Appendix A

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

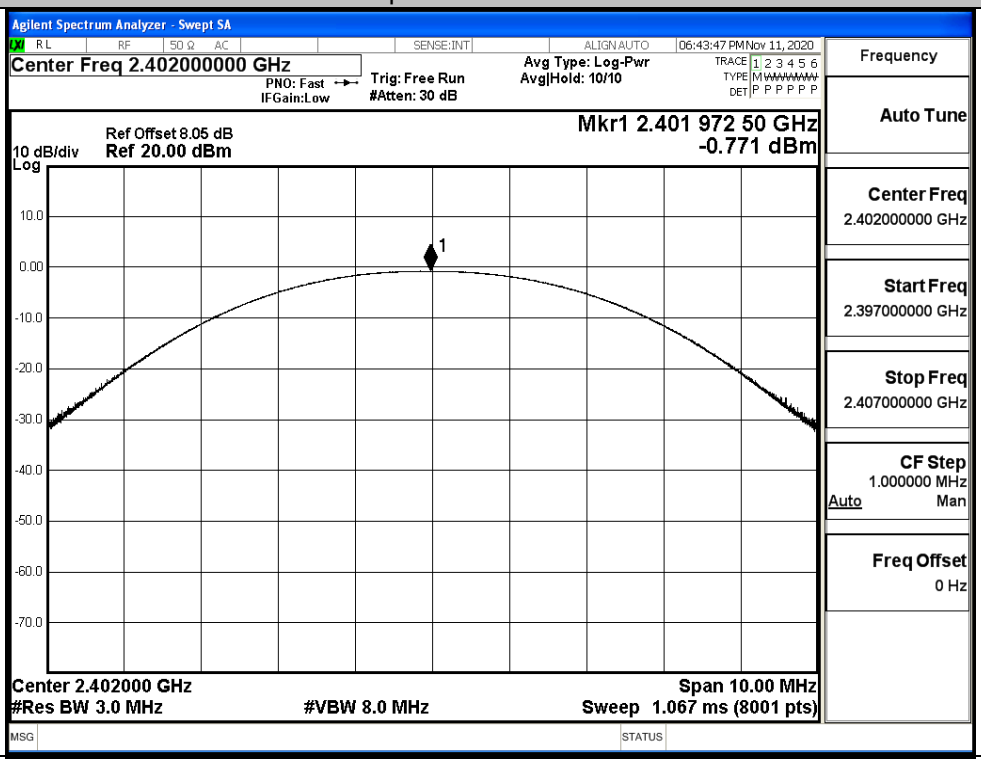
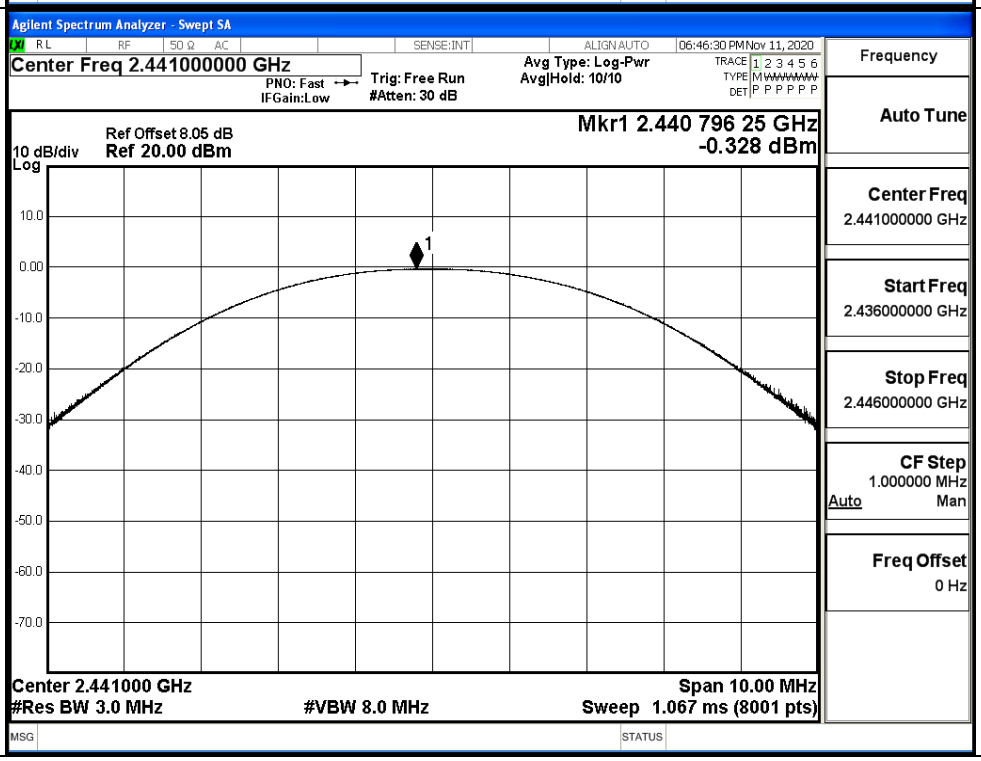
Product Name: MEE audio X20 Truly Wireless Earphones
Trade Mark: MEE audio
Test Model: X20

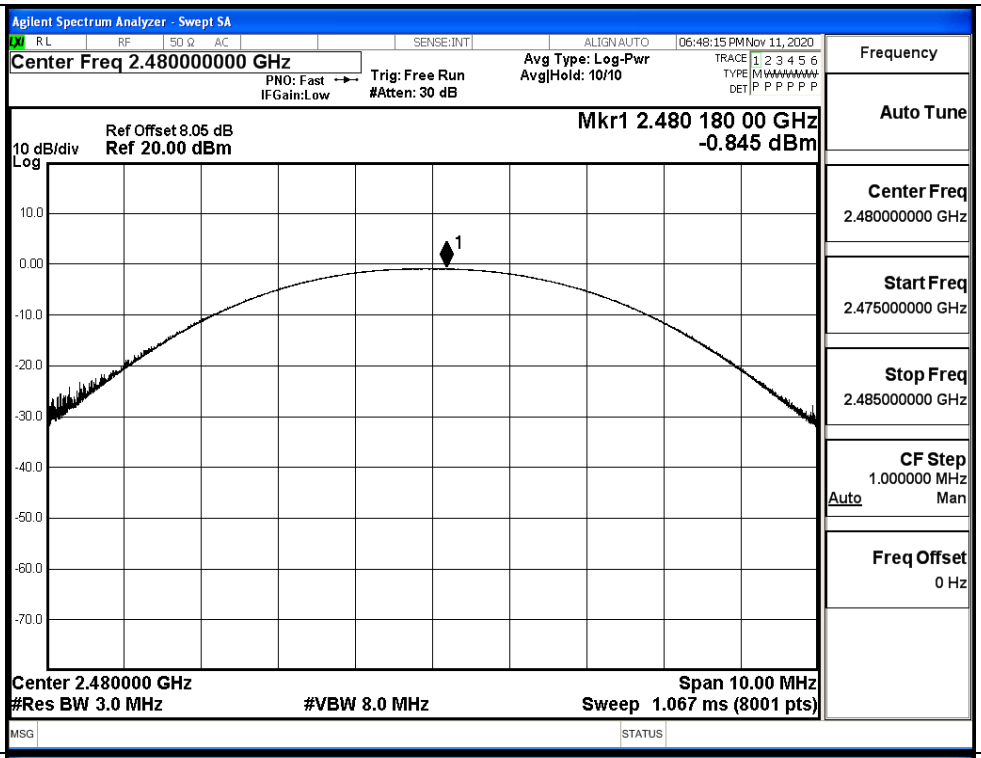
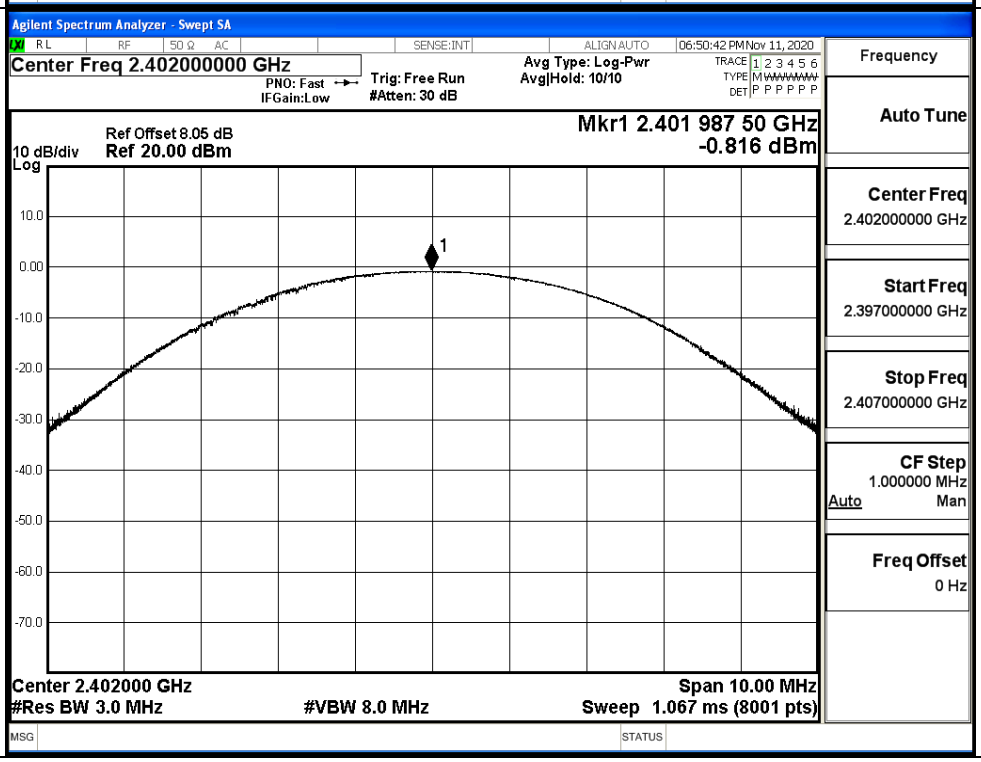
Environmental Conditions

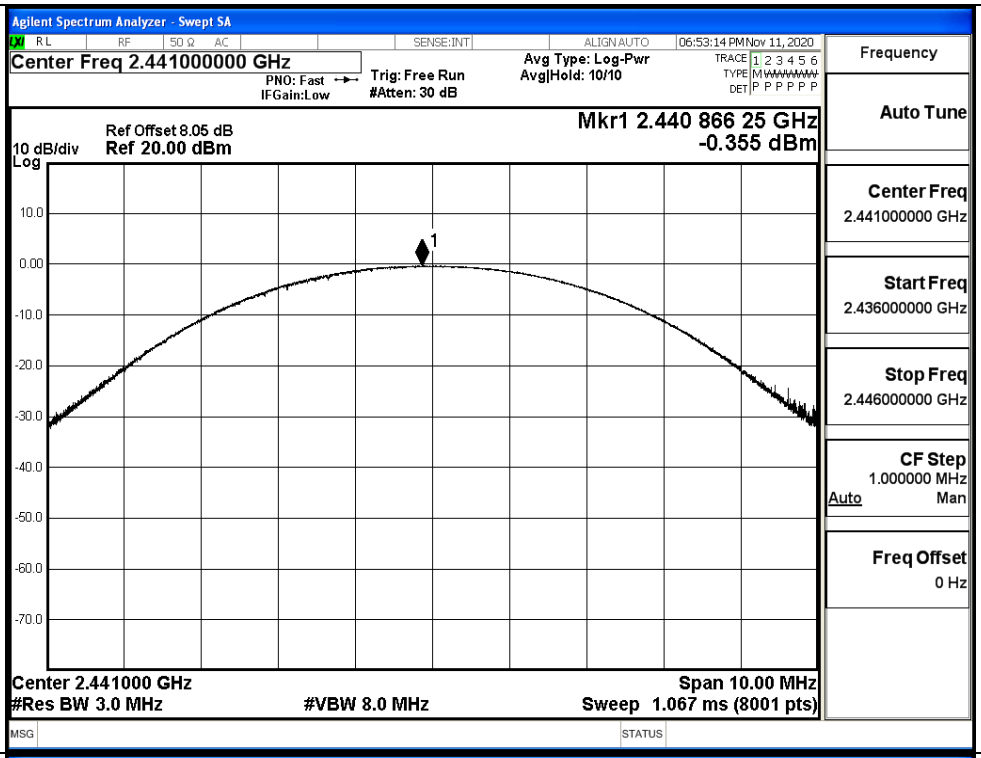
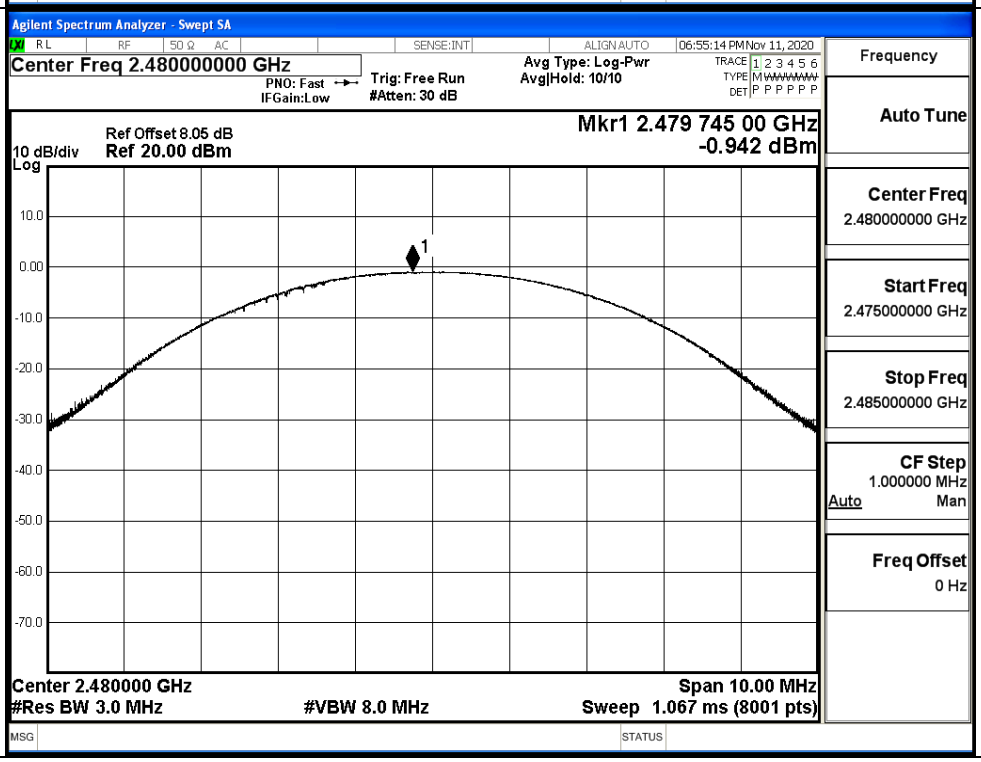
Temperature:	22.5°C
Relative Humidity:	51.8%
ATM Pressure:	100.0 kPa
Test Engineer:	Kay Hu
Supervised by:	Li Huan

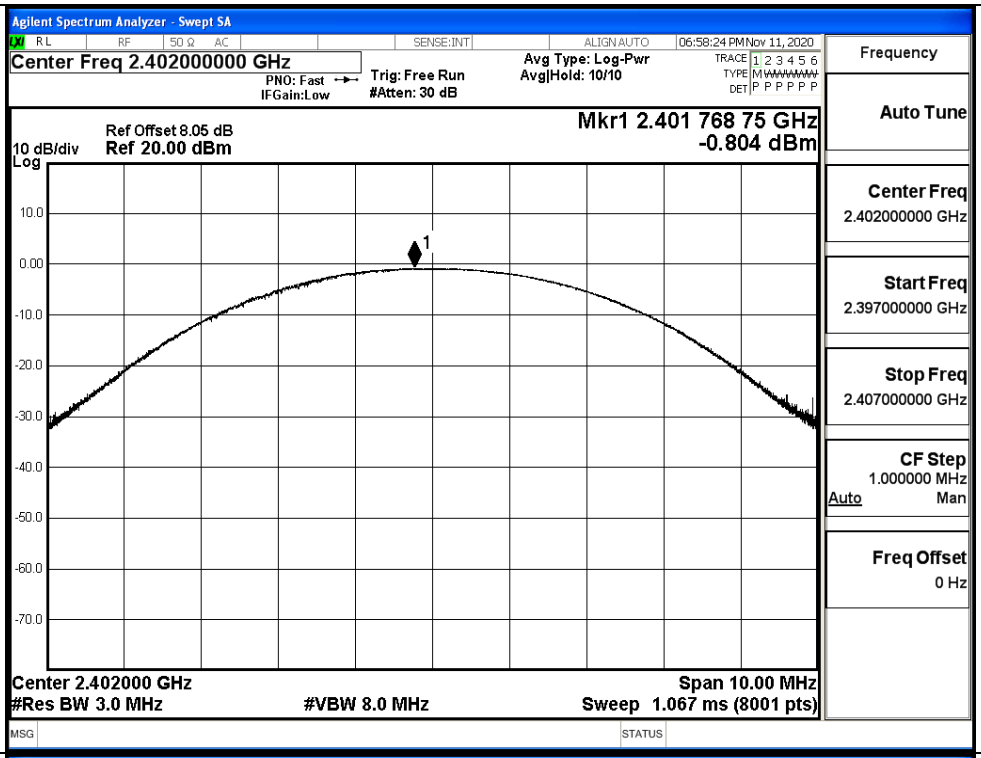
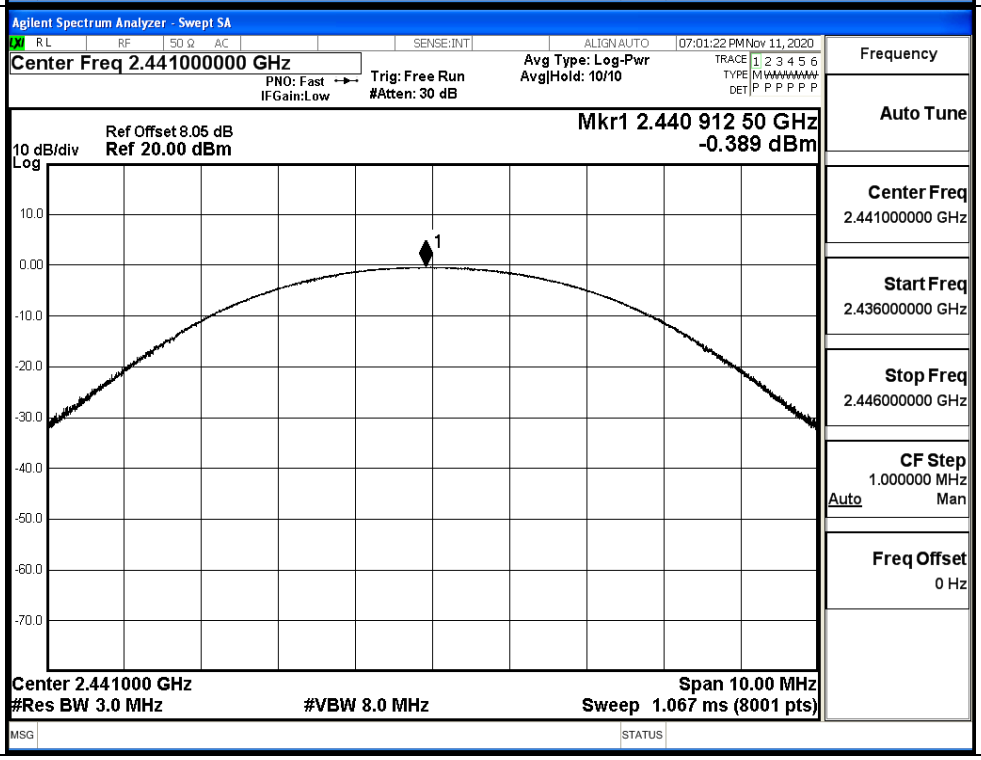
A.1 Maximum Conducted Peak Output Power

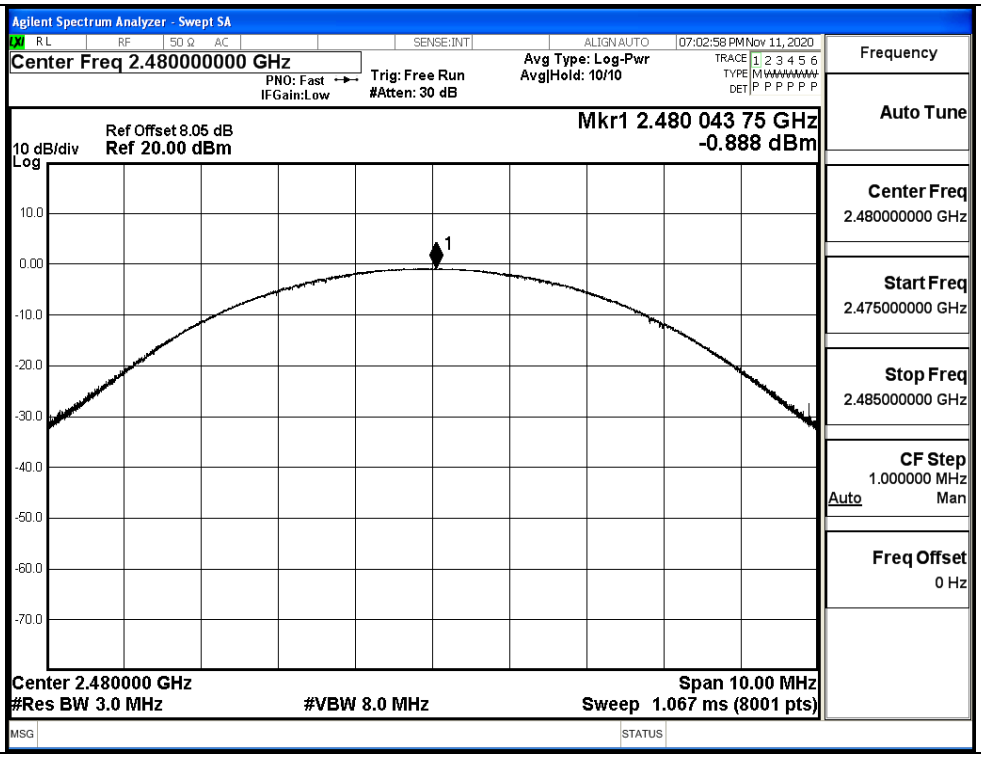
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-0.771	30	PASS
	MCH	-0.328	30	PASS
	HCH	-0.845	30	PASS
π/4DQPSK	LCH	-0.816	21	PASS
	MCH	-0.355	21	PASS
	HCH	-0.942	21	PASS
8DPSK	LCH	-0.804	21	PASS
	MCH	-0.389	21	PASS
	HCH	-0.888	21	PASS

Test Graphs		
GFSK/LCH		
GFSK/MCH		

GFSK/HCH	
π/4DQPSK/LCH	

π/4DQPSK/MCH	
π/4DQPSK/HCH	

8DPSK/LCH		
8DPSK/MCH		

8DPSK/HCH	

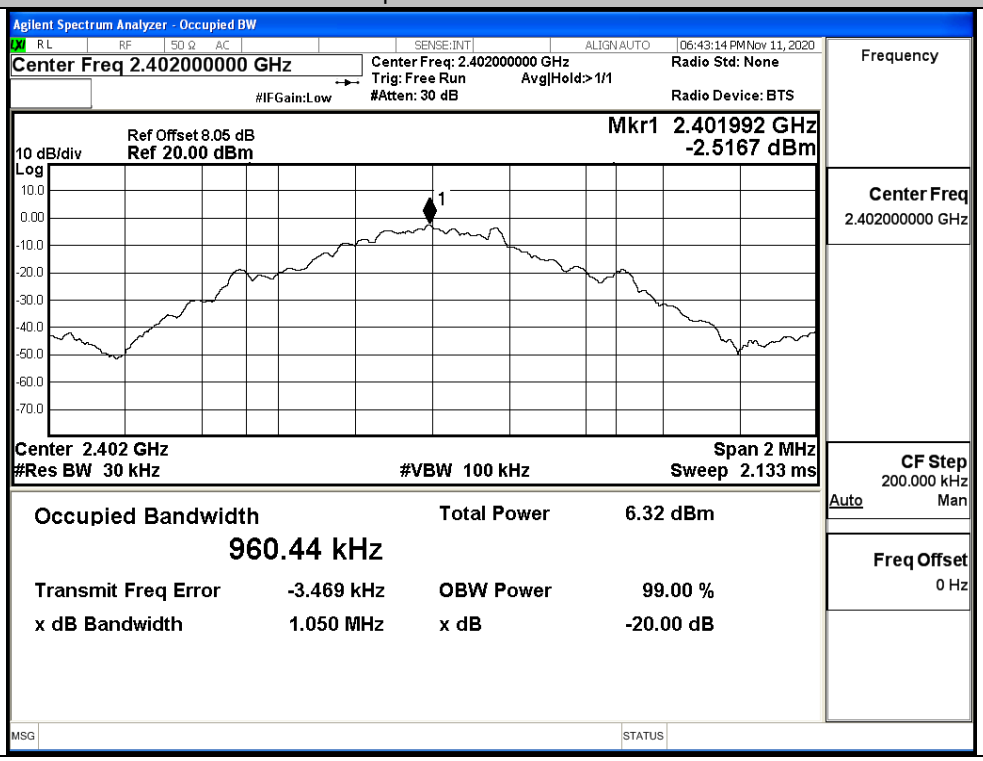
Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
07:02:58 PM Nov 11, 2020
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 10/10
TRACE 1 2 3 4 5 6
TYPE M
DET P P P P P
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
Mkr1 2.480 043 75 GHz
-0.888 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

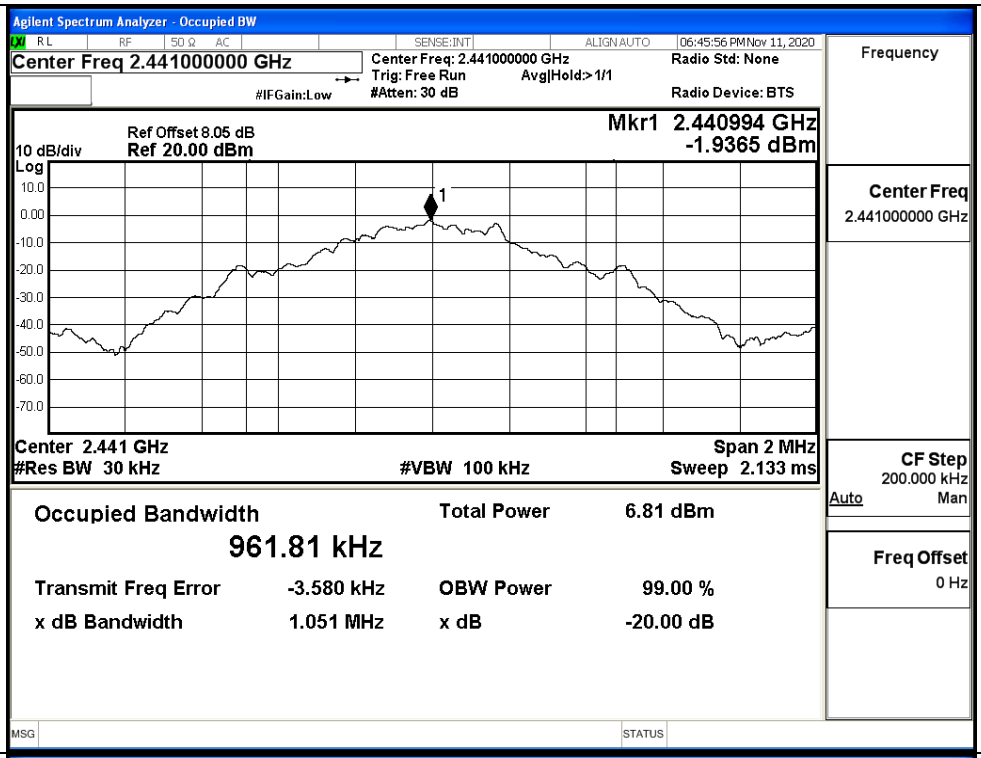
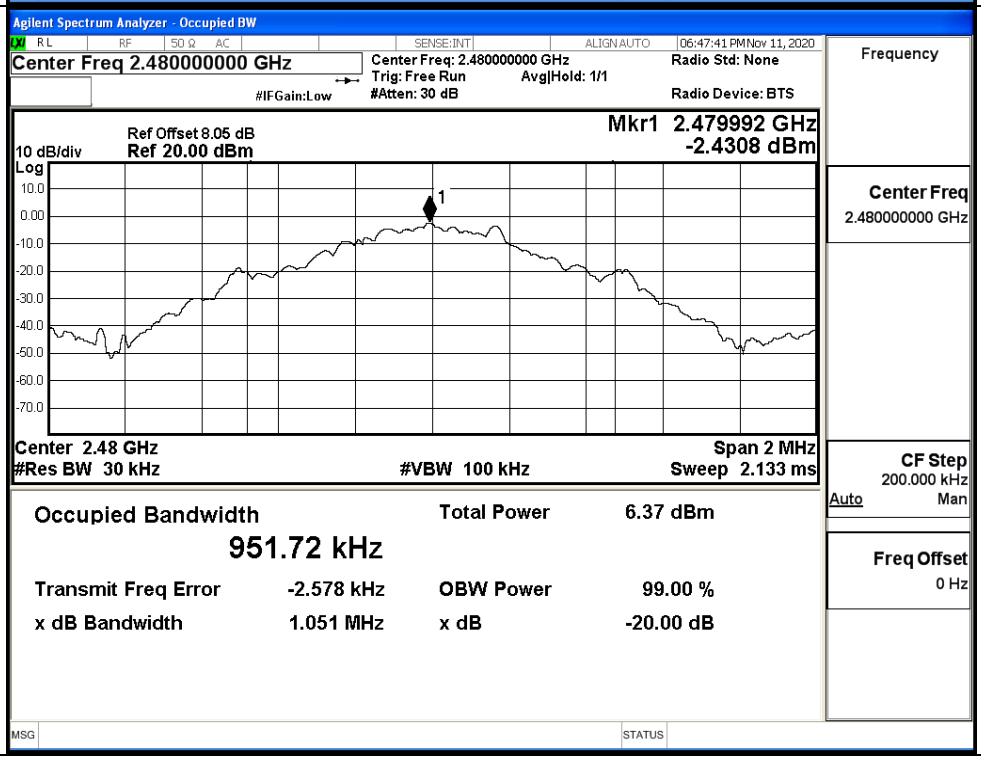
A.2 20dB Bandwidth

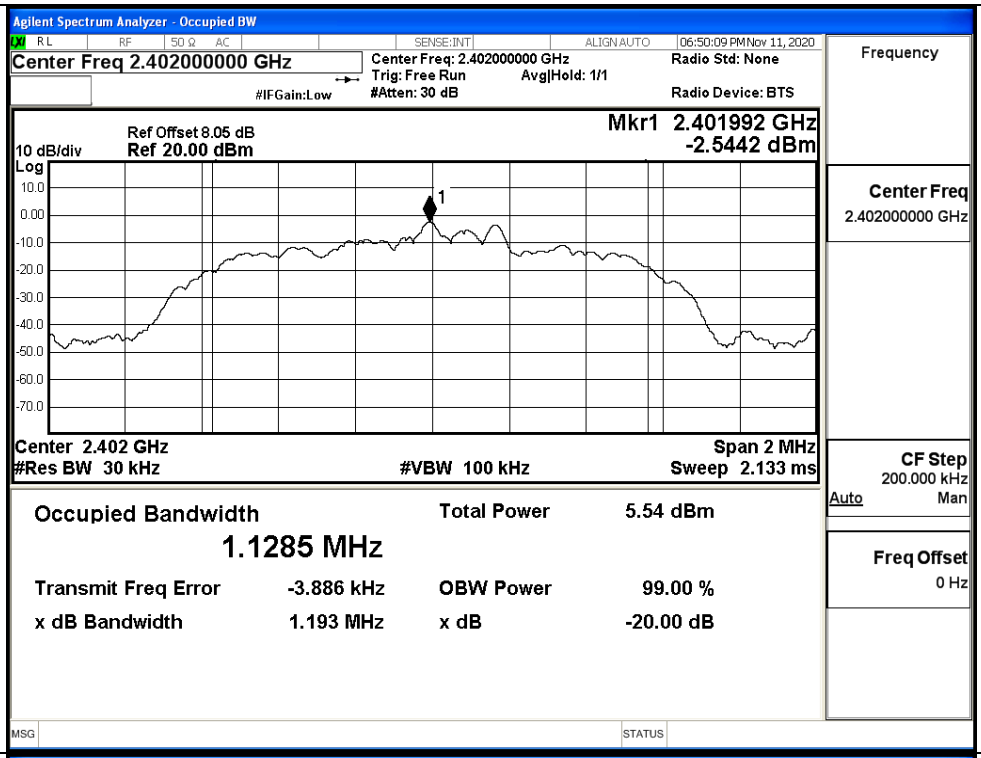
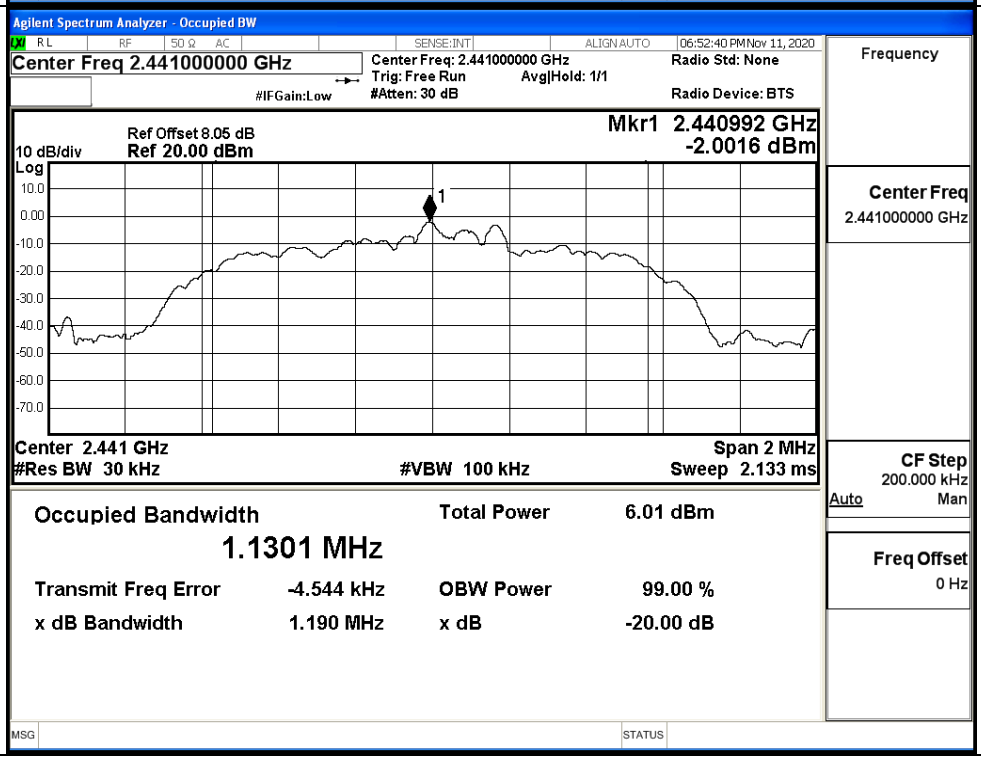
Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.050	Not Specified	PASS
	MCH	1.051	Not Specified	PASS
	HCH	1.051	Not Specified	PASS
π/4DQPSK	LCH	1.193	Not Specified	PASS
	MCH	1.190	Not Specified	PASS
	HCH	1.190	Not Specified	PASS
8DPSK	LCH	1.234	Not Specified	PASS
	MCH	1.230	Not Specified	PASS
	HCH	1.197	Not Specified	PASS

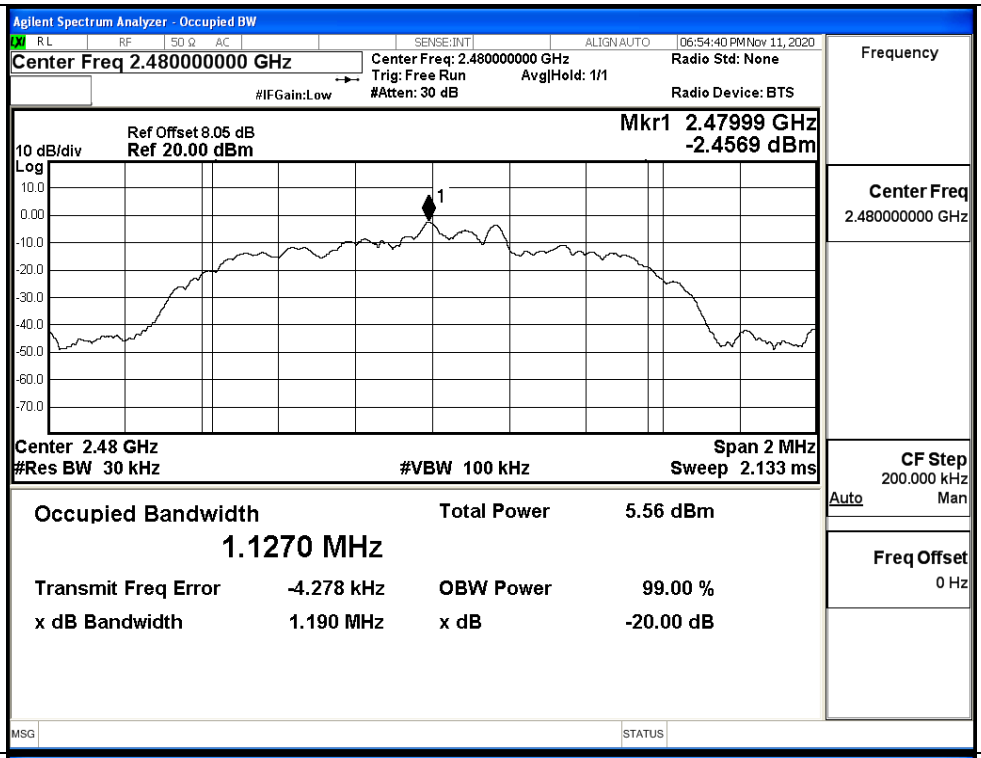
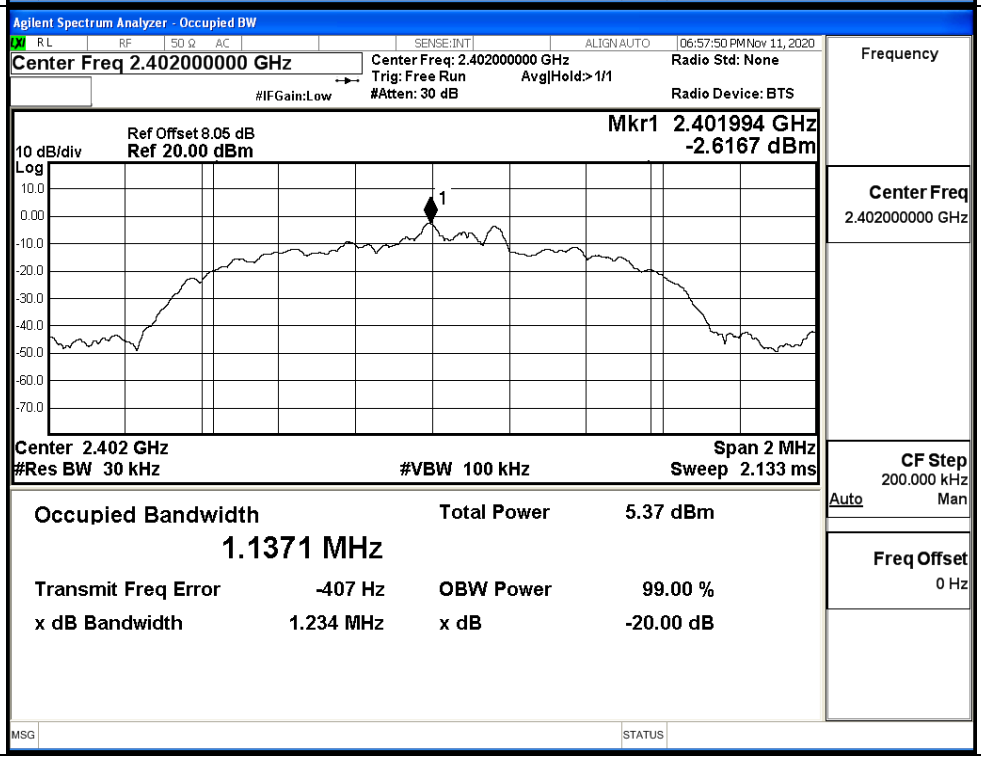
Test Graphs

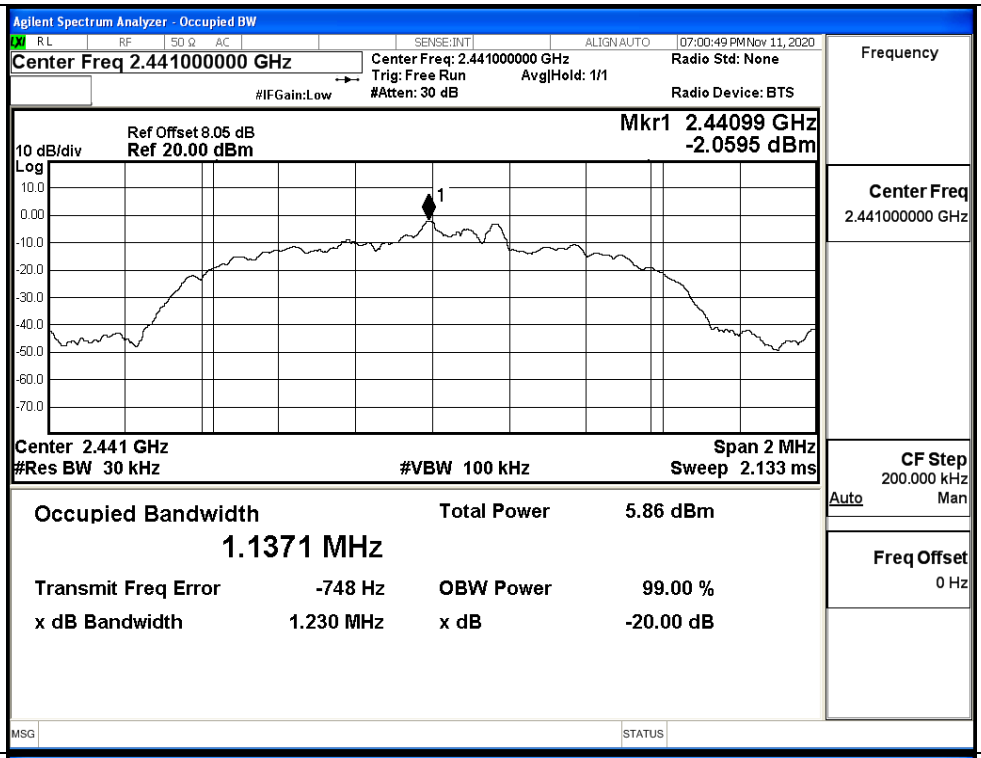
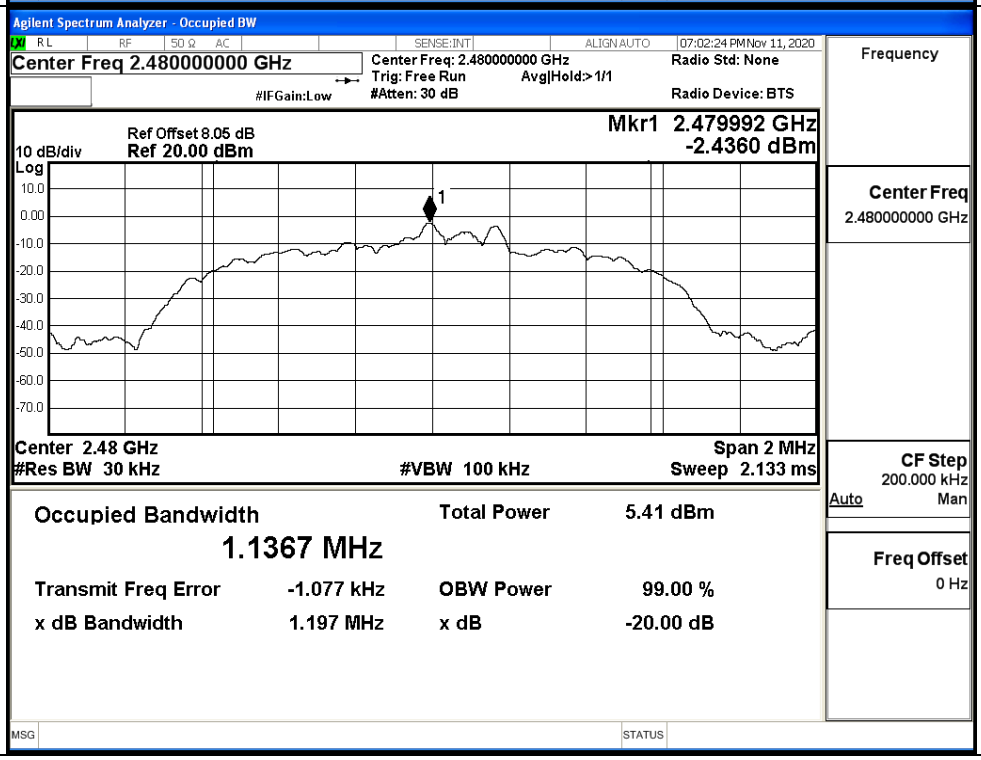
GFSK/LCH



GFSK/MCH	
GFSK/HCH	

π/4DQPSK/LCH	
π/4DQPSK/MCH	

π/4DQPSK/HCH	
8DPSK/LCH	

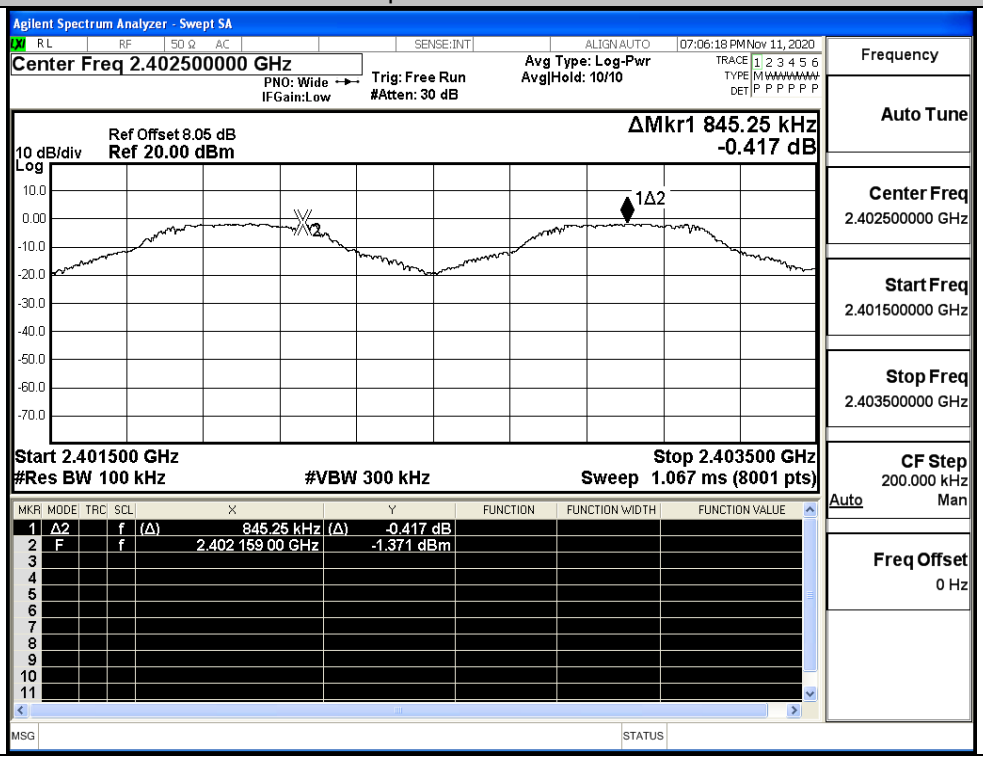
8DPSK/MCH	
8DPSK/HCH	

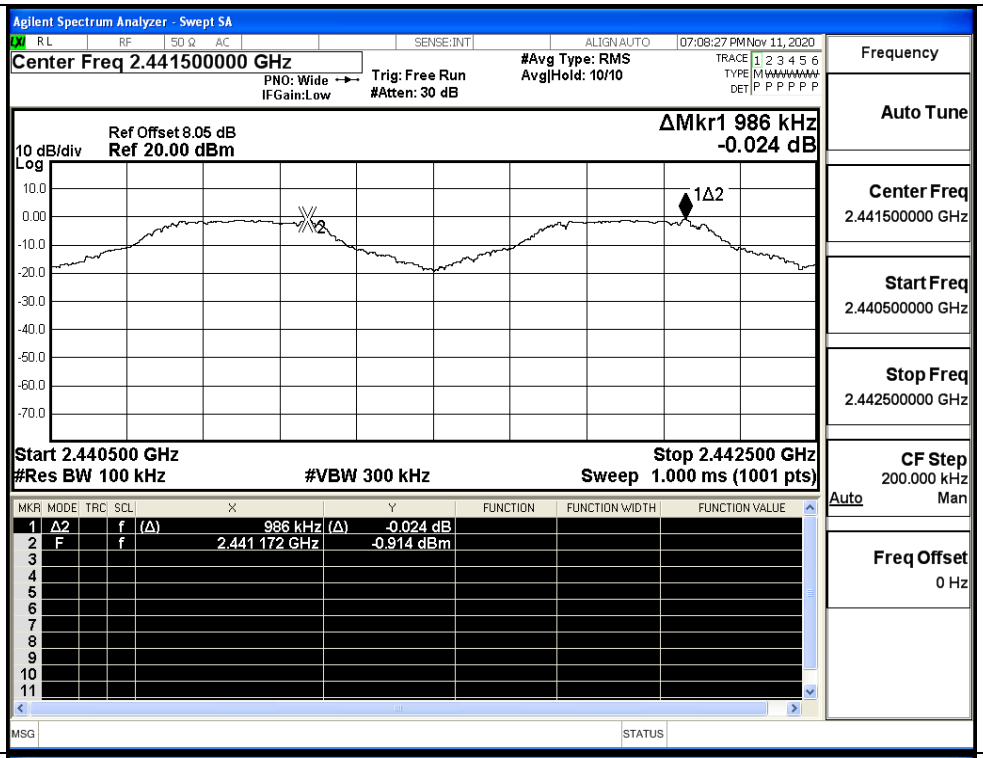
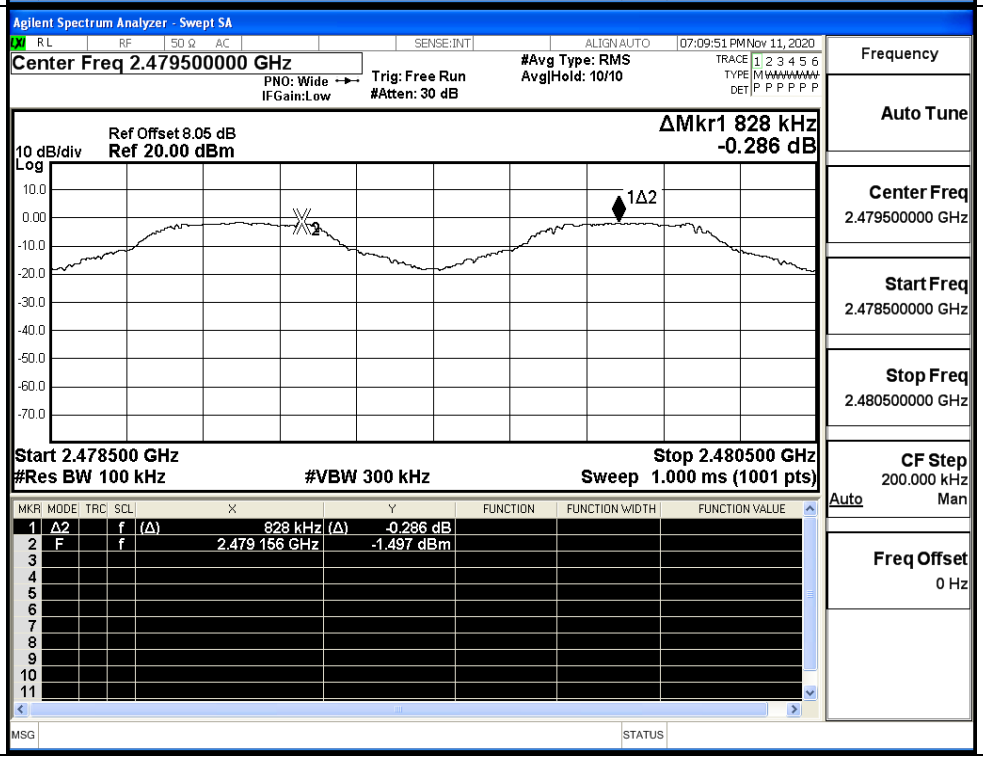
A.3 Carrier Frequency Separation

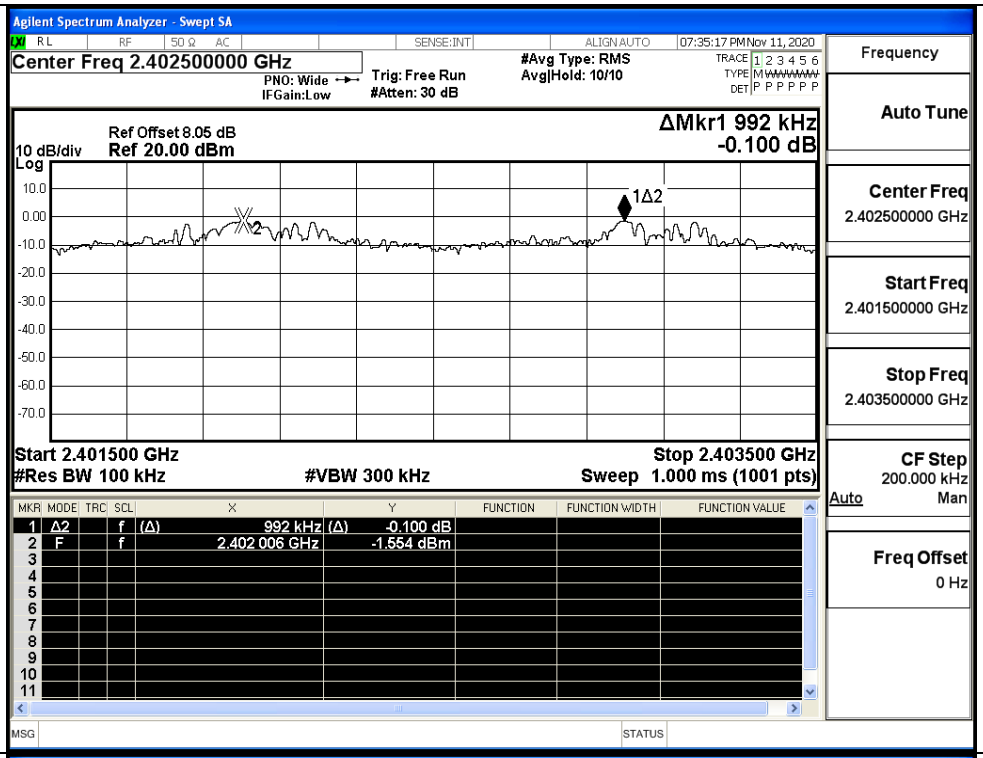
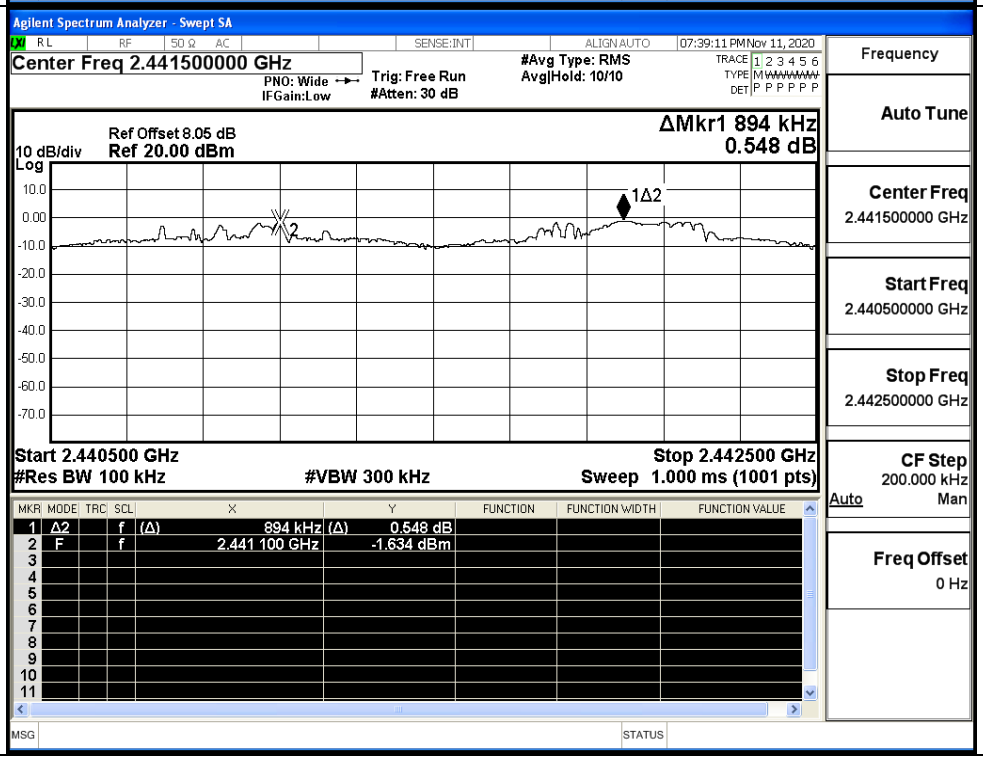
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.845	0.701	PASS
	MCH	0.986	0.701	PASS
	HCH	0.828	0.701	PASS
π/4DQPSK	LCH	0.992	0.795	PASS
	MCH	0.894	0.795	PASS
	HCH	1.040	0.795	PASS
8DPSK	LCH	0.888	0.823	PASS
	MCH	1.054	0.823	PASS
	HCH	1.136	0.823	PASS

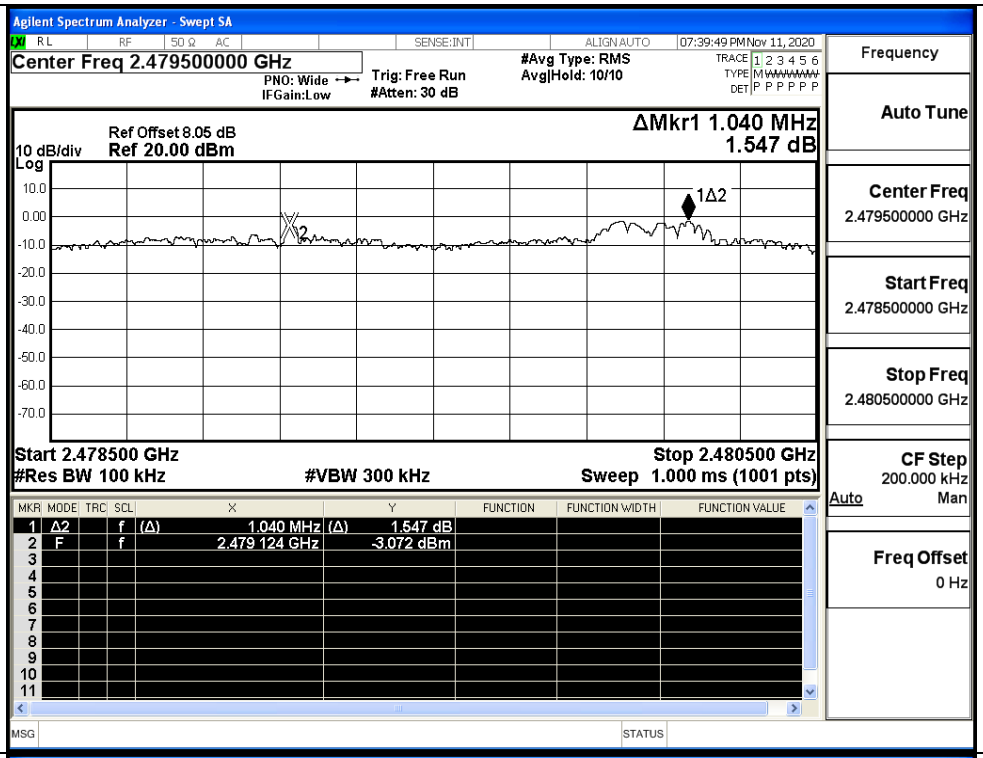
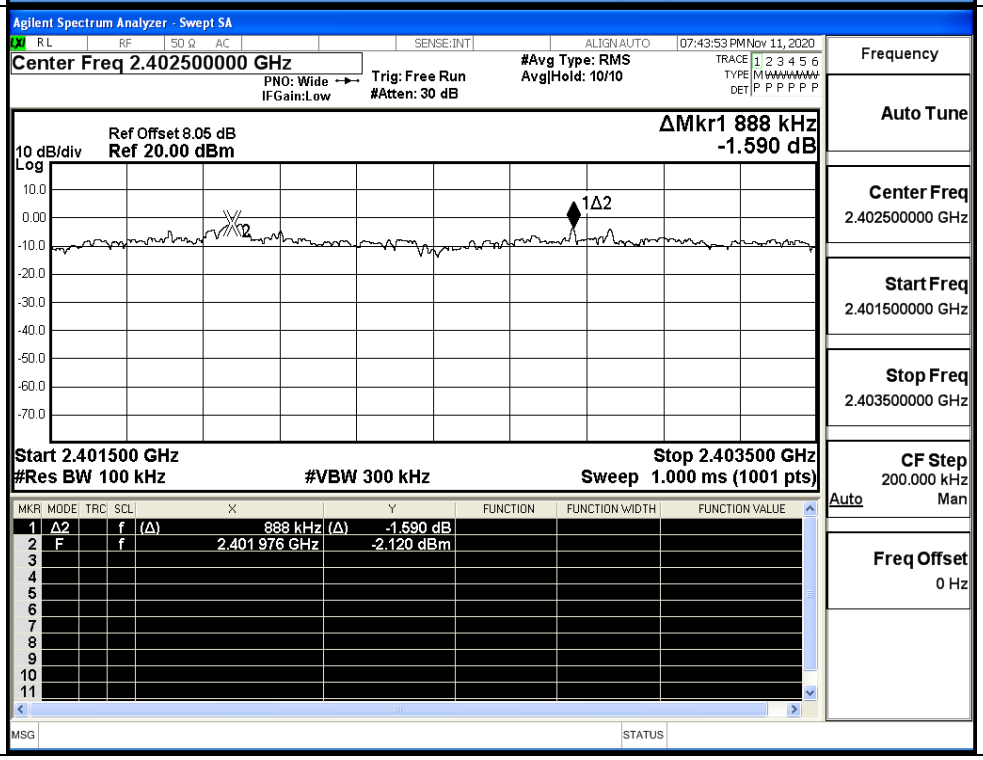
Test Graphs

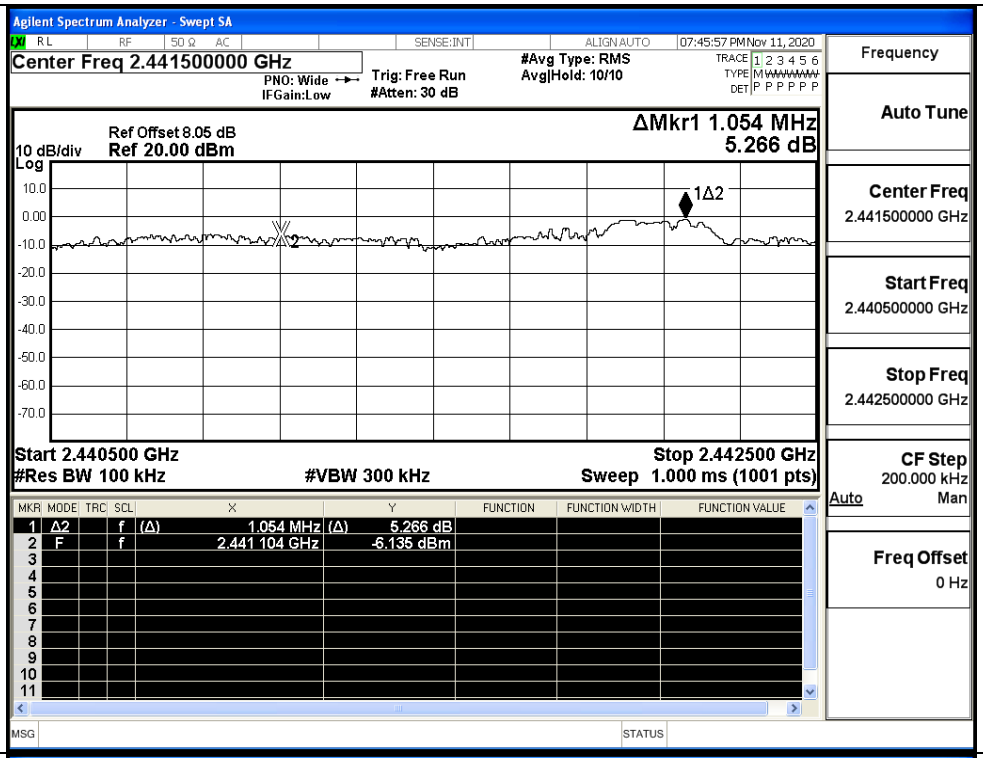
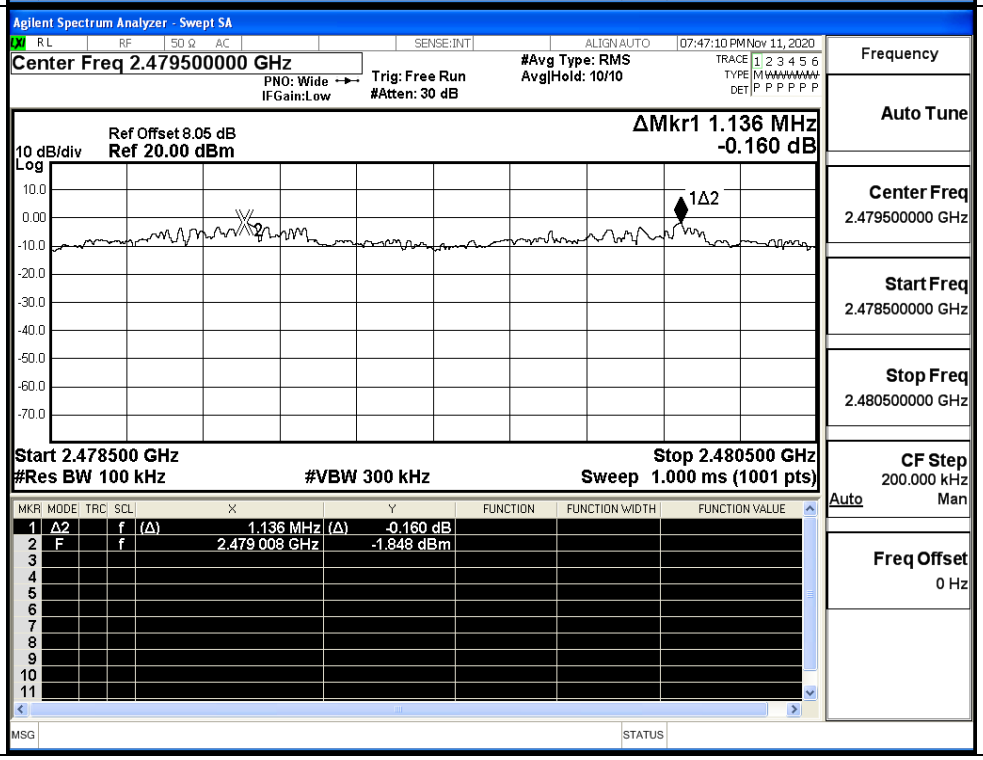
GFSK/LCH



GFSK/MCH	
GFSK/HCH	

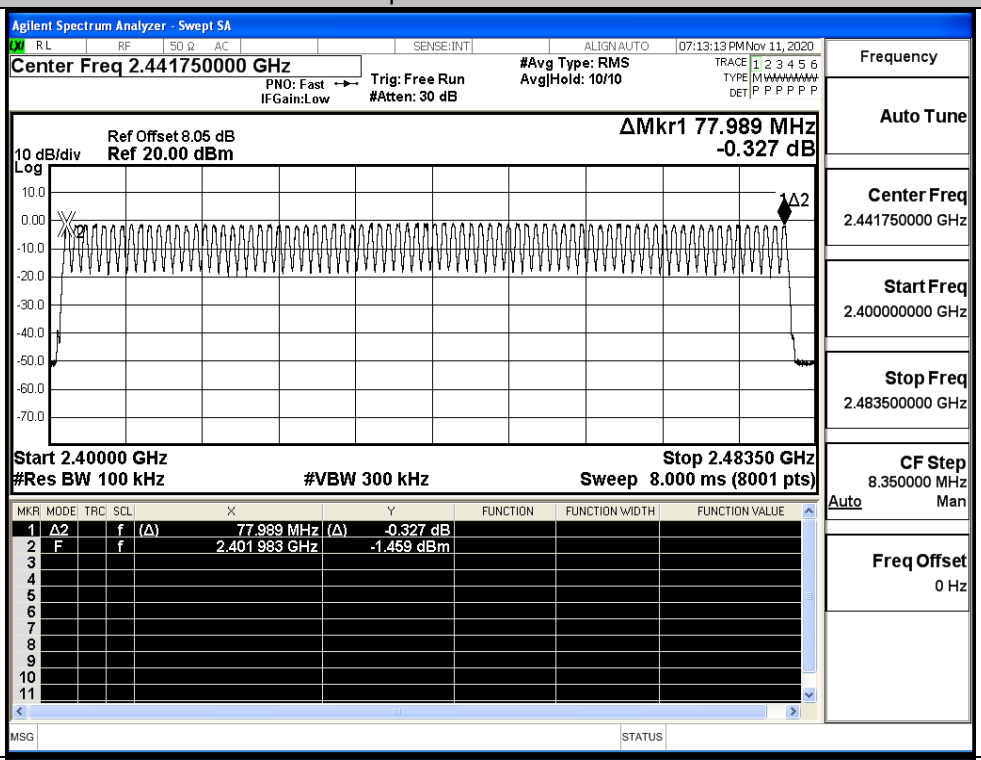
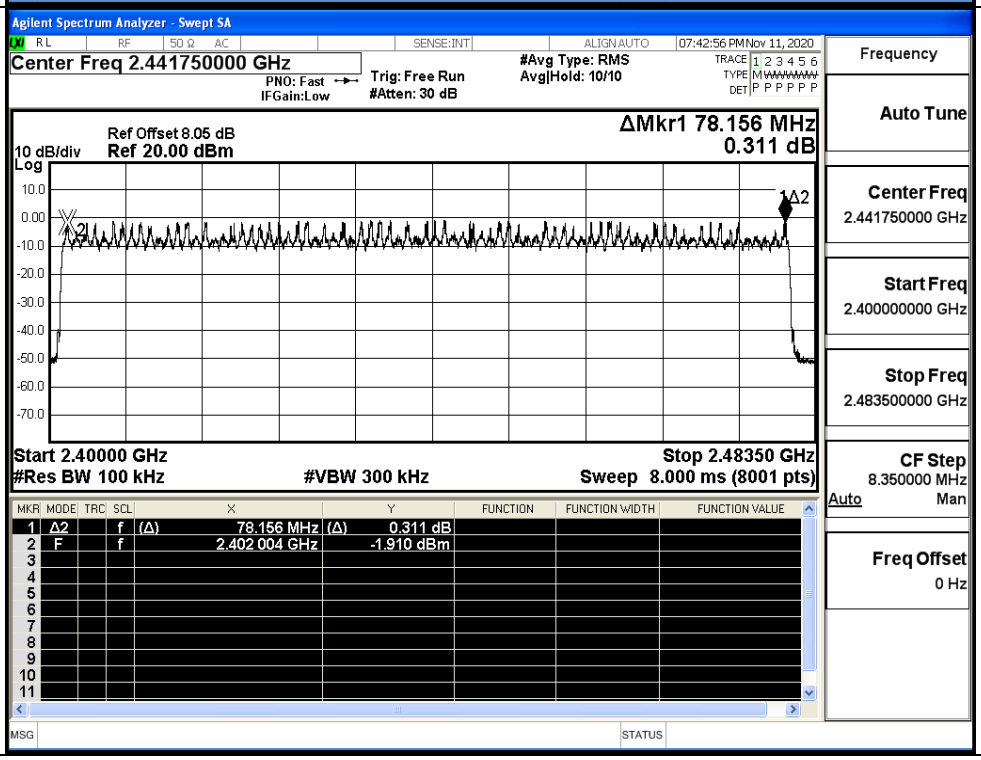
π/4DQPSK/LCH	
π/4DQPSK/MCH	

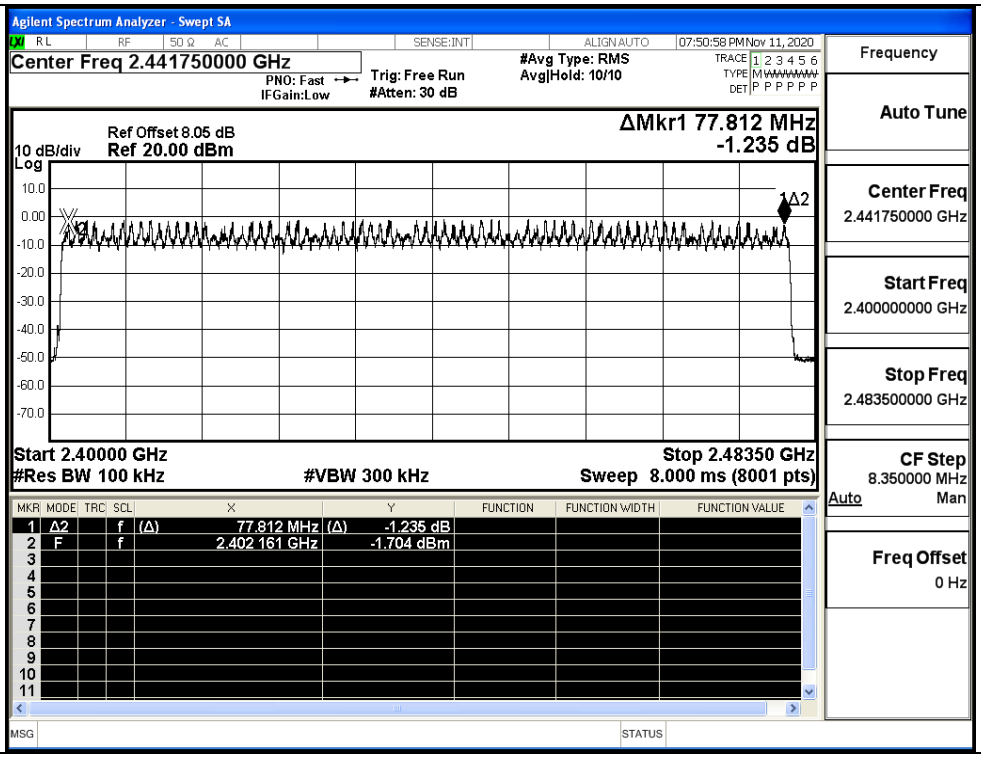
π/4DQPSK/HCH	
8DPSK/LCH	

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	

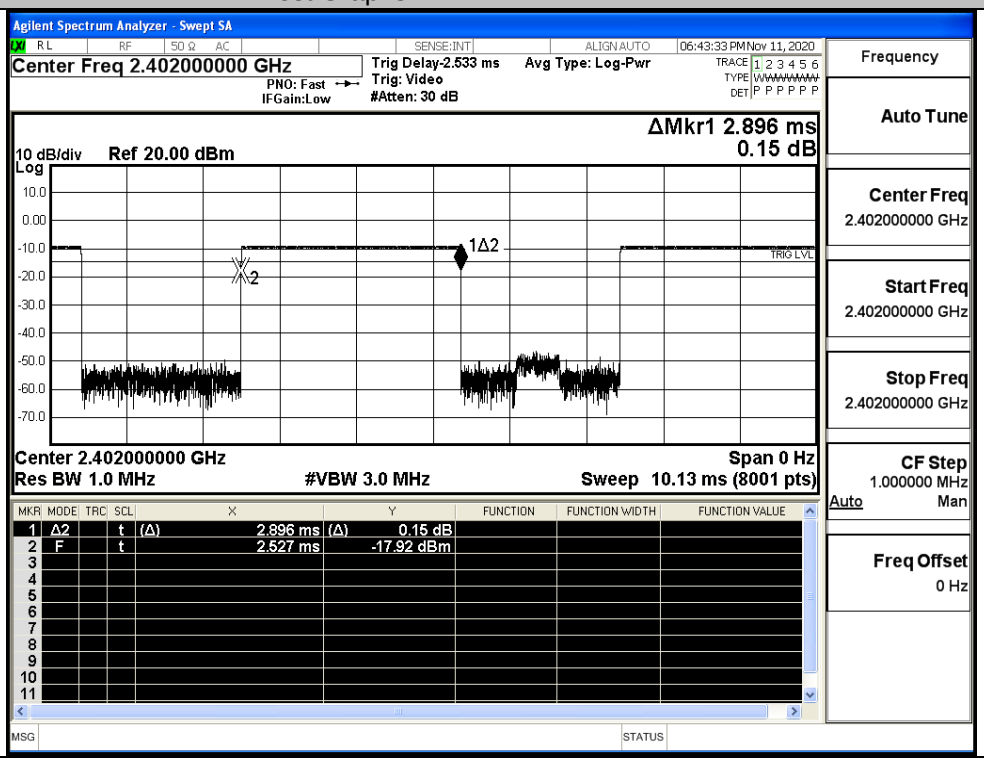
Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441750000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 10/10
07:50:58 PM Nov 11, 2020
Ref Offset 8.05 dB
10 dB/div
Log
Ref 20.00 dBm
ΔMkr1 77.812 MHz
-1.235 dB
Start 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 8.000 ms (8001 pts)
1 Δ2 f (Δ) 77.812 MHz (Δ) -1.235 dB
2 F f 2.402 161 GHz -1.704 dBm
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

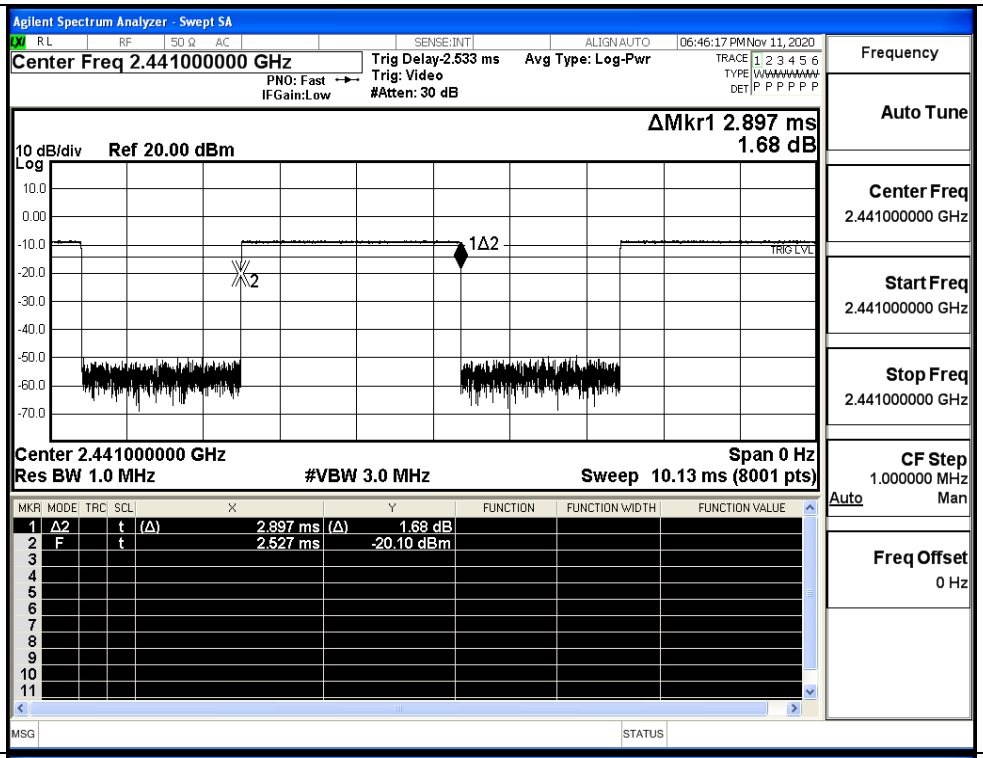
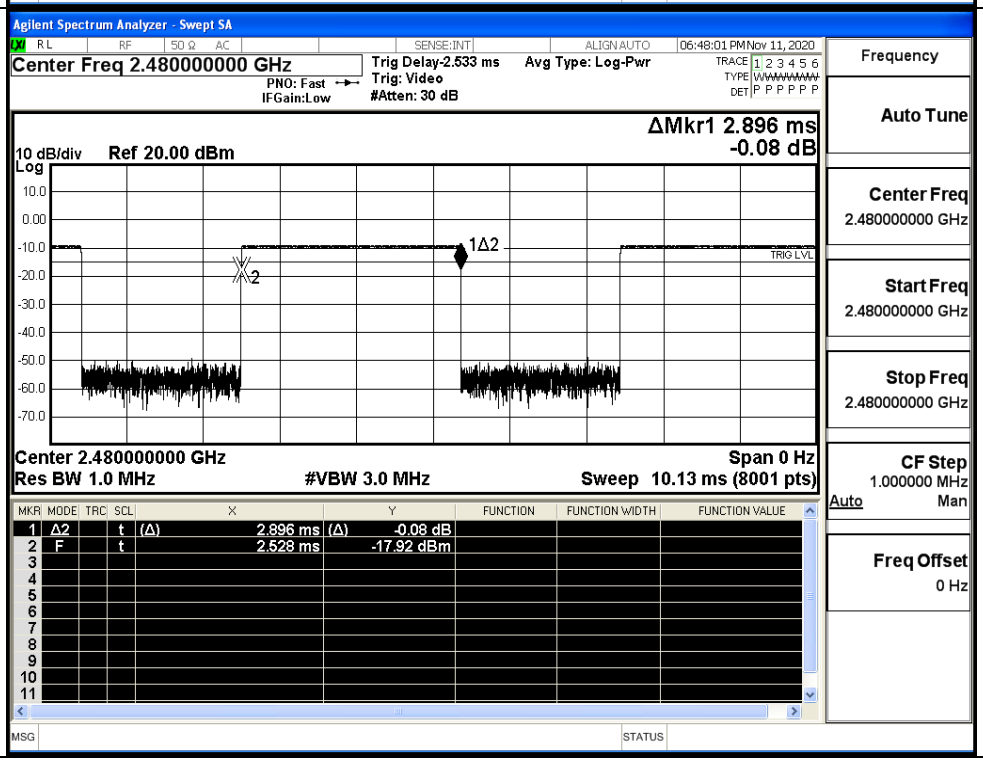
A.5 Dwell Time

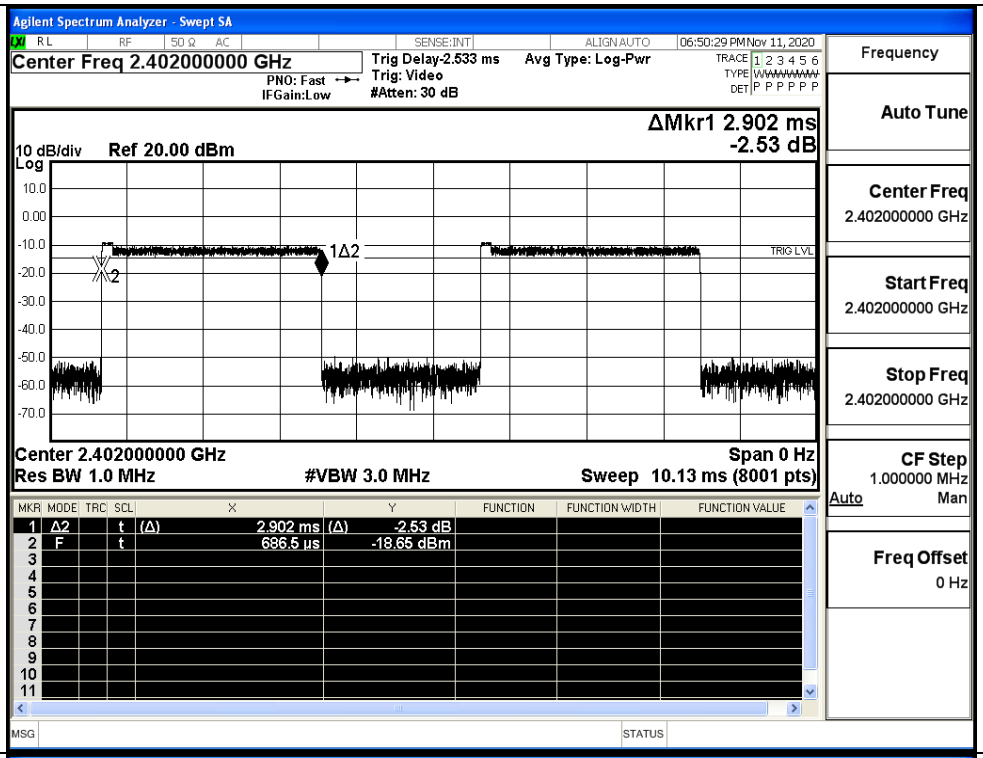
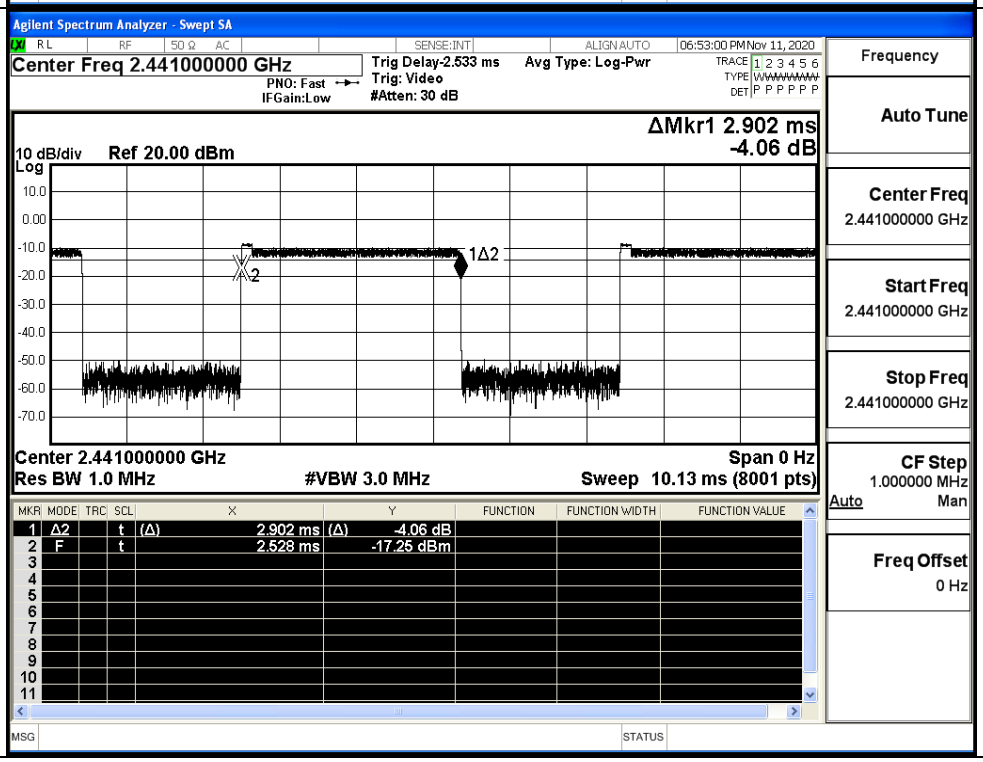
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.9	106.7	0.309	0.4	PASS
	DH5	MCH	2.9	106.7	0.309	0.4	PASS
	DH5	HCH	2.9	106.7	0.309	0.4	PASS
π/4DQPSK	2DH5	LCH	2.9	106.7	0.309	0.4	PASS
	2DH5	MCH	2.9	106.7	0.309	0.4	PASS
	2DH5	HCH	2.9	106.7	0.309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

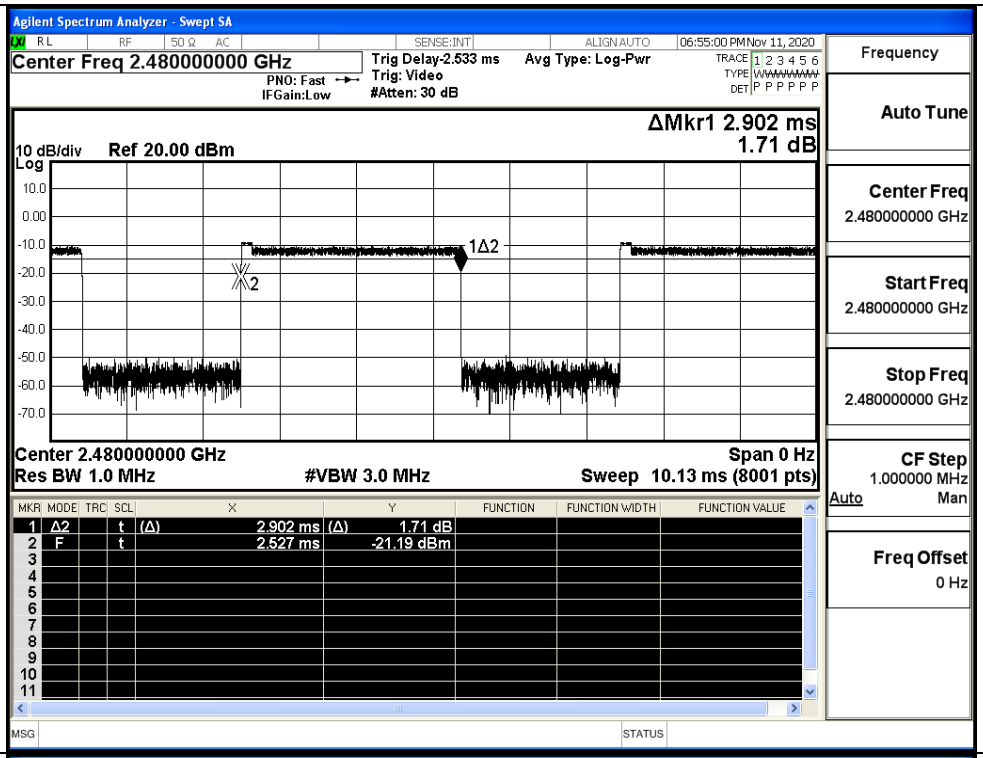
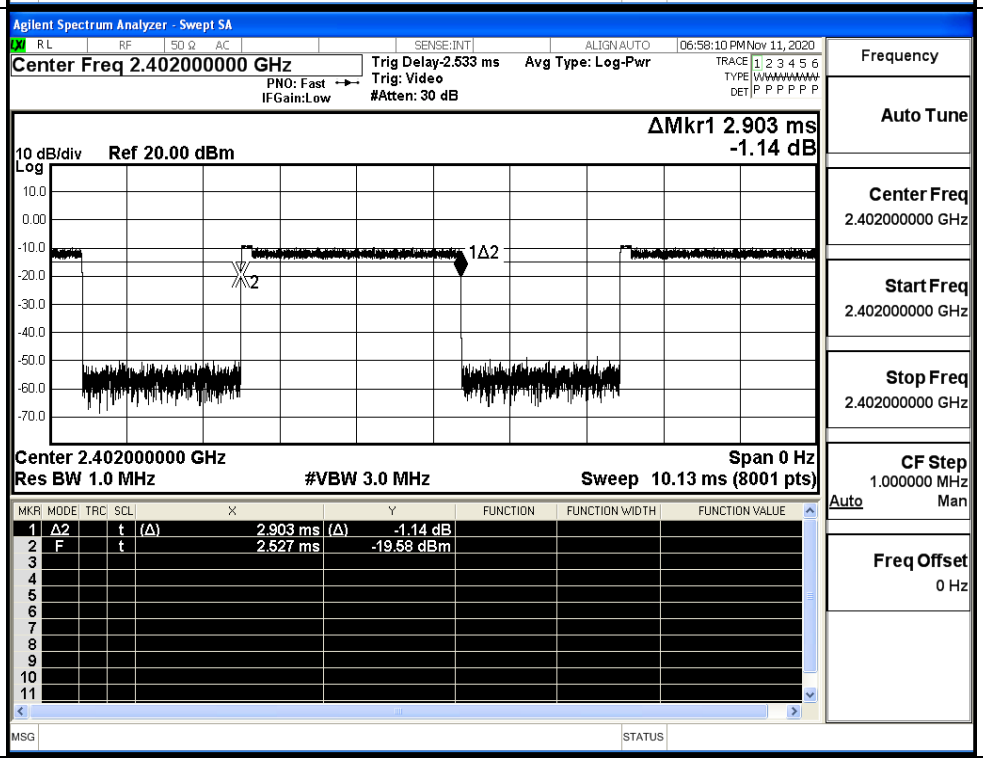
Test Graphs

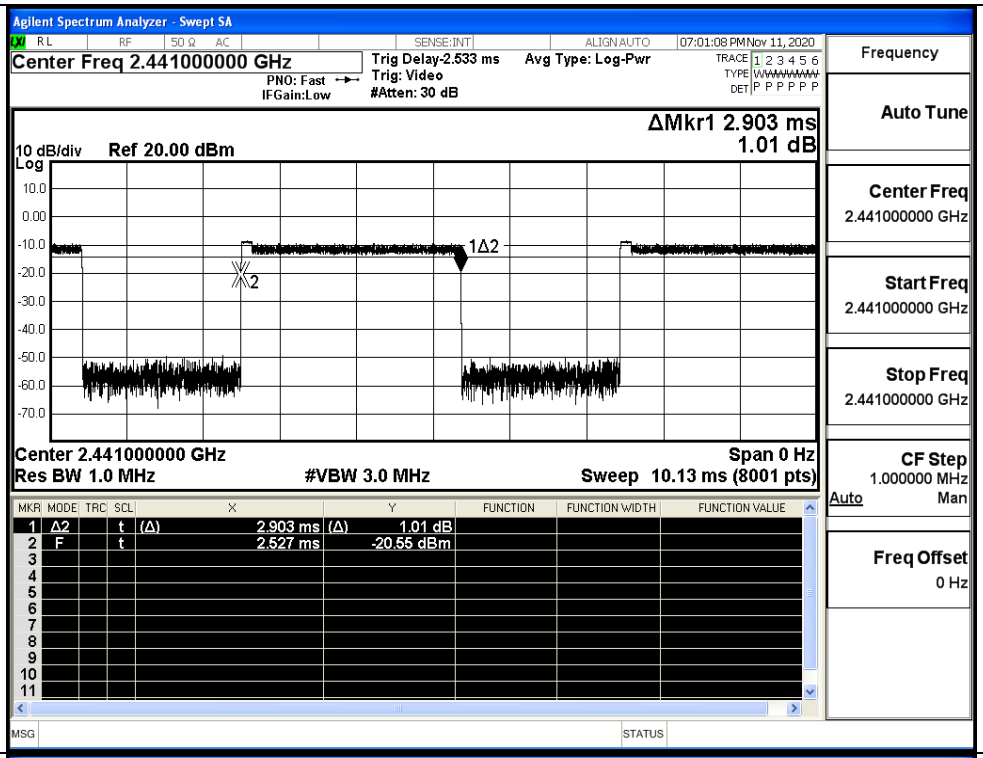
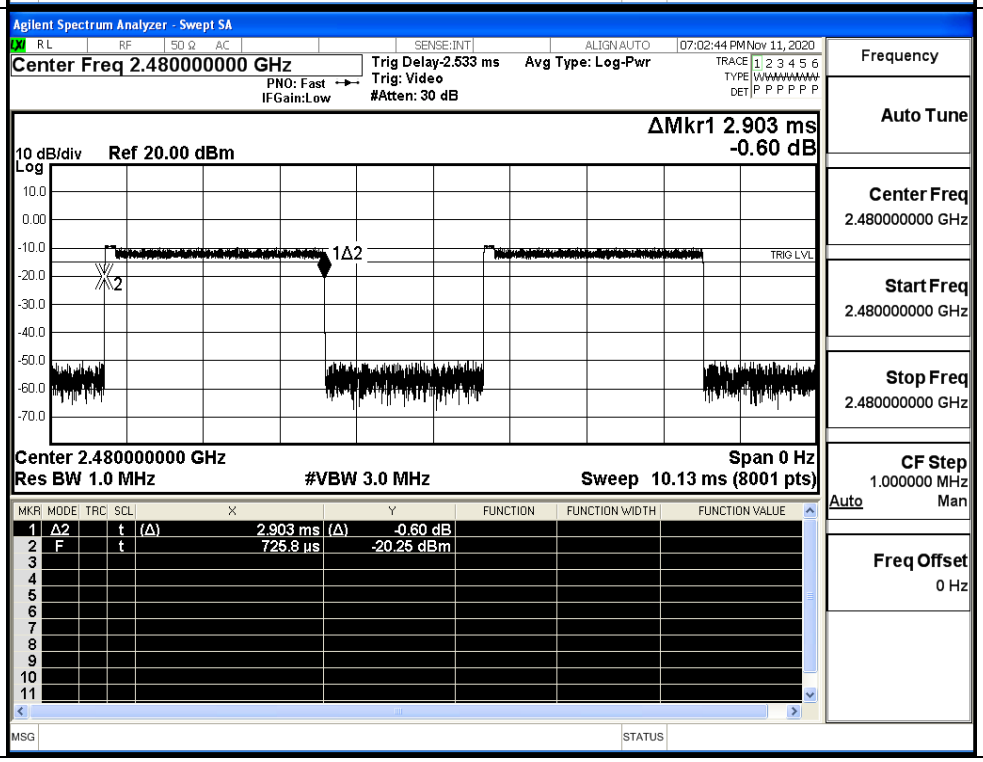
GFSK_DH5/LCH



GFSK_DH5/MCH	
GFSK_DH5/HCH	

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

π/4DQPSK _2DH5/HCH	
8DPSK _3DH5/LCH	

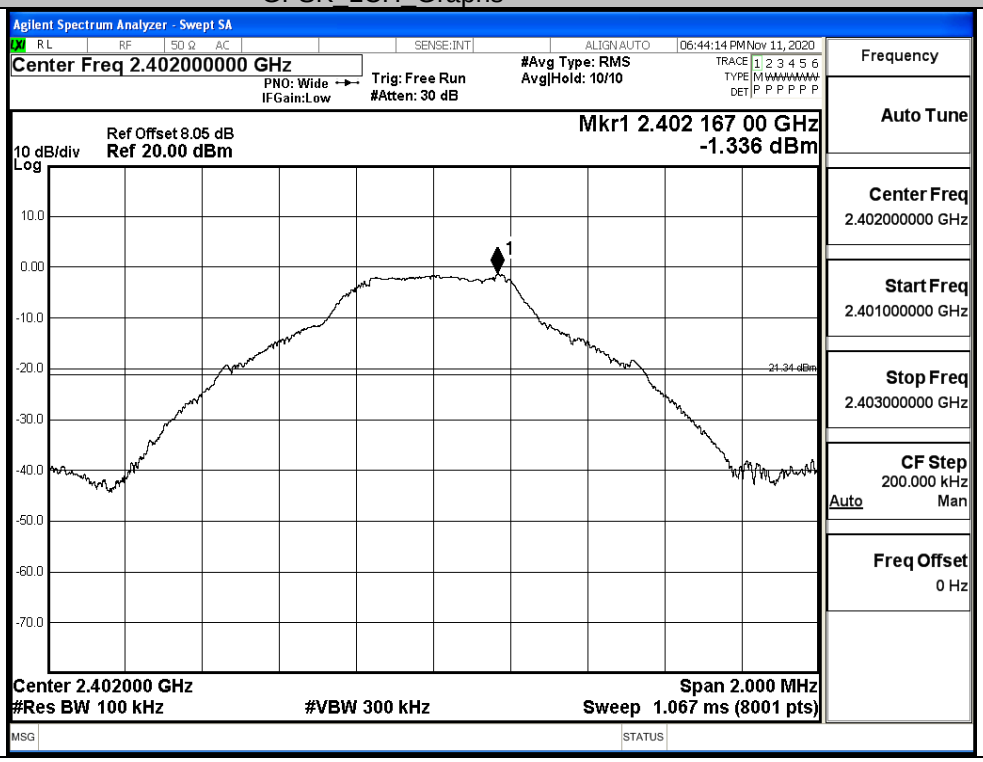
8DPSK _3DH5/MCH	
8DPSK _3DH5/HCH	

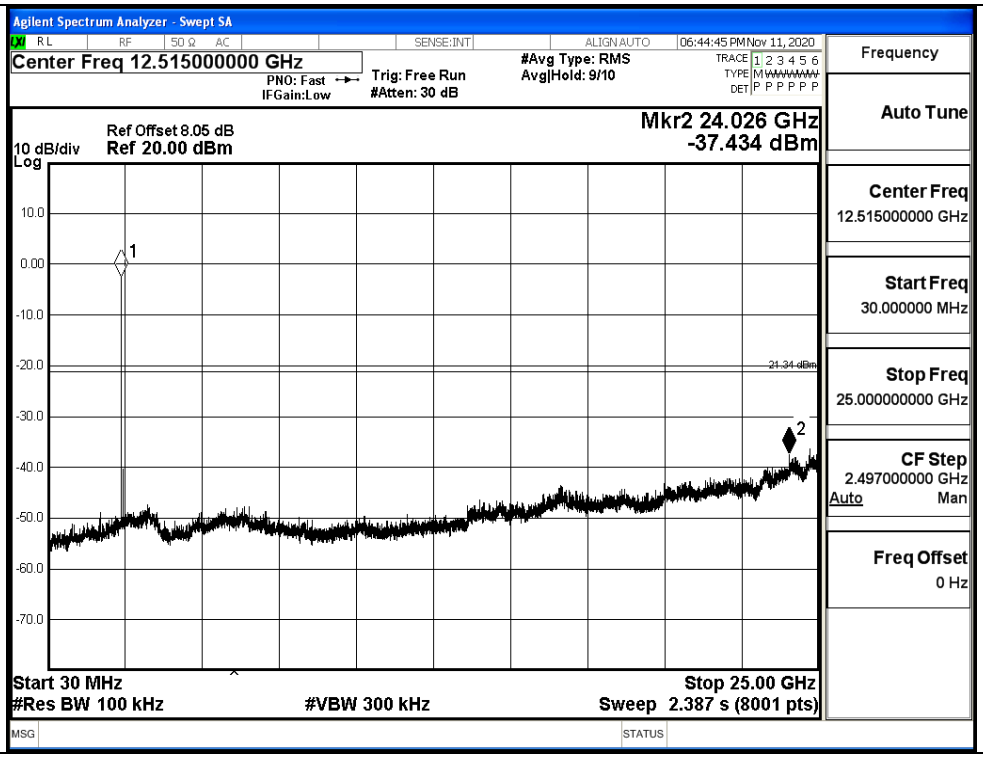
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-1.336	-37.434	-21.336	PASS
	MCH	-0.996	-36.860	-20.996	PASS
	HCH	-1.577	-37.777	-21.577	PASS
π/4DQPSK	LCH	-1.468	-37.673	-21.468	PASS
	MCH	-1.506	-37.732	-21.506	PASS
	HCH	-2.089	-36.665	-22.089	PASS
8DPSK	LCH	-1.362	-36.264	-21.362	PASS
	MCH	-0.916	-37.952	-20.916	PASS
	HCH	-1.394	-37.134	-21.394	PASS

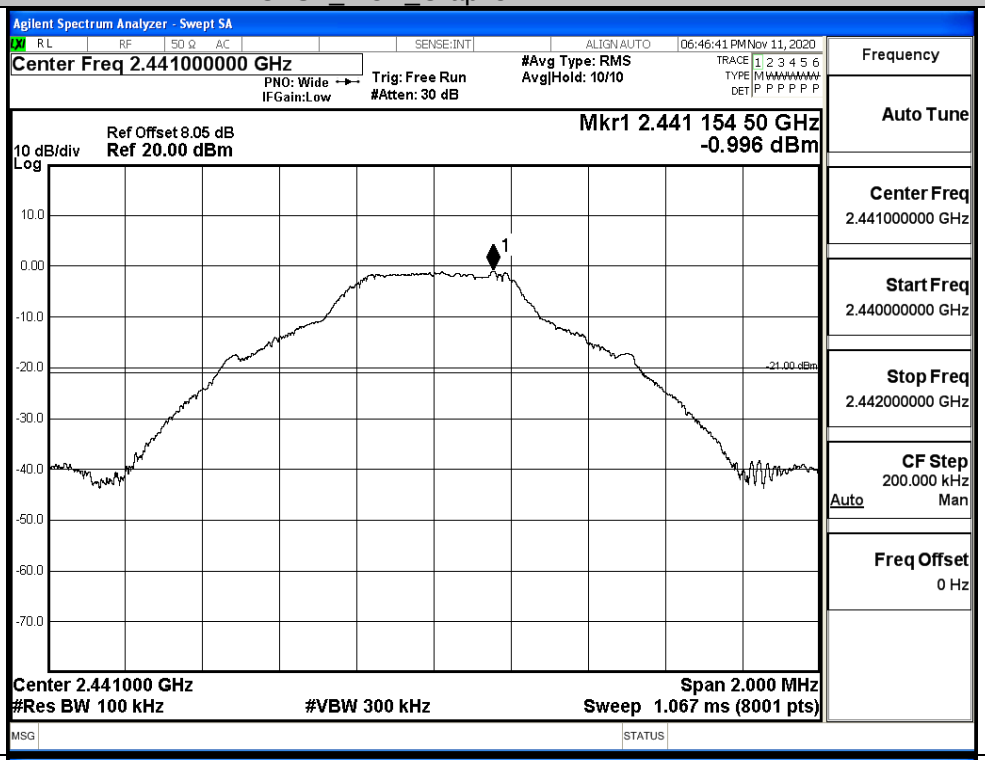
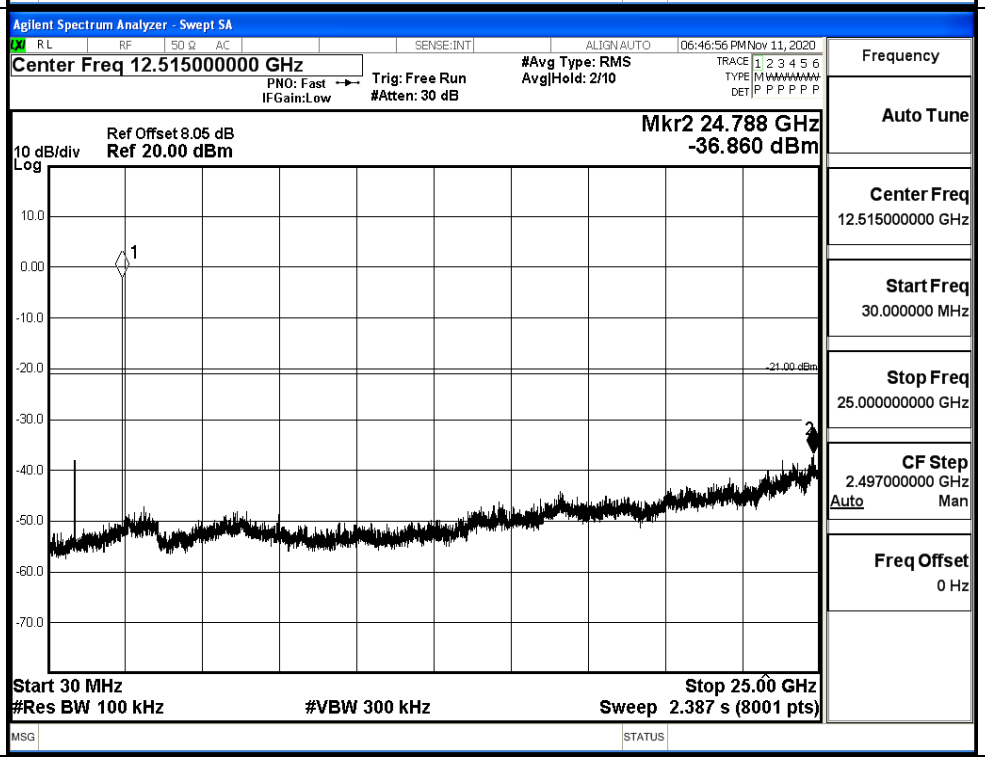
GFSK_LCH_Graphs

Pref



Puw		

Agilent Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
ALIGN AUTO
06:44:45 PM Nov 11, 2020
Center Freq 12.515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 9/10
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 24.026 GHz
-37.434 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
2
-21.34 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.387 s (8001 pts)
MSG
STATUS
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

GFSK_MCH_Graphs			
Pref			
Puw			

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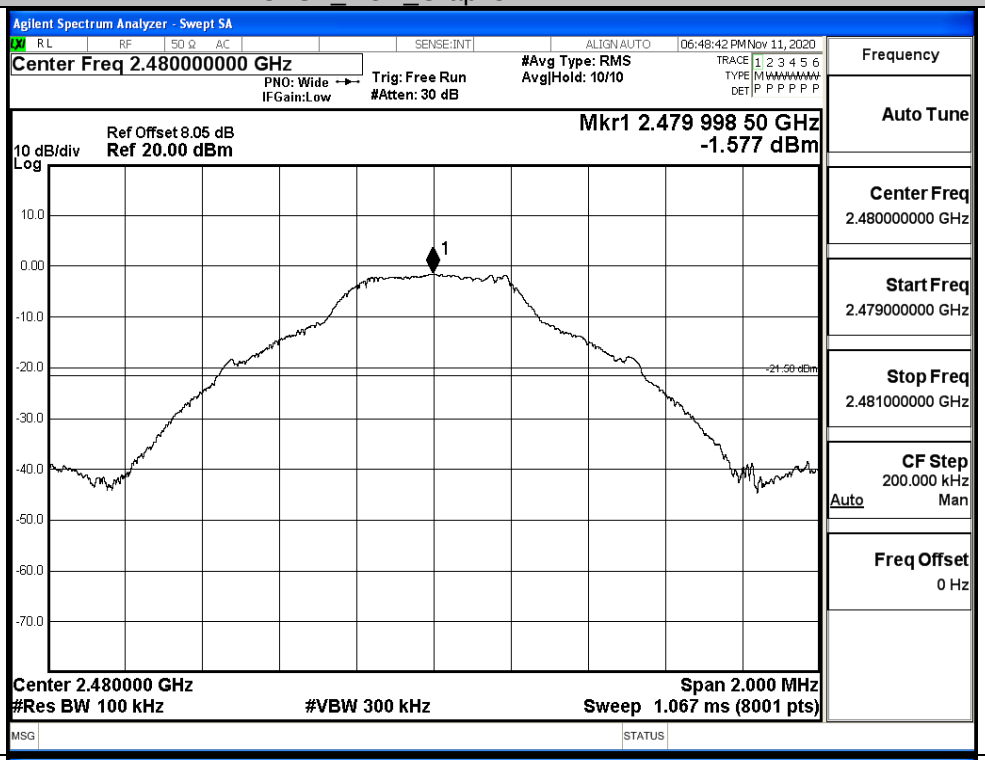
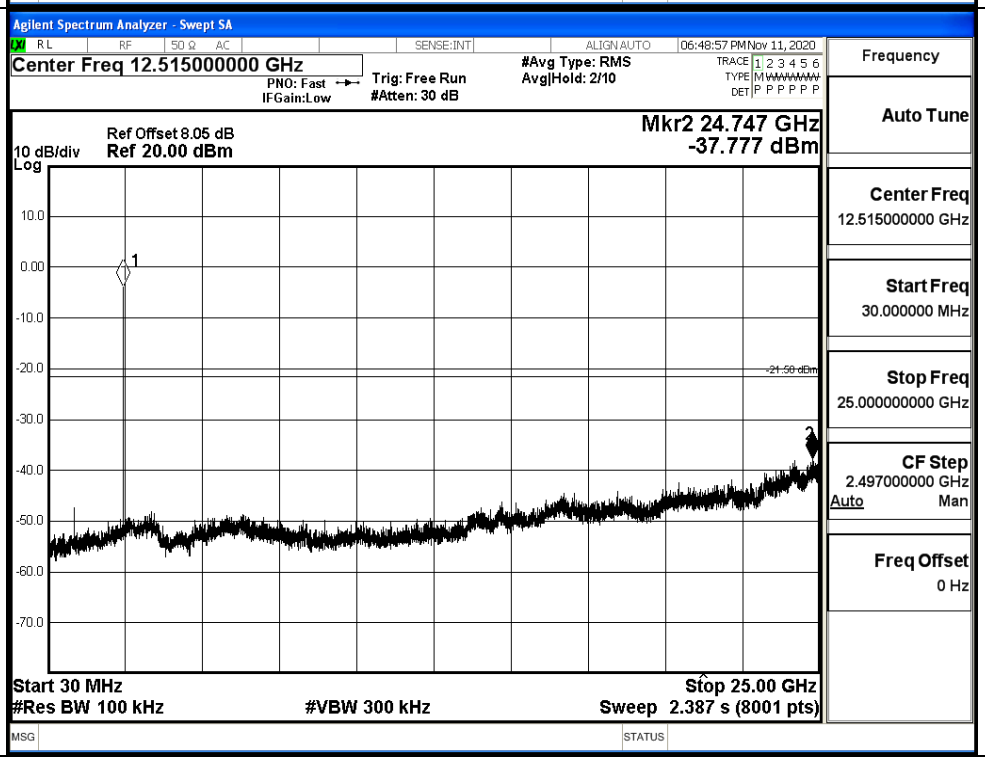
Pref			
Puw			

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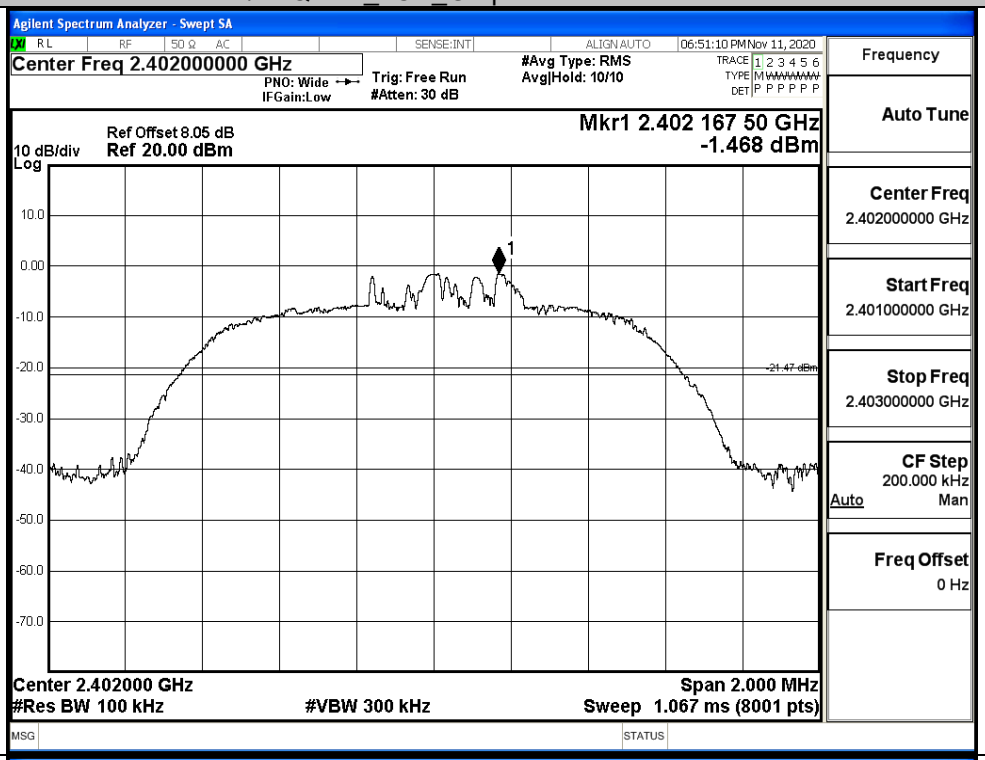
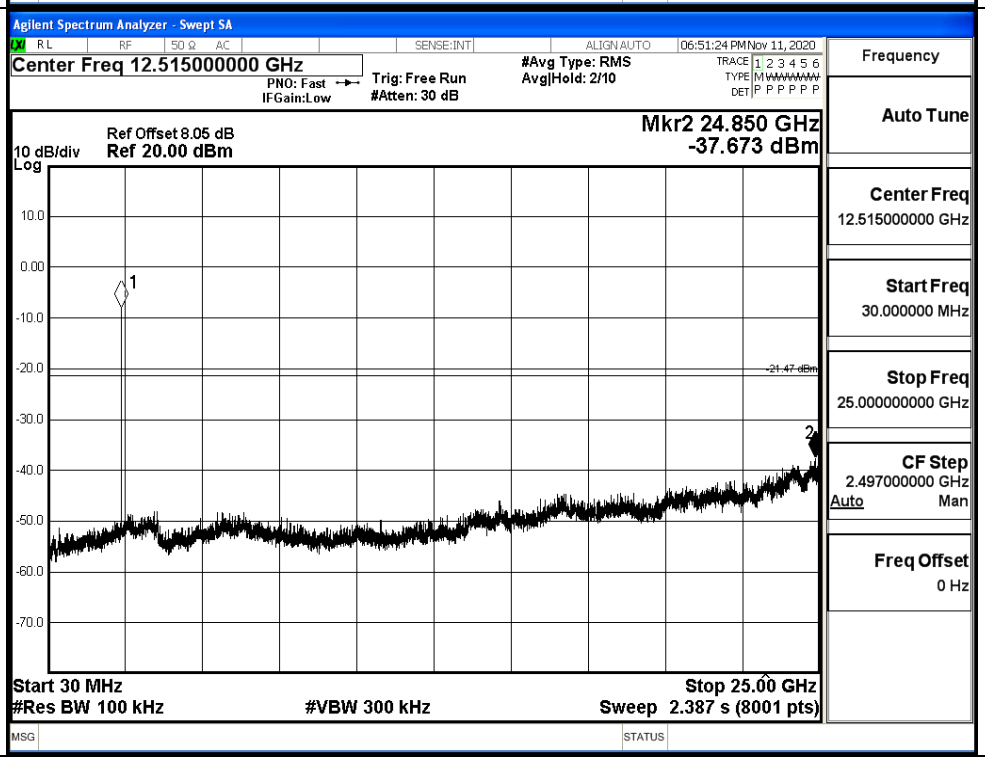
Pref		
Puw		

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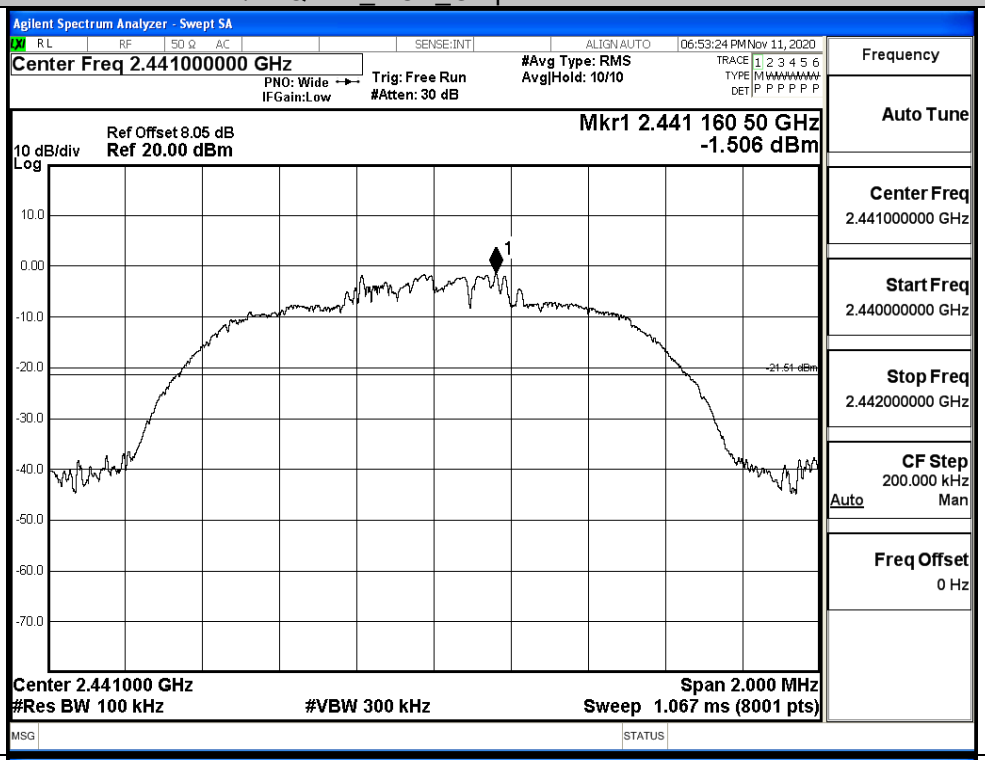
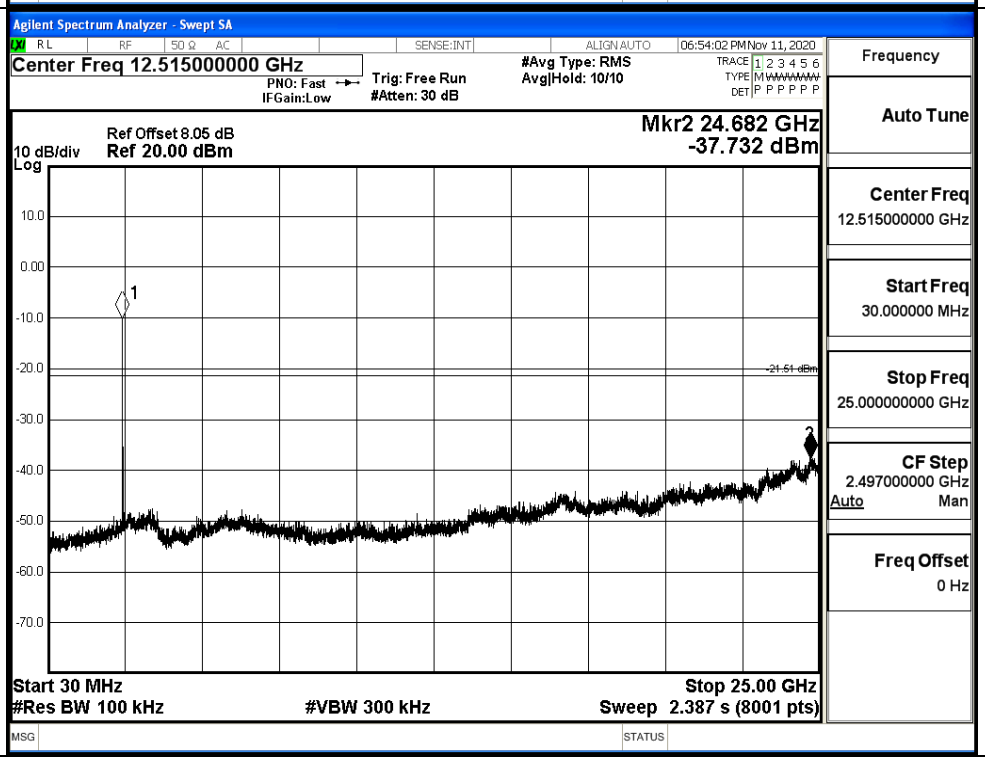
Pref			
Puw			

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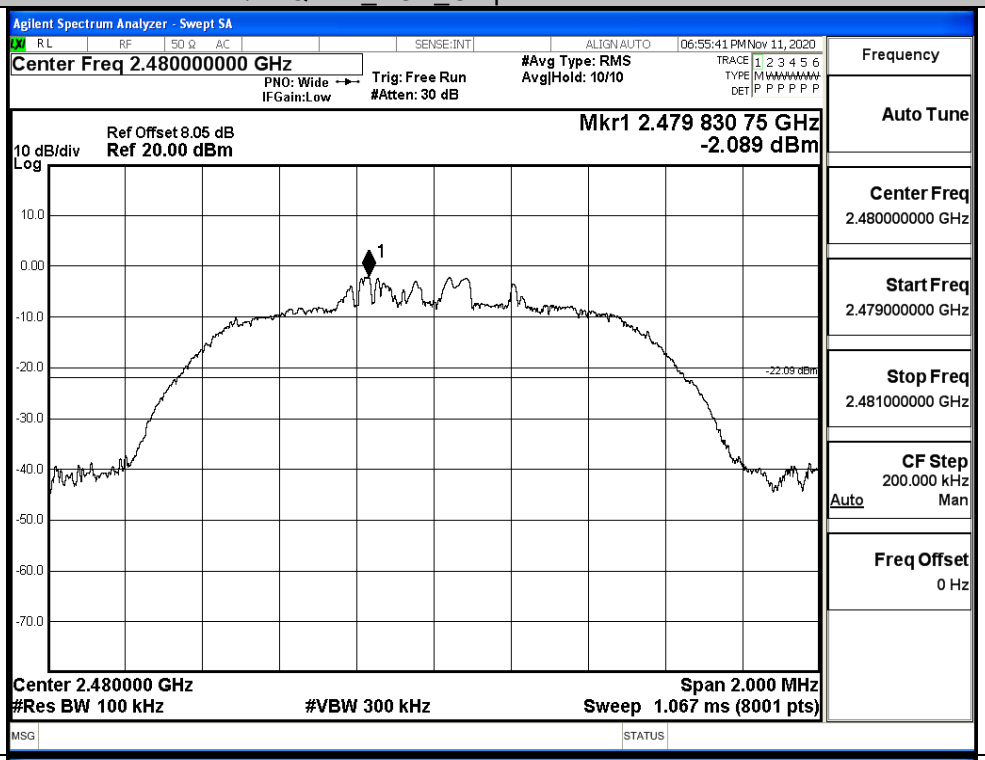
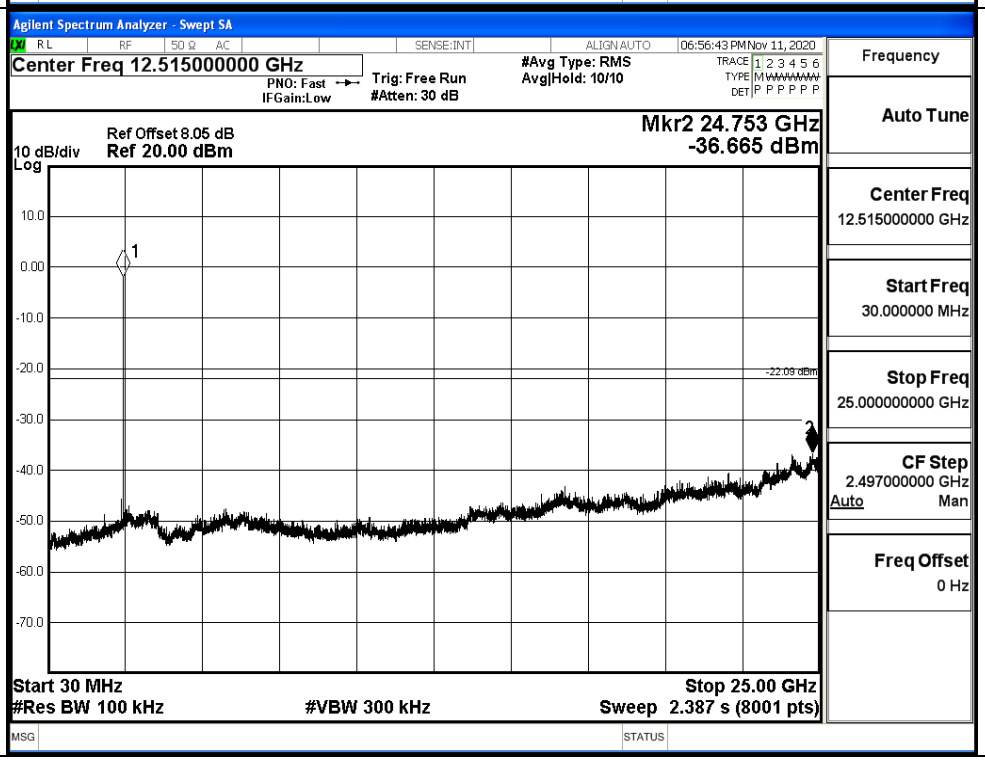
Pref			
Puw			

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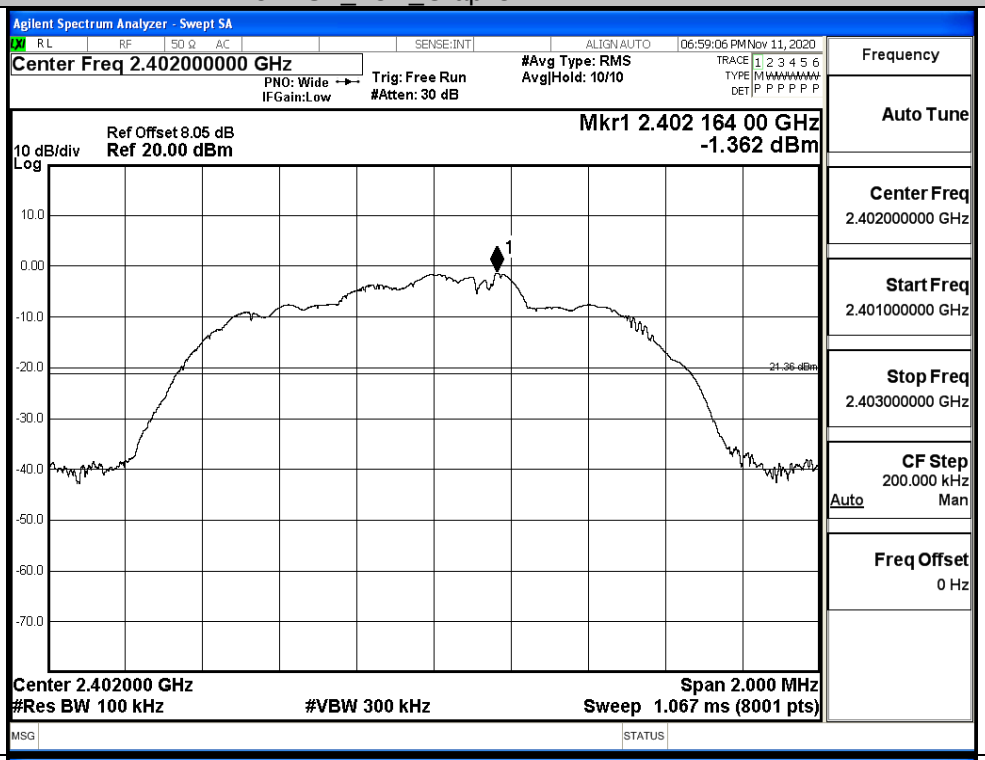
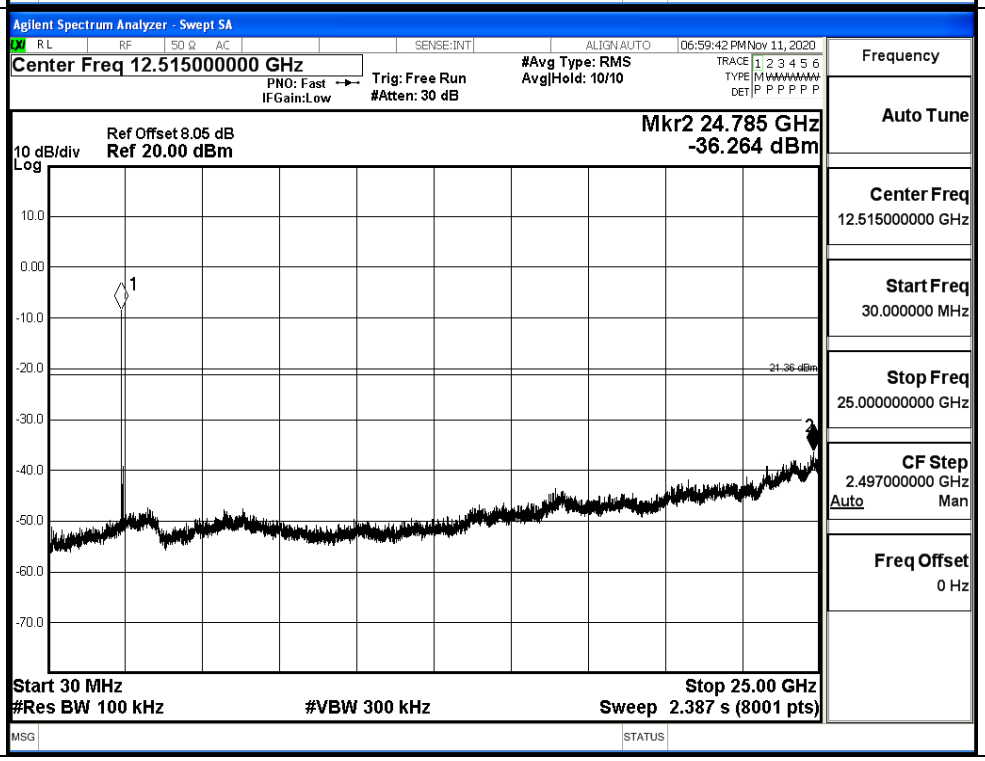
Pref		
Puw		

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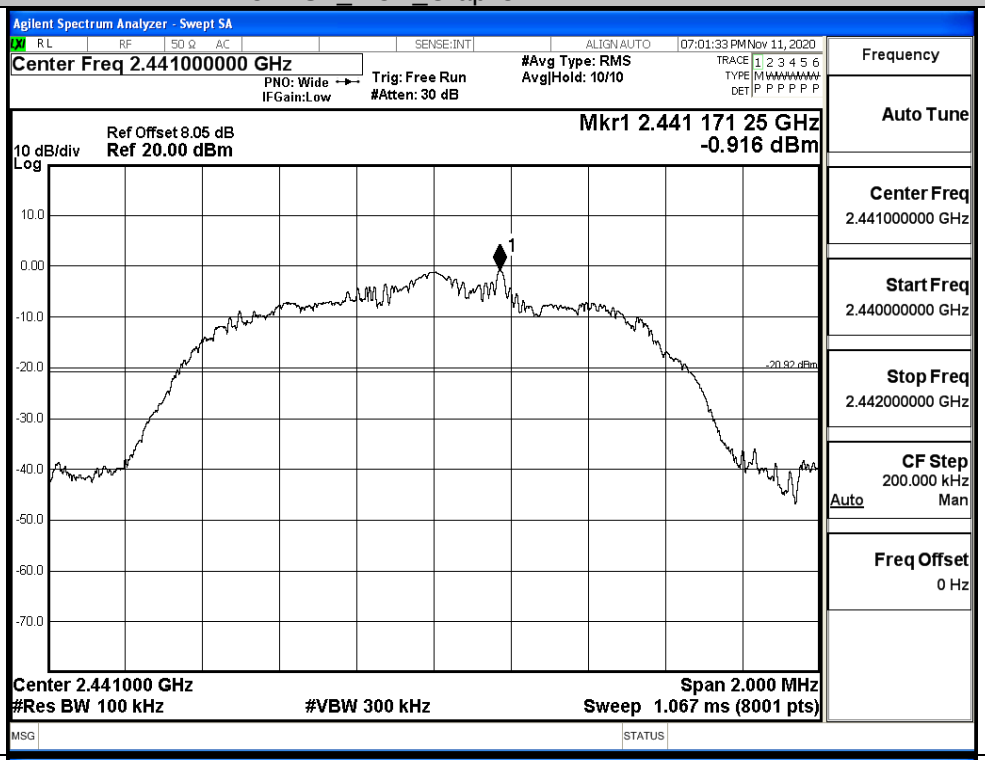
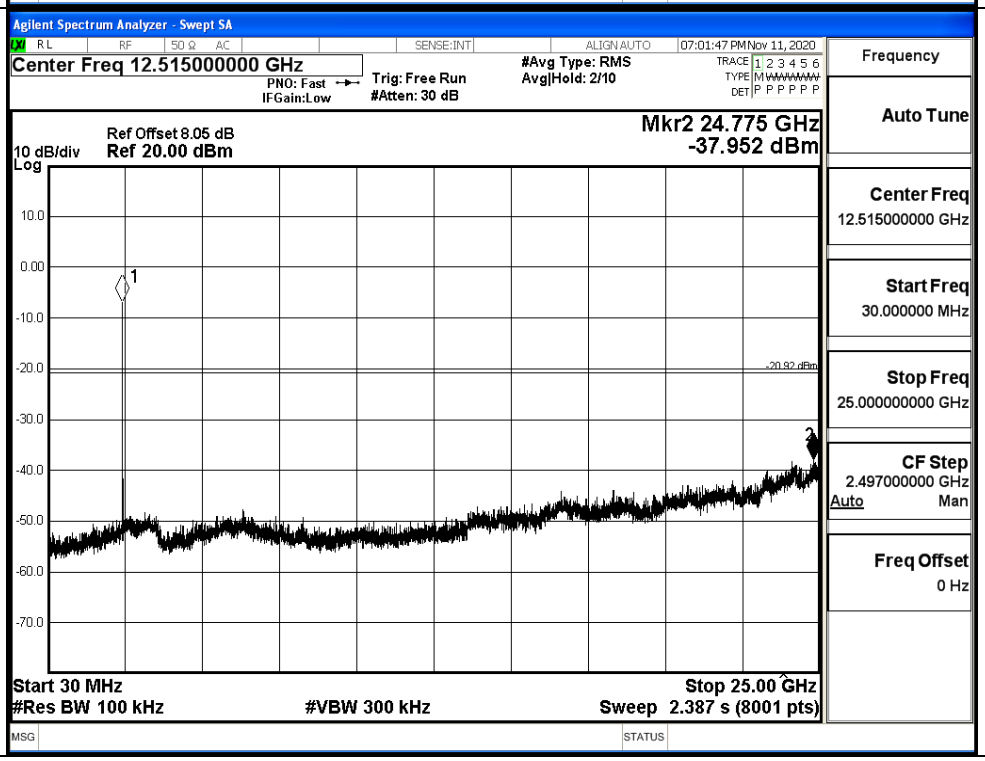
Pref			
Puw			

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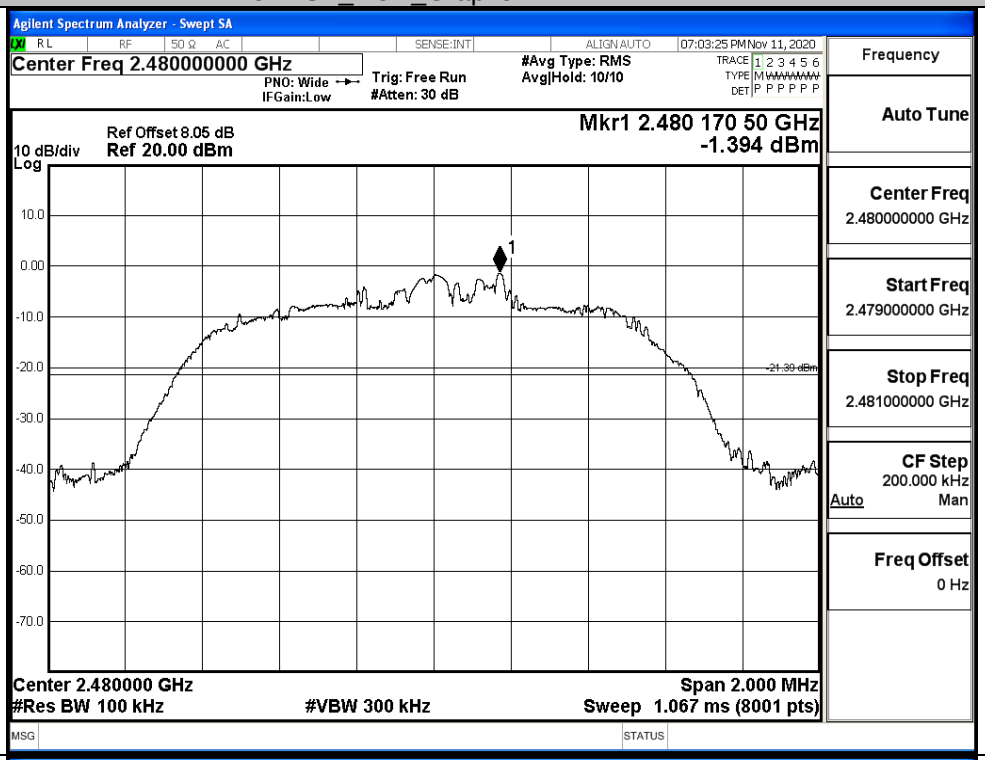
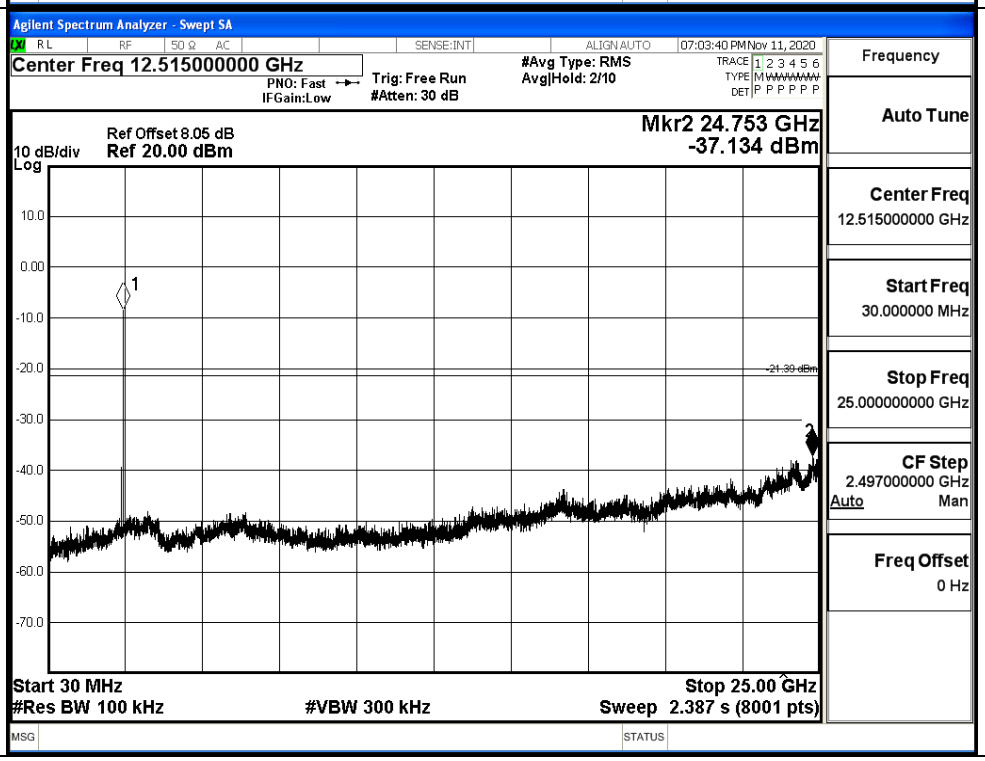
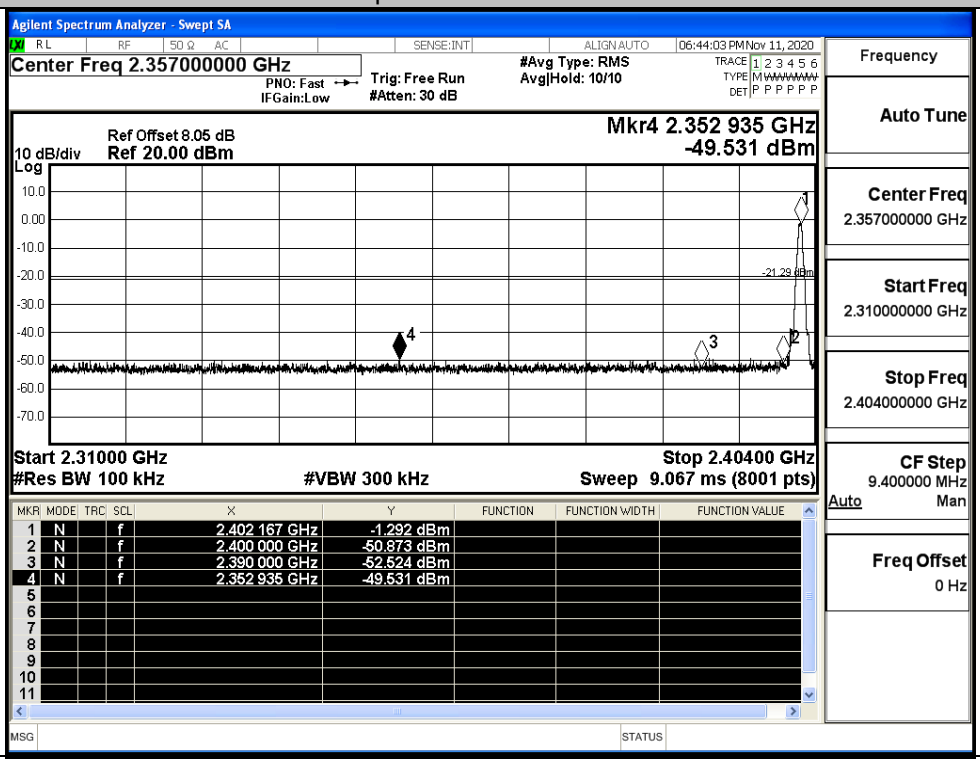
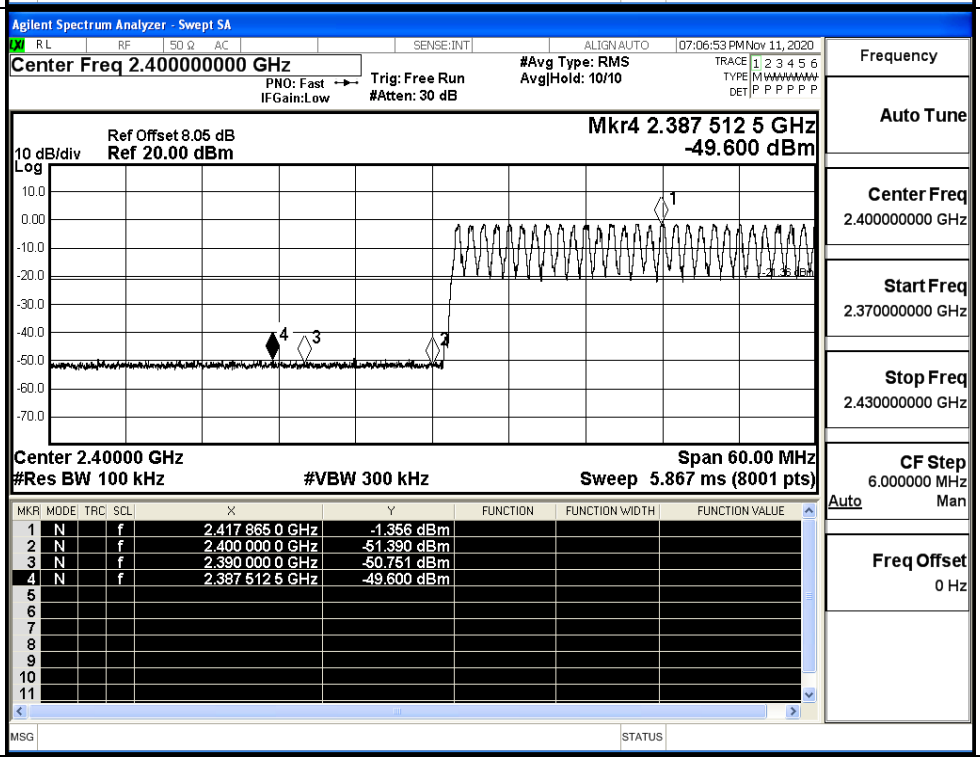
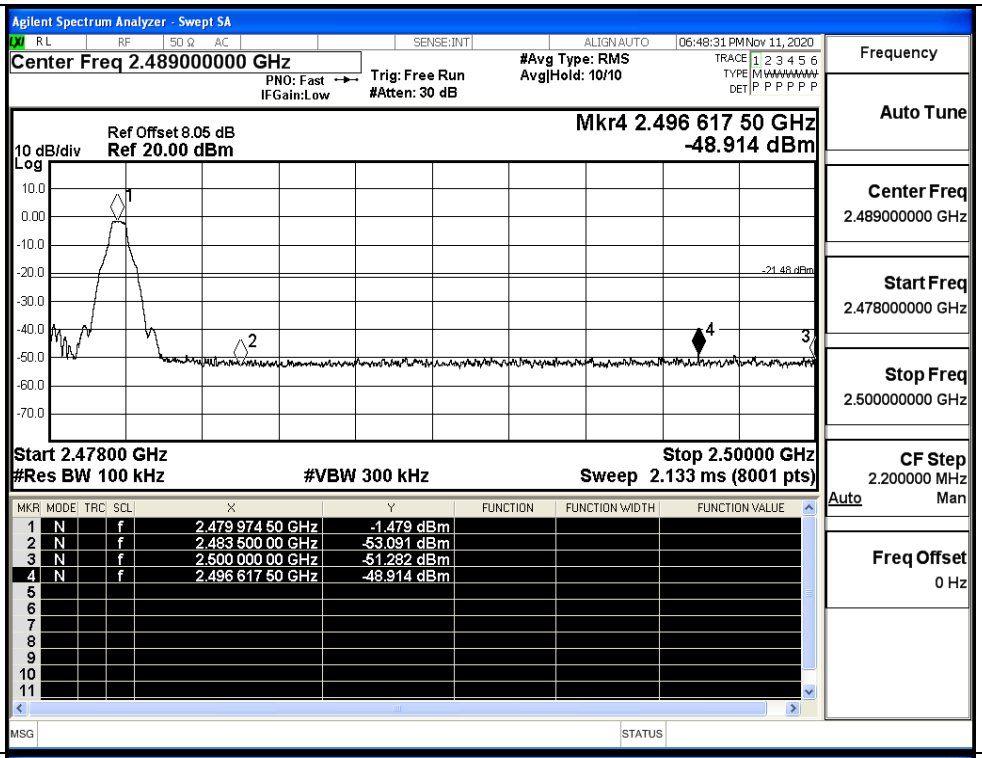
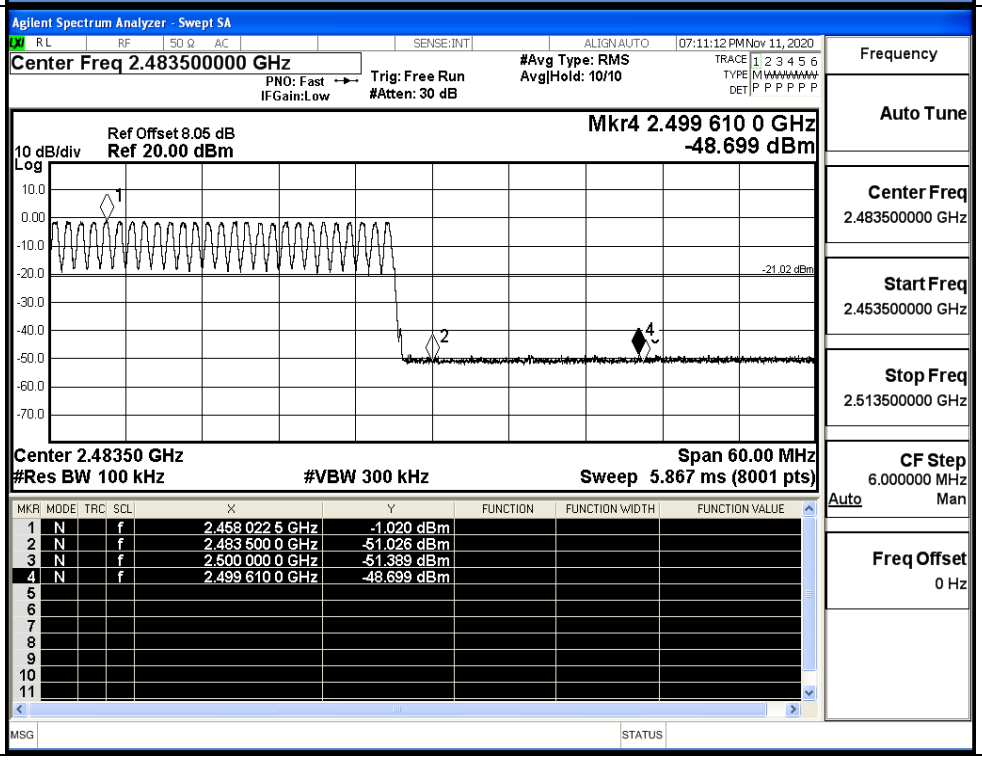
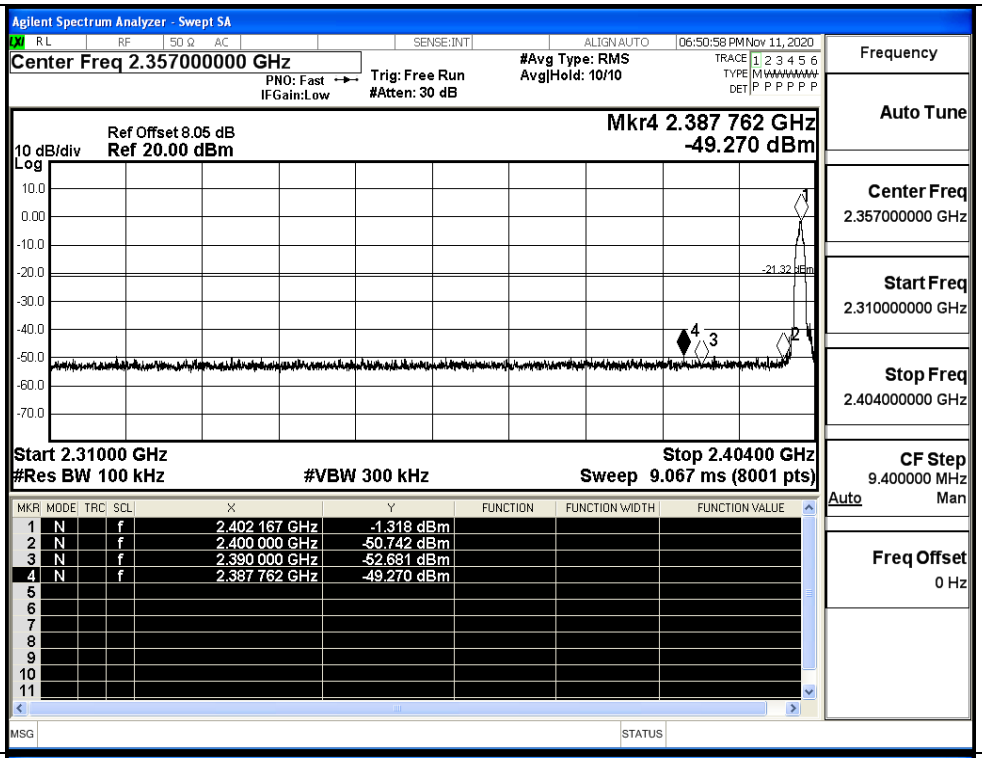
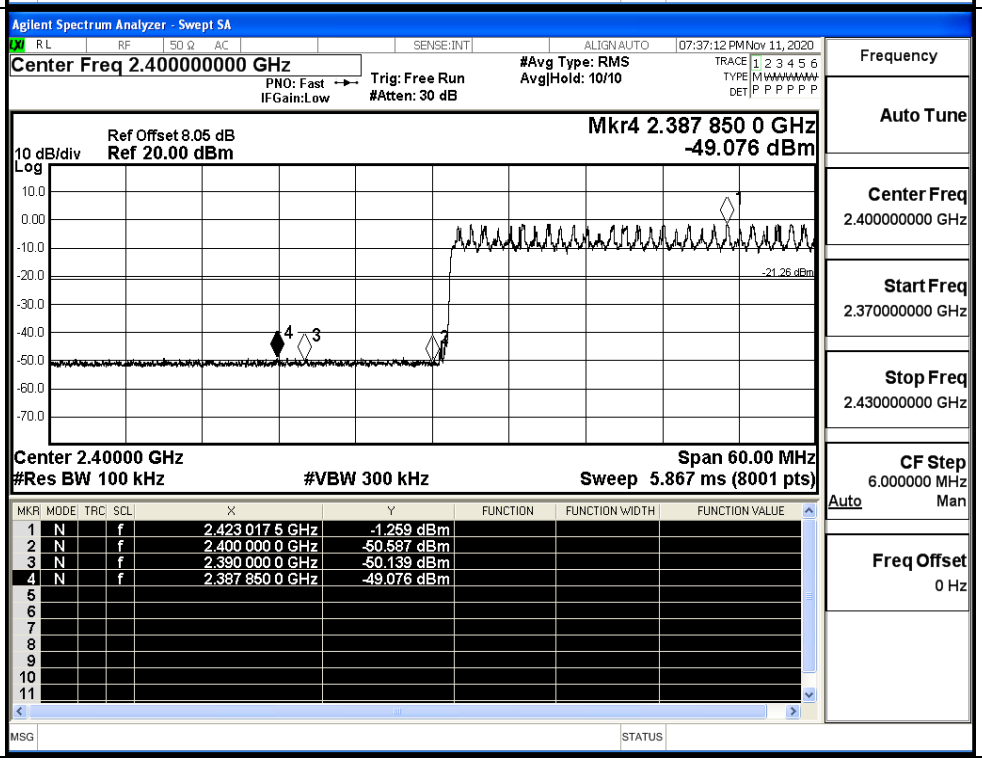
Pref			
Puw			

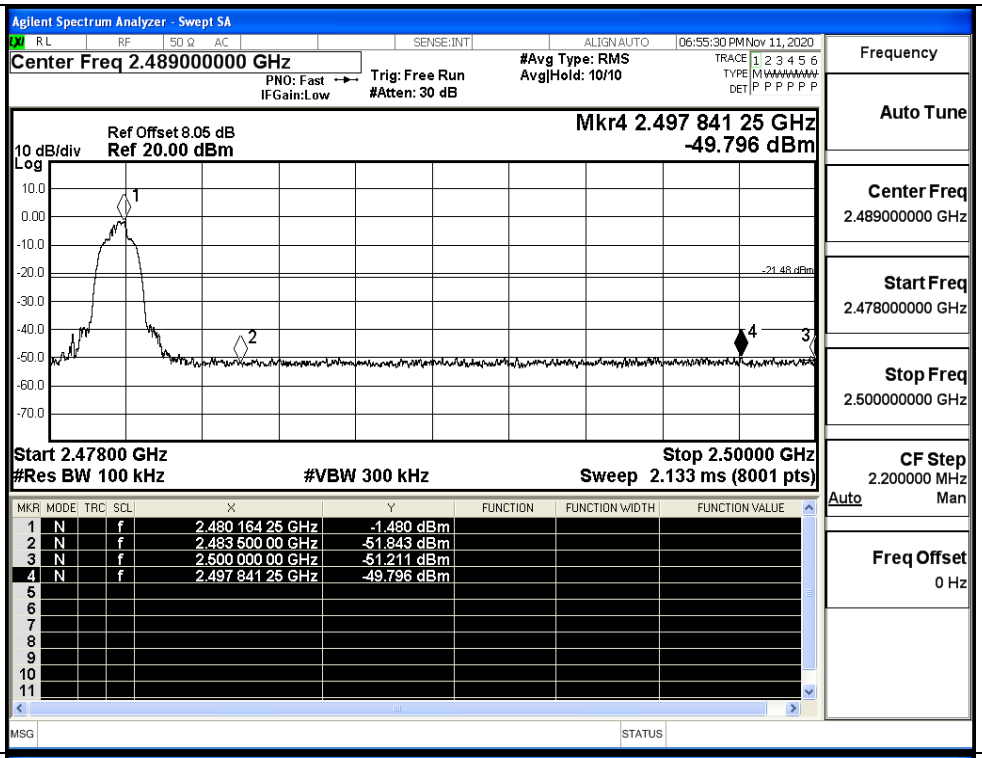
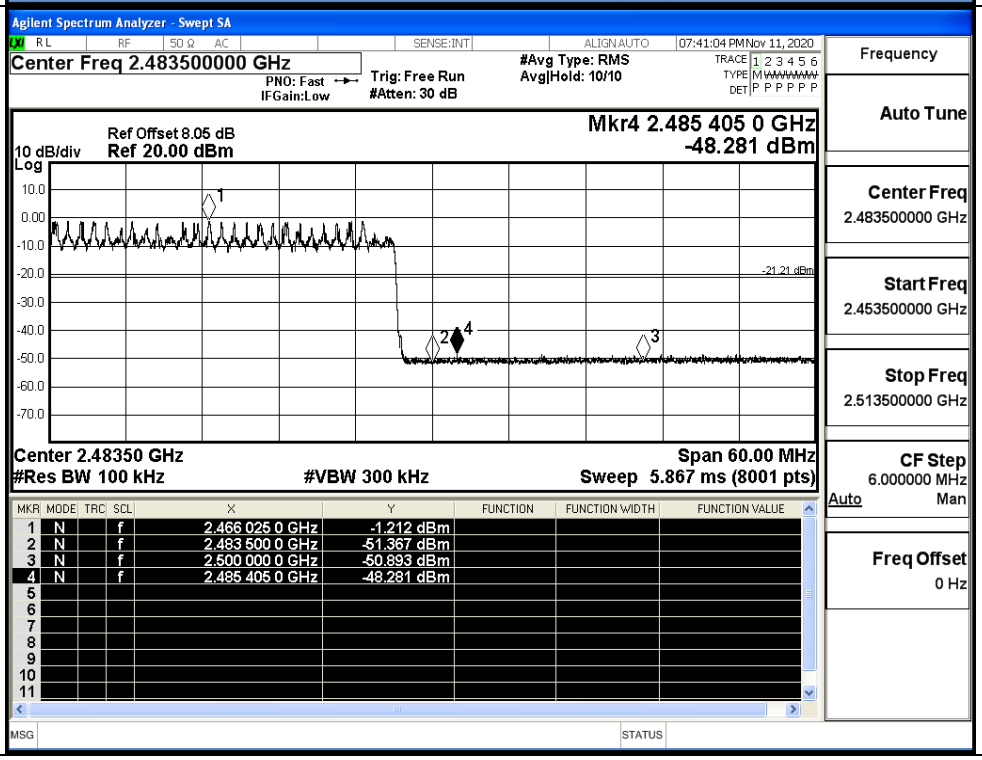
A.7 Band-edge for RF Conducted Emissions

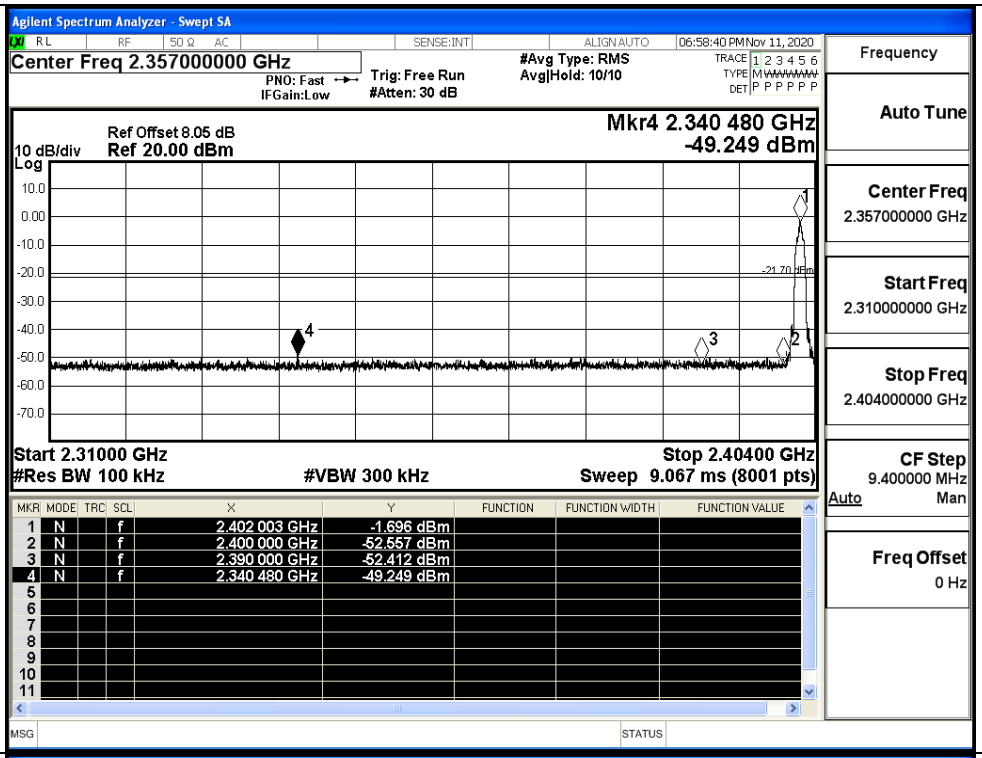
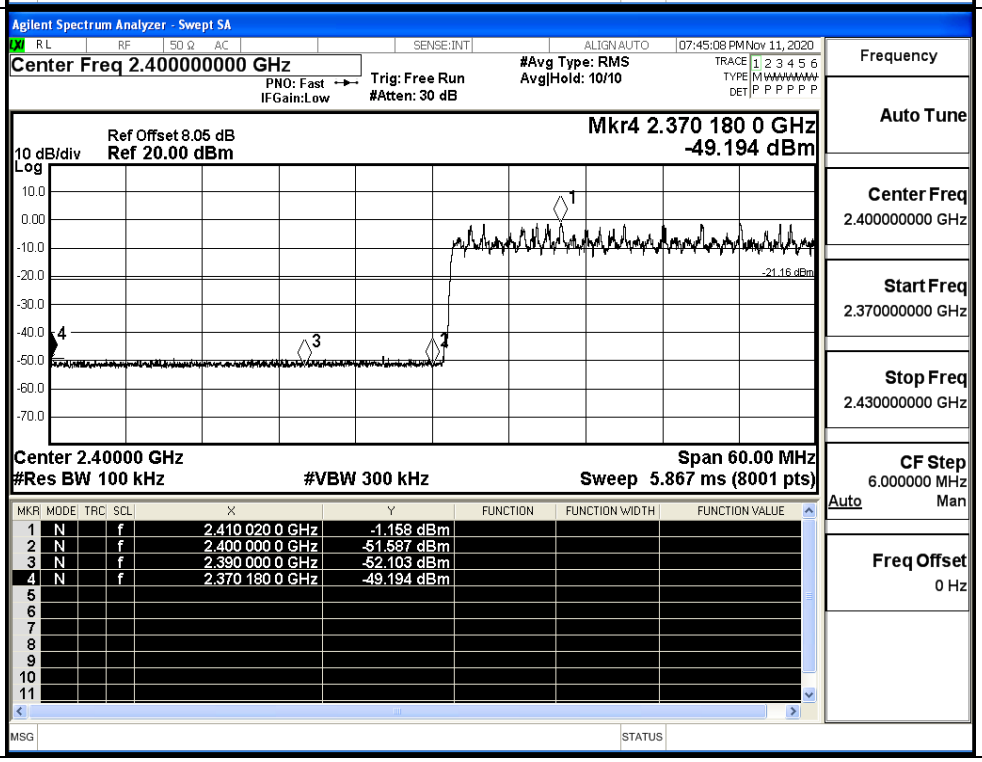
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-1.292	Off	-49.531	-21.29	PASS
			-1.356	On	-49.600	-21.36	PASS
	HCH	2480	-1.479	Off	-48.914	-21.48	PASS
			-1.020	On	-48.699	-21.02	PASS
π/4DQPSK	LCH	2402	-1.318	Off	-49.270	-21.32	PASS
			-1.259	On	-49.076	-21.26	PASS
	HCH	2480	-1.480	Off	-49.796	-21.48	PASS
			-1.212	On	-48.281	-21.21	PASS
8DPSK	LCH	2402	-1.696	Off	-49.249	-21.7	PASS
			-1.158	On	-49.194	-21.16	PASS
	HCH	2480	-1.494	Off	-49.251	-21.49	PASS
			-1.043	On	-47.871	-21.04	PASS

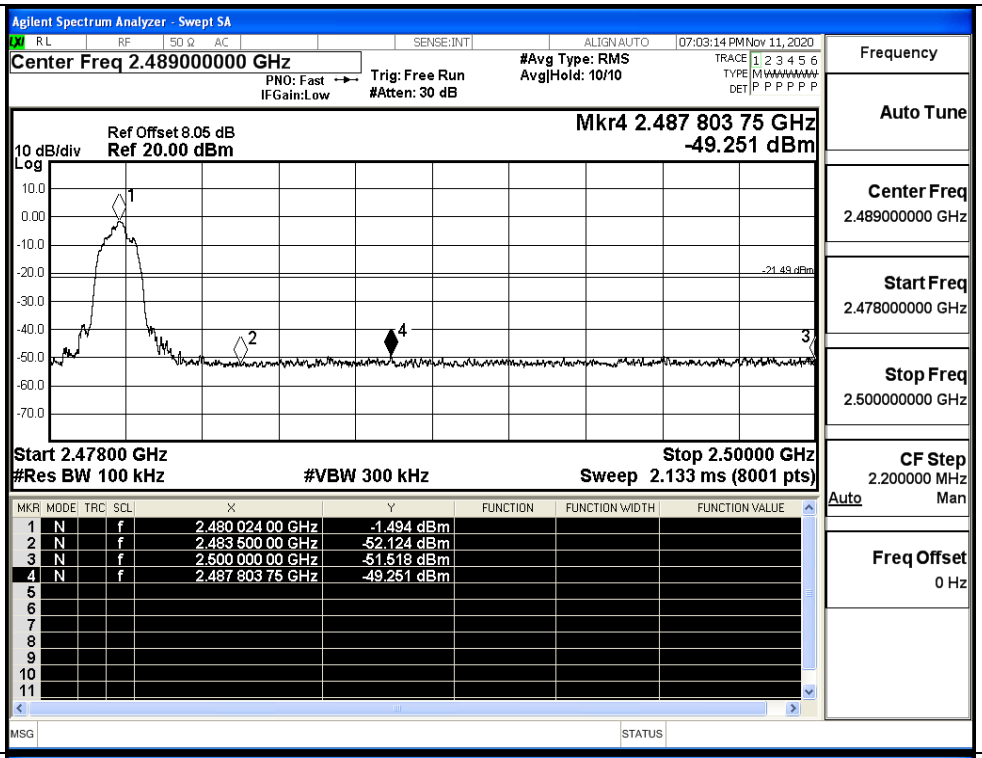
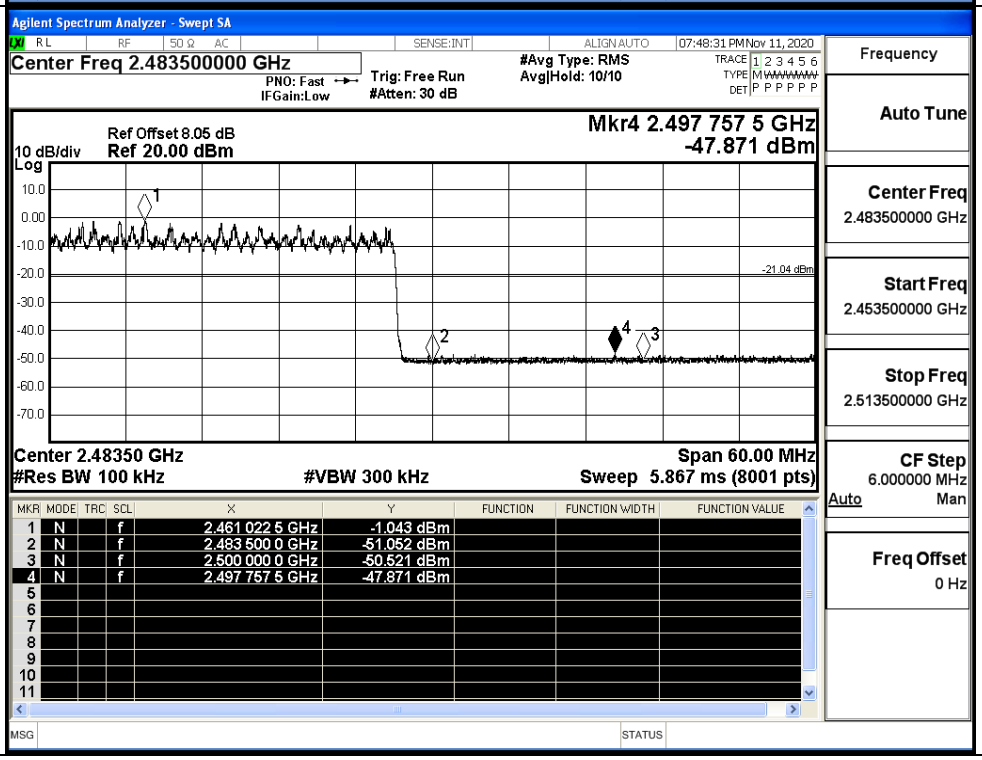
Test Graphs	
GFSK/LCH/No Hop	
GFSK/LCH/Hop	

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	

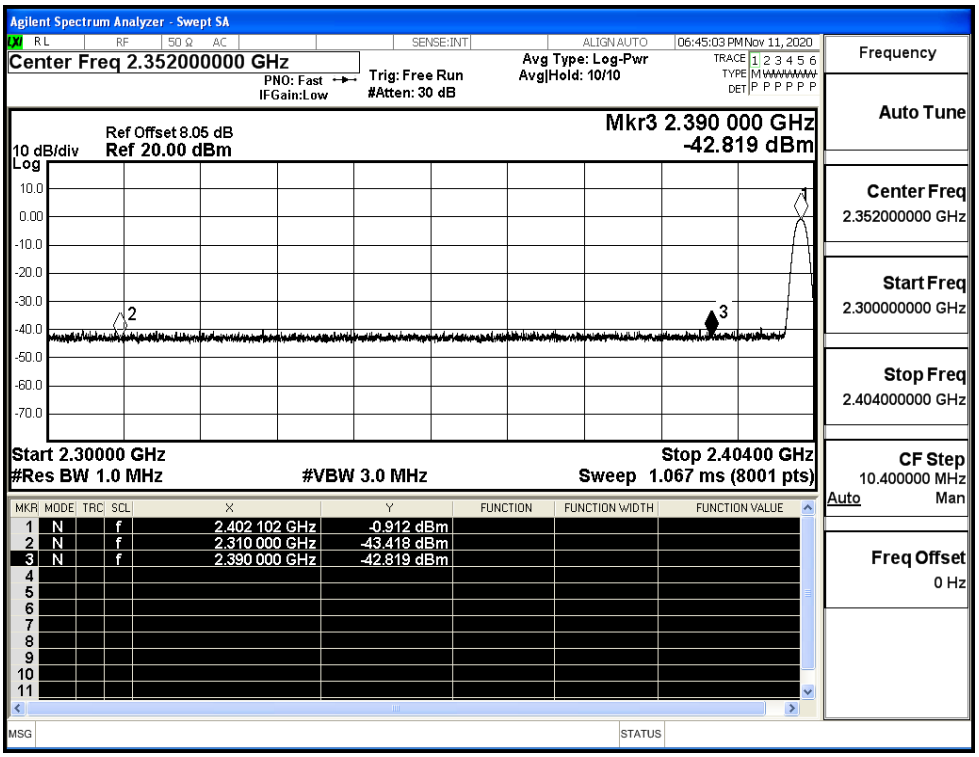
8DPSK/LCH/No Hop	
8DPSK/LCH/Hop	

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

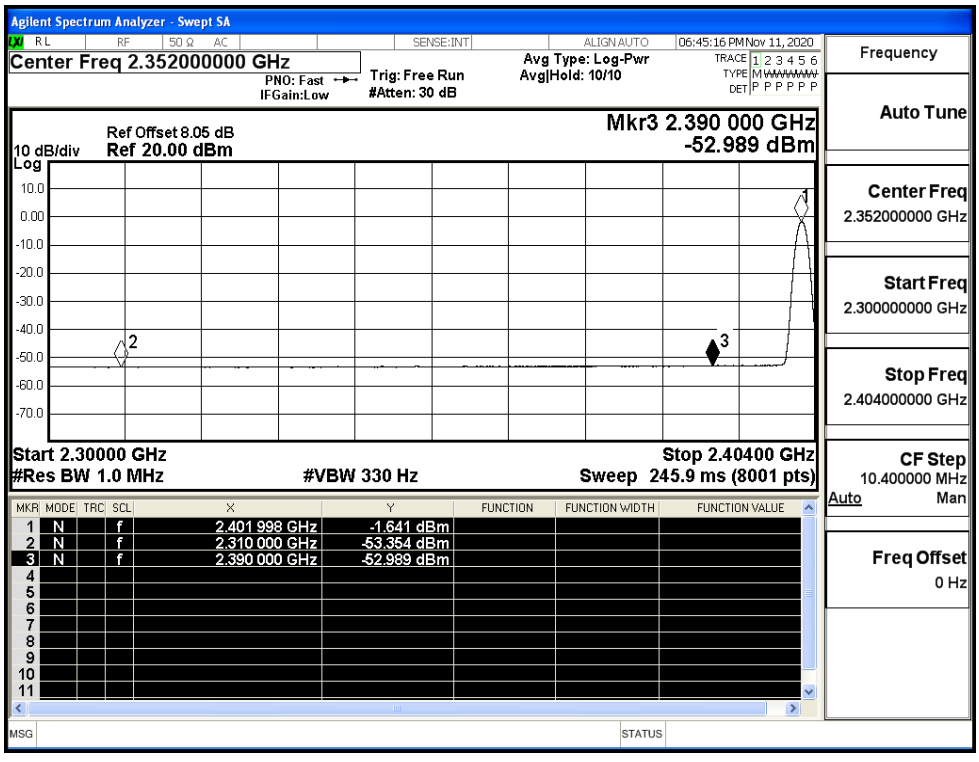
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.42	2.0	0	53.84	PEAK	74	PASS
	Off	2310.0	-53.35	2.0	0	43.9	AV	54	PASS
	Off	2390.0	-42.82	2.0	0	54.44	PEAK	74	PASS
	Off	2390.0	-52.99	2.0	0	44.27	AV	54	PASS
	Off	2483.5	-41.32	2.0	0	55.94	PEAK	74	PASS
	Off	2483.5	-52.36	2.0	0	44.9	AV	54	PASS
	Off	2500.0	-42.01	2.0	0	55.25	PEAK	74	PASS
	Off	2500.0	-52.24	2.0	0	45.02	AV	54	PASS
π/4DQPSK	Off	2310.0	-43.79	2.0	0	53.47	PEAK	74	PASS
	Off	2310.0	-53.38	2.0	0	43.88	AV	54	PASS
	Off	2390.0	-42.76	2.0	0	54.49	PEAK	74	PASS
	Off	2390.0	-53.08	2.0	0	44.17	AV	54	PASS
	Off	2483.5	-42.06	2.0	0	55.19	PEAK	74	PASS
	Off	2483.5	-52.44	2.0	0	44.81	AV	54	PASS
	Off	2500.0	-42.42	2.0	0	54.84	PEAK	74	PASS
	Off	2500.0	-52.23	2.0	0	45.03	AV	54	PASS
8DPSK	Off	2310.0	-43.26	2.0	0	54	PEAK	74	PASS
	Off	2310.0	-53.31	2.0	0	43.94	AV	54	PASS
	Off	2390.0	-41.31	2.0	0	55.95	PEAK	74	PASS
	Off	2390.0	-52.99	2.0	0	44.27	AV	54	PASS
	Off	2483.5	-40.60	2.0	0	56.66	PEAK	74	PASS
	Off	2483.5	-52.38	2.0	0	44.88	AV	54	PASS
	Off	2500.0	-42.32	2.0	0	54.93	PEAK	74	PASS
	Off	2500.0	-52.25	2.0	0	45.01	AV	54	PASS

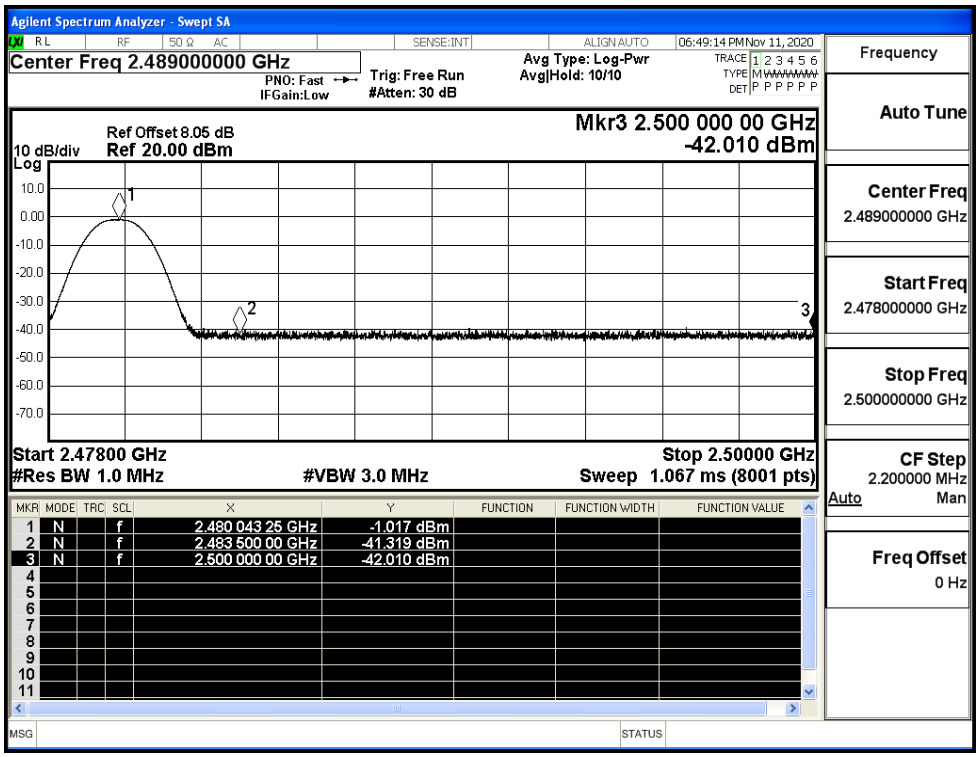
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (Low Channel)



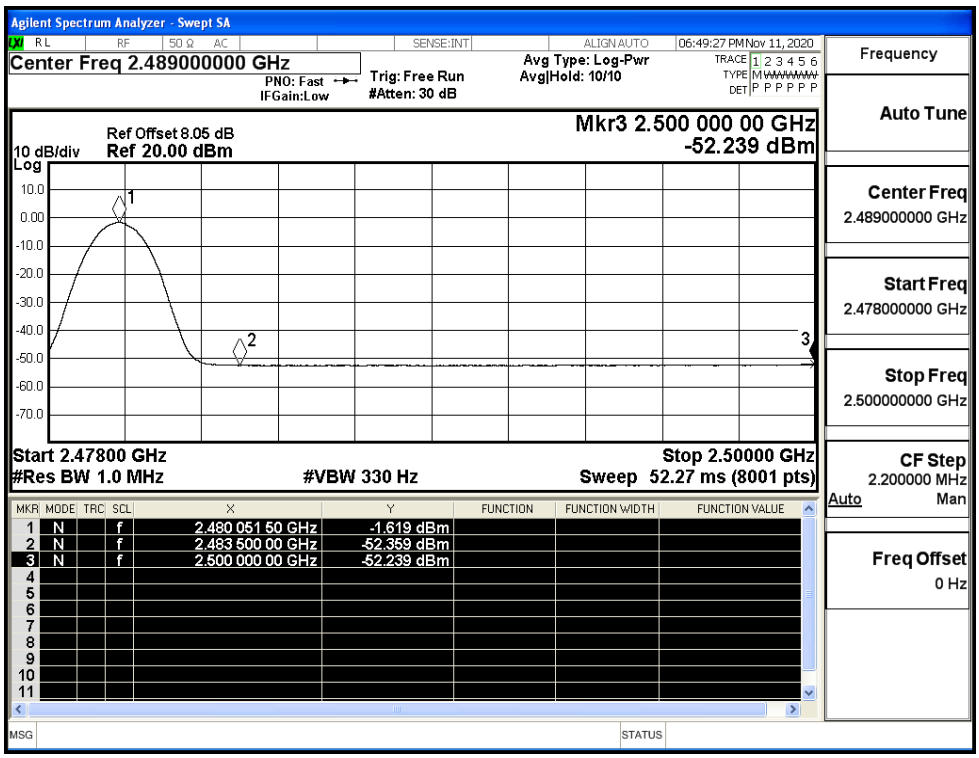
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (Low Channel)



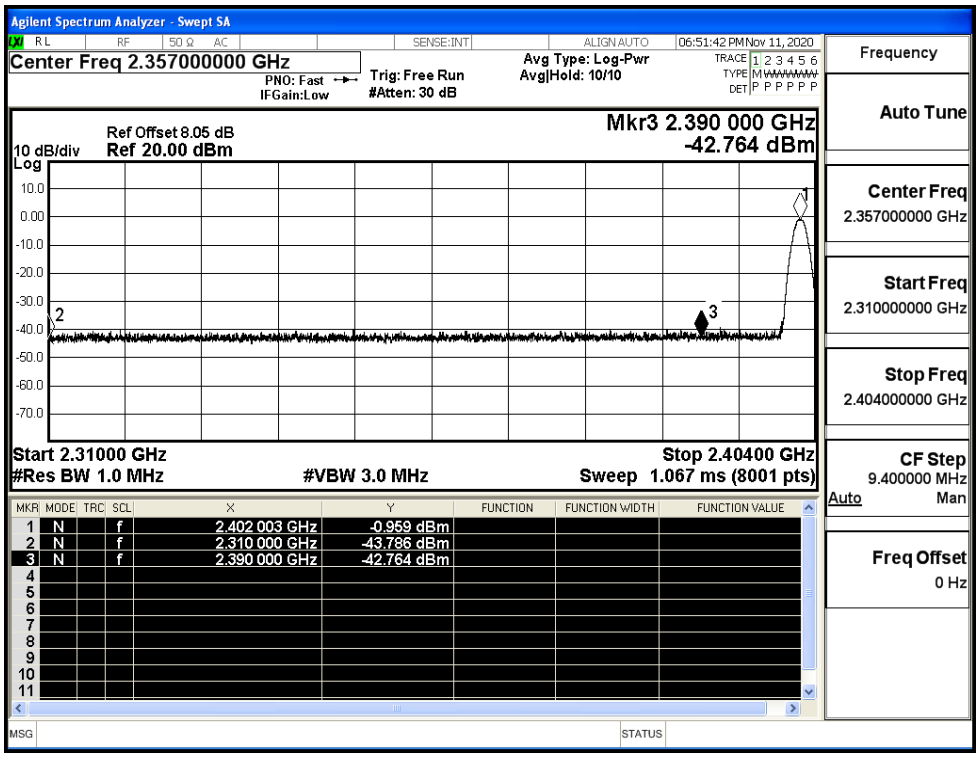
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)



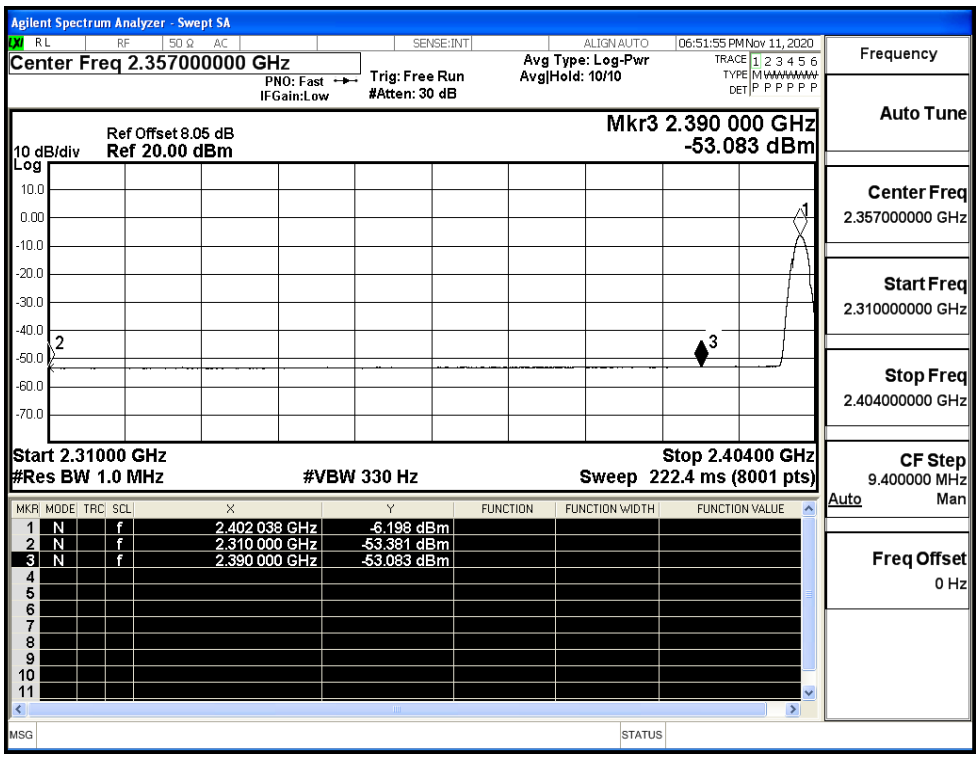
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)



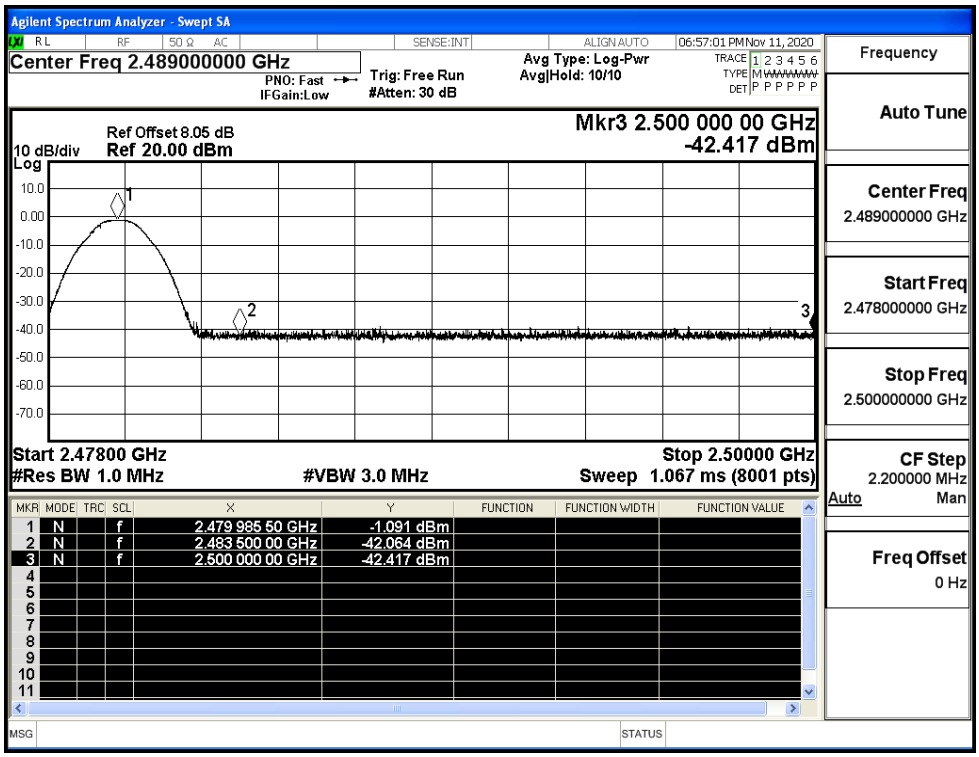
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (Low Channel)



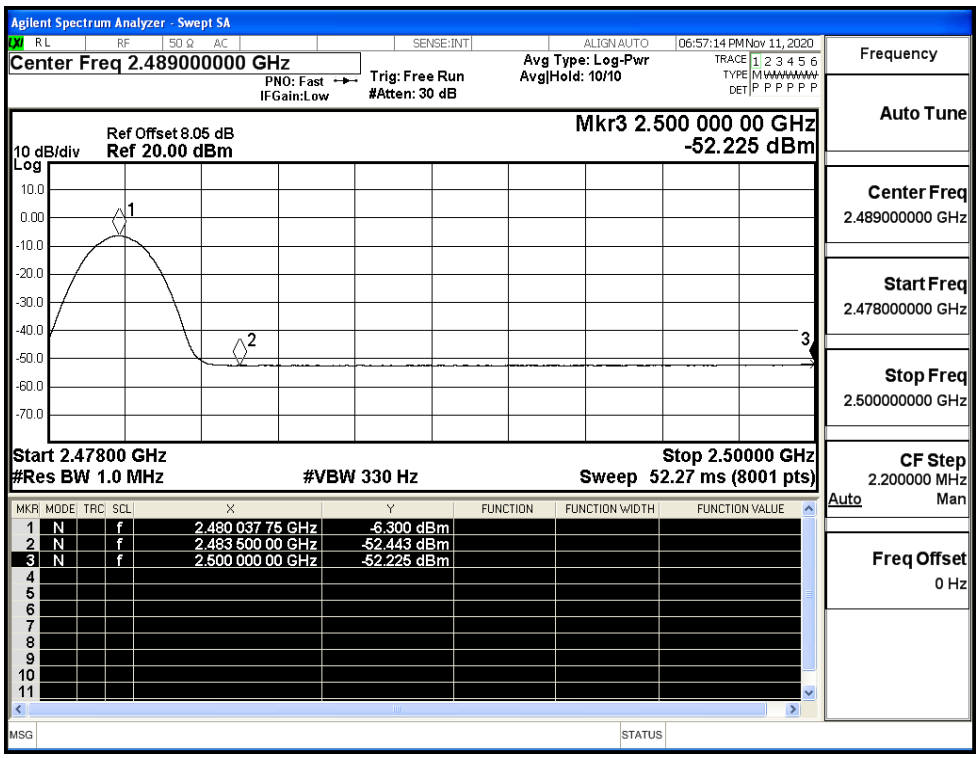
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (Low Channel)



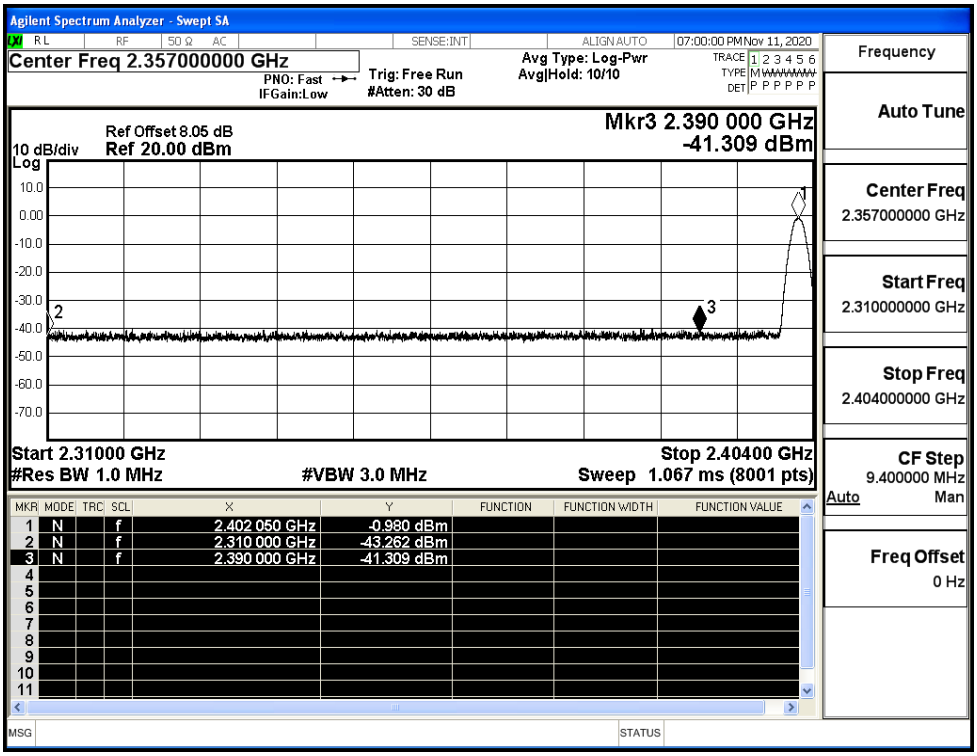
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



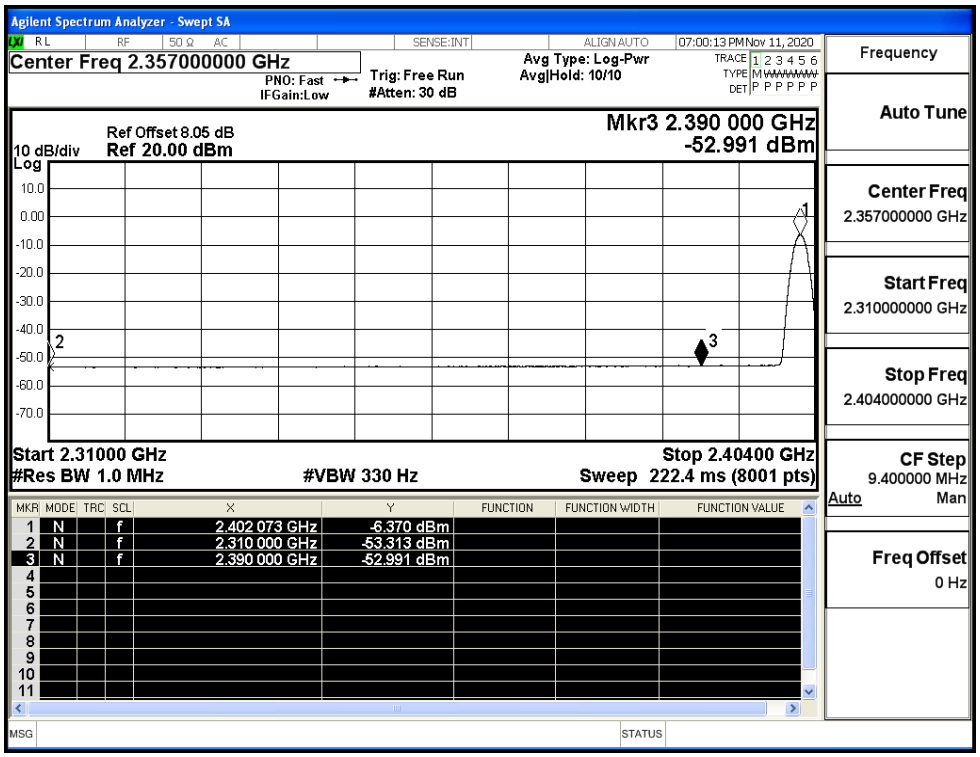
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)



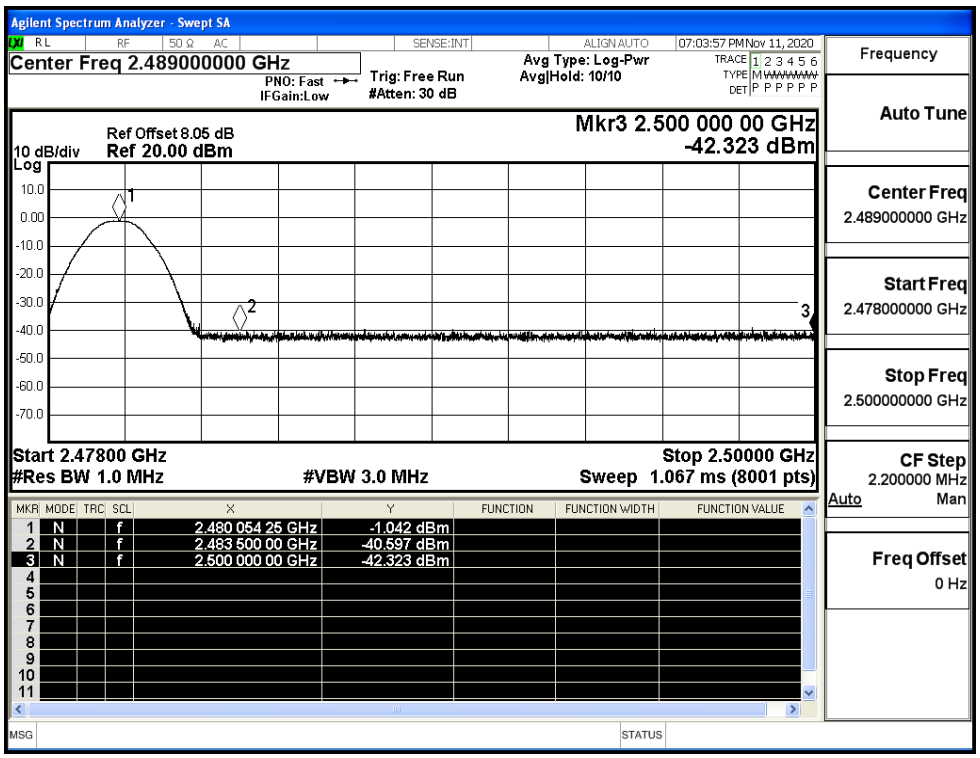
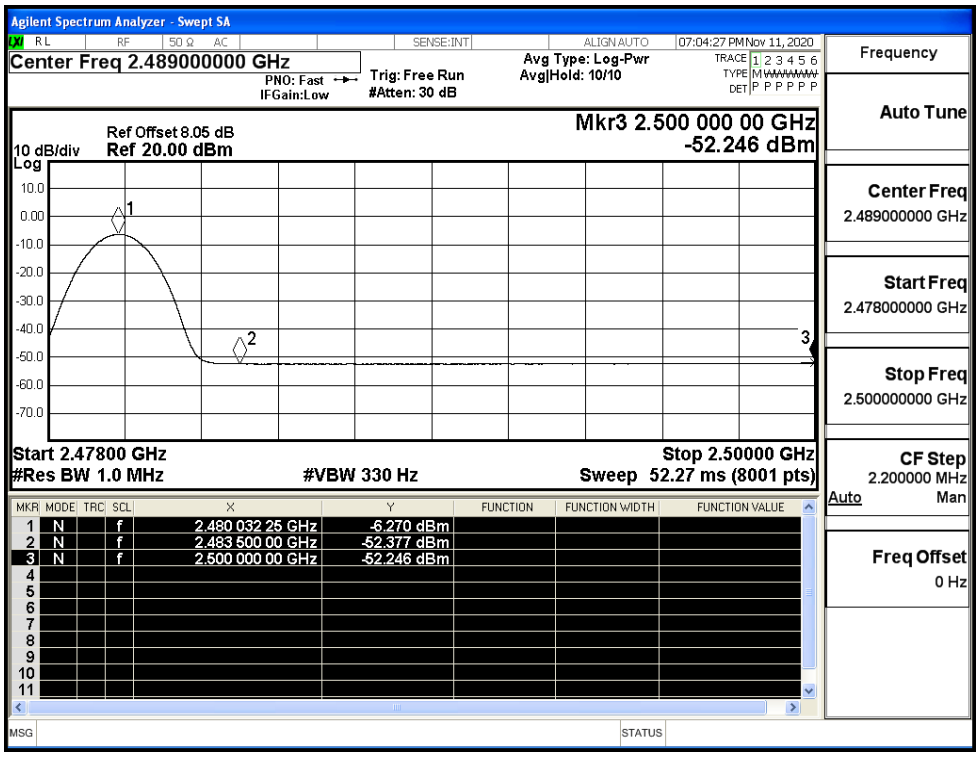
Restrict-band band-edge measurements_Hopping Off_8DPSK_PEAK (Low Channel)



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)