WLAN TEST REPORT

Report Number:	**103264009LEX-001**
Project Number:	**G103264009**
Report Issue Date:	**1/9/2018**
Product Name:	**Wireless Print Server**
FCC Standards:	**FCC Title 47 CFR Part 15.247**
Industry Canada Standards:	**RSS-247 Issue 2 & RSS-GEN Issue 4**

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Drive
Lexington, KY 40510

Client:
Lexmark International, Inc.
740 W New Circle Road, F61/004-2
Lexington, KY 40511

Report prepared by
Bryan Taylor, Team Leader

Report reviewed by
Brian Lackey, Project Engineer

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1 Introduction and Conclusion

The tests indicated in section 2 were performed on the product constructed as described in section 3. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test method, a list of the actual test equipment used, documentation photos, results and raw data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complied with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

The INTERTEK-Lexington is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1 and ANSI C63.4. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters. The test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number IC 2042M-1.

2 Test Summary

Page	Test full name	FCC Reference	IC Reference	Result
6	Peak Conducted Power	§ 15.247(b)(3)(4)	RSS-247 (5.4)	Pass
9	Occupied Bandwidth	§ 15.247(a)(2)	RSS-247 (5.2)	Pass
24	Conducted Spurious Emissions	§ 15.247(d)	RSS-247 (5.5)	Pass
41	Power Spectral Density	§ 15.247(e)	RSS-247 (5.2)	Pass
55	Radiated Spurious Emissions (Transmitter)	§ 15.247(d), § 15.209, and § 15.205	RSS-247 (5.5)	Pass
81	Radiated Spurious Emissions (Receiver)	§ 15.109	RSS-Gen (7.1.2)	Pass
85	AC Powerline Conducted Emissions	§ 15.107, § 15.207	RSS-Gen (8.8)	Pass
91	Antenna Requirement per FCC Part 15.203	§ 15.203	RSS-Gen (8.3)	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	Lexmark International, Inc.
Model Number	LEX-M07-001
Serial Number	Test Sample 3
Receive Date	10/9/2017
Test Start Date	10/9/2017
Test End Date	11/29/2017
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	2412MHz – 2462MHz
Mode(s) of Operation	802.11b,g,n
Modulation Type	BPSK, QPSK, CCK, OFDM
Duty Cycle	100%
Transmission Control	Test Commands
Maximum Output Power	27.4dBm (total peak conducted output power)
Maximum Antenna Gain	Chain A:2.8dBi Chain B: 2.0dBi
Test Channels	802.11 b, g, n(HT20): Channels 1, 6, 11 802.11n(HT40): Channels 3, 6, 9
Antenna Type (15.203)	PCB Antenna
Operating Voltage	5V via USB

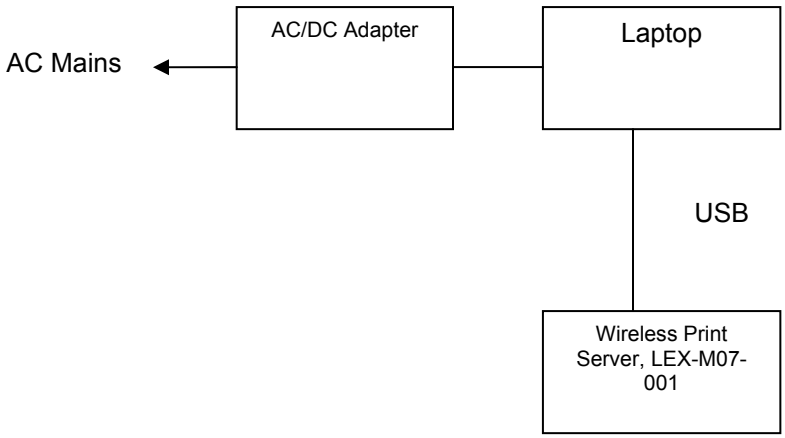
Description of Equipment Under Test
The LEX-M07-001 is a 2.4GHz/5GHz dual band Wi-Fi module supporting 802.11b/g/a/n/ac standards. WiFi function supports 2x2 MU-MIMO. Module hardware also supports Bluetooth 4.2/Bluetooth Low Energy.

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmitting 802.11 b, g or n on low, mid or high channels
2	Receive mode / idle mode

4 System setup including cable interconnection details, support equipment and simplified block diagram

4.1 EUT Block Diagram:



4.2 Cables:

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	USB Cable	2m	Yes	None	Laptop Computer

4.3 Support Equipment:

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	HP	ProBook 455 G4	5CD7212NG5

5 Peak Conducted Power

5.1 Test Limits:

§ 15.247(b)(3): For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

§ 15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RSS-247 5.4(d): For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

5.2 Test Procedure:

ANSI C63.10:2013 § 11.9.1.3 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247). The peak output power was measured using a wideband power sensor.

5.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Wideband Power Sensor	100155	Rohde&Schwarz	NRP-Z81	9/20/2017	9/20/2018

5.4 Test Results:

The device was found to be **compliant**. The peak output power from each transmit chain was less than the limit. The combined peak output power summed across both transmit chains was also below the limit. For RSS-247, the peak calculated EIRP was below the 4W (36dBm) limit.

5.5 Test Conditions:

Test Personnel:	Brian Lackey	Test Date:	10/26/2017
Supervising/Reviewing Engineer: (Where Applicable)	NA	Ambient Temperature:	20.7C
Input Voltage:	DC Powered via USB	Relative Humidity:	29.1%
		Atmospheric Pressure:	988.8mbar

5.6 Test Data:

Chain A+B Peak Conducted Output Power								
	Channel	Frequency (MHz)	Chain A (dBm)	Chain B (dBm)	Total Conducted Power (dBm)	15.247 / RSS-247 Conducted Limit (dBm)	Margin (dBm)	Result
802.11b	1	2412	17.3	18.04	20.70	30.00	9.30	Pass
	6	2437	17.24	18.01	20.65	30.00	9.35	Pass
	11	2462	17.17	17.96	20.59	30.00	9.41	Pass
802.11g	1	2412	24.31	24.47	27.40	30.00	2.60	Pass
	6	2437	24.22	24.45	27.35	30.00	2.65	Pass
	11	2462	24.17	24.41	27.30	30.00	2.70	Pass
802.11n (HT20)	1	2412	24.32	24.46	27.40	30.00	2.60	Pass
	6	2437	24.21	24.43	27.33	30.00	2.67	Pass
	11	2462	24.14	24.39	27.28	30.00	2.72	Pass
802.11n (HT40)	3	2422	24.08	24.42	27.26	30.00	2.74	Pass
	6	2437	24.06	24.4	27.24	30.00	2.76	Pass
	9	2442	23.99	24.37	27.19	30.00	2.81	Pass

Chain A+B EIRP									
	Channel	Frequency (MHz)	Total Conducted Power	Ant 1 Gain (dBi)	Ant 2 Gain (dBi)	Total EIRP (dBm)	RSS-247 EIRP Limit (dBm)	Margin (dBm)	Result
802.11b	1	2412	20.70	2.8	2.1	20.77	36.00	15.23	Pass
	6	2437	20.65	2.8	2.1	20.72	36.00	15.28	Pass
	11	2462	20.59	2.8	2.1	20.66	36.00	15.34	Pass
802.11g	1	2412	27.40	2.8	2.1	27.42	36.00	8.58	Pass
	6	2437	27.35	2.8	2.1	27.36	36.00	8.64	Pass
	11	2462	27.30	2.8	2.1	27.32	36.00	8.68	Pass
802.11n (HT20)	1	2412	27.40	2.8	2.1	27.42	36.00	8.58	Pass
	6	2437	27.33	2.8	2.1	27.35	36.00	8.65	Pass
	11	2462	27.28	2.8	2.1	27.29	36.00	8.71	Pass
802.11n (HT40)	3	2422	27.26	2.8	2.1	27.28	36.00	8.72	Pass
	6	2437	27.24	2.8	2.1	27.26	36.00	8.74	Pass
	9	2442	27.19	2.8	2.1	27.21	36.00	8.79	Pass

6 Occupied Bandwidth

6.1 Test Limits:

§ 15.247(a)(2): For digital modulation systems, the minimum 6dB bandwidth shall be at least 500kHz.

RSS-247(5.2)(a): The minimum 6dB bandwidth shall be 500kHz.

6.2 Test Procedure:

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

6.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/20/2017	9/20/2018

6.4 Test Results:

The device was found to be **compliant**. All occupied bandwidth measurements were greater than 500kHz.

6.5 Test Conditions

Test Personnel:	Brian Lackey	Test Date:	10/27/2017 – 10/30/2017
Supervising/Reviewing Engineer: (Where Applicable)	NA	Ambient Temperature:	22.1C
Input Voltage:	5VDC via USB	Relative Humidity:	35.2%
		Atmospheric Pressure:	992.0mbar

6.6 Test Data:

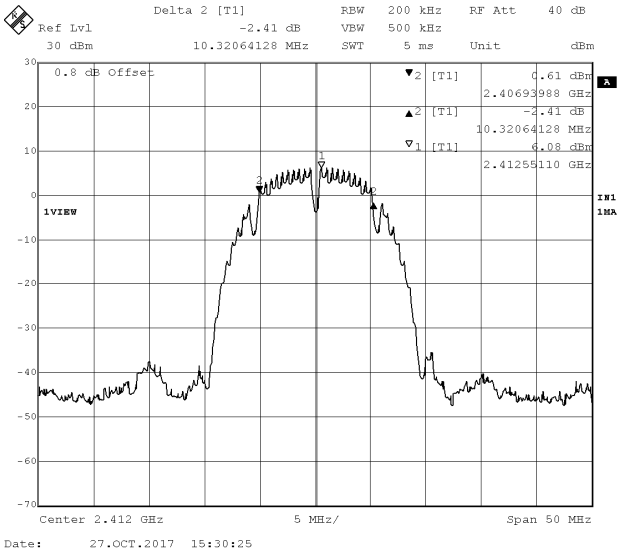
Mode	Channel Number	Frequency (MHz)	6dB Bandwidth (MHz)	99% Power Bandwidth (MHz)	Result
802.11b	1	2412	10.321MHz	13.527MHz	Pass
802.11b	6	2437	10.321MHz	13.426MHz	Pass
802.11b	11	2462	10.421MHz	13.527MHz	Pass
802.11g	1	2412	16.733MHz	17.435MHz	Pass
802.11g	6	2437	16.733MHz	17.435MHz	Pass
802.11g	11	2462	16.633MHz	17.335MHz	Pass
802.11n (20MHz)	1	2412	17.836MHz	18.036MHz	Pass
802.11n (20MHz)	6	2437	17.836MHz	18.036MHz	Pass
802.11n (20MHz)	11	2462	17.836MHz	18.036MHz	Pass
802.11n (40MHz)	3	2427	36.473MHz	36.473MHz	Pass
802.11n (40MHz)	6	2442	36.473MHz	36.473MHz	Pass
802.11n (40MHz)	9	2462	36.673MHz	36.473MHz	Pass

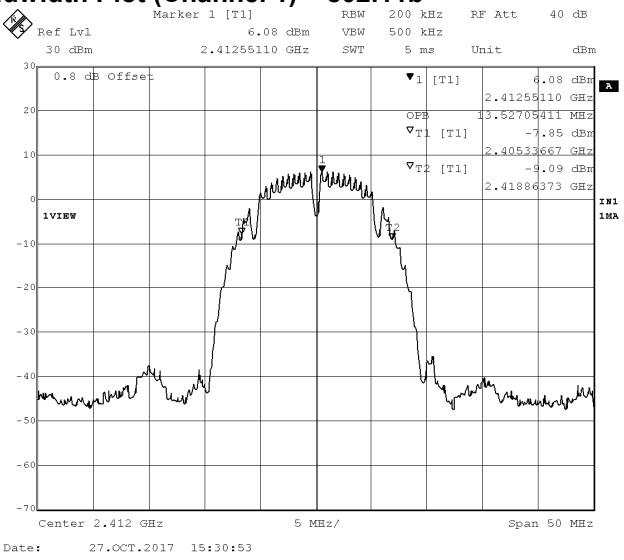
Chain A

Mode	Channel Number	Frequency (MHz)	6dB Bandwidth (MHz)	99% Power Bandwidth (MHz)	Result
802.11b	1	2412	10.421MHz	13.427MHz	Pass
802.11b	6	2437	10.421MHz	13.527MHz	Pass
802.11b	11	2462	10.421MHz	13.627MHz	Pass
802.11g	1	2412	16.733MHz	17.435MHz	Pass
802.11g	6	2437	16.633MHz	17.435MHz	Pass
802.11g	11	2462	16.733MHz	17.434MHz	Pass
802.11n (20MHz)	1	2412	17.836MHz	18.036MHz	Pass
802.11n (20MHz)	6	2437	17.836MHz	18.036MHz	Pass
802.11n (20MHz)	11	2462	17.836MHz	18.036MHz	Pass
802.11n (40MHz)	3	2422	36.473MHz	36.473MHz	Pass
802.11n (40MHz)	6	2442	36.473MHz	36.473MHz	Pass
802.11n (40MHz)	9	2462	36.874MHz	36.473MHz	Pass

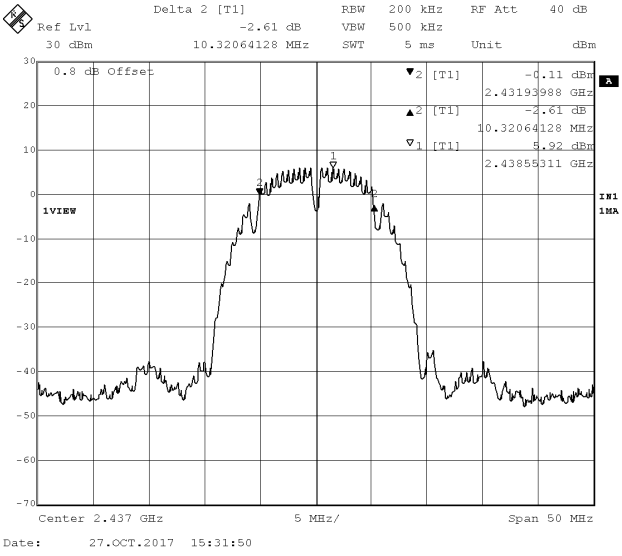
Chain B

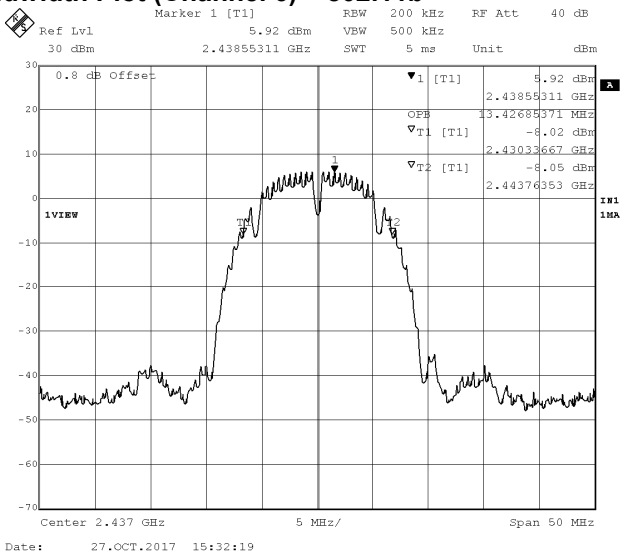
Chain A 6dB and 99% Power Bandwidth Plot (Channel 1) – 802.11b



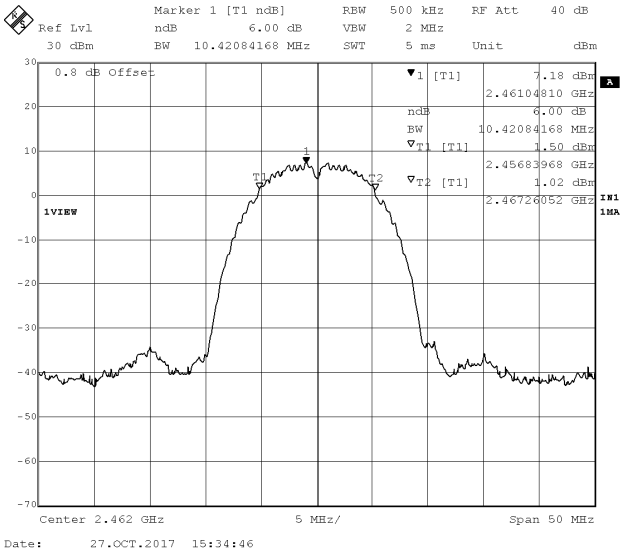


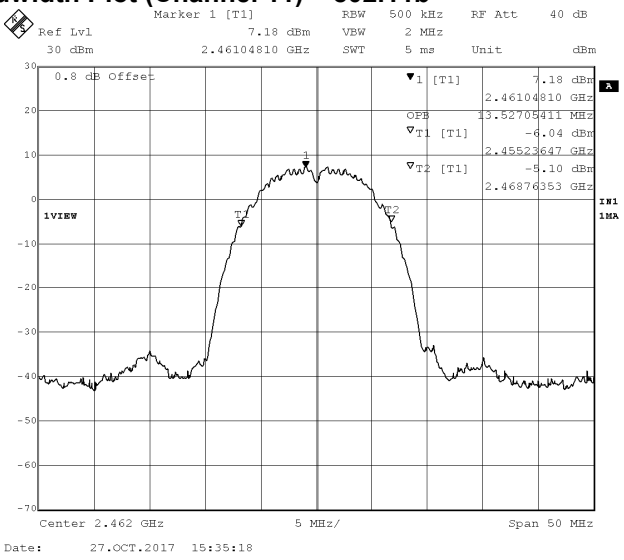
Chain A 6dB and 99% Power Bandwidth Plot (Channel 6) – 802.11b



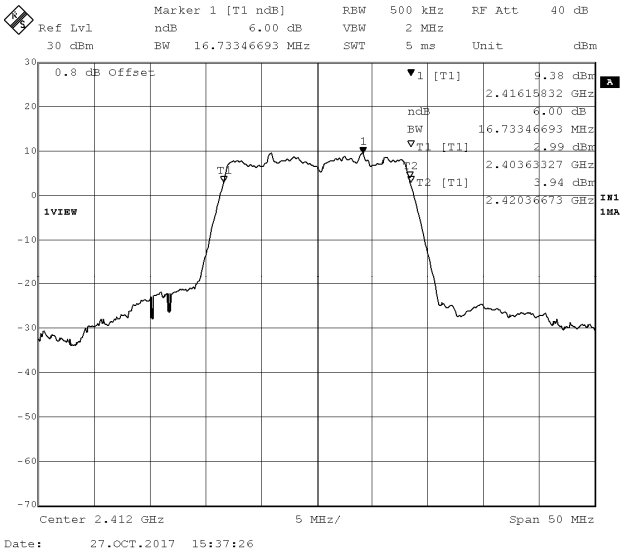


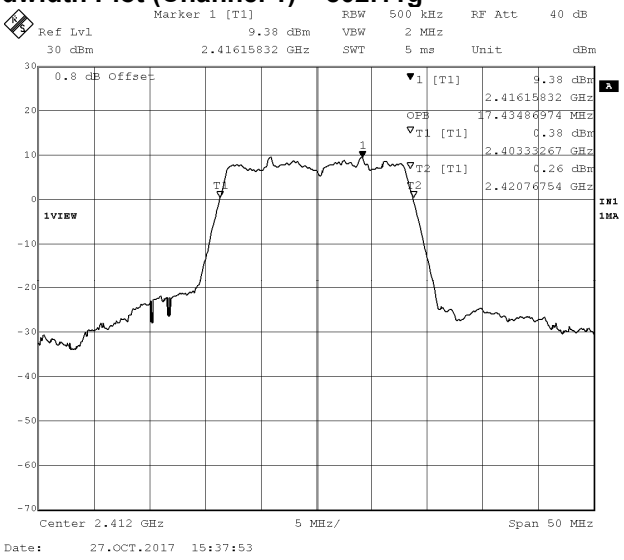
Chain A 6dB and 99% Power Bandwidth Plot (Channel 11) – 802.11b



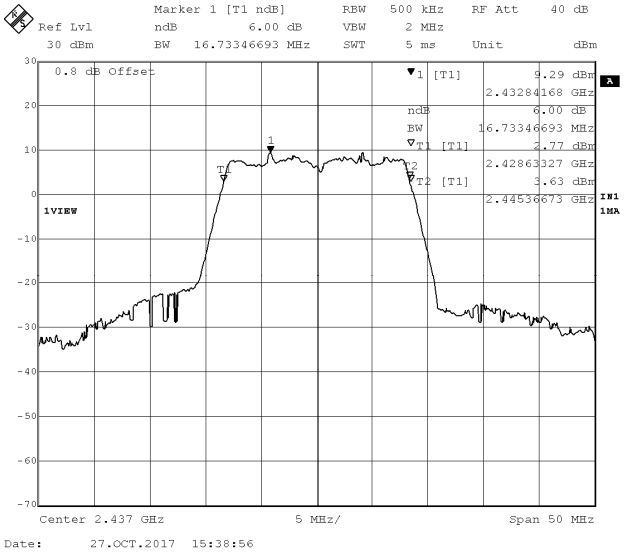


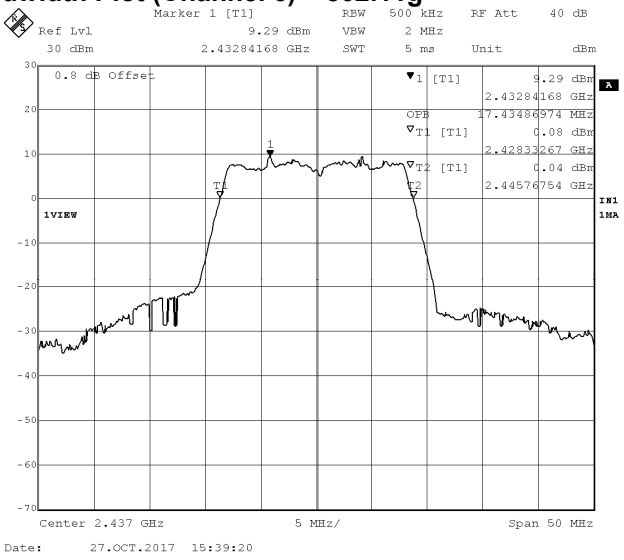
Chain A 6dB and 99% Power Bandwidth Plot (Channel 1) – 802.11g



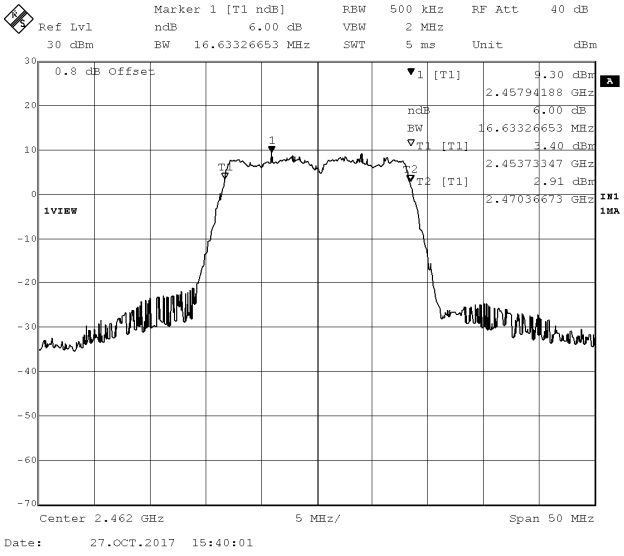


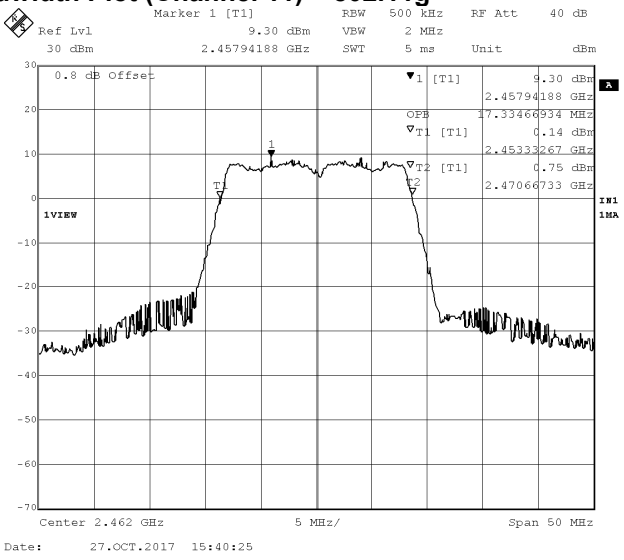
Chain A 6dB and 99% Power Bandwidth Plot (Channel 6) – 802.11g



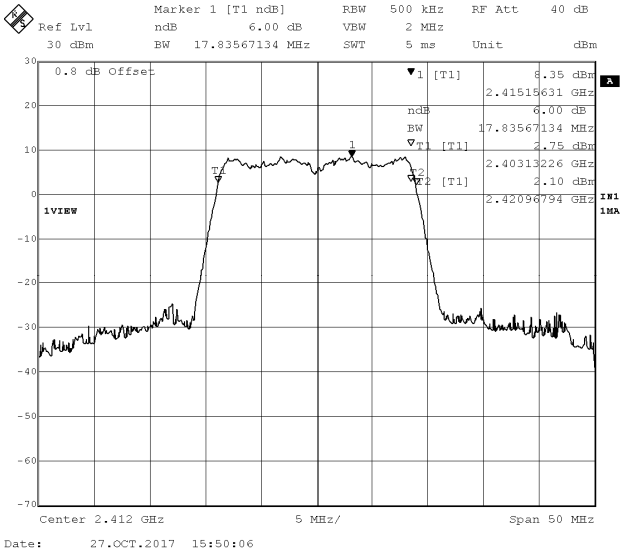


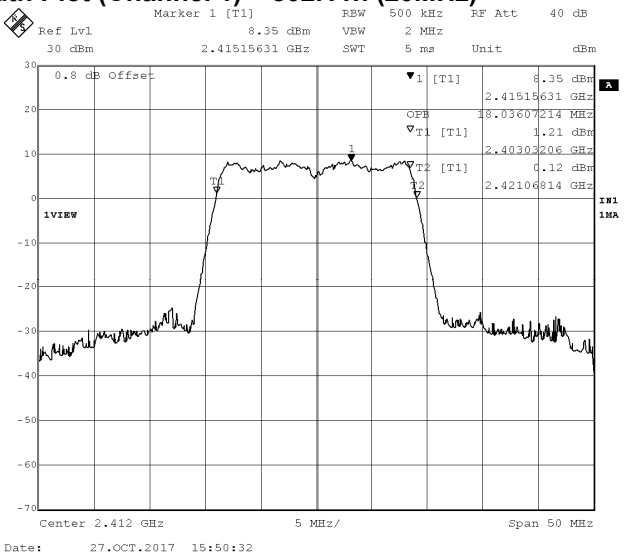
Chain A 6dB and 99% Power Bandwidth Plot (Channel 11) – 802.11g



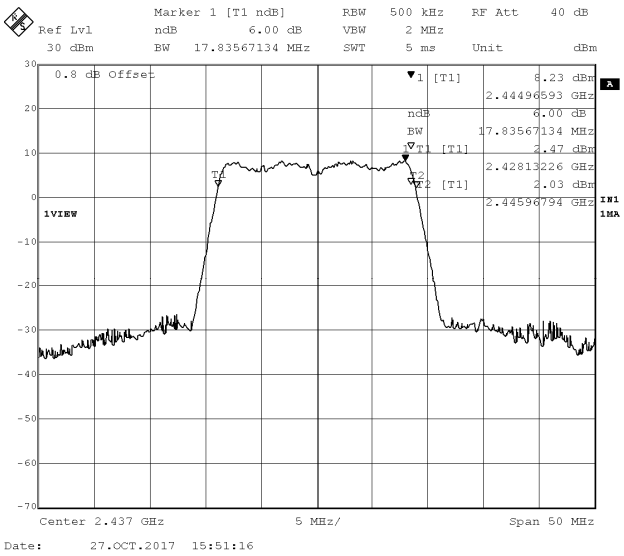


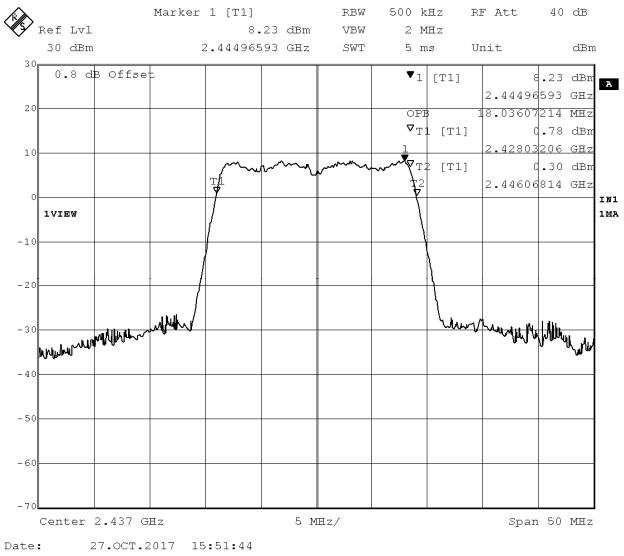
Chain A 6dB and 99% Power Bandwidth Plot (Channel 1) – 802.11n (20MHz)



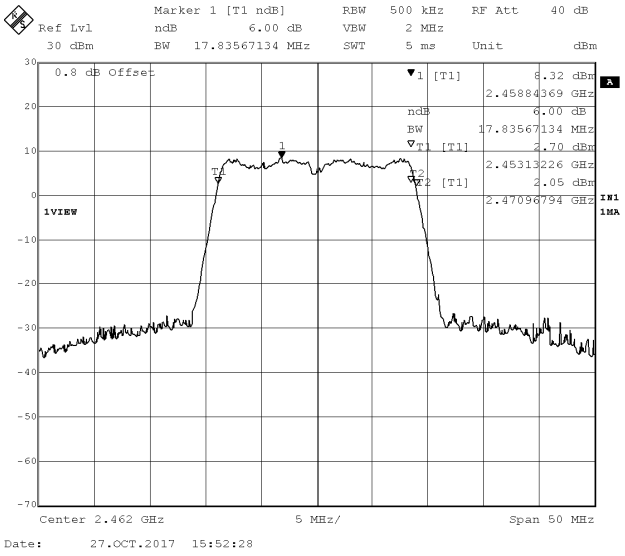


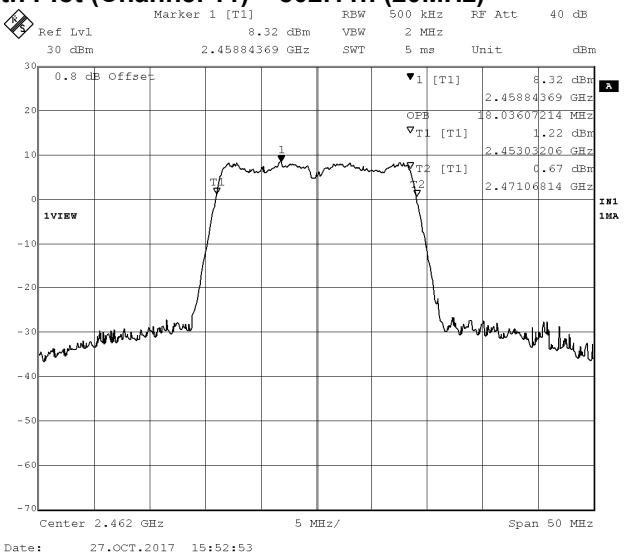
Chain A 6dB and 99% Power Bandwidth Plot (Channel 6) – 802.11n (20MHz)



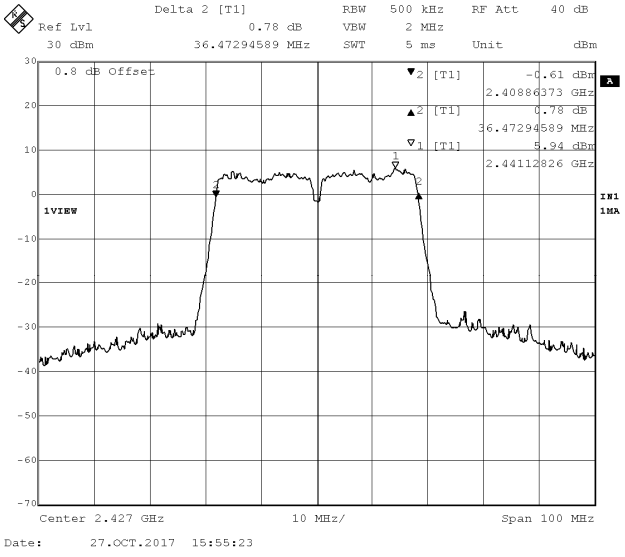


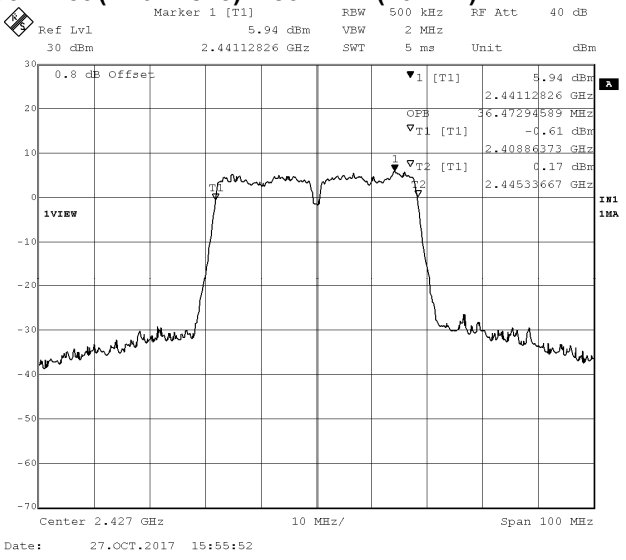
Chain A 6dB and 99% Power Bandwidth Plot (Channel 11) – 802.11n (20MHz)



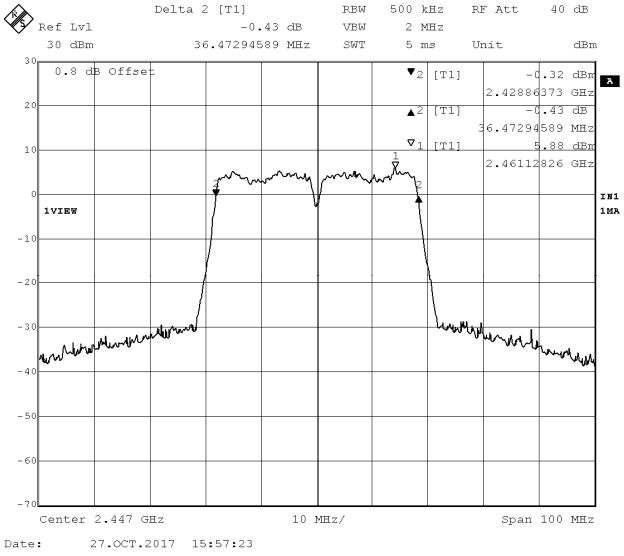


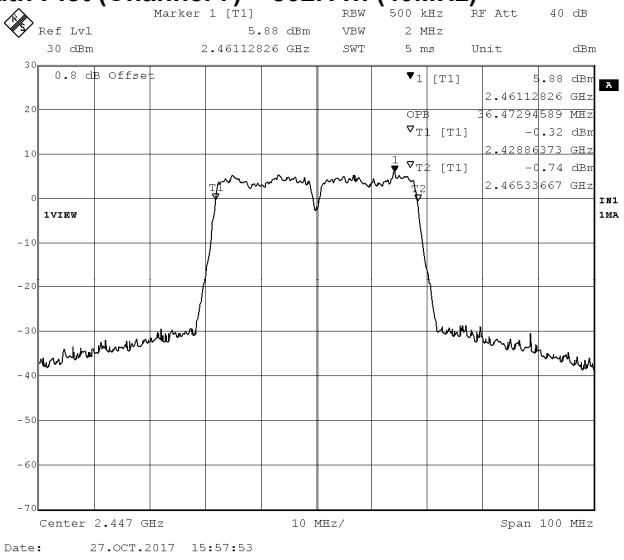
Chain A 6dB and 99% Power Bandwidth Plot (Channel 3) – 802.11n (40MHz)



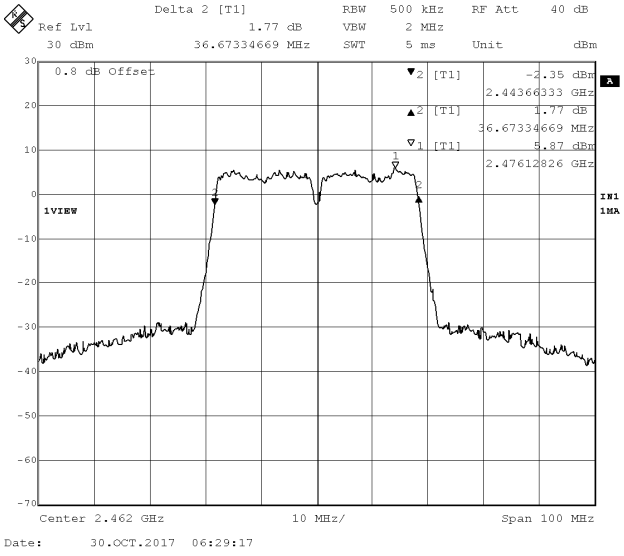


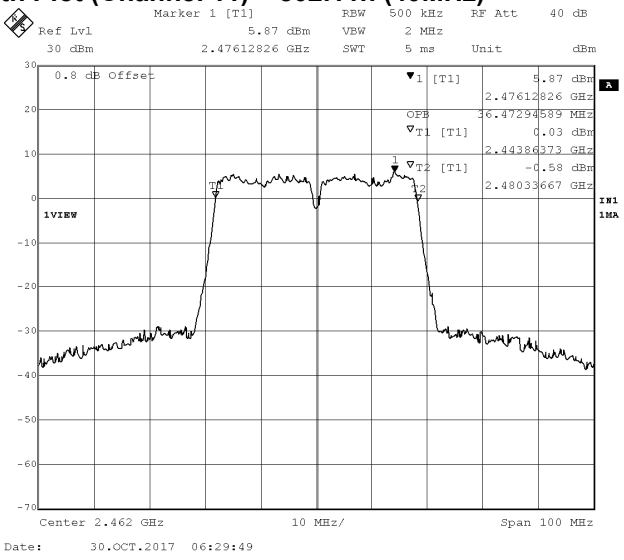
Chain A 6dB and 99% Power Bandwidth Plot (Channel 7) – 802.11n (40MHz)



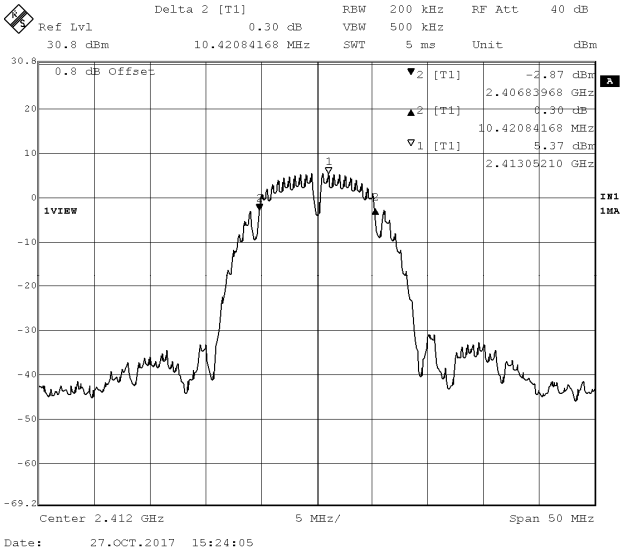


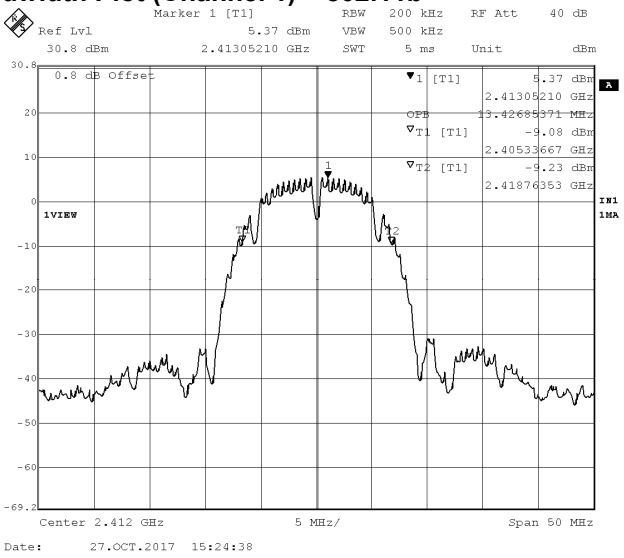
Chain A 6dB and 99% Power Bandwidth Plot (Channel 11) – 802.11n (40MHz)



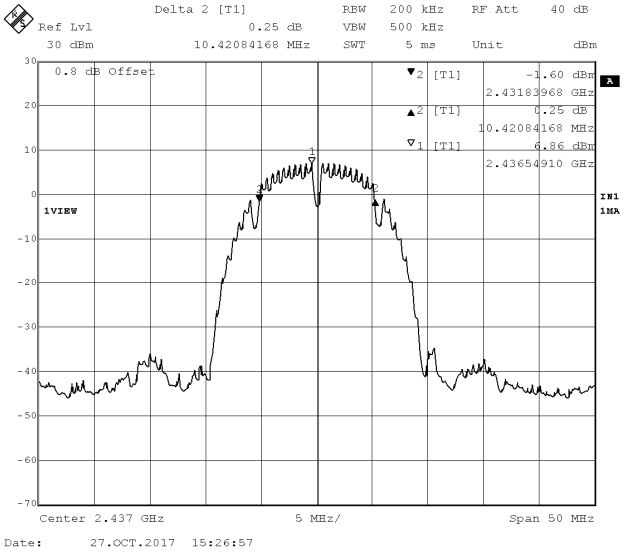


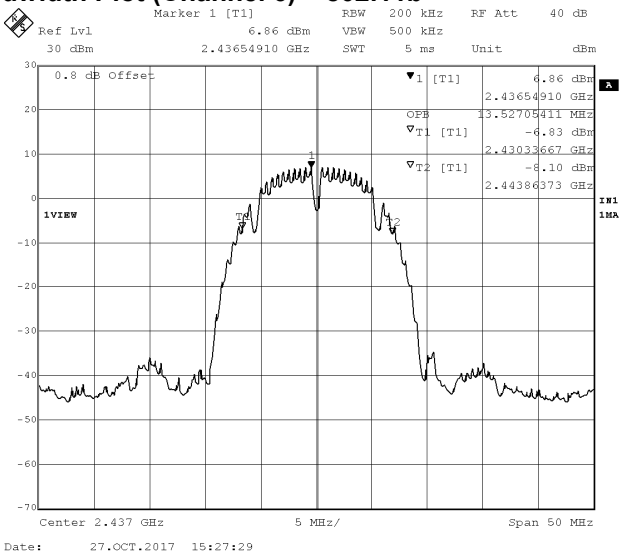
Chain B 6dB and 99% Power Bandwidth Plot (Channel 1) – 802.11b



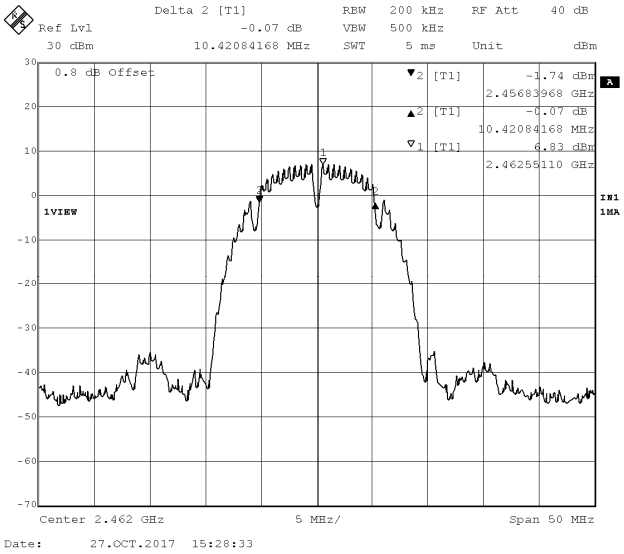


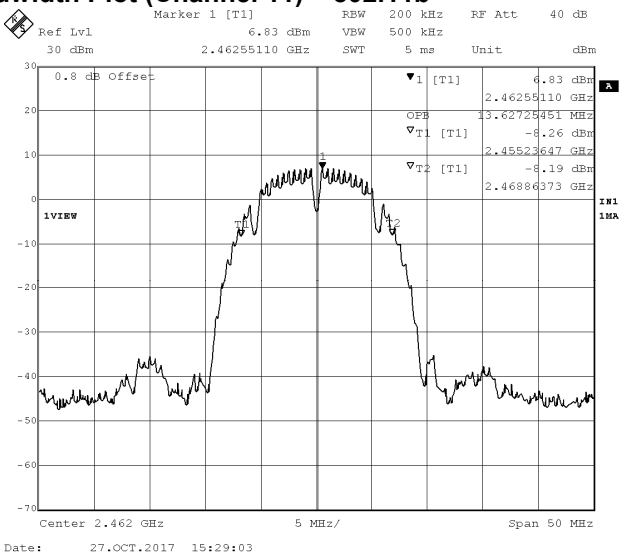
Chain B 6dB and 99% Power Bandwidth Plot (Channel 6) – 802.11b



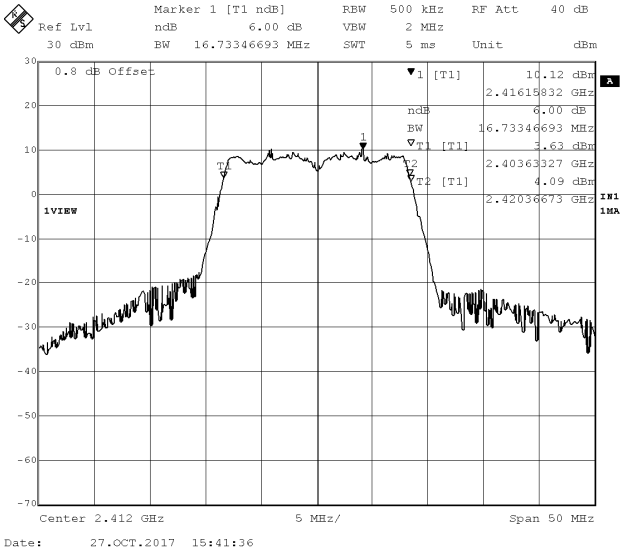


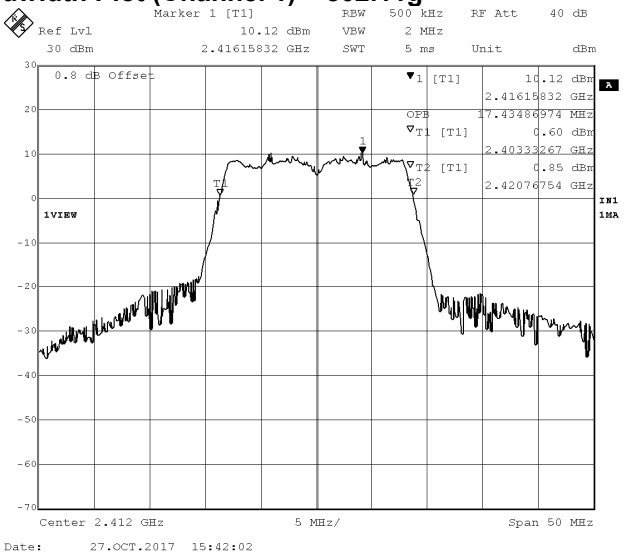
Chain B 6dB and 99% Power Bandwidth Plot (Channel 11) – 802.11b



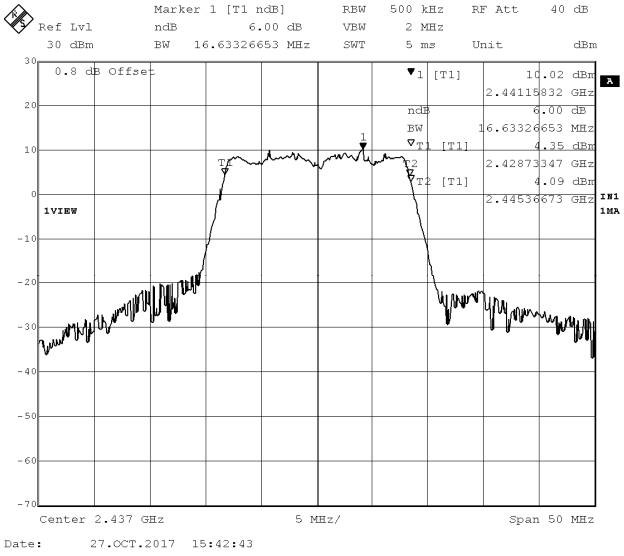


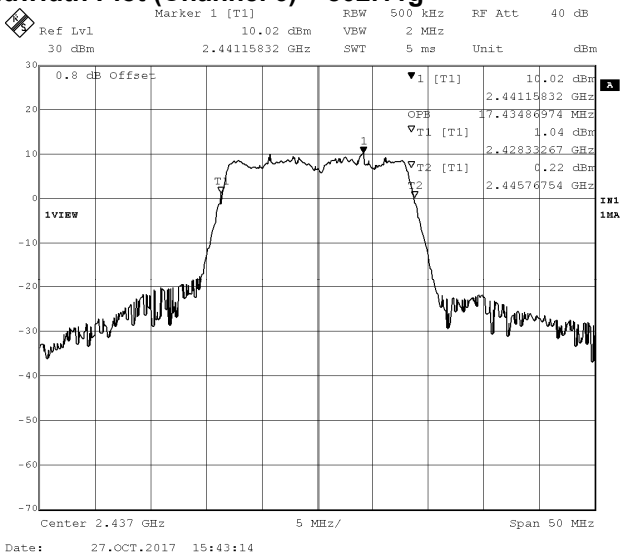
Chain B 6dB and 99% Power Bandwidth Plot (Channel 1) – 802.11g



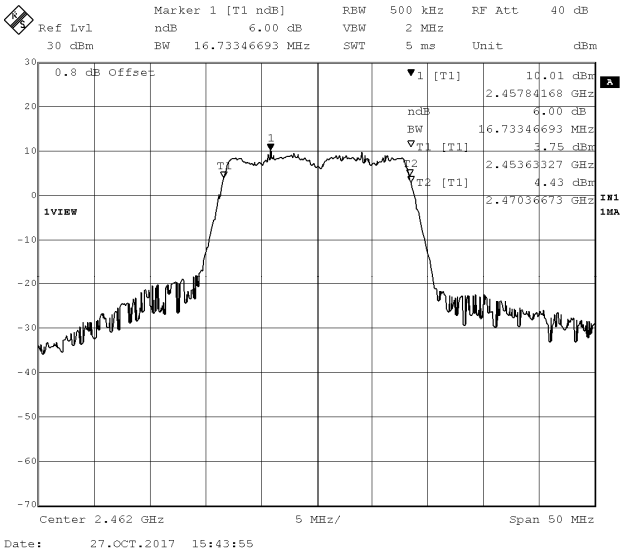


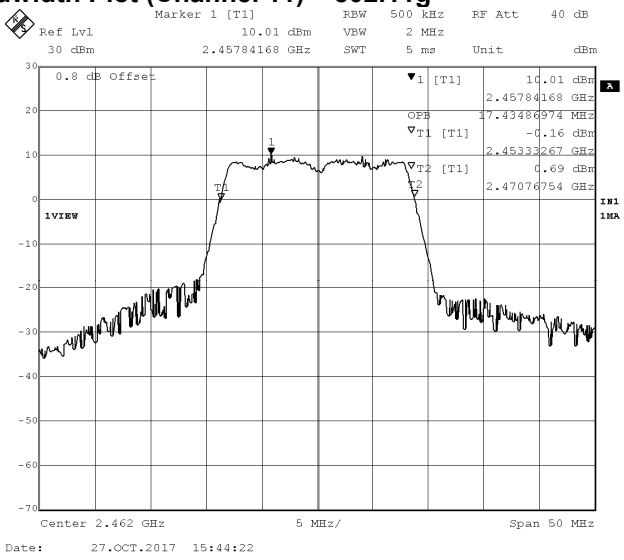
Chain B 6dB and 99% Power Bandwidth Plot (Channel 6) – 802.11g



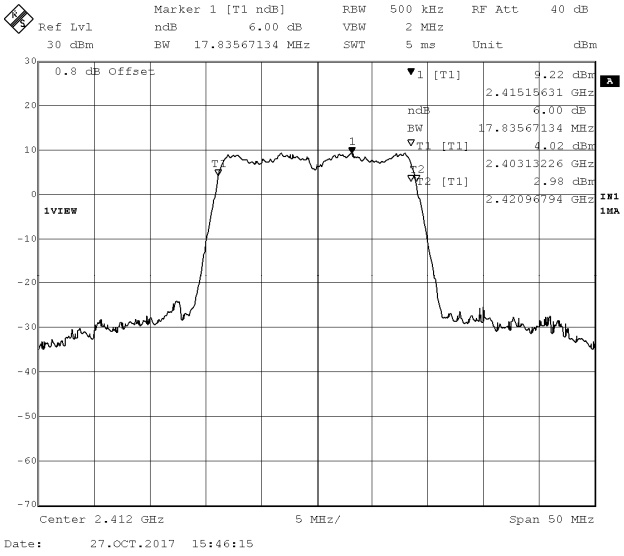


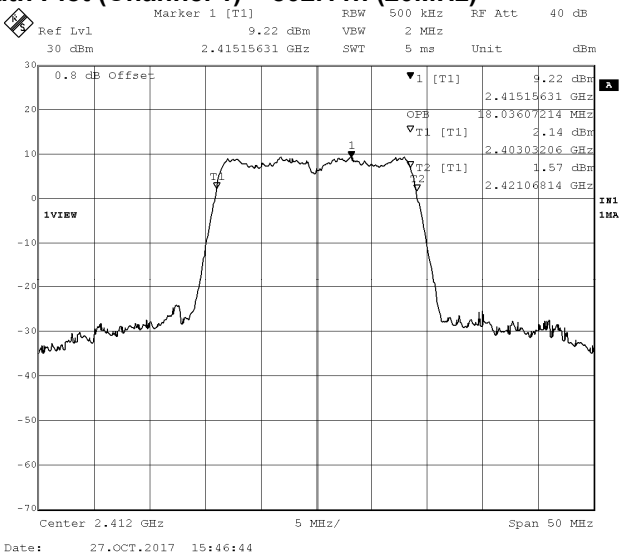
Chain B 6dB and 99% Power Bandwidth Plot (Channel 11) – 802.11g



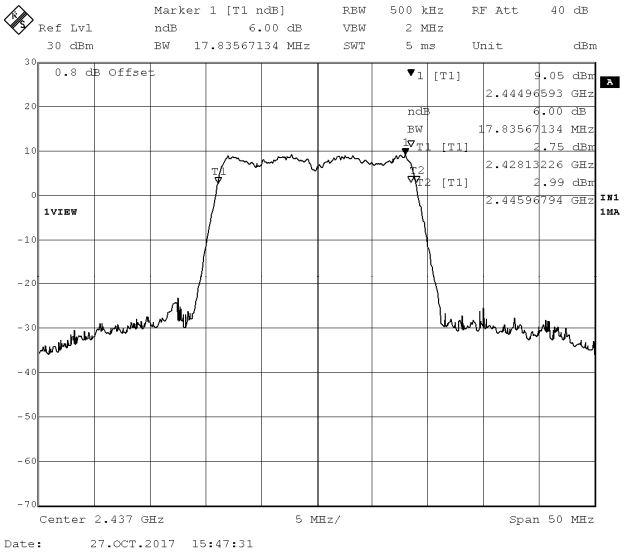


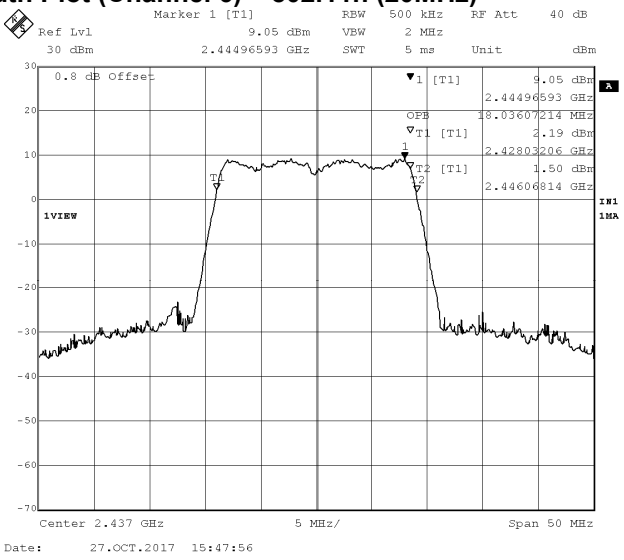
Chain B 6dB and 99% Power Bandwidth Plot (Channel 1) – 802.11n (20MHz)



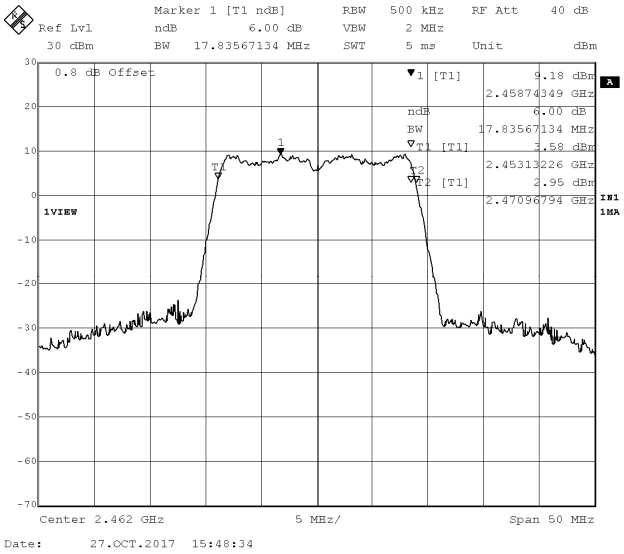


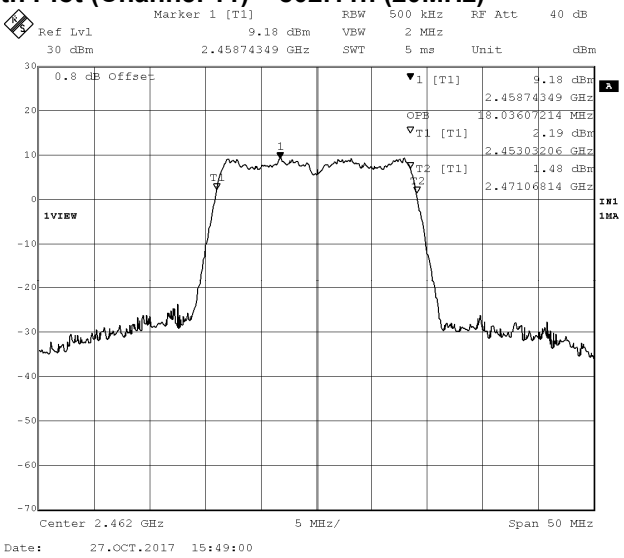
Chain B 6dB and 99% Power Bandwidth Plot (Channel 6) – 802.11n (20MHz)



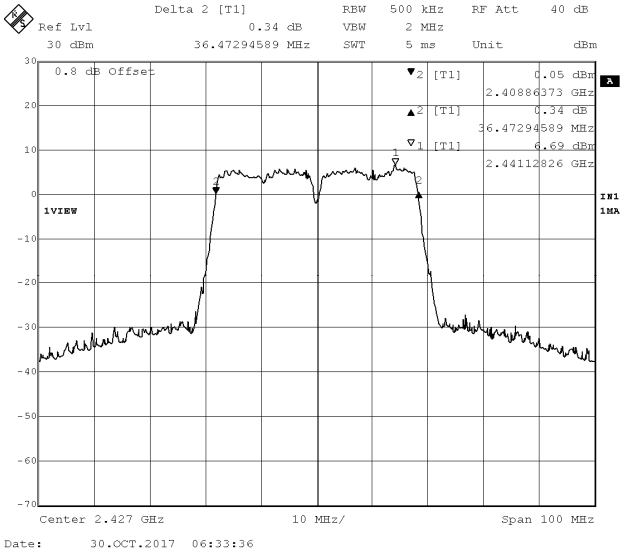


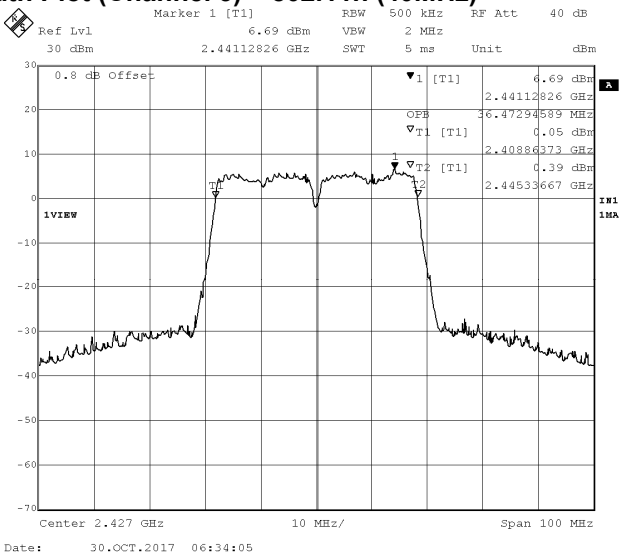
Chain B 6dB and 99% Power Bandwidth Plot (Channel 11) – 802.11n (20MHz)



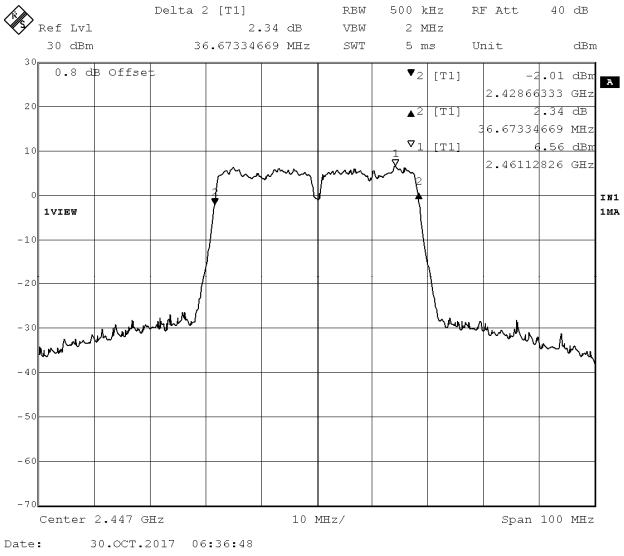


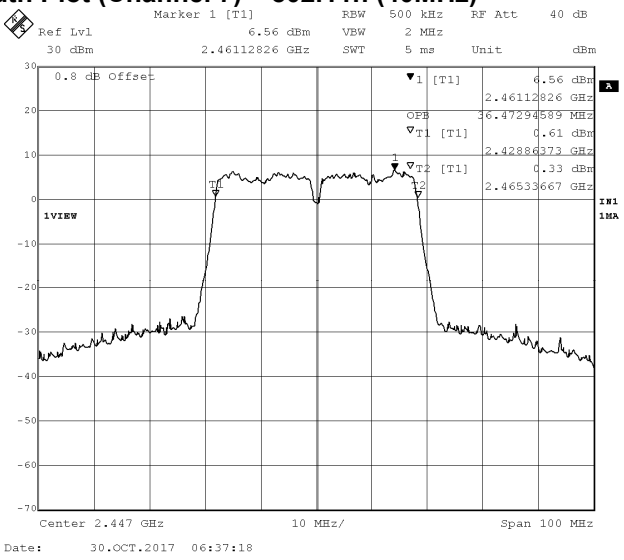
Chain B 6dB and 99% Power Bandwidth Plot (Channel 3) – 802.11n (40MHz)



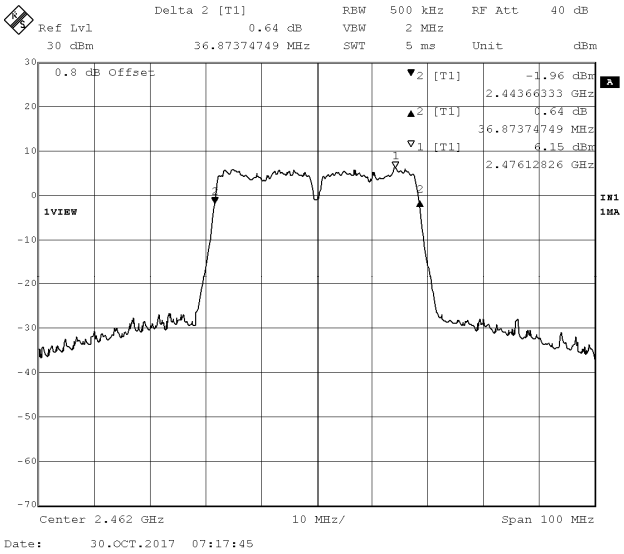


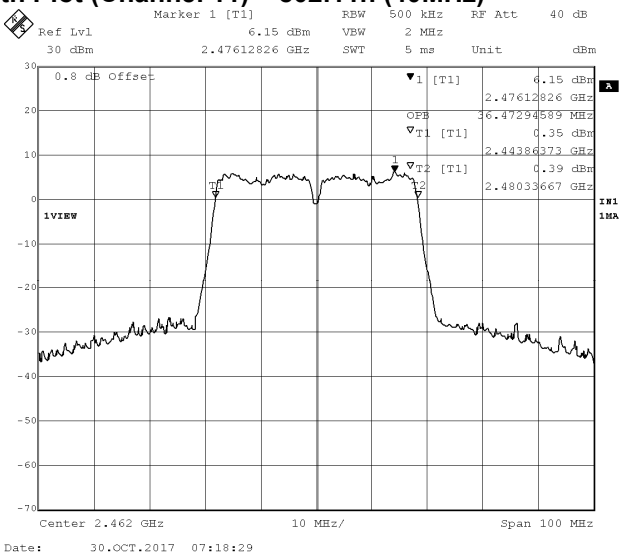
Chain B 6dB and 99% Power Bandwidth Plot (Channel 7) – 802.11n (40MHz)





Chain B 6dB and 99% Power Bandwidth Plot (Channel 11) – 802.11n (40MHz)





7 Conducted Spurious Emissions

7.1 Test Limits:

§ 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

RSS-247(5.5): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

7.2 Test Procedure:

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

7.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/20/2017	9/20/2018

7.4 Test Results:

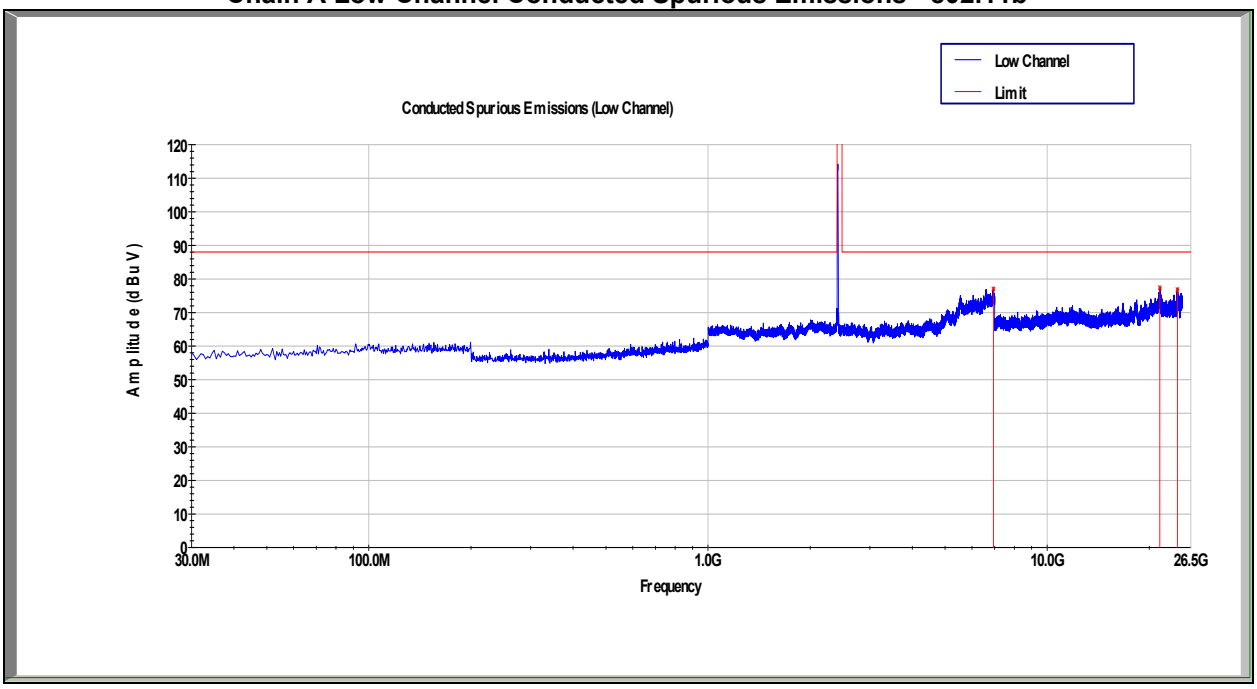
The device was found to be **compliant**. The following plots show that there are no conducted spurious emissions exceeding the 20dB down criteria.

7.5 Test Conditions:

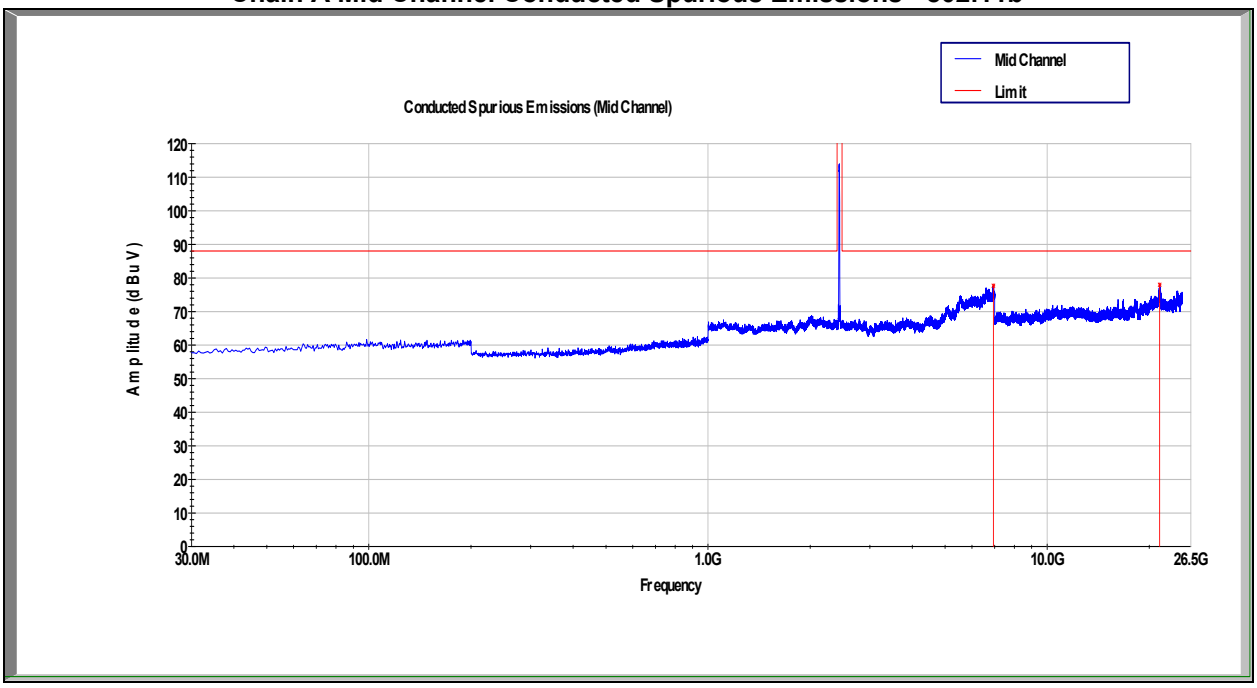
Test Personnel:	Brian Lackey	Test Date:	10/30/2017 – 10/31/2017
Supervising/Reviewing Engineer: (Where Applicable)	NA	Ambient Temperature:	22.0C
Input Voltage:	5VDC via USB	Relative Humidity:	33.0%
		Atmospheric Pressure:	999.0mbar

7.6 Test Data:

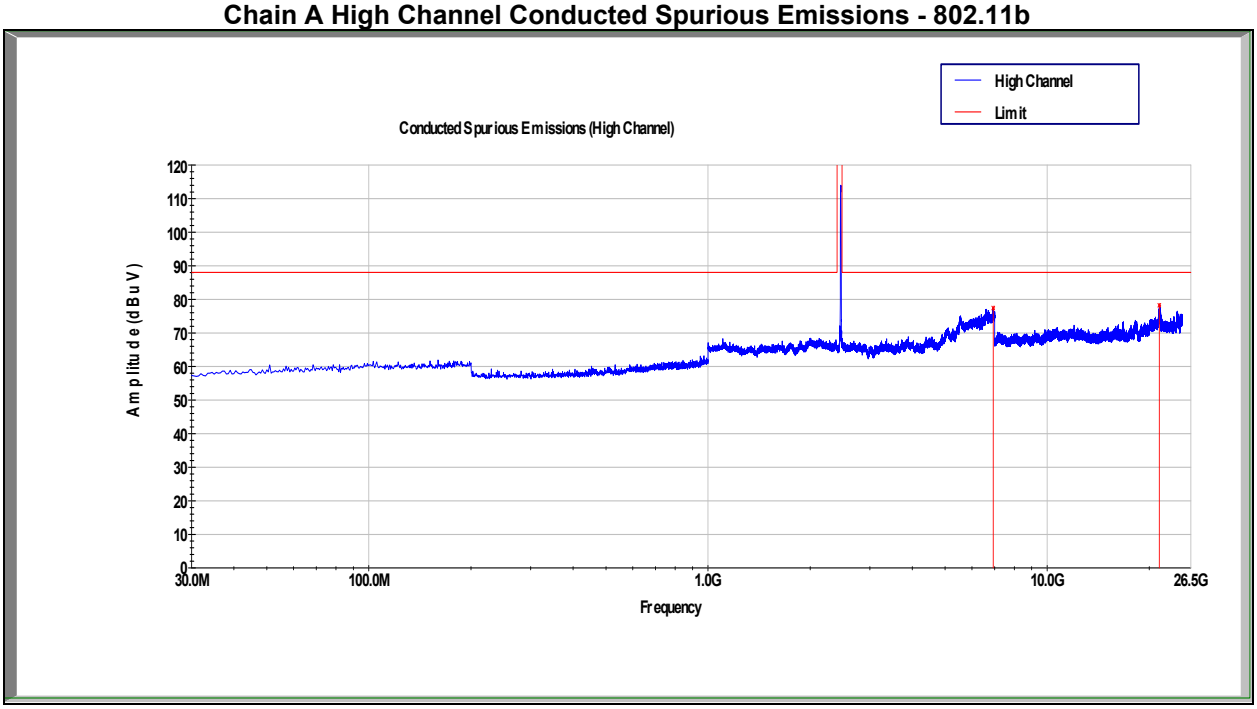
Chain A Low Channel Conducted Spurious Emissions - 802.11b



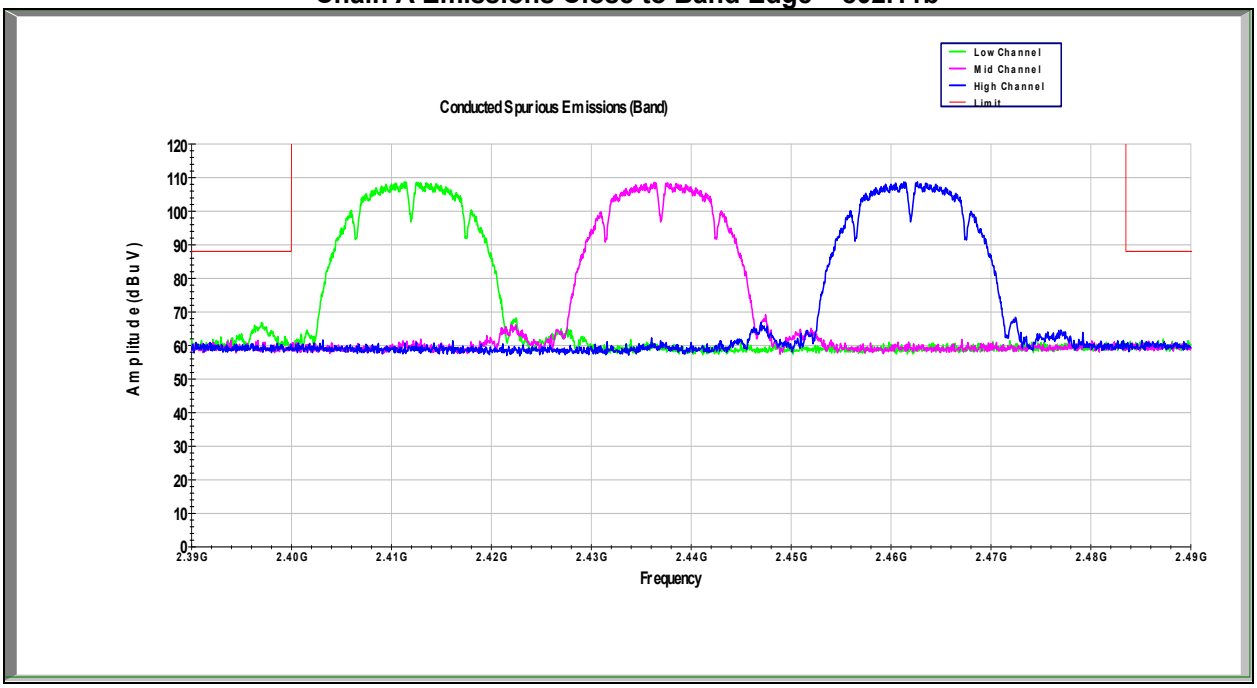
Chain A Mid Channel Conducted Spurious Emissions - 802.11b



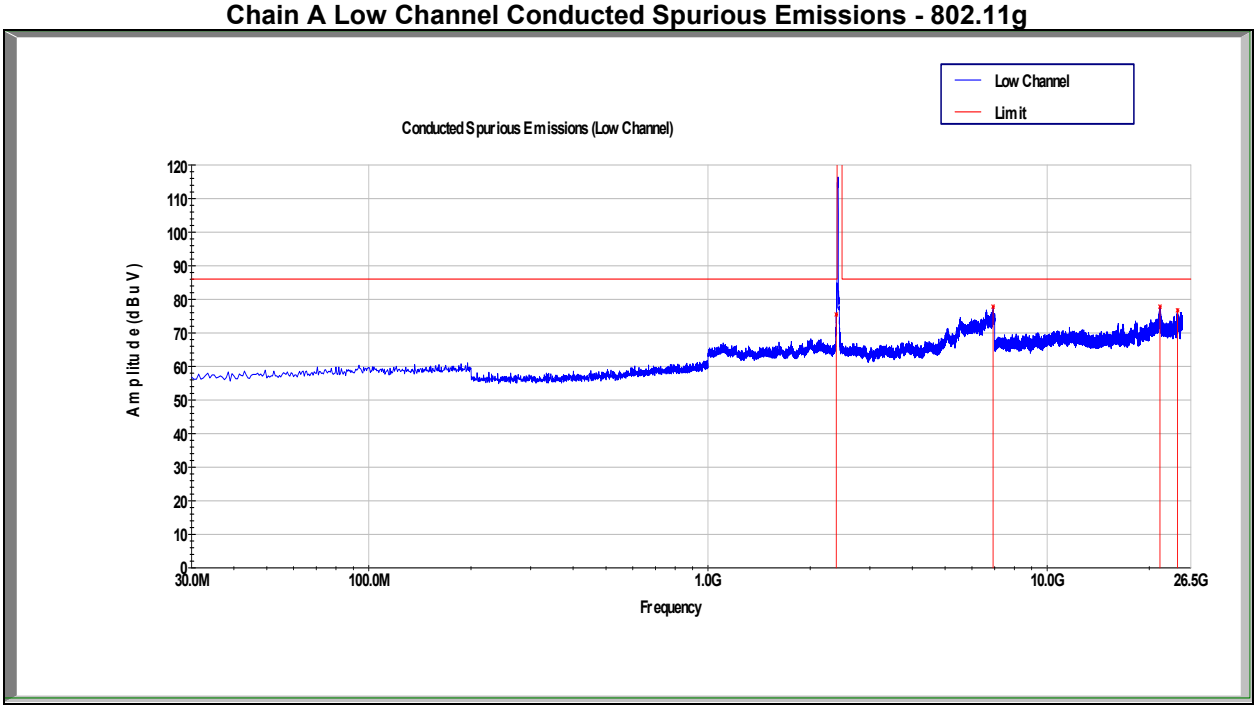
Chain A High Channel Conducted Spurious Emissions - 802.11b



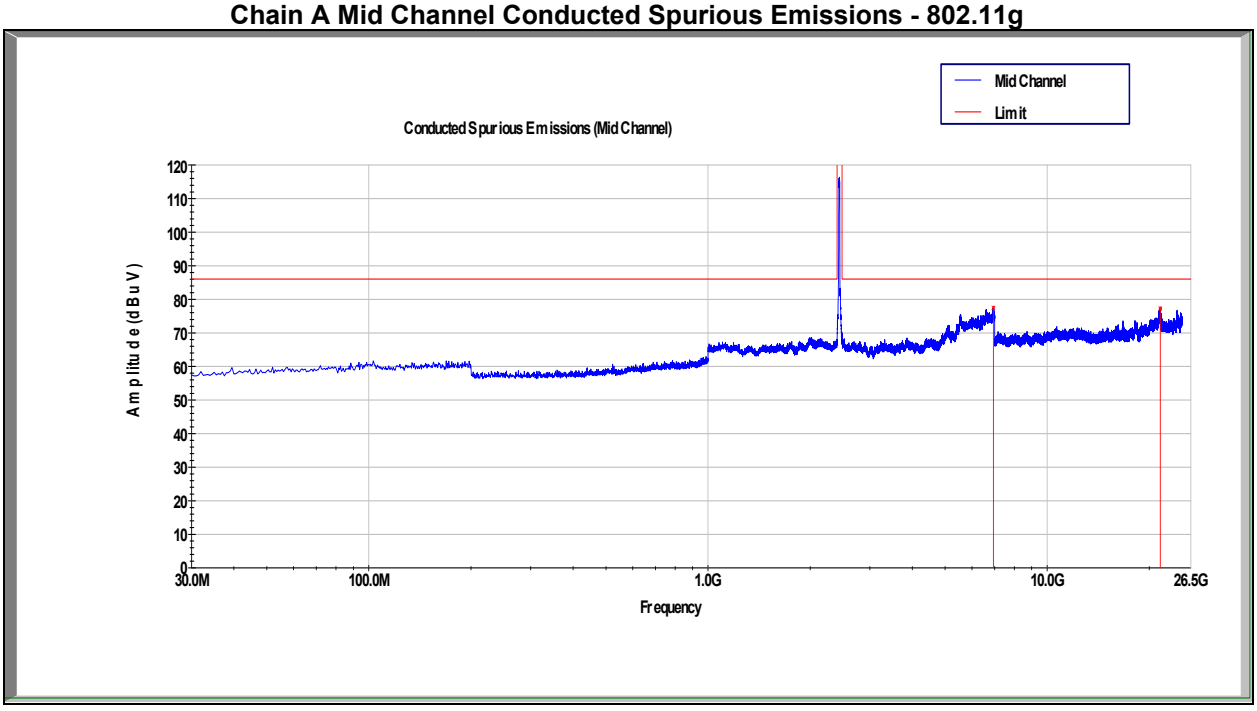
Chain A Emissions Close to Band Edge – 802.11b



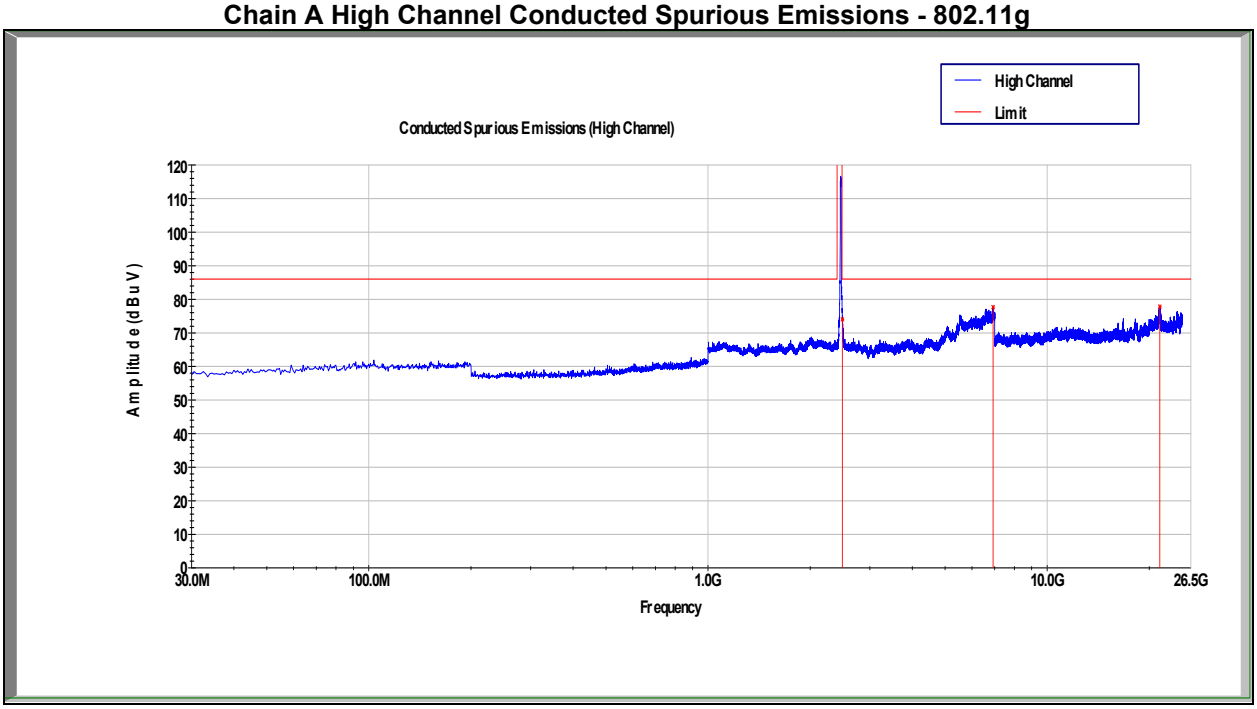
Chain A Low Channel Conducted Spurious Emissions - 802.11g



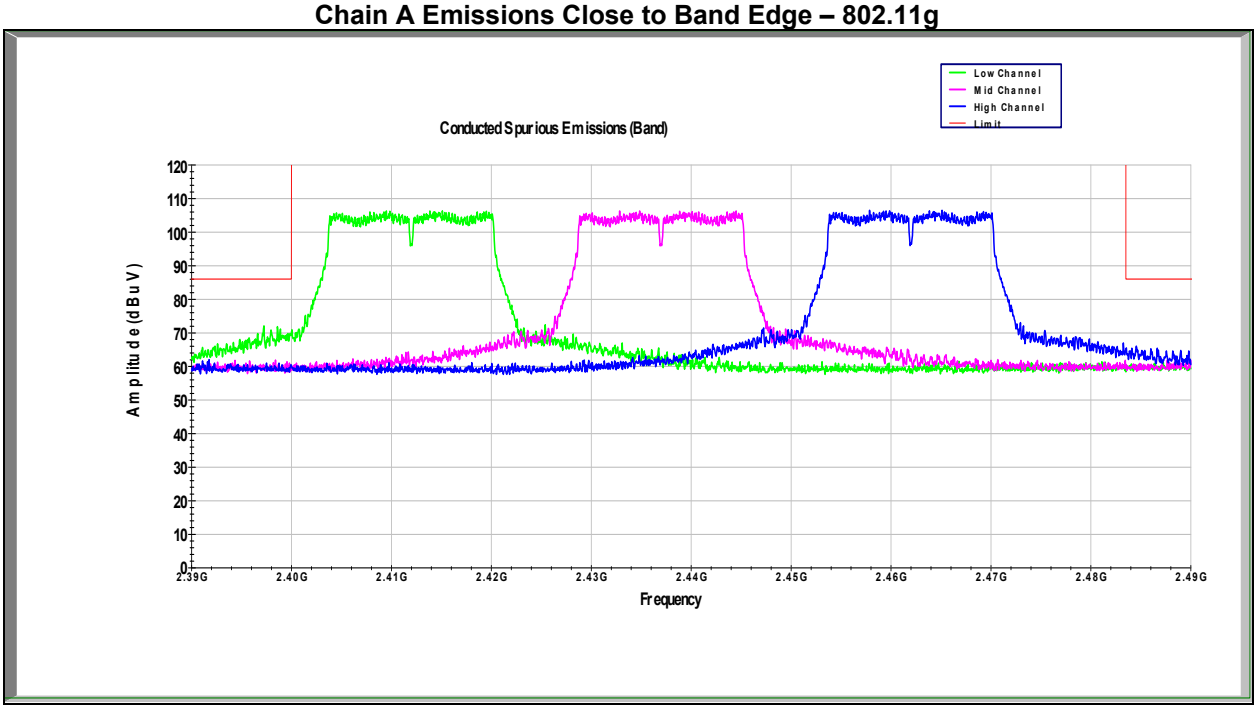
Chain A Mid Channel Conducted Spurious Emissions - 802.11g



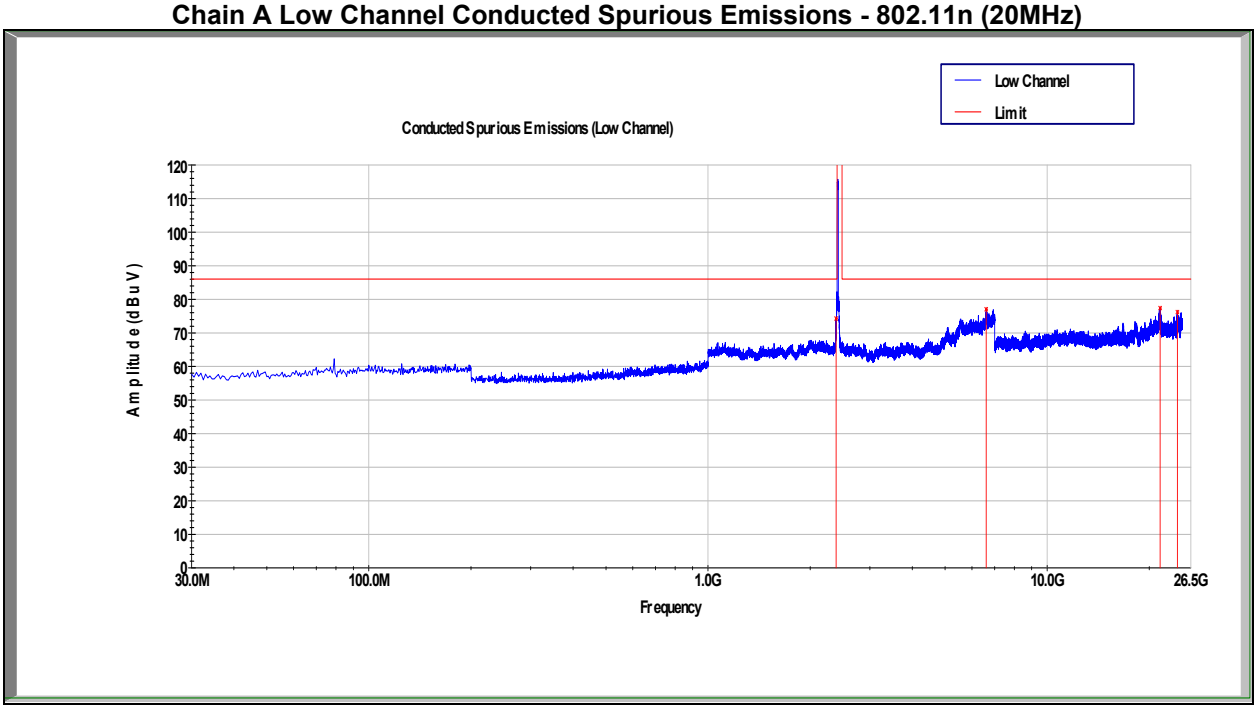
Chain A High Channel Conducted Spurious Emissions - 802.11g



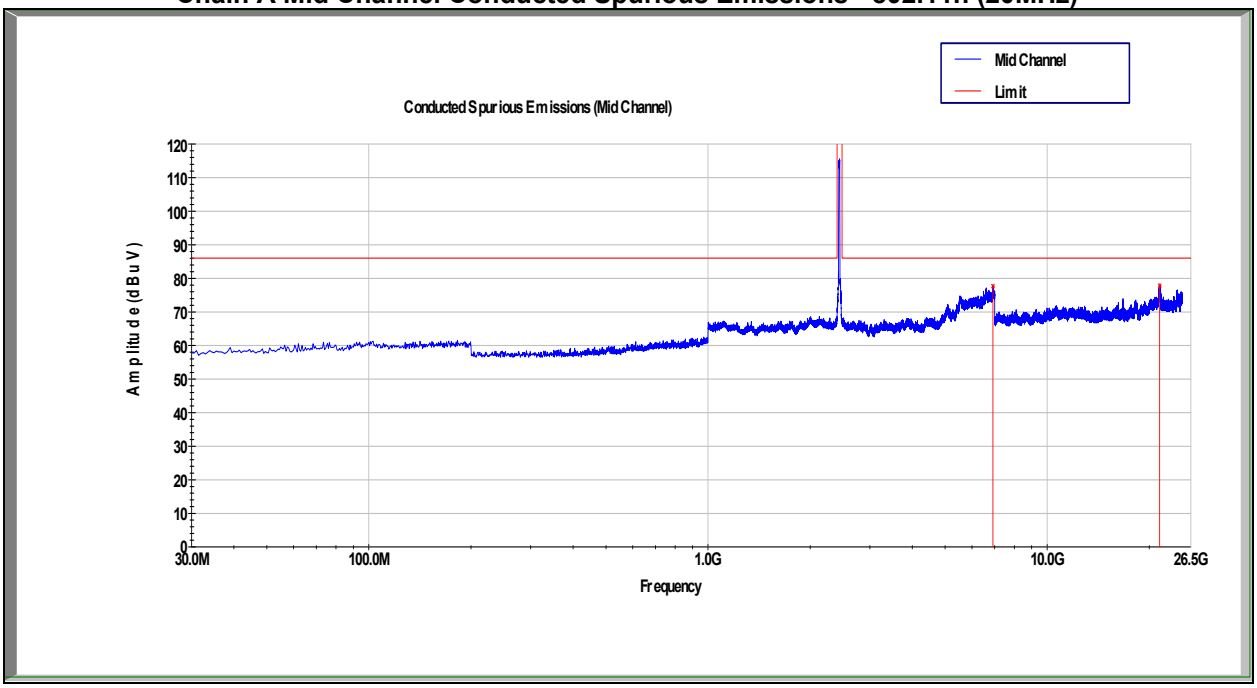
Chain A Emissions Close to Band Edge – 802.11g



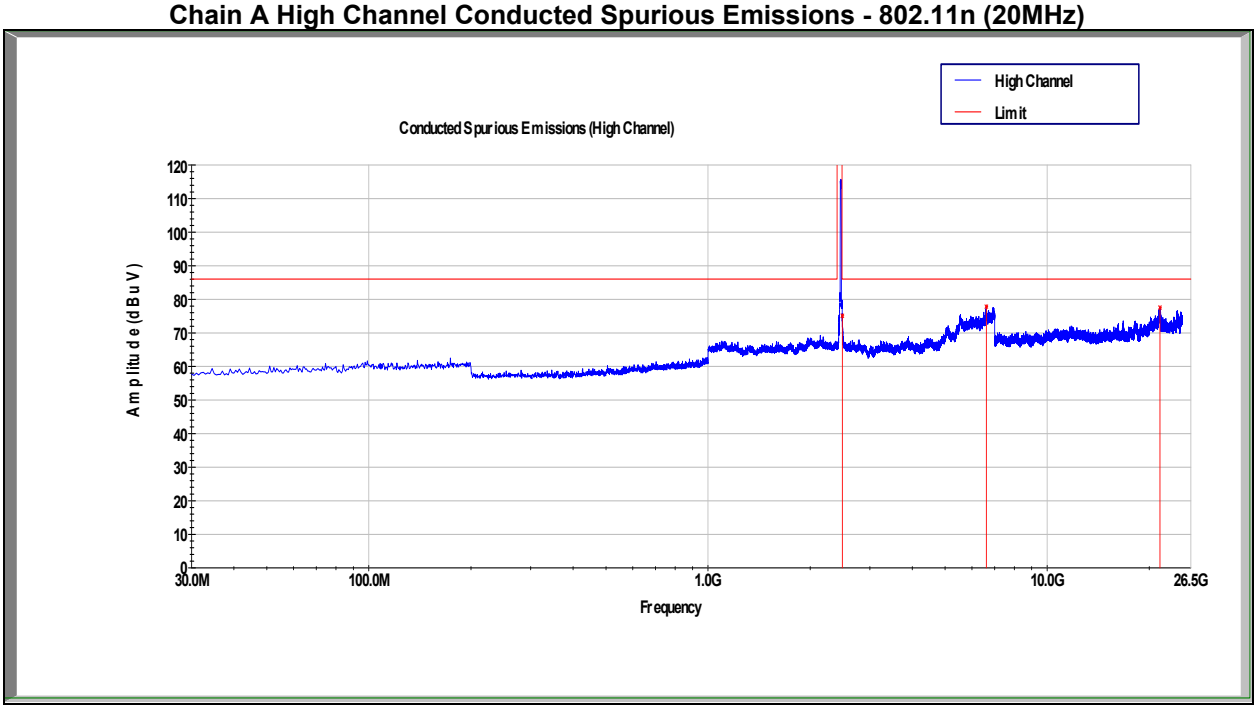
Chain A Low Channel Conducted Spurious Emissions - 802.11n (20MHz)



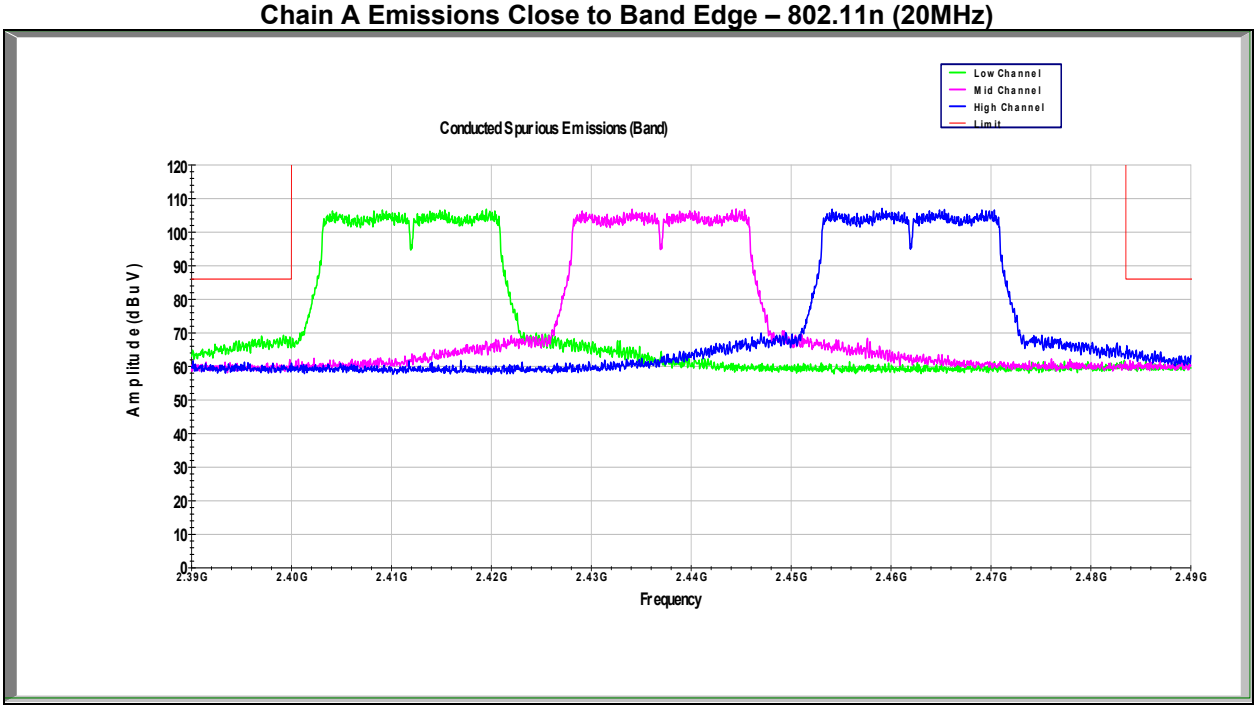
Chain A Mid Channel Conducted Spurious Emissions - 802.11n (20MHz)



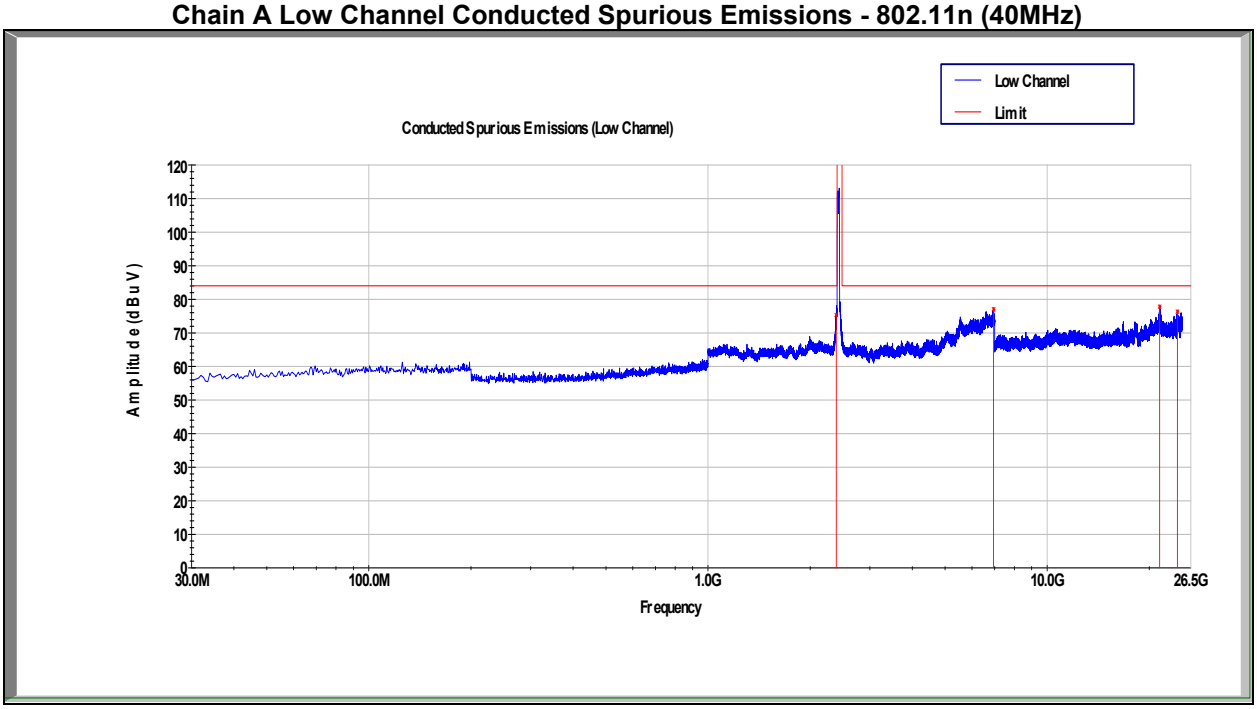
Chain A High Channel Conducted Spurious Emissions - 802.11n (20MHz)



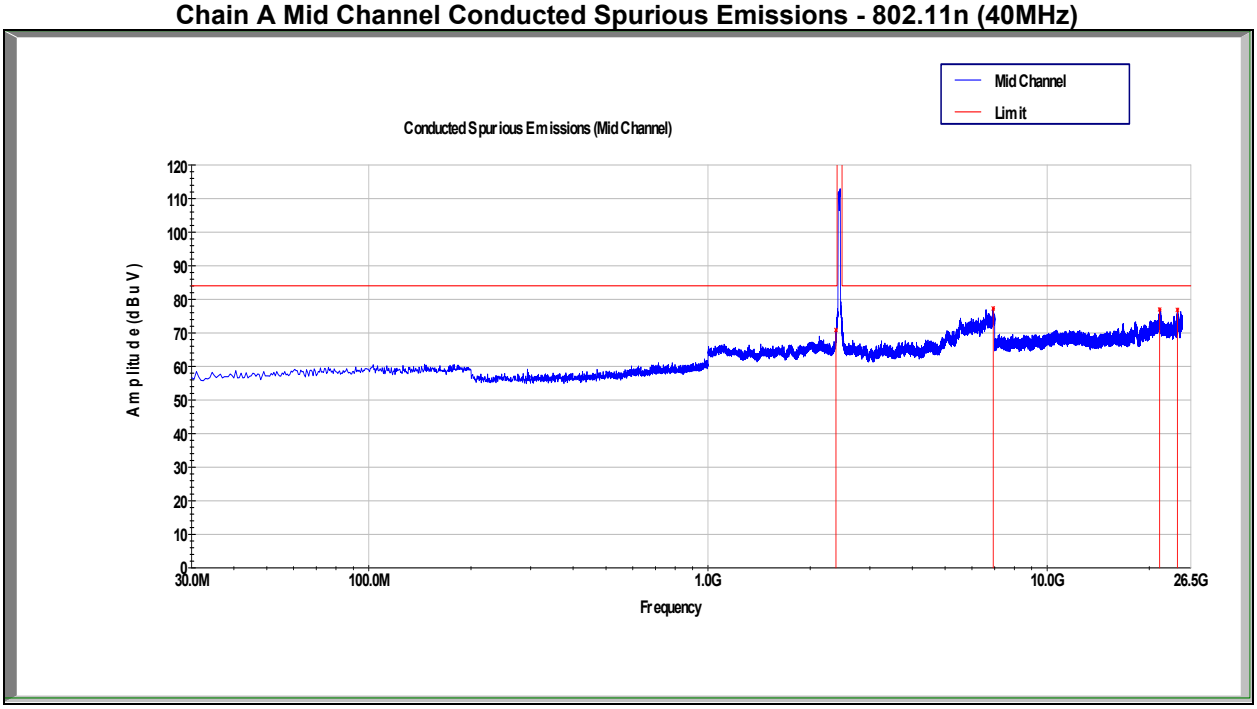
Chain A Emissions Close to Band Edge – 802.11n (20MHz)



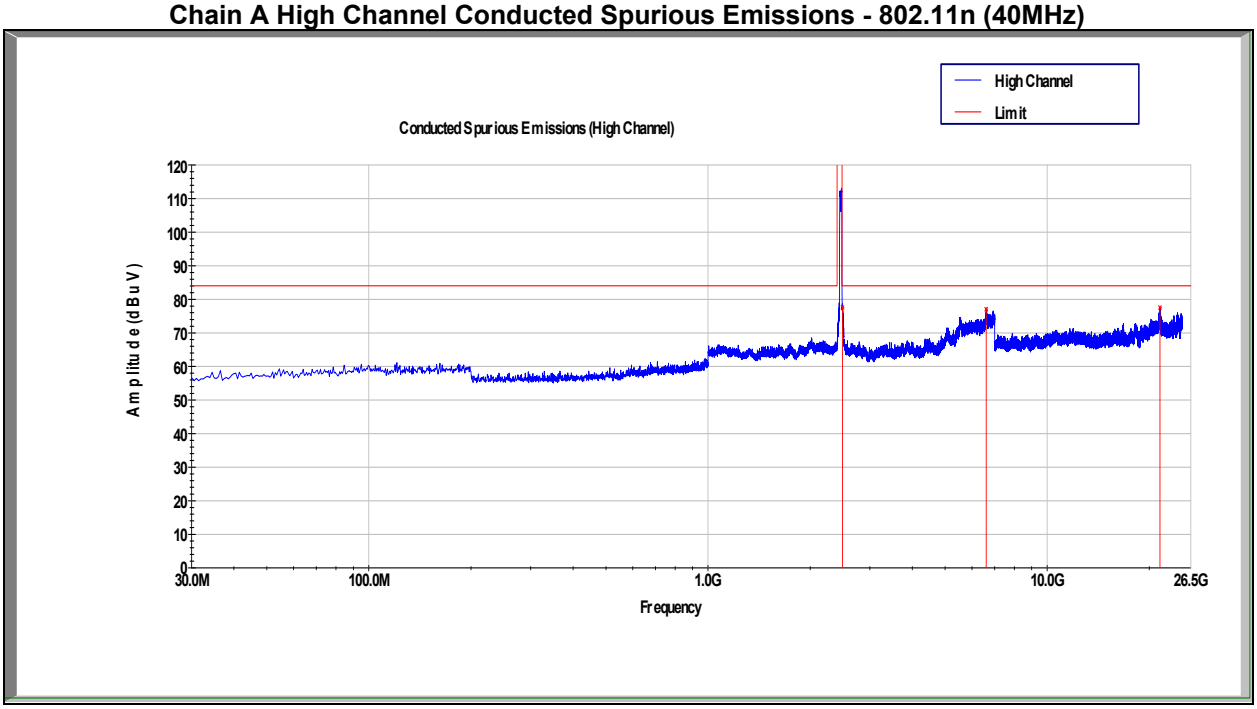
Chain A Low Channel Conducted Spurious Emissions - 802.11n (40MHz)



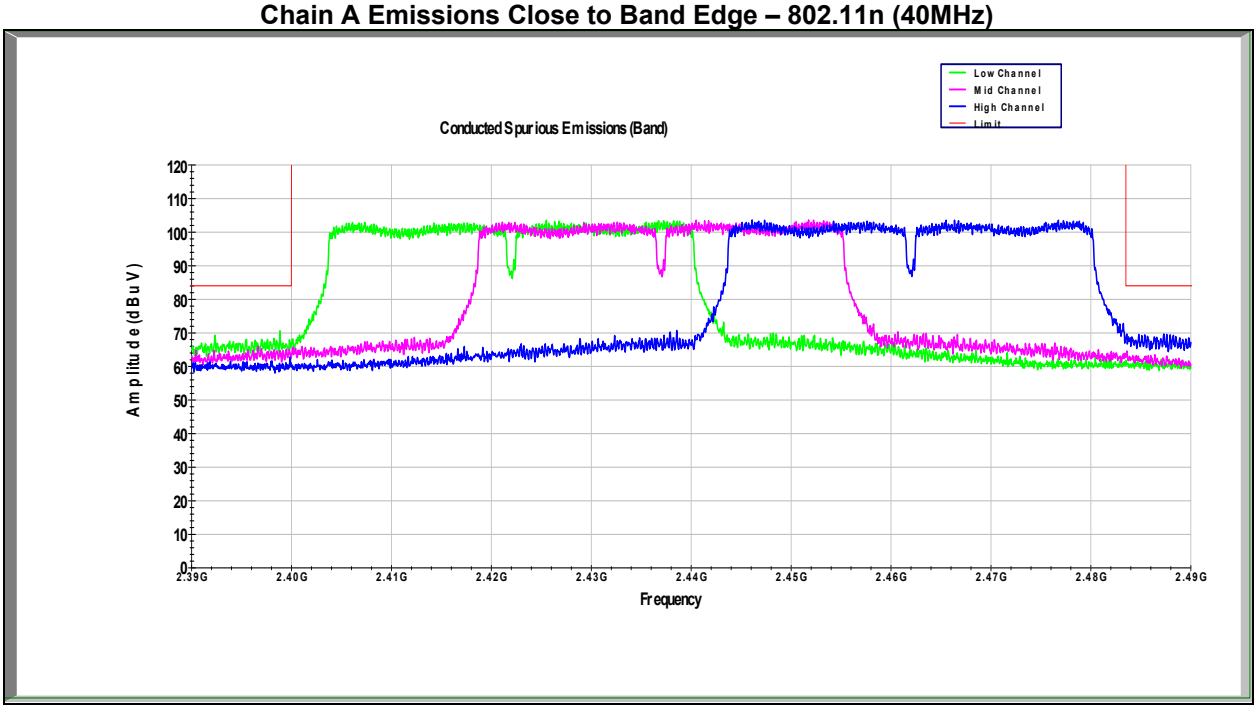
Chain A Mid Channel Conducted Spurious Emissions - 802.11n (40MHz)



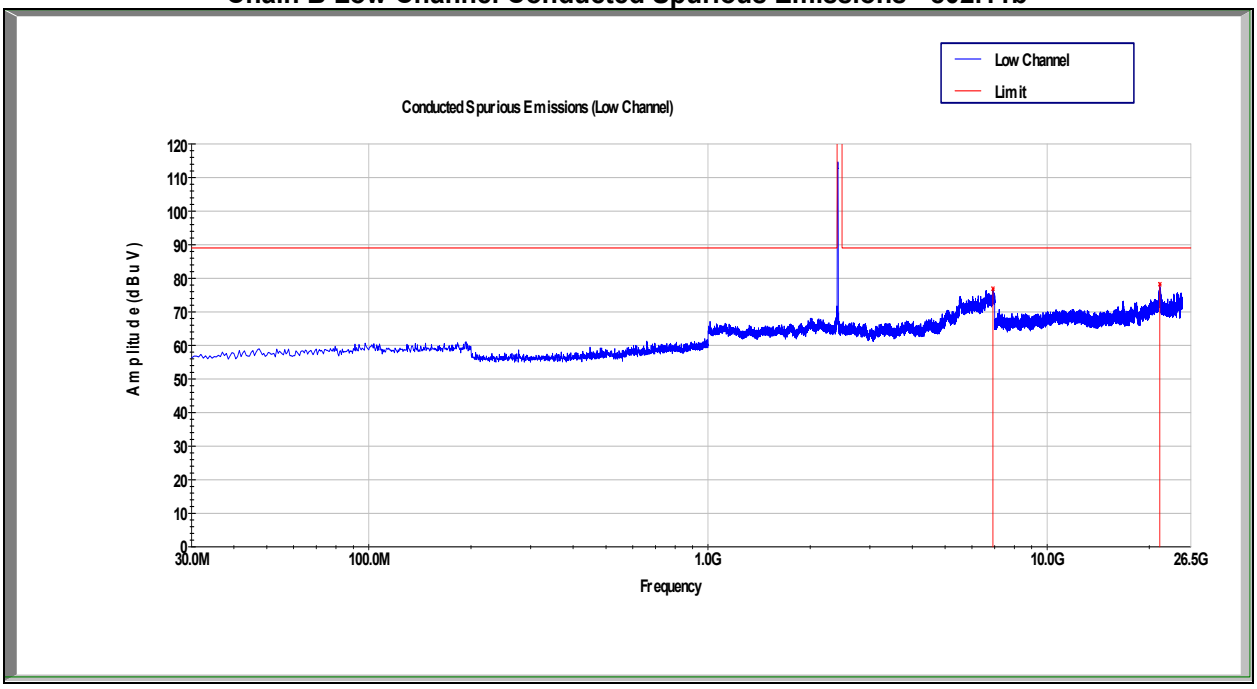
Chain A High Channel Conducted Spurious Emissions - 802.11n (40MHz)



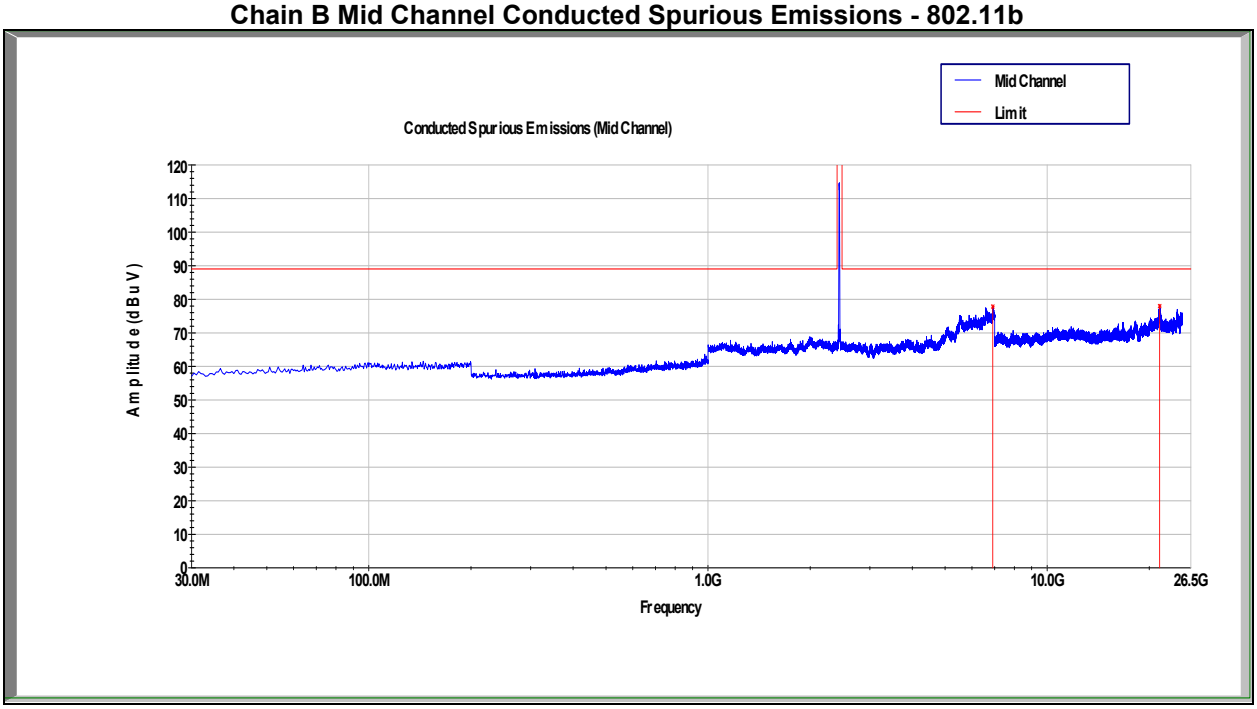
Chain A Emissions Close to Band Edge – 802.11n (40MHz)



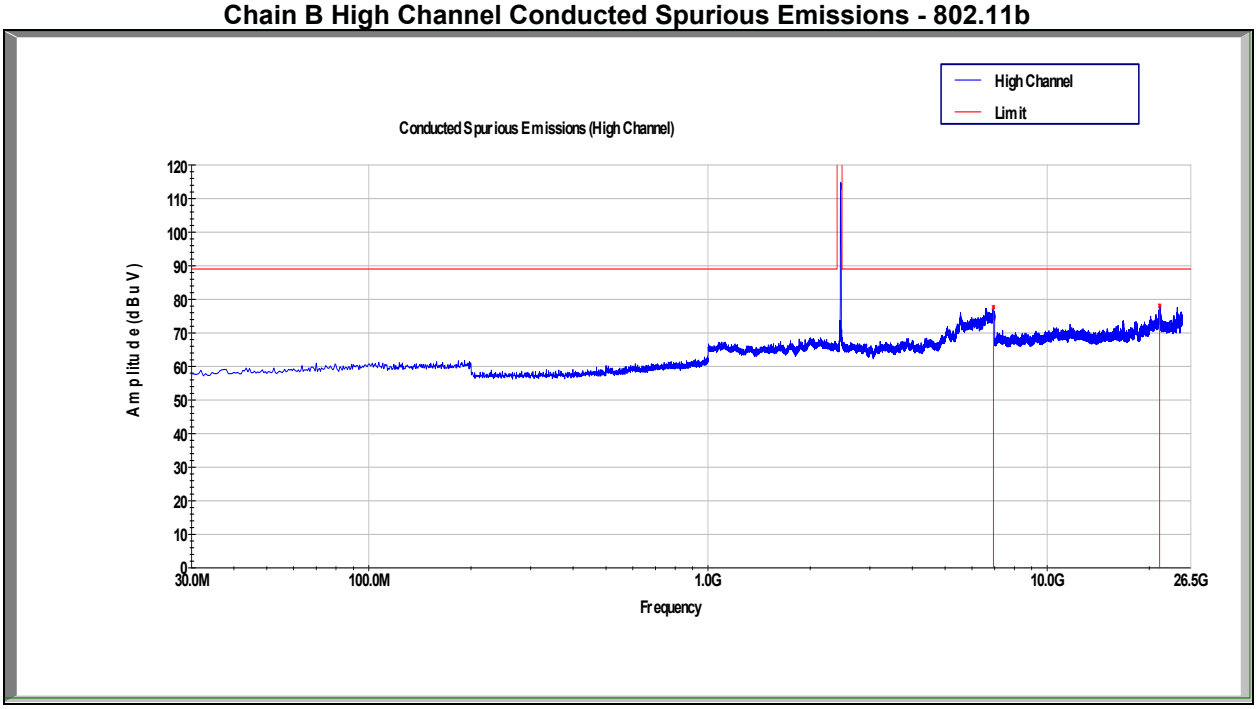
Chain B Low Channel Conducted Spurious Emissions - 802.11b



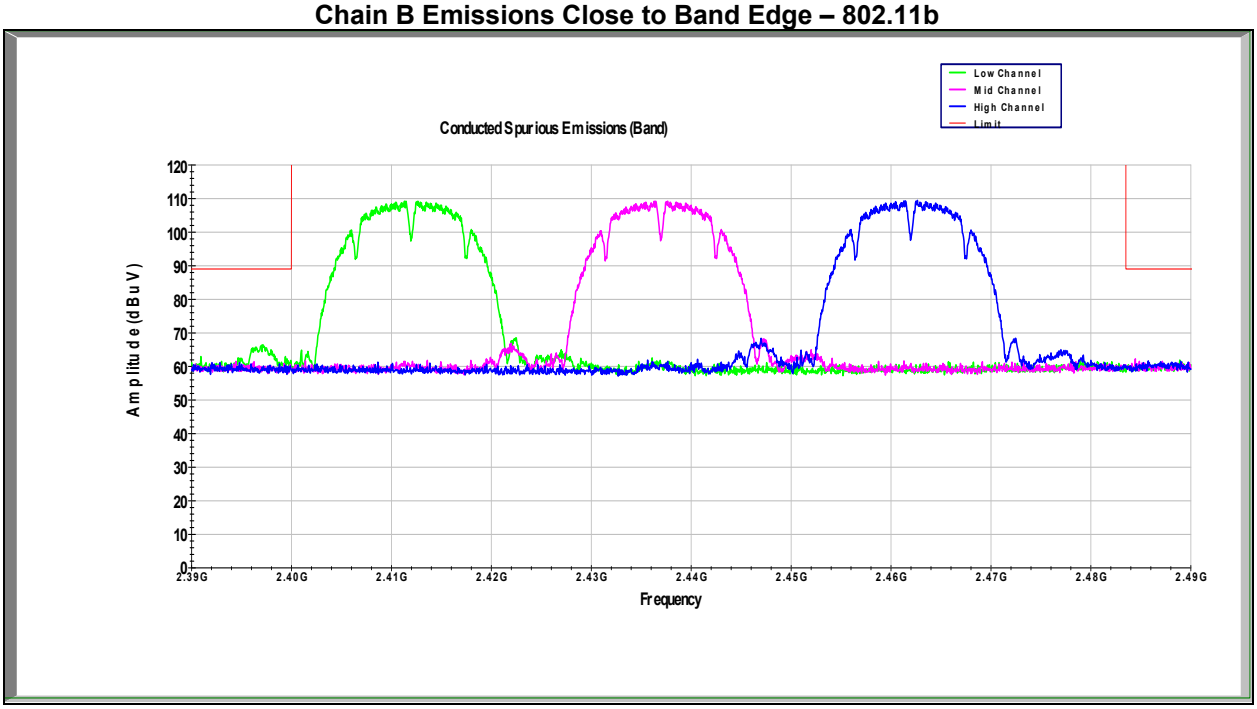
Chain B Mid Channel Conducted Spurious Emissions - 802.11b



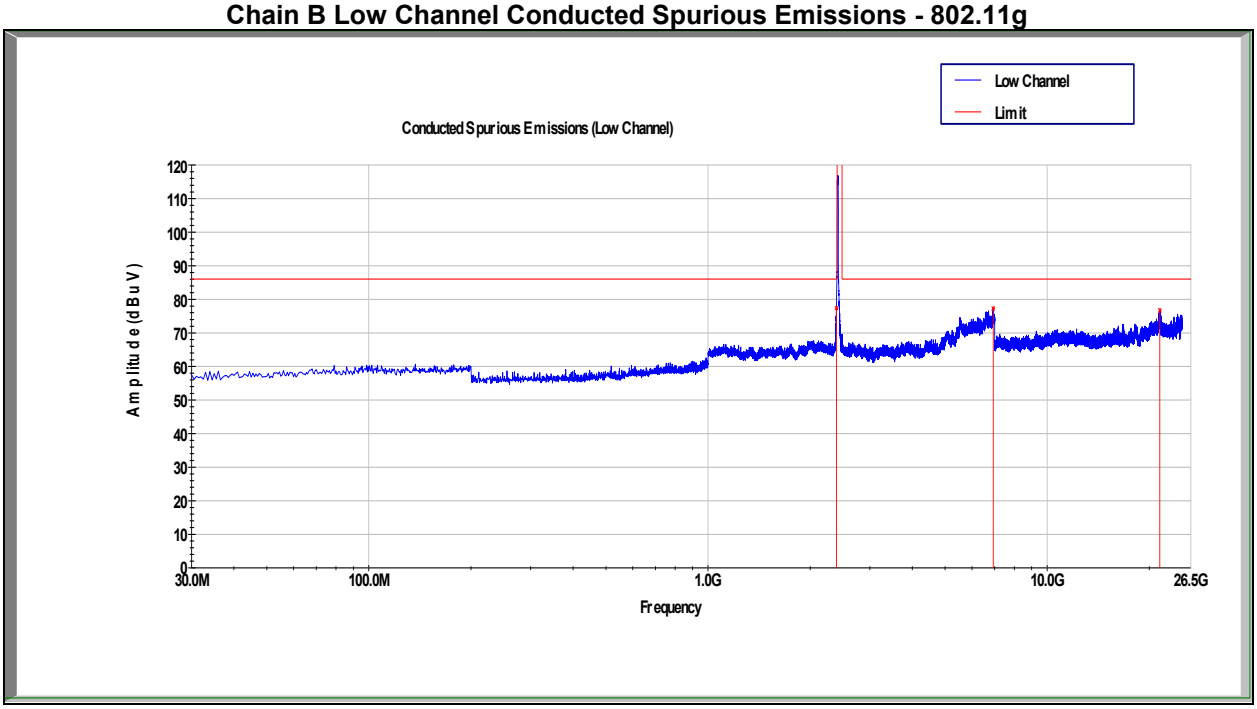
Chain B High Channel Conducted Spurious Emissions - 802.11b



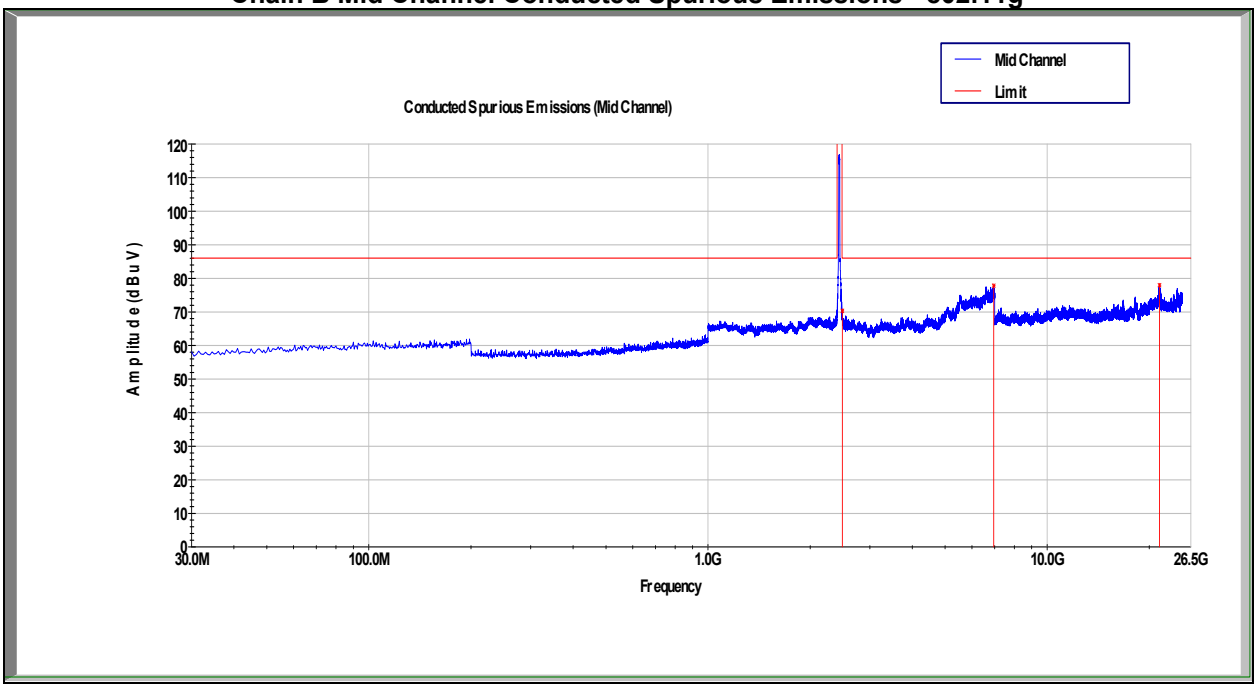
Chain B Emissions Close to Band Edge – 802.11b



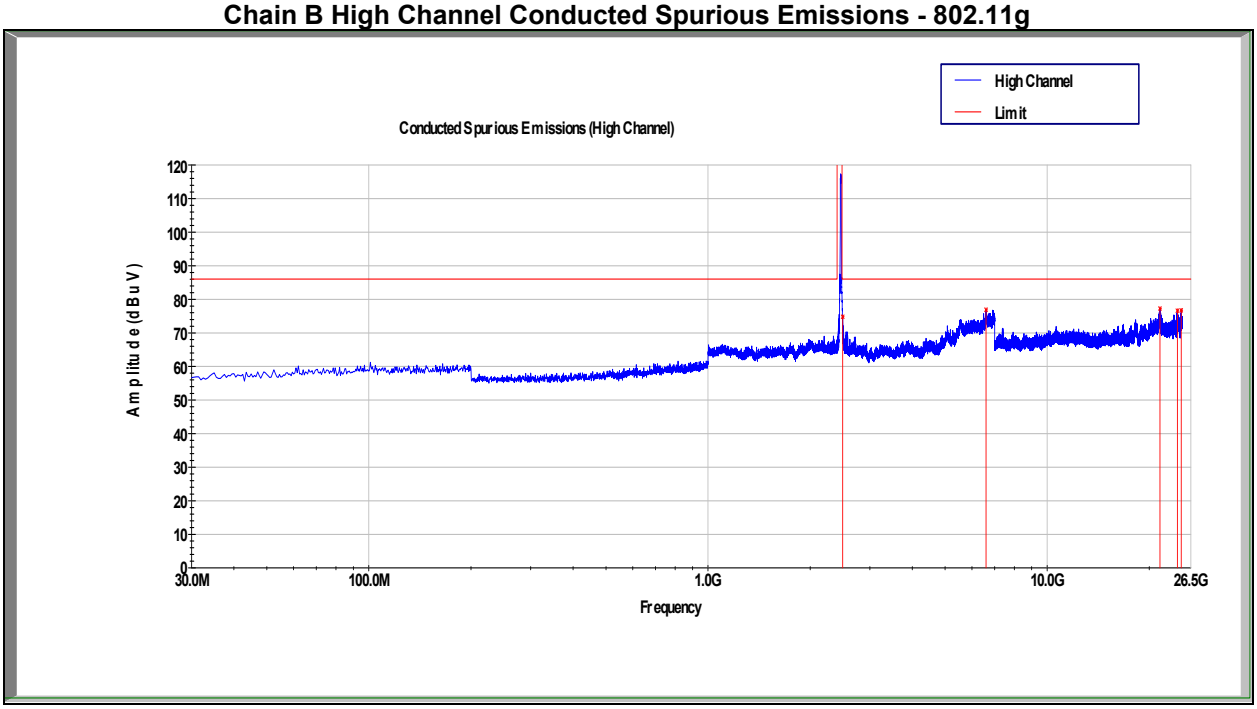
Chain B Low Channel Conducted Spurious Emissions - 802.11g



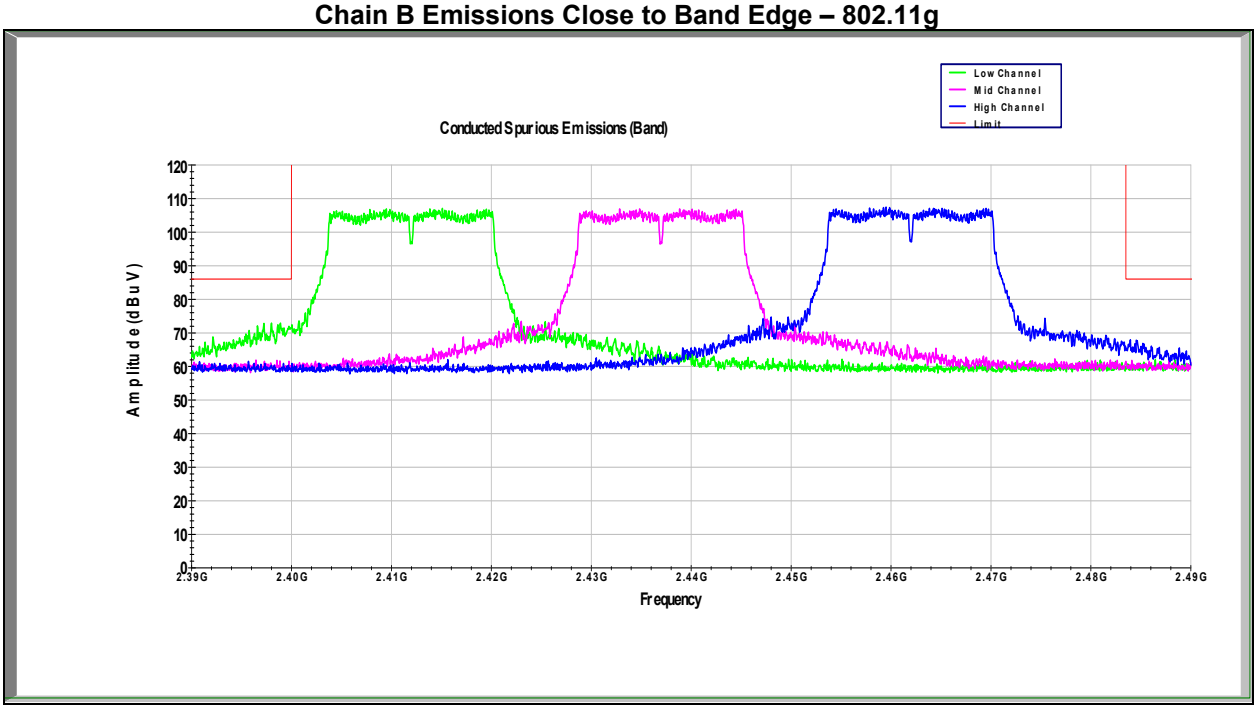
Chain B Mid Channel Conducted Spurious Emissions - 802.11g



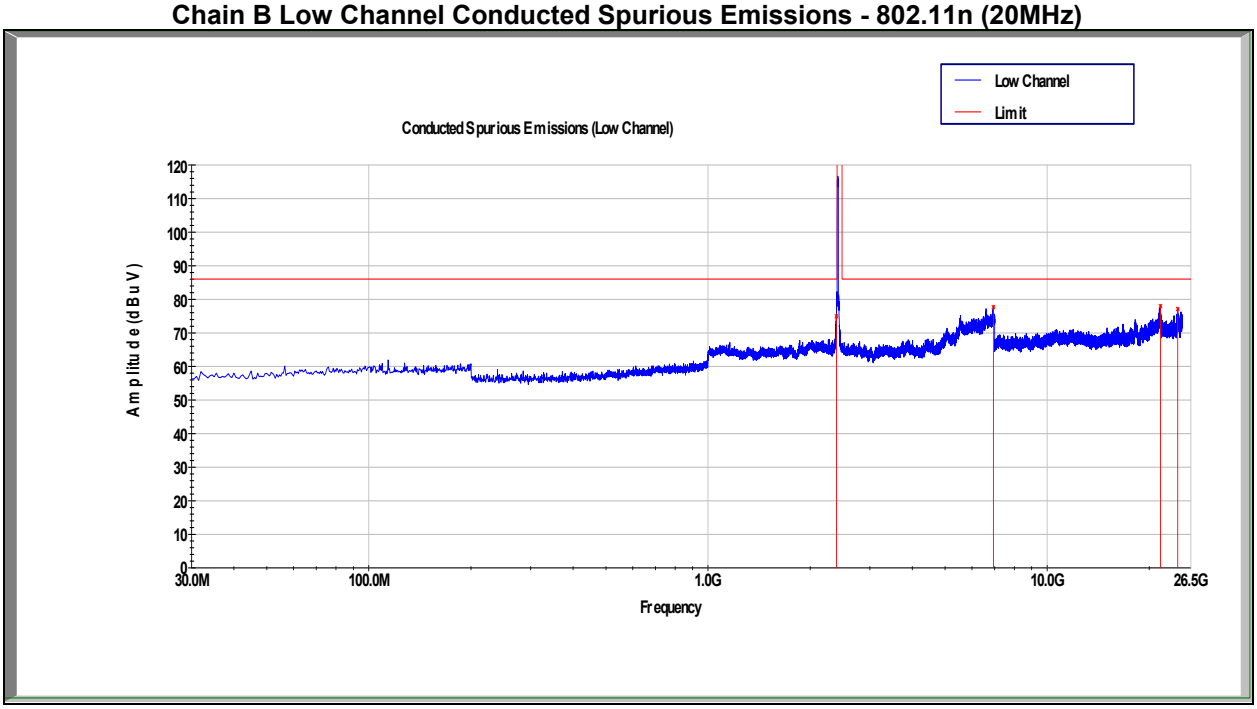
Chain B High Channel Conducted Spurious Emissions - 802.11g



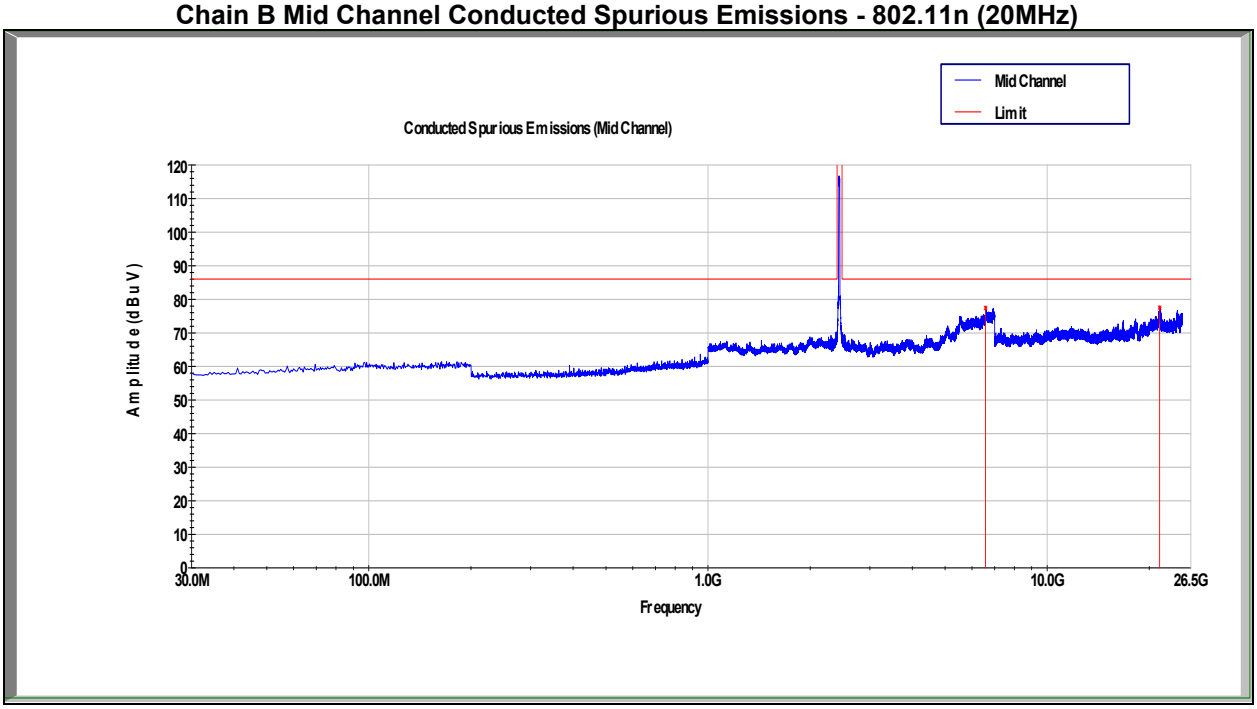
Chain B Emissions Close to Band Edge – 802.11g



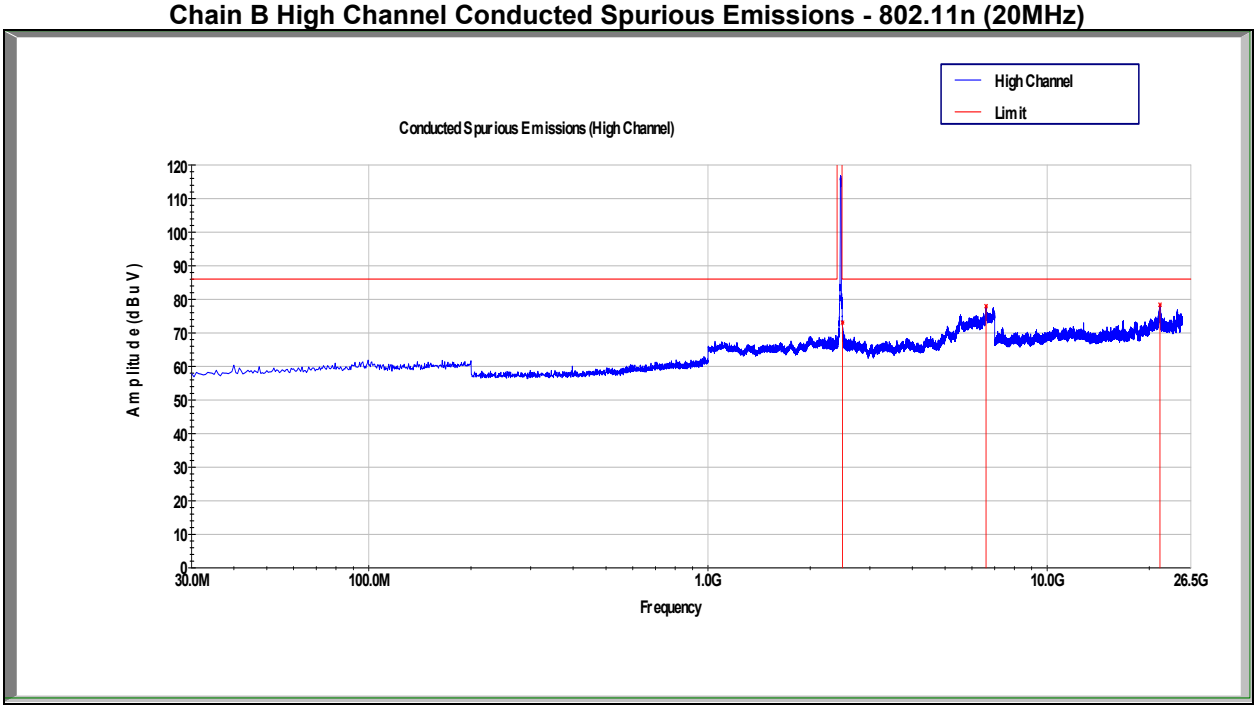
Chain B Low Channel Conducted Spurious Emissions - 802.11n (20MHz)



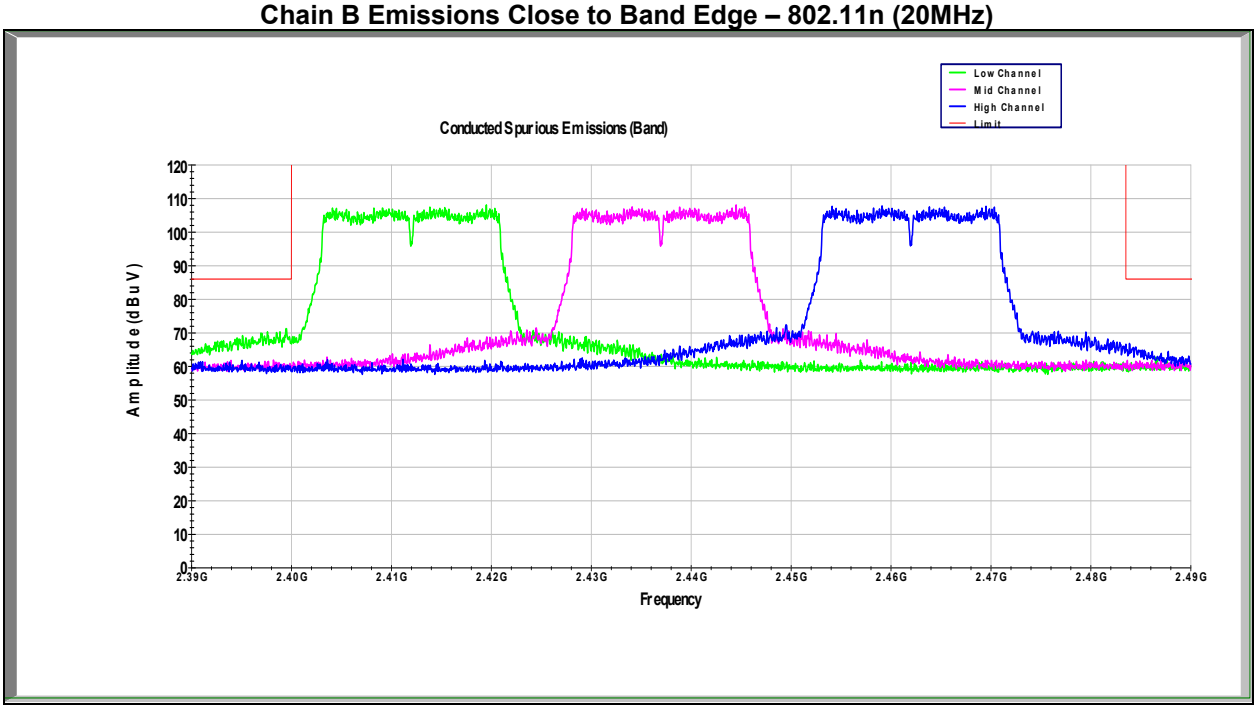
Chain B Mid Channel Conducted Spurious Emissions - 802.11n (20MHz)



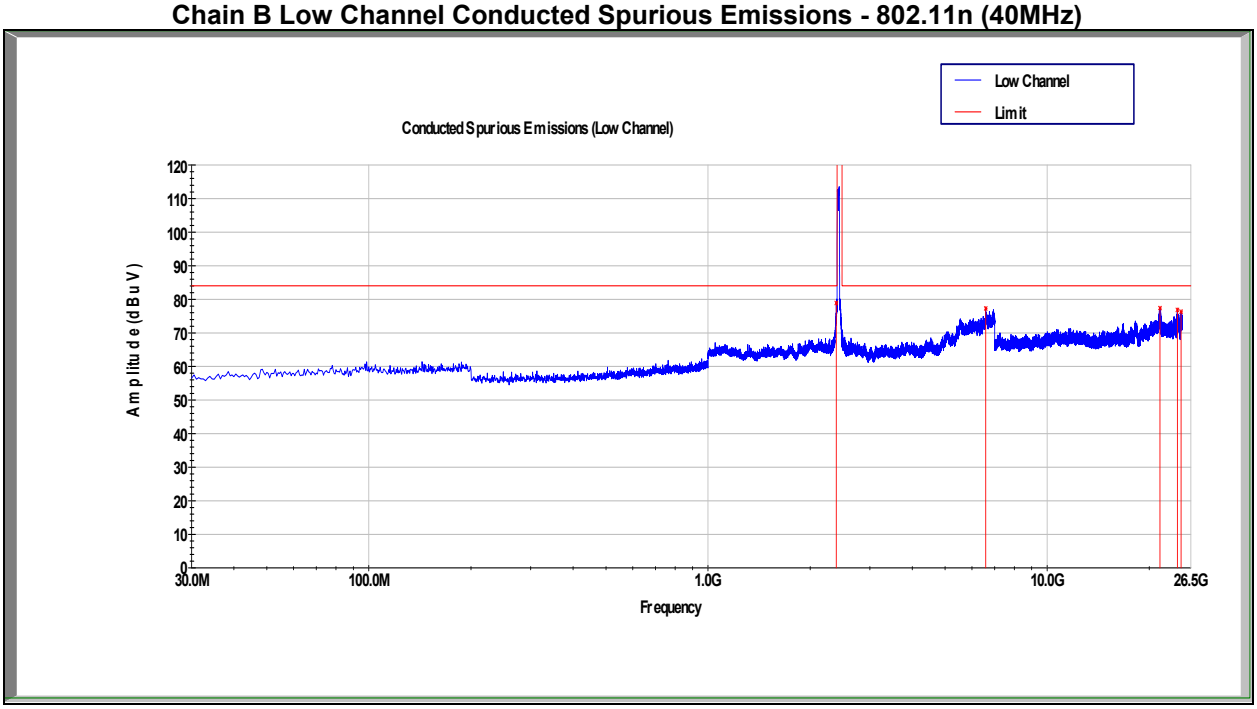
Chain B High Channel Conducted Spurious Emissions - 802.11n (20MHz)



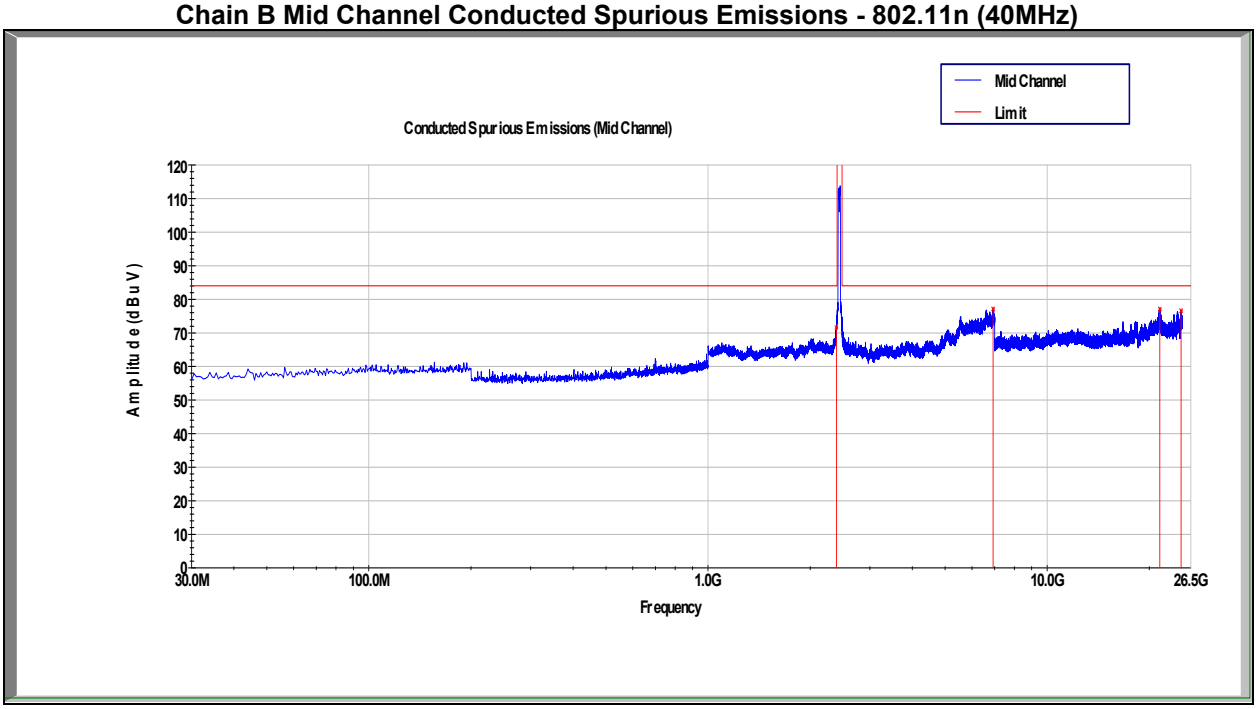
Chain B Emissions Close to Band Edge – 802.11n (20MHz)



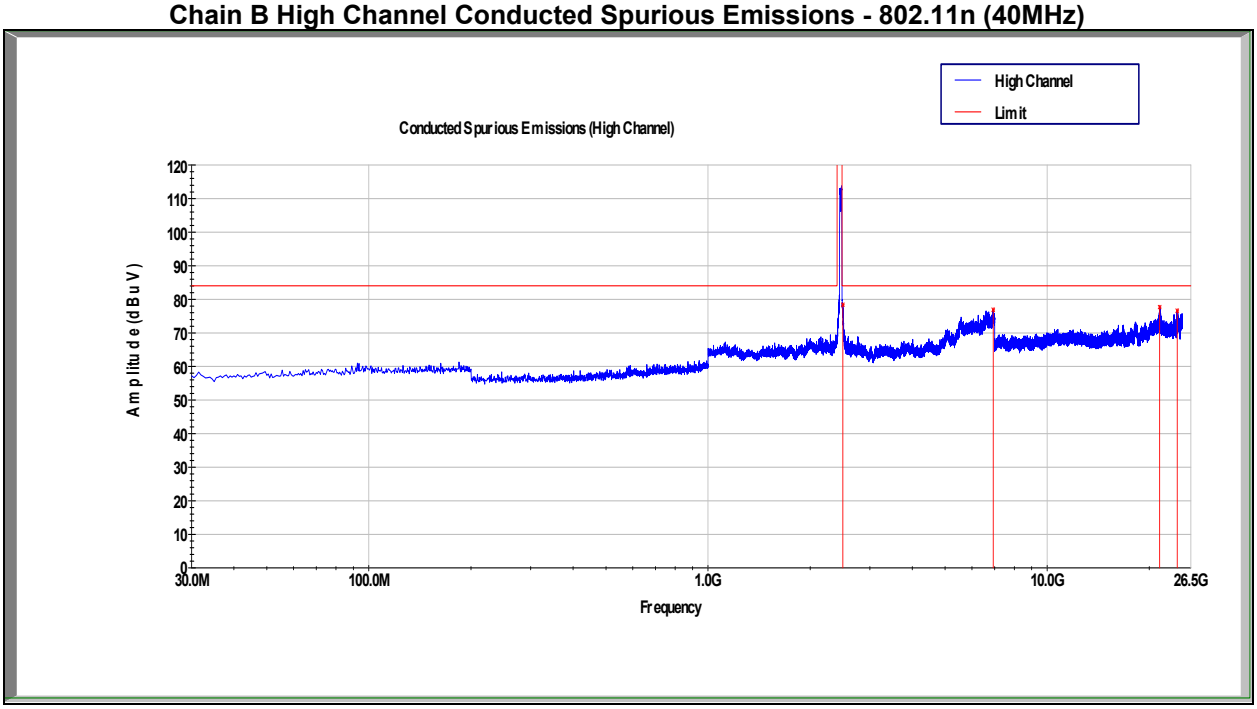
Chain B Low Channel Conducted Spurious Emissions - 802.11n (40MHz)



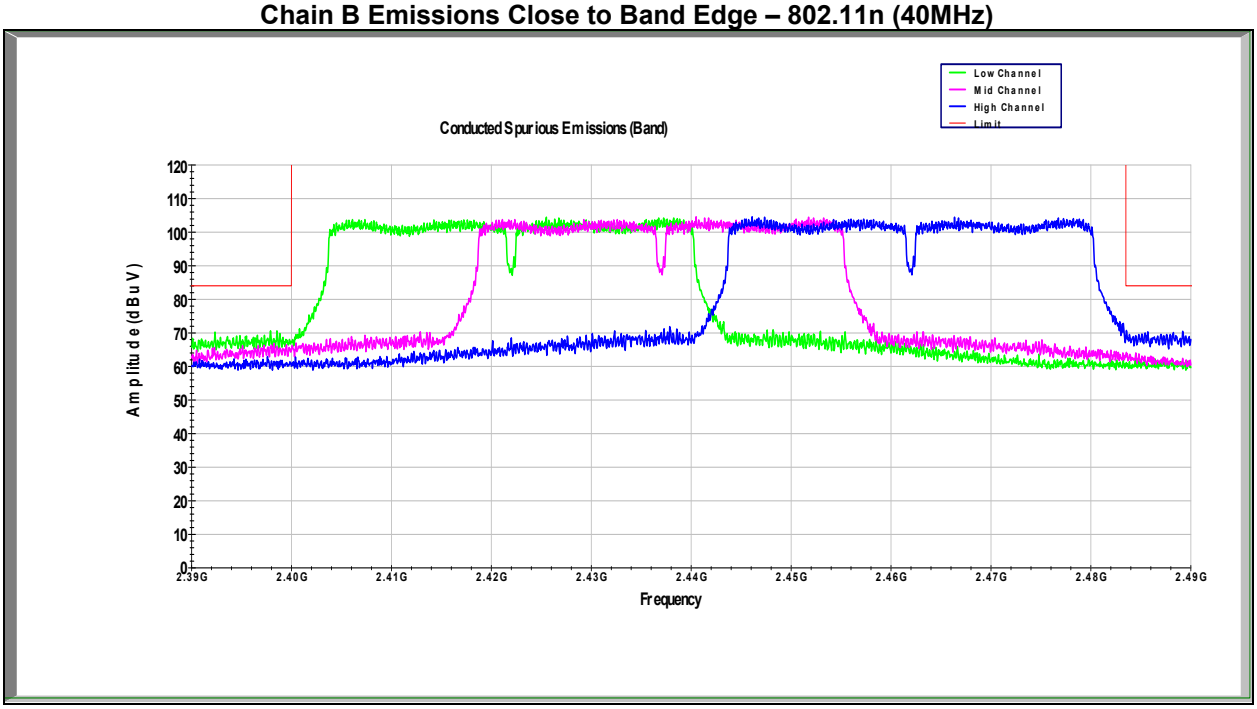
Chain B Mid Channel Conducted Spurious Emissions - 802.11n (40MHz)



Chain B High Channel Conducted Spurious Emissions - 802.11n (40MHz)



Chain B Emissions Close to Band Edge – 802.11n (40MHz)



8 Power Spectral Density

8.1 Test Limits:

§ 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

RSS-247(5.2)(b): The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d),(i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

8.2 Test Procedure:

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

8.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/20/2017	9/20/2018

8.4 Test Results:

The device was found to be **compliant**. The peak power spectral density did not exceed 8dBm in any 3kHz bandwidth on any operating channel using the PKPSD method. Additionally the sum of the two transmitting chains did not exceed the limit (summation performed in linear terms then converted to dBm.)

8.5 Test Conditions:

Test Personnel:	Brian Lackey, Bryan Taylor	Test Date:	10/30/2017
Supervising/Reviewing Engineer: (Where Applicable)	NA	Ambient Temperature:	20.7C
Input Voltage:	5VDC via USB	Relative Humidity:	29.1%
		Atmospheric Pressure:	988.8mbar

8.6 Test Data:

Chain A+B 802.11b Peak Power Spectral Density								
	Channel	Frequency (MHz)	Chain A (dBm)	Chain B (dBm)	Total Conducted PSD (dBm)	15.247 / RSS-247 Conducted Limit (dBm)	Margin (dBm)	Result
802.11b	1	2412	-14.61	-13.75	-11.15	8.00	19.15	Pass
	6	2437	-14.58	-13.8	-11.16	8.00	19.16	Pass
	11	2462	-14.43	-13.86	-11.13	8.00	19.13	Pass
802.11g	1	2412	-12.11	-11.29	-8.67	8.00	16.67	Pass
	6	2437	-12.13	-11.545	-8.82	8.00	16.82	Pass
	11	2462	-12.17	-11.74	-8.94	8.00	16.94	Pass
802.11n (HT20)	1	2412	-12.59	-12.02	-9.29	8.00	17.29	Pass
	6	2437	-12.52	-12.07	-9.28	8.00	17.28	Pass
	11	2462	-12.79	-12.04	-9.39	8.00	17.39	Pass
802.11n (HT40)	3	2422	-14.22	-14.13	-11.16	8.00	19.16	Pass
	6	2437	-14.15	-14.08	-11.10	8.00	19.10	Pass
	9	2442	-14.42	-14.28	-11.34	8.00	19.34	Pass

Note 1: The total conducted power spectral density was found by converting each of the measurements from chain A and chain B to linear quantities, summing the emissions, then converting back to dBm.

Example Calculation (802.11b Ch. 1):

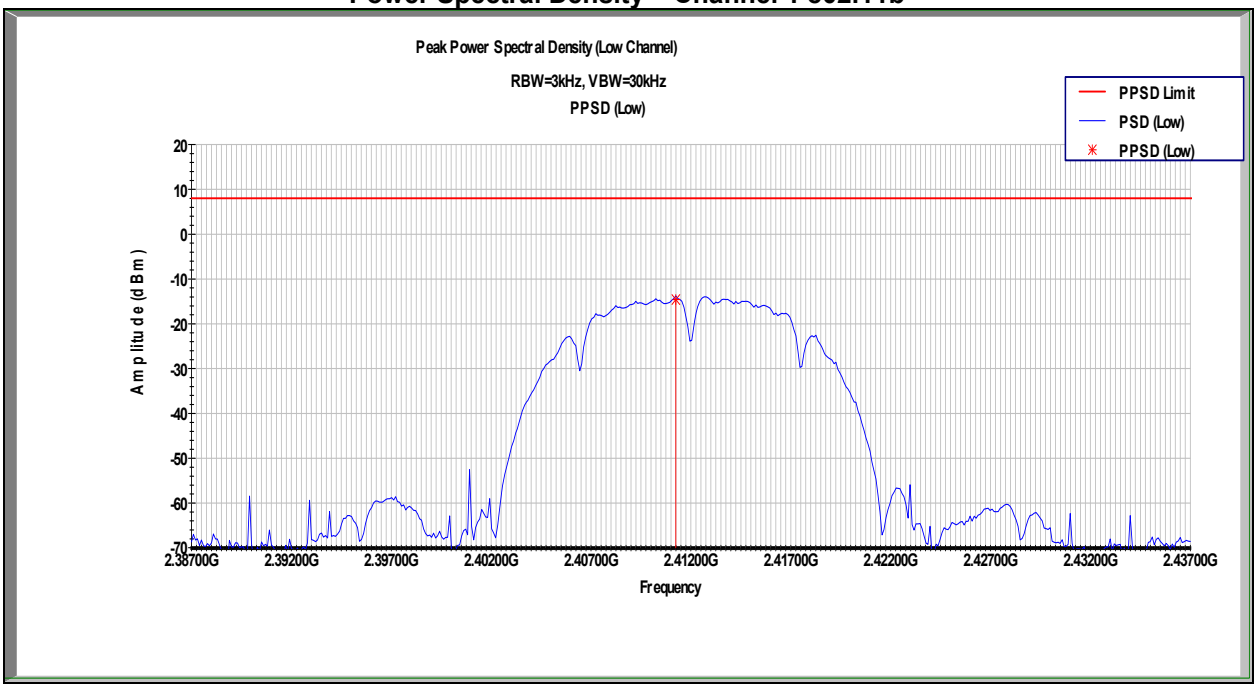
Chain A PSD (mW) = $10^{(-14.61/10)}$ = 0.03459mW

Chain B PSD (mW) = $10^{(-13.75/10)}$ = 0.04217mW

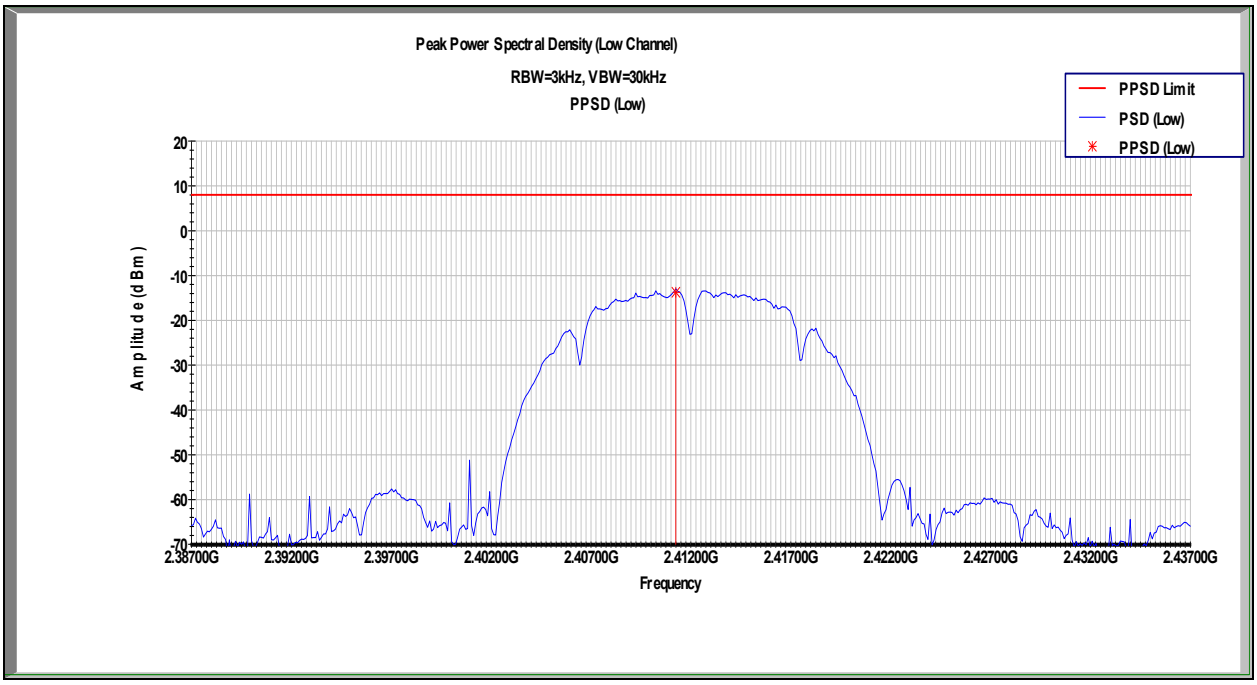
Total Conducted PSD (mW) = Chain A + Chain B PSD = 0.03459mW + 0.04217mW = 0.07676mW

Total Conducted PSD (dBm) = $10\log_{10}(0.07676)$ = -11.15dBm

Power Spectral Density – Channel 1 802.11b

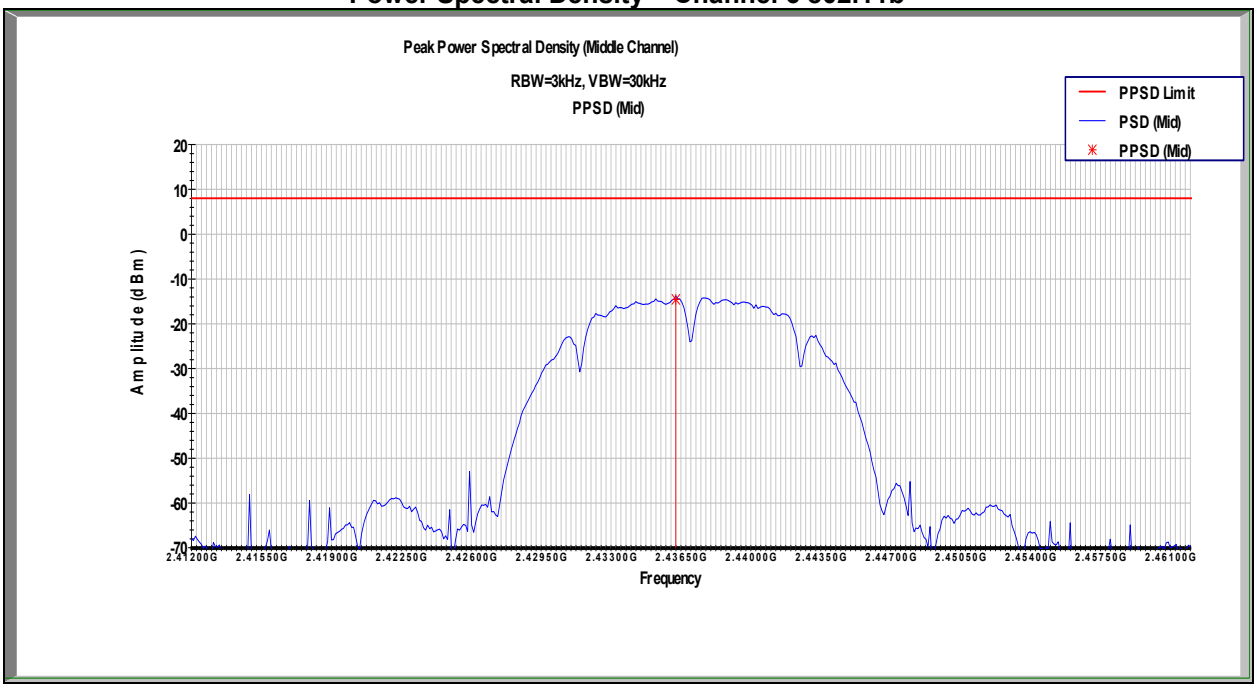


Chain A

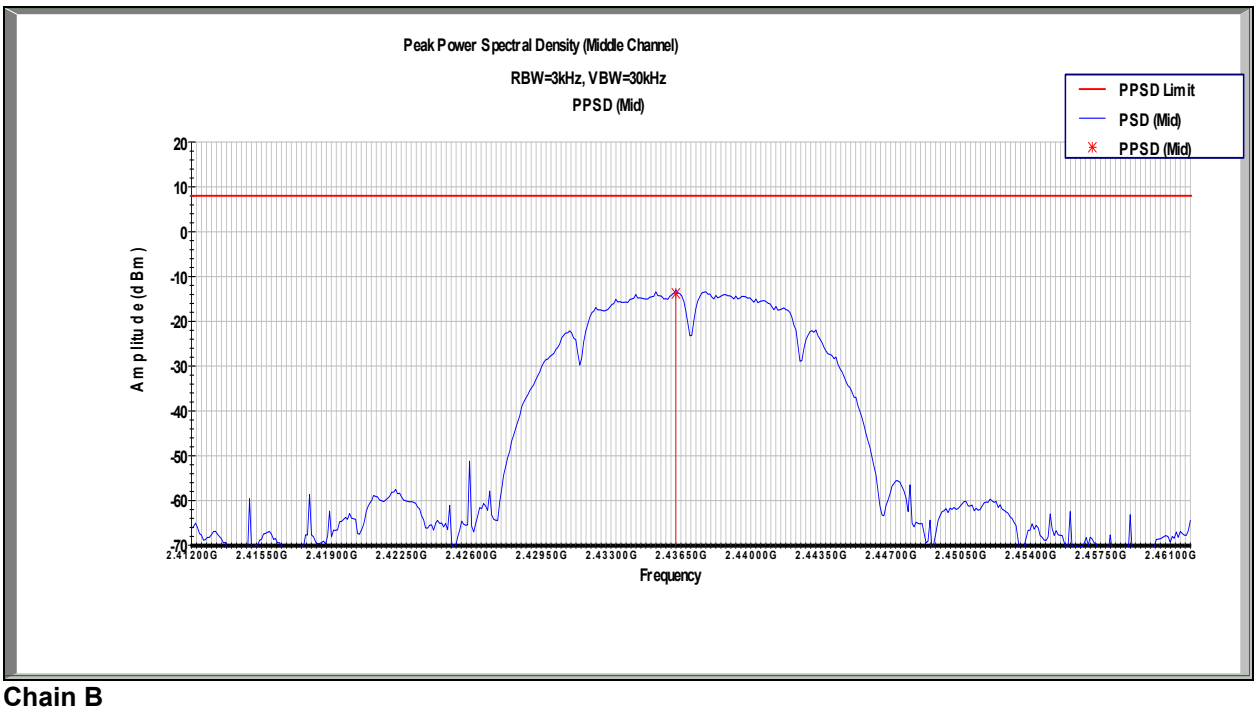


Chain B

Power Spectral Density – Channel 6 802.11b

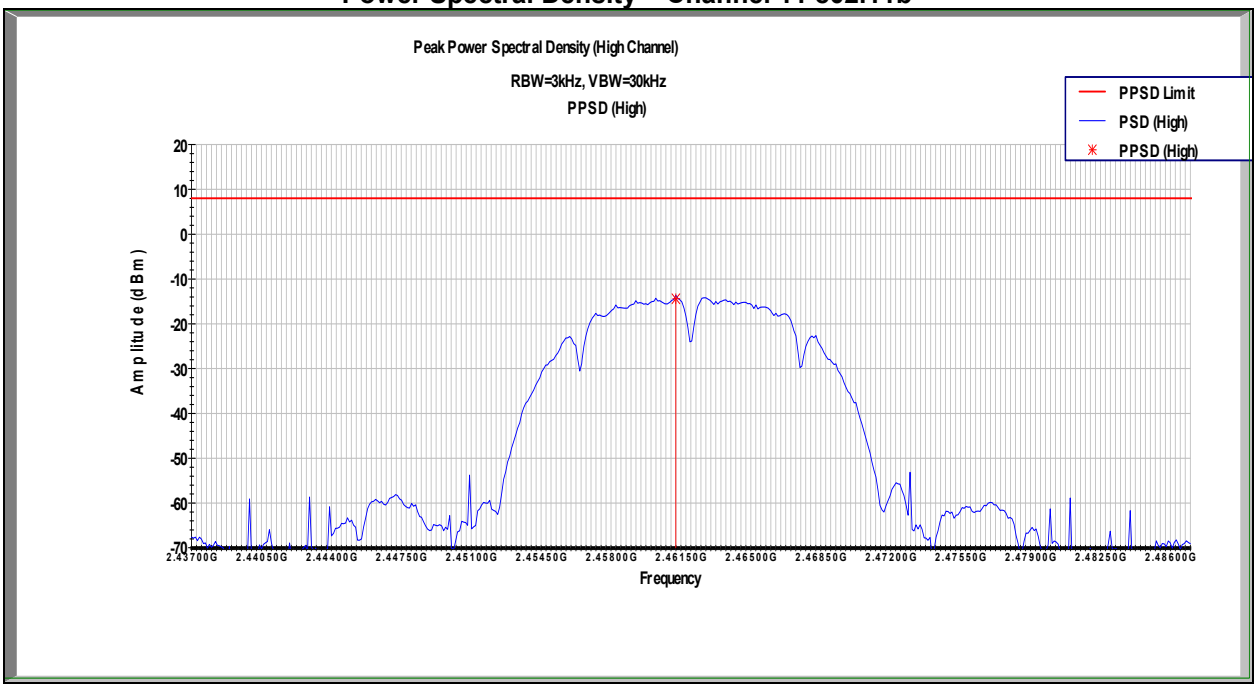


Chain A

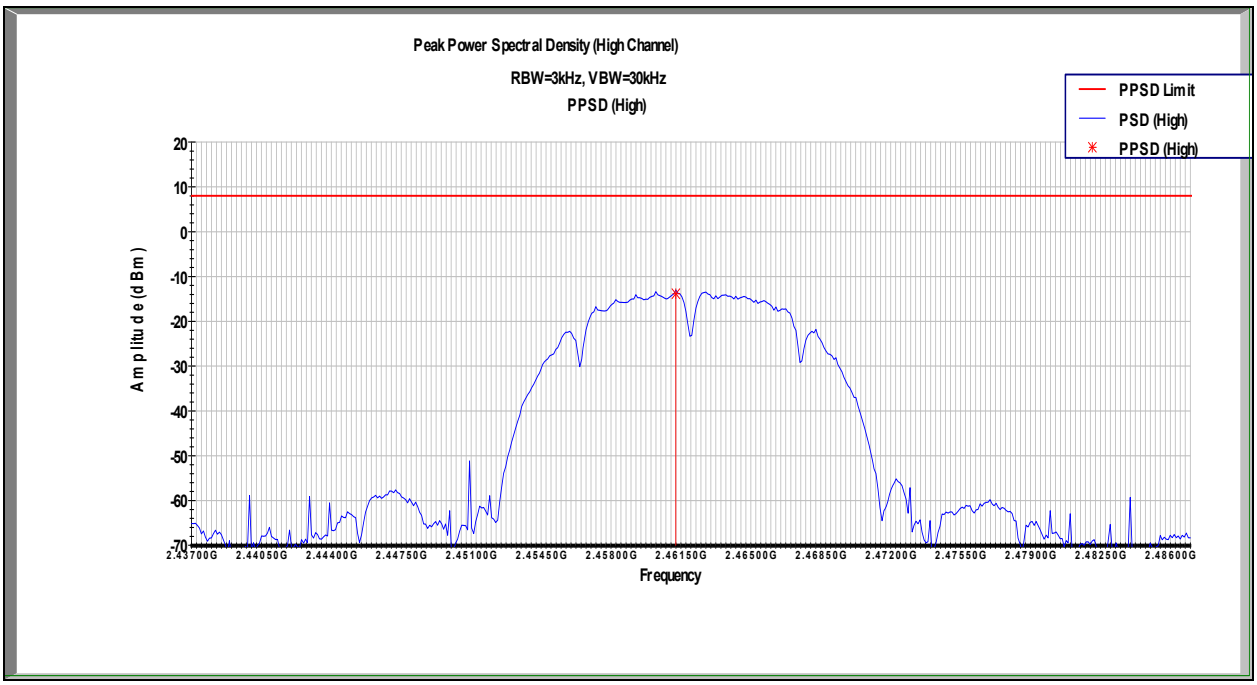


Chain B

Power Spectral Density – Channel 11 802.11b

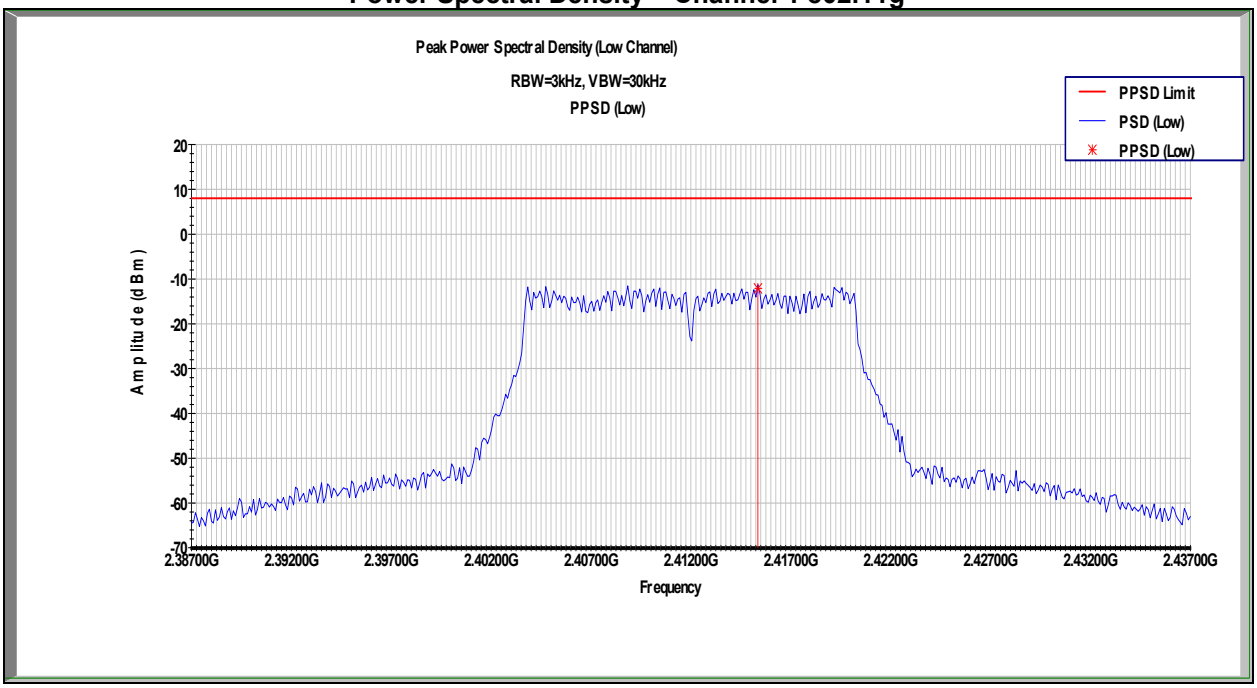


Chain A

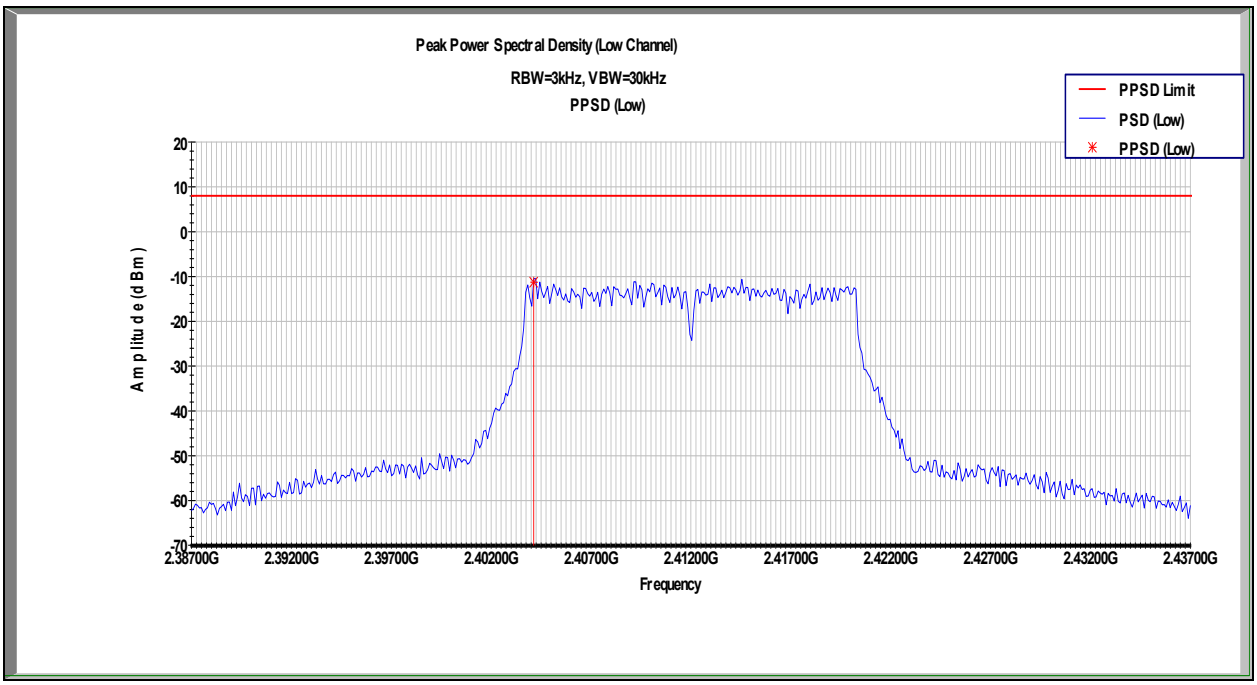


Chain B

Power Spectral Density – Channel 1 802.11g

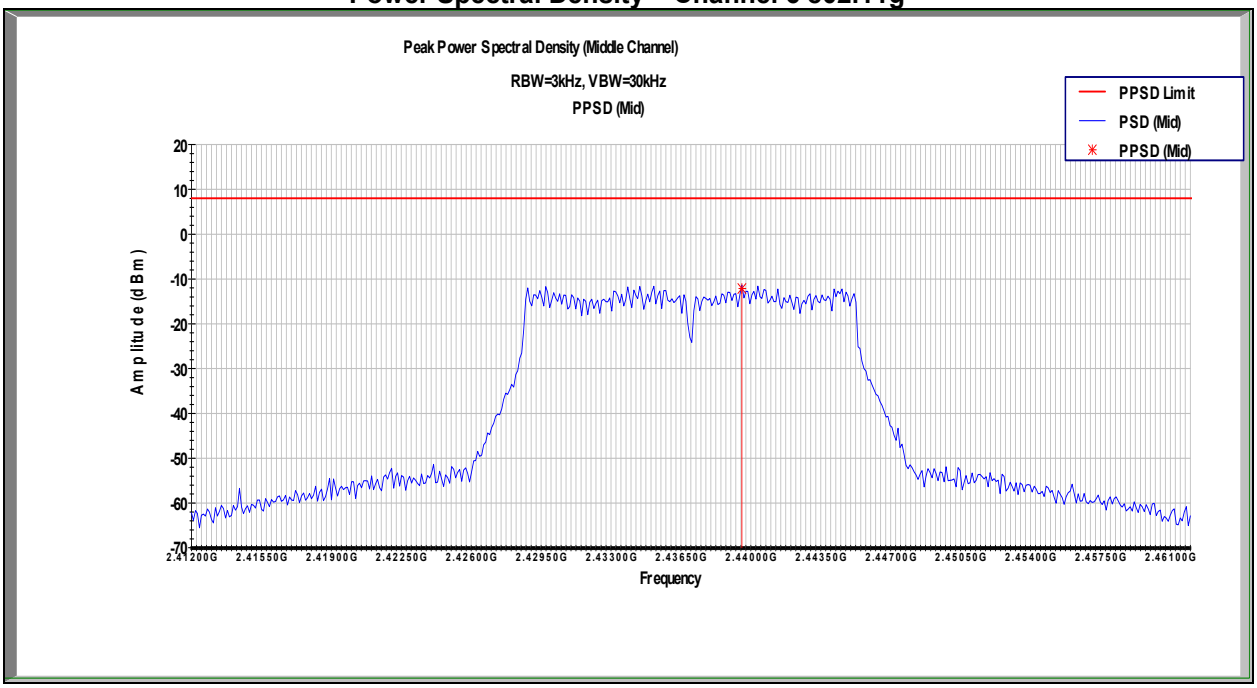


Chain A

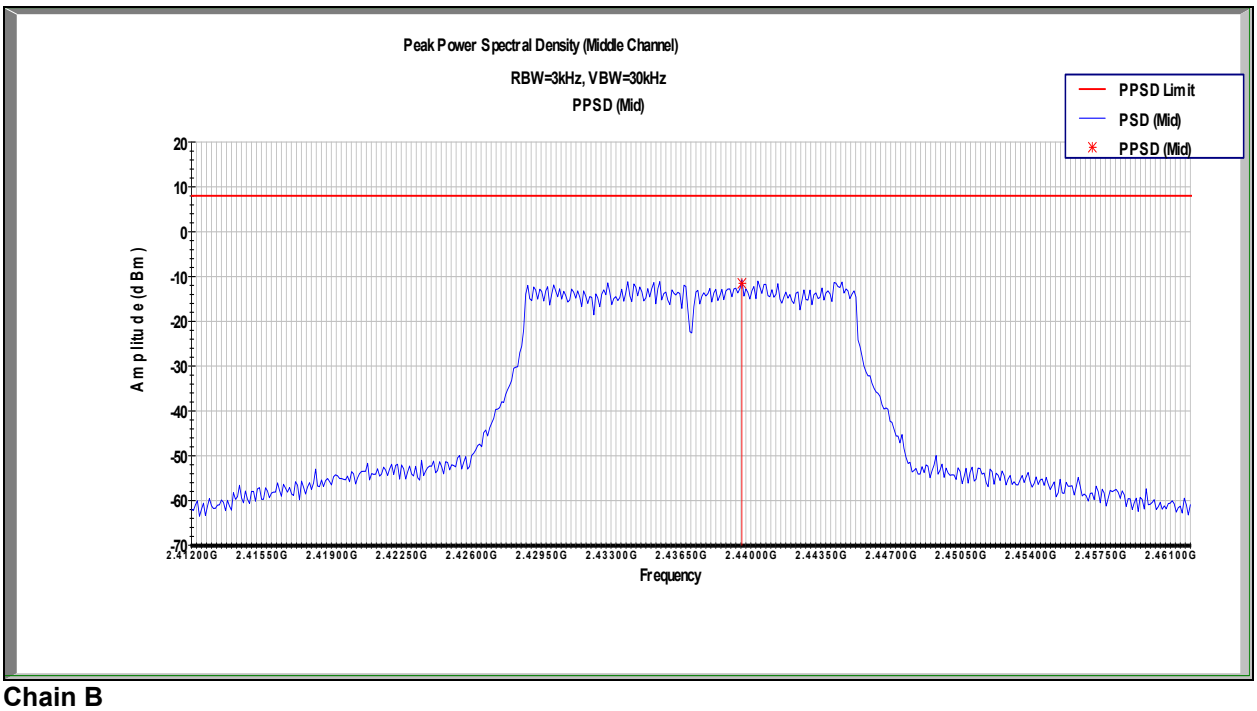


Chain B

Power Spectral Density – Channel 6 802.11g

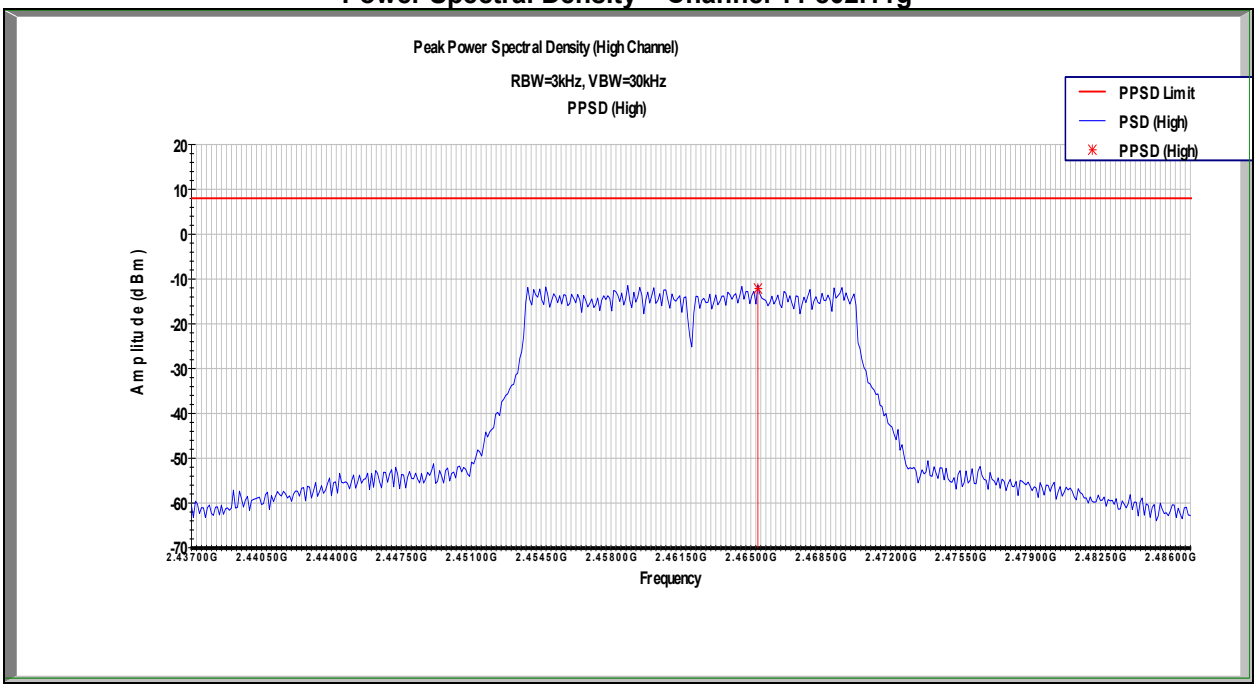


Chain A

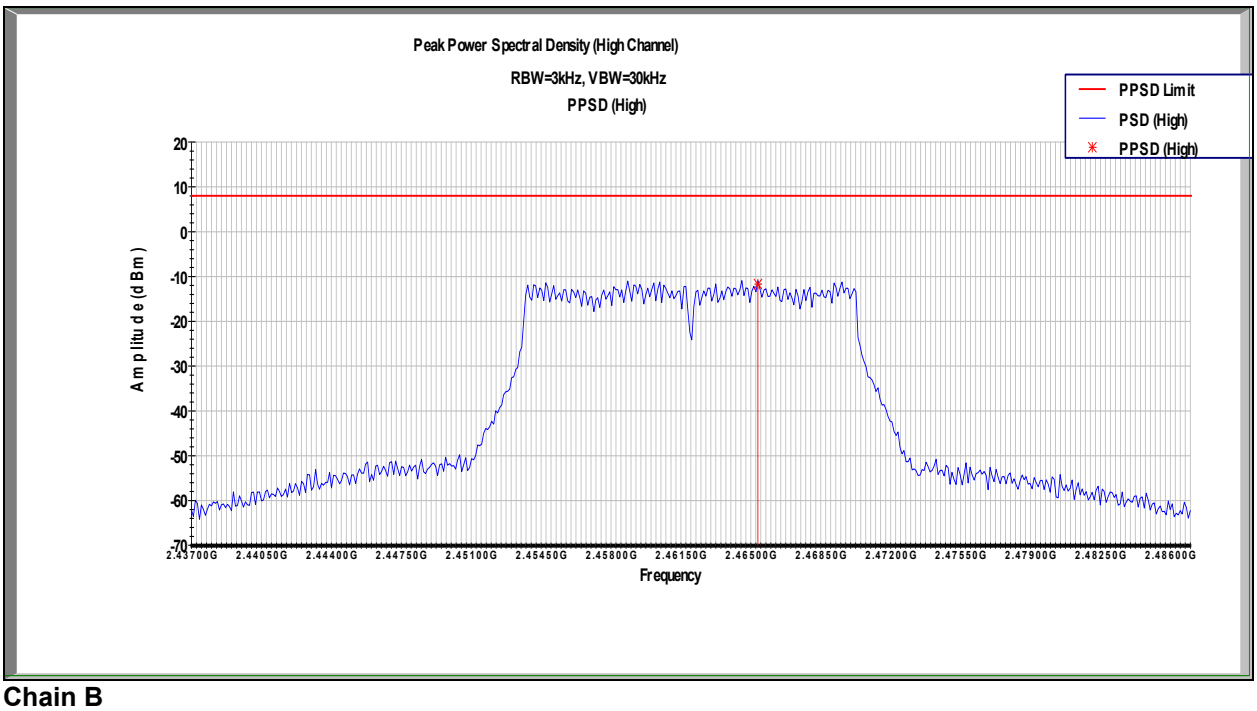


Chain B

Power Spectral Density – Channel 11 802.11g

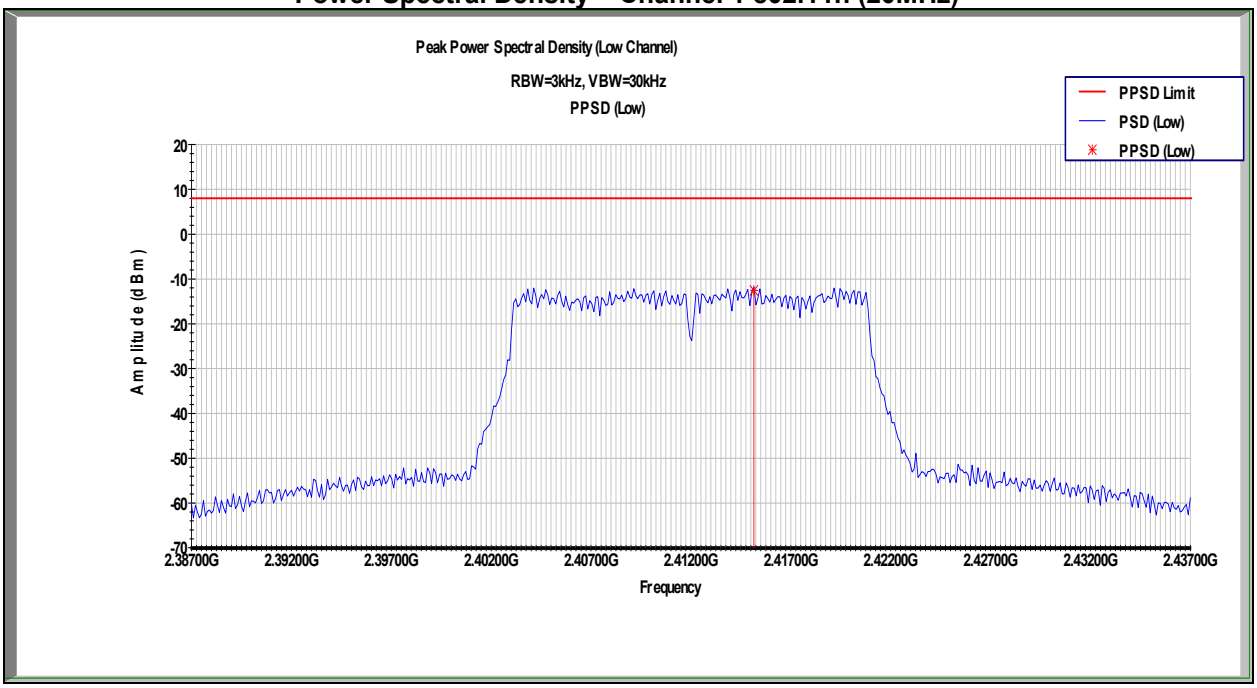


Chain A

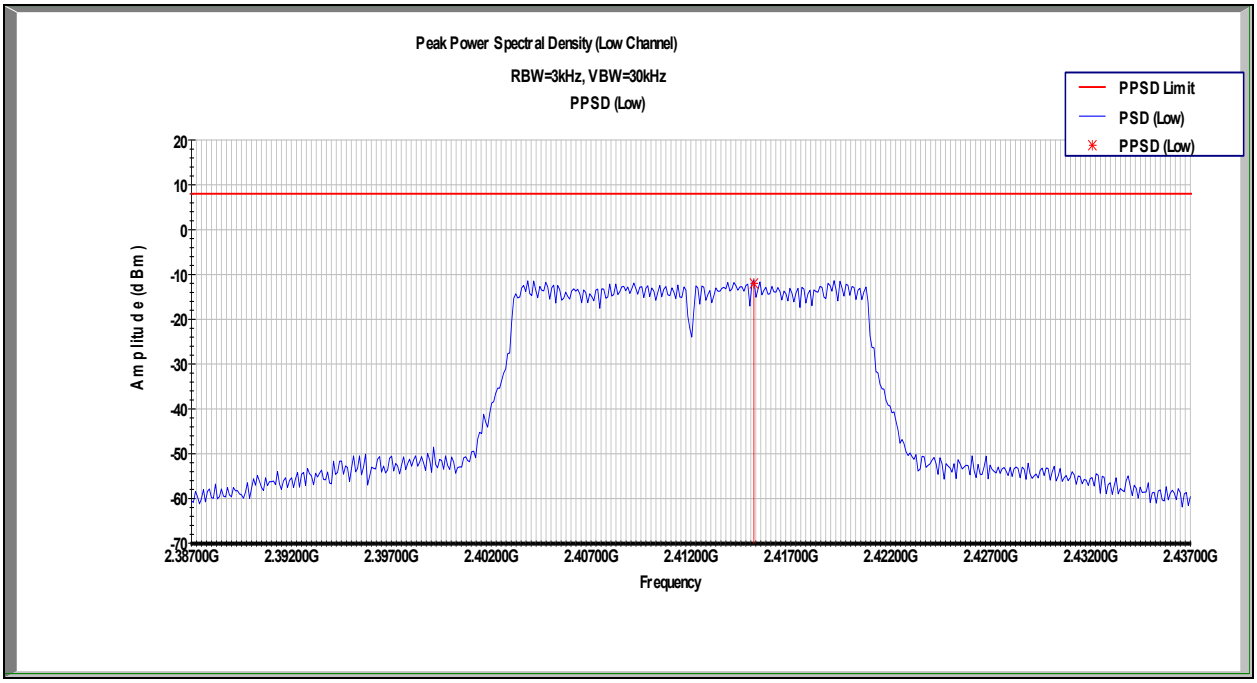


Chain B

Power Spectral Density – Channel 1 802.11n (20MHz)

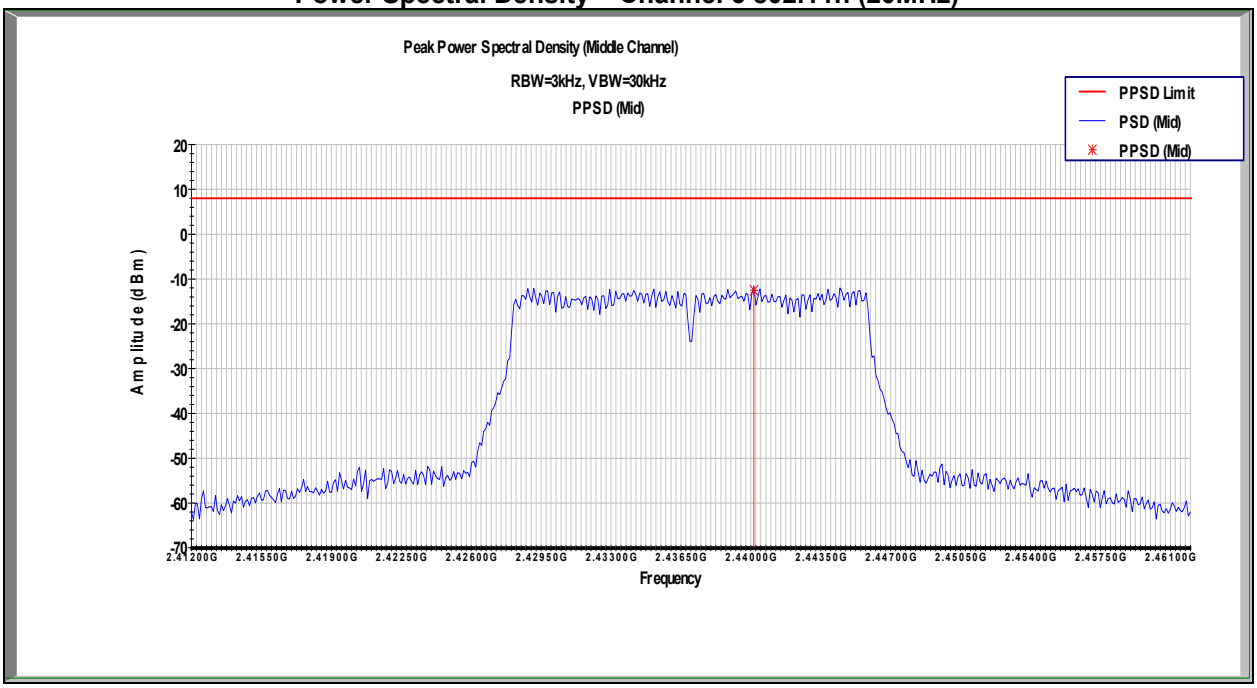


Chain A

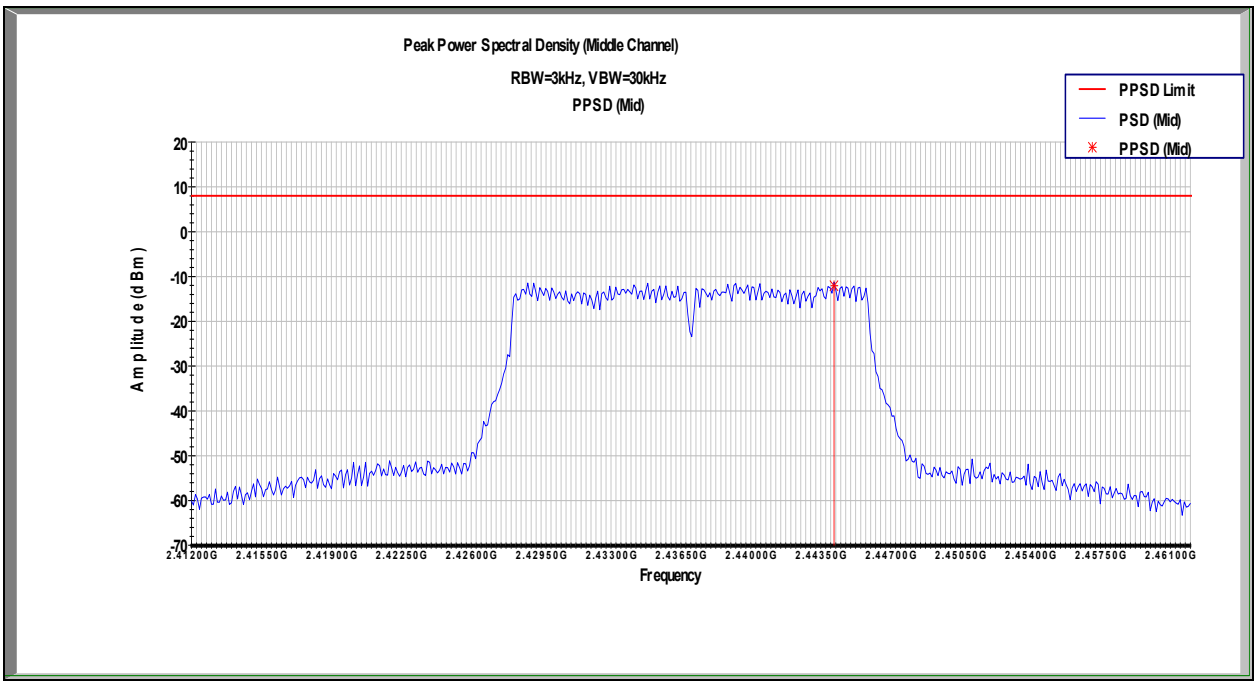


Chain B

Power Spectral Density – Channel 6 802.11n (20MHz)

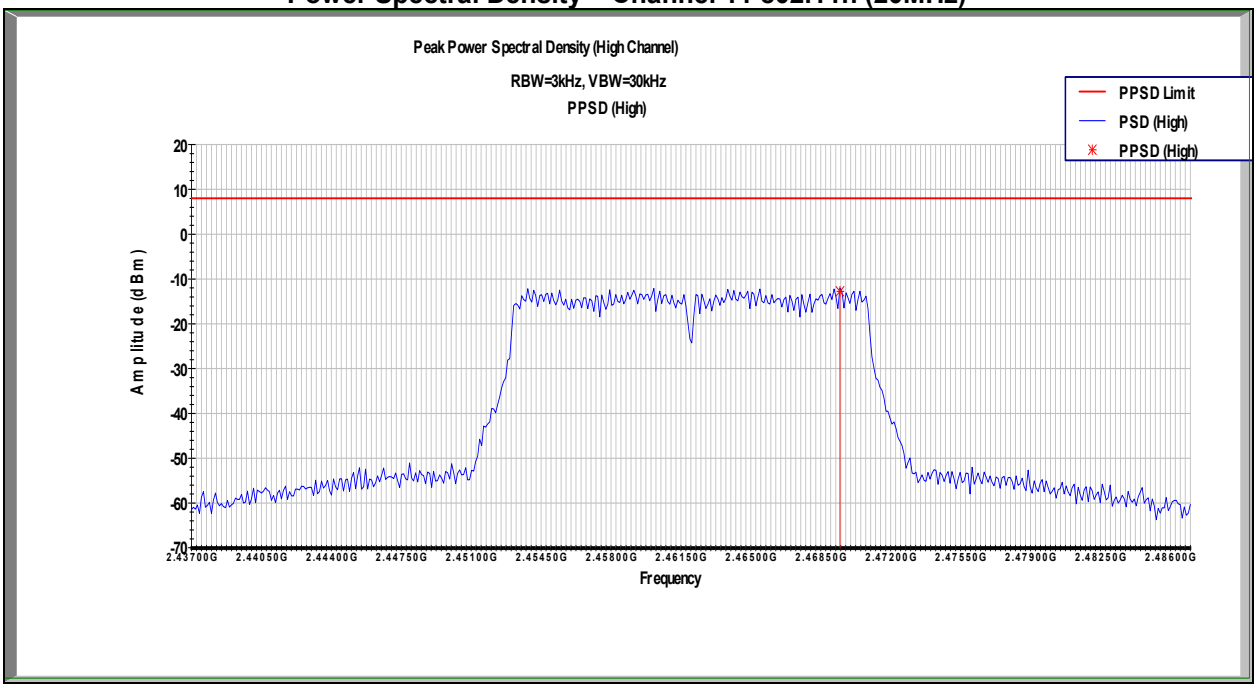


Chain A

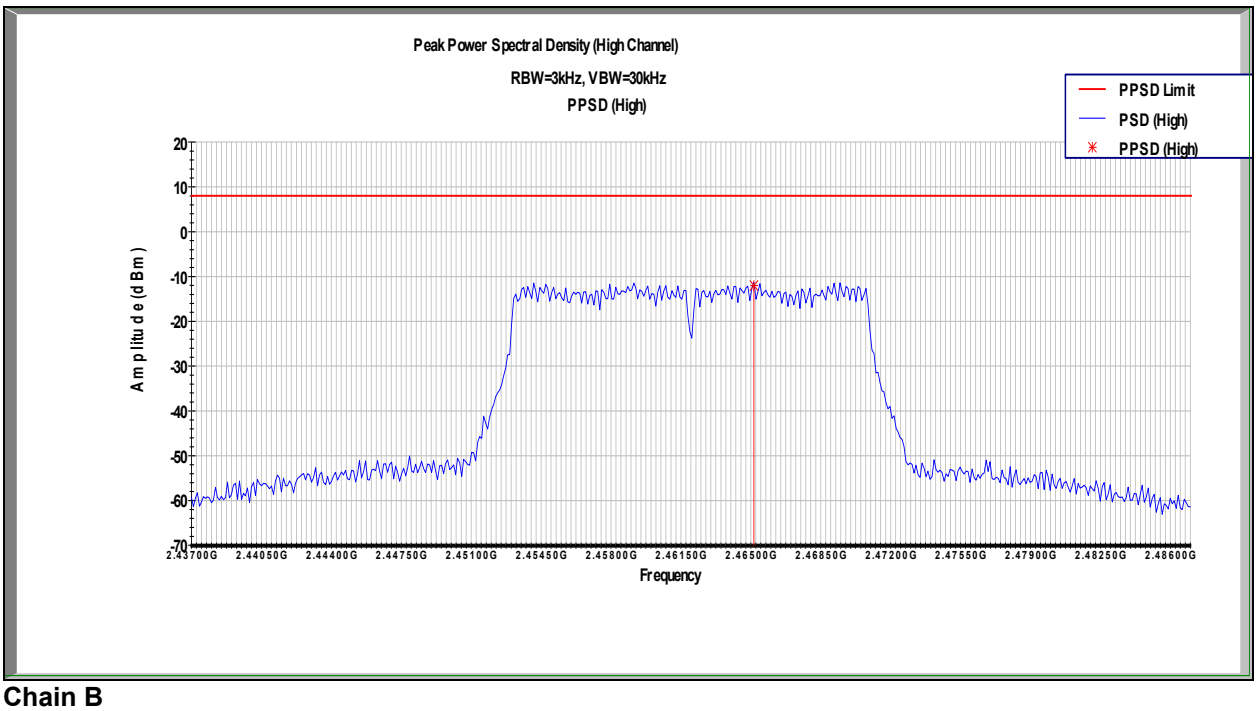


Chain B

Power Spectral Density – Channel 11 802.11n (20MHz)

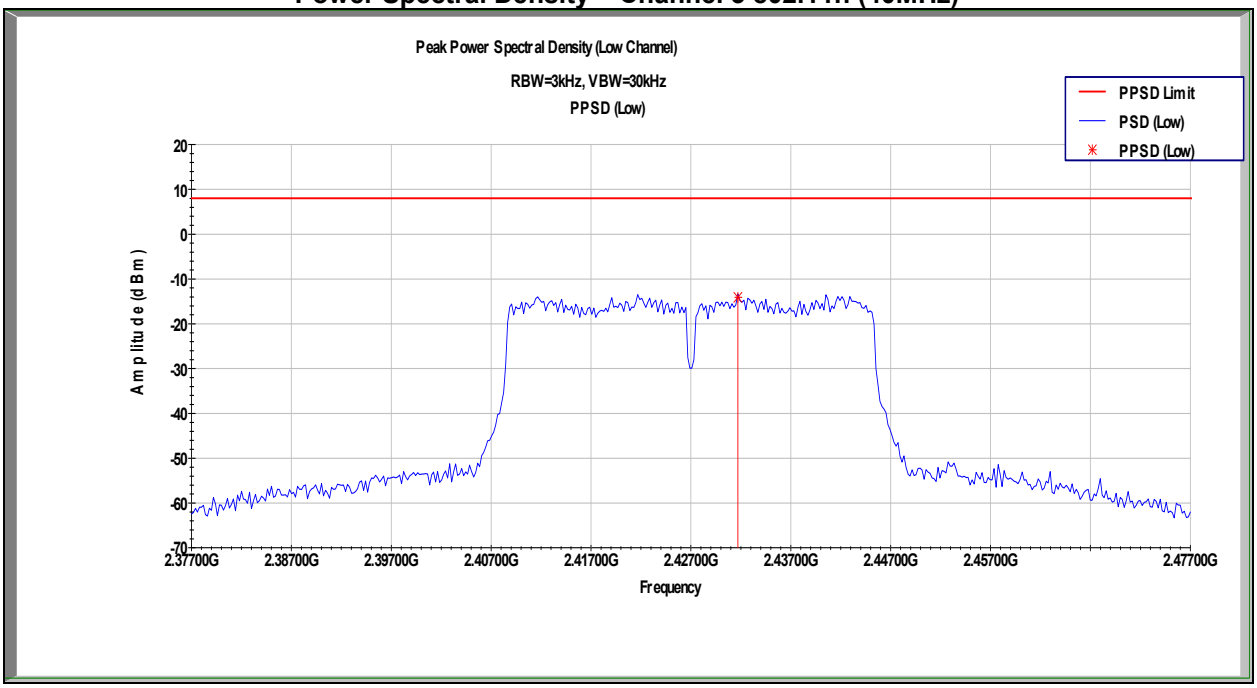


Chain A

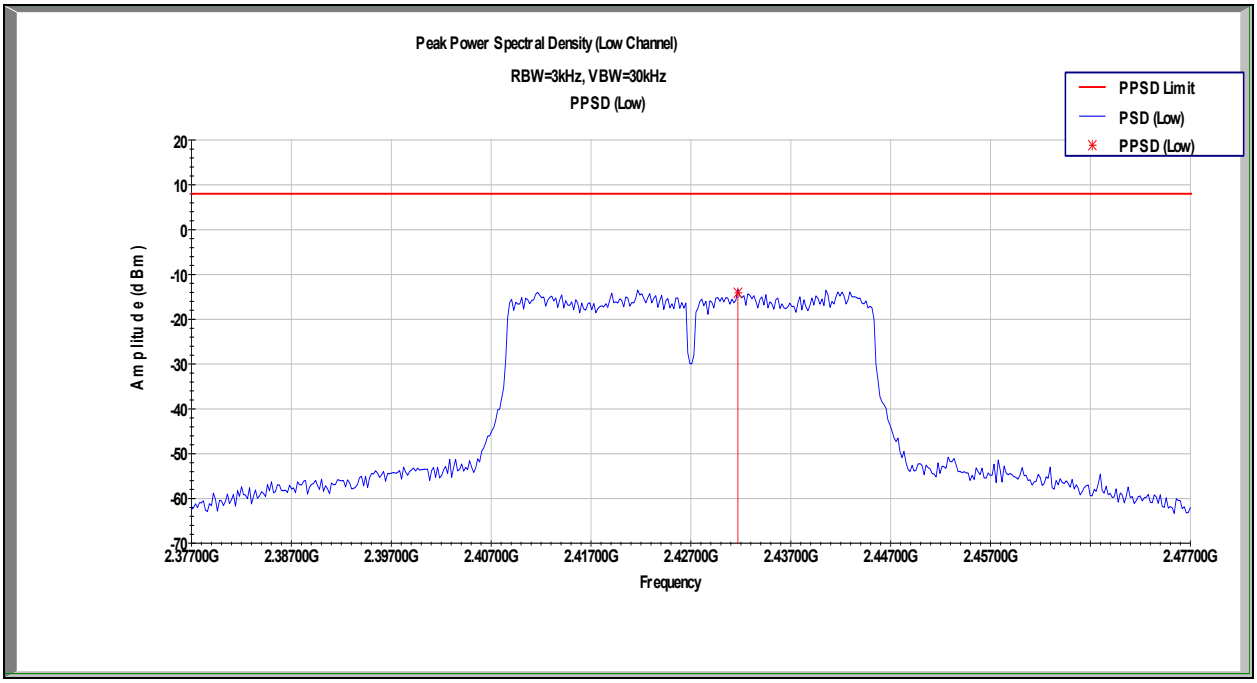


Chain B

Power Spectral Density – Channel 3 802.11n (40MHz)

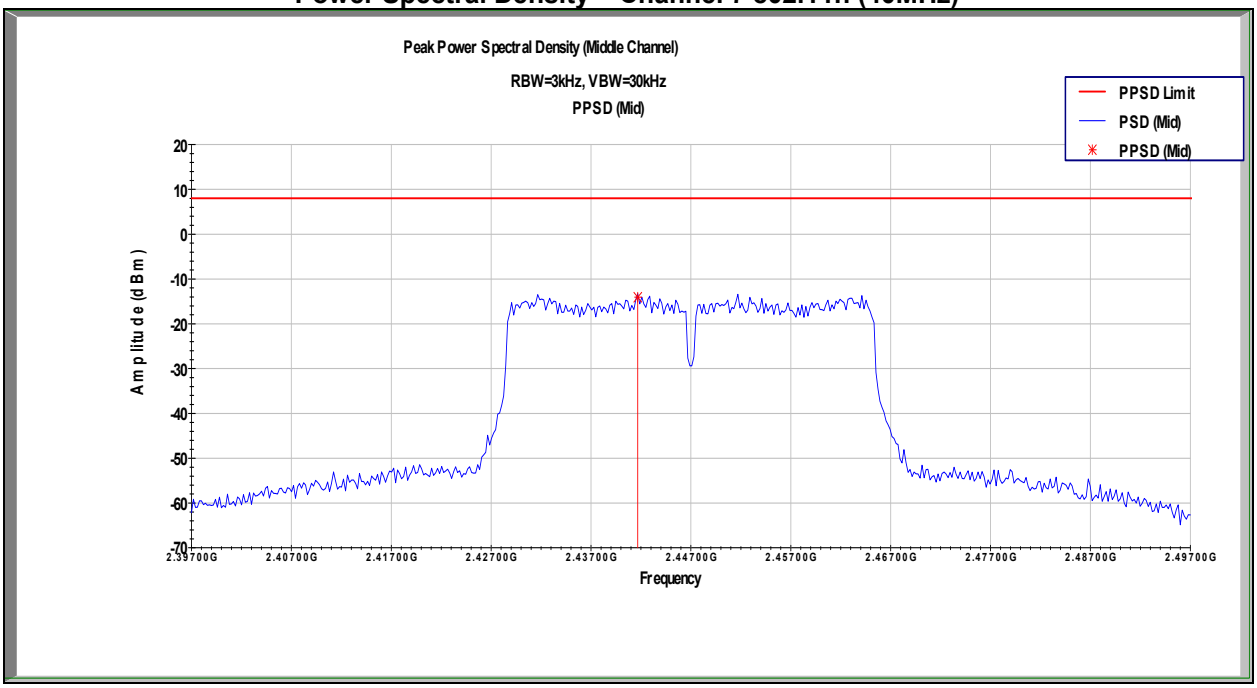


Chain A

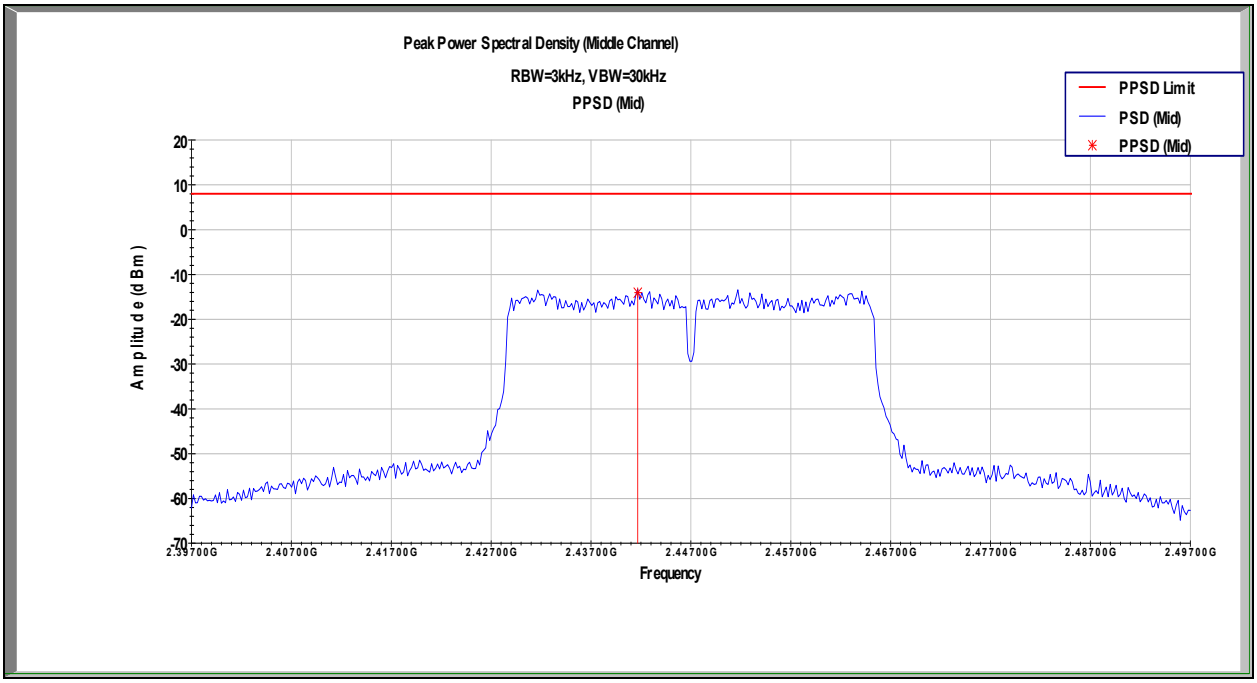


Chain B

Power Spectral Density – Channel 7 802.11n (40MHz)

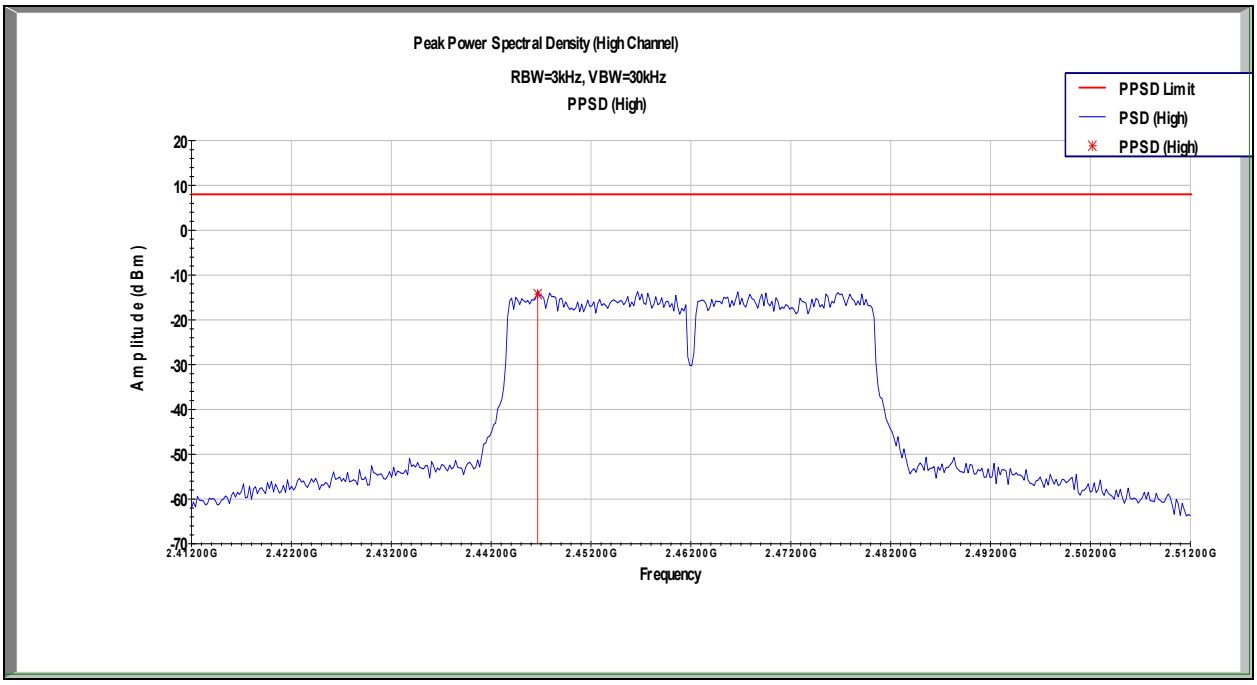


Chain A

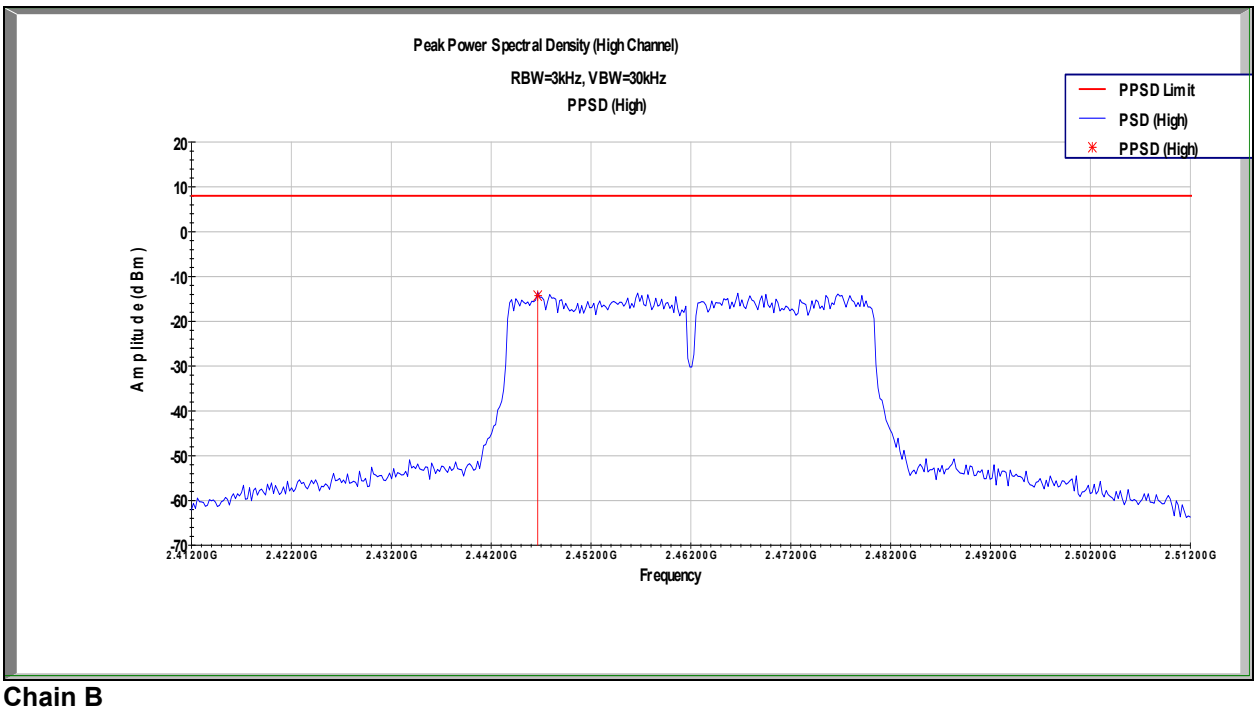


Chain B

Power Spectral Density – Channel 11 802.11n (40MHz)



Chain A



Chain B

9 Radiated Spurious Emissions (Transmitter)

9.1 Test Limits:

§ 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

RSS-247(5.5): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Part 15.205(a): Restricted Bands of Operations

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	[2]
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

Part 15.209(a): Field Strength Limits for Restricted Bands of Operation

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

9.2 Test Procedure:

ANSI C63.10: 2013 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

9.3 Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculations are listed below:

Formula:
FS = RA + AF + CF

FS = Field Strength in dBμV/m
RA = Receiver Amplitude in dBμV
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dBμV
AF = 18.52 dB
CF = 0.78 dB

FS = 19.48 + 18.52 + 0.78 = 38.78 dBμV/m
Level in μV/m = Common Antilogarithm [(38.78 dBμV/m)/20] = 86.89 μV/m

9.4 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1302.6005.40	Rohde & Schwarz	ESU40	10/12/2017	10/12/2018
Preamplifier	122005	Rohde & Schwarz	TS-PR18	11/17/2016	11/17/2017
Biconnilog Antenna	00051864	ETS	3142C	4/6/2017	4/6/2018
Horn Antenna	154521	ETS	3117	11/14/2016	11/14/2017
System Controller	121701-1	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Horn Antenna (18 - 40GHz)	117798	ETS	3116c	6/5/2017	6/5/2018
40GHz Preamplifier	3921	Rohde & Schwarz	TS-PR40	11/17/2016	11/17/2017
Highpass Filter	SN1	Wainwright	WHKX12-2533.85-2710-18000-40ss	Verify at Time of Use	Verify at Time of Use
3m Cable Antenna→Preamp	3074			11/17/2016	11/17/2017
3m Cable Preamp→Chamber	2588			11/17/2016	11/17/2017
3m Cable Chamber→Control Room	2593			11/17/2016	11/17/2017
3m Cable Control Room→Receiver	2592			11/17/2016	11/17/2017
10m Cable Antenna→Preamp	3339			11/17/2016	11/17/2017
10m Cable Preamp→Chamber	3172			11/17/2016	11/17/2017
10m Cable Chamber→Control Room	2590			11/17/2016	11/17/2017
10m Cable Control Room→Receiver	2589			11/17/2016	11/17/2017

9.5 Test Conditions:

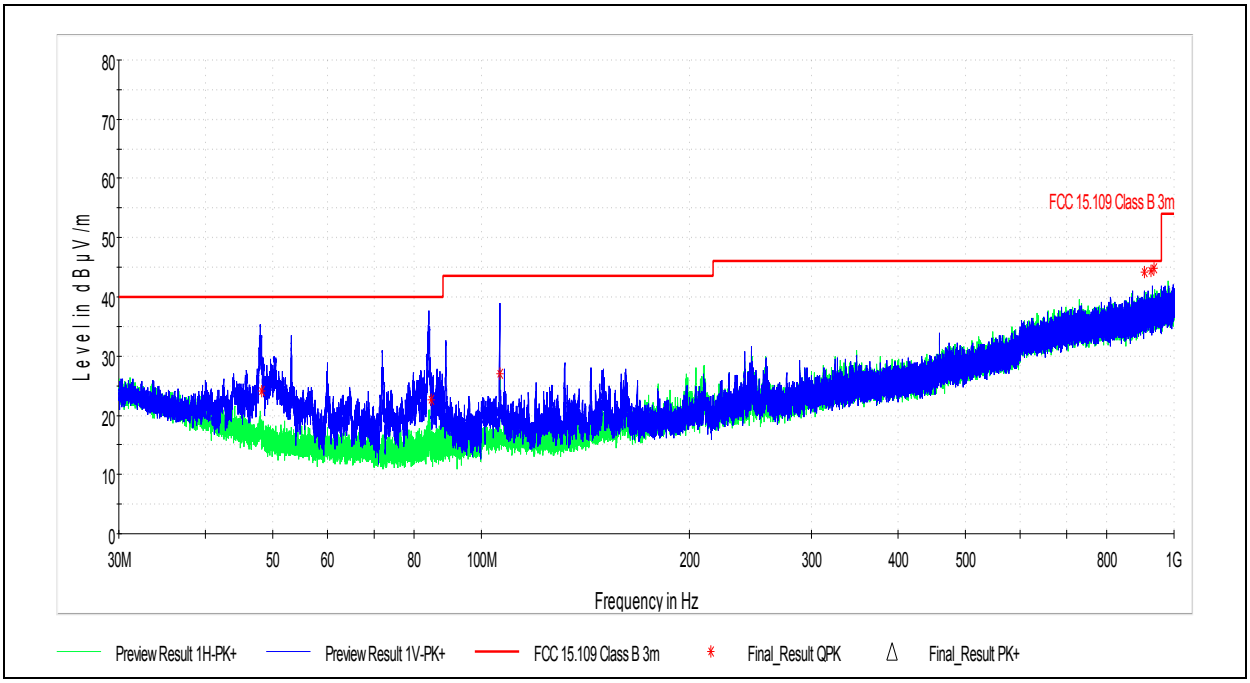
Test Personnel:	Carmen Davis	Test Date:	10/25/2017, 10/26/2017
Supervising/Reviewing Engineer: (Where Applicable)	NA	Ambient Temperature:	22.4C
Input Voltage:	5VDC via USB	Relative Humidity:	44.9%
		Atmospheric Pressure:	995.6mbar

9.6 Test Results:

The device was found to be **compliant**. All spurious emissions were attenuated by at least 20dB below the level of the fundamental as required by Part 15.247(d). Additionally, all emissions falling within restricted bands of operation and at the band edges were found to be below the limit specified in Part 15.209(a). The spurious emissions listed in the following tables are the worst case emissions. Emissions were investigated with the test sample positioned in 3 orthogonal axis and the worst case reported.

9.7 Test Data:

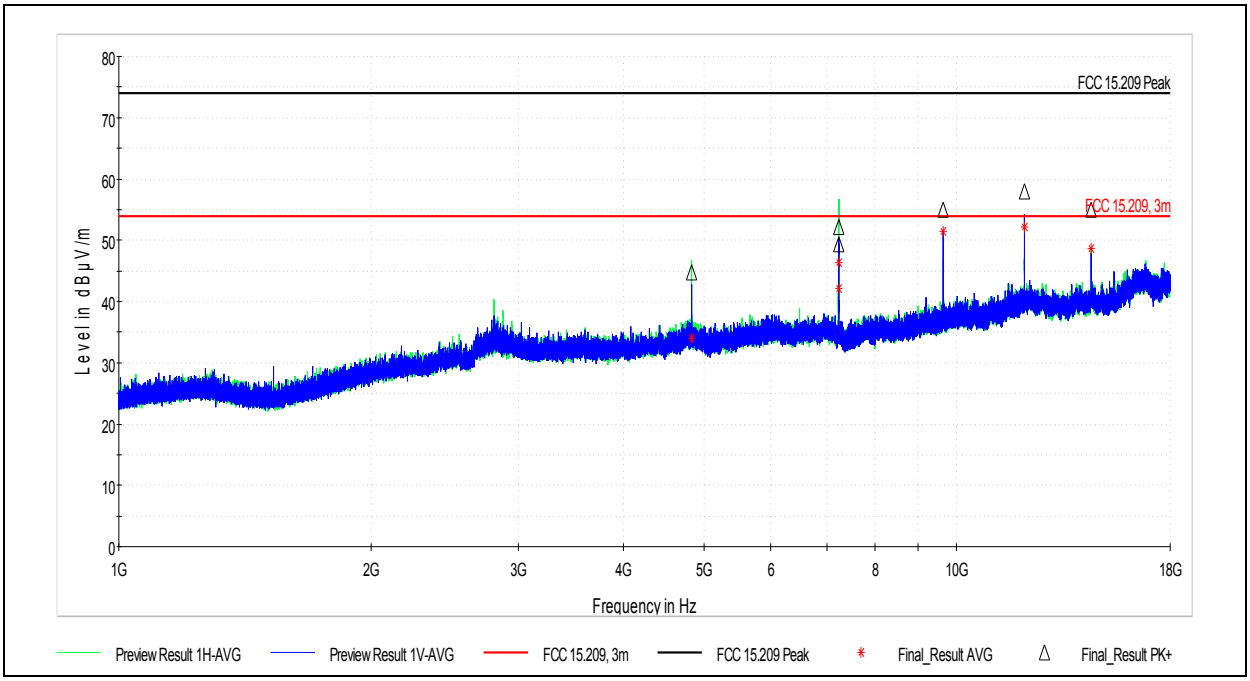
802.11b Channel 6, 30MHz – 1GHz Data
(Worst case is shown and is representative of all channels)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.204000	24.03	40.00	15.97	120.000	104.7	V	313.0	17.0
84.718000	22.66	40.00	17.34	120.000	145.2	V	0.0	16.2
106.460000	27.09	43.52	16.43	120.000	105.3	V	0.0	16.8
905.280000	44.18	46.02	1.84	120.000	263.4	V	202.0	35.8
925.960000	44.50	46.02	1.52	120.000	202.4	V	54.0	36.0
936.660000	44.83	46.02	1.19	120.000	335.1	H	314.0	36.1

802.11b Channel 1 Worst Case RSE



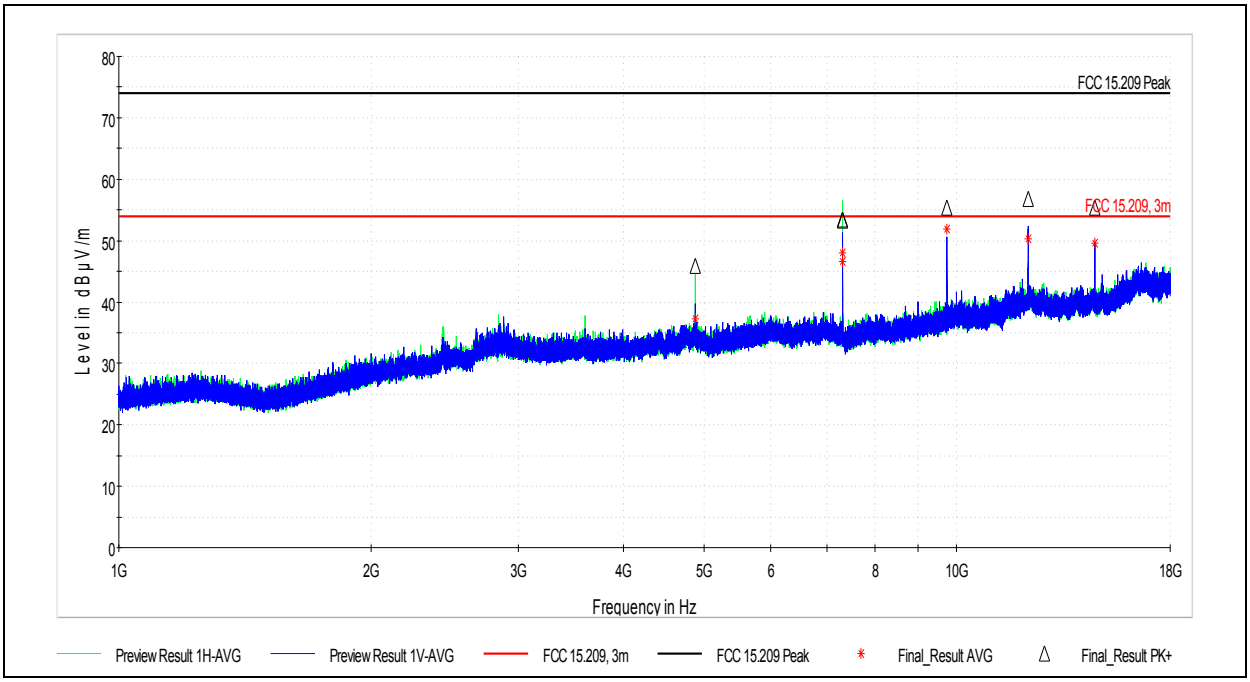
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4824.094500	44.82	74.00	29.18	1000.000	129.0	H	20.0	7.5
7234.020000	49.29	74.00	24.71	1000.000	177.0	H	50.0	10.4
7237.383000	52.12	74.00	21.88	1000.000	200.0	H	40.0	10.4
9647.982500	54.91	74.00	19.09	1000.000	200.0	V	32.0	13.6
12061.503500	58.03	74.00	15.97	1000.000	200.0	V	24.0	17.4
14472.030000	55.02	74.00	18.98	1000.000	200.0	V	38.0	17.2

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4824.094500	34.00	54.00	20.00	1000.000	129.0	H	20.0	7.5
7234.020000	42.10	54.00	11.90	1000.000	177.0	H	50.0	10.4
7237.383000	46.39	54.00	7.61	1000.000	200.0	H	40.0	10.4
9647.982500	51.44	54.00	2.56	1000.000	200.0	V	32.0	13.6
12061.503500	52.20	54.00	1.80	1000.000	200.0	V	24.0	17.4
14472.030000	48.64	54.00	5.36	1000.000	200.0	V	38.0	17.2

802.11b Channel 6 Worst Case RSE



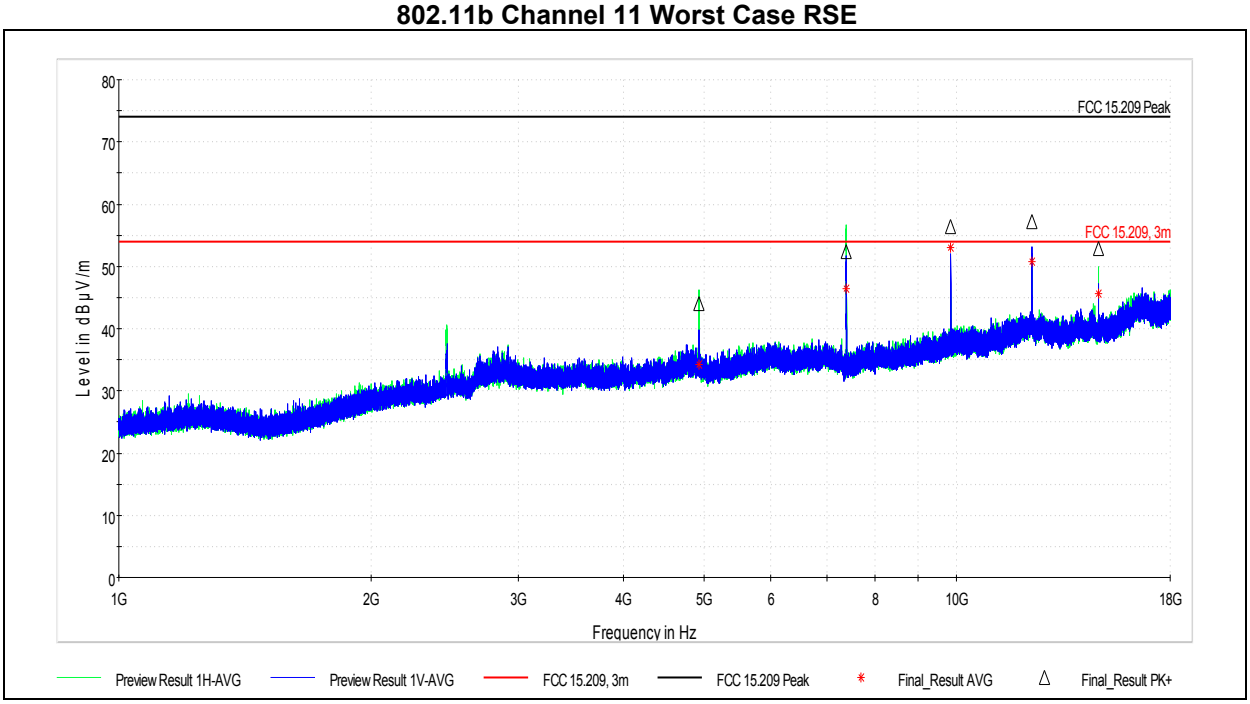
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4874.065000	45.89	74.00	28.11	1000.000	100.0	H	0.0	7.4
7310.429500	53.20	74.00	20.80	1000.000	200.0	H	0.0	10.5
7311.335000	53.48	74.00	20.52	1000.000	200.0	H	0.0	10.5
9747.964500	55.30	74.00	18.70	1000.000	200.0	V	27.0	13.7
12185.989500	56.75	74.00	17.25	1000.000	200.0	V	18.0	17.2
14621.929500	55.33	74.00	18.67	1000.000	200.0	V	27.0	17.3

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4874.065000	37.31	54.00	16.69	1000.000	100.0	H	0.0	7.4
7310.429500	47.95	54.00	6.05	1000.000	200.0	H	0.0	10.5
7311.335000	46.67	54.00	7.33	1000.000	200.0	H	0.0	10.5
9747.964500	51.81	54.00	2.19	1000.000	200.0	V	27.0	13.7
12185.989500	50.30	54.00	3.70	1000.000	200.0	V	18.0	17.2
14621.929500	49.64	54.00	4.36	1000.000	200.0	V	27.0	17.3

802.11b Channel 11 Worst Case RSE



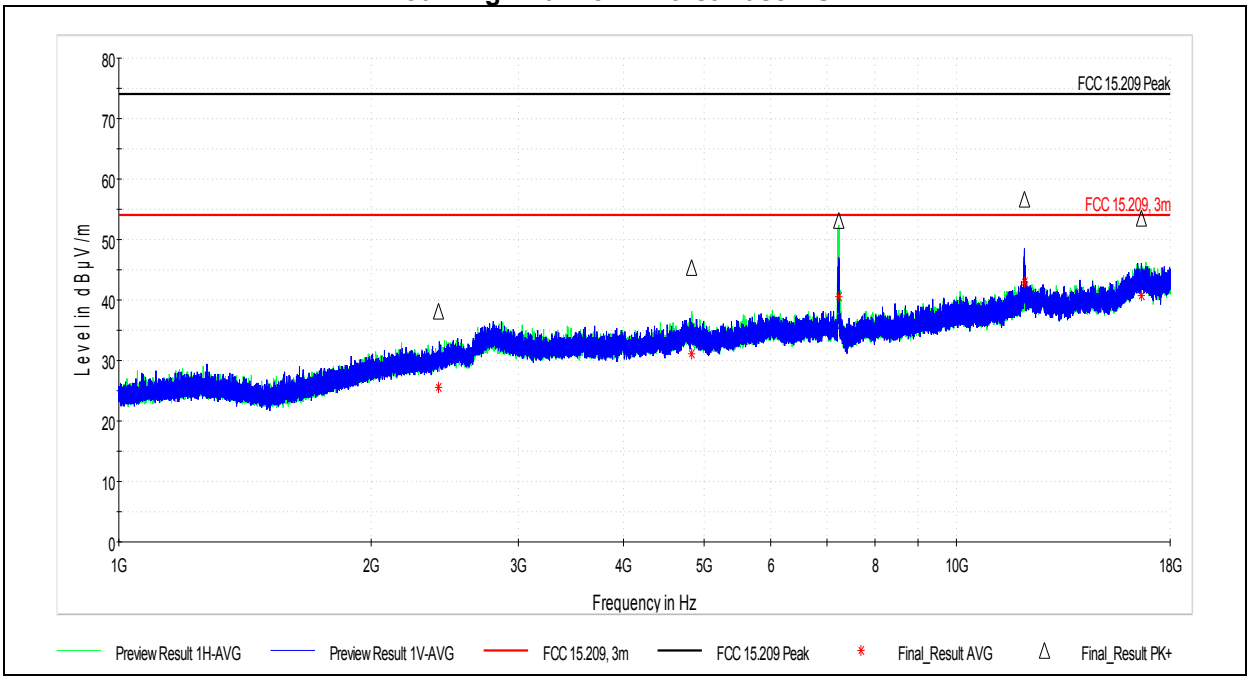
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4923.877500	44.09	74.00	29.91	1000.000	200.0	V	18.0	7.3
7389.095000	52.30	74.00	21.70	1000.000	137.0	V	29.0	10.7
9847.972500	56.35	74.00	17.65	1000.000	200.0	V	38.0	14.0
12311.025000	57.13	74.00	16.87	1000.000	200.0	V	38.0	17.1
14772.003000	52.86	74.00	21.14	1000.000	200.0	V	0.0	17.7

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4923.877500	34.28	54.00	19.72	1000.000	200.0	V	18.0	7.3
7389.095000	46.47	54.00	7.53	1000.000	137.0	V	29.0	10.7
9847.972500	52.98	54.00	1.02	1000.000	200.0	V	38.0	14.0
12311.025000	50.75	54.00	3.25	1000.000	200.0	V	38.0	17.1
14772.003000	45.59	54.00	8.41	1000.000	200.0	V	0.0	17.7

802.11g Channel 1 Worst Case RSE



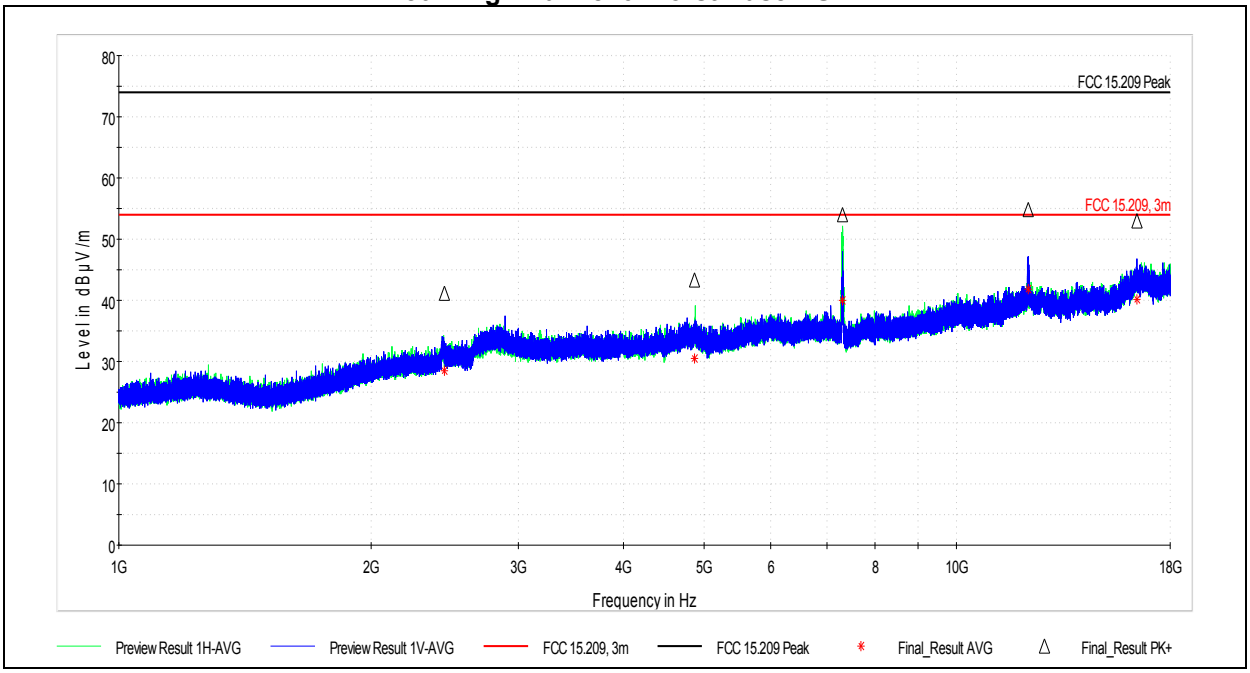
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2408.625000	38.13	74.00	35.87	1000.000	160.0	V	50.0	3.9
4824.388500	45.44	74.00	28.56	1000.000	100.0	H	18.0	7.5
7243.724500	53.13	74.00	20.87	1000.000	200.0	V	50.0	10.4
12060.284000	56.63	74.00	17.37	1000.000	200.0	V	21.0	17.4
16619.441500	53.48	74.00	20.52	1000.000	146.0	H	23.0	21.5

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2408.625000	25.59	54.00	28.41	1000.000	160.0	V	50.0	3.9
4824.388500	31.12	54.00	22.88	1000.000	100.0	H	18.0	7.5
7243.724500	40.50	54.00	13.50	1000.000	200.0	V	50.0	10.4
12060.284000	42.96	54.00	11.04	1000.000	200.0	V	21.0	17.4
16619.441500	40.69	54.00	13.31	1000.000	146.0	H	23.0	21.5

802.11g Channel 6 Worst Case RSE



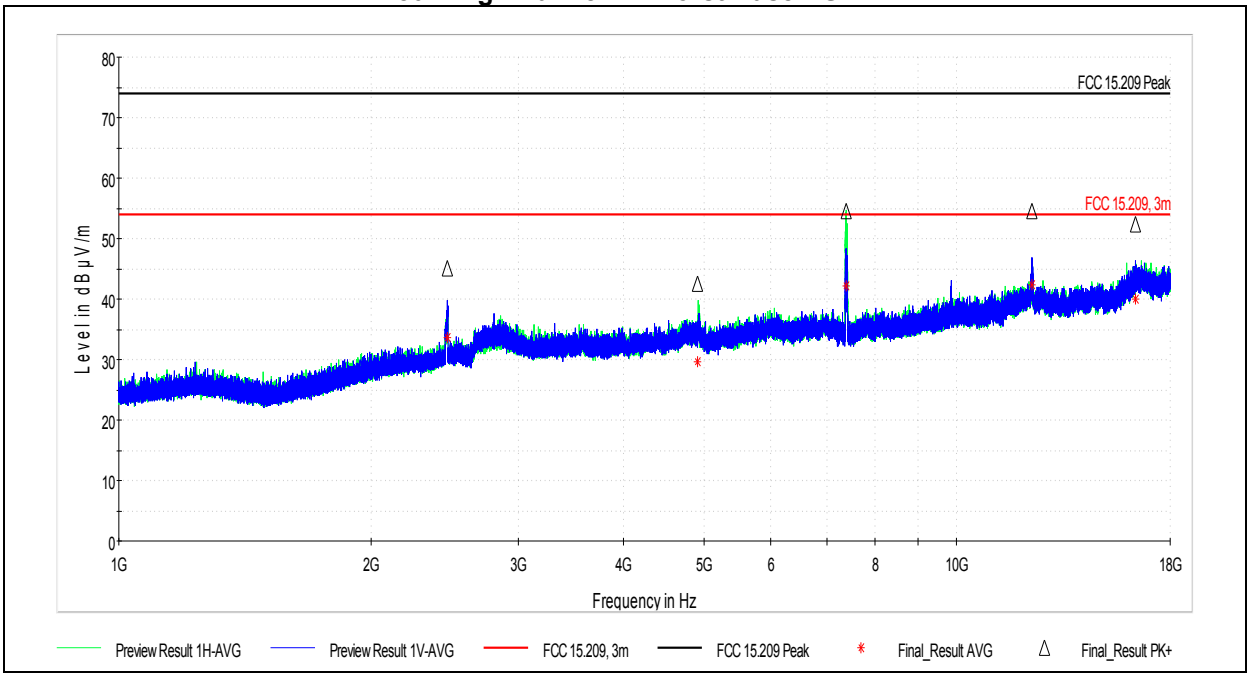
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2445.043500	41.24	74.00	32.76	1000.000	200.0	V	50.0	3.9
4870.620000	43.37	74.00	30.63	1000.000	140.0	H	38.0	7.4
7305.310000	54.08	74.00	19.92	1000.000	200.0	H	0.0	10.5
12189.407500	54.87	74.00	19.13	1000.000	200.0	V	27.0	17.2
16434.422000	53.02	74.00	20.98	1000.000	170.0	V	50.0	21.0

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2445.043500	28.54	54.00	25.46	1000.000	200.0	V	50.0	3.9
4870.620000	30.42	54.00	23.58	1000.000	140.0	H	38.0	7.4
7305.310000	39.93	54.00	14.07	1000.000	200.0	H	0.0	10.5
12189.407500	41.81	54.00	12.19	1000.000	200.0	V	27.0	17.2
16434.422000	40.18	54.00	13.82	1000.000	170.0	V	50.0	21.0

802.11g Channel 11 Worst Case RSE



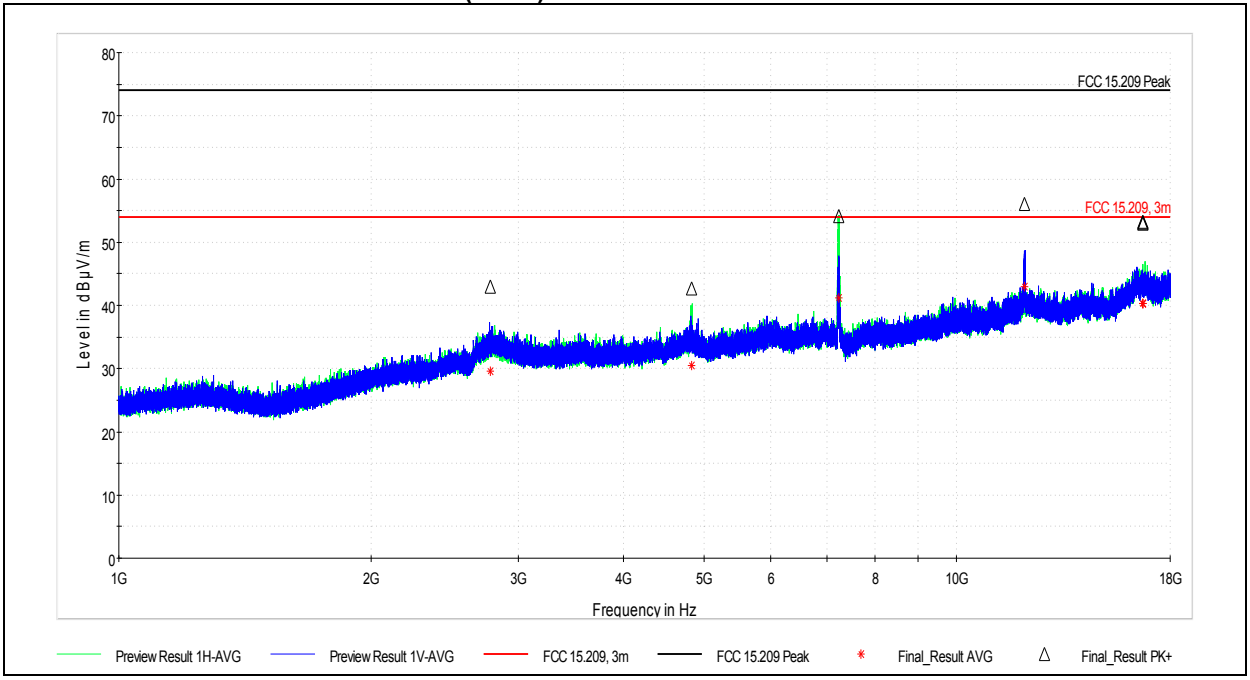
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2469.558000	45.04	74.00	28.96	1000.000	200.0	V	50.0	3.9
4908.595500	42.54	74.00	31.46	1000.000	188.0	V	50.0	7.3
7387.919000	54.48	74.00	19.52	1000.000	126.0	V	36.0	10.7
12307.222500	54.59	74.00	19.41	1000.000	200.0	V	50.0	17.1
16349.398500	52.35	74.00	21.65	1000.000	200.0	H	20.0	20.9

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2469.558000	33.62	54.00	20.38	1000.000	200.0	V	50.0	3.9
4908.595500	29.62	54.00	24.38	1000.000	188.0	V	50.0	7.3
7387.919000	42.27	54.00	11.73	1000.000	126.0	V	36.0	10.7
12307.222500	42.32	54.00	11.68	1000.000	200.0	V	50.0	17.1
16349.398500	39.94	54.00	14.06	1000.000	200.0	H	20.0	20.9

802.11n (HT20) Channel 1 Worst Case RSE



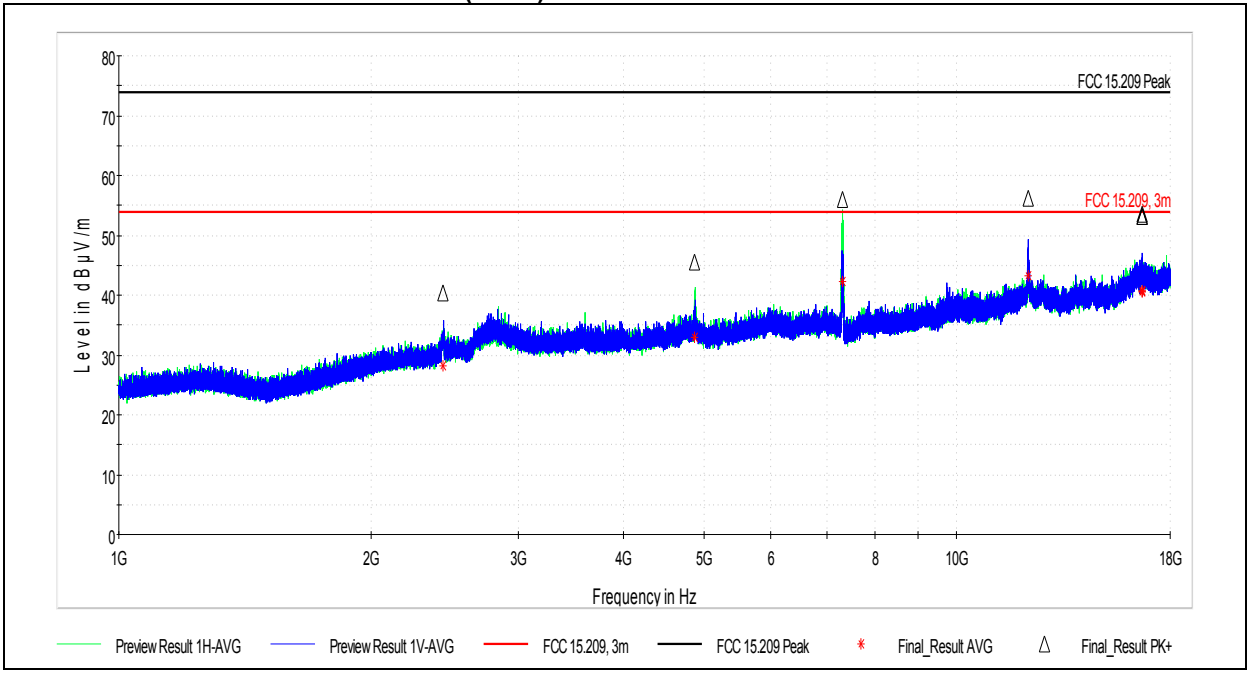
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2776.939000	42.92	74.00	31.08	1000.000	100.0	V	50.0	4.2
4827.284500	42.72	74.00	31.28	1000.000	133.0	H	34.0	7.4
7242.121500	54.17	74.00	19.83	1000.000	200.0	V	39.0	10.4
12062.948500	56.00	74.00	18.00	1000.000	200.0	V	28.0	17.3
16692.031500	53.15	74.00	20.85	1000.000	154.0	H	34.0	21.5
16698.432000	52.91	74.00	21.09	1000.000	200.0	V	38.0	21.4
16698.957000	53.19	74.00	20.81	1000.000	156.0	H	180.0	21.4

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2776.939000	29.53	54.00	24.47	1000.000	100.0	V	50.0	4.2
4827.284500	30.47	54.00	23.53	1000.000	133.0	H	34.0	7.4
7242.121500	41.24	54.00	12.76	1000.000	200.0	V	39.0	10.4
12062.948500	42.98	54.00	11.02	1000.000	200.0	V	28.0	17.3
16692.031500	40.28	54.00	13.72	1000.000	154.0	H	34.0	21.5
16698.432000	40.27	54.00	13.73	1000.000	200.0	V	38.0	21.4
16698.957000	40.27	54.00	13.73	1000.000	156.0	H	180.0	21.4

802.11n (HT20) Channel 6 Worst Case RSE



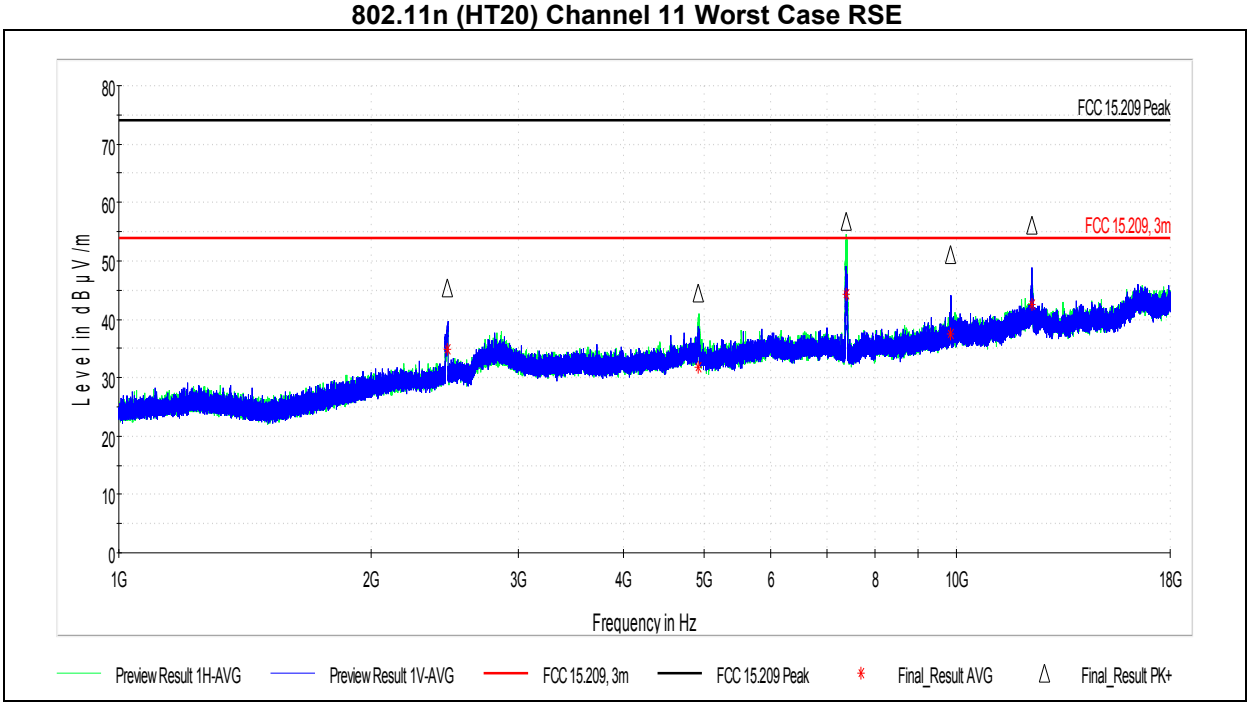
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2438.943500	40.33	74.00	33.67	1000.000	200.0	V	50.0	3.9
4869.271500	45.61	74.00	28.39	1000.000	100.0	H	0.0	7.4
7307.860500	55.95	74.00	18.05	1000.000	188.0	V	50.0	10.5
12189.405000	56.15	74.00	17.85	1000.000	200.0	V	20.0	17.2
16659.974000	53.50	74.00	20.50	1000.000	255.0	V	214.0	21.5
16665.933500	53.23	74.00	20.77	1000.000	170.0	H	38.0	21.5
16667.531000	53.18	74.00	20.82	1000.000	134.0	V	14.0	21.5

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2438.943500	28.19	54.00	25.81	1000.000	200.0	V	50.0	3.9
4869.271500	32.89	54.00	21.11	1000.000	100.0	H	0.0	7.4
7307.860500	42.29	54.00	11.71	1000.000	188.0	V	50.0	10.5
12189.405000	43.19	54.00	10.81	1000.000	200.0	V	20.0	17.2
16659.974000	40.67	54.00	13.33	1000.000	255.0	V	214.0	21.5
16665.933500	40.55	54.00	13.45	1000.000	170.0	H	38.0	21.5
16667.531000	40.57	54.00	13.43	1000.000	134.0	V	14.0	21.5

802.11n (HT20) Channel 11 Worst Case RSE



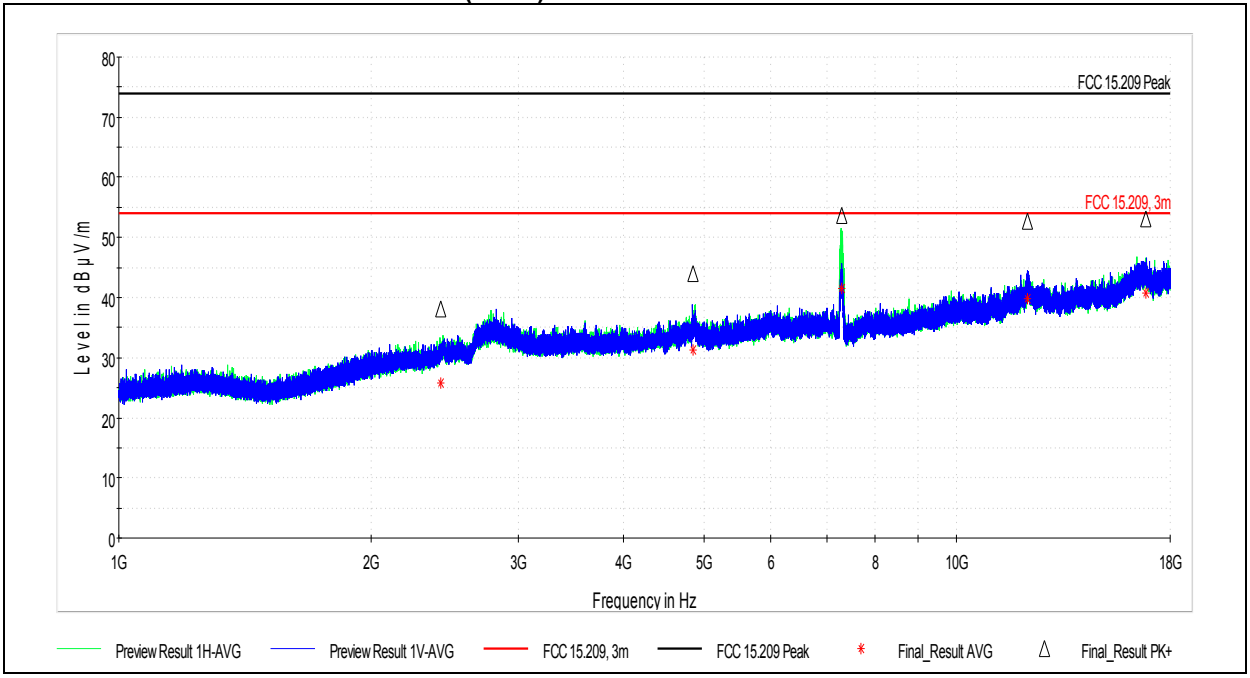
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2469.677500	45.29	74.00	28.71	1000.000	200.0	V	50.0	3.9
4921.175500	44.59	74.00	29.41	1000.000	136.0	H	18.0	7.3
7391.200000	56.67	74.00	17.33	1000.000	200.0	V	50.0	10.7
9840.439500	51.07	74.00	22.93	1000.000	200.0	V	50.0	14.0
12315.064500	56.12	74.00	17.88	1000.000	188.0	V	50.0	17.1

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2469.677500	34.80	54.00	19.20	1000.000	200.0	V	50.0	3.9
4921.175500	31.87	54.00	22.13	1000.000	136.0	H	18.0	7.3
7391.200000	44.27	54.00	9.73	1000.000	200.0	V	50.0	10.7
9840.439500	37.42	54.00	16.58	1000.000	200.0	V	50.0	14.0
12315.064500	42.48	54.00	11.52	1000.000	188.0	V	50.0	17.1

802.11n (HT40) Channel 1 Worst Case RSE



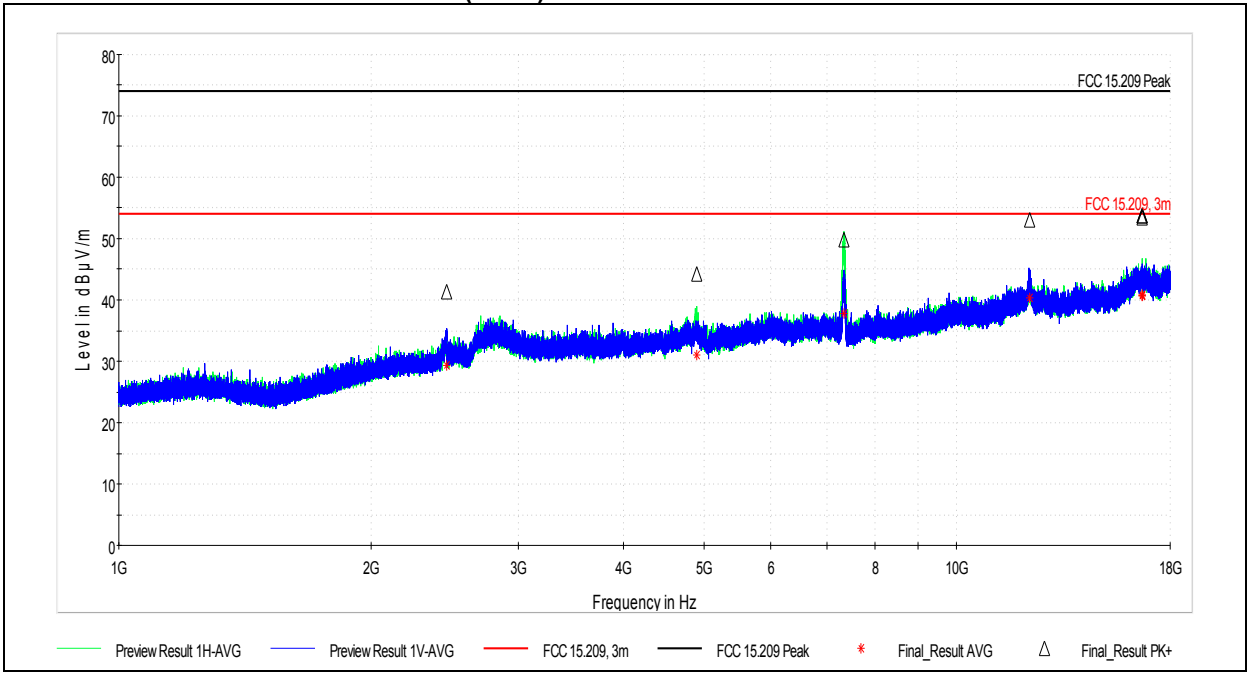
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2422.266000	38.02	74.00	35.98	1000.000	100.0	V	50.0	3.9
4851.114500	44.04	74.00	29.96	1000.000	100.0	H	14.0	7.4
7294.830500	53.64	74.00	20.36	1000.000	200.0	V	50.0	10.4
12159.257500	52.64	74.00	21.36	1000.000	200.0	V	38.0	17.2
16839.115000	53.00	74.00	21.00	1000.000	162.0	H	50.0	21.6

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2422.266000	25.81	54.00	28.19	1000.000	100.0	V	50.0	3.9
4851.114500	31.26	54.00	22.74	1000.000	100.0	H	14.0	7.4
7294.830500	41.56	54.00	12.44	1000.000	200.0	V	50.0	10.4
12159.257500	39.81	54.00	14.19	1000.000	200.0	V	38.0	17.2
16839.115000	40.69	54.00	13.31	1000.000	162.0	H	50.0	21.6

802.11n (HT40) Channel 6 Worst Case RSE



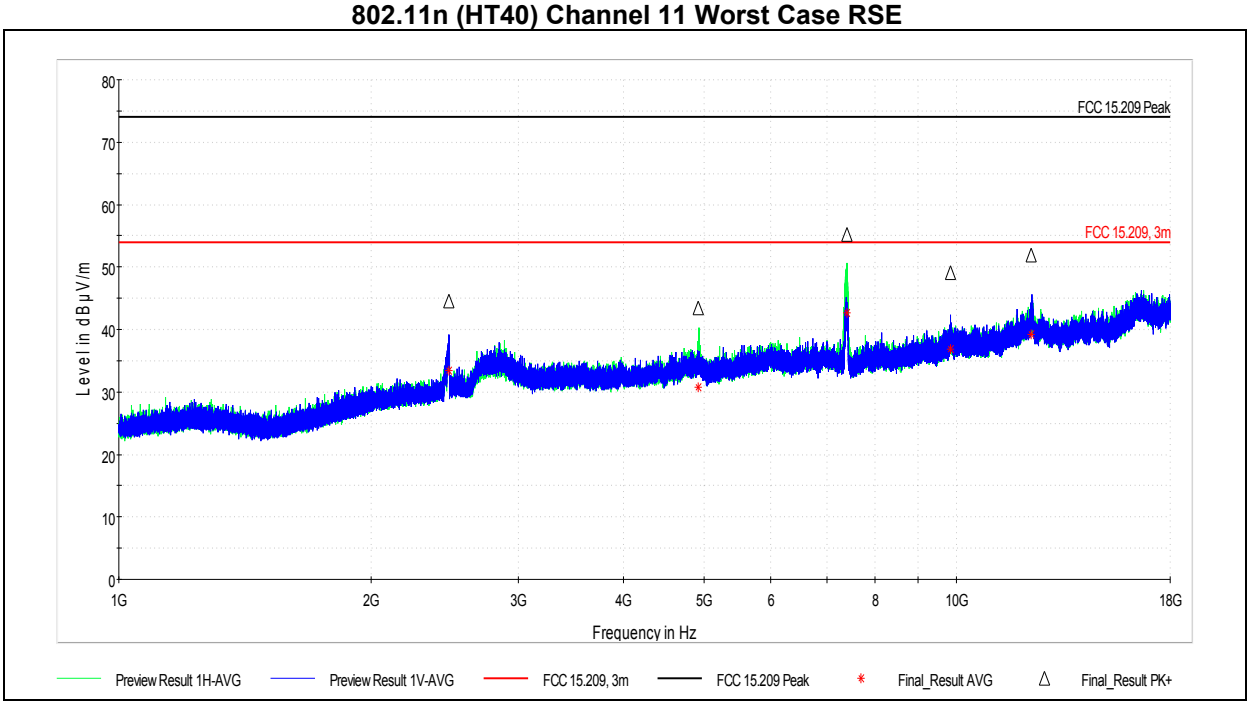
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2461.250500	41.33	74.00	32.67	1000.000	175.0	V	50.0	3.9
4893.720000	44.26	74.00	29.74	1000.000	100.0	H	22.0	7.4
7337.122500	49.81	74.00	24.19	1000.000	200.0	H	50.0	10.5
12240.319500	53.04	74.00	20.96	1000.000	200.0	V	23.0	17.2
16649.778500	53.70	74.00	20.30	1000.000	148.0	H	36.0	21.6
16653.455000	53.65	74.00	20.35	1000.000	171.0	V	50.0	21.5
16654.505000	53.47	74.00	20.53	1000.000	300.0	H	301.0	21.5

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2461.250500	29.36	54.00	24.64	1000.000	175.0	V	50.0	3.9
4893.720000	31.03	54.00	22.97	1000.000	100.0	H	22.0	7.4
7337.122500	37.84	54.00	16.16	1000.000	200.0	H	50.0	10.5
12240.319500	40.38	54.00	13.62	1000.000	200.0	V	23.0	17.2
16649.778500	40.77	54.00	13.23	1000.000	148.0	H	36.0	21.6
16653.455000	40.71	54.00	13.29	1000.000	171.0	V	50.0	21.5
16654.505000	40.74	54.00	13.26	1000.000	300.0	H	301.0	21.5

802.11n (HT40) Channel 11 Worst Case RSE



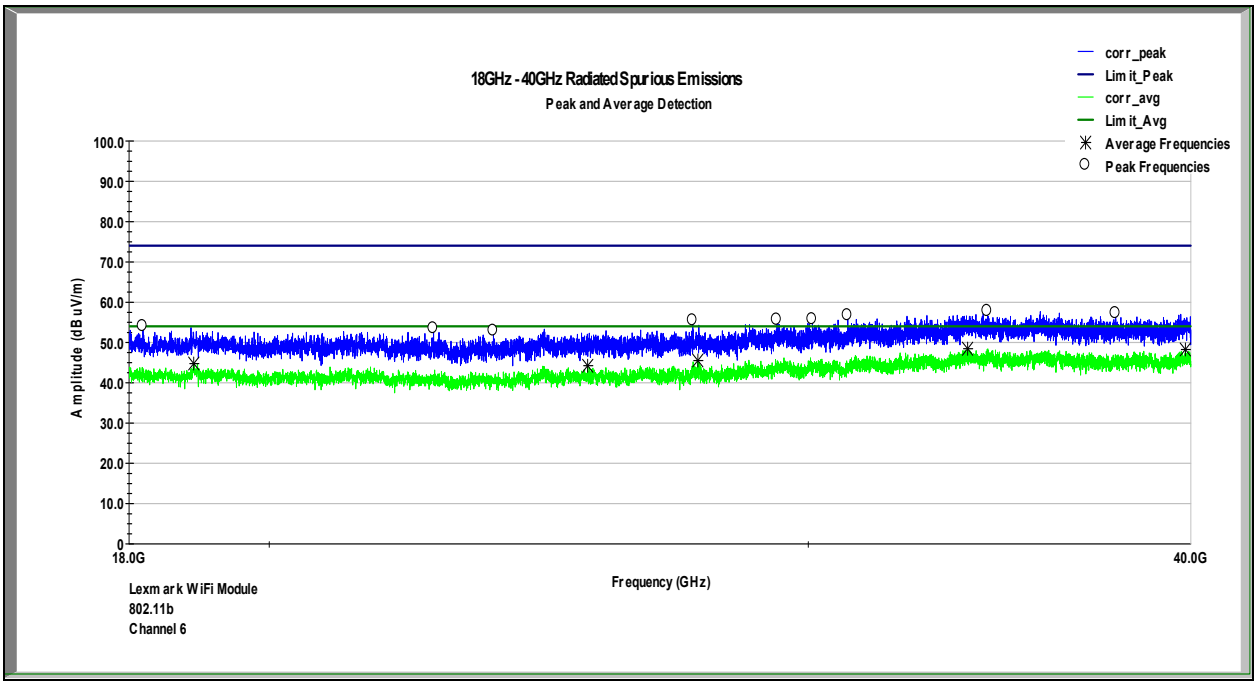
Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2478.336000	44.50	74.00	29.50	1000.000	174.0	V	50.0	3.9
4919.743500	43.39	74.00	30.61	1000.000	100.0	H	20.0	7.3
7396.664000	55.25	74.00	18.75	1000.000	200.0	V	38.0	10.7
9841.686500	49.04	74.00	24.96	1000.000	200.0	V	36.0	14.0
12287.482500	51.92	74.00	22.08	1000.000	182.0	V	32.0	17.1

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2478.336000	33.43	54.00	20.57	1000.000	174.0	V	50.0	3.9
4919.743500	30.77	54.00	23.23	1000.000	100.0	H	20.0	7.3
7396.664000	42.59	54.00	11.41	1000.000	200.0	V	38.0	10.7
9841.686500	36.81	54.00	17.19	1000.000	200.0	V	36.0	14.0
12287.482500	39.21	54.00	14.79	1000.000	182.0	V	32.0	17.1

2.4GHz WiFi 18 – 40GHz Data
(Worst case is shown and is representative of all channels)



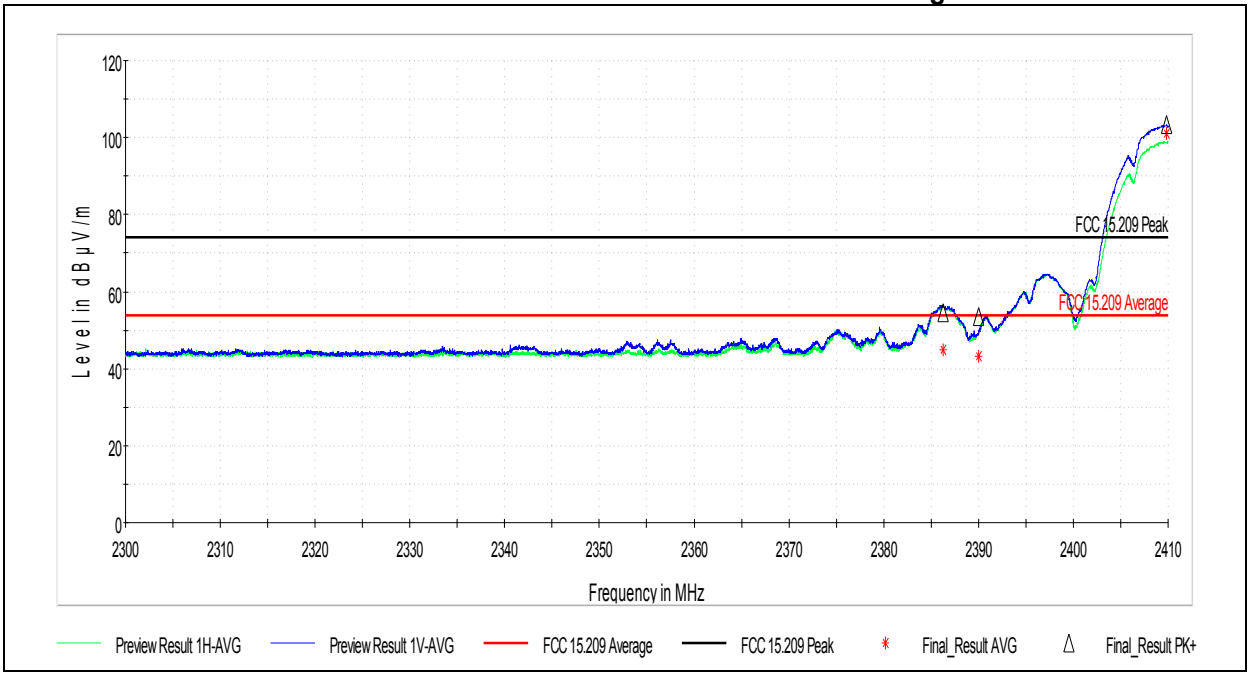
Final_Result_PK+

Frequency (GHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)
18.189 GHz	53.90	74.00	20.10
22.633 GHz	53.43	74.00	20.57
23.676 GHz	52.79	74.00	21.21
27.506 GHz	55.37	74.00	18.63
29.304 GHz	55.54	74.00	18.46
30.096 GHz	55.67	74.00	18.33
30.905 GHz	56.61	74.00	17.39
34.331 GHz	57.68	74.00	16.32
37.804 GHz	57.15	74.00	16.85

Final_Result_AVG

Frequency (GHz)	Average (dBuV/m)	Limit (dBuV/m)	Average Margin (dB)
18.898 GHz	44.75	54.00	29.25
25.414 GHz	44.23	54.00	29.77
27.610 GHz	45.50	54.00	28.50
33.820 GHz	48.42	54.00	25.58
39.837 GHz	48.26	54.00	25.74

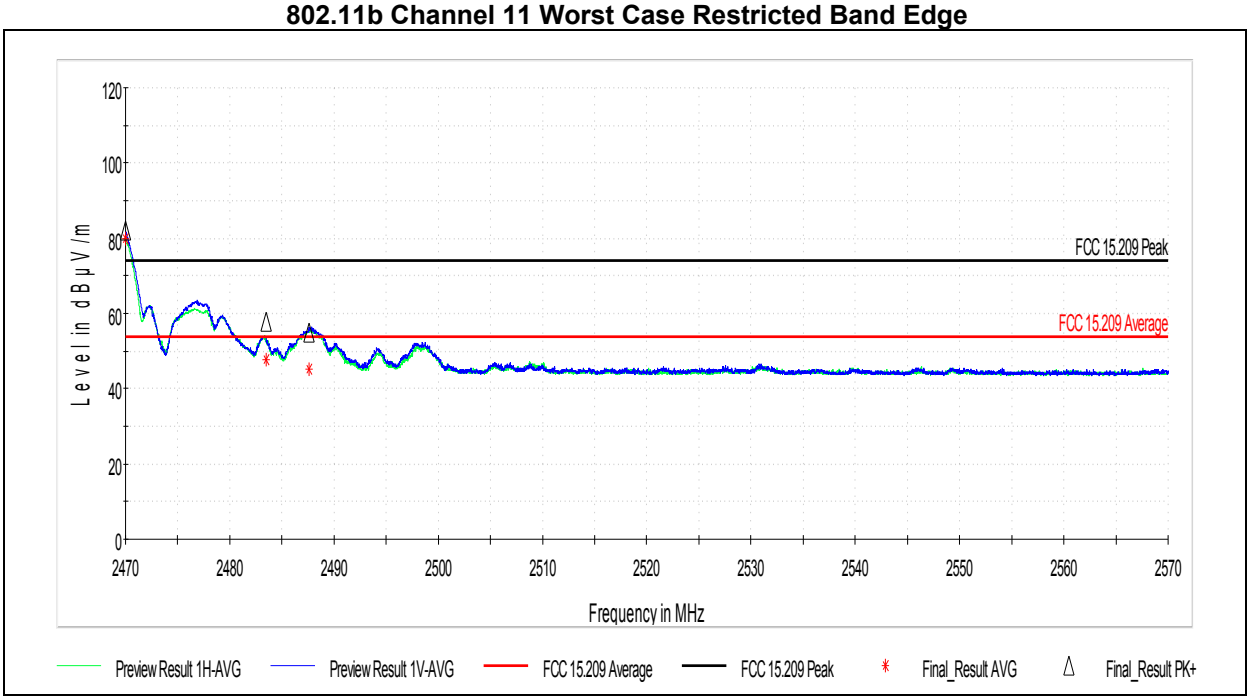
802.11b Channel 1 Worst Case Restricted Band Edge



Final_Result

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2386.262000	---	54.55	74.00	19.45	1000.000	410.0	V	171.0	37.7
2386.262000	44.92	---	54.00	9.08	1000.000	410.0	V	171.0	37.7
2390.000000	43.17	---	54.00	10.83	1000.000	290.0	H	191.0	37.7
2390.000000	---	53.54	74.00	20.46	1000.000	290.0	H	191.0	37.7
2409.846000	101.08	---	Fund	Fund	1000.000	301.0	V	315.0	37.8
2409.846000	---	103.53	Fund	Fund	1000.000	301.0	V	315.0	37.8

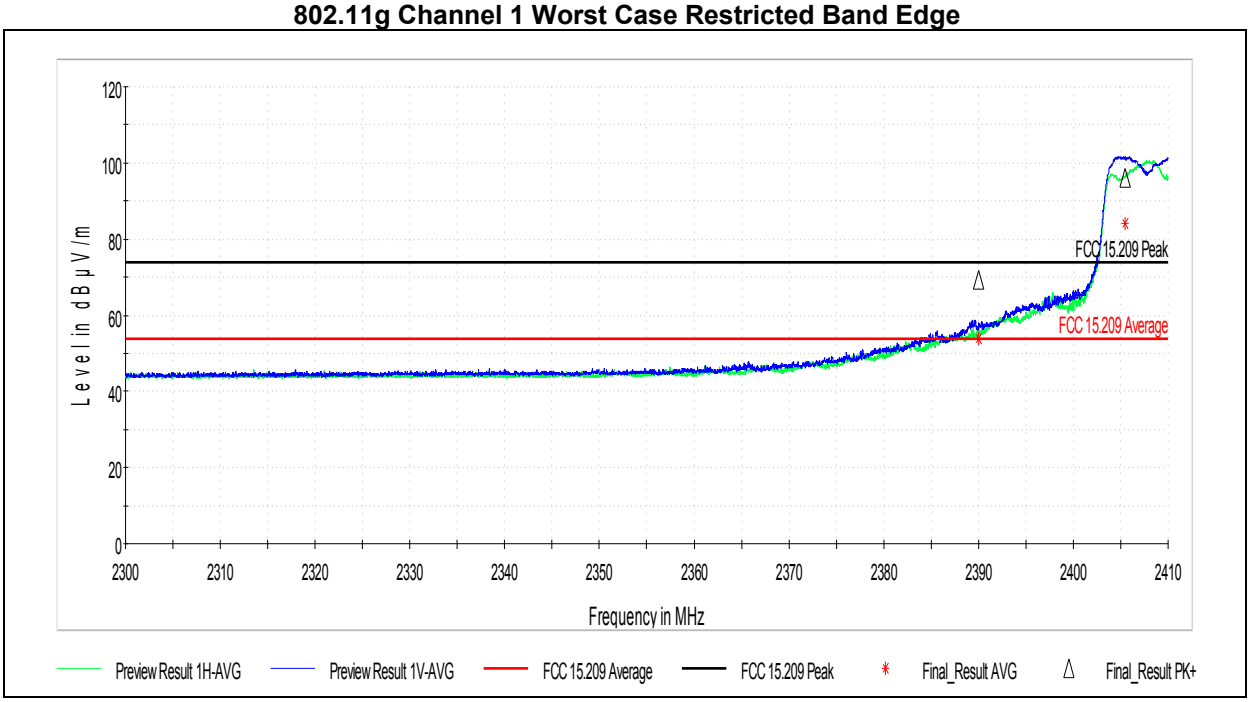
802.11b Channel 11 Worst Case Restricted Band Edge



Final_Result

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2483.500000	---	57.76	74.00	16.24	1000.000	410.0	H	0.0	37.8
2483.500000	47.58	---	54.00	6.42	1000.000	410.0	H	0.0	37.8
2487.580000	---	54.80	74.00	19.20	1000.000	361.0	V	218.0	37.8
2487.580000	45.17	---	54.00	8.83	1000.000	361.0	V	218.0	37.8

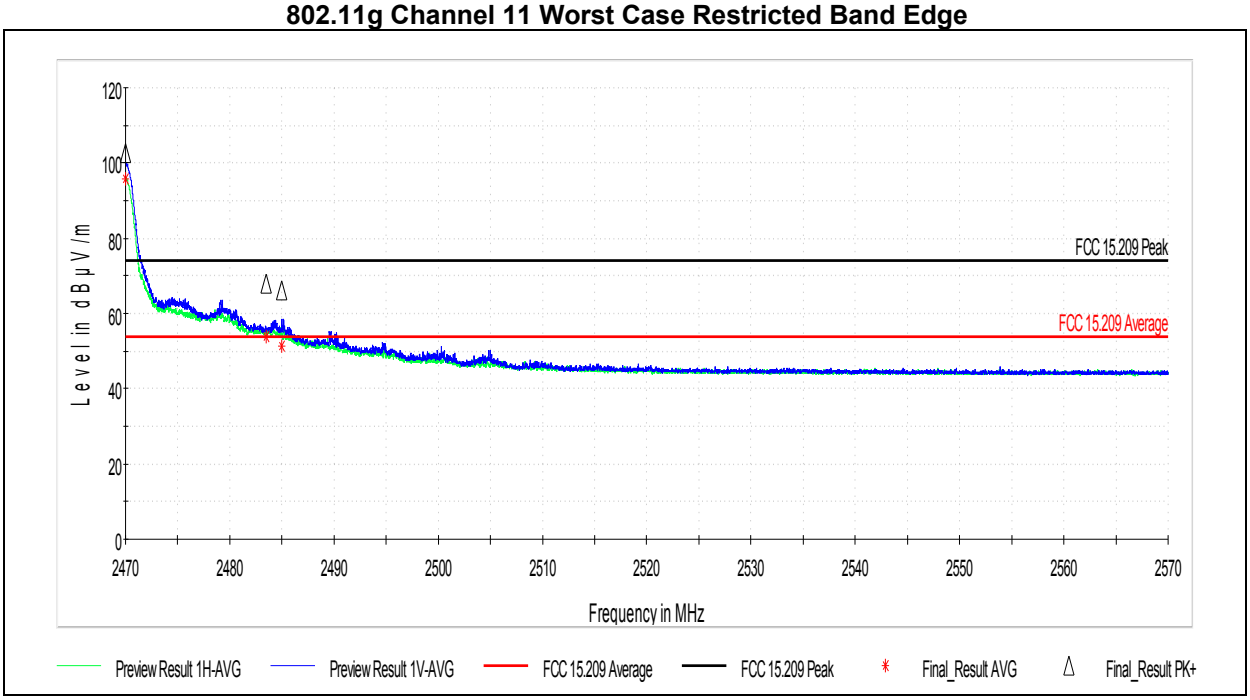
802.11g Channel 1 Worst Case Restricted Band Edge



Final_Result

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2390.000000	53.90	---	54.00	0.10	1000.000	243.0	V	309.0	37.7
2390.000000	---	69.25	74.00	4.75	1000.000	243.0	V	309.0	37.7
2405.490000	84.28	---	Fund	Fund	1000.000	226.0	H	189.0	37.8
2405.490000	---	95.92	Fund	Fund	1000.000	226.0	H	189.0	37.8

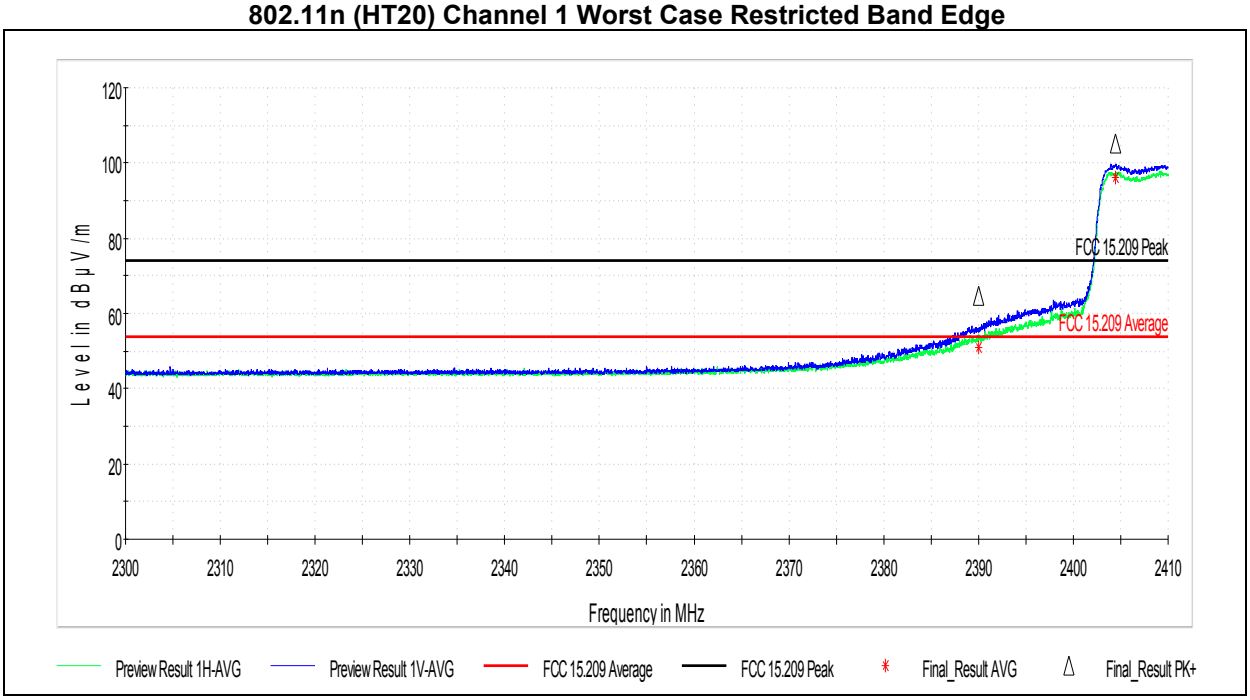
802.11g Channel 11 Worst Case Restricted Band Edge



Final_Result

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2483.500000	53.79	---	54.00	0.21	1000.000	397.0	H	340.0	37.8
2483.500000	---	67.91	74.00	6.09	1000.000	397.0	H	340.0	37.8
2484.980000	---	66.04	74.00	7.96	1000.000	263.0	V	168.0	37.8
2484.980000	51.26	---	54.00	2.74	1000.000	263.0	V	168.0	37.8

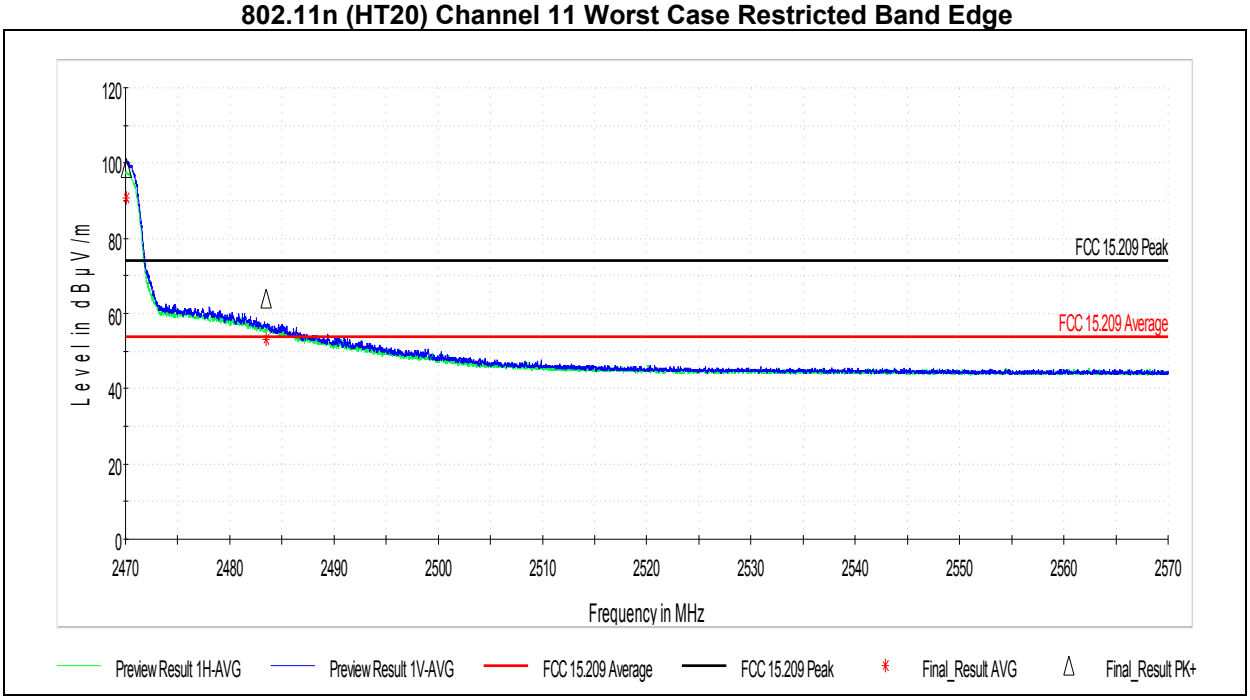
802.11n (HT20) Channel 1 Worst Case Restricted Band Edge



Final_Result

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2390.000000	51.10	---	54.00	2.90	1000.000	279.0	V	166.0	37.7
2390.000000	---	64.70	74.00	9.30	1000.000	279.0	V	166.0	37.7
2404.434000	96.23	---	Fund	Fund	1000.000	256.0	H	0.0	37.8
2404.434000	---	105.21	Fund	Fund	1000.000	256.0	H	0.0	37.8

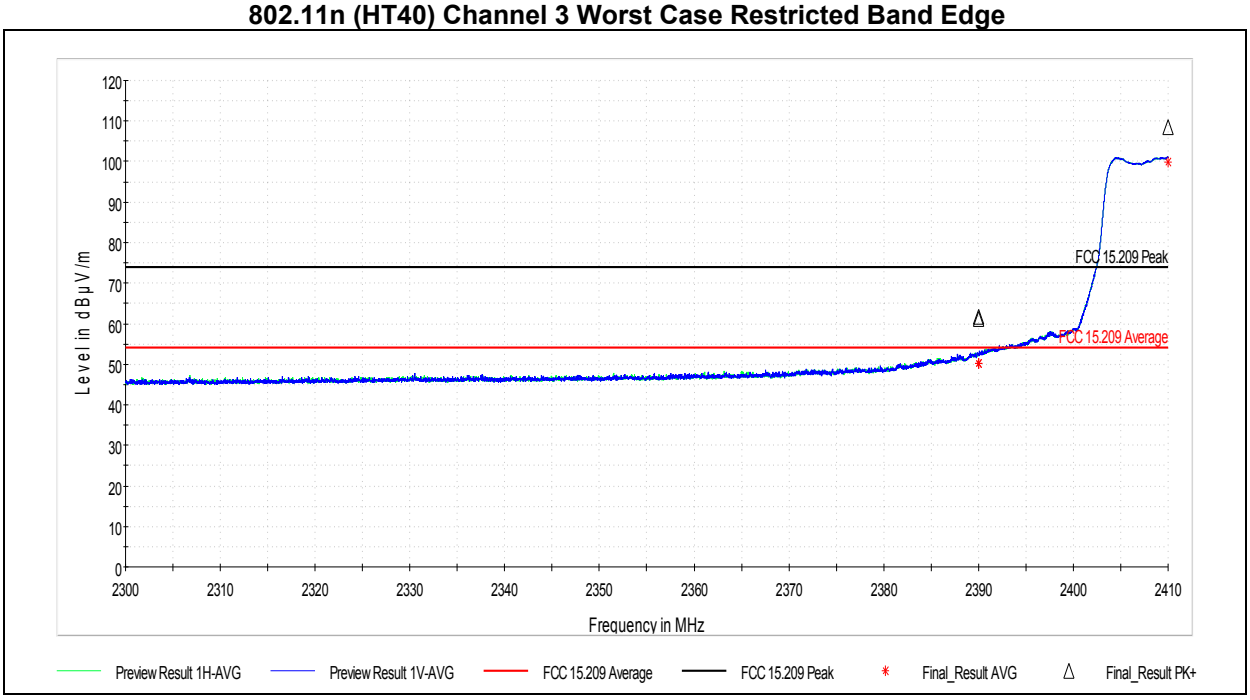
802.11n (HT20) Channel 11 Worst Case Restricted Band Edge



Final_Result

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2470.090000	---	98.51	Fund	Fund	1000.000	212.0	H	234.0	37.8
2470.090000	90.55	---	Fund	Fund	1000.000	212.0	H	234.0	37.8
2483.500000	---	64.08	74.00	9.92	1000.000	410.0	H	0.0	37.8
2483.500000	52.99	---	54.00	1.01	1000.000	410.0	H	0.0	37.8

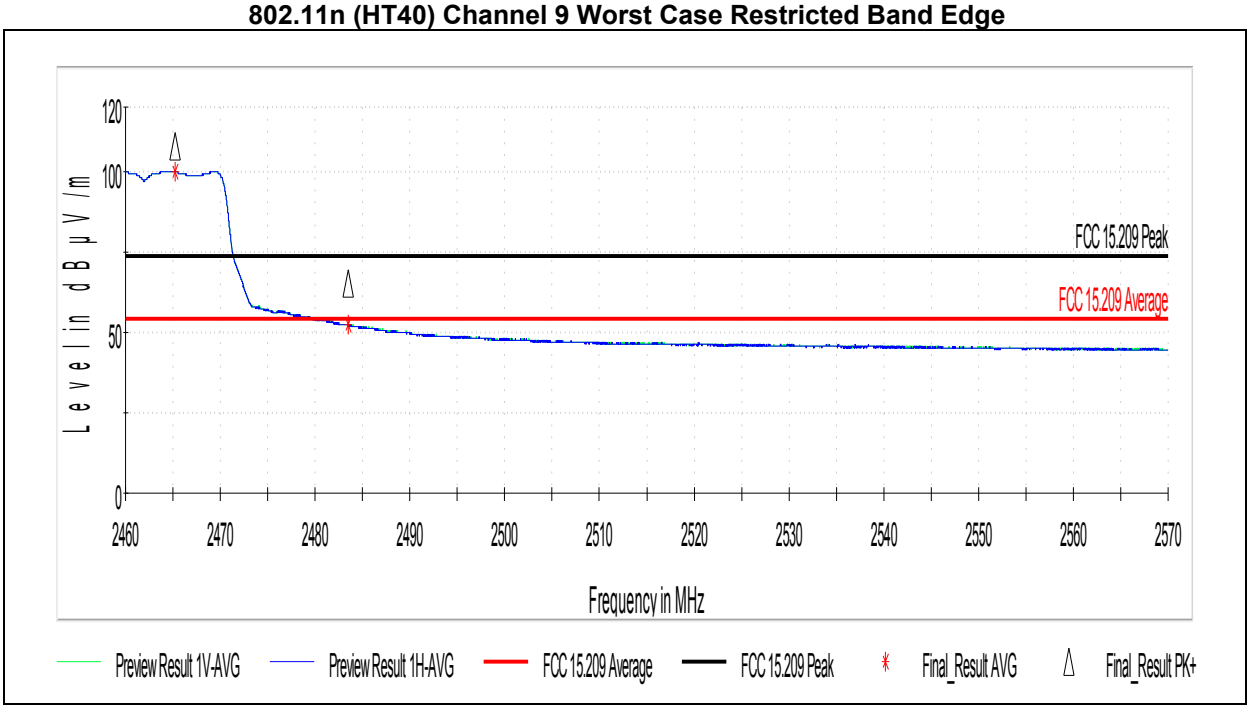
802.11n (HT40) Channel 3 Worst Case Restricted Band Edge



Final_Result

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2389.980000	50.30	---	54.00	3.70	1000.000	211.0	H	259.0	37.8
2389.980000	---	61.25	74.00	12.75	1000.000	211.0	H	259.0	37.8
2390.000000	50.27	---	54.00	3.73	1000.000	360.0	V	278.0	37.8
2390.000000	---	61.58	74.00	12.42	1000.000	360.0	V	278.0	37.8
2409.978000	---	108.39	Fund	Fund	1000.000	206.0	H	130.0	37.8
2409.978000	99.89	---	Fund	Fund	1000.000	206.0	H	130.0	37.8

802.11n (HT40) Channel 9 Worst Case Restricted Band Edge



Final_Result

Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2465.203000	99.69	---	Fund	Fund	1000.000	100.0	H	0.0	37.8
2465.203000	---	107.90	Fund	Fund	1000.000	100.0	H	0.0	37.8
2483.500000	52.37	---	54.00	1.63	1000.000	100.0	H	0.0	37.8
2483.500000	---	65.25	74.00	8.75	1000.000	100.0	H	0.0	37.8

10 Radiated Spurious Emissions (Receiver)

10.1 Test Limits:

§ 15.109: Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

RSS-Gen (7.1.2): Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least 5x the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz. Spurious emissions from receivers shall not exceed the radiated limits shown below:

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m)
30–88	100	40
88–216	150	43.5
216–960	200	46
Above 960	500	54

These limits are identical to those in RSS-GEN

10.2 Test Procedure:

ANSI C63.4: 2014

10.3 Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculations are listed below:

Formula:
FS = RA + AF + CF

FS = Field Strength in dBμV/m
RA = Receiver Amplitude in dBμV
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dBμV
AF = 18.52 dB
CF = 0.78 dB

FS = 19.48 + 18.52 + 0.78 = 38.78 dBμV/m
Level in μV/m = Common Antilogarithm [(38.78 dBμV/m)/20] = 86.89 μV/m

10.4 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1302.6005.40	Rohde & Schwarz	ESU40	10/12/2017	10/12/2018
Preamplifier	122005	Rohde&Schwarz	TS-PR18	11/17/2016	11/17/2017
Biconnilog Antenna	00051864	ETS	3142C	4/6/2017	4/6/2018
Horn Antenna	154521	ETS	3117	11/14/2016	11/14/2017
System Controller	121701-1	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
3m Cable Antenna→Preamp	3074			11/17/2016	11/17/2017
3m Cable Preamp→Chamber	2588			11/17/2016	11/17/2017
3m Cable Chamber→Control Room	2593			11/17/2016	11/17/2017
3m Cable Control Room→Receiver	2592			11/17/2016	11/17/2017
10m Cable Antenna→Preamp	3339			11/17/2016	11/17/2017
10m Cable Preamp→Chamber	3172			11/17/2016	11/17/2017
10m Cable Chamber→Control Room	2590			11/17/2016	11/17/2017
10m Cable Control Room→Receiver	2589			11/17/2016	11/17/2017

10.5 Test Results:

The device was found to be **compliant**. All spurious emissions with the test sample in receive mode were below the limits specified in Part 15.109 for a class B digital device and RSS-GEN Section 6.1.

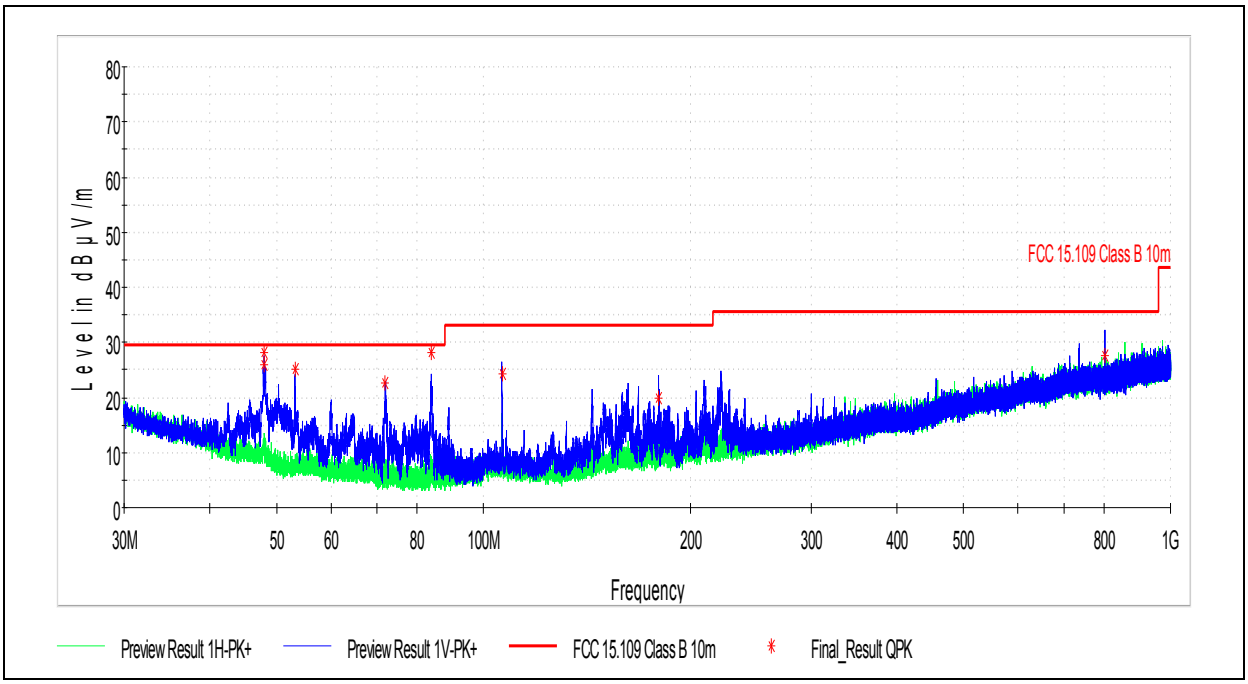
10.6 Test Conditions:

Test Personnel:	Carmen Davis	Test Date:	10/24/2017
Supervising/Reviewing Engineer:			
(Where Applicable)	NA	Ambient Temperature:	22.4C
Input Voltage:	5VDC via USB	Relative Humidity:	44.9%
		Atmospheric Pressure:	995.6mbar

10.7 Test Data:

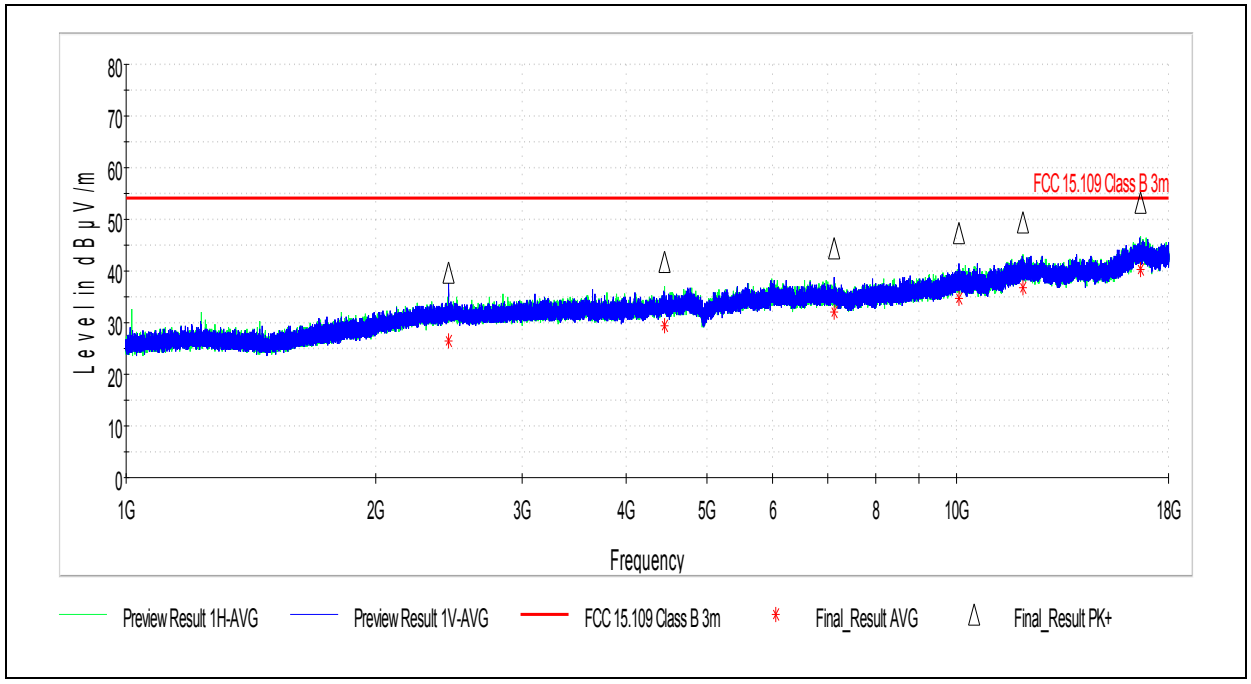
The worst case test data is shown below. Note that emissions were investigated with the test sample in its worst operating position across 3 orthogonal axes.

10.7.1 Receive / Idle Mode, Bilog:



Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.001600	28.26	29.55	1.29	120.000	343.8	V	0.0	-10.8
48.012300	26.03	29.55	3.52	120.000	337.0	V	94.0	-10.8
53.193700	25.01	29.55	4.54	120.000	100.5	V	244.0	-11.8
71.986100	22.64	29.55	6.91	120.000	181.9	V	0.0	-13.0
83.989200	28.16	29.55	1.39	120.000	139.4	V	0.0	-13.1
106.533600	24.34	33.10	8.76	120.000	99.6	V	0.0	-11.9
179.994000	19.99	33.10	13.11	120.000	104.9	V	60.0	-9.1
801.822000	27.71	35.55	7.84	120.000	110.2	V	274.0	6.5

10.7.2 Receive / Idle Mode, Horn:



Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2447.233000	39.66	74.00	34.34	1000.000	166.0	V	50.0	3.9
4450.298000	41.86	74.00	32.14	1000.000	200.0	V	50.0	7.2
7122.561500	44.46	74.00	29.54	1000.000	177.0	V	19.0	10.2
10067.851000	47.45	74.00	26.55	1000.000	165.0	V	20.0	14.4
12028.892500	49.42	74.00	24.58	1000.000	135.0	V	50.0	17.4
16650.824000	53.21	74.00	20.79	1000.000	200.0	H	50.0	21.5

Final_Result_AVG

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2447.233000	26.48	54.00	27.52	1000.000	166.0	V	50.0	3.9
4450.298000	29.32	54.00	24.68	1000.000	200.0	V	50.0	7.2
7122.561500	32.02	54.00	21.98	1000.000	177.0	V	19.0	10.2
10067.851000	34.56	54.00	19.44	1000.000	165.0	V	20.0	14.4
12028.892500	36.89	54.00	17.11	1000.000	135.0	V	50.0	17.4
16650.824000	40.36	54.00	13.64	1000.000	200.0	H	50.0	21.5

11 AC Powerline Conducted Emissions

11.1 Test Limits:

§ 15.107(e): Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

RSS-Gen (8.8): A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3. Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The more stringent limit applies at the frequency range boundaries.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
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.

11.2 Test Procedure:

ANSI C63.4: 2014

11.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1302.6005.40	Rohde & Schwarz	ESU40	10/12/2017	10/12/2018
LISN	3333	Teseq	NNB52	6/15/2017	6/15/2018
3m Cable Antenna→ Bulkhead	3074			11/17/2016	11/17/2017
3m Cable Bulkhead→ Chamber	2588			11/17/2016	11/17/2017
3m Cable Chamber→ Control Room	2593			11/17/2016	11/17/2017
3m Cable Control Room→Receiver	2592			11/17/2016	11/17/2017

11.4 Test Results:

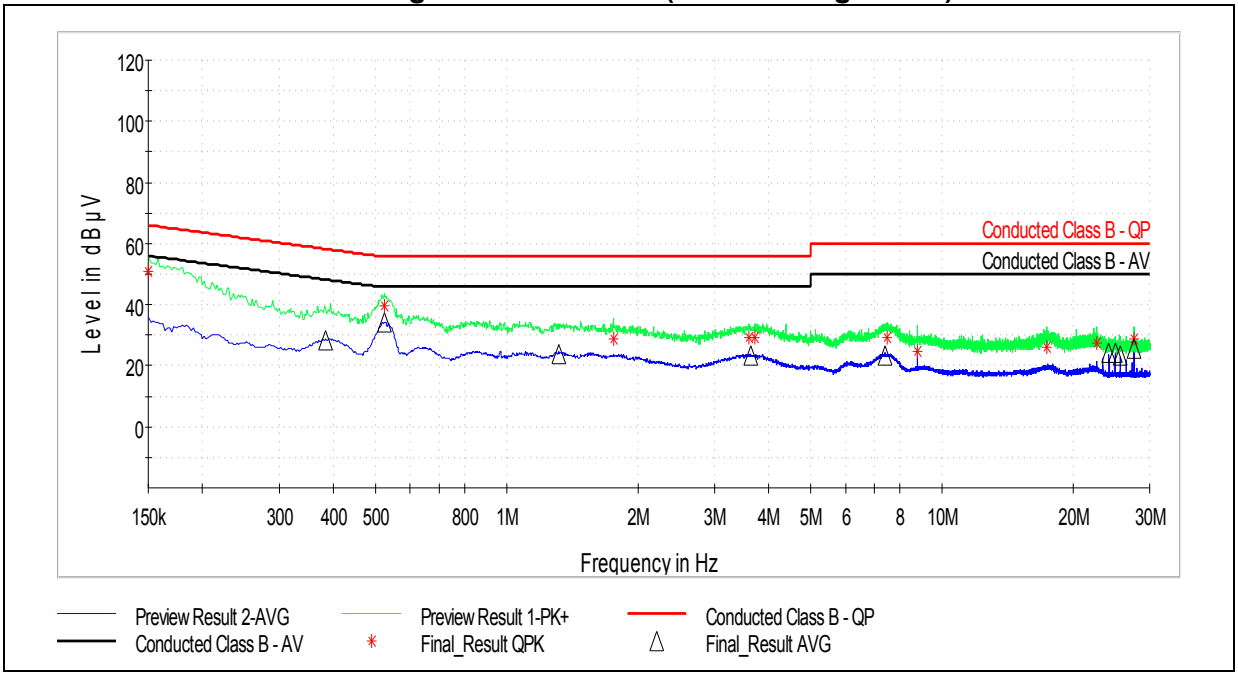
The device was found to be **compliant**.

11.5 Test Conditions:

Test Personnel:	Carmen Davis	Test Date:	10/24/2017
Supervising/Reviewing Engineer: (Where Applicable)	NA	Ambient Temperature:	22.4C
Input Voltage:	120VAC Input to Laptop	Relative Humidity:	44.9%
		Atmospheric Pressure:	995.6mbar

11.6 Test Data:

11.6.1 Quasi-Peak and Average Measurements (Transmitting Line 1):



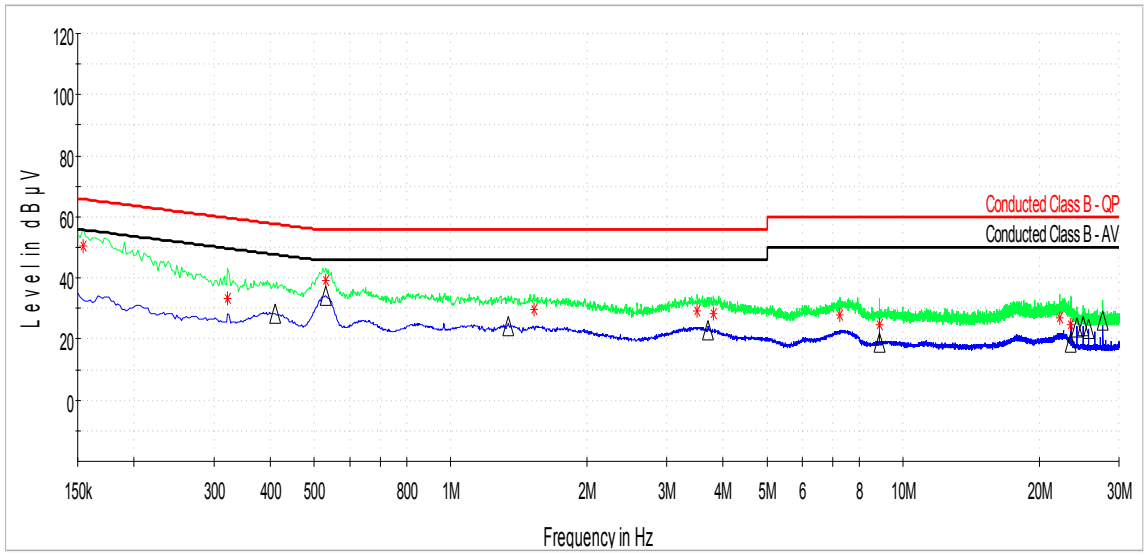
Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)
0.150000	51.00	66.00	15.00	9.000
0.522000	39.46	56.00	16.54	9.000
1.756000	28.97	56.00	27.03	9.000
3.596000	29.24	56.00	26.76	9.000
3.720000	29.30	56.00	26.70	9.000
7.484000	29.42	60.00	30.58	9.000
8.792000	24.75	60.00	35.25	9.000
17.388000	26.29	60.00	33.71	9.000
22.656000	27.28	60.00	32.72	9.000
27.648000	28.66	60.00	31.34	9.000

Final_Result_AVG

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)
0.384000	28.22	48.19	19.97	9.000
0.524000	34.11	46.00	11.89	9.000
1.316000	24.02	46.00	21.98	9.000
3.628000	23.24	46.00	22.76	9.000
7.384000	23.52	50.00	26.48	9.000
24.192000	24.32	50.00	25.68	9.000
24.960000	24.40	50.00	25.60	9.000
25.728000	23.34	50.00	26.66	9.000
27.648000	25.82	50.00	24.18	9.000

11.6.2 Quasi-Peak and Average Measurements (Transmitting Line 2):



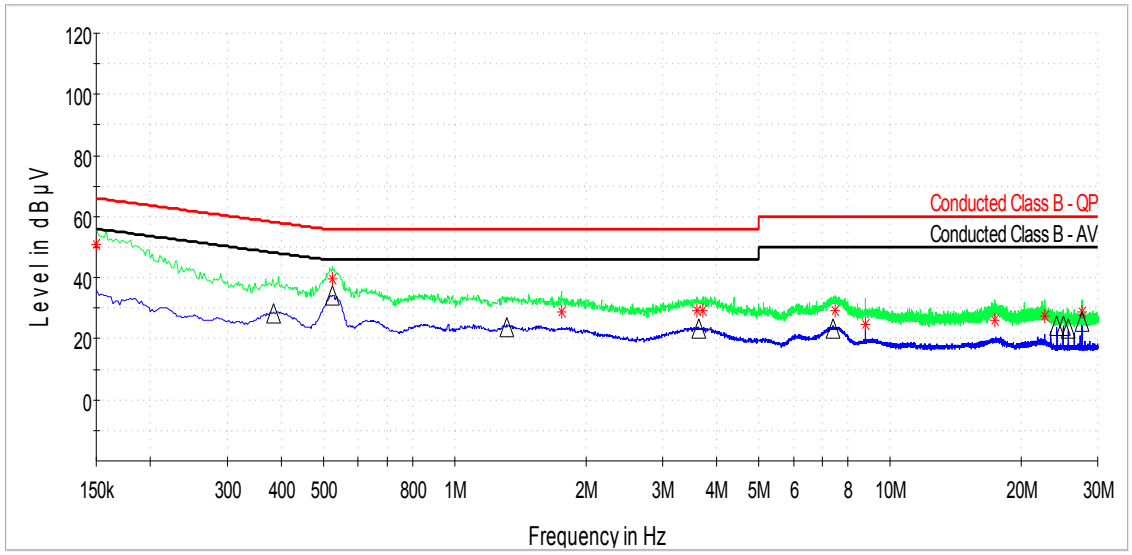
Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)
0.154000	50.52	65.78	15.26	9.000
0.322000	33.17	59.66	26.49	9.000
0.530000	39.34	56.00	16.66	9.000
1.532000	29.61	56.00	26.39	9.000
3.504000	29.13	56.00	26.87	9.000
3.812000	28.51	56.00	27.49	9.000
7.244000	27.95	60.00	32.05	9.000
8.872000	24.90	60.00	35.10	9.000
22.196000	26.77	60.00	33.23	9.000
23.500000	24.70	60.00	35.30	9.000

Final_Result_AVG

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)
0.410000	28.26	47.65	19.39	9.000
0.530000	34.01	46.00	11.99	9.000
1.340000	24.28	46.00	21.72	9.000
3.712000	23.03	46.00	22.97	9.000
8.872000	18.76	50.00	31.24	9.000
23.500000	18.82	50.00	31.18	9.000
24.192000	24.03	50.00	25.97	9.000
24.960000	24.14	50.00	25.86	9.000
25.728000	23.15	50.00	26.85	9.000
27.648000	26.29	50.00	23.71	9.000

11.6.3 Quasi-Peak and Average Measurements (Receive Mode Line 1):



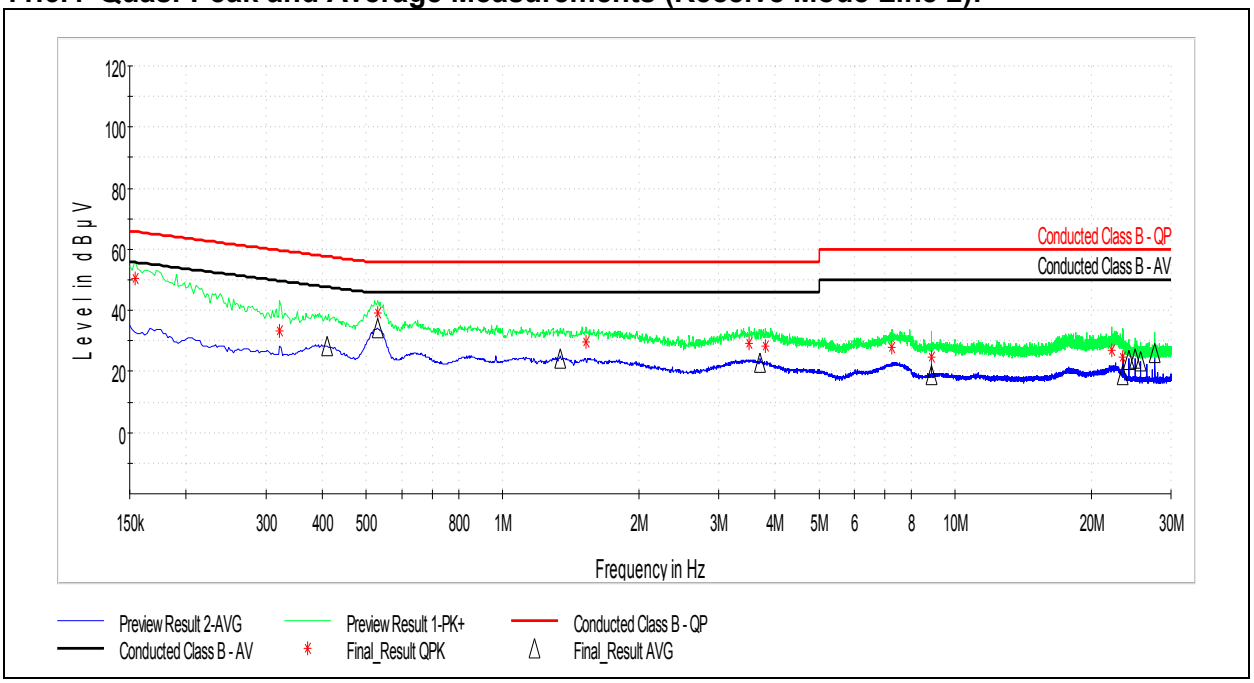
Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)
0.150000	50.78	66.00	15.22	9.000
0.520000	39.08	56.00	16.92	9.000
2.008000	28.10	56.00	27.90	9.000
3.460000	28.82	56.00	27.18	9.000
3.768000	29.25	56.00	26.75	9.000
7.612000	29.25	60.00	30.75	9.000
17.504000	26.86	60.00	33.14	9.000
21.896000	25.35	60.00	34.65	9.000
26.712000	26.35	60.00	33.65	9.000
26.944000	26.76	60.00	33.24	9.000

Final_Result_AVG

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)
0.382000	28.16	48.24	20.08	9.000
0.524000	34.05	46.00	11.95	9.000
1.336000	24.11	46.00	21.89	9.000
3.668000	23.26	46.00	22.74	9.000
7.628000	23.01	50.00	26.99	9.000
23.424000	22.88	50.00	27.12	9.000
24.192000	24.29	50.00	25.71	9.000
24.960000	24.38	50.00	25.62	9.000
25.728000	23.43	50.00	26.57	9.000
27.648000	25.52	50.00	24.48	9.000

11.6.4 Quasi-Peak and Average Measurements (Receive Mode Line 2):



Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)
0.154000	50.52	65.78	15.26	9.000
0.322000	33.17	59.66	26.49	9.000
0.530000	39.34	56.00	16.66	9.000
1.532000	29.61	56.00	26.39	9.000
3.504000	29.13	56.00	26.87	9.000
3.812000	28.51	56.00	27.49	9.000
7.244000	27.95	60.00	32.05	9.000
8.872000	24.90	60.00	35.10	9.000
22.196000	26.77	60.00	33.23	9.000
23.500000	24.70	60.00	35.30	9.000

Final_Result_AVG

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)
0.410000	28.26	47.65	19.39	9.000
0.530000	34.01	46.00	11.99	9.000
1.340000	24.28	46.00	21.72	9.000
3.712000	23.03	46.00	22.97	9.000
8.872000	18.76	50.00	31.24	9.000
23.500000	18.82	50.00	31.18	9.000
24.192000	24.03	50.00	25.97	9.000
24.960000	24.14	50.00	25.86	9.000
25.728000	23.15	50.00	26.85	9.000
27.648000	26.29	50.00	23.71	9.000

12 Antenna Requirement per FCC Part 15.203

12.1 Test Limits:

§ 15.203: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

RSS-Gen (8.3): Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. 8 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

12.2 Test Results:

The device was found to be **compliant**. The sample tested met the antenna requirement. The antenna used was permanently attached and internal to the unit.

12.3 Test Conditions:

Test Personnel:	Brian Lackey	Test Date:	10/24/2017
Supervising/Reviewing Engineer:			
(Where Applicable)	NA	Ambient Temperature:	22.4C
Input Voltage:	5VDC via USB	Relative Humidity:	44.9%
		Atmospheric Pressure:	995.6mbar

13 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of k = 2, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty	Notes
Radiated emissions, 30 to 1000 MHz	±3.9dB	
Radiated emissions, 1 to 18 GHz	±4.2dB	
Radiated emissions, 18 to 40 GHz	±4.3dB	
Power Port Conducted emissions, 150kHz to 30 MHz	±2.8dB	

14 Revision History

Revision Level	Date	Report Number	Notes
0	1/9/2018	103264009LEX-001	Original Issue