

Appendix A

RF Test Data for BT LE V5.0 (Conducted Measurement)

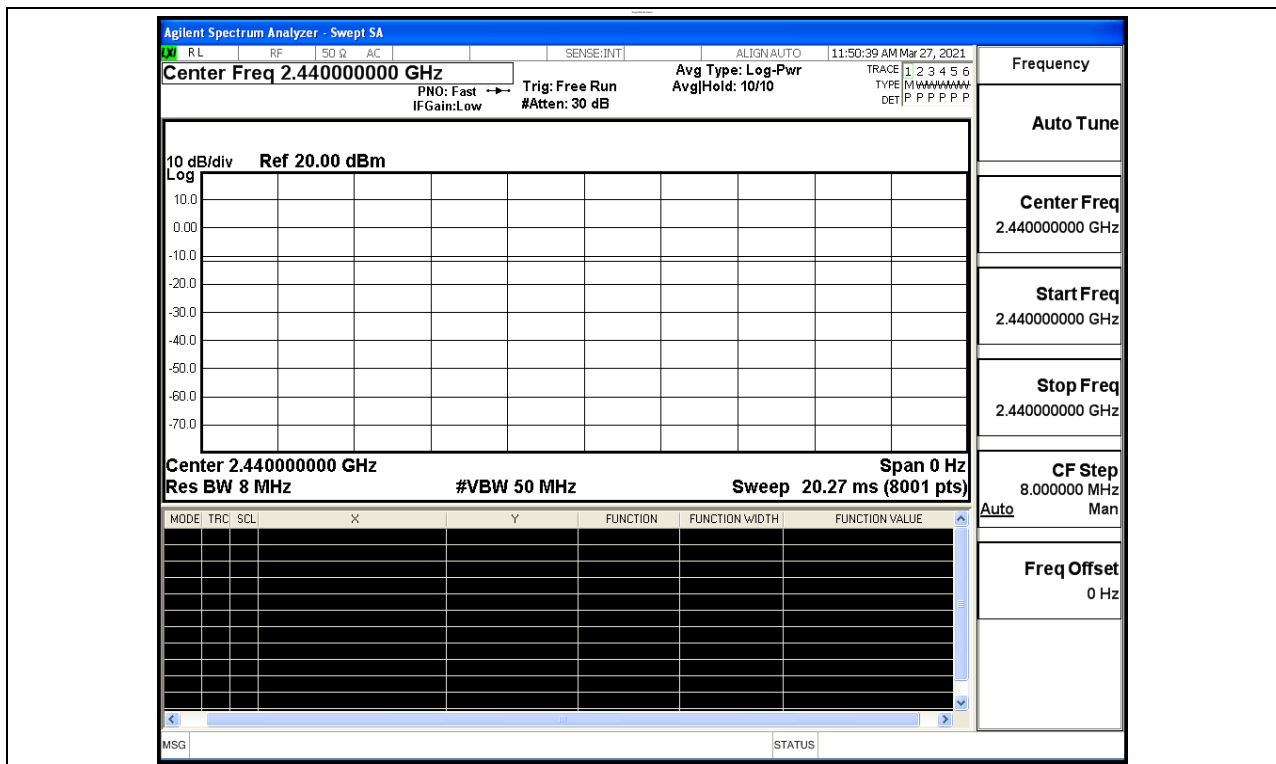
Product Name: LED light bulb
Trade Mark: SPERLL
Test Model: SP611E

Environmental Conditions

Temperature:	22.2 ° C
Relative Humidity:	53.1%
ATM Pressure:	101.0 kPa
Test Engineer:	Diamond Lu
Supervised by:	Li Huan

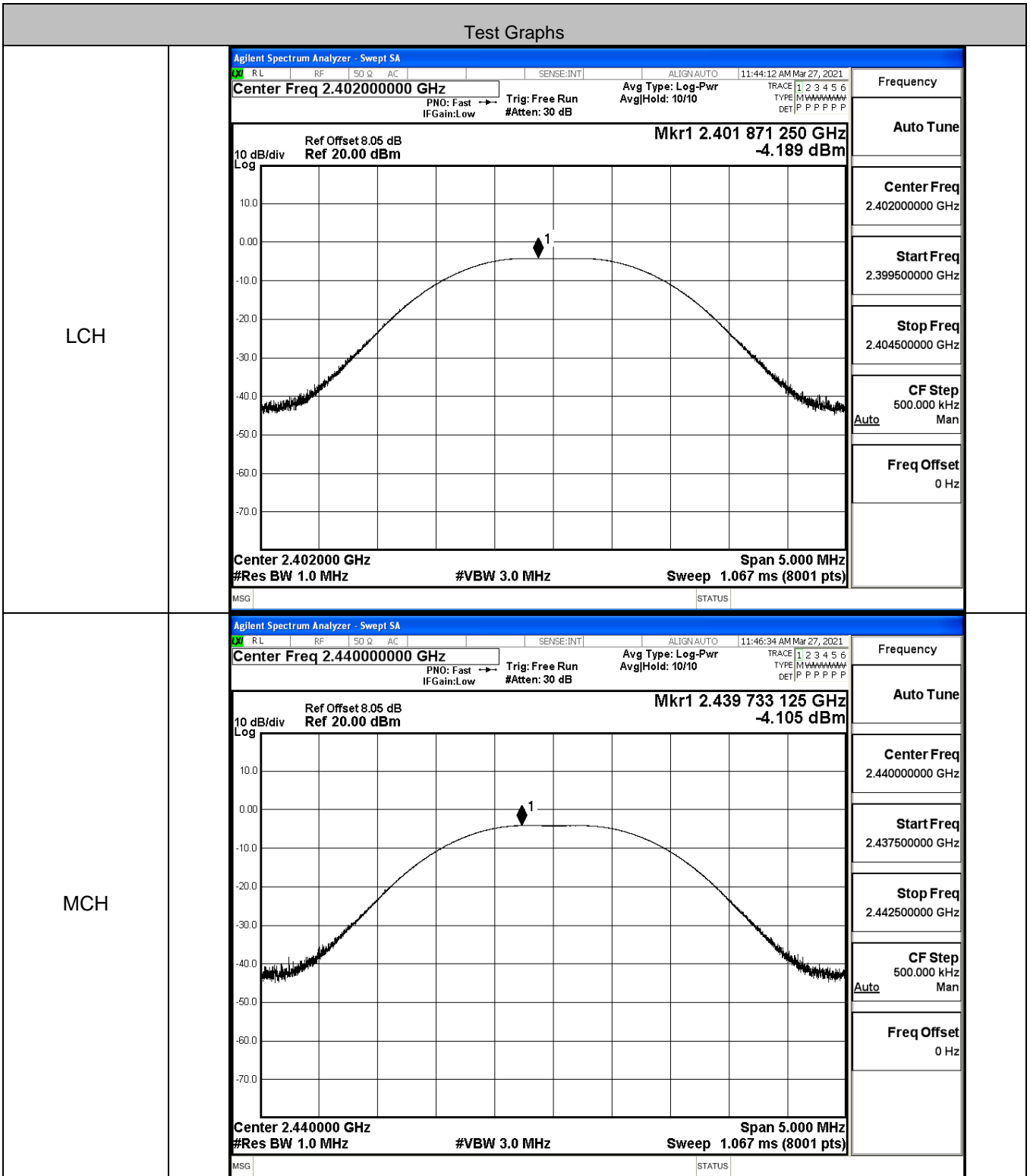
A.1 Duty Cycle

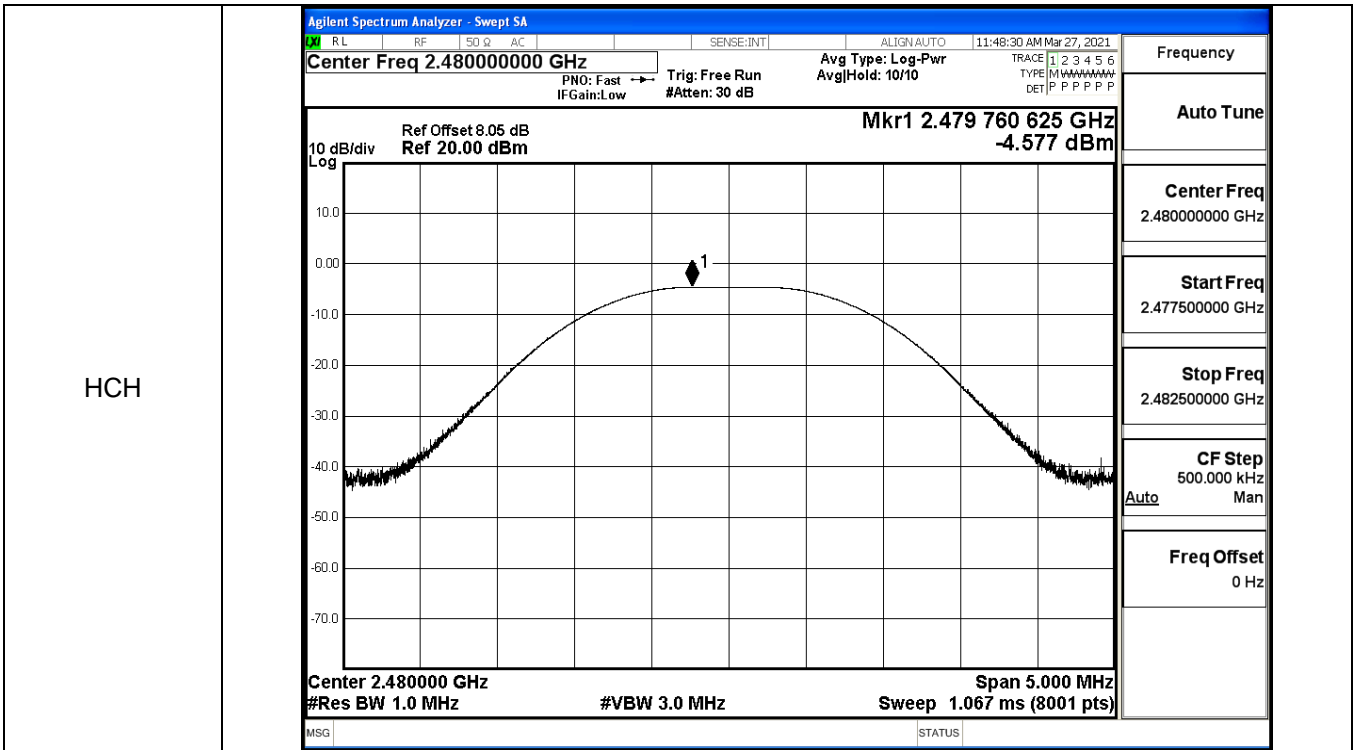
Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
BT LE	2440	Ant1	100	PASS



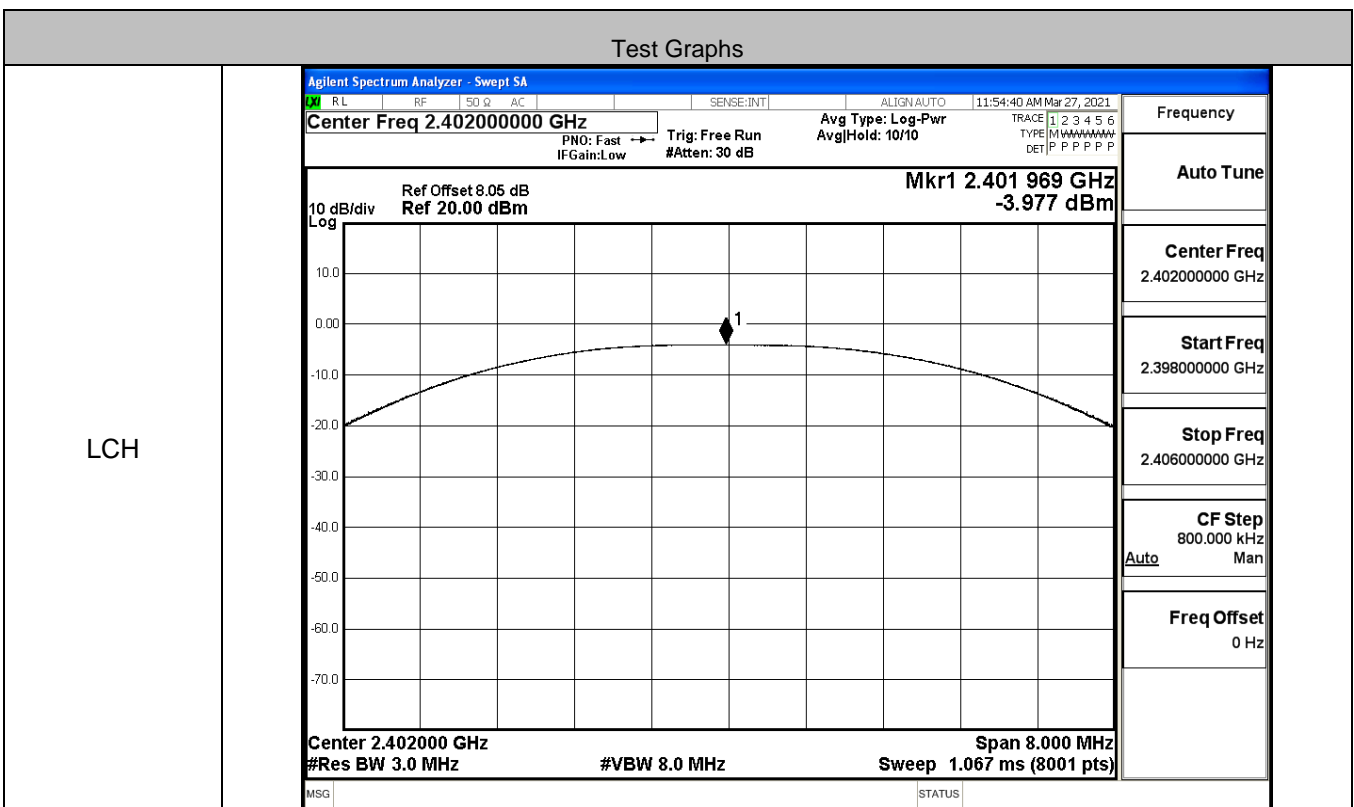
A.2 Maximum Conducted Peak Output Power

Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
BT LE	LCH	-4.189	30	PASS
BT LE	MCH	-4.105	30	PASS
BT LE	HCH	-4.577	30	PASS

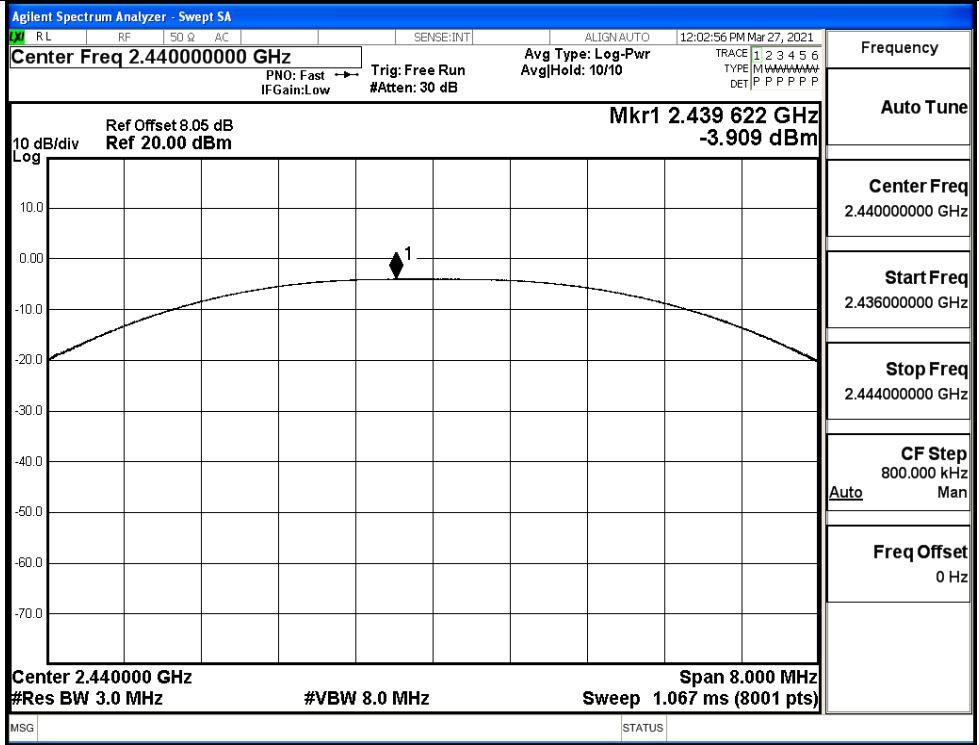




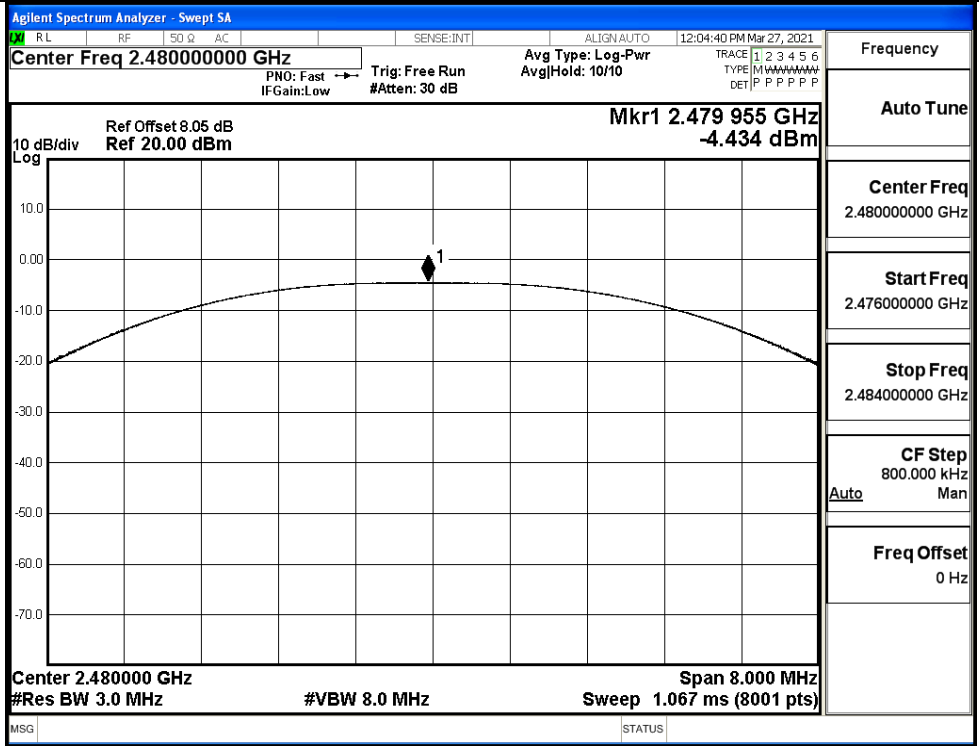
Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
BT 2LE	LCH	-3.977	30	PASS
BT 2LE	MCH	-3.909	30	PASS
BT 2LE	HCH	-4.434	30	PASS



MCH



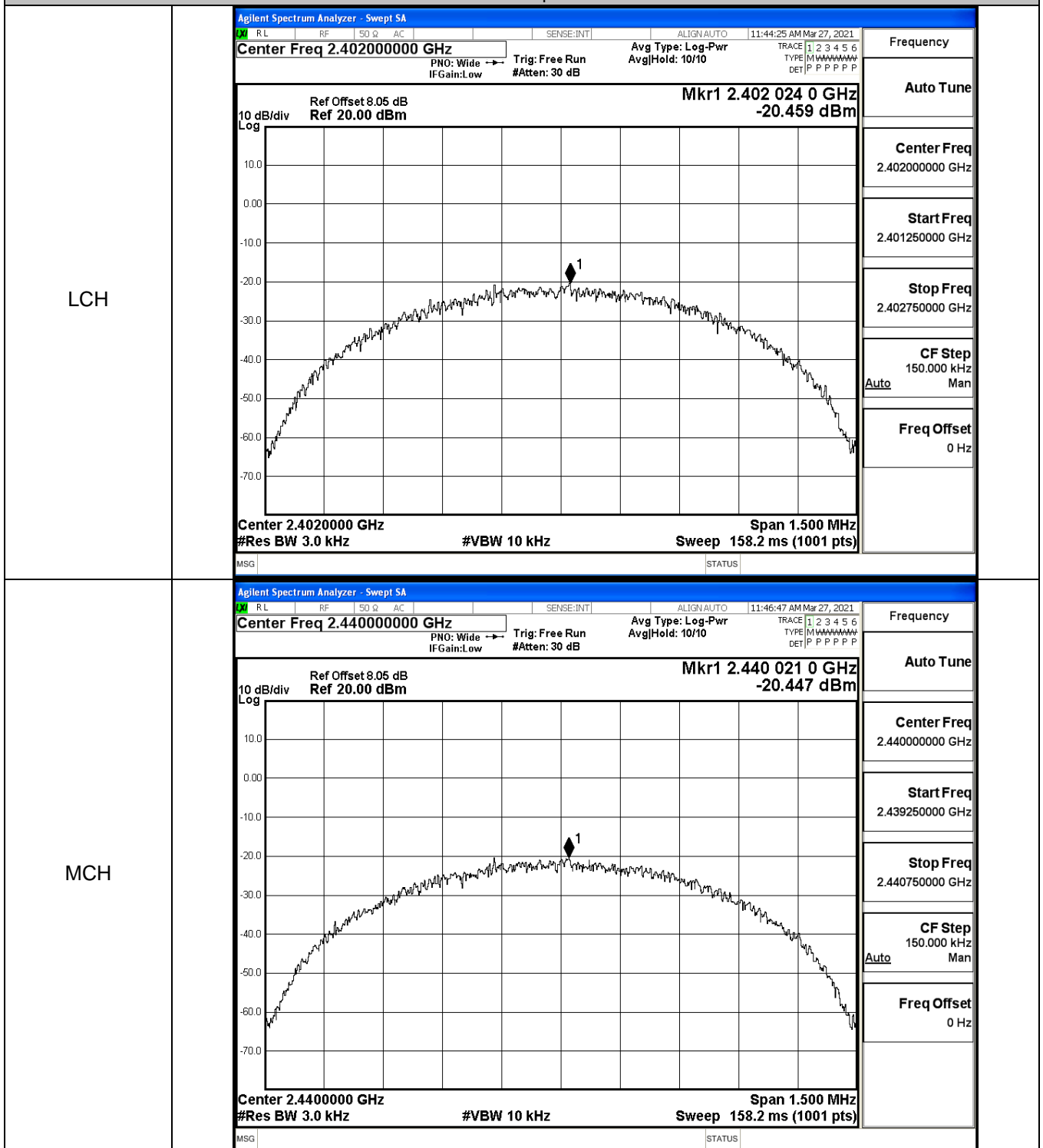
HCH

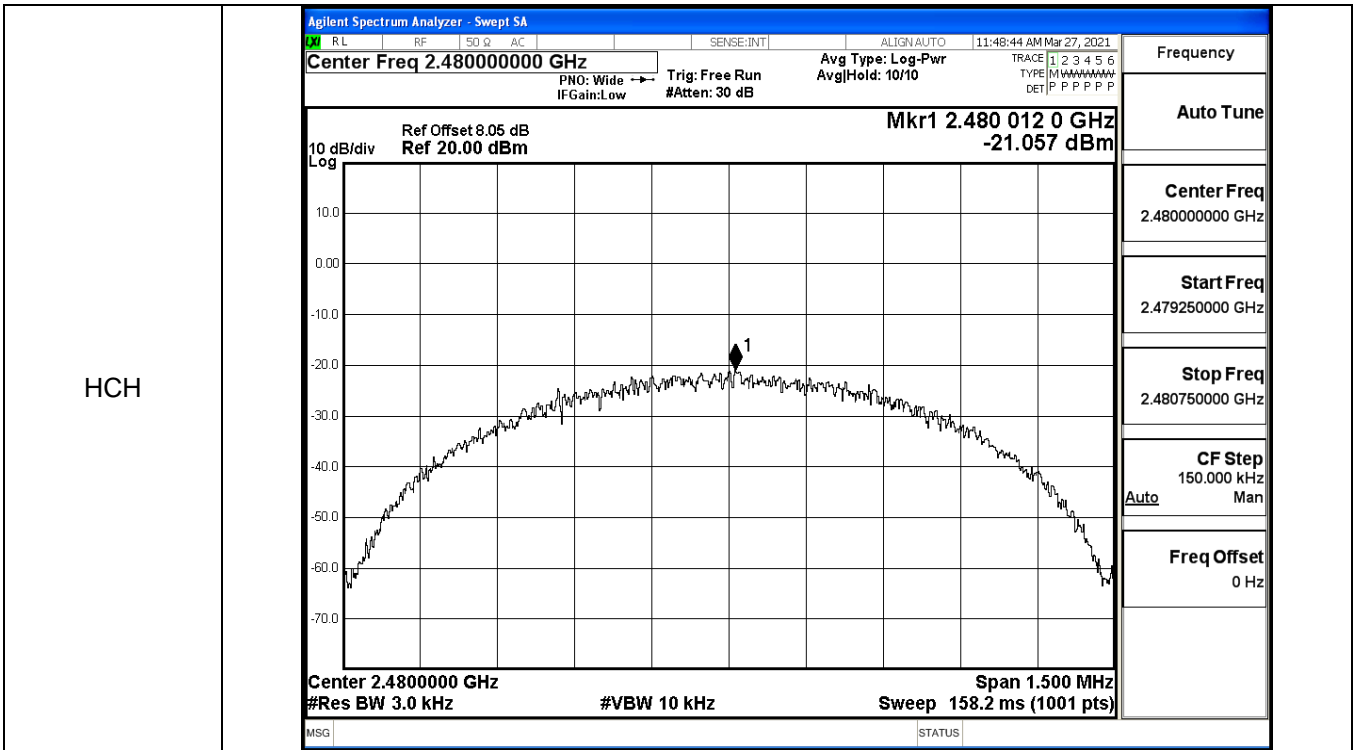


A.3 Maximum Power Spectral Density

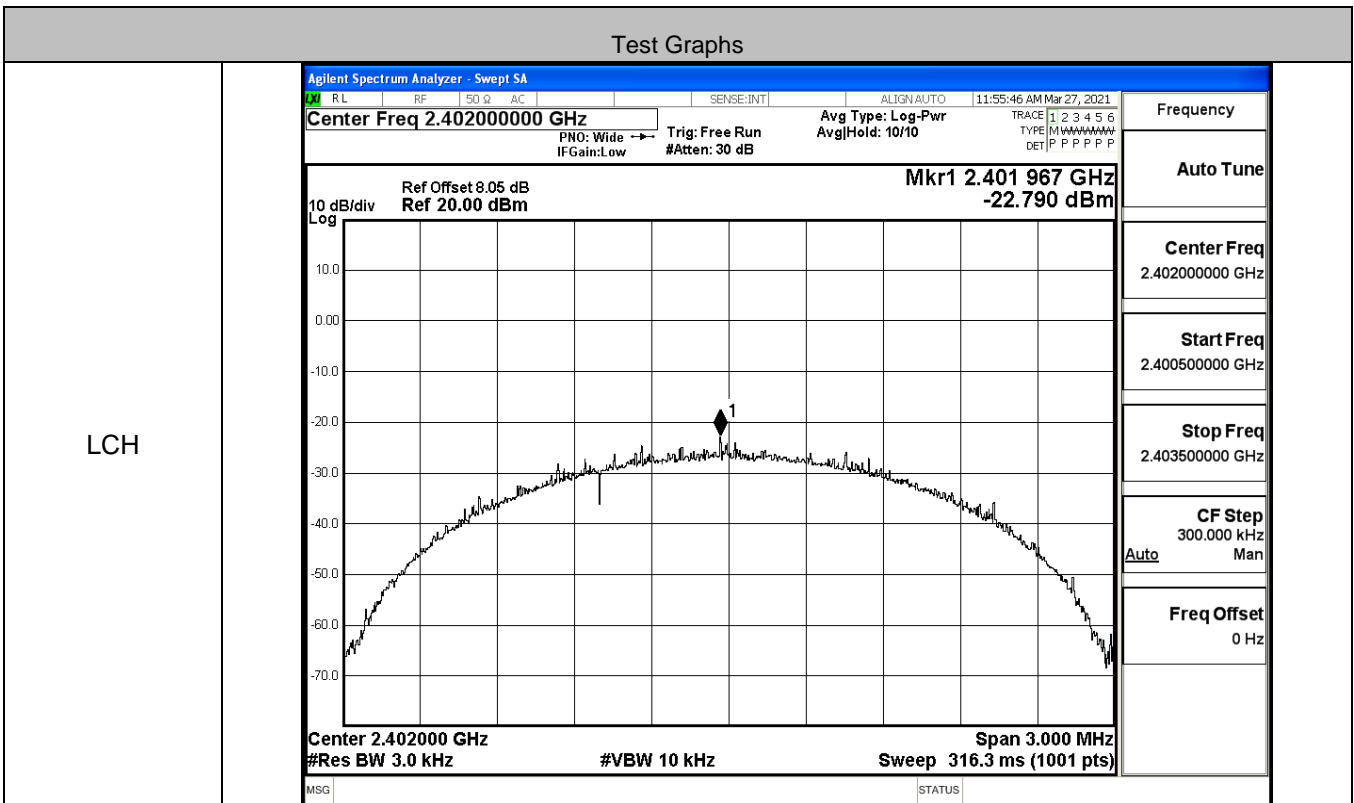
Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT LE	LCH	-20.459	8	PASS
BT LE	MCH	-20.447	8	PASS
BT LE	HCH	-21.057	8	PASS

Test Graphs

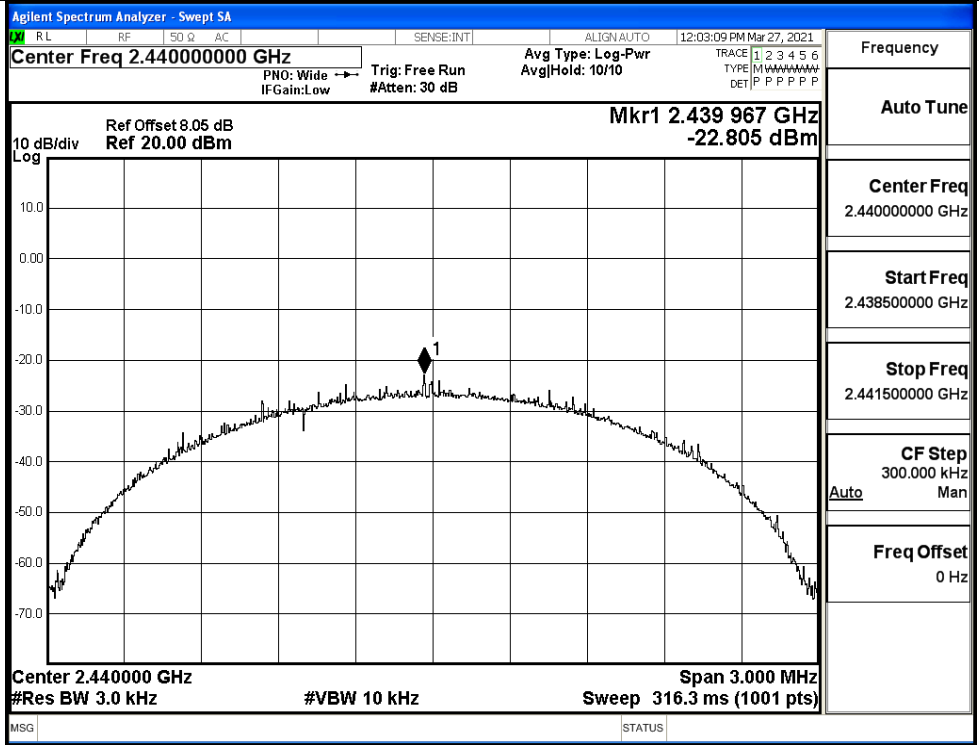




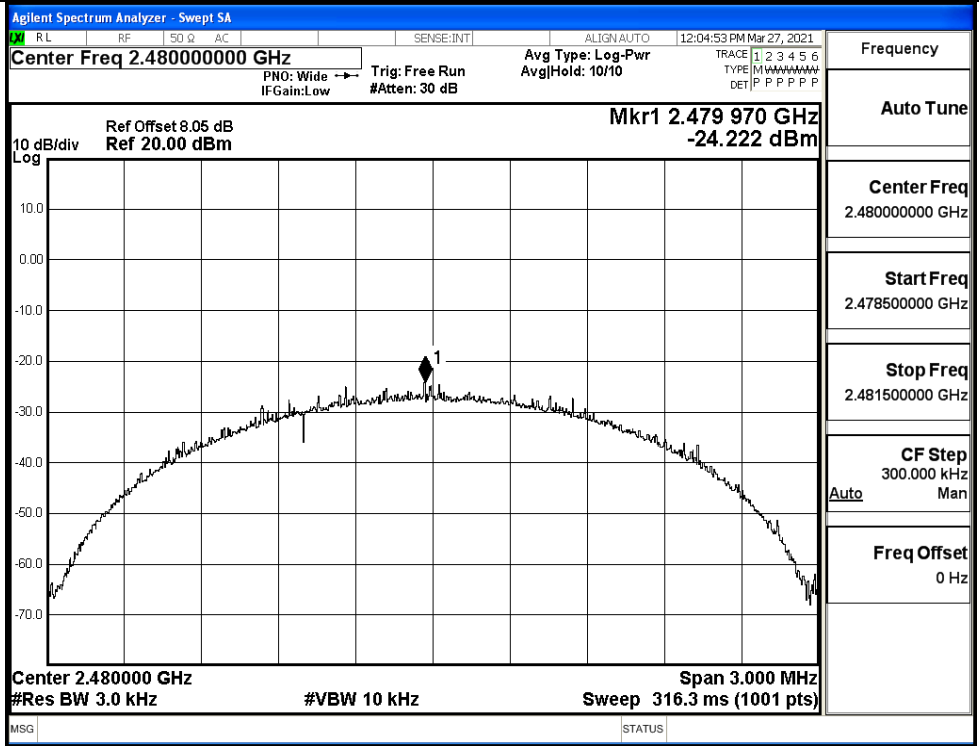
Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT 2LE	LCH	-22.790	8	PASS
BT 2LE	MCH	-22.805	8	PASS
BT 2LE	HCH	-24.222	8	PASS



MCH



HCH

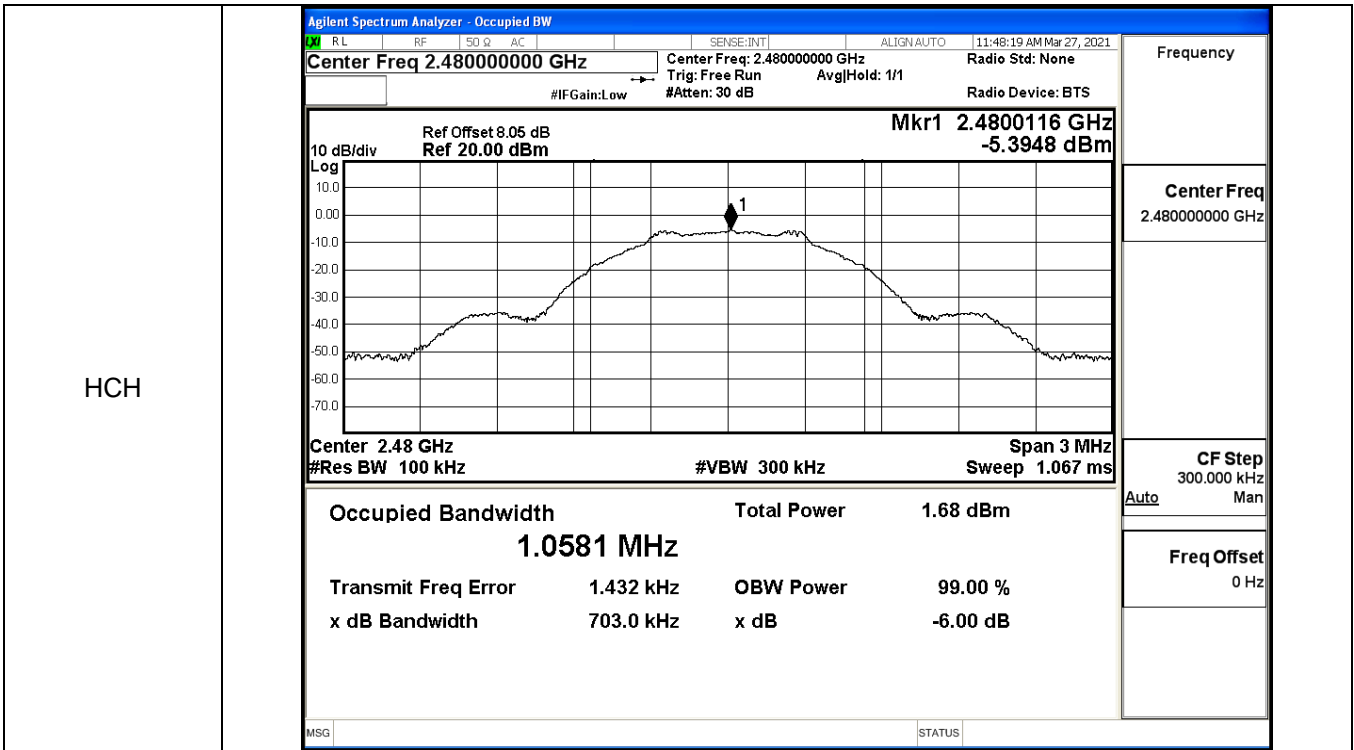


A.4 6dB Bandwidth

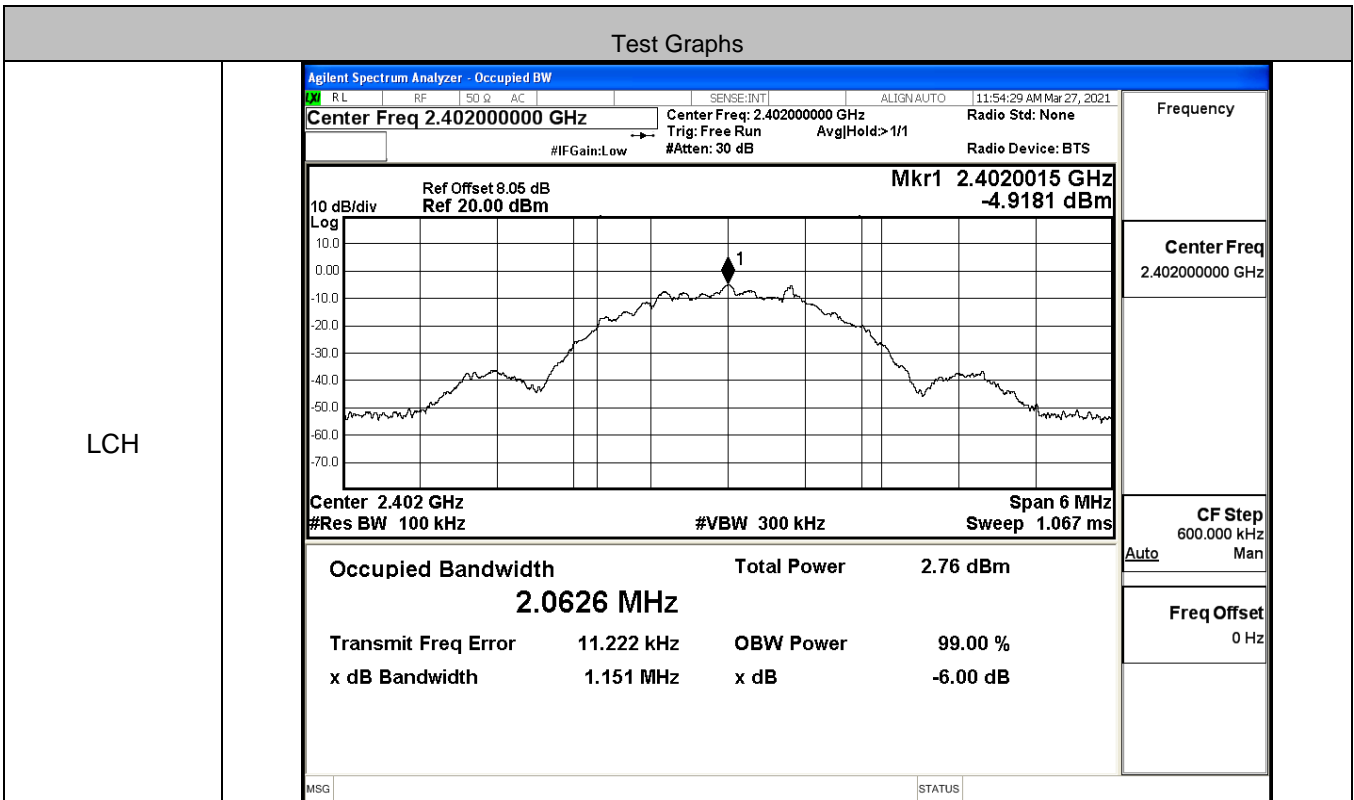
Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT LE	LCH	0.6713	≥0.5	PASS
BT LE	MCH	0.6595	≥0.5	PASS
BT LE	HCH	0.7030	≥0.5	PASS

Test Graphs

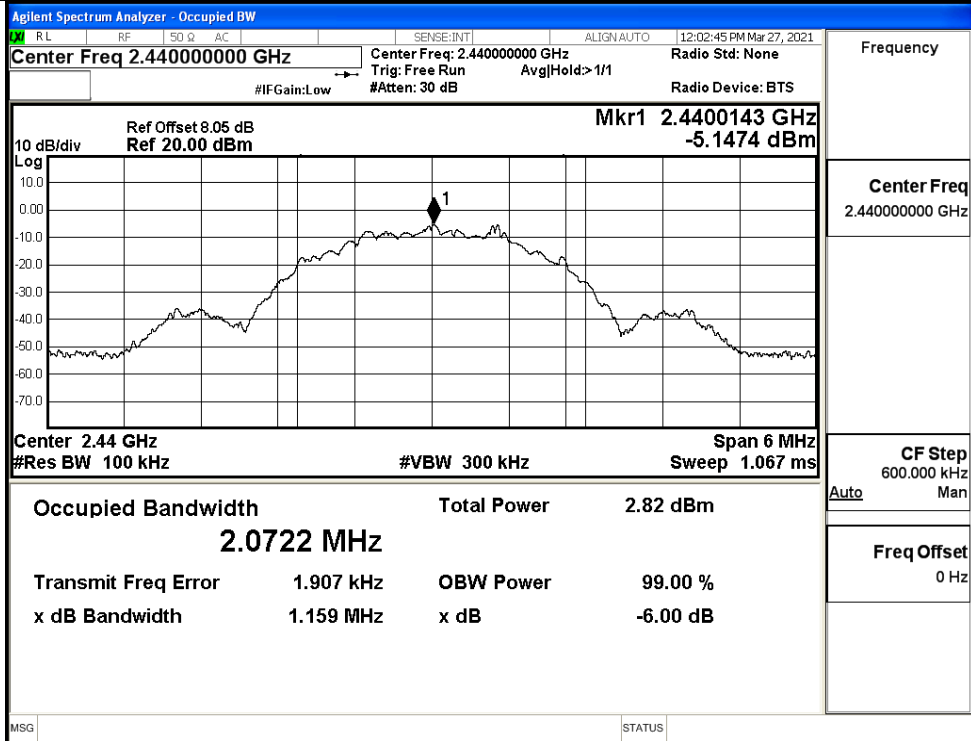
LCH	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.402000000 GHz Center Freq: 2.402000000 GHz Radio Std: None</p> <p>Trig: Free Run AvgHold: 1/1</p> <p>#IFGain:Low #Atten: 30 dB Radio Device: BTS</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.4022629 GHz -4.5261 dBm</p> <p>Center 2.402 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>2.24 dBm</td> </tr> <tr> <td>1.0523 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>1.382 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>671.3 kHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>99.00 %</td> </tr> <tr> <td></td> <td></td> <td>-6.00 dB</td> </tr> </table> <p>MSG STATUS</p>	Occupied Bandwidth	Total Power	2.24 dBm	1.0523 MHz			Transmit Freq Error	1.382 kHz	OBW Power	x dB Bandwidth	671.3 kHz	x dB			99.00 %			-6.00 dB	<p>Frequency</p> <p>Center Freq 2.402000000 GHz</p> <p>CF Step 300.000 kHz Auto Man</p> <p>Freq Offset 0 Hz</p>
	Occupied Bandwidth	Total Power	2.24 dBm																	
1.0523 MHz																				
Transmit Freq Error	1.382 kHz	OBW Power																		
x dB Bandwidth	671.3 kHz	x dB																		
		99.00 %																		
		-6.00 dB																		
MCH	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.440000000 GHz Center Freq: 2.440000000 GHz Radio Std: None</p> <p>Trig: Free Run AvgHold: >1/1</p> <p>#IFGain:Low #Atten: 30 dB Radio Device: BTS</p> <p>Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.4402471 GHz -4.2545 dBm</p> <p>Center 2.44 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms</p> <table border="1"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>2.33 dBm</td> </tr> <tr> <td>1.0542 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>3.534 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>659.5 kHz</td> <td>x dB</td> </tr> <tr> <td></td> <td></td> <td>99.00 %</td> </tr> <tr> <td></td> <td></td> <td>-6.00 dB</td> </tr> </table> <p>MSG STATUS</p>	Occupied Bandwidth	Total Power	2.33 dBm	1.0542 MHz			Transmit Freq Error	3.534 kHz	OBW Power	x dB Bandwidth	659.5 kHz	x dB			99.00 %			-6.00 dB	<p>Frequency</p> <p>Center Freq 2.440000000 GHz</p> <p>CF Step 300.000 kHz Auto Man</p> <p>Freq Offset 0 Hz</p>
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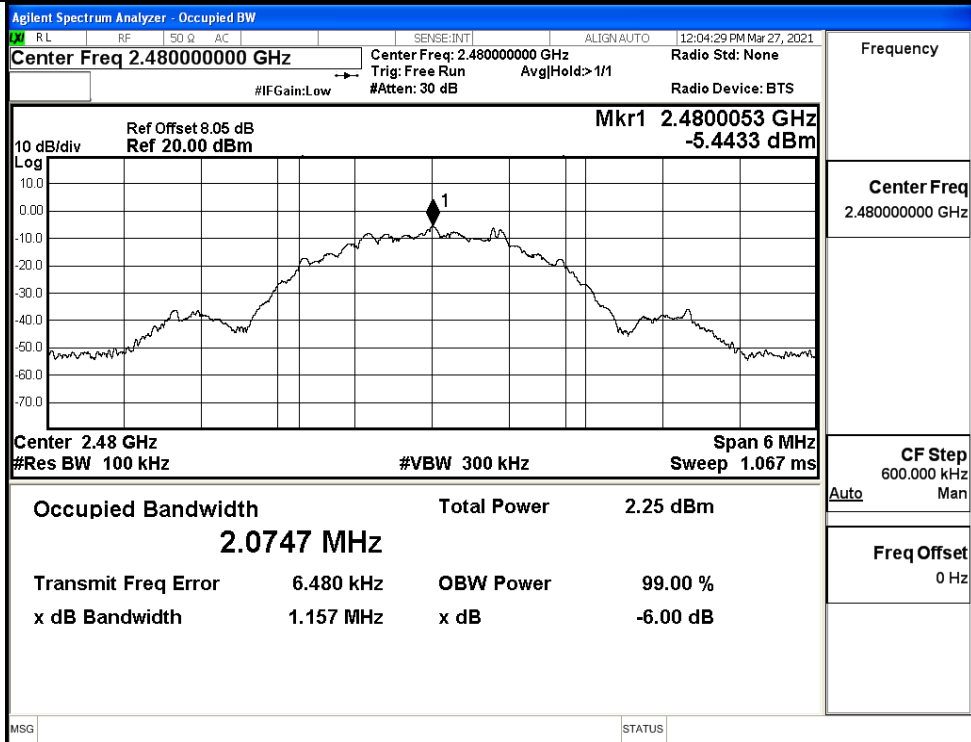
Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT 2LE	LCH	1.151	≥0.5	PASS
BT 2LE	MCH	1.159	≥0.5	PASS
BT 2LE	HCH	1.157	≥0.5	PASS



MCH

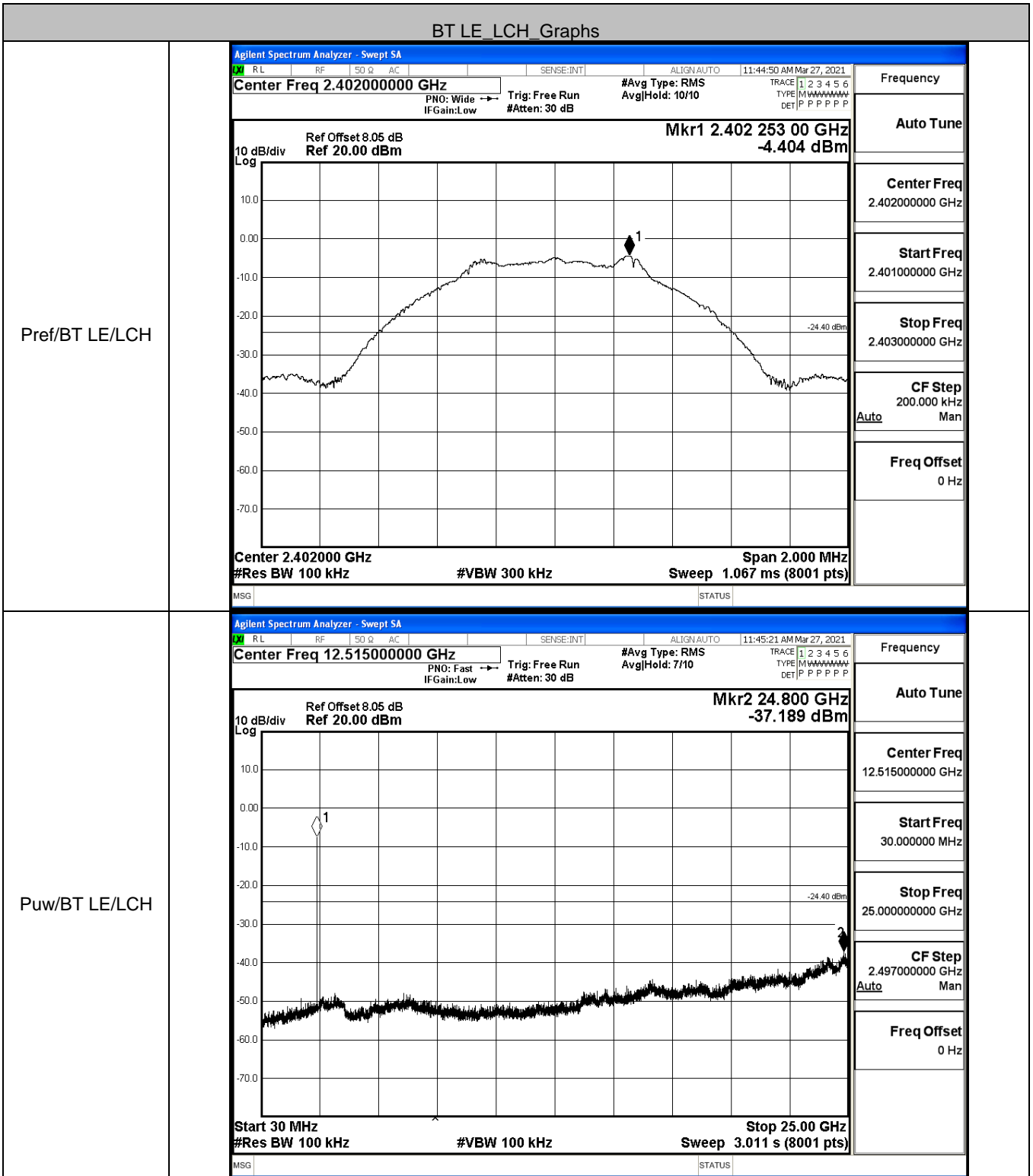


HCH



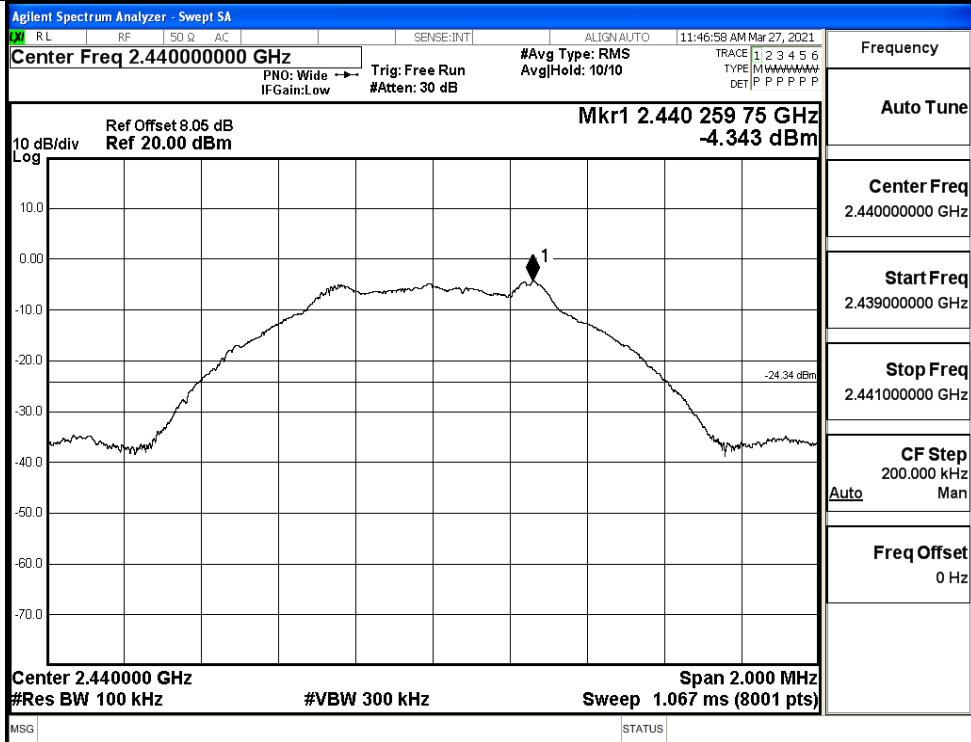
A.5 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	-4.404	-37.189	-24.404	PASS
BT LE	MCH	-4.343	-37.323	-24.343	PASS
BT LE	HCH	-5.186	-36.789	-25.186	PASS

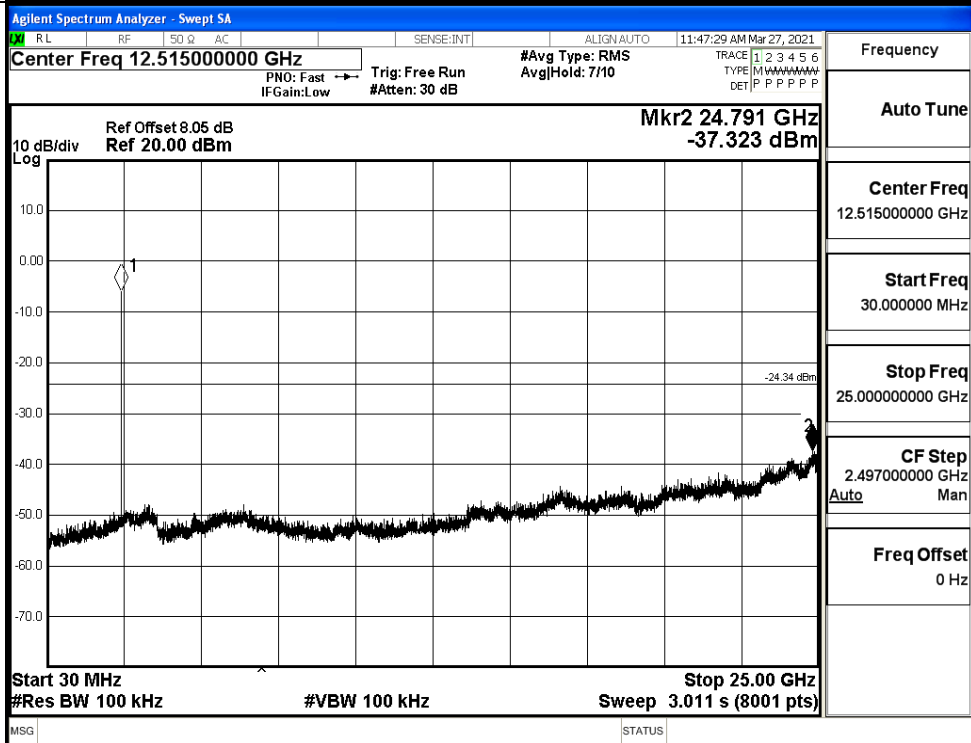


BT LE_MCH_Graphs

Pref/BT LE/MCH

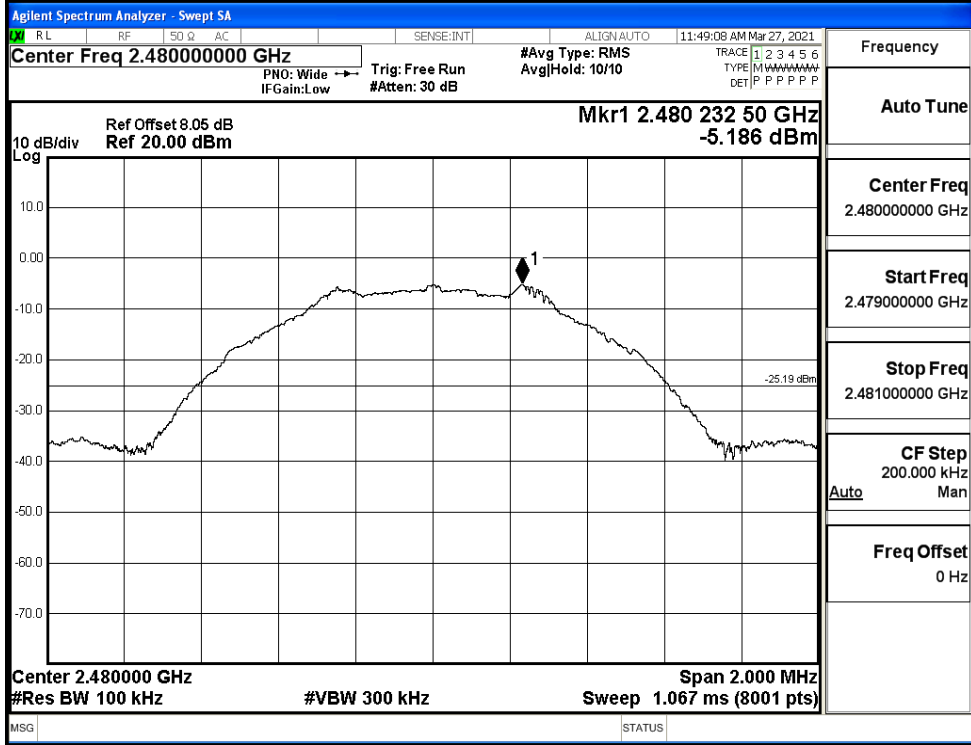


Puw/BT LE/MCH

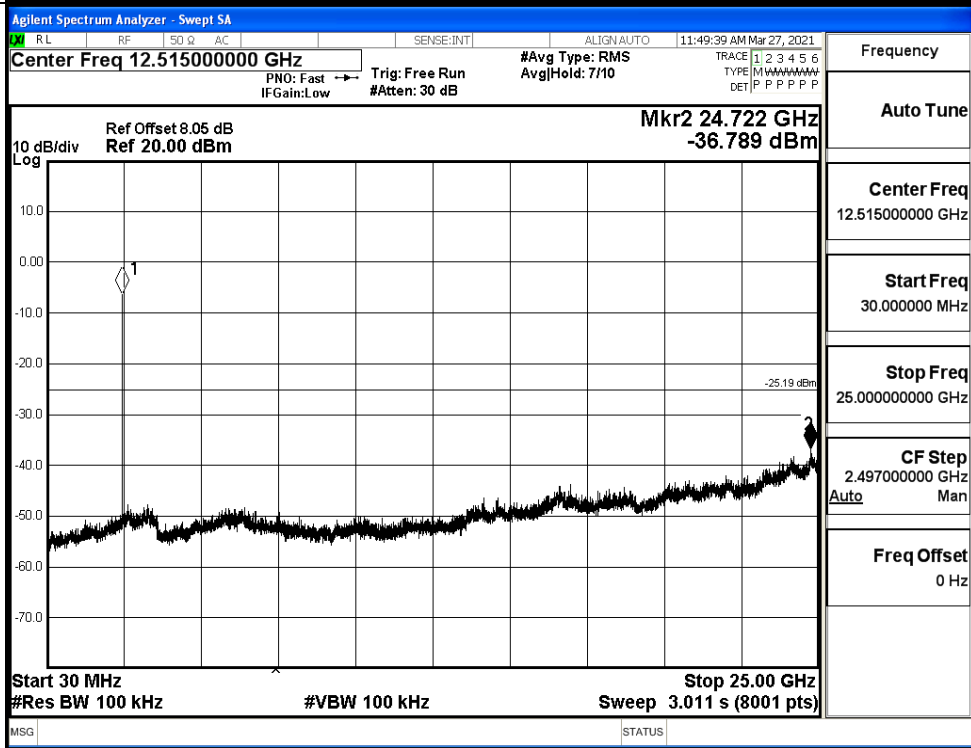


BT LE_HCH_Graphs

Pref/BT LE/HCH

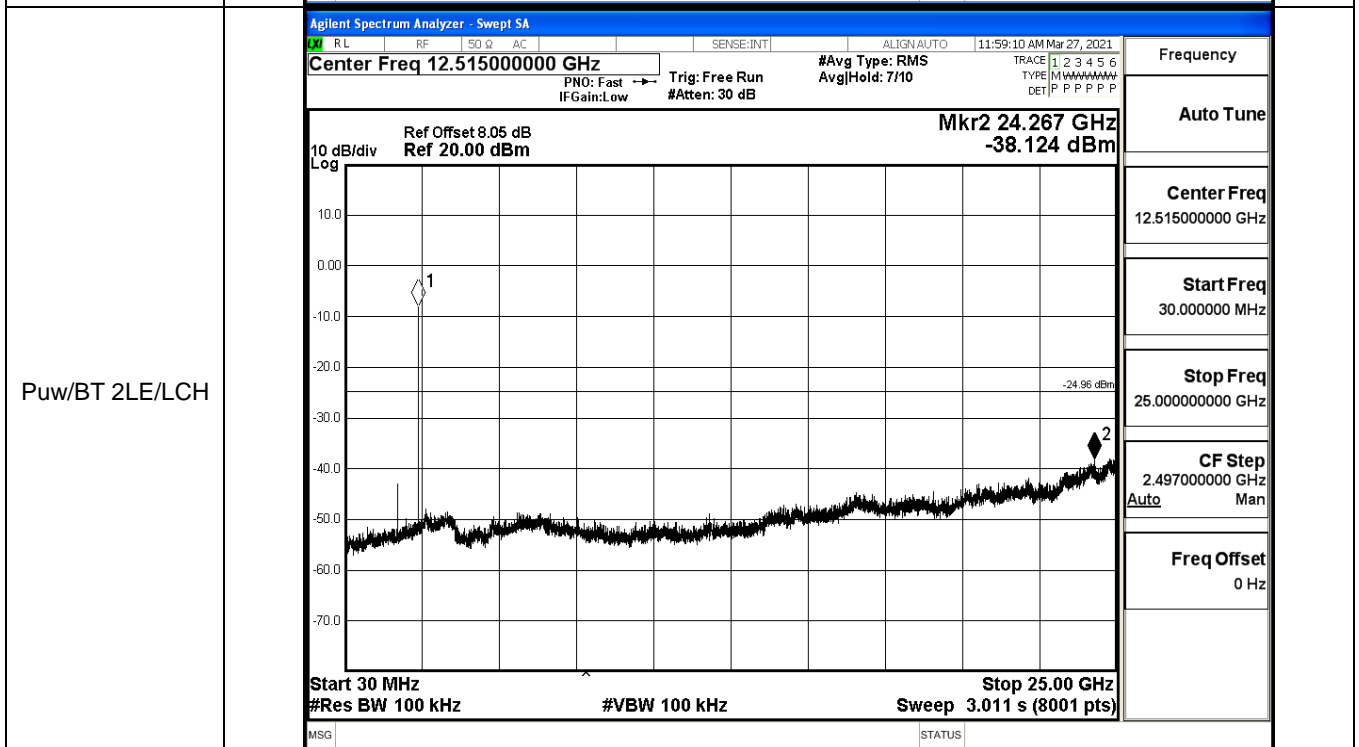
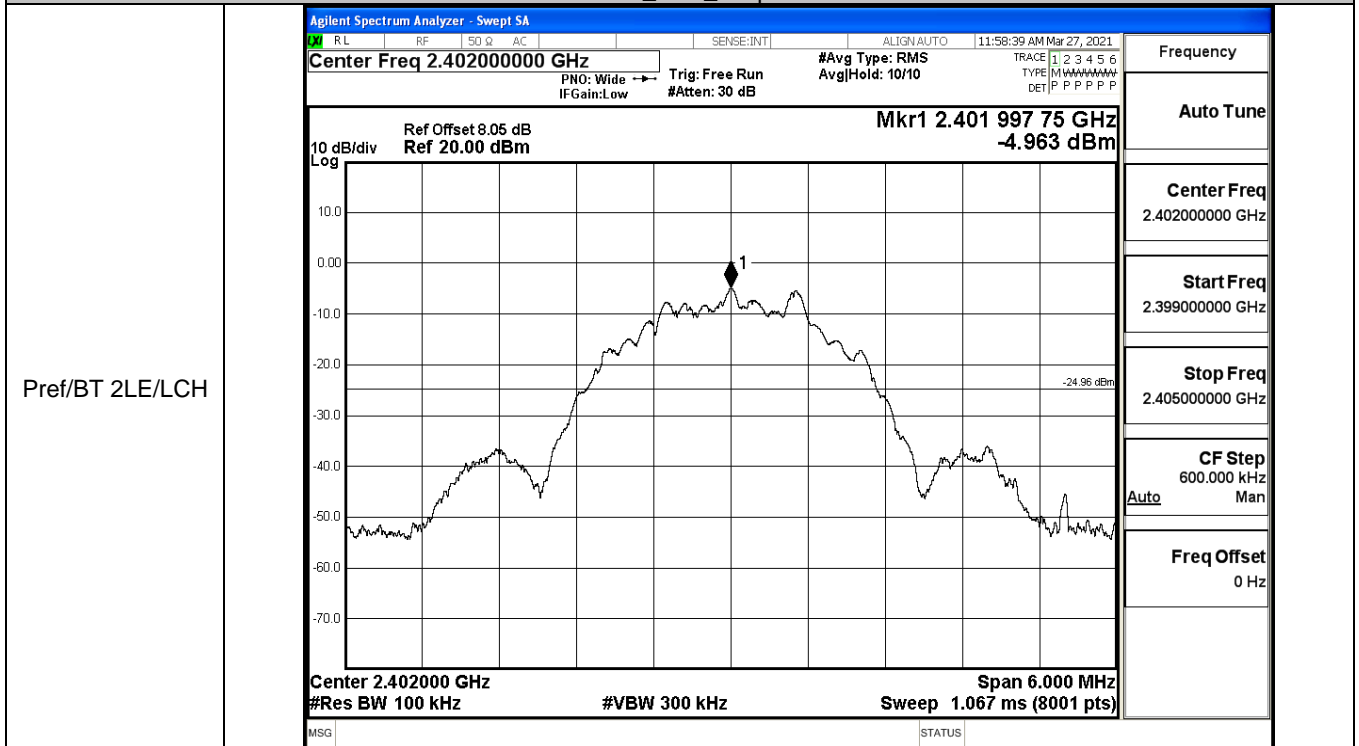


Puw/BT LE/HCH



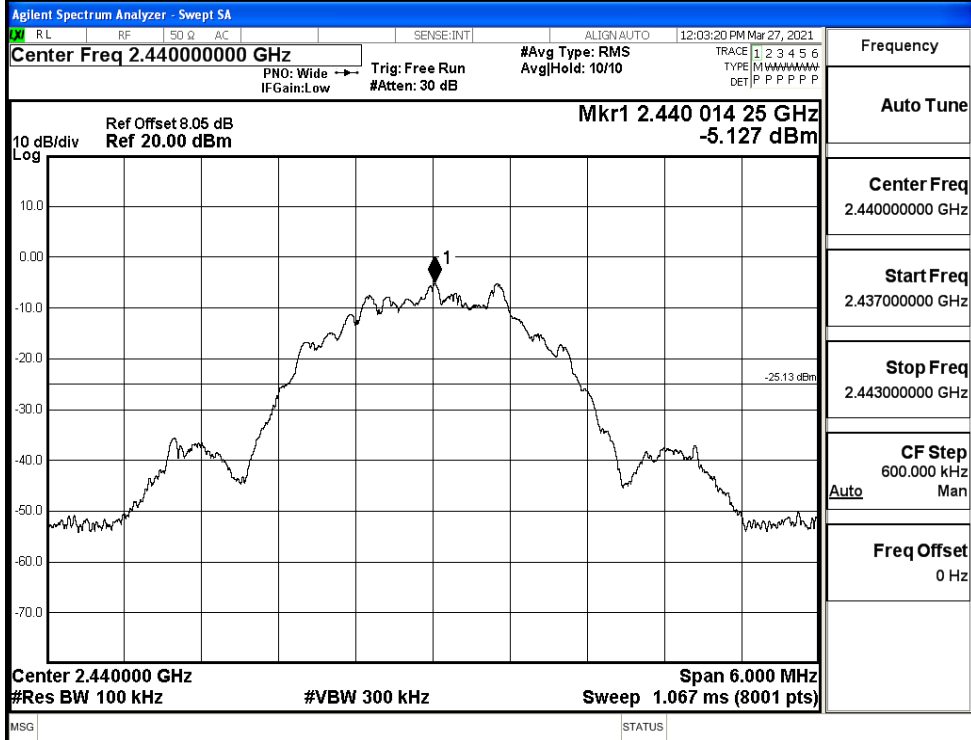
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT 2LE	LCH	-4.963	-38.124	-24.963	PASS
BT 2LE	MCH	-5.127	-32.635	-25.127	PASS
BT 2LE	HCH	-5.43	-38.158	-25.430	PASS

BT 2LE_LCH_Graphs

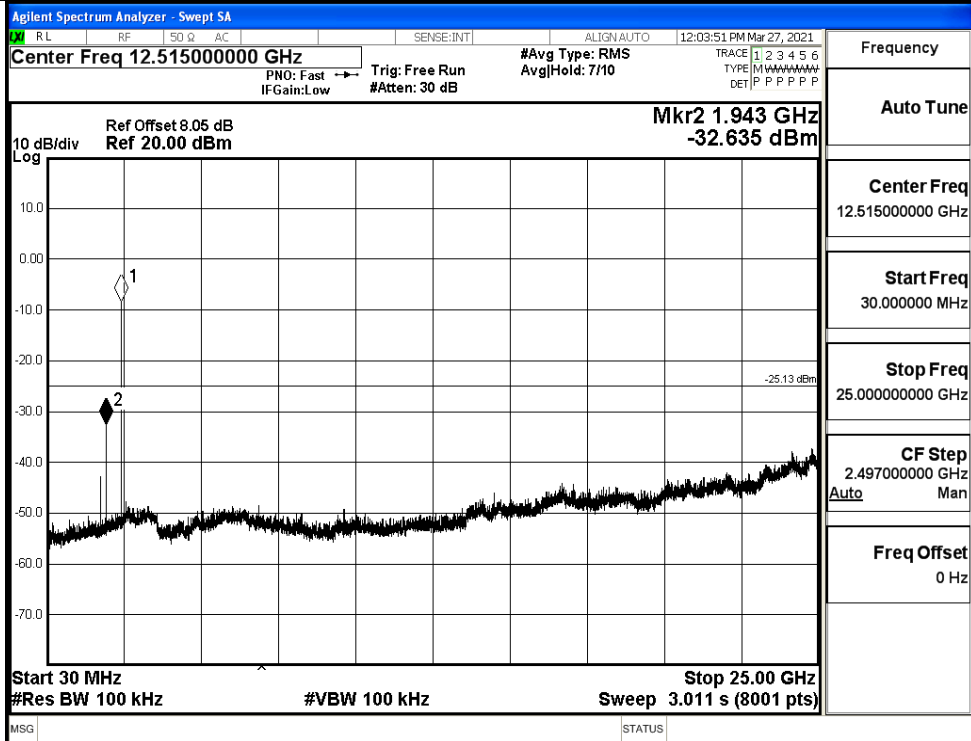


BT 2LE_MCH_Graphs

Pref/BT
2LE/MCH

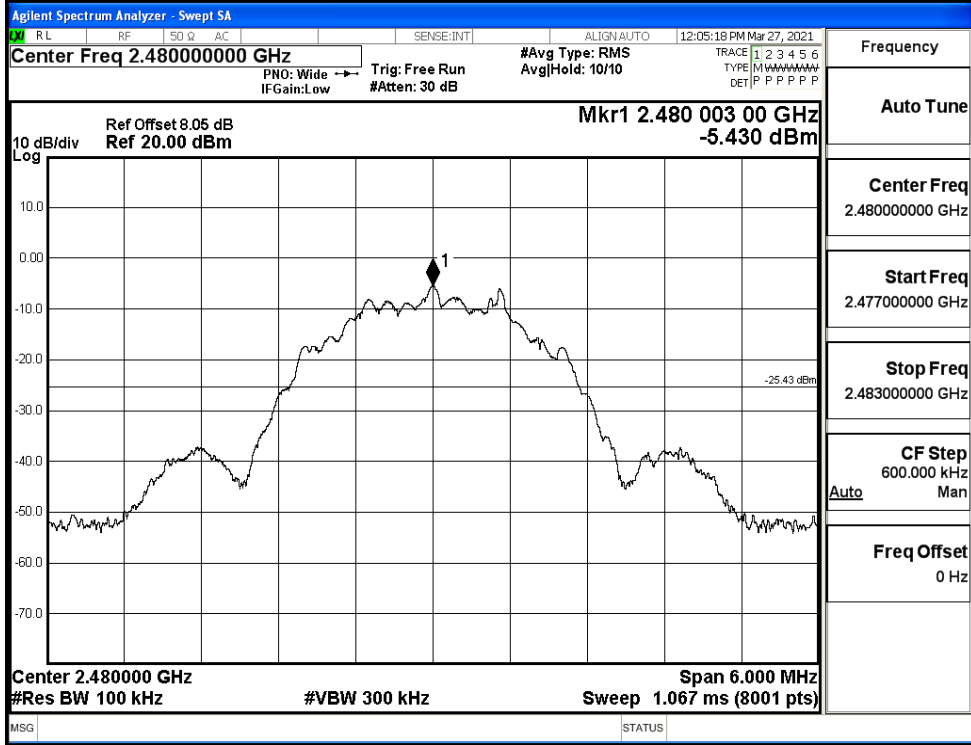


Puw/BT
2LE/MCH

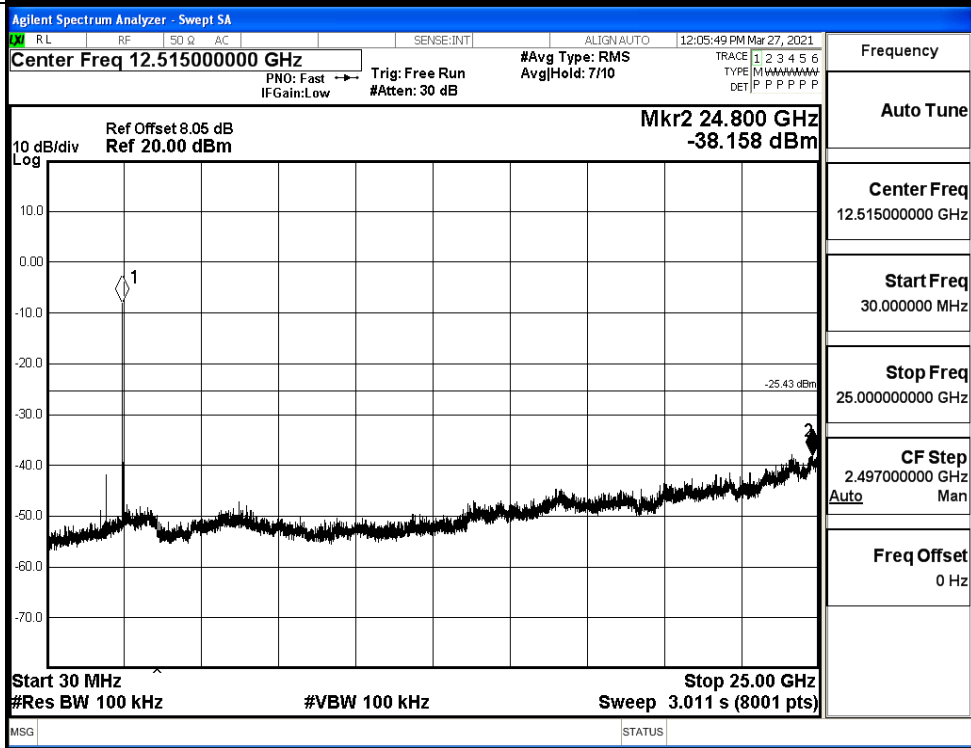


BT 2LE_HCH_Graphs

Pref/BT 2LE/HCH



Puw/BT 2LE/HCH



A.6 Band-edge for RF Conducted Emissions

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	-4.976	-49.739	-24.98	PASS
BT LE	HCH	-4.742	-49.100	-24.74	PASS

Test Graphs

LCH

Agilent Spectrum Analyzer - Swept SA
 Center Freq 2.35700000 GHz
 Mkr4 2.389 924 GHz -49.739 dBm
 Start 2.31000 GHz Stop 2.40400 GHz
 #Res BW 100 kHz #VBW 300 kHz Sweep 9.067 ms (8001 pts)

MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
N	f		2.402 261 GHz	-4.976 dBm			
N	f		2.400 000 GHz	-52.304 dBm			
N	f		2.390 000 GHz	-54.365 dBm			
N	f		2.389 924 GHz	-49.739 dBm			

Frequency

Auto Tune

Center Freq
2.35700000 GHz

Start Freq
2.31000000 GHz

Stop Freq
2.40400000 GHz

CF Step
9.400000 MHz

Freq Offset
0 Hz

HCH

Agilent Spectrum Analyzer - Swept SA
 Center Freq 2.48900000 GHz
 Mkr4 2.492 294 50 GHz -49.100 dBm
 Start 2.47800 GHz Stop 2.50000 GHz
 #Res BW 100 kHz #VBW 300 kHz Sweep 2.133 ms (8001 pts)

MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
N	f		2.480 255 00 GHz	-4.742 dBm			
N	f		2.483 500 00 GHz	-53.406 dBm			
N	f		2.500 000 00 GHz	-52.203 dBm			
N	f		2.492 294 50 GHz	-49.100 dBm			

Frequency

Auto Tune

Center Freq
2.48900000 GHz

Start Freq
2.47800000 GHz

Stop Freq
2.50000000 GHz

CF Step
2.200000 MHz

Freq Offset
0 Hz

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BT 2LE	LCH	-4.990	-49.478	-24.99	PASS
BT 2LE	HCH	-5.318	-49.563	-25.32	PASS

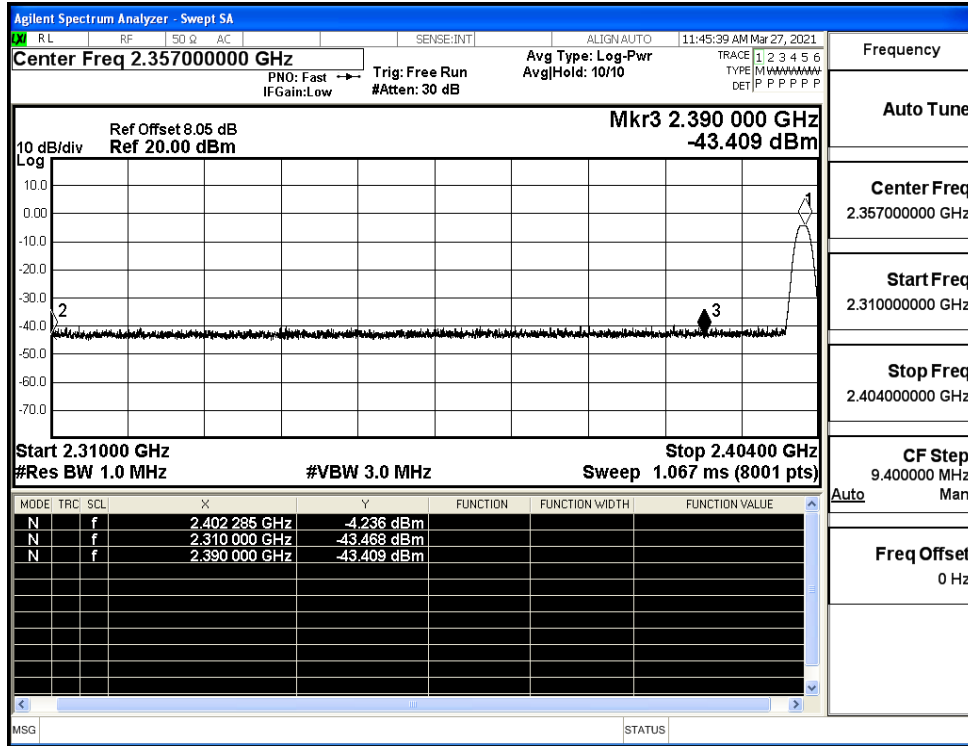
Test Graphs

LCH		<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.357000000 GHz</p> <p>Mkr4 2.381 217 GHz -49.478 dBm</p> <p>Start 2.31000 GHz #Res BW 100 kHz</p> <p>Stop 2.40400 GHz #VBW 300 kHz Sweep 9.067 ms (8001 pts)</p> <table border="1"> <thead> <tr> <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>N</td> <td>f</td> <td></td> <td>2.402 014 GHz</td> <td>-4.990 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>N</td> <td>f</td> <td></td> <td>2.400 000 GHz</td> <td>-36.402 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>N</td> <td>f</td> <td></td> <td>2.390 000 GHz</td> <td>-53.057 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>N</td> <td>f</td> <td></td> <td>2.381 217 GHz</td> <td>-49.478 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	N	f		2.402 014 GHz	-4.990 dBm				N	f		2.400 000 GHz	-36.402 dBm				N	f		2.390 000 GHz	-53.057 dBm				N	f		2.381 217 GHz	-49.478 dBm			
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<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.357000000 GHz</p> <p>Start Freq 2.310000000 GHz</p> <p>Stop Freq 2.404000000 GHz</p> <p>CF Step 9.400000 MHz</p> <p>Freq Offset 0 Hz</p>																																										
HCH		<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.489000000 GHz</p> <p>Mkr4 2.488 010 00 GHz -49.563 dBm</p> <p>Start 2.47800 GHz #Res BW 100 kHz</p> <p>Stop 2.50000 GHz #VBW 300 kHz Sweep 2.133 ms (8001 pts)</p> <table border="1"> <thead> <tr> <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>N</td> <td>f</td> <td></td> <td>2.480 002 00 GHz</td> <td>-5.318 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>N</td> <td>f</td> <td></td> <td>2.483 500 00 GHz</td> <td>-52.758 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>N</td> <td>f</td> <td></td> <td>2.500 000 00 GHz</td> <td>-52.435 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>N</td> <td>f</td> <td></td> <td>2.488 010 00 GHz</td> <td>-49.563 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	N	f		2.480 002 00 GHz	-5.318 dBm				N	f		2.483 500 00 GHz	-52.758 dBm				N	f		2.500 000 00 GHz	-52.435 dBm				N	f		2.488 010 00 GHz	-49.563 dBm			
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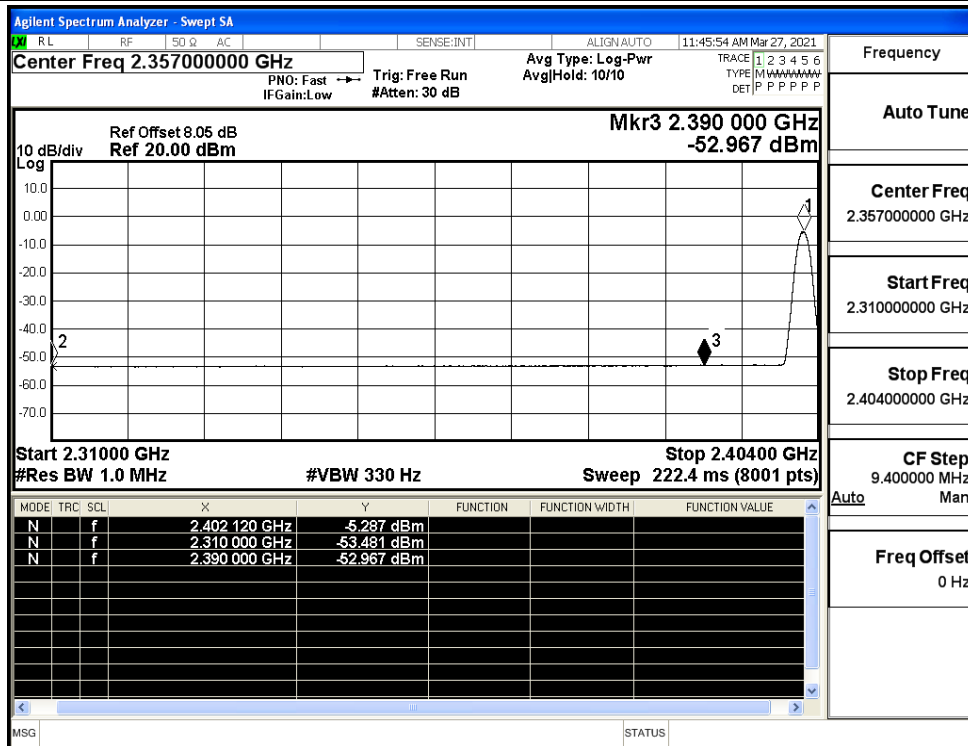
A.7 Restrict-band band-edge measurements

Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdi
BT LE	2402	Ant1	2310.0	-43.47	2.0	0	53.79	PEAK	74	PASS
		Ant1	2310.0	-53.48	2.0	0	43.78	AV	54	PASS
		Ant1	2390.0	-43.41	2.0	0	53.85	PEAK	74	PASS
		Ant1	2390.0	-52.97	2.0	0	44.29	AV	54	PASS
	2480	Ant1	2483.5	-43.01	2.0	0	54.25	PEAK	74	PASS
		Ant1	2483.5	-52.50	2.0	0	44.76	AV	54	PASS
		Ant1	2500.0	-40.75	2.0	0	56.51	PEAK	74	PASS
		Ant1	2500.0	-52.36	2.0	0	44.9	AV	54	PASS

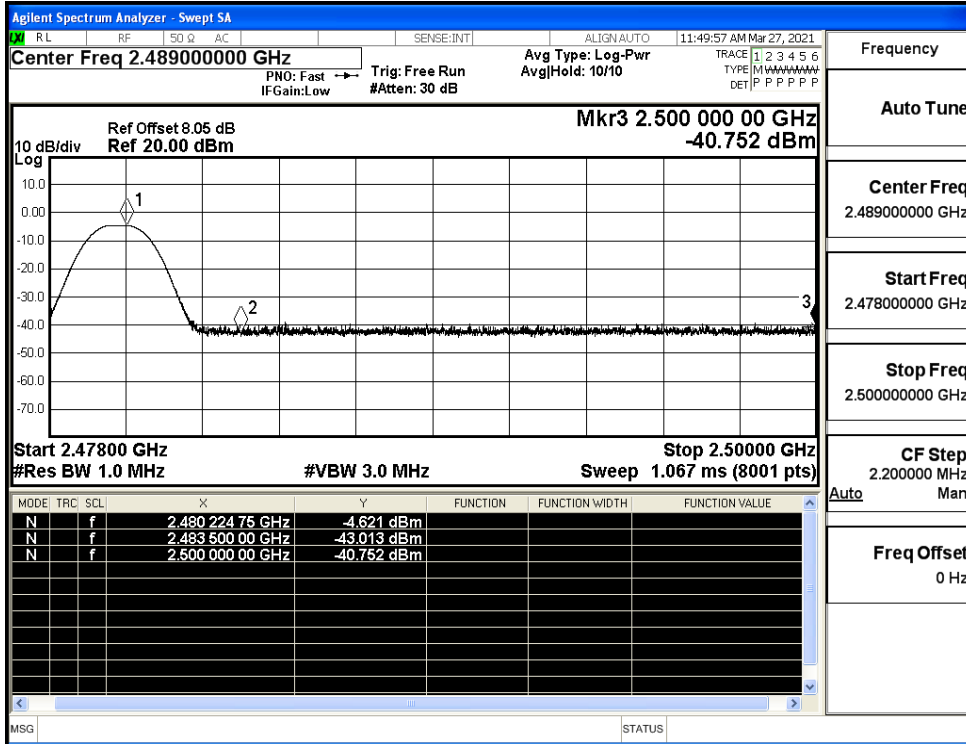
Restrict-band band-edge measurements_BT LE_2402_Ant1_PEAK



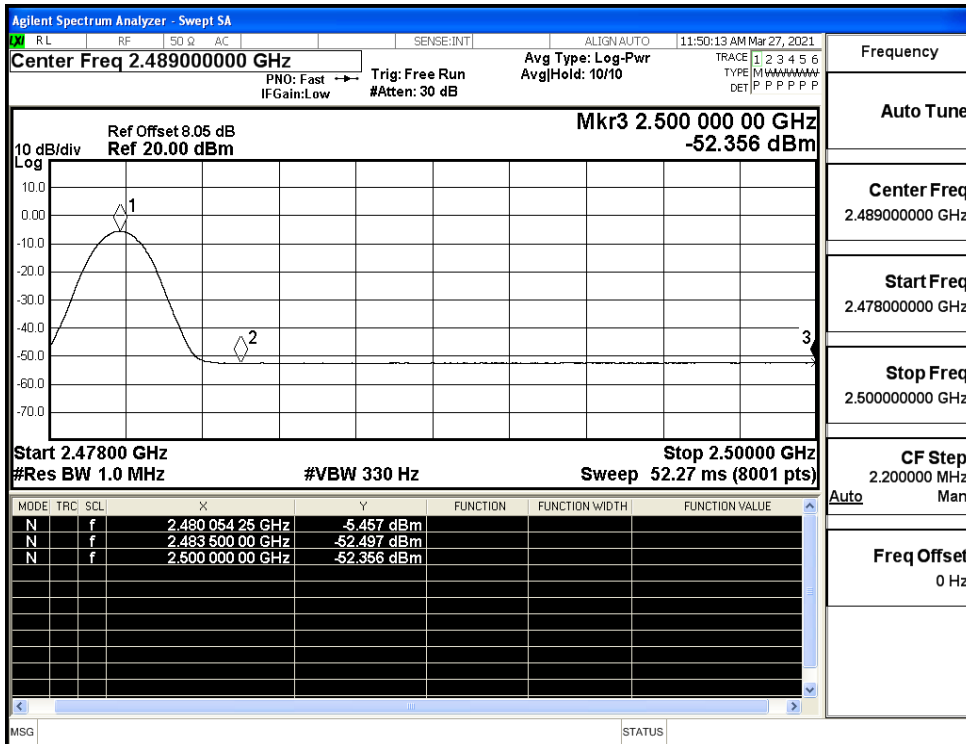
Restrict-band band-edge measurements_BT LE_2402_Ant1_AV



Restrict-band band-edge measurements_BT LE_2480_Ant1_PEAK

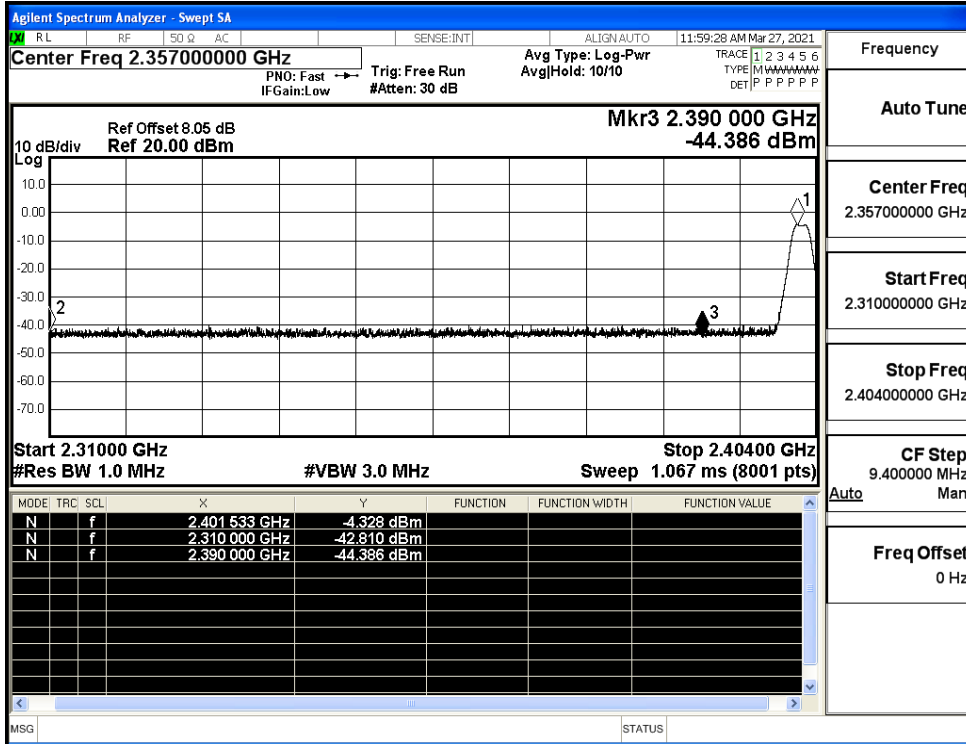


Restrict-band band-edge measurements_BT LE_2480_Ant1_AV

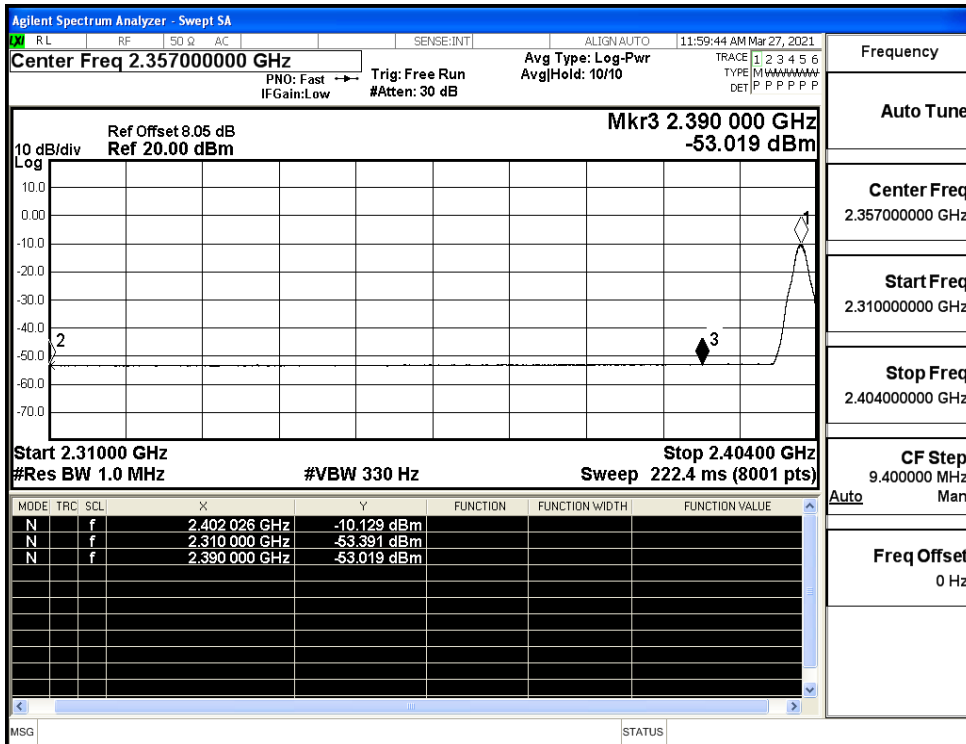


Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdi
BT 2LE	2402	Ant1	2310.0	-42.81	2.0	0	54.45	PEAK	74	PASS
		Ant1	2310.0	-53.39	2.0	0	43.87	AV	54	PASS
		Ant1	2390.0	-44.39	2.0	0	52.87	PEAK	74	PASS
		Ant1	2390.0	-53.02	2.0	0	44.24	AV	54	PASS
	2480	Ant1	2483.5	-40.20	2.0	0	57.06	PEAK	74	PASS
		Ant1	2483.5	-52.44	2.0	0	44.82	AV	54	PASS
		Ant1	2500.0	-42.46	2.0	0	54.8	PEAK	74	PASS
		Ant1	2500.0	-52.41	2.0	0	44.85	AV	54	PASS

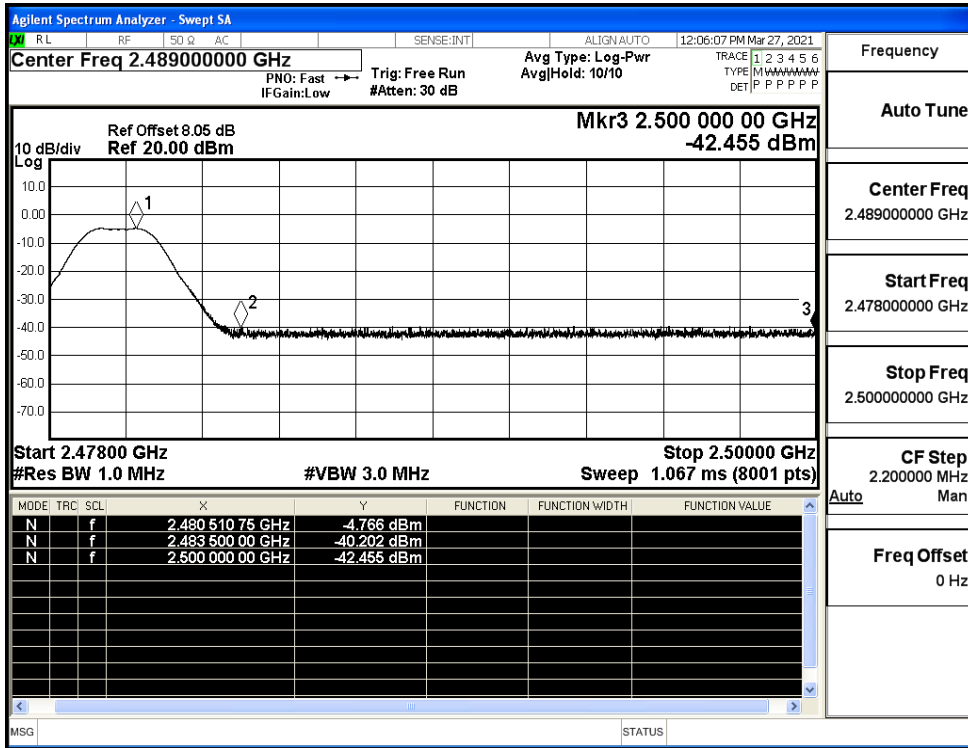
Restrict-band band-edge measurements_BT 2LE_2402_Ant1_PEAK



Restrict-band band-edge measurements_BT 2LE_2402_Ant1_AV



Restrict-band band-edge measurements_BT 2LE_2480_Ant1_PEAK



Restrict-band band-edge measurements_BT 2LE_2480_Ant1_AV

