

## Appendix A

### RF Test Data for BT(BLE) (Conducted Measurement)

Product Name: Shenzhen SEI Robotics Co., Ltd.

Trade Mark: eSTREAM4K

Test Model: IPA1104HDW- 01-400-05T-TiVo

FCC ID: 2AOVU-IPA1104HDW

IC: 25669-IPA1104HDW

### Environmental Conditions

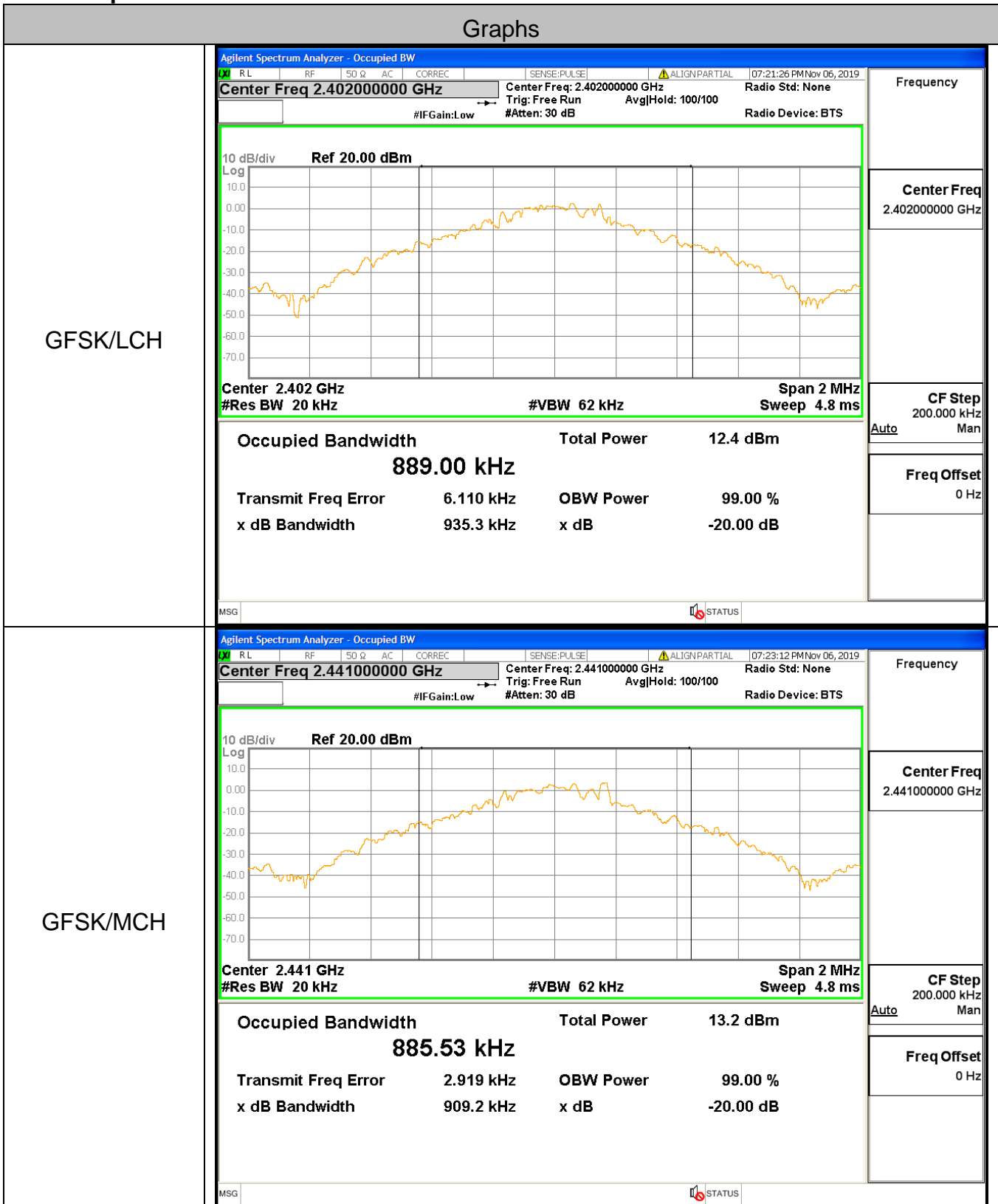
Temperature:	23.7° C
Relative Humidity:	52%
ATM Pressure:	100.0 kPa
Test Engineer:	Gary Qian
Supervised by:	Eden Hu

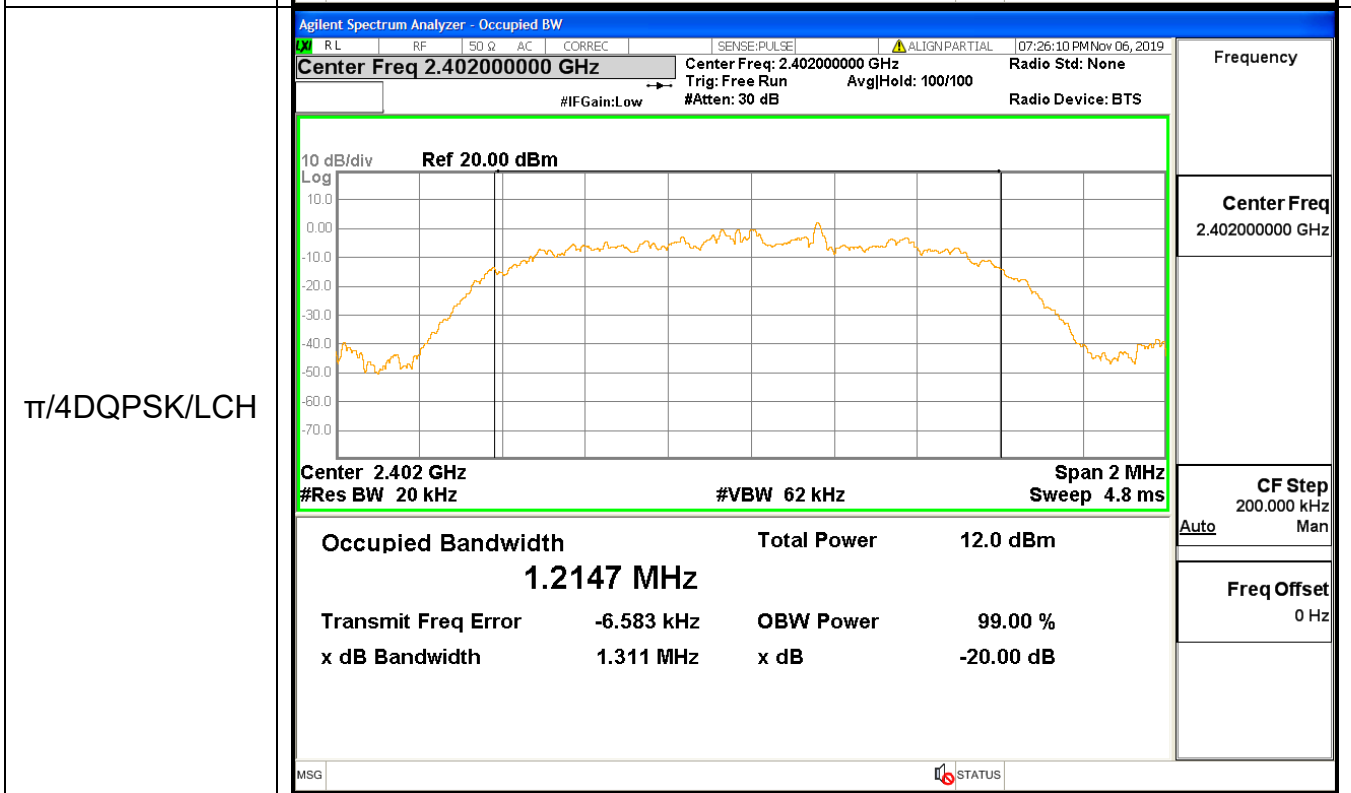
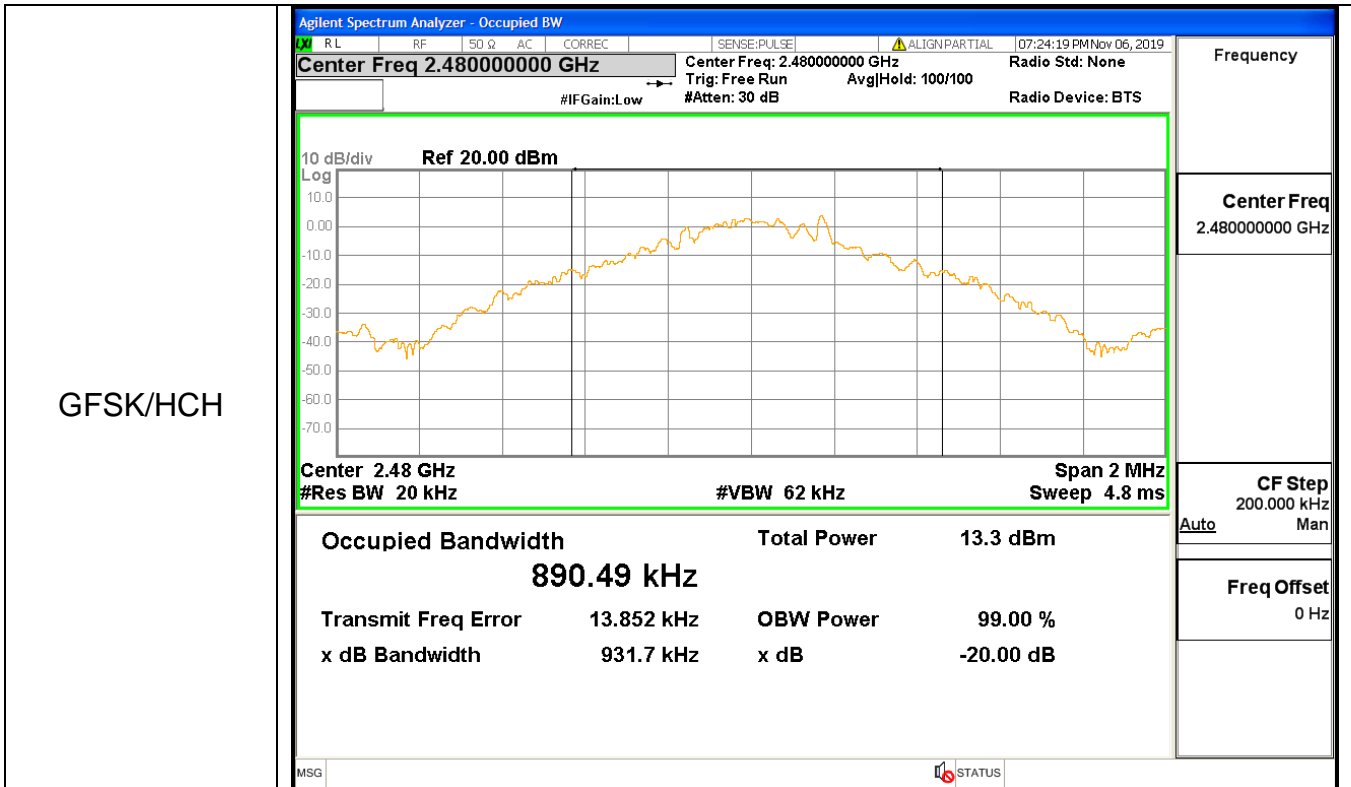
#### A.1 20 dB Bandwidth & 99% Occupied Bandwidth

Mode	Channel	Occupied Bandwidth[MHz]	20dB Bandwidth [MHz]	Limit(MHz)	Verdict
GFSK	LCH	0.889	0.935	Not Specified	PASS
GFSK	MCH	0.886	0.909	Not Specified	PASS
GFSK	HCH	0.890	0.932	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.215	1.311	Not Specified	PASS
$\pi/4$ DQPSK	MCH	1.209	1.301	Not Specified	PASS
$\pi/4$ DQPSK	HCH	1.215	1.294	Not Specified	PASS
8DPSK	LCH	1.212	1.308	Not Specified	PASS
8DPSK	MCH	1.225	1.337	Not Specified	PASS
8DPSK	HCH	1.223	1.345	Not Specified	PASS

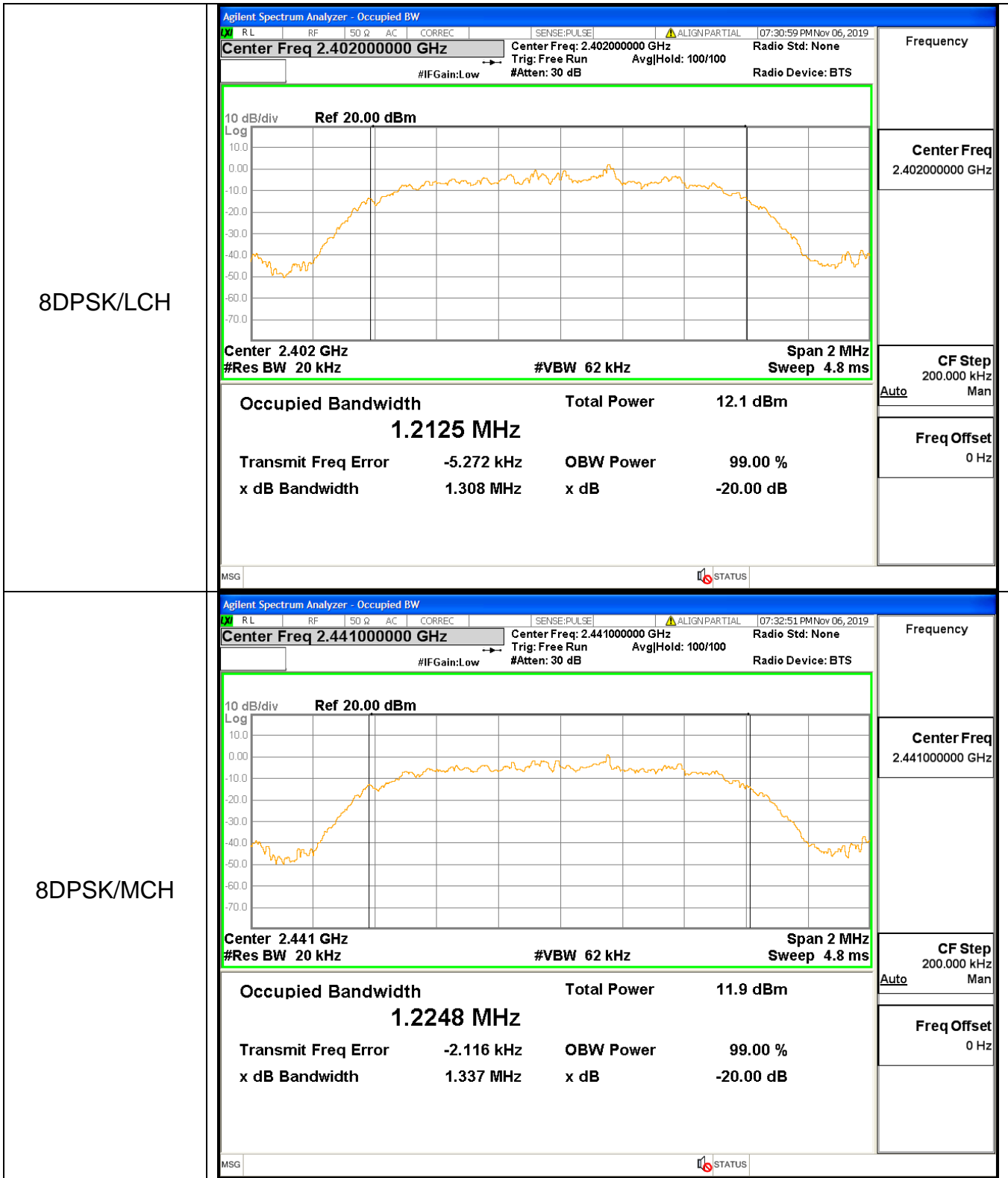
Test Graph

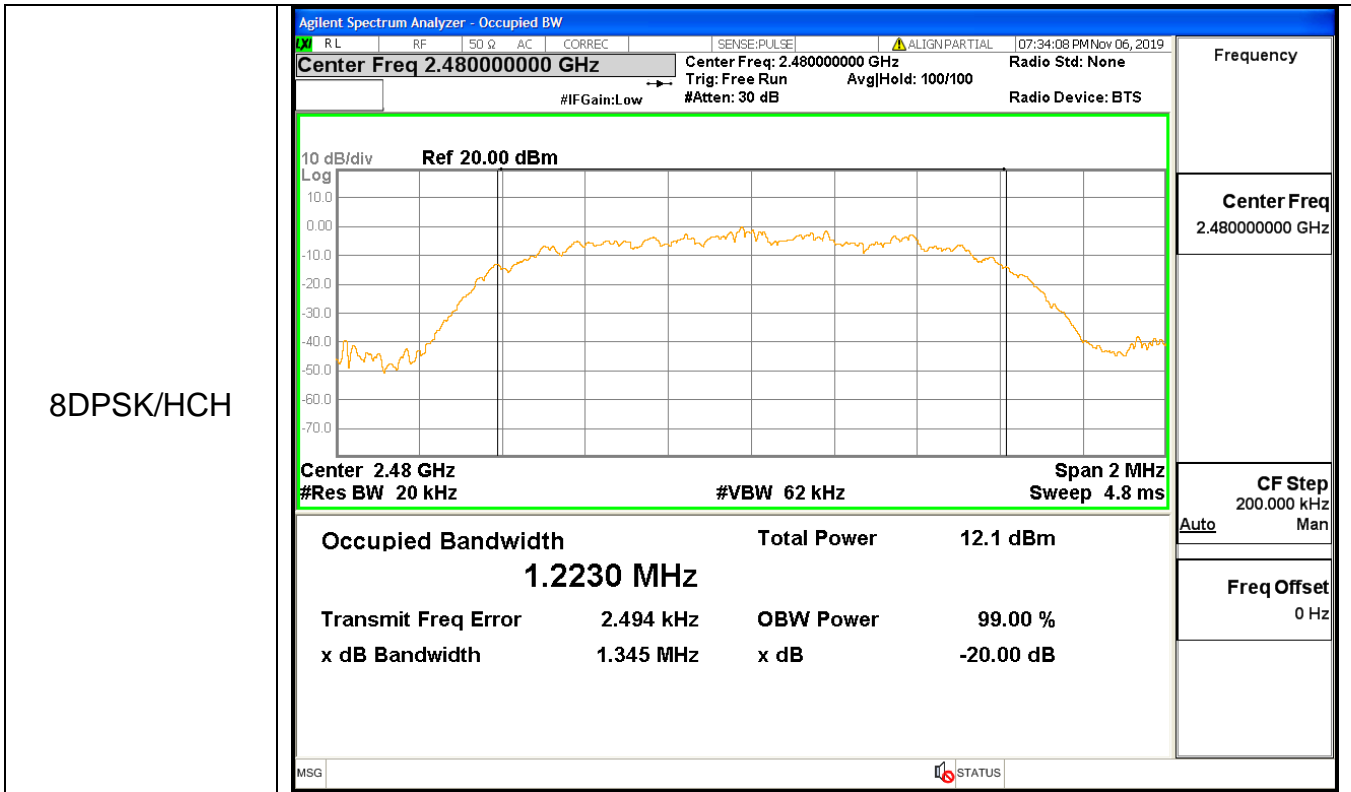
Graphs







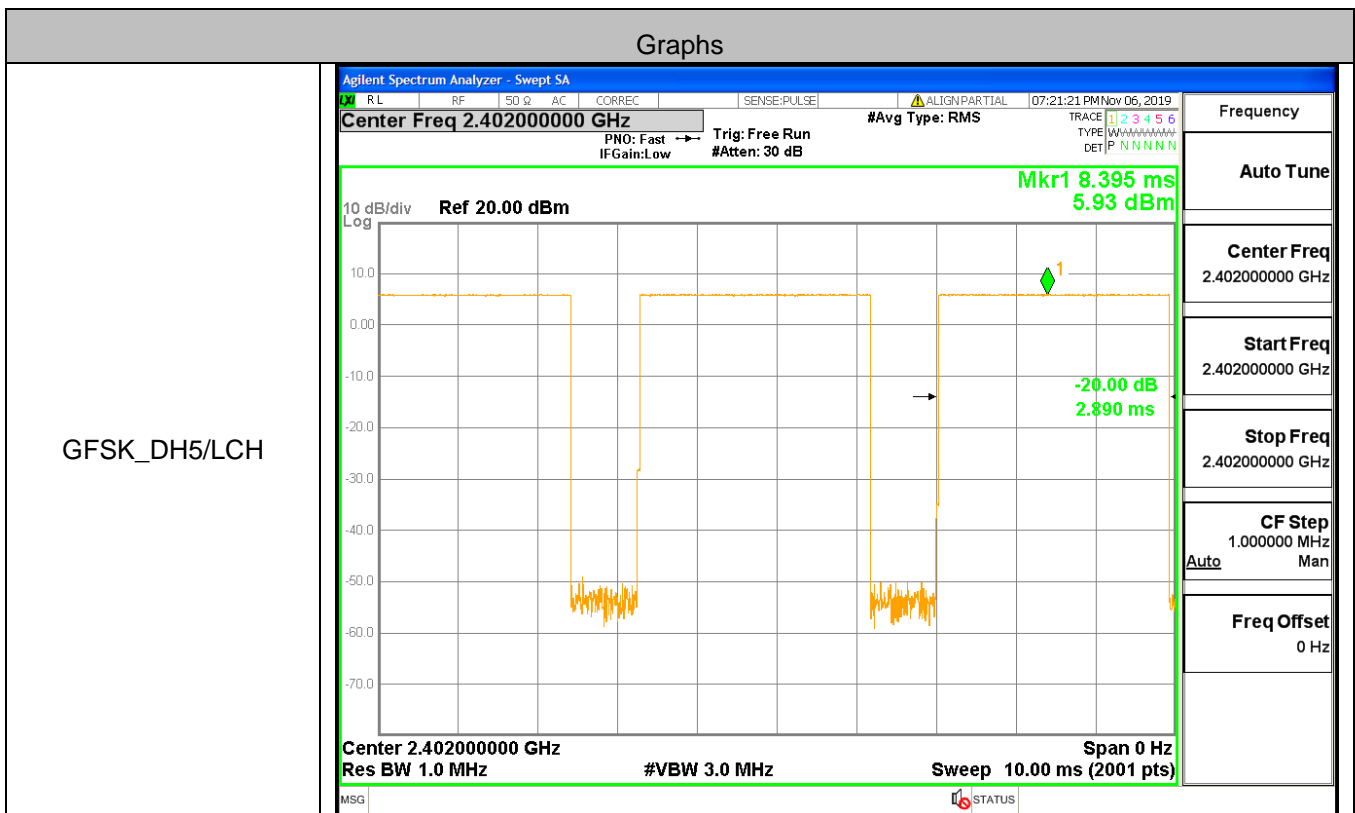


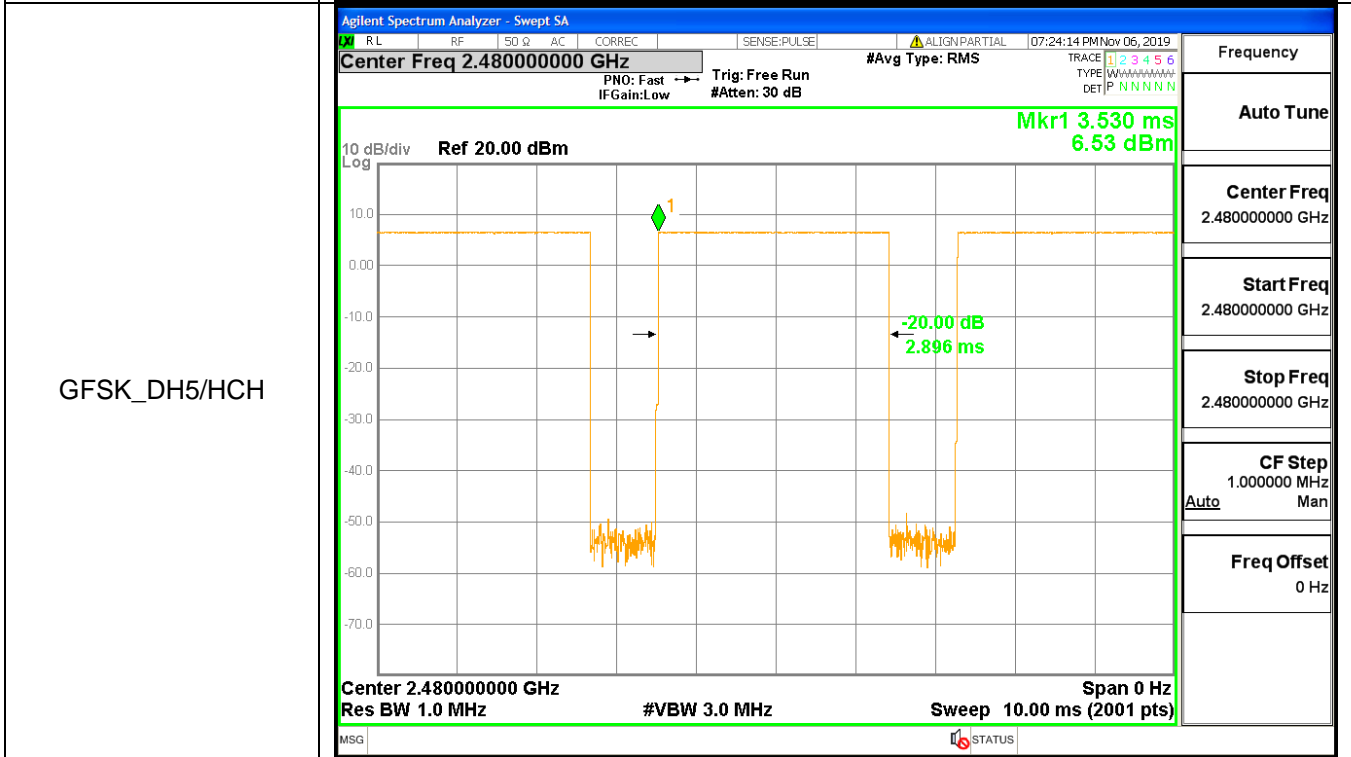
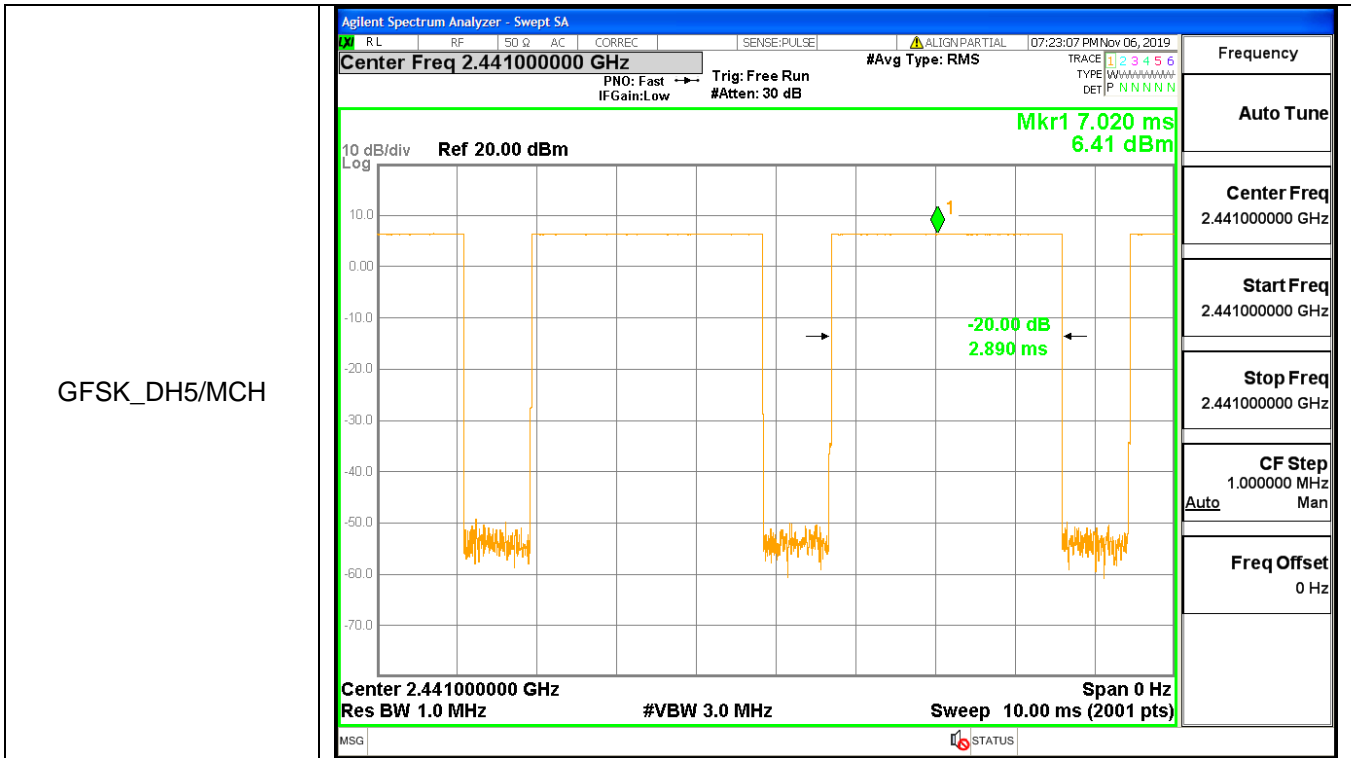


### A.2 Dwell Time

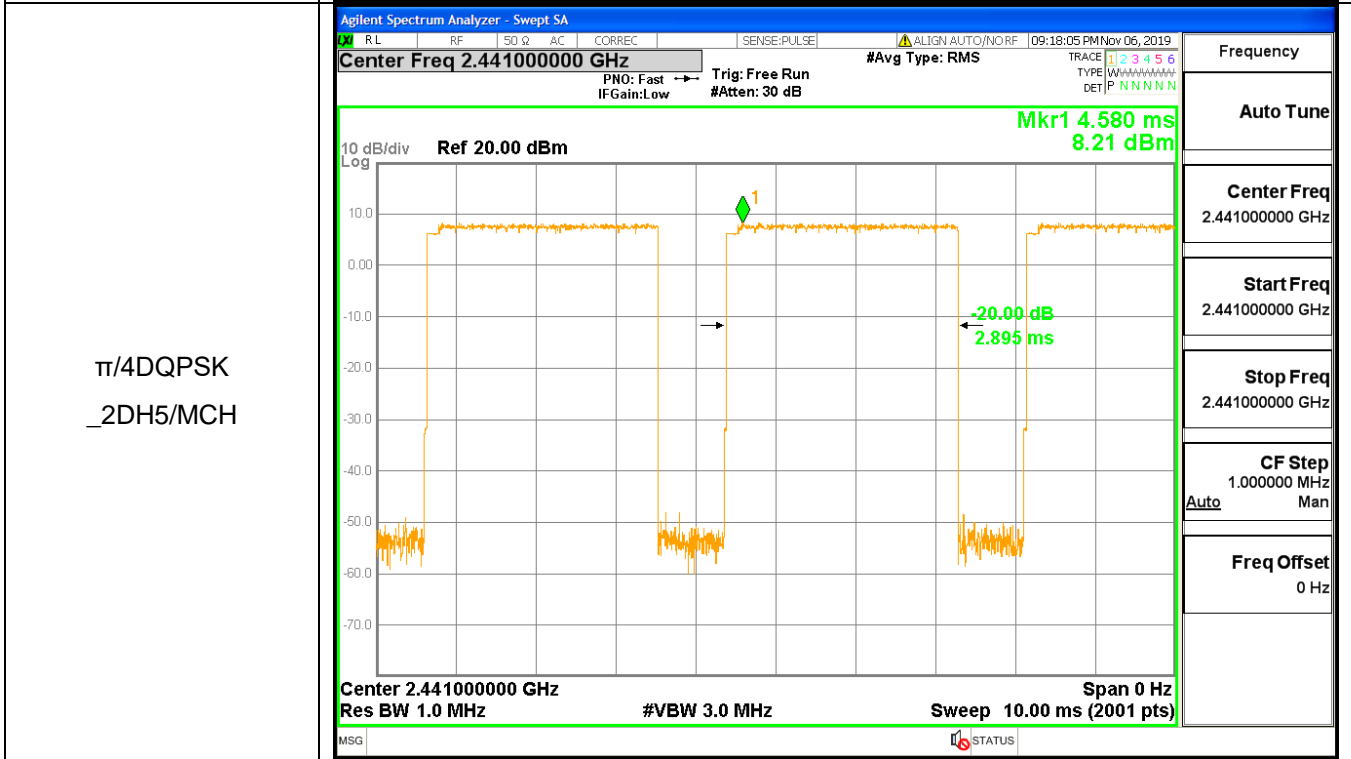
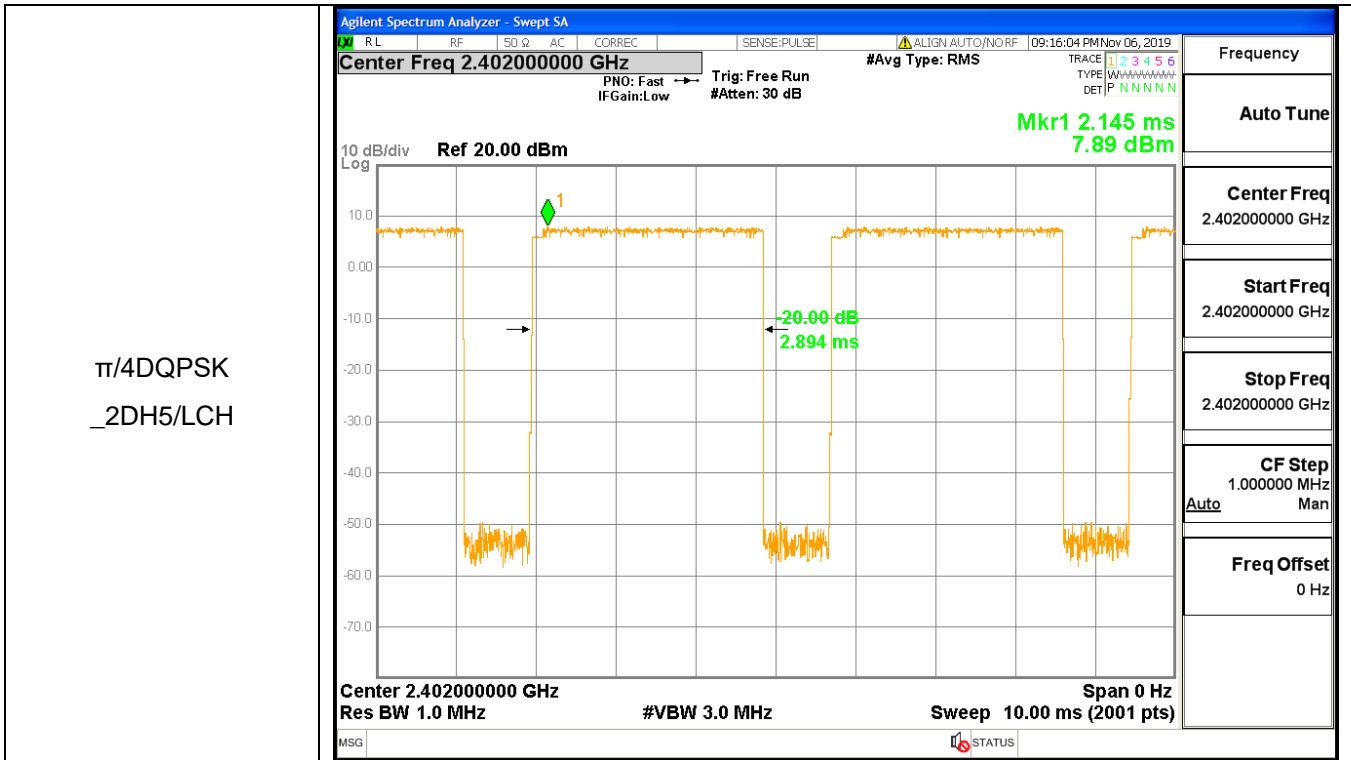
Mode	Packet	Channel	Burst Width [s/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	0.002890	106.7	0.308329	0.4	PASS
GFSK	DH5	MCH	0.002890	106.7	0.308333	0.4	PASS
GFSK	DH5	HCH	0.002896	106.7	0.308955	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	0.002894	106.7	0.308817	0.4	PASS
$\pi/4$ DQPSK	2DH5	MCH	0.002895	106.7	0.308868	0.4	PASS
$\pi/4$ DQPSK	2DH5	HCH	0.002895	106.7	0.308845	0.4	PASS
8DPSK	3DH5	LCH	0.002900	106.7	0.309470	0.4	PASS
8DPSK	3DH5	MCH	0.002899	106.7	0.309334	0.4	PASS
8DPSK	3DH5	HCH	0.002895	106.7	0.308931	0.4	PASS

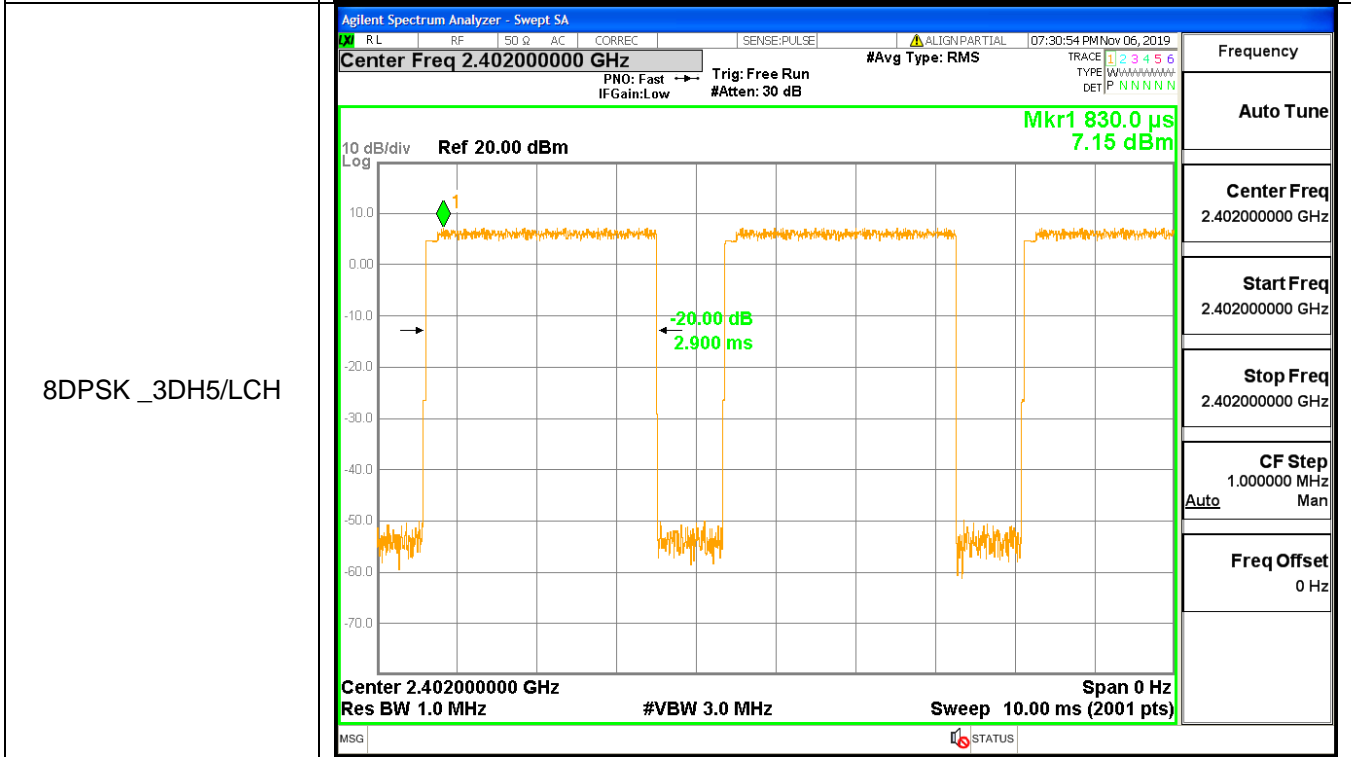
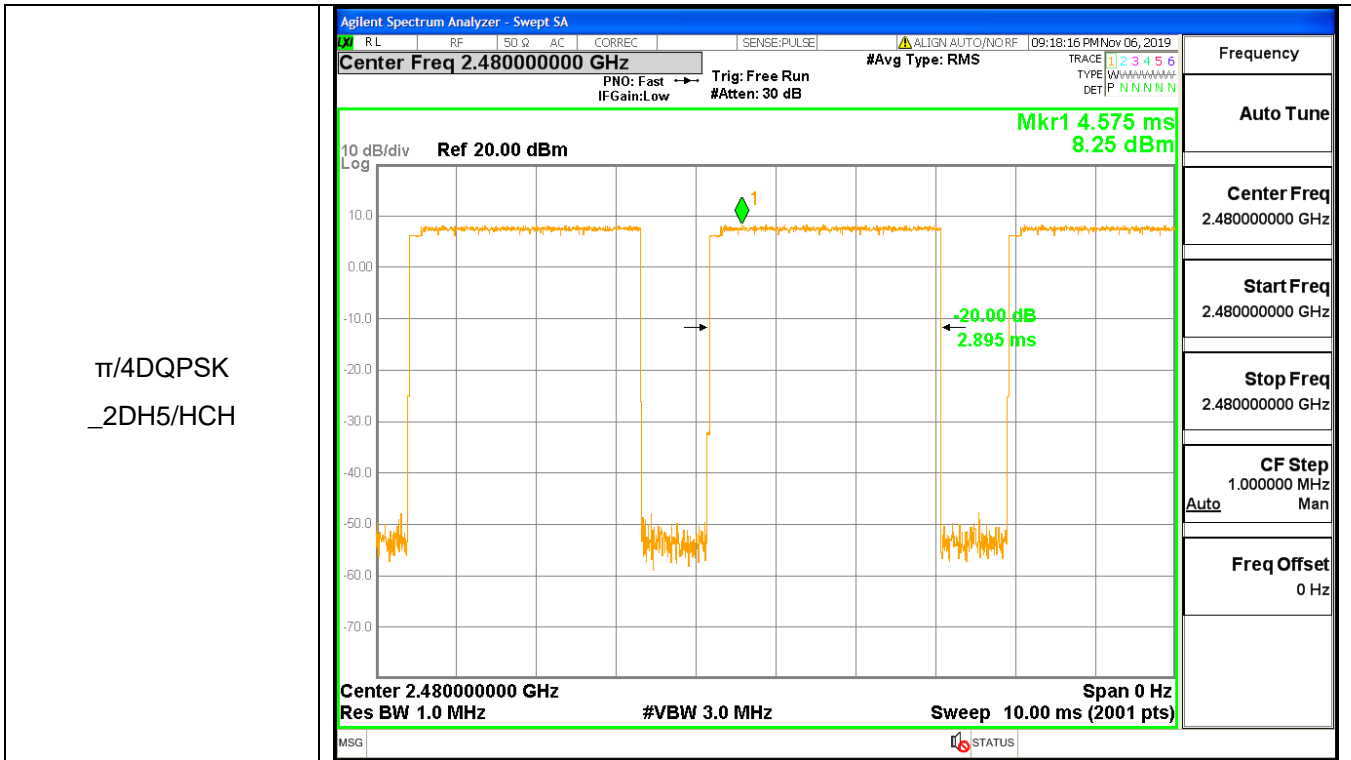
### Test Graph

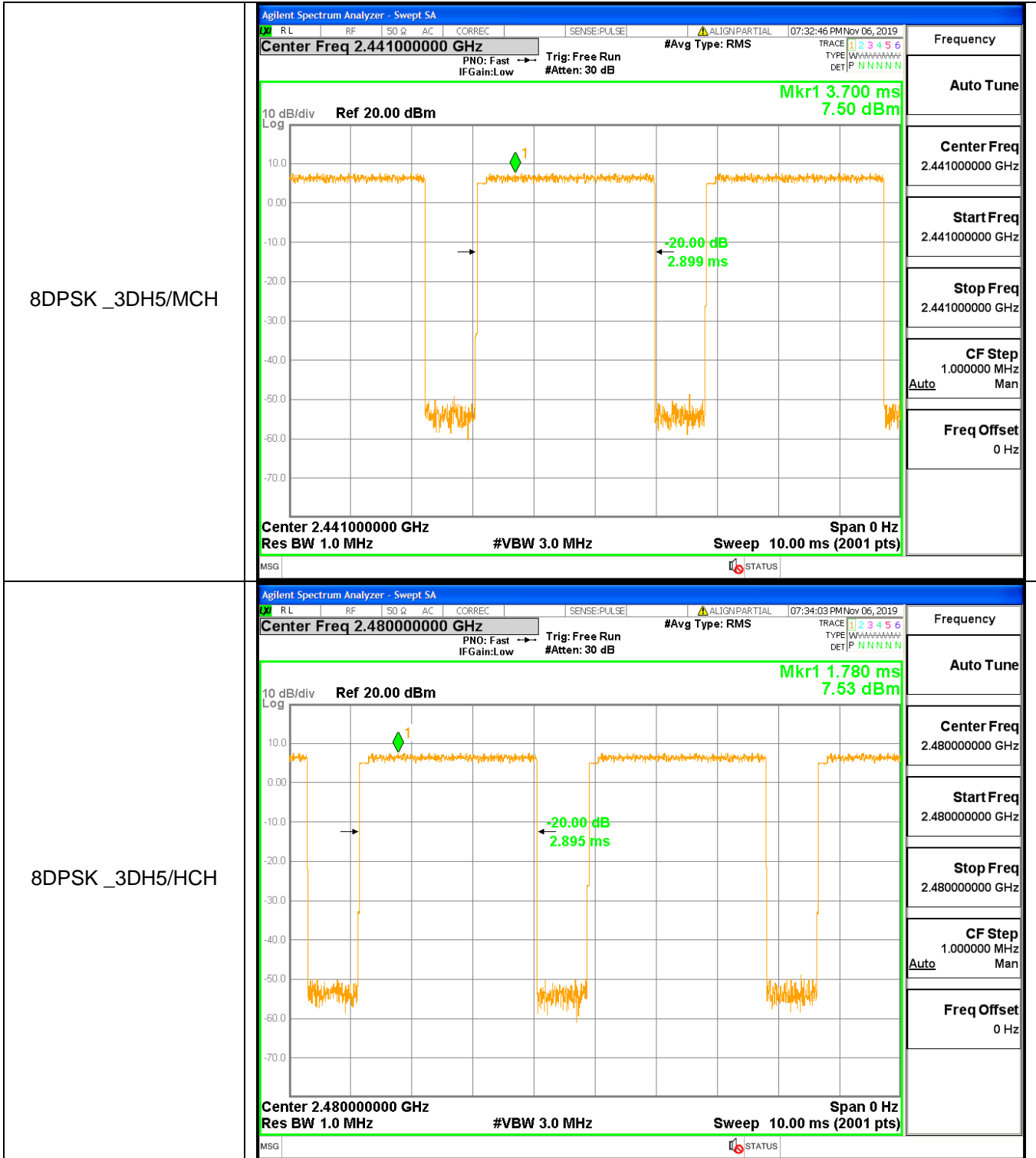








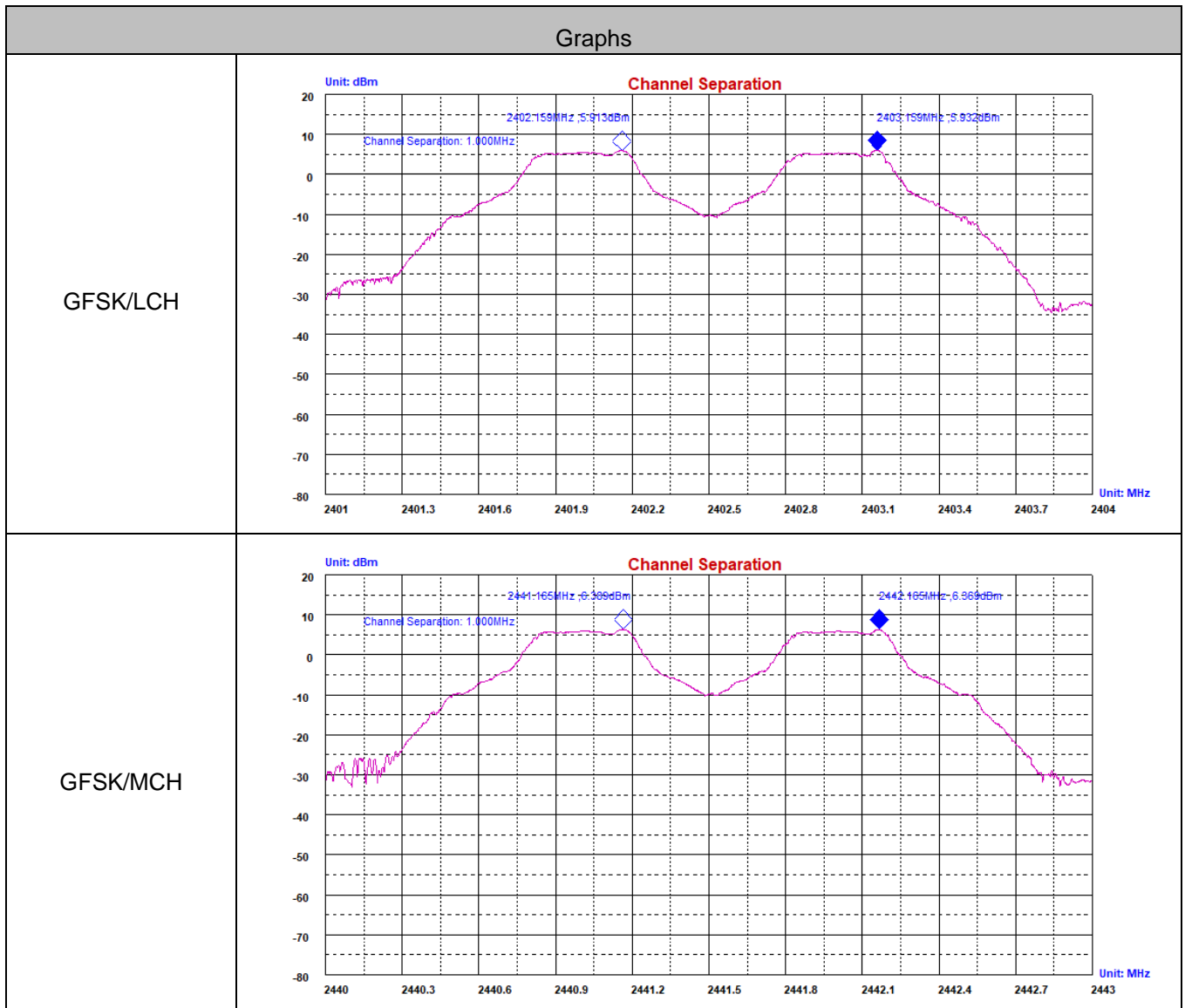


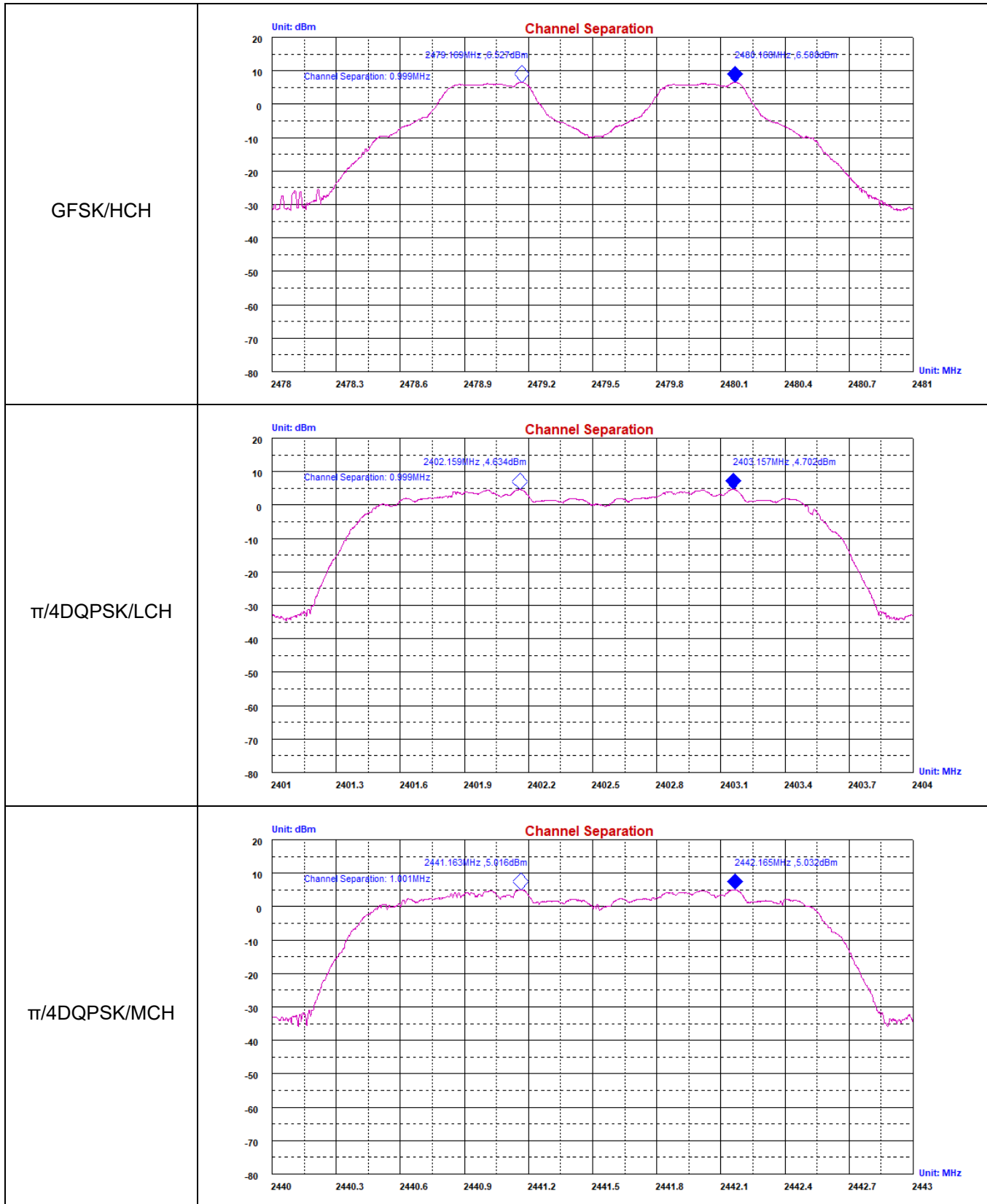


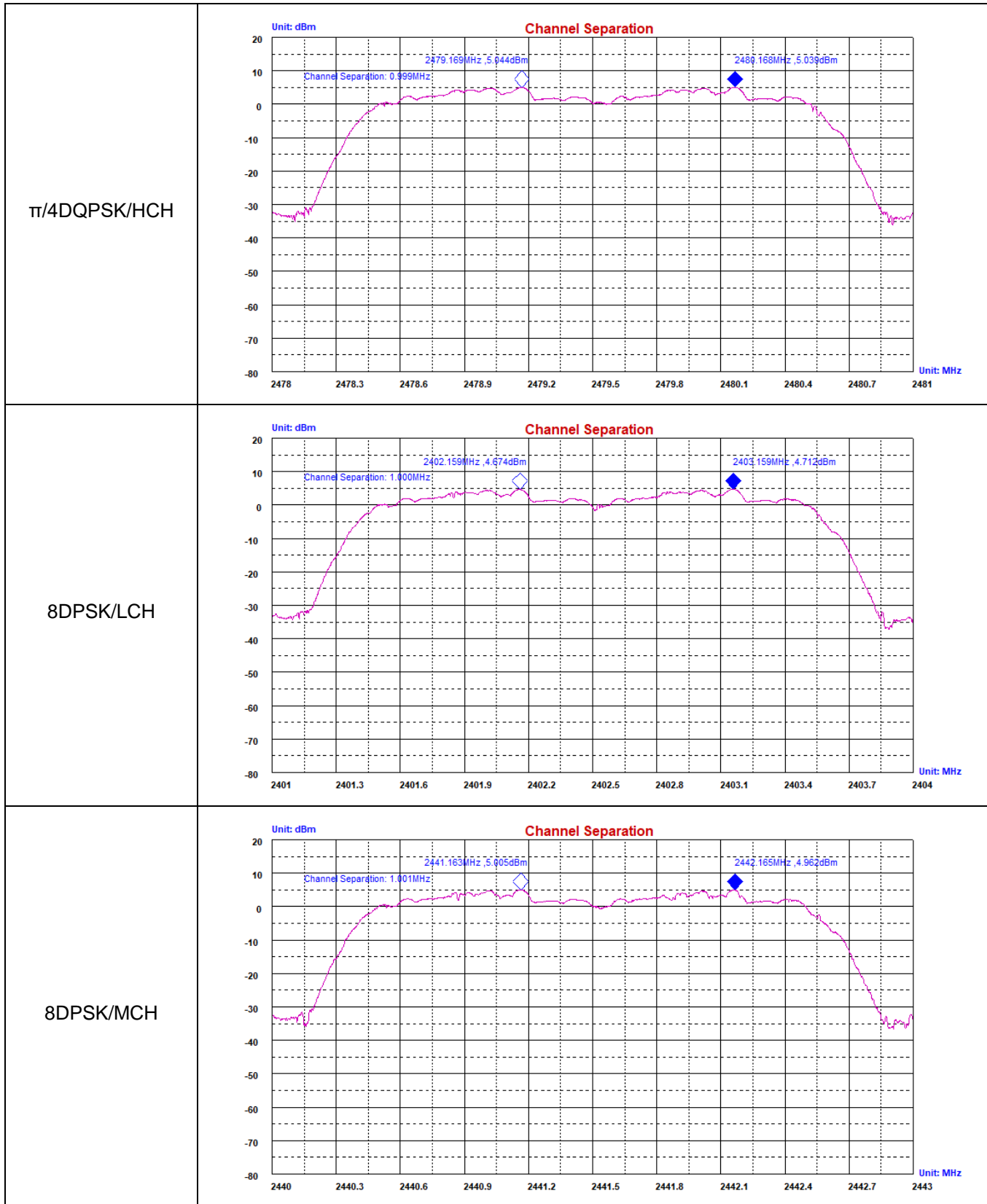
### A.3 Carrier Frequency Separation

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.000	0.623	PASS
GFSK	MCH	1.000	0.606	PASS
GFSK	HCH	0.999	0.621	PASS
$\pi/4$ DQPSK	LCH	0.999	0.874	PASS
$\pi/4$ DQPSK	MCH	1.001	0.867	PASS
$\pi/4$ DQPSK	HCH	0.999	0.863	PASS
8DPSK	LCH	1.000	0.872	PASS
8DPSK	MCH	1.001	0.891	PASS
8DPSK	HCH	1.000	0.897	PASS

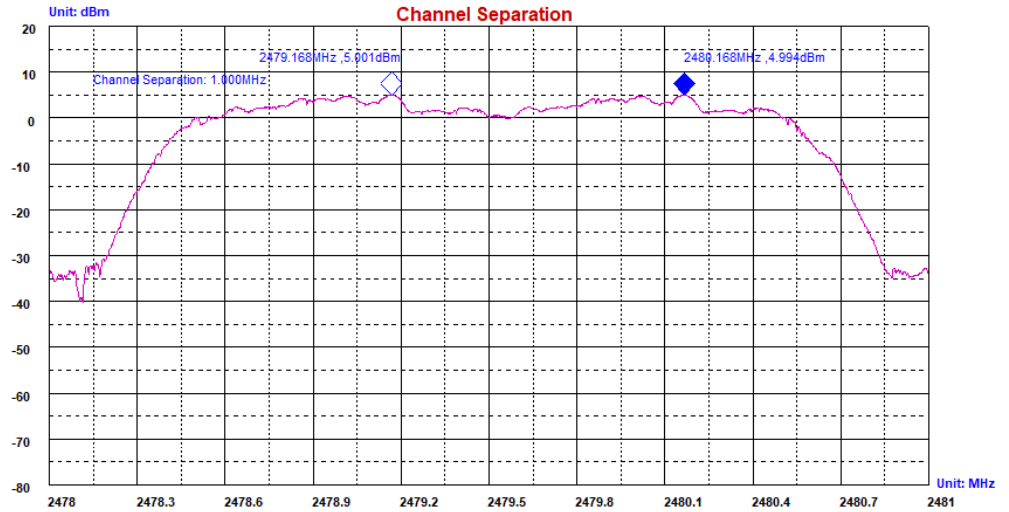
### Test Graph







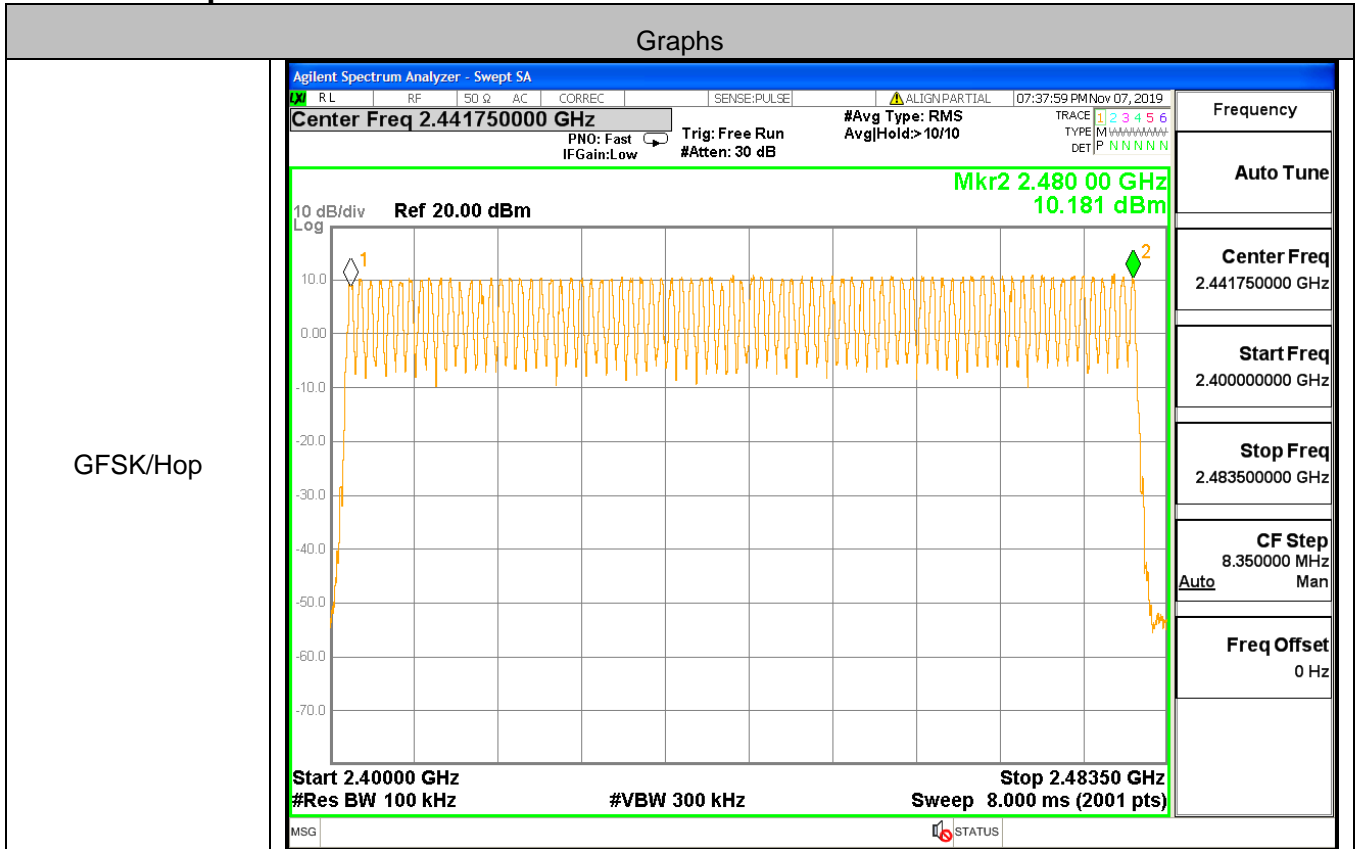
8DPSK/HCH



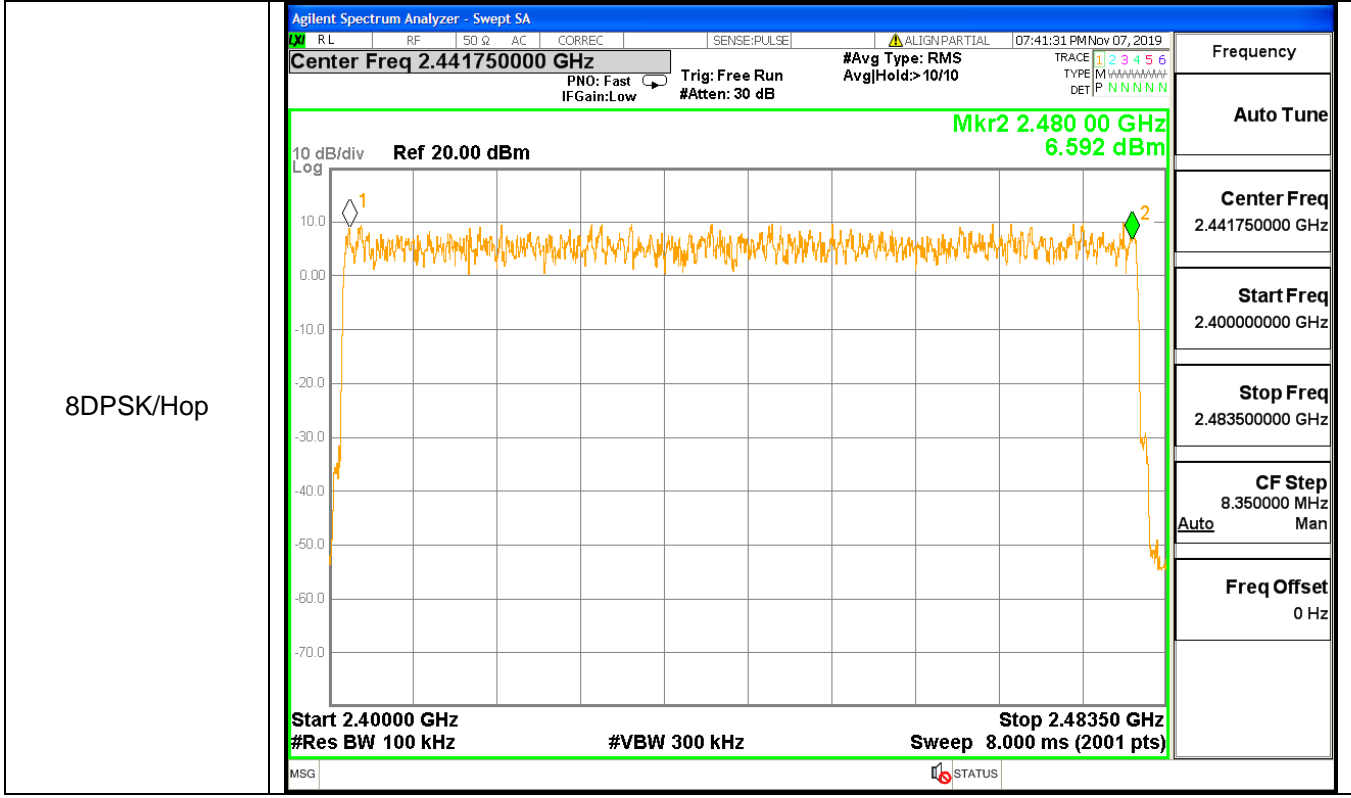
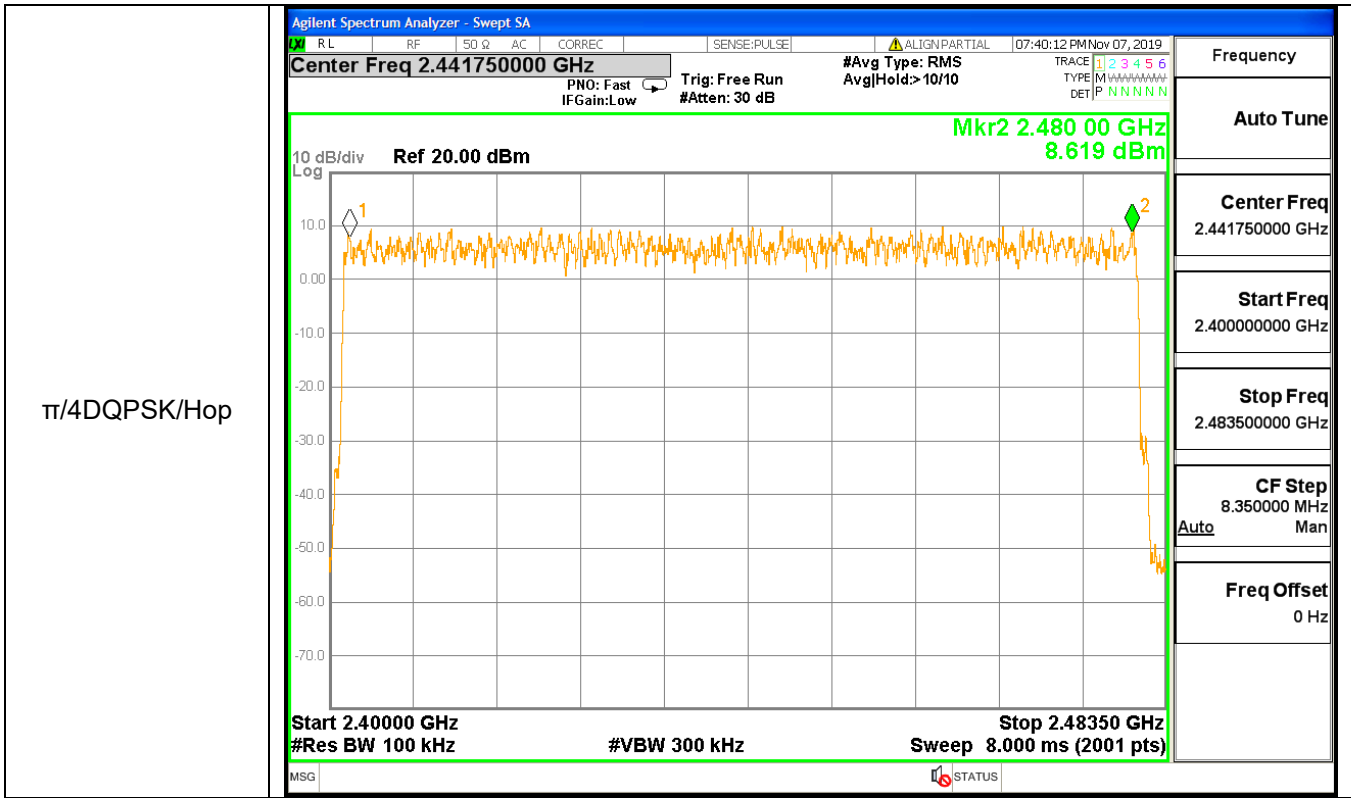
### A.4 Hopping Channel Number

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

### Test Graph



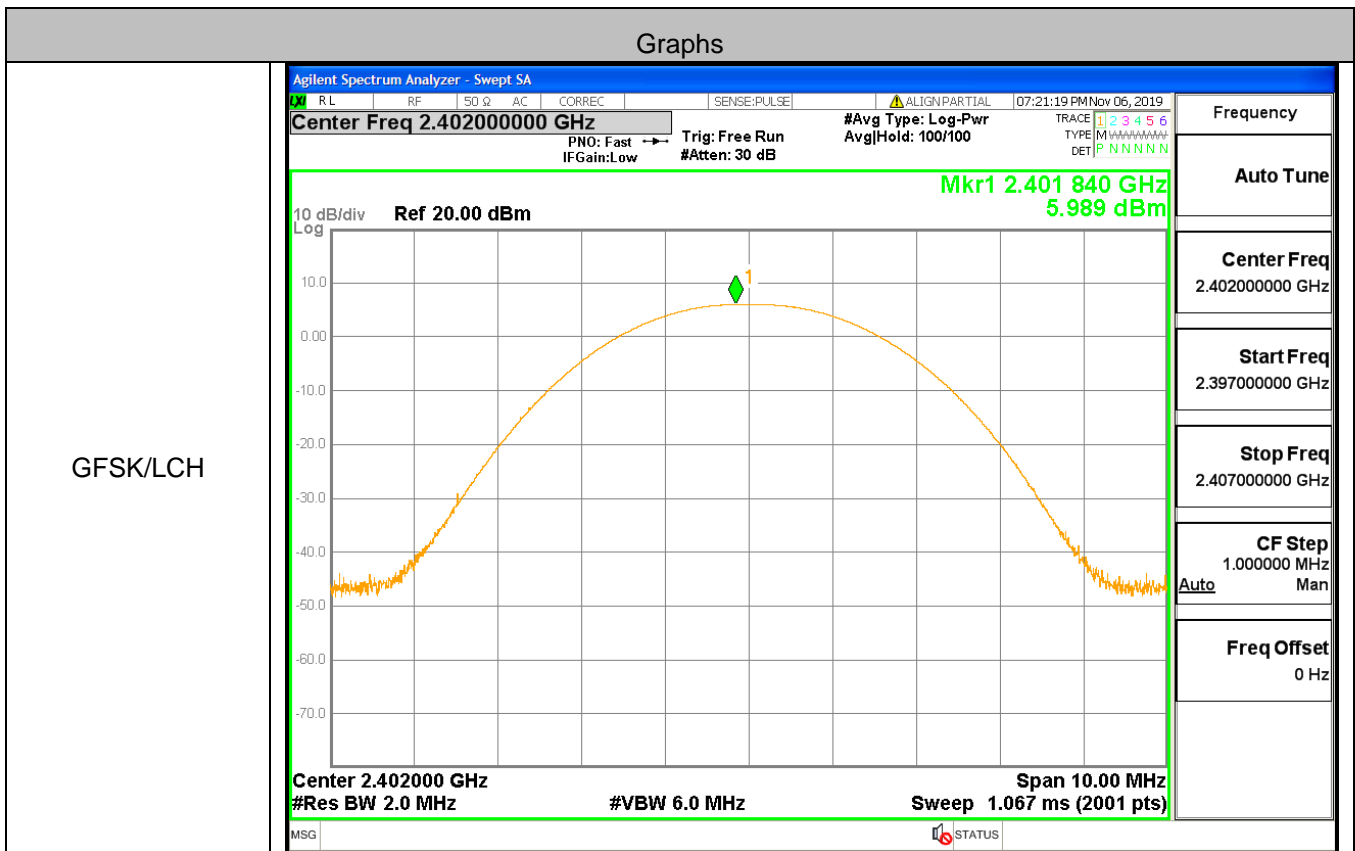


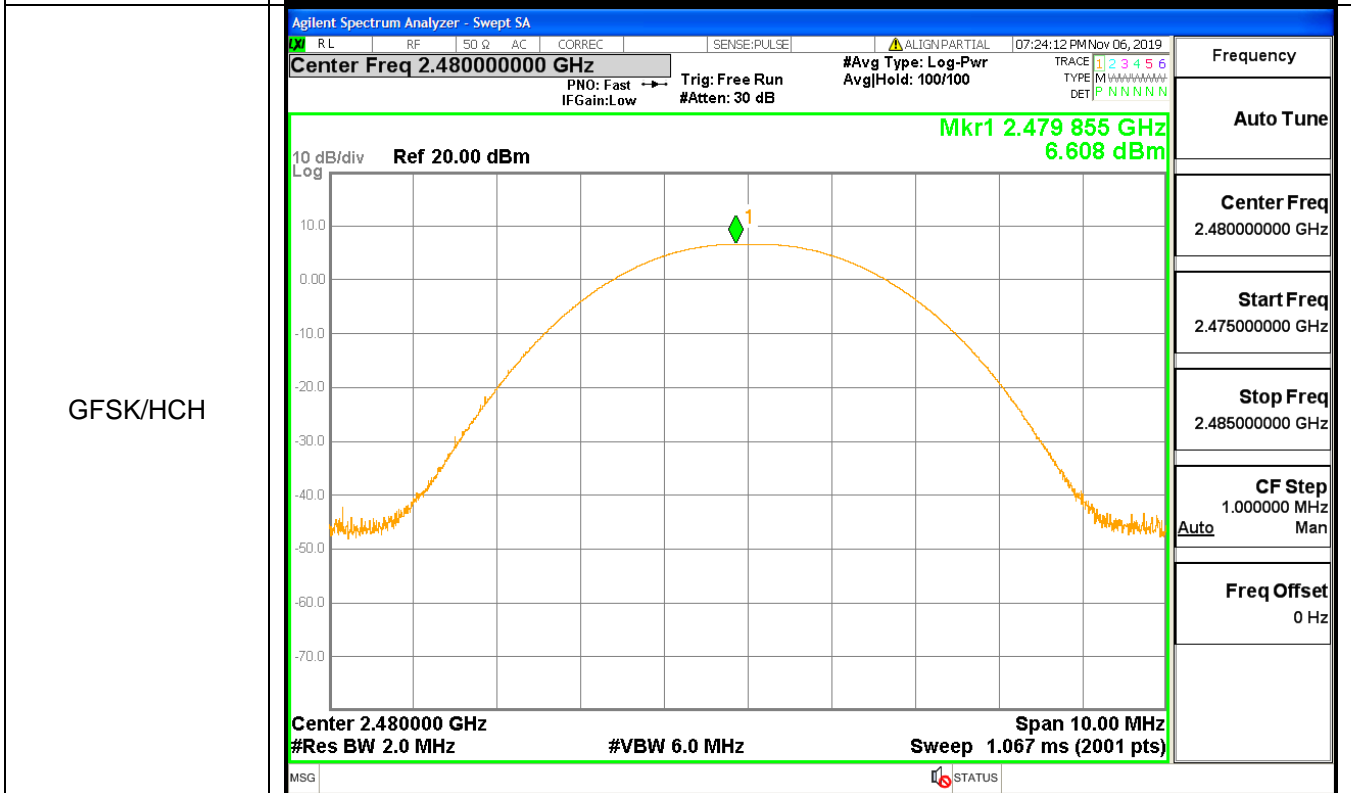
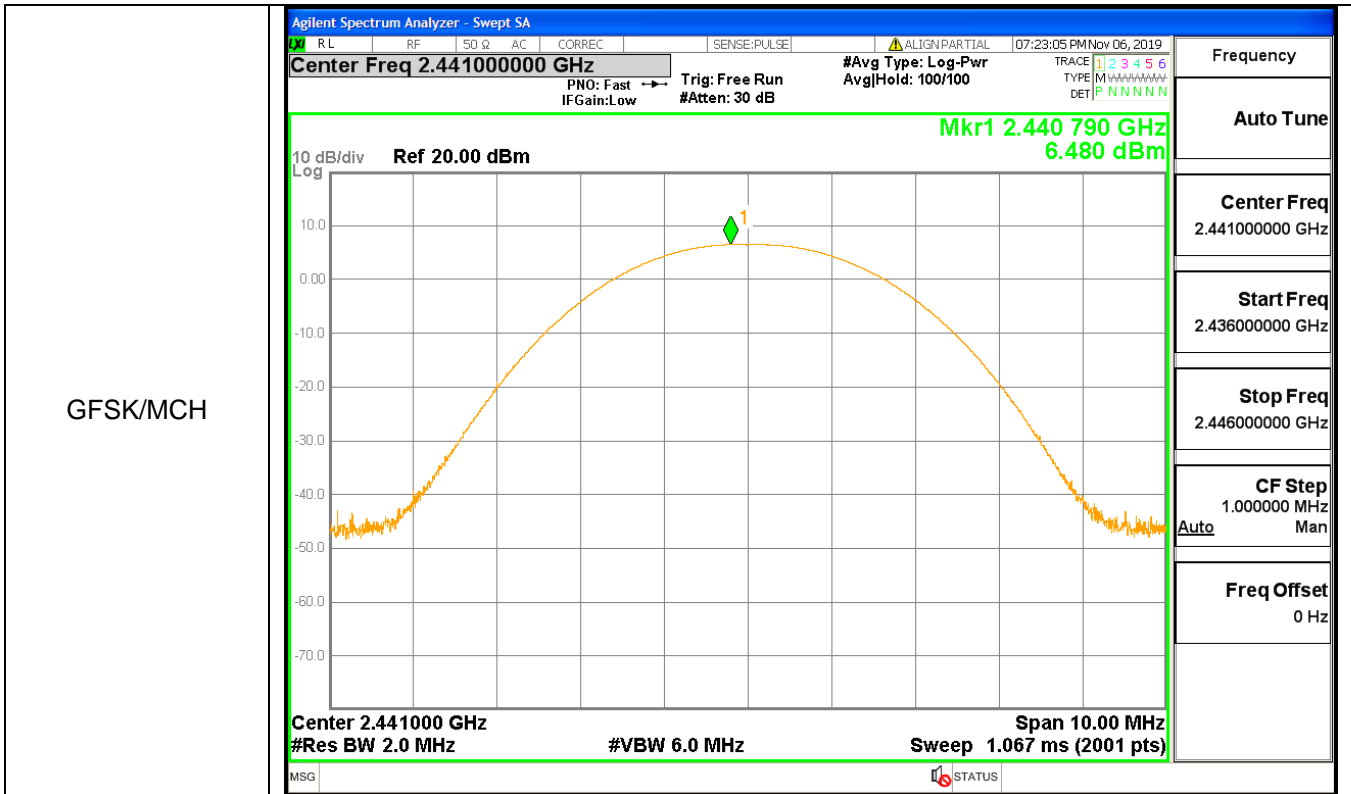


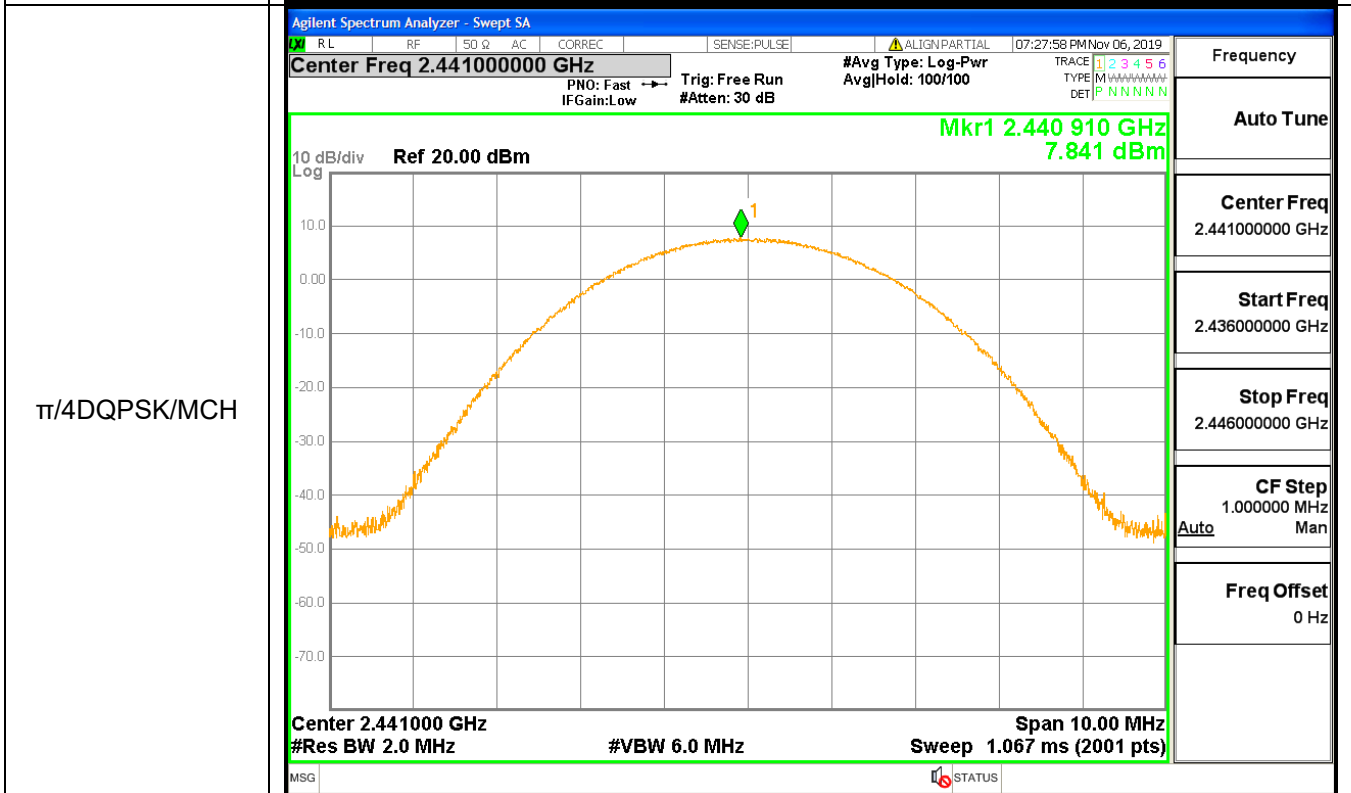
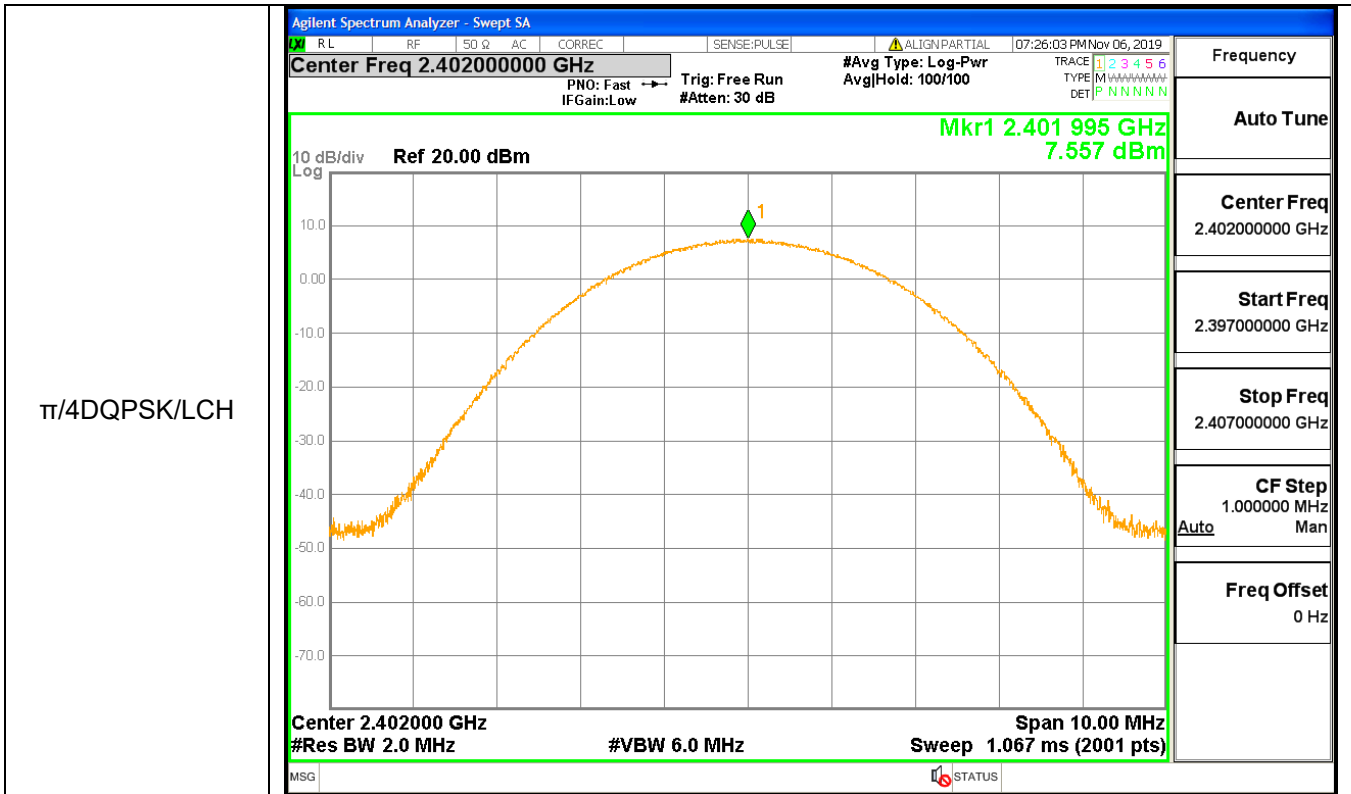
### A.5 Conducted Peak Output Power

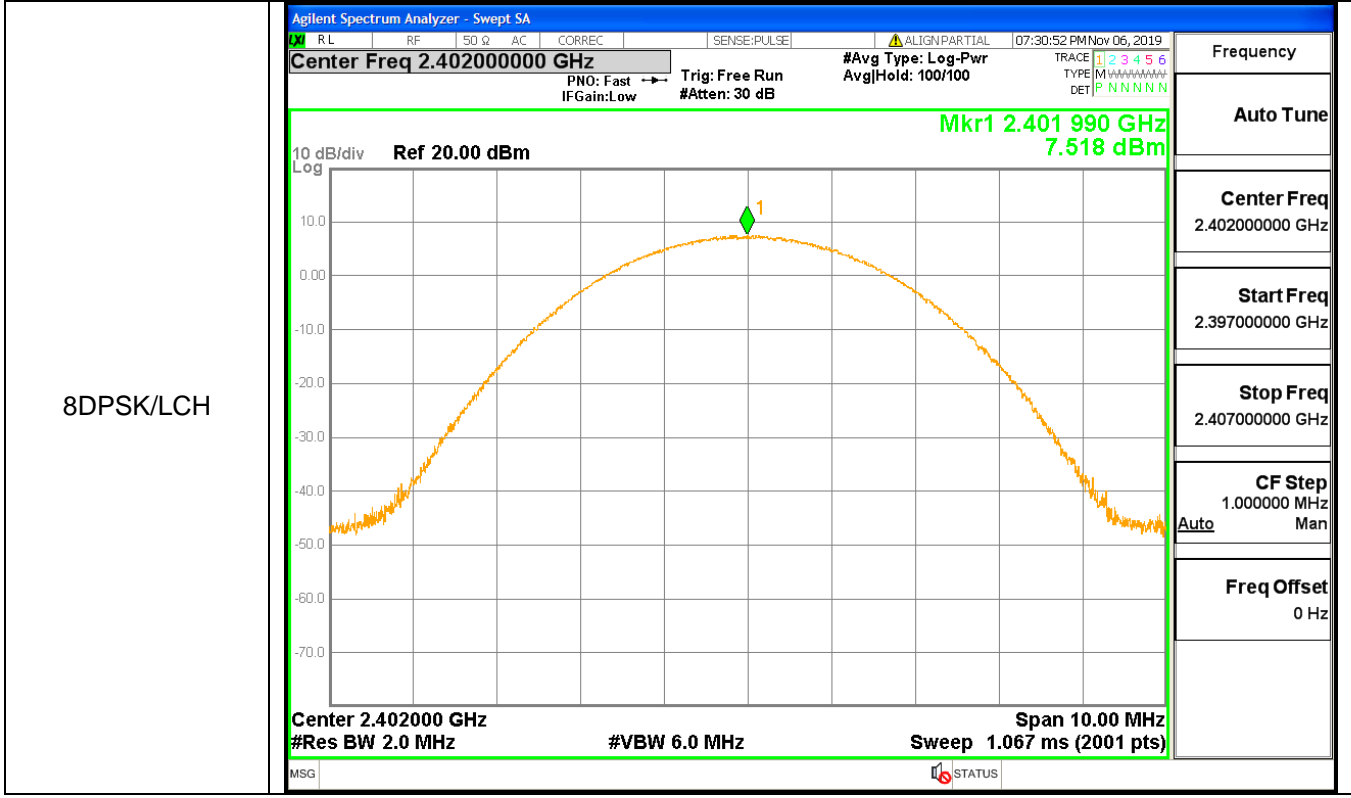
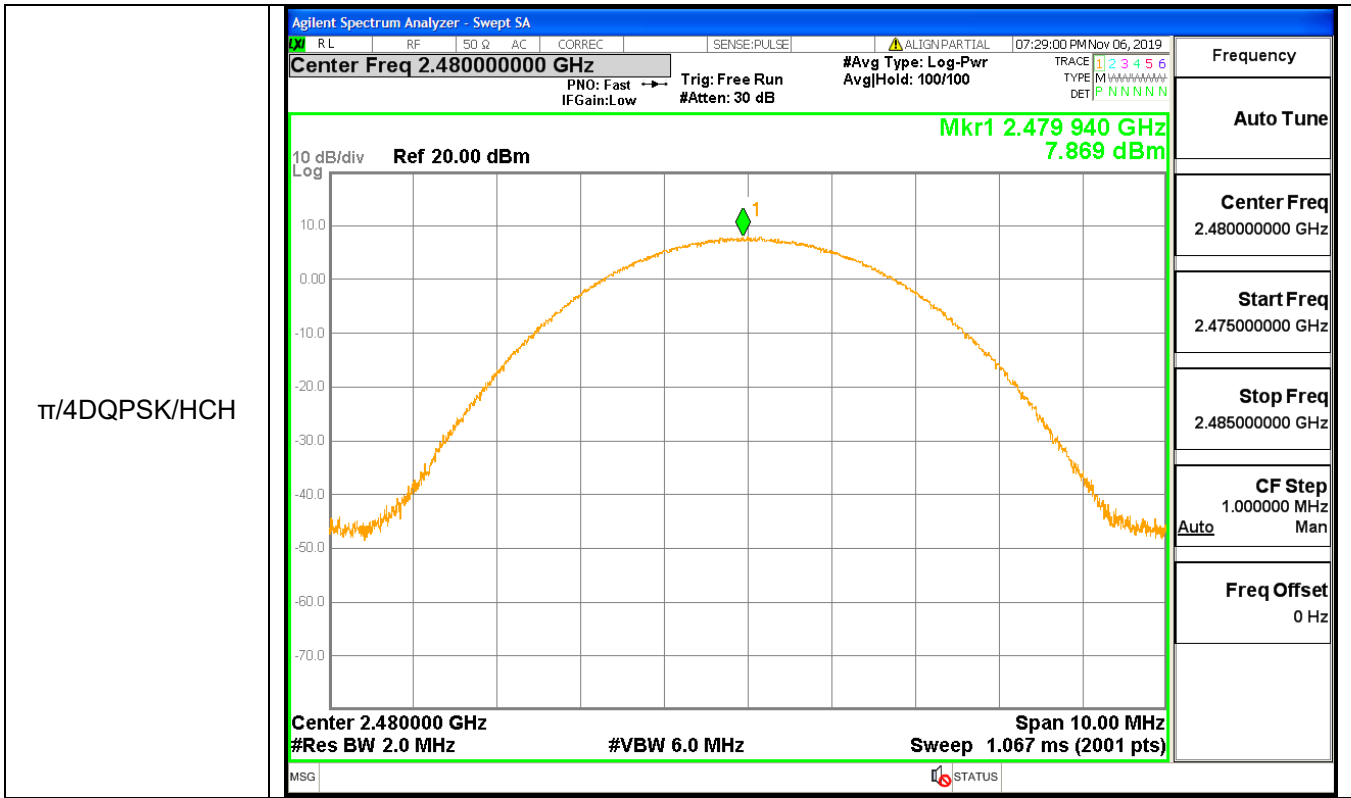
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	5.989	21	PASS
GFSK	MCH	6.480	21	PASS
GFSK	HCH	6.608	21	PASS
$\pi/4$ DQPSK	LCH	7.557	21	PASS
$\pi/4$ DQPSK	MCH	7.841	21	PASS
$\pi/4$ DQPSK	HCH	7.869	21	PASS
8DPSK	LCH	7.518	21	PASS
8DPSK	MCH	7.876	21	PASS
8DPSK	HCH	7.845	21	PASS

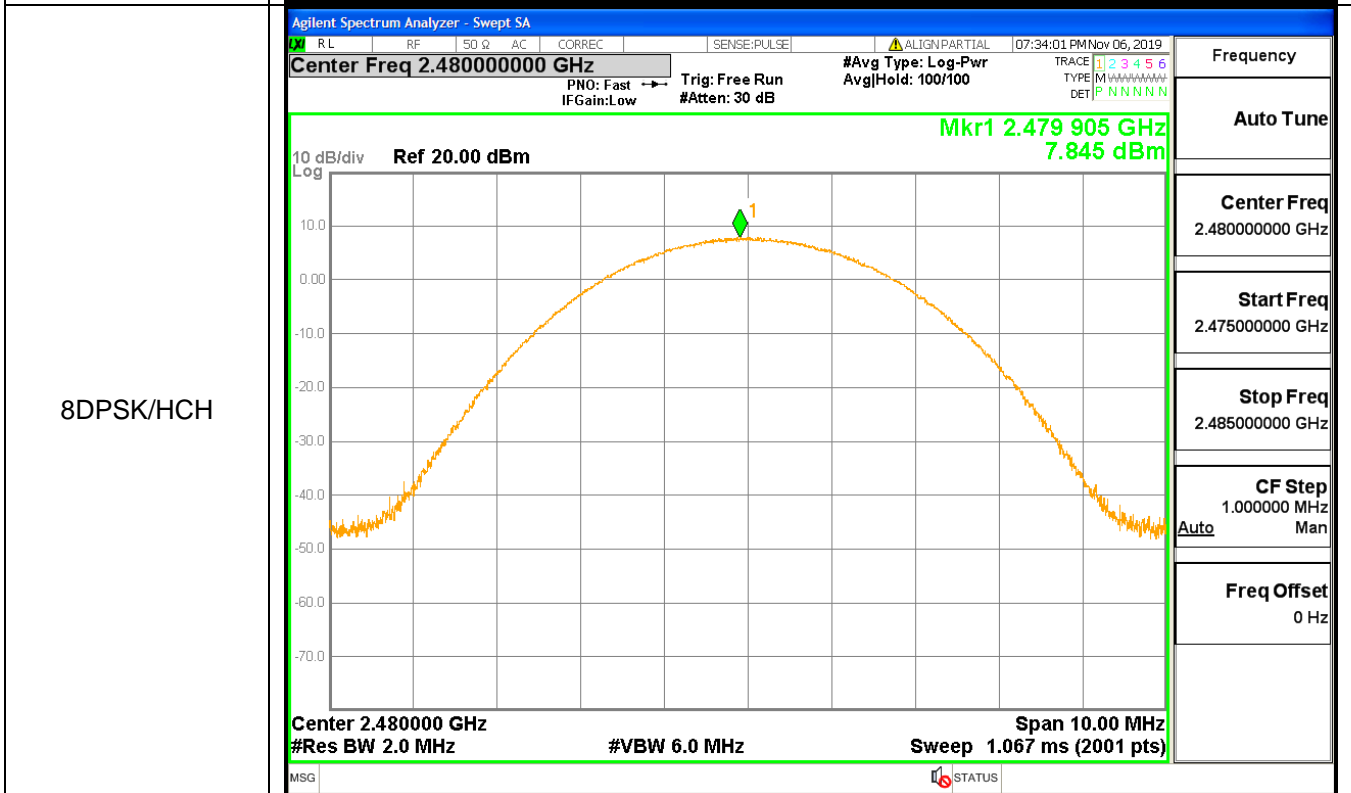
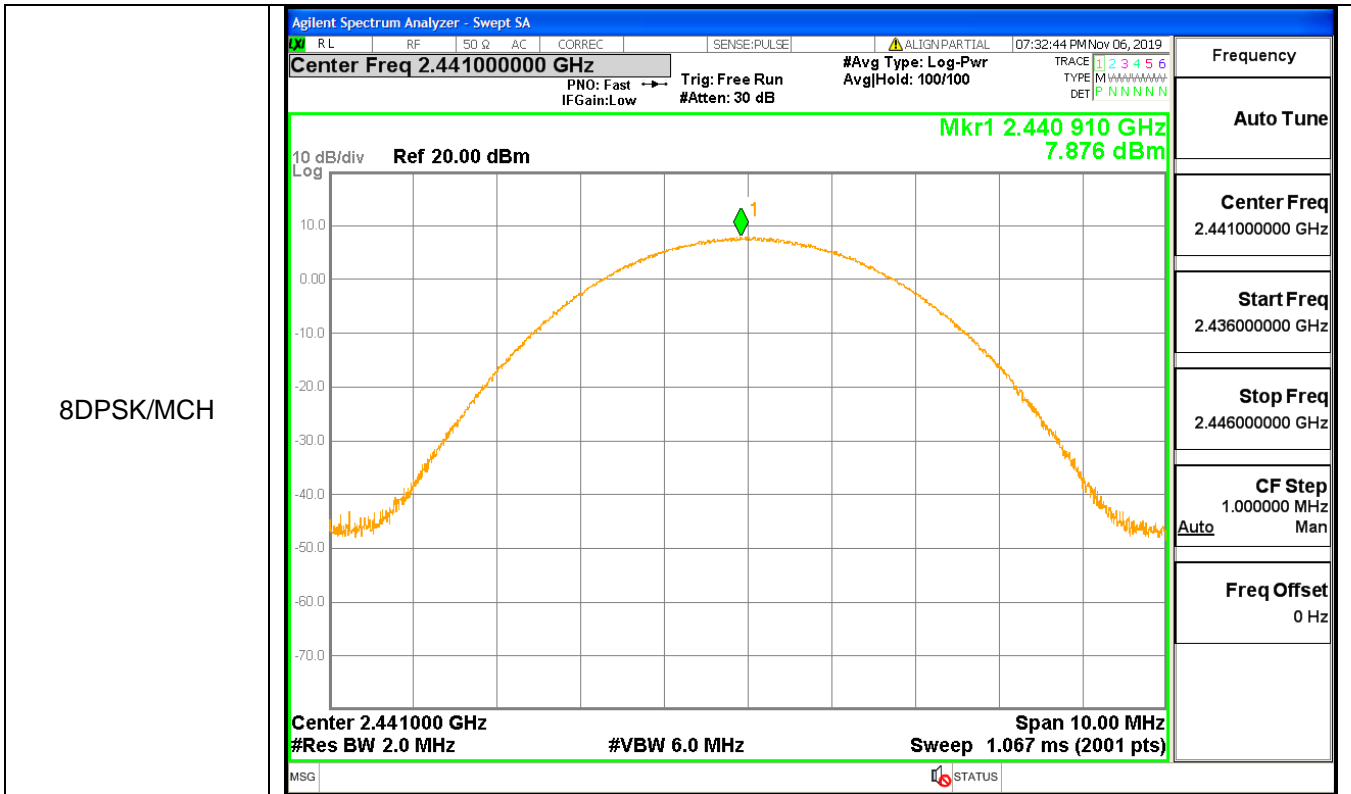
### Test Graph









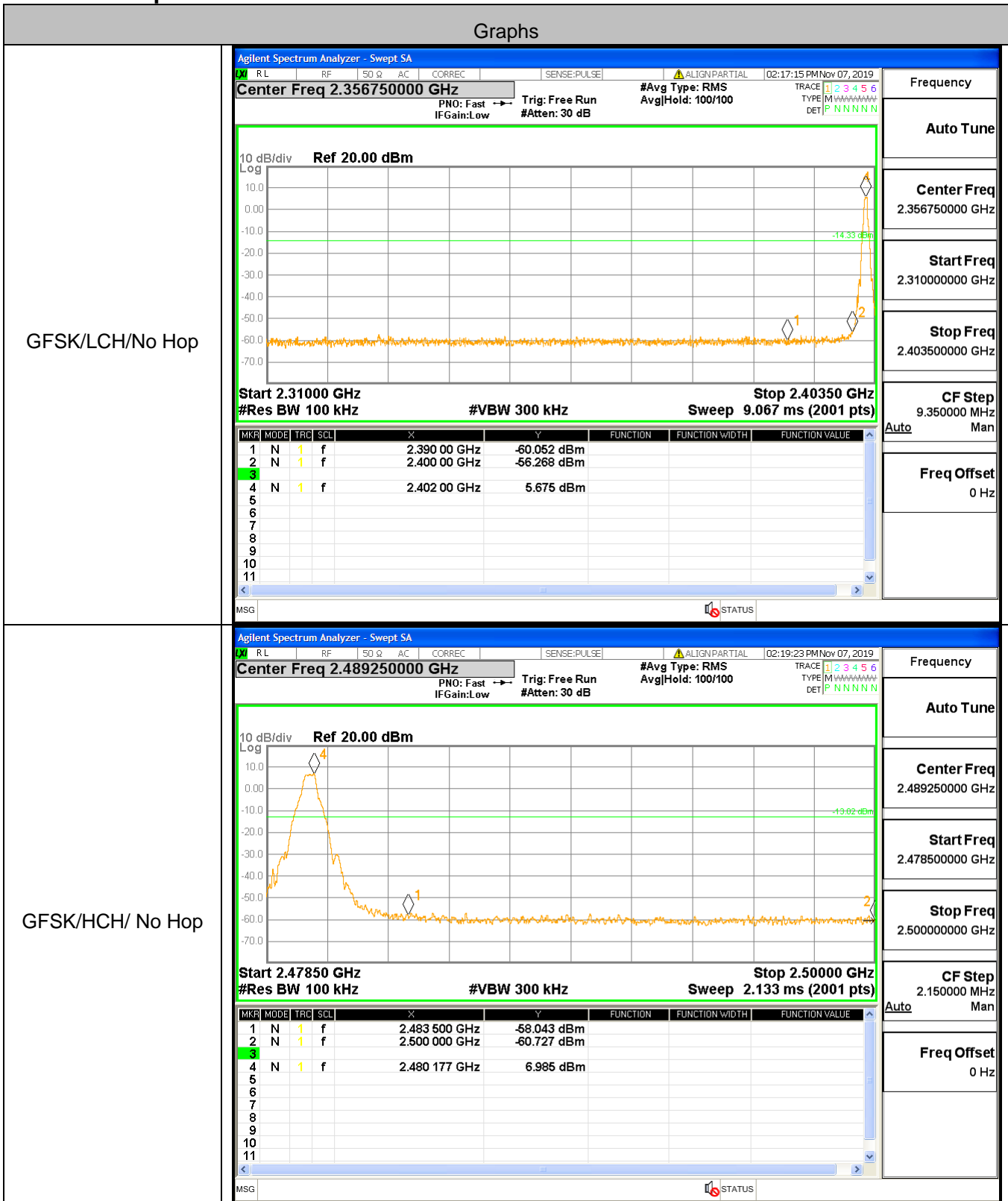


**A.6 Band-edge for RF Conducted Emissions**

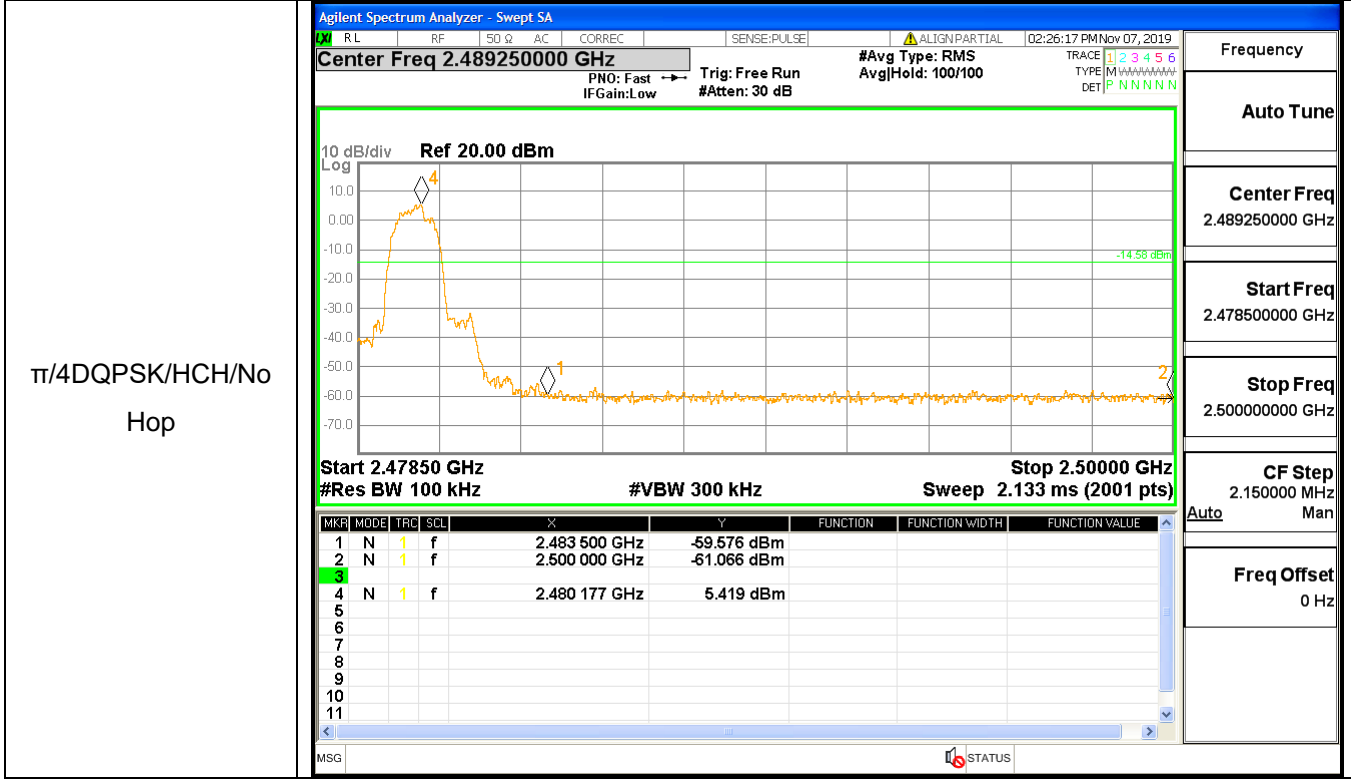
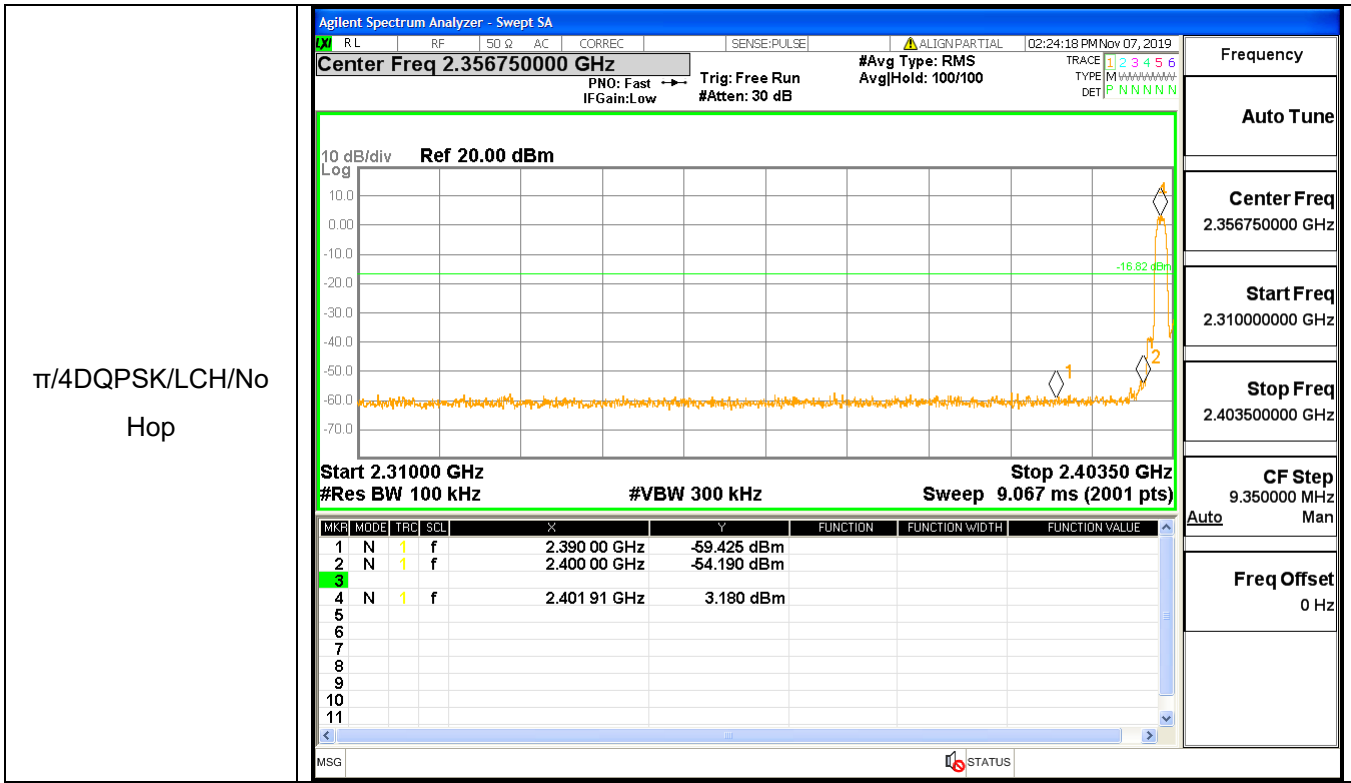
Type	Carrier Frequency(MHz)	Frequency(MHz)	Carrier Frequency Power [dBm]	Bandedge Peak(dBm)	Upper limit(dBm)	Conclusion
1DH5	2402	2400	5.675	-56.27	-14.325	Pass
1DH5	2480	2483.5	6.985	-58.04	-13.015	Pass
2DH5	2402	2400	3.18	-54.19	-16.820	Pass
2DH5	2480	2483.5	5.419	-59.58	-14.581	Pass
3DH5	2402	2400	4.236	-55.76	-15.764	Pass
3DH5	2480	2500	3.710	-60.05	-16.29	Pass
1DH5-Hopping	2402	2400	10.751	-51.20	-9.249	Pass
1DH5-Hopping	2480	2499.82	11.084	-48.858	-8.916	Pass
2DH5-Hopping	2402	2400	9.640	-51.87	-10.36	Pass
2DH5-Hopping	2480	2483.5	9.721	-54.13	-10.279	Pass
3DH5-Hopping	2402	2400	9.004	-52.36	-10.996	Pass
3DH5-Hopping	2480	2489.77	9.521	-49.115	-10.479	Pass

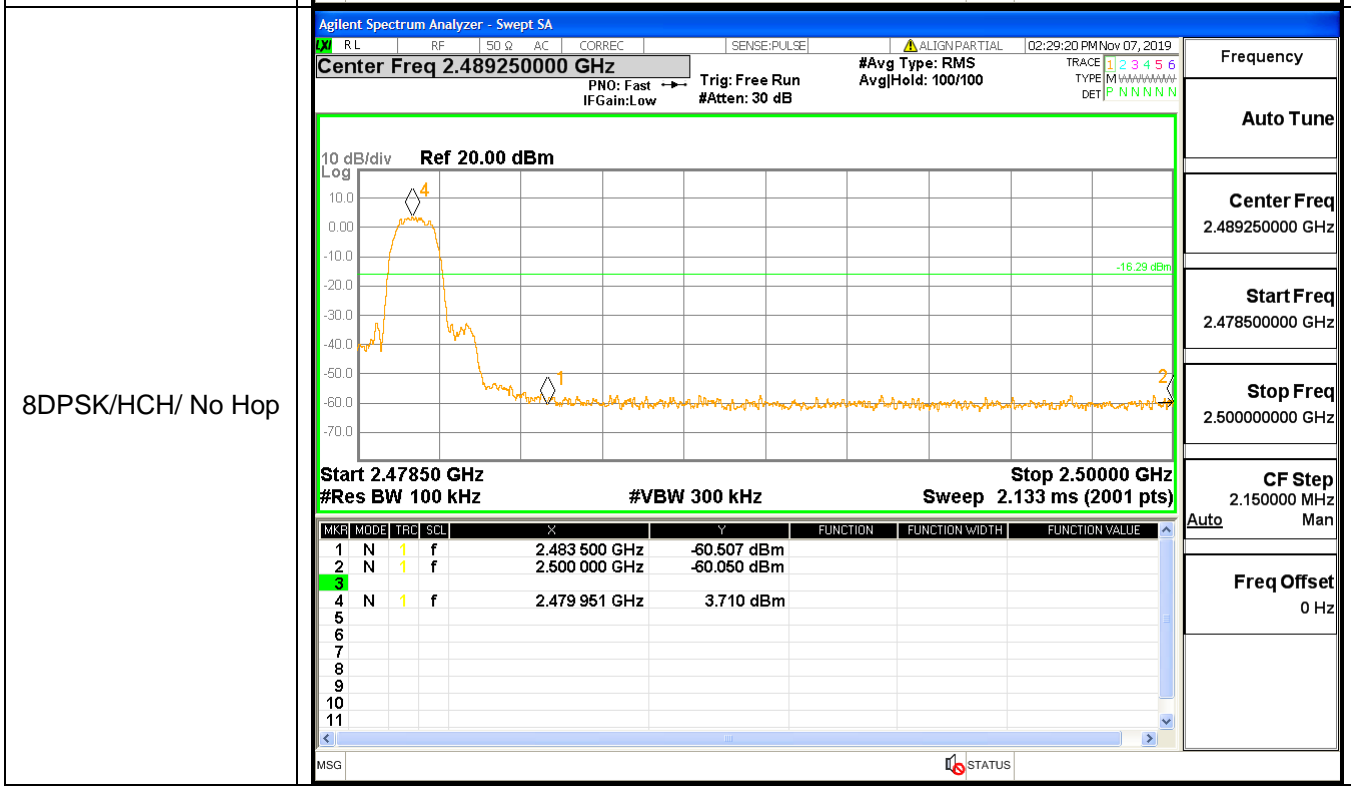
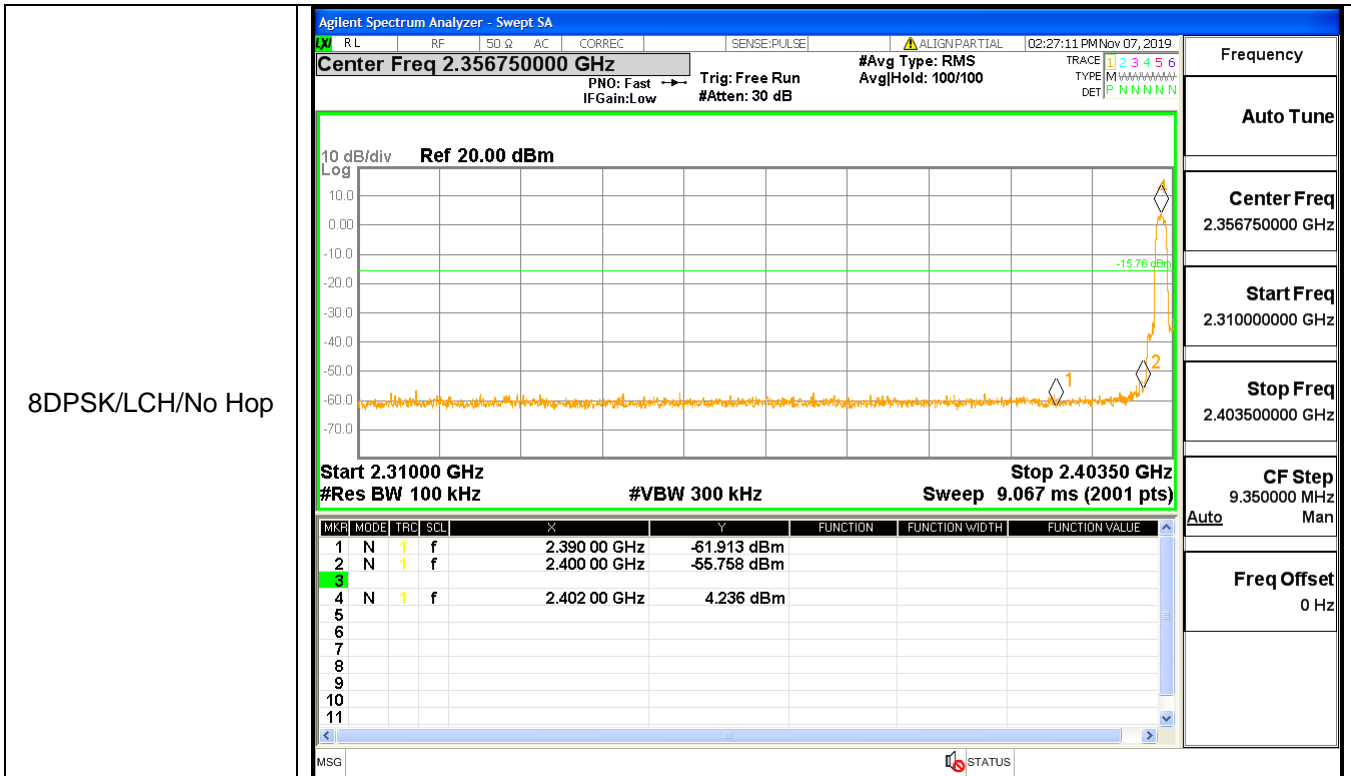
Test Graph

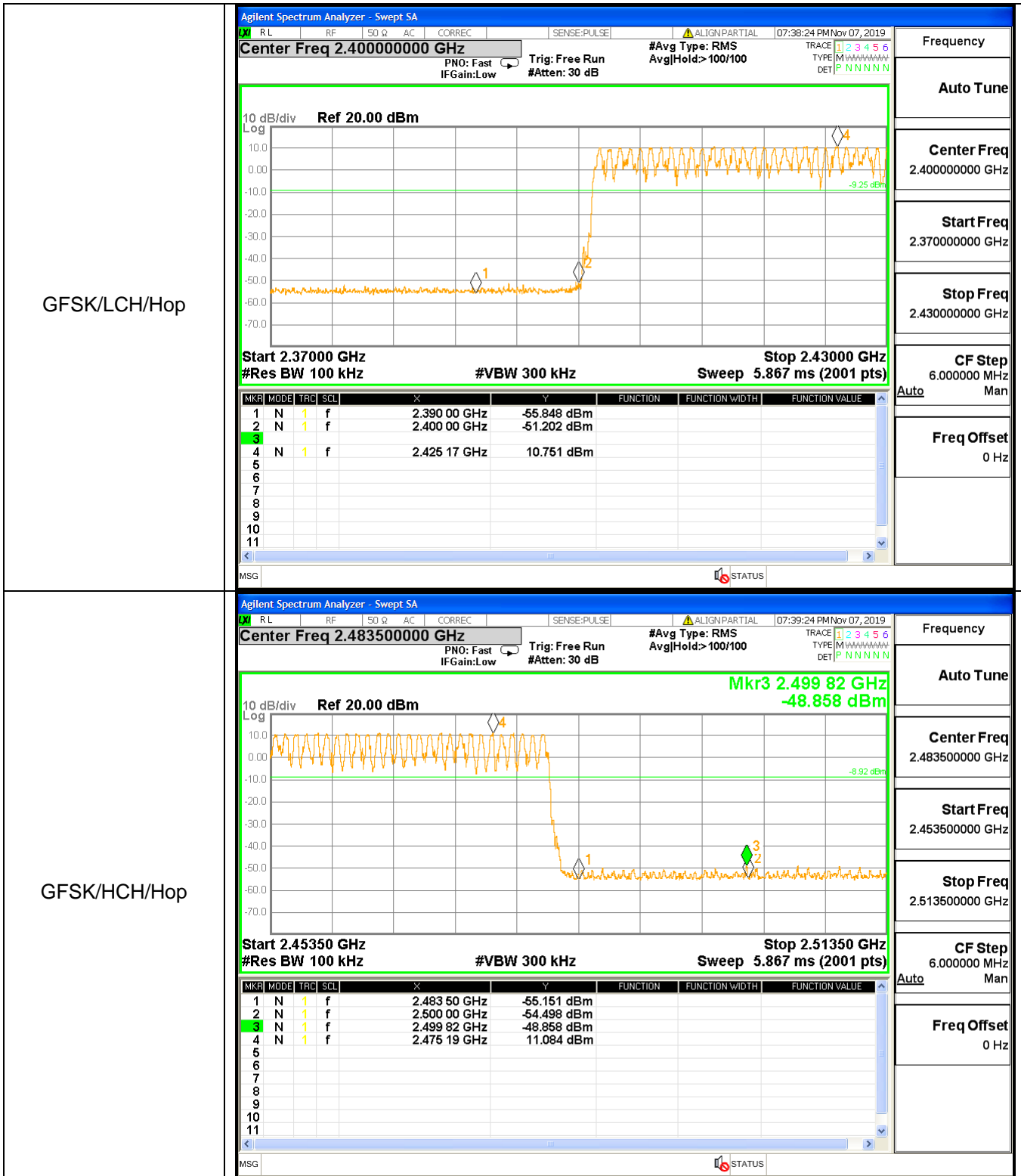
Graphs

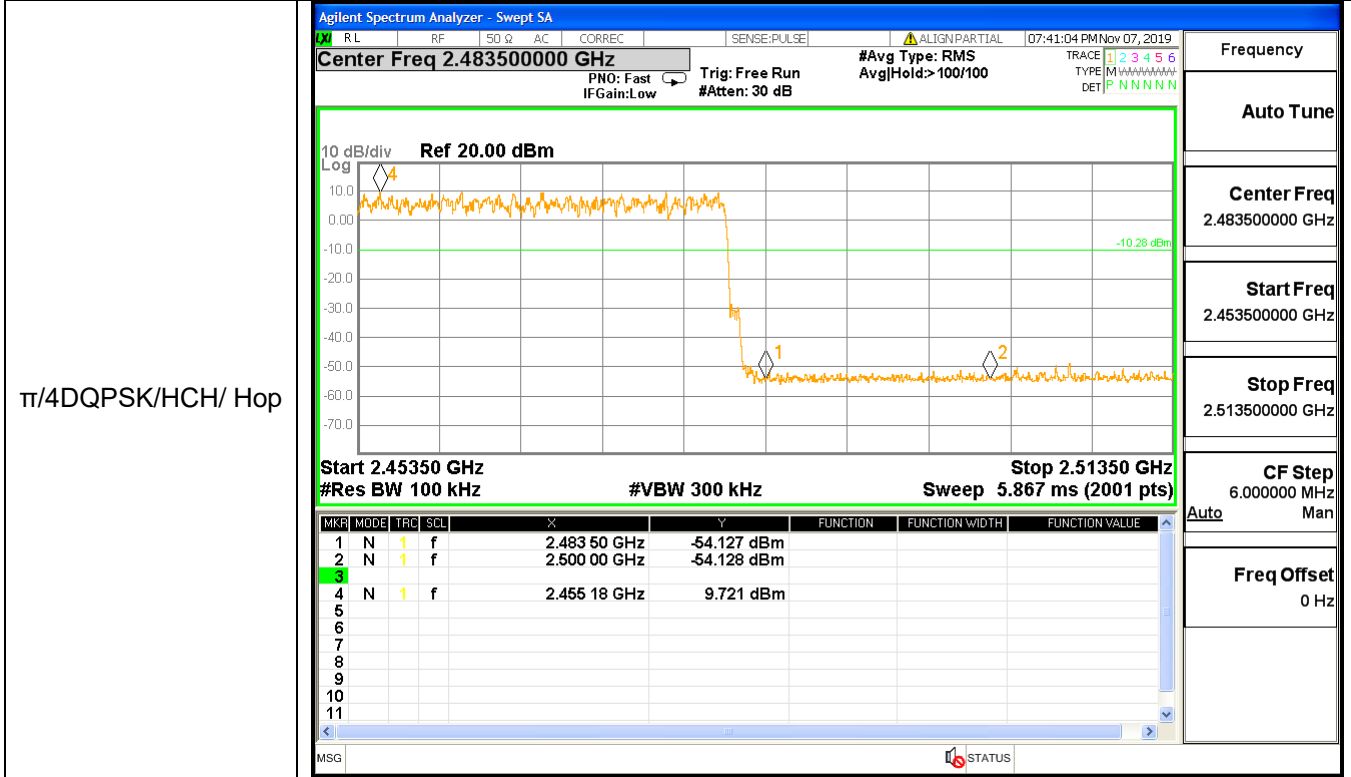
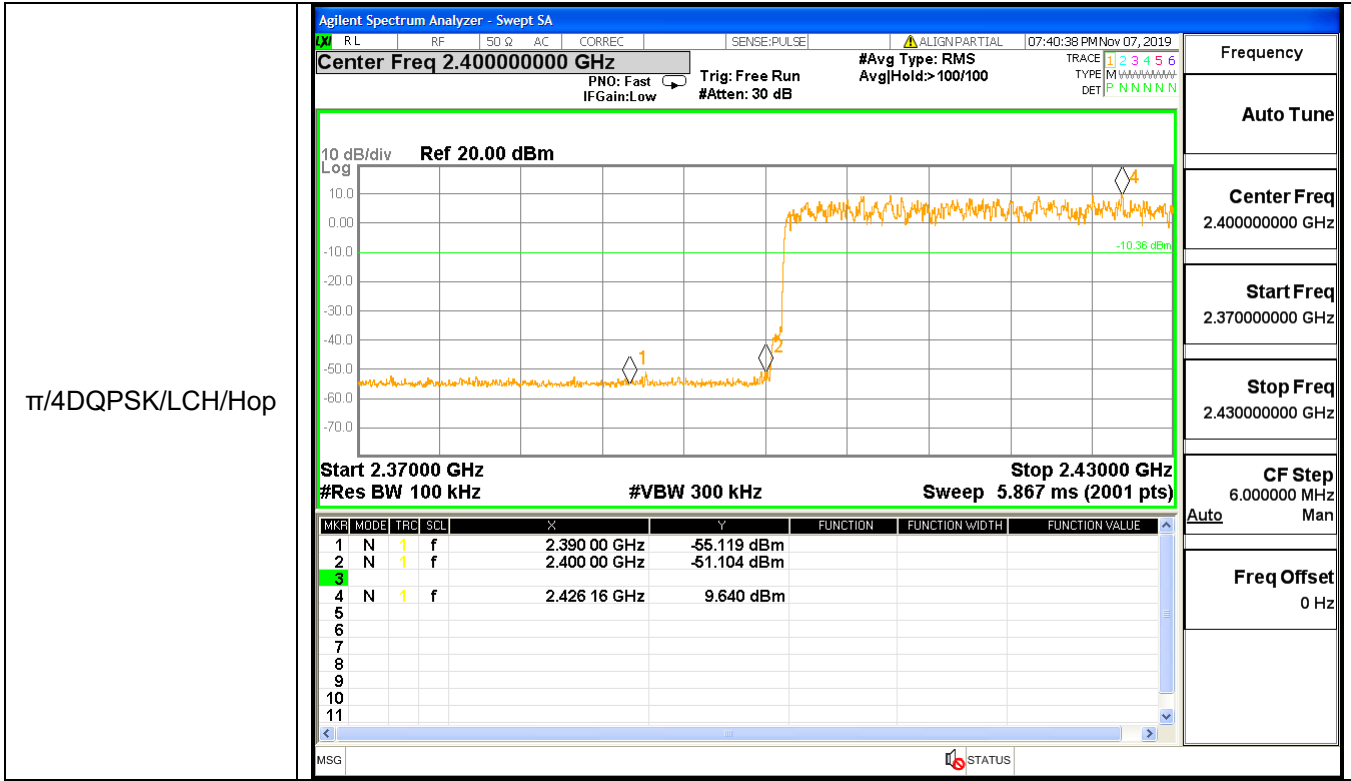


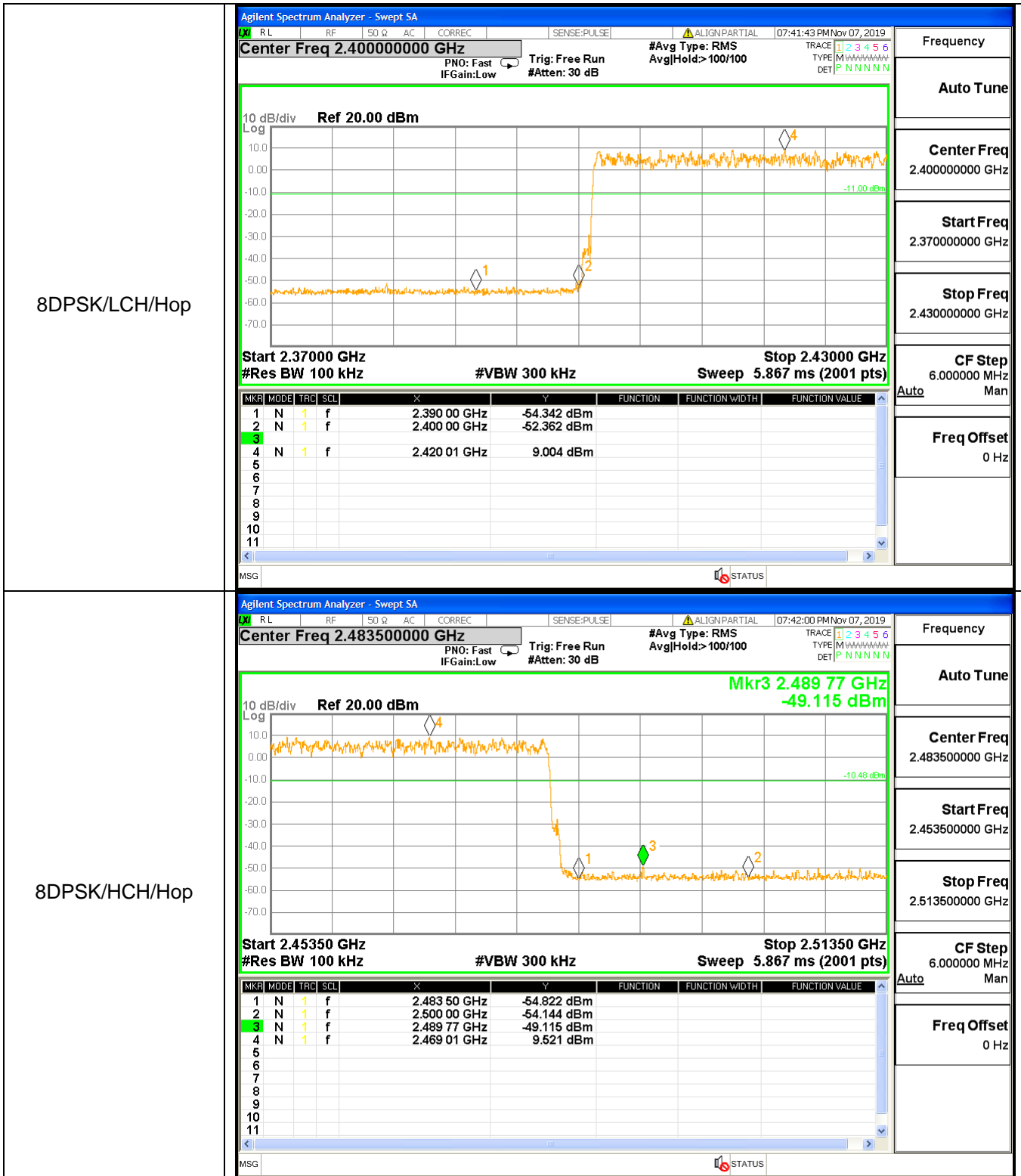




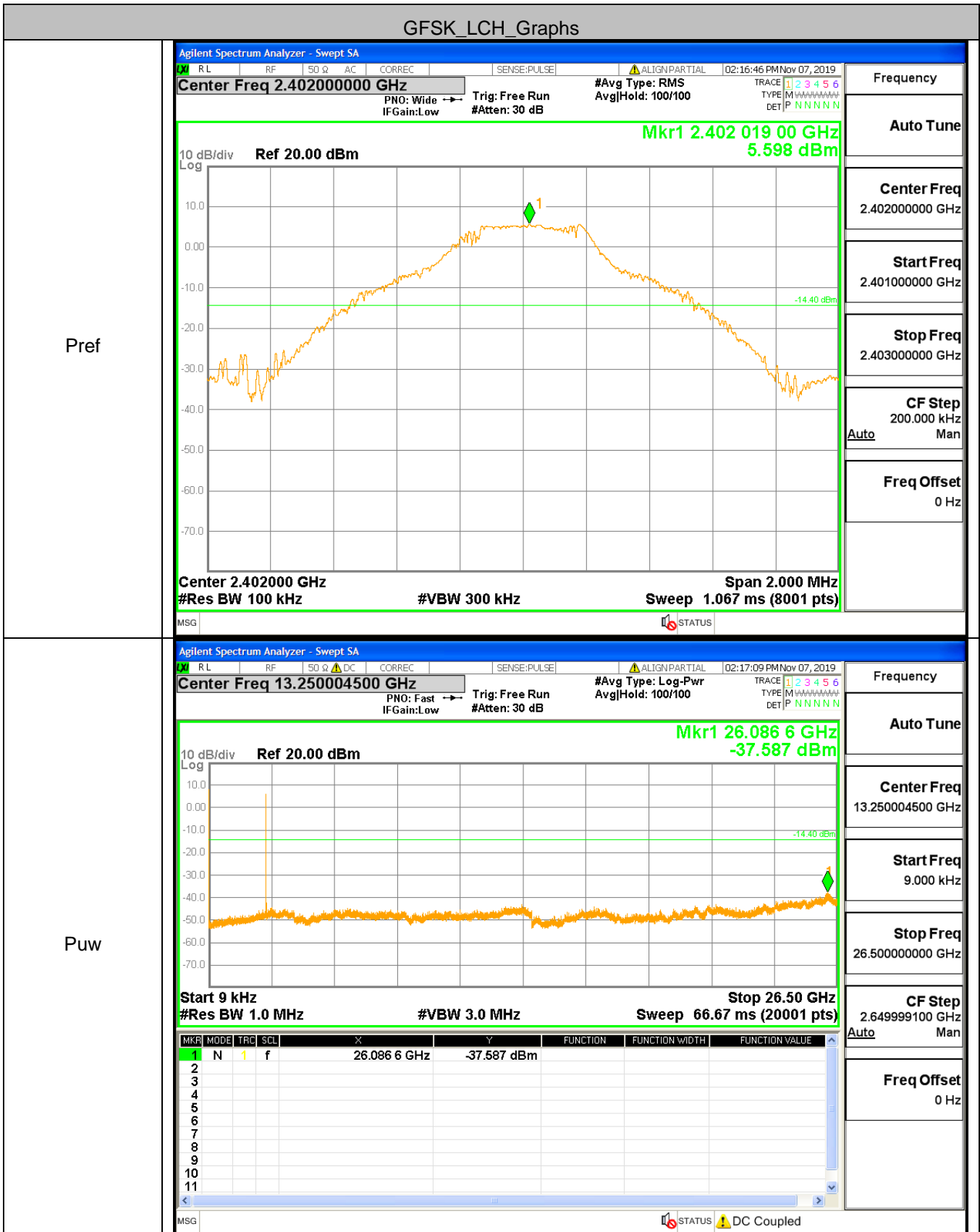


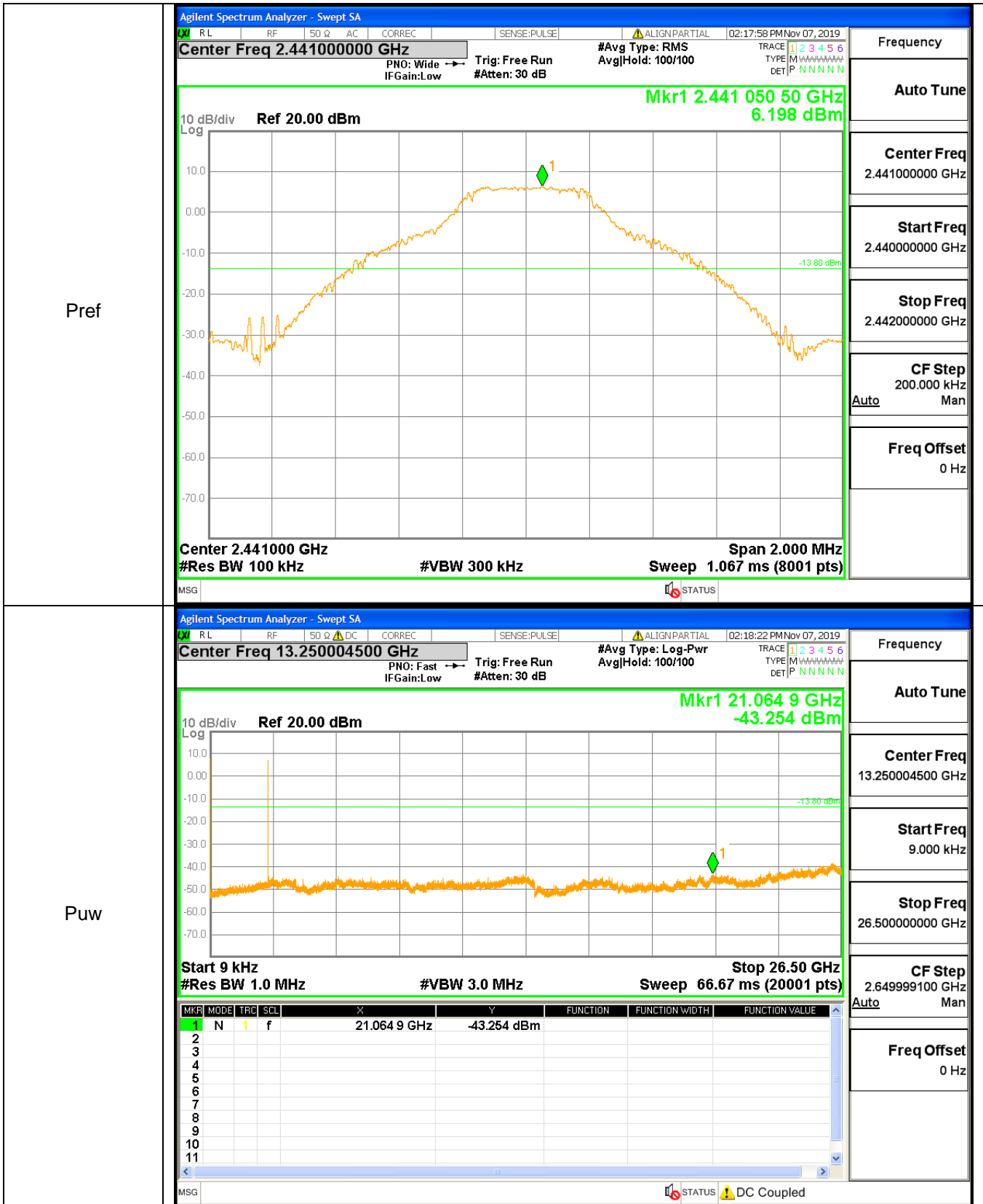






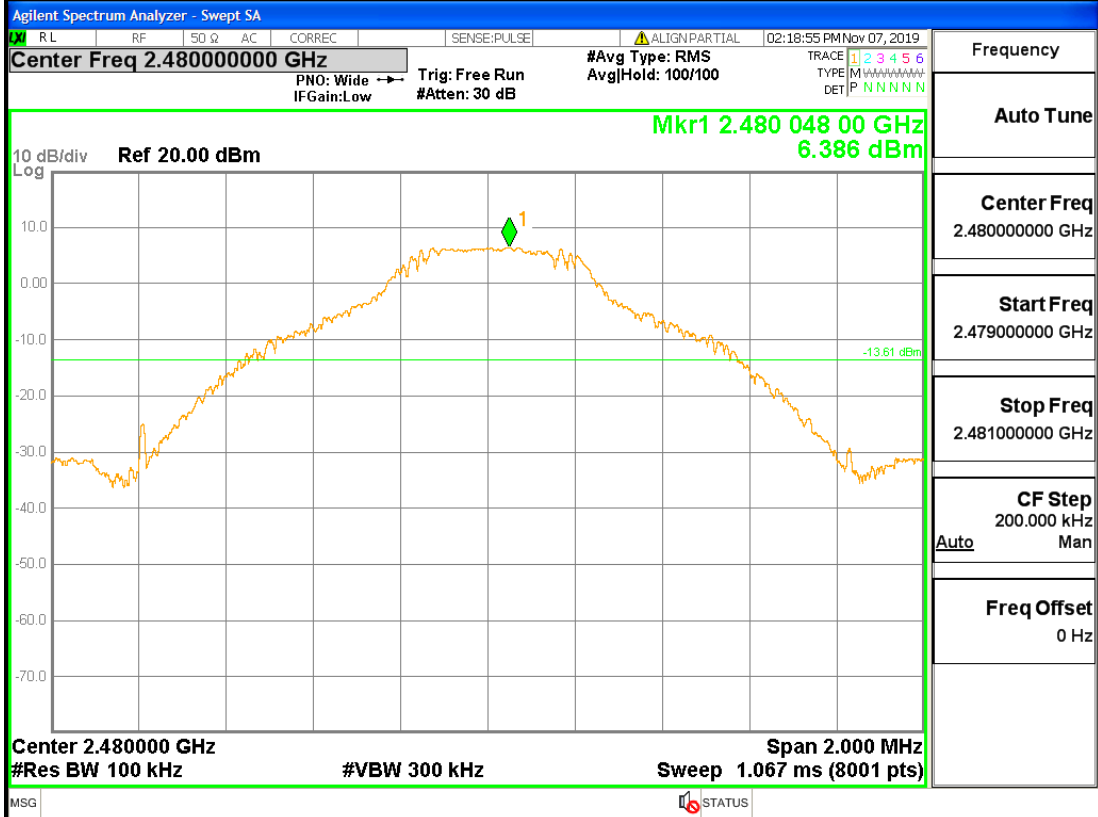
### A.7 RF Conducted Spurious Emissions Test Graph



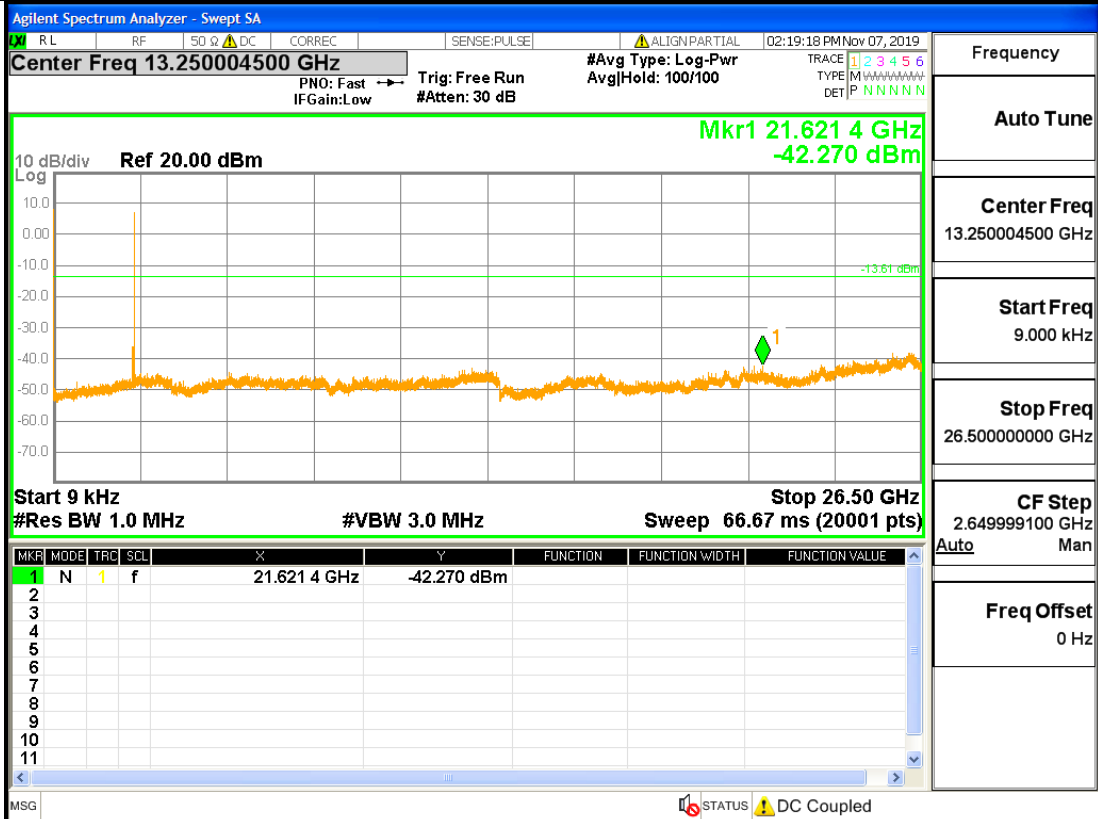


GFSK\_HCH\_Graphs

Pref



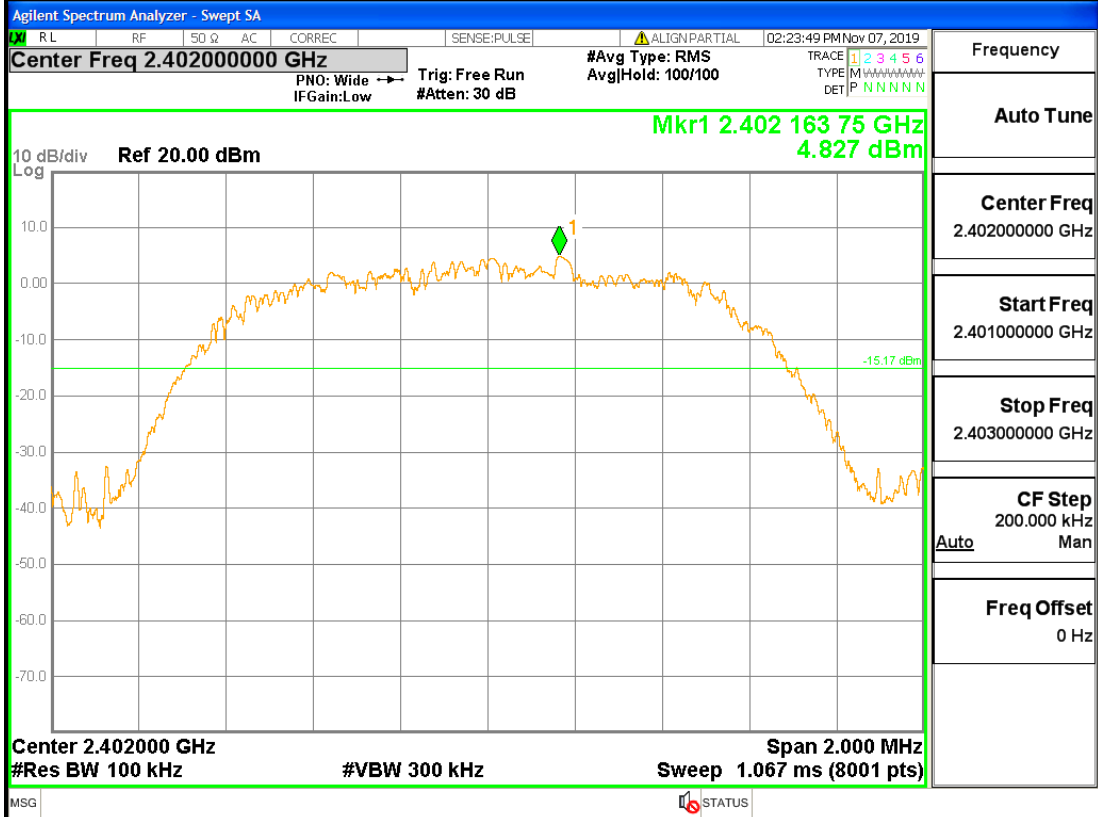
Puw





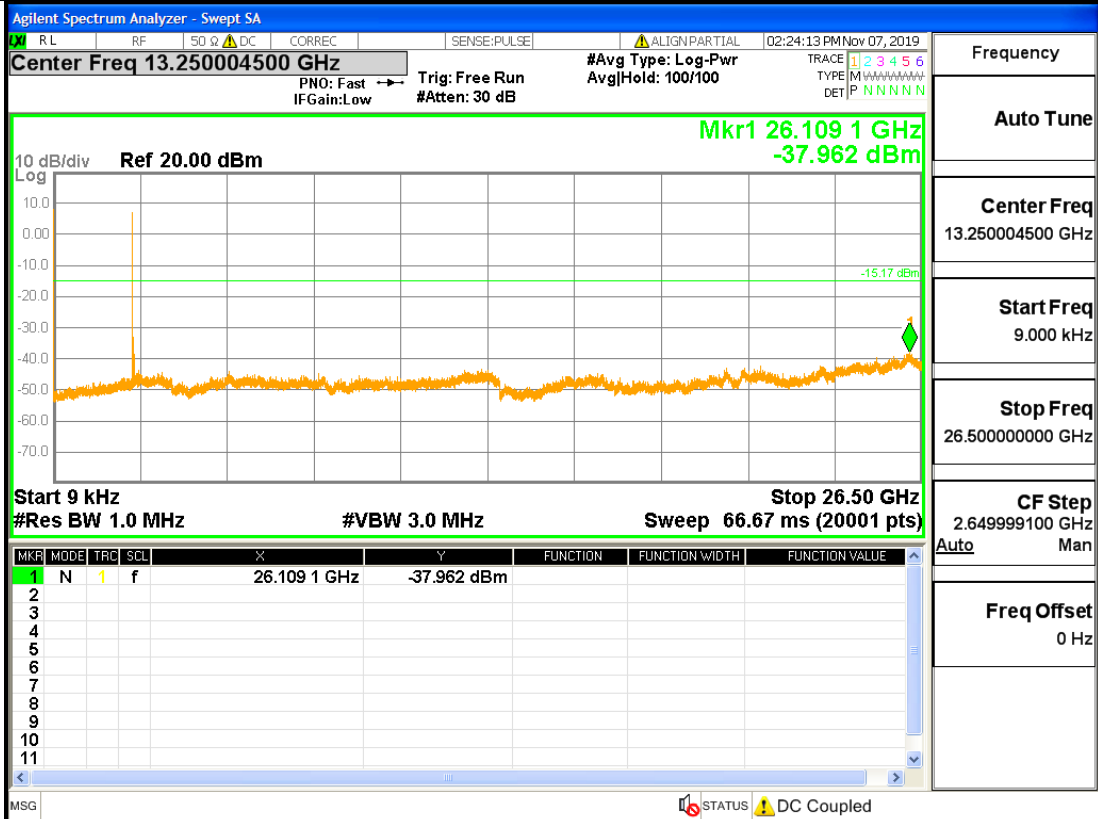
$\pi/4$ DQPSK LCH\_Graphs

Pref



Frequency
Auto Tune
Center Freq 2.402000000 GHz
Start Freq 2.401000000 GHz
Stop Freq 2.403000000 GHz
CF Step 200.000 kHz Auto Man
Freq Offset 0 Hz

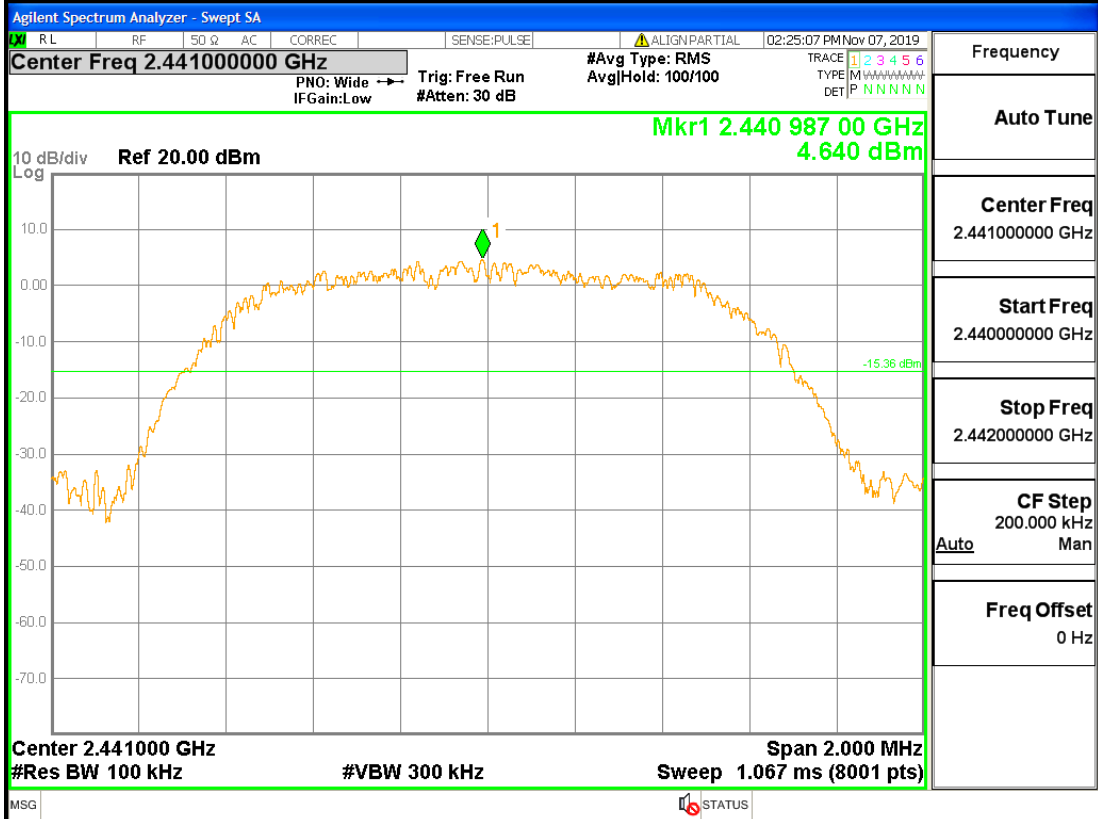
Puw



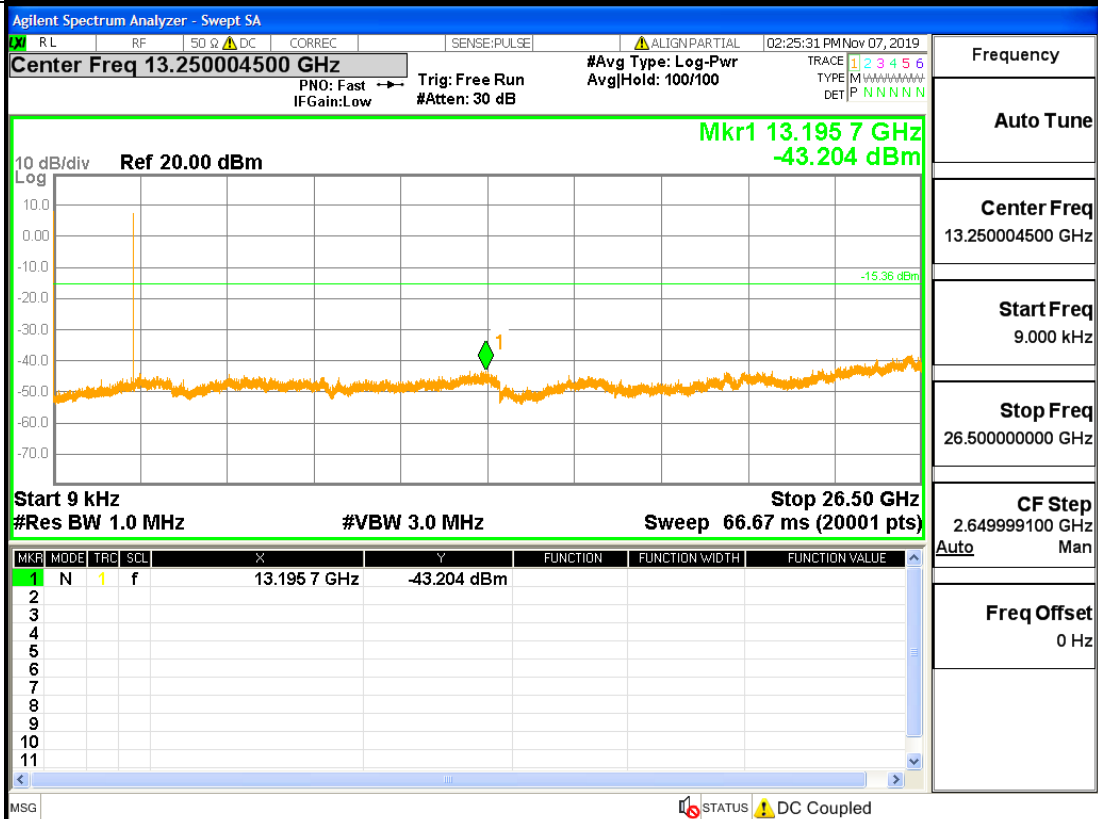
Frequency
Auto Tune
Center Freq 13.250004500 GHz
Start Freq 9.000 kHz
Stop Freq 26.500000000 GHz
CF Step 2.649999100 GHz Auto Man
Freq Offset 0 Hz

$\pi/4$ DQPSK MCH Graphs

Pref

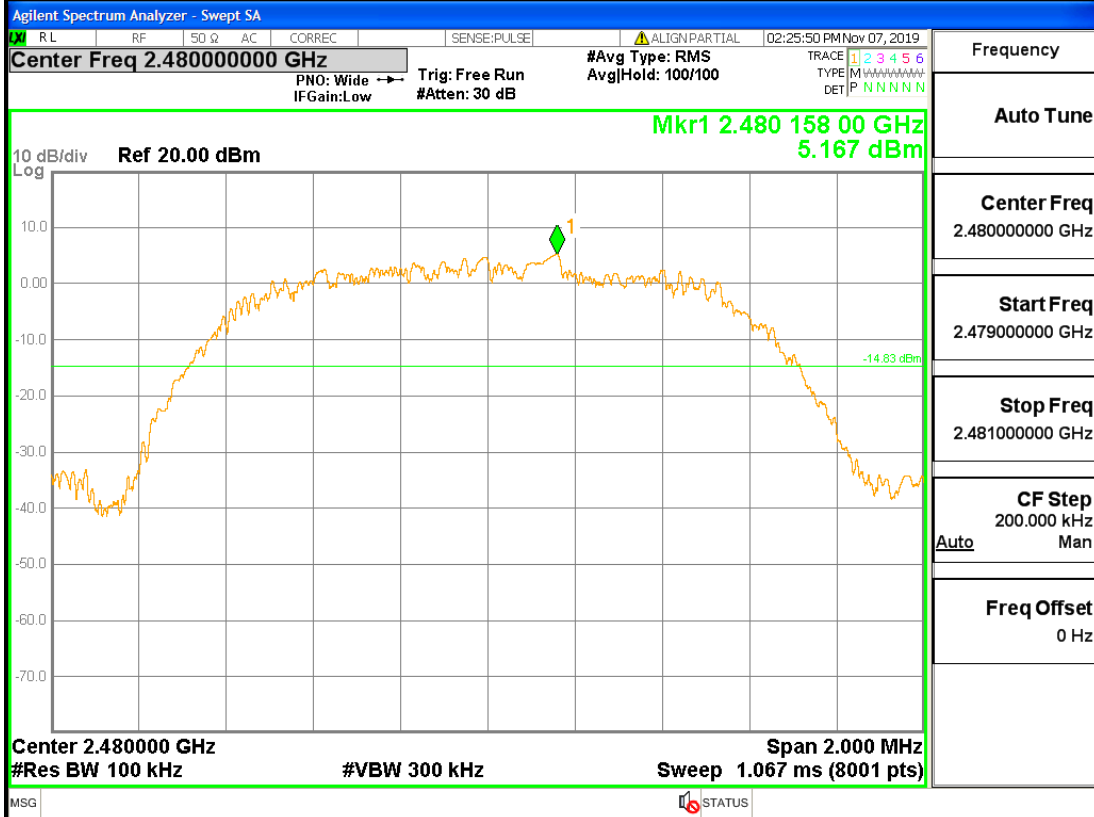


Puw



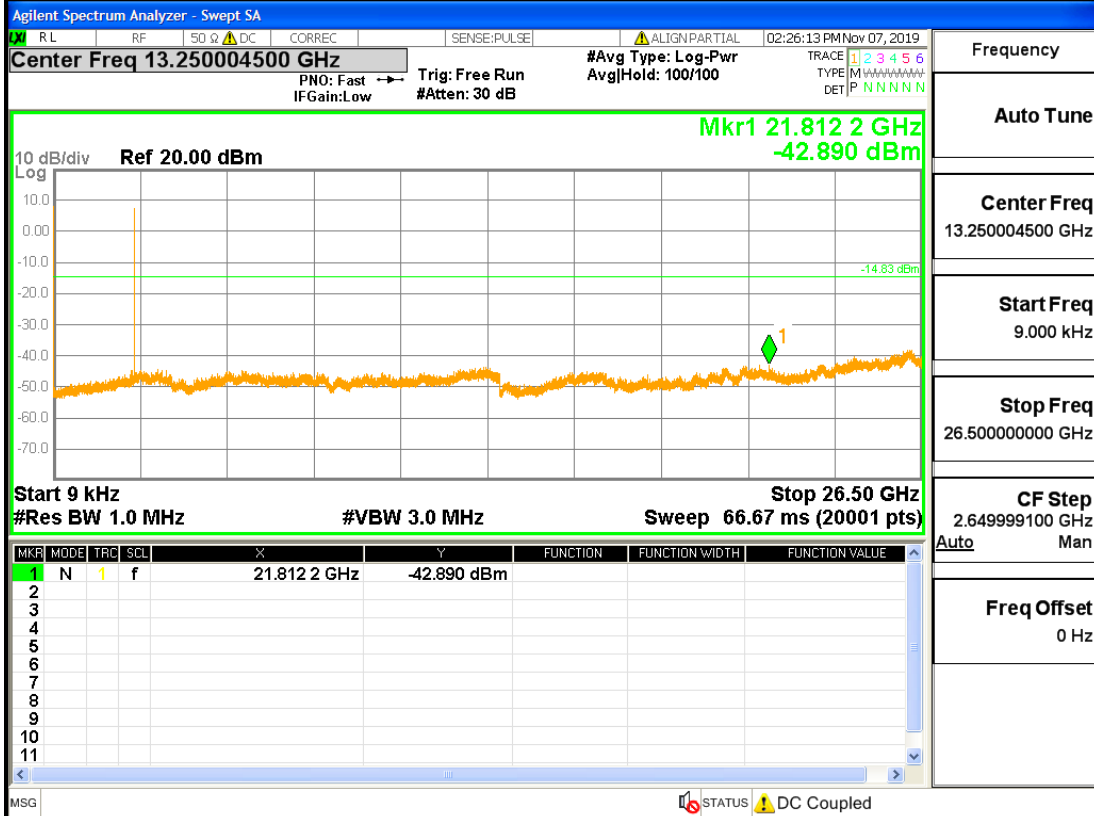
$\pi/4$ DQPSK HCH Graphs

Pref



Frequency
Auto Tune
Center Freq 2.48000000 GHz
Start Freq 2.479000000 GHz
Stop Freq 2.481000000 GHz
CF Step 200.000 kHz Auto Man
Freq Offset 0 Hz

Puw

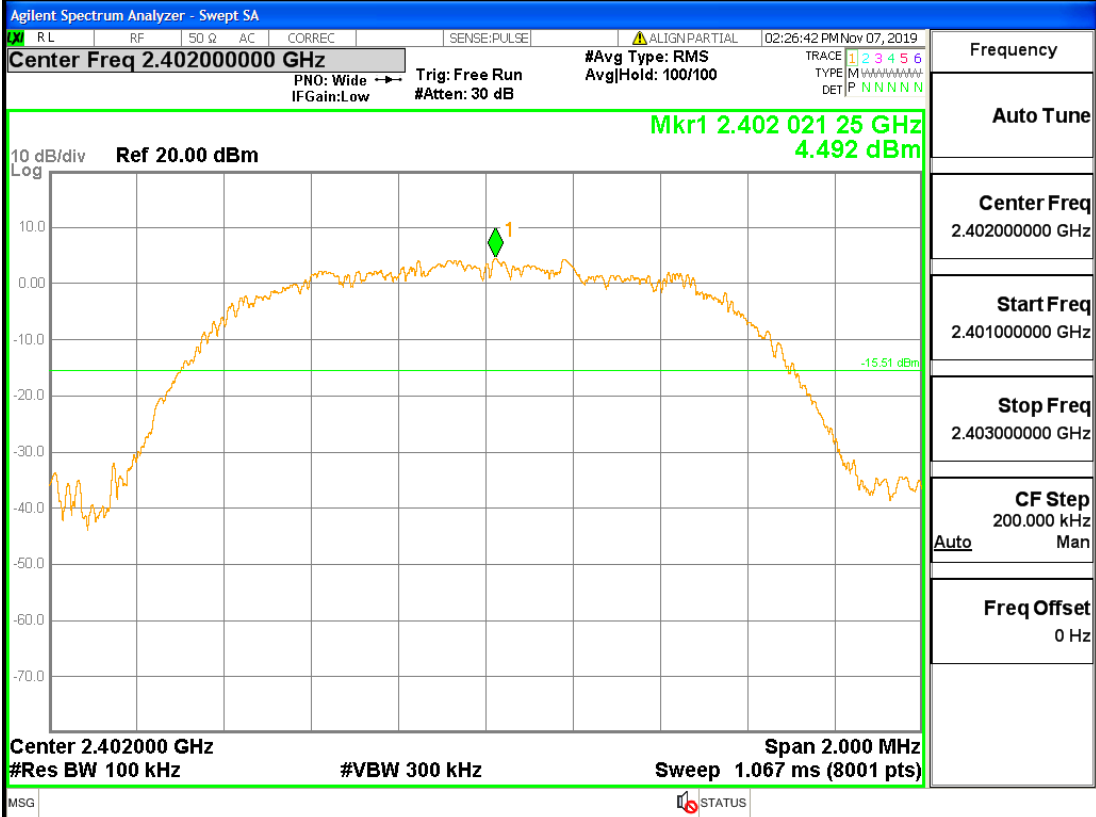


Frequency
Auto Tune
Center Freq 13.250004500 GHz
Start Freq 9.000 kHz
Stop Freq 26.500000000 GHz
CF Step 2.649999100 GHz Auto Man
Freq Offset 0 Hz

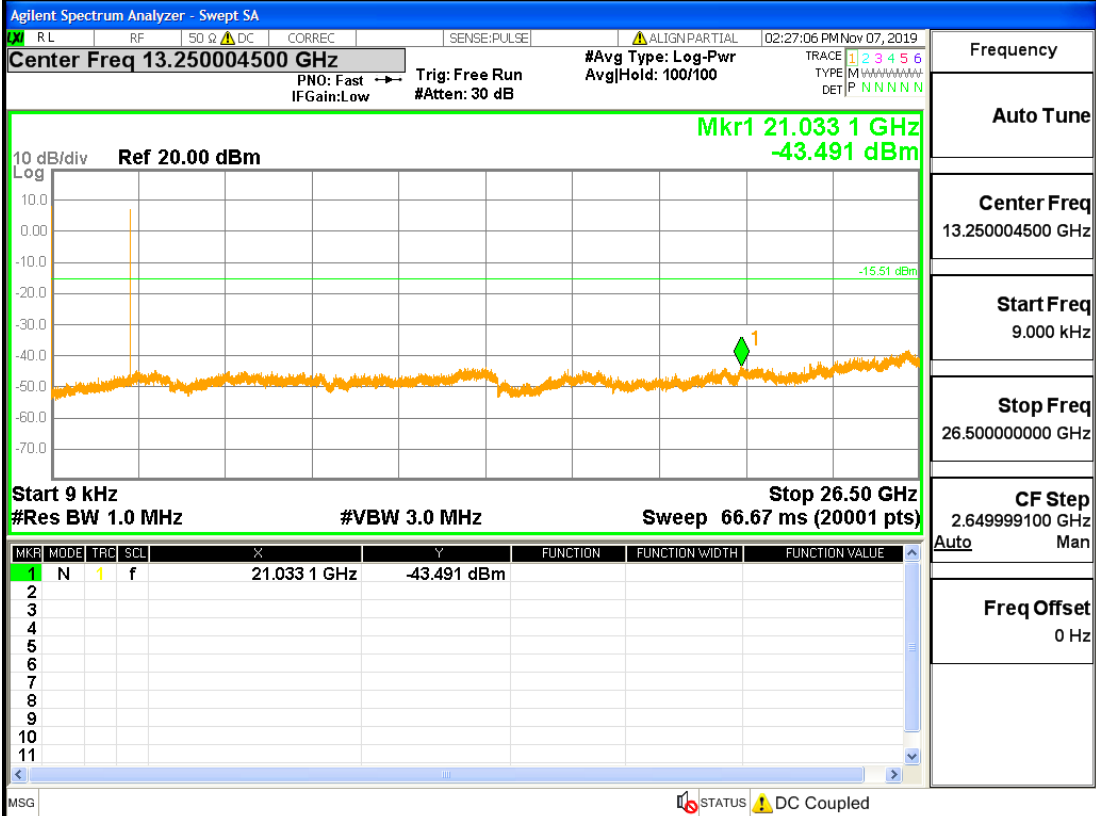
MKR	MODE	TRG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	21.812 2 GHz	-42.890 dBm			
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

8DPSK\_LCH\_Graphs

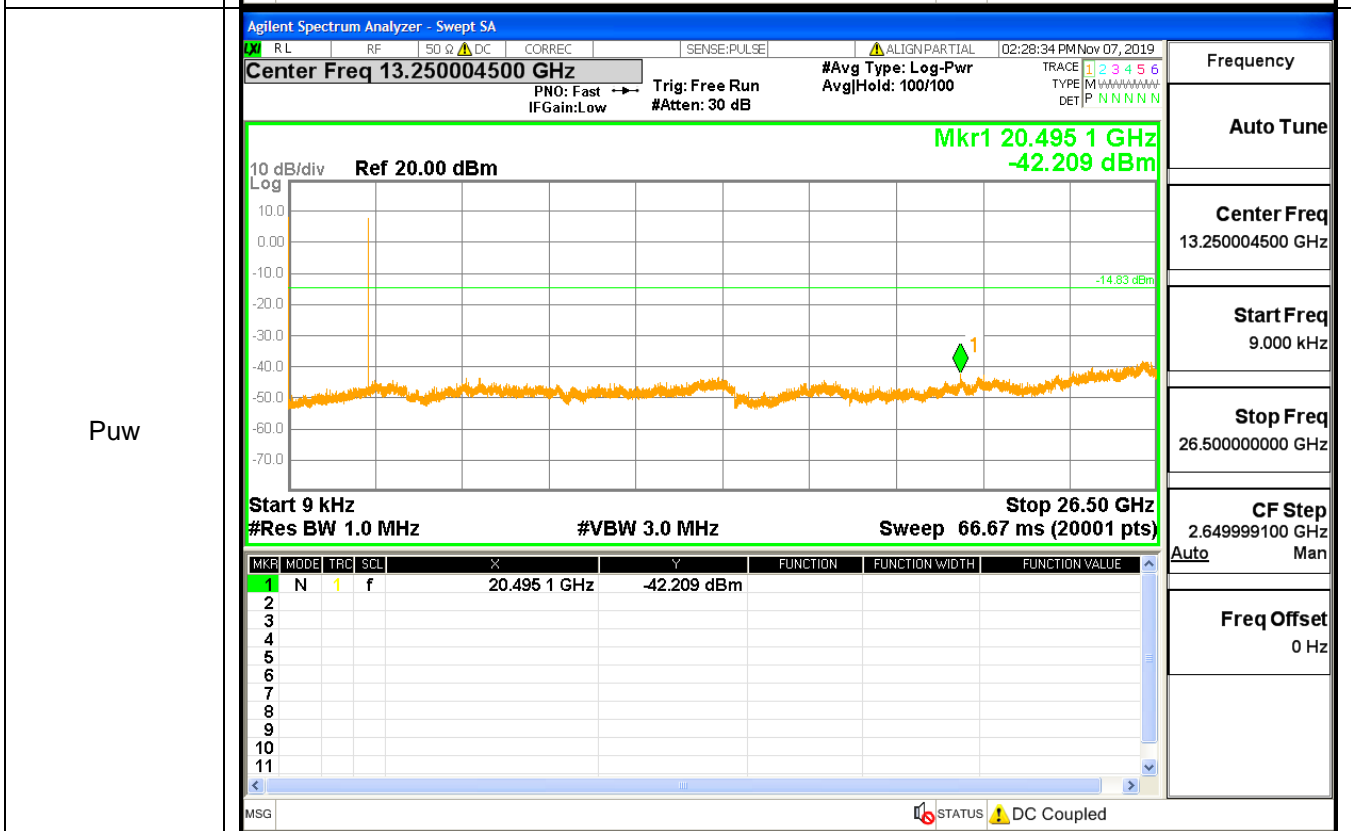
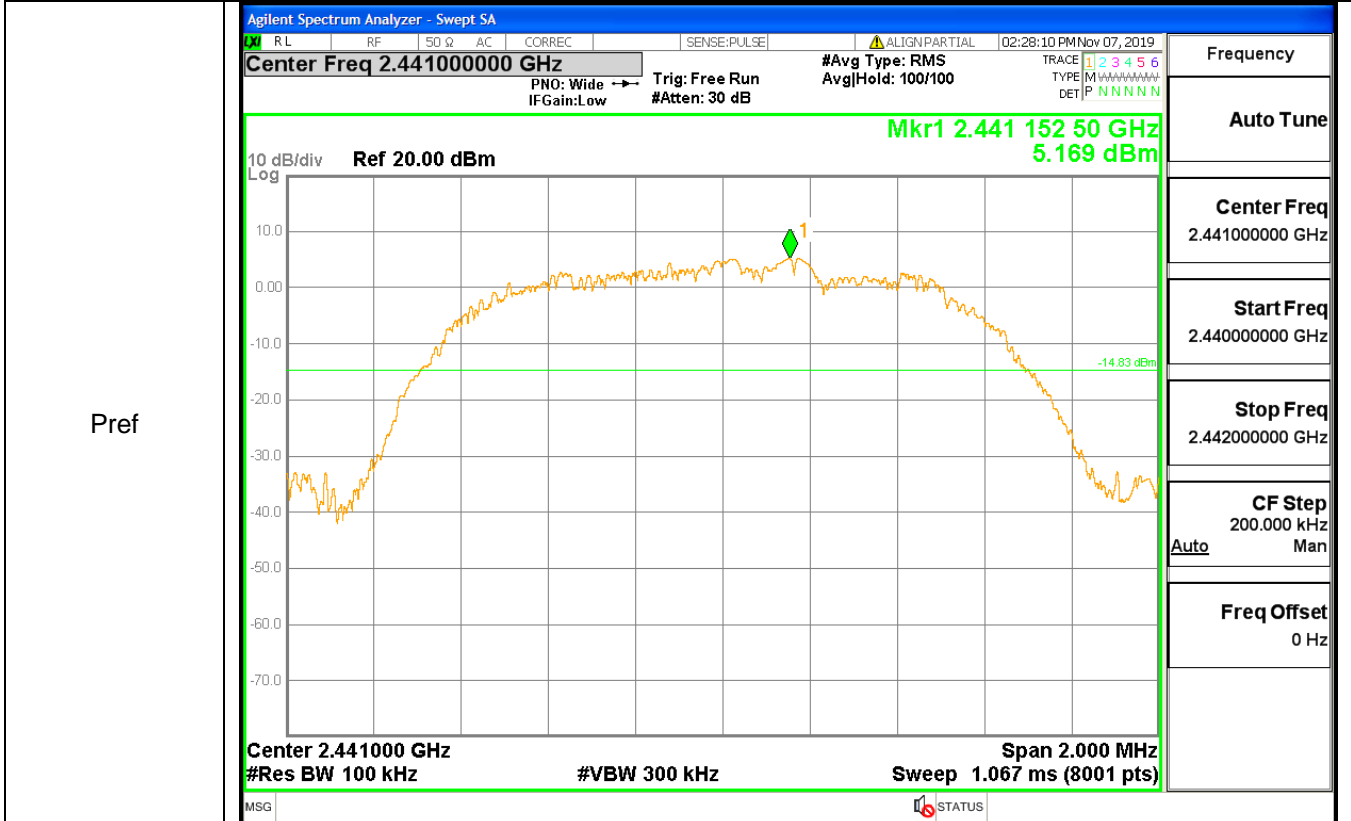
Pref



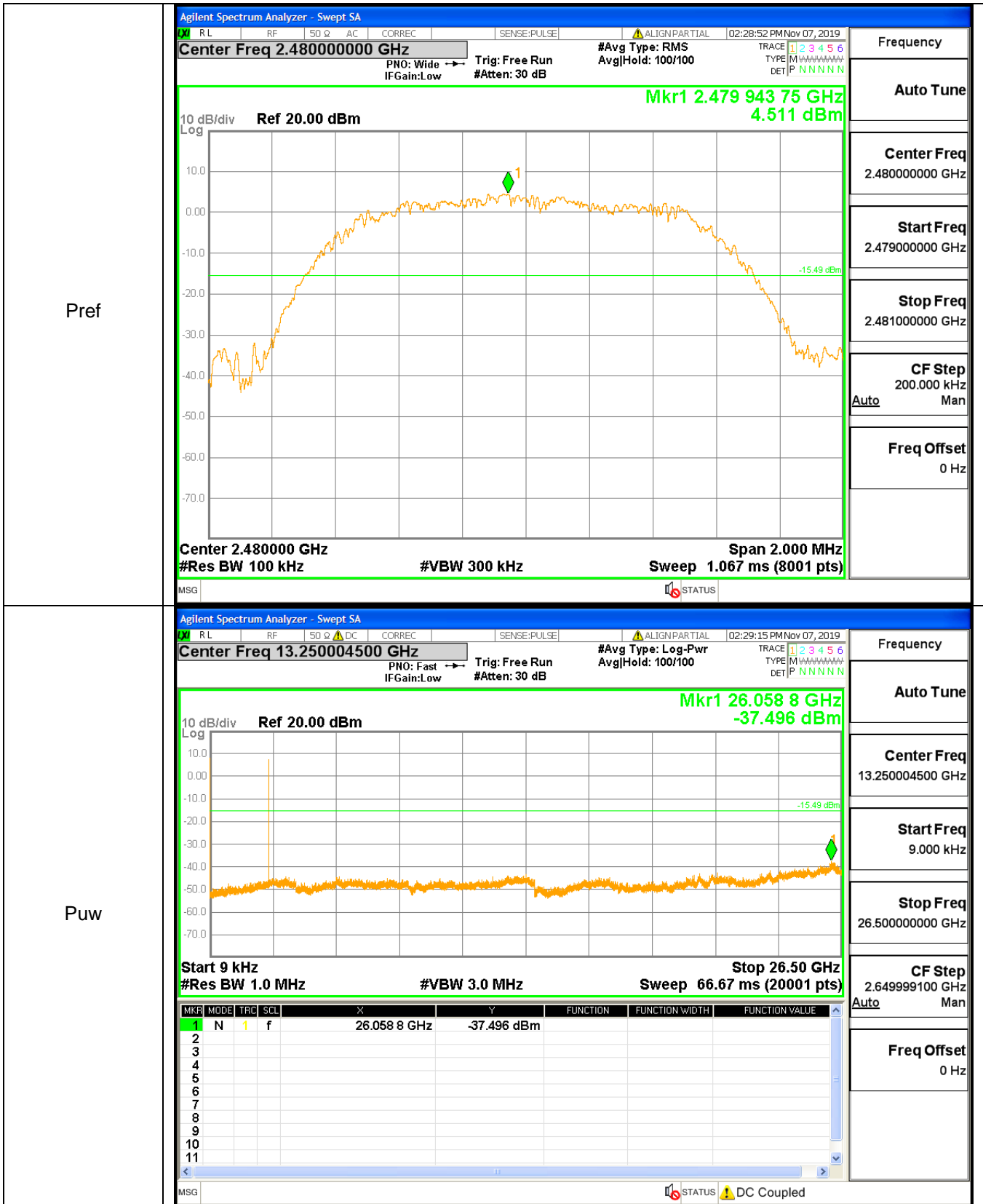
Puw



8DPSK\_MCH\_Graphs



8DPSK\_HCH\_Graphs

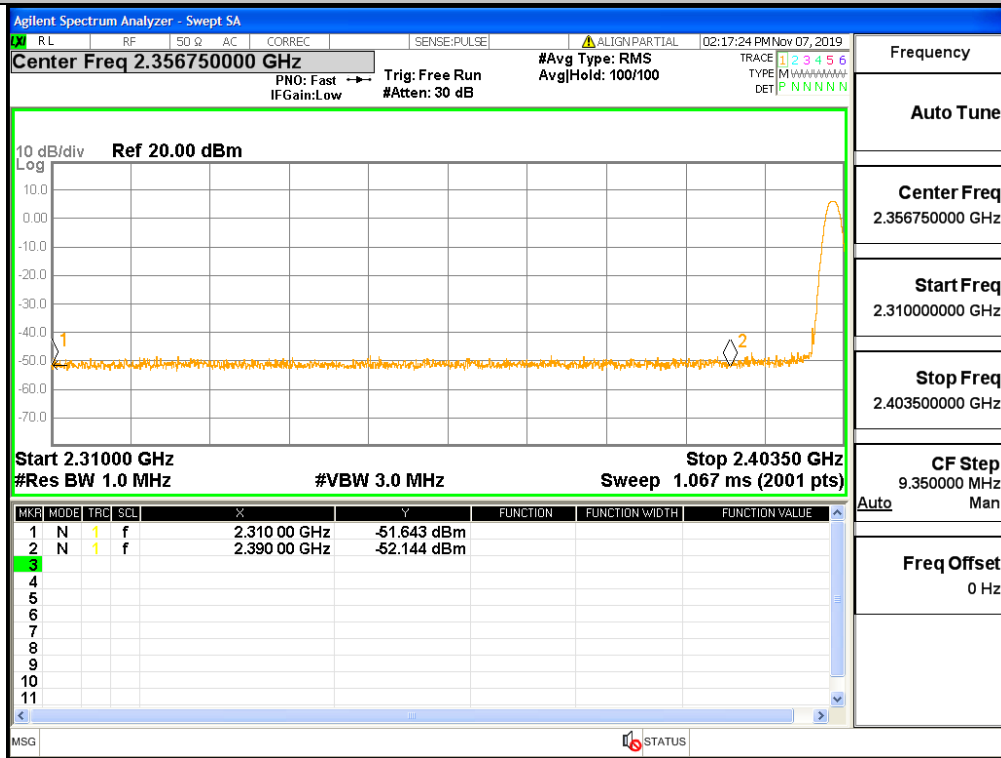


**A.8 Restrict-band band-edge measurements**

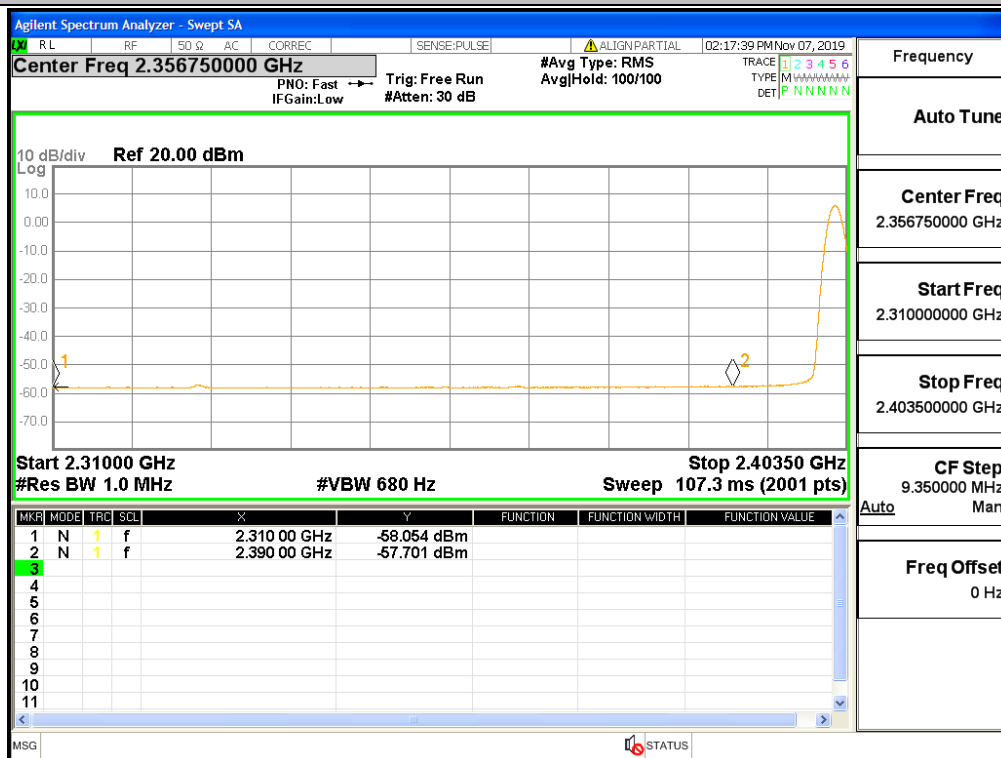
Type	Carrier Frequency (MHz)	Frequency(M Hz)	Gain	Ground Factor	Peak Value(dBm)	E [dBuV/m]	Limit [dBuV/m]	Conclusion
1DH5	2402	2310.00	2.5	0.00	-51.64	46.06	74	Pass
1DH5	2480	2483.50	2.5	0.00	-49.29	48.41	74	Pass
2DH5	2402	2390.00	2.5	0.00	-50.636	47.064	74	Pass
2DH5	2480	2487.97	2.5	0.00	-47.848	49.852	74	Pass
3DH5	2402	2327.34	2.5	0.00	-46.99	50.71	74	Pass
3DH5	2480	2483.50	2.5	0.00	-49.18	48.52	74	Pass

Type	Carrier Frequency (MHz)	Frequency(M Hz)	Gain	Ground Factor	Average Value(dBm)	E [dBuV/m]	Limit [dBuV/m]	Conclusion
1DH5	2402	2310.00	2.5	0.00	-57.70	40.00	54	Pass
1DH5	2480	2483.50	2.5	0.00	-49.73	47.97	54	Pass
2DH5	2402	2390	2.5	0.00	-57.229	40.471	54	Pass
2DH5	2480	2483.5	2.5	0.00	-47.885	49.815	54	Pass
3DH5	2402	2327.34	2.5	0.00	-57.39	40.31	54	Pass
3DH5	2480	2483.50	2.5	0.00	-48.65	49.05	54	Pass

Restrict-band band-edge measurements\_2402\_PEAK\_DH5

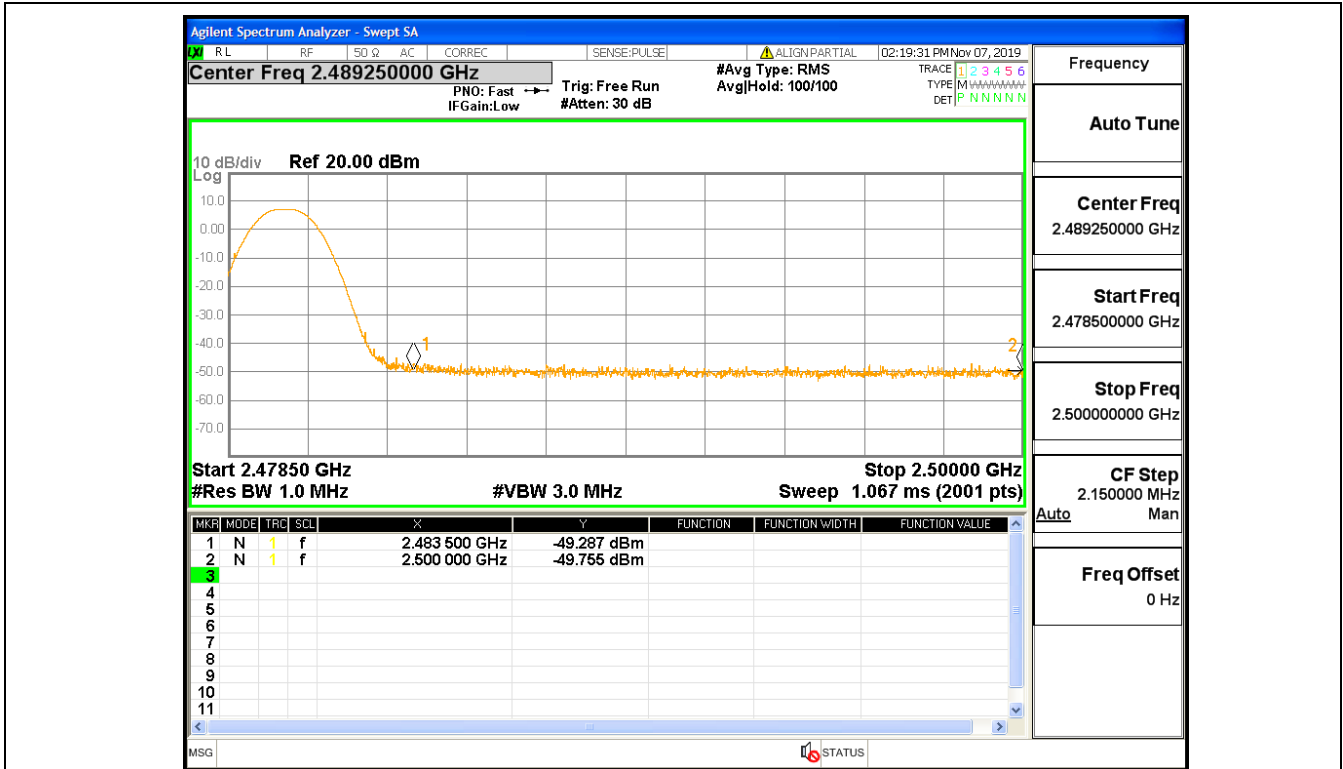


Restrict-band band-edge measurements\_2402\_AV\_DH5

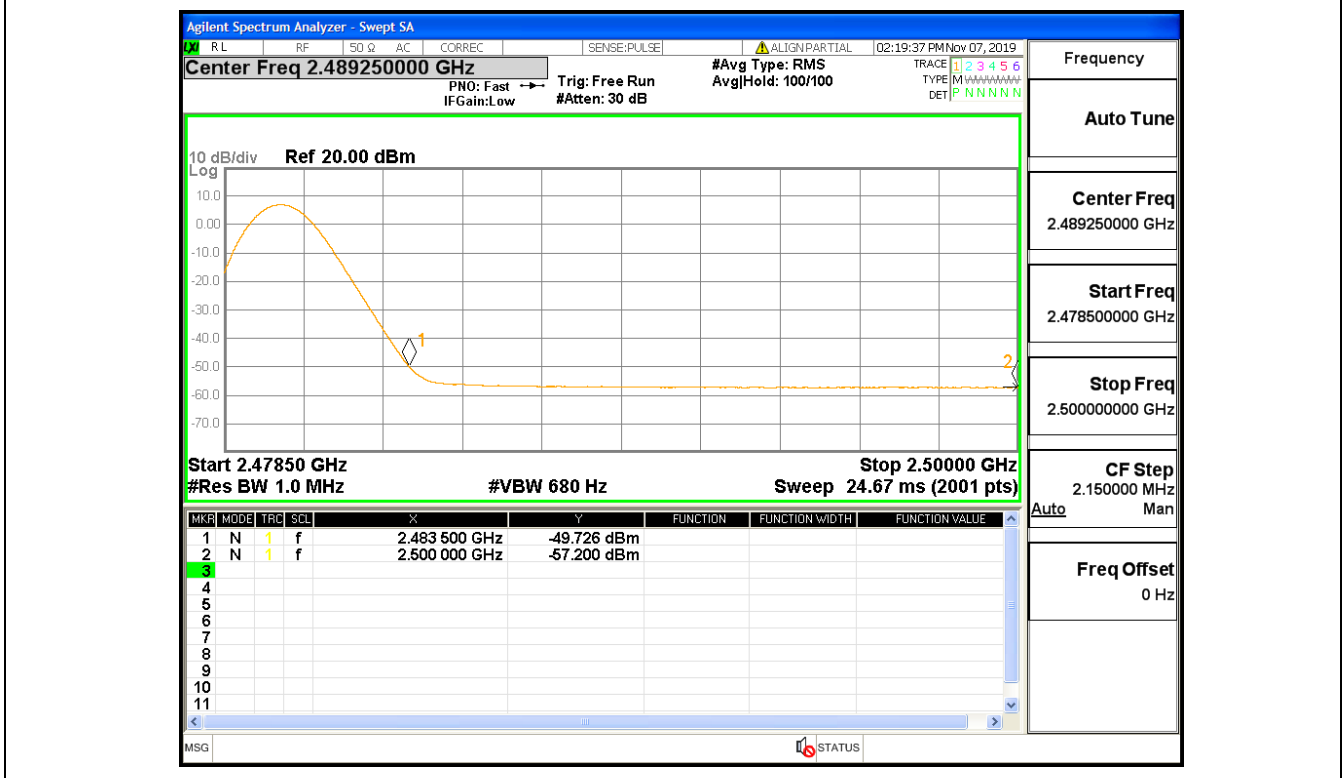


Restrict-band band-edge measurements\_2480\_PEAK\_DH5

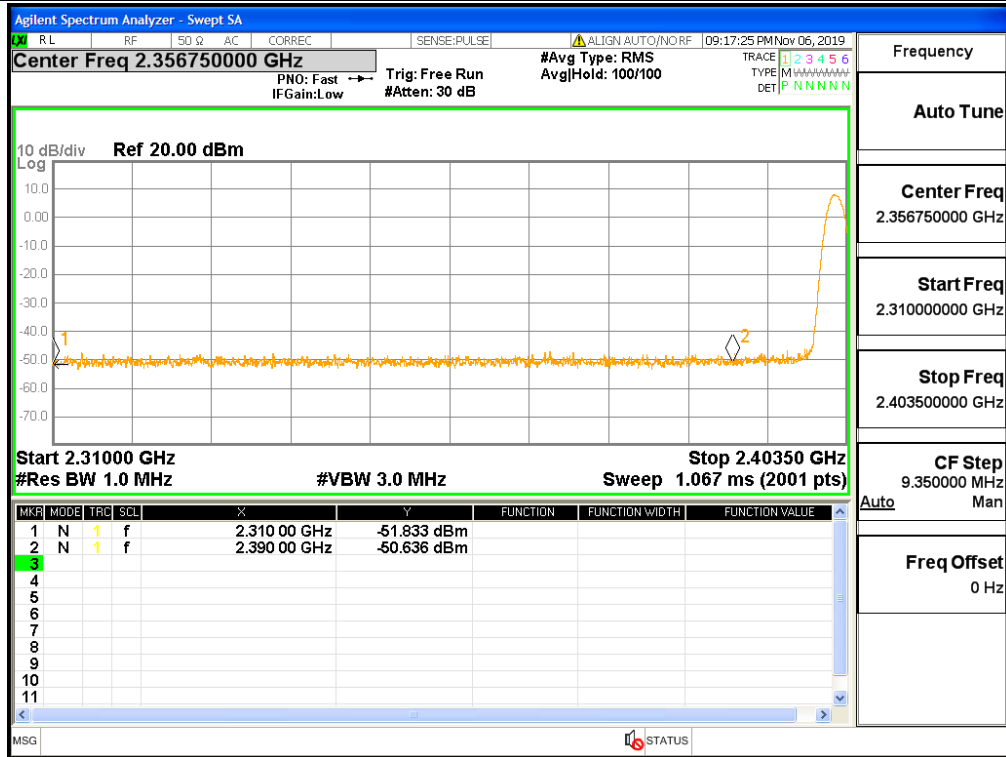




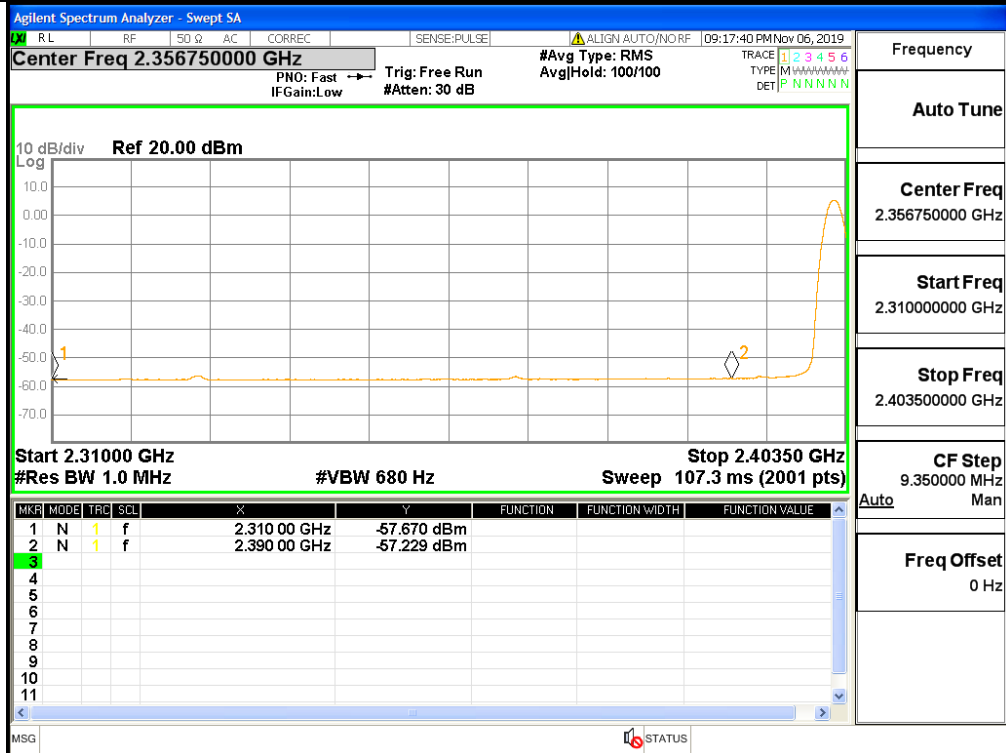
Restrict-band band-edge measurements\_2480\_AV\_DH5



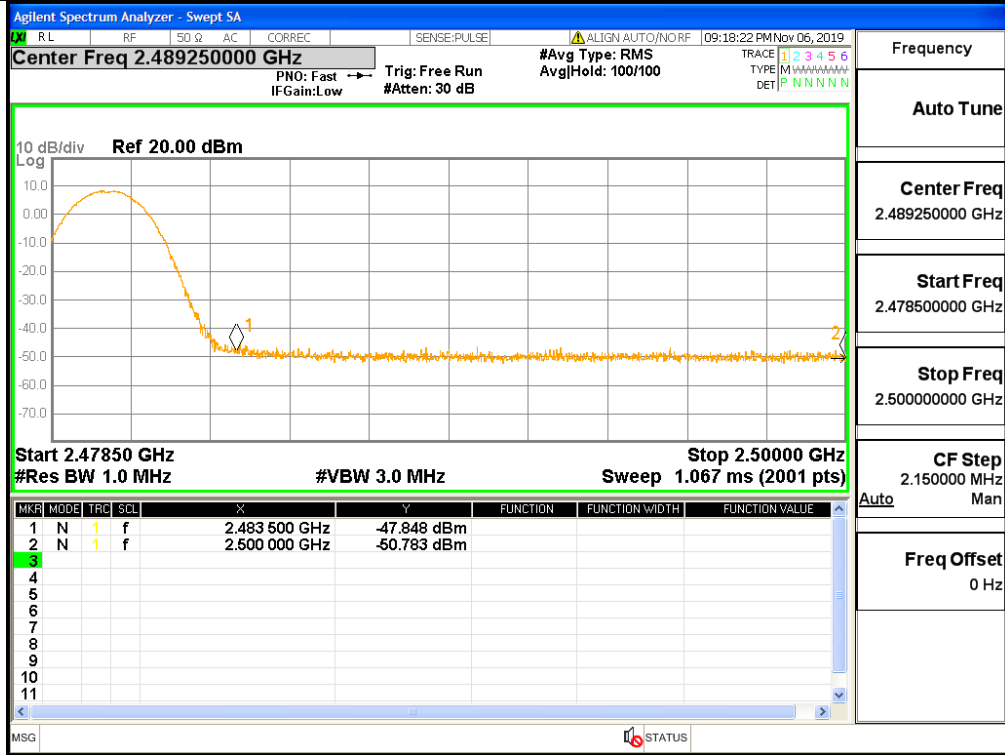
Restrict-band band-edge measurements\_2402\_PEAK\_2DH5



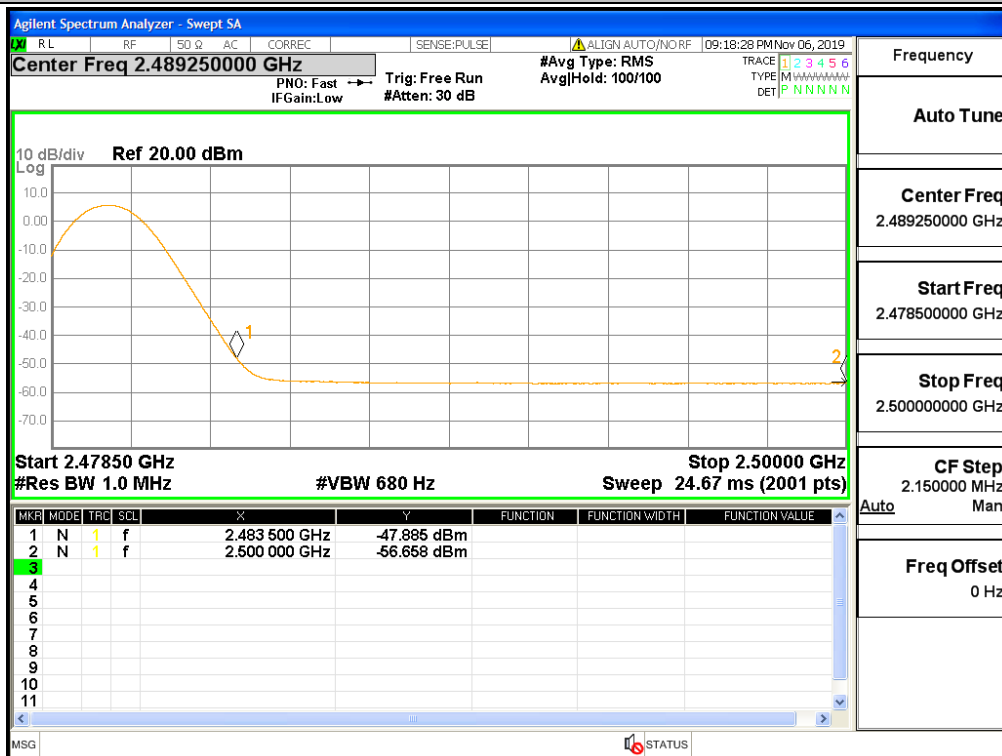
Restrict-band band-edge measurements\_2402\_AV\_2DH5



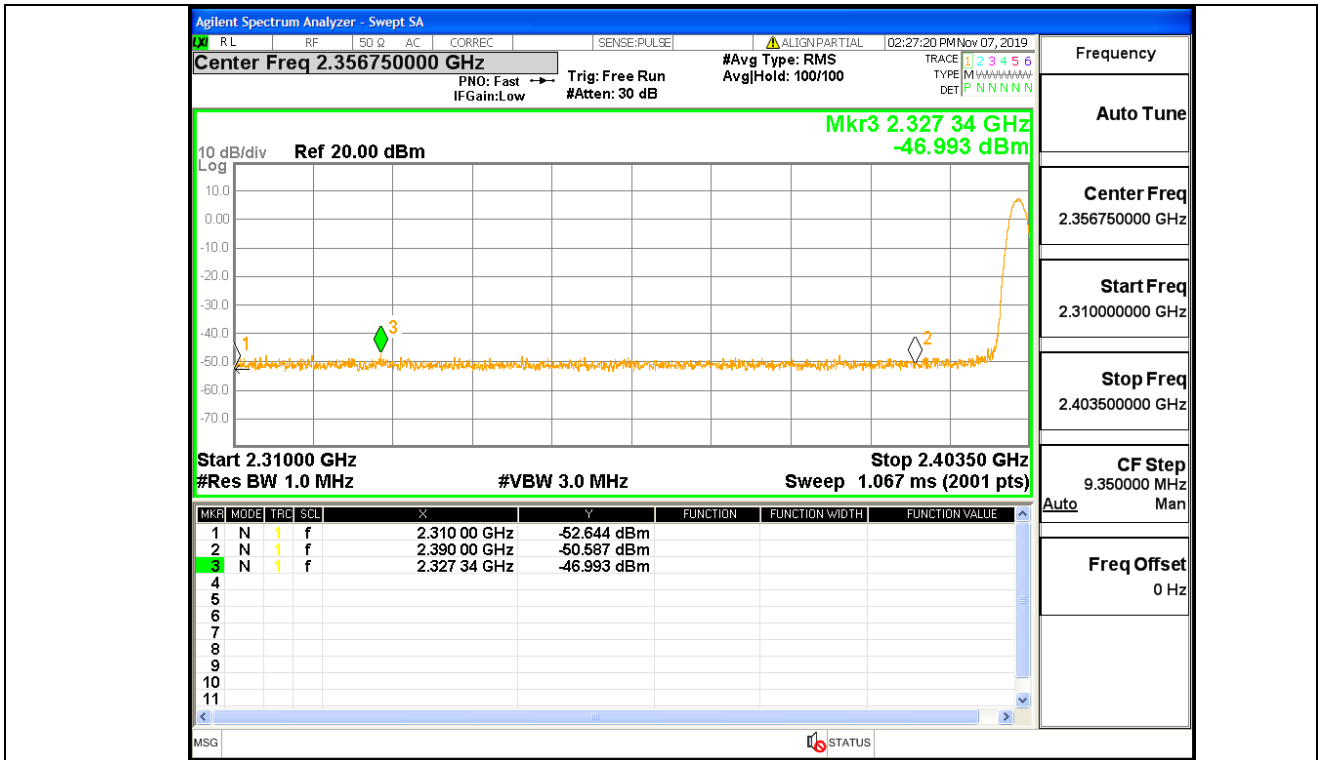
Restrict-band band-edge measurements\_2480\_PEAK\_2DH5



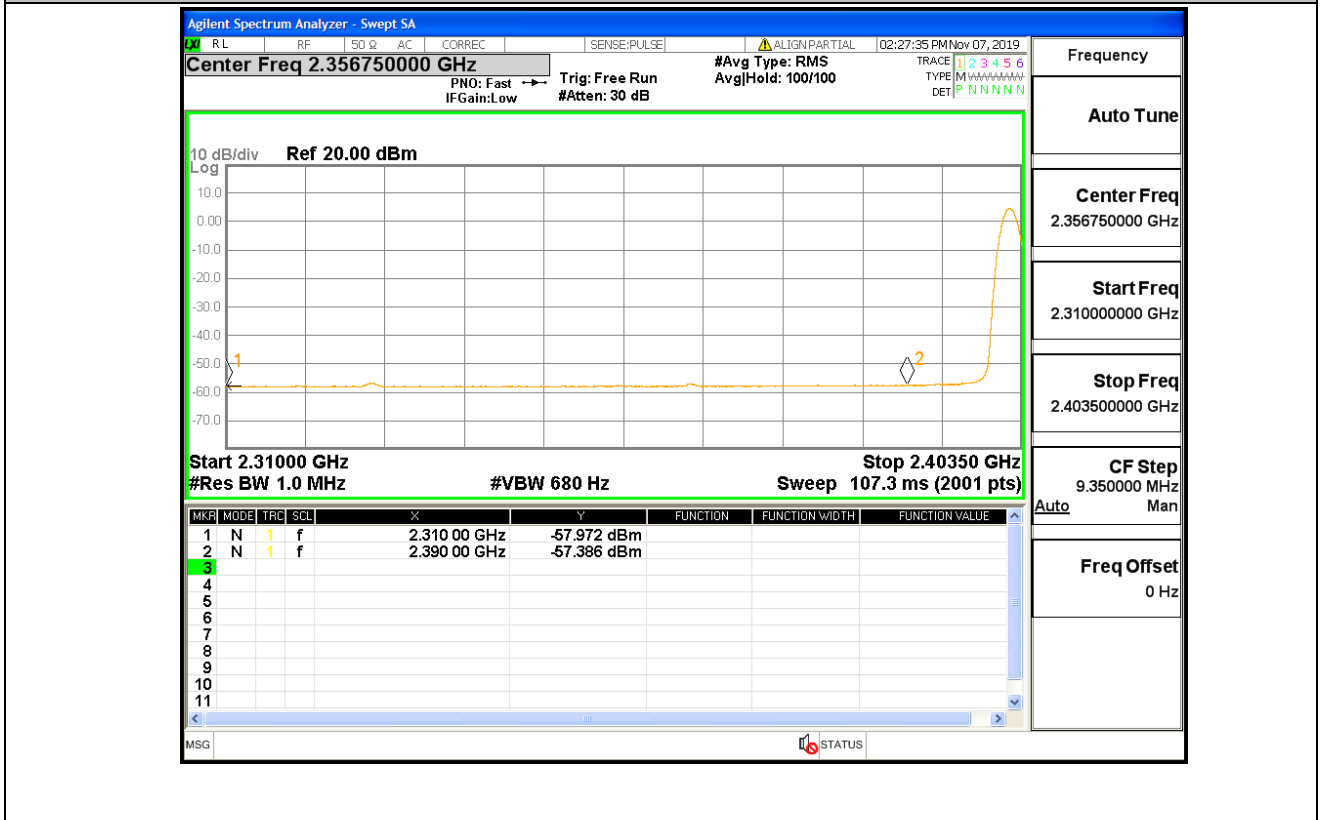
Restrict-band band-edge measurements\_2480\_AV\_2DH5



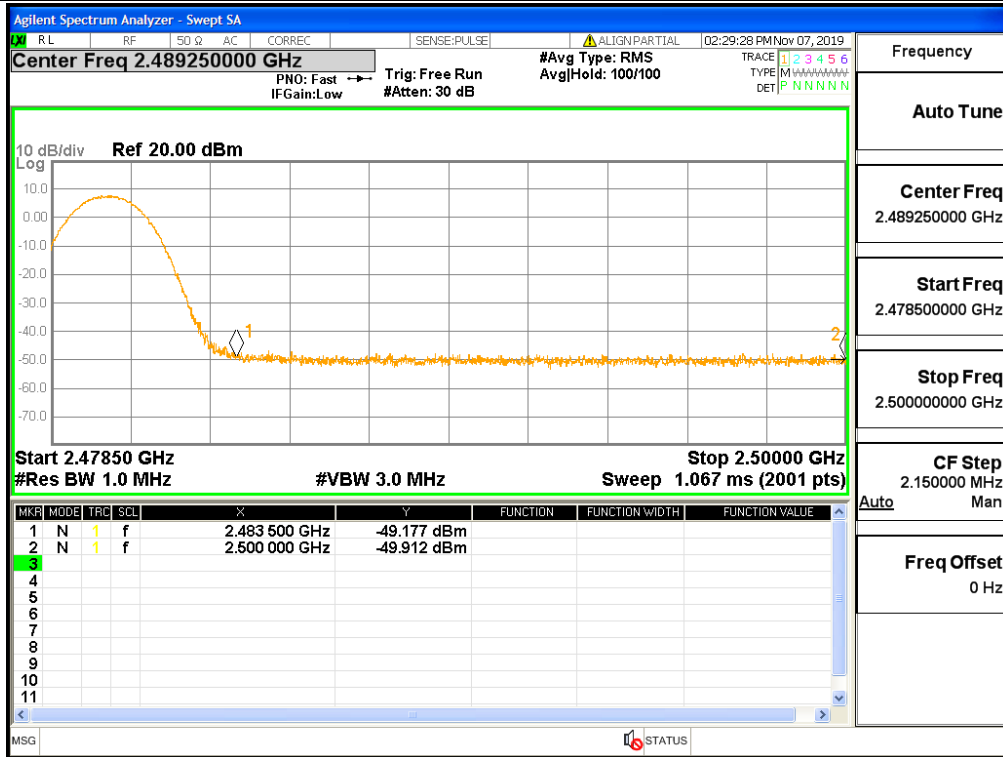
Restrict-band band-edge measurements\_2402\_PEAK\_3DH5



Restrict-band band-edge measurements\_2402\_AV\_3DH5



Restrict-band band-edge measurements\_2480\_PEAK\_3DH5



Restrict-band band-edge measurements\_2480\_AV\_3DH5

