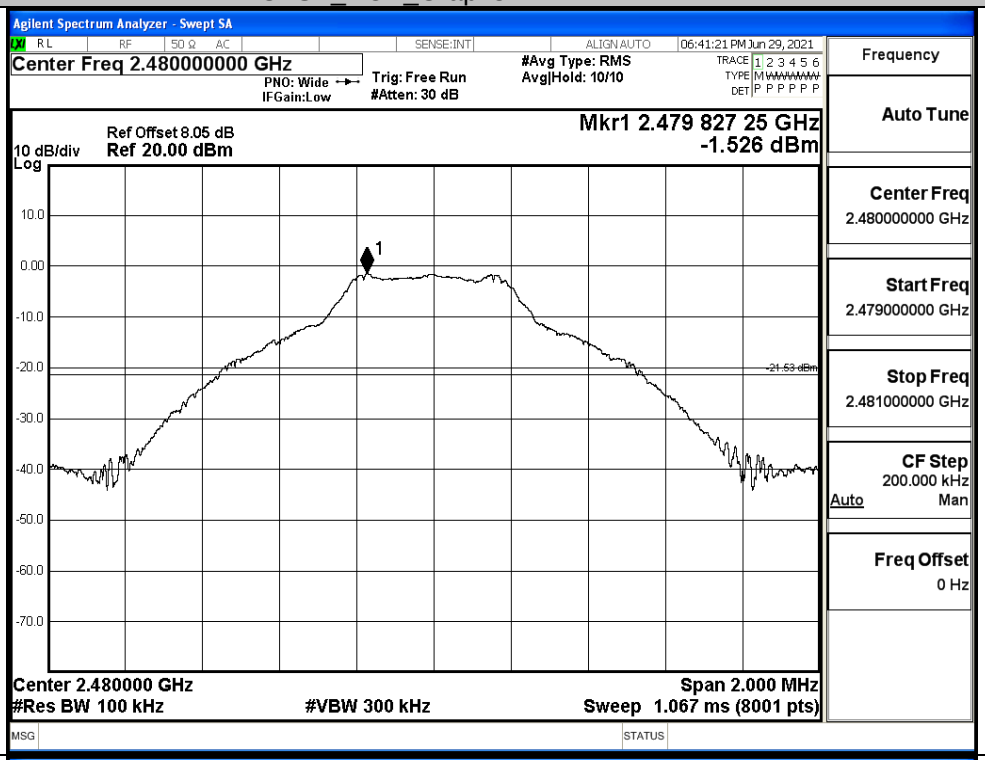
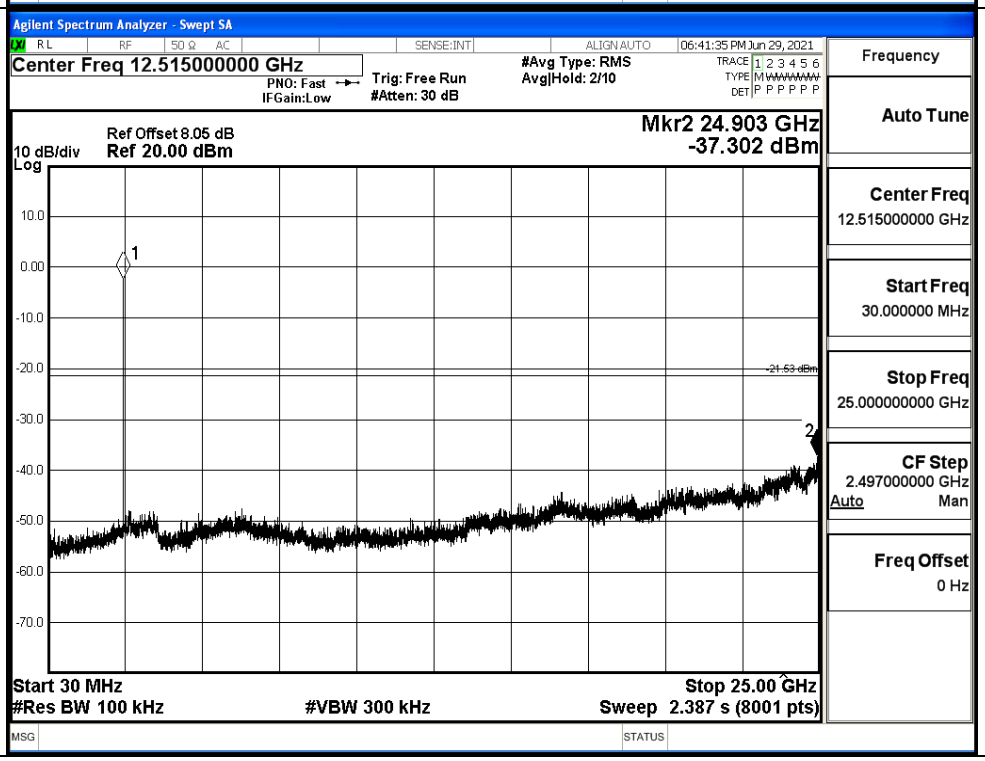
Pref

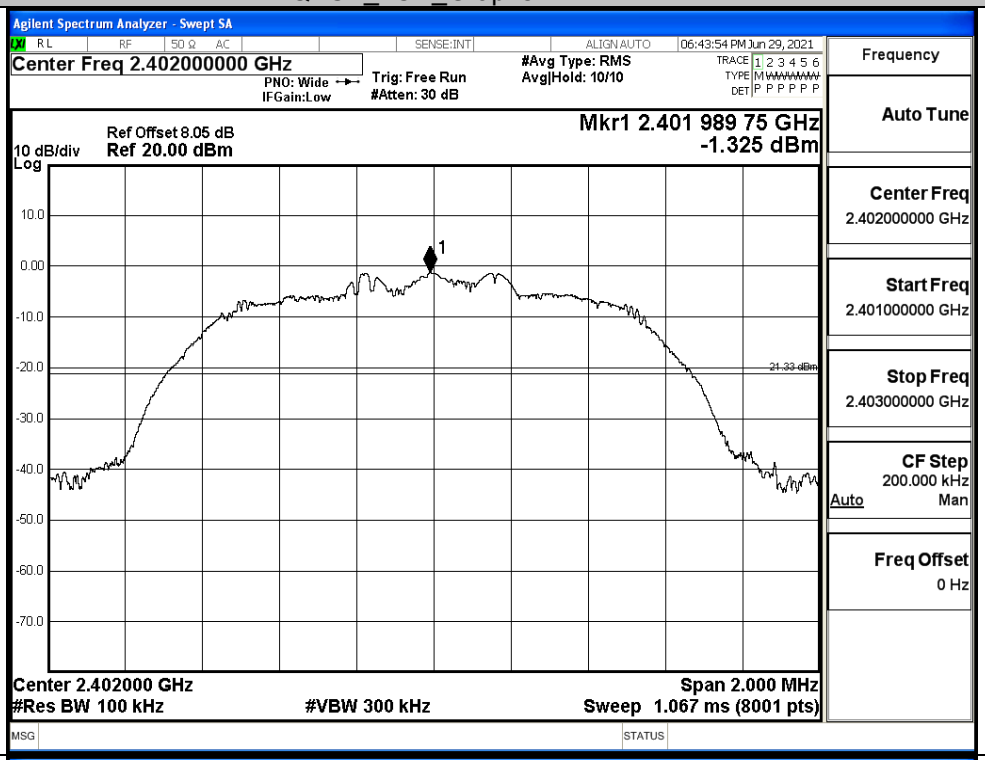
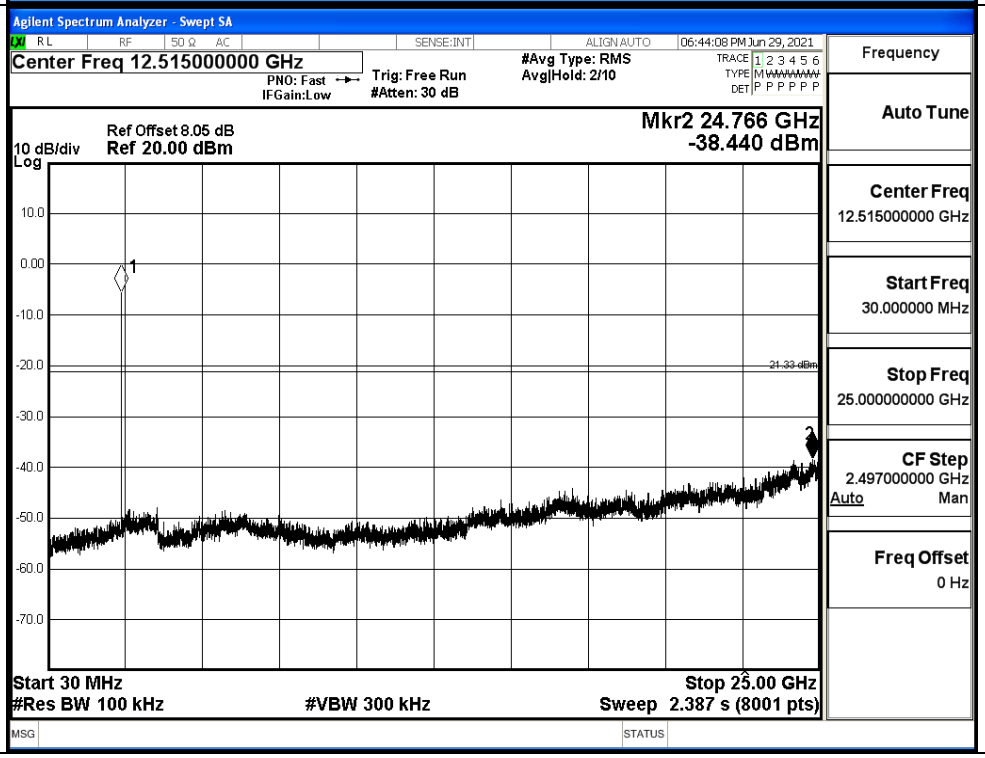


Puw		

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
06:37:05 PM Jun 29, 2021
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 2/10
TRACE 1 2 3 4 5 6
TYPE M
DET P P P P P
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr2 24.822 GHz
-38.199 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-22.05 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (8001 pts)
Frequency
Auto Tune
Center Freq
12.515000000 GHz
Start Freq
30.000000 MHz
Stop Freq
25.000000000 GHz
CF Step
2.497000000 GHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

GFSK_MCH_Graphs		
Pref		
Puw		

GFSK_HCH_Graphs		
Pref		
Puw		

π/4DQPSK_LCH_Graphs		
Pref		
Puw		

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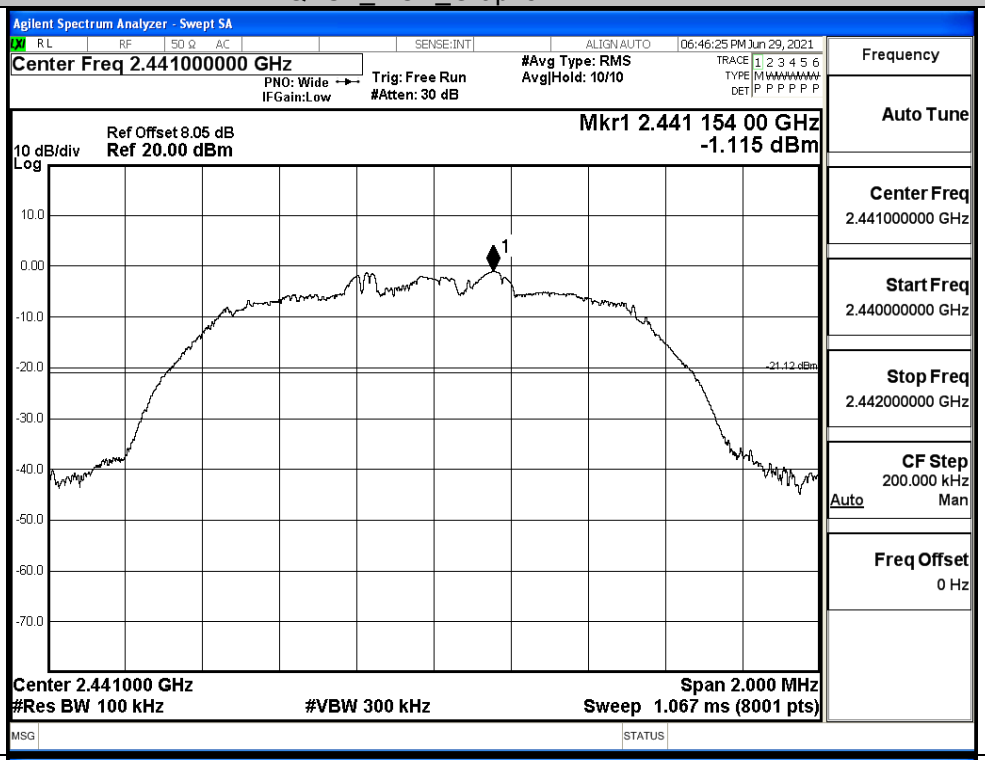
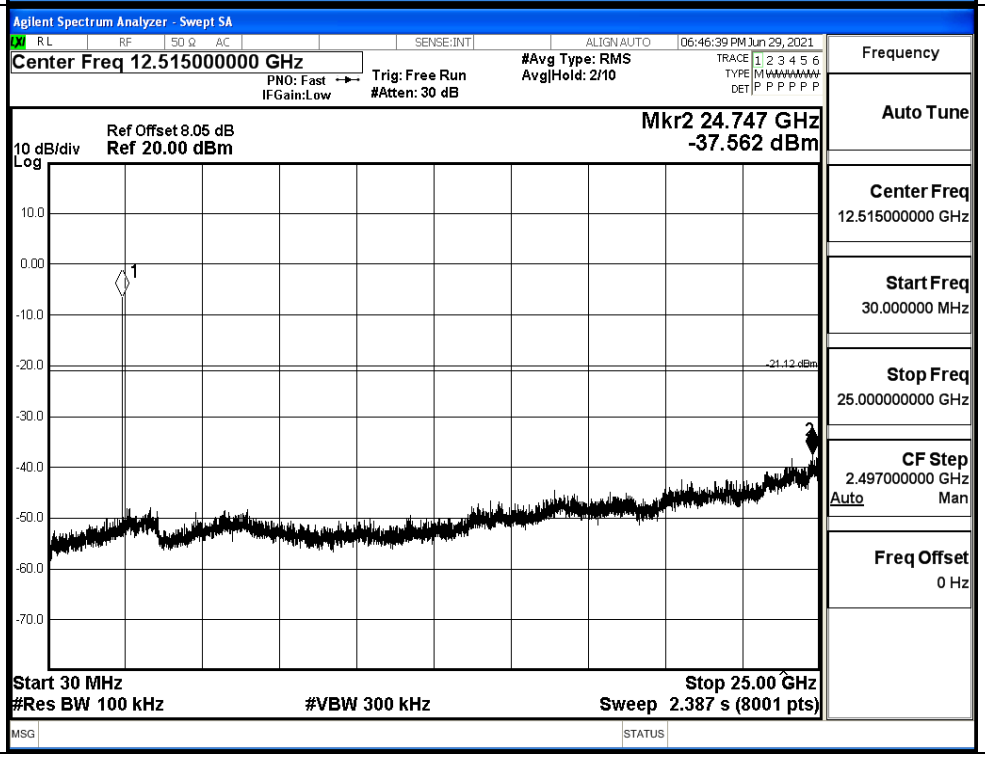
Pref		
Puw		

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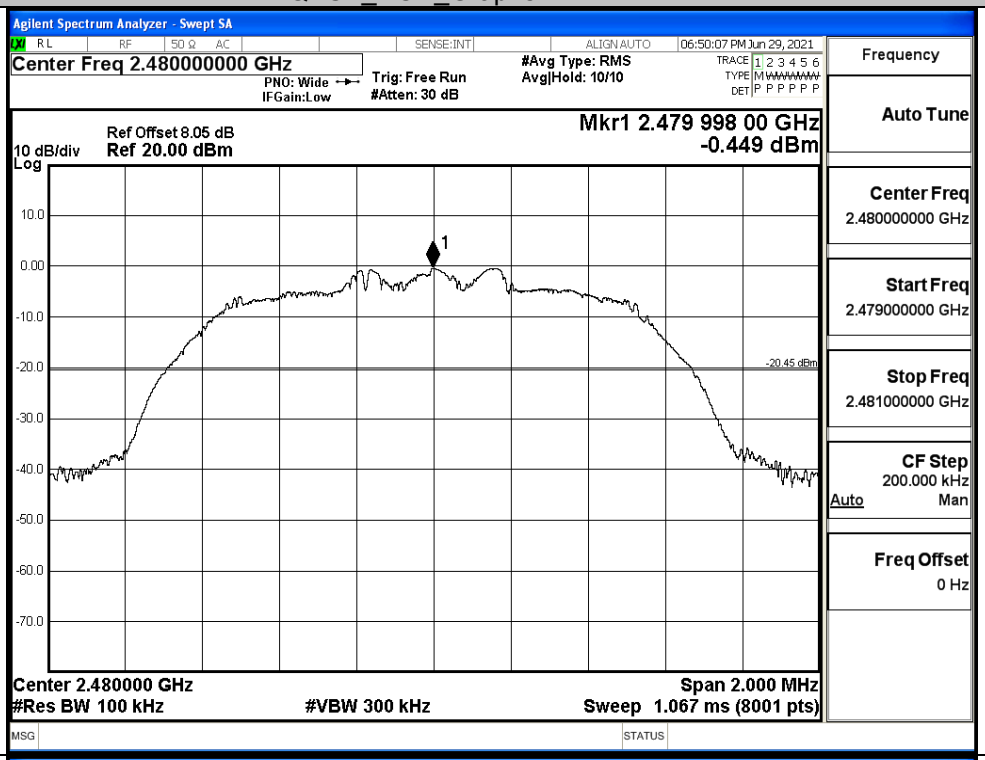
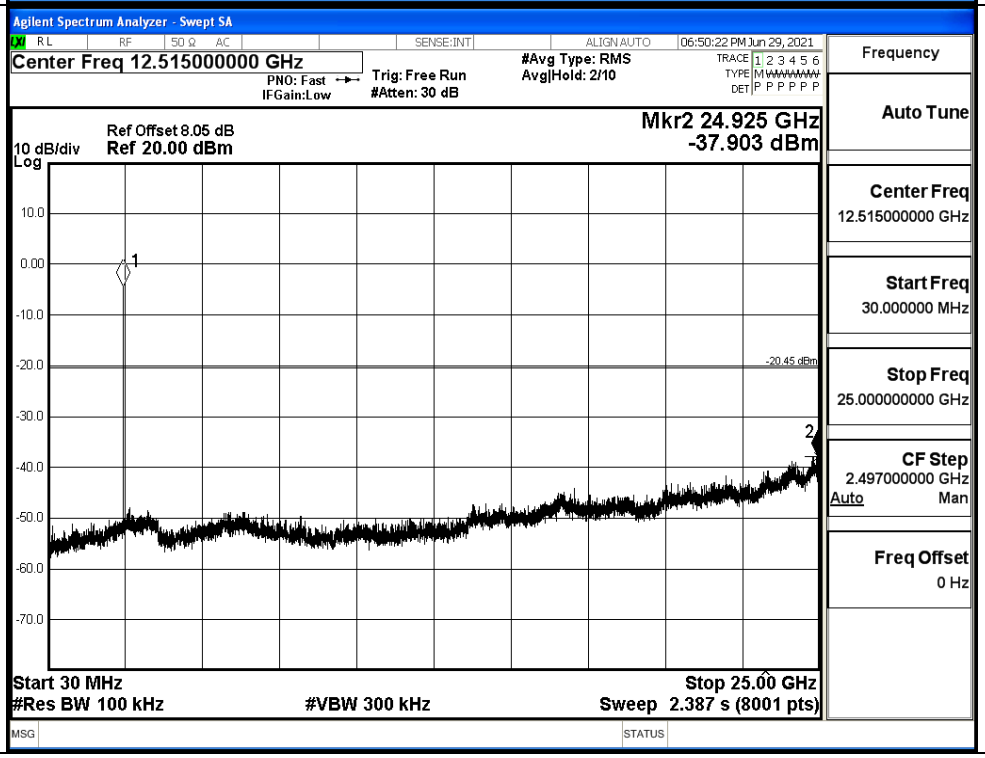
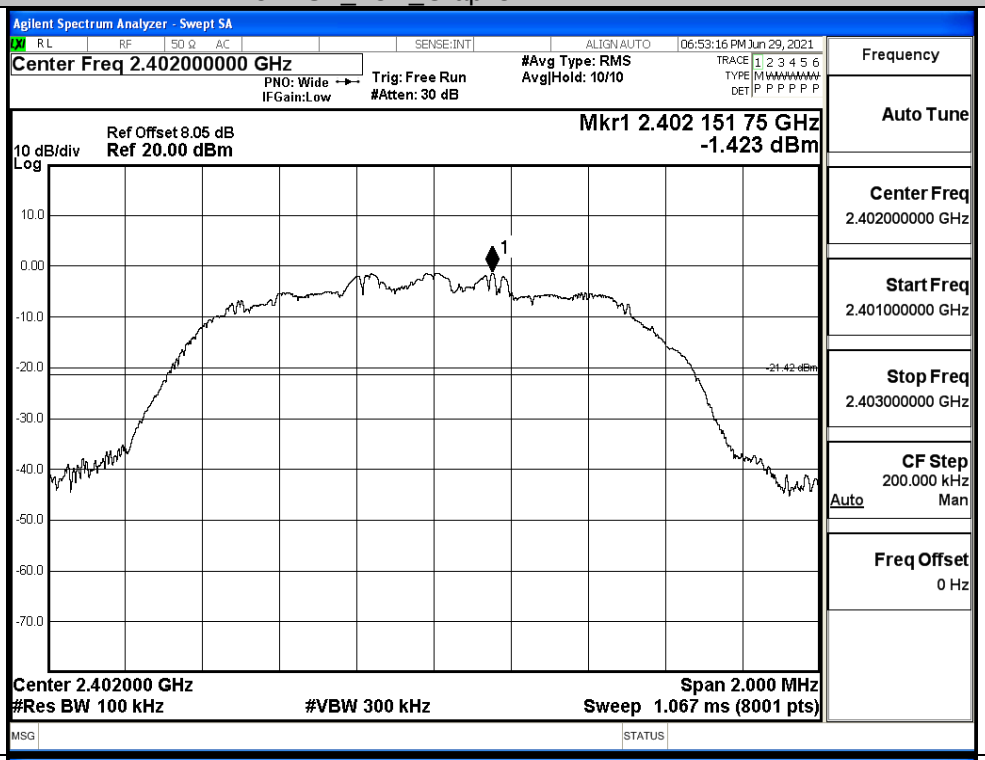
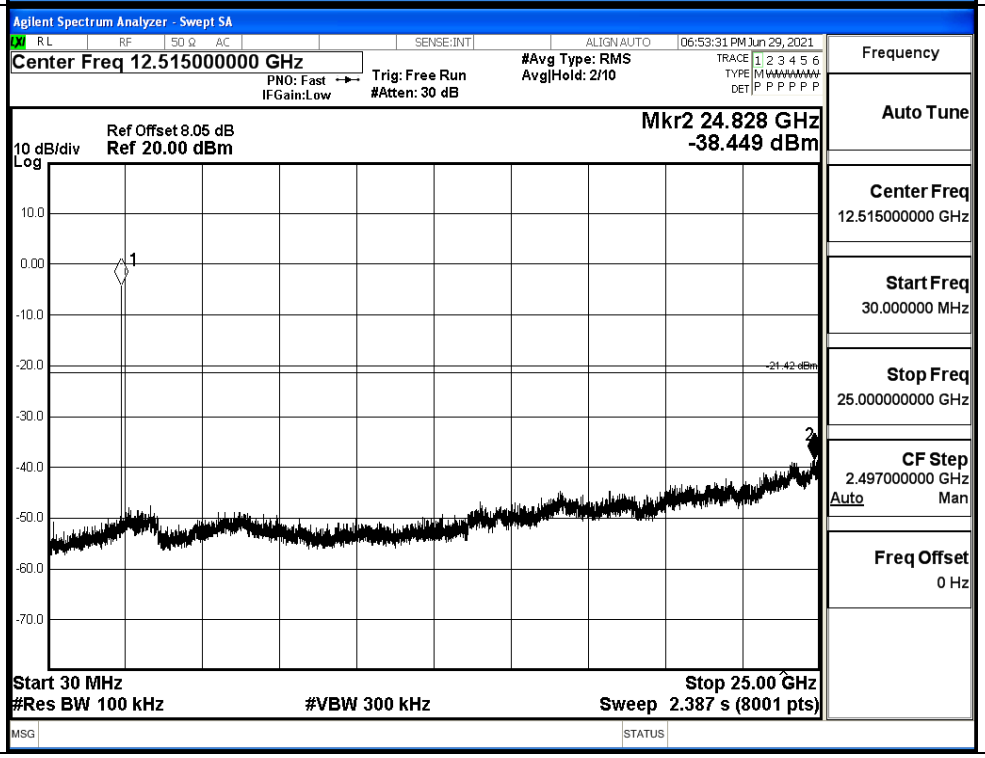
Pref		
Puw		

8DPSK_LCH_Graphs		
Pref		
Puw		

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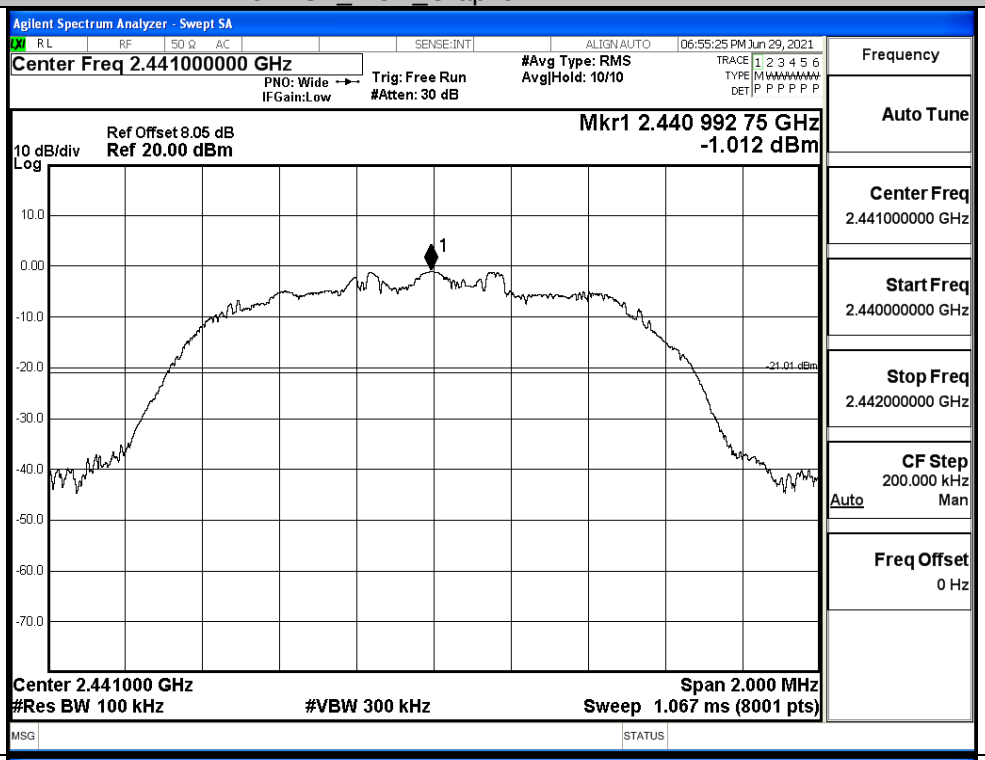
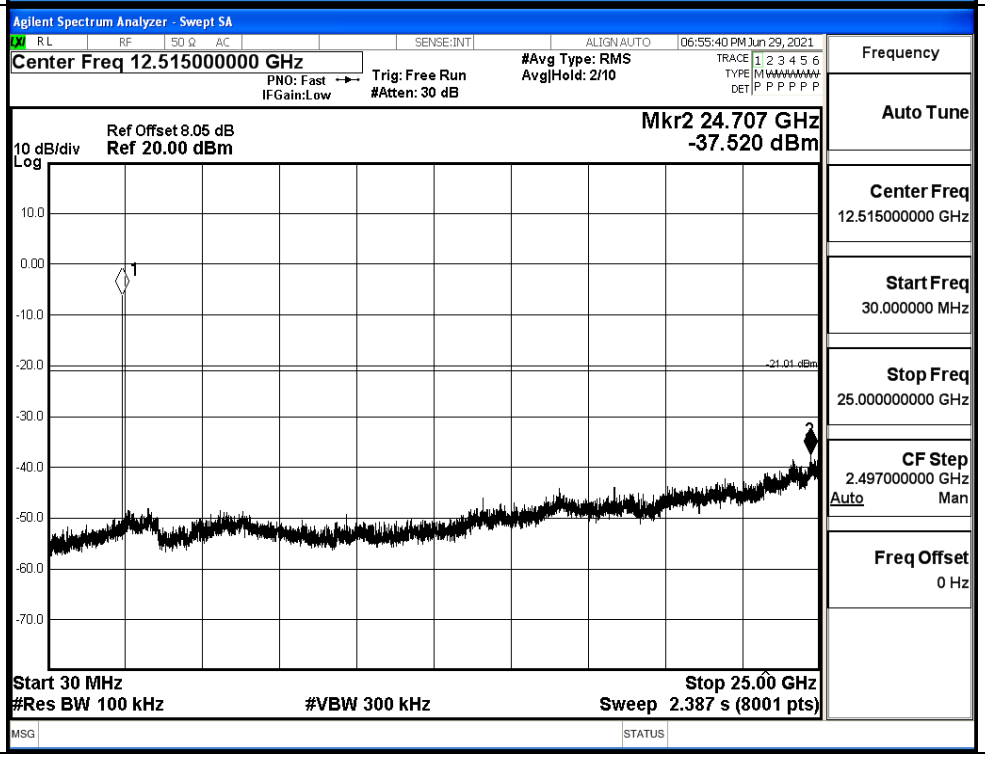
Pref		
Puw		

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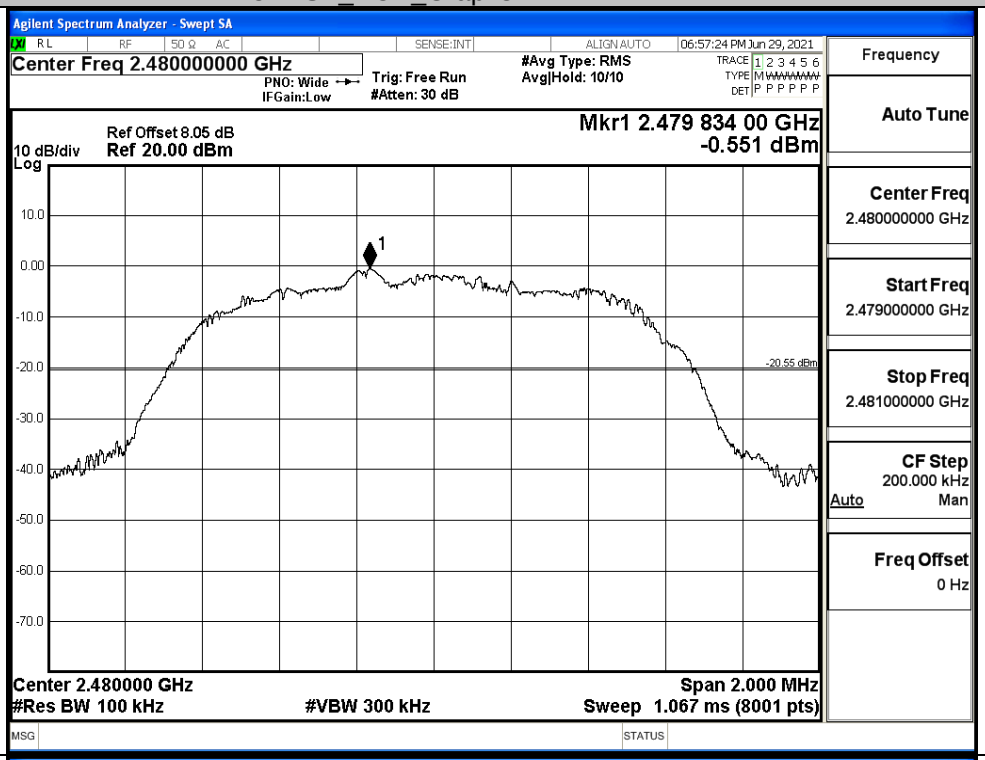
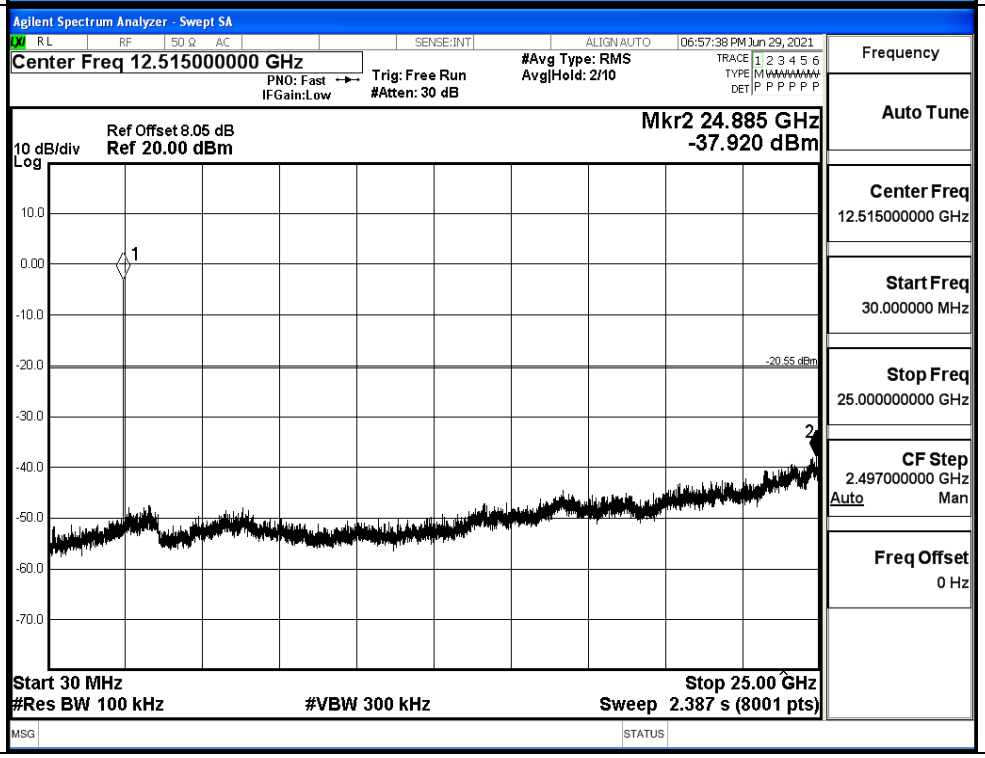
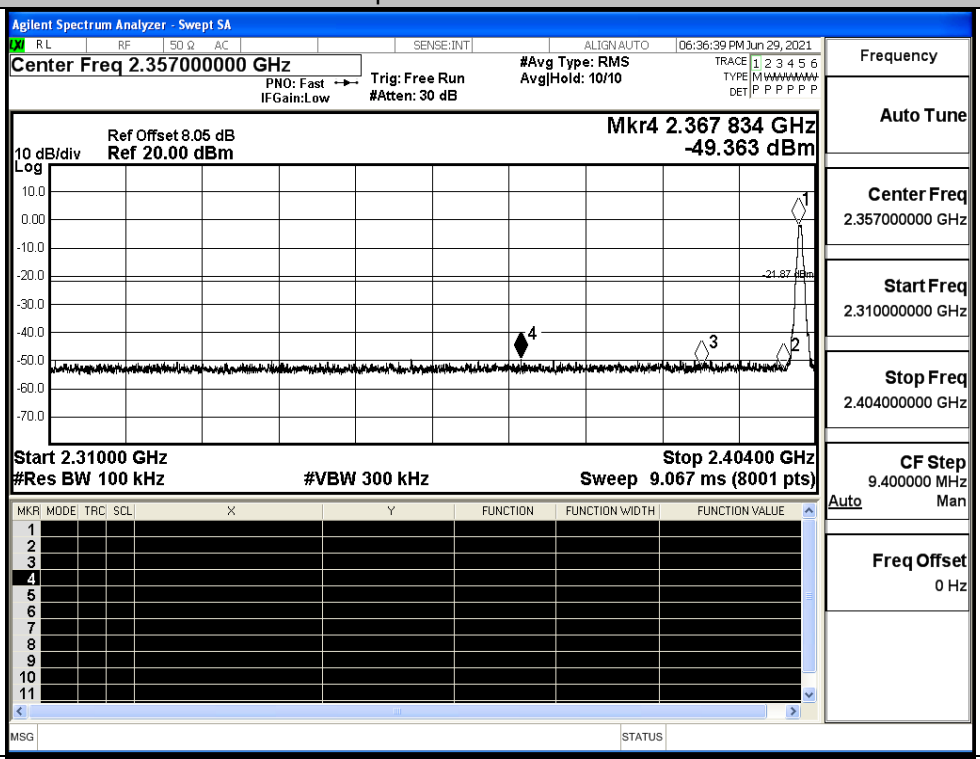
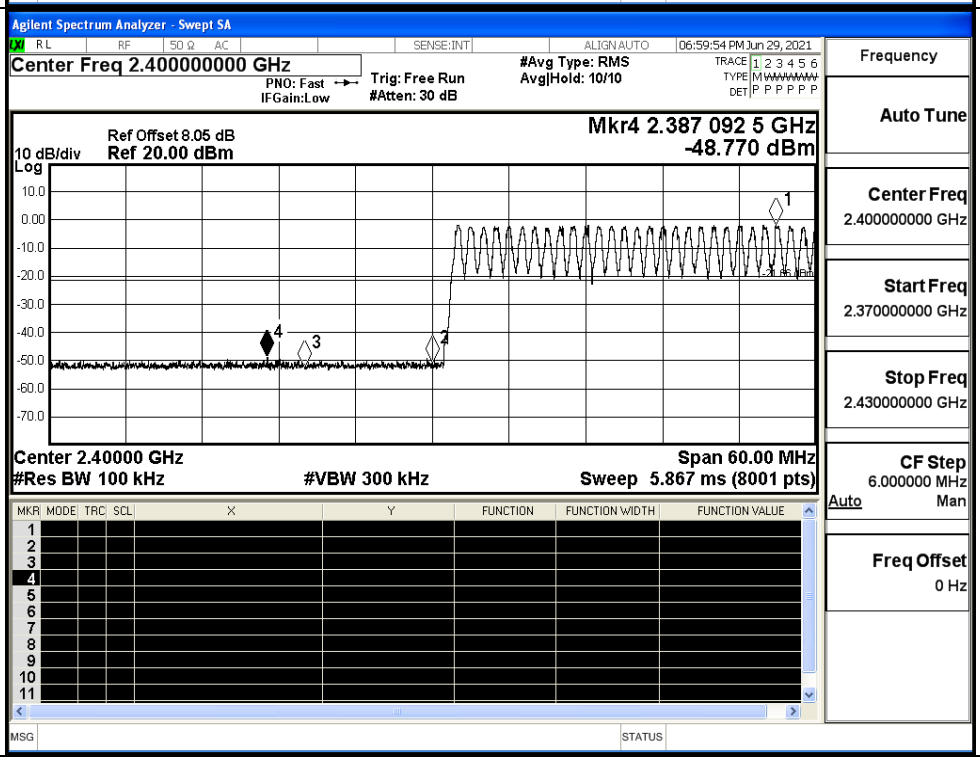
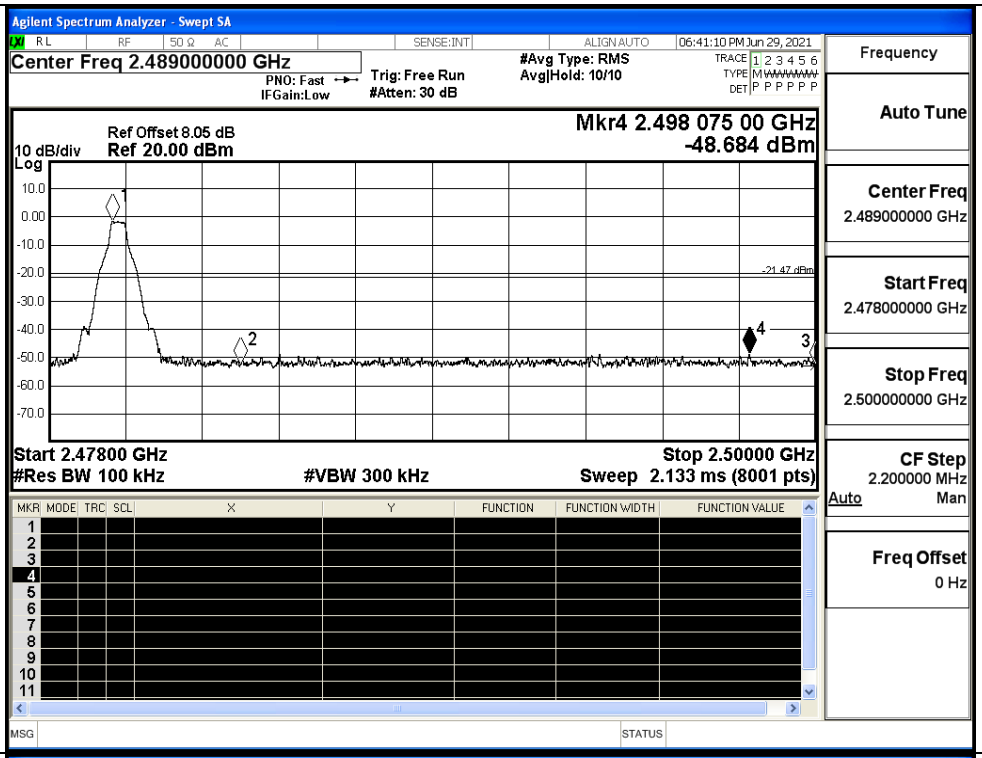
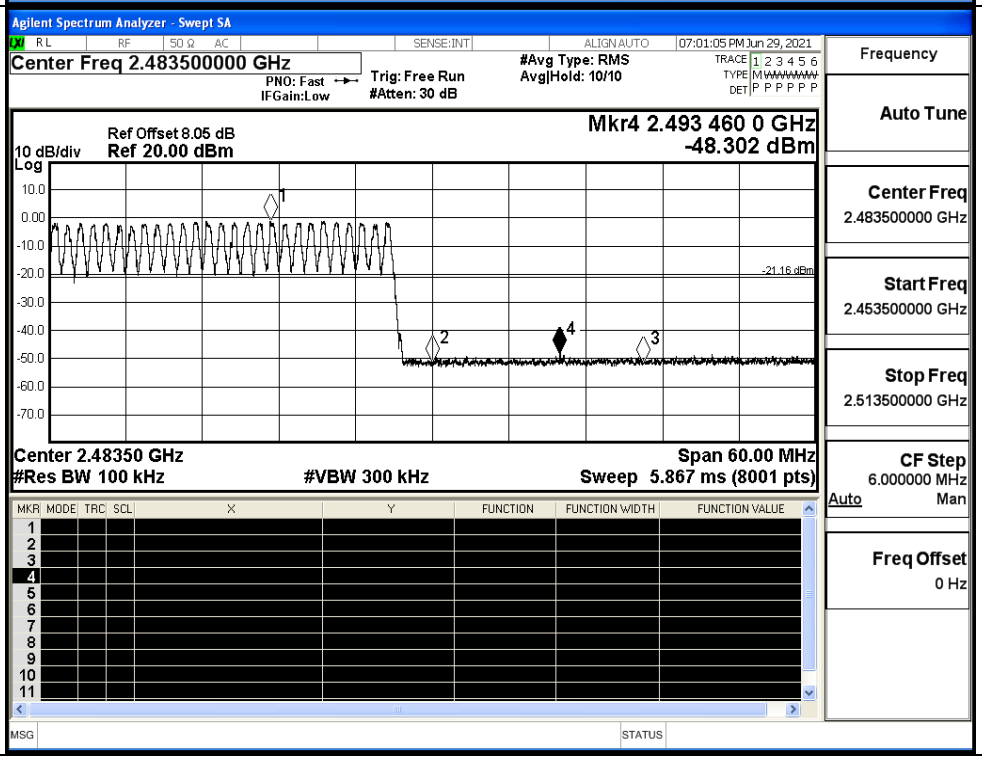
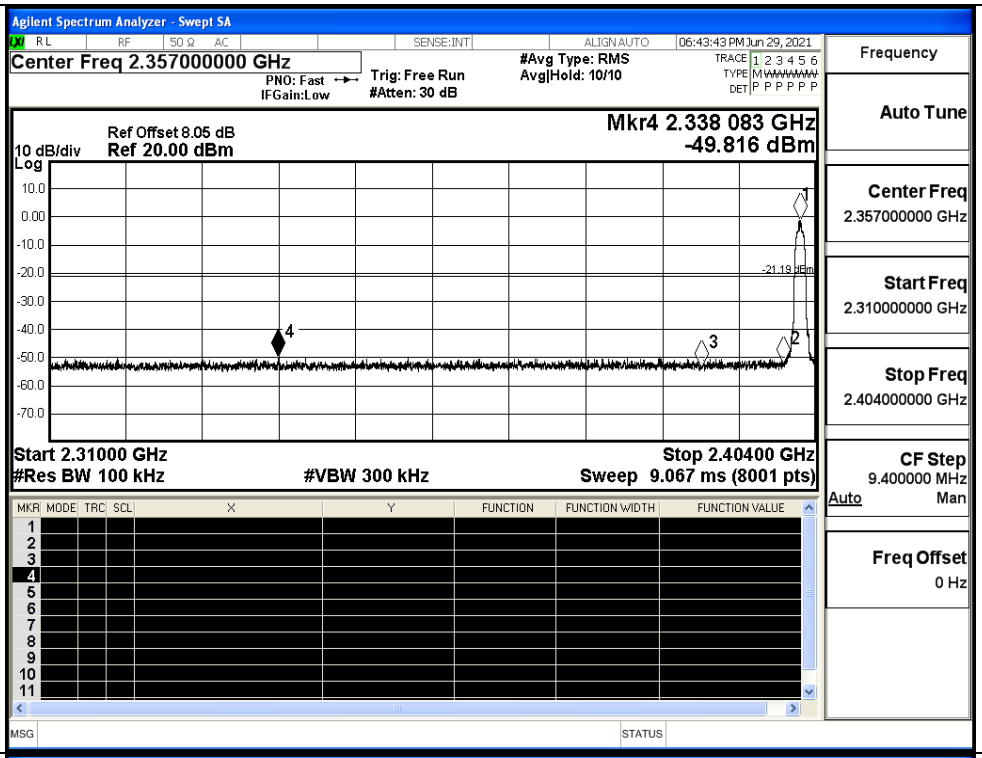
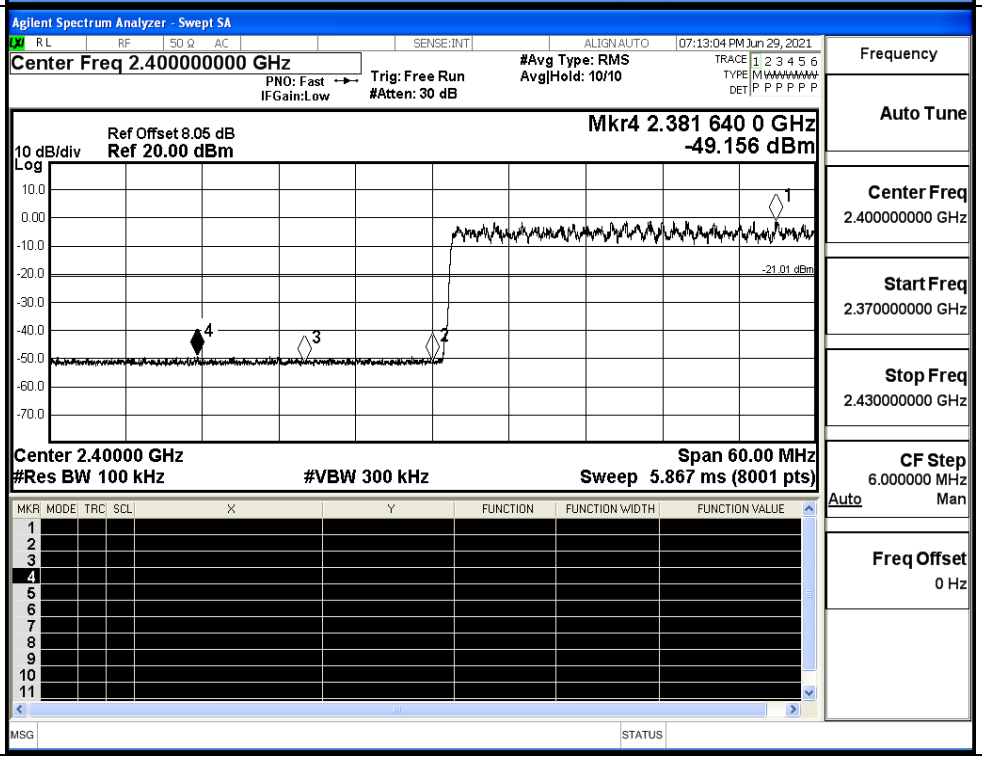
Pref		
Puw		

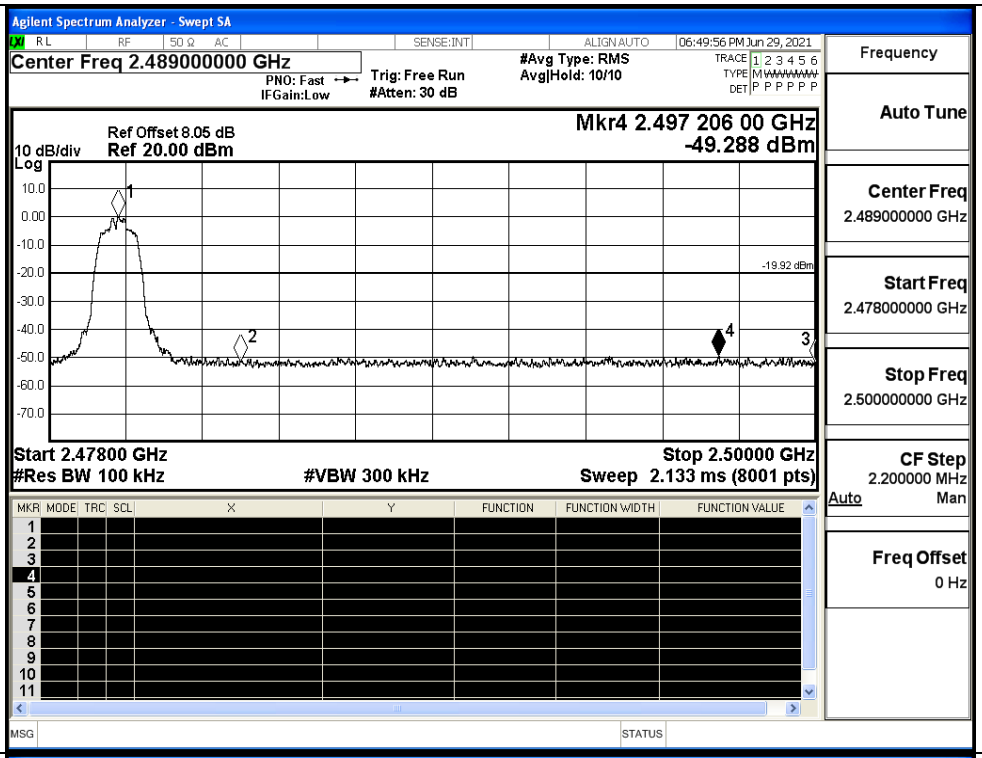
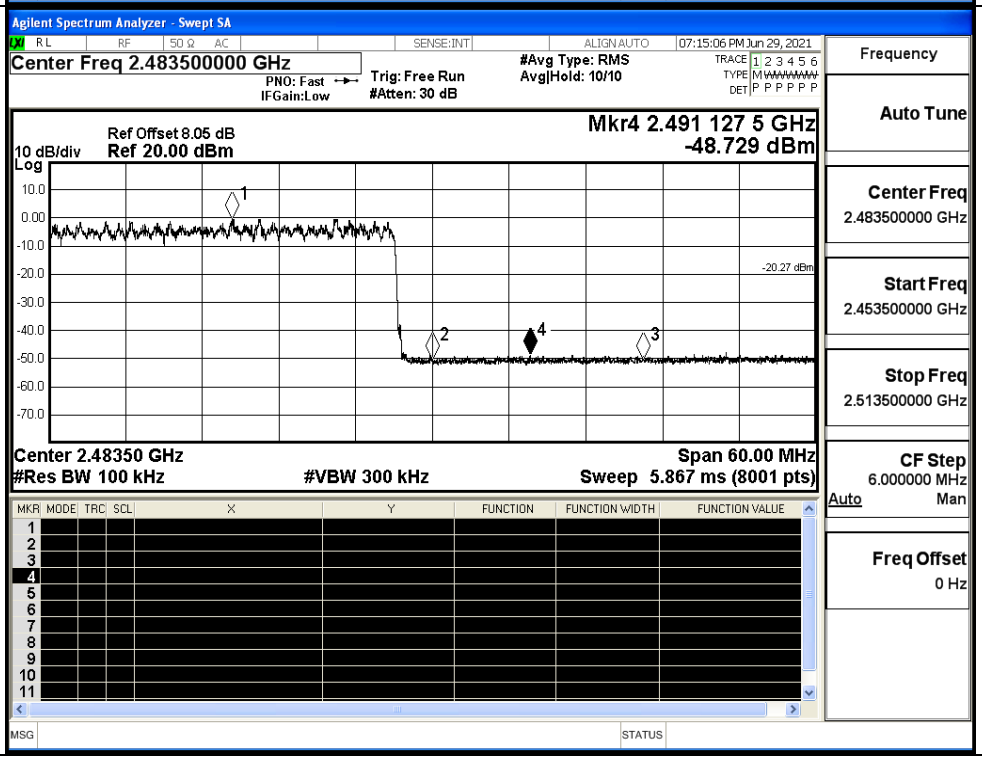
A.7 Band-edge for RF Conducted Emissions

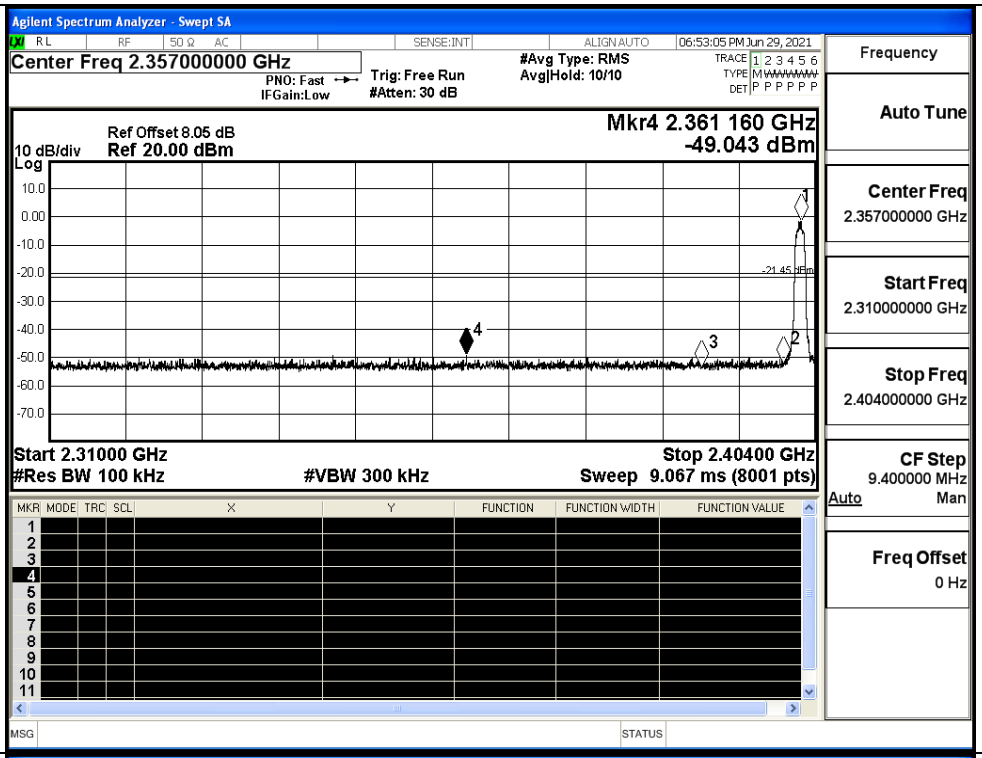
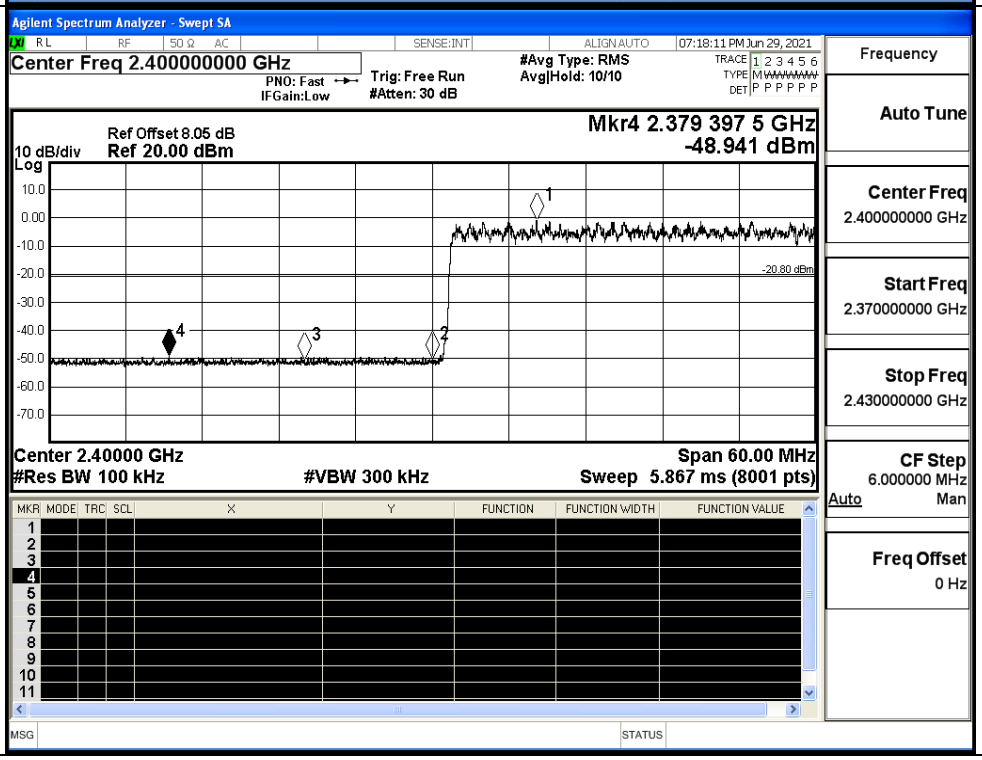
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-1.870	Off	-49.363	-21.87	PASS
			-1.657	On	-48.770	-21.66	PASS
	HCH	2480	-1.468	Off	-48.684	-21.47	PASS
			-1.157	On	-48.302	-21.16	PASS
π/4DQPSK	LCH	2402	-1.187	Off	-49.816	-21.19	PASS
			-1.008	On	-49.156	-21.01	PASS
	HCH	2480	0.085	Off	-49.288	-19.92	PASS
			-0.269	On	-48.729	-20.27	PASS
8DPSK	LCH	2402	-1.454	Off	-49.043	-21.45	PASS
			-0.795	On	-48.941	-20.8	PASS
	HCH	2480	-0.328	Off	-48.621	-20.33	PASS
			0.102	On	-48.330	-19.9	PASS

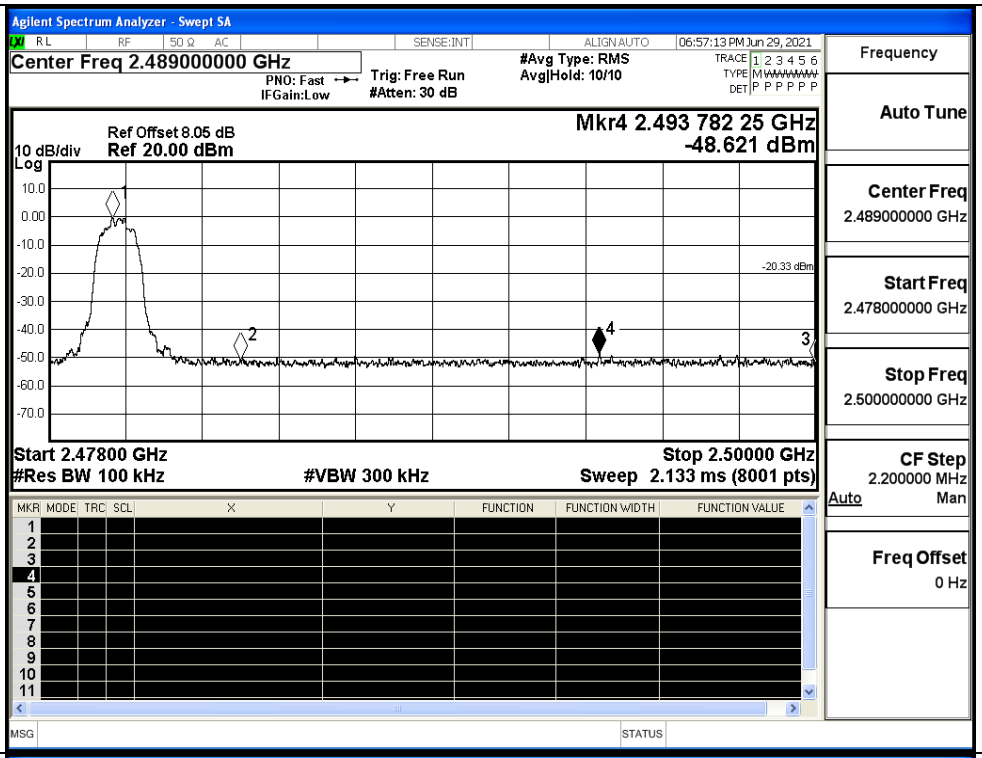
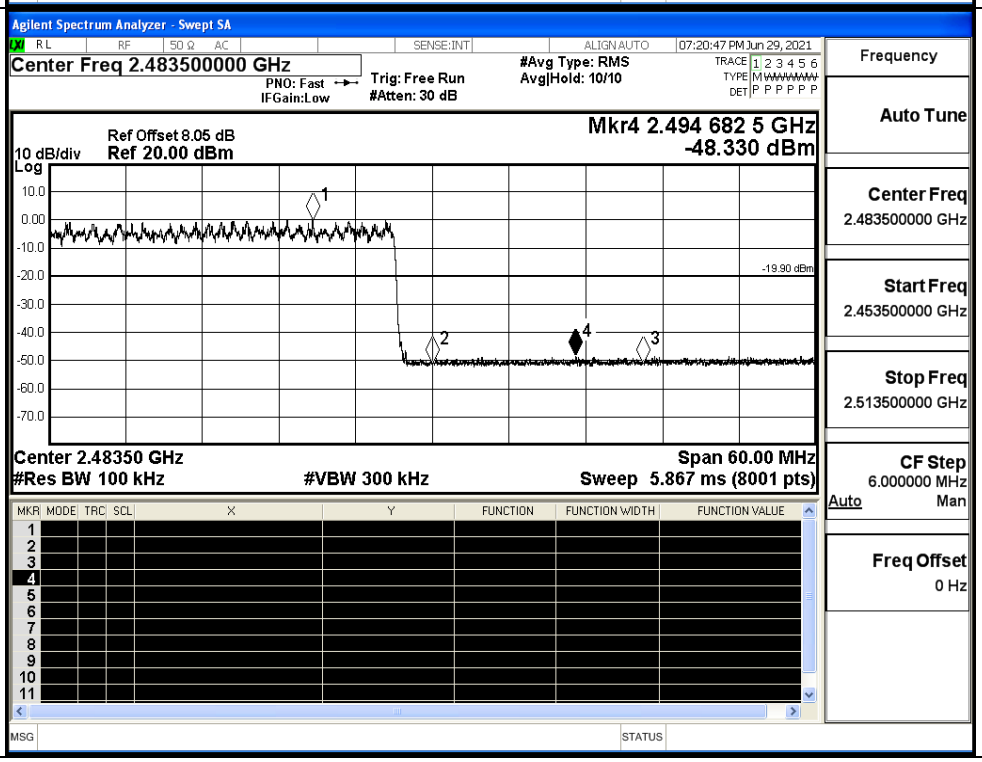
Test Graphs	
GFSK/LCH/No Hop	
GFSK/LCH/Hop	

GFSK/HCH/No Hop	
GFSK/HCH/Hop	

π/4DQPSK/LCH/No Hop	
π/4DQPSK/LCH/Hop	

π/4DQPSK/HCH/No Hop	
π/4DQPSK/HCH/Hop	

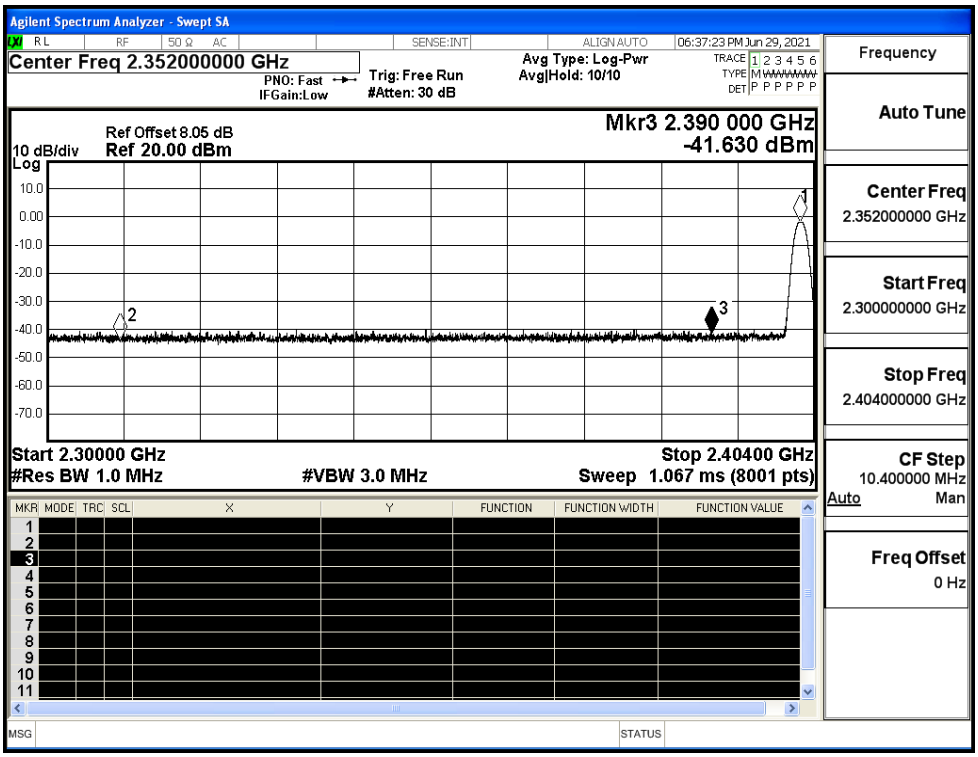
8DPSK/LCH/No Hop	
8DPSK/LCH/Hop	

8DPSK/HCH/No Hop	
8DPSK/HCH/Hop	

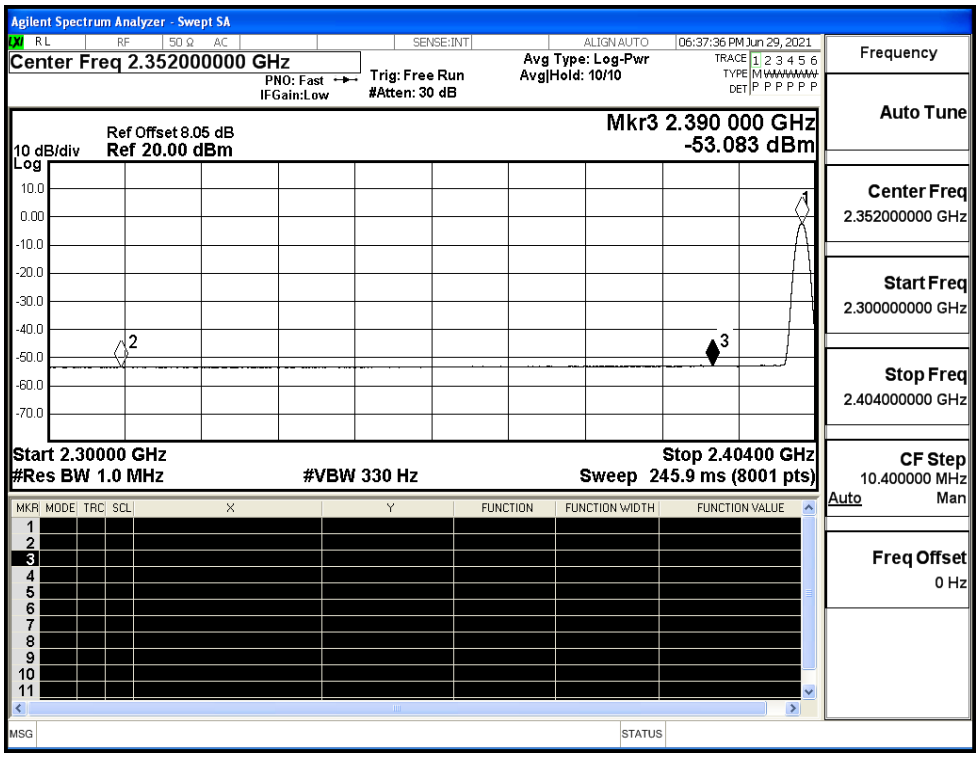
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.94	2.0	0	51.31	PEAK	74	PASS
	Off	2310.0	-53.31	2.0	0	41.95	AV	54	PASS
	Off	2390.0	-41.63	2.0	0	53.63	PEAK	74	PASS
	Off	2390.0	-53.08	2.0	0	42.17	AV	54	PASS
	Off	2483.5	-42.41	2.0	0	52.85	PEAK	74	PASS
	Off	2483.5	-52.55	2.0	0	42.71	AV	54	PASS
	Off	2500.0	-43.20	2.0	0	52.06	PEAK	74	PASS
	Off	2500.0	-52.38	2.0	0	42.88	AV	54	PASS
π/4DQPSK	Off	2310.0	-42.14	2.0	0	53.11	PEAK	74	PASS
	Off	2310.0	-53.31	2.0	0	41.95	AV	54	PASS
	Off	2390.0	-41.00	2.0	0	54.26	PEAK	74	PASS
	Off	2390.0	-52.95	2.0	0	42.31	AV	54	PASS
	Off	2483.5	-42.20	2.0	0	53.05	PEAK	74	PASS
	Off	2483.5	-52.45	2.0	0	42.81	AV	54	PASS
	Off	2500.0	-41.68	2.0	0	53.58	PEAK	74	PASS
	Off	2500.0	-52.40	2.0	0	42.86	AV	54	PASS
8DPSK	Off	2310.0	-41.18	2.0	0	54.08	PEAK	74	PASS
	Off	2310.0	-53.42	2.0	0	41.84	AV	54	PASS
	Off	2390.0	-42.62	2.0	0	52.63	PEAK	74	PASS
	Off	2390.0	-52.93	2.0	0	42.33	AV	54	PASS
	Off	2483.5	-41.24	2.0	0	54.02	PEAK	74	PASS
	Off	2483.5	-52.37	2.0	0	42.89	AV	54	PASS
	Off	2500.0	-41.51	2.0	0	53.74	PEAK	74	PASS
	Off	2500.0	-52.29	2.0	0	42.97	AV	54	PASS

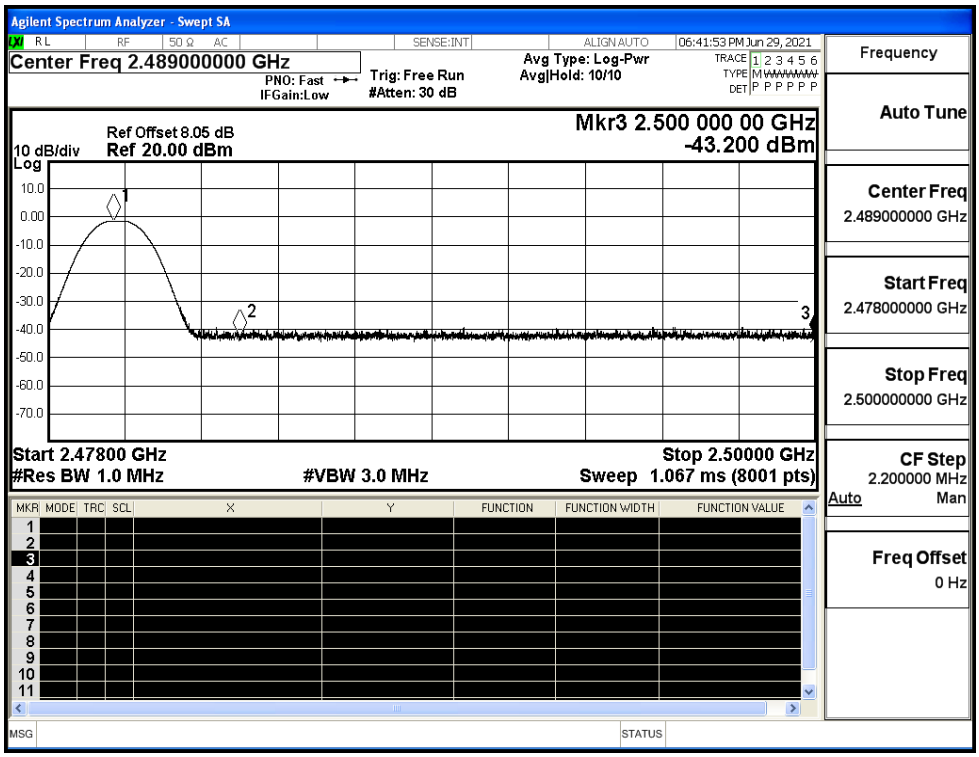
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (Low Channel)



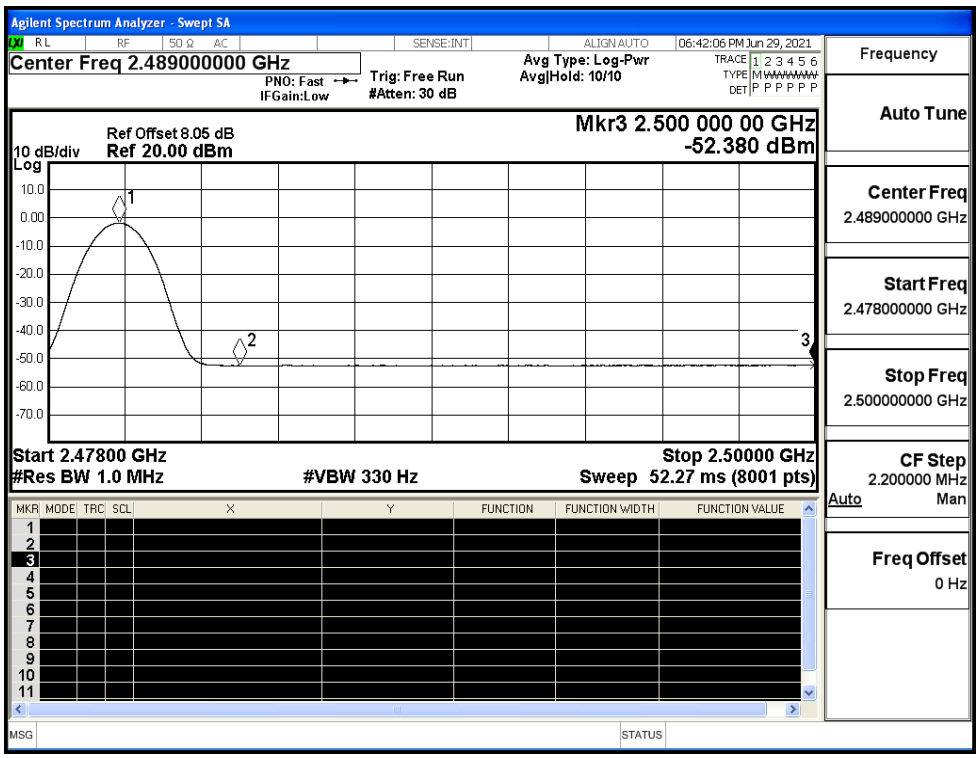
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (Low Channel)



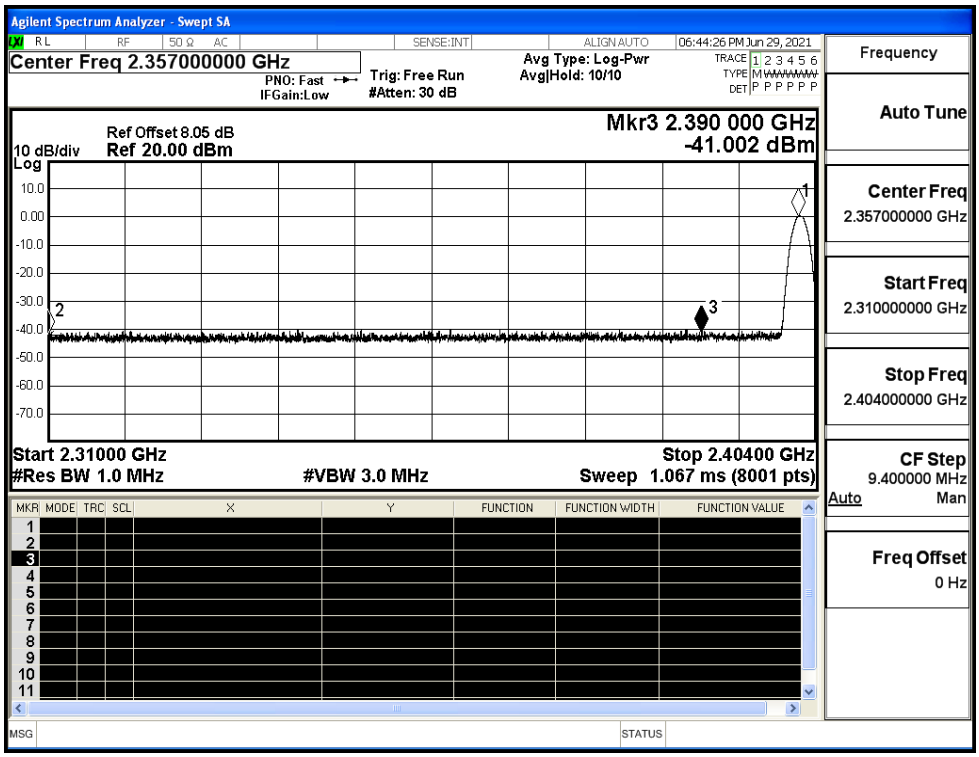
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)



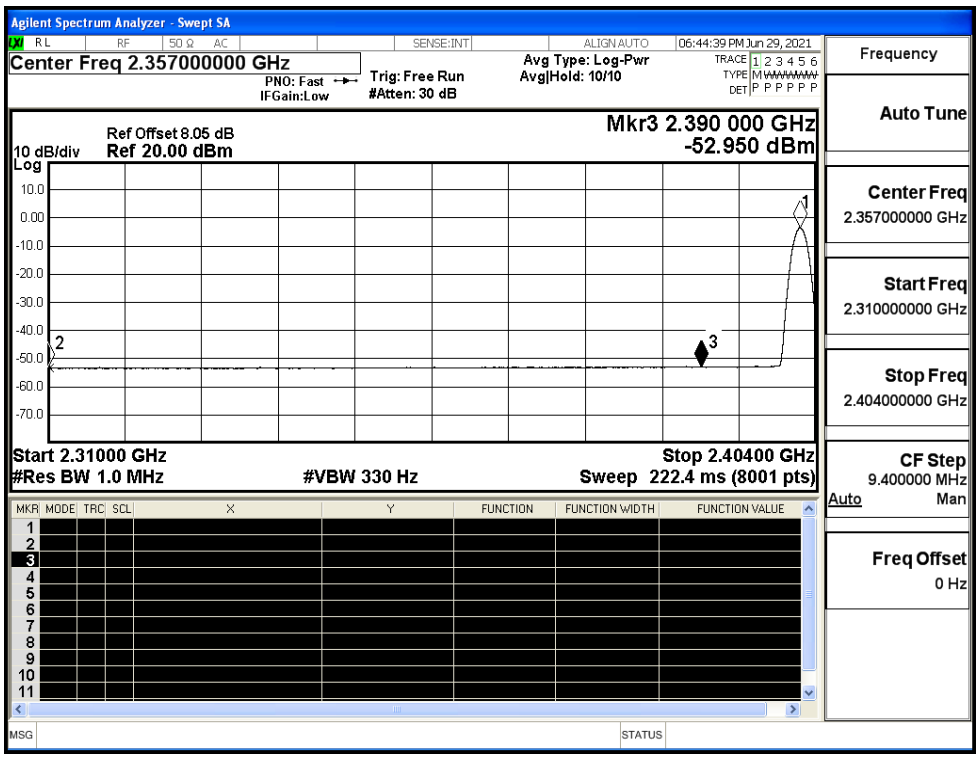
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)



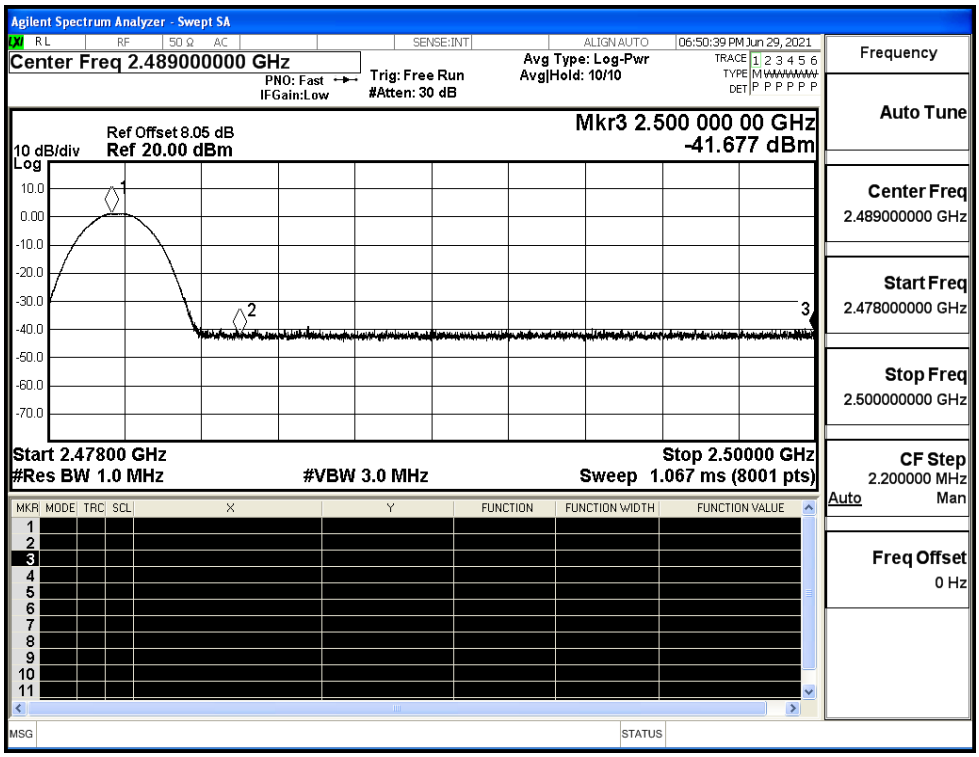
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (Low Channel)



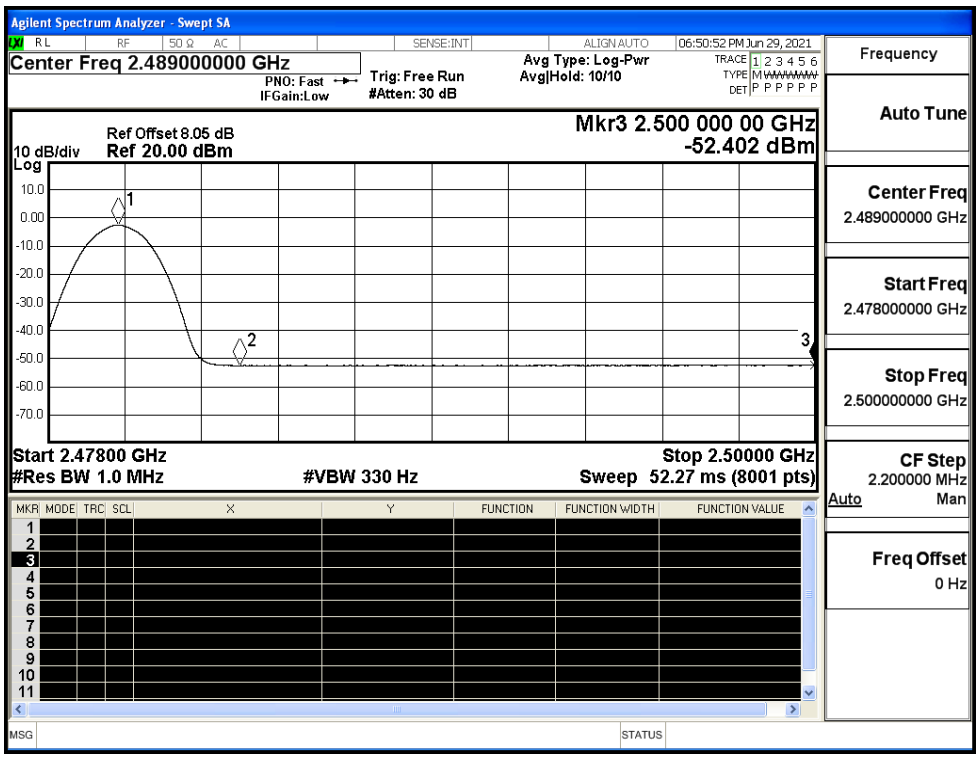
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (Low Channel)



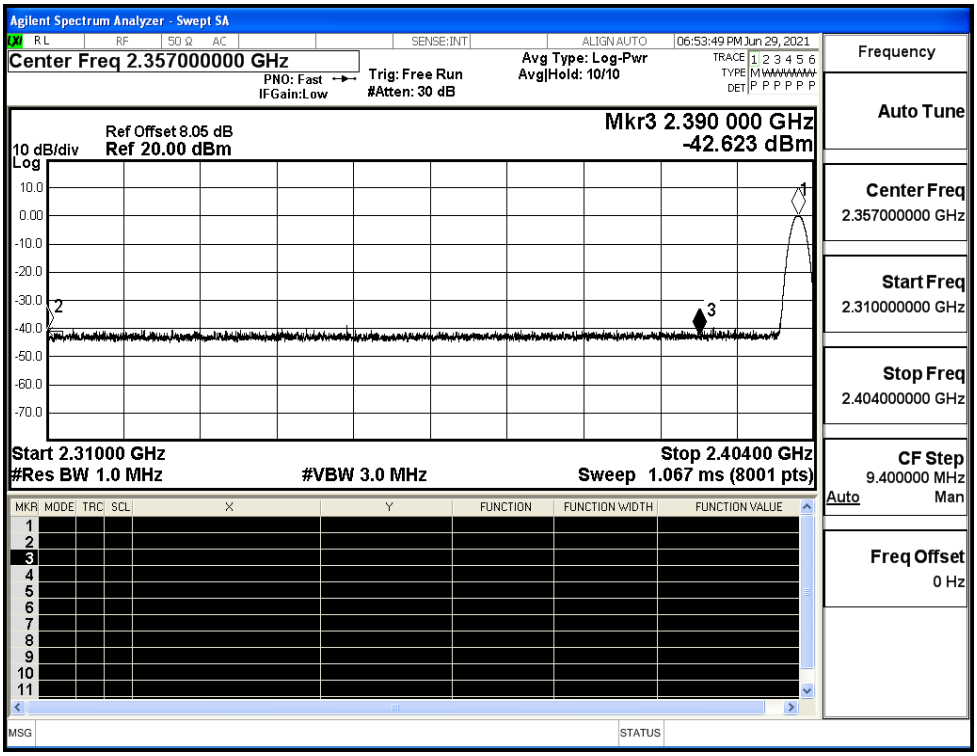
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



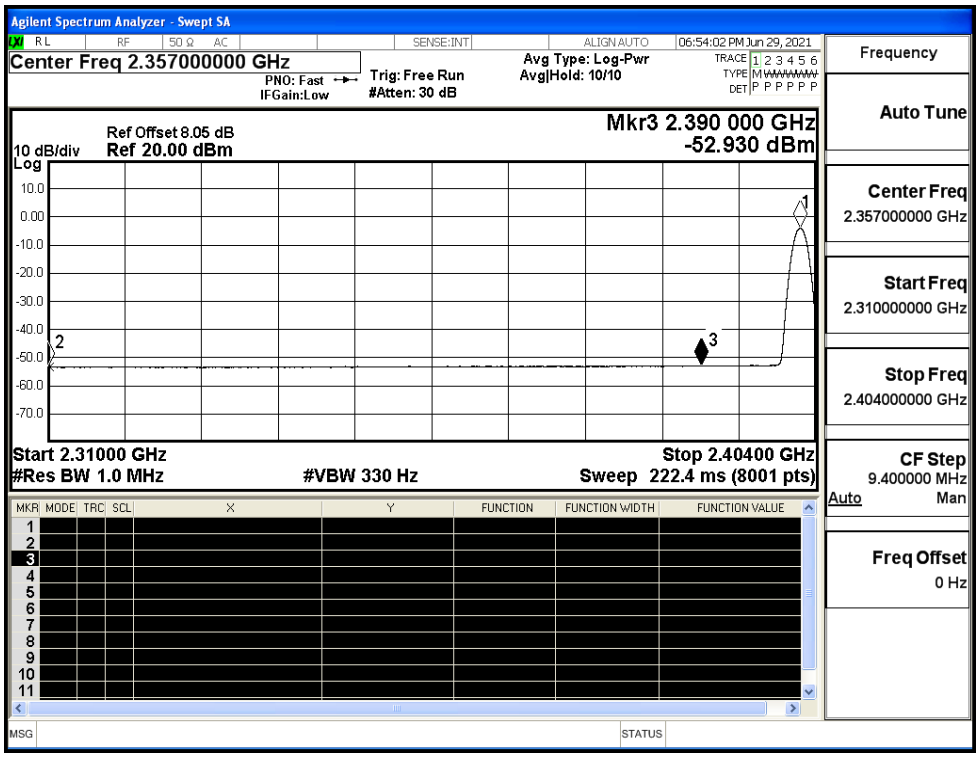
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



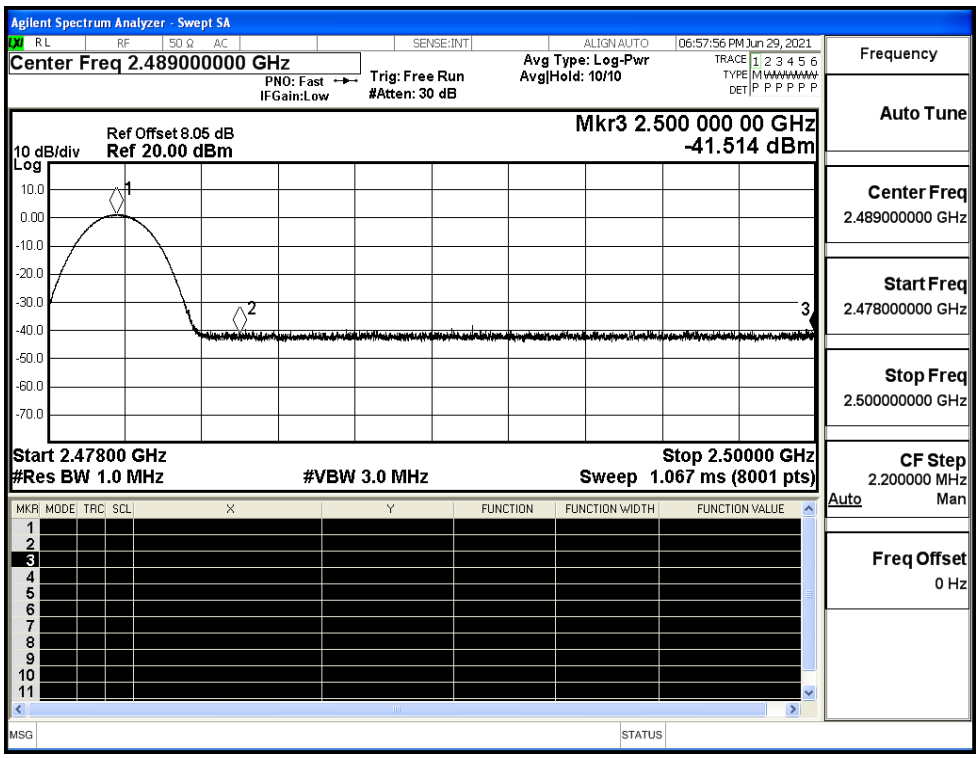
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)