

Appendix A

RF Test Data for BT V5.0(BDR/EDR) (Conducted Measurement)

Product Name: TWS Earbuds with Cylinder Casing

Trade Mark: N/A

Test Model: 23906

Environmental Conditions

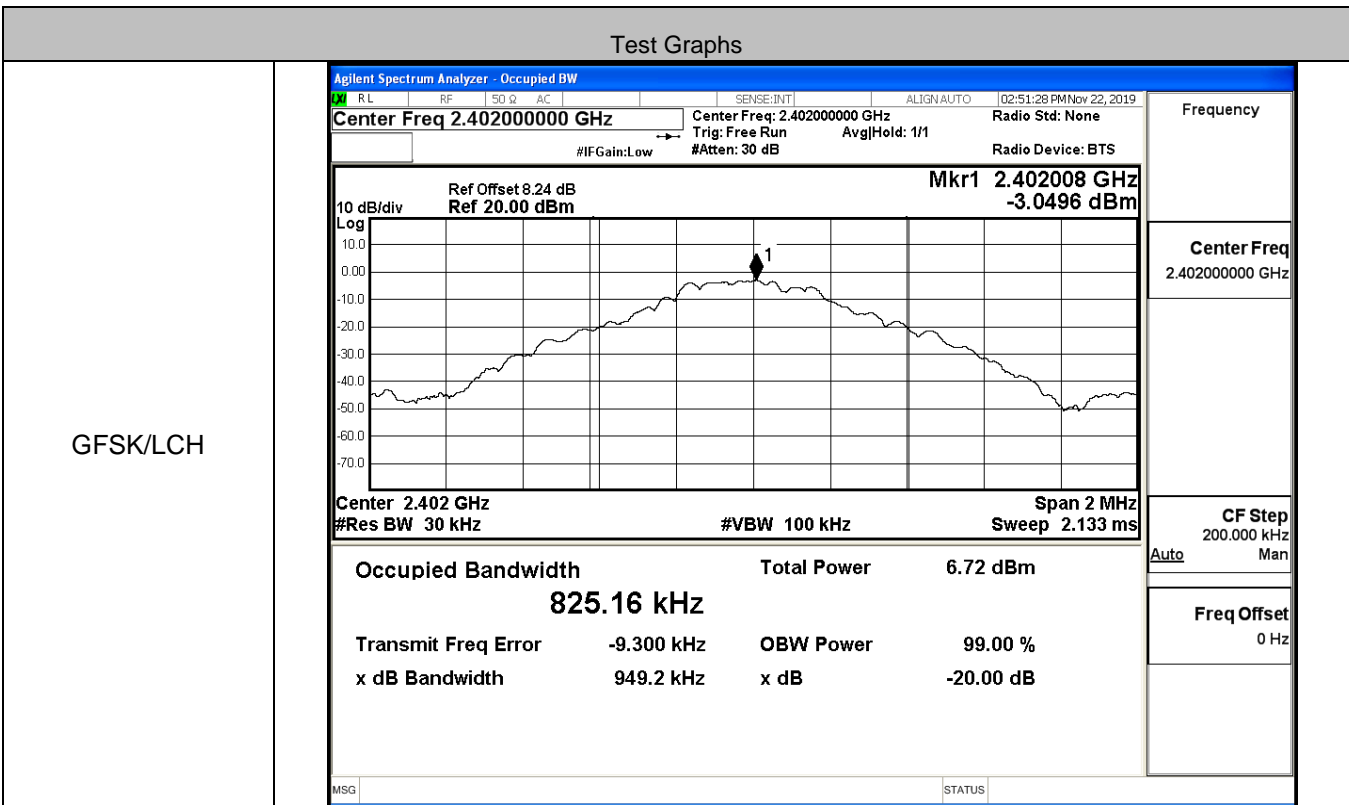
Temperature:	23.7°C
Relative Humidity:	53.2%
ATM Pressure:	100.0 kPa
Test Engineer:	QuXin
Supervised by:	Tom.Liu

A.1 Maximum Conducted Peak Output Power

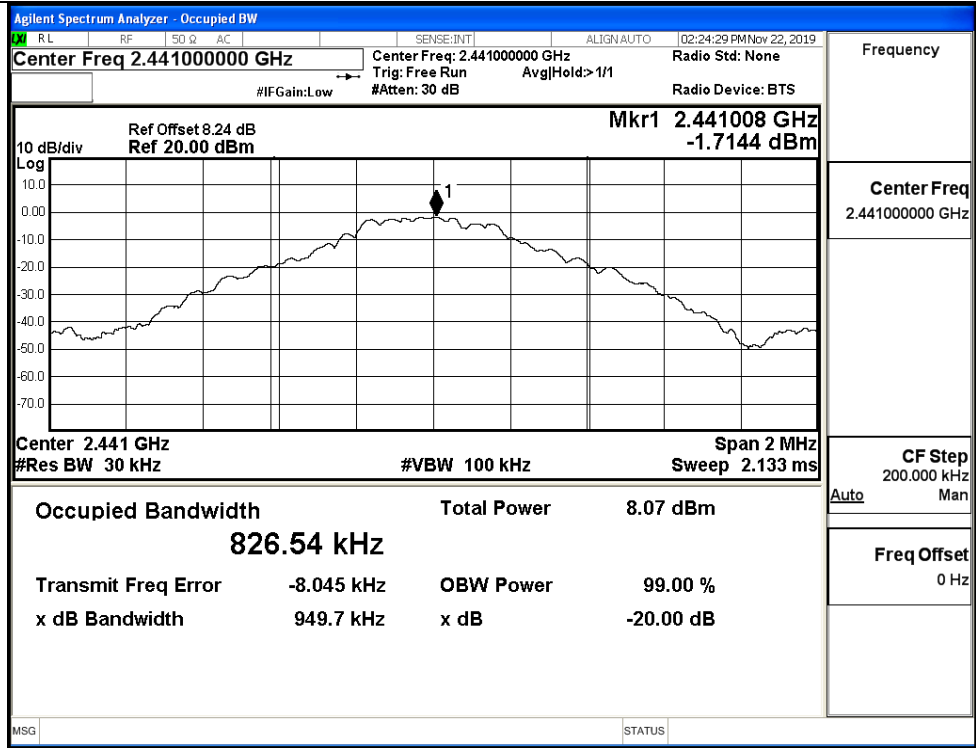
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-0.462	21	PASS
	MCH	0.866	21	PASS
	HCH	-0.564	21	PASS
$\pi/4$ DQPSK	LCH	1.760	21	PASS
	MCH	0.372	21	PASS
	HCH	-1.028	21	PASS

A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9492	Not Specified	PASS
	MCH	0.9497	Not Specified	PASS
	HCH	0.9488	Not Specified	PASS
$\pi/4$ DQPSK	LCH	1.313	Not Specified	PASS
	MCH	1.311	Not Specified	PASS
	HCH	1.315	Not Specified	PASS

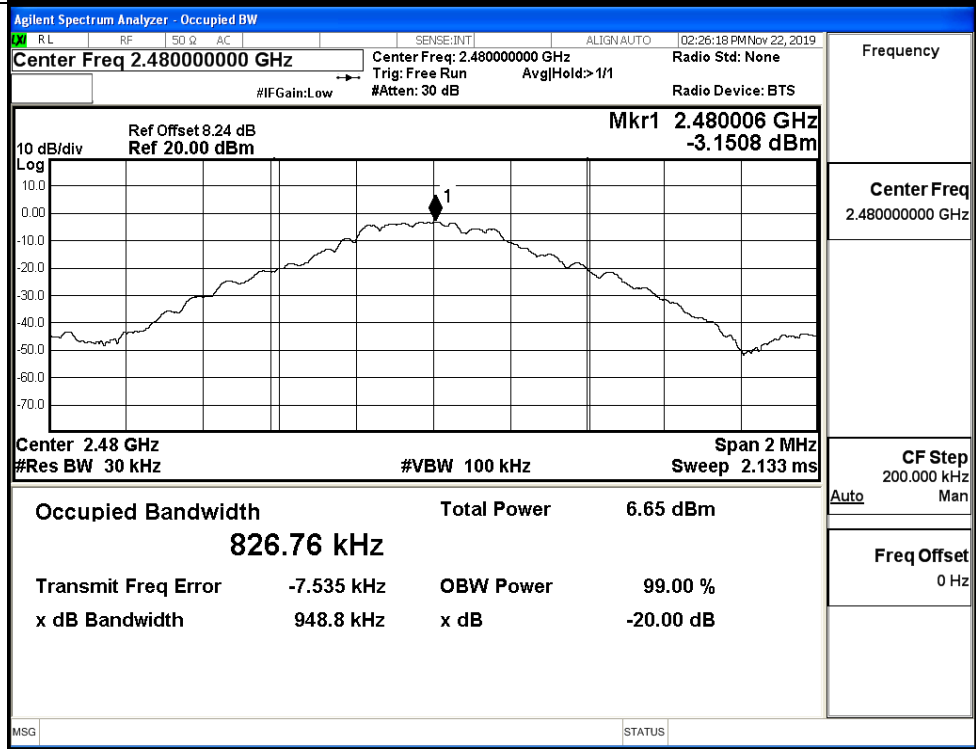


GFSK/MCH



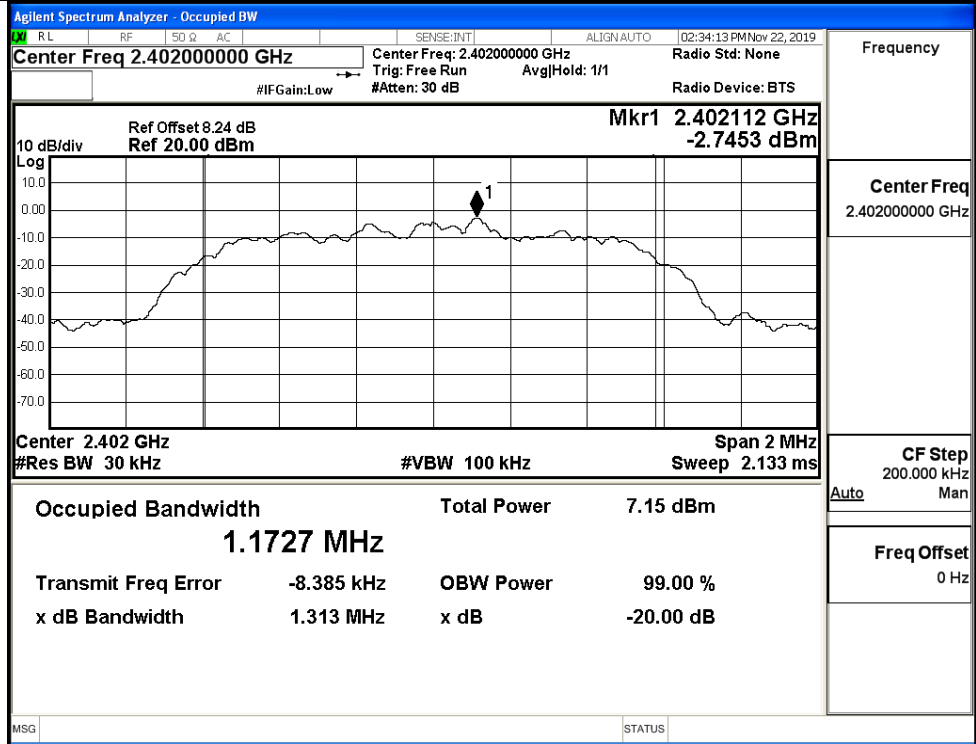
Frequency	2.441000000 GHz
Center Freq	2.441000000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

GFSK/HCH

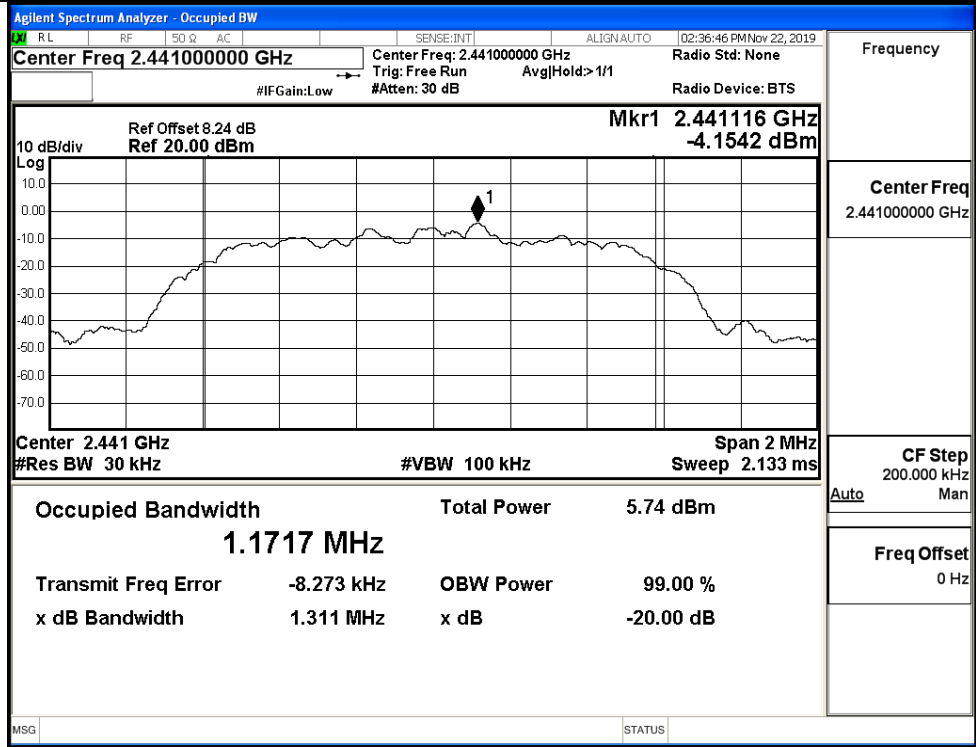


Frequency	2.480000000 GHz
Center Freq	2.480000000 GHz
CF Step	200.000 kHz
Auto	Man
Freq Offset	0 Hz

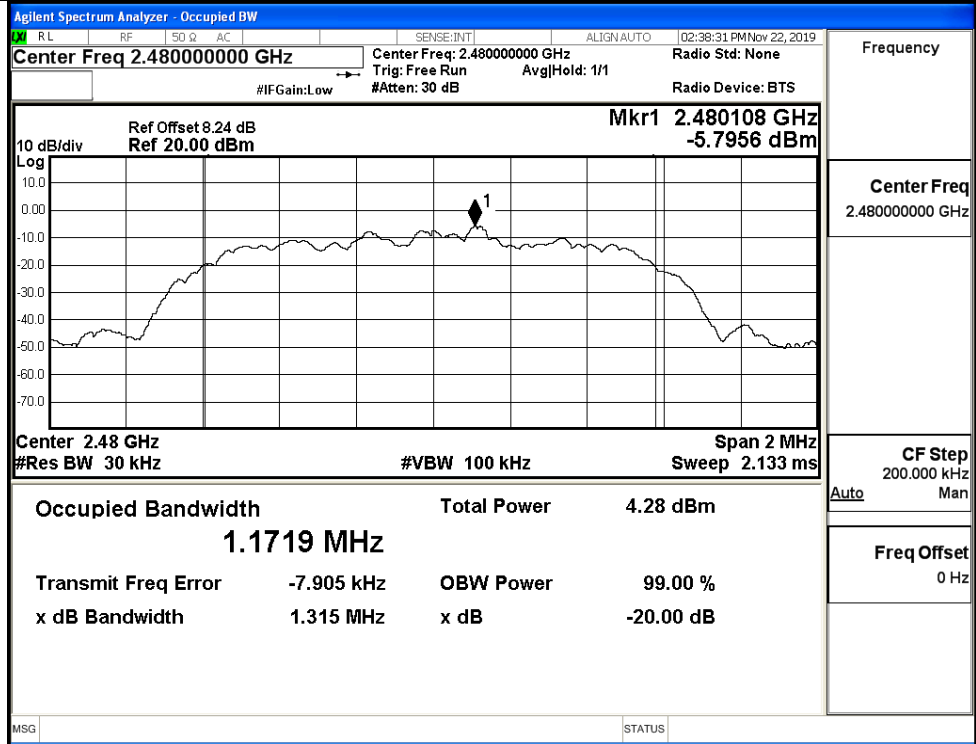
$\pi/4$ DQPSK/LCH



$\pi/4$ DQPSK/MCH

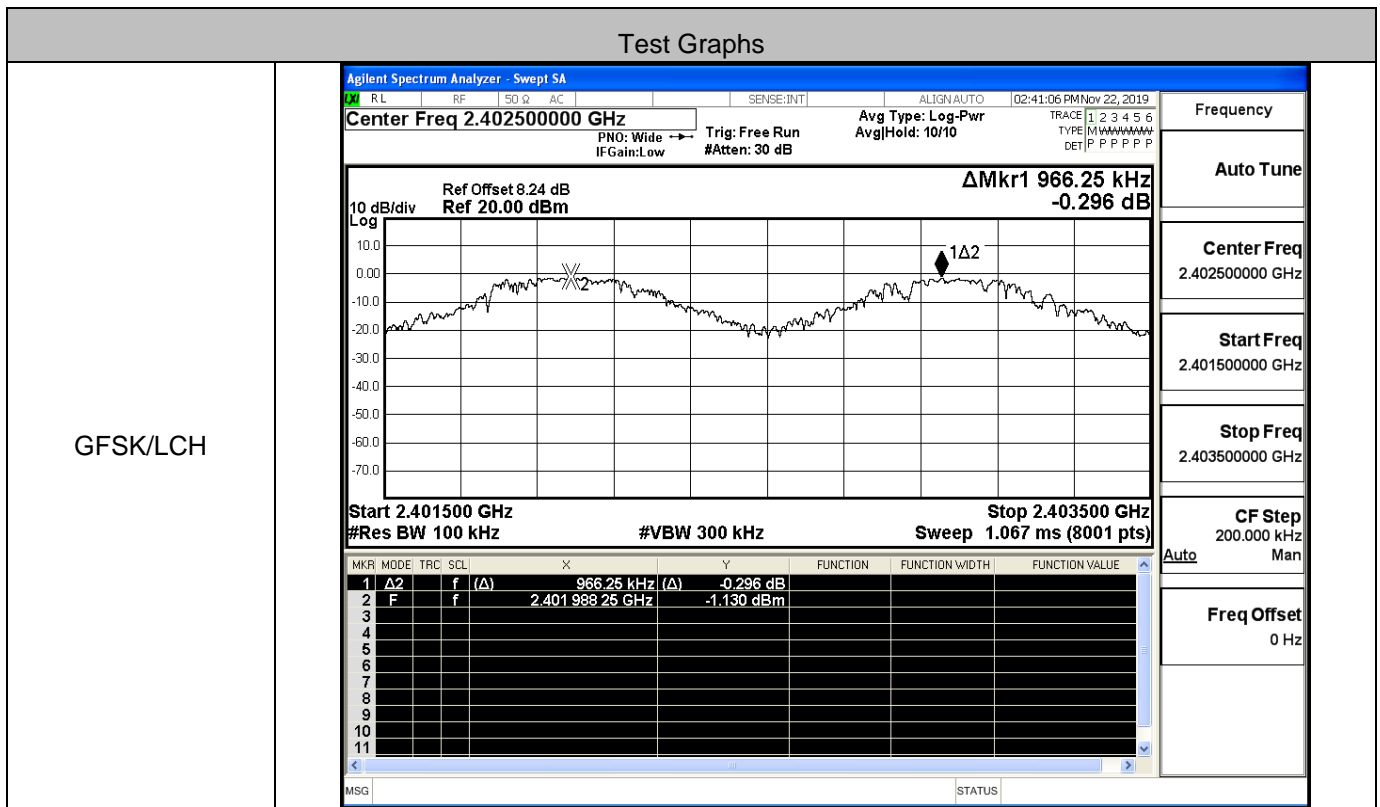


$\pi/4$ DQPSK/HCH

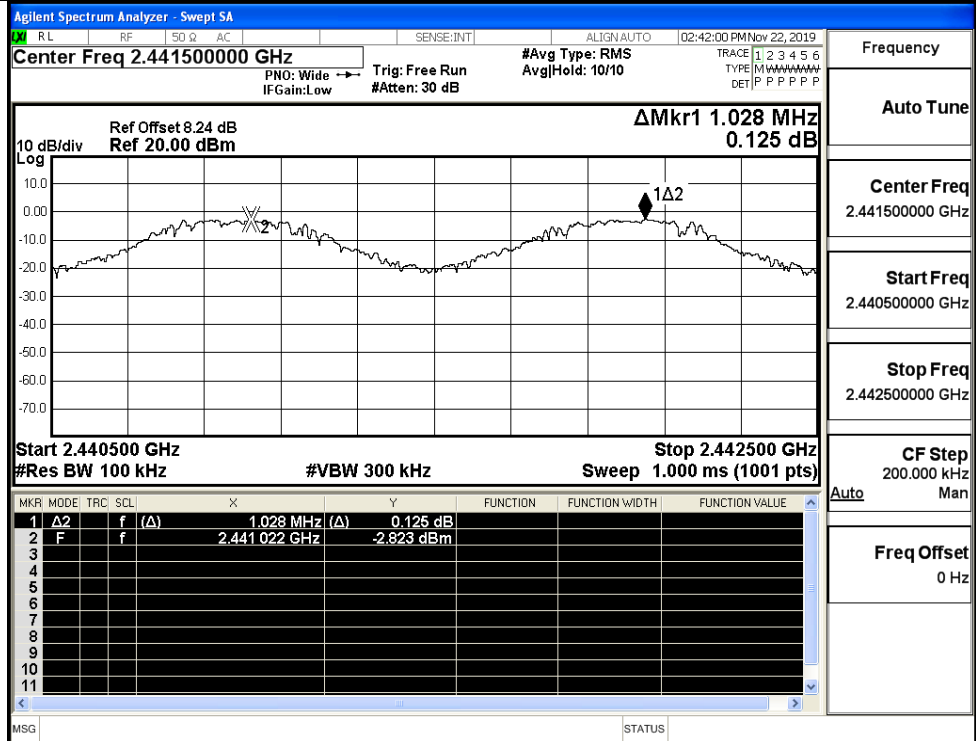


A.3 Carrier Frequency Separation

Mode	Channel	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.966	0.633	PASS
	MCH	1.028	0.633	PASS
	HCH	1.148	0.633	PASS
π/4DQPSK	LCH	1.340	0.877	PASS
	MCH	1.172	0.877	PASS
	HCH	1.122	0.877	PASS

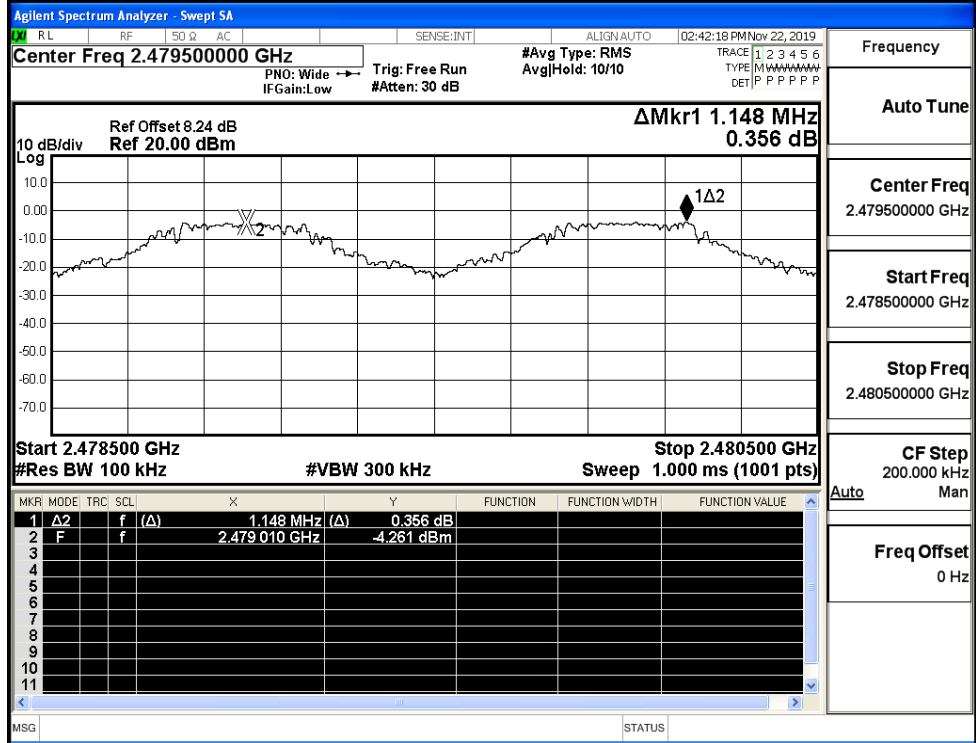


GFSK/MCH



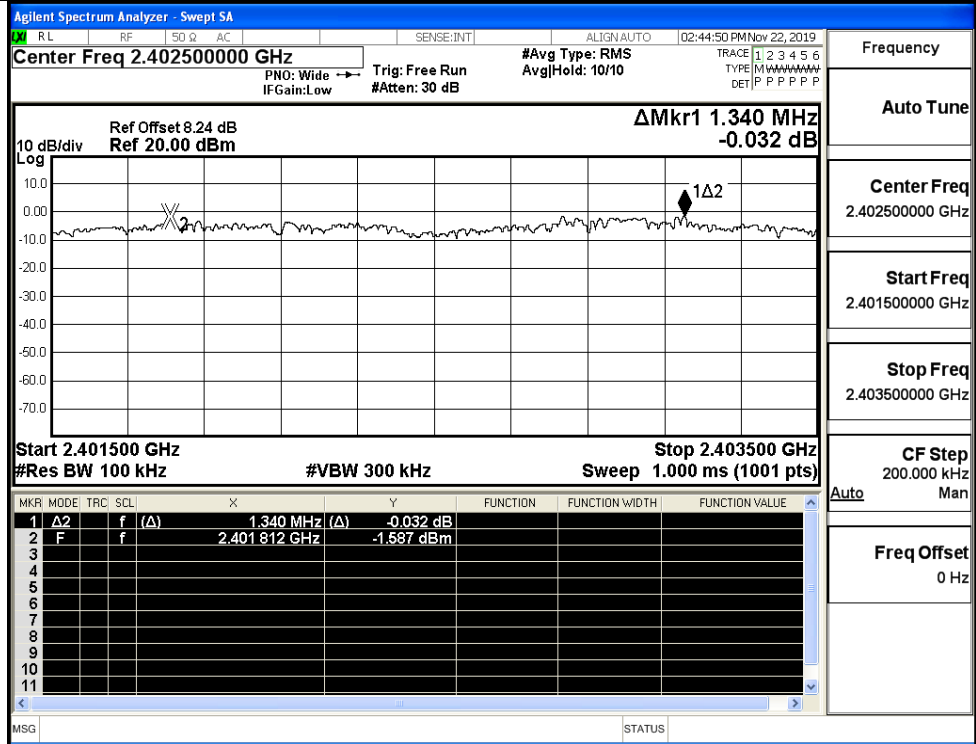
Frequency
Auto Tune
Center Freq
2.441500000 GHz
Start Freq
2.440500000 GHz
Stop Freq
2.442500000 GHz
CF Step
200.000 kHz
Auto
Man
Freq Offset
0 Hz

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
Auto
Man
Freq Offset
0 Hz

$\pi/4$ DQPSK/LCH



Frequency

Auto Tune

Center Freq
2.402500000 GHz

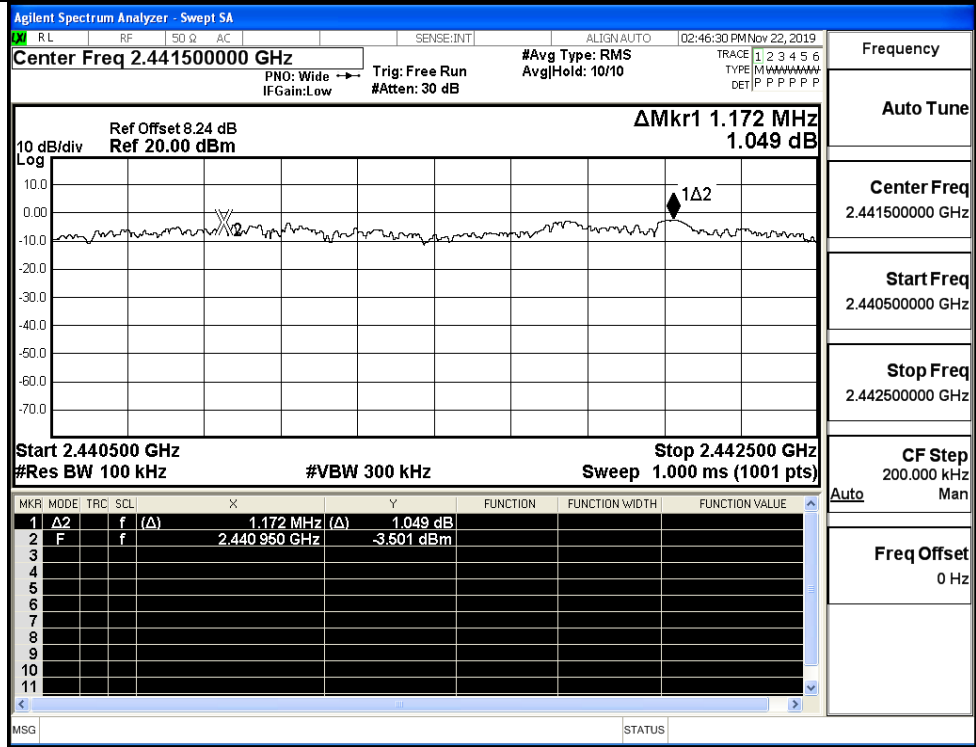
Start Freq
2.401500000 GHz

Stop Freq
2.403500000 GHz

CF Step
200.000 kHz

Freq Offset
0 Hz

$\pi/4$ DQPSK/MCH



Frequency

Auto Tune

Center Freq
2.441500000 GHz

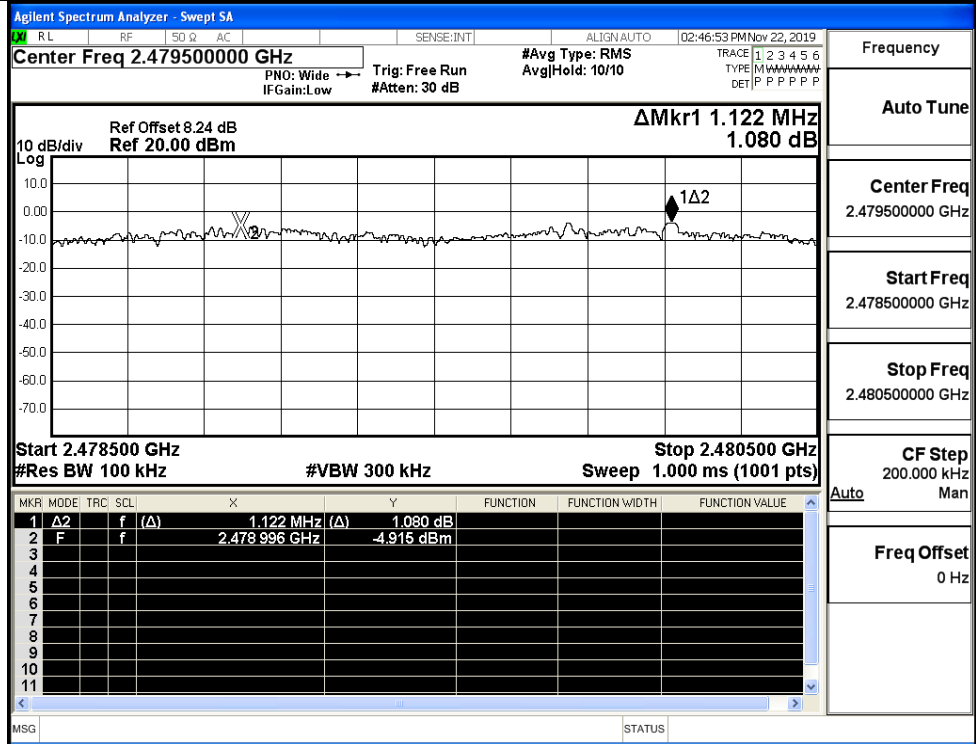
Start Freq
2.440500000 GHz

Stop Freq
2.442500000 GHz

CF Step
200.000 kHz

Freq Offset
0 Hz

$\pi/4$ DQPSK/HCH



A.4 Hopping Channel Number

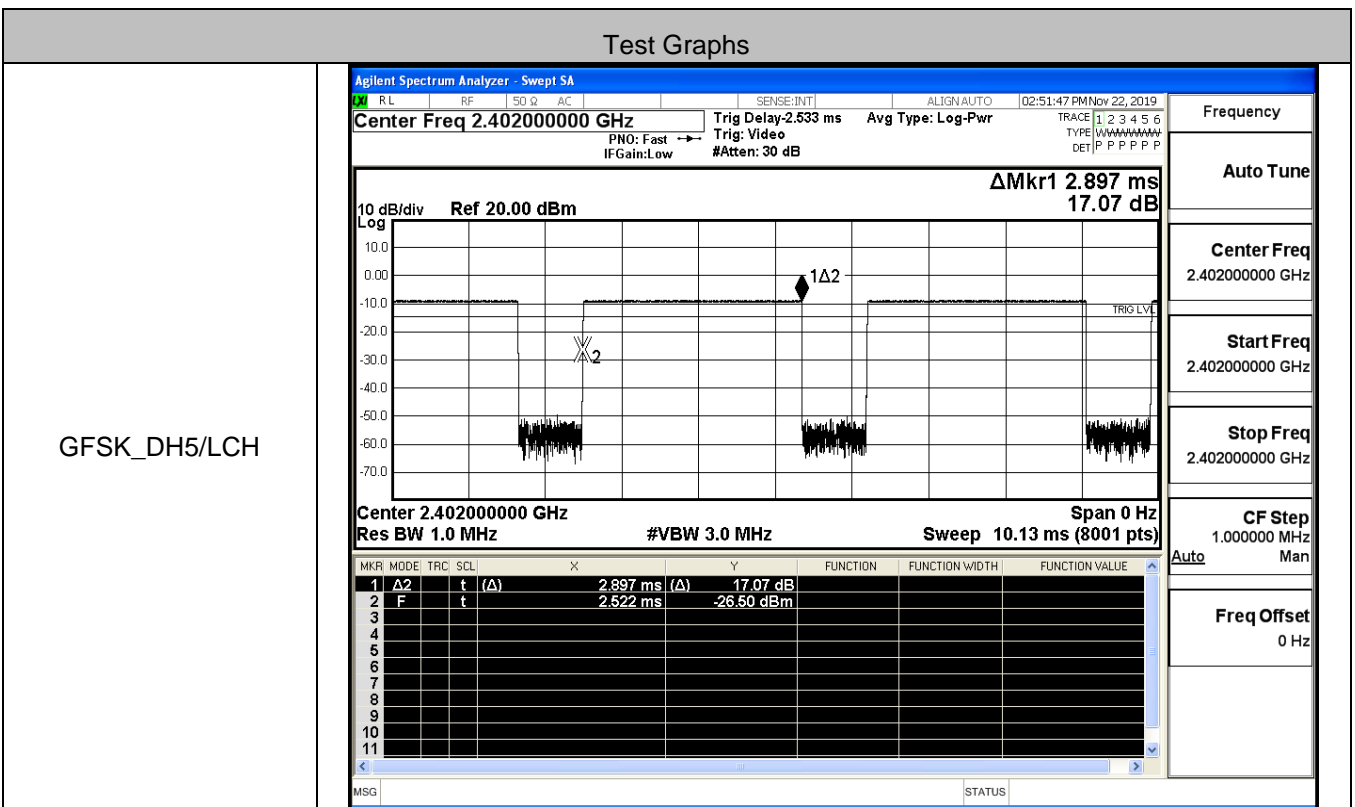
Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS
$\pi/4$ DQPSK	Hop	79	>=15	PASS

Test Graphs

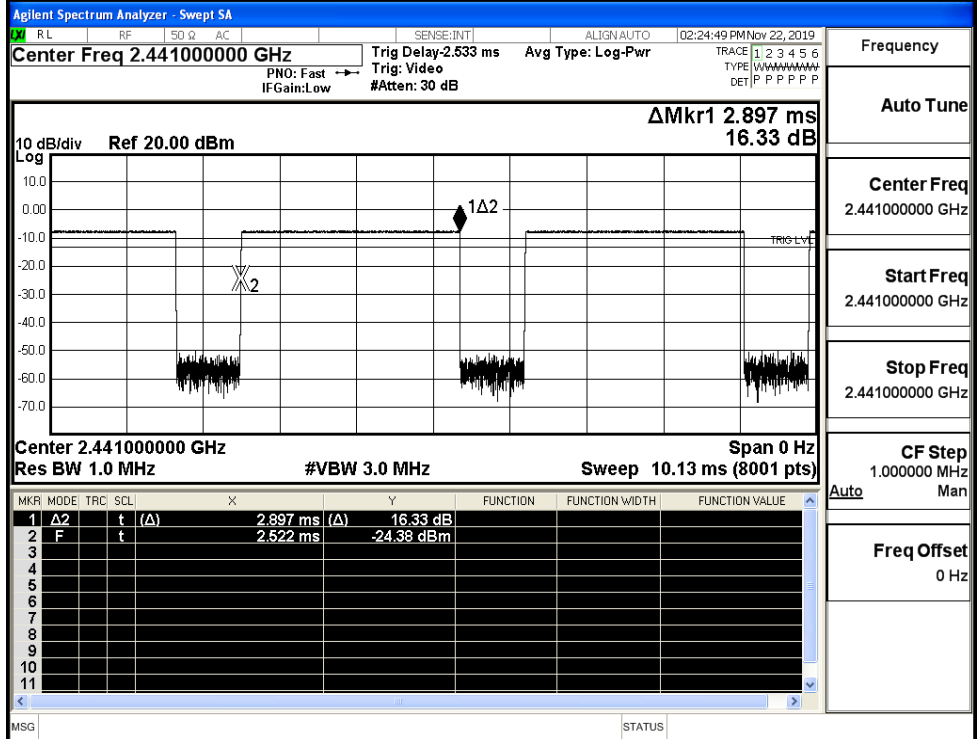
GFSK/Hop	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.441750000 GHz Ref Offset 8.24 dB Ref 20.00 dBm ΔMkr1 77.937 MHz -3.042 dB Start 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.48350 GHz Sweep 8.000 ms (8001 pts)</p> <table border="1" style="font-size: small; width: 100%;"> <thead> <tr> <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> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>f</td> <td>(Δ)</td> <td>77.937 MHz</td> <td>(Δ)</td> <td>-3.042 dB</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.402046 GHz</td> <td></td> <td>-0.857 dBm</td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	77.937 MHz	(Δ)	-3.042 dB			2	F	f		2.402046 GHz		-0.857 dBm			Frequency Auto Tune Center Freq 2.441750000 GHz Start Freq 2.400000000 GHz Stop Freq 2.483500000 GHz CF Step 8.350000 MHz Auto Man Freq Offset 0 Hz
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	Δ 2	f	(Δ)	77.937 MHz	(Δ)	-3.042 dB																							
2	F	f		2.402046 GHz		-0.857 dBm																							
$\pi/4$ DQPSK/Hop	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.441750000 GHz Ref Offset 8.24 dB Ref 20.00 dBm ΔMkr1 77.958 MHz -3.247 dB Start 2.40000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.48350 GHz Sweep 8.000 ms (8001 pts)</p> <table border="1" style="font-size: small; width: 100%;"> <thead> <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> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>f</td> <td>(Δ)</td> <td>77.958 MHz</td> <td>(Δ)</td> <td>-3.247 dB</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.402119 GHz</td> <td></td> <td>-1.008 dBm</td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	77.958 MHz	(Δ)	-3.247 dB			2	F	f		2.402119 GHz		-1.008 dBm			Frequency Auto Tune Center Freq 2.441750000 GHz Start Freq 2.400000000 GHz Stop Freq 2.483500000 GHz CF Step 8.350000 MHz Auto Man Freq Offset 0 Hz
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	Δ 2	f	(Δ)	77.958 MHz	(Δ)	-3.247 dB																							
2	F	f		2.402119 GHz		-1.008 dBm																							

A.5 Dwell Time

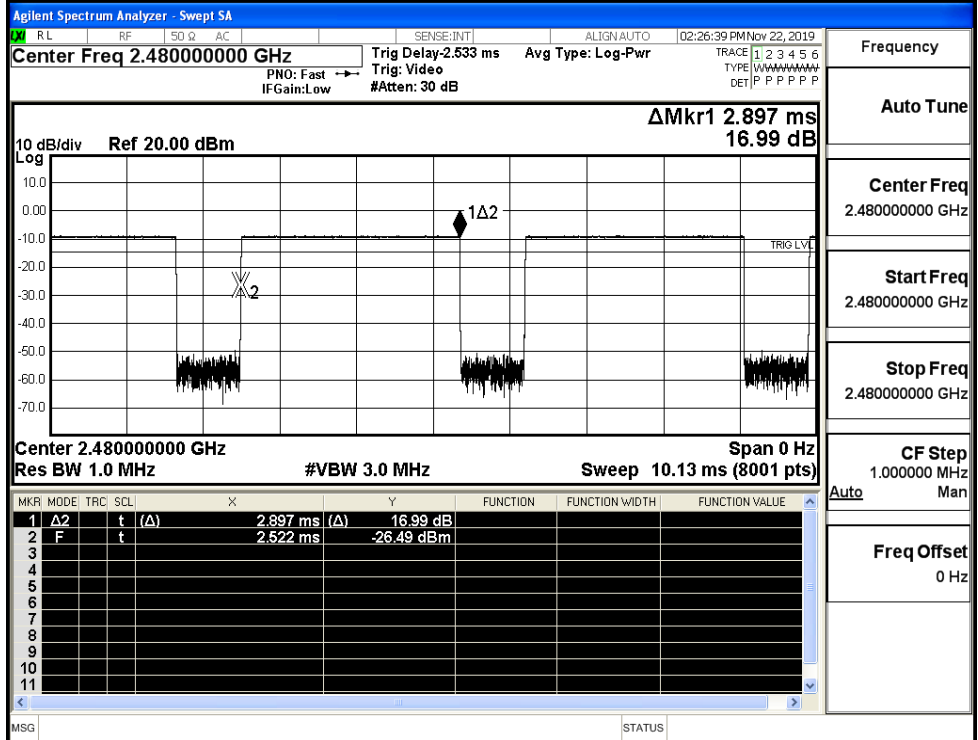
Mode	Packet	Channel	Burst Width [ms/hop/ch]	Total Hops[hop*ch]	Dwell Time[s]	Limit [s]	Verdict
GFSK	DH5	LCH	2.9	106.7	0.309	0.4	PASS
	DH5	MCH	2.9	106.7	0.309	0.4	PASS
	DH5	HCH	2.9	106.7	0.309	0.4	PASS
π/4DQPSK	2DH5	LCH	2.9	106.7	0.309	0.4	PASS
	2DH5	MCH	2.9	106.7	0.309	0.4	PASS
	2DH5	HCH	2.9	106.7	0.309	0.4	PASS



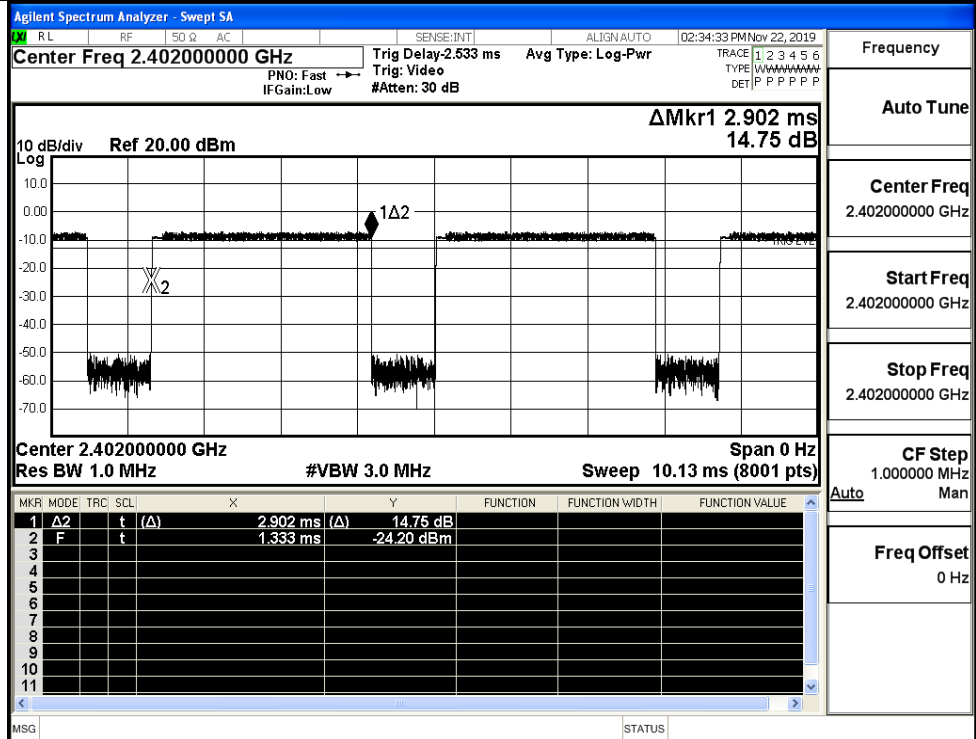
GFSK_DH5/MCH



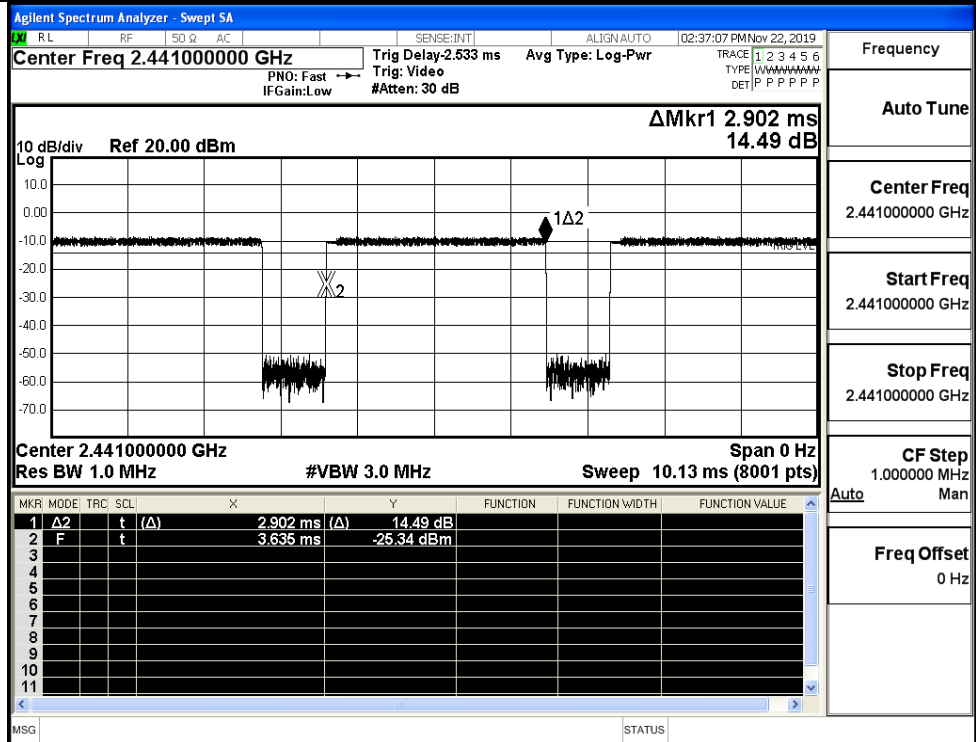
GFSK_DH5/HCH



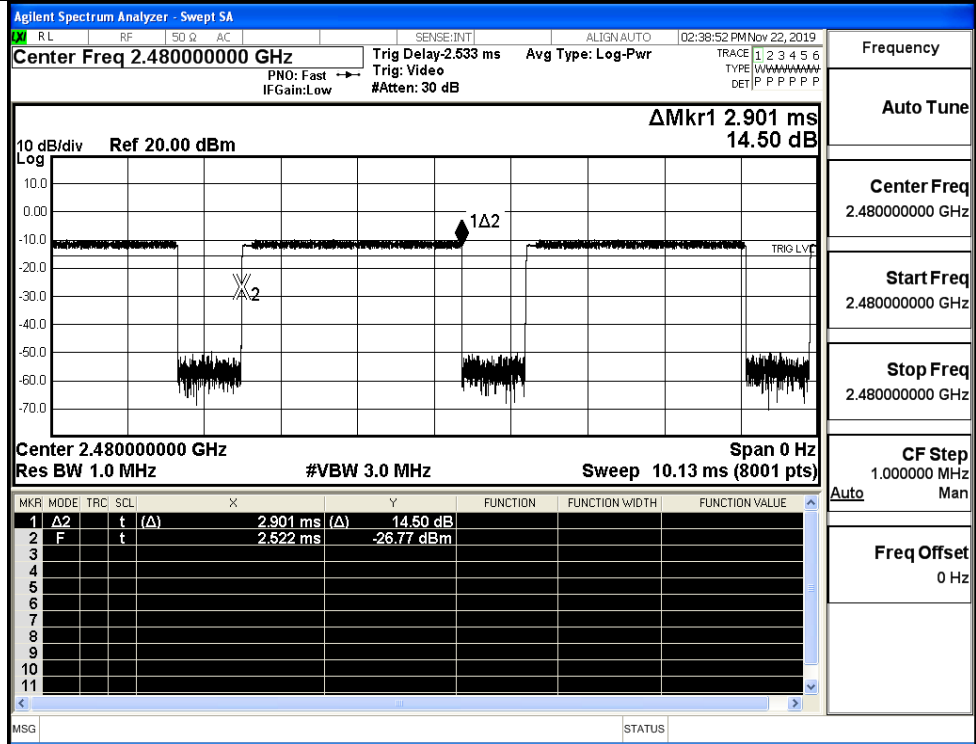
$\pi/4$ DQPSK
_2DH5/LCH



$\pi/4$ DQPSK
_2DH5/MCH

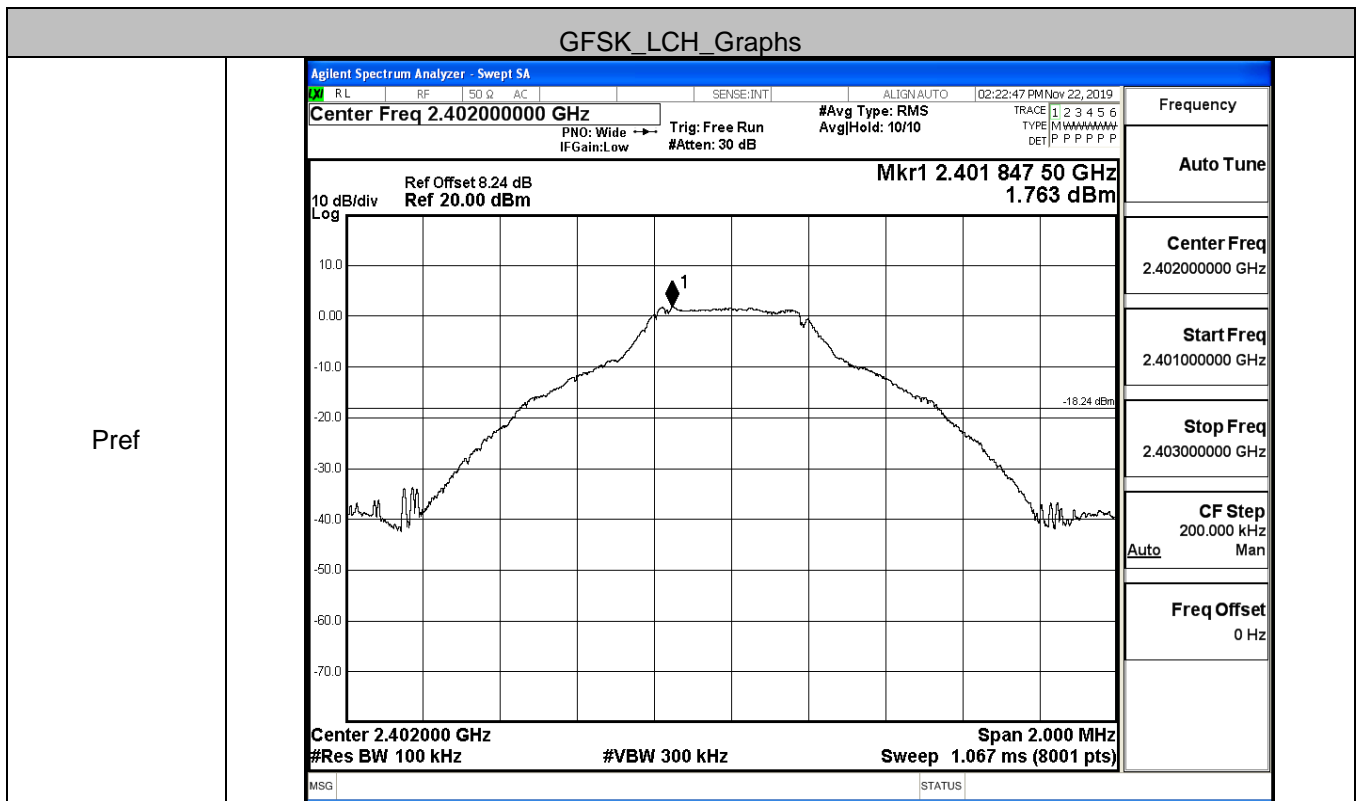


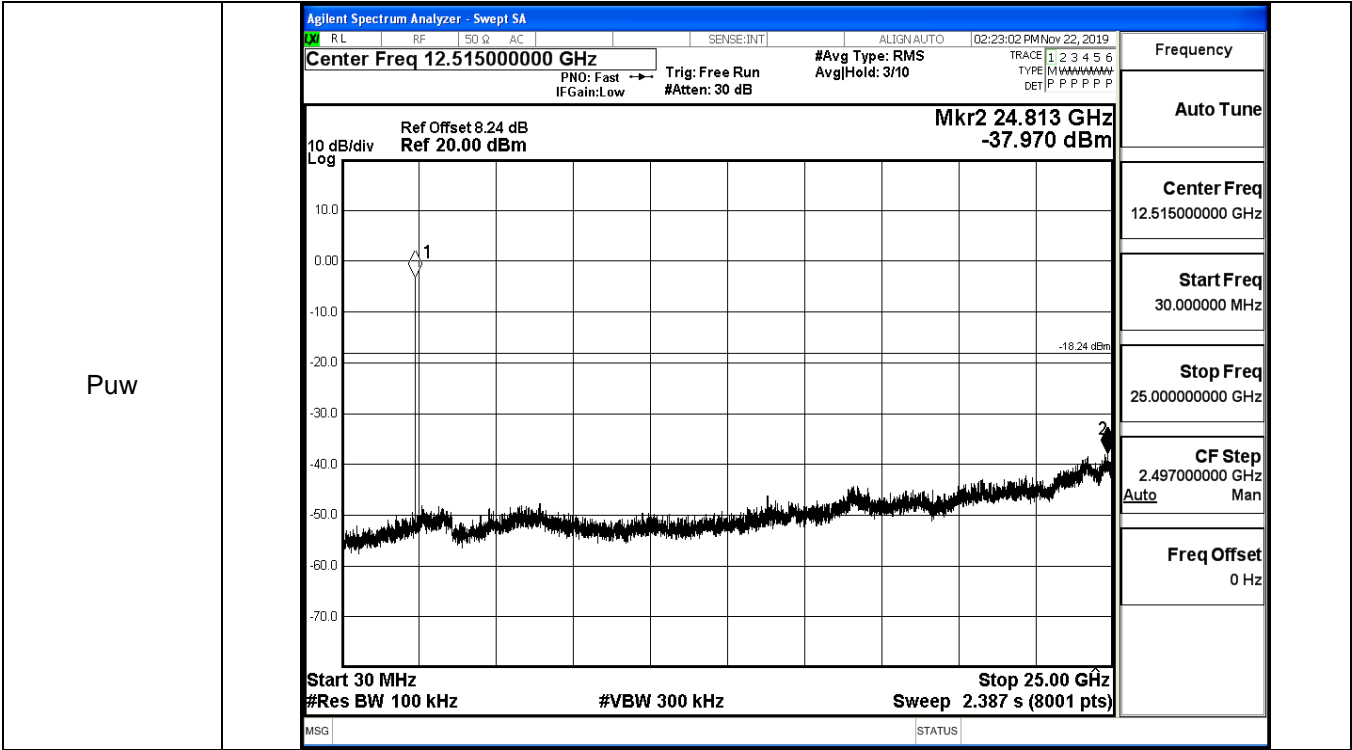
$\pi/4$ DQPSK
_2DH5/HCH



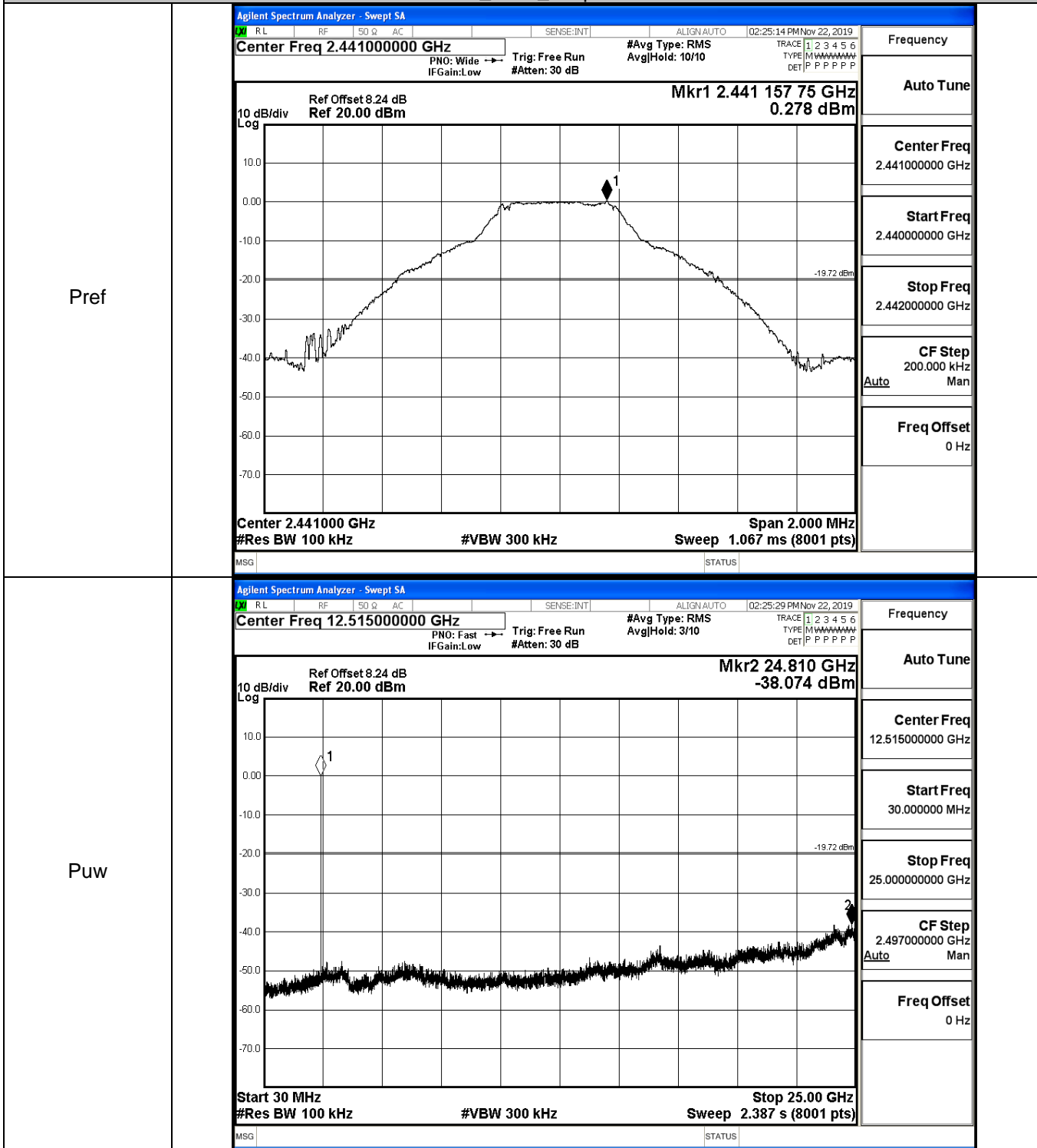
A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	1.763	-37.970	-18.237	PASS
	MCH	0.278	-38.074	-19.722	PASS
	HCH	-1.238	-37.941	-21.238	PASS
$\pi/4$ DQPSK	LCH	-1.017	-37.908	-21.017	PASS
	MCH	-2.399	-37.495	-22.399	PASS
	HCH	-3.767	-37.249	-23.767	PASS



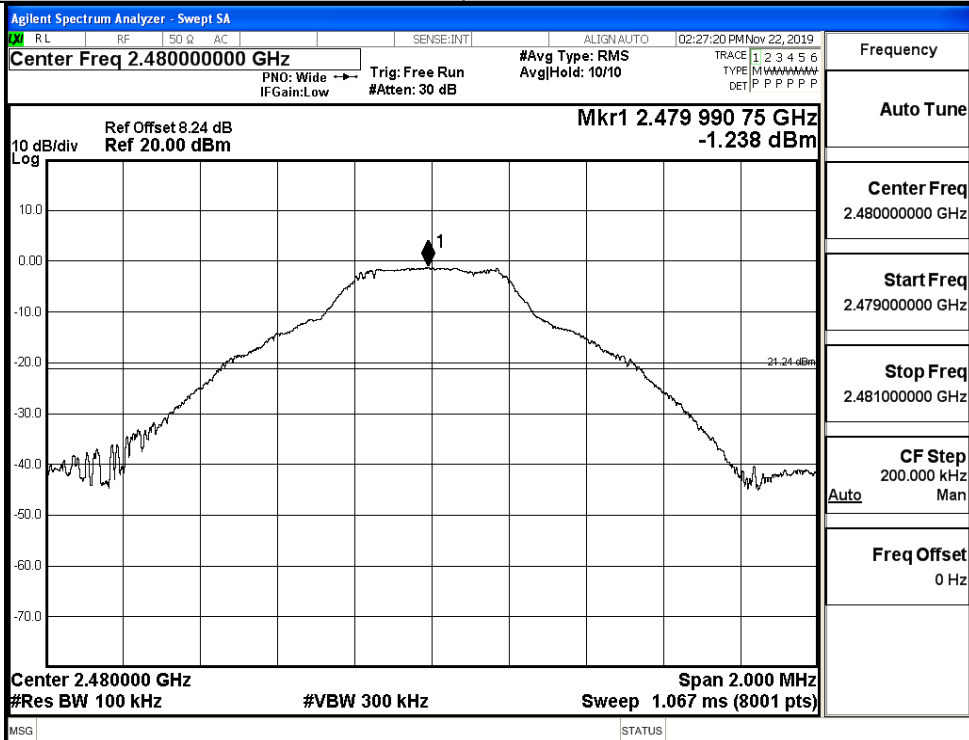


GFSK_MCH_Graphs

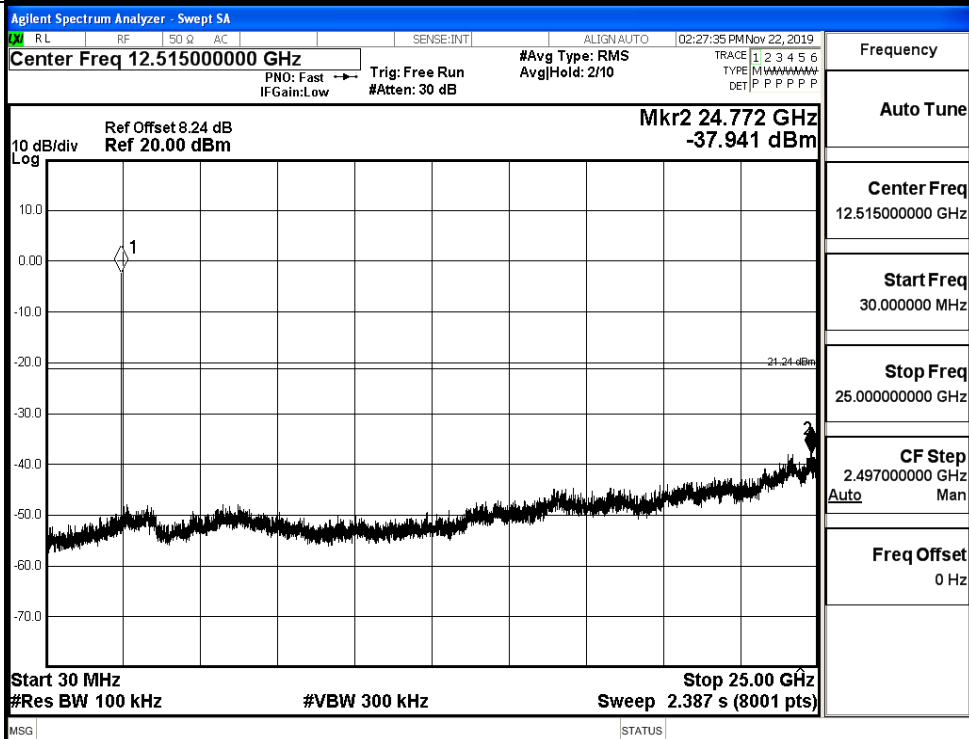


GFSK_HCH_Graphs

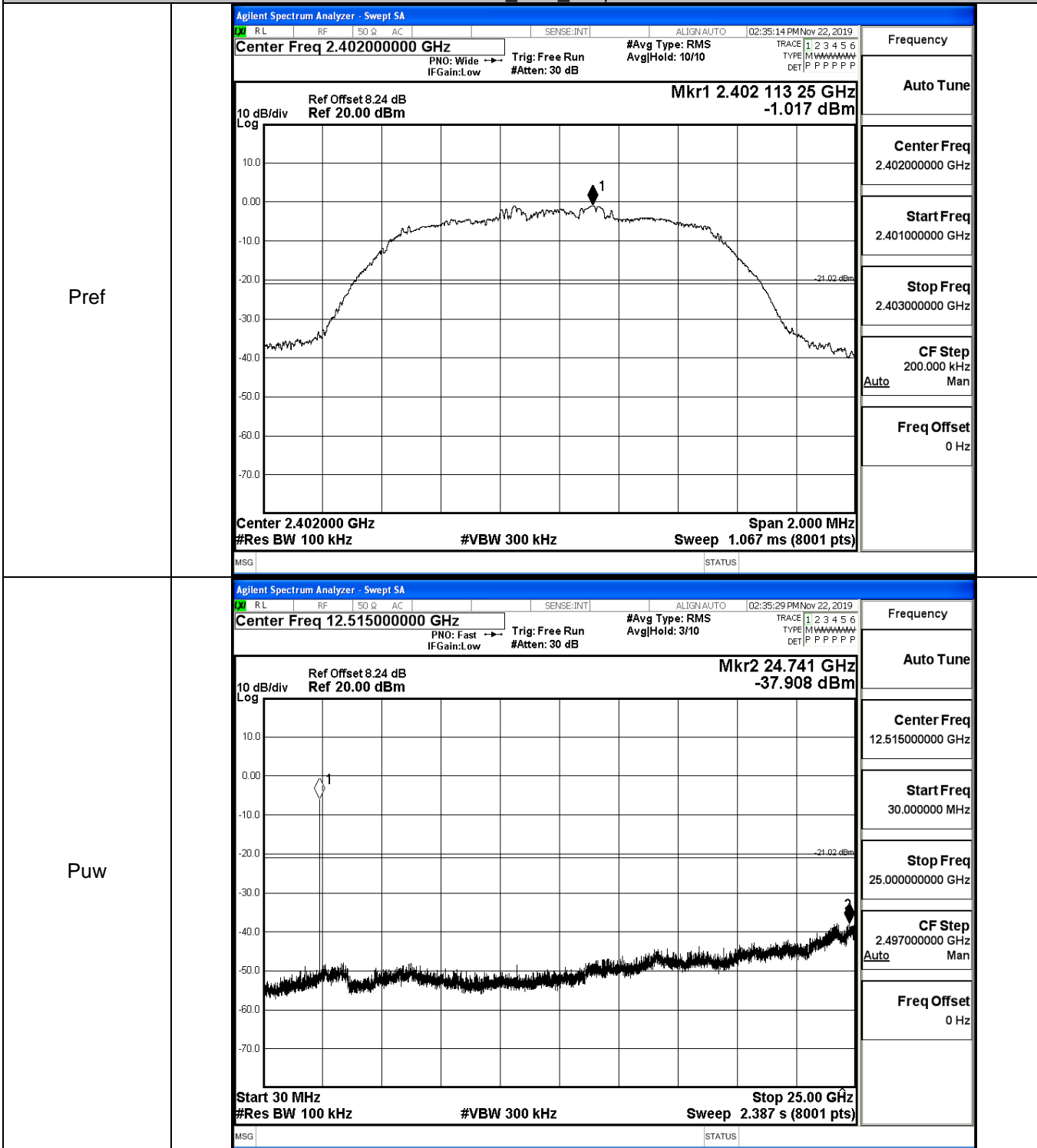
Pref



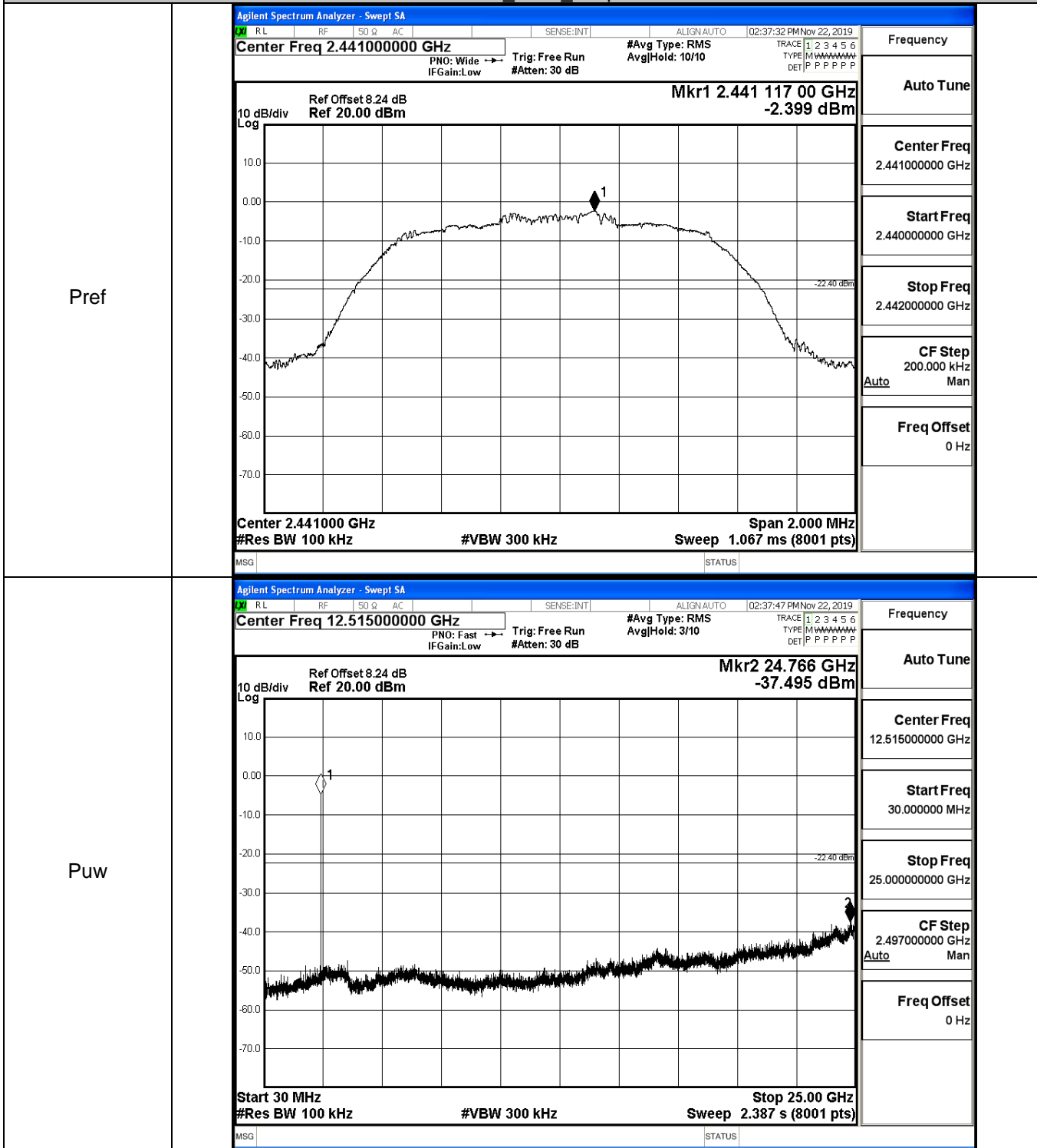
Puw



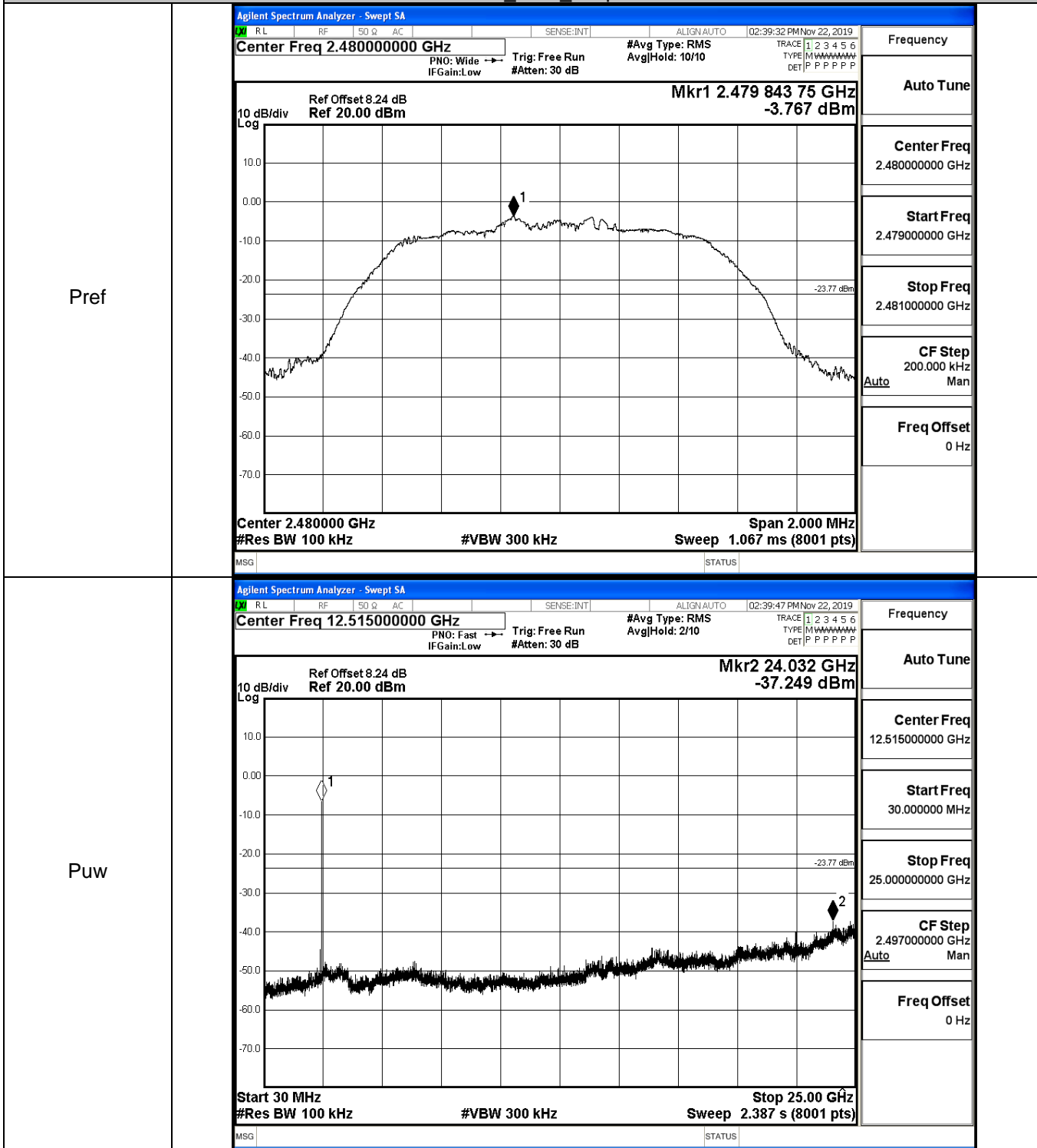
$\pi/4$ DQPSK_LCH_Graphs



$\pi/4$ DQPSK_MCH_Graphs



$\pi/4$ DQPSK_HCH_Graphs

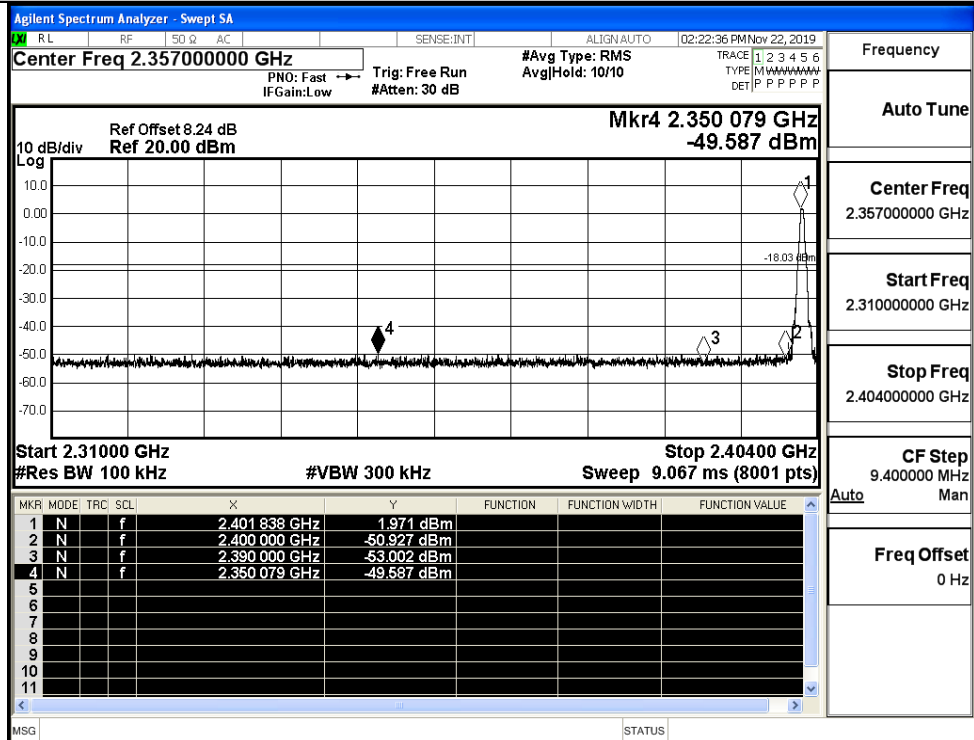


A.7 Band-edge for RF Conducted Emissions

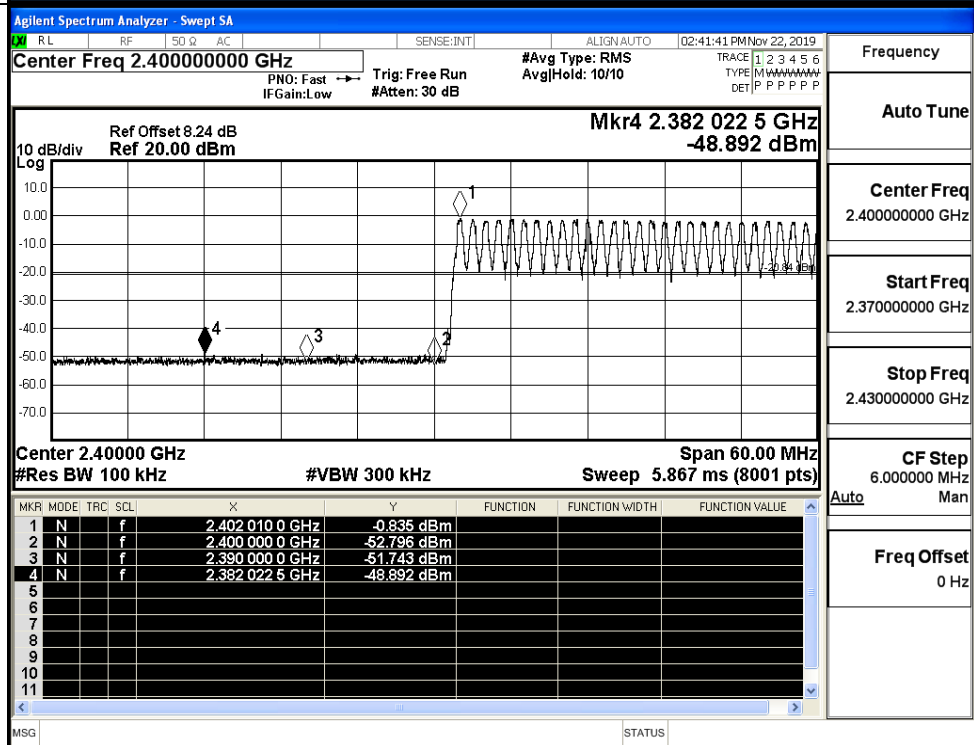
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	1.971	Off	-49.587	-18.03	PASS
			-0.835	On	-48.892	-20.84	PASS
	HCH	2480	-0.919	Off	-49.229	-20.92	PASS
			-2.892	On	-48.625	-22.89	PASS
$\pi/4$ DQPSK	LCH	2402	-0.965	Off	-49.339	-20.97	PASS
			-1.109	On	-48.756	-21.11	PASS
	HCH	2480	-3.502	Off	-48.469	-23.5	PASS
			-3.013	On	-48.211	-23.01	PASS

Test Graphs

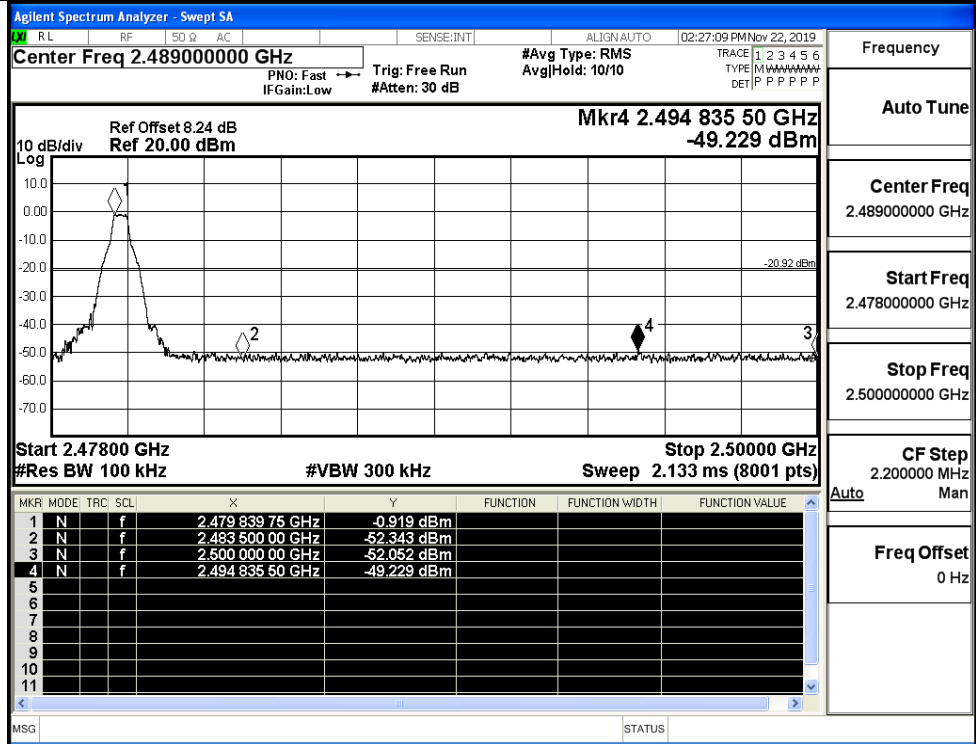
GFSK/LCH/No Hop



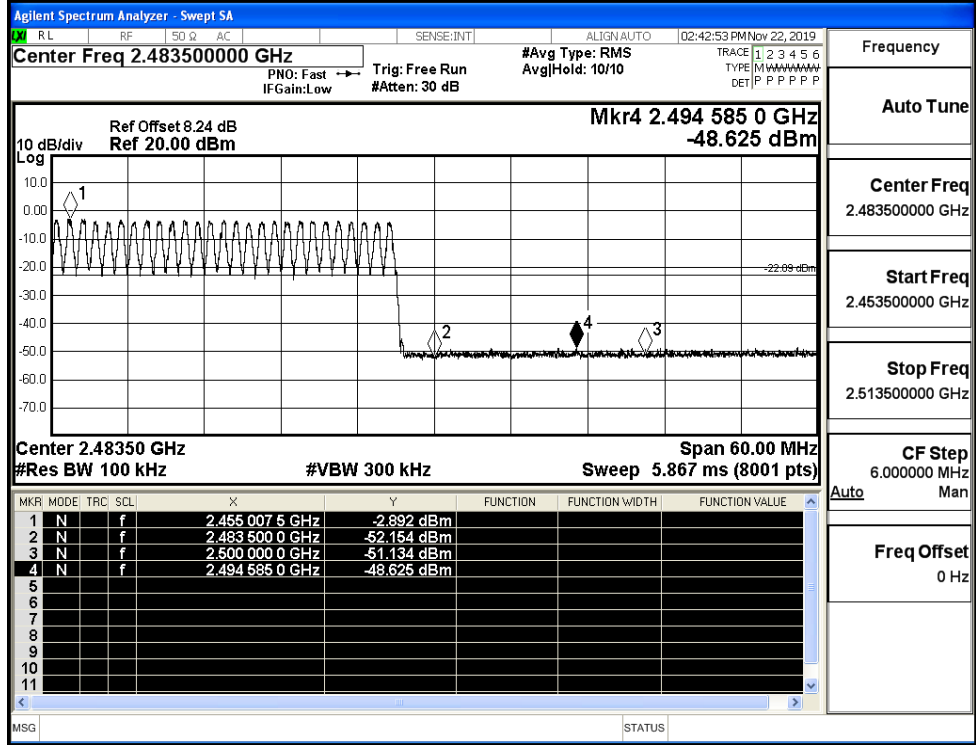
GFSK/LCH/Hop



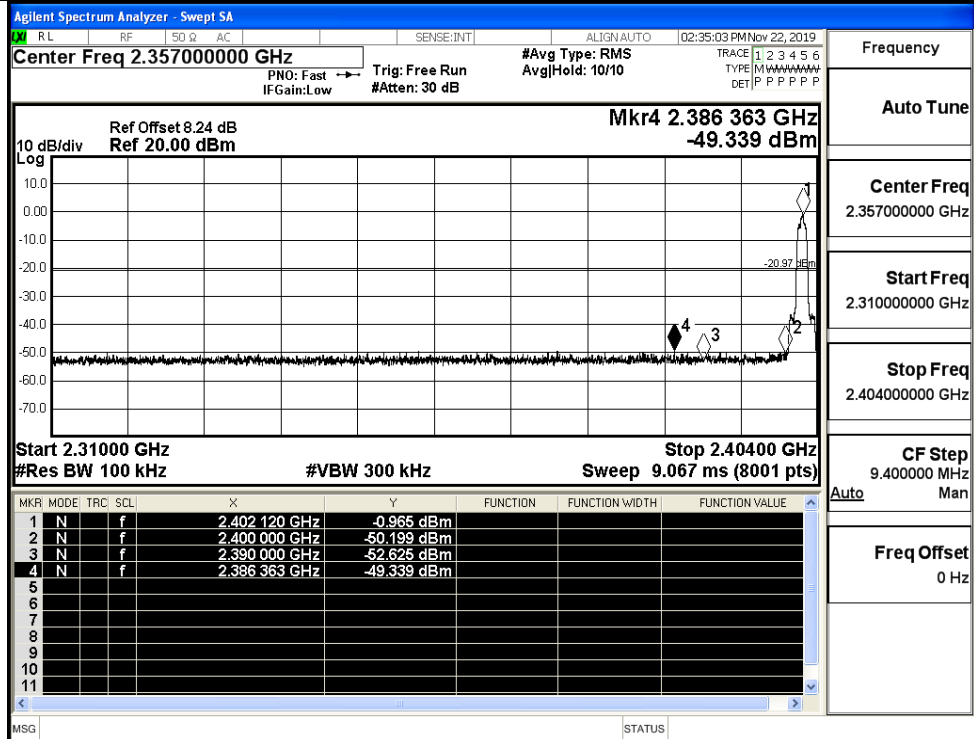
GFSK/HCH/No Hop



GFSK/HCH/Hop

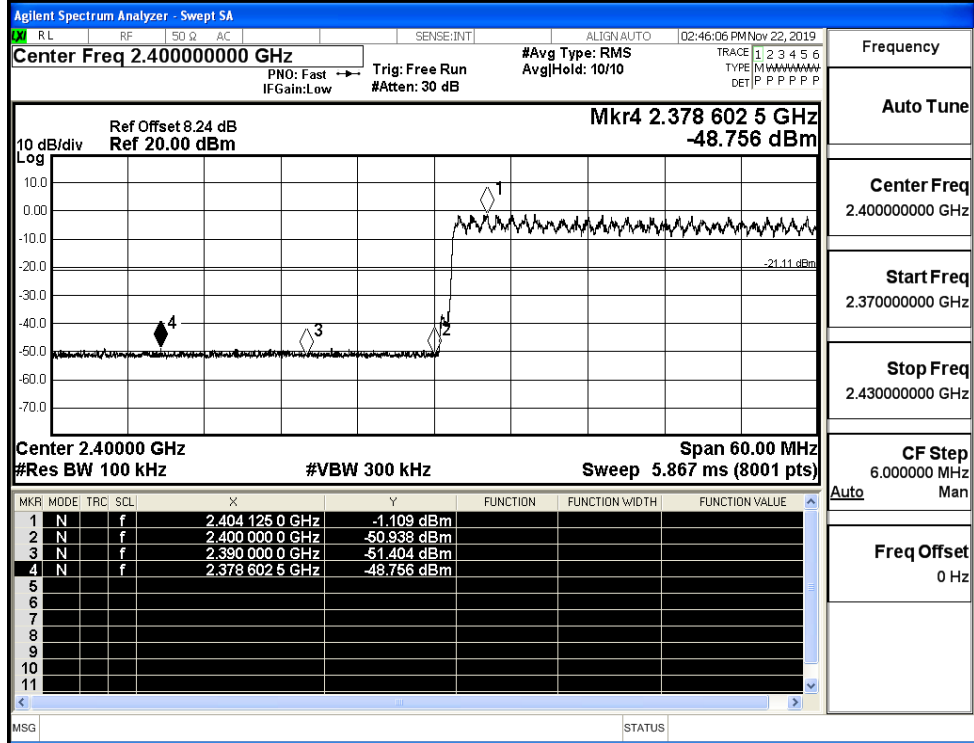


$\pi/4$ DQPSK/LCH/No
Hop



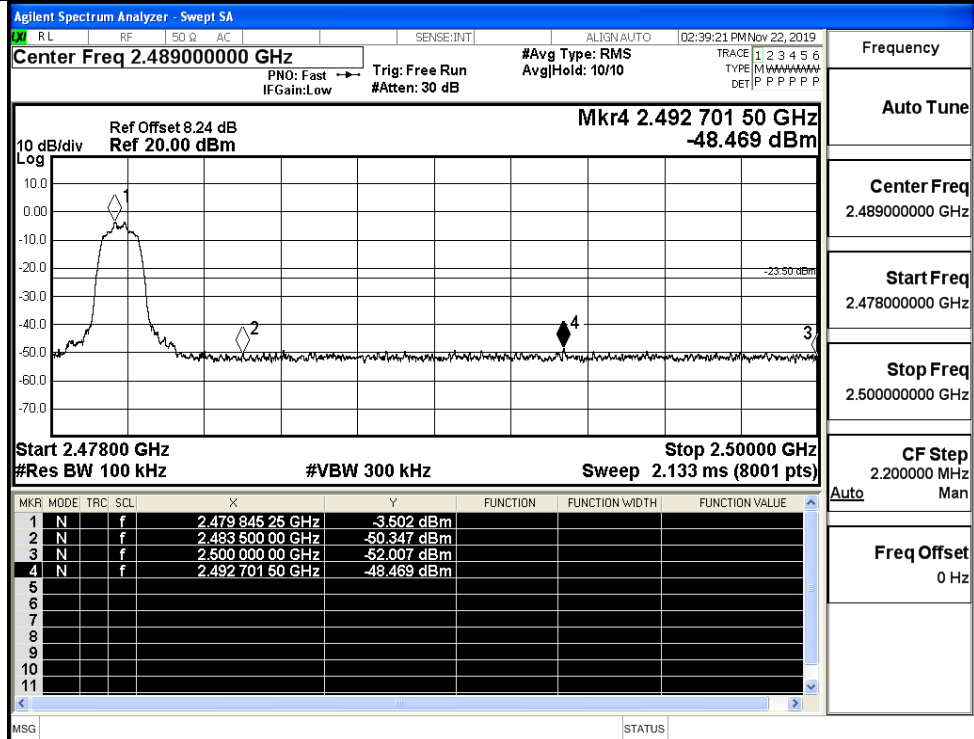
Frequency
Auto Tune
Center Freq
2.357000000 GHz
Start Freq
2.310000000 GHz
Stop Freq
2.404000000 GHz
CF Step
9.400000 MHz
Auto Man
Freq Offset
0 Hz

$\pi/4$ DQPSK/LCH/Hop



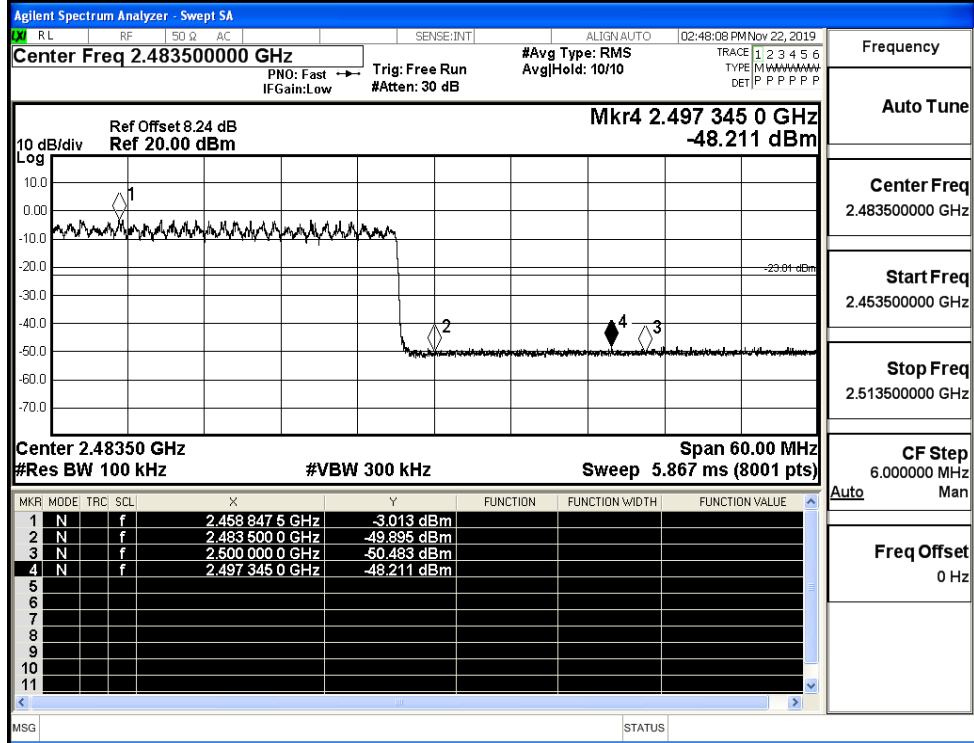
Frequency
Auto Tune
Center Freq
2.400000000 GHz
Start Freq
2.370000000 GHz
Stop Freq
2.430000000 GHz
CF Step
6.000000 MHz
Auto Man
Freq Offset
0 Hz

π /4DQPSK/HCH/No
Hop



Frequency
Auto Tune
Center Freq
2.489000000 GHz
Start Freq
2.478000000 GHz
Stop Freq
2.500000000 GHz
CF Step
2.200000 MHz
Auto Man
Freq Offset
0 Hz

π /4DQPSK/HCH/Hop

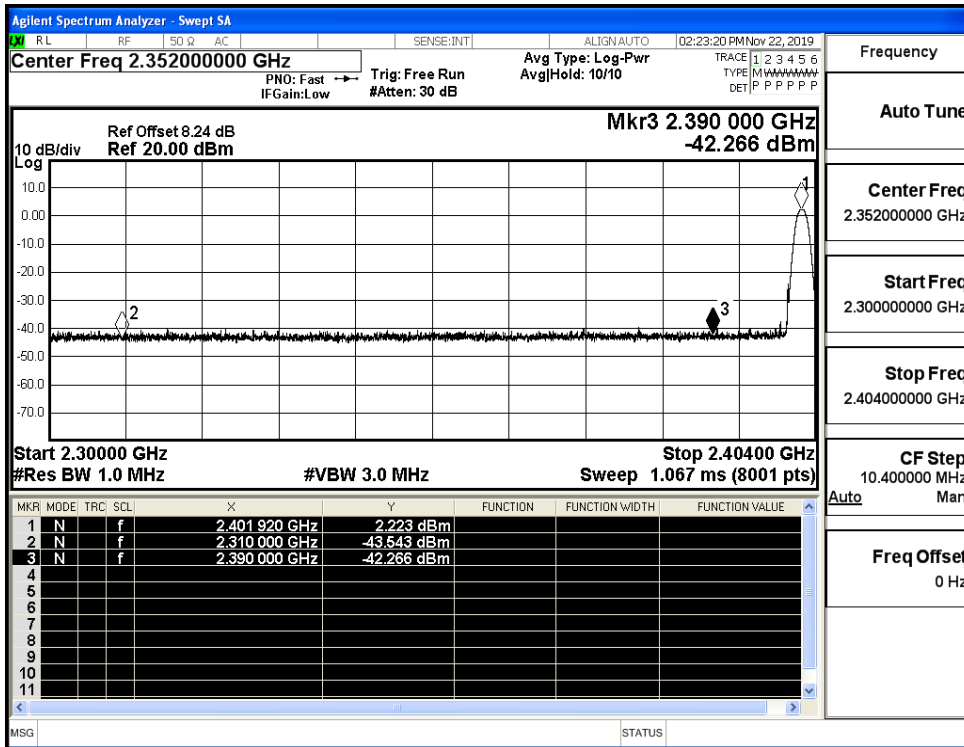


Frequency
Auto Tune
Center Freq
2.483500000 GHz
Start Freq
2.453500000 GHz
Stop Freq
2.513500000 GHz
CF Step
6.000000 MHz
Auto Man
Freq Offset
0 Hz

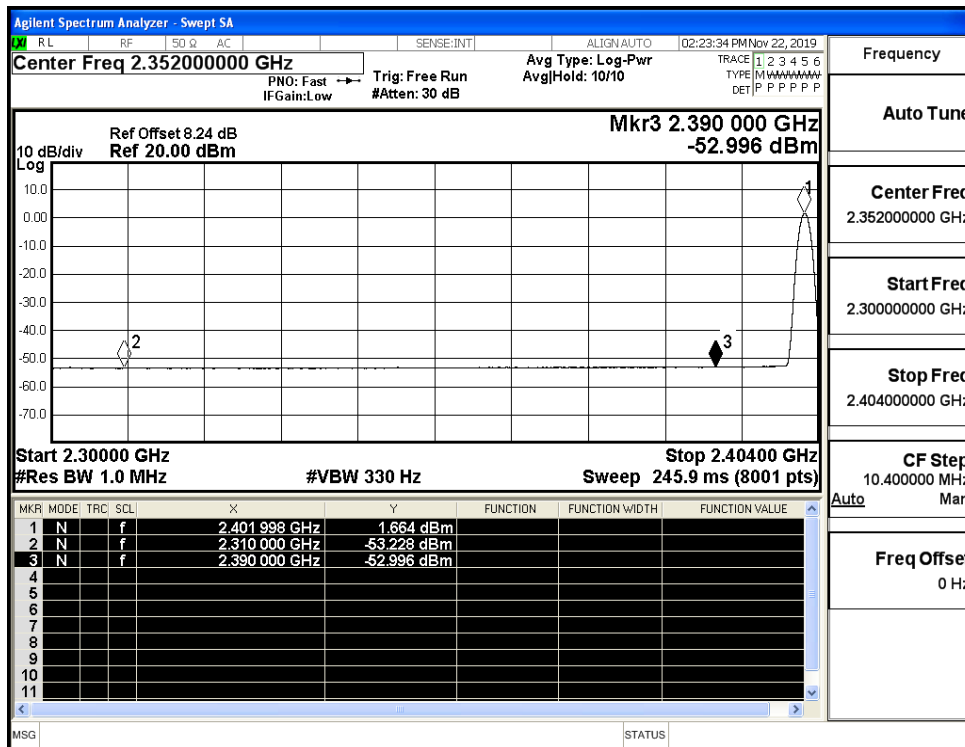
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-43.54	2.0	0	51.71	PEAK	74	PASS
	Off	2310.0	-53.23	2.0	0	42.03	AV	54	PASS
	Off	2390.0	-42.27	2.0	0	52.99	PEAK	74	PASS
	Off	2390.0	-53.00	2.0	0	42.26	AV	54	PASS
	Off	2483.5	-42.23	2.0	0	53.03	PEAK	74	PASS
	Off	2483.5	-52.42	2.0	0	42.84	AV	54	PASS
	Off	2500.0	-42.67	2.0	0	52.58	PEAK	74	PASS
	Off	2500.0	-52.37	2.0	0	42.89	AV	54	PASS
$\pi/4$ DQPSK	Off	2310.0	-42.34	2.0	0	52.92	PEAK	74	PASS
	Off	2310.0	-53.18	2.0	0	42.08	AV	54	PASS
	Off	2390.0	-42.17	2.0	0	53.09	PEAK	74	PASS
	Off	2390.0	-52.91	2.0	0	42.35	AV	54	PASS
	Off	2483.5	-41.88	2.0	0	53.38	PEAK	74	PASS
	Off	2483.5	-52.30	2.0	0	42.95	AV	54	PASS
	Off	2500.0	-41.91	2.0	0	53.34	PEAK	74	PASS
	Off	2500.0	-52.11	2.0	0	43.15	AV	54	PASS

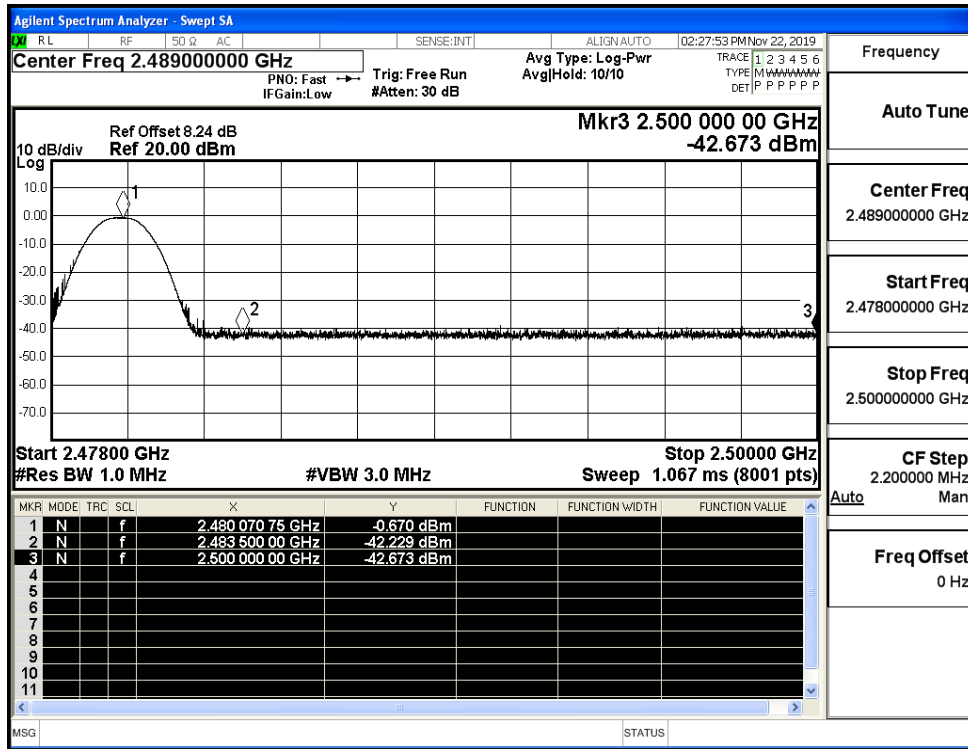
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



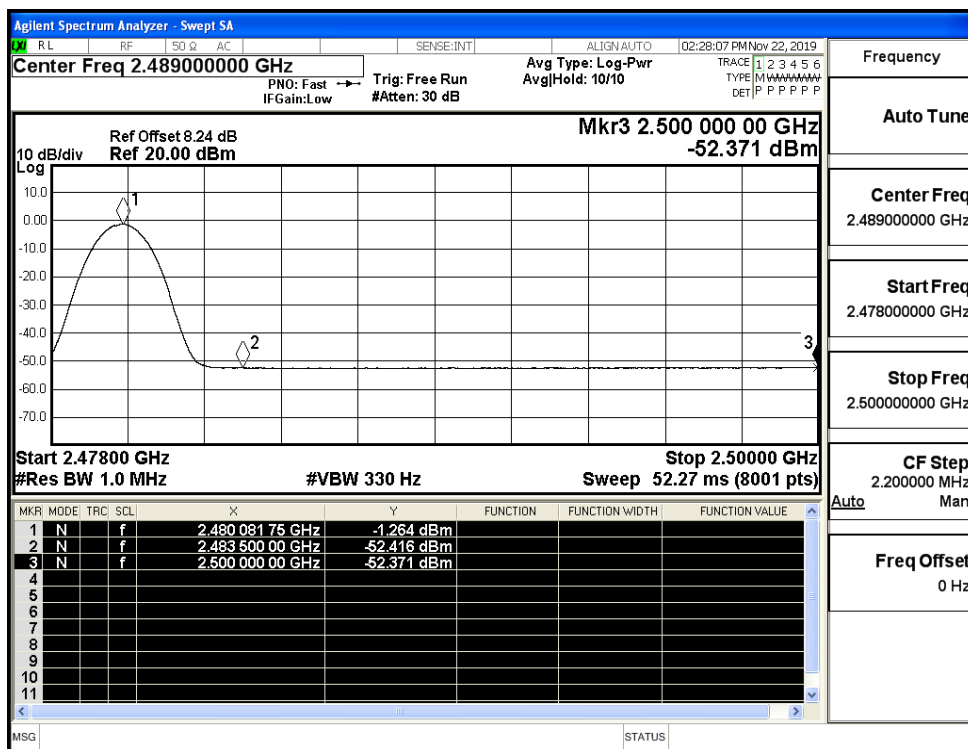
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (Low Channel)



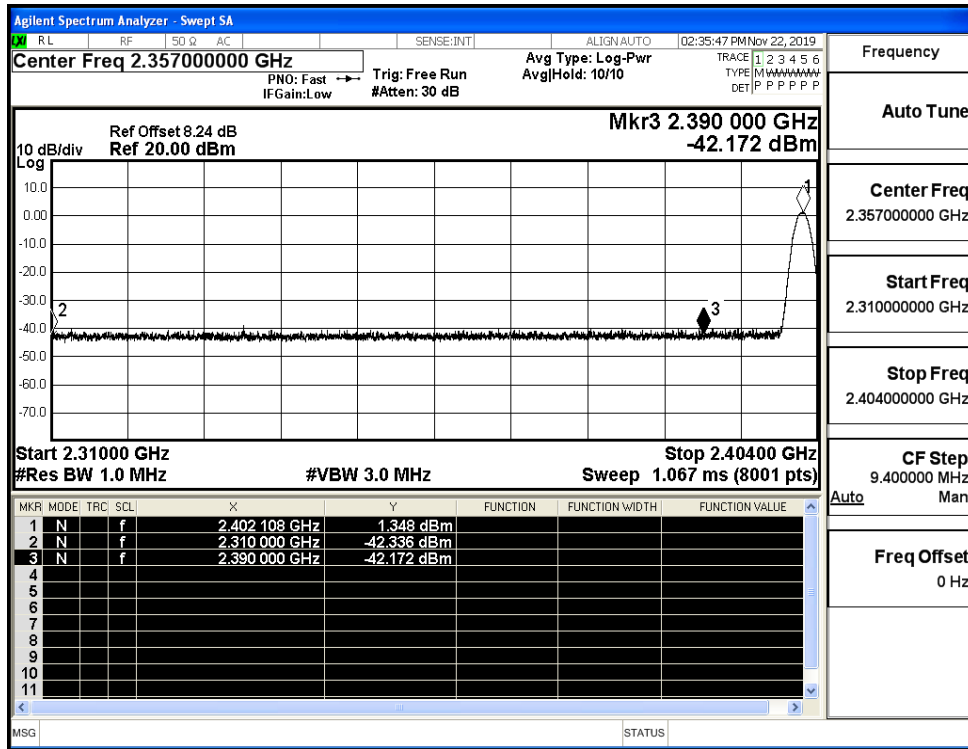
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (High Channel)



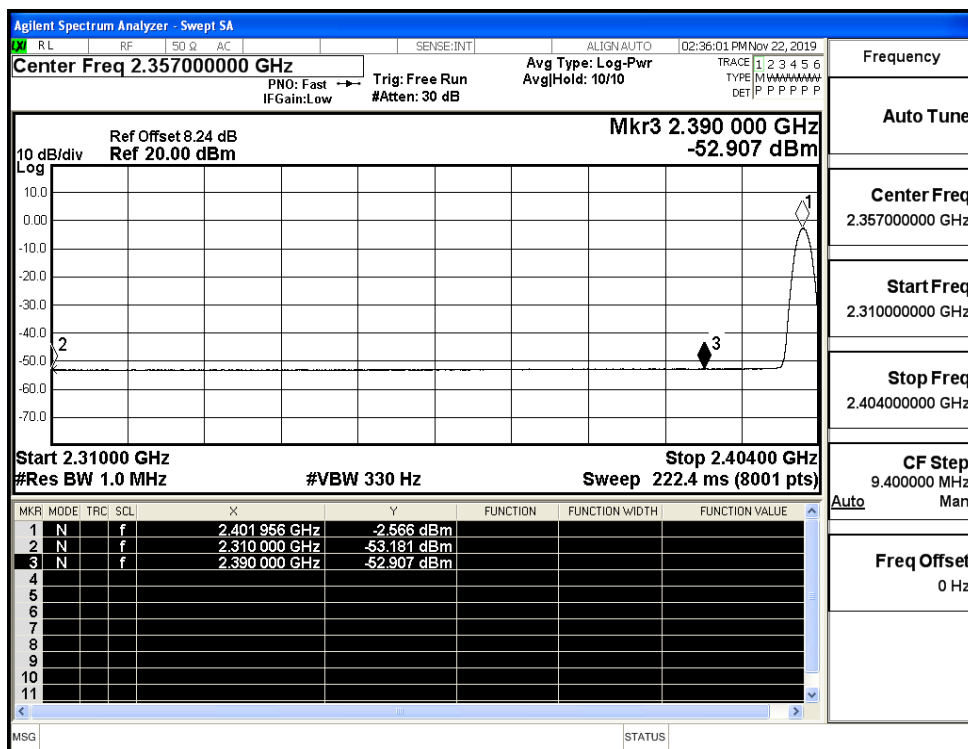
Restrict-band band-edge measurements_Hopping Off_GFSK_Average (High Channel)



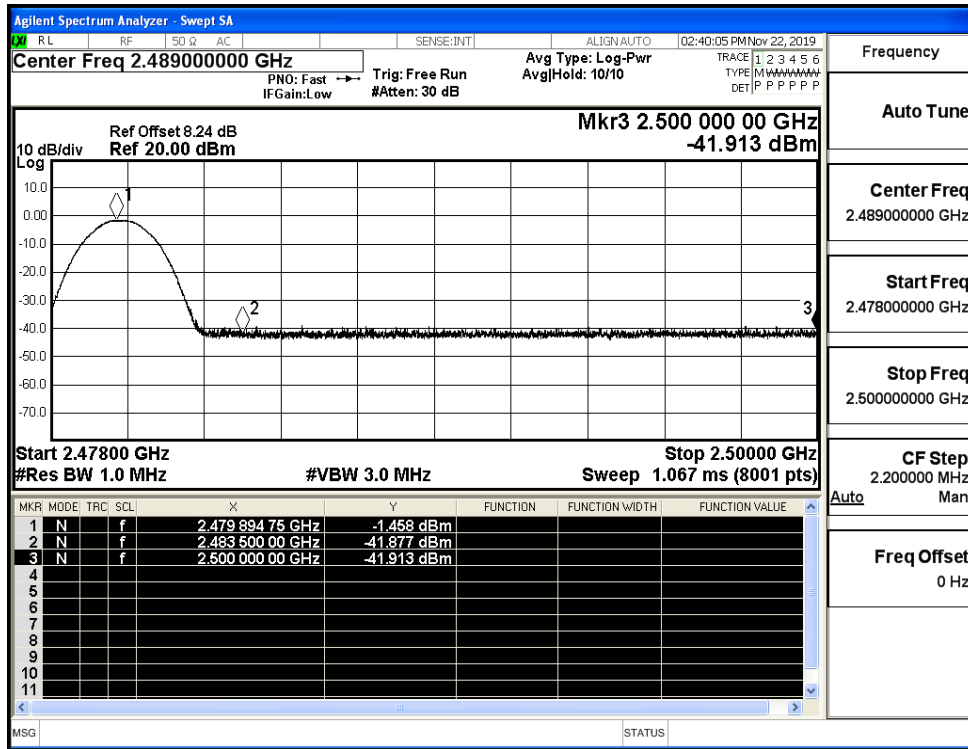
Restrict-band band-edge measurements_Hopping Off_pi/4-DQPSK_PEAK (Low Channel)



Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (Low Channel)



Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_PEAK (High Channel)



Restrict-band band-edge measurements_Hopping Off_π/4-DQPSK_Average (High Channel)

