
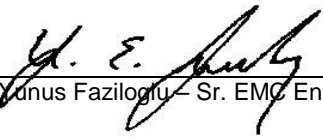




# Test Report

Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

Report No	ER2499-10
Client	Harman International Industries, Inc. Mark Bowman
Address	30001 Cabot Drive Novi, MI 48377
Phone	248-254-7751
Items tested FCC ID IC FRN	G31 MID 2AHPN-BE2833 6434C-BE2833 0026894154
Equipment Type Equipment Code	Digital Transmission System DTS
FCC/IC Rule Parts	CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2
Test Dates	September 22 - October 17, 2017
Results	As detailed within this report
Prepared by	 Zachary Johnson - Test Engineer
Authorized by	 Yunus Faziloglu - Sr. EMC Engineer
Issue Date	10/26/2017
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 16 of this report.

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Report REV Sep-08-2017 - YF



## Summary

This test report supports an application for certification of a transmitter operating pursuant to:  
CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2

The product is the G31 MID. It is a direct sequence spread spectrum transmitter that operates in the 2412 – 2462MHz frequency range. This report covers the 2.4GHz Wifi portion of the device.

Antenna Type: Switching PCB trace antenna

Gain: 1.18dBi maximum in 2.4GHz – 2.5GHz range

We found that the product met the above requirements without modification.

Test samples were received in good condition.

## Test Methodology

All testing was performed according to the following rules/procedures/documents;  
CFR 47 Part 15.247, RSS-247 Issue 2, RSS-Gen Issue 4, FCC KDB 558074 D01 DTS  
Measurement Guidance v04 and ANSI C63.10-2013.

Radiated emissions were maximized by measuring the device in normal operating position,  
as well as varying the test antenna's height and polarity.

EUT operating voltage is 11-16V DC

The following bandwidths were used during radiated spurious and AC line conducted emissions  
testing.

Frequency	RBW	VBW
0.15-30MHz	9kHz	30kHz
30-1000MHz	120kHz	1MHz
1-25GHz	1MHz	3MHz

**Product Tested - Configuration Documentation**

EUT Configuration											
<b>Work Order:</b>	R2499										
<b>Company:</b>	Harman International Industries, Incorporated										
<b>Company Address:</b>	30001 Cabot Drive										
	Novi, MI, 48377										
<b>Contact:</b>	Mark Bowman										
	MN			PN			SN				
<b>EUT:</b>	G31 MID			--			--				
<b>EUT Description:</b>	Car Stereo System										
<b>EUT Components</b>	MN			SN							
Back up camera	--			--							
FM/AM antenna	--			--							
<b>Support Equipment</b>	MN			SN							
CS Supplied Laptop.	--			--							
USB to Ethernet Converter	--			--							
13.5Vdc Power Supply	--			--							
<b>Port Label</b>	<b>Port Type</b>	<b># ports</b>	<b># populated</b>	<b>cable type</b>	<b>shielded</b>	<b>ferrites</b>	<b>length (m)</b>	<b>in/out</b>	<b>under test</b>	<b>comment</b>	
DC main	Power DC	2	2	Power DC	No	No	1.2	in	yes		
Audio		1	1	-	Yes	No	3	in	yes		
USB	USB	3	1	USB	Yes	No	1	in	yes		
xm/Dab connector		1	1	Coaxial	Yes	No	1.2	in	yes		
FM/AM antenna	-	1	1		Yes	No	0.4	in	yes		
Back up camera		1	1		Yes	No	0.3	in	yes		
Next Gen port	-	1	0	-				in	no		
<b>Software Operating Mode Description:</b>											
EUT will be operating in a test mode for Immunity tests, RX for non intentional REMI, and Constant TX internal mode for Spurious.											
<b>Performance Criteria:</b>											
EUT will connect to CMW and perform less than 10% PER during test.BT- EUT will connect to tablet or CMW over bluetooth and stay connected at appropriate distance.											

**Statement of Conformity**

RSS-GEN	RSP-100	RSS 247	Part 15	Comments
6.3			15.15(b)	There are no controls accessible to the user that varies the output power to operate in violation of the regulatory requirements.
	3.1		15.19	The label is shown in the label exhibit.
	4		15.21	Information to the user is shown in the instruction manual exhibit.
			15.27	No special accessories are required for compliance.
3, 6.1			15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13			15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
8.1			15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
8.3			15.203	EUT employs single switching PCB trace antenna with 1.18dBi maximum gain.
8.10			15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable
8.8			15.207	N/A. Unit is powered by a vehicle battery only.

Refer to Appendix A of this report for antenna port conducted measurements.

## Test Results

### Radiated Spurious Emissions

#### LIMITS

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

[15.247(d)]

Device was measured in normal operating position.

#### MEASUREMENTS / RESULTS

Curtis Straus - a Bureau Veritas Company				Work Order - R2499					
Radiated Emissions Electric Field 3m Distance				EUT Power Input - 13.8V DC					
30-1000MHz Vertical Data				Test Site - CH 2					
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar					
2.4GHz 802.11n ch6									
Frequency	Raw QP Reading	Correction Factor	Adjusted QP Amplitude	Limit Req 1	Margin Req 1	Test Results Req 1	Antenna Height	EUT Azimuth	Worst Margin Req 1
MHz	(dBµV)	(dB/m)	(dBµV/m)	(dBµV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)
31.077	39.5	-15.4	24.2	40	-15.8	PASS	202	25	
479.558	44.8	-15.9	28.9	46	-17.1	PASS	155	141	
479.979	48	-15.8	32.2	46	-13.8	PASS	125	160	
480.967	46.5	-15.8	30.7	46	-15.4	PASS	141	146	
720.024	48.6	-12.2	36.5	46	-9.6	PASS	139	328	-9.6
960.041	44.6	-9.2	35.4	54	-18.6	PASS	138	37	

Curtis Straus - a Bureau Veritas Company				Work Order - R2499					
Radiated Emissions Electric Field 3m Distance				EUT Power Input - 13.8V DC					
30-1000MHz Horizontal Data				Test Site - CH 2					
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar					
2.4GHz 802.11n ch6									
Frequency	Raw QP Reading	Correction Factor	Adjusted QP Amplitude	Limit Req 1	Margin Req 1	Test Results Req 1	Antenna Height	EUT Azimuth	Worst Margin Req 1
MHz	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)
30.414	38.6	-14.7	23.9	40	-16.1	PASS	107	55	
720.03	52.3	-12.2	40.2	46	-5.8	PASS	125	104	
956.047	28.9	-9.3	19.6	46	-26.4	PASS	125	11	
958.023	42.2	-9.2	33	46	-13	PASS	155	328	
959.524	38.8	-9.2	29.6	46	-16.4	PASS	135	315	
959.996	51.8	-9.2	42.6	46	-3.4	PASS	152	344	-3.4

## 30-1000MHz Mid Channel

Curtis Straus - a Bureau Veritas Company				Work Order - R2499											
Radiated Emissions Electric Field 3m Distance				EUT Power Input - 13.8V DC											
1-6GHz Vertical Data				Test Site - CH 2											
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar											
2.4GHz 802.11b ch1															
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Adjusted Avg Amplitude	Peak Limit	Peak Margin	Peak Results	Avg Limit	Avg Margin	Avg Results	Antenna Height	EUT Azimuth	Worst Peak Margin	Worst Avg Margin
MHz	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)	(dB)
1064.8	45.7	43.3	-6.4	39.3	36.9	74	-34.6	PASS	54	-17.1	PASS	275	51		
1087.5	40.6	32.9	-6	34.6	26.9	74	-39.4	PASS	54	-27.1	PASS	290	29		
1328.9	43.8	33	-3.9	40	29.2	74	-34	PASS	54	-24.8	PASS	102	201		
4874.1	46	40.7	3.2	49.2	43.9	74	-24.7	PASS	54	-10.1	PASS	102	165	-24.7	-10.1

Curtis Straus - a Bureau Veritas Company				Work Order - R2499											
Radiated Emissions Electric Field 3m Distance				EUT Power Input - 13.8V DC											
1-6GHz Horizontal Data				Test Site - CH 2											
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar											
2.4GHz 802.11b ch1															
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Adjusted Avg Amplitude	Peak Limit	Peak Margin	Peak Results	Avg Limit	Avg Margin	Avg Results	Antenna Height	EUT Azimuth	Worst Peak Margin	Worst Average Margin
MHz	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)	(dB)
1064.5	47	38.9	-6.4	40.6	32.5	74	-33.4	PASS	54	-21.5	PASS	275	124		
5706.5	39.1	30.6	5.6	44.7	36.2	74	-29.3	PASS	54	-17.8	PASS	127	47	-29.3	-17.8

## 1-6GHz Low Channel





Curtis Straus - a Bureau Veritas Company				Work Order - R2499													
Radiated Emissions Electric Field 3m Distance				EUT Power Input - 13.8V DC													
1-6GHz Vertical Data				Test Site - CH 2													
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar													
2.4GHz 802.11n ch6																	
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Adjusted Avg Amplitude	Peak Limit	Peak Margin	Peak Results	Avg Limit	Avg Margin	Avg Results	Antenna Height	EUT Azimuth	Worst Peak Margin	Worst Avg Margin		
MHz	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)	(dB)		
1037.9	42.4	33.6	-6.8	35.6	26.8	74	-38.4	PASS	54	-27.1	PASS	188	28				
1064.9	55	41.4	-6.4	48.6	35	74	-25.3	PASS	54	-19	PASS	285	2				
1176.8	41.4	33.2	-5.5	35.9	27.7	74	-38	PASS	54	-26.3	PASS	100	185				
1329.8	42.7	33.3	-3.9	38.8	29.4	74	-35.2	PASS	54	-24.6	PASS	125	193				
4874.3	44.7	41.2	3.2	47.9	44.4	74	-26.1	PASS	54	-9.6	PASS	125	160	-26.1	-9.6		

Curtis Straus - a Bureau Veritas Company				Work Order - R2499													
Radiated Emissions Electric Field 3m Distance				EUT Power Input - 13.8V DC													
1-6GHz Horizontal Data				Test Site - CH 2													
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar													
2.4GHz 802.11n ch6																	
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Adjusted Avg Amplitude	Peak Limit	Peak Margin	Peak Results	Avg Limit	Avg Margin	Avg Results	Antenna Height	EUT Azimuth	Worst Peak Margin	Worst Average Margin		
MHz	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)	(dB)		
1063.9	46.9	33.6	-6.4	40.5	27.2	74	-33.4	PASS	54	-26.7	PASS	204	146				
1331.4	42	32.4	-3.9	38.1	28.6	74	-35.9	PASS	54	-25.4	PASS	100	5				
5759.6	39.5	30.5	5.6	45.1	36	74	-28.9	PASS	54	-17.9	PASS	102	0	-28.9	-17.9		

## 1-6GHz Mid Channel

Curtis Straus - a Bureau Veritas Company				Work Order - R2499													
Radiated Emissions Electric Field 3m Distance				EUT Power Input - 13.8V DC													
1-6GHz Vertical Data				Test Site - CH 2													
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar													
2.4GHz 802.11b ch11																	
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Adjusted Avg Amplitude	Peak Limit	Peak Margin	Peak Results	Avg Limit	Avg Margin	Avg Results	Antenna Height	EUT Azimuth	Worst Peak Margin	Worst Avg Margin		
MHz	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)	(dB)		
1042	42.9	33.3	-6.8	36.2	26.6	74	-37.8	PASS	54	-27.4	PASS	175	69				
1062.7	49.2	42.5	-6.4	42.8	36.1	74	-31.2	PASS	54	-17.9	PASS	287	0				
1177.7	40.5	33.5	-5.5	35	28	74	-39	PASS	54	-25.9	PASS	110	149				
1332.1	41.1	32.7	-3.9	37.2	28.8	74	-36.7	PASS	54	-25.2	PASS	125	172				
4874.1	46.7	42.3	3.2	49.9	45.5	74	-24.1	PASS	54	-8.5	PASS	100	176	-24.1	-8.5		

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Curtis Straus - a Bureau Veritas Company				Work Order - R2499													
Radiated Emissions Electric Field 3m Distance				EUT Power Input - 13.8V DC													
1-6GHz Horizontal Data				Test Site - CH 2													
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar													
2.4GHz 802.11b ch11																	
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Adjusted Avg Amplitude	Peak Limit	Peak Margin	Peak Results	Avg Limit	Avg Margin	Avg Results	Antenna Height	EUT Azimuth	Worst Peak Margin	Worst Average Margin		
MHz	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)	(dB)		
1063.9	46.9	33.6	-6.4	40.5	27.2	74	-33.4	PASS	54	-26.7	PASS	204	146				
1331.4	42	32.4	-3.9	38.1	28.6	74	-35.9	PASS	54	-25.4	PASS	100	5				
5759.6	39.5	30.5	5.6	45.1	36	74	-28.9	PASS	54	-17.9	PASS	102	0	-28.9	-17.9		

## 1-6GHz High Channel

Curtis Straus - a Bureau Veritas Company				Work Order - R2499													
Radiated Emissions Electric Field 1m Distance				EUT Power Input - 13.8V DC													
6-18GHz Vertical Data				Test Site - CH 2													
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar													
2.4GHz 802.11n ch6																	
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Adjusted Avg Amplitude	Peak Limit	Peak Margin	Peak Results	Avg Limit	Avg Margin	Avg Results	Antenna Height	EUT Azimuth	Worst Peak Margin	Worst Avg Margin		
MHz	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)	(dB)		
10534.4	39.5	28.8	11.1	50.7	39.9	83.5	-32.8	PASS	63.5	-23.6	PASS	200	340				
14480	39.1	30.7	14	53.1	44.7	83.5	-30.4	PASS	63.5	-18.8	PASS	132	109				
17045.4	36.9	27.5	18.8	55.8	46.4	83.5	-27.7	PASS	63.5	-17.1	PASS	200	253				
17925.8	35.7	26.6	20.9	56.6	47.5	83.5	-26.9	PASS	63.5	-16	PASS	200	237	-26.9	-16		

Curtis Straus - a Bureau Veritas Company				Work Order - R2499													
Radiated Emissions Electric Field 1m Distance				EUT Power Input - 13.8V DC													
6-18GHz Horizontal Data				Test Site - CH 2													
Operator: CCH				Temp; Humid; Pres - 25.2°C; 52%RH; 1009mBar													
2.4GHz 802.11n ch6																	
Frequency	Raw Peak Reading	Raw Avg Reading	Correction Factor	Adjusted Peak Amplitude	Adjusted Avg Amplitude	Peak Limit	Peak Margin	Peak Test Results	Avg Limit	Avg Margin	Avg Test Results	Antenna Height	EUT Azimuth	Worst Peak Margin	Worst Avg Margin		
MHz	(dBμV)	(dBμV)	(dB/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)	(Pass/Fail)	(dBμV/m)	(dB)	(Pass/Fail)	(cm)	(degrees)	(dB)	(dB)		
10534	36.6	28.7	11.1	47.7	39.8	83.5	-35.8	PASS	63.5	-23.7	PASS	150	129				
12500.6	38.8	30.3	14.1	52.9	44.4	83.5	-30.6	PASS	63.5	-19.1	PASS	166	81				
15574	38.4	29.7	15.5	53.9	45.2	83.5	-29.6	PASS	63.5	-18.3	PASS	162	156				
16810.3	38.6	29.1	17.7	56.2	46.8	83.5	-27.3	PASS	63.5	-16.7	PASS	139	229				
17957.7	35.9	26.7	20.9	56.8	47.6	83.5	-26.7	PASS	63.5	-15.9	PASS	175	241	-26.7	-15.9		

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Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	12/22/2017
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due
EMI Chamber 2	719150	2762A-7	A-0015	30-1000MHz	1686	I	12/21/2018
EMI Chamber 2	719150	2762A-7	A-0015	1-18GHz	1686	I	12/21/2018
Preamps / Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Blue	0.009-2000MHz	ZFL-1000-LN	CS	N/A	759	II	5/9/2018
2311 PA	1-1000MHz	PAM-103	COM-POWER	441174	2311	II	2/4/2017
2444 PA	9KHz-6GHz	BBV9744	SCWARZBECK	67	2444	I	10/2/2018
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red-Black Bilog	30-2000MHz	JB1	Sunol	A091604-2	1106	I	2/28/2019
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018
TH A#2082		HTC-1	HDE		2082	II	3/23/2018
Cables	Range		Mfr			Cat	Calibration Due
Asset #1509	9kHz - 18GHz		Florida RF			II	10/2/2018
Asset #1522	9kHz - 18GHz		Florida RF			II	2/11/2018
Asset #2052	9kHz - 18GHz		Florida RF			II	3/5/2018
Asset #2053	9kHz - 18GHz		Florida RF			II	10/30/2017

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## 6-18GHz Mid Channel

### Radiated Emissions Table

Date: 17-Oct-17		Company: Harman International				Work Order: R2499								
Engineer: Chris Hamel		EUT Desc: G31 MID				EUT Operating Voltage/Frequency: 13.8V DC								
Temp: 24.2°C		Humidity: 42%				Pressure: 1010mbar								
Frequency Range: 18-26.5GHz						Measurement Distance: 0.1 m								
Notes: No emissions Found						EUT Max Freq:								
Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBμV)	Average Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBμV/m)	Adjusted Avg Reading (dBμV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
									No Emissions Found					
Table Result:		Pass		by		N/A dB		Worst Freq:		N/A MHz				
Test Site: EMI Chamber 2		Cable 1: Asset #2324				Cable 2: ---				Cable 3: ---				
Analyzer: Gold		Preamp: 18-26.5GHz				Antenna: 18-26.5GHz Horn				Preselector: ---				
CSsoft Radiated Emissions Calculator v 1.017.188										Copyright Curtis-Straus LLC 2000				
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor														

Rev. 9/20/2017

Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Gold	100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	2/28/2018	2/28/2017
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on
EMI Chamber 2	719150	2762A-7	A-0015	30-1000MHz	1686	I	12/21/2018	12/21/2016
EMI Chamber 2	719150	2762A-7	A-0015	1-18GHz	1686	I	12/21/2018	12/21/2016
Preamps / Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
HF (Yellow)	18-26.5GHz	AFS4-18002650-60-8P-4	CS	467559	1266	II	10/16/2017	9/16/2016
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
HF (White) Horn	18-26.5GHz	801-WLM	Waveline	758	758	III	Verify before Use	date of test
Meteorological Meters		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2084		HTC-1	HDE		2084	II	3/23/2018	3/23/2017
Cables	Range		Mfr			Cat	Calibration Due	Calibrated on
Asset 2324	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 001	2324	II	8/19/2018	8/19/2017

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## 18-26.5GHz Mid Channel



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**Radiated Emissions Table**

Date: 17-Oct-17			Company: Harman International			Work Order: R2499										
Engineer: Chris Hamel			EUT Desc: G31 MID			EUT Operating Voltage/Frequency: 13.8V DC										
Temp: 24.2°C			Humidity: 42%			Pressure: 1010mbar										
Frequency Range: 26.5-40GHz						Measurement Distance: 0.1 m										
Notes: No emissions Found						EUT Max Freq:										
Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average				
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)		
0 Emissions Found									---	---	---	---	---	---		
Table Result:			Pass			by			N/A dB			Worst Freq:			N/A MHz	
Test Site: EMI Chamber 1			Cable 1: Asset #2323						Cable 2: Asset #2324			Cable 3: ---				
Analyzer: Gold			Preamp: 40GHz Mixer						Antenna: 40GHz Mixer			Preselector: ---				
CSsoft Radiated Emissions Calculator v 1.017.195																
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor																
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<b>Spectrum Analyzers / Receivers /Preselectors</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
Gold	100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	2/28/2018	2/28/2017
<b>Radiated Emissions Sites</b>	<b>FCC Code</b>	<b>IC Code</b>	<b>VCCI Code</b>	<b>Range</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
EMI Chamber 1	719150	2762A-6	A-0015	1-18GHz	1685	I	12/21/2018	12/21/2016
<b>Mixers/Duplexers</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
Mixer / Horn	26.5-40 GHz	11970A	Agilent	3003A10230	2154	I	3/12/2019	3/12/2016
<b>Meteorological Meters/Chambers</b>		<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018	4/28/2016
TH A#2084		HTC-1	HDE		2084	II	3/23/2018	3/23/2017
<b>Cables</b>	<b>Range</b>		<b>Mfr</b>			<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
Asset 2323	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 002	2323	II	8/19/2018	8/19/2017
Asset 2324	1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 001	2324	II	8/19/2018	8/19/2017

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

**26.5-40GHz Mid Channel**

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## Radiated Band Edge

## Radiated Emissions Table

Date: 21-Sep-17		Company: Harman International Industries, Inc.							Work Order: R2499					
Engineer: Chris Hamel		EUT Desc: G31 MID							EUT Operating Voltage/Frequency: 13.8V DC					
Temp: 25.1°C		Humidity: 47%							Pressure: 1006 mbar					
Frequency Range:									Measurement Distance: 3 m					
Notes: 802.11g Reduced power.									EUT Max Freq:					
Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBμV)	Average Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBμV/m)	Adjusted Avg Reading (dBμV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
Low				---	---	---	---	---	---	---	---	---	---	---
Max V	2416.5	65.5		0.0	32.3	3.4	---	---	74.0	---	---	54.0	---	---
Max H	2409.5	60.6		0.0	32.3	3.4	---	---	74.0	---	---	54.0	---	---
V	2390.0	25.0	14.8	0.0	32.2	3.4	60.6	50.4	74.0	-13.4	Pass	54.0	-3.6	Pass
				---	---	---	---	---	---	---	---	---	---	---
High				---	---	---	---	---	---	---	---	---	---	---
Max V	2466.8	65.7		0.0	32.4	3.5	---	---	74.0	---	---	54.0	---	---
Max H	2466.8	61.7		0.0	32.4	3.5	---	---	74.0	---	---	54.0	---	---
V	2483.5	28.1	17.9	0.0	32.4	3.5	64.0	53.8	74.0	-10.0	Pass	54.0	-0.2	Pass
V	2483.8	29.2	17.6	0.0	32.4	3.5	65.1	53.5	74.0	-8.9	Pass	54.0	-0.5	Pass
V	2485.8	26.6	15.4	0.0	32.4	3.5	62.5	51.3	74.0	-11.5	Pass	54.0	-2.7	Pass
Table Result:		Pass		by		-0.2 dB		Worst Freq:		2483.5 MHz				

Test Site: EMI Chamber 2	Cable 1: Asset #2052	Cable 2: Asset #2053	Cable 3: ---
Analyzer: Rental SA#3	Preamp: none	Antenna: Blue Horn	Preselector: ---
CSsoft Radiated Emissions Calculator v 1.017.188			
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor			
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Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Rental MXE EMI Receiver(1170725)	20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	12/22/2017
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due
EMI Chamber 2	719150	2762A-7	A-0015	1-18GHz	1686	I	12/21/2018
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Orange Horn	1-18GHz	3115	EMCO	0004-6123	390	I	10/13/2018
Blue Horn	1-18Ghz	3117	ETS	157647	1861	I	2/14/2019
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due
Weather Clock (Pressure Only)		BA928	Oregon Scientific	C3166-1	831	I	4/28/2018
TH A#2082		HTC-1	HDE		2082	II	3/23/2018
Cables	Range		Mfr			Cat	Calibration Due
Asset #2052	9kHz - 18GHz		Florida RF			II	3/5/2018
Asset #2053	9kHz - 18GHz		Florida RF			II	10/30/2017

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



## **AC Line Conducted Emissions LIMITS**

Frequency of emission (MHz)	Quasi-peak limit (dB $\mu$ V)	Average limit (dB $\mu$ V)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

## **MEASUREMENTS / RESULTS**

\*\*EUT is battery powered only

## Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz)	5.6dB	N/A
NIST	4.6dB	5.2dB (Ucisp)
CISPR		
Radiated Emissions (1-26.5GHz)	4.6dB	N/A
Radiated Emissions (above 26.5GHz)	4.9dB	N/A
Magnetic Radiated Emissions	5.6dB	N/A
Conducted Emissions		
NIST	3.9dB	N/A
CISPR	3.6dB	3.6dB (Ucisp)
Telco Conducted Emissions (Current)	2.9dB	N/A
Telco Conducted Emissions (Voltage)	4.4dB	N/A
Electrostatic Discharge	11.5%	N/A
Radiated RF Immunity (Uniform Field)	1.6dB	N/A
Electrical Fast Transients	23.1%	N/A
Surge	23.1%	N/A
Conducted RF Immunity	3dB	N/A
Magnetic Immunity	12.8%	N/A
Dips and Interrupts	2.3V	N/A
Harmonics	3.5%	N/A
Flicker	3.5%	N/A
Radio frequency (@ 2.4GHz)	$3.23 \times 10^{-8}$	$1 \times 10^{-7}$
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation:		
• Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4%	5%
	0.3dB	3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		



## Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "BUREAU VERITAS," "BUREAU VERITAS CONSUMER PRODUCTS SERVICES," "BVCPS," "MTL," "ACTS," "MTL-ACTS" and CURTIS-STRAUS (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only where such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.
13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.
14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.



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15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B) NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.\$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

The complete list of the Approved Subcontractors Curtis-Straus may use to delegate the performance of work can be provided upon request.  
Rev.160009121(2)\_#684340 v14CS



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**Appendix A:****CFR Title 47 FCC Part §15.247 and ISCED Canada RSS-247 Issue 2****DUT Information**

Model: G31 MID  
 Manufacturer: Harman International Industries, Inc.  
 Serial Number: 047

Mode	Channel	Frequency
802.11b/g/n(HT20)	1	2412 MHz
802.11b/g/n(HT20)	2	2417 MHz
802.11b/g/n(HT20)	3	2422 MHz
802.11b/g/n(HT20)	4	2427 MHz
802.11b/g/n(HT20)	5	2432 MHz
802.11b/g/n(HT20)	6	2437 MHz
802.11b/g/n(HT20)	7	2442 MHz
802.11b/g/n(HT20)	8	2447 MHz
802.11b/g/n(HT20)	9	2452 MHz
802.11b/g/n(HT20)	10	2457 MHz
802.11b/g/n(HT20)	11	2462 MHz

Antenna Gain:

Frequency (MHz)	Efficiency (dB)	Efficiency (%)	Gain (dBi)
2400	-4.35	36.70	0.94
2410	-4.40	36.33	0.93
2420	-4.43	36.06	0.92
2430	-4.46	35.78	1.18
2440	-4.44	35.94	0.95
2450	-4.50	35.47	0.87
2460	-4.61	34.60	0.88
2470	-4.80	33.13	0.71
2480	-4.90	32.38	0.93
2490	-5.06	31.18	0.85
2500	-5.33	29.32	0.24

Number of transmission chains 1  
 Equipment Type Digital Transmission System (DTS)

## Test Equipment Used: R&amp;S TS8997 Test System

Spectrum Analyzers / Receivers / Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
FSV40 Signal Generator	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	6/30/2018	6/30/2017
<b>Signal Generators</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
SMBV100A Vector Signal Generator	9KHz-6GHz	SMBV100A	ROHDE & SCHWARZ	261919	2201	I	6/26/2018	6/26/2017
SMB100A Signal Generator	100kHz-40GHz	SMB100A	ROHDE & SCHWARZ	179846	2434	I	5/30/2018	5/30/2017
R&S@OSP120 with R&S@OSP-B157	30MHz-18GHz	OSP120	ROHDE & SCHWARZ	101674		I	6/1/2018	6/1/2017
<b>Cables</b>	<b>Range</b>		<b>Mfr</b>			<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
Asset #2052	9kHz - 18GHz		Florida RF			II	3/5/2018	3/5/2017
DUT1	30MHz-26GHz		Micro-Coax			II	6/21/2018	6/21/2017
<b>Attenuators</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
10dB Attenuator-01 Brown	30MHz-26GHz		Mini Circuits			II	7/13/2018	7/14/2017
10dB Attenuator-02 Yellow	30MHz-26GHz		Mini Circuits			II	7/13/2018	7/14/2017
<b>Wideband Radio Communication Tester</b>	<b>Range</b>	<b>MN</b>	<b>Mfr</b>	<b>SN</b>	<b>Asset</b>	<b>Cat</b>	<b>Calibration Due</b>	<b>Calibrated on</b>
(Rental)CMW500	DC to 6GHz	CMW500	ROHDE & SCHWARZ	155905		I	6/2/2018	6/2/2017

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Testing Cert. No. 1627-01

**Test Results Summary**

Test	Frequency (MHz)	802.11b	802.11g	802.11n (HT20)
Average Output Power	2412.000	PASS	PASS	PASS
Peak Power Spectral Density	2412.000	PASS	PASS	PASS
DTS Bandwidth (6dB)	2412.000	PASS	PASS	PASS
Conducted Band Edges	2412.000	PASS	PASS	PASS
Conducted Spurious Emissions	2412.000	PASS	PASS	PASS
Average Output Power	2437.000	PASS	PASS	PASS
Peak Power Spectral Density	2437.000	PASS	PASS	PASS
DTS Bandwidth (6dB)	2437.000	PASS	PASS	PASS
Conducted Band Edges	2437.000	PASS	PASS	PASS
Conducted Spurious Emissions	2437.000	PASS	PASS	PASS
Average Output Power	2462.000	PASS	PASS	PASS
Peak Power Spectral Density	2462.000	PASS	PASS	PASS
DTS Bandwidth (6dB)	2462.000	PASS	PASS	PASS
Conducted Band Edges	2462.000	PASS	PASS	PASS
Conducted Spurious Emissions	2462.000	PASS	PASS	PASS



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Testing Cert. No. 1627-01

## Average Output Power (Gated)

Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 9.2.3.2.

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.  
Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 1 dB

### 802.11b (Power Setting: Default)

Data Rate	Gated RMS (dBm) 2412 MHz	Gated RMS (dBm) 2437 MHz	Gated RMS (dBm) 2462 MHz	Limit (dBm)	Duty Cycle (%)
1 Mbps	16.691	16.15	15.45	30.0	97.982
2 Mbps	17.098	16.283	15.598	30.0	97.005
5.5 Mbps	17.198	16.344	15.62	30.0	97.009
11 Mbps	17.04	16.315	15.6	30.0	89.041

### 802.11g (Power Setting: 26)

Data Rate	Gated RMS (dBm) 2412 MHz	Gated RMS (dBm) 2437 MHz	Gated RMS (dBm) 2462 MHz	Limit (dBm)	Duty Cycle (%)
6 Mbps	13.527	13.471	13.935	30.0	92.267
9 Mbps	13.075	13.092	13.523	30.0	89.343
12 Mbps	12.972	13.11	13.542	30.0	86.618
18 Mbps	13.02	13.144	13.488	30.0	81.868
24 Mbps	13.146	13.303	13.628	30.0	77.620
36 Mbps	13.212	13.311	13.686	30.0	70.775
48 Mbps	13.304	13.462	13.803	30.0	64.949
54 Mbps	13.25	13.441	13.705	30.0	63.047

### 802.11n(HT20) (Power Setting: Default)

Data Rate	Gated RMS (dBm) 2412 MHz	Gated RMS (dBm) 2437 MHz	Gated RMS (dBm) 2462 MHz	Limit (dBm)	Duty Cycle (%)
MCS0	14.12	13.62	12.948	30.0	91.848
MCS1	13.936	13.666	12.94	30.0	85.993
MCS2	13.948	13.486	12.969	30.0	81.261
MCS3	14.305	13.827	13.304	30.0	77.168
MCS4	13.133	12.596	11.952	30.0	70.774
MCS5	13.274	12.678	11.974	30.0	65.531
MCS6	13.132	12.725	11.987	30.0	63.701
MCS7	13.131	12.691	11.974	30.0	61.631

## Peak Power Spectral Density

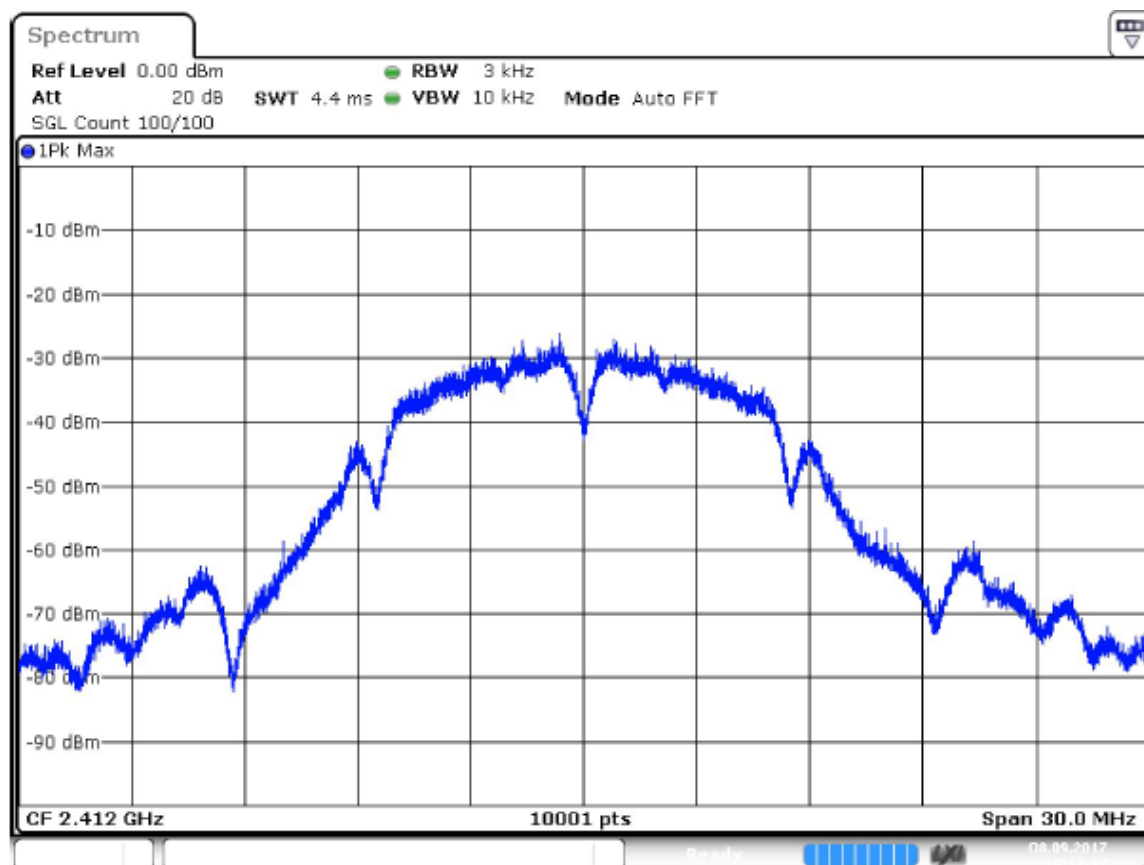
Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 10.2

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1.3 dB

### 802.11b (Power Setting: Default)

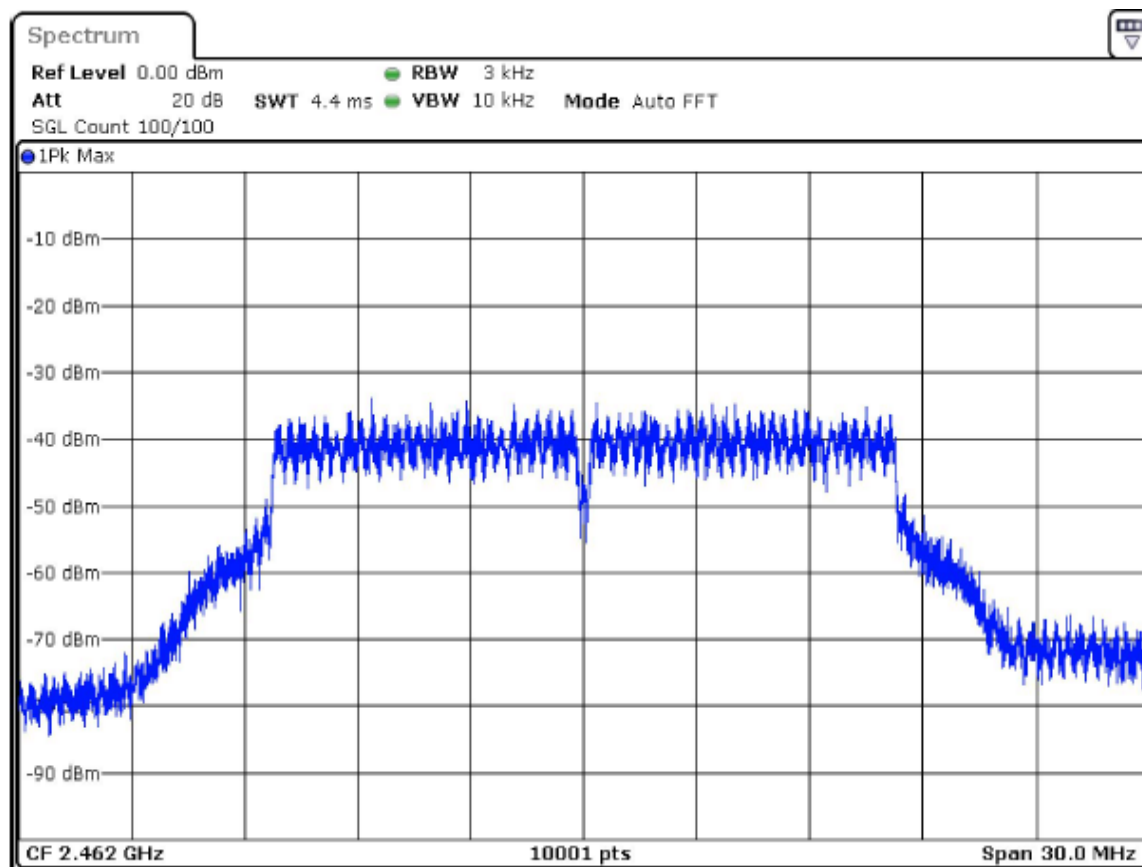
Data Rate	Peak PSD (dBm) 2412 MHz	Peak PSD (dBm) 2437 MHz	Peak PSD (dBm) 2462 MHz	Limit (dBm)
1 Mbps	-4.506	-6.222	-7.470	8
2 Mbps	-5.240	-6.026	-6.540	8
5.5 Mbps	-4.231	-5.795	-6.669	8
11 Mbps	-5.944	-5.723	-7.450	8

### 802.11b 5.5 Mbps 2412MHz



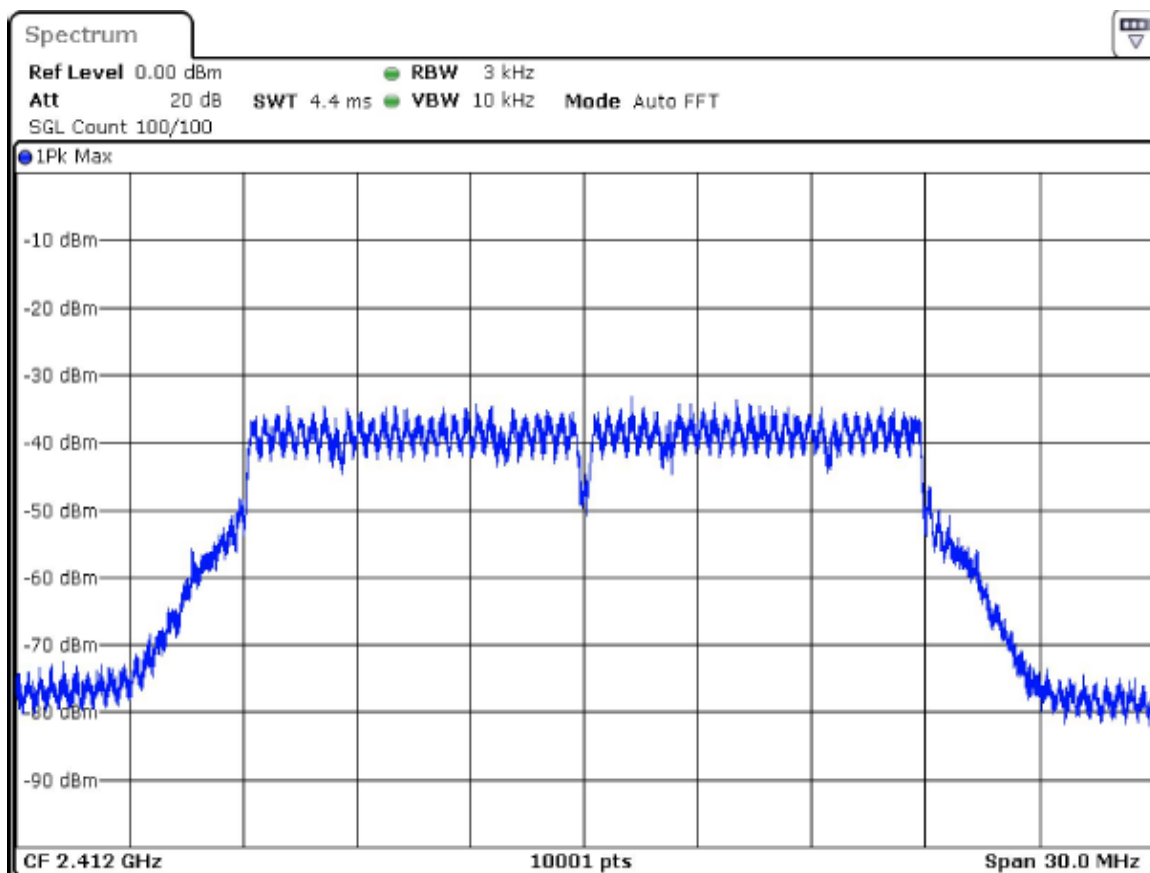
**802.11g (Power Setting: 26)**

Data Rate	Peak PSD (dBm) 2412 MHz	Peak PSD (dBm) 2437 MHz	Peak PSD (dBm) 2462 MHz	Limit (dBm)
6 Mbps	-12.253	-12.309	-11.956	8
9 Mbps	-13.789	-13.671	-13.223	8
12 Mbps	-12.664	-12.545	-12.272	8
18 Mbps	-14.146	-13.988	-13.492	8
24 Mbps	-13.227	-12.984	-12.737	8
36 Mbps	-14.086	-13.947	-13.497	8
48 Mbps	-14.724	-14.656	-14.289	8
54 Mbps	-15.173	-14.829	-14.596	8

**802.11g 6 Mbps 2462MHz**

**802.11n(HT20) (Power Setting: Default)**

Data Rate	Peak PSD (dBm) 2412 MHz	Peak PSD (dBm) 2437 MHz	Peak PSD (dBm) 2462 MHz	Limit (dBm)
MCS0	-11.238	-12.387	-12.712	8
MCS1	-11.893	-12.460	-12.664	8
MCS2	-12.294	-12.406	-13.332	8
MCS3	-11.821	-12.383	-12.001	8
MCS4	-12.628	-13.755	-14.283	8
MCS5	-13.453	-13.540	-14.049	8
MCS6	-13.404	-12.476	-14.777	8
MCS7	-13.619	-13.326	-14.227	8

**802.11n(HT20) MCS0 2412MHz**

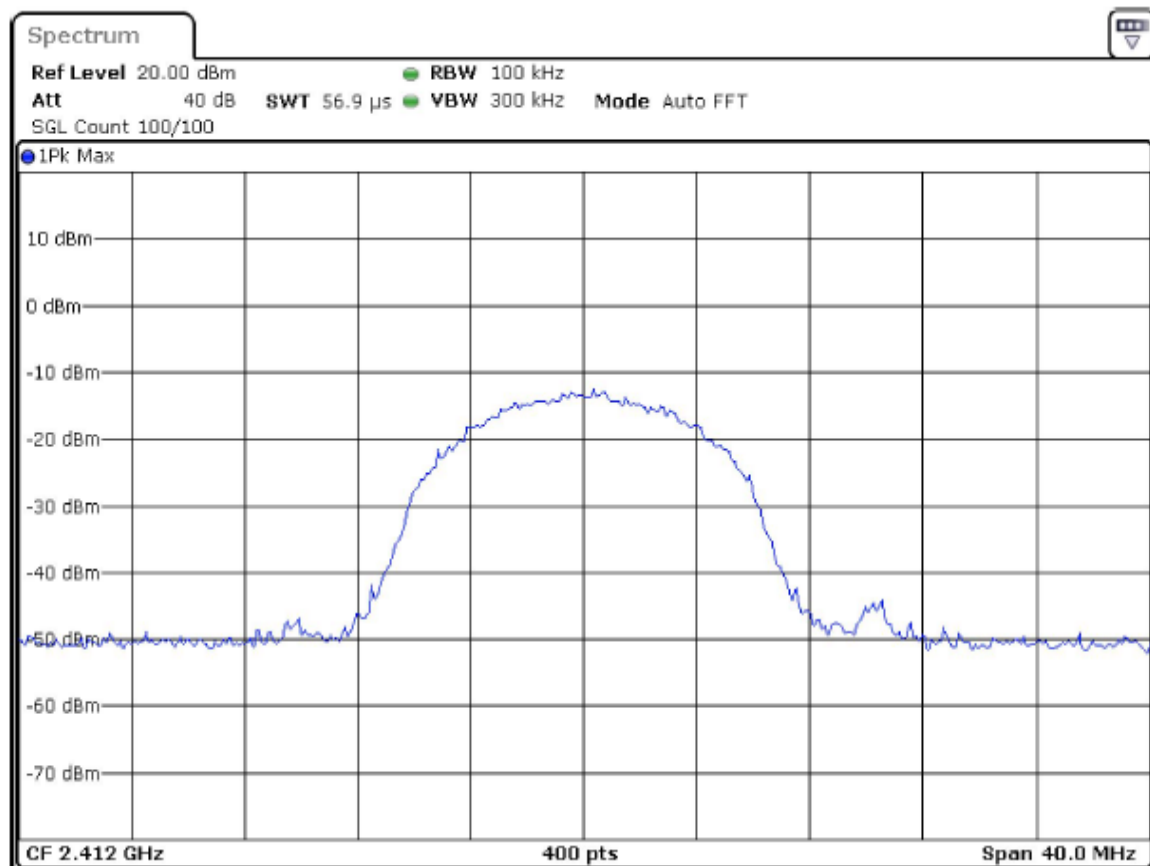
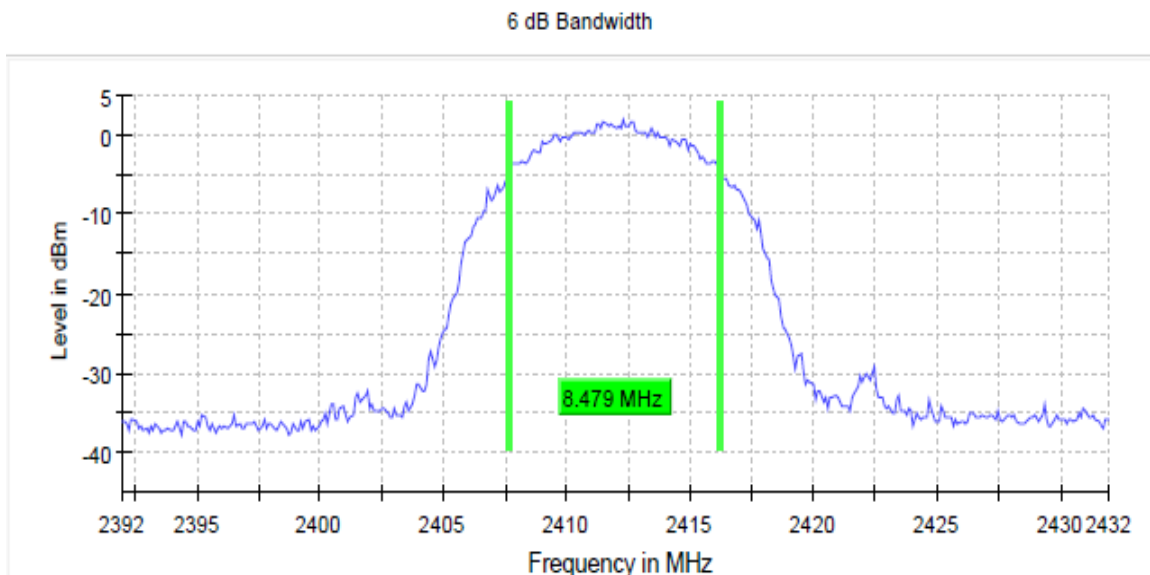


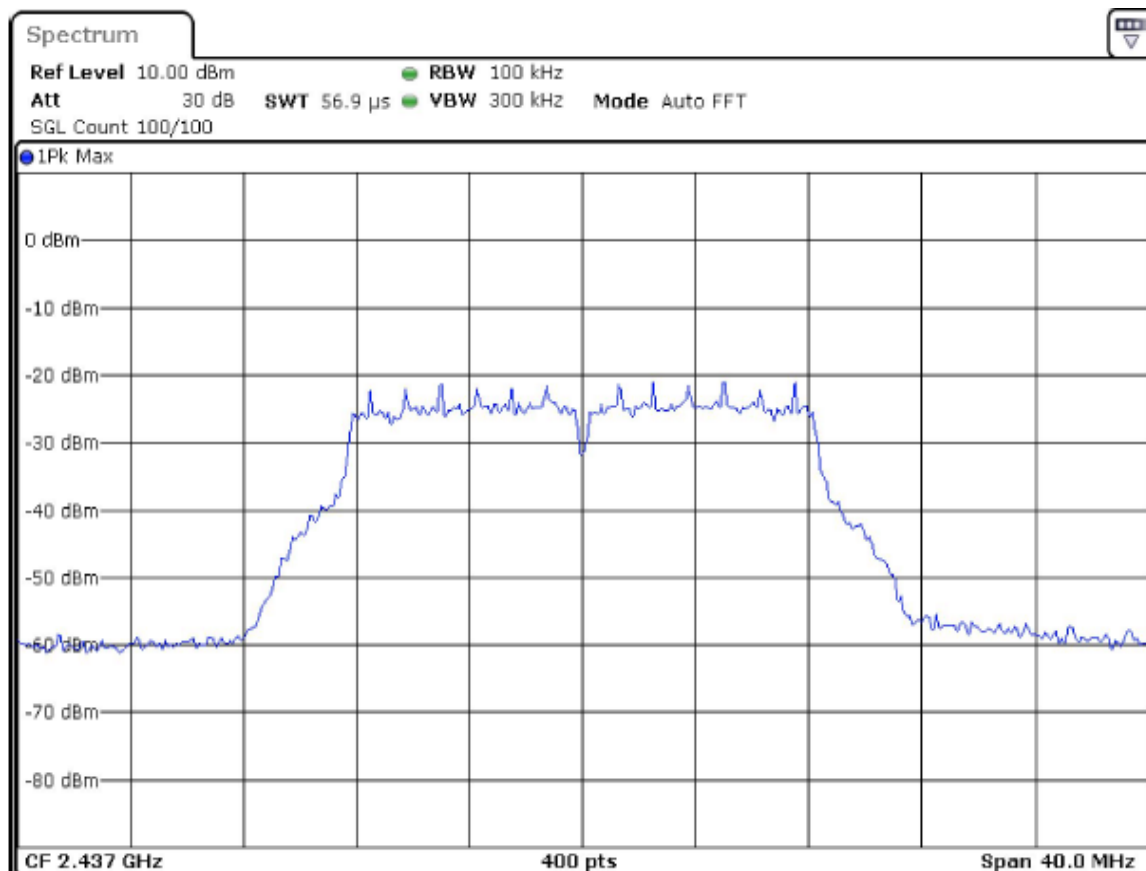
## DTS Bandwidth (6dB)

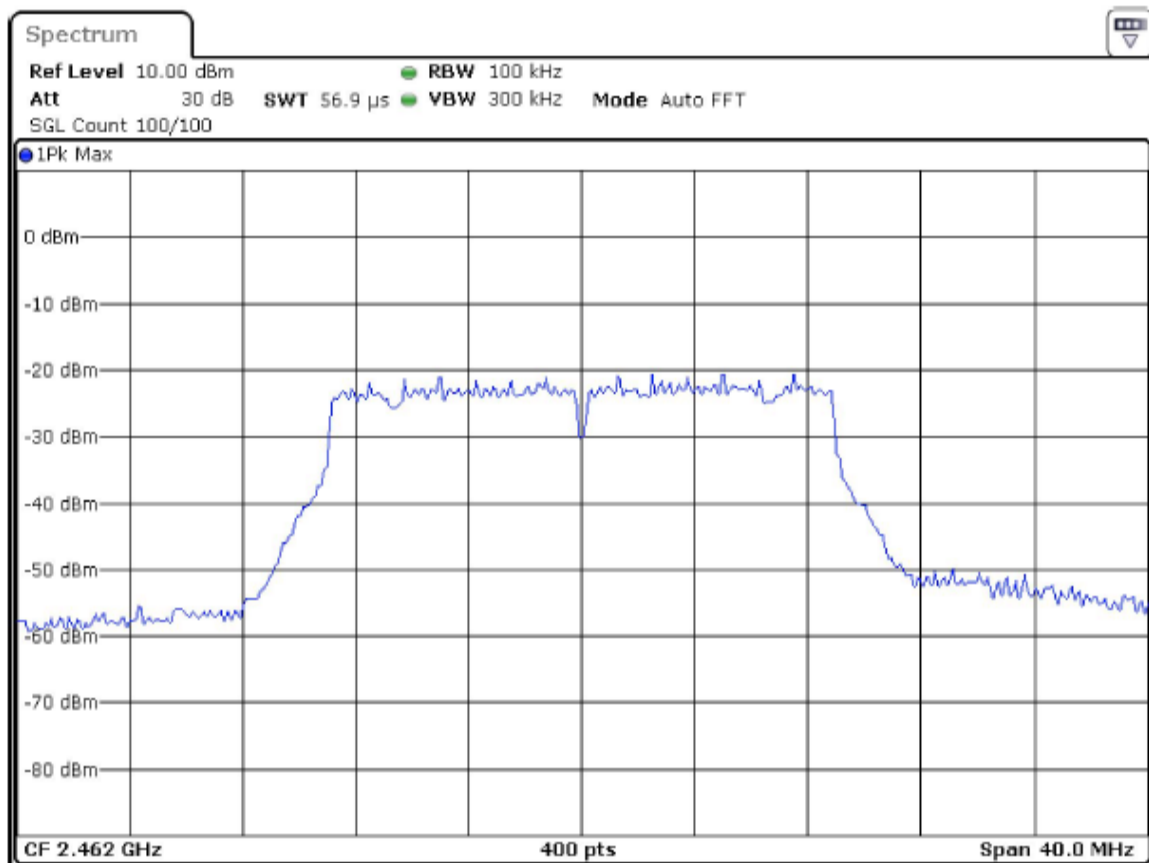
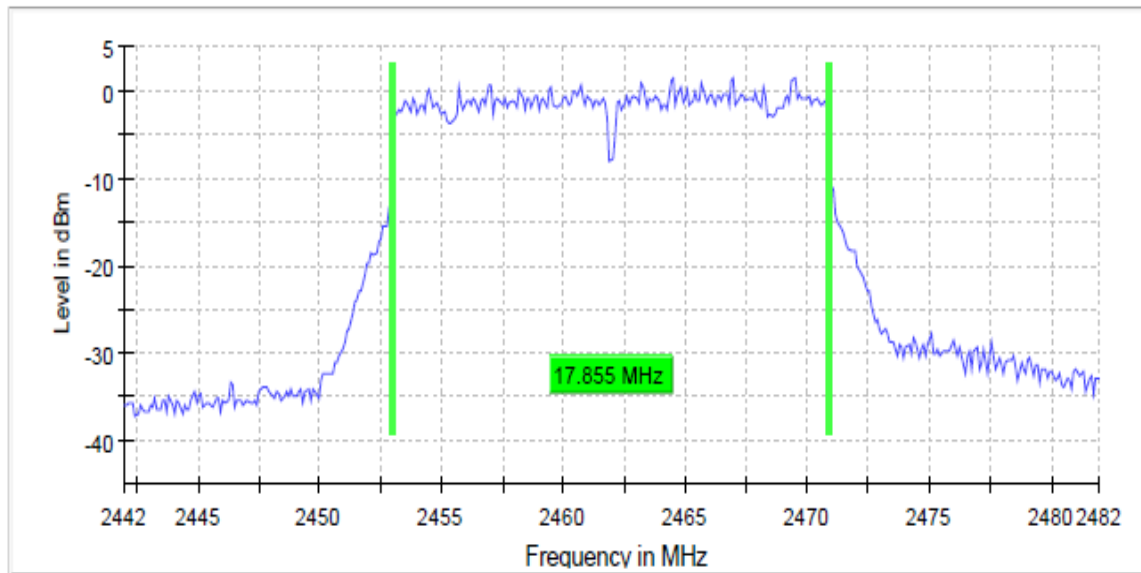
Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 8.1

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

Data Rate	DUT Frequency (MHz)	Bandwidth (MHz)	Minimum Limit (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
802.11b 5.5 Mbps	2412.000	8.478803	0.5	2403.022444	2420.877805
802.11g 6 Mbps	2412.000	16.458853	0.5	2403.720698	2420.179551
802.11n(HT20) MCS3	2412.000	17.855361	0.5	2403.022444	2420.877805
802.11b 5.5 Mbps	2437.000	8.179551	0.5	2428.022444	2445.877805
802.11g 6 Mbps	2437.000	16.458853	0.5	2428.720698	2445.179551
802.11n(HT20) MCS3	2437.000	17.855361	0.5	2428.022444	2445.877805
802.11b 5.5 Mbps	2462.000	8.179551	0.5	2453.022444	2470.877805
802.11g 6 Mbps	2462.000	16.458853	0.5	2453.720698	2470.179551
802.11n(HT20) MCS3	2462.000	17.855361	0.5	2453.022444	2470.877805

**802.11b 5.5Mbps 2412MHz**

**802.11g 6 Mbps 2437MHz**

**802.11n(HT20) MCS3 2462MHz**

## Conducted Band Edge

Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 11.

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

### 802.11b 5.5Mbps 2412MHz

#### Band Edge Low

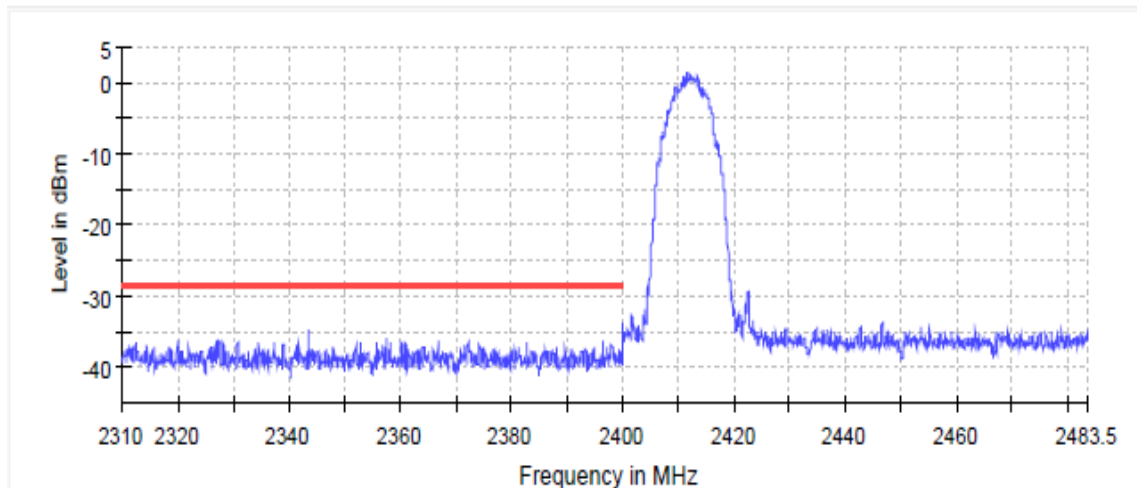
##### Inband Peak

Frequency (MHz)	Level (dBm)
2414.516308	2.5

## Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2396.926707	-31.1	3.6	-27.5	PASS
2396.976680	-31.1	3.6	-27.5	PASS
2399.475292	-31.4	3.9	-27.5	PASS
2399.525264	-31.7	4.1	-27.5	PASS
2397.626319	-31.7	4.2	-27.5	PASS
2398.825652	-31.8	4.3	-27.5	PASS
2398.875625	-31.9	4.3	-27.5	PASS
2398.775680	-32.1	4.6	-27.5	PASS
2397.576346	-32.2	4.6	-27.5	PASS
2399.425319	-32.2	4.6	-27.5	PASS
2399.825097	-32.2	4.6	-27.5	PASS
2399.775125	-32.3	4.7	-27.5	PASS
2399.575236	-32.6	5.0	-27.5	PASS
2395.727374	-32.9	5.4	-27.5	PASS
2399.125486	-33.1	5.6	-27.5	PASS

Band Edge



— Limit — Sum Level ✗ Fail

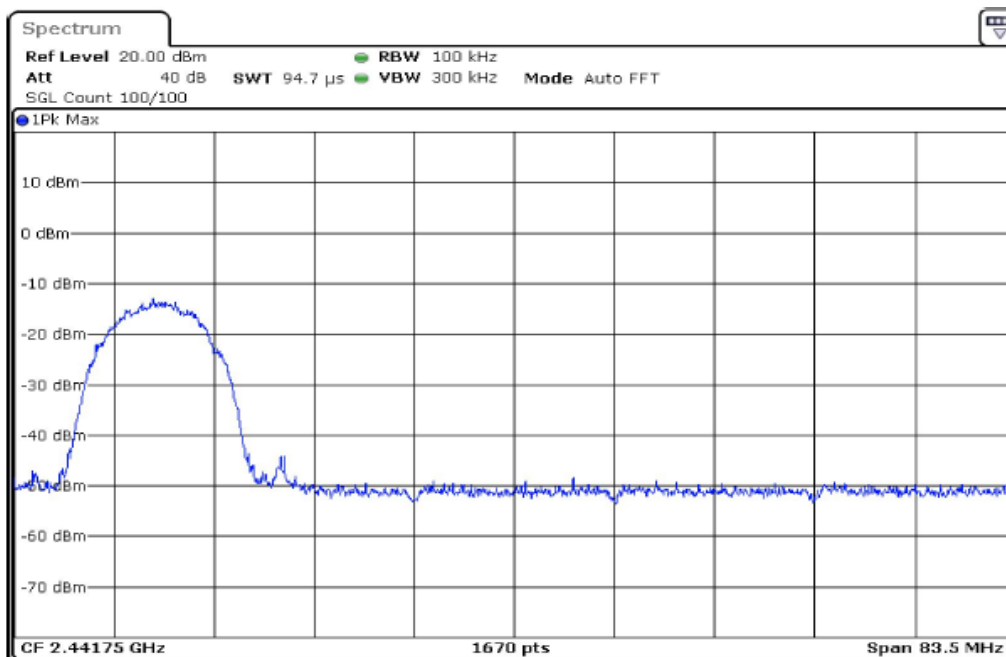
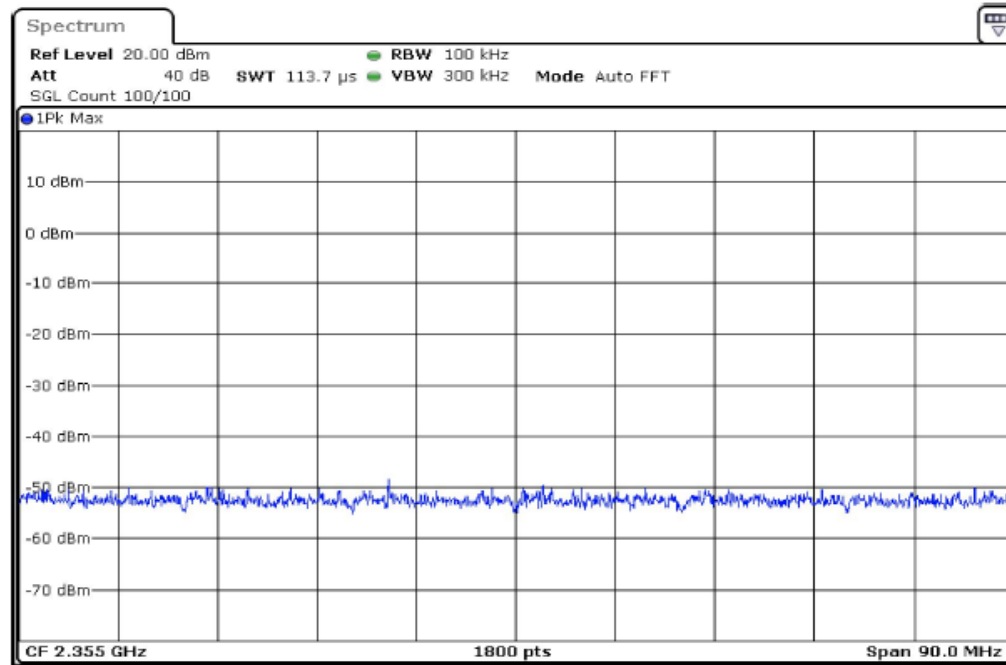


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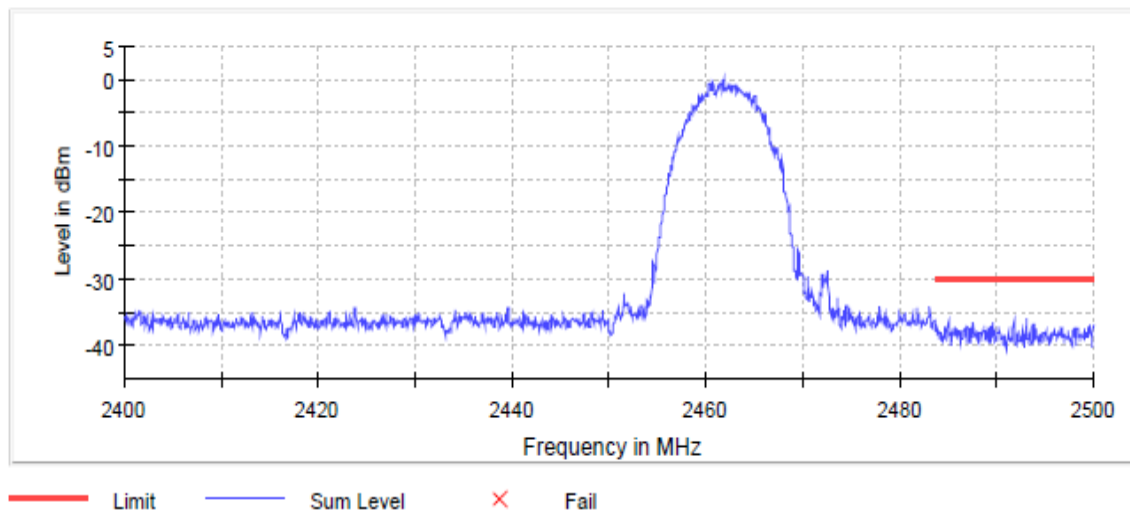
**802.11b 5.5Mbps 2462MHz****Band Edge High****Inband Peak**

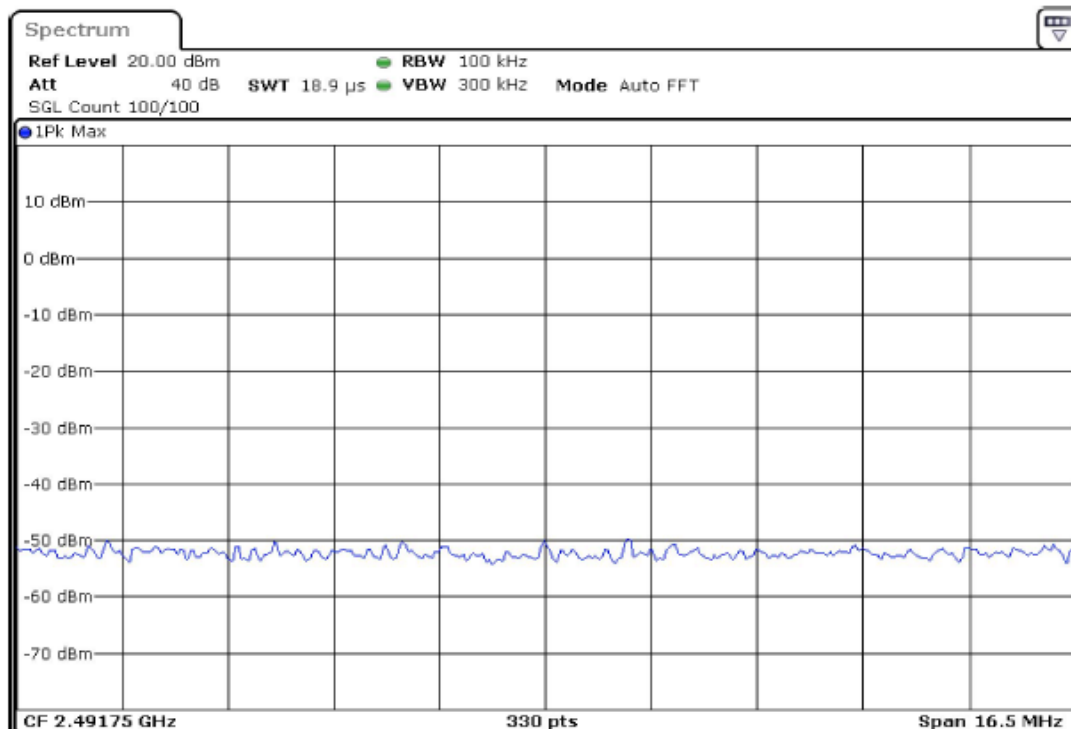
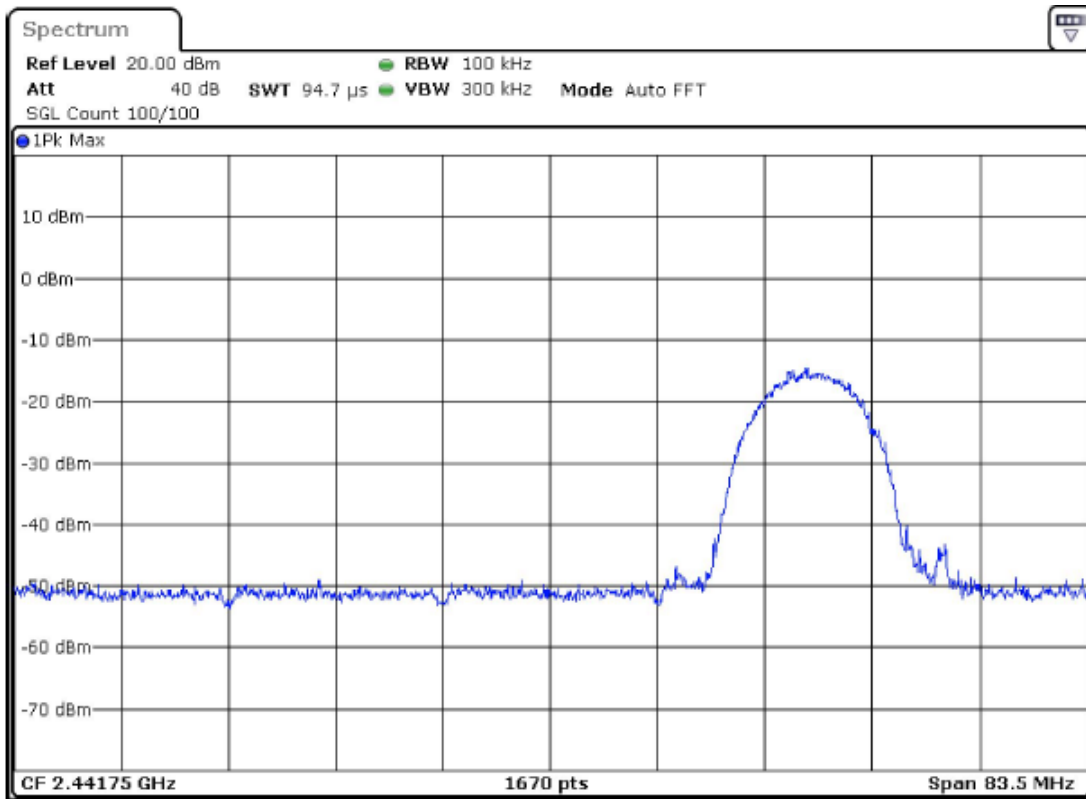
Frequency (MHz)	Level (dBm)
2464.486385	1.4

**Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.524924	-35.0	6.4	-28.6	PASS
2486.366314	-35.9	7.3	-28.6	PASS
2484.771148	-36.0	7.5	-28.6	PASS
2484.721299	-36.1	7.6	-28.6	PASS
2483.574773	-36.3	7.7	-28.6	PASS
2486.416163	-36.3	7.7	-28.6	PASS
2485.668429	-36.3	7.7	-28.6	PASS
2483.824018	-36.5	7.9	-28.6	PASS
2485.618580	-36.5	7.9	-28.6	PASS
2486.316465	-36.5	8.0	-28.6	PASS
2483.873867	-36.5	8.0	-28.6	PASS
2483.774169	-36.6	8.1	-28.6	PASS
2483.923716	-36.7	8.2	-28.6	PASS
2484.222810	-36.9	8.4	-28.6	PASS
2484.571752	-36.9	8.4	-28.6	PASS

Band Edge







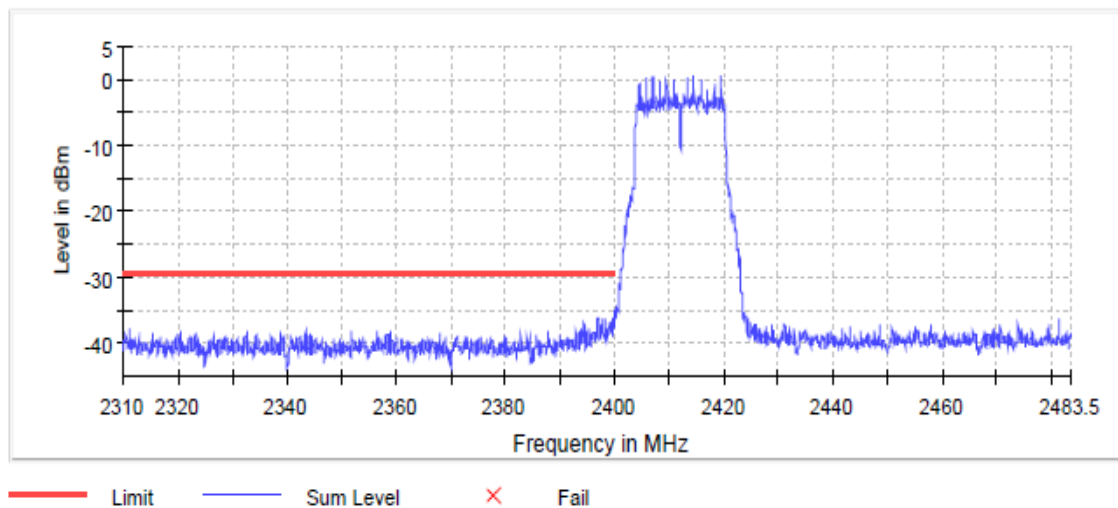
**802.11g 6 Mbps 2412MHz****Band Edge Low****Inband Peak**

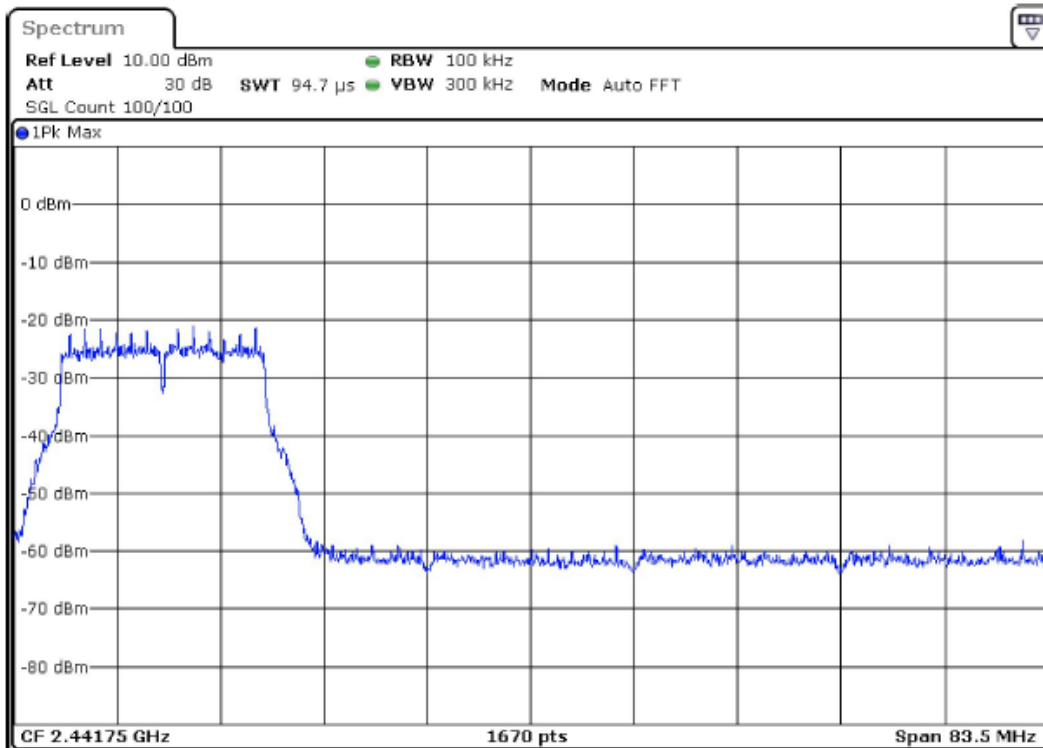
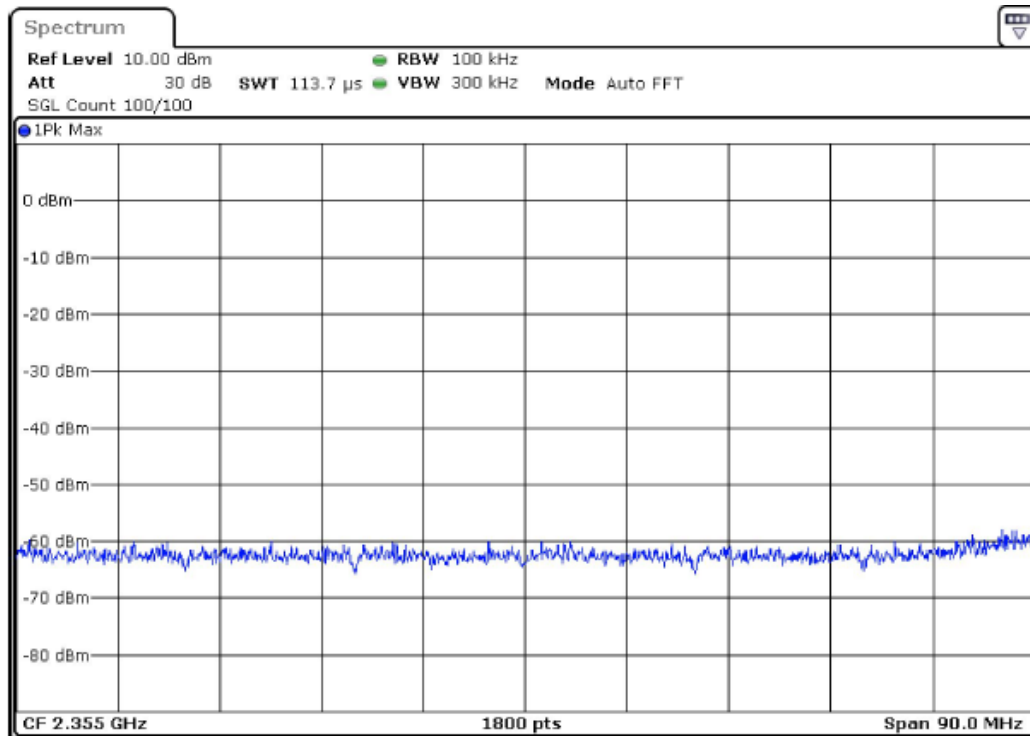
Frequency (MHz)	Level (dBm)
2414.516308	0.7

**Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2396.926707	-36.1	6.9	-29.3	PASS
2399.825097	-36.3	7.0	-29.3	PASS
2399.775125	-36.3	7.0	-29.3	PASS
2398.176013	-36.3	7.0	-29.3	PASS
2397.926152	-36.4	7.1	-29.3	PASS
2396.976680	-36.4	7.1	-29.3	PASS
2397.876180	-36.6	7.3	-29.3	PASS
2398.225986	-36.6	7.4	-29.3	PASS
2398.825652	-36.8	7.6	-29.3	PASS
2398.875625	-36.9	7.6	-29.3	PASS
2399.375347	-36.9	7.6	-29.3	PASS
2394.378123	-36.9	7.6	-29.3	PASS
2399.425319	-36.9	7.6	-29.3	PASS
2397.276513	-37.0	7.7	-29.3	PASS
2397.226541	-37.1	7.8	-29.3	PASS

Band Edge





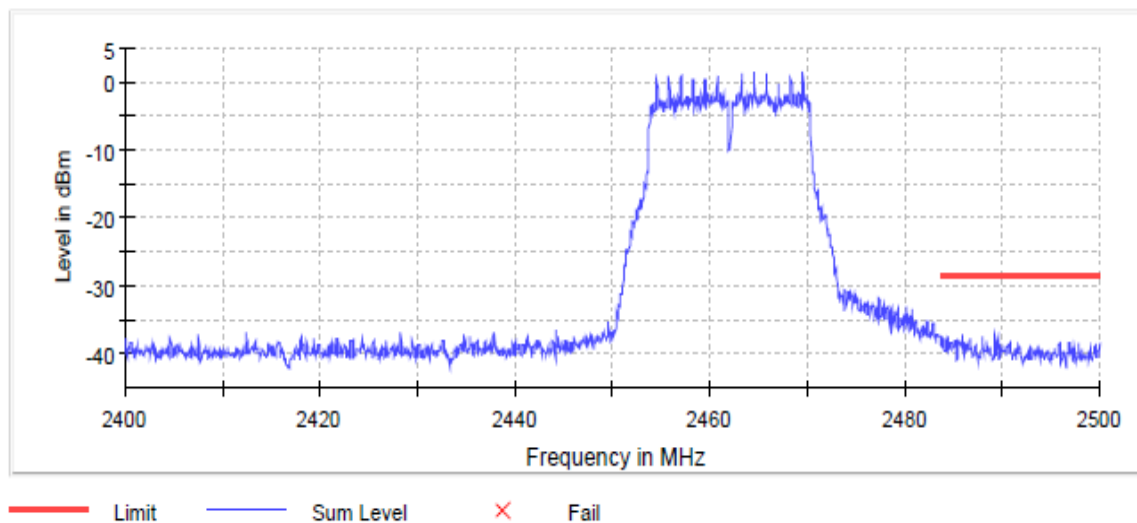
**802.11g 6 Mbps 2462MHz****Band Edge High****Inband Peak**

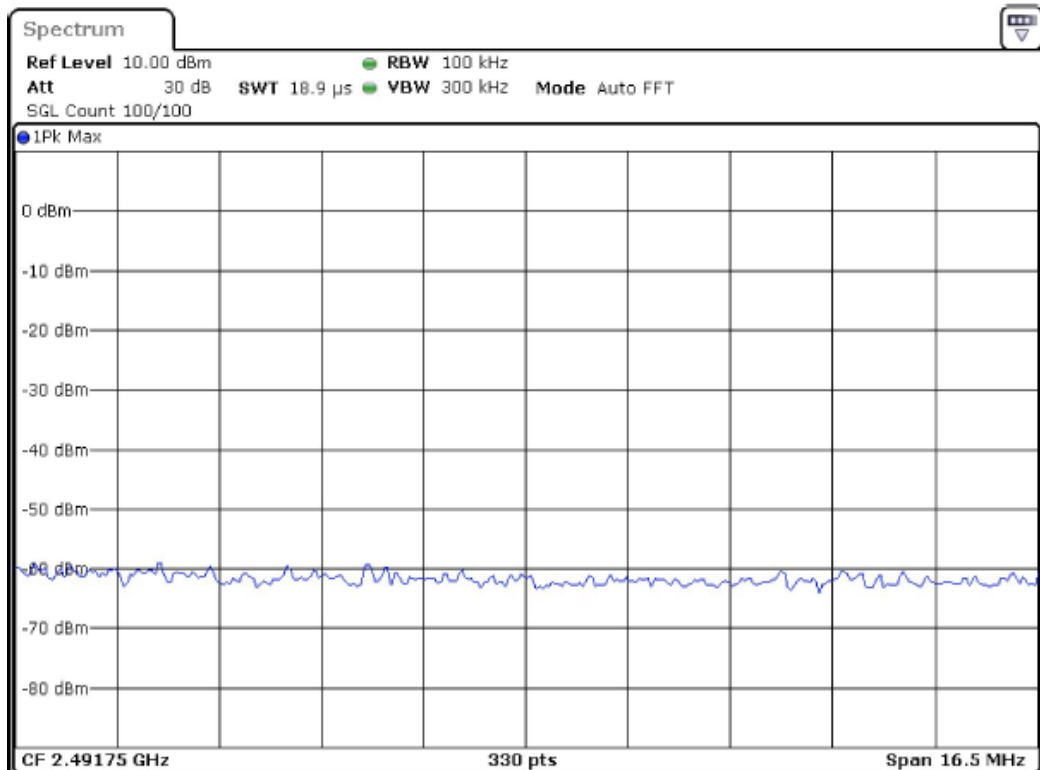
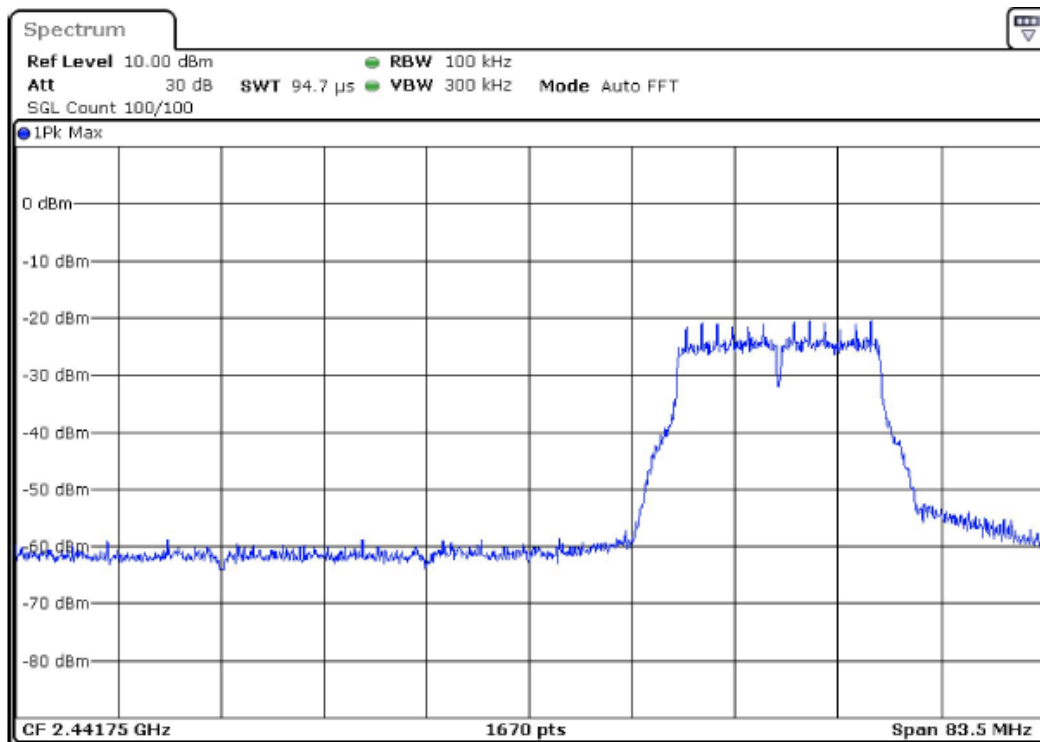
Frequency (MHz)	Level (dBm)
2464.486385	1.5

**Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2485.817976	-37.1	8.6	-28.5	PASS
2485.867825	-37.2	8.7	-28.5	PASS
2489.157855	-37.3	8.8	-28.5	PASS
2489.207704	-37.3	8.8	-28.5	PASS
2483.824018	-37.4	8.9	-28.5	PASS
2487.911631	-37.5	9.0	-28.5	PASS
2484.422205	-37.5	9.0	-28.5	PASS
2486.665408	-37.7	9.1	-28.5	PASS
2483.873867	-37.7	9.1	-28.5	PASS
2487.861782	-37.7	9.2	-28.5	PASS
2484.372356	-37.7	9.2	-28.5	PASS
2489.456949	-37.8	9.2	-28.5	PASS
2483.574773	-37.8	9.2	-28.5	PASS
2489.506798	-37.8	9.3	-28.5	PASS
2483.973565	-37.9	9.4	-28.5	PASS

Band Edge



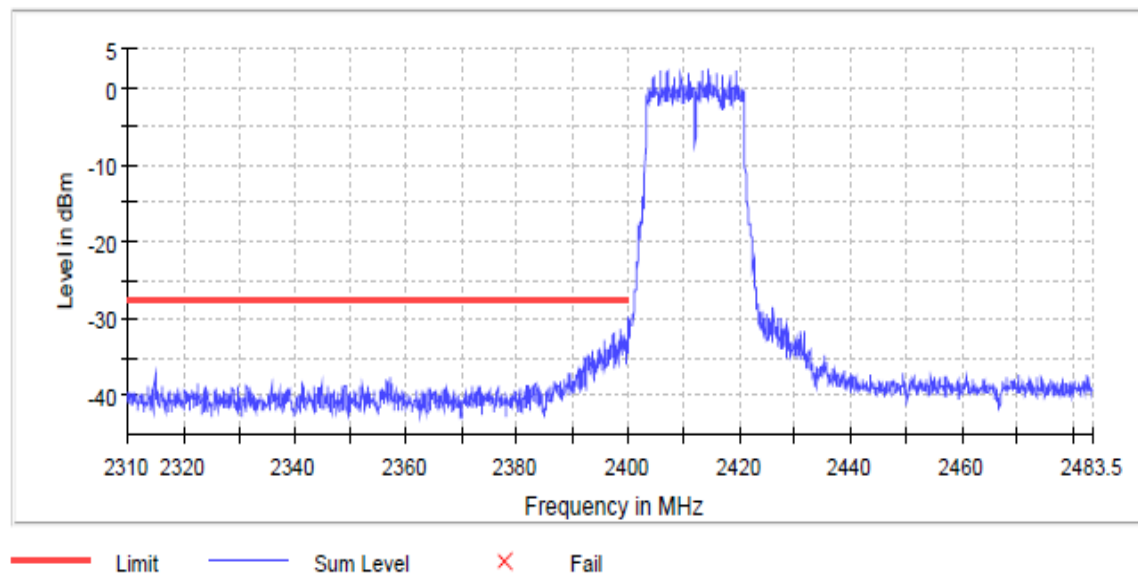


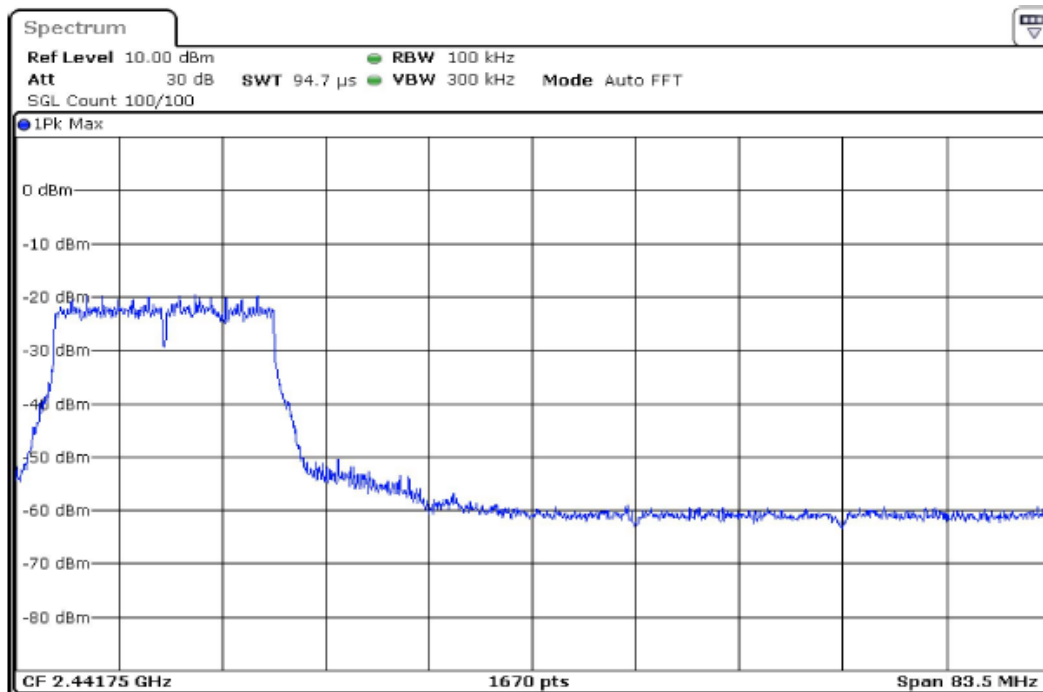
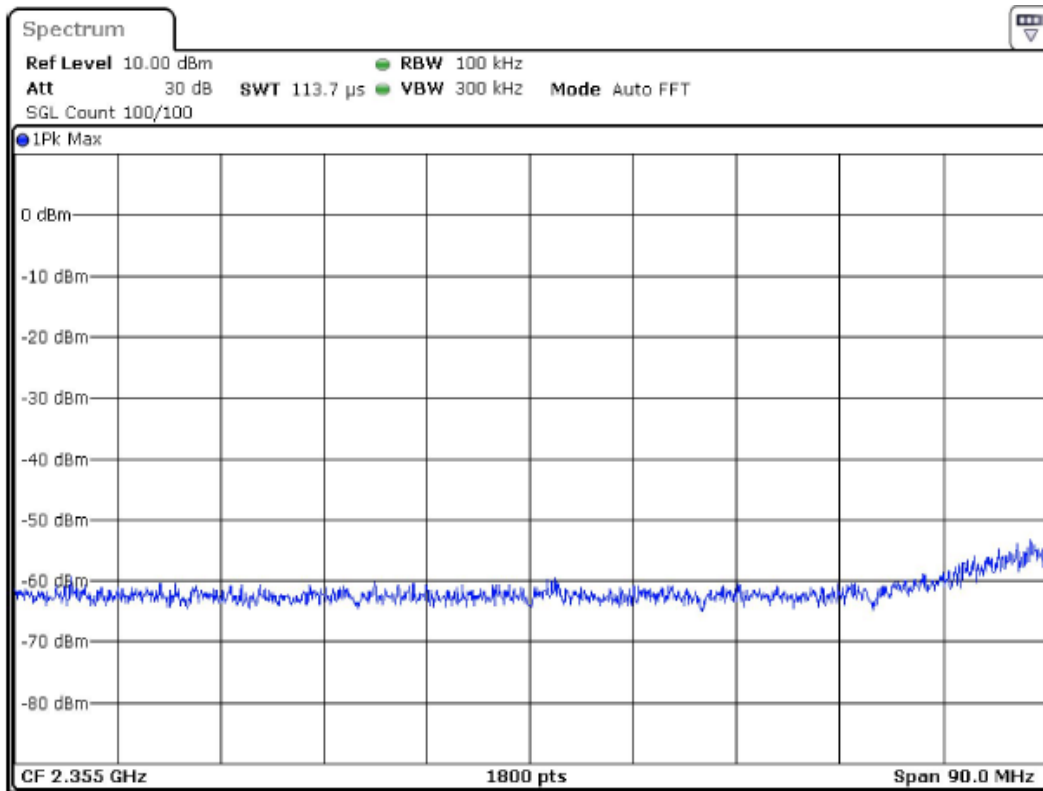
**802.11n(HT20) MCS3 2412MHz****Band Edge Low****Inband Peak**

Frequency (MHz)	Level (dBm)
2414.516308	2.4

**Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2398.475847	-31.4	3.8	-27.6	PASS
2398.525819	-31.7	4.1	-27.6	PASS
2398.425875	-31.7	4.1	-27.6	PASS
2397.326485	-32.1	4.5	-27.6	PASS
2397.276513	-32.2	4.6	-27.6	PASS
2398.825652	-32.3	4.7	-27.6	PASS
2398.176013	-32.8	5.2	-27.6	PASS
2399.125486	-32.8	5.2	-27.6	PASS
2398.225986	-32.8	5.2	-27.6	PASS
2399.175458	-32.8	5.2	-27.6	PASS
2399.725153	-32.8	5.2	-27.6	PASS
2395.727374	-32.8	5.3	-27.6	PASS
2395.677401	-33.0	5.4	-27.6	PASS
2399.475292	-33.0	5.4	-27.6	PASS
2399.775125	-33.0	5.4	-27.6	PASS



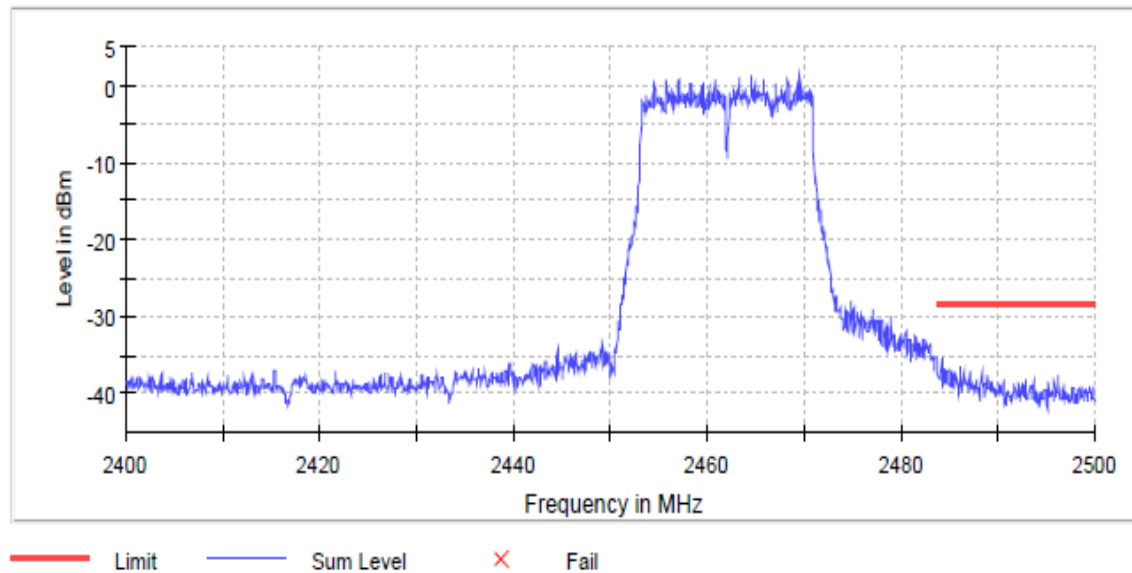


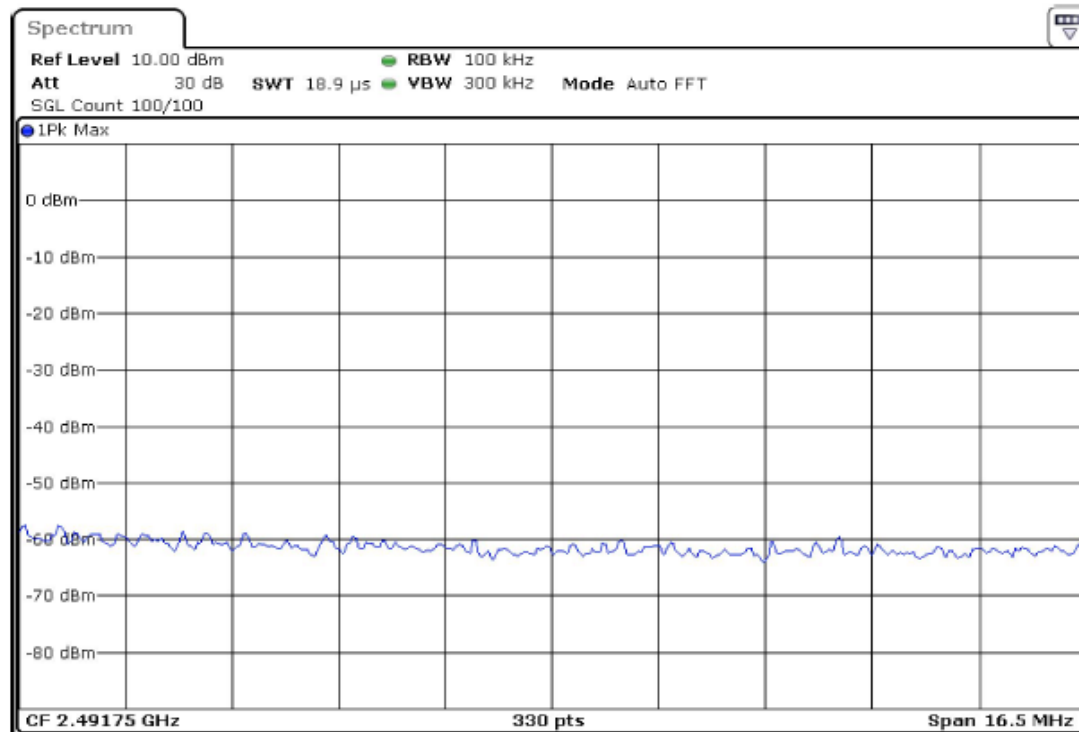
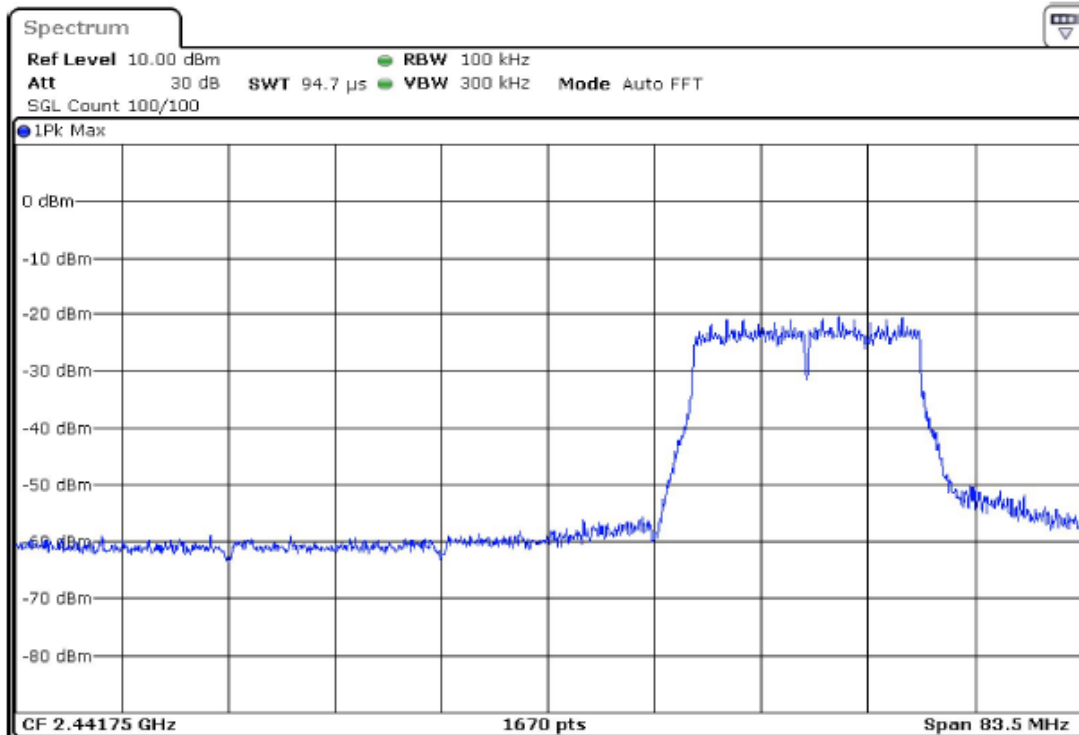
**802.11n(HT20) MCS3 2462MHz****Band Edge High****Inband Peak**

Frequency (MHz)	Level (dBm)
2464.486385	1.4

**Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2484.123112	-35.5	6.8	-28.6	PASS
2483.624622	-35.6	7.0	-28.6	PASS
2484.172961	-35.7	7.0	-28.6	PASS
2483.574773	-35.9	7.2	-28.6	PASS
2486.067221	-36.6	7.9	-28.6	PASS
2483.524924	-36.7	8.1	-28.6	PASS
2484.372356	-36.7	8.1	-28.6	PASS
2484.222810	-36.8	8.1	-28.6	PASS
2486.017372	-36.8	8.2	-28.6	PASS
2487.014350	-36.9	8.3	-28.6	PASS
2486.416163	-36.9	8.3	-28.6	PASS
2484.422205	-36.9	8.3	-28.6	PASS
2484.721299	-37.0	8.4	-28.6	PASS
2486.366314	-37.0	8.4	-28.6	PASS
2486.964502	-37.1	8.4	-28.6	PASS







## Conducted Spurious Emissions

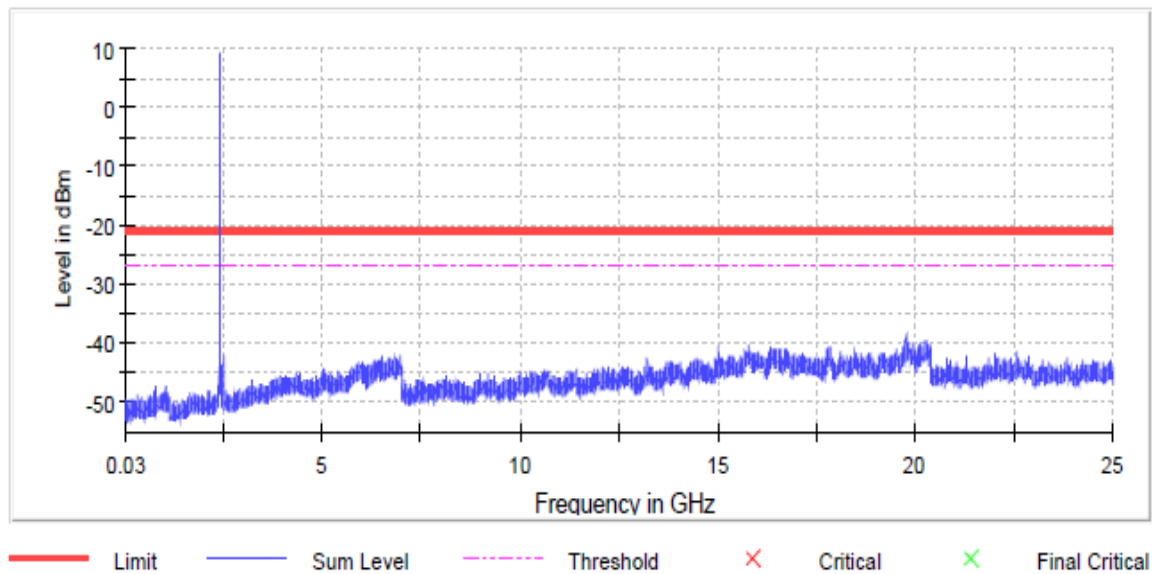
Test according to FCC KDB 558074 DTS Measurement Guidance v04 Section 11.

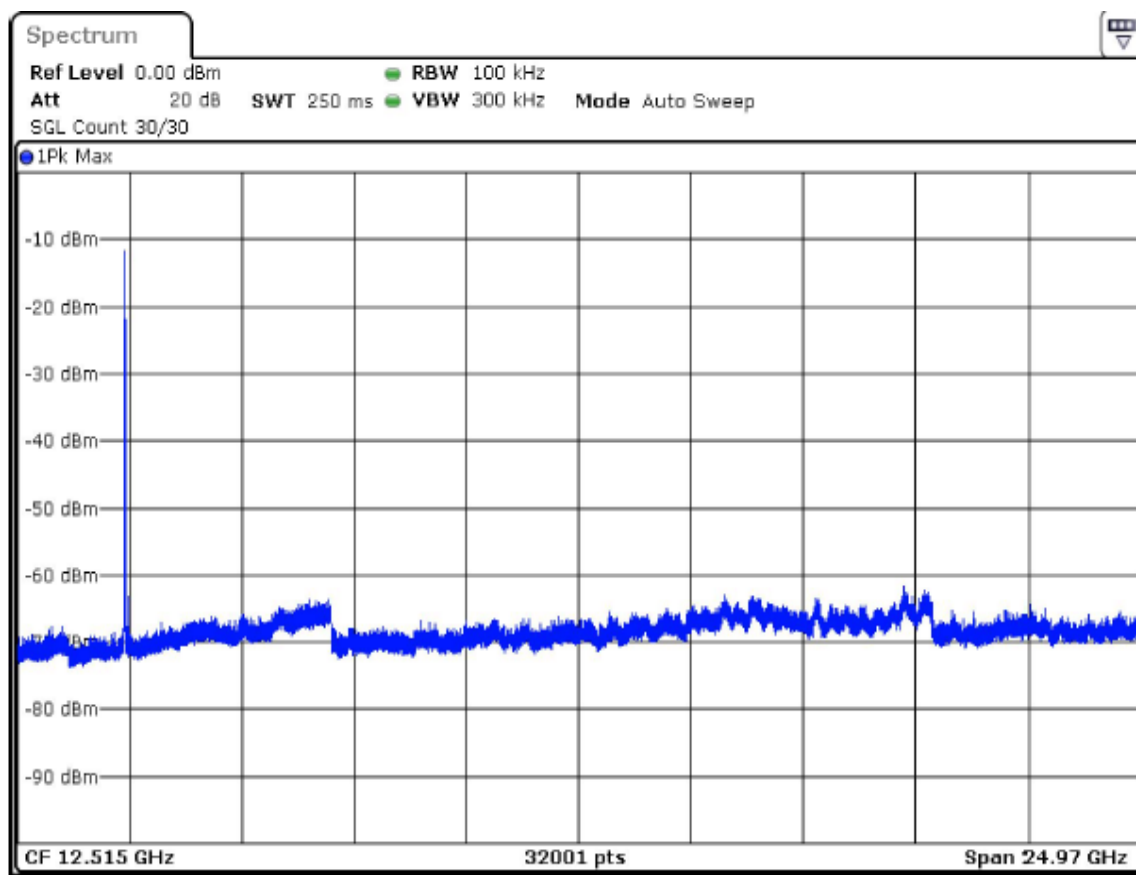
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1.8 dB

### 802.11b 5.5 Mbps 2412MHz

## Pre Measurements

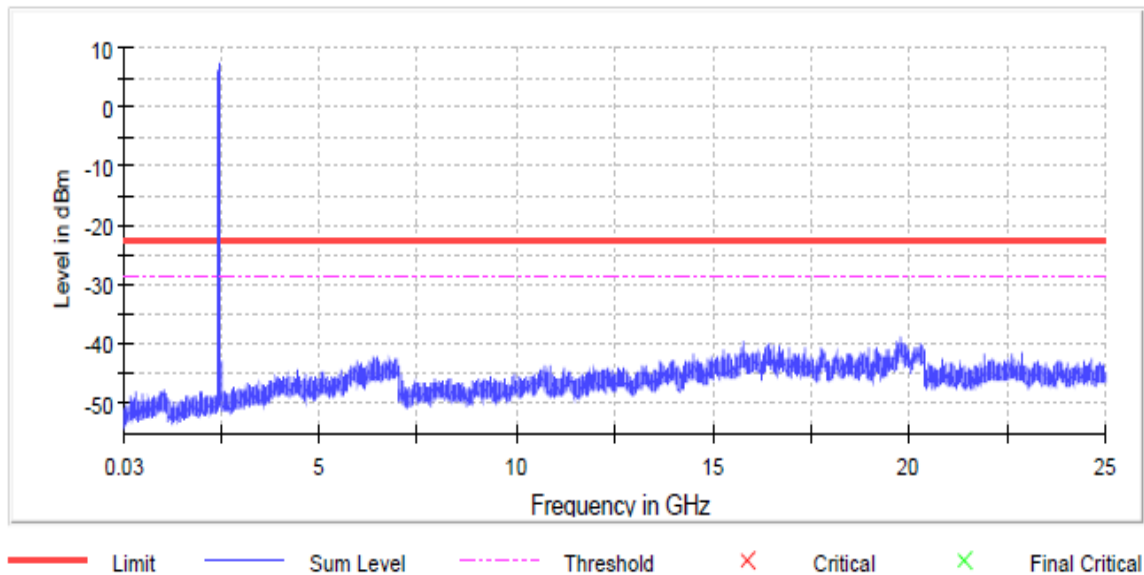
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2399.270827	-35.4	14.5	-20.9
2396.149772	-36.2	15.3	-20.9
2394.589244	-38.1	17.2	-20.9
19767.941535	-38.4	17.5	-20.9
19758.578370	-38.6	17.7	-20.9
19766.381007	-39.1	18.2	-20.9
19777.304700	-39.2	18.3	-20.9
2396.930036	-39.3	18.4	-20.9
20217.373445	-39.4	18.5	-20.9
19761.699425	-39.5	18.6	-20.9
19753.896788	-39.5	18.6	-20.9
20282.135335	-39.6	18.7	-20.9
19741.412568	-39.6	18.7	-20.9
19837.385007	-39.7	18.8	-20.9
20279.014280	-39.8	18.9	-20.9

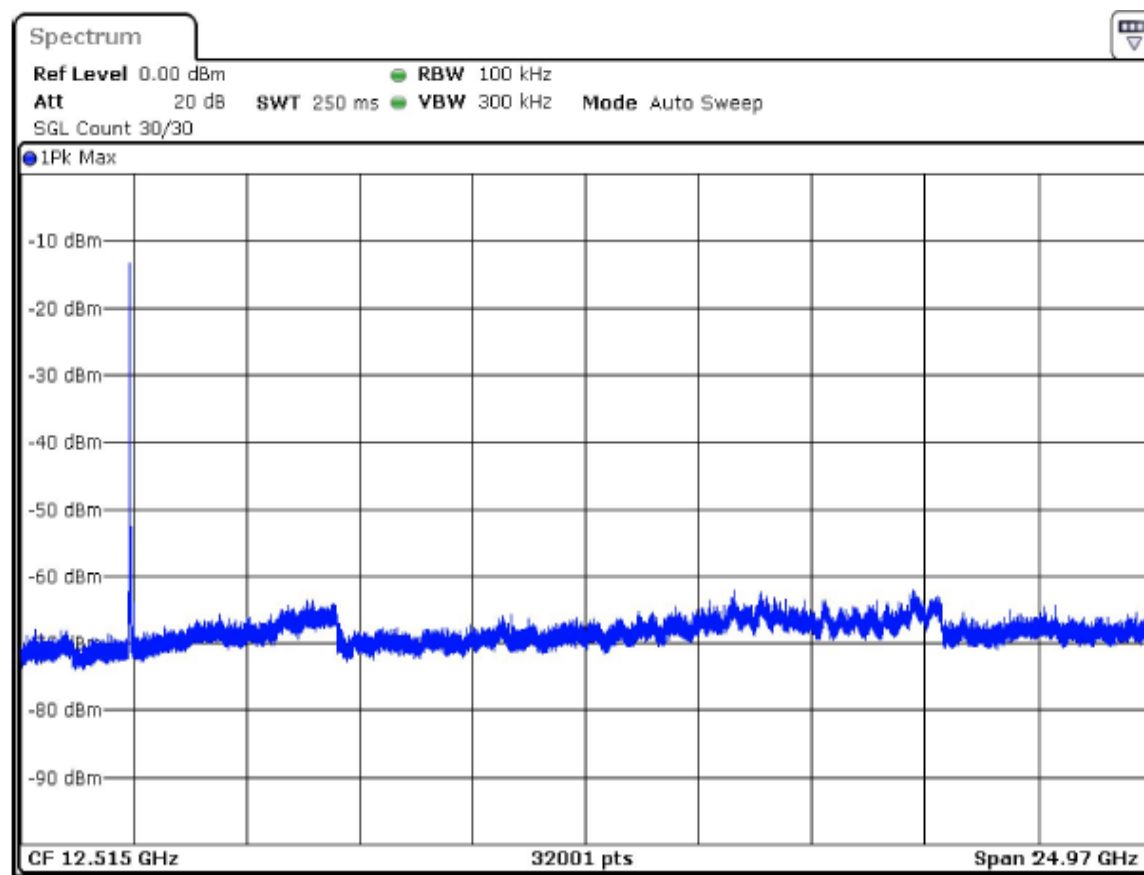




**802.11b 5.5Mbps 2437MHz****Pre Measurements**

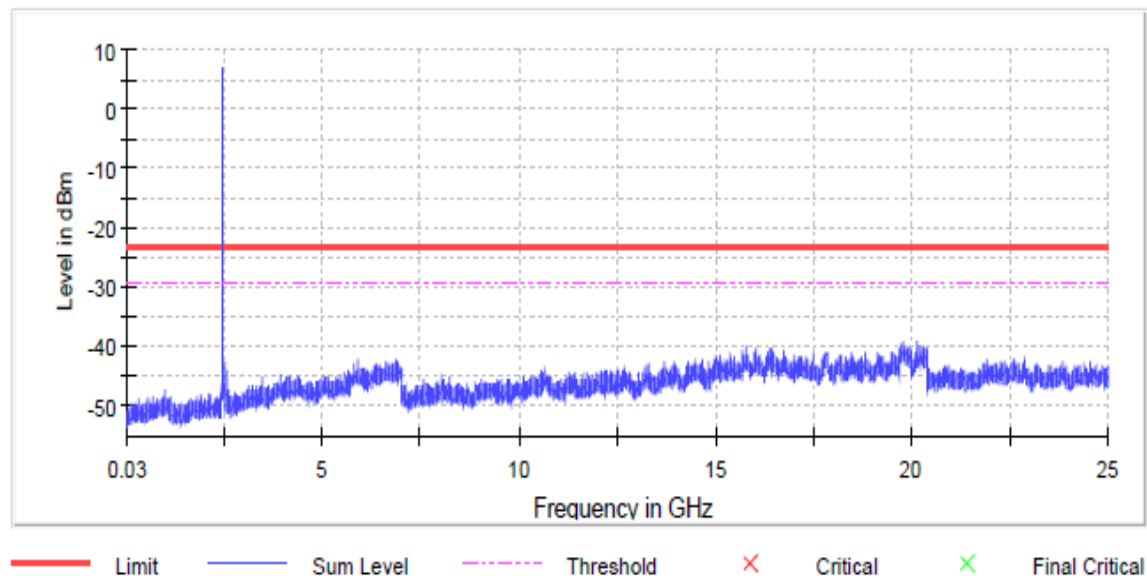
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
19760.138898	-38.8	16.2	-22.6
19772.623117	-39.0	16.4	-22.6
19791.349447	-39.2	16.6	-22.6
19681.332260	-39.4	16.8	-22.6
15799.520186	-39.5	16.9	-22.6
19759.358634	-39.5	16.9	-22.6
19770.282326	-39.7	17.2	-22.6
16417.489063	-39.9	17.3	-22.6
19849.869227	-39.9	17.3	-22.6
19807.734985	-39.9	17.3	-22.6
20302.422192	-39.9	17.3	-22.6
19892.003469	-40.0	17.4	-22.6
19792.129711	-40.0	17.4	-22.6
19826.461315	-40.0	17.4	-22.6
19746.874414	-40.0	17.4	-22.6

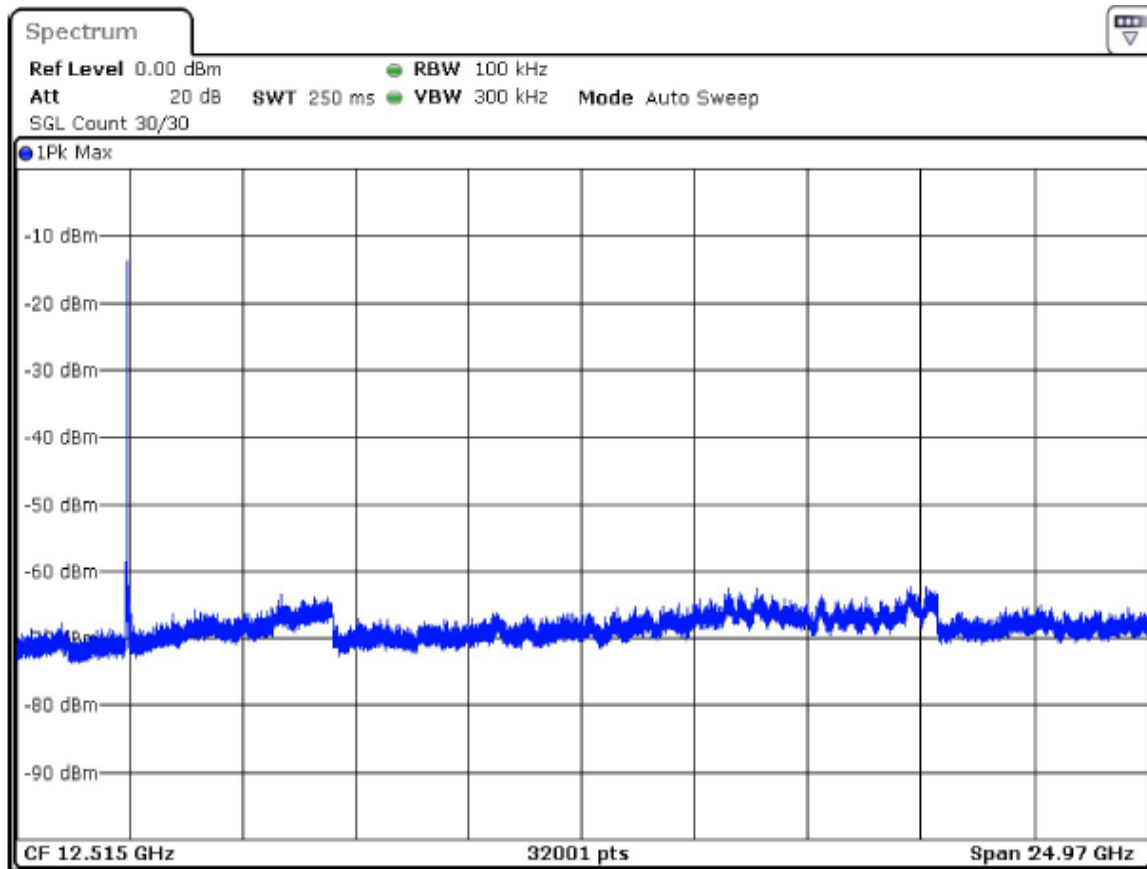




**802.11b 5.5Mbps 2462MHz****Pre Measurements**

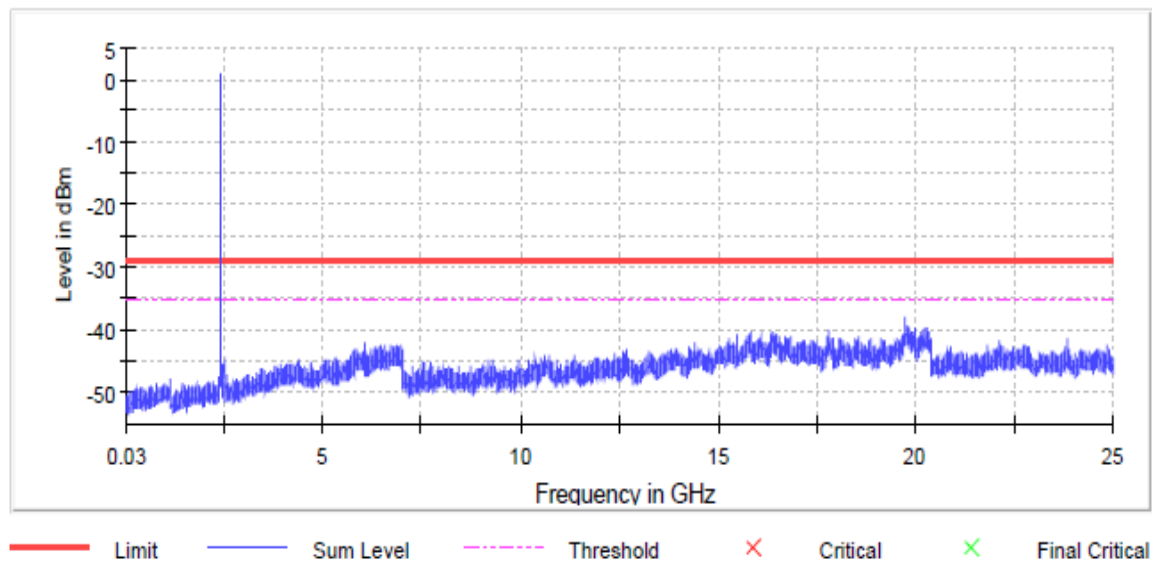
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
19774.963909	-39.0	15.9	-23.1
19768.721799	-39.1	16.1	-23.1
19771.842854	-39.2	16.1	-23.1
20118.279951	-39.2	16.1	-23.1
19775.744172	-39.2	16.2	-23.1
19774.183645	-39.3	16.3	-23.1
19718.784920	-39.4	16.4	-23.1
19771.062590	-39.6	16.5	-23.1
20140.127336	-39.7	16.6	-23.1
15779.233329	-39.8	16.7	-23.1
19764.820480	-40.0	16.9	-23.1
20307.884038	-40.0	16.9	-23.1
19753.896788	-40.0	17.0	-23.1
19935.698238	-40.0	17.0	-23.1
20200.987907	-40.0	17.0	-23.1

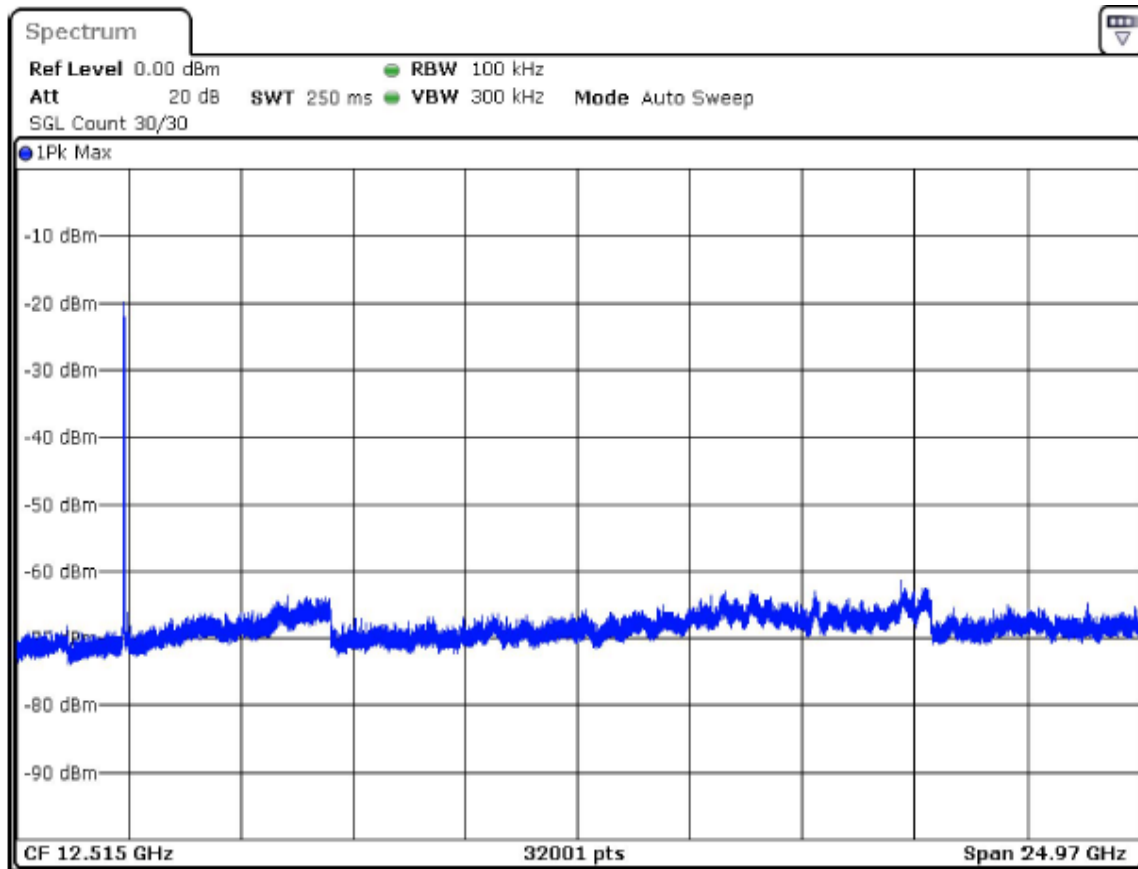




**802.11g 6 Mbps 2412MHz****Pre Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2396.930036	-37.8	8.7	-29.2
19730.488876	-38.0	8.8	-29.2
2398.490563	-38.8	9.6	-29.2
19778.084963	-39.4	10.3	-29.2
19807.734985	-39.5	10.4	-29.2
19773.403381	-39.6	10.4	-29.2
2399.270827	-39.6	10.5	-29.2
19787.448128	-39.7	10.5	-29.2
20310.224830	-39.7	10.5	-29.2
19996.558809	-39.7	10.5	-29.2
19808.515249	-39.7	10.5	-29.2
2397.710299	-39.7	10.6	-29.2
20293.059028	-39.7	10.6	-29.2
19740.632304	-39.8	10.6	-29.2
20255.606368	-39.8	10.6	-29.2

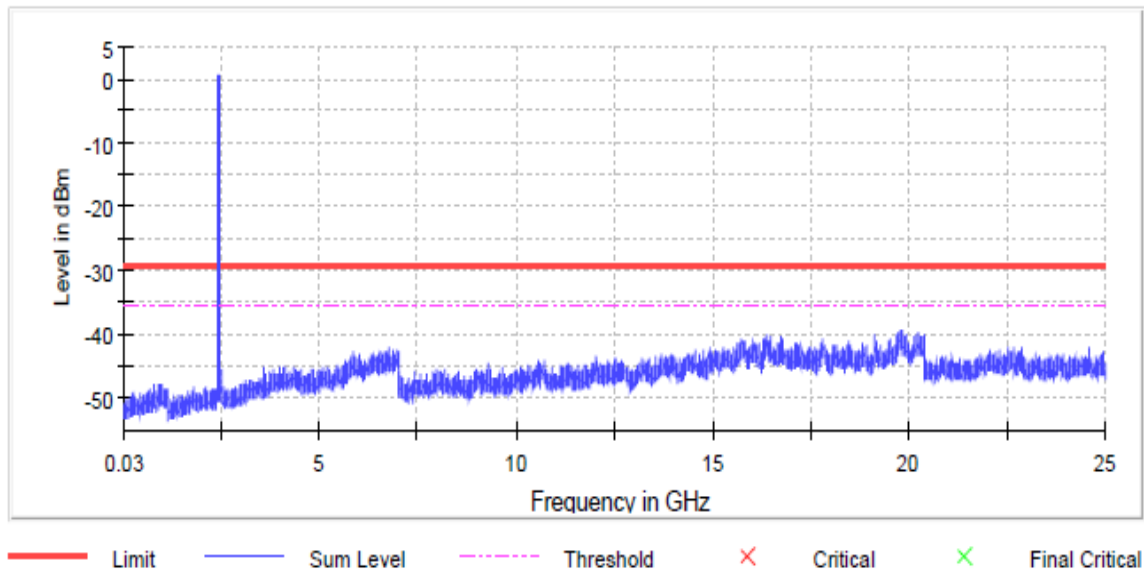


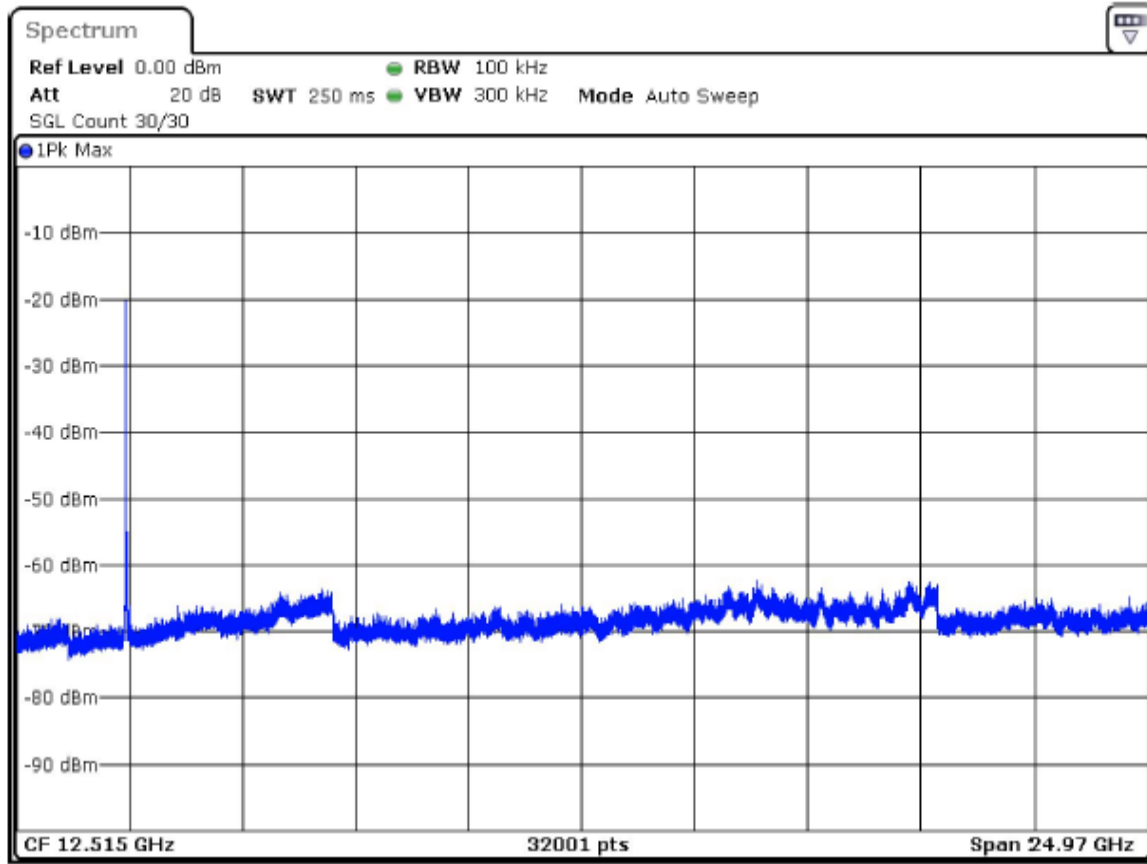




**802.11g 6 Mbps 2437MHz****Pre Measurements**

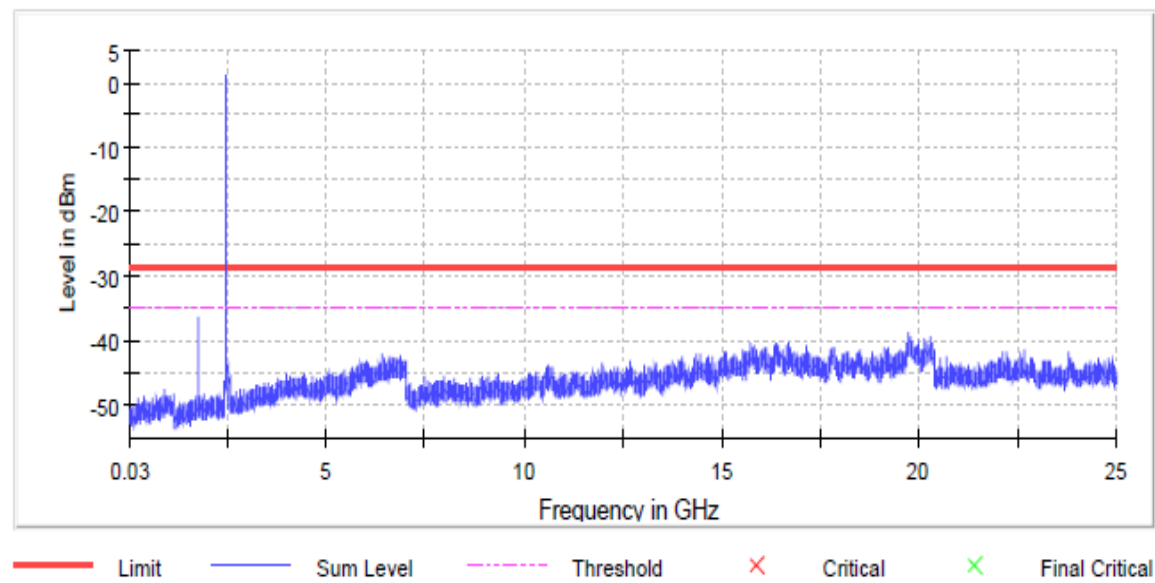
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
19763.259953	-39.2	9.7	-29.4
19808.515249	-39.5	10.0	-29.4
19747.654678	-39.5	10.1	-29.4
19760.138898	-39.6	10.1	-29.4
19765.600744	-39.7	10.2	-29.4
20239.220830	-39.8	10.4	-29.4
19714.103337	-39.8	10.4	-29.4
20371.085401	-39.9	10.4	-29.4
19729.708612	-39.9	10.4	-29.4
19768.721799	-39.9	10.4	-29.4
19767.941535	-39.9	10.5	-29.4
19781.986282	-39.9	10.5	-29.4
19764.820480	-39.9	10.5	-29.4
19734.390194	-40.0	10.5	-29.4
16397.982470	-40.0	10.5	-29.4

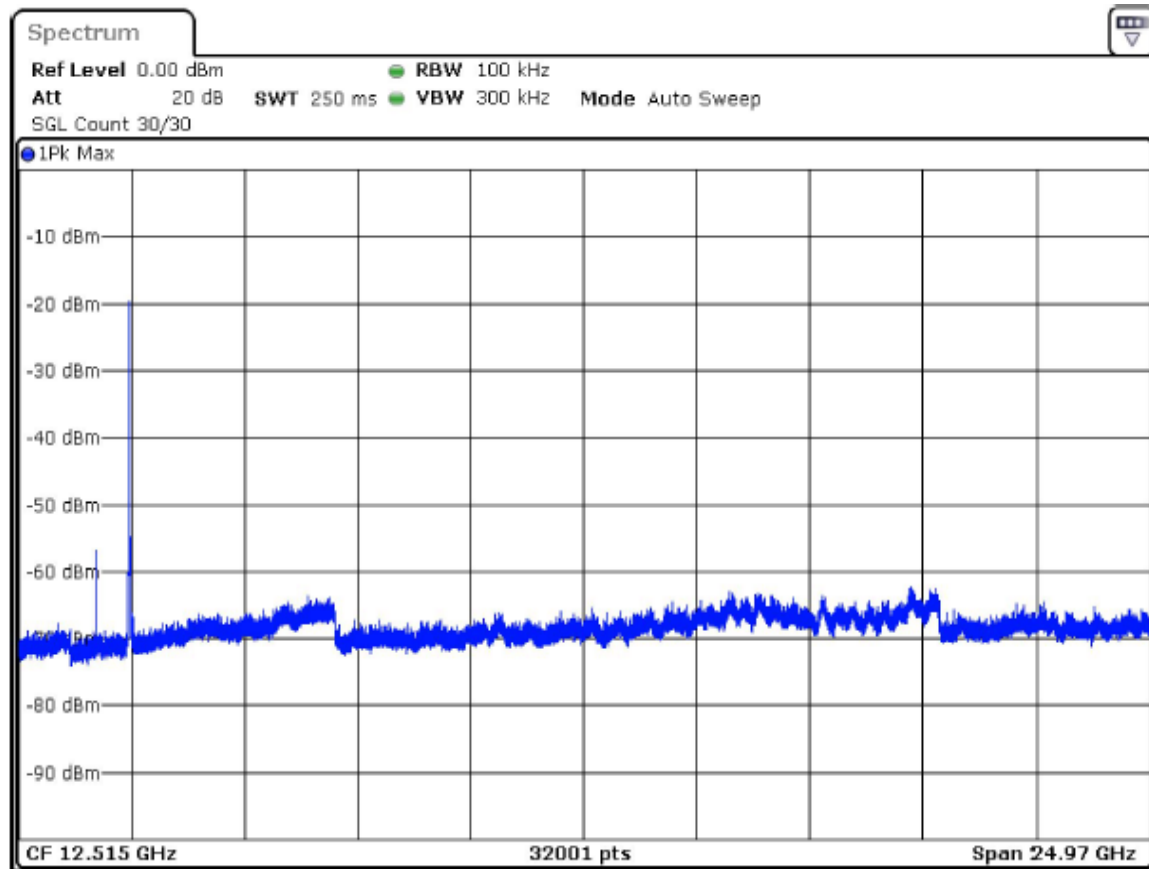




**802.11g 6 Mbps 2462MHz****Pre Measurements**

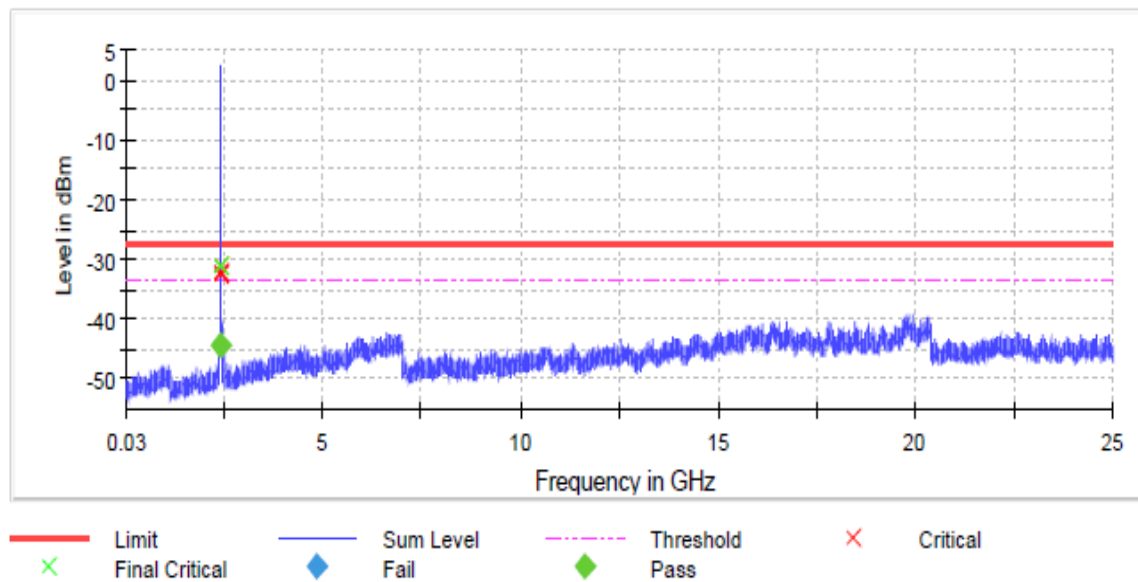
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
1731.365071	-36.2	7.4	-28.8
19742.192832	-38.8	9.9	-28.8
19725.807293	-39.0	10.1	-28.8
19721.905975	-39.0	10.2	-28.8
20302.422192	-39.4	10.5	-28.8
19772.623117	-39.5	10.6	-28.8
20151.831292	-39.7	10.8	-28.8
19762.479689	-39.7	10.8	-28.8
19800.712612	-39.7	10.8	-28.8
19747.654678	-39.7	10.9	-28.8
19775.744172	-39.9	11.0	-28.8
19754.677051	-39.9	11.0	-28.8
19753.116524	-40.0	11.2	-28.8
19757.798106	-40.0	11.2	-28.8
19811.636304	-40.0	11.2	-28.8

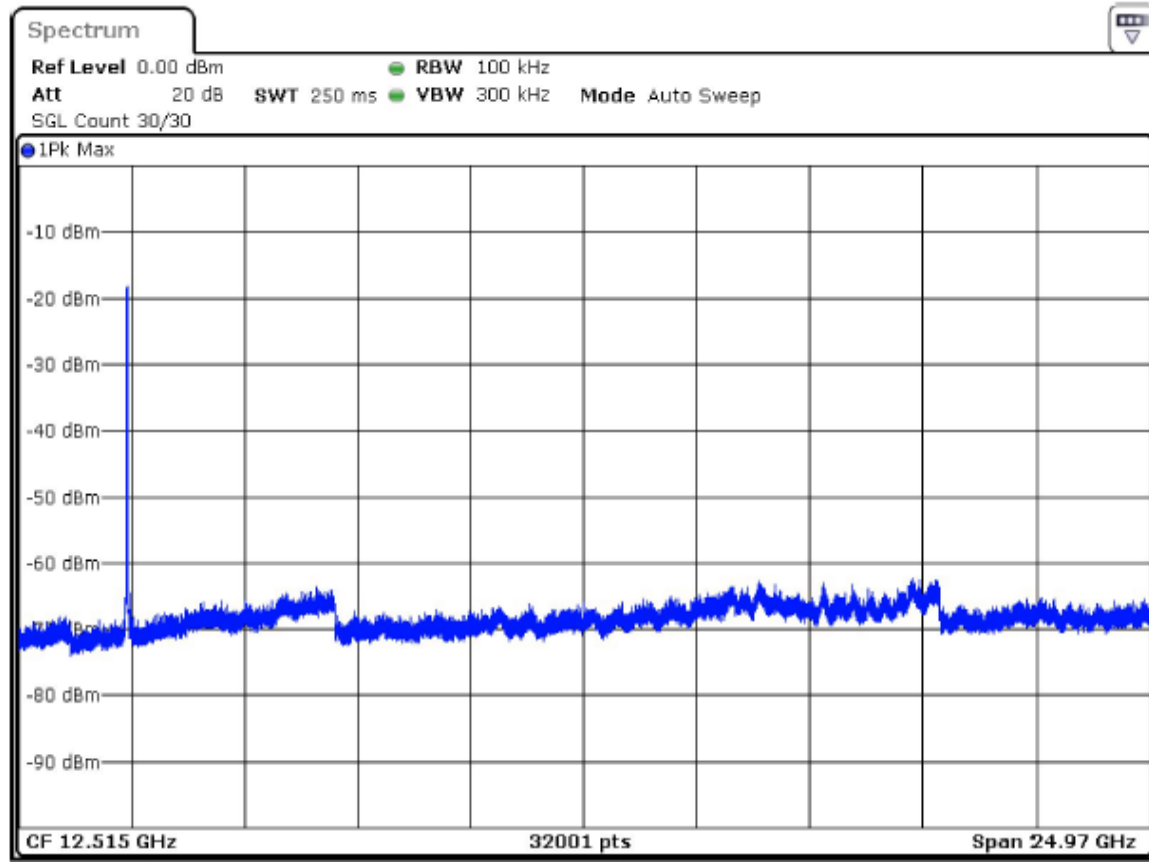




**802.11n(HT20) MCS3 2412MHz****Pre Measurements**

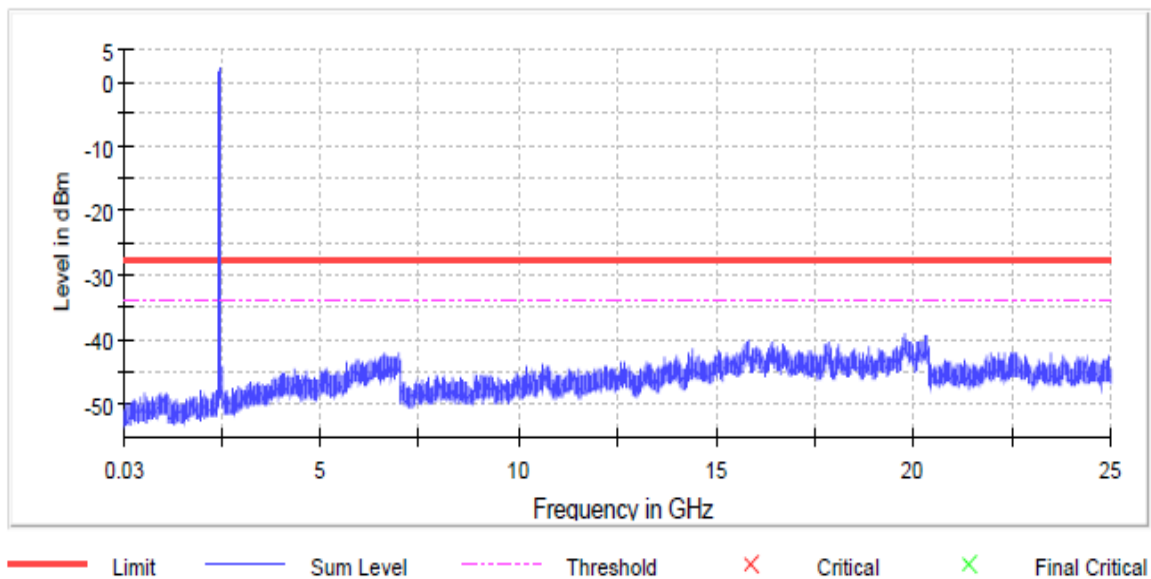
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2399.270827	-31.1	3.5	-27.6
2396.930036	-32.0	4.5	-27.6
2398.490563	-32.1	4.5	-27.6
2397.710299	-32.7	5.2	-27.6
2396.149772	-34.1	6.5	-27.6
2393.028717	-35.0	7.5	-27.6
2395.369508	-35.4	7.9	-27.6
2394.589244	-35.5	8.0	-27.6
2393.808981	-35.8	8.3	-27.6
2392.248453	-35.9	8.3	-27.6
2391.468189	-37.1	9.5	-27.6
2390.687926	-37.4	9.9	-27.6
2389.907662	-38.1	10.5	-27.6
19794.470502	-39.0	11.5	-27.6
19935.698238	-39.2	11.6	-27.6

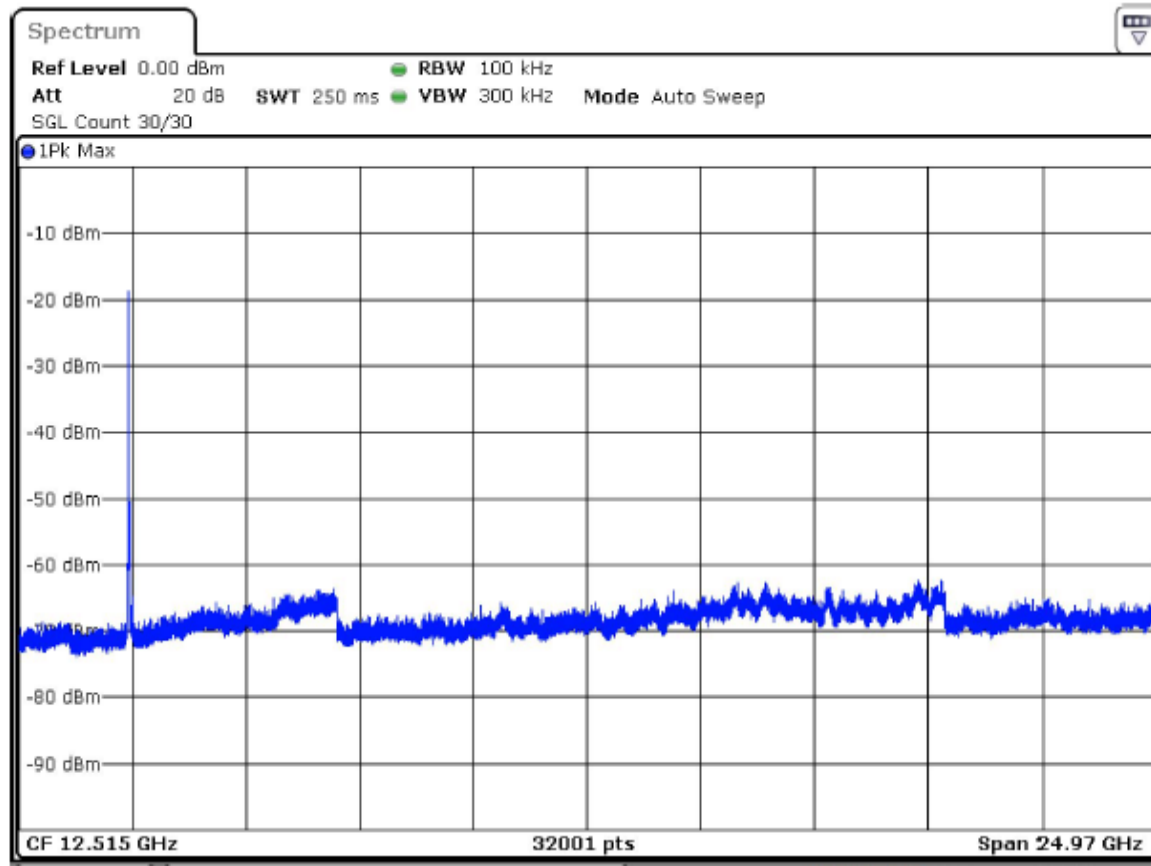




**802.11n(HT20) MCS3 2437MHz****Pre Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
19770.282326	-39.0	11.1	-27.9
20303.202456	-39.2	11.4	-27.9
20328.170896	-39.4	11.6	-27.9
19717.224392	-39.6	11.7	-27.9
19799.932348	-39.6	11.7	-27.9
19778.865227	-39.8	11.9	-27.9
19739.071777	-39.8	11.9	-27.9
19750.775733	-39.8	11.9	-27.9
19772.623117	-39.8	12.0	-27.9
19761.699425	-39.9	12.0	-27.9
19757.017843	-39.9	12.0	-27.9
19779.645491	-39.9	12.0	-27.9
19832.703425	-39.9	12.0	-27.9
19774.963909	-39.9	12.0	-27.9
19849.869227	-39.9	12.1	-27.9







**802.11n(HT20) MCS3 2462MHz****Pre Measurements**

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2483.539310	-37.3	8.9	-28.5
2486.660365	-38.4	9.9	-28.5
2484.319574	-38.9	10.4	-28.5
2487.440629	-39.0	10.5	-28.5
19800.712612	-39.1	10.6	-28.5
19845.967908	-39.2	10.7	-28.5
16393.300887	-39.3	10.8	-28.5
20224.395819	-39.4	10.9	-28.5
19842.066590	-39.4	10.9	-28.5
19762.479689	-39.5	11.0	-28.5
20171.337885	-39.5	11.0	-28.5
19738.291513	-39.6	11.1	-28.5
2485.099838	-39.7	11.3	-28.5
2485.880101	-39.8	11.3	-28.5
19788.228392	-39.8	11.3	-28.5

