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 17, 2013

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

Dear Rajendran Chary,

Enclosed is the EMC Wireless test report for the testing of the Meru Networks, Inc., Dual Radio 802.11abgn 3x3 Access Point with internal antenna – AP332i 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.\EMCS34526B-FCC407 Rev. 4 (UNII 2))

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Electromagnetic Compatibility Criteria
Test Report

for the

Meru Networks, Inc.
Model Dual Radio 802.11abgn 3x3 Access Point with internal antenna – AP332i

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

MET Report: EMCS34526B-FCC407 Rev. 4(UNII 2)

December 17, 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 Draft Status Sheet

Draft Revision	Report Draft Date	Reason for Draft Revision
∅	December 23, 2012	Initial Draft Issue.
1	October 21, 2013	Revised to add DFS test data.
2	November 12, 2013	Revised to reflect customer information.
3	December 2, 2013	Revised to reflect engineer corrections.
4	December 17, 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 internal antenna – AP332i, 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 internal antenna – AP332i. 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 internal antenna – AP332i, 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
15.407 (h)(2)(ii)	--	Initial Channel Availability Check Time	Compliant
15.407 (h)	--	DFS Bandwidth	Compliant
15.407 (h)(2)(ii)	--	Radar Burst at the Beginning of Channel Availability Check Time	Compliant
15.407 (h)(2)(ii)	--	Radar Burst at the End of Channel Availability Check Time	Compliant
15.407 (h)(2)(iii)	--	Channel Move Time and Channel Closing Time	Compliant
15.407 (h)(2)(iv)	--	Non-Occupancy Period	Compliant
15.407 (h)(2)	--	Statistical Performance Check	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 internal antenna – AP332i, 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 internal antenna – AP332i.

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

Model(s) Tested:	Dual Radio 802.11abgn 3x3 Access Point with internal antenna – AP332i	
Model(s) Covered:	Dual Radio 802.11abgn 3x3 Access Point with internal antenna – AP332i	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: RE7-AP332I IC: 6749A-AP332I	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Peak RF Output Power:	18.03 dBm
	EUT Frequency Ranges:	5260-5320 MHz and 5500-5700 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 17, 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 internal antenna – AP332i, 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.

Photograph 1. Meru Networks, Inc. Dual Radio 802.11abgn 3x3 Access Point with internal antenna – AP332i

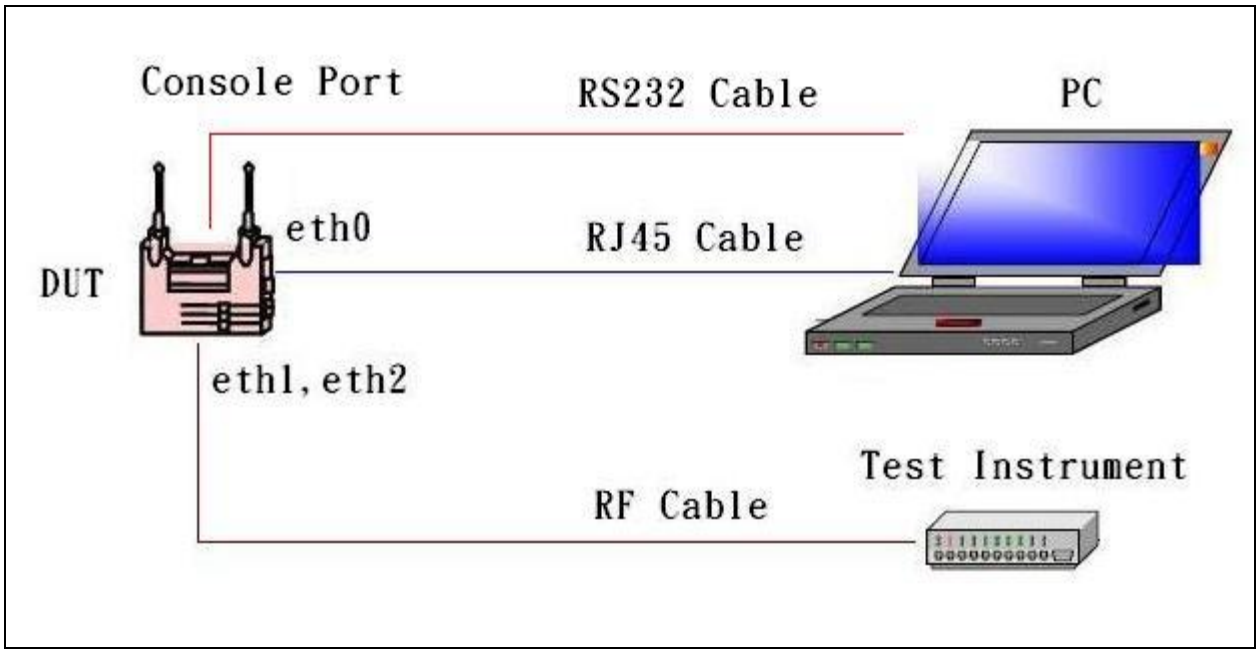


Figure 1. Block Diagram of Test Configuration

E. Support Equipment

Meru Networks, Inc. supplied support equipment necessary for the operation and testing of the Dual Radio 802.11abgn 3x3 Access Point with internal antenna – AP332i. All support equipment supplied is listed in the following Support Equipment List.

SN	Type	Model and Serial Number	Quantity
2	AP433i	SN: 112A332e0DEE9D,112A332e0DEE9B, 112A332e0DEE9F	3
--	Antenna	ERU-ANT-PI622 Internal PIFA Dual-Band 3 x 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. The device is professionally installed. This model also has an integral antenna, so it is also compliant because of this.

Test Engineer(s): Jeff Pratt

Test Date(s): 05/23/12

Gain (dBi)		Antenna Type	Antenna Description	Manufacturer	Model Number
2.4 GHz	5 GHz				
4	5	Planar Inverted-F Antenna (PIFA)	Internal PIFA Dual-Band 3 x 3	Meru	ERU-ANT-PI622

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.

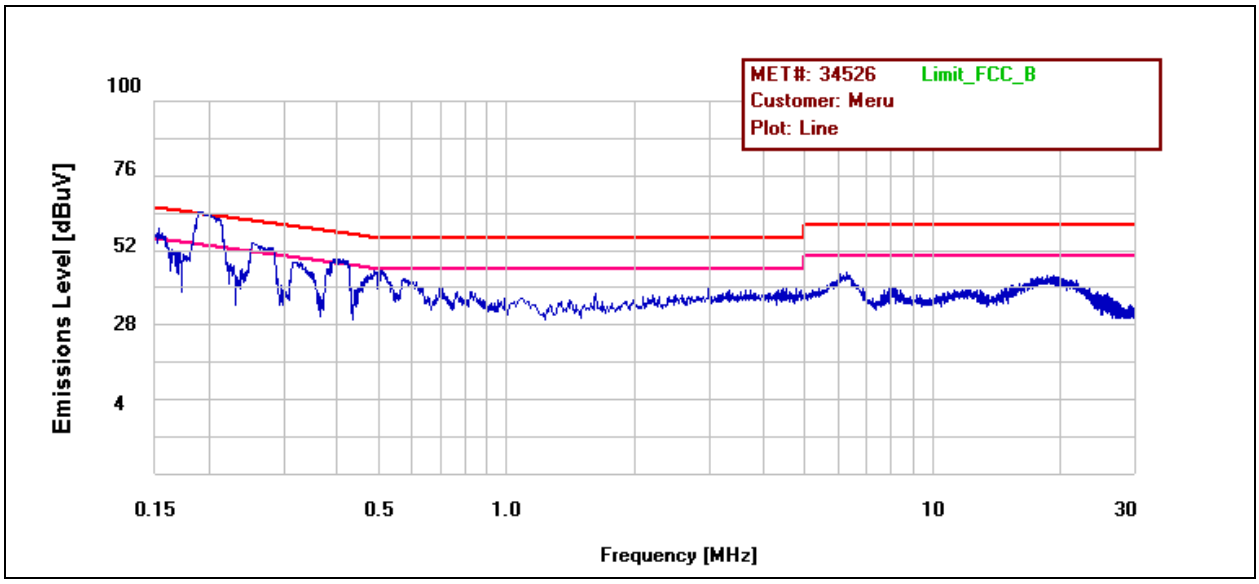
Test Engineer(s): Anderson Soungpanya

Test Date(s): 05/07/12

15.207(a) Conducted Emissions Test Results

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

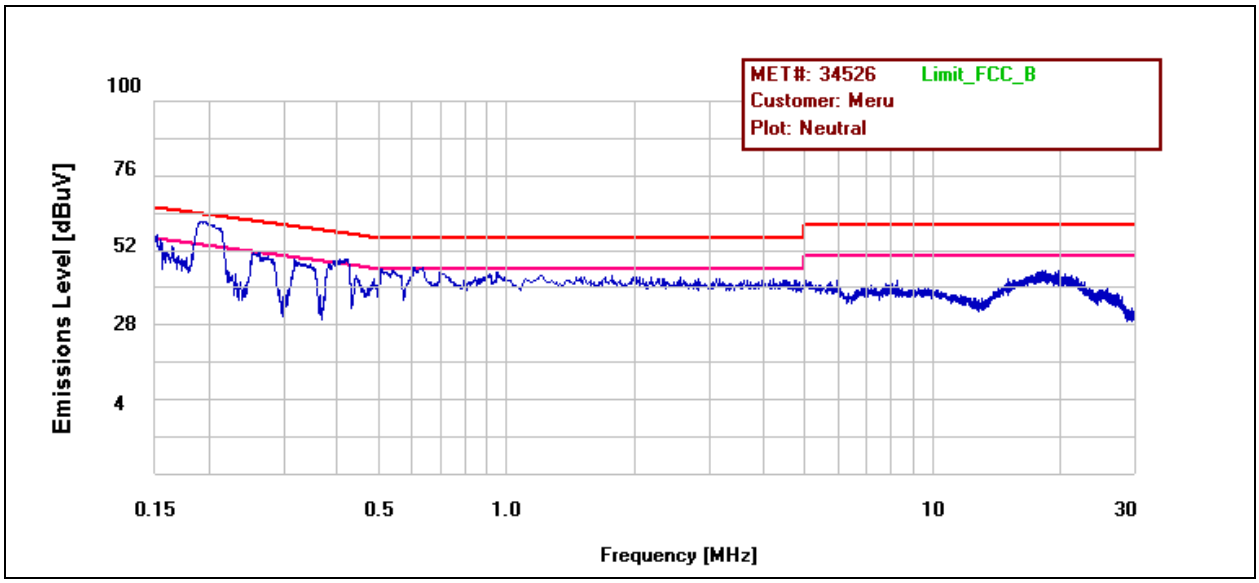


Plot 1. Conducted Emissions, 15.207(a), Phase Line

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



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

15.207(a) Conducted Emissions Test Setup

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

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 both 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): 05/24/12

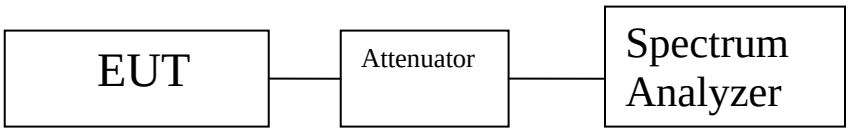


Figure 2. Occupied Bandwidth, Test Setup

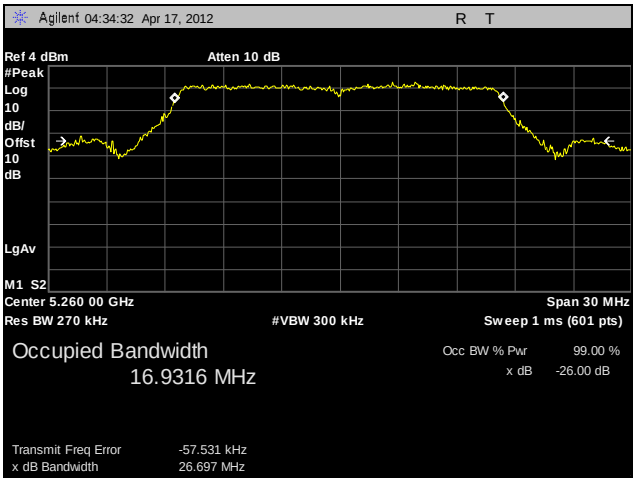
Mode	Frequency (MHz)	26 dB Bandwidth (MHz)
802.11a A4	5260	26.697
	5300	27.902
	5320	27.231
	5500	26.870
	5580	27.878
	5700	27.534
802.11n 20 MHz A4	5260	27.468
802.11n 20 MHz A5	5260	26.348
802.11n 20 MHz A6	5260	26.839
802.11n 20 MHz A4	5300	27.096
802.11n 20 MHz A5	5300	26.643
802.11n 20 MHz A6	5300	26.794
802.11n 20 MHz A4	5320	27.260
802.11n 20 MHz A5	5320	26.364
802.11n 20 MHz A6	5320	25.808
802.11n 20 MHz A4	5500	27.705
802.11n 20 MHz A5	5500	26.413
802.11n 20 MHz A6	5500	26.779
802.11n 20 MHz A4	5580	27.178
802.11n 20 MHz A5	5580	25.821
802.11n 20 MHz A6	5580	26.328
802.11n 20 MHz A4	5700	27.274
802.11n 20 MHz A5	5700	27.120
802.11n 20 MHz A6	5700	27.183
802.11n 40 MHz A4	5270	39.097
802.11n 40 MHz A5	5270	39.418
802.11n 40 MHz A6	5270	39.387
802.11n 40 MHz A4	5310	39.246
802.11n 40 MHz A5	5310	39.591
802.11n 40 MHz A6	5310	39.318
802.11n 40 MHz A4	5510	39.360
802.11n 40 MHz A5	5510	39.538
802.11n 40 MHz A6	5510	39.444
802.11n 40 MHz A4	5670	39.241
802.11n 40 MHz A5	5670	39.487
802.11n 40 MHz A6	5670	39.367

Table 10. 26 dB Occupied Bandwidth, Test Results

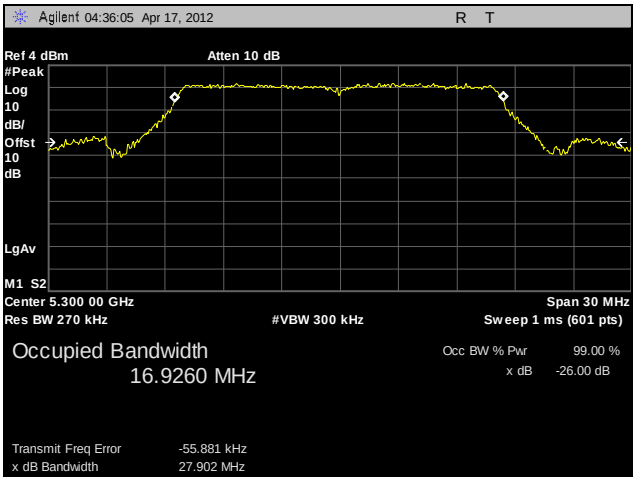
Mode	Frequency (MHz)	99% Bandwidth (MHz)
802.11a A4	5260	16.59
	5300	16.52
	5320	16.52
	5500	16.48
	5580	16.76
	5700	16.43
802.11n 20 MHz A4	5260	17.67
802.11n 20 MHz A5	5260	17.59
802.11n 20 MHz A6	5260	17.81
802.11n 20 MHz A4	5300	17.69
802.11n 20 MHz A5	5300	17.70
802.11n 20 MHz A6	5300	17.79
802.11n 20 MHz A4	5320	17.78
802.11n 20 MHz A5	5320	17.68
802.11n 20 MHz A6	5320	17.67
802.11n 20 MHz A4	5500	17.78
802.11n 20 MHz A5	5500	17.80
802.11n 20 MHz A6	5500	17.81
802.11n 20 MHz A4	5580	17.72
802.11n 20 MHz A5	5580	17.79
802.11n 20 MHz A6	5580	17.75
802.11n 20 MHz A4	5700	17.62
802.11n 20 MHz A5	5700	17.67
802.11n 20 MHz A6	5700	17.78
802.11n 40 MHz A4	5270	36.50
802.11n 40 MHz A5	5270	36.63
802.11n 40 MHz A6	5270	36.34
802.11n 40 MHz A4	5310	36.15
802.11n 40 MHz A5	5310	36.70
802.11n 40 MHz A6	5310	36.36
802.11n 40 MHz A4	5510	36.57
802.11n 40 MHz A5	5510	36.98
802.11n 40 MHz A6	5510	36.14
802.11n 40 MHz A4	5670	36.76
802.11n 40 MHz A5	5670	36.70
802.11n 40 MHz A6	5670	37.14

Table 11. 99% Occupied Bandwidth, Test Results

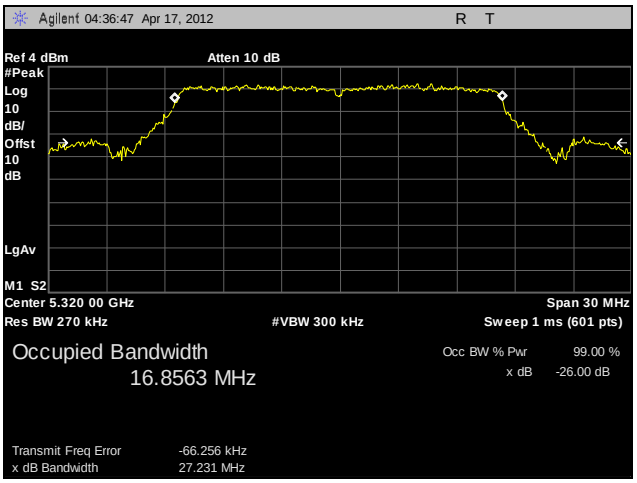
Electromagnetic Compatibility Criteria for Intentional Radiators



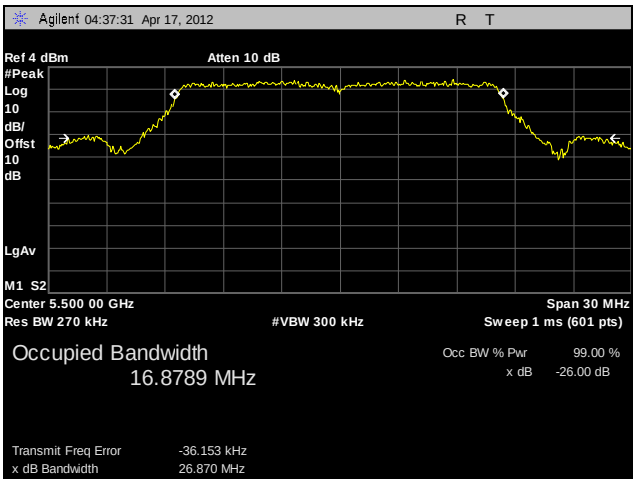
Plot 3. 26 dB Occupied Bandwidth, 802.11a, 5260 MHz, A4



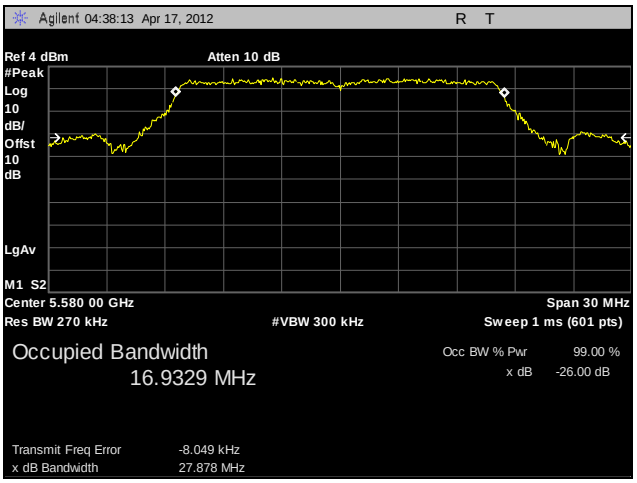
Plot 4. 26 dB Occupied Bandwidth, 802.11a, 5300 MHz, A4



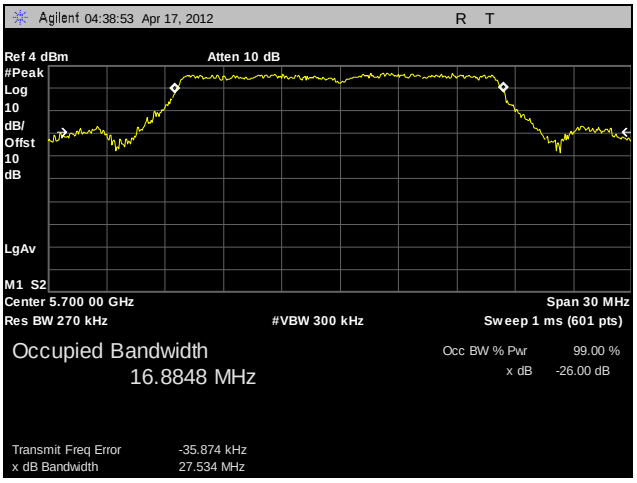
Plot 5. 26 dB Occupied Bandwidth, 802.11a, 5320 MHz, A4



Plot 6. 26 dB Occupied Bandwidth, 802.11a, 5500 MHz, A4

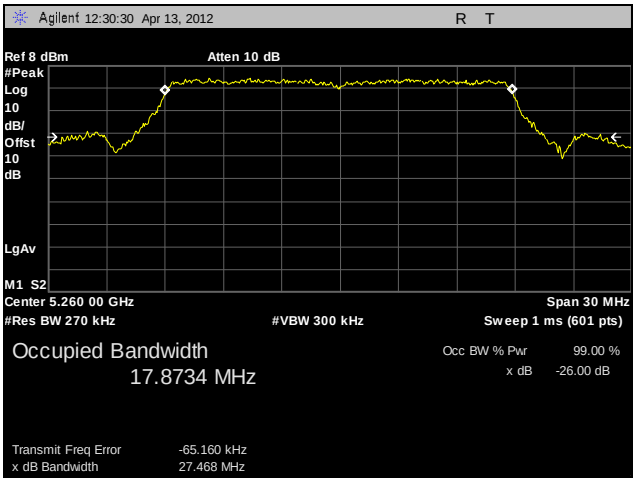


Plot 7. 26 dB Occupied Bandwidth, 802.11a, 5580 MHz, A4

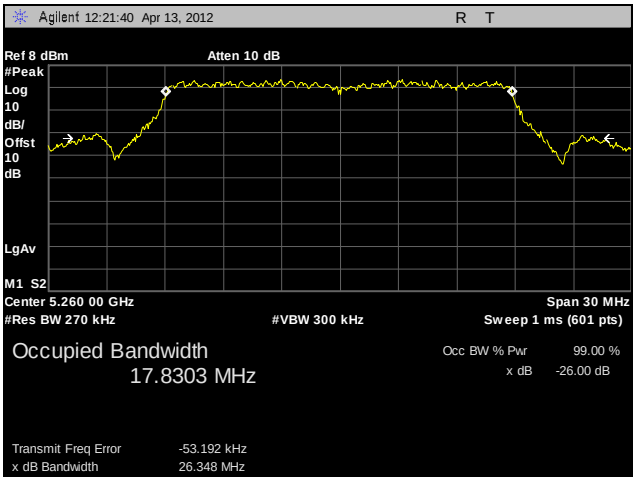


Plot 8. 26 dB Occupied Bandwidth, 802.11a, 5700 MHz, A4

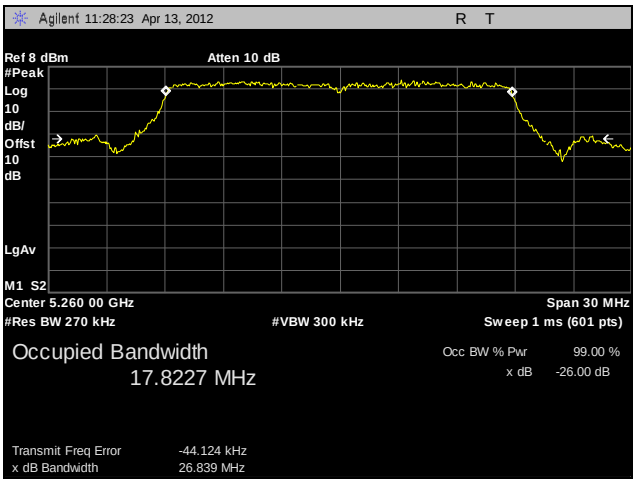
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 9. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5260 MHz, A4

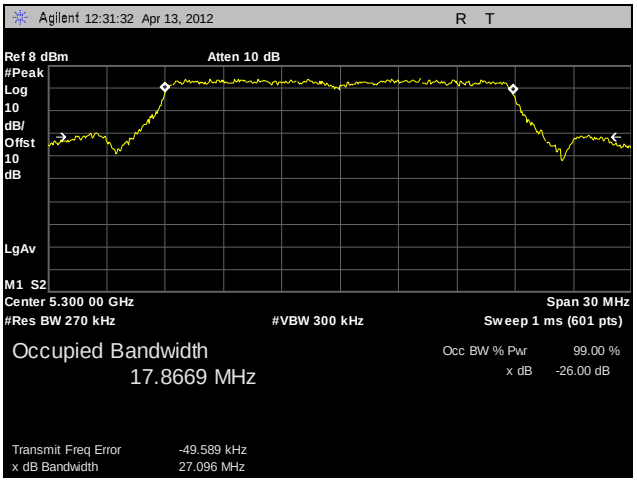


Plot 10. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5260 MHz, A5

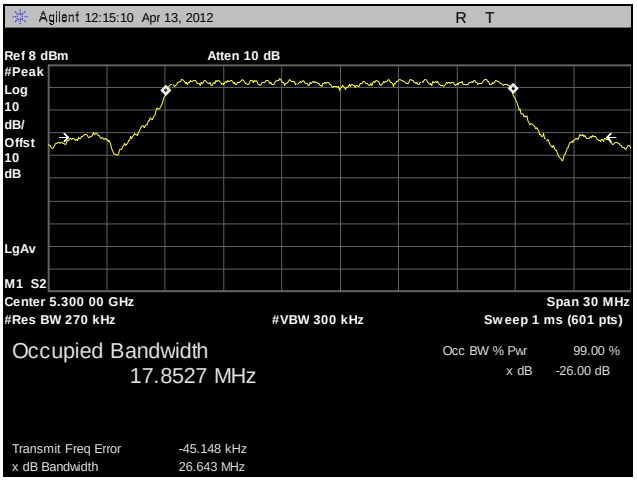


Plot 11. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5260 MHz, A6

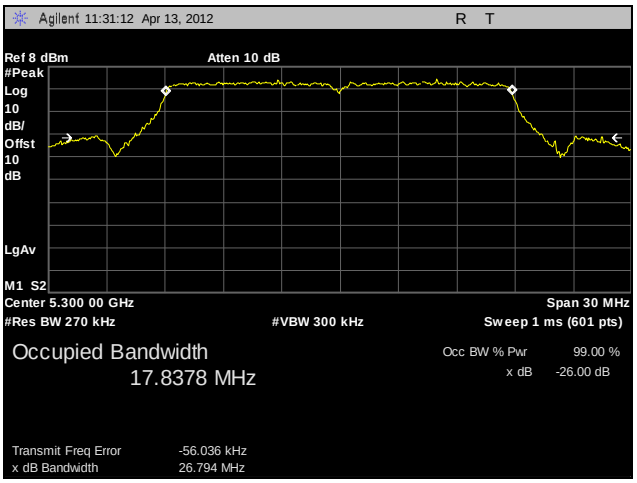
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 12. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5300 MHz, A4

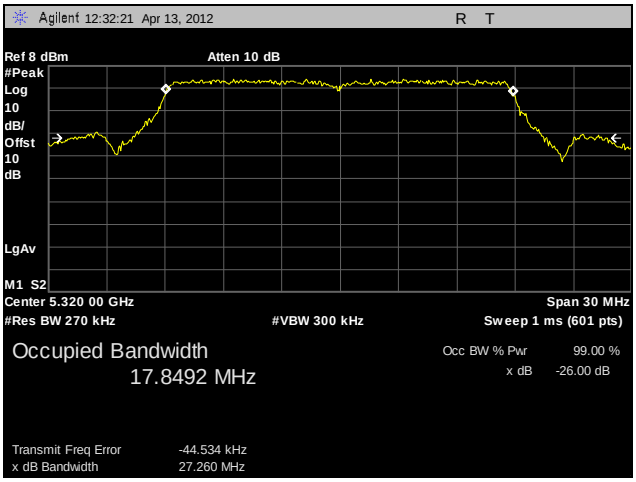


Plot 13. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5300 MHz, A5

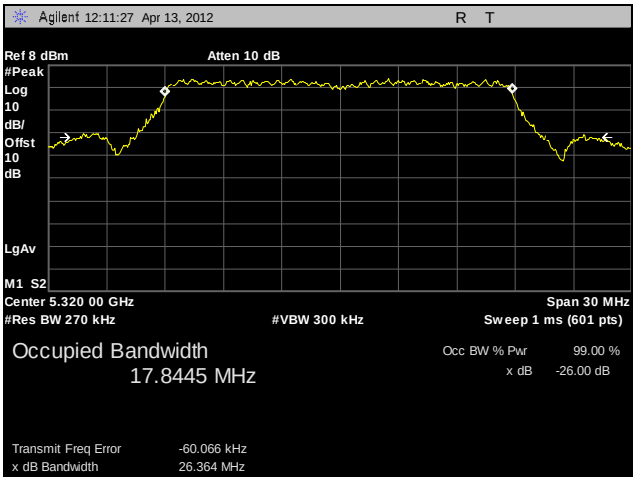


Plot 14. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5300 MHz, A6

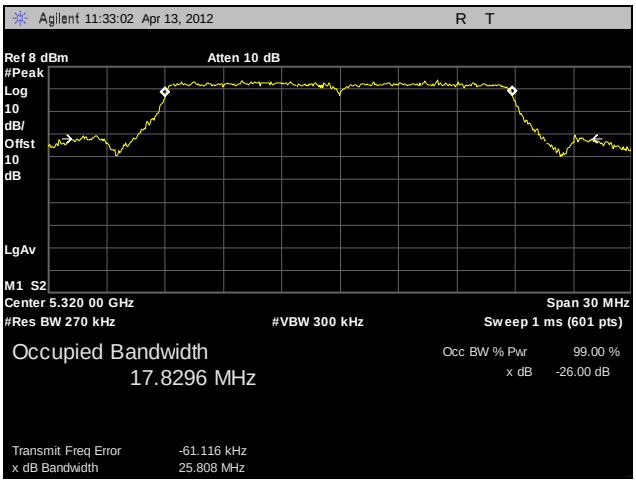
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 15. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5320 MHz, A4

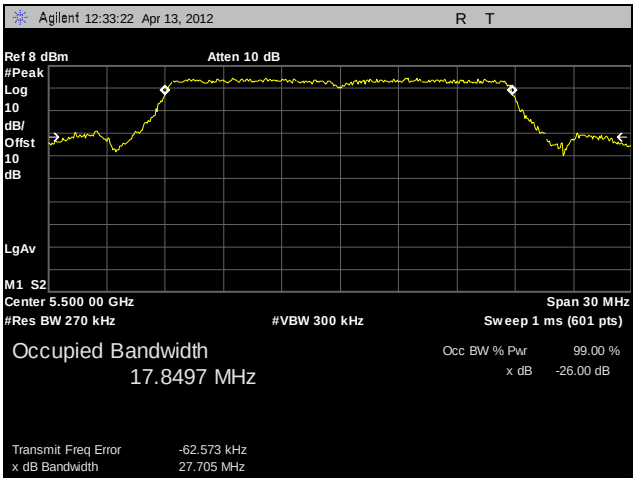


Plot 16. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5320 MHz, A5

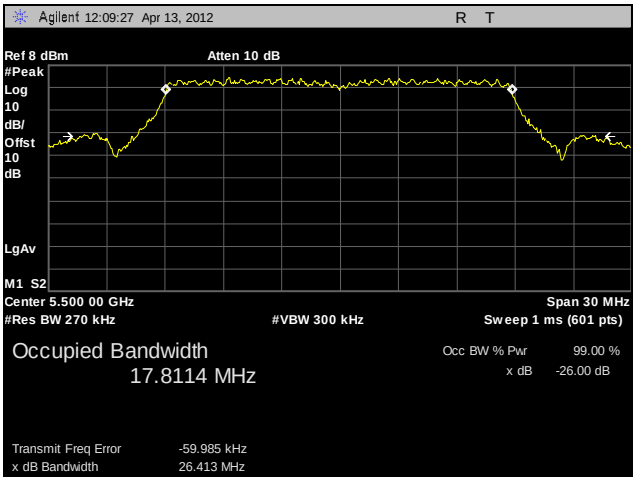


Plot 17. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5320 MHz, A6

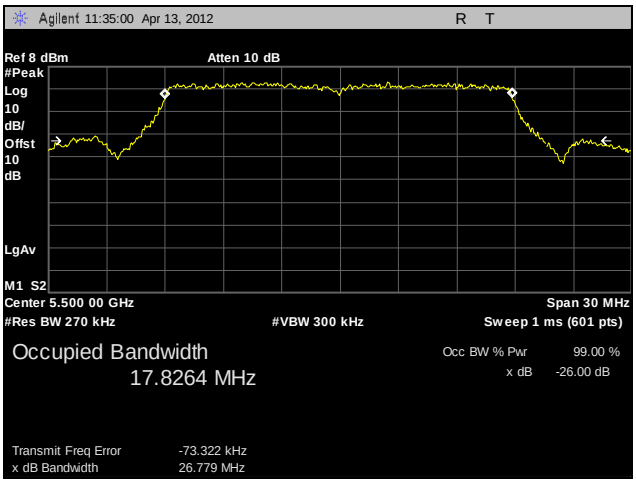
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 18. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5500 MHz, A4

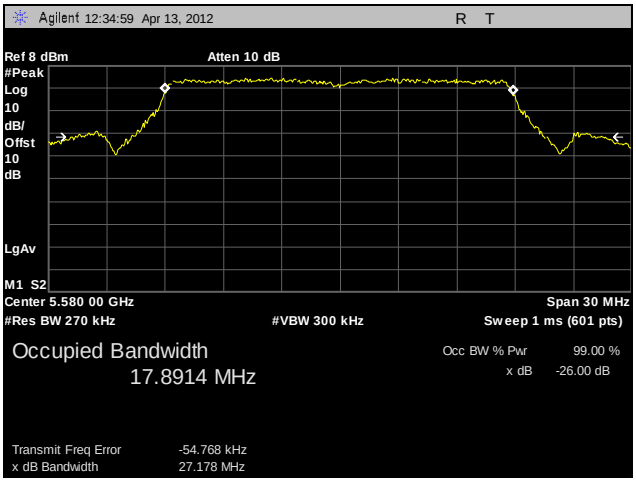


Plot 19. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5500 MHz, A5

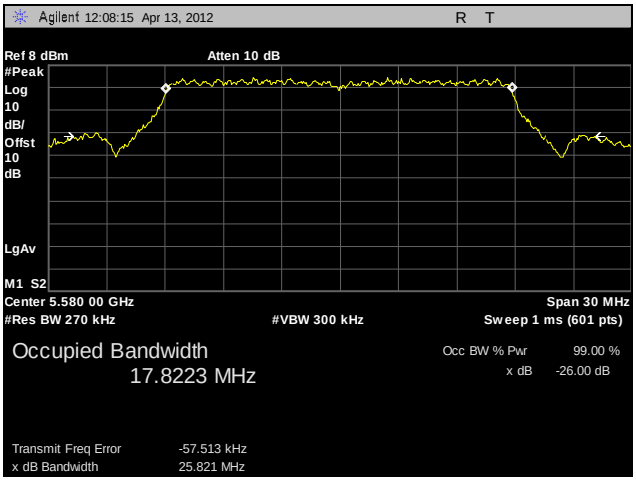


Plot 20. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5500 MHz, A6

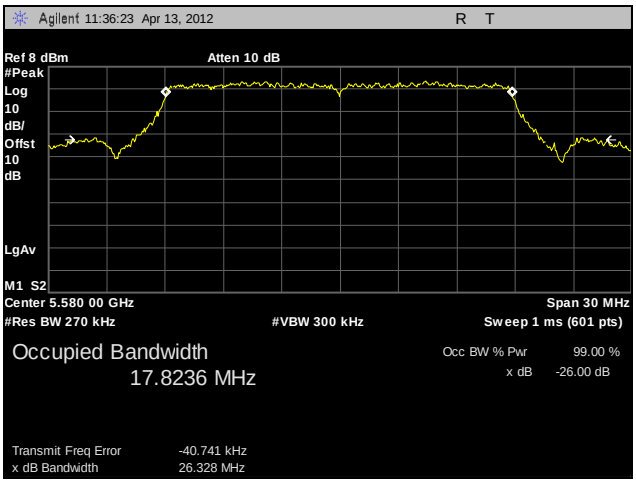
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 21. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5580 MHz, A4

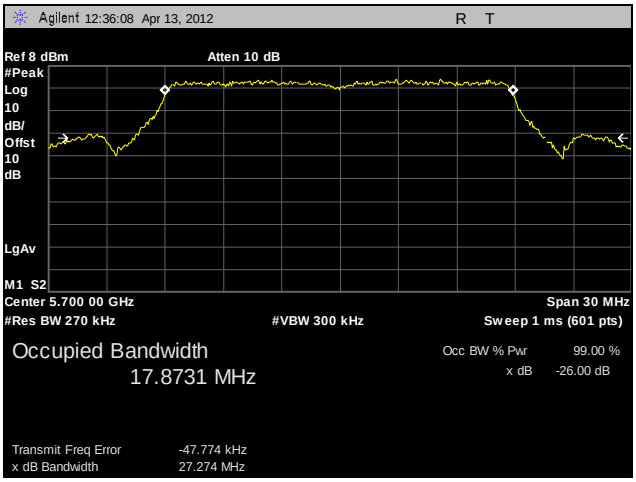


Plot 22. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5580 MHz, A5

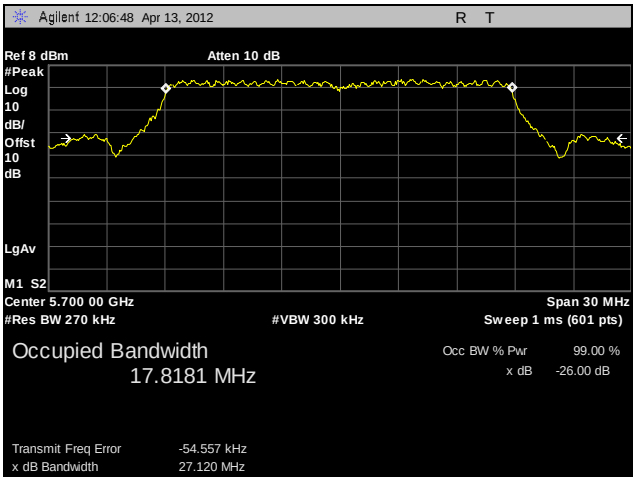


Plot 23. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5580 MHz, A6

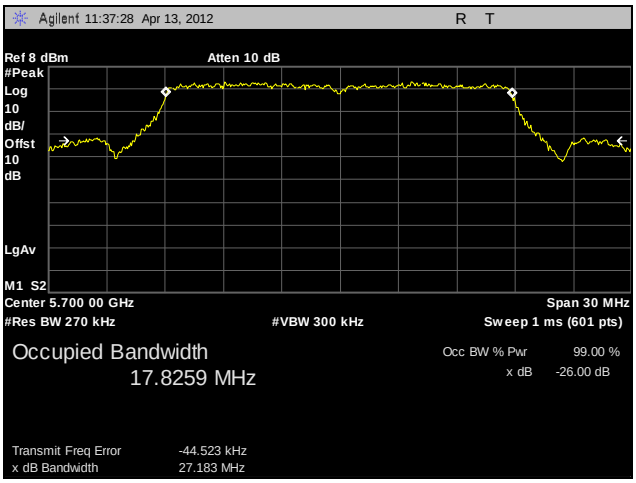
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 24. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5700 MHz, A4

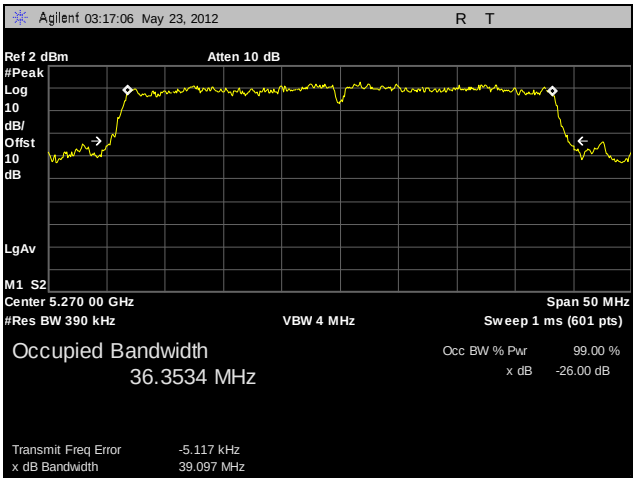


Plot 25. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5700 MHz, A5

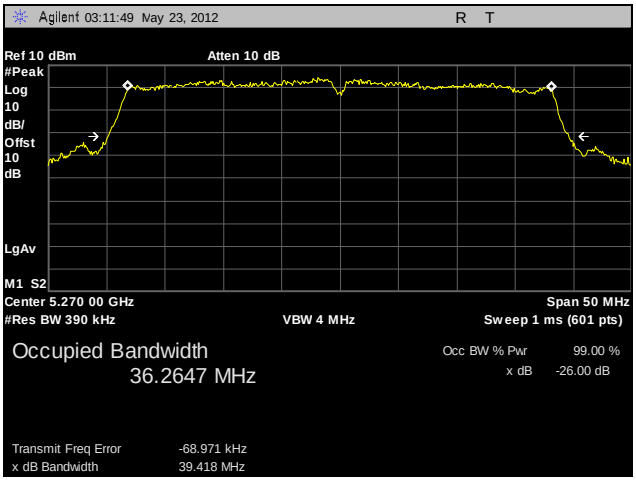


Plot 26. 26 dB Occupied Bandwidth, 802.11n 20 MHz, 5700 MHz, A6

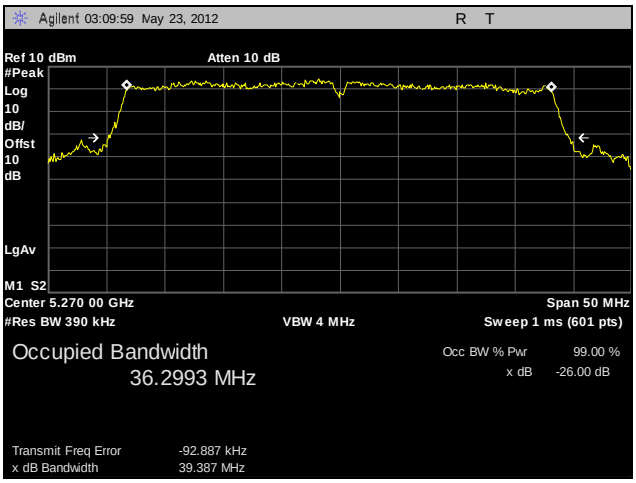
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 27. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5270 MHz, A4

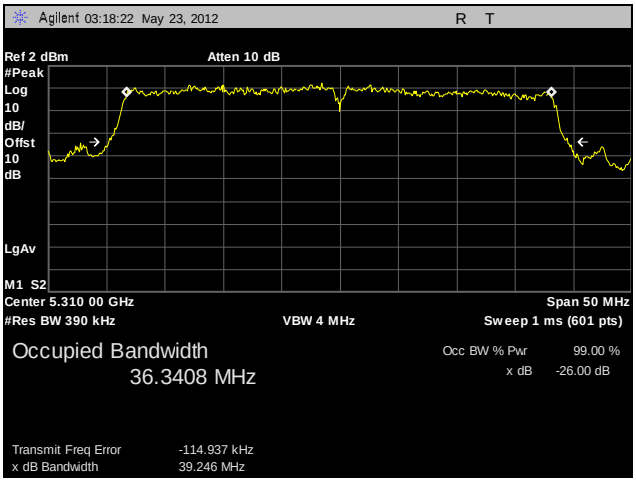


Plot 28. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5270 MHz, A5

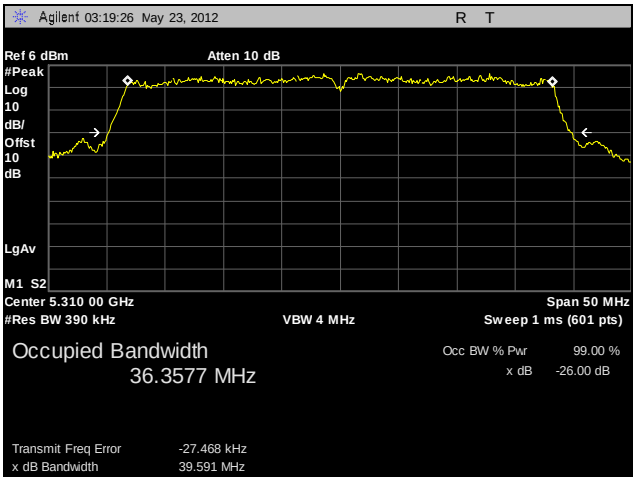


Plot 29. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5270 MHz, A6

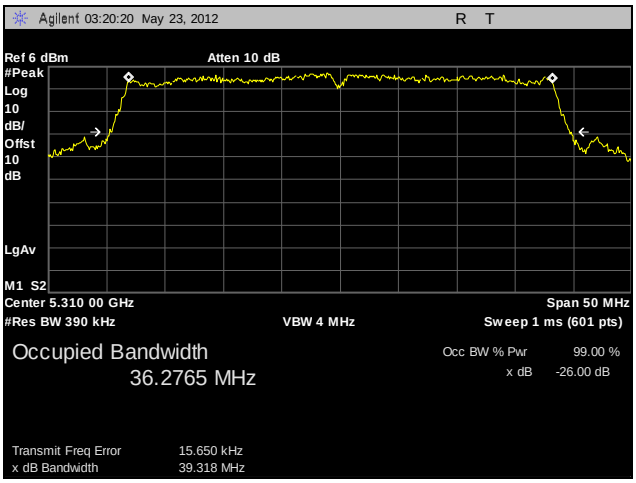
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 30. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5310 MHz, A4

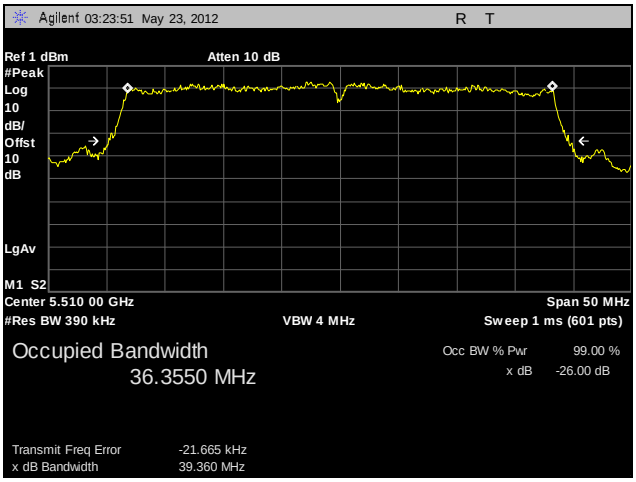


Plot 31. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5310 MHz, A5

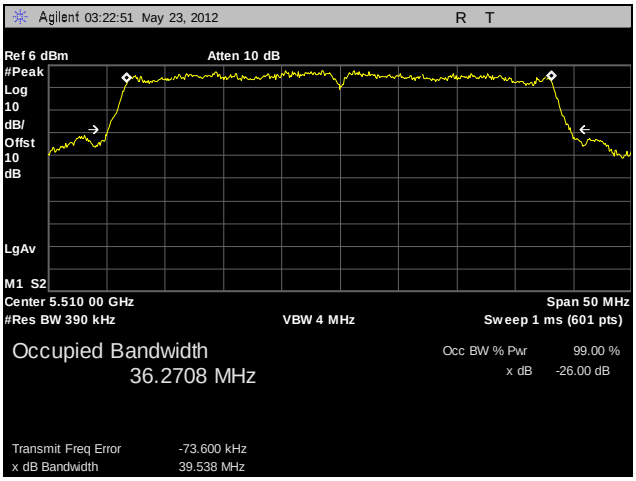


Plot 32. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5310 MHz, A6

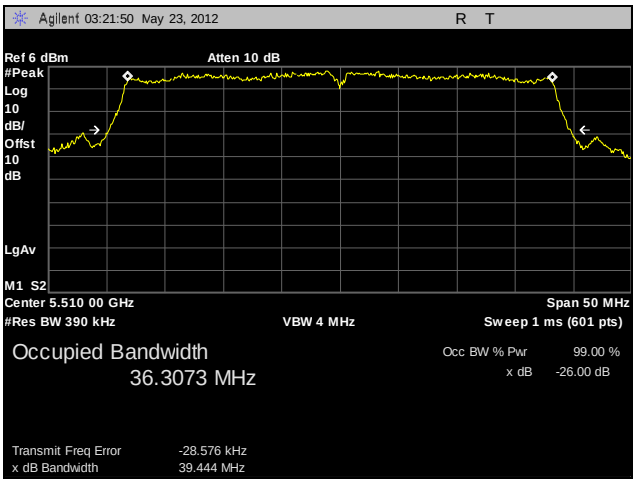
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 33. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5510 MHz, A4

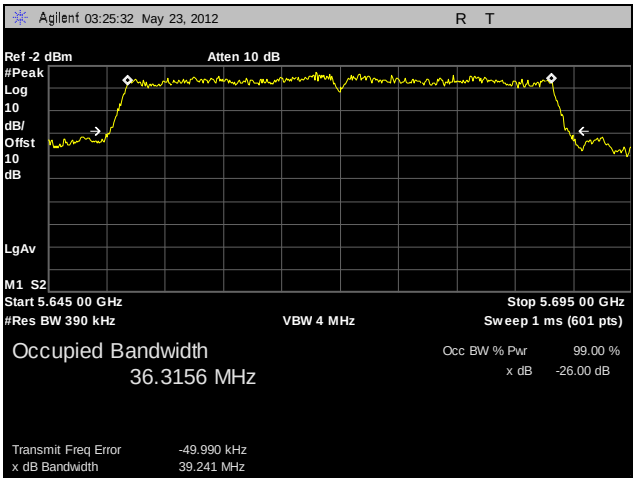


Plot 34. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5510 MHz, A5

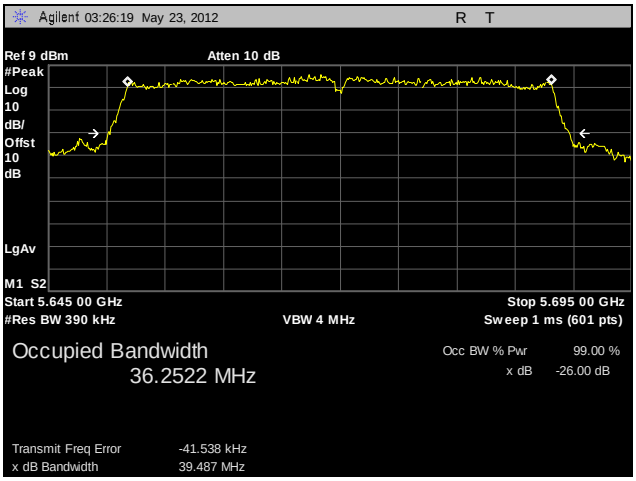


Plot 35. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5510 MHz, A6

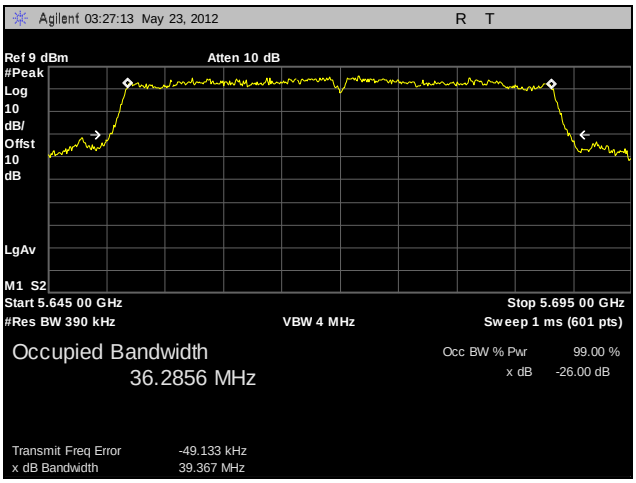
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 36. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5670 MHz, A4

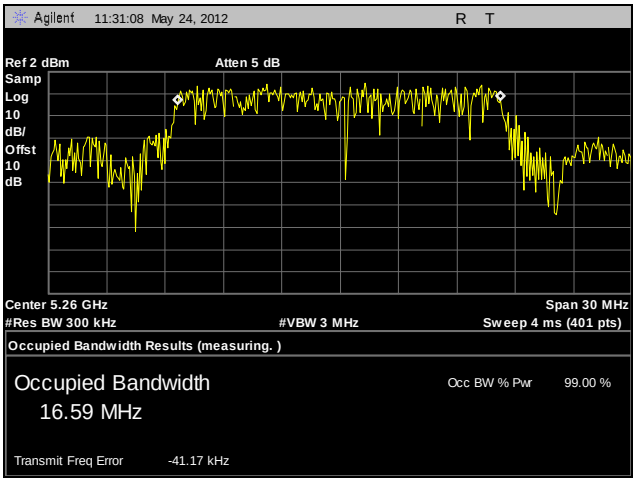


Plot 37. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5670 MHz, A5

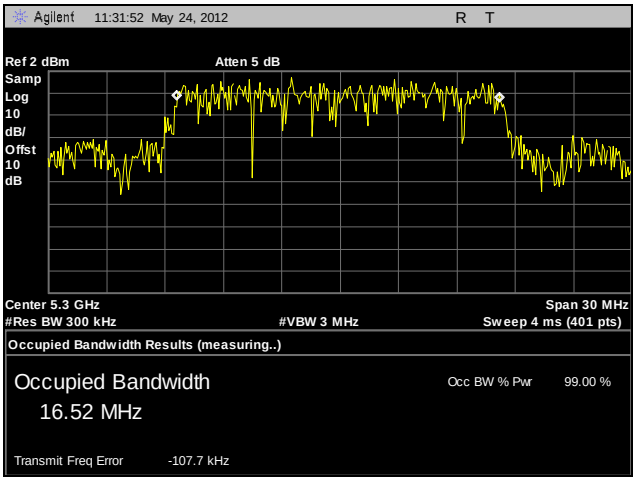


Plot 38. 26 dB Occupied Bandwidth, 802.11n 40 MHz, 5670 MHz, A6

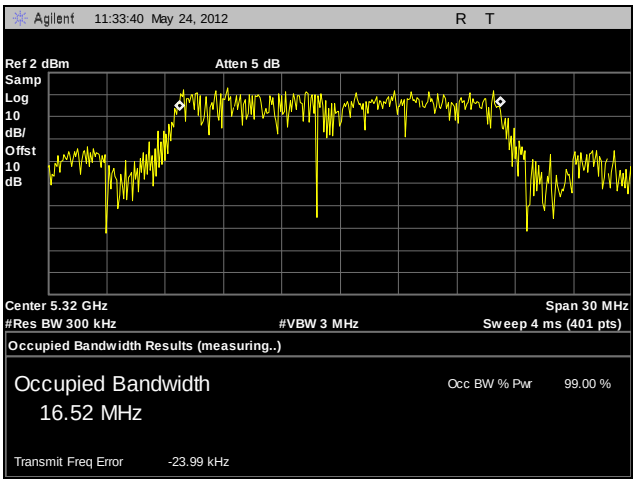
Electromagnetic Compatibility Criteria for Intentional Radiators



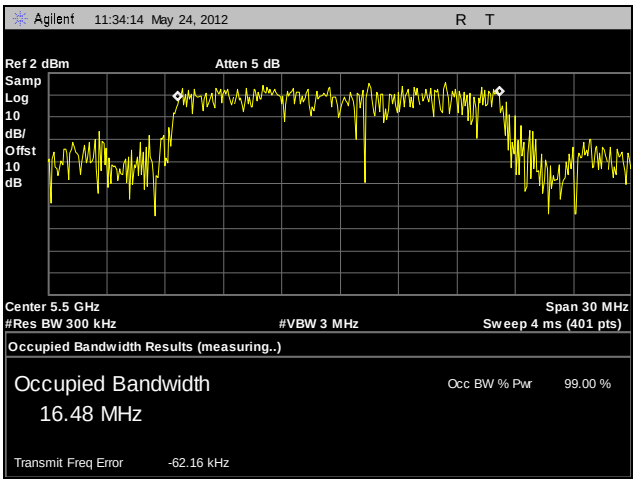
Plot 39. 99% Occupied Bandwidth, 802.11a, 5260 MHz, A4



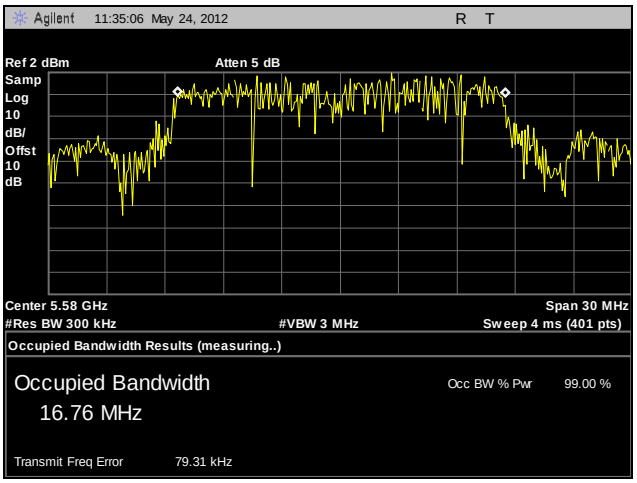
Plot 40. 99% Occupied Bandwidth, 802.11a, 5300 MHz, A4



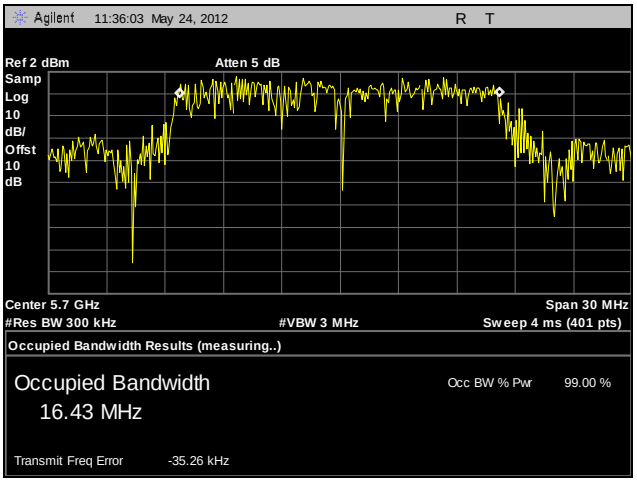
Plot 41. 99% Occupied Bandwidth, 802.11a, 5320 MHz, A4



Plot 42. 99% Occupied Bandwidth, 802.11a, 5500 MHz, A4

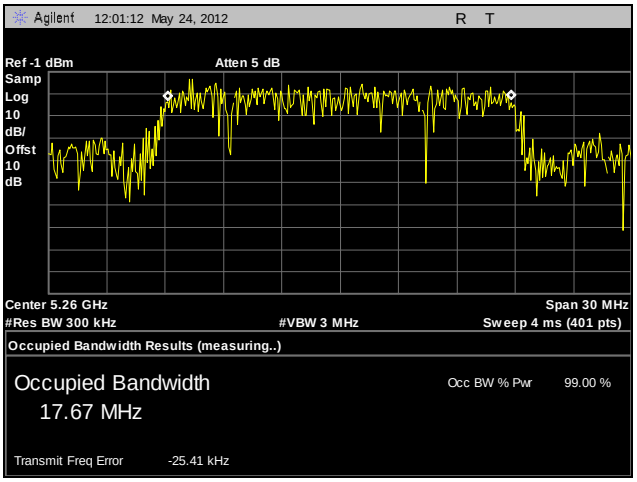


Plot 43. 99% Occupied Bandwidth, 802.11a, 5580 MHz, A4

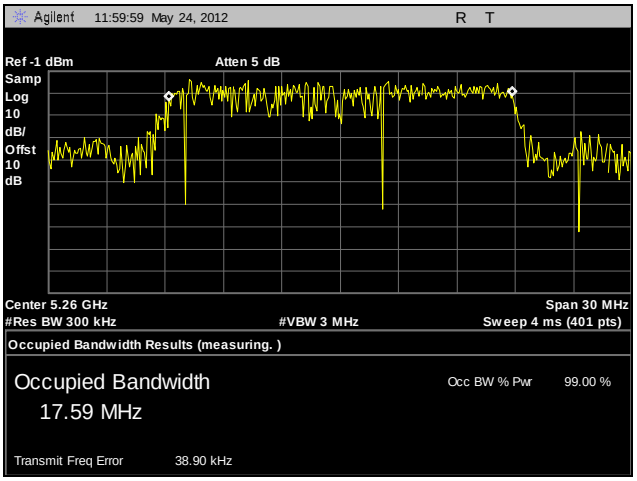


Plot 44. 99% Occupied Bandwidth, 802.11a, 5700 MHz, A4

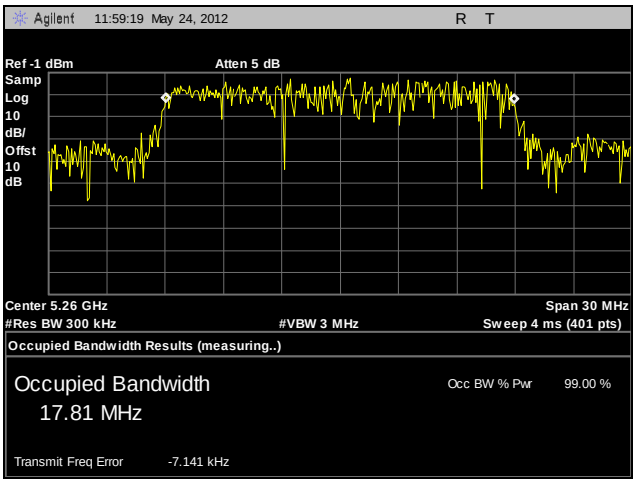
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 45. 99% Occupied Bandwidth, 802.11n 20 MHz, 5260 MHz, A4

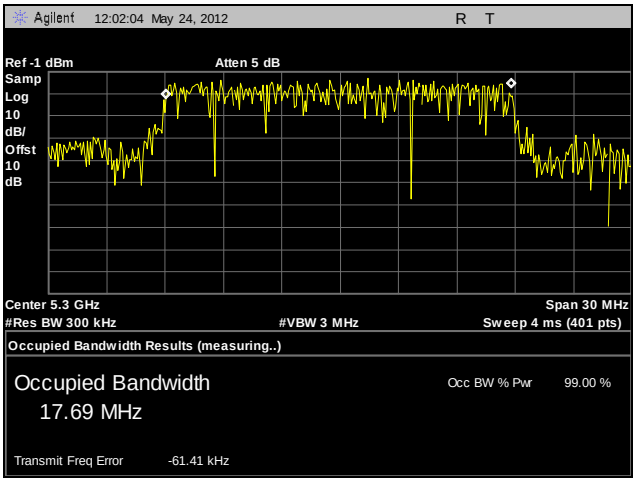


Plot 46. 99% Occupied Bandwidth, 802.11n 20 MHz, 5260 MHz, A5

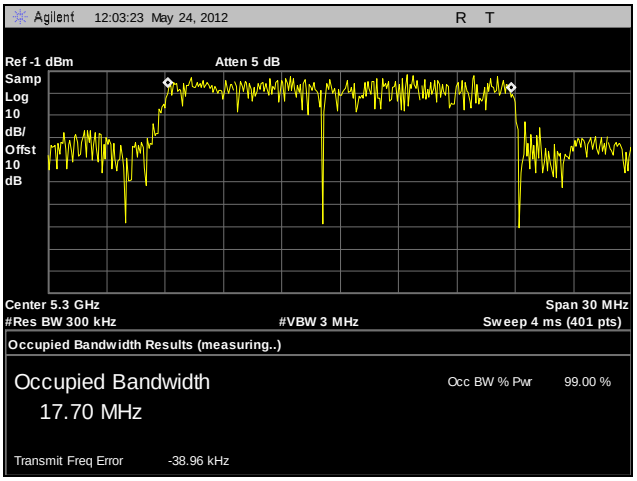


Plot 47. 99% Occupied Bandwidth, 802.11n 20 MHz, 5260 MHz, A6

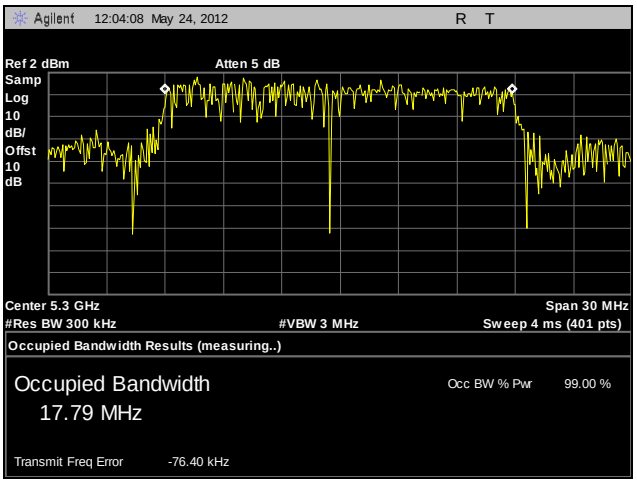
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 48. 99% Occupied Bandwidth, 802.11n 20 MHz, 5300 MHz, A4

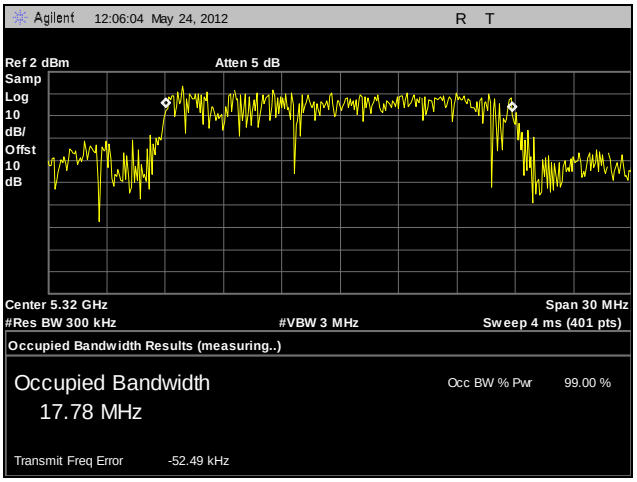


Plot 49. 99% Occupied Bandwidth, 802.11n 20 MHz, 5300 MHz, A5

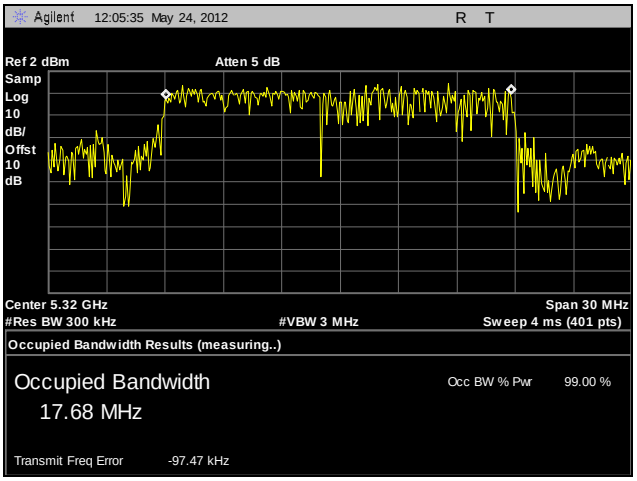


Plot 50. 99% Occupied Bandwidth, 802.11n 20 MHz, 5300 MHz, A6

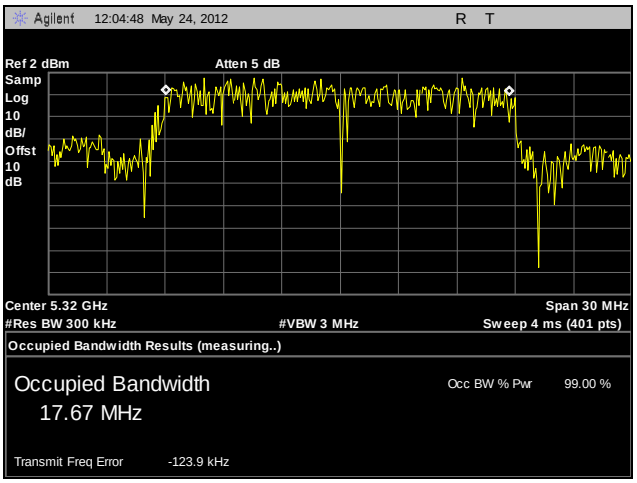
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 51. 99% Occupied Bandwidth, 802.11n 20 MHz, 5320 MHz, A4

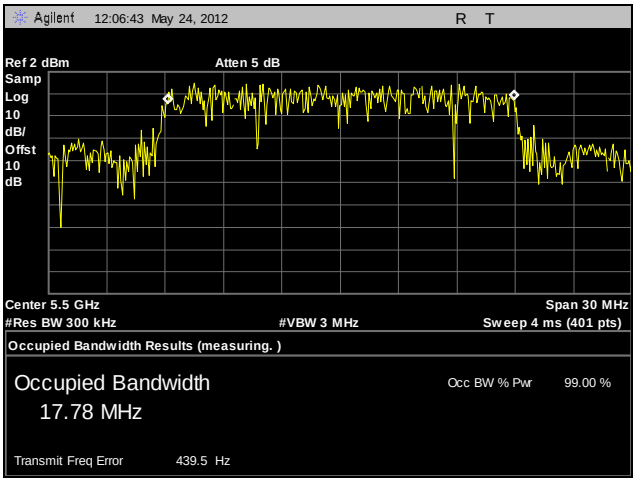


Plot 52. 99% Occupied Bandwidth, 802.11n 20 MHz, 5320 MHz, A5

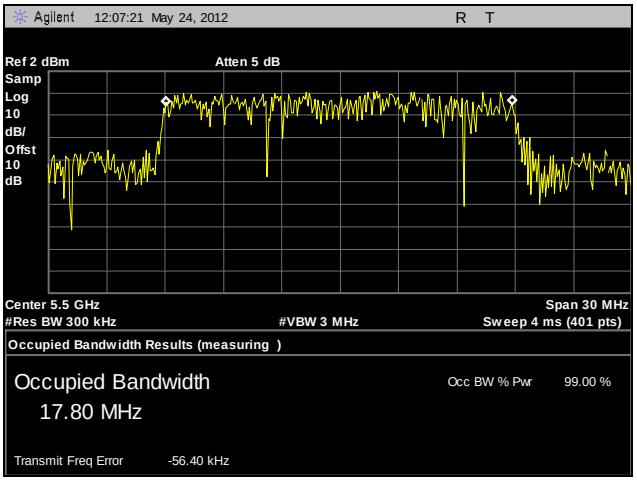


Plot 53. 99% Occupied Bandwidth, 802.11n 20 MHz, 5320 MHz, A6

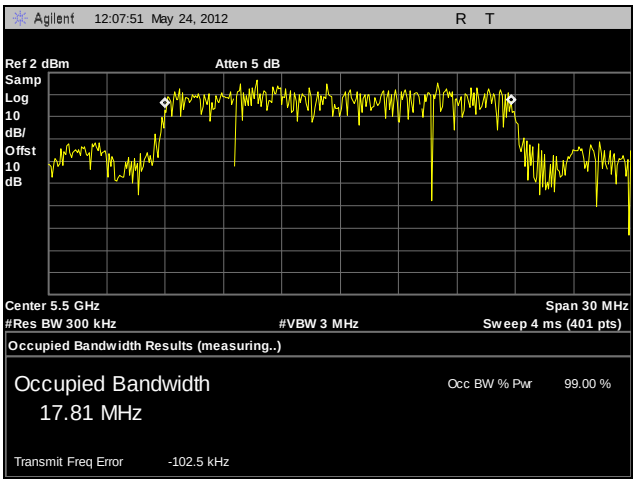
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 54. 99% Occupied Bandwidth, 802.11n 20 MHz, 5500 MHz, A4

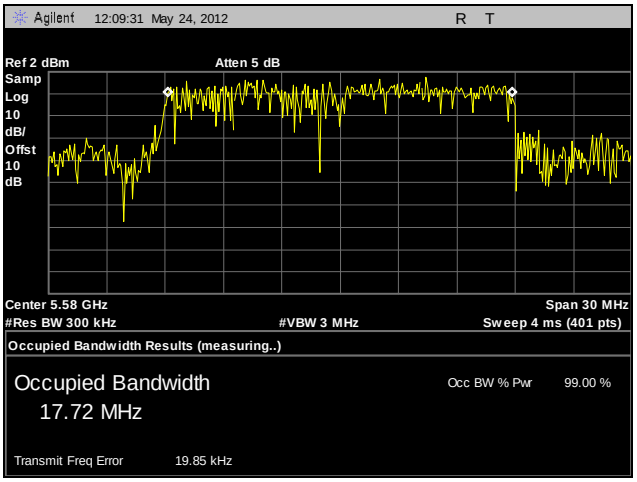


Plot 55. 99% Occupied Bandwidth, 802.11n 20 MHz, 5500 MHz, A5

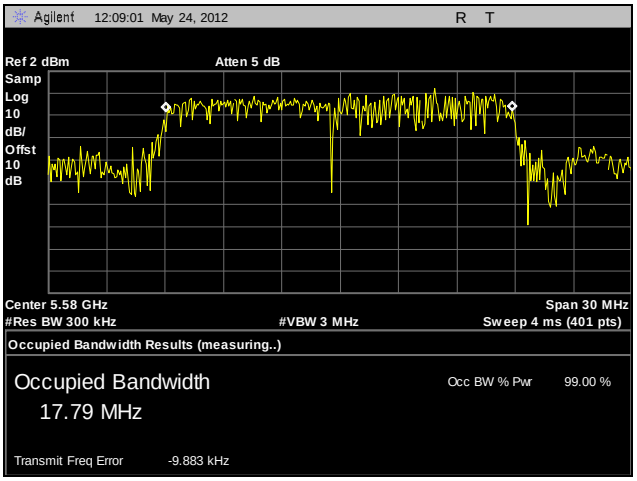


Plot 56. 99% Occupied Bandwidth, 802.11n 20 MHz, 5500 MHz, A6

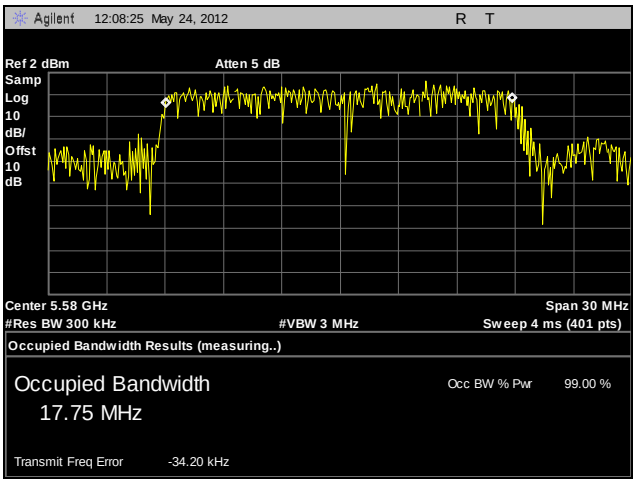
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 57. 99% Occupied Bandwidth, 802.11n 20 MHz, 5580 MHz, A4

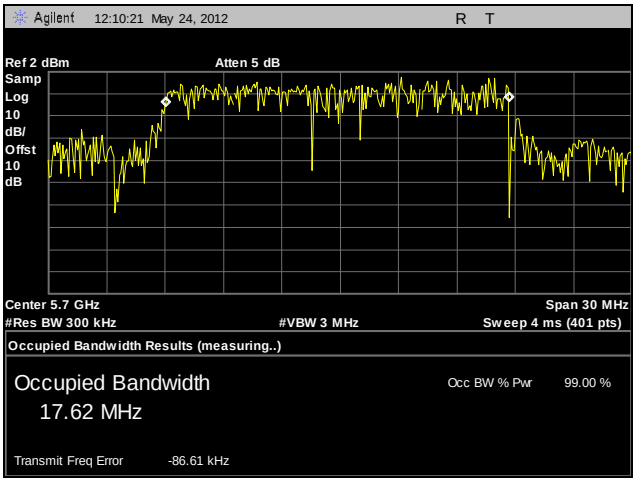


Plot 58. 99% Occupied Bandwidth, 802.11n 20 MHz, 5580 MHz, A5

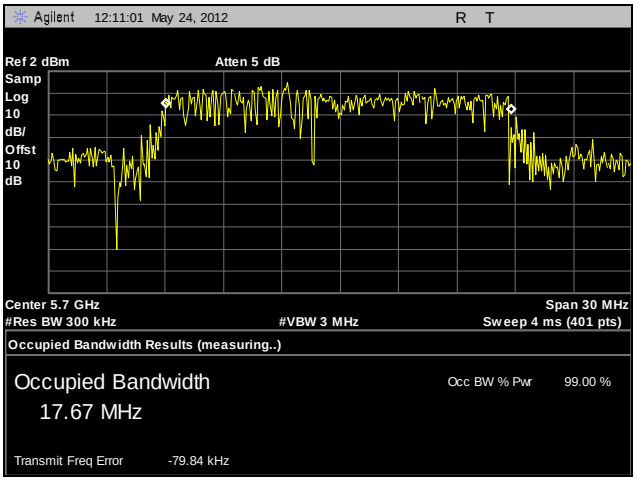


Plot 59. 99% Occupied Bandwidth, 802.11n 20 MHz, 5580 MHz, A6

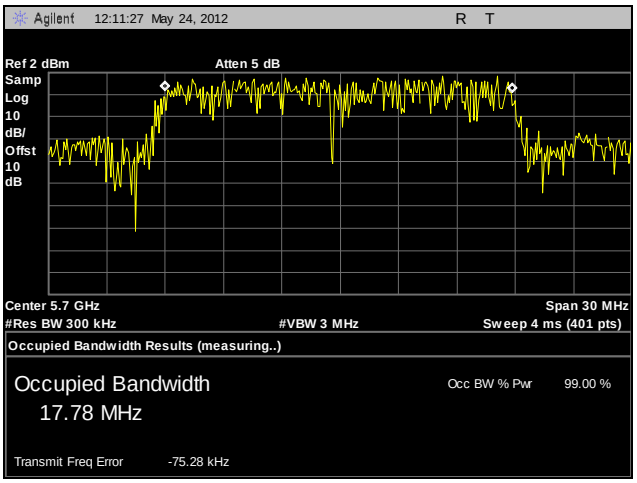
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 60. 99% Occupied Bandwidth, 802.11n 20 MHz, 5700 MHz, A4

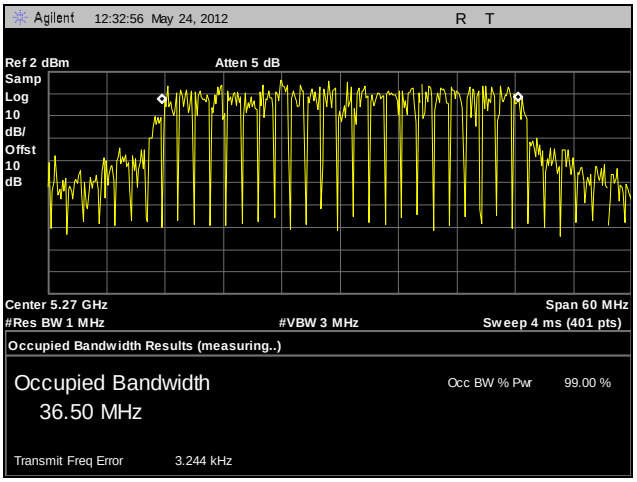


Plot 61. 99% Occupied Bandwidth, 802.11n 20 MHz, 5700 MHz, A5

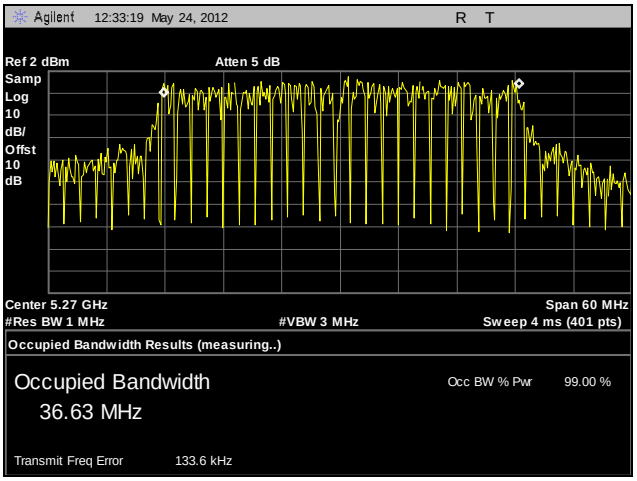


Plot 62. 99% Occupied Bandwidth, 802.11n 20 MHz, 5700 MHz, A6

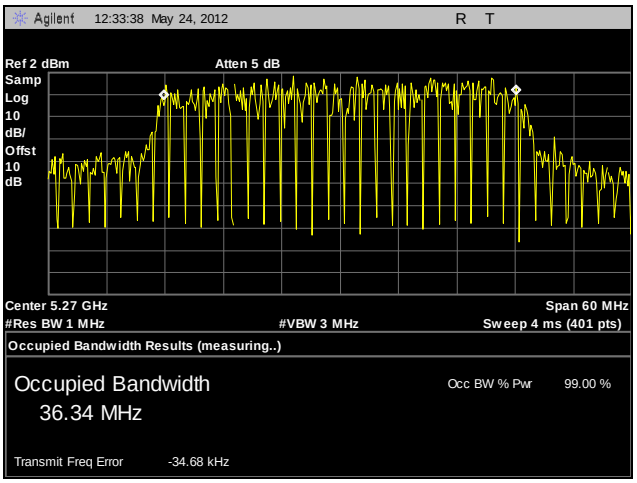
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 63. 99% Occupied Bandwidth, 802.11n 40 MHz, 5270 MHz, A4

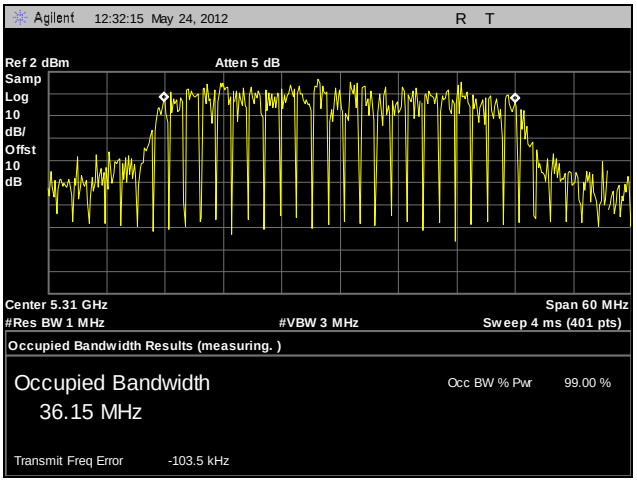


Plot 64. 99% Occupied Bandwidth, 802.11n 40 MHz, 5270 MHz, A5

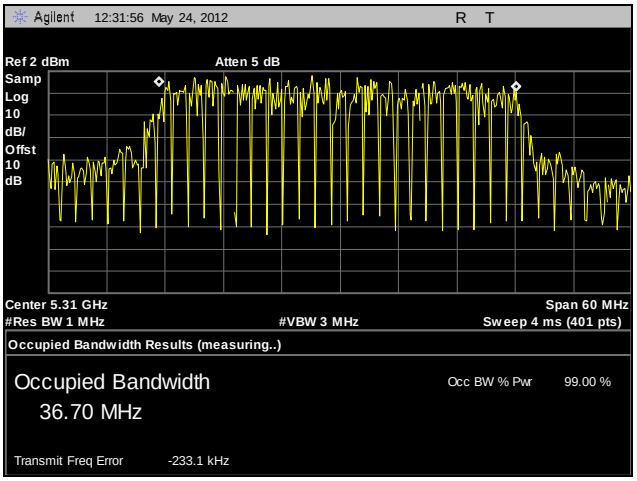


Plot 65. 99% Occupied Bandwidth, 802.11n 40 MHz, 5270 MHz, A6

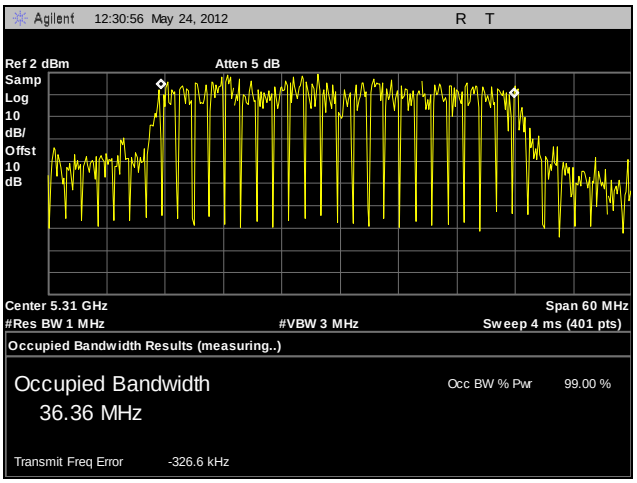
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 66. 99% Occupied Bandwidth, 802.11n 40 MHz, 5310 MHz, A4

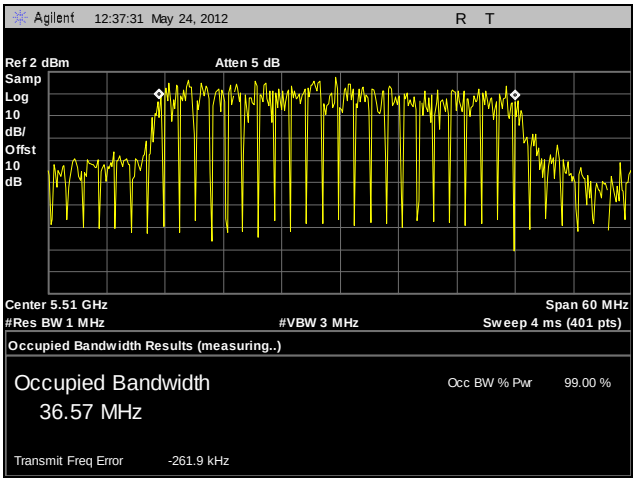


Plot 67. 99% Occupied Bandwidth, 802.11n 40 MHz, 5310 MHz, A5

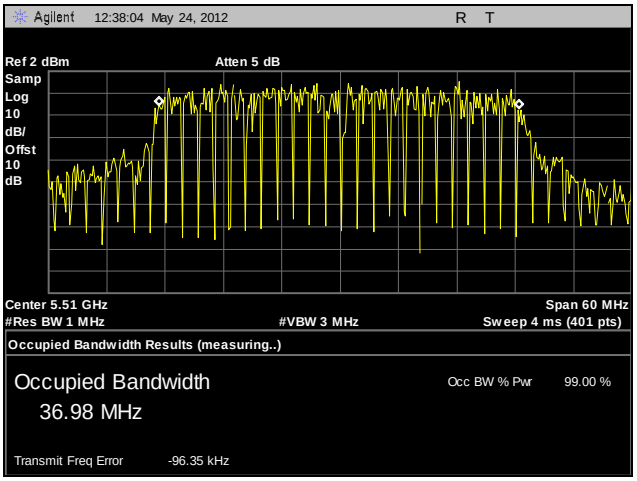


Plot 68. 99% Occupied Bandwidth, 802.11n 40 MHz, 5310 MHz, A6

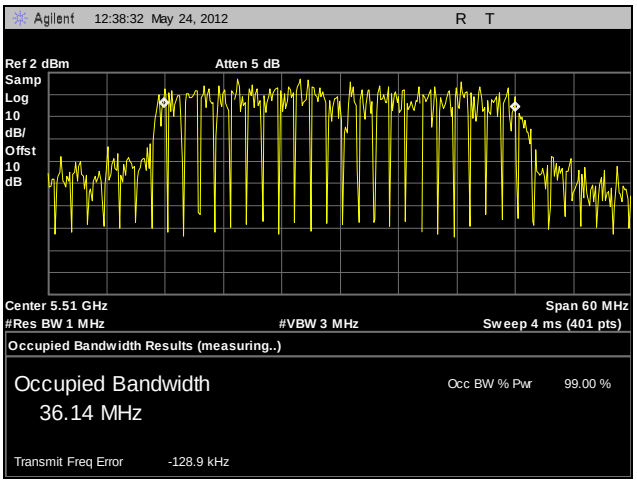
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 69. 99% Occupied Bandwidth, 802.11n 40 MHz, 5510 MHz, A4

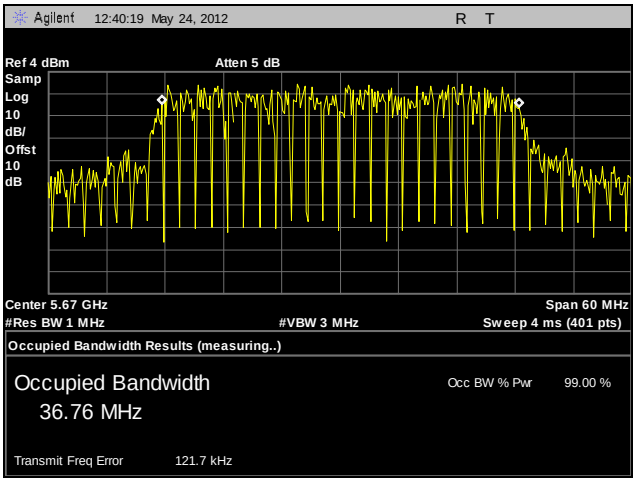


Plot 70. 99% Occupied Bandwidth, 802.11n 40 MHz, 5510 MHz, A5

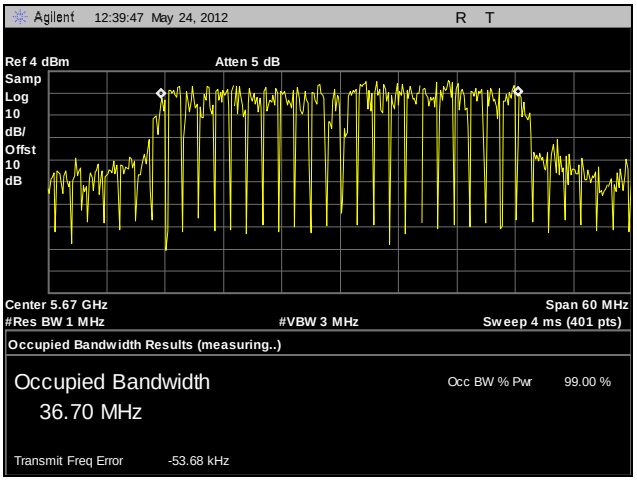


Plot 71. 99% Occupied Bandwidth, 802.11n 40 MHz, 5510 MHz, A6

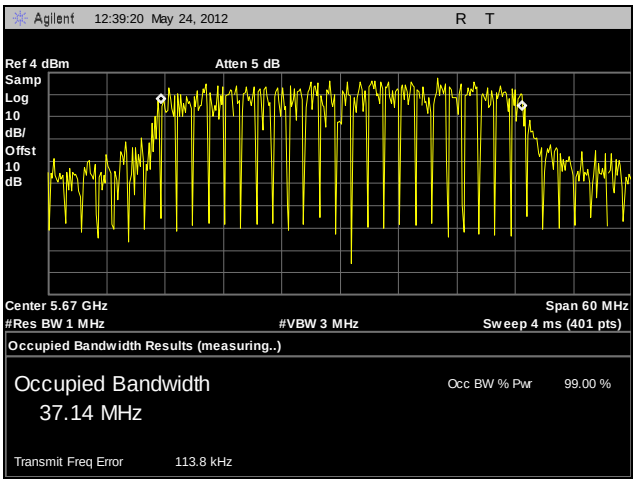
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 72. 99% Occupied Bandwidth, 802.11n 40 MHz, 5670 MHz, A4



Plot 73. 99% Occupied Bandwidth, 802.11n 40 MHz, 5670 MHz, A5



Plot 74. 99% Occupied Bandwidth, 802.11n 40 MHz, 5670 MHz, A6

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(2) RF Power Output

Test Requirements: **§15.407(a)(2):** The maximum output power of the intentional radiator shall not exceed the following:

§15.407(a) (2): For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26 dB emission bandwidth in megahertz.

Test Procedure: The EUT was connected to a Spectrum Analyzer. The power was measured on both channels.

Test Results: Equipment was compliant with the Peak Power Output limits of **§ 15.401(a)(2)**.

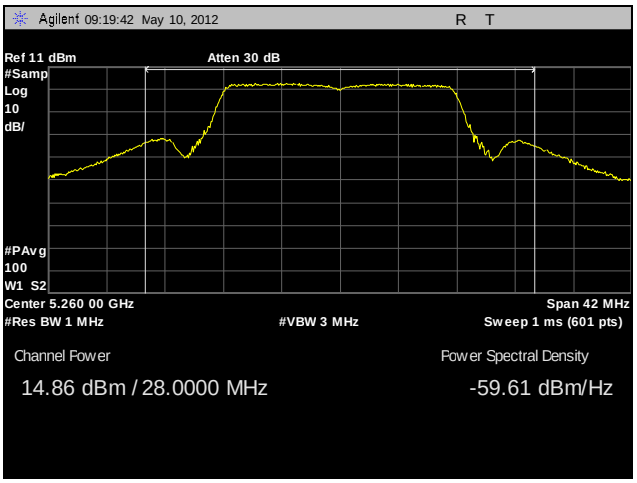
Test Engineer(s): Jeff Pratt

Test Date(s): 05/14/12

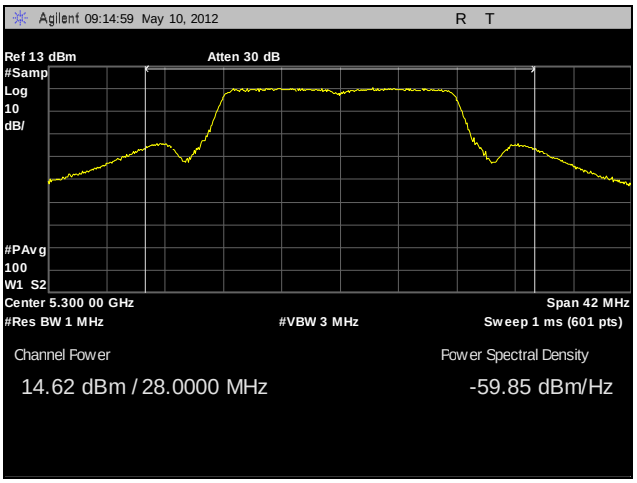
Figure 3. Power Output Test Setup

Frequency MHz	Mode	Output Power Port 1 dBm	Output Power Port 2 dBm	Output Power Port 3 dBm	Sum Port dBm	Limit dBm
5260	802.11a	14.86	NA	NA	14.86	20.23
5300	802.11a	14.62	NA	NA	14.62	20.23
5320	802.11a	13.07	NA	NA	13.07	20.23
5500	802.11a	13.1	NA	NA	13.1	20.23
5580	802.11a	13.89	NA	NA	13.89	20.23
5700	802.11a	13.75	NA	NA	13.75	20.23
5260	802.11n 20 MHz	12.43	11.56	11.74	16.70	20.23
5300	802.11n 20 MHz	12.92	12.04	12.09	17.14	20.23
5320	802.11n 20 MHz	12.84	11.6	12.18	17.01	20.23
5500	802.11n 20 MHz	12.9	12.33	12.93	17.50	20.23
5580	802.11n 20 MHz	13.46	13.05	13.27	18.03	20.23
5700	802.11n 20 MHz	12.87	13.37	13.45	18.01	20.23
5270	802.11n 40 MHz	12.8	12.39	11.79	17.12	20.23
5310	802.11n 40 MHz	12.2	11.18	10.59	16.15	20.23
5510	802.11n 40 MHz	11.57	11.39	11.54	16.27	20.23
5670	802.11n 40 MHz	12.55	12.4	12.86	17.38	20.23

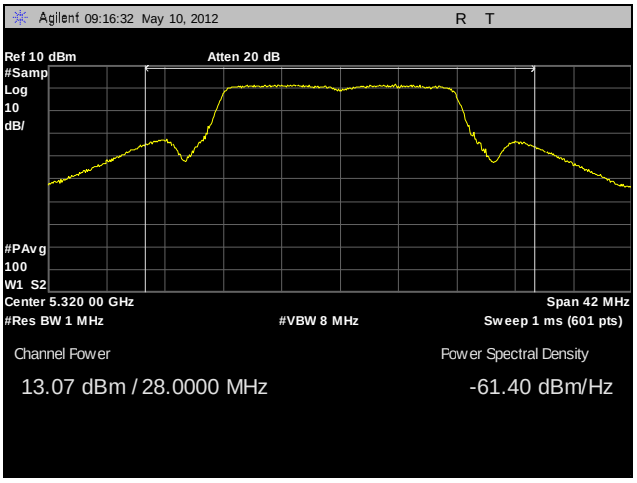
Table 12. RF Power Output, Test Results



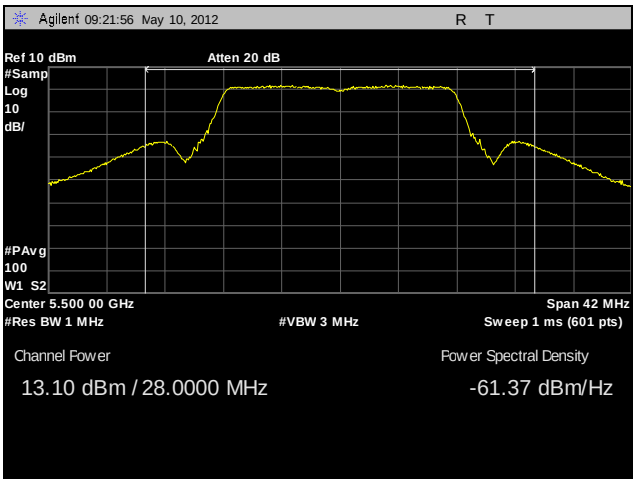
Plot 75. RF Output Power, 802.11a, 5260 MHz, A4



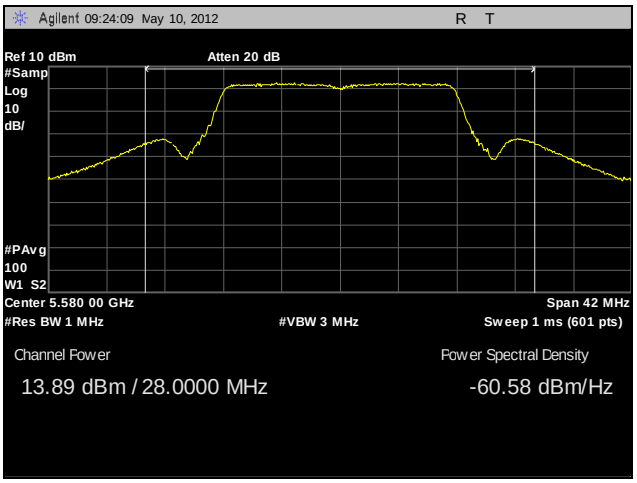
Plot 76. RF Output Power, 802.11a, 5300 MHz, A4



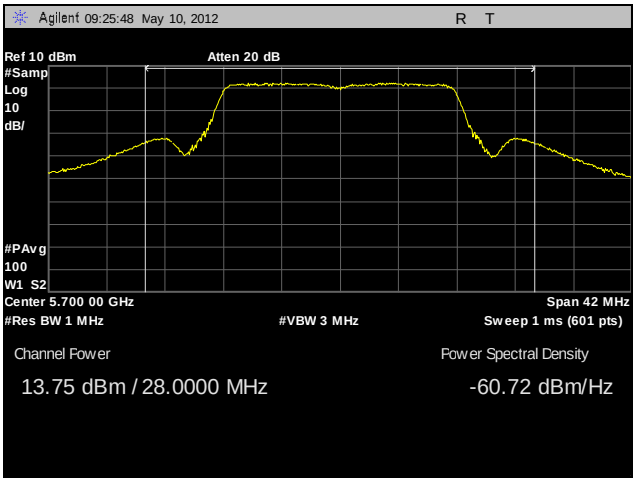
Plot 77. RF Output Power, 802.11a, 5320 MHz, A4



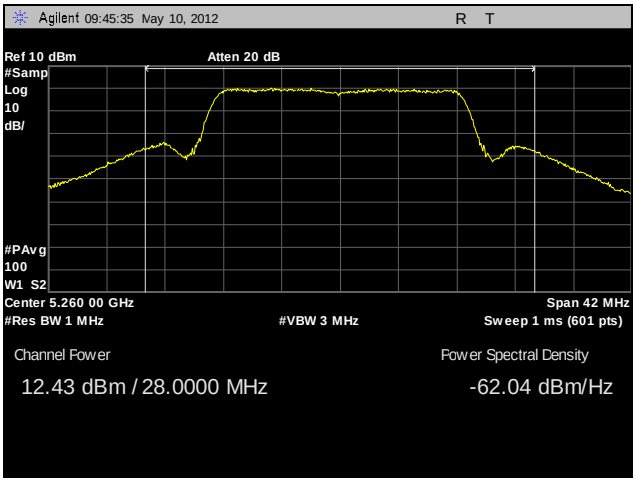
Plot 78. RF Output Power, 802.11a, 5500 MHz, A4



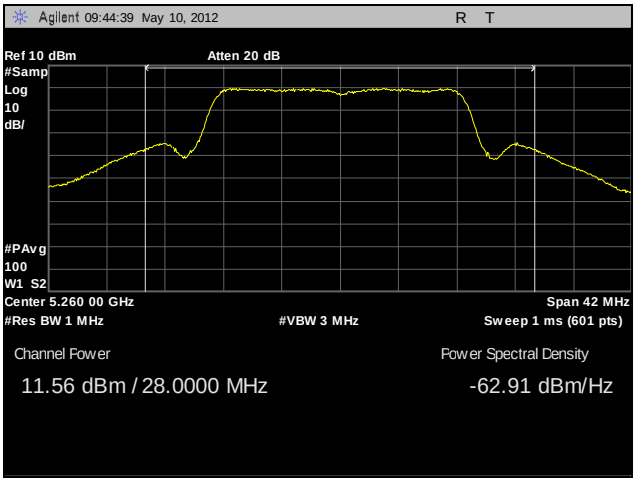
Plot 79. RF Output Power, 802.11a, 5580 MHz, A4



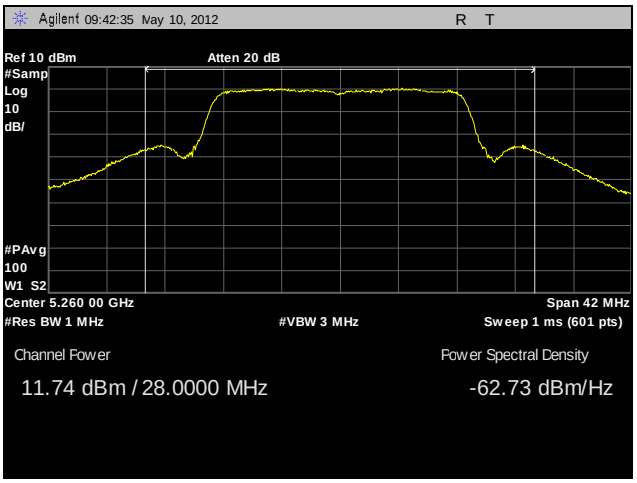
Plot 80. RF Output Power, 802.11a, 5700 MHz, A4



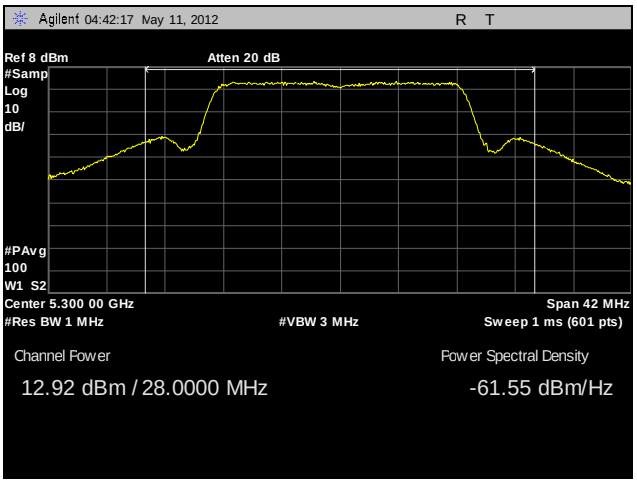
Plot 81. RF Output Power, 802.11n 20 MHz, 5260 MHz, A4



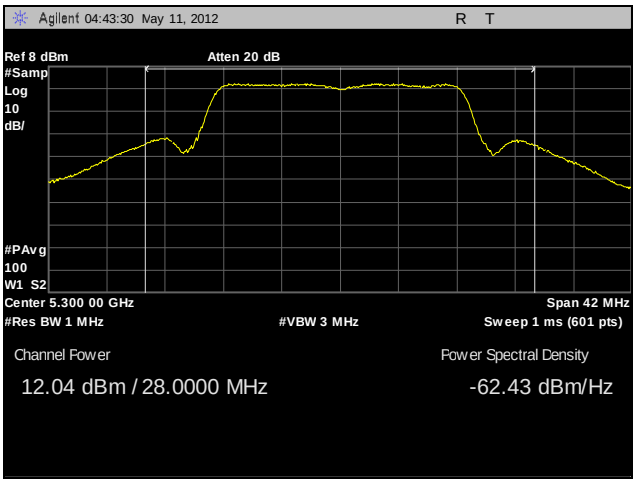
Plot 82. RF Output Power, 802.11n 20 MHz, 5260 MHz, A5



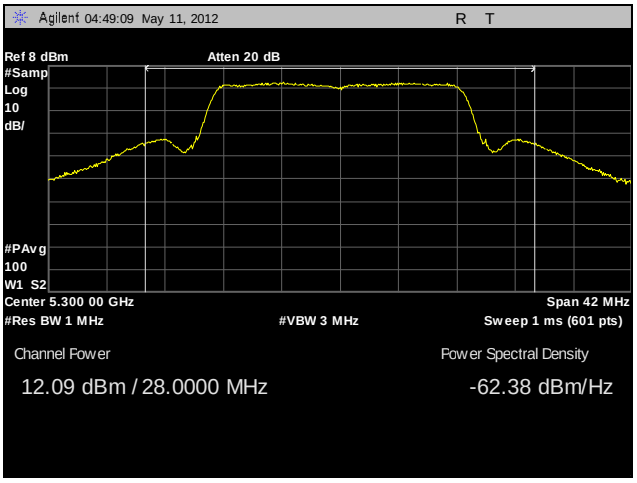
Plot 83. RF Output Power, 802.11n 20 MHz, 5260 MHz, A6



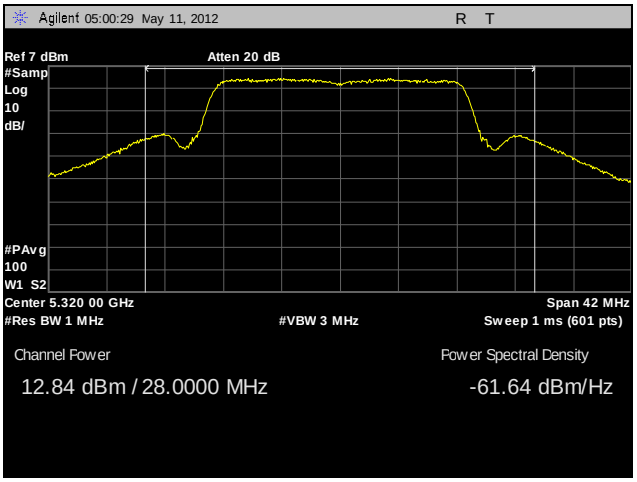
Plot 84. RF Output Power, 802.11n 20 MHz, 5300 MHz, A4



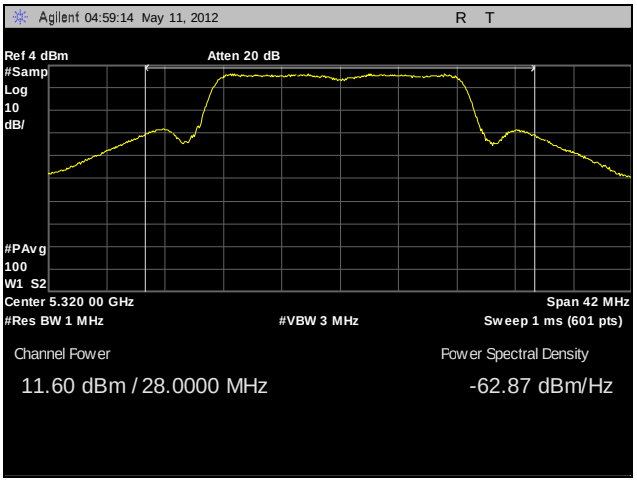
Plot 85. RF Output Power, 802.11n 20 MHz, 5300 MHz, A5



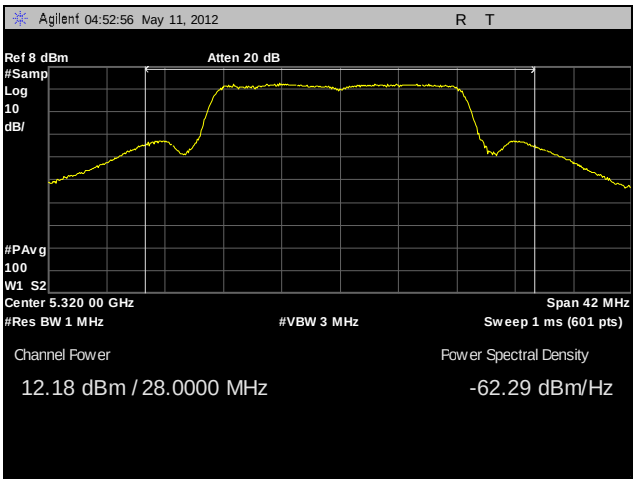
Plot 86. RF Output Power, 802.11n 20 MHz, 5300 MHz, A6



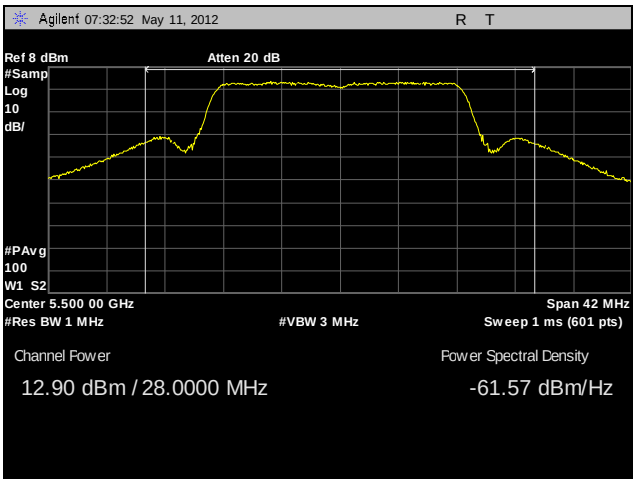
Plot 87. RF Output Power, 802.11n 20 MHz, 5320 MHz, A4



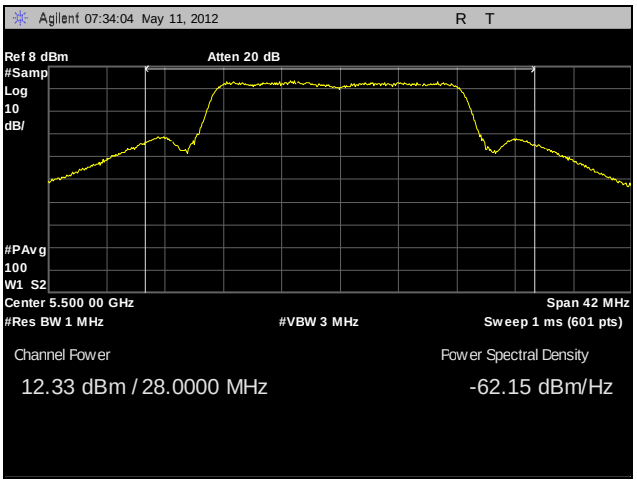
Plot 88. RF Output Power, 802.11n 20 MHz, 5320 MHz, A5



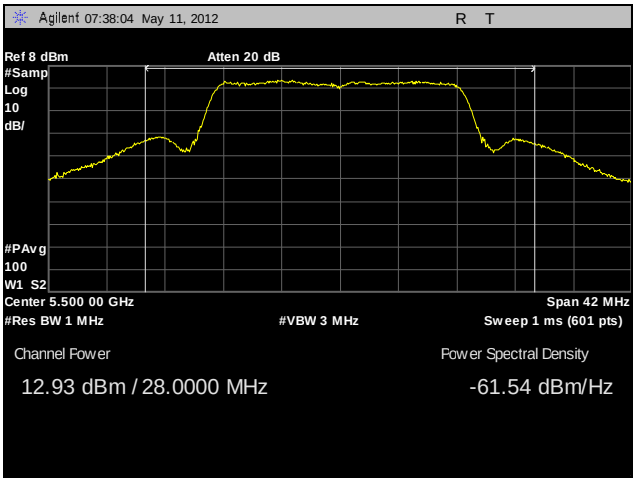
Plot 89. RF Output Power, 802.11n 20 MHz, 5320 MHz, A6



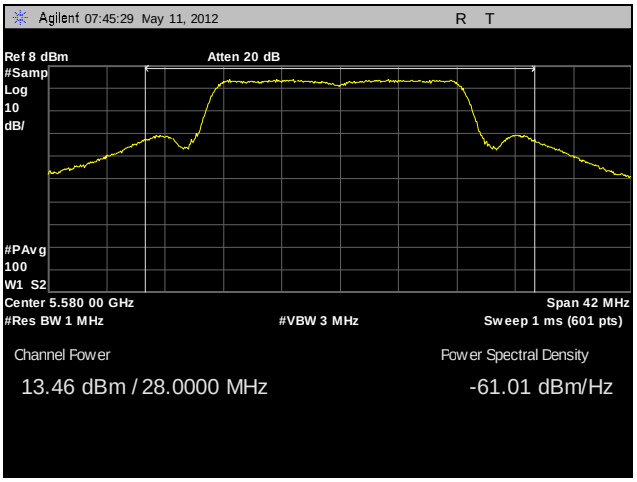
Plot 90. RF Output Power, 802.11n 20 MHz, 5500 MHz, A4



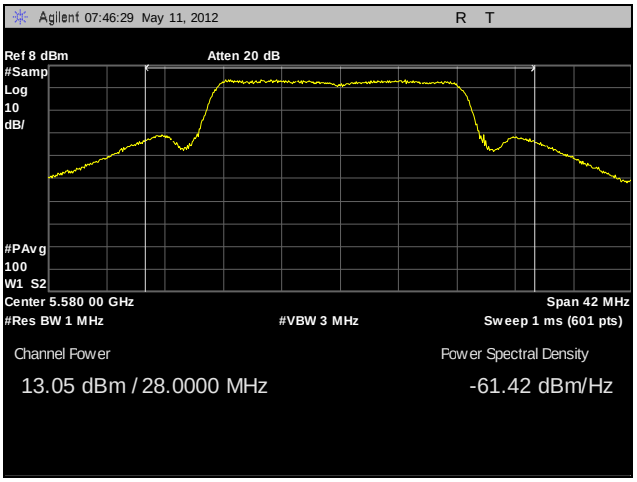
Plot 91. RF Output Power, 802.11n 20 MHz, 5500 MHz, A5



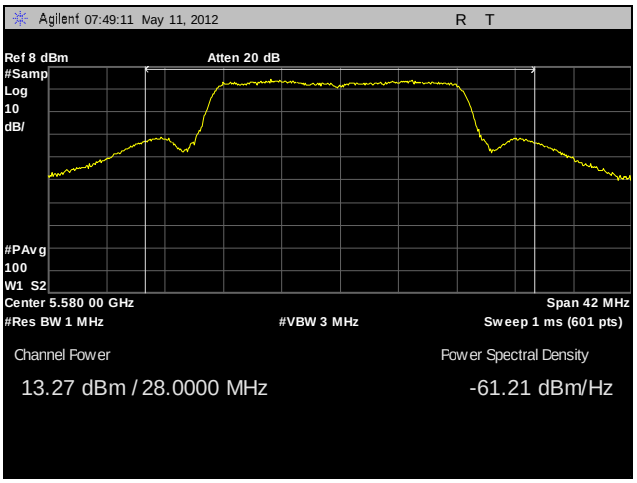
Plot 92. RF Output Power, 802.11n 20 MHz, 5500 MHz, A6



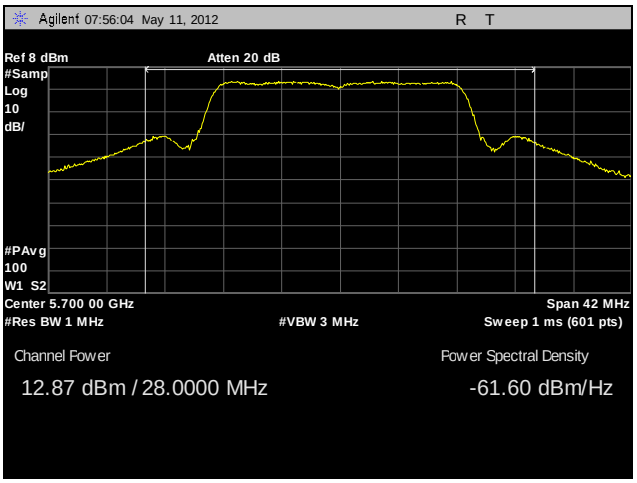
Plot 93. RF Output Power, 802.11n 20 MHz, 5580 MHz, A4



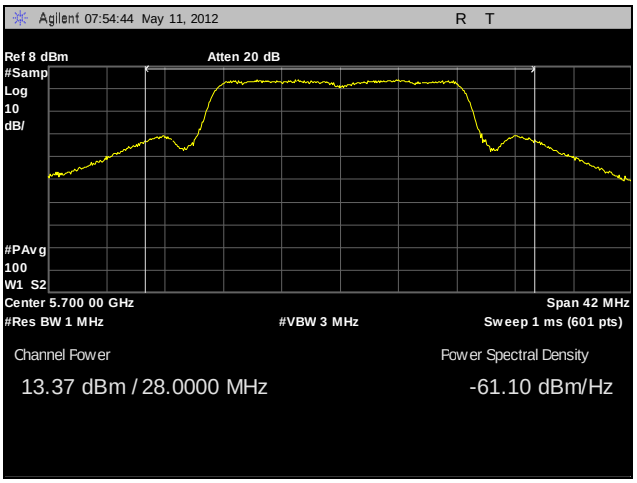
Plot 94. RF Output Power, 802.11n 20 MHz, 5580 MHz, A5



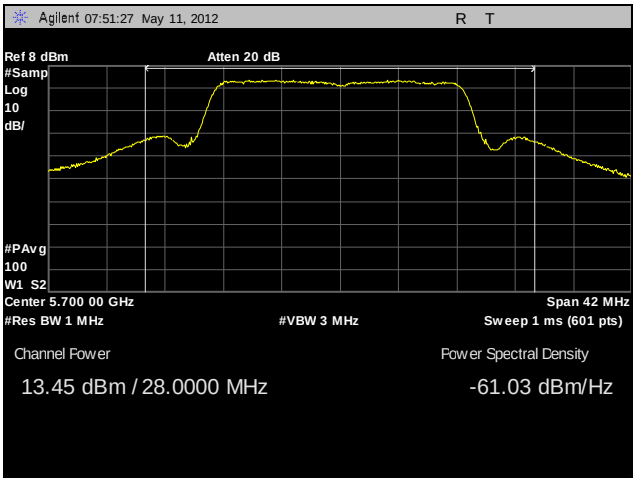
Plot 95. RF Output Power, 802.11n 20 MHz, 5580 MHz, A6



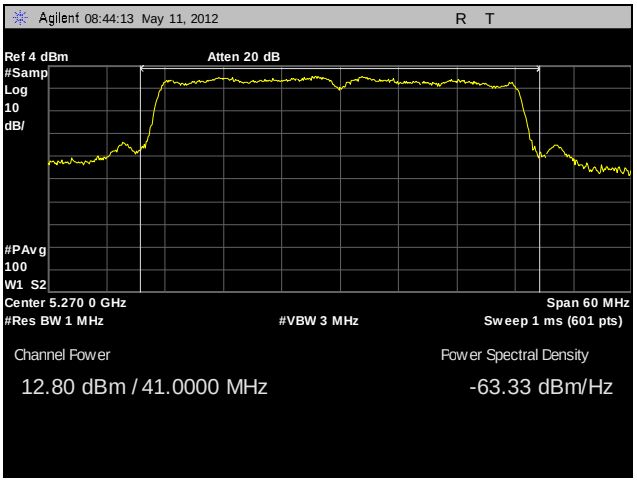
Plot 96. RF Output Power, 802.11n 20 MHz, 5700 MHz, A4



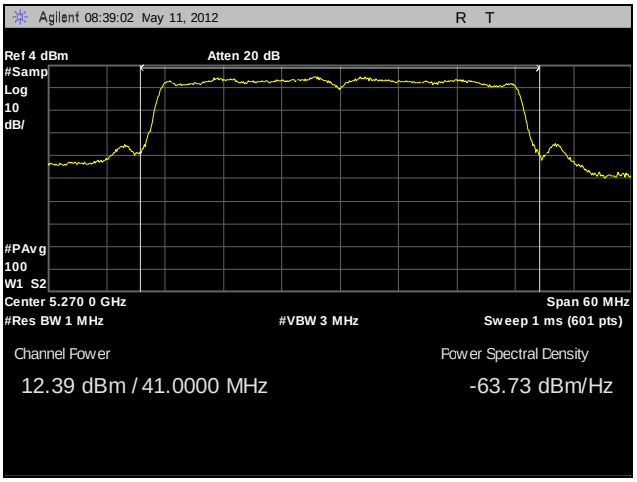
Plot 97. RF Output Power, 802.11n 20 MHz, 5700 MHz, A5



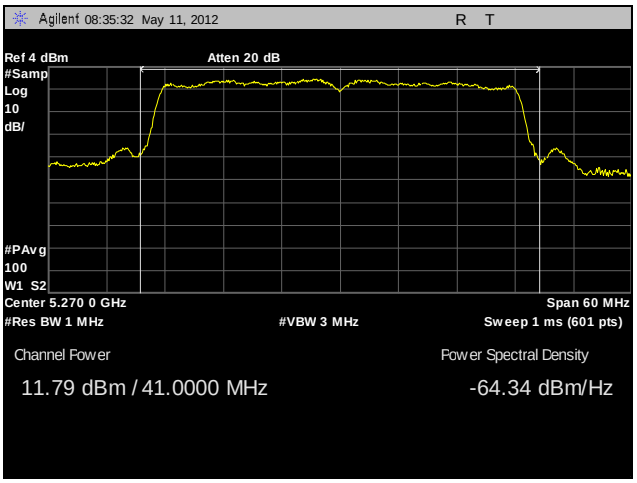
Plot 98. RF Output Power, 802.11n 20 MHz, 5700 MHz, A6



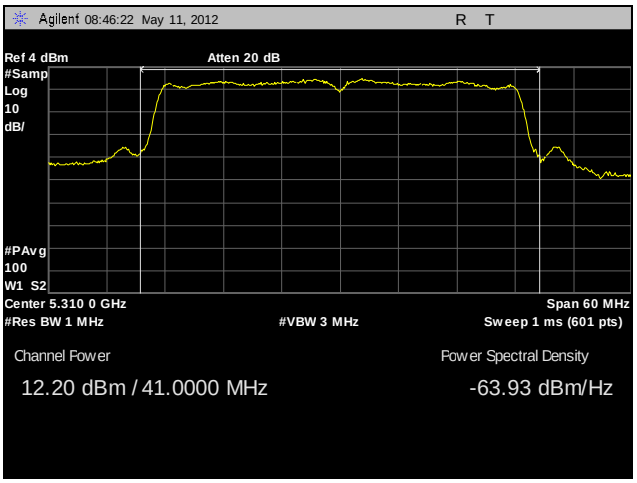
Plot 99. RF Output Power, 802.11n 40 MHz, 5270 MHz, A4



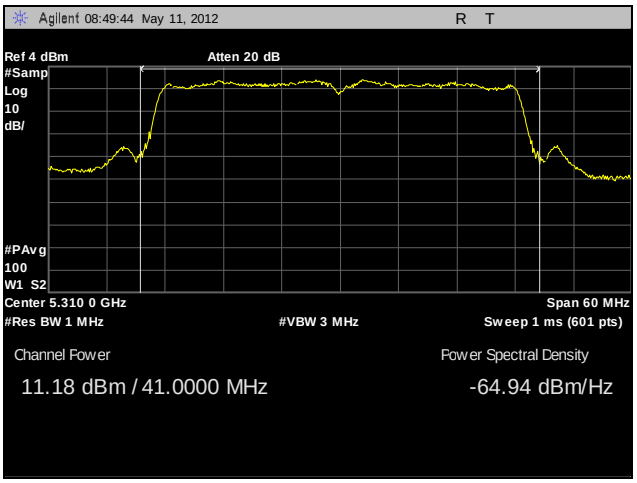
Plot 100. RF Output Power, 802.11n 40 MHz, 5270 MHz, A5



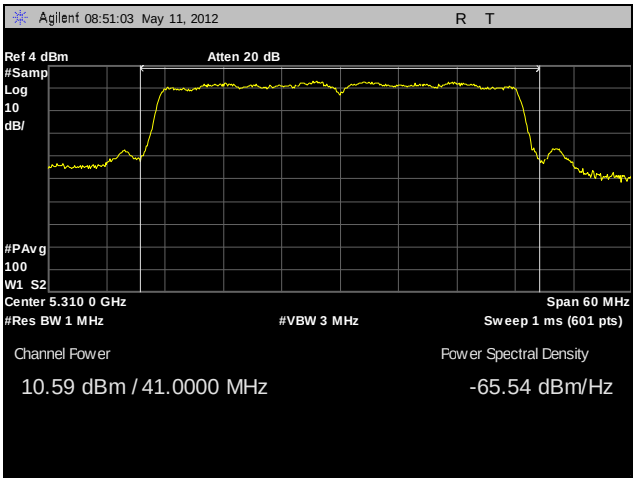
Plot 101. RF Output Power, 802.11n 40 MHz, 5270 MHz, A6



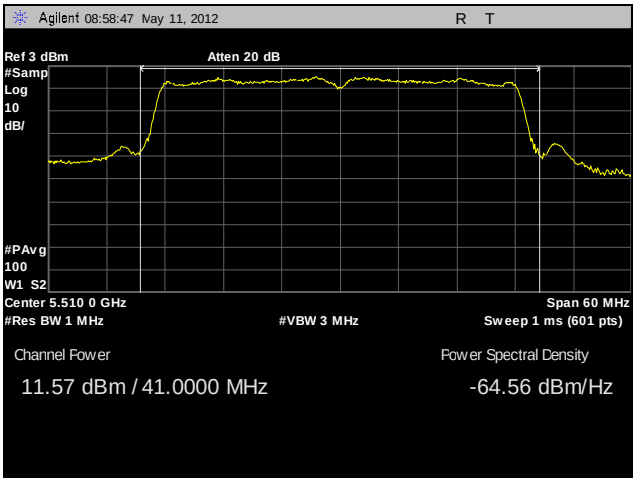
Plot 102. RF Output Power, 802.11n 40 MHz, 5310 MHz, A4



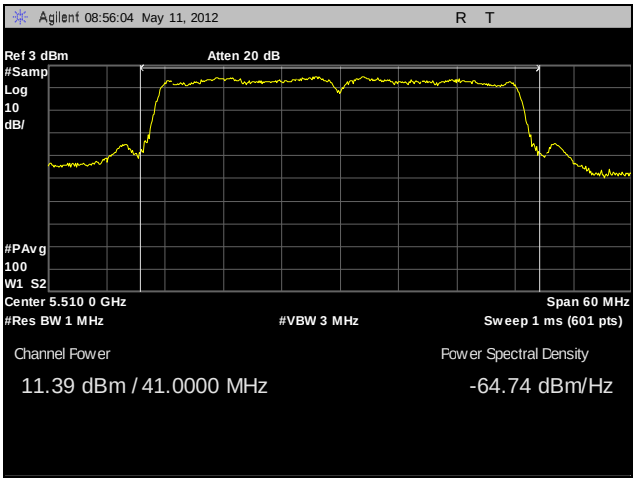
Plot 103. RF Output Power, 802.11n 40 MHz, 5310 MHz, A5



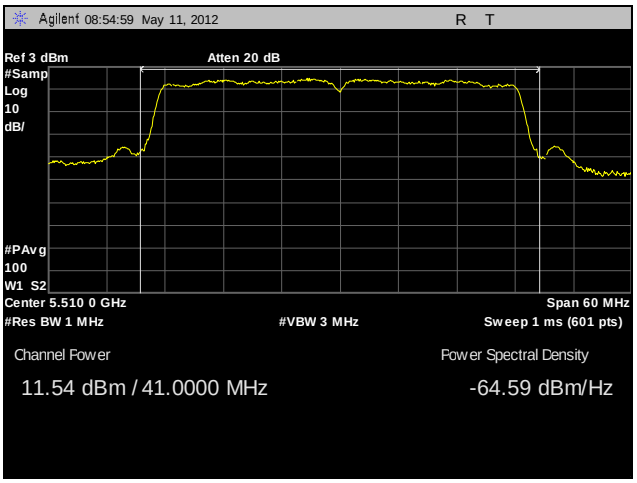
Plot 104. RF Output Power, 802.11n 40 MHz, 5310 MHz, A6



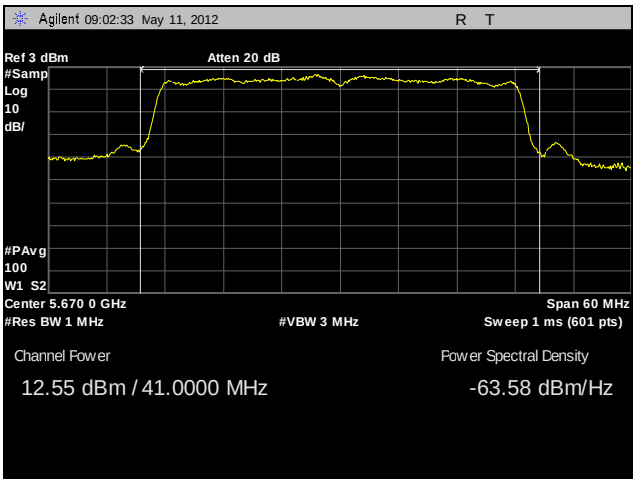
Plot 105. RF Output Power, 802.11n 40 MHz, 5510 MHz, A4



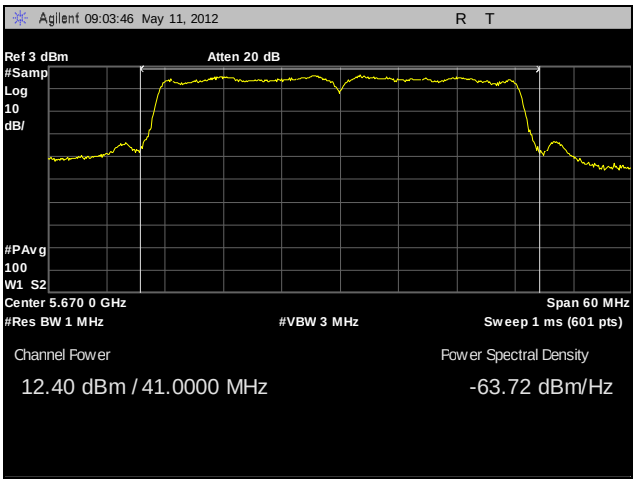
Plot 106. RF Output Power, 802.11n 40 MHz, 5510 MHz, A5



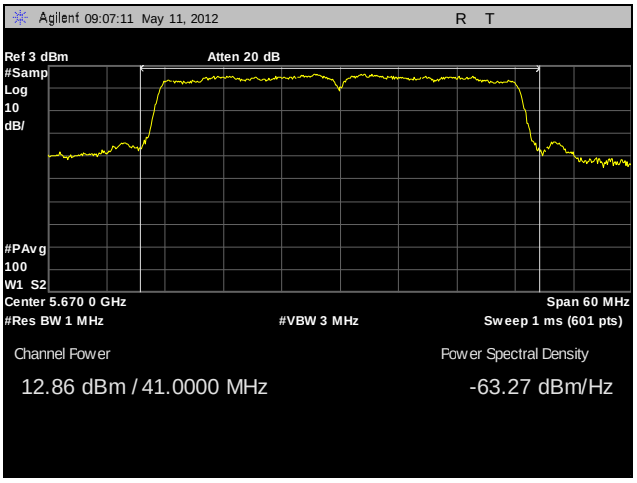
Plot 107. RF Output Power, 802.11n 40 MHz, 5510 MHz, A6



Plot 108. RF Output Power, 802.11n 40 MHz, 5670 MHz, A4



Plot 109. RF Output Power, 802.11n 40 MHz, 5670 MHz, A5



Plot 110. RF Output Power, 802.11n 40 MHz, 5670 MHz, A6

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(2) Peak Power Spectral Density

Test Requirements: **§ 15.407(a)(2):** In addition, the peak power spectral density shall not exceed 11 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 SA-1 from FCC Publication 789033 was used.

Test Results: Equipment was compliant with the peak power spectral density limits of **§ 15.407 (a)(2).** 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

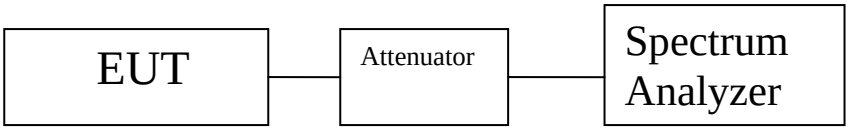
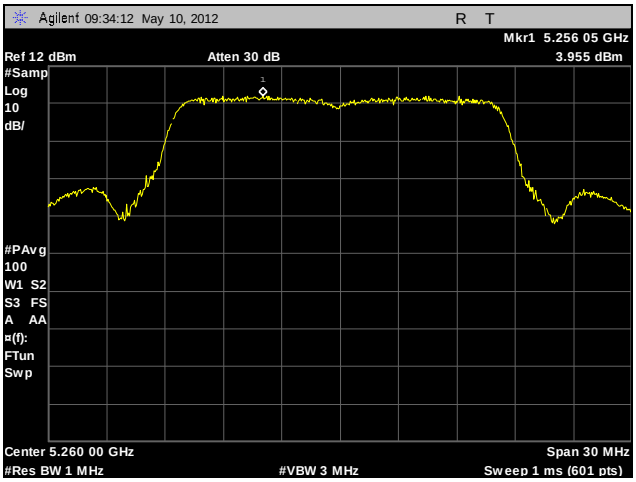


Figure 4. Power Spectral Density Test Setup

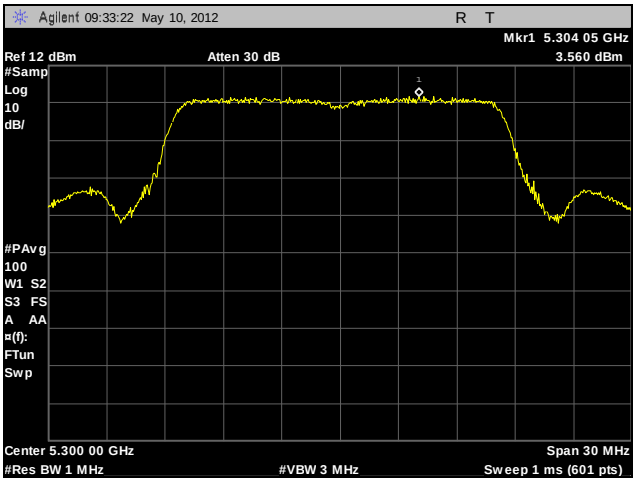
Frequency MHz	Mode	PSD Port 1 dBm	PSD Port 2 dBm	PSD Port 3 dBm	Sum Port dBm	Limit dBm
5260	802.11a	3.955	NA	NA	3.955	7.23
5300	802.11a	3.56	NA	NA	3.56	7.23
5320	802.11a	2.223	NA	NA	2.223	7.23
5260	802.11n 20 MHz	1.334	0.005	0.822	5.53	7.23
5300	802.11n 20 MHz	1.723	1.197	0.741	6.01	7.23
5320	802.11n 20 MHz	1.48	0.525	0.798	5.72	7.23
5270	802.11n 40 MHz	0.099	-0.806	-1.549	4.07	7.23
5310	802.11n 40 MHz	-0.855	-2.123	-2.337	3.05	7.23
5500	802.11a	1.938	NA	NA	1.938	7.23
5580	802.11a	2.937	NA	NA	2.937	7.23
5700	802.11a	2.672	NA	NA	2.672	7.23
5500	802.11n 20 MHz	1.638	1.352	2.028	6.45	7.23
5580	802.11n 20 MHz	2.218	1.771	2.287	6.87	7.23
5700	802.11n 20 MHz	1.763	2.223	2.091	6.80	7.23
5510	802.11n 40 MHz	-1.18	-2.258	-2.235	2.91	7.23
5670	802.11n 40 MHz	-0.017	-0.919	-0.62	4.27	7.23

Table 13. Power Spectral Density, Test Results

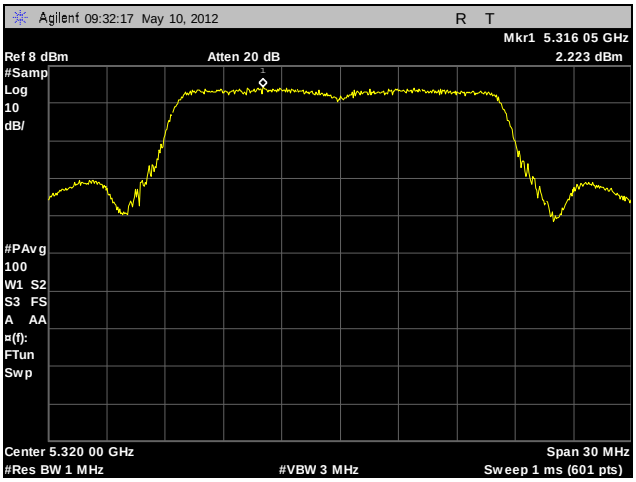
Electromagnetic Compatibility Criteria for Intentional Radiators



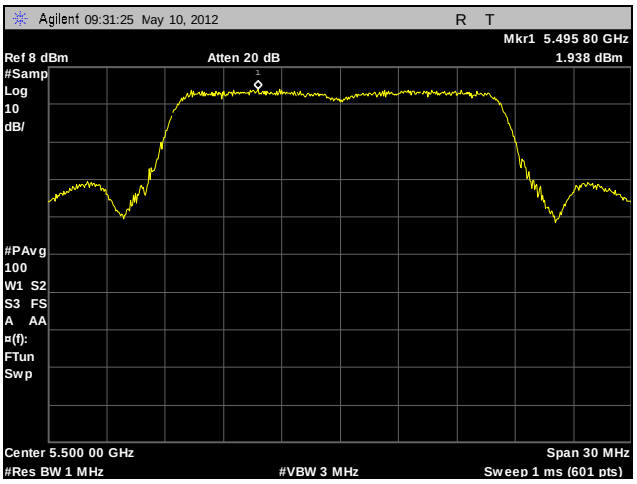
Plot 111. Peak Spectral Density, 802.11a, 5260 MHz, A4



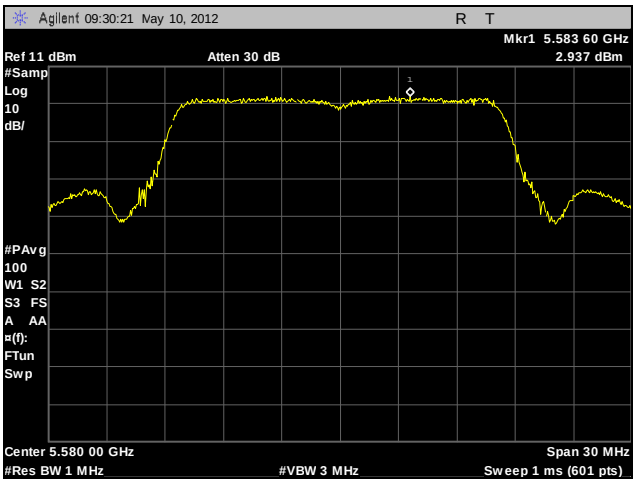
Plot 112. Peak Spectral Density, 802.11a, 5300 MHz, A4



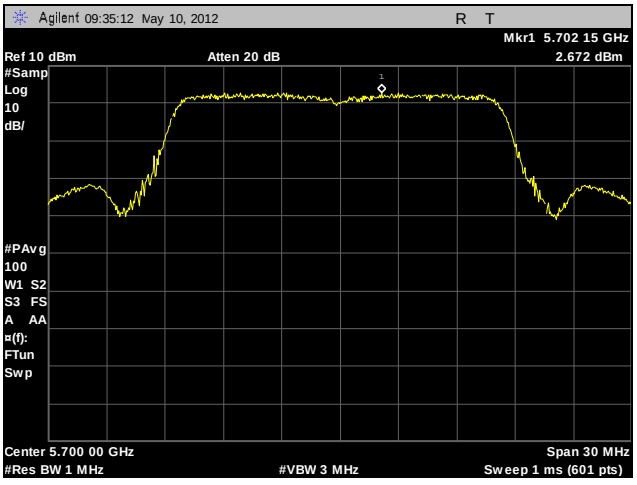
Plot 113. Peak Spectral Density, 802.11a, 5320 MHz, A4



Plot 114. Peak Spectral Density, 802.11a, 5500 MHz, A4

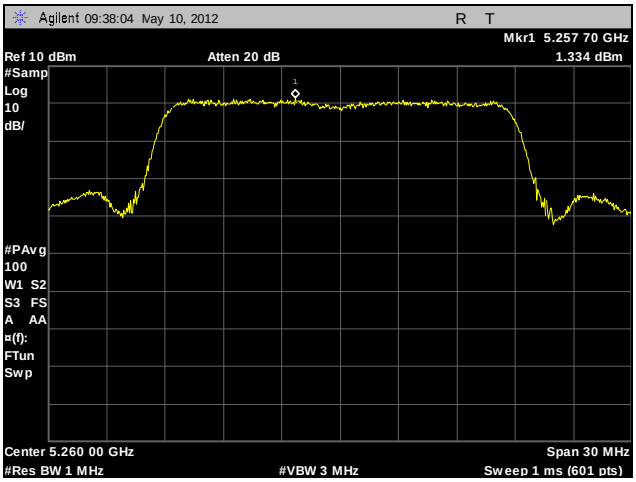


Plot 115. Peak Spectral Density, 802.11a, 5580 MHz, A4

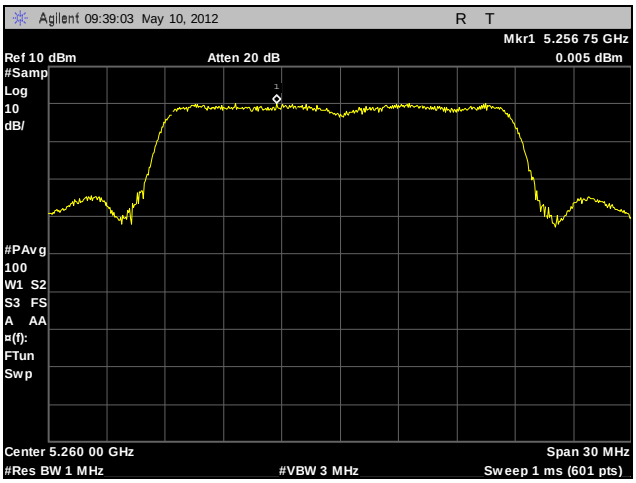


Plot 116. Peak Spectral Density, 802.11a, 5700 MHz, A4

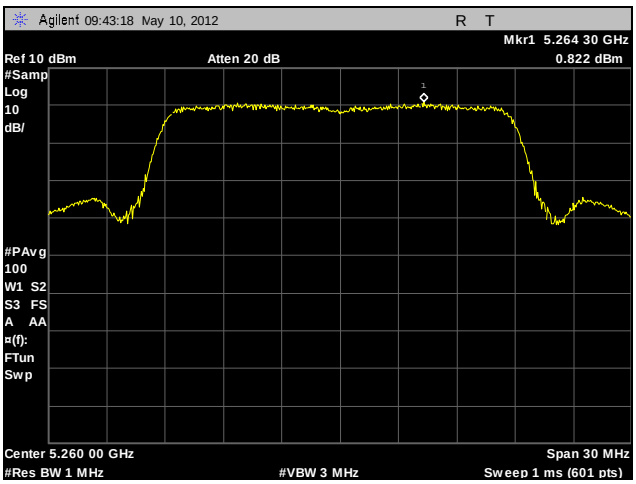
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 117. Peak Spectral Density, 802.11n 20 MHz, 5260 MHz, A4

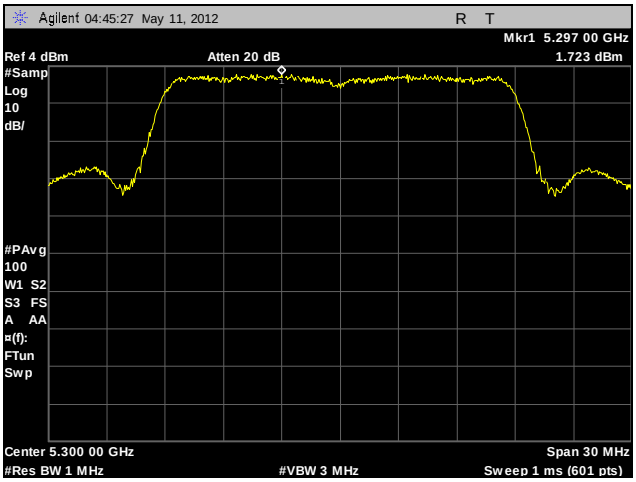


Plot 118. Peak Spectral Density, 802.11n 20 MHz, 5260 MHz, A5

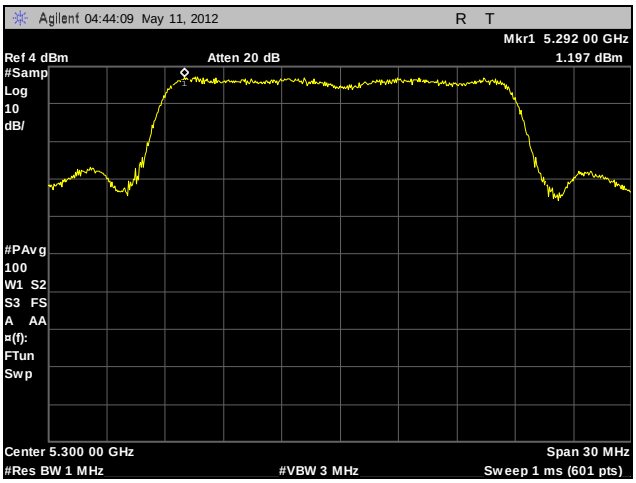


Plot 119. Peak Spectral Density, 802.11n 20 MHz, 5260 MHz, A6

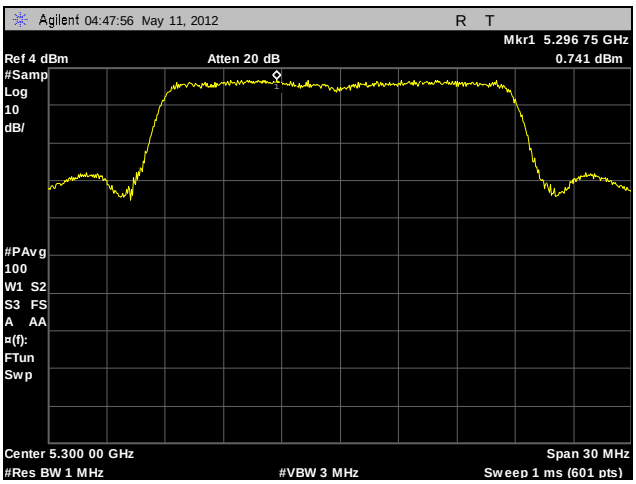
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 120. Peak Spectral Density, 802.11n 20 MHz, 5300 MHz, A4

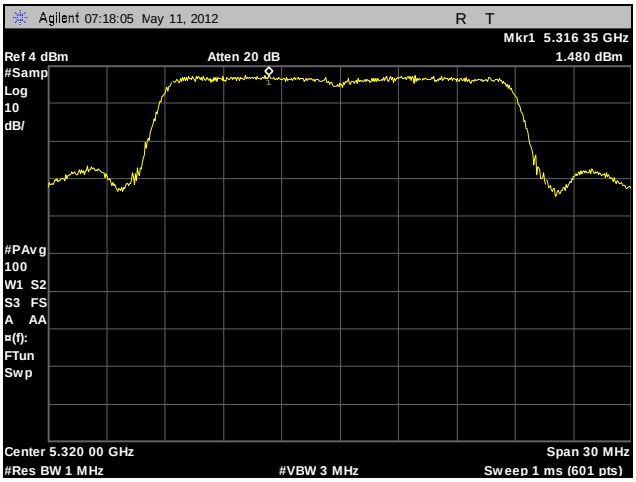


Plot 121. Peak Spectral Density, 802.11n 20 MHz, 5300 MHz, A5

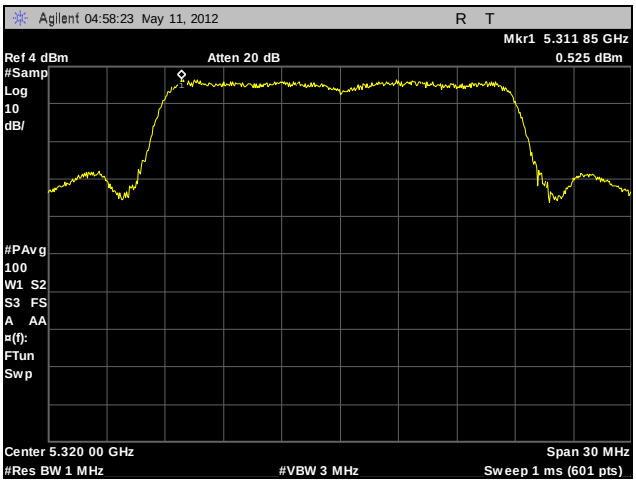


Plot 122. Peak Spectral Density, 802.11n 20 MHz, 5300 MHz, A6

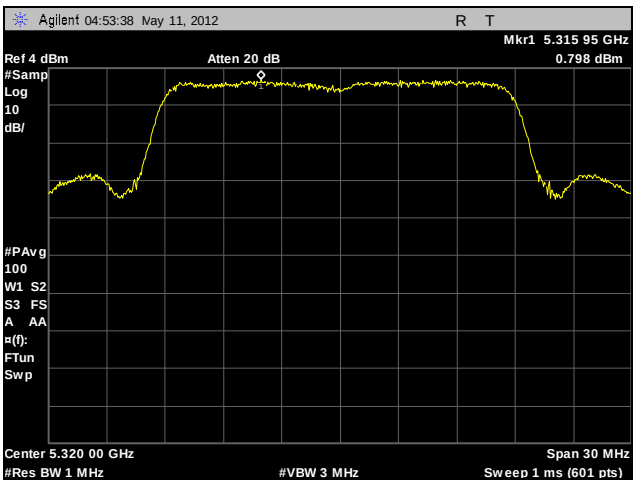
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 123. Peak Spectral Density, 802.11n 20 MHz, 5320 MHz, A4

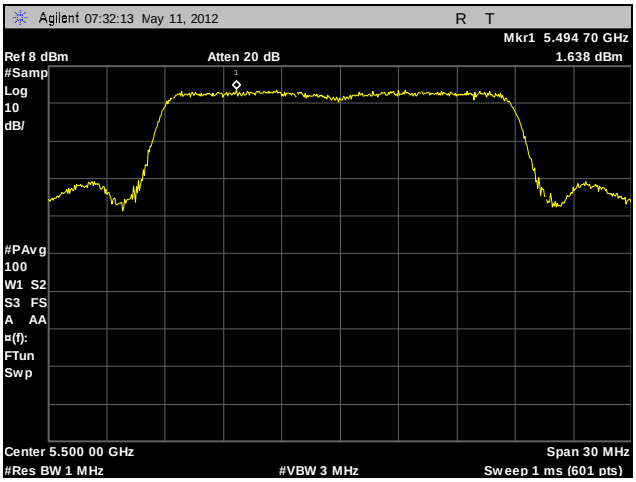


Plot 124. Peak Spectral Density, 802.11n 20 MHz, 5320 MHz, A5

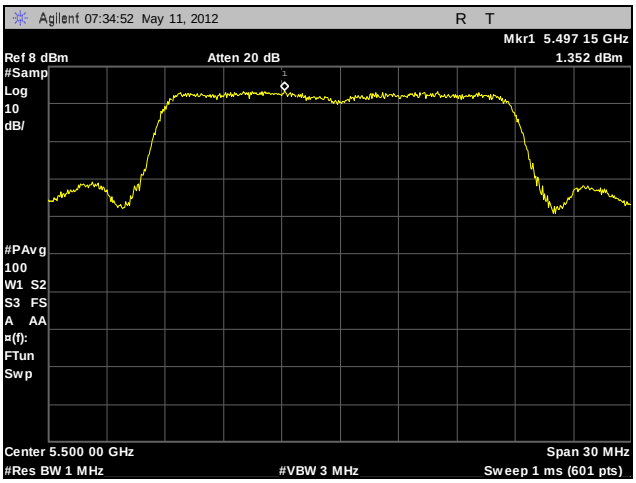


Plot 125. Peak Spectral Density, 802.11n 20 MHz, 5320 MHz, A6

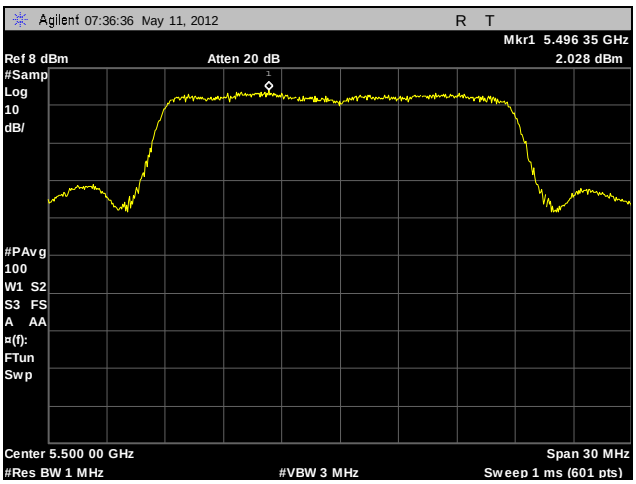
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 126. Peak Spectral Density, 802.11n 20 MHz, 5500 MHz, A4

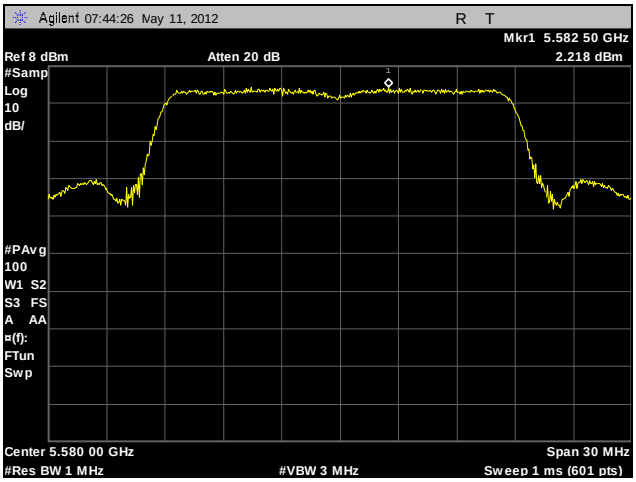


Plot 127. Peak Spectral Density, 802.11n 20 MHz, 5500 MHz, A5

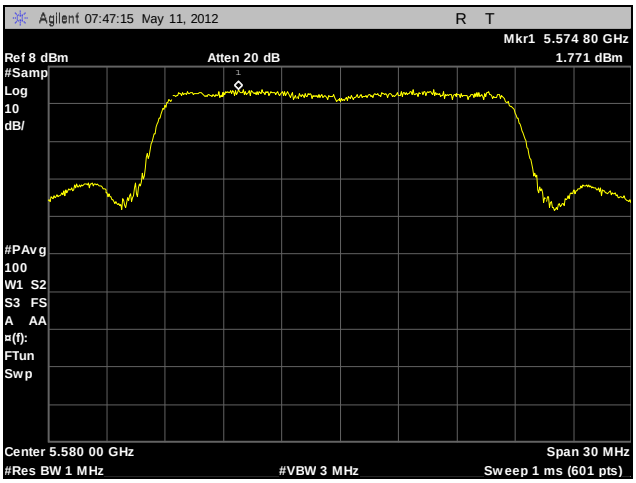


Plot 128. Peak Spectral Density, 802.11n 20 MHz, 5500 MHz, A6

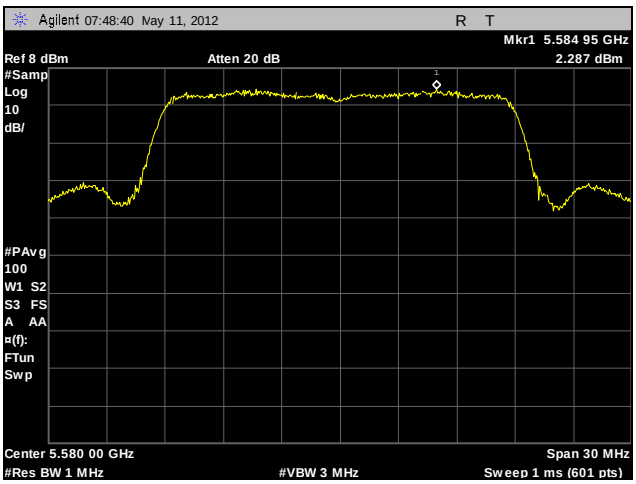
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 129. Peak Spectral Density, 802.11n 20 MHz, 5580 MHz, A4

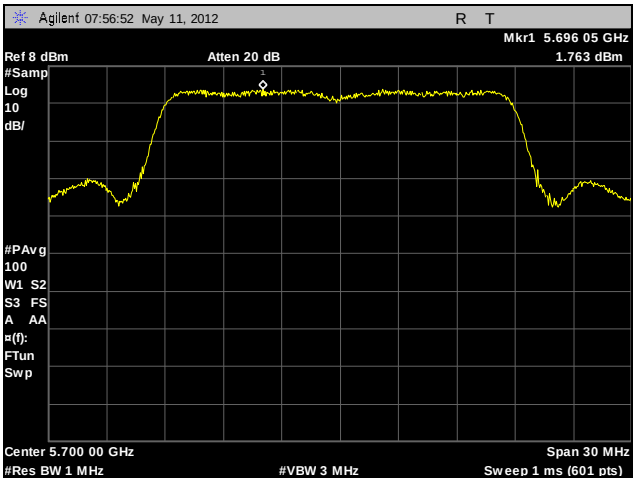


Plot 130. Peak Spectral Density, 802.11n 20 MHz, 5580 MHz, A5

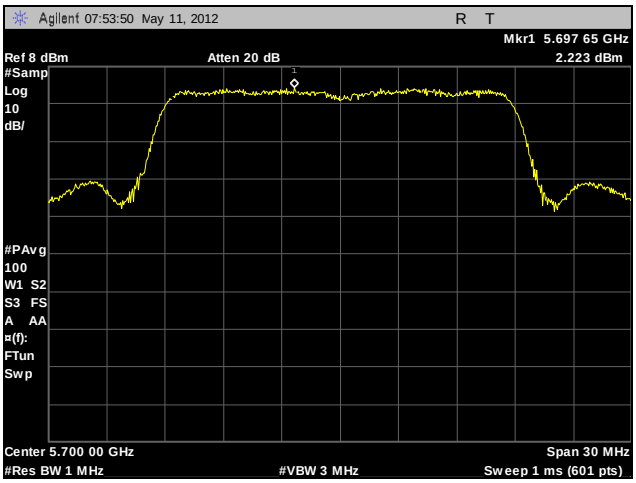


Plot 131. Peak Spectral Density, 802.11n 20 MHz, 5580 MHz, A6

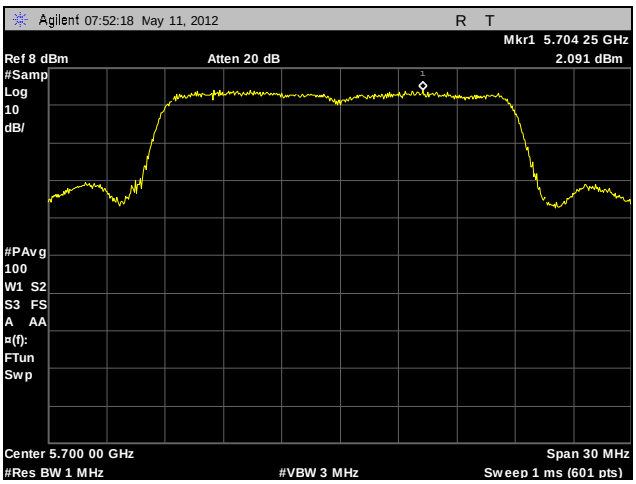
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 132. Peak Spectral Density, 802.11n 20 MHz, 5700 MHz, A4

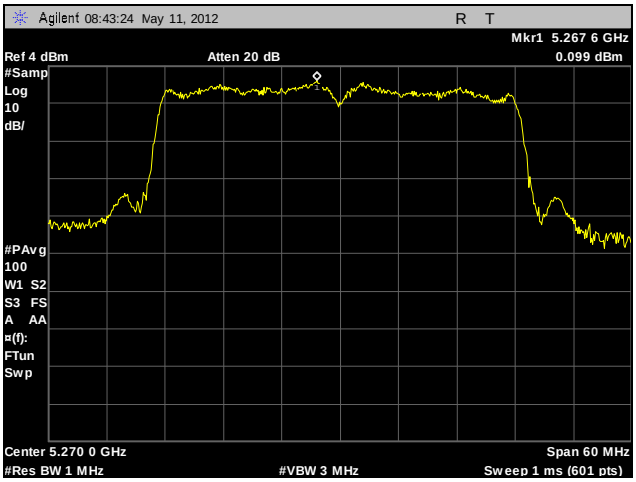


Plot 133. Peak Spectral Density, 802.11n 20 MHz, 5700 MHz, A5

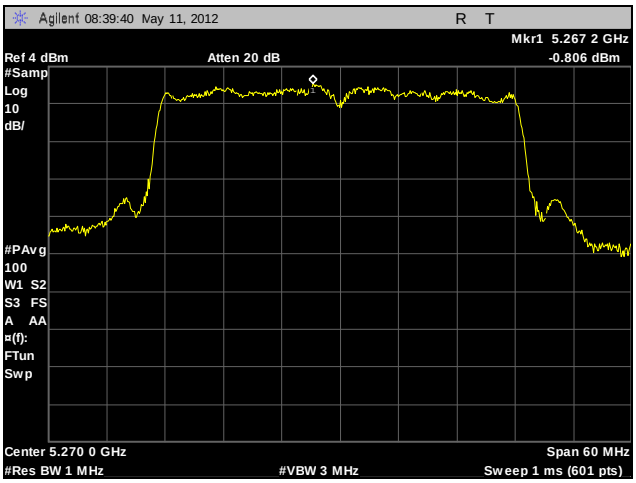


Plot 134. Peak Spectral Density, 802.11n 20 MHz, 5700 MHz, A6

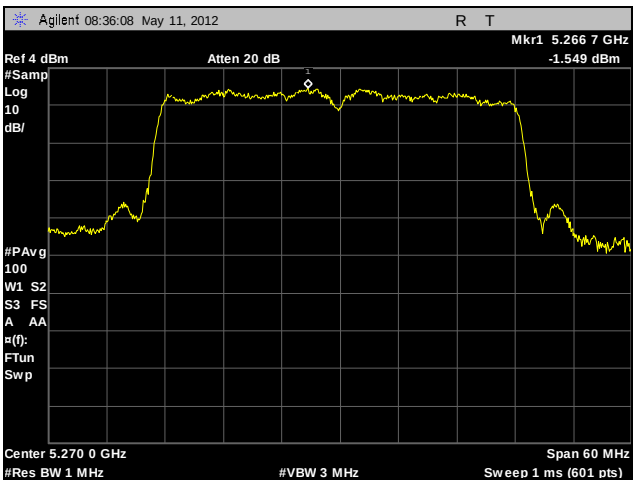
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 135. Peak Spectral Density, 802.11n 40 MHz, 5270 MHz, A4

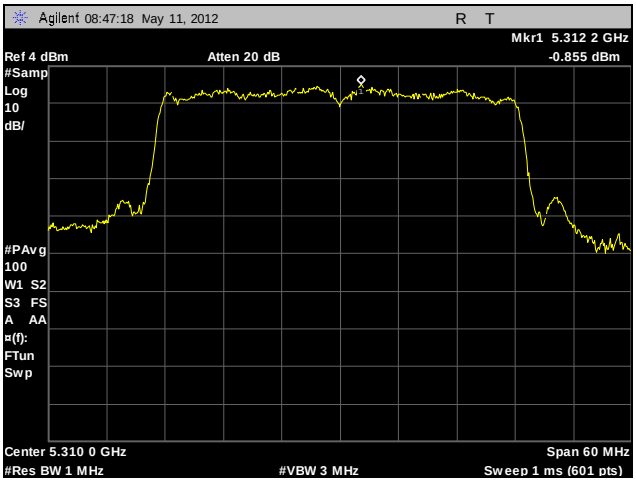


Plot 136. Peak Spectral Density, 802.11n 40 MHz, 5270 MHz, A5

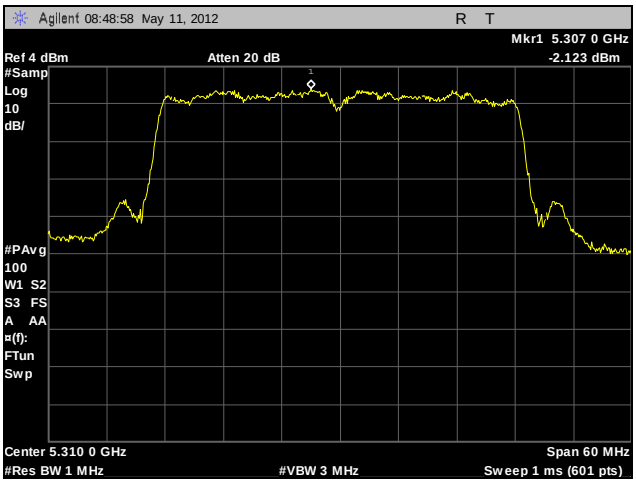


Plot 137. Peak Spectral Density, 802.11n 40 MHz, 5270 MHz, A6

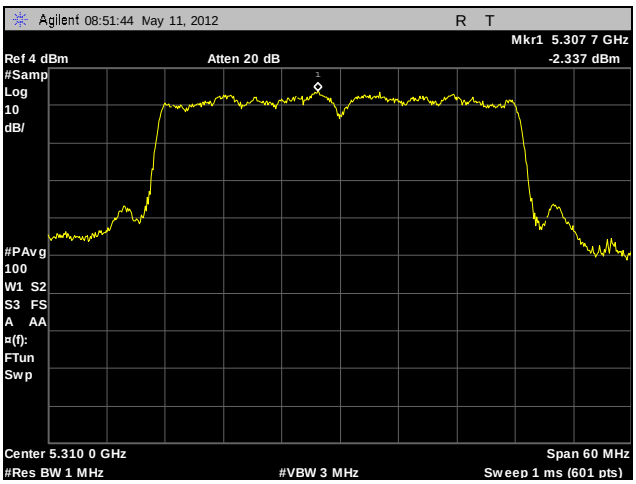
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 138. Peak Spectral Density, 802.11n 40 MHz, 5310 MHz, A4

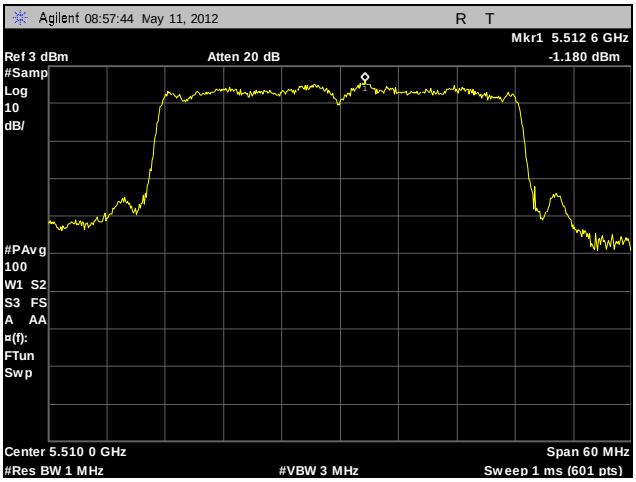


Plot 139. Peak Spectral Density, 802.11n 40 MHz, 5310 MHz, A5

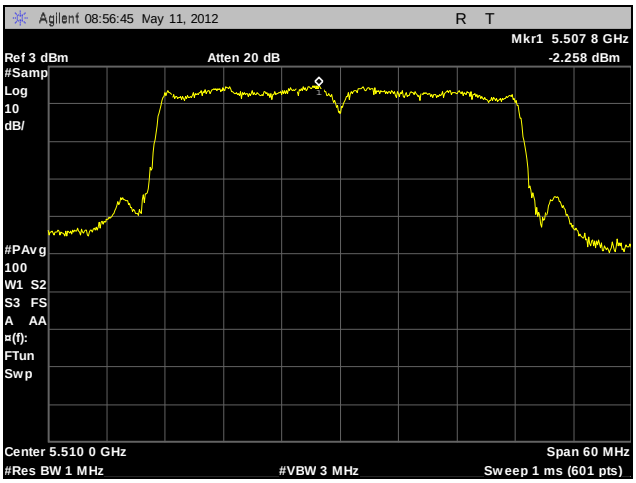


Plot 140. Peak Spectral Density, 802.11n 40 MHz, 5310 MHz, A6

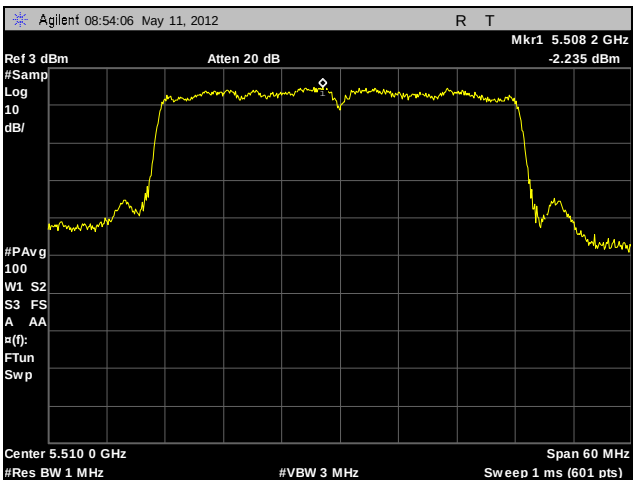
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 141. Peak Spectral Density, 802.11n 40 MHz, 5510 MHz, A4

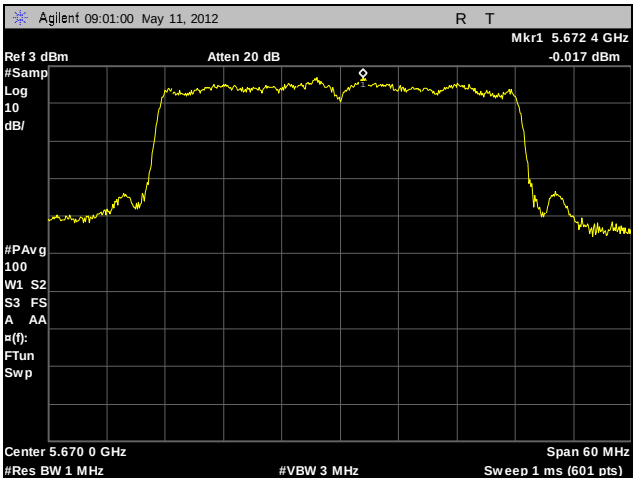


Plot 142. Peak Spectral Density, 802.11n 40 MHz, 5510 MHz, A5

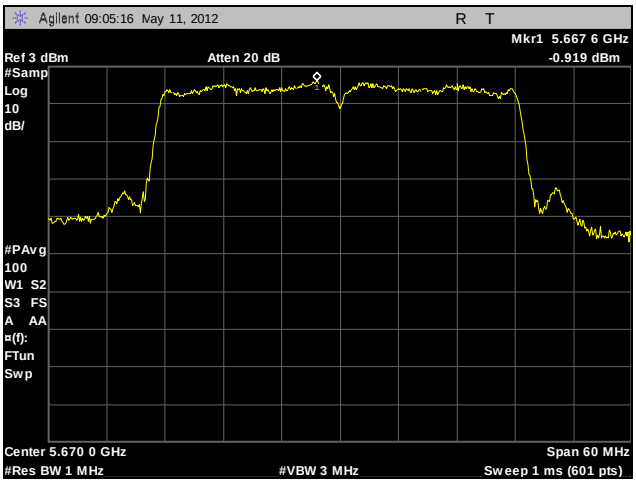


Plot 143. Peak Spectral Density, 802.11n 40 MHz, 5510 MHz, A6

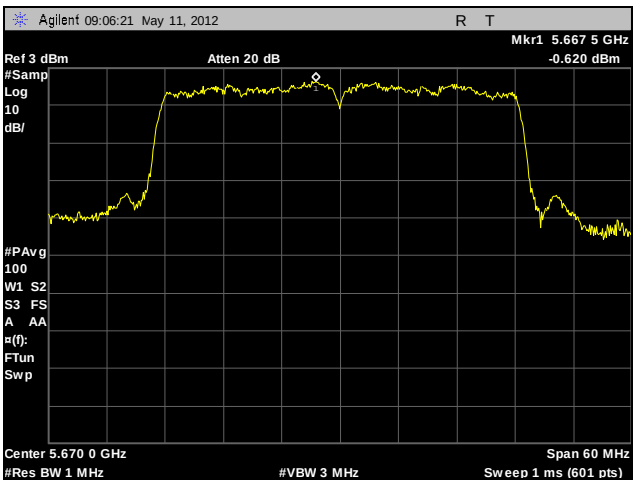
Electromagnetic Compatibility Criteria for Intentional Radiators



Plot 144. Peak Spectral Density, 802.11n 40 MHz, 5670 MHz, A4



Plot 145. Peak Spectral Density, 802.11n 40 MHz, 5670 MHz, A5



Plot 146. Peak Spectral Density, 802.11n 40 MHz, 5670 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. The peak detector mode was used and the trace max held. The 2nd trace on the spectrum analyzer was set according to measurement Method SA-1 from FCC Publication 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): 05/08/12

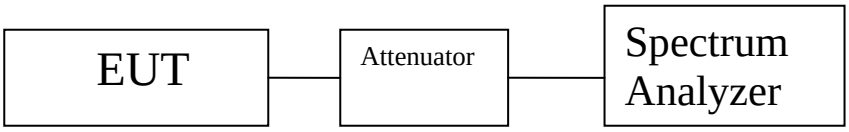
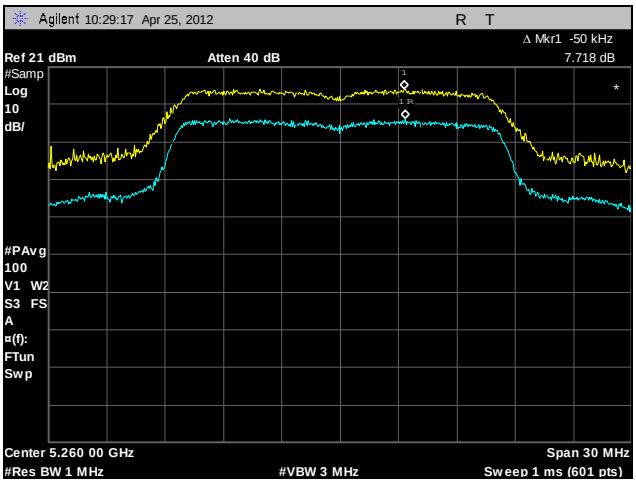
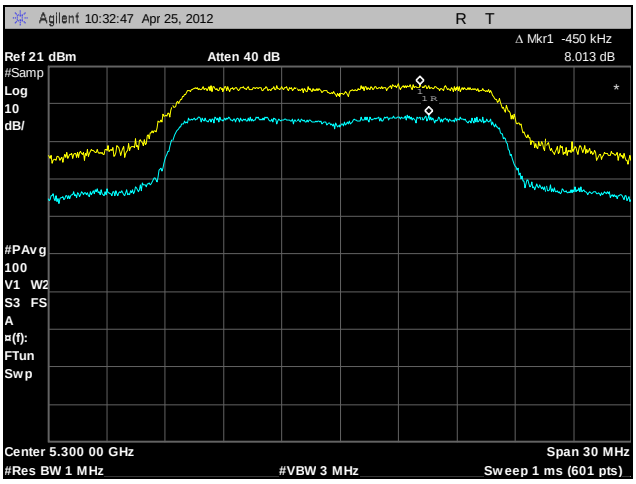


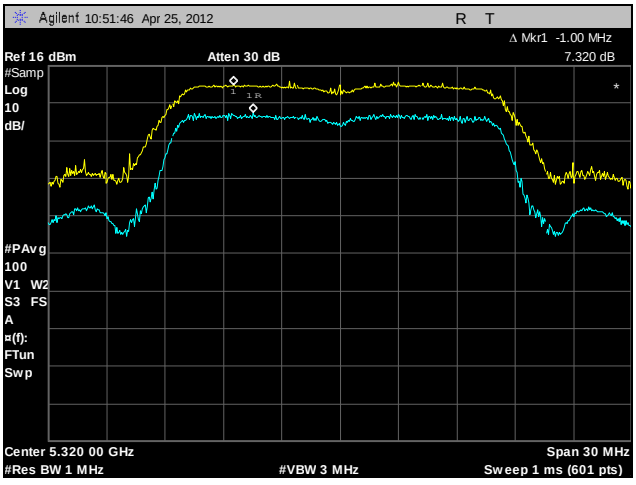
Figure 5. Peak Excursion Ration Test Setup



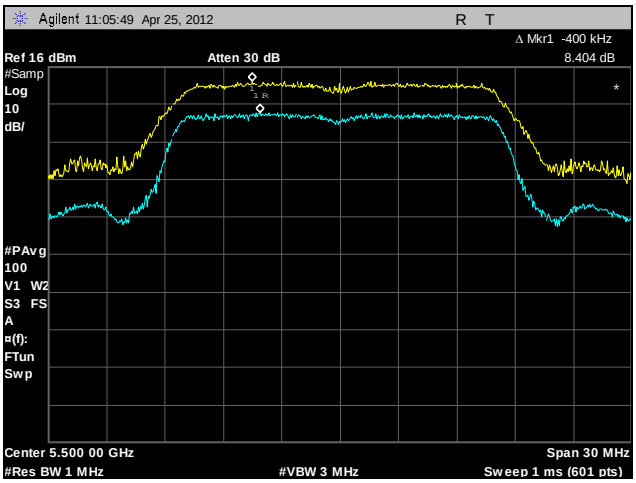
Plot 147. Peak Excursion Ratio, 802.11a, A4, 5260 MHz



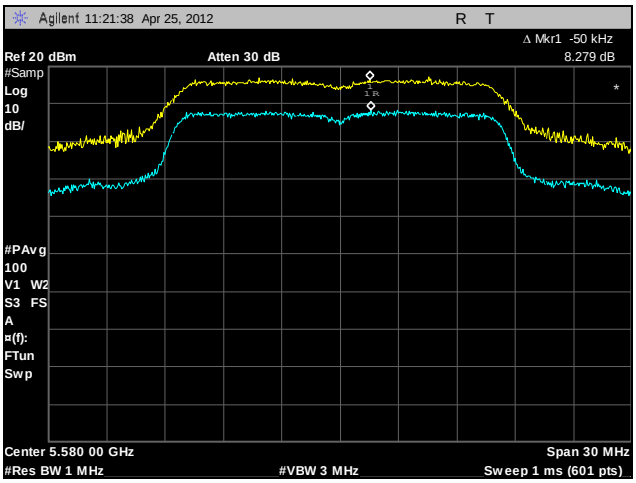
Plot 148. Peak Excursion Ratio, 802.11a, A4, 5300 MHz



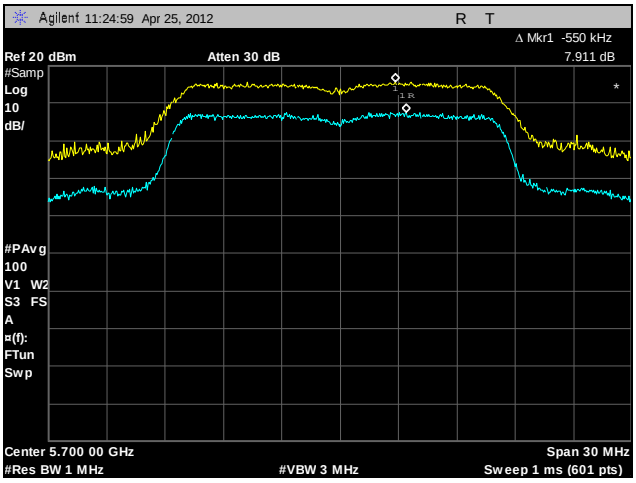
Plot 149. Peak Excursion Ratio, 802.11a, A4, 5320 MHz



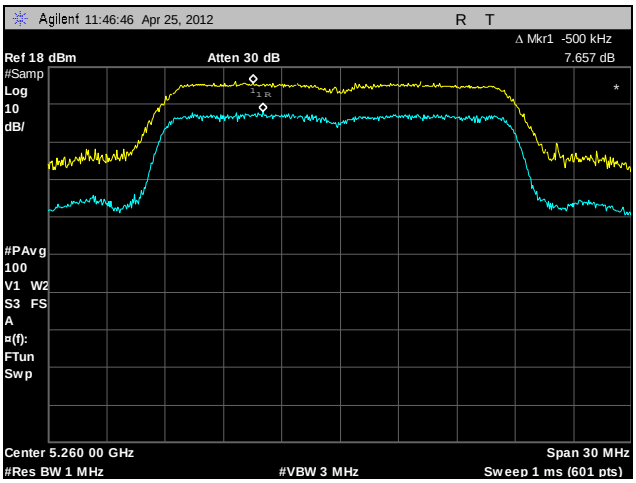
Plot 150. Peak Excursion Ratio, 802.11a, A4, 5500 MHz



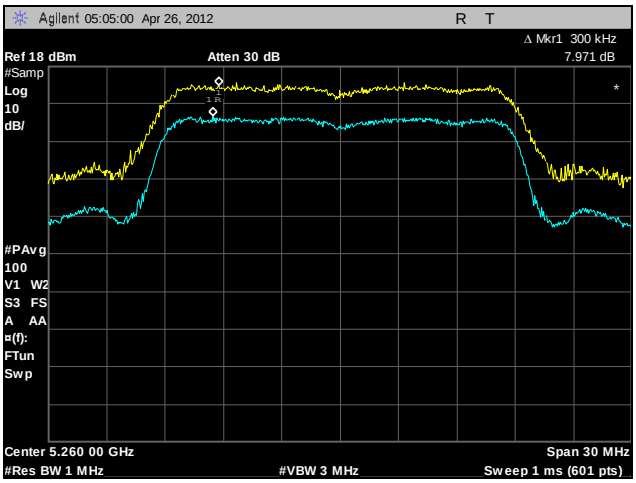
Plot 151. Peak Excursion Ratio, 802.11a, A4, 5580 MHz



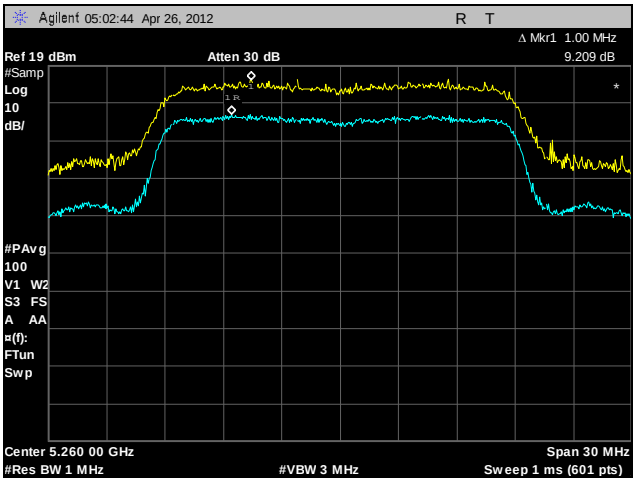
Plot 152. Peak Excursion Ratio, 802.11a, A4, 5700 MHz



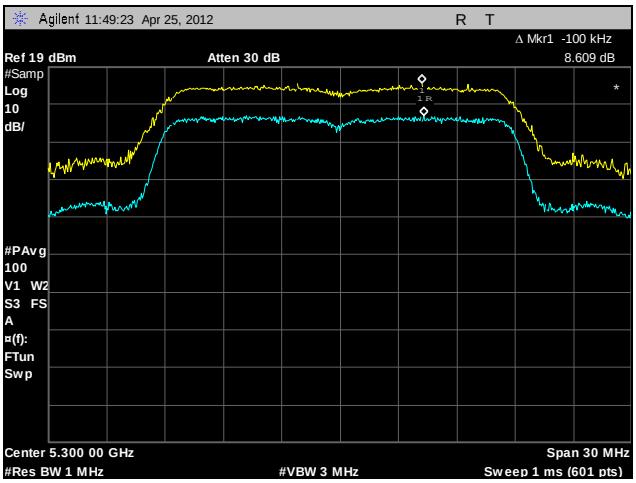
Plot 153. Peak Excursion Ratio, 802.11n 20 MHz, A4, 5260 MHz



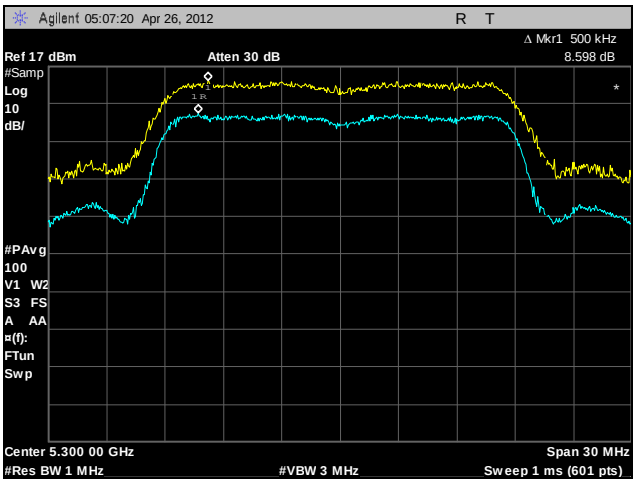
Plot 154. Peak Excursion Ratio, 802.11n 20 MHz, A5, 5260 MHz



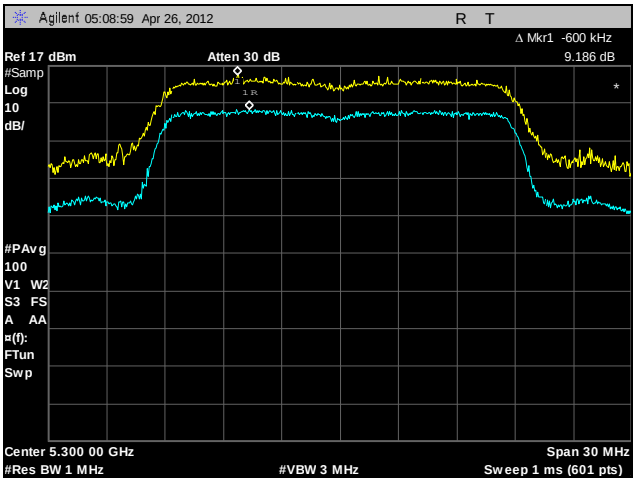
Plot 155. Peak Excursion Ratio, 802.11n 20 MHz, A6, 5260 MHz



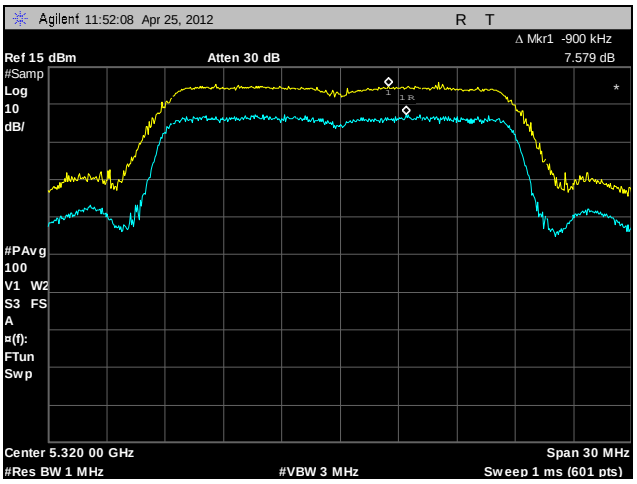
Plot 156. Peak Excursion Ratio, 802.11n 20 MHz, A4, 5300 MHz



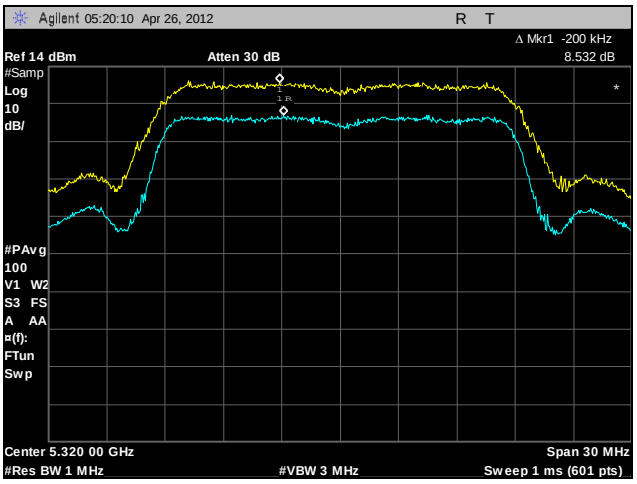
Plot 157. Peak Excursion Ratio, 802.11n 20 MHz, A5, 5300 MHz



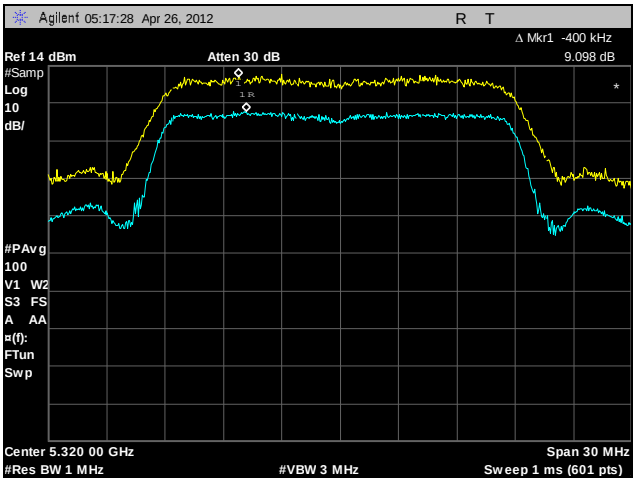
Plot 158. Peak Excursion Ratio, 802.11n 20 MHz, A6, 5300 MHz



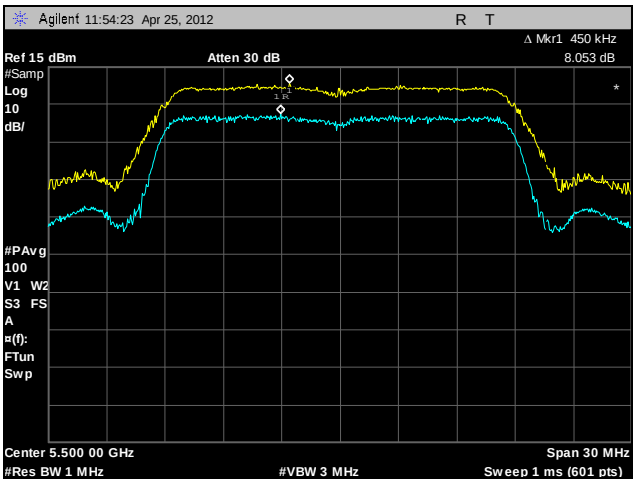
Plot 159. Peak Excursion Ratio, 802.11n 20 MHz, A4, 5320 MHz



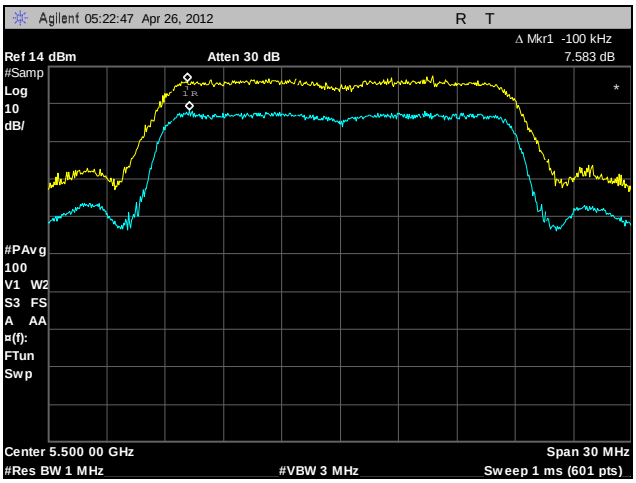
Plot 160. Peak Excursion Ratio, 802.11n 20 MHz, A5, 5320 MHz



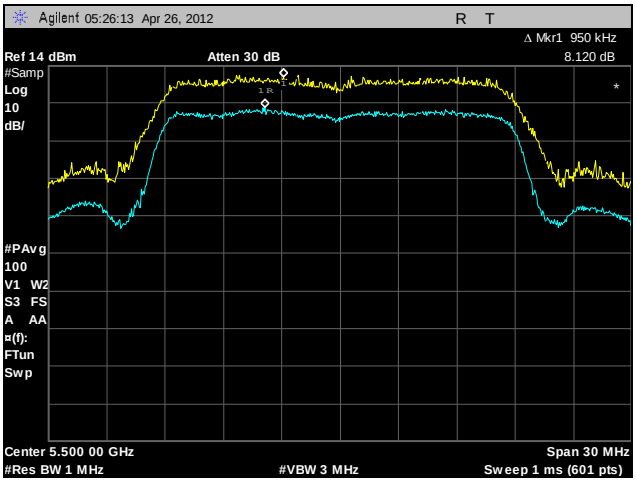
Plot 161. Peak Excursion Ratio, 802.11n 20 MHz, A6, 5320 MHz



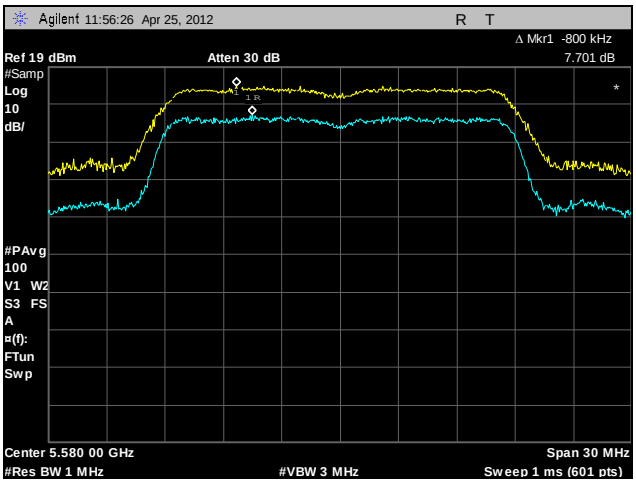
Plot 162. Peak Excursion Ratio, 802.11n 20 MHz, A4, 5500 MHz



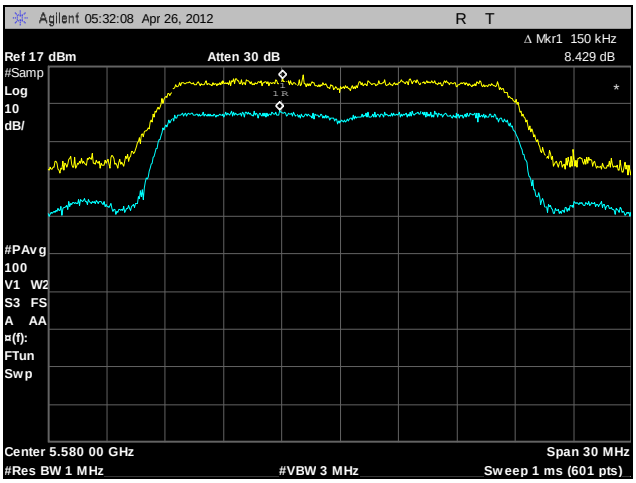
Plot 163. Peak Excursion Ratio, 802.11n 20 MHz, A5, 5500 MHz



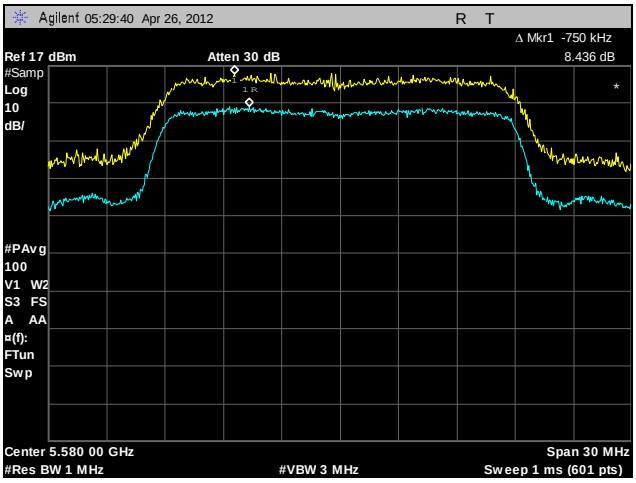
Plot 164. Peak Excursion Ratio, 802.11n 20 MHz, A6, 5500 MHz



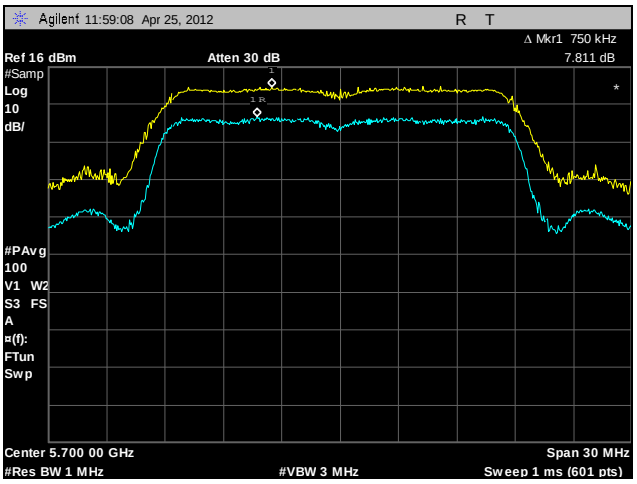
Plot 165. Peak Excursion Ratio, 802.11n 20 MHz, A4, 5580 MHz



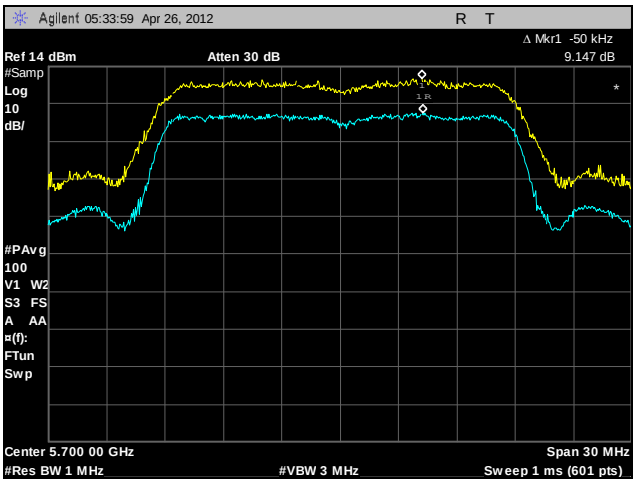
Plot 166. Peak Excursion Ratio, 802.11n 20 MHz, A5, 5580 MHz



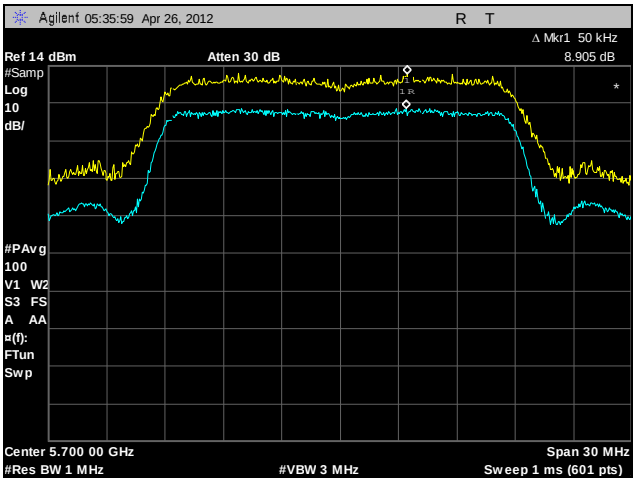
Plot 167. Peak Excursion Ratio, 802.11n 20 MHz, A6, 5580 MHz



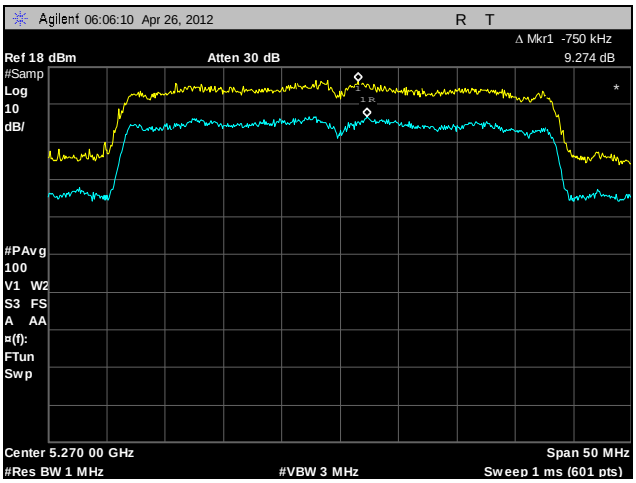
Plot 168. Peak Excursion Ratio, 802.11n 20 MHz, A4, 5700 MHz



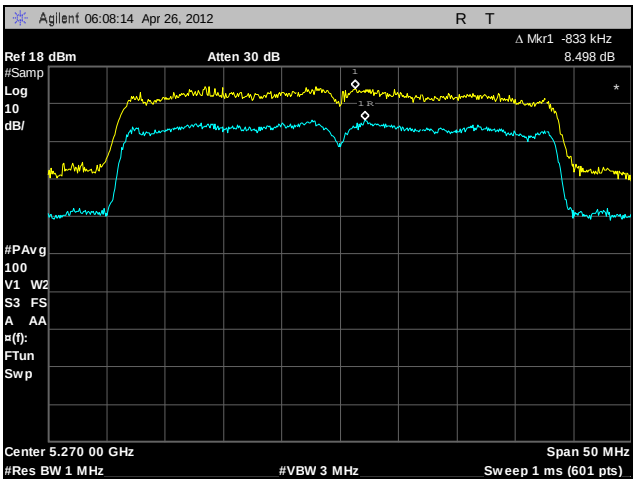
Plot 169. Peak Excursion Ratio, 802.11n 20 MHz, A5, 5700 MHz



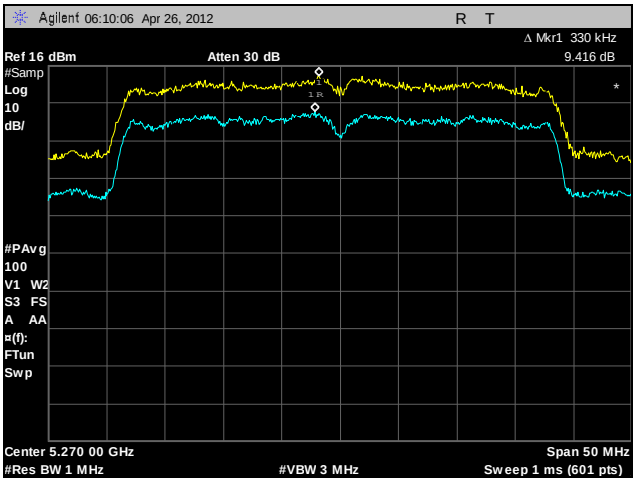
Plot 170. Peak Excursion Ratio, 802.11n 20 MHz, A6, 5700 MHz



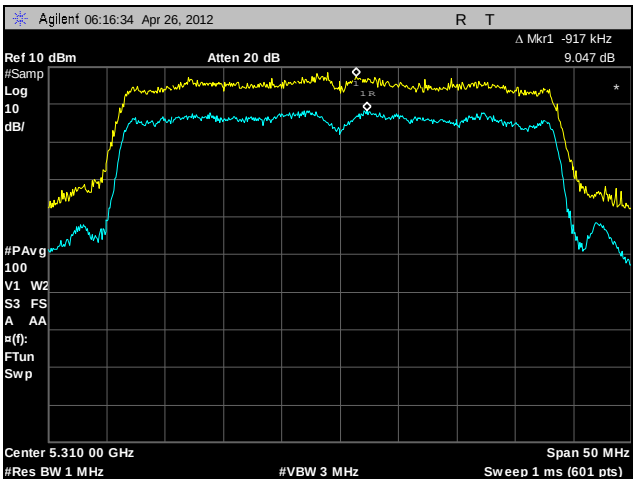
Plot 171. Peak Excursion Ratio, 802.11n 40 MHz, A4, 5270 MHz



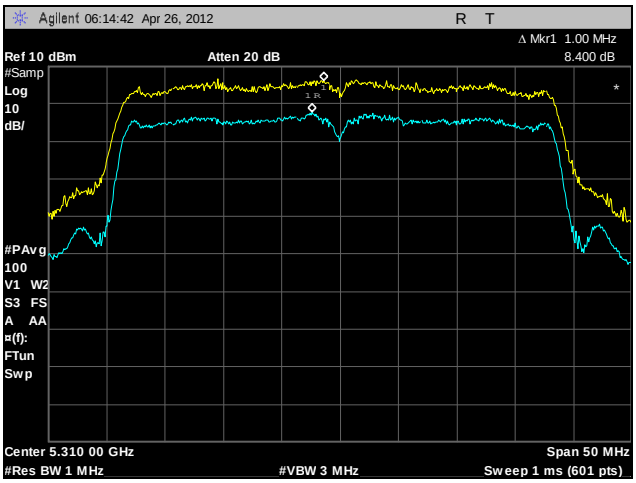
Plot 172. Peak Excursion Ratio, 802.11n 40 MHz, A5, 5270 MHz



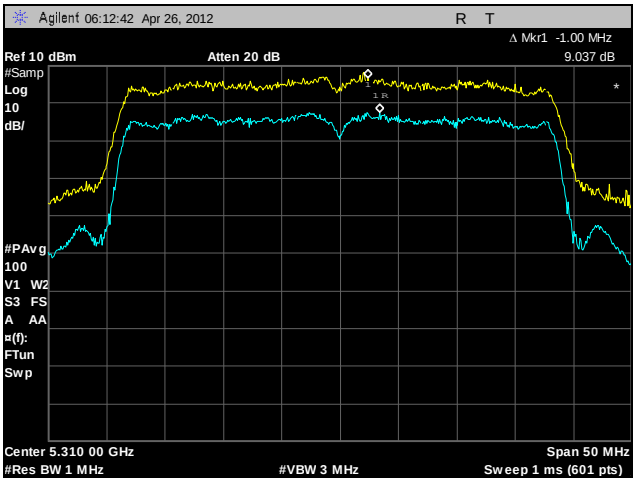
Plot 173. Peak Excursion Ratio, 802.11n 40 MHz, A6, 5270 MHz



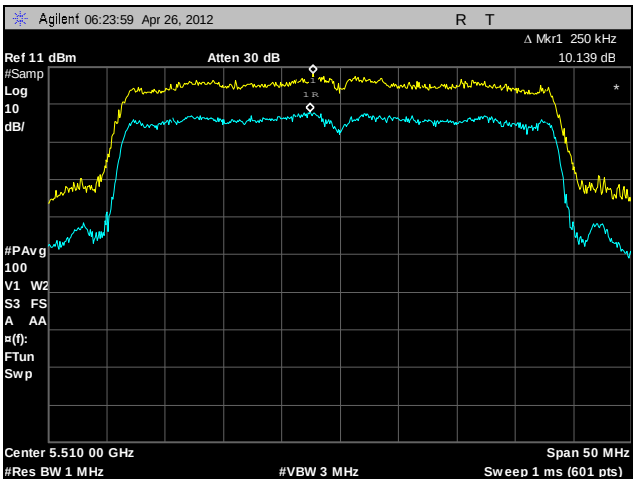
Plot 174. Peak Excursion Ratio, 802.11n 40 MHz, A4, 5310 MHz



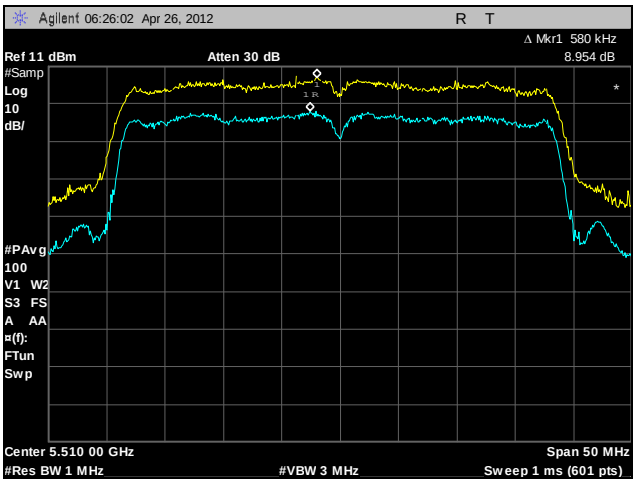
Plot 175. Peak Excursion Ratio, 802.11n 40 MHz, A5, 5310 MHz



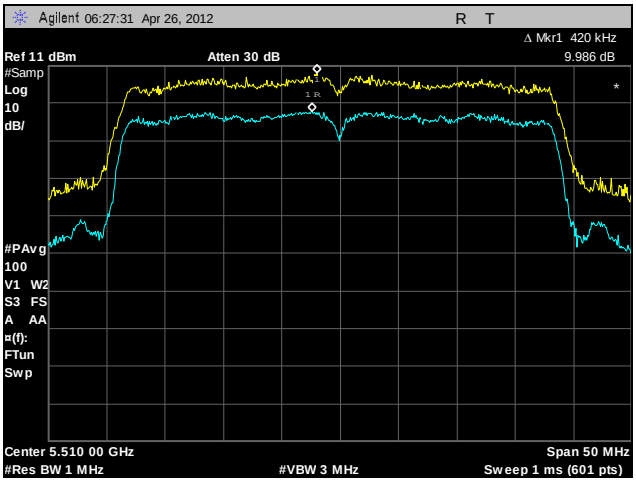
Plot 176. Peak Excursion Ratio, 802.11n 40 MHz, A6, 5310 MHz



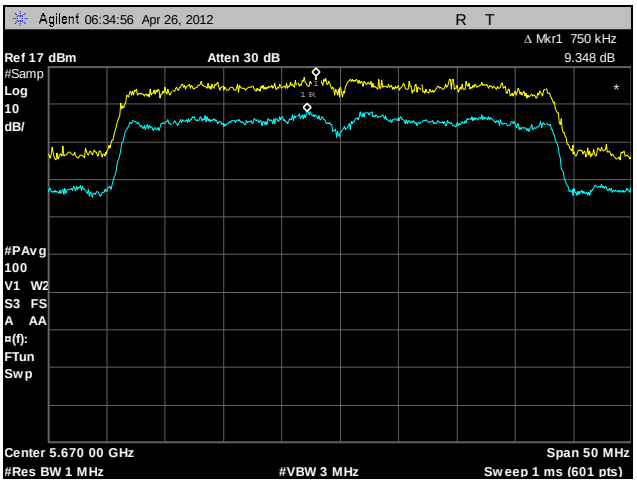
Plot 177. Peak Excursion Ratio, 802.11n 40 MHz, A4, 5510 MHz



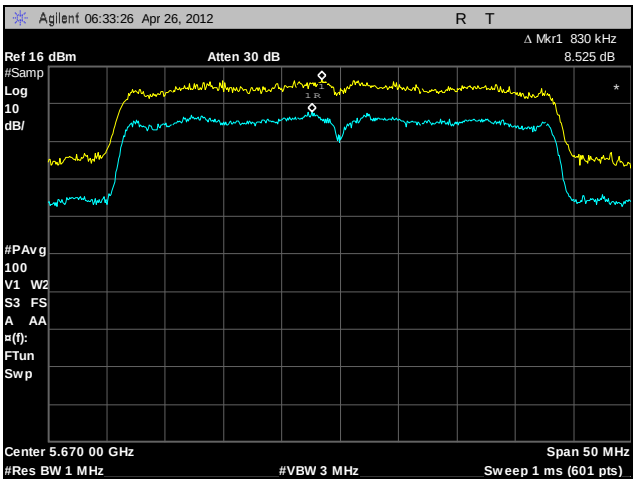
Plot 178. Peak Excursion Ratio, 802.11n 40 MHz, A5, 5510 MHz



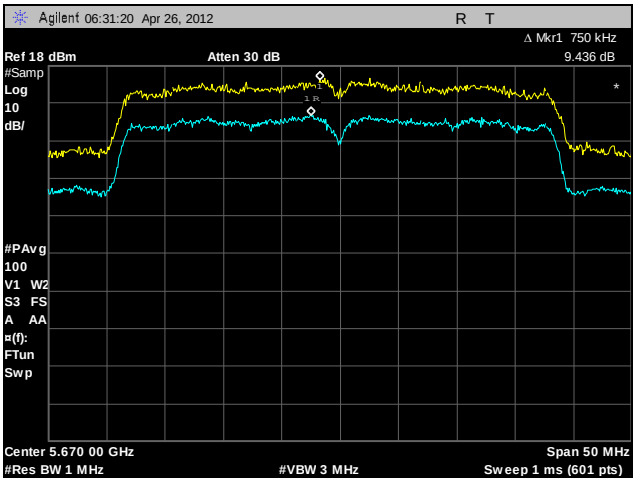
Plot 179. Peak Excursion Ratio, 802.11n 40 MHz, A6, 5510 MHz



Plot 180. Peak Excursion Ratio, 802.11n 40 MHz, A4, 5670 MHz



Plot 181. Peak Excursion Ratio, 802.11n 40 MHz, A5, 5670 MHz



Plot 182. Peak Excursion Ratio, 802.11n 40 MHz, A6, 5670 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(2), (3), (6), (7) Undesirable Emissions

Test Requirements: **§ 15.407(b)(2), (3), (6), (7)**; **§15.205:** Emissions outside the frequency band.

§ 15.407(b)(2): For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.

§ 15.407(b)(3): For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 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 acrylic stand 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.

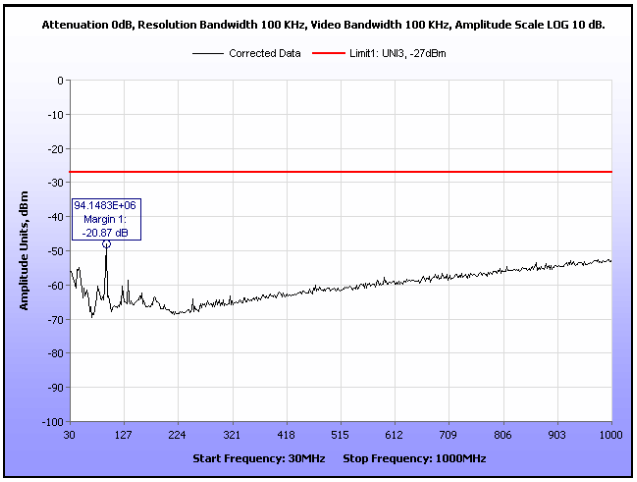
For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Emissions were explored up to 40 GHz.
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.

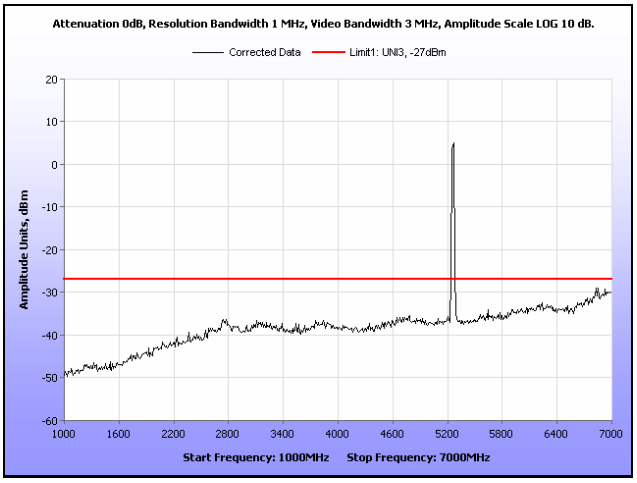
Test Engineer(s): Jeff Pratt

Test Date(s): 04/16/12 – 05/23/12

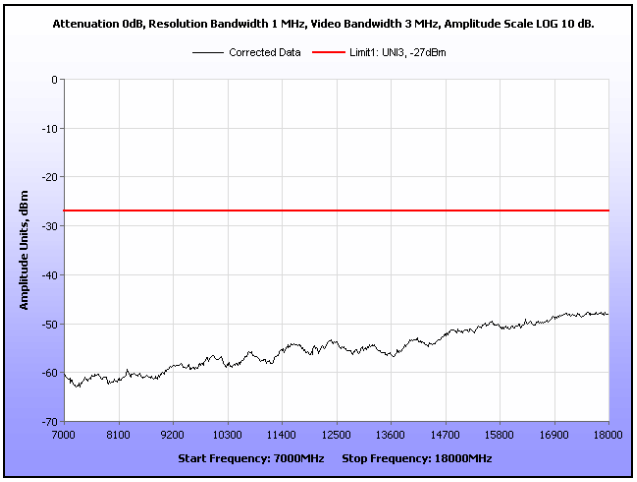
Radiated Emissions Limits



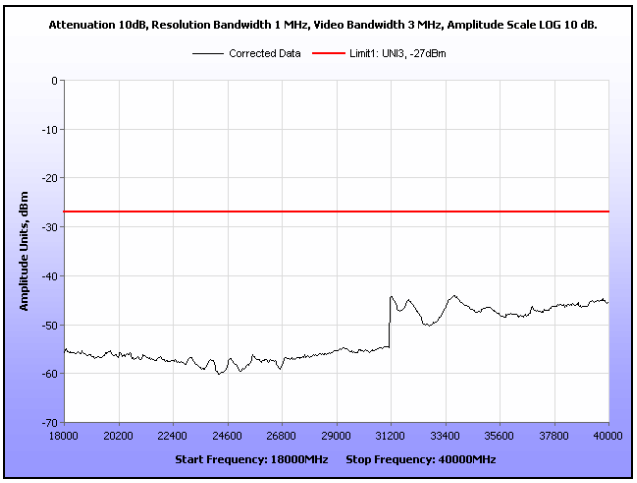
Plot 183. Radiated Spurious Emissions, 802.11a, 5260 MHz, 30 MHz – 1 GHz



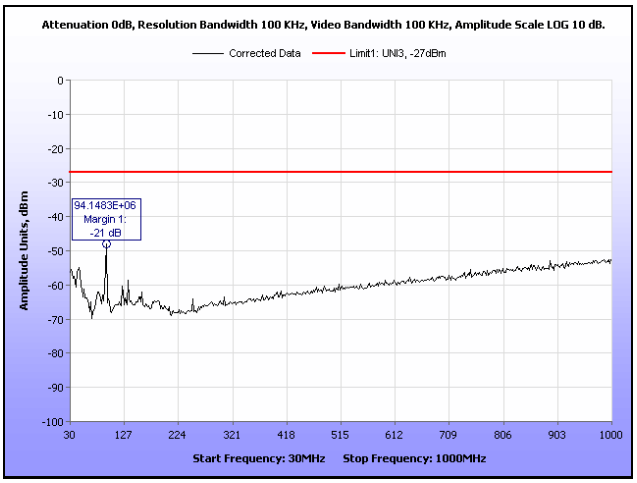
Plot 184. Radiated Spurious Emissions, 802.11a, 5260 MHz, 1 GHz – 7 GHz



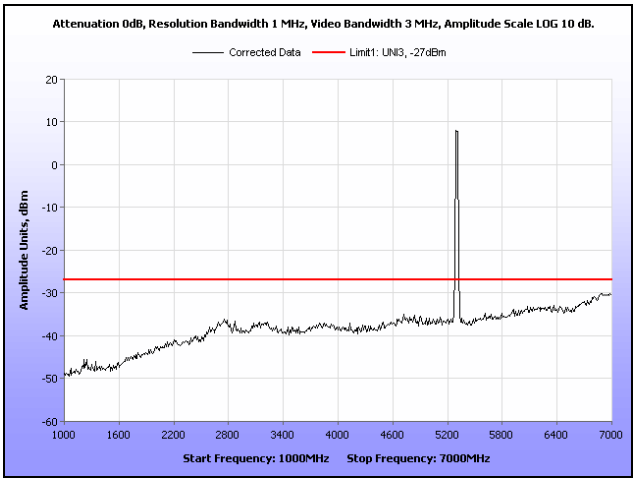
Plot 185. Radiated Spurious Emissions, 802.11a, 5260 MHz, 7 GHz – 18 GHz



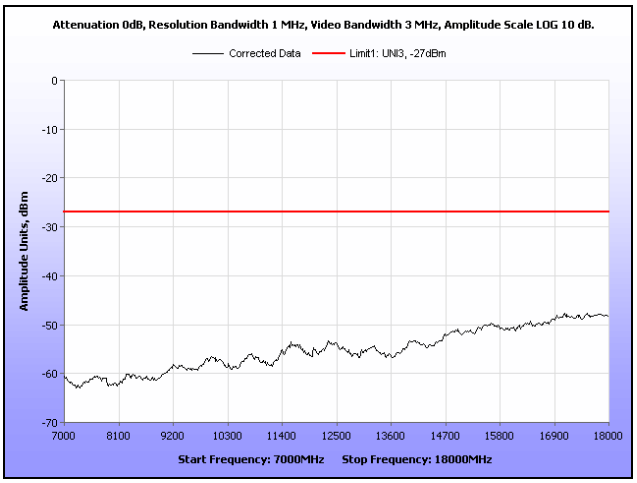
Plot 186. Radiated Spurious Emissions, 802.11a, 5260 MHz, 18 GHz – 40 GHz



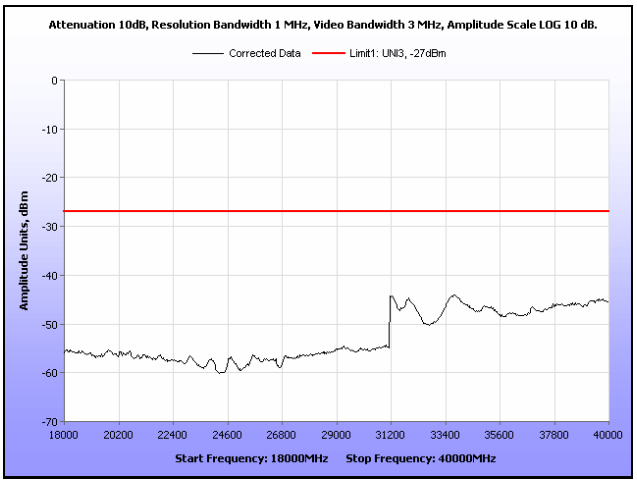
Plot 187. Radiated Spurious Emissions, 802.11a, 5300 MHz, 30 MHz – 1 GHz



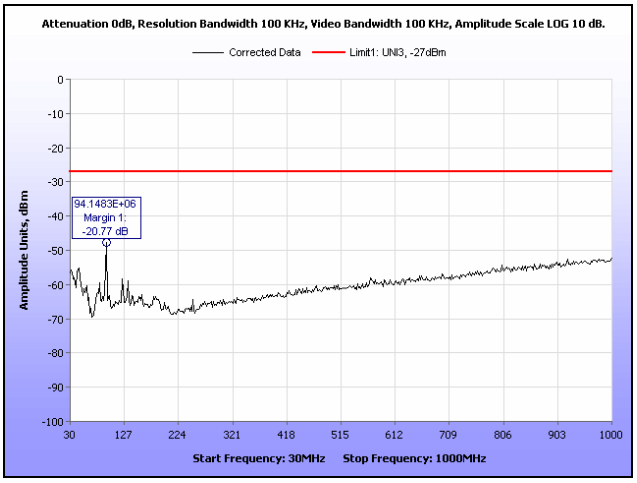
Plot 188. Radiated Spurious Emissions, 802.11a, 5300 MHz, 1 GHz – 7 GHz



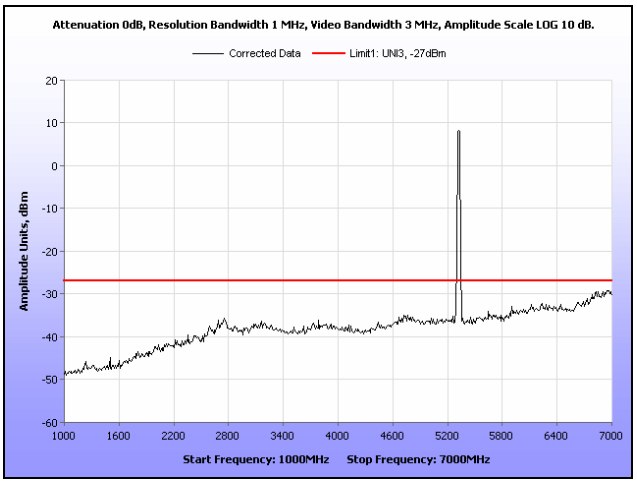
Plot 189. Radiated Spurious Emissions, 802.11a, 5300 MHz, 7 GHz – 18 GHz



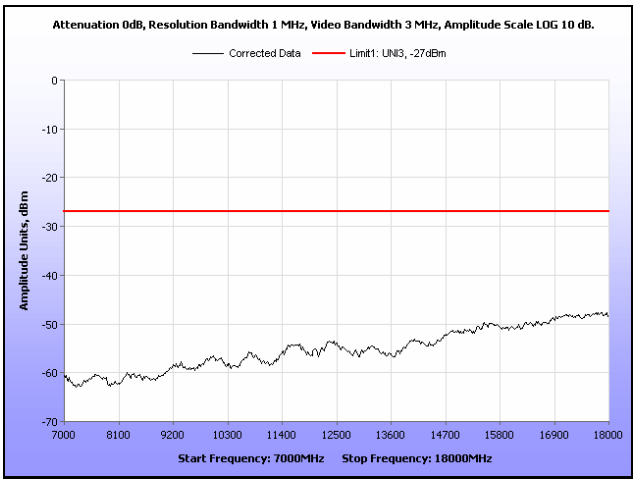
Plot 190. Radiated Spurious Emissions, 802.11a, 5300 MHz, 18 GHz – 40 GHz



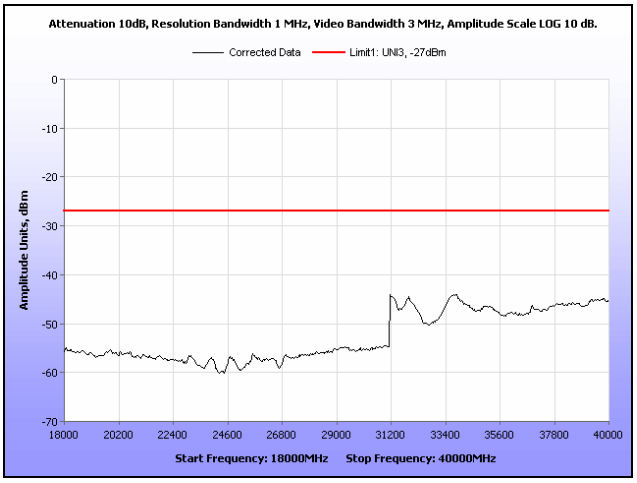
Plot 191. Radiated Spurious Emissions, 802.11a, 5320 MHz, 30 MHz – 1 GHz



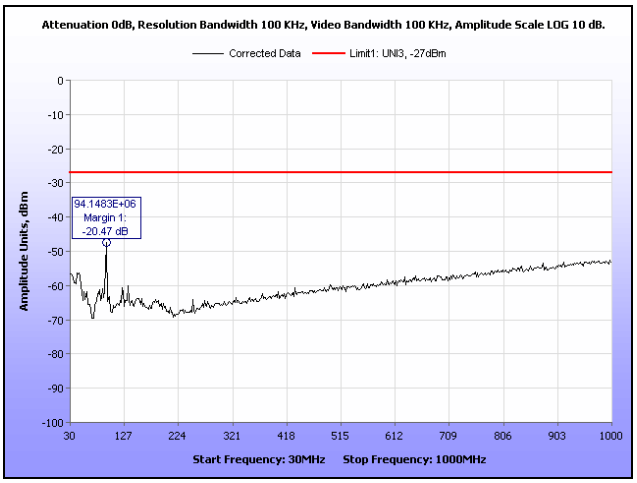
Plot 192. Radiated Spurious Emissions, 802.11a, 5320 MHz, 1 GHz – 7 GHz



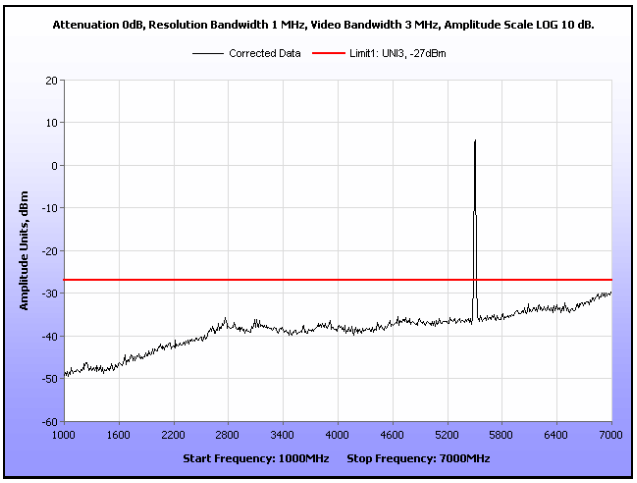
Plot 193. Radiated Spurious Emissions, 802.11a, 5320 MHz, 7 GHz – 18 GHz



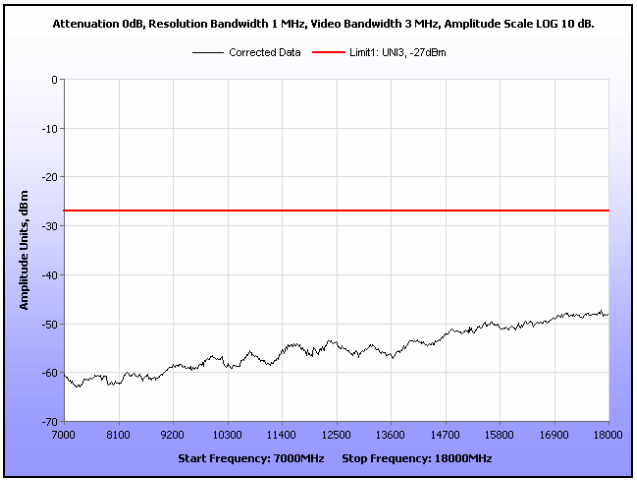
Plot 194. Radiated Spurious Emissions, 802.11a, 5320 MHz, 18 GHz – 40 GHz



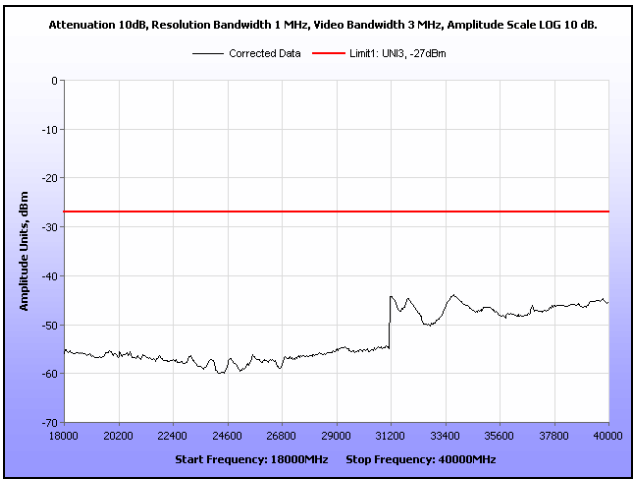
Plot 195. Radiated Spurious Emissions, 802.11a, 5500 MHz, 30 MHz – 1 GHz



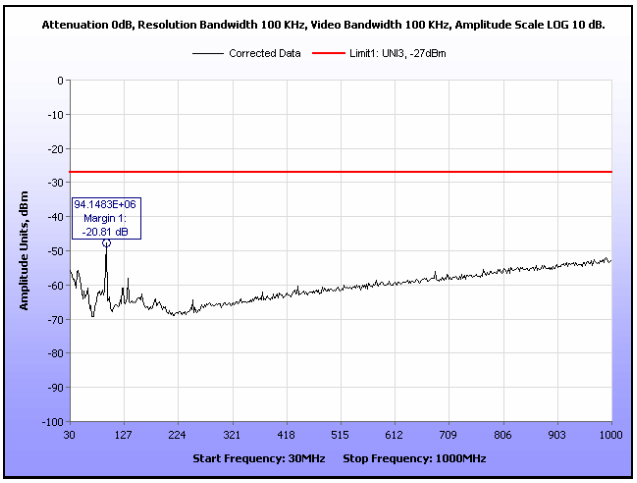
Plot 196. Radiated Spurious Emissions, 802.11a, 5500 MHz, 1 GHz – 7 GHz



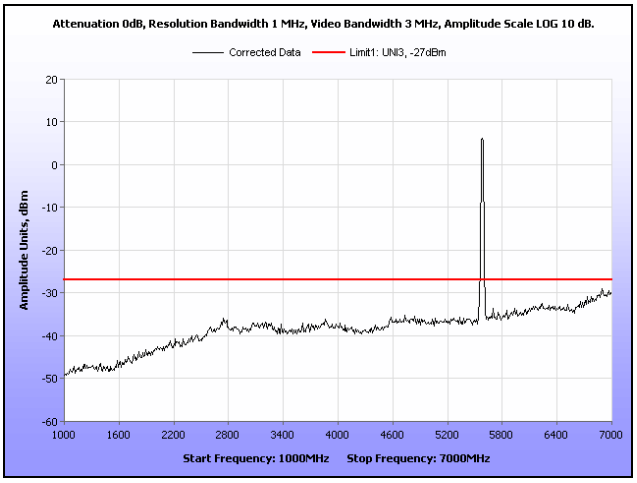
Plot 197. Radiated Spurious Emissions, 802.11a, 5500 MHz, 7 GHz – 18 GHz



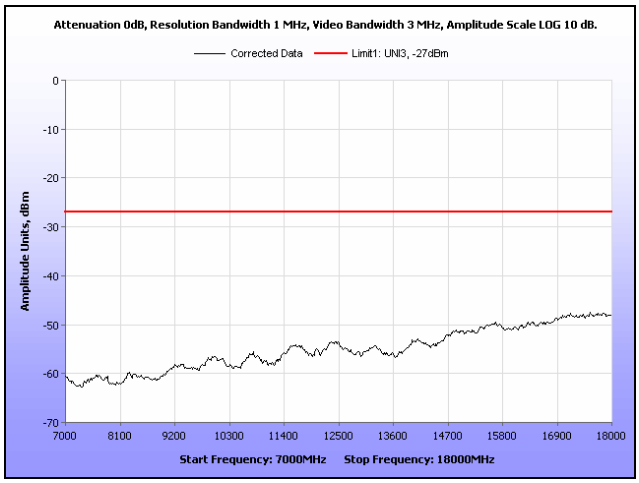
Plot 198. Radiated Spurious Emissions, 802.11a, 5500 MHz, 18 GHz – 40 GHz



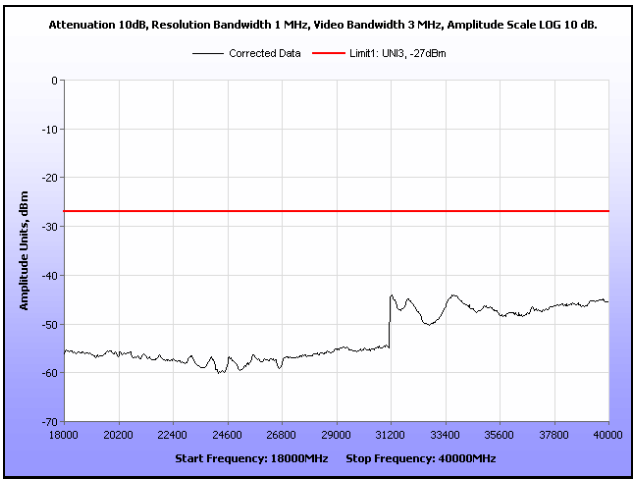
Plot 199. Radiated Spurious Emissions, 802.11a, 5580 MHz, 30 MHz – 1 GHz



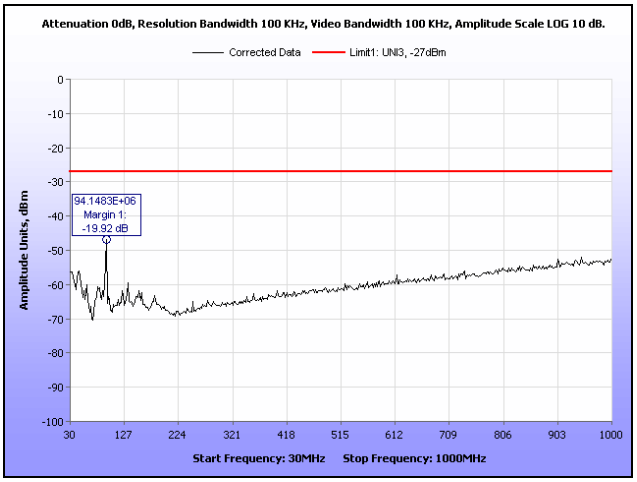
Plot 200. Radiated Spurious Emissions, 802.11a, 5580 MHz, 1 GHz – 7 GHz



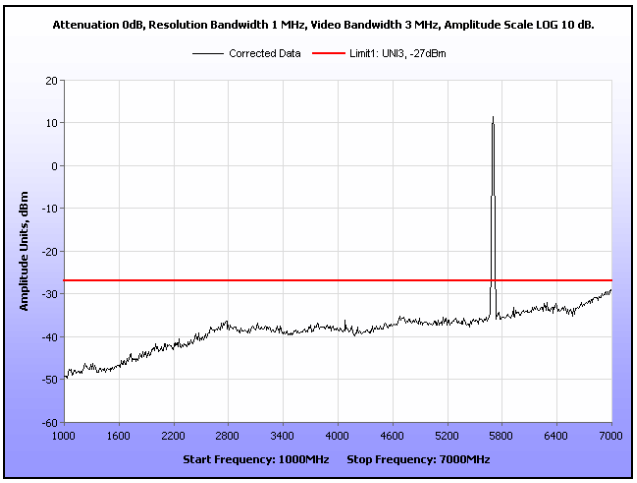
Plot 201. Radiated Spurious Emissions, 802.11a, 5580 MHz, 7 GHz – 18 GHz



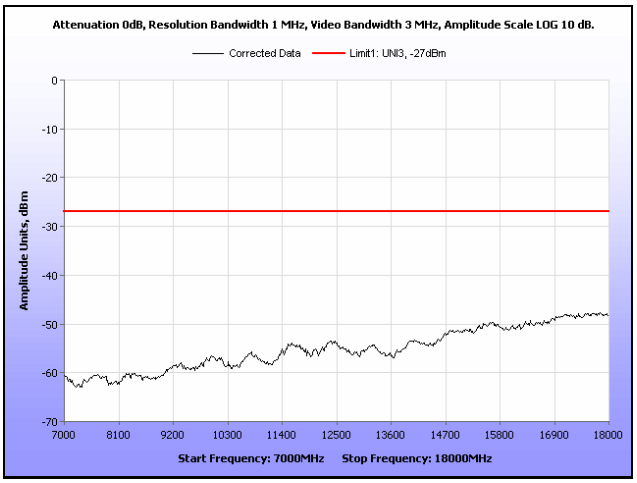
Plot 202. Radiated Spurious Emissions, 802.11a, 5580 MHz, 18 GHz – 40 GHz



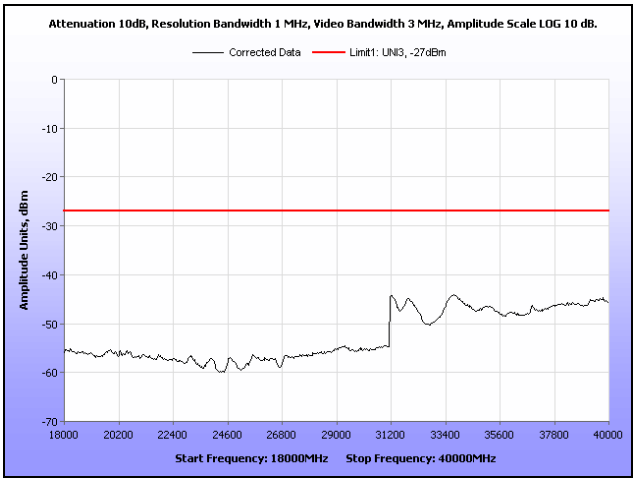
Plot 203. Radiated Spurious Emissions, 802.11a, 5700 MHz, 30 MHz – 1 GHz



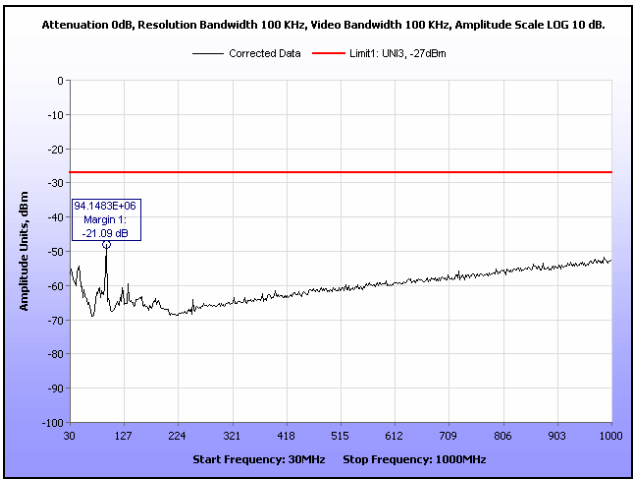
Plot 204. Radiated Spurious Emissions, 802.11a, 5700 MHz, 1 GHz – 7 GHz



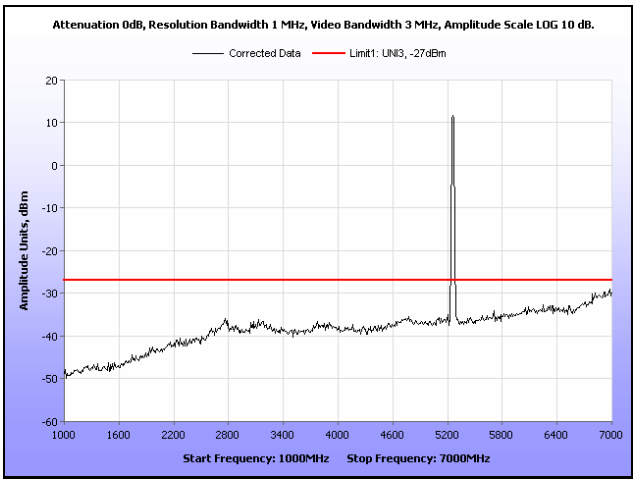
Plot 205. Radiated Spurious Emissions, 802.11a, 5700 MHz, 7 GHz – 18 GHz



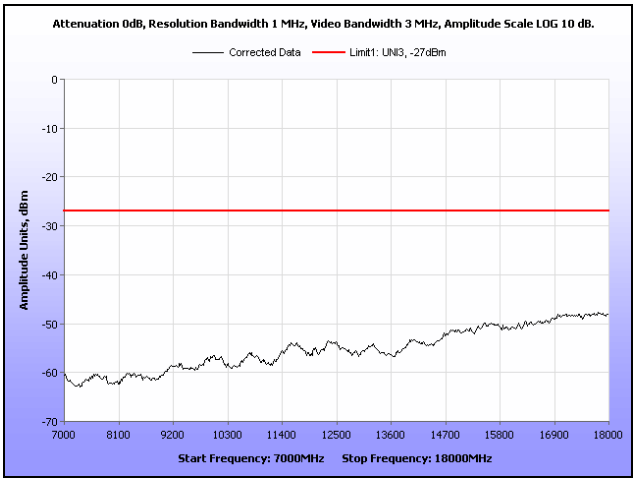
Plot 206. Radiated Spurious Emissions, 802.11a, 5700 MHz, 18 GHz – 40 GHz



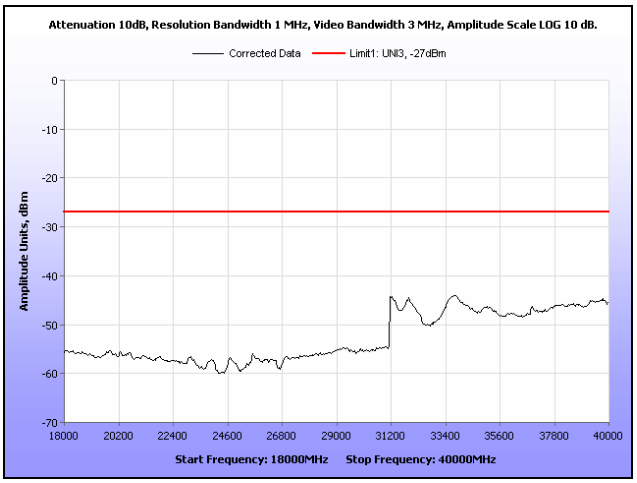
Plot 207. Radiated Spurious Emissions, 802.11n 20 MHz, 5260 MHz, 30 MHz – 1 GHz



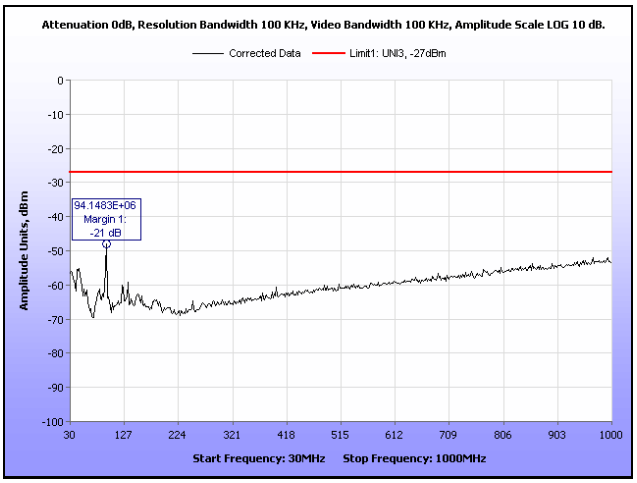
Plot 208. Radiated Spurious Emissions, 802.11n 20 MHz, 5260 MHz, 1 GHz – 7 GHz



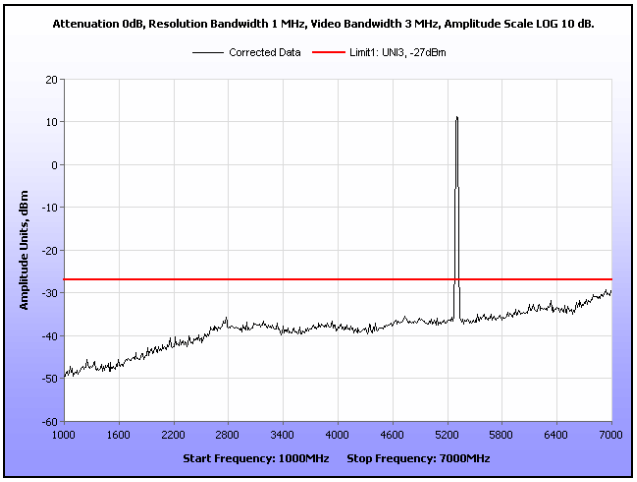
Plot 209. Radiated Spurious Emissions, 802.11n 20 MHz, 5260 MHz, 7 GHz – 18 GHz



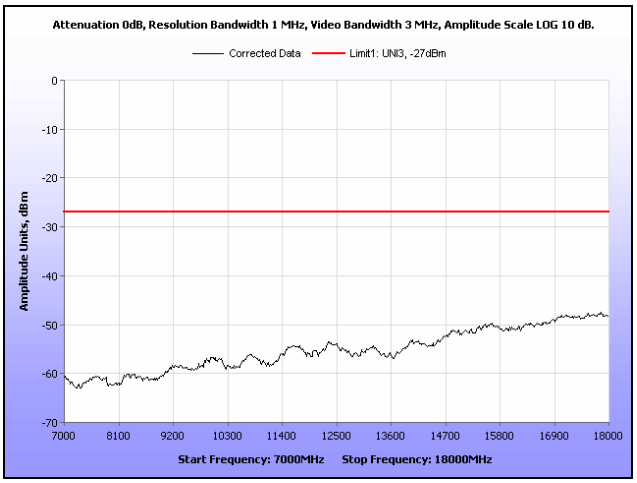
Plot 210. Radiated Spurious Emissions, 802.11n 20 MHz, 5260 MHz, 18 GHz – 40 GHz



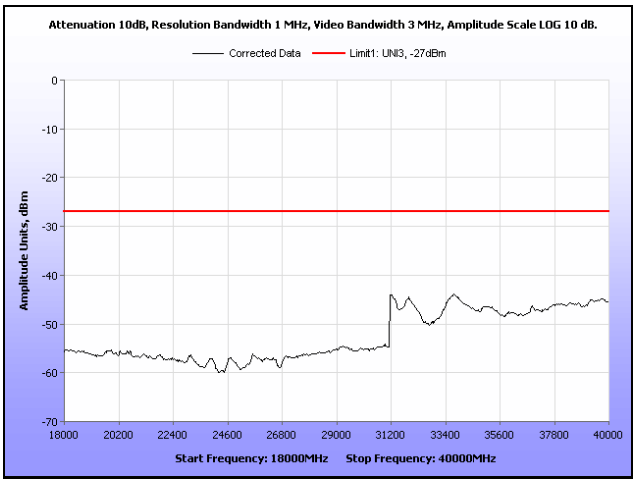
Plot 211. Radiated Spurious Emissions, 802.11n 20 MHz, 5300 MHz, 30 MHz – 1 GHz



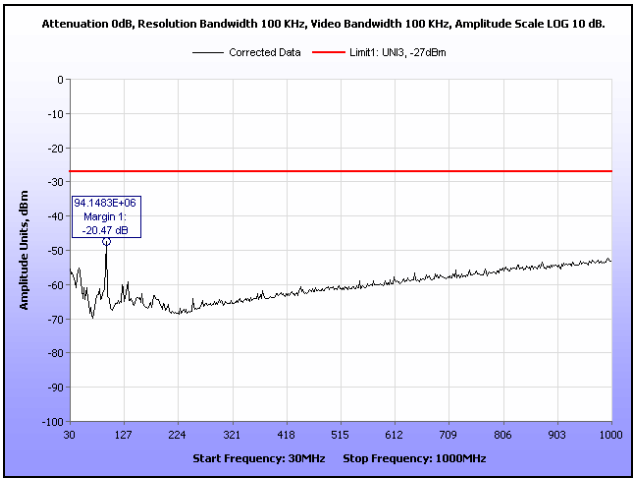
Plot 212. Radiated Spurious Emissions, 802.11n 20 MHz, 5300 MHz, 1 GHz – 7 GHz



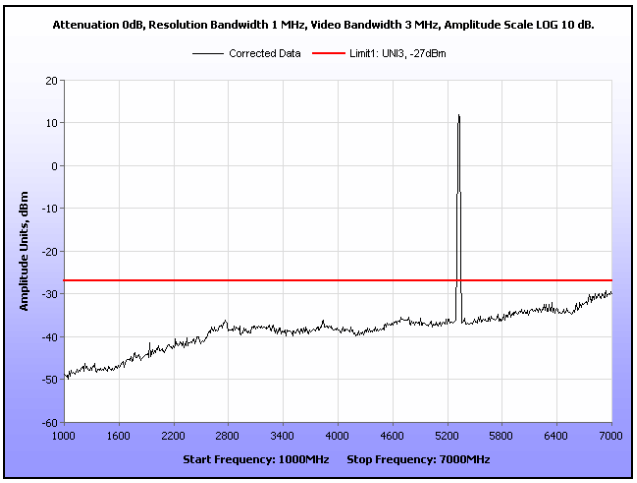
Plot 213. Radiated Spurious Emissions, 802.11n 20 MHz, 5300 MHz, 7 GHz – 18 GHz



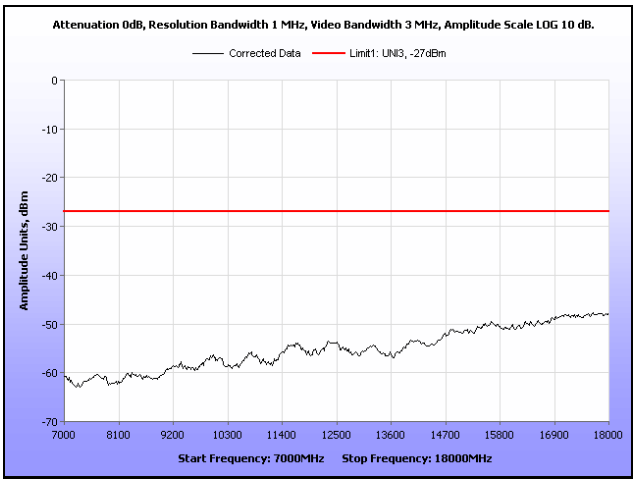
Plot 214. Radiated Spurious Emissions, 802.11n 20 MHz, 5300 MHz, 18 GHz – 40 GHz



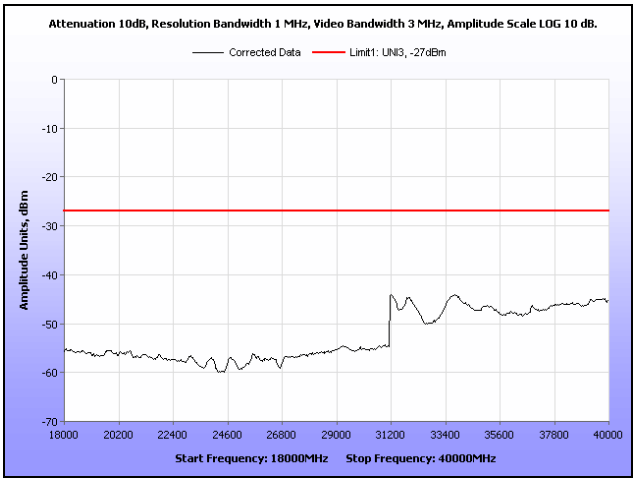
Plot 215. Radiated Spurious Emissions, 802.11n 20 MHz, 5320 MHz, 30 MHz – 1 GHz



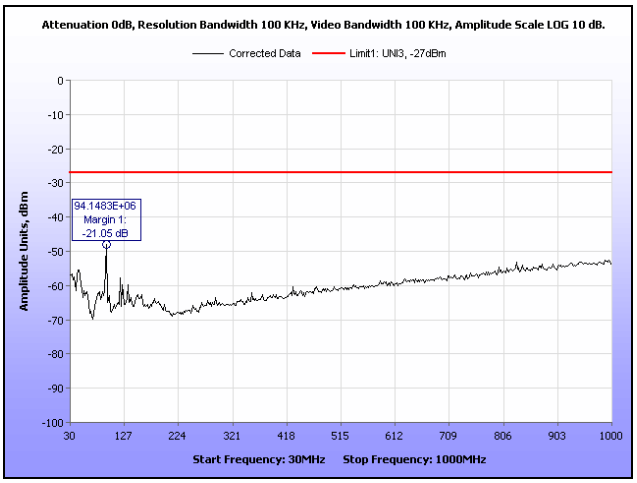
Plot 216. Radiated Spurious Emissions, 802.11n 20 MHz, 5320 MHz, 1 GHz – 7 GHz



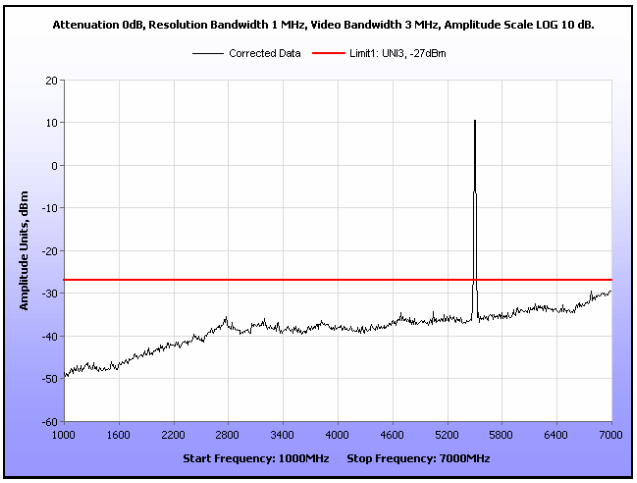
Plot 217. Radiated Spurious Emissions, 802.11n 20 MHz, 5320 MHz, 7 GHz – 18 GHz



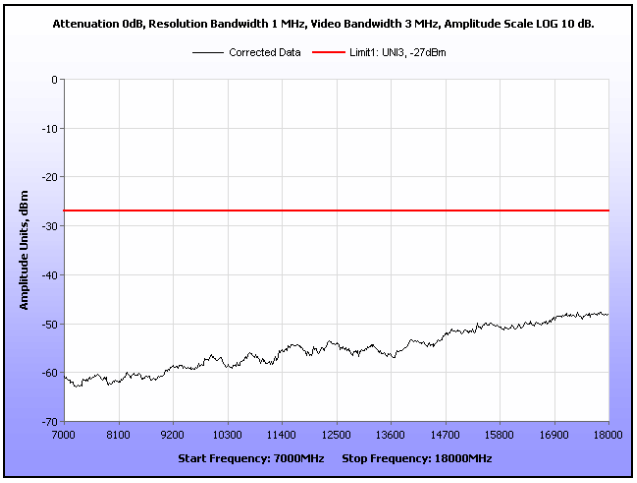
Plot 218. Radiated Spurious Emissions, 802.11n 20 MHz, 5320 MHz, 18 GHz – 40 GHz



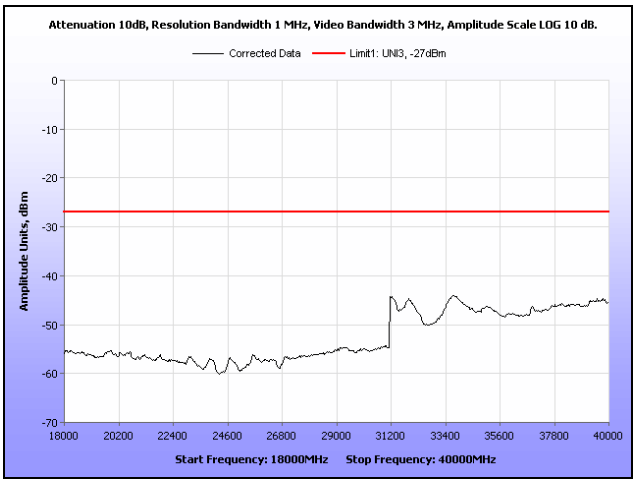
Plot 219. Radiated Spurious Emissions, 802.11n 20 MHz, 5500 MHz, 30 MHz – 1 GHz



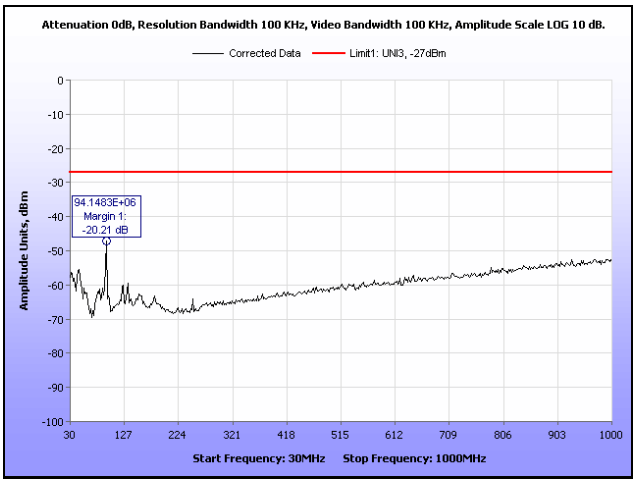
Plot 220. Radiated Spurious Emissions, 802.11n 20 MHz, 5500 MHz, 1 GHz – 7 GHz



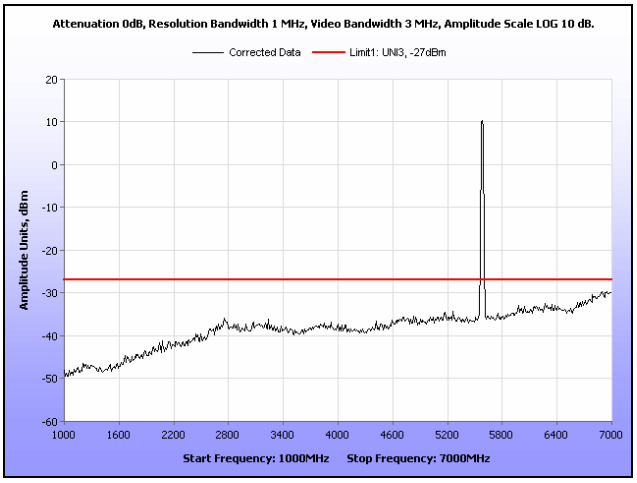
Plot 221. Radiated Spurious Emissions, 802.11n 20 MHz, 5500 MHz, 7 GHz – 18 GHz



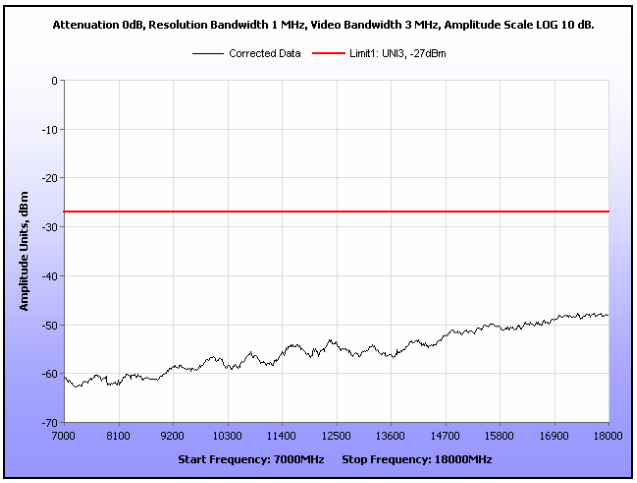
Plot 222. Radiated Spurious Emissions, 802.11n 20 MHz, 5500 MHz, 18 GHz – 40 GHz



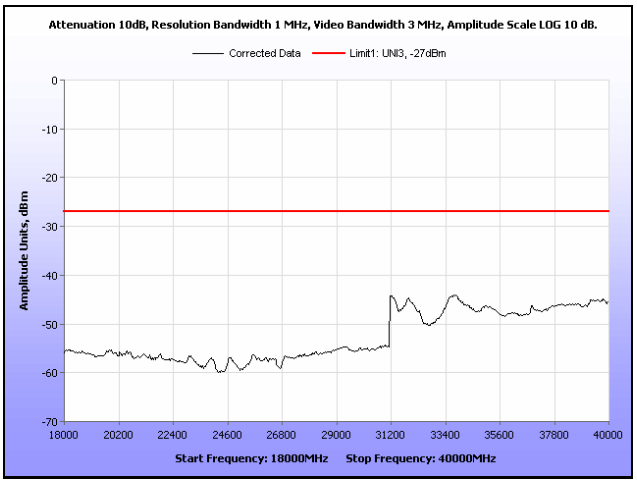
Plot 223. Radiated Spurious Emissions, 802.11n 20 MHz, 5580 MHz, 30 MHz – 1 GHz



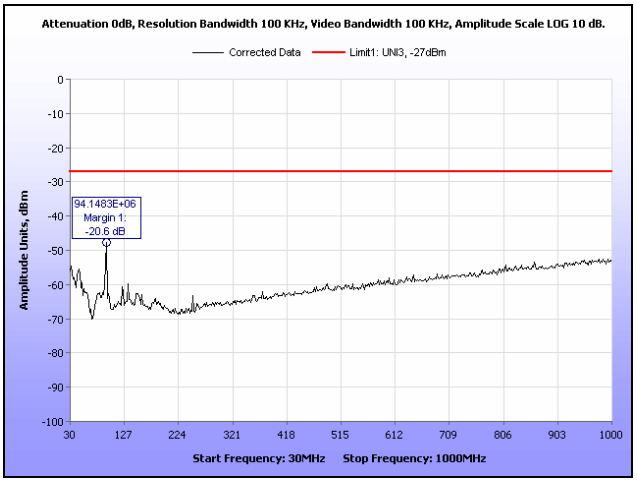
Plot 224. Radiated Spurious Emissions, 802.11n 20 MHz, 5580 MHz, 1 GHz – 7 GHz



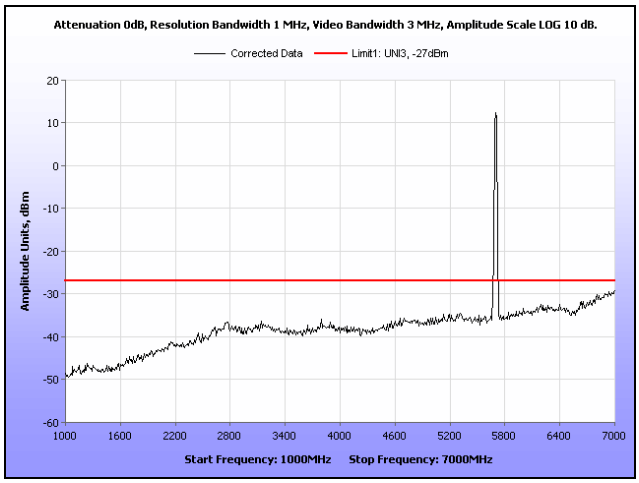
Plot 225. Radiated Spurious Emissions, 802.11n 20 MHz, 5580 MHz, 7 GHz – 18 GHz



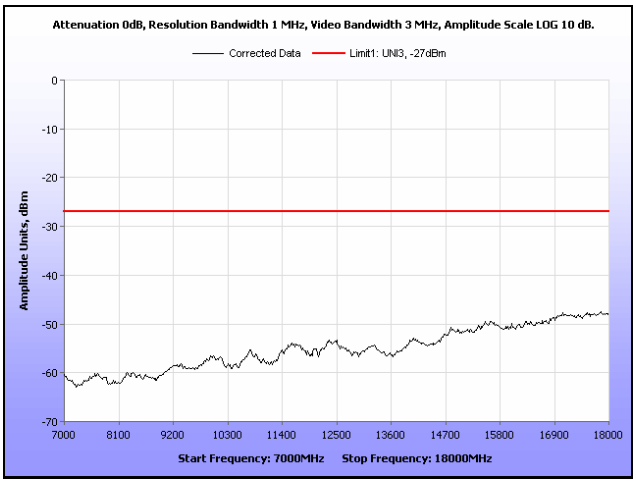
Plot 226. Radiated Spurious Emissions, 802.11n 20 MHz, 5580 MHz, 18 GHz – 40 GHz



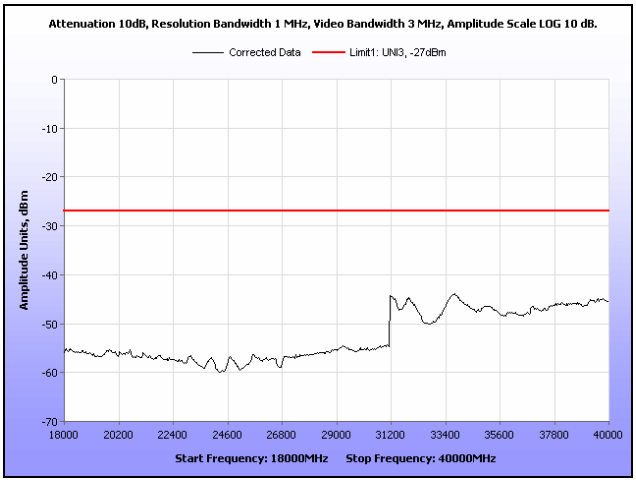
Plot 227. Radiated Spurious Emissions, 802.11n 20 MHz, 5700 MHz, 30 MHz – 1 GHz



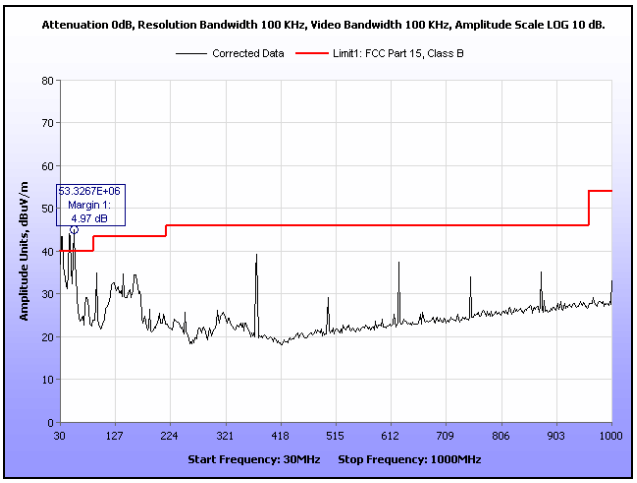
Plot 228. Radiated Spurious Emissions, 802.11n 20 MHz, 5700 MHz, 1 GHz – 7 GHz



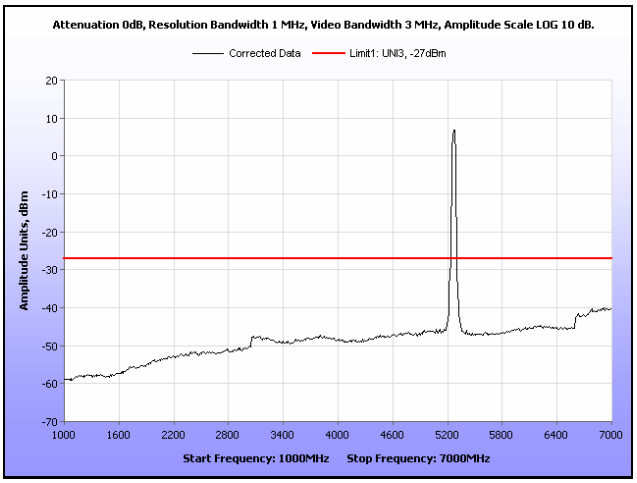
Plot 229. Radiated Spurious Emissions, 802.11n 20 MHz, 5700 MHz, 7 GHz – 18 GHz



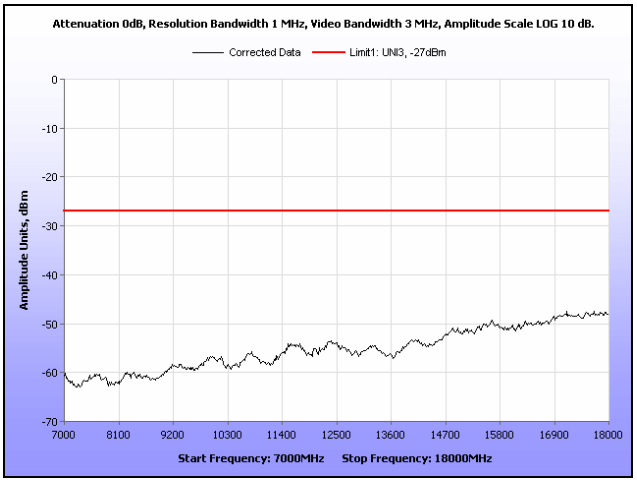
Plot 230. Radiated Spurious Emissions, 802.11n 20 MHz, 5700 MHz, 18 GHz – 40 GHz



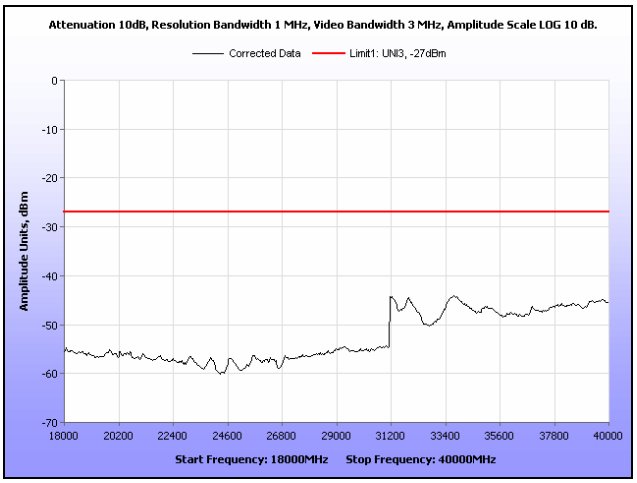
Plot 231. Radiated Spurious Emissions, 802.11n 40 MHz, 5270 MHz, 30 MHz – 1 GHz



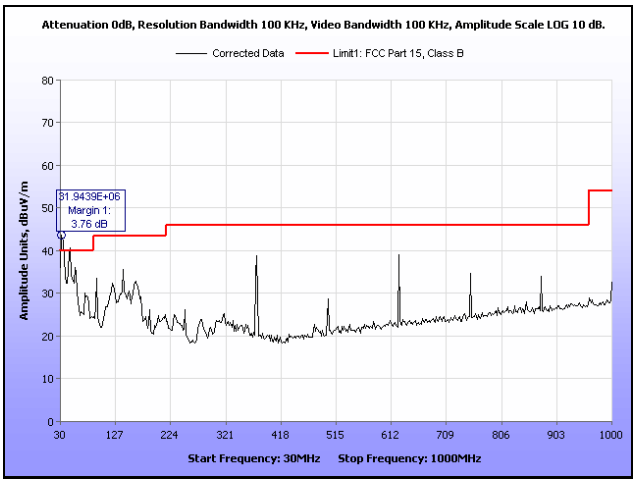
Plot 232. Radiated Spurious Emissions, 802.11n 40 MHz, 5270 MHz, 1 GHz – 7 GHz



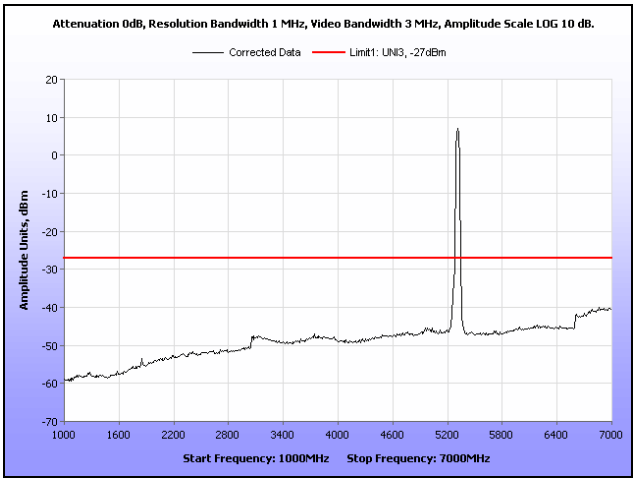
Plot 233. Radiated Spurious Emissions, 802.11n 40 MHz, 5270 MHz, 7 GHz – 18 GHz



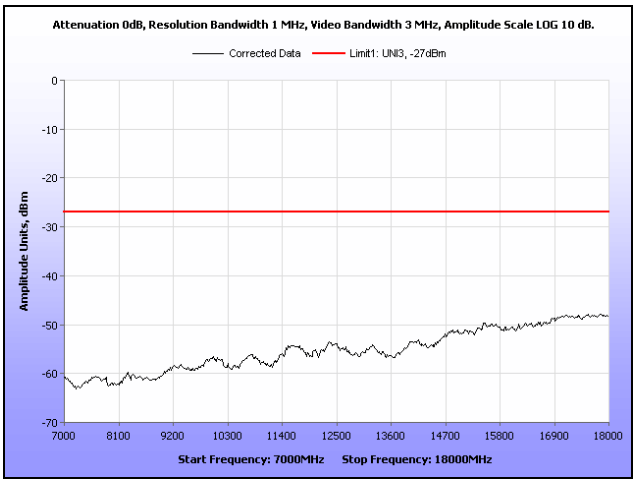
Plot 234. Radiated Spurious Emissions, 802.11n 40 MHz, 5270 MHz, 18 GHz – 40 GHz



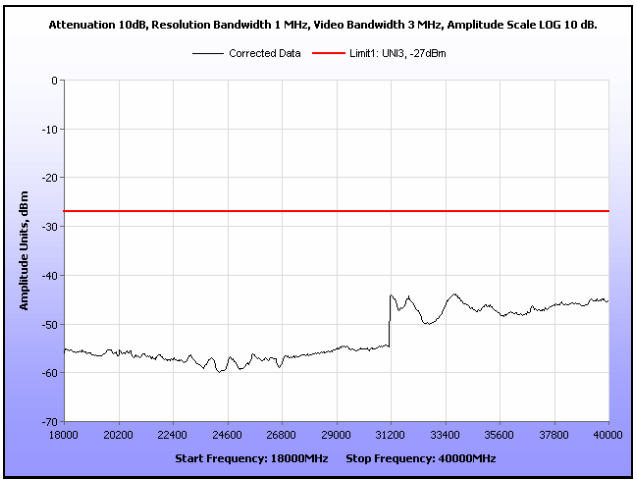
Plot 235. Radiated Spurious Emissions, 802.11n 40 MHz, 5310 MHz, 30 MHz – 1 GHz



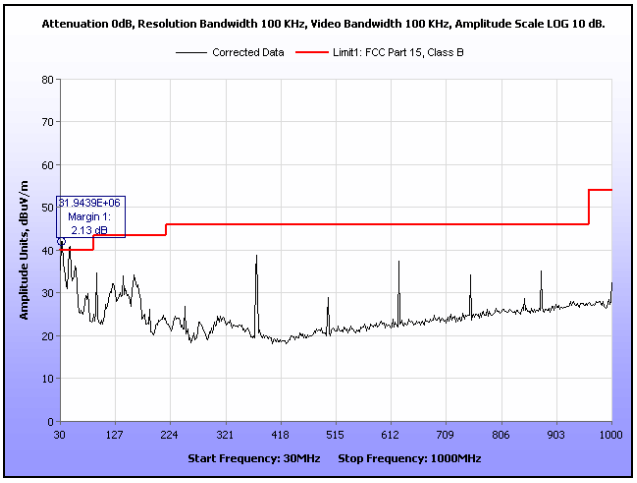
Plot 236. Radiated Spurious Emissions, 802.11n 40 MHz, 5310 MHz, 1 GHz – 7 GHz



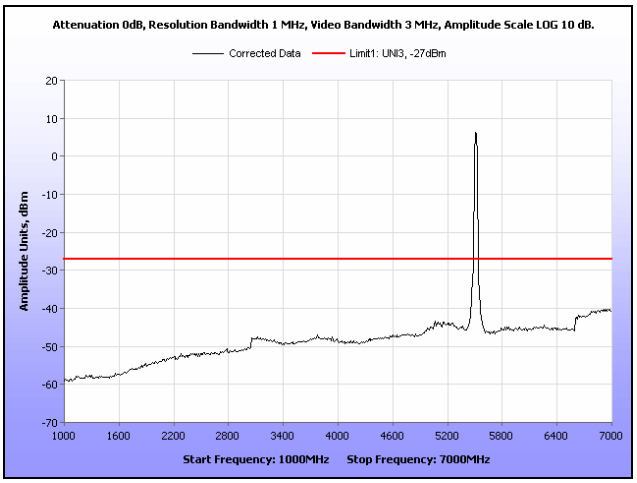
Plot 237. Radiated Spurious Emissions, 802.11n 40 MHz, 5310 MHz, 7 GHz – 18 GHz



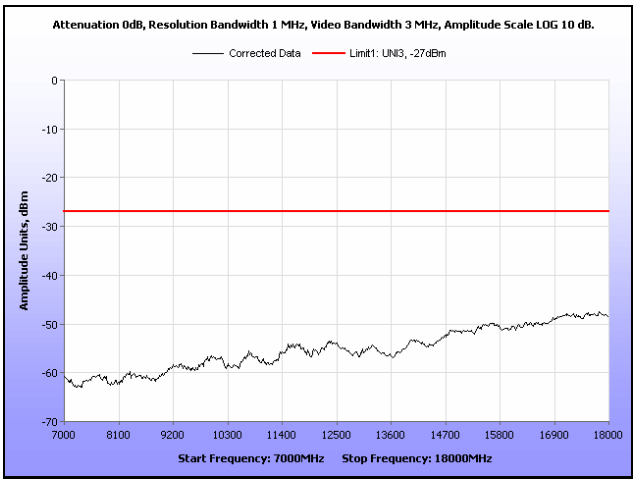
Plot 238. Radiated Spurious Emissions, 802.11n 40 MHz, 5310 MHz, 18 GHz – 40 GHz



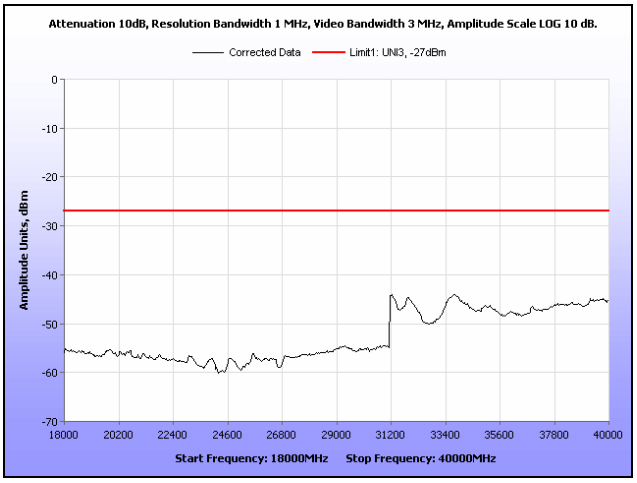
Plot 239. Radiated Spurious Emissions, 802.11n 40 MHz, 5510 MHz, 30 MHz – 1 GHz



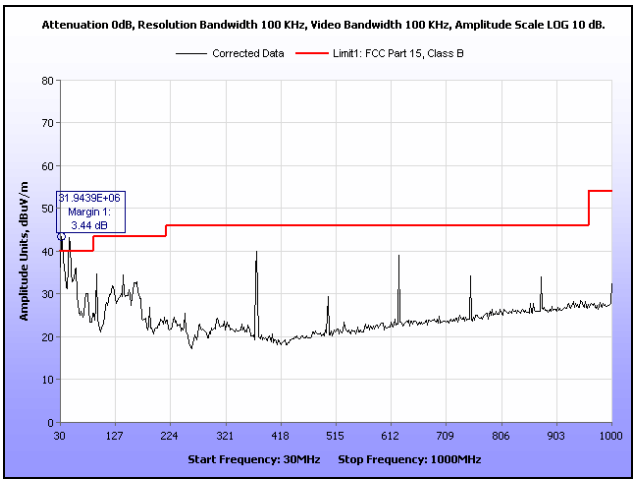
Plot 240. Radiated Spurious Emissions, 802.11n 40 MHz, 5510 MHz, 1 GHz – 7 GHz



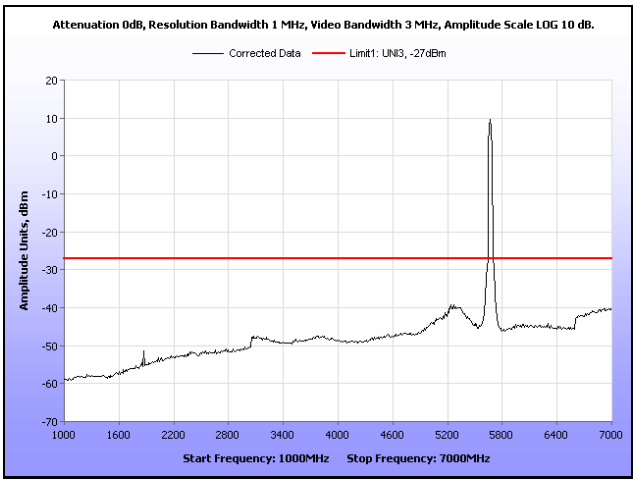
Plot 241. Radiated Spurious Emissions, 802.11n 40 MHz, 5510 MHz, 7 GHz – 18 GHz



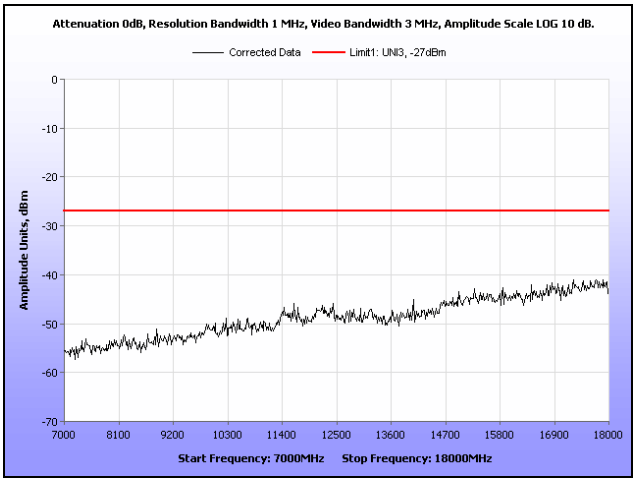
Plot 242. Radiated Spurious Emissions, 802.11n 40 MHz, 5510 MHz, 18 GHz – 40 GHz



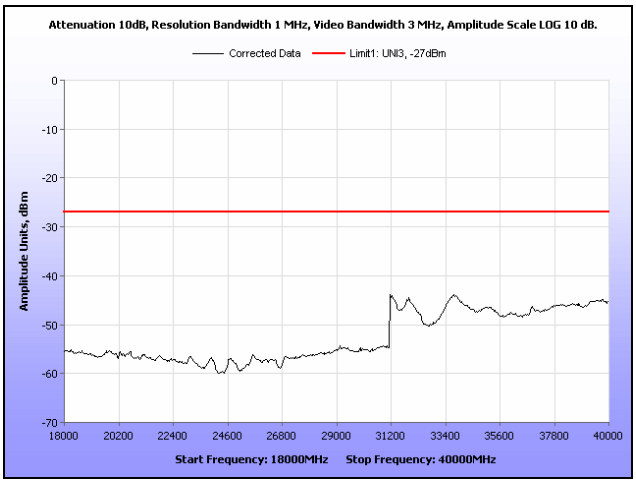
Plot 243. Radiated Spurious Emissions, 802.11n 40 MHz, 5670 MHz, 30 MHz – 1 GHz



Plot 244. Radiated Spurious Emissions, 802.11n 40 MHz, 5670 MHz, 1 GHz – 7 GHz

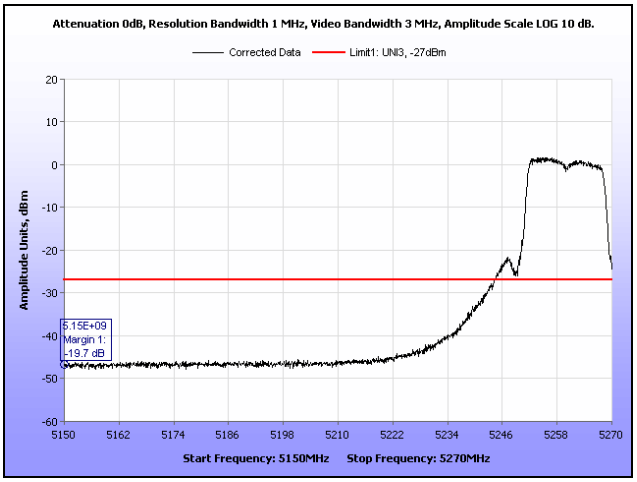


Plot 245. Radiated Spurious Emissions, 802.11n 40 MHz, 5670 MHz, 7 GHz – 18 GHz

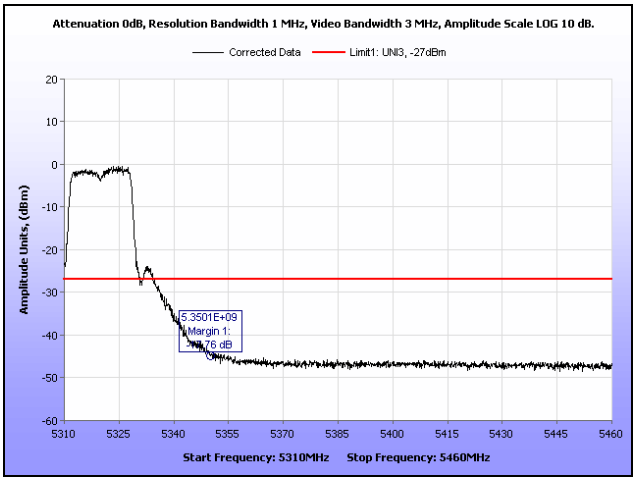


Plot 246. Radiated Spurious Emissions, 802.11n 40 MHz, 5670 MHz, 18 GHz – 40 GHz

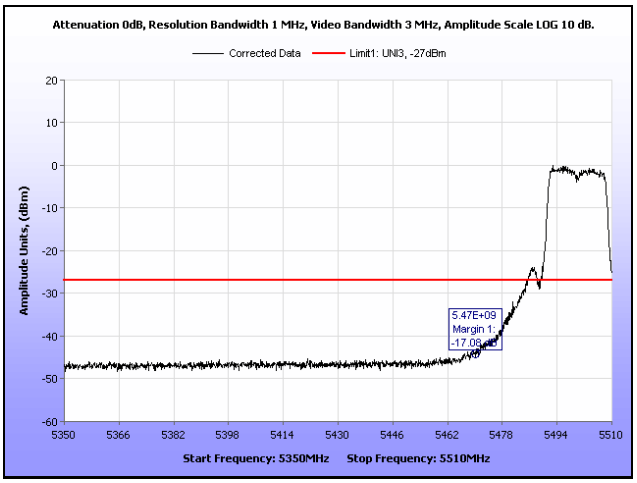
Radiated Band Edge



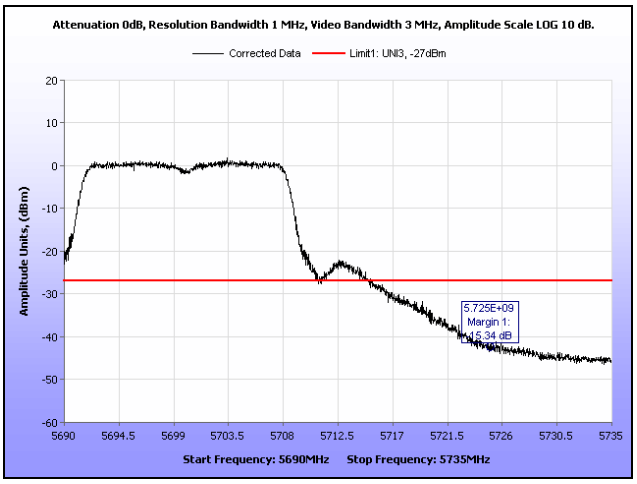
Plot 247. Radiated Band Edge, 802.11a, 5260 MHz



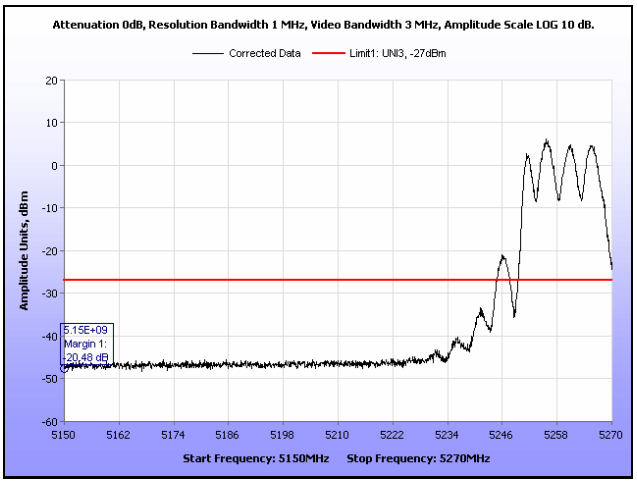
Plot 248. Radiated Band Edge, 802.11a, 5320 MHz



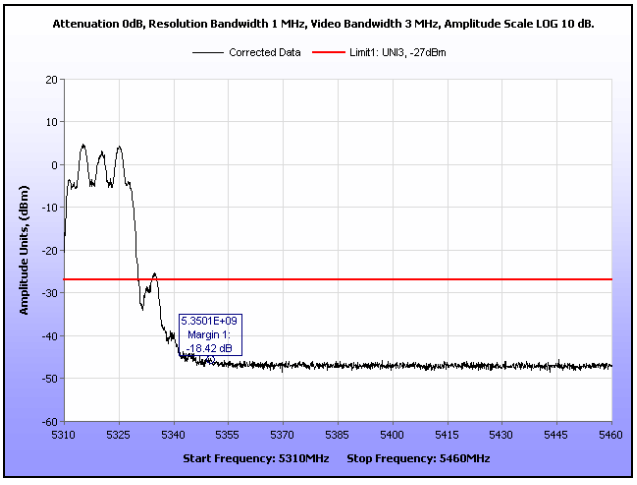
Plot 249. Radiated Band Edge, 802.11a, 5500 MHz



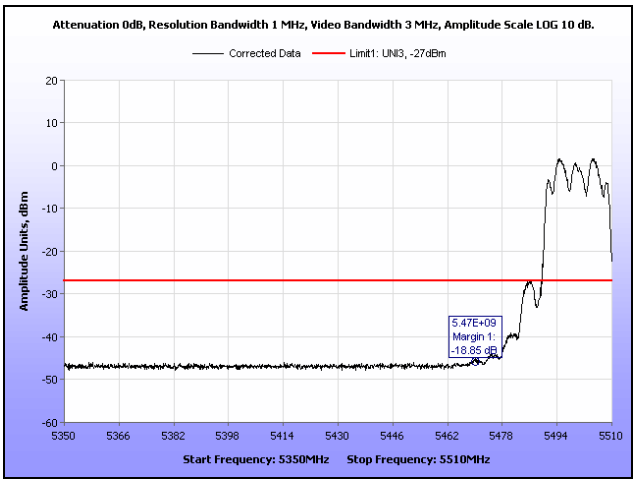
Plot 250. Radiated Band Edge, 802.11a, 5700 MHz



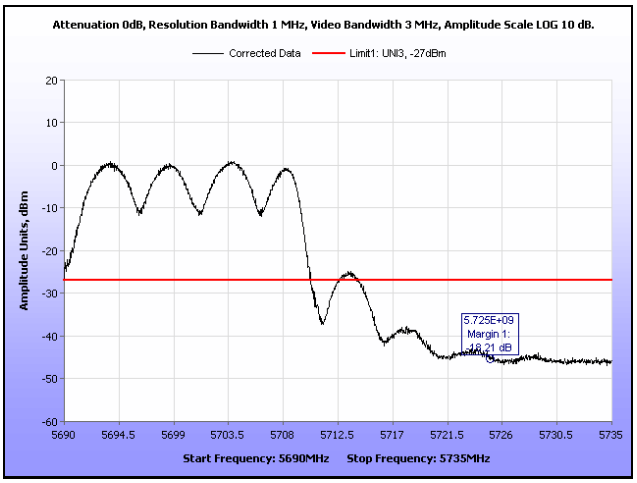
Plot 251. Radiated Band Edge, 802.11n 20 MHz, 5260 MHz



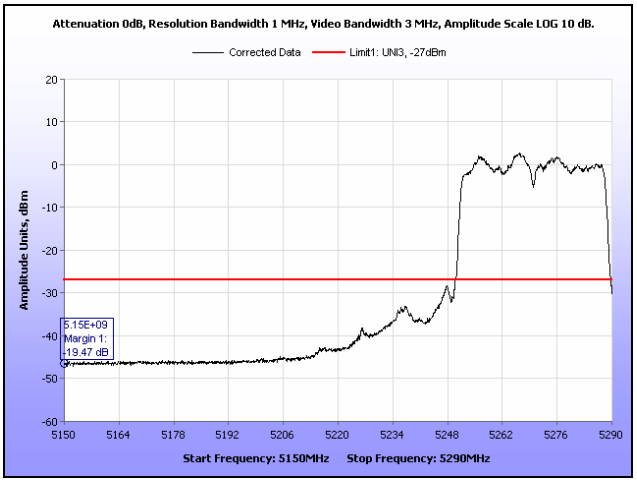
Plot 252. Radiated Band Edge, 802.11n 20 MHz, 5320 MHz



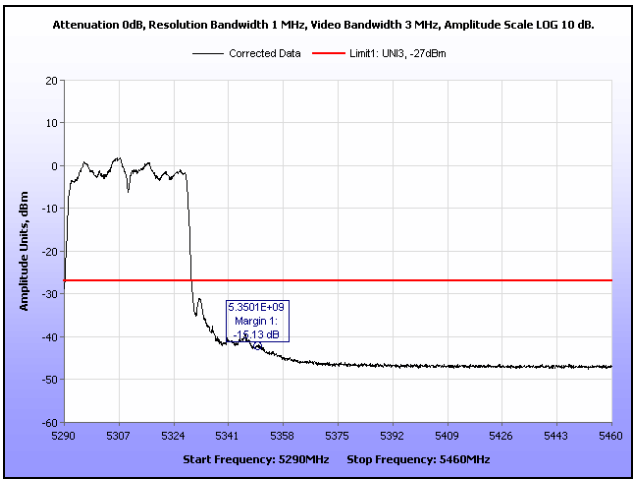
Plot 253. Radiated Band Edge, 802.11n 20 MHz, 5500 MHz



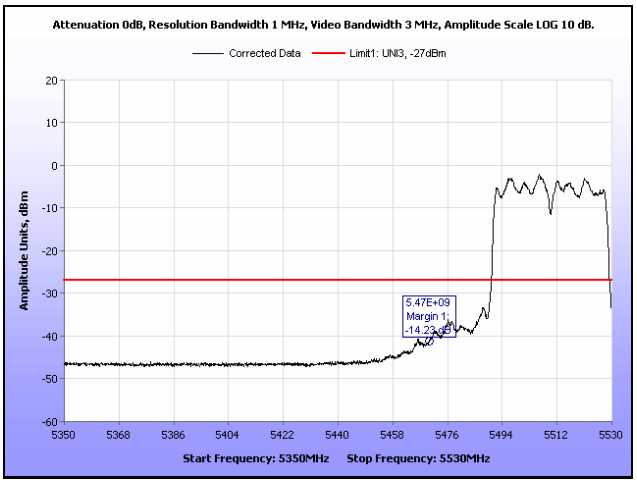
Plot 254. Radiated Band Edge, 802.11n 20 MHz, 5700 MHz



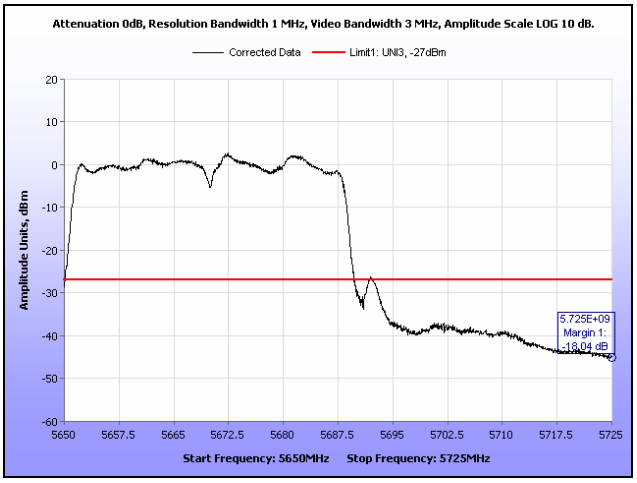
Plot 255. Radiated Band Edge, 802.11n 40 MHz, 5270 MHz



Plot 256. Radiated Band Edge, 802.11n 40 MHz, 5310 MHz

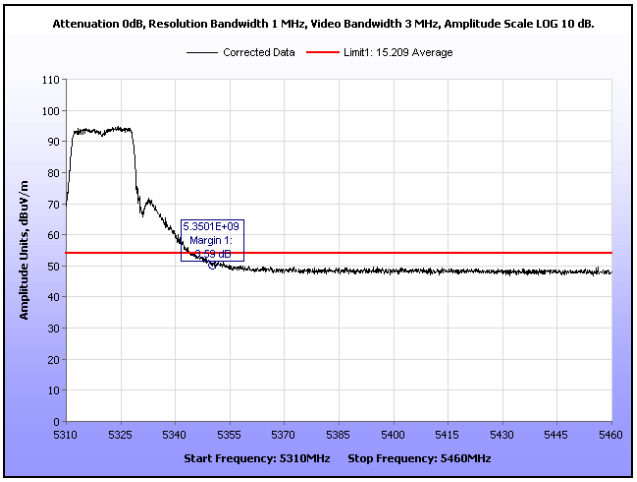


Plot 257. Radiated Band Edge, 802.11n 40 MHz, 5510 MHz

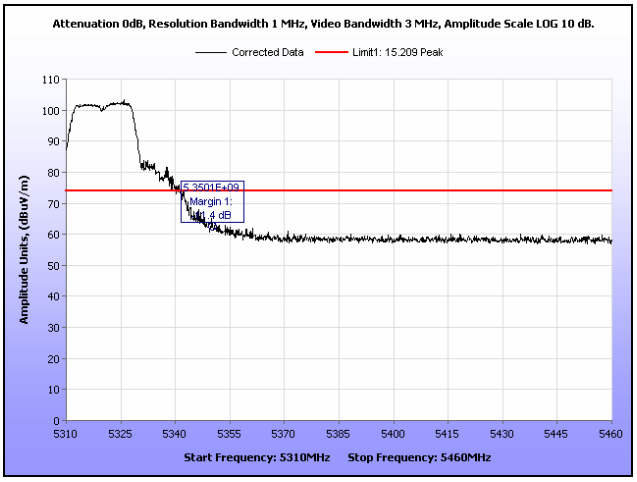


Plot 258. Radiated Band Edge, 802.11n 40 MHz, 5670 MHz

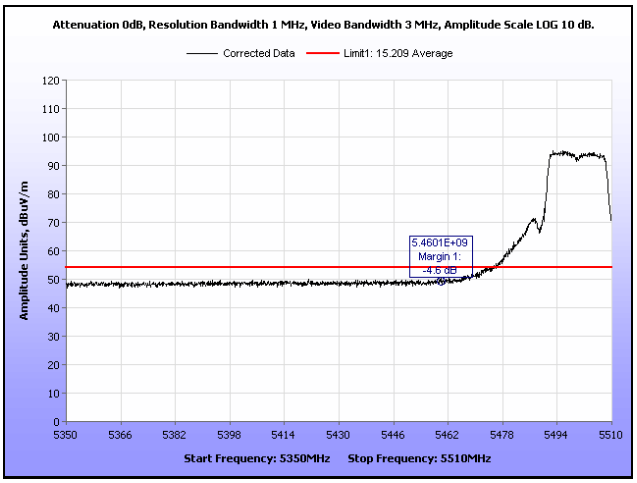
Restricted Band



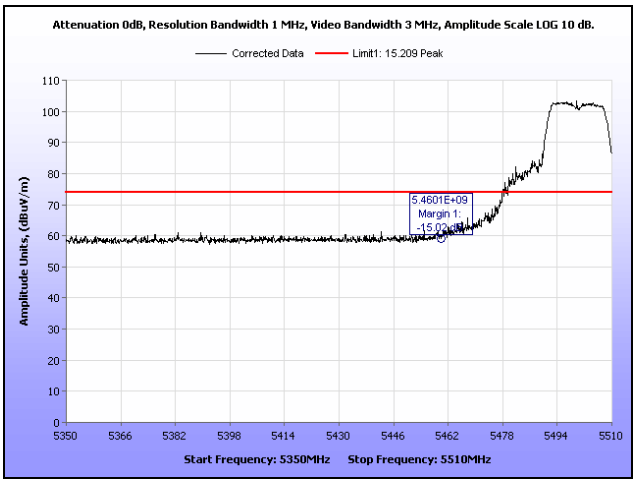
Plot 259. Restricted Band, 802.11a, 5320 MHz, Average



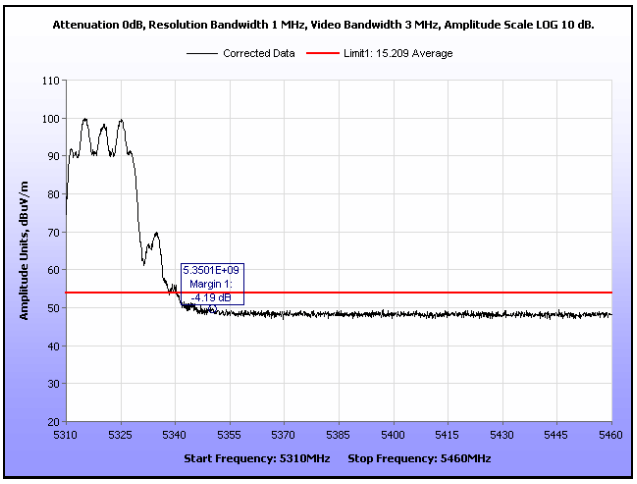
Plot 260. Restricted Band, 802.11a, 5320 MHz, Peak



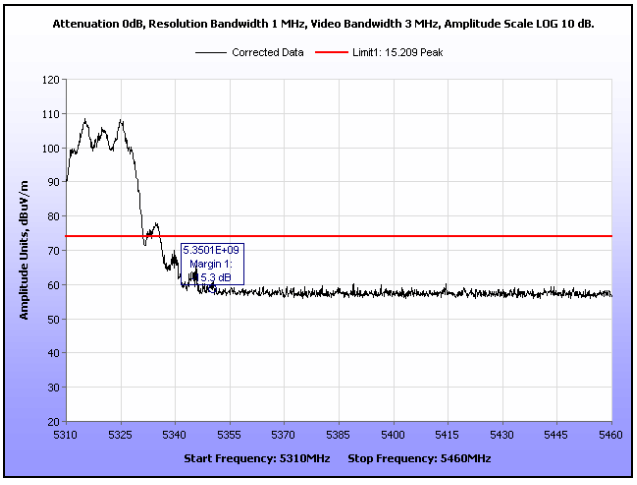
Plot 261. Restricted Band, 802.11a, 5500 MHz, Average



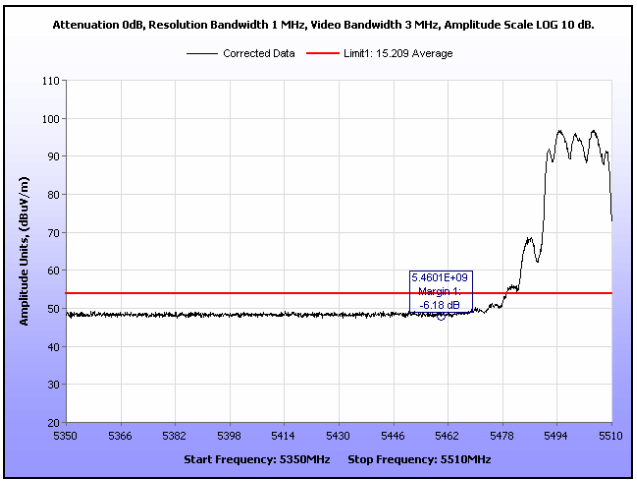
Plot 262. Restricted Band, 802.11a, 5500 MHz, Peak



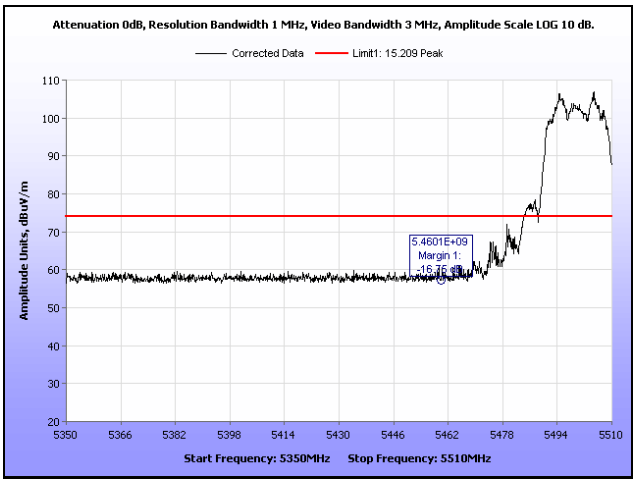
Plot 263. Restricted Band, 802.11n 20 MHz, 5320 MHz, Average



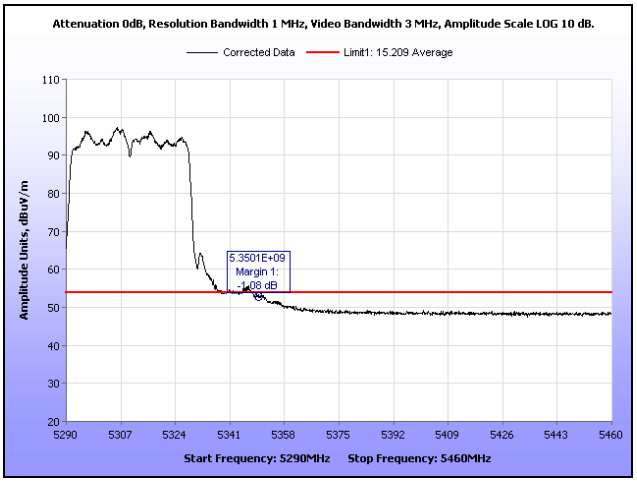
Plot 264. Restricted Band, 802.11n 20 MHz, 5320 MHz, Peak



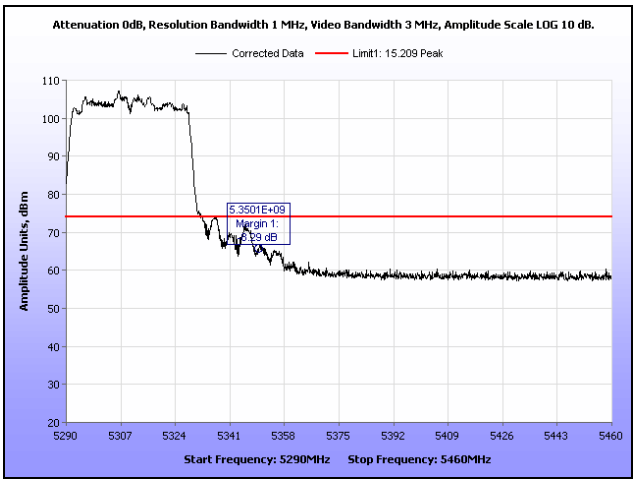
Plot 265. Restricted Band, 802.11n 20 MHz, 5500 MHz, Average



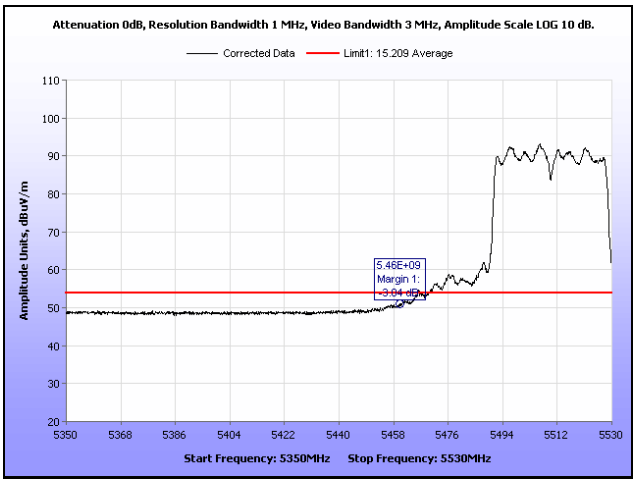
Plot 266. Restricted Band, 802.11n 20 MHz, 5500 MHz, Peak



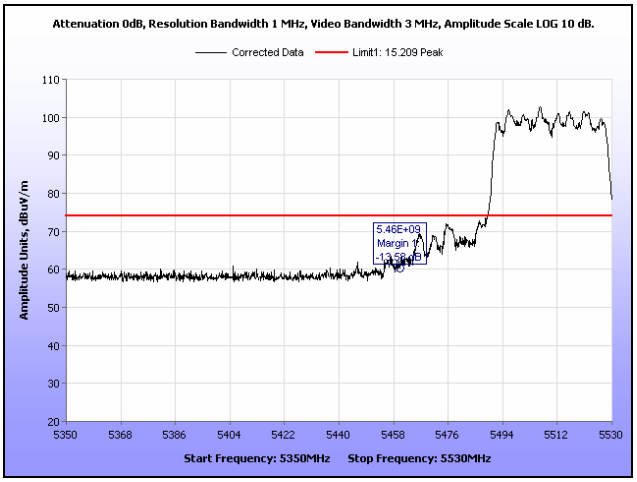
Plot 267. Restricted Band, 802.11n 40 MHz, 5310 MHz, Average



Plot 268. Restricted Band, 802.11n 40 MHz, 5310 MHz, Peak



Plot 269. Restricted Band, 802.11n 40 MHz, 5510 MHz, Average



Plot 270. Restricted Band, 802.11n 40 MHz, 5510 MHz, Peak

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 @ 5260-5320MHz and 5500-5700MHz; highest conducted power = 18.03 dBm (Avg 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 (63.53 mW)
G = Linear Antenna Gain (9.48)
R = Minimum Distance between User and Antenna (20 cm)

$S = (63.53 * 9.48)/(4*3.14*20^2) = 0.120$ 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

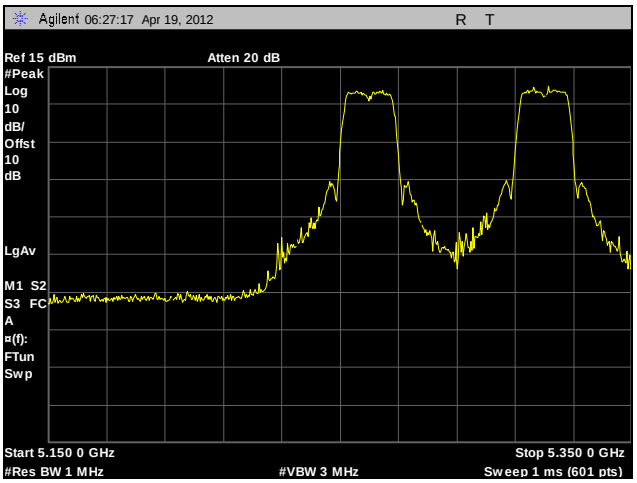
Test Requirements: **§ 15.407(g):** Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The low and high channel of each band was turned on. The channels were inspected at 10°C intervals from -30°C to 55°C to see if they were within their band.

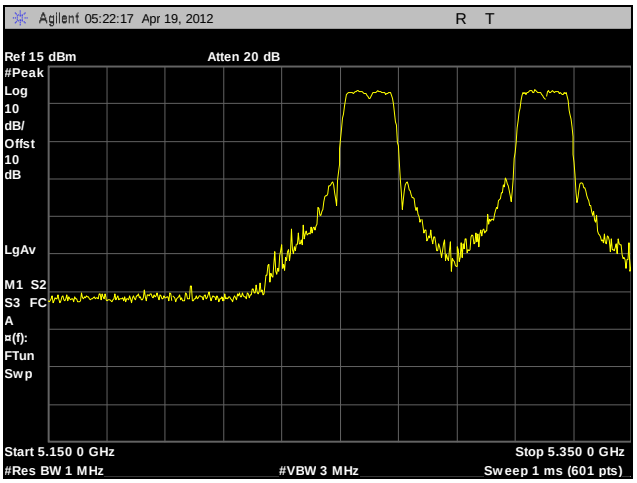
Test Results: The EUT was compliant with the requirements of **§15.407(g)**.

Test Engineer(s): Jeff Pratt

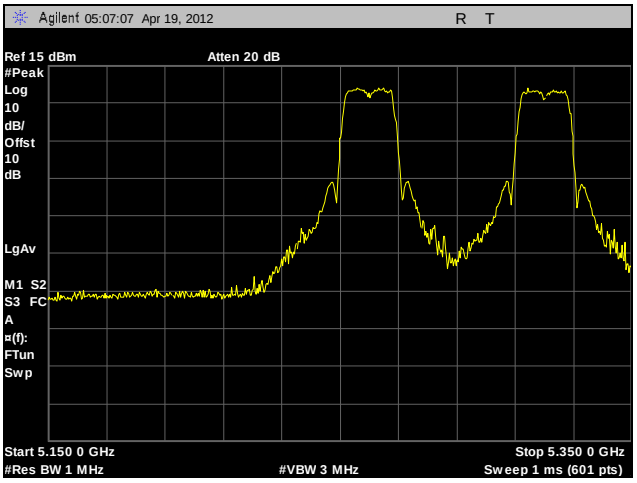
Test Date(s): 05/23/12



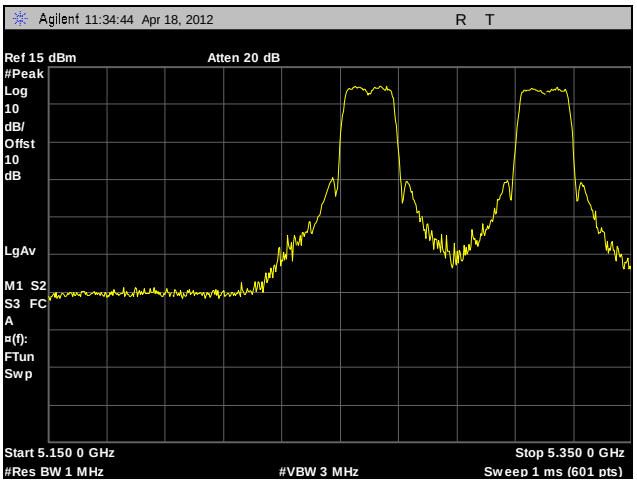
Plot 271. Frequency Stability, 5250 MHz – 5350 MHz, -30°C, 120 V



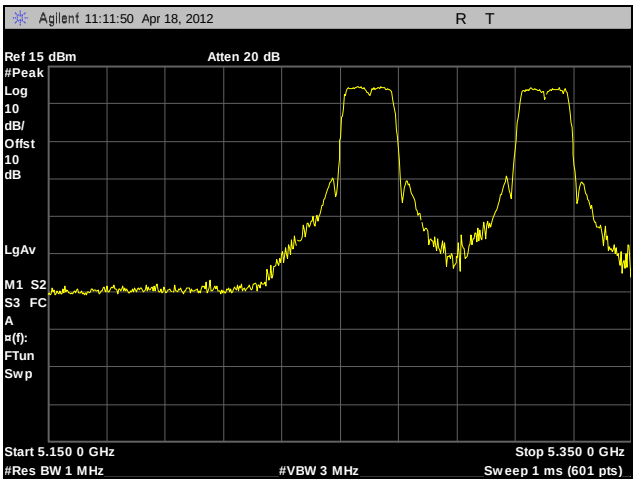
Plot 272. Frequency Stability, 5250 MHz – 5350 MHz, -20°C, 120 V



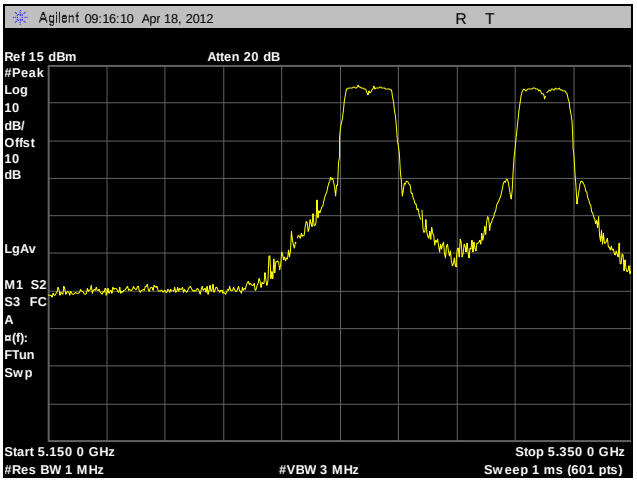
Plot 273. Frequency Stability, 5250 MHz – 5350 MHz, -10°C, 120 V



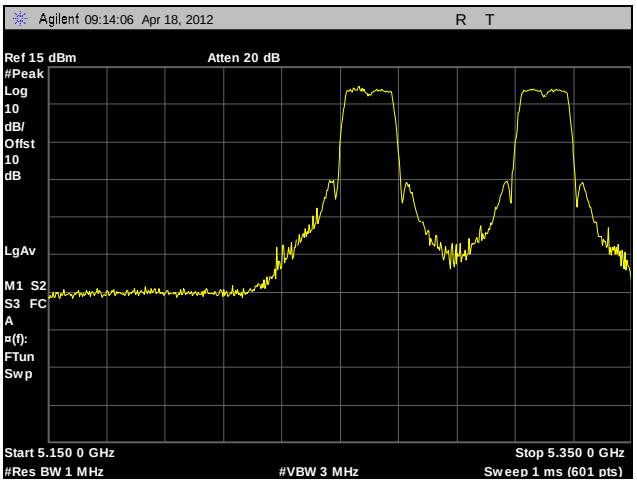
Plot 274. Frequency Stability, 5250 MHz – 5350 MHz, 0°C, 120 V



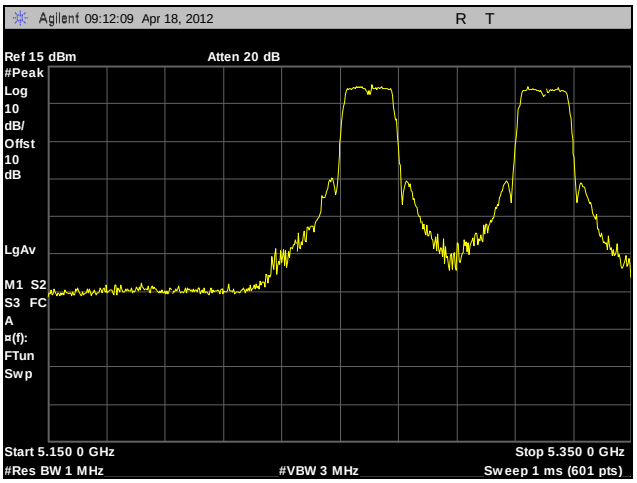
Plot 275. Frequency Stability, 5250 MHz – 5350 MHz, 10°C, 120 V



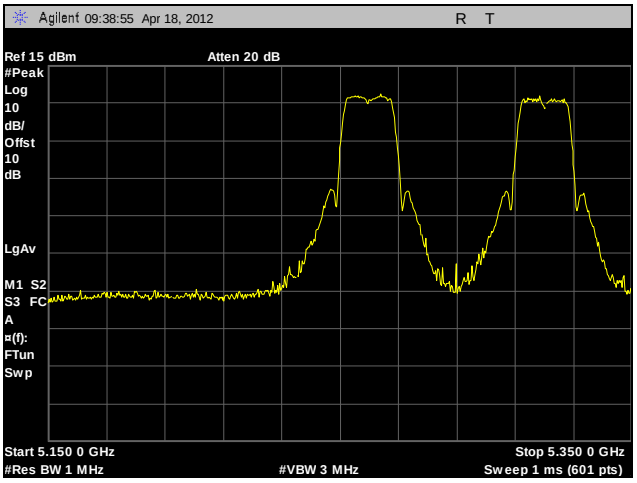
Plot 276. Frequency Stability, 5250 MHz – 5350 MHz, 20°C, 108 V



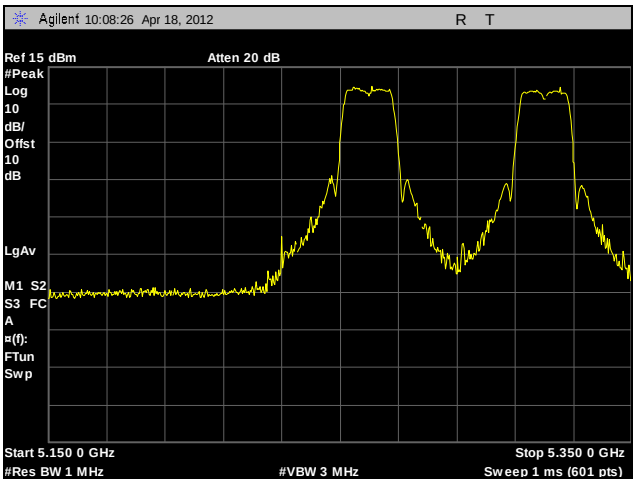
Plot 277. Frequency Stability, 5250 MHz – 5350 MHz, 20°C, 120 V



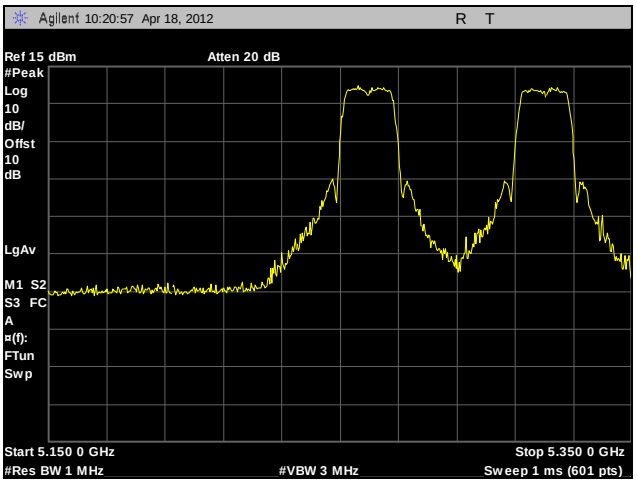
Plot 278. Frequency Stability, 5250 MHz – 5350 MHz, 20°C, 132 V



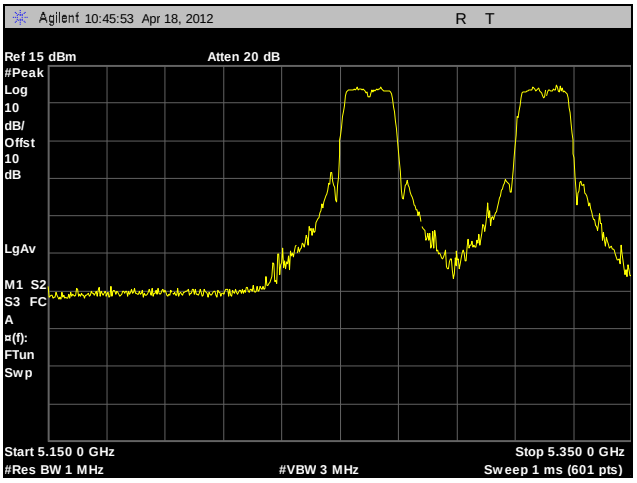
Plot 279. Frequency Stability, 5250 MHz – 5350 MHz, 30°C, 120 V



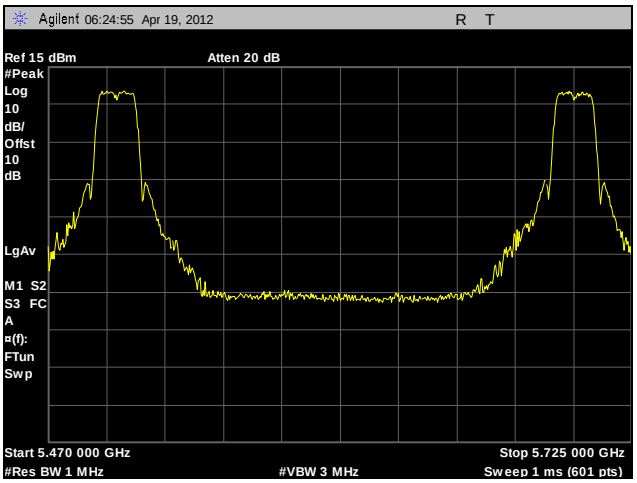
Plot 280. Frequency Stability, 5250 MHz – 5350 MHz, 40°C, 120 V



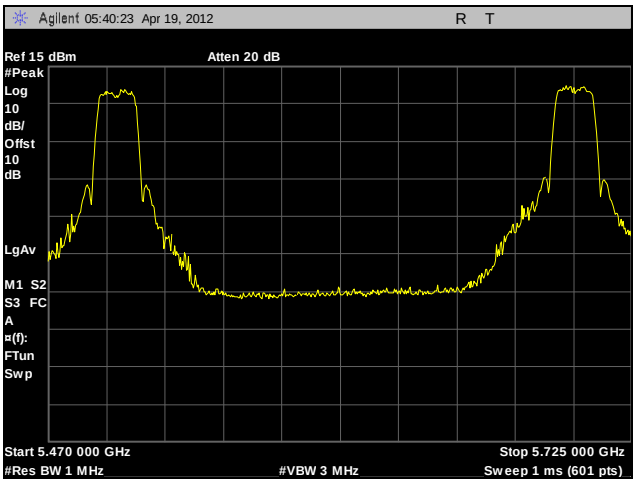
Plot 281. Frequency Stability, 5250 MHz – 5350 MHz, 50°C, 120 V



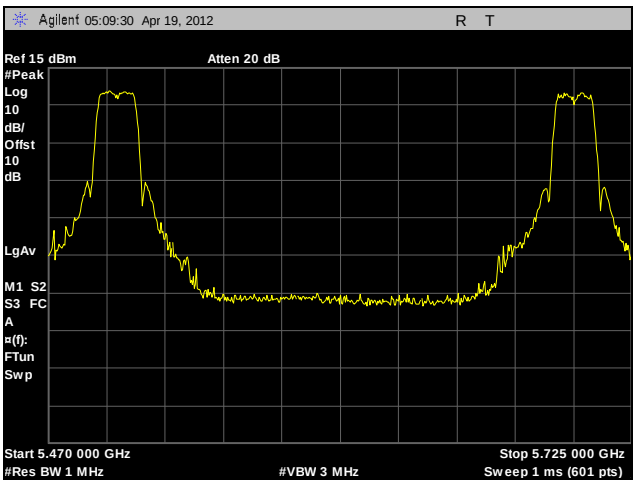
Plot 282. Frequency Stability, 5250 MHz – 5350 MHz, 55°C, 120 V



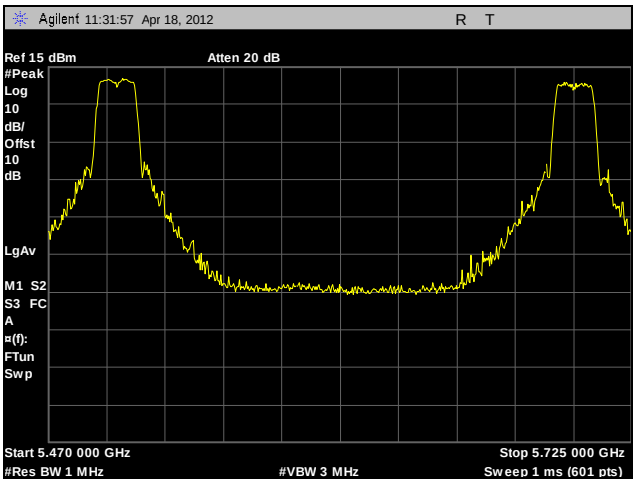
Plot 283. Frequency Stability, 5470 MHz – 5725 MHz, -30°C, 120 V



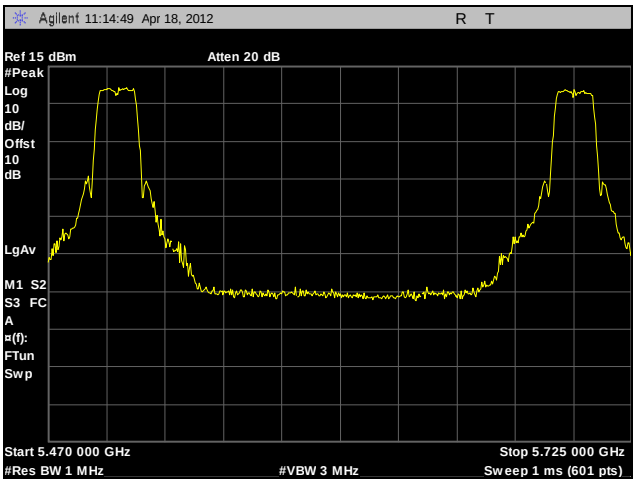
Plot 284. Frequency Stability, 5470 MHz – 5725 MHz, -20°C, 120 V



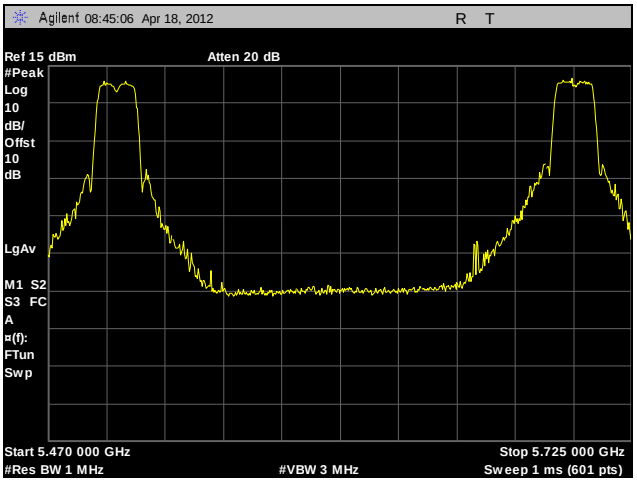
Plot 285. Frequency Stability, 5470 MHz – 5725 MHz, -10°C, 120 V



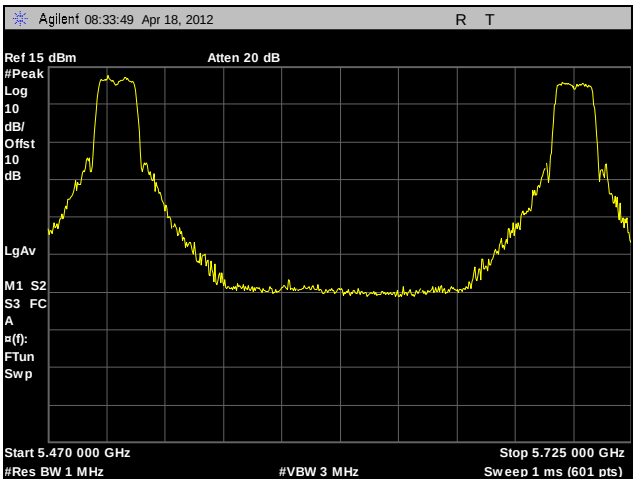
Plot 286. Frequency Stability, 5470 MHz – 5725 MHz, 0°C, 120 V



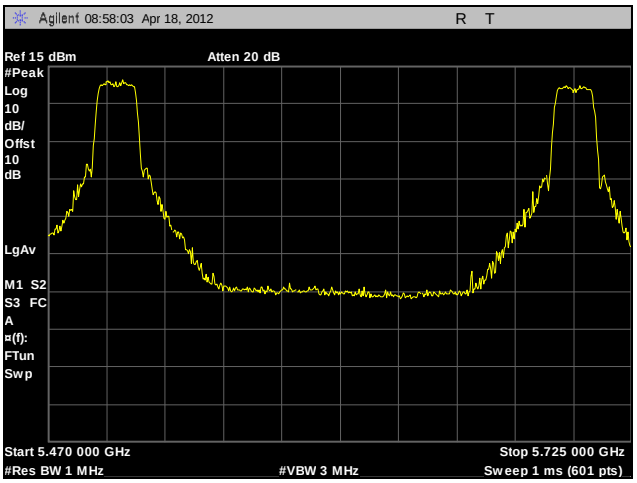
Plot 287. Frequency Stability, 5470 MHz – 5725 MHz, 10°C, 120 V



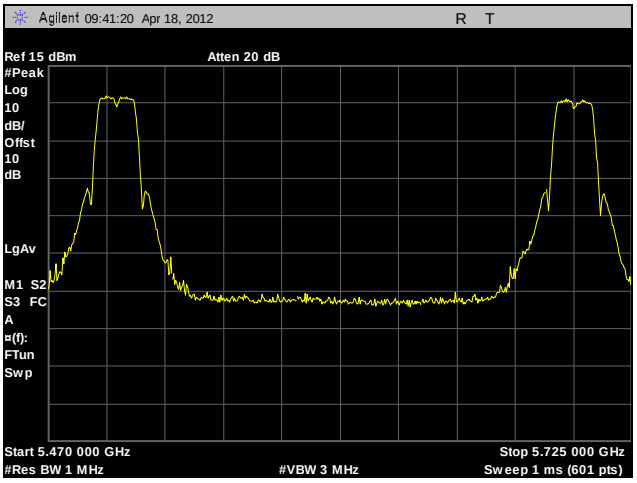
Plot 288. Frequency Stability, 5470 MHz – 5725 MHz, 20°C, 108 V



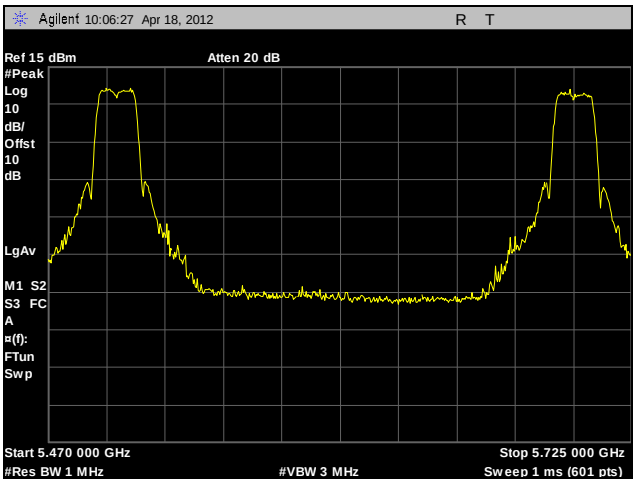
Plot 289. Frequency Stability, 5470 MHz – 5725 MHz, 20°C, 120 V



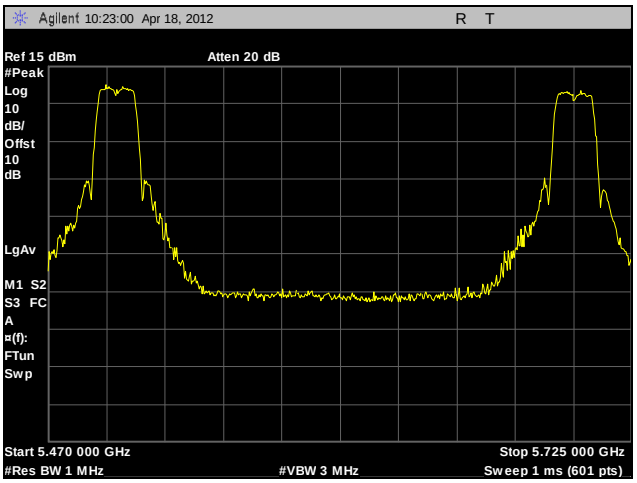
Plot 290. Frequency Stability, 5470 MHz – 5725 MHz, 20°C, 132 V



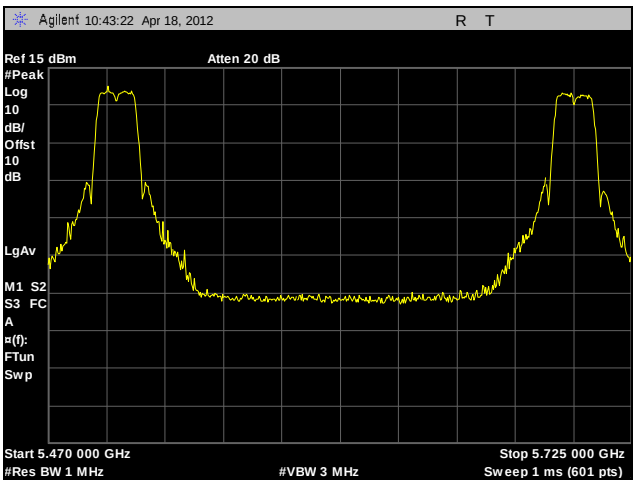
Plot 291. Frequency Stability, 5470 MHz – 5725 MHz, 30°C, 120 V



Plot 292. Frequency Stability, 5470 MHz – 5725 MHz, 40°C, 120 V



Plot 293. Frequency Stability, 5470 MHz – 5725 MHz, 50°C, 120 V



Plot 294. Frequency Stability, 5470 MHz – 5725 MHz, 55°C, 120 V

IV. DFS Requirements and Radar Waveform Description & Calibration

A. DFS Requirements

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 14. Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 15. Applicability of DFS Requirements During Normal Operation

Maximum Transmit Power	Value
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna **Note 2:** Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

Table 16. DFS Detection Thresholds for Master or Client Devices Incorporating DFS

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2
U-NII Detection Bandwidth	Minimum 80% of the 99% power bandwidth. See Note 3.

Note 1: The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows:
- For the Short pulse radar Test Signals this instant is the end of the *Burst*.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar *Burst* generated.
- For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.

Note 2: The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required facilitating *Channel* changes (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the *U-NII Detection Bandwidth* detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.

Table 17. DFS Response Requirement Values

B. Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

A minimum of 30 unique waveforms are required for each of the short pulse radar types 2 through 4. For short pulse radar type 1, the same waveform is used a minimum of 30 times. If more than 30 waveforms are used for short pulse radar types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. The aggregate is the average of the percentage of successful detections of short pulse radar types 1-4.

Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Bursts	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse radar test signal. If more than 30 waveforms are used for the Long Pulse radar test signal, then each additional waveform must also be unique and not repeated from the previous waveforms.

Each waveform is defined as follows:

1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
2) There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst_Count.
3) Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.
4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.
5) Each pulse has a linear FM chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a Burst will have the same chirp width. Pulses in different Bursts may have different chirp widths. The chirp is centered on the pulse. For example, with radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.
6) If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the time between the first and second pulses is chosen independently of the time between the second and third pulses.
7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst_Count. Each interval is of length (12,000,000 / Burst_Count) microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and [(12,000,000 / Burst_Count) – (Total Burst Length) + (One Random PRI Interval)] microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen independently.

A representative example of a Long Pulse radar test waveform:

1) The total test signal length is 12 seconds.
2) 8 Bursts are randomly generated for the Burst_Count.
3) Burst 1 has 2 randomly generated pulses.
4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.
5) The PRI is randomly selected to be at 1213 microseconds.
6) Bursts 2 through 8 are generated using steps 3 – 5.
7) Each Burst is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, Burst 1 is randomly generated (1 to 1,500,000 minus the total Burst 1 length + 1 random PRI interval) at the 325,001 microsecond step. Bursts 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. Burst 2 falls in the 1,500,001 – 3,000,000 microsecond range).

Graphical Representation of a Long Pulse radar Test Waveform

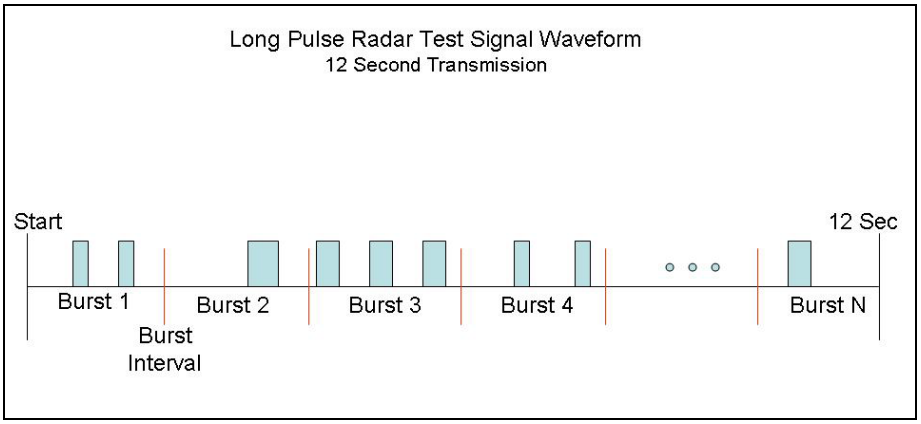


Figure 6. Long Pulse Radar Test Signal Waveform

Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	9	.333	300	70%	30

For the Frequency Hopping Radar Type, the same *Burst* parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected1 from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

C. Radar Waveform Calibration

The following equipment setup was used to calibrate the radiated Radar Waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were no transmissions by either the Master or Client Device. The spectrum analyzer was switched to the zero span (Time Domain) mode at the frequency of the Radar Waveform generator. Peak detection was utilized. The spectrum analyzer's resolution bandwidth (RBW) was set to 3 MHz and the video bandwidth (VBW) was set to 3 MHz. The calibration setup is diagrammed in Figure 7, and the radar test signal generator is shown in Photograph 3.

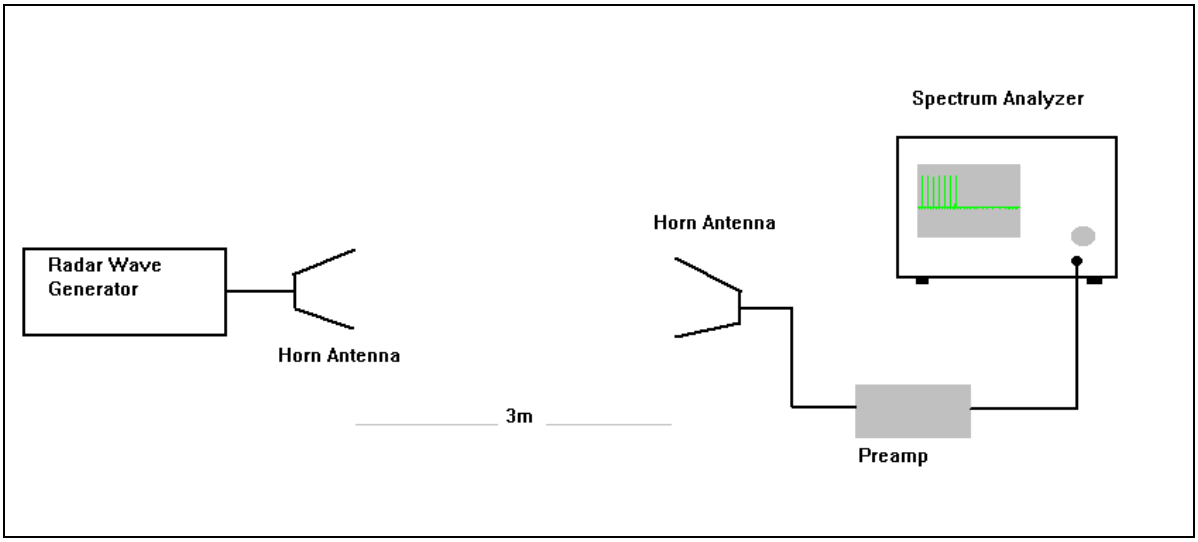
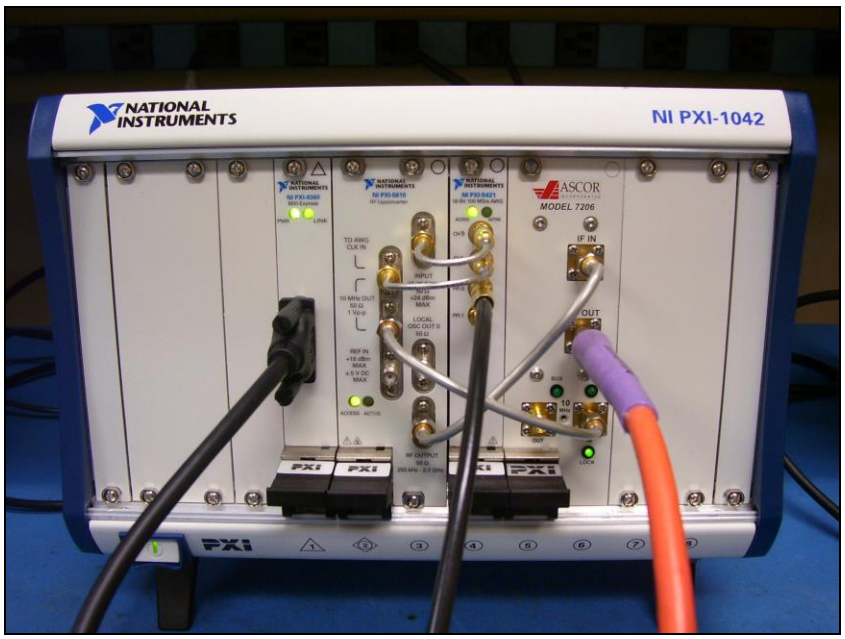
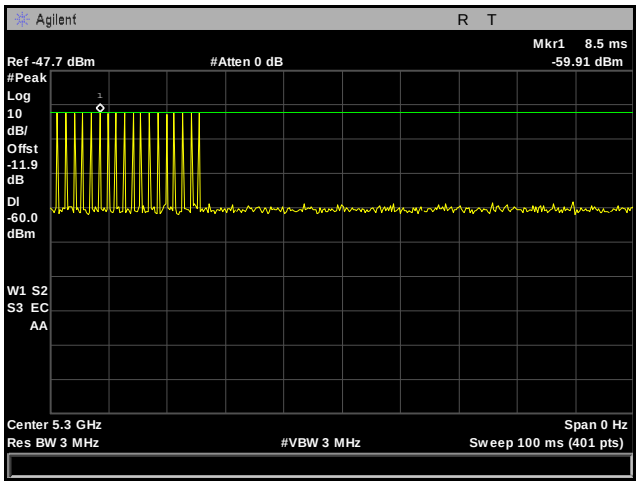


Figure 7. Calibration Test setup

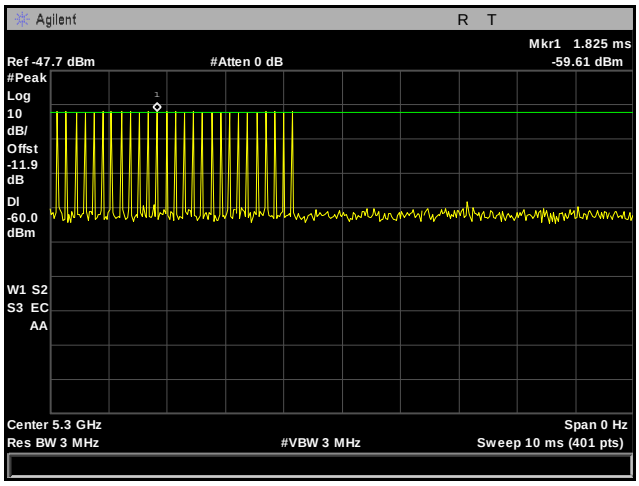


Photograph 3. DFS Radar Test Signal Generator

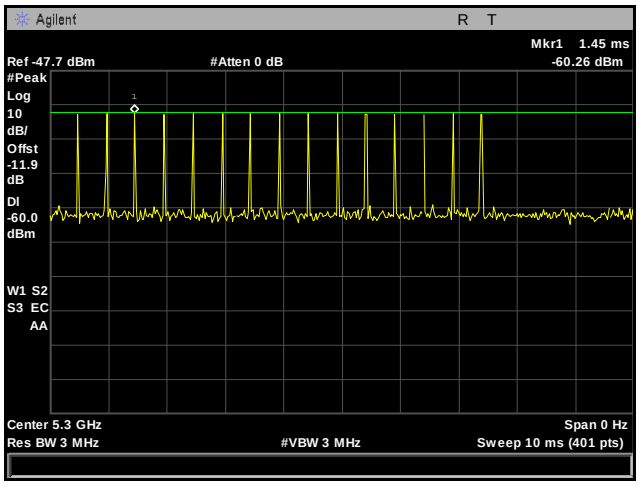
Radar Waveform Calibration



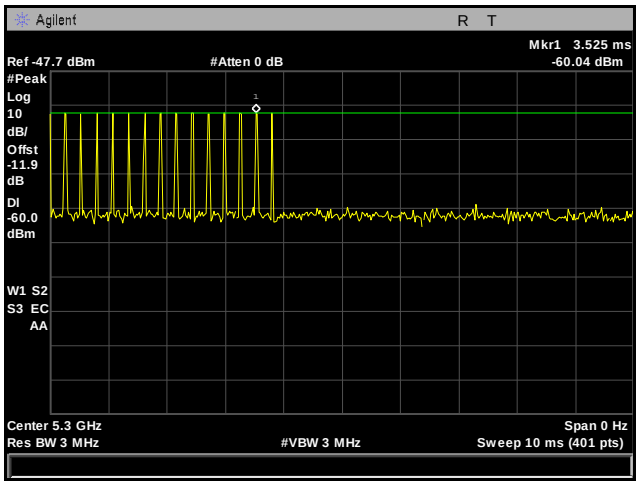
Plot 295. Radar Type 1 Calibration, 5300 MHz



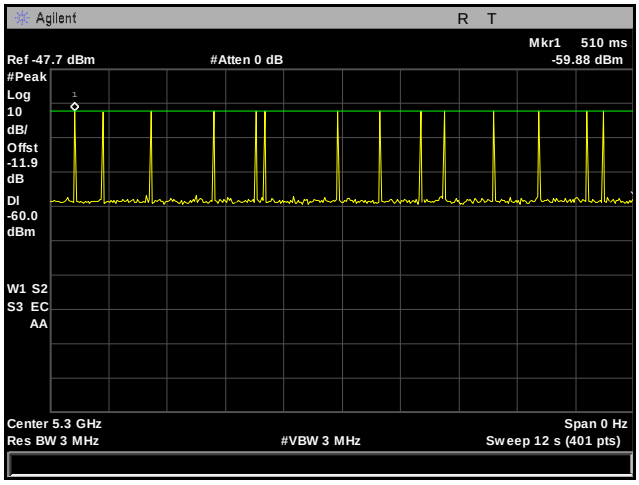
Plot 296. Radar Type 2 Calibration, 5300 MHz



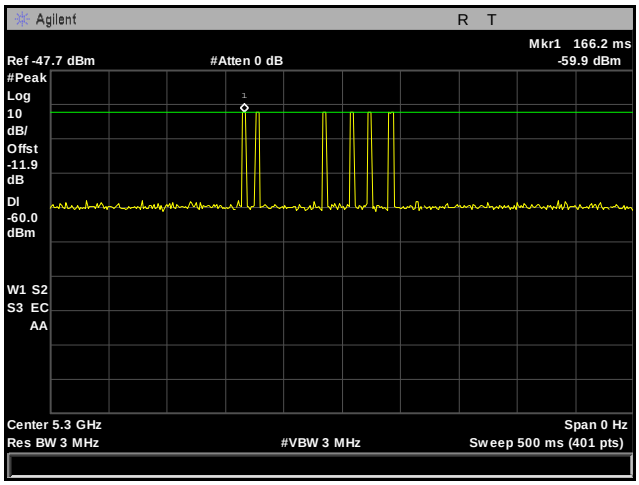
Plot 297. Radar Type 3 Calibration, 5300 MHz



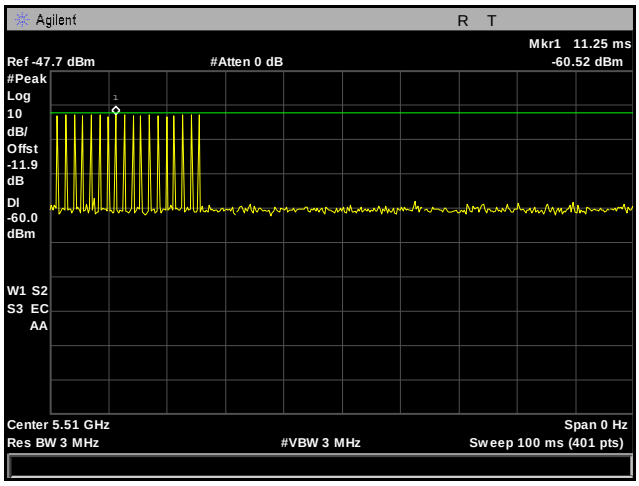
Plot 298. Radar Type 4 Calibration, 5300 MHz



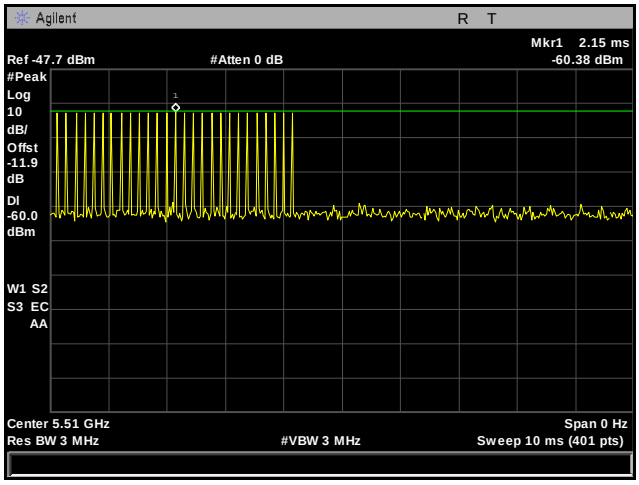
Plot 299. Radar Type 5 Calibration, 5300 MHz



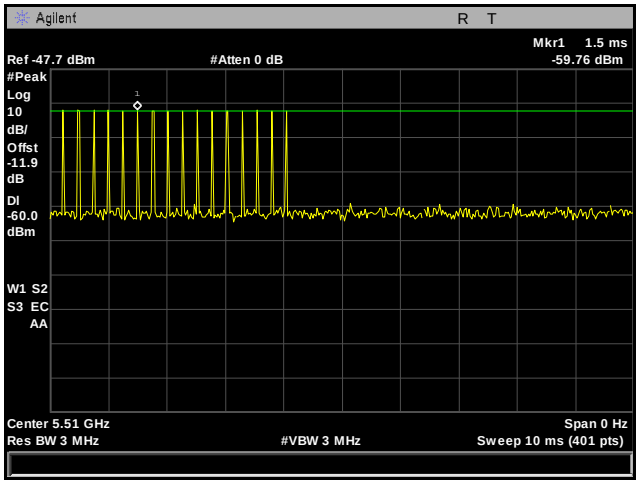
Plot 300. Radar Type 6 Calibration, 5300 MHz



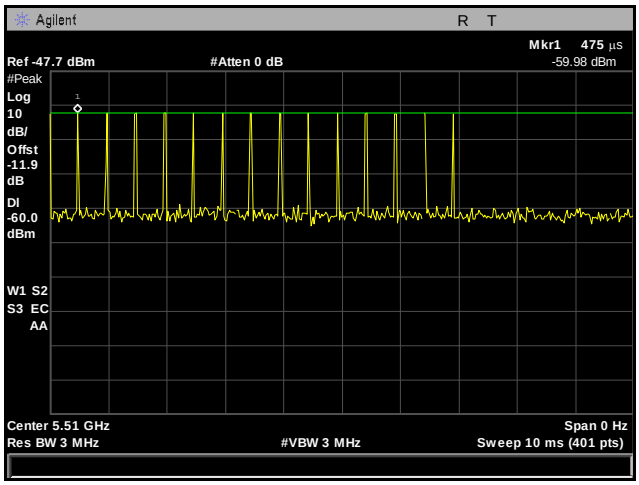
Plot 301. Radar Type 1 Calibration, 5510 MHz



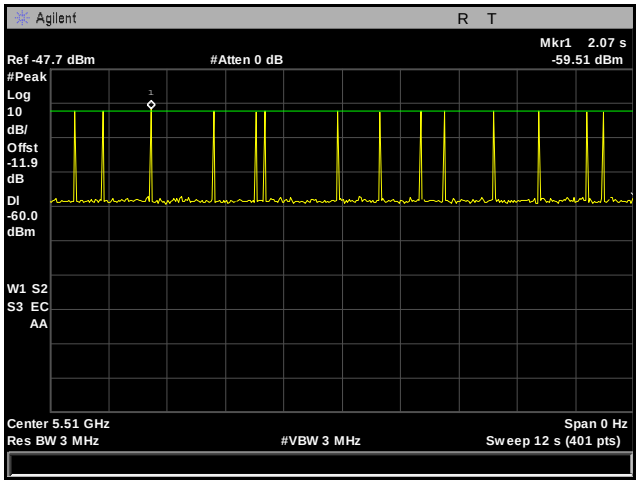
Plot 302. Radar Type 2 Calibration, 5510 MHz



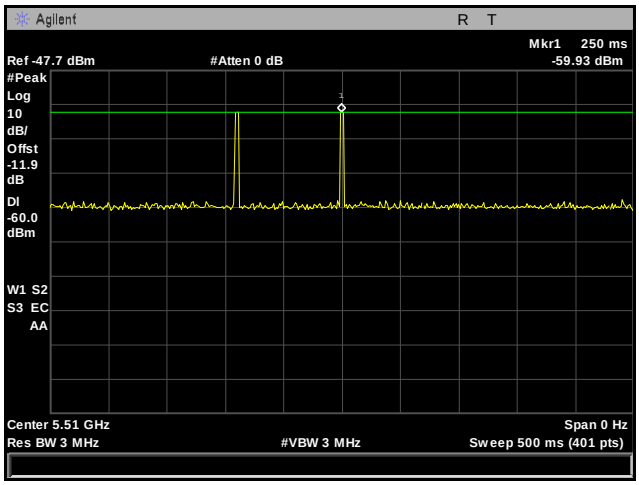
Plot 303. Radar Type 3 Calibration, 5510 MHz



Plot 304. Radar Type 4 Calibration, 5510 MHz



Plot 305. Radar Type 5 Calibration, 5510 MHz



Plot 306. Radar Type 6 Calibration, 5510 MHz

V. DFS Test Procedure and Test Results

A. DFS Test Setup

1. A spectrum analyzer is used as a monitor to verify that the Unit Under Test (UUT) has vacated the Channel within the Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the detection and subsequent Channel move. It is also used to monitor UUT transmissions during the Channel Availability Check Time.
2. The test setup, which consists of test equipment and equipment under test (EUT), is diagrammed in Figure 8 and pictured in Photograph 4.

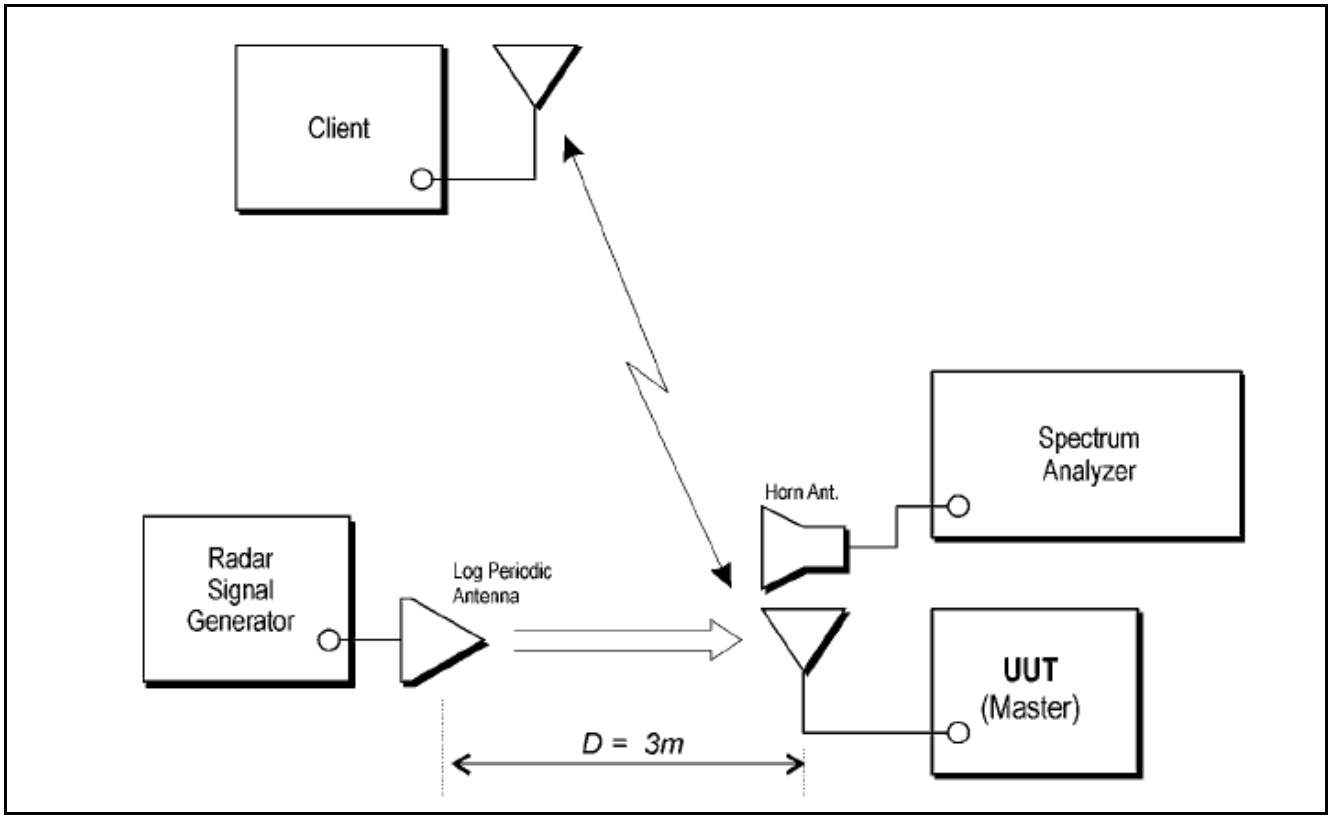


Figure 8. Test Setup Diagram

Photograph 4. DFS, Test Setup

B. Description of Master Device

1. Operating Frequency Range – 5150-5250 MHz, 5250-5350 MHz, 5470-5725 MHz, 5725-5825 MHz
2. Modes of Operation – Master device
3. Highest and Lowest EIRP – Highest EIRP=29.59 dBm; Lowest EIRP=21.02 dBm
4. List all antennas and associated gains – see antenna section in report
5. List antenna impedance – 50 Ohms
6. Antenna gain verification - Use antenna data sheet
7. State test file that is transmitted – 6.5 magical hours
8. TCP description: The device does not support TCP.
9. Time for master to complete its power-on-cycle: 2 minutes
10. Describe EUT's uniform channel spreading: Refer to information below

The AP332i DFS operational behavior as described below.
The AP332i shall support DFS for following country: USA, Canada, Europe and Japan.

1. When AP switches a radio to fallback channel after detecting radar in current operating channel, if the fallback channel is a DFS channel, AP shall perform DFS procedure on that channel
2. When AP switches a radio to another channel (other than fallback channel) after detecting radar, it shall ensure that the selected channel has a minimum separation of 140Mhz i.e., 28 channel numbers from any other operational radio on that AP. If such a channel cannot be found, then the radio shall be disabled.
3. When user specifies fallback channel for a wireless interface of AP433, NMS shall verify that it has a separation of at least 140Mhz from the configured channel of any other radios of that AP which are operating in same band.

List of 5GHz channels in various regulatory domains with information about DFS required/not required, indoor / outdoor.

Channel	US	Europe	Japan
36	Indoor/Outdoor	Indoor	Indoor/Outdoor
40	Indoor/Outdoor	Indoor	Indoor/Outdoor
44	Indoor/Outdoor	Indoor	Indoor/Outdoor
48	Indoor/Outdoor	Indoor	Indoor/Outdoor
52	Indoor/Outdoor/DFS	Indoor/DFS	Indoor/Outdoor/DFS
56	Indoor/Outdoor/DFS	Indoor/DFS	
60	Indoor/Outdoor/DFS	Indoor/DFS	
64	Indoor/Outdoor/DFS	Indoor/DFS	
100	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	
104	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	
108	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	
112	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	
116	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	
120	Not allowed	Indoor/Outdoor/DFS	
124	Not allowed	Indoor/Outdoor/DFS	
128	Not allowed	Indoor/Outdoor/DFS	
132	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	
136	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	
140	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	

Channel	US	Europe	Japan
144	Indoor/Outdoor/DFS	Indoor/Outdoor/DFS	
149		Not allowed	
153		Not allowed	
157		Not allowed	
161		Not allowed	

C. UNII Detection Bandwidth

Test Requirement(s): **§ 15.407** A minimum 80% detection rate is required across an EUT's 99% bandwidth.

Test Procedure: All UNII channels for this device have identical channel bandwidths.

A single burst of the short pulse radar type 1 is produced at 5300 MHz, at the -60dBm test level. The UUT is set up as a standalone device (no associated client, and no data traffic).

A single radar burst is generated for a minimum of 10 trials, and the response of the UUT is recorded. The UUT must detect the radar waveform 90% or more of the time.

The radar frequency is increased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The highest frequency at which detection is greater than or equal to 90% is denoted F_H.

The radar frequency is decreased in 1 MHz steps, repeating the above test sequence, until the detection rate falls below 90%. The lowest frequency at which detection is greater than or equal to 90% is denoted F_L.

The U-NII Detection Bandwidth is calculated as follows:

$$\text{U-NII Detection Bandwidth} = F_H - F_L$$

Test Engineer: Aaron Chang

Test Date: 09/10/13

UNII Detection Bandwidth – Test Results

EUT Frequency- 5300MHz											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5289	1	0	0	0	0	0	0	1	0	0	20
5290 (FL)	1	1	1	1	1	1	1	1	1	1	100
5291	1	1	1	1	1	1	1	1	1	1	100
5292	1	1	1	1	1	1	1	1	1	1	100
5293	1	1	1	1	1	1	1	1	1	1	100
5294	1	1	1	1	1	1	1	1	1	1	100
5295	1	1	1	1	1	1	1	1	1	1	100
5296	1	1	1	1	1	1	1	1	1	1	100
5297	1	1	1	1	1	1	1	1	1	1	100
5298	1	1	1	1	1	1	1	1	1	1	100
5299	1	1	1	1	1	1	1	1	1	1	100
5300	1	1	1	1	1	1	1	1	1	1	100
5301	1	1	1	1	1	1	1	1	1	1	100
5302	1	1	1	1	1	1	1	1	1	1	100
5303	1	1	1	1	1	1	1	1	1	1	100
5304	1	1	1	1	1	1	1	1	1	1	100
5305	1	1	1	1	1	1	1	1	1	1	100
5306	1	1	1	1	1	1	1	1	1	1	100
5307	1	1	1	1	1	1	1	1	1	1	100
5308	1	1	1	1	1	1	1	1	1	1	100
5309	1	1	1	1	1	1	1	1	1	1	100
5310	1	1	1	1	1	1	1	1	1	1	100
5311 (FH)	1	1	1	1	1	1	1	1	0	1	90
5312	1	1	1	1	1	1	1	0	0	0	70
Overall Detection Percentage											%
Detection Bandwidth = f_h - f_l = 5311MHz-5290MHz = 21MHz											
EUT 99% Bandwidth = 17.8378MHz											
OBW* 80% = 14.27											

Table 18. UNII Detection Bandwidth, Test Results, 5300 MHz, 20MHz

EUT Frequency- 5510MHz											
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Frequency (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5486	1	0	0	0	0	0	0	0	0	0	10
5487 (FL)	1	1	1	0	1	1	1	1	1	1	90
5488	1	1	1	1	1	1	1	1	1	1	100
5489	1	1	1	1	1	1	1	1	1	1	100
5490	1	1	1	1	1	1	1	1	1	1	100
5491	1	1	1	1	1	1	1	1	1	1	100
5492	1	1	1	1	1	1	1	1	1	1	100
5493	1	1	1	1	1	1	1	1	1	1	100
5494	1	1	1	1	1	1	1	1	1	1	100
5495	1	1	1	1	1	1	1	1	1	1	100
5496	1	1	1	1	1	1	1	1	1	1	100
5497	1	1	1	1	1	1	1	1	1	1	100
5498	1	1	1	1	1	1	1	1	1	1	100
5499	1	1	1	1	1	1	1	1	1	1	100
5500	1	1	1	1	1	1	1	1	1	1	100
5501	1	1	1	1	1	1	1	1	1	1	100
5502	1	1	1	1	1	1	1	1	1	1	100
5503	1	1	1	1	1	1	1	1	1	1	100
5504	1	1	1	1	1	1	1	1	1	1	100
5505	1	1	1	1	1	1	1	1	1	1	100
5506	1	1	1	1	1	1	1	1	1	1	100
5507	1	1	1	1	1	1	1	1	1	1	100
5508	1	1	1	1	1	1	1	1	1	1	100
5509	1	1	1	1	1	1	1	1	1	1	100
5510	1	1	1	1	1	1	1	1	1	1	100
5511	1	1	1	1	1	1	1	1	1	1	100
5512	1	1	1	1	1	1	1	1	1	1	100
5513	1	1	1	1	1	1	1	1	1	1	100
5514	1	1	1	1	1	1	1	1	1	1	100
5515	1	1	1	1	1	1	1	1	1	1	100
5516	1	1	1	1	1	1	1	1	1	1	100
5517	1	1	1	1	1	1	1	1	1	1	100
5518	1	1	1	1	1	1	1	1	1	1	100
5519	1	1	1	1	1	1	1	1	1	1	100
5520	1	1	1	1	1	1	1	1	1	1	100
5521	1	1	1	1	1	1	1	1	1	1	100
5522	1	1	1	1	1	1	1	1	1	1	100
5523	1	1	1	1	1	1	1	1	1	1	100
5524	1	1	1	1	1	1	1	1	1	1	100
5525	1	1	1	1	1	1	1	1	1	1	100
5526	1	1	1	1	1	1	1	1	1	1	100
5527	1	1	1	1	1	1	1	1	1	1	100
5528	1	1	1	1	1	1	1	1	1	1	100
5529	1	1	1	1	1	1	1	1	1	1	100
5530	1	1	1	1	1	1	1	1	1	1	100
5531(FH)	1	1	1	1	1	1	1	1	1	1	100
5532	0	0	0	0	0	0	0	0	0	0	0
Overall Detection Percentage											%
Detection Bandwidth = f_h - f_l = 5529MHz-5491MHz = 45MHz											
EUT 99% Bandwidth = 36.3073											
OBW* 80% = 29.04584											

Table 19 UNII Detection Bandwidth, Test Results, 5510 MHz, 40MHz

Initial Channel Availability Check Time

Test Requirements: **§ 15.407** The Initial Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test channel until the power-up sequence has been completed and the U-NII device has checked for radar waveforms, for one minute, on the test channel. This test does not use any of the radar waveforms and only needs to be performed once.

The UUT should not make any transmissions over the test channel, for at least 1 minute after completion of its power-on cycle.

Test Procedure: The U-NII device is powered on and instructed to operate at 5300 MHz. At the same time the UUT is powered on, the spectrum analyzer is set to 5300MHz with a zero span and a 2.5 minute sweep time. The analyzer is triggered at the same time power is applied to the U-NII device.

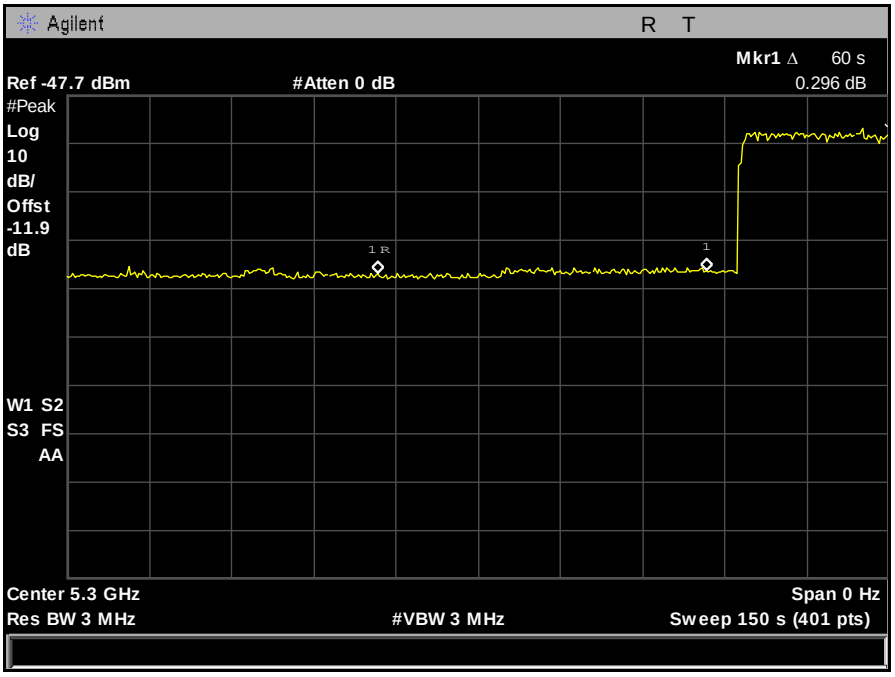
Test Results: Marker 1 on plot 314 indicate the start of the channel availability check time. Initial beacon/data transmission is indicated by marker 1R.

The Equipment was compliant with § 15.407 Initial Channel Availability Check Time.

Test Engineer: Aaron Chang

Test Date: 09/10/13

Initial Channel Availability Check Time – Plot



Plot 307. Initial Channel Availability Check Time, Boot-Up

D. Radar Burst at the Beginning of Channel Availability Check Time

Test Requirements: **§ 15.407** A Radar Burst at the Beginning of the Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test Channel if it has detected a radar burst during that time period until the power-up sequence has been completed and the U-NII device checks for Radar Waveforms for one minute on the test Channel. The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-59dBm) occurs at the beginning of the Channel Availability Check Time.

Test Procedure: The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence. The Channel Availability Check Time commences at instant T1 and will end no sooner than T1 + 60 seconds.

A single Burst of short pulse radar type 1, at -59 dBm, will commence within a 6 second window starting at T1.

Visual indication of the UUT of successful detection of the radar Burst will be recorded and reported. Observation of transmission at 5300MHz will continue for 2.5 minutes after the radar Burst has been generated.

Verify that during the 2.5 minute measurement window, no UUT transmissions occurr at 5300MHz.

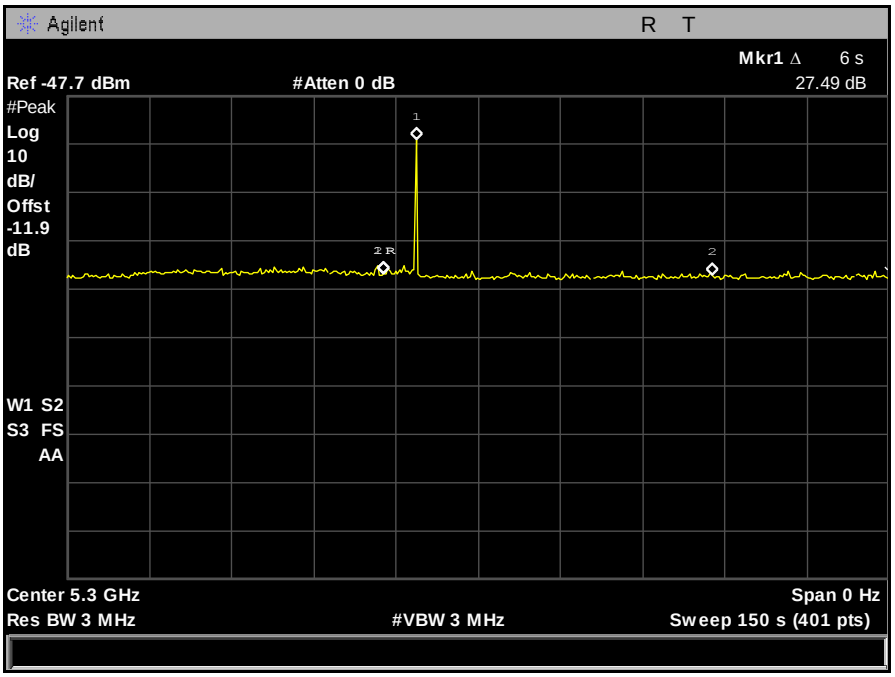
Test Results Plot 315 below indicates that there were no UUT transmissions during the 2.5 minute measurement window when a radar burst was injected 6 seconds into the CACT. Therefore, the UUT detected the presence of a radar during the CACT and moved away from that channel.

The equipment was compliant with § 15.407 Radar Burst at the Beginning of the Channel Availability Check Time.

Test Engineer: Aaron Chang

Test Date: 09/10/13

Radar Burst at the Beginning of Channel Availability Check Time – Plot



Plot 308. Radar Burst at the Beginning of CACT

E. Radar Burst at the End of Channel Availability Check Time

Test Requirements: **§ 15.407** A Radar Burst at the End of the Channel Availability Check Time tests that the UUT does not emit beacon, control, or data signals on the test Channel if it has detected a radar burst during that time period until the power-up sequence has been completed and the U-NII device checks for Radar Waveforms for one minute on the test Channel. The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-59dBm) occurs at the end of the Channel Availability Check Time.

Test Procedure: The steps below define the procedure to verify successful radar detection on the selected Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB (-59dBm) occurs at the end of the Channel Availability Check Time.

The UUT is powered on at T0. T1 denotes the instant when the UUT has completed its power-up sequence. The Channel Availability Check Time commences at instant T1 and will end no sooner than T1 + 60 seconds.

A single Burst of short pulse of radar type 1 at -59 dBm will commence within a 6 second window starting at T1+ 54 seconds.

Visual indication on the UUT of successful detection of the radar Burst will be recorded and reported. Observation of emissions at 5300MHz will continue for 2.5 minutes after the radar Burst has been generated.

Verify that during the 2.5 minute measurement window no UUT transmissions occurred at 5300MHz.

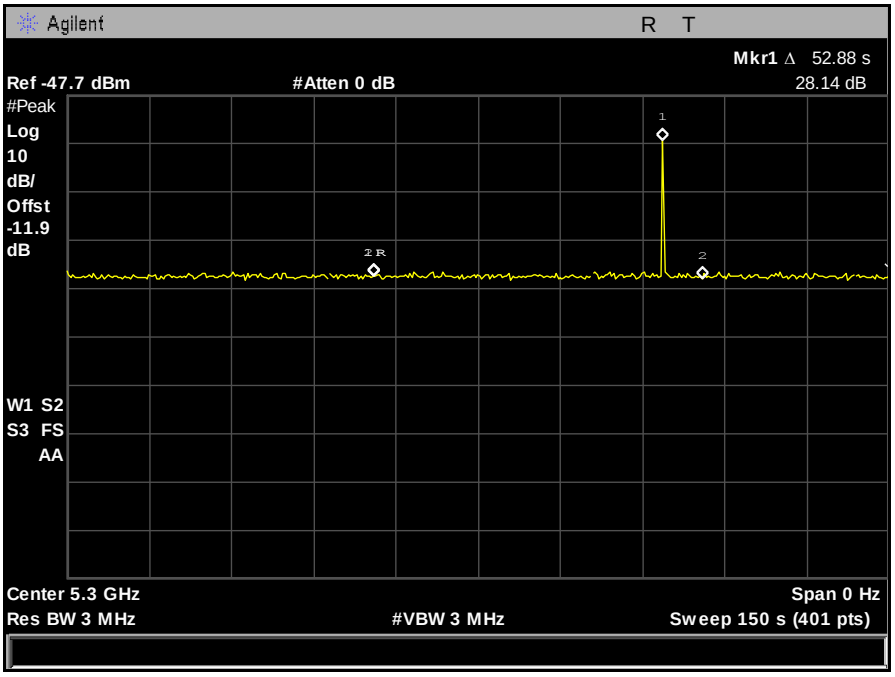
Test Results: Plots 316 indicates that no UUT transmissions occurred during the 2.5 minute measurement window when a radar burst was injected 6 seconds before the end of the CACT. Therefore, the UUT detected the presence of a radar and moved away from that channel.

The equipment was compliant with § 15.407 Radar Burst at the End of the Channel Availability Check Time.

Test Engineer: Aaron Chang

Test Date: 09/10/13

Radar Burst at the End of Channel Availability Check Time – Plot



Plot 309. Radar Burst at the End of CACT

F. In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time, and Non-Occupancy Period

Test Requirements: **§ 15.407** (Refer to DFS Response Requirement Values table in section III-A of this report.) The UUT shall continuously monitor for radar transmissions in the operating test channel. When a radar burst occurs in the test channel, it has 10 seconds to move to another channel. This 10 second window is termed Channel Move Time (CMT).

When a radar burst occurs, the UUT has 200 milliseconds, plus an aggregate of 60 milliseconds, to cease transmission in the operating test channel. This 200 ms + 60 ms requirement is termed Channel Closing Transmission Time (CCT).

After radar burst and subsequent move to another channel, the UUT shall not resume transmission, on the channel it moved from, for a period of 30 minutes. This requirement is termed Non-Occupancy Period (NOP).

Test Procedure: These tests define how the following DFS parameters are verified during In-Service Monitoring: Channel Closing Transmission Time, Channel Move Time, and Non-Occupancy Period.

The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold + 1dB (-59dBm) is generated on the Operating Channel of the U-NII device.

A U-NII device operating as a Client Device will associate with the UUT (Master) at 5300 MHz. Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test.

At time T0 the Radar Waveform generator sends a Burst of pulses for each of the radar types at -59dBm.

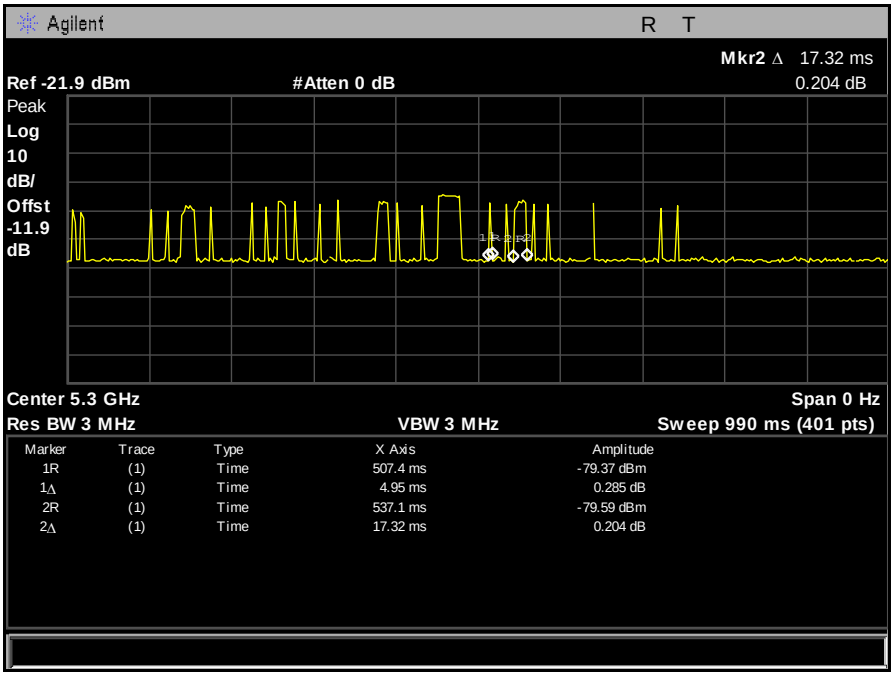
Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing Transmission Time results to the limits defined in the *DFS Response Requirement Values table*.

Test Results: The EUT was compliant with § 15.407 In-Service Monitoring for Channel Move Time, Channel Closing Transmission Time, and Non-Occupancy Period.

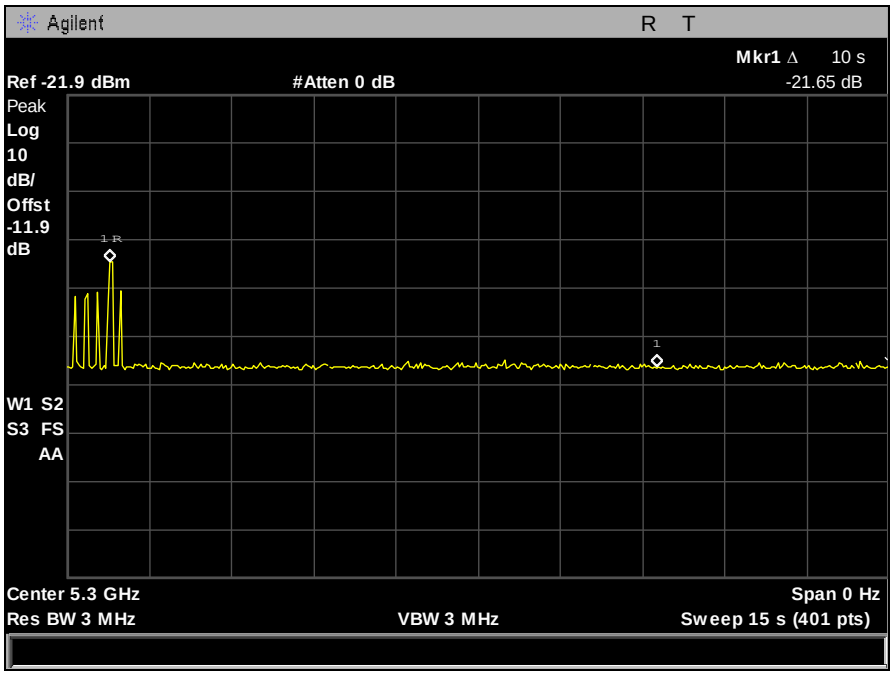
Test Engineer: Aaron Chang

Test Date: 09/10/13

Channel Move Time – Plots

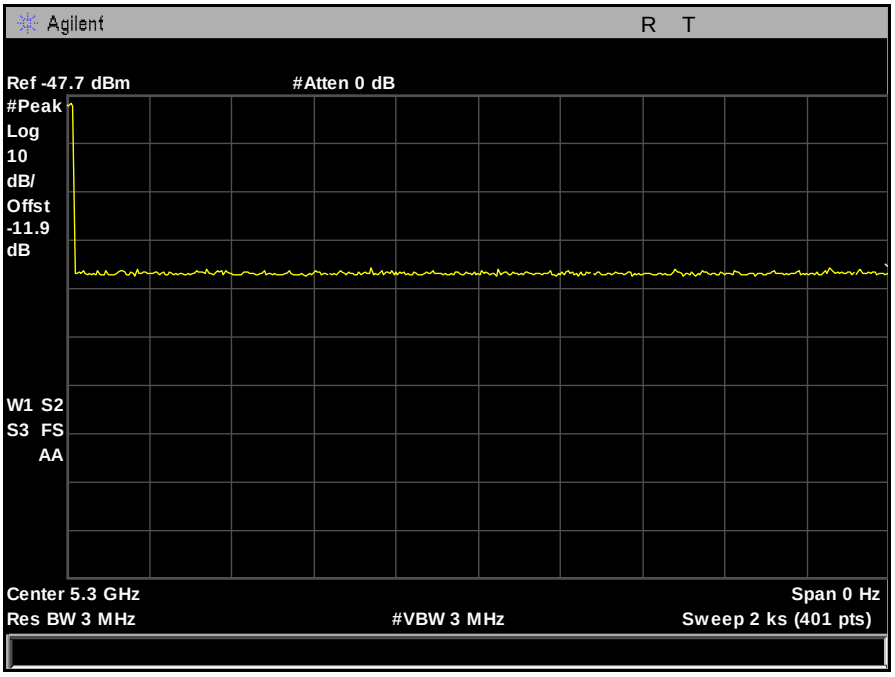


Plot 310. Channel Move Time, 1 second



Plot 311. Channel Move Time, 10 seconds

Non-Occupancy Period – Plot



Plot 312. Non-Occupancy Period

G. Statistical Performance Check

Test Requirements: **§ 15.407** During In-Service Monitoring, the EUT requires a minimum percentage of successful radar detections from all required radar waveforms at a level equal to the DFS Detection Threshold + 1dB.

Test Procedure: Stream the MPEG test file from the Master Device to the Client Device on the selected Channel for the entire period of the test. The Radar Waveform generator sends the individual waveform for each of the radar types 1-6 at -60dbm. Statistical data is gathered to determine the ability of the device to detect the radar test waveforms. The device can utilize a test mode to demonstrate when detection occurs to prevent the need to reset the device between trial runs. The percentage of successful detection is calculated by:

$$\frac{TotalWaveformDetections}{TotalWaveformTrials} \times 100$$

The Minimum number of trails, minimum percentage of successful detection and the average minimum percentage of successful detection are found in the Radar Test Waveforms section.

Test Results: The equipment was compliant with § 15.407 Statistical Performance Check.

Test Engineer: Aaron Chang

Test Date: 09/10/13

Statistical Performance Check – Radar Type 1

Radar Type	Trial #	Pulses per Burst	Pulse Width (µsec)	PRI (µsec)	Detection
					1 = Yes, 0 = No
1	1	18	1	1428	1
	2	18	1	1428	1
	3	18	1	1428	1
	4	18	1	1428	1
	5	18	1	1428	1
	6	18	1	1428	1
	7	18	1	1428	1
	8	18	1	1428	1
	9	18	1	1428	1
	10	18	1	1428	1
	11	18	1	1428	1
	12	18	1	1428	1
	13	18	1	1428	1
	14	18	1	1428	1
	15	18	1	1428	1
	16	18	1	1428	1
	17	18	1	1428	1
	18	18	1	1428	1
	19	18	1	1428	1
	20	18	1	1428	1
	21	18	1	1428	1
	22	18	1	1428	1
	23	18	1	1428	1
	24	18	1	1428	1
	25	18	1	1428	1
	26	18	1	1428	1
	27	18	1	1428	1
	28	18	1	1428	1
	29	18	1	1428	1
	30	18	1	1428	1
	Detection Percentage				100% (> 60%)

Table 20. Statistical Performance Check – Radar Type 1, 20 MHz, 5300 MHz

Statistical Performance Check – Radar Type 2

Radar Type	Trial #	Pulse Width 1 to 5 µsec	PRI 150 to 230 µsec	Pulses per Burst 23 to 29	Detection 1 = Yes, 0 = No
2	1	1.9	155	28	1
	2	4.8	185	29	1
	3	3.3	163	29	1
	4	4.8	158	28	1
	5	1.7	204	26	1
	6	1.5	230	28	1
	7	1.2	181	26	1
	8	1.4	194	28	1
	9	1.2	194	28	1
	10	3.6	197	23	1
	11	2.5	213	29	1
	12	1.7	190	29	1
	13	1.2	206	27	1
	14	3.5	193	24	1
	15	1.4	169	24	1
	16	1.4	182	23	1
	17	4.7	221	25	1
	18	4	197	29	1
	19	1.5	230	23	1
	20	3.2	178	23	1
	21	3.7	158	25	1
	22	3.1	150	27	1
	23	2.3	217	27	1
	24	3.3	164	29	1
	25	5	195	25	1
	26	4.9	162	26	1
	27	3.5	164	24	1
	28	3.8	201	29	1
	29	4.8	162	25	1
	30	1.2	151	23	1
	Detection Percentage				**100% (> 60%)**

Table 21. Statistical Performance Check – Radar Type 2, 20 MHz. 5300 MHz

Statistical Performance Check – Radar Type 3

Radar Type	Trial #	Pulse Width 6 to 10 µsec	PRI 200 to 500 µsec	Pulses per Burst 16 to 18	Detection 1 = Yes, 0 = No
3	1	9.3	255	17	1
	2	6.7	423	18	1
	3	6.9	494	16	1
	4	7	341	18	1
	5	9.9	211	18	1
	6	8.6	337	17	1
	7	9.2	322	18	1
	8	7.8	228	16	1
	9	8.4	203	17	1
	10	8.3	284	16	1
	11	7.7	362	18	1
	12	6.5	233	17	1
	13	8	432	16	1
	14	9.9	238	17	1
	15	8.4	304	17	1
	16	9.2	488	16	1
	17	7	415	17	1
	18	8.5	273	17	1
	19	8	269	18	1
	20	6.7	422	18	1
	21	6.2	401	18	1
	22	7.9	378	16	1
	23	9.1	387	16	1
	24	8	322	18	1
	25	7.5	401	18	1
	26	6	355	16	1
	27	6.4	497	18	1
	28	8.5	237	18	1
	29	7.8	223	16	1
	30	8.8	289	16	1
	Detection Percentage				100% (> 60%)

Table 22. Statistical Performance Check – Radar Type 3, 20 MHz, 5300 MHz

Statistical Performance Check – Radar Type 4

Radar Type	Trial #	Pulse Width 11 to 20 µsec	PRI 200 to 500 µsec	Pulses per Burst 12 to 16	Detection 1 = Yes, 0 = No
4	1	17.6	273	15	1
	2	15.9	310	16	1
	3	18.4	494	15	1
	4	16	333	15	1
	5	15.9	302	14	1
	6	16.9	354	15	1
	7	12.3	331	14	1
	8	13	307	14	1
	9	15.8	436	12	1
	10	18	277	16	1
	11	16.4	272	15	1
	12	15.3	420	16	1
	13	13.4	440	14	1
	14	17.3	224	16	1
	15	11.3	426	13	1
	16	13	250	14	1
	17	11.1	271	16	1
	18	13	238	16	1
	19	13.4	270	13	1
	20	17.1	205	13	1
	21	19.6	297	14	1
	22	15.8	355	12	1
	23	14.2	222	15	1
	24	19.1	296	12	1
	25	13.3	310	14	1
	26	16.2	293	13	1
	27	12.1	402	12	1
	28	13.9	266	16	1
	29	16.8	278	13	1
	30	15.4	461	13	1
	Detection Percentage				100% (> 60%)

Table 23. Statistical Performance Check – Radar Type 4, 20 MHz, 5300 MHz

Statistical Performance Check – Radar Type 5

Radar Type	Trial #	Filename*	Detection
			1 = Yes, 0 = No
5	1	bin5-trial 1	1
	2	bin5-trial 2	1
	3	bin5-trial 3	1
	4	bin5-trial 4	1
	5	bin5-trial 5	1
	6	bin5-trial 6	1
	7	bin5-trial 7	1
	8	bin5-trial 8	1
	9	bin5-trial 9	1
	10	bin5-trial 10	1
	11	bin5-trial 11	1
	12	bin5-trial 12	1
	13	bin5-trial 13	1
	14	bin5-trial 14	1
	15	bin5-trial 15	1
	16	bin5-trial 16	1
	17	bin5-trial 17	1
	18	bin5-trial 18	1
	19	bin5-trial 19	1
	20	bin5-trial 20	1
	21	bin5-trial 21	1
	22	bin5-trial 22	1
	23	bin5-trial 23	1
	24	bin5-trial 24	1
	25	bin5-trial 25	1
	26	bin5-trial 26	1
	27	bin5-trial 27	1
	28	bin5-trial 28	1
	29	bin5-trial 29	1
	30	bin5-trial 30	1
	Detection Percentage		100% (> 80%)

Table 24. Statistical Performance Check – Radar Type 5, 20 MHz, 5300 MHz

Statistical Performance Check – Radar Type 6

Radar Type	Trial #	Frequency (MHz)	Pulses/Hop	Pulse Width (µsec)	PRI (µsec)	Detection 1 = Yes, 0 = No
6	1	5580	9	1	333	1
	2	5580	9	1	333	1
	3	5580	9	1	333	1
	4	5580	9	1	333	1
	5	5580	9	1	333	1
	6	5580	9	1	333	1
	7	5580	9	1	333	1
	8	5580	9	1	333	1
	9	5580	9	1	333	1
	10	5580	9	1	333	1
	11	5580	9	1	333	1
	12	5580	9	1	333	0
	13	5580	9	1	333	1
	14	5580	9	1	333	1
	15	5580	9	1	333	1
	16	5580	9	1	333	1
	17	5580	9	1	333	1
	18	5580	9	1	333	1
	19	5580	9	1	333	1
	20	5580	9	1	333	0
	21	5580	9	1	333	0
	22	5580	9	1	333	0
	23	5580	9	1	333	1
	24	5580	9	1	333	1
	25	5580	9	1	333	1
	26	5580	9	1	333	1
	27	5580	9	1	333	1
	28	5580	9	1	333	1
	29	5580	9	1	333	1
	30	5580	9	1	333	0
	Detection Percentage					**93% (> 60%)**

Table 25. Statistical Performance Check – Radar Type 6, 20 MHz, 5300 MHz

Statistical Performance Check – Radar Type 1

Radar Type	Trial #	Pulses per Burst	Pulse Width (µsec)	PRI (µsec)	Detection
					1 = Yes, 0 = No
1	1	18	1	1428	1
	2	18	1	1428	1
	3	18	1	1428	1
	4	18	1	1428	1
	5	18	1	1428	1
	6	18	1	1428	1
	7	18	1	1428	1
	8	18	1	1428	1
	9	18	1	1428	1
	10	18	1	1428	1
	11	18	1	1428	1
	12	18	1	1428	1
	13	18	1	1428	1
	14	18	1	1428	1
	15	18	1	1428	1
	16	18	1	1428	1
	17	18	1	1428	1
	18	18	1	1428	1
	19	18	1	1428	1
	20	18	1	1428	1
	21	18	1	1428	0
	22	18	1	1428	1
	23	18	1	1428	1
	24	18	1	1428	1
	25	18	1	1428	1
	26	18	1	1428	1
	27	18	1	1428	1
	28	18	1	1428	1
	29	18	1	1428	1
	30	18	1	1428	1
	Detection Percentage				97% (> 60%)

Table 26. Statistical Performance Check – Radar Type 1, 40 MHz, 5510 MHz

Statistical Performance Check – Radar Type 2

Radar Type	Trial #	Pulse Width 1 to 5 µsec	PRI 150 to 230 µsec	Pulses per Burst 23 to 29	Detection 1 = Yes, 0 = No
2	1	1.9	155	28	1
	2	4.8	185	29	1
	3	3.3	163	29	1
	4	4.8	158	28	1
	5	1.7	204	26	1
	6	1.5	230	28	1
	7	1.2	181	26	1
	8	1.4	194	28	1
	9	1.2	194	28	1
	10	3.6	197	23	1
	11	2.5	213	29	1
	12	1.7	190	29	1
	13	1.2	206	27	1
	14	3.5	193	24	1
	15	1.4	169	24	1
	16	1.4	182	23	1
	17	4.7	221	25	1
	18	4	197	29	1
	19	1.5	230	23	1
	20	3.2	178	23	1
	21	3.7	158	25	1
	22	3.1	150	27	1
	23	2.3	217	27	1
	24	3.3	164	29	1
	25	5	195	25	1
	26	4.9	162	26	1
	27	3.5	164	24	1
	28	3.8	201	29	1
	29	4.8	162	25	1
	30	1.2	151	23	1
	Detection Percentage				**100% (> 60%)**

Table 27. Statistical Performance Check – Radar Type 2, 40 MHz. 5510 MHz

Statistical Performance Check – Radar Type 3

Radar Type	Trial #	Pulse Width 6 to 10 µsec	PRI 200 to 500 µsec	Pulses per Burst 16 to 18	Detection 1 = Yes, 0 = No
3	1	9.3	255	17	1
	2	6.7	423	18	1
	3	6.9	494	16	1
	4	7	341	18	1
	5	9.9	211	18	1
	6	8.6	337	17	1
	7	9.2	322	18	1
	8	7.8	228	16	1
	9	8.4	203	17	1
	10	8.3	284	16	1
	11	7.7	362	18	1
	12	6.5	233	17	1
	13	8	432	16	1
	14	9.9	238	17	0
	15	8.4	304	17	1
	16	9.2	488	16	1
	17	7	415	17	1
	18	8.5	273	17	1
	19	8	269	18	1
	20	6.7	422	18	1
	21	6.2	401	18	1
	22	7.9	378	16	1
	23	9.1	387	16	1
	24	8	322	18	1
	25	7.5	401	18	1
	26	6	355	16	1
	27	6.4	497	18	1
	28	8.5	237	18	1
	29	7.8	223	16	1
	30	8.8	289	16	1
	Detection Percentage				**97% (> 60%)**

Table 28. Statistical Performance Check – Radar Type 3, 40 MHz, 5510 MHz

Statistical Performance Check – Radar Type 4

Radar Type	Trial #	Pulse Width 11 to 20 µsec	PRI 200 to 500 µsec	Pulses per Burst 12 to 16	Detection 1 = Yes, 0 = No
4	1	17.6	273	15	1
	2	15.9	310	16	1
	3	18.4	494	15	1
	4	16	333	15	1
	5	15.9	302	14	1
	6	16.9	354	15	1
	7	12.3	331	14	1
	8	13	307	14	1
	9	15.8	436	12	1
	10	18	277	16	1
	11	16.4	272	15	1
	12	15.3	420	16	1
	13	13.4	440	14	1
	14	17.3	224	16	1
	15	11.3	426	13	1
	16	13	250	14	1
	17	11.1	271	16	1
	18	13	238	16	1
	19	13.4	270	13	1
	20	17.1	205	13	1
	21	19.6	297	14	1
	22	15.8	355	12	1
	23	14.2	222	15	1
	24	19.1	296	12	1
	25	13.3	310	14	1
	26	16.2	293	13	1
	27	12.1	402	12	1
	28	13.9	266	16	1
	29	16.8	278	13	1
	30	15.4	461	13	1
	Detection Percentage				**100% (> 60%)**

Table 29. Statistical Performance Check – Radar Type 4, 40 MHz, 5510 MHz

Statistical Performance Check – Radar Type 5

Radar Type	Trial #	Filename*	Detection
			1 = Yes, 0 = No
5	1	bin5-trial 1	1
	2	bin5-trial 2	1
	3	bin5-trial 3	1
	4	bin5-trial 4	0
	5	bin5-trial 5	1
	6	bin5-trial 6	1
	7	bin5-trial 7	1
	8	bin5-trial 8	1
	9	bin5-trial 9	1
	10	bin5-trial 10	0
	11	bin5-trial 11	1
	12	bin5-trial 12	1
	13	bin5-trial 13	1
	14	bin5-trial 14	1
	15	bin5-trial 15	0
	16	bin5-trial 16	1
	17	bin5-trial 17	1
	18	bin5-trial 18	1
	19	bin5-trial 19	1
	20	bin5-trial 20	0
	21	bin5-trial 21	1
	22	bin5-trial 22	1
	23	bin5-trial 23	1
	24	bin5-trial 24	1
	25	bin5-trial 25	1
	26	bin5-trial 26	0
	27	bin5-trial 27	1
	28	bin5-trial 28	0
	29	bin5-trial 29	1
	30	bin5-trial 30	1
	Detection Percentage		**90% (> 80%)**

Table 30. Statistical Performance Check – Radar Type 5, 40 MHz, 5510 MHz

Statistical Performance Check – Radar Type 6

Radar Type	Trial #	Frequency (MHz)	Pulses/Hop	Pulse Width (µsec)	PRI (µsec)	Detection 1 = Yes, 0 = No
6	1	5580	9	1	333	1
	2	5580	9	1	333	1
	3	5580	9	1	333	1
	4	5580	9	1	333	1
	5	5580	9	1	333	1
	6	5580	9	1	333	1
	7	5580	9	1	333	1
	8	5580	9	1	333	1
	9	5580	9	1	333	1
	10	5580	9	1	333	1
	11	5580	9	1	333	1
	12	5580	9	1	333	1
	13	5580	9	1	333	1
	14	5580	9	1	333	1
	15	5580	9	1	333	1
	16	5580	9	1	333	1
	17	5580	9	1	333	1
	18	5580	9	1	333	1
	19	5580	9	1	333	1
	20	5580	9	1	333	1
	21	5580	9	1	333	1
	22	5580	9	1	333	1
	23	5580	9	1	333	1
	24	5580	9	1	333	1
	25	5580	9	1	333	1
	26	5580	9	1	333	1
	27	5580	9	1	333	1
	28	5580	9	1	333	1
	29	5580	9	1	333	1
	30	5580	9	1	333	1
	Detection Percentage					**100% (> 60%)**

Table 31. Statistical Performance Check – Radar Type 6, 40 MHz, 5510 MHz

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 32. 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