

Appendix B

RF Test Data for BLE V4.2 (Conducted Measurement)

Product Name: LED bluetooth controller

Trade Mark: N/A

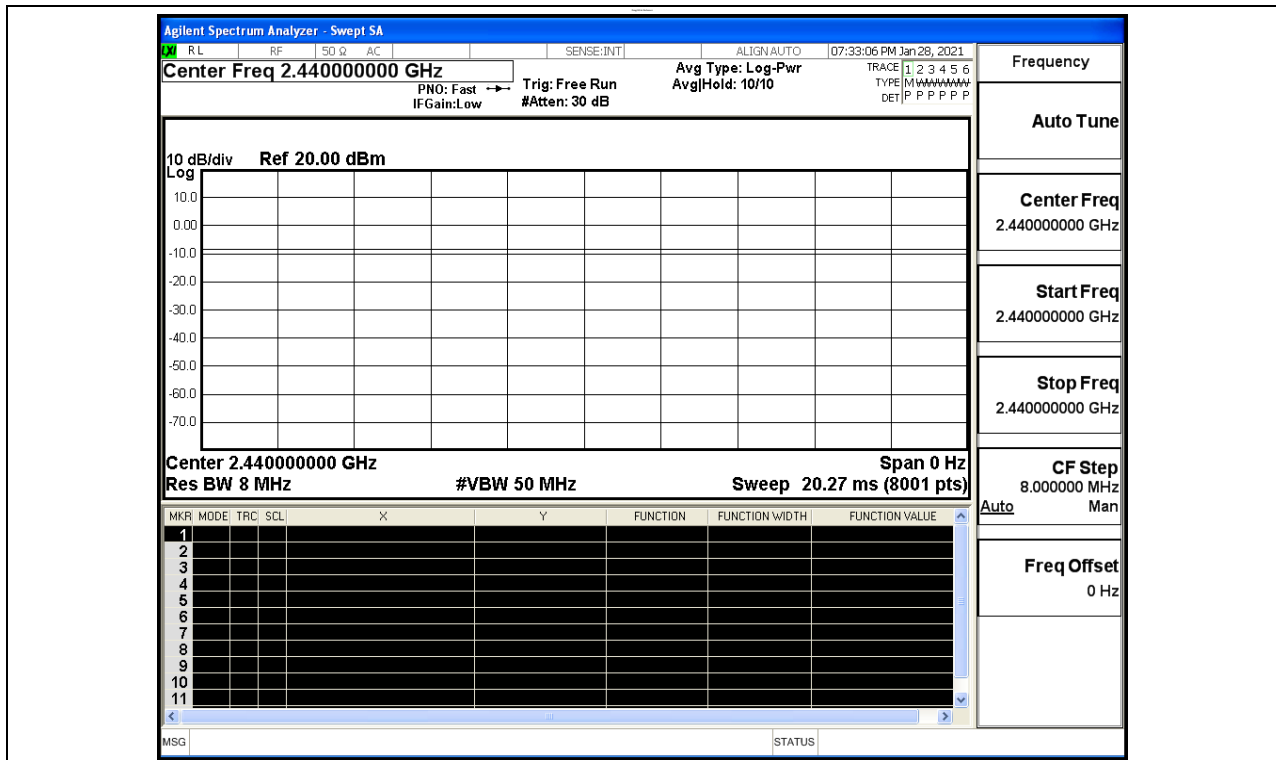
Test Model: 30MAC864WB

Environmental Conditions

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

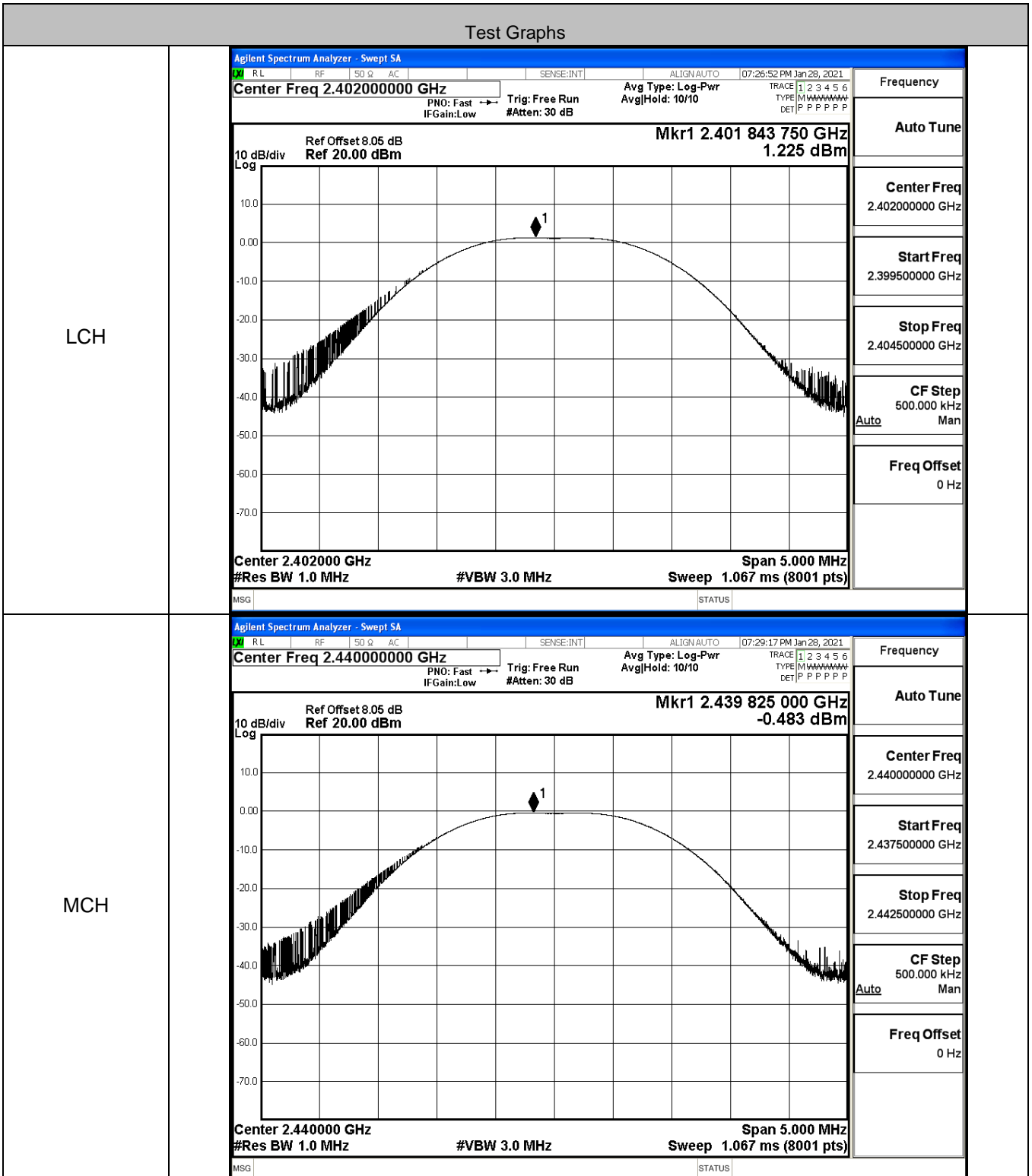
B.1 Duty Cycle

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



B.2 Maximum Conducted Peak Output Power

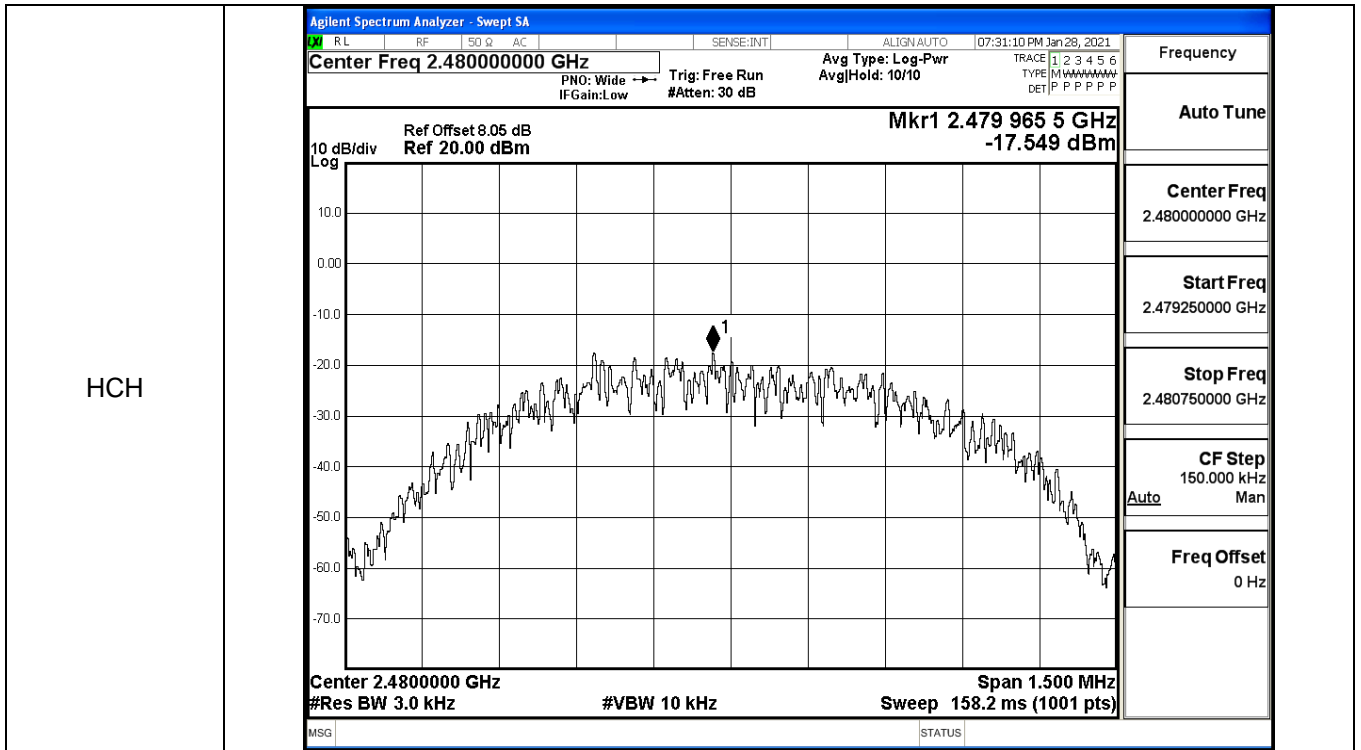
Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
BT LE	LCH	1.225	30	PASS
BT LE	MCH	-0.483	30	PASS
BT LE	HCH	-2.481	30	PASS



B.3 Maximum Power Spectral Density

Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT LE	LCH	-13.833	8	PASS
BT LE	MCH	-15.621	8	PASS
BT LE	HCH	-17.549	8	PASS

Test Graphs	
LCH	<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: small; margin: 0;">Agilent Spectrum Analyzer - Swept SA</p> <p style="font-size: x-small; margin: 0;">RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 07:27:05 PM Jan 28, 2021</p> <p style="font-size: small; margin: 0;">Center Freq 2.40200000 GHz Avg Type: Log-Pwr TRACE 1 2 3 4 5 6</p> <p style="font-size: x-small; margin: 0;">PNO: Wide → Trig: Free Run AvgHold: 10/10 TYPE M W W W W W W W</p> <p style="font-size: x-small; margin: 0;">IFGain: Low #Atten: 30 dB DET P P P P P P</p> <div style="display: flex; justify-content: space-between; font-size: small;"> <div>Ref Offset 8.05 dB Ref 20.00 dBm</div> <div>Mkr1 2.401 734 5 GHz -13.833 dBm</div> </div> <div style="display: flex; justify-content: space-between; font-size: x-small; margin-top: 5px;"> <div>Center 2.4020000 GHz #Res BW 3.0 kHz</div> <div>#VBW 10 kHz</div> <div>Span 1.500 MHz Sweep 158.2 ms (1001 pts)</div> </div> <p style="font-size: x-small; margin: 0;">MSG STATUS</p> </div>
MCH	<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: small; margin: 0;">Agilent Spectrum Analyzer - Swept SA</p> <p style="font-size: x-small; margin: 0;">RL RF 50 Ω AC SENSE:INT ALIGN: AUTO 07:29:30 PM Jan 28, 2021</p> <p style="font-size: small; margin: 0;">Center Freq 2.44000000 GHz Avg Type: Log-Pwr TRACE 1 2 3 4 5 6</p> <p style="font-size: x-small; margin: 0;">PNO: Wide → Trig: Free Run AvgHold: 10/10 TYPE M W W W W W W W</p> <p style="font-size: x-small; margin: 0;">IFGain: Low #Atten: 30 dB DET P P P P P P</p> <div style="display: flex; justify-content: space-between; font-size: small;"> <div>Ref Offset 8.05 dB Ref 20.00 dBm</div> <div>Mkr1 2.439 734 5 GHz -15.621 dBm</div> </div> <div style="display: flex; justify-content: space-between; font-size: x-small; margin-top: 5px;"> <div>Center 2.4400000 GHz #Res BW 3.0 kHz</div> <div>#VBW 10 kHz</div> <div>Span 1.500 MHz Sweep 158.2 ms (1001 pts)</div> </div> <p style="font-size: x-small; margin: 0;">MSG STATUS</p> </div>

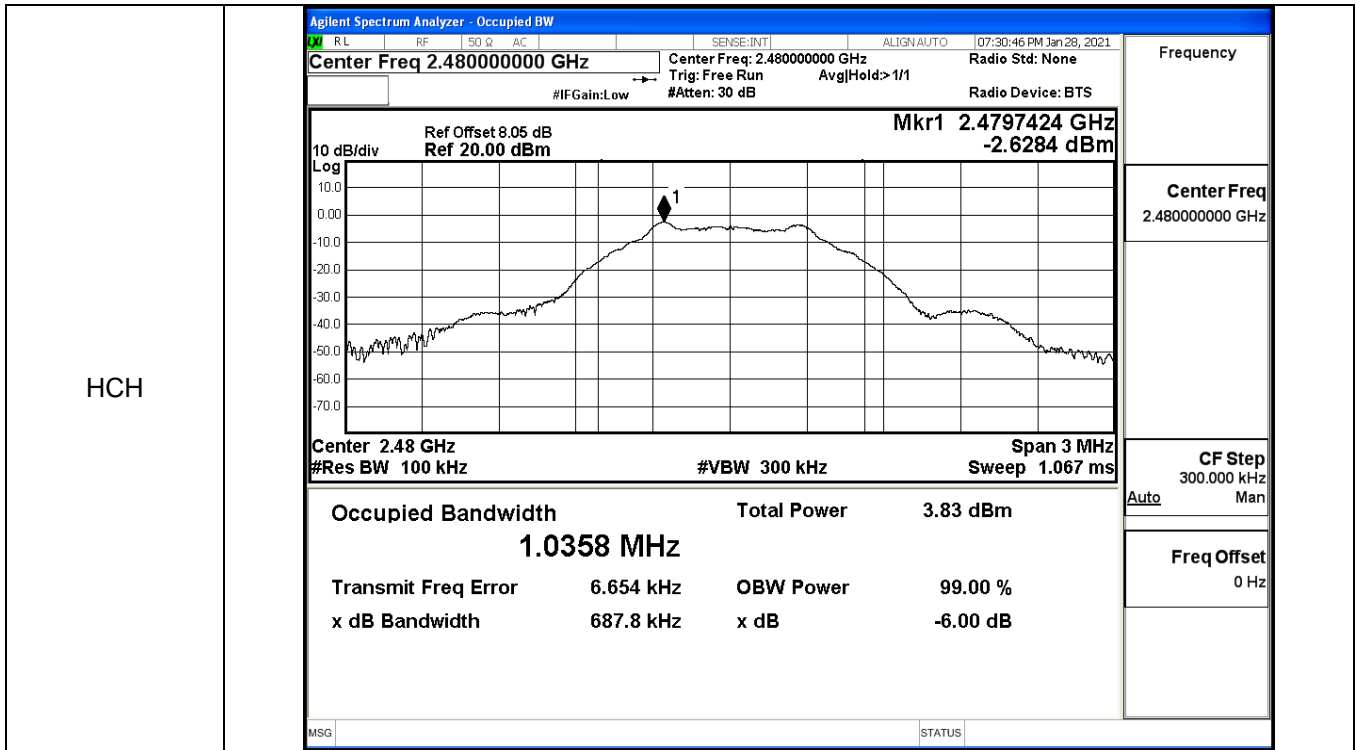


B.4 6dB Bandwidth

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT LE	LCH	0.6908	≥0.5	PASS
BT LE	MCH	0.6942	≥0.5	PASS
BT LE	HCH	0.6878	≥0.5	PASS

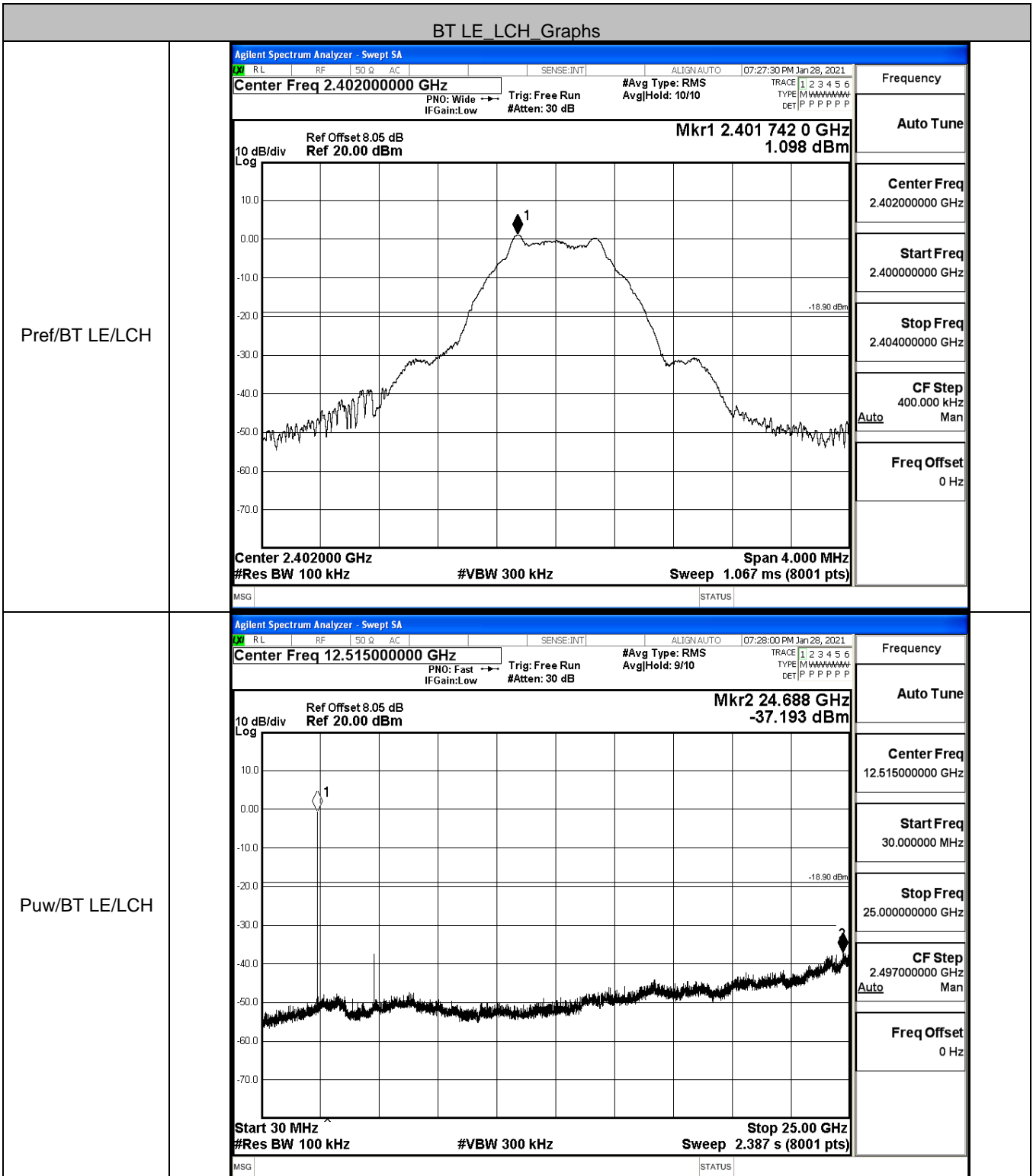
Test Graphs

LCH	<p>Agilent Spectrum Analyzer - Occupied BW Center Freq 2.40200000 GHz Mkr1 2.4017413 GHz 1.0867 dBm Occupied Bandwidth 1.0348 MHz Total Power 7.58 dBm Transmit Freq Error 6.558 kHz x dB Bandwidth 690.8 kHz</p>	Frequency 2.40200000 GHz CF Step 300.000 kHz Freq Offset 0 Hz
	<p>Agilent Spectrum Analyzer - Occupied BW Center Freq 2.44000000 GHz Mkr1 2.4397409 GHz -0.62733 dBm Occupied Bandwidth 1.0361 MHz Total Power 5.84 dBm Transmit Freq Error 6.977 kHz x dB Bandwidth 694.2 kHz</p>	Frequency 2.44000000 GHz CF Step 300.000 kHz Freq Offset 0 Hz



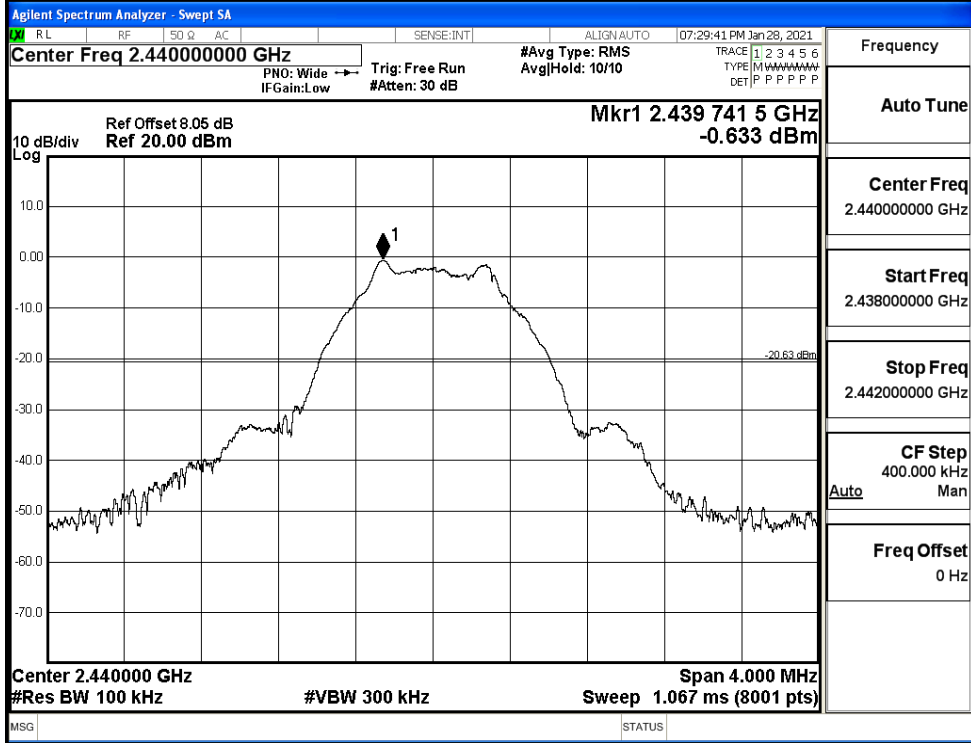
B.5 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	1.098	-37.193	-18.902	PASS
BT LE	MCH	-0.633	-36.878	-20.633	PASS
BT LE	HCH	-2.637	-37.007	-22.637	PASS

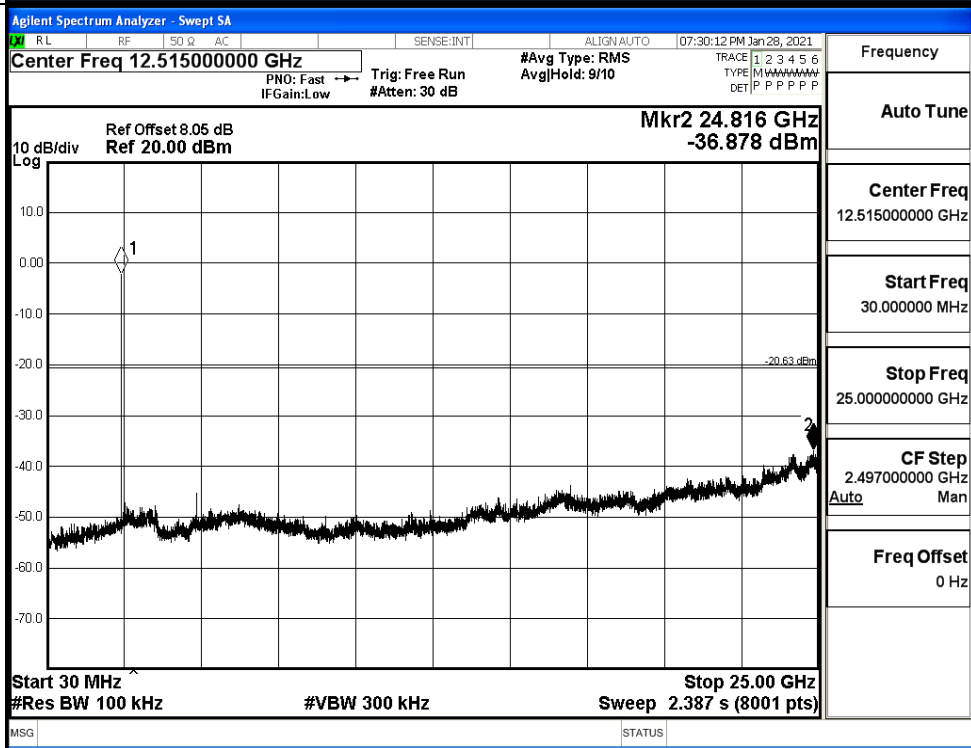


BT LE_MCH_Graphs

Pref/BT LE/MCH

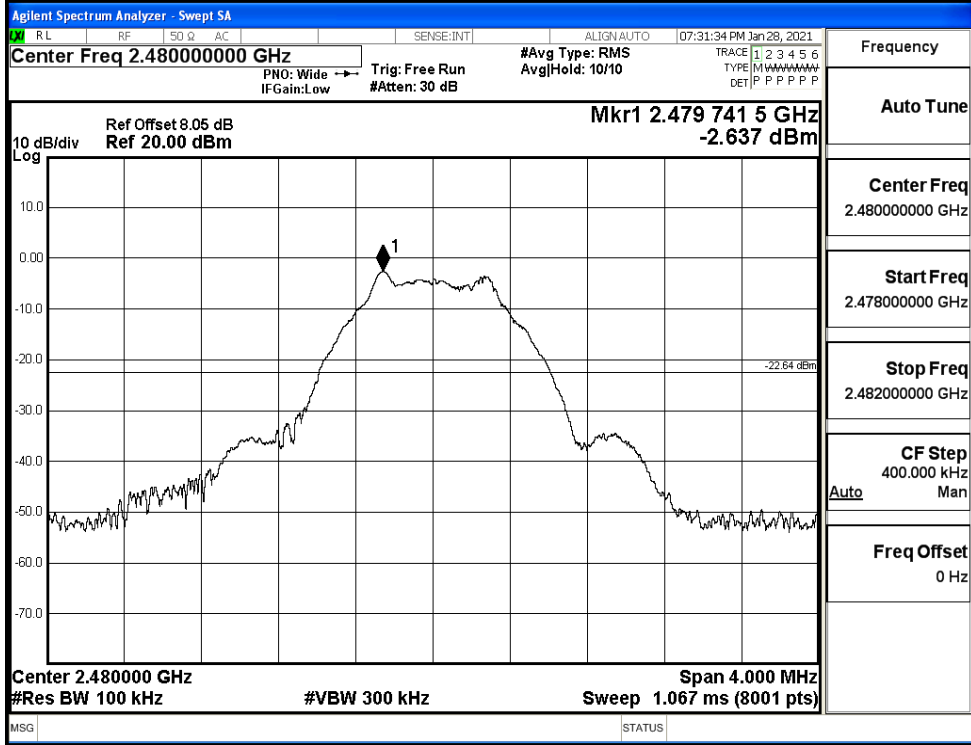


Puw/BT LE/MCH

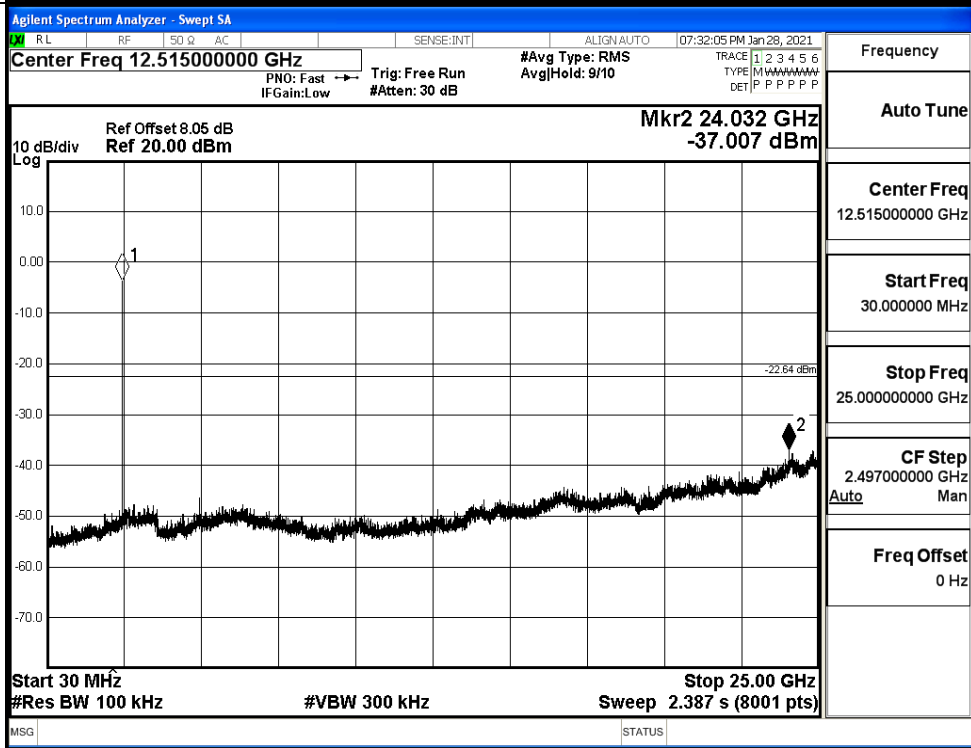


BT LE_HCH_Graphs

Pref/BT LE/HCH



Puw/BT LE/HCH



B.6 Band-edge for RF Conducted Emissions

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	1.099	-49.458	-18.9	PASS
BT LE	HCH	-2.636	-49.401	-22.64	PASS

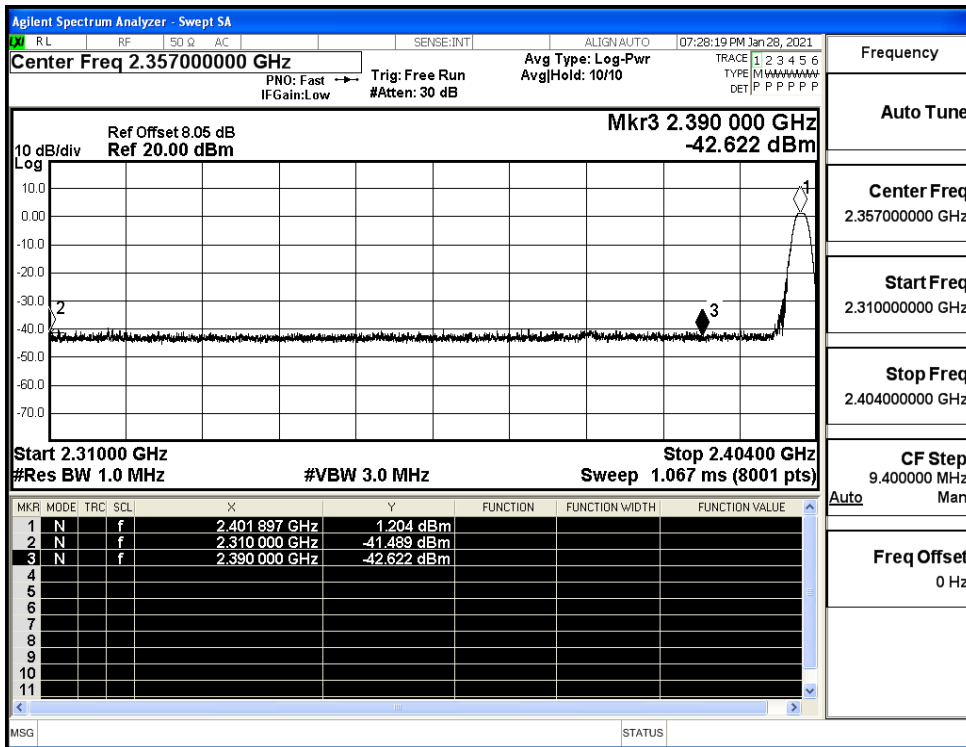
Test Graphs

LCH	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.35700000 GHz Max Spurious Level -49.458 dBm Mkr4 2.376 200 GHz -49.458 dBm Start 2.31000 GHz Stop 2.40400 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 9.067 ms (8001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <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>N</td><td>f</td><td></td><td>2.401 744 GHz</td><td>1.099 dBm</td><td></td><td></td><td></td></tr> <tr><td>2</td><td>N</td><td>f</td><td></td><td>2.400 000 GHz</td><td>-48.873 dBm</td><td></td><td></td><td></td></tr> <tr><td>3</td><td>N</td><td>f</td><td></td><td>2.390 000 GHz</td><td>-53.762 dBm</td><td></td><td></td><td></td></tr> <tr><td>4</td><td>N</td><td>f</td><td></td><td>2.376 200 GHz</td><td>-49.458 dBm</td><td></td><td></td><td></td></tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	f		2.401 744 GHz	1.099 dBm				2	N	f		2.400 000 GHz	-48.873 dBm				3	N	f		2.390 000 GHz	-53.762 dBm				4	N	f		2.376 200 GHz	-49.458 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
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																																							
1	N	f		2.401 744 GHz	1.099 dBm																																										
2	N	f		2.400 000 GHz	-48.873 dBm																																										
3	N	f		2.390 000 GHz	-53.762 dBm																																										
4	N	f		2.376 200 GHz	-49.458 dBm																																										
HCH	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.48900000 GHz Max Spurious Level -49.401 dBm Mkr4 2.497 299 50 GHz -49.401 dBm Start 2.47800 GHz Stop 2.50000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.133 ms (8001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <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>N</td><td>f</td><td></td><td>2.479 746 25 GHz</td><td>-2.636 dBm</td><td></td><td></td><td></td></tr> <tr><td>2</td><td>N</td><td>f</td><td></td><td>2.483 500 00 GHz</td><td>-52.064 dBm</td><td></td><td></td><td></td></tr> <tr><td>3</td><td>N</td><td>f</td><td></td><td>2.500 000 00 GHz</td><td>-52.226 dBm</td><td></td><td></td><td></td></tr> <tr><td>4</td><td>N</td><td>f</td><td></td><td>2.497 299 50 GHz</td><td>-49.401 dBm</td><td></td><td></td><td></td></tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	f		2.479 746 25 GHz	-2.636 dBm				2	N	f		2.483 500 00 GHz	-52.064 dBm				3	N	f		2.500 000 00 GHz	-52.226 dBm				4	N	f		2.497 299 50 GHz	-49.401 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
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																																							
1	N	f		2.479 746 25 GHz	-2.636 dBm																																										
2	N	f		2.483 500 00 GHz	-52.064 dBm																																										
3	N	f		2.500 000 00 GHz	-52.226 dBm																																										
4	N	f		2.497 299 50 GHz	-49.401 dBm																																										

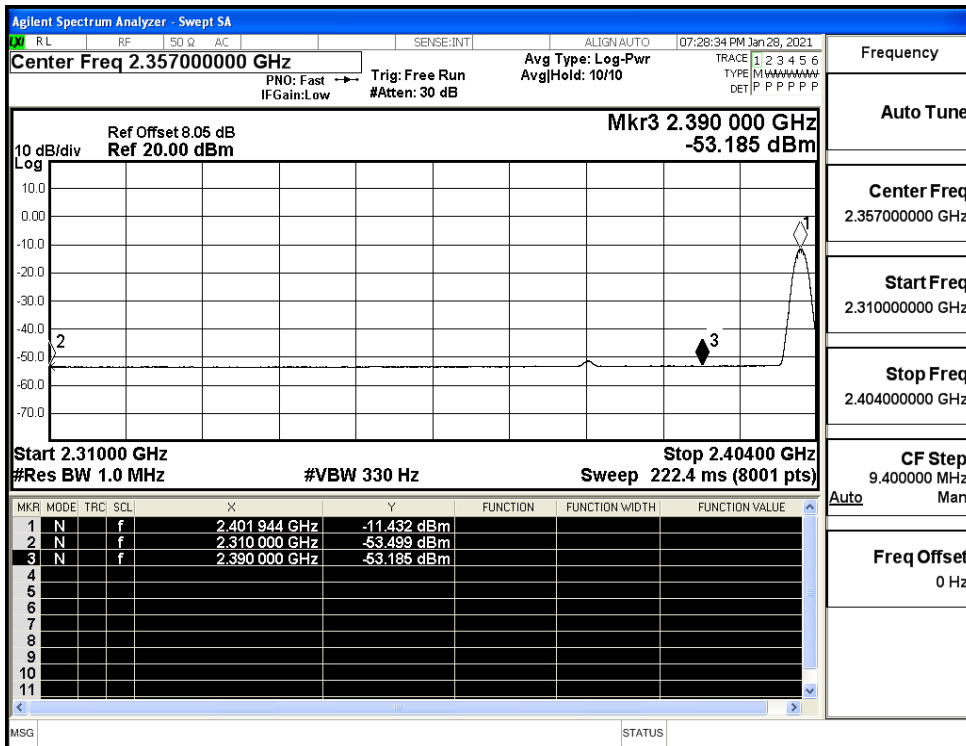
B.7 Restrict-band band-edge measurements

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	-41.49	2.0	0	55.77	PEAK	74	PASS
		Ant1	2310.0	-53.50	2.0	0	43.76	AV	54	PASS
		Ant1	2390.0	-42.62	2.0	0	54.64	PEAK	74	PASS
		Ant1	2390.0	-53.19	2.0	0	44.07	AV	54	PASS
	2480	Ant1	2483.5	-43.77	2.0	0	53.49	PEAK	74	PASS
		Ant1	2483.5	-52.73	2.0	0	44.53	AV	54	PASS
		Ant1	2500.0	-41.63	2.0	0	55.63	PEAK	74	PASS
		Ant1	2500.0	-52.45	2.0	0	44.80	AV	54	PASS

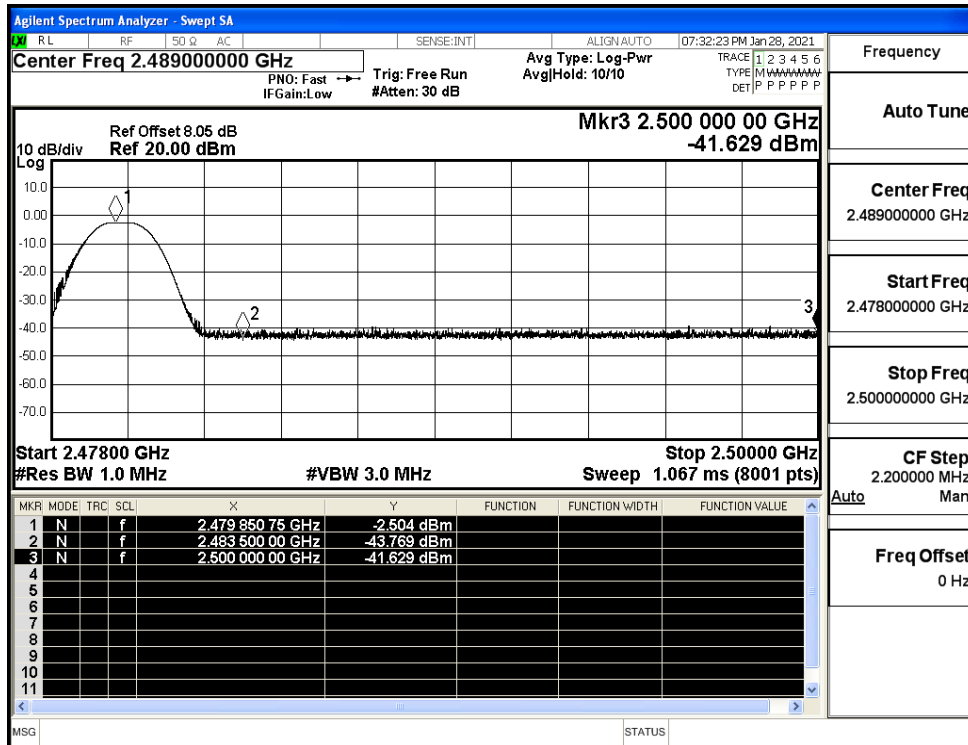
Restrict-band band-edge measurements_BT LE_2402_Ant1_PEAK



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

