

Appendix A

RF Test Data for BLE V4.0 (Conducted Measurement)

Product Name: bicycle light remote control

Trade Mark: MAGICSHINE

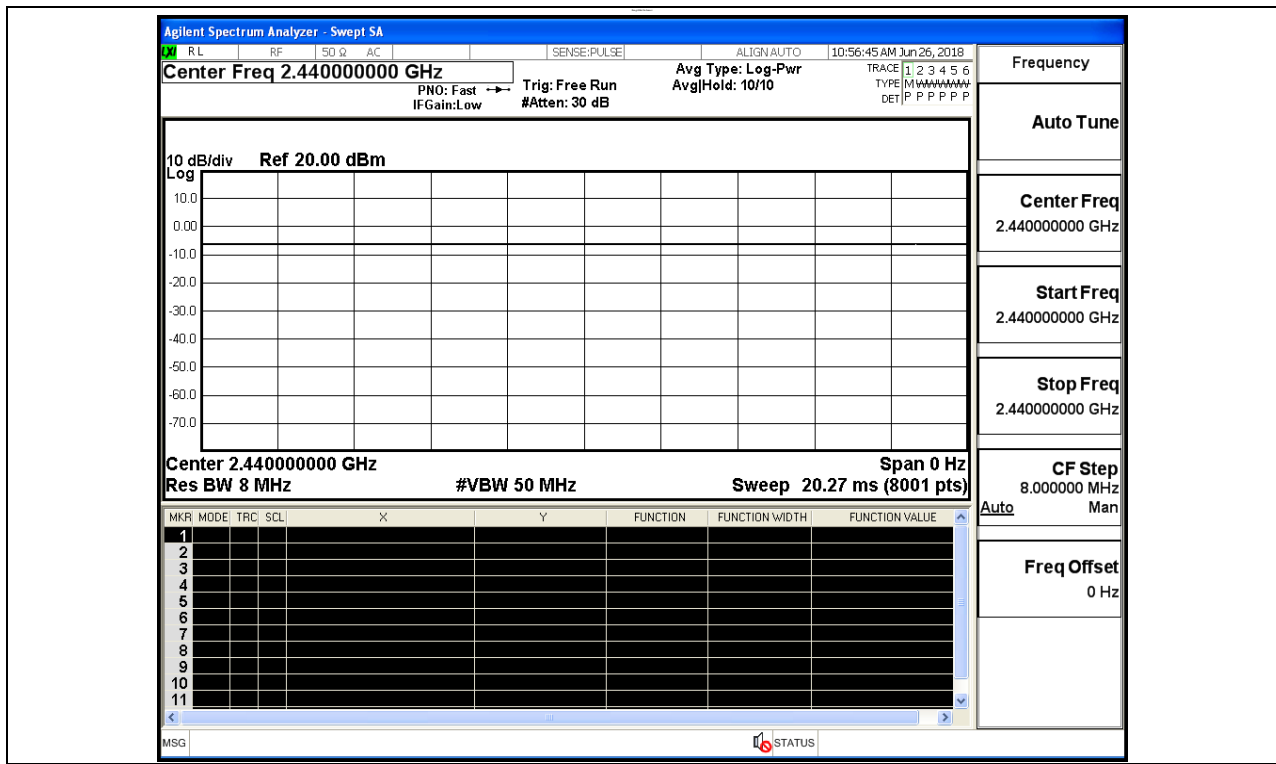
Test Model: MJ-6230B

Environmental Conditions

Temperature:	23.4 ° C
Relative Humidity:	53.6%
ATM Pressure:	100.0 kPa
Test Engineer:	Wilson.Hong
Supervised by:	Jayden.Zhuo

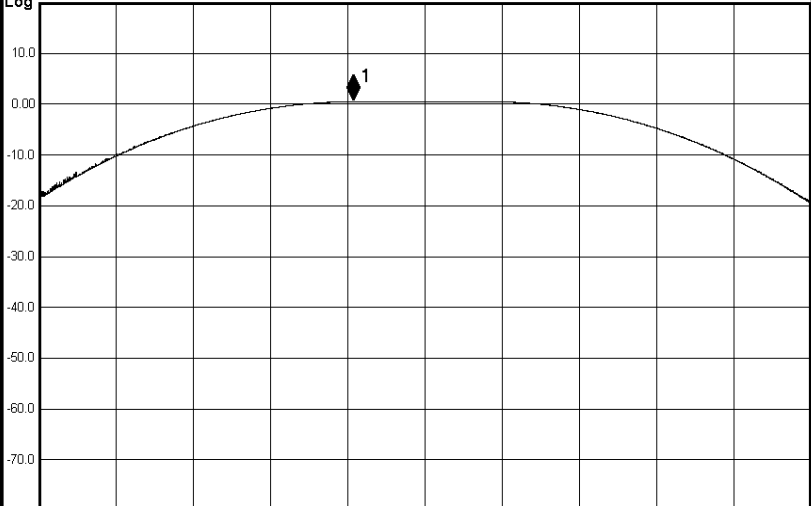
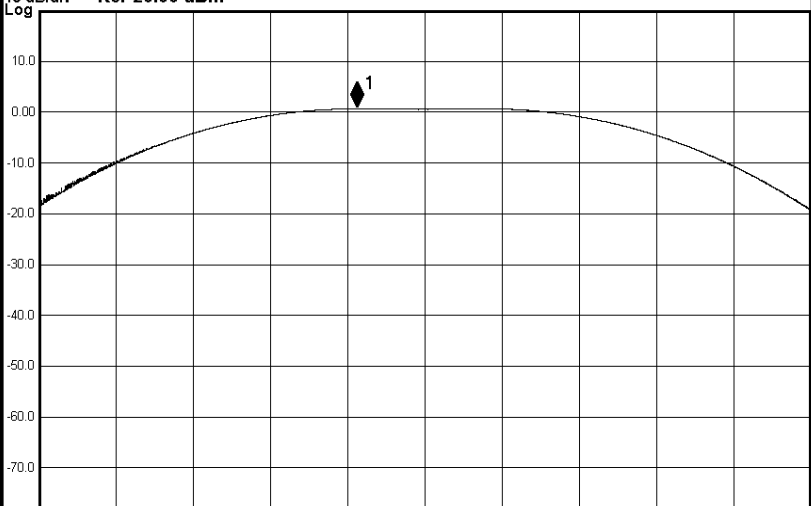
A.1 Duty Cycle

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

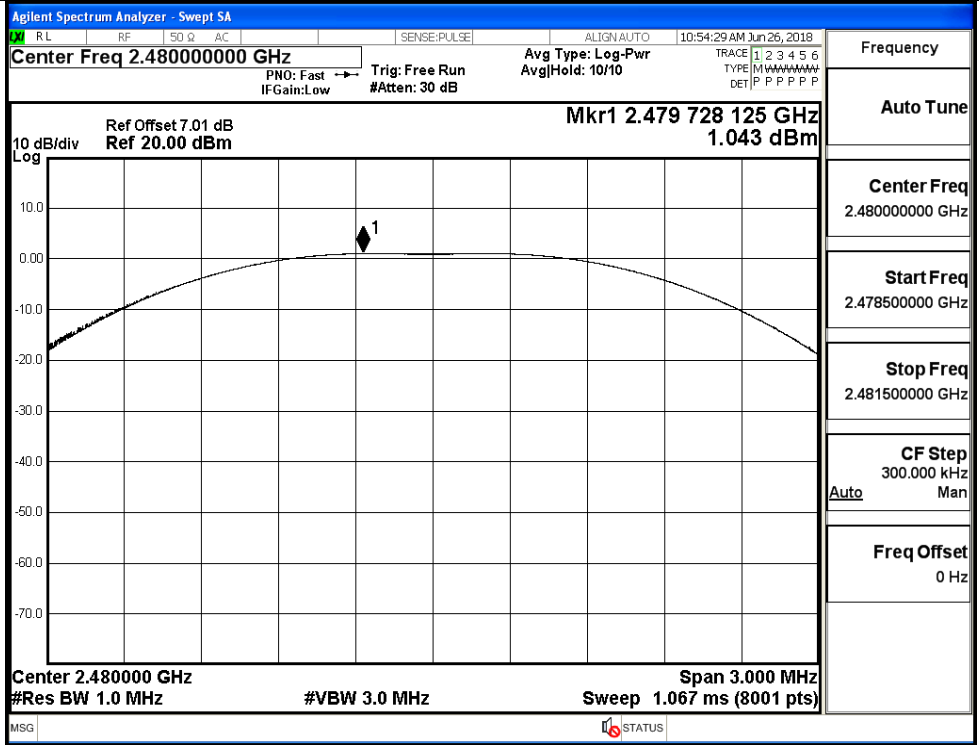


A.2 Maximum Conducted Peak Output Power

Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
BT LE	LCH	0.528	30	PASS
BT LE	MCH	0.705	30	PASS
BT LE	HCH	1.043	30	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:PULSE ALIGN:AUTO 10:50:09 AM Jun 26, 2018</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: Fast Trig: Free Run AvgHold: 10/10 TYPE M W M M M M M M</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;"> Ref Offset 7.01 dB Mkr1 2.401 723 625 GHz </div> <p style="margin: 0;">10 dB/div Ref 20.00 dBm 0.528 dBm</p>  <div style="display: flex; justify-content: space-between; font-size: x-small; margin-top: 5px;"> Center 2.402000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.067 ms (8001 pts) </div> <p style="font-size: x-small; margin: 0;">MSG STATUS</p> </div> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr><td>Frequency</td></tr> <tr><td>Auto Tune</td></tr> <tr><td>Center Freq 2.402000000 GHz</td></tr> <tr><td>Start Freq 2.400500000 GHz</td></tr> <tr><td>Stop Freq 2.403500000 GHz</td></tr> <tr><td>CF Step 300.000 kHz</td></tr> <tr><td>Auto Man</td></tr> <tr><td>Freq Offset 0 Hz</td></tr> </table>	Frequency	Auto Tune	Center Freq 2.402000000 GHz	Start Freq 2.400500000 GHz	Stop Freq 2.403500000 GHz	CF Step 300.000 kHz	Auto Man	Freq Offset 0 Hz
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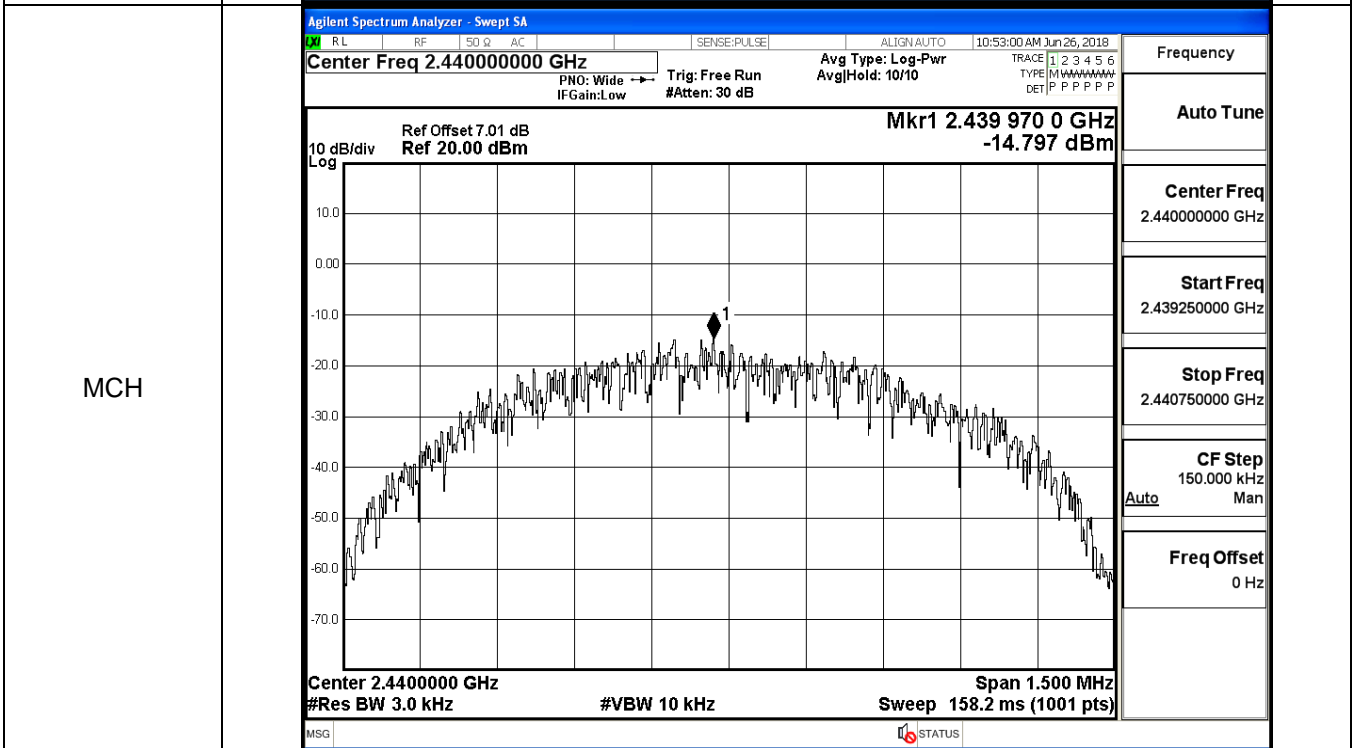
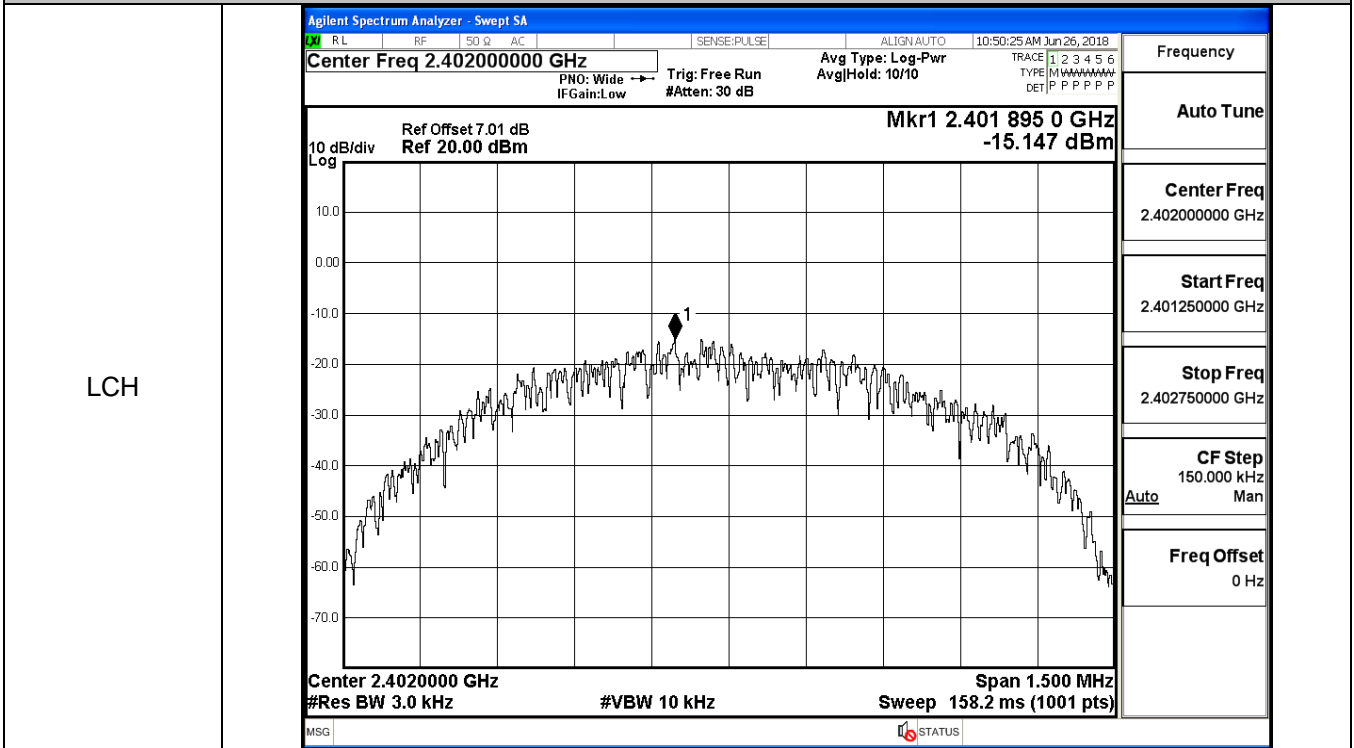
HCH

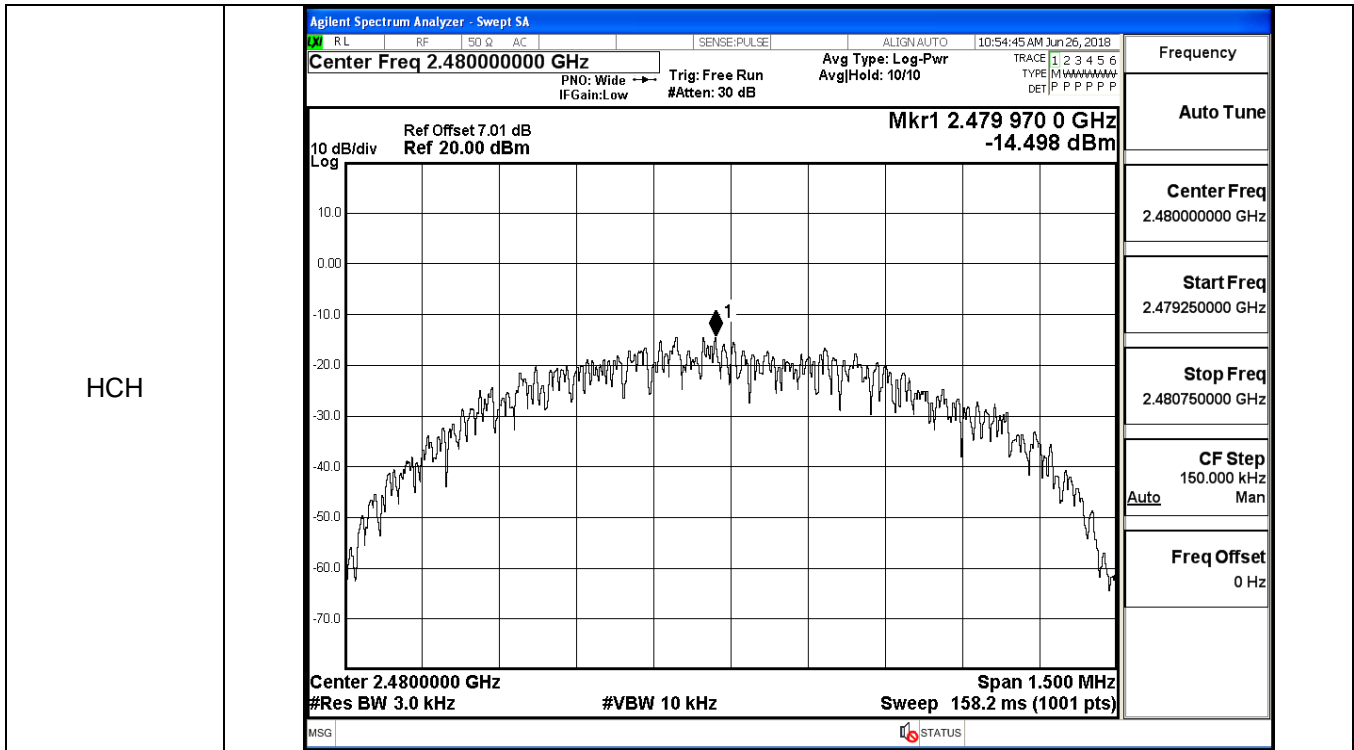


A.3 Maximum Power Spectral Density

Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT LE	LCH	-15.147	8	PASS
BT LE	MCH	-14.797	8	PASS
BT LE	HCH	-14.498	8	PASS

Test Graphs





A.4 6dB Bandwidth

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT LE	LCH	0.7055	≥0.5	PASS
BT LE	MCH	0.7080	≥0.5	PASS
BT LE	HCH	0.7071	≥0.5	PASS

Test Graphs													
LCH	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center; margin: 0;">Agilent Spectrum Analyzer - Occupied BW</p> <p style="font-size: small; margin: 0;">RL RF 50 Ω AC SENSE:PULSE ALIGN:AUTO 10:49:56 AM Jun 26, 2018</p> <p style="margin: 0;">Center Freq 2.402000000 GHz Center Freq: 2.402000000 GHz Radio Std: None Trig: Free Run AvgHold> 1/1 #IFGain:Low #Atten: 30 dB Radio Device: BTS</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="font-size: x-small; margin: 0;">10 dB/div Ref Offset 7.01 dB Mkr1 2.4022351 GHz Log Ref 20.00 dBm -0.36133 dBm</p> <p style="font-size: x-small; margin: 0;">Center 2.402 GHz Span 3 MHz #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>6.83 dBm</td> </tr> <tr> <td style="text-align: center;">1.0603 MHz</td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>OBW Power</td> <td>99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td> <td>x dB</td> <td>-6.00 dB</td> </tr> </table> </div> <div style="width: 35%; border-left: 1px solid black; padding-left: 5px;"> <p style="font-size: x-small; margin: 0;">Frequency</p> <hr/> <p style="font-size: x-small; margin: 0;">Center Freq 2.402000000 GHz</p> <hr/> <p style="font-size: x-small; margin: 0;">CF Step 300.000 kHz Auto Man</p> <hr/> <p style="font-size: x-small; margin: 0;">Freq Offset 0 Hz</p> </div> </div> <p style="font-size: x-small; margin: 0; text-align: right;">MSG STATUS</p> </div>	Occupied Bandwidth	Total Power	6.83 dBm	1.0603 MHz			Transmit Freq Error	OBW Power	99.00 %	x dB Bandwidth	x dB	-6.00 dB
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x dB Bandwidth	x dB	-6.00 dB											

HCH

Agilent Spectrum Analyzer - Occupied BW

RL	RF	50 Ω	AC	SENSE:PULSE	ALIGN:AUTO	10:54:15 AM Jun 26, 2018
Center Freq 2.480000000 GHz			Center Freq: 2.480000000 GHz		Radio Std: None	
			Trig: Free Run		AvgHold>1/1	
#IFGain:Low			#Atten: 30 dB		Radio Device: BTS	

10 dB/div	Ref Offset 7.01 dB	Mkr1 2.4799846 GHz
Log	Ref 20.00 dBm	0.16561 dBm

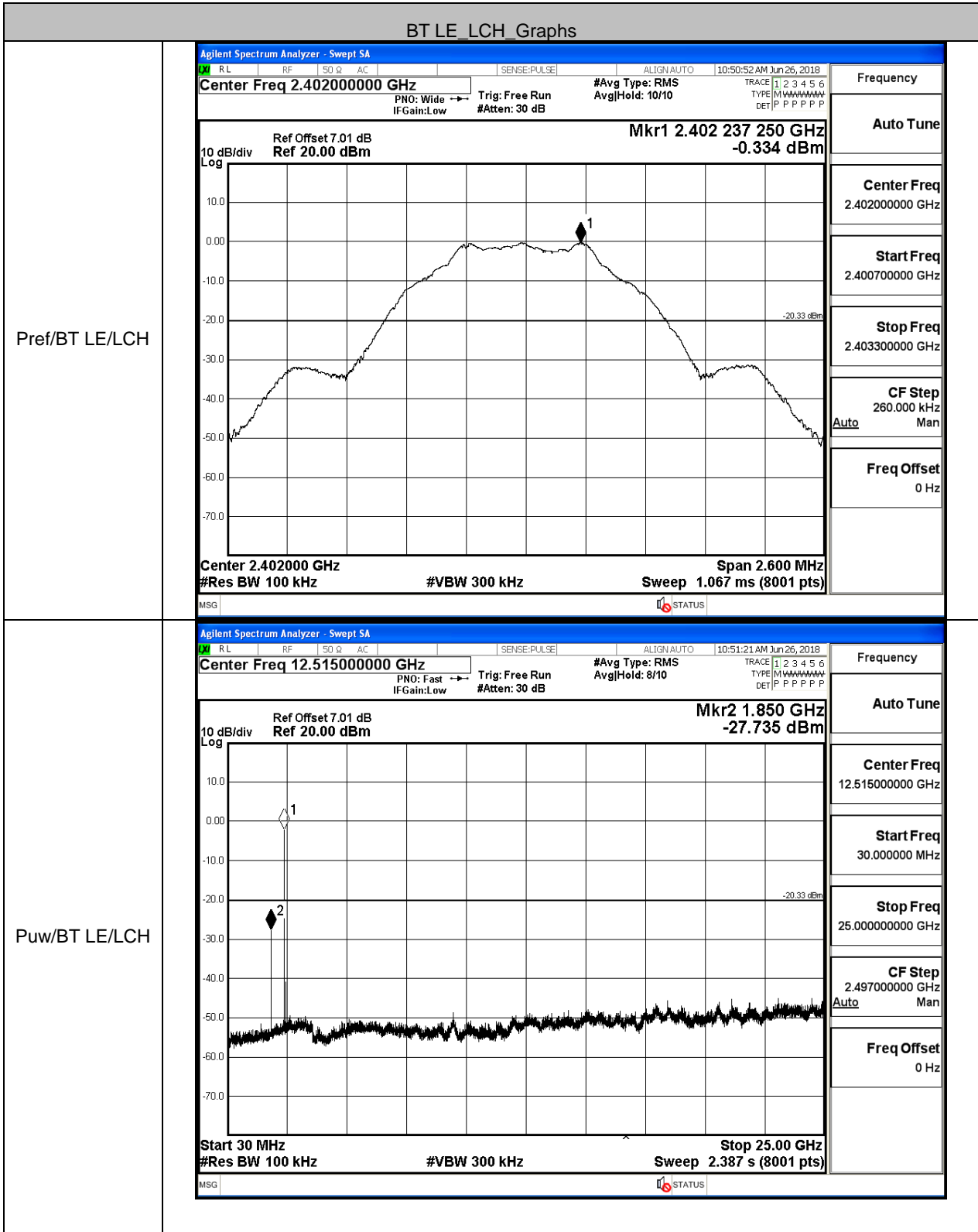
Center 2.48 GHz	#VBW 300 kHz	Span 3 MHz
#Res BW 100 kHz		Sweep 1.067 ms

Occupied Bandwidth	Total Power	7.32 dBm
1.0601 MHz		
Transmit Freq Error	-4.656 kHz	OBW Power
x dB Bandwidth	707.1 kHz	x dB
		99.00 %
		-6.00 dB

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

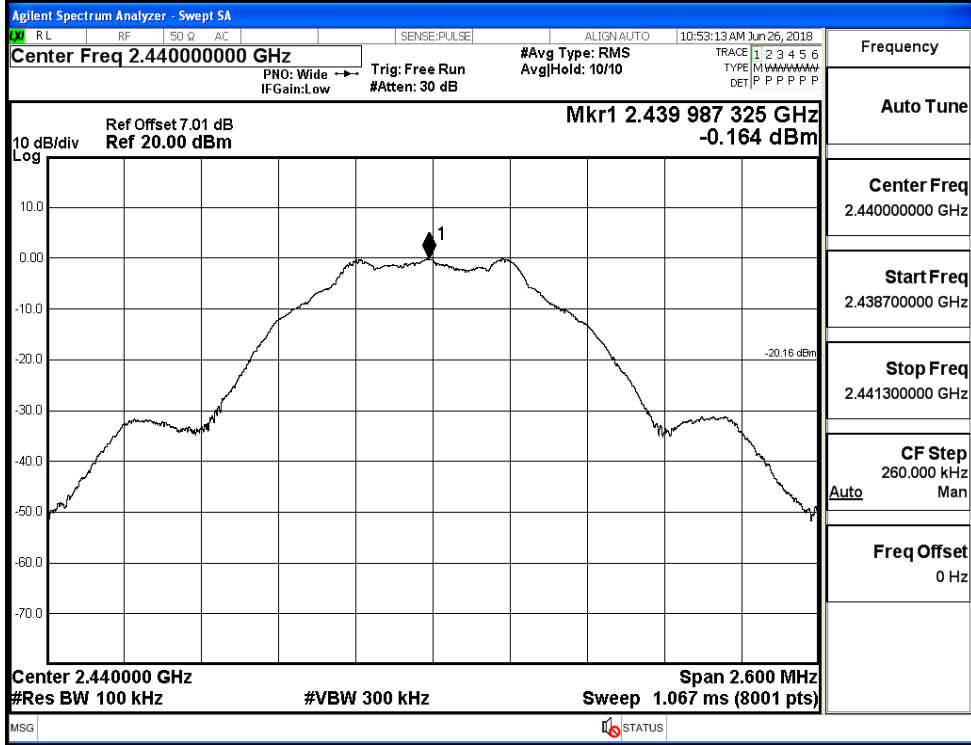
A.5 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	-0.334	-27.735	-20.334	PASS
BT LE	MCH	-0.164	-30.478	-20.164	PASS
BT LE	HCH	0.172	-29.305	-19.828	PASS

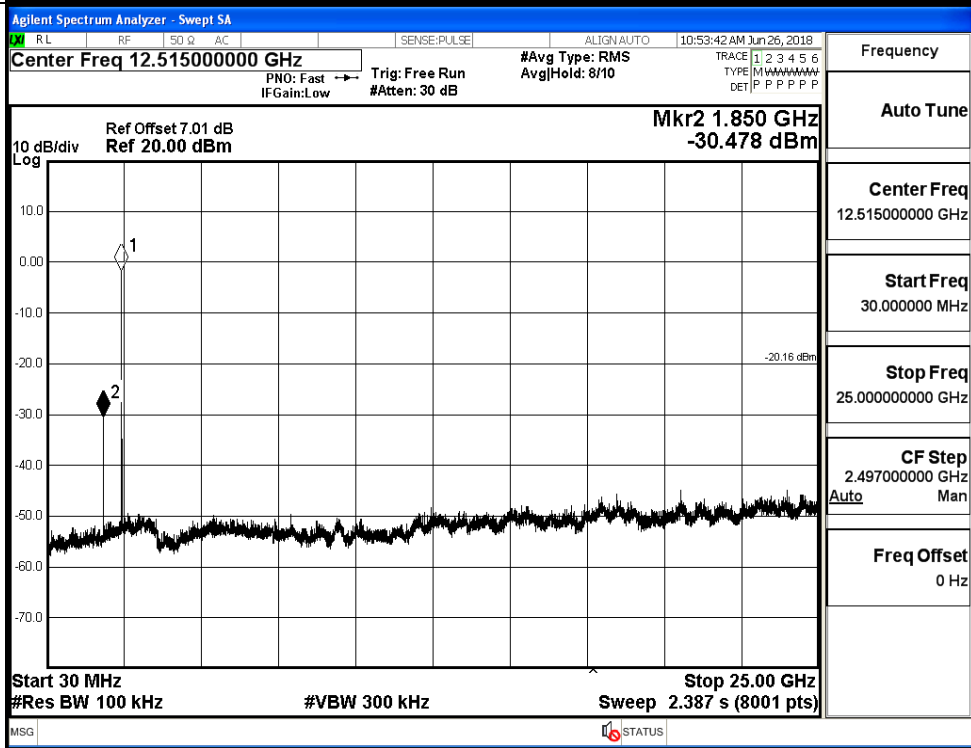


BT LE_MCH_Graphs

Pref/BT LE/MCH

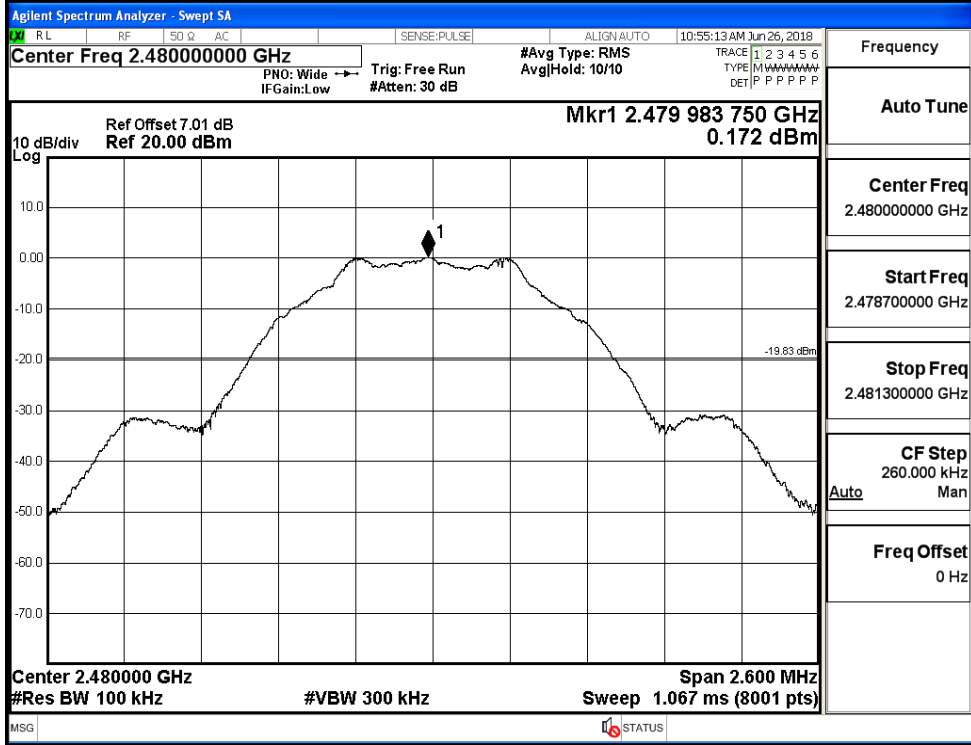


Puw/BT LE/MCH

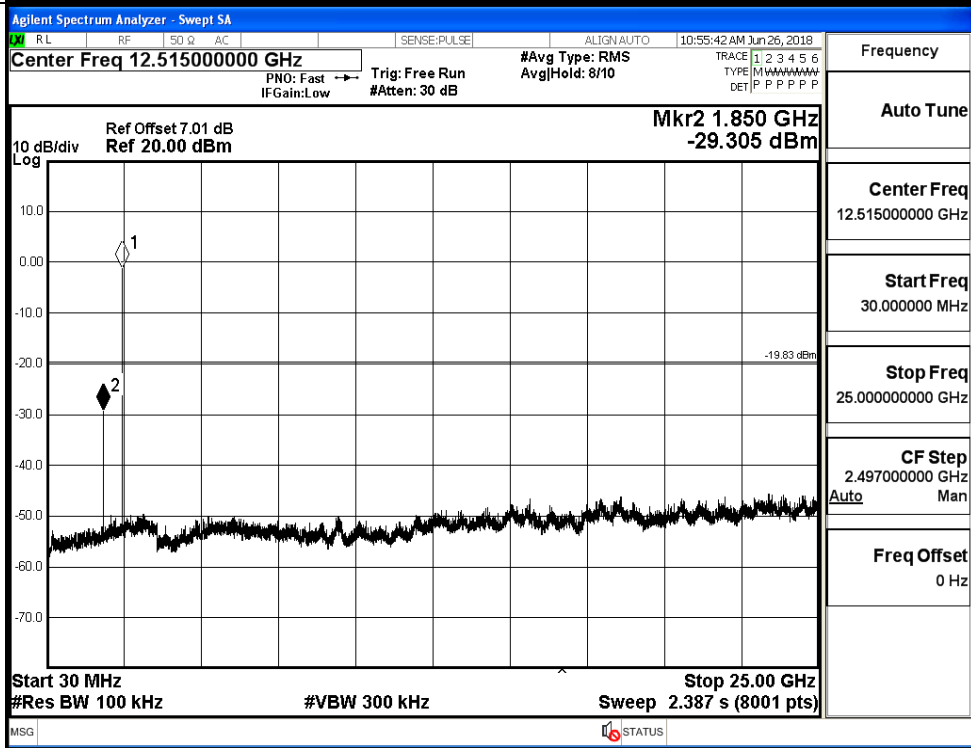


BT LE_HCH_Graphs

Pref/BT LE/HCH



Puw/BT LE/HCH



A.6 Band-edge for RF Conducted Emissions

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	-0.098	-51.088	-20.1	PASS
BT LE	HCH	0.382	-51.290	-19.62	PASS

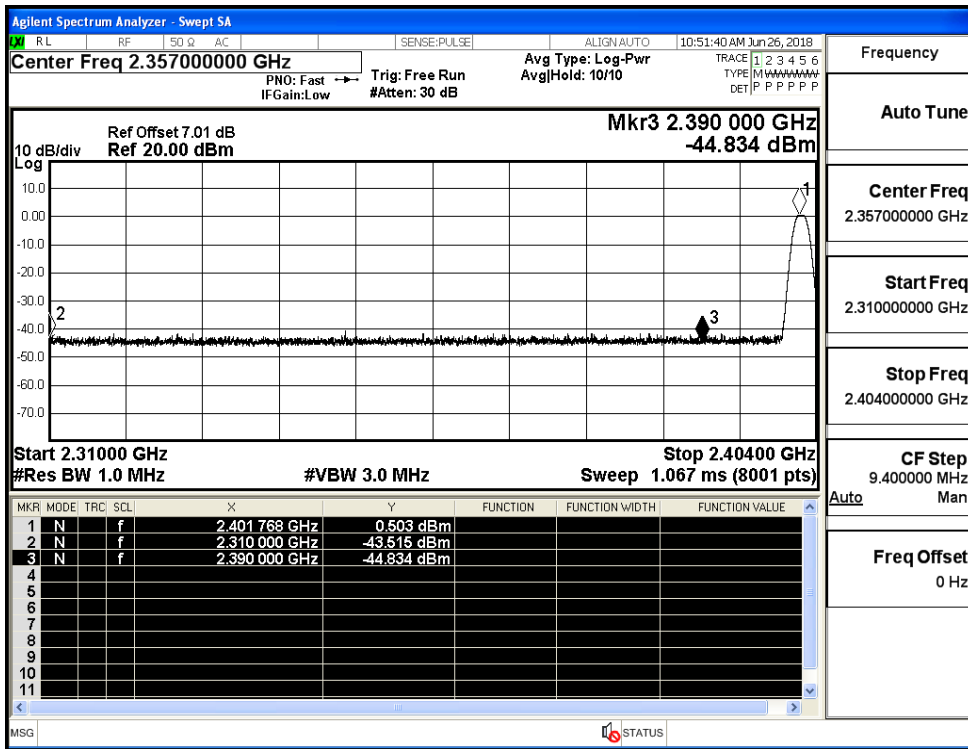
Test Graphs

LCH	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.35700000 GHz Max Spurious Level -51.088 dBm Mkr4 2.378 914 GHz 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="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>2.402 238 GHz</td><td>-0.098 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>-54.016 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>-54.192 dBm</td><td></td><td></td><td></td></tr> <tr><td>4</td><td>N</td><td>f</td><td></td><td>2.378 914 GHz</td><td>-51.088 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		2.402 238 GHz	-0.098 dBm				2	N	f		2.400 000 GHz	-54.016 dBm				3	N	f		2.390 000 GHz	-54.192 dBm				4	N	f		2.378 914 GHz	-51.088 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
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HCH	<p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.48900000 GHz Max Spurious Level -51.290 dBm Mkr4 2.489 998 25 GHz 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="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>2.479 767 25 GHz</td><td>0.382 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>-54.388 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>-53.667 dBm</td><td></td><td></td><td></td></tr> <tr><td>4</td><td>N</td><td>f</td><td></td><td>2.489 998 25 GHz</td><td>-51.290 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		2.479 767 25 GHz	0.382 dBm				2	N	f		2.483 500 00 GHz	-54.388 dBm				3	N	f		2.500 000 00 GHz	-53.667 dBm				4	N	f		2.489 998 25 GHz	-51.290 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
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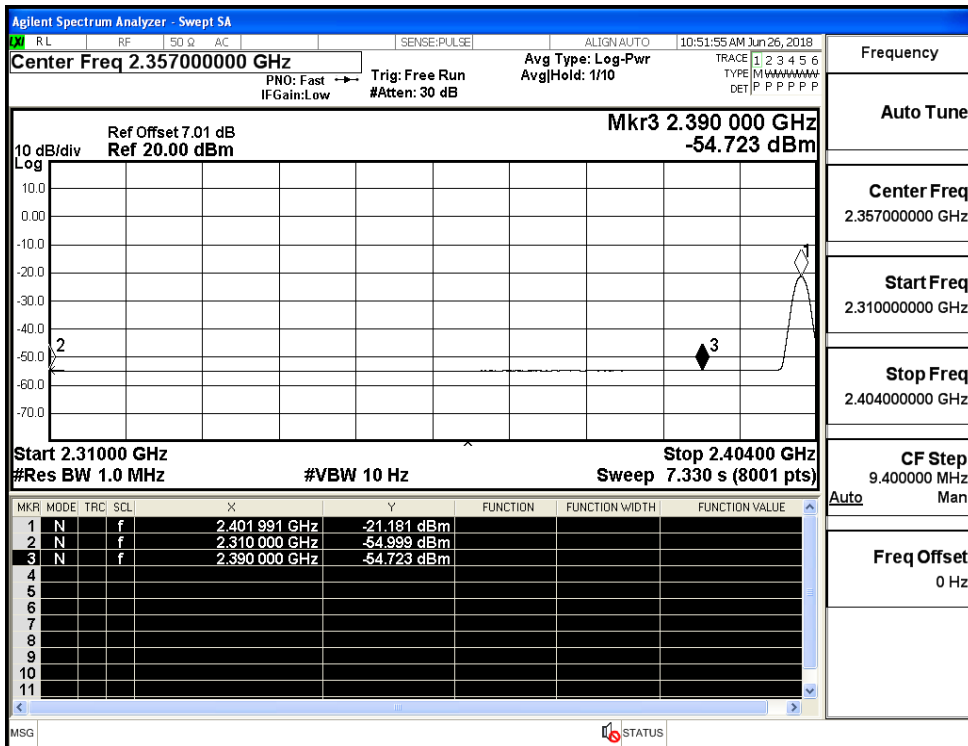
A.7 Restrict-band band-edge measurements

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	-43.52	2.0	0	53.74	PEAK	74	PASS
		Ant1	2310.0	-55.00	2.0	0	42.26	AV	54	PASS
		Ant1	2390.0	-44.83	2.0	0	52.42	PEAK	74	PASS
		Ant1	2390.0	-54.72	2.0	0	42.53	AV	54	PASS
	2480	Ant1	2483.5	-44.29	2.0	0	52.97	PEAK	74	PASS
		Ant1	2483.5	-54.45	2.0	0	42.80	AV	54	PASS
		Ant1	2500.0	-44.11	2.0	0	53.15	PEAK	74	PASS
		Ant1	2500.0	-54.37	2.0	0	42.89	AV	54	PASS

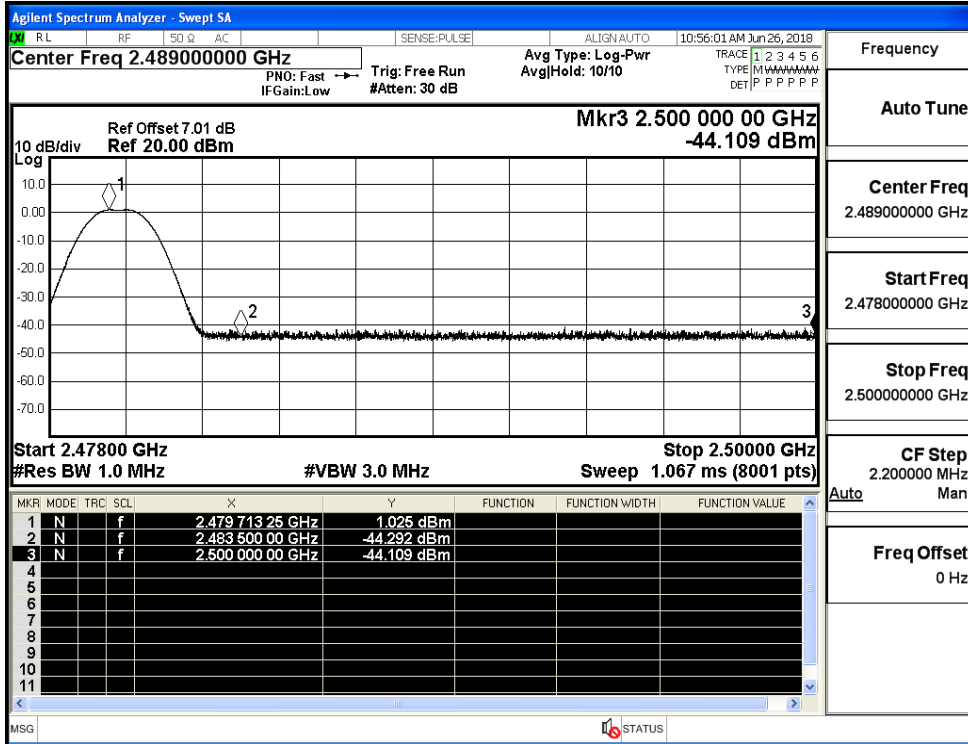
Restrict-band band-edge measurements_BT LE_2402_Ant1_PEAK



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

