

Appendix A

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

Product Name: Bluetooth Speaker with Wireless Charger

Trade Mark: /

Test Model: B90

FCC ID: QIF-LC-D990

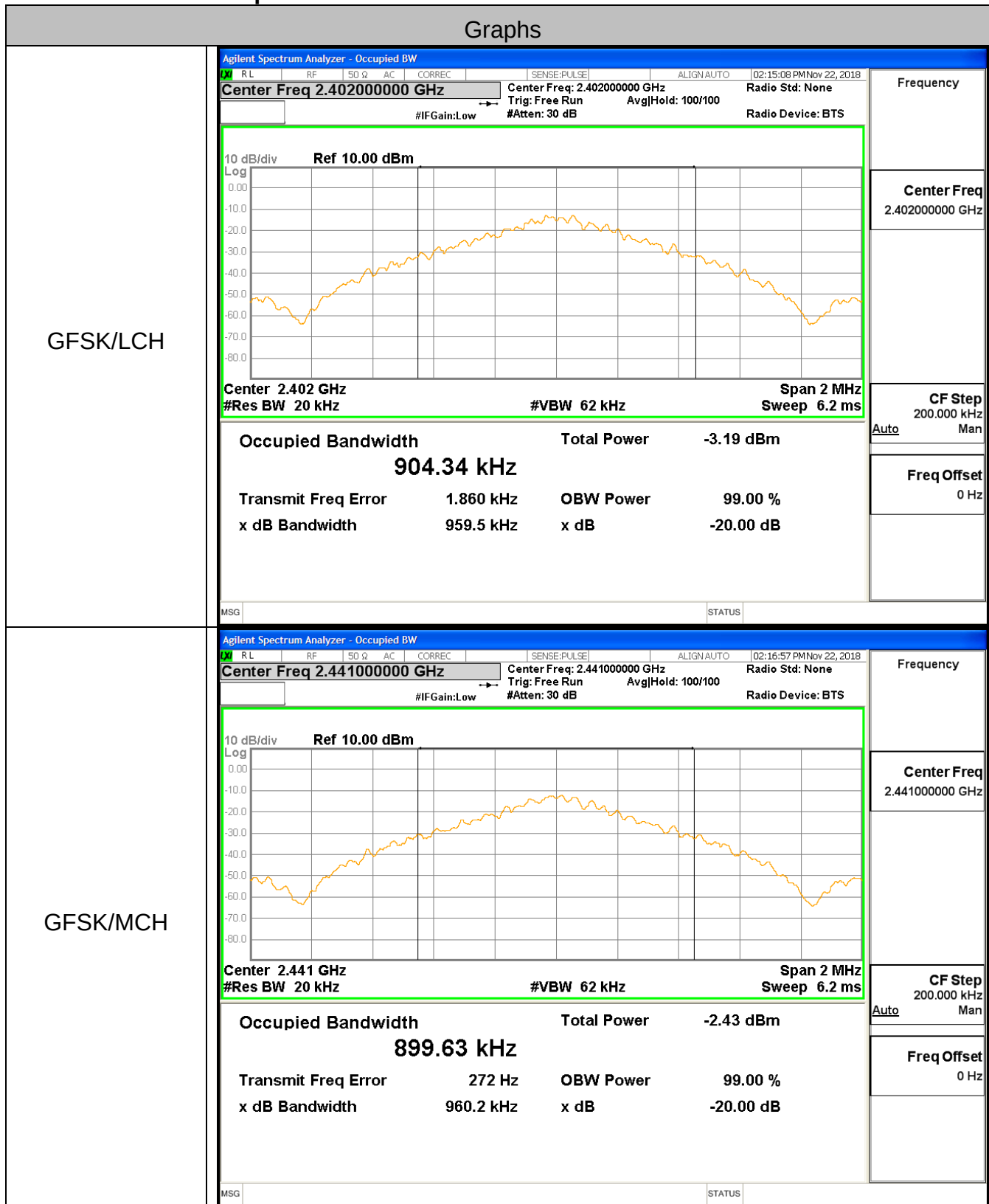
Environmental Conditions

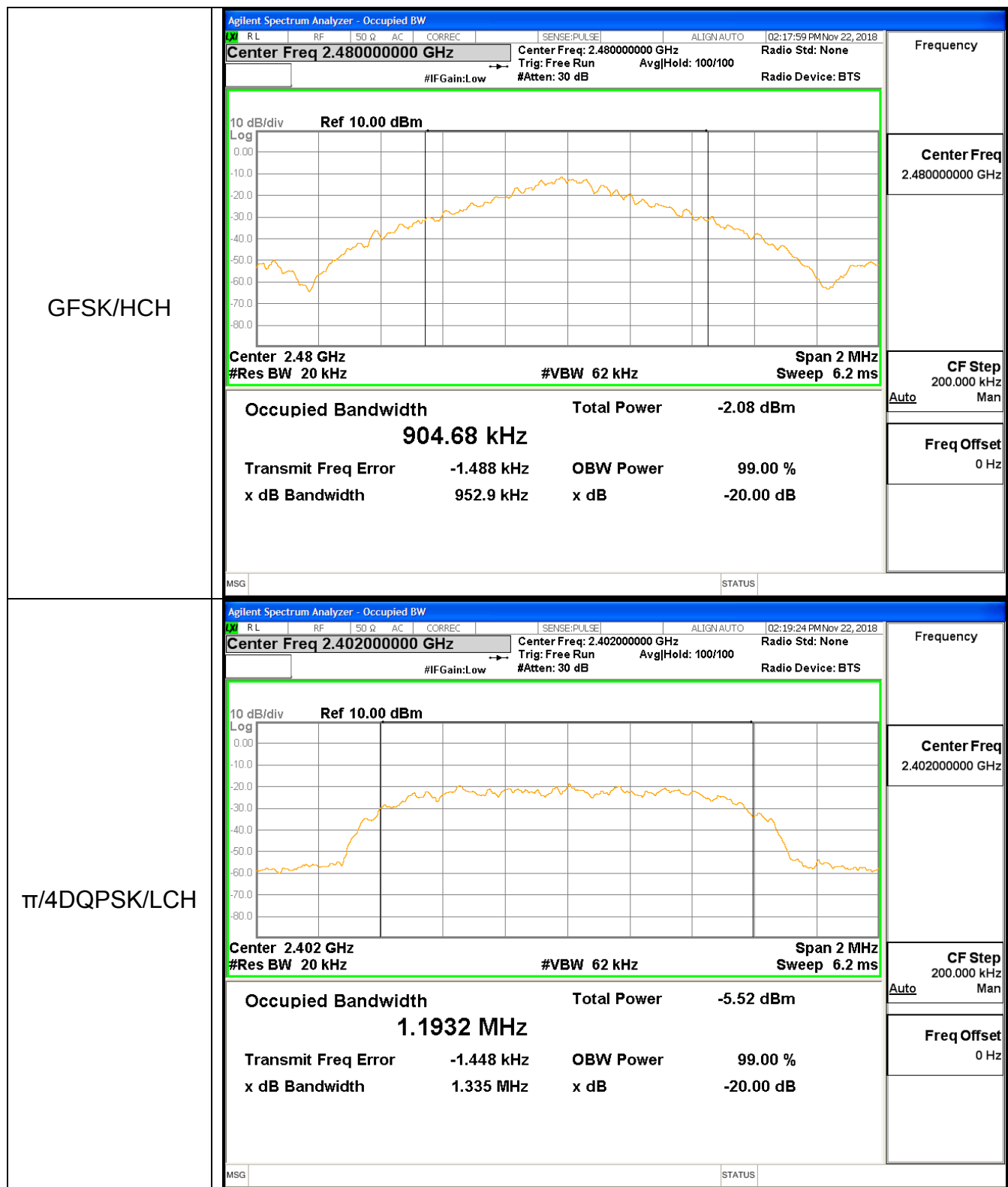
Temperature:	22.9 ° C
Relative Humidity:	52.3%
ATM Pressure:	100.0 kPa
Test Engineer:	Gary Qian
Supervised by:	Eden Hu

A.1 20 dB Bandwidth

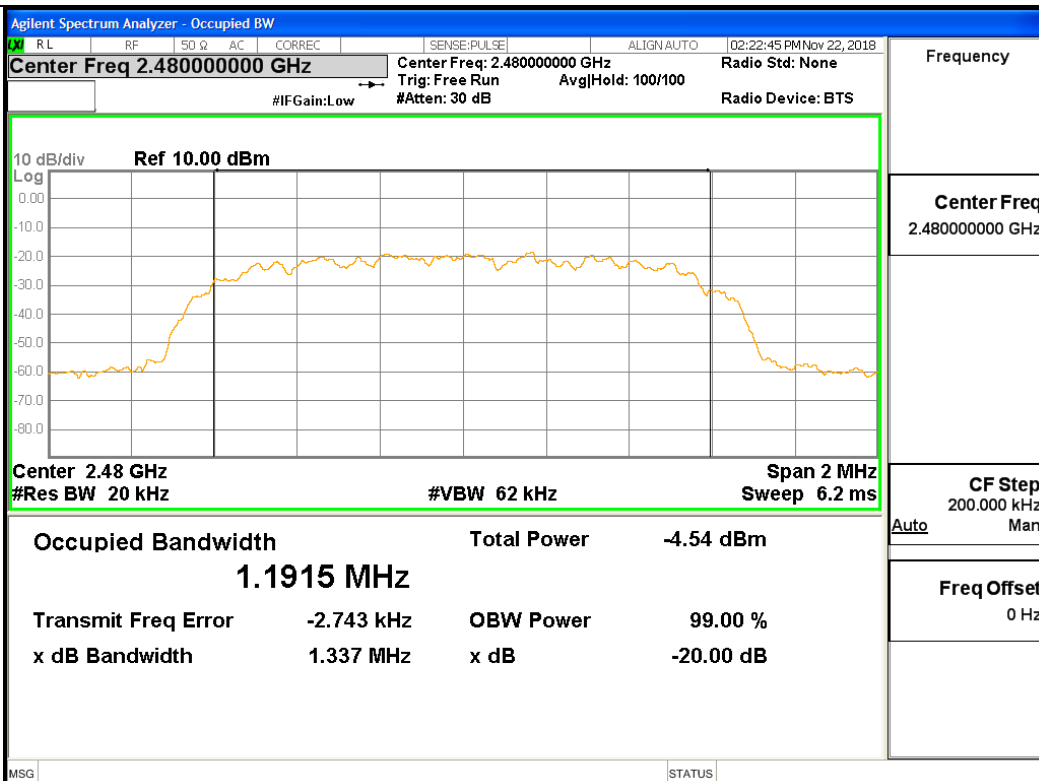
Mode	Channel.	20dB Bandwidth [MHz]	Limit(MHz)	Verdict
GFSK	LCH	0.960	Not Specified	PASS
GFSK	MCH	0.960	Not Specified	PASS
GFSK	HCH	0.953	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.335	Not Specified	PASS
$\pi/4$ DQPSK	MCH	1.337	Not Specified	PASS
$\pi/4$ DQPSK	HCH	1.337	Not Specified	PASS
8DPSK	LCH	1.336	Not Specified	PASS
8DPSK	MCH	1.335	Not Specified	PASS
8DPSK	HCH	1.324	Not Specified	PASS

1.1.1.1.1 Test Graph

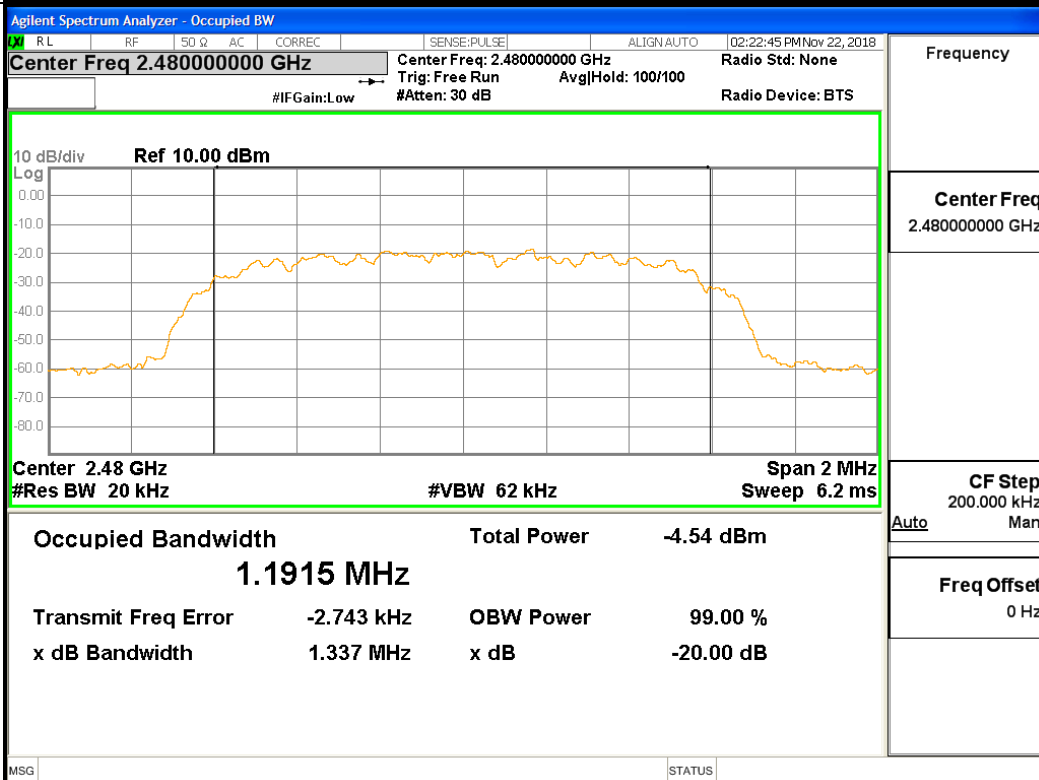


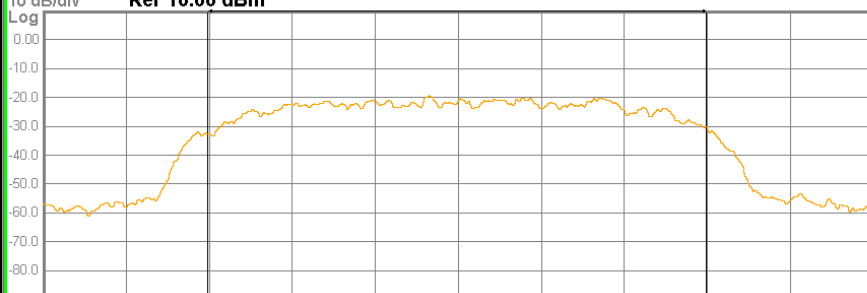


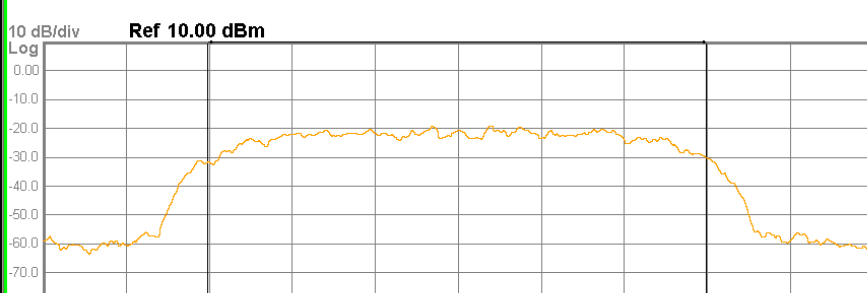
π /4DQPSK/MCH



π /4DQPSK/HCH



8DPSK/LCH	Agilent Spectrum Analyzer - Occupied BW										Frequency		
	RL RF 50 Ω AC CORREC				SENSE:PULSE		ALIGN:AUTO		02:24:05 PM Nov 22, 2018		Center Freq		
	Center Freq 2.402000000 GHz				Center Freq: 2.402000000 GHz		Trig: Free Run		Avg Hold: 100/100		Radio Std: None		
	#IFGain:Low				#Atten: 30 dB						Radio Device: BTS		
											2.402000000 GHz		
Center 2.402 GHz										Span 2 MHz		CF Step	
#Res BW 20 kHz										#VBW 62 kHz		200.000 kHz	
										Sweep 6.2 ms		Auto	
Occupied Bandwidth										Total Power		-5.41 dBm	
1.1968 MHz													
Transmit Freq Error										-2.920 kHz		OBW Power	
												99.00 %	
x dB Bandwidth										1.336 MHz		x dB	
												-20.00 dB	
MSG										STATUS			

8DPSK/MCH	Agilent Spectrum Analyzer - Occupied BW										Frequency		
	RL RF 50 Ω AC CORREC				SENSE:PULSE		ALIGN:AUTO		02:25:37 PM Nov 22, 2018		Center Freq		
	Center Freq 2.441000000 GHz				Center Freq: 2.441000000 GHz		Trig: Free Run		Avg Hold: 100/100		Radio Std: None		
	#IFGain:Low				#Atten: 30 dB						Radio Device: BTS		
											2.441000000 GHz		
Center 2.441 GHz										Span 2 MHz		CF Step	
#Res BW 20 kHz										#VBW 62 kHz		200.000 kHz	
										Sweep 6.2 ms		Auto	
Occupied Bandwidth										Total Power		-5.02 dBm	
1.1981 MHz													
Transmit Freq Error										-2.829 kHz		OBW Power	
												99.00 %	
x dB Bandwidth										1.335 MHz		x dB	
												-20.00 dB	
MSG										STATUS			

Center Freq 2.441000000 GHz

Center Freq: 2.441000000 GHz

Trig: Free Run

Avg|Hold: 100/100

Radio Std: None

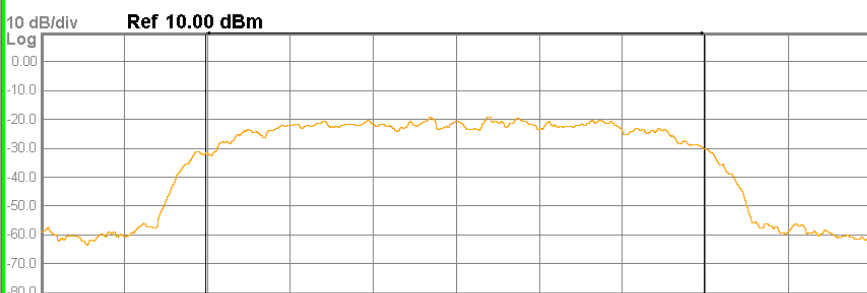
#IFGain:Low

#Atten: 30 dB

Radio Device: BTS

10 dB/div

Ref 10.00 dBm



Center 2.441 GHz

#Res BW 20 kHz

#VBW 62 kHz

Span 2 MHz

Sweep 6.2 ms

Occupied Bandwidth

1.1981 MHz

Total Power

-5.02 dBm

Transmit Freq Error

-2.829 kHz

OBW Power

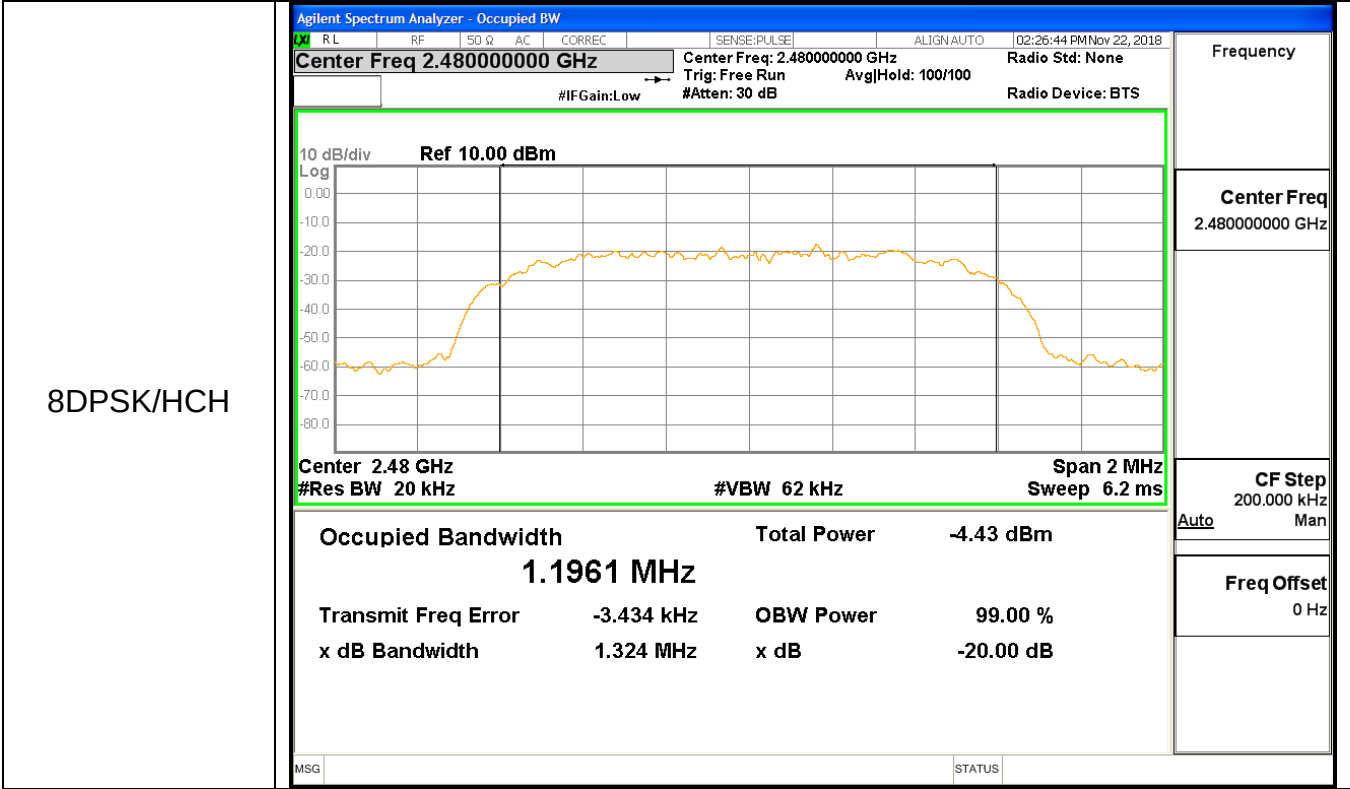
99.00 %

x dB Bandwidth

1.335 MHz

x dB

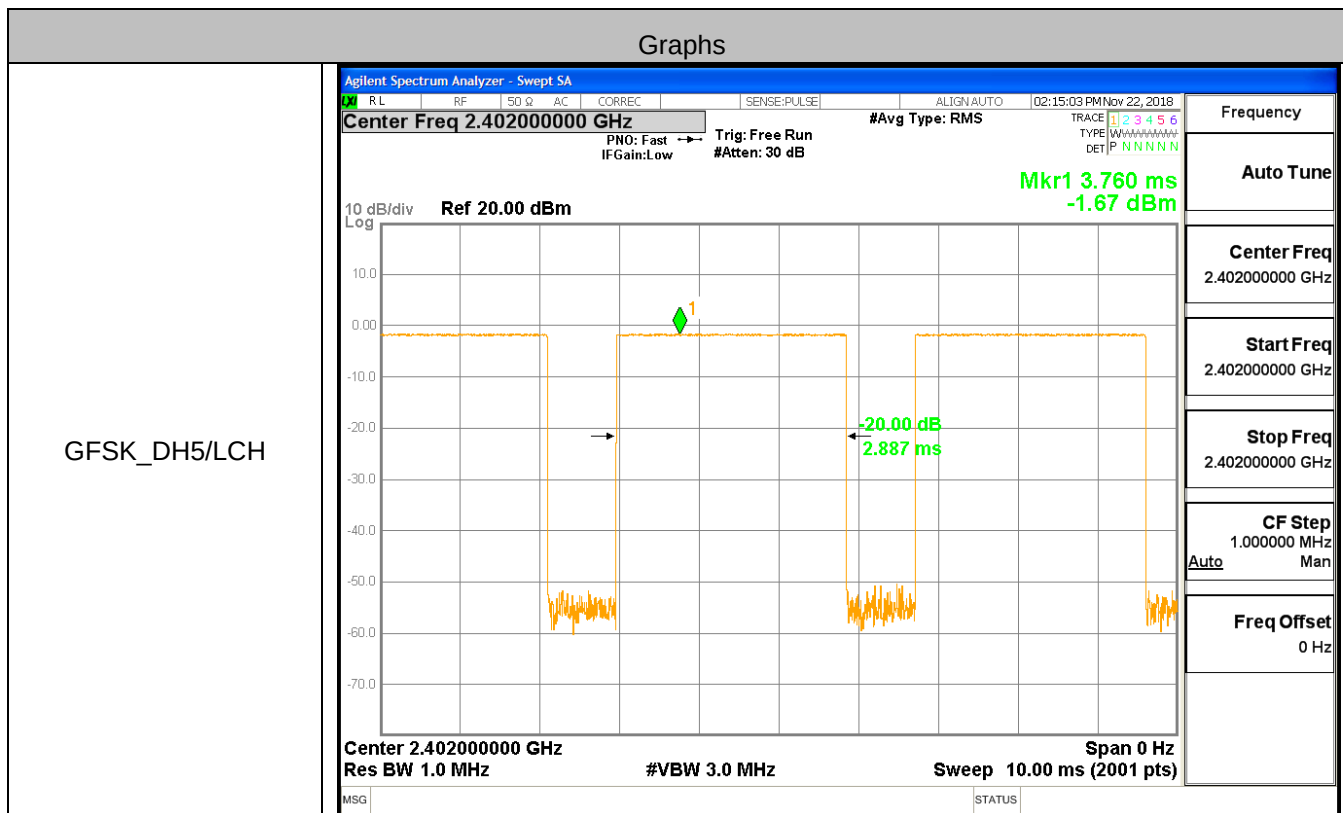
-20.00 dB

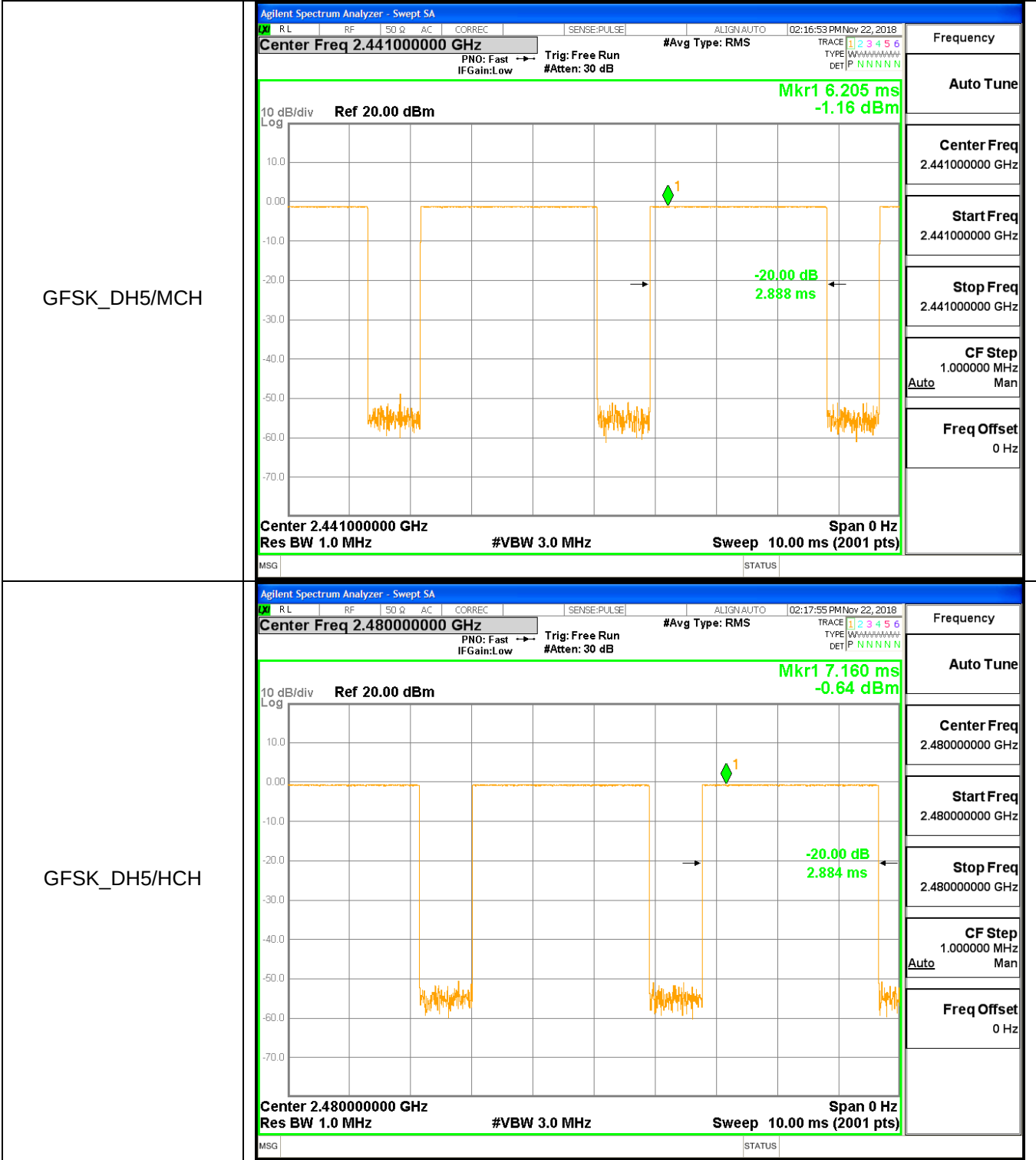


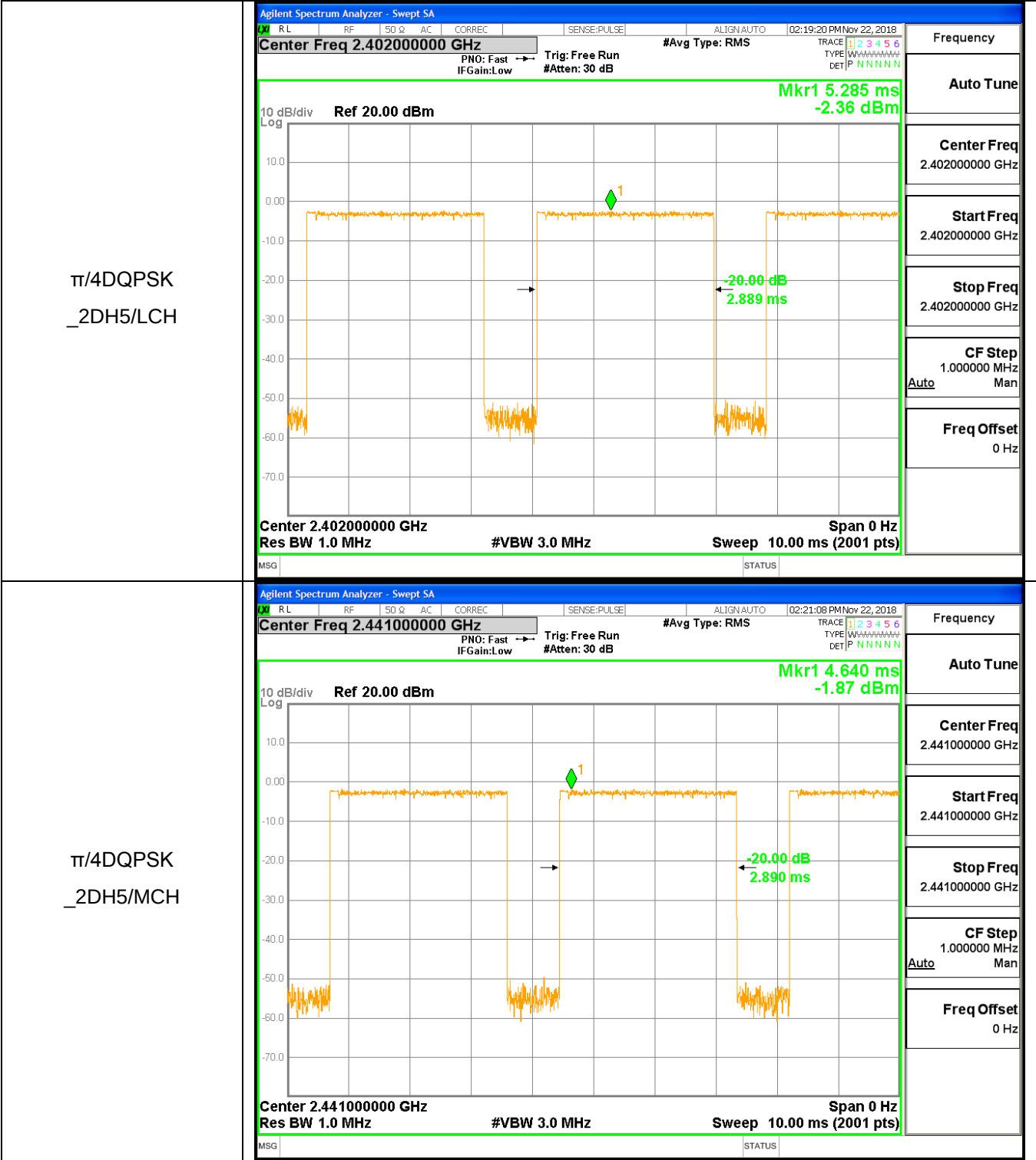
A.2 Dwell Time

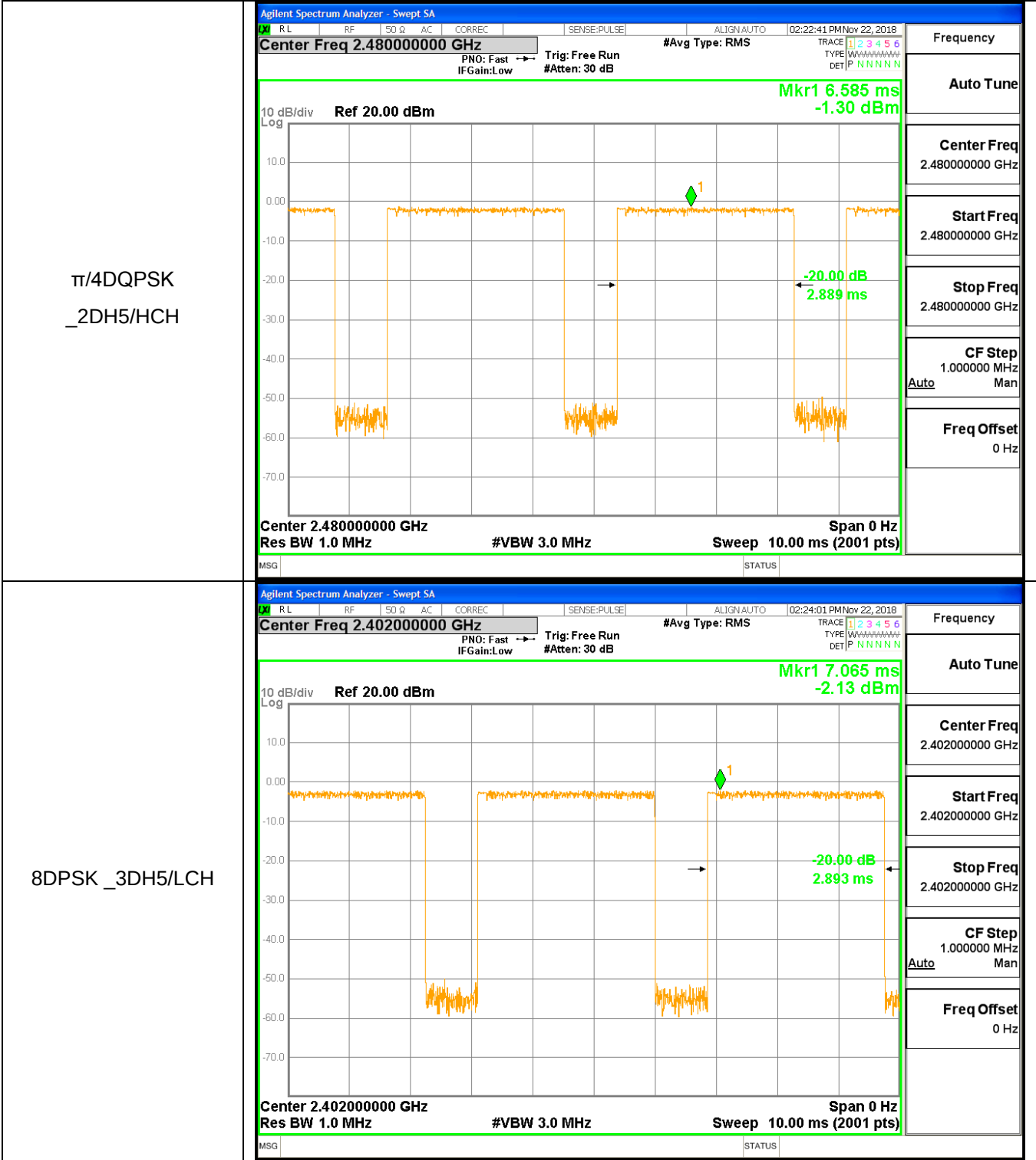
Mode	Packet	Channel	Burst Width [s/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	0.002887	106.7	0.308009	0.4	PASS
GFSK	DH5	MCH	0.002888	106.7	0.308165	0.4	PASS
GFSK	DH5	HCH	0.002884	106.7	0.307692	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	0.002889	106.7	0.308221	0.4	PASS
$\pi/4$ DQPSK	2DH5	MCH	0.00289	106.7	0.308329	0.4	PASS
$\pi/4$ DQPSK	2DH5	HCH	0.002889	106.7	0.308224	0.4	PASS
8DPSK	3DH5	LCH	0.002893	106.7	0.308722	0.4	PASS
8DPSK	3DH5	MCH	0.002889	106.7	0.308228	0.4	PASS
8DPSK	3DH5	HCH	0.002893	106.7	0.30873	0.4	PASS

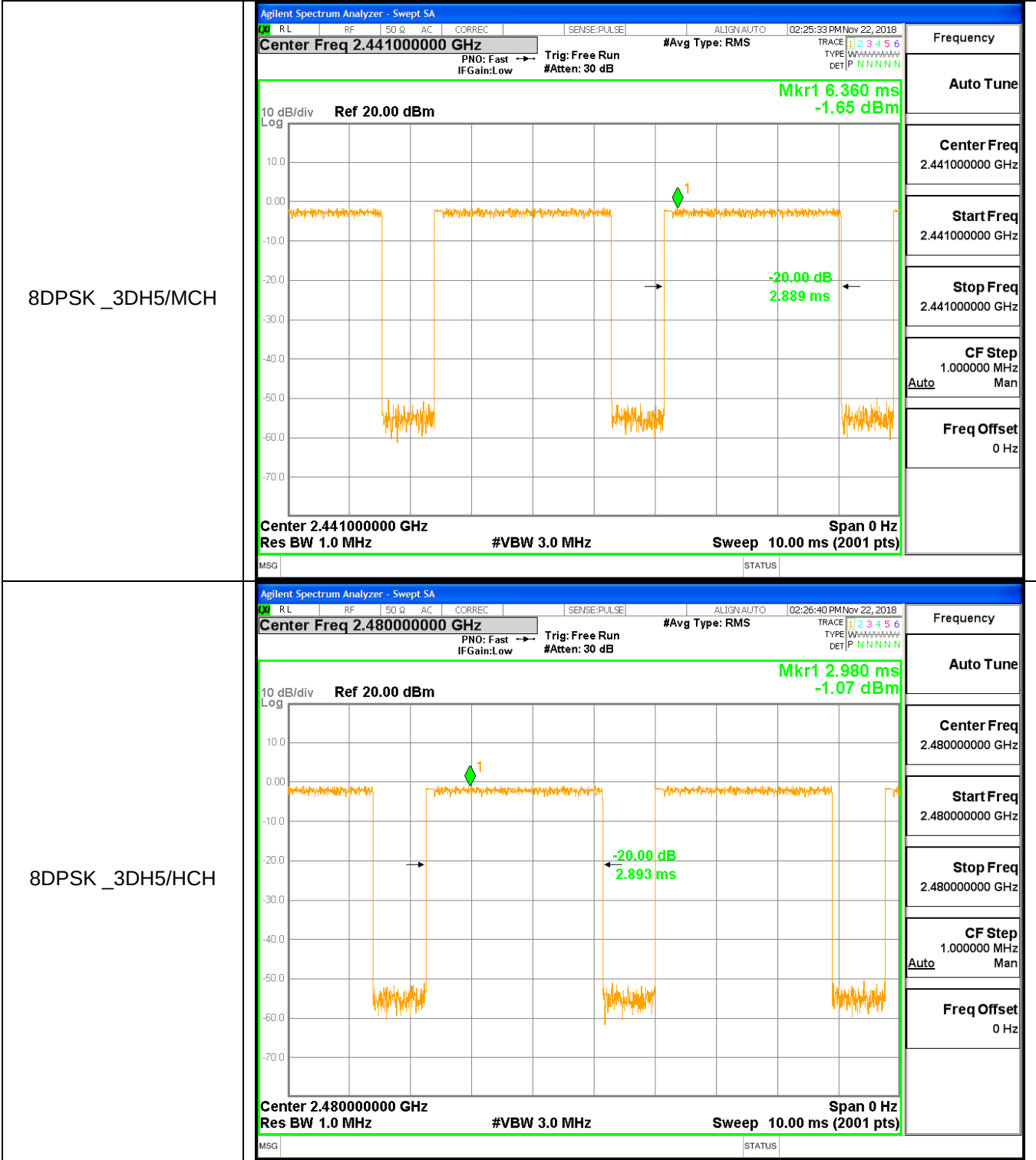
Test Graph







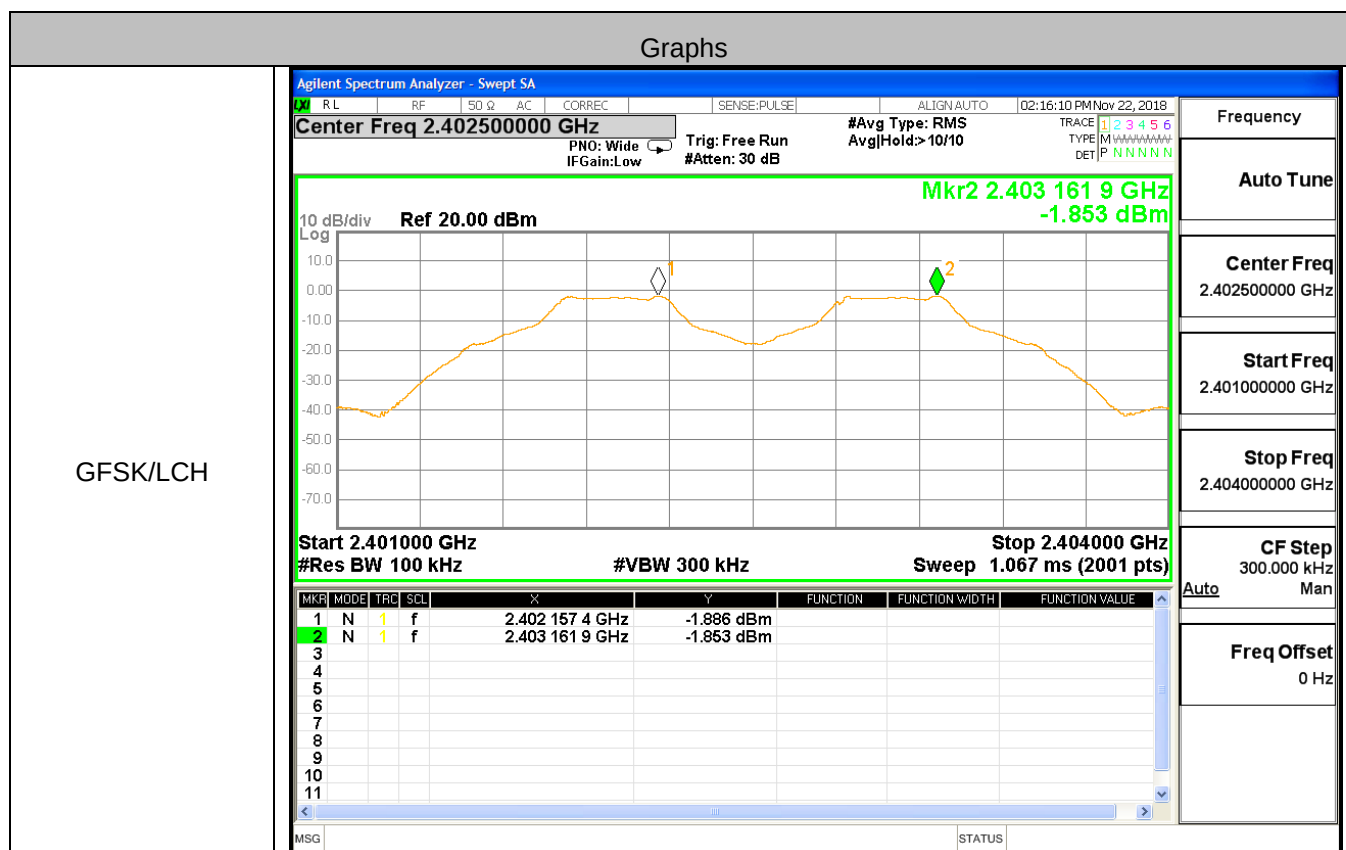


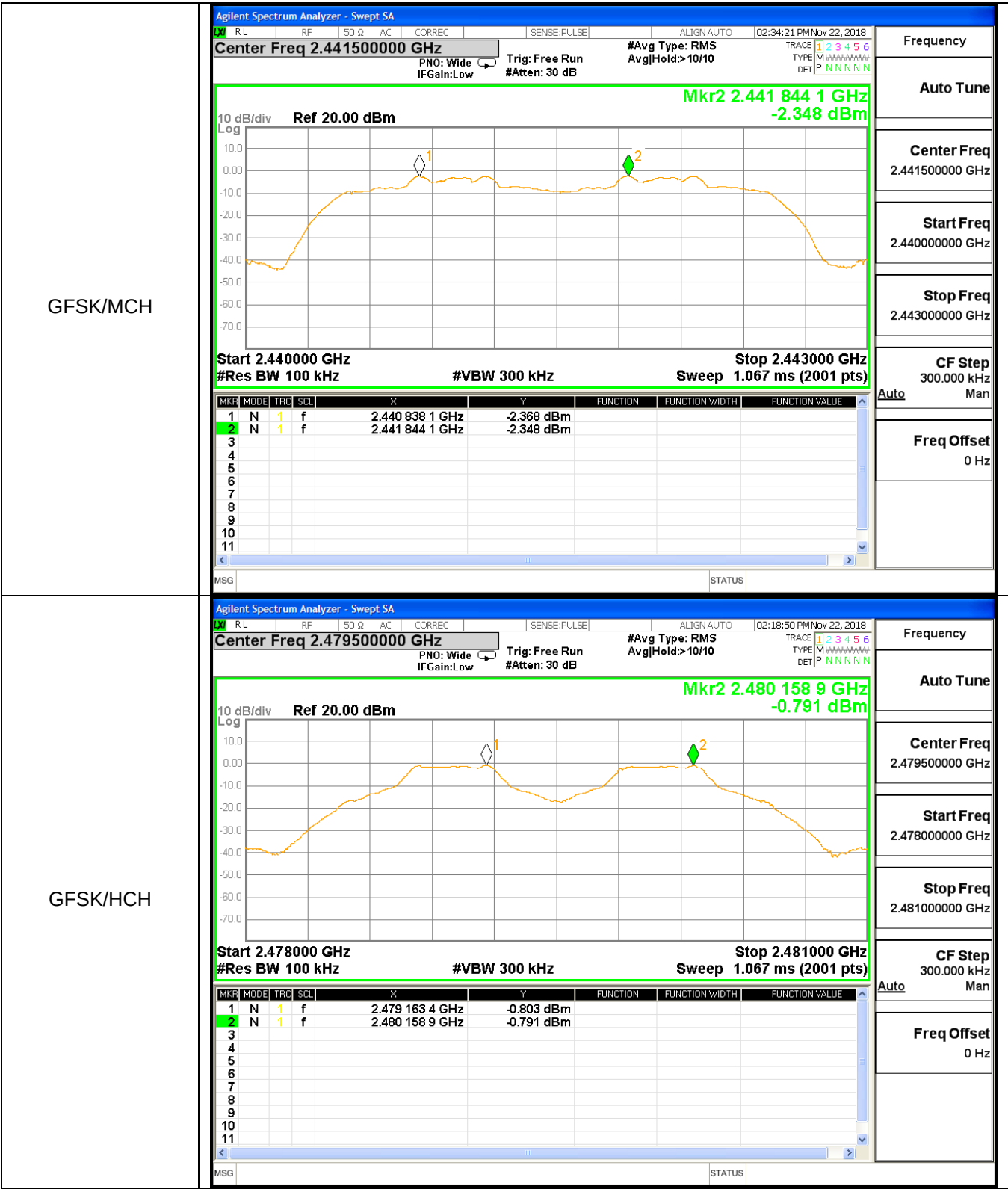


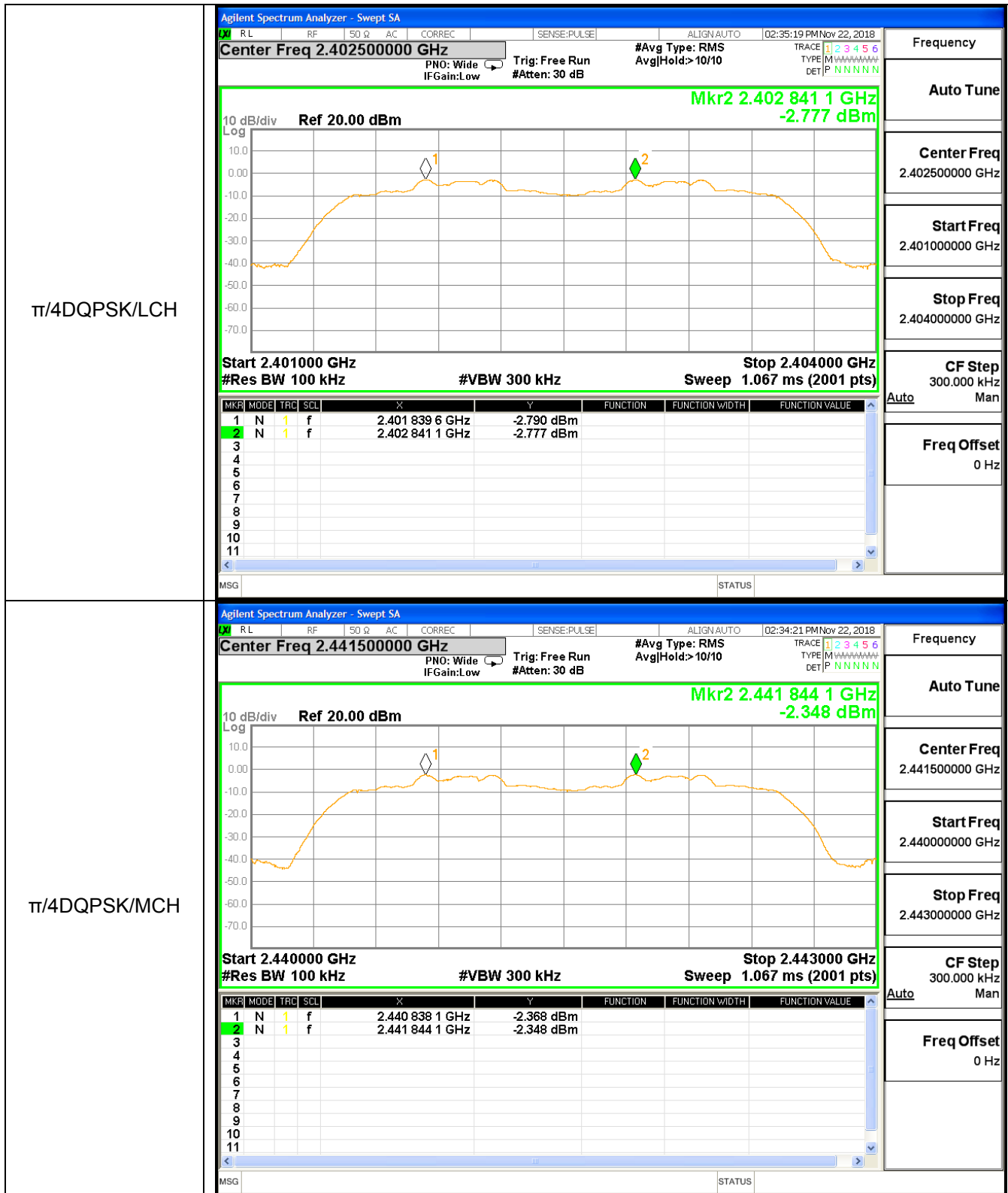
A.3 Carrier Frequency Separation

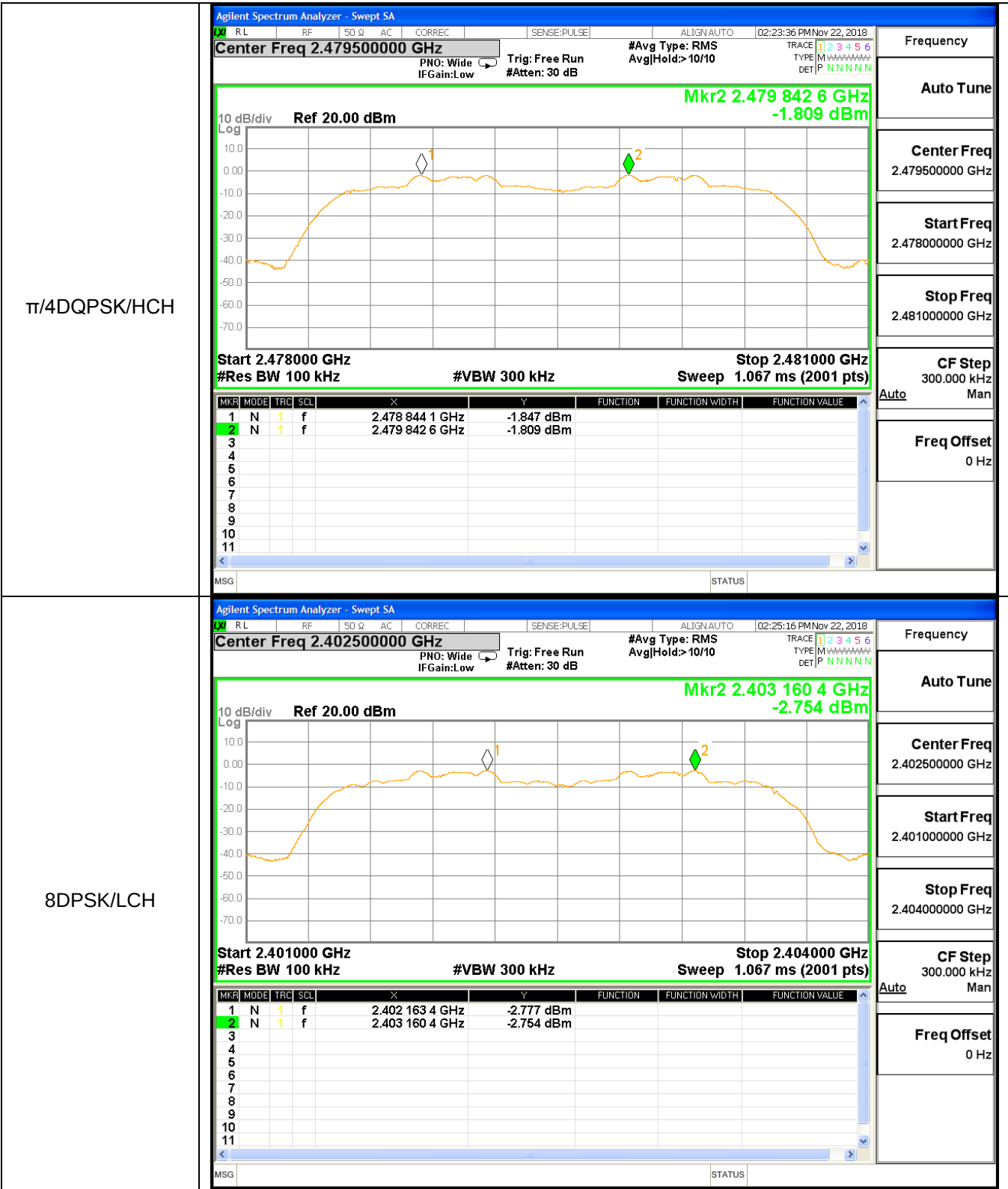
Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	1.004	0.640	PASS
GFSK	MCH	1.004	0.641	PASS
GFSK	HCH	0.996	0.636	PASS
$\pi/4$ DQPSK	LCH	1.001	0.891	PASS
$\pi/4$ DQPSK	MCH	0.996	0.887	PASS
$\pi/4$ DQPSK	HCH	0.999	0.891	PASS
8DPSK	LCH	0.997	0.891	PASS
8DPSK	MCH	1.004	0.892	PASS
8DPSK	HCH	1.004	0.883	PASS

Test Graph







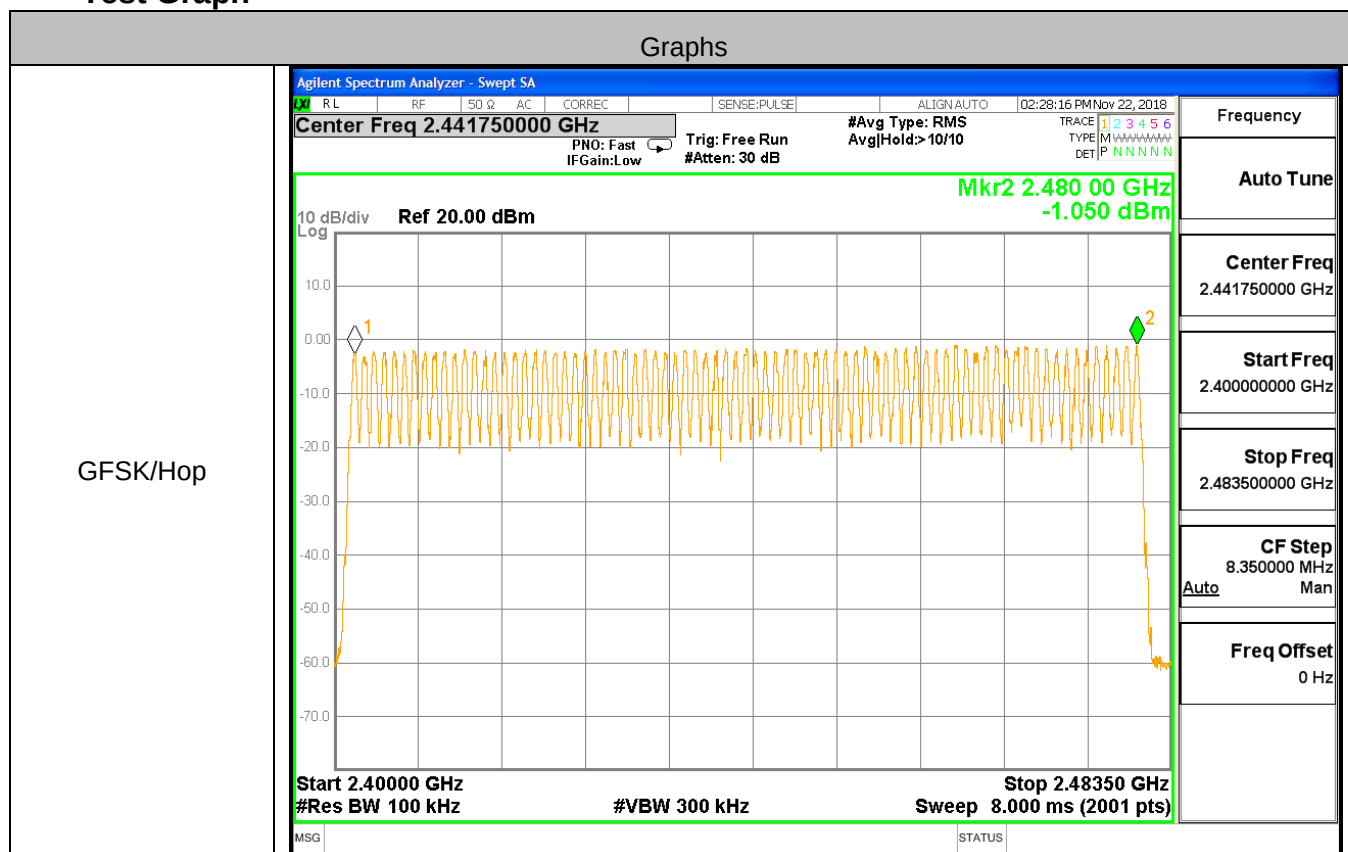


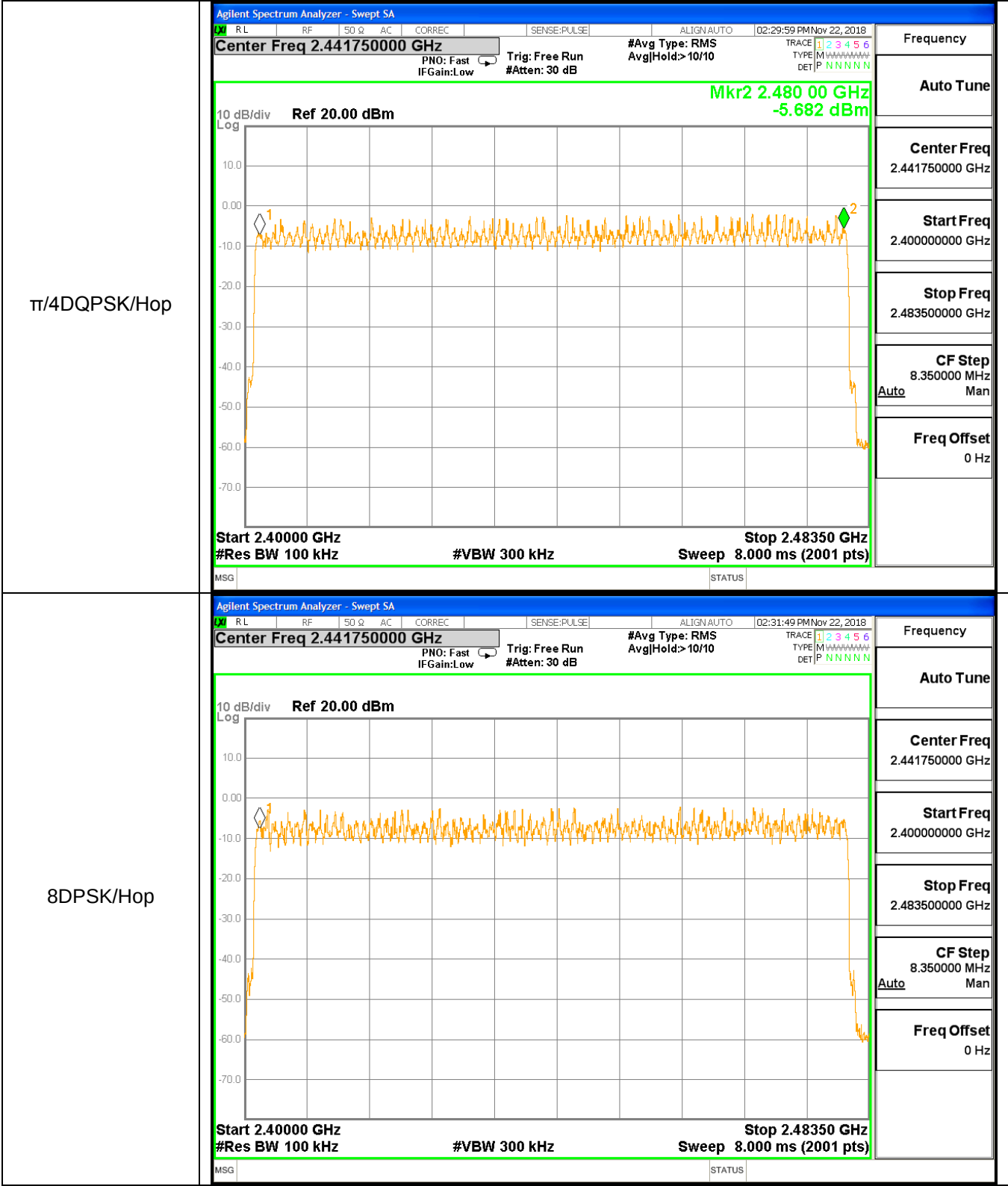


A.4 Hopping Channel Number

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

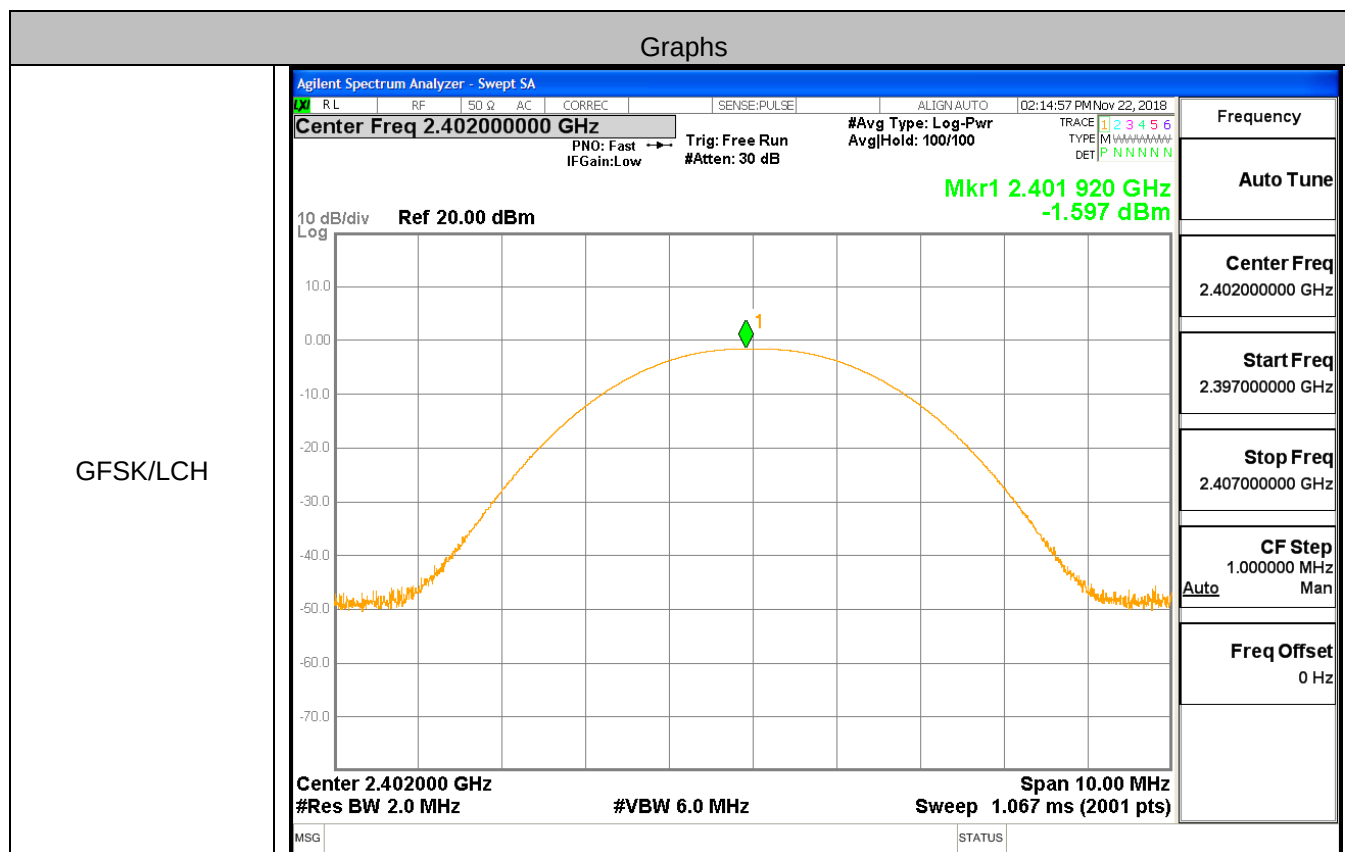


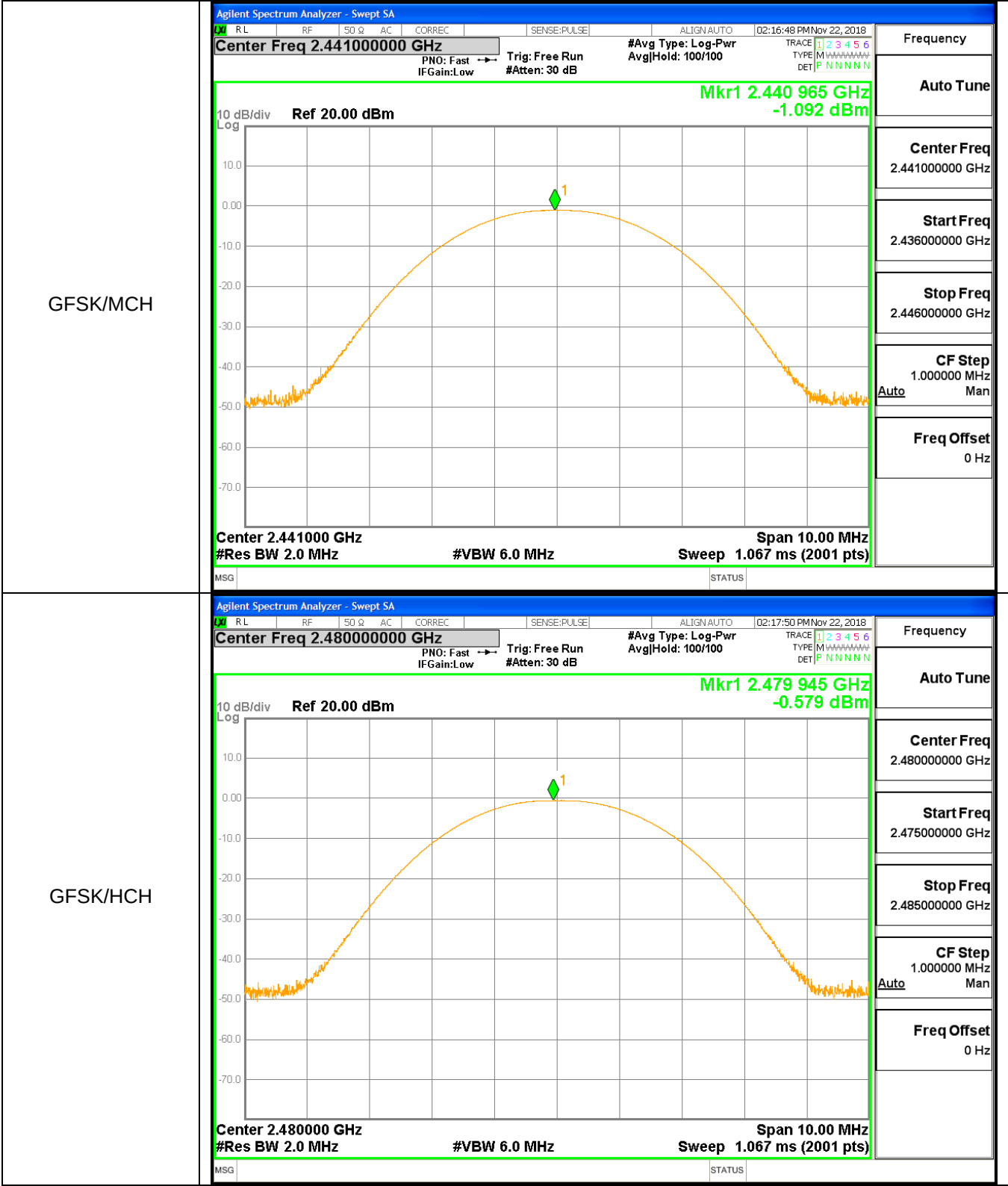


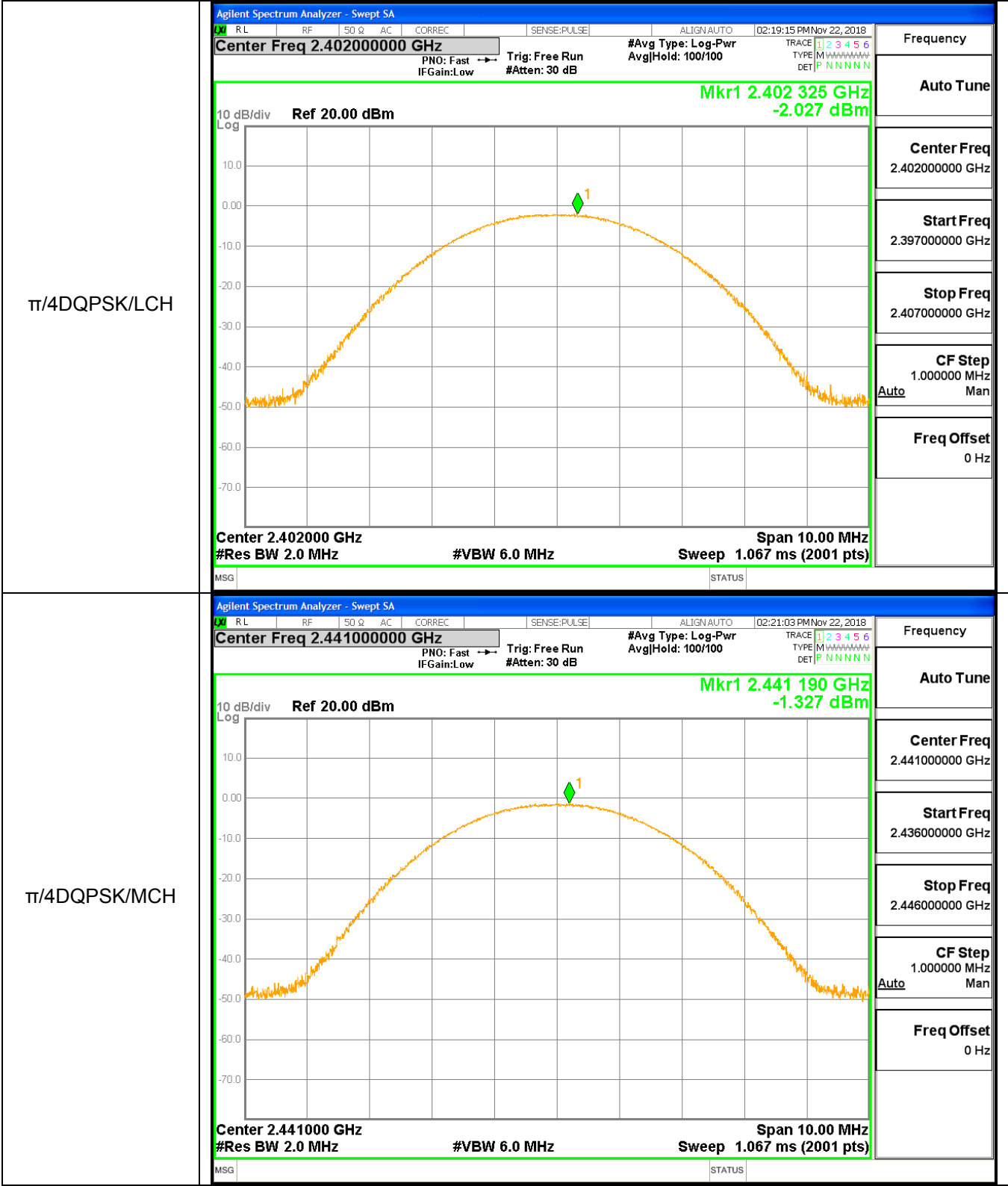
A.5 Conducted Peak Output Power

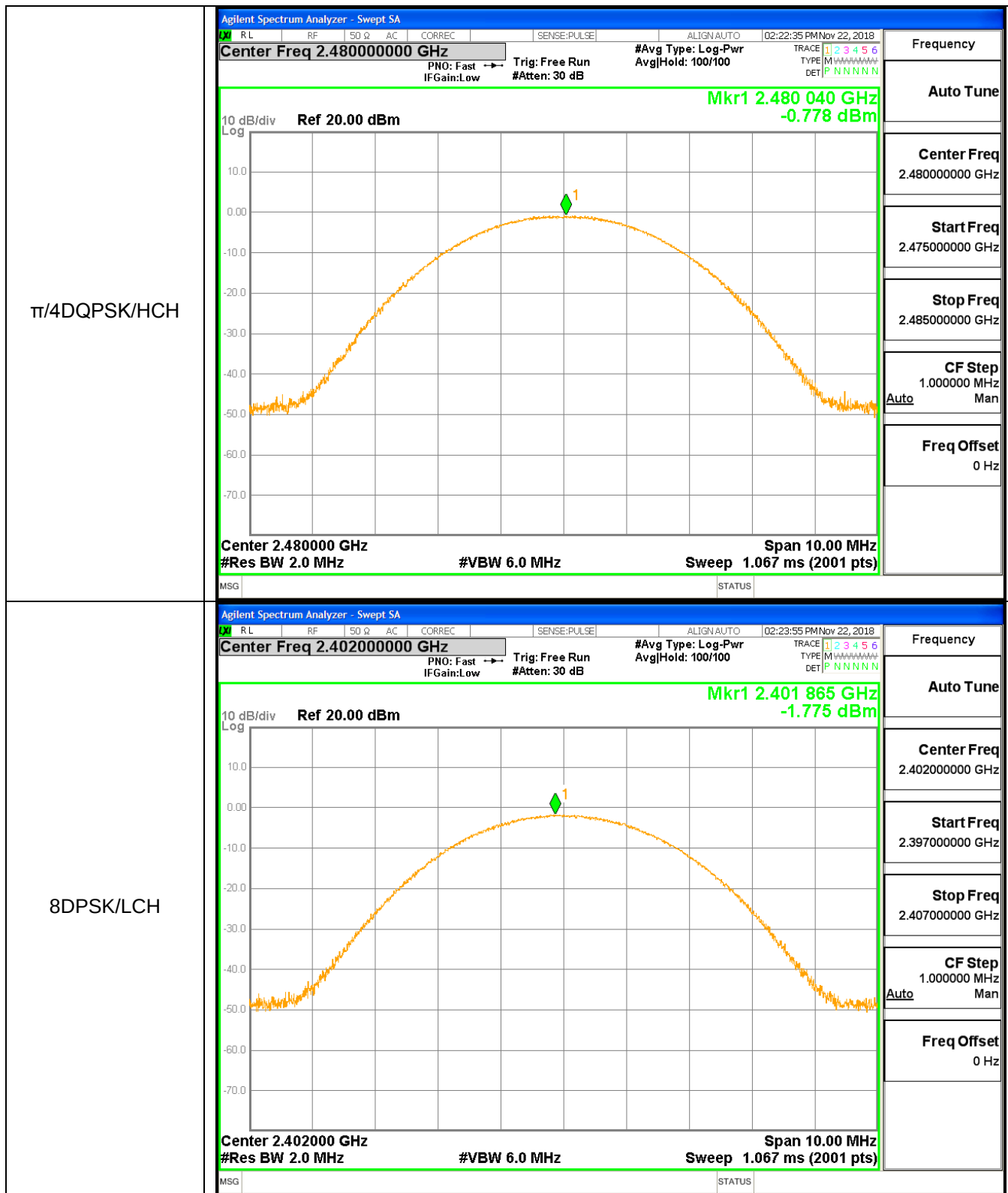
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-1.597	21	PASS
GFSK	MCH	-1.092	21	PASS
GFSK	HCH	-0.579	21	PASS
$\pi/4$ DQPSK	LCH	-2.027	21	PASS
$\pi/4$ DQPSK	MCH	-1.327	21	PASS
$\pi/4$ DQPSK	HCH	-0.778	21	PASS
8DPSK	LCH	-1.775	21	PASS
8DPSK	MCH	-1.200	21	PASS
8DPSK	HCH	-0.623	21	PASS

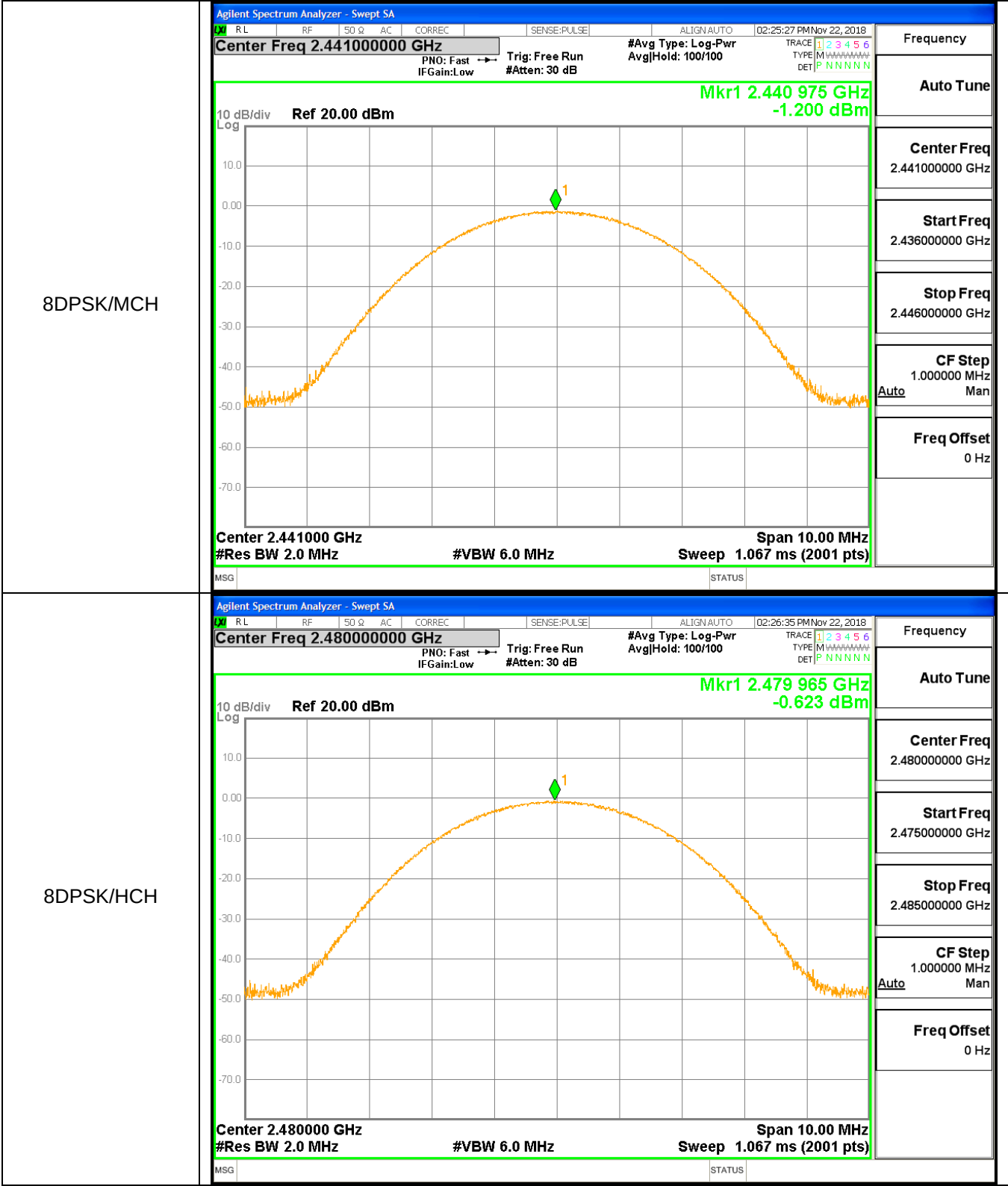
Test Graph







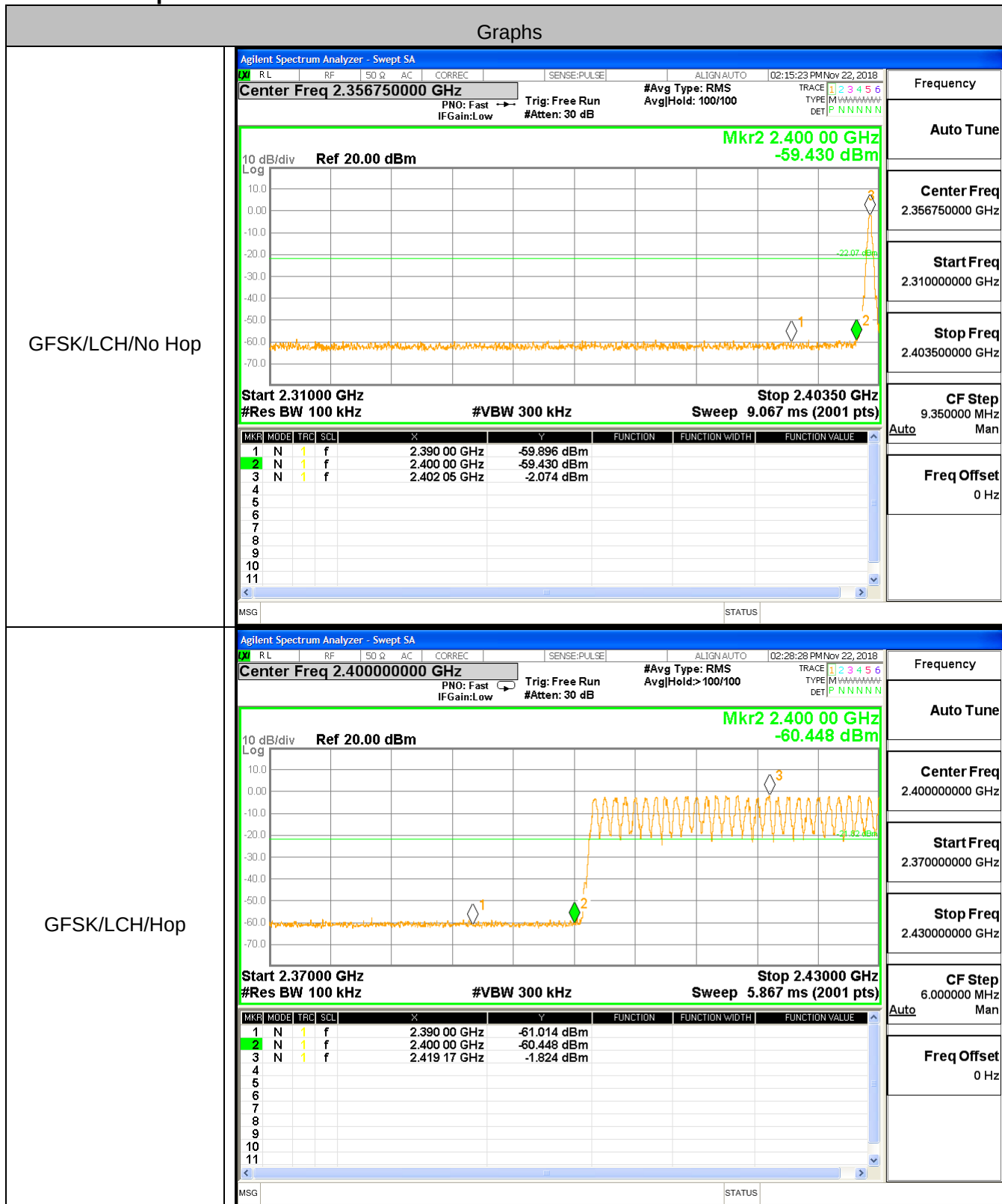




A.6 Band-edge for RF Conducted Emissions

Type	Carrier Frequency(MHz)	Frequency(MHz)	Carrier Frequency Power [dBm]	Bandedge Peak(dBm)	Upper limit(dBm)	Conclusion
1DH5	2402	2390	-2.074	-59.9	-22.074	Pass
1DH5	2402	2400	-2.074	-59.43	-22.074	Pass
1DH5-Hopping	2402	2390	-1.824	-61.01	-21.824	Pass
1DH5-Hopping	2402	2400	-1.824	-60.45	-21.824	Pass
1DH5	2480	2483.5	-0.971	-62.57	-20.971	Pass
1DH5	2480	2500	-0.971	-61.54	-20.971	Pass
1DH5-Hopping	2480	2483.5	-1.212	-60.04	-21.212	Pass
1DH5-Hopping	2480	2500	-1.212	-60.11	-21.212	Pass
2DH5	2402	2390	-4.977	-61.7	-24.977	Pass
2DH5	2402	2400	-4.977	-57.4	-24.977	Pass
2DH5-Hopping	2480	2483.5	-2.507	-60.86	-22.507	Pass
2DH5-Hopping	2480	2500	-2.507	-60.45	-22.507	Pass
2DH5	2480	2483.5	-2.344	-62.74	-22.344	Pass
2DH5	2480	2500	-2.344	-62.91	-22.344	Pass
2DH5-Hopping	2402	2390	-2.746	-61.1	-22.746	Pass
2DH5-Hopping	2402	2400	-2.746	-59.85	-22.746	Pass
3DH5	2402	2390	-2.873	-61.94	-22.873	Pass
3DH5	2402	2400	-2.928	-60.86	-22.928	Pass
3DH5-Hopping	2402	2390	-2.928	-59.01	-22.928	Pass
3DH5-Hopping	2402	2400	-2.873	-58.16	-22.873	Pass
3DH5	2480	2483.5	-1.808	-61.29	-21.808	Pass
3DH5	2480	2500	-1.808	-61.72	-21.808	Pass
3DH5-Hopping	2480	2483.5	-2.07	-60.32	-22.07	Pass
3DH5-Hopping	2480	2500	-2.07	-58.39	-22.07	Pass

Test Graph



GFSK/HCH/No Hop	Agilent Spectrum Analyzer - Swept SA RL RF 50 Ω AC CORREC SENSE:PULSE ALIGN:AUTO 02:18:13 PM Nov 22, 2018 Center Freq 2.489250000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB #Avg Type: RMS AvgHold: 100/100 TRACE 1 2 3 4 5 6 TYPE M M M M M M M M DET P N N N N N 10 dB/div Ref 20.00 dBm Mkr2 2.500 000 GHz -61.545 dBm Start 2.47850 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.50000 GHz Sweep 2.133 ms (2001 pts) <table><tr><th>MKR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.483 500 GHz</td><td>-62.574 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.500 000 GHz</td><td>-61.545 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.479 855 GHz</td><td>-0.971 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> MSG STATUS	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.483 500 GHz	-62.574 dBm				2	N	1	f	2.500 000 GHz	-61.545 dBm				3	N	1	f	2.479 855 GHz	-0.971 dBm				4									5									6									7									8									9									10									11									Frequency Auto Tune Center Freq 2.489250000 GHz Start Freq 2.478500000 GHz Stop Freq 2.500000000 GHz CF Step 2.150000 MHz Auto Man Freq Offset 0 Hz
	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																																																																																																					
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GFSK/HCH/Hop	Agilent Spectrum Analyzer - Swept SA RL RF 50 Ω AC CORREC SENSE:PULSE ALIGN:AUTO 02:28:46 PM Nov 22, 2018 Center Freq 2.483500000 GHz PNO: Fast IFGain:Low Trig: Free Run #Atten: 30 dB #Avg Type: RMS AvgHold> 100/100 TRACE 1 2 3 4 5 6 TYPE M M M M M M M M DET P N N N N N 10 dB/div Ref 20.00 dBm Mkr2 2.500 00 GHz -60.114 dBm Start 2.45350 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.51350 GHz Sweep 5.867 ms (2001 pts) <table><tr><th>MKR</th><th>MODE</th><th>TRC</th><th>SCL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.483 50 GHz</td><td>-60.038 dBm</td><td></td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>2.500 00 GHz</td><td>-60.114 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td>N</td><td>1</td><td>f</td><td>2.475 97 GHz</td><td>-1.212 dBm</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> MSG STATUS	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	1	f	2.483 50 GHz	-60.038 dBm				2	N	1	f	2.500 00 GHz	-60.114 dBm				3	N	1	f	2.475 97 GHz	-1.212 dBm				4									5									6									7									8									9									10									11									Frequency Auto Tune Center Freq 2.483500000 GHz Start Freq 2.453500000 GHz Stop Freq 2.513500000 GHz CF Step 6.000000 MHz Auto Man Freq Offset 0 Hz
	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																																																																																																					
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$\pi/4$ DQPSK/LCH/No
Hop

Agilent Spectrum Analyzer - Swept SA

Center Freq 2.356750000 GHz

Ref 20.00 dBm

Mkr2 2.400 00 GHz -57.401 dBm

Start 2.31000 GHz Stop 2.40350 GHz

#Res BW 100 kHz #VBW 300 kHz Sweep 9.067 ms (2001 pts)

MKR	MODE	TRG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.390 00 GHz	-61.701 dBm			
2	N	1	f	2.400 00 GHz	-57.401 dBm			
3	N	1	f	2.402 10 GHz	-4.977 dBm			

$\pi/4$ DQPSK/LCH/Hop

Agilent Spectrum Analyzer - Swept SA

Center Freq 2.400000000 GHz

Ref 20.00 dBm

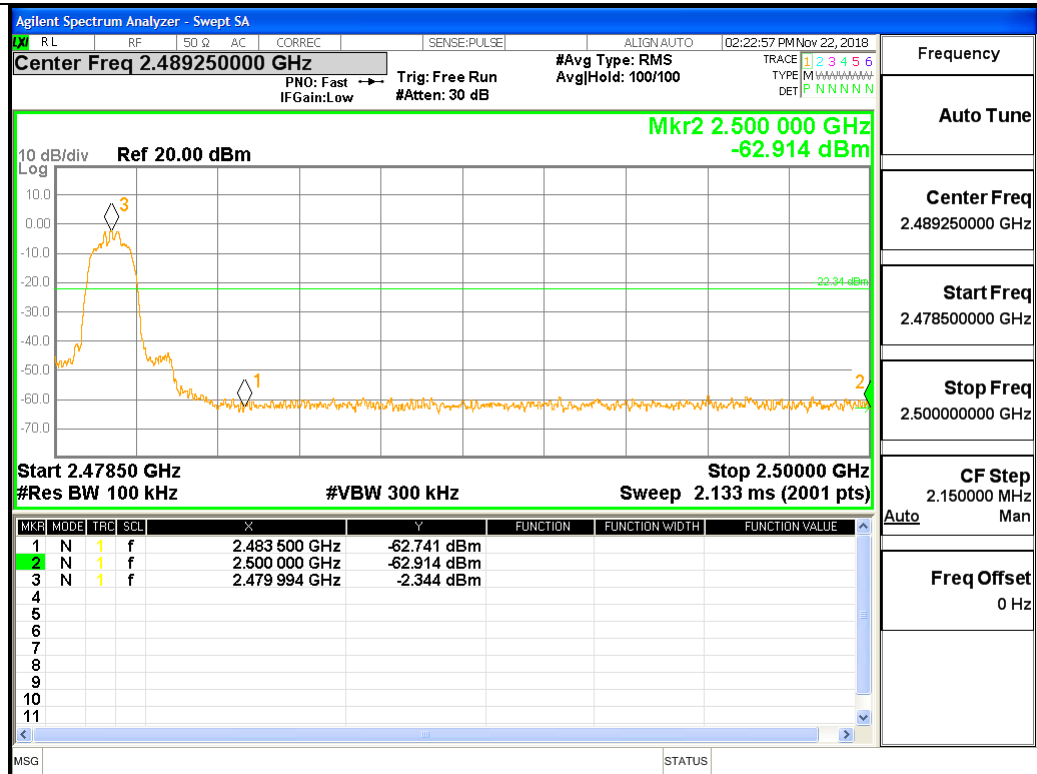
Mkr2 2.400 00 GHz -59.851 dBm

Start 2.37000 GHz Stop 2.43000 GHz

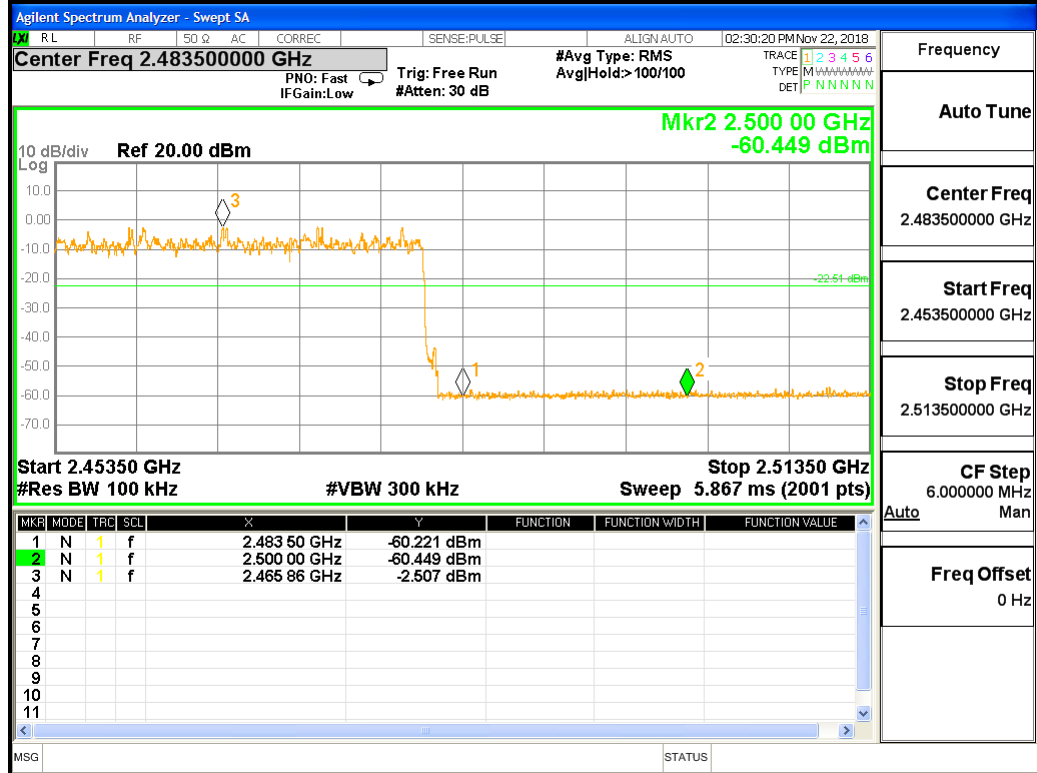
#Res BW 100 kHz #VBW 300 kHz Sweep 5.867 ms (2001 pts)

MKR	MODE	TRG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.390 00 GHz	-61.097 dBm			
2	N	1	f	2.400 00 GHz	-59.851 dBm			
3	N	1	f	2.413 17 GHz	-2.746 dBm			

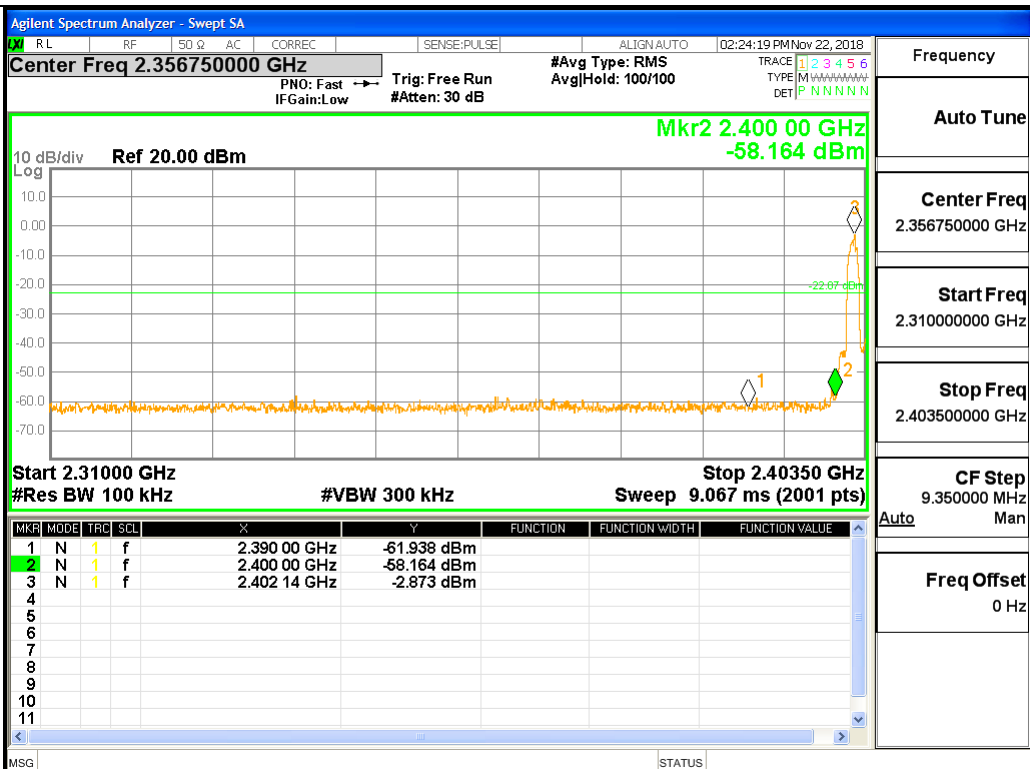
$\pi/4$ DQPSK/HCH/No
Hop



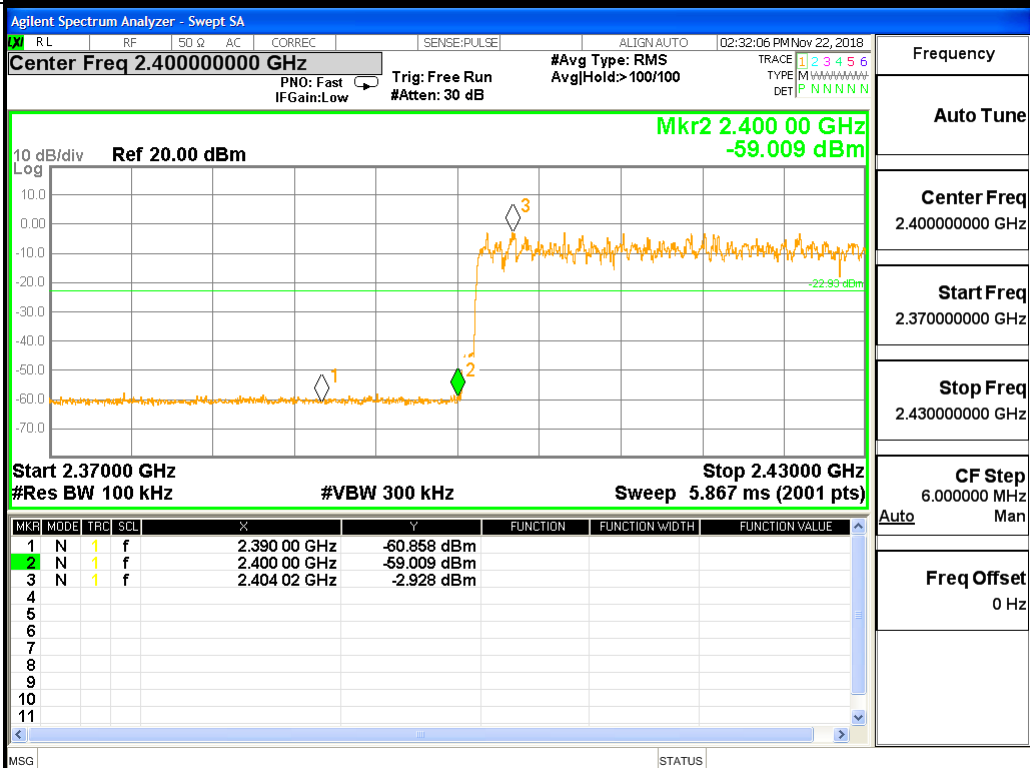
$\pi/4$ DQPSK/HCH/Hop



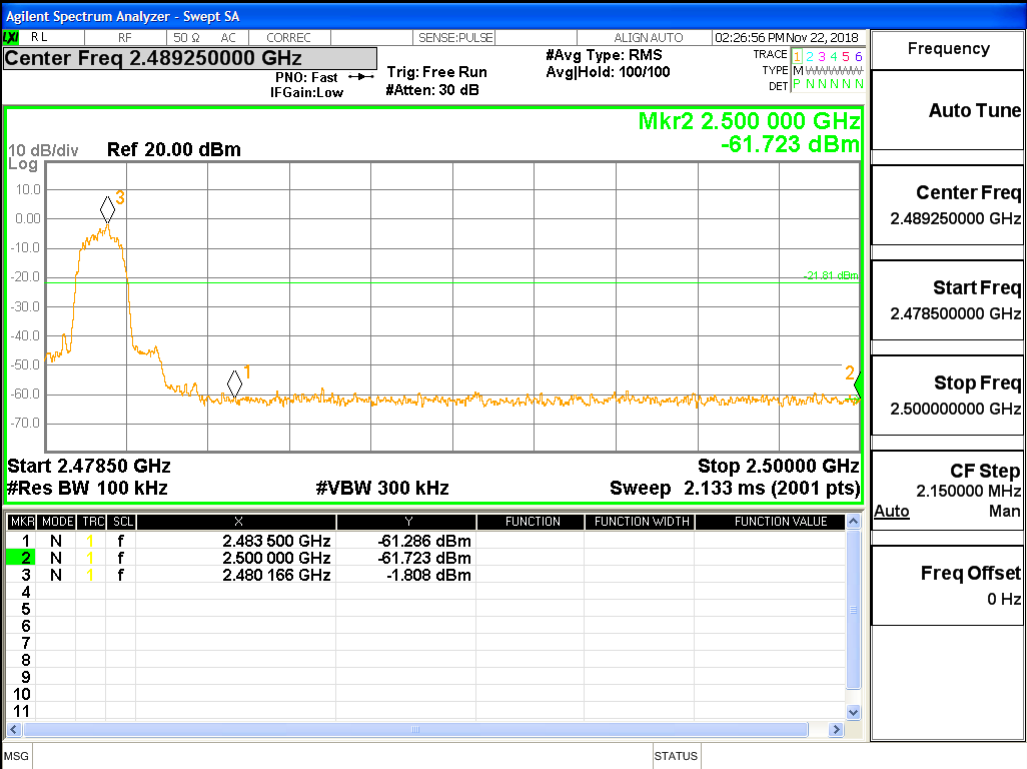
8DPSK/LCH/No Hop



8DPSK/LCH/Hop

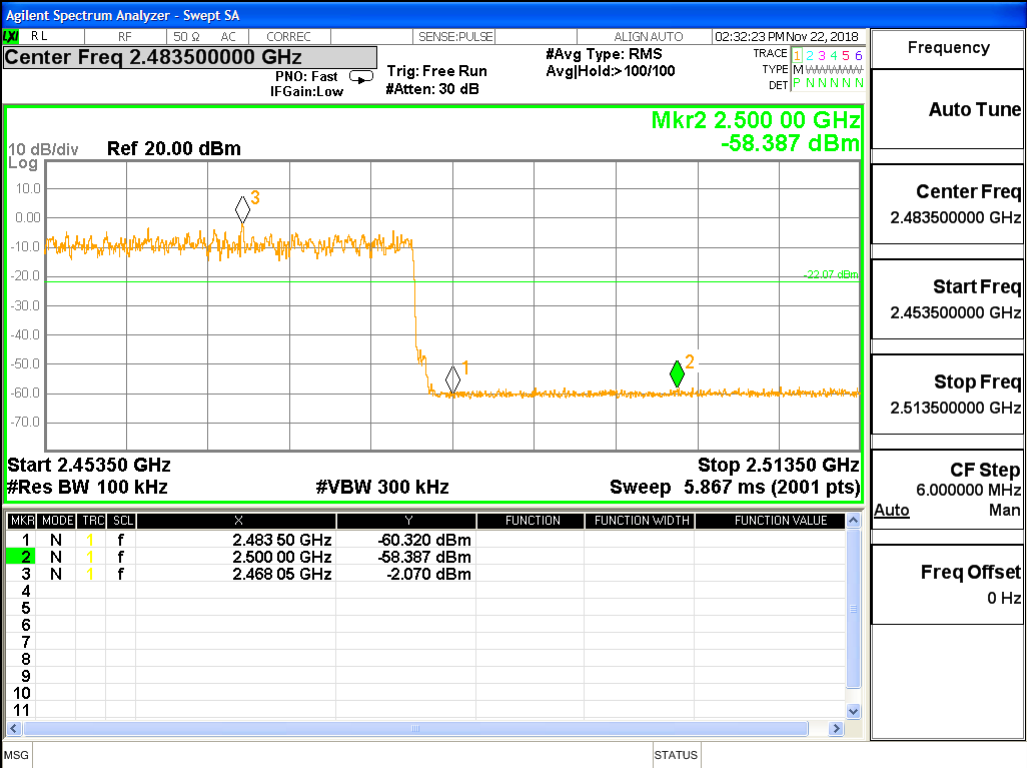


8DPSK/HCH/No Hop



Frequency
Auto Tune
Center Freq 2.489250000 GHz
Start Freq 2.478500000 GHz
Stop Freq 2.500000000 GHz
CF Step 2.150000 MHz Auto Man
Freq Offset 0 Hz

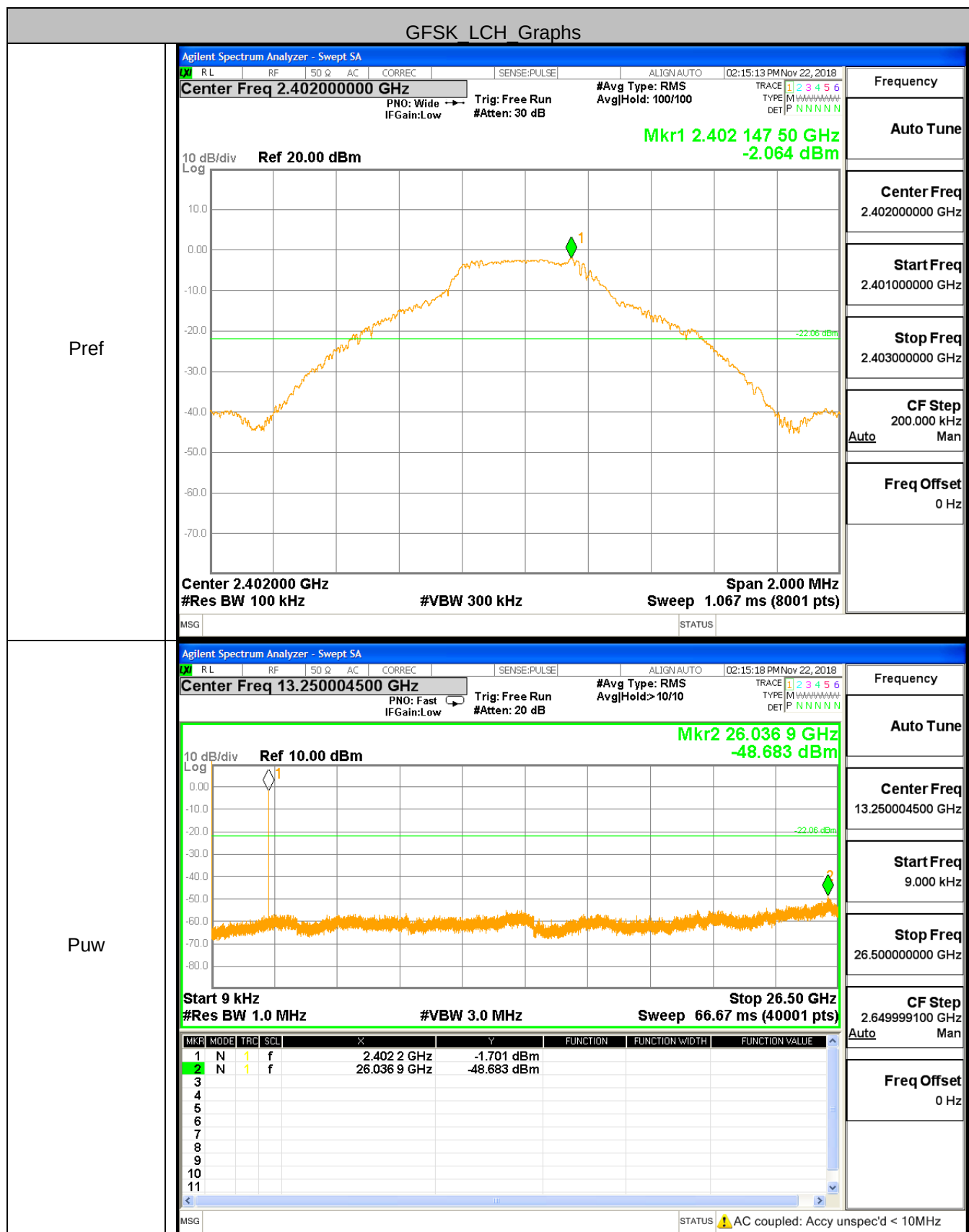
8DPSK/HCH/Hop

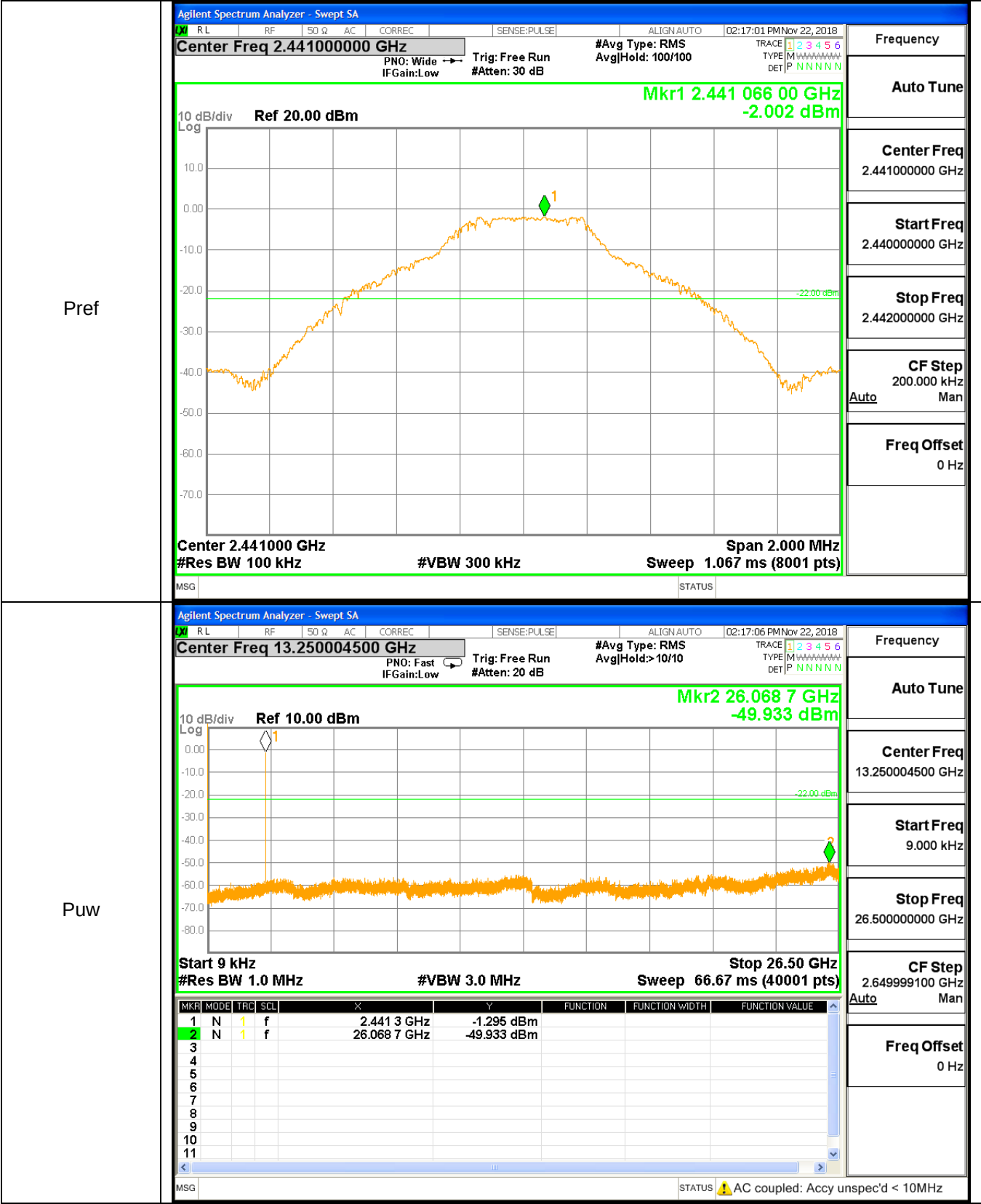


Frequency
Auto Tune
Center Freq 2.483500000 GHz
Start Freq 2.453500000 GHz
Stop Freq 2.513500000 GHz
CF Step 6.000000 MHz Auto Man
Freq Offset 0 Hz

A.7 RF Conducted Spurious Emissions

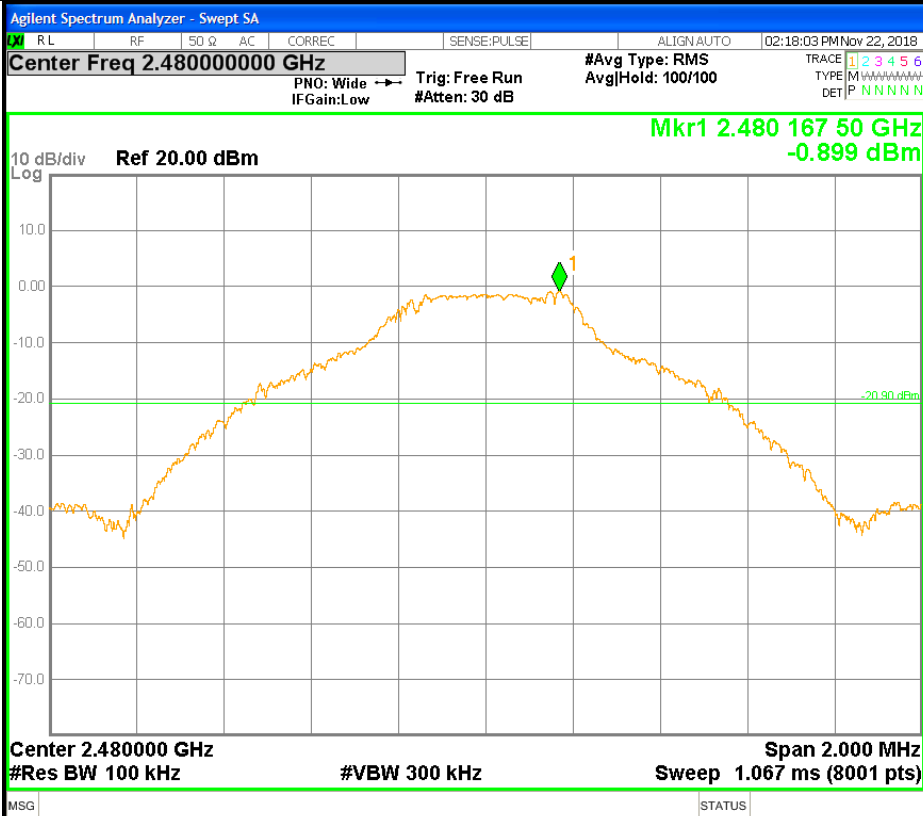
Test Graph



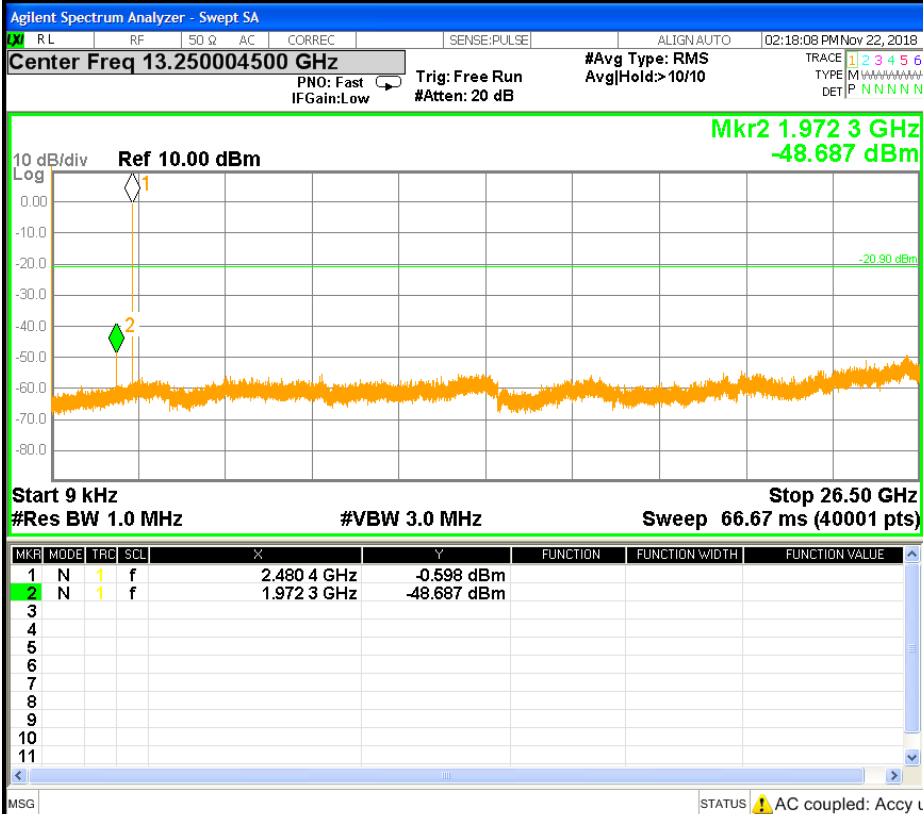


GFSK HCH Graphs

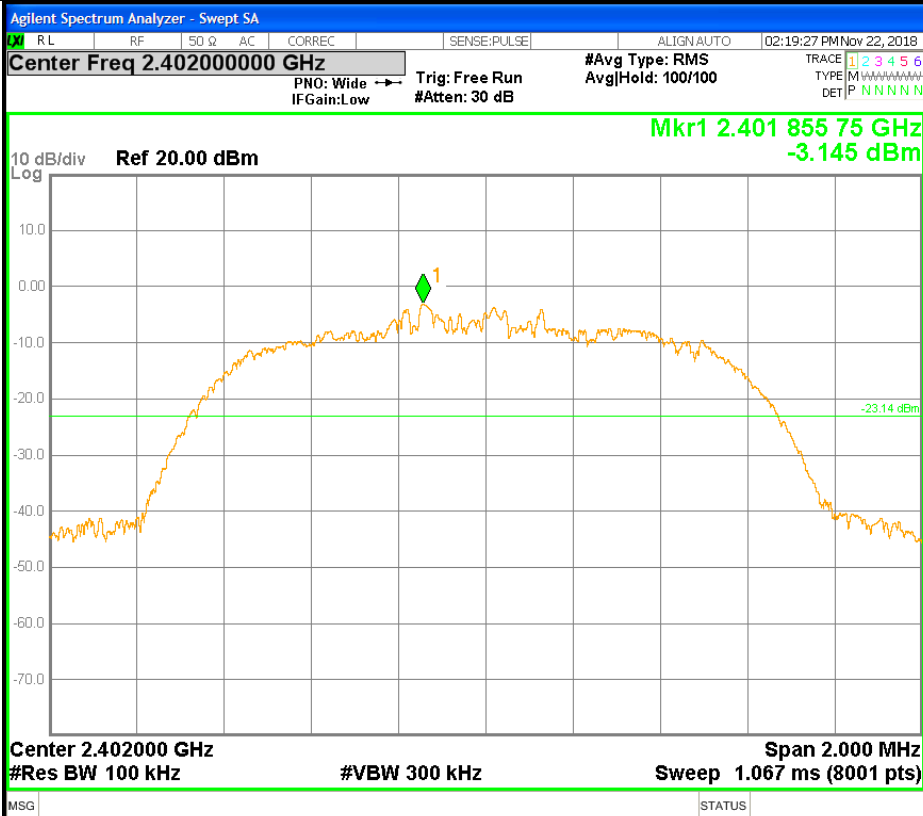
Pref



Puw

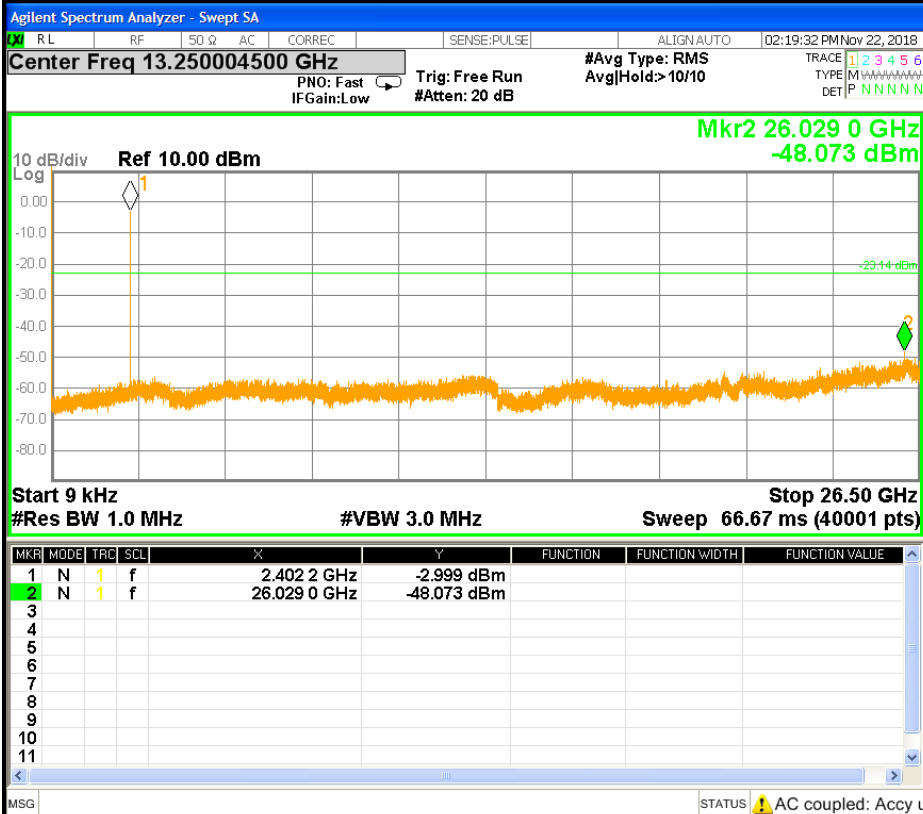


$\pi/4$ DQPSK LCH Graphs



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

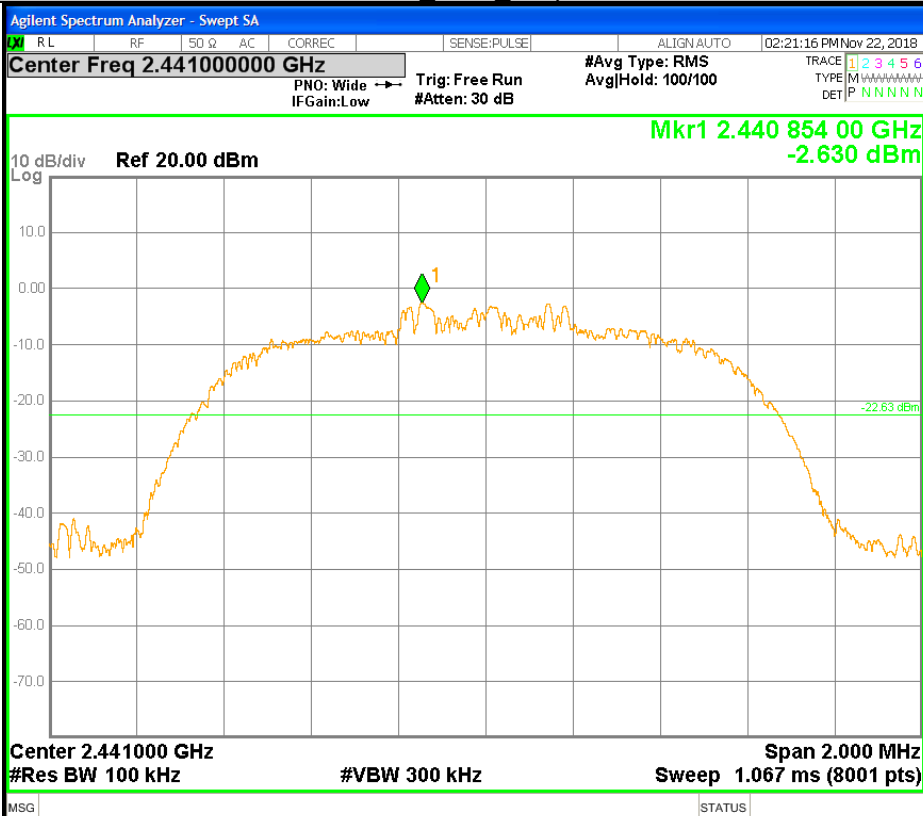
Puw



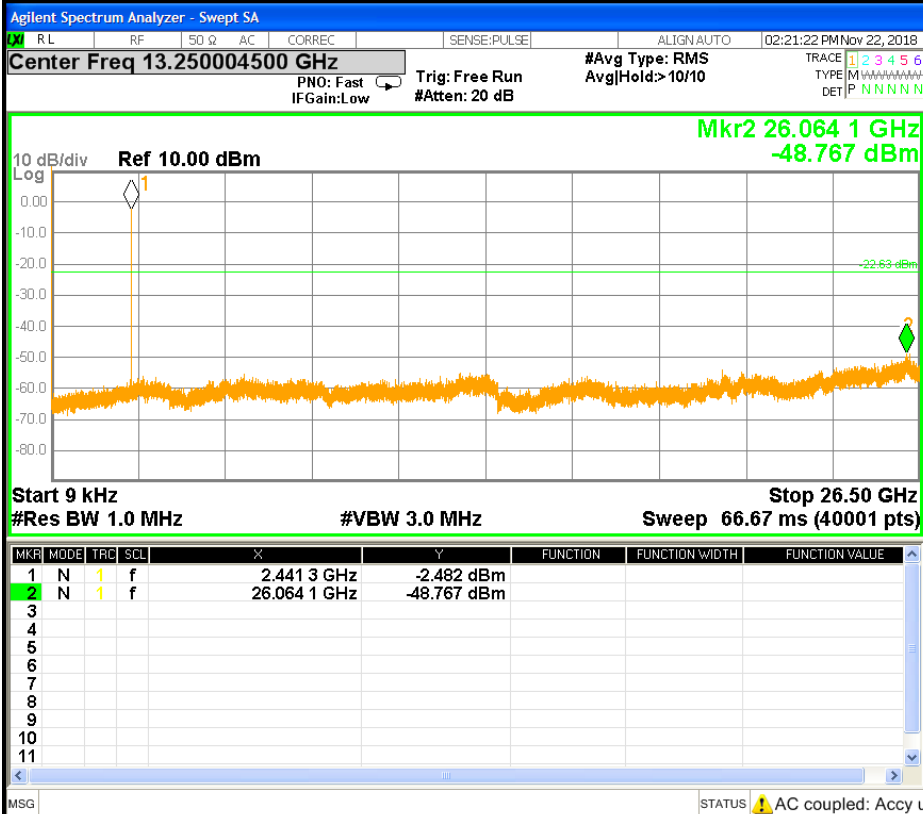
Frequency	
Auto Tune	
Center Freq	13.250004500 GHz
Start Freq	9.000 kHz
Stop Freq	26.500000000 GHz
CF Step	2.649999100 GHz
<u>Auto</u>	Man
Freq Offset	0 Hz

$\pi/4$ DQPSK MCH Graphs

Pref



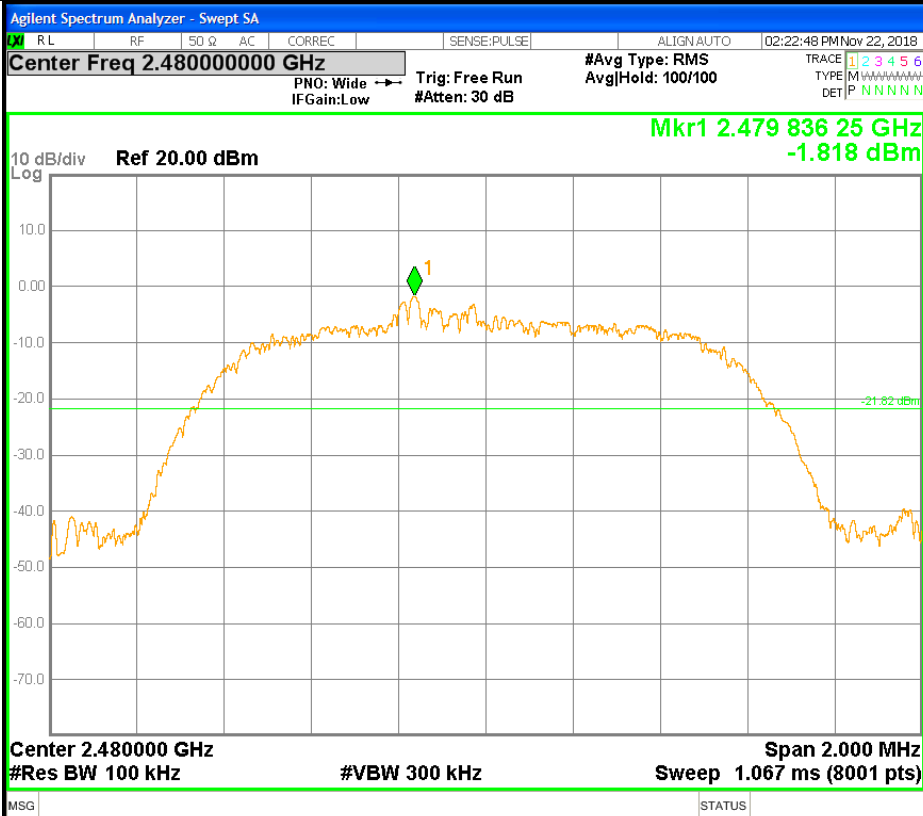
Puw



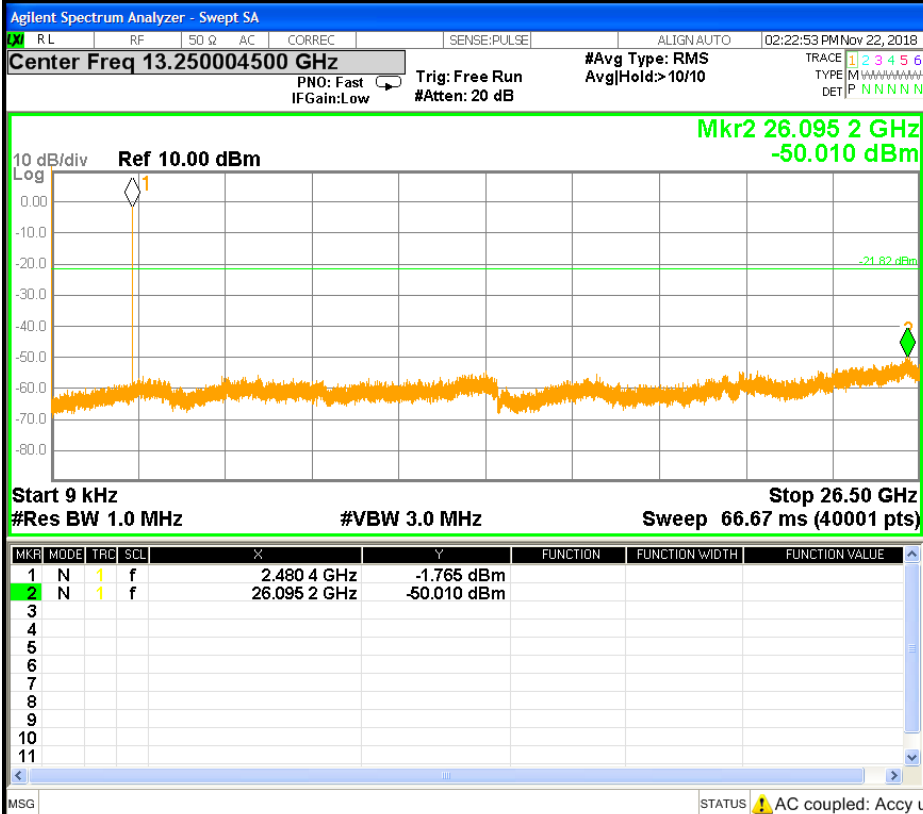
STATUS AC coupled: Accy unspec'd < 10MHz

$\pi/4$ DQPSK HCH Graphs

Pref

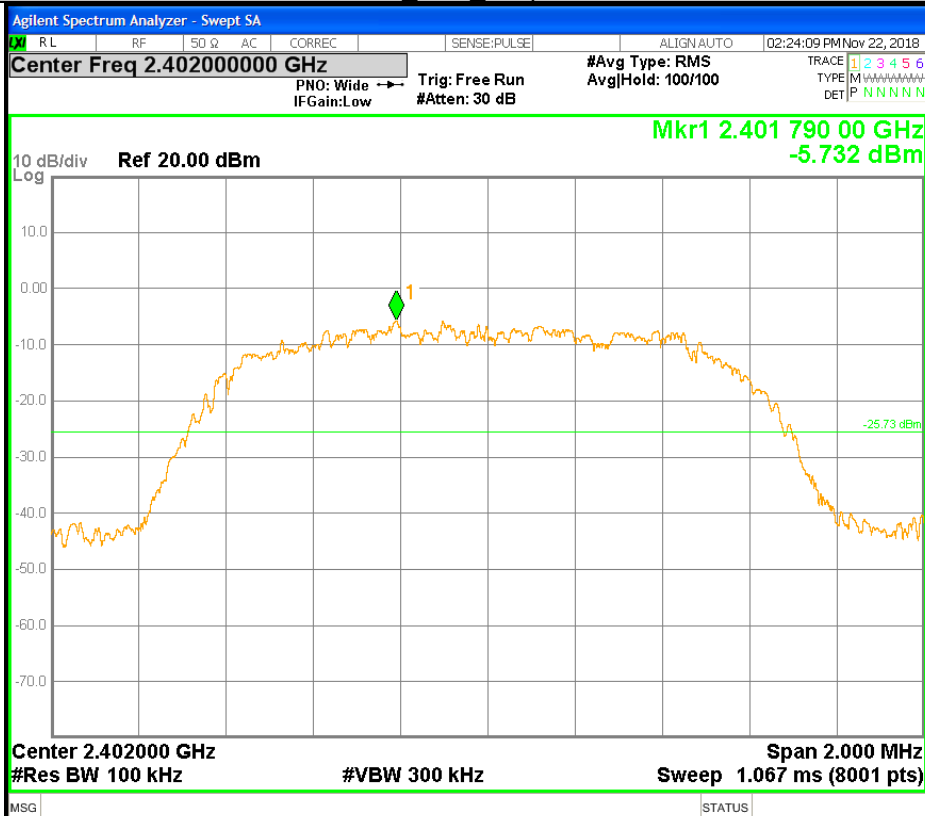


Puw

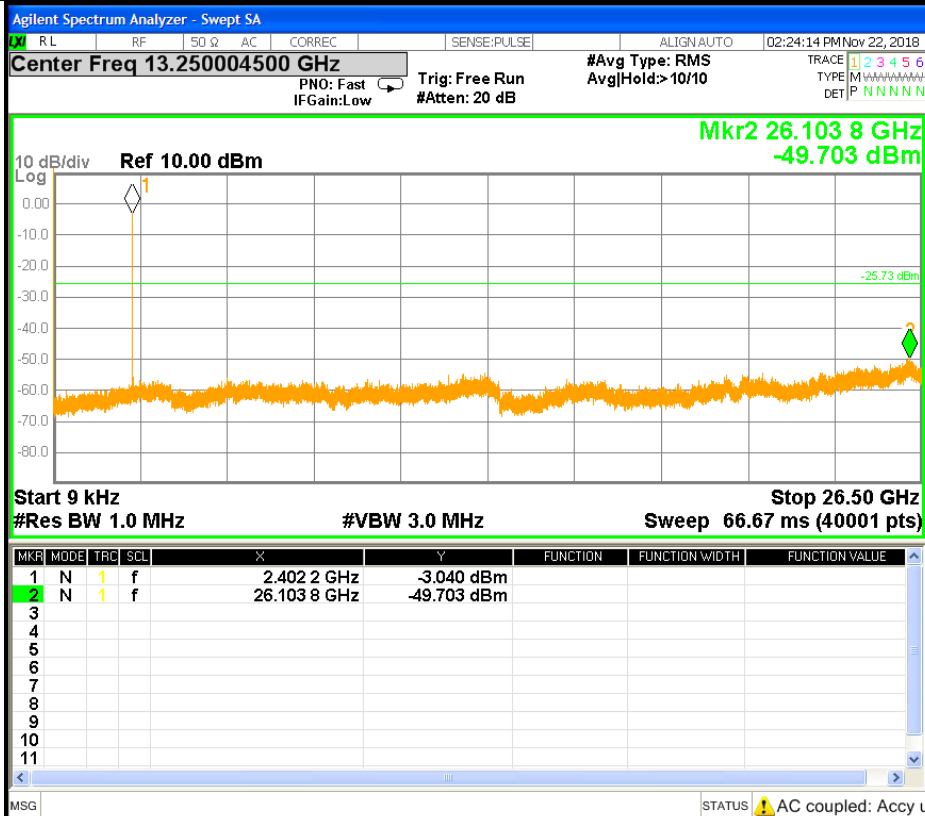


8DPSK LCH Graphs

Pref

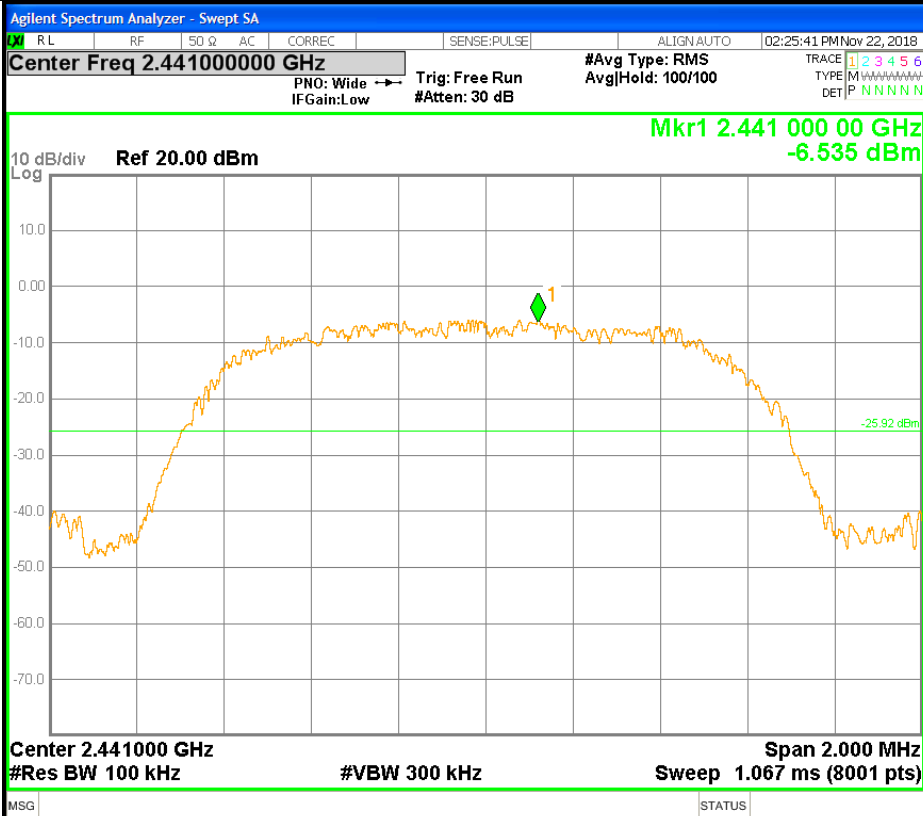


Puw

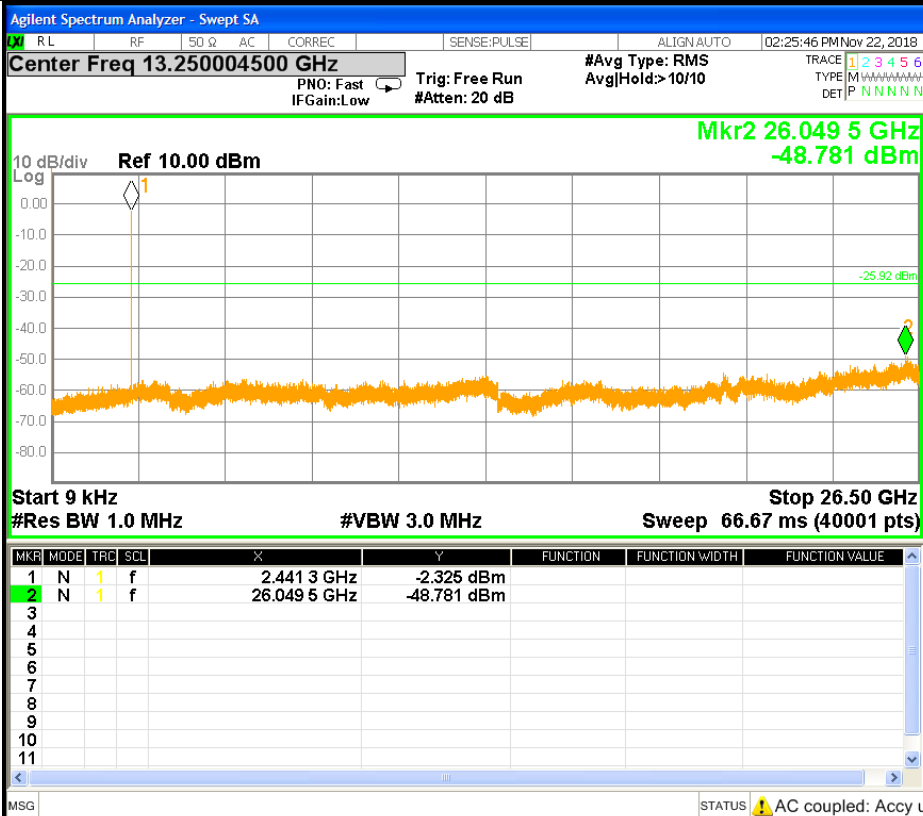


8DPSK MCH Graphs

Pref

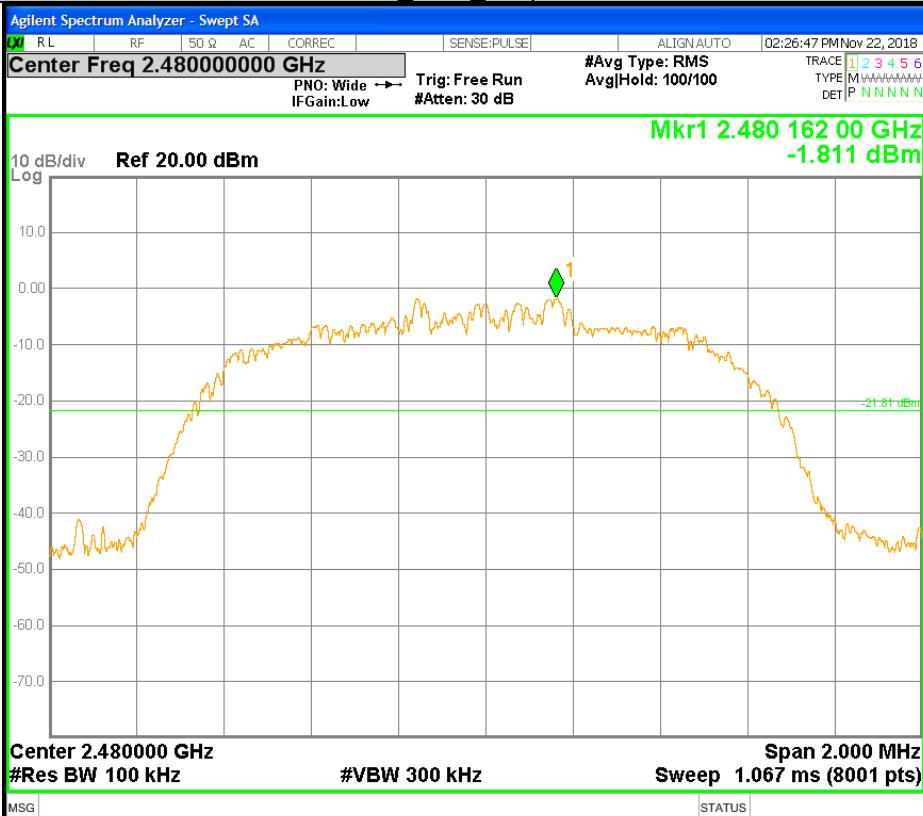


Puw

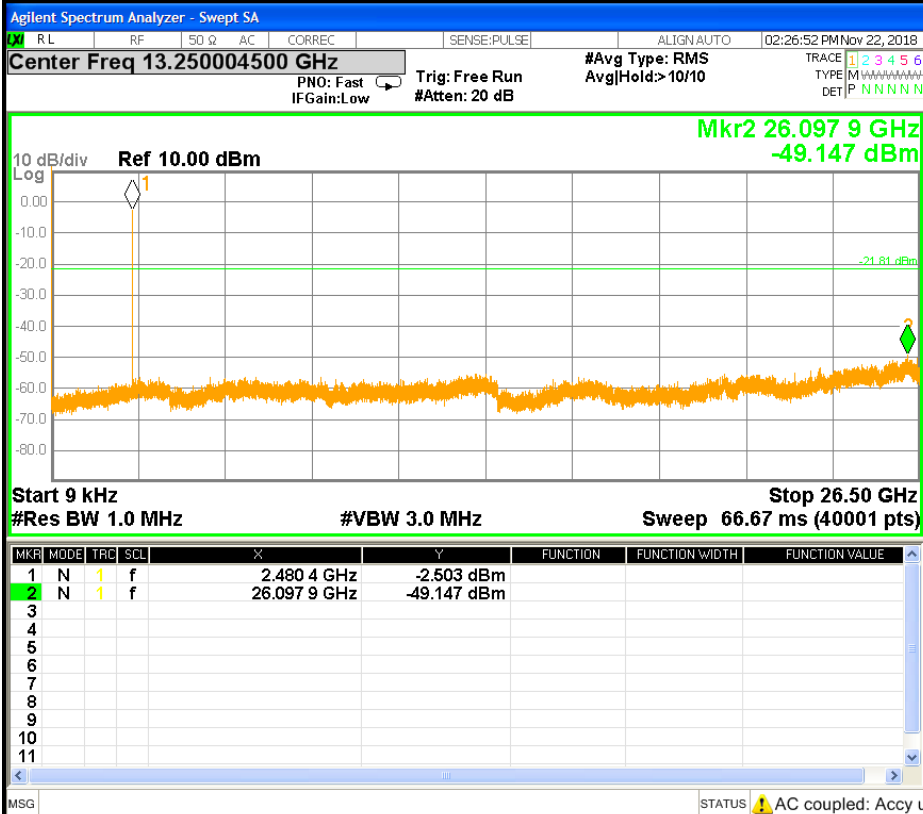


8DPSK HCH Graphs

Pref



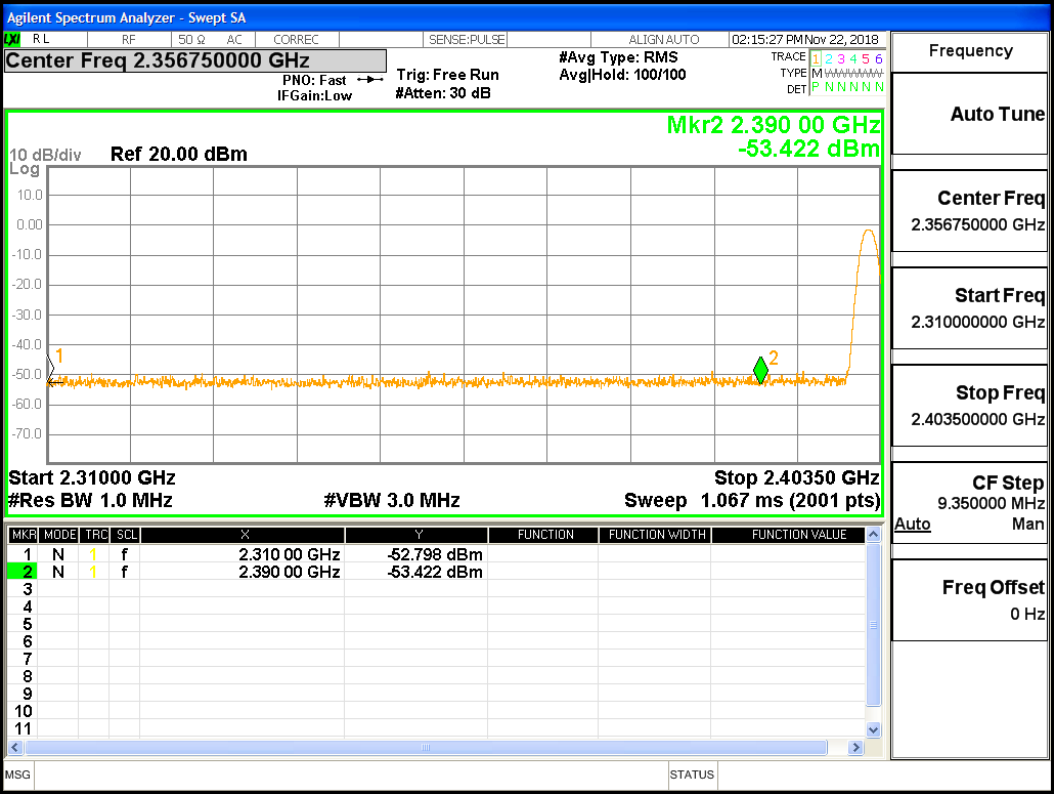
Puw



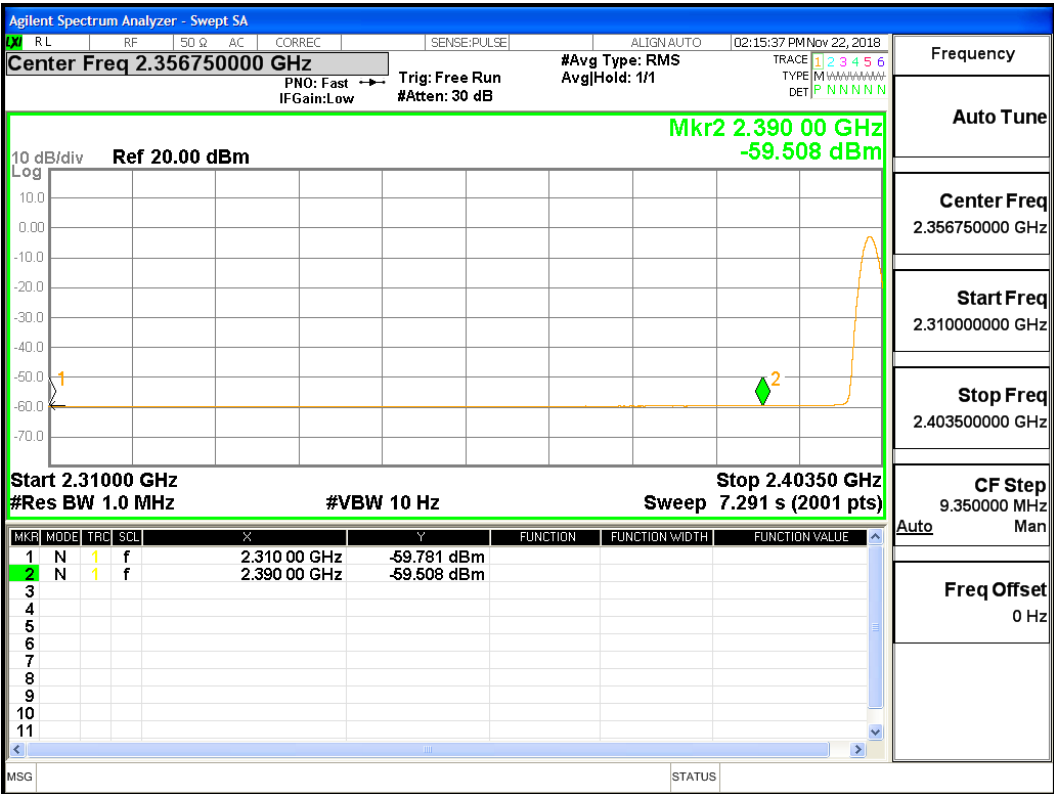
A.8 Restrict-band band-edge measurements

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	0.00	0.00	-52.8	42.4	74	-59.78	35.42	54	Pass
1DH5	2402	2390	0.00	0.00	-53.42	41.78	74	-59.51	35.69	54	Pass
1DH5	2480	2483.5	0.00	0.00	-52.4	42.8	74	-57.57	37.63	54	Pass
1DH5	2480	2500	0.00	0.00	-51.04	44.16	74	-58.96	36.24	54	Pass
2DH5	2402	2310	0.00	0.00	-50.35	44.85	74	-59.79	35.41	54	Pass
2DH5	2402	2390	0.00	0.00	-52.8	42.4	74	-59.49	35.71	54	Pass
2DH5	2480	2483.5	0.00	0.00	-51.96	43.24	74	-57.45	37.75	54	Pass
2DH5	2480	2500	0.00	0.00	-52.79	42.41	74	-58.97	36.23	54	Pass
3DH5	2402	2310	0.00	0.00	-52.38	42.82	74	-59.83	35.37	54	Pass
3DH5	2402	2390	0.00	0.00	-51.89	43.31	74	-59.48	35.72	54	Pass
3DH5	2480	2483.5	0.00	0.00	-50.64	44.56	74	-57.42	37.78	54	Pass
3DH5	2480	2500	0.00	0.00	-51.61	43.59	74	-58.97	36.23	54	Pass

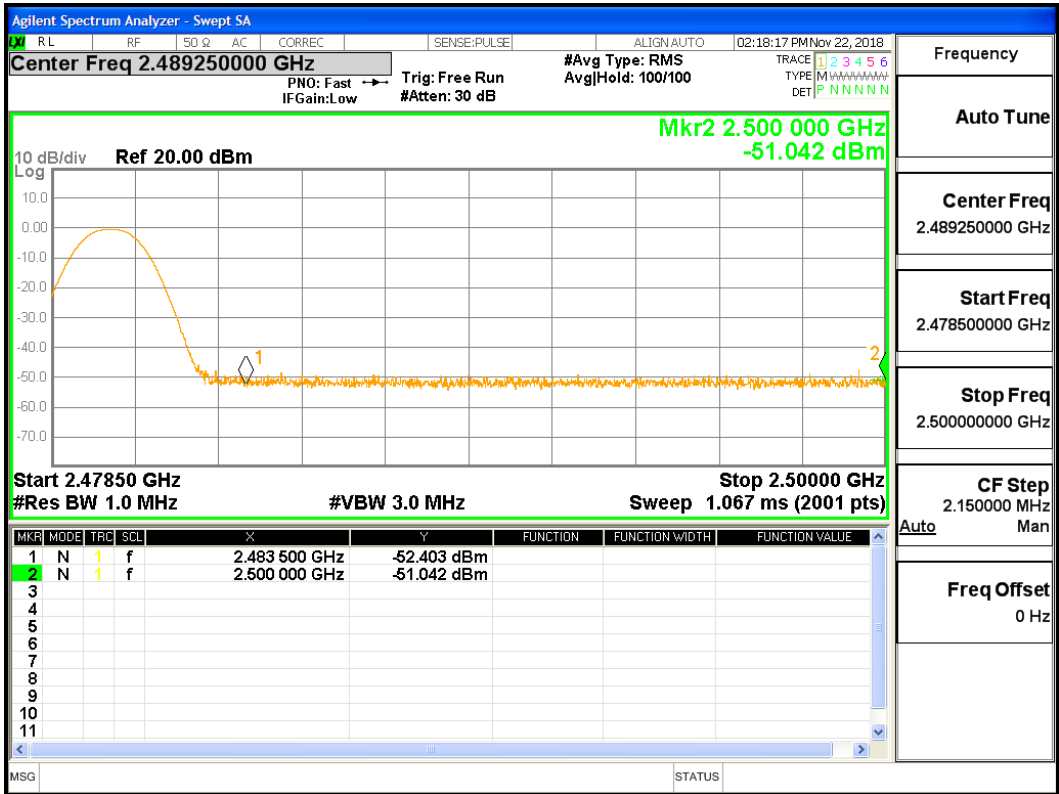
Restrict-band band-edge measurements_2402_PEAK_DH5



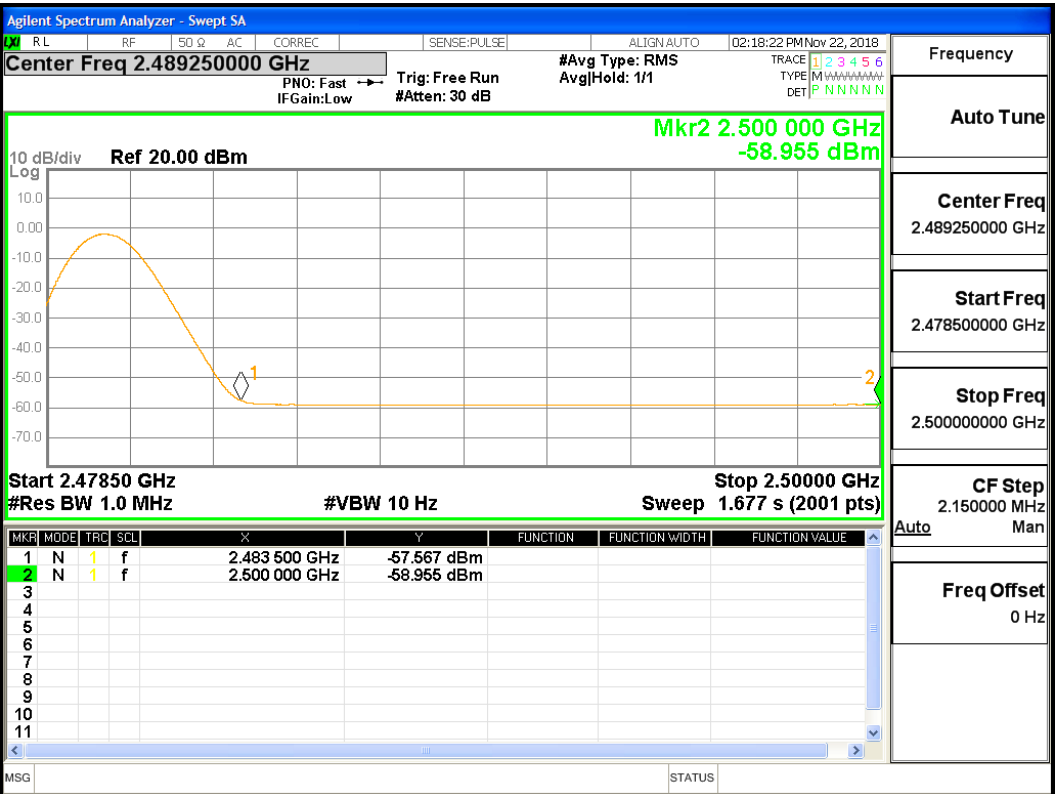
Restrict-band band-edge measurements_2402_AV_DH5



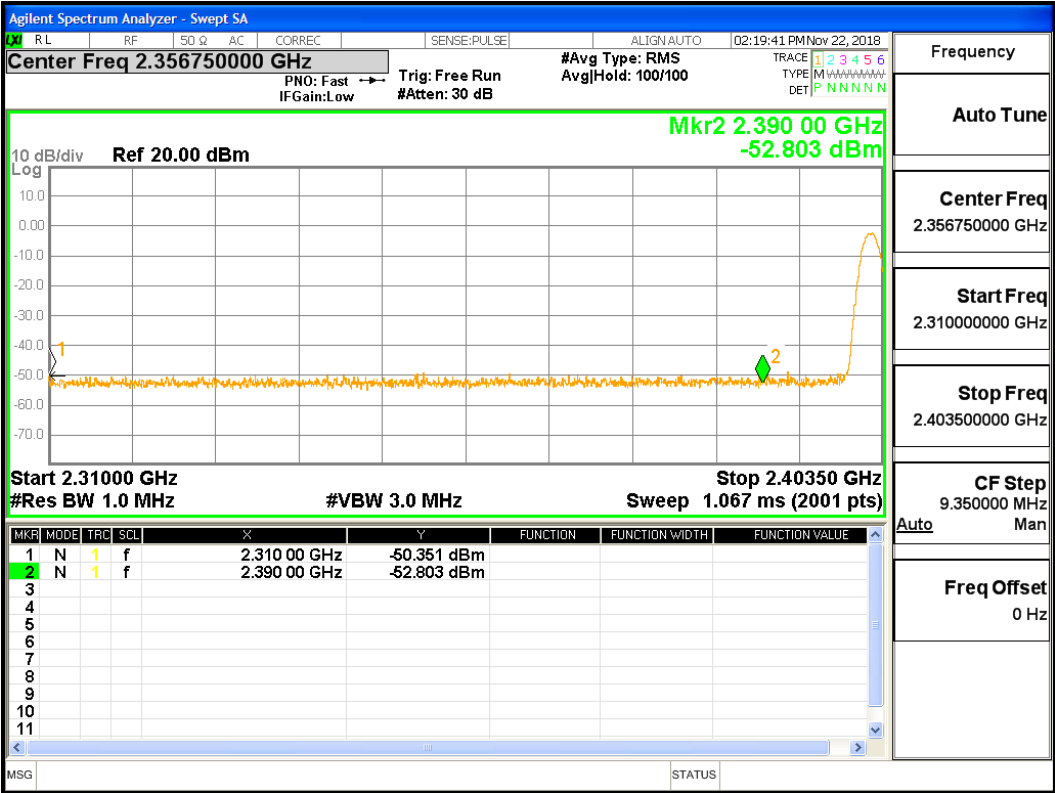
Restrict-band band-edge measurements_2480_PEAK_DH5



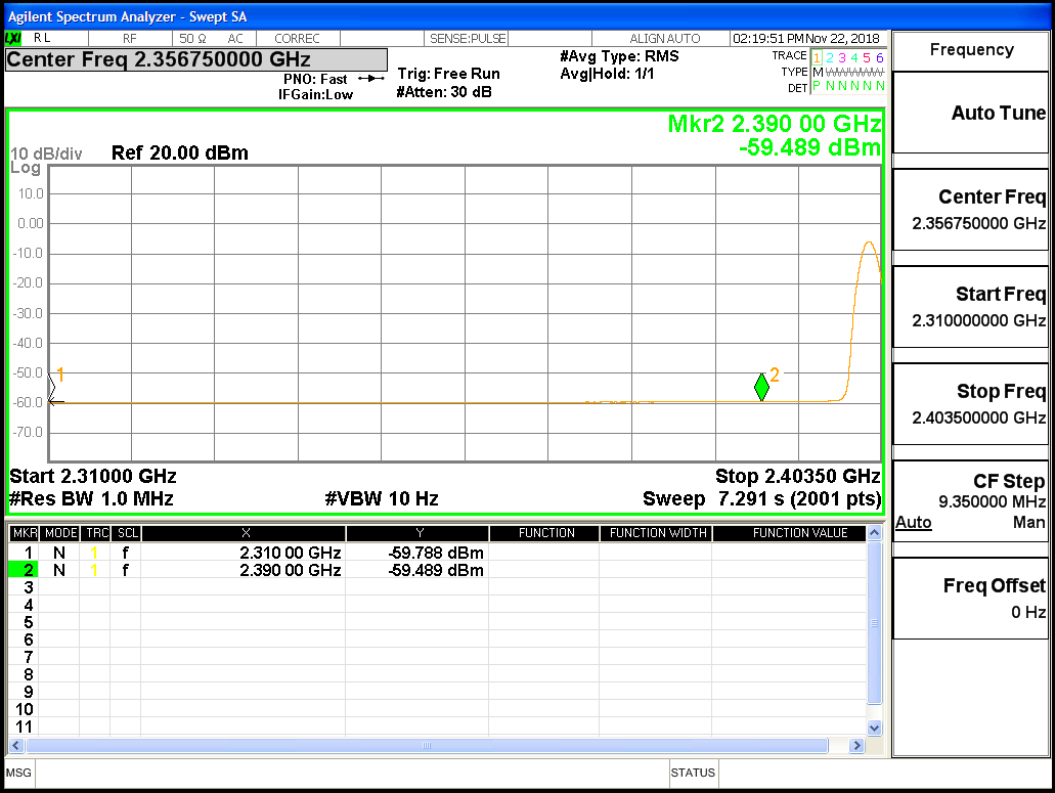
Restrict-band band-edge measurements_2480_AV_DH5



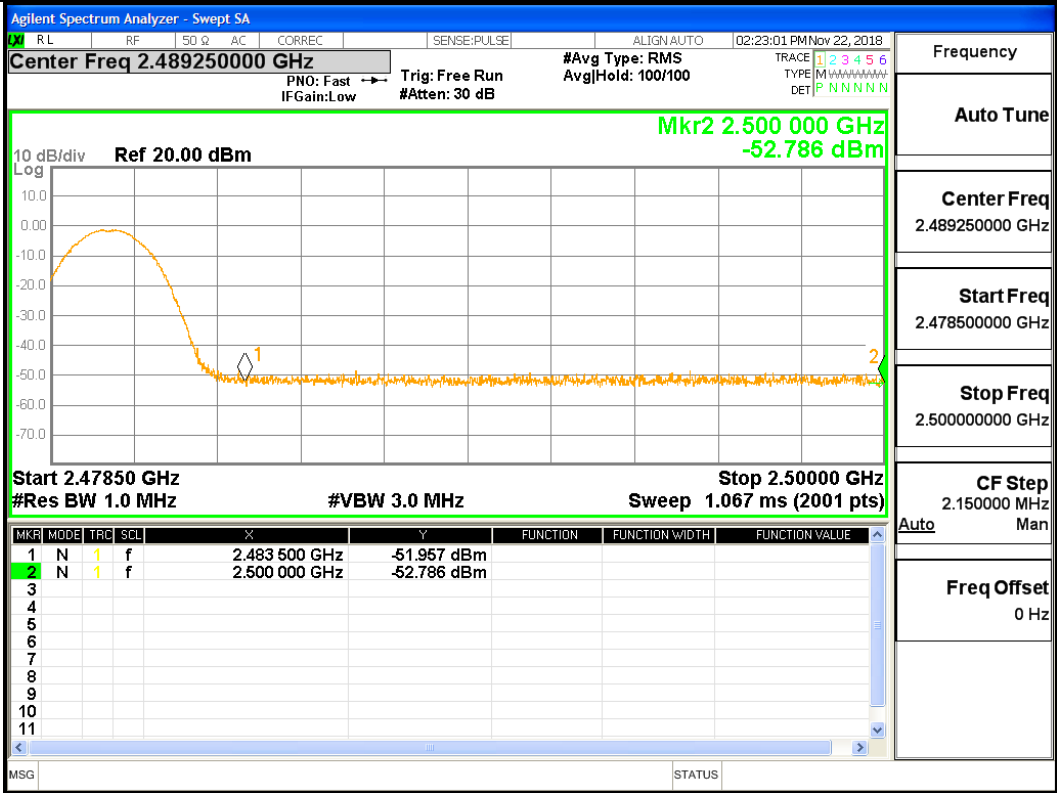
Restrict-band band-edge measurements_2402_PEAK_2DH5



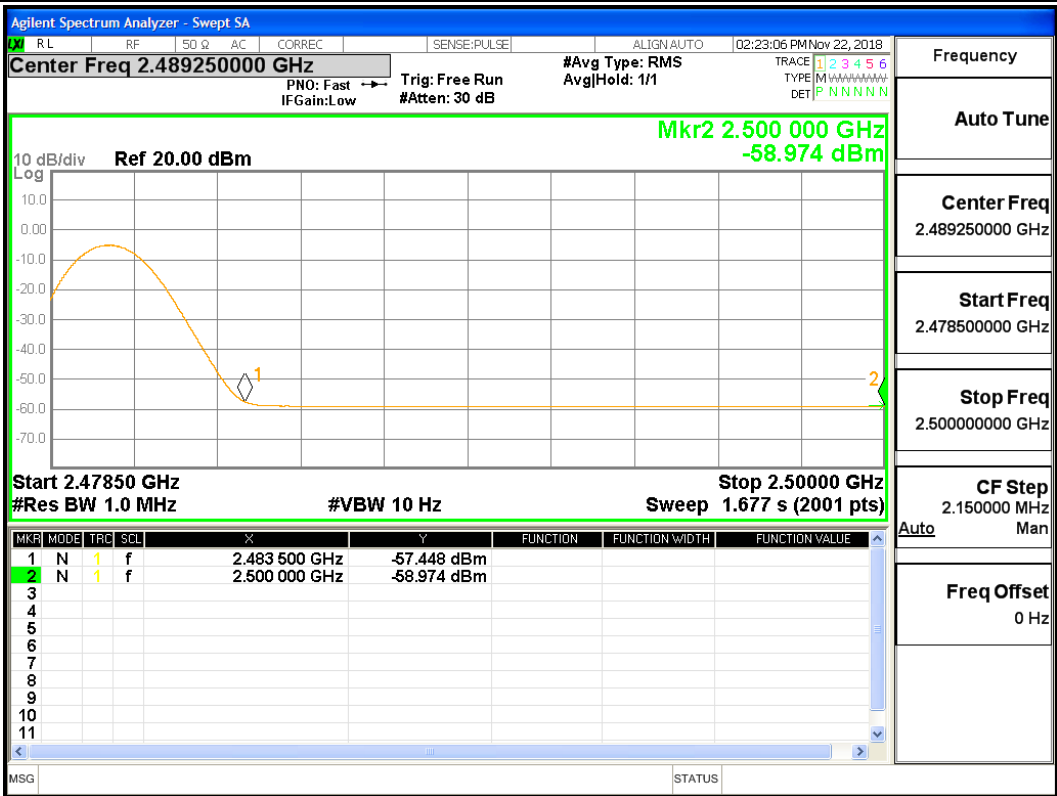
Restrict-band band-edge measurements_2402_AV_2DH5



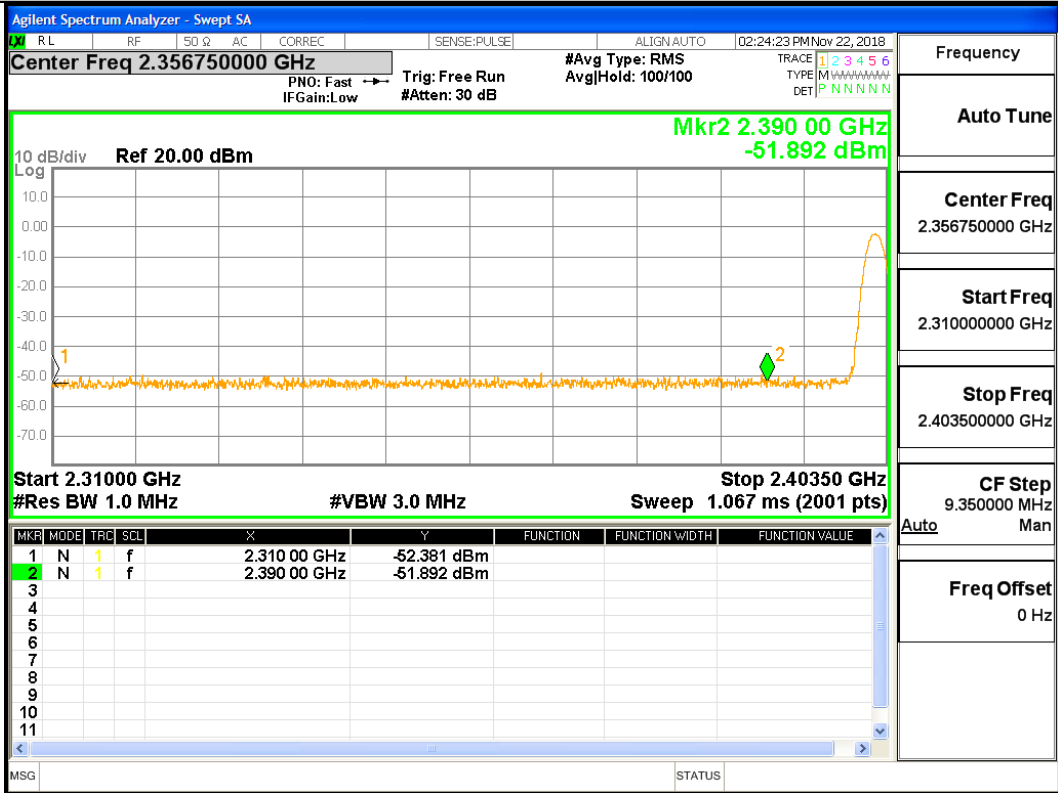
Restrict-band band-edge measurements_2480_PEAK_2DH5



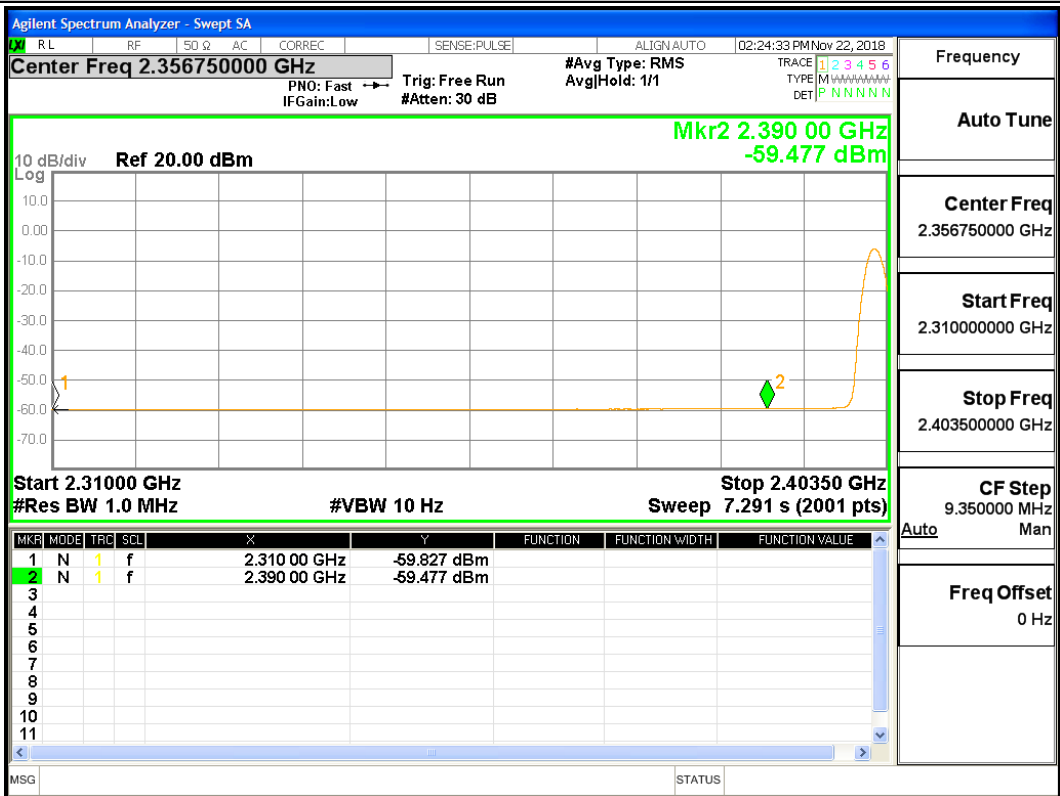
Restrict-band band-edge measurements_2480_AV_2DH5



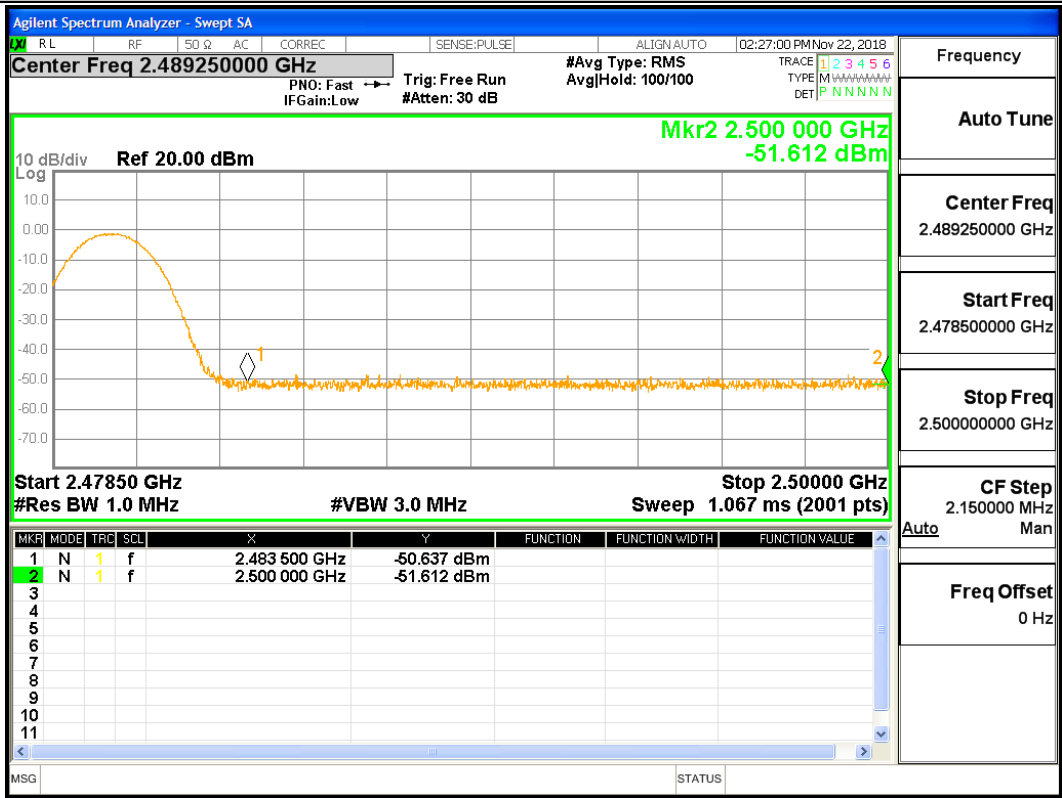
Restrict-band band-edge measurements_2402_PEAK_3DH5



Restrict-band band-edge measurements_2402_AV_3DH5



Restrict-band band-edge measurements_2480_PEAK_3DH5



Restrict-band band-edge measurements_2480_AV_3DH5

