731 Enterprise Drive
Lexington, KY 40510

Telephone: 859-226-1000
Facsimile: 859-226-1040
www.intertek-etlsemko.com

TEST REPORT

Report Number:	**100316156LEX-001**
Project Number:	**G100316156**
Report Issue Date:	**2/17/2011**
Product Name:	**802.11bgn Wireless Adapter**
FCCID:	**IYLM01004**
ICID:	**2376A-M01004**
FCC Standards:	**Title 47 CFR FCC Part 15 Subpart C**
Industry Canada Standards:	**RSS-210 Issue 8, RSS-GEN Issue 3, and RSS-102 Issue 4**

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

Client:
Lexmark International Inc.
740 West New Circle Road Bldg 005-1
Lexington, KY 40511

Report prepared by
Bryan C. Taylor, Team Leader

Report reviewed by
Jason Centers, Senior 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-210 (A8.4)	Pass
9	Occupied Bandwidth	§ 15.247(a)(2)	RSS-210 (A8.2), RSS-GEN (4.6.1)	Pass
18	Conducted Spurious Emissions	§ 15.247(d)	RSS-210 (A8.5)	Pass
35	Power Spectral Density	§ 15.247(e)	RSS-210 (A8.2b)	Pass
42	Radiated Spurious Emissions (Transmitter)	§ 15.247(d), § 15.209, and § 15.205	RSS-210 (2.2) (A8.5)	Pass
56	Radiated Spurious Emissions (Receiver)	§ 15.109	RSS-Gen (6.1)	Pass
58	AC Powerline Conducted Emissions	§ 15.107, § 15.207	RSS-Gen (7.2.4)	Pass
63	Antenna Requirement per FCC Part 15.203	§ 15.203	RSS-Gen (7.1.2)	Pass
64	RF Exposure Requirements (MPE Calculations)	§ 1.1310	RSS-102	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	Lexmark International Inc.
Model Number	LEX-M01-004
Serial Number	Not Labeled
FCC Identifier	IYLM01004
IC Identifier	2376A-M01004
Receive Date	1/18/2011
Test Start Date	1/18/2011
Test End Date	1/28/2011
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
Test Channels	1, 6, 11 (3, 6, 9 for the 40MHz wide 802.11n mode)
Antenna Type (15.203)	Internal PCB
Antenna Gain	2.66dBi

Description of Equipment Under Test
The 802.11bgn Wireless Adapter was a wireless print server module which installs inside a printer.

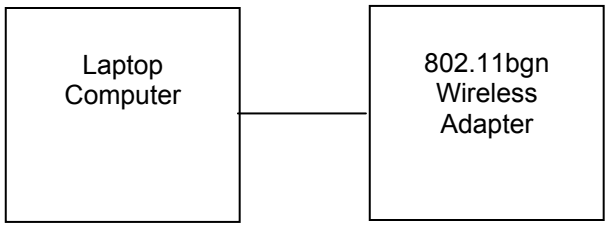
Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmitting on low mid or high channels
2	Receive / idle mode

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

3.2 EUT Block Diagram:

During the testing the sample was connected to a laptop computer via a USB cable.



3.3 Cables:

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
USB Cable	6ft	Yes	None	USB Port on ProgrammingBoard	Laptop Computer

3.4 Support Equipment:

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop Computer	Toshiba	Tecra PTA83U-03202C	76104530H

4 Peak Conducted Power

4.1 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.

4.2 Test Procedure

ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247). The peak output power was measured using the channel power function of the spectrum analyzer.

4.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	8/27/2010	8/27/2011

4.4 Results:

Mode	Channel Number	Frequency (MHz)	Data Rate	Average Conducted Power (dBm)	Peak Conducted Power (dBm)	Peak Conducted Power Limit (dBm)	Margin (dB)	Result
			1	15.64	24.07	30	-5.93	**Pass**
			2	15.79	24.3	30	-5.7	**Pass**
			5.5	16.07	19.4	30	-10.6	**Pass**
802.11b	1	2412	11	15.59	23.89	30	-6.11	**Pass**
			1	16.51	24.81	30	-5.19	**Pass**
			2	16.14	24.78	30	-5.22	**Pass**
			5.5	16.28	19.61	30	-10.39	**Pass**
802.11b	6	2437	11	16.11	24.74	30	-5.26	**Pass**
			1	16.33	24.61	30	-5.39	**Pass**
			2	16.18	24.76	30	-5.24	**Pass**
			5.5	16.41	19.77	30	-10.23	**Pass**
802.11b	11	2462	11	15.88	24.52	30	-5.48	**Pass**
			6	14.88	21.06	30	-8.94	**Pass**
			9	15.28	22.56	30	-7.44	**Pass**
			12	15.25	22.39	30	-7.61	**Pass**
			18	15.3	22.64	30	-7.36	**Pass**
			24	15.11	22.93	30	-7.07	**Pass**
			36	15.11	22.95	30	-7.05	**Pass**
			48	15.05	22.94	30	-7.06	**Pass**
802.11g	1	2412	54	15.1	23.51	30	-6.49	**Pass**
			6	15.34	21.96	30	-8.04	**Pass**
			9	15.23	22.51	30	-7.49	**Pass**
			12	15.35	22.06	30	-7.94	**Pass**
			18	14.88	22.65	30	-7.35	**Pass**
			24	14.8	22.58	30	-7.42	**Pass**
			36	15.2	23.08	30	-6.92	**Pass**
			48	15.06	23.01	30	-6.99	**Pass**
802.11g	6	2437	54	14.86	22.77	30	-7.23	**Pass**
			6	15.24	22.04	30	-7.96	**Pass**
			9	15.25	22.57	30	-7.43	**Pass**
			12	15.3	22.43	30	-7.57	**Pass**
			18	15.3	22.77	30	-7.23	**Pass**
			24	15.37	22.9	30	-7.1	**Pass**
			36	15.23	23.23	30	-6.77	**Pass**
			48	15.27	23.21	30	-6.79	**Pass**
802.11g	11	2462	54	15.31	23.73	30	-6.27	**Pass**

802.11b and g results

Mode	Channel Number	Frequency (MHz)	Data Rate	Average Conducted Power (dBm)	Peak Conducted Power (dBm)	Peak Conducted Power Limit (dBm)	Margin (dB)	Result
			MCS0	15.41	22.78	30	-7.22	**Pass**
			MCS1	15.33	22.59	30	-7.41	**Pass**
			MCS2	15.18	22.55	30	-7.45	**Pass**
			MCS3	15.13	22.47	30	-7.53	**Pass**
			MCS4	15.59	22.49	30	-7.51	**Pass**
			MCS5	15.28	22.91	30	-7.09	**Pass**
			MCS6	15.55	22.9	30	-7.1	**Pass**
802.11n (20MHz)	1	2412	MCS7	15.61	22.89	30	-7.11	**Pass**
			MCS0	15.61	22.95	30	-7.05	**Pass**
			MCS1	15.57	22.87	30	-7.13	**Pass**
			MCS2	15.48	22.83	30	-7.17	**Pass**
			MCS3	15.57	22.85	30	-7.15	**Pass**
			MCS4	15.51	22.88	30	-7.12	**Pass**
			MCS5	15.47	22.79	30	-7.21	**Pass**
			MCS6	15.52	22.91	30	-7.09	**Pass**
802.11n (20MHz)	6	2437	MCS7	15.51	22.83	30	-7.17	**Pass**
			MCS0	15.68	22.93	30	-7.07	**Pass**
			MCS1	15.67	22.87	30	-7.13	**Pass**
			MCS2	15.63	22.9	30	-7.1	**Pass**
			MCS3	15.62	22.84	30	-7.16	**Pass**
			MCS4	15.67	22.96	30	-7.04	**Pass**
			MCS5	15.74	22.94	30	-7.06	**Pass**
			MCS6	15.65	22.89	30	-7.11	**Pass**
802.11n (20MHz)	11	2462	MCS7	15.65	22.88	30	-7.12	**Pass**
			MCS0	14.71	22.1	30	-7.9	**Pass**
			MCS1	14.78	22.34	30	-7.66	**Pass**
			MCS2	14.75	22.33	30	-7.67	**Pass**
			MCS3	14.58	23.31	30	-6.69	**Pass**
			MCS4	14.71	23.18	30	-6.82	**Pass**
			MCS5	14.82	23.08	30	-6.92	**Pass**
			MCS6	14.99	23.78	30	-6.22	**Pass**
802.11n (40MHz)	3	2422	MCS7	14.79	23.45	30	-6.55	**Pass**
			MCS0	15.17	22.54	30	-7.46	**Pass**
			MCS1	15.18	22.75	30	-7.25	**Pass**
			MCS2	15.18	22.78	30	-7.22	**Pass**
			MCS3	15.12	23.48	30	-6.52	**Pass**
			MCS4	15.13	23.6	30	-6.4	**Pass**
			MCS5	15.11	23.34	30	-6.66	**Pass**
			MCS6	15.09	23.85	30	-6.15	**Pass**
802.11n (40MHz)	6	2437	MCS7	15.07	23.71	30	-6.29	**Pass**
			MCS0	15.27	22.65	30	-7.35	**Pass**
			MCS1	15.28	22.82	30	-7.18	**Pass**
			MCS2	15.23	22.81	30	-7.19	**Pass**
			MCS3	15.09	23.45	30	-6.55	**Pass**
			MCS4	15.14	23.61	30	-6.39	**Pass**
			MCS5	15.11	23.27	30	-6.73	**Pass**
			MCS6	15.12	23.81	30	-6.19	**Pass**
802.11n (40MHz)	9	2452	MCS7	14.95	23.61	30	-6.39	**Pass**

802.11n results

5 Occupied Bandwidth

5.1 Test Limits

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

5.2 Test Procedure

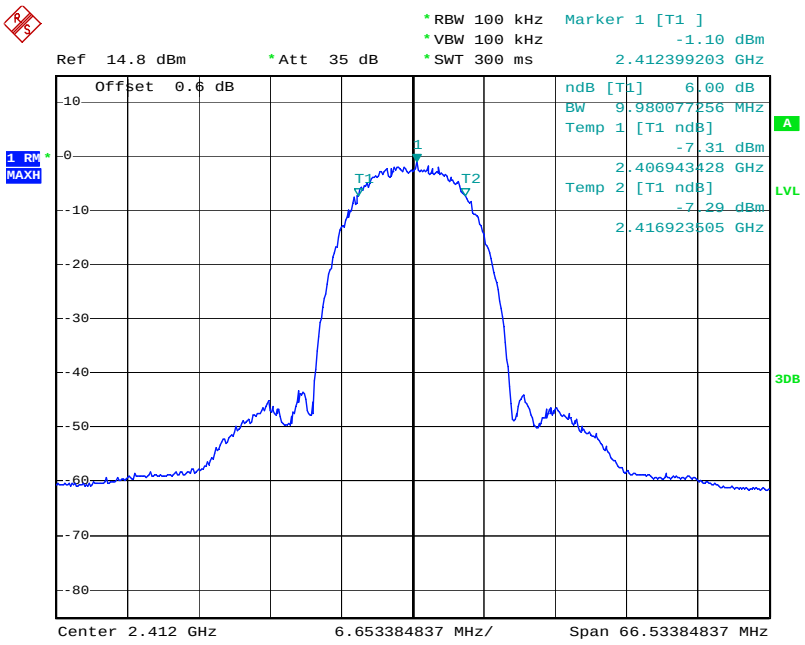
ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

5.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	8/27/2010	8/27/2011

5.4 Results:

Mode	Channel Number	Frequency (MHz)	6dB Bandwidth	99% Power Bandwidth	Result
802.11b	1	2412	9.9MHz	---	Pass
802.11b	6	2437	9.8MHz	17.55	Pass
802.11b	11	2462	9.7MHz	---	Pass
802.11g	1	2412	16.6MHz	---	Pass
802.11g	6	2437	16.6MHz	16.5MHz	Pass
802.11g	11	2462	16.6MHz	---	Pass
802.11n (20MHz)	1	2412	17.8MHz	---	Pass
802.11n (20MHz)	6	2437	17.8MHz	17.7MHz	Pass
802.11n (20MHz)	11	2462	17.8MHz	---	Pass
802.11n (40MHz)	3	2422	36.6MHz	---	Pass
802.11n (40MHz)	6	2437	36.6MHz	36.4MHz	Pass
802.11n (40MHz)	9	2452	36.6MHz	---	Pass



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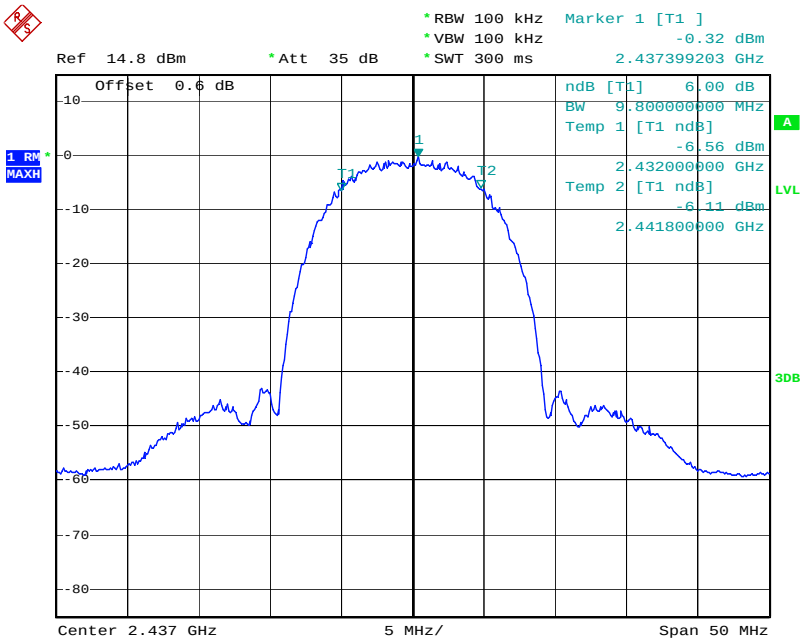
6dB Bandwidth Plot (Channel 1) – 802.11b mode



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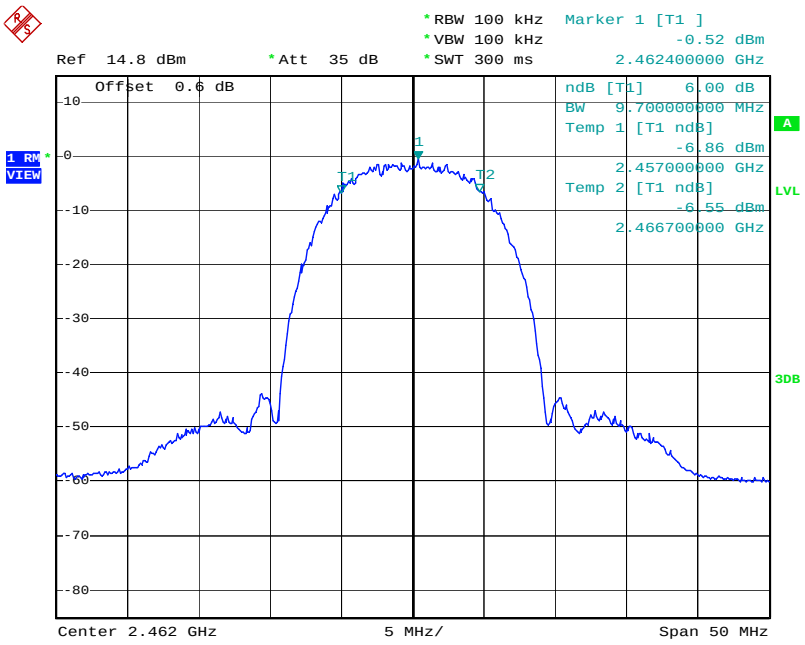
6dB Bandwidth Plot (Channel 6) – 802.11b mode



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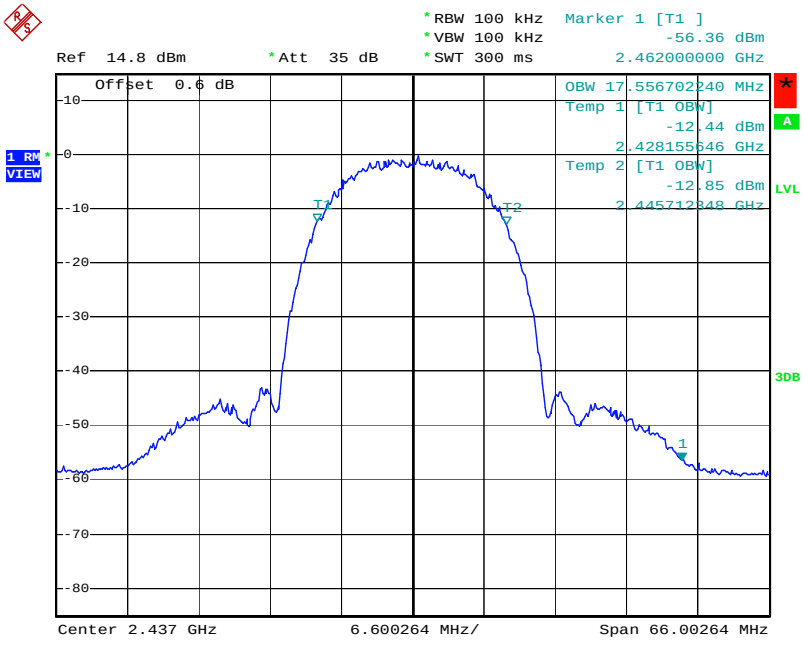
6dB Bandwidth Plot (Channel 11) – 802.11b mode



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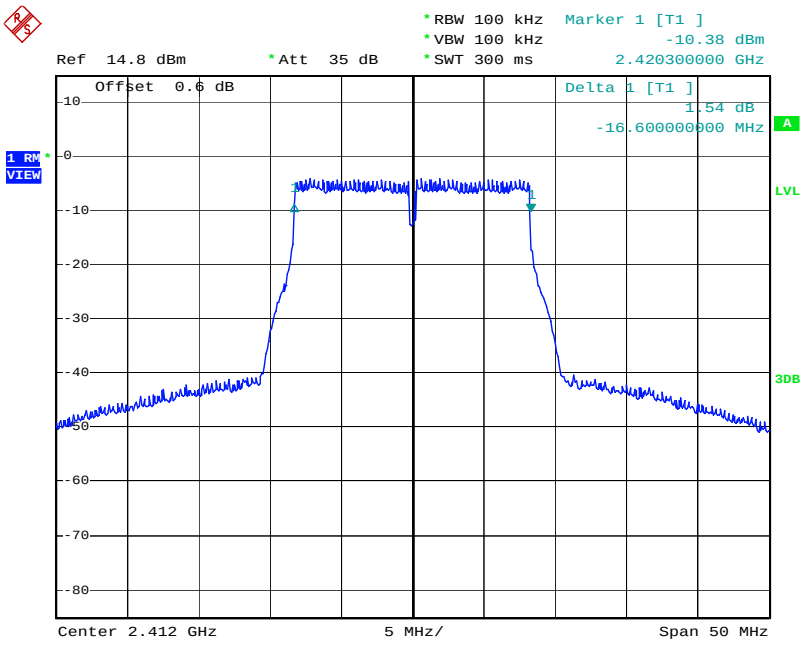
99% Power Bandwidth Plot (Channel 6) – 802.11b mode



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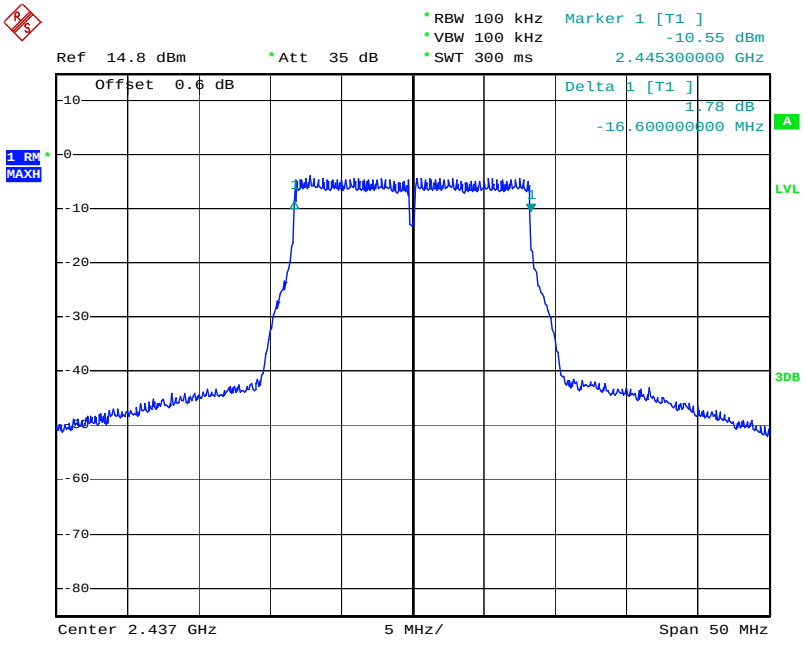
6dB Bandwidth Plot (Channel 1) – 802.11g mode



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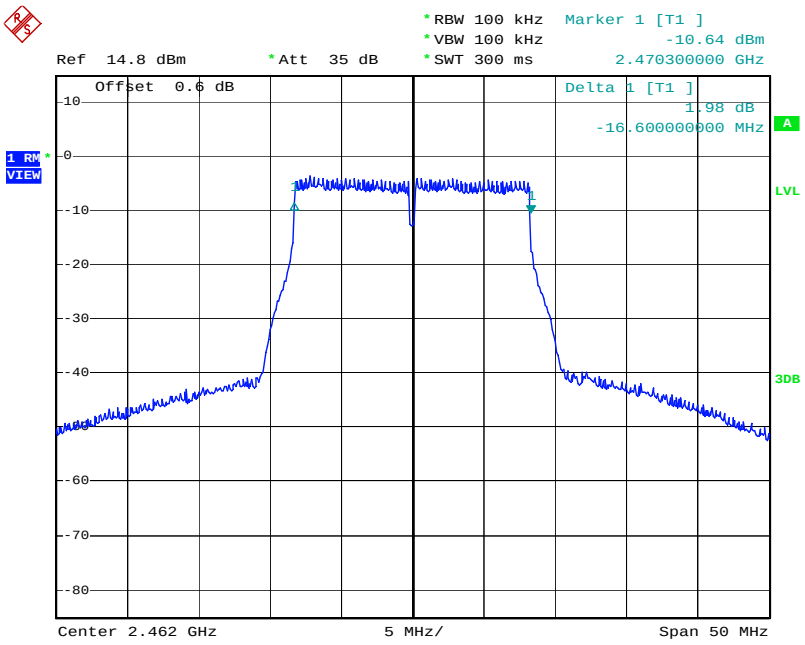
6dB Bandwidth Plot (Channel 6) – 802.11g mode



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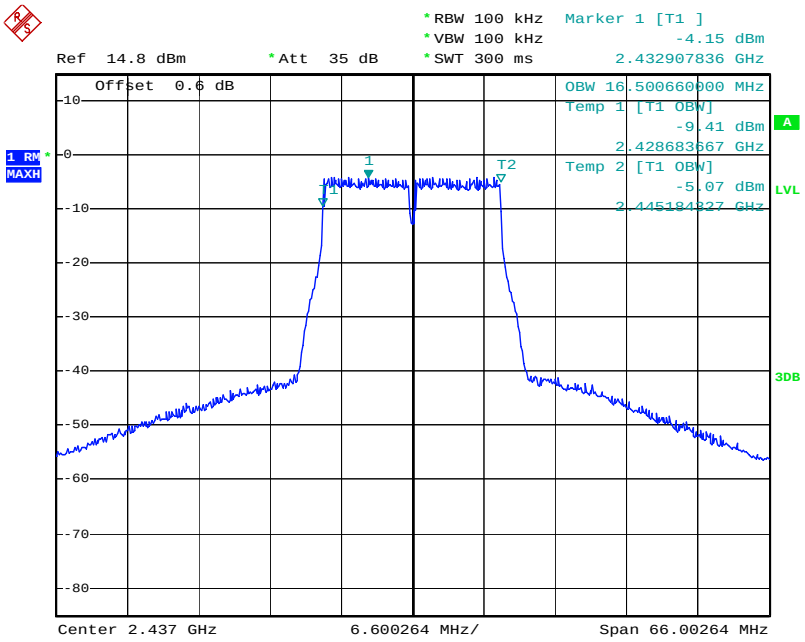
6dB Bandwidth Plot (Channel 11) – 802.11g mode



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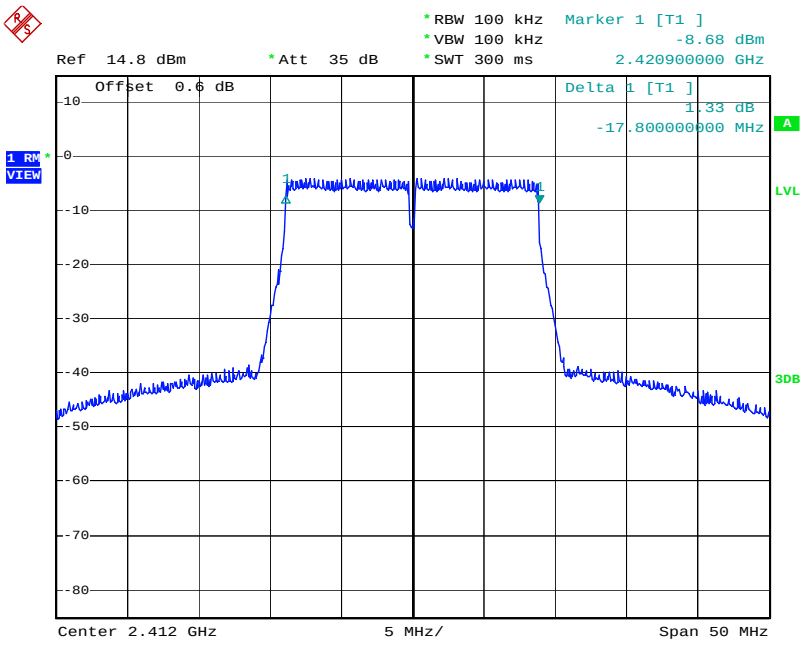
99% Power Bandwidth Plot (Channel 6) – 802.11g mode



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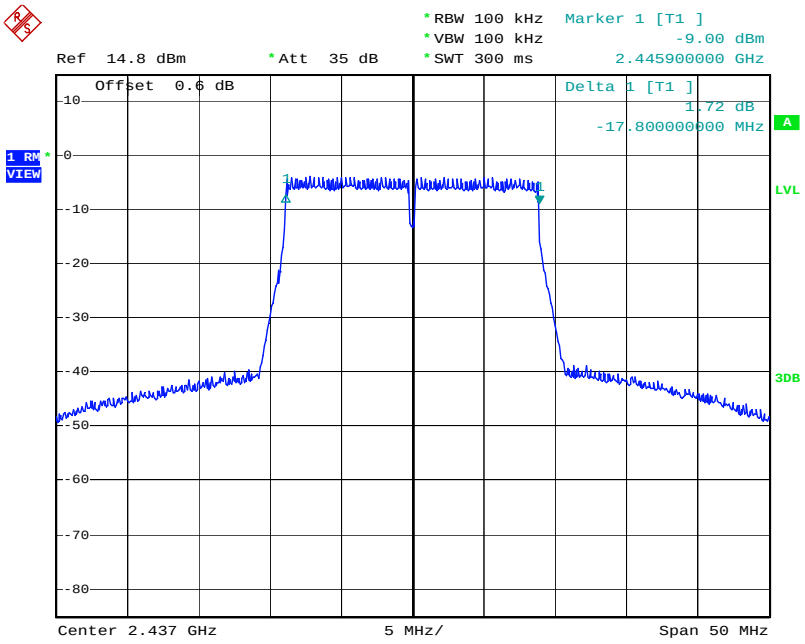
6dB Bandwidth Plot (Channel 1) – 802.11n mode (20MHz)



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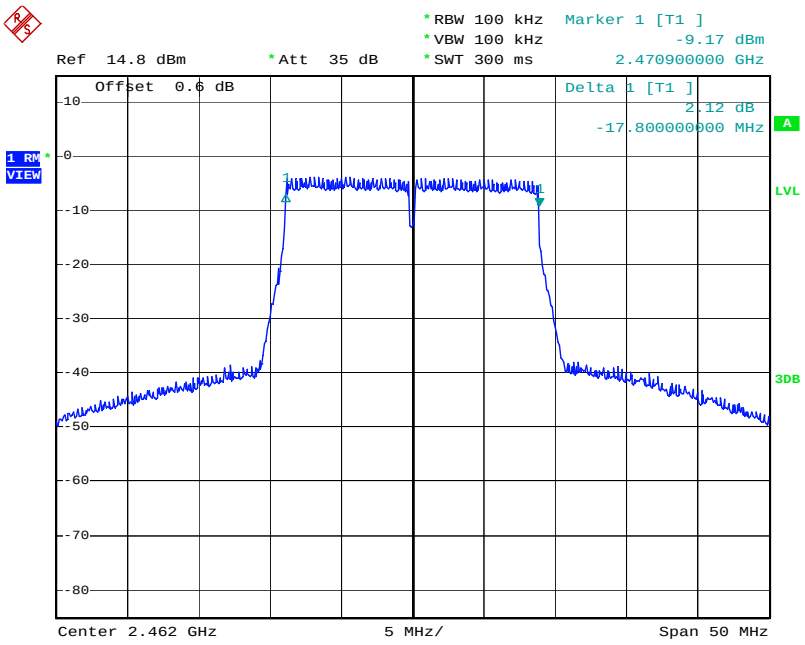
6dB Bandwidth Plot (Channel 6) – 802.11n mode (20MHz)



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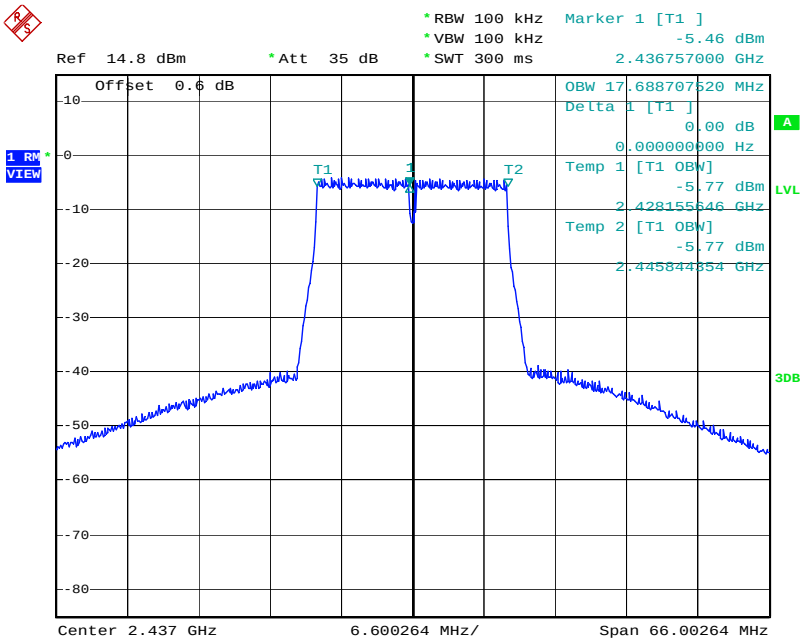
6dB Bandwidth Plot (Channel 11) – 802.11n mode (20MHz)



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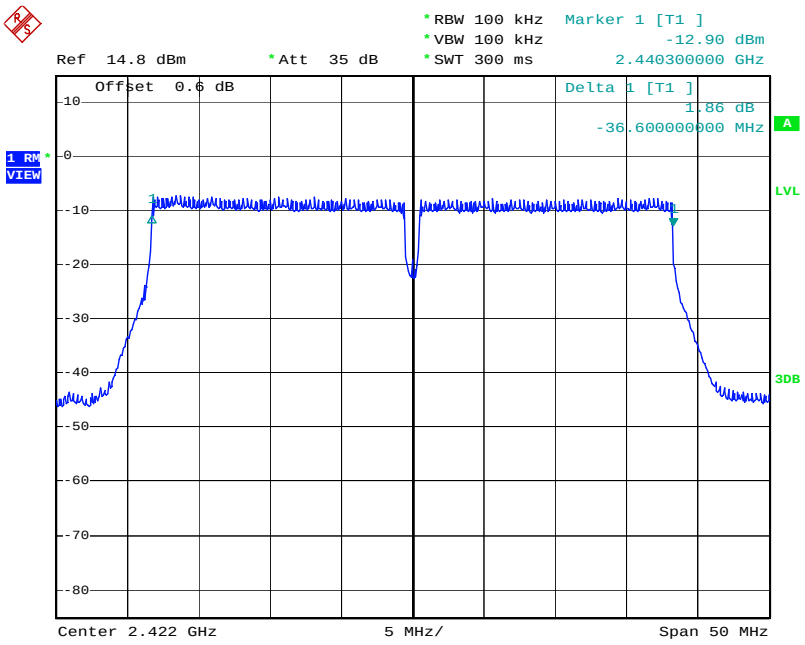
99% Power Bandwidth Plot (Channel 6) – 802.11n mode (20MHz)



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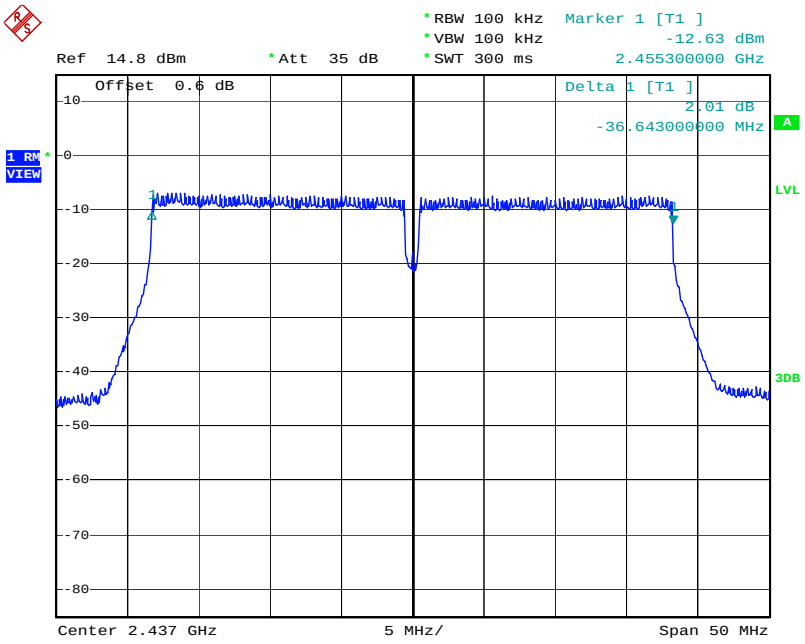
6dB Bandwidth Plot (Channel 3) – 802.11n mode (40MHz)



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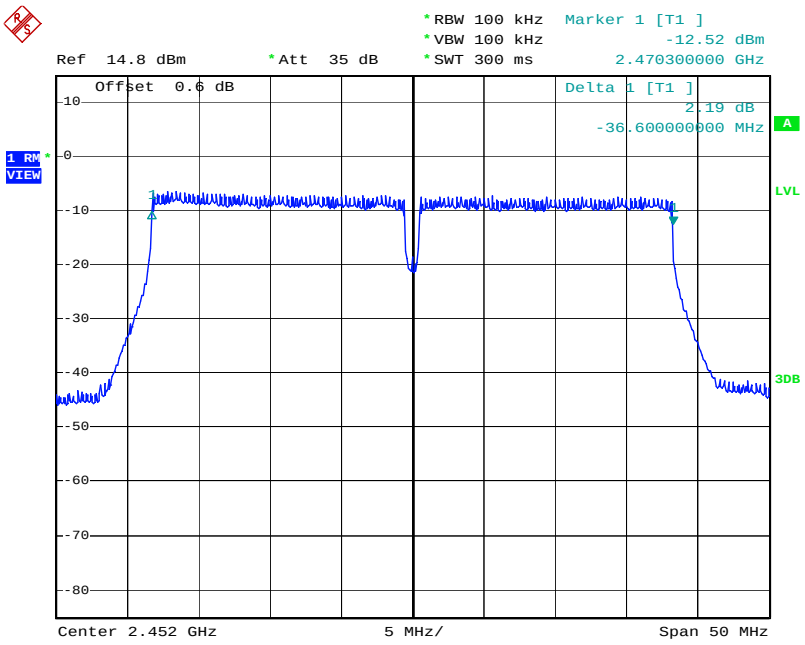
6dB Bandwidth Plot (Channel 6) – 802.11n mode (40MHz)



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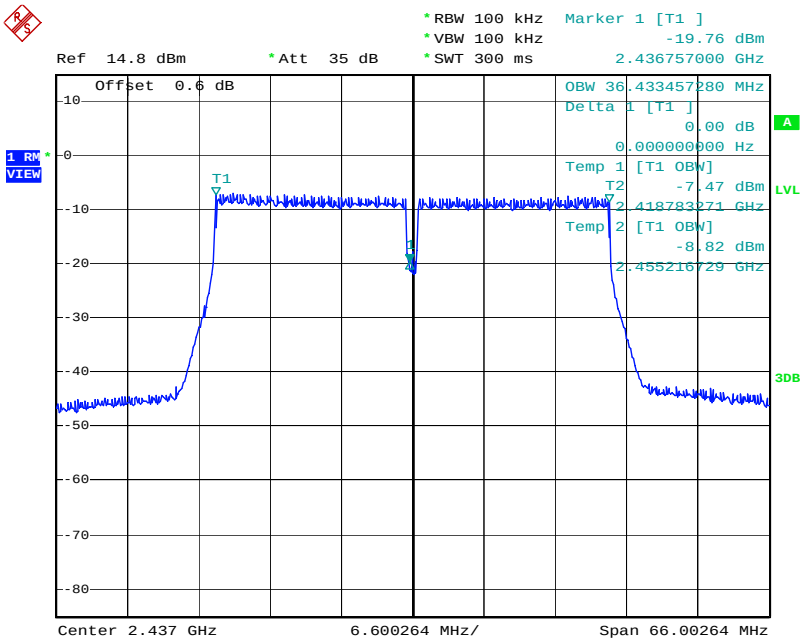
6dB Bandwidth Plot (Channel 9) – 802.11n mode (40MHz)



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99% Power Bandwidth Plot (Channel 6) – 802.11n mode (40MHz)

6 Conducted Spurious Emissions

6.1 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.

6.2 Test Procedure

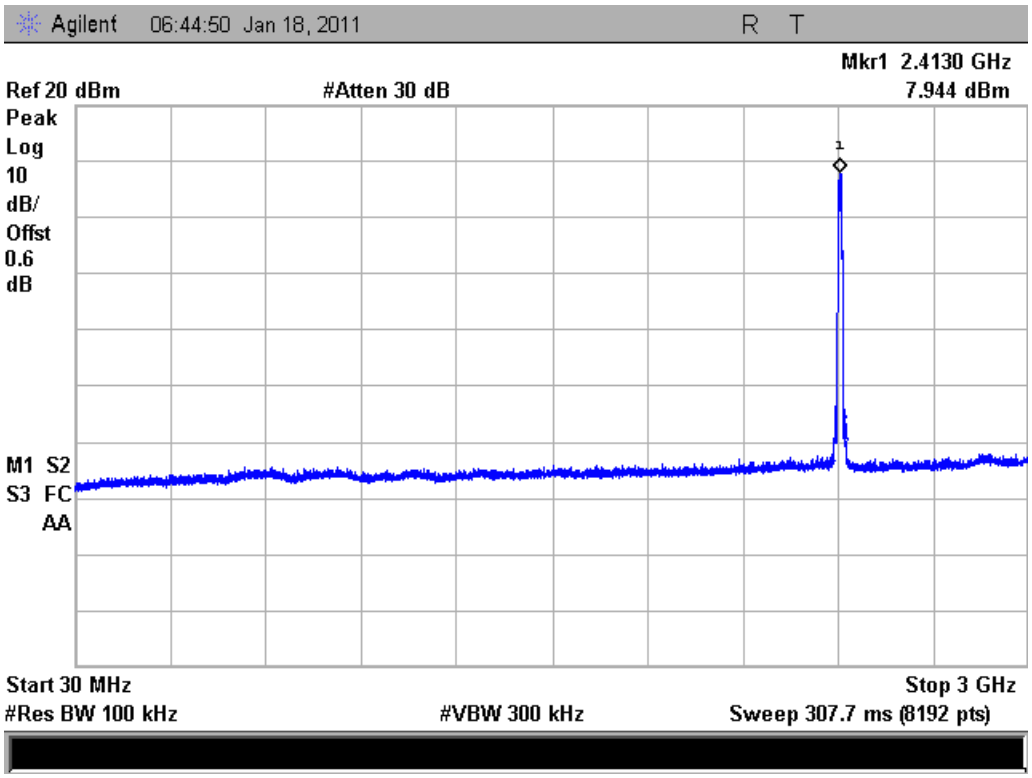
ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

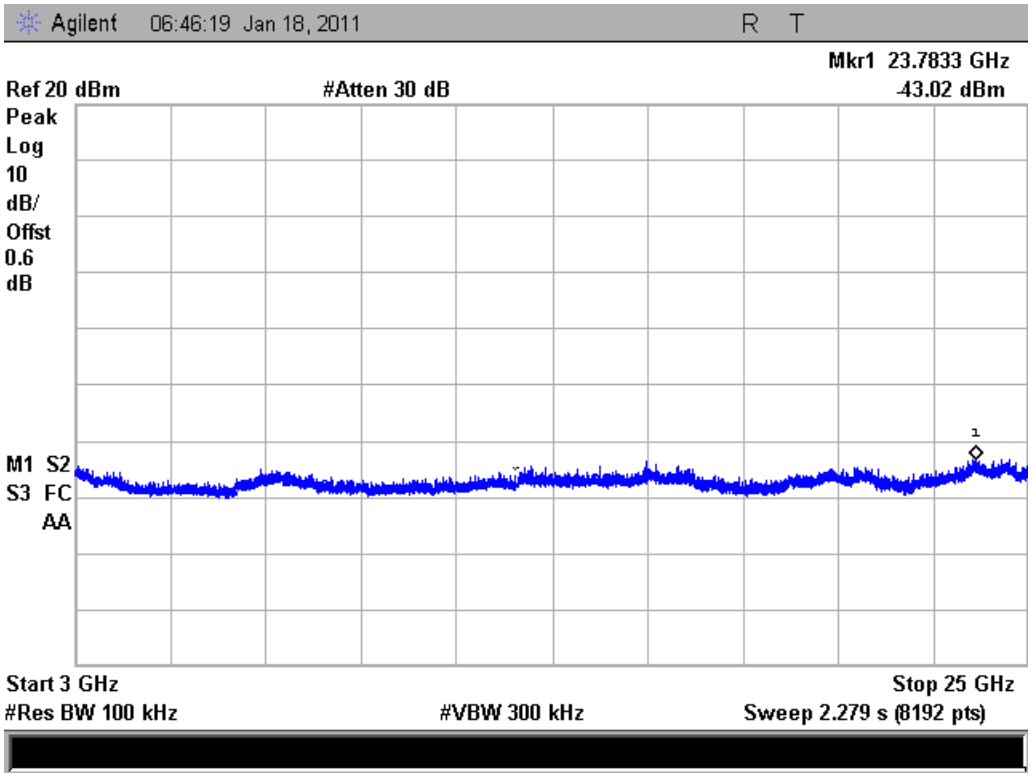
6.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	9/1/2010	9/1/2011

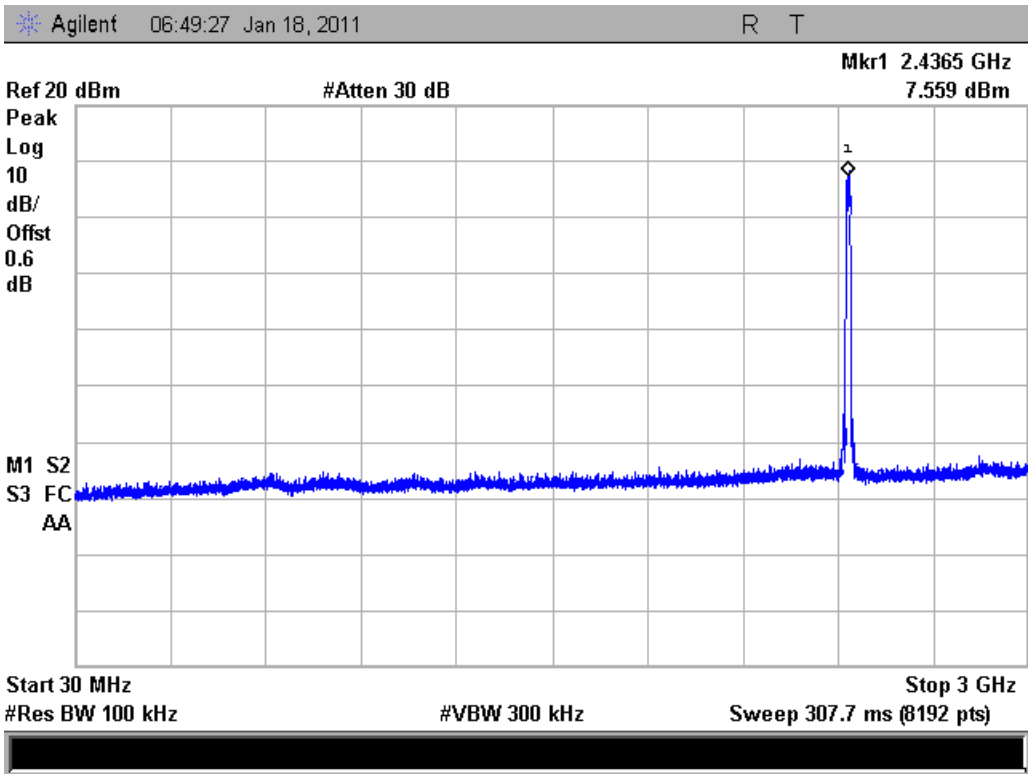
6.4 Results:

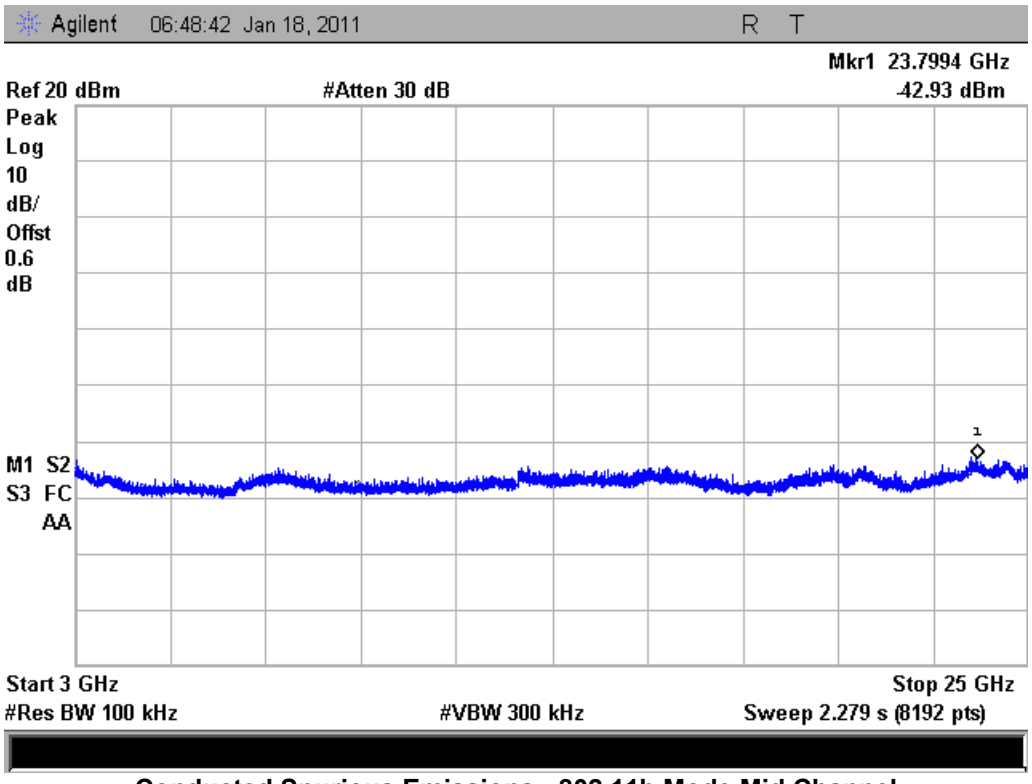
The following plots show that there are no conducted spurious emissions exceeding the 20dB down criteria.



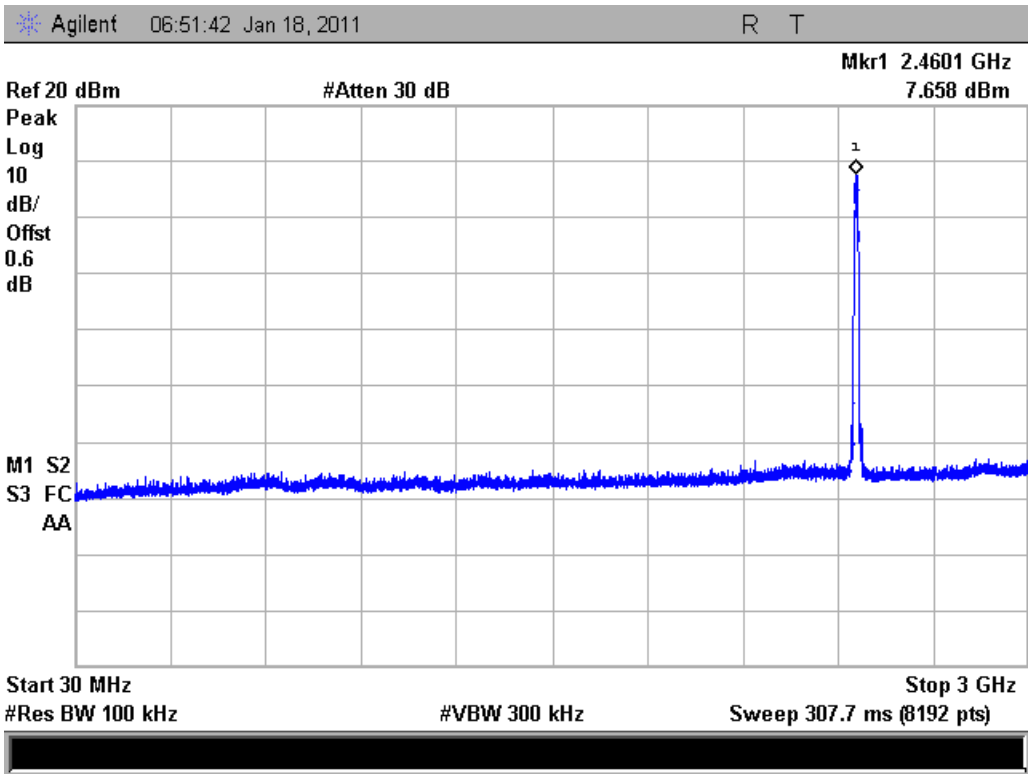


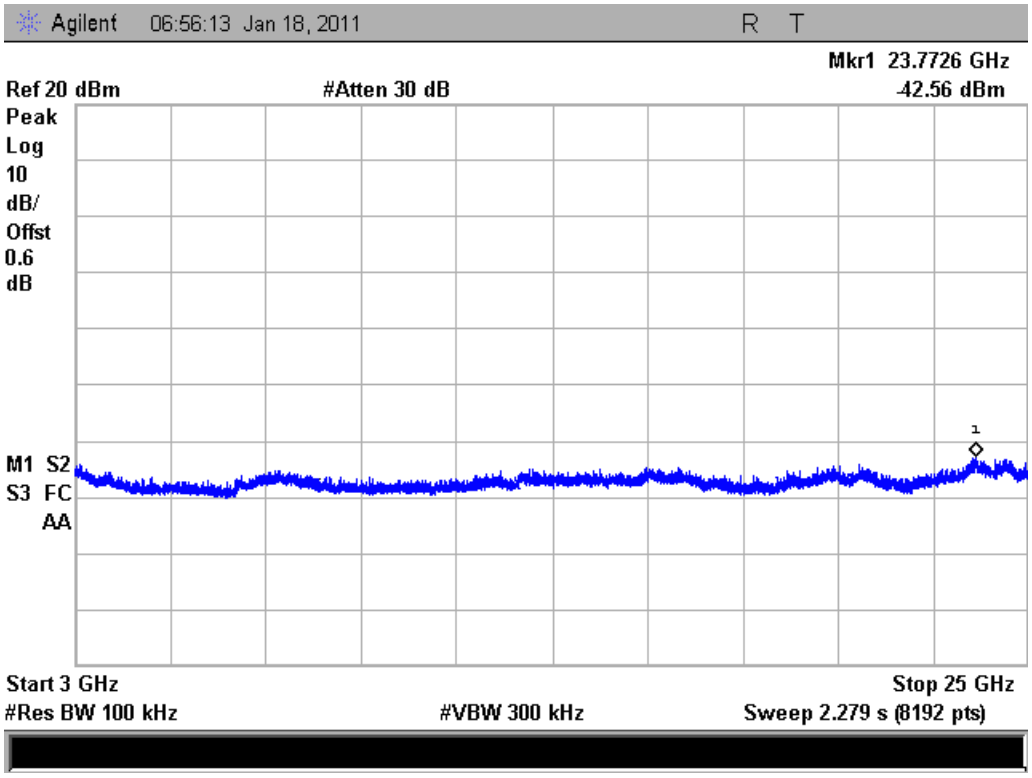
Conducted Spurious Emissions - 802.11b Mode Low Channel



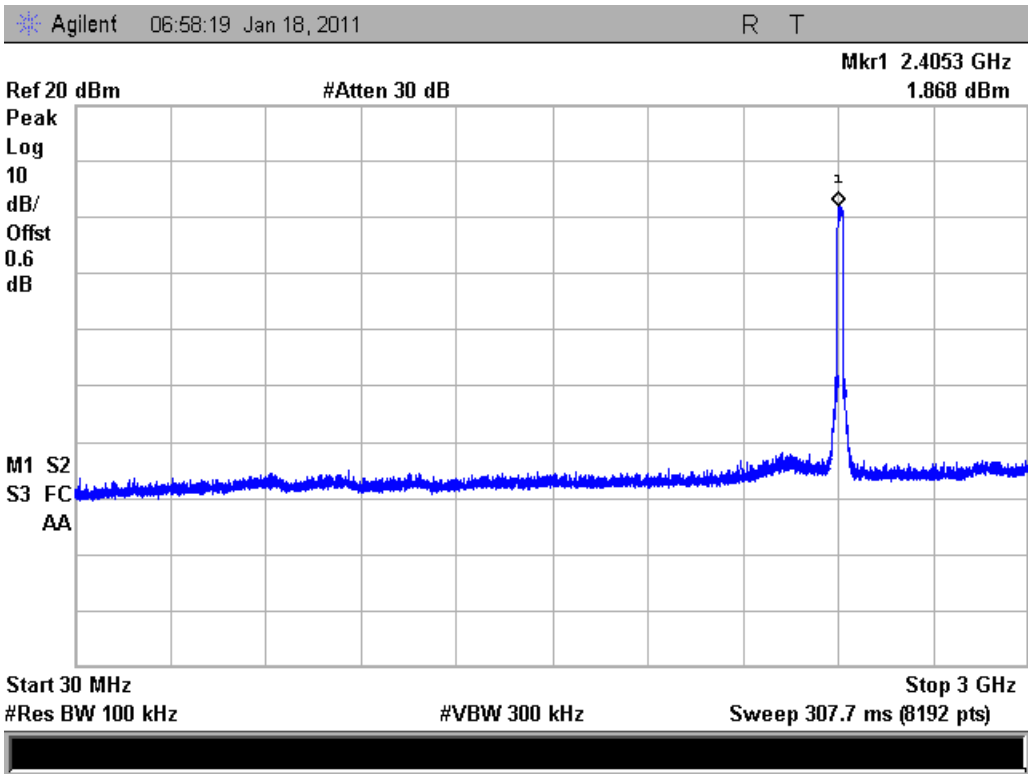


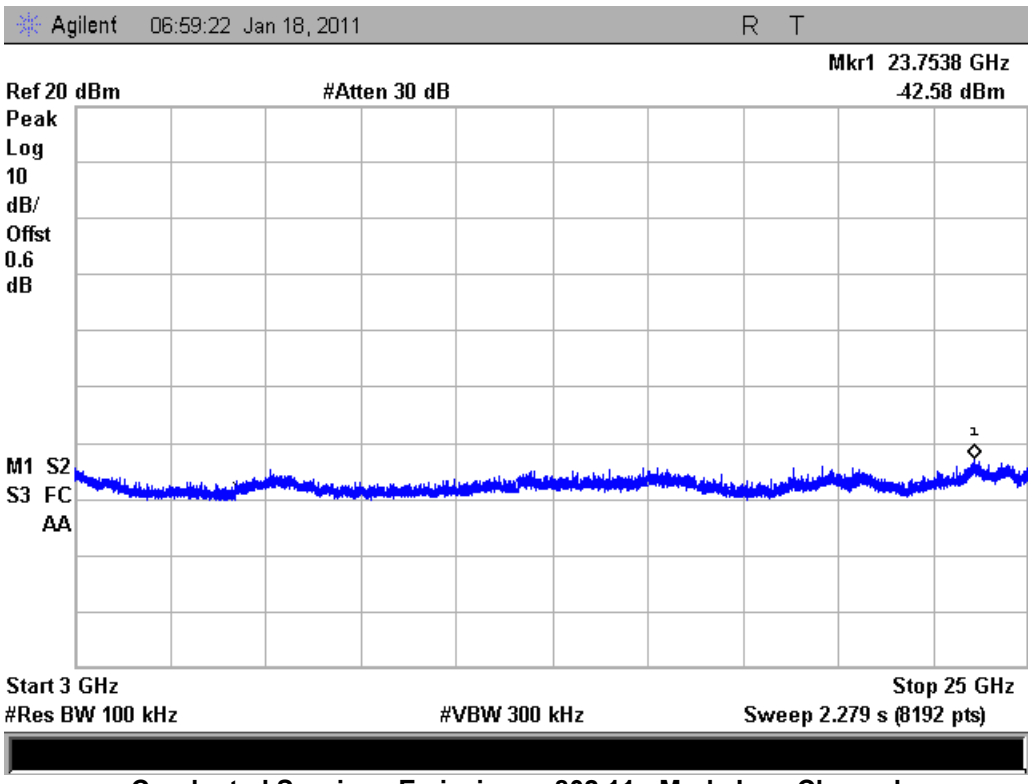
Conducted Spurious Emissions - 802.11b Mode Mid Channel



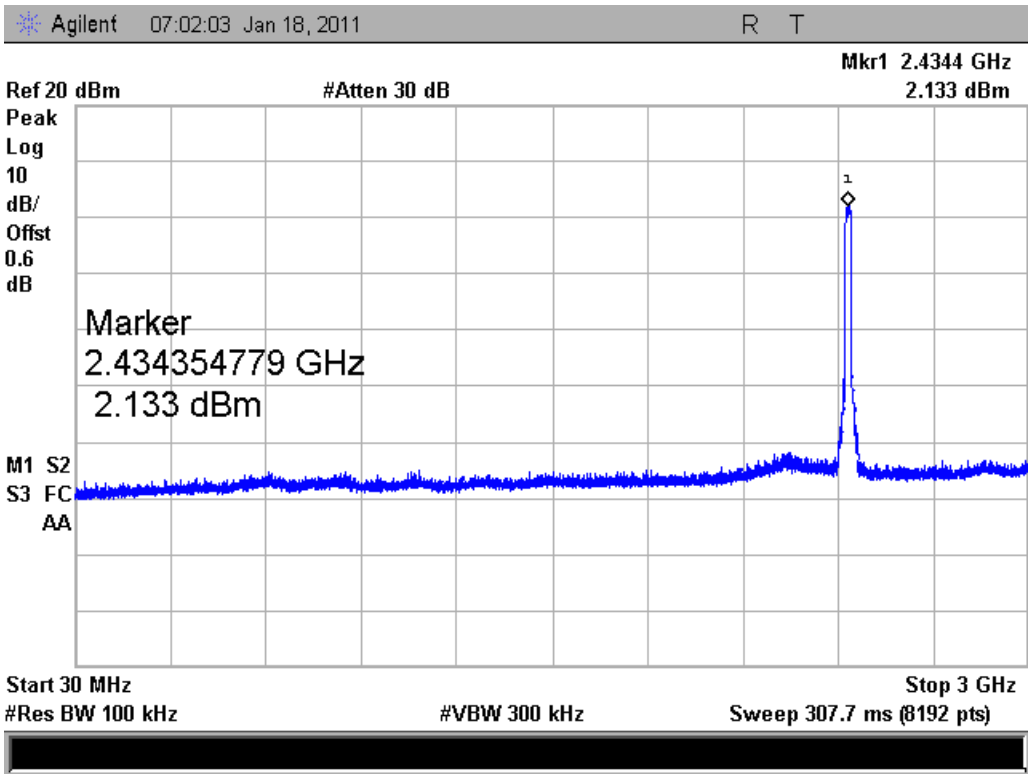


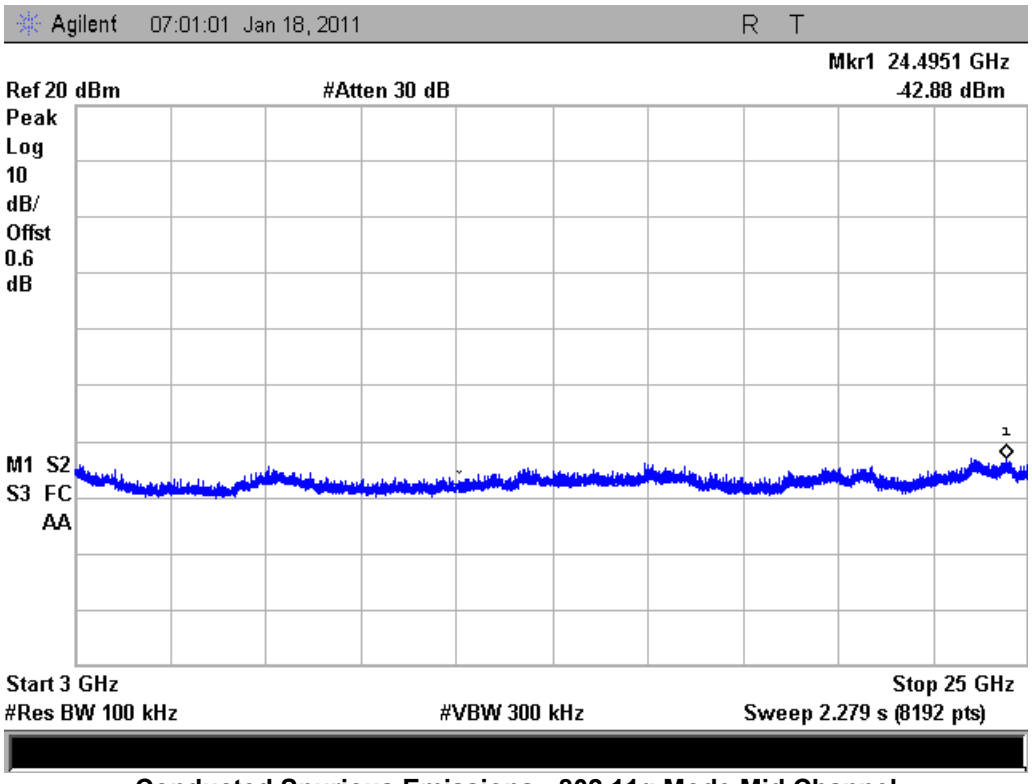
Conducted Spurious Emissions - 802.11b Mode High Channel



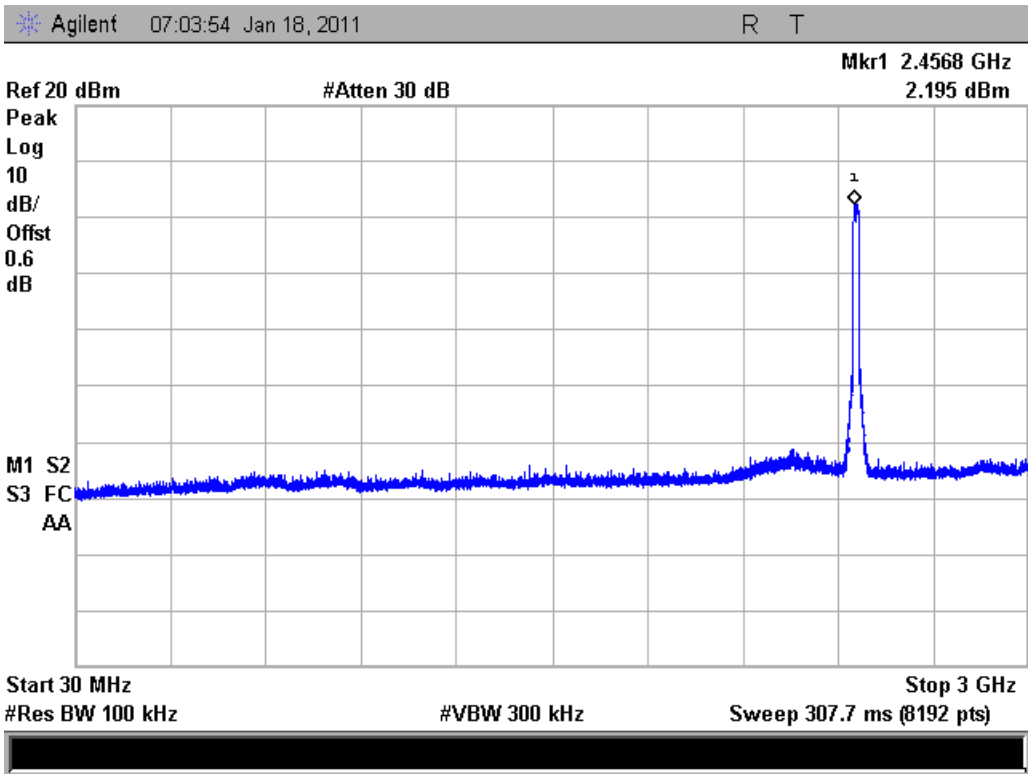


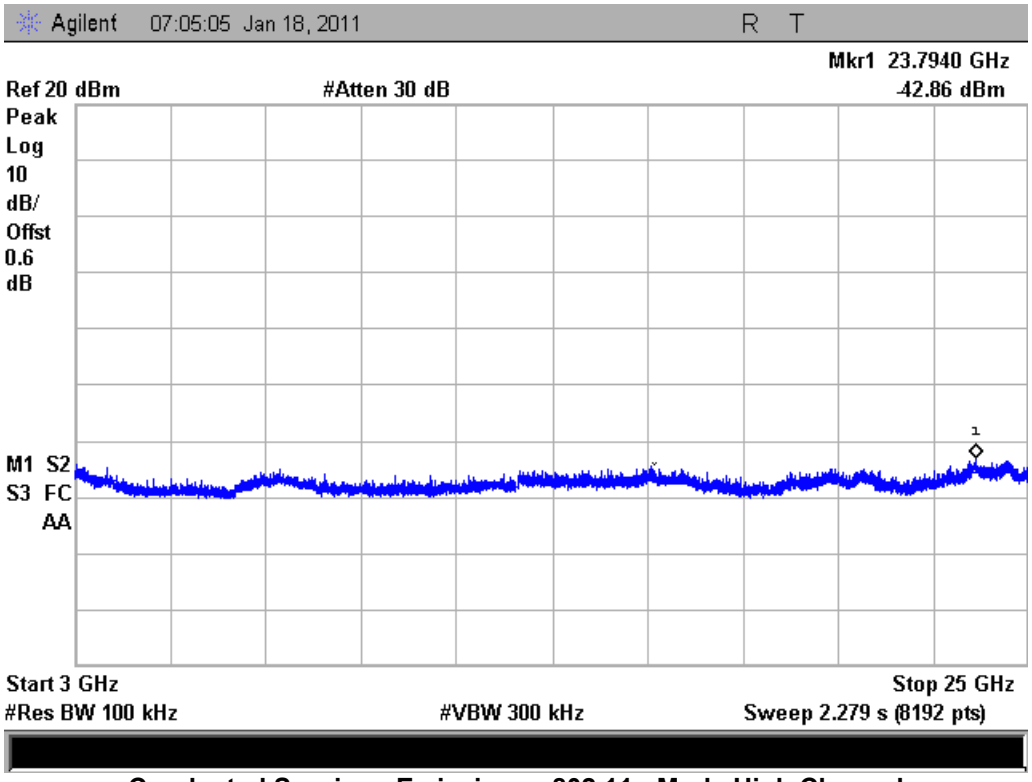
Conducted Spurious Emissions - 802.11g Mode Low Channel



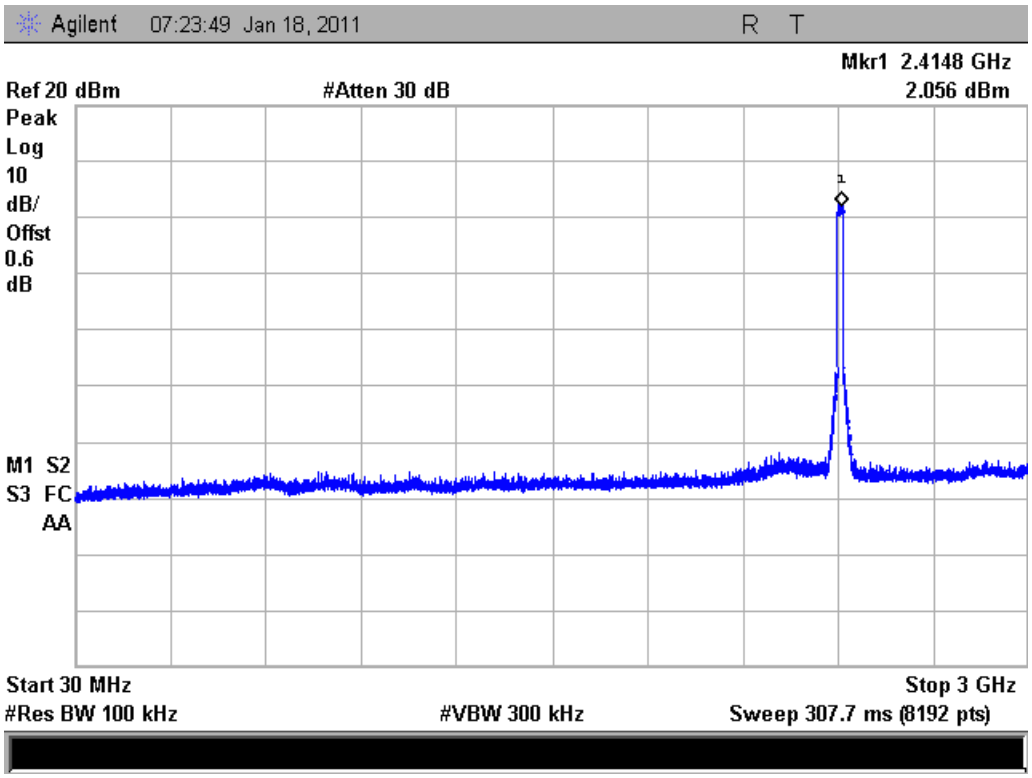


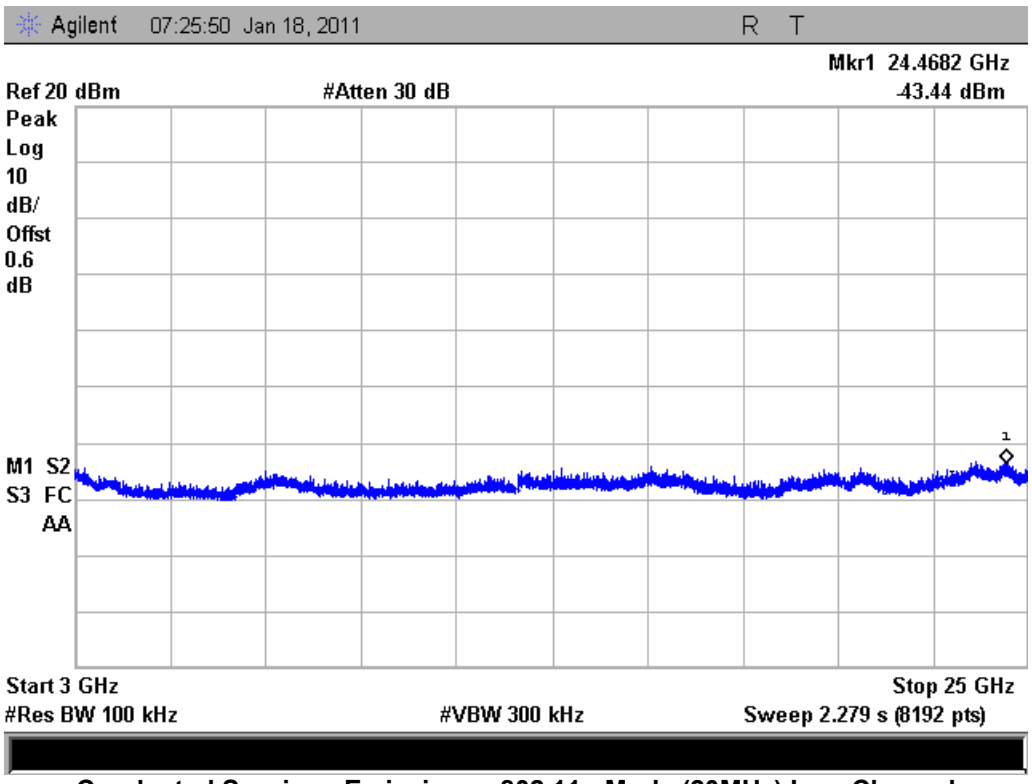
Conducted Spurious Emissions - 802.11g Mode Mid Channel



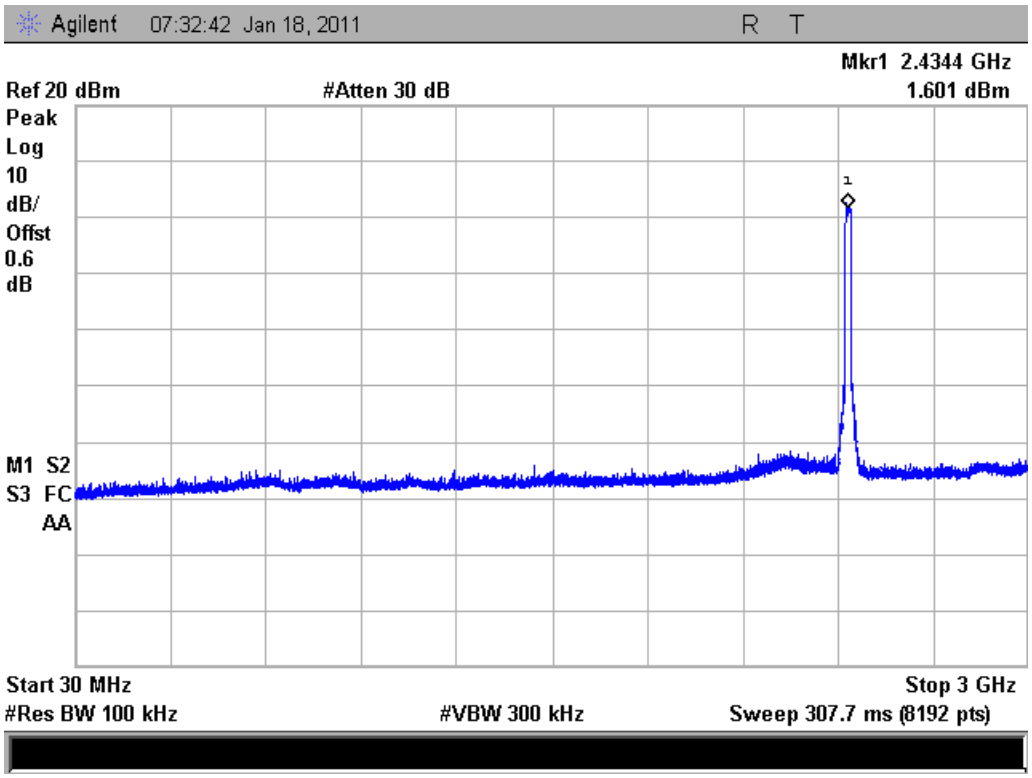


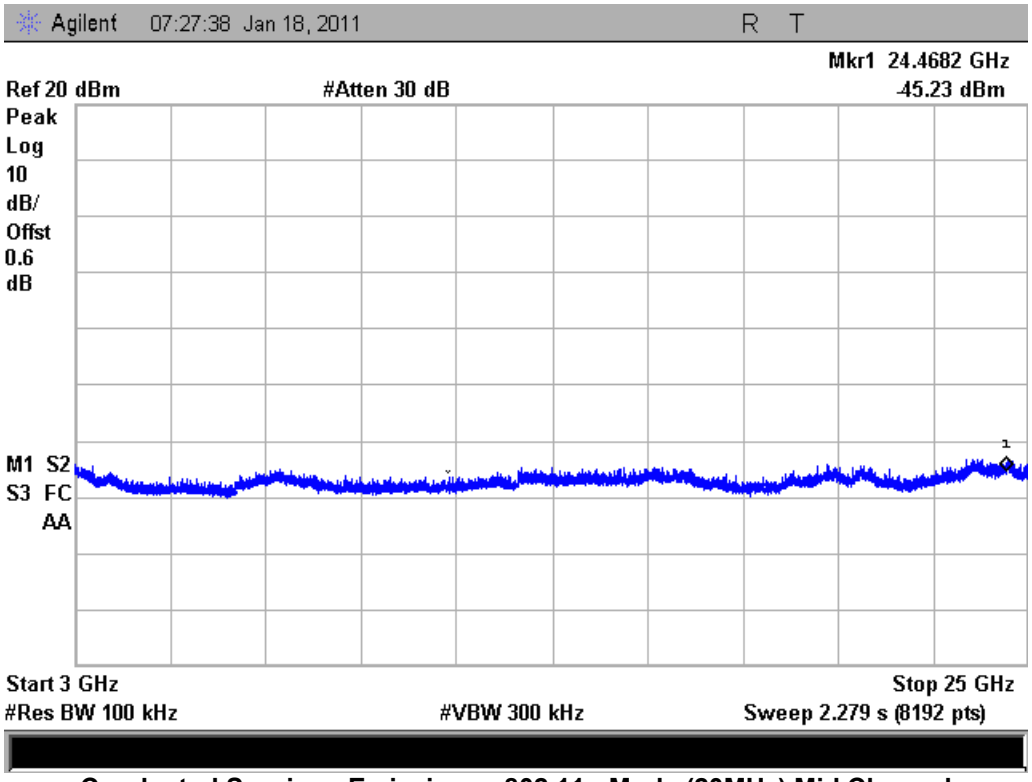
Conducted Spurious Emissions - 802.11g Mode High Channel



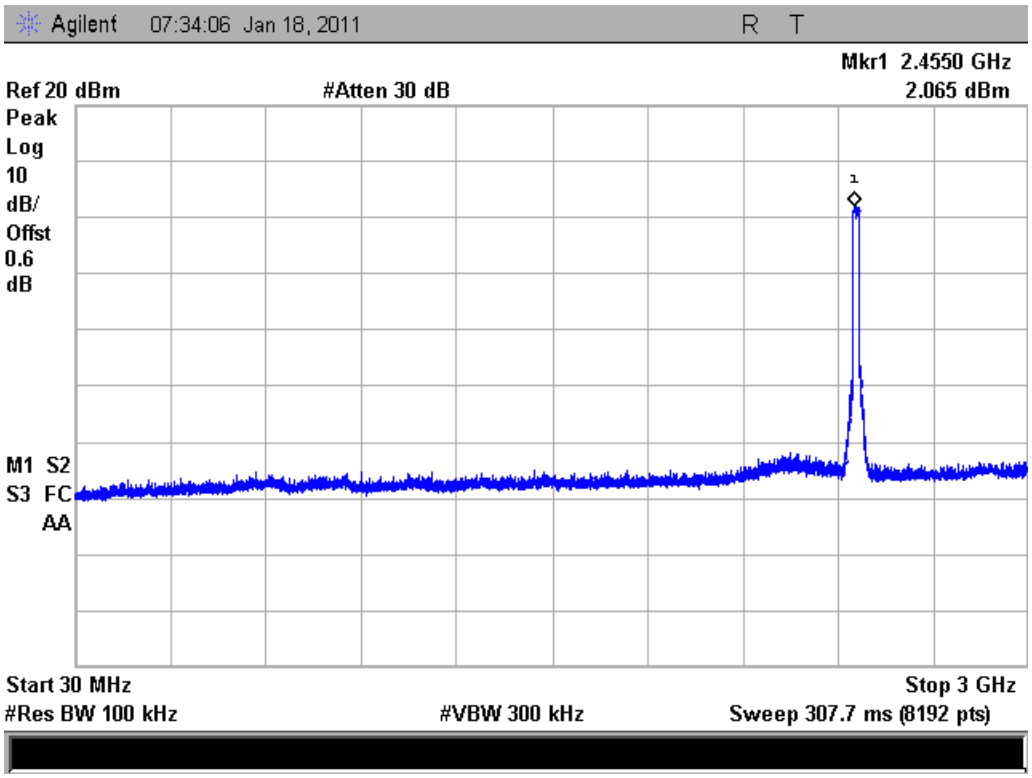


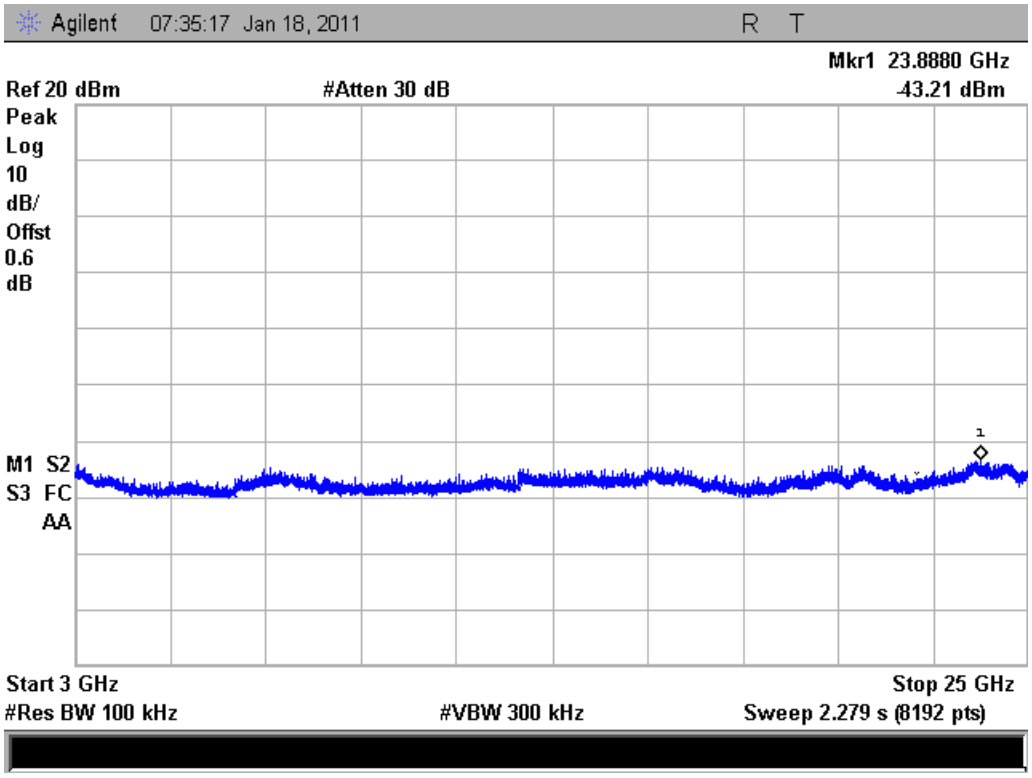
Conducted Spurious Emissions - 802.11n Mode (20MHz) Low Channel



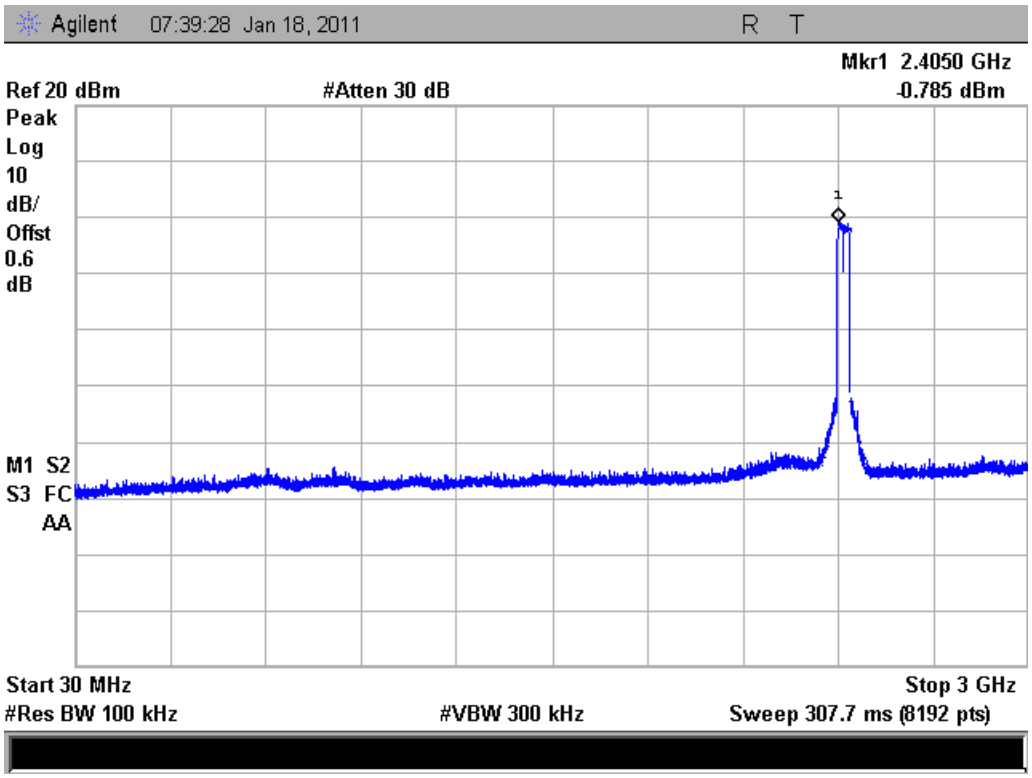


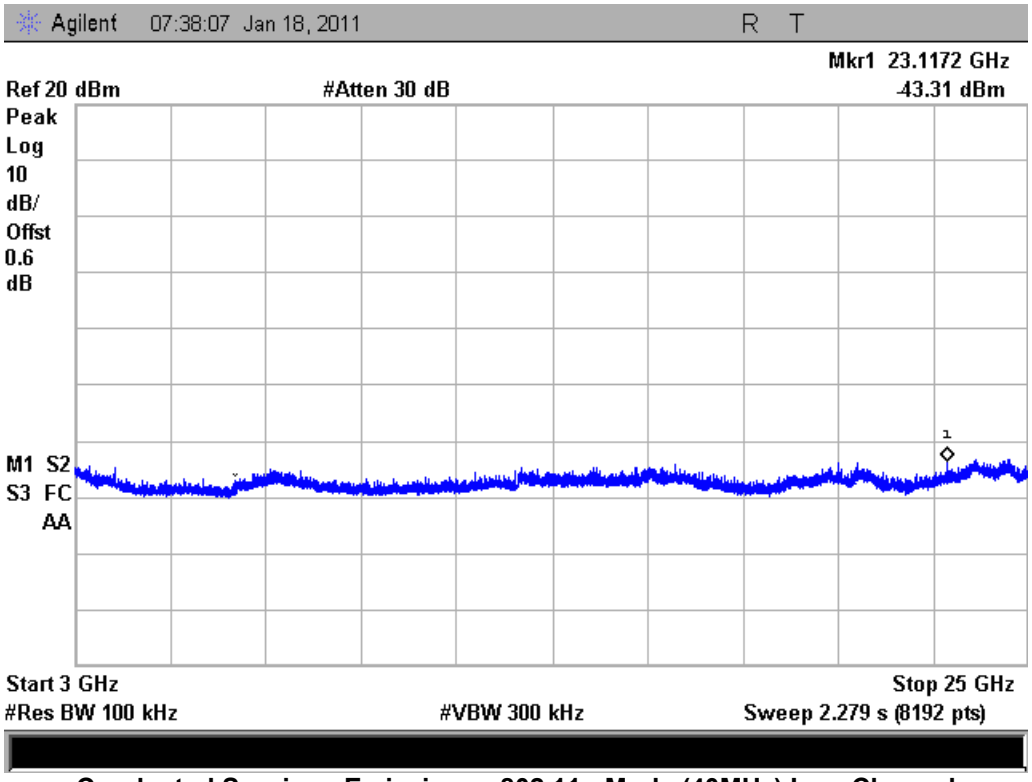
Conducted Spurious Emissions - 802.11n Mode (20MHz) Mid Channel



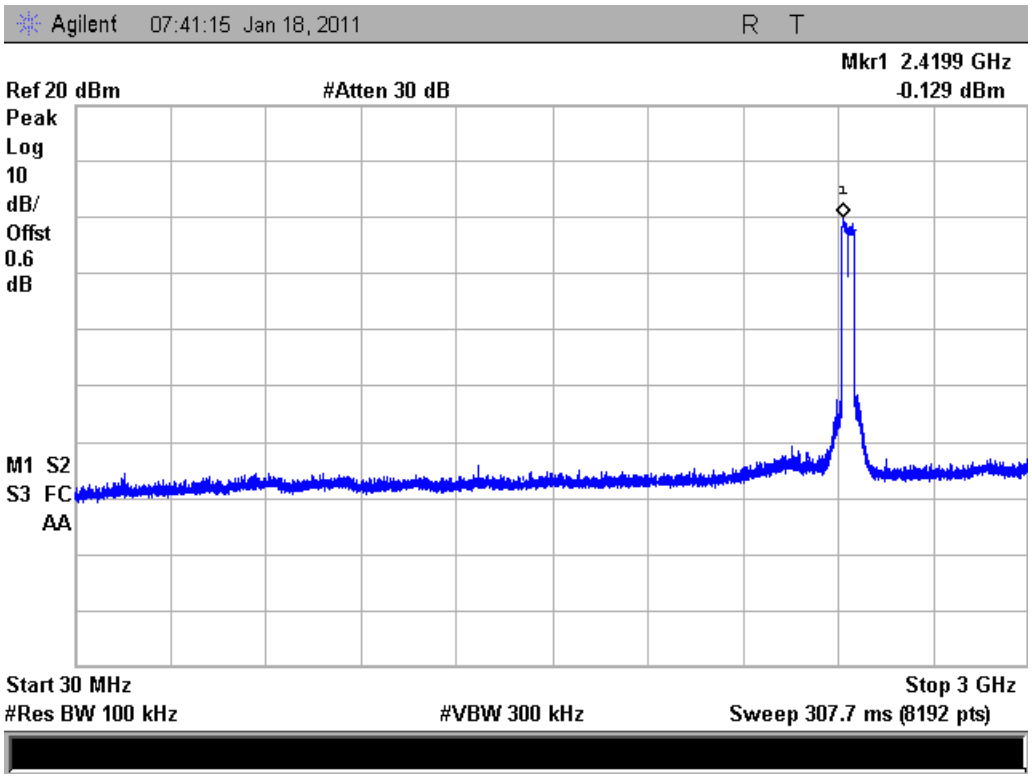


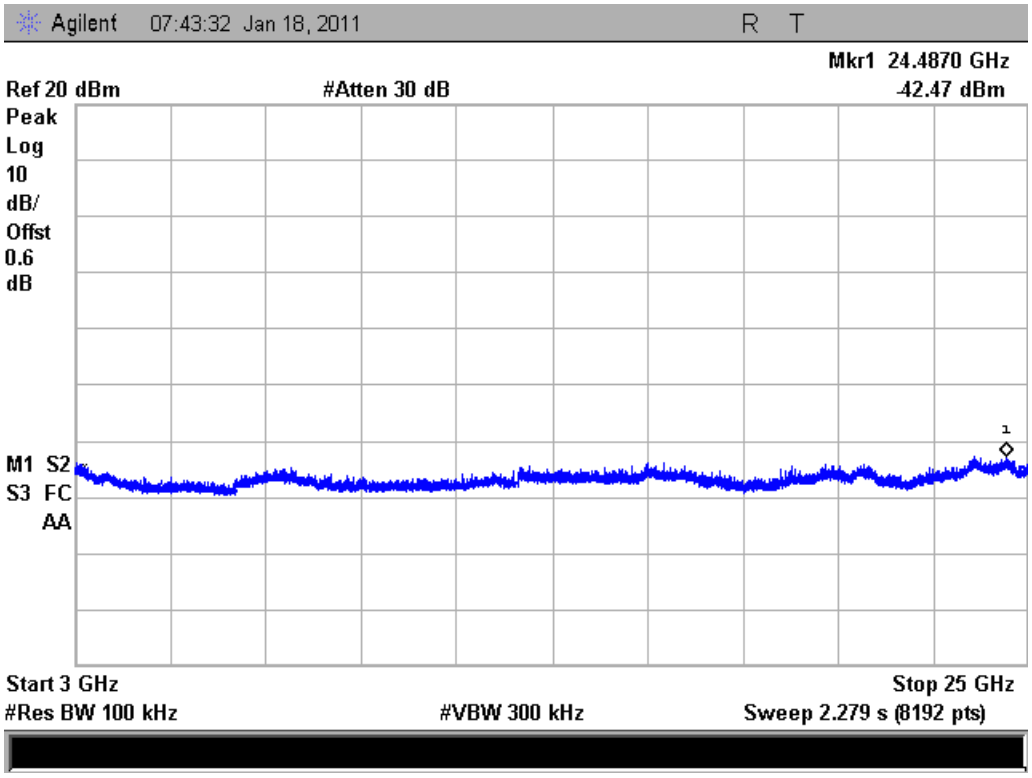
Conducted Spurious Emissions - 802.11n (20MHz) Mode High Channel



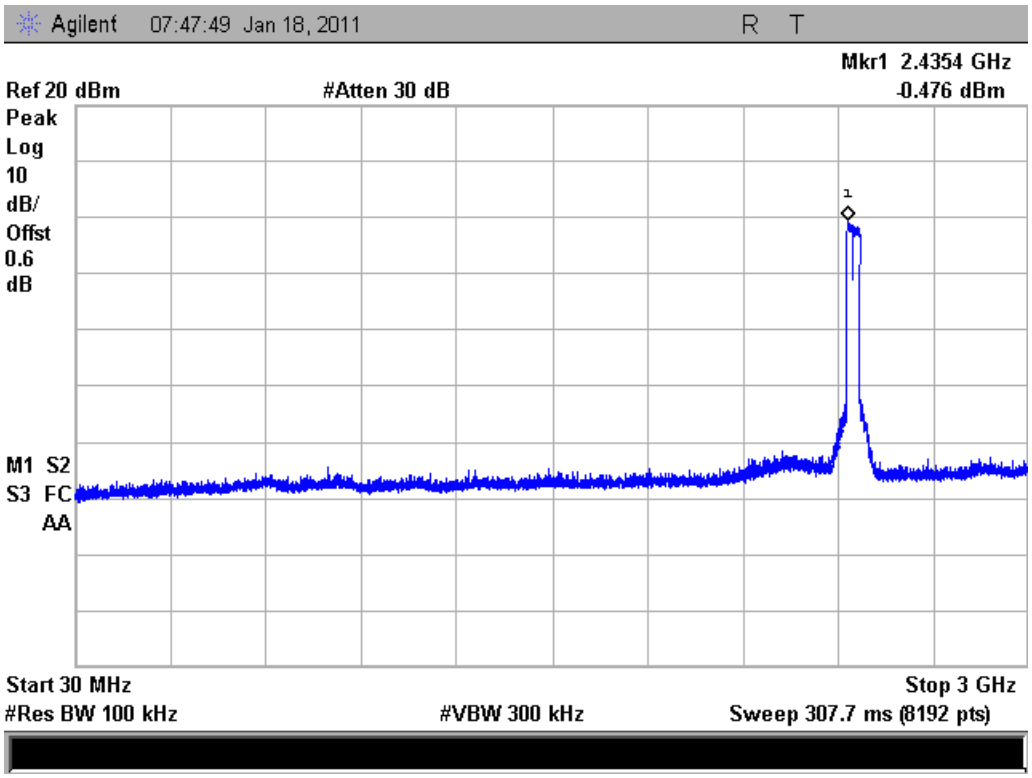


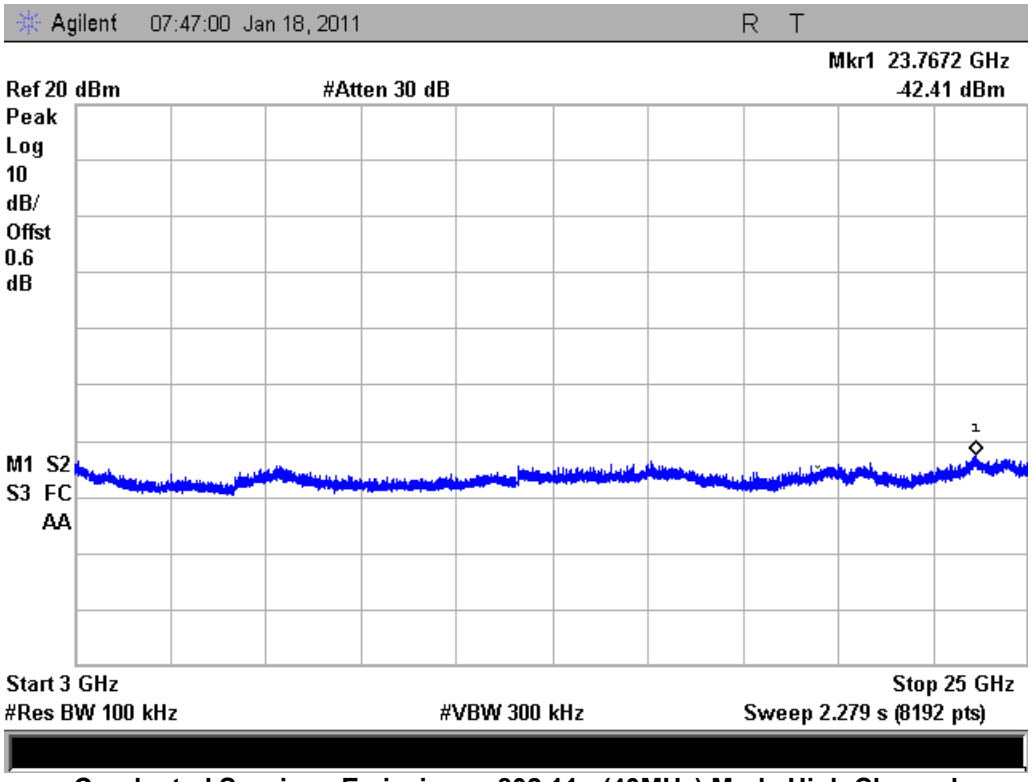
Conducted Spurious Emissions - 802.11n Mode (40MHz) Low Channel



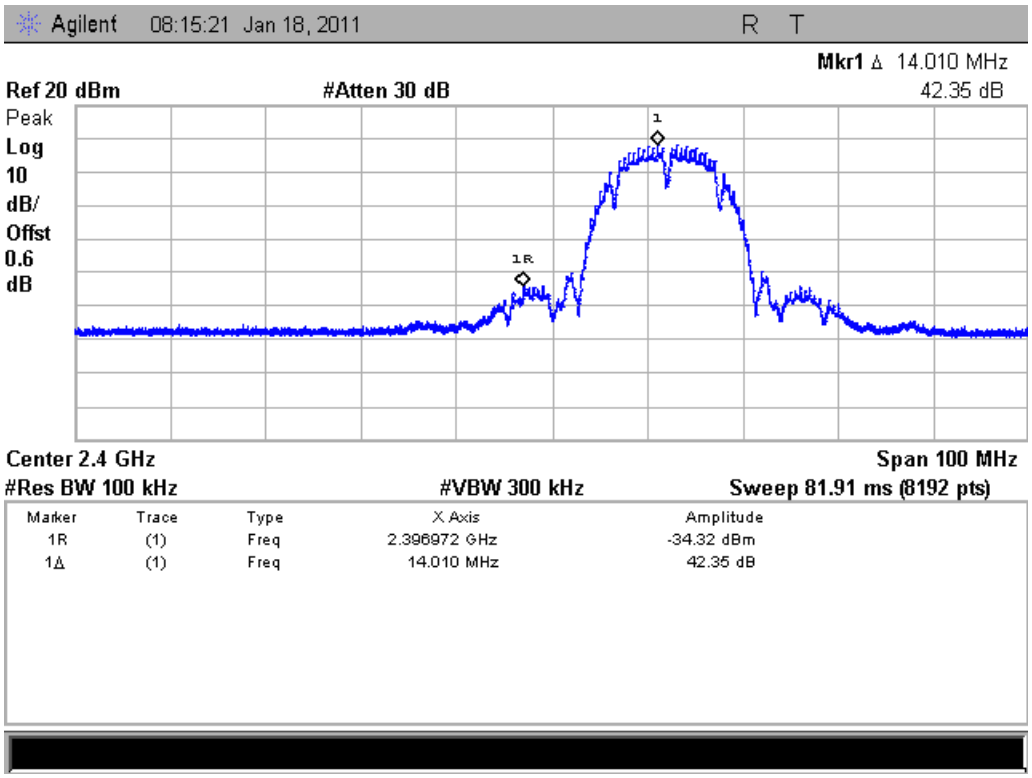


Conducted Spurious Emissions - 802.11n Mode (40MHz) Mid Channel

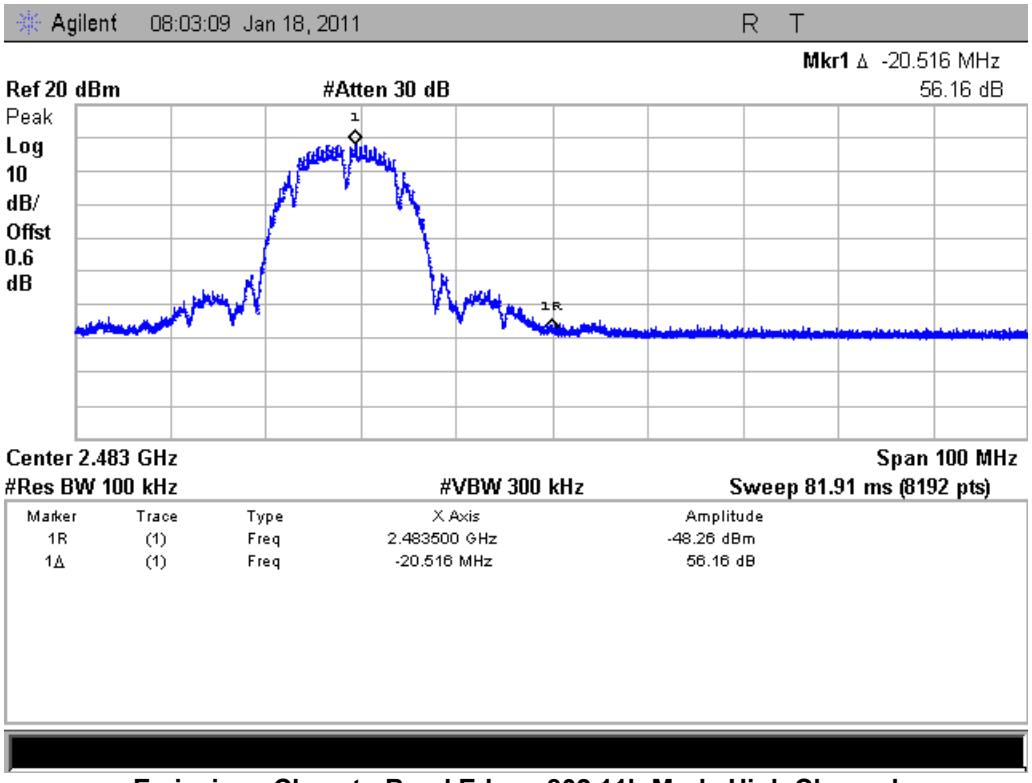




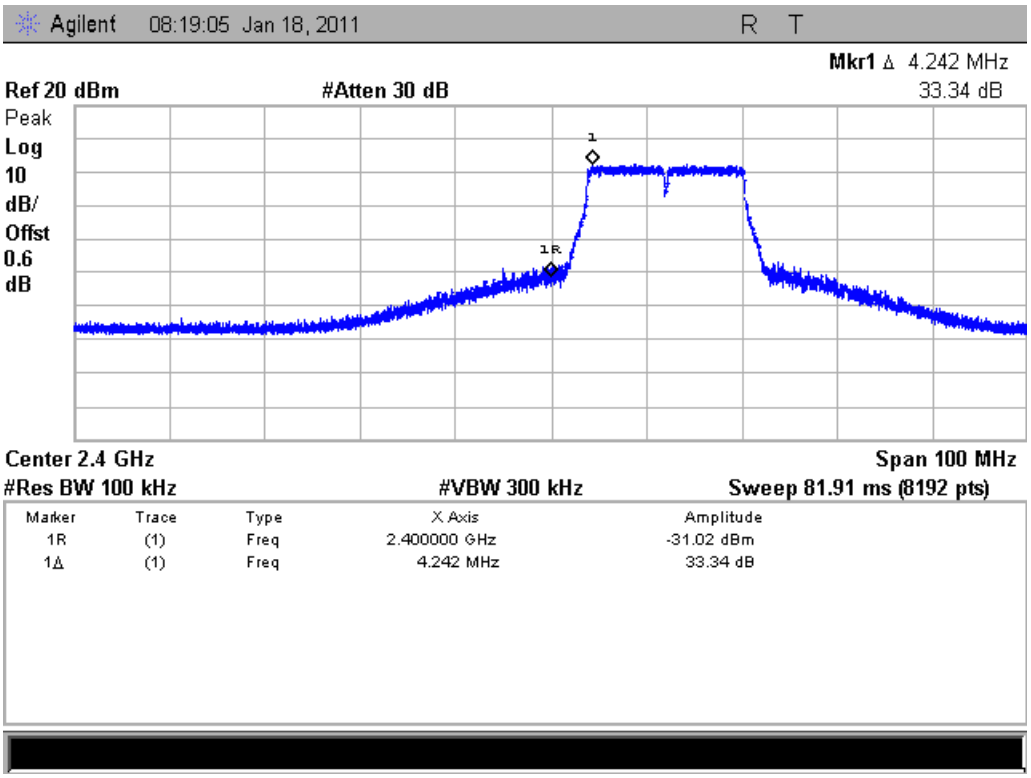
Conducted Spurious Emissions - 802.11n (40MHz) Mode High Channel



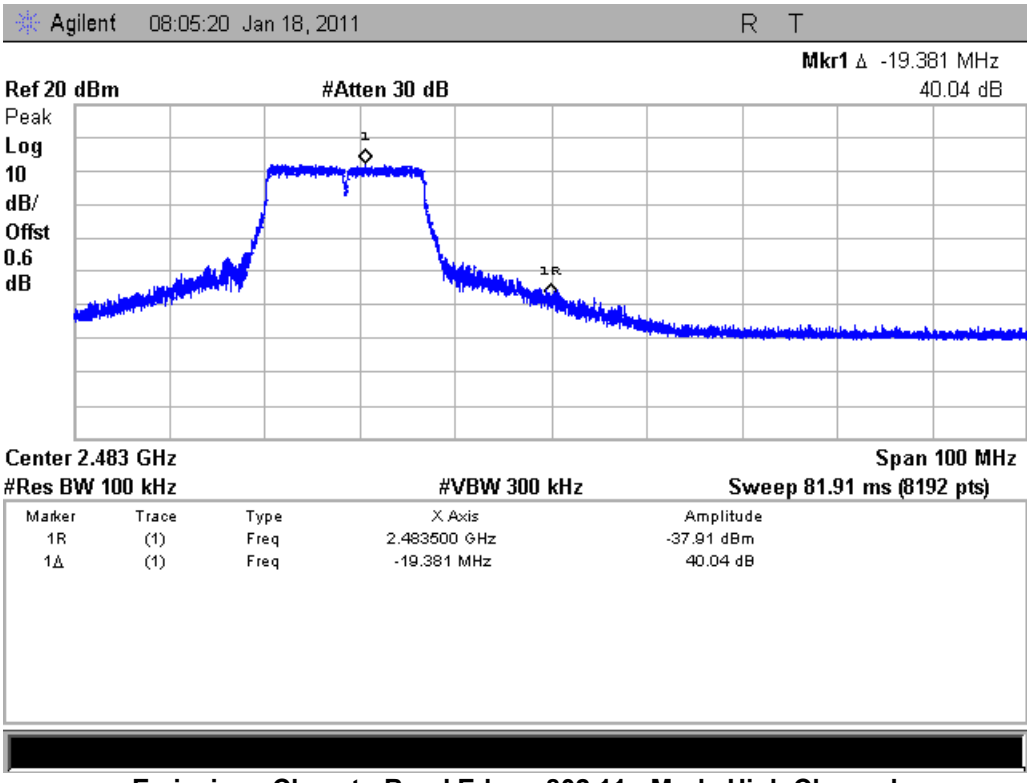
Emissions Close to Band Edge - 802.11b Mode Low Channel



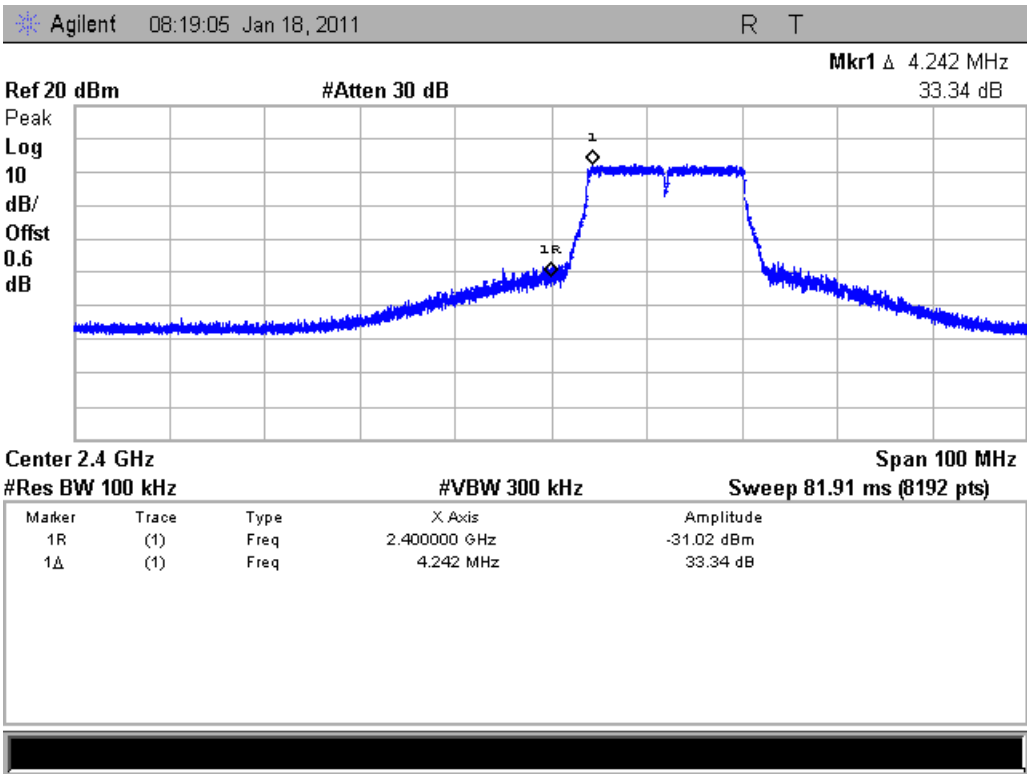
Emissions Close to Band Edge - 802.11b Mode High Channel



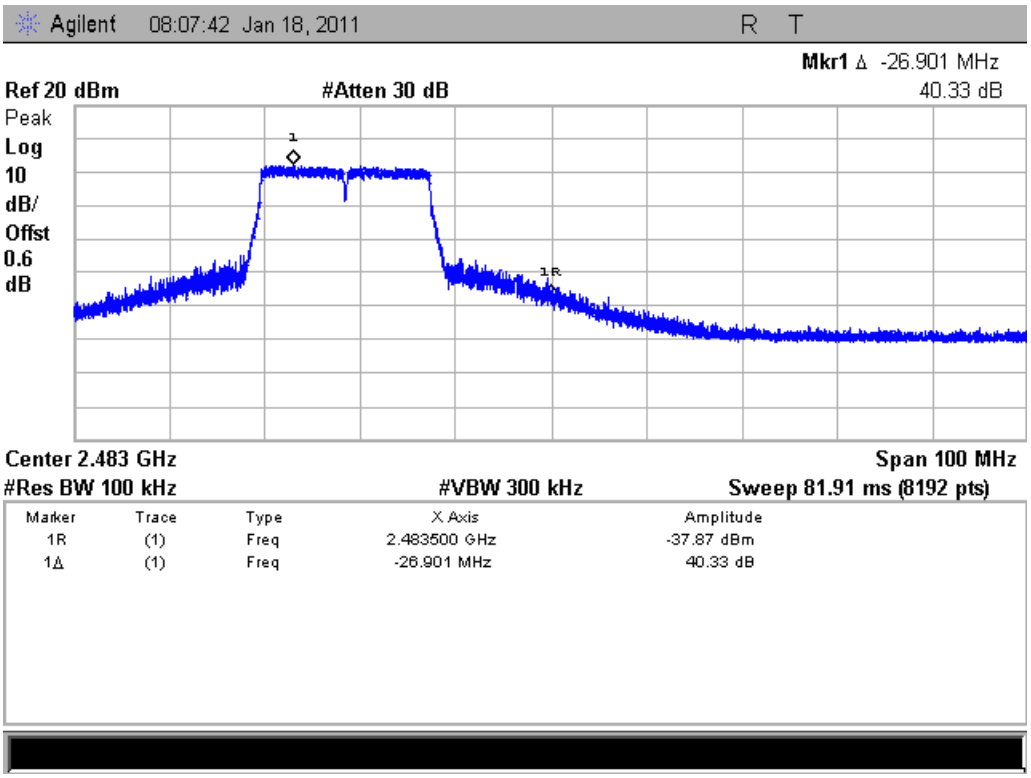
Emissions Close to Band Edge - 802.11g Mode Low Channel



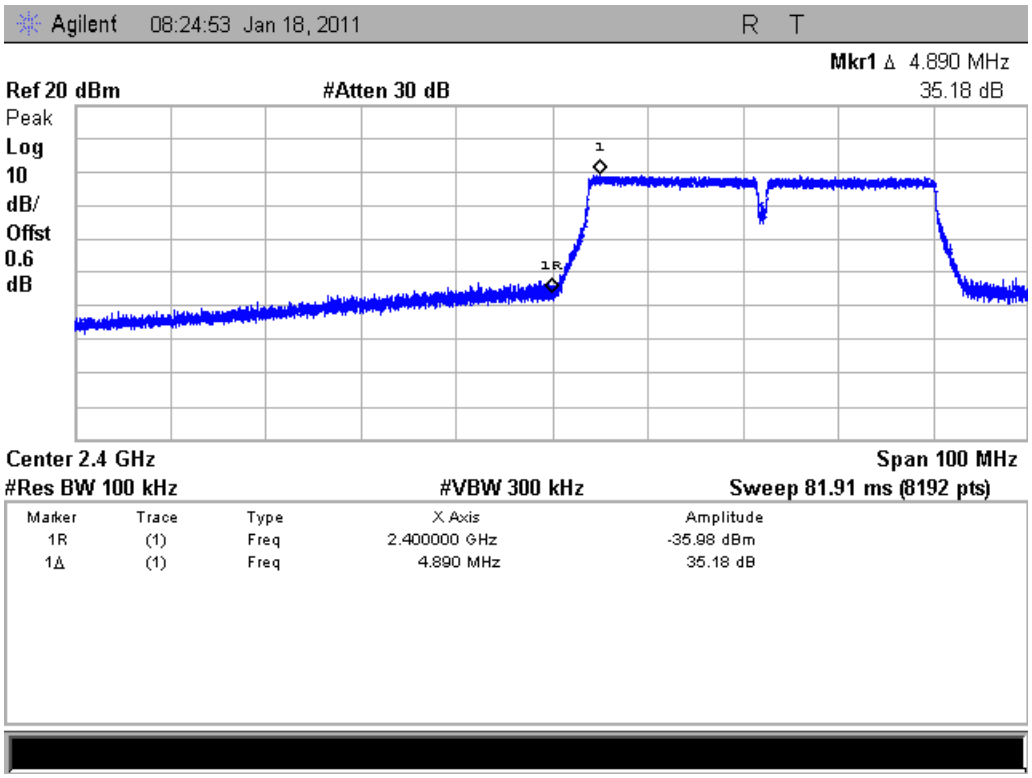
Emissions Close to Band Edge - 802.11g Mode High Channel



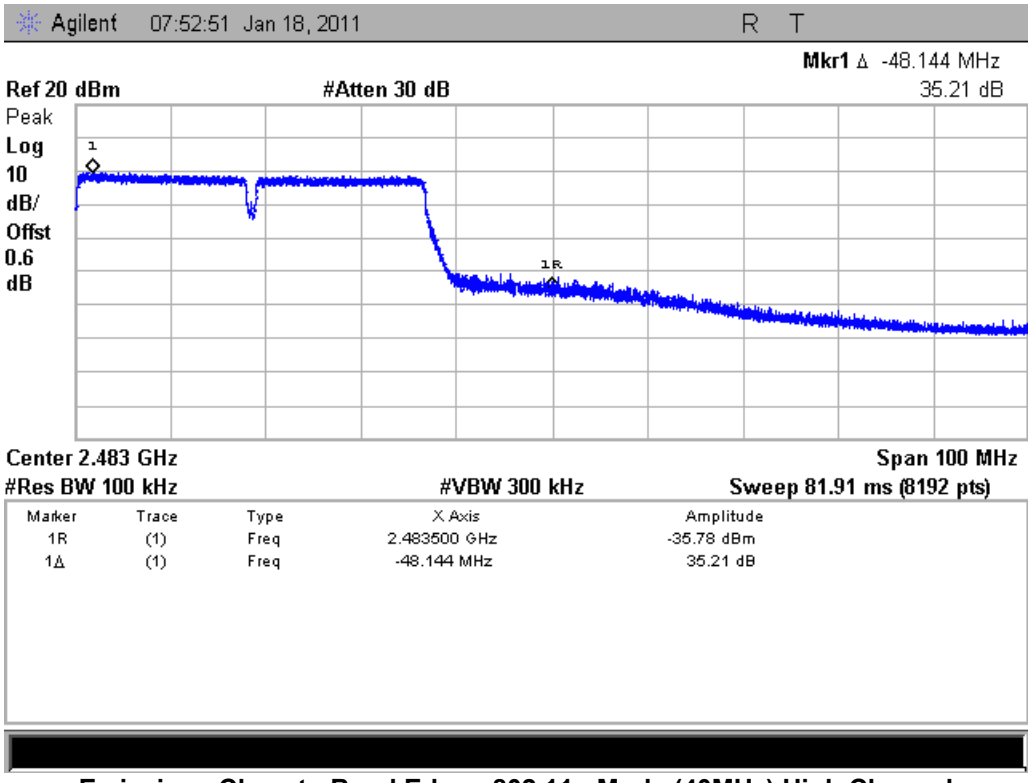
Emissions Close to Band Edge - 802.11n Mode (20MHz) Low Channel



Emissions Close to Band Edge - 802.11n Mode (20MHz) High Channel



Emissions Close to Band Edge - 802.11n Mode (40MHz) Low Channel



Emissions Close to Band Edge - 802.11n Mode (40MHz) High Channel

7 Power Spectral Density

7.1 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.

7.2 Test Procedure

ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

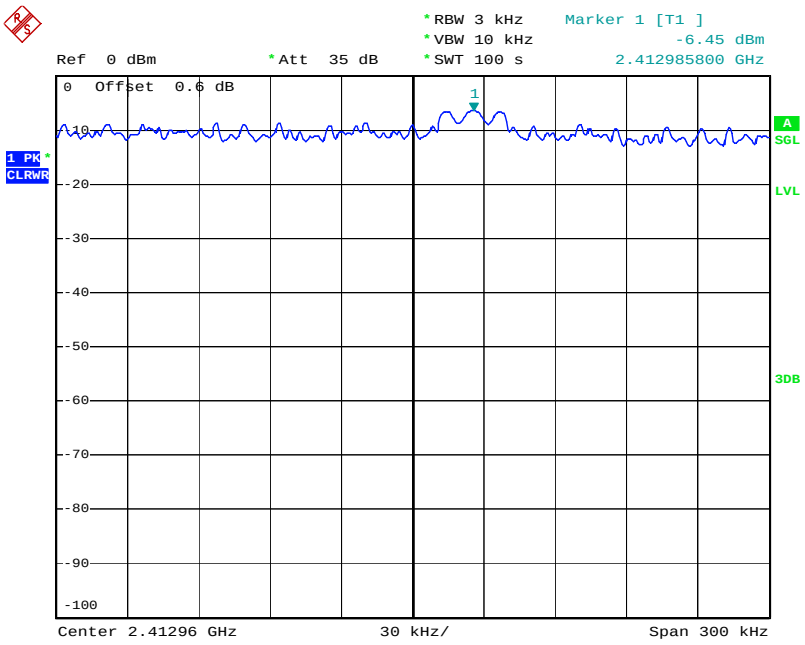
7.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	8/27/2010	8/27/2011

7.4 Results:

*PSD Option 1 Method

Mode	Channel Number	Frequency (MHz)	PSD in 3kHz BW (dBm)	Limit (dBm)	Margin (dBm)	Result
802.11b	1	2413	-6.45	8.0	-14.45	Pass
802.11b	6	2436	-5.82	8.0	-13.82	Pass
802.11b	11	2461	-6.15	8.0	-14.15	Pass
802.11g	1	2412	-11.26	8.0	-19.26	Pass
802.11g	6	2437	-11.32	8.0	-19.32	Pass
802.11g	11	2463	-11.00	8.0	-19.00	Pass
802.11n (20MHz)	1	2410	-7.64	8.0	-15.64	Pass
802.11n (20MHz)	6	2433	-8.04	8.0	-16.04	Pass
802.11n (20MHz)	11	2461	-8.16	8.0	-16.16	Pass
802.11n (40MHz)	3	2406	-14.41	8.0	-22.41	Pass
802.11n (40MHz)	6	2427	-13.19	8.0	-21.19	Pass
802.11n (40MHz)	9	2446	-13.16	8.0	-21.16	Pass



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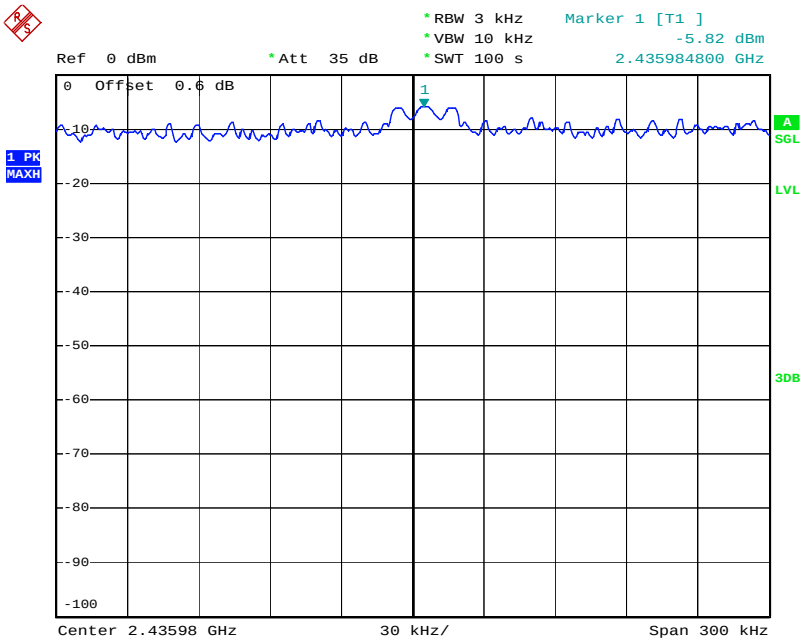
Power Spectral Density – Channel 1 802.11b mode



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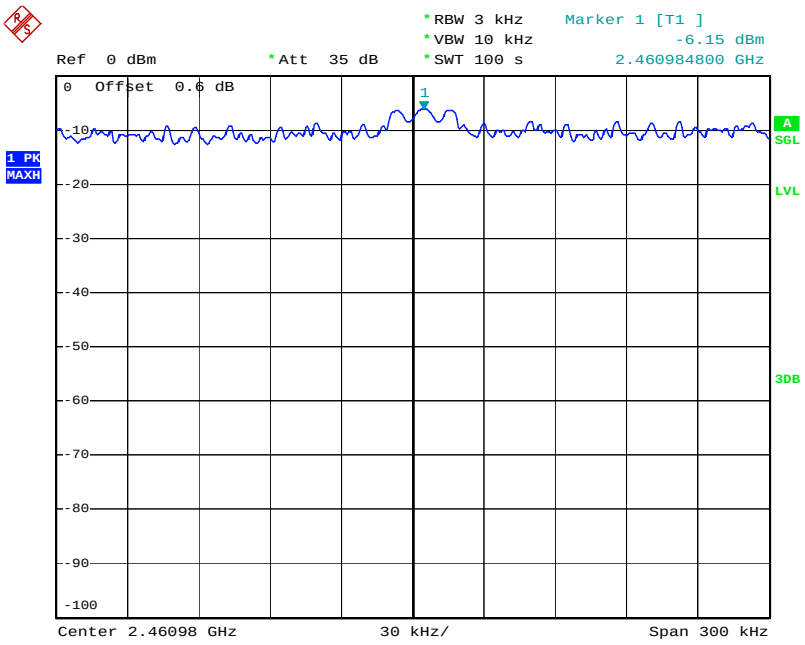
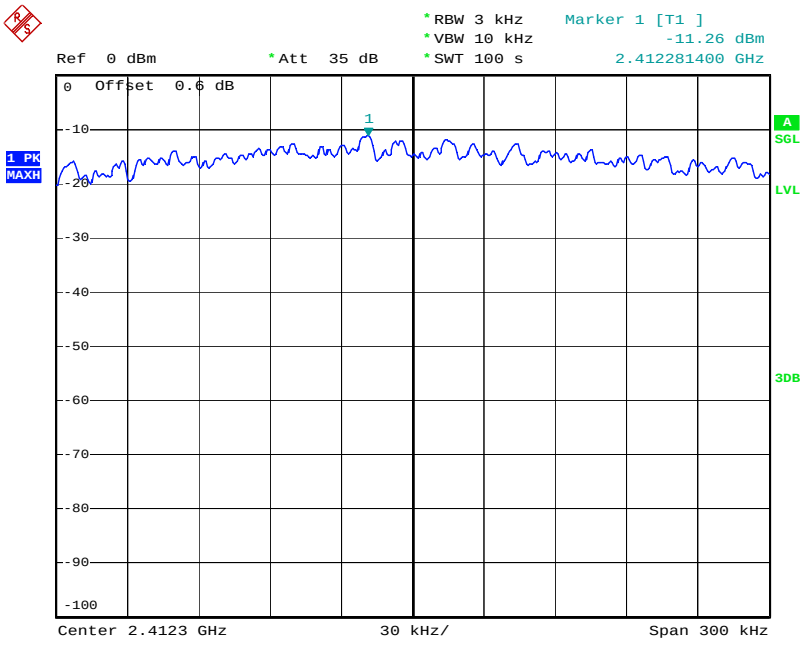
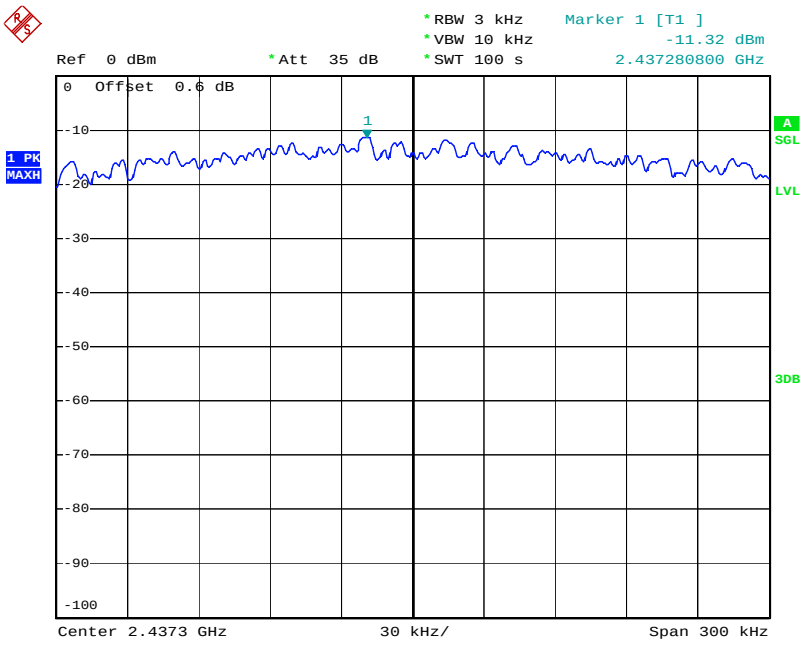
Power Spectral Density – Channel 6 802.11b mode



Power Spectral Density – Channel 11 802.11b mode



Power Spectral Density – Channel 1 802.11g mode



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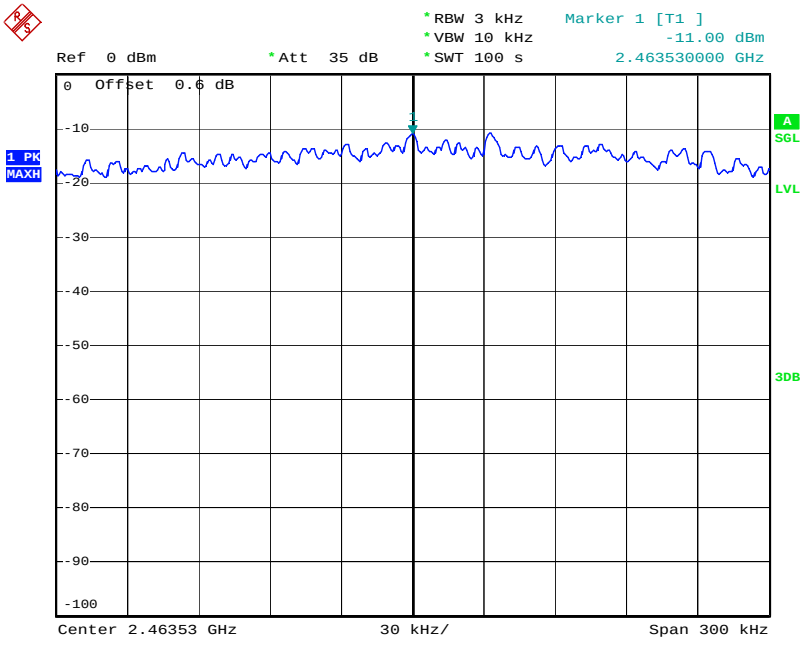
Power Spectral Density – Channel 6 802.11g mode



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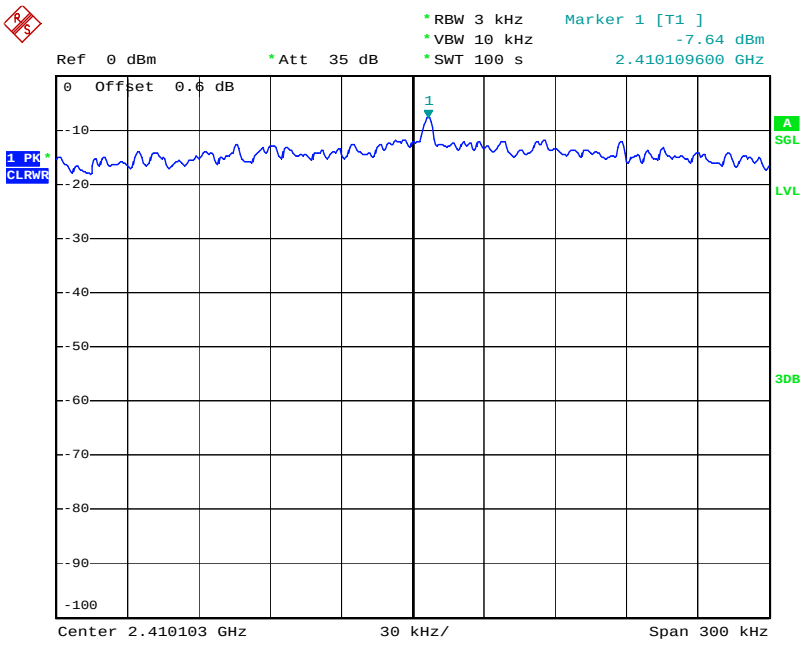
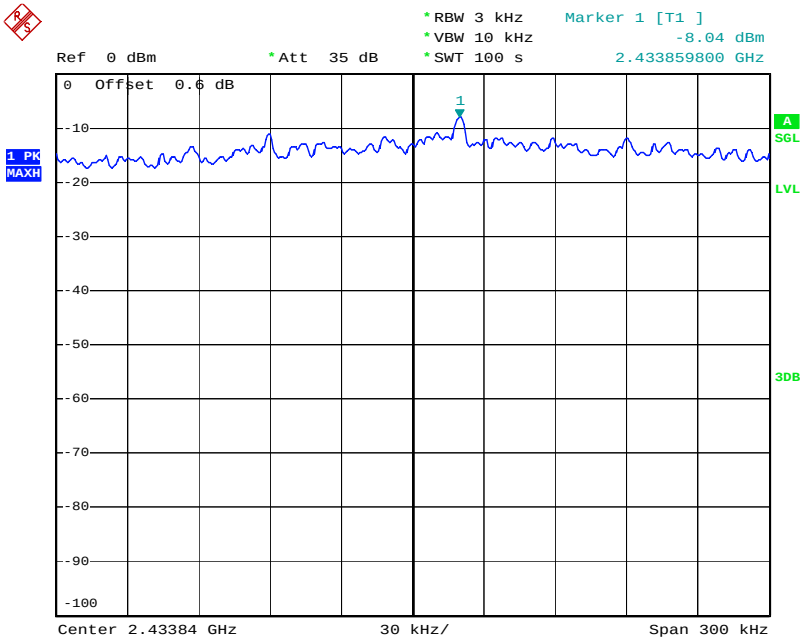
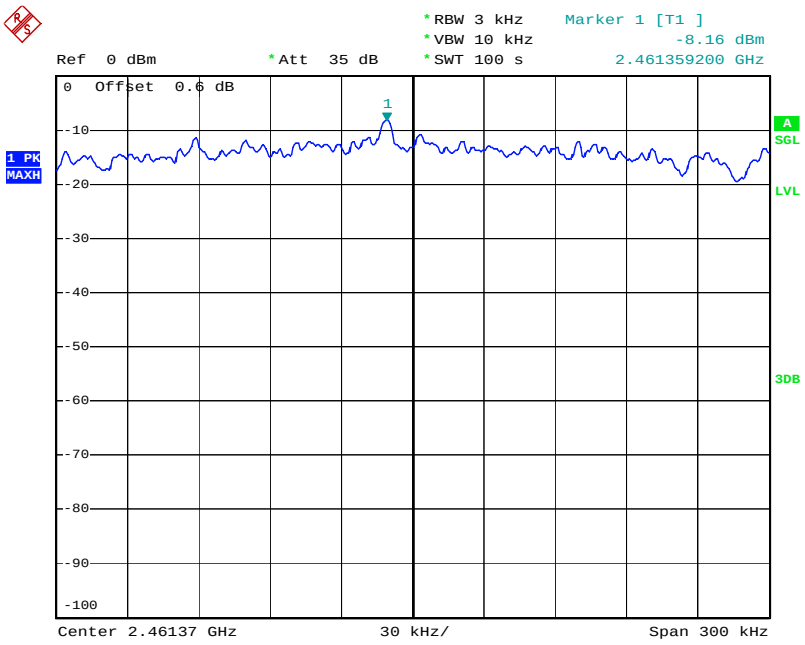
Power Spectral Density – Channel 11 802.11g mode



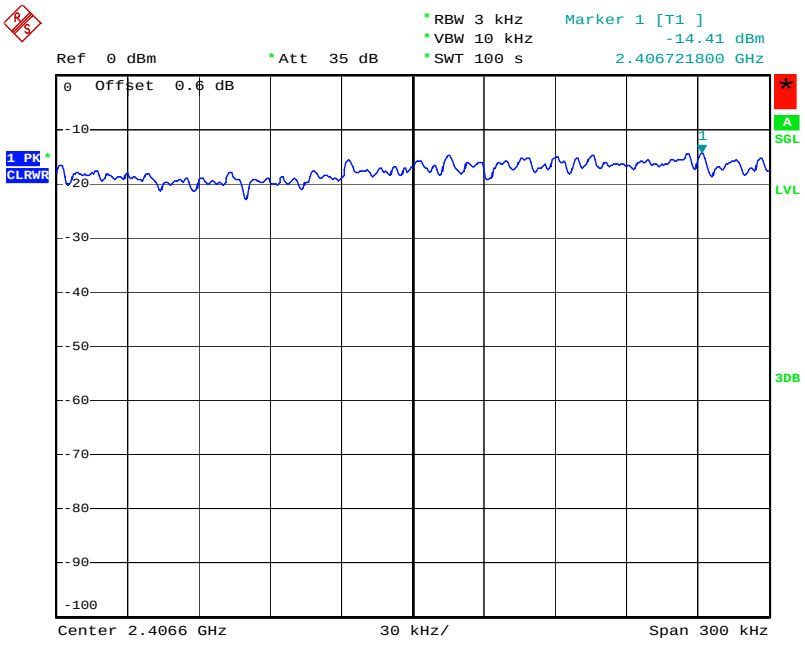
Power Spectral Density – Channel 1 802.11n mode (20MHz)



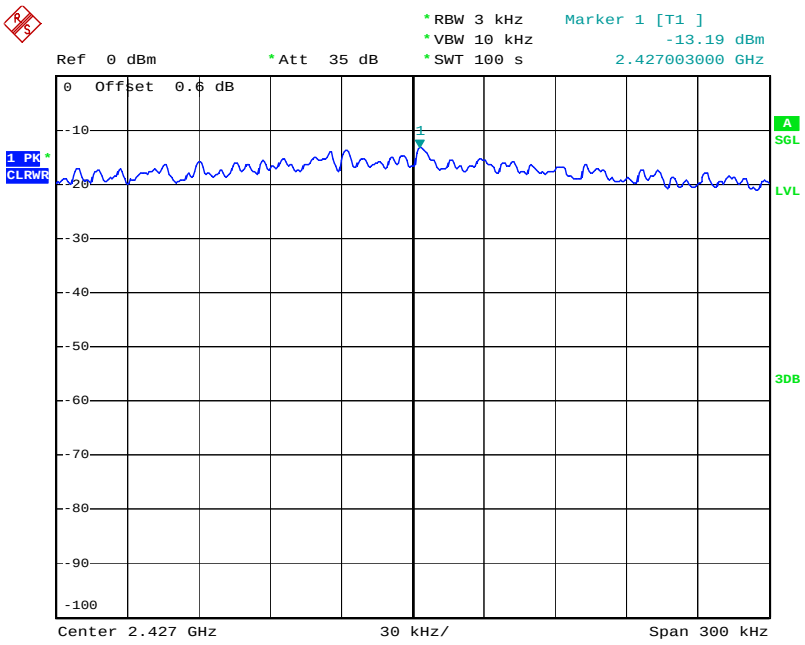
Power Spectral Density – Channel 6 802.11n mode (20MHz)



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



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



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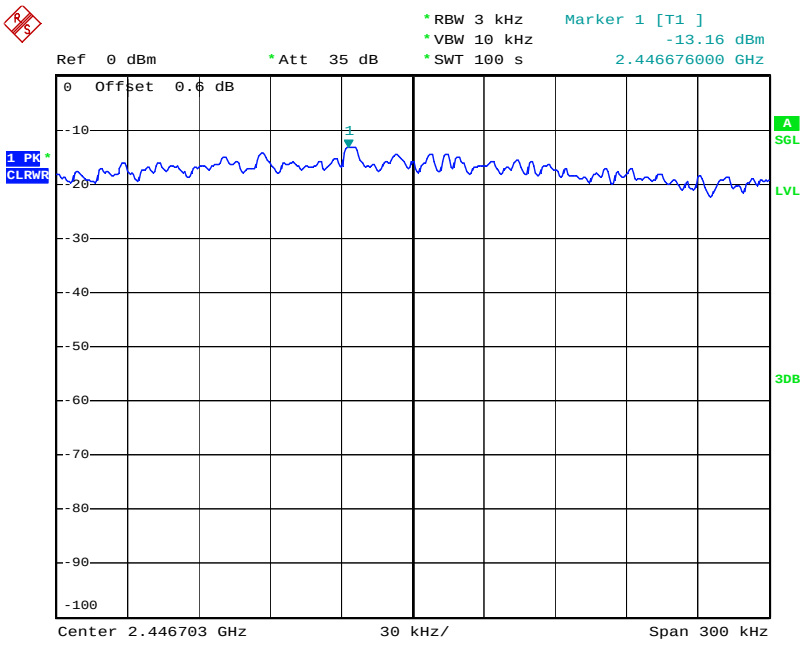
Power Spectral Density – Channel 6 802.11n mode (40MHz)



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Power Spectral Density – Channel 9 802.11n mode (40MHz)

Radiated Spurious Emissions (Transmitter)

7.5 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)).

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

7.6 Test Procedure

ANSI C63.10: 2009 and KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

7.7 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

7.8 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2010	6/29/2011
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	6/17/2010	6/17/2011
Biconnilog Antenna	00051864	ETS	3142C	6/29/2010	6/29/2011
Horn Antenna	6556	ETS	3115	8/9/2010	8/9/2011
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use
High Pass Filter	3986-01 DC0408	Microwave Circuits, Inc.	H3G020G2	2/10/2010	2/10/2011

7.9 Results:

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.

Worst Case Spurious Measurements (802.11b Mode)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
1	4.8239 GHz	H	44.881	32.544	74	54	**Compliant**	Restricted Band
1	7.236 GHz	H	44.113	34.093	74	54	**Compliant**	
1	9.6481 GHz	H	46.278	37.678	74	54	**Compliant**	
1	12.06 GHz	H	47.463	38.123	74	54	**Compliant**	Restricted Band
1	14.472 GHz	H	50.549	40.569	74	54	**Compliant**	Restricted Band
1	4.8242 GHz	V	46.351	30.794	74	54	**Compliant**	
1	7.2312 GHz	V	46.385	34.065	74	54	**Compliant**	
1	9.6375 GHz	V	49.513	37.563	74	54	**Compliant**	
1	12.059 GHz	V	47.862	38.082	74	54	**Compliant**	Restricted Band
1	14.47 GHz	V	51.698	40.508	74	54	**Compliant**	Restricted Band
6	4.874 GHz	H	46.39	34.989	74	54	**Compliant**	Restricted Band
6	7.311 GHz	H	45.623	34.753	74	54	**Compliant**	Restricted Band
6	9.748 GHz	H	47.075	37.725	74	54	**Compliant**	
6	12.185 GHz	H	48.831	38.241	74	54	**Compliant**	Restricted Band
6	14.622 GHz	H	51.22	41.07	74	54	**Compliant**	Restricted Band
6	4.874 GHz	V	46.762	34.109	74	54	**Compliant**	Restricted Band
6	7.311 GHz	V	48.023	34.773	74	54	**Compliant**	Restricted Band
6	12.18 GHz	V	51.435	38.385	74	54	**Compliant**	Restricted Band
6	14.626 GHz	V	52.615	40.955	74	54	**Compliant**	Restricted Band
11	4.924 GHz	H	44.47	33.53	74	54	**Compliant**	Restricted Band
11	7.3861 GHz	H	44.529	35.409	74	54	**Compliant**	Restricted Band
11	12.3 GHz	H	51.886	38.766	74	54	**Compliant**	Restricted Band
11	14.772 GHz	H	49.958	40.738	74	54	**Compliant**	Restricted Band
11	4.924 GHz	V	48.53	42.29	74	54	**Compliant**	Restricted Band
11	7.3859 GHz	V	46.316	35.456	74	54	**Compliant**	Restricted Band
11	12.31 GHz	V	48.303	39.033	74	54	**Compliant**	Restricted Band
11	14.772 GHz	V	50.858	40.828	74	54	**Compliant**	Restricted Band

*Emissions were investigated with the test sample positioned in 3 orthogonal axis and the worst case reported.

Worst Case Spurious Measurements (802.11g Mode)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
1	4.8239 GHz	H	42.015	30.455	74	54	**Compliant**	Restricted Band
1	7.2361 GHz	H	44.377	34.367	74	54	**Compliant**	
1	9.6482 GHz	H	48.549	37.989	74	54	**Compliant**	
1	12.065 GHz	H	56.003	39.253	74	54	**Compliant**	Restricted Band
1	14.472 GHz	H	52.559	40.979	74	54	**Compliant**	Restricted Band
1	4.8241 GHz	V	40.451	30.671	74	54	**Compliant**	Restricted Band
1	7.2311 GHz	V	45.186	34.716	74	54	**Compliant**	
1	9.6375 GHz	V	47.332	38.262	74	54	**Compliant**	
1	12.059 GHz	V	49.132	38.742	74	54	**Compliant**	Restricted Band
1	14.47 GHz	V	51.328	41.148	74	54	**Compliant**	Restricted Band
6	4.8739 GHz	H	51.22	41.07	74	54	**Compliant**	Restricted Band
6	7.311 GHz	H	45.153	34.583	74	54	**Compliant**	Restricted Band
6	9.748 GHz	H	46.185	37.315	74	54	**Compliant**	
6	12.185 GHz	H	51.182	38.482	74	54	**Compliant**	Restricted Band
6	14.622 GHz	H	54.04	40.87	74	54	**Compliant**	Restricted Band
6	4.8739 GHz	V	43.958	29.878	74	54	**Compliant**	Restricted Band
6	7.311 GHz	V	43.673	34.413	74	54	**Compliant**	Restricted Band
6	12.18 GHz	V	48.465	38.155	74	54	**Compliant**	Restricted Band
6	14.626 GHz	V	50.535	40.745	74	54	**Compliant**	Restricted Band
11	4.9239 GHz	H	41.221	30.071	74	54	**Compliant**	Restricted Band
11	7.3861 GHz	H	44.769	35.099	74	54	**Compliant**	Restricted Band
11	12.3 GHz	H	47.986	38.676	74	54	**Compliant**	Restricted Band
11	14.772 GHz	H	50.438	40.598	74	54	**Compliant**	Restricted Band
11	4.924 GHz	V	47.12	33.16	74	54	**Compliant**	Restricted Band
11	7.3859 GHz	V	45.324	35.354	74	54	**Compliant**	Restricted Band
11	12.31 GHz	V	49.803	38.873	74	54	**Compliant**	Restricted Band
11	14.772 GHz	V	50.438	40.768	74	54	**Compliant**	Restricted Band

*Emissions were investigated with the test sample positioned in 3 orthogonal axis and the worst case reported.

Worst Case Spurious Measurements (802.11n (20MHz) Mode)

TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
1	4.824 GHz	H	44.208	28.847	74	54	**Compliant**	Restricted Band
1	7.236 GHz	H	42.67	32.77	74	54	**Compliant**	
1	9.648 GHz	H	45.988	36.958	74	54	**Compliant**	
1	12.06 GHz	H	49.633	38.083	74	54	**Compliant**	Restricted Band
1	14.472 GHz	H	48.739	40.069	74	54	**Compliant**	Restricted Band
1	4.824 GHz	V	43.389	30.168	74	54	**Compliant**	Restricted Band
1	7.2361 GHz	V	44.074	34.144	74	54	**Compliant**	
1	9.648 GHz	V	46.858	37.708	74	54	**Compliant**	
1	12.06 GHz	V	48.353	38.343	74	54	**Compliant**	Restricted Band
1	14.472 GHz	V	50.499	40.779	74	54	**Compliant**	Restricted Band
6	4.8739 GHz	H	54.04	40.87	74	54	**Compliant**	Restricted Band
6	7.311 GHz	H	44.072	34.282	74	54	**Compliant**	Restricted Band
6	9.748 GHz	H	46.075	36.995	74	54	**Compliant**	
6	12.185 GHz	H	51.861	39.001	74	54	**Compliant**	Restricted Band
6	14.622 GHz	H	49.43	40.24	74	54	**Compliant**	Restricted Band
6	4.874 GHz	V	43.309	29.769	74	54	**Compliant**	Restricted Band
6	7.311 GHz	V	44.594	34.334	74	54	**Compliant**	Restricted Band
6	12.18 GHz	V	48.085	38.345	74	54	**Compliant**	Restricted Band
6	14.626 GHz	V	51.655	40.555	74	54	**Compliant**	Restricted Band
11	4.924 GHz	H	40.81	29.92	74	54	**Compliant**	Restricted Band
11	7.386 GHz	H	44.247	34.907	74	54	**Compliant**	Restricted Band
11	9.848 GHz	H	48.002	38.092	74	54	**Compliant**	
11	12.31 GHz	H	49.684	38.804	74	54	**Compliant**	Restricted Band
11	14.772 GHz	H	50.848	40.588	74	54	**Compliant**	Restricted Band
11	4.924 GHz	V	38.149	30.209	74	54	**Compliant**	Restricted Band
11	7.386 GHz	V	46.409	34.879	74	54	**Compliant**	Restricted Band
11	9.848 GHz	V	47.912	37.702	74	54	**Compliant**	
11	12.31 GHz	V	46.753	38.523	74	54	**Compliant**	Restricted Band
11	14.772 GHz	V	49.778	40.348	74	54	**Compliant**	Restricted Band

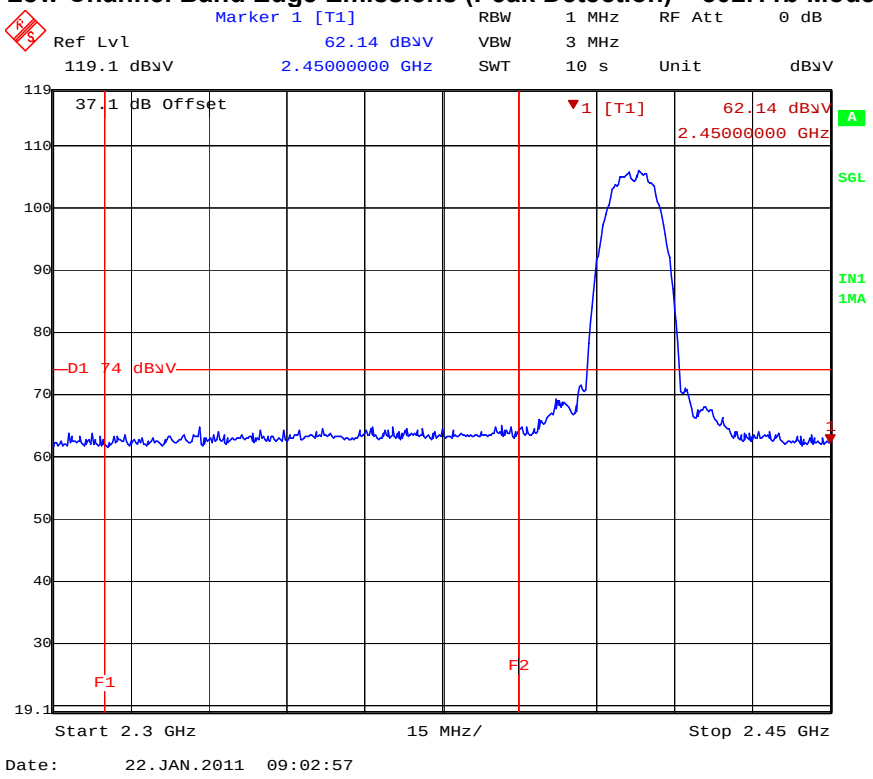
*Emissions were investigated with the test sample positioned in 3 orthogonal axis and the worst case reported.

Worst Case Spurious Measurements (802.11n (40MHz)Mode)

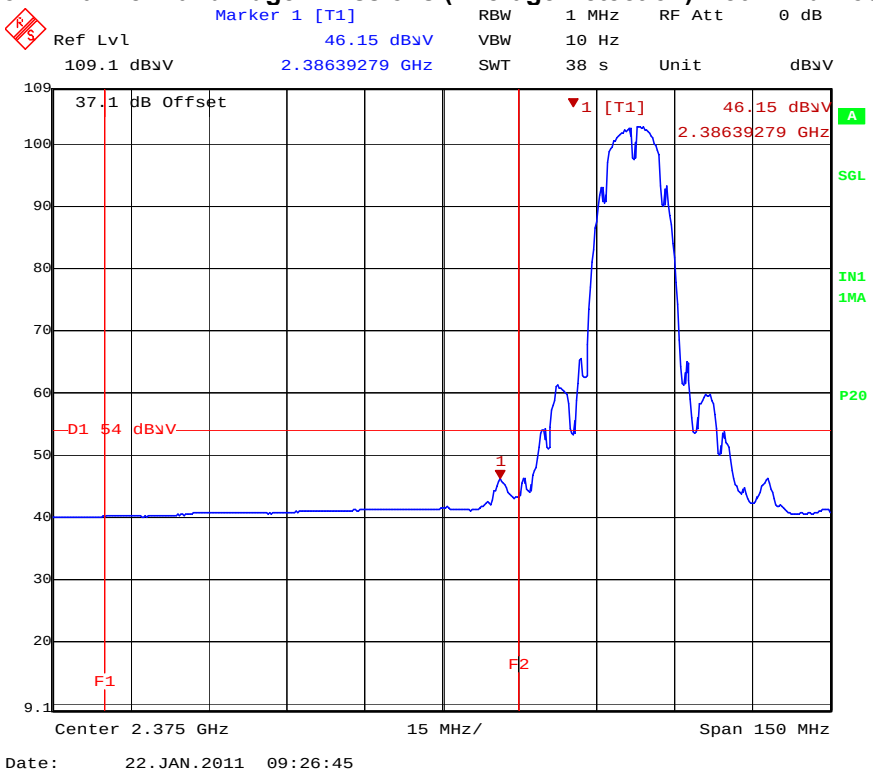
TX Channel	Spurious Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
3	4.844 GHz	H	37.83	28.68	74	54	**Compliant**	Restricted Band
3	7.266 GHz	H	43.179	33.769	74	54	**Compliant**	Restricted Band
3	9.688 GHz	H	46.802	37.062	74	54	**Compliant**	
3	12.11 GHz	H	47.766	37.926	74	54	**Compliant**	Restricted Band
3	14.532 GHz	H	49.563	40.323	74	54	**Compliant**	Restricted Band
3	4.844 GHz	V	37.53	28.25	74	54	**Compliant**	Restricted Band
3	7.266 GHz	V	43.051	33.491	74	54	**Compliant**	Restricted Band
3	9.688 GHz	V	45.962	36.952	74	54	**Compliant**	
3	12.11 GHz	V	47.917	37.857	74	54	**Compliant**	Restricted Band
3	14.532 GHz	V	50.953	40.903	74	54	**Compliant**	Restricted Band
6	4.874 GHz	H	40.32	30.8	74	54	**Compliant**	Restricted Band
6	7.311 GHz	H	45.993	34.933	74	54	**Compliant**	Restricted Band
6	9.7481 GHz	H	48.227	37.997	74	54	**Compliant**	
6	12.185 GHz	H	47.621	38.341	74	54	**Compliant**	Restricted Band
6	14.622 GHz	H	50.41	41.1	74	54	**Compliant**	Restricted Band
6	4.8739 GHz	V	40.718	31.178	74	54	**Compliant**	Restricted Band
6	7.311 GHz	V	45.153	35.283	74	54	**Compliant**	Restricted Band
6	12.18 GHz	V	48.085	38.695	74	54	**Compliant**	Restricted Band
6	14.626 GHz	V	51.043	41.213	74	54	**Compliant**	Restricted Band
9	4.904 GHz	H	39.005	29.445	74	54	**Compliant**	Restricted Band
9	7.356 GHz	H	43.629	34.329	74	54	**Compliant**	Restricted Band
9	9.808 GHz	H	45.782	36.692	74	54	**Compliant**	Restricted Band
9	12.26 GHz	H	48.962	38.402	74	54	**Compliant**	Restricted Band
9	14.712 GHz	H	50.082	40.332	74	54	**Compliant**	Restricted Band
9	4.904 GHz	V	39.405	29.685	74	54	**Compliant**	Restricted Band
9	7.3561 GHz	V	44.284	34.474	74	54	**Compliant**	Restricted Band
9	9.808 GHz	V	46.362	36.712	74	54	**Compliant**	Restricted Band
9	12.26 GHz	V	49.092	38.212	74	54	**Compliant**	Restricted Band
9	14.712 GHz	V	49.823	40.233	74	54	**Compliant**	Restricted Band

*Emissions were investigated with the test sample positioned in 3 orthogonal axis and the worst case reported.

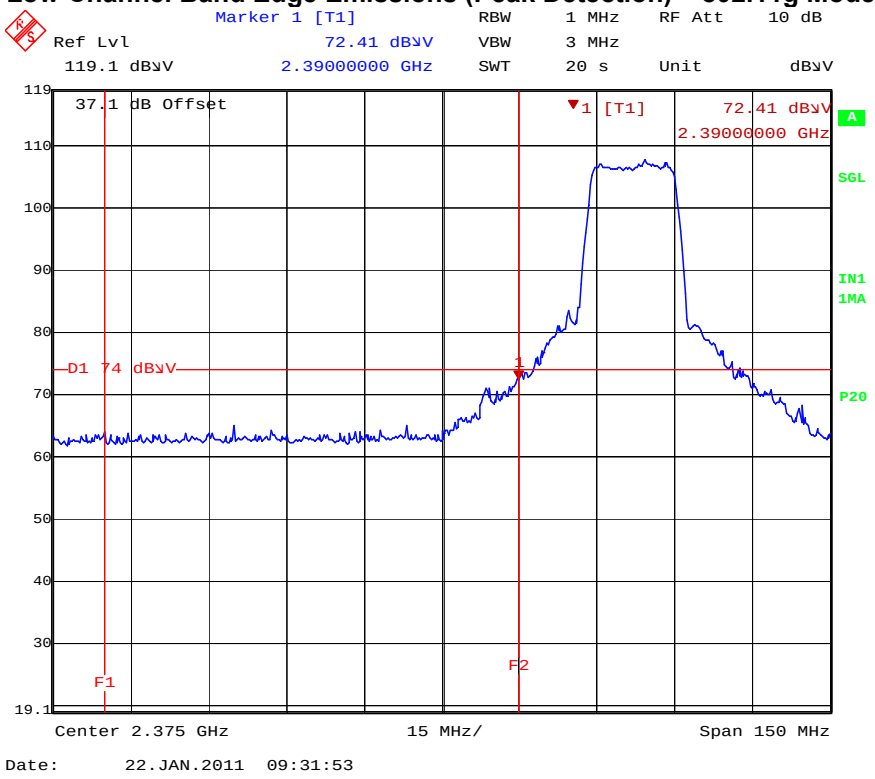
Low Channel Band Edge Emissions (Peak Detection) – 802.11b Mode



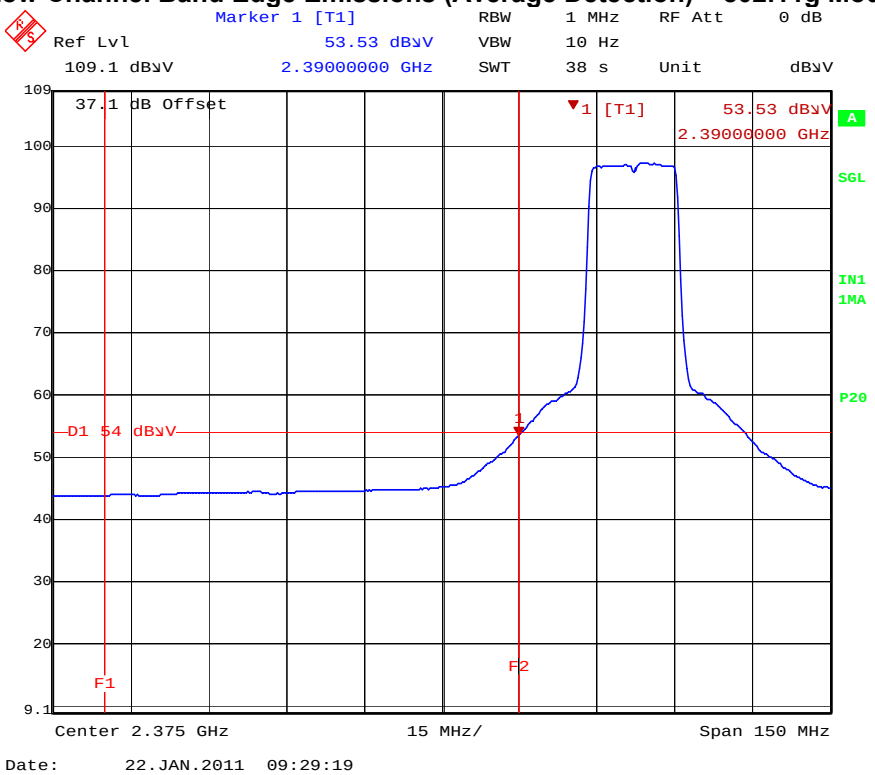
Low Channel Band Edge Emissions (Average Detection) – 802.11b Mode



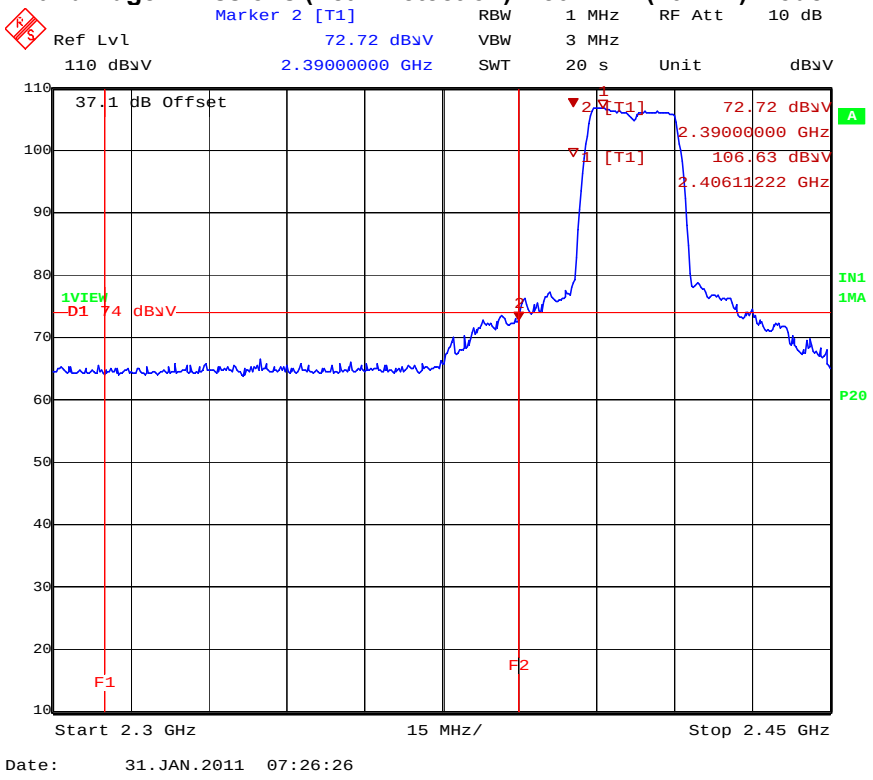
Low Channel Band Edge Emissions (Peak Detection) – 802.11g Mode



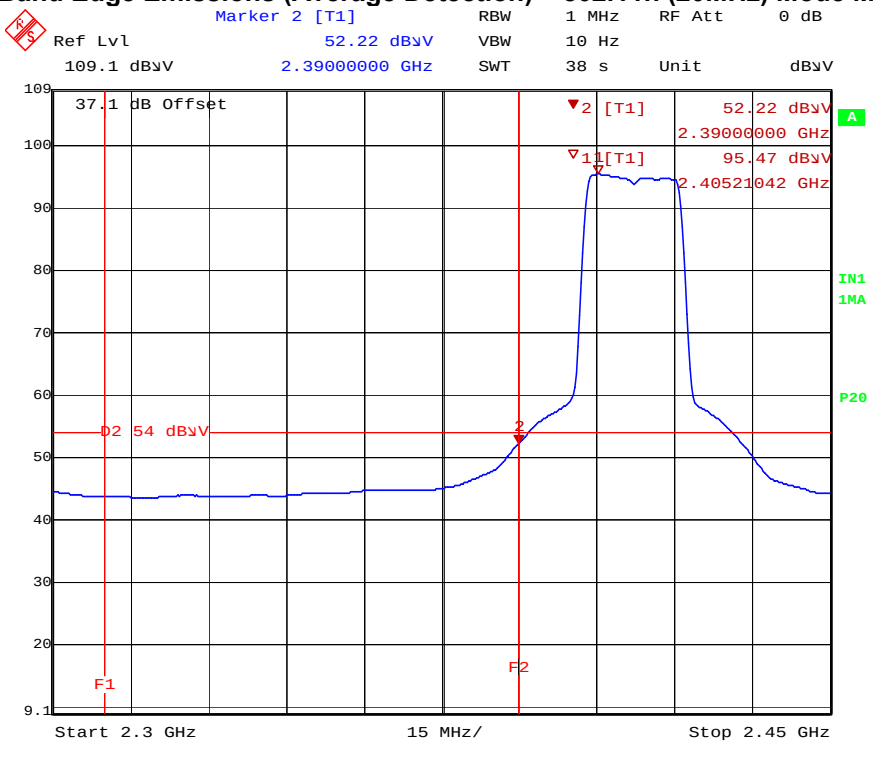
Low Channel Band Edge Emissions (Average Detection) – 802.11g Mode



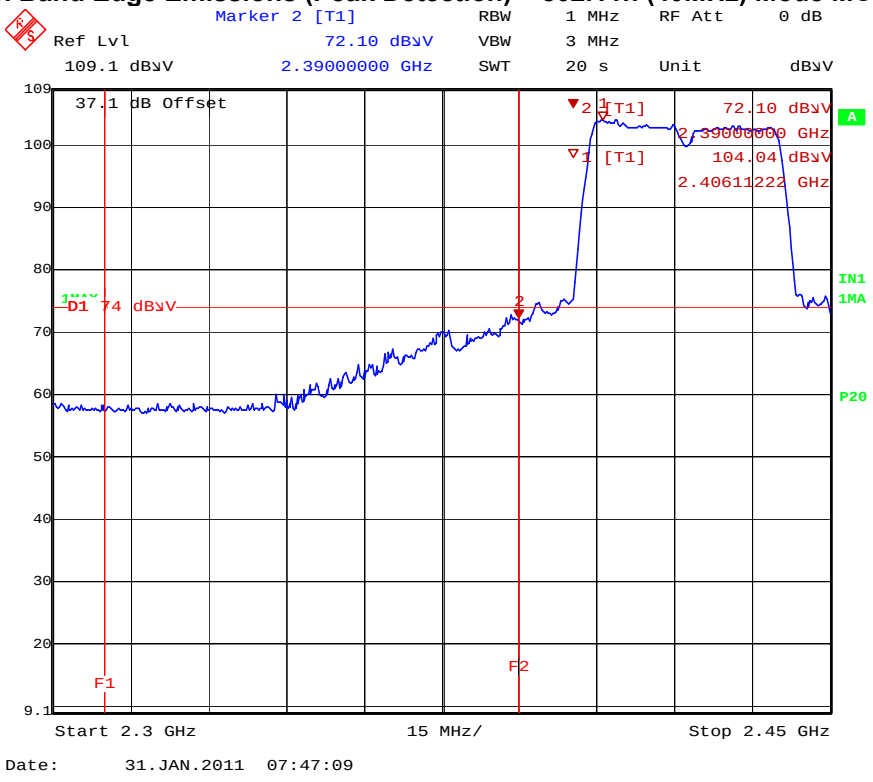
Low Channel Band Edge Emissions (Peak Detection) – 802.11n (20MHz) Mode MCSO 0, 16dBm



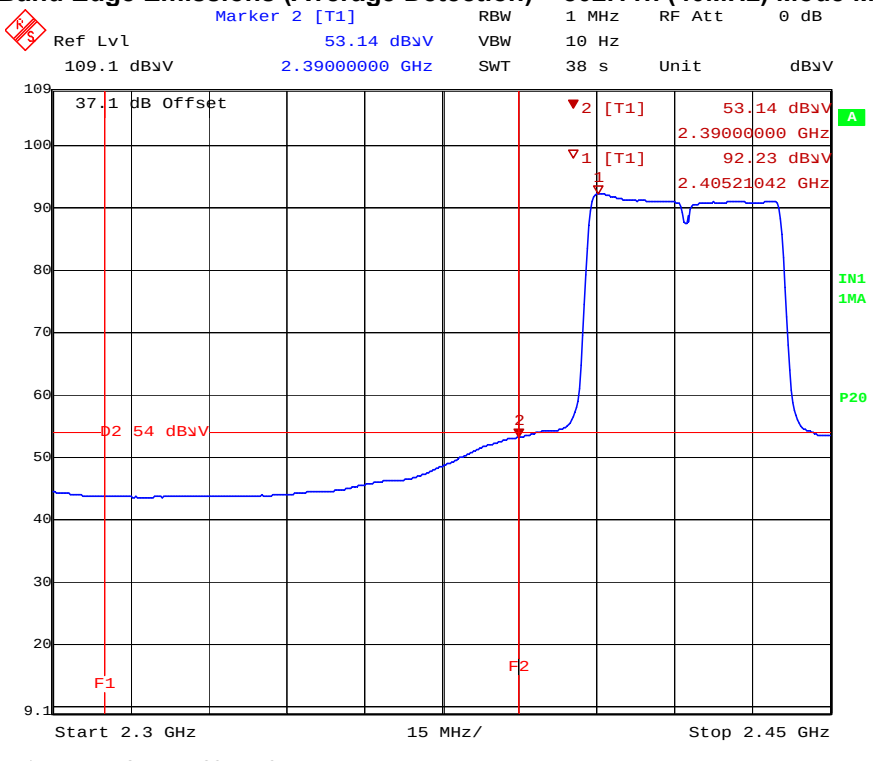
Low Channel Band Edge Emissions (Average Detection) – 802.11n (20MHz) Mode MCSO 0, 16dBm



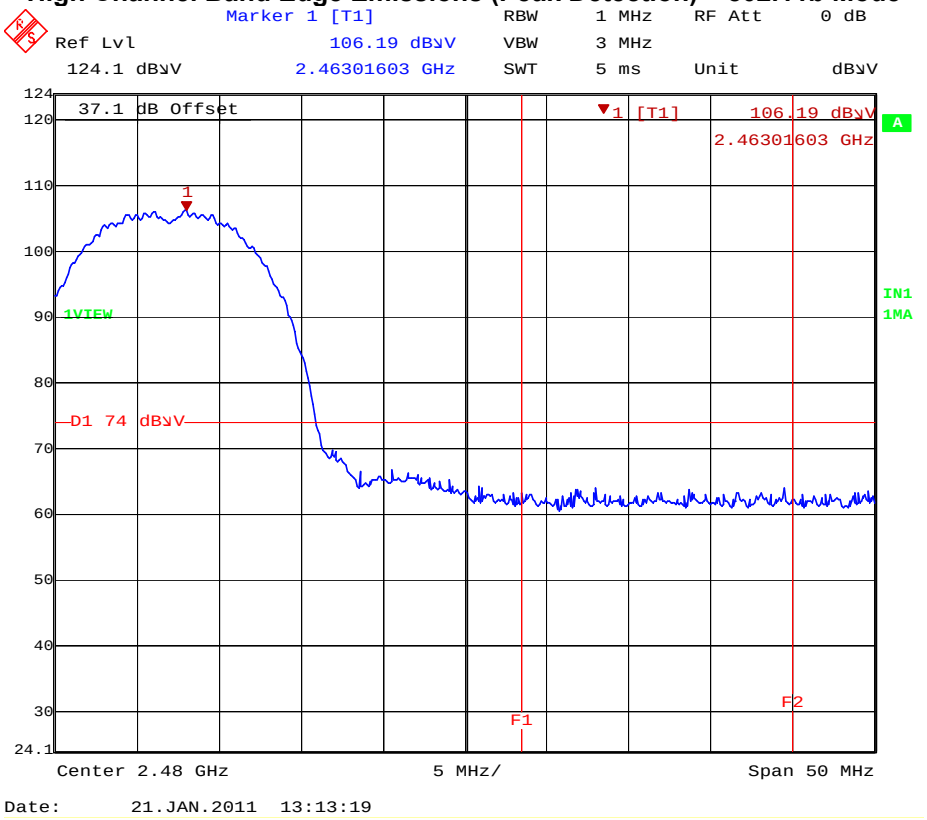
Low Channel Band Edge Emissions (Peak Detection) – 802.11n (40MHz) Mode MCSO 0, 16dBm



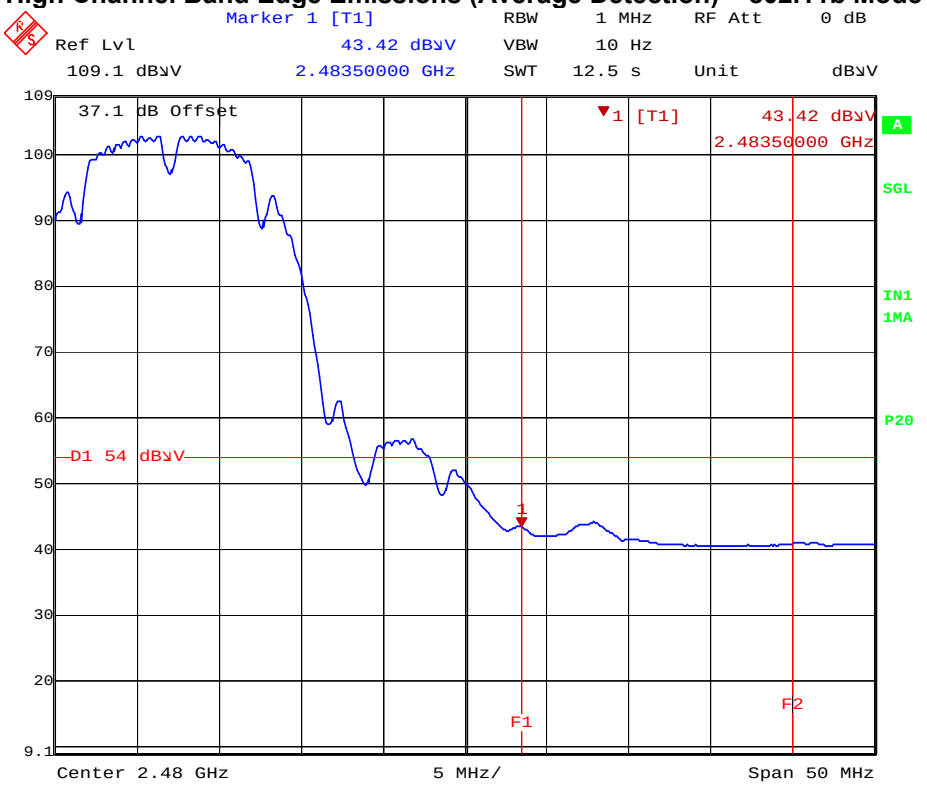
Low Channel Band Edge Emissions (Average Detection) – 802.11n (40MHz) Mode MCSO 0, 16dBm



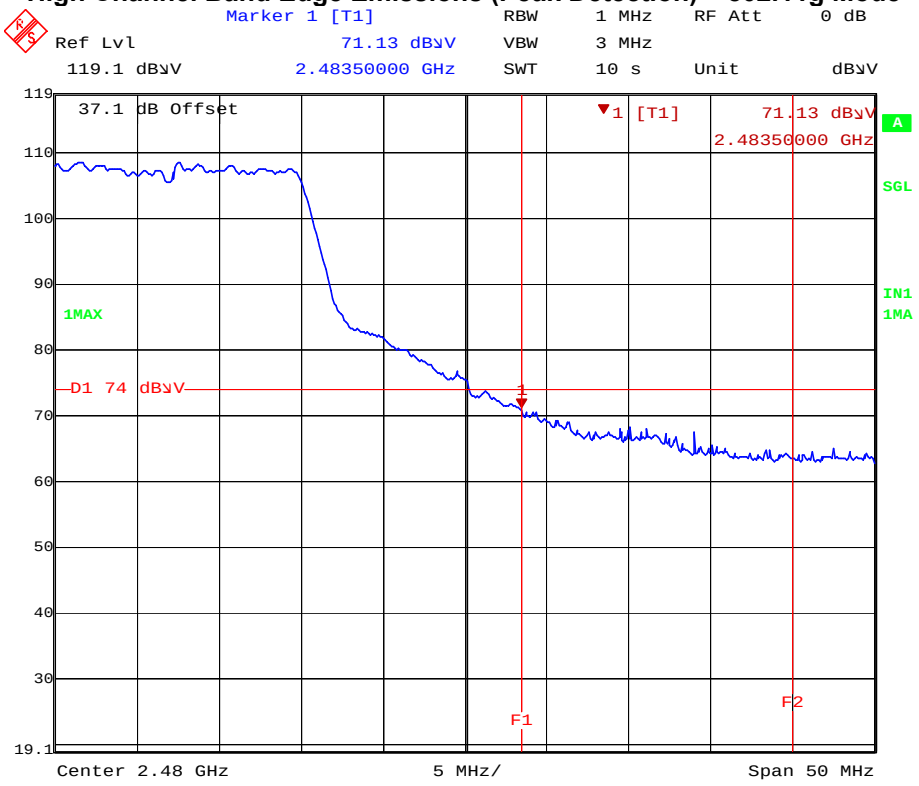
High Channel Band Edge Emissions (Peak Detection) – 802.11b Mode



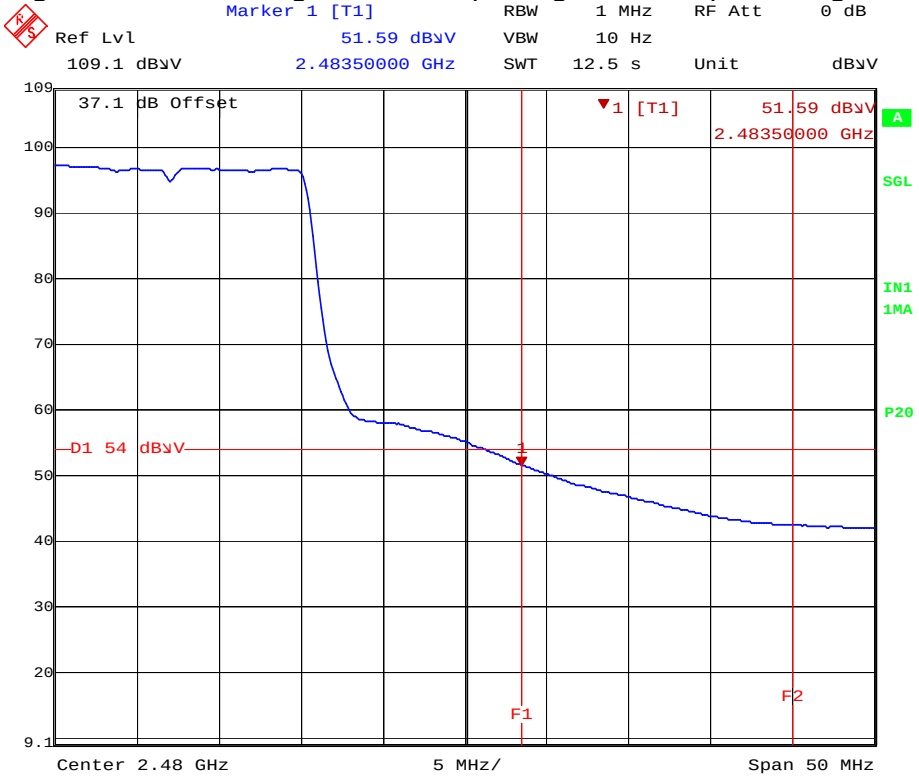
High Channel Band Edge Emissions (Average Detection) – 802.11b Mode



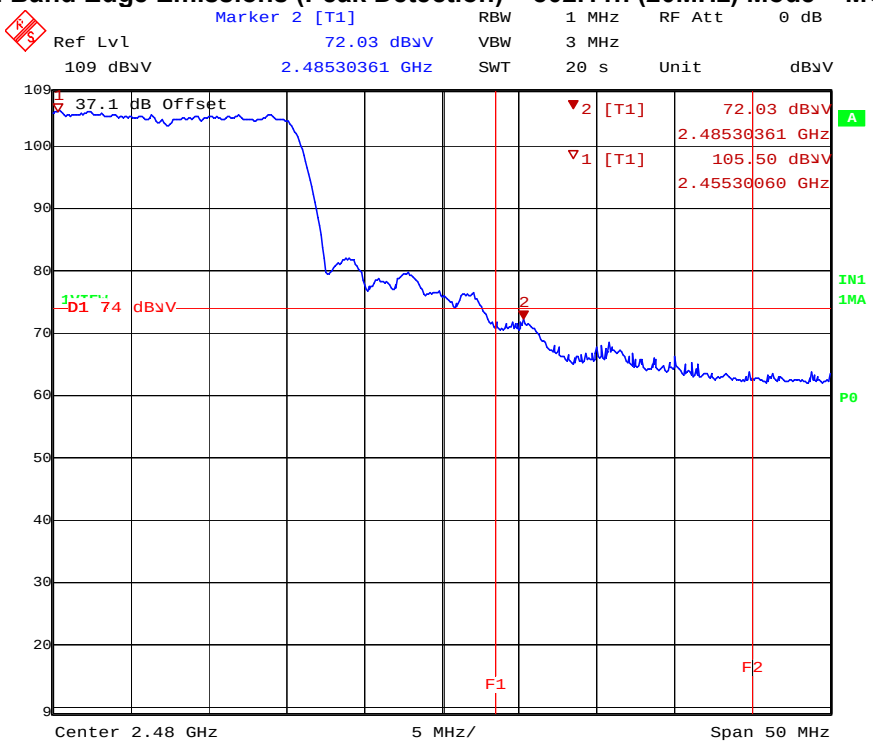
High Channel Band Edge Emissions (Peak Detection) – 802.11g Mode



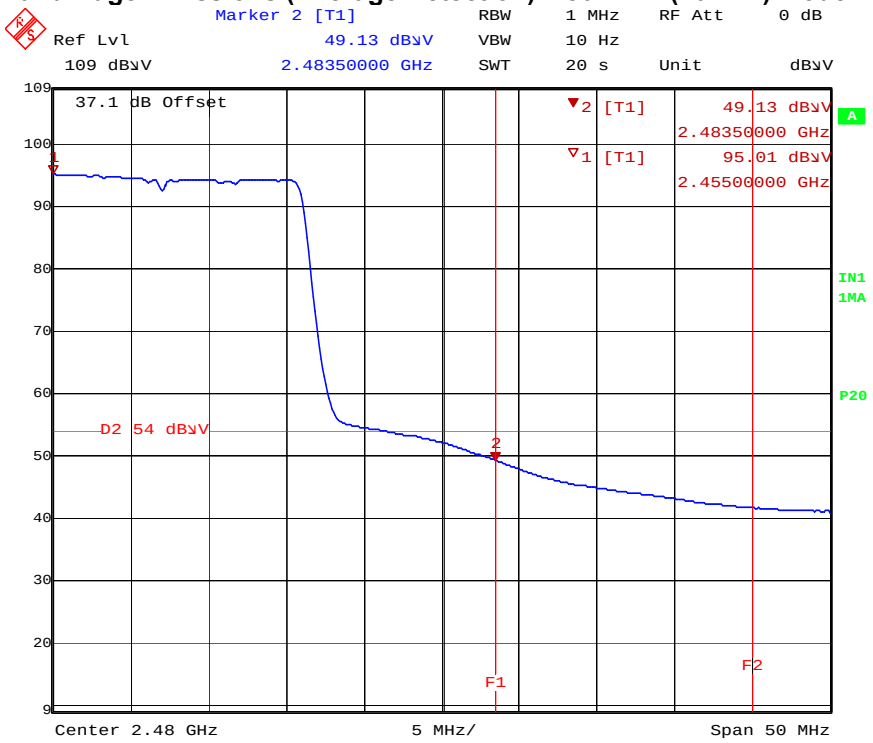
High Channel Band Edge Emissions (Average Detection) – 802.11g Mode



High Channel Band Edge Emissions (Peak Detection) – 802.11n (20MHz) Mode – MCSO 0, 16dBm

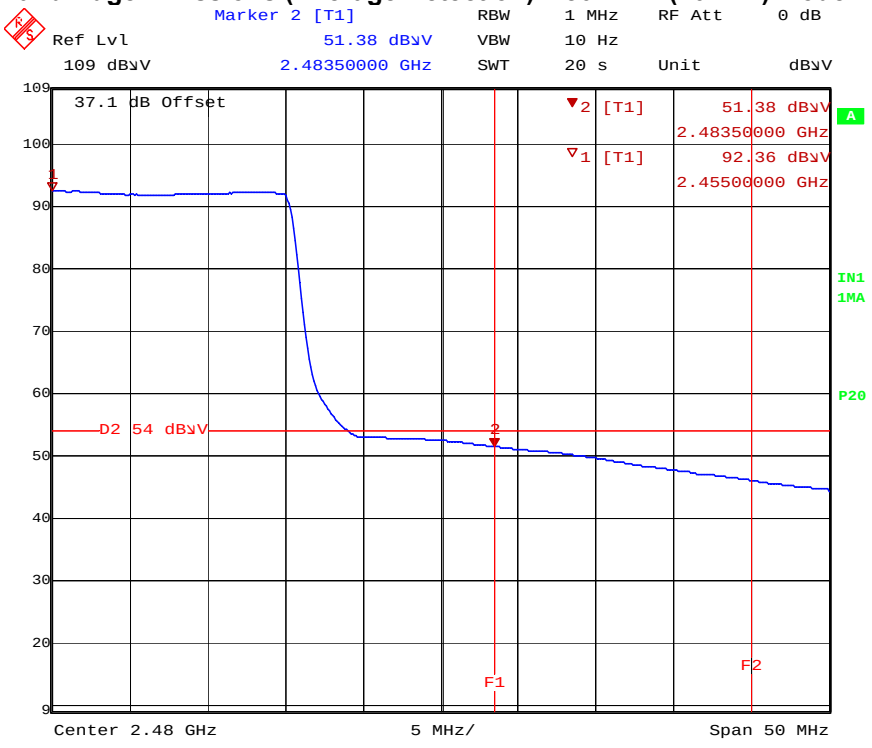


High Channel Band Edge Emissions (Average Detection) – 802.11n (20MHz) Mode MCSO 0, 16dBm



High Channel Band Edge Emissions (Peak Detection) – 802.11n (40MHz) Mode – MCSO 0, 16dBm

High Channel Band Edge Emissions (Average Detection) – 802.11n (40MHz) Mode MCSO 0, 16dBm



8 Radiated Spurious Emissions (Receiver)

8.1 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:

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

8.2 Test Procedure

ANSI C63.4: 2003

8.3 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

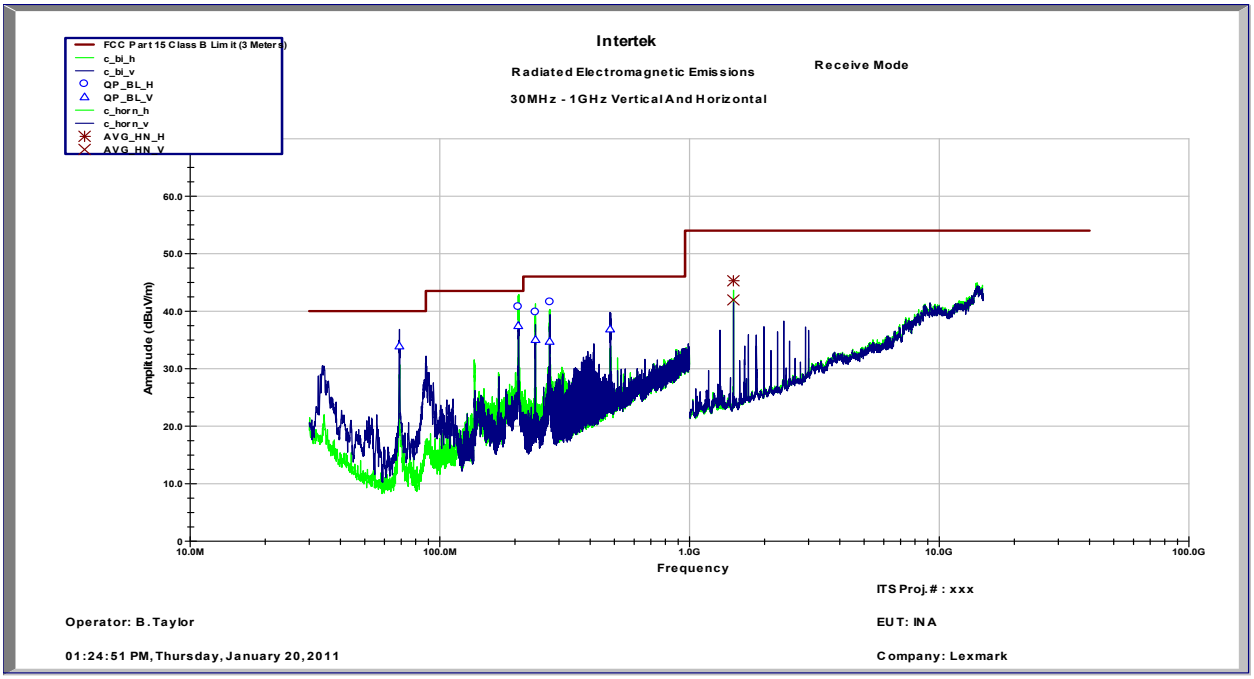
8.4 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2010	6/29/2011
Biconnilog Antenna	00051864	ETS	3142C	7/20/2010	7/20/2011
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use

8.5 Results:

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.

Radiated Emissions										
Test Engineer:	Bryan Taylor	**Start Date:**	1/20/2011		**End Date:**	1/20/2011				
Temperature:	21.6C	**Humidity:**	23.40%		**Pressure:**	978.6 mbar				
Specification:	Part 15.109	**Test Limit:**	Class B							
Notes:	Receiver Mode									
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Frequency	**Polarity (H/V)**	**Raw Reading (dBuV)**	**Cab. (dB)**	**Ant. (dB)**	**Corr. Reading. (dBuV/m)**	**Limit (dBuV/m)**	**Delta (dB)**	**RBW / Detector**	**Test Distance**	**Results**
206.1 MHz	H	27.91	2	10.87	40.77	43.52	-2.75	120kHz/QP	3m	**Compliant**
241.76 MHz	H	25.64	1.93	12.27	39.84	46.02	-6.18	120kHz/QP	3m	**Compliant**
276.3 MHz	H	26.17	2.25	13.17	41.59	46.02	-4.43	120kHz/QP	3m	**Compliant**
68.827 MHz	V	26.56	0.96	6.42	33.94	40	-6.06	120kHz/QP	3m	**Compliant**
206.1 MHz	V	24.61	2	10.87	37.47	43.52	-6.05	120kHz/QP	3m	**Compliant**
241.73 MHz	V	20.86	1.92	12.27	35.05	46.02	-10.97	120kHz/QP	3m	**Compliant**
275.36 MHz	V	19.26	2.3	13.19	34.75	46.02	-11.27	120kHz/QP	3m	**Compliant**
480.76 MHz	V	15.1	3.1	18.68	36.89	46.02	-9.13	120kHz/QP	3m	**Compliant**
1.5 GHz	H	54.63	-34.55	25.22	45.29	53.98	-8.69	1MHz/AVG	3m	**Compliant**
1.4999 GHz	V	51.29	-34.56	25.22	41.95	53.98	-12.03	1MHz/AVG	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			



Peak Scan (Receive Mode)

9 AC Powerline Conducted Emissions

9.1 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.

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.

9.2 Test Procedure

ANSI C63.4: 2003

9.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	6/29/2010	6/29/2011
LISN	2509	Fischer Custom Communication	FCC-LISN-50-50-2M	6/04/2010	6/04/2011

9.4 Results:

Quasi-Peak and Average Measurements (802.11b,Mode)

Conducted Voltage Emissions on Power Lines								
Test Engineer:	J. Centers		**Start Date:**	1/22/2011		**End Date:**	1/22/2011	
Temperature:	19.3C		**Humidity:**	11.40%		**Pressure:**	28.9mbar	
Specification:	FCC Part 15		**Test Limit:**	Class B		**RBW:**	9kHz	
Notes:	802.11b mode							
Line	**Frequency (MHz)**	**Quasi-Peak (dBuV)**	**Quasi-Peak Limit (dBuV)**	**Quasi-Peak Delta (dB)**	**Average (dBuV)**	**Average Limit (dBuV)**	**Average Delta (dB)**	**Results**
L1	150.0 KHz	50.57	66	-15.43	25.47	56	-30.53	**Compliant**
L1	168.0 KHz	48.78	65.06	-16.28	24.4	55.06	-30.66	**Compliant**
L1	197.9 KHz	45.64	63.7	-18.06	36.59	53.7	-17.11	**Compliant**
L2	150.0 KHz	48.69	66	-17.31	24.65	56	-31.35	**Compliant**
L2	168.0 KHz	45.62	65.06	-19.44	23.19	55.06	-31.87	**Compliant**
L2	197.3 KHz	44.4	63.72	-19.32	36.06	53.72	-17.66	**Compliant**

Quasi-Peak and Average Measurements (802.11g,Mode)

Conducted Voltage Emissions on Power Lines								
Test Engineer:	J. Centers		**Start Date:**	1/22/2011		**End Date:**	1/22/2011	
Temperature:	19.3C		**Humidity:**	11.40%		**Pressure:**	28.9mbar	
Specification:	FCC Part 15		**Test Limit:**	Class B		**RBW:**	9kHz	
Notes:	802.11g mode							
Line	**Frequency (MHz)**	**Quasi-Peak (dBuV)**	**Quasi-Peak Limit (dBuV)**	**Quasi-Peak Delta (dB)**	**Average (dBuV)**	**Average Limit (dBuV)**	**Average Delta (dB)**	**Results**
L1	150.0 KHz	51.69	66	-14.31	25.91	56	-30.09	**Compliant**
L1	168.0 KHz	48.94	65.06	-16.12	23.99	55.06	-31.07	**Compliant**
L1	197.2 KHz	45.28	63.73	-18.45	36.34	53.73	-17.39	**Compliant**
L2	150.0 KHz	48.37	66	-17.63	24.68	56	-31.32	**Compliant**
L2	168.0 KHz	45.2	65.06	-19.86	23.09	55.06	-31.97	**Compliant**
L2	197.9 KHz	44.66	63.7	-19.04	36.05	53.7	-17.65	**Compliant**

Quasi-Peak and Average Measurements (802.11n,Mode)

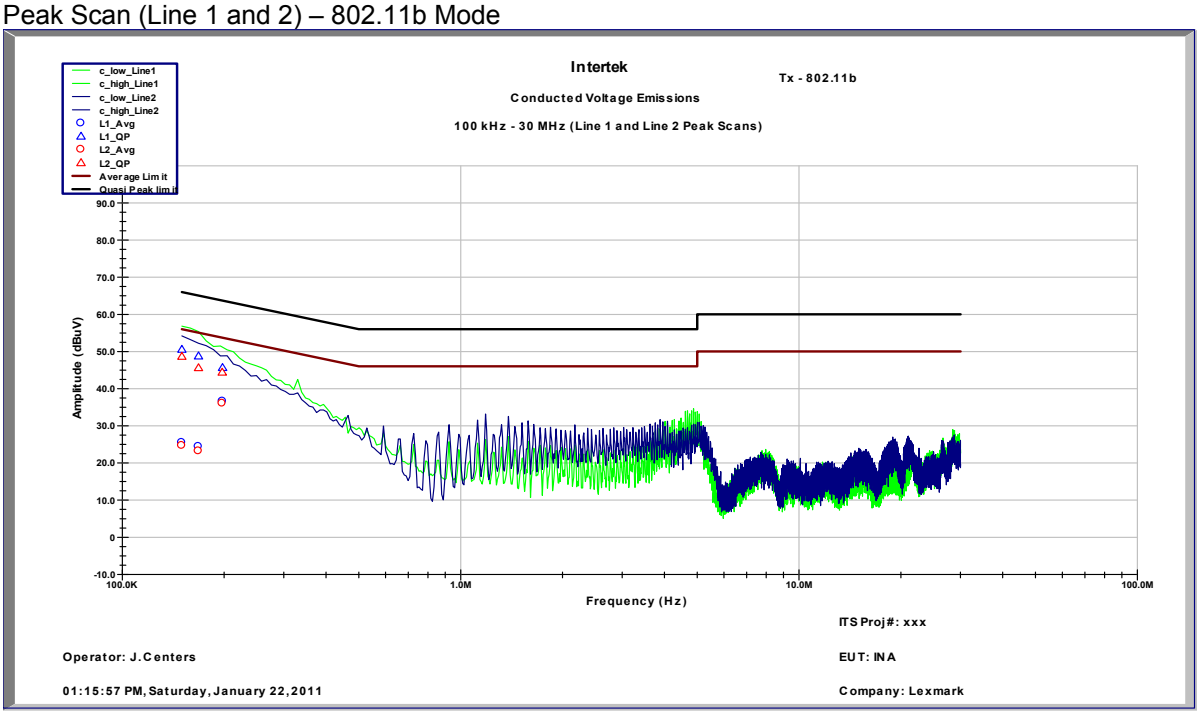
Conducted Voltage Emissions on Power Lines								
Test Engineer:	J. Centers		**Start Date:**	1/22/2011		**End Date:**	1/22/2011	
Temperature:	19.3C		**Humidity:**	11.40%		**Pressure:**	28.9mbar	
Specification:	FCC Part 15		**Test Limit:**	Class B		**RBW:**	9kHz	
Notes:	802.11n mode							
Line	**Frequency (MHz)**	**Quasi-Peak (dBuV)**	**Quasi-Peak Limit (dBuV)**	**Quasi-Peak Delta (dB)**	**Average (dBuV)**	**Average Limit (dBuV)**	**Average Delta (dB)**	**Results**
L1	150.0 KHz	51.27	66	-14.73	25.89	56	-30.11	**Compliant**
L1	168.0 KHz	48.74	65.06	-16.32	24.37	55.06	-30.69	**Compliant**
L1	197.2 KHz	45.69	63.73	-18.04	36.36	53.73	-17.37	**Compliant**
L2	150.0 KHz	46.03	66	-19.97	23.78	56	-32.22	**Compliant**
L2	168.0 KHz	43.77	65.06	-21.29	22.66	55.06	-32.4	**Compliant**
L2	197.1 KHz	43.95	63.73	-19.78	35.81	53.73	-17.92	**Compliant**

Quasi-Peak and Average Measurements (Receive Mode)

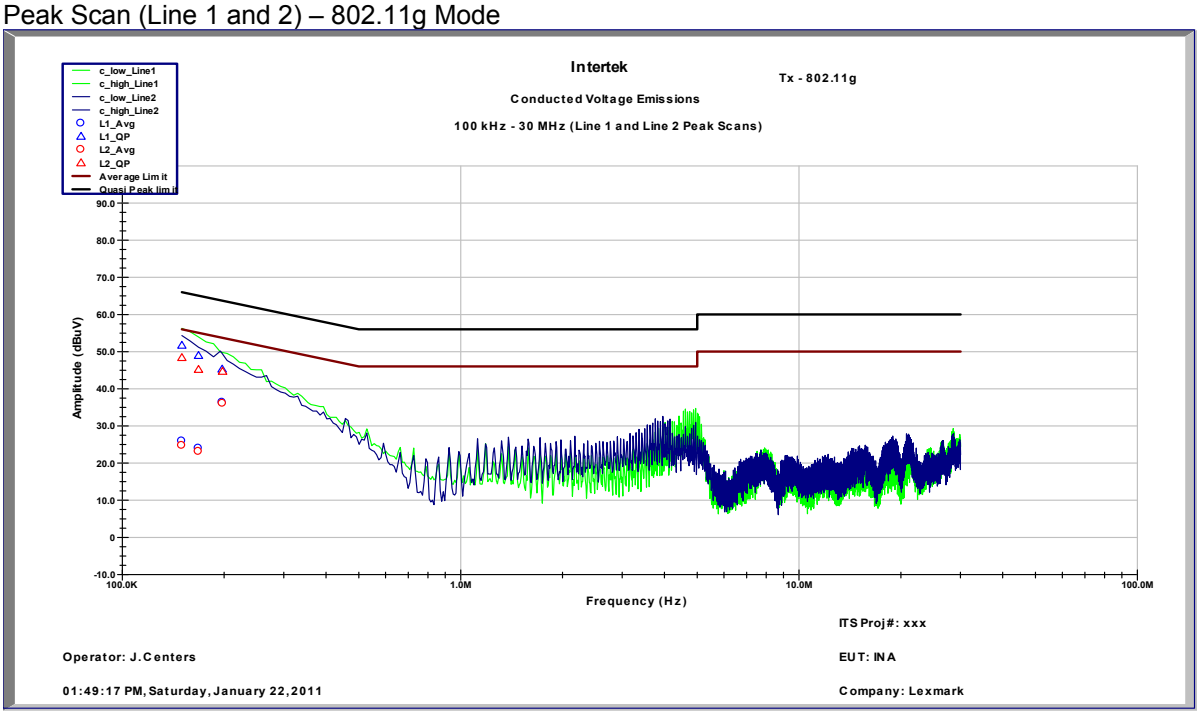
Conducted Voltage Emissions on Power Lines								
Test Engineer:	J. Centers	**Start Date:**	1/22/2011	**End Date:**	1/22/2011			
Temperature:	19.3C	**Humidity:**	11.40%	**Pressure:**	28.9mbar			
Specification:	FCC Part 15	**Test Limit:**	Class B	**RBW:**	9kHz			
Notes:	802.11 rx mode							

Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	150.0 KHz	51.19	66	-14.81	25.73	56	-30.27	**Compliant**
L1	159.2 KHz	49.39	65.51	-16.12	24.74	55.51	-30.77	**Compliant**
L1	196.7 KHz	45.06	63.75	-18.69	35.69	53.75	-18.06	**Compliant**
L2	150.0 KHz	48.61	66	-17.39	24.66	56	-31.34	**Compliant**
L2	159.0 KHz	47.33	65.52	-18.19	23.83	55.52	-31.69	**Compliant**
L2	196.8 KHz	43.66	63.74	-20.09	35.36	53.74	-18.39	**Compliant**

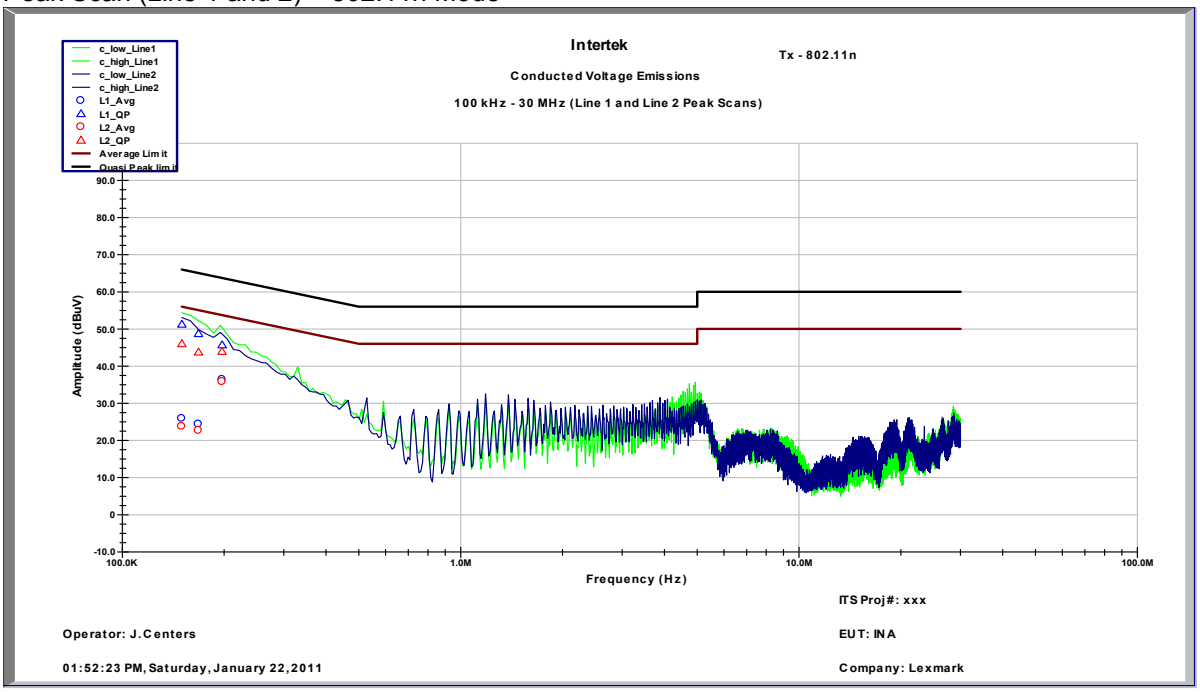
Peak Scan (Line 1 and 2) – 802.11b Mode



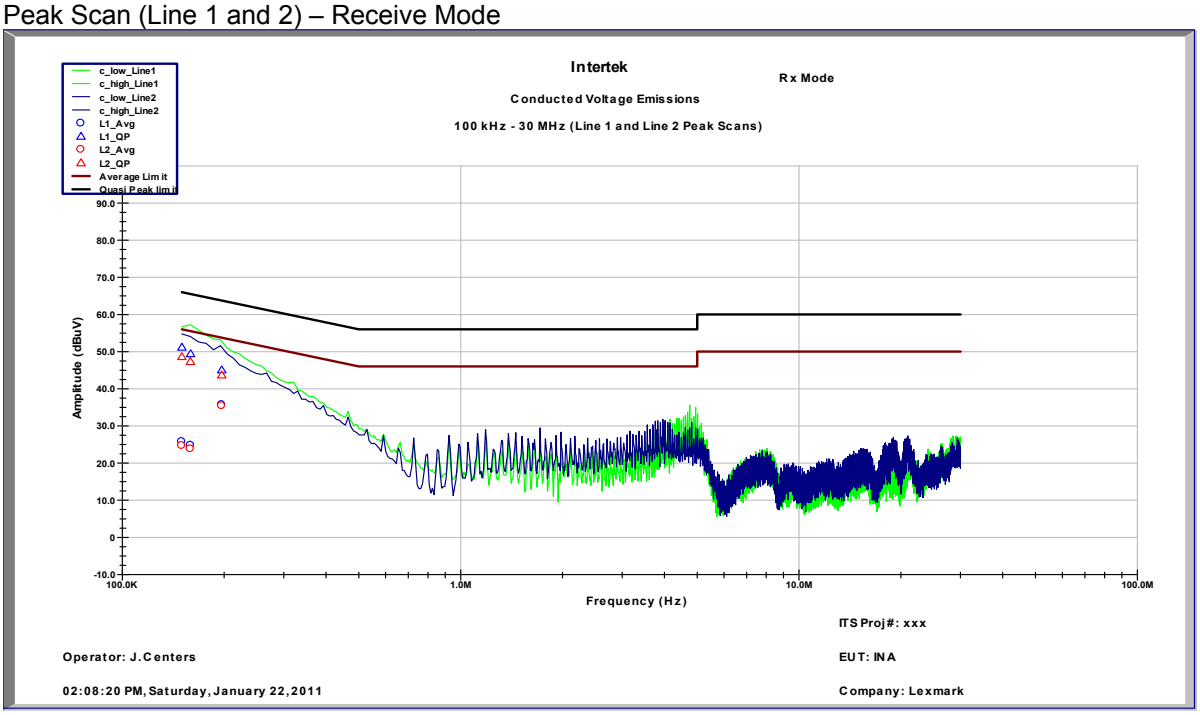
Peak Scan (Line 1 and 2) – 802.11g Mode



Peak Scan (Line 1 and 2) – 802.11n Mode



Peak Scan (Line 1 and 2) – Receive Mode



10 Antenna Requirement per FCC Part 15.203

10.1 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.

10.2 Results:

The sample tested met the antenna requirement. The antenna used was permanently attached and integral to the PCB.

11 RF Exposure Requirements (MPE Calculations)

11.1 Test Limits

§ 1.1310: The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

Part 1.1310 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

11.2 Test Procedure

The radiated RF power (calculated from the average conducted output power and antenna gain) was used to calculate the maximum RF exposure at a 20 cm distance using the formula:

Maximum RF Exposure at 20cm = (EIRP in mW)/(4Pi(20cm)^2)

Once the Maximum RF Exposure calculations were complete the results were compared to the MPE limits above.

11.3 Results:

The following calculations show the Maximum RF Exposure from the test sample at 20cm for the worst case EIRP. The MPE level is well below the limits for the general population described in the table above.

Maximum EIRP = 16.51dBm + 2.66dBi = 19.17dBm = 82.6mW

MPE = 82.6mW / (4Pi(20cm)^2) = 82.6mW / 5025.6 cm^2 = **0.016mW/cm^2** (Limit = 1 mW/cm^2)

12 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	

13 Revision History

Revision Level	Date	Report Number	Notes
0	2/17/2011	100316156LEX-001	Original Issue

14 Appendix A: A2LA Certificate

The American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

INTERTEK TESTING SERVICES NA
731 Enterprise Road
Lexington, KY 40510
Mr. James Sudduth 859 226 1000
james.sudduth@intertek.com

ELECTRICAL

Valid to: April 30, 2012 Certificate Number: 1926.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with A2LA's ENERGY STAR® Accreditation Program requirements[1]) accreditation is granted to this laboratory to perform the following energy efficiency, electromagnetic compatibility, telecom, CTIA and NEBS testing:

Test Technology	Test Method(s)
Emissions	
Radiated & Conducted	Code of Federal Regulation (CFR) 47, FCC Part 15 Subpart B (using ANSI C63.4-2003); EN 55022; CISPR 24; EN 55024; AS/NZS 3548; IEC/CISPR 22; AS/NZS CISPR 22; CNS 13438 (up to 6GHz); IEC 61000-3-2; AS/NZS 2297.1
Current Harmonics	EN 61000-3-2
Flicker	IEC 61000-3-3; EN 61000-3-3, A1
Household Appliances	IEC 55014-1; EN 55014-1
Immunity	
Electrostatic Discharge (ESD)	IEC 61000-4-2 + A1; EN 61000-4-2
Radiated Immunity	IEC 61000-4-3 + A1; EN 61000-4-3; IEC 55014-2; EN 55014-2
Electrical Fast Transient/Burst	IEC 61000-4-4; EN 61000-4-4
Surge	IEC 61000-4-5; EN 61000-4-5
Conducted Immunity	IEC 61000-4-6; EN 61000-4-6
Power Frequency Magnetic Field Immunity	IEC 61000-4-8; EN 61000-4-8
Voltage Dips, Short Interruptions, and Line Voltage Variations	IEC 61000-4-11; EN 61000-4-11
Hearing Aid Compatibility	ANSI C63.19-2006; CTIA HAC, Rev 1
Specific Absorption Rate (SAR)	OET Bulletin No. 65, Supplement C; IEEE Std 1528-2003; FCC Public Notice, DA 02-1438

(A2LA Cert. No. 1926.01) revised 01/12/2011 Page 1 of 4

5301 Buckeystown Pike, Suite 350 | Frederick, Maryland 21704-8373 | Phone: 301 644 3248 | Fax: 301 662 2974 | www.A2LA.org

Test Technology	Test Method(s)
Transmitters and Receivers (below 40 GHz)	CFR 47, FCC Parts 2 and 15C; ANSI C63.10-2009; CFR 47 FCC Parts 22 and 24 ANSI/TIA/EIA-603-C; RSS-Gen; RSS-102; RSS-129; RSS-132; RSS-133; RSS-210 (no DFS testing)
CTIA Over the Air (OTA) CDMA	CTIA Over the Air Test Plan CTIA CDMA Mobile Station Test Plan
3GPP2 Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations	3GPP2 C.S0011-C, As required by the CCF test plan
Signaling Conformance Test Specification for cdma2000 Spread Spectrum Systems	3GPP2 C.S0031-0 – Withdrawn by the CCF; 3GPP2 C.S0043, As required by the CCF test plan; 3GPP2 C.S0062, As required by the CCF test plan
Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Terminal	3GPP2 C.S0033-0, As required by the CCF test plan
Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Terminal	3GPP2 C.S0033-A, As required by the CCF test plan
Recommended Minimum Performance Specification for C.S0022-0 Spread Spectrum Mobile Stations	3GPP2 C.S0036-0, As required by the CCF test plan
Signaling Conformance Specification for cdma2000 Wireless IP Networks	3GPP2 C.S0037-0, As required by the CCF test plan
Signaling Conformance Specification for cdma2000 High Rate Packet Data Air Interface	3GPP2 C.S0038-A, As required by the CCF test plan
Electro-Acoustic Recommended Minimum Performance Specification for cdma2000 Mobile Stations	3GPP2 C.S0056-0, As required by the CCF test plan
Signaling Conformance Test Specification for cdma2000 Position Determination Services	3GPP2 C.S0059-0, As required by the CCF test plan
Signaling Conformance Test Specification for Over-the-Air Service Provisioning	3GPP2 C.S0060-0, As required by the CCF test plan

Test Technology	Test Method(s)
3GPP2 (cont.)	
Signaling Conformance Test Specification for Short Message Service	3GPP2 C.S0061-0, As required by the CCF test plan
Signaling Test Specification for Mobile Station Equipment Identifier (MEID) Support for cdma2000 Spread Spectrum Systems	3GPP2 C.S0073-0, As required by the CCF test plan
Radio Communication	ETSI EN 300 328; ETSI EN 301 489-1; ETSI 301 489-17
NEBS	
Electrostatic Discharge (ESD)	GR-1089-CORE, Section 2
Emissions	GR-1089-CORE, Section 3
Immunity	GR-1089-CORE, Section 3
Power Cross	GR-1089-CORE, Section 4
Lightning	GR-1089-CORE, Section 4
Steady State Induction	GR-1089-CORE, Section 5
DC Potential	GR-1089-CORE, Section 6
Electrical Safety	GR-1089-CORE, Section 7
Corrosion	GR-1089-CORE, Section 8
Bonding & Grounding	GR-1089-CORE, Section 9; GR-487-CORE, Section 3.15
Criteria for DC Power Ports	GR-1089-CORE, Section 10
Spatial	GR-63-CORE, Section 2.0
Temperature/Humidity/Altitude	GR-63-CORE, Section 4.1; GR-487-CORE, Sections 3.27, 3.34
Needle Flame	GR-63-CORE, Section 4.2
Flammability	GR-63-CORE, Section 4.2
Equipment Handling	GR-63-CORE, Section 4.3
Earthquake	GR-63-CORE, Section 4.4; GR-487-CORE, Section 3.35
Airborne Contaminates	GR-63-CORE, Section 4.5
Hygroscopic Dust	GR-63-CORE, Section 4.5
Acoustics	GR-63-CORE, Section 4.6; GR-487-CORE, Section 3.29
Illumination	GR-63-CORE, Section 4.7
Salt Fog	GR-487-CORE, Section 3.34
Wind Driven Rain	GR-487-CORE, Section 3.28

On the following products or types of products:
Telco Control Office Equipment, Outside Plant, Customer Premise Equipment

Test Technology	Test Method(s)
Energy Efficiency	
Household Electrical Appliances: Measurement of Standby Power	IEC 62301-2005
ENERGY STAR Tests	
Product Family Guidelines	Supporting Test Methods(s)
Home Electronics	
Set Top Boxes	ENERGY STAR® Program Requirements for Set Top Boxes Ver. 2.0 (including CSA C380-08)

[1] A2LA provides accreditation to the U.S. EPA's *Conditions and Criteria for Recognition of Laboratories for the ENERGY STAR Program* by verifying an organization's compliance to A2LA document *R222 - Specific Requirements - EPA ENERGY STAR Accreditation Program* and to the related test methods listed above

Accreditation by A2LA does not infer Recognition by the EPA for ENERGY STAR testing. Please verify this organization's recognition status at the EPA's website, located at http://www.energystar.gov/index.cfm?c=partners.epa_recognized_laboratories

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

INTERTEK TESTING SERVICES NA

Lexington, KY

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 10th day of August 2010.

President & CEO
For the Accreditation Council
Certificate Number 1926.01
Valid to April 30, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.