Appendix A

RF Test Data for BT V4.2 (BDR/EDR) (Conducted Measurement)

Product Name: Halo Lighted Bluetooth® Headphones

Trade Mark: Gemline

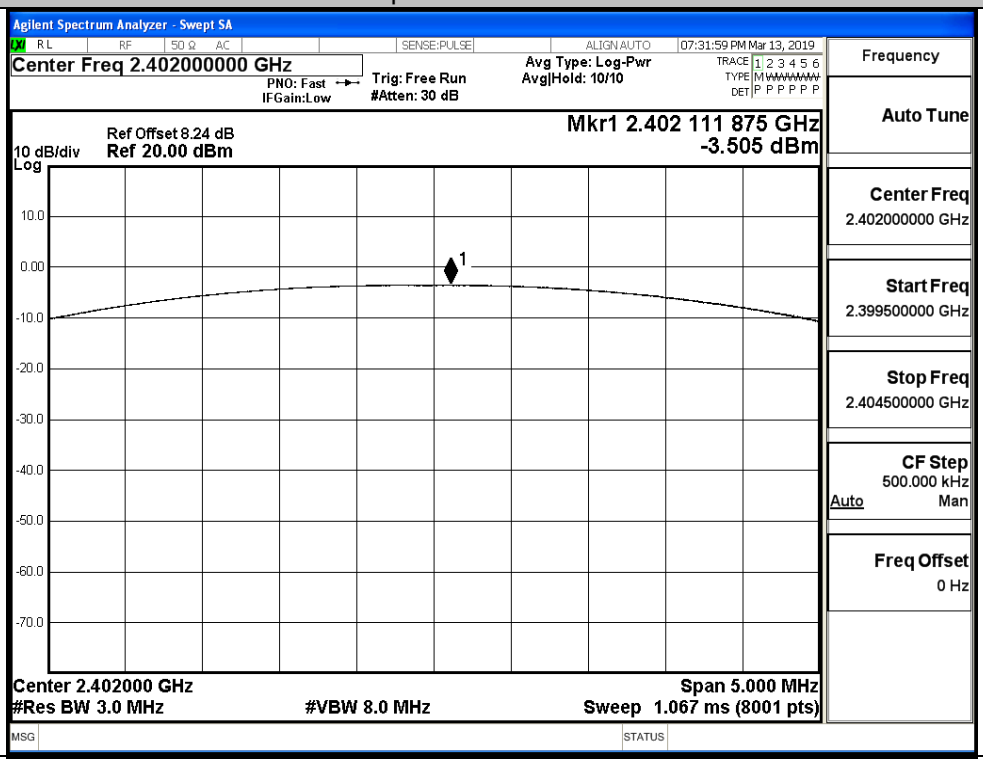
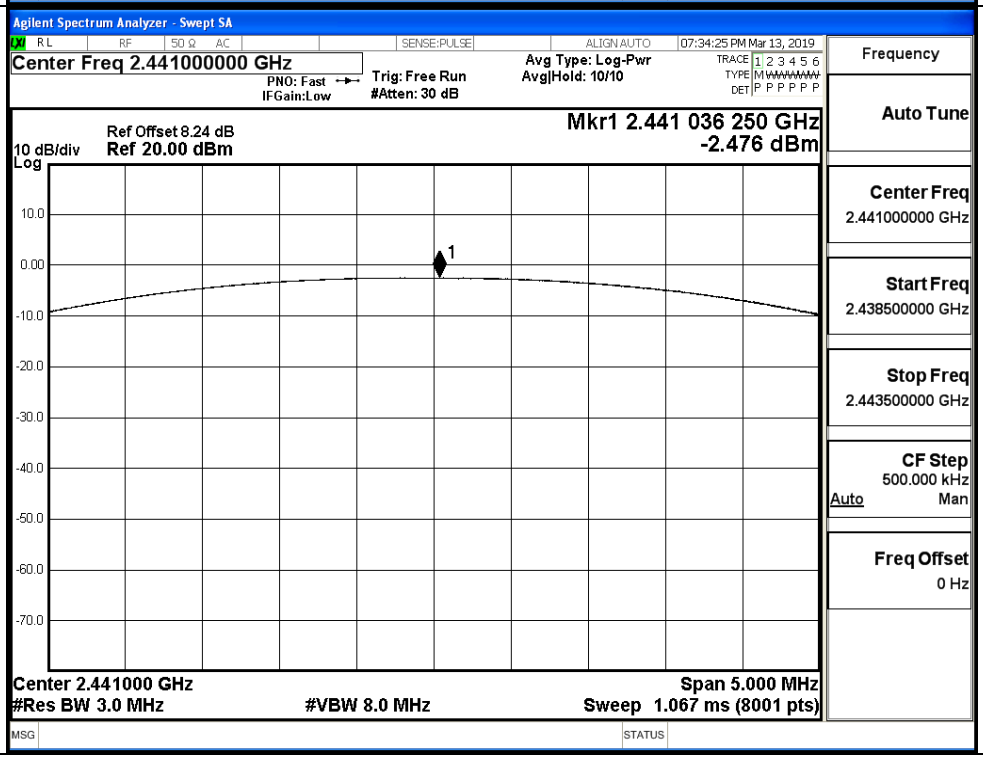
Test Model: 100200-001B

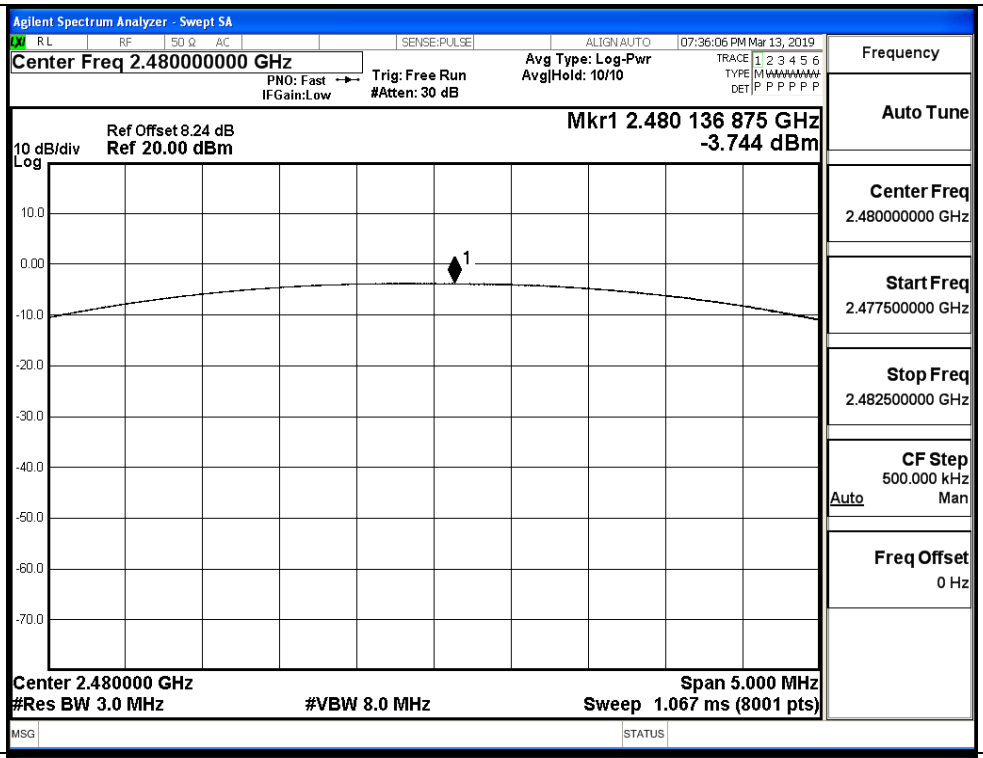
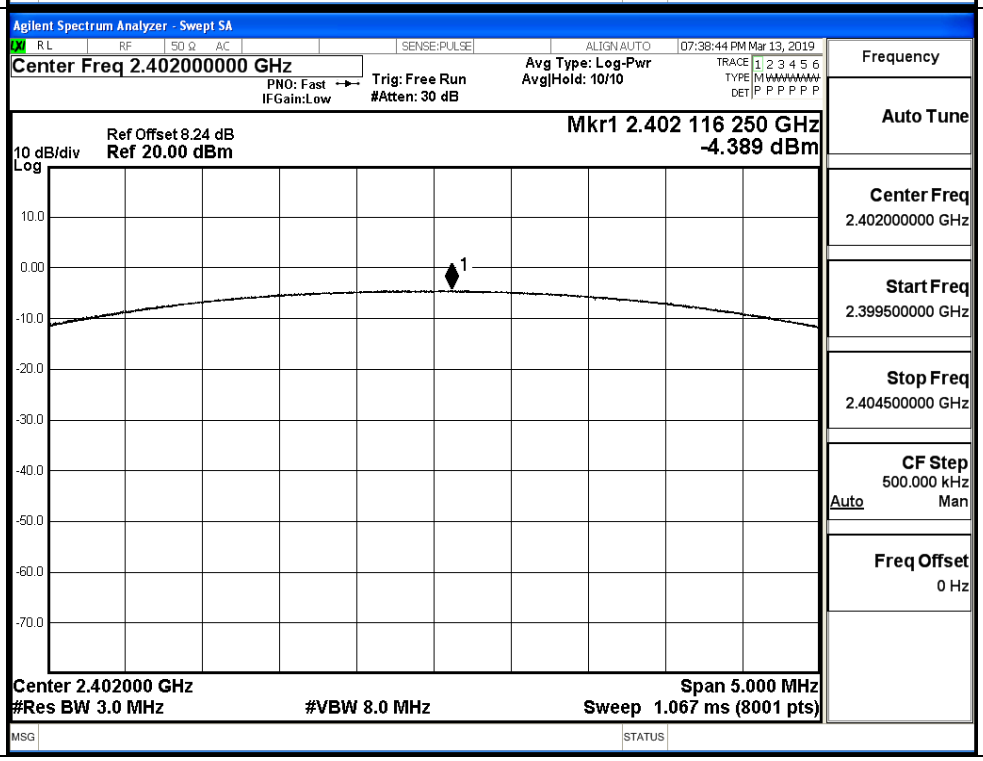
Environmental Conditions

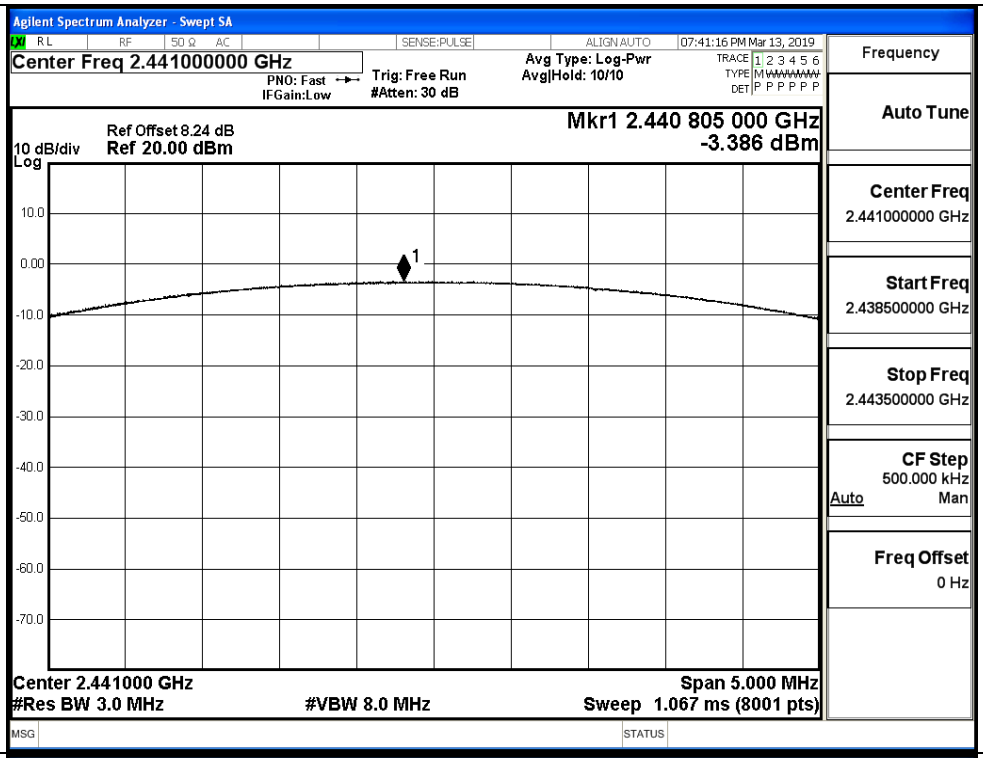
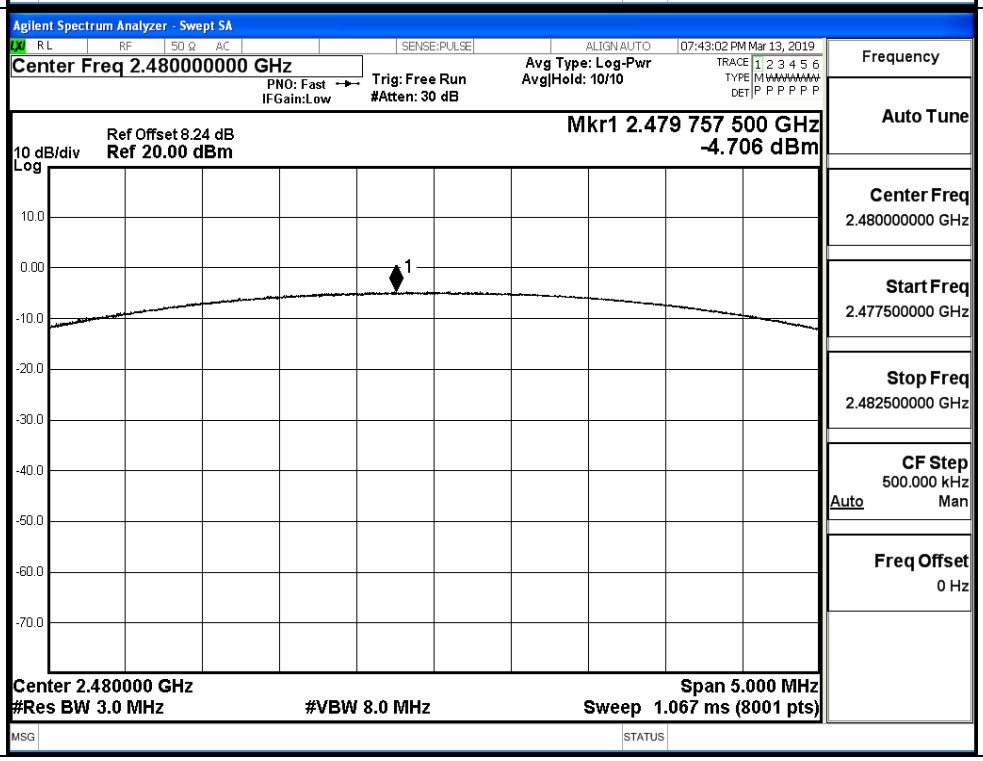
Temperature:	22.4 ° C
Relative Humidity:	53.7%
ATM Pressure:	100.0 kPa
Test Engineer:	SCENT HU
Supervised by:	Tom.Liu

A.1 Maximum Conducted Peak Output Power

Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-3.505	21	PASS
	MCH	-2.476	21	PASS
	HCH	-3.744	21	PASS
π/4DQPSK	LCH	-4.389	21	PASS
	MCH	-3.386	21	PASS
	HCH	-4.706	21	PASS

Test Graphs		
GFSK/LCH		
GFSK/MCH		

GFSK/HCH	
π/4DQPSK/LCH	

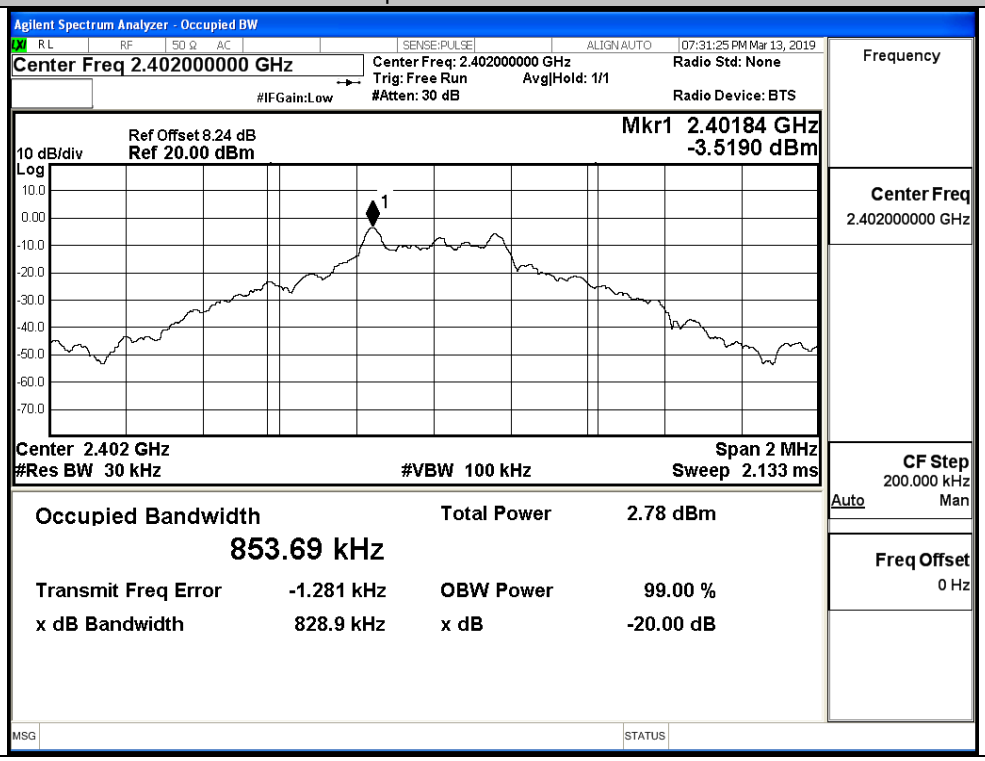
π/4DQPSK/MCH	
π/4DQPSK/HCH	

A.2 99% and 20dB Bandwidth

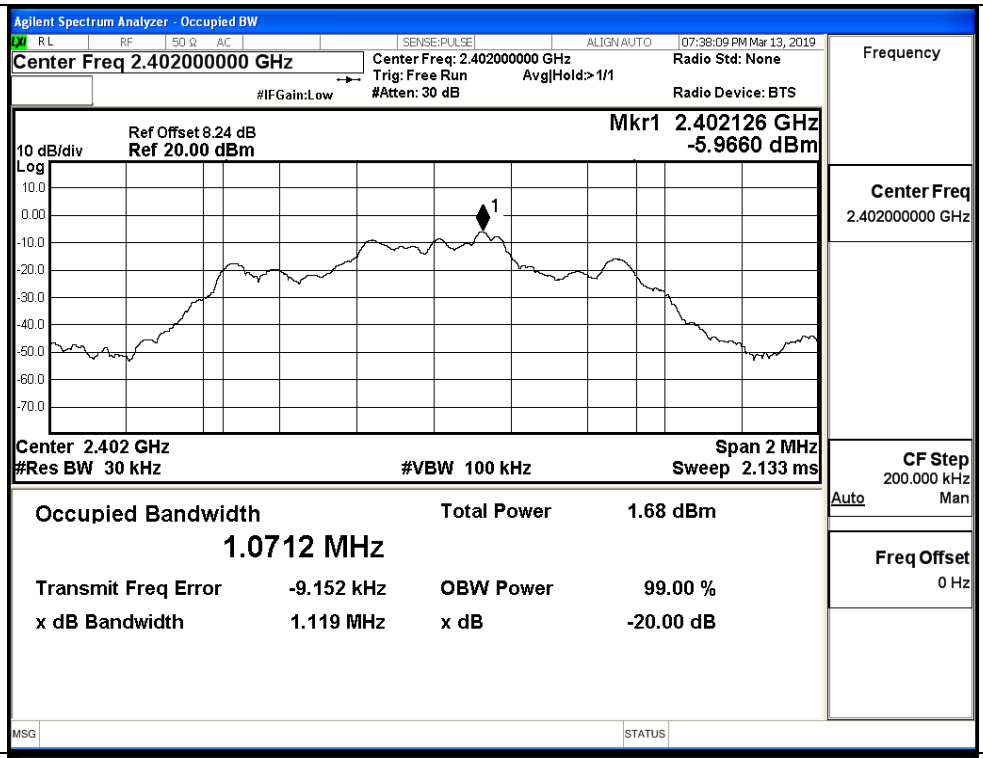
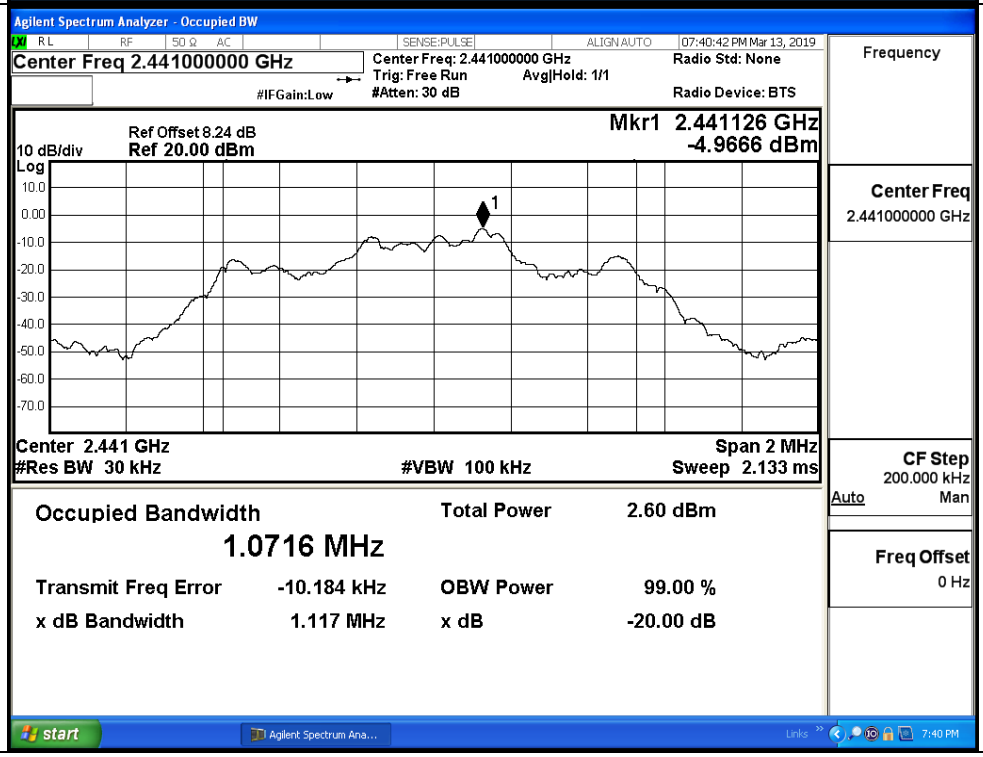
Mode	Channel.	99% Bandwidth [MHz]	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.85369	0.8289	Not Specified	PASS
	MCH	0.85295	0.8299	Not Specified	PASS
	HCH	0.85253	0.8319	Not Specified	PASS
π/4DQPSK	LCH	1.0712	1.119	Not Specified	PASS
	MCH	1.0716	1.117	Not Specified	PASS
	HCH	1.0714	1.111	Not Specified	PASS

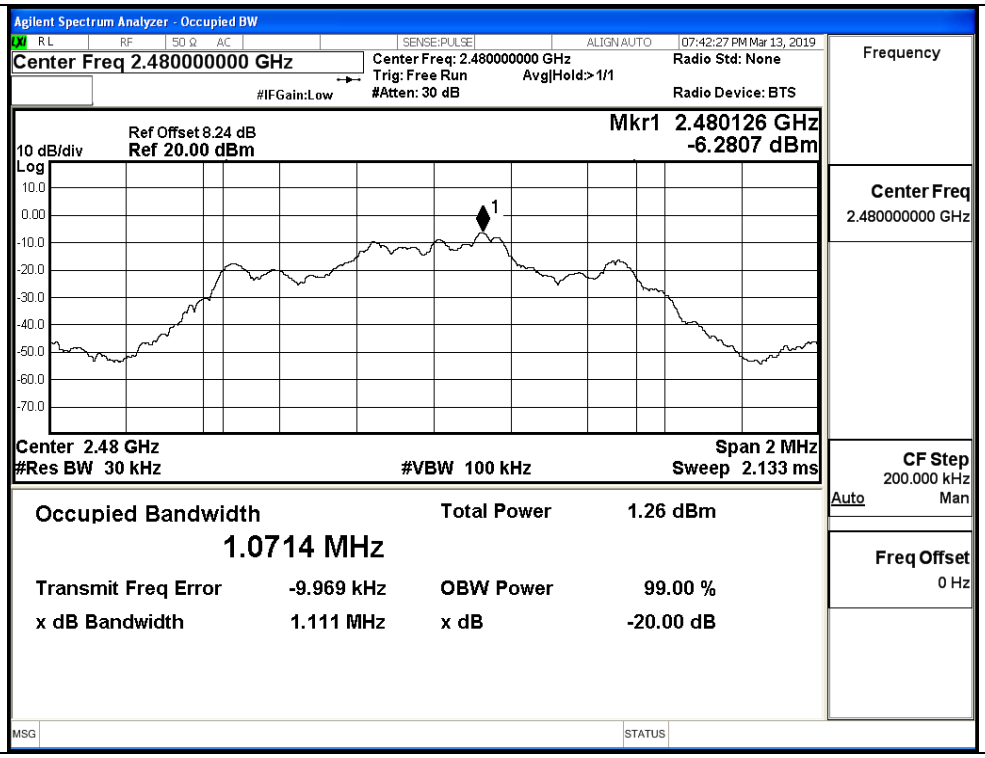
Test Graphs

GFSK/LCH



GFSK/MCH	
GFSK/HCH	

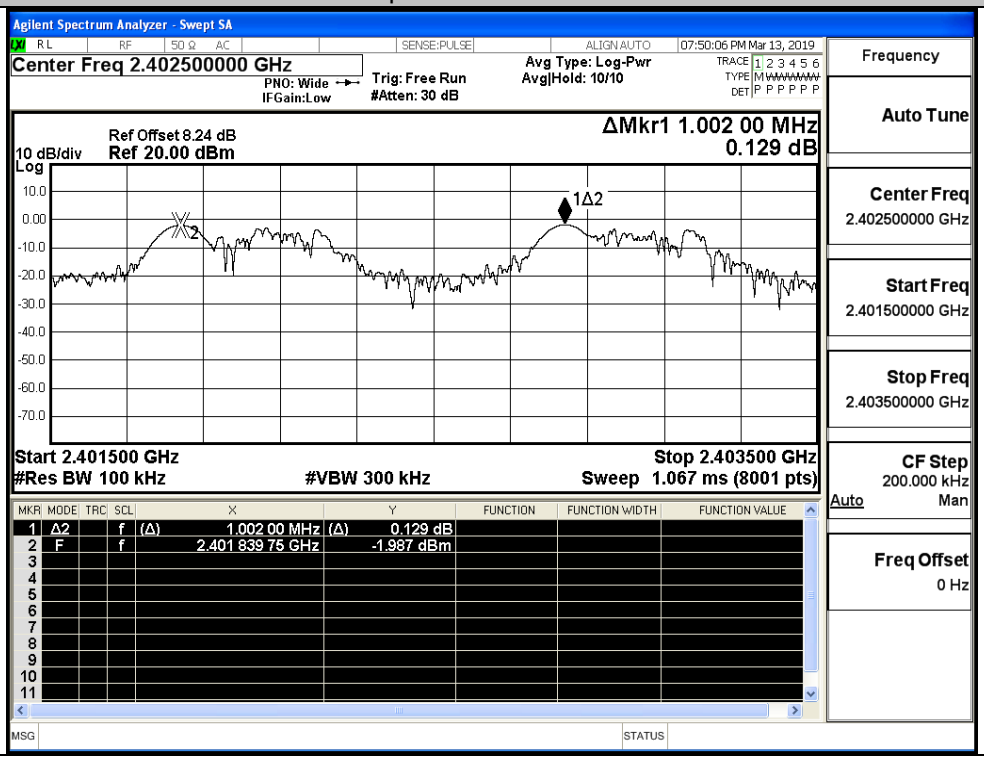
π/4DQPSK/LCH	
π/4DQPSK/MCH	

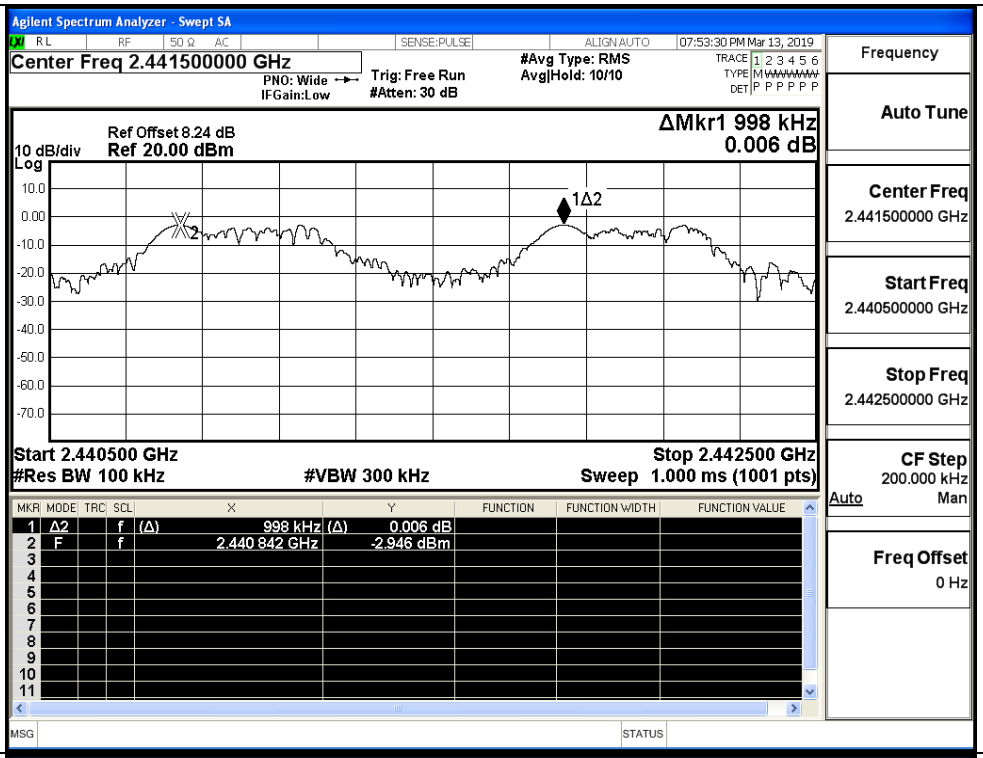
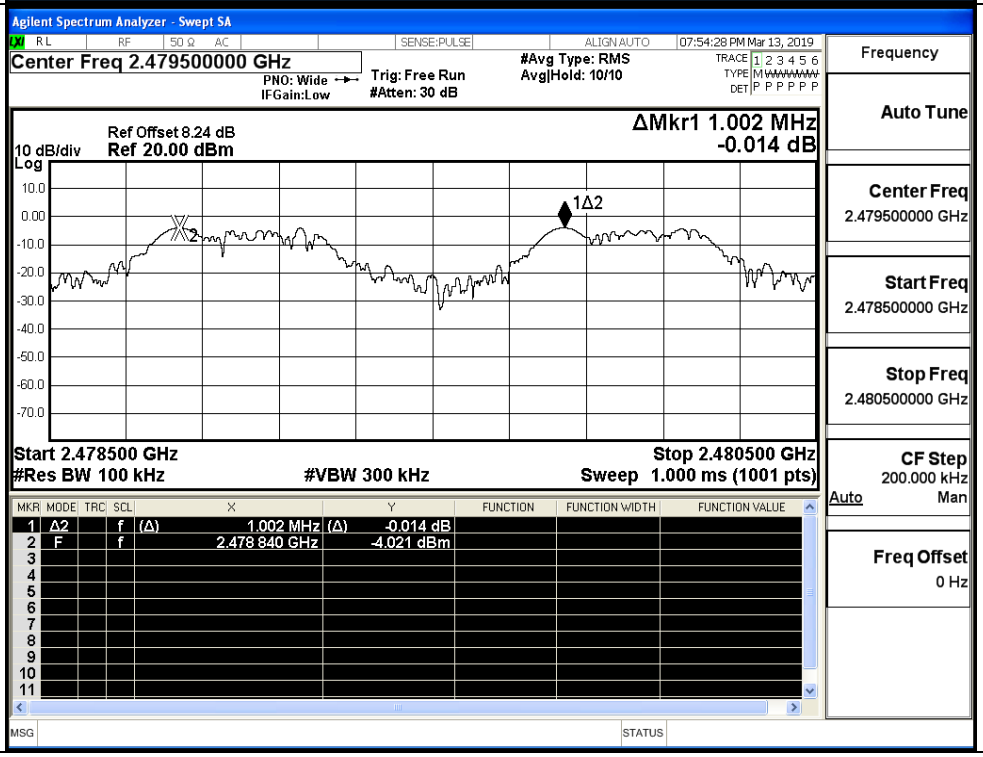
π/4DQPSK/HCH	

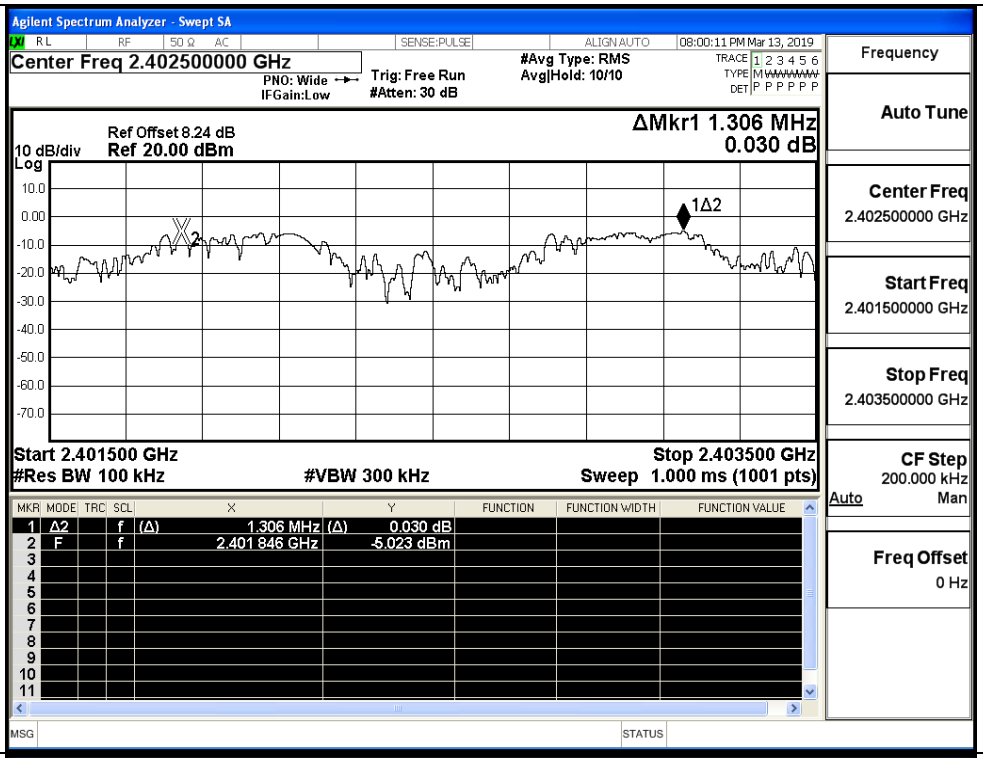
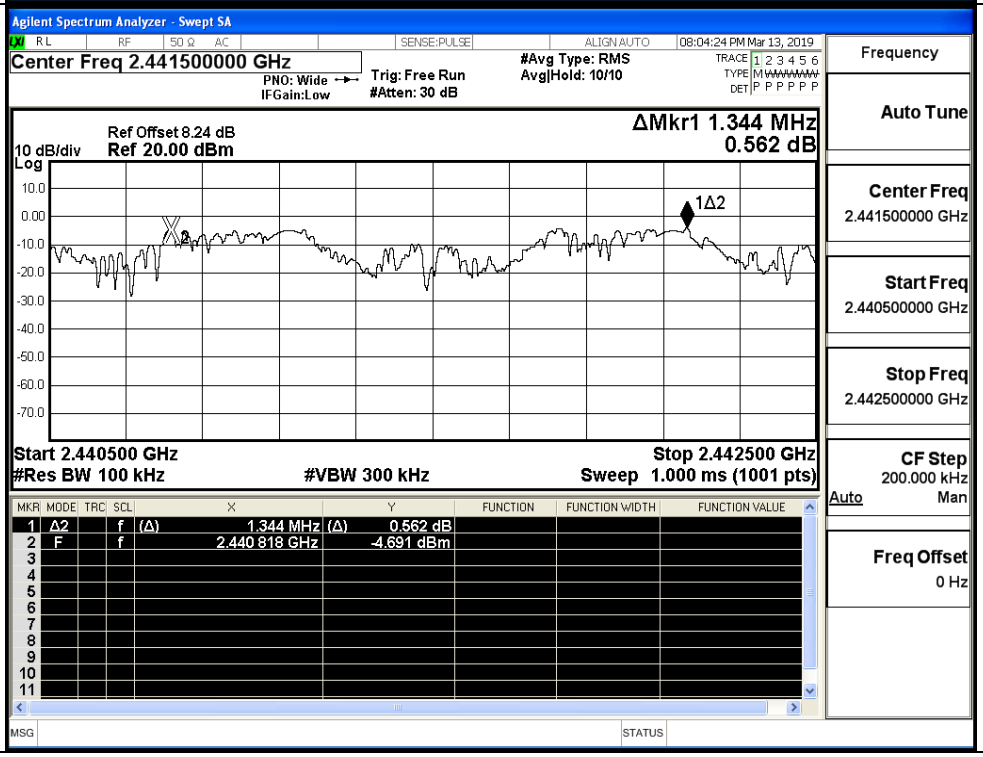
Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
SENSE:PULSE
ALIGN AUTO
07:42:27 PM Mar 13, 2019
Center Freq 2.480000000 GHz
#IFGain:Low
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>1/1
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
Ref Offset 8.24 dB
10 dB/div
Ref 20.00 dBm
Mkr1 2.480126 GHz
-6.2807 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
1
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2 MHz
Sweep 2.133 ms
Occupied Bandwidth
1.0714 MHz
Total Power 1.26 dBm
Transmit Freq Error -9.969 kHz
OBW Power 99.00 %
x dB Bandwidth 1.111 MHz
x dB -20.00 dB
Center Freq
2.480000000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

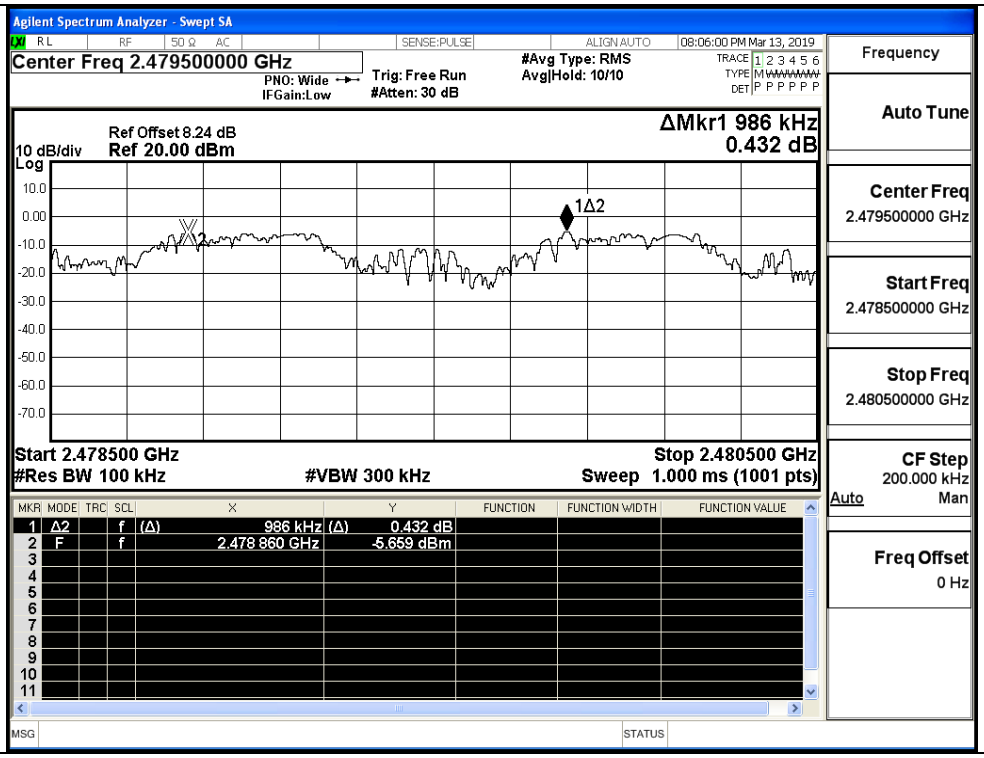
A.3 Carrier Frequency Separation

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.002	0.555	PASS
	MCH	0.998	0.555	PASS
	HCH	1.002	0.555	PASS
π/4DQPSK	LCH	1.306	0.746	PASS
	MCH	1.344	0.746	PASS
	HCH	0.986	0.746	PASS

Test Graphs	
GFSK/LCH	

GFSK/MCH	
GFSK/HCH	

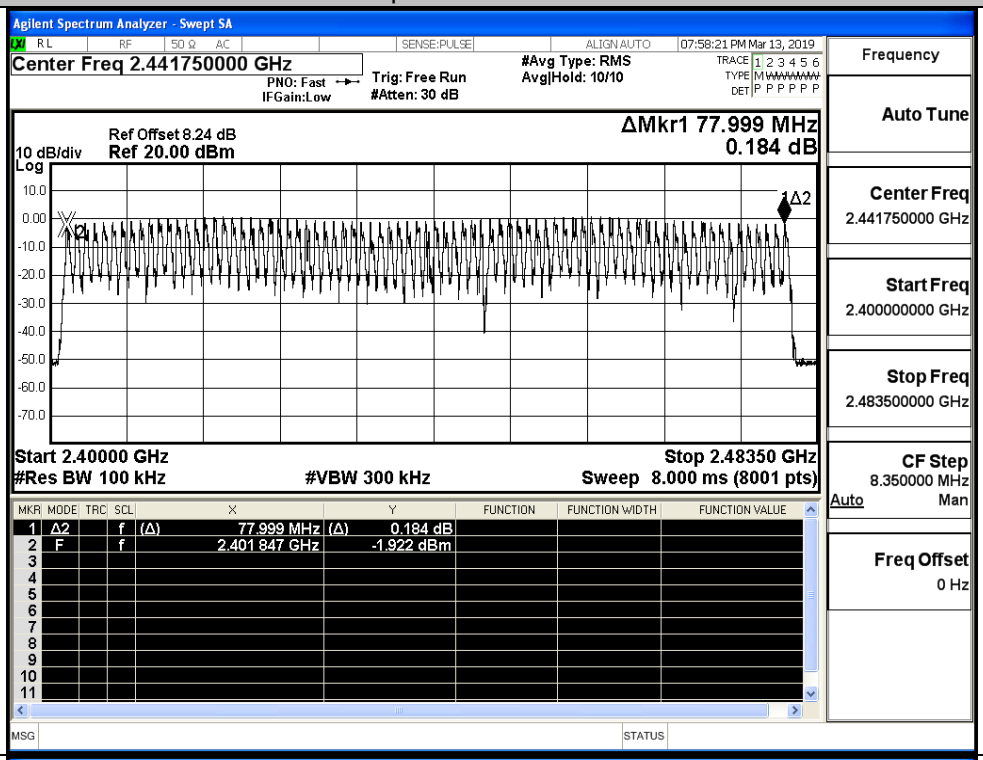
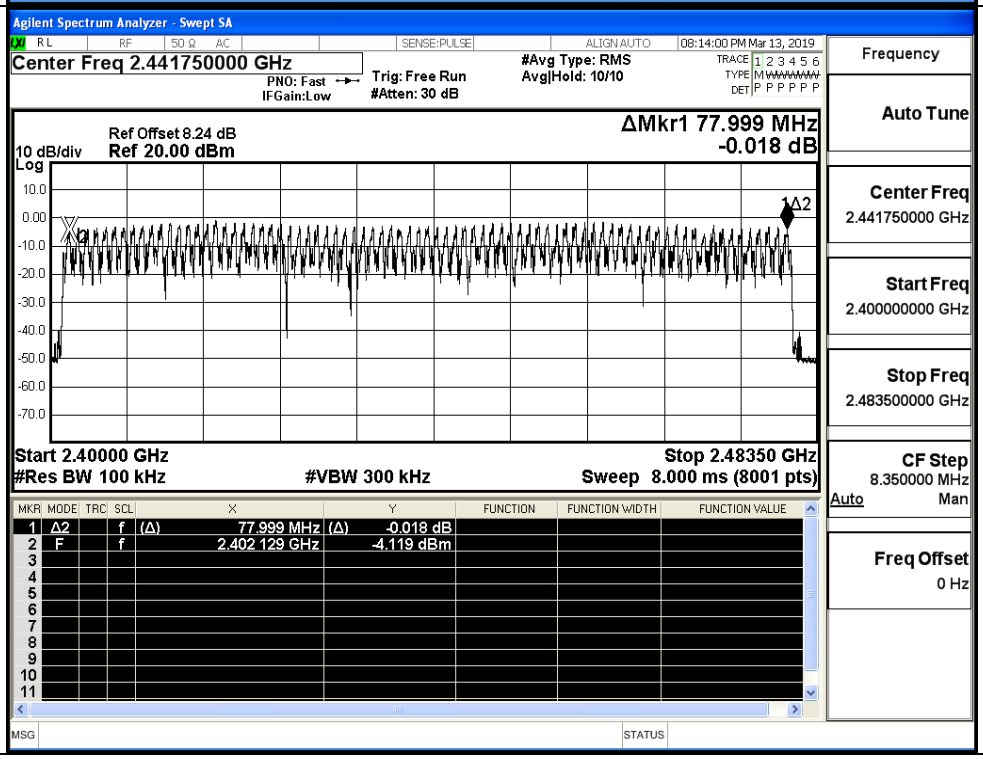
π/4DQPSK/LCH	
π/4DQPSK/MCH	

π/4DQPSK/HCH	

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.479500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 10/10
08:06:00 PM Mar 13, 2019
Ref Offset 8.24 dB
10 dB/div
Ref 20.00 dBm
ΔMkr1 986 kHz
0.432 dB
1Δ2
Start 2.478500 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.480500 GHz
Sweep 1.000 ms (1001 pts)
1 Δ2 f (Δ) 986 kHz (Δ) 0.432 dB
2 F f 2.478 860 GHz -5.659 dBm
Frequency
Auto Tune
Center Freq
2.479500000 GHz
Start Freq
2.478500000 GHz
Stop Freq
2.480500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

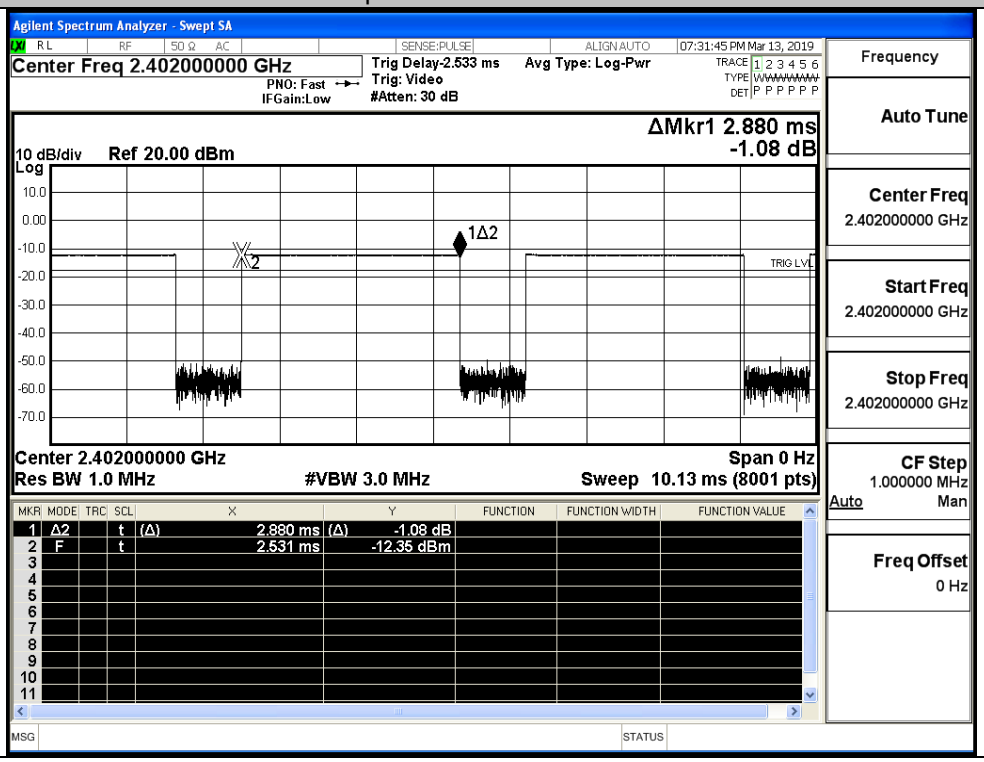
A.4 Hopping Channel Number

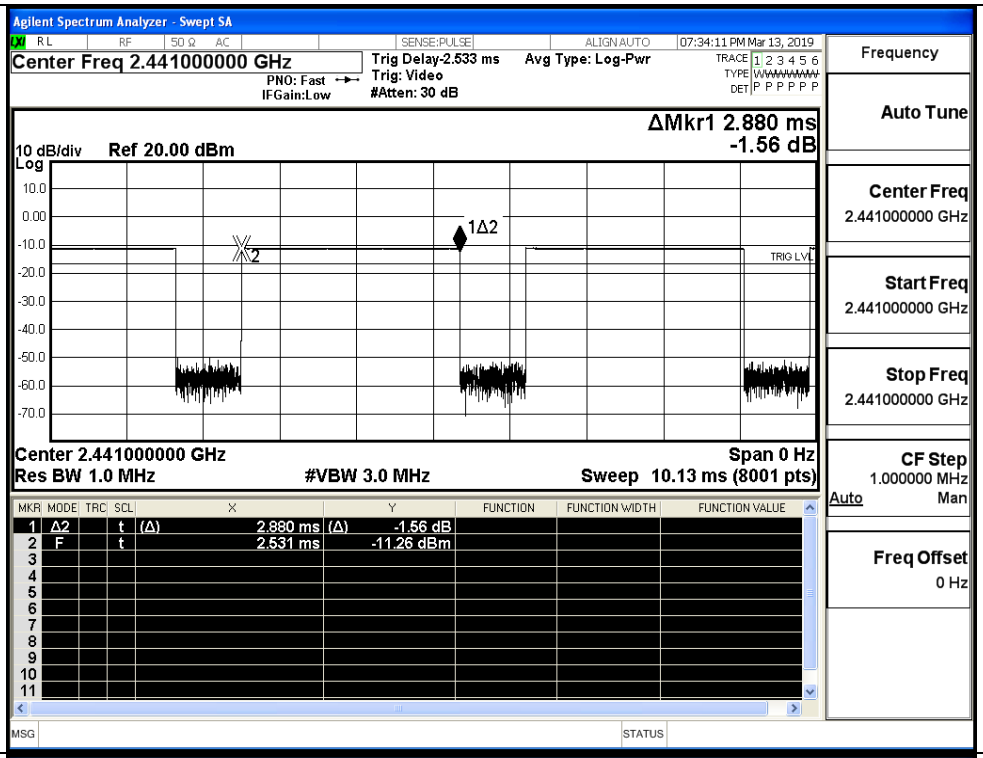
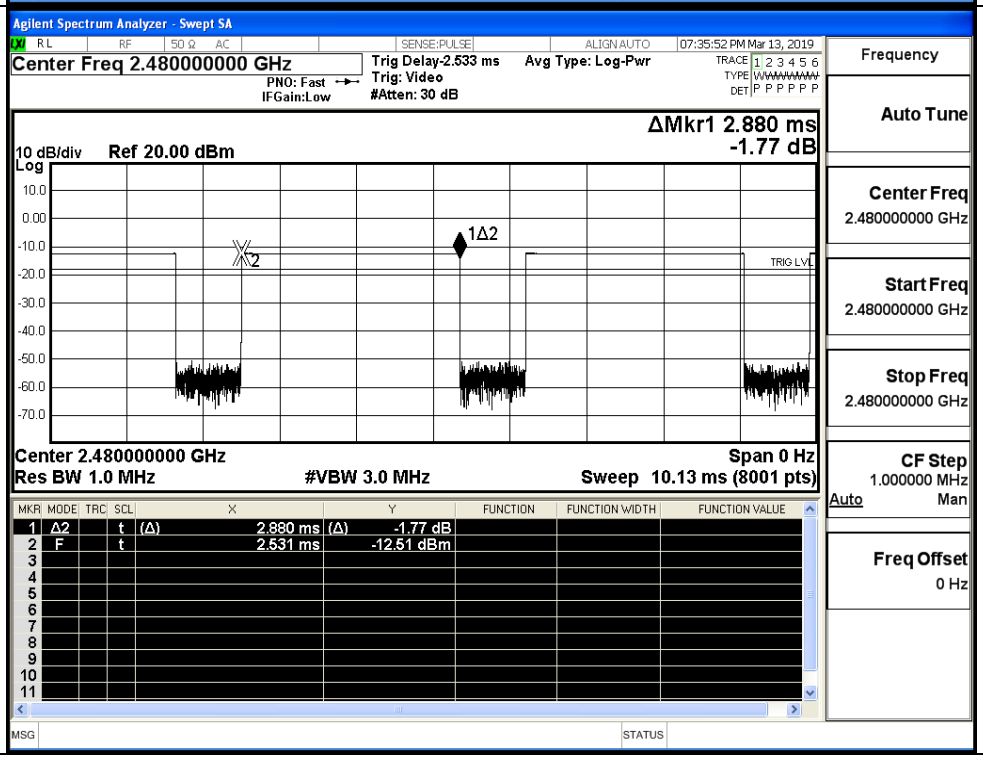
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
π/4DQPSK	Hop	79	>=15	PASS

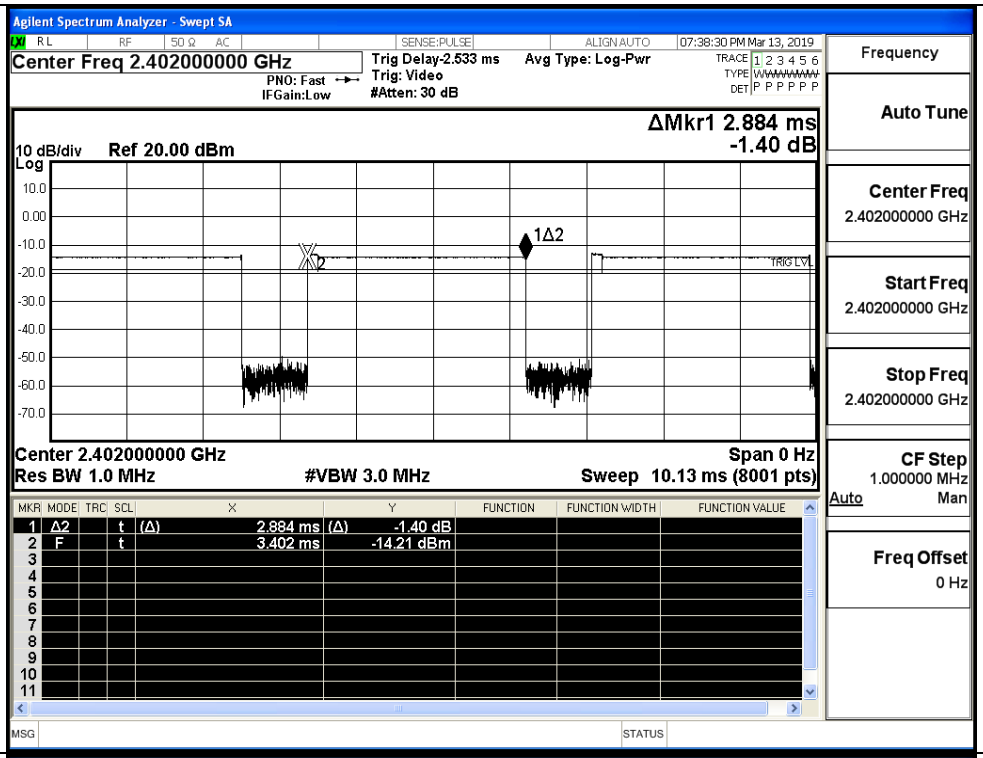
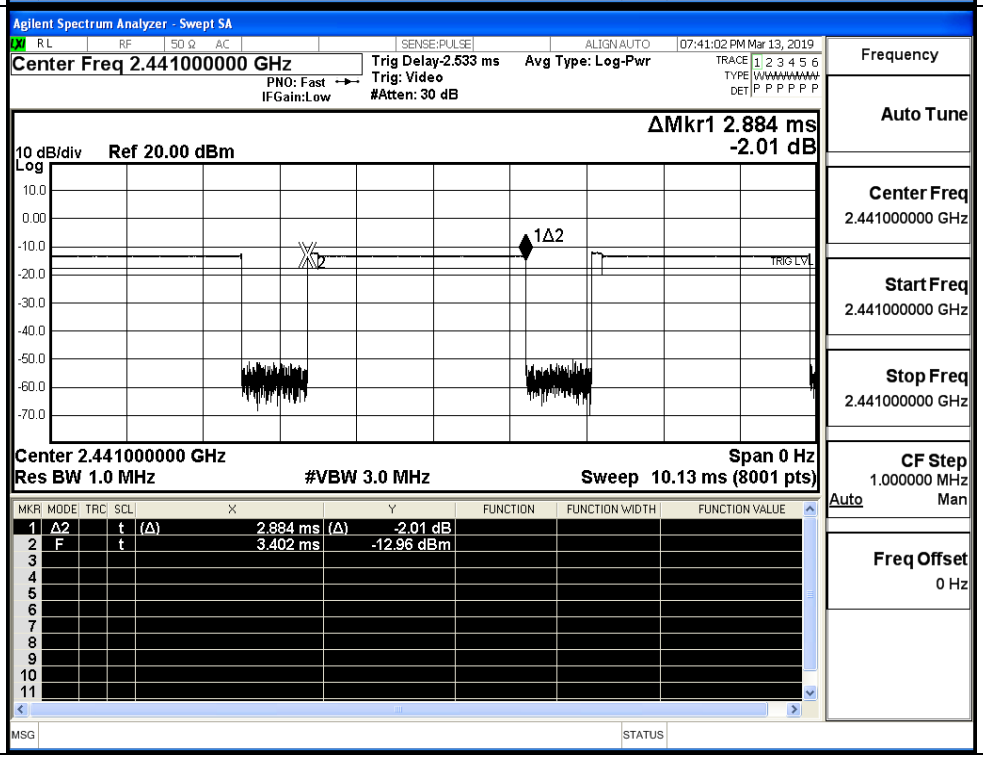
Test Graphs		
GFSK/Hop		
π/4DQPSK/Hop		

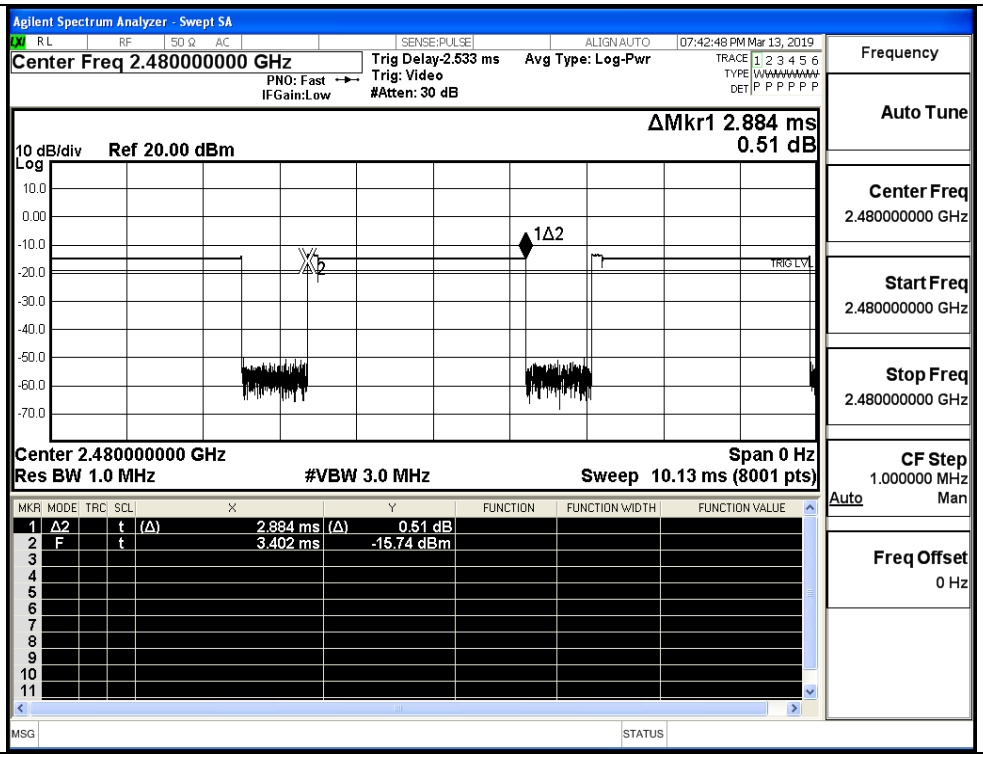
A.5 Dwell Time

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

Test Graphs	
GFSK_DH5/LCH	

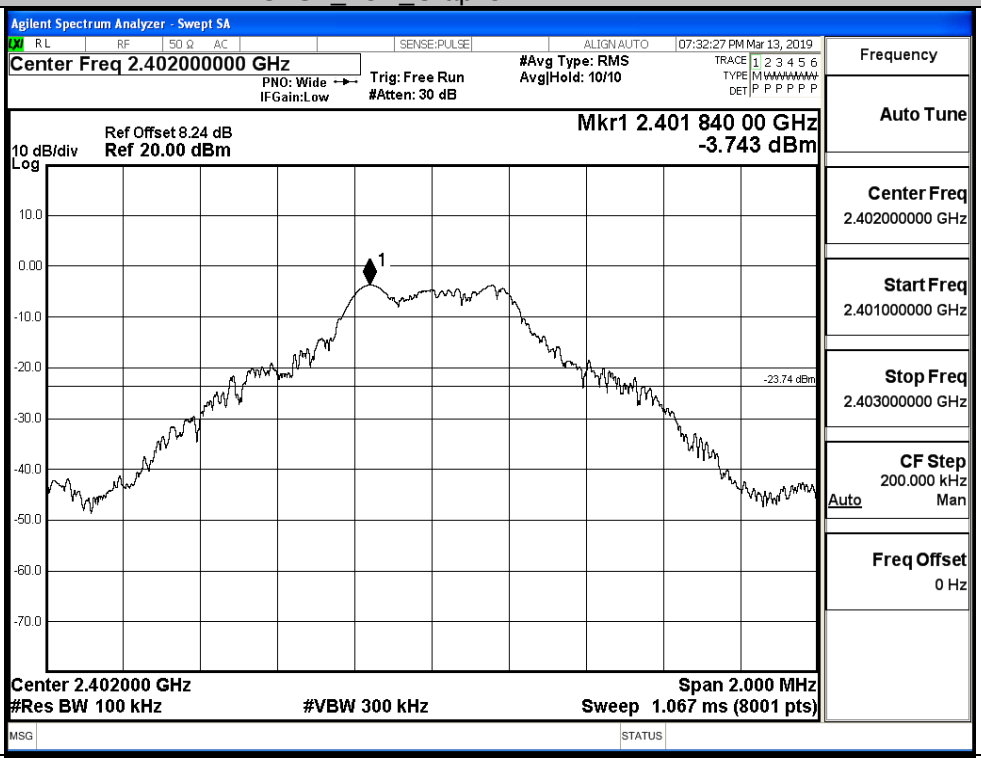
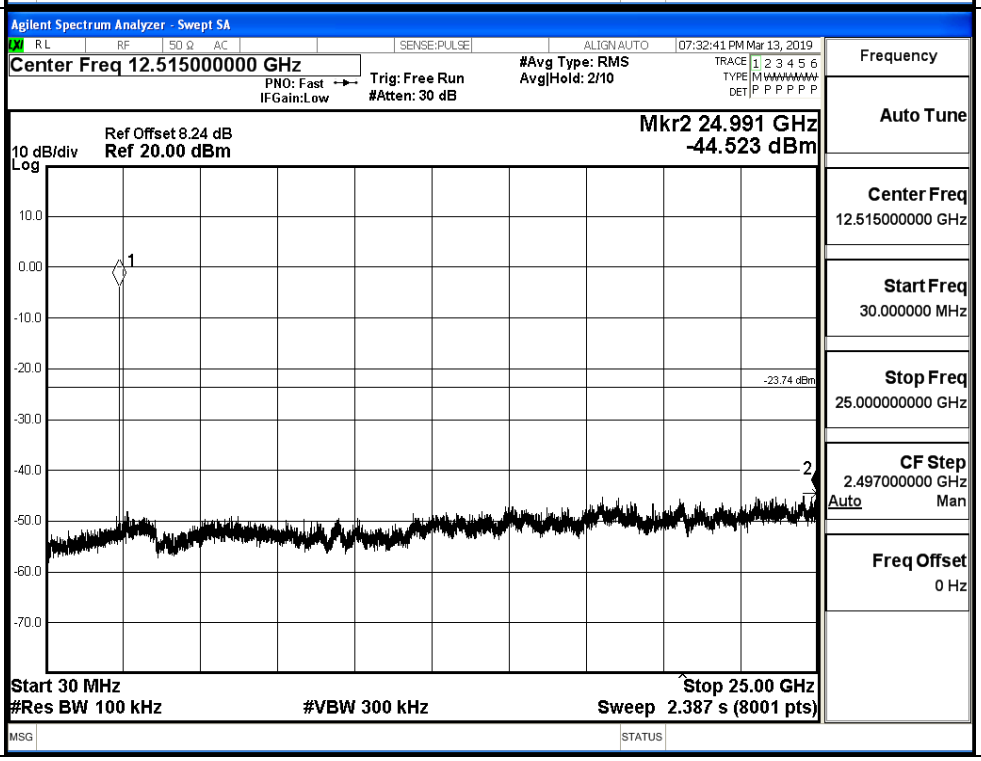
GFSK_DH5/MCH	
GFSK_DH5/HCH	

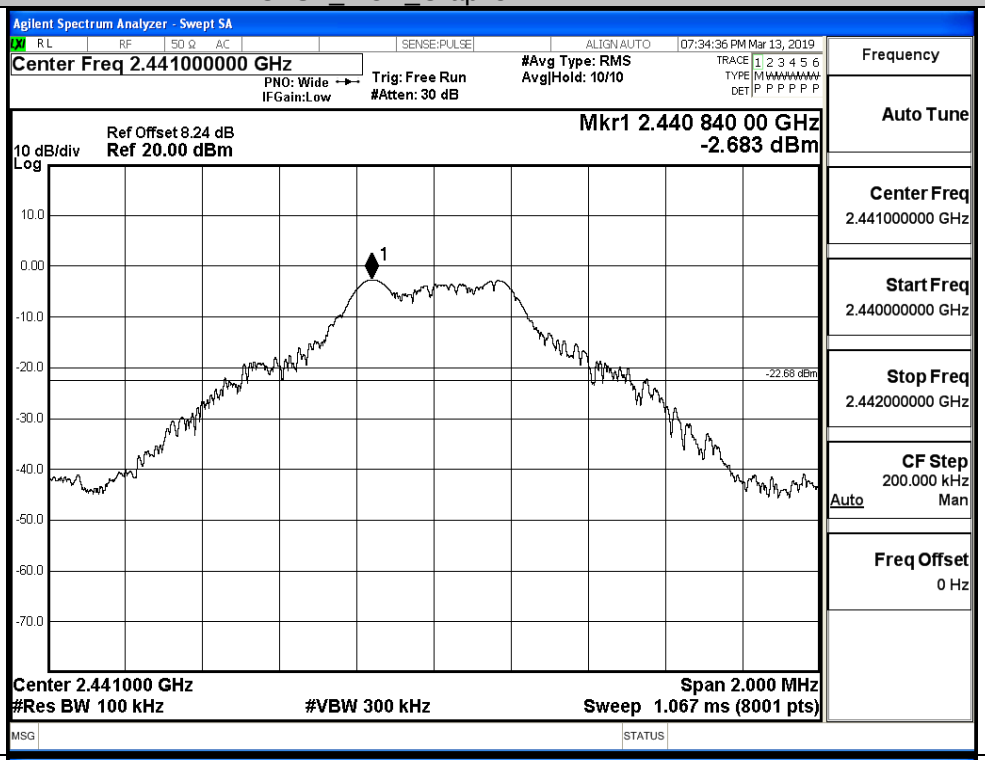
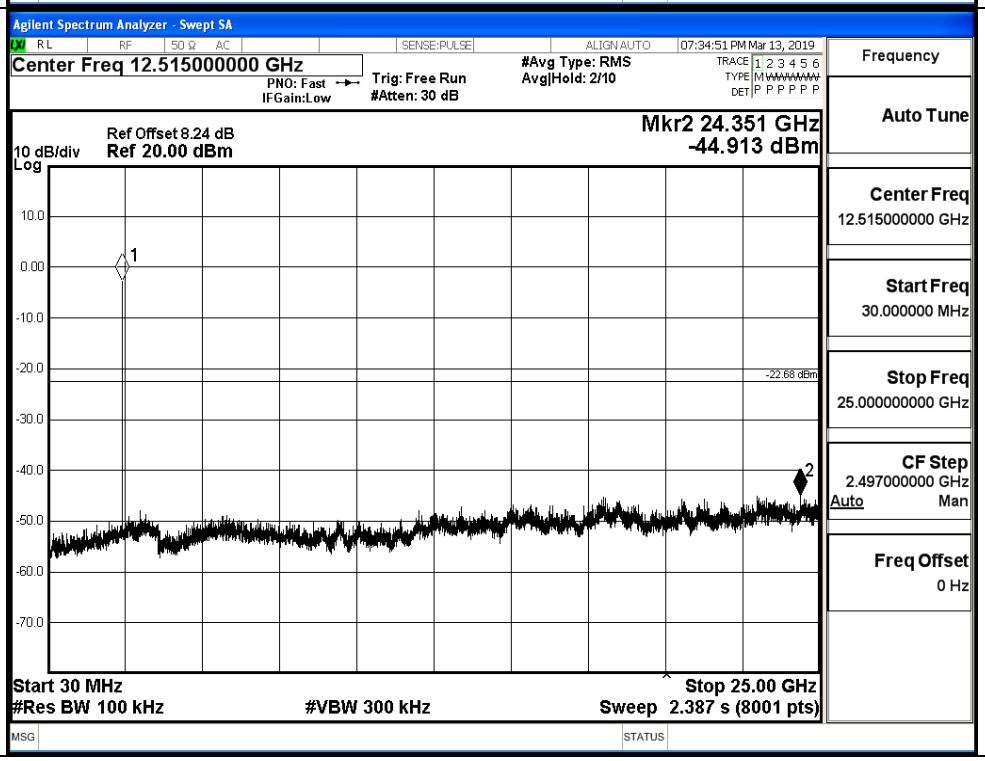
π/4DQPSK _2DH5/LCH	
π/4DQPSK _2DH5/MCH	

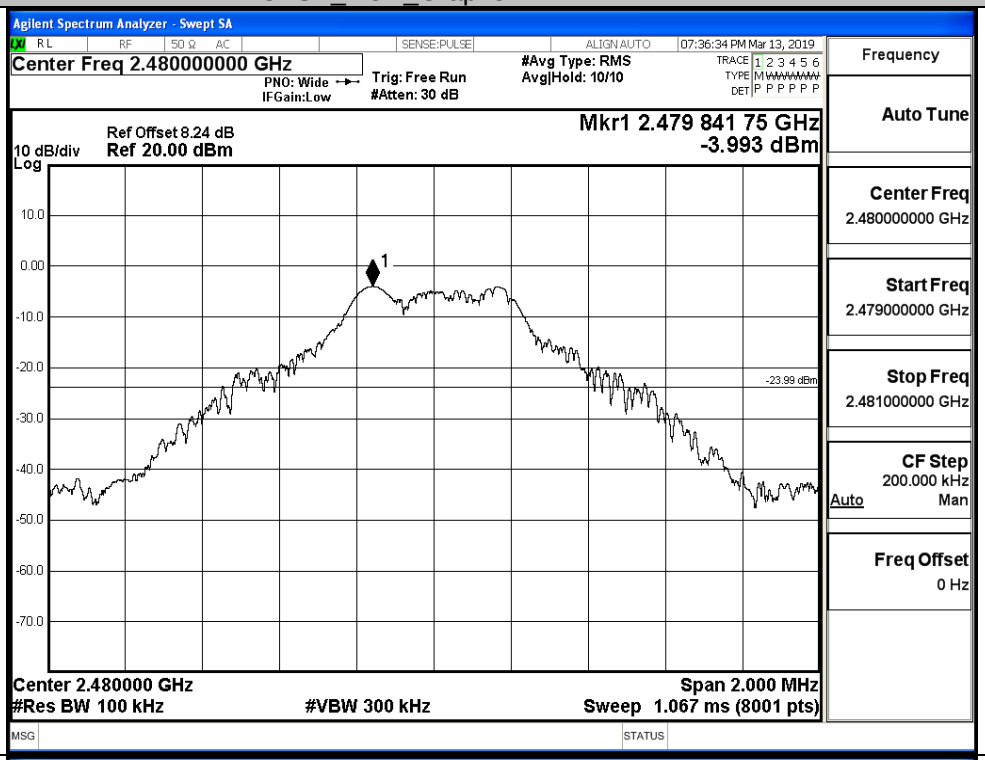
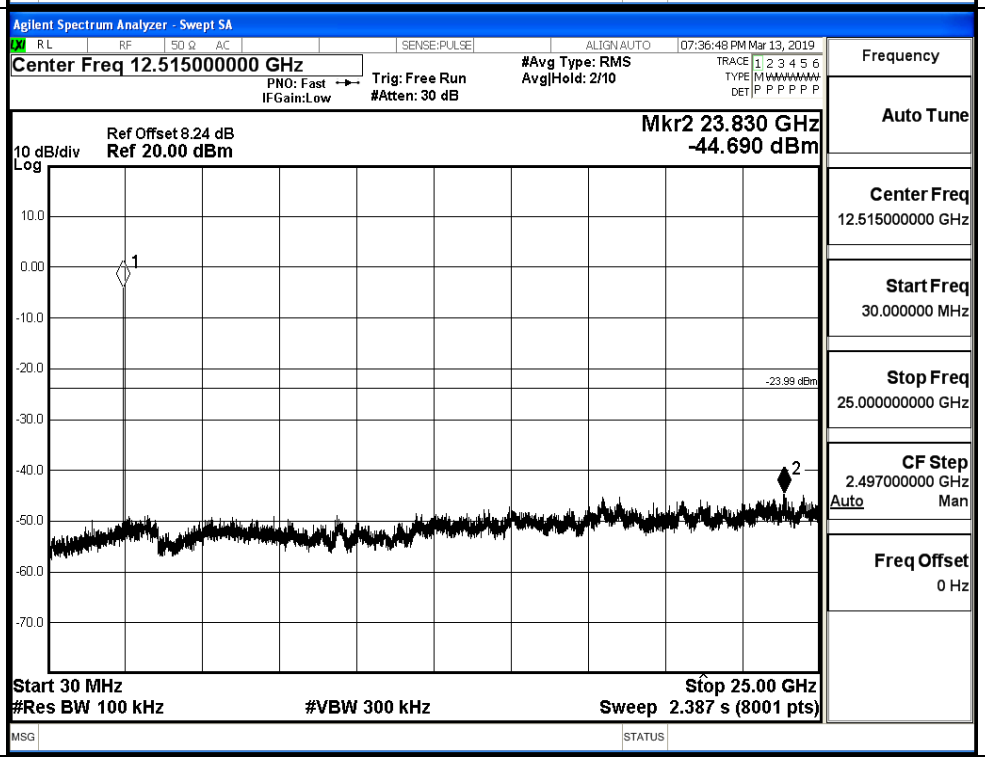
π/4DQPSK _2DH5/HCH	

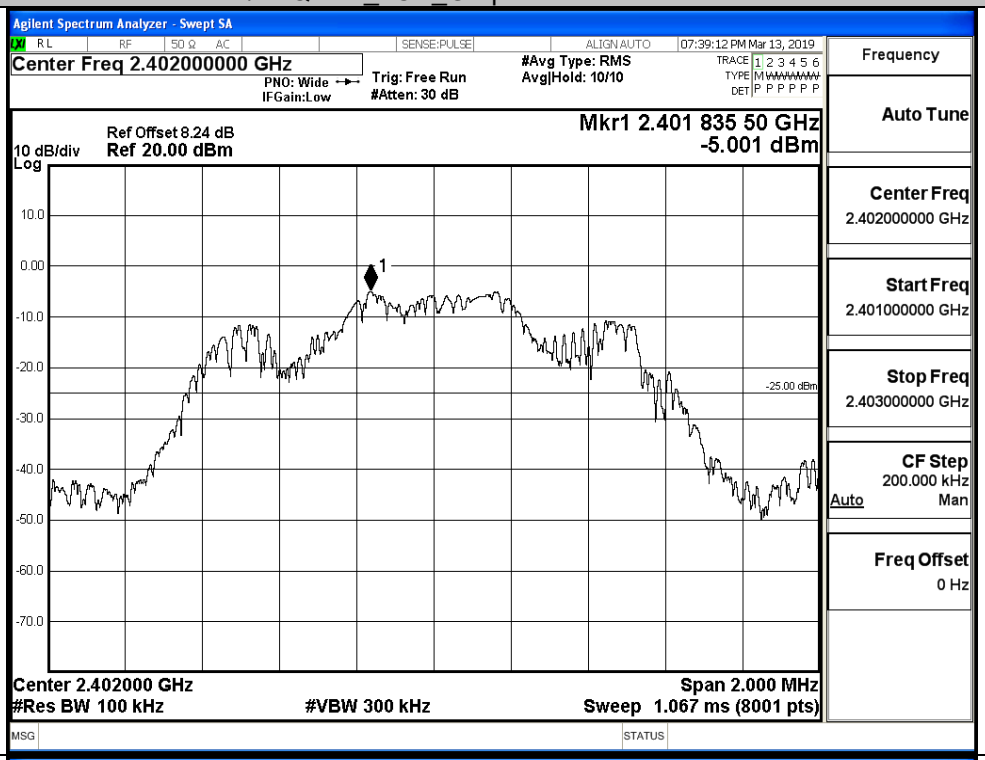
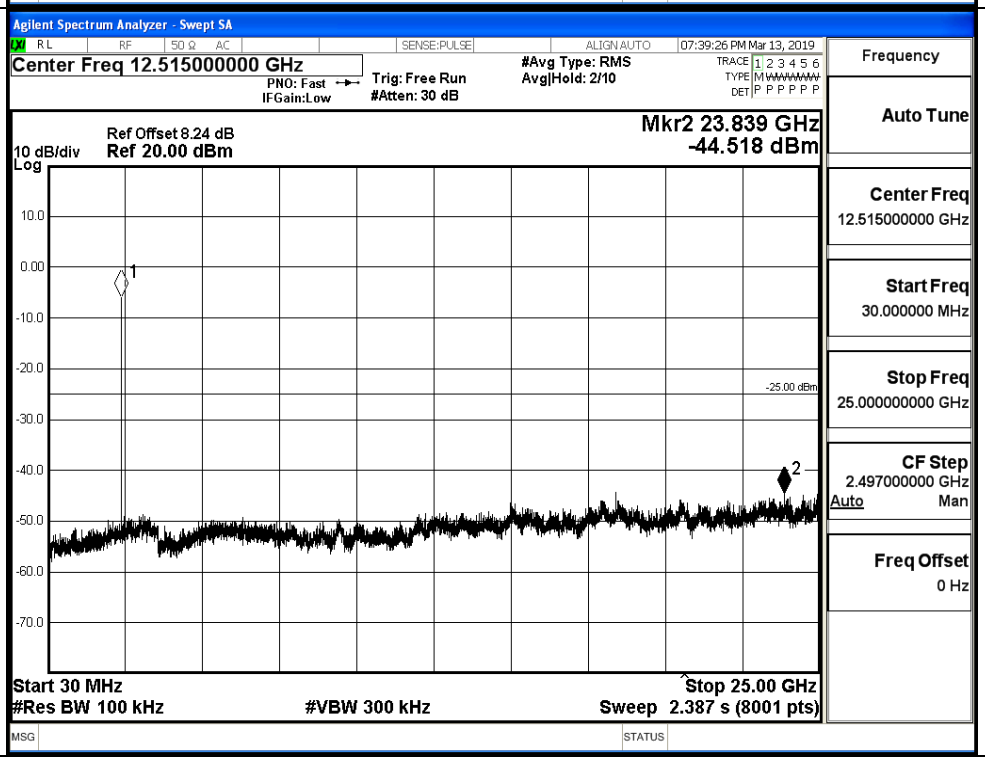
A.6 RF Conducted Spurious Emissions

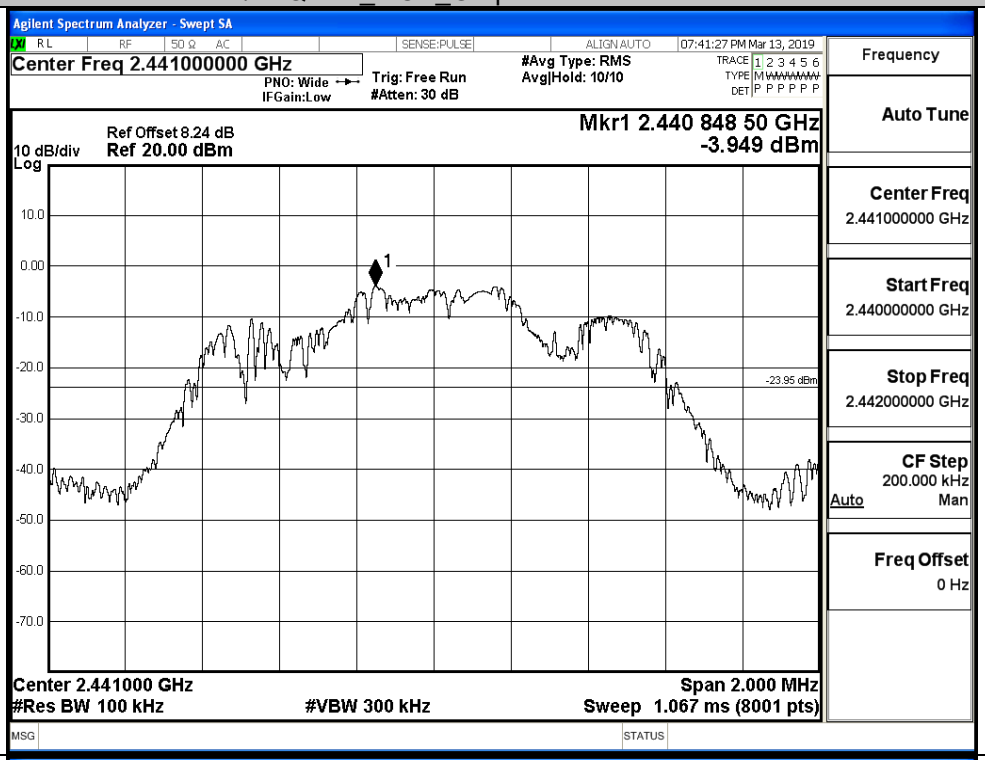
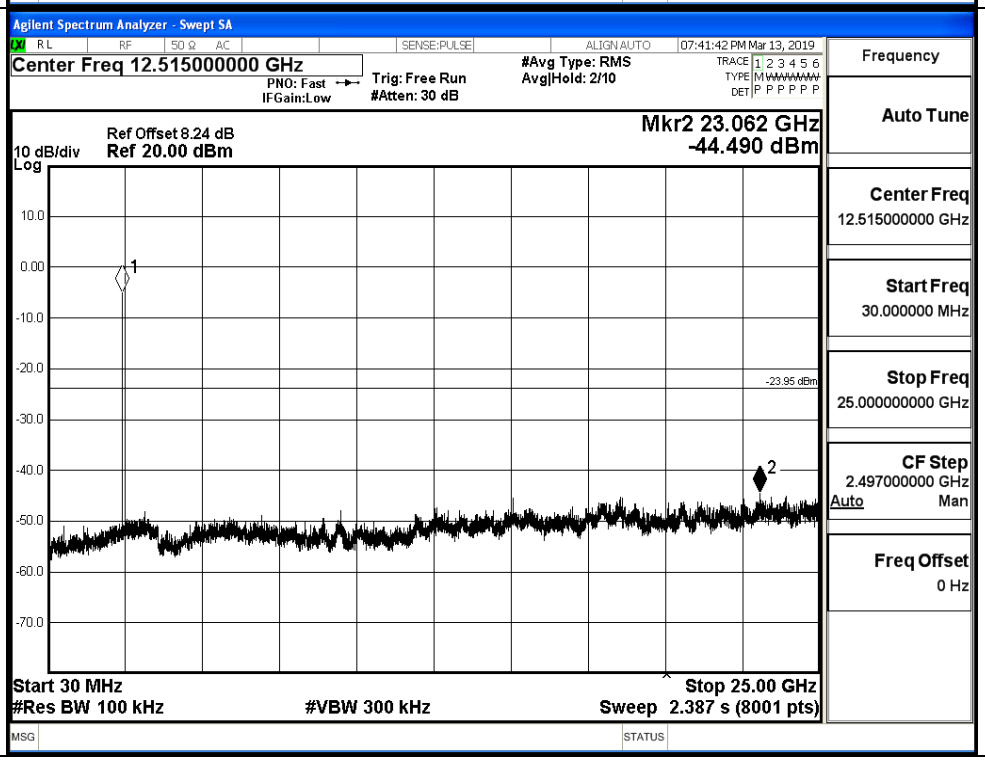
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-3.743	-44.523	-23.743	PASS
	MCH	-2.683	-44.913	-22.683	PASS
	HCH	-3.993	-44.690	-23.993	PASS
π/4DQPSK	LCH	-5.001	-44.518	-25.001	PASS
	MCH	-3.949	-44.490	-23.949	PASS
	HCH	-5.26	-44.848	-25.260	PASS

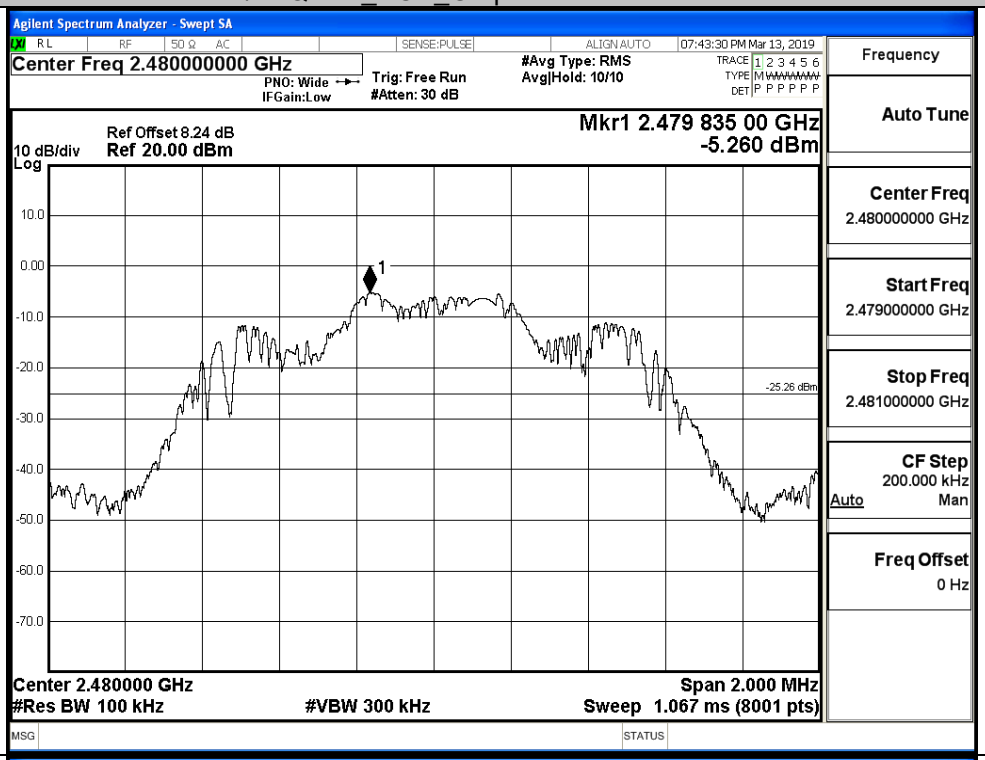
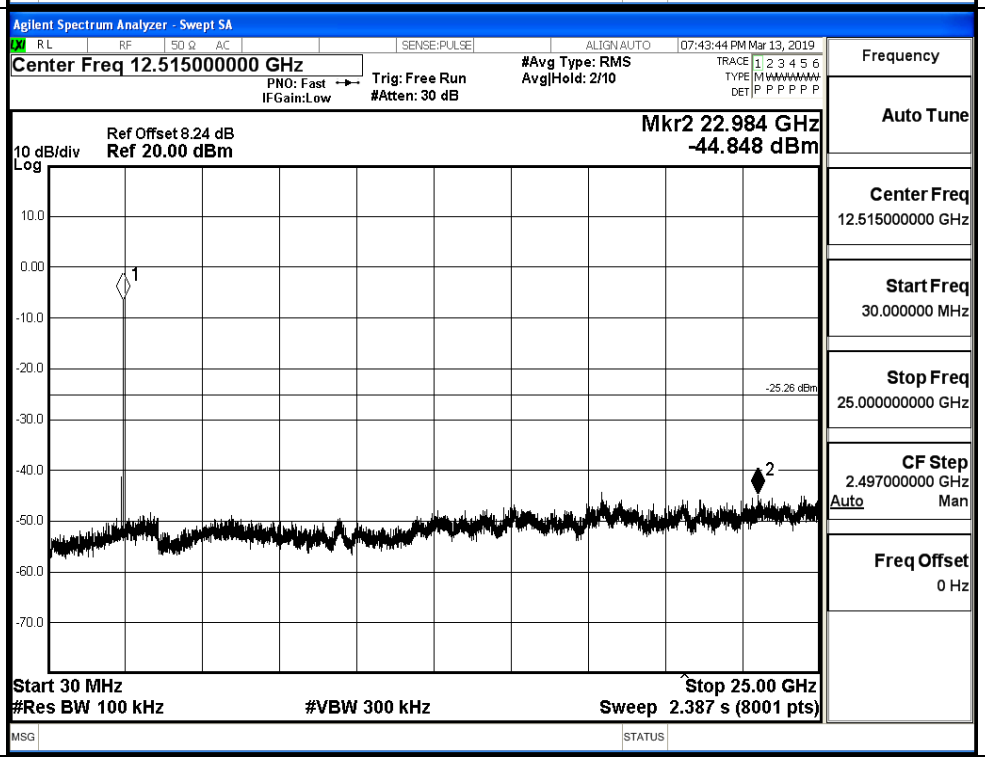
GFSK_LCH_Graphs		
Pref		
Puw		

GFSK_MCH_Graphs		
Pref		
Puw		

GFSK_HCH_Graphs		
Pref		
Puw		

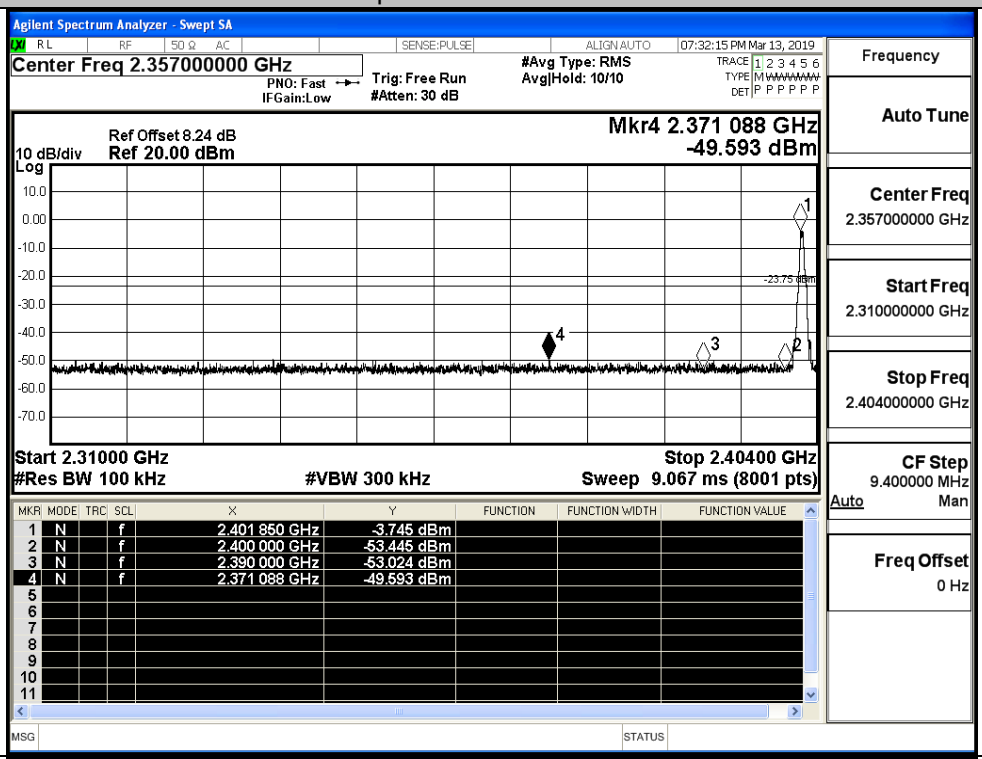
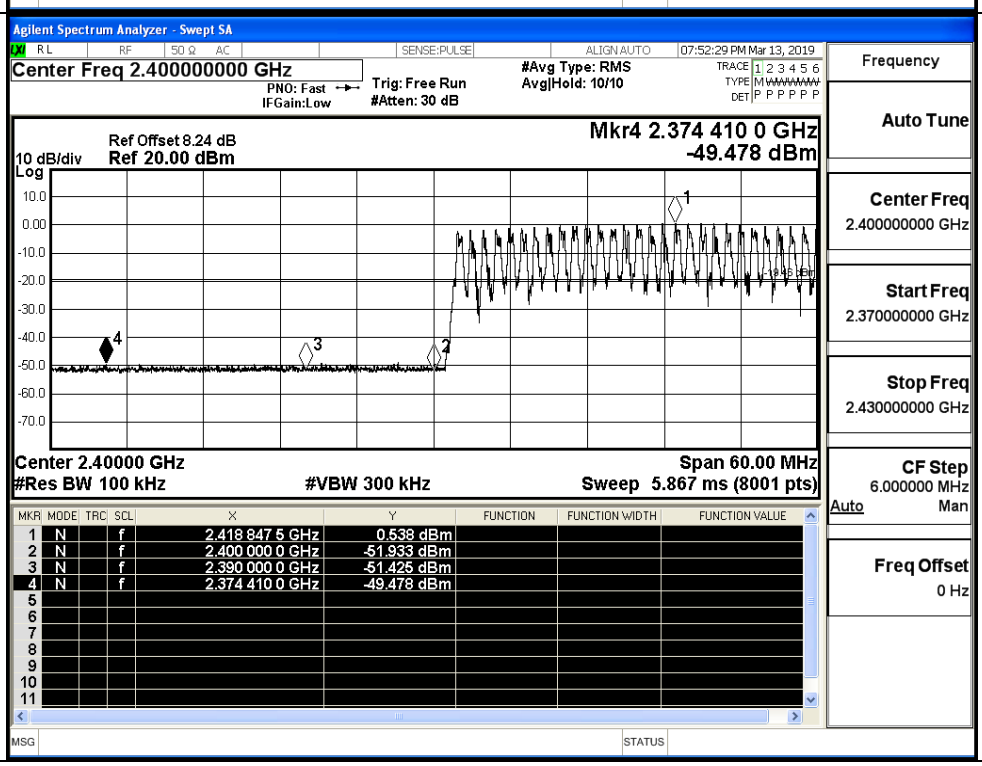
π/4DQPSK_LCH_Graphs		
Pref		
Puw		

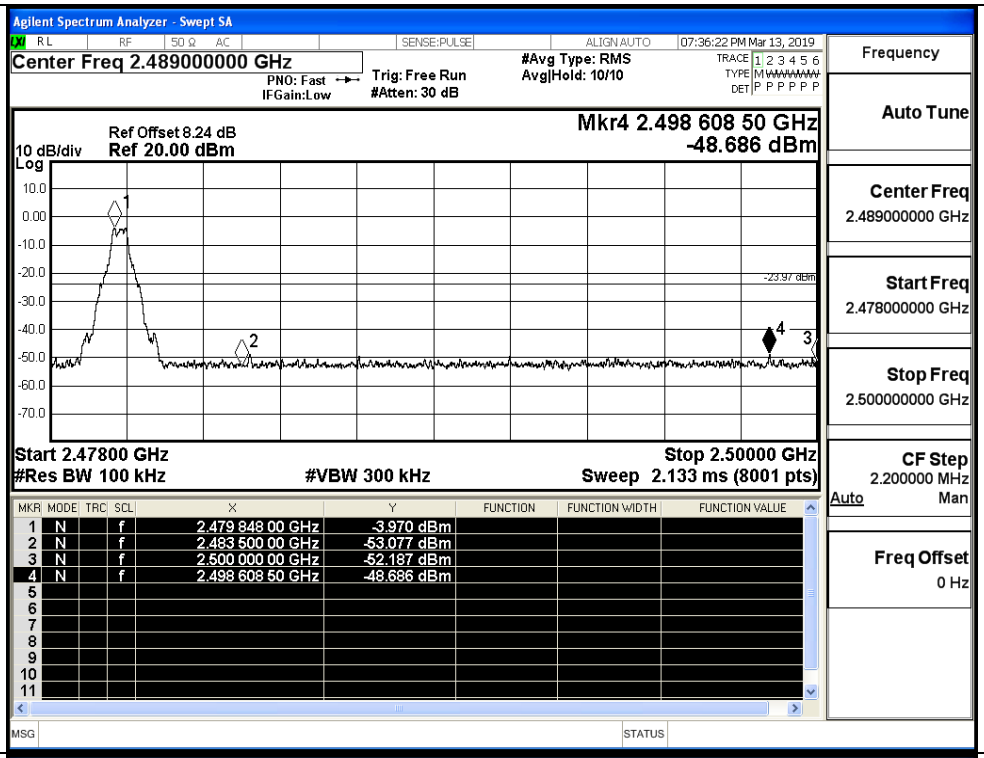
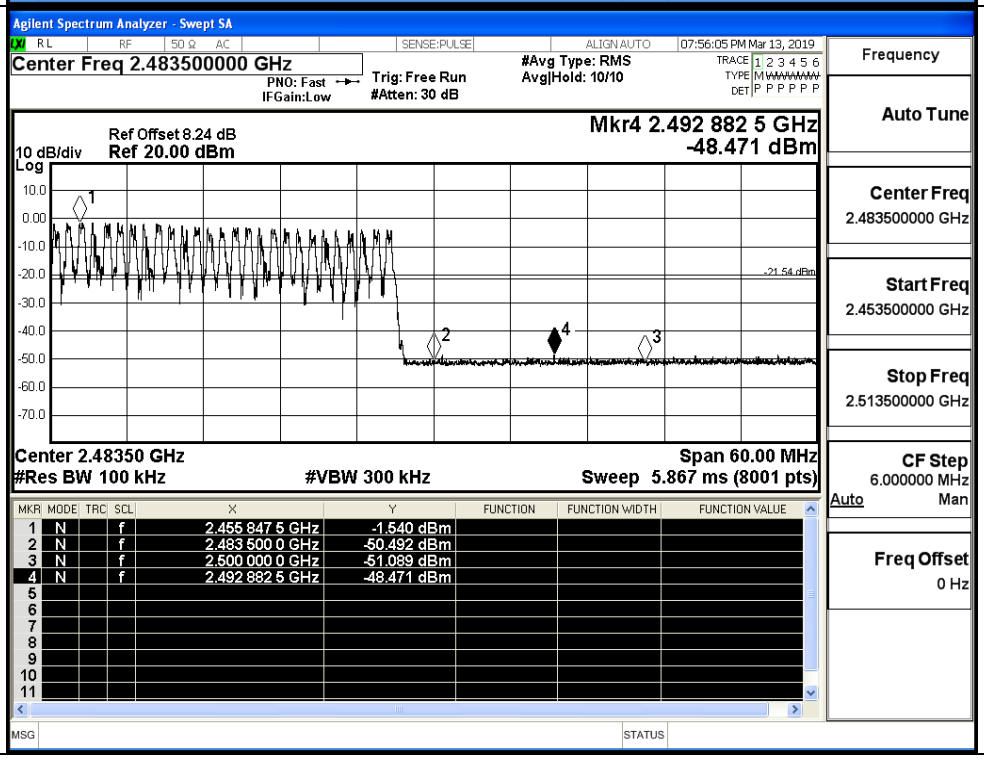
π/4DQPSK_MCH_Graphs		
Pref		
Puw		

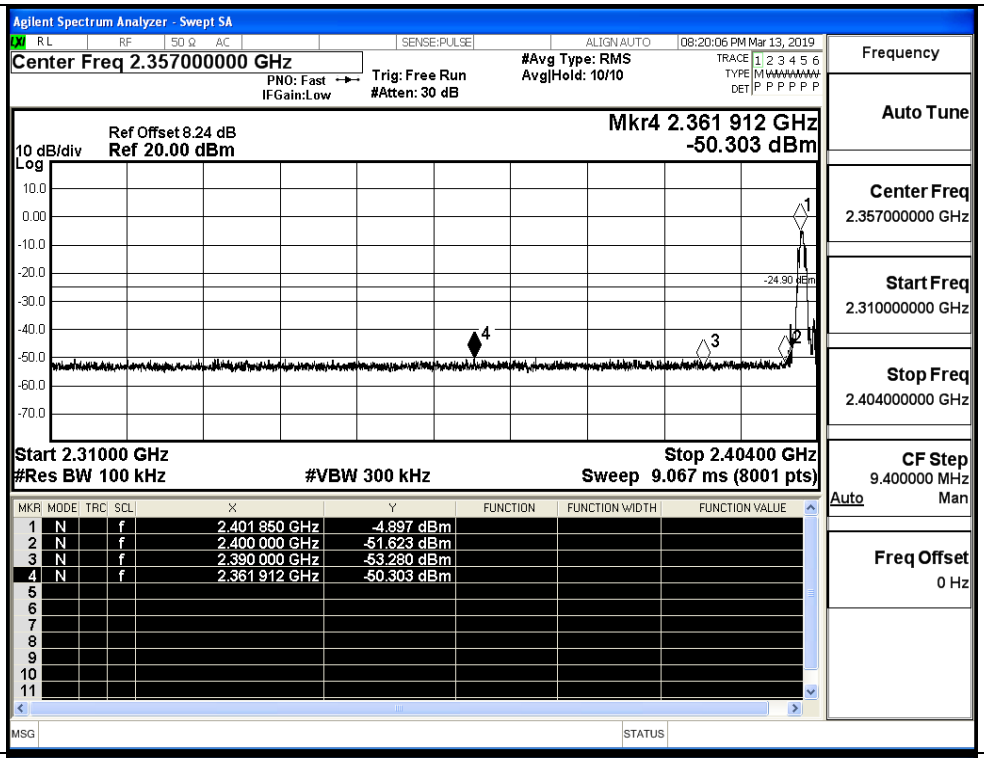
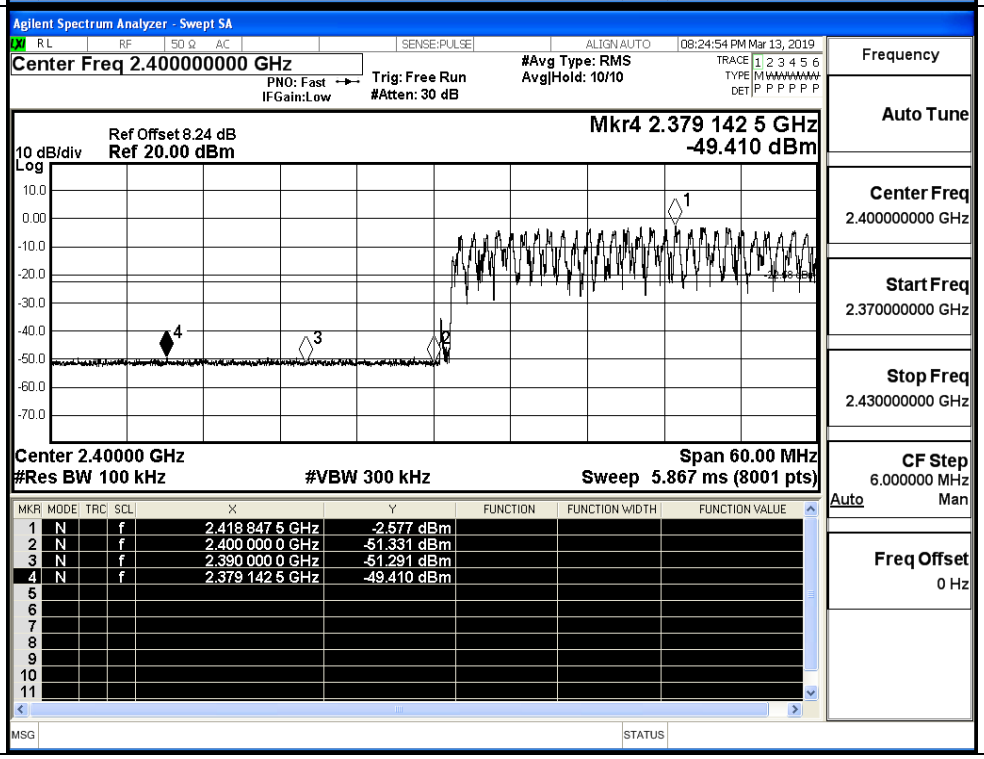
π/4DQPSK_HCH_Graphs		
Pref		
Puw		

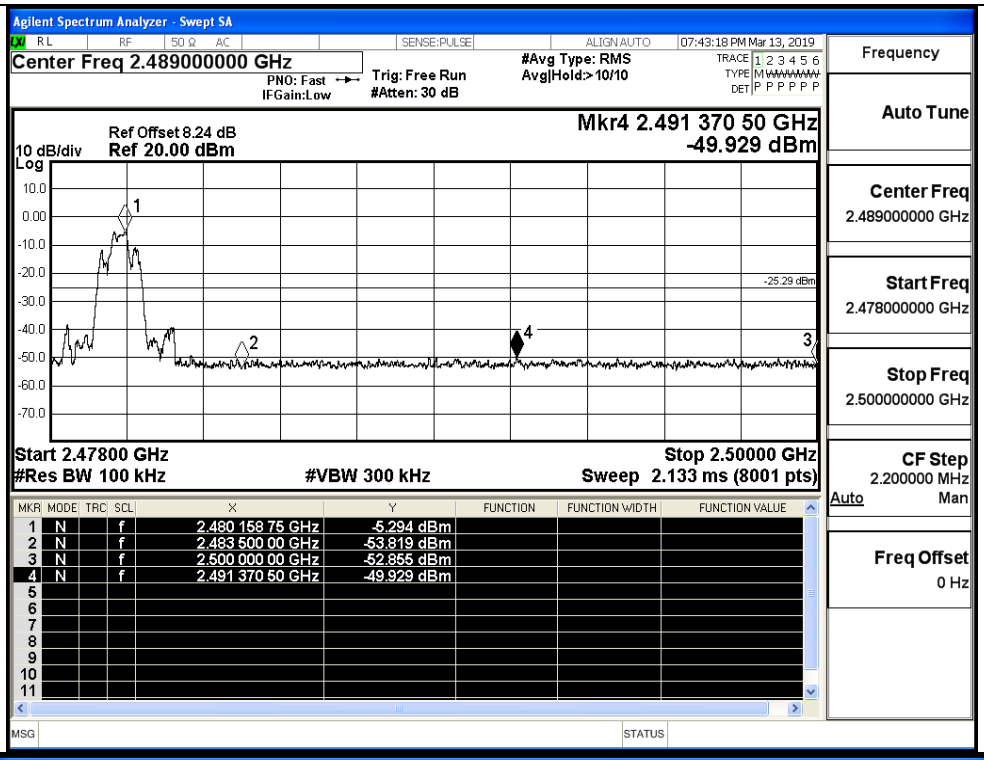
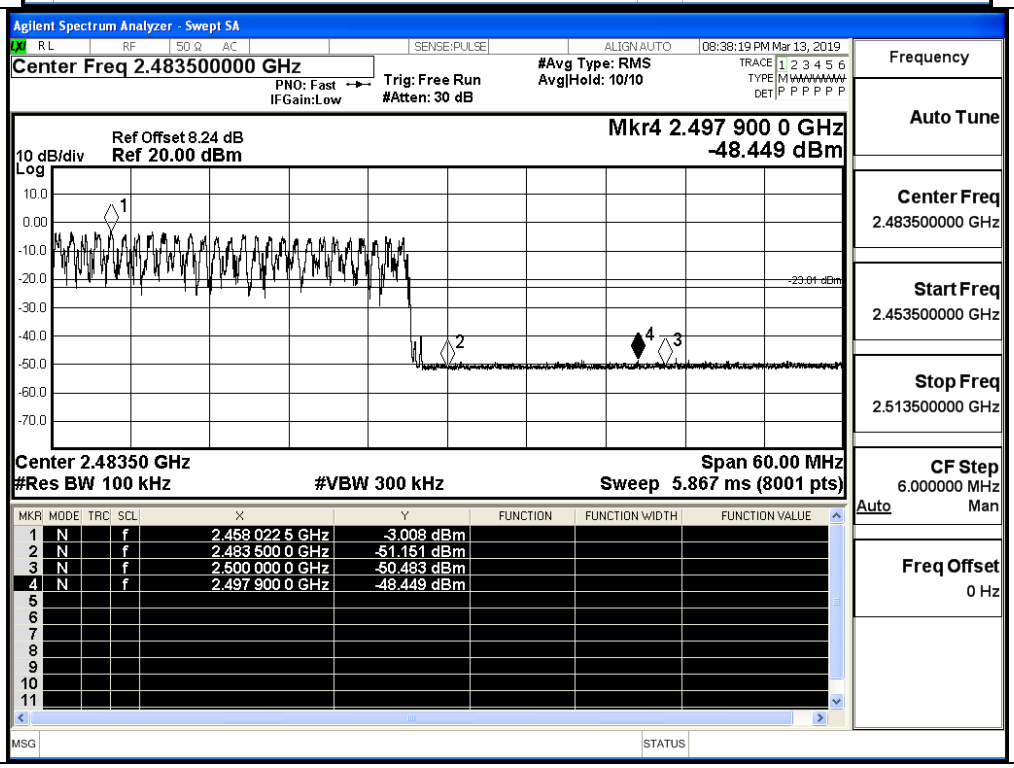
A.7 Band-edge for RF Conducted Emissions

Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-3.745	Off	-49.593	-23.75	PASS
			0.538	On	-49.478	-19.46	PASS
	HCH	2480	-3.970	Off	-48.686	-23.97	PASS
			-1.540	On	-48.471	-21.54	PASS
π/4DQPSK	LCH	2402	-4.897	Off	-50.303	-24.9	PASS
			-2.577	On	-49.410	-22.58	PASS
	HCH	2480	-5.294	Off	-49.929	-25.29	PASS
			-3.257	On	-48.753	-23.26	PASS

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

GFSK/HCH/No Hop	
GFSK/HCH/Hop	

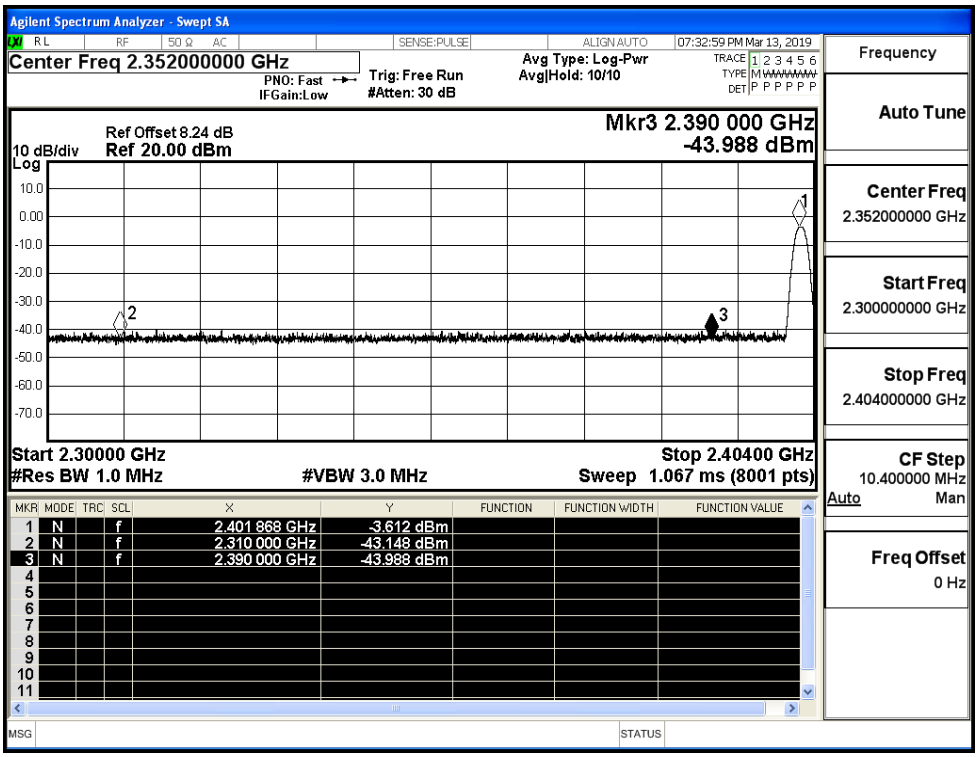
π/4DQPSK/LCH/No Hop	
π/4DQPSK/LCH/Hop	

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

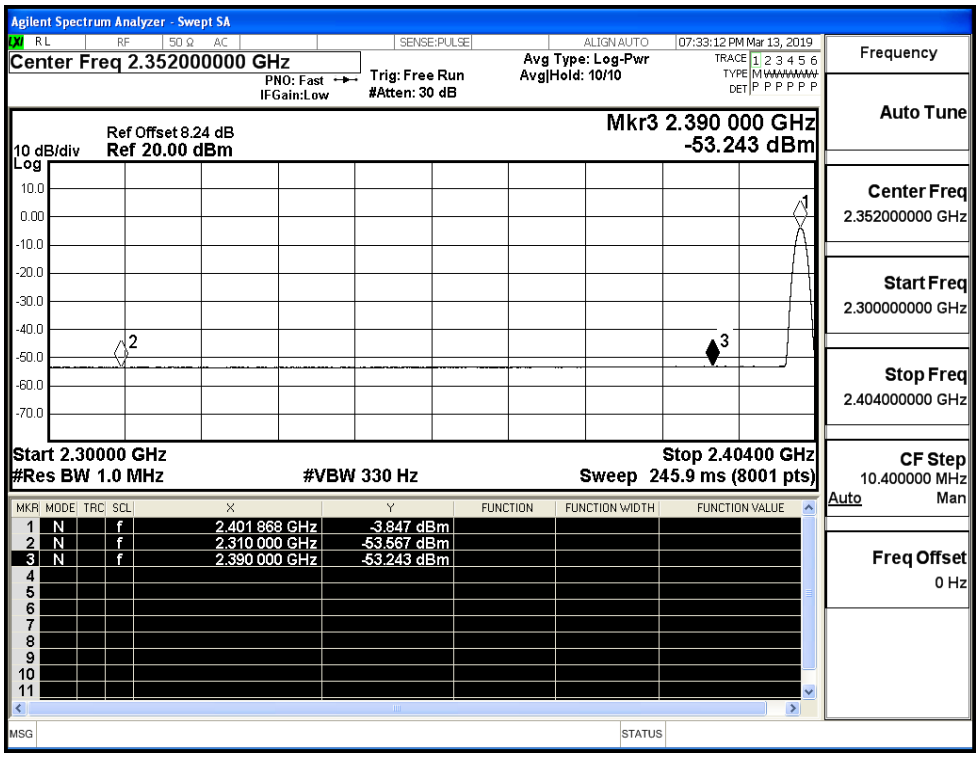
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.15	2.0	0	52.11	PEAK	74	PASS
	Off	2310.0	-53.57	2.0	0	41.69	AV	54	PASS
	Off	2390.0	-43.99	2.0	0	51.27	PEAK	74	PASS
	Off	2390.0	-53.24	2.0	0	42.01	AV	54	PASS
	Off	2483.5	-43.43	2.0	0	51.83	PEAK	74	PASS
	Off	2483.5	-52.97	2.0	0	42.28	AV	54	PASS
	Off	2500.0	-42.58	2.0	0	52.68	PEAK	74	PASS
	Off	2500.0	-52.72	2.0	0	42.53	AV	54	PASS
π/4DQPSK	Off	2310.0	-43.70	2.0	0	51.56	PEAK	74	PASS
	Off	2310.0	-53.49	2.0	0	41.77	AV	54	PASS
	Off	2390.0	-43.28	2.0	0	51.98	PEAK	74	PASS
	Off	2390.0	-53.12	2.0	0	42.14	AV	54	PASS
	Off	2483.5	-42.82	2.0	0	52.44	PEAK	74	PASS
	Off	2483.5	-52.95	2.0	0	42.31	AV	54	PASS
	Off	2500.0	-41.29	2.0	0	53.97	PEAK	74	PASS
	Off	2500.0	-52.87	2.0	0	42.39	AV	54	PASS

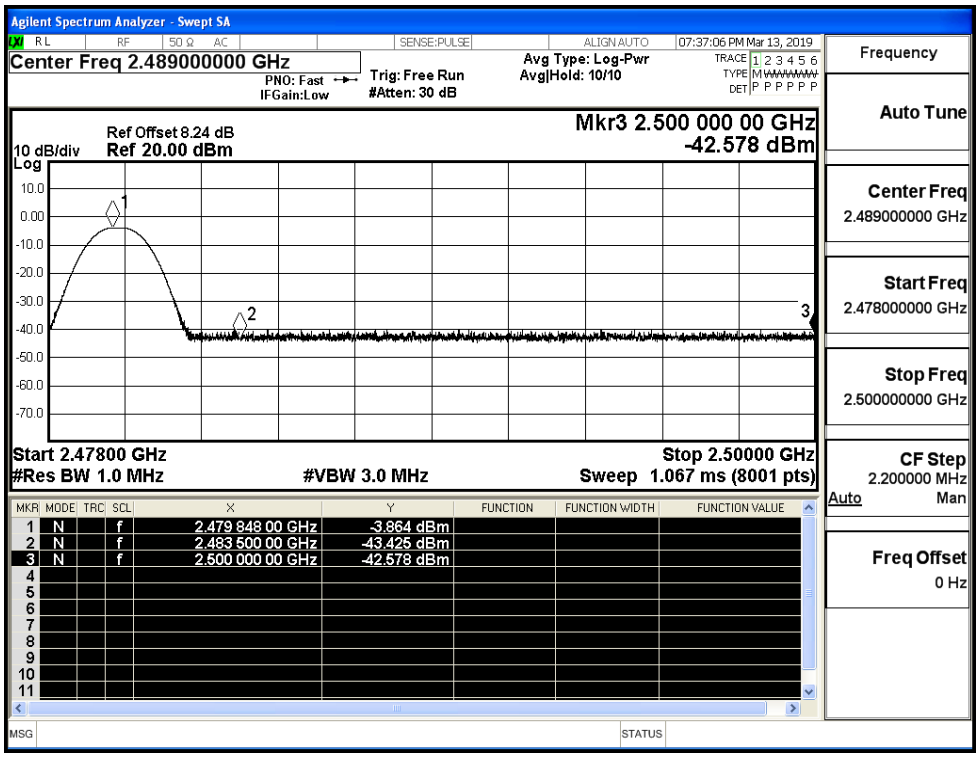
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (Low Channel)



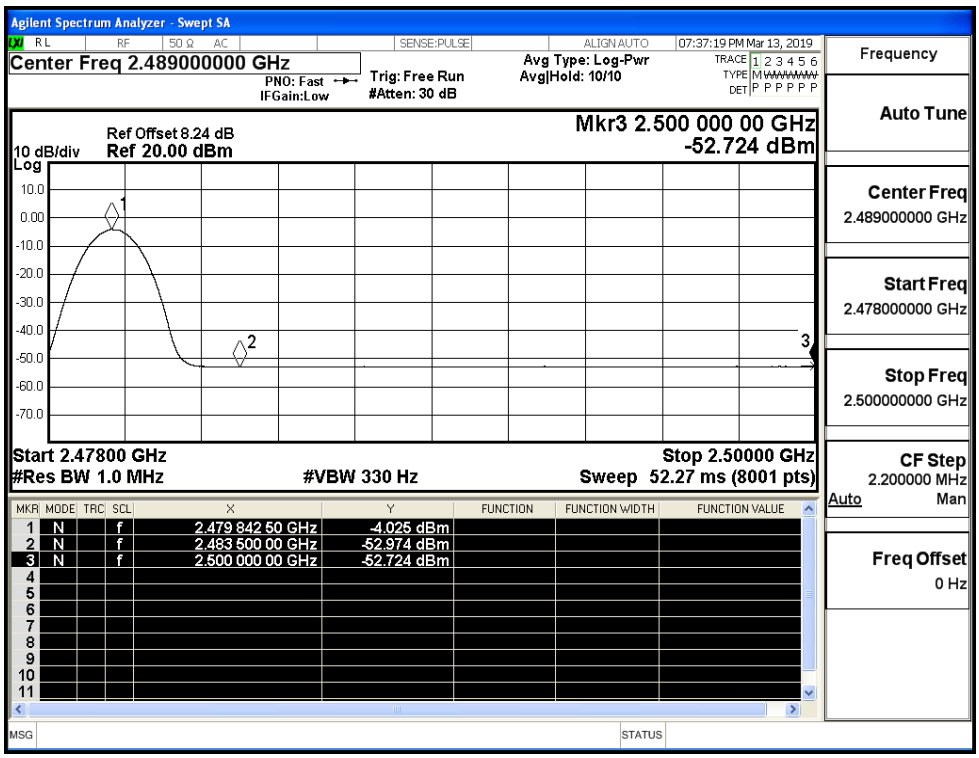
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (Low Channel)



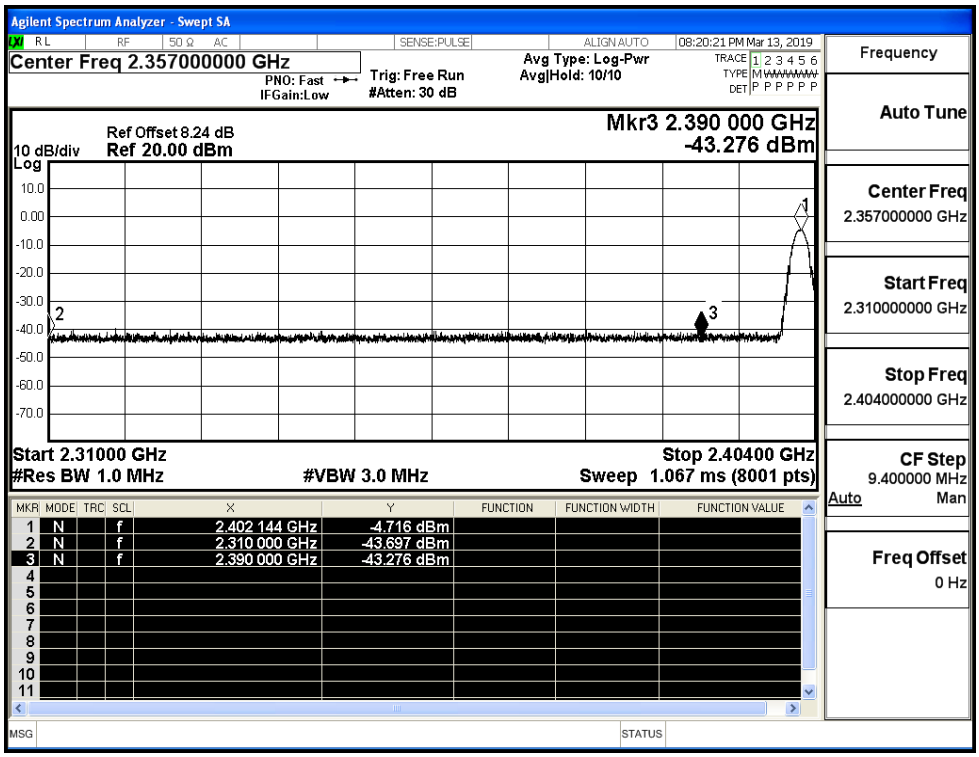
Restrict-band band-edge measurements_Hopping Off_ GFSK_PEAK (High Channel)



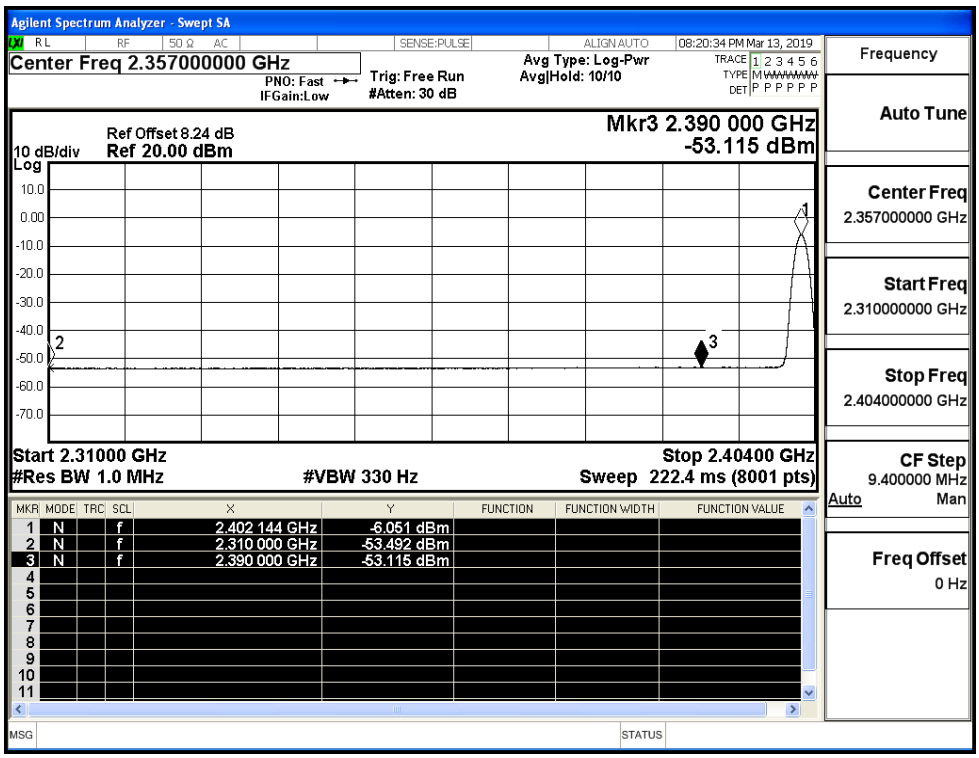
Restrict-band band-edge measurements_Hopping Off_ GFSK_Average (High Channel)



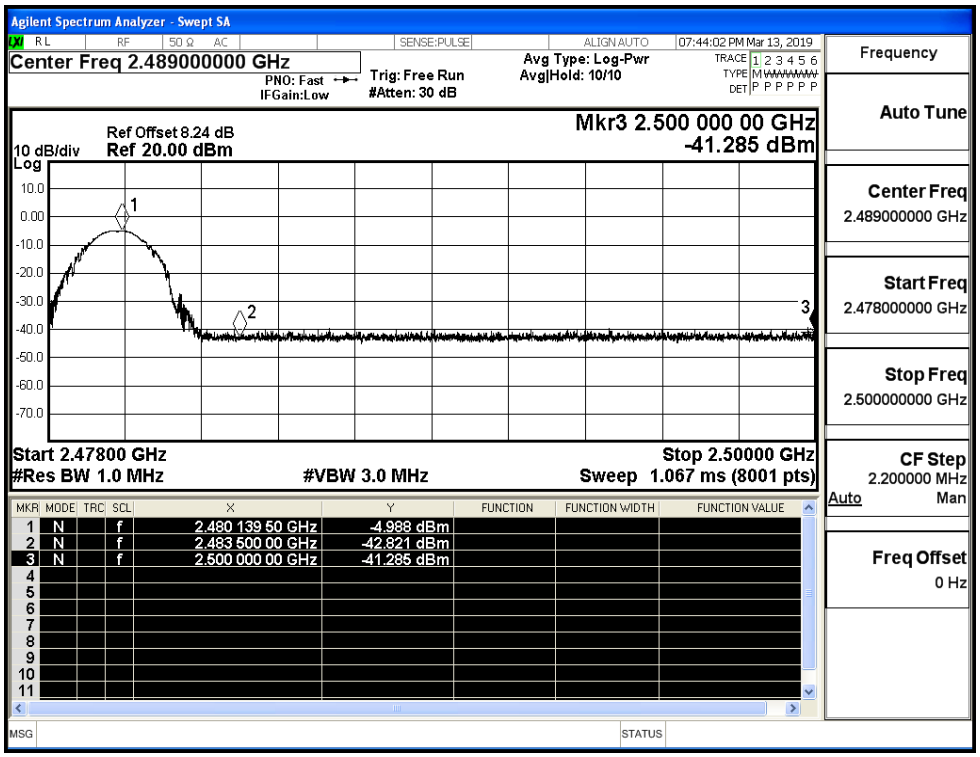
Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (Low Channel)



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)