

Appendix B

RF Test Data for ZigBee (Conducted Measurement)

Product Name: Smart Gateway

Trade Mark: N/A

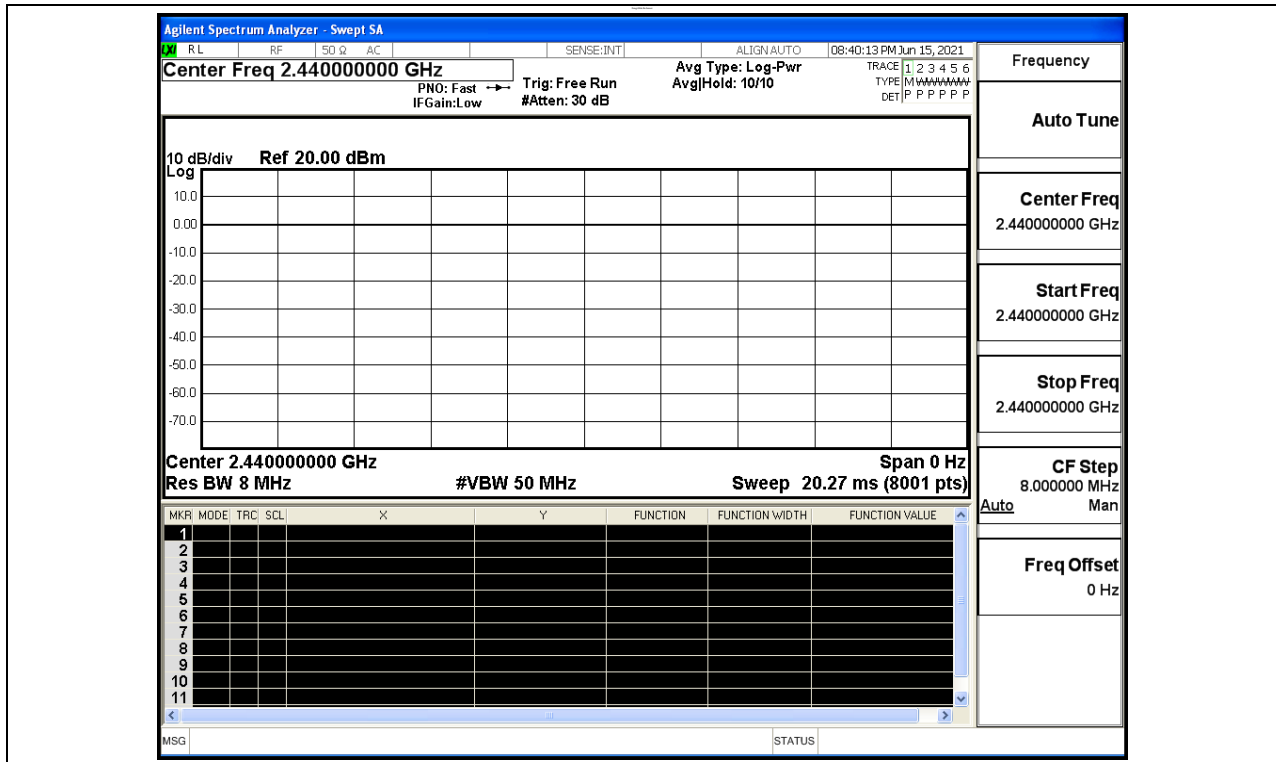
Test Model: TYGWZW-01N

Environmental Conditions

Temperature:	21.6° C
Relative Humidity:	52.7%
ATM Pressure:	100.0 kPa
Test Engineer:	Ken He
Supervised by:	Li Huan

B.1 Duty Cycle

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

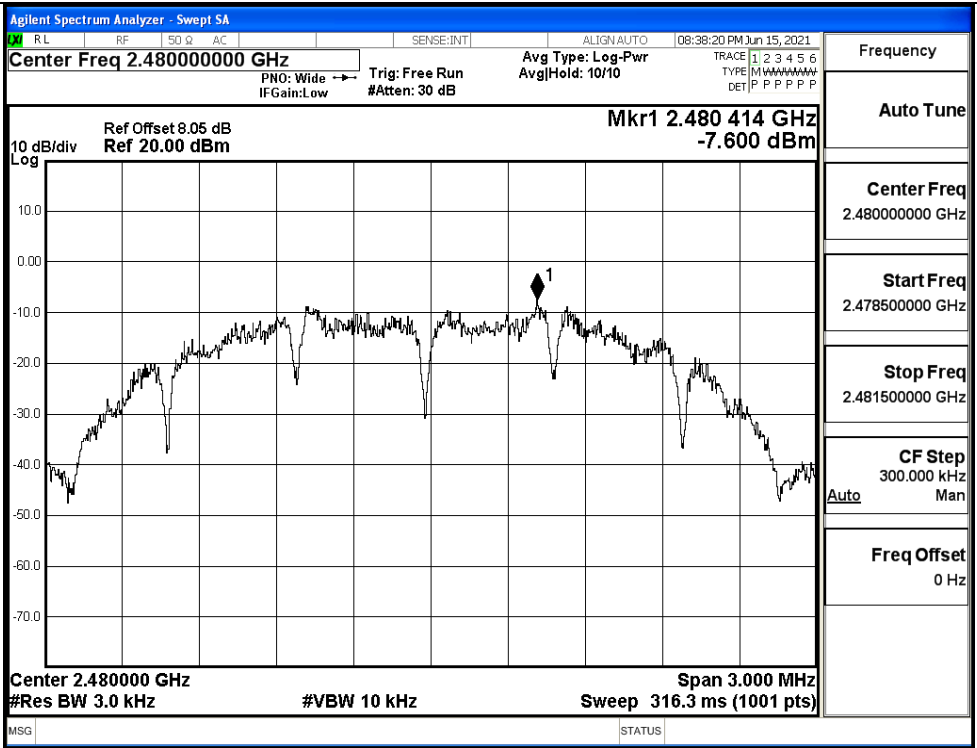


B.2 Maximum Conducted Peak Output Power

Mode	Channel	Conduct Peak Power[dBm]	Limit [dBm]	Verdict
ZigBee	LCH	7.777	30	PASS
ZigBee	MCH	7.794	30	PASS
ZigBee	HCH	7.593	30	PASS

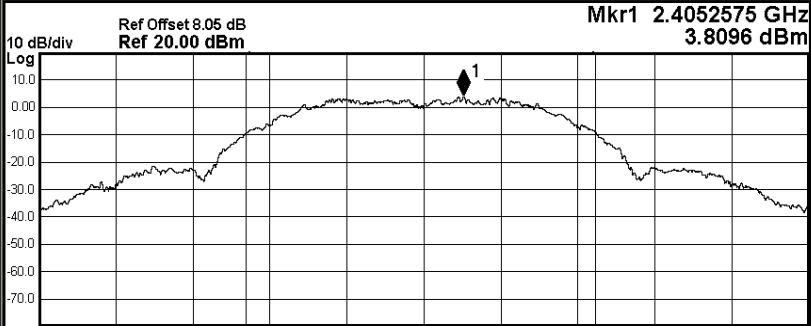
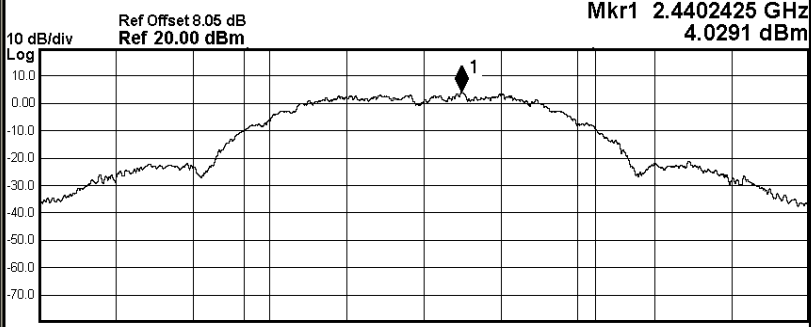
Test Graphs	
LCH	<div data-bbox="418 607 1390 1330"> <p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.40500000 GHz Mkr1 2.405 563 125 GHz 7.777 dBm Span 5.000 MHz #Res BW 2.0 MHz #VBW 6.0 MHz Sweep 1.067 ms (8001 pts)</p> </div>
MCH	<div data-bbox="418 1339 1390 2056"> <p>Agilent Spectrum Analyzer - Swept SA Center Freq 2.44000000 GHz Mkr1 2.439 415 000 GHz 7.794 dBm Span 5.000 MHz #Res BW 2.0 MHz #VBW 6.0 MHz Sweep 1.067 ms (8001 pts)</p> </div>

HCH



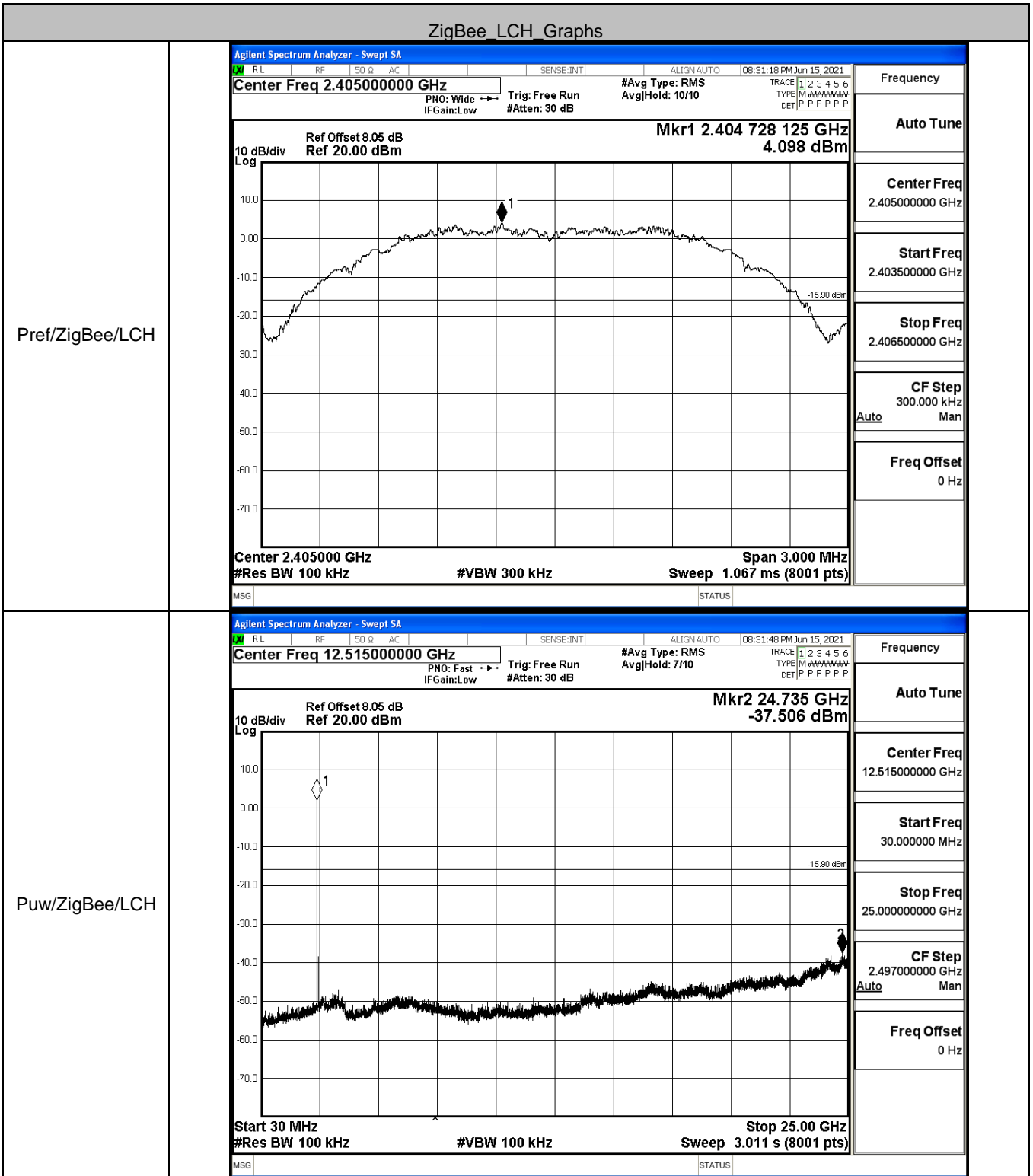
B.4 6dB Bandwidth

Mode	Channel	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
ZigBee	LCH	1.652	≥0.5	PASS
ZigBee	MCH	1.638	≥0.5	PASS
ZigBee	HCH	1.637	≥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:INT ALIGN:AUTO 08:24:14 PM Jun 15, 2021</p> <p style="margin: 0;">Center Freq 2.405000000 GHz Center Freq: 2.405000000 GHz Radio Std: None Trig: Free Run AvgHold>1/1 #IFGain:Low #Atten: 30 dB Radio Device: BTS</p> <div style="border: 1px solid black; padding: 2px;"> <p style="text-align: right; margin: 0;">Mkr1 2.4052575 GHz 3.8096 dBm</p>  </div> <p style="font-size: small; margin: 0;">Center 2.405 GHz Span 5 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.067 ms</p> <table style="width: 100%; border-collapse: collapse; font-size: small;"> <tr> <td style="width: 33%;">Occupied Bandwidth</td> <td style="width: 33%;">Total Power</td> <td style="width: 33%;">14.0 dBm</td> </tr> <tr> <td style="text-align: center;">2.2589 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> <p style="font-size: x-small; margin: 0;">MSG STATUS</p> </div>	Occupied Bandwidth	Total Power	14.0 dBm	2.2589 MHz			Transmit Freq Error	OBW Power	99.00 %	x dB Bandwidth	x dB	-6.00 dB
Occupied Bandwidth	Total Power	14.0 dBm											
2.2589 MHz													
Transmit Freq Error	OBW Power	99.00 %											
x dB Bandwidth	x dB	-6.00 dB											
MCH	<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:INT ALIGN:AUTO 08:36:16 PM Jun 15, 2021</p> <p style="margin: 0;">Center Freq 2.440000000 GHz Center Freq: 2.440000000 GHz Radio Std: None Trig: Free Run AvgHold>1/1 #IFGain:Low #Atten: 30 dB Radio Device: BTS</p> <div style="border: 1px solid black; padding: 2px;"> <p style="text-align: right; margin: 0;">Mkr1 2.4402425 GHz 4.0291 dBm</p>  </div> <p style="font-size: small; margin: 0;">Center 2.44 GHz Span 5 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.067 ms</p> <table style="width: 100%; border-collapse: collapse; font-size: small;"> <tr> <td style="width: 33%;">Occupied Bandwidth</td> <td style="width: 33%;">Total Power</td> <td style="width: 33%;">13.9 dBm</td> </tr> <tr> <td style="text-align: center;">2.2704 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> <p style="font-size: x-small; margin: 0;">MSG STATUS</p> </div>	Occupied Bandwidth	Total Power	13.9 dBm	2.2704 MHz			Transmit Freq Error	OBW Power	99.00 %	x dB Bandwidth	x dB	-6.00 dB
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2.2704 MHz													
Transmit Freq Error	OBW Power	99.00 %											
x dB Bandwidth	x dB	-6.00 dB											

B.5 RF Conducted Spurious Emissions

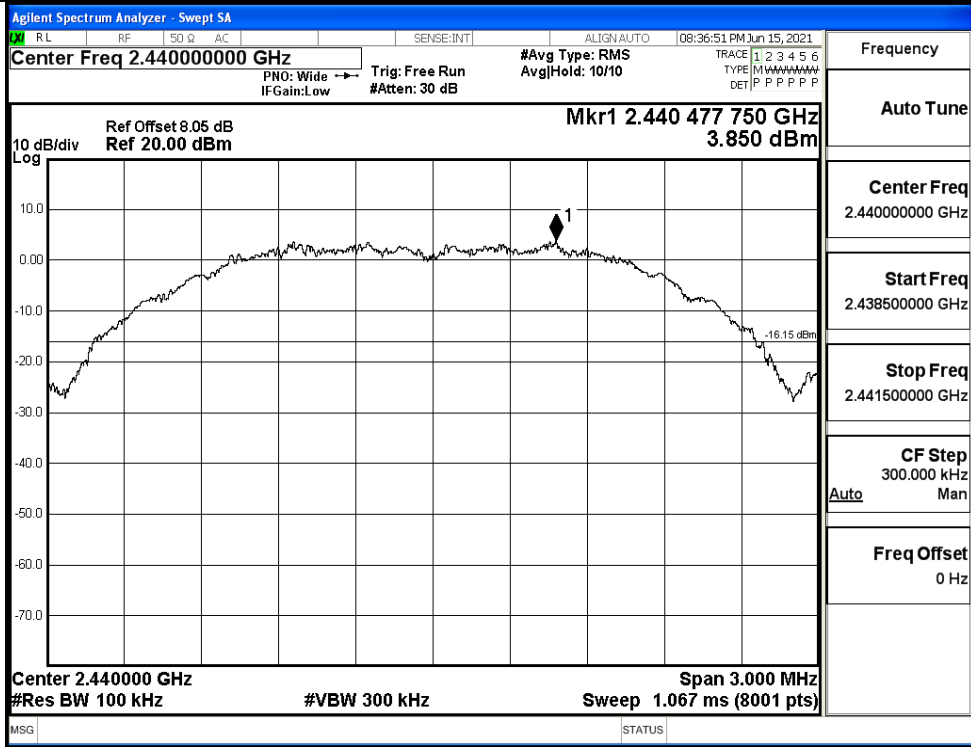
Mode	Channel	Pref [dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
ZigBee	LCH	4.098	-37.506	-15.902	PASS
ZigBee	MCH	3.85	-27.848	-16.150	PASS
ZigBee	HCH	3.802	-38.000	-16.198	PASS



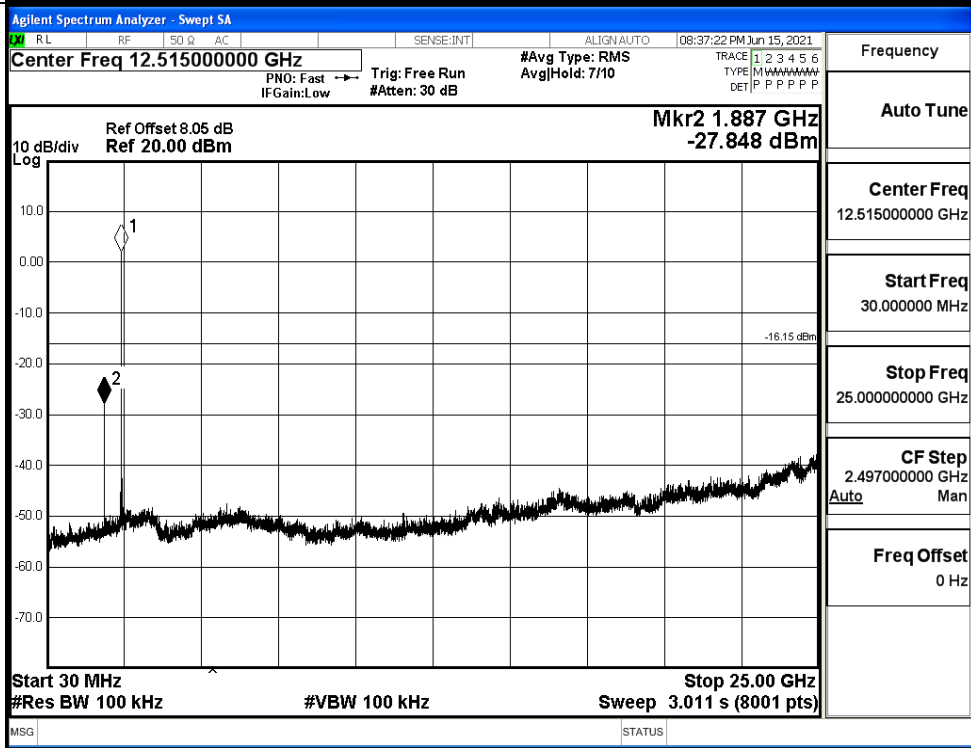
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ZigBee_MCH_Graphs

Pref/ZigBee/MCH

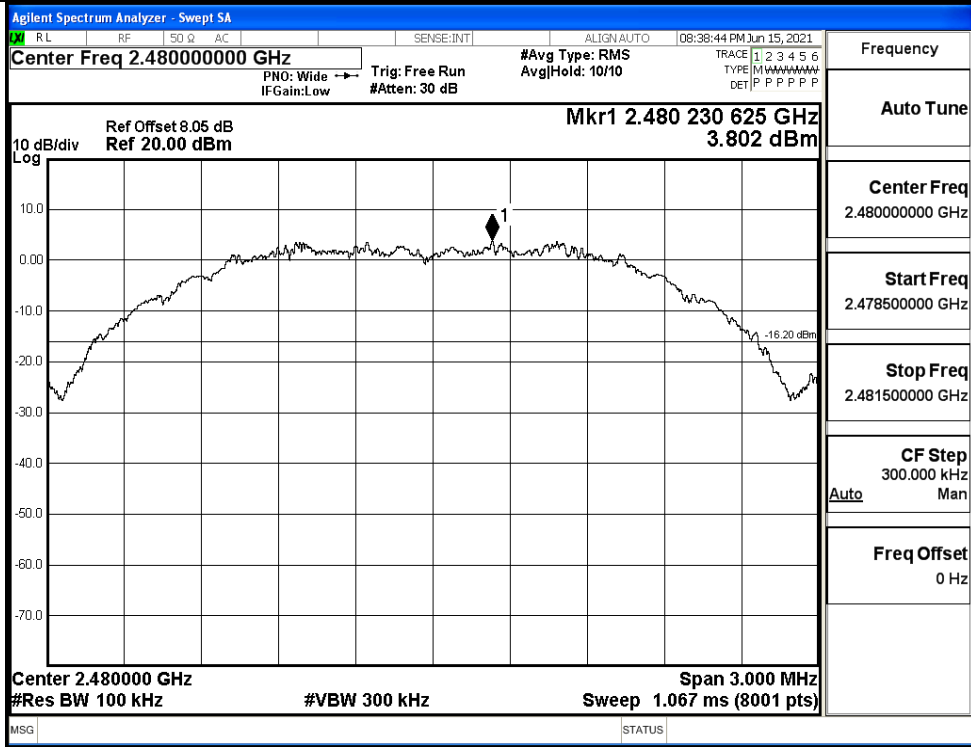


Puw/ZigBee/MCH
H

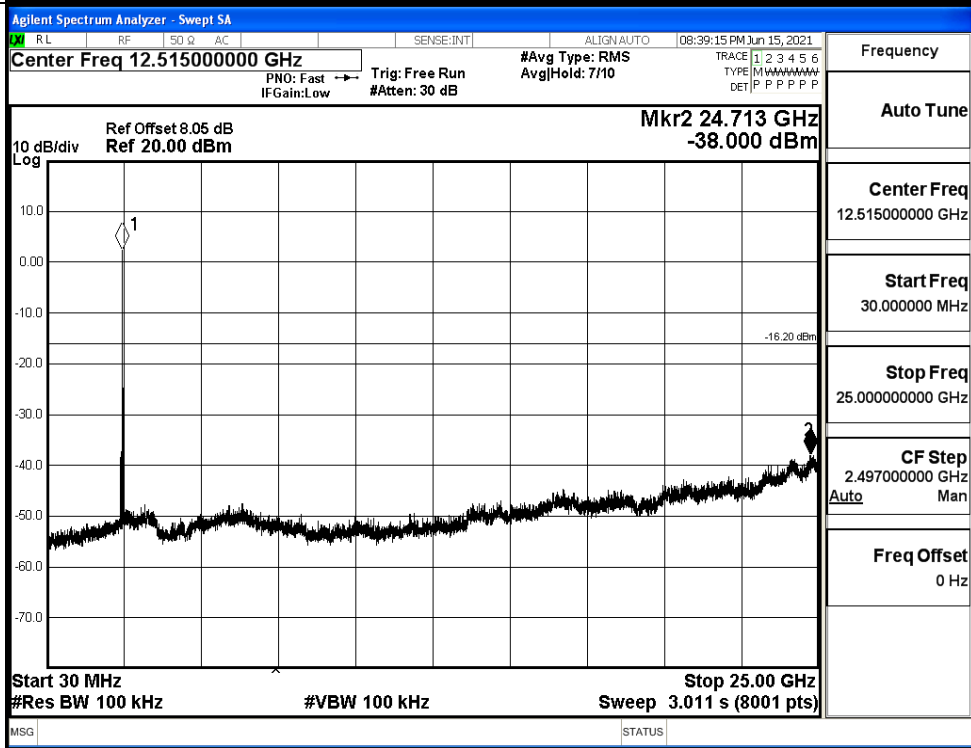


ZigBee_HCH_Graphs

Pref/ZigBee/HCH



Puw/ZigBee/HCH



B.6 Band-edge for RF Conducted Emissions

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
ZigBee	LCH	-4.721	-48.861	-24.72	PASS
ZigBee	HCH	3.918	-45.179	-16.08	PASS

Test Graphs

LCH

Agilent Spectrum Analyzer - Swept SA

Start Freq 2.31000000 GHz #Avg Type: RMS Traces: 1 2 3 4 5 6
 PNO: Fast Trig: Free Run TYPE: M W W W W W W W W W
 IFGain: Low #Atten: 30 dB DET: P P P P P P P

10 dB/div Ref Offset 8.05 dB Mkr4 2.320 140 GHz
 Log Ref 20.00 dBm -53.397 dBm

Start 2.31000 GHz Stop 2.40800 GHz
 #Res BW 100 kHz #VBW 300 kHz Sweep 9.600 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.405 464 GHz	4.242 dBm			
2	N	f		2.400 000 GHz	-47.952 dBm			
3	N	f		2.390 000 GHz	-52.141 dBm			
4	N	f		2.320 140 GHz	-53.397 dBm			

Frequency

Auto Tune

Center Freq
2.359000000 GHz

Start Freq
2.310000000 GHz

Stop Freq
2.408000000 GHz

CF Step
9.800000 MHz

Freq Offset
0 Hz

HCH

Agilent Spectrum Analyzer - Swept SA

Center Freq 2.489000000 GHz #Avg Type: RMS Traces: 1 2 3 4 5 6
 PNO: Fast Trig: Free Run TYPE: M W W W W W W W W W
 IFGain: Low #Atten: 30 dB DET: P P P P P P P

10 dB/div Ref Offset 8.05 dB Mkr4 2.483 885 00 GHz
 Log Ref 20.00 dBm -45.179 dBm

Start 2.47800 GHz Stop 2.50000 GHz
 #Res BW 100 kHz #VBW 300 kHz Sweep 2.133 ms (8001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.480 241 25 GHz	3.918 dBm			
2	N	f		2.483 500 00 GHz	-45.354 dBm			
3	N	f		2.500 000 00 GHz	-52.021 dBm			
4	N	f		2.483 885 00 GHz	-45.179 dBm			

Frequency

Auto Tune

Center Freq
2.489000000 GHz

Start Freq
2.478000000 GHz

Stop Freq
2.500000000 GHz

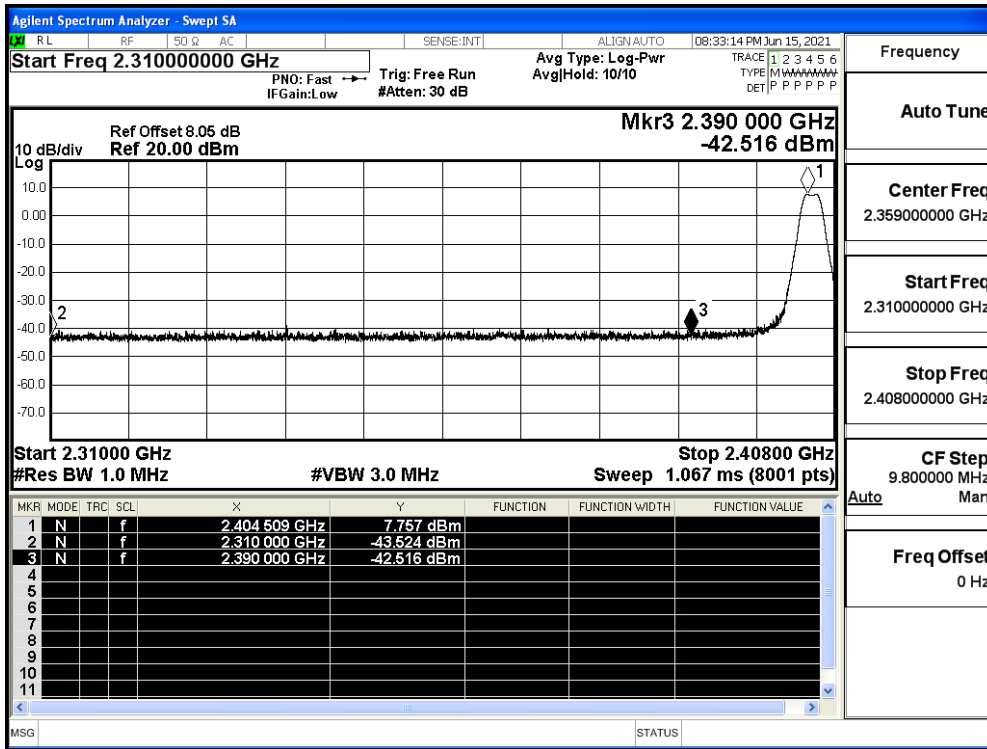
CF Step
2.200000 MHz

Freq Offset
0 Hz

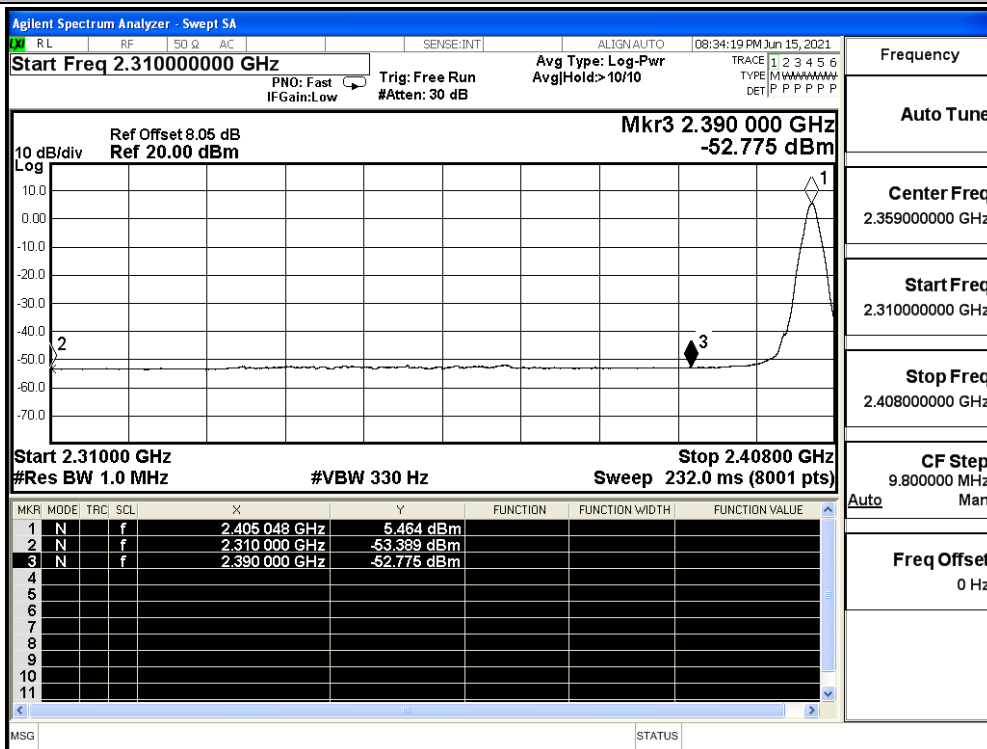
B.7 Restrict-band band-edge measurements

Test Mode	Test Channel	Ant	Freq.	Power [dBm]	Gain	Ground Factor	E [dBuV/m]	Detector	Limit [dBuV/m]	Verdi
ZigBee	2402	Ant1	2310.0	-42.88	3.0	0	55.38	PEAK	74	PASS
		Ant1	2310.0	-53.39	3.0	0	44.87	AV	54	PASS
		Ant1	2390.0	-42.99	3.0	0	55.27	PEAK	74	PASS
		Ant1	2390.0	-52.90	3.0	0	45.36	AV	54	PASS
	2480	Ant1	2483.5	-35.39	3.0	0	62.87	PEAK	74	PASS
		Ant1	2483.5	-44.37	3.0	0	53.89	AV	54	PASS
		Ant1	2500.0	-41.64	3.0	0	56.62	PEAK	74	PASS
		Ant1	2500.0	-52.35	3.0	0	45.91	AV	54	PASS

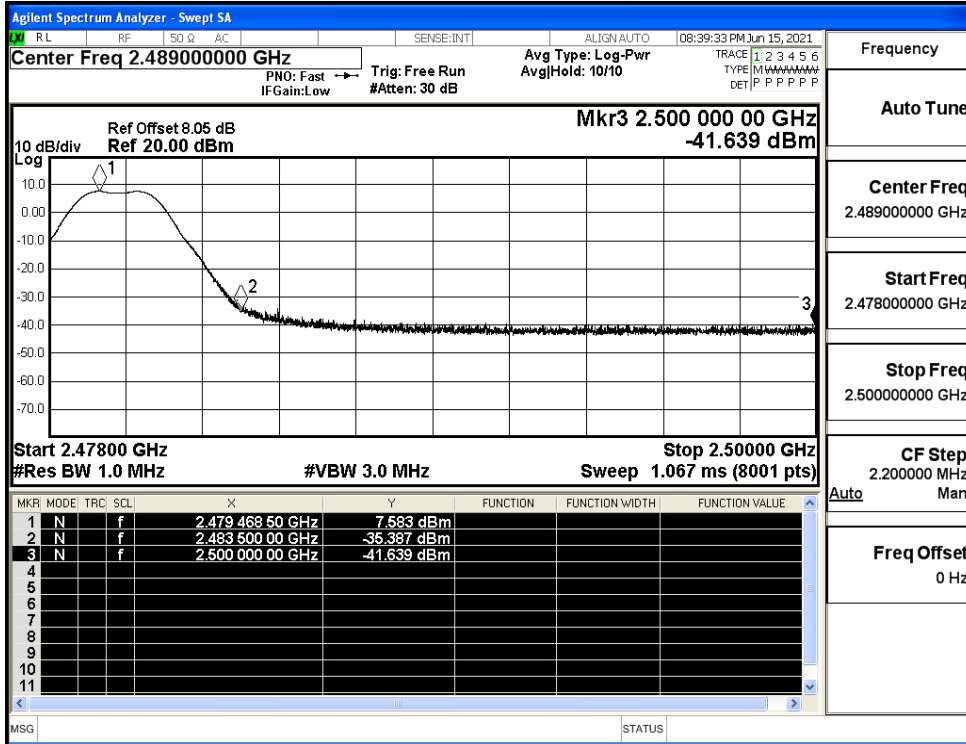
Restrict-band band-edge measurements_ZigBee_2402_Ant1_PEAK



Restrict-band band-edge measurements_ZigBee_2402_Ant1_AV



Restrict-band band-edge measurements_ZigBee_2480_Ant1_PEAK



Restrict-band band-edge measurements_ZigBee_2480_Ant1_AV

