

## Appendix A

### RF Test Data for Zigbee (Conducted Measurement)

Product Name: LED Controllers



Trade Mark: SUNRICHER

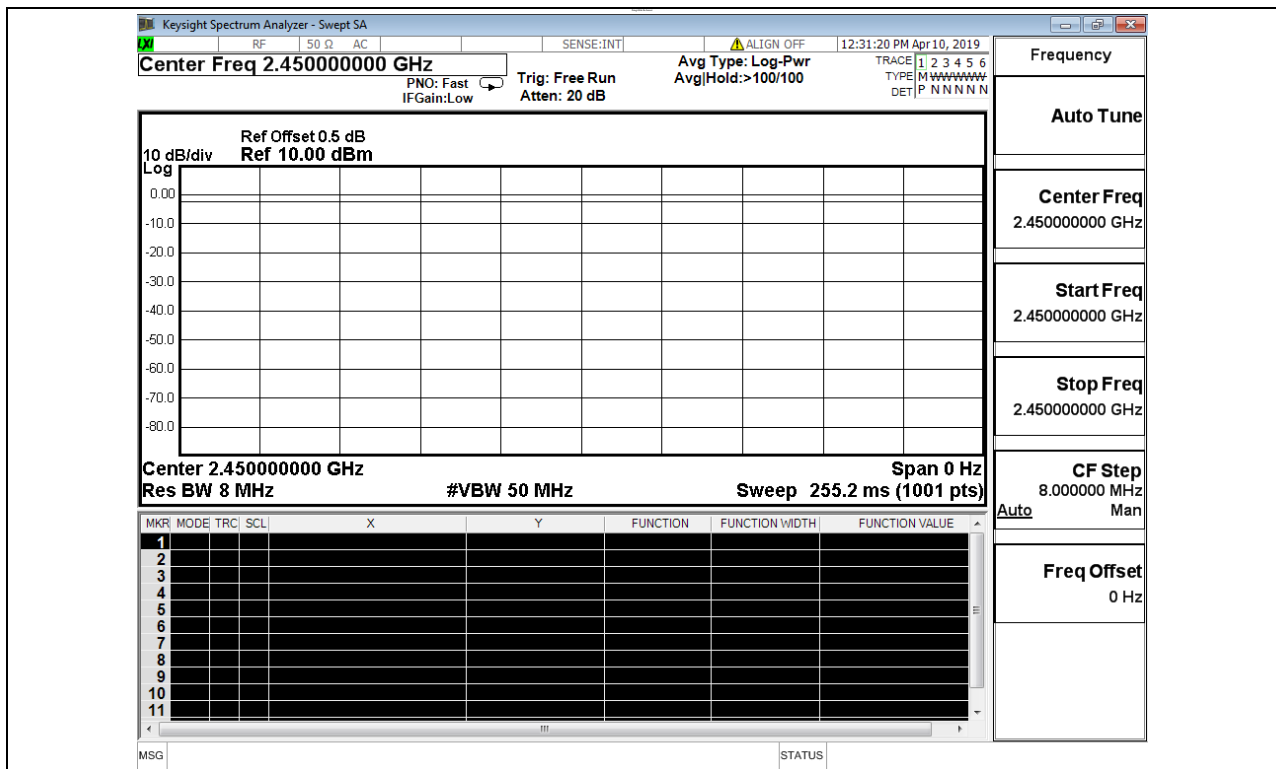
Test Model: SR-ZG9101FA-RGBW

#### Environmental Conditions

Temperature:	23.8 ° C
Relative Humidity:	54.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Diamond Lu
Supervised by:	Tom Liu

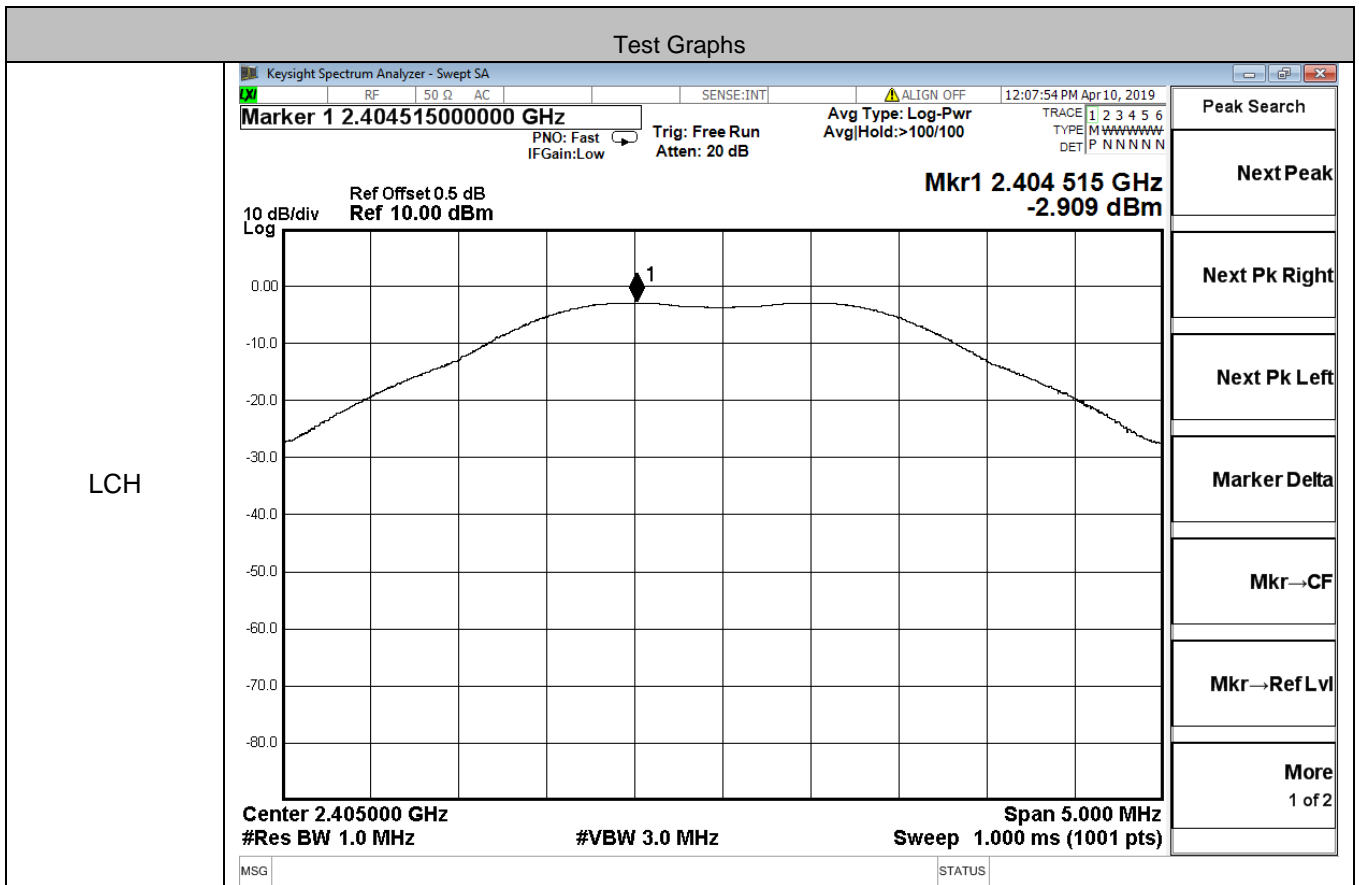
#### A.1 Duty Cycle

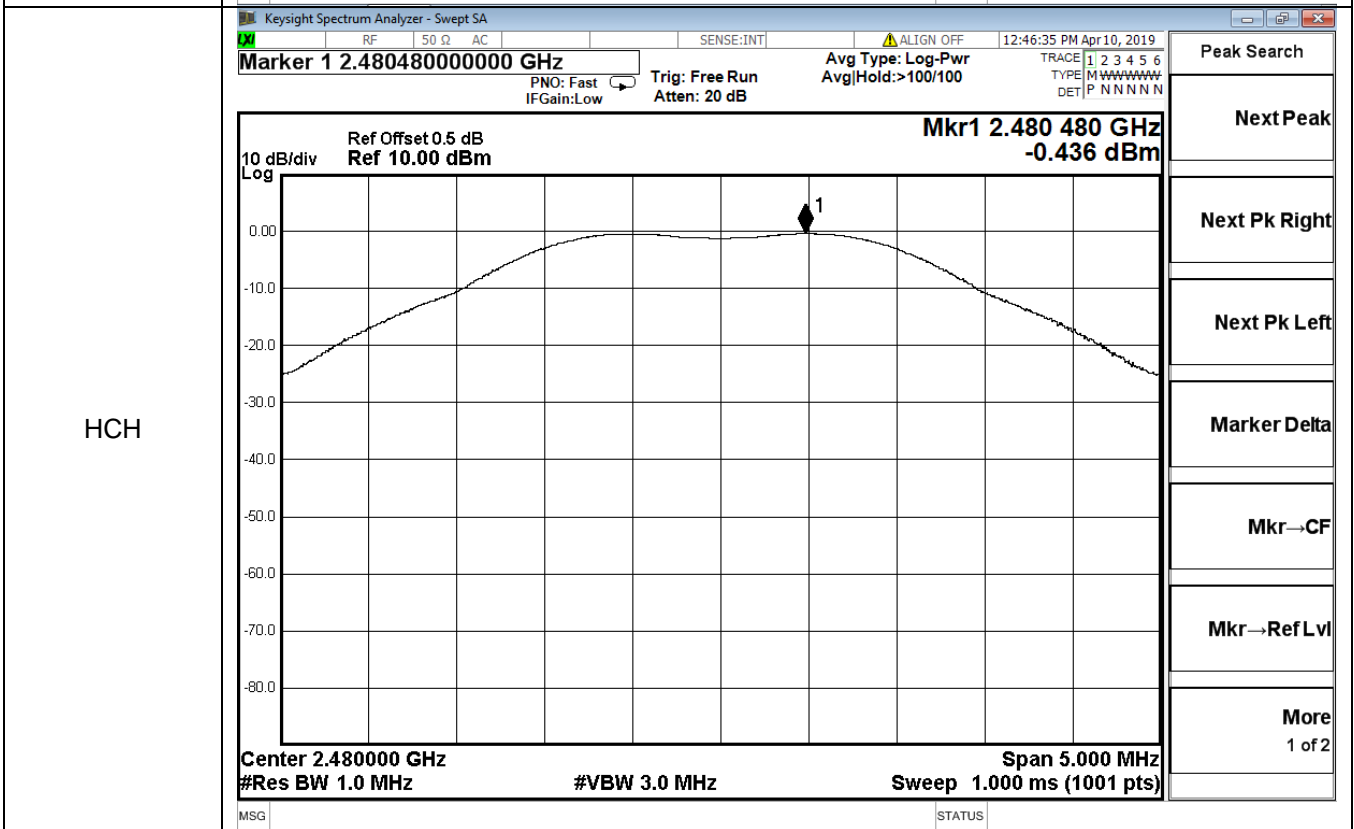
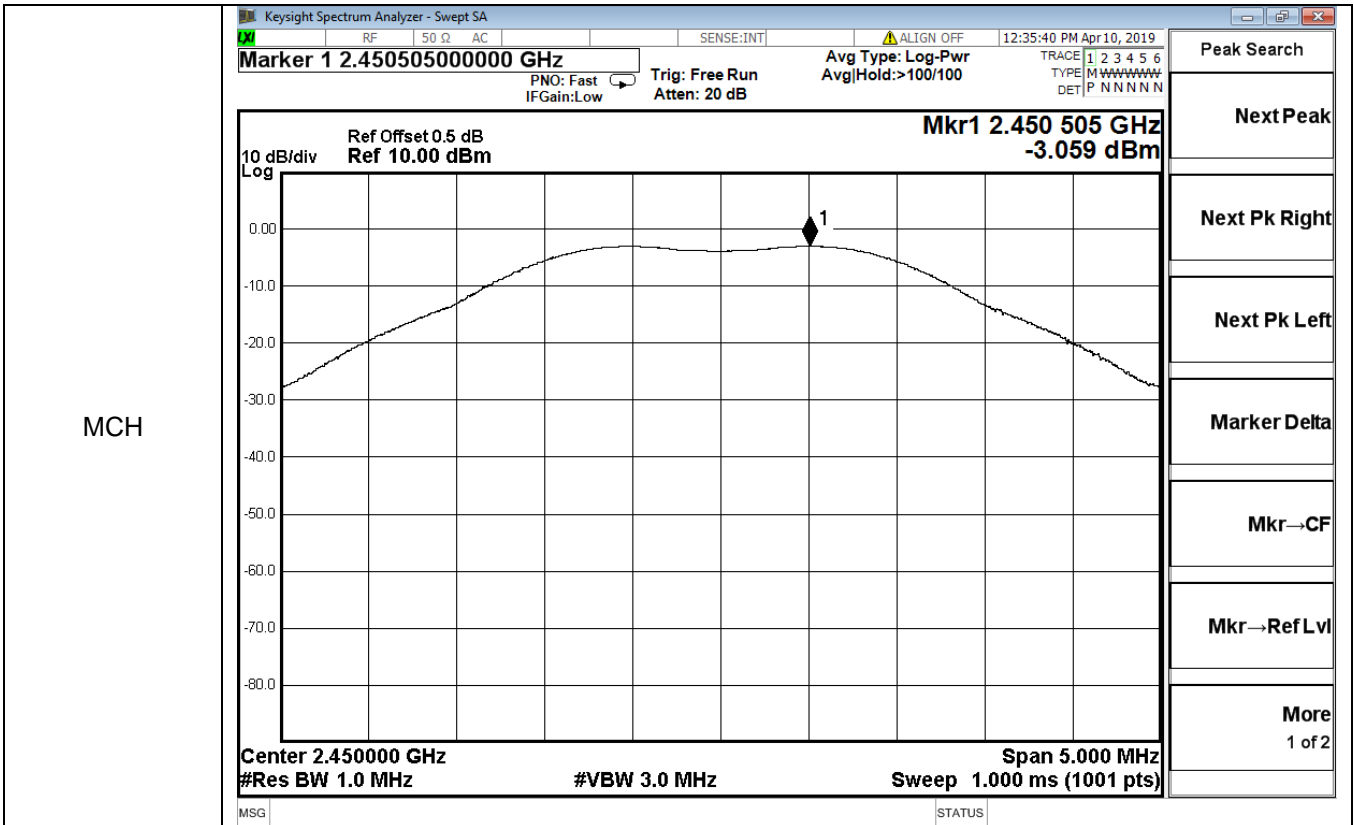
Test Mode	Test Channel	Ant	Duty Cycle[%]	Verdict
Zigbee	2450	Ant1	100	PASS



### A.2 Maximum Conducted Peak Output Power

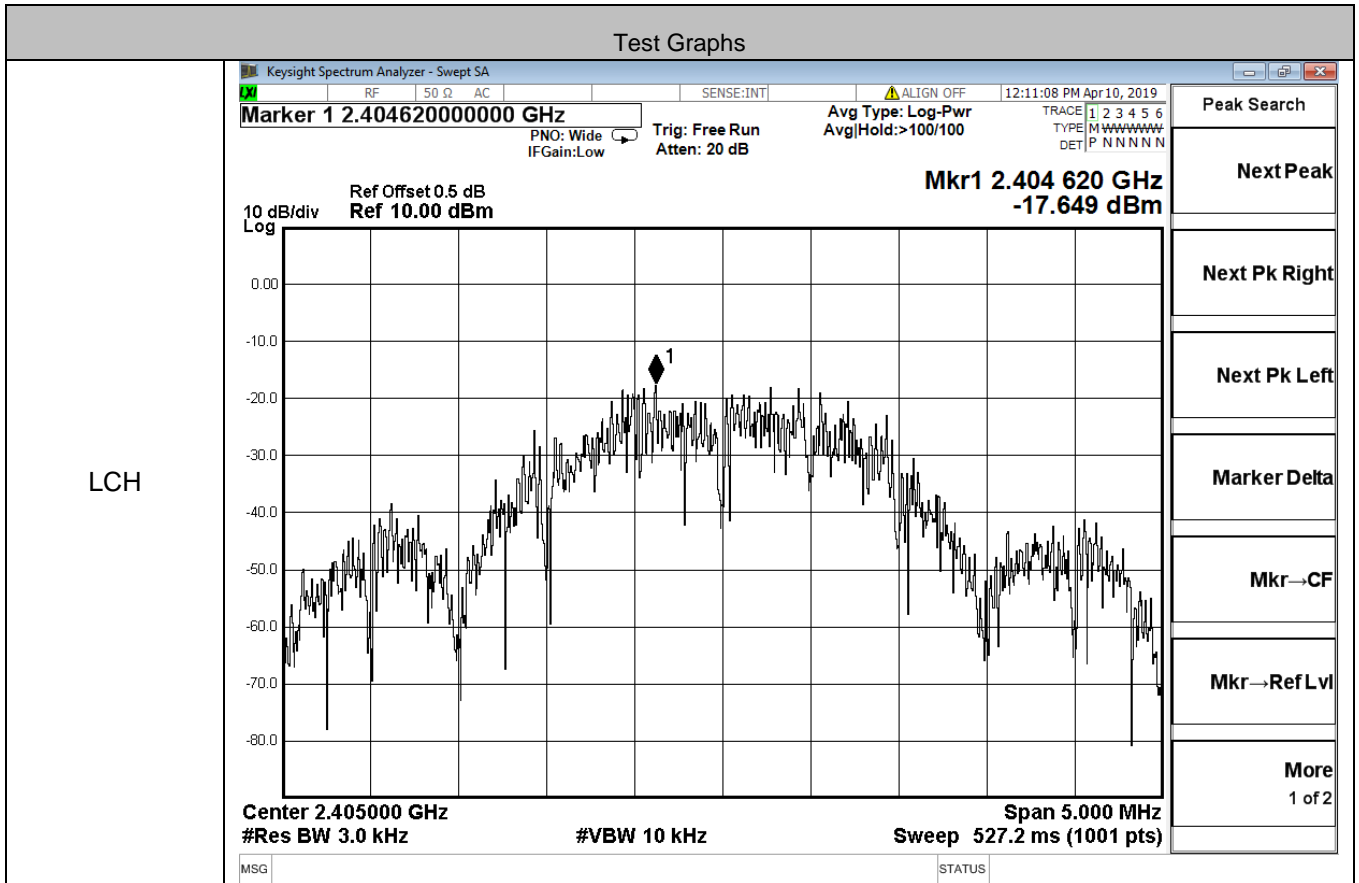
Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
Zigbee	LCH	-2.909	30	PASS
Zigbee	MCH	-3.059	30	PASS
Zigbee	HCH	-0.436	30	PASS



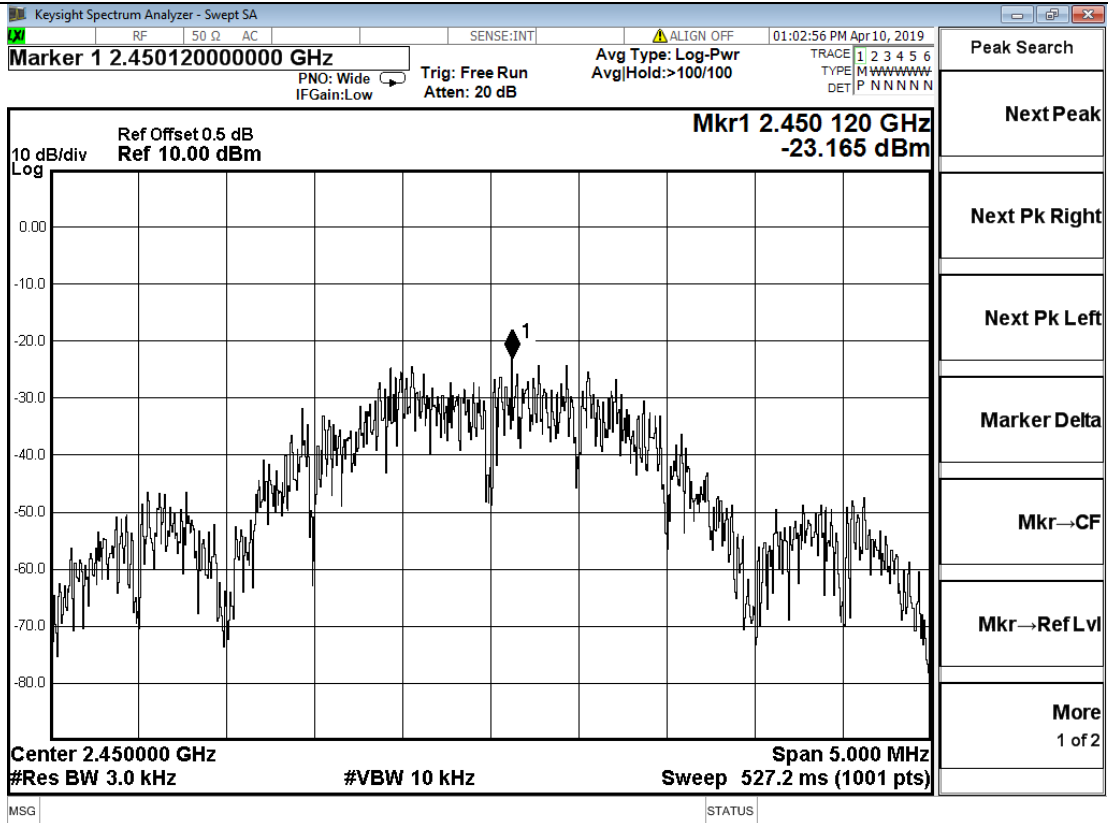


### A.3 Maximum Power Spectral Density

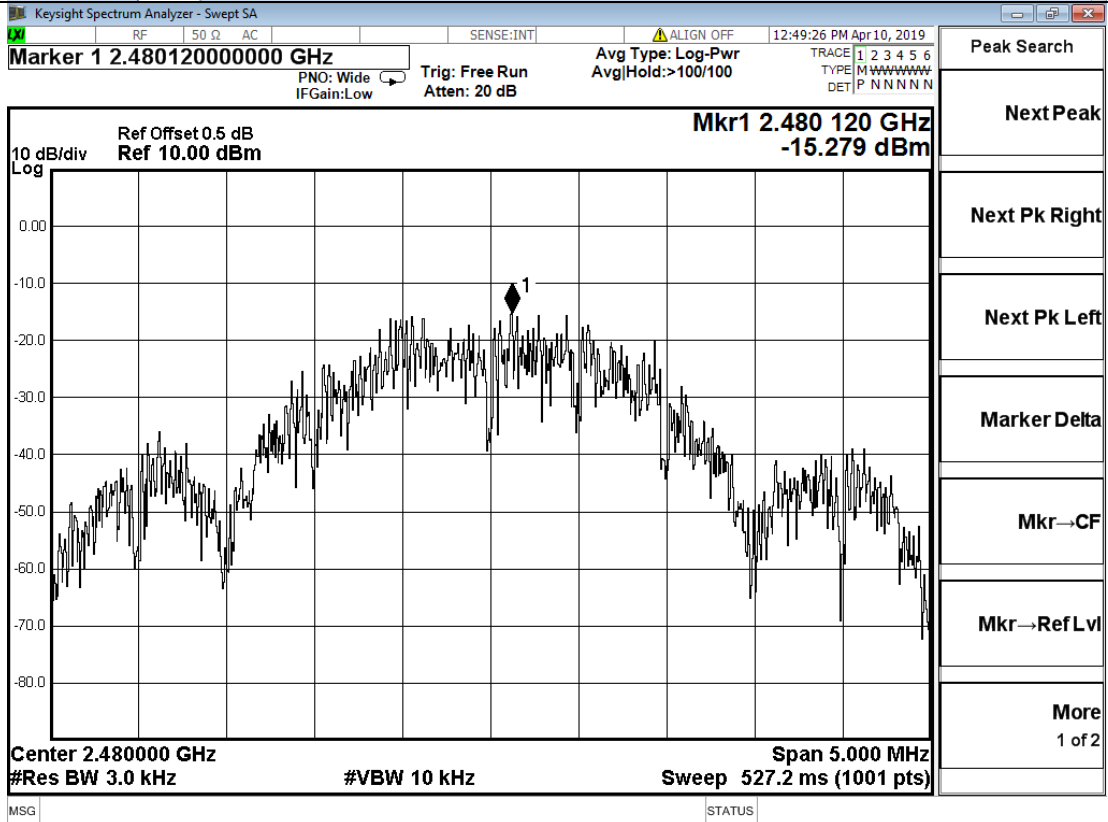
Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
Zigbee	LCH	-17.649	8	PASS
Zigbee	MCH	-23.165	8	PASS
Zigbee	HCH	-15.279	8	PASS



MCH



HCH



**A.4 6dB Bandwidth**

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
Zigbee	LCH	1.248	≥0.5	PASS
Zigbee	MCH	1.260	≥0.5	PASS
Zigbee	HCH	1.245	≥0.5	PASS

Test Graphs

LCH

Keysight Spectrum Analyzer - Occupied BW

Center Freq 2.405000000 GHz

Center Freq: 2.405000000 GHz

Trig: Free Run Avg|Hold:>10/10

#Res BW 100 kHz #VBW 300 kHz Span 5 MHz Sweep 1 ms

Occupied Bandwidth **2.3654 MHz**

Total Power 3.39 dBm

Transmit Freq Error -12.762 kHz

x dB Bandwidth 1.248 MHz

OBW Power 99.00 %

x dB -6.00 dB

MCH

Keysight Spectrum Analyzer - Occupied BW

Center Freq 2.450000000 GHz

Center Freq: 2.450000000 GHz

Trig: Free Run Avg|Hold:>10/10

#Res BW 100 kHz #VBW 300 kHz Span 5 MHz Sweep 1 ms

Occupied Bandwidth **2.3607 MHz**

Total Power 3.91 dBm

Transmit Freq Error -7.146 kHz

x dB Bandwidth 1.260 MHz

OBW Power 99.00 %

x dB -6.00 dB

HCH

Keysight Spectrum Analyzer - Occupied BW

Center Freq 2.48000000 GHz

Center Freq: 2.48000000 GHz

Trig: Free Run

#IFGain: Low

#Atten: 20 dB

Radio Std: None

Avg|Hold: >10/10

Radio Device: BTS

12:58:59 PM Apr 10, 2019

Trace/Detector

Clear Write

Average

Max Hold

Min Hold

Detector Average

Auto Man

MSG STATUS

Occupied Bandwidth	Total Power	5.49 dBm	
<b>2.3533 MHz</b>			
Transmit Freq Error	-16.814 kHz	OBW Power	99.00 %
x dB Bandwidth	1.245 MHz	x dB	-6.00 dB

### A.5 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
Zigbee	LCH	-4.150	-49.492	-24.15	PASS
Zigbee	MCH	-4.508	-47.190	-24.51	PASS
Zigbee	HCH	-1.747	-53.657	-21.75	PASS

**Zigbee\_LCH\_Graphs**

Pref/Zigbee/LCH

Keysight Spectrum Analyzer - Swept SA  
 Display Line -24.15 dBm  
 PNO: Wide IFGain:Low Trig: Free Run Atten: 20 dB  
 Avg Type: Log-Pwr AvgHold: >100/100  
 12:13:16 PM Apr 10, 2019  
 Mkr1 2.404 495 GHz -4.150 dBm  
 Ref Offset 0.5 dB Ref 10.00 dBm  
 10 dB/div Log  
 Center 2.405000 GHz #Res BW 100 kHz #VBW 300 kHz Span 5.000 MHz Sweep 1.000 ms (1001 pts)

Display

Annotation▶

Title▶

Graticule On Off

Display Line On Off

System Display Settings▶

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Puw/Zigbee/LCH

Keysight Spectrum Analyzer - Swept SA  
 Marker 2 4.799270000000 GHz  
 PNO: Fast IFGain:Low Trig: Free Run Atten: 20 dB  
 Avg Type: Log-Pwr AvgHold: 20/100  
 12:15:47 PM Apr 10, 2019  
 Mkr2 4.799 GHz -49.492 dBm  
 Ref Offset 0.5 dB Ref 10.00 dBm  
 10 dB/div Log  
 Start 30 MHz #Res BW 100 kHz #VBW 300 kHz Stop 25.00 GHz Sweep 2.386 s (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N		f	2.405 GHz	-9.294 dBm			
2	N		f	4.799 GHz	-49.492 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

Marker

Select Marker 2

Normal

Delta

Fixed▶

Off

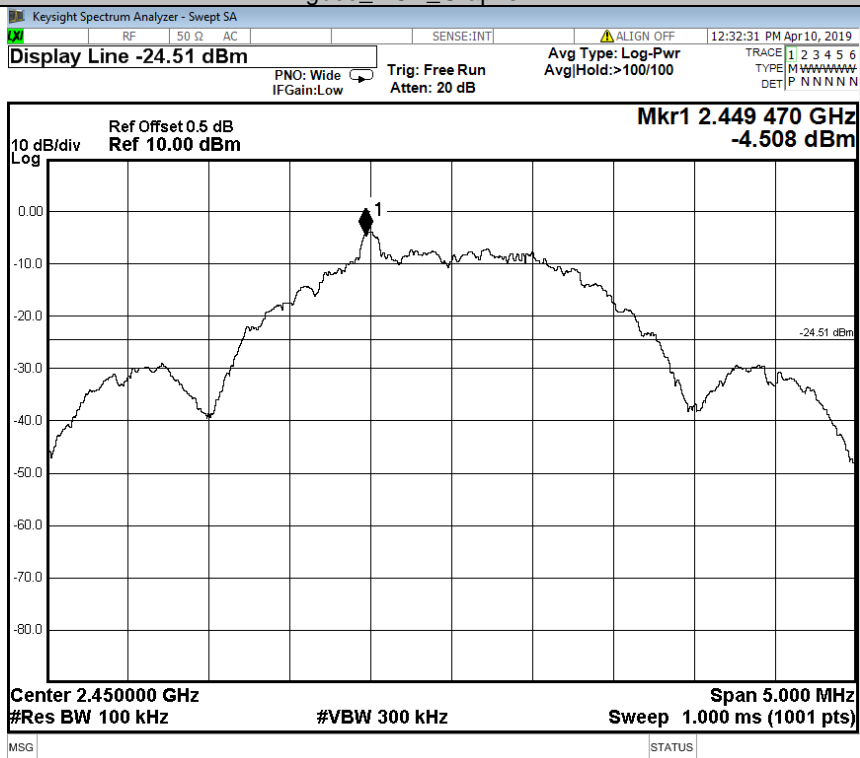
Properties▶

More 1 of 2



Zigbee\_MCH\_Graphs

Pref/Zigbee/MCH



Display

Annotation

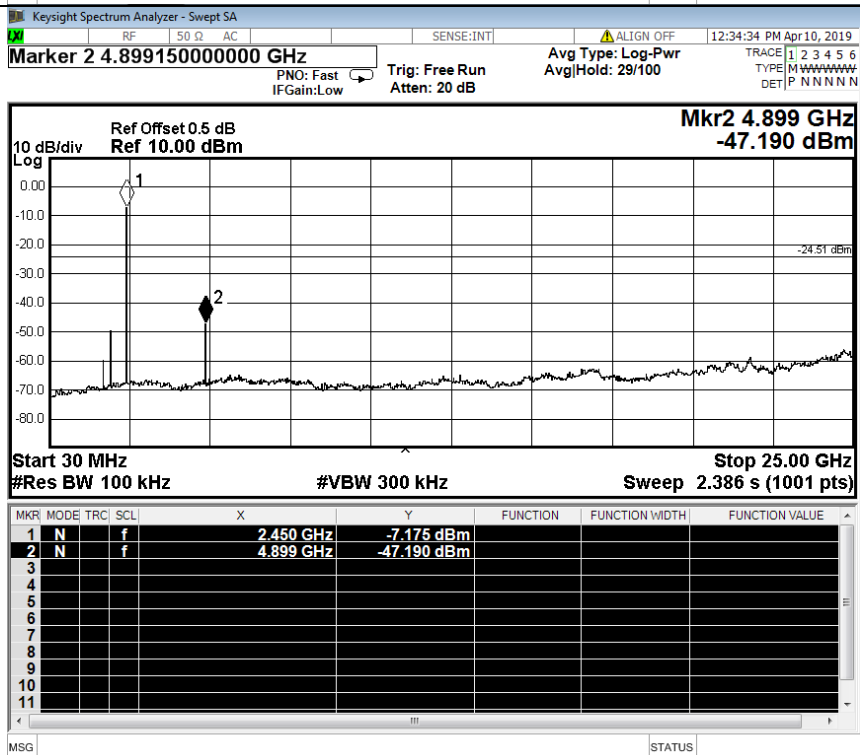
Title

Graticule  
On Off

Display Line  
On -24.51 dBm Off

System Display Settings

Puw/Zigbee/MCH



Marker

Select Marker  
2

Normal

Delta

Fixed

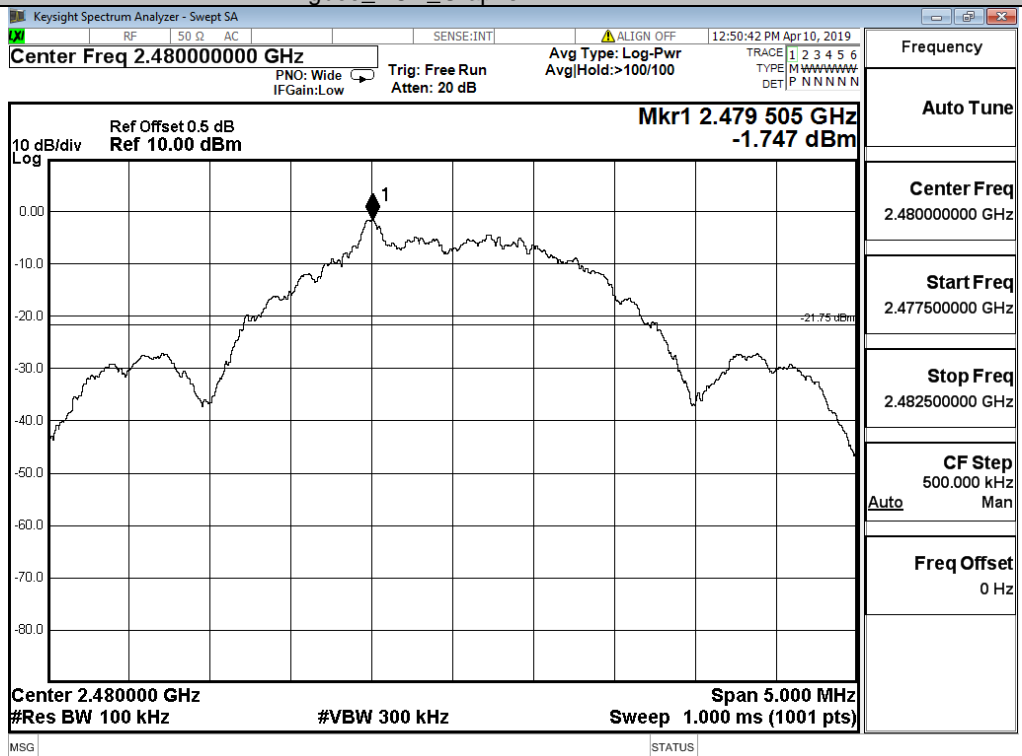
Off

Properties

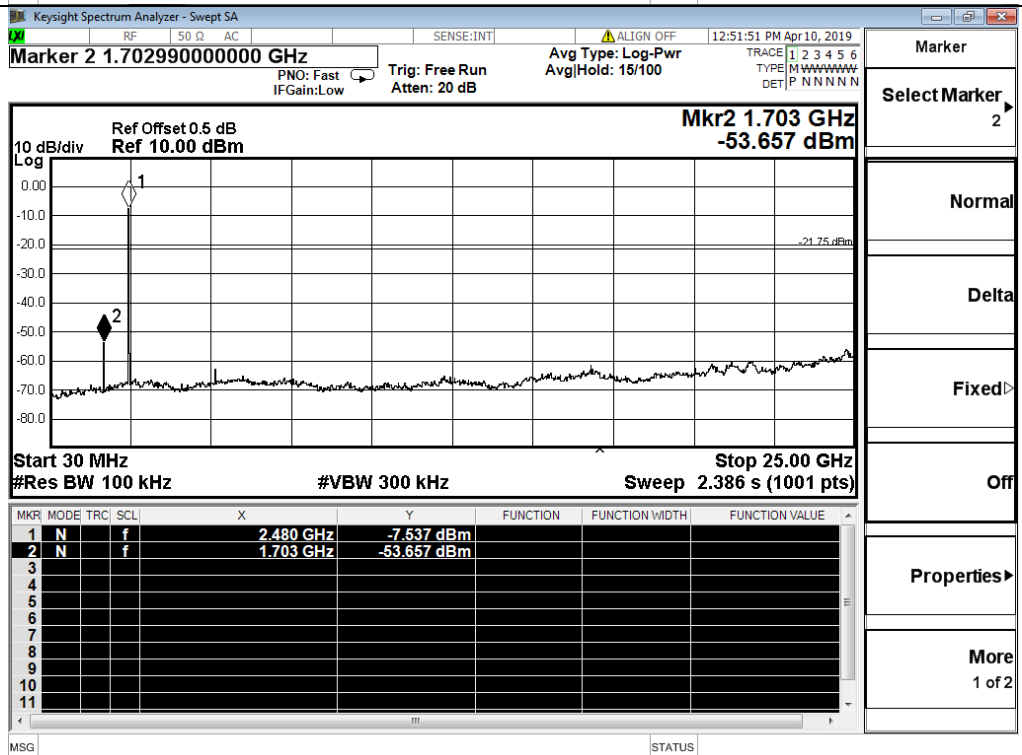
More  
1 of 2

Zigbee\_HCH\_Graphs

Pref/Zigbee/HCH



Puw/Zigbee/HCH



### A.6 Band-edge for RF Conducted Emissions

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
Zigbee	LCH	-4.119	-47.569	-24.12	PASS
Zigbee	HCH	-1.389	-48.679	-21.39	PASS

Test Graphs

LCH

Keysight Spectrum Analyzer - Swept SA  
 Display Line -24.12 dBm  
 PNO: Fast IFGain:Low Trig: Free Run Atten: 20 dB  
 Avg Type: Log-Pwr AvgHold: >100/100  
 12:19:00 PM Apr 10, 2019  
 TRACE 1 2 3 4 5 6  
 TYPE M N N N N N N  
 DET P N N N N N N

10 dB/div Ref Offset 0.5 dB Ref 10.00 dBm  
 Mkr4 2.338 84 GHz -67.713 dBm

Start 2.30000 GHz Stop 2.40700 GHz  
 #Res BW 100 kHz #VBW 300 kHz Sweep 10.27 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.404 54 GHz	-4.119 dBm			
2	N	f		2.400 00 GHz	-47.569 dBm			
3	N	f		2.390 00 GHz	-66.261 dBm			
4	N	f		2.338 84 GHz	-67.713 dBm			

Display  
 Annotation▶  
 Title▶  
 Graticule  
 On Off  
 Display Line  
 -24.12 dBm  
 On Off  
 System  
 Display▶  
 Settings

HCH

Keysight Spectrum Analyzer - Swept SA  
 Display Line -21.39 dBm  
 PNO: Fast IFGain:Low Trig: Free Run Atten: 20 dB  
 Avg Type: Log-Pwr AvgHold: >100/100  
 12:55:20 PM Apr 10, 2019  
 TRACE 1 2 3 4 5 6  
 TYPE M N N N N N N  
 DET P N N N N N N

10 dB/div Ref Offset 0.5 dB Ref 10.00 dBm  
 Mkr1 2.479 496 GHz -1.389 dBm

Start 2.47800 GHz Stop 2.50000 GHz  
 #Res BW 100 kHz #VBW 300 kHz Sweep 2.133 ms (1001 pts)

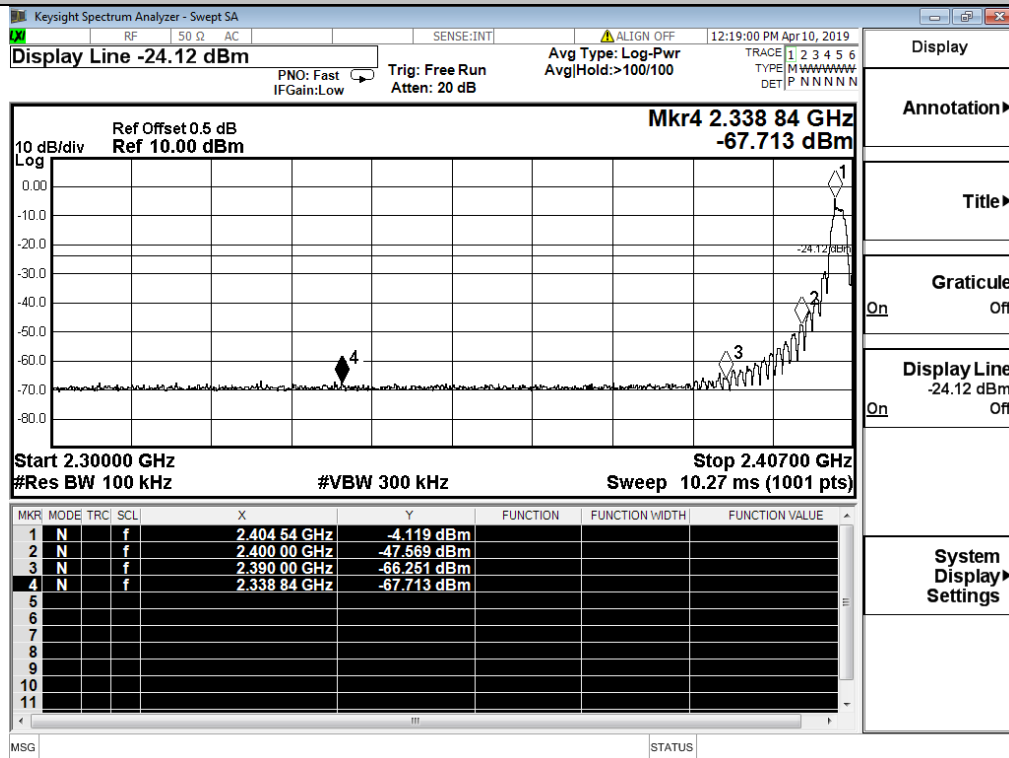
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.479 496 GHz	-1.389 dBm			
2	N	f		2.483 500 GHz	-48.679 dBm			
3	N	f		2.500 000 GHz	-68.049 dBm			
4	N	f		2.484 930 GHz	-44.146 dBm			

Display  
 Annotation▶  
 Title▶  
 Graticule  
 On Off  
 Display Line  
 -21.39 dBm  
 On Off  
 System  
 Display▶  
 Settings

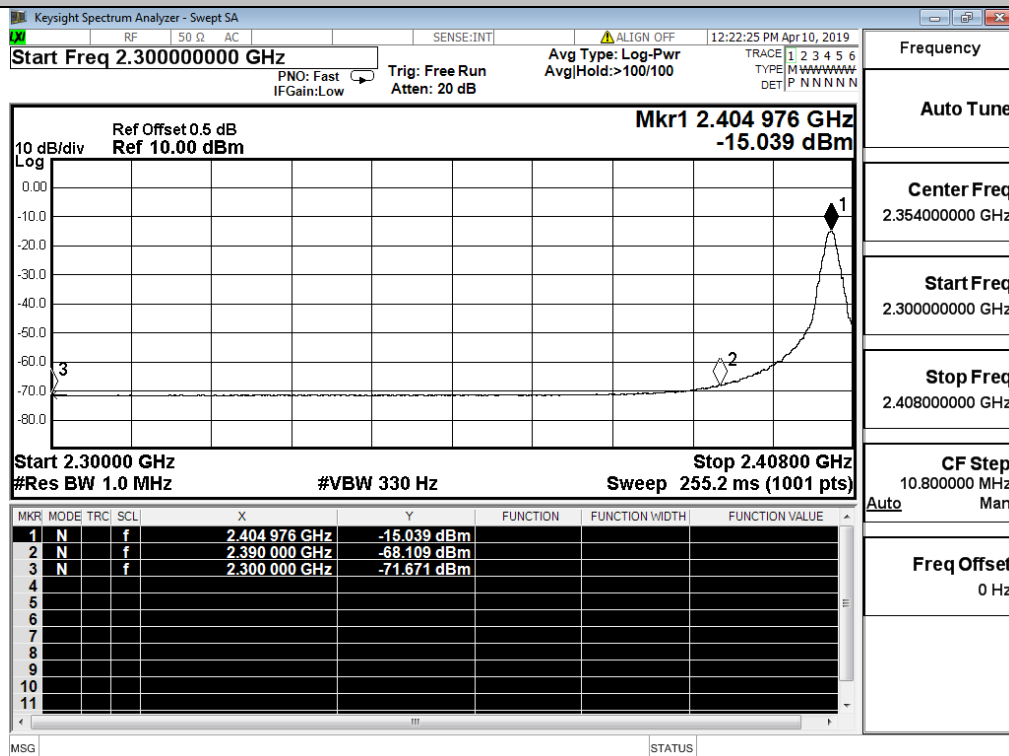
## A.7 Restrict-band band-edge measurements

Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdi
Zigbee	2405	Ant1	2300.0	-59.846	2.0	0	37.414	PEAK	74	PASS
		Ant1	2300.0	-71.671	2.0	0	25.589	AV	54	PASS
		Ant1	2390.0	-53.472	2.0	0	43.788	PEAK	74	PASS
		Ant1	2390.0	-68.109	2.0	0	29.151	AV	54	PASS
	2480	Ant1	2483.5	-31.124	2.0	0	66.136	PEAK	74	PASS
		Ant1	2483.5	-48.705	2.0	0	48.555	AV	54	PASS
		Ant1	2500.0	-53.051	2.0	0	44.209	PEAK	74	PASS
		Ant1	2500.0	-68.884	2.0	0	28.376	AV	54	PASS

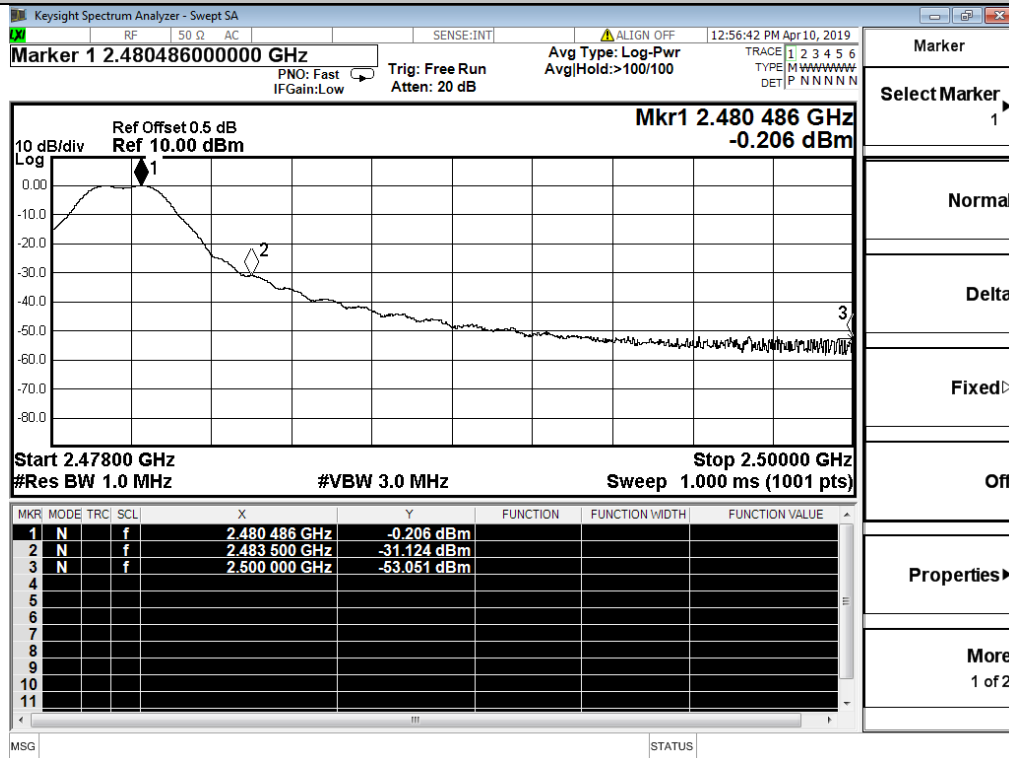
Restrict-band band-edge measurements\_Zigbee\_2405\_Ant1\_PEAK



Restrict-band band-edge measurements\_Zigbee\_2405\_Ant1\_AV



Restrict-band band-edge measurements\_Zigbee\_2480\_Ant1\_PEAK



Restrict-band band-edge measurements\_Zigbee\_2480\_Ant1\_AV

