

## Appendix A

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

Product Name: Bluetooth Earphones

Trade Mark: Altec Lansing

Test Model: MZX148

FCC ID: 2AL9B-MZX148

### Environmental Conditions

Temperature:	22.3 ° C
Relative Humidity:	50%
ATM Pressure:	100.0 kPa
Test Engineer:	Gary Qian
Supervised by:	Eden Hu

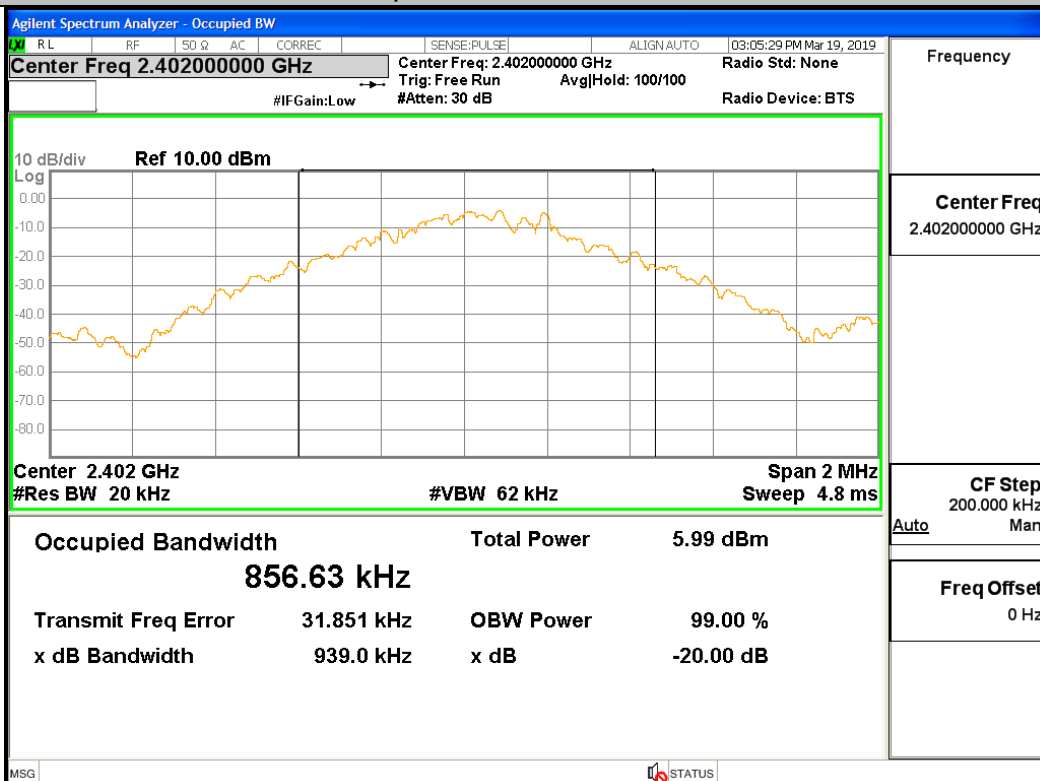
#### A.1 20 dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit(MHz)	Verdict
GFSK	LCH	0.939	Not Specified	PASS
GFSK	MCH	0.936	Not Specified	PASS
GFSK	HCH	0.944	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.285	Not Specified	PASS
$\pi/4$ DQPSK	MCH	1.250	Not Specified	PASS
$\pi/4$ DQPSK	HCH	1.228	Not Specified	PASS
8DPSK	LCH	1.297	Not Specified	PASS
8DPSK	MCH	1.255	Not Specified	PASS
8DPSK	HCH	1.253	Not Specified	PASS

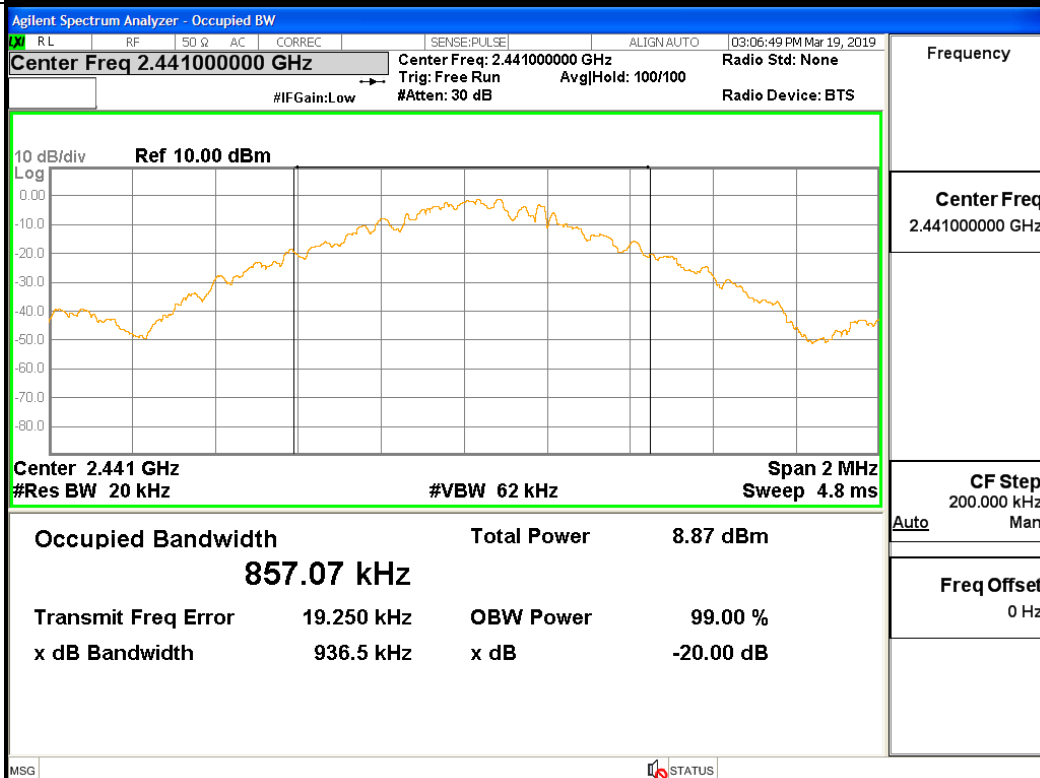
## Test Graph

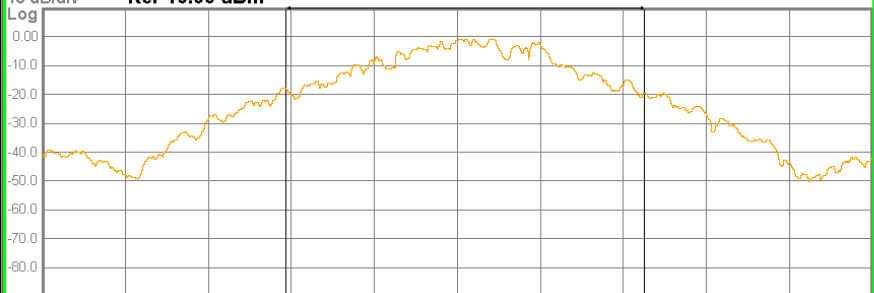
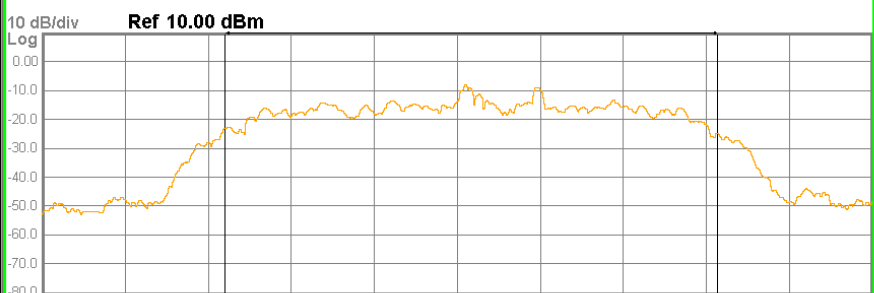
### Graphs

GFSK/LCH

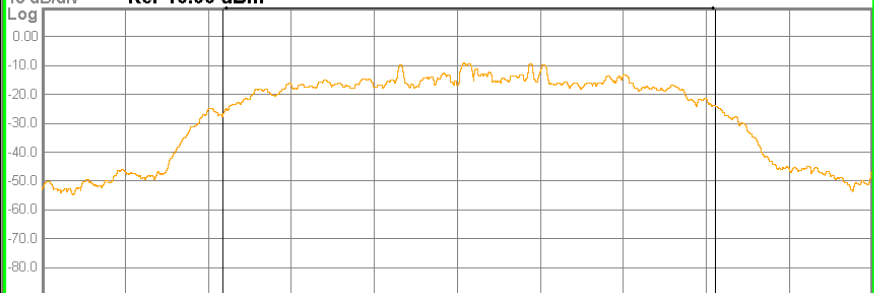
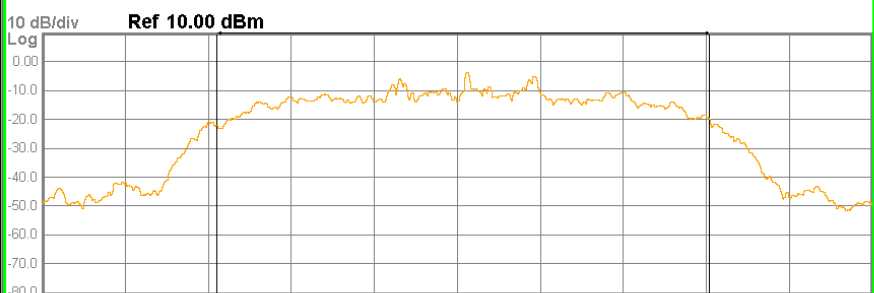


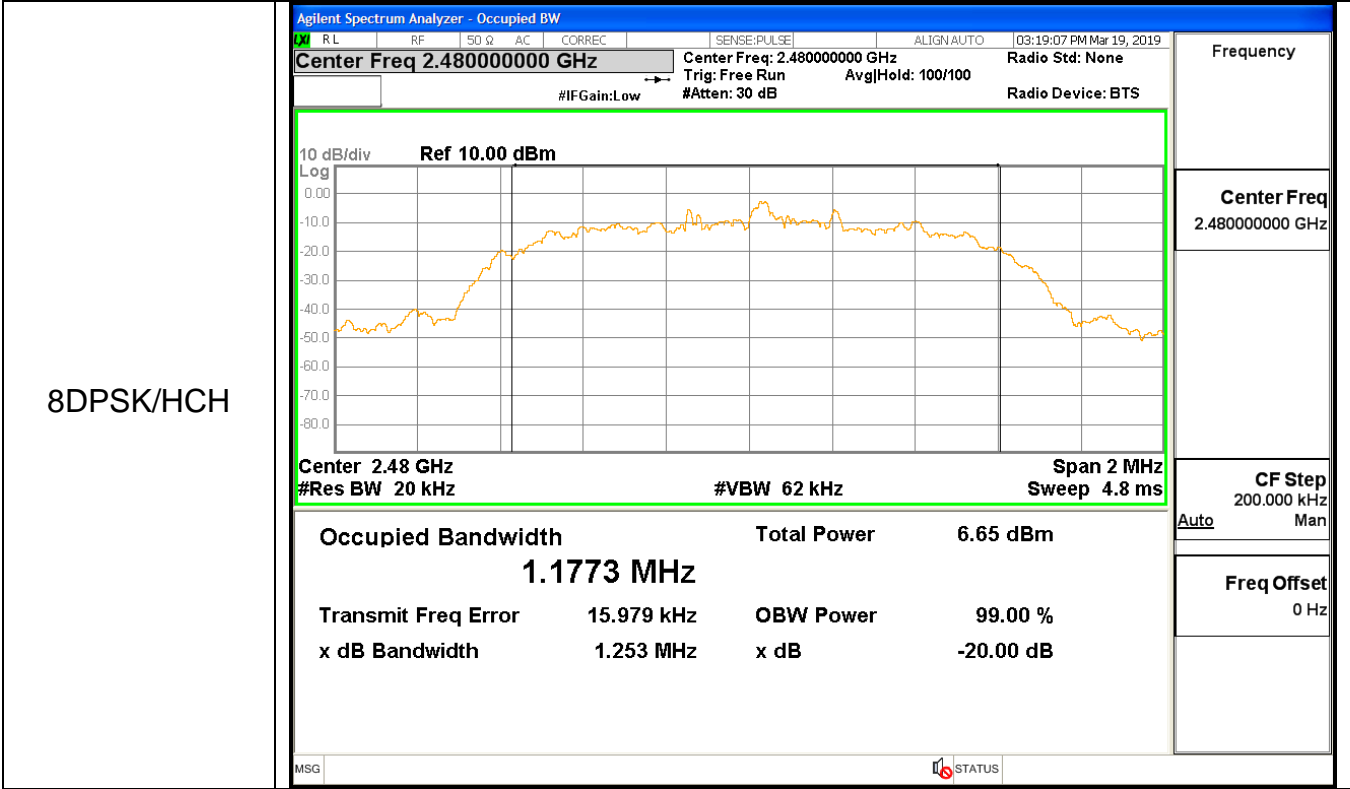
GFSK/MCH



GFSK/HCH	<div>Agilent Spectrum Analyzer - Occupied BW</div> <div><div><div>RL</div><div>RF</div><div>50 Ω</div><div>AC</div><div>CORREC</div></div><div><div>SENSE:PULSE</div><div>ALIGN:AUTO</div><div>03:09:30 PM Mar 19, 2019</div></div></div> <div><div>Center Freq 2.480000000 GHz</div><div>Center Freq: 2.480000000 GHz</div><div>Radio Std: None</div></div> <div><div>#IFGain:Low</div><div>#Atten: 30 dB</div><div>AvgHold: 100/100</div><div>Radio Device: BTS</div></div>				Frequency
	<div><div>10 dB/div</div><div>Ref 10.00 dBm</div><div><div>Log</div><div></div></div></div> <div><div>Center 2.48 GHz</div><div>#Res BW 20 kHz</div><div>#VBW 62 kHz</div><div>Span 2 MHz</div><div>Sweep 4.8 ms</div></div>				Center Freq 2.480000000 GHz
	<div><div>Occupied Bandwidth</div><div>859.73 kHz</div><div>Total Power</div><div>9.70 dBm</div></div> <div><div>Transmit Freq Error</div><div>18.994 kHz</div><div>OBW Power</div><div>99.00 %</div></div> <div><div>x dB Bandwidth</div><div>944.1 kHz</div><div>x dB</div><div>-20.00 dB</div></div>				CF Step 200.000 kHz Auto Man
					Freq Offset 0 Hz
π/4DQPSK/LCH	<div>Agilent Spectrum Analyzer - Occupied BW</div> <div><div><div>RL</div><div>RF</div><div>50 Ω</div><div>AC</div><div>CORREC</div></div><div><div>SENSE:PULSE</div><div>ALIGN:AUTO</div><div>03:10:53 PM Mar 19, 2019</div></div></div> <div><div>Center Freq 2.402000000 GHz</div><div>Center Freq: 2.402000000 GHz</div><div>Radio Std: None</div></div> <div><div>#IFGain:Low</div><div>#Atten: 30 dB</div><div>AvgHold: 100/100</div><div>Radio Device: BTS</div></div>				Frequency
	<div><div>10 dB/div</div><div>Ref 10.00 dBm</div><div><div>Log</div><div></div></div></div> <div><div>Center 2.402 GHz</div><div>#Res BW 20 kHz</div><div>#VBW 62 kHz</div><div>Span 2 MHz</div><div>Sweep 4.8 ms</div></div>				Center Freq 2.402000000 GHz
	<div><div>Occupied Bandwidth</div><div>1.1844 MHz</div><div>Total Power</div><div>1.82 dBm</div></div> <div><div>Transmit Freq Error</div><div>33.704 kHz</div><div>OBW Power</div><div>99.00 %</div></div> <div><div>x dB Bandwidth</div><div>1.285 MHz</div><div>x dB</div><div>-20.00 dB</div></div>				CF Step 200.000 kHz Auto Man
					Freq Offset 0 Hz

<p><math>\pi</math>/4DQPSK/MCH</p>	<div> <div> Agilent Spectrum Analyzer - Occupied BW <div> <div>RL</div> <div>RF</div> <div>50 <math>\Omega</math></div> <div>AC</div> <div>CORREC</div> <div>SENSE:PULSE</div> <div>ALIGN:AUTO</div> <div>03:12:19 PM Mar 19, 2019</div> </div> <div> <div>Center Freq 2.441000000 GHz</div> <div>Center Freq: 2.441000000 GHz</div> <div>Trig: Free Run</div> <div>Avg/Hold: 100/100</div> <div>Radio Std: None</div> <div>#IFGain:Low</div> <div>#Atten: 30 dB</div> <div>Radio Device: BTS</div> </div> </div> <div> <div>10 dB/div</div> <div>Ref 10.00 dBm</div>  </div> <div> <div>Center 2.441 GHz</div> <div>#Res BW 20 kHz</div> <div>#VBW 62 kHz</div> <div>Span 2 MHz</div> <div>Sweep 4.8 ms</div> </div> <div> <div>Occupied Bandwidth</div> <div>1.1734 MHz</div> <div>Total Power</div> <div>5.29 dBm</div> <div>Transmit Freq Error</div> <div>22.683 kHz</div> <div>OBW Power</div> <div>99.00 %</div> <div>x dB Bandwidth</div> <div>1.250 MHz</div> <div>x dB</div> <div>-20.00 dB</div> </div> <div> <div>MSG</div> <div>STATUS</div> </div> </div> <div> <div>Frequency</div> <div>Center Freq</div> <div>2.441000000 GHz</div> <div>CF Step</div> <div>200.000 kHz</div> <div>Auto</div> <div>Man</div> <div>Freq Offset</div> <div>0 Hz</div> </div>
<p><math>\pi</math>/4DQPSK/HCH</p>	<div> <div> Agilent Spectrum Analyzer - Occupied BW <div> <div>RL</div> <div>RF</div> <div>50 <math>\Omega</math></div> <div>AC</div> <div>CORREC</div> <div>SENSE:PULSE</div> <div>ALIGN:AUTO</div> <div>03:14:47 PM Mar 19, 2019</div> </div> <div> <div>Center Freq 2.480000000 GHz</div> <div>Center Freq: 2.480000000 GHz</div> <div>Trig: Free Run</div> <div>Avg/Hold: 100/100</div> <div>Radio Std: None</div> <div>#IFGain:Low</div> <div>#Atten: 30 dB</div> <div>Radio Device: BTS</div> </div> </div> <div> <div>10 dB/div</div> <div>Ref 10.00 dBm</div>  </div> <div> <div>Center 2.48 GHz</div> <div>#Res BW 20 kHz</div> <div>#VBW 62 kHz</div> <div>Span 2 MHz</div> <div>Sweep 4.8 ms</div> </div> <div> <div>Occupied Bandwidth</div> <div>1.1713 MHz</div> <div>Total Power</div> <div>6.50 dBm</div> <div>Transmit Freq Error</div> <div>22.434 kHz</div> <div>OBW Power</div> <div>99.00 %</div> <div>x dB Bandwidth</div> <div>1.228 MHz</div> <div>x dB</div> <div>-20.00 dB</div> </div> <div> <div>MSG</div> <div>STATUS</div> </div> </div> <div> <div>Frequency</div> <div>Center Freq</div> <div>2.480000000 GHz</div> <div>CF Step</div> <div>200.000 kHz</div> <div>Auto</div> <div>Man</div> <div>Freq Offset</div> <div>0 Hz</div> </div>

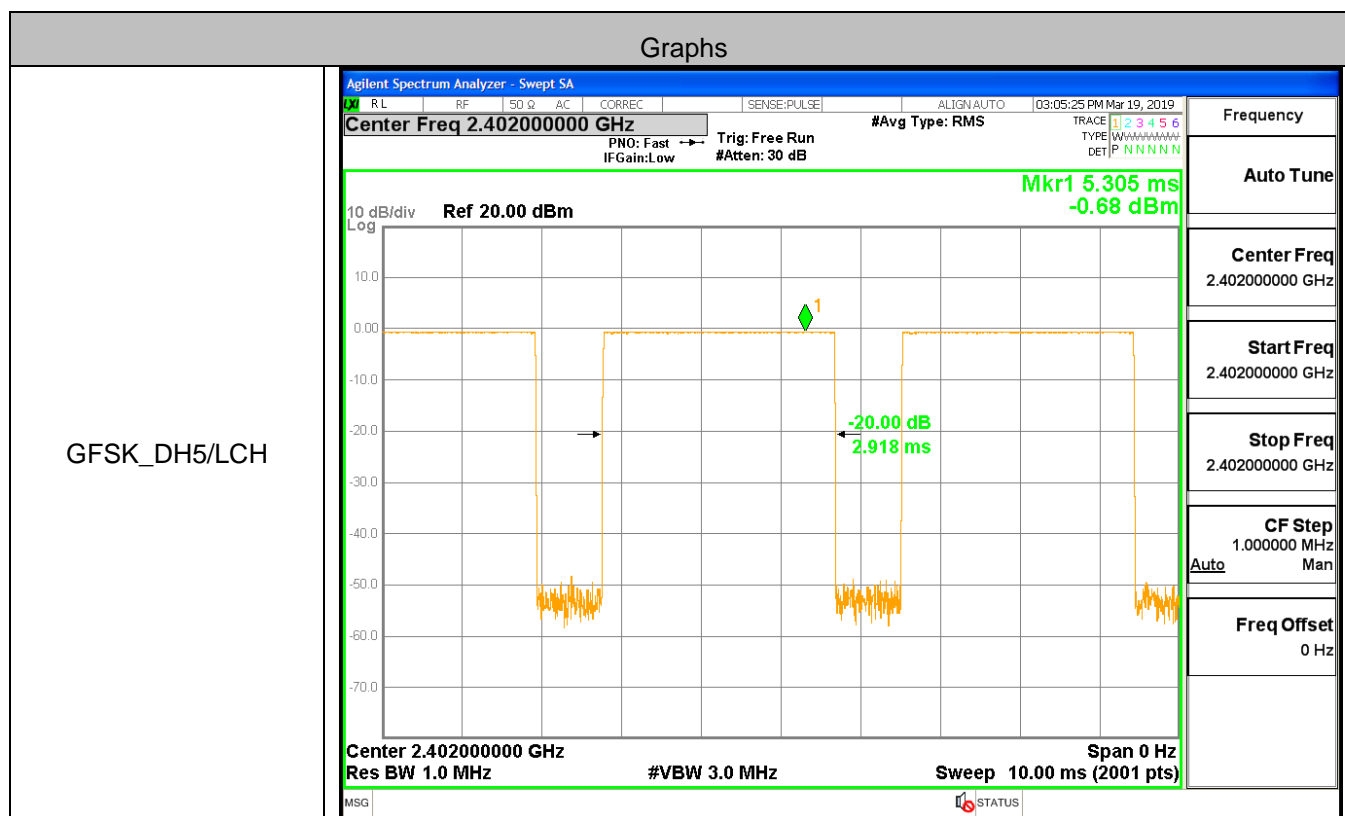
8DPSK/LCH	<div>Agilent Spectrum Analyzer - Occupied BW</div> <div><div><div>RL</div><div>RF</div><div>50 Ω</div><div>AC</div><div>CORREC</div></div><div><div>SENSE:PULSE</div><div>ALIGN:AUTO</div><div>03:16:35 PM Mar 19, 2019</div></div></div> <div><div>Center Freq 2.402000000 GHz</div><div>Center Freq: 2.402000000 GHz</div><div>Radio Std: None</div></div> <div><div>#IFGain:Low</div><div>#Atten: 30 dB</div><div>AvgHold: 100/100</div><div>Radio Device: BTS</div></div>										Frequency
	<div>10 dB/div</div> <div>Ref 10.00 dBm</div> <div>Log</div> 										Center Freq 2.402000000 GHz
	<div>Center 2.402 GHz</div> <div>#Res BW 20 kHz</div> <div>#VBW 62 kHz</div> <div>Span 2 MHz</div> <div>Sweep 4.8 ms</div>										CF Step 200.000 kHz Auto Man
	<div>Occupied Bandwidth</div> <div>1.1824 MHz</div> <div>Total Power</div> <div>1.99 dBm</div> <div>Transmit Freq Error</div> <div>29.230 kHz</div> <div>OBW Power</div> <div>99.00 %</div> <div>x dB Bandwidth</div> <div>1.297 MHz</div> <div>x dB</div> <div>-20.00 dB</div>										Freq Offset 0 Hz
8DPSK/MCH	<div>Agilent Spectrum Analyzer - Occupied BW</div> <div><div><div>RL</div><div>RF</div><div>50 Ω</div><div>AC</div><div>CORREC</div></div><div><div>SENSE:PULSE</div><div>ALIGN:AUTO</div><div>03:17:54 PM Mar 19, 2019</div></div></div> <div><div>Center Freq 2.441000000 GHz</div><div>Center Freq: 2.441000000 GHz</div><div>Radio Std: None</div></div> <div><div>#IFGain:Low</div><div>#Atten: 30 dB</div><div>AvgHold: 100/100</div><div>Radio Device: BTS</div></div>										Frequency
	<div>10 dB/div</div> <div>Ref 10.00 dBm</div> <div>Log</div> 										Center Freq 2.441000000 GHz
	<div>Center 2.441 GHz</div> <div>#Res BW 20 kHz</div> <div>#VBW 62 kHz</div> <div>Span 2 MHz</div> <div>Sweep 4.8 ms</div>										CF Step 200.000 kHz Auto Man
	<div>Occupied Bandwidth</div> <div>1.1819 MHz</div> <div>Total Power</div> <div>5.46 dBm</div> <div>Transmit Freq Error</div> <div>15.532 kHz</div> <div>OBW Power</div> <div>99.00 %</div> <div>x dB Bandwidth</div> <div>1.255 MHz</div> <div>x dB</div> <div>-20.00 dB</div>										Freq Offset 0 Hz

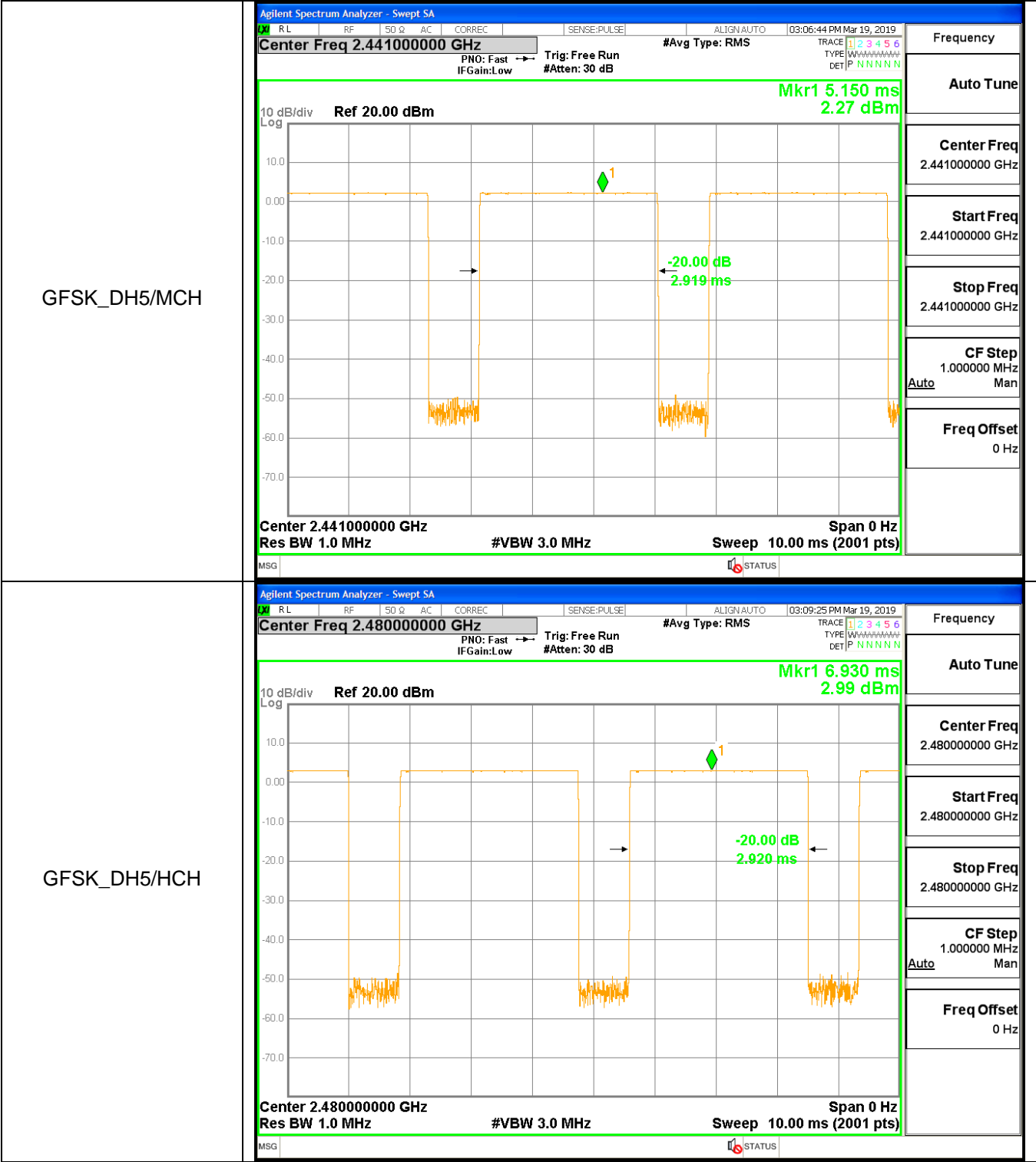


## A.2 Dwell Time

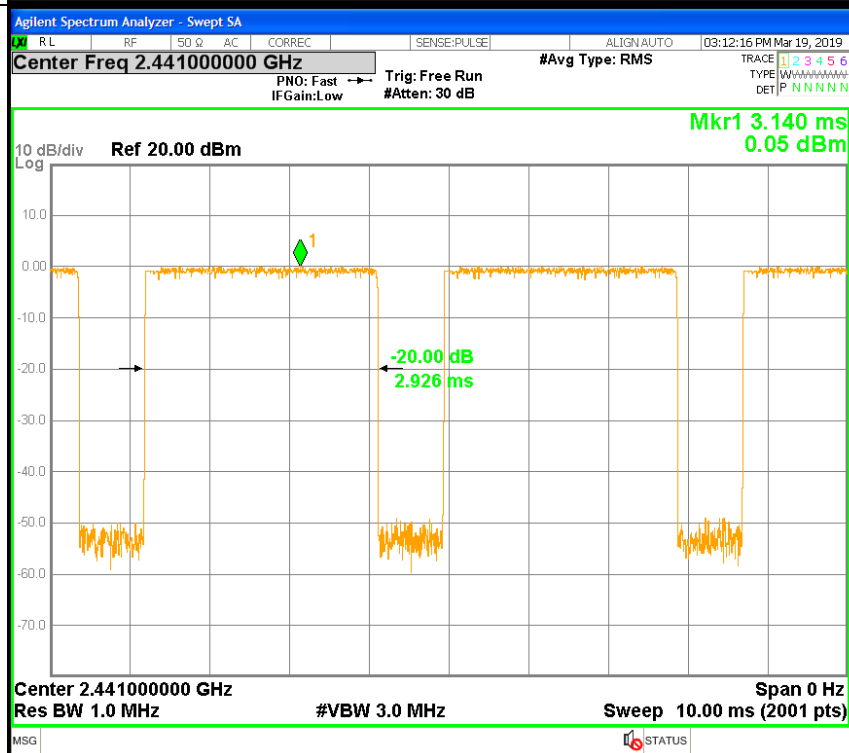
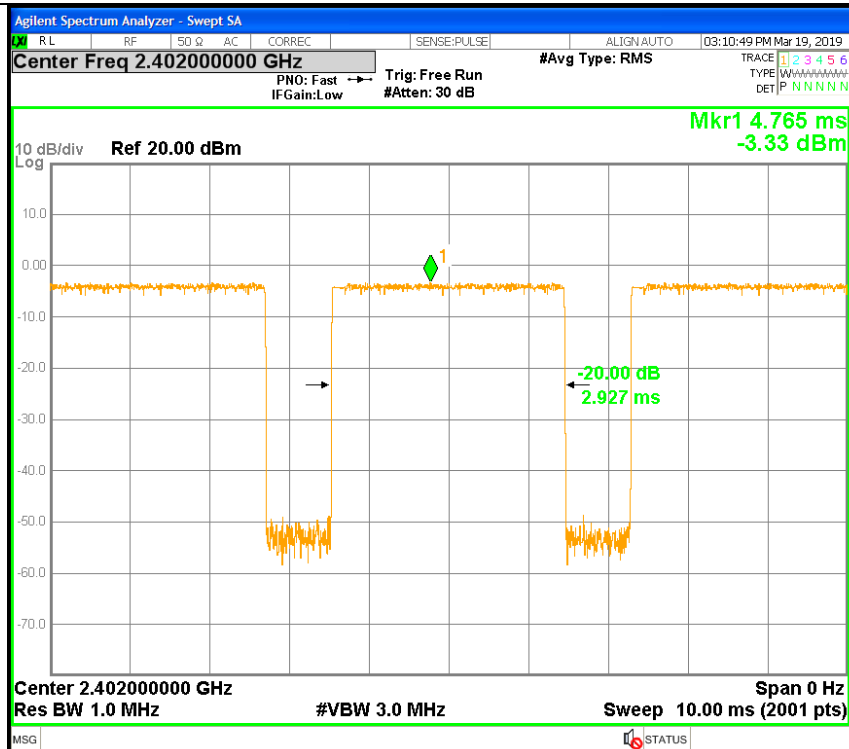
Mode	Packet	Channel	Burst Width [s/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	0.002918	106.7	0.311373	0.4	PASS
GFSK	DH5	MCH	0.002919	106.7	0.311479	0.4	PASS
GFSK	DH5	HCH	0.00292	106.7	0.311604	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	0.002927	106.7	0.312334	0.4	PASS
$\pi/4$ DQPSK	2DH5	MCH	0.002926	106.7	0.312196	0.4	PASS
$\pi/4$ DQPSK	2DH5	HCH	0.002927	106.7	0.312289	0.4	PASS
8DPSK	3DH5	LCH	0.002927	106.7	0.312297	0.4	PASS
8DPSK	3DH5	MCH	0.002927	106.7	0.312305	0.4	PASS
8DPSK	3DH5	HCH	0.002928	106.7	0.312443	0.4	PASS

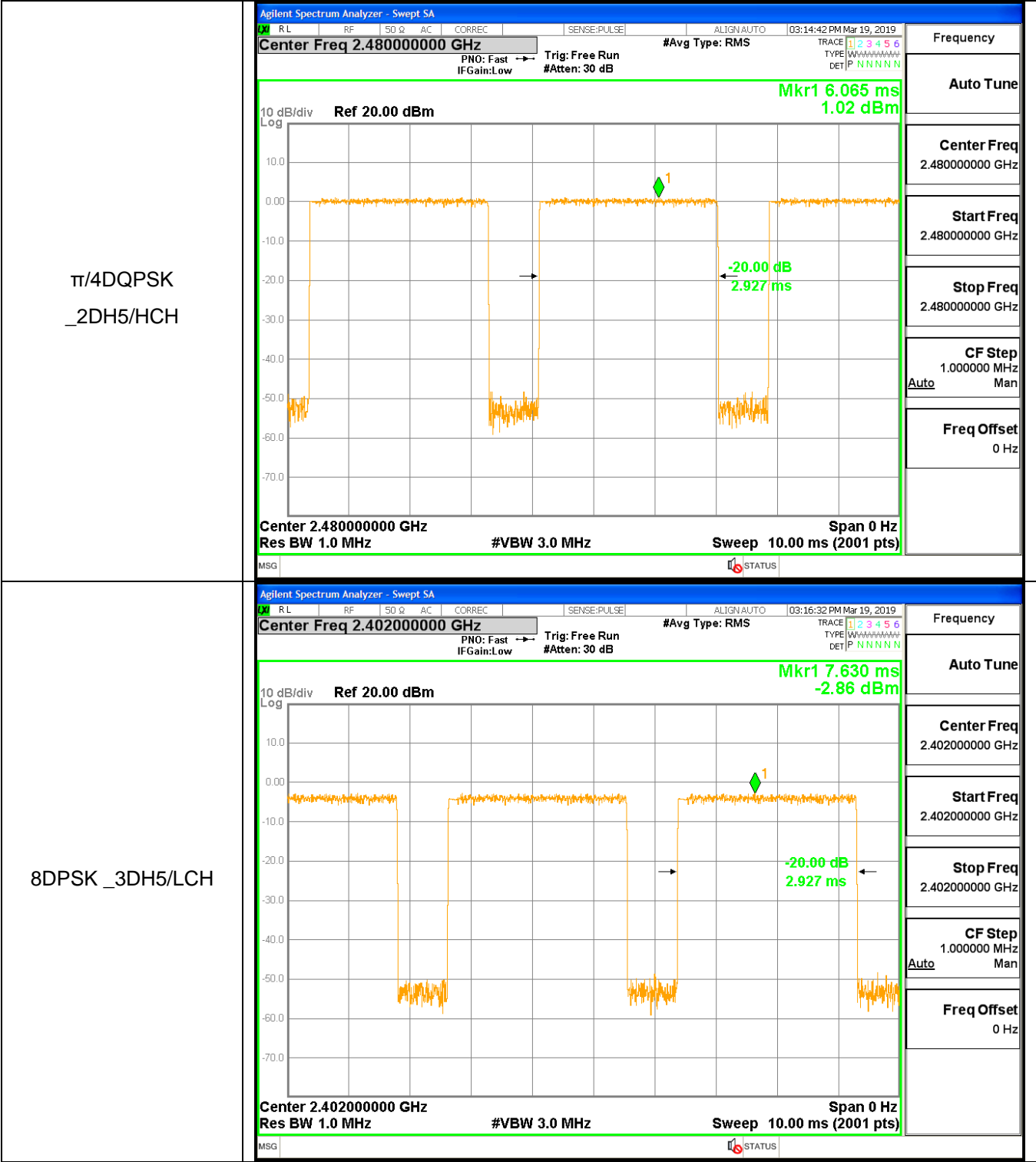
## Test Graph

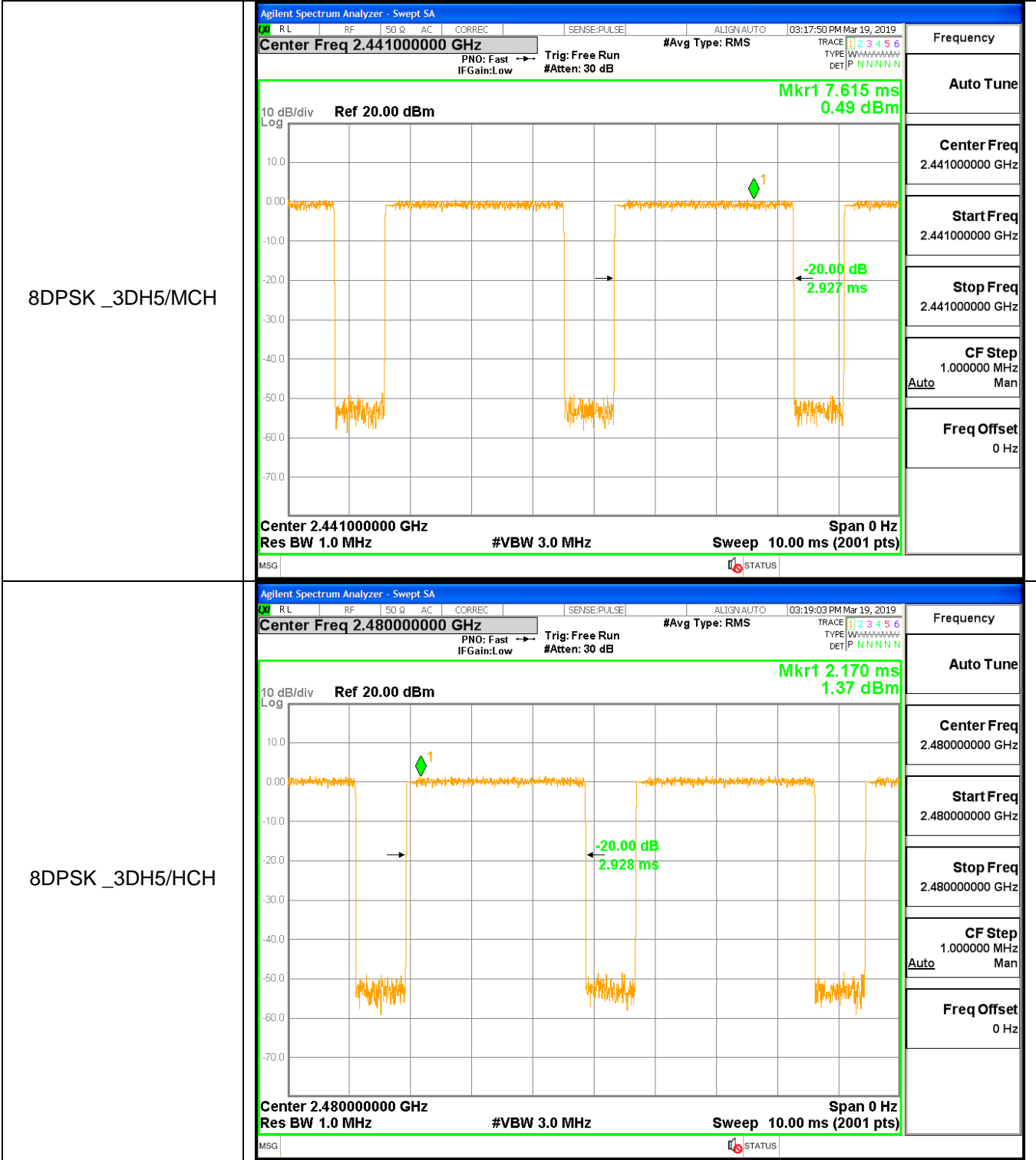








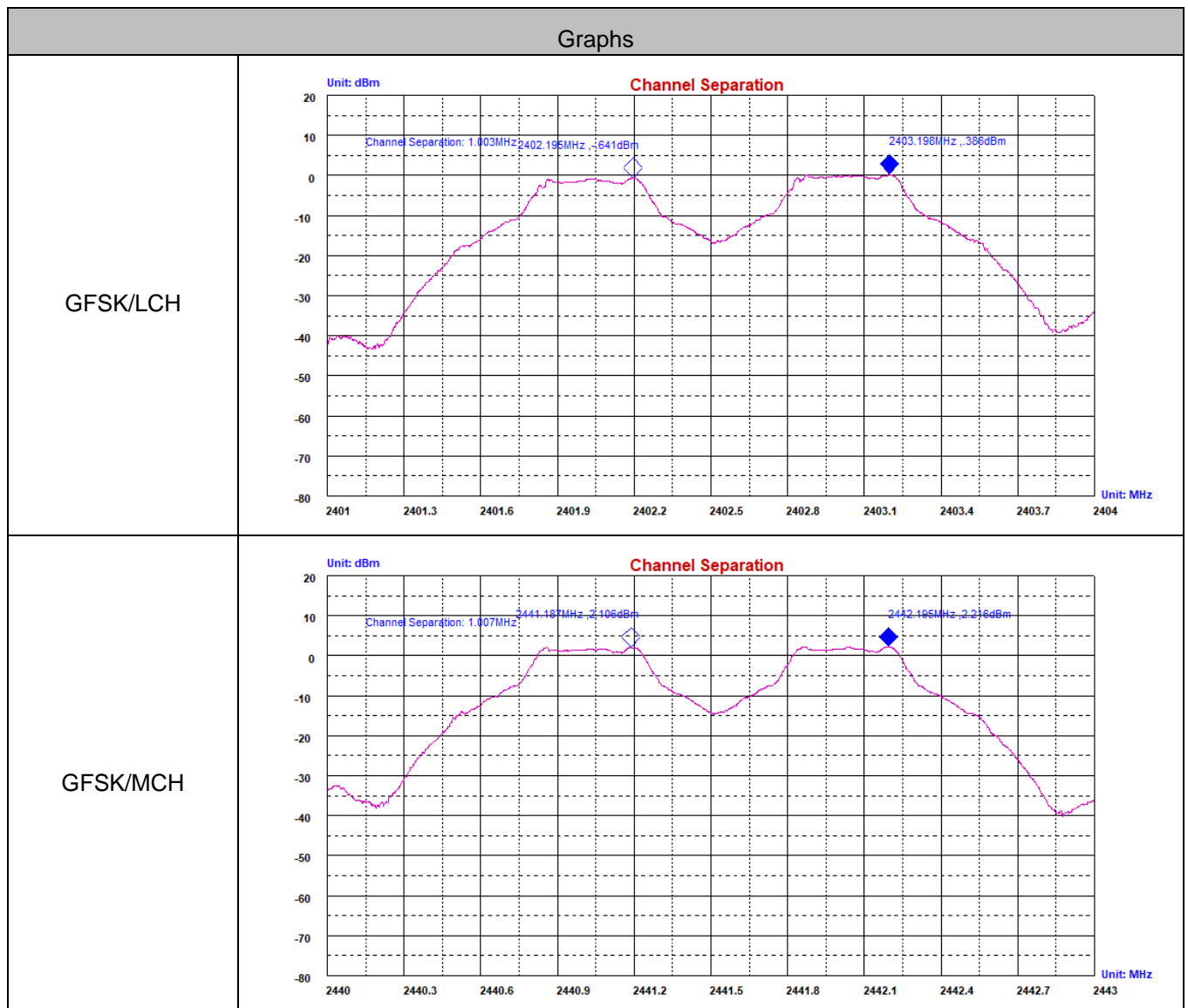


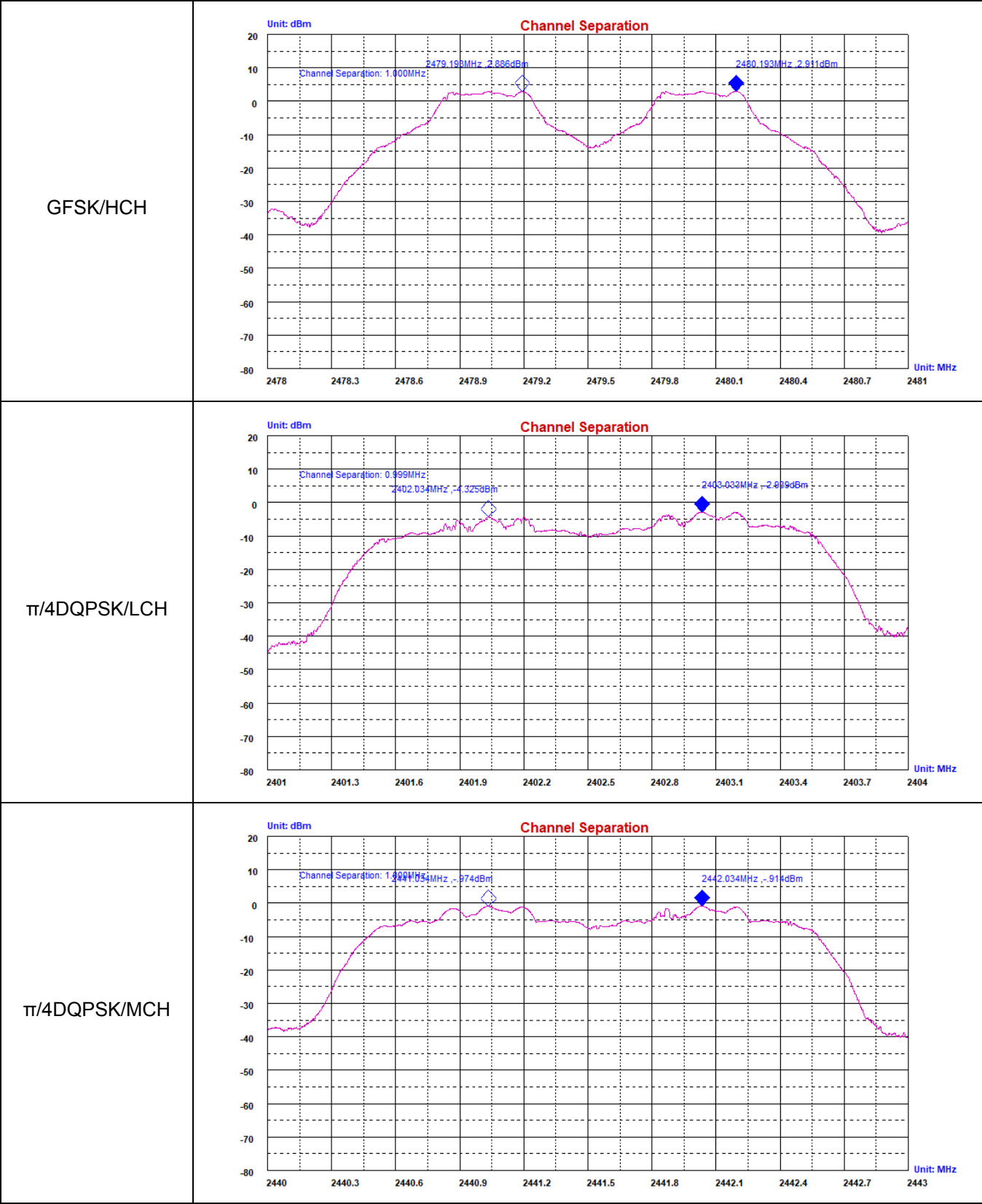


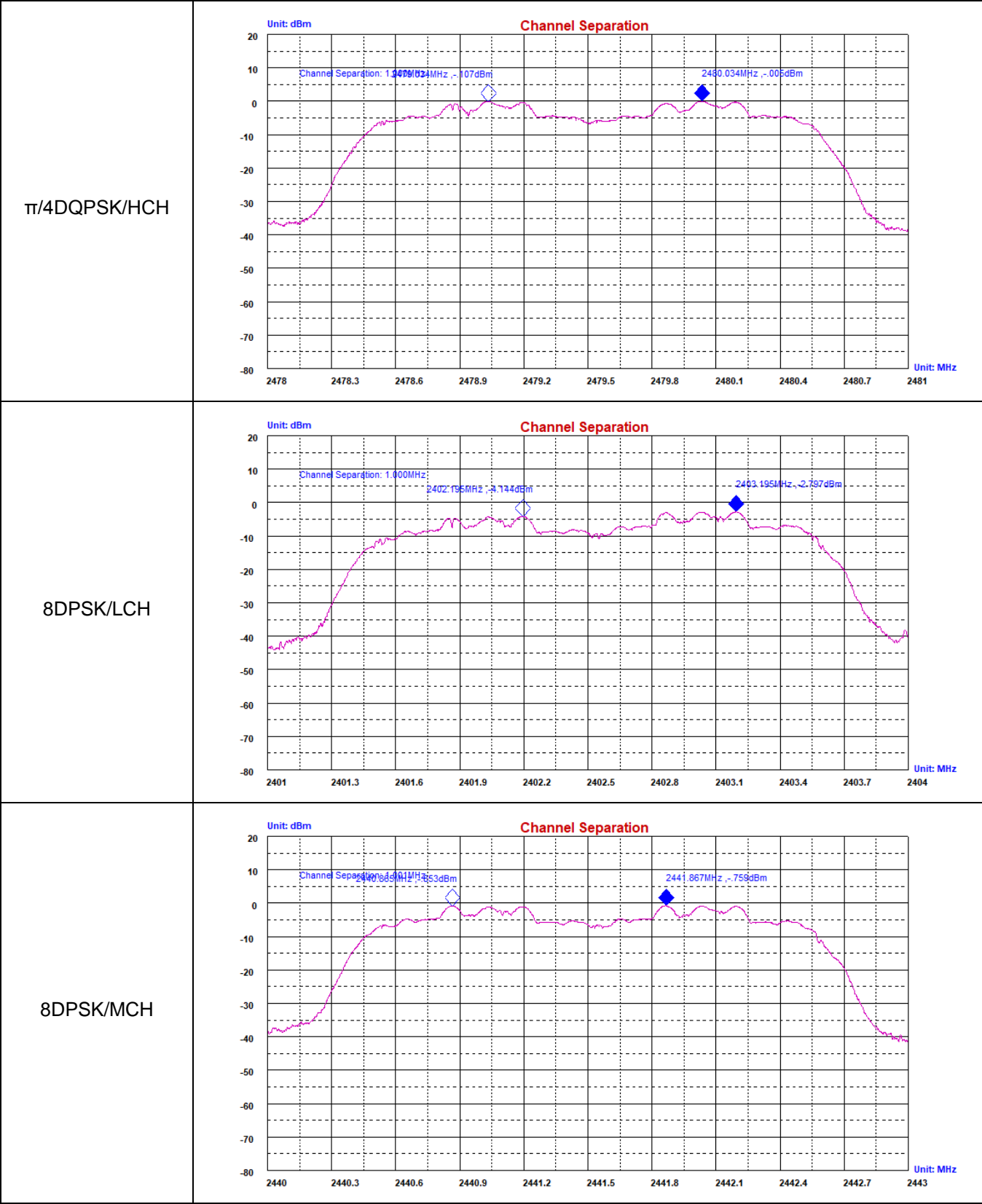
### A.3 Carrier Frequency Separation

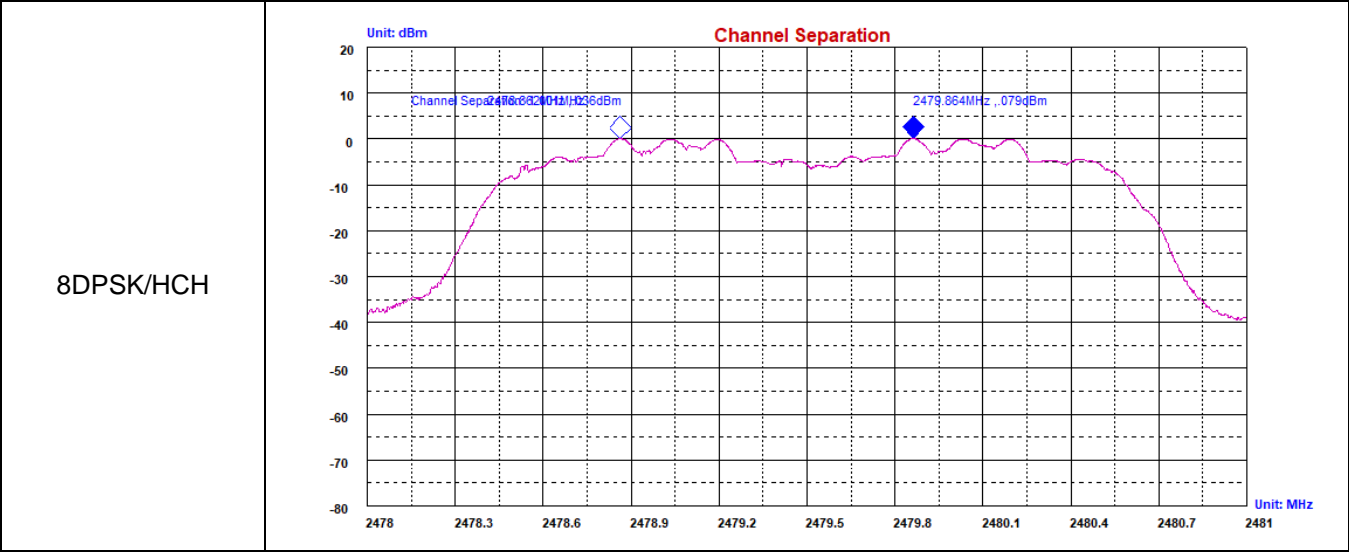
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.003	0.626	PASS
GFSK	MCH	1.007	0.624	PASS
GFSK	HCH	1.000	0.629	PASS
$\pi/4$ DQPSK	LCH	0.999	0.857	PASS
$\pi/4$ DQPSK	MCH	1.000	0.833	PASS
$\pi/4$ DQPSK	HCH	1.000	0.819	PASS
8DPSK	LCH	1.000	0.865	PASS
8DPSK	MCH	1.001	0.837	PASS
8DPSK	HCH	1.001	0.835	PASS

### Test Graph





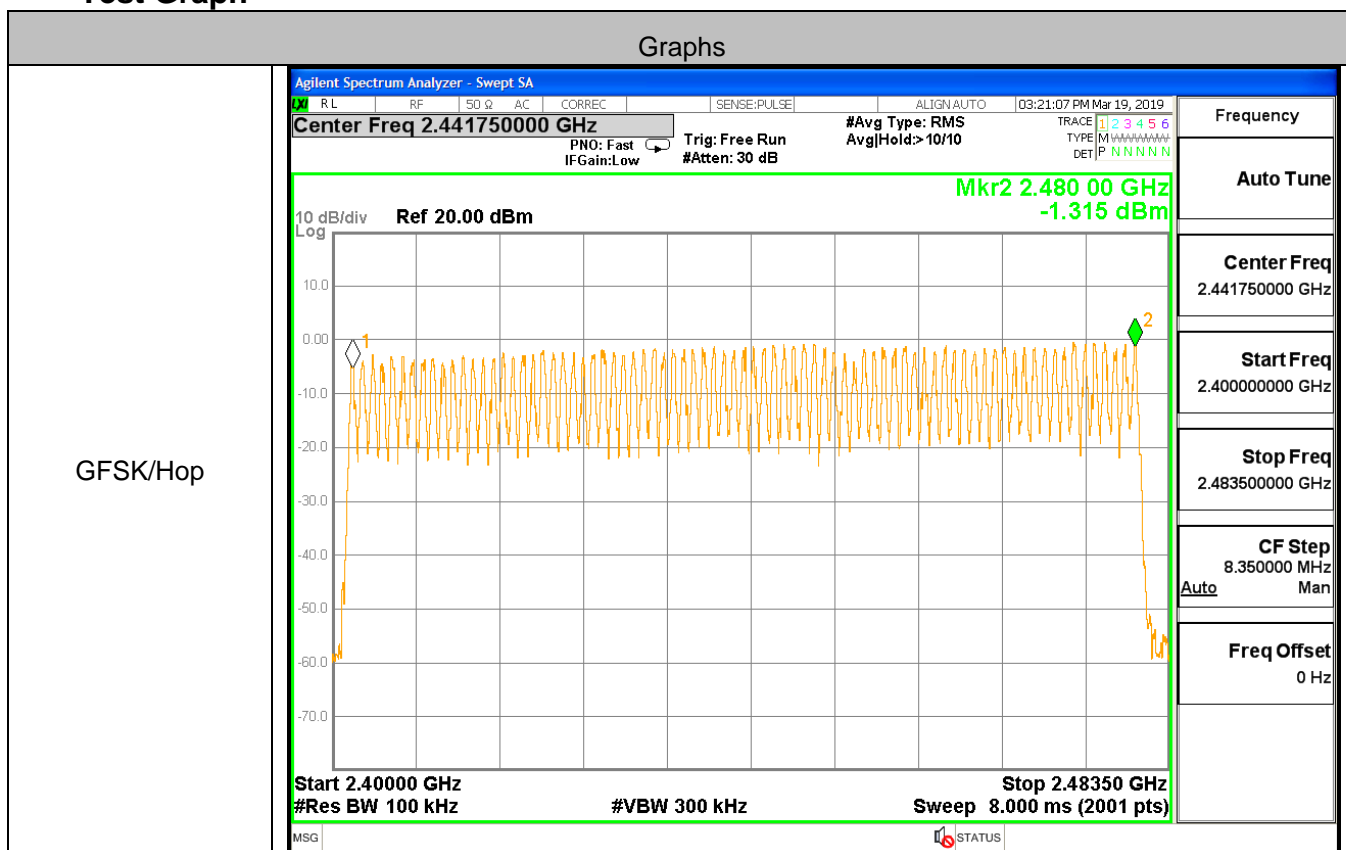




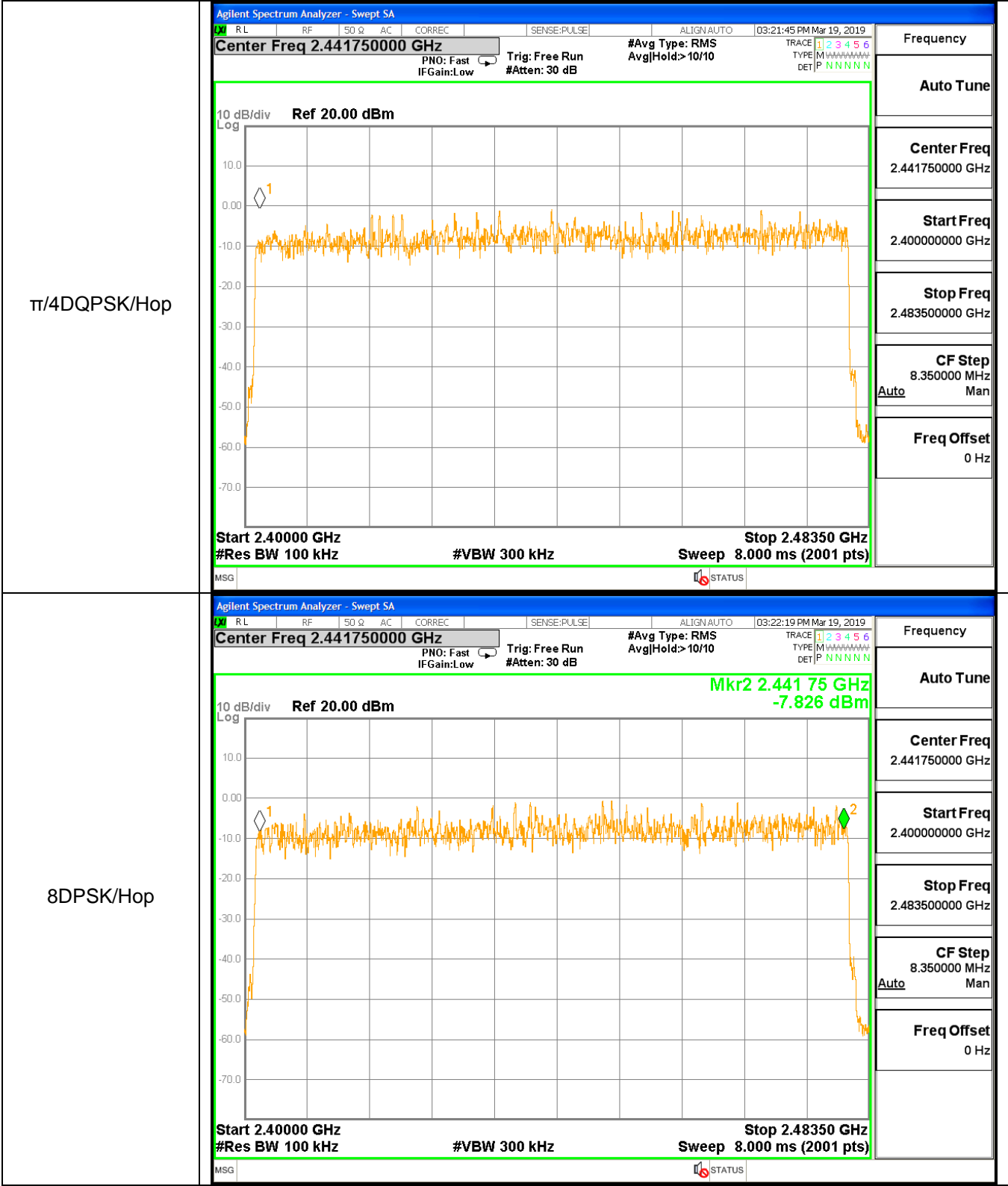
#### A.4 Hopping Channel Number

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





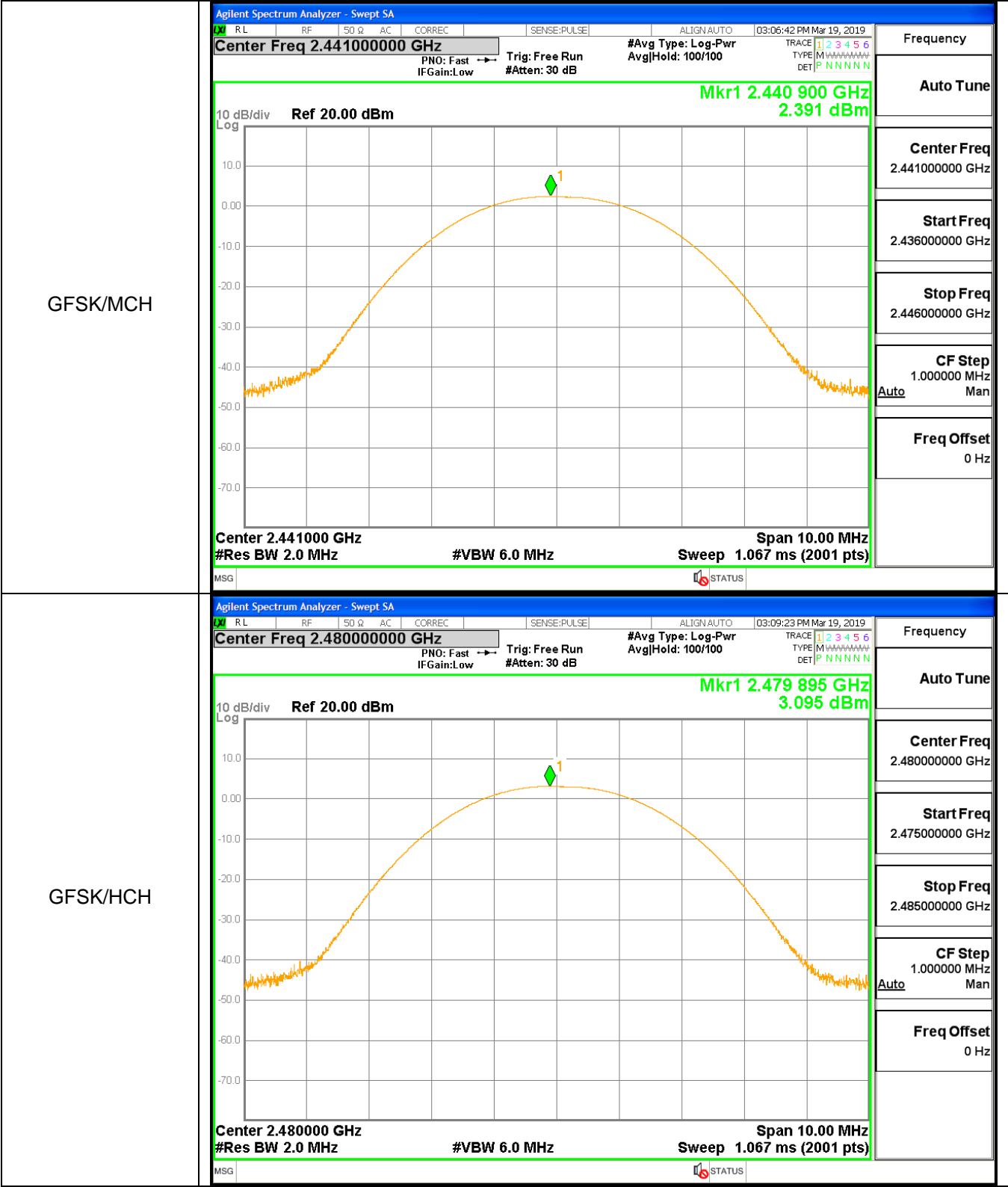


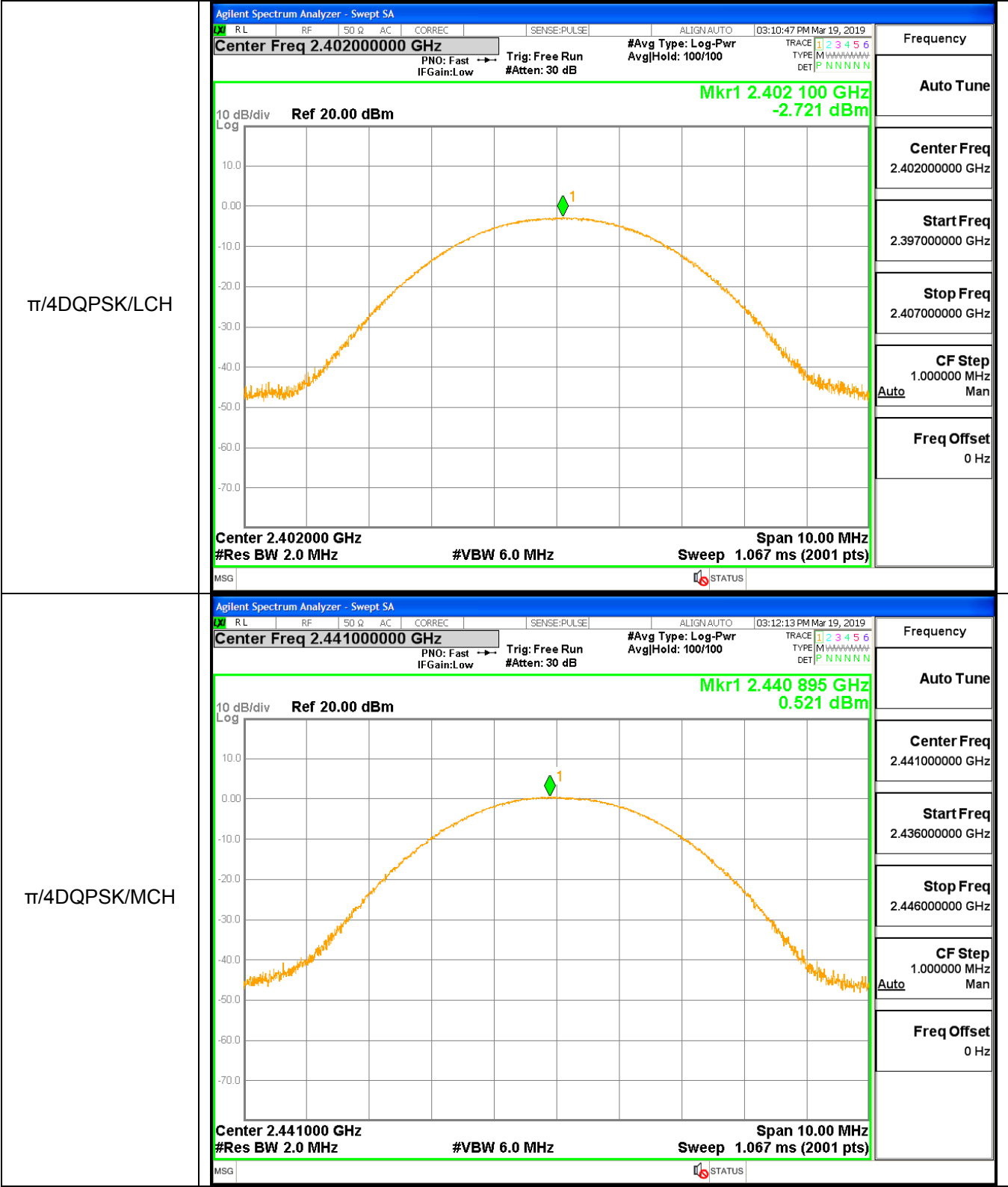
### A.5 Conducted Peak Output Power

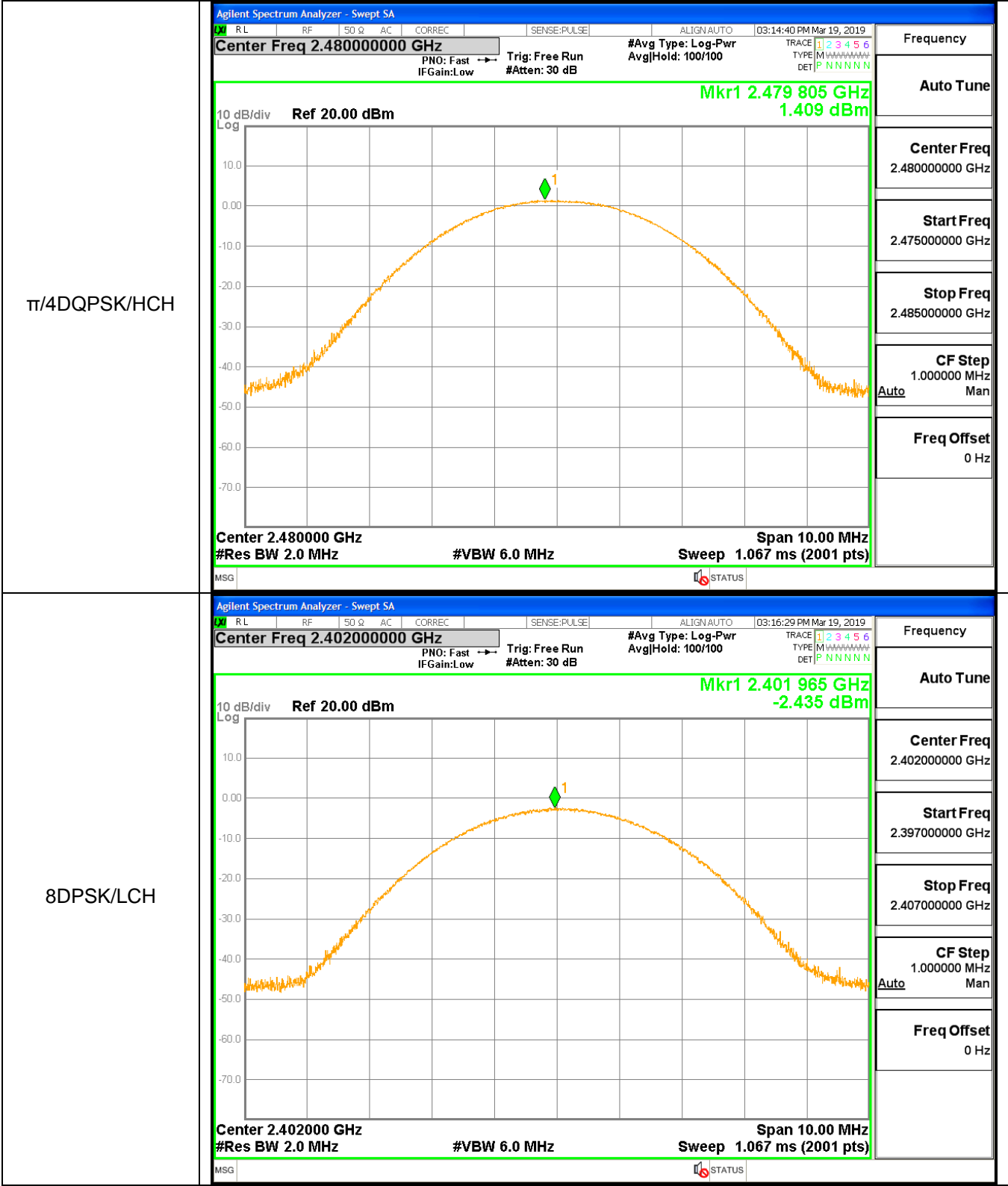
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-0.434	21	PASS
GFSK	MCH	2.391	21	PASS
GFSK	HCH	3.095	21	PASS
$\pi/4$ DQPSK	LCH	-2.721	21	PASS
$\pi/4$ DQPSK	MCH	0.521	21	PASS
$\pi/4$ DQPSK	HCH	1.409	21	PASS
8DPSK	LCH	-2.435	21	PASS
8DPSK	MCH	0.939	21	PASS
8DPSK	HCH	1.832	21	PASS

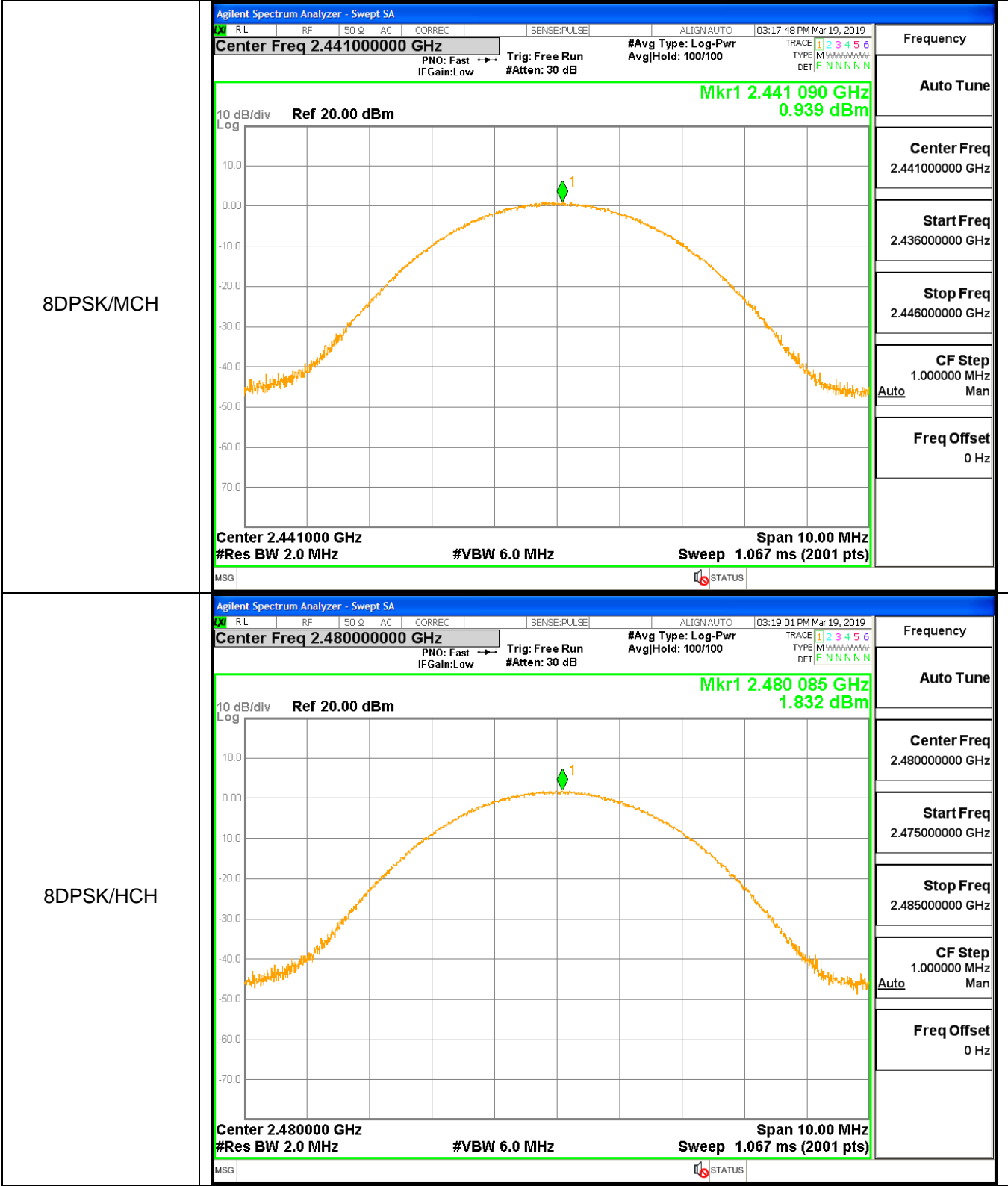
### Test Graph











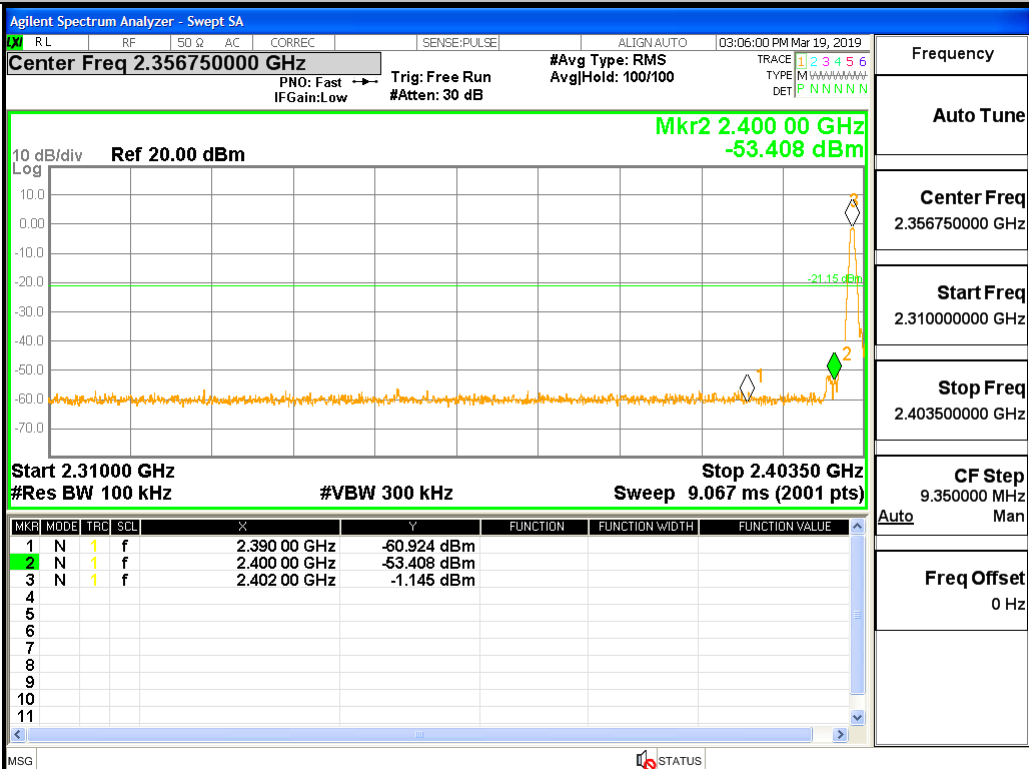
**A.6 Band-edge for RF Conducted Emissions**

Type	Carrier Frequency(MHz)	Frequency(MHz)	Carrier Frequency Power [dBm]	Bandedge Peak(dBm)	Upper limit(dBm)	Conclusion
1DH5	2402	2390	-1.145	-60.92	-21.145	Pass
1DH5	2402	2400	-1.145	-53.41	-21.145	Pass
1DH5-Hopping	2402	2390	-1.877	-59.04	-21.877	Pass
1DH5-Hopping	2402	2400	-1.877	-59.16	-21.877	Pass
1DH5	2480	2483.5	3.014	-60.09	-16.986	Pass
1DH5	2480	2500	3.014	-59.28	-16.986	Pass
1DH5-Hopping	2480	2483.5	-0.567	-59.05	-20.567	Pass
1DH5-Hopping	2480	2500	-0.567	-55.36	-20.567	Pass
2DH5	2402	2390	-4.444	-60.66	-24.444	Pass
2DH5	2402	2400	-4.444	-56.62	-24.444	Pass
2DH5-Hopping	2480	2483.5	-0.723	-57.81	-20.723	Pass
2DH5-Hopping	2480	2500	-0.723	-56.04	-20.723	Pass
2DH5	2480	2483.5	-0.416	-59.11	-20.416	Pass
2DH5	2480	2500	-0.416	-59.84	-20.416	Pass
2DH5-Hopping	2402	2390	-2.508	-59.19	-22.508	Pass
2DH5-Hopping	2402	2400	-2.508	-58.57	-22.508	Pass
3DH5	2402	2390	-4.153	-59.04	-24.153	Pass
3DH5	2402	2400	-4.153	-55.90	-24.153	Pass
3DH5-Hopping	2402	2390	-3.283	-60.19	-23.283	Pass
3DH5-Hopping	2402	2400	-3.283	-59.64	-23.283	Pass
3DH5	2480	2483.5	-0.073	-55.58	-20.073	Pass
3DH5	2480	2500	-0.073	-58.79	-20.073	Pass
3DH5-Hopping	2480	2483.5	-1.644	-56.88	-21.644	Pass
3DH5-Hopping	2480	2500	-1.644	-55.15	-21.644	Pass

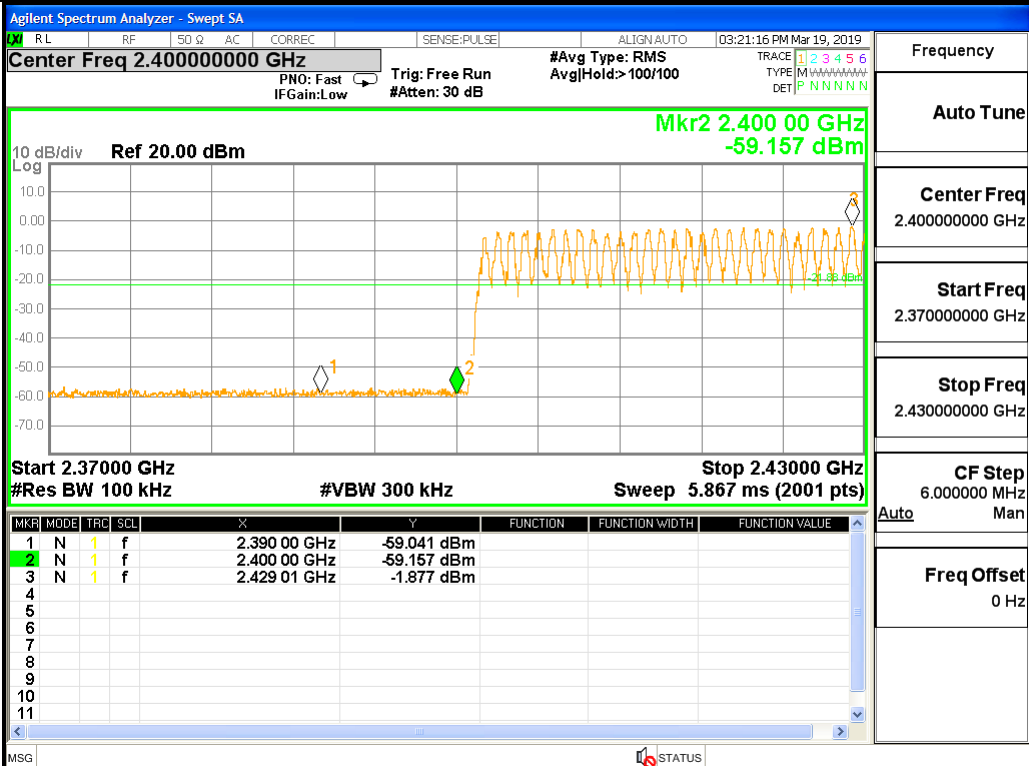
## Test Graph

## Graphs

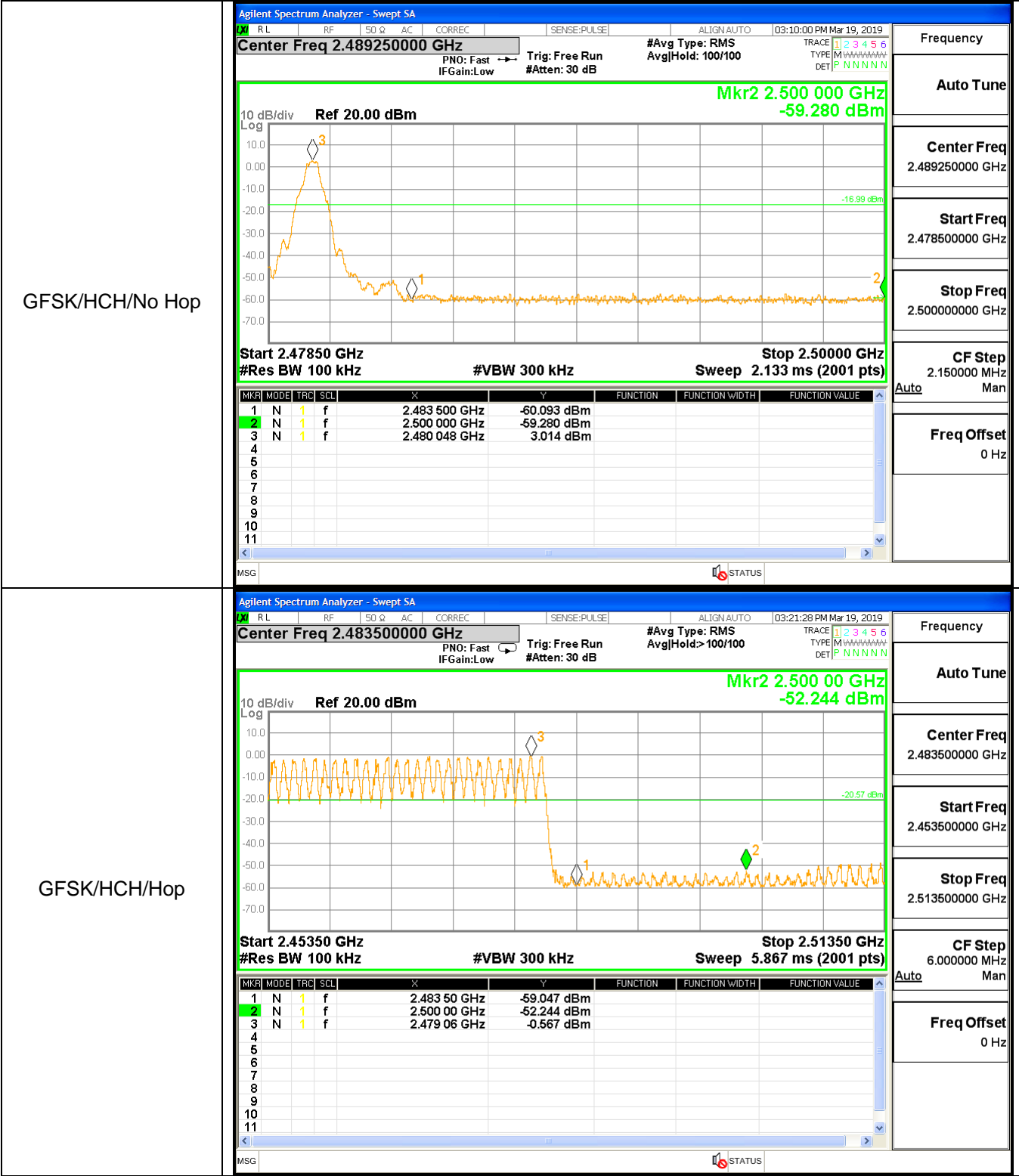
GFSK/LCH/No Hop



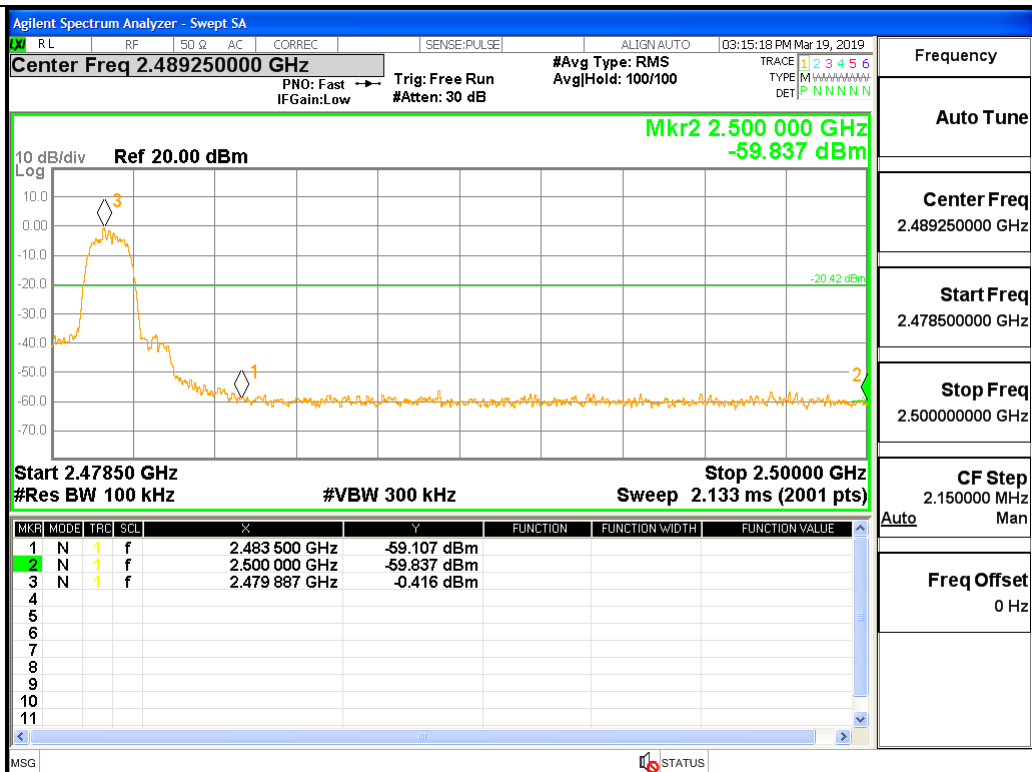
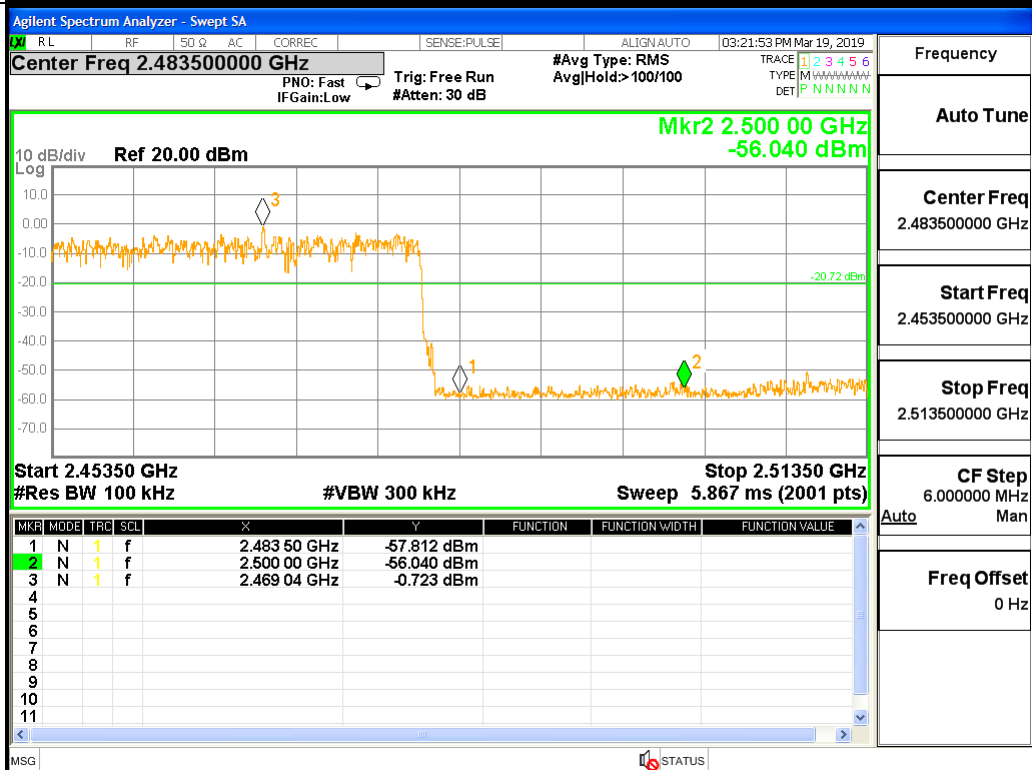
GFSK/LCH/Hop



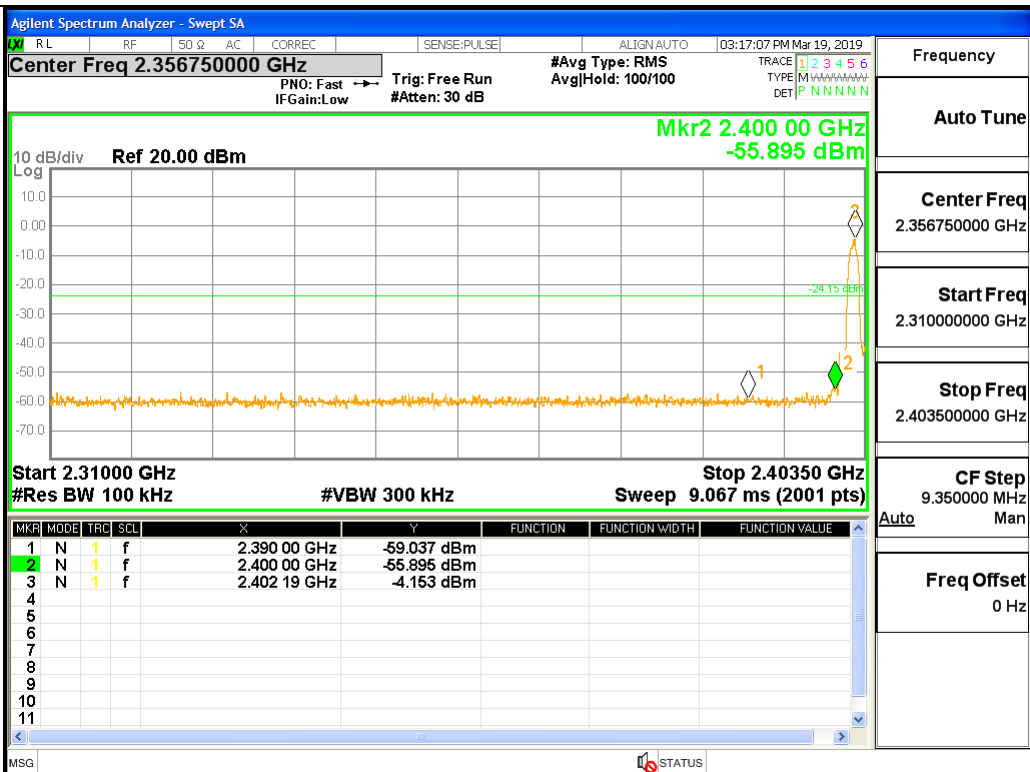




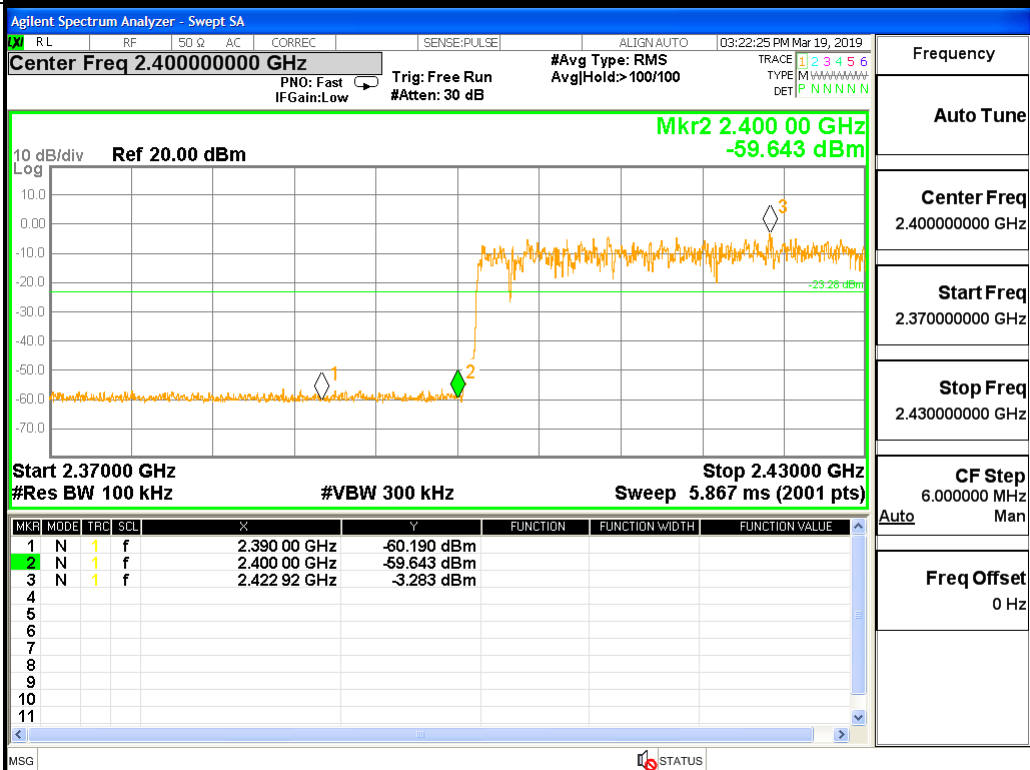


$\pi/4$ DQPSK/HCH/No  
Hop $\pi/4$ DQPSK/HCH/Hop

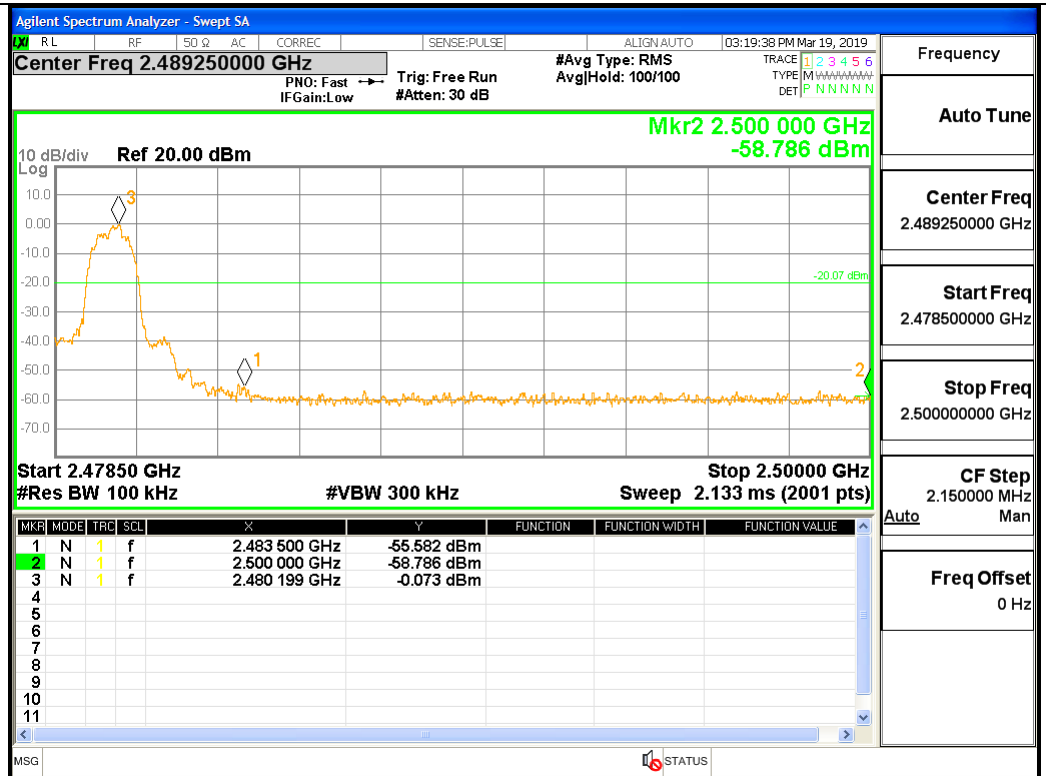
8DPSK/LCH/No Hop



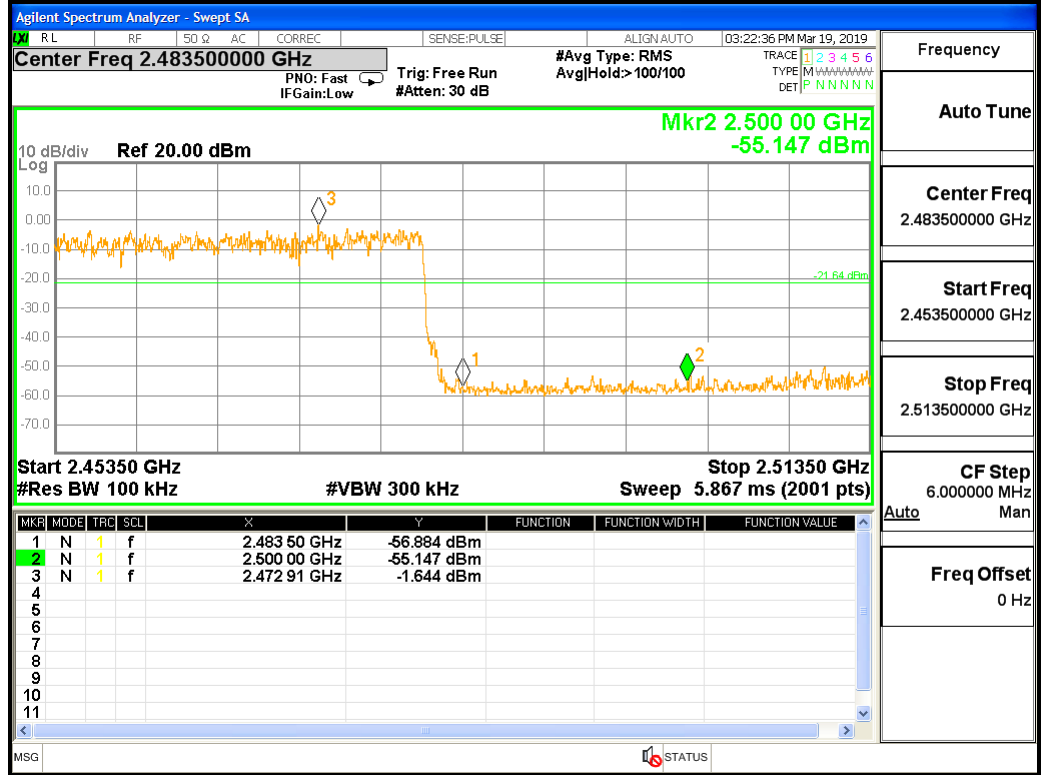
8DPSK/LCH/Hop



8DPSK/HCH/No Hop

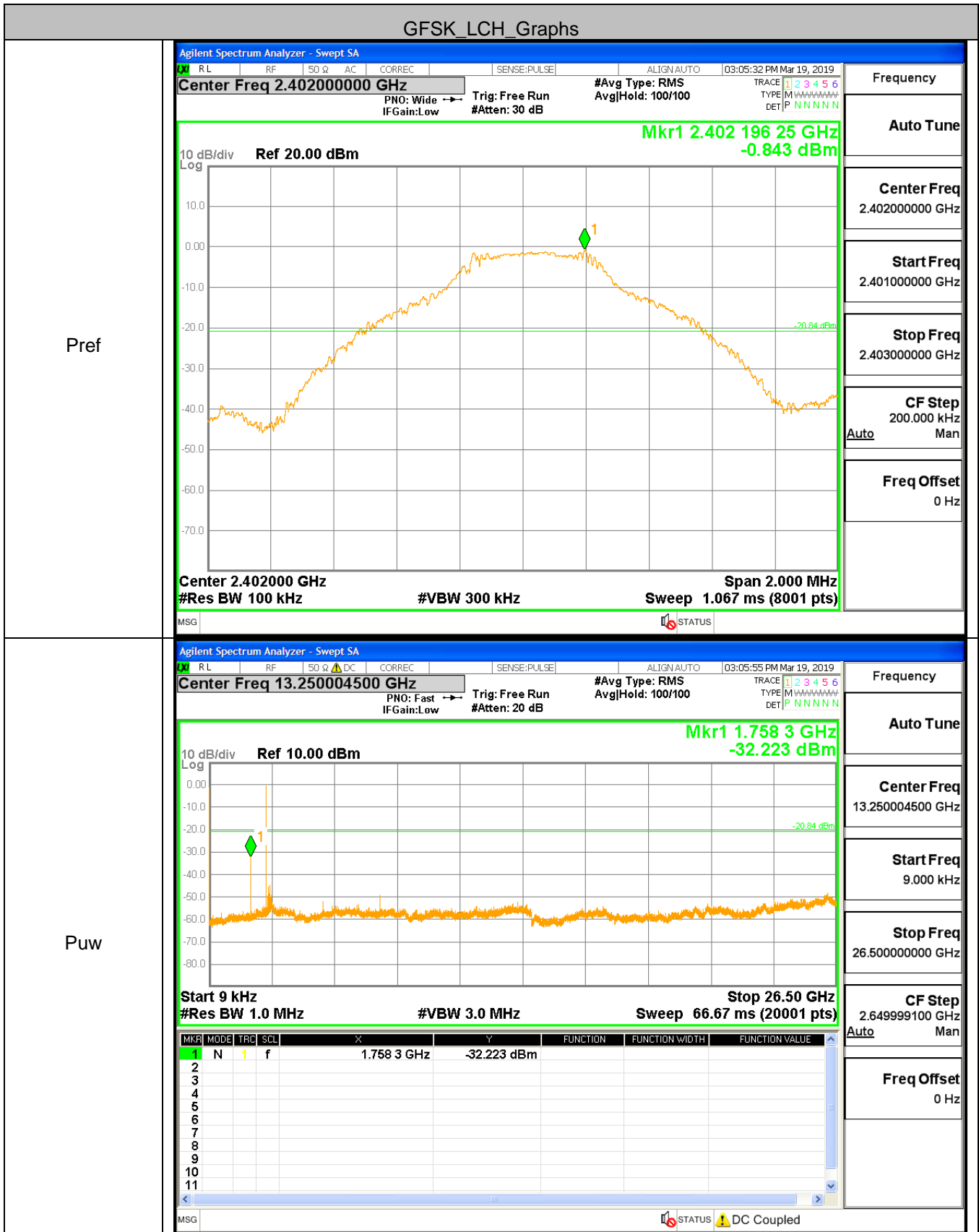


8DPSK/HCH/Hop



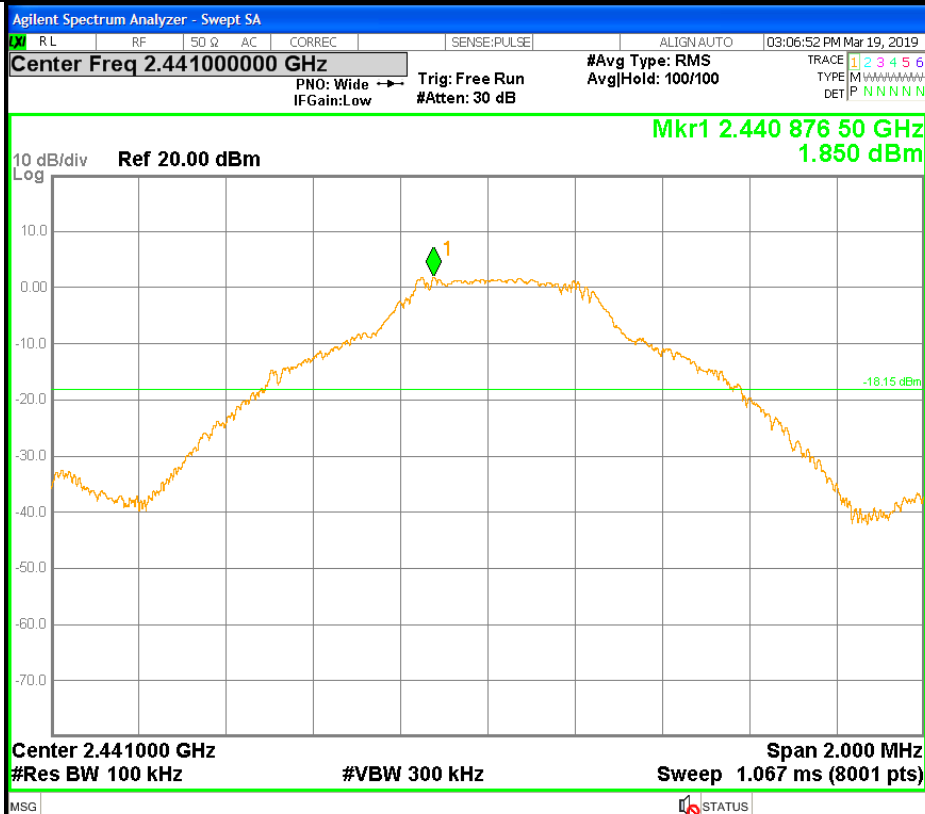
### A.7 RF Conducted Spurious Emissions

#### Test Graph



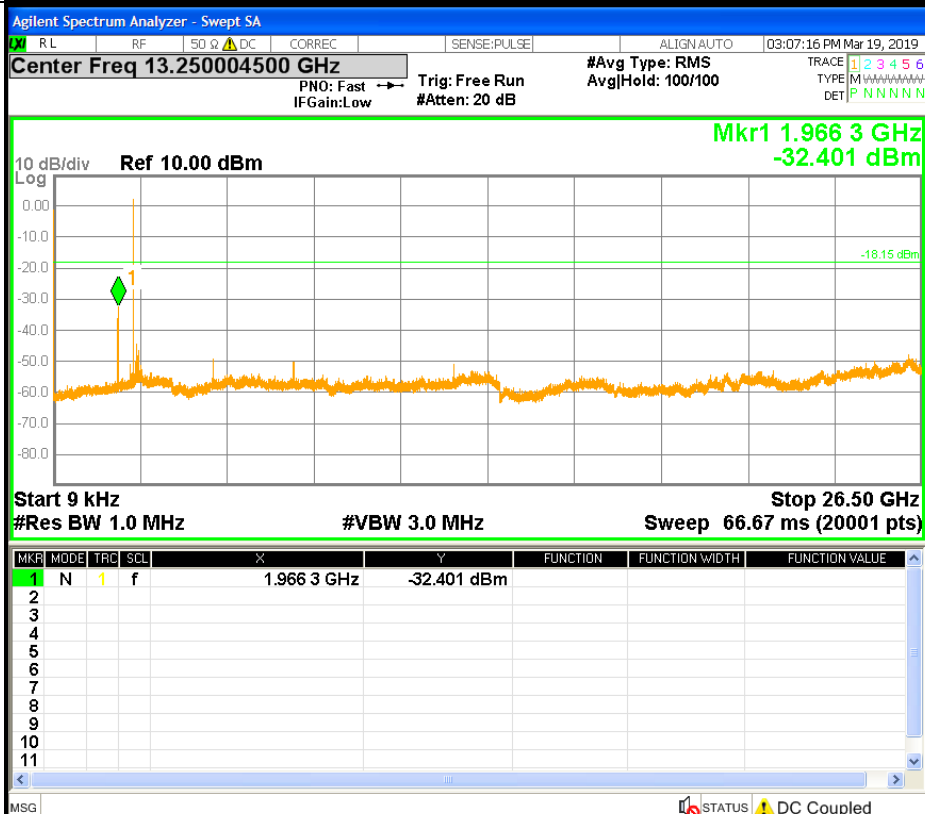
# GFSK\_MCH\_Graphs

Pref

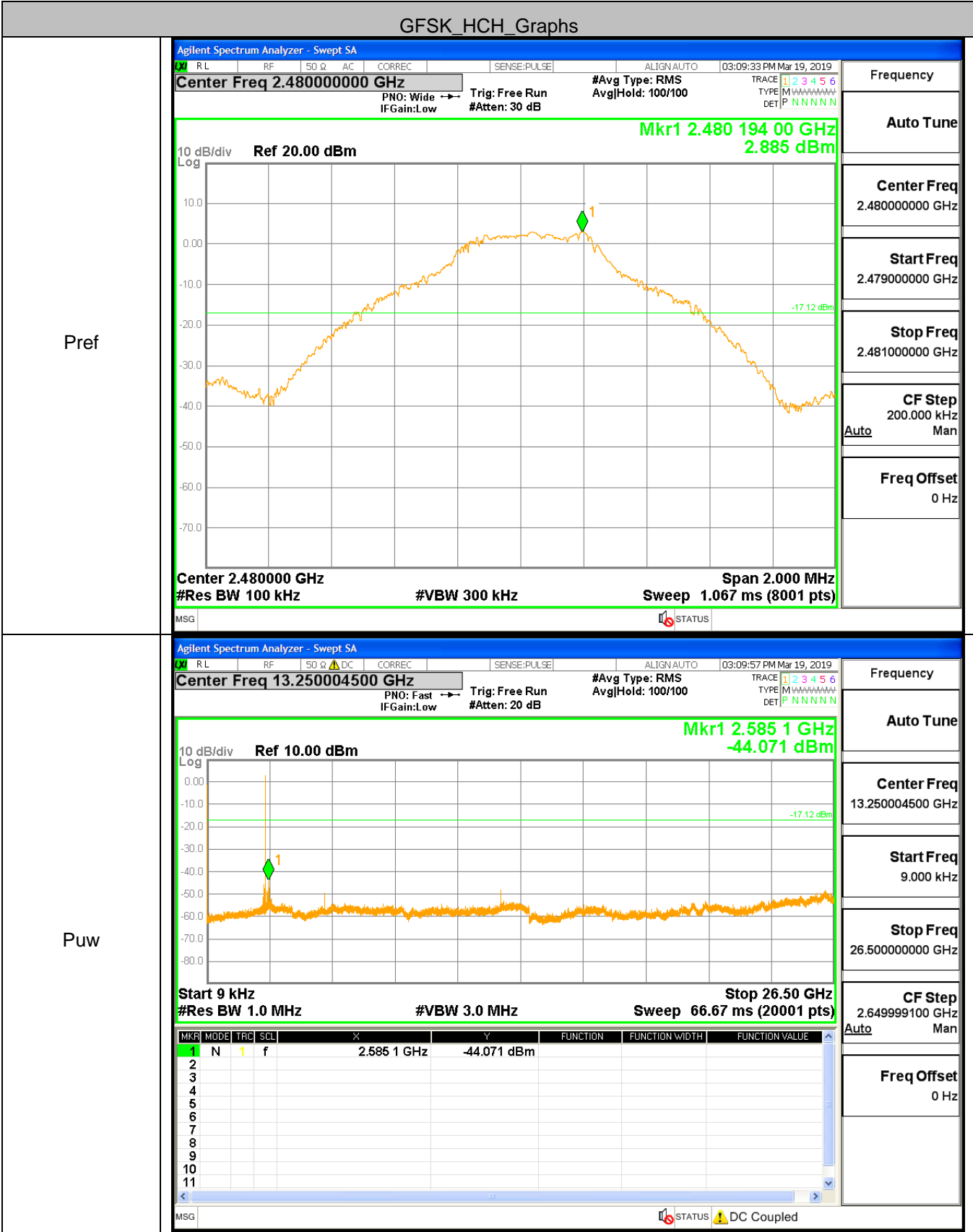


Frequency
Auto Tune
Center Freq 2.441000000 GHz
Start Freq 2.440000000 GHz
Stop Freq 2.442000000 GHz
CF Step 200.000 kHz Auto Man
Freq Offset 0 Hz

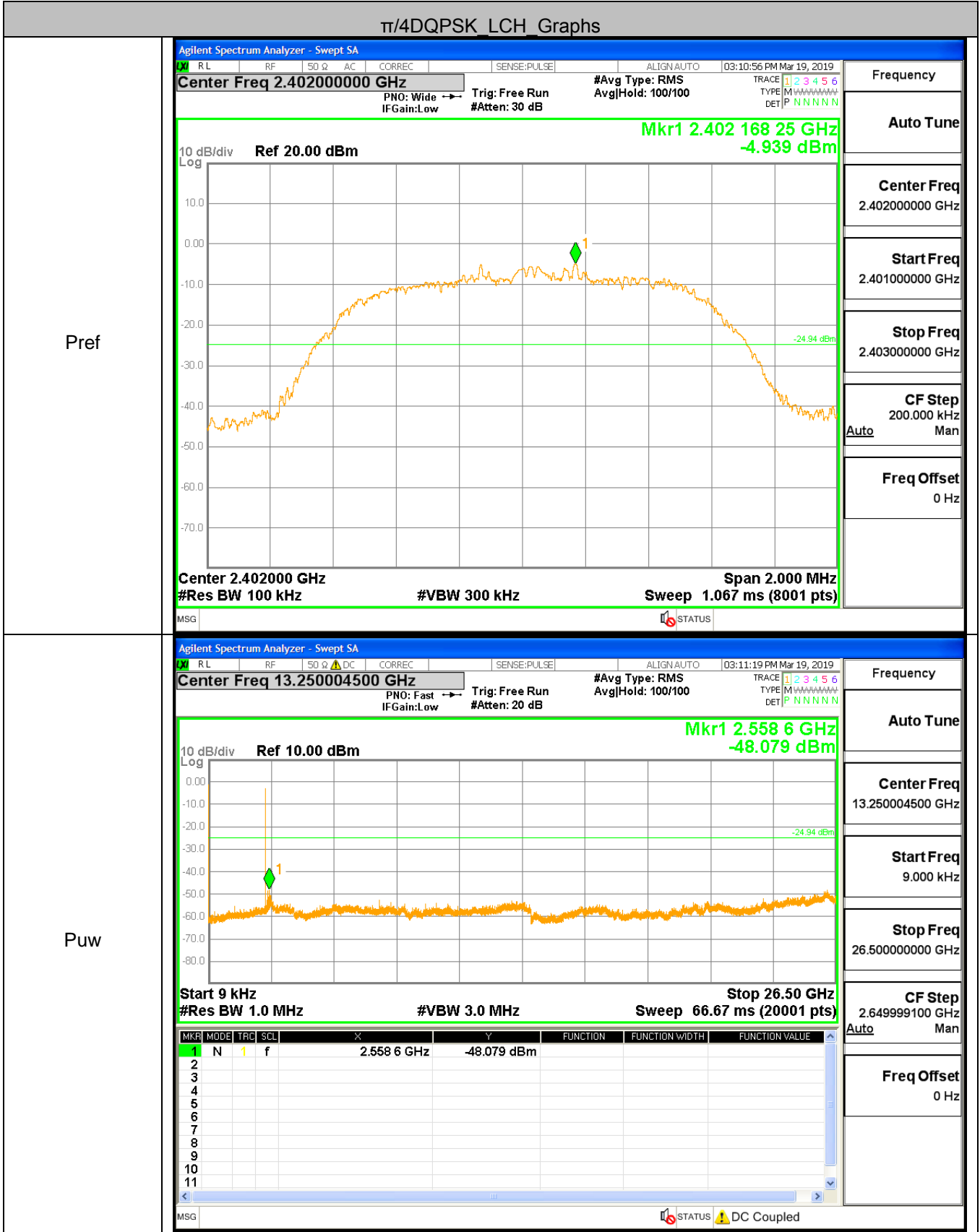
Puw

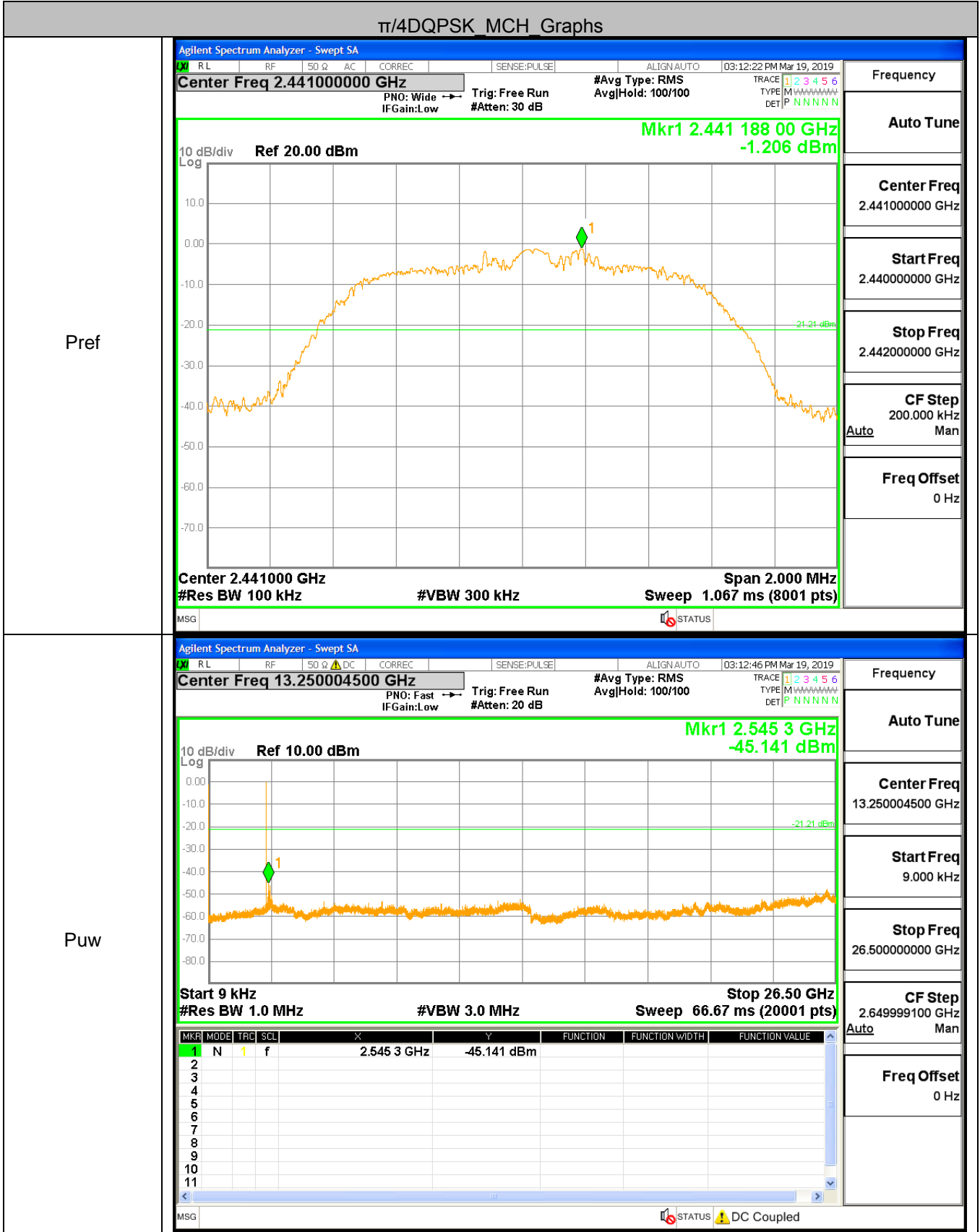


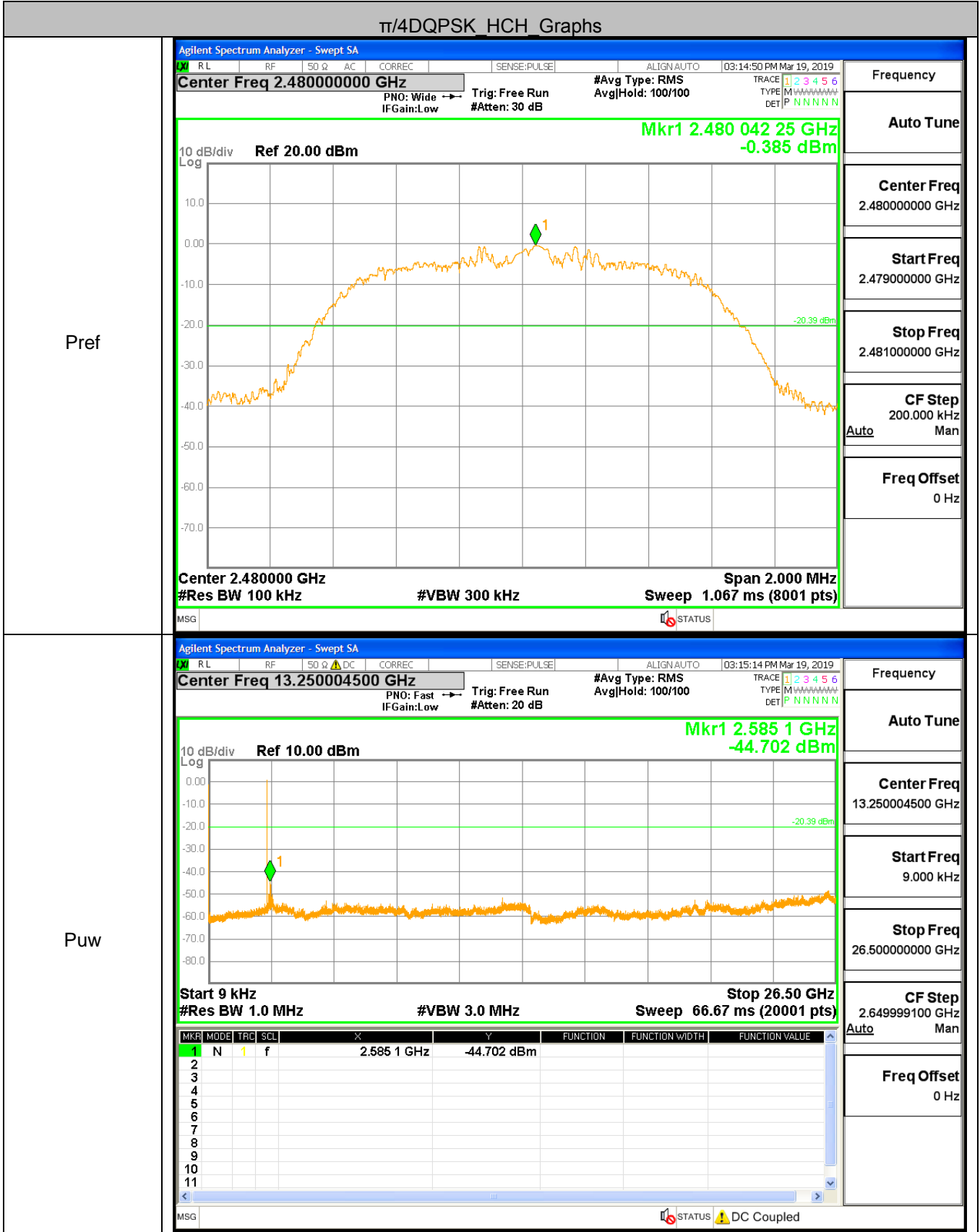
Frequency
Auto Tune
Center Freq 13.250004500 GHz
Start Freq 9.000 kHz
Stop Freq 26.500000000 GHz
CF Step 2.649999100 GHz Auto Man
Freq Offset 0 Hz

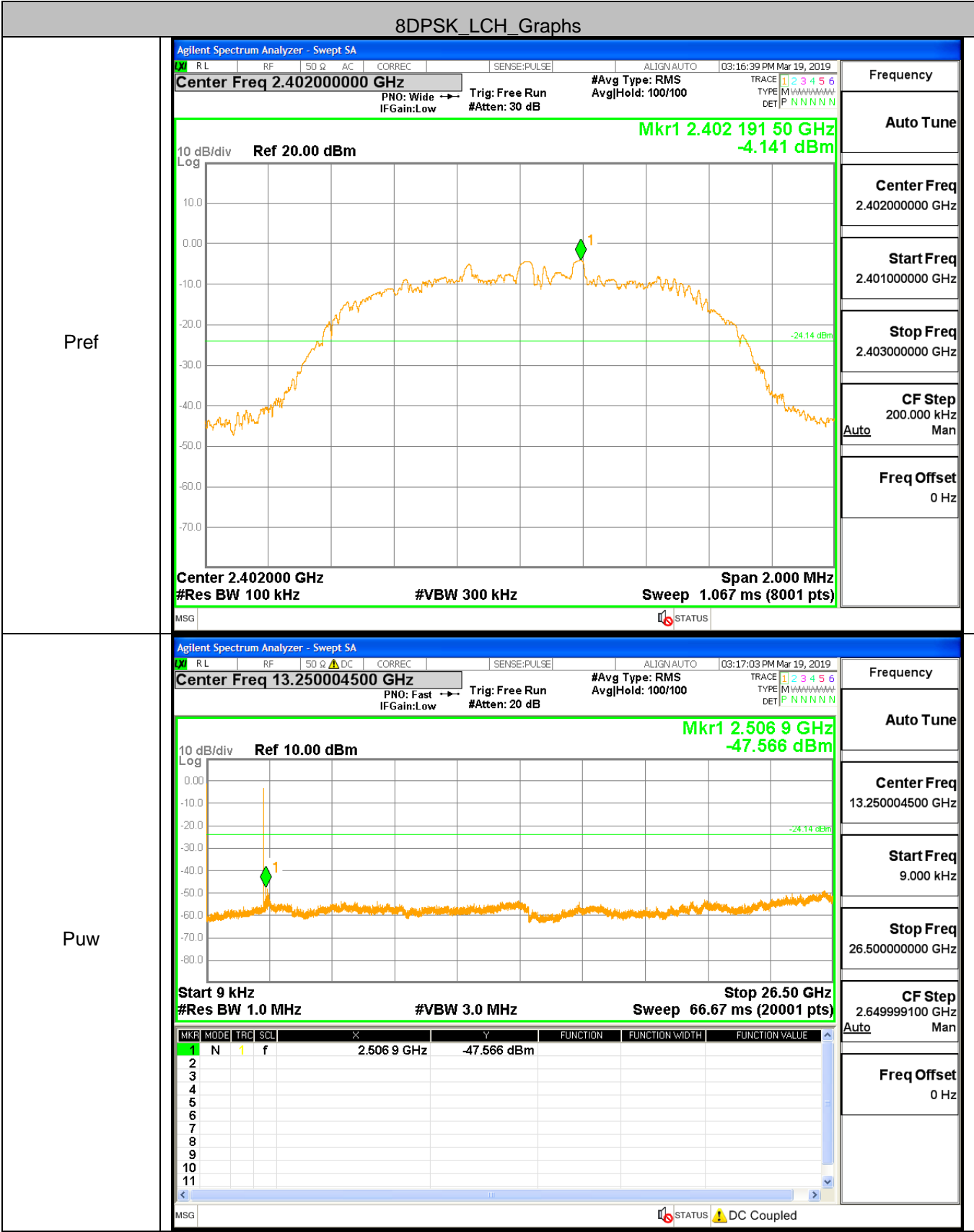


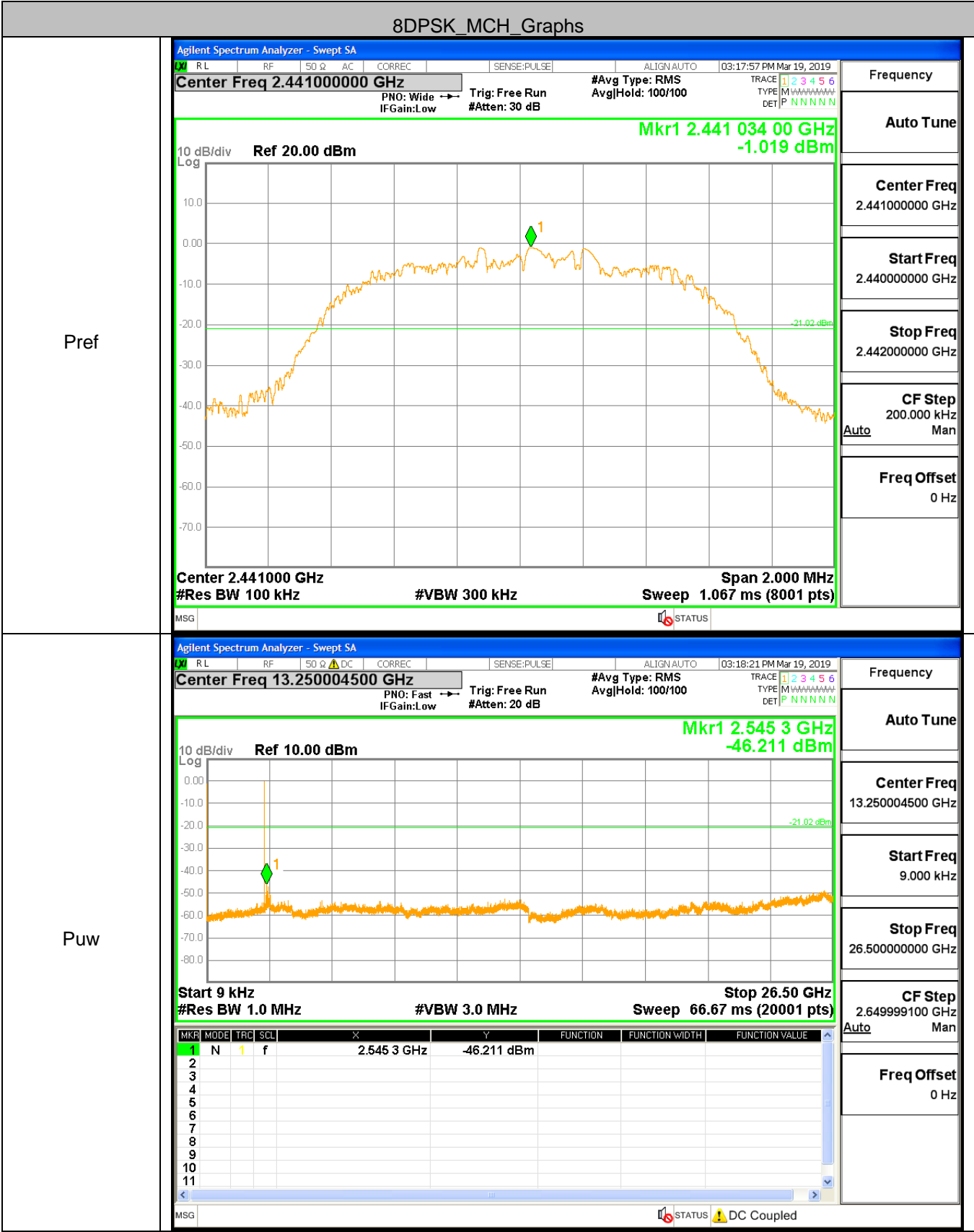






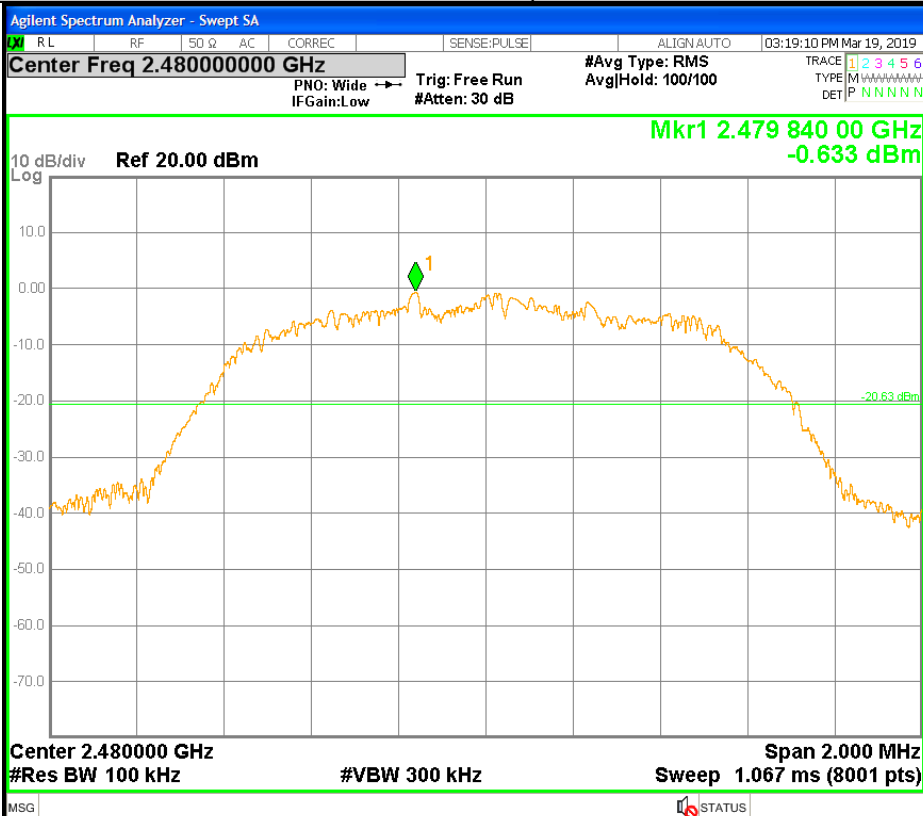




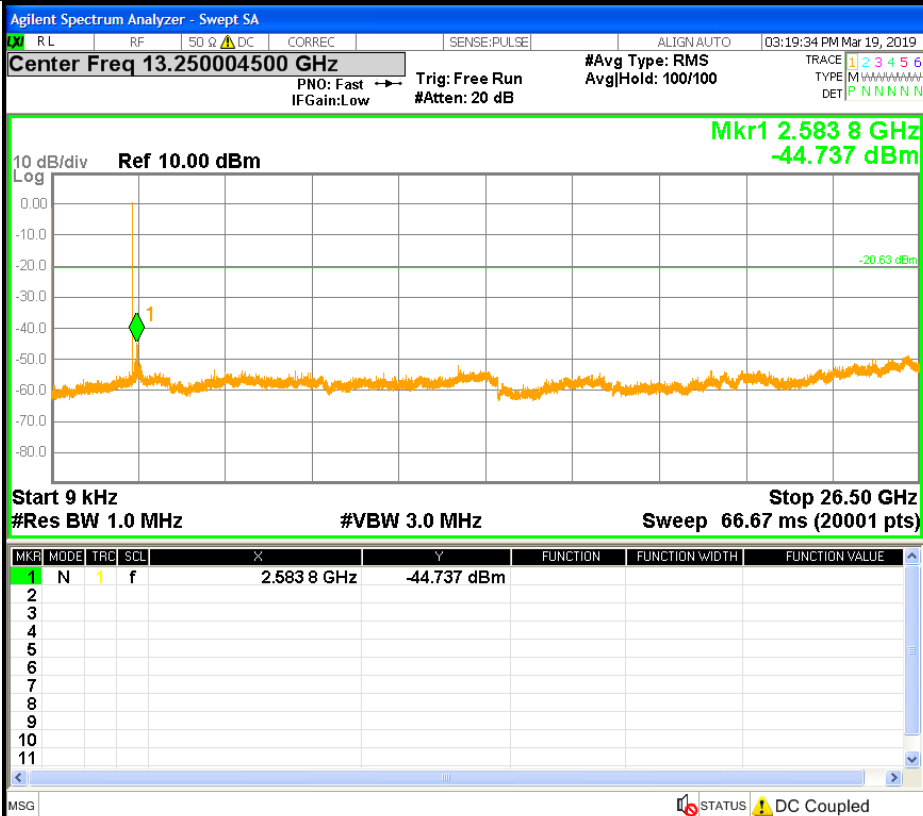


# 8DPSK\_HCH\_Graphs

Pref



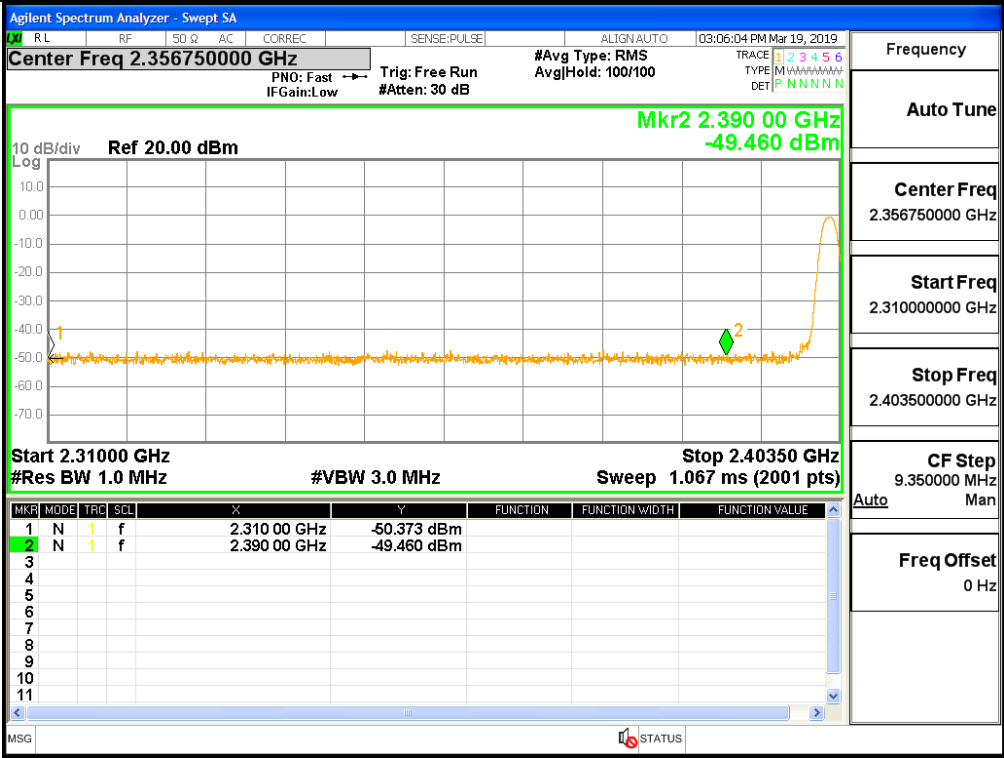
Puw



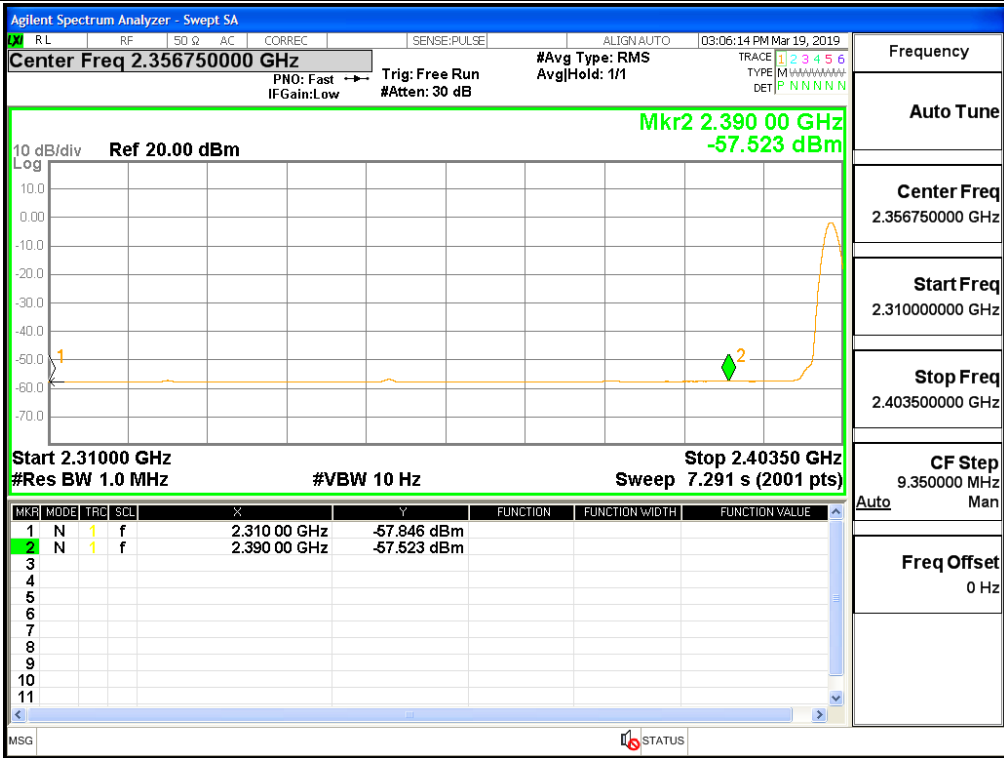
**A.8 Restrict-band band-edge measurements**

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	-50.37	46.83	74	-57.85	39.35	54	Pass
1DH5	2402	2390	2.00	0.00	-49.46	47.74	74	-57.52	39.68	54	Pass
1DH5	2480	2483.5	2.00	0.00	-47.58	49.62	74	-53.35	43.85	54	Pass
1DH5	2480	2500	2.00	0.00	-50.65	46.55	74	-56.96	40.24	54	Pass
2DH5	2402	2310	2.00	0.00	-51.77	45.43	74	-57.79	39.41	54	Pass
2DH5	2402	2390	2.00	0.00	-51.40	45.80	74	-57.57	39.63	54	Pass
2DH5	2480	2483.5	2.00	0.00	-46.95	50.25	74	-54.34	42.86	54	Pass
2DH5	2480	2500	2.00	0.00	-49.66	47.54	74	-56.99	40.21	54	Pass
3DH5	2402	2310	2.00	0.00	-50.43	46.77	74	-57.89	39.31	54	Pass
3DH5	2402	2390	2.00	0.00	-50.34	46.86	74	-57.57	39.63	54	Pass
3DH5	2480	2483.5	2.00	0.00	-47.80	49.40	74	-54.29	42.91	54	Pass
3DH5	2480	2500	2.00	0.00	-50.33	46.87	74	-56.96	40.24	54	Pass

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

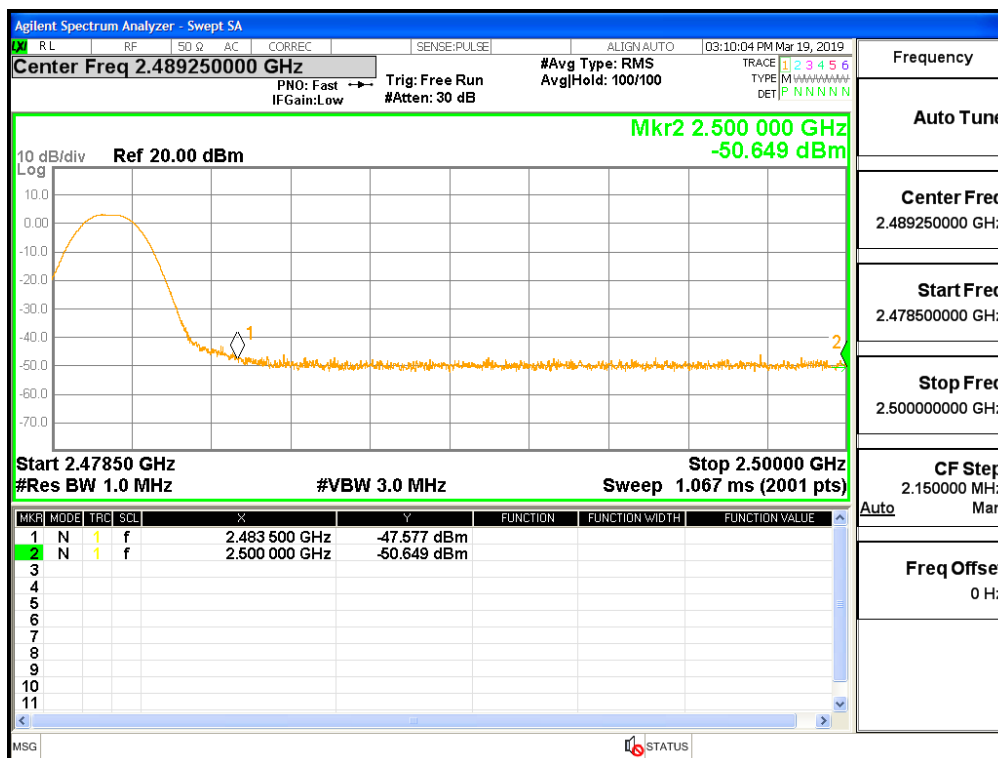


Restrict-band band-edge measurements\_2402\_AV\_DH5

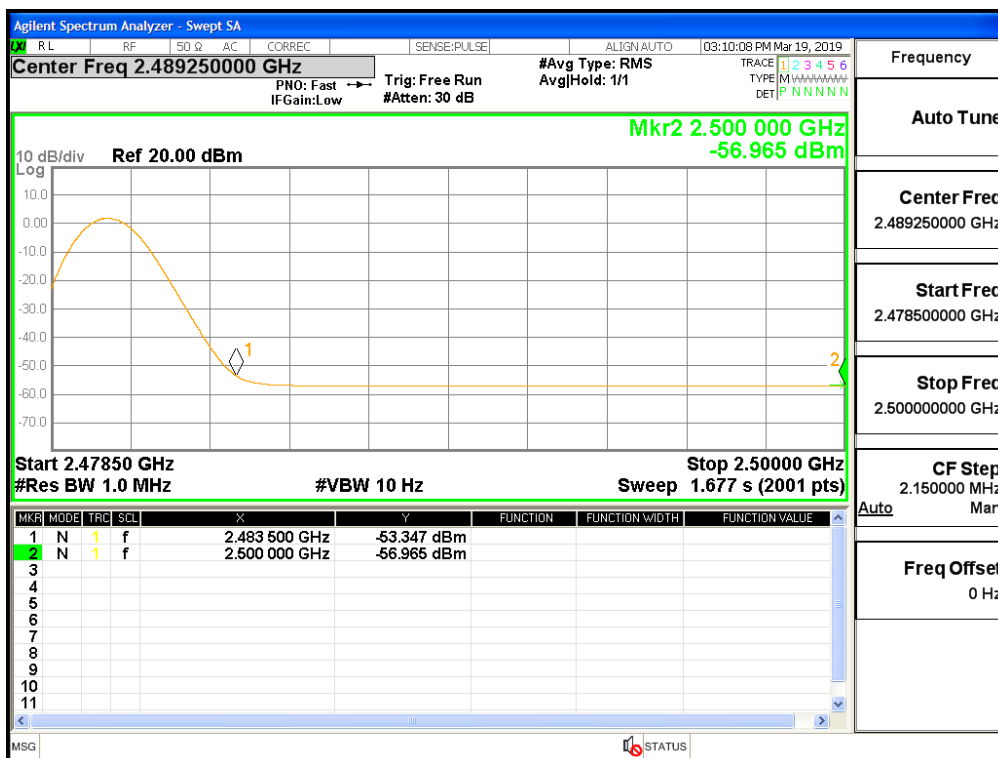




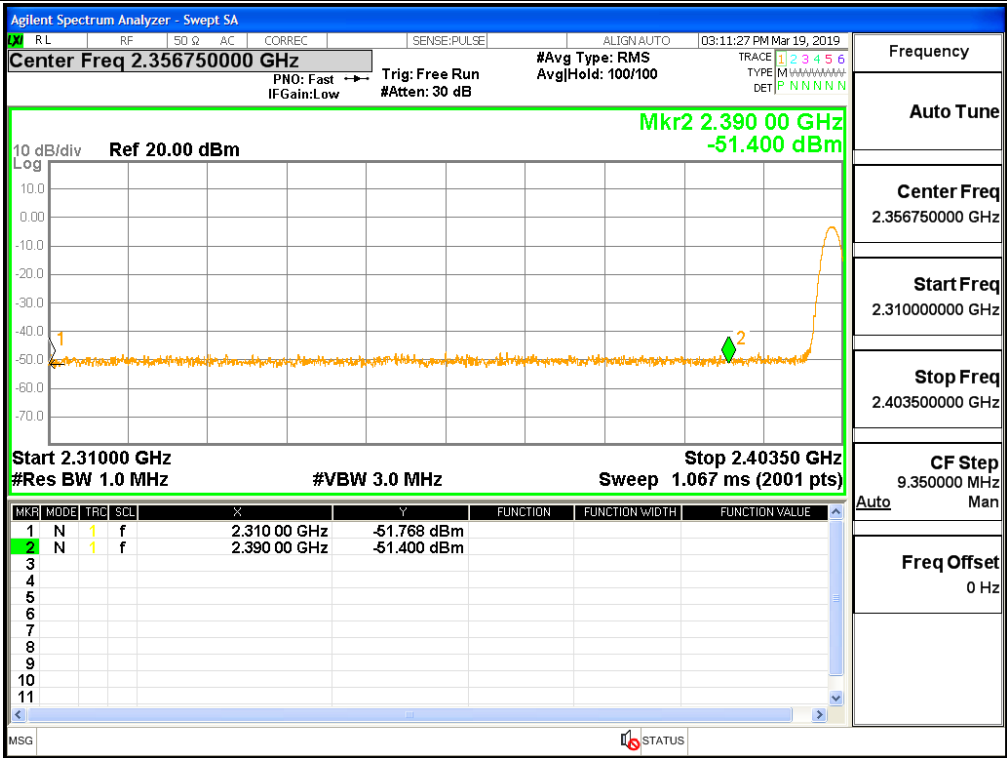
# Restrict-band band-edge measurements\_2480\_PEAK\_DH5



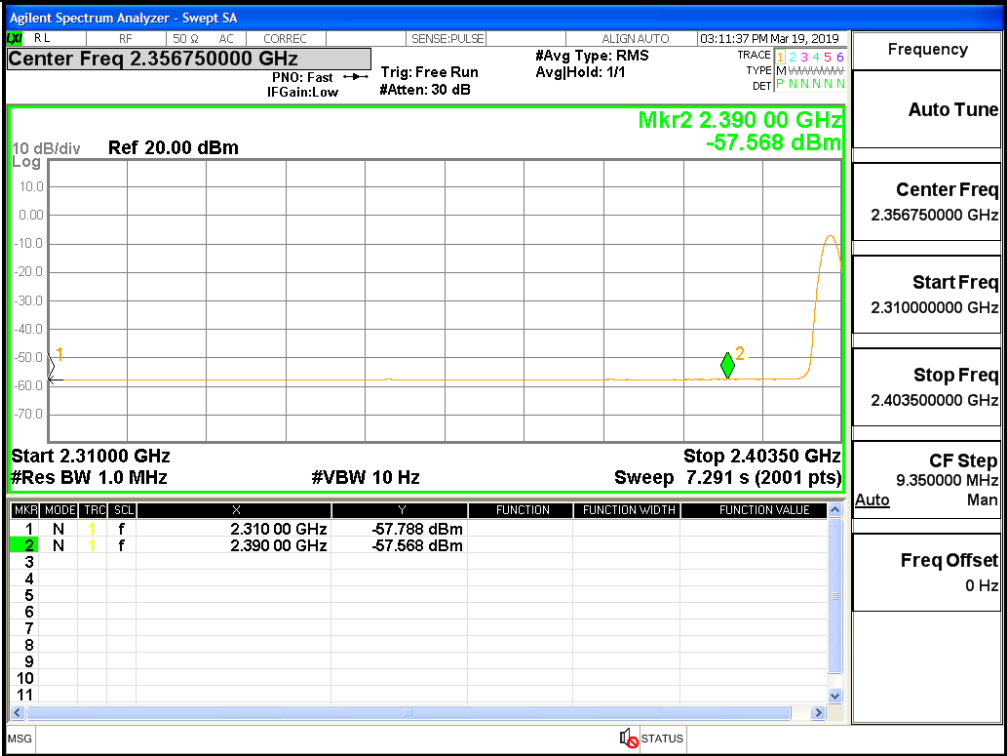
# Restrict-band band-edge measurements\_2480\_AV\_DH5



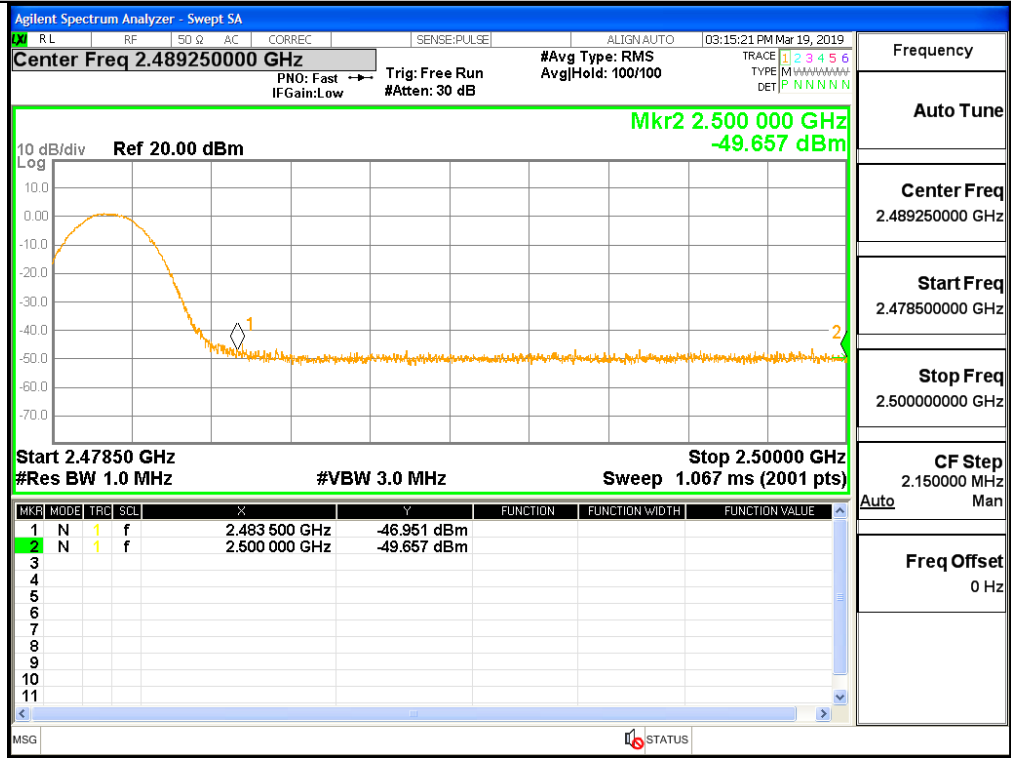
Restrict-band band-edge measurements\_2402\_PEAK\_2DH5



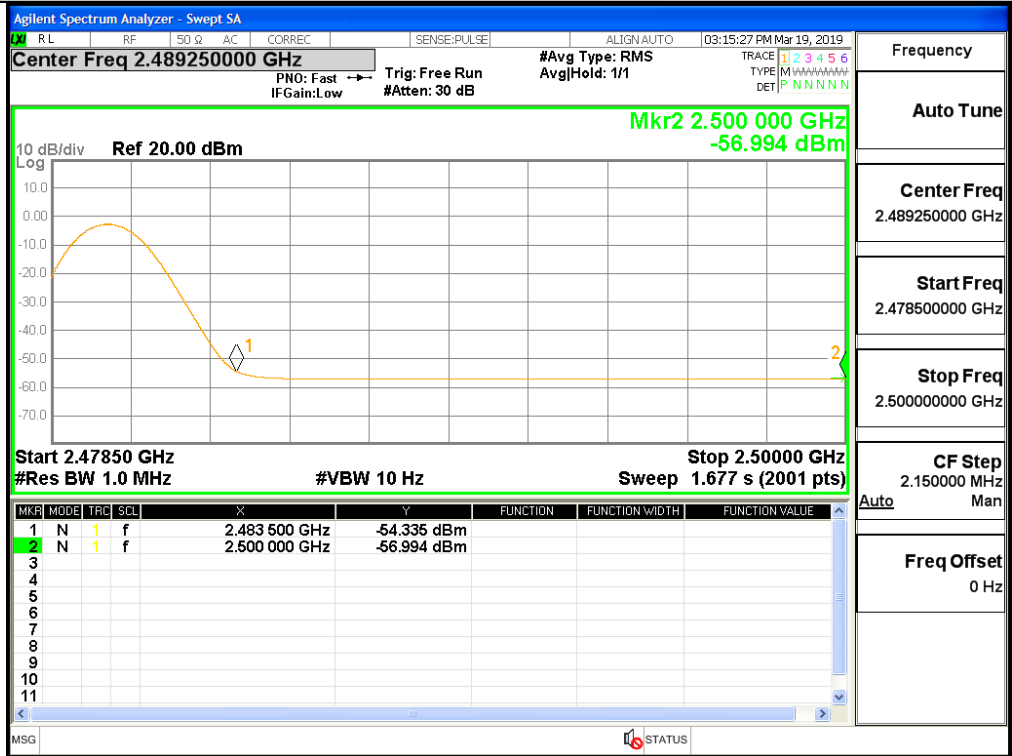
Restrict-band band-edge measurements\_2402\_AV\_2DH5



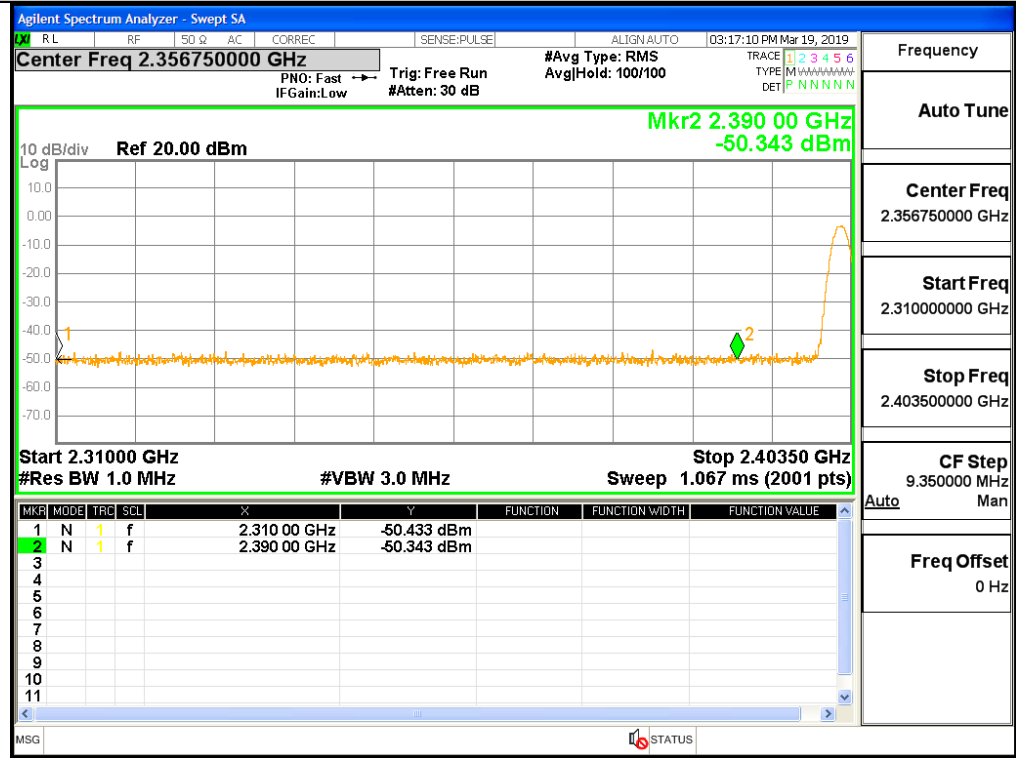
Restrict-band band-edge measurements\_2480\_PEAK\_2DH5



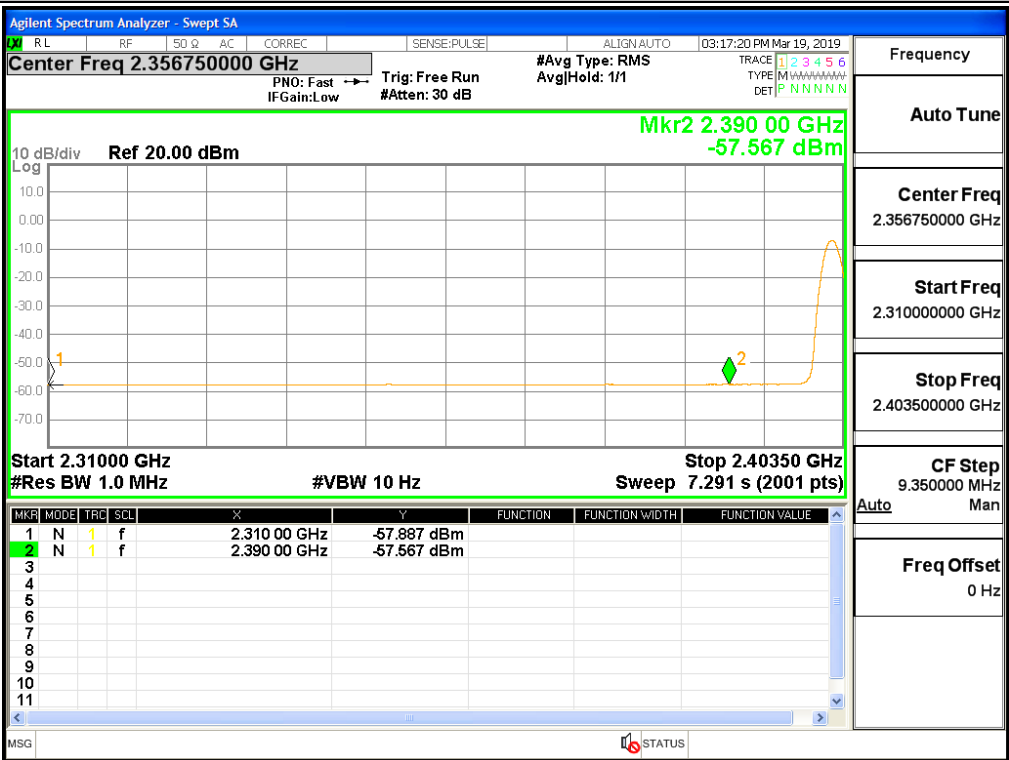
Restrict-band band-edge measurements\_2480\_AV\_2DH5



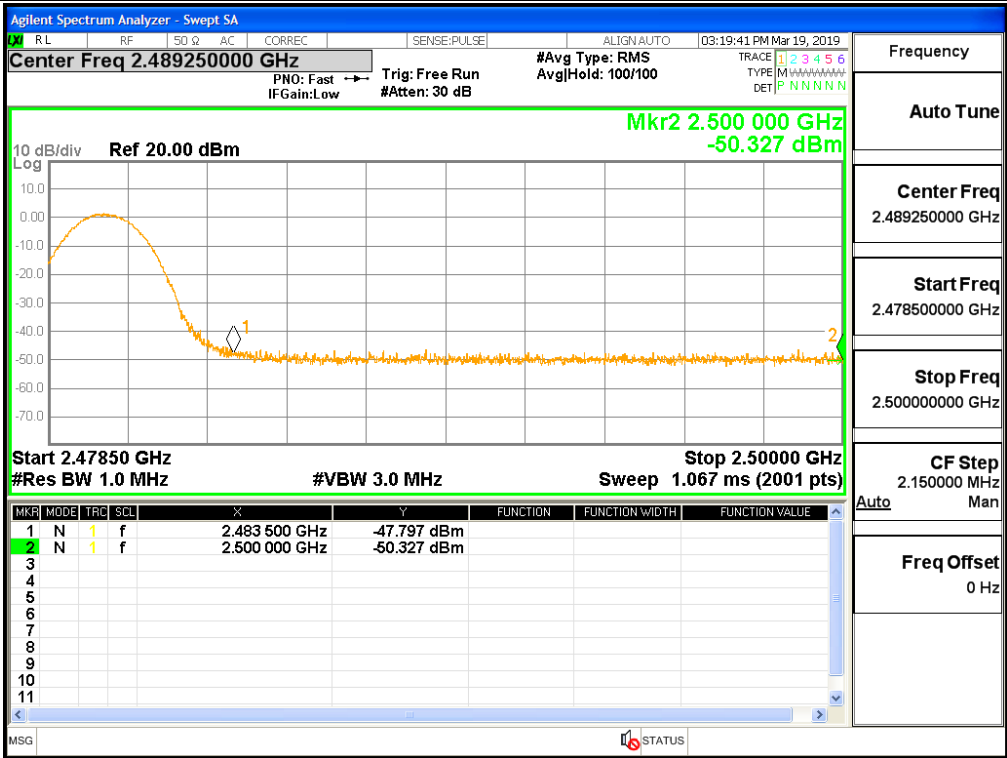
Restrict-band band-edge measurements\_2402\_PEAK\_3DH5



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



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



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

