

Appendix A

RF Test Data for BT V4.1 (BDR/EDR) (Conducted Measurement)

Product Name: Speaker

Trade Mark: Diablo

Test Model: DB--RUMBLE

Environmental Conditions

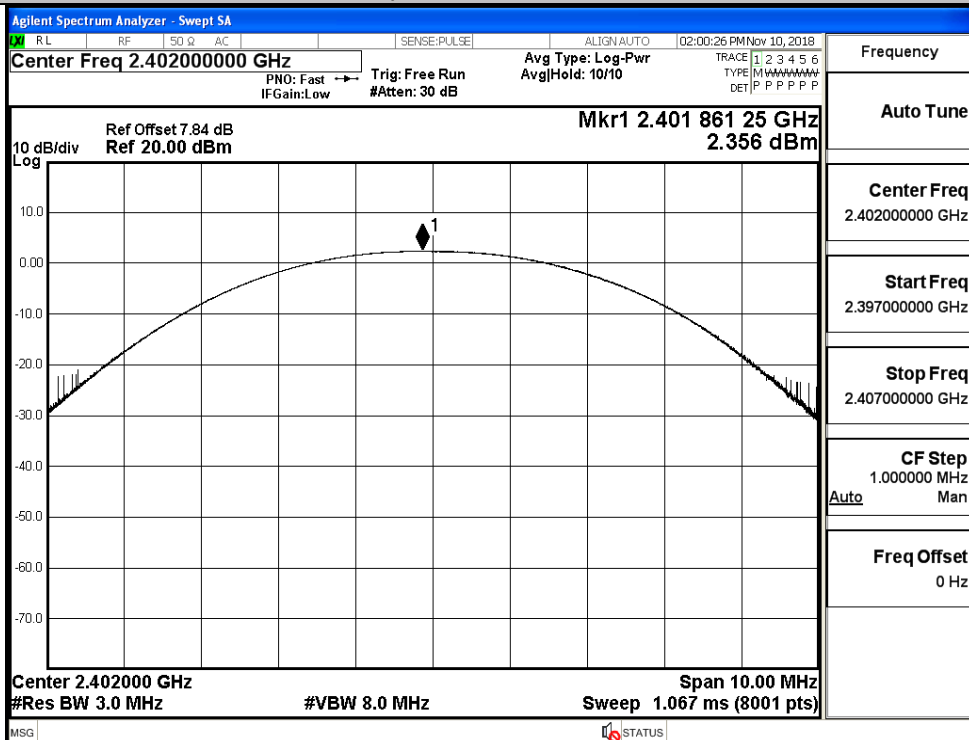
Temperature:	23.8 ° C
Relative Humidity:	54.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Wang Chuang
Supervised by:	Jayden.Zhuo

A.1 Maximum Conducted Peak Output Power

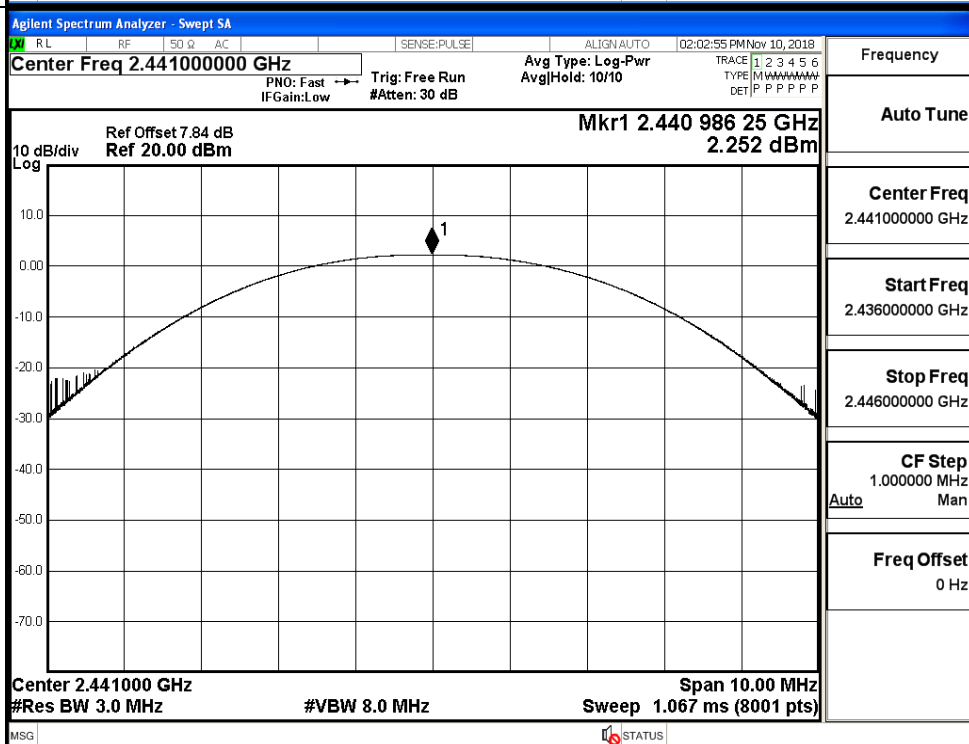
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2.356	30	PASS
	MCH	2.252	30	PASS
	HCH	2.176	30	PASS
$\pi/4$ DQPSK	LCH	1.586	21	PASS
	MCH	1.435	21	PASS
	HCH	1.270	21	PASS

Test Graphs

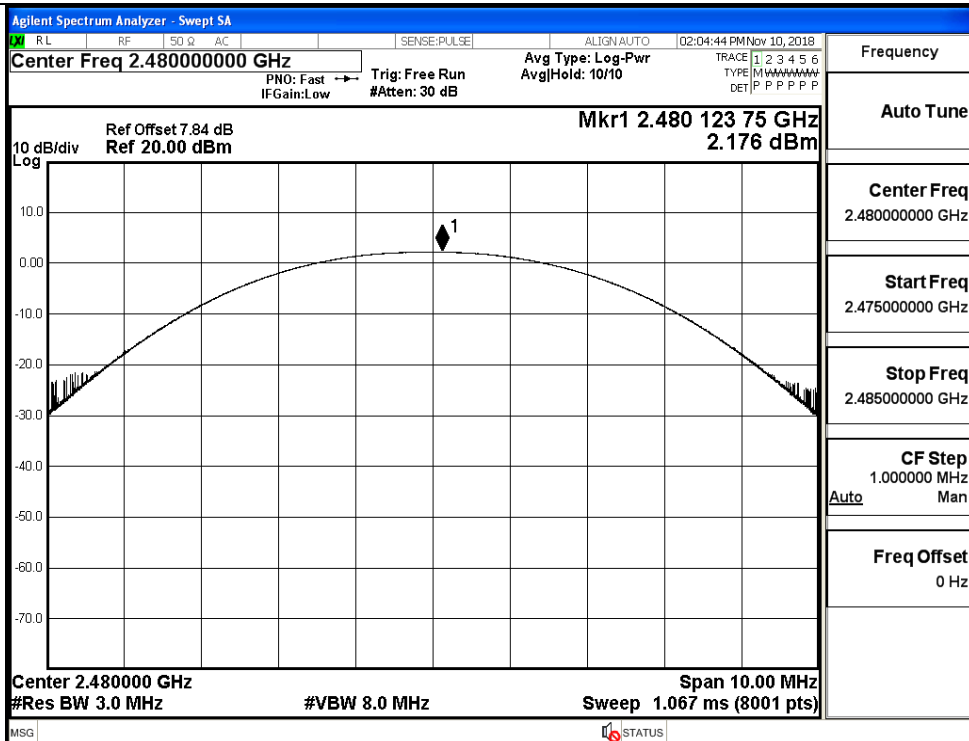
GFSK/LCH



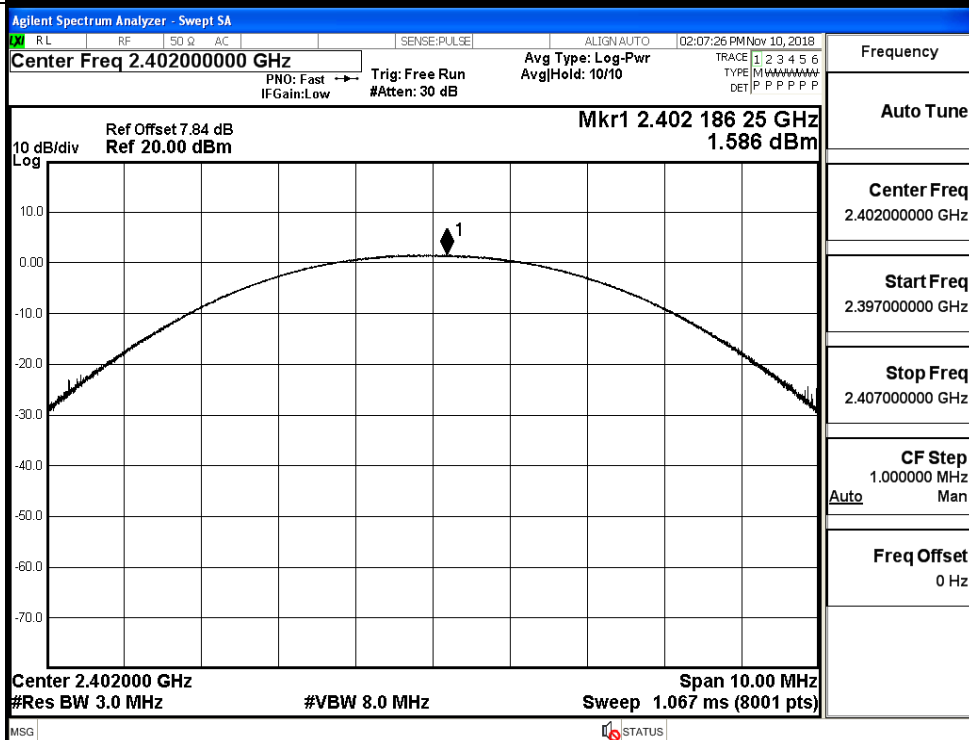
GFSK/MCH

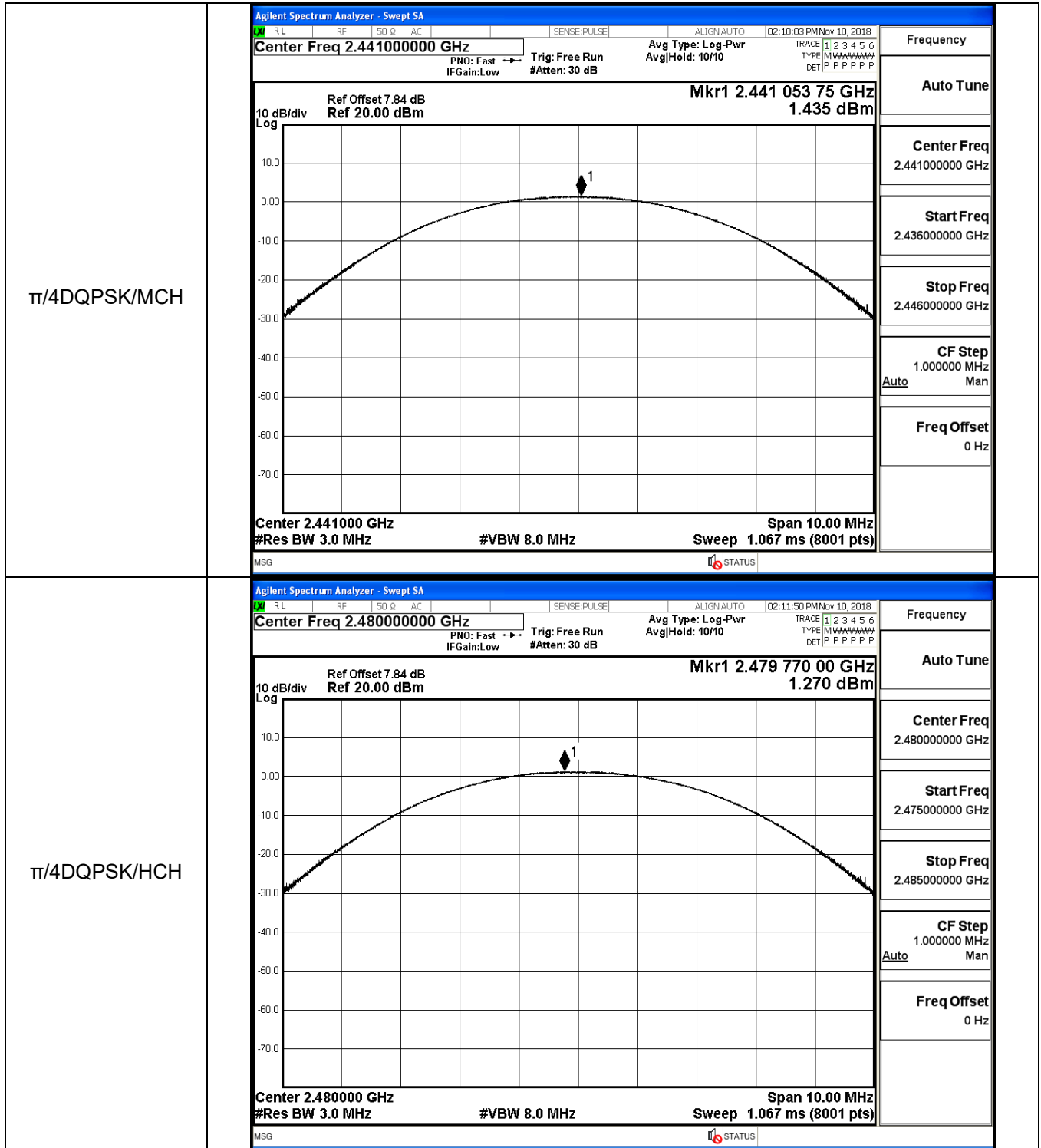


GFSK/HCH



π /4DQPSK/LCH

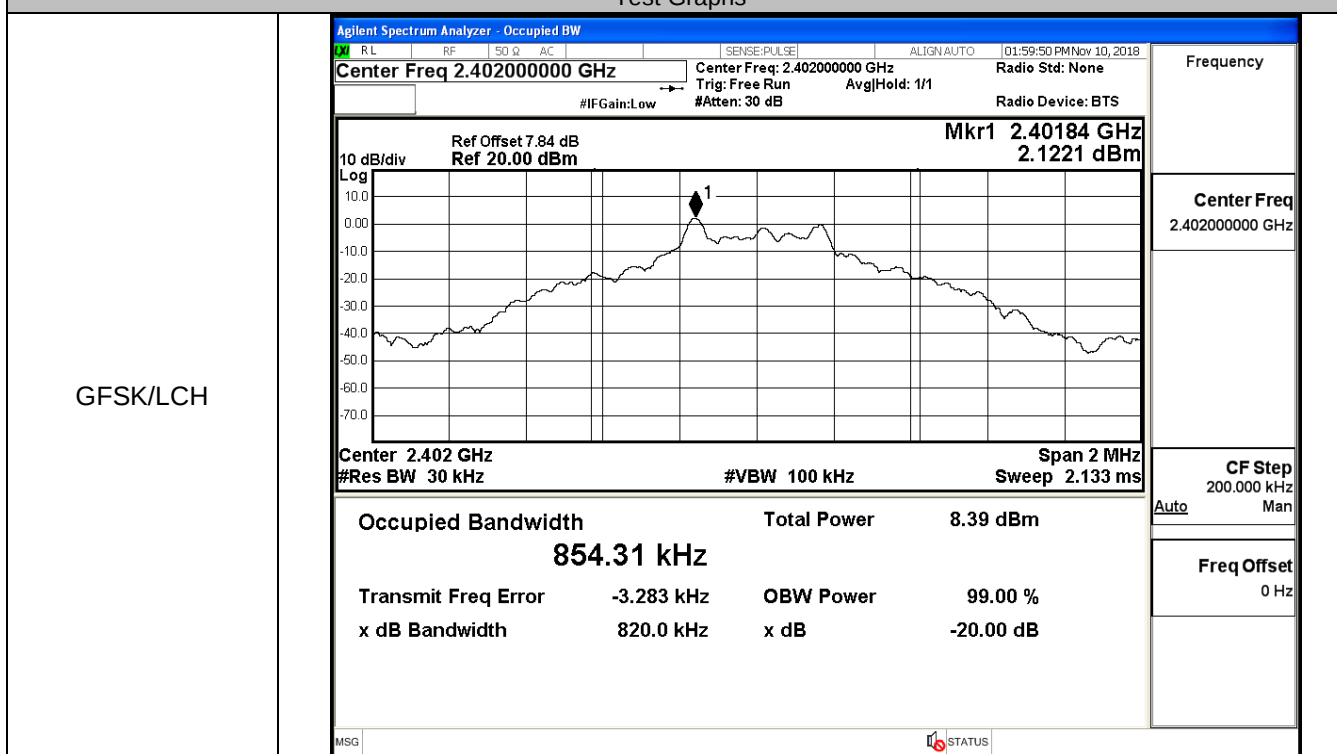




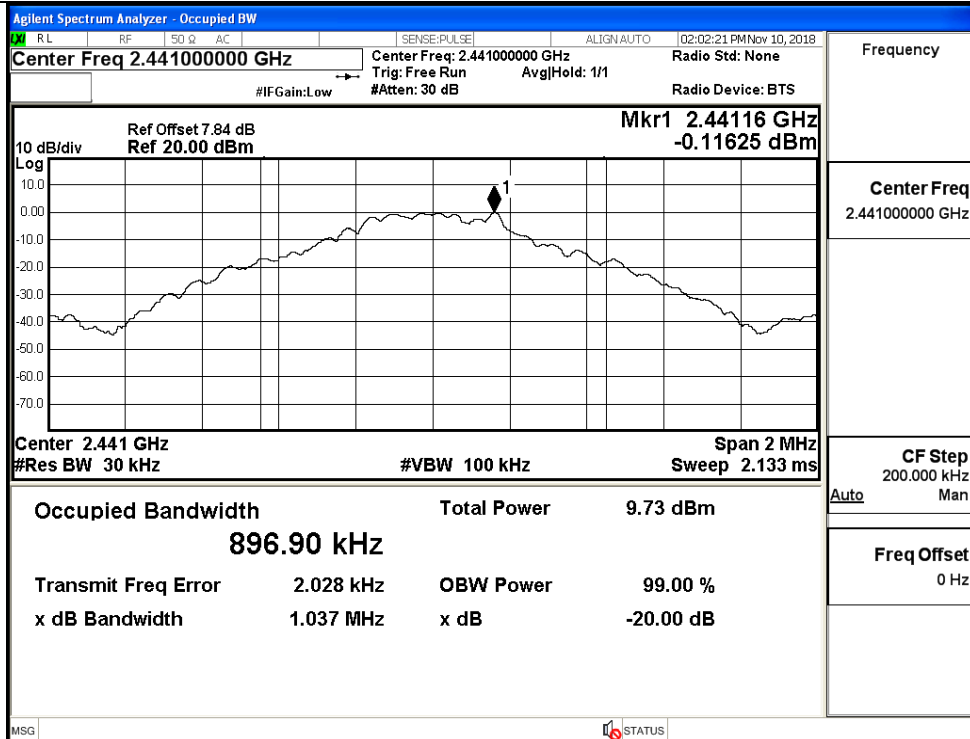
A.2 99% and 20dB Bandwidth

Mode	Channel.	99% Bandwidth [MHz]	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.85431	0.8200	Not Specified	PASS
	MCH	0.89690	1.037	Not Specified	PASS
	HCH	0.89924	1.040	Not Specified	PASS
π /4DQPSK	LCH	1.1804	1.313	Not Specified	PASS
	MCH	1.1766	1.308	Not Specified	PASS
	HCH	1.1745	1.315	Not Specified	PASS

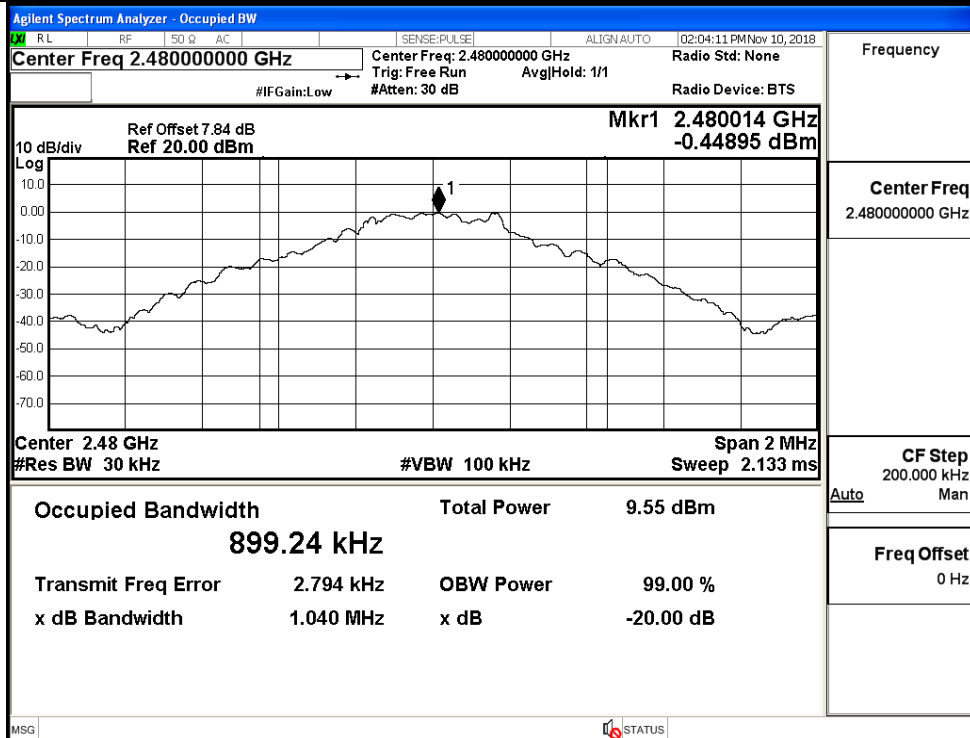
Test Graphs

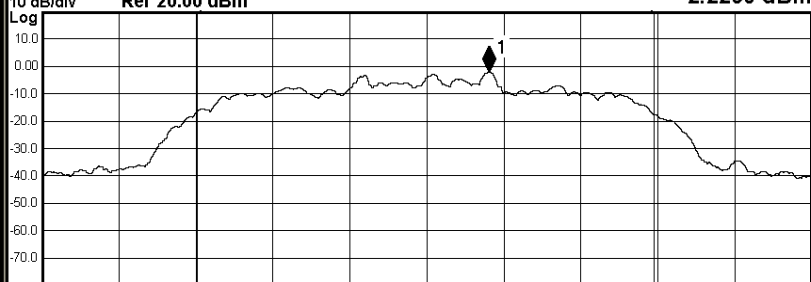
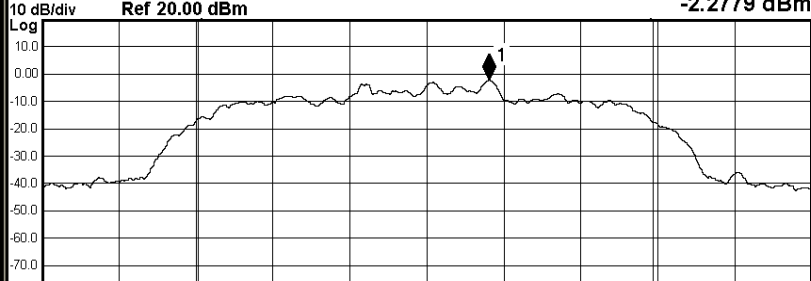


GFSK/MCH

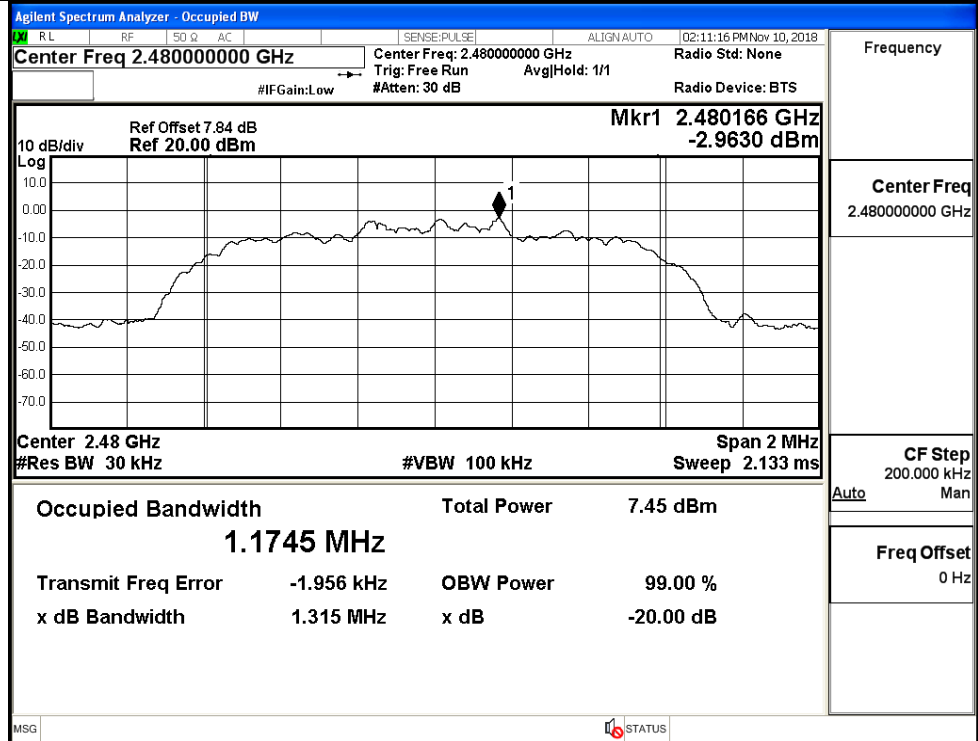


GFSK/HCH



$\pi/4$DQPSK/LCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE-PULSE ALIGN AUTO 02:06:52 PM Nov 10, 2018 Center Freq 2.402000000 GHz Center Freq: 2.402000000 GHz Trig: Free Run Avg/Hold: 1/1 Radio Std: None #IFGain: Low #Atten: 30 dB Radio Device: BTS 10 dB/div Ref Offset 7.84 dB Ref 20.00 dBm Mkr1 2.402162 GHz -2.2260 dBm  Center 2.402 GHz #Res BW 30 kHz #VBW 100 kHz Span 2 MHz Sweep 2.133 ms Occupied Bandwidth 1.1804 MHz Total Power 7.87 dBm Transmit Freq Error -1.663 kHz OBW Power 99.00 % x dB Bandwidth 1.313 MHz x dB -20.00 dB MSG STATUS	Frequency Center Freq 2.402000000 GHz CF Step 200.000 kHz Man Freq Offset 0 Hz
$\pi/4$DQPSK/MCH	Agilent Spectrum Analyzer - Occupied BW RL RF 50 Ω AC SENSE-PULSE ALIGN AUTO 02:09:29 PM Nov 10, 2018 Center Freq 2.441000000 GHz Center Freq: 2.441000000 GHz Trig: Free Run Avg/Hold: 1/1 Radio Std: None #IFGain: Low #Atten: 30 dB Radio Device: BTS 10 dB/div Ref Offset 7.84 dB Ref 20.00 dBm Mkr1 2.441162 GHz -2.2779 dBm  Center 2.441 GHz #Res BW 30 kHz #VBW 100 kHz Span 2 MHz Sweep 2.133 ms Occupied Bandwidth 1.1766 MHz Total Power 7.73 dBm Transmit Freq Error -1.832 kHz OBW Power 99.00 % x dB Bandwidth 1.308 MHz x dB -20.00 dB MSG STATUS	Frequency Center Freq 2.441000000 GHz CF Step 200.000 kHz Man Freq Offset 0 Hz

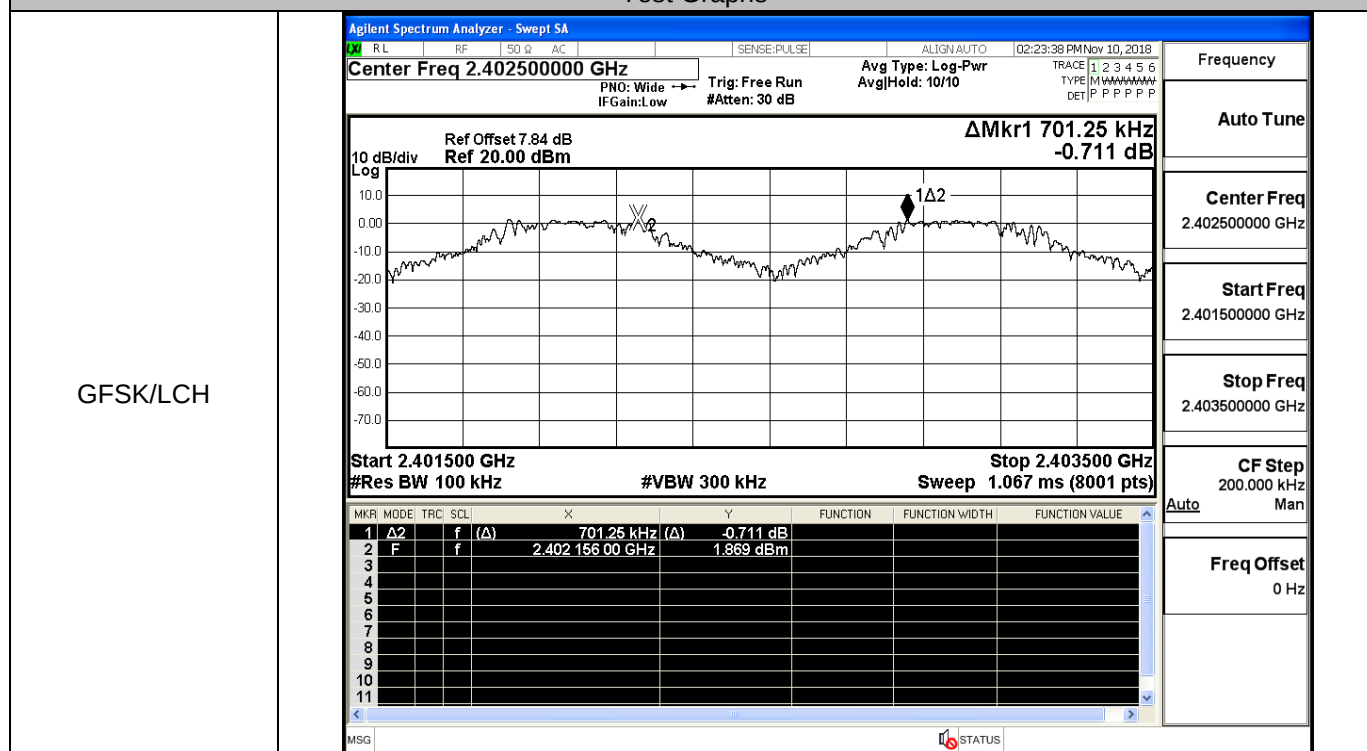
$\pi/4$ DQPSK/HCH



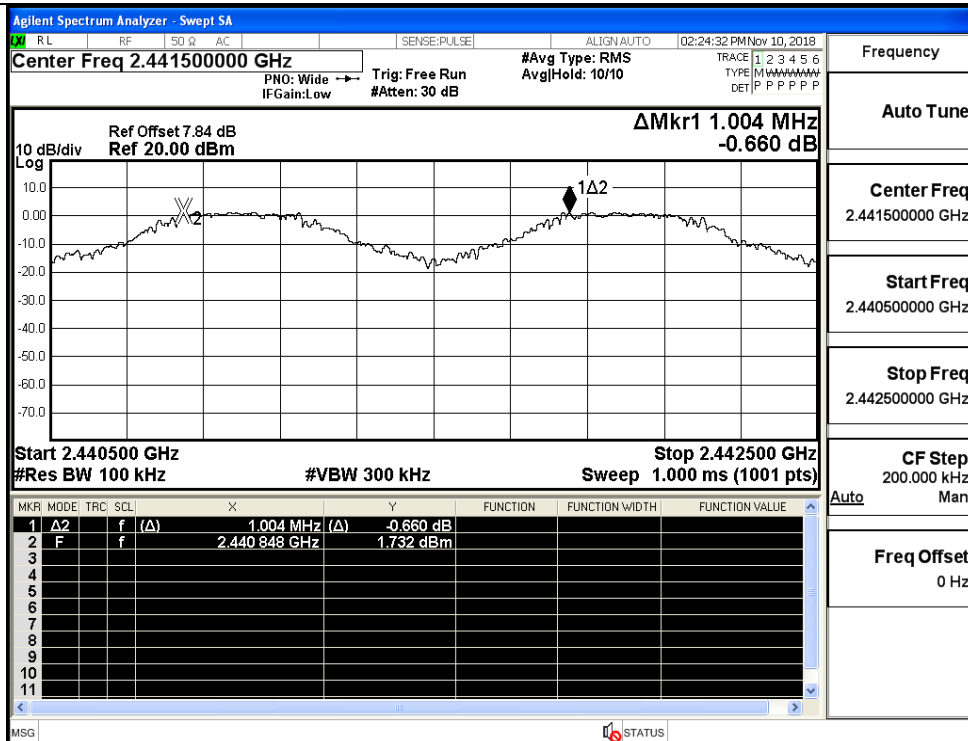
A.3 Carrier Frequency Separation

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.701	0.693	PASS
	MCH	1.004	0.693	PASS
	HCH	0.990	0.693	PASS
π /4DQPSK	LCH	0.998	0.877	PASS
	MCH	0.976	0.877	PASS
	HCH	1.004	0.877	PASS

Test Graphs



GFSK/MCH



Frequency

Auto Tune

Center Freq
2.441500000 GHz

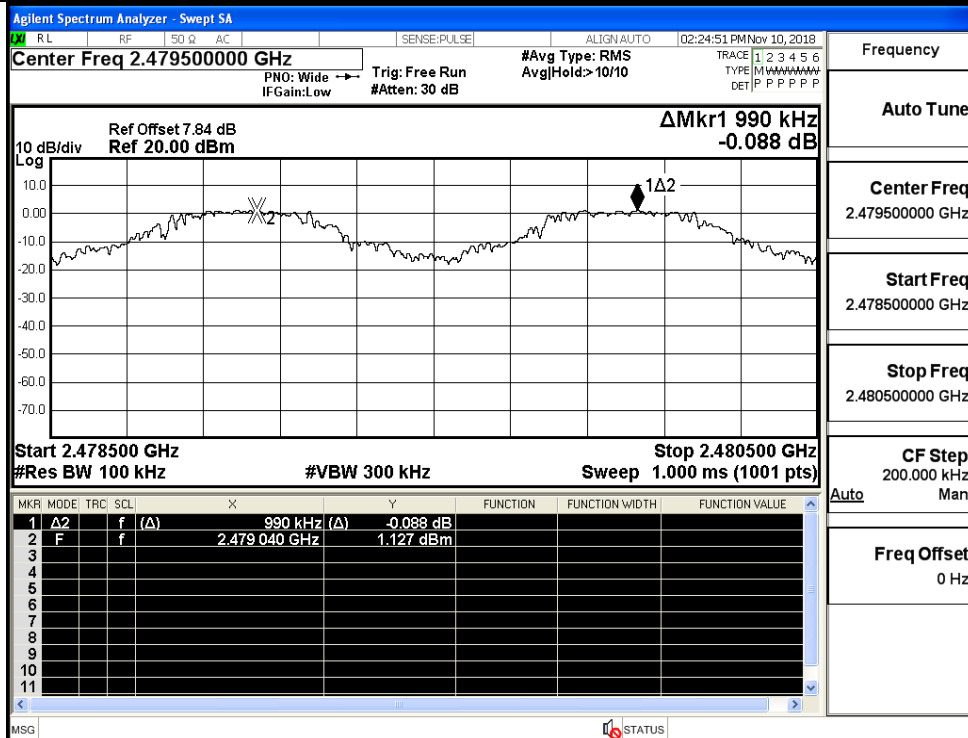
Start Freq
2.440500000 GHz

Stop Freq
2.442500000 GHz

CF Step
200.000 kHz
Man

Freq Offset
0 Hz

GFSK/HCH



Frequency

Auto Tune

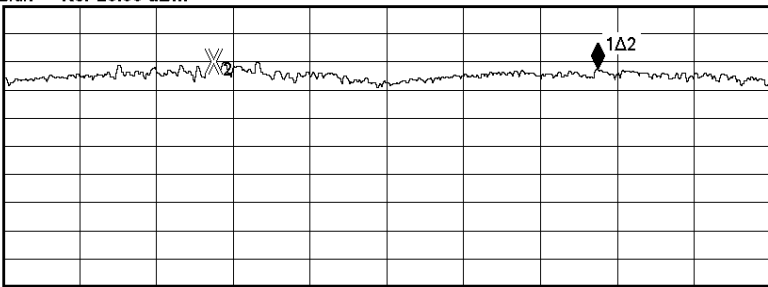
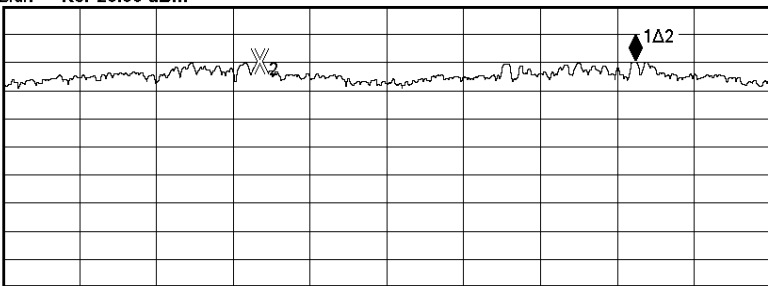
Center Freq
2.479500000 GHz

Start Freq
2.478500000 GHz

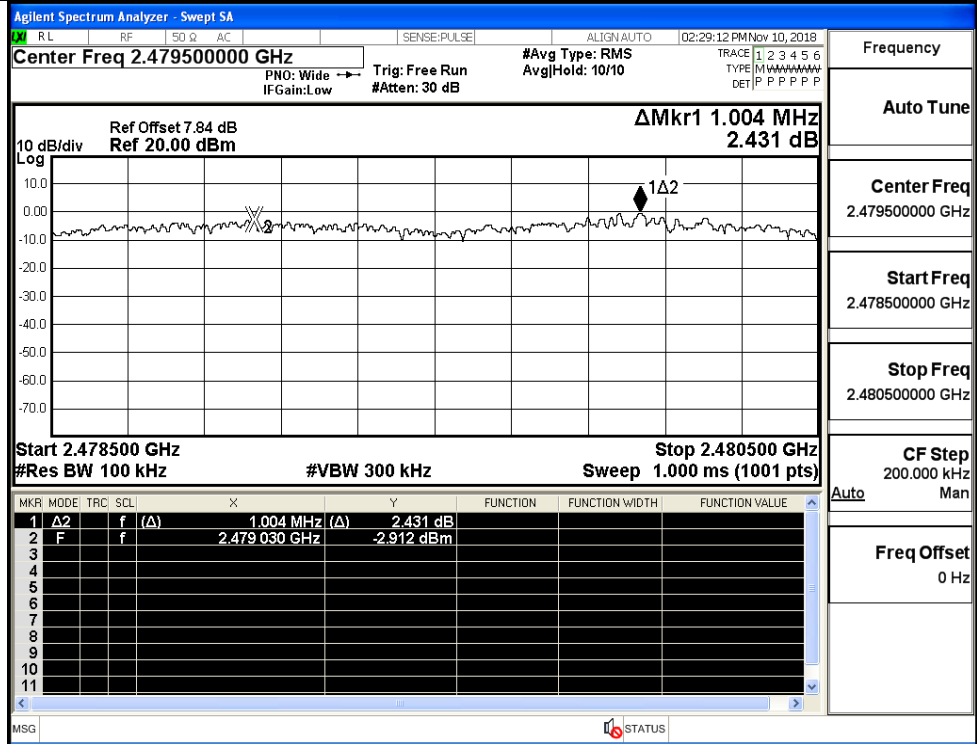
Stop Freq
2.480500000 GHz

CF Step
200.000 kHz
Man

Freq Offset
0 Hz

$\pi/4$ DQPSK/LCH	Agilent Spectrum Analyzer - Swept SA RL RF 50 Q AC SENSE:PULSE ALIGN:AUTO 02:27:10 PM Nov 10, 2018 Center Freq 2.402500000 GHz PN0: Wide IF Gain: Low Trig: Free Run #Atten: 30 dB #Avg Type: RMS AvgHold: 10/10 TRACE 1 2 3 4 5 6 TYPE M W W W W W W DET P P P P P P P Ref Offset 7.84 dB Ref 20.00 dBm ΔMkr1 998 kHz -2.575 dB 10 dB/div Log  Start 2.401500 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.403500 GHz Sweep 1.000 ms (1001 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>Δ2</td><td>f</td><td>(Δ)</td><td>998 kHz (Δ)</td><td>-2.575 dB</td><td></td><td></td><td></td></tr><tr><td>2</td><td>F</td><td>f</td><td></td><td>2.402 050 GHz</td><td>-0.093 dBm</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></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 Frequency Auto Tune Center Freq 2.402500000 GHz Start Freq 2.401500000 GHz Stop Freq 2.403500000 GHz CF Step 200.000 kHz Man Freq Offset 0 Hz	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	998 kHz (Δ)	-2.575 dB				2	F	f		2.402 050 GHz	-0.093 dBm				3									4									5									6									7									8									9									10									11								
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$\pi/4$ DQPSK/HCH

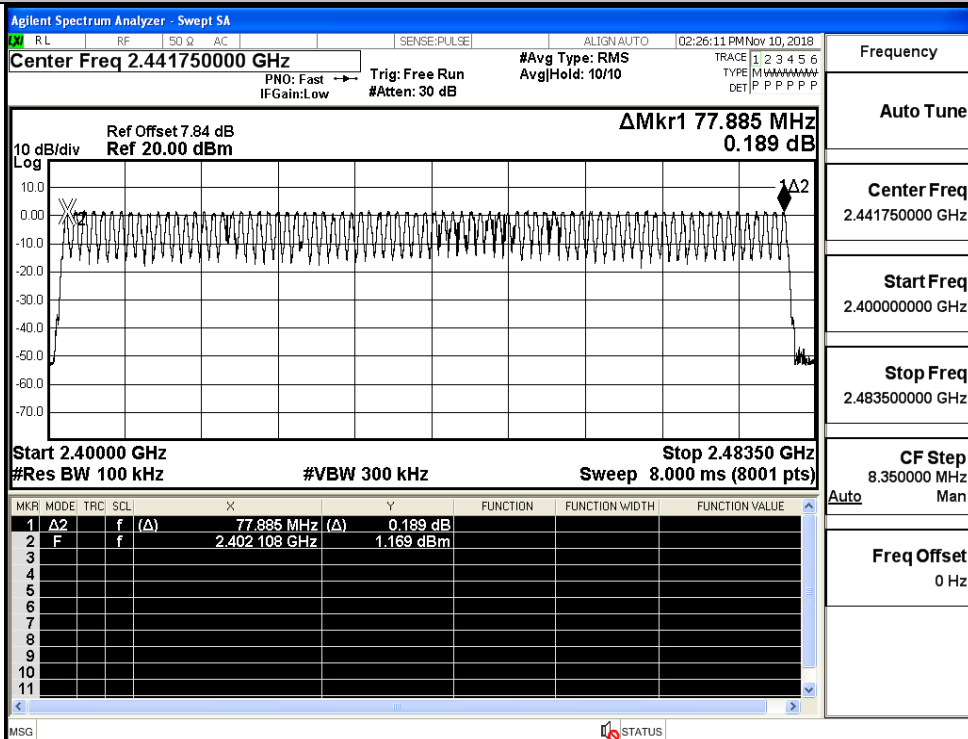


A.4 Hopping Channel Number

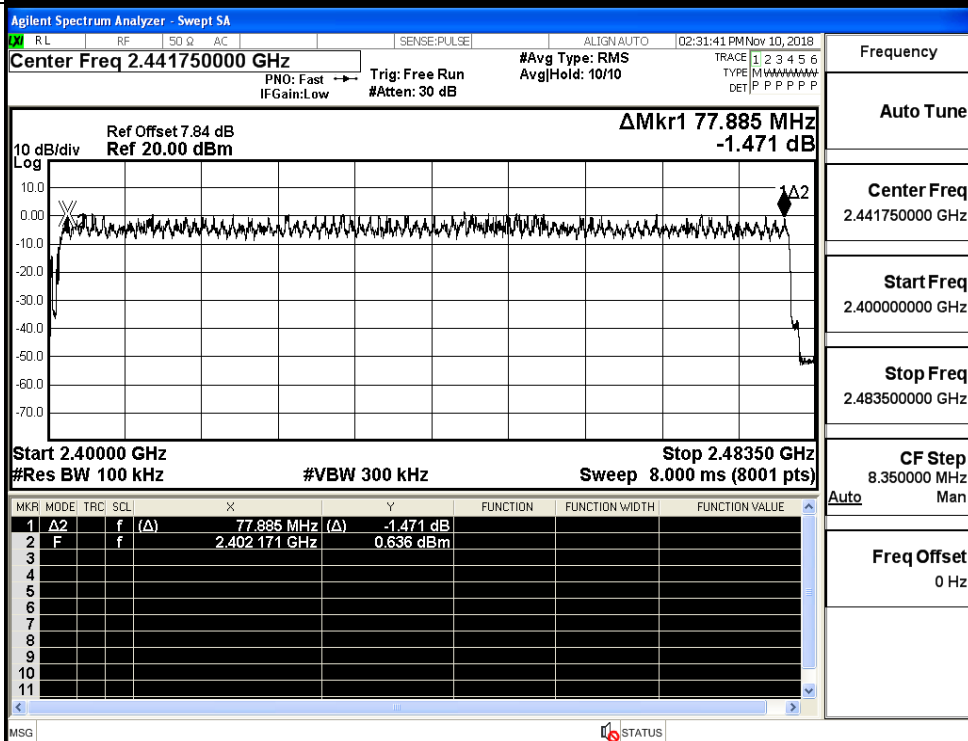
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
$\pi/4$ DQPSK	Hop	79	>=15	PASS

Test Graphs

GFSK/Hop



$\pi/4$ DQPSK/Hop

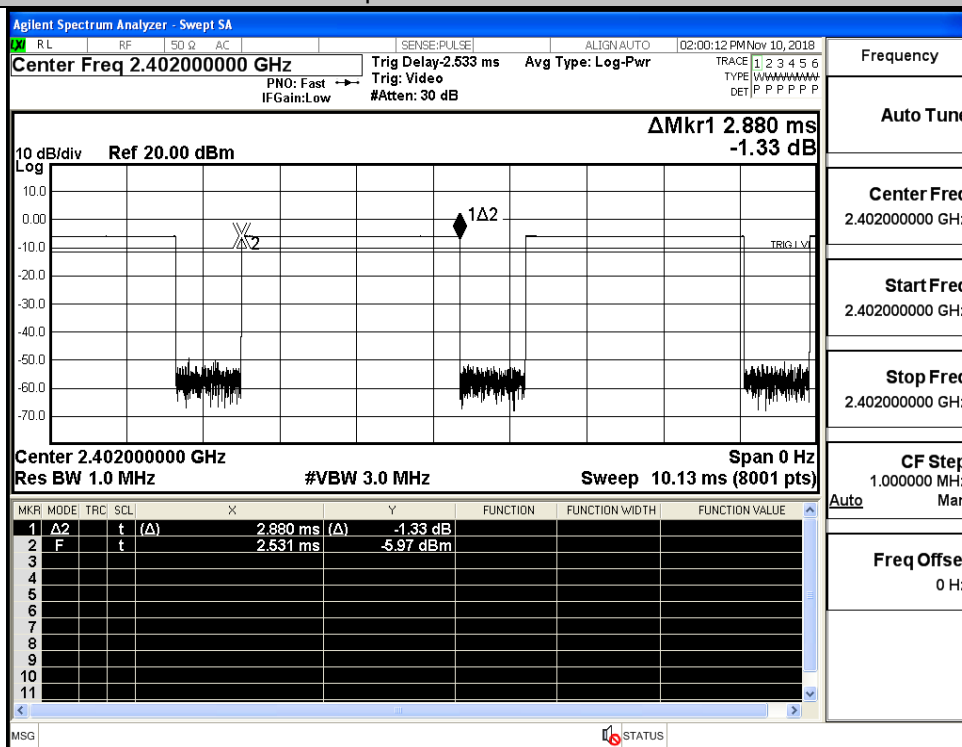


A.5 Dwell Time

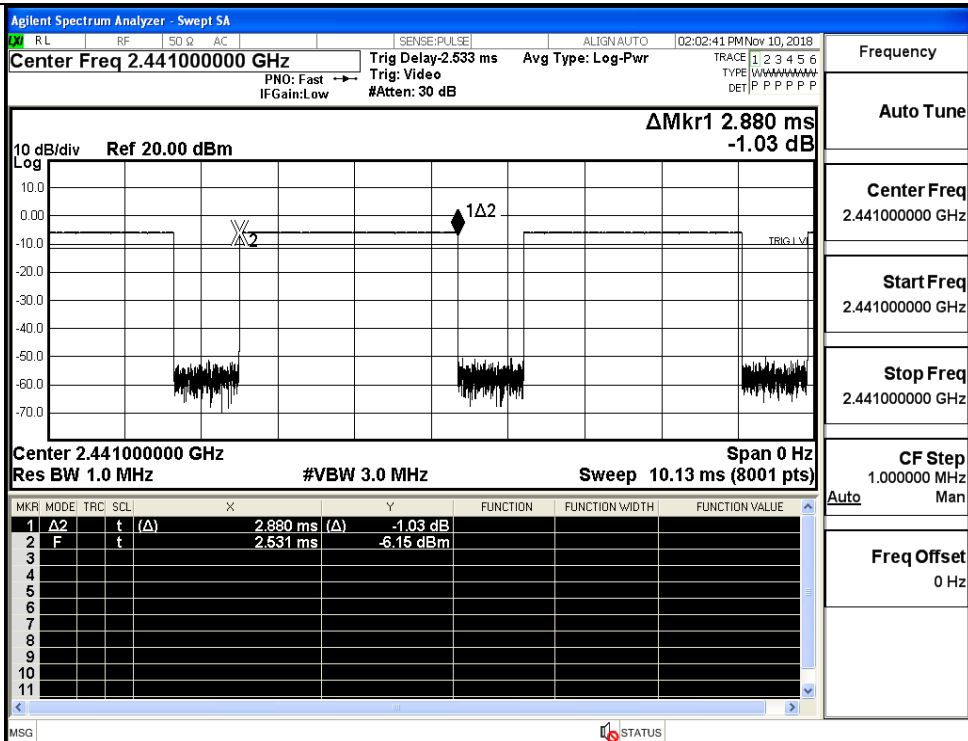
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.88	106.7	0.307	0.4	PASS
	DH5	MCH	2.88	106.7	0.307	0.4	PASS
	DH5	HCH	2.88	106.7	0.307	0.4	PASS
$\pi/4$ DQPSK	2DH5	LCH	2.88	106.7	0.307	0.4	PASS
	2DH5	MCH	2.88	106.7	0.307	0.4	PASS
	2DH5	HCH	2.89	106.7	0.308	0.4	PASS

Test Graphs

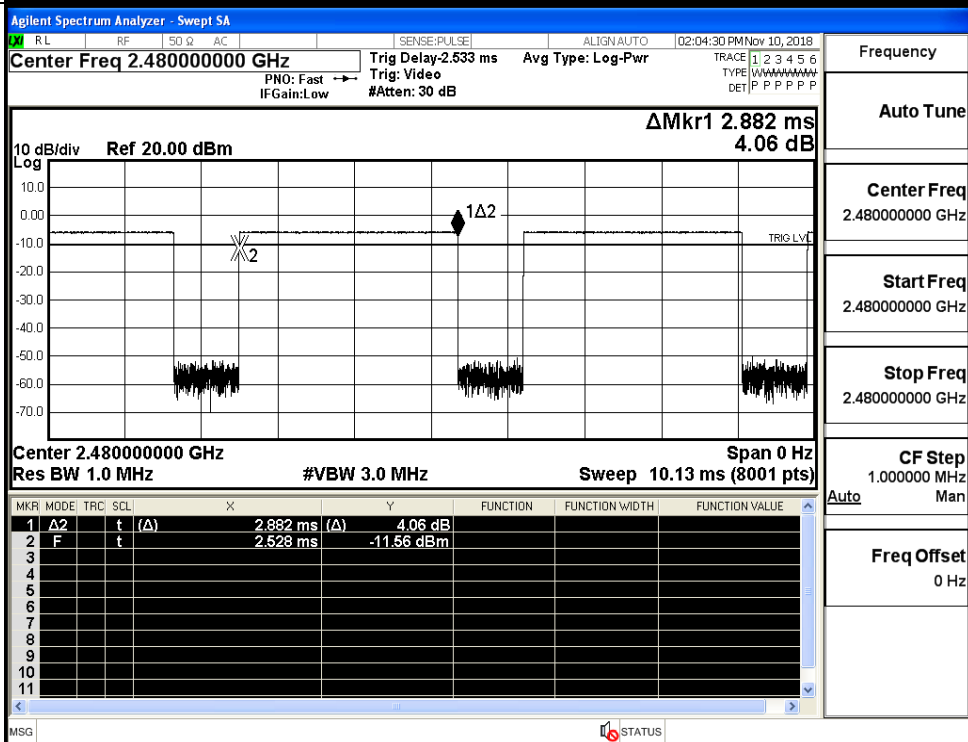
GFSK_DH5/LCH



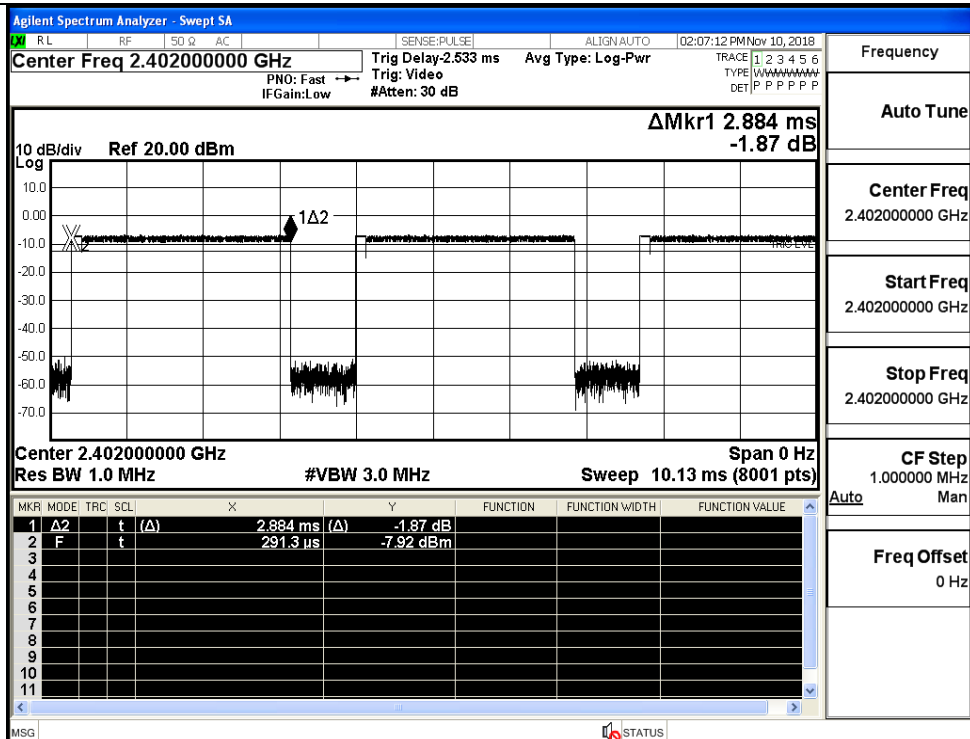
GFSK_DH5/MCH



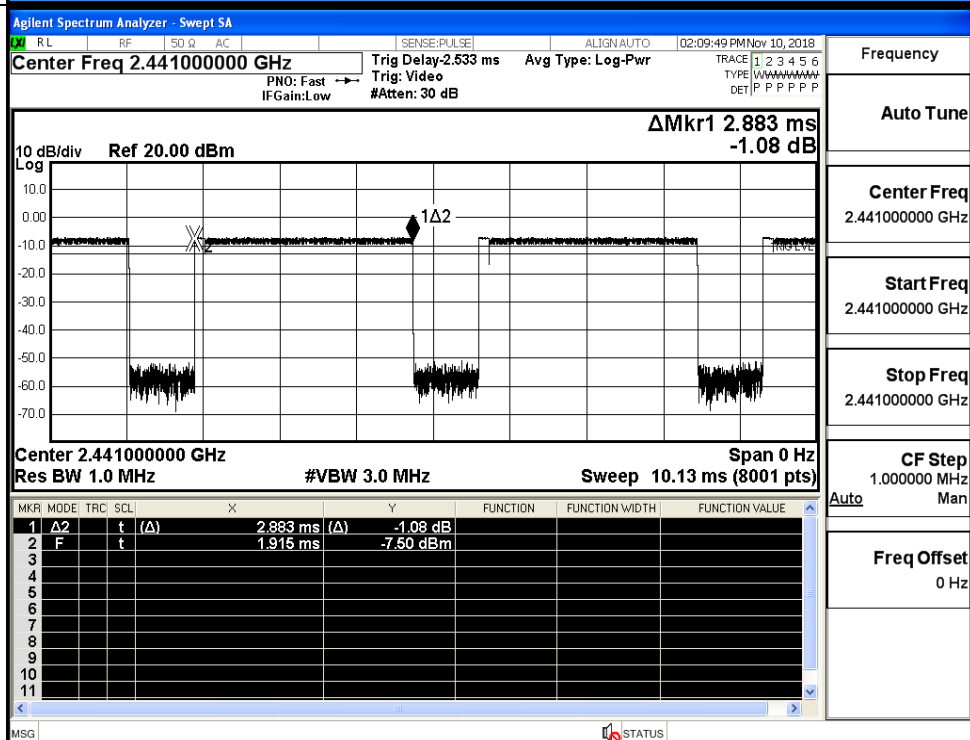
GFSK_DH5/HCH



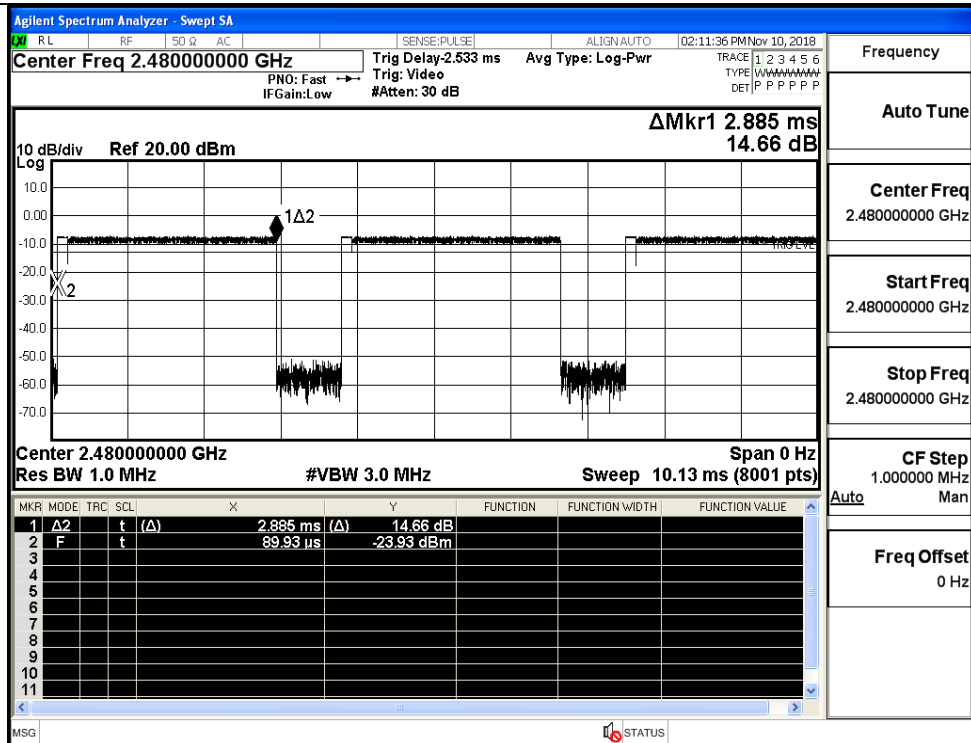
$\pi/4$ DQPSK
_2DH5/LCH



$\pi/4$ DQPSK
_2DH5/MCH



π/4DQPSK
_2DH5/HCH

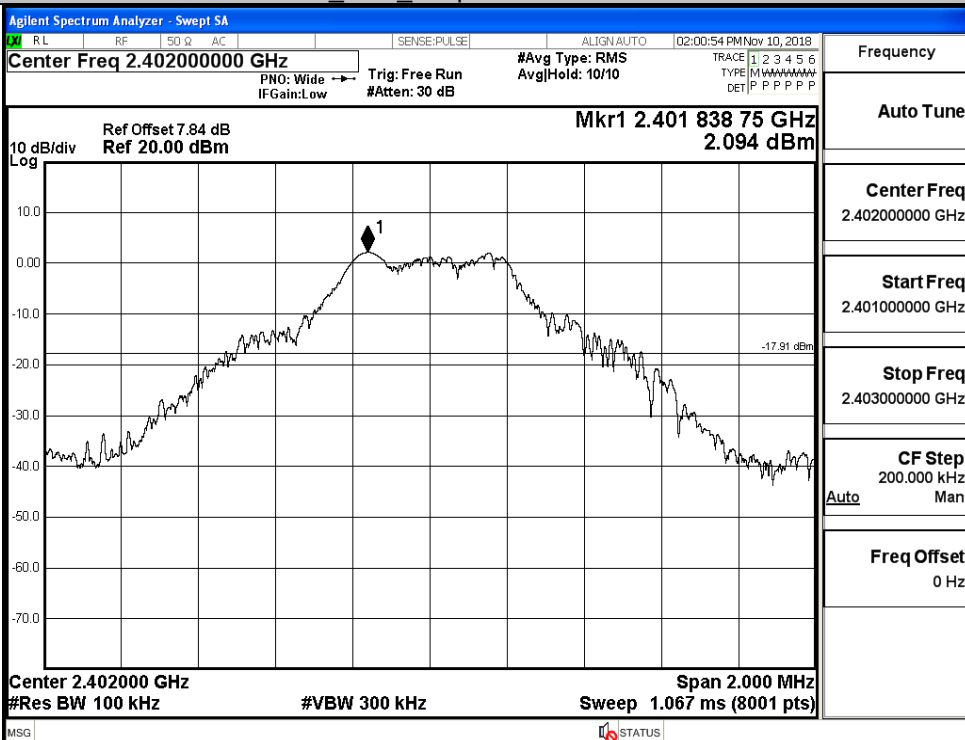


A.6 RF Conducted Spurious Emissions

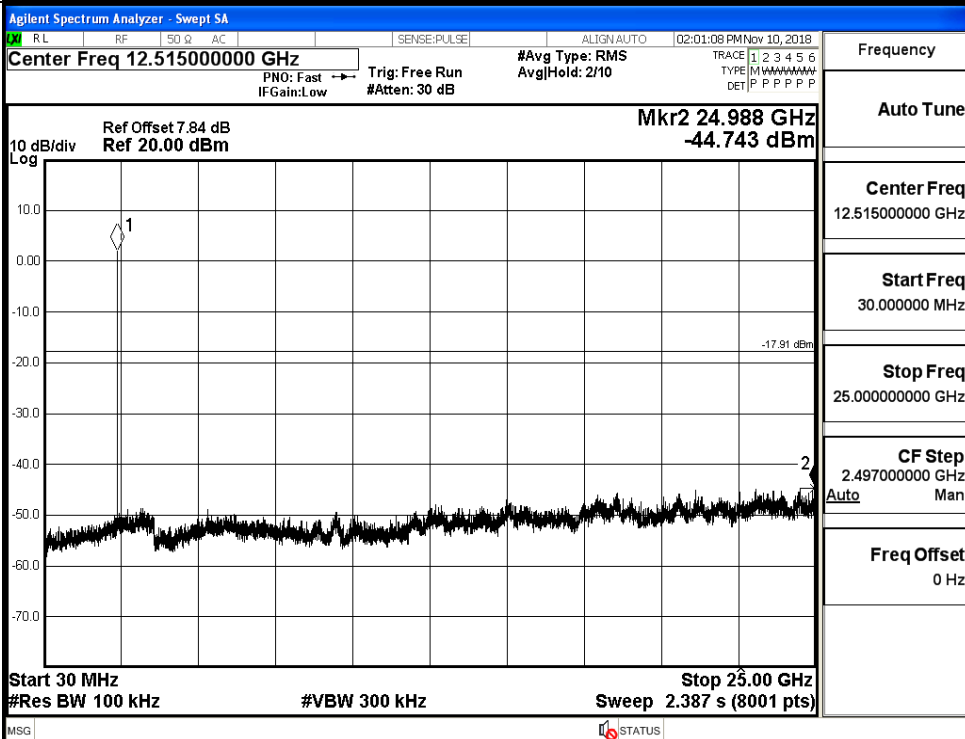
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2.094	-44.743	-17.906	PASS
	MCH	1.877	-44.487	-18.123	PASS
	HCH	1.526	-42.464	-18.474	PASS
$\pi/4$ DQPSK	LCH	0.605	-45.148	-19.395	PASS
	MCH	0.473	-45.162	-19.527	PASS
	HCH	0.288	-44.325	-19.712	PASS

GFSK LCH Graphs

Pref

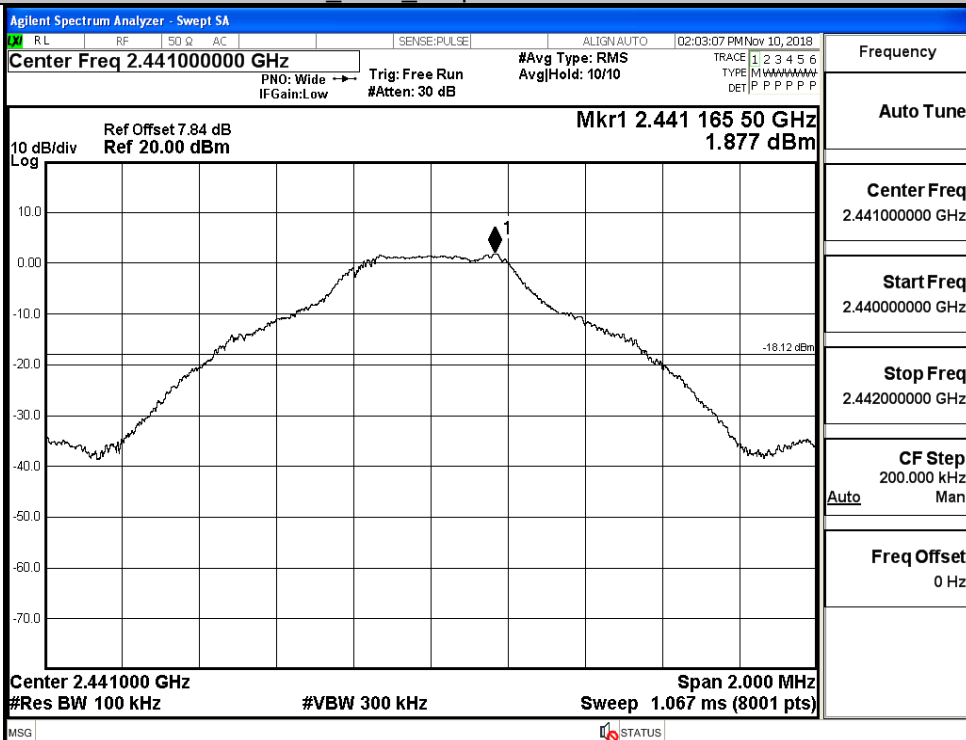


Puw

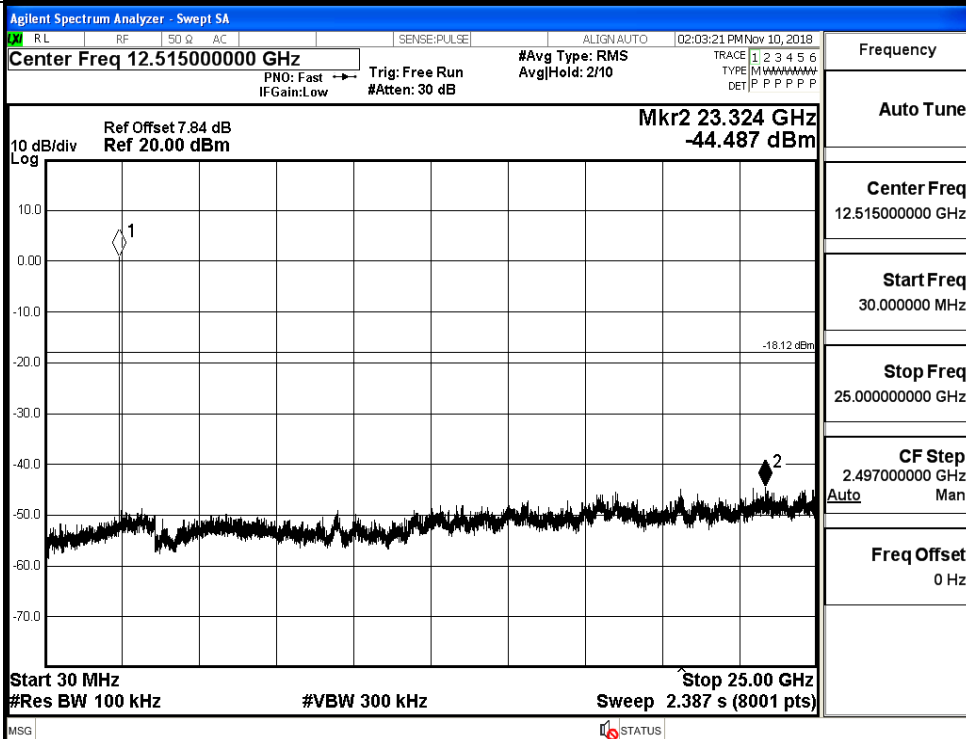


GFSK_MCH_Graphs

Pref

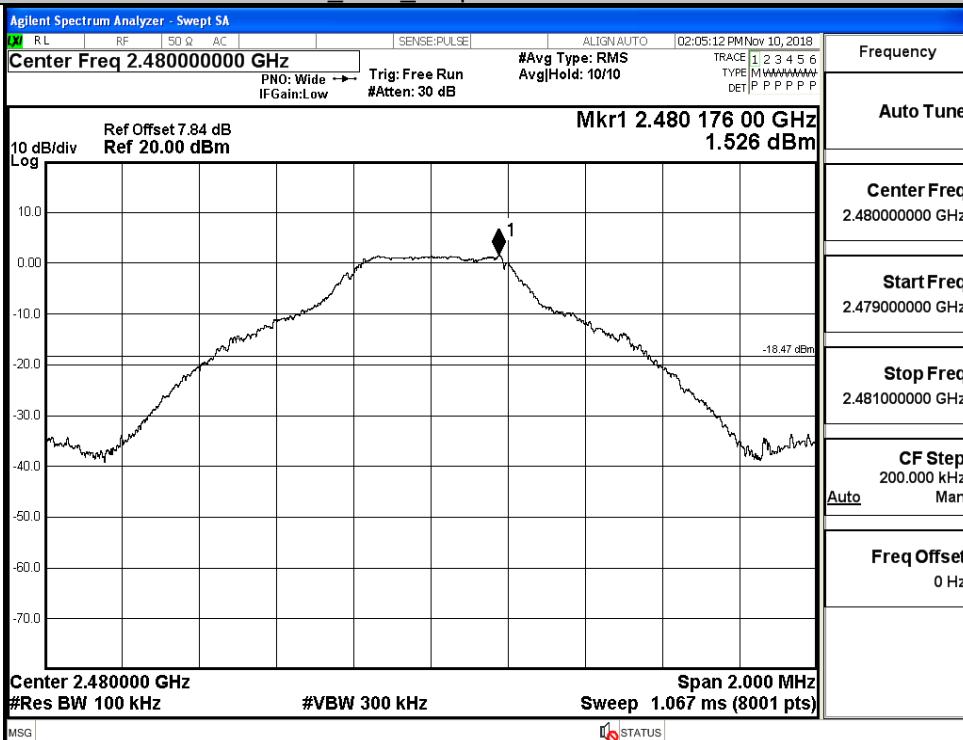


Puw

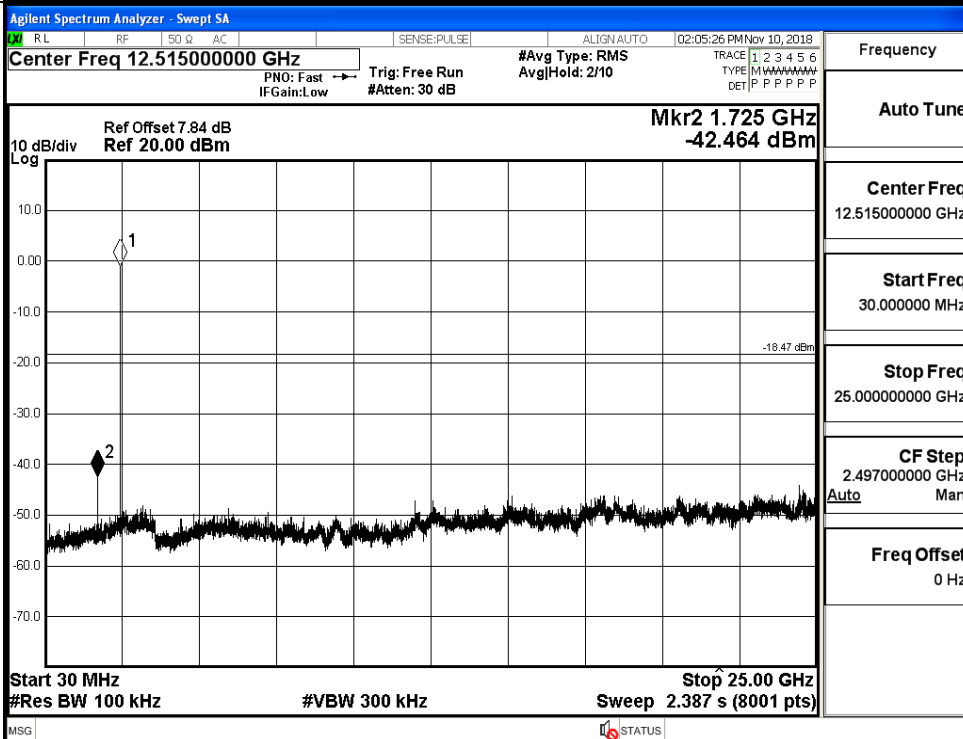


GFSK_HCH_Graphs

Pref

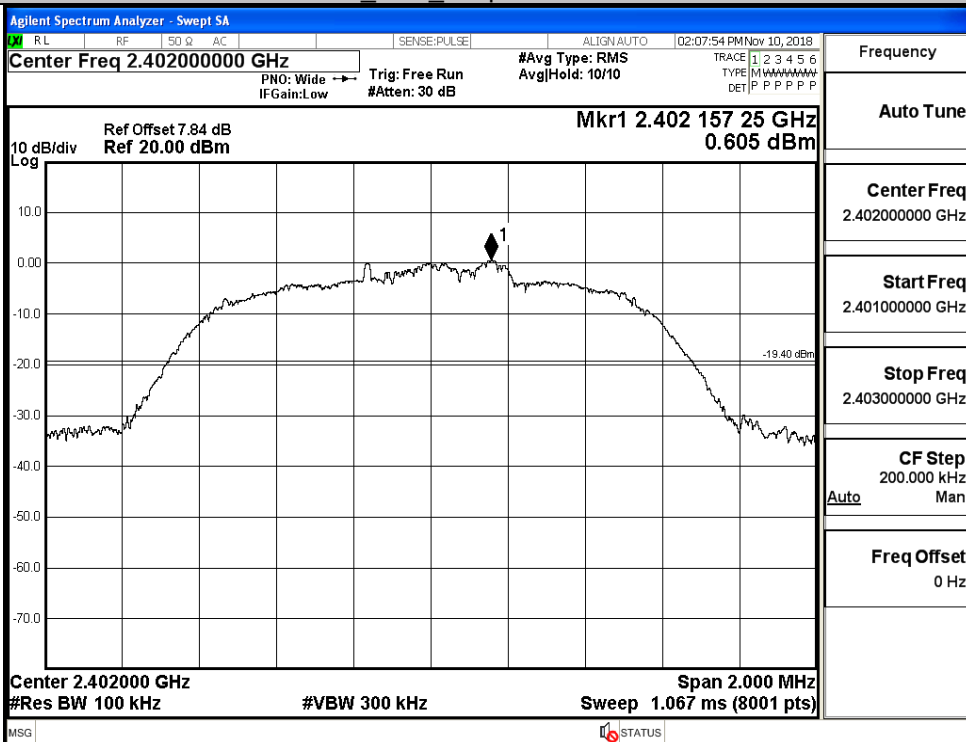


Puw

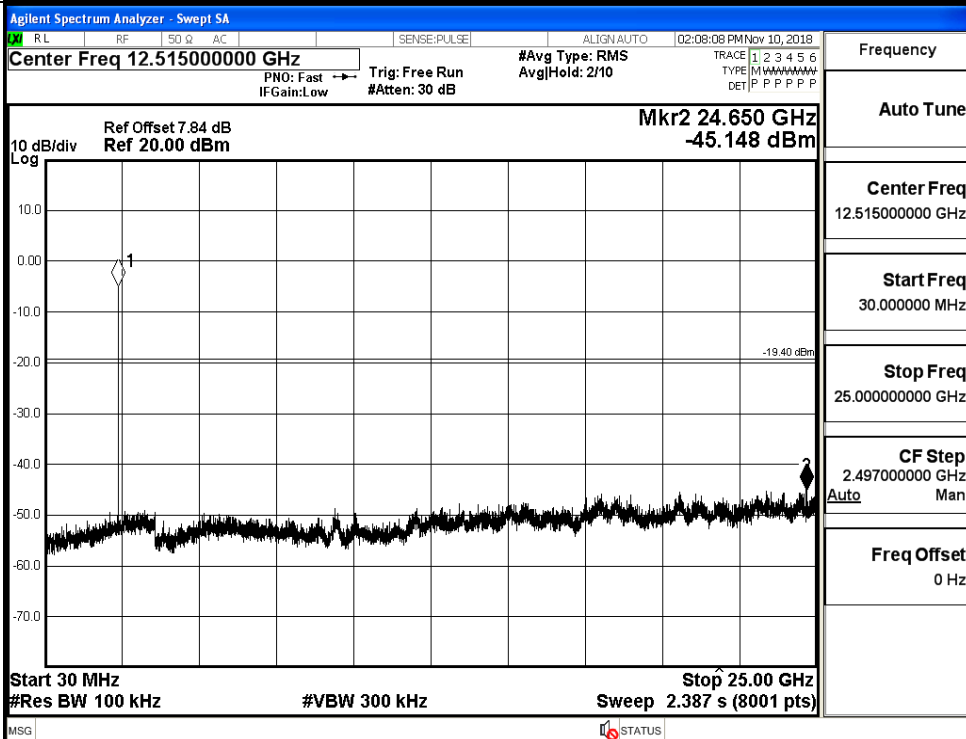


$\pi/4$ DQPSK LCH_Graphs

Pref

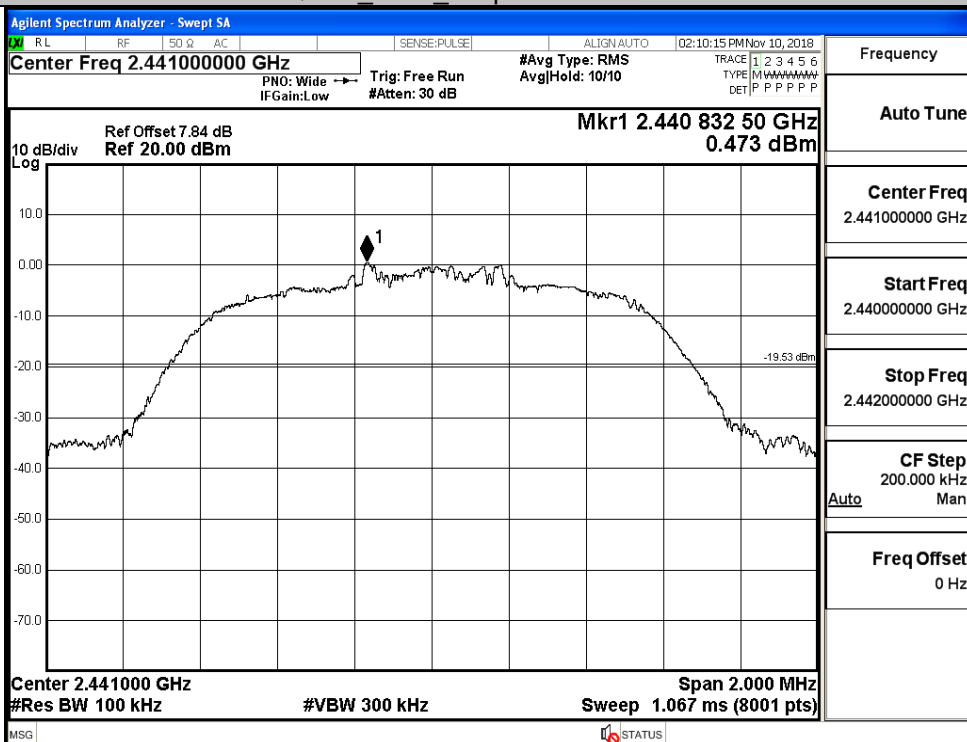


Puw

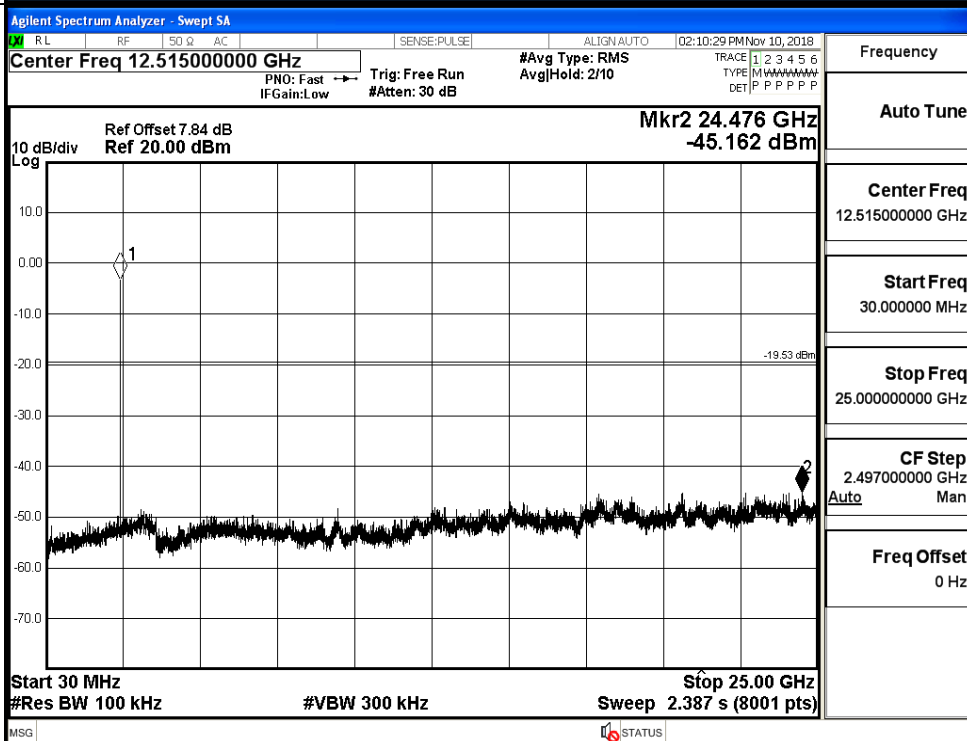


$\pi/4$ DQPSK_MCH_Graphs

Pref

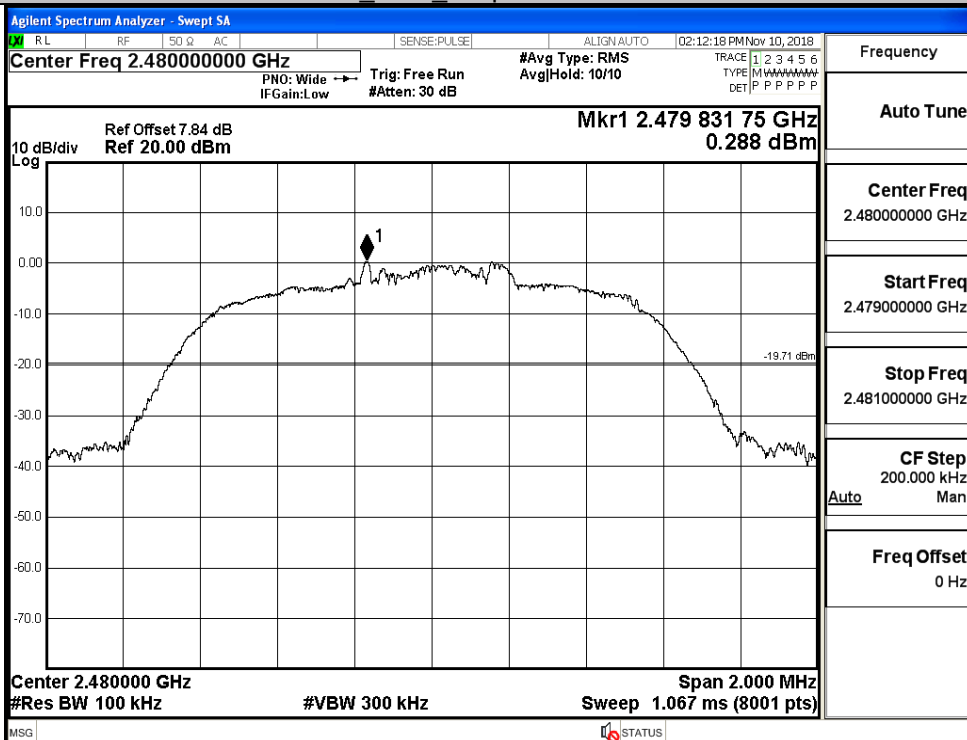


Puw

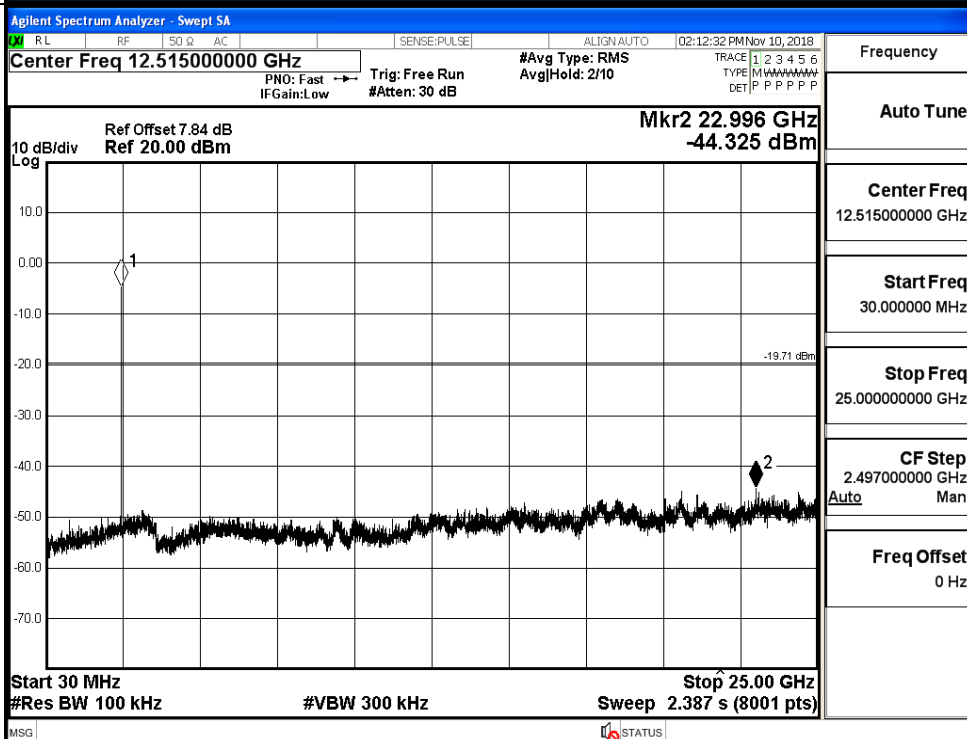


$\pi/4$ DQPSK_HCH_Graphs

Pref



Puw

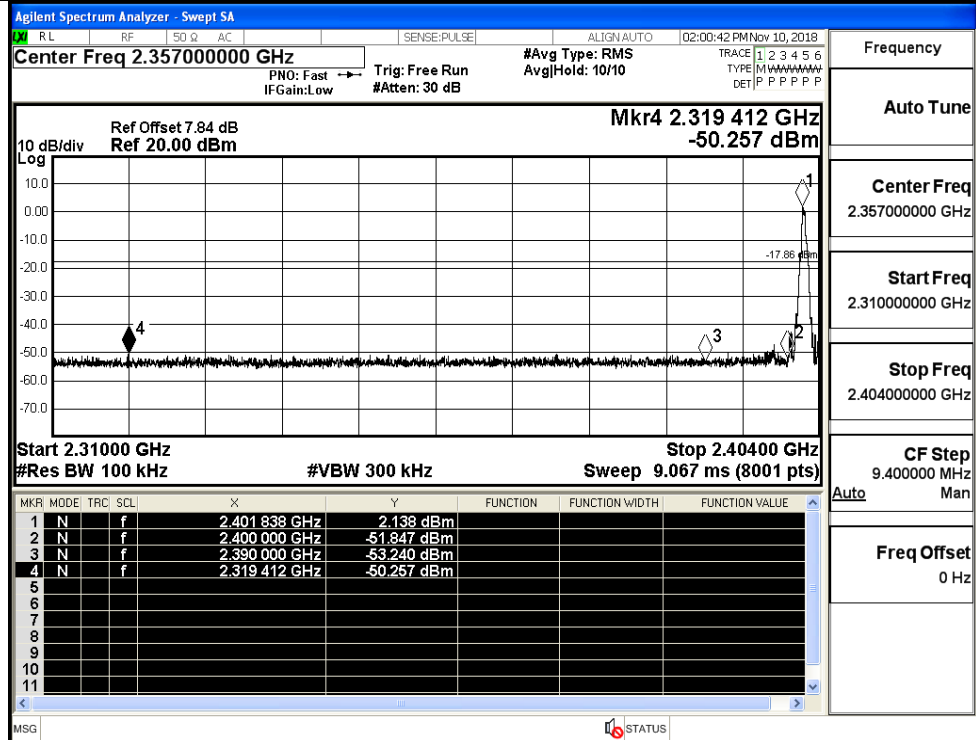


A.7 Band-edge for RF Conducted Emissions

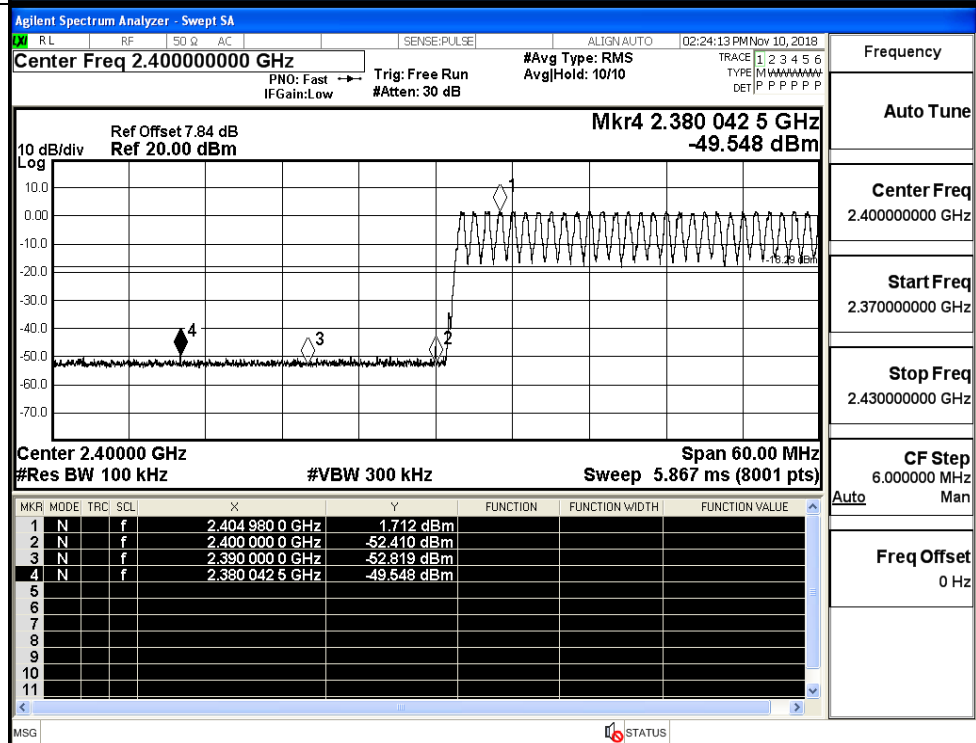
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	2.138	Off	-50.257	-17.86	PASS
			1.712	On	-49.548	-18.29	PASS
	HCH	2480	1.755	Off	-48.387	-18.25	PASS
			1.671	On	-49.772	-18.33	PASS
$\pi/4$ DQPSK	LCH	2402	0.739	Off	-50.333	-19.26	PASS
			0.601	On	-49.638	-19.4	PASS
	HCH	2480	-0.040	Off	-50.113	-20.04	PASS
			0.370	On	-48.628	-19.63	PASS

Test Graphs

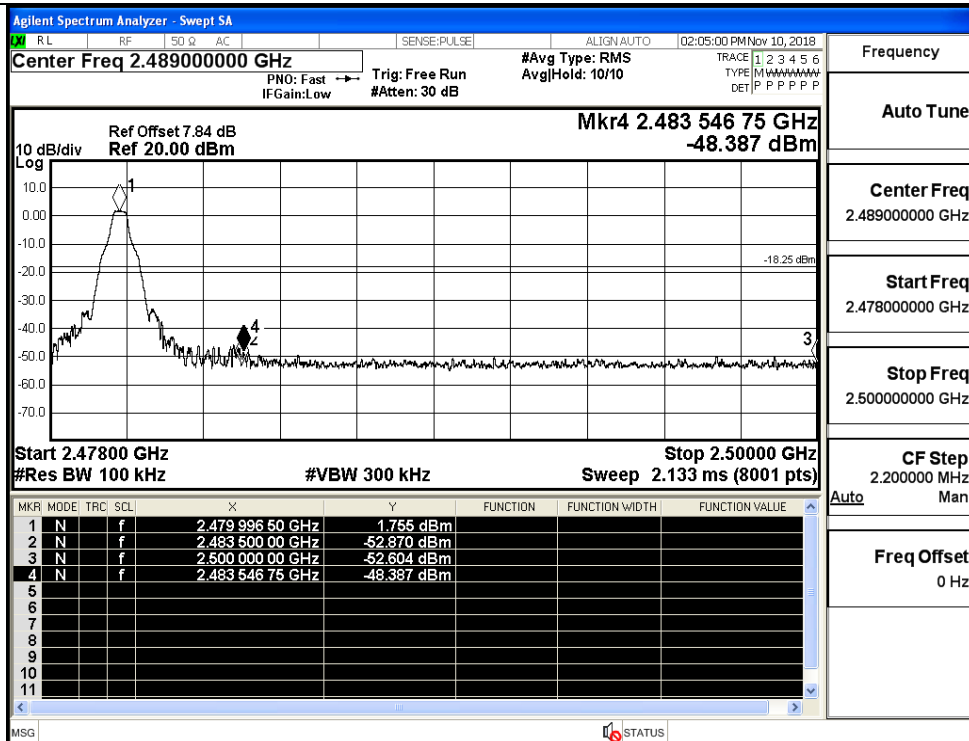
GFSK/LCH/No Hop



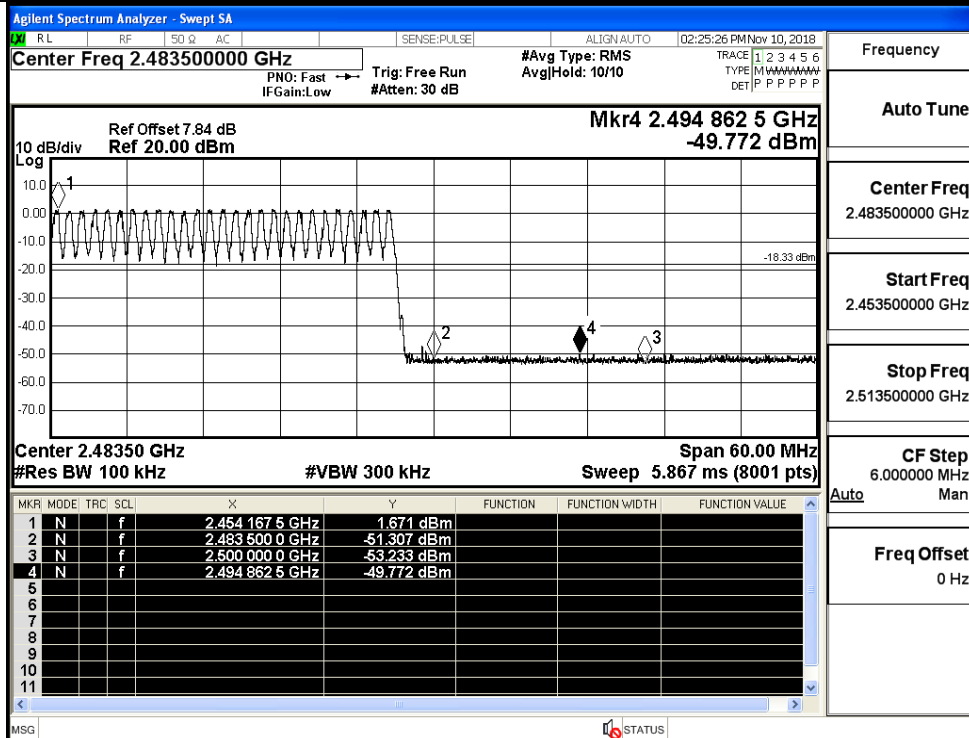
GFSK/LCH/Hop



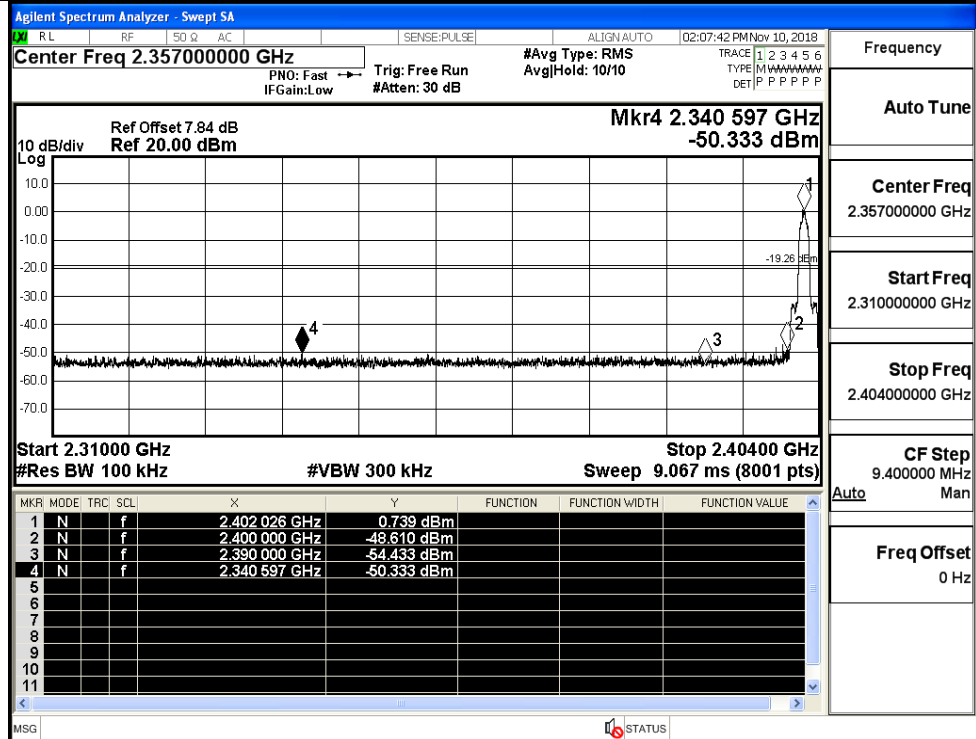
GFSK/HCH/No Hop



GFSK/HCH/Hop



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



Frequency

Auto Tune

Center Freq
2.357000000 GHz

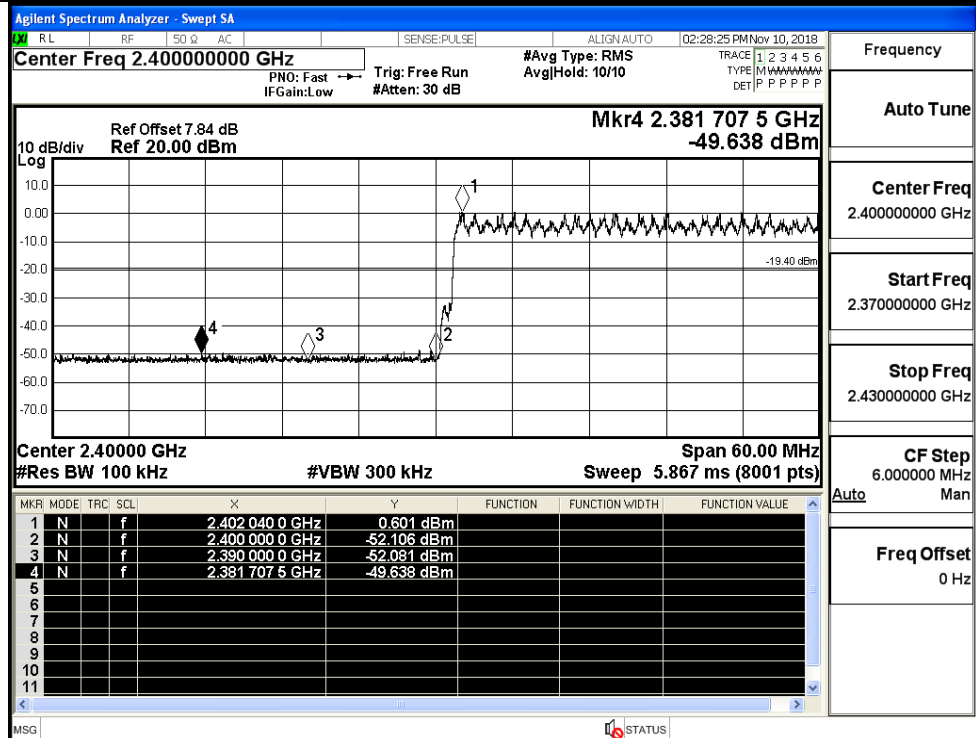
Start Freq
2.310000000 GHz

Stop Freq
2.404000000 GHz

CF Step
9.400000 MHz
Auto Man

Freq Offset
0 Hz

$\pi/4$ DQPSK/LCH/Hop



Frequency

Auto Tune

Center Freq
2.400000000 GHz

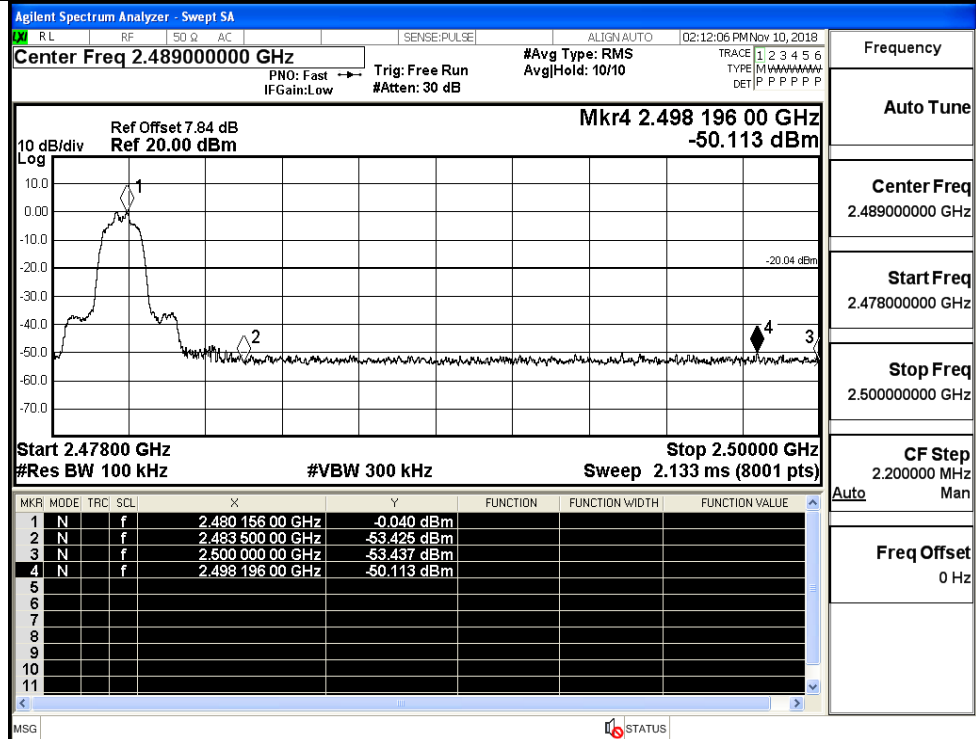
Start Freq
2.370000000 GHz

Stop Freq
2.430000000 GHz

CF Step
6.000000 MHz
Auto Man

Freq Offset
0 Hz

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

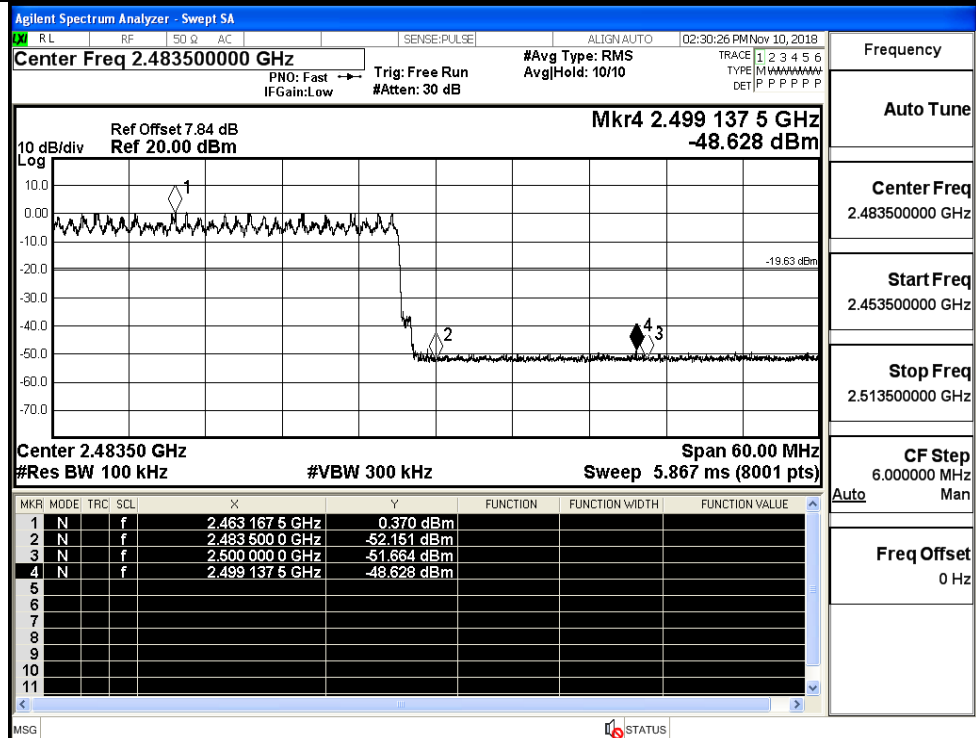


Frequency

Auto Tune

Center Freq
2.489000000 GHzStart Freq
2.478000000 GHzStop Freq
2.500000000 GHzCF Step
2.200000 MHz
Auto ManFreq Offset
0 Hz

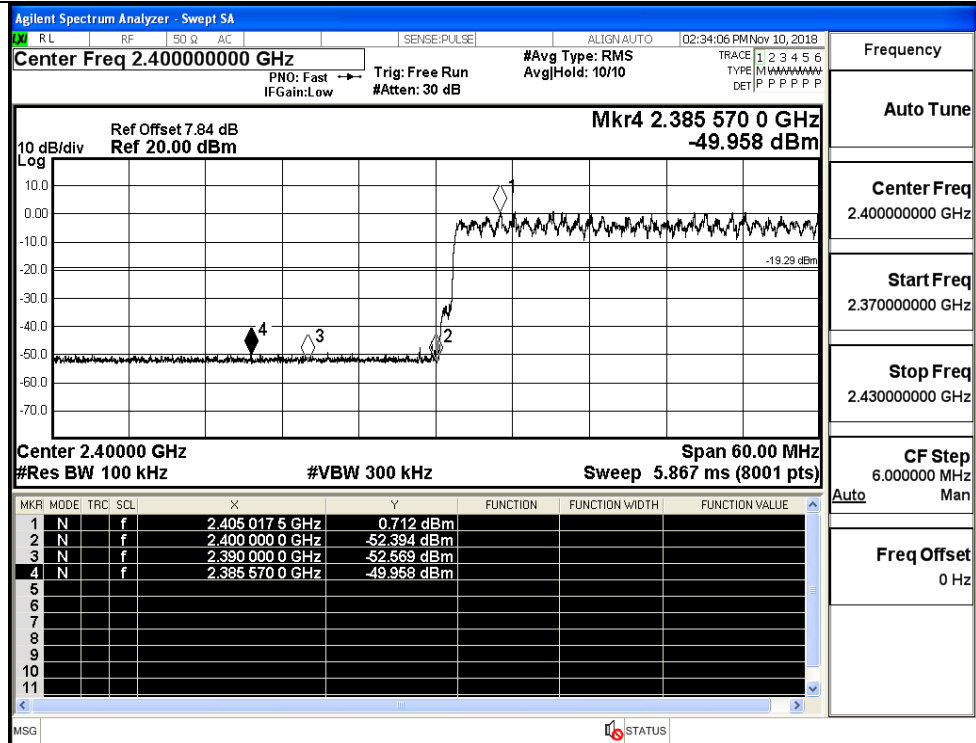
$\pi/4$ DQPSK/HCH/Hop



Frequency

Auto Tune

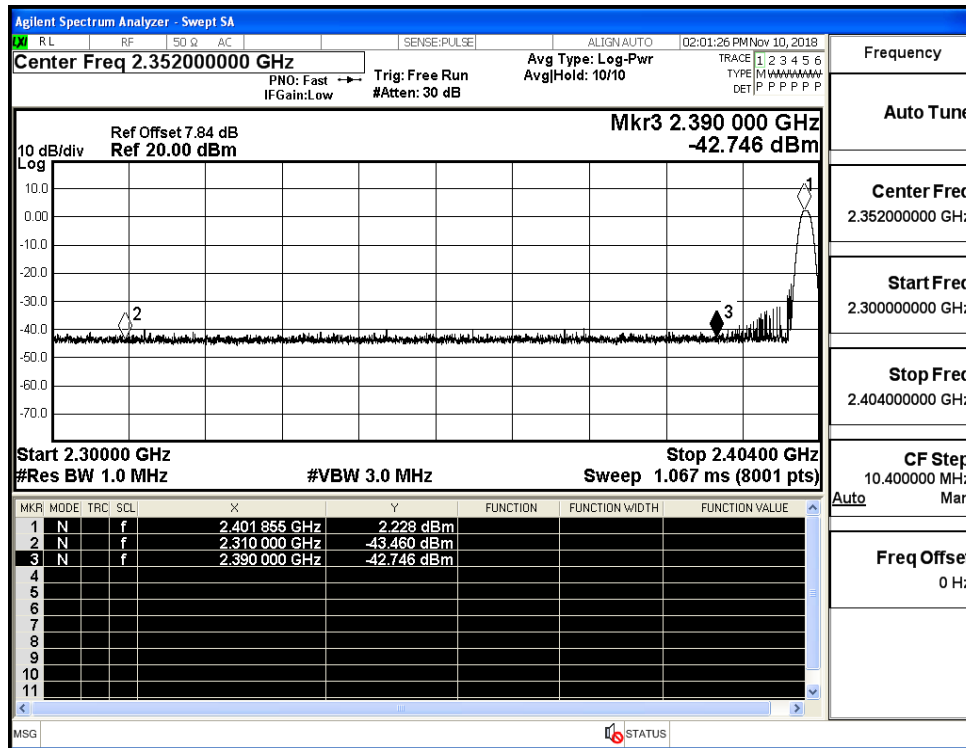
Center Freq
2.483500000 GHzStart Freq
2.453500000 GHzStop Freq
2.513500000 GHzCF Step
6.000000 MHz
Auto ManFreq Offset
0 Hz



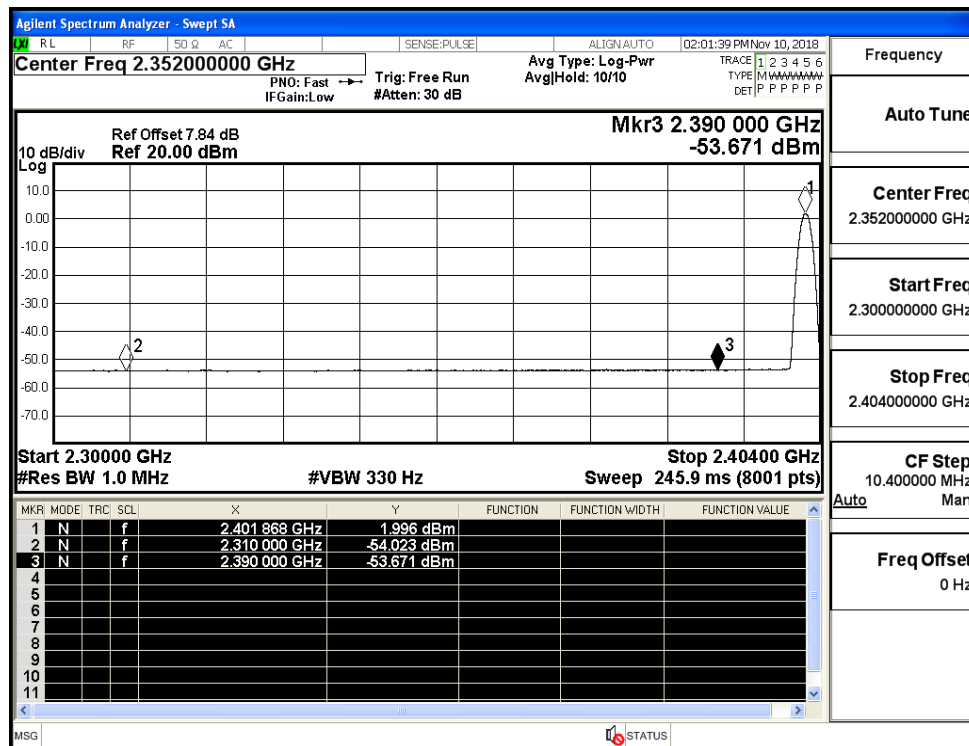
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.46	2.0	0	53.80	PEAK	74	PASS
	Off	2310.0	-54.02	2.0	0	43.23	AV	54	PASS
	Off	2390.0	-42.75	2.0	0	54.51	PEAK	74	PASS
	Off	2390.0	-53.67	2.0	0	43.59	AV	54	PASS
	Off	2483.5	-40.88	2.0	0	56.38	PEAK	74	PASS
	Off	2483.5	-53.19	2.0	0	44.07	AV	54	PASS
	Off	2500.0	-42.74	2.0	0	54.51	PEAK	74	PASS
	Off	2500.0	-53.28	2.0	0	43.98	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-43.85	2.0	0	53.41	PEAK	74	PASS
	Off	2310.0	-53.99	2.0	0	43.27	AV	54	PASS
	Off	2390.0	-42.68	2.0	0	54.57	PEAK	74	PASS
	Off	2390.0	-53.75	2.0	0	43.51	AV	54	PASS
	Off	2483.5	-42.87	2.0	0	54.39	PEAK	74	PASS
	Off	2483.5	-53.31	2.0	0	43.95	AV	54	PASS
	Off	2500.0	-43.99	2.0	0	53.27	PEAK	74	PASS
	Off	2500.0	-53.28	2.0	0	43.98	AV	54	PASS

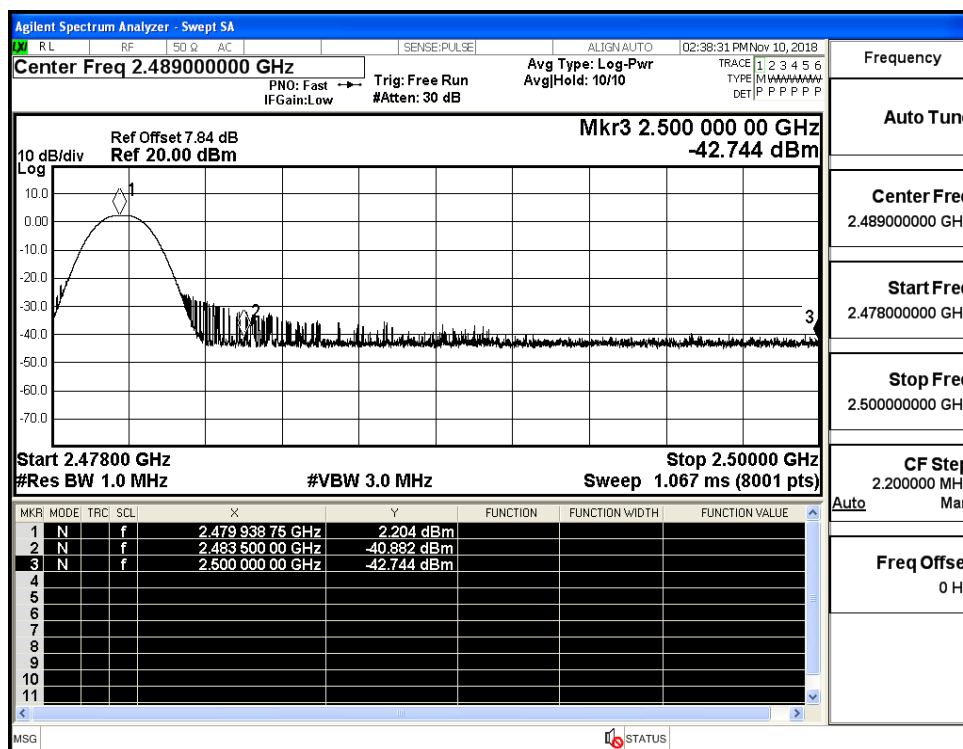
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



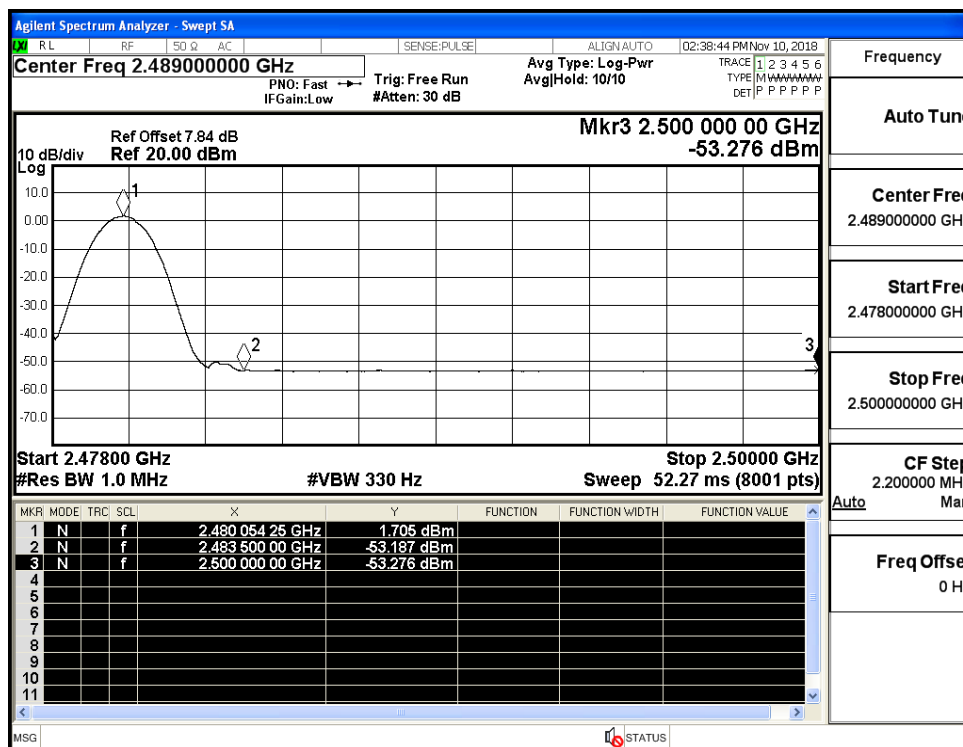
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



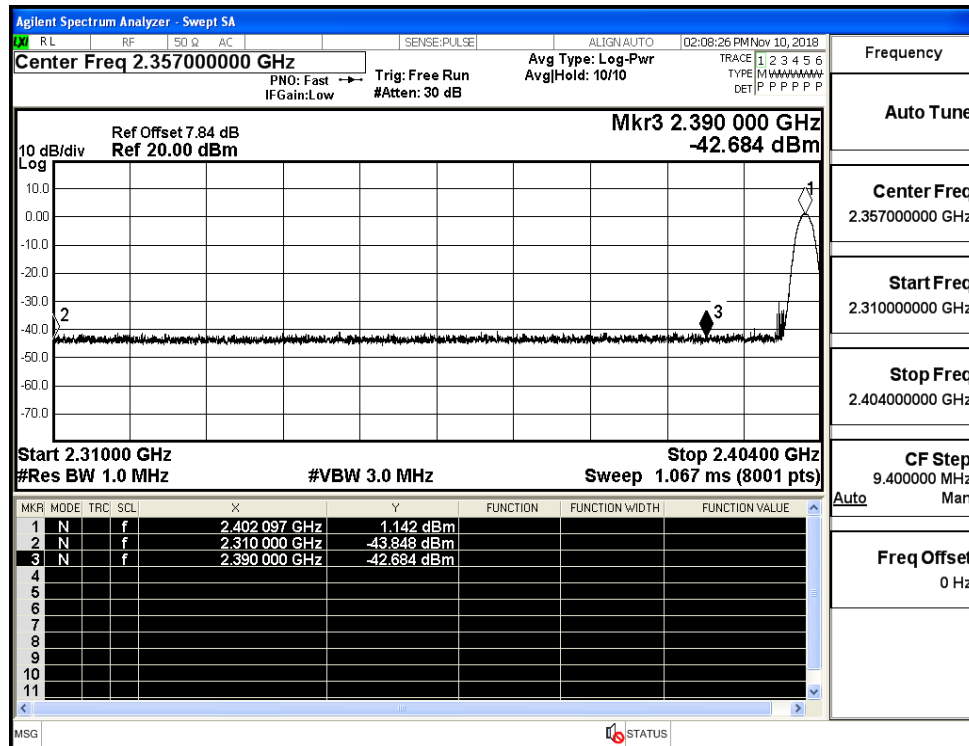
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



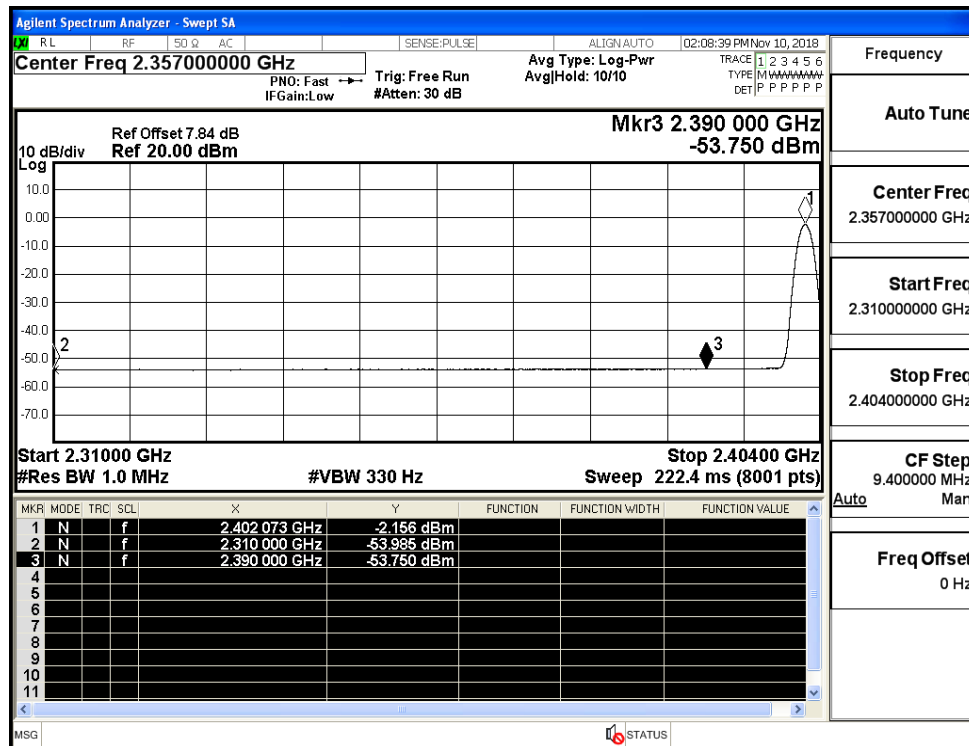
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



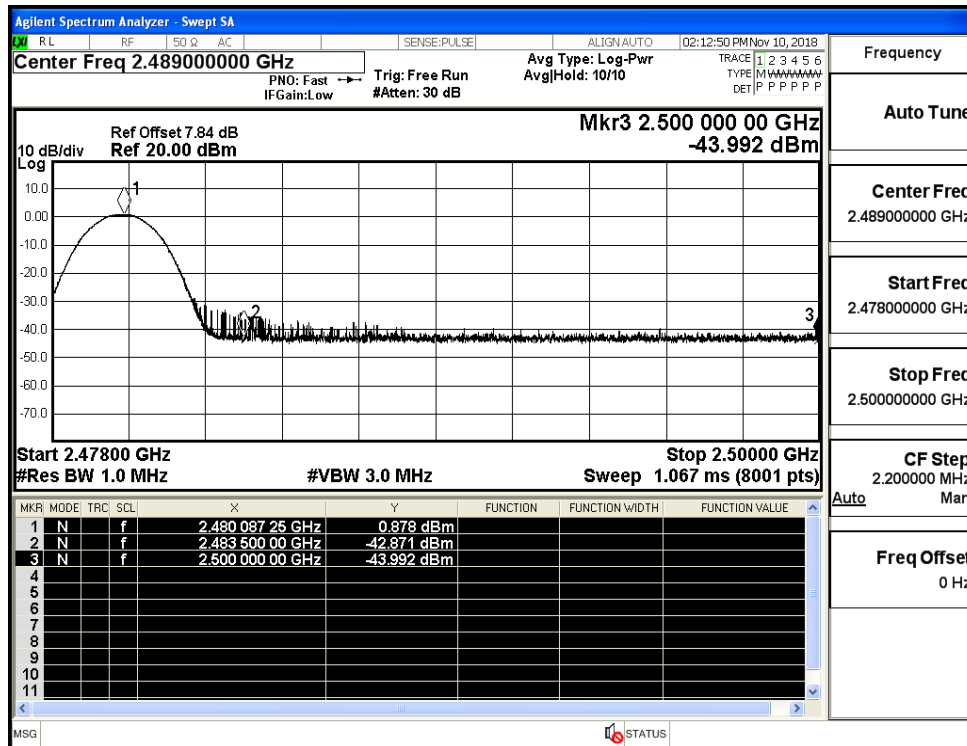
Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (Low Channel)



Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (Low Channel)



Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_PEAK (High Channel)



Restrict-band band-edge measurements_Hopping Off $\pi/4$ -DQPSK_Average (High Channel)

