

## Appendix A

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

Product Name: Aquarium Luminaire

Trade Mark: **FUVAL**

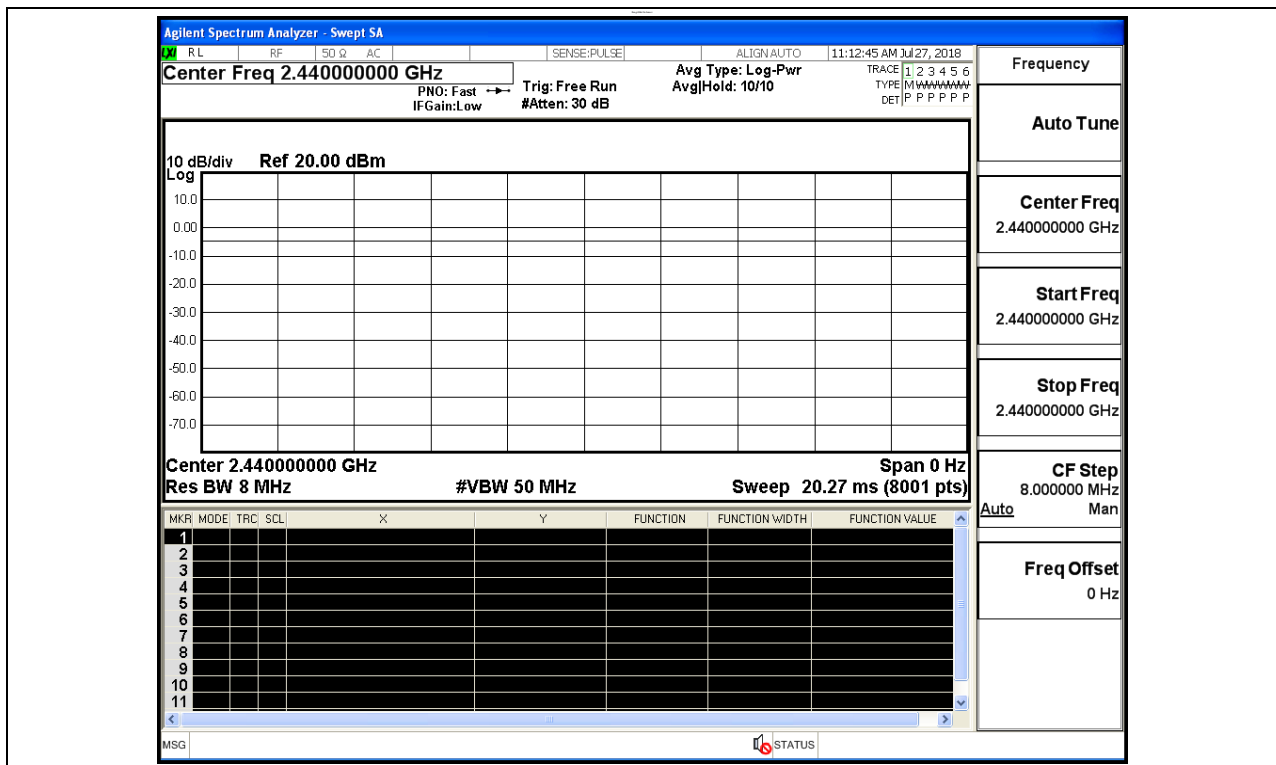
Test Model: 14523

#### Environmental Conditions

Temperature:	23.3 ° C
Relative Humidity:	52.4%
ATM Pressure:	100.0 kPa
Test Engineer:	Wilson.Hong
Supervised by:	Jayden.Zhuo

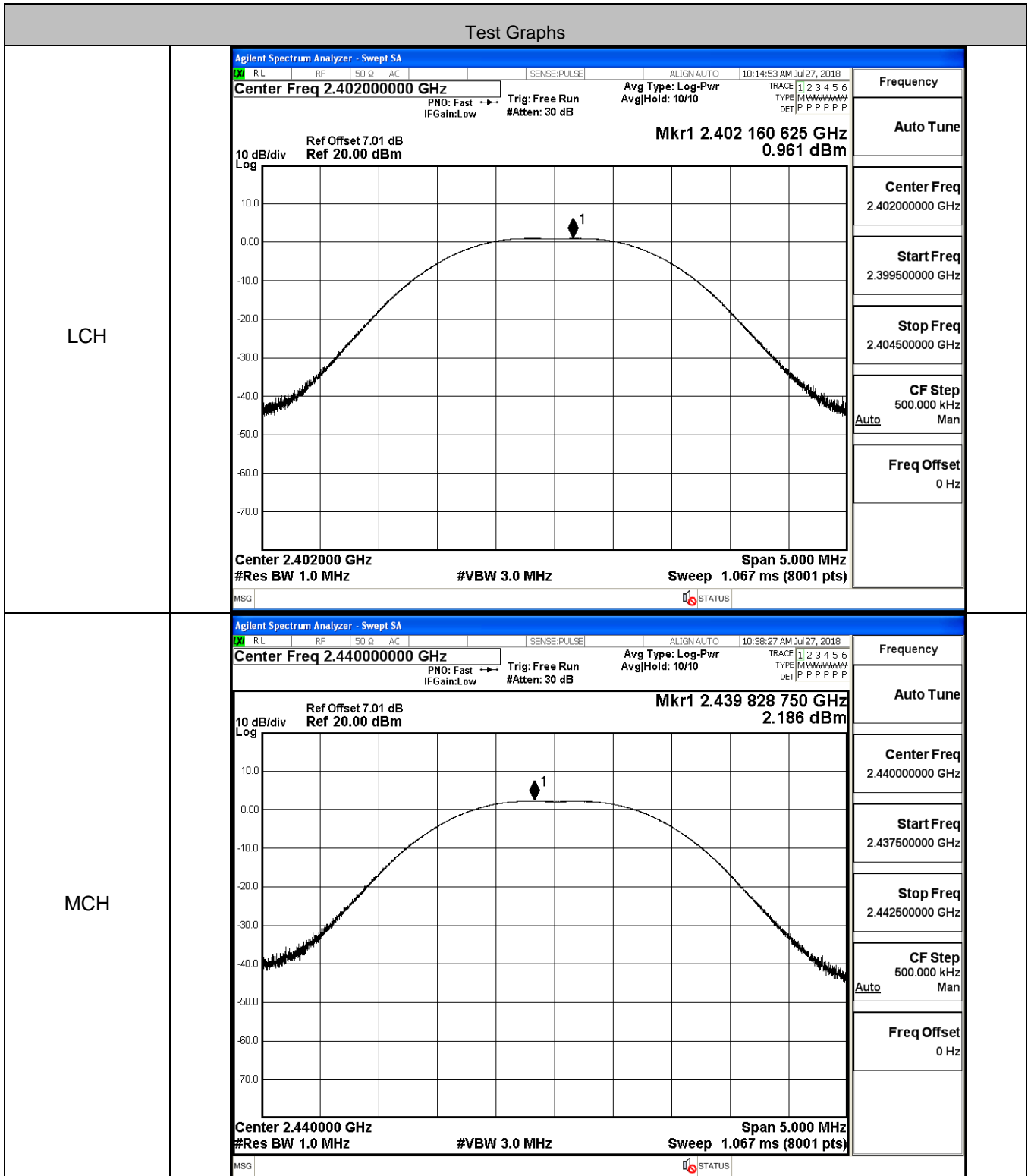
#### A.1 Duty Cycle

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

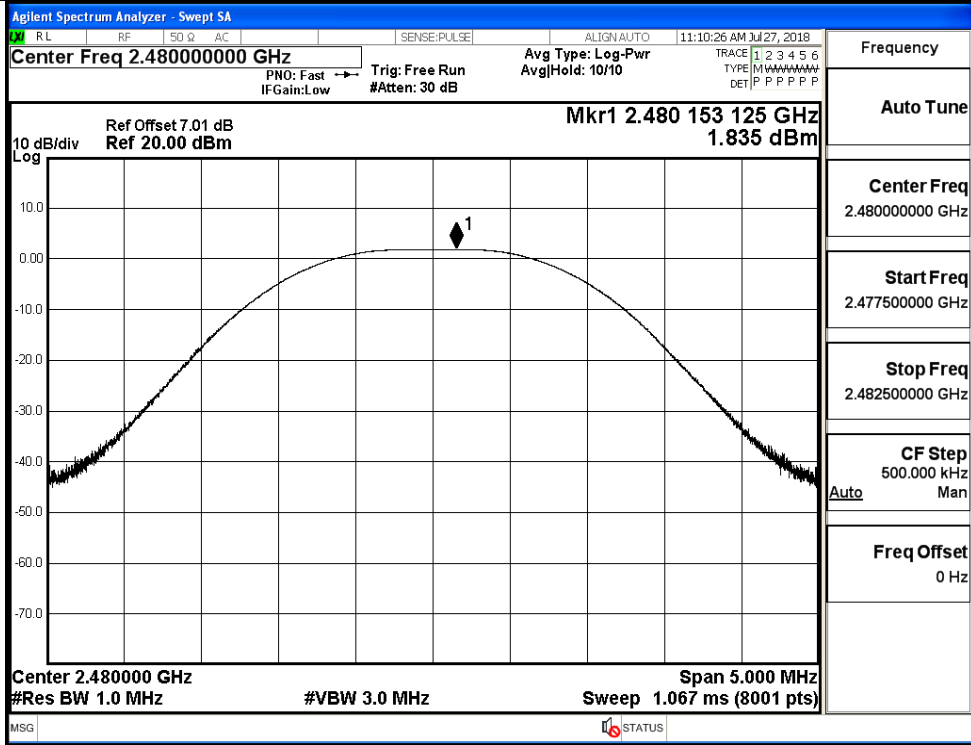


### A.2 Maximum Conducted Peak Output Power

Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
BT LE	LCH	0.961	30	PASS
BT LE	MCH	2.186	30	PASS
BT LE	HCH	1.835	30	PASS



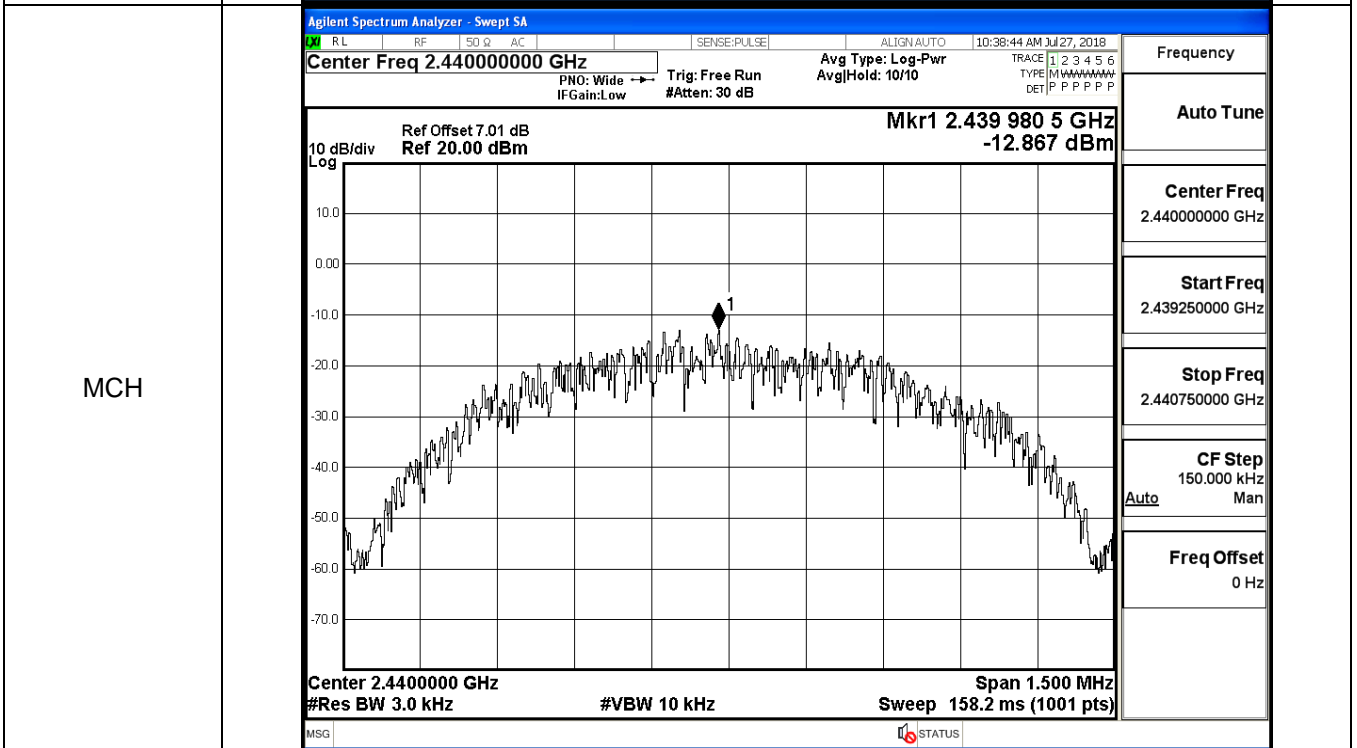
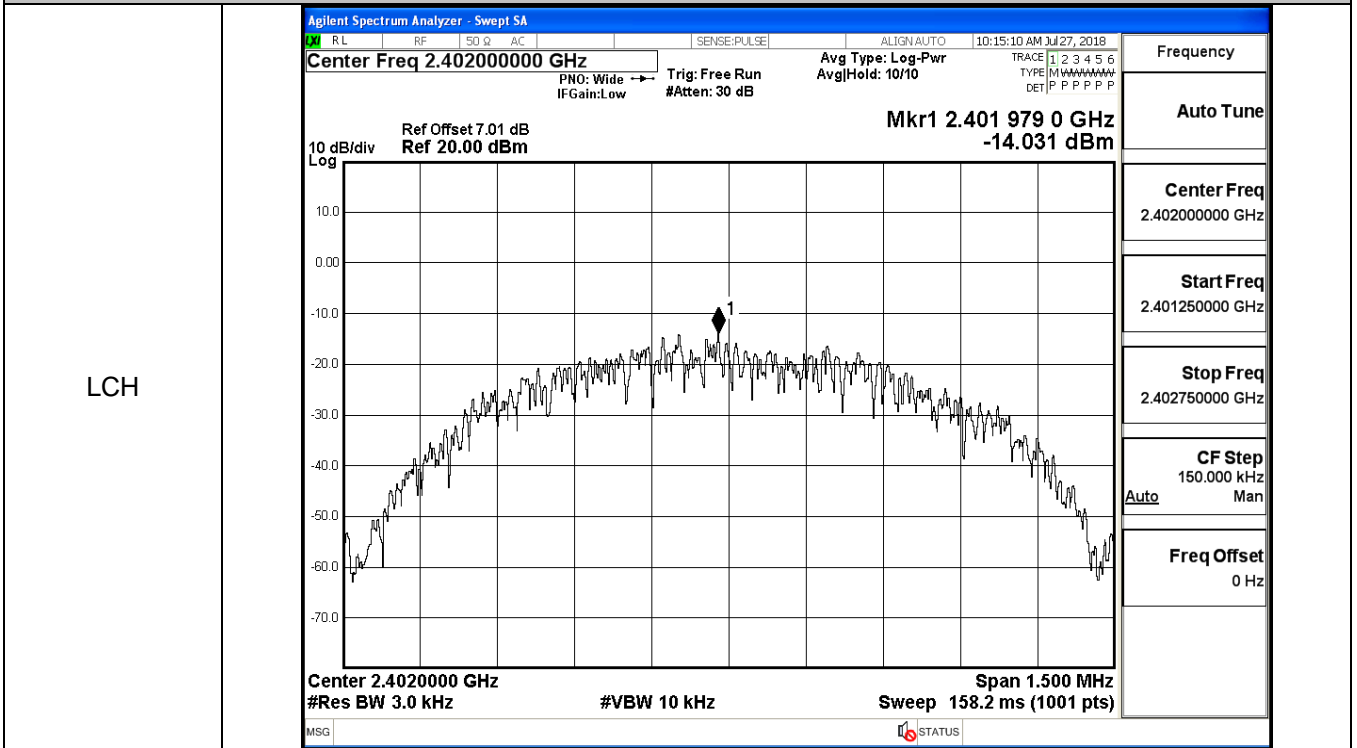
HCH

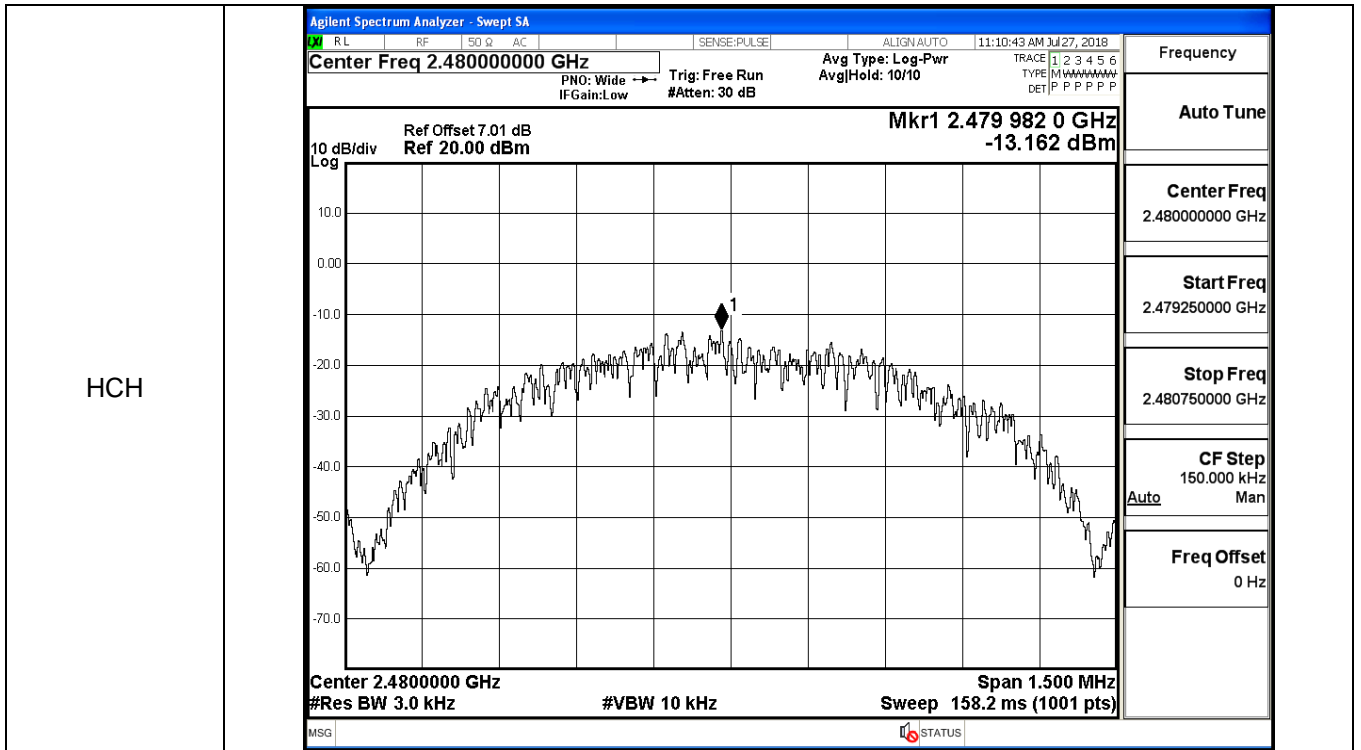


### A.3 Maximum Power Spectral Density

Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
BT LE	LCH	-14.031	8	PASS
BT LE	MCH	-12.867	8	PASS
BT LE	HCH	-13.162	8	PASS

#### Test Graphs

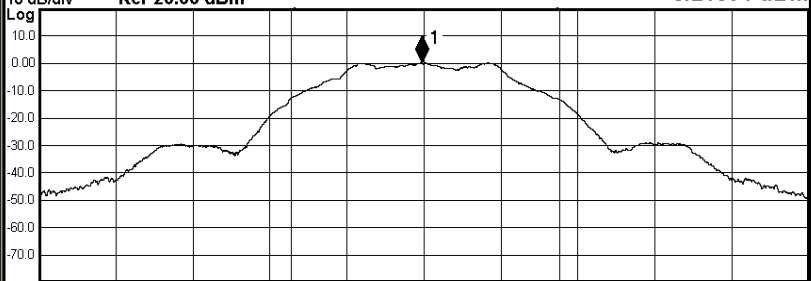


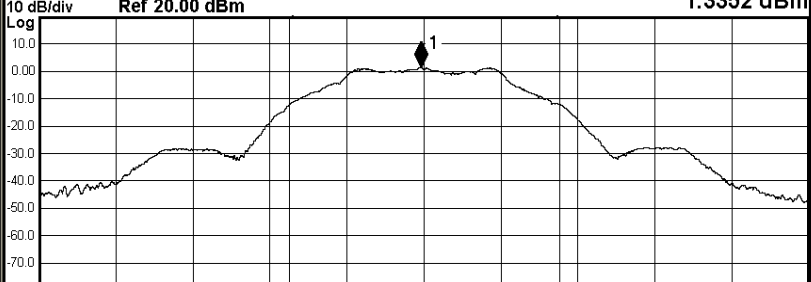


**A.4 6dB Bandwidth**

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
BT LE	LCH	0.7005	≥0.5	PASS
BT LE	MCH	0.6993	≥0.5	PASS
BT LE	HCH	0.6958	≥0.5	PASS

**Test Graphs**

LCH	<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:PULSE ALIGN:AUTO 10:14:38 AM Jul 27, 2018</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: 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; margin: 5px 0;"> <p style="font-size: x-small; margin: 0;">10 dB/div Ref Offset 7.01 dB Mkr1 2.401991 GHz</p> <p style="font-size: x-small; margin: 0;">Log Ref 20.00 dBm 0.21094 dBm</p>  </div> <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 style="width: 33%;">Occupied Bandwidth</td> <td style="width: 33%;">Total Power</td> <td style="width: 33%;">7.34 dBm</td> </tr> <tr> <td style="text-align: center;"><b>1.0478 MHz</b></td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>5.520 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>700.5 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 style="font-size: x-small; margin: 0;">MSG STATUS</p>	Occupied Bandwidth	Total Power	7.34 dBm	<b>1.0478 MHz</b>			Transmit Freq Error	5.520 kHz	OBW Power	x dB Bandwidth	700.5 kHz	x dB			99.00 %			-6.00 dB	<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>
	Occupied Bandwidth	Total Power	7.34 dBm																	
	<b>1.0478 MHz</b>																			
	Transmit Freq Error	5.520 kHz	OBW Power																	
x dB Bandwidth	700.5 kHz	x dB																		
		99.00 %																		
		-6.00 dB																		

MCH	<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:PULSE ALIGN:AUTO 10:38:12 AM Jul 27, 2018</p> <p style="font-size: small; margin: 0;">Center Freq 2.440000000 GHz Center Freq: 2.440000000 GHz Radio Std: None</p> <p style="font-size: x-small; margin: 0;">Trig: Free Run AvgHold: 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; margin: 5px 0;"> <p style="font-size: x-small; margin: 0;">10 dB/div Ref Offset 7.01 dB Mkr1 2.4399891 GHz</p> <p style="font-size: x-small; margin: 0;">Log Ref 20.00 dBm 1.3352 dBm</p>  </div> <p style="font-size: x-small; margin: 0;">Center 2.44 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 style="width: 33%;">Occupied Bandwidth</td> <td style="width: 33%;">Total Power</td> <td style="width: 33%;">8.46 dBm</td> </tr> <tr> <td style="text-align: center;"><b>1.0484 MHz</b></td> <td></td> <td></td> </tr> <tr> <td>Transmit Freq Error</td> <td>5.073 kHz</td> <td>OBW Power</td> </tr> <tr> <td>x dB Bandwidth</td> <td>699.3 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 style="font-size: x-small; margin: 0;">MSG STATUS</p>	Occupied Bandwidth	Total Power	8.46 dBm	<b>1.0484 MHz</b>			Transmit Freq Error	5.073 kHz	OBW Power	x dB Bandwidth	699.3 kHz	x dB			99.00 %			-6.00 dB	<p style="font-size: x-small; margin: 0;">Frequency</p> <hr/> <p style="font-size: x-small; margin: 0;">Center Freq 2.440000000 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>
	Occupied Bandwidth	Total Power	8.46 dBm																	
	<b>1.0484 MHz</b>																			
	Transmit Freq Error	5.073 kHz	OBW Power																	
x dB Bandwidth	699.3 kHz	x dB																		
		99.00 %																		
		-6.00 dB																		

HCH

Agilent Spectrum Analyzer - Occupied BW

RL	RF	50 Ω	AC	SENSE:PULSE	ALIGN:AUTO	11:10:12 AM Jul 27, 2018
<b>Center Freq 2.480000000 GHz</b>				Center Freq: 2.480000000 GHz	Radio Std: None	Frequency
				Trig: Free Run	AvgHold>1/1	
				#IFGain:Low	#Atten: 30 dB	Radio Device: BTS

Mkr1 2.4799963 GHz  
1.0416 dBm

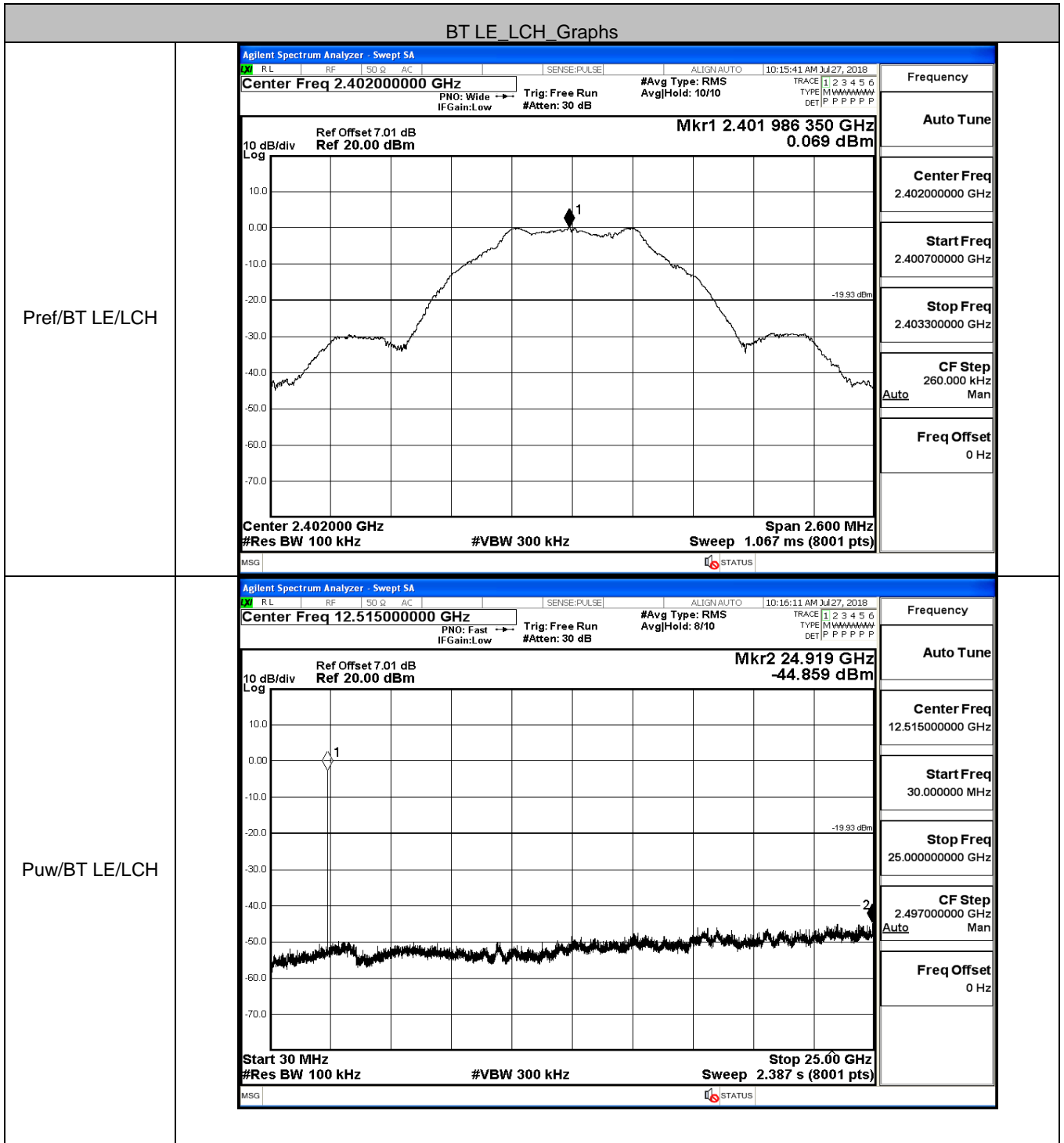
Center 2.48 GHz		Span 3 MHz	
#Res BW 100 kHz	#VBW 300 kHz	Sweep 1.067 ms	

<b>Occupied Bandwidth</b>		<b>Total Power</b>	
<b>1.0418 MHz</b>		<b>8.12 dBm</b>	
Transmit Freq Error	7.711 kHz	OBW Power	99.00 %
x dB Bandwidth	695.8 kHz	x dB	-6.00 dB

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

### A.5 RF Conducted Spurious Emissions

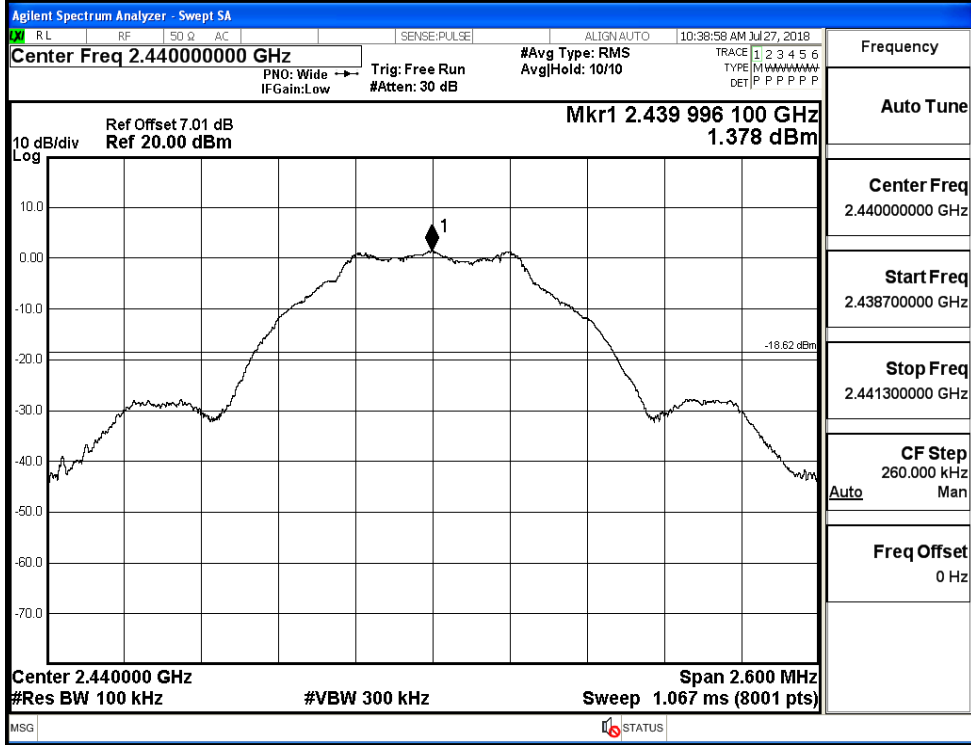
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BT LE	LCH	0.069	-44.859	-19.931	PASS
BT LE	MCH	1.378	-44.109	-18.622	PASS
BT LE	HCH	1.036	-42.617	-18.964	PASS



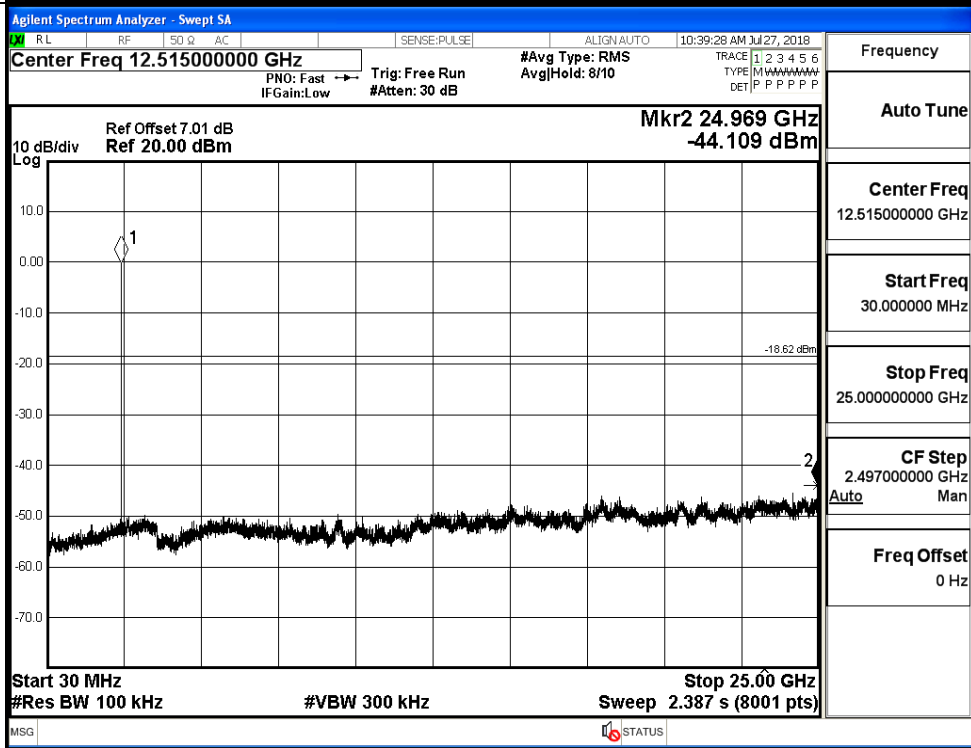


BT LE\_MCH\_Graphs

Pref/BT LE/MCH

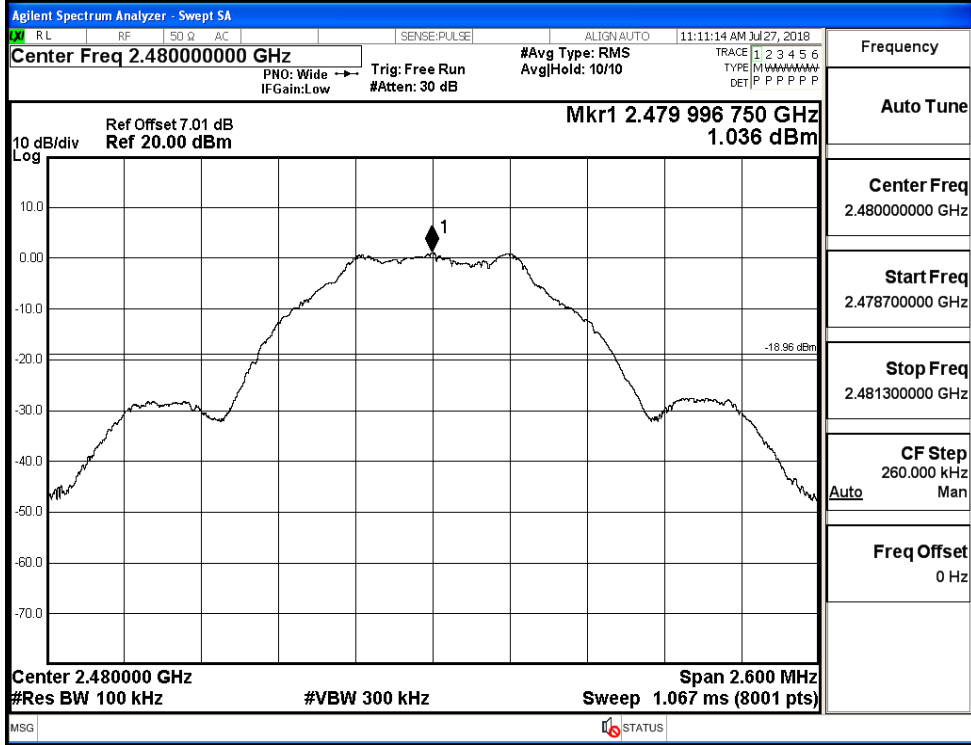


Puw/BT LE/MCH

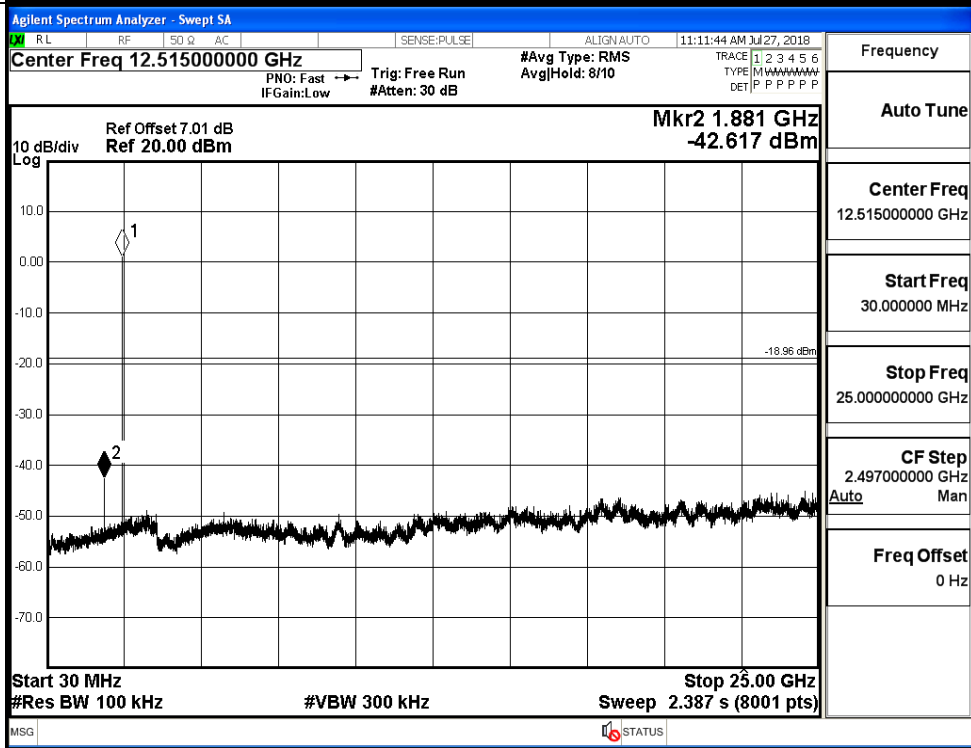


BT LE\_HCH\_Graphs

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	0.326	-51.372	-19.67	PASS
BT LE	HCH	1.147	-50.186	-18.85	PASS

Test Graphs

LCH

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

Frequency

Auto Tune

Center Freq  
2.48900000 GHz

Start Freq  
2.47800000 GHz

Stop Freq  
2.50000000 GHz

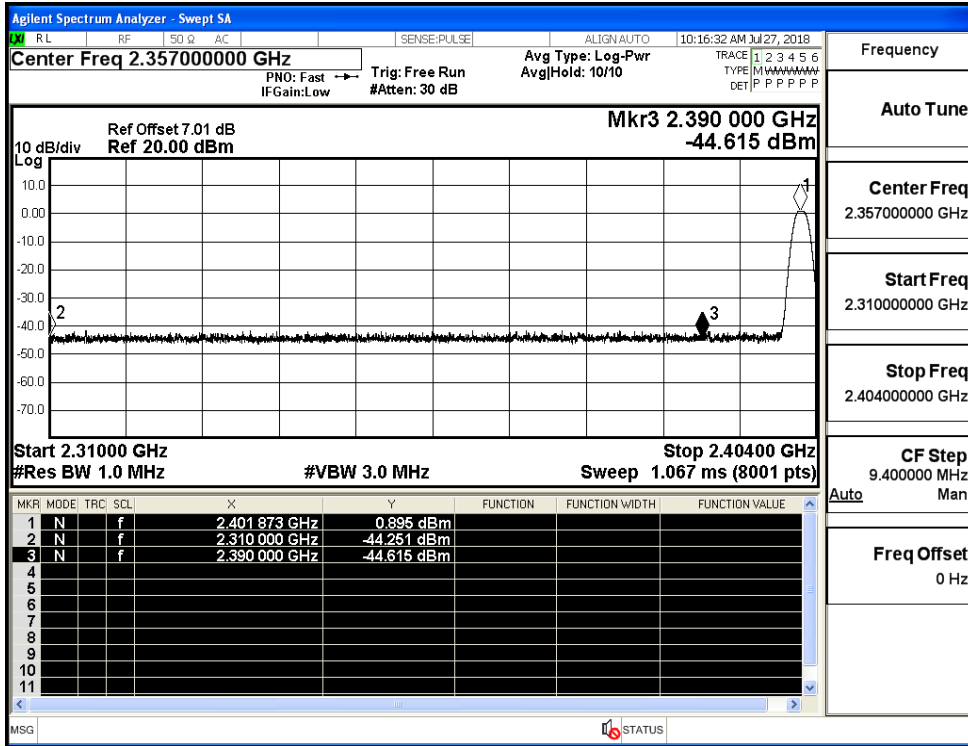
CF Step  
2.200000 MHz

Freq Offset  
0 Hz

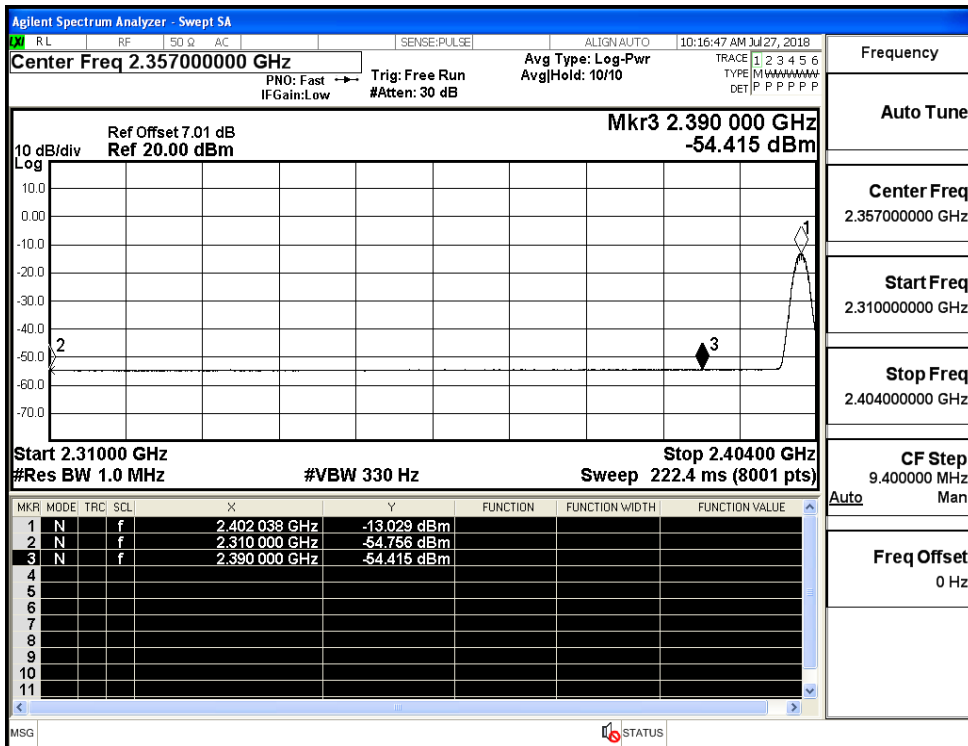
## A.7 Restrict-band band-edge measurements

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	-44.25	2.0	0	53.01	PEAK	74	PASS
		Ant1	2310.0	-54.76	2.0	0	42.50	AV	54	PASS
		Ant1	2390.0	-44.62	2.0	0	52.64	PEAK	74	PASS
		Ant1	2390.0	-54.42	2.0	0	42.84	AV	54	PASS
	2480	Ant1	2483.5	-44.87	2.0	0	52.39	PEAK	74	PASS
		Ant1	2483.5	-54.11	2.0	0	43.15	AV	54	PASS
		Ant1	2500.0	-43.67	2.0	0	53.59	PEAK	74	PASS
		Ant1	2500.0	-54.09	2.0	0	43.17	AV	54	PASS

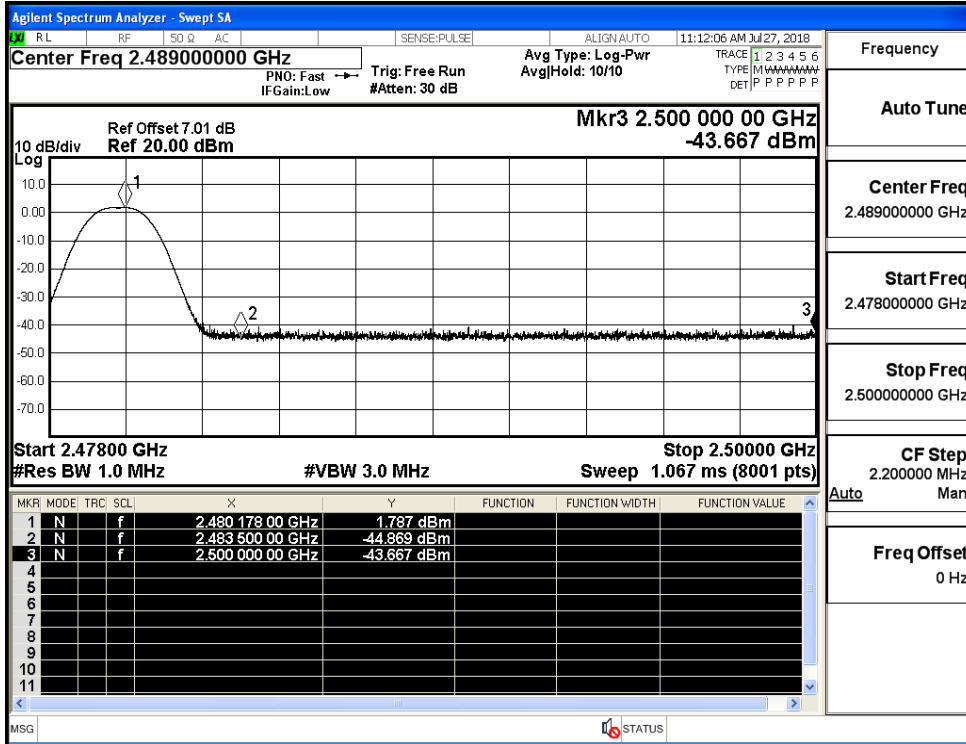
Restrict-band band-edge measurements\_BT LE\_2402\_Ant1\_PEAK



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

