

Appendix A

RF Test Data for BT 2.0(BDR/EDR) (Conducted Measurement)

Product Name: Bluetooth Underwater Light

Trade Mark: N/A

Test Model: HY-H290

Environmental Conditions

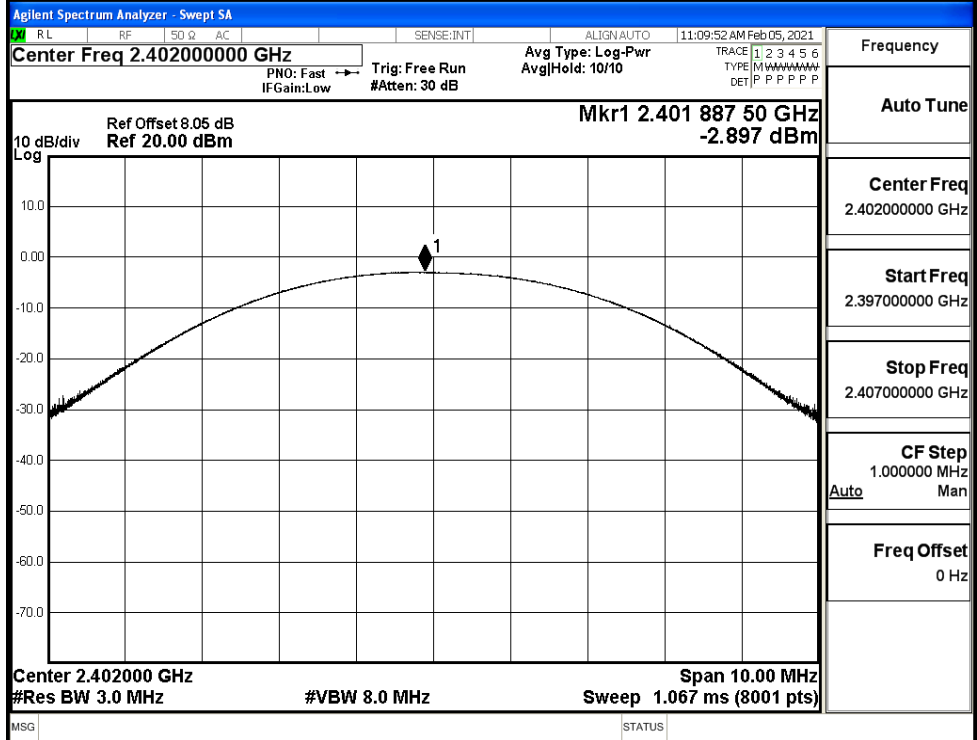
Temperature:	24.6° C
Relative Humidity:	54.1%
ATM Pressure:	100.0 kPa
Test Engineer:	Jay Li
Supervised by:	Li Huan

A.1 Maximum Conducted Peak Output Power

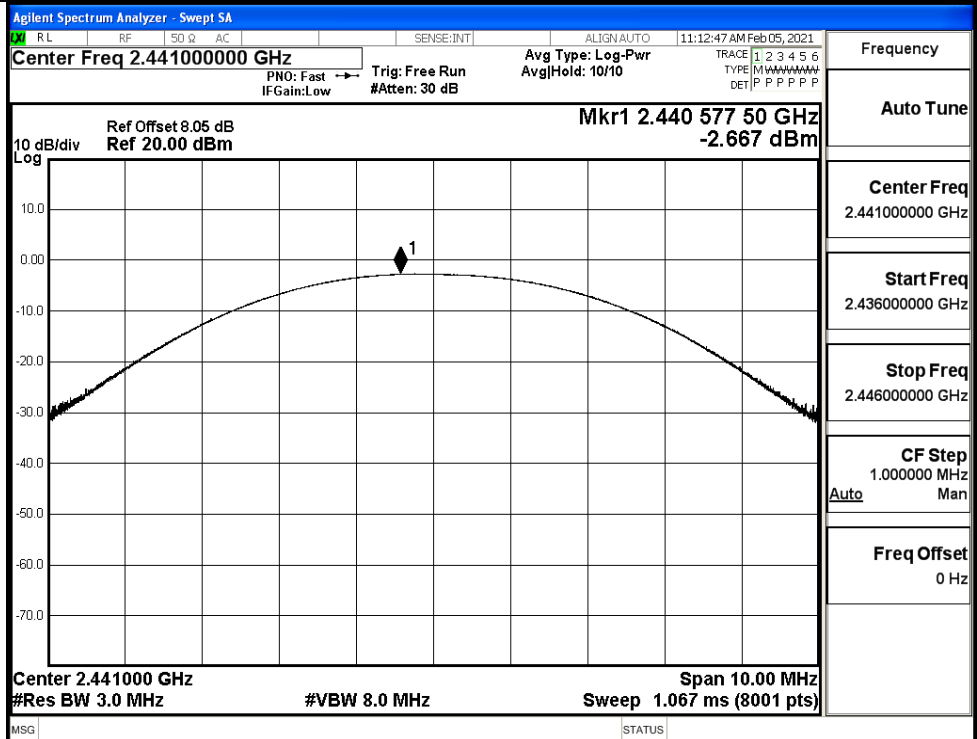
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-2.897	21	PASS
	MCH	-2.667	21	PASS
	HCH	-2.708	21	PASS

Test Graphs

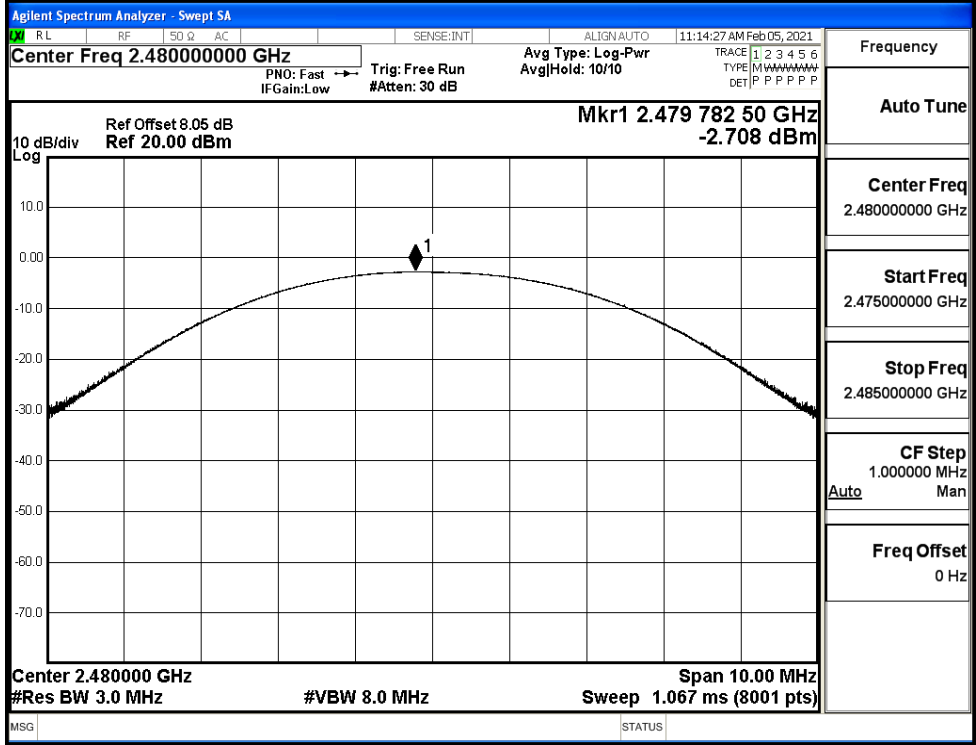
GFSK/LCH



GFSK/MCH



GFSK/HCH

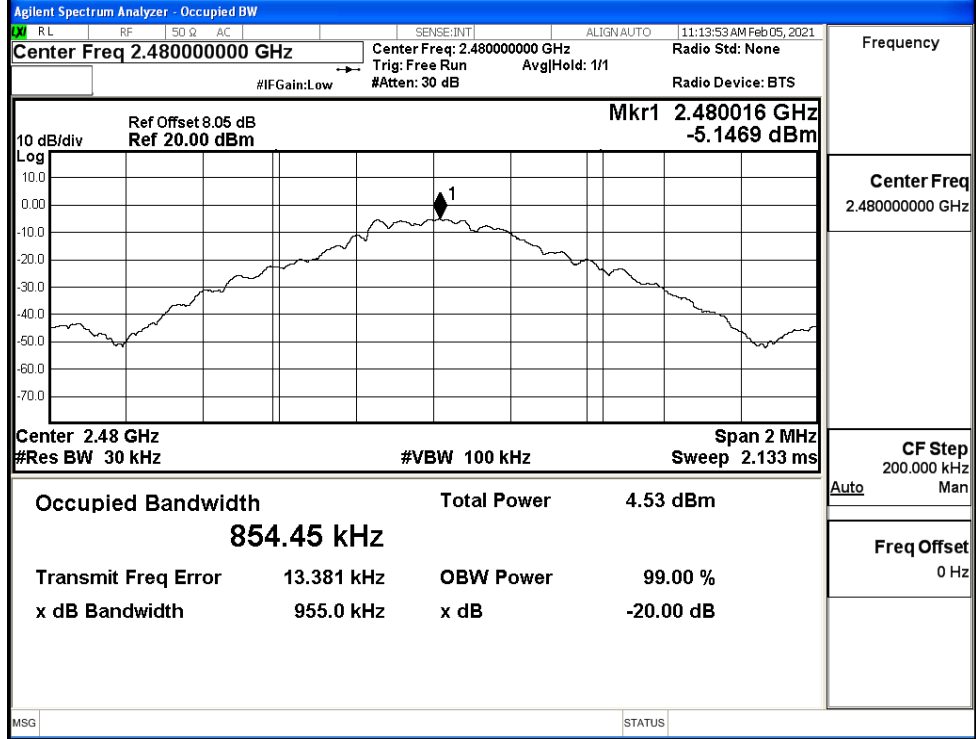


A.2 20dB Bandwidth

Mode	Channel.	20dB Bandwidth [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.9581	Not Specified	PASS
	MCH	0.9546	Not Specified	PASS
	HCH	0.9550	Not Specified	PASS

Test Graphs																													
GFSK/LCH	<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: small; margin: 0;">Agilent Spectrum Analyzer - Occupied BW</p> <p style="font-size: x-small; margin: 0;"> RL SENSE:INT ALIGN:AUTO 11:09:19 AM Feb 05, 2021 </p> <p style="font-size: small; margin: 0;"> Center Freq 2.40200000 GHz Center Freq: 2.40200000 GHz Radio Std: None </p> <p style="font-size: x-small; margin: 0;"> #IFGain:Low Trig: Free Run AvgJHold: 1/1 </p> <p style="font-size: x-small; margin: 0;"> Radio Device: BTS </p> <hr/> <p style="font-size: x-small; margin: 0;"> Ref Offset 8.05 dB Mkr1 2.402008 GHz </p> <p style="font-size: x-small; margin: 0;"> Ref 20.00 dBm -5.5369 dBm </p> <p style="font-size: x-small; margin: 0;"> Center 2.402 GHz Span 2 MHz </p> <p style="font-size: x-small; margin: 0;"> #Res BW 30 kHz #VBW 100 kHz Sweep 2.133 ms </p> <hr/> <table style="width: 100%; font-size: x-small;"> <tr> <td style="width: 33%;">Occupied Bandwidth</td> <td style="width: 33%;">Total Power</td> <td style="width: 33%;">4.31 dBm</td> </tr> <tr> <td style="text-align: center;">849.69 kHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>13.038 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>958.1 kHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>99.00 %</td> </tr> <tr> <td></td> <td></td> <td>-20.00 dB</td> </tr> </table> <p style="font-size: x-small; margin: 0;">MSG STATUS</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <table style="width: 100%; font-size: x-small;"> <tr> <td style="width: 70%;">Frequency</td> <td style="width: 30%;"></td> </tr> <tr> <td style="text-align: center;">Center Freq</td> <td style="text-align: center;">2.40200000 GHz</td> </tr> <tr> <td style="text-align: center;">CF Step</td> <td style="text-align: center;">200.000 kHz</td> </tr> <tr> <td style="text-align: center;">Auto</td> <td style="text-align: center;">Man</td> </tr> <tr> <td style="text-align: center;">Freq Offset</td> <td style="text-align: center;">0 Hz</td> </tr> </table> </div>	Occupied Bandwidth	Total Power	4.31 dBm	849.69 kHz			Transmit Freq Error	13.038 kHz	OBW Power	x dB Bandwidth	958.1 kHz	x dB			99.00 %			-20.00 dB	Frequency		Center Freq	2.40200000 GHz	CF Step	200.000 kHz	Auto	Man	Freq Offset	0 Hz
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GFSK/HCH



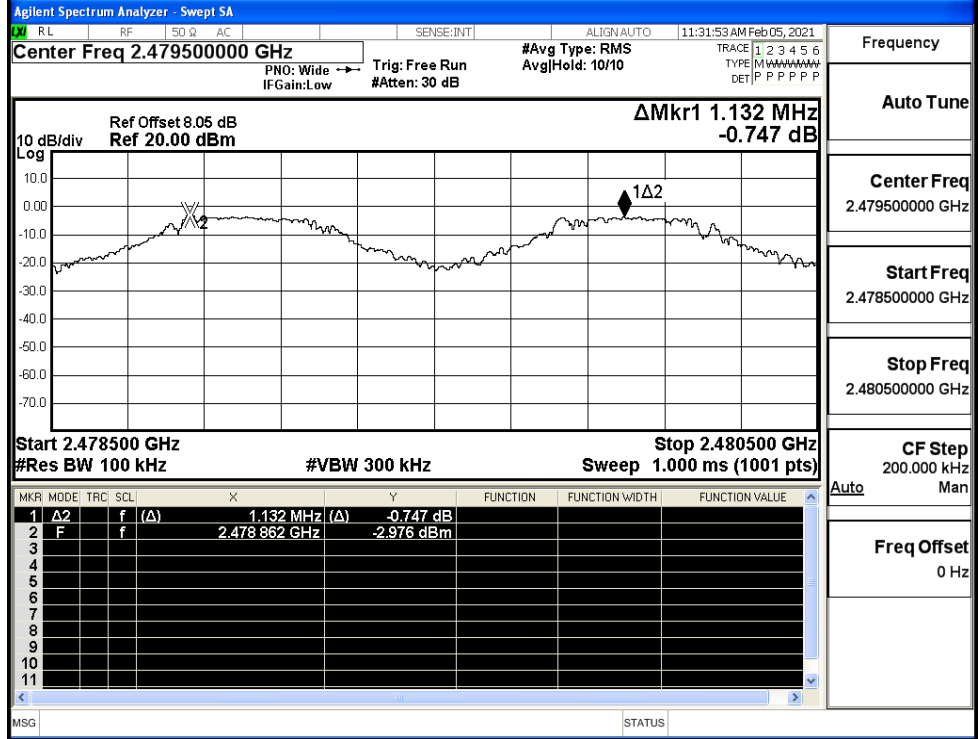
A.3 Carrier Frequency Separation

Mode	Channel.	Carrier Frequency Separation [MHz]	Limit [MHz]	Verdict
GFSK	LCH	0.864	0.639	PASS
	MCH	1.044	0.639	PASS
	HCH	1.132	0.639	PASS

Test Graphs

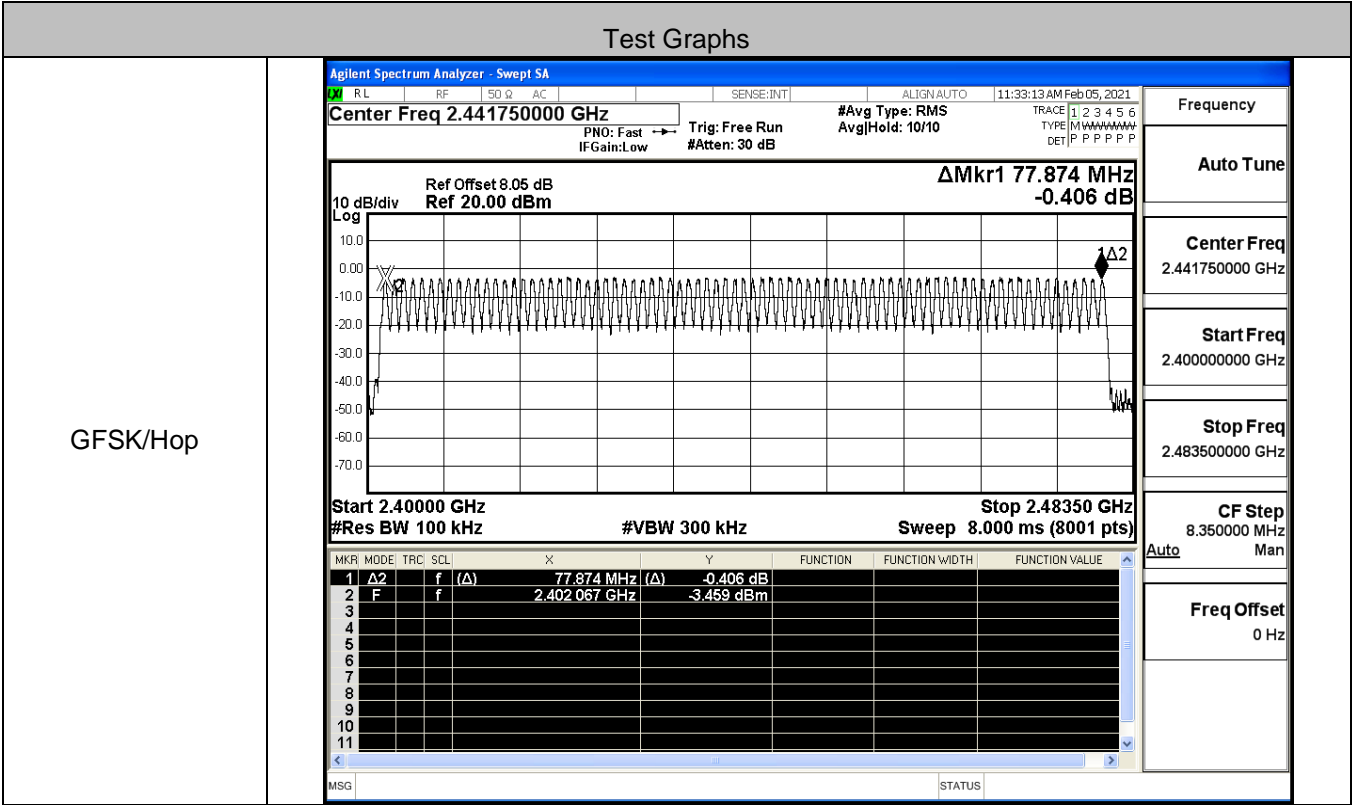
GFSK/LCH	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.402500000 GHz</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm</p> <p>ΔMkr1 864.00 kHz -0.050 dB</p> <p>Start 2.401500 GHz #Res BW 100 kHz</p> <p>Stop 2.403500 GHz #VBW 300 kHz Sweep 1.067 ms (8001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <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>864.00 kHz (Δ)</td> <td>-0.050 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.402 017 00 GHz</td> <td>-3.861 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	864.00 kHz (Δ)	-0.050 dB				2	F	f		2.402 017 00 GHz	-3.861 dBm			
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GFSK/MCH	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.441500000 GHz</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm</p> <p>ΔMkr1 1.044 MHz 0.118 dB</p> <p>Start 2.440500 GHz #Res BW 100 kHz</p> <p>Stop 2.442500 GHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <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>1.044 MHz (Δ)</td> <td>0.118 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.440 978 GHz</td> <td>-3.666 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ 2	f	(Δ)	1.044 MHz (Δ)	0.118 dB				2	F	f		2.440 978 GHz	-3.666 dBm			
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GFSK/HCH



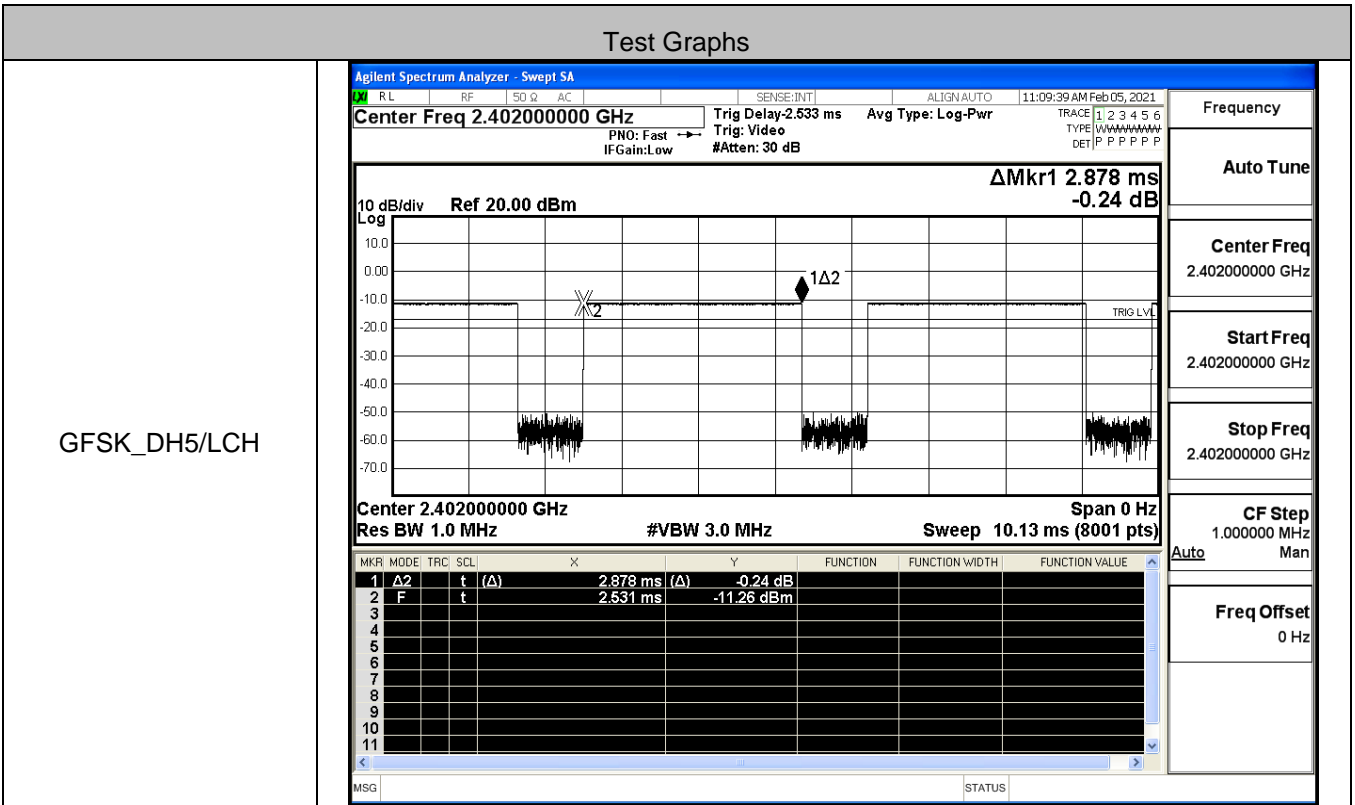
A.4 Hopping Channel Number

Mode	Channel.	Number of Hopping Channel [N]	Limit [N]	Verdict
GFSK	Hop	79	>=15	PASS

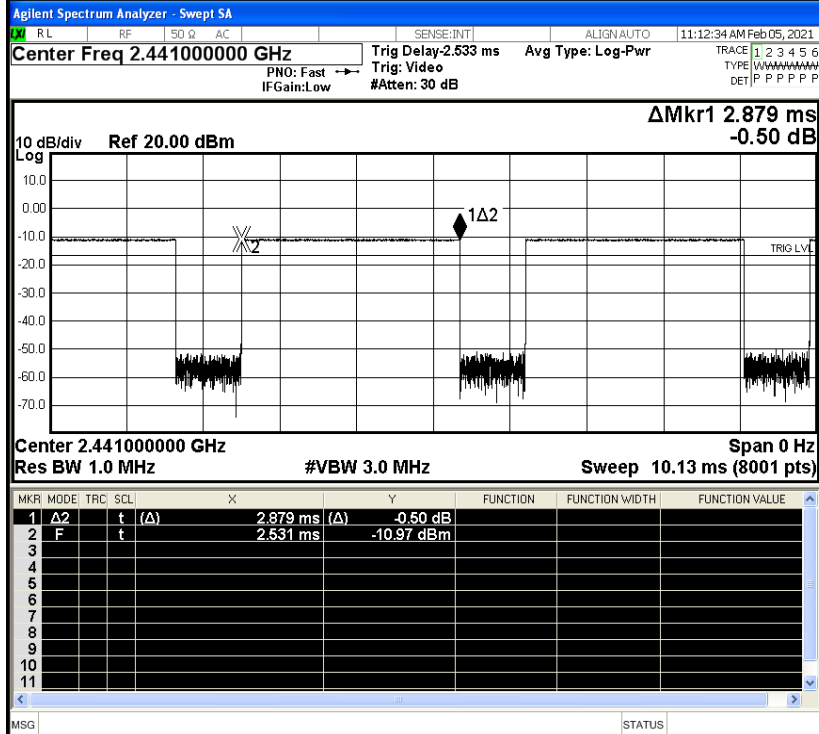


A.5 Dwell Time

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

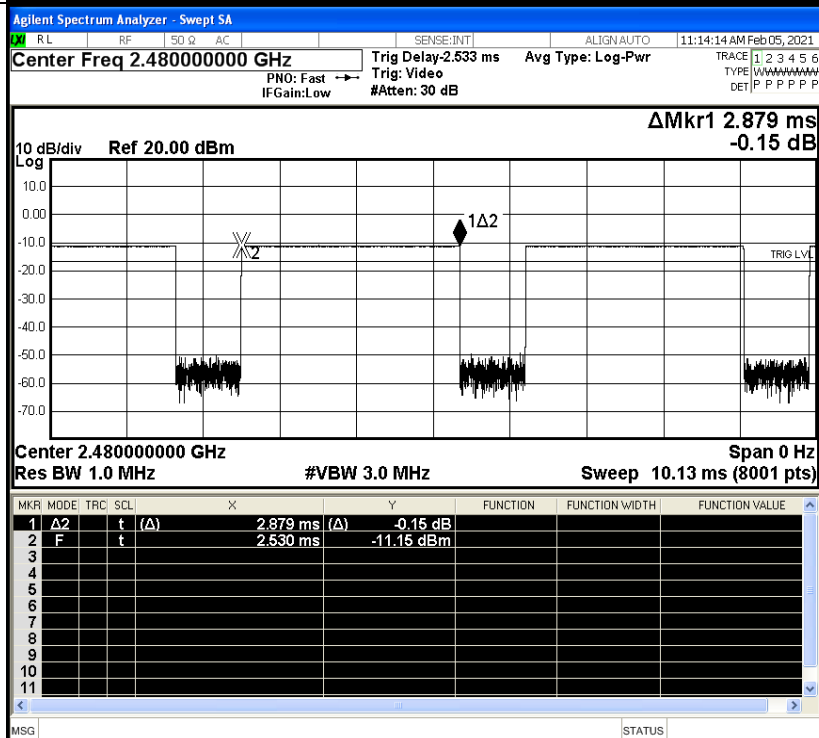


GFSK_DH5/MCH



Frequency	
Auto Tune	
Center Freq	2.441000000 GHz
Start Freq	2.441000000 GHz
Stop Freq	2.441000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

GFSK_DH5/HCH

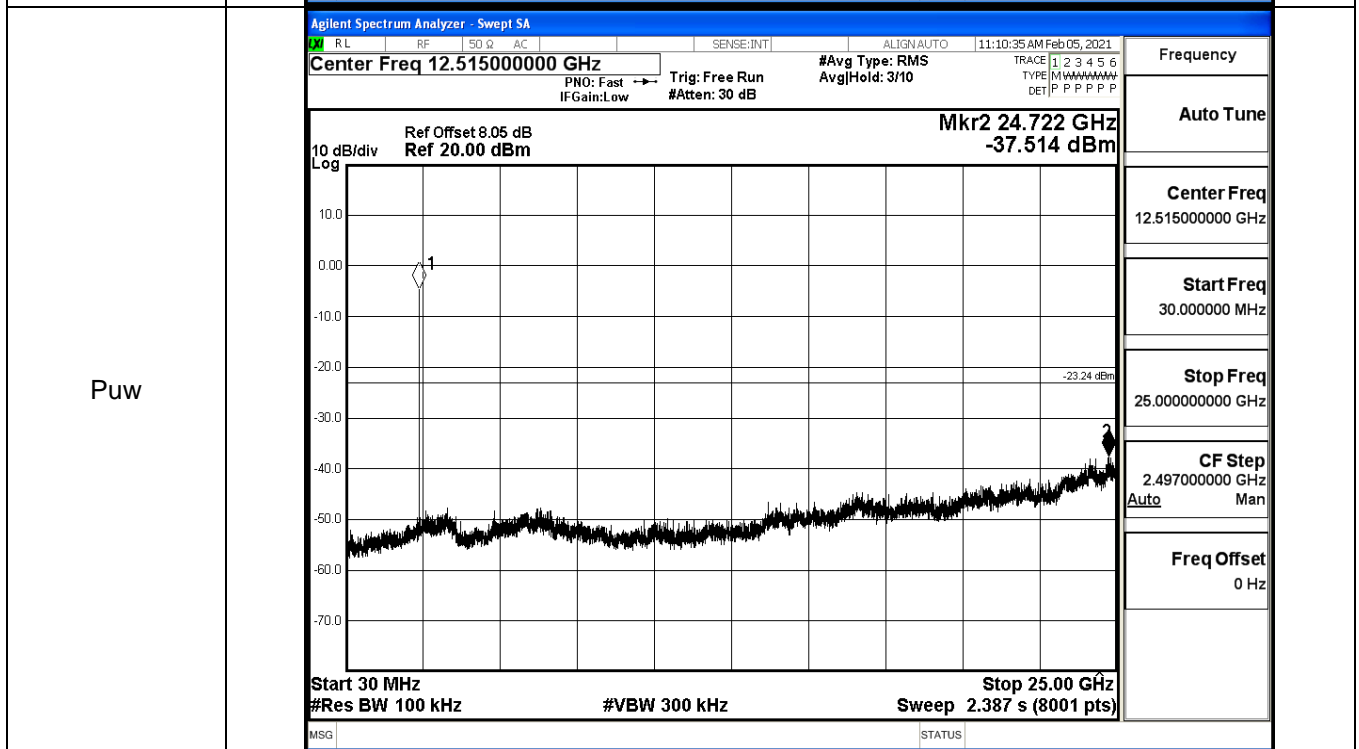
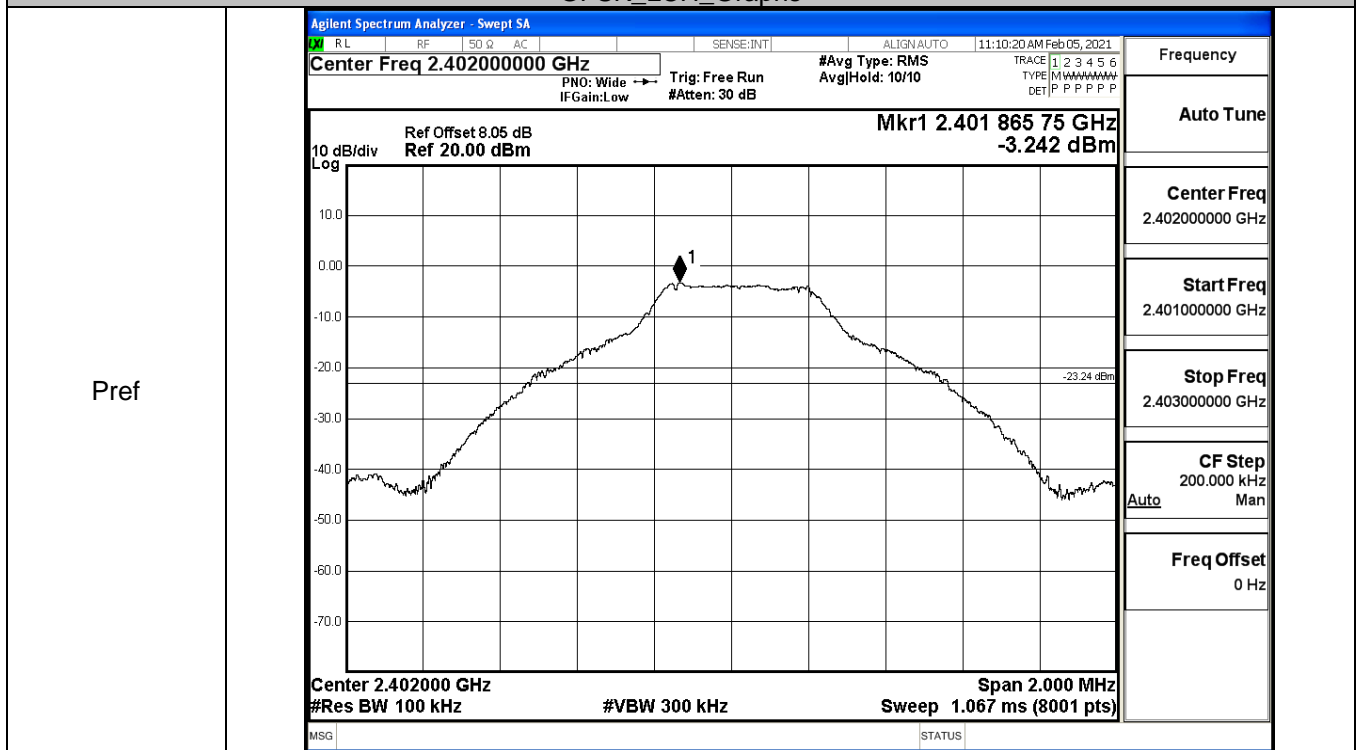


Frequency	
Auto Tune	
Center Freq	2.480000000 GHz
Start Freq	2.480000000 GHz
Stop Freq	2.480000000 GHz
CF Step	1.000000 MHz
Auto	Man
Freq Offset	0 Hz

A.6 RF Conducted Spurious Emissions

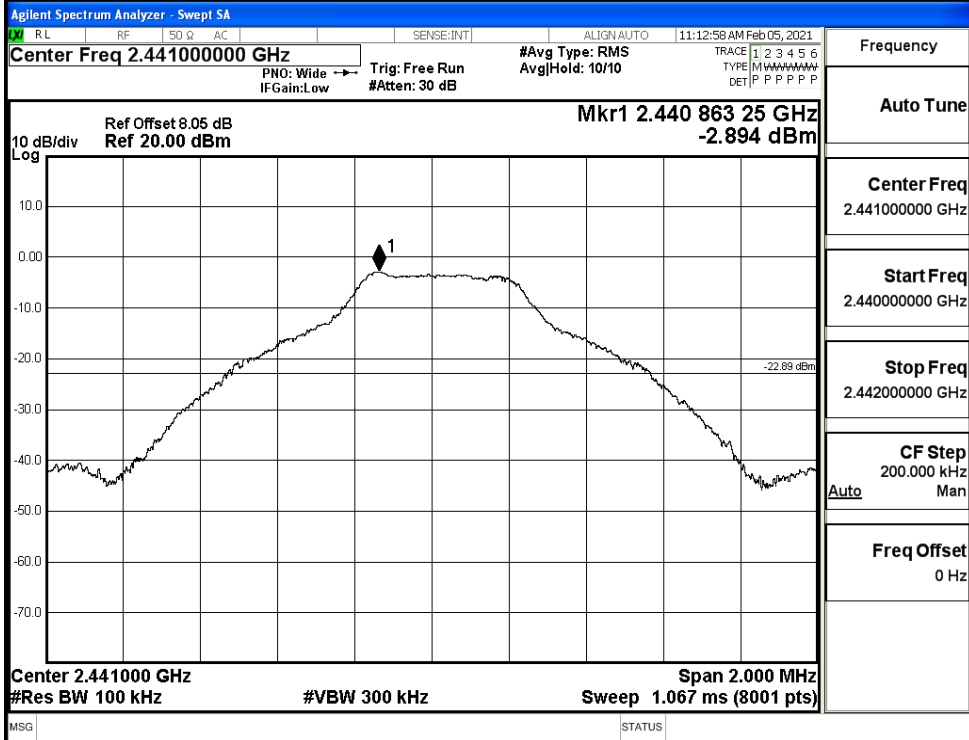
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	-3.242	-37.514	-23.242	PASS
	MCH	-2.894	-37.889	-22.894	PASS
	HCH	-2.986	-38.417	-22.986	PASS

GFSK_LCH_Graphs

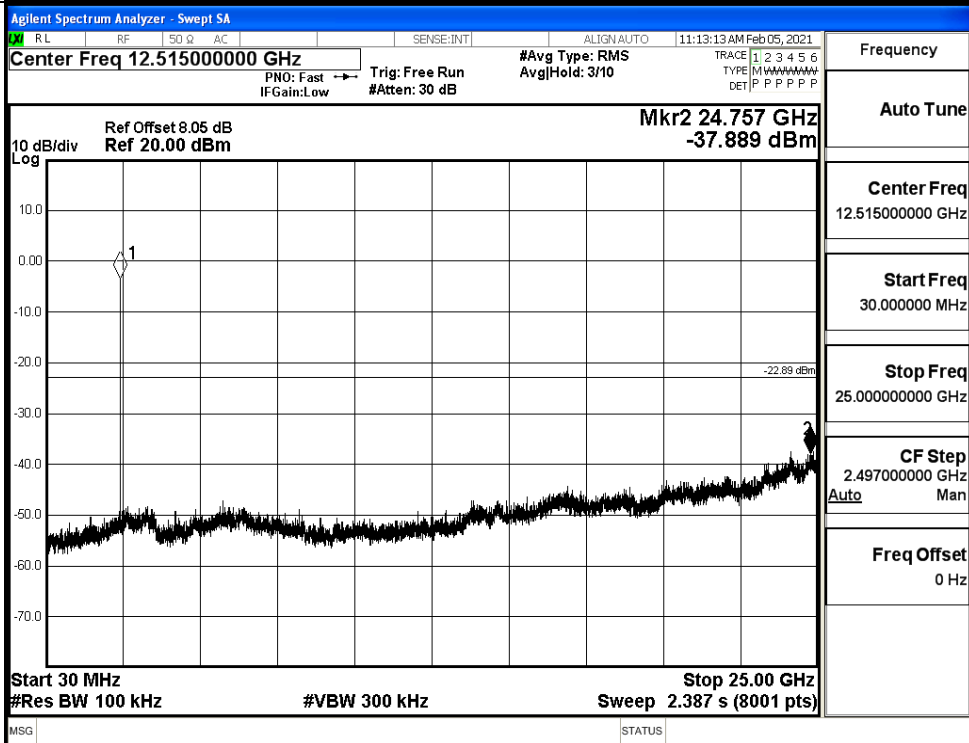


GFSK_MCH_Graphs

Pref

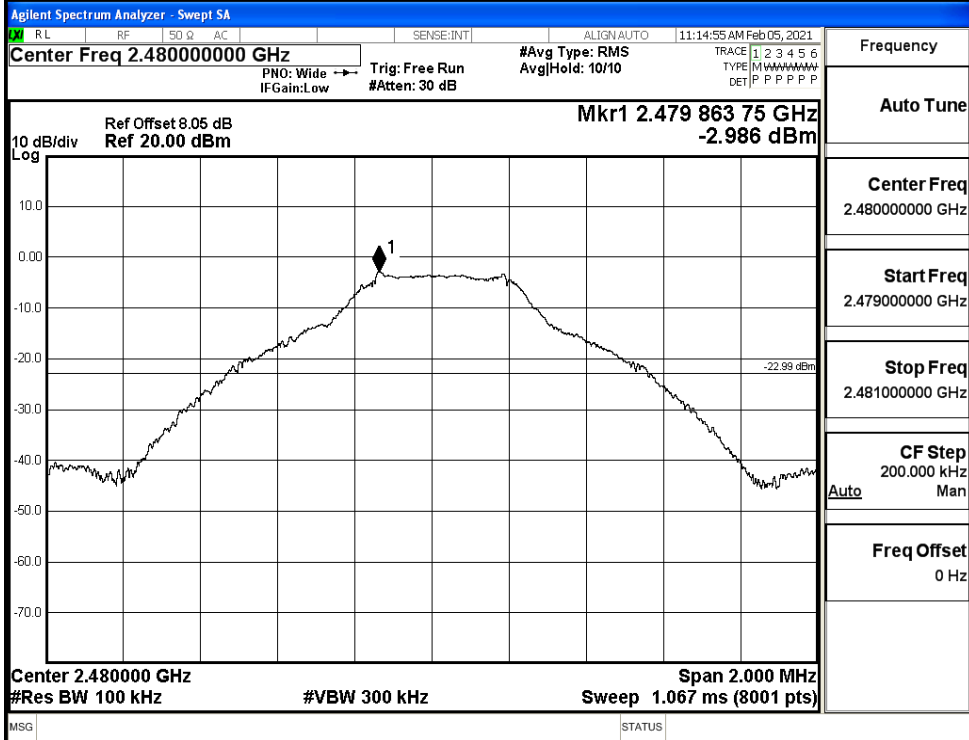


Puw

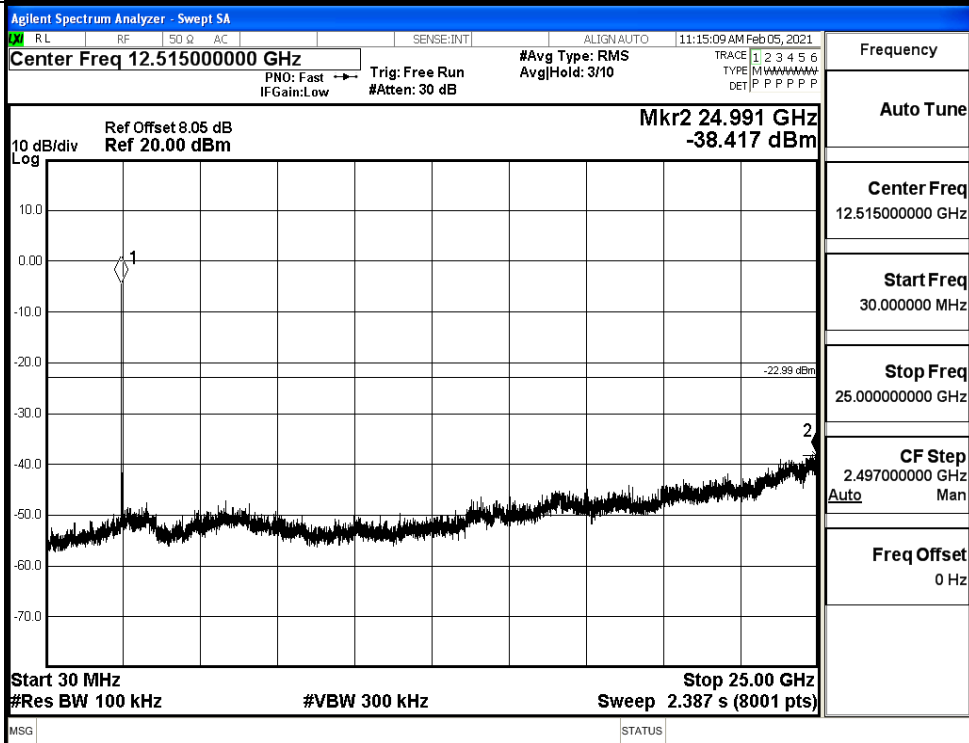


GFSK_HCH_Graphs

Pref



Puw

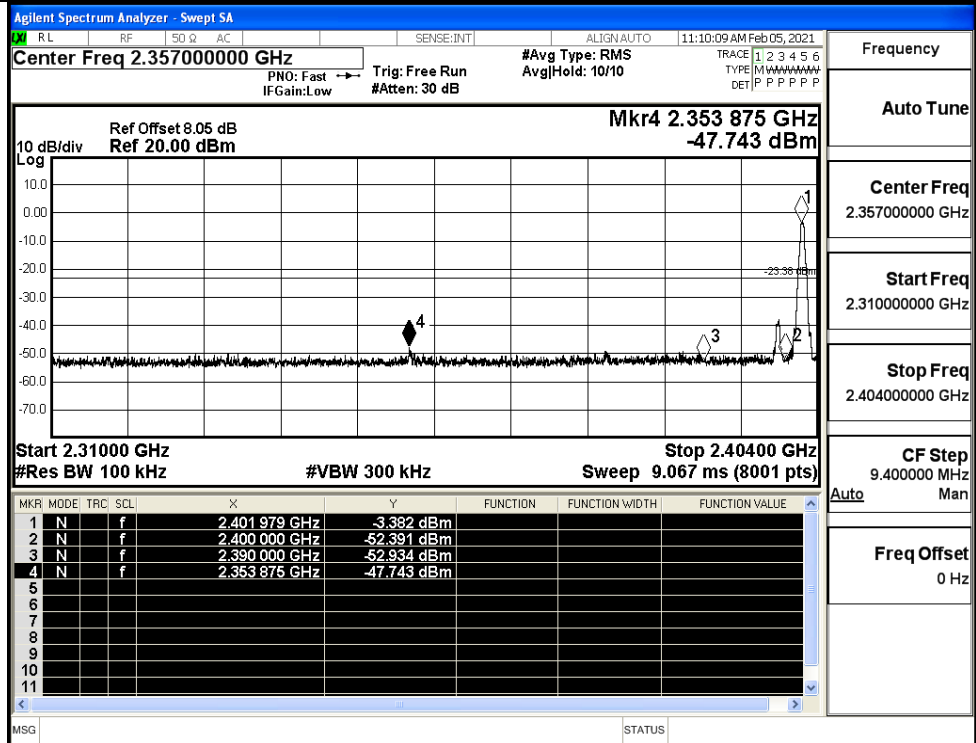


A.7 Band-edge for RF Conducted Emissions

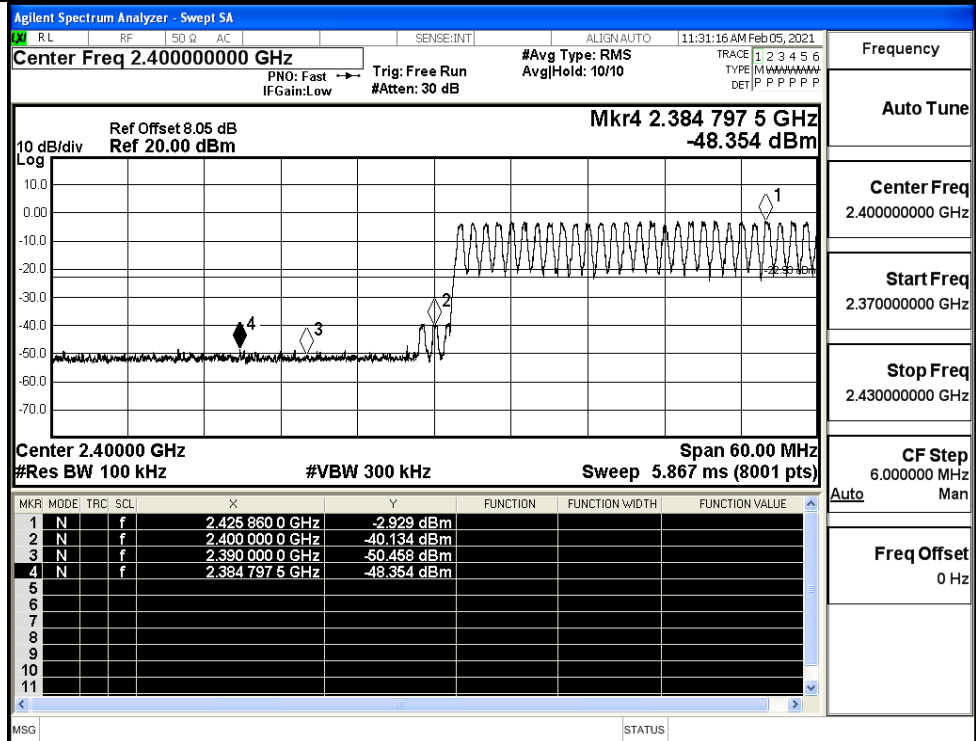
Mode	Channel	Carrier Frequency [MHz]	Carrier Power [dBm]	Frequency Hopping	Max Spurious Level [dBm]	Limit [dBm]	Verdict
GFSK	LCH	2402	-3.382	Off	-47.743	-23.38	PASS
			-2.929	On	-48.354	-22.93	PASS
	HCH	2480	-3.212	Off	-42.980	-23.21	PASS
			-2.805	On	-45.039	-22.81	PASS

Test Graphs

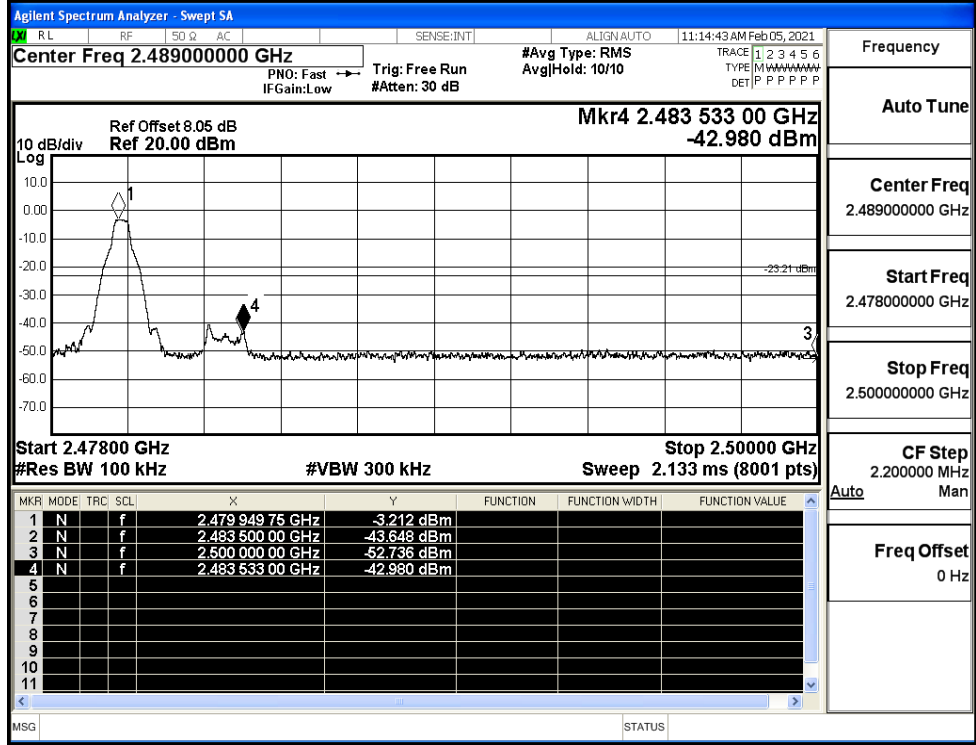
GFSK/LCH/No Hop



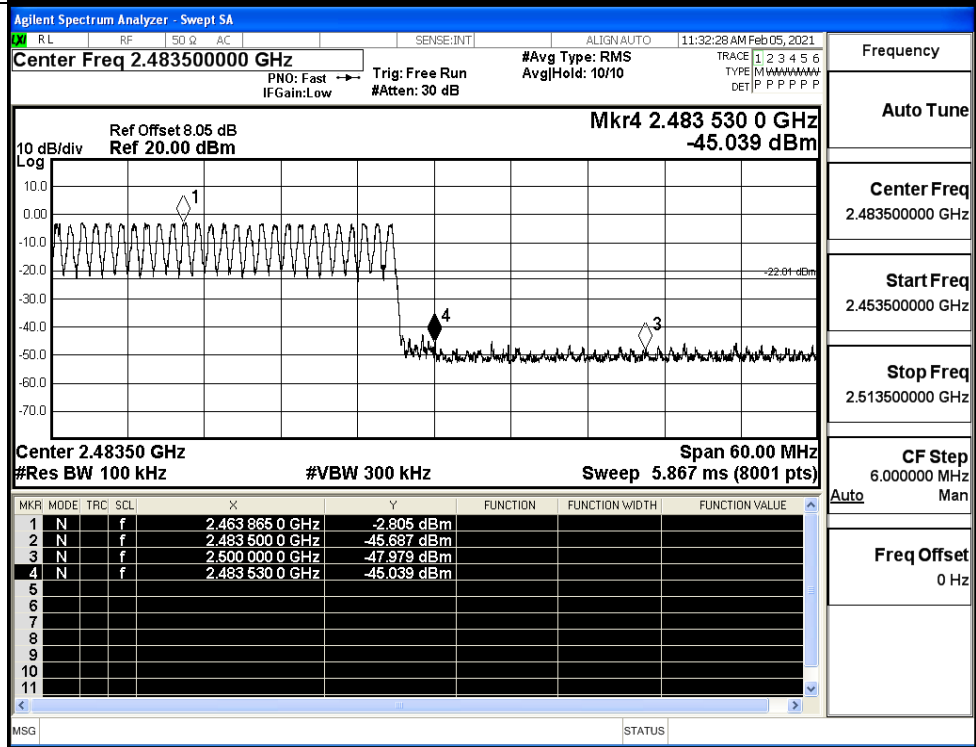
GFSK/LCH/Hop



GFSK/HCH/No Hop



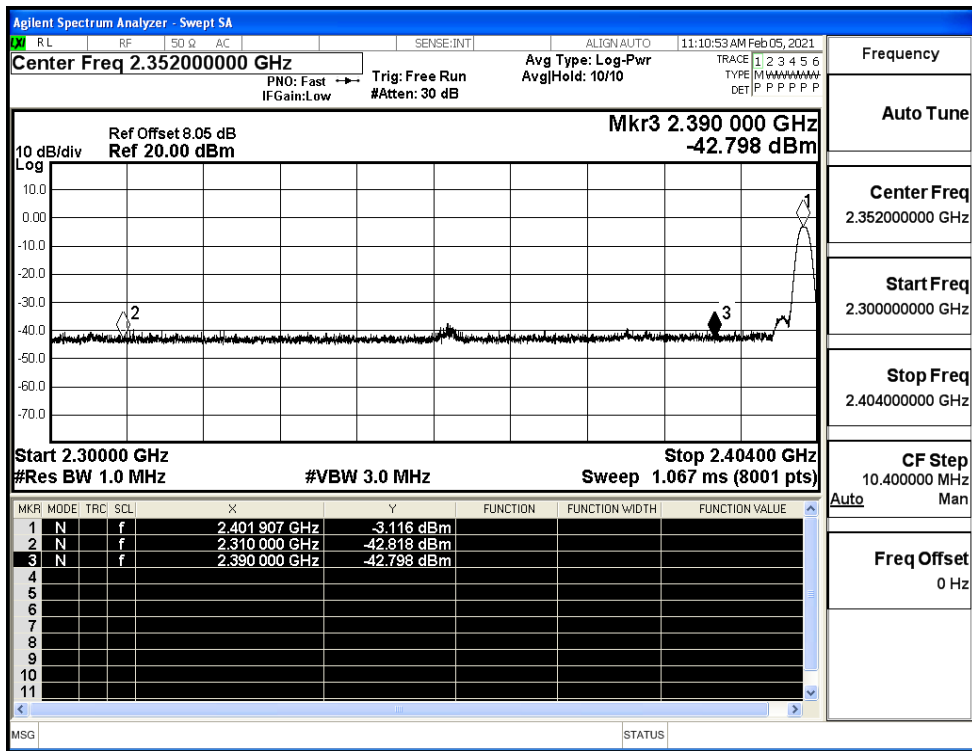
GFSK/HCH/Hop



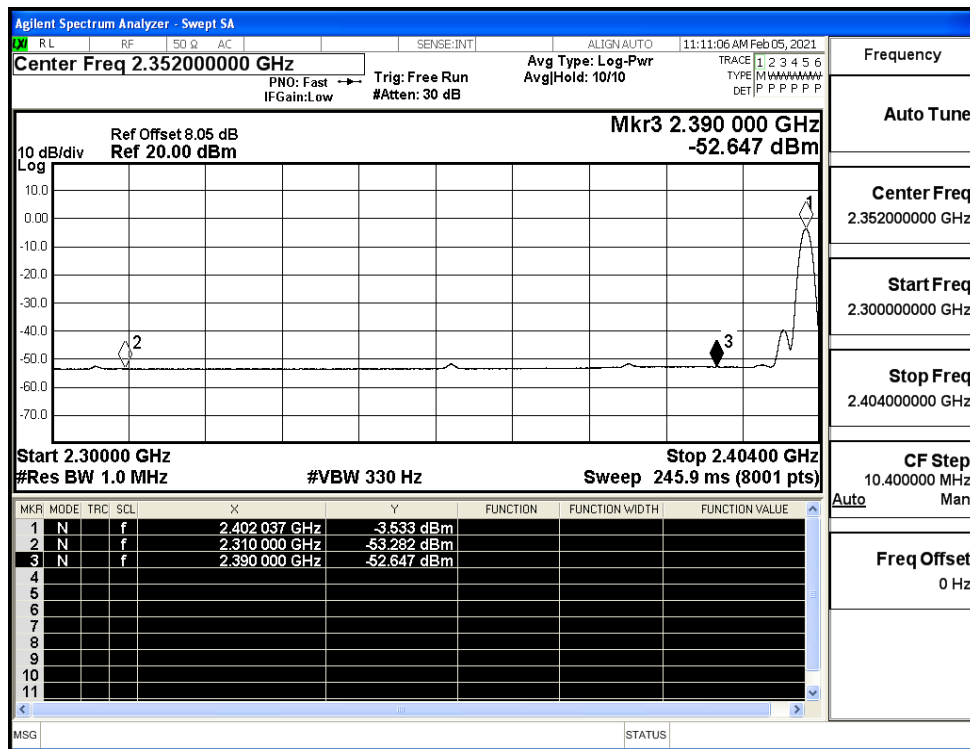
A.8 Restrict-band band-edge measurements

Test Mode	Hopping	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
GFSK	Off	2310.0	-42.82	2.0	0	52.44	PEAK	74	PASS
	Off	2310.0	-53.28	2.0	0	41.98	AV	54	PASS
	Off	2390.0	-42.80	2.0	0	52.46	PEAK	74	PASS
	Off	2390.0	-52.65	2.0	0	42.61	AV	54	PASS
	Off	2483.5	-38.91	2.0	0	56.35	PEAK	74	PASS
	Off	2483.5	-46.03	2.0	0	49.23	AV	54	PASS
	Off	2500.0	-42.43	2.0	0	52.82	PEAK	74	PASS
	Off	2500.0	-51.93	2.0	0	43.32	AV	54	PASS

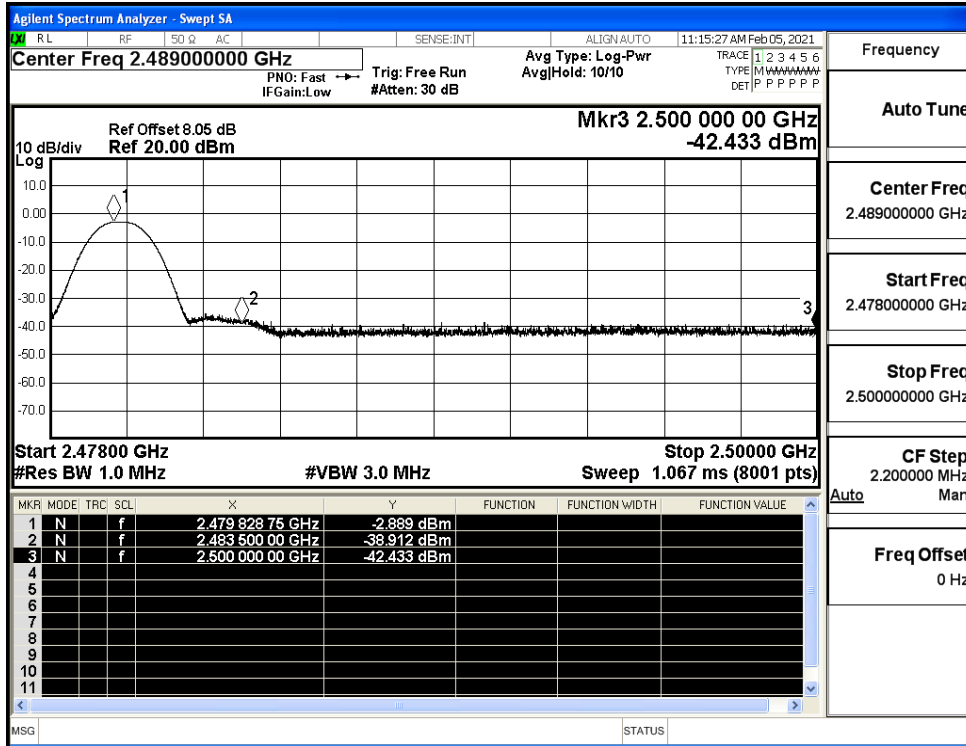
Restrict-band band-edge measurements_Hopping Off_GFSK_PEAK (Low Channel)



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)

