

## Appendix A

### RF Test Data for BT LE V4.0 (Conducted Measurement)

Product Name: RGB LED CONTROLLER

Trade Mark: DS18

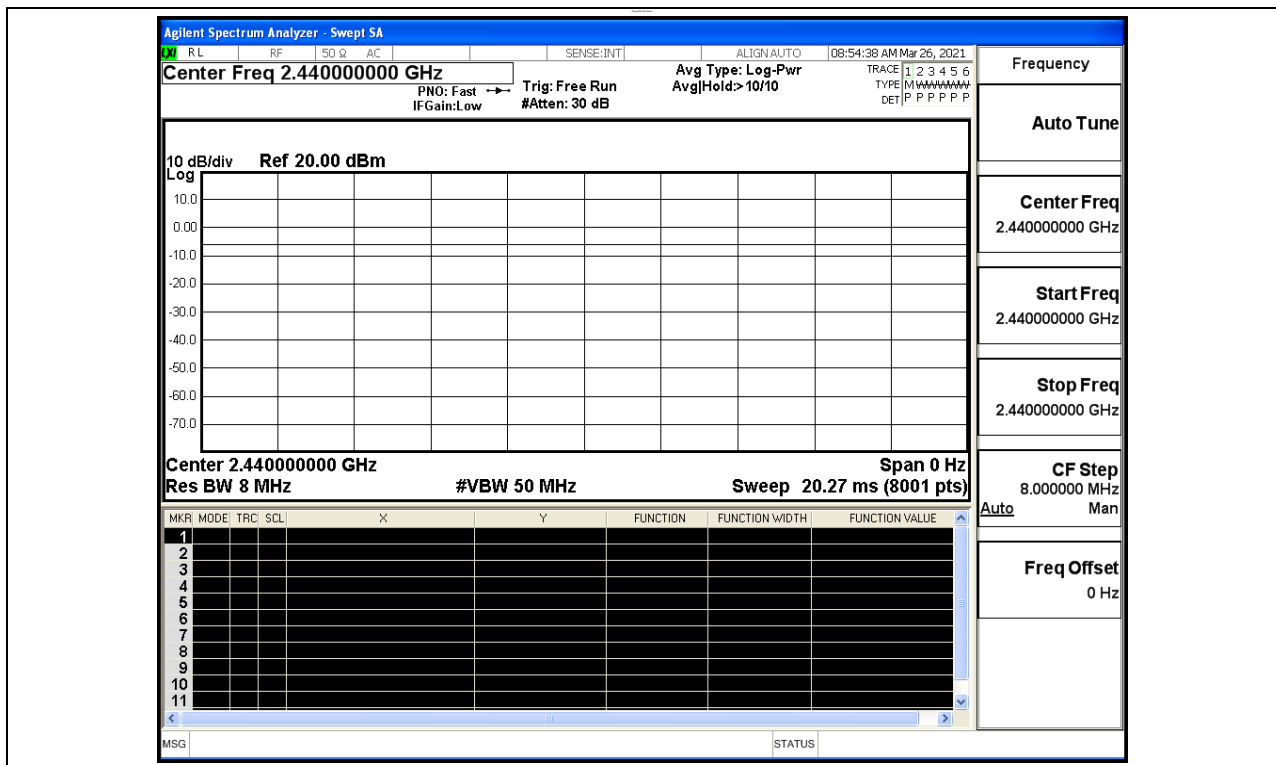
Test Model: LED-BTC

#### Environmental Conditions

Temperature:	21.4 °C
Relative Humidity:	51.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Carl Fu
Supervised by:	Li Huan

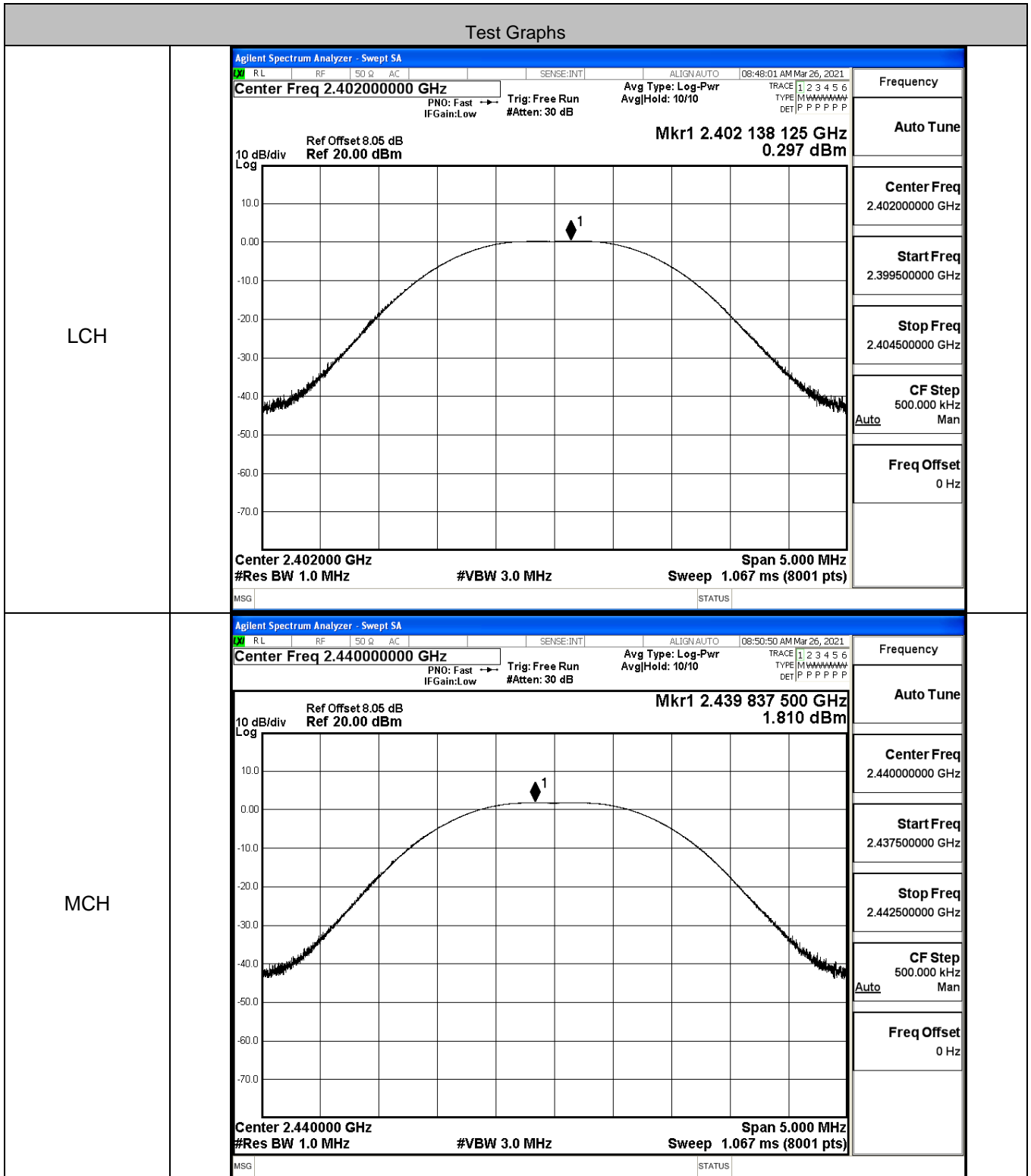
#### A.1 Duty Cycle

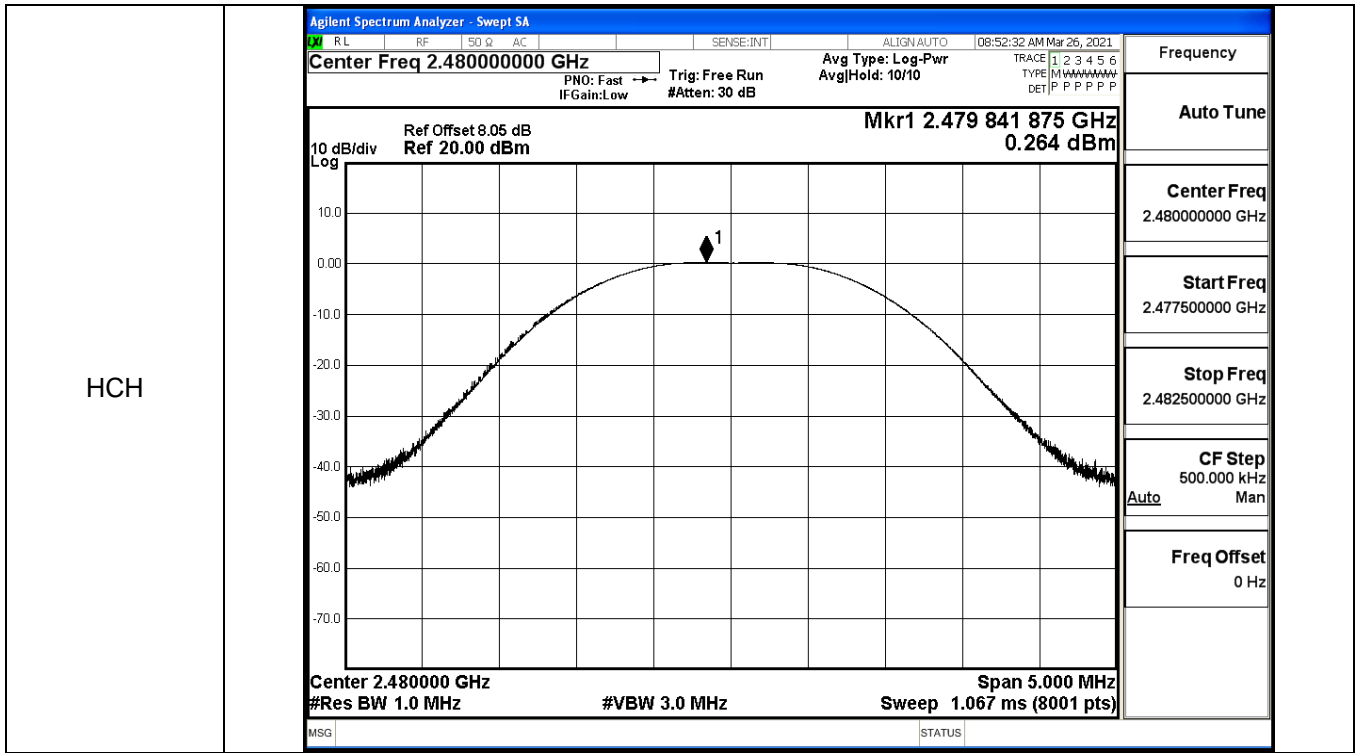
Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
BT LE	2440	Ant1	100	PASS



### A.2 Maximum Conducted Peak Output Power

Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
BT LE	LCH	0.297	30	PASS
BT LE	MCH	1.81	30	PASS
BT LE	HCH	0.264	30	PASS

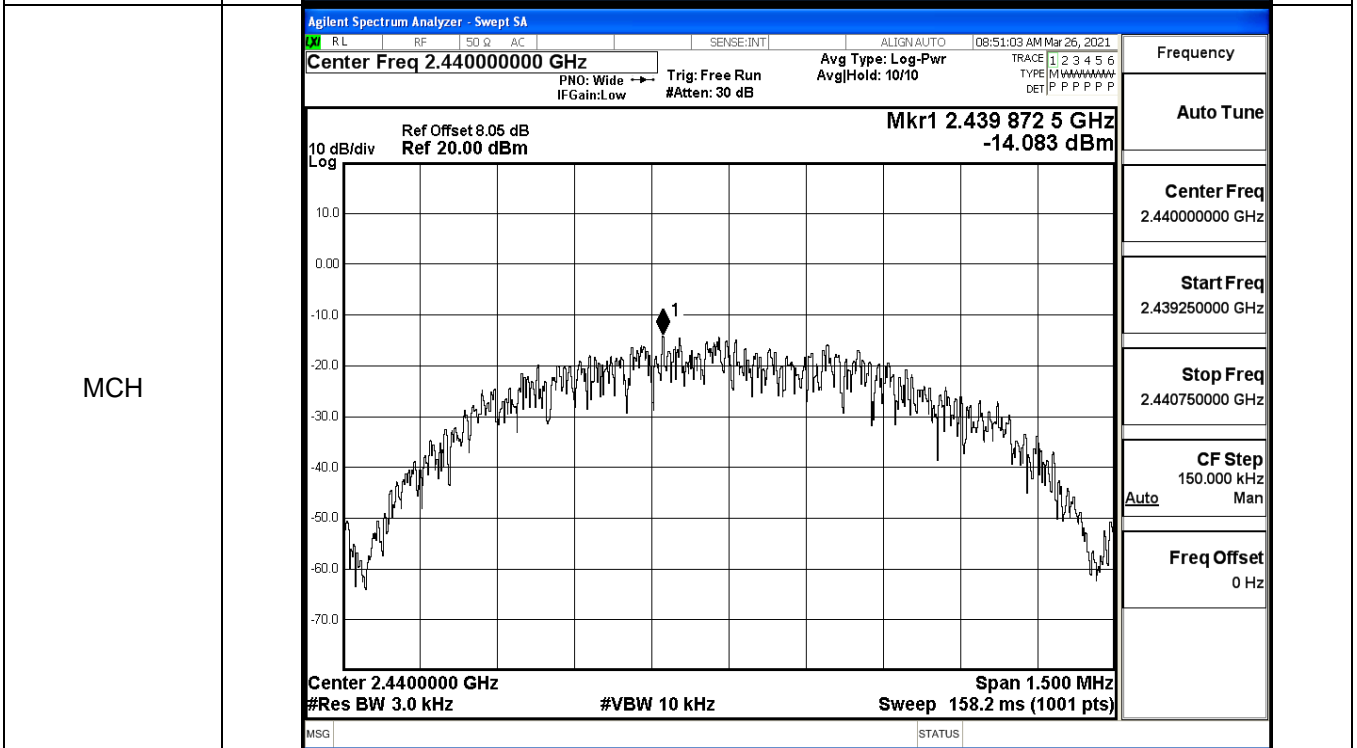
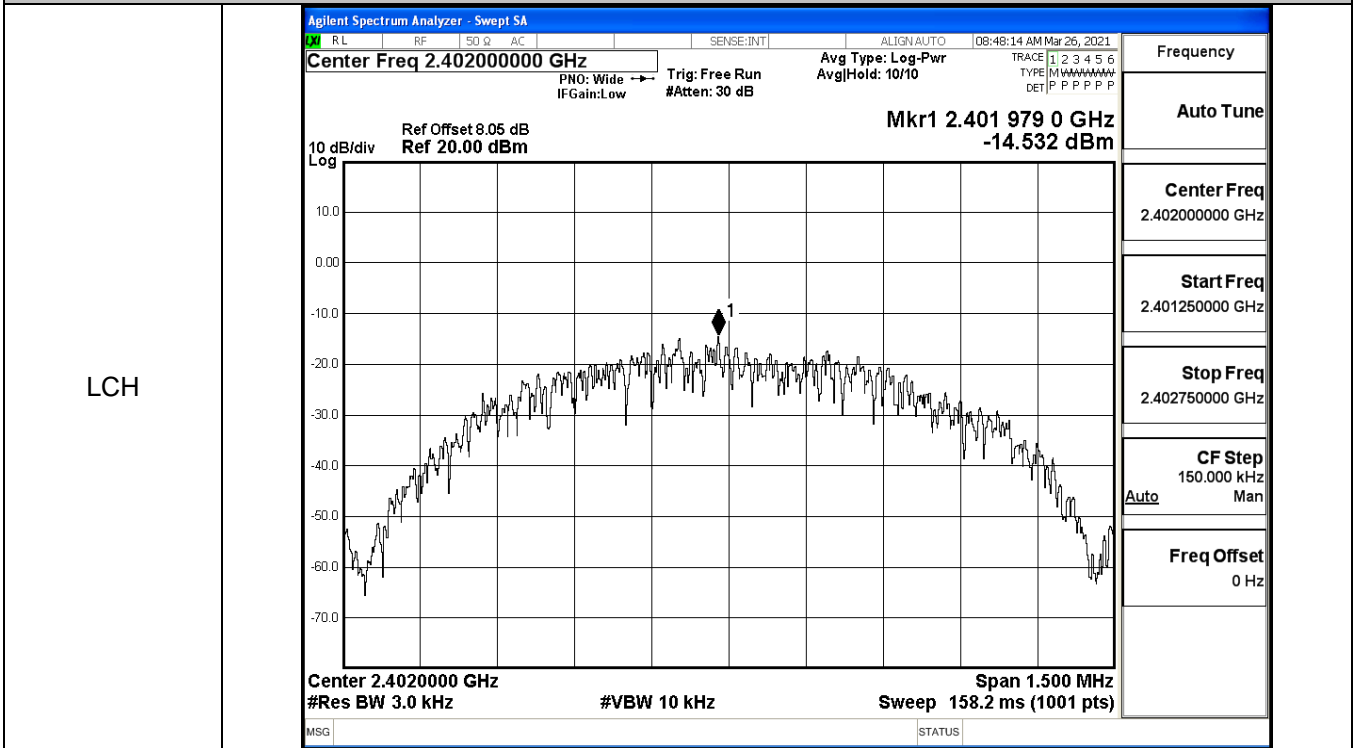


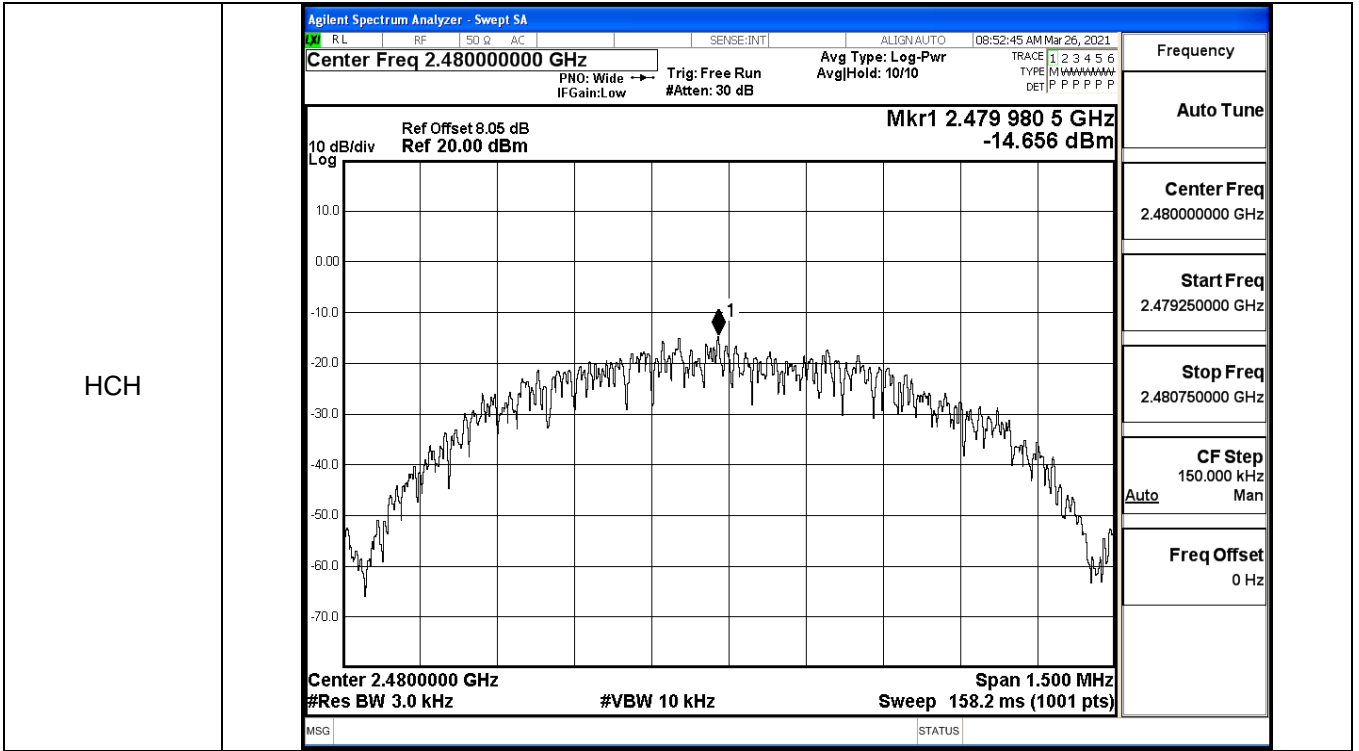


### A.3 Maximum Power Spectral Density

Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT LE	LCH	-14.532	8	PASS
BT LE	MCH	-14.083	8	PASS
BT LE	HCH	-14.656	8	PASS

#### Test Graphs

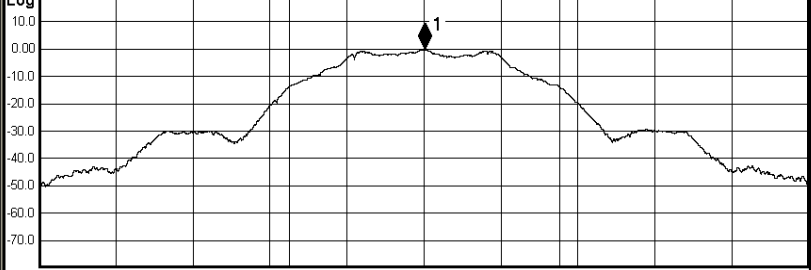




**A.4 6dB Bandwidth**

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT LE	LCH	0.6679	≥0.5	PASS
BT LE	MCH	0.6610	≥0.5	PASS
BT LE	HCH	0.6685	≥0.5	PASS

Test Graphs																													
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 RF 50 Ω AC SENSE:INT ALIGN:AUTO 08:47:50 AM Mar 26, 2021</p> <p style="font-size: small; margin: 0;">Center Freq 2.402000000 GHz Center Freq: 2.402000000 GHz Radio Std: None</p> <p style="font-size: x-small; margin: 0;">Trig: Free Run AvgHold&gt;1/1</p> <p style="font-size: x-small; margin: 0;">#IFGain:Low #Atten: 30 dB Radio Device: BTS</p> <div style="border: 1px solid black; padding: 2px;"> <p style="font-size: x-small; margin: 0;">10 dB/div Ref Offset 8.05 dB Mkr1 2.4020049 GHz</p> <p style="font-size: x-small; margin: 0;">Log Ref 20.00 dBm -0.25876 dBm</p> <p style="font-size: x-small; margin: 0;">Center 2.402 GHz Span 3 MHz</p> <p style="font-size: x-small; margin: 0;">#Res BW 100 kHz #VBW 300 kHz Sweep 1.067 ms</p> <table style="width: 100%; font-size: x-small; border-collapse: collapse;"> <tr> <td>Occupied Bandwidth</td> <td>Total Power</td> <td>6.51 dBm</td> </tr> <tr> <td style="text-align: center;"><b>1.0498 MHz</b></td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>7.093 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>667.9 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 style="font-size: x-small; margin: 0;">MSG STATUS</p> </div> </div> <table border="1" style="width: 100%; font-size: x-small; border-collapse: collapse;"> <tr> <td style="width: 50%;">Frequency</td> <td style="width: 50%;">Center Freq</td> </tr> <tr> <td></td> <td>2.402000000 GHz</td> </tr> <tr> <td>CF Step</td> <td>300.000 kHz</td> </tr> <tr> <td>Auto</td> <td>Man</td> </tr> <tr> <td>Freq Offset</td> <td>0 Hz</td> </tr> </table>	Occupied Bandwidth	Total Power	6.51 dBm	<b>1.0498 MHz</b>			Transmit Freq Error	7.093 kHz	OBW Power	x dB Bandwidth	667.9 kHz	x dB			99.00 %			-6.00 dB	Frequency	Center Freq		2.402000000 GHz	CF Step	300.000 kHz	Auto	Man	Freq Offset	0 Hz
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HCH	<b>Agilent Spectrum Analyzer - Occupied BW</b>	
	RL RF 50 Ω AC	SENSE:INT ALIGN:AUTO 08:52:21 AM Mar 26, 2021
	<b>Center Freq 2.480000000 GHz</b>	Center Freq: 2.480000000 GHz Trig: Free Run AvgHold: 1/1 Radio Std: None #IFGain:Low #Atten: 30 dB Radio Device: BTS
	10 dB/div Log	Ref Offset 8.05 dB Ref 20.00 dBm Mkr1 2.4800019 GHz -0.23404 dBm
	 <p>The plot shows a signal spectrum with a peak at 2.48 GHz. The y-axis is labeled 'Log' and ranges from -70.0 to 10.0 dB/div. The x-axis represents frequency. A marker 'Mkr1' is placed at the peak of the signal.</p>	
Center 2.48 GHz #Res BW 100 kHz #VBW 300 kHz Span 3 MHz Sweep 1.067 ms		
<b>Occupied Bandwidth 1.0473 MHz</b>		
Total Power 6.52 dBm		
Transmit Freq Error 4.086 kHz OBW Power 99.00 %		
x dB Bandwidth 668.5 kHz x dB -6.00 dB		
MSG	STATUS	

Frequency
Center Freq 2.480000000 GHz
CF Step 300.000 kHz Auto Man
Freq Offset 0 Hz

### A.6 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	-0.257	-37.906	-20.257	PASS
BT LE	MCH	1.253	-37.468	-18.747	PASS
BT LE	HCH	-0.274	-37.542	-20.274	PASS

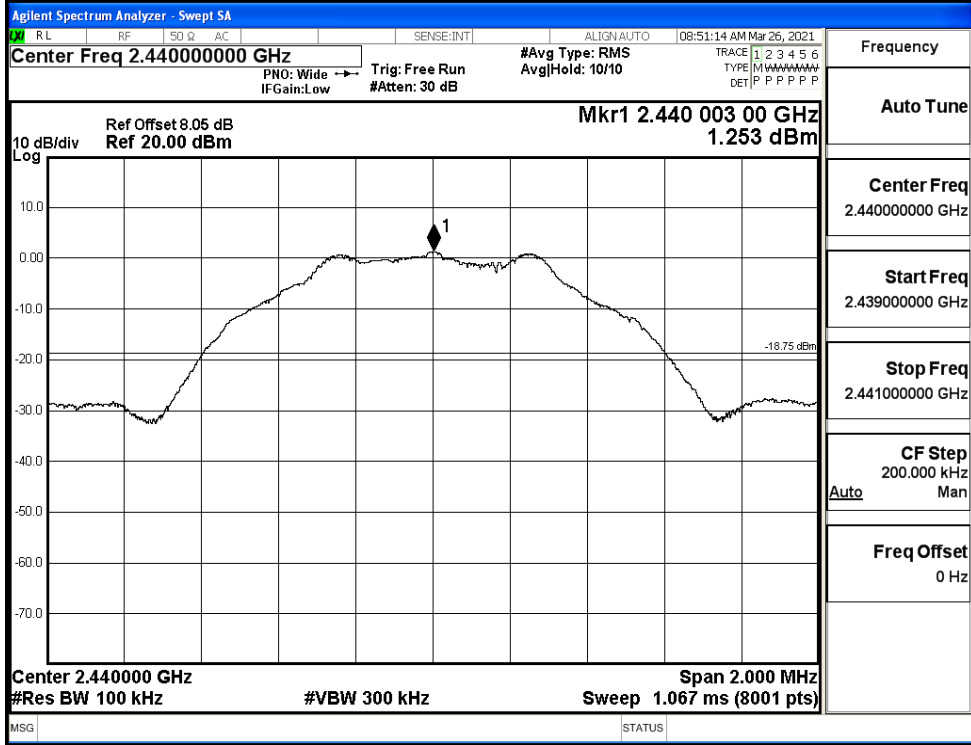
**BT LE\_LCH\_Graphs**

Pref/BT LE/LCH	<p>Agilent Spectrum Analyzer - Swept SA                  Center Freq 2.40200000 GHz                  Ref Offset 8.05 dB                  Ref 20.00 dBm                  Mkr1 2.401 999 75 GHz                  -0.257 dBm                  Center 2.402000 GHz                  #Res BW 100 kHz                  #VBW 300 kHz                  Sweep 1.067 ms (8001 pts)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Frequency</td></tr> <tr><td>Auto Tune</td></tr> <tr><td>Center Freq 2.402000000 GHz</td></tr> <tr><td>Start Freq 2.401000000 GHz</td></tr> <tr><td>Stop Freq 2.403000000 GHz</td></tr> <tr><td>CF Step 200.000 kHz Auto Man</td></tr> <tr><td>Freq Offset 0 Hz</td></tr> </table>	Frequency	Auto Tune	Center Freq 2.402000000 GHz	Start Freq 2.401000000 GHz	Stop Freq 2.403000000 GHz	CF Step 200.000 kHz Auto Man	Freq Offset 0 Hz
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CF Step 200.000 kHz Auto Man									
Freq Offset 0 Hz									
Puw/BT LE/LCH	<p>Agilent Spectrum Analyzer - Swept SA                  Center Freq 12.51500000 GHz                  Ref Offset 8.05 dB                  Ref 20.00 dBm                  Mkr2 24.722 GHz                  -37.906 dBm                  Start 30 MHz                  #Res BW 100 kHz                  #VBW 100 kHz                  Stop 25.00 GHz                  Sweep 3.011 s (8001 pts)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Frequency</td></tr> <tr><td>Auto Tune</td></tr> <tr><td>Center Freq 12.515000000 GHz</td></tr> <tr><td>Start Freq 30.000000 MHz</td></tr> <tr><td>Stop Freq 25.000000000 GHz</td></tr> <tr><td>CF Step 2.497000000 GHz Auto Man</td></tr> <tr><td>Freq Offset 0 Hz</td></tr> </table>	Frequency	Auto Tune	Center Freq 12.515000000 GHz	Start Freq 30.000000 MHz	Stop Freq 25.000000000 GHz	CF Step 2.497000000 GHz Auto Man	Freq Offset 0 Hz
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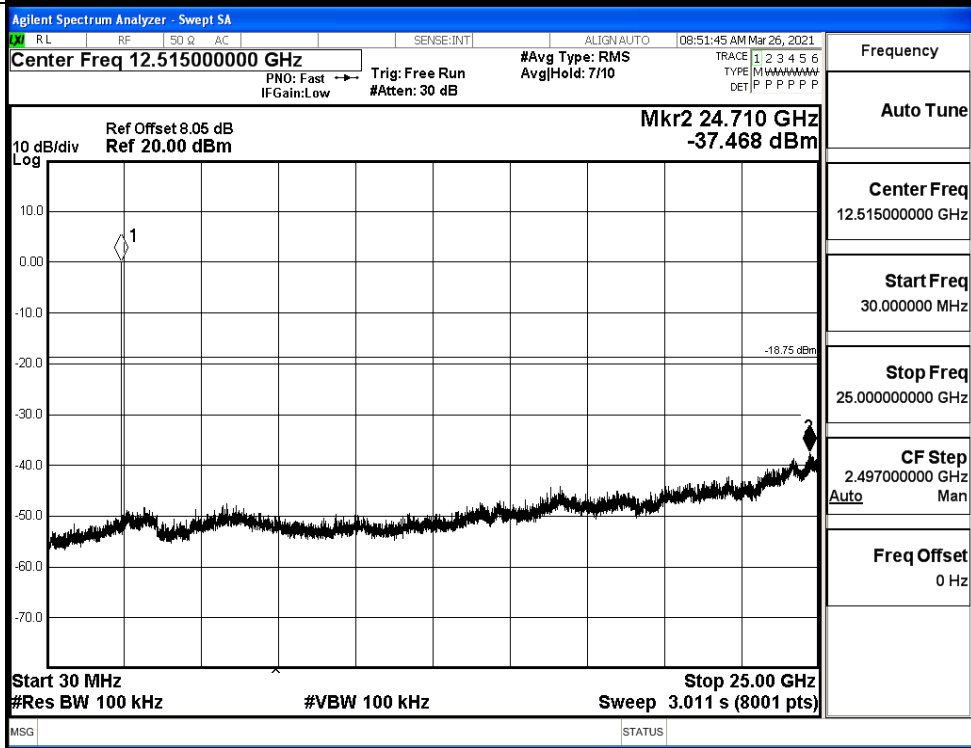


BT LE\_MCH\_Graphs

Pref/BT LE/MCH

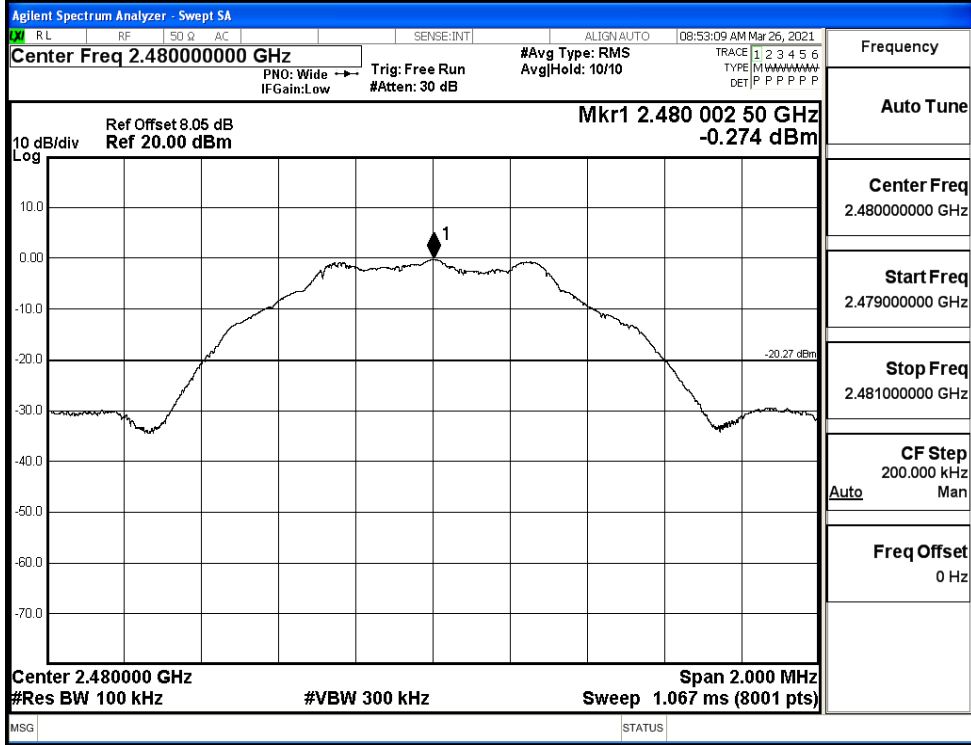


Puw/BT LE/MCH

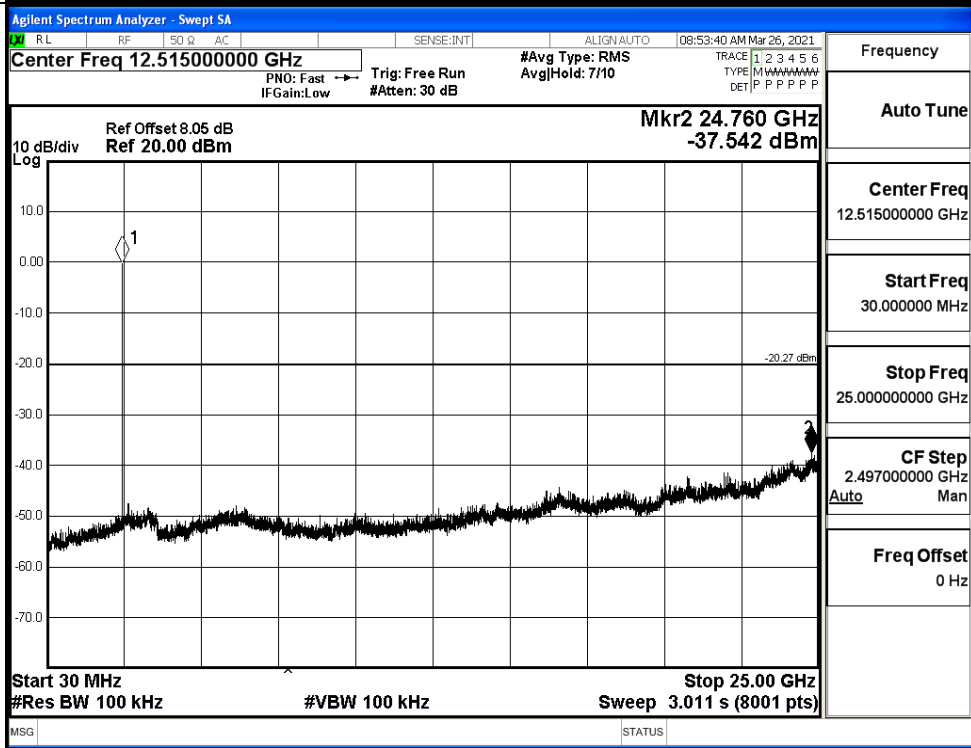


BT LE\_HCH\_Graphs

Pref/BT LE/HCH



Puw/BT LE/HCH



### A.7 Band-edge for RF Conducted Emissions

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	-0.133	-50.390	-20.13	PASS
BT LE	HCH	-0.108	-48.683	-20.11	PASS

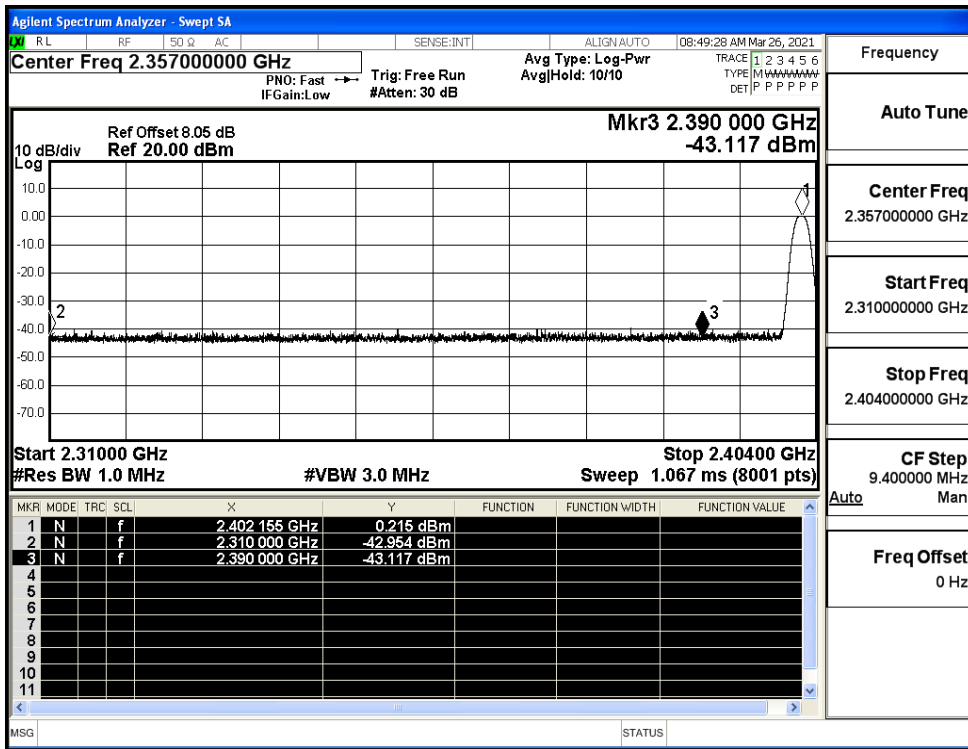
#### Test Graphs

LCH	<p>Agilent Spectrum Analyzer - Swept SA                  Center Freq 2.35700000 GHz                  Ref Offset 8.05 dB, Ref 20.00 dBm                  Mkr4 2.366 847 GHz, -50.390 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"> <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>2.402 003 GHz</td><td>-0.133 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>-53.128 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>-54.089 dBm</td><td></td><td></td><td></td></tr> <tr><td>4</td><td>N</td><td>f</td><td></td><td>2.366 847 GHz</td><td>-50.390 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		2.402 003 GHz	-0.133 dBm				2	N	f		2.400 000 GHz	-53.128 dBm				3	N	f		2.390 000 GHz	-54.089 dBm				4	N	f		2.366 847 GHz	-50.390 dBm				<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.35700000 GHz</p> <p>Start Freq 2.31000000 GHz</p> <p>Stop Freq 2.40400000 GHz</p> <p>CF Step 9.400000 MHz</p> <p>Freq Offset 0 Hz</p>
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HCH	<p>Agilent Spectrum Analyzer - Swept SA                  Center Freq 2.48900000 GHz                  Ref Offset 8.05 dB, Ref 20.00 dBm                  Mkr4 2.498 845 00 GHz, -48.683 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"> <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>2.480 004 75 GHz</td><td>-0.108 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>-52.828 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>-52.970 dBm</td><td></td><td></td><td></td></tr> <tr><td>4</td><td>N</td><td>f</td><td></td><td>2.498 845 00 GHz</td><td>-48.683 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		2.480 004 75 GHz	-0.108 dBm				2	N	f		2.483 500 00 GHz	-52.828 dBm				3	N	f		2.500 000 00 GHz	-52.970 dBm				4	N	f		2.498 845 00 GHz	-48.683 dBm				<p>Frequency</p> <p>Auto Tune</p> <p>Center Freq 2.48900000 GHz</p> <p>Start Freq 2.47800000 GHz</p> <p>Stop Freq 2.50000000 GHz</p> <p>CF Step 2.200000 MHz</p> <p>Freq Offset 0 Hz</p>
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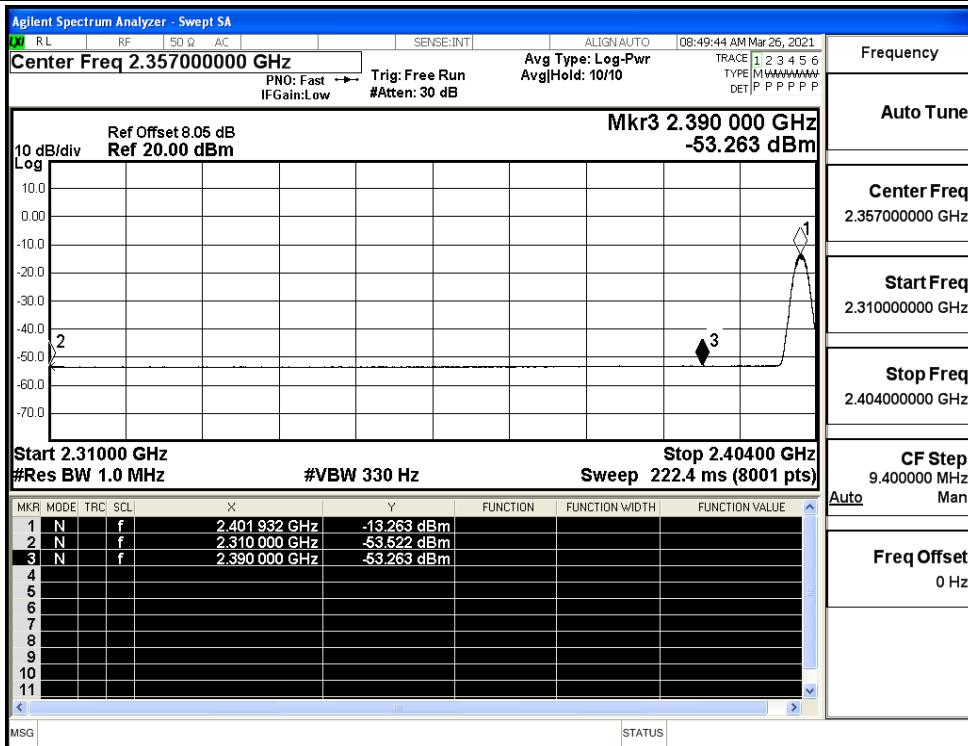
A.8 Restrict-band band-edge measurements

Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
BT LE	2402	Ant1	2310.0	-42.95	2.0	0	54.28	PEAK	74	PASS
		Ant1	2310.0	-53.52	2.0	0	43.71	AV	54	PASS
		Ant1	2390.0	-43.12	2.0	0	54.11	PEAK	74	PASS
		Ant1	2390.0	-53.26	2.0	0	43.97	AV	54	PASS
	2480	Ant1	2483.5	-43.07	2.0	0	54.16	PEAK	74	PASS
		Ant1	2483.5	-52.70	2.0	0	44.53	AV	54	PASS
		Ant1	2500.0	-42.04	2.0	0	55.19	PEAK	74	PASS
		Ant1	2500.0	-52.59	2.0	0	44.64	AV	54	PASS

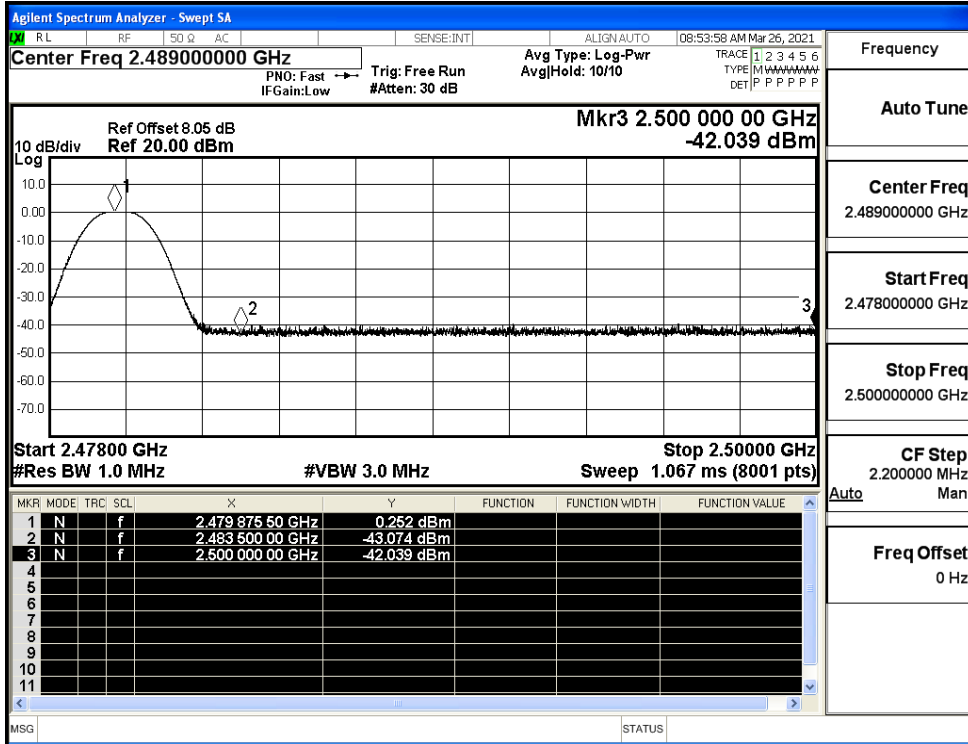
Restrict-band band-edge measurements\_BT LE\_2402\_Ant1\_PEAK



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

