MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE ! BALTIMORE, MARYLAND 21230-3432 ! PHONE (410) 354-3300 ! FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408 748-3585 ● FAX (510) 489-6372
13301 MCCALLEN PASS ! AUSTIN, TX 78753 ! PHONE (512) 287-2500 ! FAX (512) 287-2513

December 12, 2013

Meru Networks, Inc.
140 Knowles Drive
Los Gatos, CA 95032

Dear Rajendran Chary,

Enclosed is the EMC Wireless test report for compliance testing of the Meru Networks, Inc., Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15.407 and Industry Canada RSS-210, Annex 9, Issue 8, December 2010 for Intentional Radiators.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Meru Networks, Inc.\EMCS34526A-FCC407 Rev. 3 (UNII 1))

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Electromagnetic Compatibility Criteria
Test Report

for the

Meru Networks, Inc.
Model Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e

Tested under
the FCC Certification Rules
contained in
Title 47 of the CFR, Part 15.407 & RSS-210, Annex 9
for Intentional Radiators

MET Report: EMCS34526A-FCC407 Rev. 3 (UNII 1)

December 12, 2013

Prepared For:

Meru Networks, Inc.
140 Knowles Drive
Los Gatos, CA 95032

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave.
Baltimore, MD 21230

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for Intentional Radiators

Jeff Pratt, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 15.407, of the FCC Rules and Industry Canada standard RSS-210 Annex 9 under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	June 14, 2012	Initial Issue.
1	September 28, 2012	Revised to reflect editorial correction regarding the model number.
2	November 19, 2013	Revised to reflect engineer corrections.
3	December 12, 2013	Revised to reflect engineer corrections.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µ	**microf**arad
µs	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Meru Networks, Inc. Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e, with the requirements of Part 15, §15.407. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e. Meru Networks, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.407, in accordance with Meru Networks, Inc., purchase order number 103991. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	Industry Canada Reference	Description	Results
§15.203	RSS-GEN 7.1.4	Antenna Requirements	Compliant
§15.207	RSS-GEN 7.2.2; RSS-210 2.2	AC Conducted Emissions 150KHz – 30MHz	Compliant
§15.403 (i)	A8.2	26dB Occupied Bandwidth	Compliant
§15.407 (a)(2)	A9.2(3)	Conducted Transmitter Output Power	Compliant
§15.407 (a)(2)	A9.2(3)	Power Spectral Density	Compliant
§15.407 (a)(6)	N/A	Peak Excursion	Compliant
§15.407 (b)(2), (3), (5), (6)	A9.3(4)	Undesirable Emissions (15.205/15.209 - General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
§15.407(f)	RSS-GEN	RF Exposure	Compliant
§15.407(g)	2.1	Frequency Stability	Compliant
N/A	RSS-Gen(4.8)	Receiver Spurious Emissions	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Meru Networks, Inc. to perform testing on the Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e, under Meru Networks, Inc.'s purchase order number 103991.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Meru Networks, Inc. Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e	
Model(s) Covered:	Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: RE7-AP332E IC: 6749A-AP332E	
	Type of Modulations:	DSSS, OFDM
	Equipment Code:	NII
	Peak RF Output Power:	16.14 dBm
	EUT Frequency Ranges:	5180 – 5240 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Jeff Pratt	
Report Date(s):	December 12, 2013	

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
RSS-210, Issue 8, Dec. 2010	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
RSS-GEN, Issue 3, Dec. 2010	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Description of Test Sample

The Meru Networks, Inc. Dual Radio 802.11abgn 3x3 Access Point with External Antenna - AP332e, Equipment Under Test (EUT), is a wireless access point (WAP) that allows wireless devices to connect to a wired network using Wi-Fi, standard. The WAP usually connects to a router (via a wired network), and can relay data between the wireless devices (such as computers or printers) and wired devices on the network. Both radios will not operate in the same band at the same time.

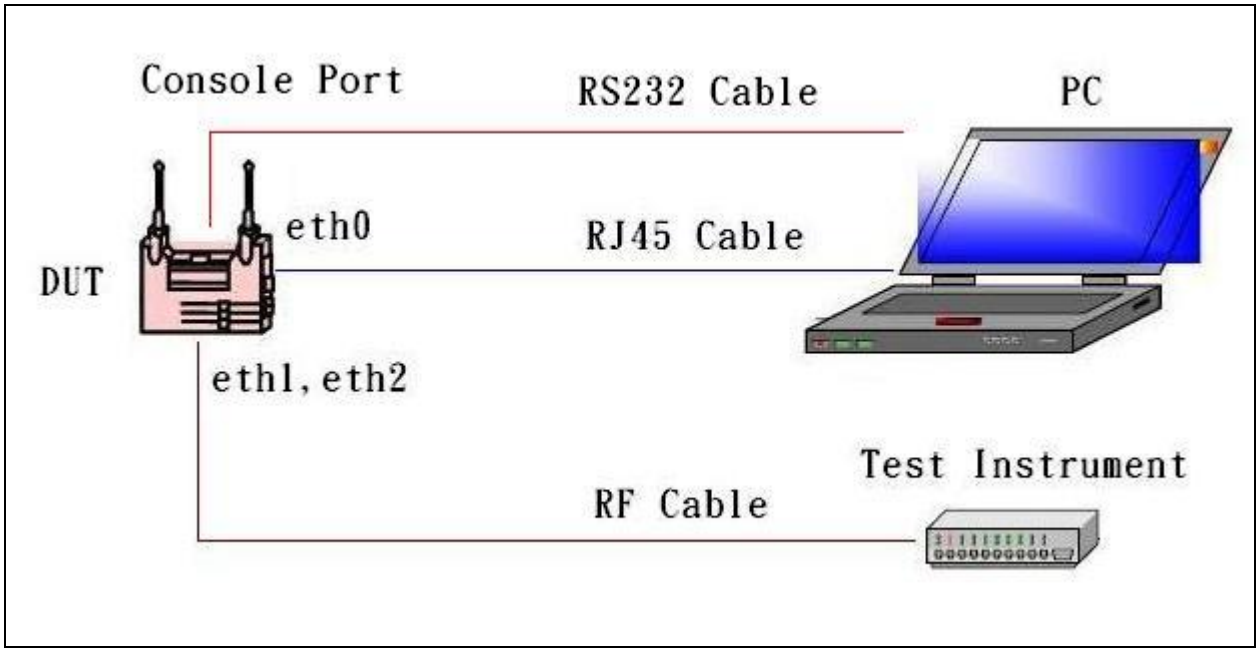


Figure 1. Block Diagram of Test Configuration

E. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

SN	Type	Model and Serial Number	Quantity
1	AP433e	SN: 112A332e0DEE93,112A332e0DEE8B, 112A332e0DEE8F	3
3	Antenna	ANT-ABGN-0304-W Omni directional rubber duct Dual-Band	36
4	Antenna	ANT-I3ABGN-0304-O Ceiling mount Omni Dual-Band 3 x 3 MIMO	1
5	Antenna	ANT-06ABGN-0606-O Outdoor Omi Dual-Band 3X3 MIMO	3
6	Antenna	ANT-06ABGN-0607-PT Wall mount Dual-Band 3 X 3 MIMO	3
10	PoE	PD-9001GR/AC	2
11	PoE	PS-9001G	2
12	Cable	Serial cable	2
13	Cable	Ethernet cable	4
--	--	AC-DC Adapter GS18A12-P1J	2

Table 4. Support Equipment

F. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
--	12V DC	DC power supply	1	1	N	--
--	Console Port	Serial cable	1	1	N	--
--	G1 PoE	Ethernet and PoE port	1	1	1	--

Table 5. Ports and Cabling Information

G. Mode of Operation

During the normal operation the configuration is controlled by the Meru controller which sets the country code, ESSID, Operating frequency band and Channel etc.

H. Method of Monitoring EUT Operation

During the normal operation with controller Green or Blue LED indication on the Access point indicate the normal operation of the Access point. A Red LED indicates a failure of hardware or software settings.

I. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

J. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Meru Networks, Inc. upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: **§ 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.

The structure and application of the EUT were analyzed to determine compliance with Section 15.203 of the Rules. Section 15.203 states that the subject device must meet at least one of the following criteria:

a.) Antenna must be permanently attached to the unit.

b.) Antenna must use a unique type of connector to attach to the EUT.

c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested is compliant the criteria of §15.203. Units are professionally installed.

Test Engineer(s): Anderson Soungpanya

Test Date(s): 04/27/12

Gain (dBi)		Antenna Type	Antenna Description	Manufacturer	Model Number
2.4 GHz	5 GHz				
2	2	Dipole	Omni Directional Rubber Duct Dual-Band	SOCAA	ANT-ABGN-0304-W
3	4	Dipole	Omni Directional Ceiling Mount Dual-Band 3 x 3 MIMO	Terrawave Solutions	ANT-I3ABGN-0304-O
6	6	Dipole	Omni Directional Cane Dual-Band 3 x 3 MIMO	Terrawave Solutions	ANT-06ABGN-0606-O
6	7	Patch	Directional Wall Mount Dual-Band 3 x 3 MIMO	Terrawave Solutions	ANT-06ABGN-0607-PT

Table 6. Antenna List

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207 Conducted Emissions Limits

Test Requirement(s): **§ 15.207 (a):** 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 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Σ 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 range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 7. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a 0.8 m-high wooden table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2003 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on.

Test Results: The EUT was compliant with this requirement. Measured emissions were below applicable limits.

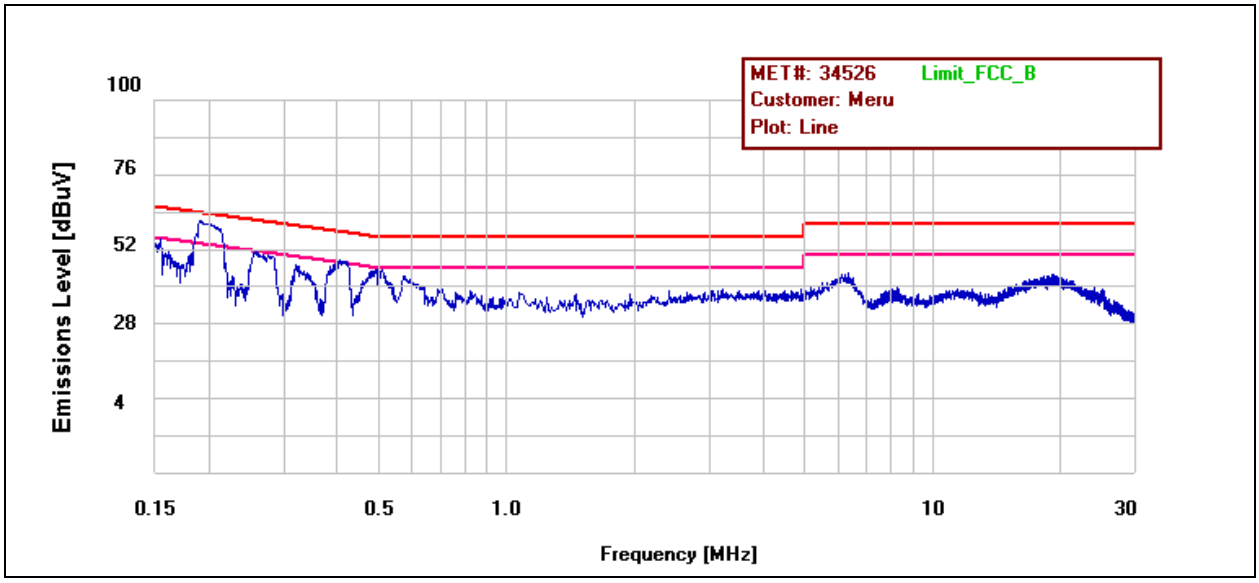
Test Engineer(s): Anderson Soungpanya

Test Date(s): 05/07/12

15.207(a) Conducted Emissions Test Results, 2.4 GHz

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	.190	60.23	64.042	-3.812	Pass	39.01	54.042	-15.032	Pass
Line	.390	43.52	58.085	-14.565	Pass	30.34	48.085	-17.745	Pass
Line	.498	39.42	56.034	-16.614	Pass	28.45	46.034	-17.584	Pass

Table 8. Conducted Emissions, 15.207(a), Phase Line, Test Results, 2.4 GHz

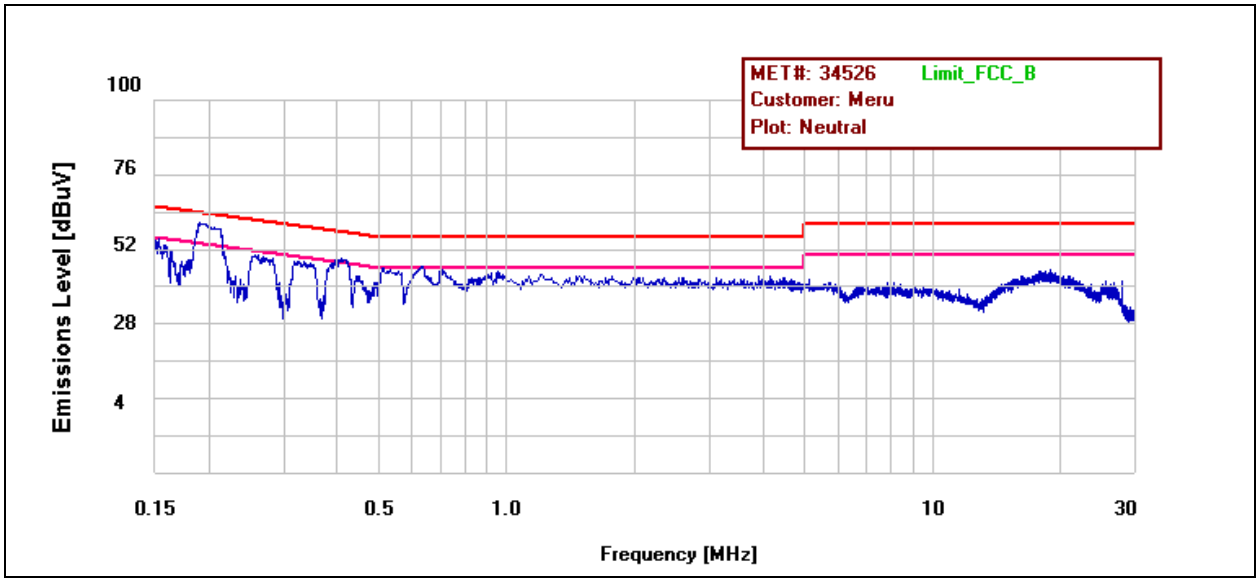


Plot 1. Conducted Emissions, 15.207(a), Phase Line, 2.4 GHz

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	.191	57.21	63.998	-6.788	Pass	37.57	53.998	-16.428	Pass
Neutral	.391	40.84	58.064	-17.224	Pass	29.58	48.064	-18.484	Pass
Neutral	.623	37.38	56	-18.62	Pass	29.01	46	-16.99	Pass

Table 9. Conducted Emissions, 15.207(a), Neutral Line, Test Results, 2.4 GHz

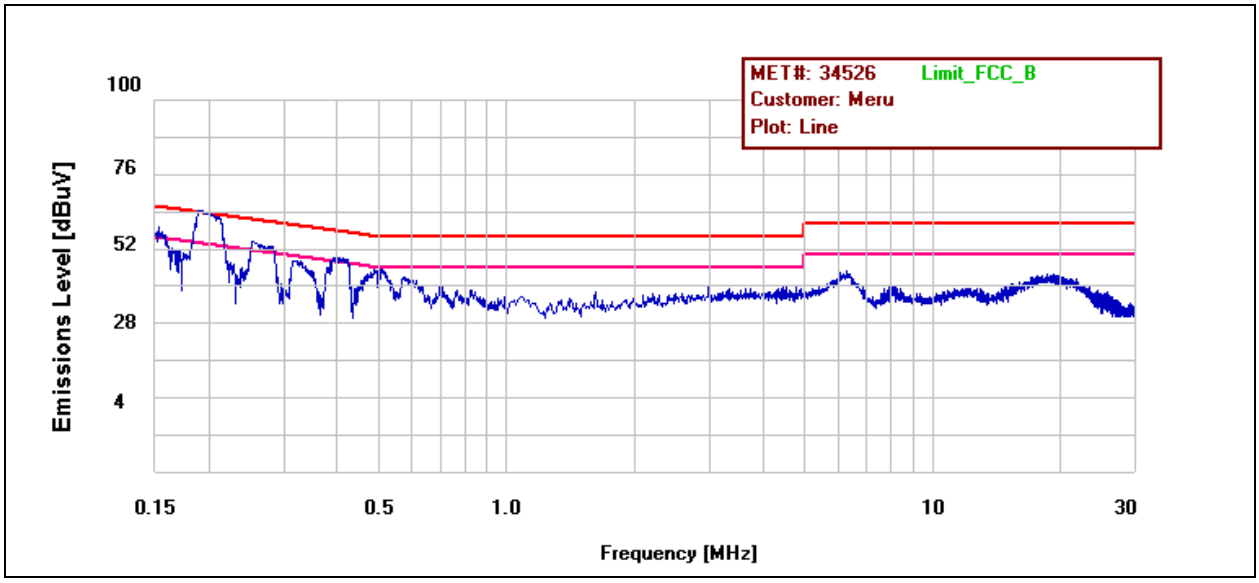


Plot 2. Conducted Emissions, 15.207(a), Neutral Line, 2.4 GHz

15.207(a) Conducted Emissions Test Results, 5 GHz

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	.190	60.18	64.042	-3.862	Pass	38.57	54.042	-15.472	Pass
Line	.257	49.38	61.54	-12.16	Pass	32.26	51.54	-19.28	Pass
Line	.389	43.69	58.107	-14.417	Pass	29.857	48.107	-18.25	Pass
Line	.485	41.37	56.26	-14.89	Pass	28.107	46.26	-18.153	Pass

Table 10. Conducted Emissions, 15.207(a), Phase Line, Test Results, 5 GHz

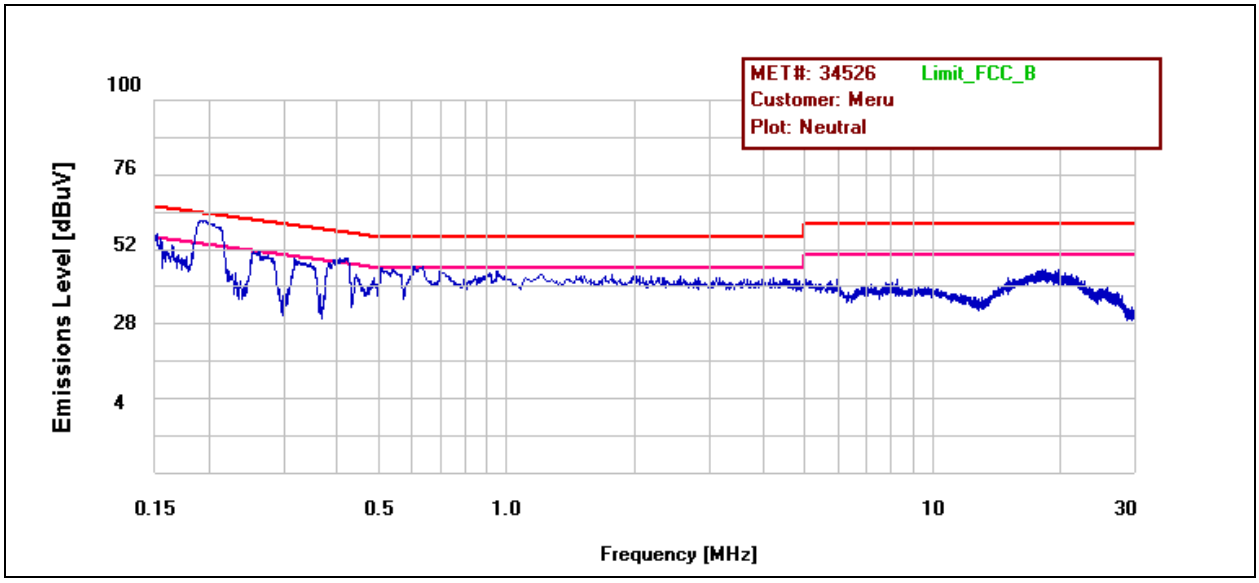


Plot 3. Conducted Emissions, 15.207(a), Phase Line, 5 GHz

15.207(a) Conducted Emissions Test Results

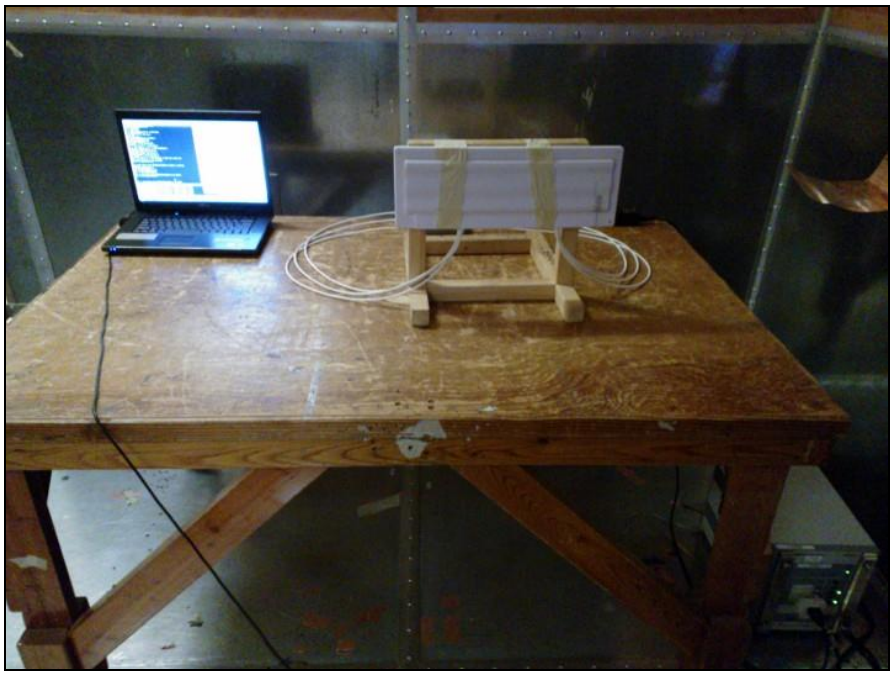
Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	.193	57.31	63.912	-6.602	Pass	38.43	53.912	-15.482	Pass
Neutral	.412	43.09	57.631	-14.541	Pass	30.54	47.631	-17.091	Pass
Neutral	.519	41.95	56	-14.05	Pass	28.42	46	-17.58	Pass

Table 11. Conducted Emissions, 15.207(a), Neutral Line, Test Results, 5 GHz

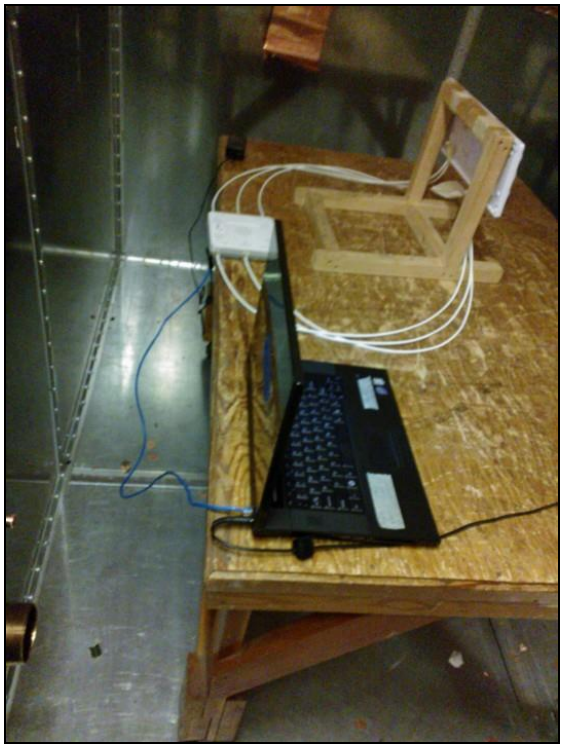


Plot 4. Conducted Emissions, 15.207(a), Neutral Line, 5 GHz

15.207(a) Conducted Emissions Test Setup



Photograph 1. Conducted Emissions, 15.207(a), Test Setup



Photograph 2. Conducted Emissions, 15.207(a), Test Setup, Rear View

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(c) 26dB Bandwidth

Test Requirements: **§ 15.403 (i):** For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Test Procedure: The transmitter was set to low, mid, and high operating frequencies at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, VBW > RBW. The 26 dB Bandwidth was measured and recorded.

Test Results The 26 dB Bandwidth was compliant with the requirements of this section and was determined from the plots on the following pages.

Test Engineer(s): Jeff Pratt

Test Date(s): 05/22/12

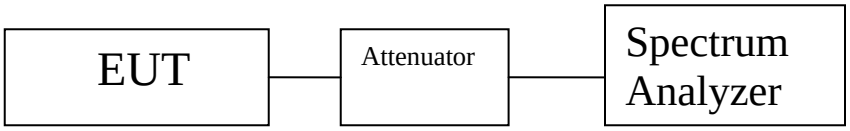


Figure 2. Occupied Bandwidth, Test Setup

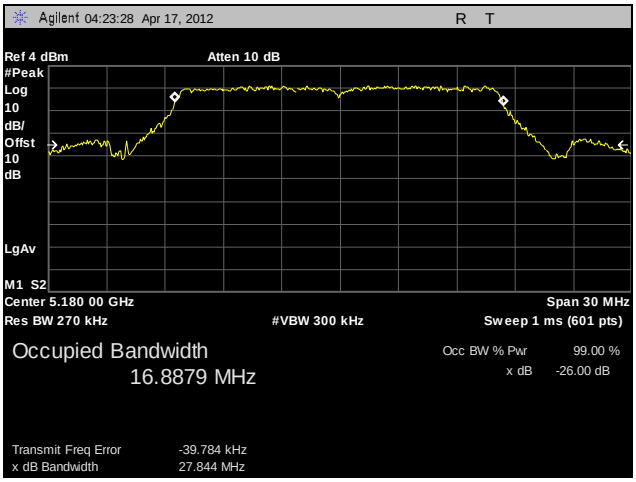
Mode	Channel	Frequency (MHz)	Port	26dB Bandwidth (MHz)
802.11a	Low	5180	A4	27.844
	Mid	5200	A4	26.809
	High	5240	A4	27.284
802.11n HT20	Low	5180	A4	26.818
			A5	26.544
			A6	27.322
	Mid	5200	A4	26.498
			A5	26.178
			A6	26.357
	High	5240	A4	26.742
			A5	25.872
			A6	25.752
802.11n HT40	Low	5190	A4	39.599
			A5	39.493
			A6	39.245
	High	5230	A4	39.093
			A5	39.563
			A6	39.491

Table 12. 26 dB Occupied Bandwidth, Test Results

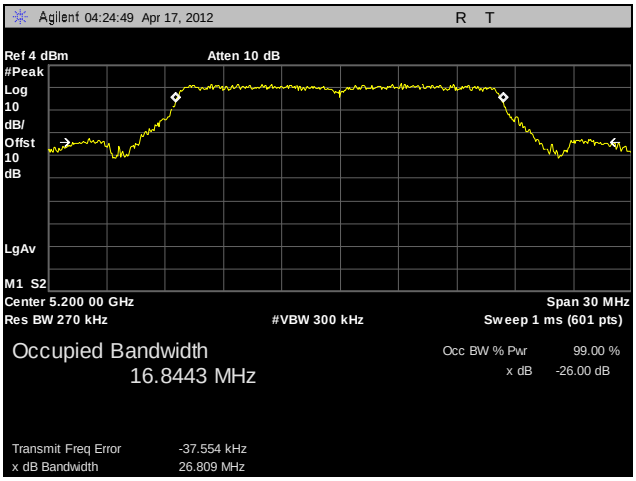
Mode	Channel	Frequency (MHz)	Port	99% Bandwidth (MHz)
802.11a	Low	5180	A4	16.75
	Mid	5200	A4	16.62
	High	5240	A4	16.74
802.11n HT20	Low	5180	A4	17.72
			A5	17.67
			A6	17.7
	Mid	5200	A4	17.76
			A5	17.73
			A6	17.72
	High	5240	A4	17.76
			A5	17.87
			A6	17.59
802.11n HT40	Low	5190	A4	36.26
			A5	36.55
			A6	36.41
	High	5230	A4	36.85
			A5	35.99
			A6	37.15

Table 13. 99% Occupied Bandwidth, Test Results

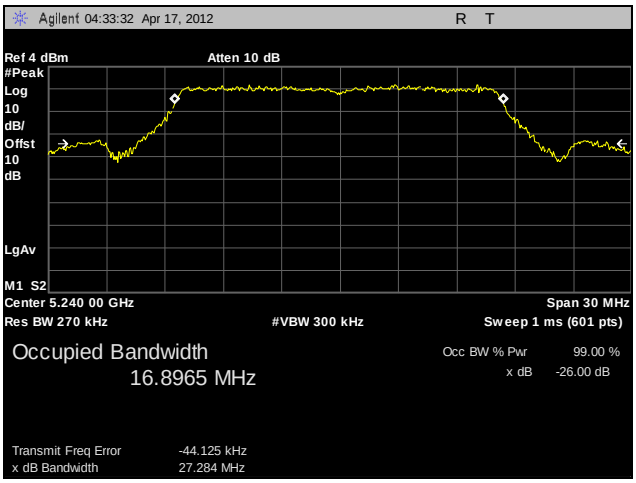
26 dB Occupied Bandwidth, 802.11a



Plot 5. 26 dB Occupied Bandwidth, Low Channel, 802.11a

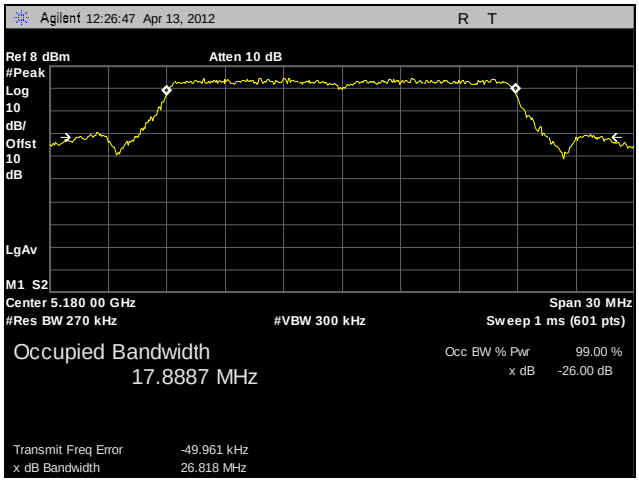


Plot 6. 26 dB Occupied Bandwidth, Mid Channel, 802.11a

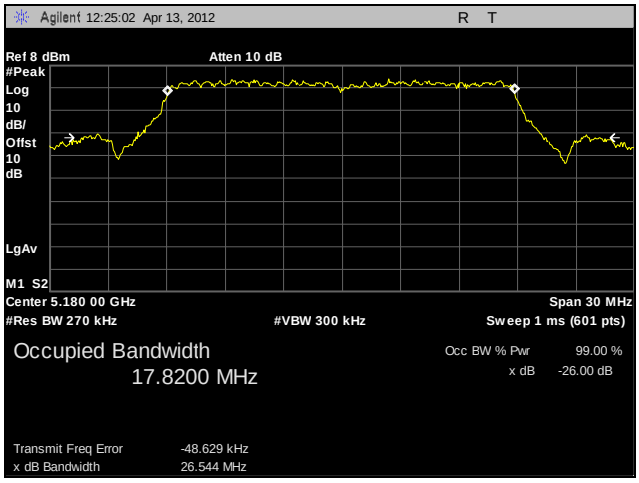


Plot 7. 26 dB Occupied Bandwidth, High Channel, 802.11a

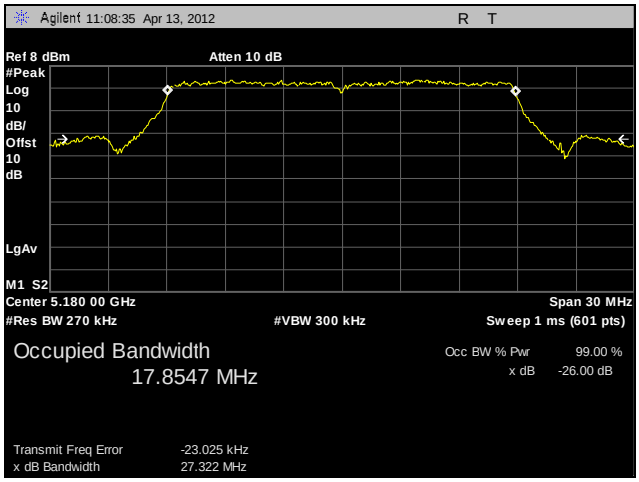
26 dB Occupied Bandwidth, 802.11n 20 MHz, Low Channel



Plot 8. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz (A4)

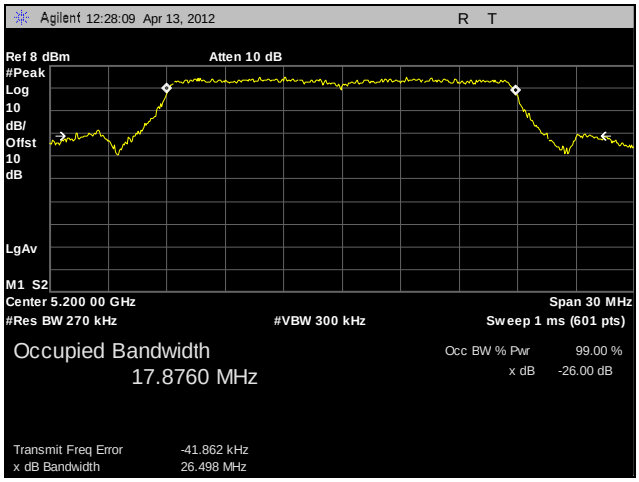


Plot 9. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz (A5)

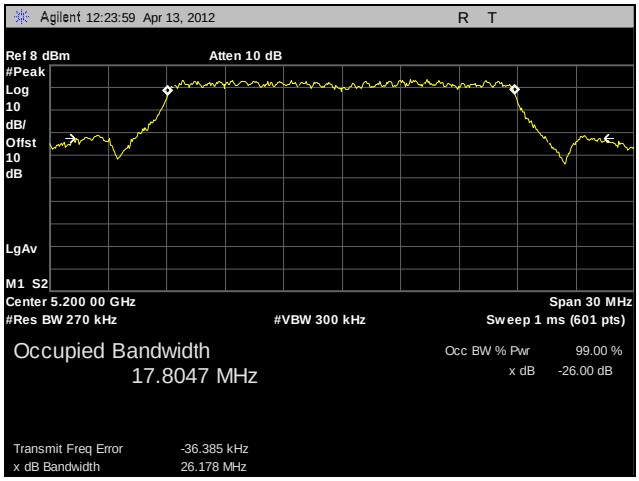


Plot 10. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz (A6)

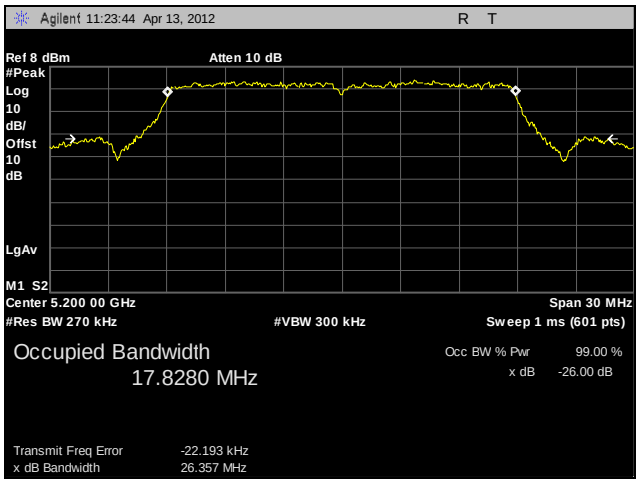
26 dB Occupied Bandwidth, 802.11n 20 MHz, Mid Channel



Plot 11. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz (A4)

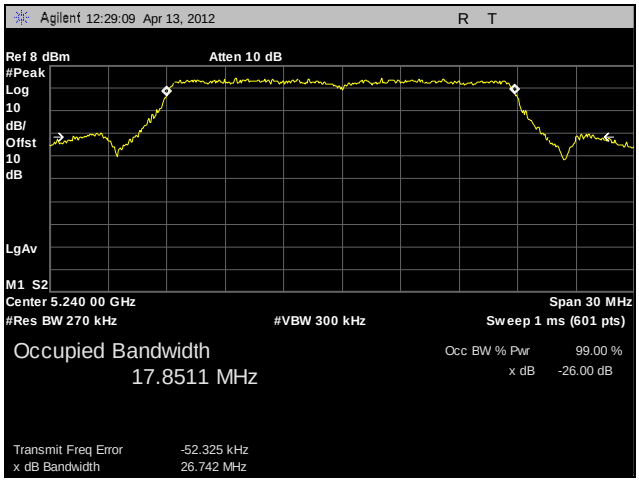


Plot 12. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz (A5)

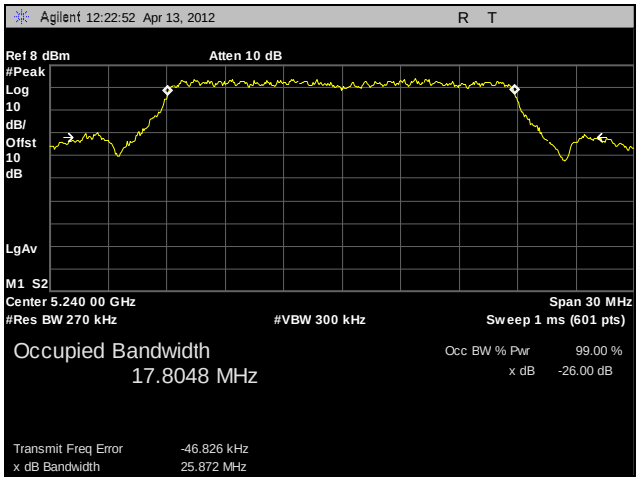


Plot 13. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz (A6)

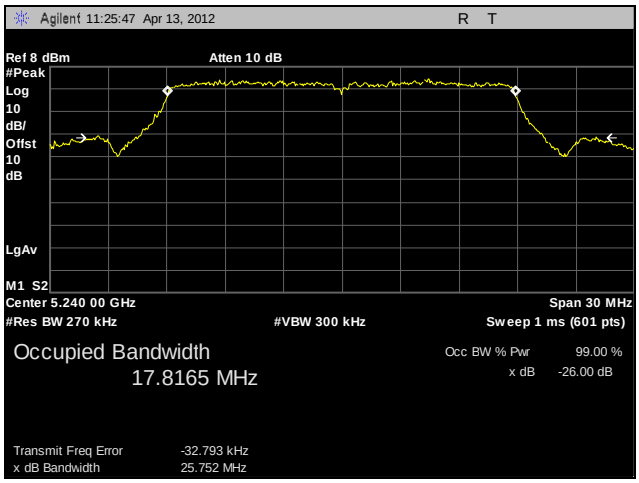
26 dB Occupied Bandwidth, 802.11n 20 MHz, High Channel



Plot 14. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz (A4)

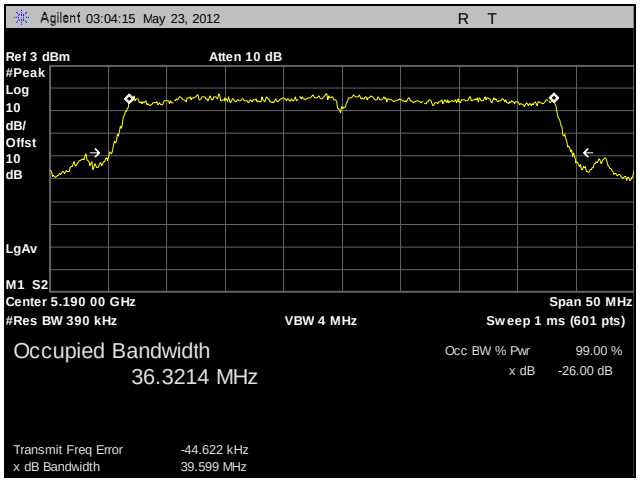


Plot 15. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz (A5)

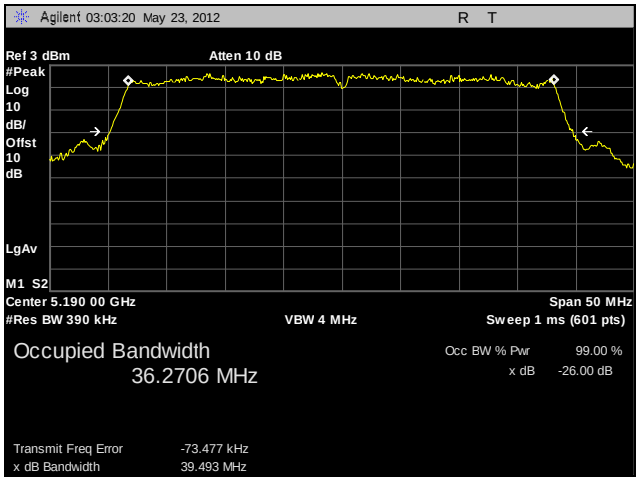


Plot 16. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz (A6)

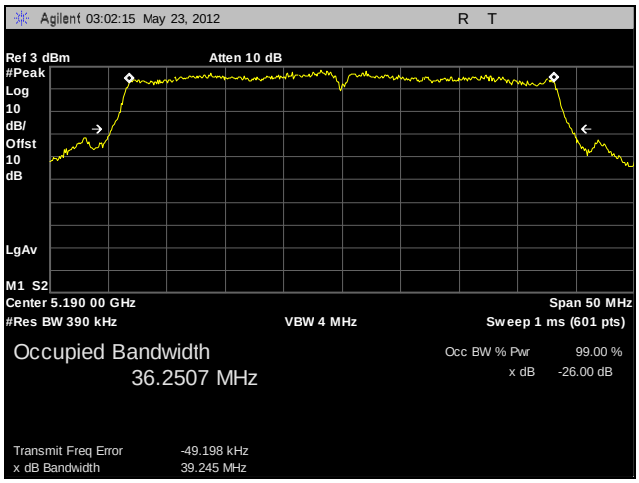
26 dB Occupied Bandwidth, 802.11n 40 MHz, Low Channel



Plot 17. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz (A4)

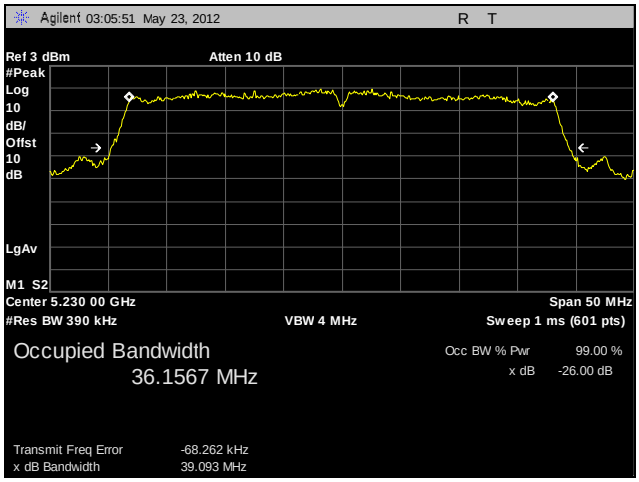


Plot 18. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz (A5)

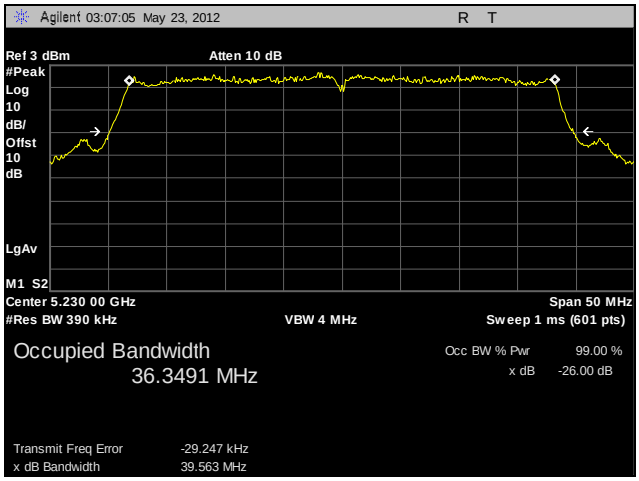


Plot 19. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz (A6)

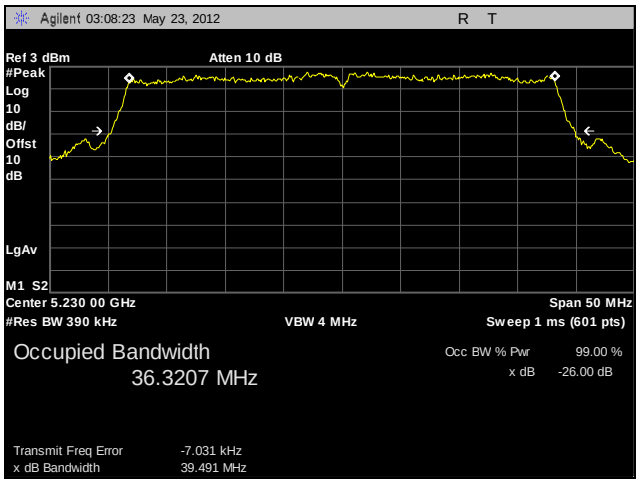
26 dB Occupied Bandwidth, 802.11n 40 MHz, High Channel



Plot 20. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz (A4)

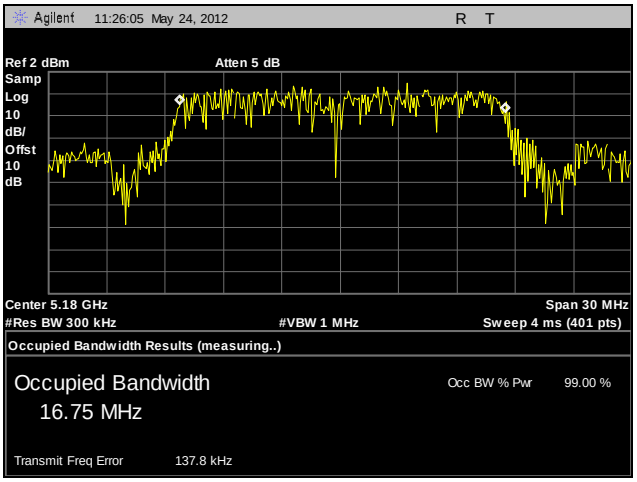


Plot 21. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz (A5)

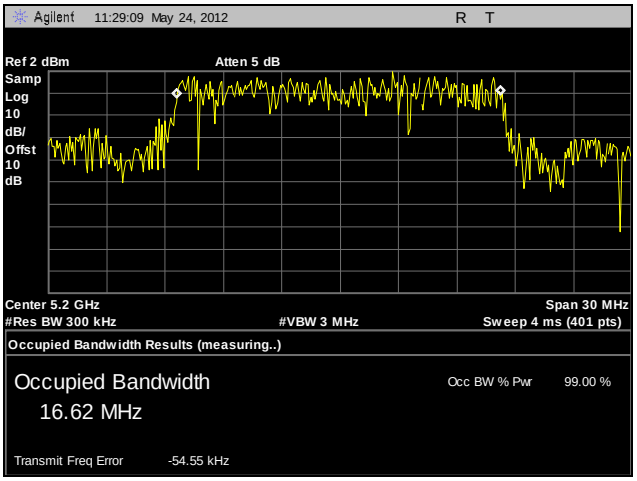


Plot 22. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz (A6)

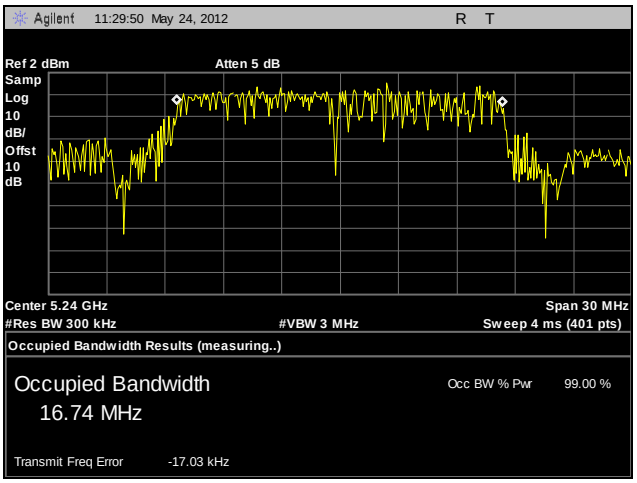
99% Occupied Bandwidth, 802.11a



Plot 23. 99% Occupied Bandwidth, Low Channel, 802.11a

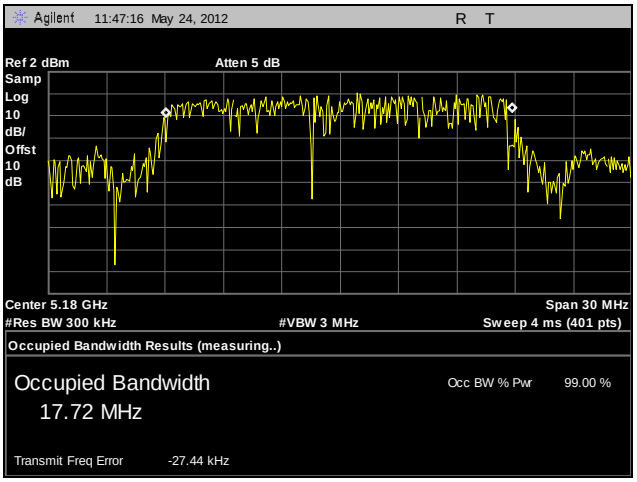


Plot 24. 99% Occupied Bandwidth, Mid Channel, 802.11a

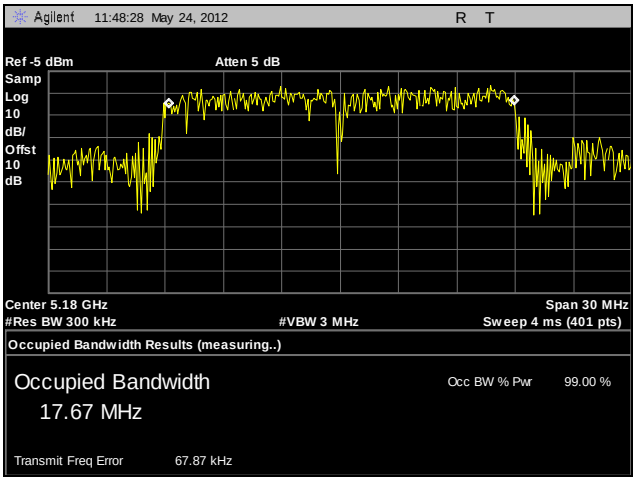


Plot 25. 99% Occupied Bandwidth, High Channel, 802.11a

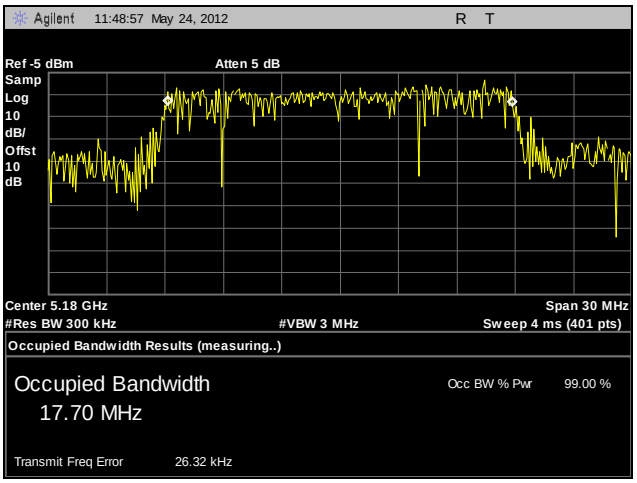
99% Occupied Bandwidth, 802.11n 20 MHz, Low Channel



Plot 26. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz (A4)

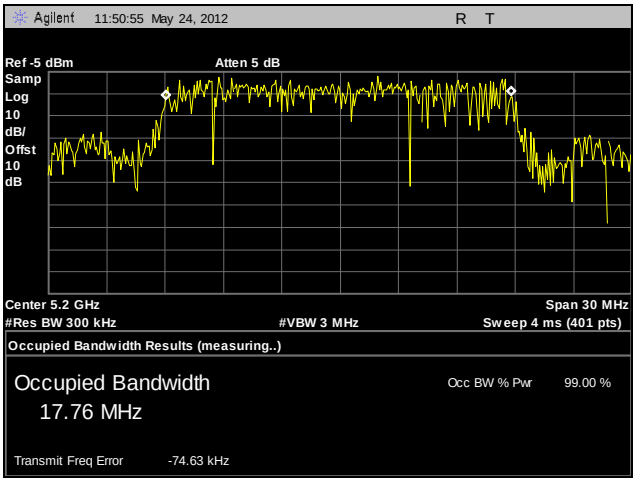


Plot 27. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz (A5)

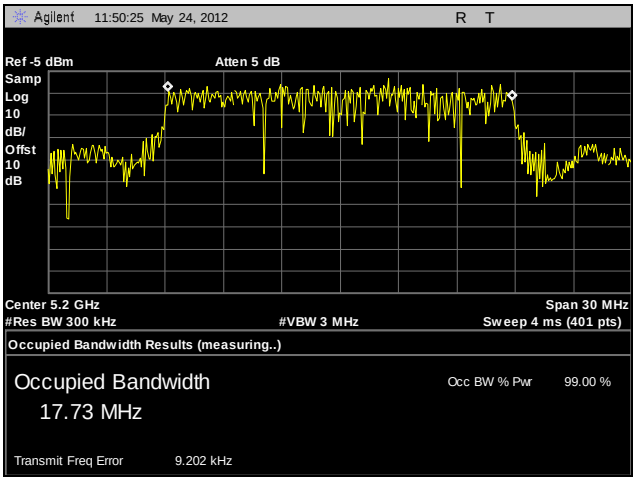


Plot 28. 99% Occupied Bandwidth, Low Channel, 802.11n 20 MHz (A6)

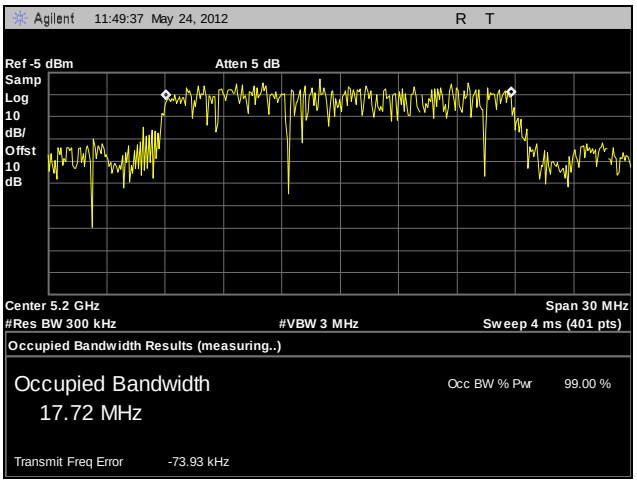
99% Occupied Bandwidth, 802.11n 20 MHz, Mid Channel



Plot 29. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz (A4)

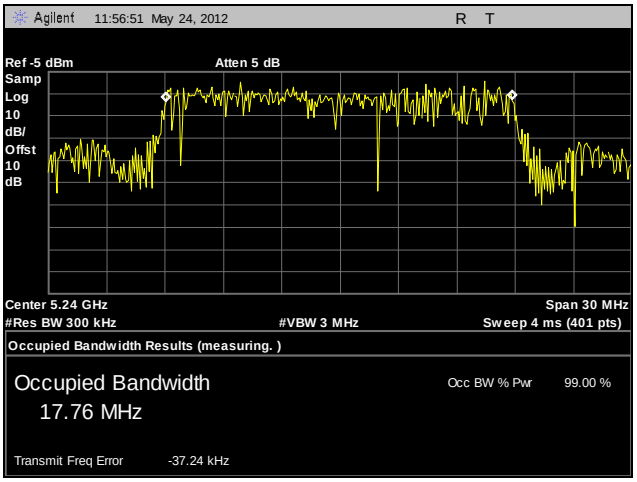


Plot 30. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz (A5)

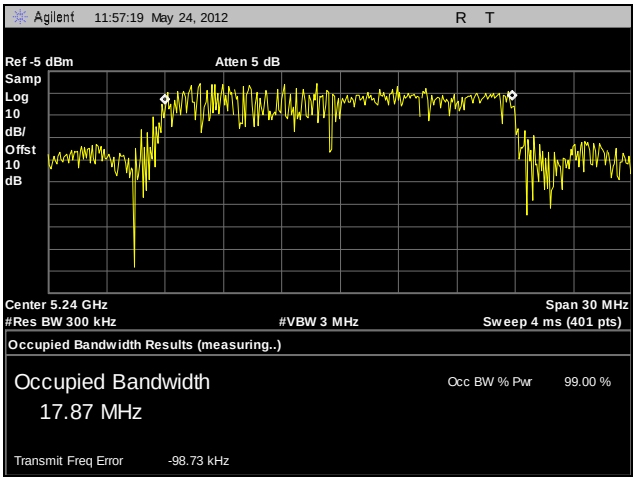


Plot 31. 99% Occupied Bandwidth, Mid Channel, 802.11n 20 MHz (A6)

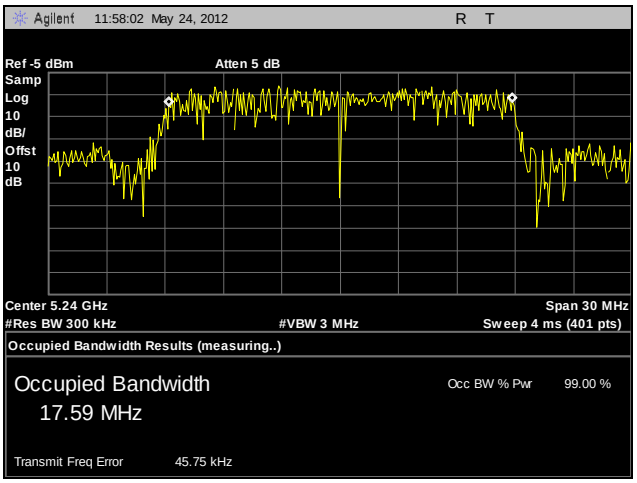
99% Occupied Bandwidth, 802.11n 20 MHz, High Channel



Plot 32. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz (A4)

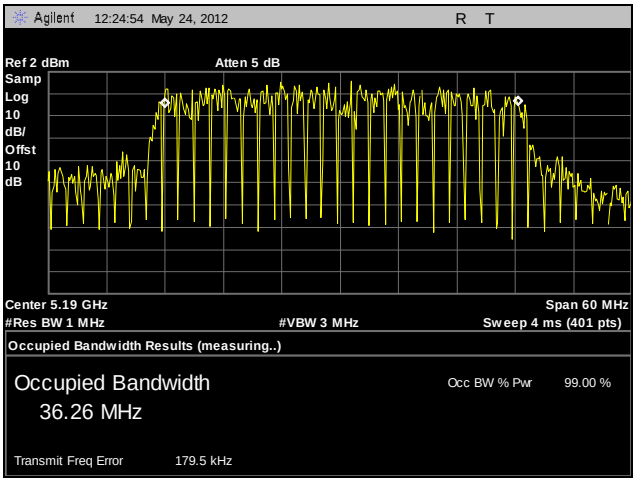


Plot 33. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz (A5)

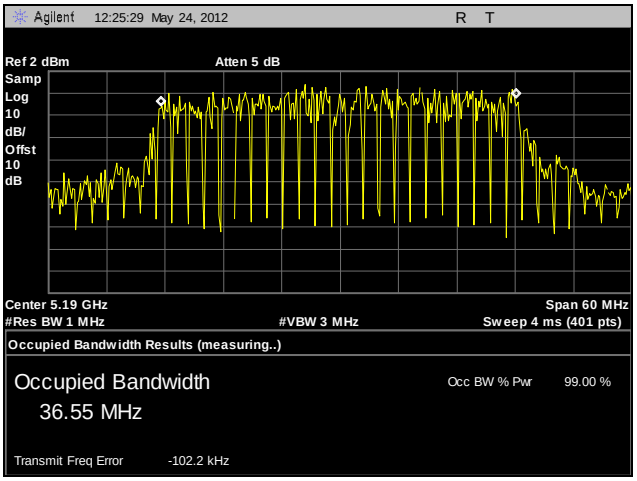


Plot 34. 99% Occupied Bandwidth, High Channel, 802.11n 20 MHz (A6)

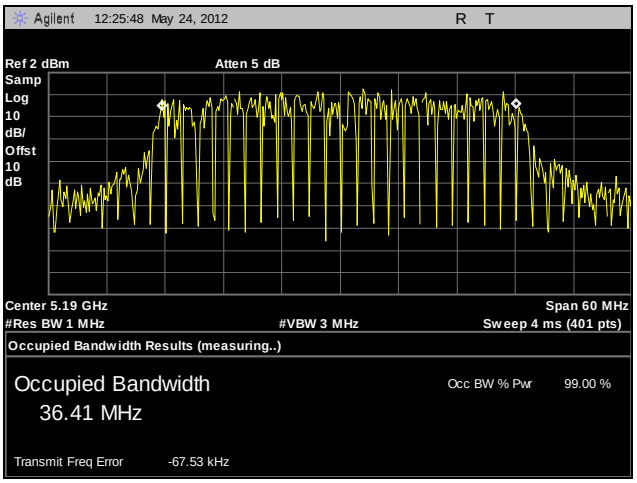
99% Occupied Bandwidth, 802.11n 40 MHz, Low Channel



Plot 35. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz (A4)

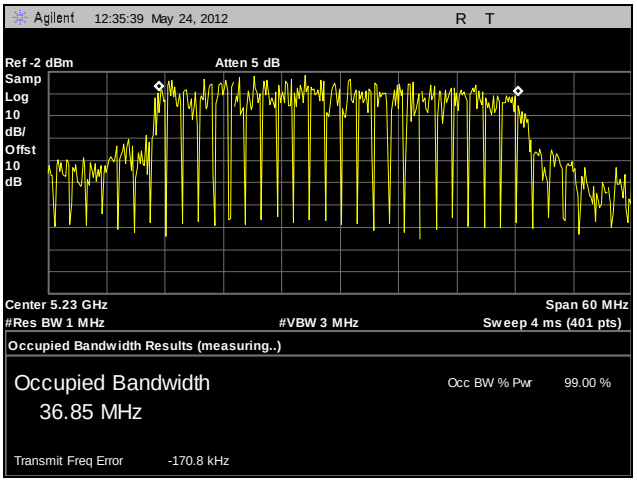


Plot 36. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz (A5)

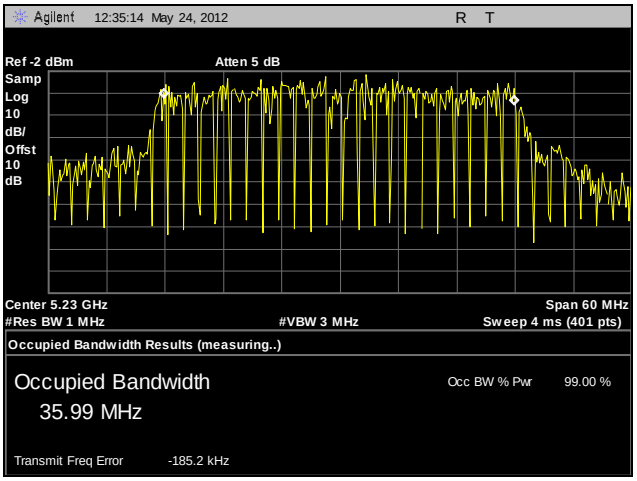


Plot 37. 99% Occupied Bandwidth, Low Channel, 802.11n 40 MHz (A6)

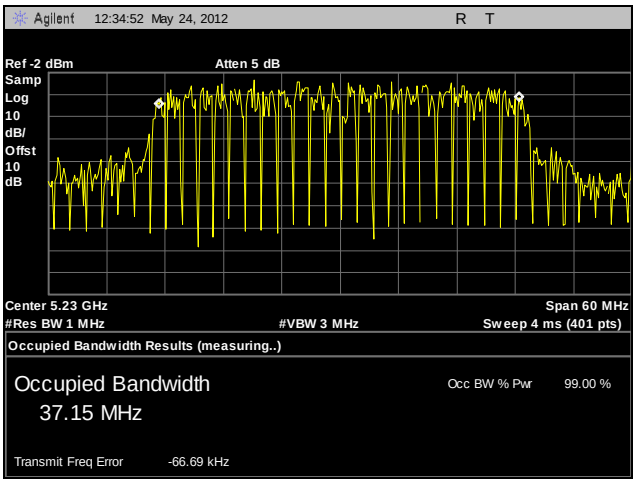
99% Occupied Bandwidth, 802.11n 40 MHz, High Channel



Plot 38. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz (A4)



Plot 39. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz (A5)



Plot 40. 99% Occupied Bandwidth, High Channel, 802.11n 40 MHz (A6)

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(1) RF Power Output

Test Requirements: **§15.407(a)(1):** For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz.

Test Procedure: The EUT was connected to a spectrum analyzer and set to transmit continuously on the low, mid, and high channels. Its power was measured according to measurement method SA-1, as described in FCC publication number 789033.

Test Results: Equipment was compliant with the Peak Power Output limits of **§ 15.401(a)(1)**.

Test Engineer(s): Jeff Pratt

Test Date(s): 05/14/12

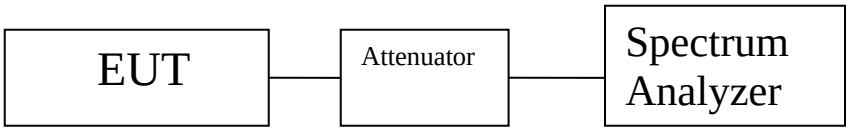


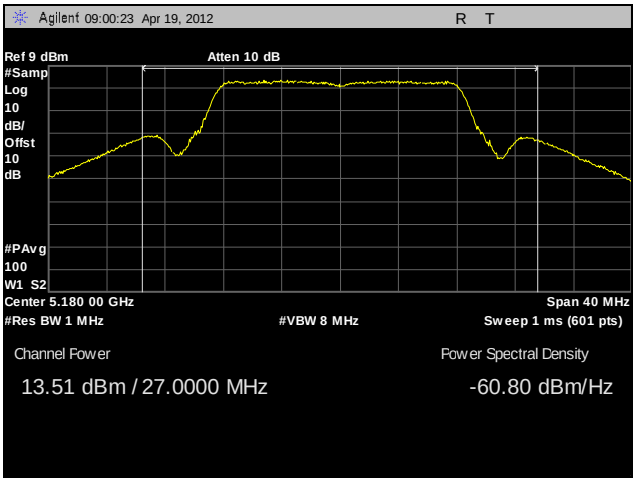
Figure 3. Power Output Test Setup

2 dBi Dipole Antenna								
Frequency (MHz)	**Mode/Modulation Type**	**Port A4 Conducted Power (dBm)**	**Port A5 Conducted Power (dBm)**	**Power A6 Conducted Power (dBm)**	**Aggregate Conducted Power (dBm)**	**Antenna Array Gain (dBi)**	**Maximum Conducted Power (dBm)**	**Margin (dB)**
5180	802.11a	13.51	--	--	13.51	6.77	16.22	-2.71
5200	802.11a	13.63	--	--	13.63	6.77	16.22	-2.59
5240	802.11a	14.05	--	--	14.05	6.77	16.22	-2.17
5180	802.11n HT20	7.52	7.62	8.62	12.72	6.77	16.22	-3.50
5200	802.11n HT20	7.86	8.21	8.51	12.97	6.77	16.22	-3.25
5240	802.11n HT20	8.63	8.52	9.12	13.54	6.77	16.22	-2.68
5190	802.11n HT40	11.47	10.84	10.78	15.81	6.77	16.22	-0.41
5230	802.11n HT40	11.62	11.05	11.41	16.14	6.77	16.22	-0.08

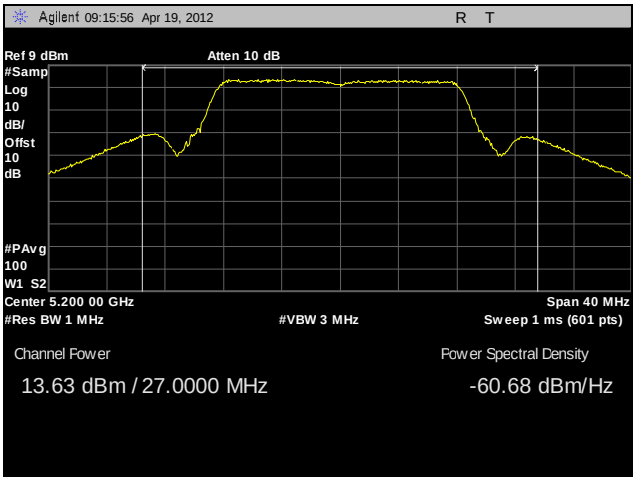
Table 14. RF Power Output, 2 dBi Dipole Antenna, Test Results (2 dBi Antenna)

*Note – For higher gain antennas, output power will be reduced accordingly

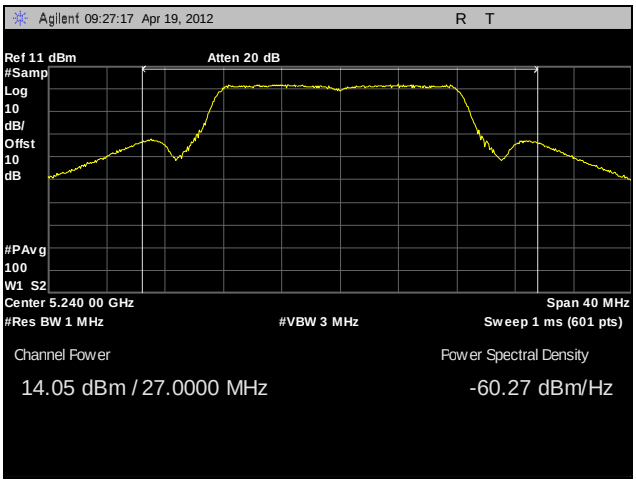
RF Power Output, 802.11a, 2 dBi Dipole Antenna



Plot 41. RF Power Output, Low Channel, 802.11a, 2 dBi Dipole Antenna

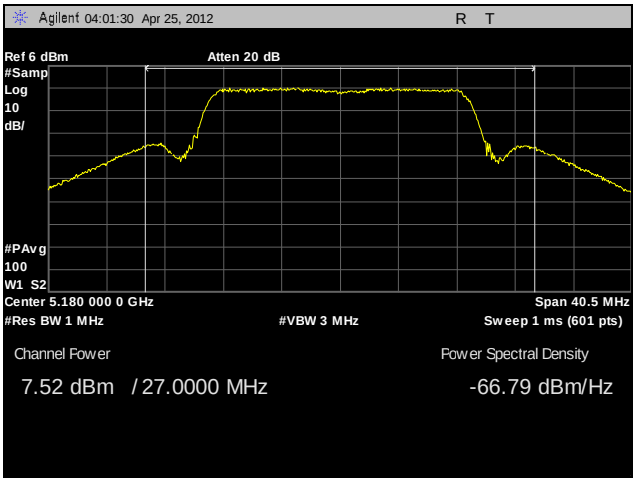


Plot 42. RF Power Output, Mid Channel, 802.11a

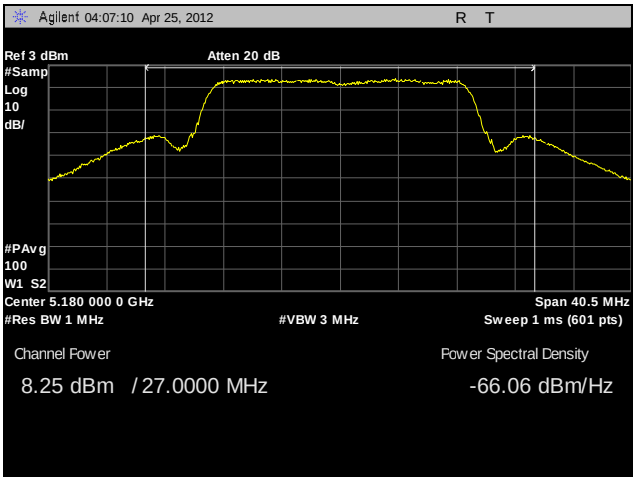


Plot 43. RF Power Output, High Channel, 802.11a

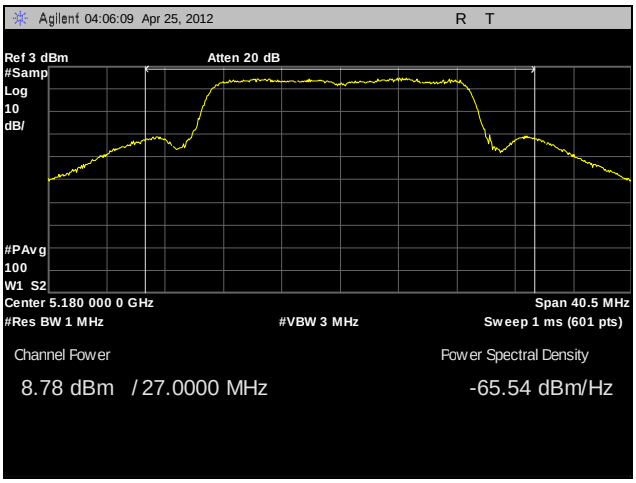
RF Power Output, 802.11n 20 MHz, Low Channel, 2 dBi Dipole Antenna



Plot 44. RF Power Output, Low Channel, 802.11n 20 MHz (A4), 2 dBi Dipole Antenna

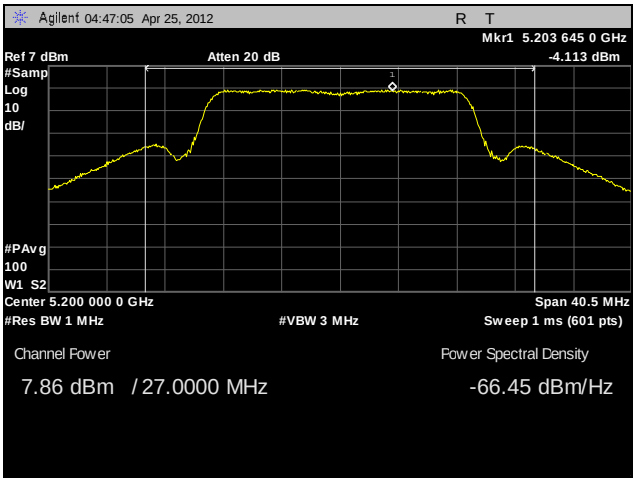


Plot 45. RF Power Output, Low Channel, 802.11n 20 MHz (A5), 2 dBi Dipole Antenna

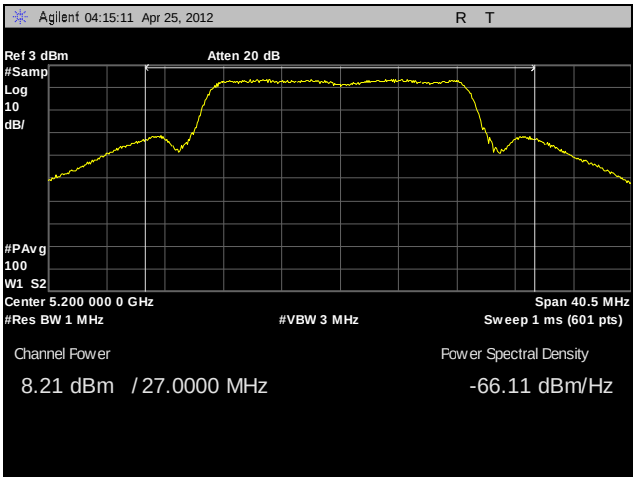


Plot 46. RF Power Output, Low Channel, 802.11n 20 MHz (A6), 2 dBi Dipole Antenna

RF Power Output, 802.11n 20 MHz, Mid Channel, 2 dBi Dipole Antenna



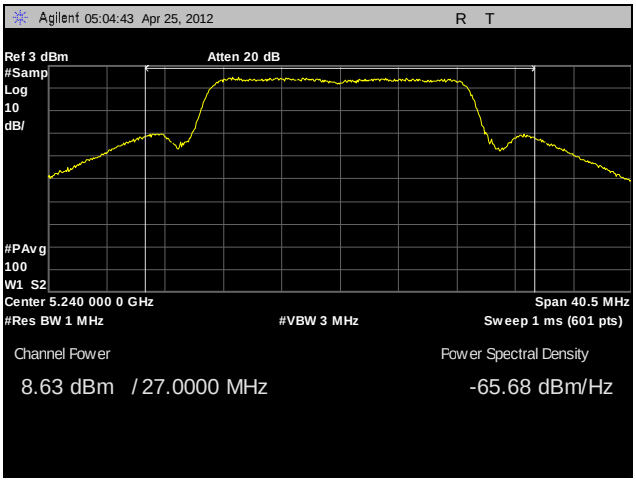
Plot 47. RF Power Output, Mid Channel, 802.11n 20 MHz (A4), 2 dBi Dipole Antenna



Plot 48. RF Power Output, Mid Channel, 802.11n 20 MHz (A5), 2 dBi Dipole Antenna

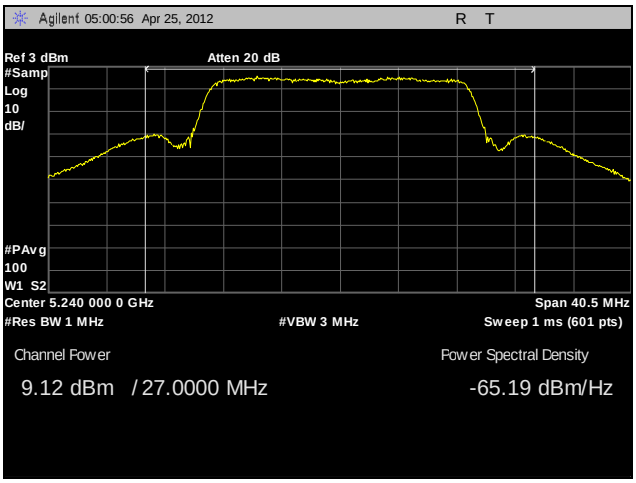
Plot 49. RF Power Output, Mid Channel, 802.11n 20 MHz (A6), 2 dBi Dipole Antenna

RF Power Output, 802.11n 20 MHz, High Channel, 2 dBi Dipole Antenna



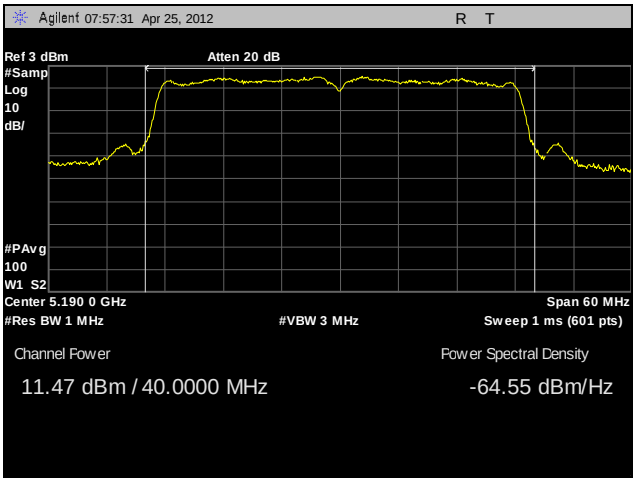
Plot 50. RF Power Output, High Channel, 802.11n 20 MHz (A4), 2 dBi Dipole Antenna

Plot 51. RF Power Output, High Channel, 802.11n 20 MHz (A5), 2 dBi Dipole Antenna

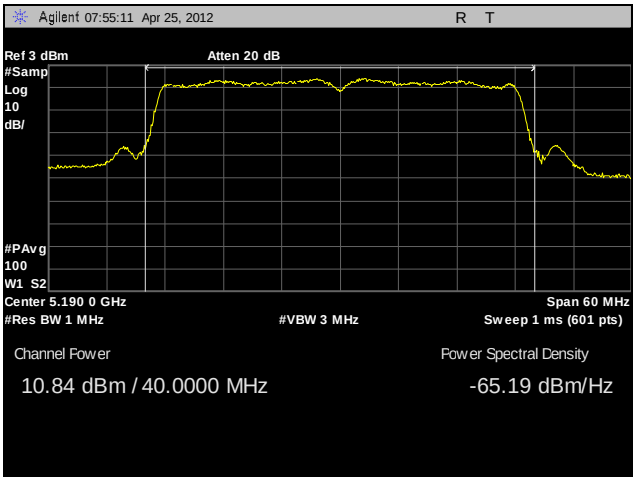


Plot 52. RF Power Output, High Channel, 802.11n 20 MHz (A6), 2 dBi Dipole Antenna

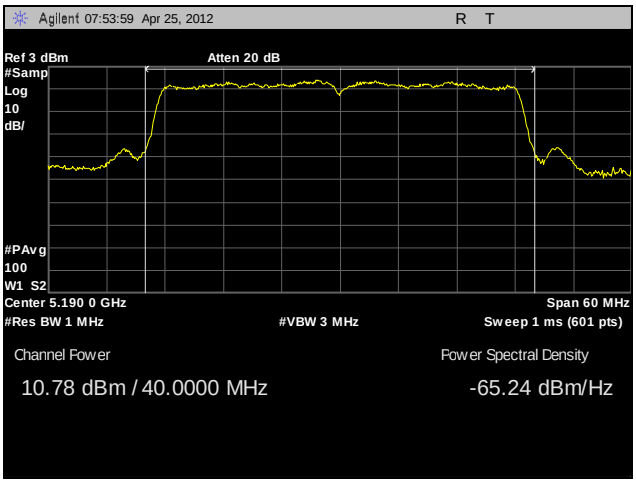
RF Power Output, 802.11n 40 MHz, Low Channel, 2 dBi Dipole Antenna



Plot 53. RF Power Output, Low Channel, 802.11n 40 MHz (A4), 2 dBi Dipole Antenna

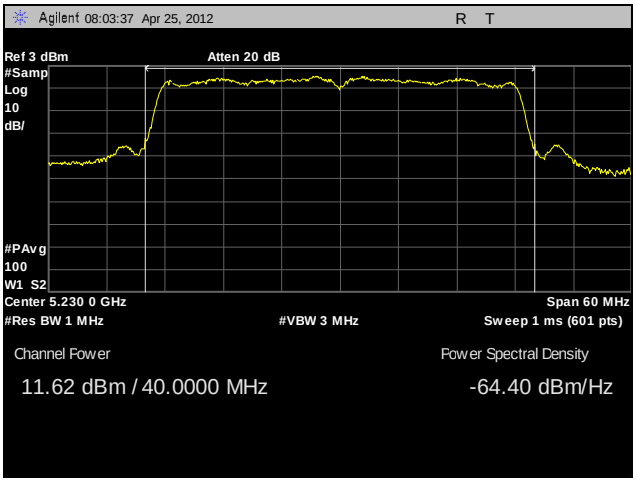


Plot 54. RF Power Output, Low Channel, 802.11n 40 MHz (A5), 2 dBi Dipole Antenna

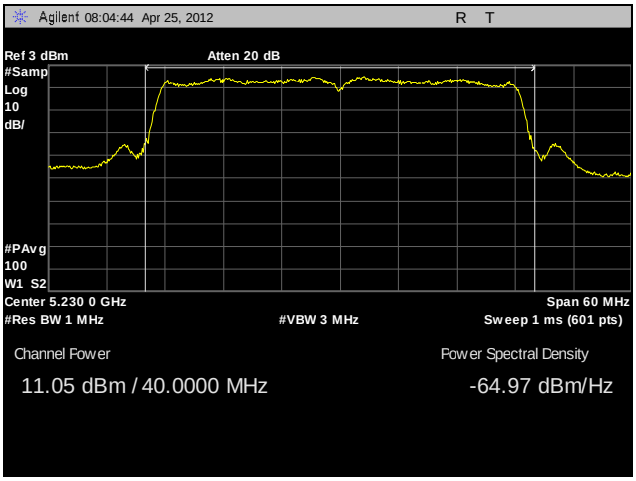


Plot 55. RF Power Output, Low Channel, 802.11n 40 MHz (A6), 2 dBi Dipole Antenna

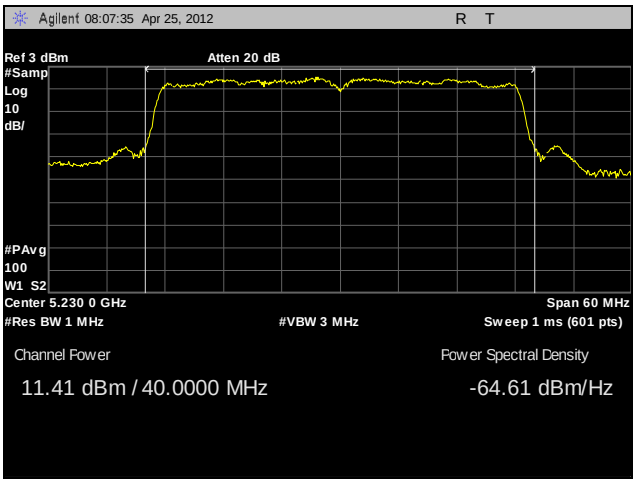
RF Power Output, 802.11n 40 MHz, High Channel, 2 dBi Dipole Antenna



Plot 56. RF Power Output, High Channel, 802.11n 40 MHz (A4), 2 dBi Dipole Antenna



Plot 57. RF Power Output, High Channel, 802.11n 40 MHz (A5), 2 dBi Dipole Antenna



Plot 58. RF Power Output, High Channel, 802.11n 40 MHz (A6), 2 dBi Dipole Antenna

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(1) Peak Power Spectral Density

Test Requirements: **§ 15.407(a)(1):** In addition, the peak power spectral density shall not exceed 4 dBm in any 1 megahertz band.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement used was method SA-1 from FCC Publication Number 789033.

Test Results: Equipment was compliant with the peak power spectral density limits of **§ 15.407 (a)(1).** The peak power spectral density was determined from plots on the following page(s).

Test Engineer(s): Jeff Pratt

Test Date(s): 05/14/12

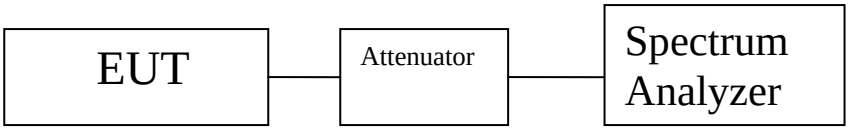
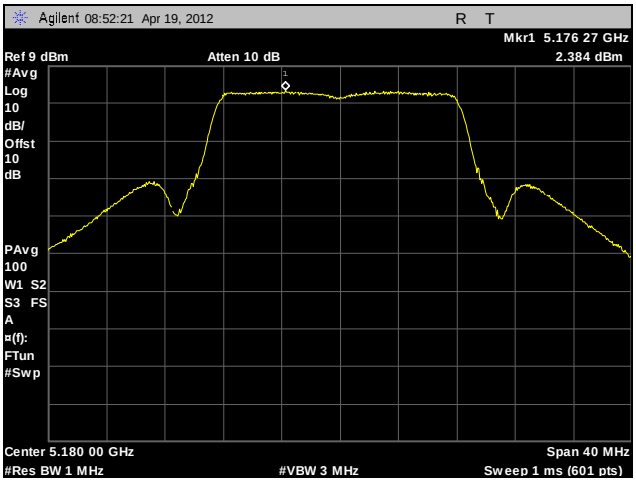


Figure 4. Power Spectral Density Test Setup

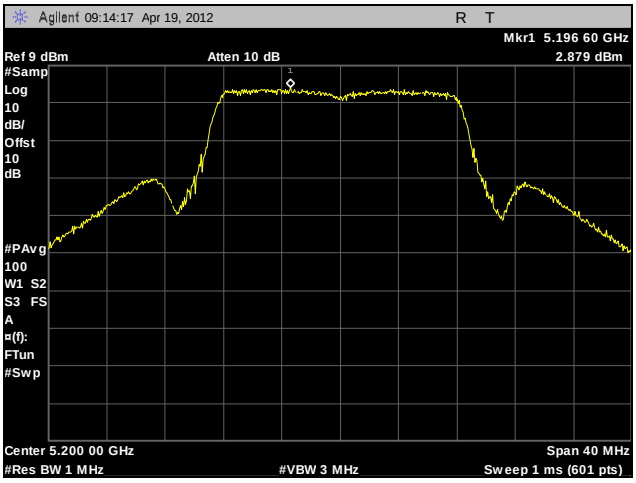
2 dBi Antenna								
Frequency (MHz)	Mode/Modulation Type	Port A4 Power Spectral Density (dBm)	Port A5 Power Spectral Density (dBm)	Port A6 Power Spectral Density (dBm)	Aggregate Power Spectral Density (dBm)	Antenna Array Gain (dBi)	Maximum Power Spectral Density (dBm)	Margin (dB)
5180	802.11a	2.384	--	--	2.38	6.77	3.23	-0.85
5200	802.11a	2.879	--	--	2.88	6.77	3.23	-0.35
5240	802.11a	3.014	--	--	3.01	6.77	3.23	-0.21
5180	802.11n HT20	-1.678	-3.151	-1.819	2.60	6.77	3.23	-0.62
5200	802.11n HT20	-1.936	-3.025	-2.346	2.36	6.77	3.23	-0.87
5240	802.11n HT20	-2.253	-2.663	-1.487	2.66	6.77	3.23	-0.56
5190	802.11n HT40	-1.482	-1.752	-2.318	2.93	6.77	3.23	-0.29
5230	802.11n HT40	-1.427	-1.922	-2.184	2.94	6.77	3.23	-0.29

Table 15. Power Spectral Density, Test Results (2 dBi Antenna)

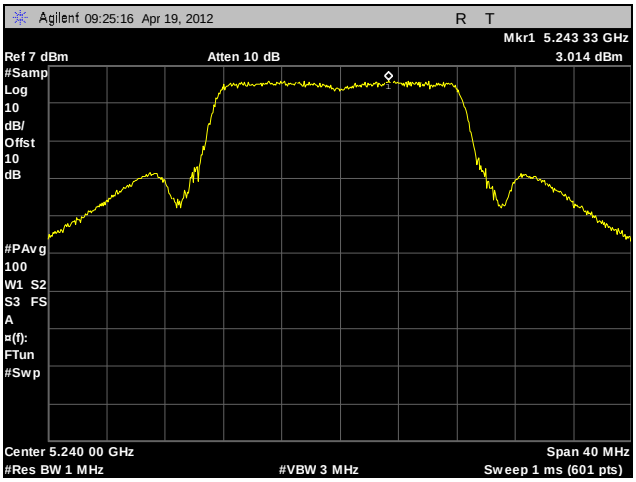
Power Spectral Density, 802.11a



Plot 59. Power Spectral Density, Low Channel, 802.11a

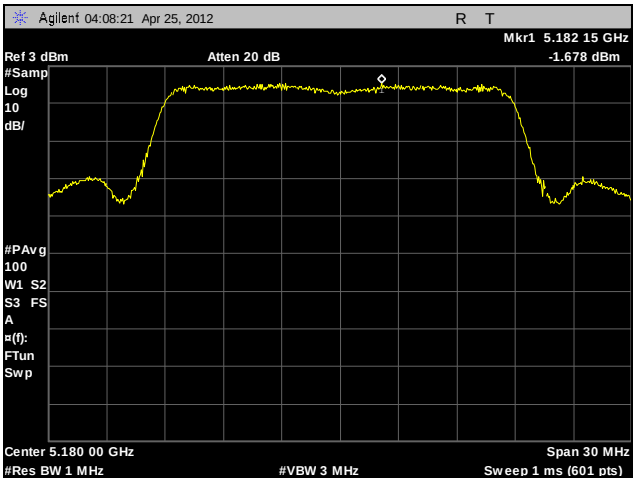


Plot 60. Power Spectral Density, Mid Channel, 802.11a

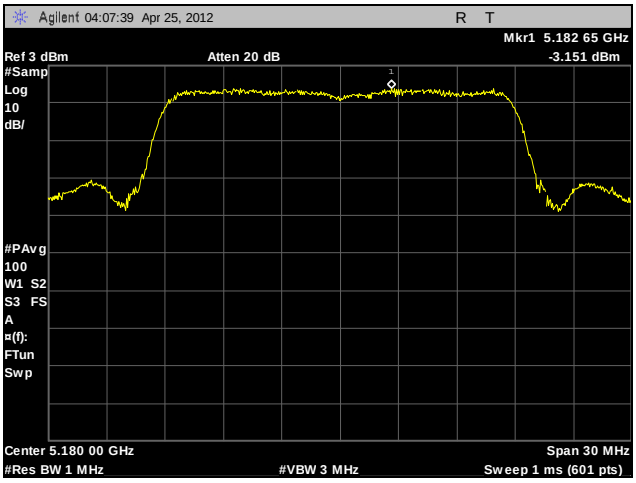


Plot 61. Power Spectral Density, High Channel, 802.11a

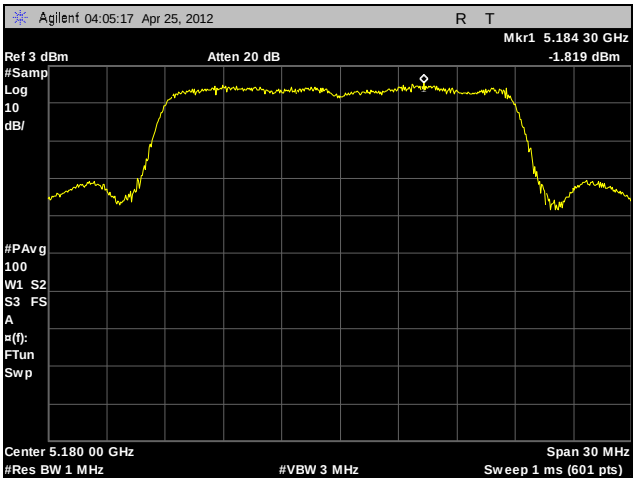
Power Spectral Density, 802.11n 20 MHz, Low Channel



Plot 62. Power Spectral Density, Low Channel, 802.11n 20 MHz (A4)

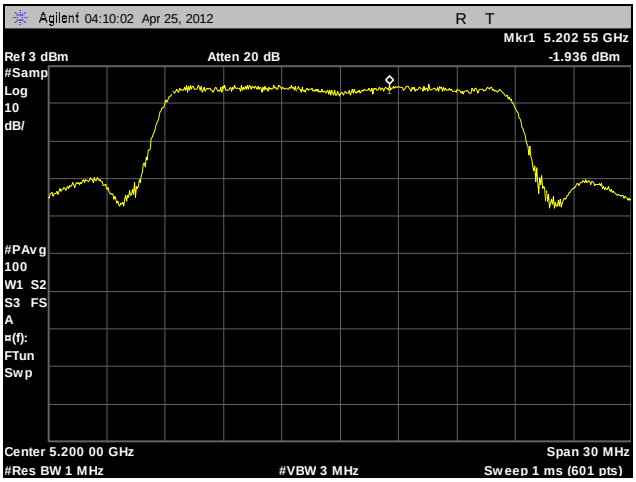


Plot 63. Power Spectral Density, Low Channel, 802.11n 20 MHz (A5)

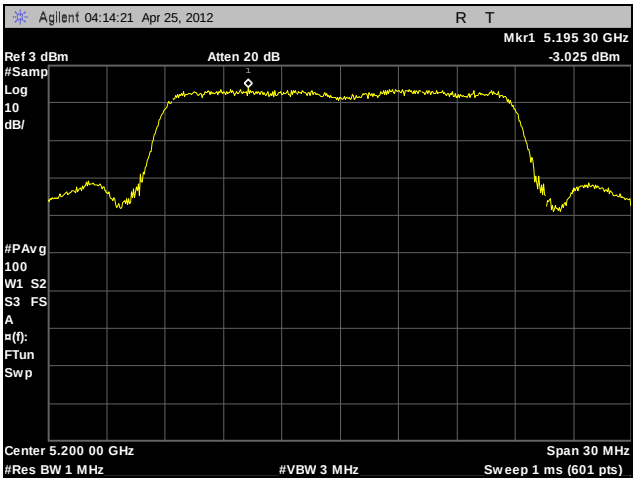


Plot 64. Power Spectral Density, Low Channel, 802.11n 20 MHz (A6)

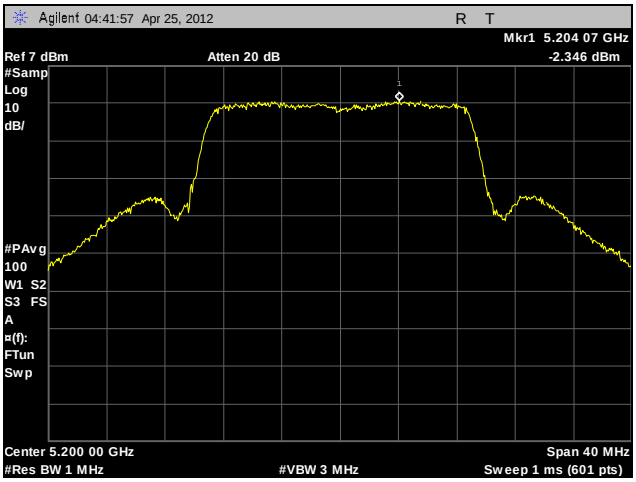
Power Spectral Density, 802.11n 20 MHz, Mid Channel



Plot 65. Power Spectral Density, Mid Channel, 802.11n 20 MHz (A4)

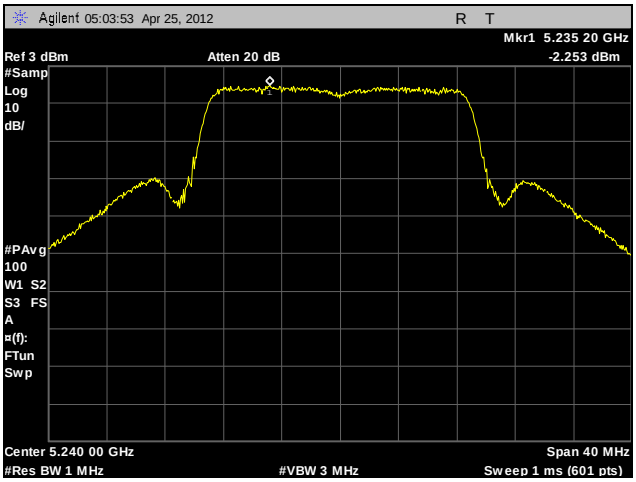


Plot 66. Power Spectral Density, Mid Channel, 802.11n 20 MHz (A5)

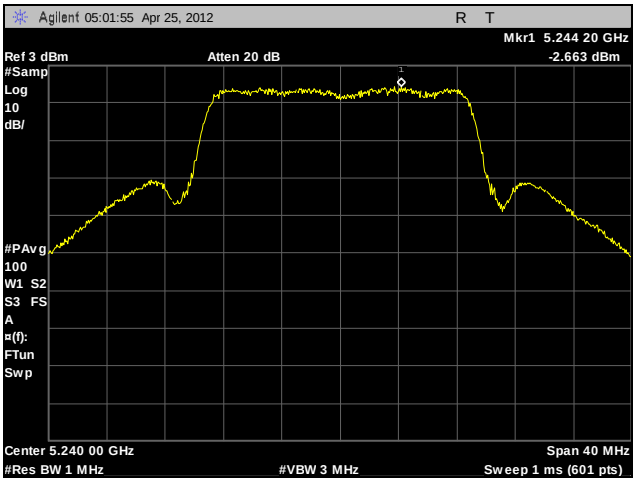


Plot 67. Power Spectral Density, Mid Channel, 802.11n 20 MHz (A6)

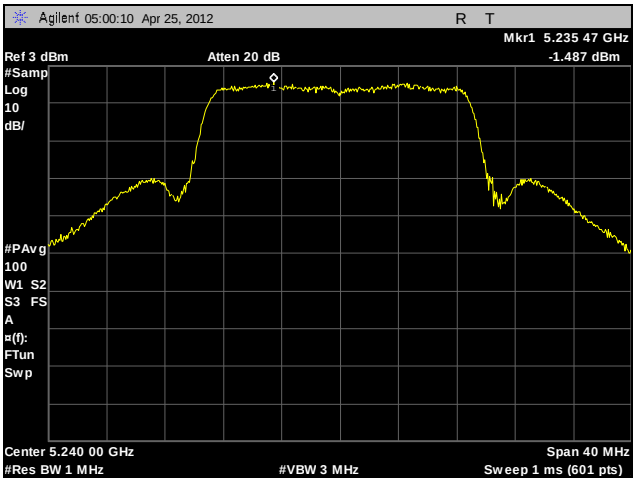
Power Spectral Density, 802.11n 20 MHz, High Channel



Plot 68. Power Spectral Density, High Channel, 802.11n 20 MHz (A4)

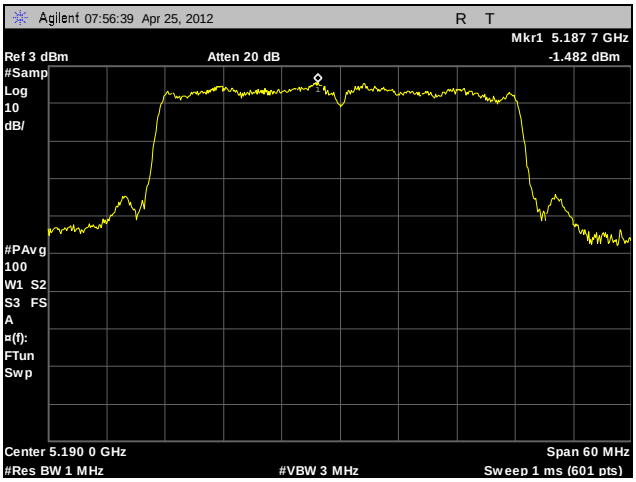


Plot 69. Power Spectral Density, High Channel, 802.11n 20 MHz (A5)

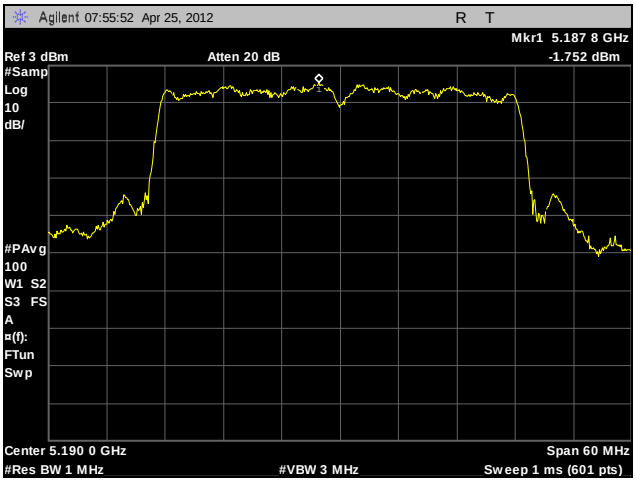


Plot 70. Power Spectral Density, High Channel, 802.11n 20 MHz (A6)

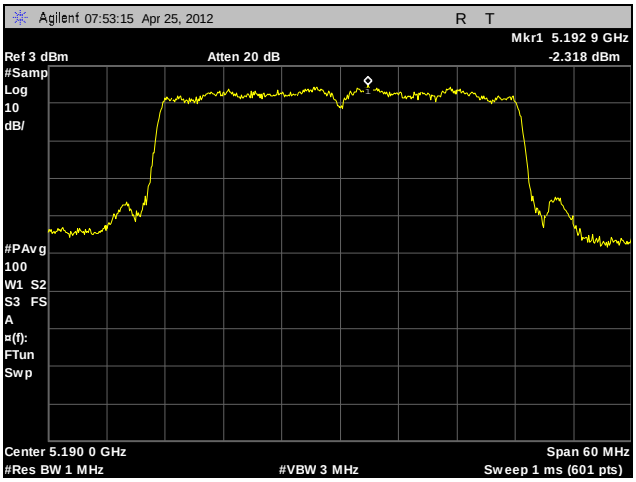
Power Spectral Density, 802.11n 40 MHz, Low Channel



Plot 71. Power Spectral Density, Low Channel, 802.11n 40 MHz (A4)

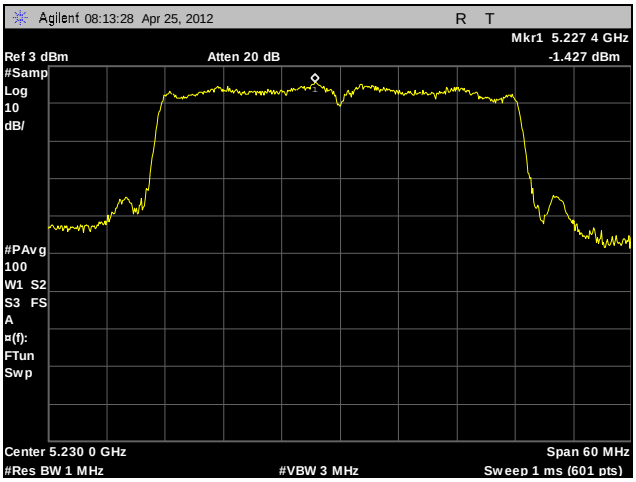


Plot 72. Power Spectral Density, Low Channel, 802.11n 40 MHz (A5)

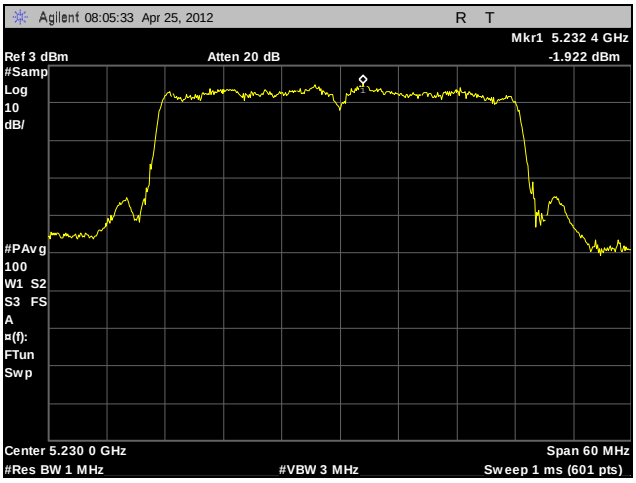


Plot 73. Power Spectral Density, Low Channel, 802.11n 40 MHz (A6)

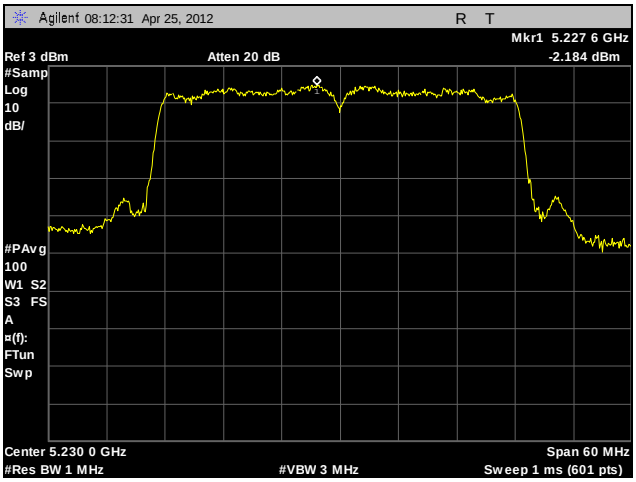
Power Spectral Density, 802.11n 40 MHz, High Channel



Plot 74. Power Spectral Density, High Channel, 802.11n 40 MHz (A4)



Plot 75. Power Spectral Density, High Channel, 802.11n 40 MHz (A5)



Plot 76. Power Spectral Density, High Channel, 802.11n 40 MHz (A6)

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(6) Peak Excursion Ratio

Test Requirements: **§ 15.407(a)(6):** The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Test Procedure: The EUT was connected directly to the spectrum analyzer through cabling and attenuation. The 1st trace on the spectrum analyzer was set to RBW=1MHz, VBW=3MHz. A peak detector was used and the trace max held.. The 2nd trace on the spectrum analyzer was set according to measurement method SA-1 from the FCC Public Notice 789033 for making conducted power measurements.

Test Results: Equipment was compliant with the peak excursion ratio limits of **§ 15.407(a)(6).** The peak excursion ratio was determined from plots on the following page(s).

Test Engineer(s): Jeff Pratt

Test Date(s): 04/26/12

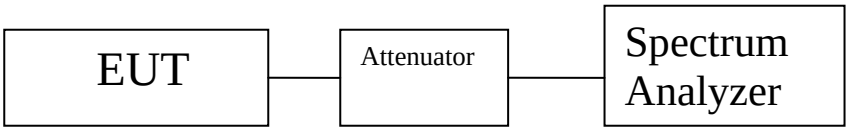
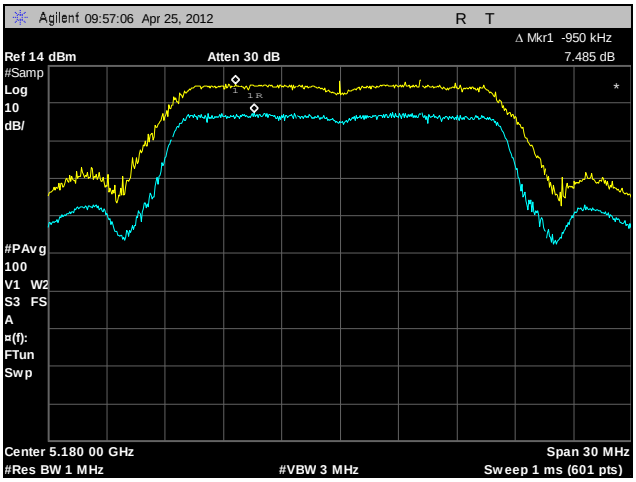
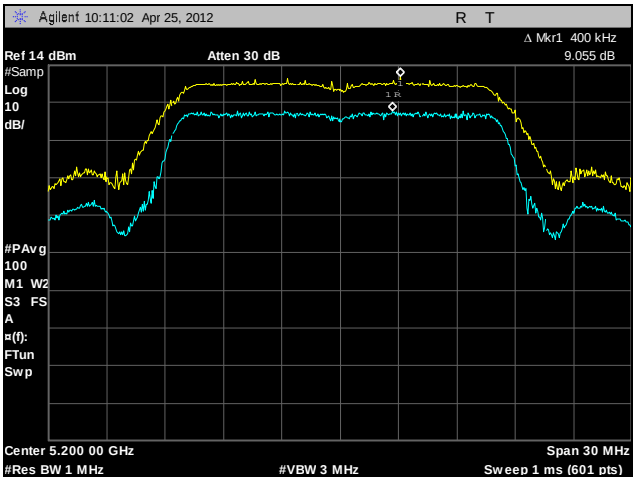


Figure 5. Peak Excursion Ration Test Setup

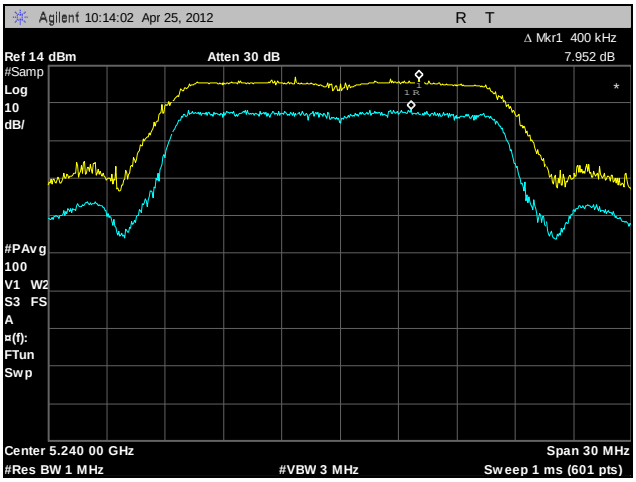
Peak Excursion Ratio, 802.11a



Plot 77. Peak Excursion Ratio, Low Channel, 802.11a

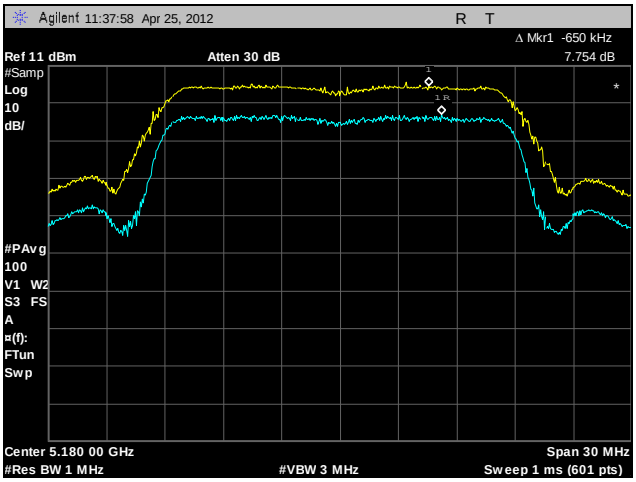


Plot 78. Peak Excursion Ratio, Mid Channel, 802.11a

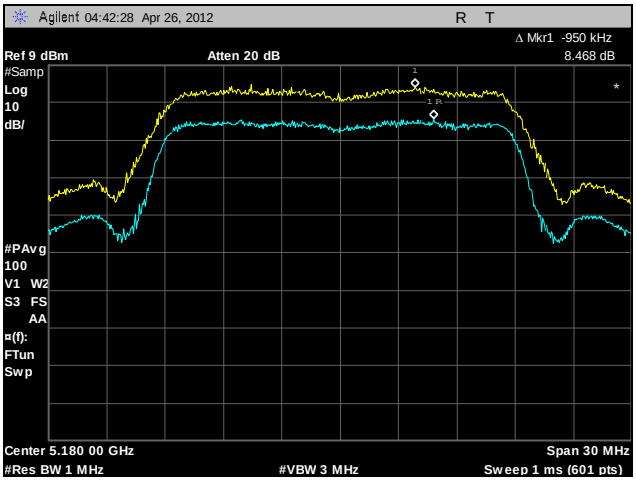


Plot 79. Peak Excursion Ratio, High Channel, 802.11a

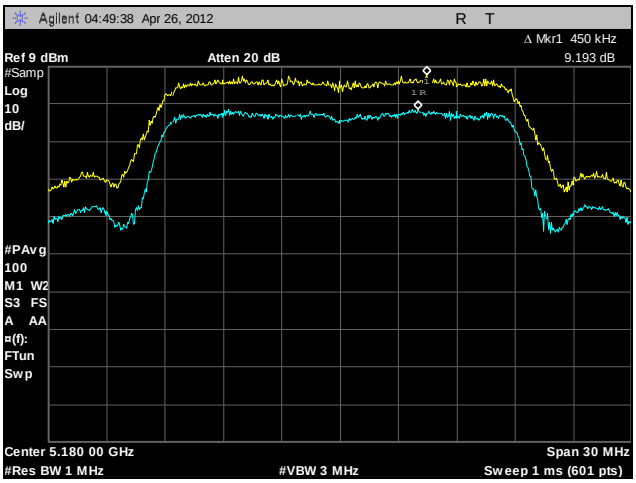
Peak Excursion Ratio, 802.11n 20 MHz, Low Channel



Plot 80. Peak Excursion Ratio, Low Channel, 802.11n 20 MHz (A4)

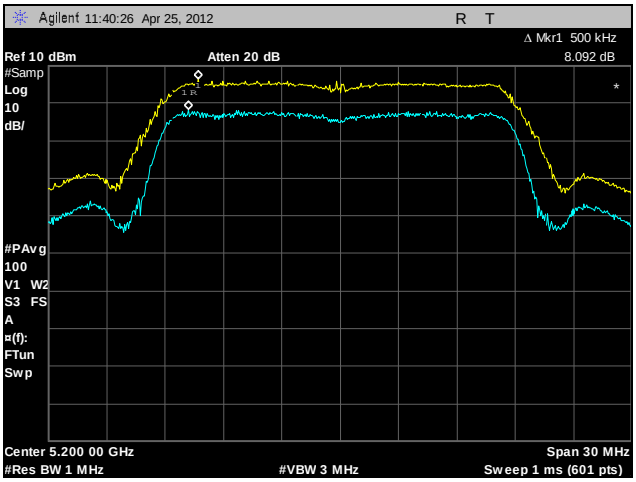


Plot 81. Peak Excursion Ratio, Low Channel, 802.11n 20 MHz (A5)

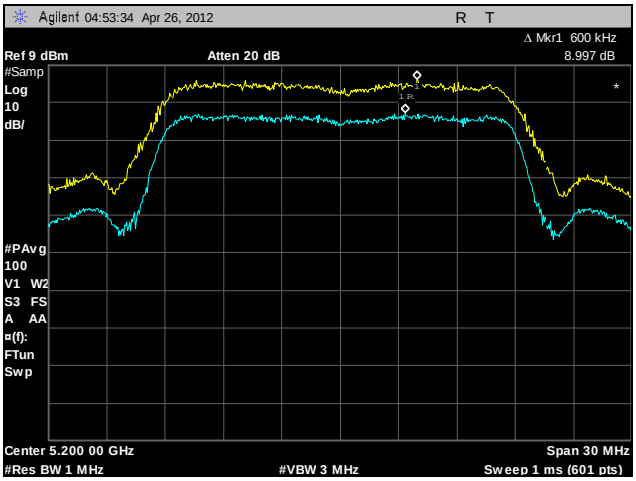


Plot 82. Peak Excursion Ratio, Low Channel, 802.11n 20 MHz (A6)

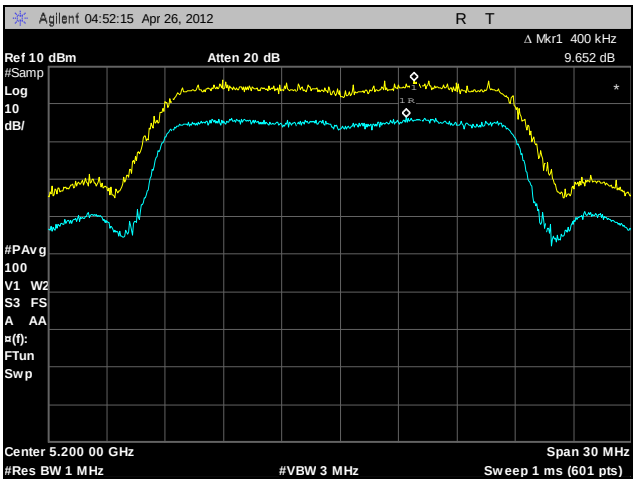
Peak Excursion Ratio, 802.11n 20 MHz, Mid Channel



Plot 83. Peak Excursion Ratio, Mid Channel, 802.11n 20 MHz (A4)

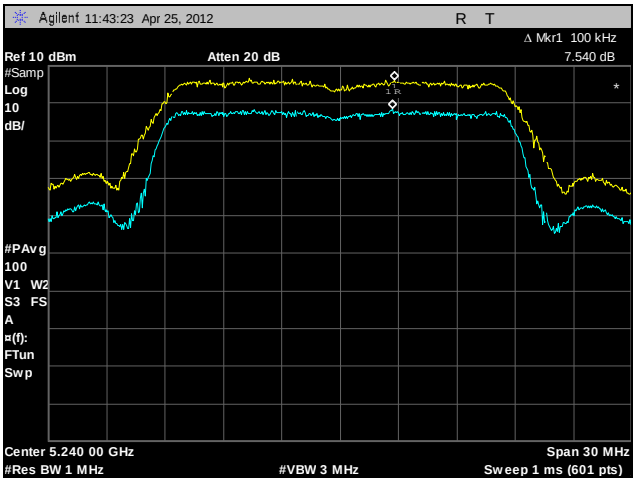


Plot 84. Peak Excursion Ratio, Mid Channel, 802.11n 20 MHz (A5)

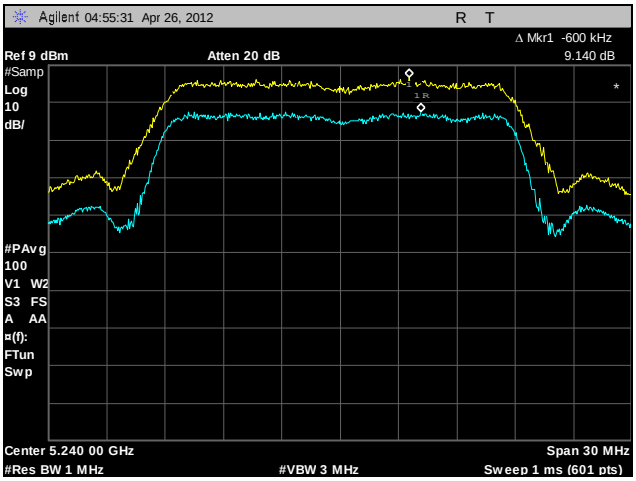


Plot 85. Peak Excursion Ratio, Mid Channel, 802.11n 20 MHz (A6)

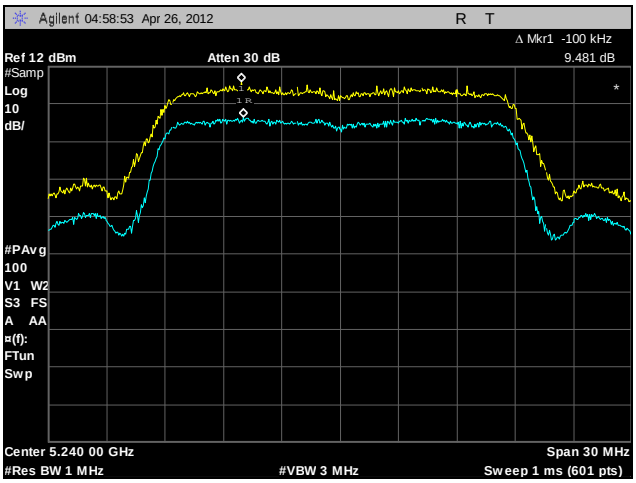
Peak Excursion Ratio, 802.11n 20 MHz, High Channel



Plot 86. Peak Excursion Ratio, High Channel, 802.11n 20 MHz (A4)

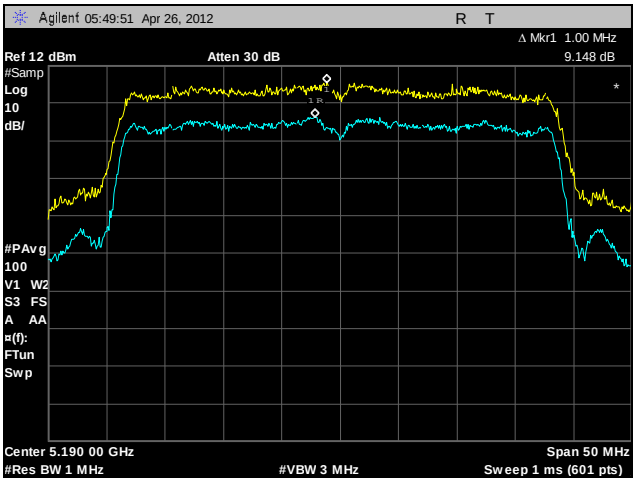


Plot 87. Peak Excursion Ratio, High Channel, 802.11n 20 MHz (A5)

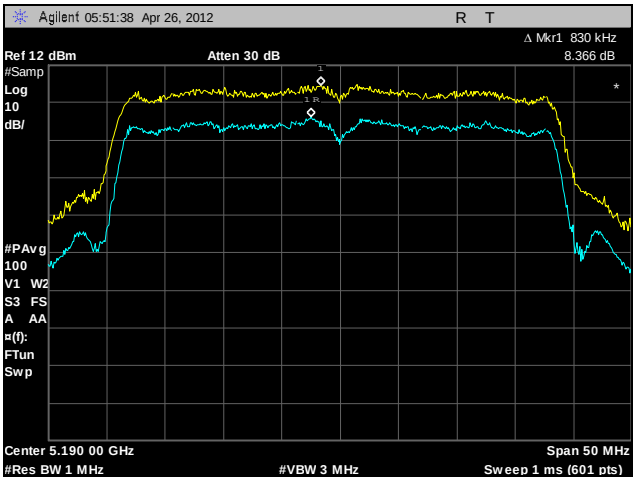


Plot 88. Peak Excursion Ratio, High Channel, 802.11n 20 MHz (A6)

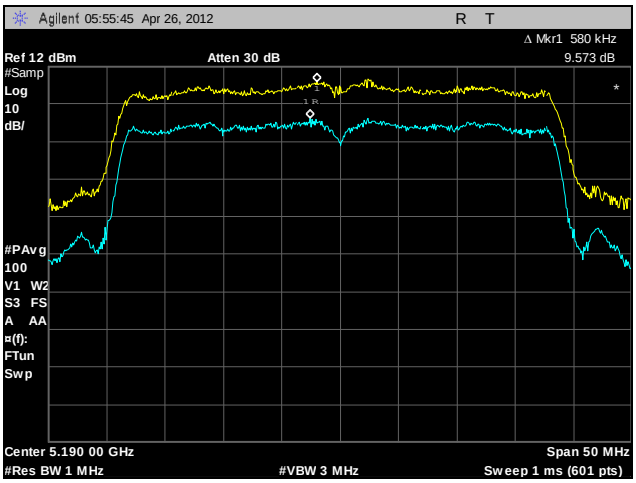
Peak Excursion Ratio, 802.11n 40 MHz, Low Channel



Plot 89. Peak Excursion Ratio, Low Channel, 802.11n 40 MHz (A4)

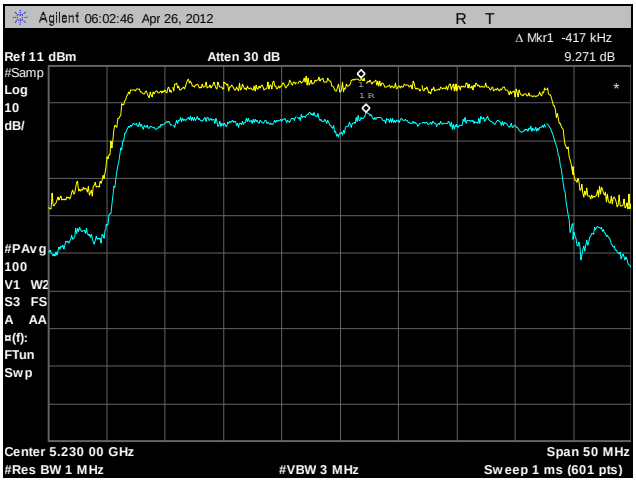


Plot 90. Peak Excursion Ratio, Low Channel, 802.11n 40 MHz (A5)

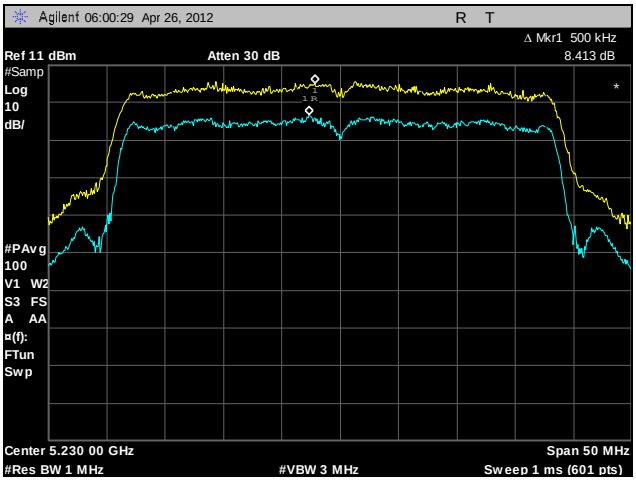


Plot 91. Peak Excursion Ratio, Low Channel, 802.11n 40 MHz (A6)

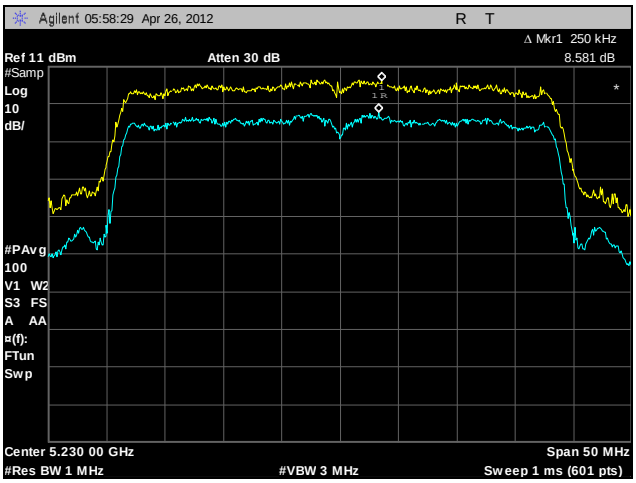
Peak Excursion Ratio, 802.11n 40 MHz, High Channel



Plot 92. Peak Excursion Ratio, High Channel, 802.11n 40 MHz (A4)



Plot 93. Peak Excursion Ratio, High Channel, 802.11n 40 MHz (A5)



Plot 94. Peak Excursion Ratio, High Channel, 802.11n 40 MHz (A6)

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(1), (6), (7) Undesirable Emissions

Test Requirements: **§ 15.407(b)(1), (6), (7)**; **§15.205:** Emissions outside the frequency band.

§ 15.407(b)(1): For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

§ 15.407(b)(6): Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

§ 15.407(b)(7): The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

Test Procedure: The transmitter was placed on an 80cm wooden table inside in a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast height to determine worst case orientation for maximum emissions.

For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

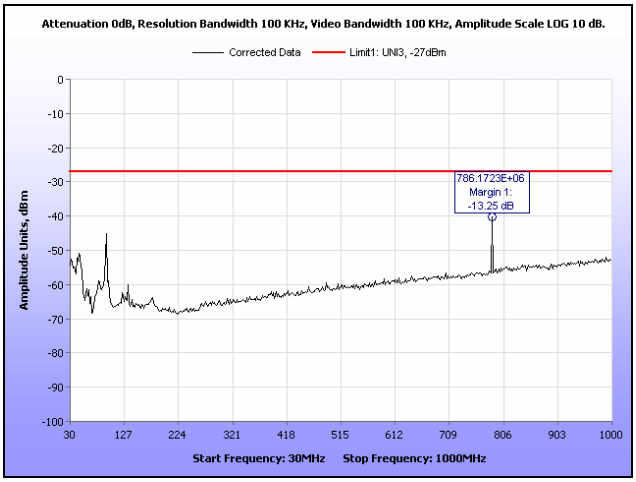
For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Only noise floor was seen above 18 GHz.
The equation, **EIRP= E + 20 log D – 104.8** was used to convert an EIRP limit to a field strength limit.
E = field strength (dBUv/m)
D = Reference measurement distance

Test Results: The EUT was compliant with the Radiated Emission limits for Intentional Radiators. See following pages for detailed test results.

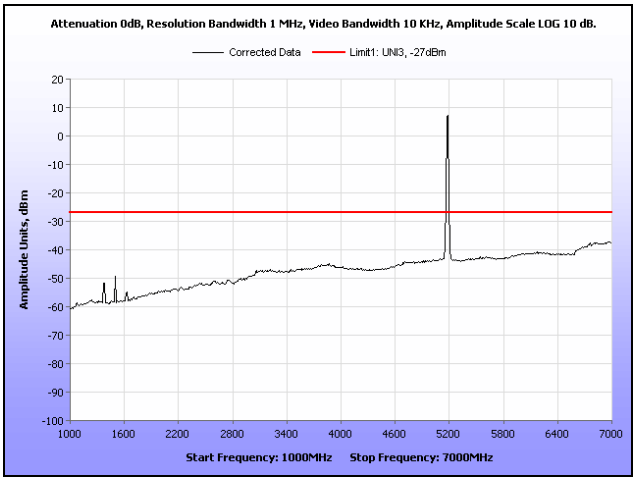
Test Engineer(s): Jeff Pratt

Test Date(s): 06/07/12

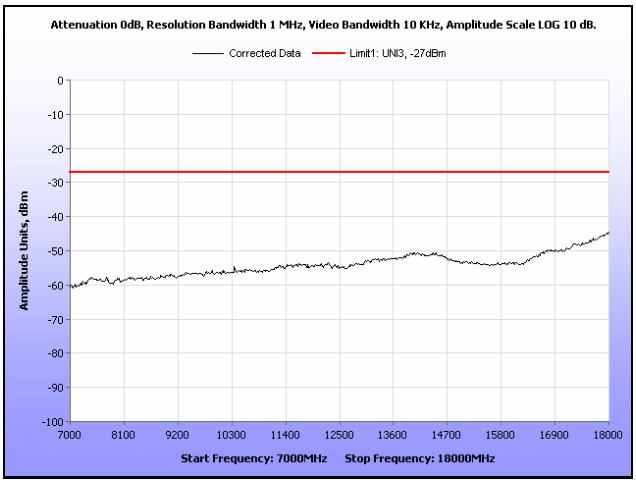
Radiated Spurious Emissions, 802.11a, 2 dBi Dipole Antenna



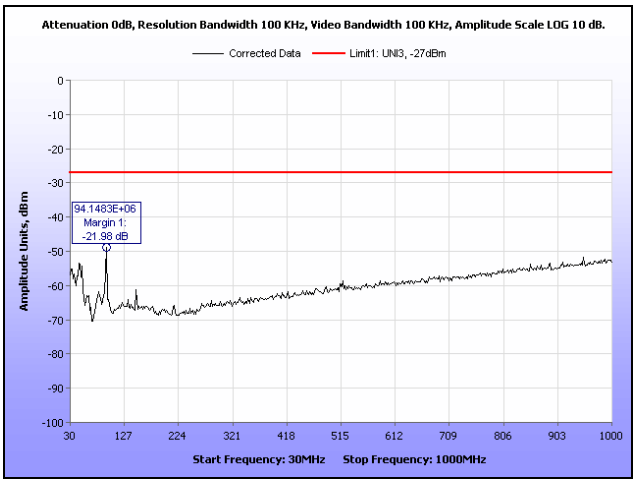
Plot 95. Radiated Spurious Emissions, 802.11a, Low Channel, 30 MHz – 1 GHz, 2 dBi Dipole Antenna



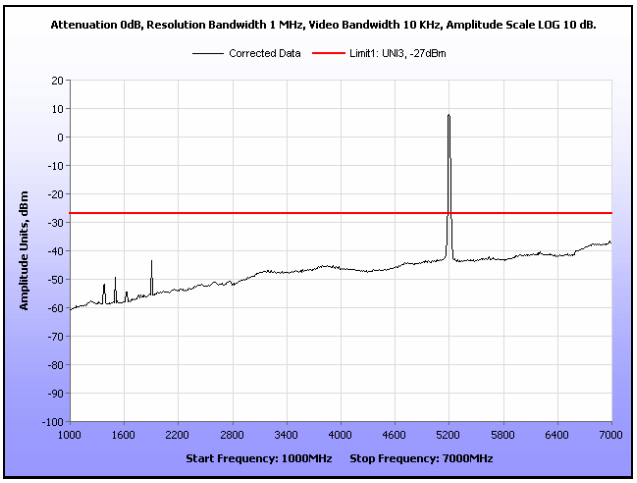
Plot 96. Radiated Spurious Emissions, 802.11a, Low Channel, 1 GHz – 7 GHz, 2 dBi Dipole Antenna



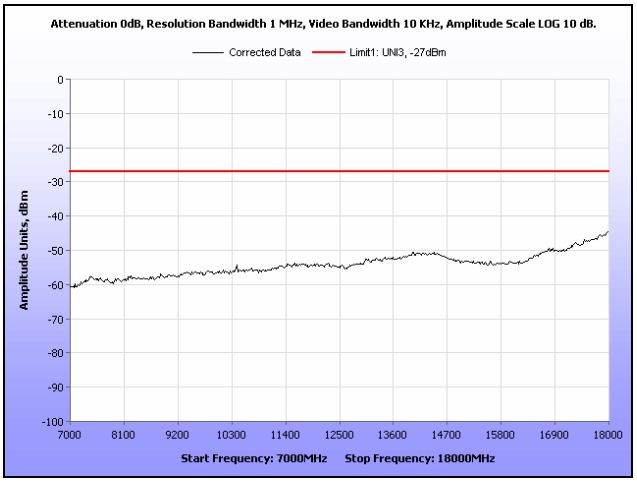
Plot 97. Radiated Spurious Emissions, 802.11a, Low Channel, 7 GHz – 18 GHz, 2 dBi Dipole Antenna



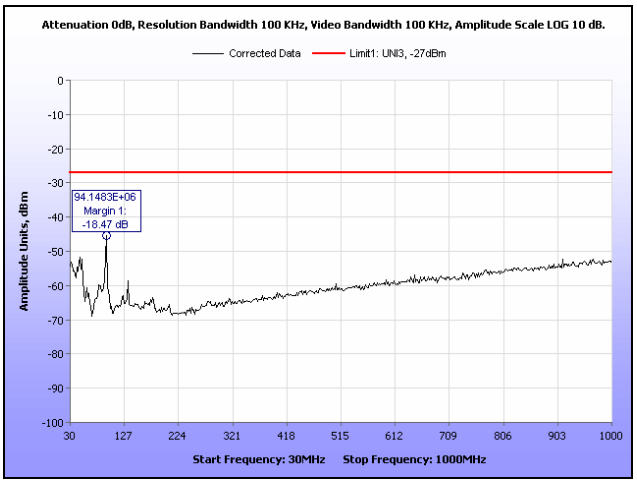
Plot 98. Radiated Spurious Emissions, 802.11a, Mid Channel, 30 MHz – 1 GHz, 2 dBi Dipole Antenna



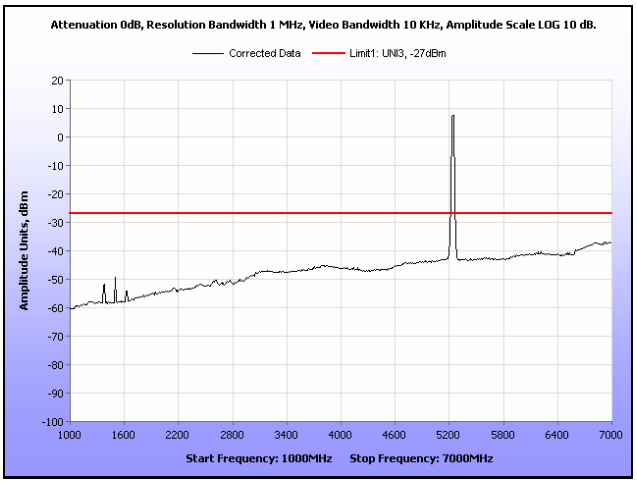
Plot 99. Radiated Spurious Emissions, 802.11a, Mid Channel, 1 GHz – 7 GHz, 2 dBi Dipole Antenna



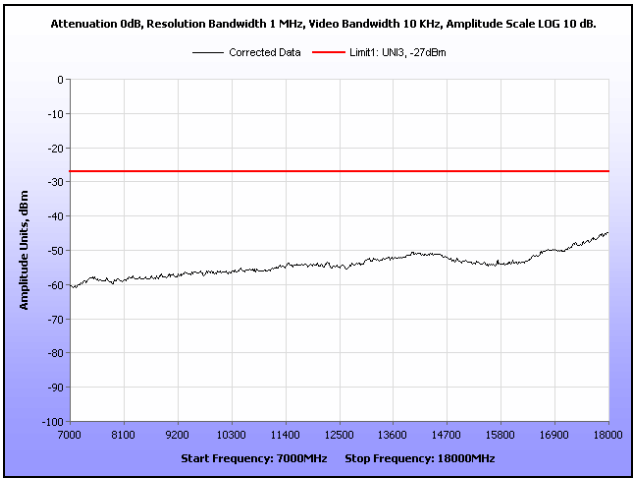
Plot 100. Radiated Spurious Emissions, 802.11a, Mid Channel, 7 GHz – 18 GHz, 2 dBi Dipole Antenna



Plot 101. Radiated Spurious Emissions, 802.11a, High Channel, 30 MHz – 1 GHz, 2 dBi Dipole Antenna

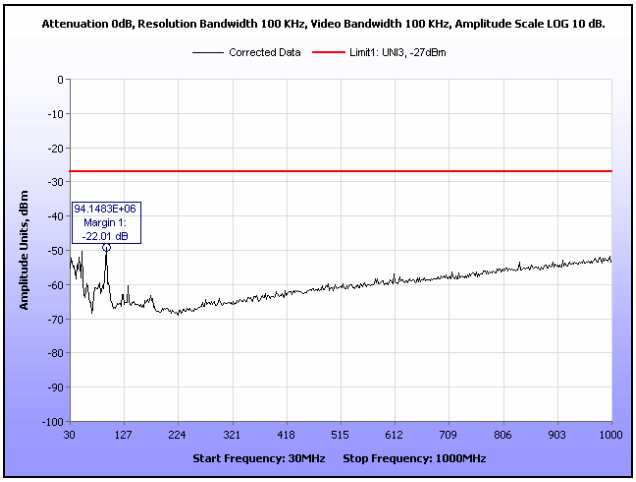


Plot 102. Radiated Spurious Emissions, 802.11a, High Channel, 1 GHz – 7 GHz, 2 dBi Dipole Antenna

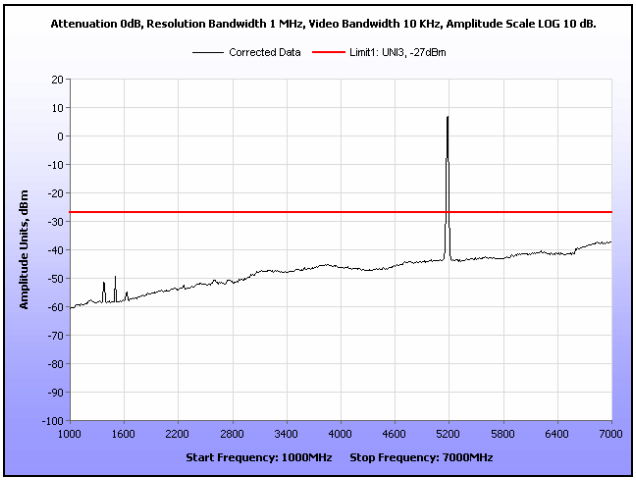


Plot 103. Radiated Spurious Emissions, 802.11a, High Channel, 7 GHz – 18 GHz, 2 dBi Dipole Antenna

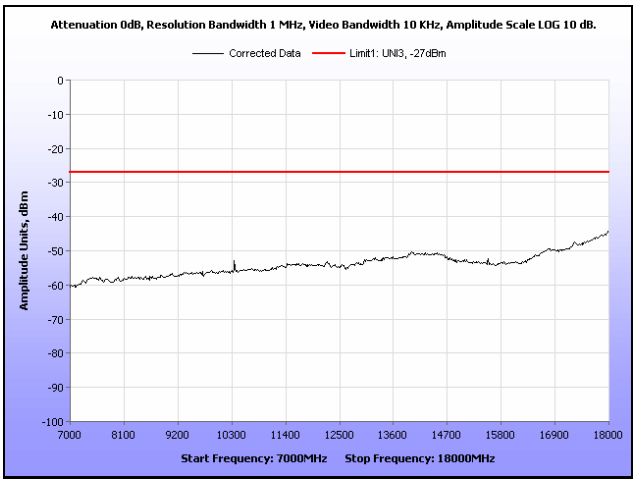
Radiated Spurious Emissions, 802.11n 20 MHz, 2 dBi Dipole Antenna



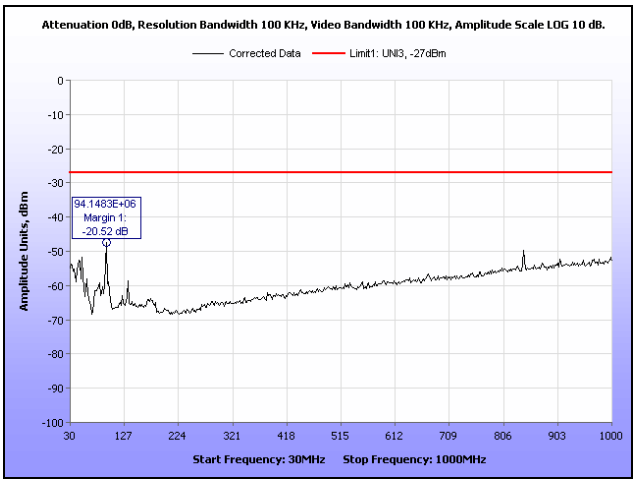
Plot 104. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, 2 dBi Dipole Antenna



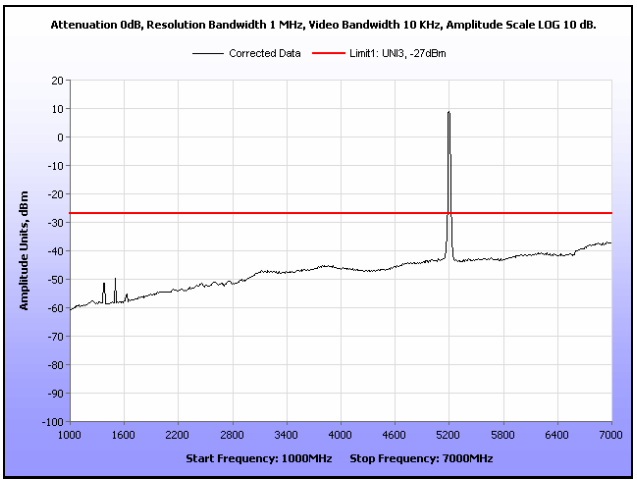
Plot 105. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, 2 dBi Dipole Antenna



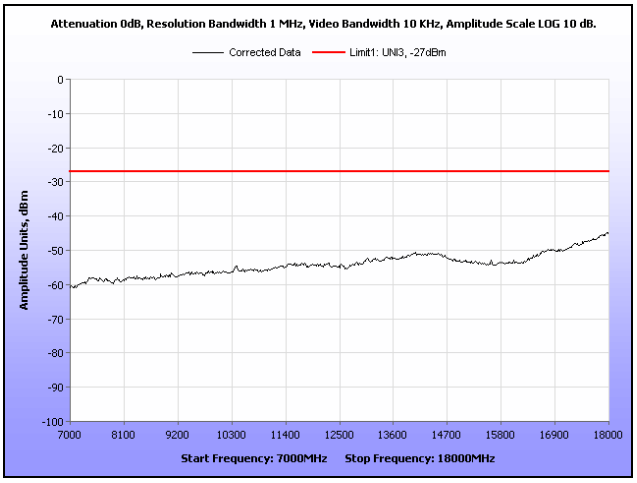
Plot 106. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, 2 dBi Dipole Antenna



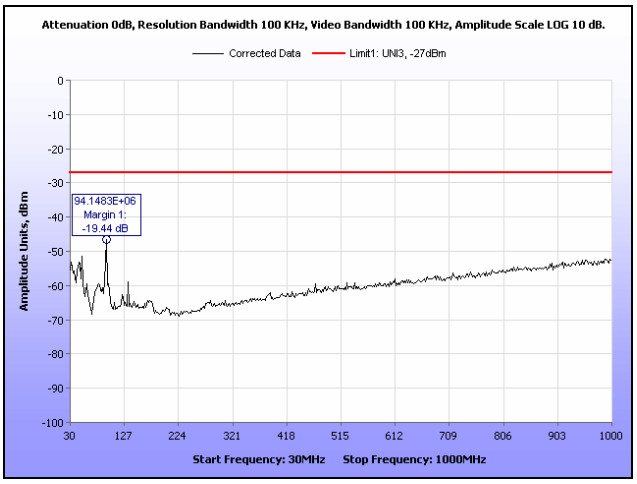
Plot 107. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, 2 dBi Dipole Antenna



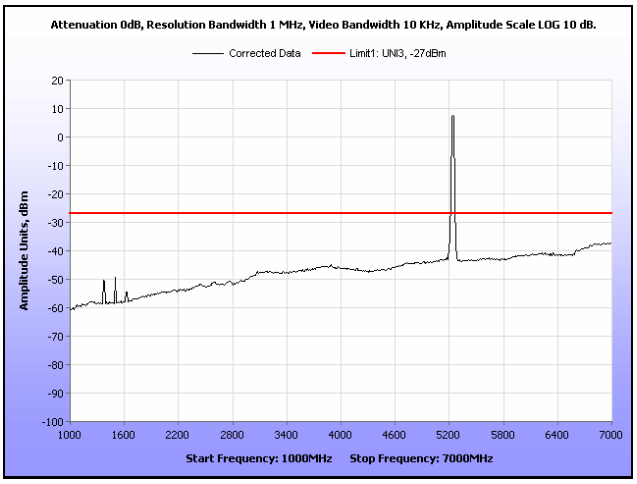
Plot 108. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, 2 dBi Dipole Antenna



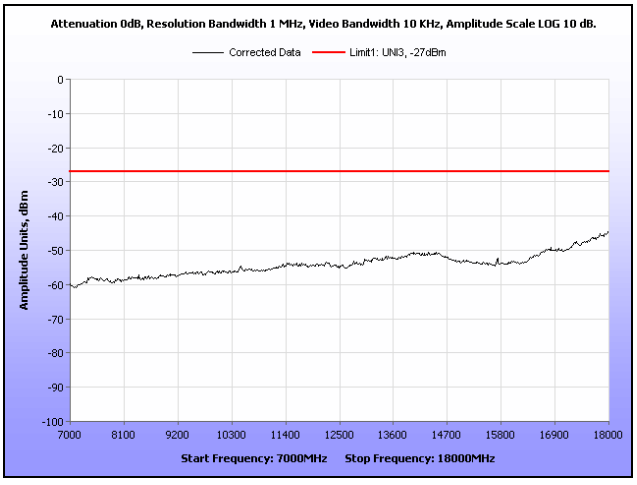
Plot 109. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, 2 dBi Dipole Antenna



Plot 110. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, 2 dBi Dipole Antenna

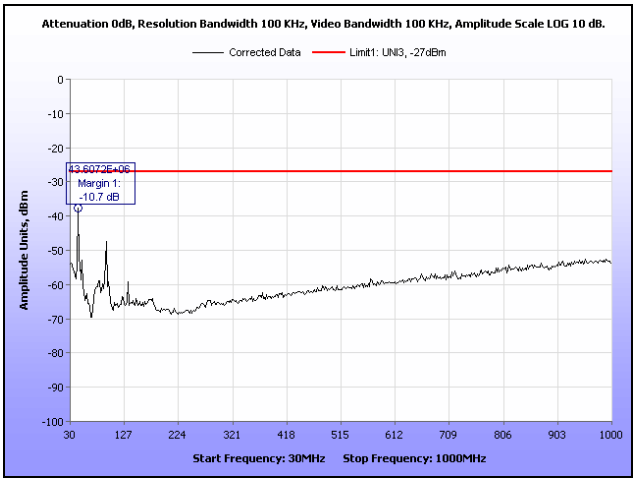


Plot 111. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, 2 dBi Dipole Antenna

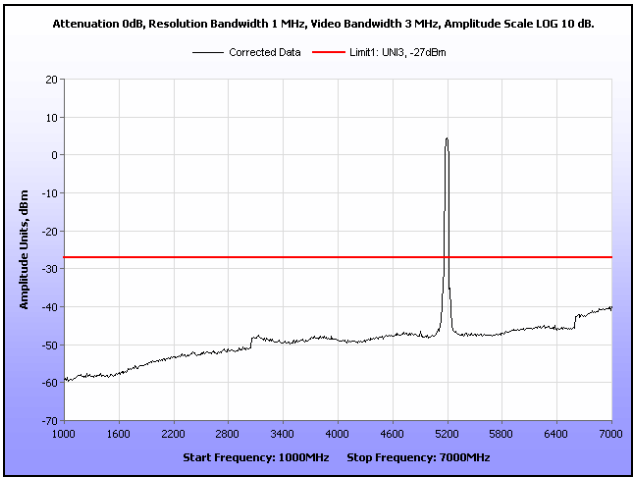


Plot 112. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, 2 dBi Dipole Antenna

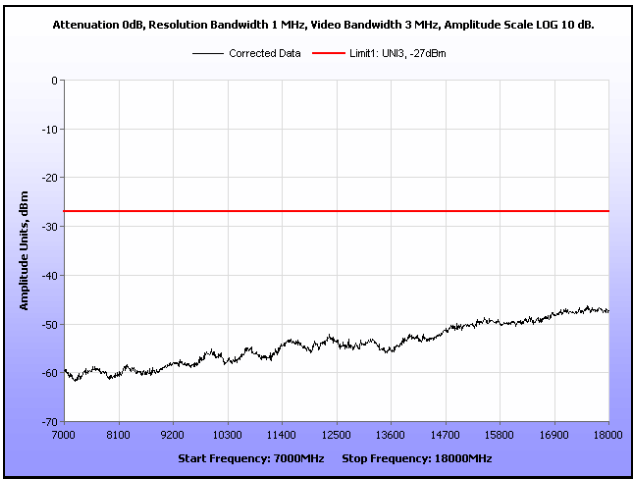
Radiated Spurious Emissions, 802.11n 40 MHz, 2 dBi Dipole Antenna



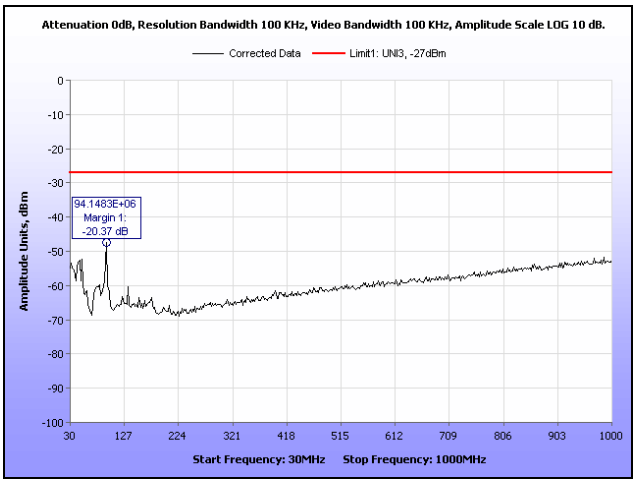
Plot 113. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, 2 dBi Dipole Antenna



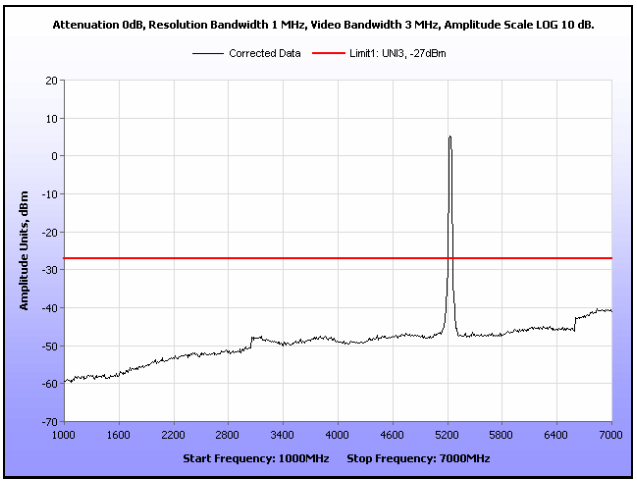
Plot 114. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, 2 dBi Dipole Antenna



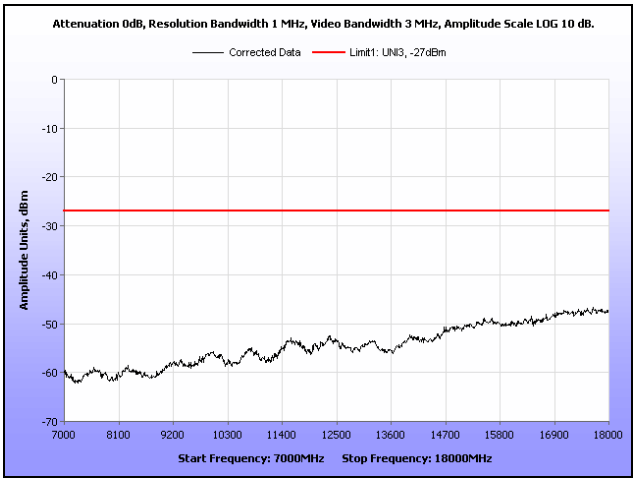
Plot 115. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, 2 dBi Dipole Antenna



Plot 116. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, 2 dBi Dipole Antenna

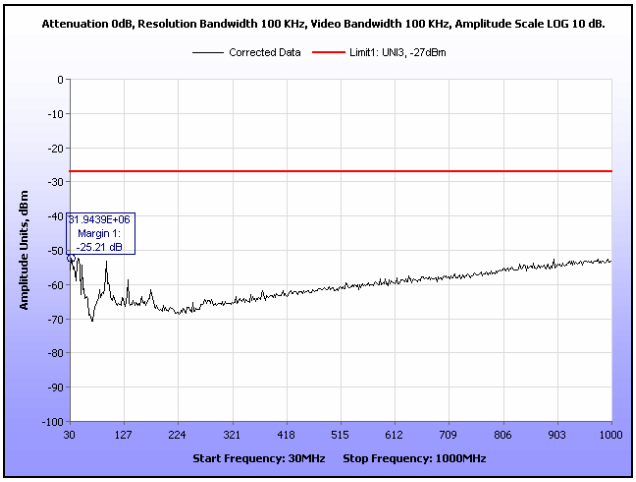


Plot 117. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, 2 dBi Dipole Antenna

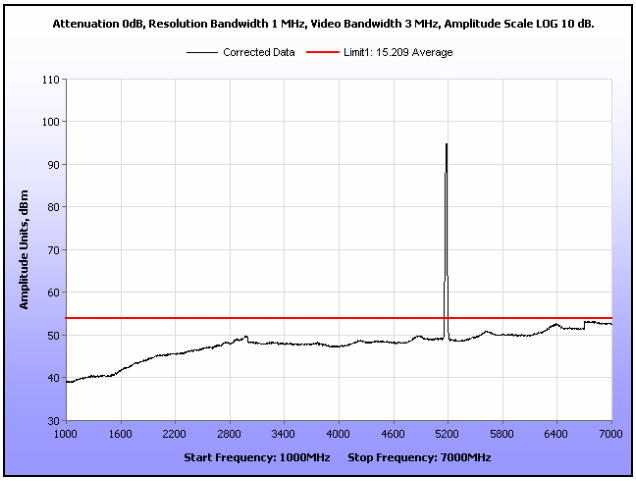


Plot 118. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, 2 dBi Dipole Antenna

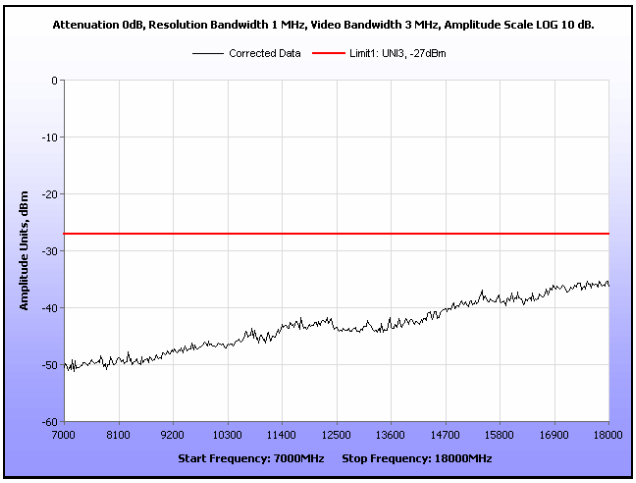
Radiated Spurious Emissions, 802.11a, Patch Antenna



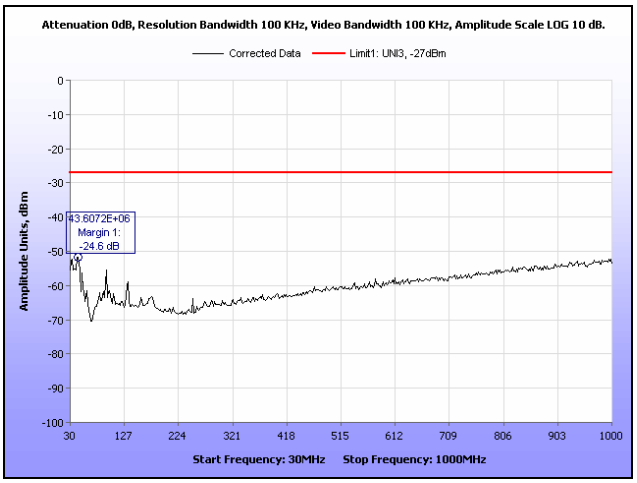
Plot 119. Radiated Spurious Emissions, 802.11a, Low Channel, 30 MHz – 1 GHz, Patch Antenna



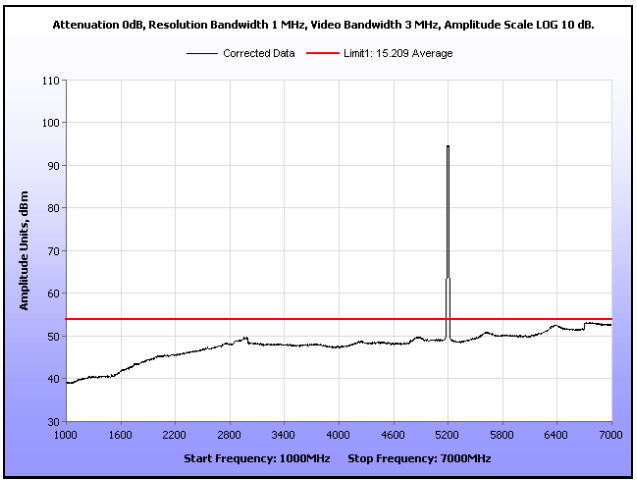
Plot 120. Radiated Spurious Emissions, 802.11a, Low Channel, 1 GHz – 7 GHz, Patch Antenna



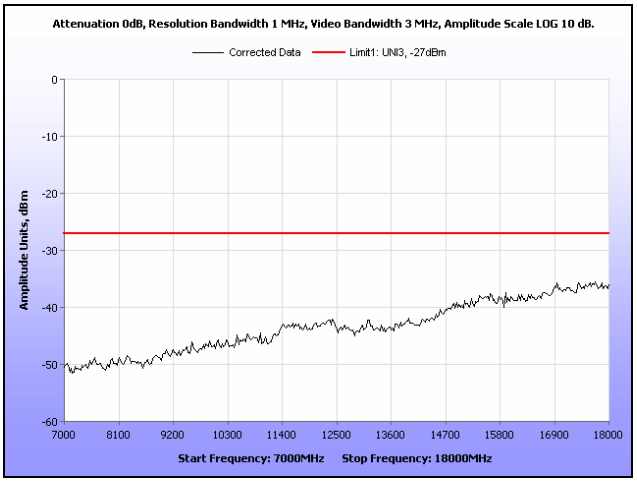
Plot 121. Radiated Spurious Emissions, 802.11a, Low Channel, 7 GHz – 18 GHz, Patch Antenna



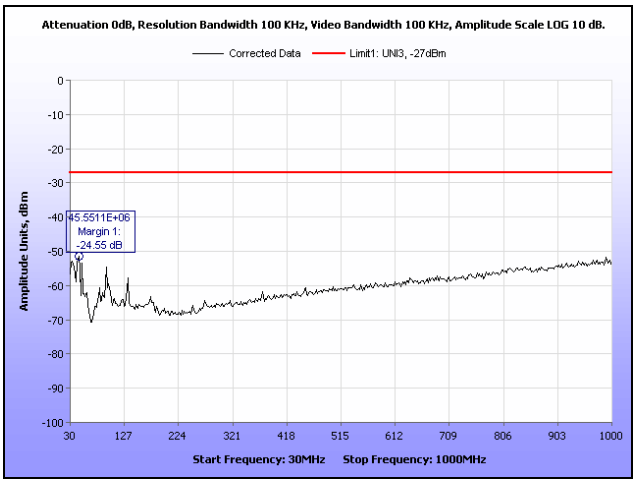
Plot 122. Radiated Spurious Emissions, 802.11a, Mid Channel, 30 MHz – 1 GHz, Patch Antenna



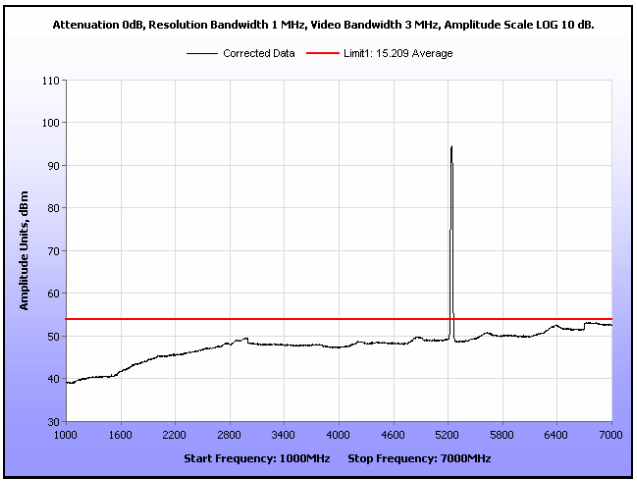
Plot 123. Radiated Spurious Emissions, 802.11a, Mid Channel, 1 GHz – 7 GHz, Patch Antenna



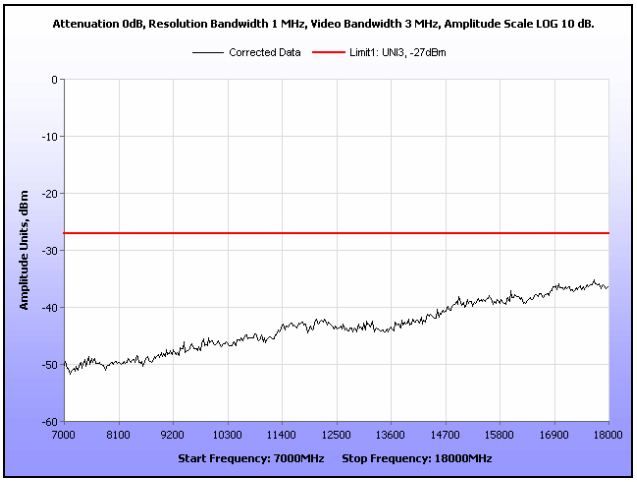
Plot 124. Radiated Spurious Emissions, 802.11a, Mid Channel, 7 GHz – 18 GHz, Patch Antenna



Plot 125. Radiated Spurious Emissions, 802.11a, High Channel, 30 MHz – 1 GHz, Patch Antenna

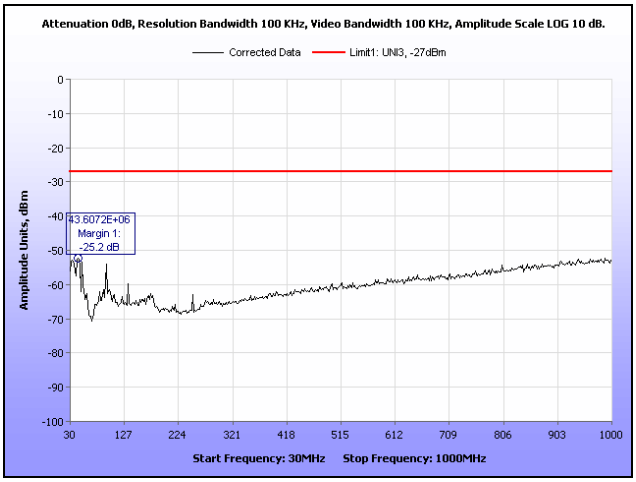


Plot 126. Radiated Spurious Emissions, 802.11a, High Channel, 1 GHz – 7 GHz, Patch Antenna

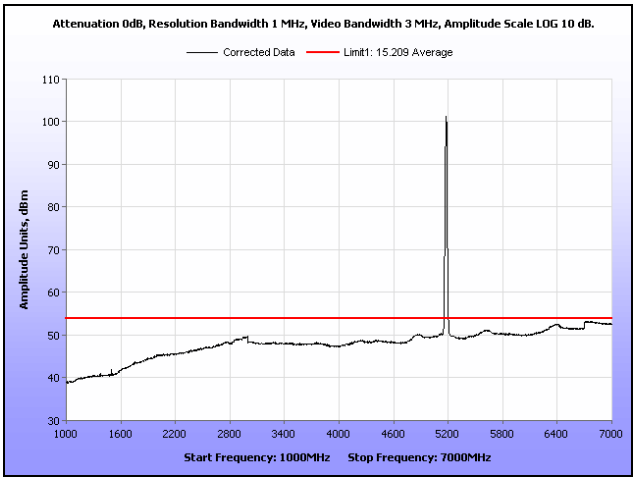


Plot 127. Radiated Spurious Emissions, 802.11a, High Channel, 7 GHz – 18 GHz, Patch Antenna

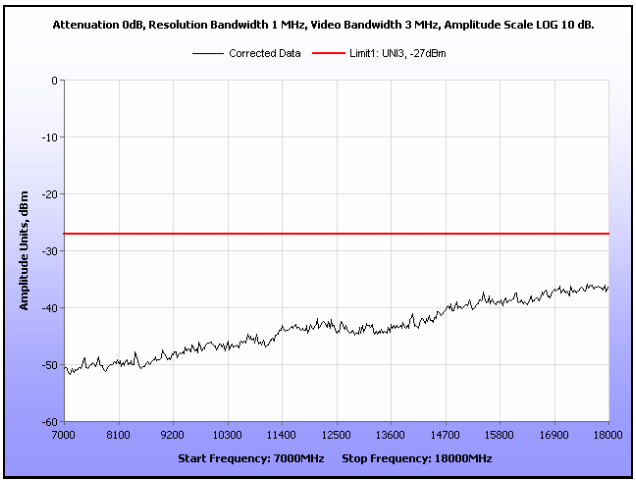
Radiated Spurious Emissions, 802.11n 20 MHz, Patch Antenna



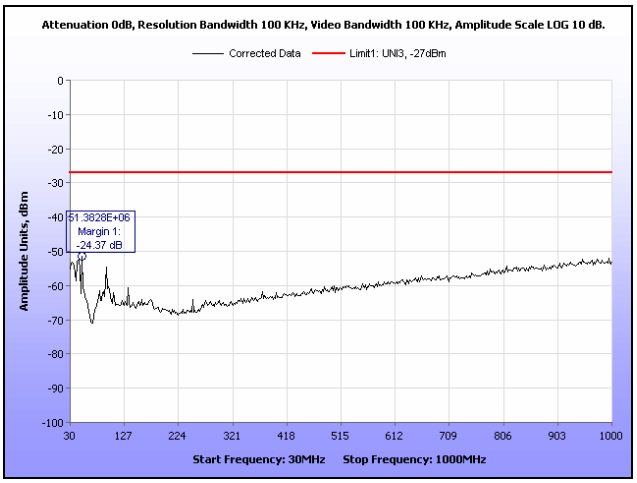
Plot 128. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, Patch Antenna



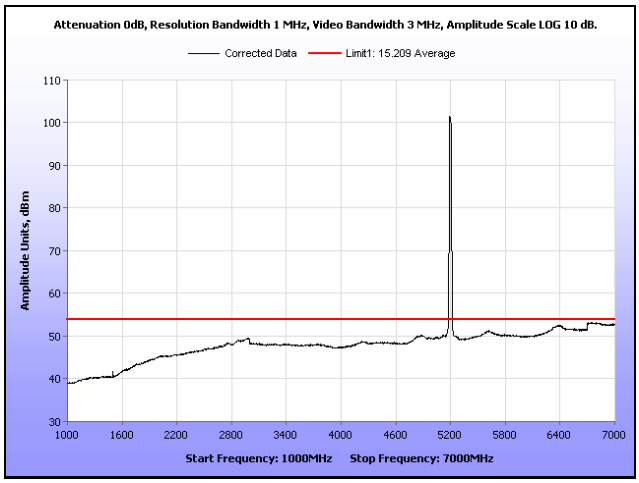
Plot 129. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, Patch Antenna



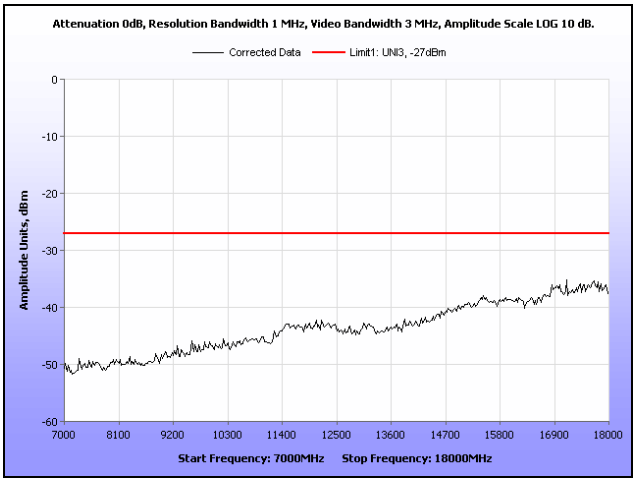
Plot 130. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, Patch Antenna



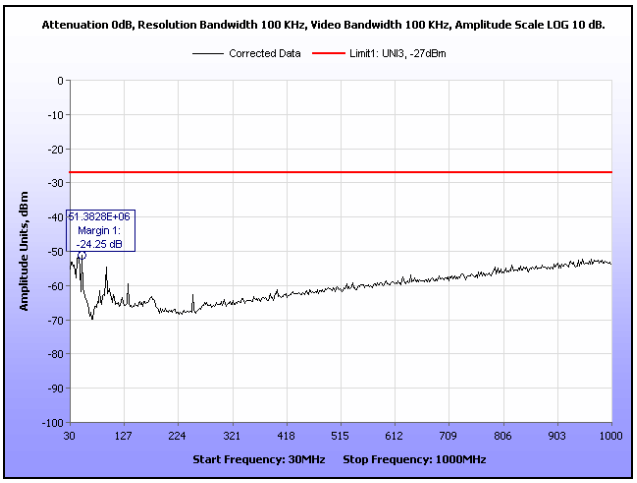
Plot 131. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, Patch Antenna



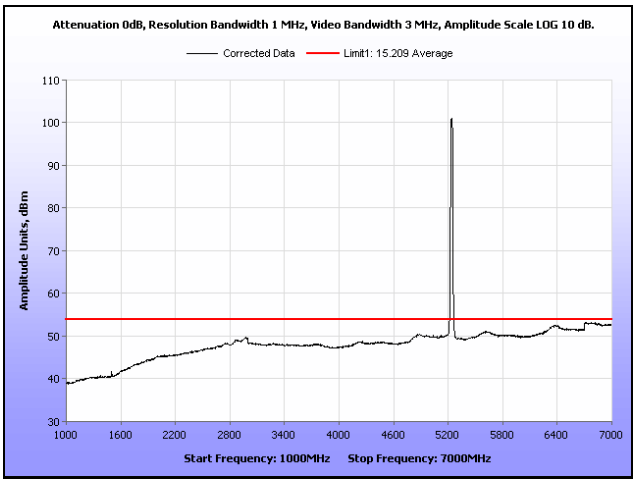
Plot 132. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, Patch Antenna



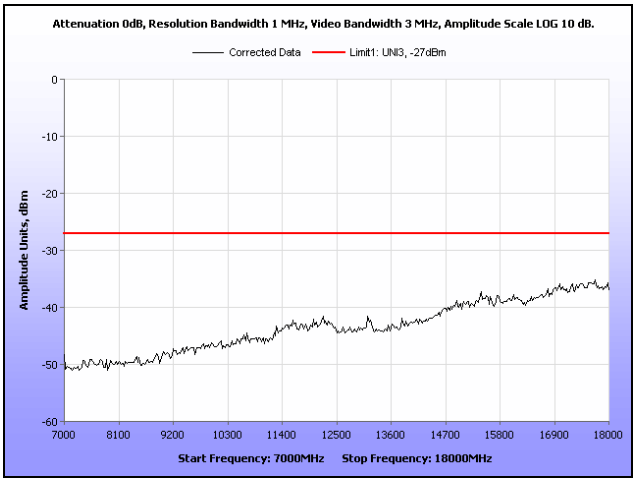
Plot 133. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, Patch Antenna



Plot 134. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, Patch Antenna

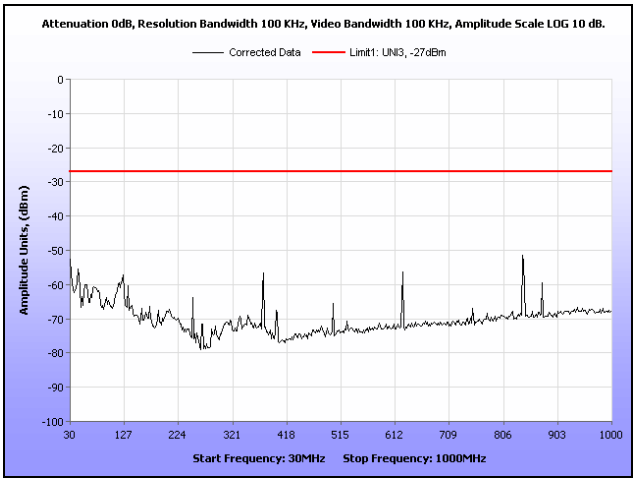


Plot 135. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, Patch Antenna

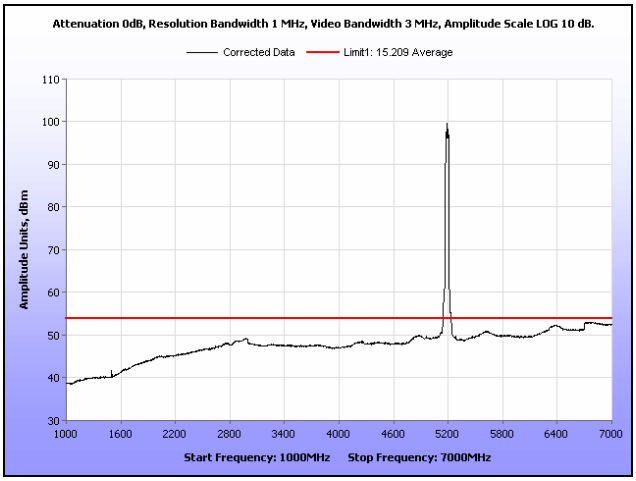


Plot 136. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, Patch Antenna

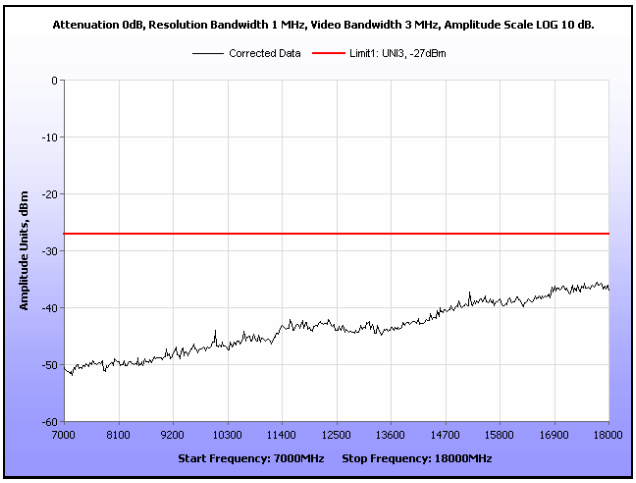
Radiated Spurious Emissions, 802.11n 40 MHz, Patch Antenna



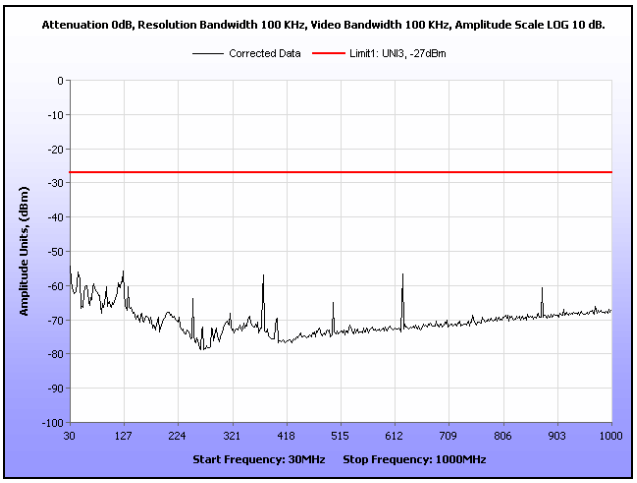
Plot 137. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, Patch Antenna



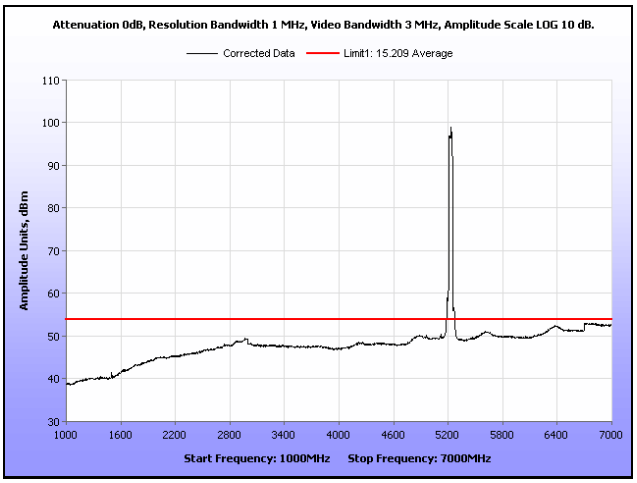
Plot 138. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, Patch Antenna



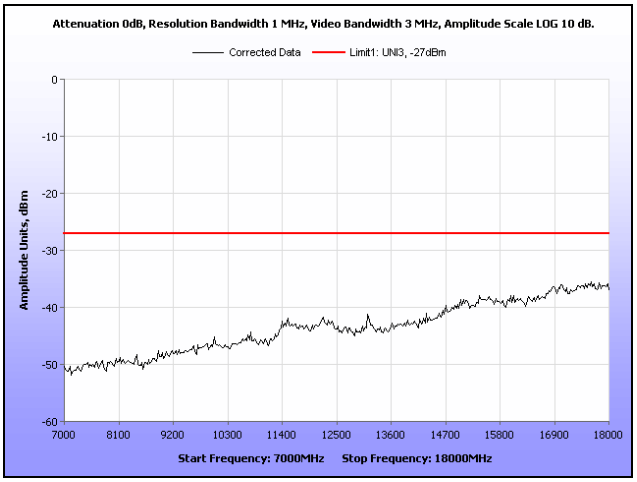
Plot 139. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, Patch Antenna



Plot 140. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, Patch Antenna

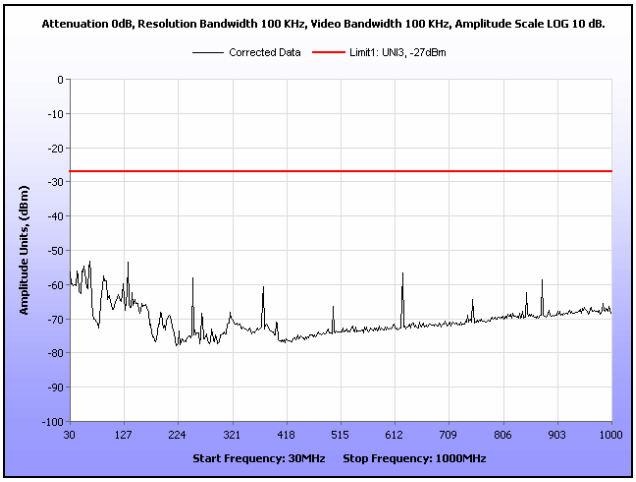


Plot 141. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, Patch Antenna

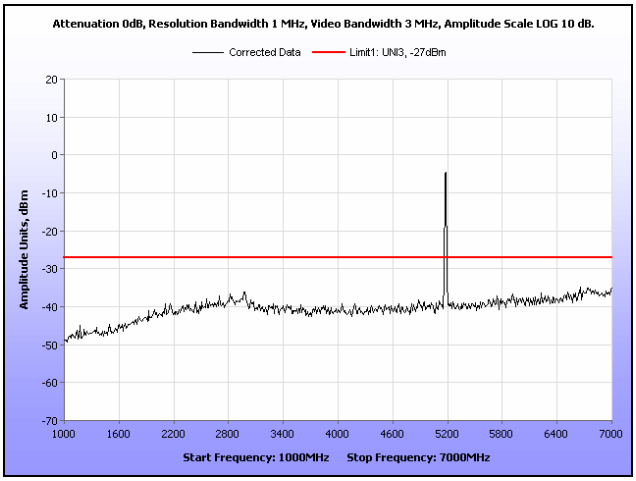


Plot 142. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, Patch Antenna

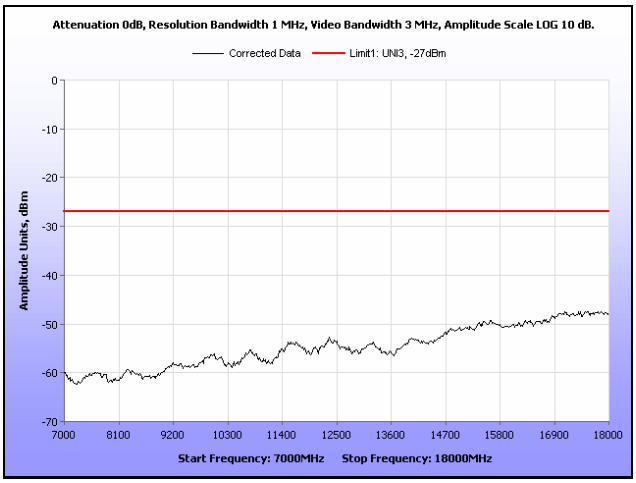
Radiated Spurious Emissions, 802.11a, 6 dBi Dipole Antenna



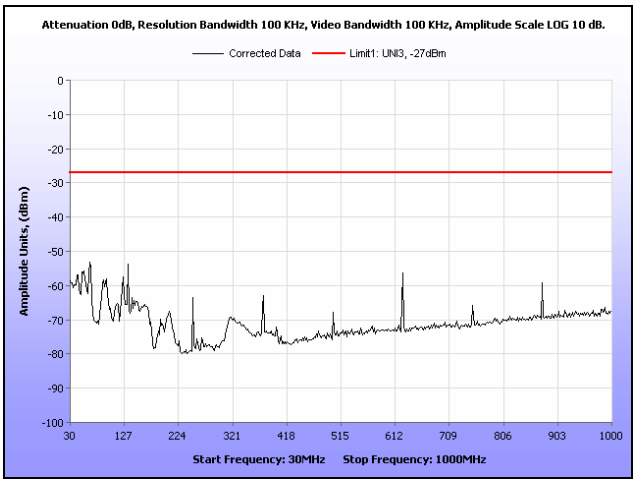
Plot 143. Radiated Spurious Emissions, 802.11a, Low Channel, 30 MHz – 1 GHz, 6 dBi Dipole Antenna



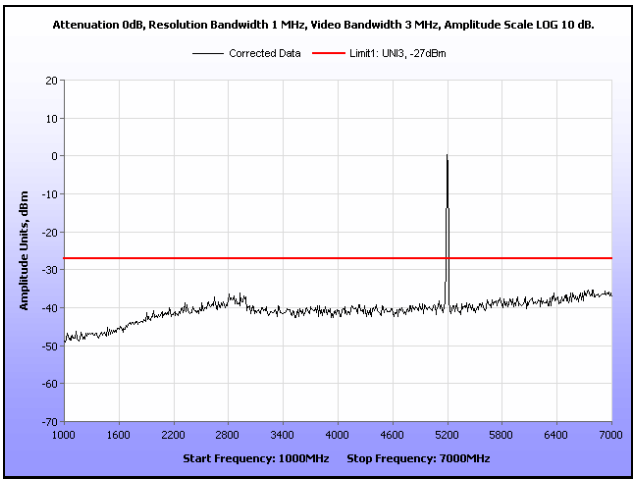
Plot 144. Radiated Spurious Emissions, 802.11a, Low Channel, 1 GHz – 7 GHz, 6 dBi Dipole Antenna



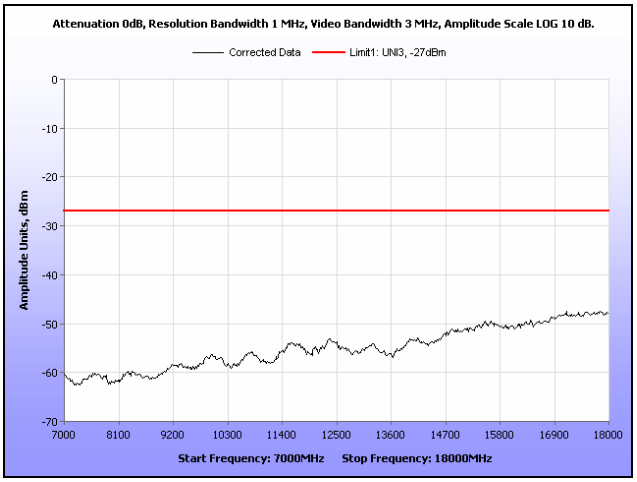
Plot 145. Radiated Spurious Emissions, 802.11a, Low Channel, 7 GHz – 18 GHz, 6 dBi Dipole Antenna



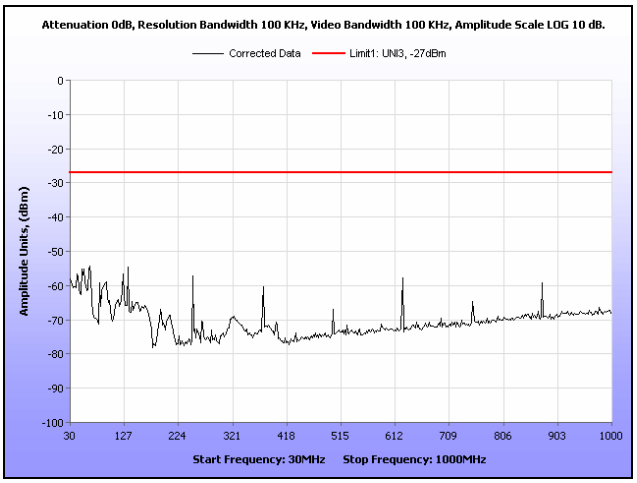
Plot 146. Radiated Spurious Emissions, 802.11a, Mid Channel, 30 MHz – 1 GHz, 6 dBi Dipole Antenna



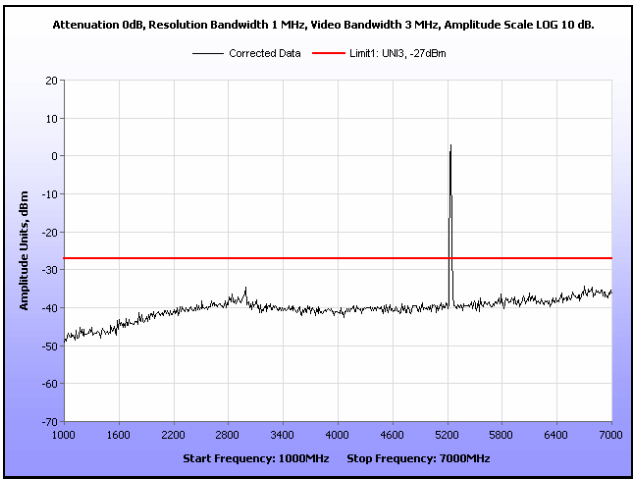
Plot 147. Radiated Spurious Emissions, 802.11a, Mid Channel, 1 GHz – 7 GHz, 6 dBi Dipole Antenna



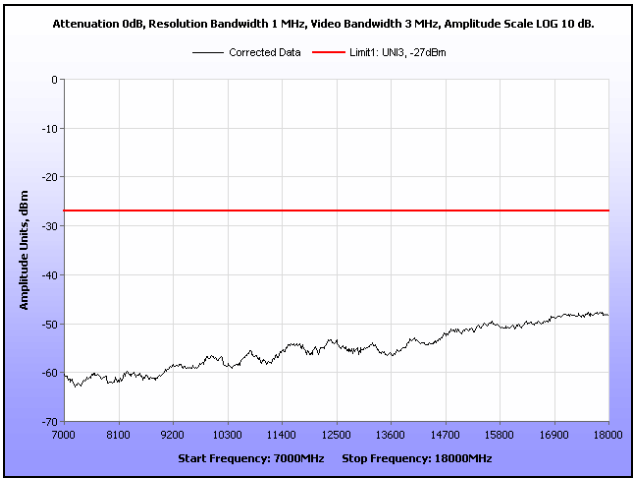
Plot 148. Radiated Spurious Emissions, 802.11a, Mid Channel, 7 GHz – 18 GHz, 6 dBi Dipole Antenna



Plot 149. Radiated Spurious Emissions, 802.11a, High Channel, 30 MHz – 1 GHz, 6 dBi Dipole Antenna

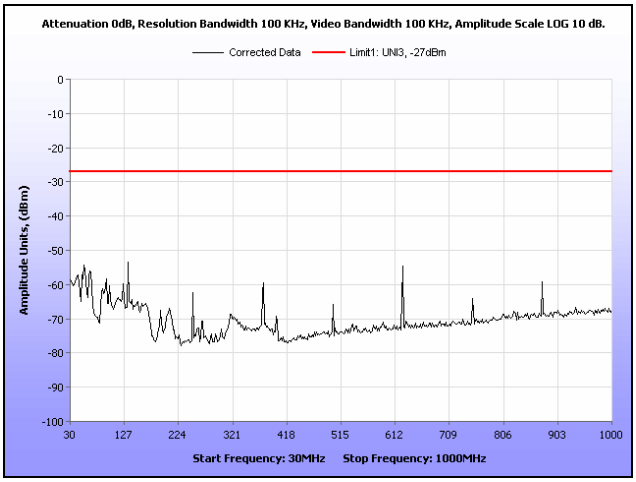


Plot 150. Radiated Spurious Emissions, 802.11a, High Channel, 1 GHz – 7 GHz, 6 dBi Dipole Antenna

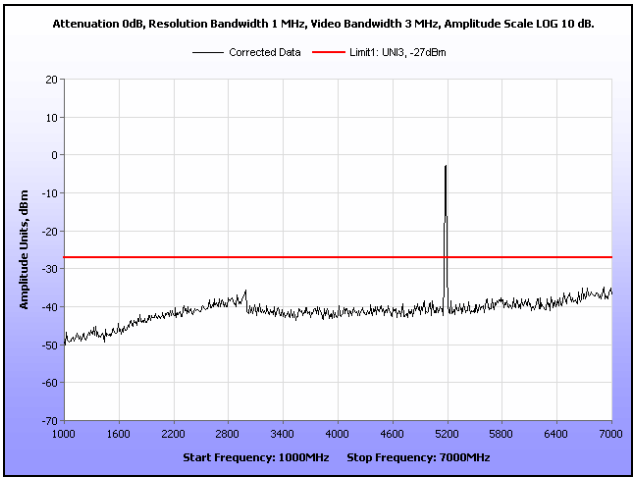


Plot 151. Radiated Spurious Emissions, 802.11a, High Channel, 7 GHz – 18 GHz, 6 dBi Dipole Antenna

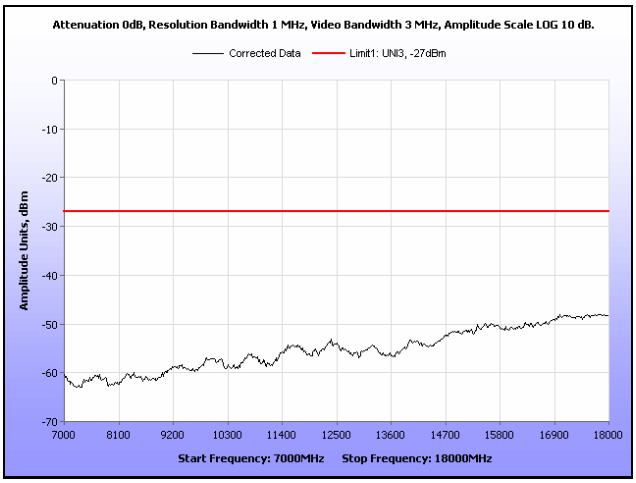
Radiated Spurious Emissions, 802.11n 20 MHz, 6 dBi Dipole Antenna



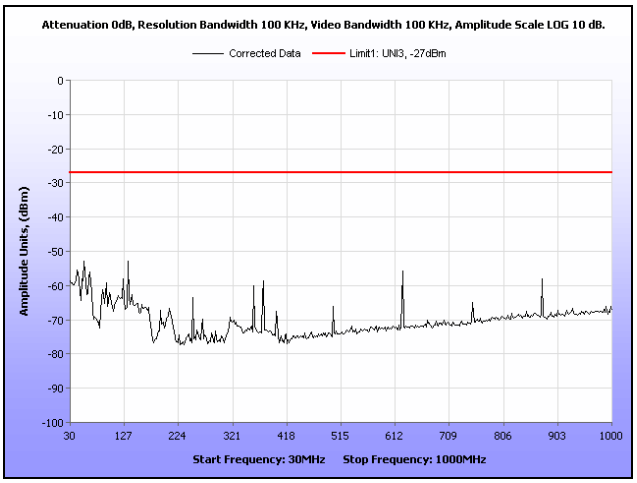
Plot 152. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, 6 dBi Dipole Antenna



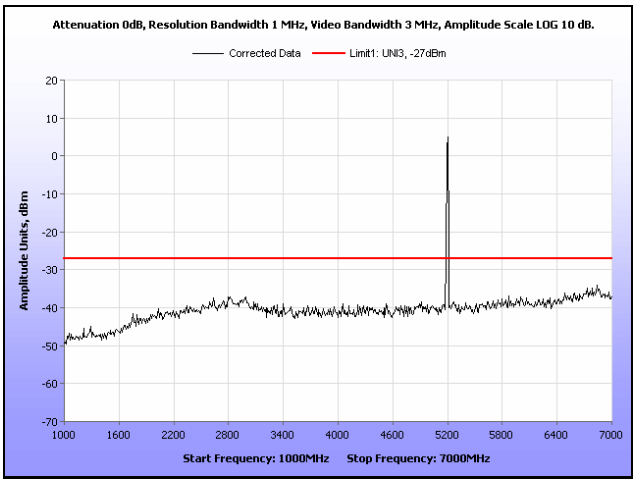
Plot 153. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, 6 dBi Dipole Antenna



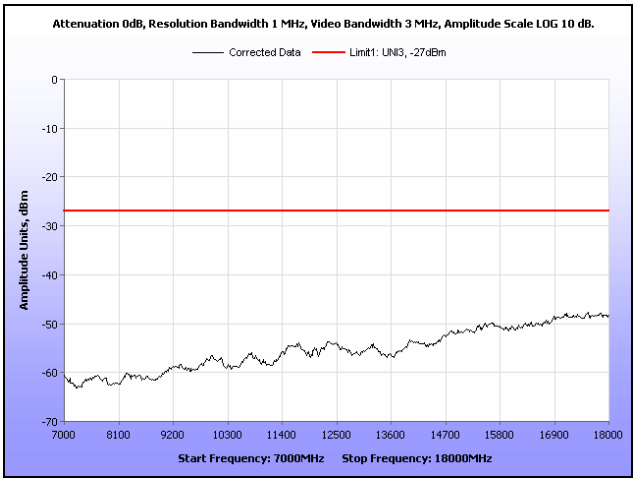
Plot 154. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, 6 dBi Dipole Antenna



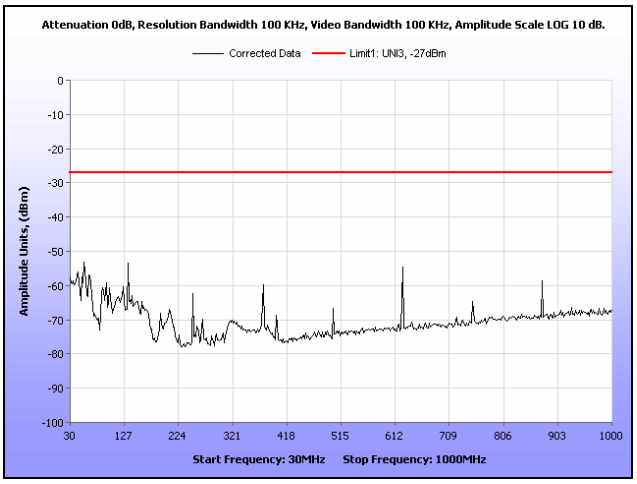
Plot 155. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, 6 dBi Dipole Antenna



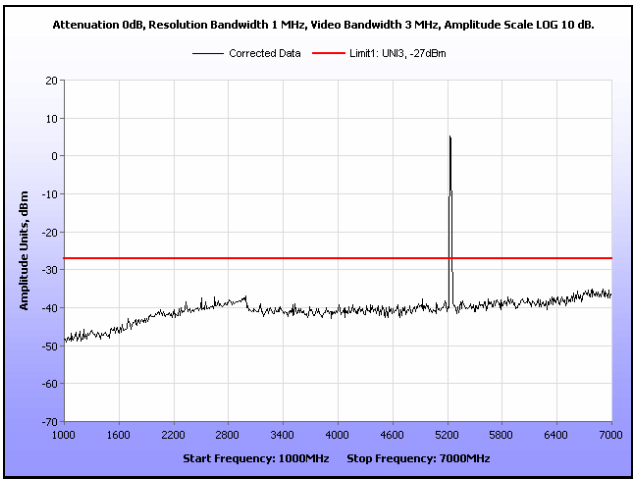
Plot 156. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, 6 dBi Dipole Antenna



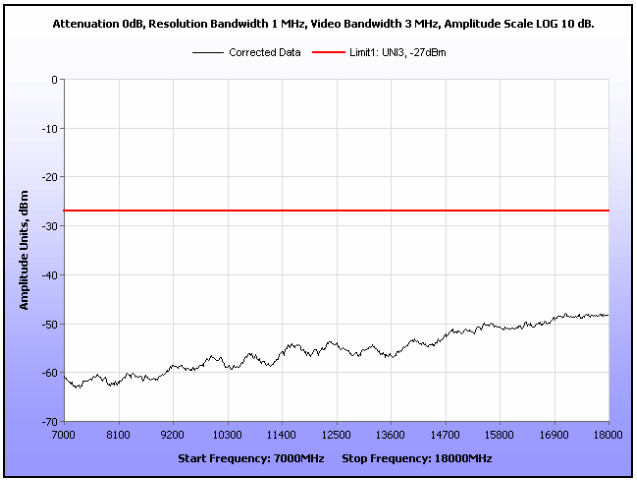
Plot 157. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, 6 dBi Dipole Antenna



Plot 158. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, 6 dBi Dipole Antenna

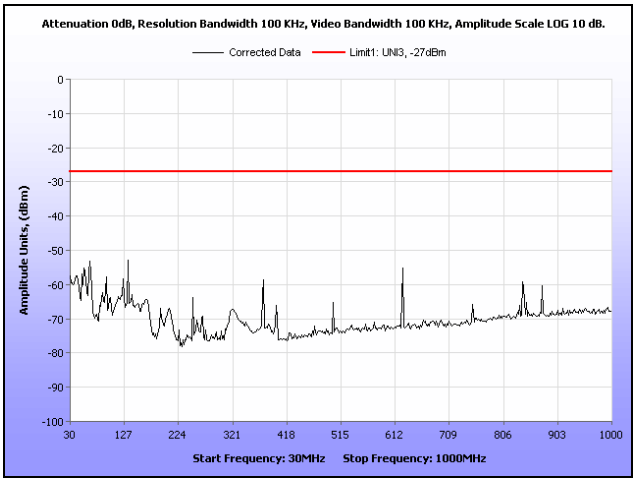


Plot 159. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, 6 dBi Dipole Antenna

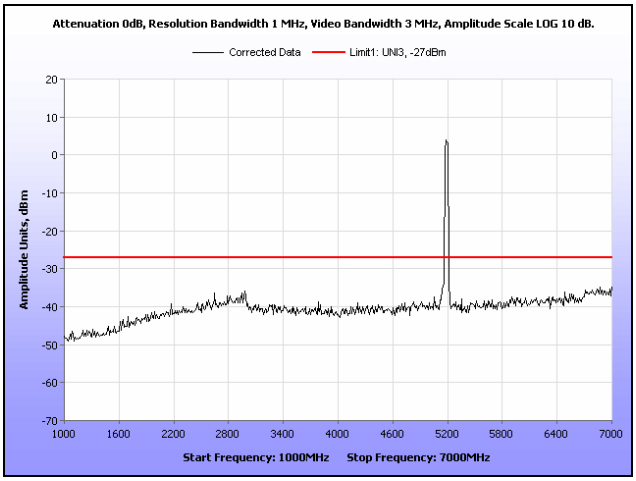


Plot 160. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, 6 dBi Dipole Antenna

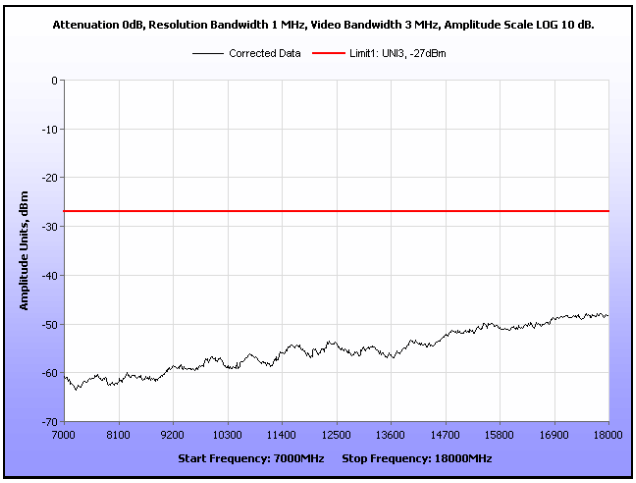
Radiated Spurious Emissions, 802.11n 40 MHz, 6 dBi Dipole Antenna



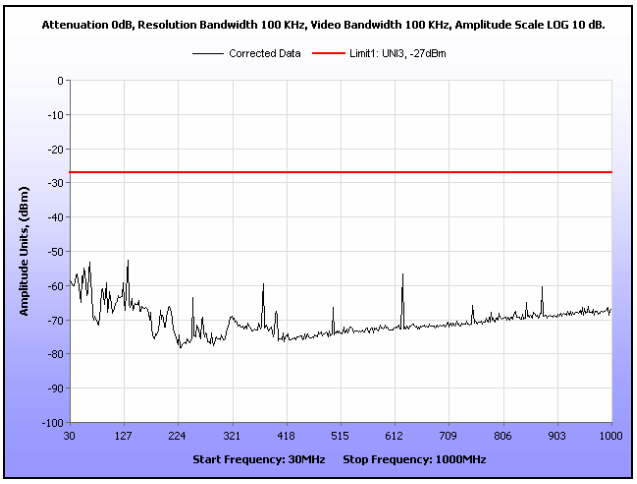
Plot 161. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, 6 dBi Dipole Antenna



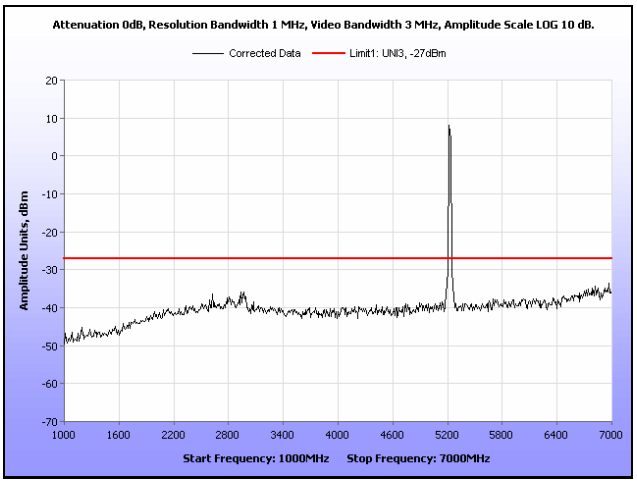
Plot 162. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, 6 dBi Dipole Antenna



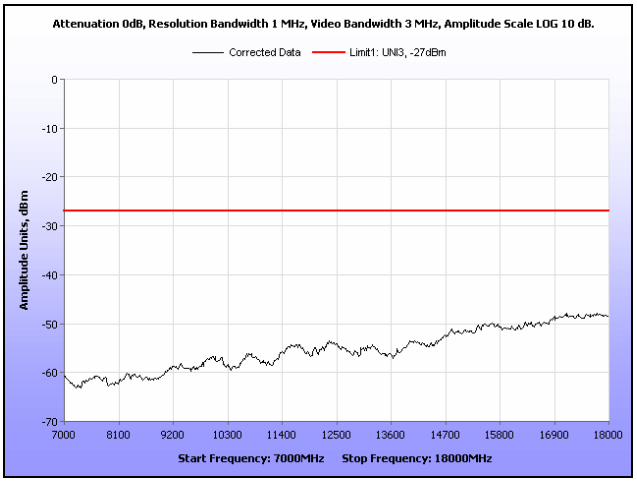
Plot 163. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, 6 dBi Dipole Antenna



Plot 164. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, 6 dBi Dipole Antenna

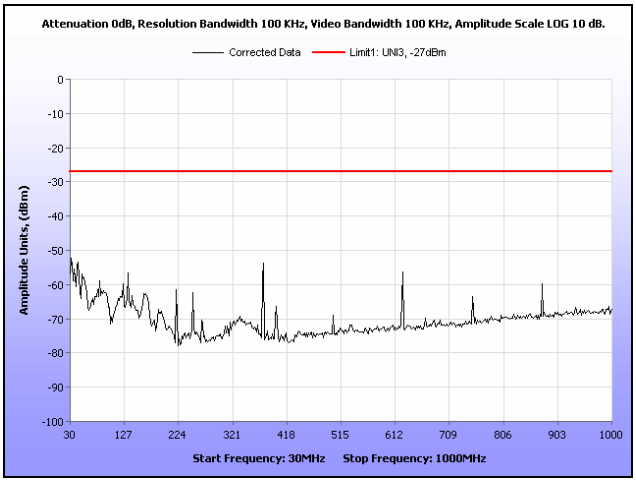


Plot 165. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, 6 dBi Dipole Antenna

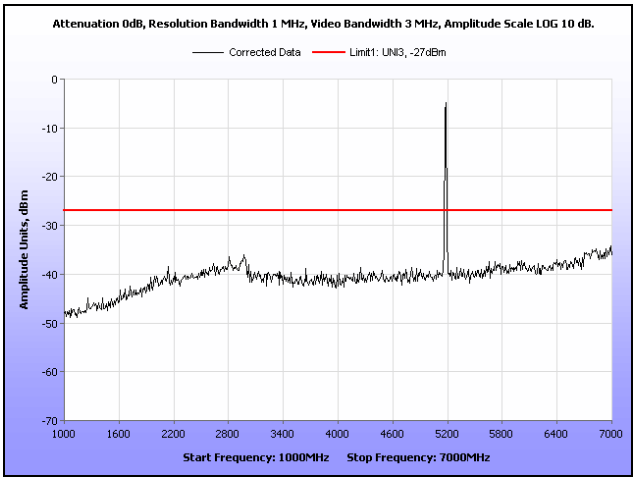


Plot 166. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, 6 dBi Dipole Antenna

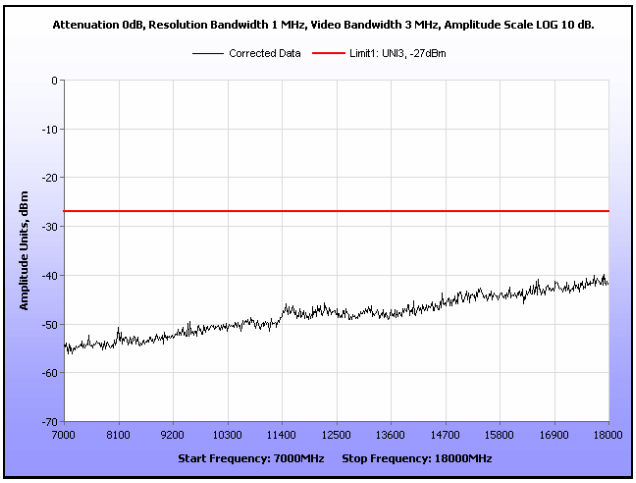
Radiated Spurious Emissions, 802.11a, Ceiling Mount Antenna



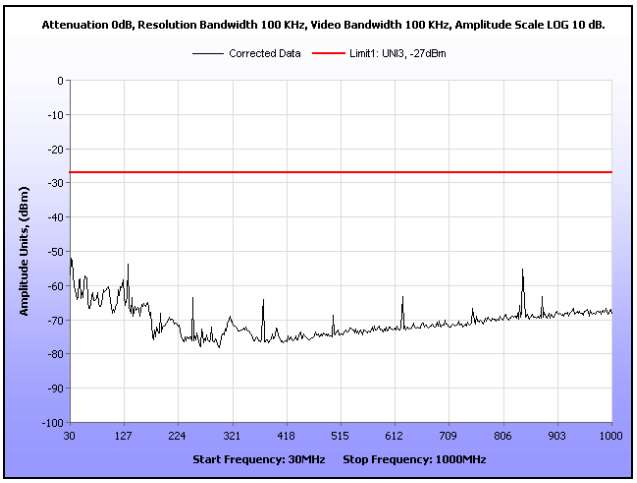
Plot 167. Radiated Spurious Emissions, 802.11a, Low Channel, 30 MHz – 1 GHz, Ceiling Mount Antenna



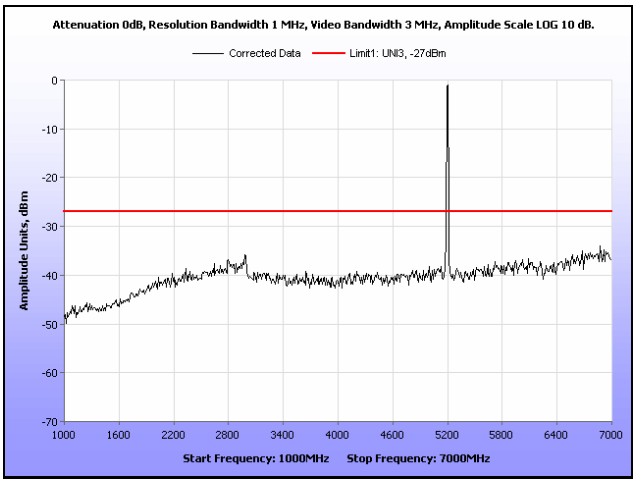
Plot 168. Radiated Spurious Emissions, 802.11a, Low Channel, 1 GHz – 7 GHz, Ceiling Mount Antenna



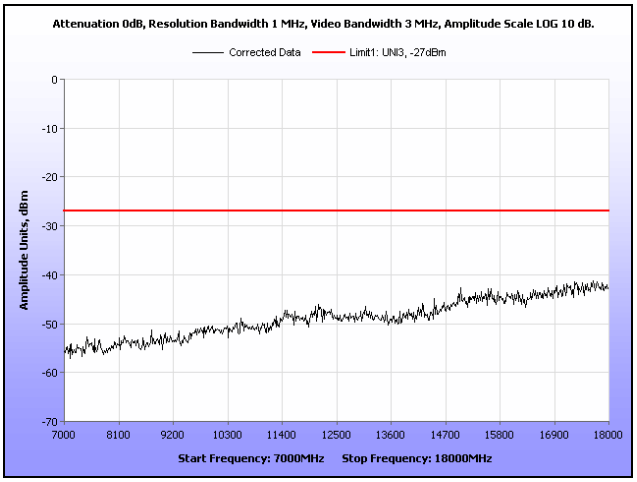
Plot 169. Radiated Spurious Emissions, 802.11a, Low Channel, 7 GHz – 18 GHz, Ceiling Mount Antenna



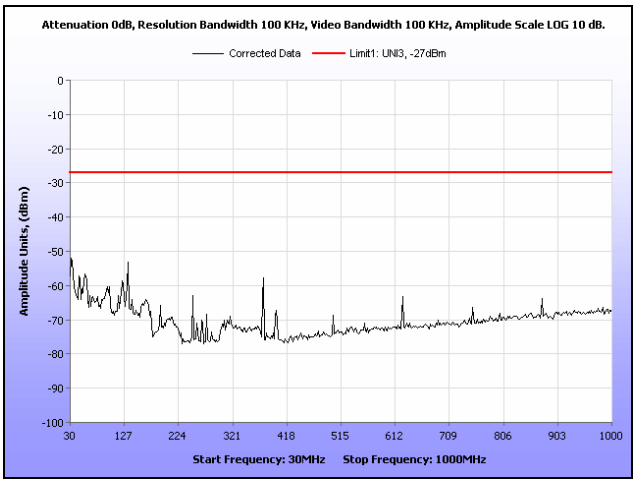
Plot 170. Radiated Spurious Emissions, 802.11a, Mid Channel, 30 MHz – 1 GHz, Ceiling Mount Antenna



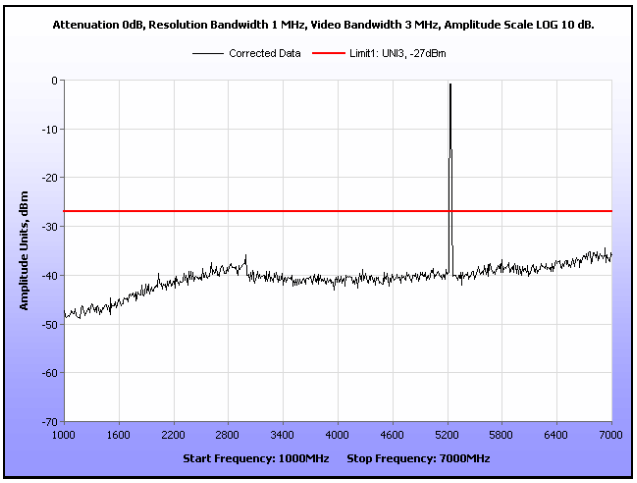
Plot 171. Radiated Spurious Emissions, 802.11a, Mid Channel, 1 GHz – 7 GHz, Ceiling Mount Antenna



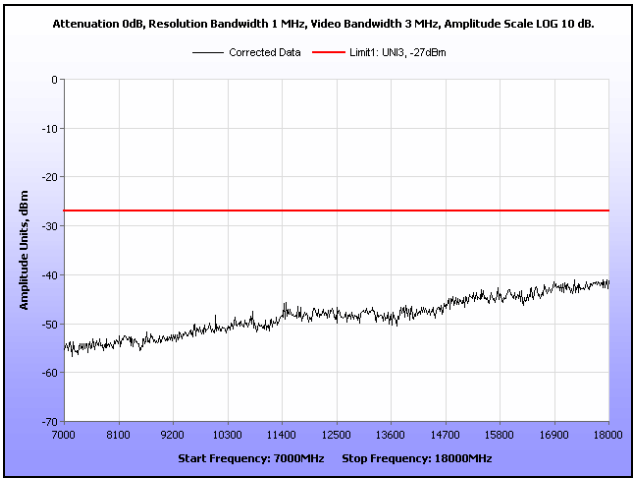
Plot 172. Radiated Spurious Emissions, 802.11a, Mid Channel, 7 GHz – 18 GHz, Ceiling Mount Antenna



Plot 173. Radiated Spurious Emissions, 802.11a, High Channel, 30 MHz – 1 GHz, Ceiling Mount Antenna

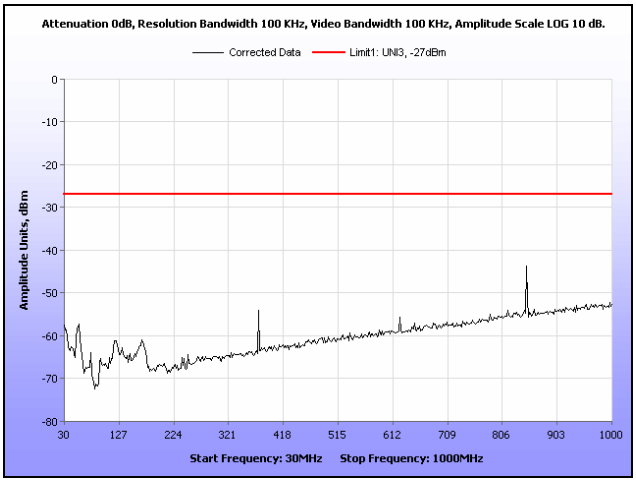


Plot 174. Radiated Spurious Emissions, 802.11a, High Channel, 1 GHz – 7 GHz, Ceiling Mount Antenna

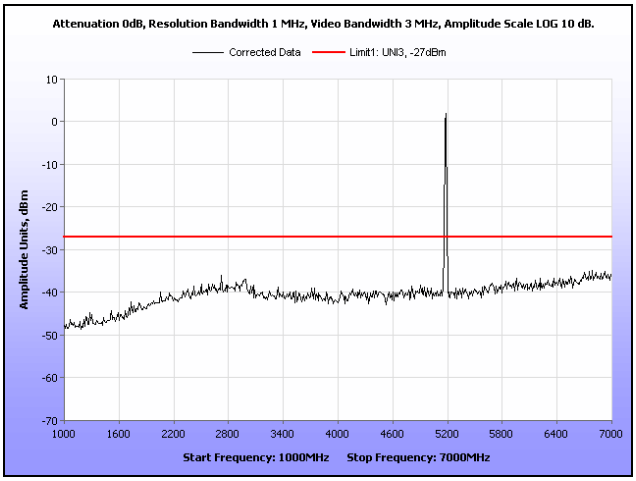


Plot 175. Radiated Spurious Emissions, 802.11a, High Channel, 7 GHz – 18 GHz, Ceiling Mount Antenna

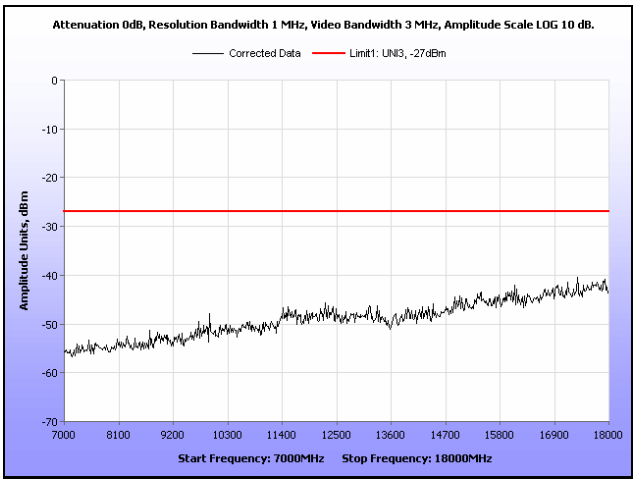
Radiated Spurious Emissions, 802.11n 20 MHz, Ceiling Mount Antenna



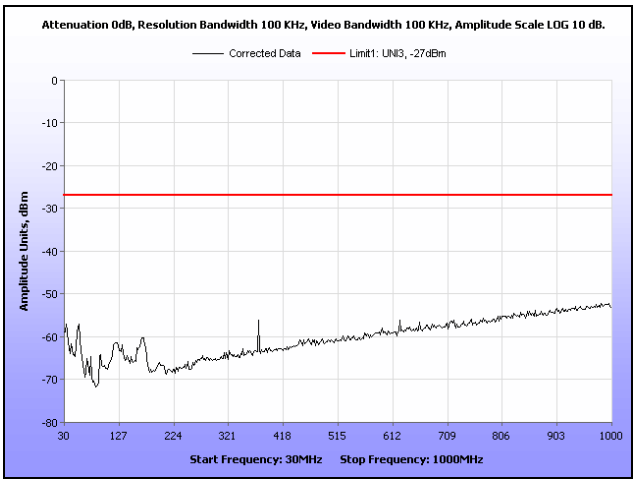
Plot 176. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, Ceiling Mount Antenna



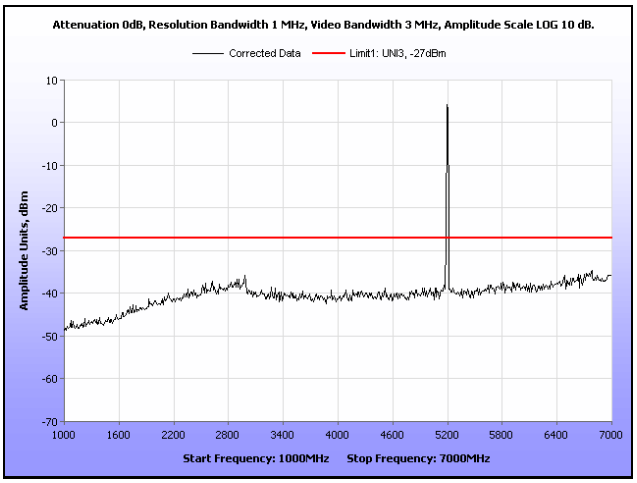
Plot 177. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, Ceiling Mount Antenna



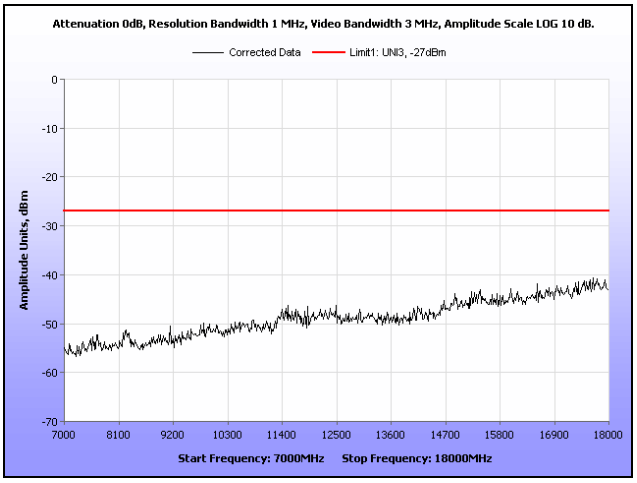
Plot 178. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, Ceiling Mount Antenna



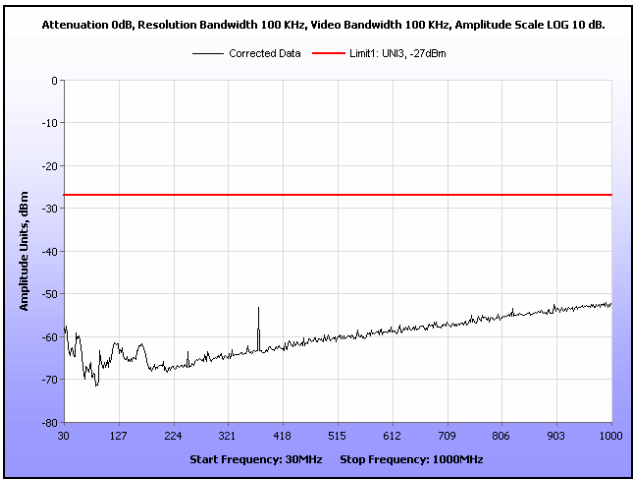
Plot 179. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, Ceiling Mount Antenna



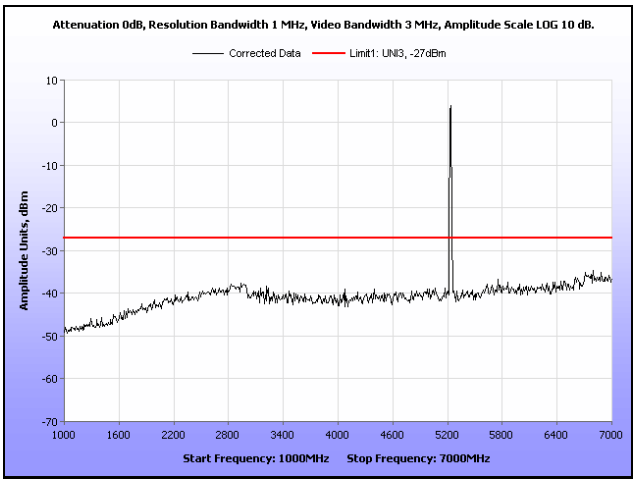
Plot 180. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, Ceiling Mount Antenna



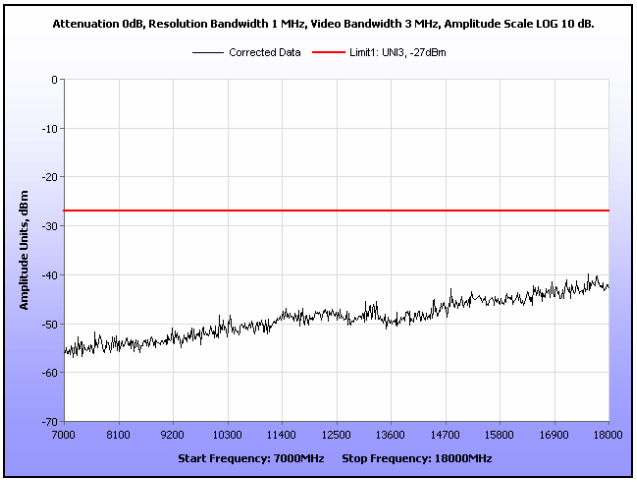
Plot 181. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, Ceiling Mount Antenna



Plot 182. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, Ceiling Mount Antenna

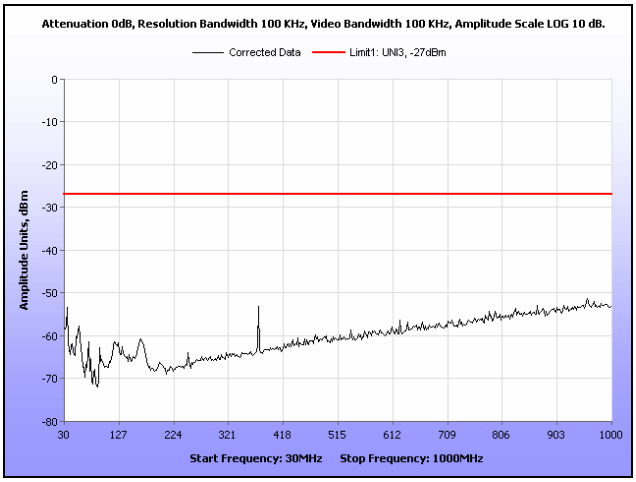


Plot 183. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, Ceiling Mount Antenna

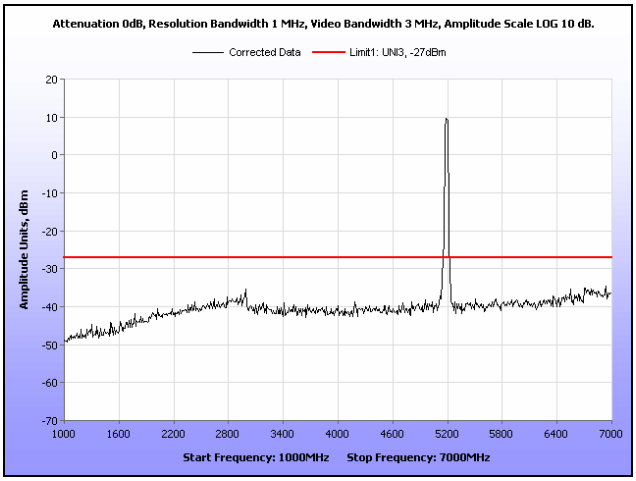


Plot 184. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, Ceiling Mount Antenna

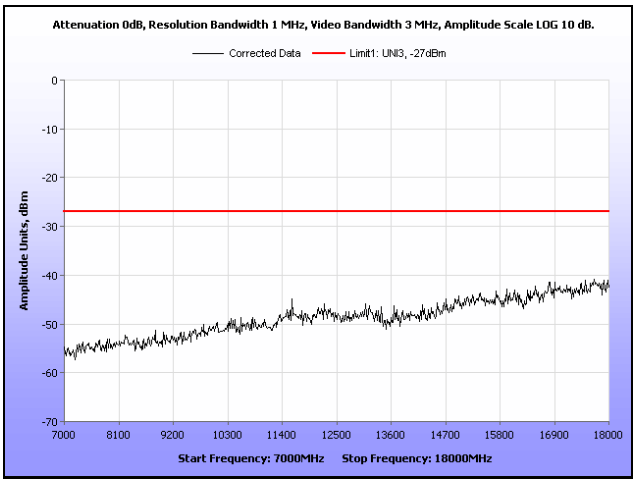
Radiated Spurious Emissions, 802.11n 40 MHz, Ceiling Mount Antenna



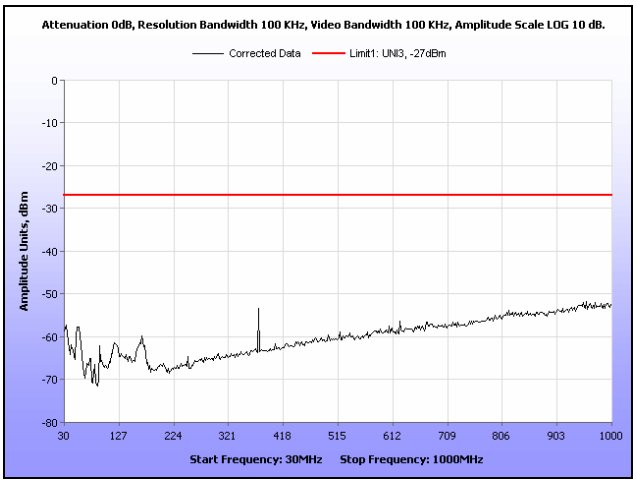
Plot 185. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, Ceiling Mount Antenna



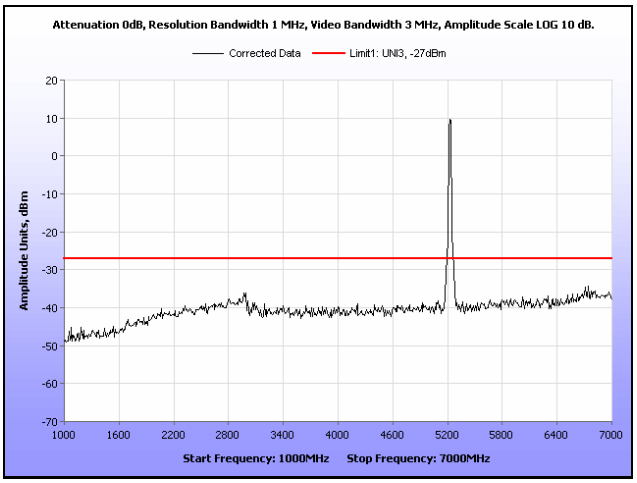
Plot 186. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, Ceiling Mount Antenna



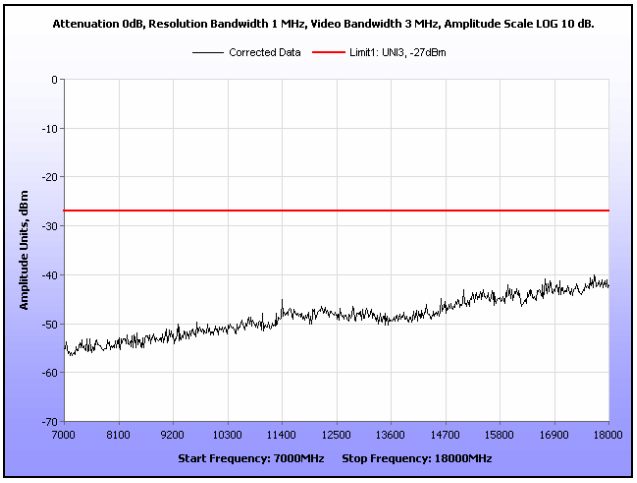
Plot 187. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, Ceiling Mount Antenna



Plot 188. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, Ceiling Mount Antenna

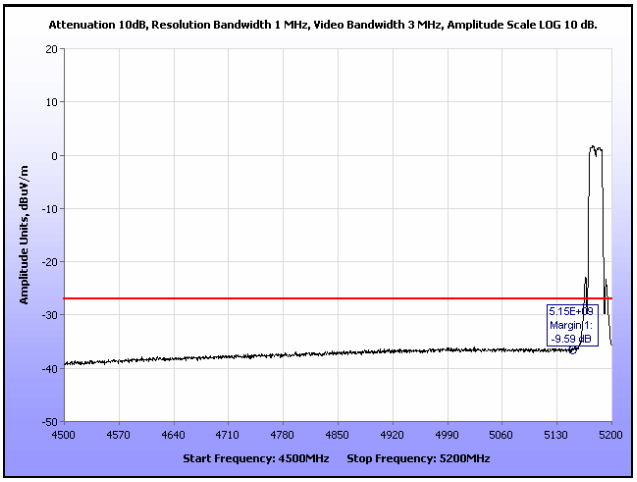


Plot 189. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, Ceiling Mount Antenna

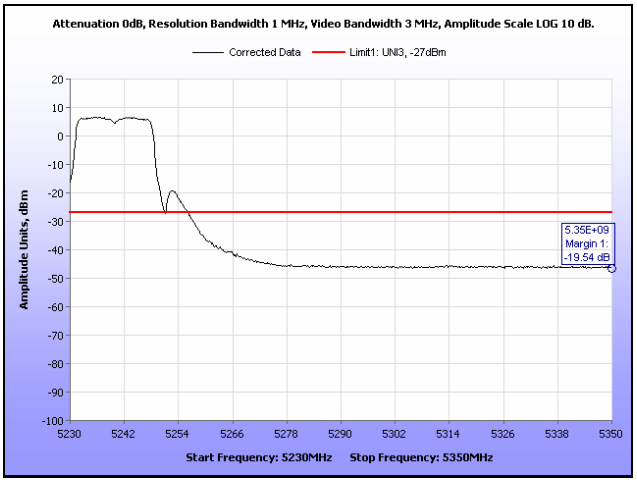


Plot 190. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, Ceiling Mount Antenna

Radiated Band Edge, 802.11a, 2 dBi Dipole Antenna

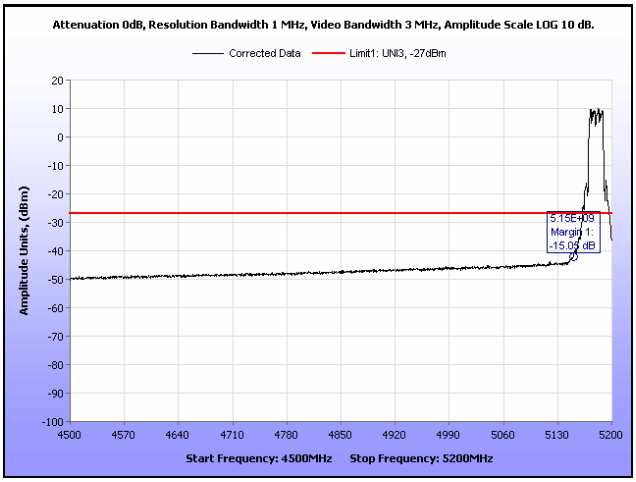


Plot 191. Radiated Band Edge, 802.11a, Low Channel

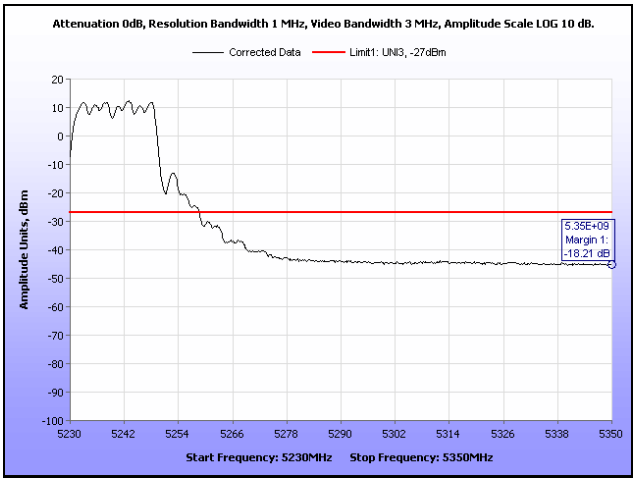


Plot 192. Radiated Band Edge, 802.11a, High Channel

Radiated Band Edge, 802.11n 20 MHz

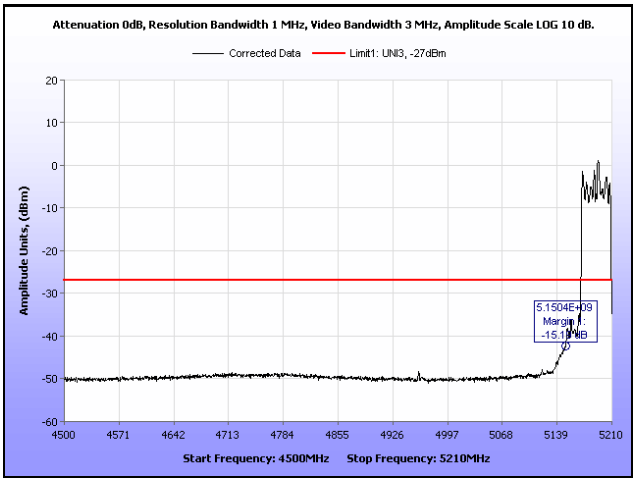


Plot 193. Radiated Band Edge, 802.11n 20 MHz, Low Channel

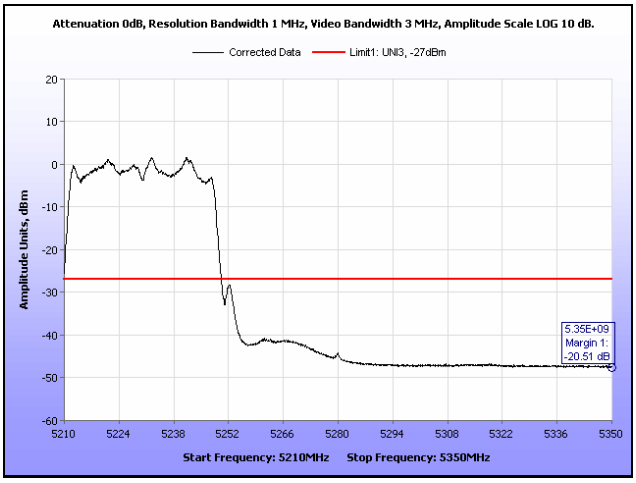


Plot 194. Radiated Band Edge, 802.11n 20 MHz, High Channel

Radiated Band Edge, 802.11n 40 MHz

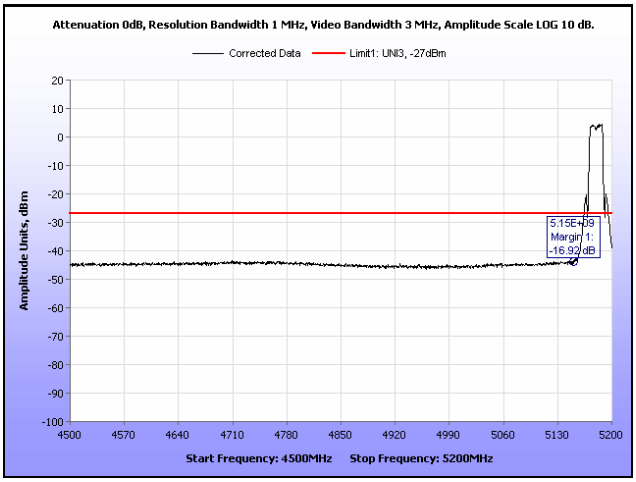


Plot 195. Radiated Band Edge, 802.11n 40 MHz, Low Channel

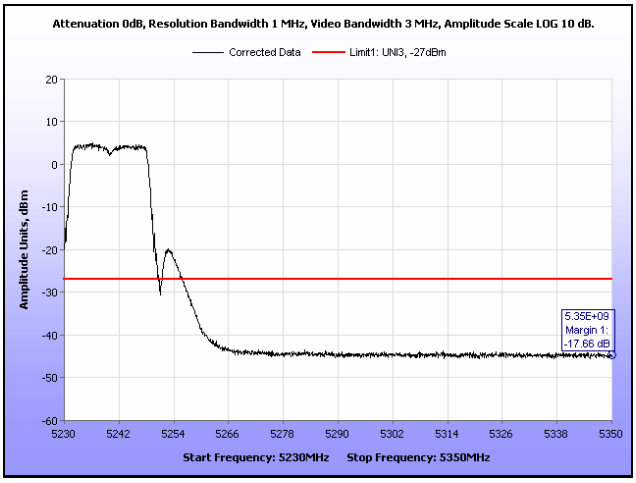


Plot 196. Radiated Band Edge, 802.11n 40 MHz, High Channel

Radiated Band Edge, 802.11a, Patch Antenna

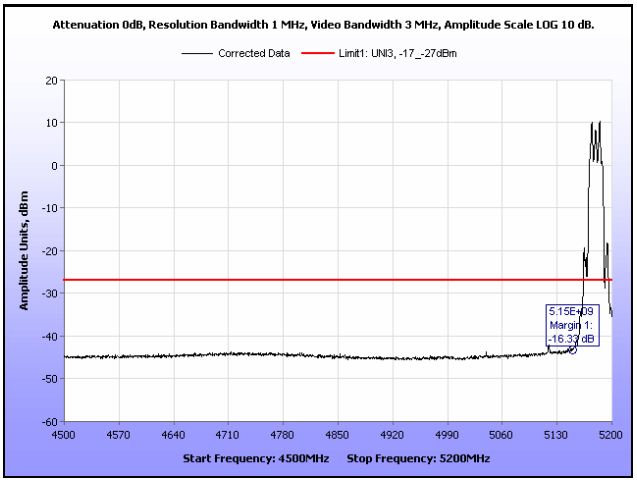


Plot 197. Radiated Band Edge, 802.11a, Low Channel, Patch Antenna

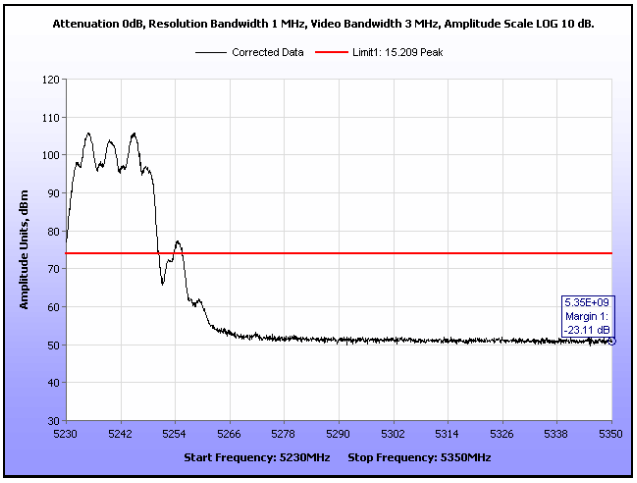


Plot 198. Radiated Band Edge, 802.11a, High Channel, Patch Antenna

Radiated Band Edge, 802.11n 20 MHz, Patch Antenna

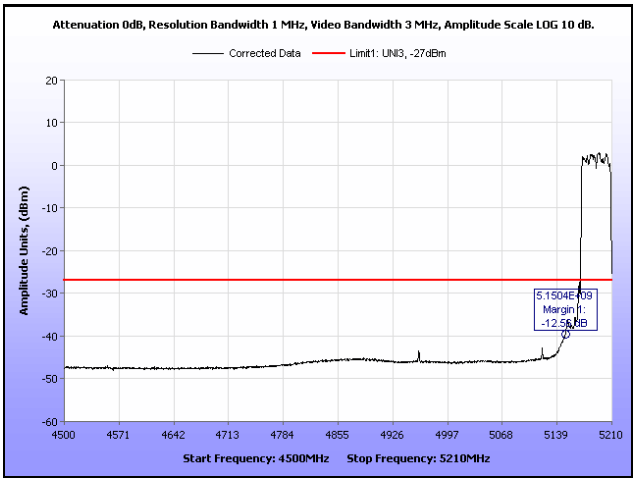


Plot 199. Radiated Band Edge, 802.11n 20 MHz, Low Channel, Patch Antenna

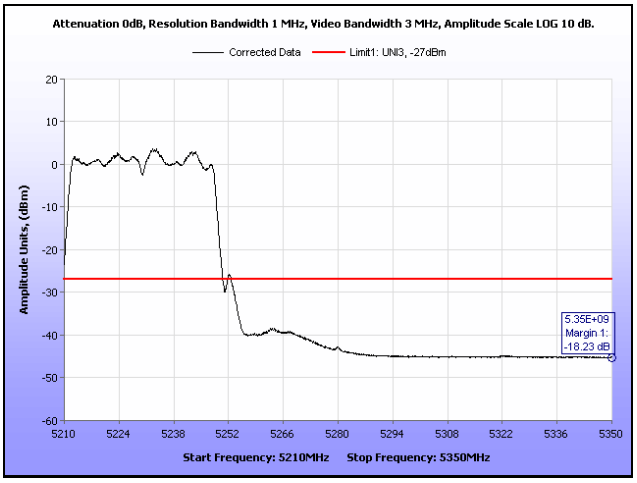


Plot 200. Radiated Band Edge, 802.11n 20 MHz, High Channel, Patch Antenna

Radiated Band Edge, 802.11n 40 MHz, Patch Antenna

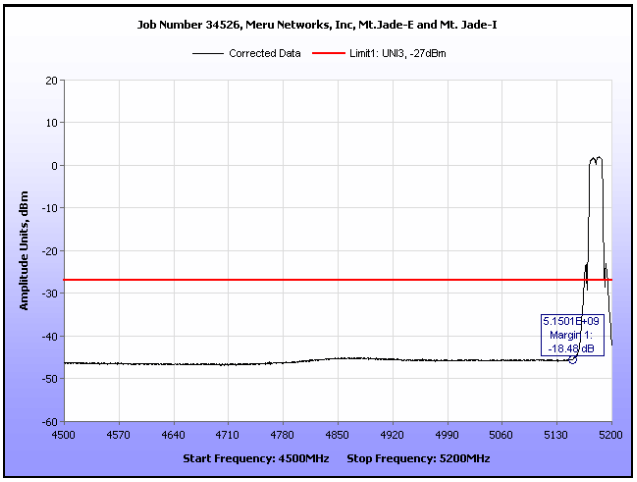


Plot 201. Radiated Band Edge, 802.11n 40 MHz, Low Channel, Patch Antenna

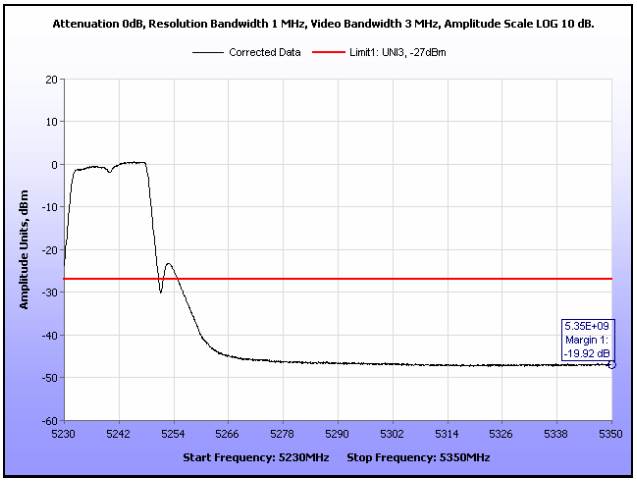


Plot 202. Radiated Band Edge, 802.11n 40 MHz, High Channel, Patch Antenna

Radiated Band Edge, 802.11a, 6 dBi Dipole Antenna

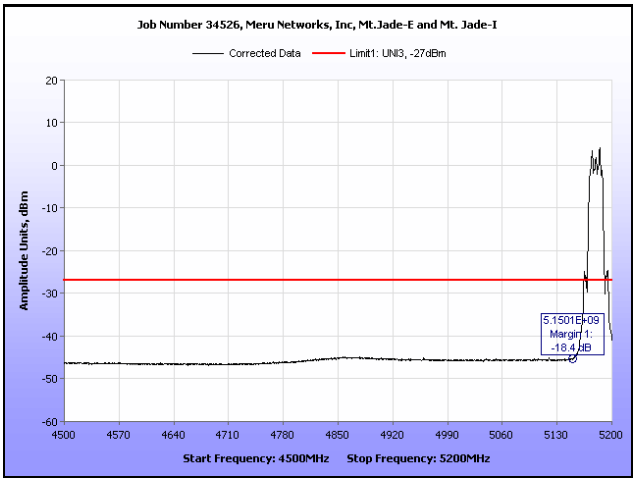


Plot 203. Radiated Band Edge, 802.11a, Low Channel, 6 dBi Dipole Antenna

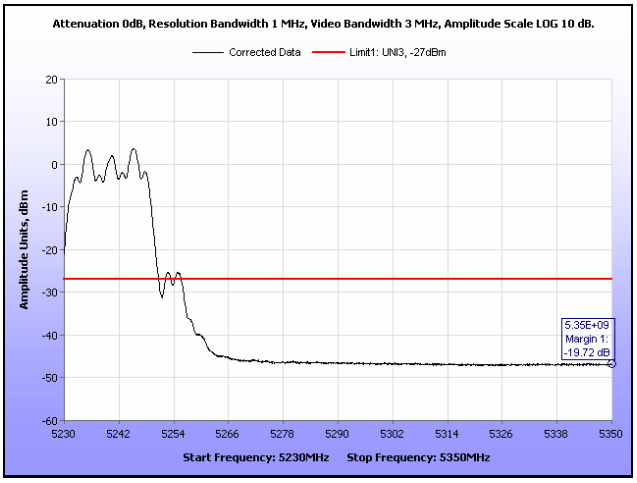


Plot 204. Radiated Band Edge, 802.11a, High Channel, 6 dBi Dipole Antenna

Radiated Band Edge, 802.11n 20 MHz, 6 dBi Dipole Antenna

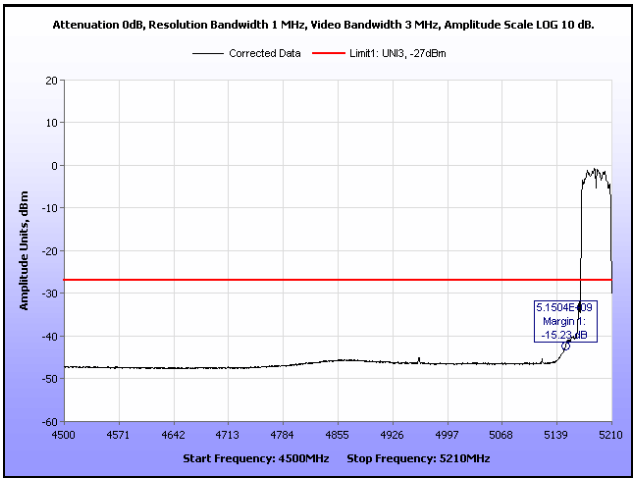


Plot 205. Radiated Band Edge, 802.11n 20 MHz, Low Channel, 6 dBi Dipole Antenna

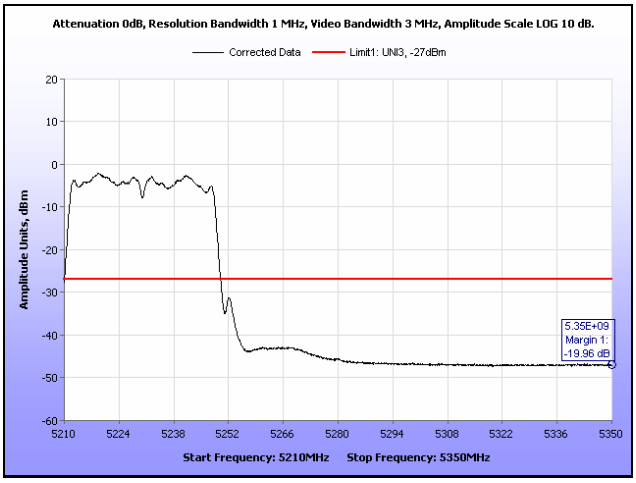


Plot 206. Radiated Band Edge, 802.11n 20 MHz, High Channel, 6 dBi Dipole Antenna

Radiated Band Edge, 802.11n 40 MHz, 6 dBi Dipole Antenna

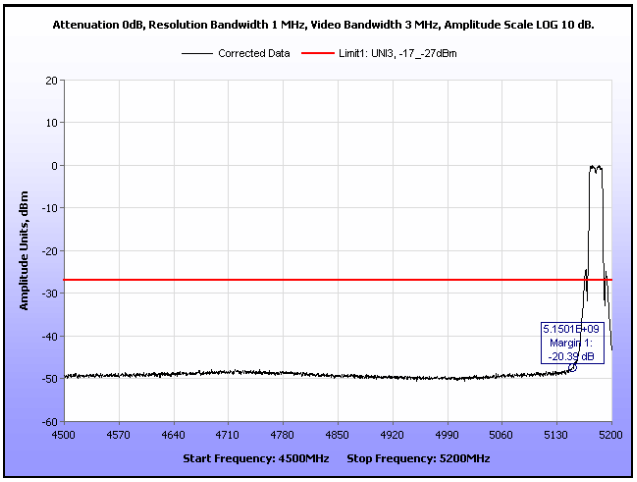


Plot 207. Radiated Band Edge, 802.11n 40 MHz, Low Channel, 6 dBi Dipole Antenna

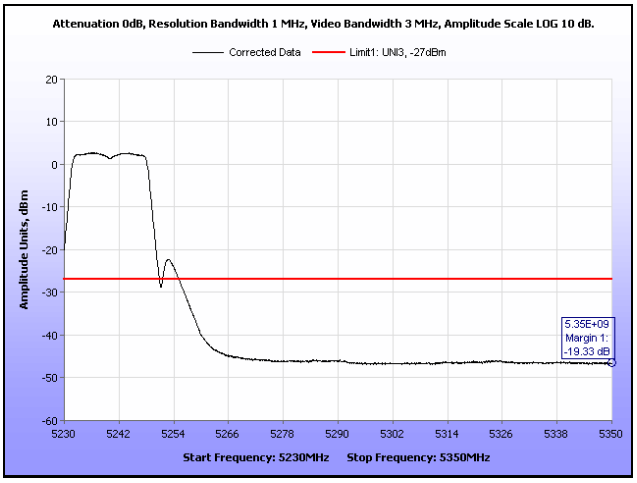


Plot 208. Radiated Band Edge, 802.11n 40 MHz, High Channel, 6 dBi Dipole Antenna

Radiated Band Edge, 802.11a, Ceiling Mount Antenna

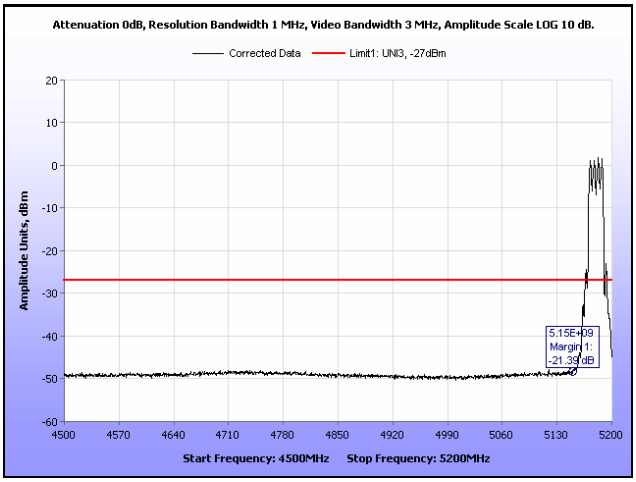


Plot 209. Radiated Band Edge, 802.11a, Low Channel, Ceiling Mount Antenna

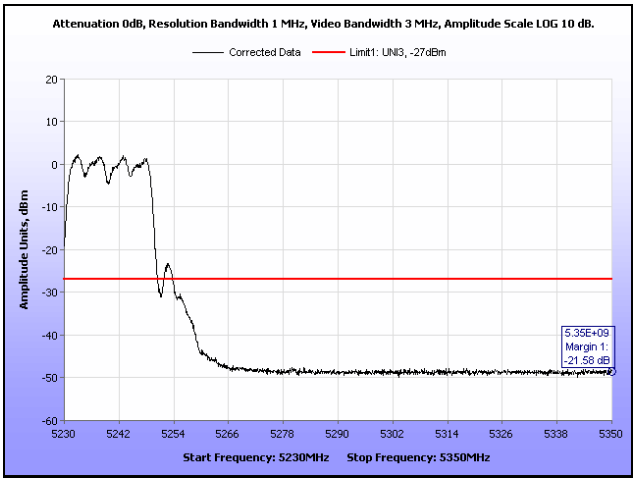


Plot 210. Radiated Band Edge, 802.11a, High Channel, Ceiling Mount Antenna

Radiated Band Edge, 802.11n 20 MHz, Ceiling Mount Antenna

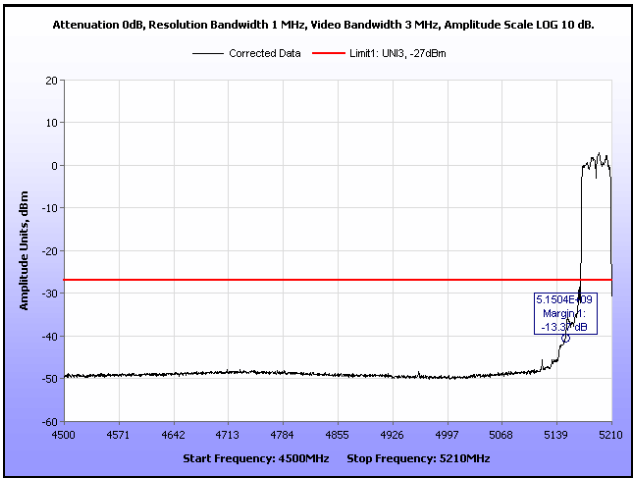


Plot 211. Radiated Band Edge, 802.11n 20 MHz, Low Channel, Ceiling Mount Antenna

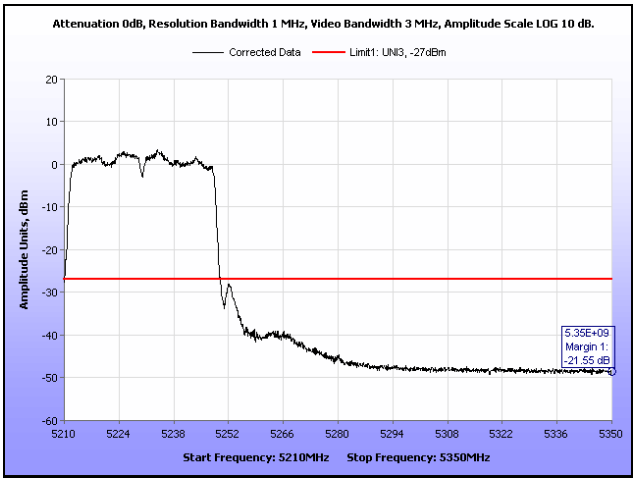


Plot 212. Radiated Band Edge, 802.11n 20 MHz, High Channel, Ceiling Mount Antenna

Radiated Band Edge, 802.11n 40 MHz, Ceiling Mount Antenna

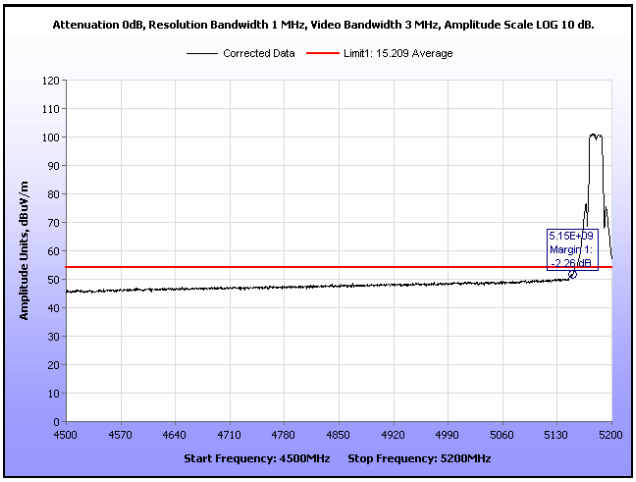


Plot 213. Radiated Band Edge, 802.11n 40 MHz, Low Channel, Ceiling Mount Antenna

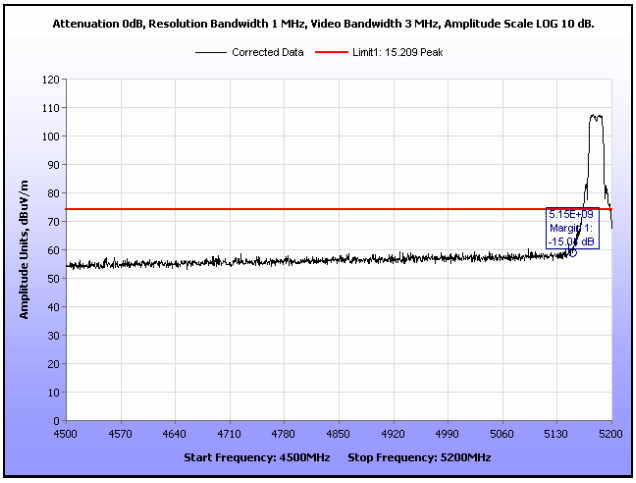


Plot 214. Radiated Band Edge, 802.11n 40 MHz, High Channel, Ceiling Mount Antenna

Restricted Band, 802.11a

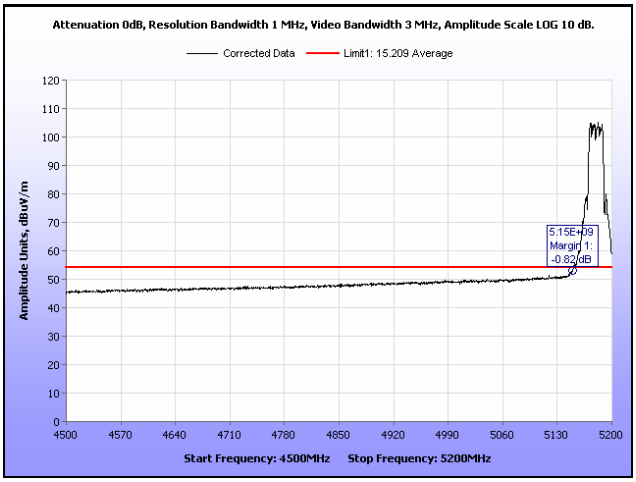


Plot 215. Restricted Band Edge, 802.11a, Low Channel, Average

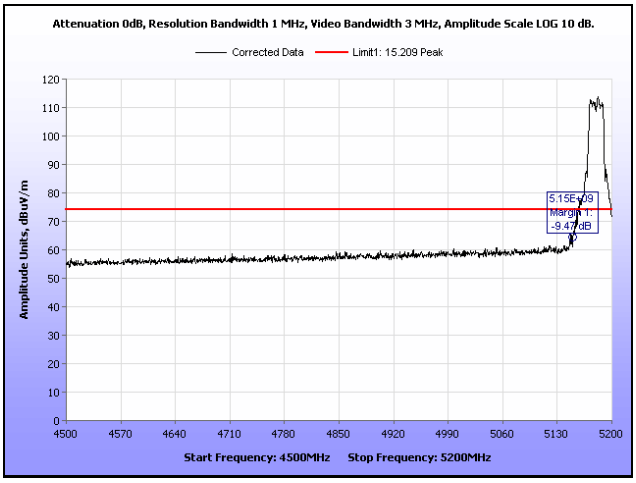


Plot 216. Restricted Band Edge, 802.11a, Low Channel, Peak

Restricted Band, 802.11n 20 MHz

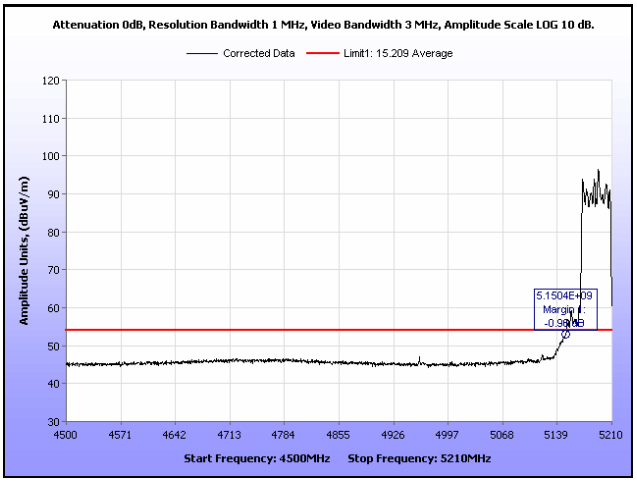


Plot 217. Restricted Band Edge, 802.11n 20 MHz, Low Channel, Average

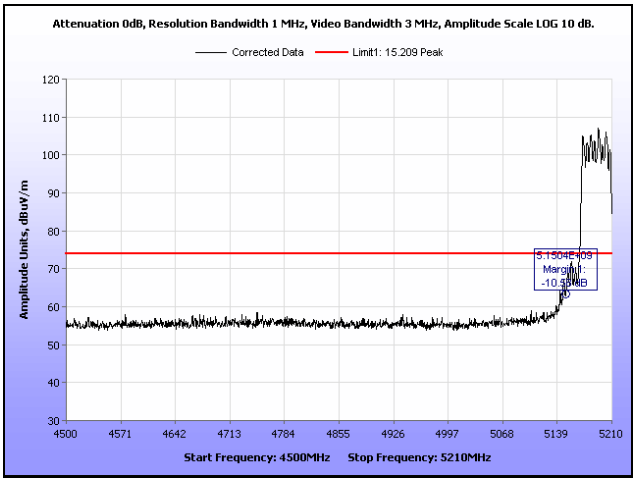


Plot 218. Restricted Band Edge, 802.11n 20 MHz, Low Channel, Peak

Restricted Band, 802.11n 40 MHz

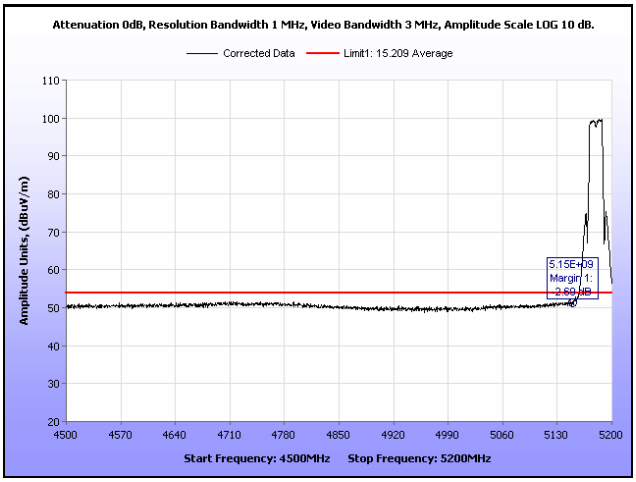


Plot 219. Restricted Band Edge, 802.11n 40 MHz, Low Channel, Average

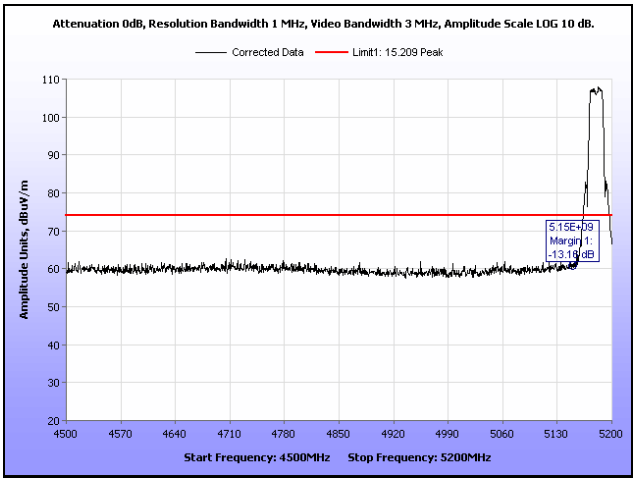


Plot 220. Restricted Band Edge, 802.11n 40 MHz, Low Channel, Peak

Restricted Band, 802.11a, Patch Antenna

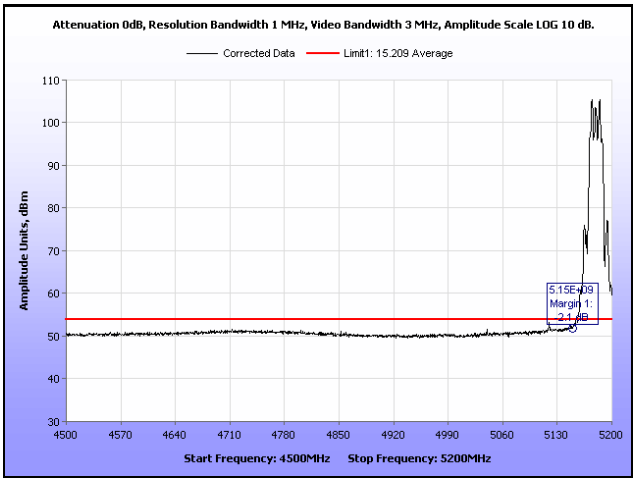


Plot 221. Restricted Band Edge, 802.11a, Low Channel, Average, Patch Antenna

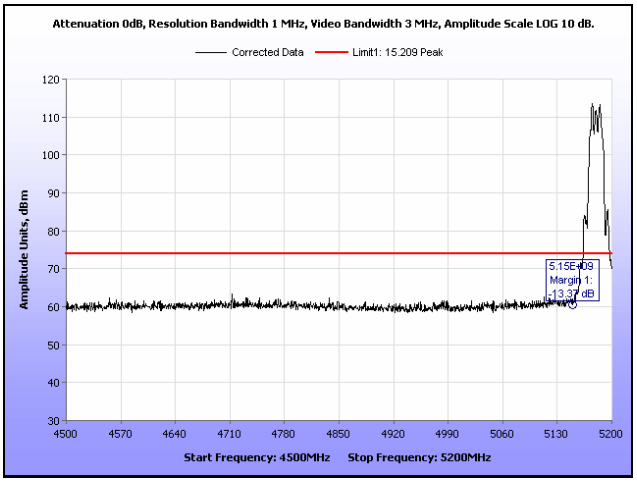


Plot 222. Restricted Band Edge, 802.11a, Low Channel, Peak, Patch Antenna

Restricted Band, 802.11n 20 MHz, Patch Antenna

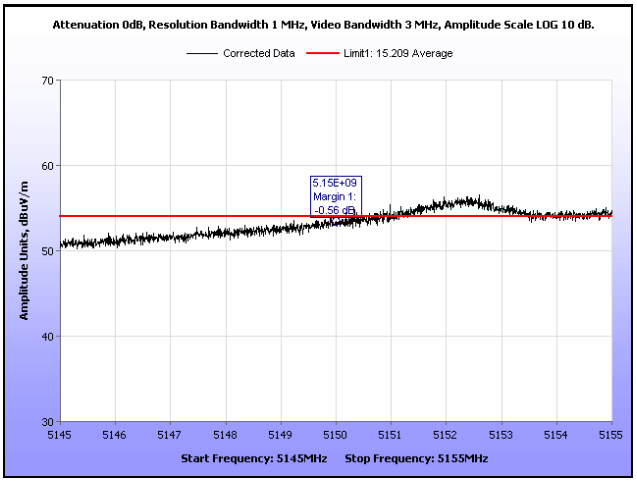


Plot 223. Restricted Band Edge, 802.11n 20 MHz, Low Channel, Average, Patch Antenna

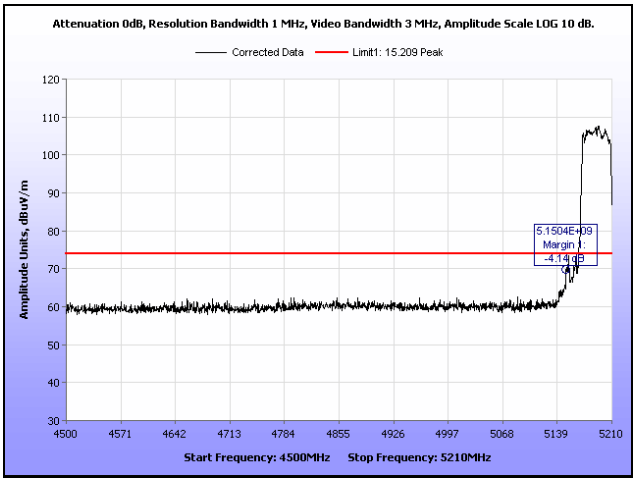


Plot 224. Restricted Band Edge, 802.11n 20 MHz, Low Channel, Peak, Patch Antenna

Restricted Band, 802.11n 40 MHz, Patch Antenna

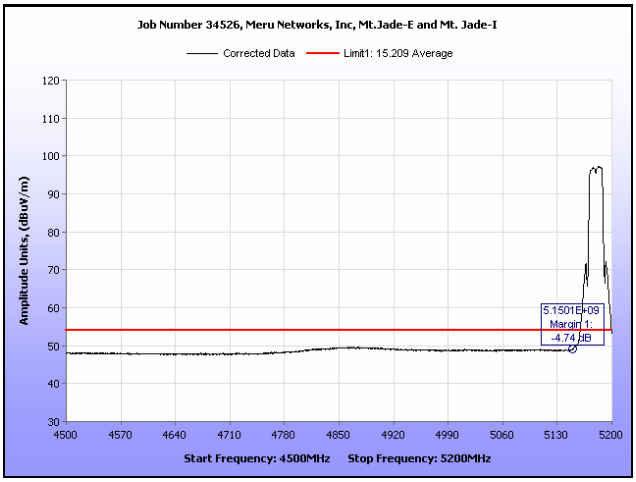


Plot 225. Restricted Band Edge, 802.11n 40 MHz, Low Channel, Average, Patch Antenna

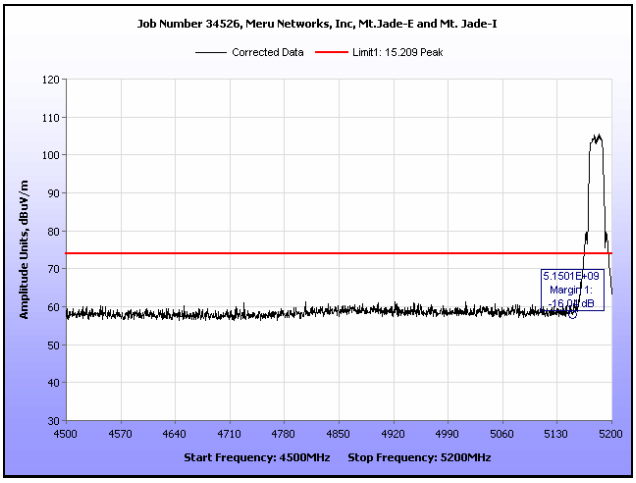


Plot 226. Restricted Band Edge, 802.11n 40 MHz, Low Channel, Peak, Patch Antenna

Restricted Band, 802.11a, 6 dBi Dipole Antenna

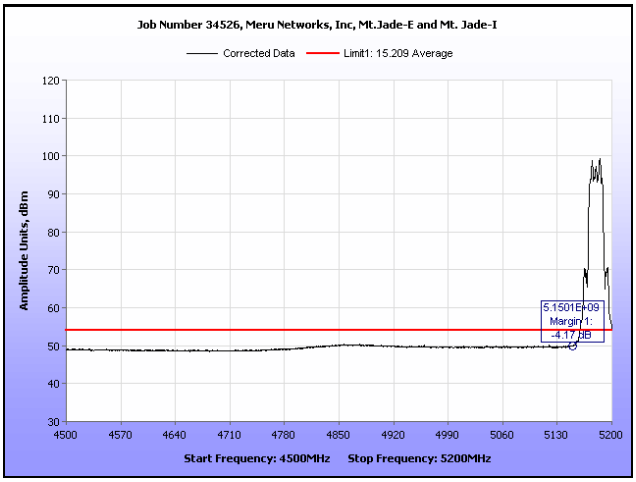


Plot 227. Restricted Band Edge, 802.11a, Low Channel, Average, 6 dBi Dipole Antenna

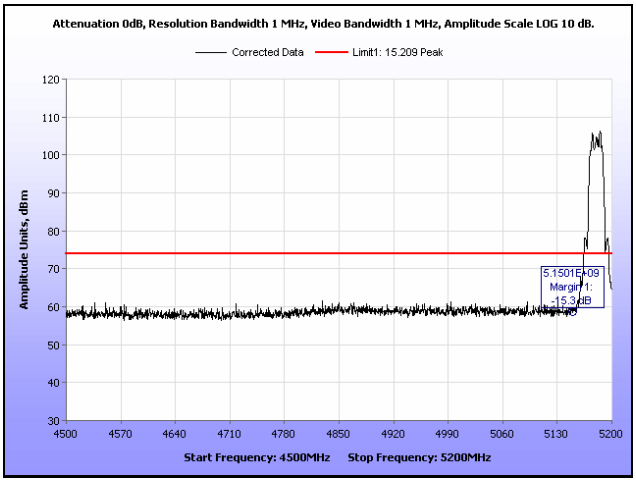


Plot 228. Restricted Band Edge, 802.11a, Low Channel, Peak, 6 dBi Dipole Antenna

Restricted Band, 802.11n 20 MHz, 6 dBi Dipole Antenna

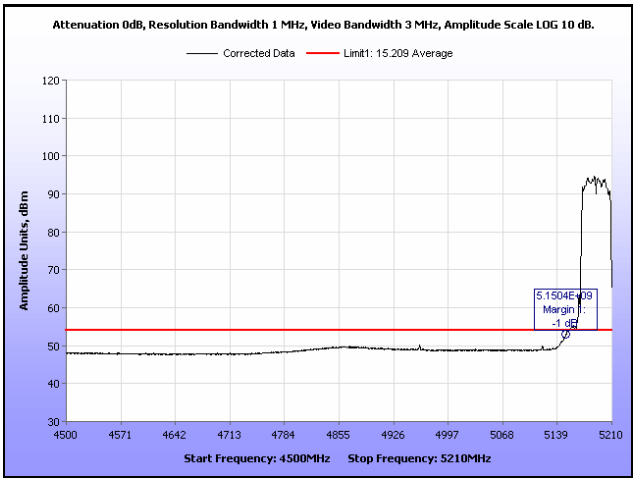


Plot 229. Restricted Band Edge, 802.11n 20 MHz, Low Channel, Average, 6 dBi Dipole Antenna

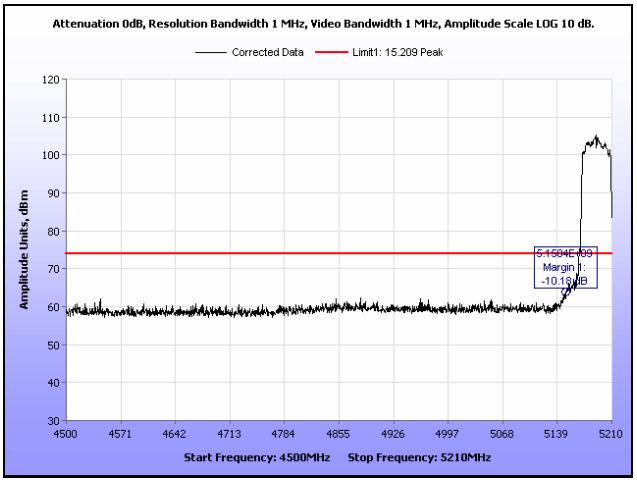


Plot 230. Restricted Band Edge, 802.11n 20 MHz, Low Channel, Peak, 6 dBi Dipole Antenna

Restricted Band, 802.11n 40 MHz, 6 dBi Dipole Antenna

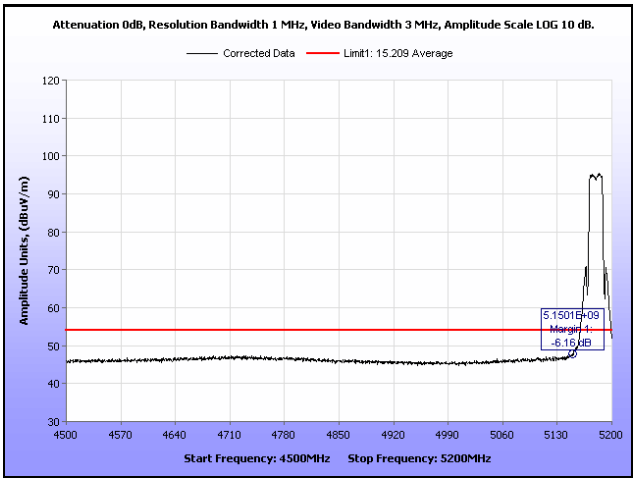


Plot 231. Restricted Band Edge, 802.11n 40 MHz, Low Channel, Average, 6 dBi Dipole Antenna

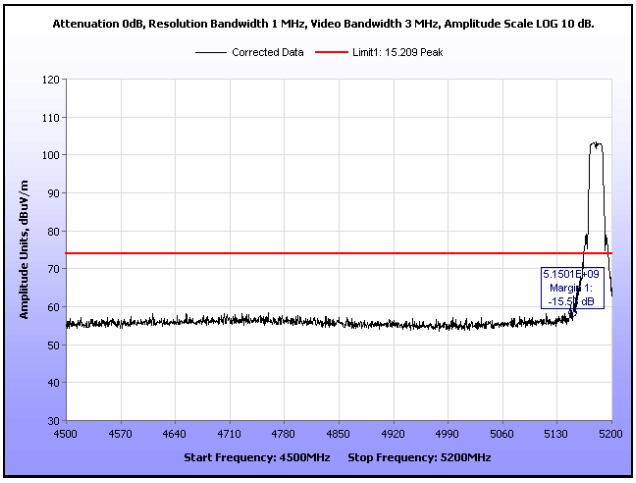


Plot 232. Restricted Band Edge, 802.11n 40 MHz, Low Channel, Peak, 6 dBi Dipole Antenna

Restricted Band, 802.11a, Ceiling Mount Antenna

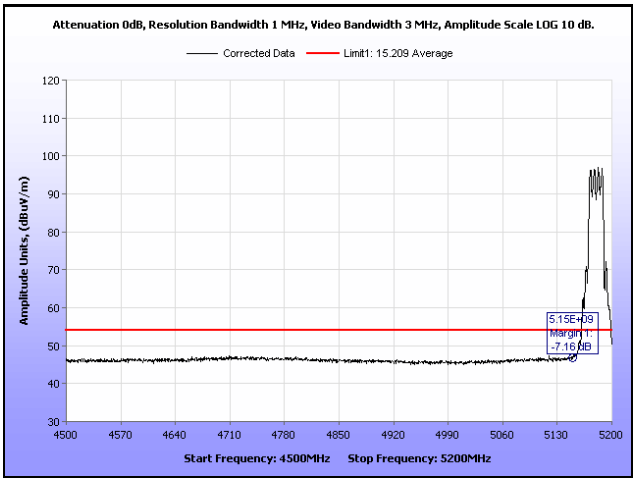


Plot 233. Restricted Band Edge, 802.11a, Low Channel, Average, Ceiling Mount Antenna

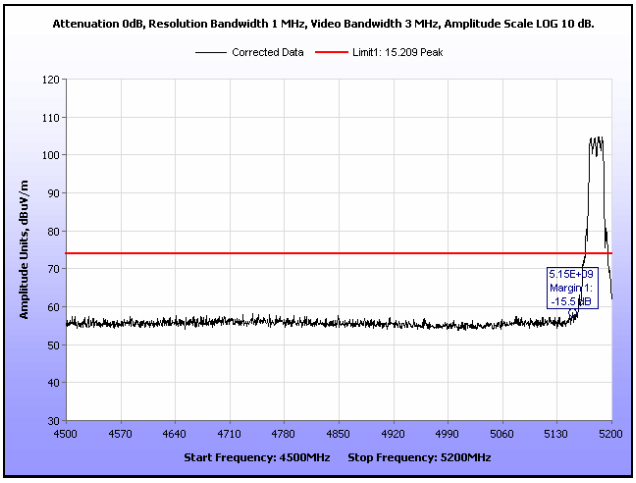


Plot 234. Restricted Band Edge, 802.11a, Low Channel, Peak, Ceiling Mount Antenna

Restricted Band, 802.11n 20 MHz, Ceiling Mount Antenna

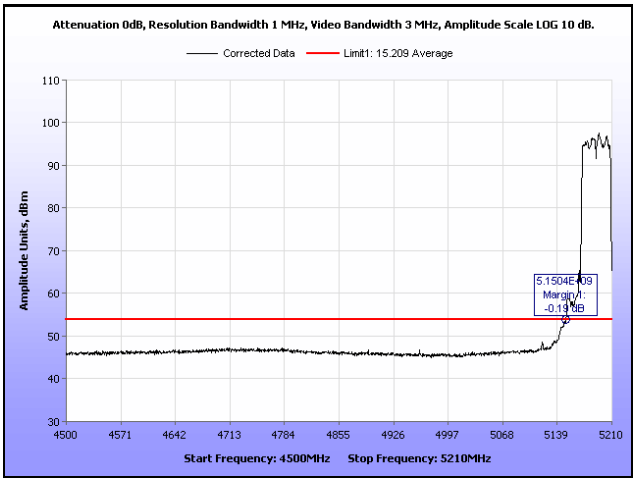


Plot 235. Restricted Band Edge, 802.11n 20 MHz, Low Channel, Average, Ceiling Mount Antenna

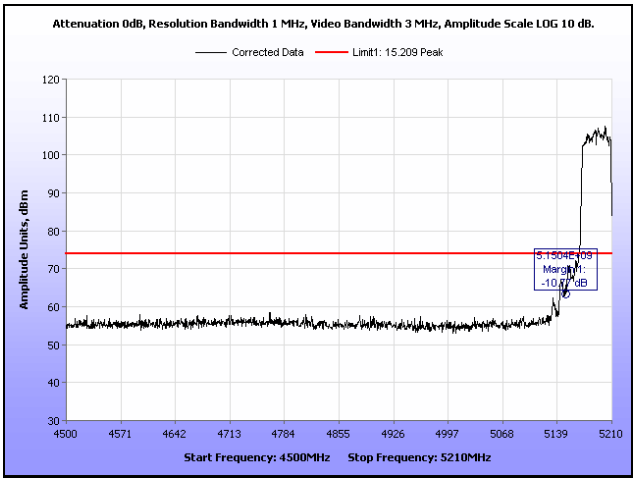


Plot 236. Restricted Band Edge, 802.11n 20 MHz, Low Channel, Peak, Ceiling Mount Antenna

Restricted Band, 802.11n 40 MHz, Ceiling Mount Antenna



Plot 237. Restricted Band Edge, 802.11n 40 MHz, Low Channel, Average, Ceiling Mount Antenna



Plot 238. Restricted Band Edge, 802.11n 40 MHz, Low Channel, Peak, Ceiling Mount Antenna

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit Calculation: EUT's operating frequencies @ 5150-5250 MHz; highest conducted power = 16.14 dBm (Sample) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

Equation from page 18 of OET 65, Edition 97-01

$S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (41.11mW)
G = Highest Antenna Gain (15.03 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S = (41.11 * 15.03)/(4*3.14*20^2) = 618.02/5024 = 0.123$ mW/cm^2

Since $S < 1$ mW/cm^2, the minimum distance (R) is 20cm

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

Test Requirements: **§ 15.407(g):** Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

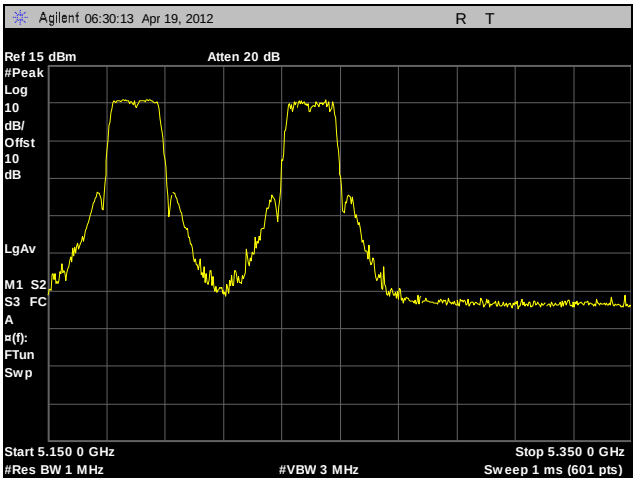
Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The resolution band width of the spectrum analyzer was set to 1 MHz.

Test Results: The EUT was compliant with the requirements of **§15.407(g)**.

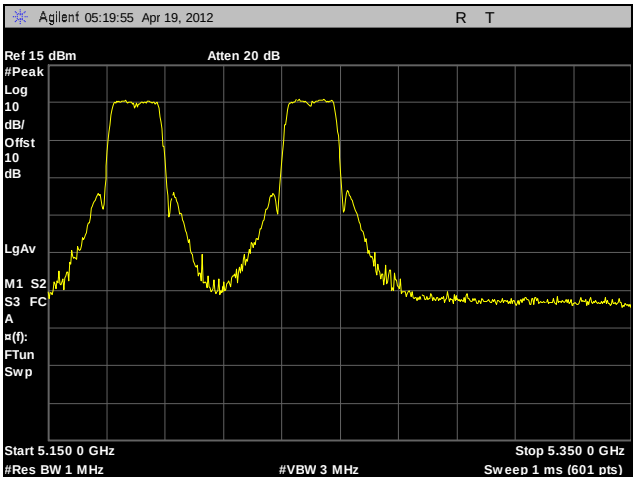
Test Engineer(s): Jeff Pratt

Test Date(s): 04/19/12

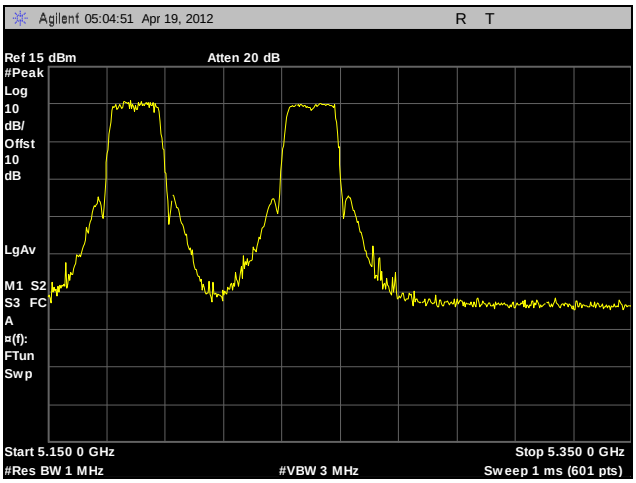
Frequency Stability



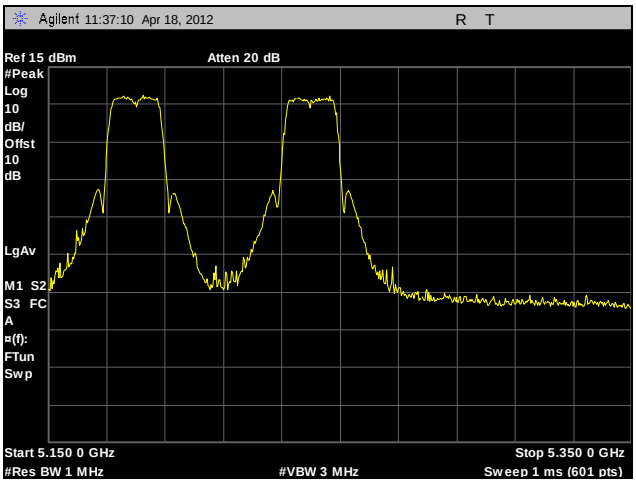
Plot 239. Frequency Stability, 5150 – 5250 MHz, -30°C, 120 V



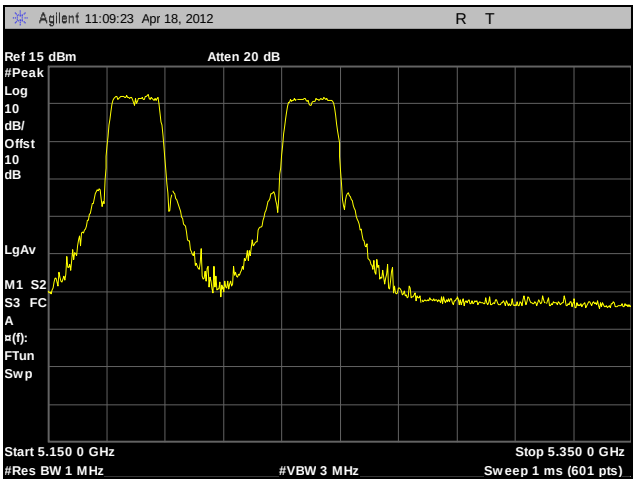
Plot 240. Frequency Stability, 5150 – 5250 MHz, -20°C, 120 V



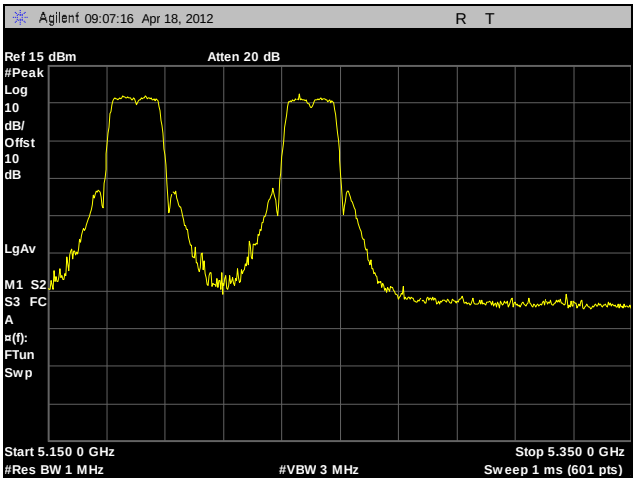
Plot 241. Frequency Stability, 5150 – 5250 MHz, -10°C, 120 V



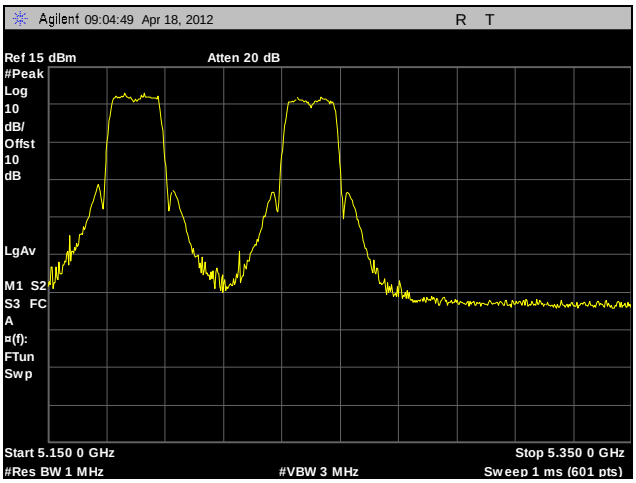
Plot 242. Frequency Stability, 5150 – 5250 MHz, 0°C, 120 V



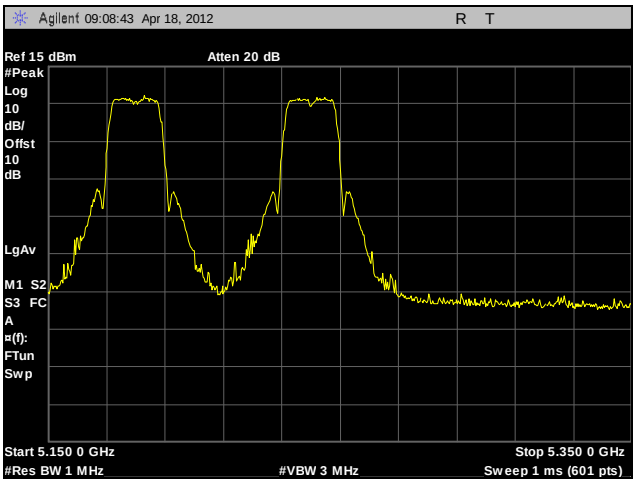
Plot 243. Frequency Stability, 5150 – 5250 MHz, 10°C, 120 V



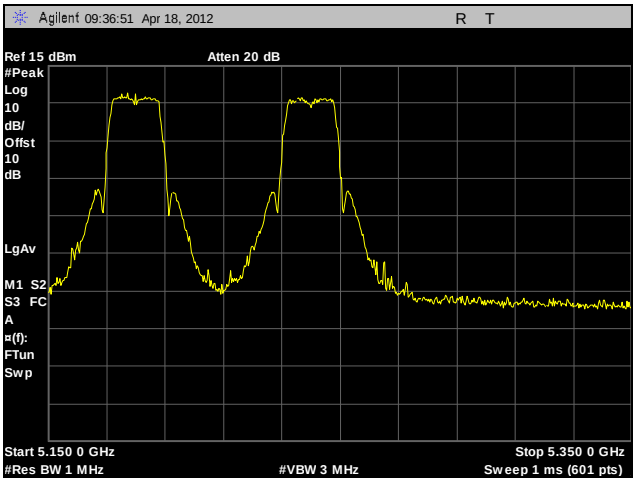
Plot 244. Frequency Stability, 5150 – 5250 MHz, 20°C, 108 V



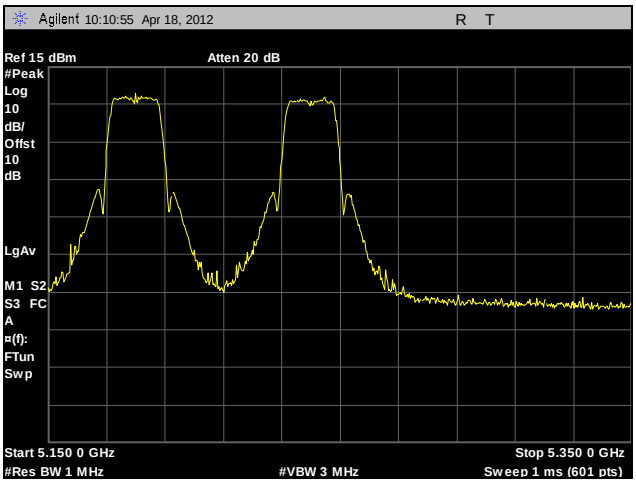
Plot 245. Frequency Stability, 5150 – 5250 MHz, 20°C, 120 V



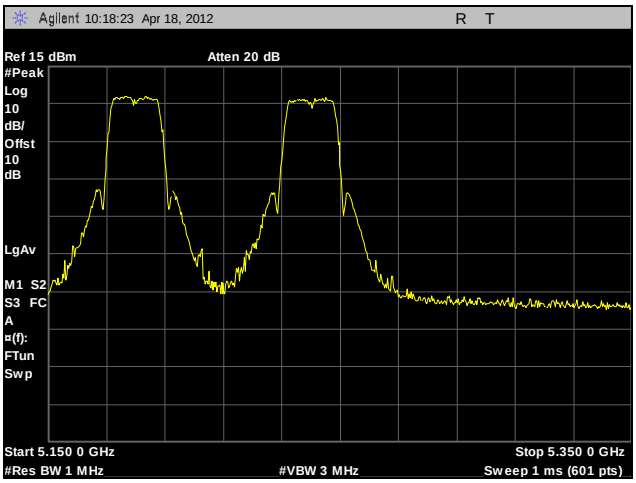
Plot 246. Frequency Stability, 5150 – 5250 MHz, 20°C, 132 V



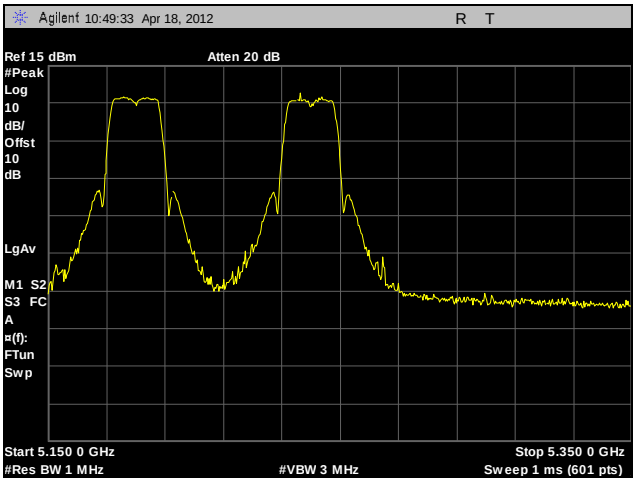
Plot 247. Frequency Stability, 5150 – 5250 MHz, 30°C, 120 V



Plot 248. Frequency Stability, 5150 – 5250 MHz, 40°C, 120 V



Plot 249. Frequency Stability, 5150 – 5250 MHz, 50°C, 120 V



Plot 250. Frequency Stability, 5150 – 5250 MHz, 55°C, 120 V

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN Receiver Spurious Emissions Requirements

Test Requirements: The following receiver spurious emission limits shall be complied with:

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 16.

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 16. Spurious Emission Limits for Receivers

(b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

Test Procedures: The EUT was programmed for receive mode only. Conducted measurements were taken at the antenna port of the EUT. 100 kHz resolution bandwidth was used from 30 MHz - 1 GHz and 1 MHz resolution was used for measurements done above 1 GHz. All plots are corrected for cable loss.

Test Results: Equipment is compliant with the Receiver Spurious Emissions Requirements of RSS-GEN.

Test Engineer(s): Anderson Soungpanya and Lionel Gabrillo

Test Date(s): 05/09/12

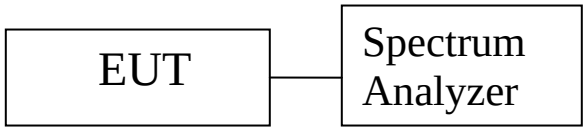
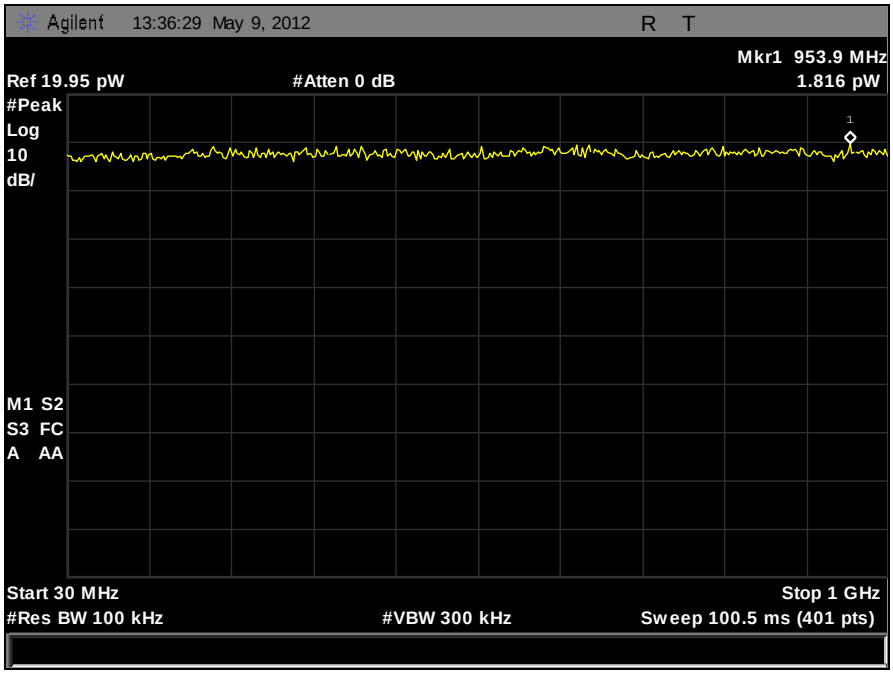
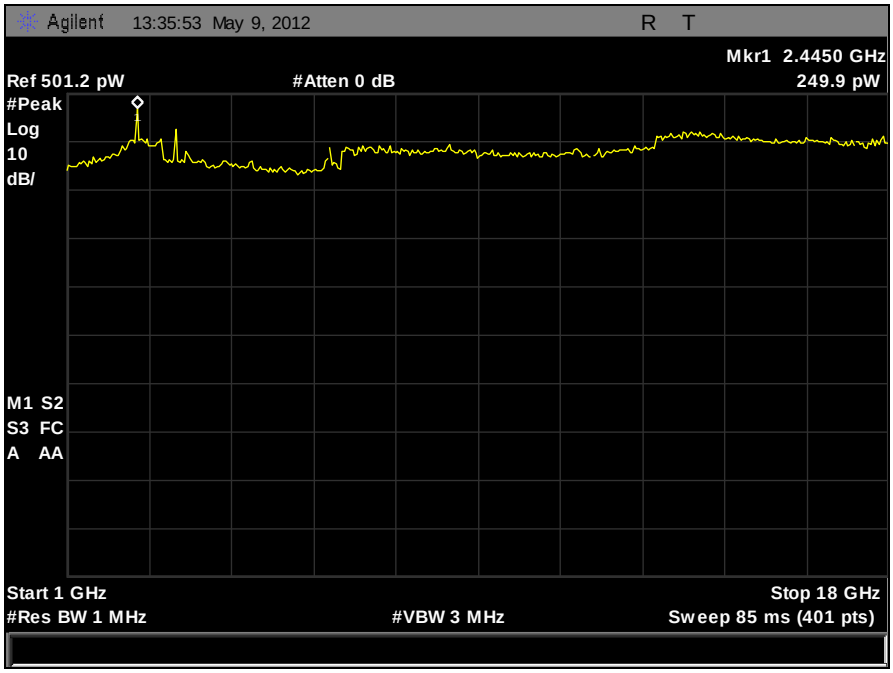


Figure 6. Block Diagram, Conducted Receiver Spurious Emissions Test Setup

Conducted Receiver Spurious Emissions (Port 1)

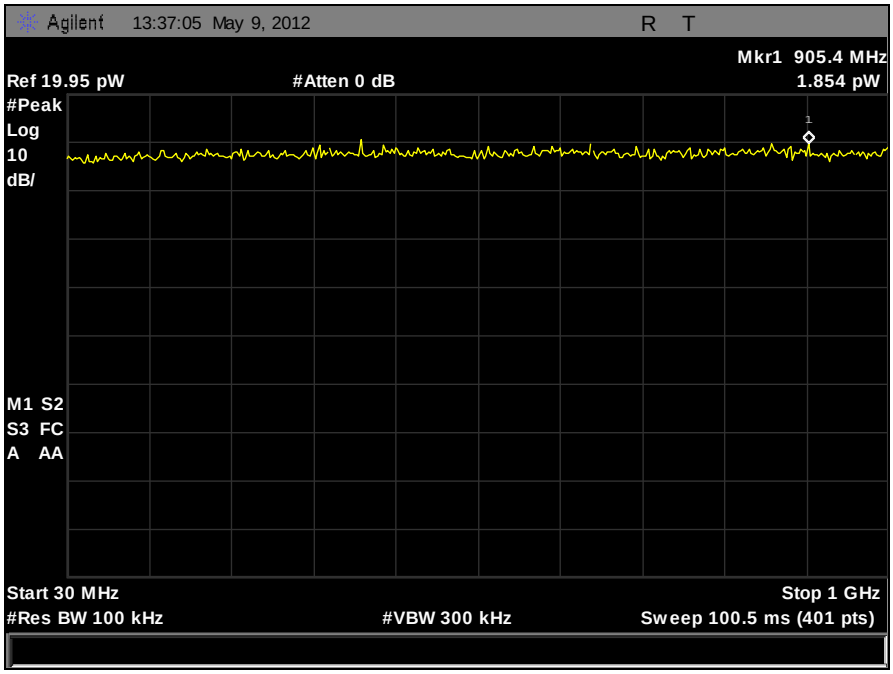


Plot 251. Receiver Spurious Emission, 30 MHz – 1 GHz (Port 1)

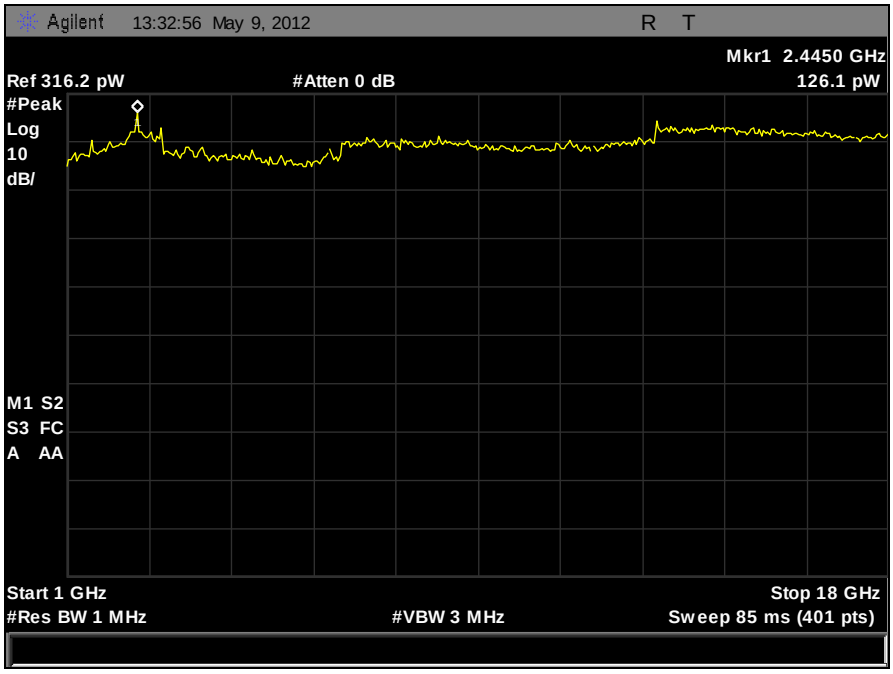


Plot 252. Receiver Spurious Emission, 1 GHz – 18 GHz (Port 1)

Conducted Receiver Spurious Emissions (Port 2)

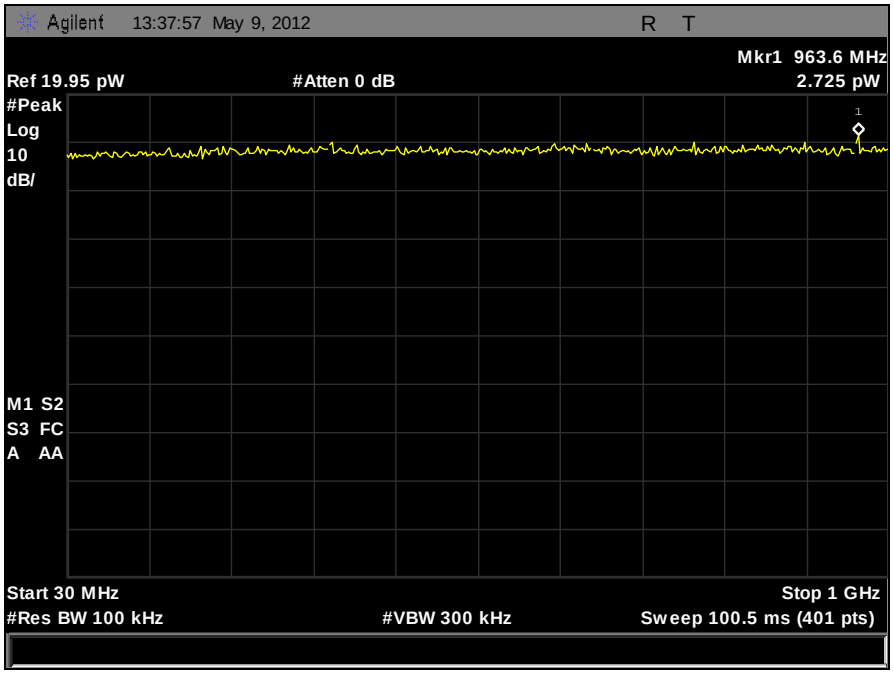


Plot 253. Receiver Spurious Emission, 30 MHz – 1 GHz (Port 2)

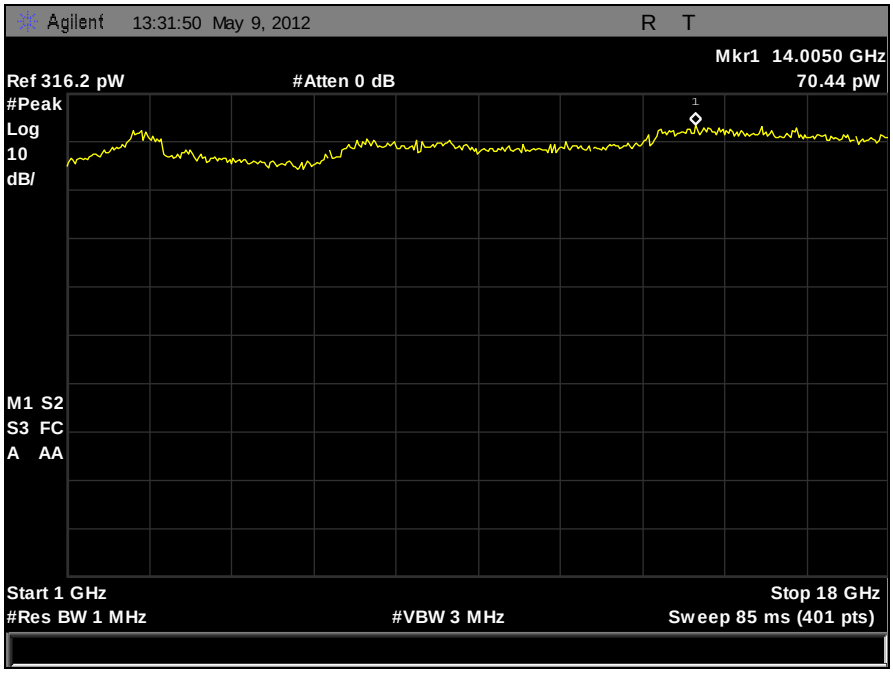


Plot 254. Receiver Spurious Emission, 1 GHz – 18 GHz (Port 2)

Conducted Receiver Spurious Emissions (Port 3)



Plot 255. Receiver Spurious Emission, 30 MHz – 1 GHz (Port 3)



Plot 256. Receiver Spurious Emission, 1 GHz – 18 GHz (Port 3)

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Description	Manufacturer	Model	Cal Date	Cal Due Date
1T4771	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	6/25/2011	6/25/2012
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	6/14/2011	6/14/2012
1T4505	TEMPERATURE CHAMBER	TEST EQUITY	115	11/30/2011	11/30/2012
1T4751	ANTENNA – BILOG	SUNOL SCIENCES	JB6	12/7/2011	12/7/2012
1T4757	ANTENNA; HORN	ETS-LINDGREN	3117	2/18/2012	8/18/2013
1T4745	ANTENNA; HORN	ETS-LINDGREN	3116	10/4/2011	10/4/2012
1T4442	PRE-AMPLIFIER; MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4752	PRE-AMPLIFIER	MITEQ	JS44-18004000-35-8P	SEE NOTE	
1T4300A	SEMI-ANECHOIC CHAMBER #1	EMC TEST SYSTEMS	NONE	1/31/2010	1/31/2013
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	SEE NOTE	
1T4503	SHIELDED ROOM	UNIVERSAL SHIELDING CORP	N/A	SEE NOTE	
1T4563	LISN (10 AMP)	SOLAR ELECTRONICS	9322-50-R-10-BNC	11/30/2011	11/30/2012
1T4564	LISN (24 AMP)	SOLAR ELECTRONICS	9252-50-R-24-BNC	11/4/2011	11/4/2012
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	
1T4502	COMB GENERATOR	COM-POWER	CGC-255	11/3/2011	11/3/2012

Table 17. Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Verification & User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

End of Report

