Appendix A
RF Test Data for BT(BDR/EDR) (Conducted Measurement)

Product Name: Bluetooth mechanical keyboard
Trade Mark: keychron

Test Model: keychron K1

FCC ID: 2ASF4-KS

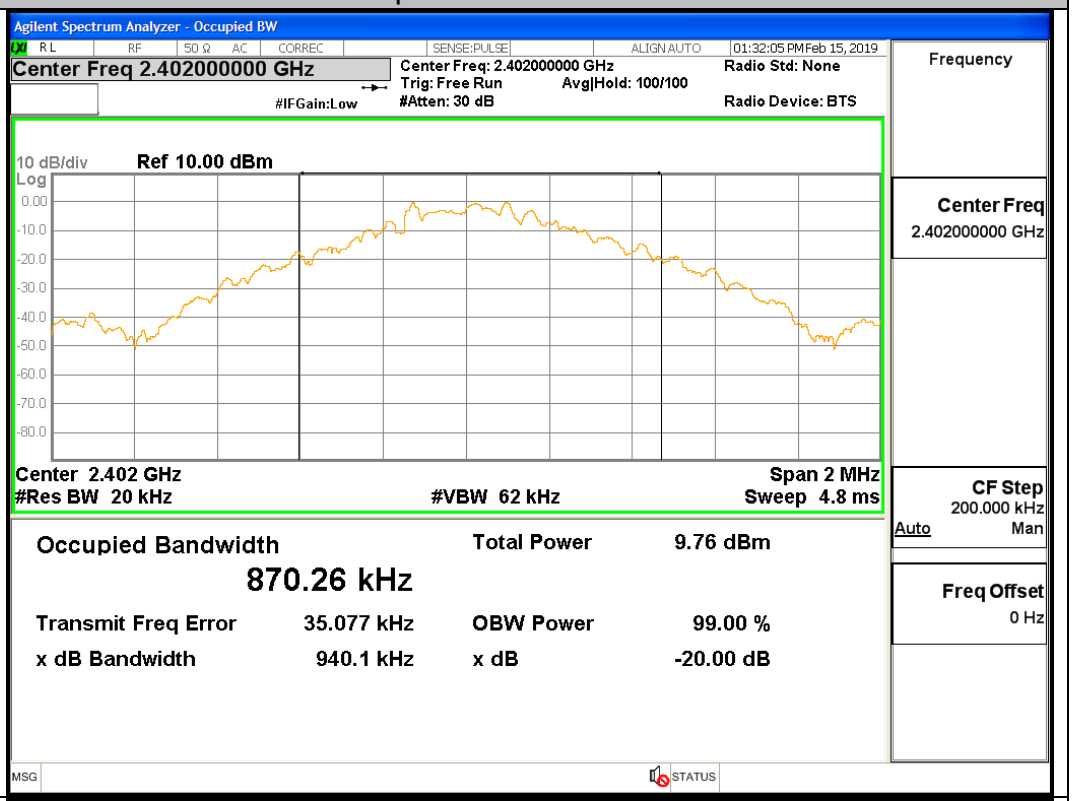
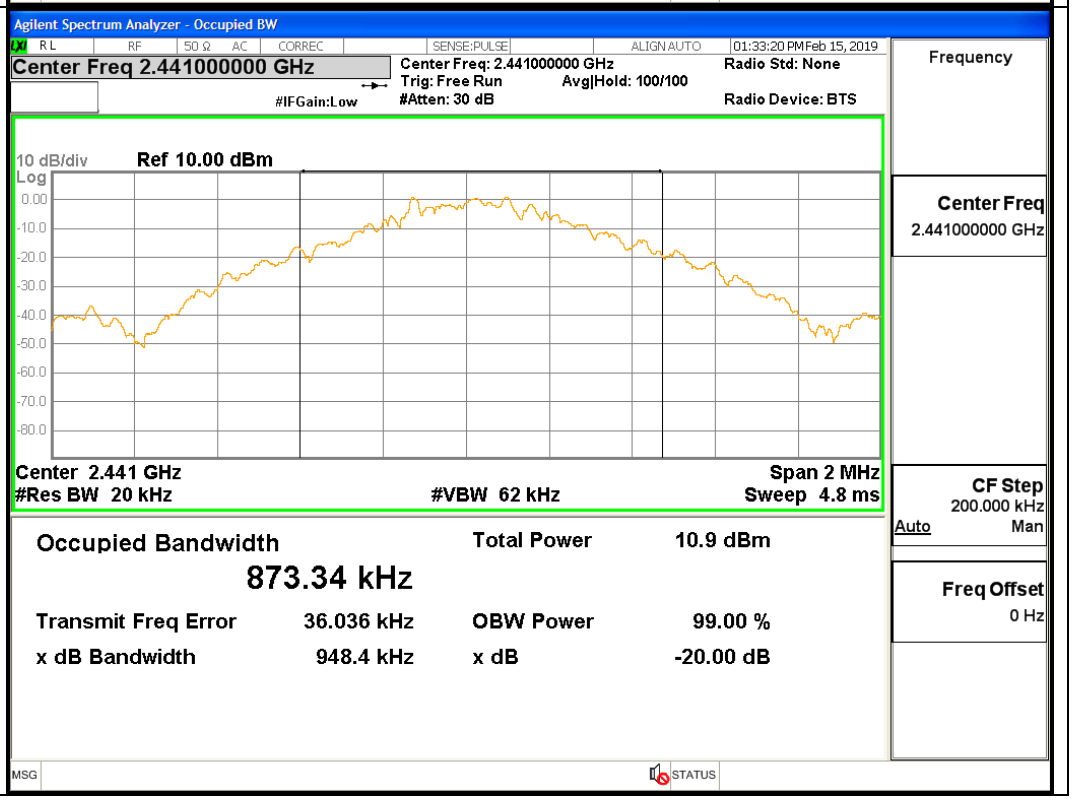
Environmental Conditions

Temperature:	22.1 ° C
Relative Humidity:	50%
ATM Pressure:	100.0 kPa
Test Engineer:	Gary Qian
Supervised by:	Eden Hu

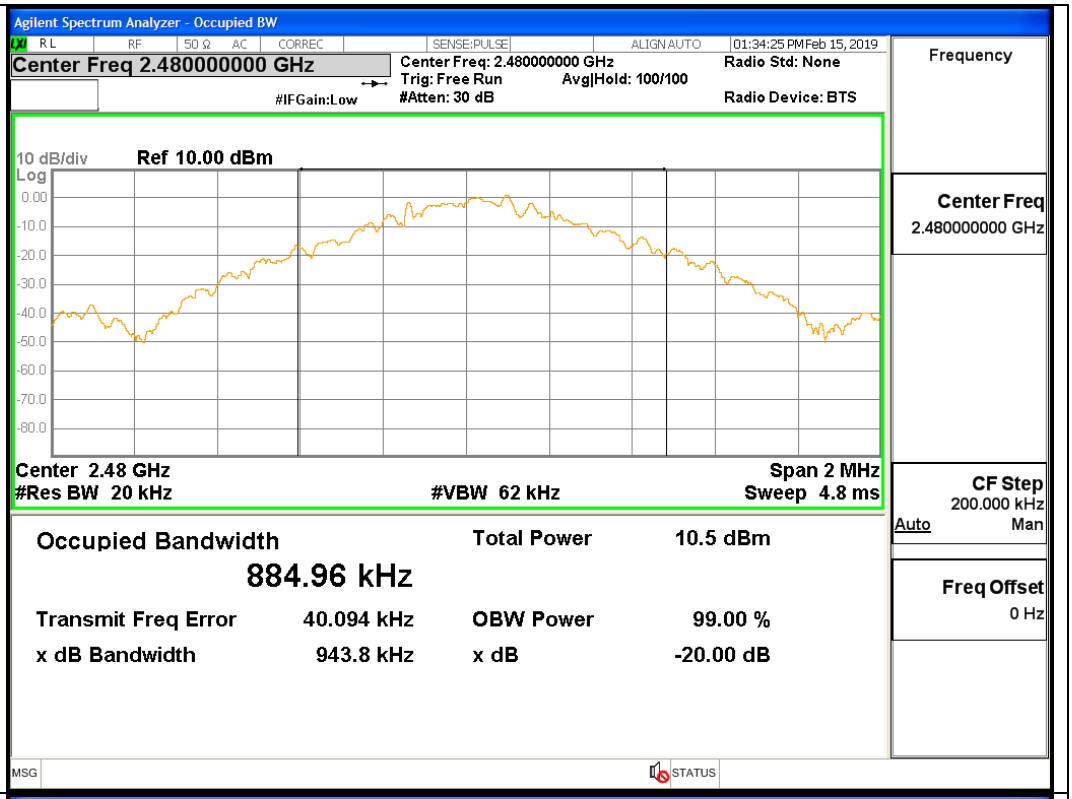
A.1 20 dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit(MHz)	Verdict
GFSK	LCH	0.940	Not Specified	PASS
GFSK	MCH	0.948	Not Specified	PASS
GFSK	HCH	0.944	Not Specified	PASS
π/4DQPSK	LCH	1.336	Not Specified	PASS
π/4DQPSK	MCH	1.344	Not Specified	PASS
π/4DQPSK	HCH	1.330	Not Specified	PASS
8DPSK	LCH	1.272	Not Specified	PASS
8DPSK	MCH	1.326	Not Specified	PASS
8DPSK	HCH	1.269	Not Specified	PASS

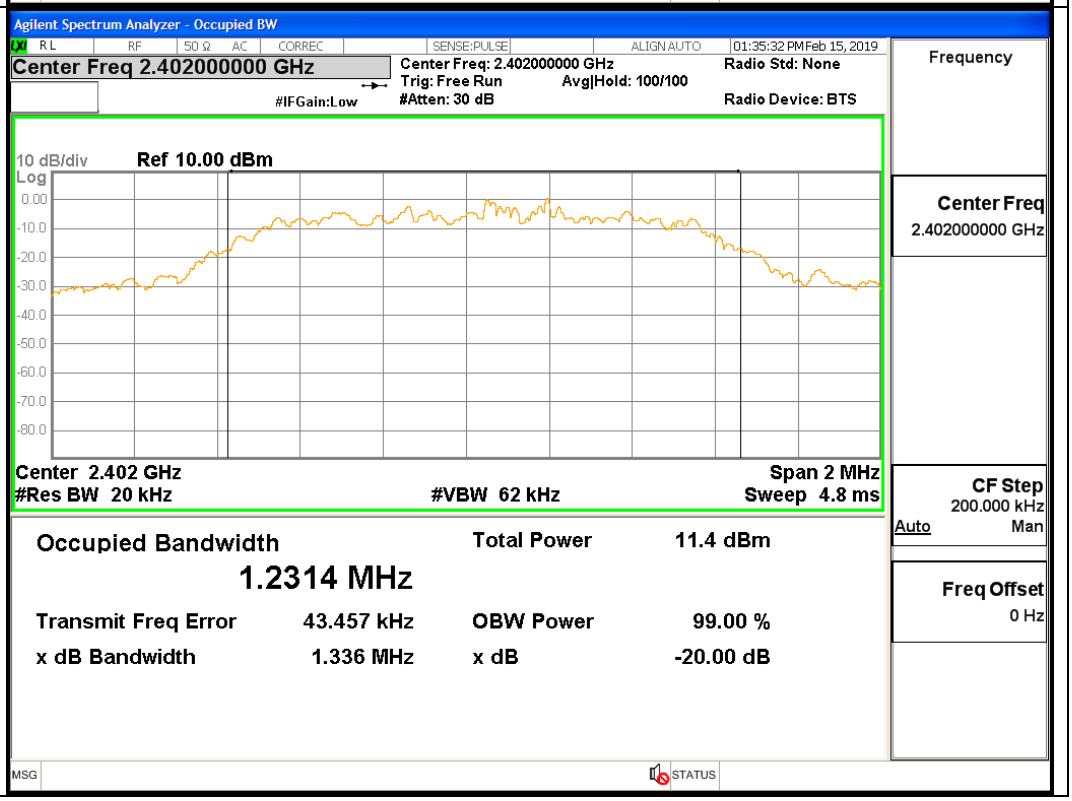
Test Graph

Graphs	
GFSK/LCH	
GFSK/MCH	

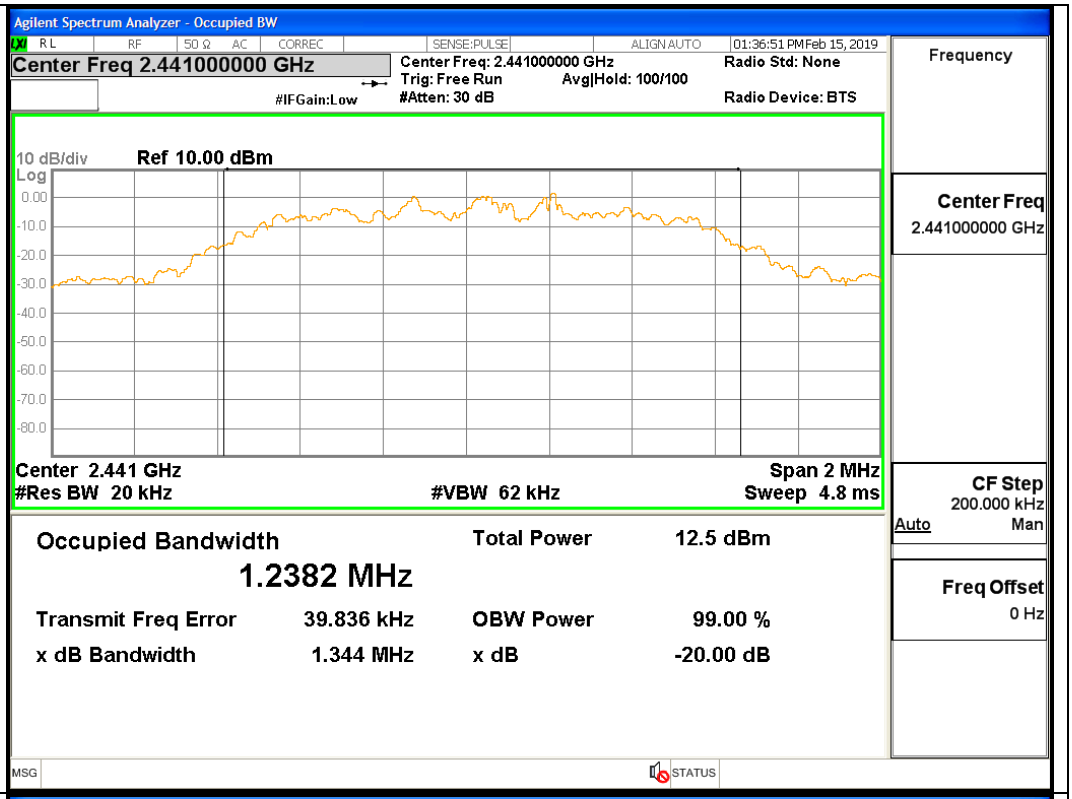
GFSK/HCH



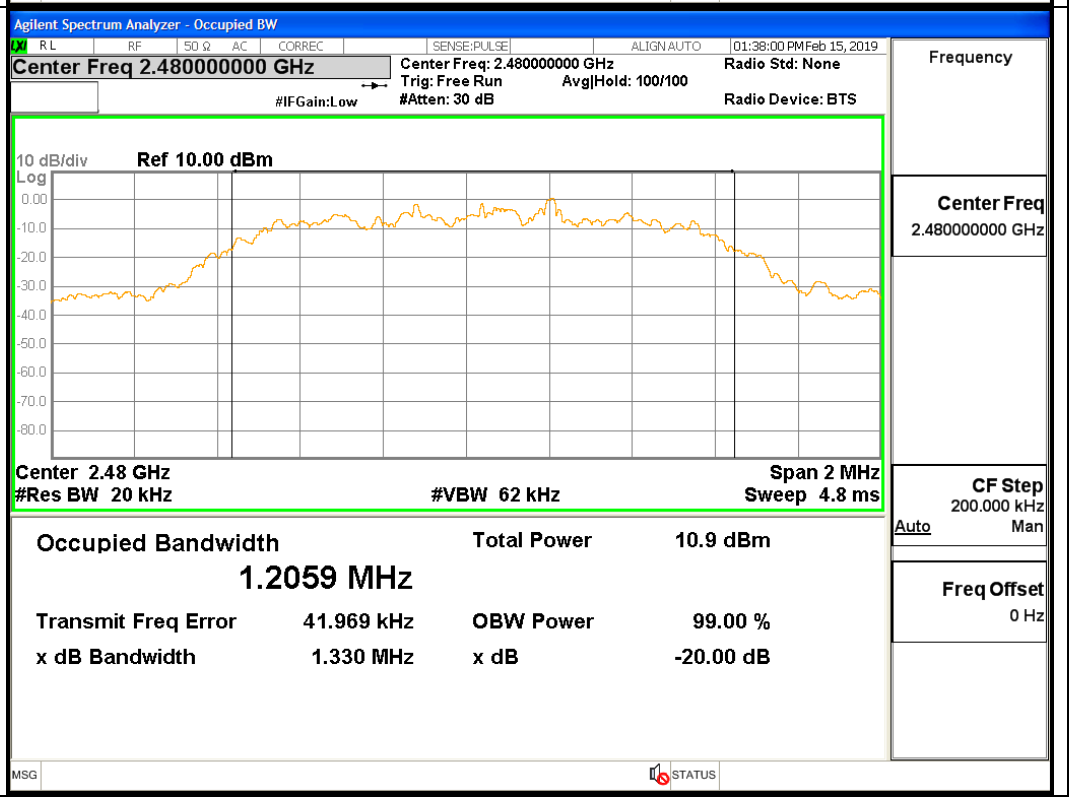
π/4DQPSK/LCH



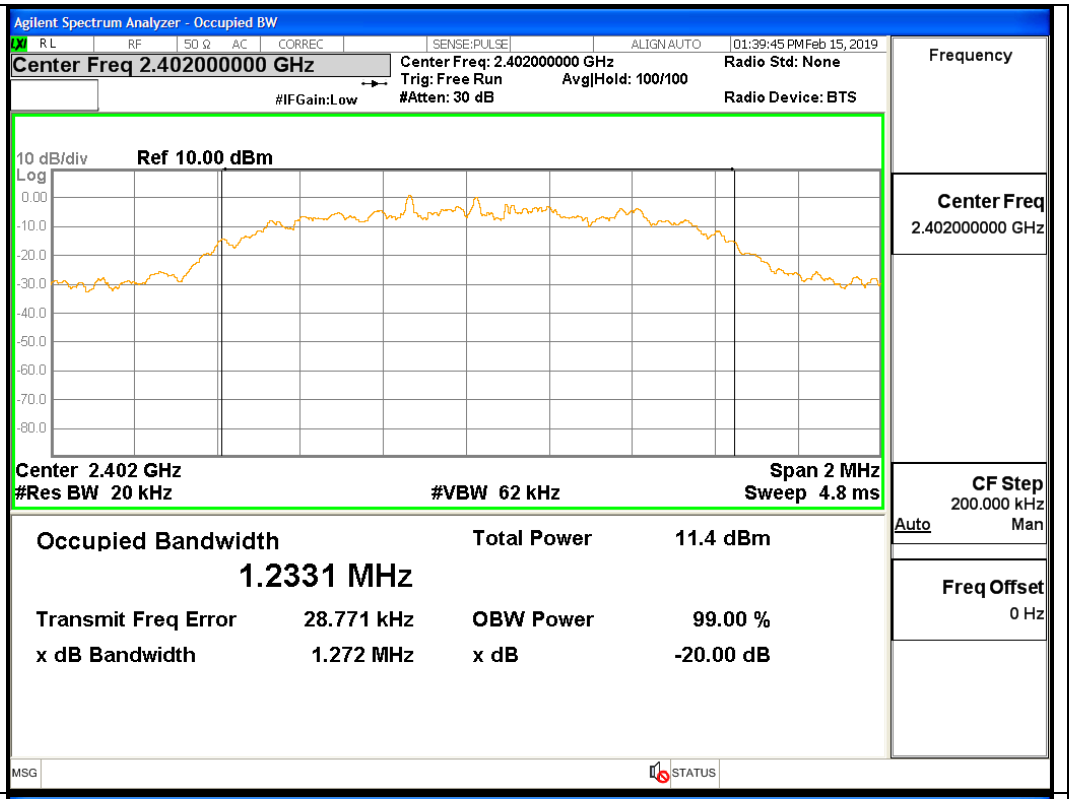
π/4DQPSK/MCH



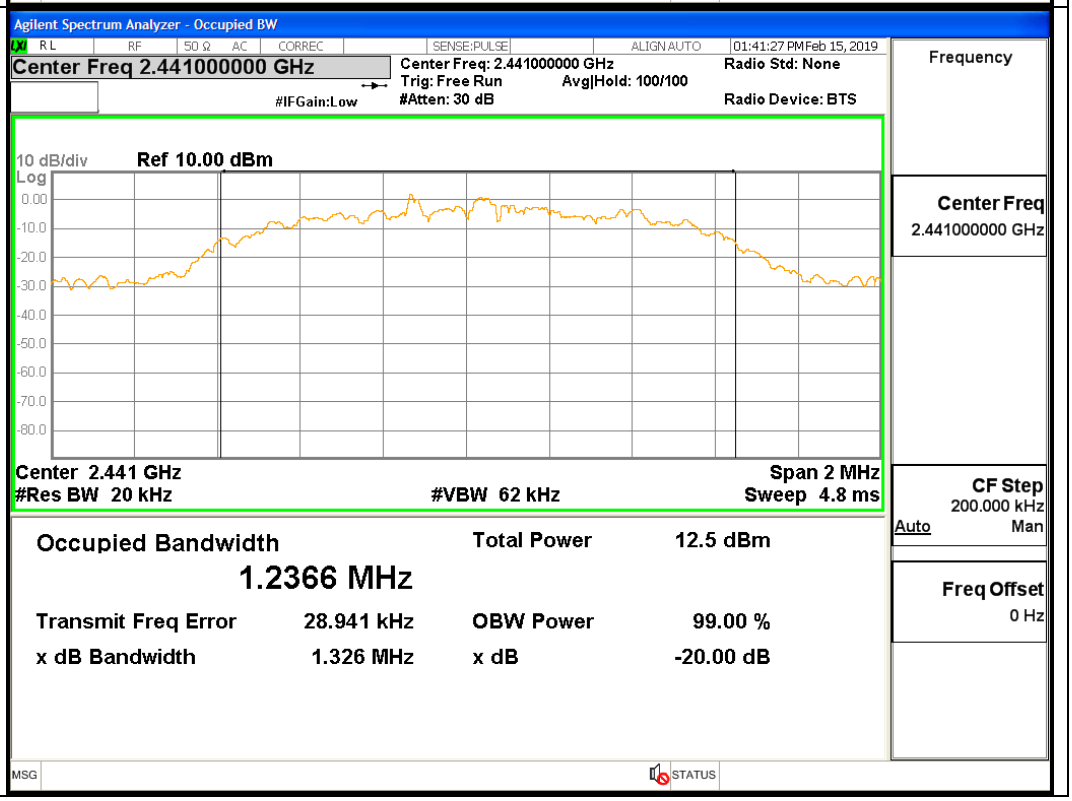
π/4DQPSK/HCH

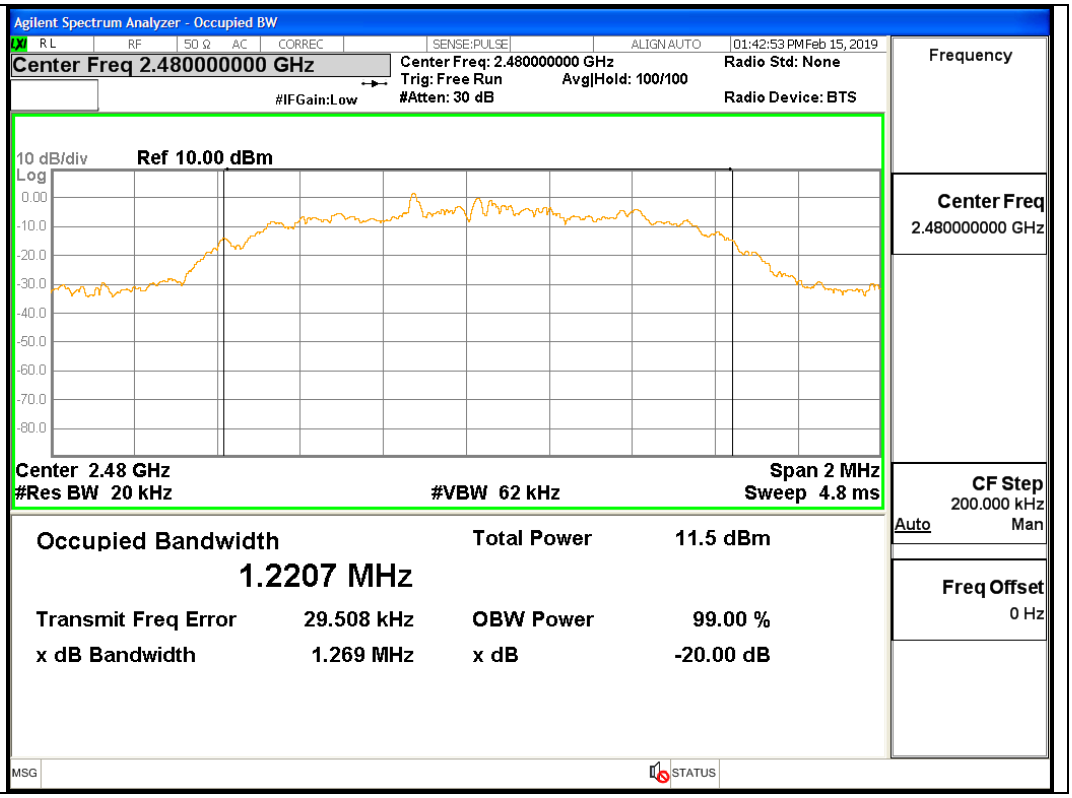


8DPSK/LCH



8DPSK/MCH



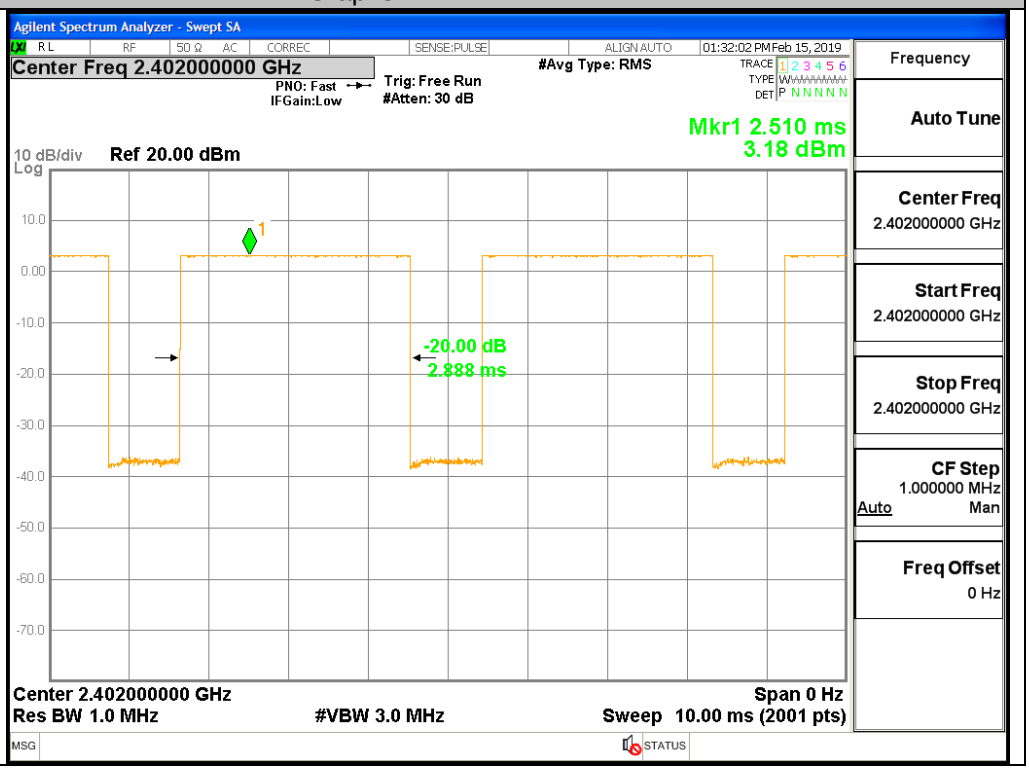
8DPSK/HCH	

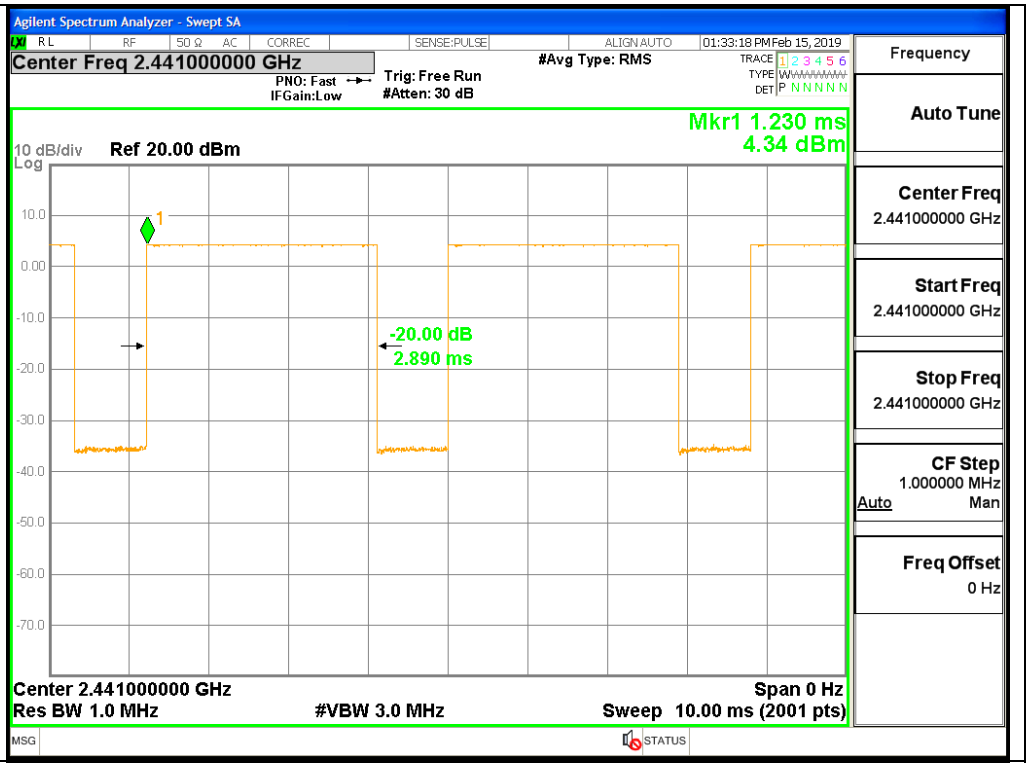
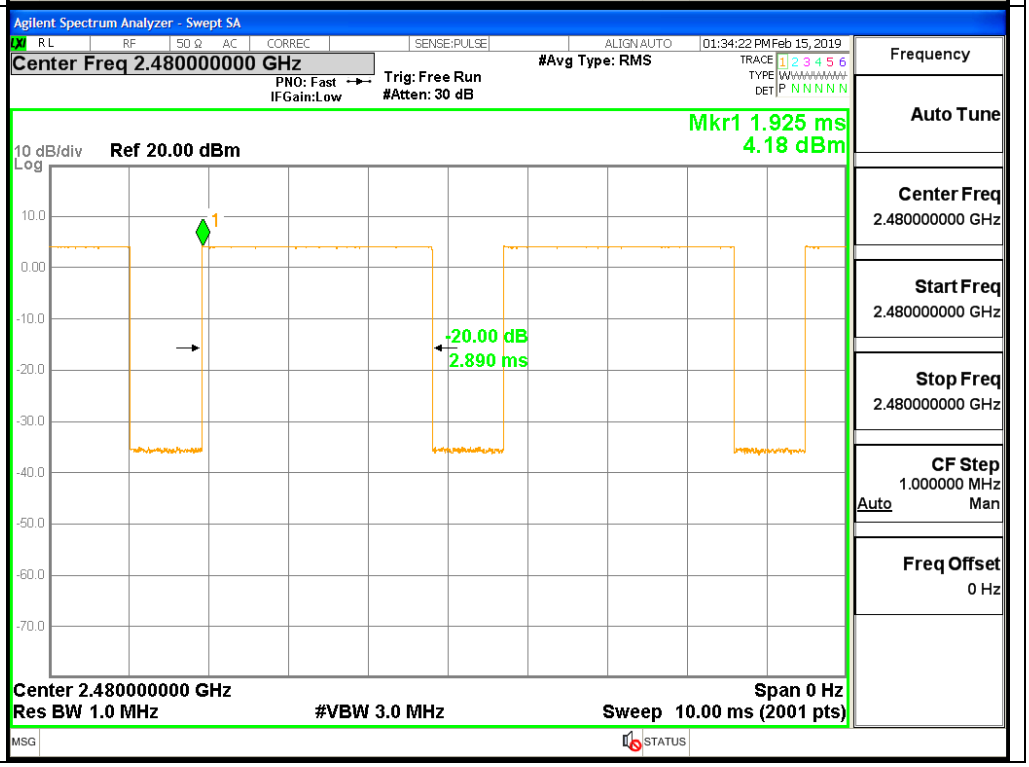
Agilent Spectrum Analyzer - Occupied BW
RL
RF
50 Ω AC
CORREC
SENSE:PULSE
ALIGN AUTO
01:42:53 PM Feb 15, 2019
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 20 kHz
#VBW 62 kHz
Span 2 MHz
Sweep 4.8 ms
CF Step
200.000 kHz
Auto
Man
Occupied Bandwidth
1.2207 MHz
Total Power
11.5 dBm
Transmit Freq Error
29.508 kHz
OBW Power
99.00 %
x dB Bandwidth
1.269 MHz
x dB
-20.00 dB
Freq Offset
0 Hz
MSG
STATUS

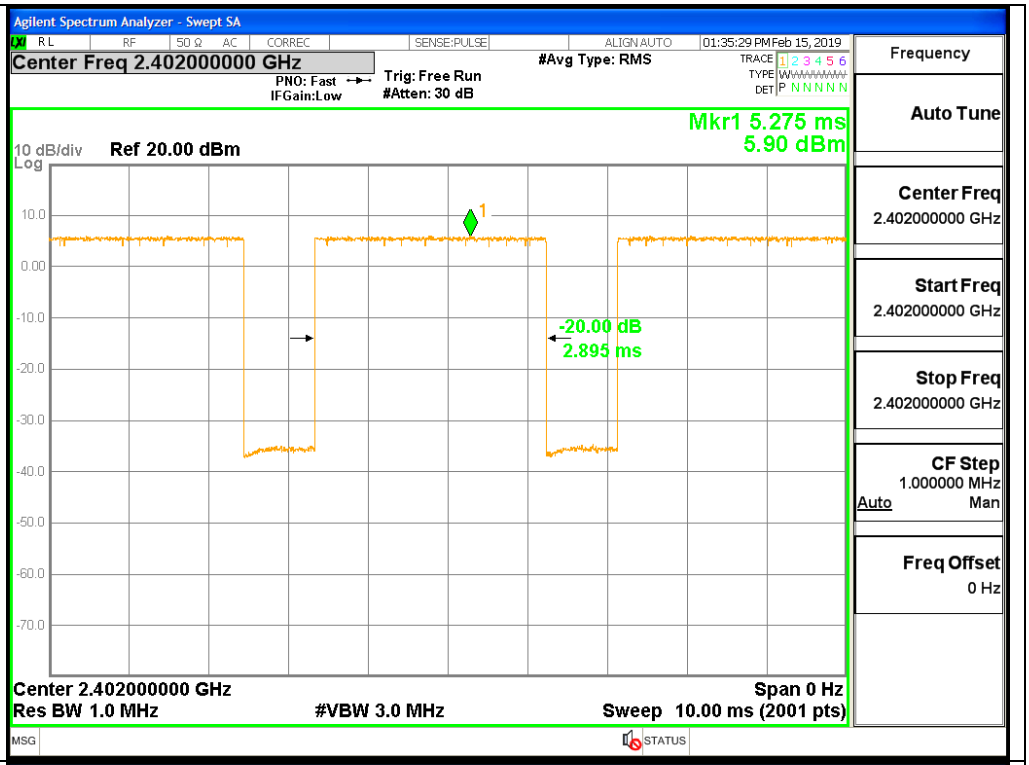
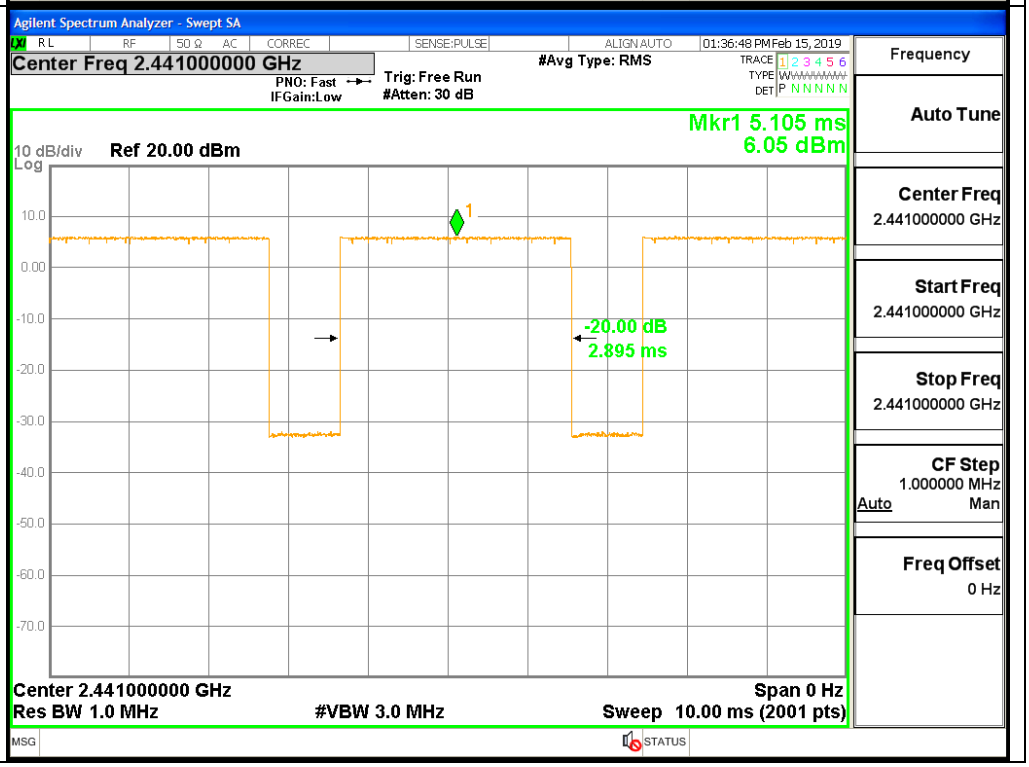
A.2 Dwell Time

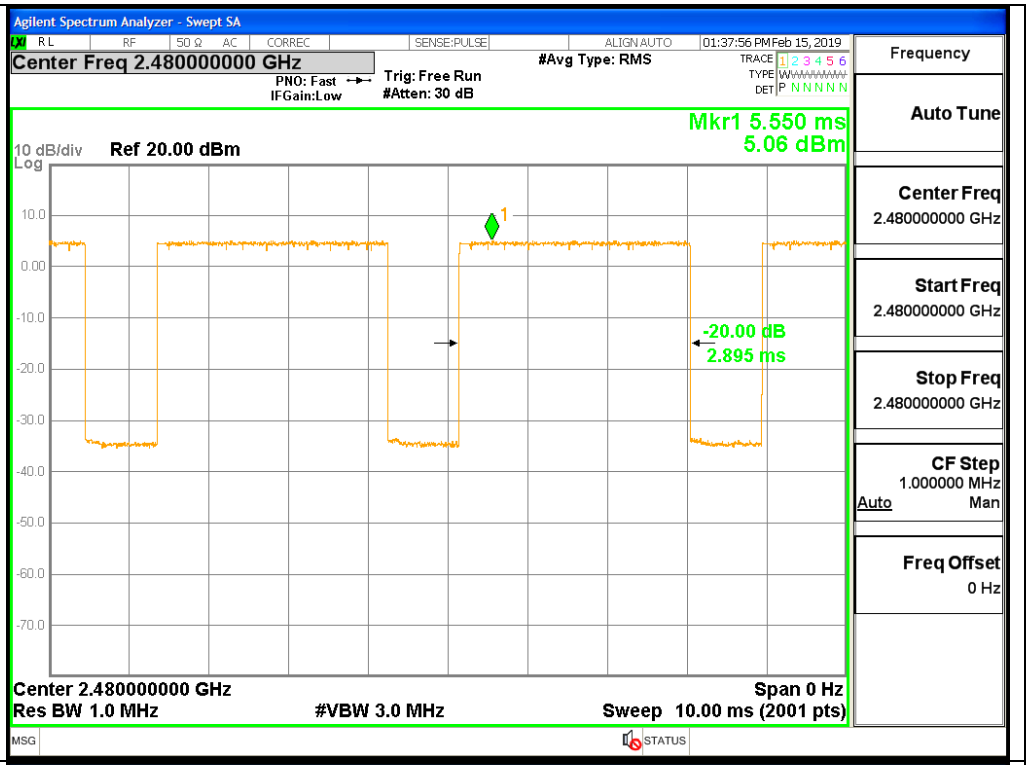
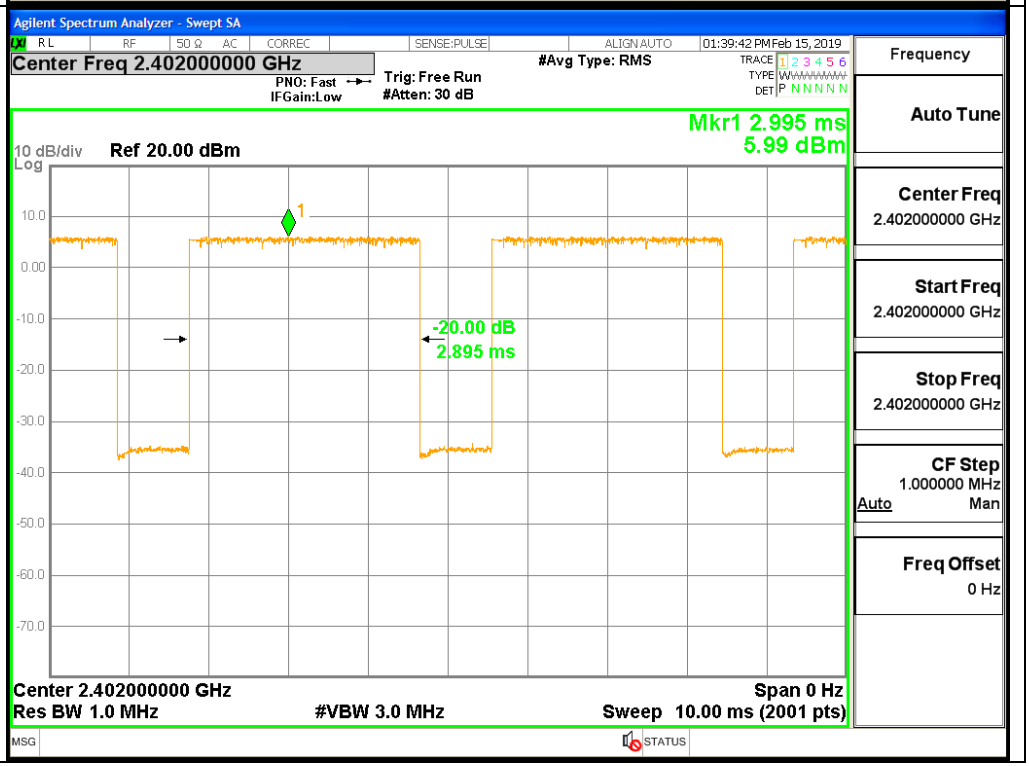
Mode	Packet	Channel	Burst Width [s/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	0.002888	106.7	0.308129	0.4	PASS
GFSK	DH5	MCH	0.00289	106.7	0.308353	0.4	PASS
GFSK	DH5	HCH	0.00289	106.7	0.308362	0.4	PASS
π/4DQPSK	2DH5	LCH	0.002895	106.7	0.308859	0.4	PASS
π/4DQPSK	2DH5	MCH	0.002895	106.7	0.308866	0.4	PASS
π/4DQPSK	2DH5	HCH	0.002895	106.7	0.308878	0.4	PASS
8DPSK	3DH5	LCH	0.002895	106.7	0.30886	0.4	PASS
8DPSK	3DH5	MCH	0.002895	106.7	0.308906	0.4	PASS
8DPSK	3DH5	HCH	0.002895	106.7	0.308902	0.4	PASS

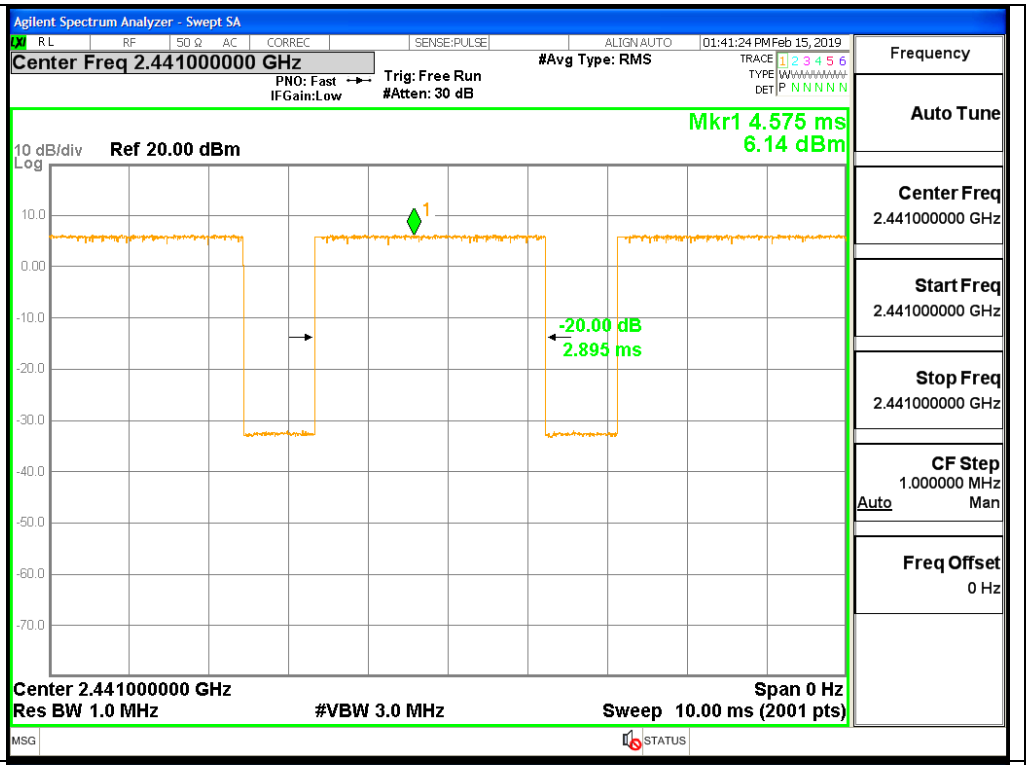
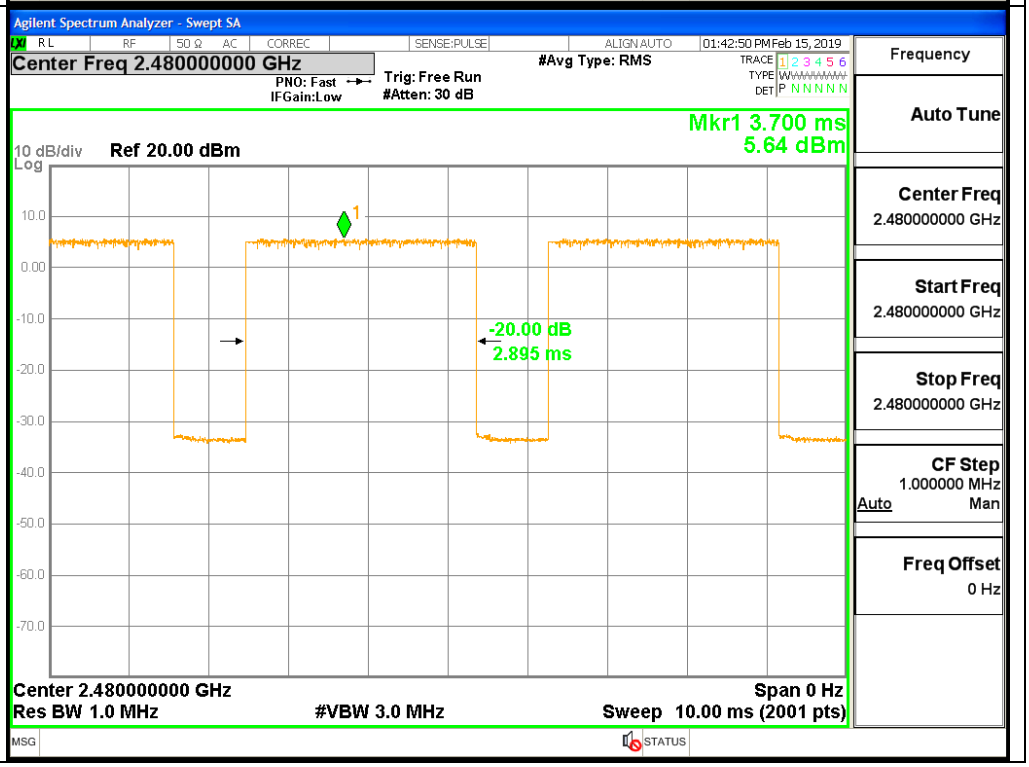
Test Graph

Graphs	
GFSK_DH5/LCH	

GFSK_DH5/MCH	
GFSK_DH5/HCH	

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

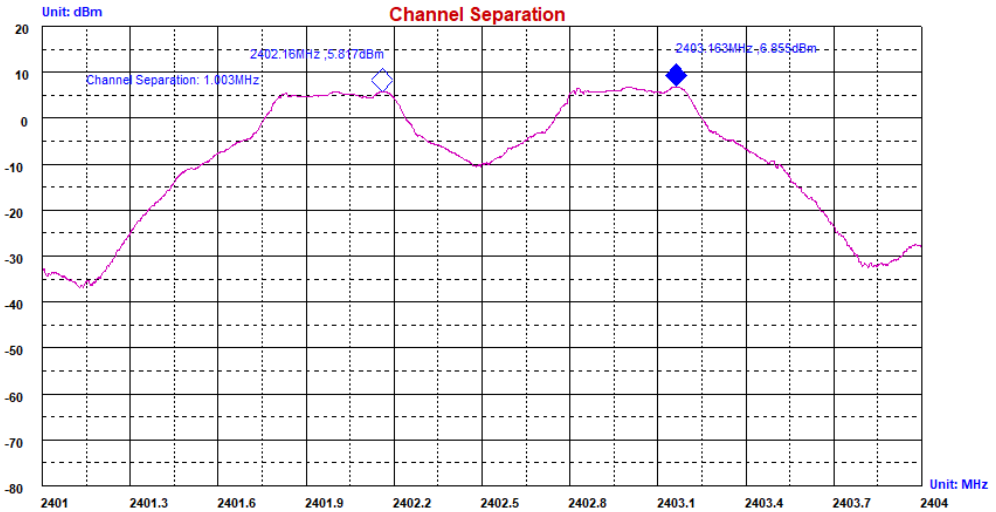
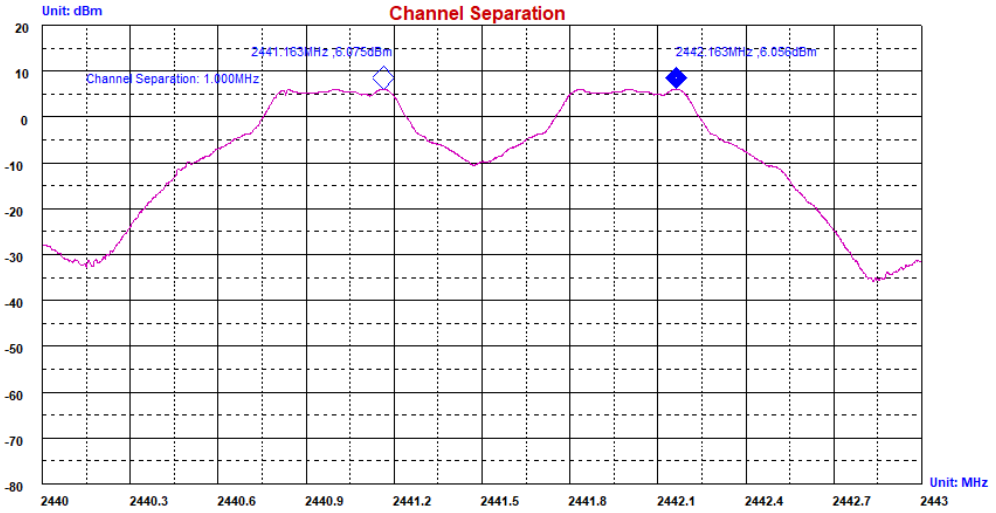
π/4DQPSK _2DH5/HCH	
8DPSK _3DH5/LCH	

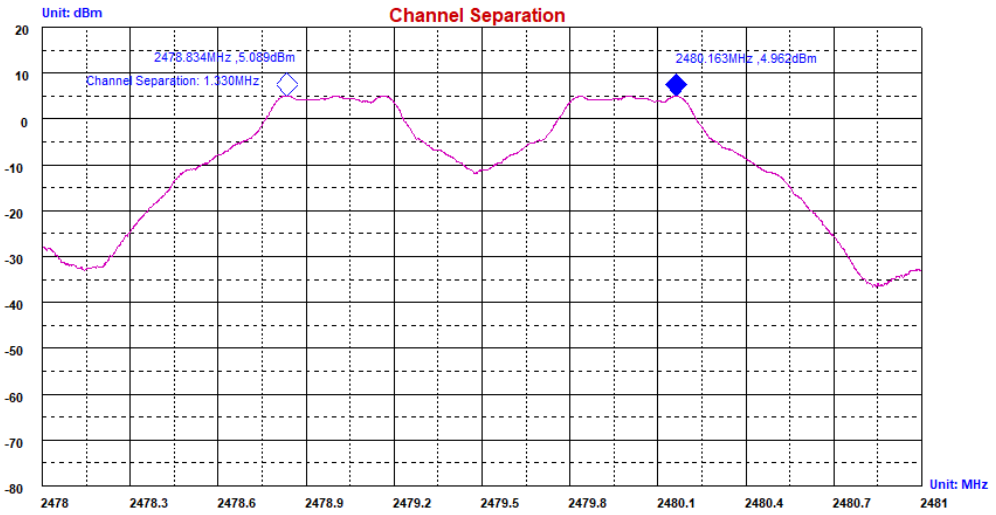
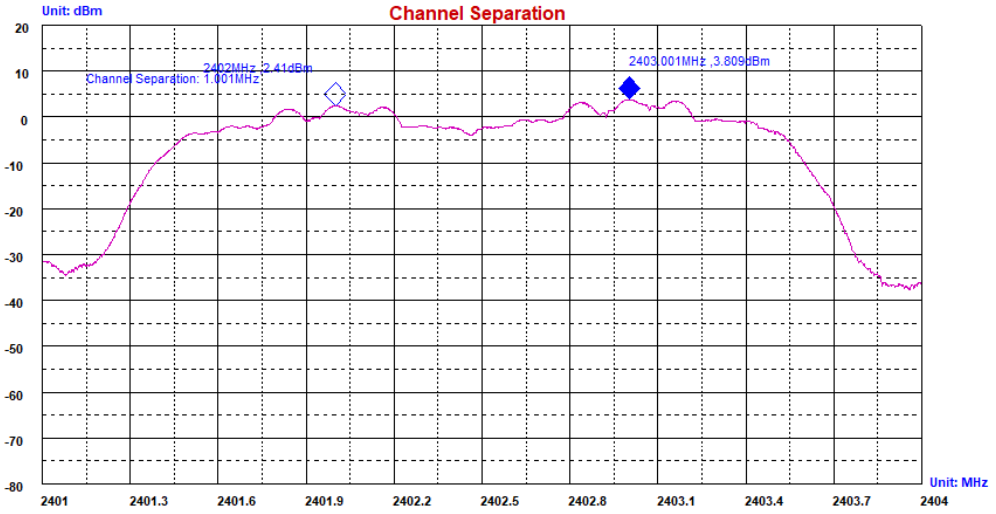
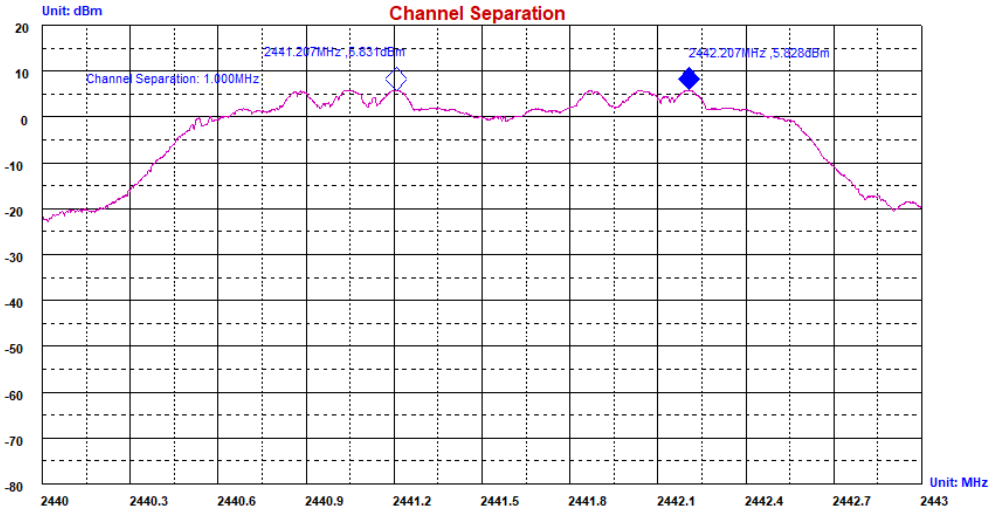
8DPSK _3DH5/MCH	
8DPSK _3DH5/HCH	

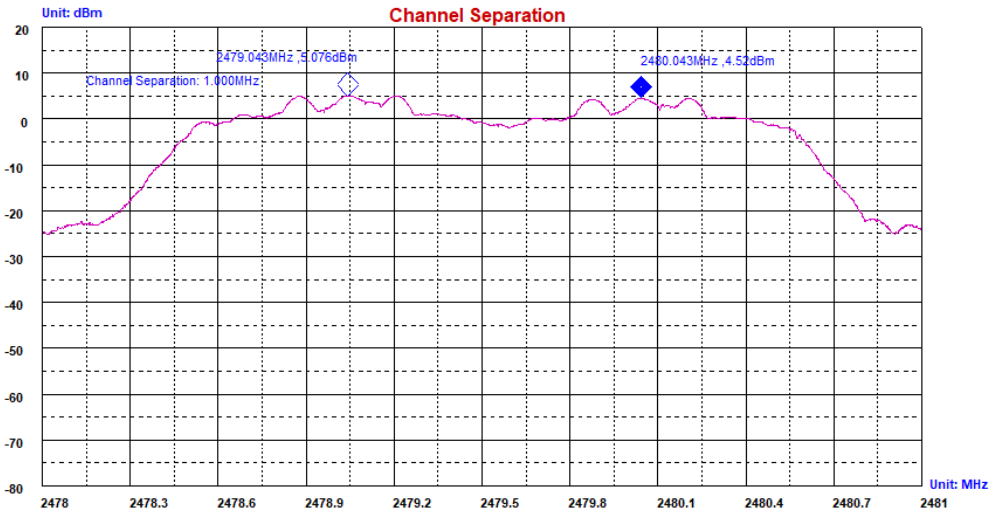
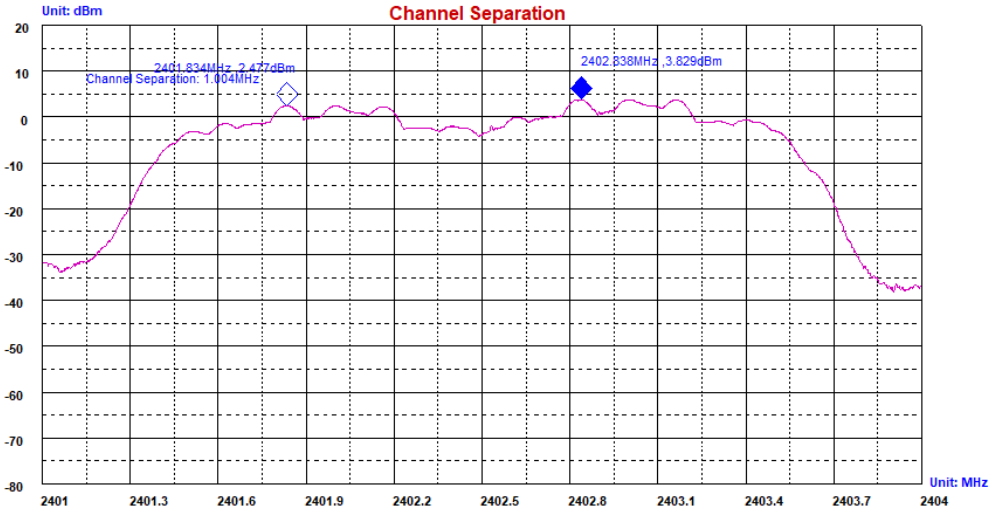
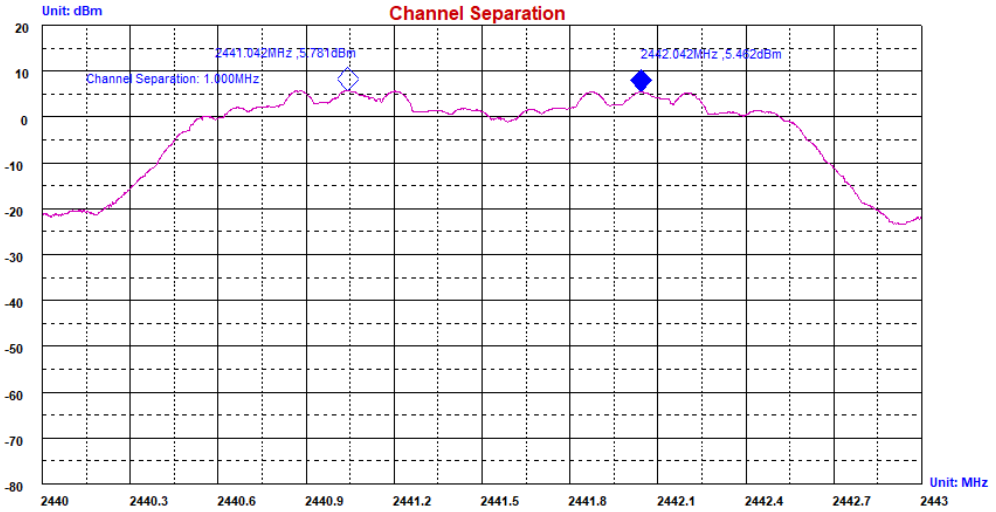
A.3 Carrier Frequency Separation

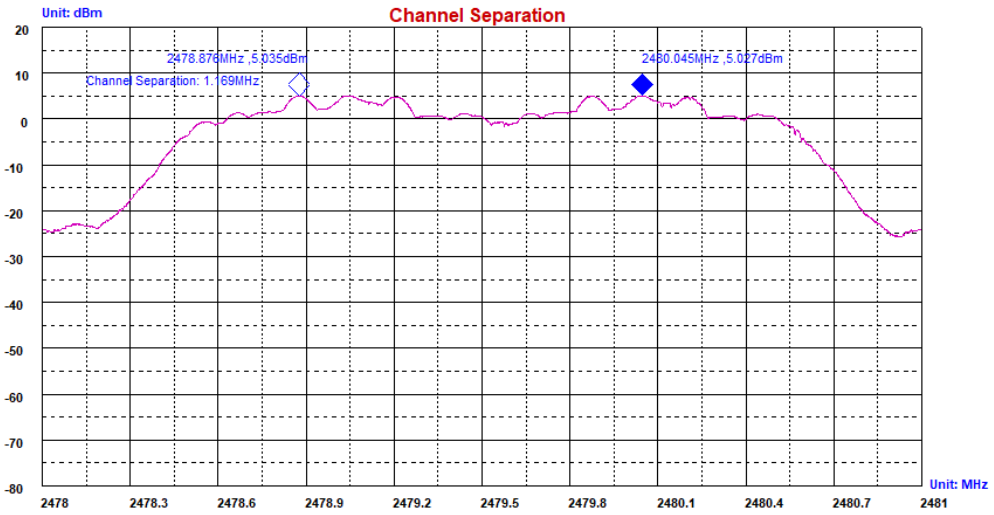
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.003	0.642	PASS
GFSK	MCH	1.000	0.625	PASS
GFSK	HCH	1.330	0.643	PASS
π/4DQPSK	LCH	1.001	0.889	PASS
π/4DQPSK	MCH	1.000	0.899	PASS
π/4DQPSK	HCH	1.000	0.899	PASS
8DPSK	LCH	1.004	0.885	PASS
8DPSK	MCH	1.000	0.896	PASS
8DPSK	HCH	1.169	0.895	PASS

Test Graph

Graphs	
GFSK/LCH	
GFSK/MCH	

GFSK/HCH	
π/4DQPSK/LCH	
π/4DQPSK/MCH	

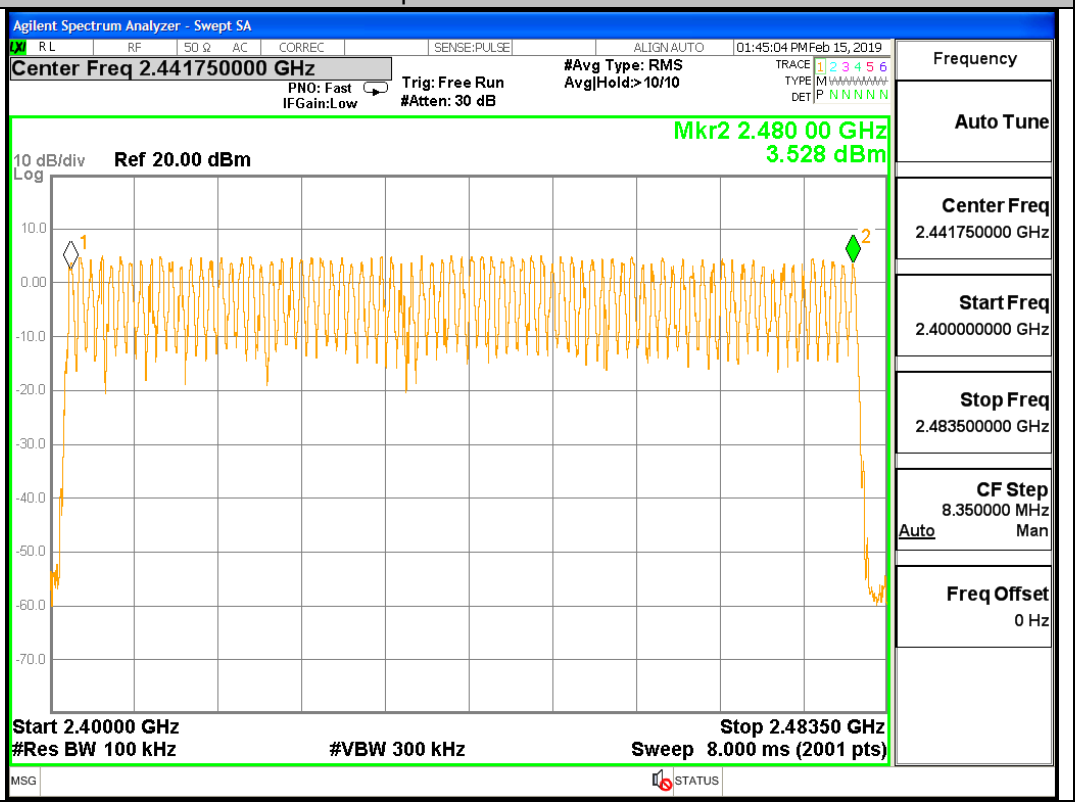
π/4DQPSK/HCH	
8DPSK/LCH	
8DPSK/MCH	

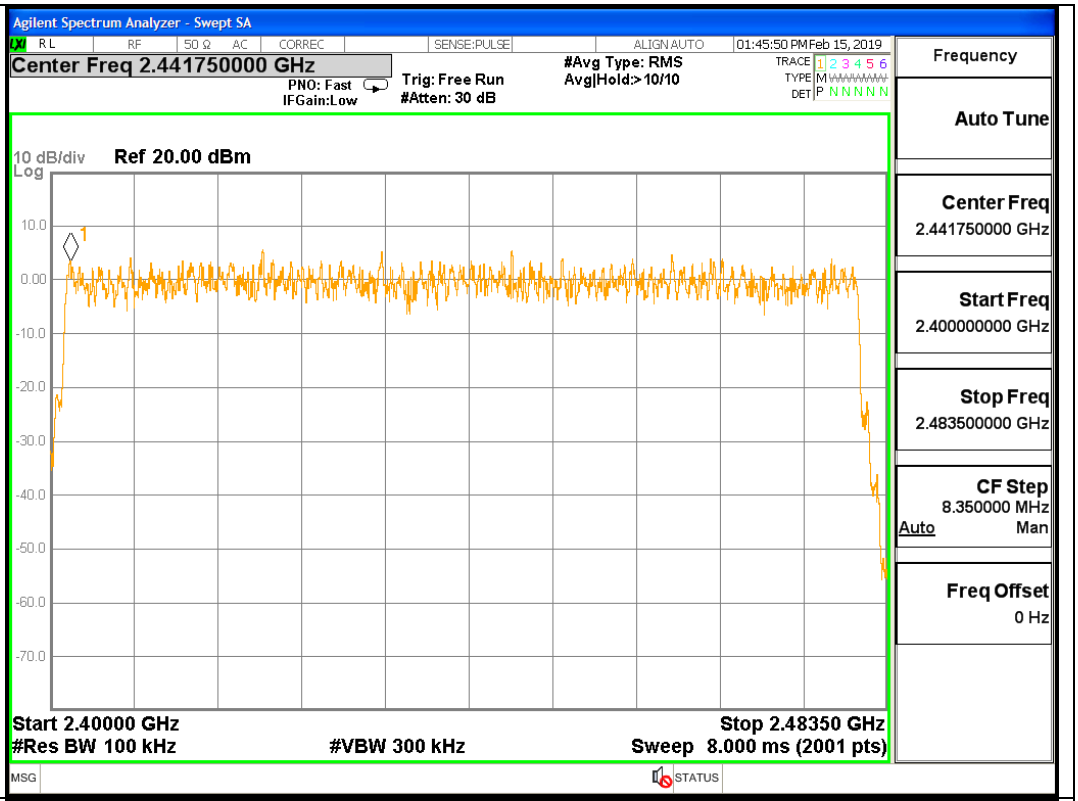
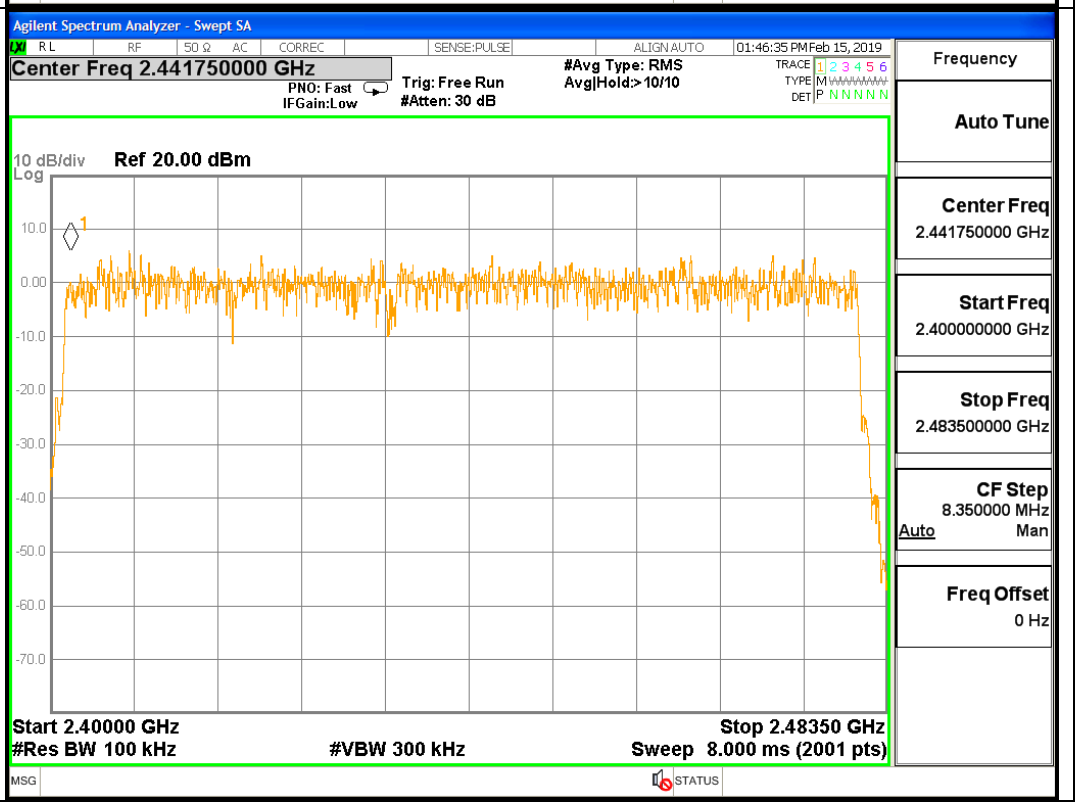
8DPSK/HCH	 Channel Separation Unit: dBm 2478.876MHz ,5.035dBm 2480.045MHz ,5.027dBm Channel Separation: 1.169MHz 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 2478 2478.3 2478.6 2478.9 2479.2 2479.5 2479.8 2480.1 2480.4 2480.7 2481 Unit: MHz

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 Graph

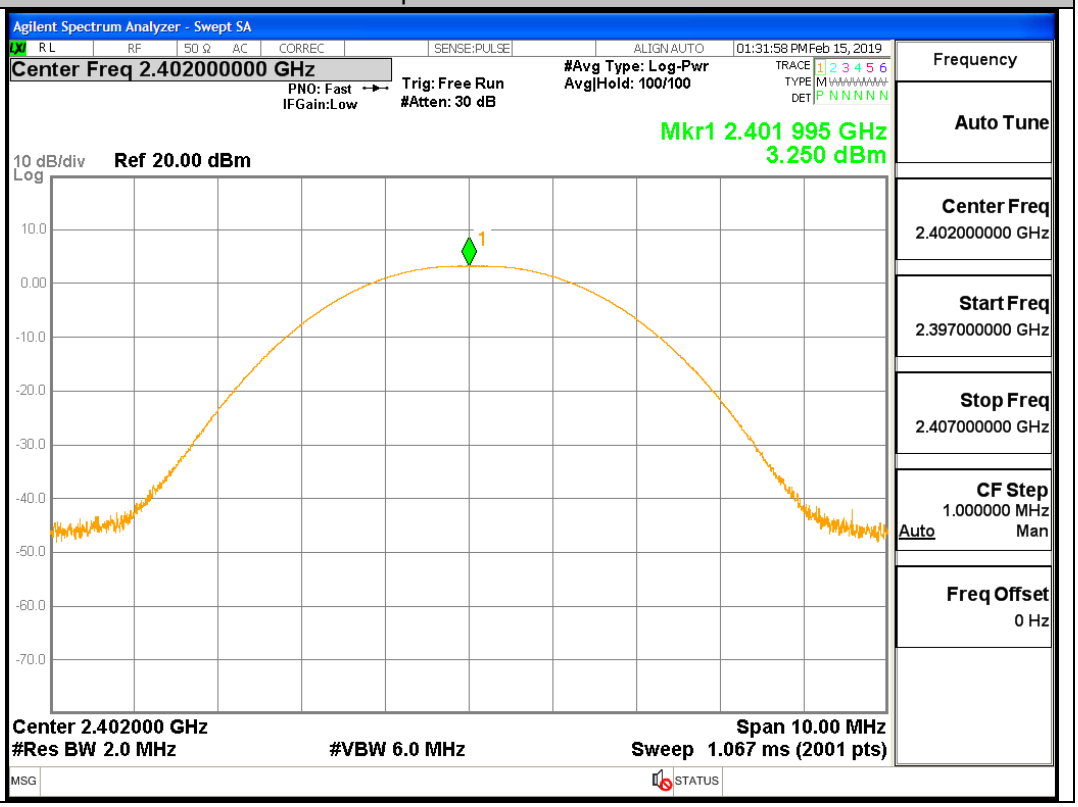
Graphs	
GFSK/Hop	

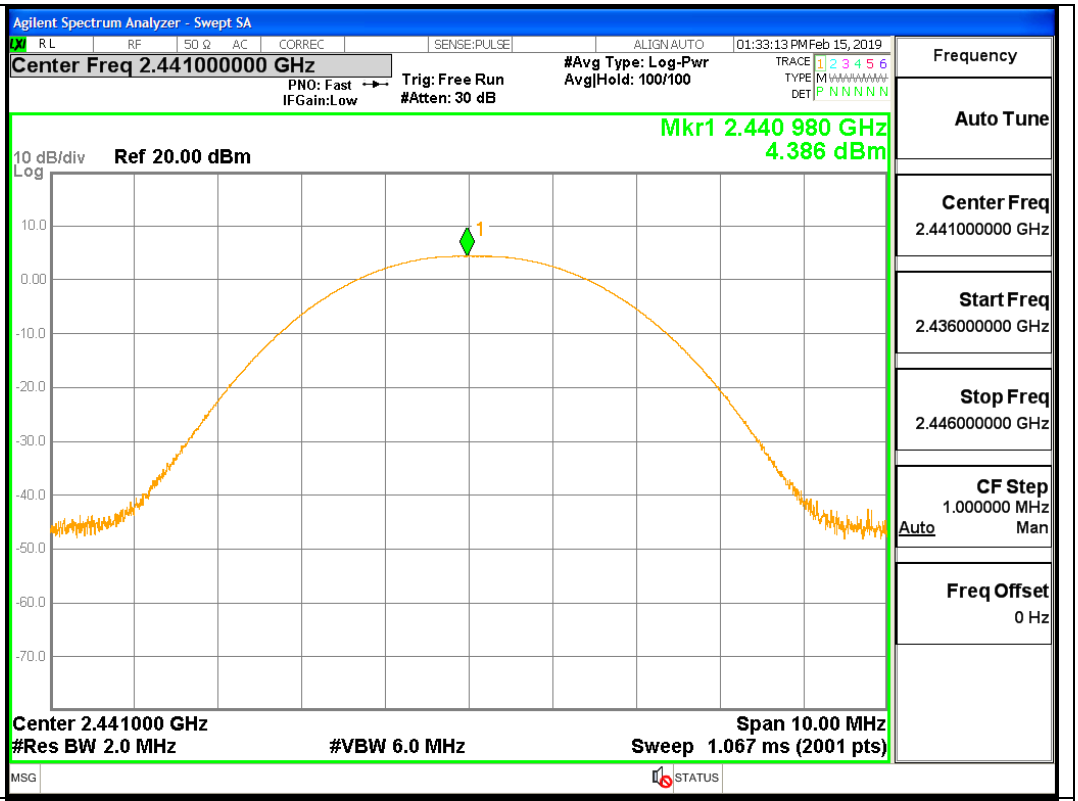
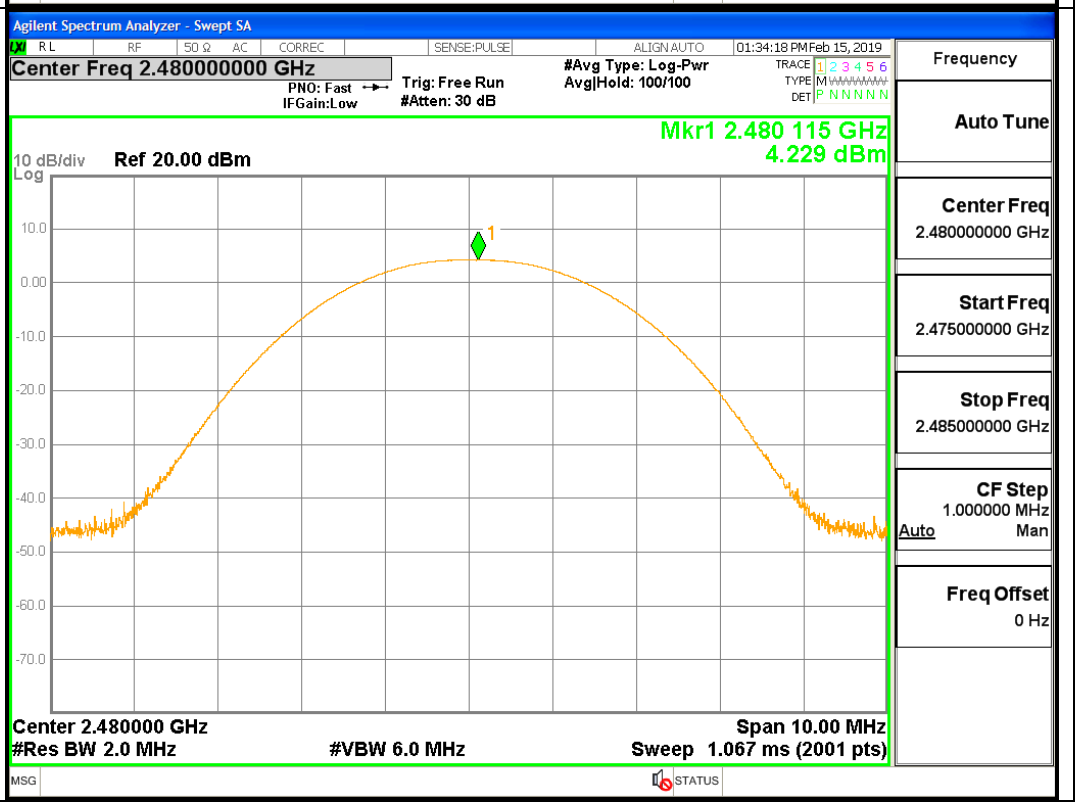
π/4DQPSK/Hop	
8DPSK/Hop	

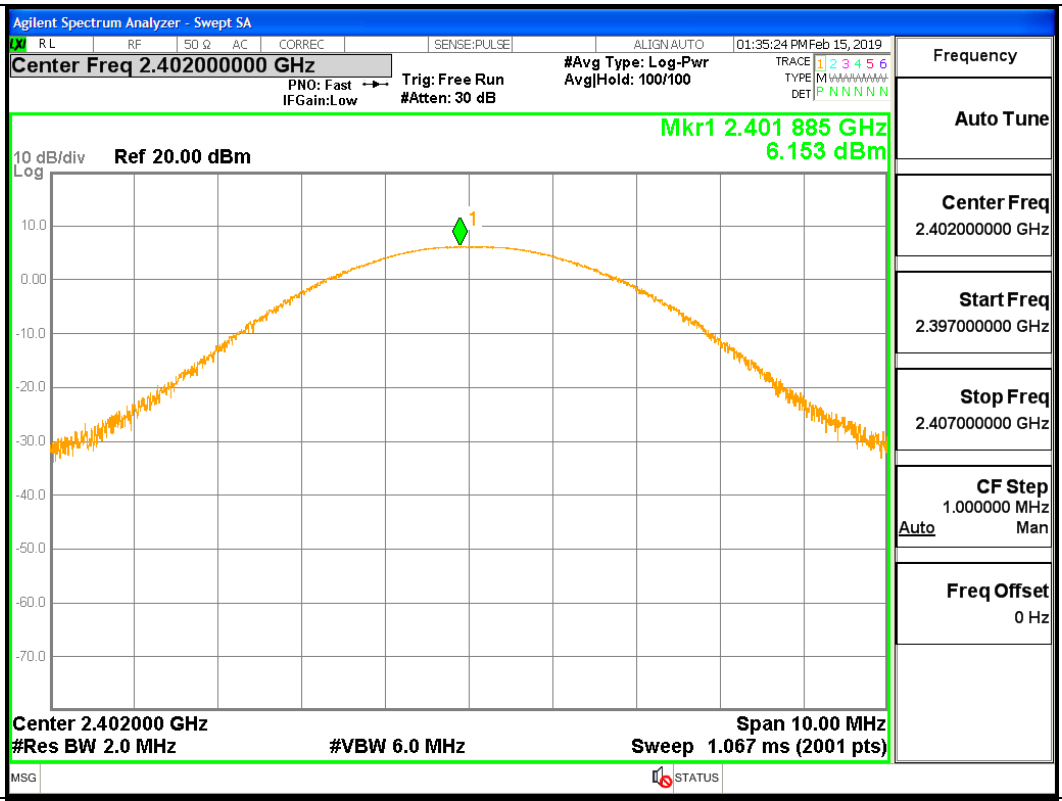
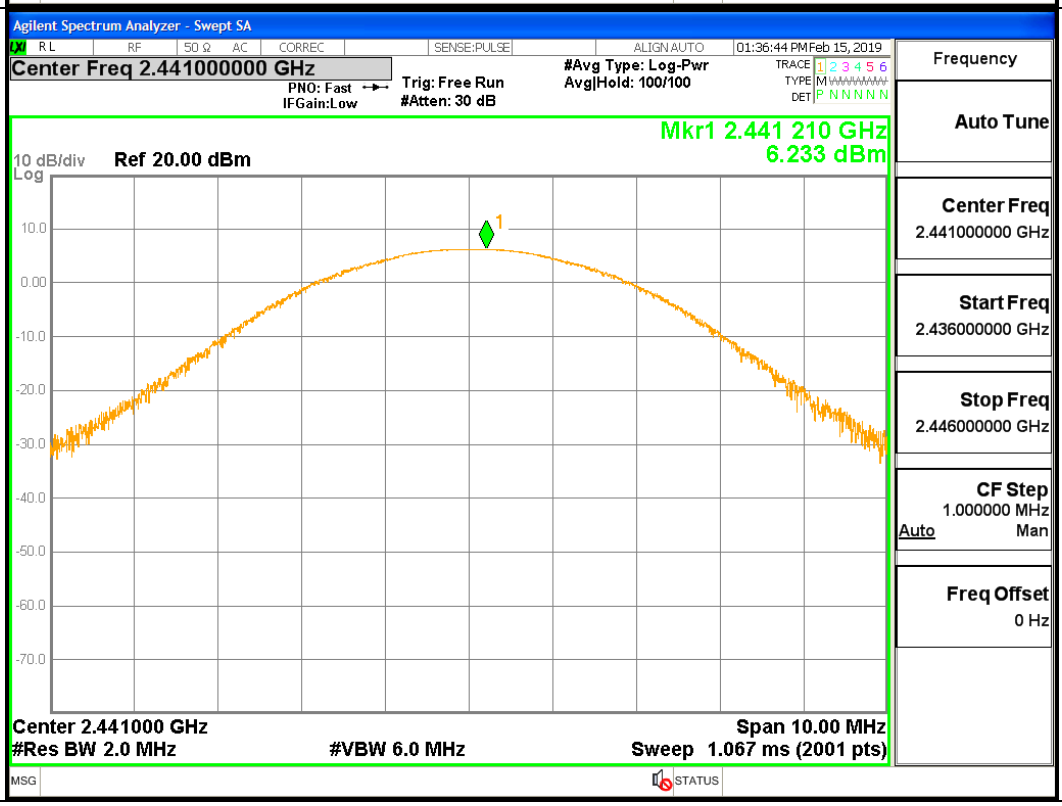
A.5 Conducted Peak Output Power

Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	3.250	21	PASS
GFSK	MCH	4.386	21	PASS
GFSK	HCH	4.229	21	PASS
π/4DQPSK	LCH	6.153	21	PASS
π/4DQPSK	MCH	6.233	21	PASS
π/4DQPSK	HCH	5.299	21	PASS
8DPSK	LCH	6.247	21	PASS
8DPSK	MCH	**6.291**	21	PASS
8DPSK	HCH	5.799	21	PASS

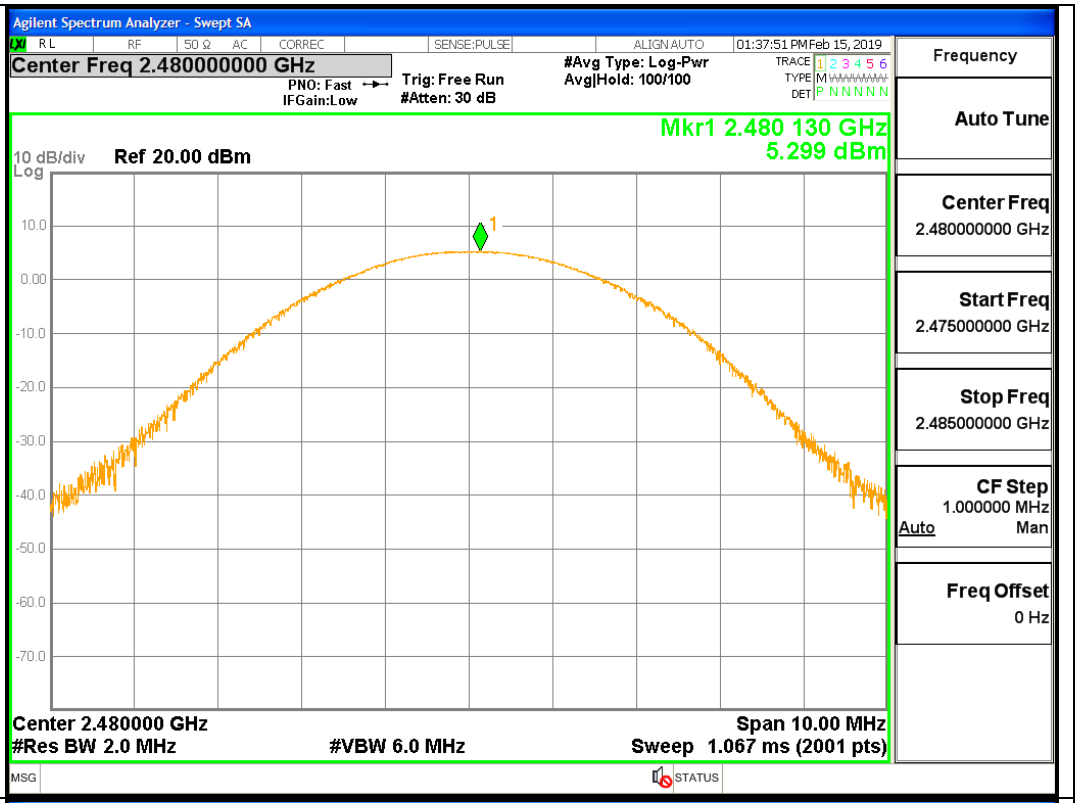
Test Graph

Graphs	
GFSK/LCH	

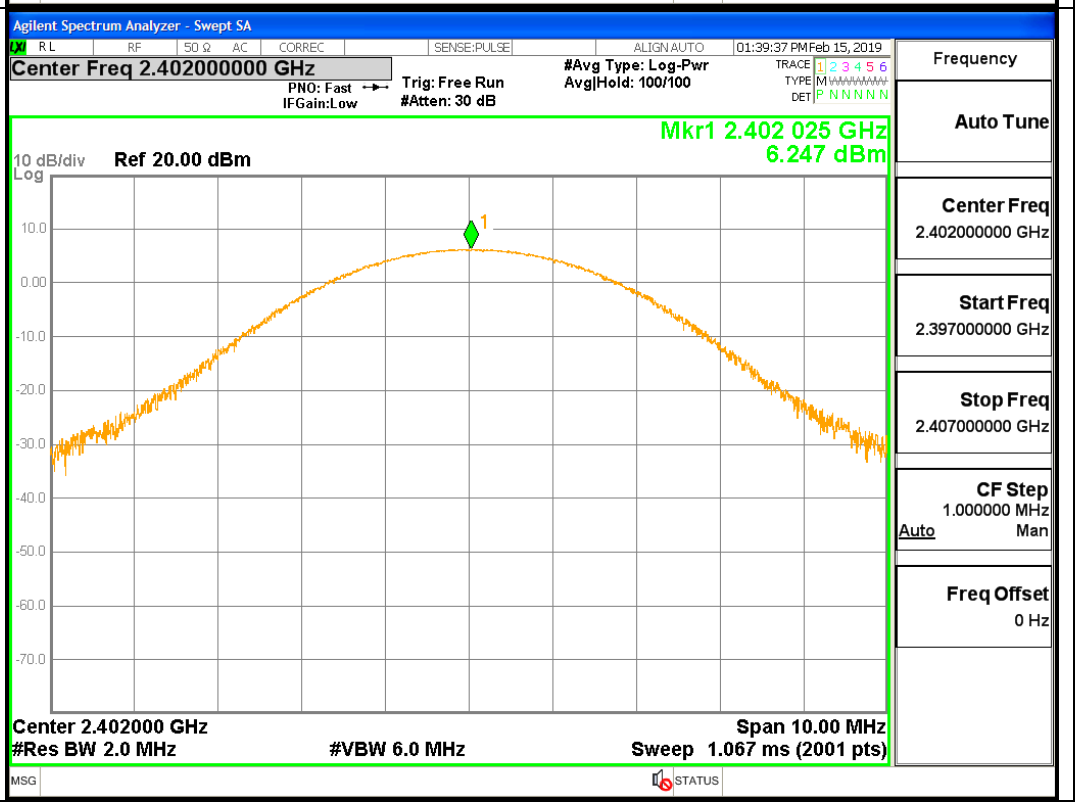
GFSK/MCH	
GFSK/HCH	

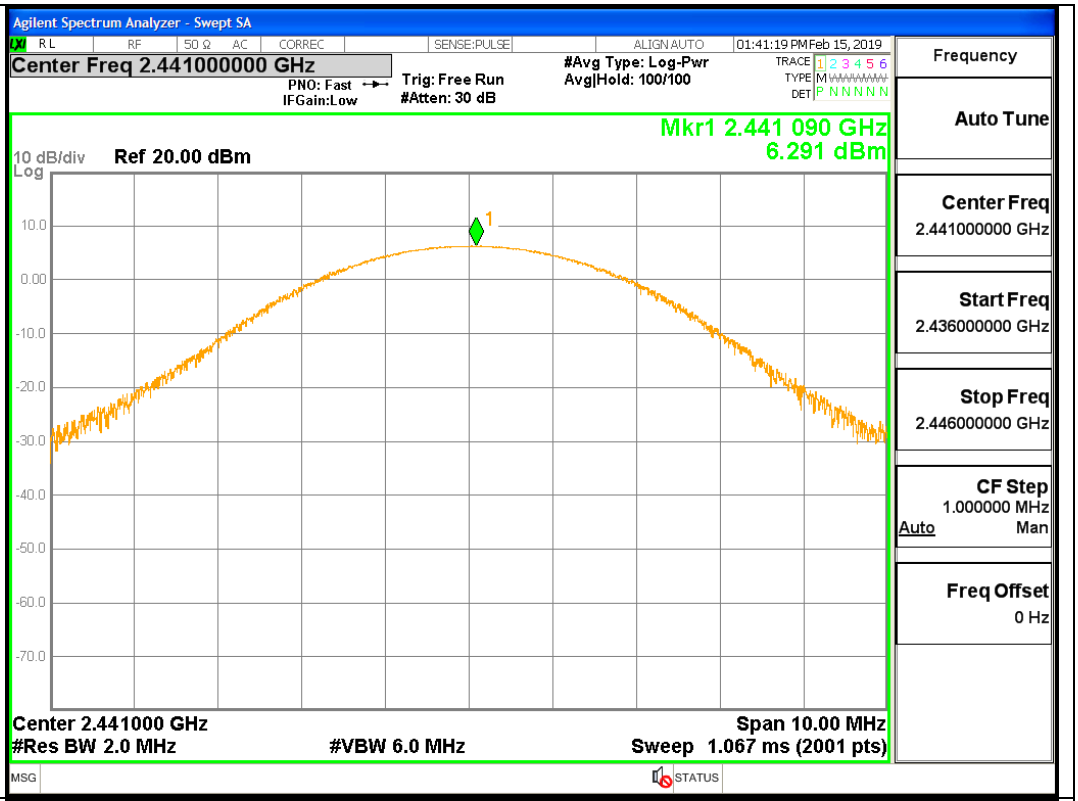
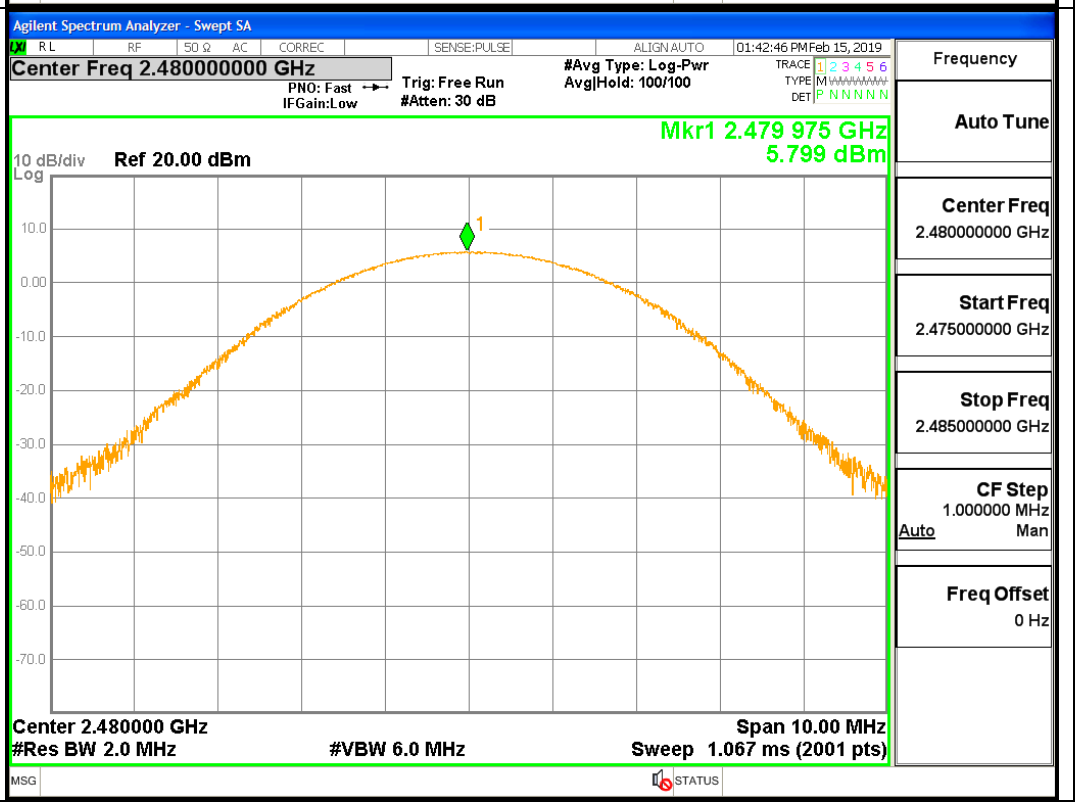
π/4DQPSK/LCH	
π/4DQPSK/MCH	

π/4DQPSK/HCH



8DPSK/LCH

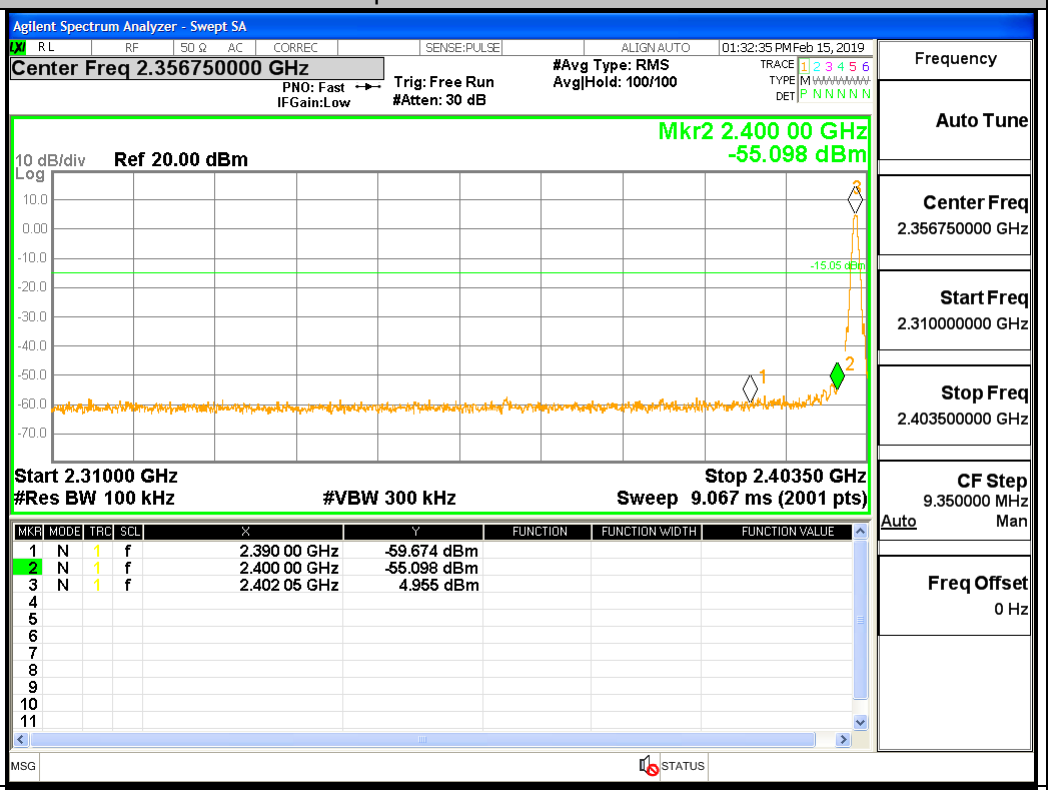
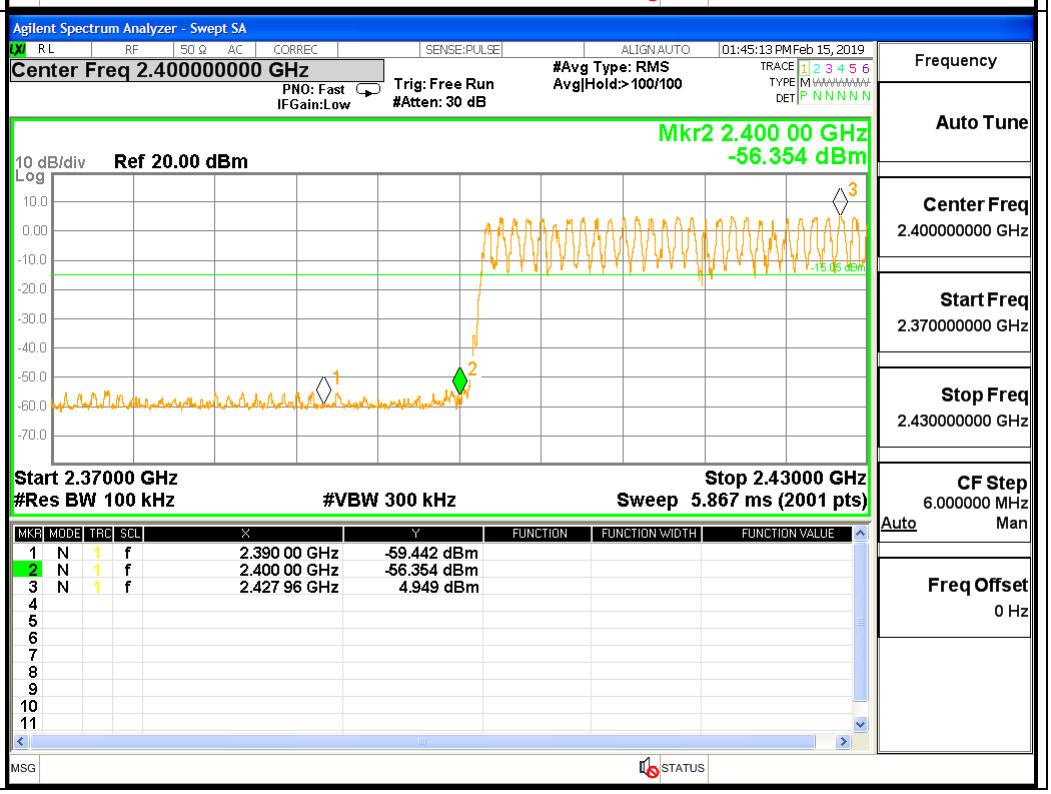


8DPSK/MCH	
8DPSK/HCH	

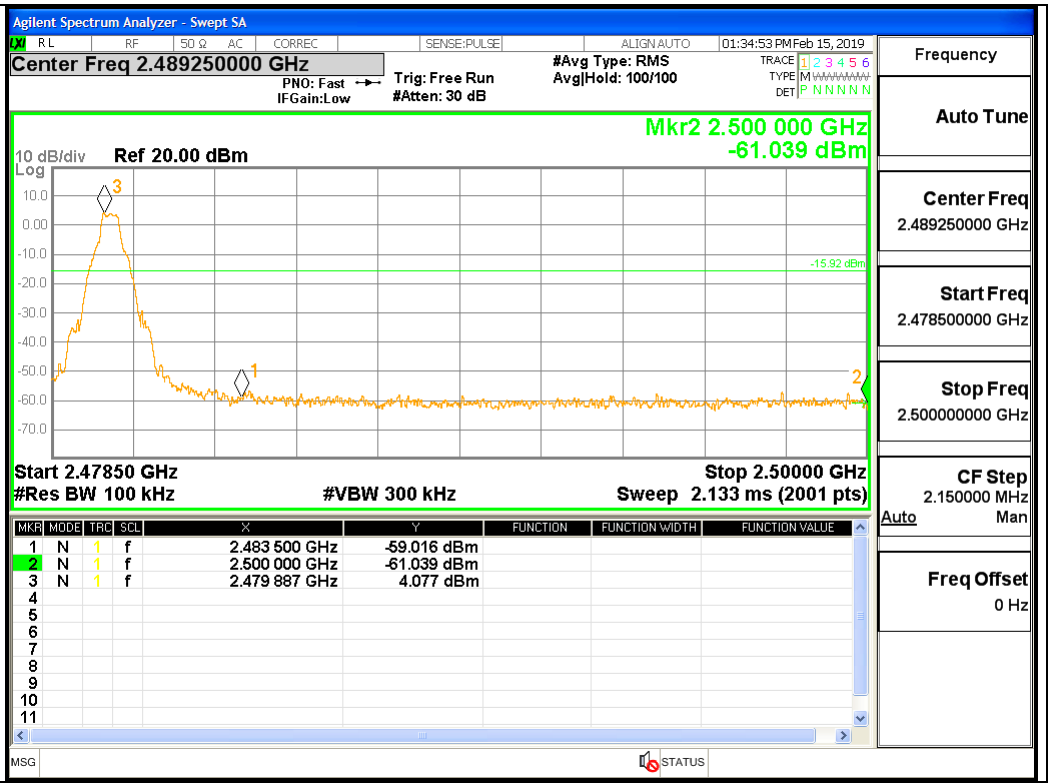
A.6 Band-edge for RF Conducted Emissions

Type	Carrier Frequency(MHz)	Frequency(MHz)	Carrier Frequency Power [dBm]	Bandedge Peak(dBm)	Upper limit(dBm)	Conclusion
1DH5	2402	2390	4.96	-59.67	-15.05	Pass
1DH5	2402	2400	4.96	-55.1	-15.05	Pass
1DH5-Hopping	2402	2390	4.95	-59.44	-15.05	Pass
1DH5-Hopping	2402	2400	4.95	-56.35	-15.05	Pass
1DH5	2480	2483.5	4.08	-59.02	-15.92	Pass
1DH5	2480	2500	4.08	-61.04	-15.92	Pass
1DH5-Hopping	2480	2483.5	4.78	-60.27	-15.22	Pass
1DH5-Hopping	2480	2500	4.78	-55.78	-15.22	Pass
2DH5	2402	2390	5.75	-61.05	-14.26	Pass
2DH5	2402	2400	5.75	-33.74	-14.26	Pass
2DH5-Hopping	2480	2483.5	5.36	-56.63	-14.64	Pass
2DH5-Hopping	2480	2500	5.36	-59.48	-14.64	Pass
2DH5	2480	2483.5	4.56	-53.34	-15.44	Pass
2DH5	2480	2500	4.56	-61.83	-15.44	Pass
2DH5-Hopping	2402	2390	3.62	-59.55	-16.38	Pass
2DH5-Hopping	2402	2400	3.62	-39.94	-16.38	Pass
3DH5	2402	2390	5.14	-61.91	-14.87	Pass
3DH5	2402	2400	5.14	-35.03	-14.87	Pass
3DH5-Hopping	2402	2390	4.66	-59.34	-15.34	Pass
3DH5-Hopping	2402	2400	4.66	-38.58	-15.34	Pass
3DH5	2480	2483.5	4.99	-50.34	-15.01	Pass
3DH5	2480	2500	4.99	-60.78	-15.01	Pass
3DH5-Hopping	2480	2483.5	4.99	-57.73	-15.01	Pass
3DH5-Hopping	2480	2500	4.99	-59.46	-15.01	Pass

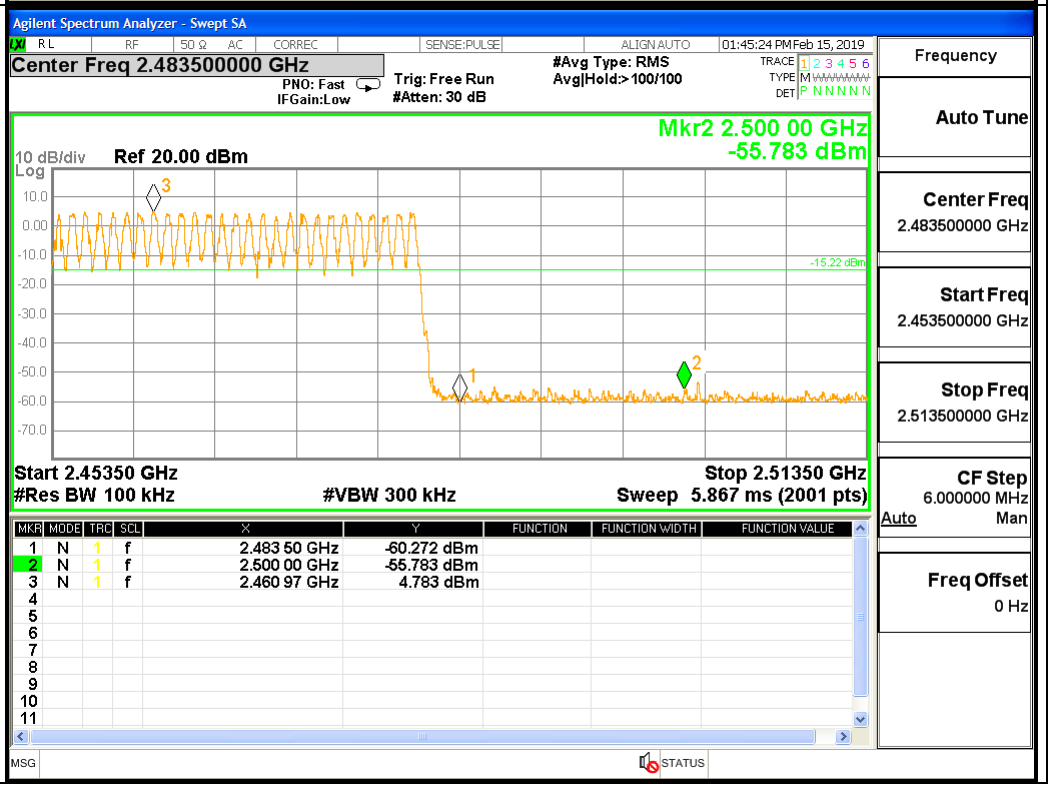
Test Graph

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

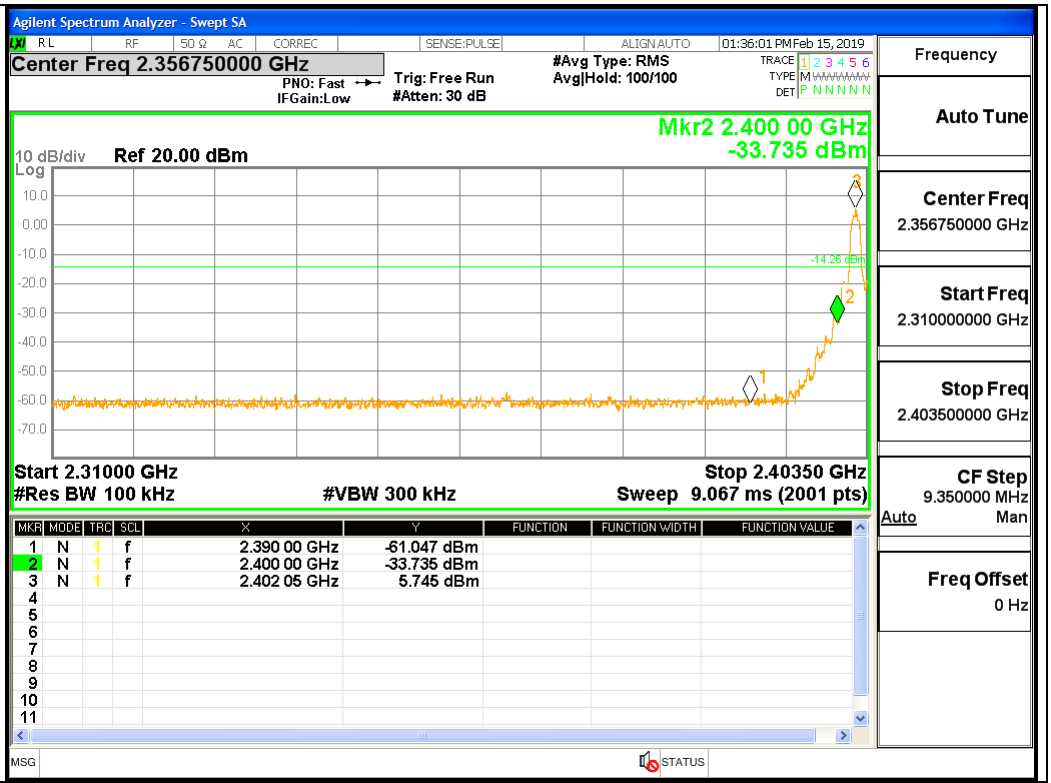
GFSK/HCH/No Hop



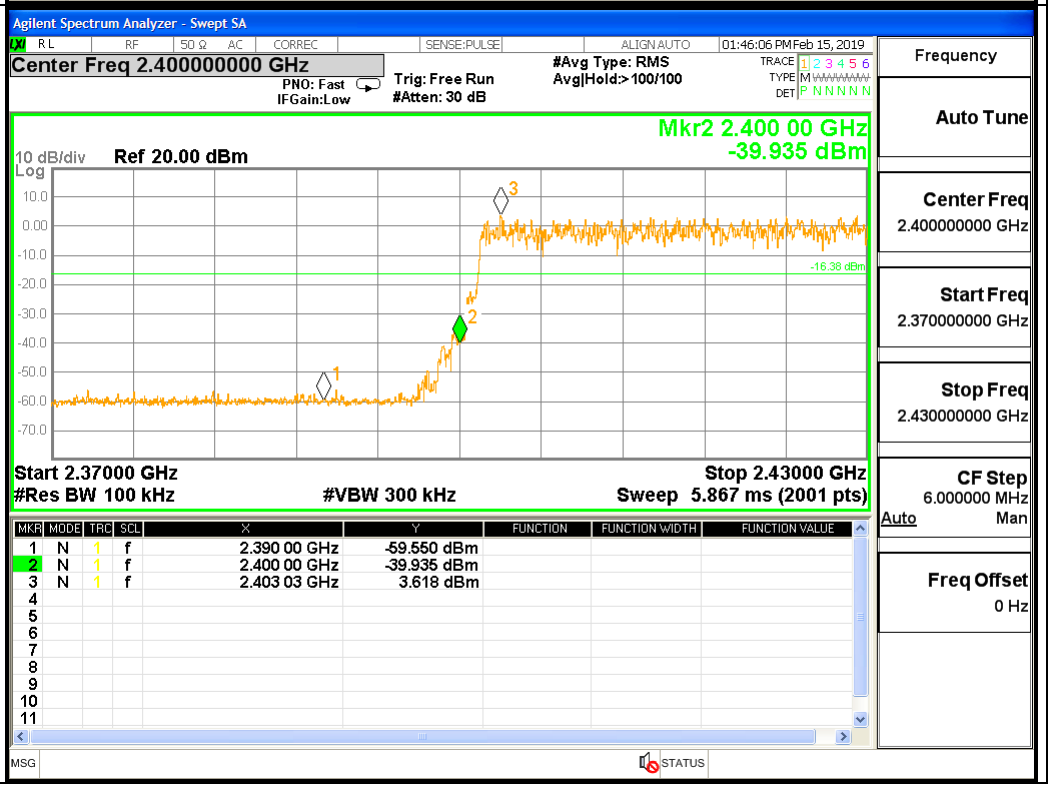
GFSK/HCH/Hop



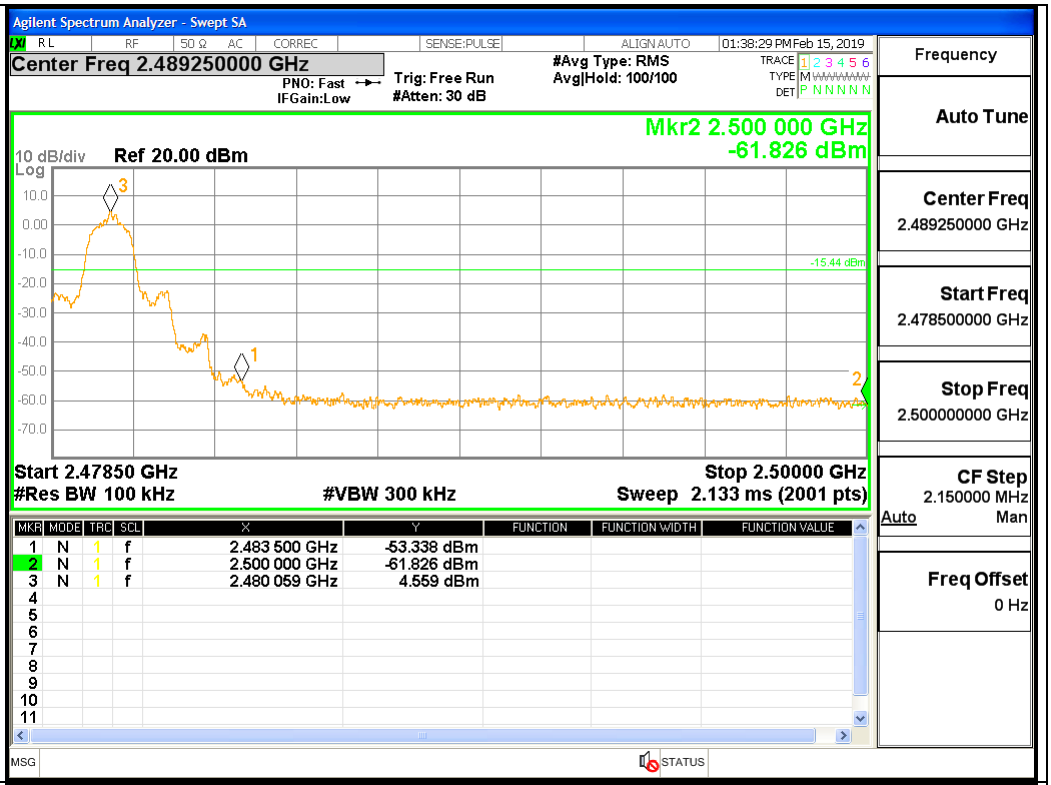
π/4DQPSK/LCH/No Hop



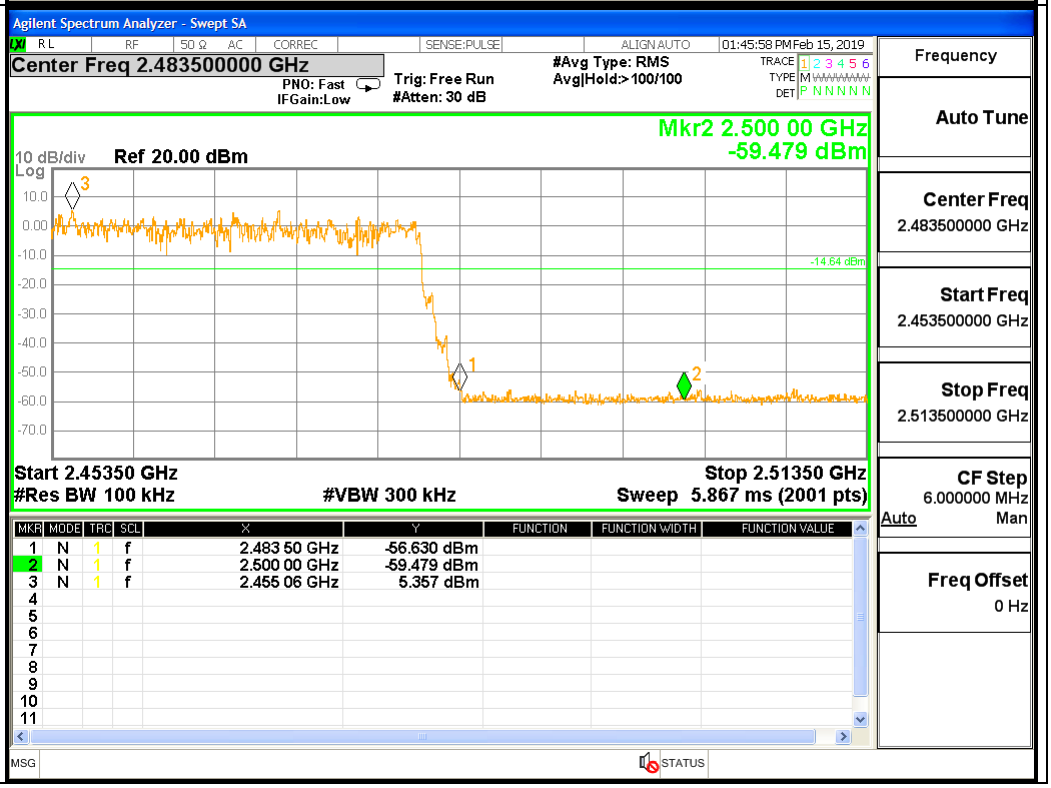
π/4DQPSK/LCH/Hop



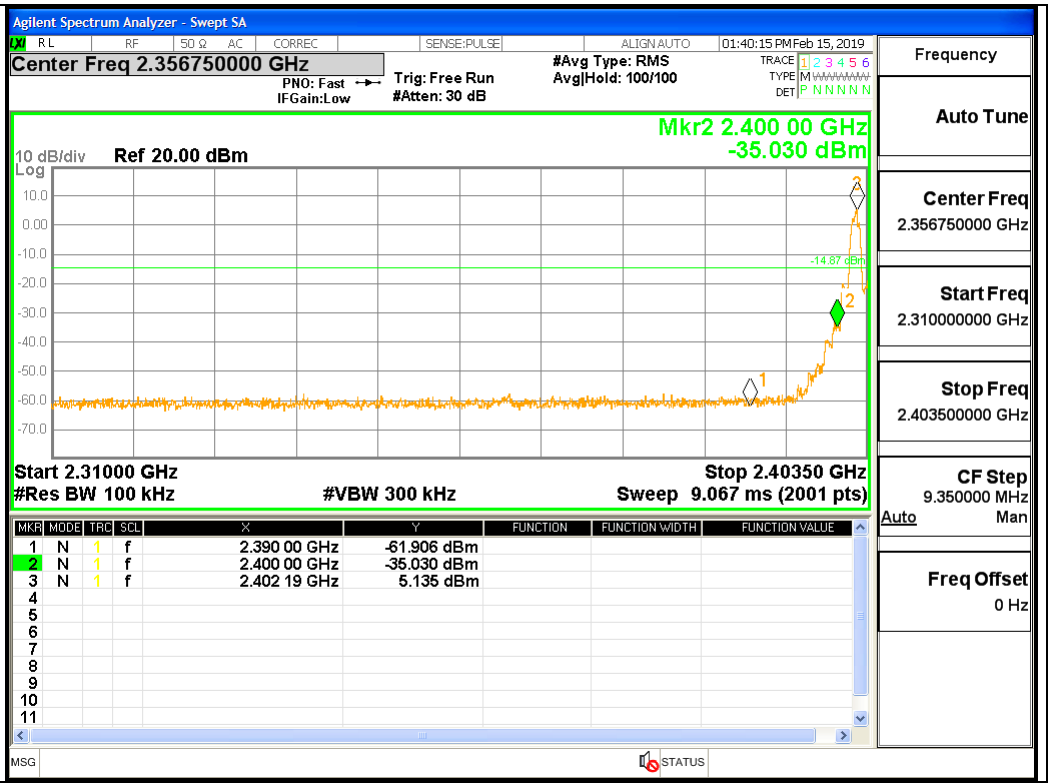
π/4DQPSK/HCH/No Hop



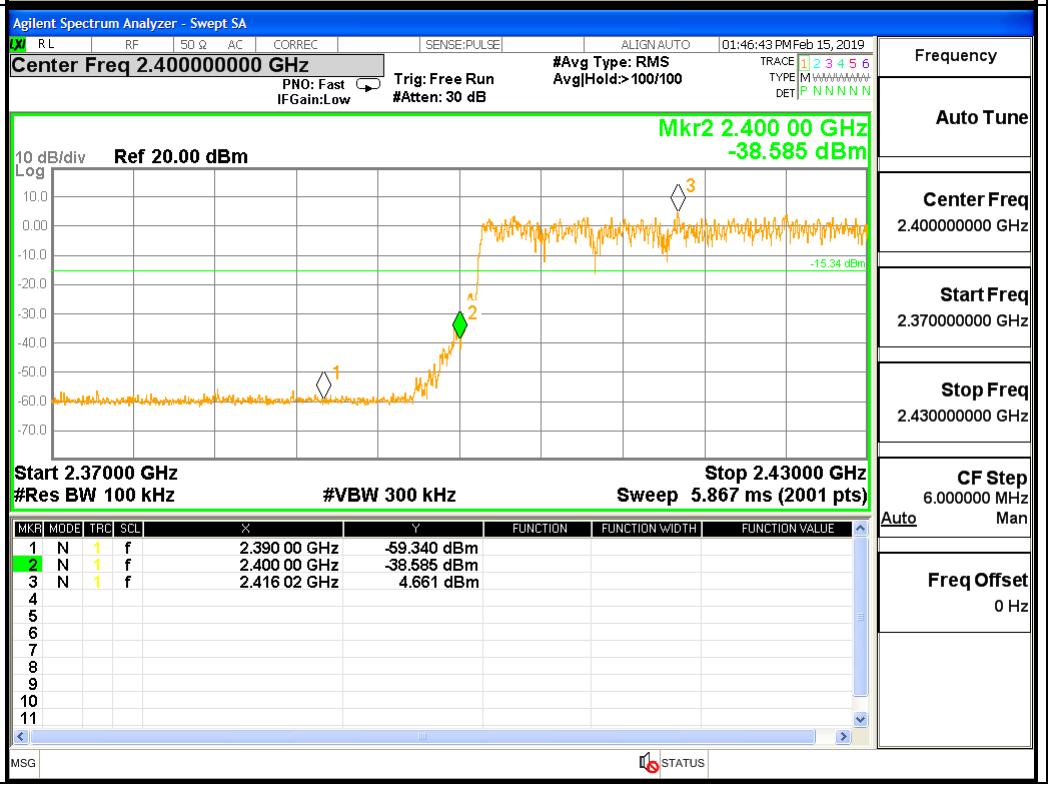
π/4DQPSK/HCH/Hop



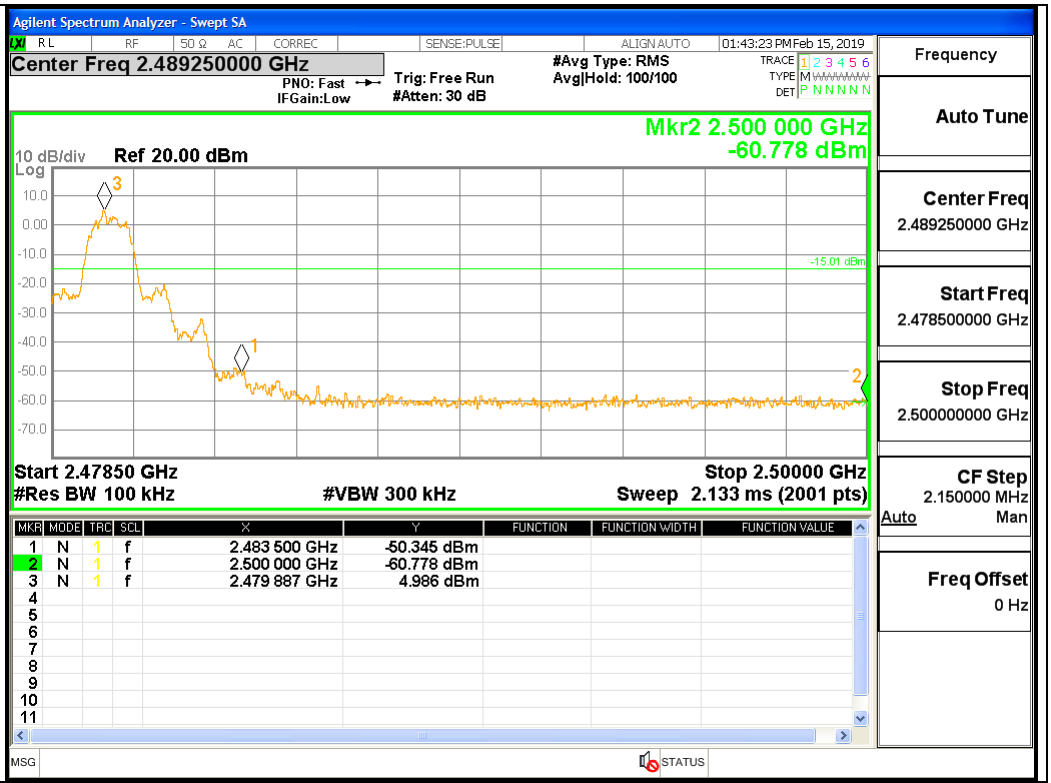
8DPSK/LCH/No Hop



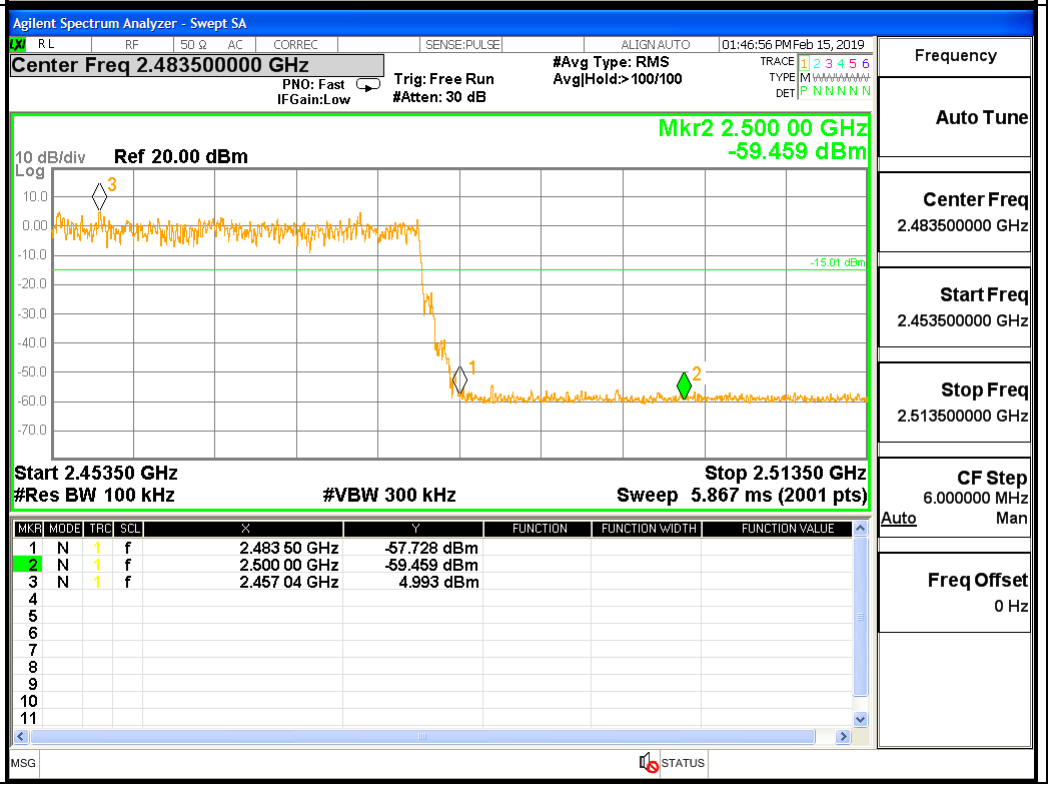
8DPSK/LCH/Hop



8DPSK/HCH/No Hop

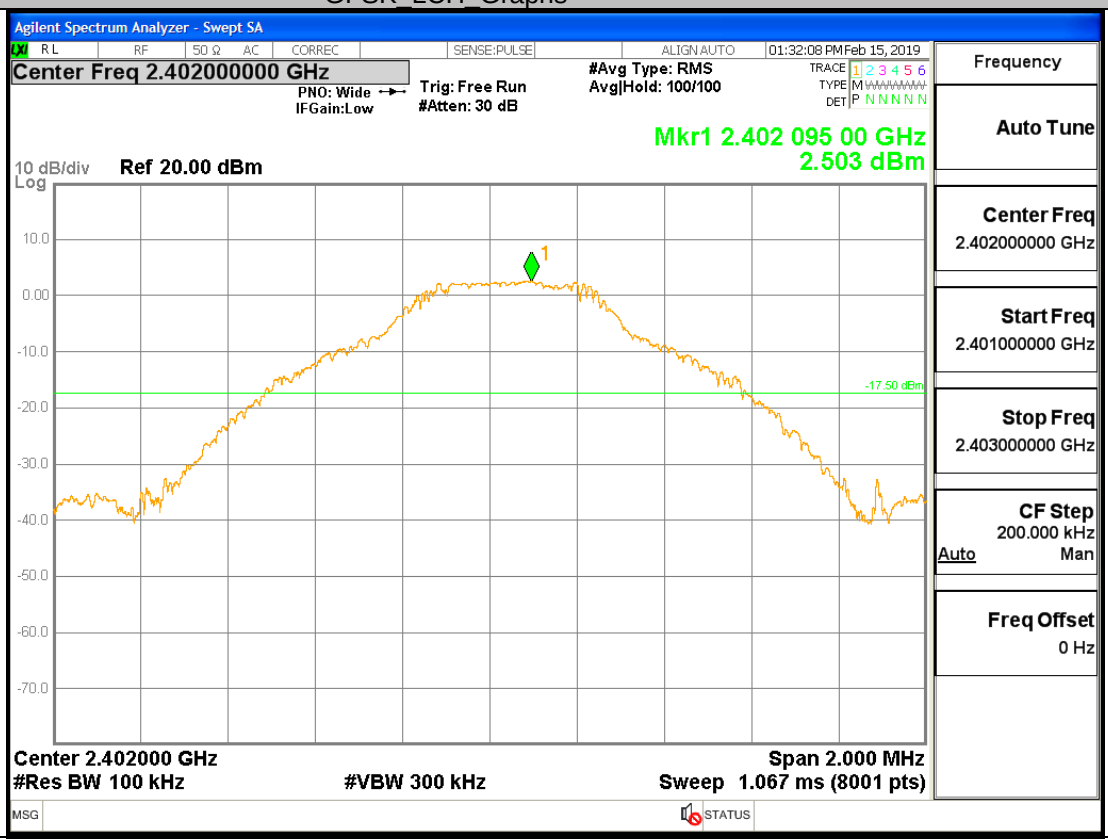
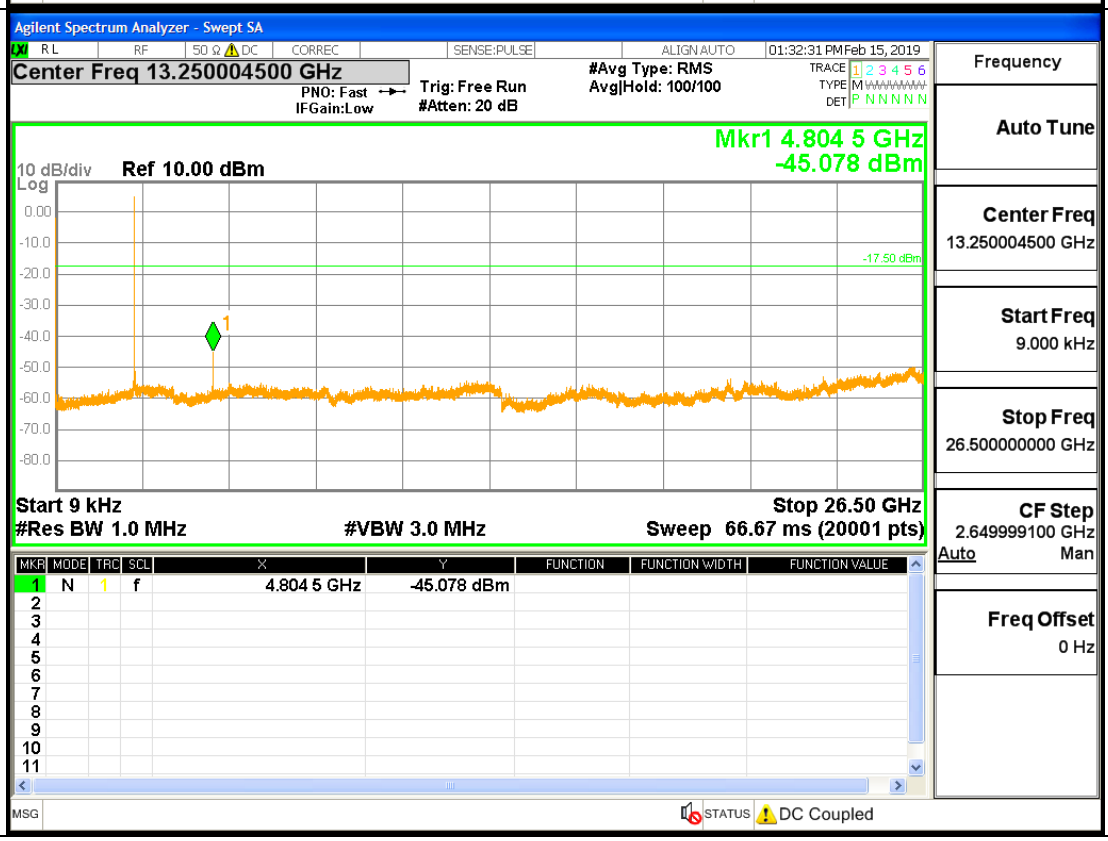


8DPSK/HCH/Hop



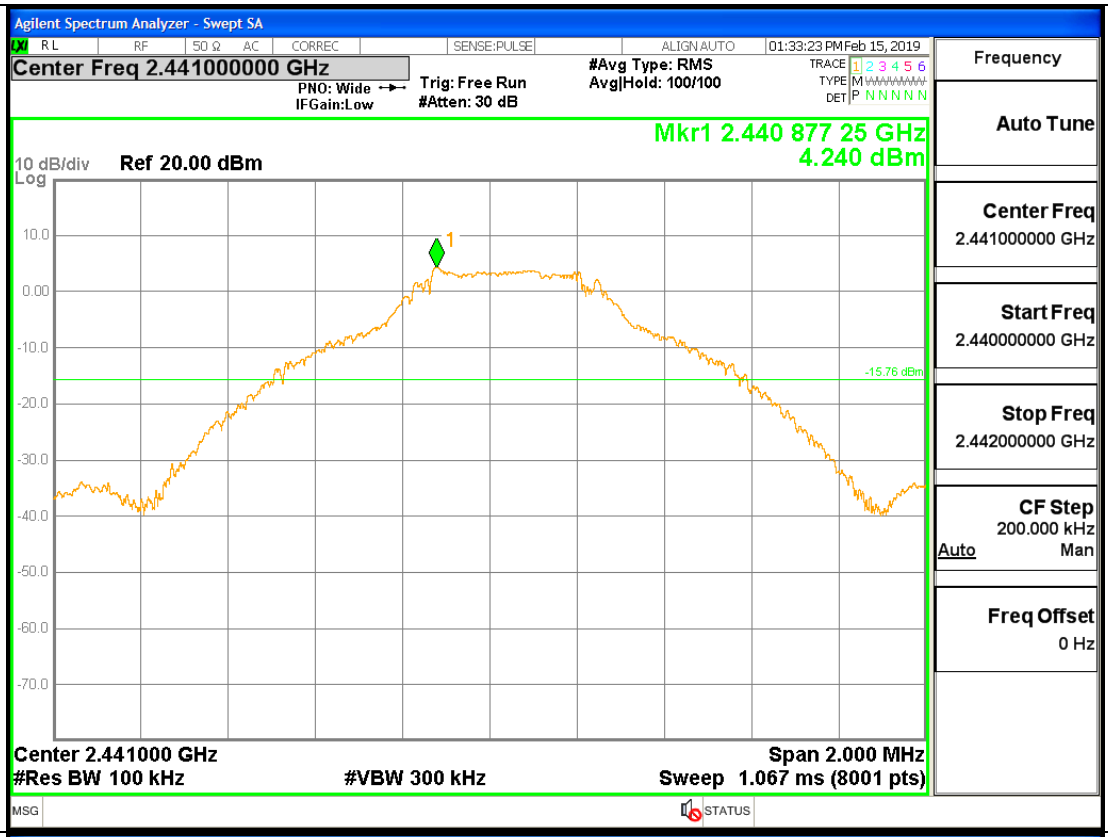
A.7 RF Conducted Spurious Emissions

Test Graph

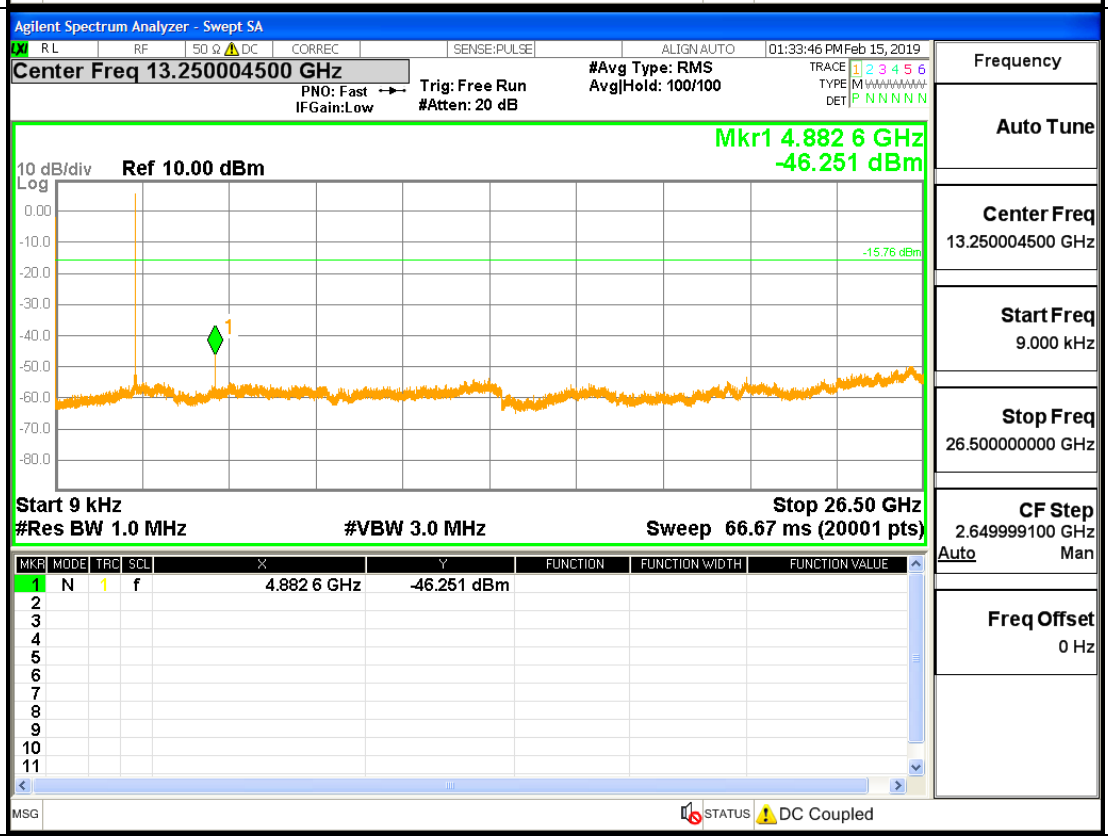
GFSK_LCH_Graphs	
Pref	
Puw	

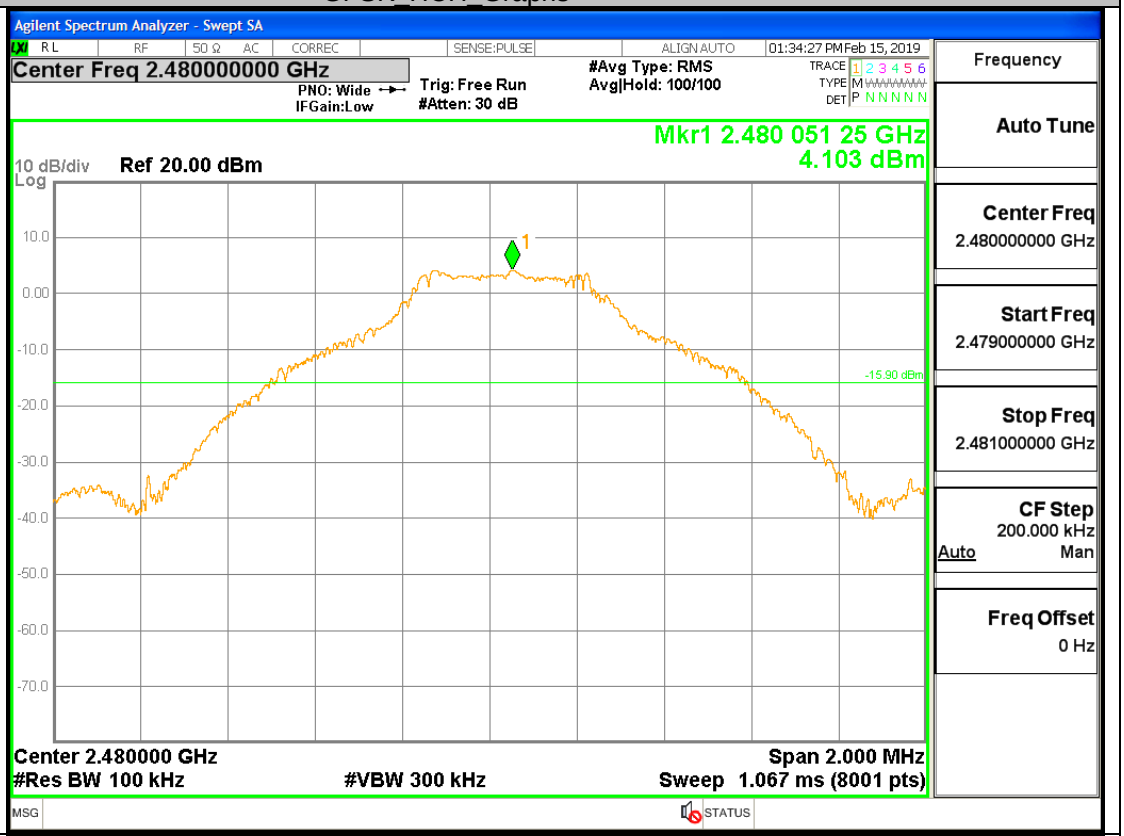
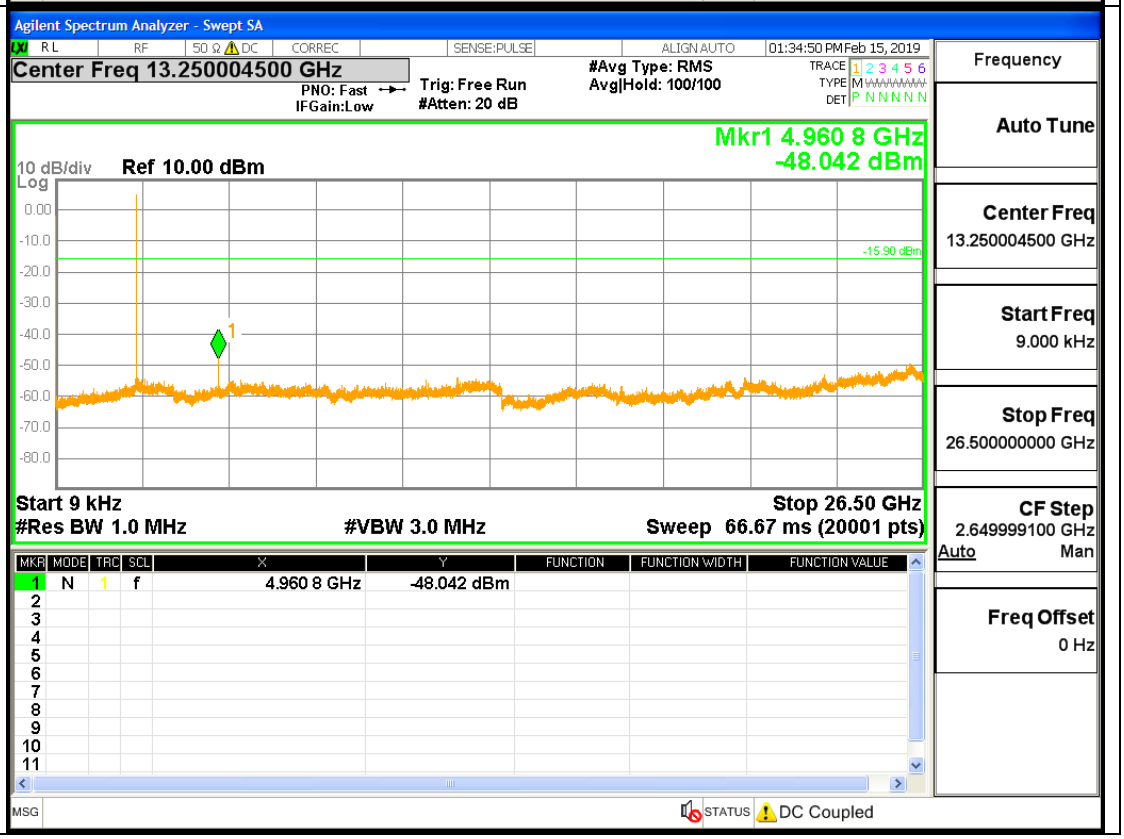
GFSK_MCH_Graphs

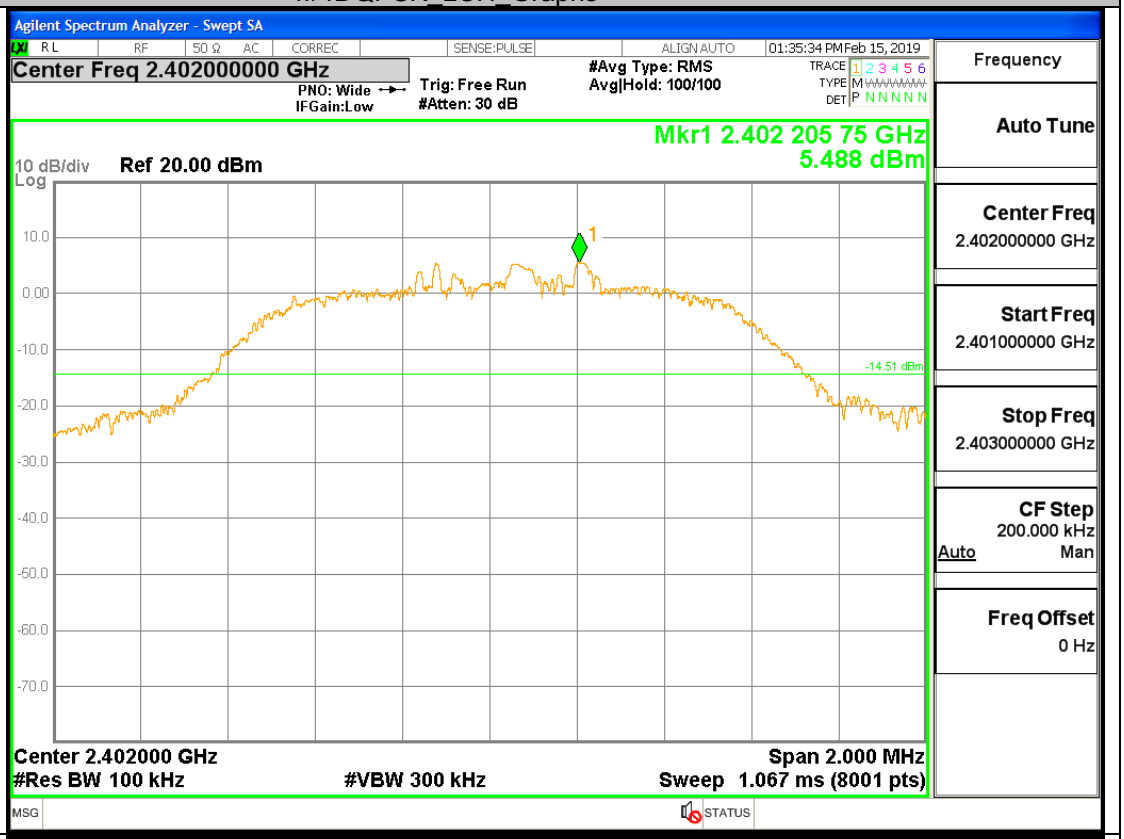
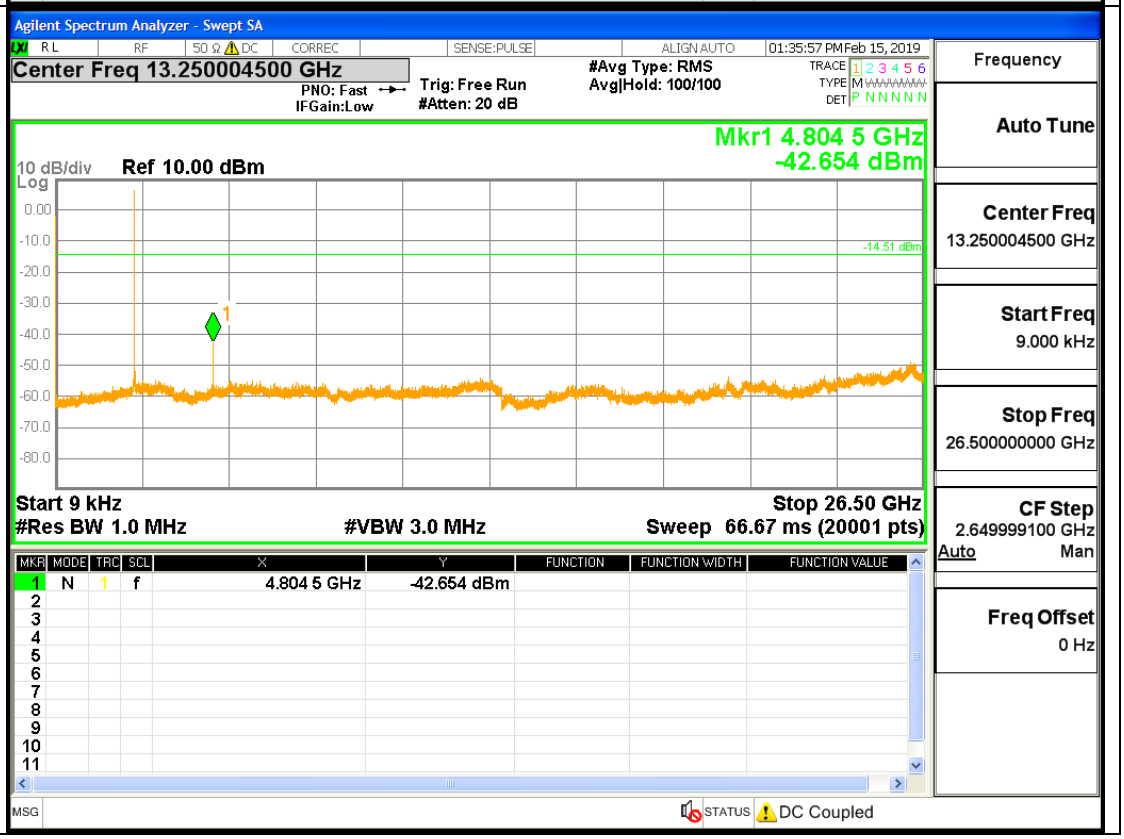
Pref

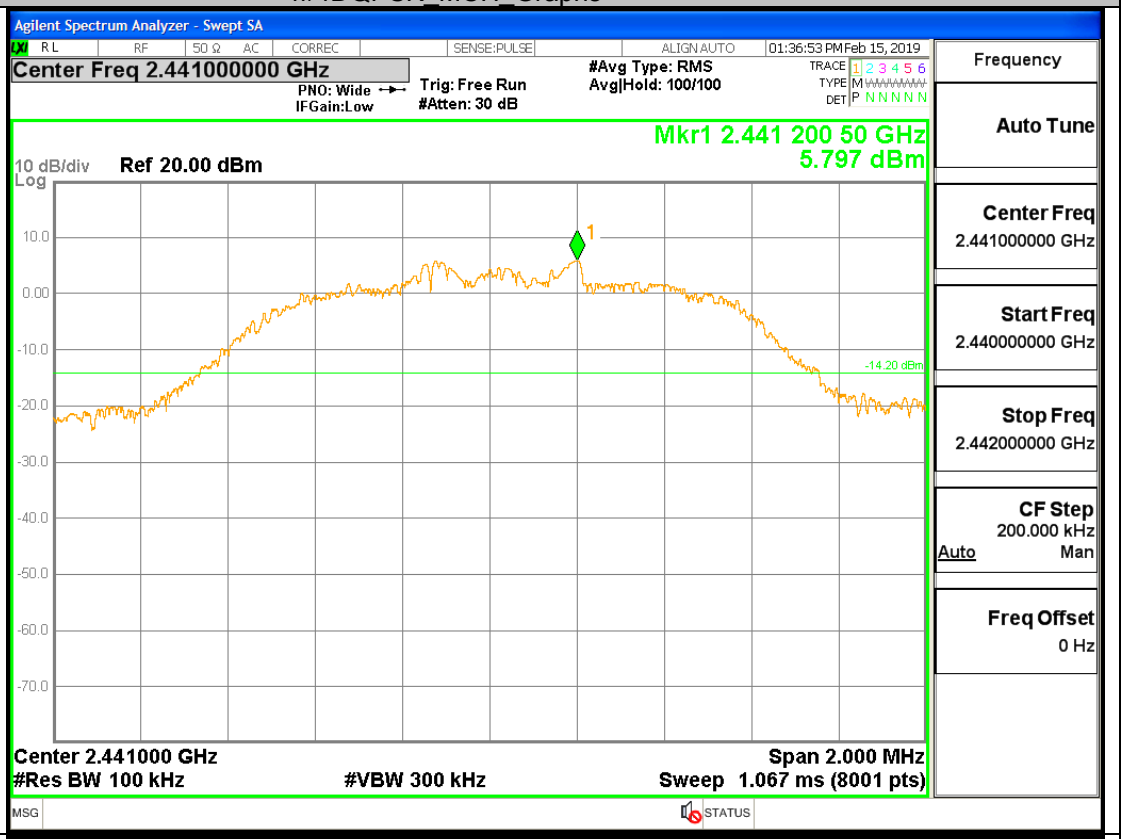
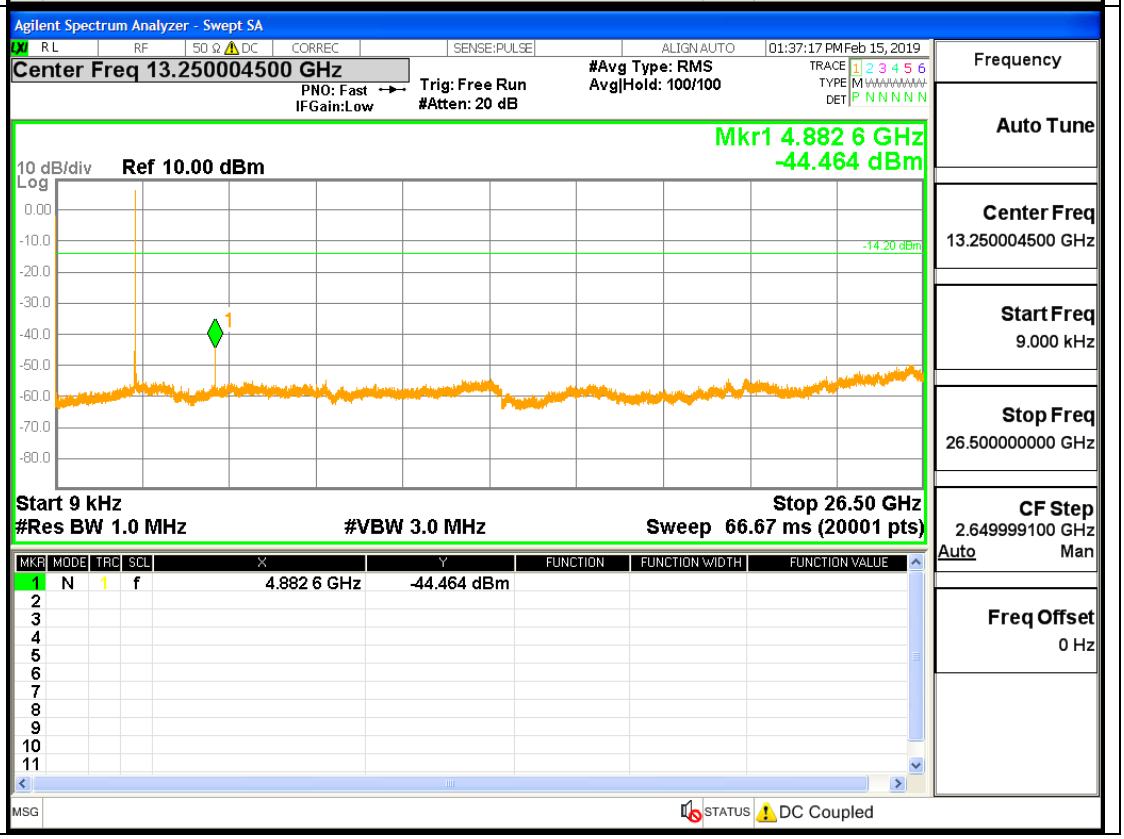

Agilent Spectrum Analyzer - Swept SA
Center Freq 2.441000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
01:33:23 PM Feb 15, 2019
Mkr1 2.440 877 25 GHz
4.240 dBm
10 dB/div Ref 20.00 dBm
Log
-15.76 dBm
Center 2.441000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2.000 MHz
Sweep 1.067 ms (8001 pts)
Frequency
Auto Tune
Center Freq
2.441000000 GHz
Start Freq
2.440000000 GHz
Stop Freq
2.442000000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

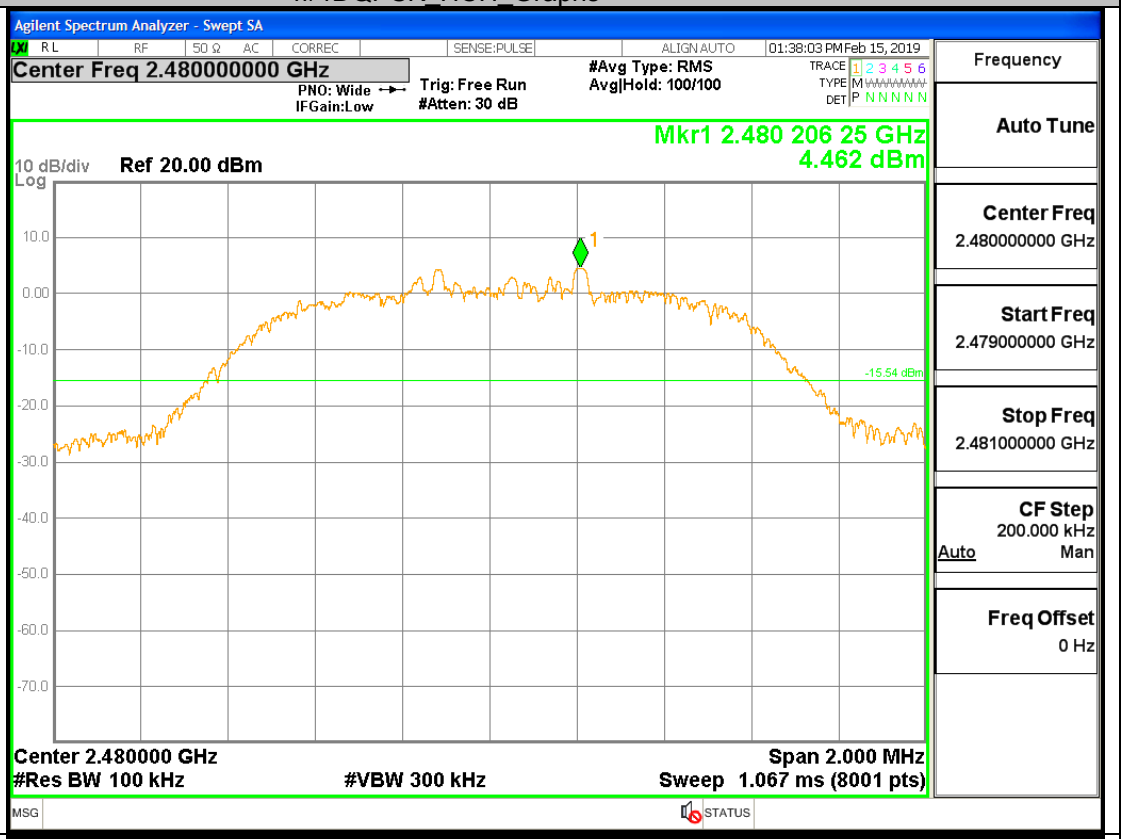
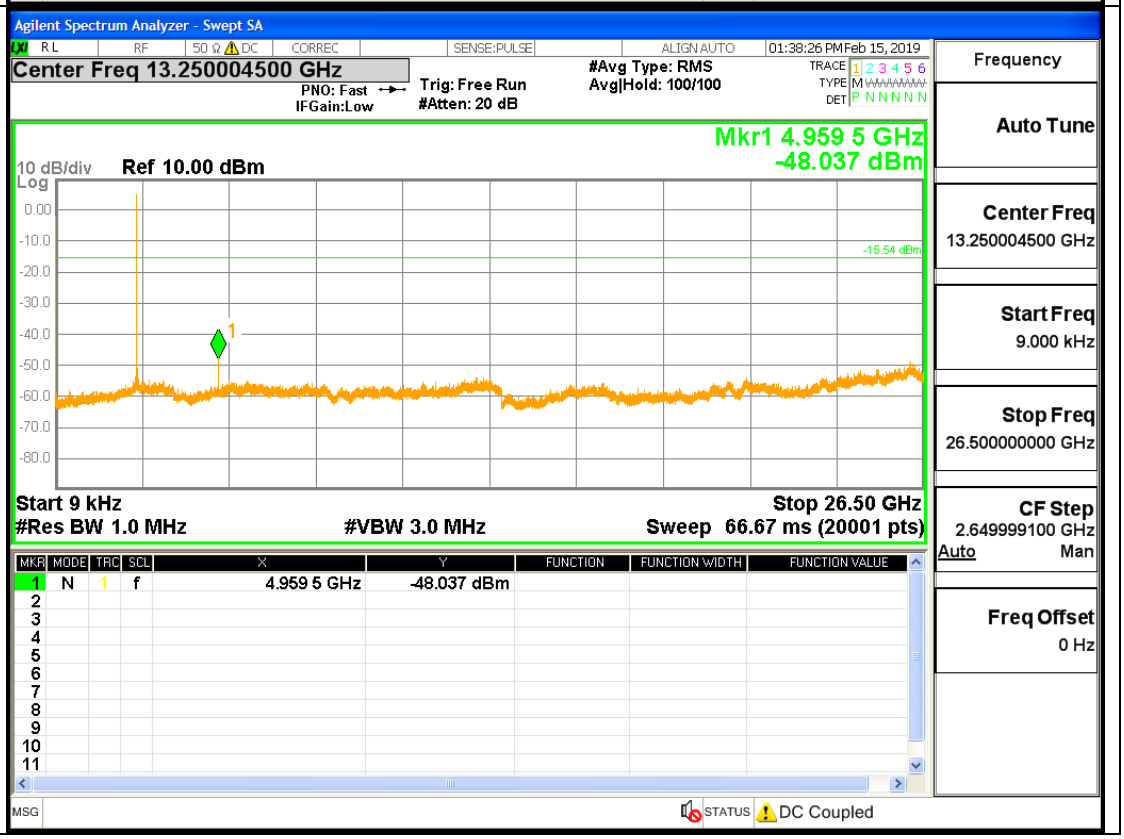
Puw

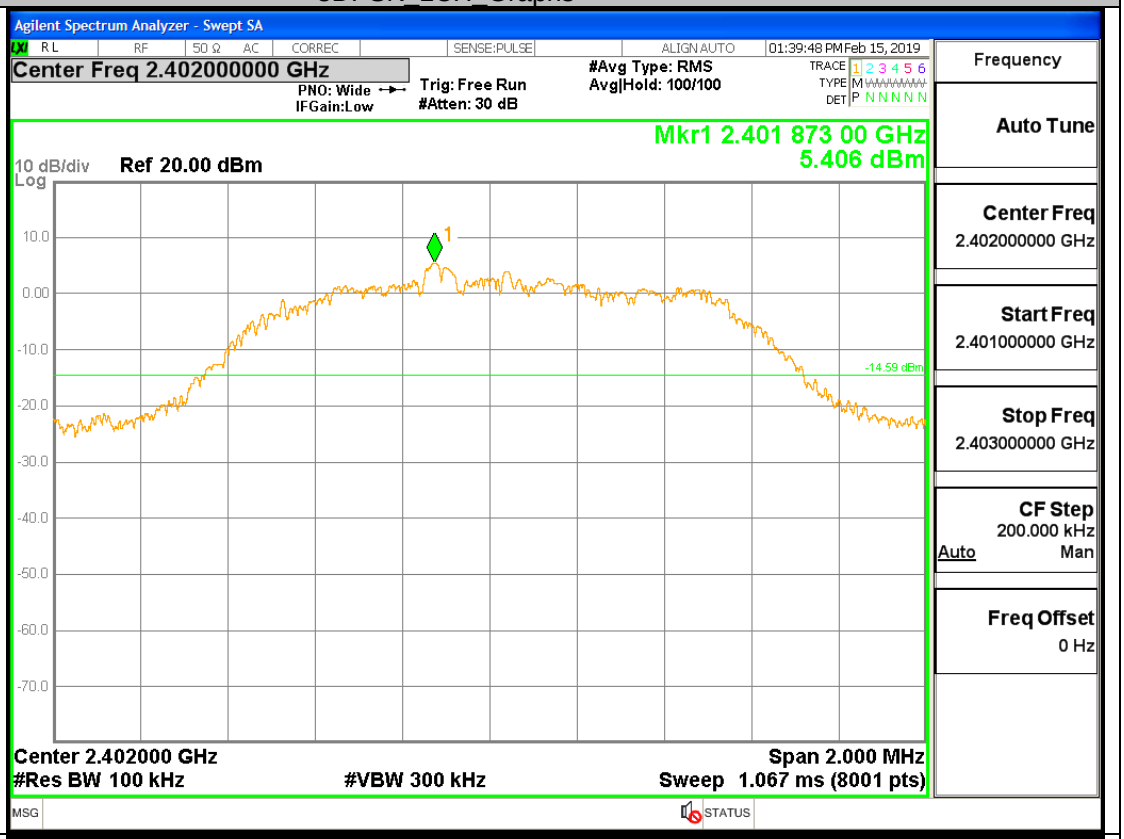
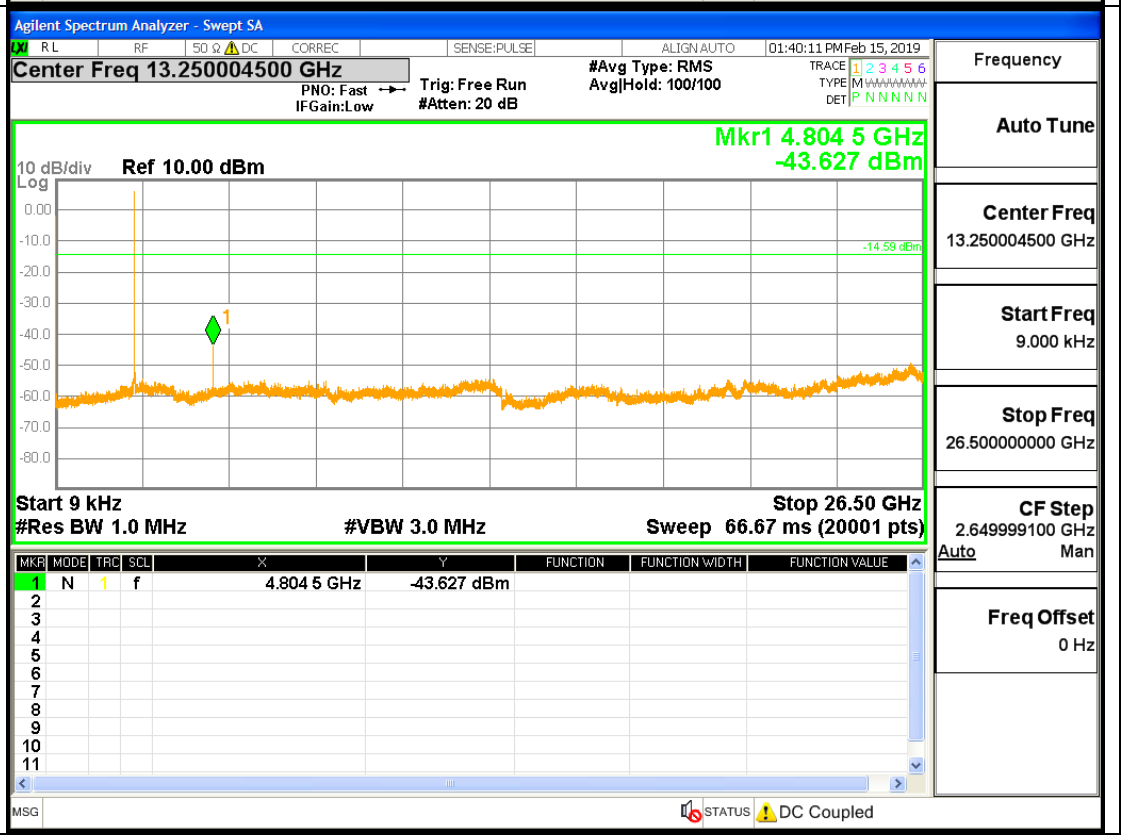

Agilent Spectrum Analyzer - Swept SA
Center Freq 13.250004500 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
01:33:46 PM Feb 15, 2019
Mkr1 4.882 6 GHz
-46.251 dBm
10 dB/div Ref 10.00 dBm
Log
-15.76 dBm
Start 9 kHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 26.50 GHz
Sweep 66.67 ms (20001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 4.882 6 GHz -46.251 dBm
DC Coupled
Frequency
Auto Tune
Center Freq
13.250004500 GHz
Start Freq
9.000 kHz
Stop Freq
26.500000000 GHz
CF Step
2.649999100 GHz
Auto
Man
Freq Offset
0 Hz

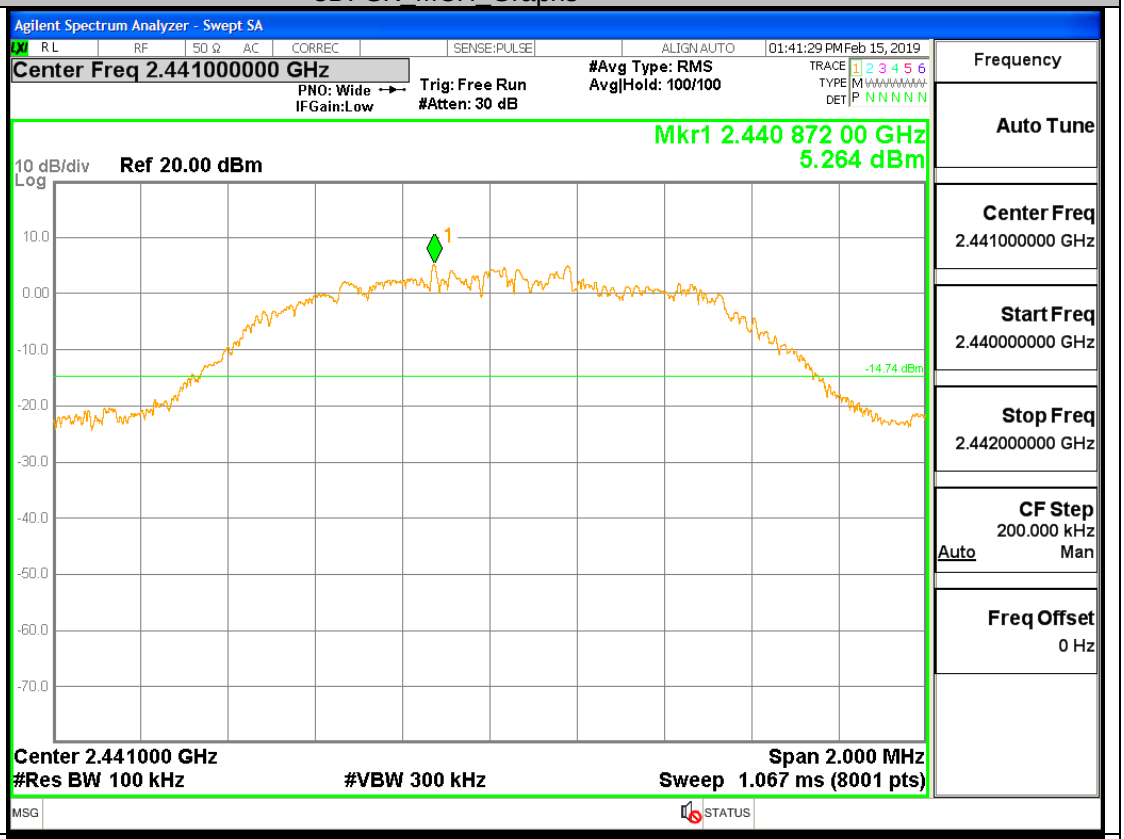
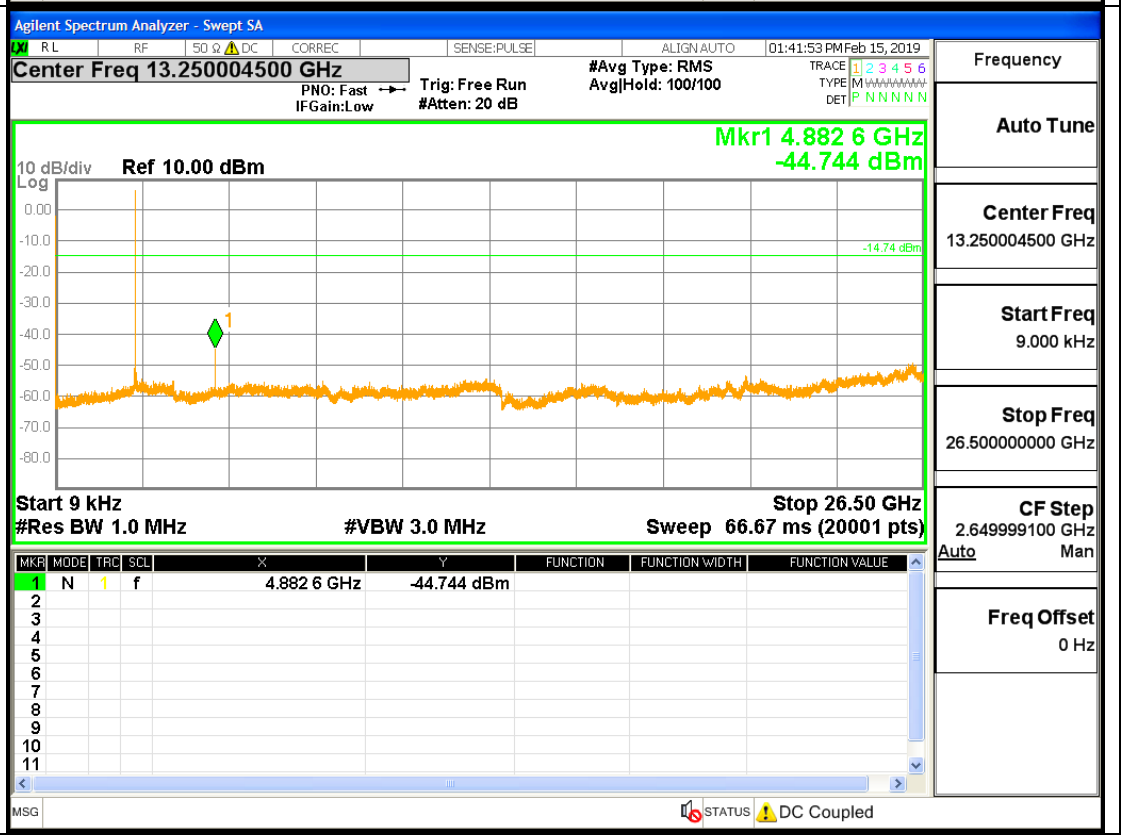
GFSK_HCH_Graphs	
Pref	
Puw	

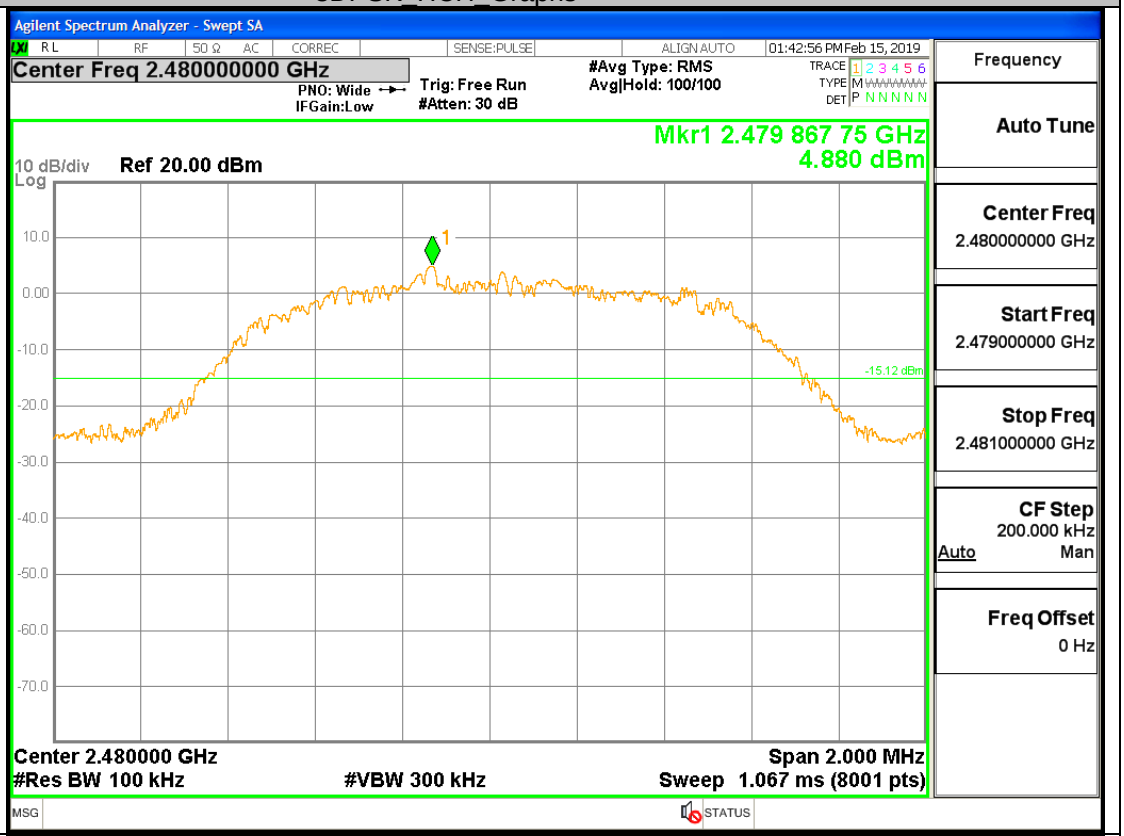
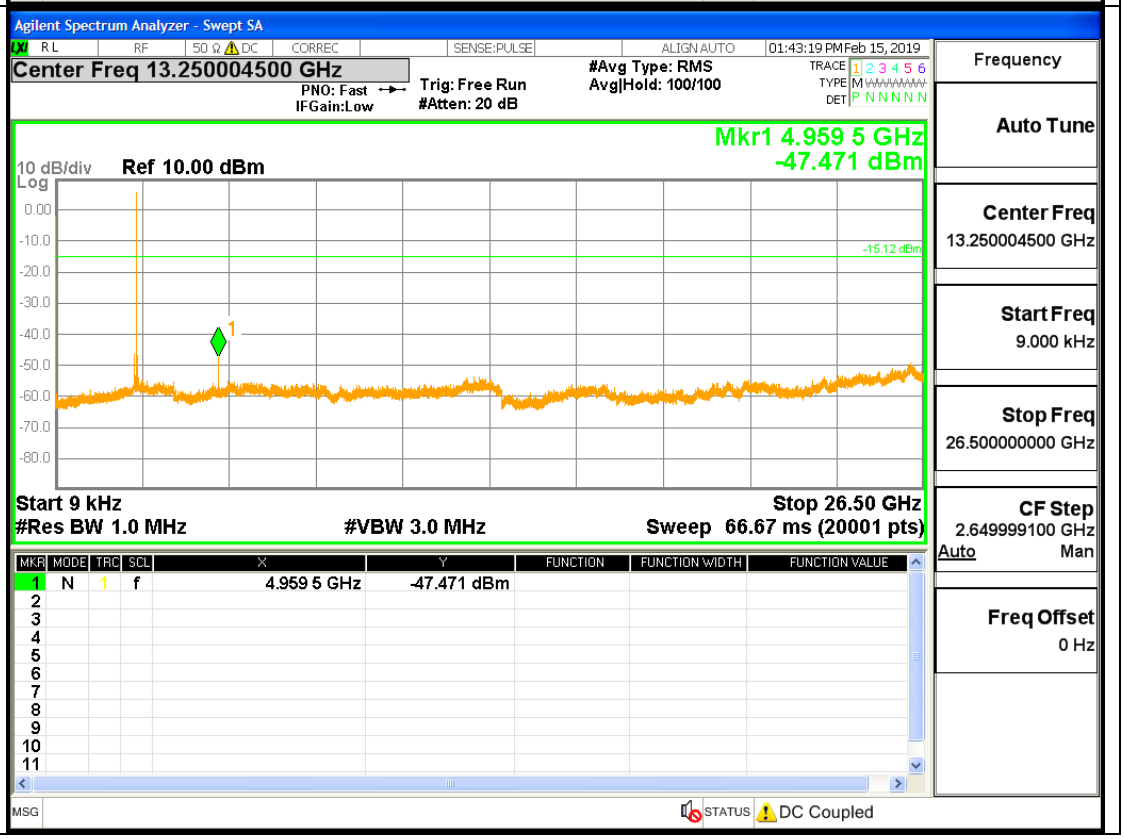
π/4DQPSK_LCH_Graphs	
Pref	
Puw	

π/4DQPSK_MCH_Graphs	
Pref	
Puw	

π/4DQPSK_HCH_Graphs	
Pref	
Puw	

8DPSK_LCH_Graphs	
Pref	
Puw	

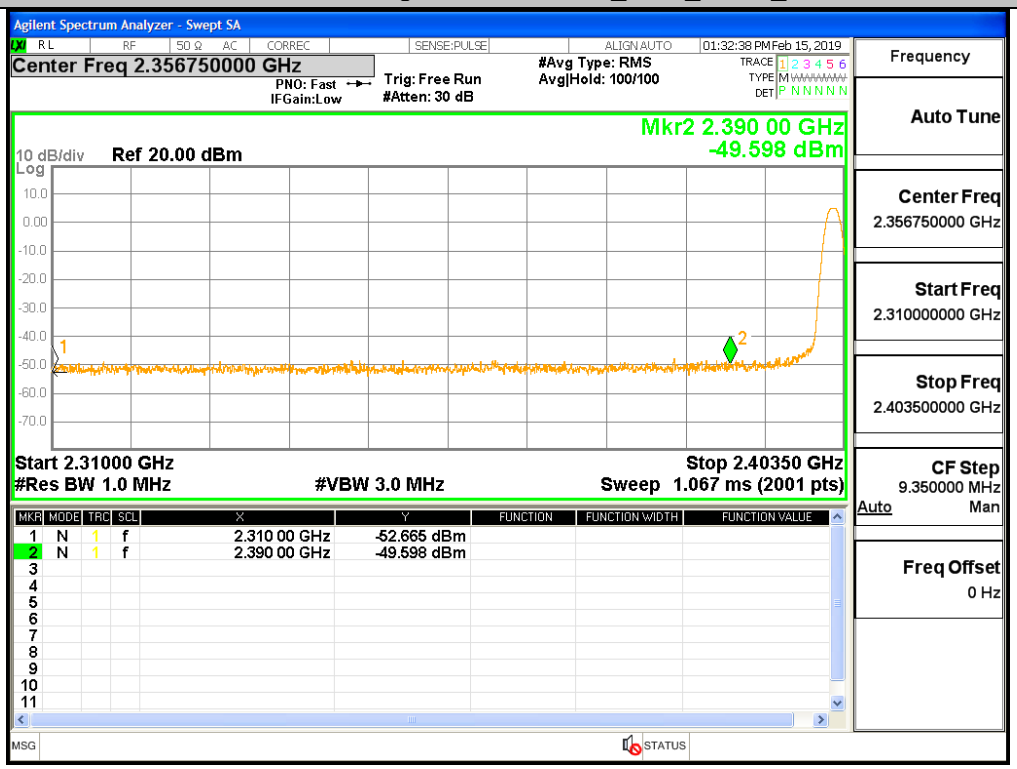
8DPSK_MCH_Graphs	
Pref	
Puw	

8DPSK_HCH_Graphs	
Pref	
Puw	

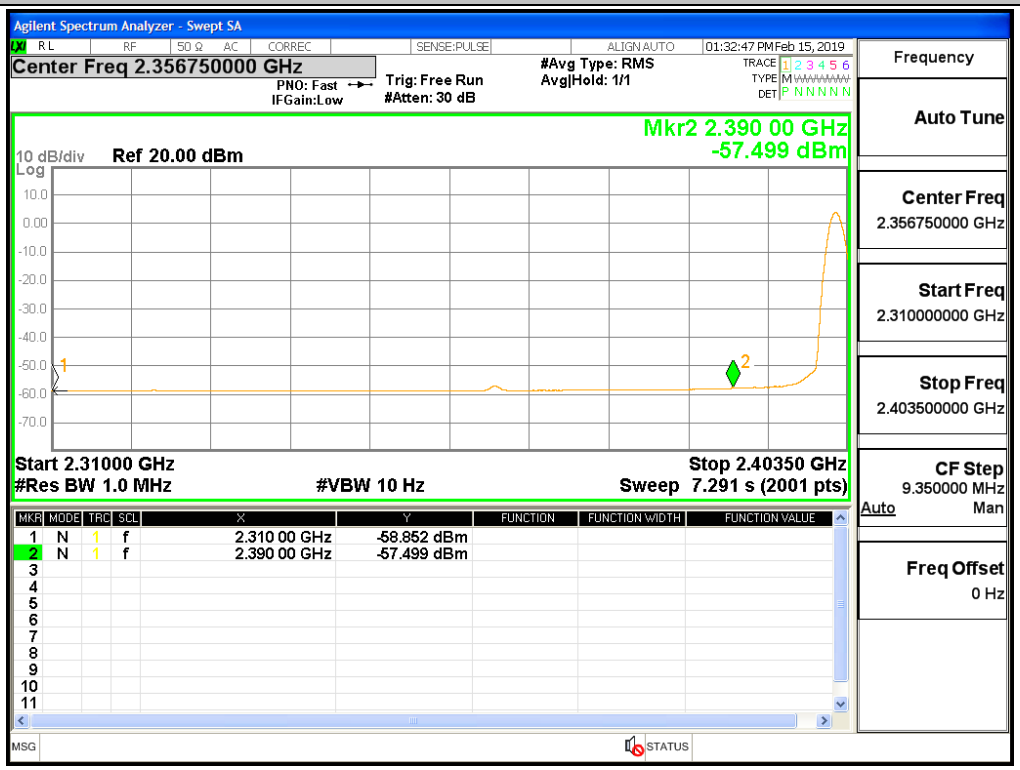
A.8 Restrict-band band-edge measurements

Type	Carrier Frequency (MHz)	Frequency(MHz)	Gain	Ground Factor	Peak Value(dBm)	E [dBuV/m]	Limit [dBuV/m]	Average Value(dBm)	E [dBuV/m]	Limit [dBuV/m]	Conclusion
1DH5	2402	2310	2.00	0.00	-52.66	44.54	74	-58.85	38.35	54	Pass
1DH5	2402	2390	2.00	0.00	-49.6	47.6	74	-57.5	39.7	54	Pass
1DH5	2480	2483.5	2.00	0.00	-47.99	49.21	74	-53.5	43.7	54	Pass
1DH5	2480	2500	2.00	0.00	-50.43	46.77	74	-57.89	39.31	54	Pass
2DH5	2402	2310	2.00	0.00	-51.72	45.48	74	-58.82	38.38	54	Pass
2DH5	2402	2390	2.00	0.00	-51.41	45.79	74	-58.03	39.17	54	Pass
2DH5	2480	2483.5	2.00	0.00	-39	58.2	74	-48.72	48.48	54	Pass
2DH5	2480	2500	2.00	0.00	-51.88	45.32	74	-57.87	39.33	54	Pass
3DH5	2402	2310	2.00	0.00	-50.28	46.92	74	-58.86	38.34	54	Pass
3DH5	2402	2390	2.00	0.00	-52.46	44.74	74	-57.94	39.26	54	Pass
3DH5	2480	2483.5	2.00	0.00	-37.76	59.44	74	-46.66	50.54	54	Pass
3DH5	2480	2500	2.00	0.00	-49.54	47.66	74	-57.92	39.28	54	Pass

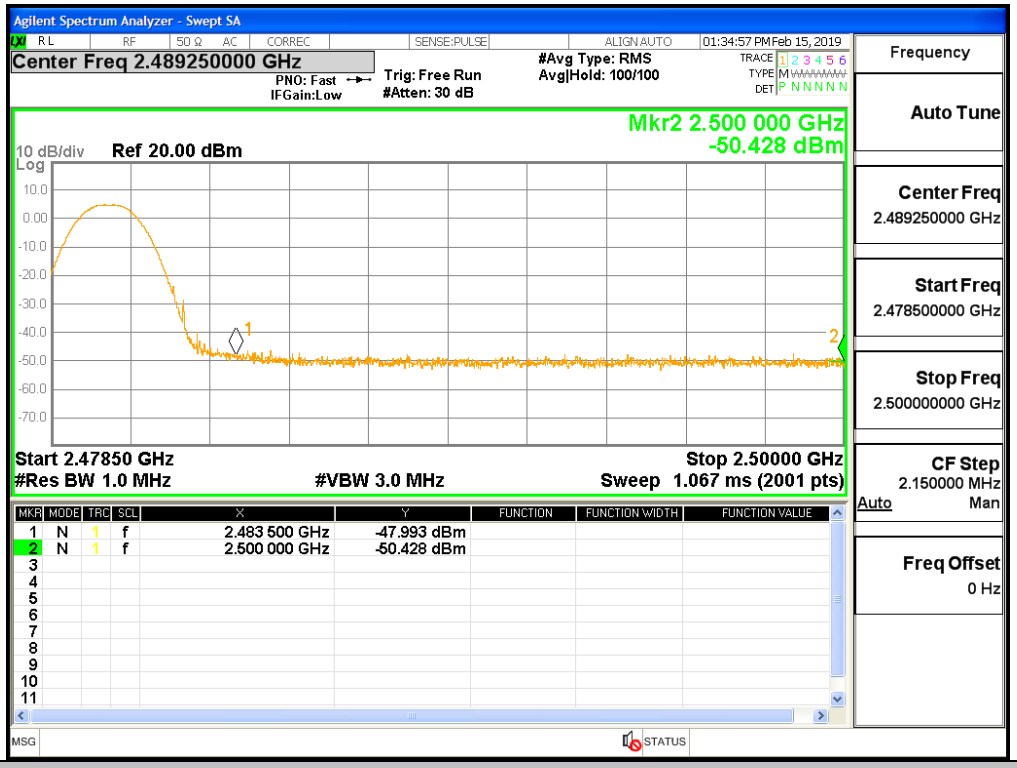
Restrict-band band-edge measurements_2402_PEAK_DH5



Restrict-band band-edge measurements_2402_AV_DH5

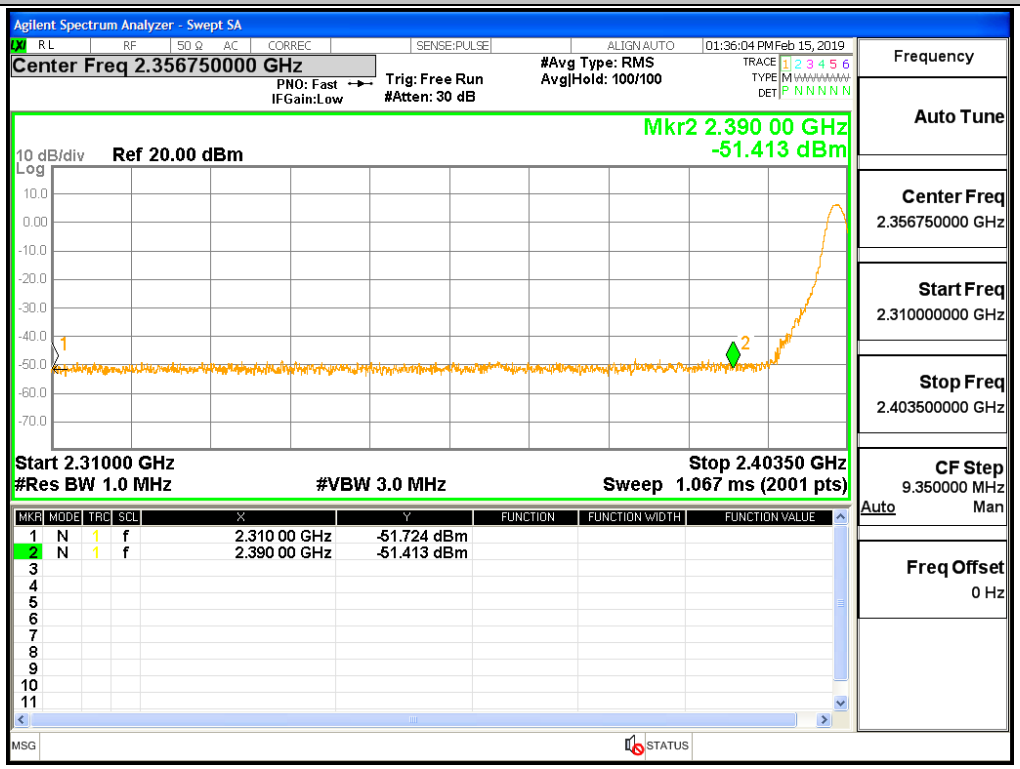


Restrict-band band-edge measurements_2480_PEAK_DH5

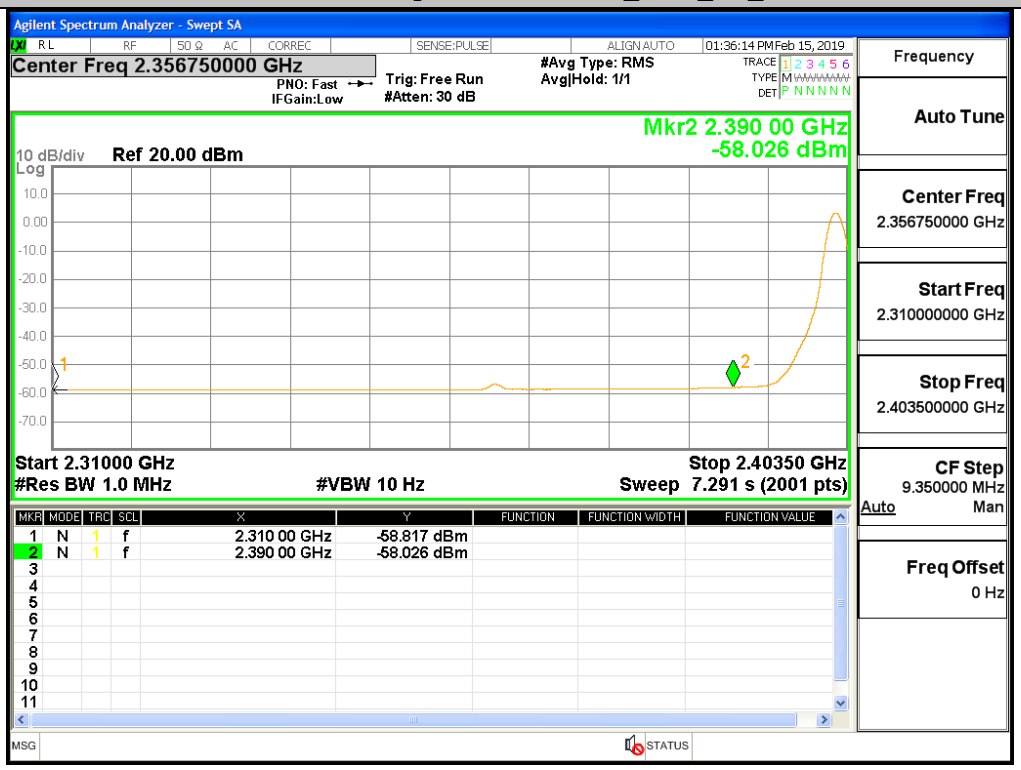


Restrict-band band-edge measurements_2480_AV_DH5

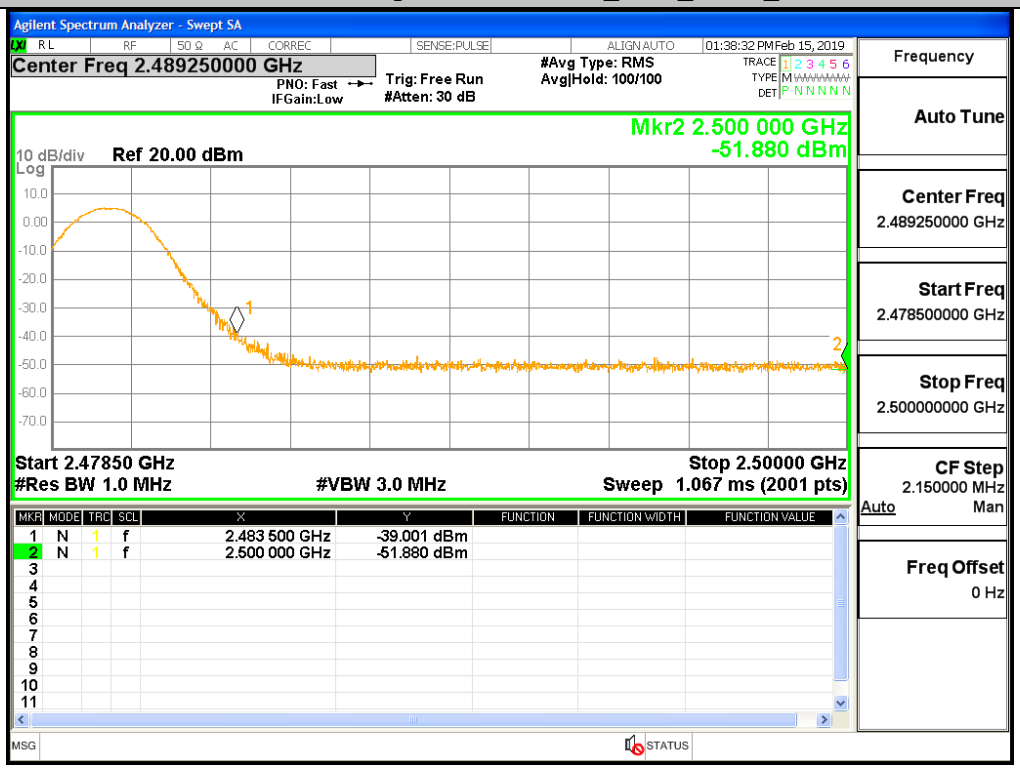
Restrict-band band-edge measurements_2402_PEAK_2DH5



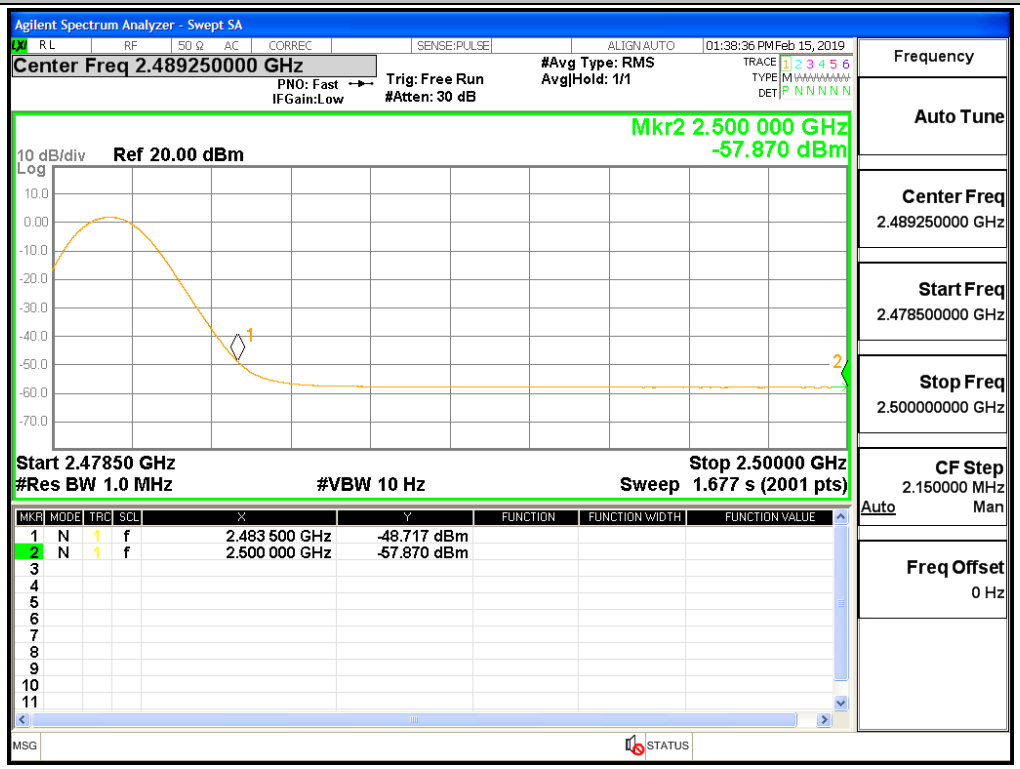
Restrict-band band-edge measurements_2402_AV_2DH5



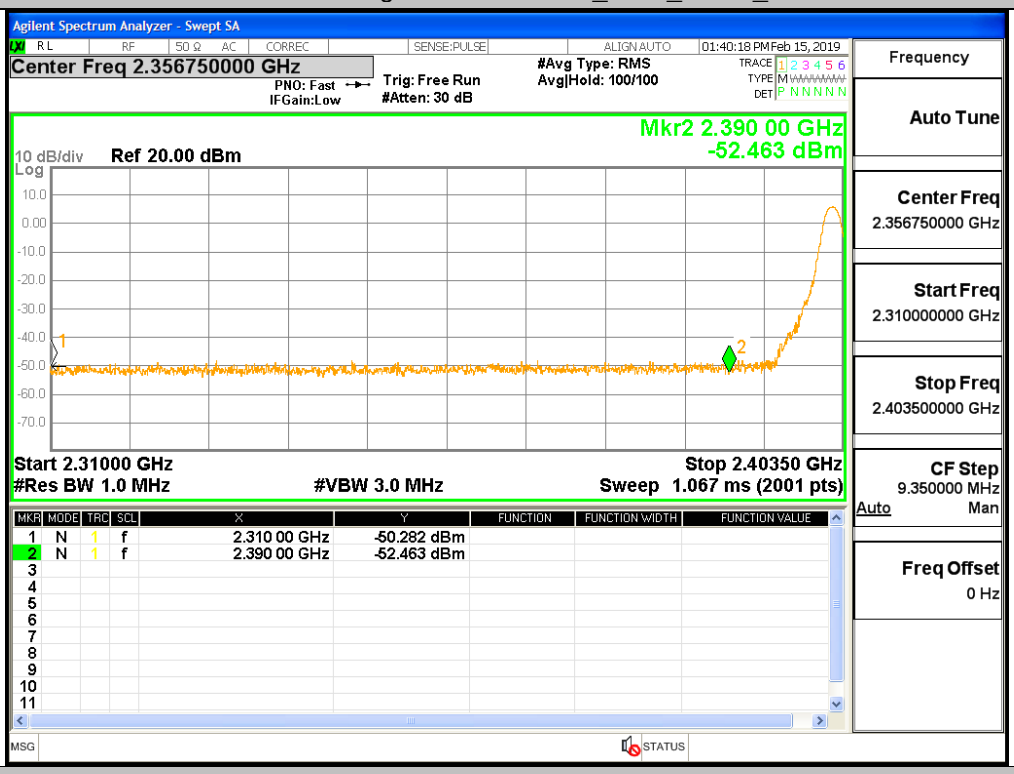
Restrict-band band-edge measurements_2480_PEAK_2DH5



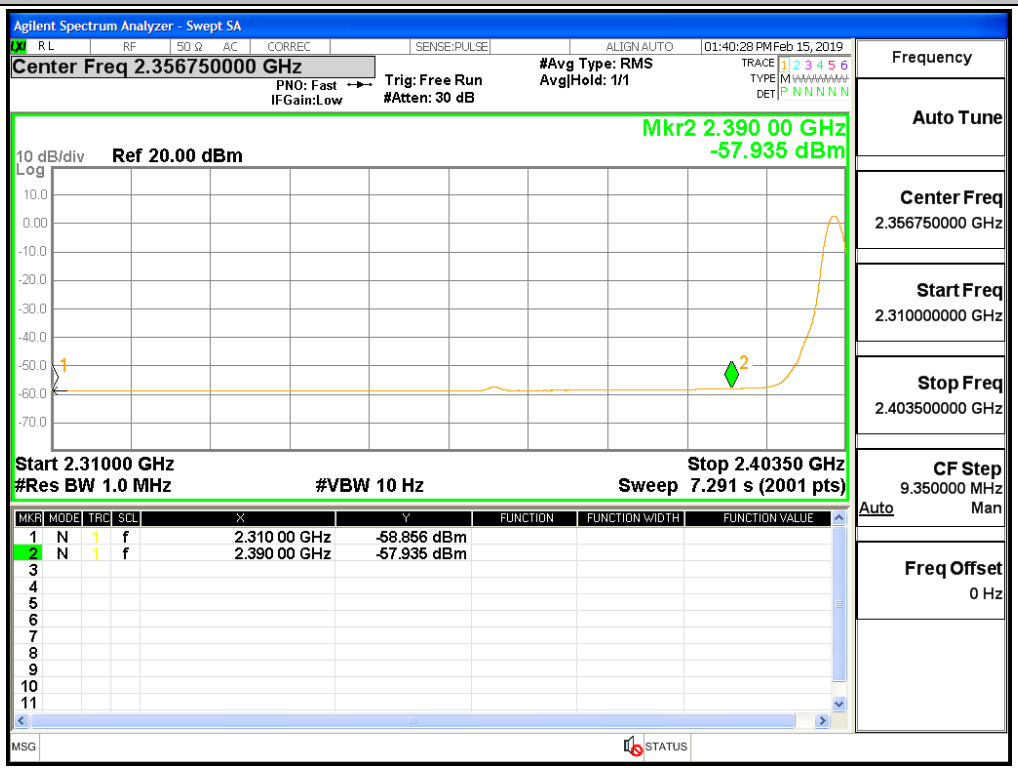
Restrict-band band-edge measurements_2480_AV_2DH5



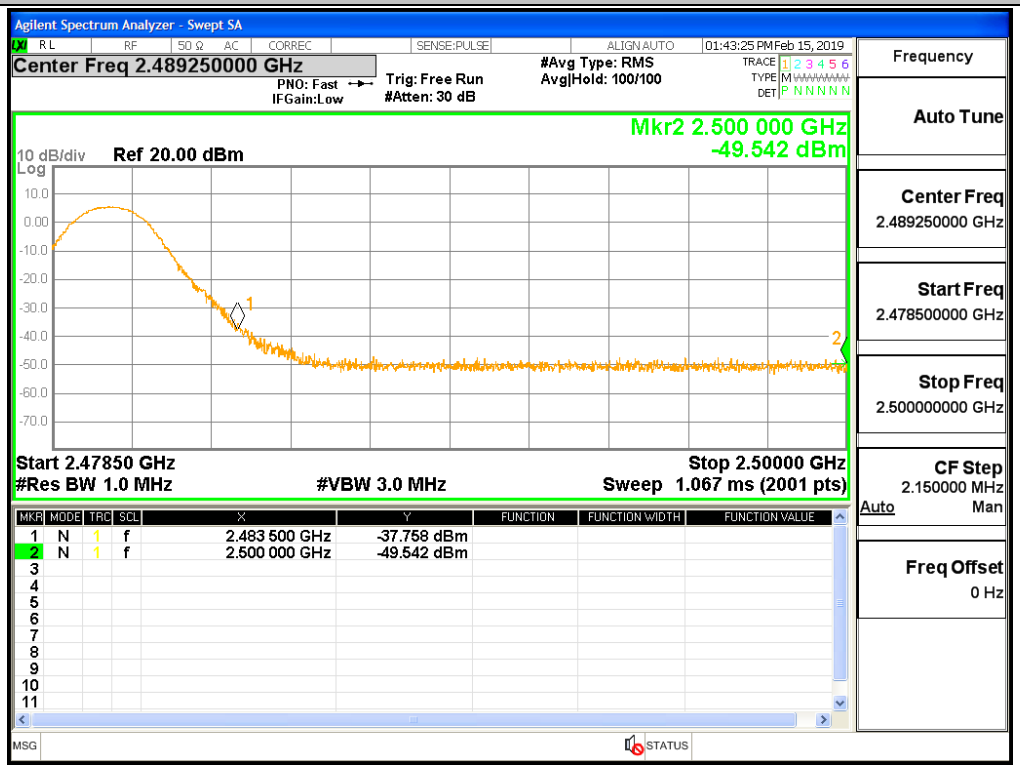
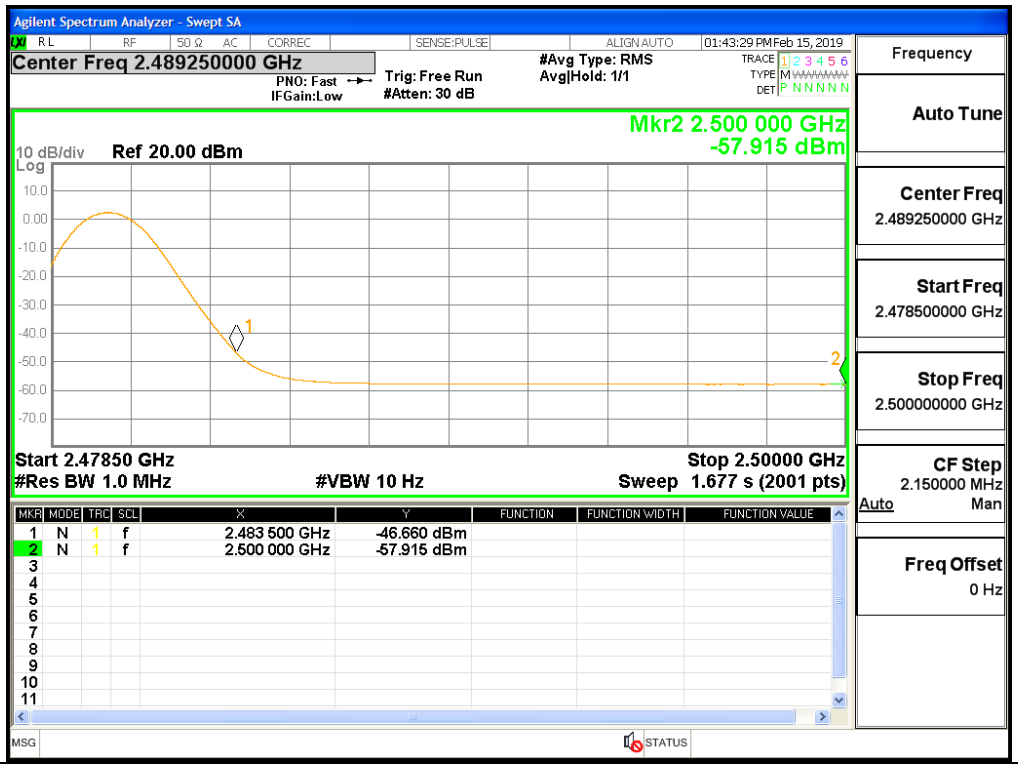
Restrict-band band-edge measurements_2402_PEAK_3DH5



Restrict-band band-edge measurements_2402_AV_3DH5



Restrict-band band-edge measurements_2480_PEAK_3DH5



Restrict-band band-edge measurements_2480_AV_3DH5