

## Appendix A

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

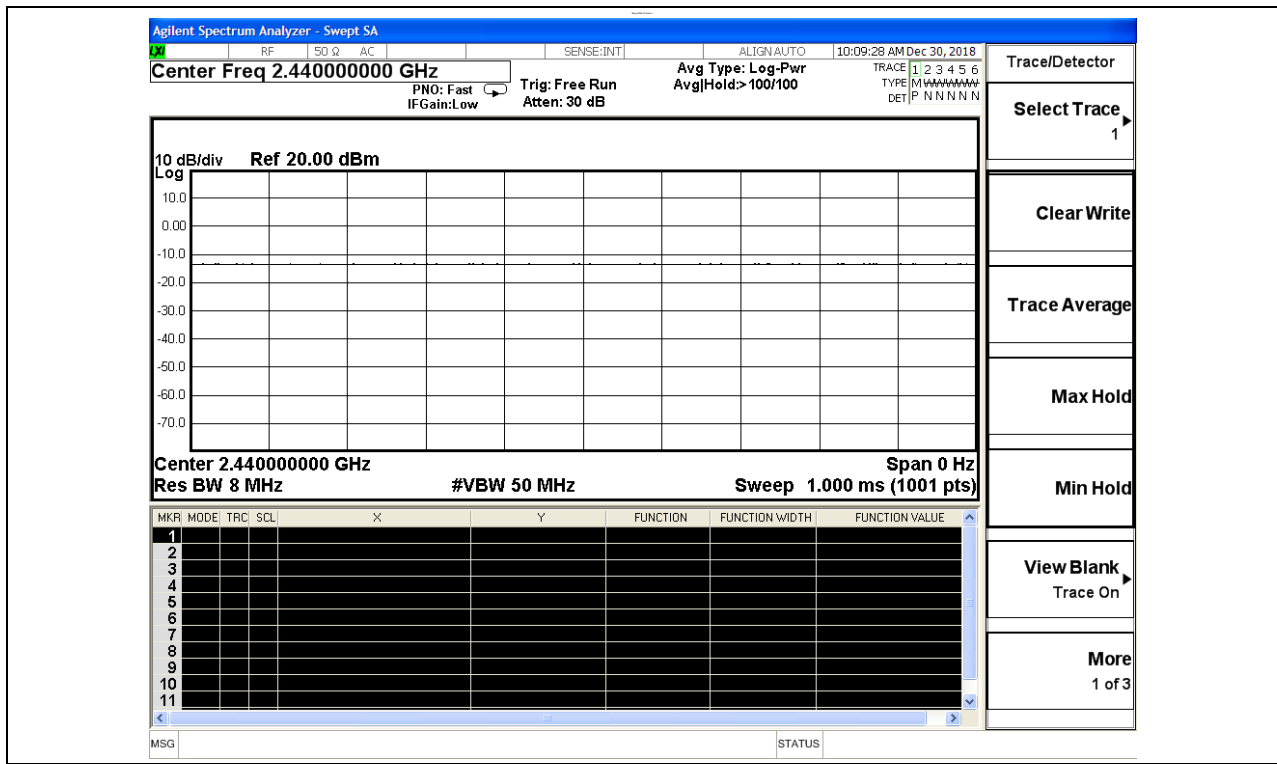
**Product Name: Director**  
**Trade Mark: Smart Forced Air**  
**Test Model: Director**

#### Environmental Conditions

Temperature:	23.8 ° C
Relative Humidity:	54.2%
ATM Pressure:	100.0 kPa
Test Engineer:	David Luo
Supervised by:	Jayden.Zhuo

#### A.1 Duty Cycle

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

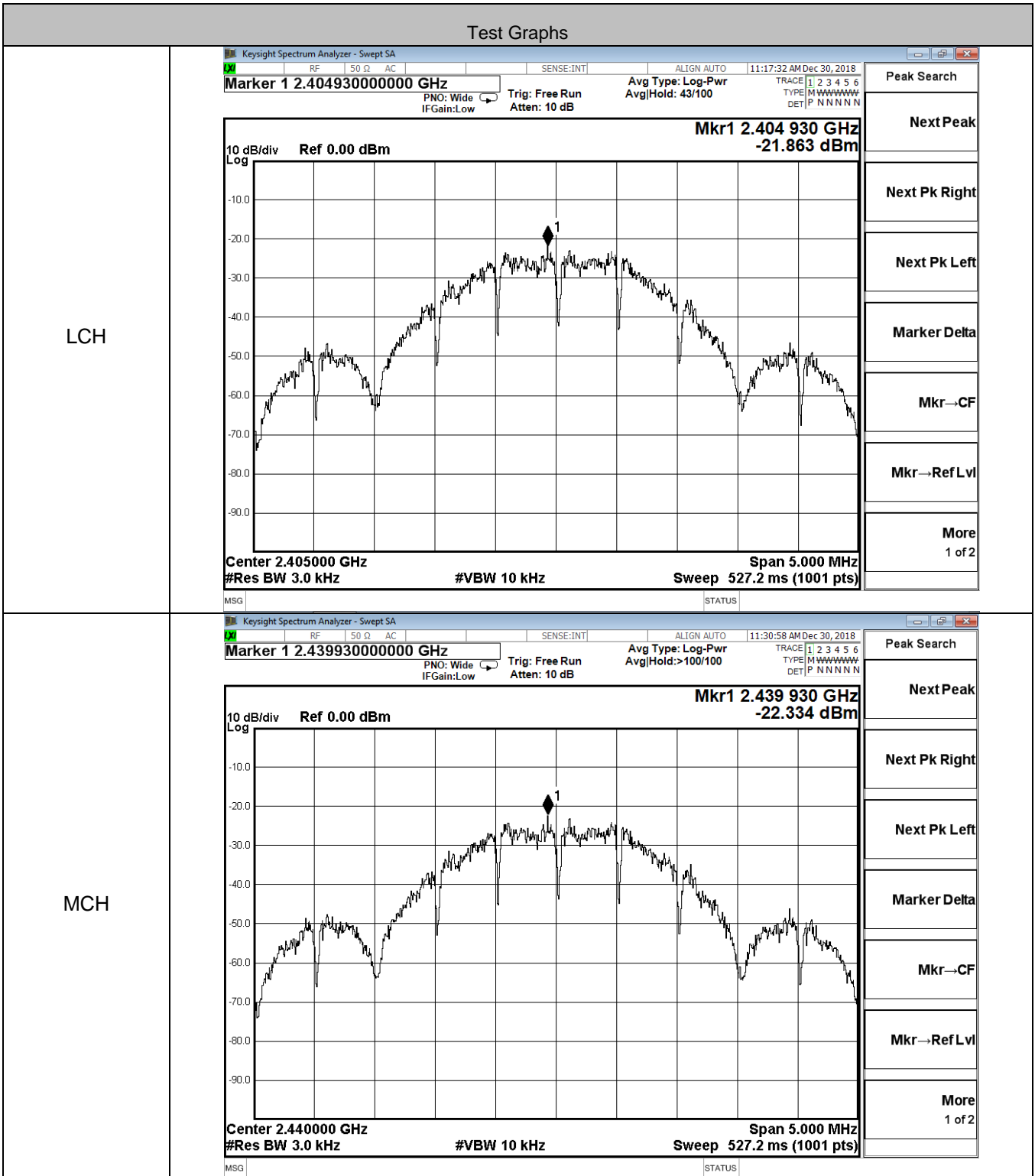


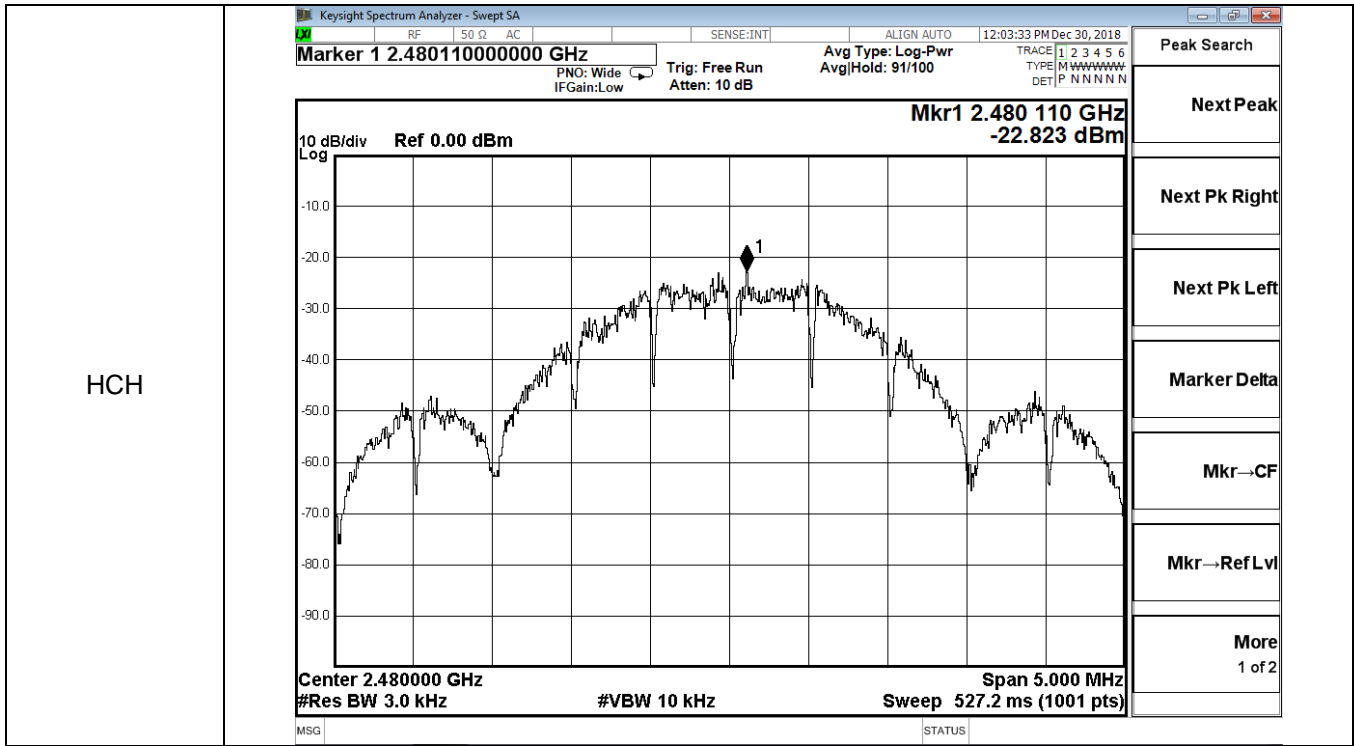
## A.2 Maximum Conducted Peak Output Power

Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
ZigBee	LCH	-6.576	30	PASS
ZigBee	MCH	-6.618	30	PASS
ZigBee	HCH	-7.320	30	PASS

### A.3 Maximum Power Spectral Density

Mode	Channel	PSD [dBm/3KHz]	Limit [dBm/3KHz]	Verdict
ZigBee	LCH	-21.863	8	PASS
ZigBee	MCH	-22.334	8	PASS
ZigBee	HCH	-22.823	8	PASS





### A.4 6dB Bandwidth

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
ZigBee	LCH	1.526	≥0.5	PASS
ZigBee	MCH	1.534	≥0.5	PASS
ZigBee	HCH	1.546	≥0.5	PASS

Test Graphs

LCH

Keysight Spectrum Analyzer - Occupied BW

Center Freq: 2.40500000 GHz  
 Trig: Free Run  
 #FGain: Low  
 #Atten: 10 dB

Center Freq: 2.40500000 GHz  
 Radio Std: None  
 Avg/Hold: >10/10  
 Radio Device: BTS

10 dB/div Ref 10.00 dBm

Center 2.405 GHz  
 #Res BW 100 kHz  
 #VBW 300 kHz  
 Span 5 MHz  
 Sweep 1 ms

Occupied Bandwidth 2.2695 MHz  
 Total Power 0.05 dBm

Transmit Freq Error 17.964 kHz  
 OBW Power 99.00 %

x dB Bandwidth 1.526 MHz  
 x dB -6.00 dB

Trace/Detector

Clear Write

Average

Max Hold

Min Hold

Detector Average

Auto Man

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MCH

Keysight Spectrum Analyzer - Occupied BW

Center Freq: 2.44000000 GHz  
 Trig: Free Run  
 #FGain: Low  
 #Atten: 10 dB

Center Freq: 2.44000000 GHz  
 Radio Std: None  
 Avg/Hold: >10/10  
 Radio Device: BTS

10 dB/div Ref 10.00 dBm

Center 2.44 GHz  
 #Res BW 100 kHz  
 #VBW 300 kHz  
 Span 5 MHz  
 Sweep 1 ms

Occupied Bandwidth 2.2944 MHz  
 Total Power -0.18 dBm

Transmit Freq Error 18.264 kHz  
 OBW Power 99.00 %

x dB Bandwidth 1.534 MHz  
 x dB -6.00 dB

Trace/Detector

Clear Write

Average

Max Hold

Min Hold

Detector Average

Auto Man

HCH

Keysight Spectrum Analyzer - Occupied BW

Center Freq 2.48000000 GHz

Center Freq: 2.48000000 GHz

Trig: Free Run

Avg|Hold:>10/10

#FGain:Low

#Atten: 10 dB

Radio Device: BTS

10 dB/div Ref 10.00 dBm

Log

Center 2.48 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 5 MHz

Sweep 1 ms

Occupied Bandwidth	Total Power		-0.55 dBm
<b>2.3551 MHz</b>			
Transmit Freq Error	17.808 kHz	OBW Power	99.00 %
x dB Bandwidth	1.546 MHz	x dB	-6.00 dB

Frequency

Center Freq 2.48000000 GHz

CF Step 500.000 kHz

Auto Man

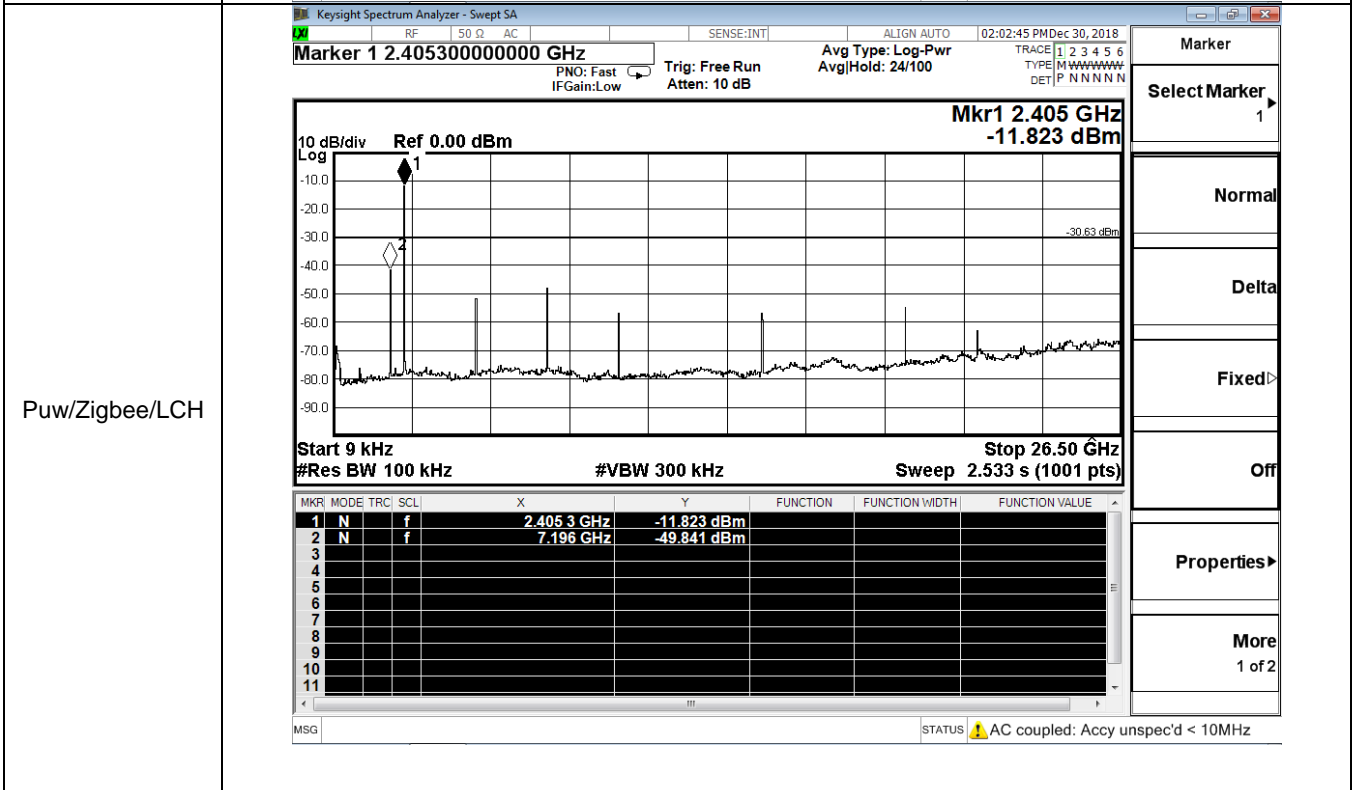
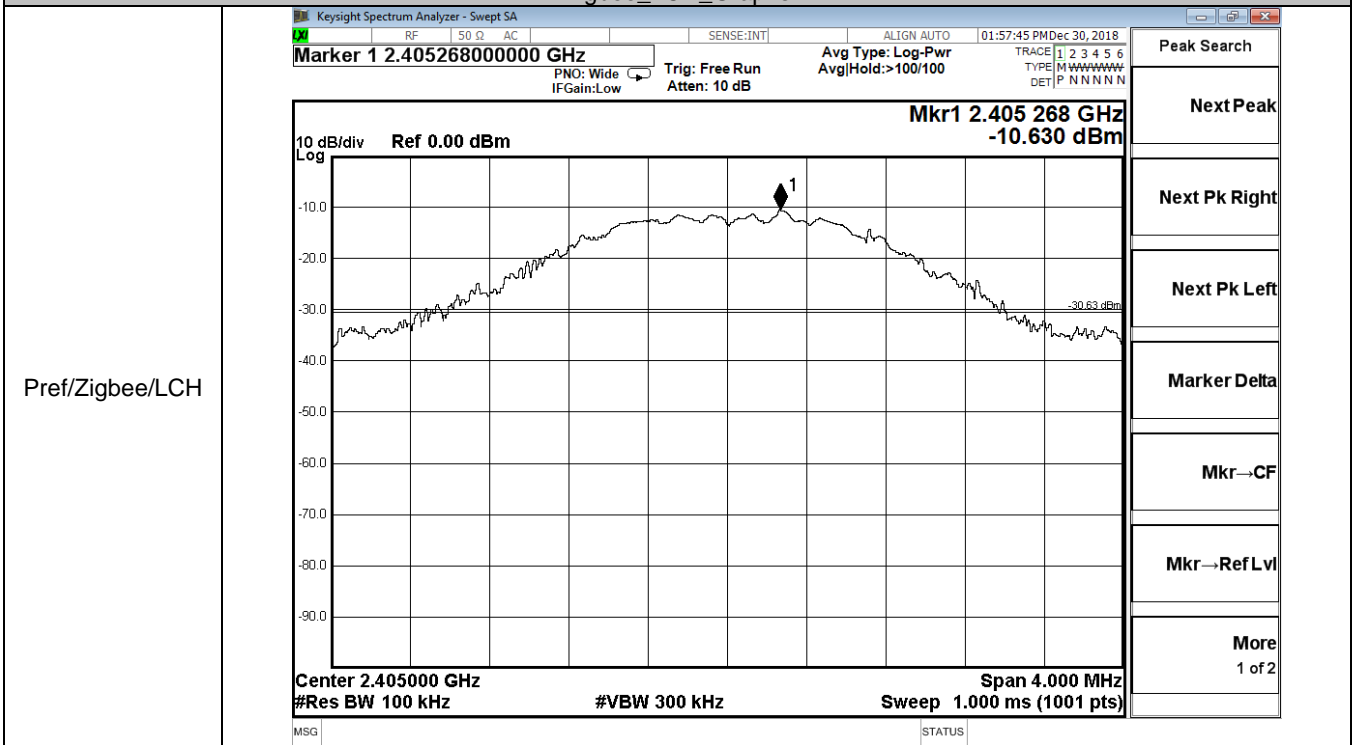
Freq Offset 0 Hz

MSG STATUS

## A.5 RF Conducted Spurious Emissions

Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
ZigBee	LCH	-10.630	-49.841	-30.630	PASS
ZigBee	MCH	-10.392	-46.195	-30.392	PASS
ZigBee	HCH	-10.669	-48.232	-30.669	PASS

Zigbee\_LCH\_Graphs

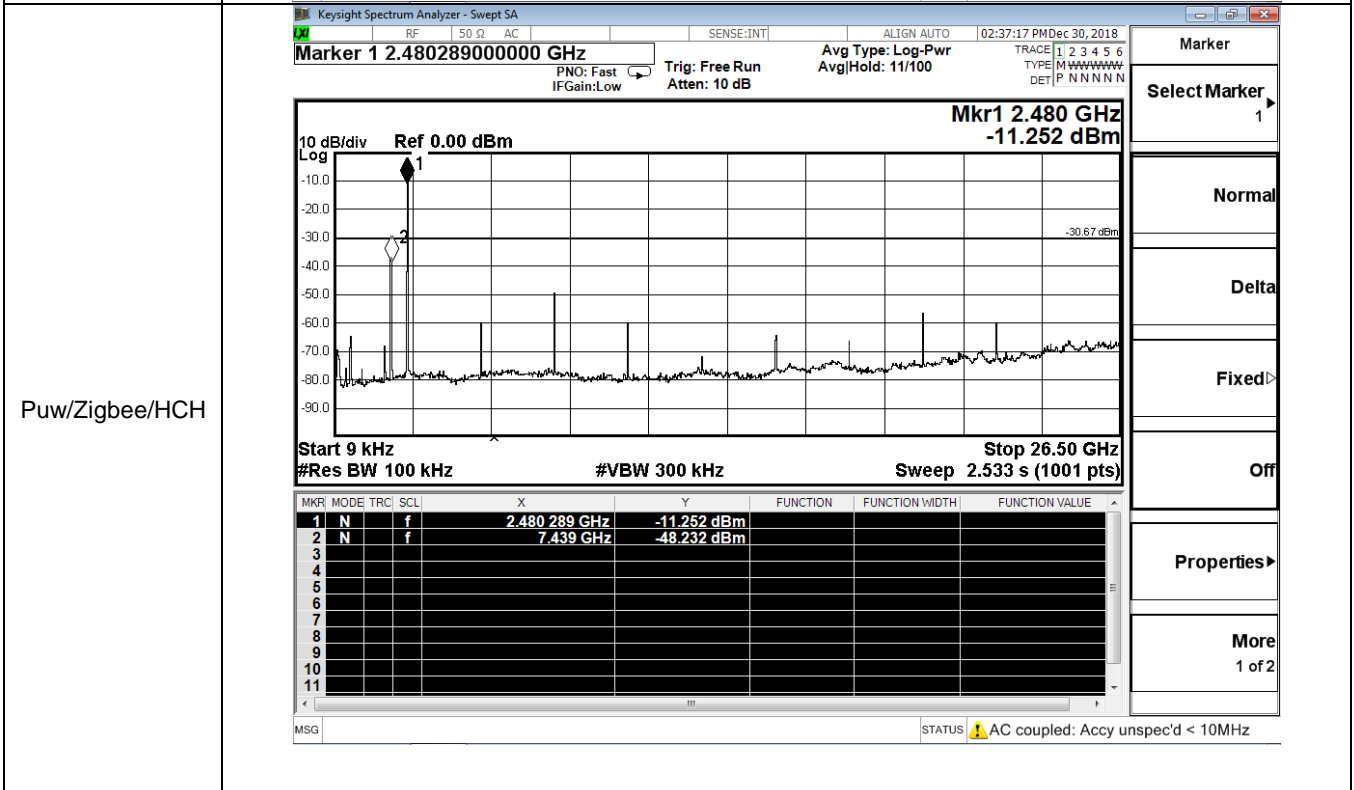
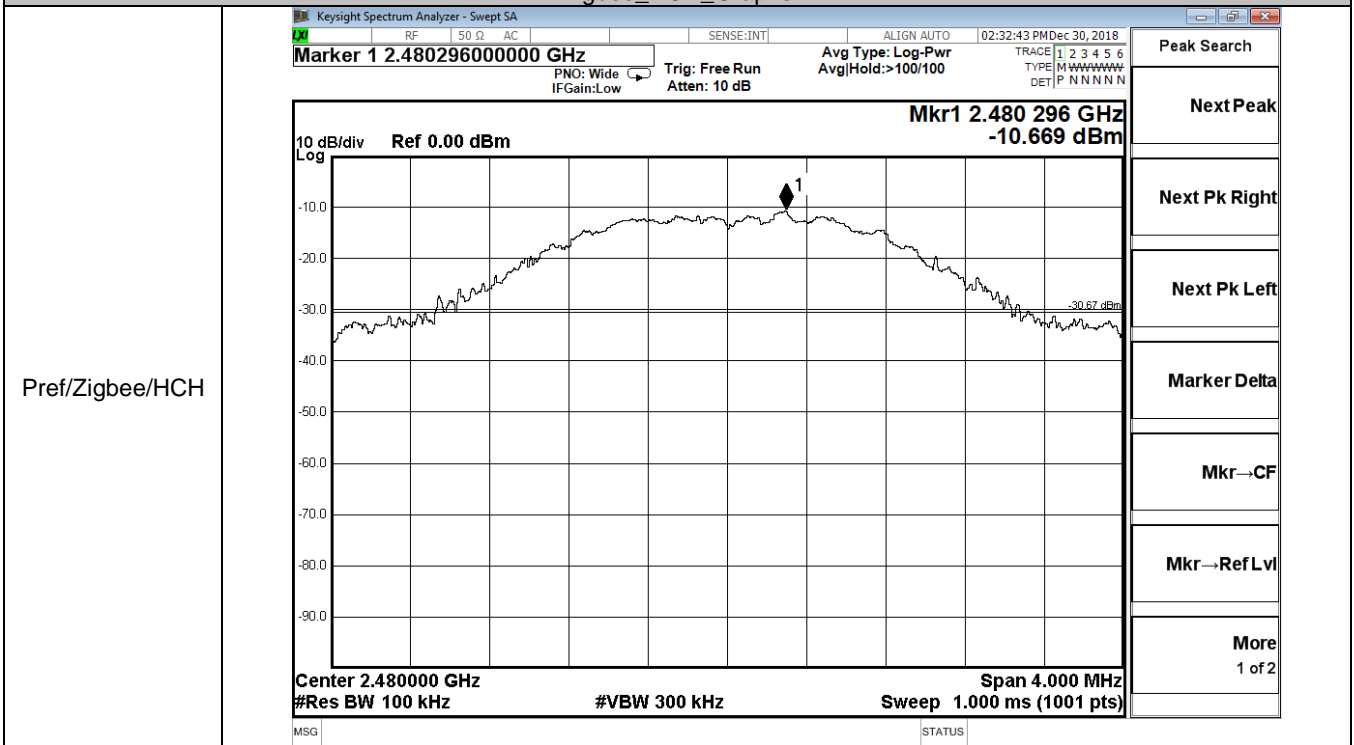




Zigbee\_MCH\_Graphs

Pref/Zigbee/MCH	<p>Keysight Spectrum Analyzer - Swept SA          Marker 1 2.44028000000 GHz          PNO: Wide IFGain: Low Trig: Free Run Atten: 10 dB          Avg Type: Log-Pwr AvgHold: &gt;100/100          02:18:07 PM Dec 30, 2018          Mkr1 2.440 280 GHz -10.392 dBm          10 dB/div Ref 0.00 dBm          Center 2.440000 GHz Span 4.000 MHz          #Res BW 100 kHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)</p>																																																																																																												
Puw/Zigbee/MCH	<p>Keysight Spectrum Analyzer - Swept SA          Marker 1 2.44028000000 GHz          PNO: Fast IFGain: Low Trig: Free Run Atten: 10 dB          Avg Type: Log-Pwr AvgHold: 26/100          02:20:57 PM Dec 30, 2018          Mkr1 2.440 GHz -11.209 dBm          10 dB/div Ref 0.00 dBm          Start 9 kHz Stop 26.50 GHz          #Res BW 100 kHz #VBW 300 kHz Sweep 2.533 s (1001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <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>2.440 GHz</td> <td>-11.209 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>N</td> <td>f</td> <td></td> <td>7.314 GHz</td> <td>-46.195 dBm</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>9</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>11</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>STATUS  AC coupled: Accy unspec'd &lt; 10MHz</p>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	N	f		2.440 GHz	-11.209 dBm				2	N	f		7.314 GHz	-46.195 dBm				3									4									5									6									7									8									9									10									11								
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Zigbee\_HCH\_Graphs



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

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
ZigBee	LCH	-10.627	-52.060	-30.630	PASS
ZigBee	HCH	-10.880	-51.326	-30.669	PASS

Test Graphs

LCH

Marker 1 2.405300000000 GHz

Mkr1 2.405 3 GHz -10.627 dBm

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.405 3 GHz	-10.627 dBm			
2	N	f		2.400 0 GHz	-52.060 dBm			
3	N	f		2.390 0 GHz	-69.414 dBm			

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

Mkr→CF

Mkr→Ref Lvl

More  
1 of 2

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HCH

Marker 1 2.480289000000 GHz

Mkr1 2.480 289 GHz -10.880 dBm

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.480 289 GHz	-10.880 dBm			
2	N	f		2.483 500 GHz	-51.326 dBm			

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

Mkr→CF

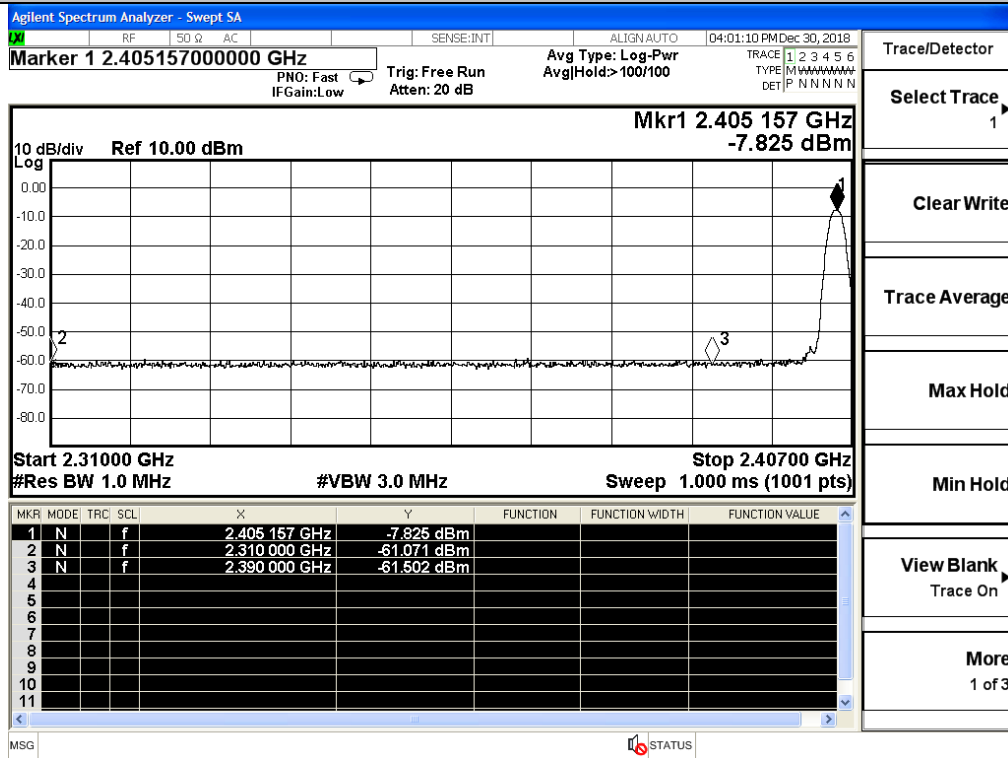
Mkr→Ref Lvl

More  
1 of 2

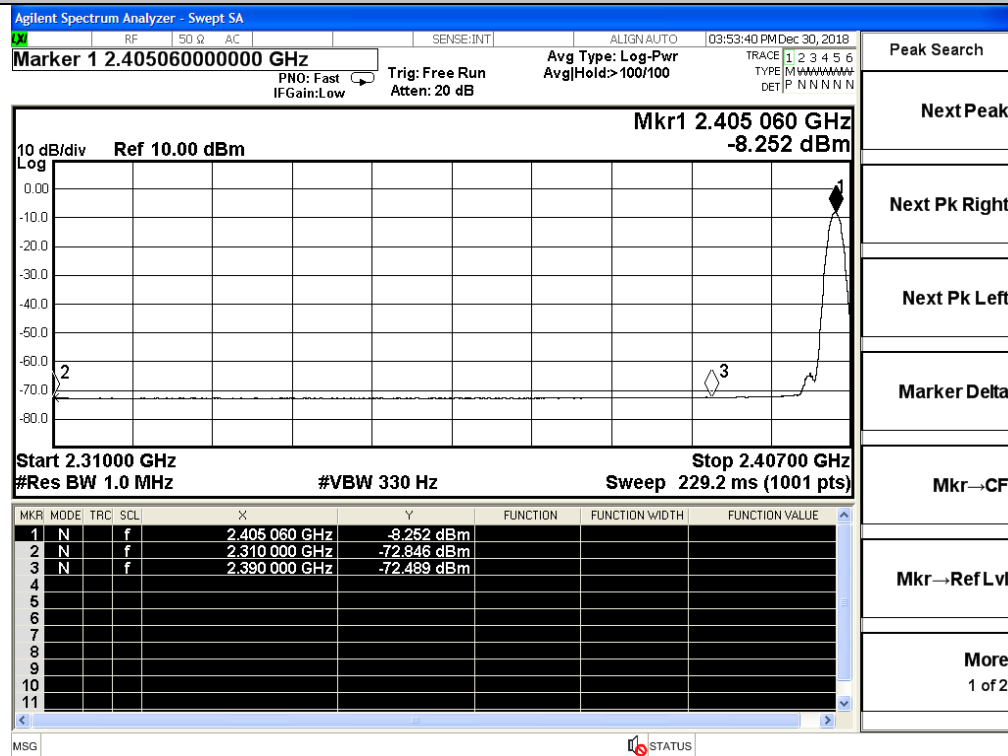
### A.7 Restrict-band band-edge measurements

Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdict
ZigBee	2405	Ant1	2310.0	-61.071	2.0	0	34.159	PEAK	74	PASS
		Ant1	2310.0	-72.845	2.0	0	22.385	AV	54	PASS
		Ant1	2390.0	-61.502	2.0	0	33.728	PEAK	74	PASS
		Ant1	2390.0	-72.489	2.0	0	22.741	AV	54	PASS
	2480	Ant1	2483.5	-58.528	2.0	0	36.702	PEAK	74	PASS
		Ant1	2483.5	-71.260	2.0	0	23.970	AV	54	PASS
		Ant1	2500.0	-59.920	2.0	0	35.310	PEAK	74	PASS
		Ant1	2500.0	-72.459	2.0	0	22.771	AV	54	PASS

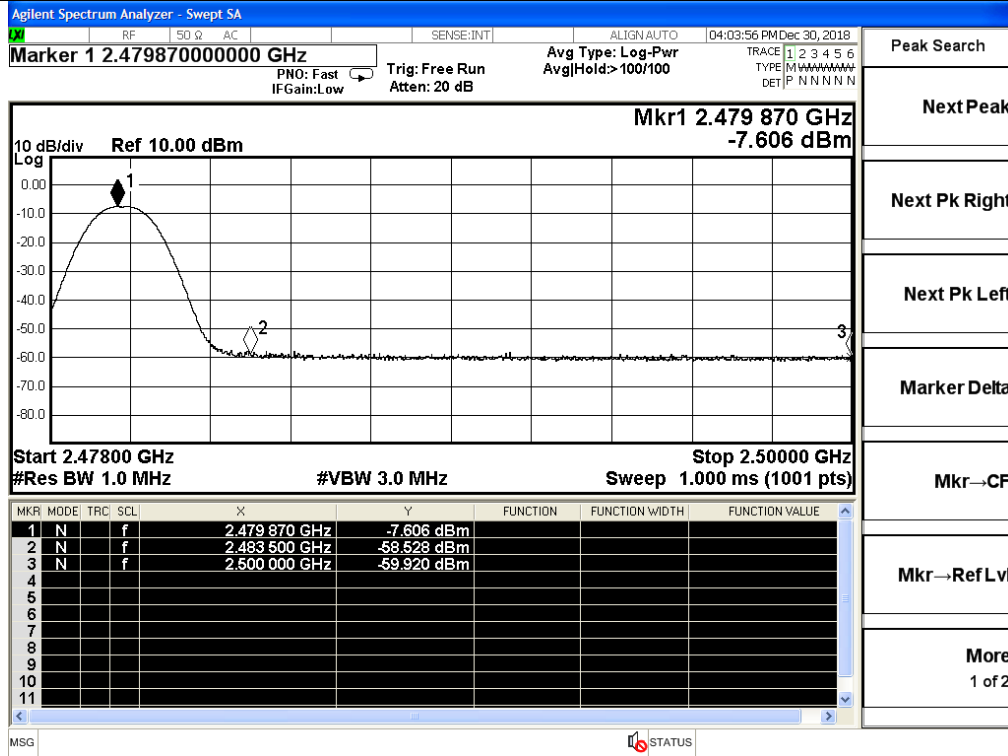
Restrict-band band-edge measurements\_Zigbee\_2405\_Ant1\_PEAK



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

