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September 20, 2011

Ubiquiti Networks, Inc.
91 E. Tasman
San Jose, CA 95134

Dear Jennifer Sanchez,

Enclosed is the EMC Wireless test report for compliance testing of the Ubiquiti Networks, Inc., NanoStationLocoM2 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B, ICES-003, Issue 4 February 2004 for a Class A Digital Device and FCC Part 15 Subpart C, RSS-210, Issue 8, Dec. 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: (\Ubiquiti Networks, Inc.\EMCS30565-FCC247)

Electromagnetic Compatibility Criteria
Test Report

for the

Ubiquiti Networks, Inc.
NanoStationLocoM2

Tested under
the FCC Certification Rules
contained in
Title 47 of the CFR, Parts 15 Subpart B & ICES-003
for Class A Digital Devices
&
15.247 Subpart C & RSS-210, Issue 8, Dec. 2010
for Intentional Radiators

MET Report: EMCS30565-FCC247

September 20, 2011

Prepared For:

Ubiquiti Networks, Inc.
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San Jose, CA 95134

Prepared By:
MET Laboratories, Inc.
3162 Belick St.
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for Intentional Radiators

Lionel Gabrillo
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 the FCC Rules Parts 15B, 15.247 and Industry Canada standards ICES-003, Issue 4 February 2004, RSS-210, Issue 8, Dec. 2010 under normal use and maintenance.

Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	September 20, 2011	Initial Issue.

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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
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
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 Ubiquiti Networks, Inc. NanoStationLocoM2, with the requirements of Part 15, §15.247. 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 NanoStationLocoM2. Ubiquiti 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 NanoStationLocoM2, 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, §15.247, in accordance with Ubiquiti Networks, Inc., purchase order number PO US100132. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference 47 CFR Part 15.247:2005	IC Reference RSS-210 Issue 8: 2010; RSS-GEN Issue 3: 2010	Description	Compliance
47 CFR Part 15.107 (a)	ICES-003 Issue 4 February 2004	Conducted Emission Limits for a Class A Digital Device	Compliant
47 CFR Part 15.109 (a)	ICES-003 Issue 4 February 2004	Radiated Emission Limits for a Class A Digital Device	Compliant
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-GEN (7.2.4)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	RSS-Gen(4.6)	6dB Occupied Bandwidth	Compliant
		99% Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-210(A8.5)	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RSS-210(A8.5)	RF Conducted Band Edge	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.2)	Peak Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	RSS-Gen(5.6)	Maximum Permissible Exposure (MPE)	Compliant
N/A	RSS-Gen(4.10)	Receiver Spurious Emissions	Compliant

Table 1. Executive Summary of EMC Part 15.247 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Ubiquiti Networks, Inc. to perform testing on the NanoStationLocoM2, under Ubiquiti Networks, Inc.'s purchase order number PO US100132.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Ubiquiti Networks, Inc., NanoStationLocoM2.

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

Model(s) Tested:	NanoStationLocoM2				
Model(s) Covered:	NanoStationLocoM2				
EUT Specifications:	FCC ID: SWX-M2L IC: 6545A-M2L				
	Type of Modulations:	DSSS			
	Equipment Code:	DTS			
	Peak RF Output Power:	**802.11b**	**802.11g**	**HT5**	**HT8**
		0.1603 W	0.4677 W	0.4891 W	0.5083 W
		HT10	**HT20**	**HT40**	
		0.5636 W	0.5530 W	0.6346 W	
	EUT Frequency Ranges:	**802.11b**	**802.11g**	**HT5**	**HT8**
		2412 – 2462 MHz	2412 – 2462 MHz	2403 – 2475 MHz	2405 – 2473 MHz
		HT10	**HT20**	**HT40**	
		2408 – 2470 MHz	2412 – 2462 MHz	2422 – 2452 MHz	
	OBW (99%):	**802.11b**	**802.11g**	**HT5**	**HT8**
		14.0555 MHz	16.6075 MHz	4.5582 MHz	6.9407 MHz
		HT10	**HT20**	**HT40**	
		9.1498 MHz	18.0452 MHz	36.6284 MHz	
	Antenna:	Integral			
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:	Lionel Gabrillo				
Report Date(s):	September 20, 2011				

Table 2. EUT Summary Table

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
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
ICES-003, Issue 4 February 2004	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
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
ANSI/NCSL Z540-1-1994	Calibration Laboratories and Measuring and Test Equipment - General Requirements
ANSI/ISO/IEC 17025:2000	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., 3162 Belick St., Santa Clara, CA 95054. 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 5 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 Ubiquiti Networks, Inc. NanoStationLocoM2, Equipment Under Test (EUT), is a 2.4GHz Hi Power 2x2 MIMO.

Photograph 1. Ubiquiti Networks, Inc. NanoStationLocoM2

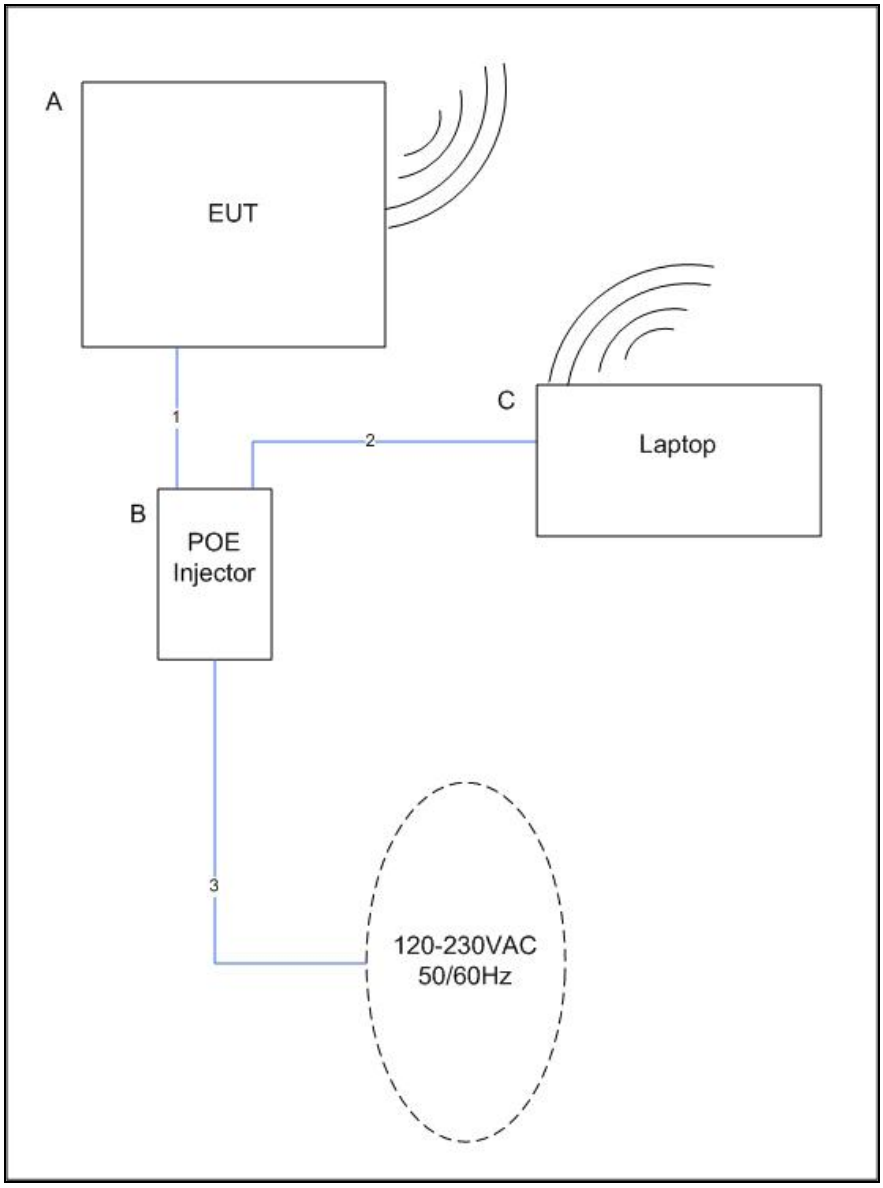


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Name / Description	Model Number	Serial Number
Power Supply (Cetus)	CPWA240500US	POEZC101126181008
Power Supply (GME)	UBI-POE-24-5	0912-0009854
LocoM2 (Radiated Sample)	M2L	00156D9E19BF
LocoM2 (Conducted Sample)	M2L	00156D9E1967

Table 4. Equipment Configuration

F. Support Equipment

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

Name / Description	Manufacturer	Model Number	Serial Number
Laptop	Dell	Vostro 1510	4953929473

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	LAN	Ethernet	1	10	Y	PSU – POE port
1	PSU - POE	Ethernet	1	10	Y	A, Main
2	PSU - LAN	Ethernet	1	10	Y	Laptop
3	AC port	AC Cable	1	0.5	Y	100-240VAC Source

Table 6. Ports and Cabling Information

H. Mode of Operation

Transmit 1-11Mbps at 802.11b mode and 6-54Mbps at 802.11g/n modes @2.4GHz.

I. Method of Monitoring EUT Operation

IP connectivity is maintained with the EUT. If IP connectivity is lost, EUT connectivity shall be re-established upon power up or re-boot.

J. 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.

K. Disposition of EUT

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

III. Electromagnetic Compatibility Criteria for Unintentional Radiators

Electromagnetic Compatibility Criteria

§ 15.107 Conducted Emissions Limits

Test Requirement(s):

15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

15.107 (b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 7. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

15.207(a), Except as shown in paragraphs (b) and (c) of this section*, charging, AC adapters or battery eliminators the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the Table 7, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency range (MHz)	Class A Conducted Limits (dBμV)		*Class B Conducted Limits (dBμV)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz. * -- Limits per Subsection 15.207(a).				

Table 7. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)

Test Results: The EUT was compliant with the Class A requirement(s) of this section. Measured emissions were below applicable limits.

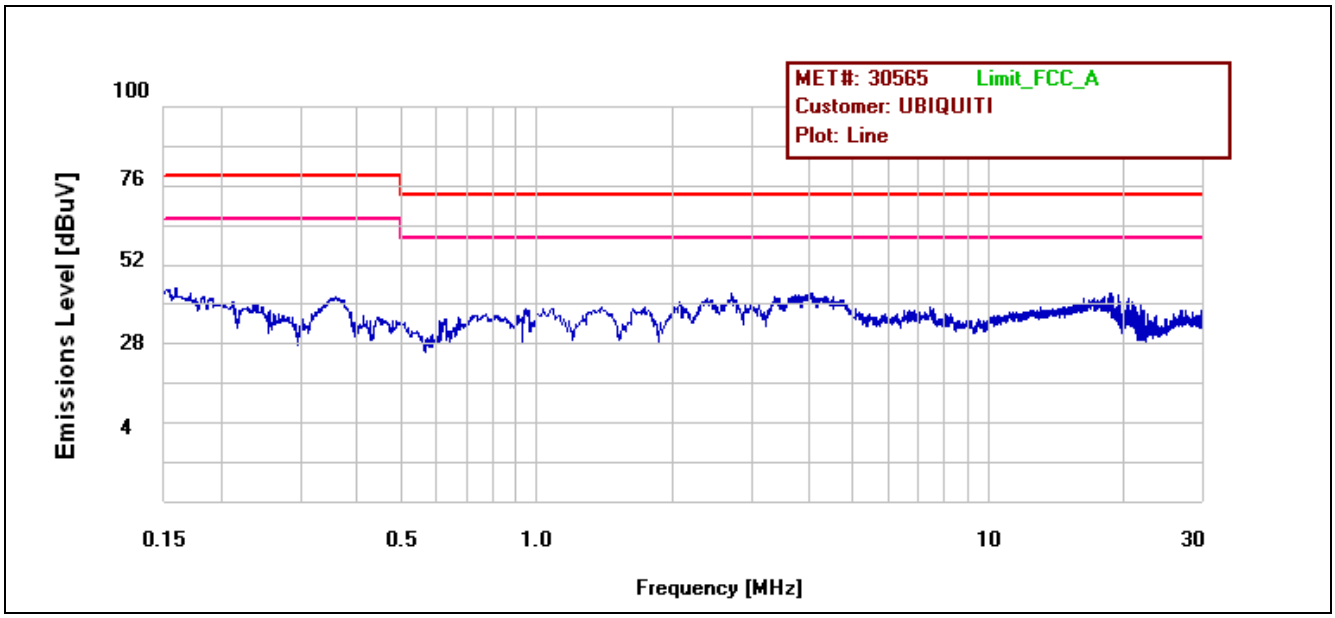
Test Engineer(s): Anderson Soungpanya

Test Date(s): 03/23/11

Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	.162	56.51	79	-22.49	Pass	41.57	66	-24.43	Pass
Line	.358	49.83	79	-29.17	Pass	41.81	66	-24.19	Pass
Line	3.74	38.92	73	-34.08	Pass	28.61	60	-31.39	Pass

Table 8. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz), CETUS

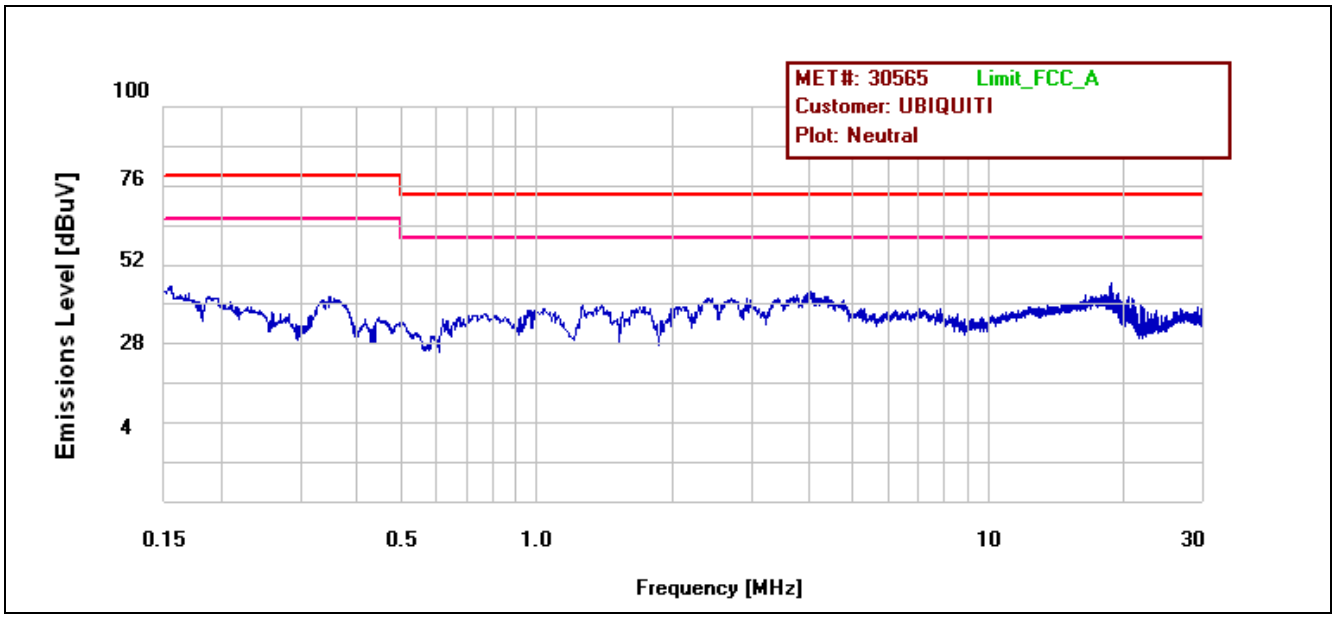


Plot 1. Conducted Emission, Phase Line Plot, CETUS

Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	.162	56.27	79	-22.73	Pass	41.93	66	-24.07	Pass
Neutral	.330	47.22	79	-31.78	Pass	39.78	66	-26.22	Pass
Neutral	18.24	42.24	73	-30.76	Pass	37.05	60	-22.95	Pass

Table 9. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz), CETUS

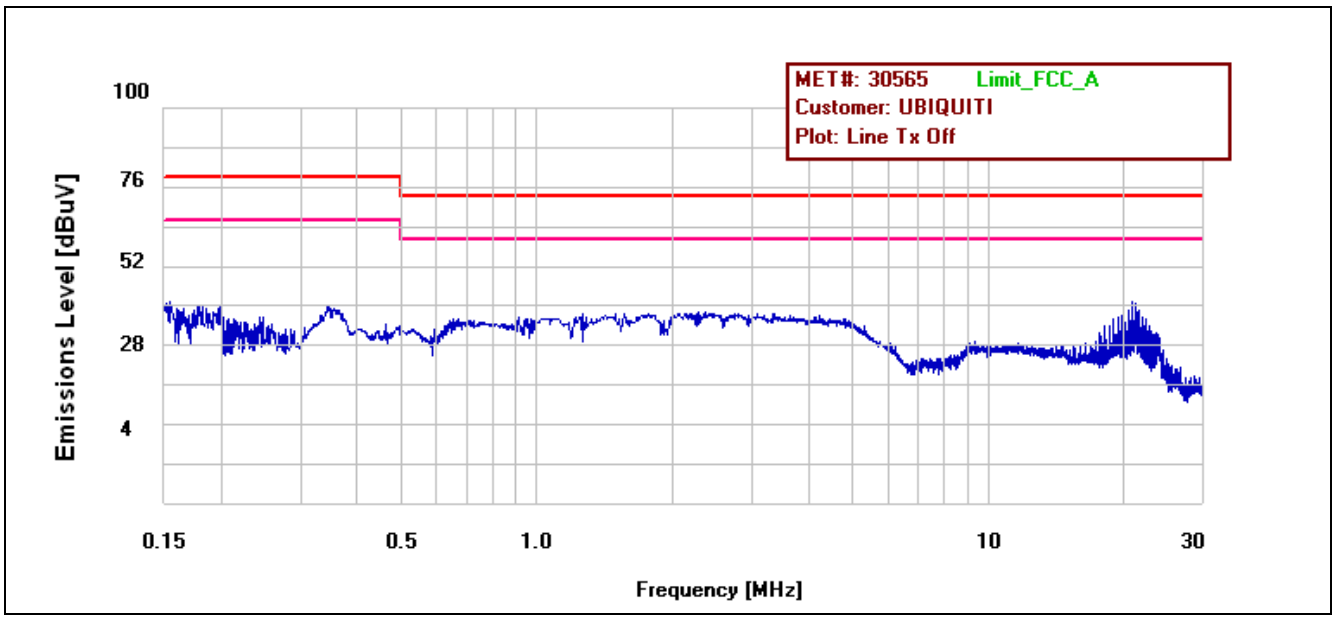


Plot 2. Conducted Emission, Neutral Line Plot, CETUS

Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line Tx Off	.178	47.52	79	-31.48	Pass	34.99	66	-31.01	Pass
Line Tx Off	.202	37.42	79	-41.58	Pass	20.42	66	-45.58	Pass
Line Tx Off	.334	44.98	79	-34.02	Pass	36.13	66	-29.87	Pass
Line Tx Off	.150	45.27	79	-33.73	Pass	32	66	-34	Pass
Line Tx Off	20.84	38.73	73	-34.27	Pass	37.43	60	-22.57	Pass

Table 10. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz), GME

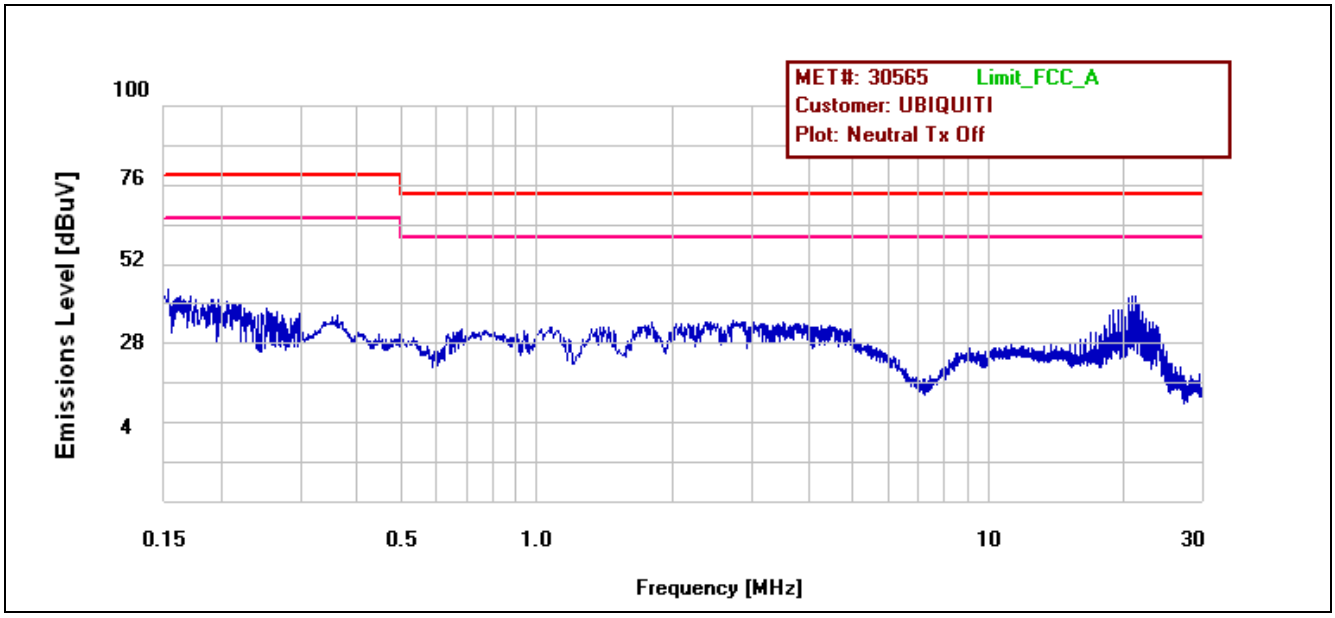


Plot 3. Conducted Emission, Phase Line Plot, GME

Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral Tx Off	.178	47.02	79	-31.98	Pass	34.24	66	-31.76	Pass
Neutral Tx Off	.214	40.02	79	-38.98	Pass	28.71	66	-37.29	Pass
Neutral Tx Off	.338	41.2	79	-37.8	Pass	31.28	66	-34.72	Pass
Neutral Tx Off	.154	45.83	79	-33.17	Pass	32.05	66	-33.95	Pass
Neutral Tx Off	20.74	40.46	73	-32.54	Pass	37.63	60	-22.37	Pass

Table 11. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz), GME



Plot 4. Conducted Emission, Neutral Line Plot, GME

Conducted Emission Limits Test Setup

Photograph 2. Conducted Emissions, Test Setup

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 12.

15.109 (b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the Class A limits expressed in Table 12.

Frequency (MHz)	Field Strength (dBµV/m)	
	§15.109 (b), Class A Limit (dBµV) @ 10m	§15.109 (a),Class B Limit (dBµV) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 12. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 5 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was compliant with the Class A requirement(s) of this section.

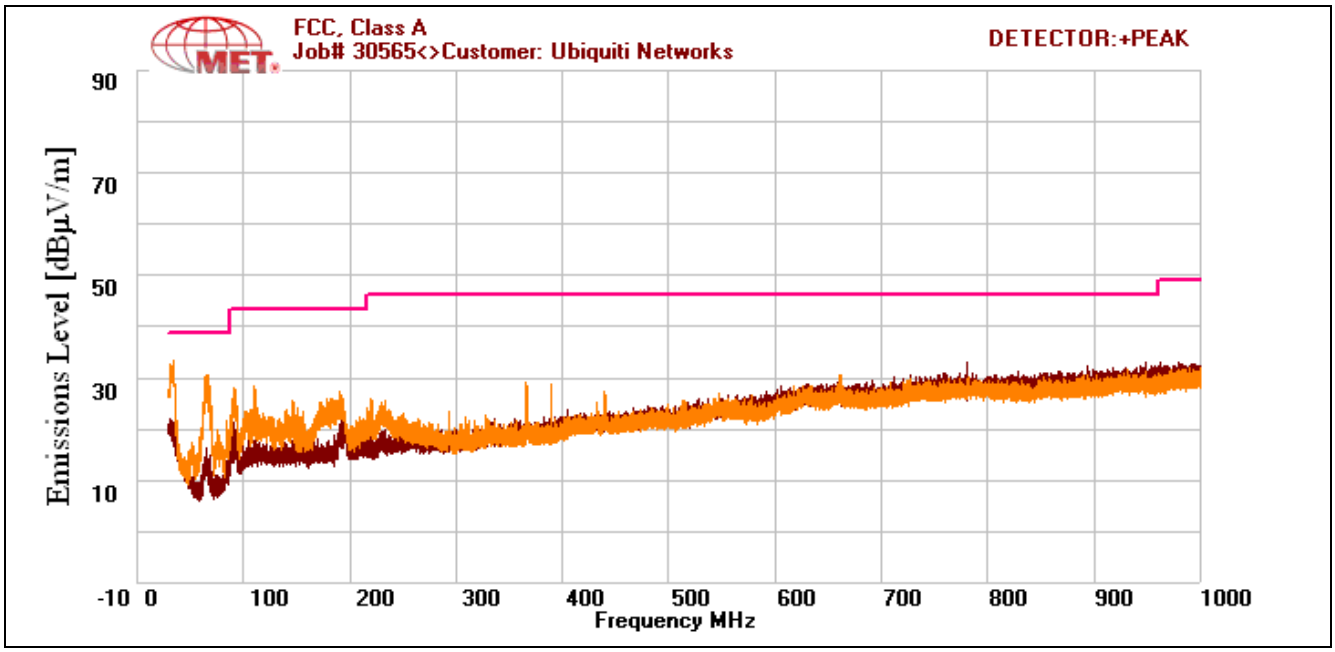
Test Engineer(s): Lionel Gabrillo and Kenshi Chung

Test Date(s): 02/22/11 and 03/22/11

Radiated Emissions Limits Test Results, Class A

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
34.67	V	145	100	24.21	15.865	0	1.383	-10.46	30.998	39	-8.002
64.8	V	281	100	32.95	6.2	0	2.11	-10.46	30.8	39	-8.2
91.52	V	106	100	22.59	9.204	0	2.667	-10.46	24.001	43.5	-19.499
366.3	V	43	100	19.49	14.678	0	3.955	-10.46	27.663	46.4	-18.737
390.01	V	120	100	19.06	15.001	0	4.092	-10.46	27.693	46.4	-18.707
390.01	V	213	100	19.53	15.001	0	4.092	-10.46	28.163	46.4	-18.237

Table 13. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits, CETUS

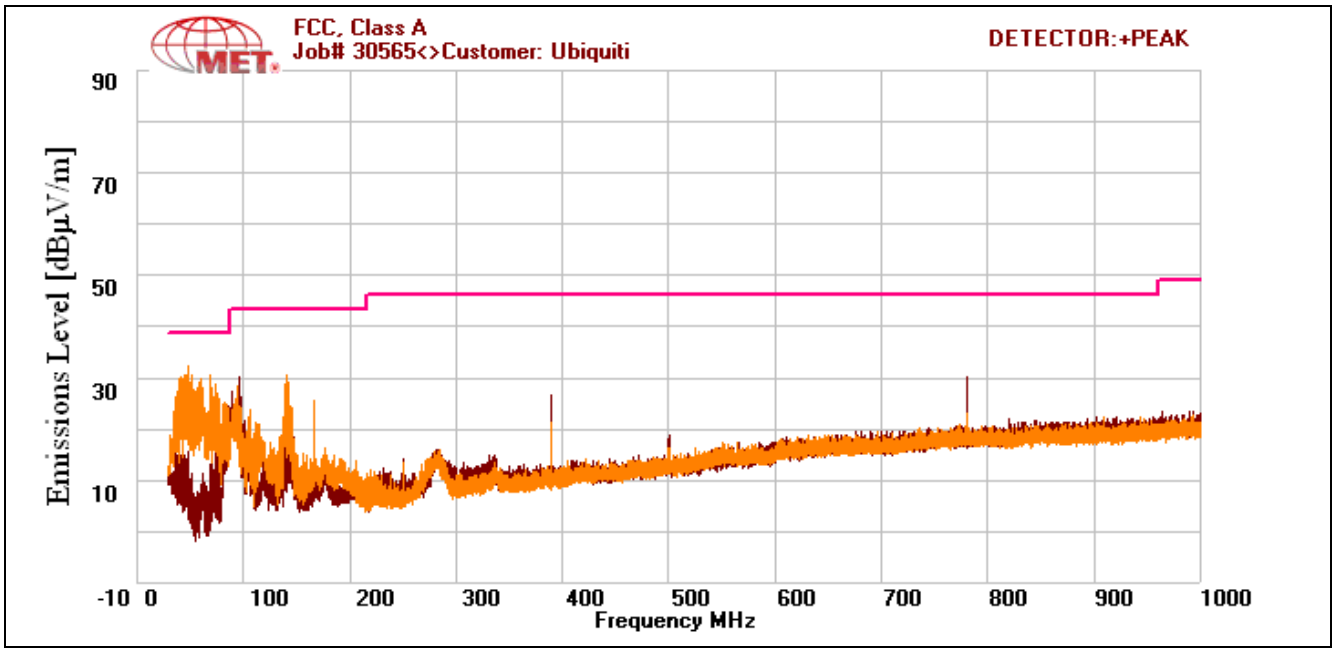


Plot 5. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits, CETUS

Radiated Emissions Limits Test Results, Class A

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
47.8	V	272.0	100.0	33.13	8.44	0	1.757	-10.46	32.867	39	-6.133
74.56	V	263.0	166.88	33.02	6.056	0	2.301	-10.46	30.917	39	-8.083
141.2	V	0	111.82	20.17	12.304	0	3.287	-10.46	25.301	43.5	-18.199
95.76	H	46	341.05	27.56	11.682	0	2.758	-10.46	31.54	43.5	-11.96
389.98	H	104.0	100.11	16.03	16.099	0	4.092	-10.46	25.761	46.4	-20.639
780.01	H	337.0	100.0	13.5	20.5	0	6.132	-10.46	29.672	46.4	-16.728

Table 14. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits, GME

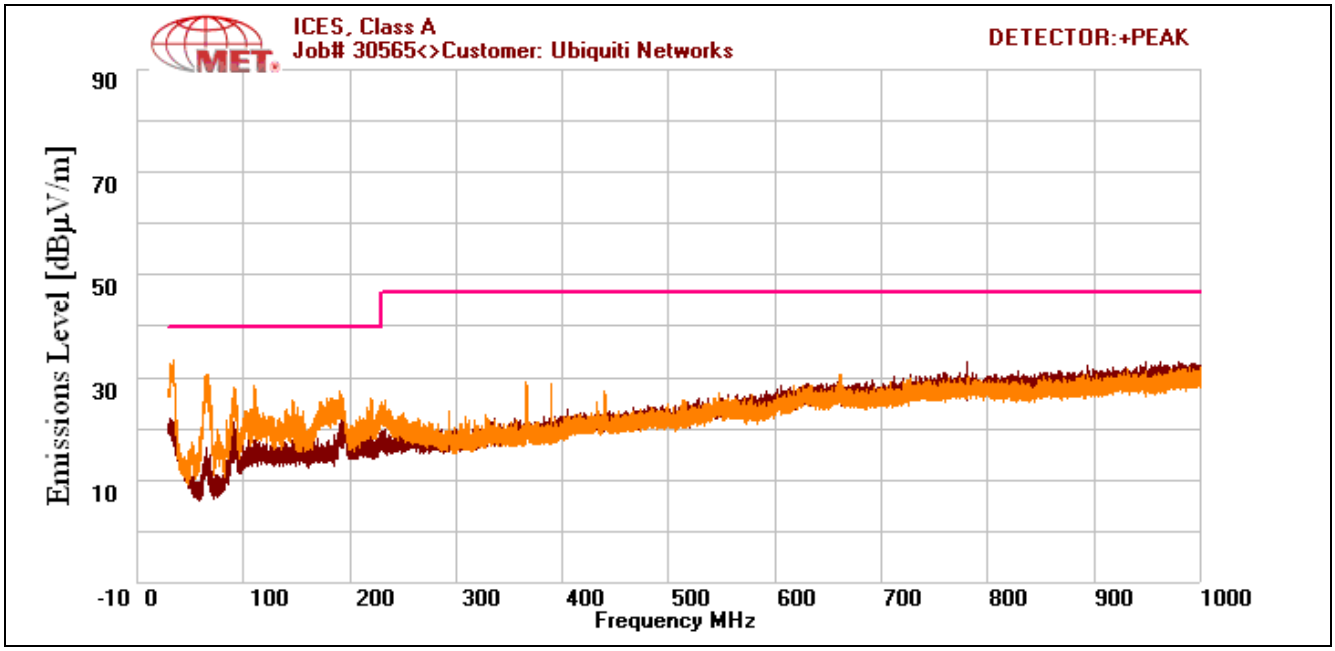


Plot 6. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits, GME

Radiated Emissions Limits Test Results, Class A

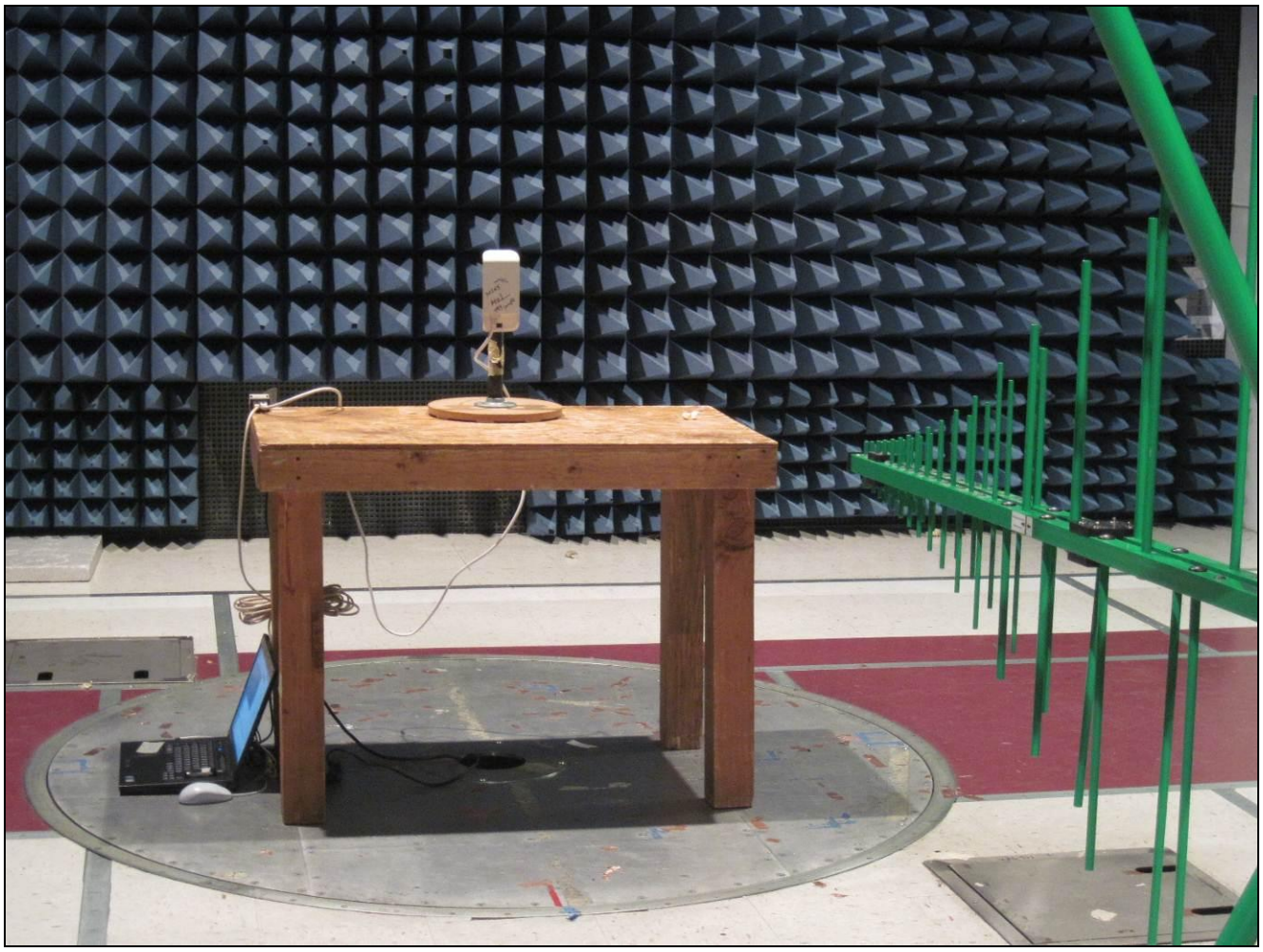
Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
34.67	V	145	100	24.21	15.865	0	1.383	-10.46	30.998	40	-9.002
64.8	V	281	100	32.95	6.2	0	2.11	-10.46	30.8	40	-9.2
91.52	V	106	100	22.59	9.204	0	2.667	-10.46	24.001	40	-15.999
366.3	V	43	100	19.49	14.678	0	3.955	-10.46	27.663	47	-19.337
390.01	V	120	100	19.06	15.001	0	4.092	-10.46	27.693	47	-19.307
390.01	V	213	100	19.53	15.001	0	4.092	-10.46	28.163	47	-18.837

Table 15. Radiated Emissions Limits, Test Results, ICES-003 Limits, CETUS

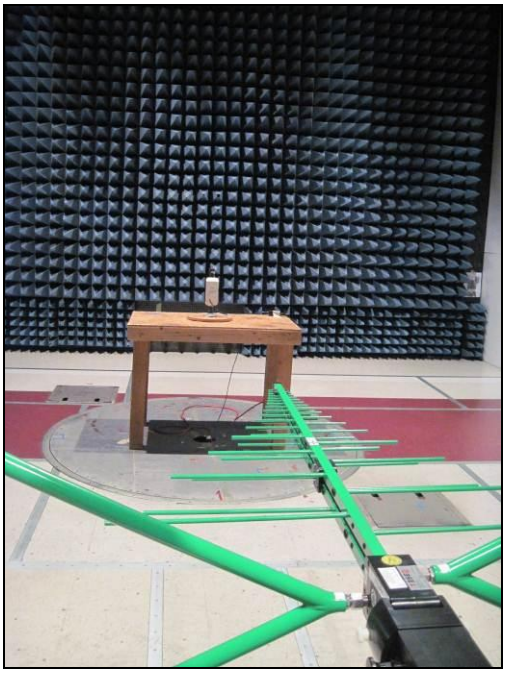


Plot 7. Radiated Emissions, ICES-003 Limits, CETUS

Radiated Emission Limits Test Setup



Photograph 3. Radiated Emission, Test Setup, CETUS



Photograph 4. Radiated Emission, Test Setup, GME

IV. 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 EUT uses an integral antenna.

Test Engineer(s): Lionel Gabrillo

Test Date(s): 09/09/11

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) 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 Ω 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 16. 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.

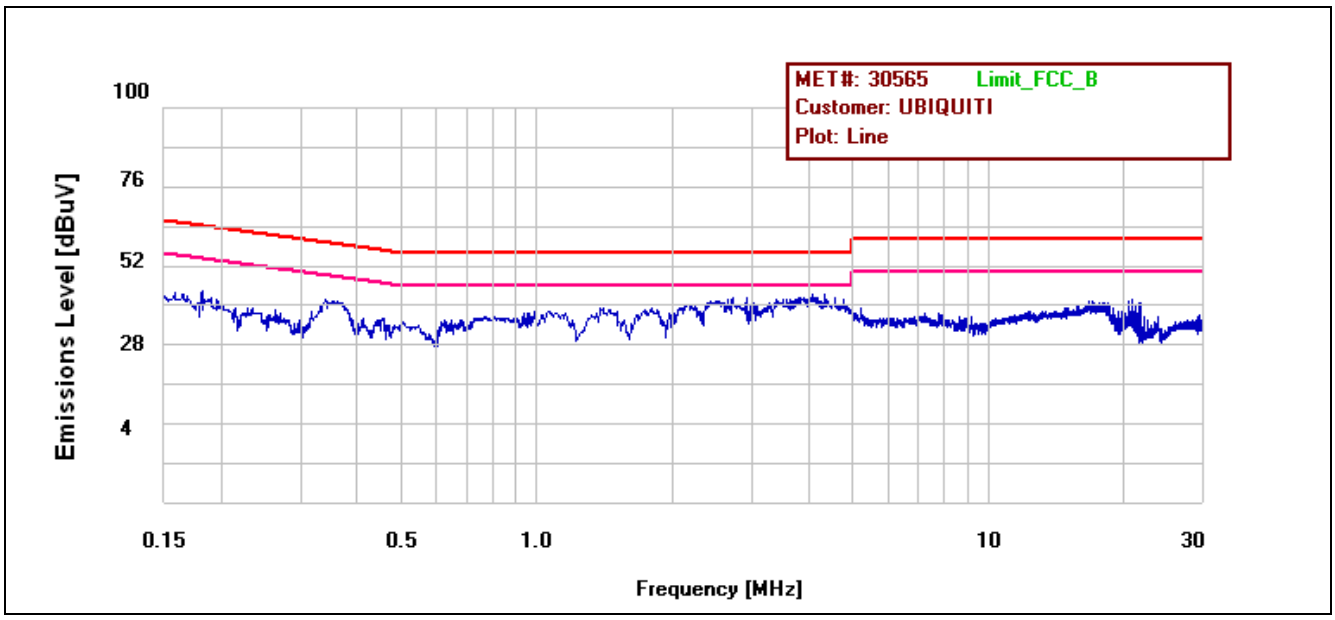
Test Engineer(s): Anderson Soungpanya

Test Date(s): 03/23/11

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	.186	52.2	64.218	-12.018	Pass	36.11	54.218	-18.108	Pass
Line	.162	55.72	65.363	-9.643	Pass	40.75	55.363	-14.613	Pass
Line	.346	49.42	59.077	-9.657	Pass	41.61	49.077	-7.467	Pass
Line	.234	45.49	62.317	-16.827	Pass	31.15	52.317	-21.167	Pass
Line	3.75	38.92	56	-17.08	Pass	28.93	46	-17.07	Pass
Line	1.23	32.18	56	-23.82	Pass	22.77	46	-23.23	Pass

Table 17. Conducted Emissions, 15.207(a), Phase Line, Test Results, CETUS

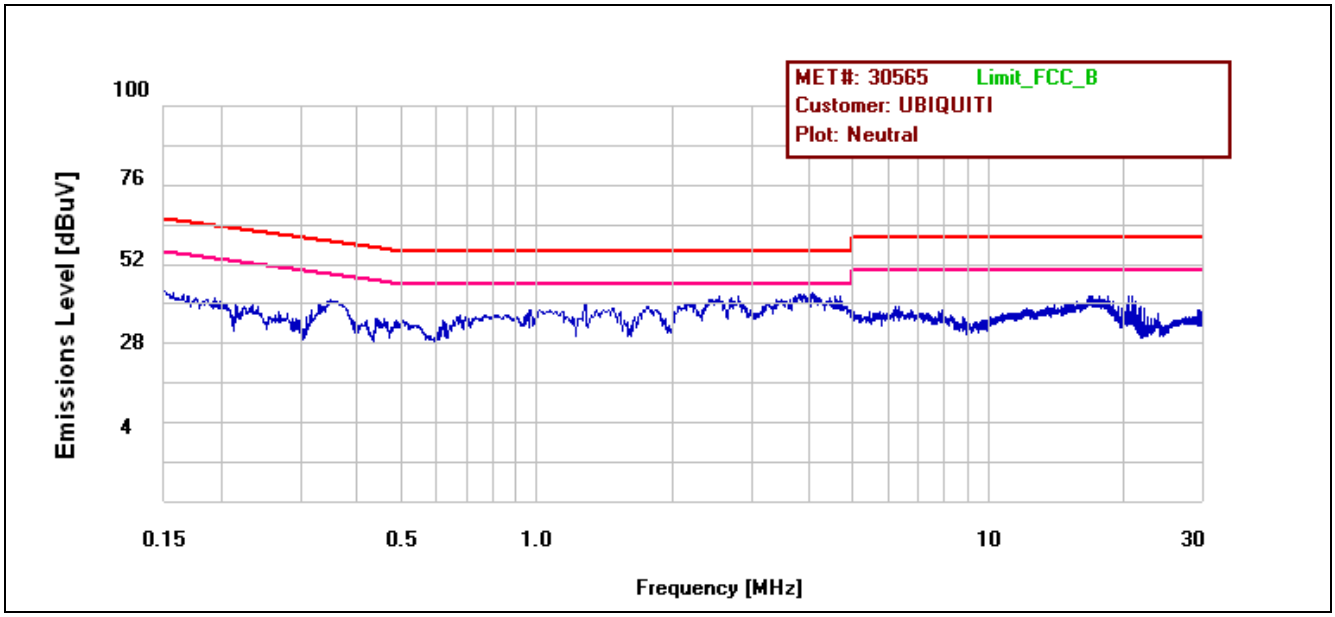


Plot 8. Conducted Emissions, 15.207(a), Phase Line, CETUS

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral	.162	55.58	65.363	-9.783	Pass	41.09	55.363	-14.273	Pass
Neutral	.350	49.33	58.982	-9.652	Pass	40.34	48.982	-8.642	Pass
Neutral	.238	40.42	62.176	-21.756	Pass	25.31	52.176	-26.866	Pass
Neutral	3.46	38.91	56	-17.09	Pass	29.78	46	-16.22	Pass
Neutral	1.19	35.13	56	-20.87	Pass	23.14	46	-22.86	Pass

Table 18. Conducted Emissions, 15.207(a), Neutral Line, Test Results, CETUS

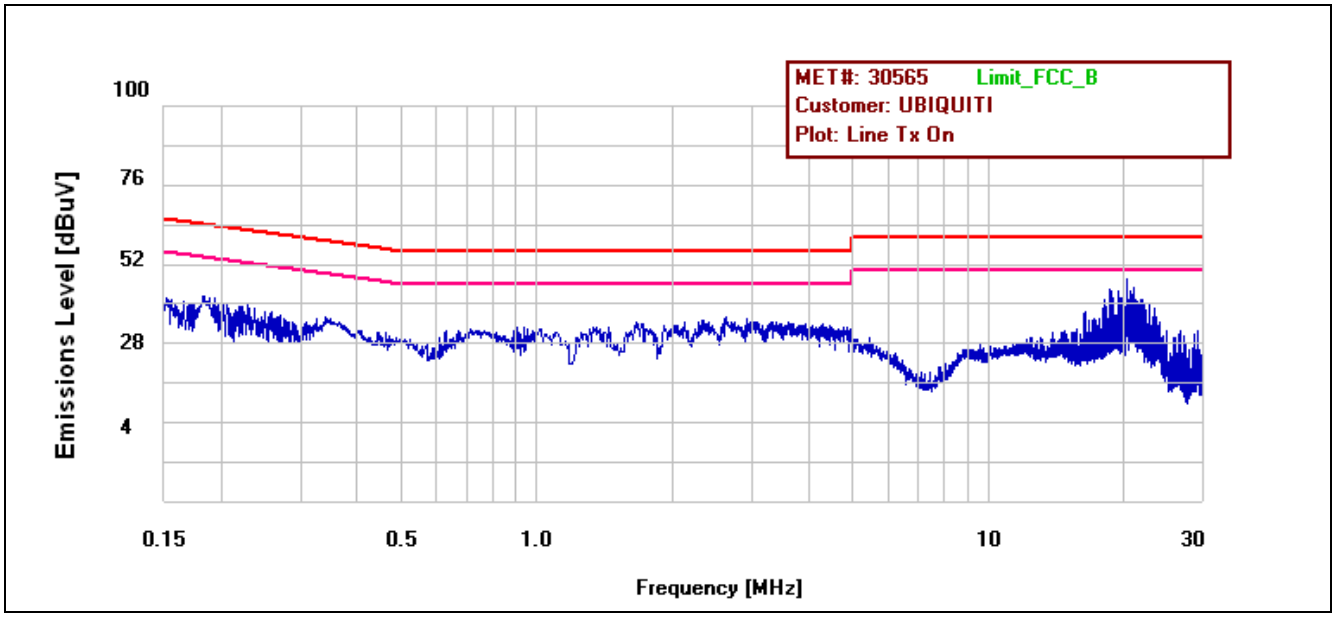


Plot 9. Conducted Emissions, 15.207(a), Neutral Line, CETUS

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line Tx On	.162	44.81	65.363	-20.553	Pass	31.54	55.363	-23.823	Pass
Line Tx On	20.68	35.83	60	-24.17	Pass	32.87	50	-17.13	Pass
Line Tx On	.218	40.33	62.903	-22.573	Pass	27.57	52.903	-25.333	Pass
Line Tx On	18.24	43.15	60	-16.85	Pass	37.93	50	-12.07	Pass

Table 19. Conducted Emissions, 15.207(a), Phase Line, Test Results, GME

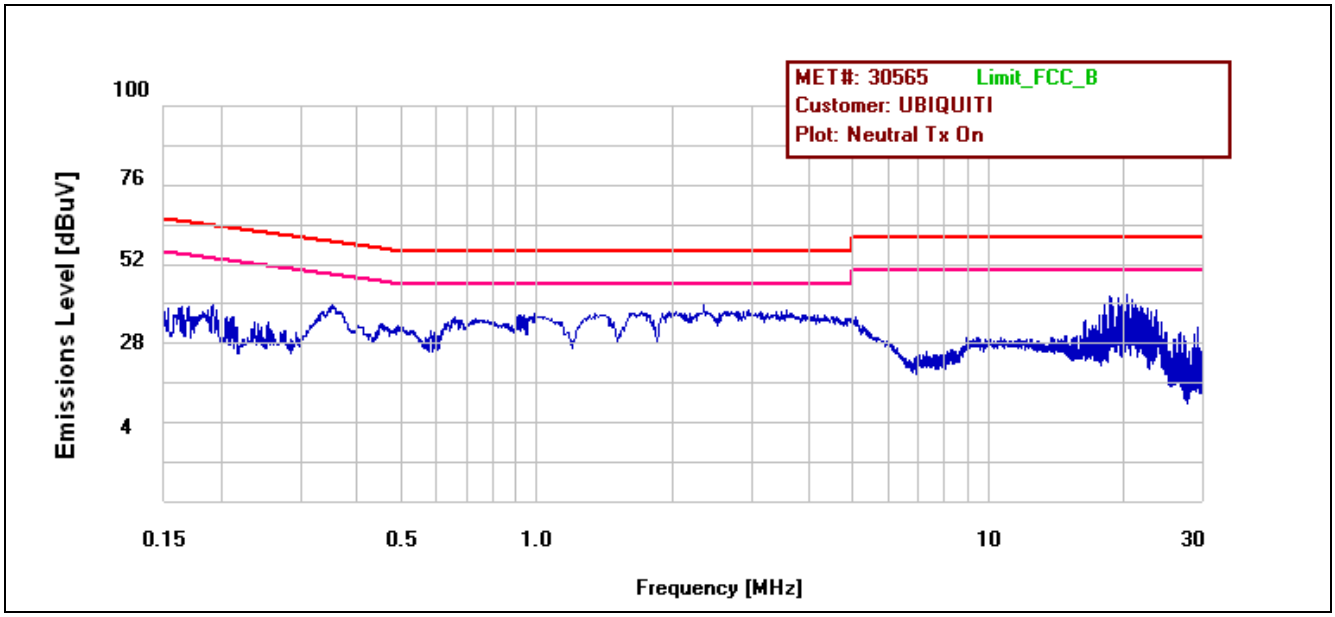


Plot 10. Conducted Emissions, 15.207(a), Phase Line, GME

15.207(a) Conducted Emissions Test Results

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Neutral Tx On	.158	45.01	65.57	-20.56	Pass	33.94	55.57	-21.63	Pass
Neutral Tx On	.178	48.61	64.582	-15.972	Pass	34.04	54.582	-20.542	Pass
Neutral Tx On	.350	46.32	58.982	-12.662	Pass	38.51	48.982	-10.472	Pass
Neutral Tx On	19.71	42.21	60	-17.79	Pass	38.77	50	-11.23	Pass

Table 20. Conducted Emissions, 15.207(a), Neutral Line, Test Results, GME



Plot 11. Conducted Emissions, 15.207(a), Neutral Line, GME

15.207(a) Conducted Emissions Test Setup

Photograph 5. Conducted Emissions, 15.207(a), Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a)(2) 6 dB and 99% Bandwidth

Test Requirements: **§ 15.247(a)(2):** Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Procedure: The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately 1% of the total emission bandwidth, VBW > RBW. The 6 dB Bandwidth was measured and recorded. The measurements were performed on the low, mid and high channels.

Test Results The EUT was compliant with § 15.247 (a)(2).

The 6 dB and 99% Bandwidth was determined from the plots on the following pages.

Test Engineer(s): Lionel Gabrillo

Test Date(s): 06/22/11

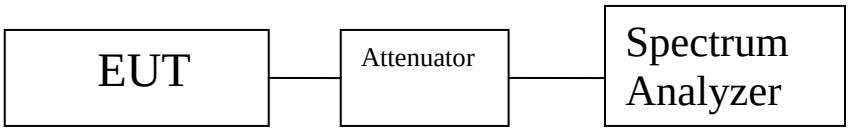


Figure 2. Block Diagram, Occupied Bandwidth Test Setup

Occupied Bandwidth Test Results

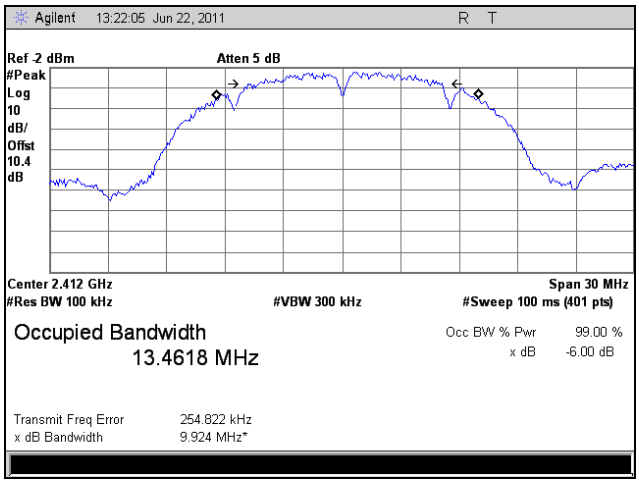
	Occupied Bandwidth		
Mode	**Carrier Channel**	**Frequency (MHz)**	**Measured 6 dB Bandwidth (MHz)**
802.11b	Low	2412	9.924
	Mid	2437	9.921
	High	2462	9.955
802.11g 20 MHz	Low	2412	16.426
	Mid	2437	16.566
	High	2462	16.607
802.11n HT5 Port 0	Low	2403	4.108
	Mid	2437	4.141
	High	2475	4.141
802.11n HT5 Port 1	Low	2403	4.128
	Mid	2437	4.103
	High	2475	4.134
802.11n HT8 Port 0	Low	2405	6.330
	Mid	2437	6.375
	High	2473	6.359
802.11n HT8 Port 1	Low	2405	6.329
	Mid	2437	6.390
	High	2473	6.350
802.11n HT10 Port 0	Low	2408	8.214
	Mid	2437	8.240
	High	2470	8.227
802.11n HT10 Port 1	Low	2408	8.219
	Mid	2437	8.263
	High	2470	8.261
802.11n HT20 Port 0	Low	2412	17.730
	Mid	2437	17.818
	High	2462	17.708
802.11n HT20 Port 1	Low	2412	17.718
	Mid	2437	17.779
	High	2462	17.762
802.11n HT40 Port 0	Low	2422	36.370
	Mid	2437	36.161
	High	2452	36.561
802.11n HT40 Port 1	Low	2422	33.044
	Mid	2437	36.510
	High	2452	36.604

Table 21. 6 dB Occupied Bandwidth, Test Results

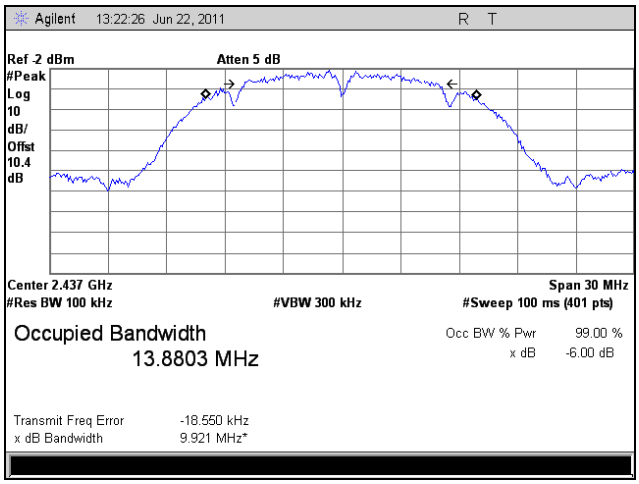
	Occupied Bandwidth		
Mode	**Carrier Channel**	**Frequency (MHz)**	**Measured 99% Bandwidth (MHz)**
802.11b	Low	2412	14.0555
	Mid	2437	13.9593
	High	2462	13.9832
802.11g 20 MHz	Low	2412	16.6075
	Mid	2437	16.6003
	High	2462	16.5241
802.11n HT5 Port 0	Low	2403	4.4672
	Mid	2437	4.4503
	High	2475	4.4328
802.11n HT5 Port 1	Low	2403	4.5582
	Mid	2437	4.4586
	High	2475	4.4559
802.11n HT8 Port 0	Low	2405	6.8757
	Mid	2437	6.9407
	High	2473	6.8544
802.11n HT8 Port 1	Low	2405	6.8771
	Mid	2437	6.8896
	High	2473	6.9077
802.11n HT10 Port 0	Low	2408	9.1334
	Mid	2437	9.0460
	High	2470	8.9372
802.11n HT10 Port 1	Low	2408	9.1194
	Mid	2437	9.1498
	High	2470	9.1279
802.11n HT20 Port 0	Low	2412	17.7814
	Mid	2437	17.7591
	High	2462	17.7353
802.11n HT20 Port 1	Low	2412	17.6294
	Mid	2437	18.0452
	High	2462	17.7615
802.11n HT40 Port 0	Low	2422	36.2655
	Mid	2437	36.3142
	High	2452	36.6284
802.11n HT40 Port 1	Low	2422	36.1915
	Mid	2437	36.6201
	High	2452	36.5643

Table 22. 99% Occupied Bandwidth, Test Results

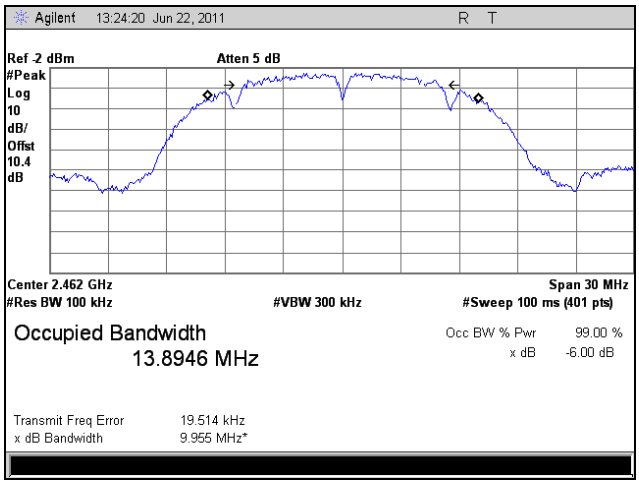
6 dB Occupied Bandwidth Test Results, 802.11b



Plot 12. 6 dB Occupied Bandwidth, Low Channel, 802.11b

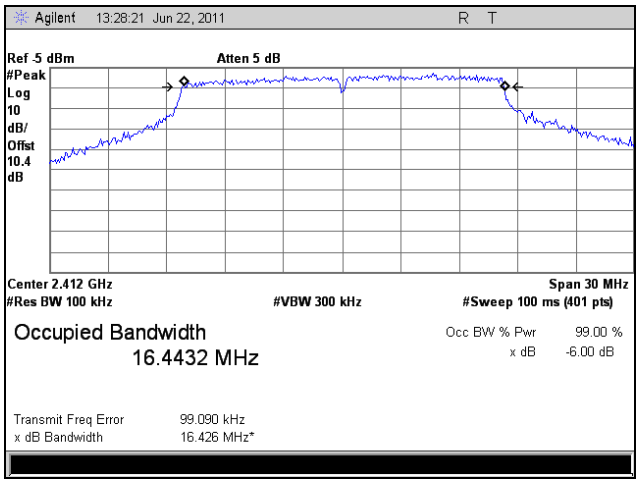


Plot 13. 6 dB Occupied Bandwidth, Mid Channel, 802.11b

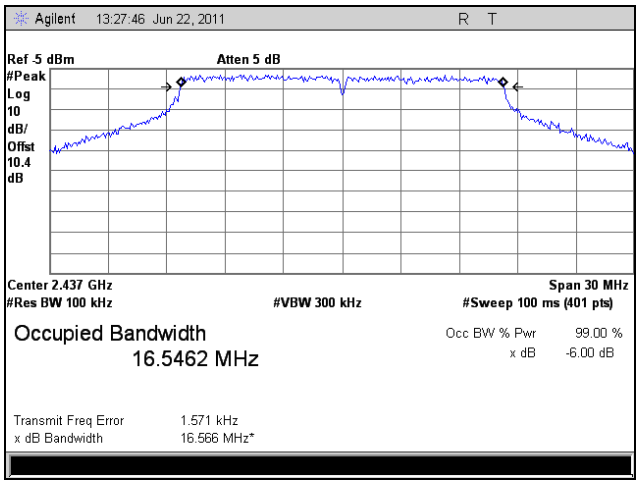


Plot 14. 6 dB Occupied Bandwidth, High Channel, 802.11b

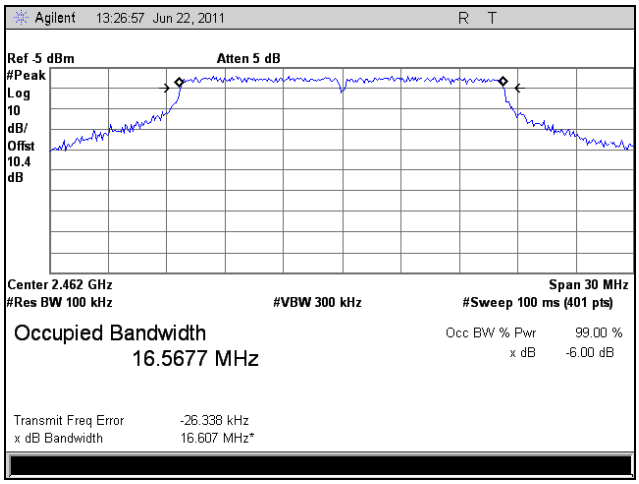
6 dB Occupied Bandwidth Test Results, 802.11g



Plot 15. 6 dB Occupied Bandwidth, Low Channel, 802.11g

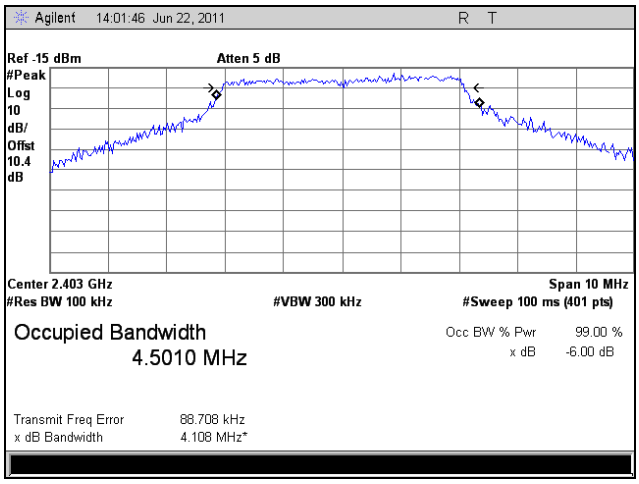


Plot 16. 6 dB Occupied Bandwidth, Mid Channel, 802.11g

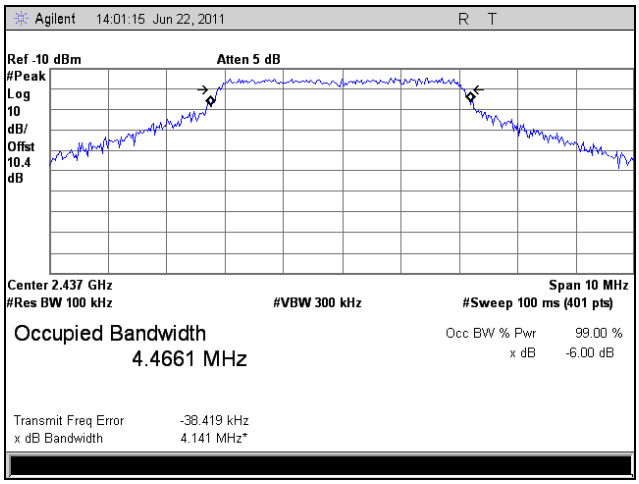


Plot 17. 6 dB Occupied Bandwidth, High Channel, 802.11g

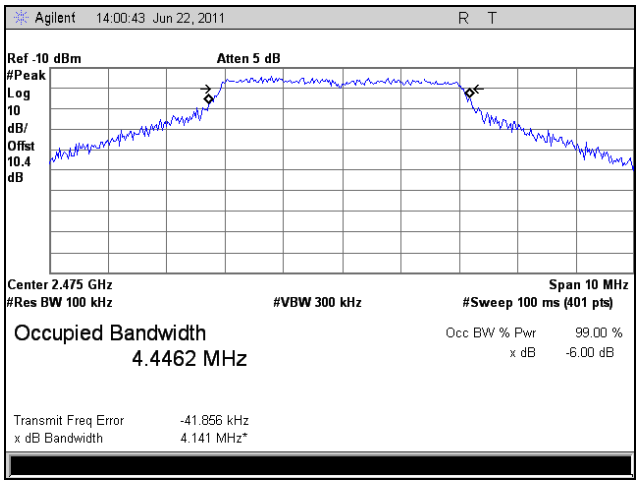
6 dB Occupied Bandwidth Test Results, 802.11n HT5, Port 0



Plot 18. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT5, Port 0

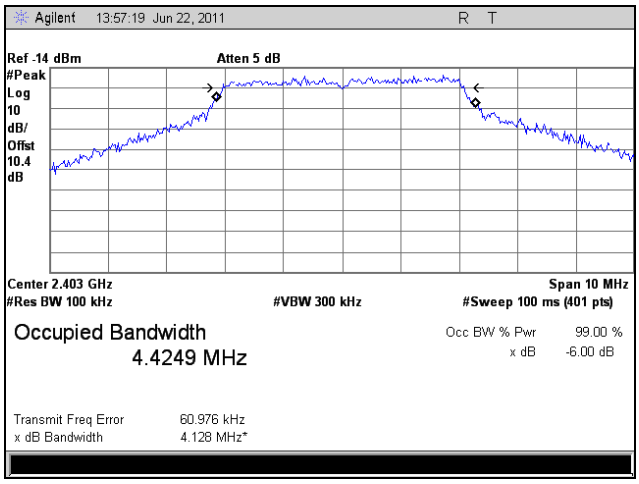


Plot 19. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT5, Port 0

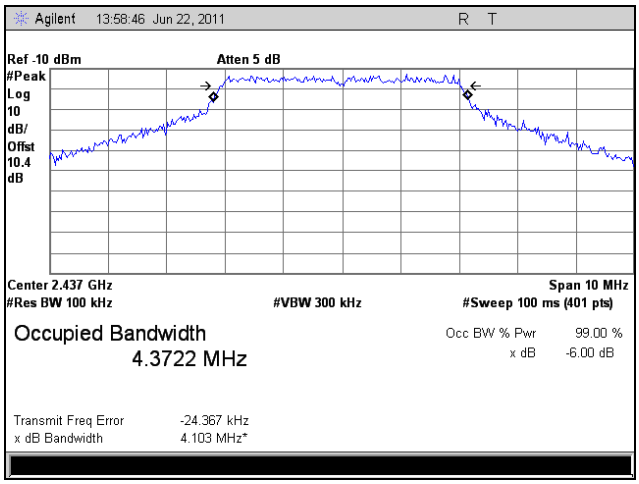


Plot 20. 6 dB Occupied Bandwidth, High Channel, 802.11n HT5, Port 0

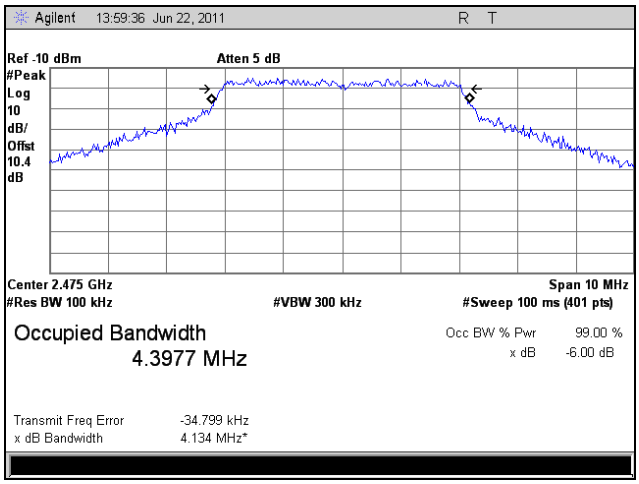
6 dB Occupied Bandwidth Test Results, 802.11n HT5, Port 1



Plot 21. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT5, Port 1

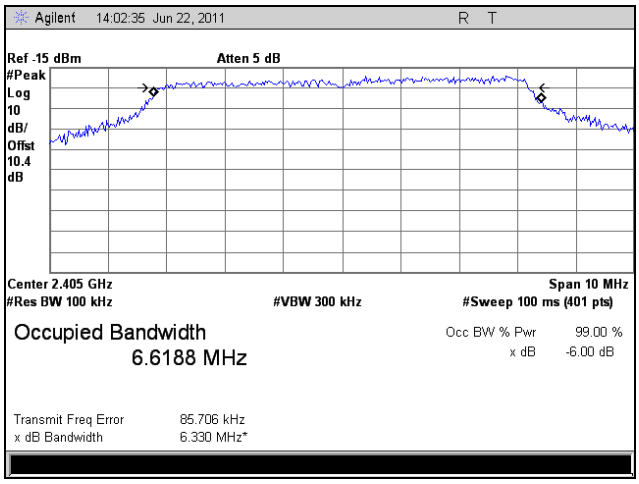


Plot 22. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT5, Port 1

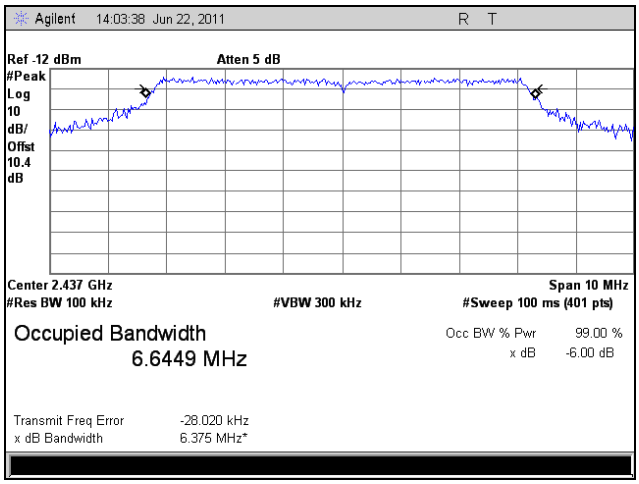


Plot 23. 6 dB Occupied Bandwidth, High Channel, 802.11n HT5, Port 1

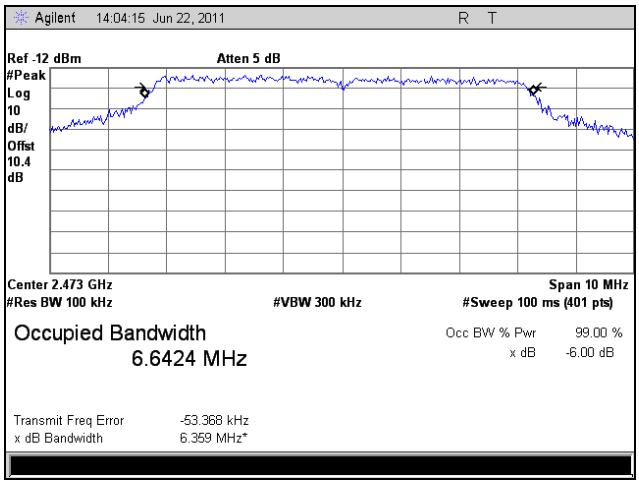
6 dB Occupied Bandwidth Test Results, 802.11n HT8, Port 0



Plot 24. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT8, Port 0

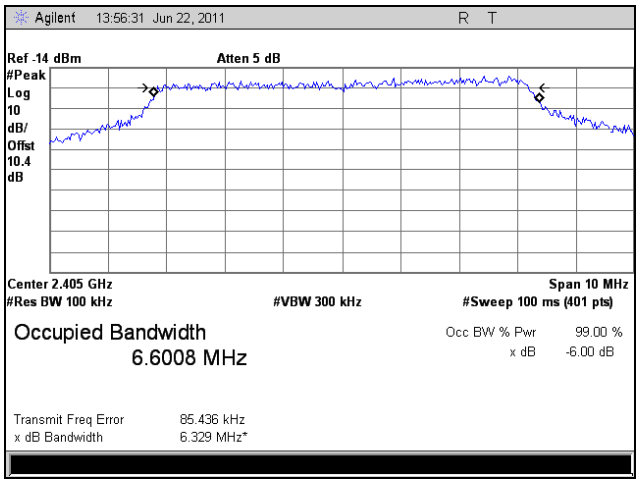


Plot 25. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT8, Port 0

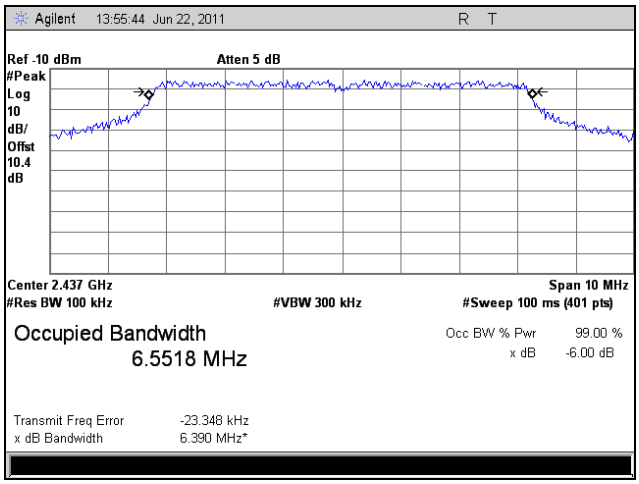


Plot 26. 6 dB Occupied Bandwidth, High Channel, 802.11n HT8, Port 0

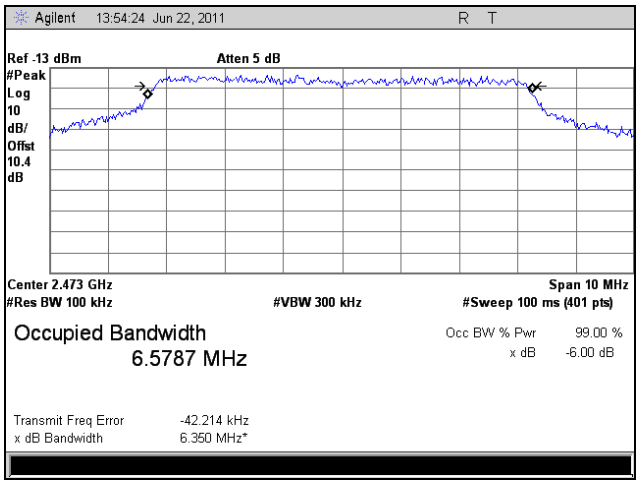
6 dB Occupied Bandwidth Test Results, 802.11n HT8, Port 1



Plot 27. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT8, Port 1

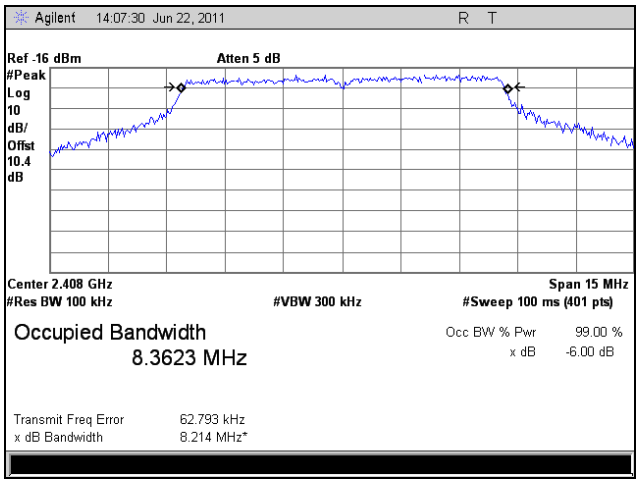


Plot 28. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT8, Port 1

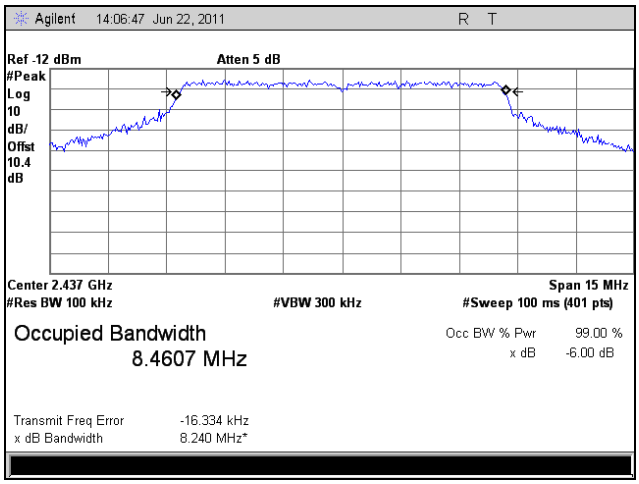


Plot 29. 6 dB Occupied Bandwidth, High Channel, 802.11n HT8, Port 1

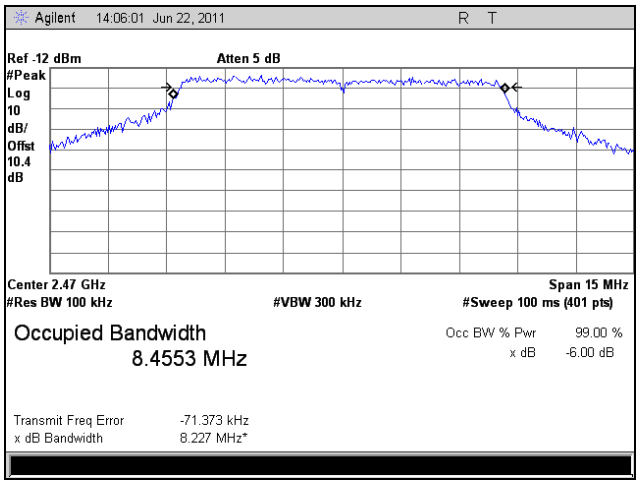
6 dB Occupied Bandwidth Test Results, 802.11n HT10, Port 0



Plot 30. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT10, Port 0

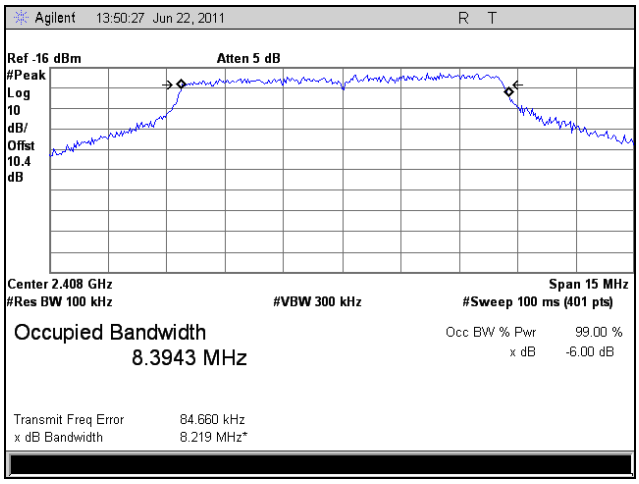


Plot 31. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT10, Port 0

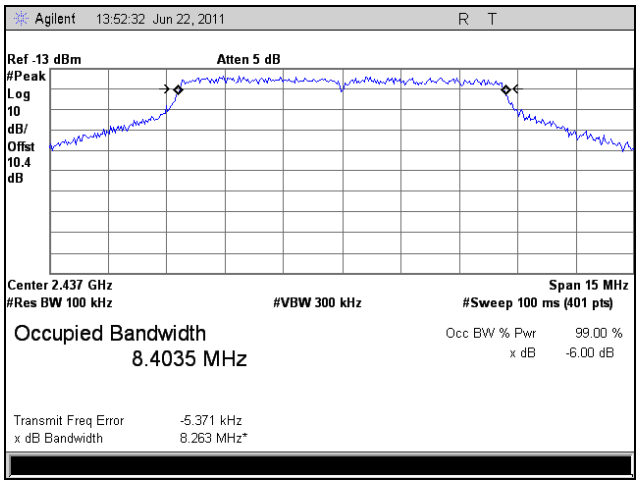


Plot 32. 6 dB Occupied Bandwidth, High Channel, 802.11n HT10, Port 0

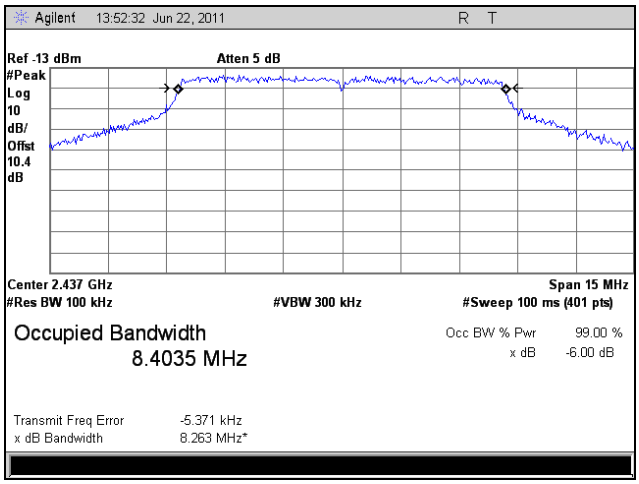
6 dB Occupied Bandwidth Test Results, 802.11n HT10, Port 1



Plot 33. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT10, Port 1

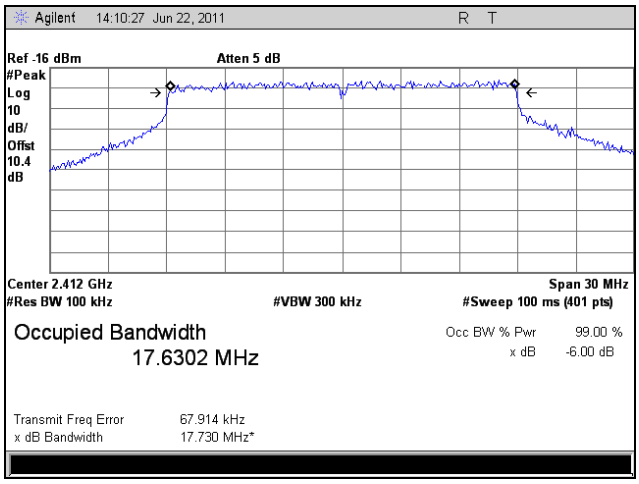


Plot 34. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT10, Port 1

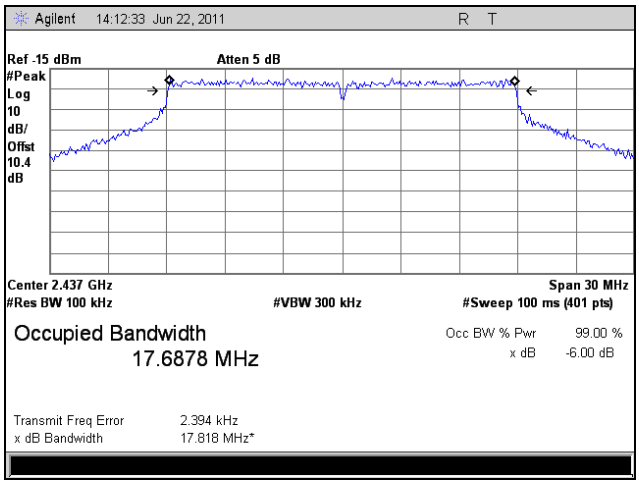


Plot 35. 6 dB Occupied Bandwidth, High Channel, 802.11n HT10, Port 1

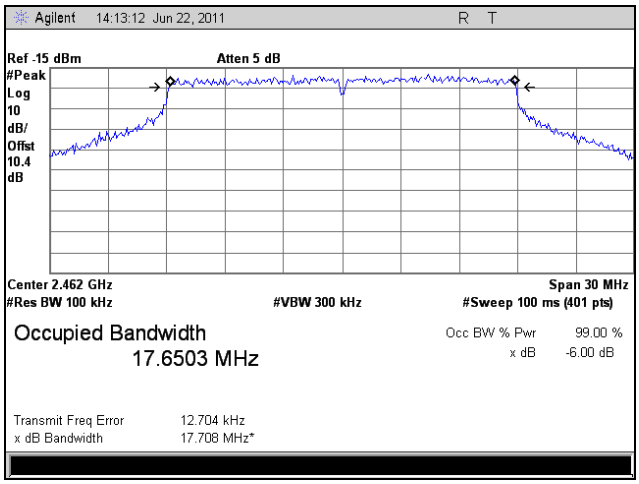
6 dB Occupied Bandwidth Test Results, 802.11n HT20, Port 0



Plot 36. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT20, Port 0

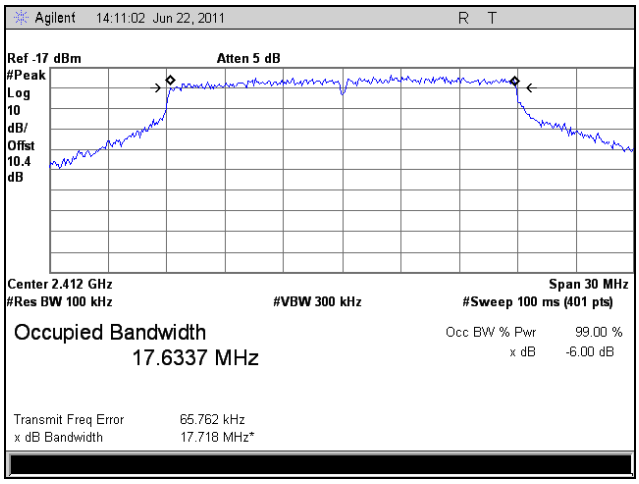


Plot 37. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT20, Port 0

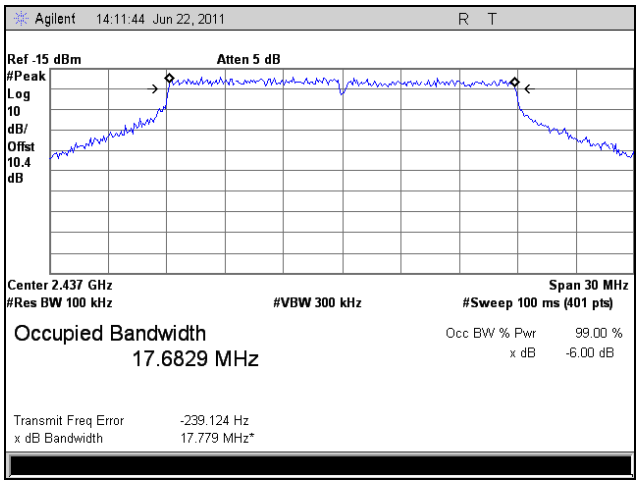


Plot 38. 6 dB Occupied Bandwidth, High Channel, 802.11n HT20, Port 0

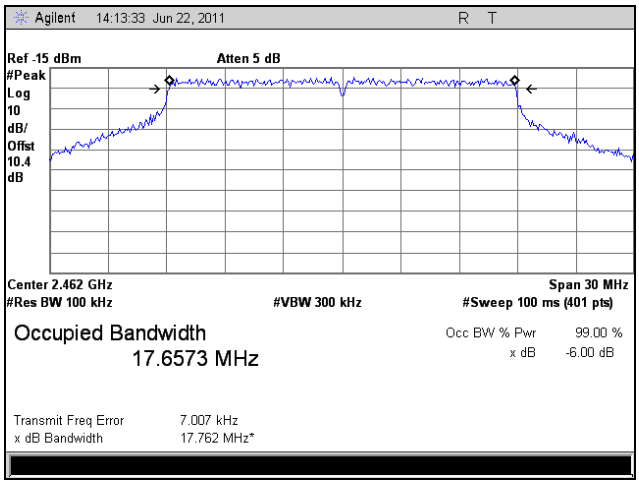
6 dB Occupied Bandwidth Test Results, 802.11n HT20, Port 1



Plot 39. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT20, Port 1

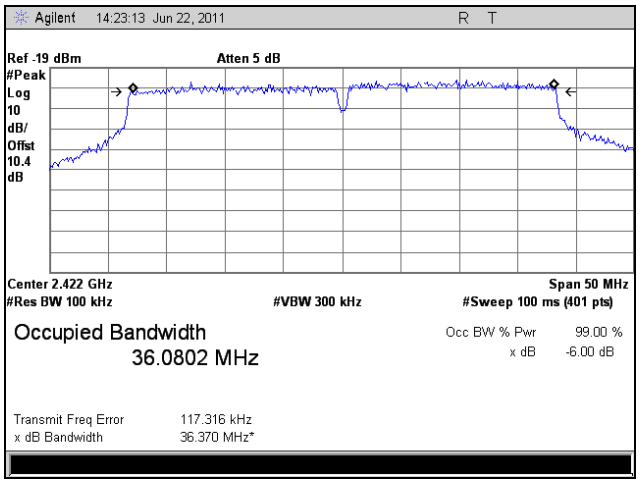


Plot 40. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT20, Port 1

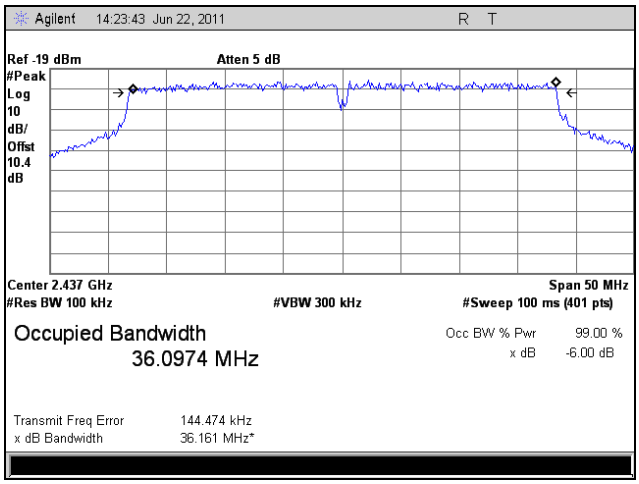


Plot 41. 6 dB Occupied Bandwidth, High Channel, 802.11n HT20, Port 1

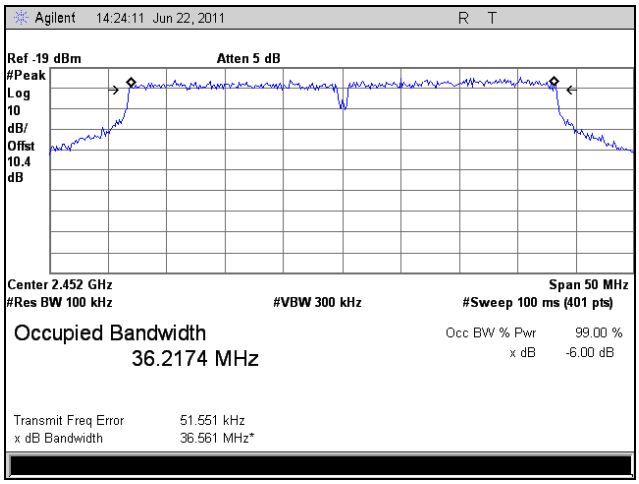
6 dB Occupied Bandwidth Test Results, 802.11n HT40, Port 0



Plot 42. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT40, Port 0

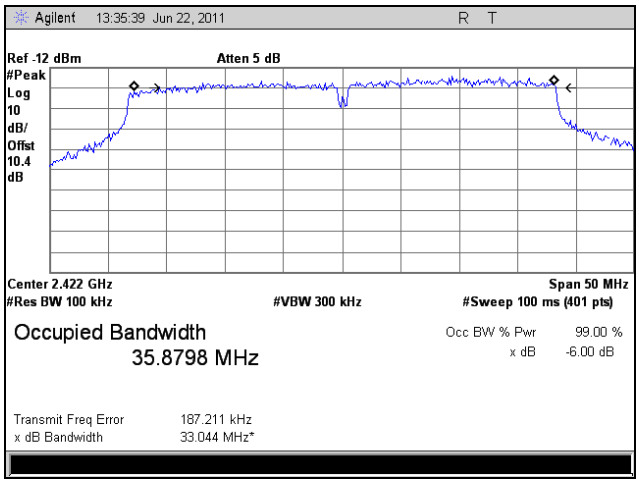


Plot 43. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT40, Port 0

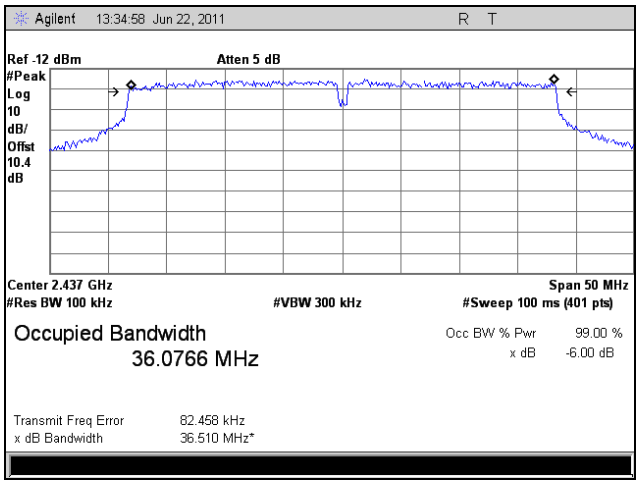


Plot 44. 6 dB Occupied Bandwidth, High Channel, 802.11n HT40, Port 0

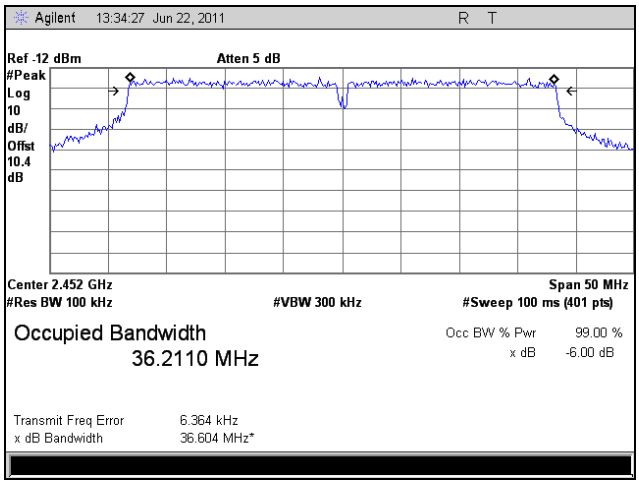
6 dB Occupied Bandwidth Test Results, 802.11n HT40, Port 1



Plot 45. 6 dB Occupied Bandwidth, Low Channel, 802.11n HT40, Port 1

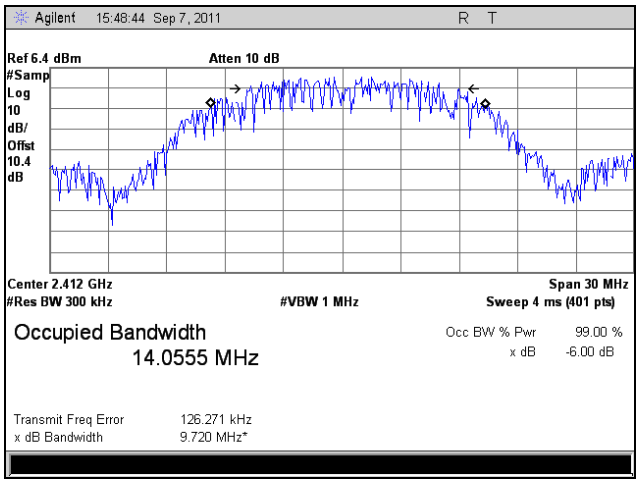


Plot 46. 6 dB Occupied Bandwidth, Mid Channel, 802.11n HT40, Port 1

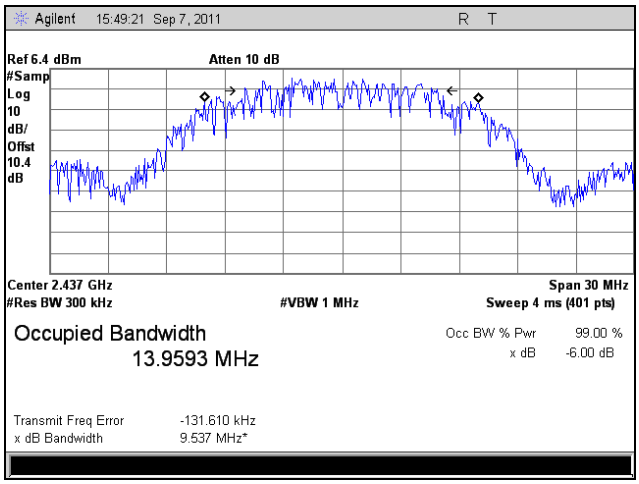


Plot 47. 6 dB Occupied Bandwidth, High Channel, 802.11n HT40, Port 1

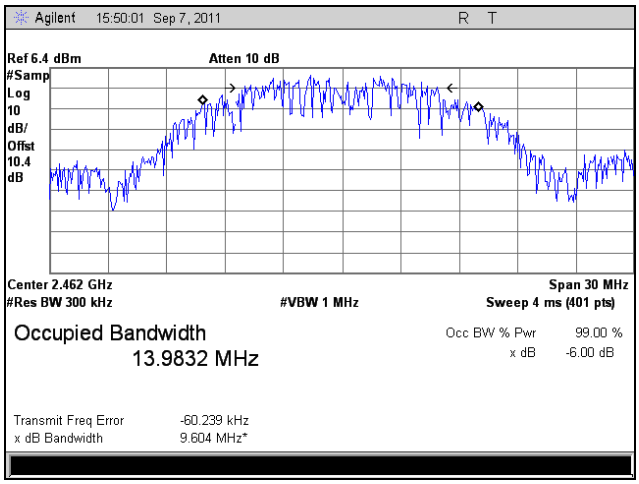
99% Occupied Bandwidth Test Results, 802.11b



Plot 48. 99% Occupied Bandwidth, Low Channel, 802.11b

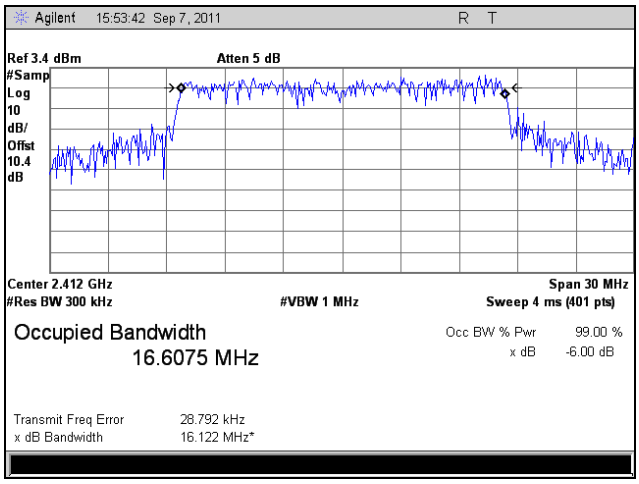


Plot 49. 99% Occupied Bandwidth, Mid Channel, 802.11b

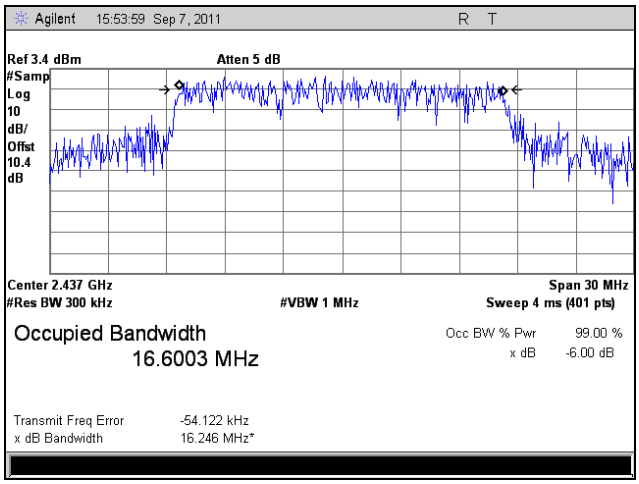


Plot 50. 99% Occupied Bandwidth, High Channel, 802.11b

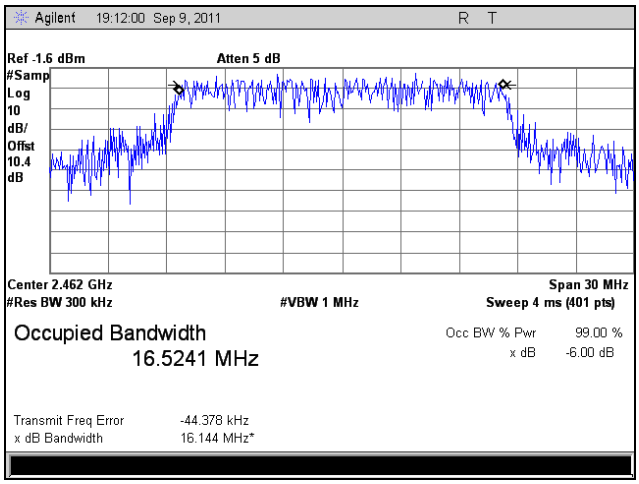
99% Occupied Bandwidth Test Results, 802.11g



Plot 51. 99% Occupied Bandwidth, Low Channel, 802.11g

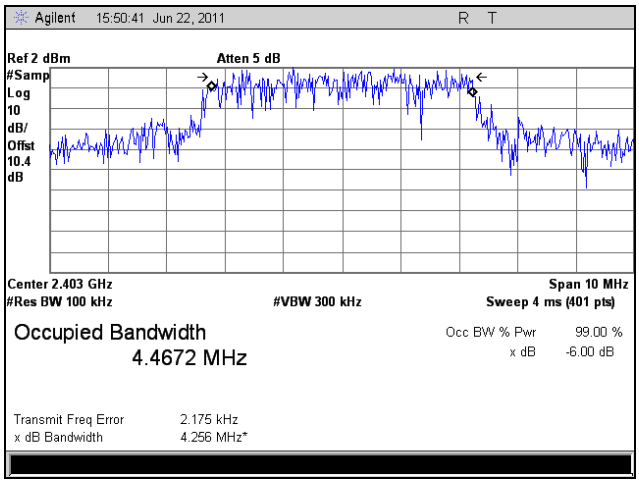


Plot 52. 99% Occupied Bandwidth, Mid Channel, 802.11g

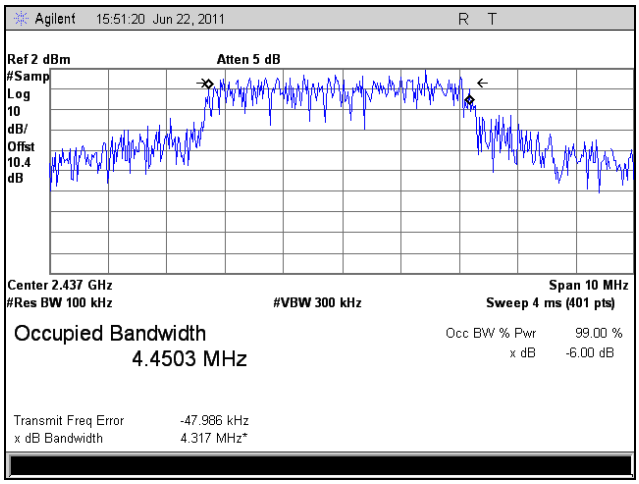


Plot 53. 99% Occupied Bandwidth, High Channel, 802.11g

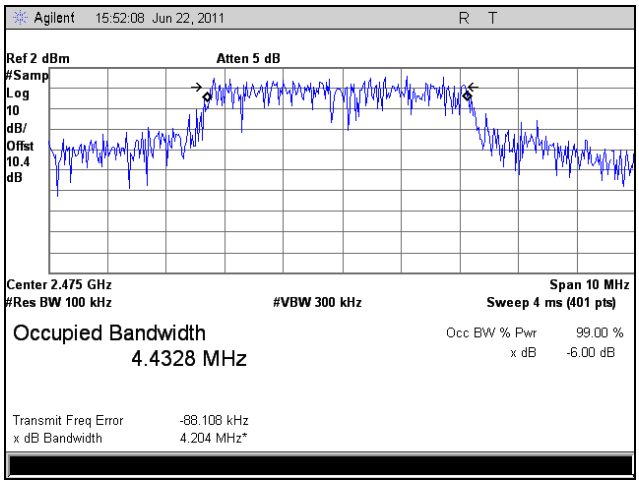
99% Occupied Bandwidth Test Results, 802.11n HT5, Port 0



Plot 54. 99% Occupied Bandwidth, Low Channel, 802.11n HT5, Port 0

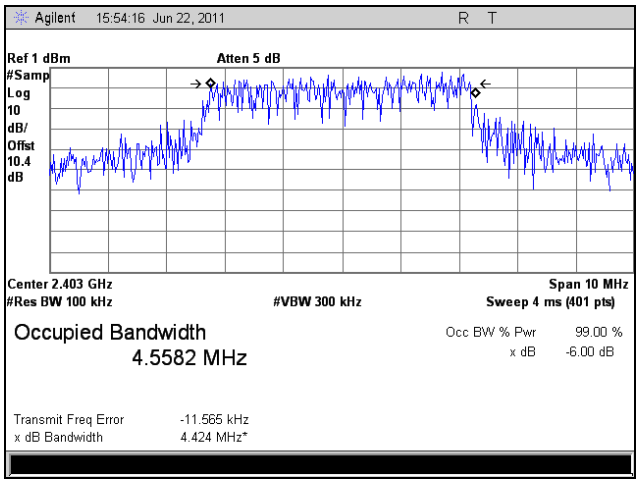


Plot 55. 99% Occupied Bandwidth, Mid Channel, 802.11n HT5, Port 0

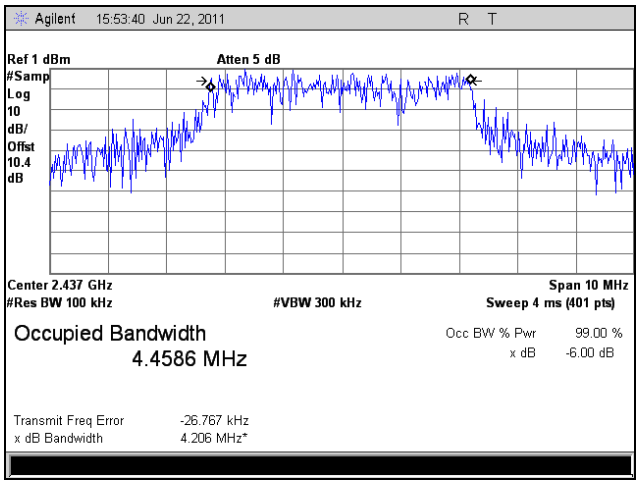


Plot 56. 99% Occupied Bandwidth, High Channel, 802.11n HT5, Port 0

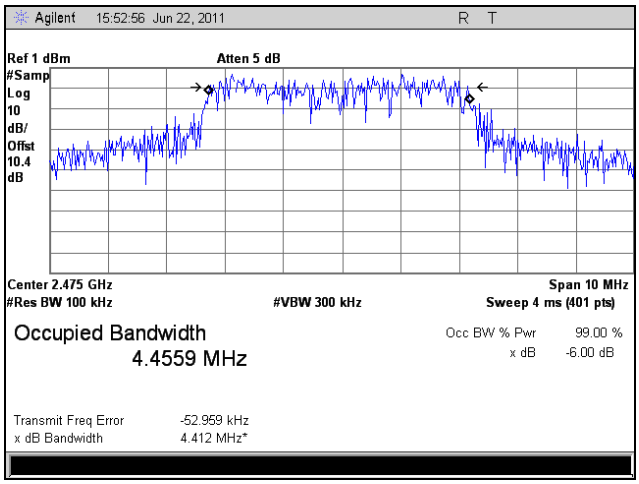
99% Occupied Bandwidth Test Results, 802.11n HT5, Port 1



Plot 57. 99% Occupied Bandwidth, Low Channel, 802.11n HT5, Port 1

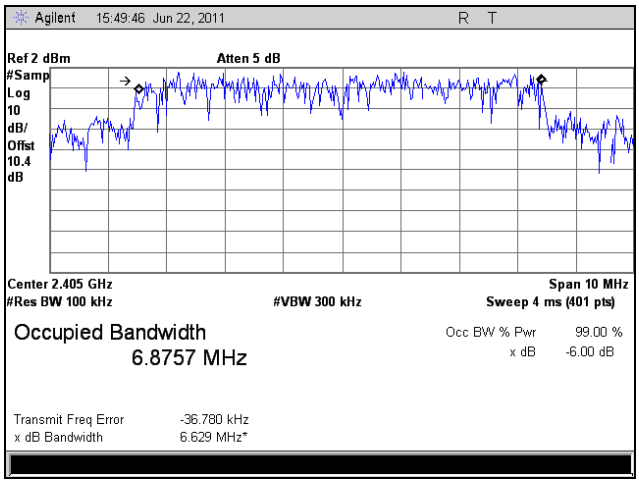


Plot 58. 99% Occupied Bandwidth, Mid Channel, 802.11n HT5, Port 1

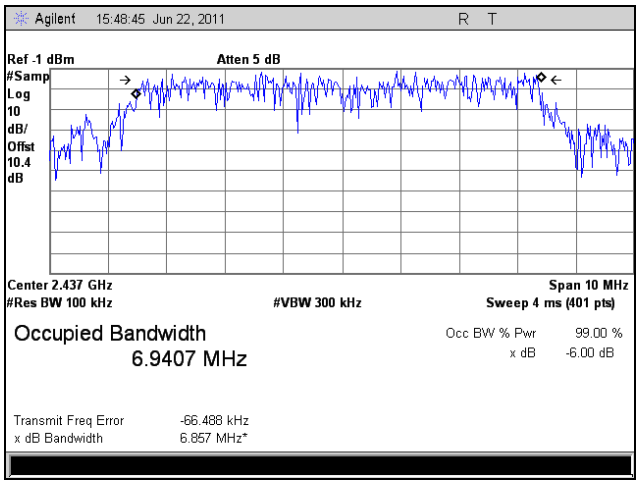


Plot 59. 99% Occupied Bandwidth, High Channel, 802.11n HT5, Port 1

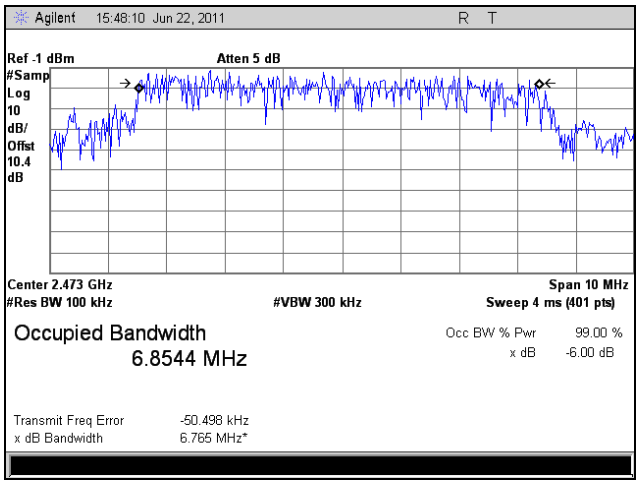
99% Occupied Bandwidth Test Results, 802.11n HT8, Port 0



Plot 60. 99% Occupied Bandwidth, Low Channel, 802.11n HT8, Port 0

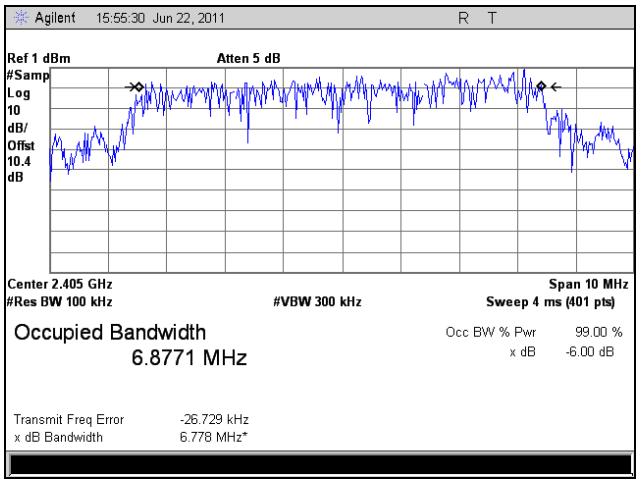


Plot 61. 99% Occupied Bandwidth, Mid Channel, 802.11n HT8, Port 0

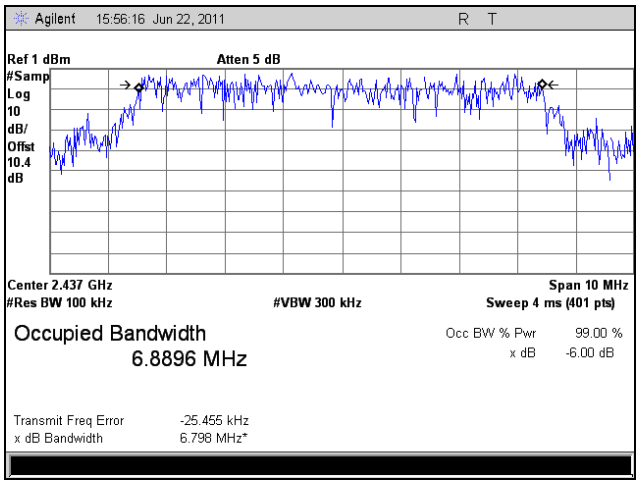


Plot 62. 99% Occupied Bandwidth, High Channel, 802.11n HT8, Port 0

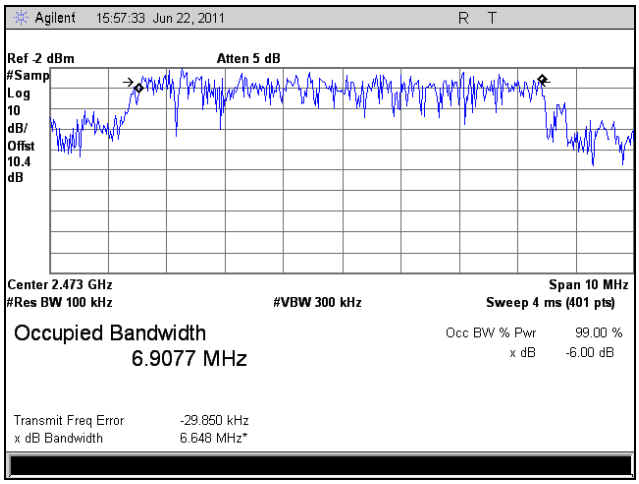
99% Occupied Bandwidth Test Results, 802.11n HT8, Port 1



Plot 63. 99% Occupied Bandwidth, Low Channel, 802.11n HT8, Port 1

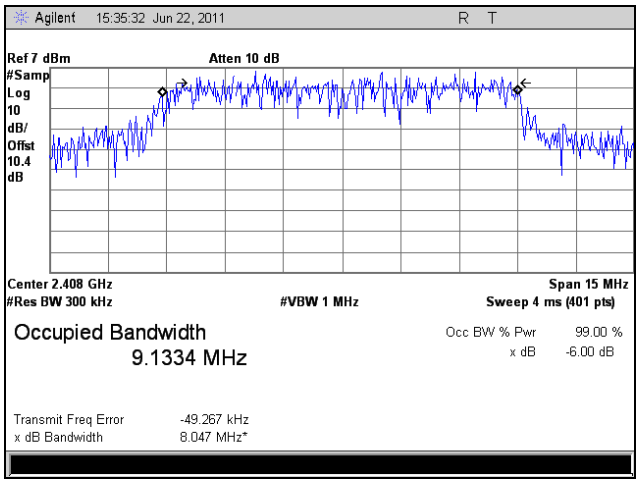


Plot 64. 99% Occupied Bandwidth, Mid Channel, 802.11n HT8, Port 1

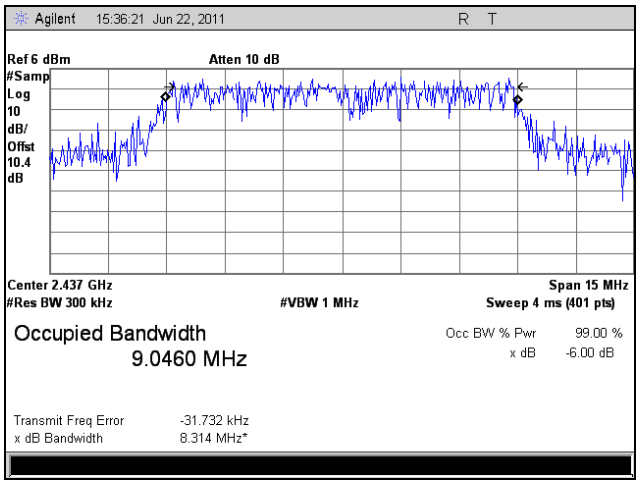


Plot 65. 99% Occupied Bandwidth, High Channel, 802.11n HT8, Port 1

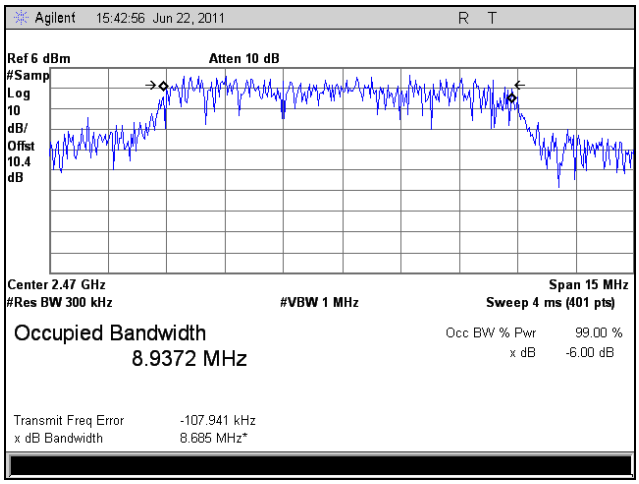
99% Occupied Bandwidth Test Results, 802.11n HT10, Port 0



Plot 66. 99% Occupied Bandwidth, Low Channel, 802.11n HT10, Port 0

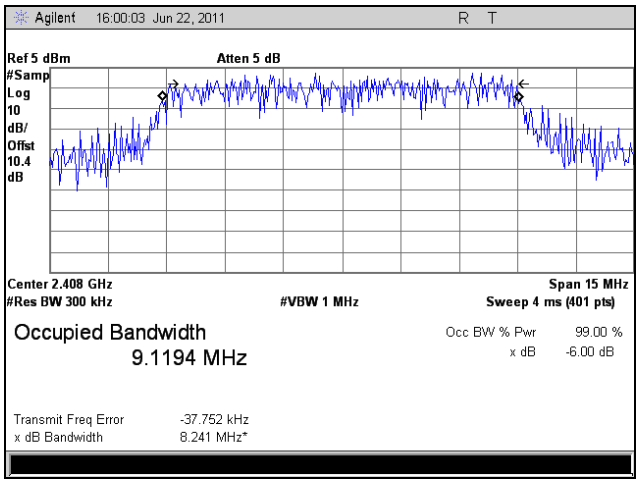


Plot 67. 99% Occupied Bandwidth, Mid Channel, 802.11n HT10, Port 0

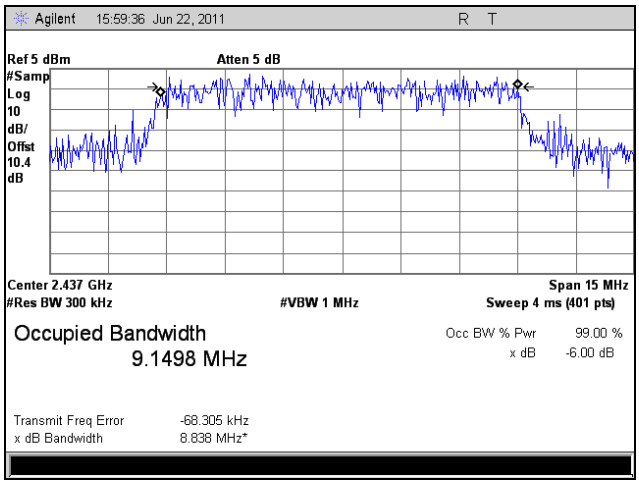


Plot 68. 99% Occupied Bandwidth, High Channel, 802.11n HT10, Port 0

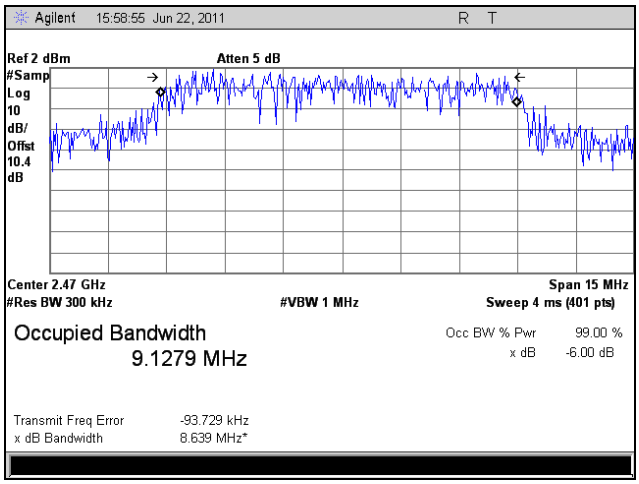
99% Occupied Bandwidth Test Results, 802.11n HT10, Port 1



Plot 69. 99% Occupied Bandwidth, Low Channel, 802.11n HT10, Port 1

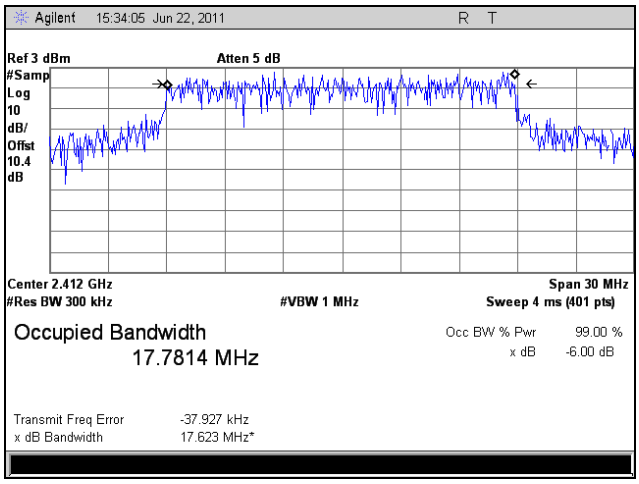


Plot 70. 99% Occupied Bandwidth, Mid Channel, 802.11n HT10, Port 1

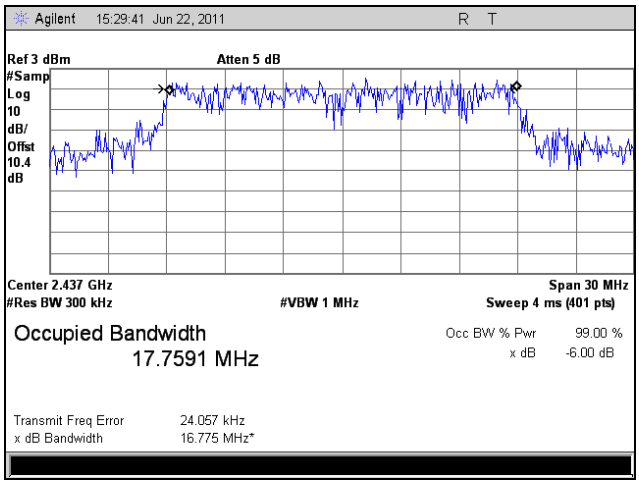


Plot 71. 99% Occupied Bandwidth, High Channel, 802.11n HT10, Port 1

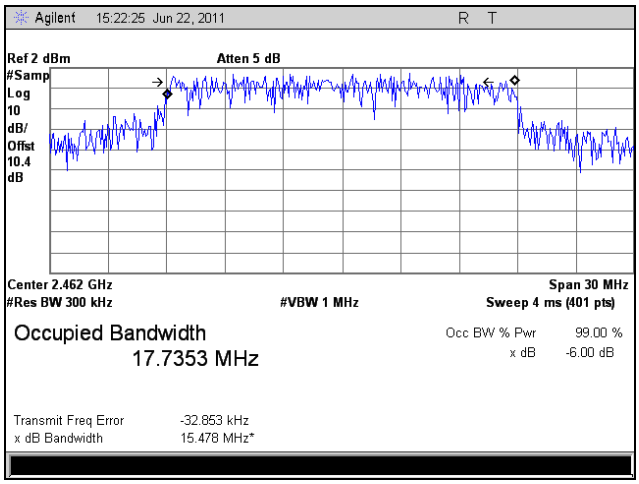
99% Occupied Bandwidth Test Results, 802.11n HT20, Port 0



Plot 72. 99% Occupied Bandwidth, Low Channel, 802.11n HT20, Port 0

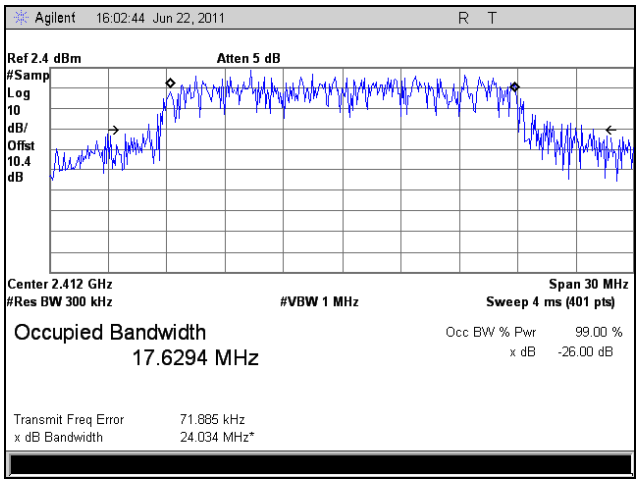


Plot 73. 99% Occupied Bandwidth, Mid Channel, 802.11n HT20, Port 0

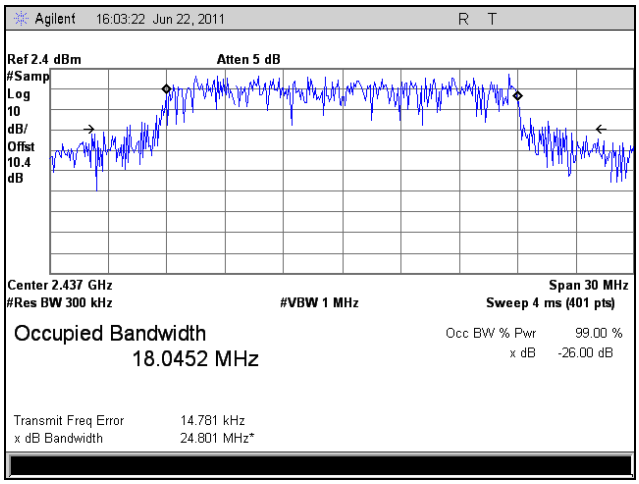


Plot 74. 99% Occupied Bandwidth, High Channel, 802.11n HT20, Port 0

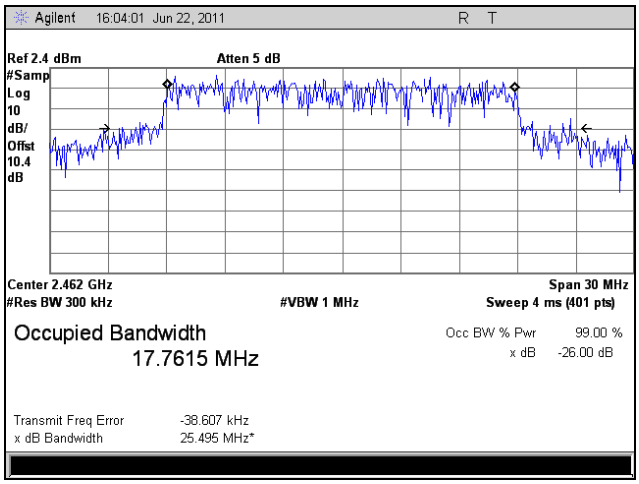
99% Occupied Bandwidth Test Results, 802.11n HT20, Port 1



Plot 75. 99% Occupied Bandwidth, Low Channel, 802.11n HT20, Port 1

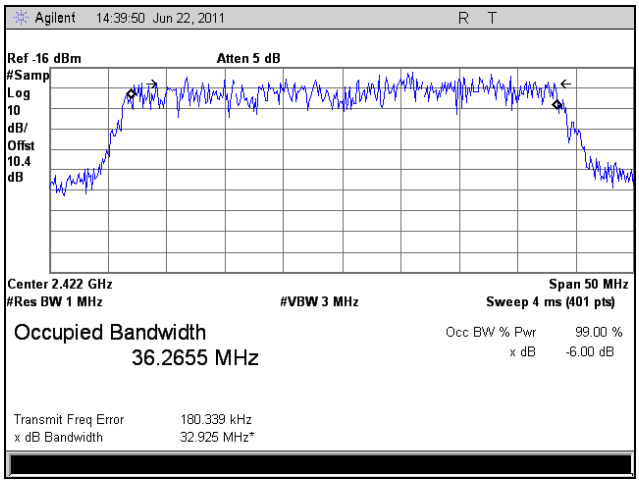


Plot 76. 99% Occupied Bandwidth, Mid Channel, 802.11n HT20, Port 1

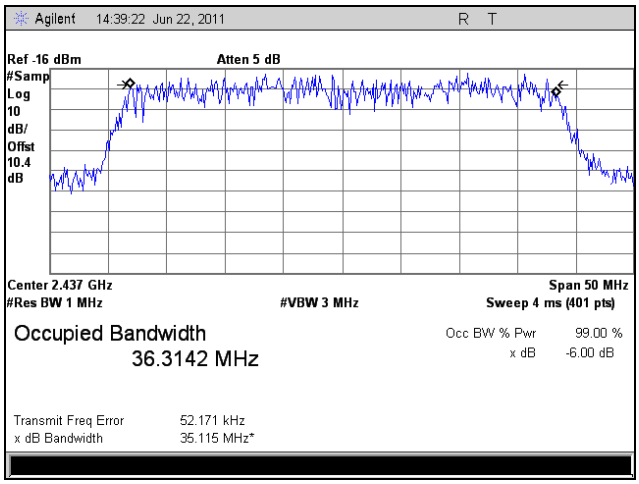


Plot 77. 99% Occupied Bandwidth, High Channel, 802.11n HT20, Port 1

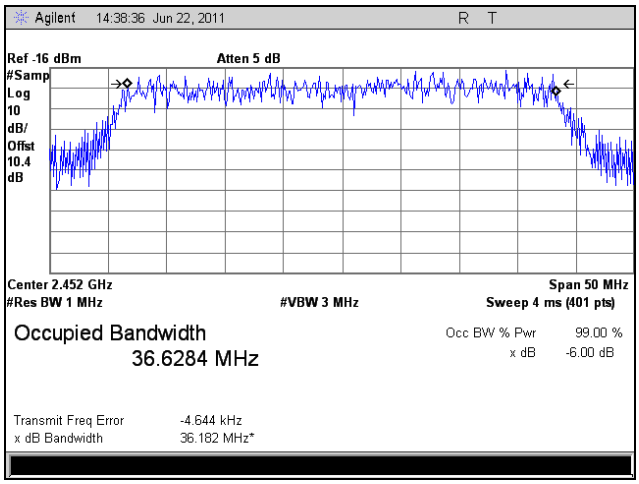
99% Occupied Bandwidth Test Results, 802.11n HT40, Port 0



Plot 78. 99% Occupied Bandwidth, Low Channel, 802.11n HT40, Port 0

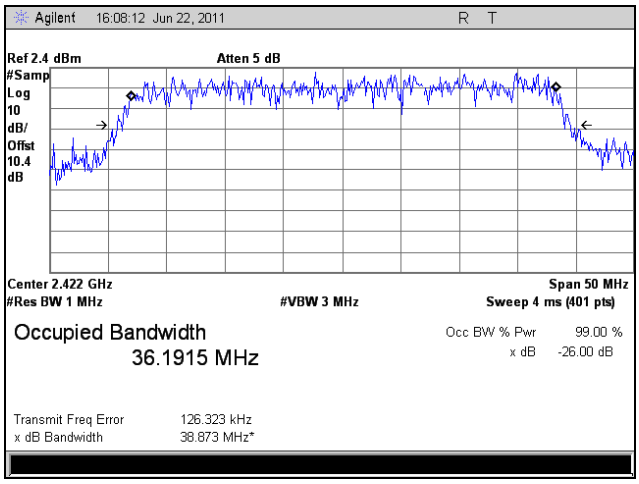


Plot 79. 99% Occupied Bandwidth, Mid Channel, 802.11n HT40, Port 0

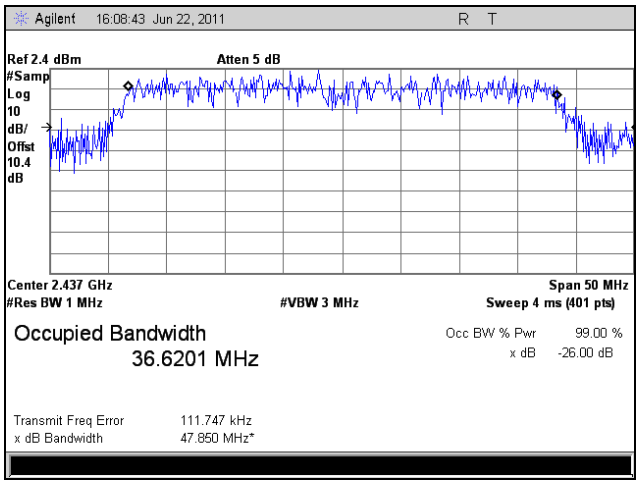


Plot 80. 99% Occupied Bandwidth, High Channel, 802.11n HT40, Port 0

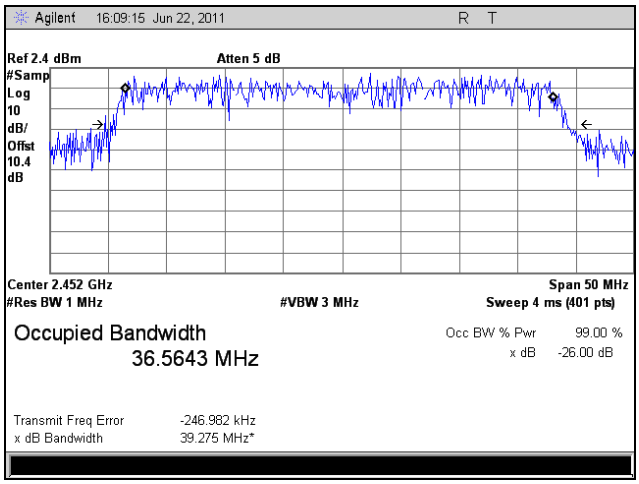
99% Occupied Bandwidth Test Results, 802.11n HT40, Port 1



Plot 81. 99% Occupied Bandwidth, Low Channel, 802.11n HT40, Port 1



Plot 82. 99% Occupied Bandwidth, Mid Channel, 802.11n HT40, Port 1



Plot 83. 99% Occupied Bandwidth, High Channel, 802.11n HT40, Port 1

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output

Test Requirements: **§15.247(b):** The maximum peak output power of the intentional radiator shall not exceed the following:

Digital Transmission Systems (MHz)	Output Limit (Watts)
902-928	1.000
2400–2483.5	1.000
5725– 5850	1.000

Table 23. Output Power Requirements from §15.247(b)

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 23, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400 – 2483.5 MHz band and using a point to point application may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Fixed, point-to-point operation excludes the use of point-to-multipoint systems, Omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

Test Procedure: The transmitter was connected to a calibrated spectrum analyzer. The EUT was measured at the low, mid and high channels of each band at the maximum power level.

Test Results: The EUT was compliant with the Peak Power Output limits of **§15.247(b)**.

Test Engineer(s): Lionel Gabrillo

Test Date(s): 09/08/11

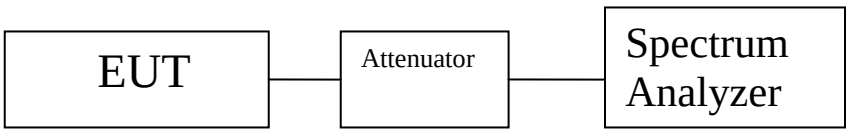


Figure 3. Peak Power Output Test Setup

Peak Power Output Test Results

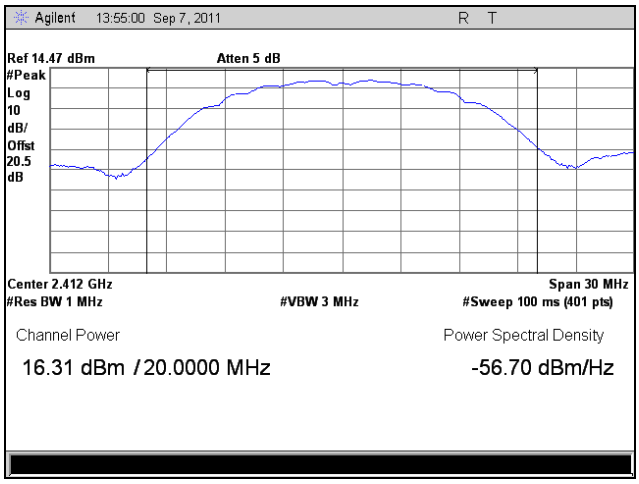
Peak Conducted Output Power			
Mode	**Carrier Channel**	**Frequency (MHz)**	**Measured Peak Output Power dBm**
802.11b	Low	2412	16.31
	Mid	2437	22.05
	High	2462	19.81
802.11g 20 MHz	Low	2412	16.10
	Mid	2437	26.70
	High	2462	15.79

Table 24. Peak Power Output, Test Results

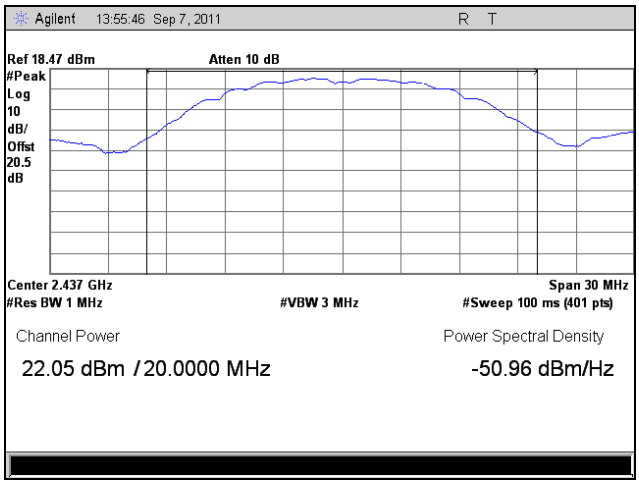
HT5								
Channel	**Port 1 (dBm)**	**Port 1 (mW)**	**Port 2 (dBm)**	**Port 2 (mW)**	**Sum (mW)**	**Sum (dBm)**	**Limit (dBm)**	**Delta**
Low	15.7	37.154	17.29	53.580	90.733	19.578	30	-10.4223
Mid	21.2	131.826	25.53	357.273	489.099	26.894	30	-3.10604
High	11.56	14.322	17.96	62.517	76.839	18.856	30	-11.1442
HT8								
Channel	**Port 1 (dBm)**	**Port 1 (mW)**	**Port 2 (dBm)**	**Port 2 (mW)**	**Sum (mW)**	**Sum (dBm)**	**Limit (dBm)**	**Delta**
Low	15.95	39.355	21	125.893	165.248	22.181	30	-7.81865
Mid	20.04	100.925	26.1	407.380	508.306	27.061	30	-2.93875
High	9.75	9.441	18.28	67.298	76.738	18.850	30	-11.1499
HT10								
Channel	**Port 1 (dBm)**	**Port 1 (mW)**	**Port 2 (dBm)**	**Port 2 (mW)**	**Sum (mW)**	**Sum (dBm)**	**Limit (dBm)**	**Delta**
Low	17.81	60.395	21.31	135.207	195.602	22.914	30	-7.08626
Mid	22.04	159.956	26.06	403.645	563.601	27.510	30	-2.49028
High	13.9	24.547	18.87	77.090	101.637	20.071	30	-9.92946
HT20								
Channel	**Port 1 (dBm)**	**Port 1 (mW)**	**Port 2 (dBm)**	**Port 2 (mW)**	**Sum (mW)**	**Sum (dBm)**	**Limit (dBm)**	**Delta**
Low	12.57	18.072	15.16	32.810	50.881	17.066	30	-12.9344
Mid	22.05	160.325	25.94	392.645	552.969	27.427	30	-2.57299
High	12.13	16.331	15.08	32.211	48.541	16.861	30	-13.1389
HT40								
Channel	**Port 1 (dBm)**	**Port 1 (mW)**	**Port 2 (dBm)**	**Port 2 (mW)**	**Sum (mW)**	**Sum (dBm)**	**Limit (dBm)**	**Delta**
Low	10.75	11.885	14.88	30.761	42.646	16.299	30	-13.7012
Mid	22.74	187.932	26.5	446.684	634.615	28.025	30	-1.97489
High	10.91	12.331	15.22	33.266	45.597	16.589	30	-13.4106

Table 25. Peak Power Output, Test Results, Summed

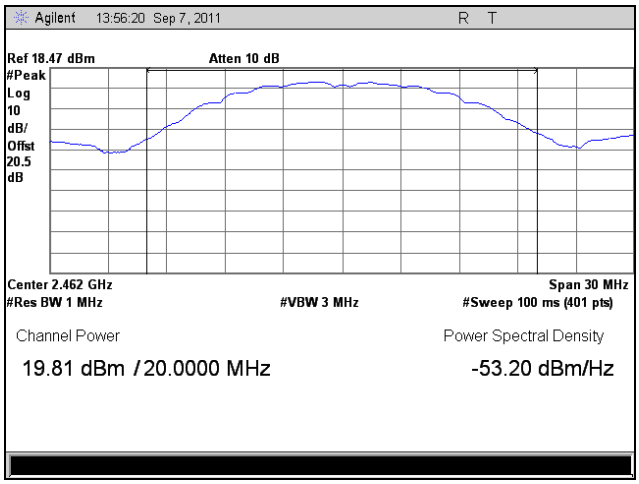
Peak Power Output Test Results, 802.11b



Plot 84. Peak Power Output, Low Channel, 802.11b

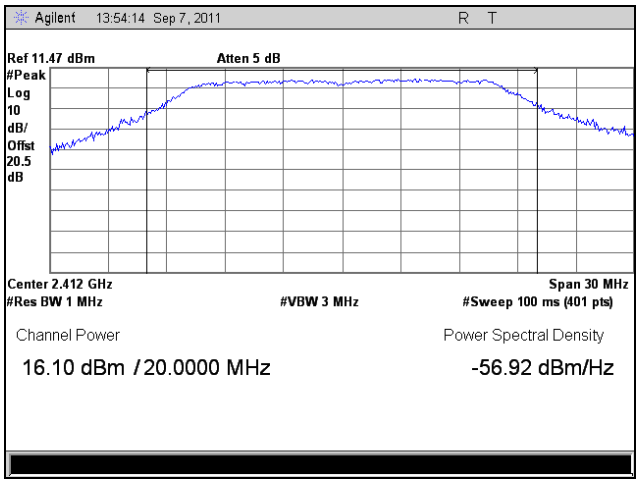


Plot 85. Peak Power Output, Mid Channel, 802.11b

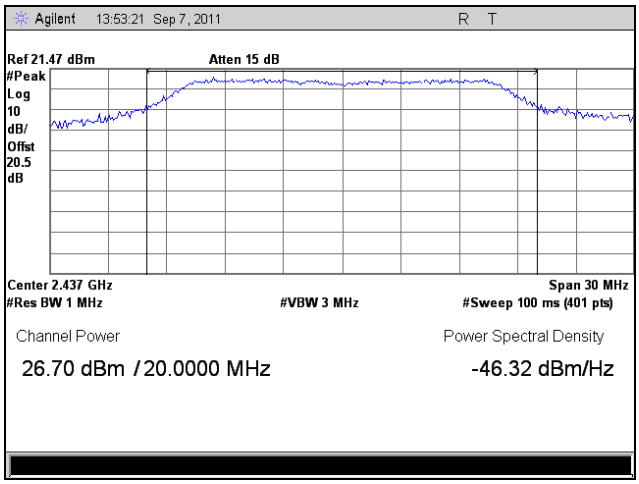


Plot 86. Peak Power Output, High Channel, 802.11b

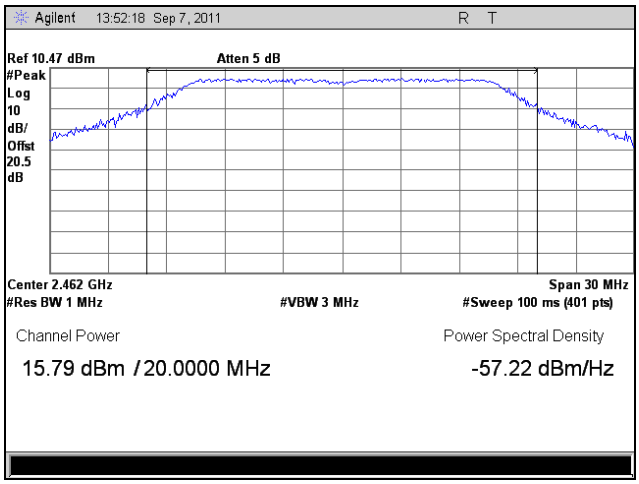
Peak Power Output Test Results, 802.11g



Plot 87. Peak Power Output, Low Channel, 802.11g

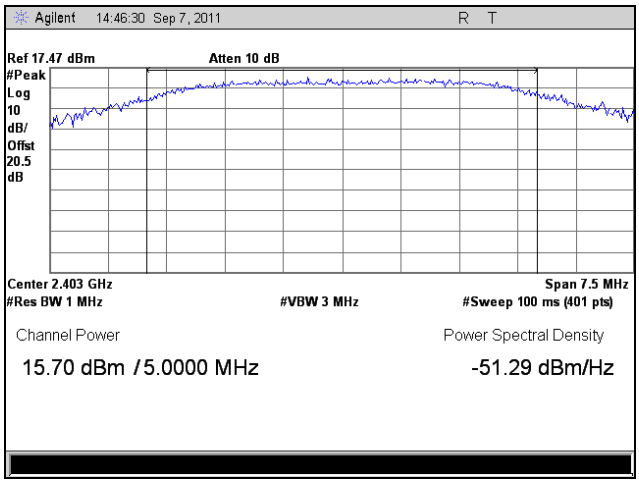


Plot 88. Peak Power Output, Mid Channel, 802.11g

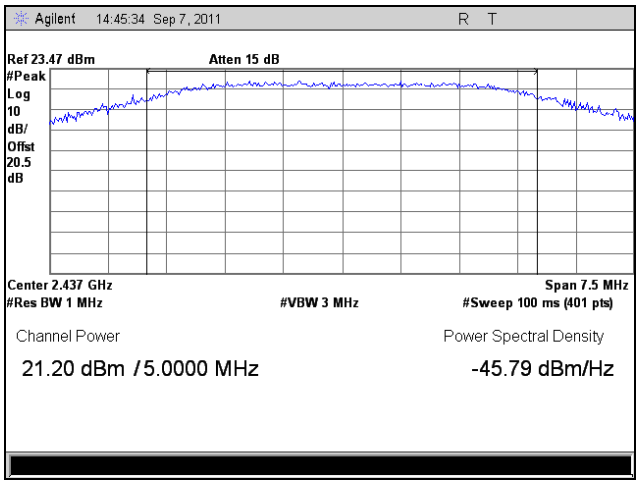


Plot 89. Peak Power Output, High Channel, 802.11g

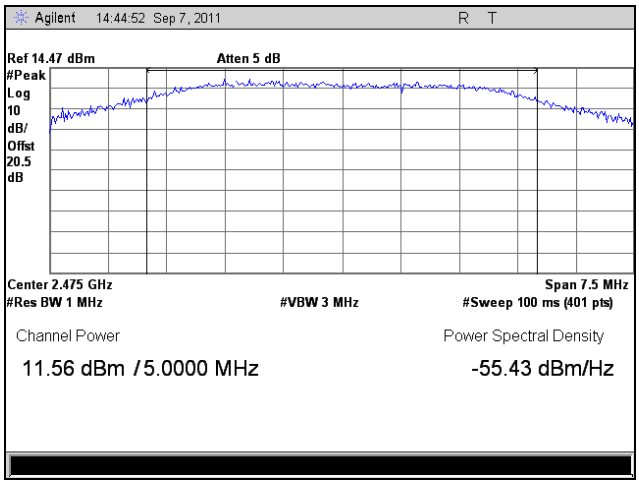
Peak Power Output Test Results, 802.11n HT5, Port 0



Plot 90. Peak Power Output, Low Channel, 802.11n HT5, Port 0

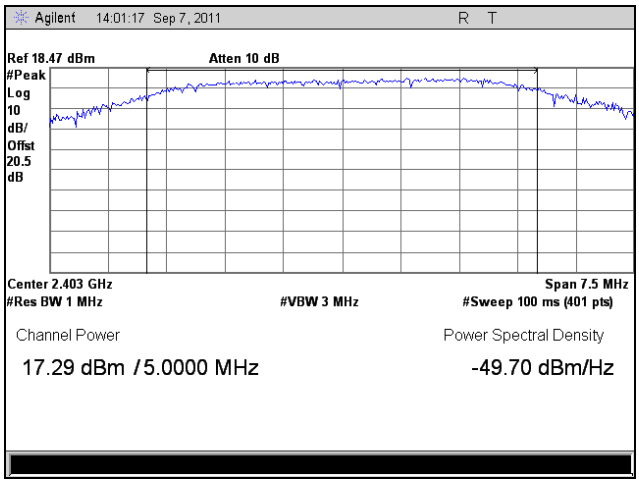


Plot 91. Peak Power Output, Mid Channel, 802.11n HT5, Port 0

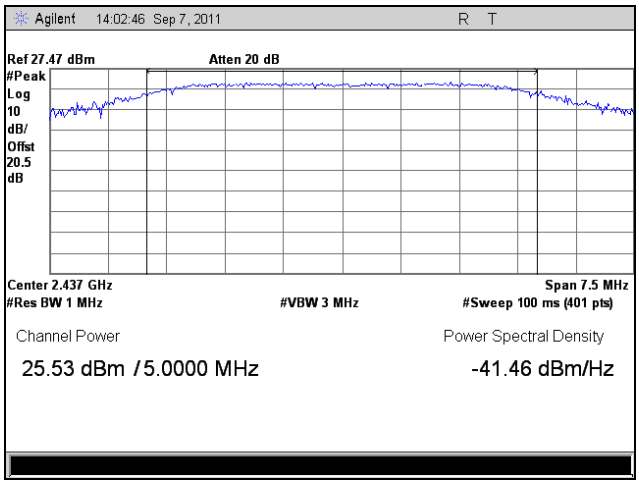


Plot 92. Peak Power Output, High Channel, 802.11n HT5, Port 0

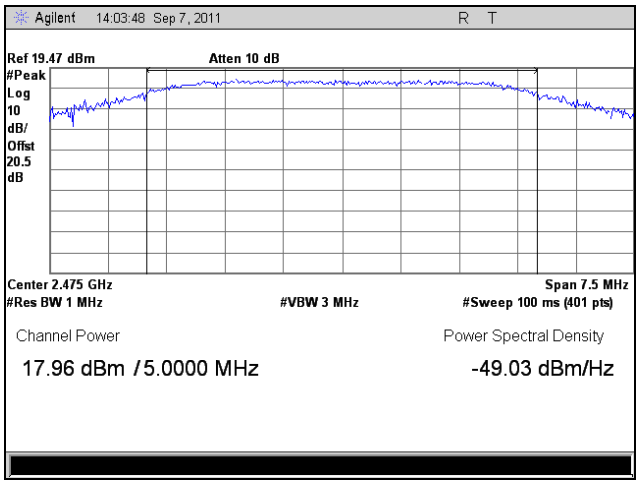
Peak Power Output Test Results, 802.11n HT5, Port 1



Plot 93. Peak Power Output, Low Channel, 802.11n HT5, Port 1

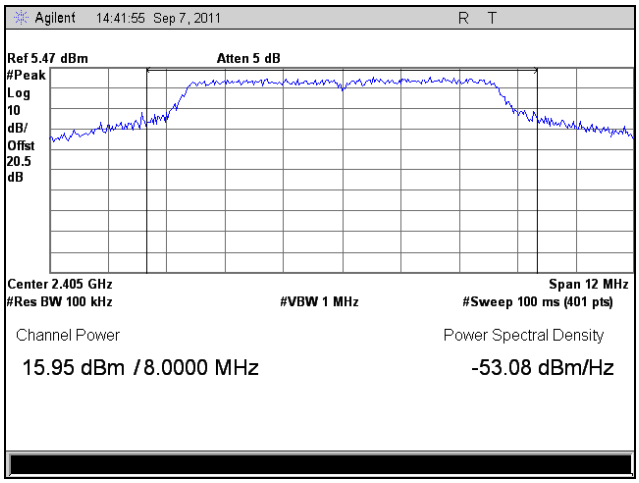


Plot 94. Peak Power Output, Mid Channel, 802.11n HT5, Port 1

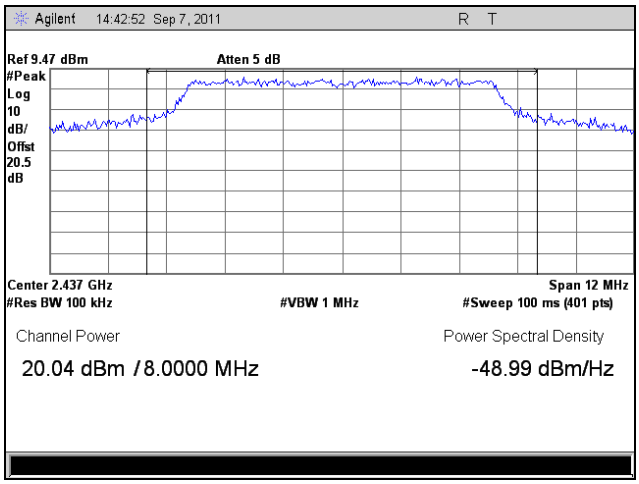


Plot 95. Peak Power Output, High Channel, 802.11n HT5, Port 1

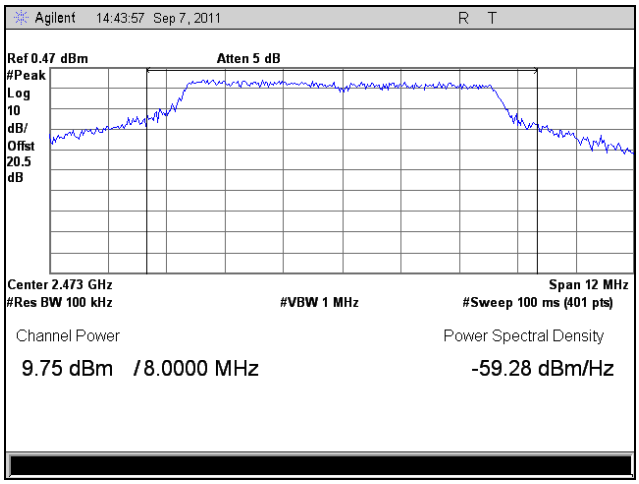
Peak Power Output Test Results, 802.11n HT8, Port 0



Plot 96. Peak Power Output, Low Channel, 802.11n HT8, Port 0

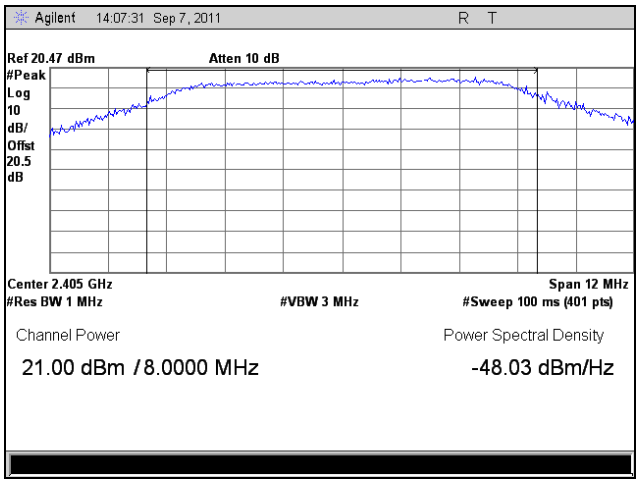


Plot 97. Peak Power Output, Mid Channel, 802.11n HT8, Port 0

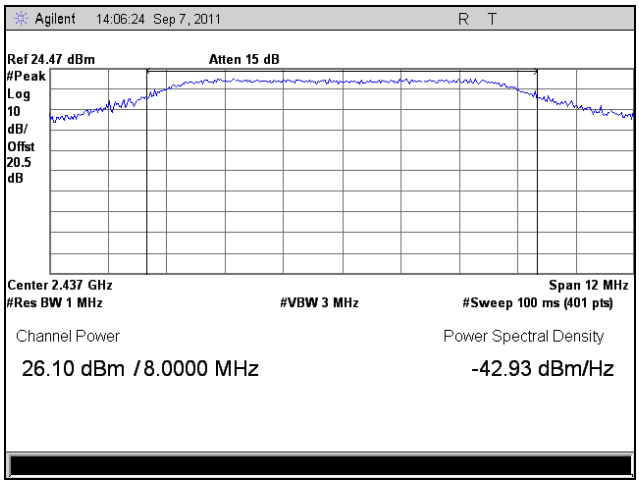


Plot 98. Peak Power Output, High Channel, 802.11n HT8, Port 0

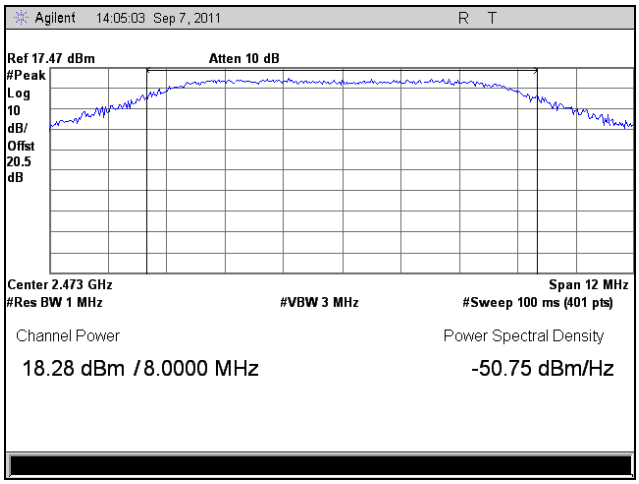
Peak Power Output Test Results, 802.11n HT8, Port 1



Plot 99. Peak Power Output, Low Channel, 802.11n HT8, Port 1

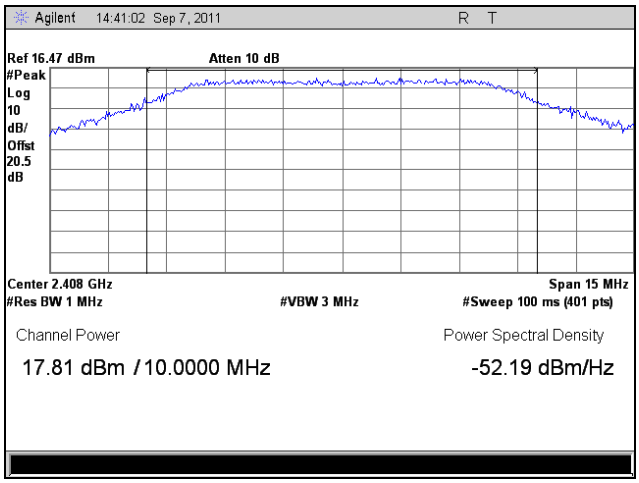


Plot 100. Peak Power Output, Mid Channel, 802.11n HT8, Port 1

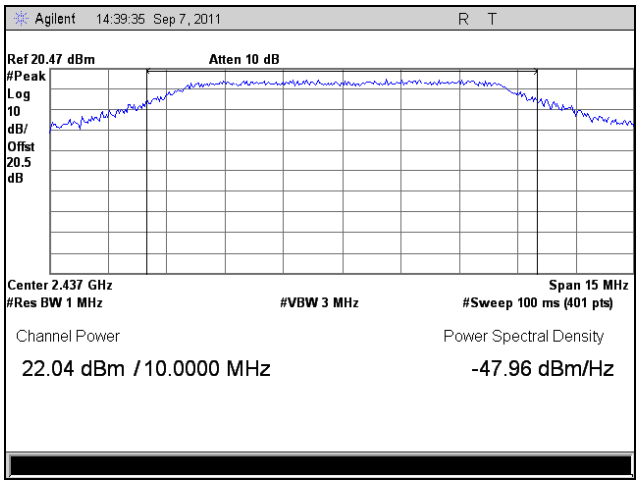


Plot 101. Peak Power Output, High Channel, 802.11n HT8, Port 1

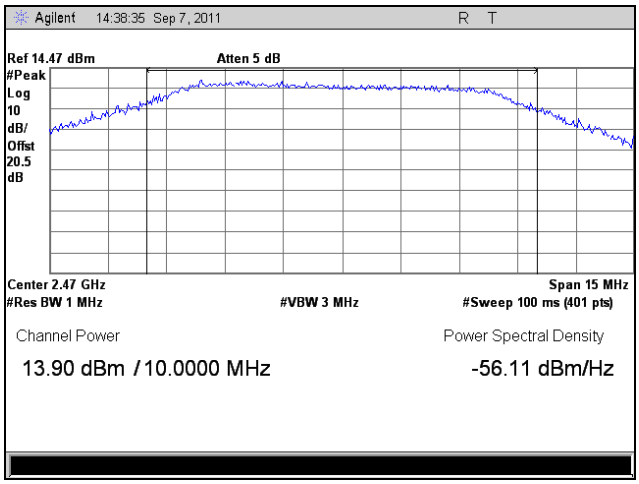
Peak Power Output Test Results, 802.11n HT10, Port 0



Plot 102. Peak Power Output, Low Channel, 802.11n HT10, Port 0

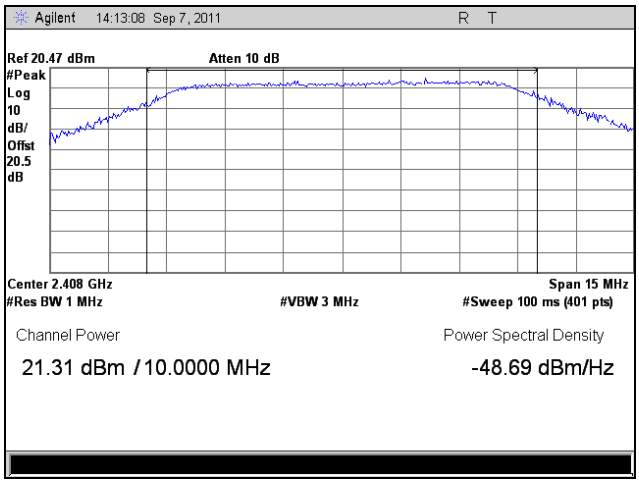


Plot 103. Peak Power Output, Mid Channel, 802.11n HT10, Port 0

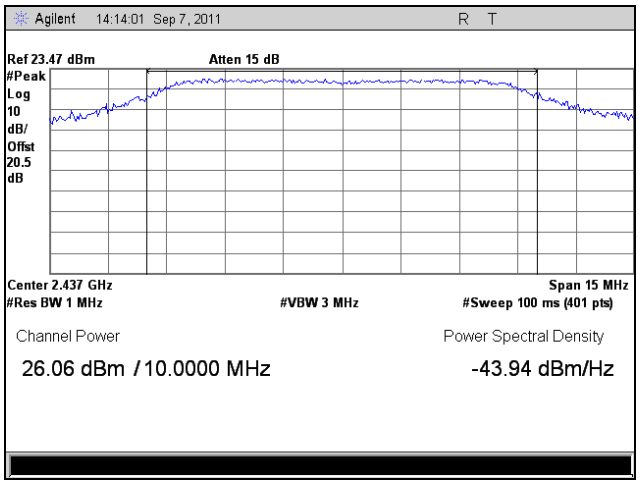


Plot 104. Peak Power Output, High Channel, 802.11n HT10, Port 0

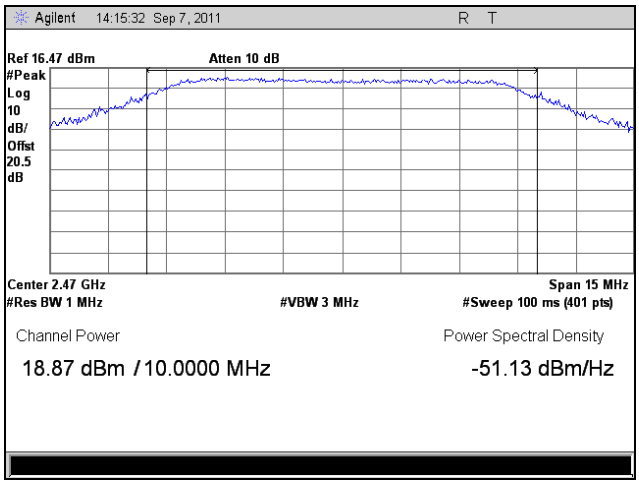
Peak Power Output Test Results, 802.11n HT10, Port 1



Plot 105. Peak Power Output, Low Channel, 802.11n HT10, Port 1

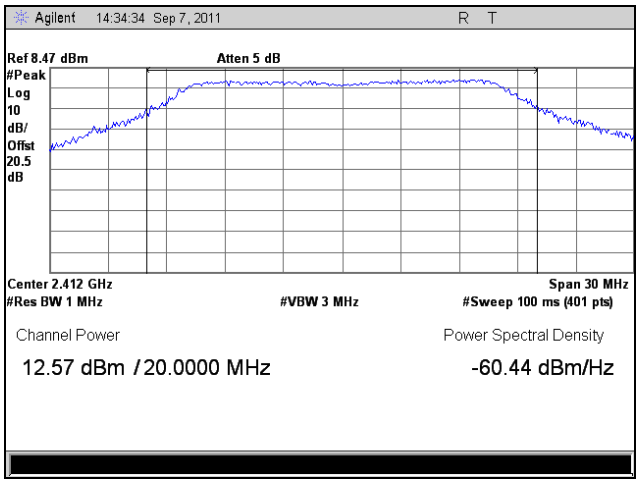


Plot 106. Peak Power Output, Mid Channel, 802.11n HT10, Port 1

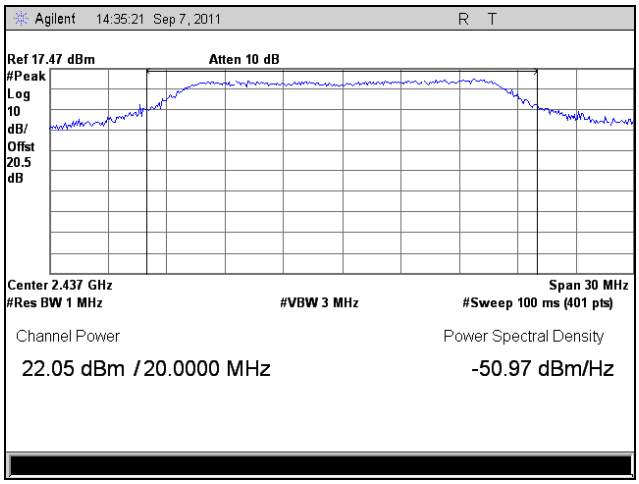


Plot 107. Peak Power Output, High Channel, 802.11n HT10, Port 1

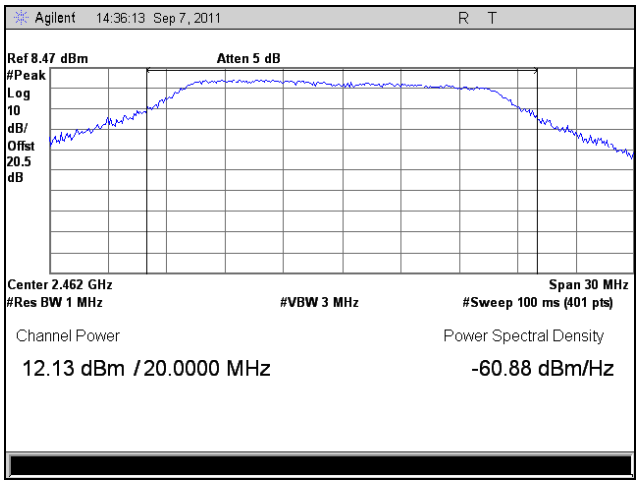
Peak Power Output Test Results, 802.11n HT20, Port 0



Plot 108. Peak Power Output, Low Channel, 802.11n HT20, Port 0

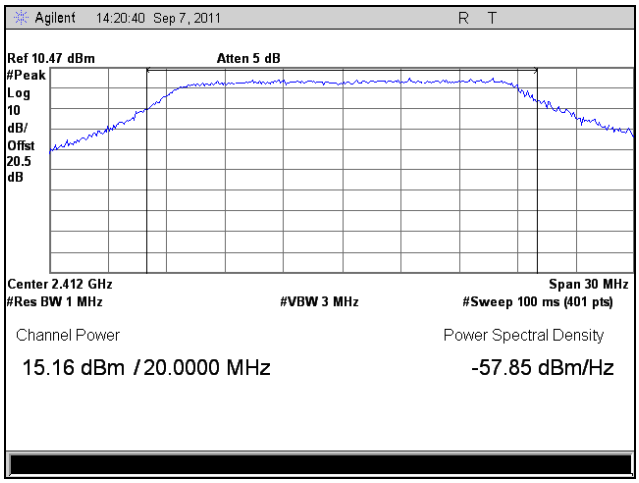


Plot 109. Peak Power Output, Mid Channel, 802.11n HT20, Port 0

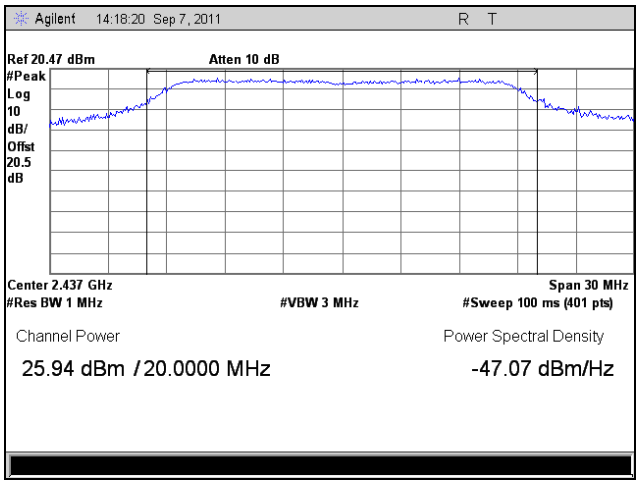


Plot 110. Peak Power Output, High Channel, 802.11n HT20, Port 0

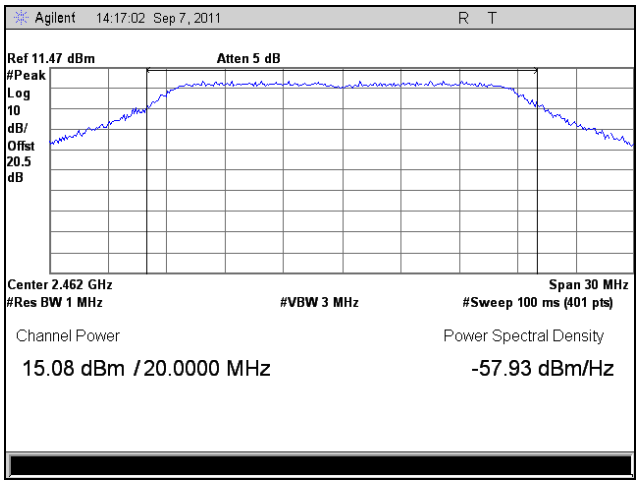
Peak Power Output Test Results, 802.11n HT20, Port 1



Plot 111. Peak Power Output, Low Channel, 802.11n HT20, Port 1

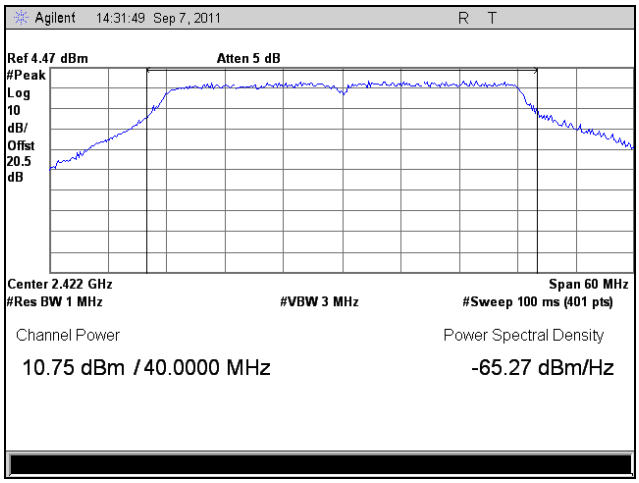


Plot 112. Peak Power Output, Mid Channel, 802.11n HT20, Port 1

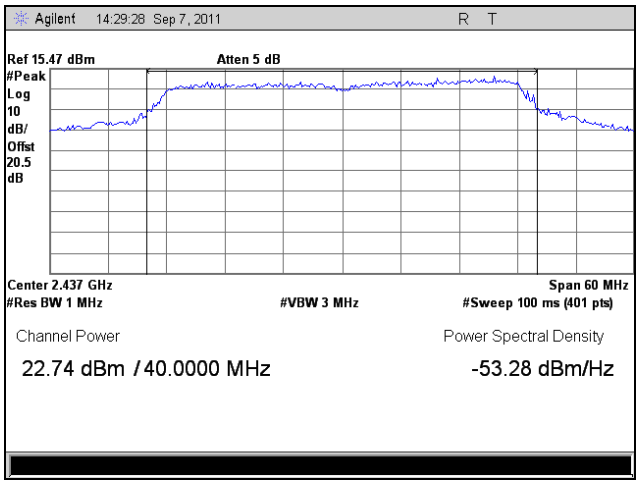


Plot 113. Peak Power Output, High Channel, 802.11n HT20, Port 1

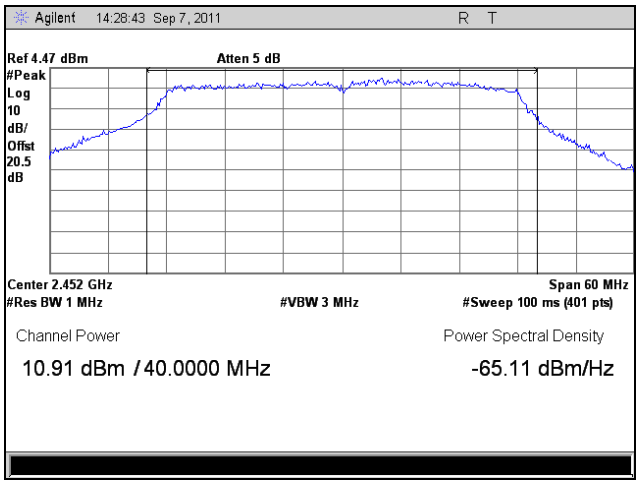
Peak Power Output Test Results, 802.11n HT40, Port 0



Plot 114. Peak Power Output, Low Channel, 802.11n HT40, Port 0

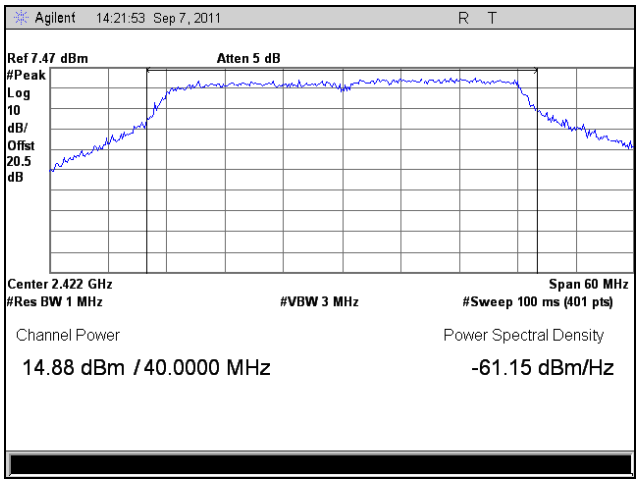


Plot 115. Peak Power Output, Mid Channel, 802.11n HT40, Port 0

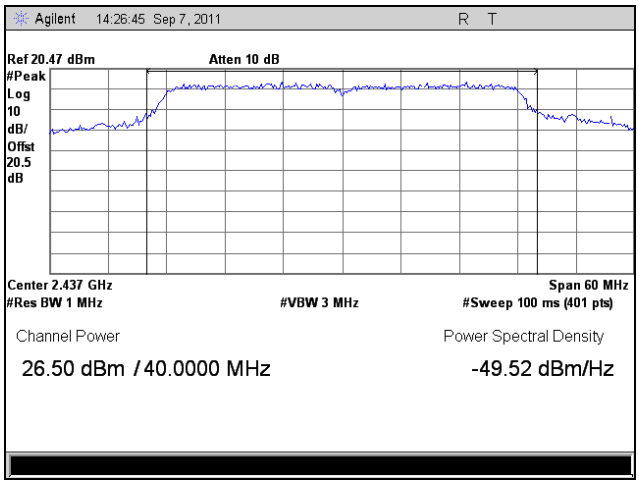


Plot 116. Peak Power Output, High Channel, 802.11n HT40, Port 0

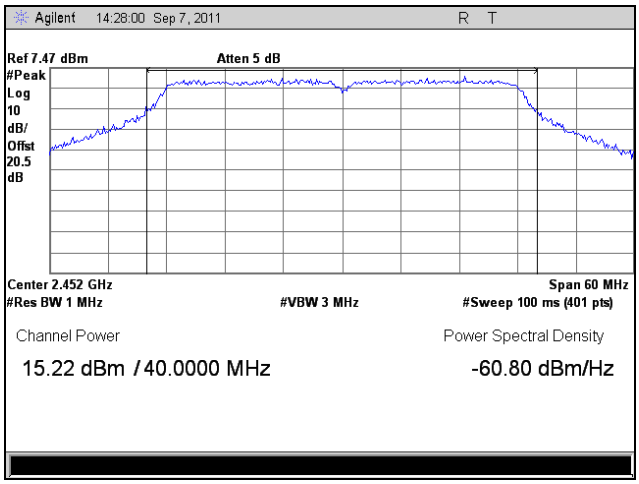
Peak Power Output Test Results, 802.11n HT40, Port 1



Plot 117. Peak Power Output, Low Channel, 802.11n HT40, Port 1



Plot 118. Peak Power Output, Mid Channel, 802.11n HT40, Port 1



Plot 119. Peak Power Output, High Channel, 802.11n HT40, Port 1

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge

Test Requirements: **§15.247(d); §15.205:** Emissions outside the frequency band.

§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110----------	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505----------	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905----------	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128----------	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775----------	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775----------	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218----------	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825----------	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225----------	123–138	2200–2300	14.47–14.5
8.291–8.294----------	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366----------	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675----------	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475----------	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293----------	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025----------	240–285	3345.8–3358 36.	43–36.5
12.57675–12.57725----------	322–335.4	3600–4400	([2])

Table 26. Restricted Bands of Operation

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

Test Requirement(s): **§ 15.209 (a):** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 27.

Frequency (MHz)	§ 15.209(a),Radiated Emission Limits (dBµV) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Table 27. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

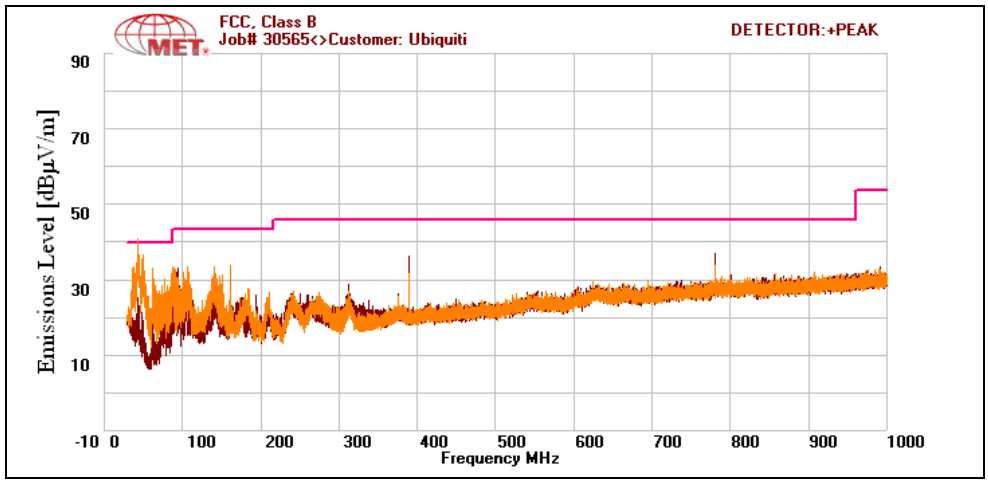
Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured above 18 GHz.

Test Results: The EUT was compliant with the Radiated Spurious Emission limits of **§ 15.247(d)**.

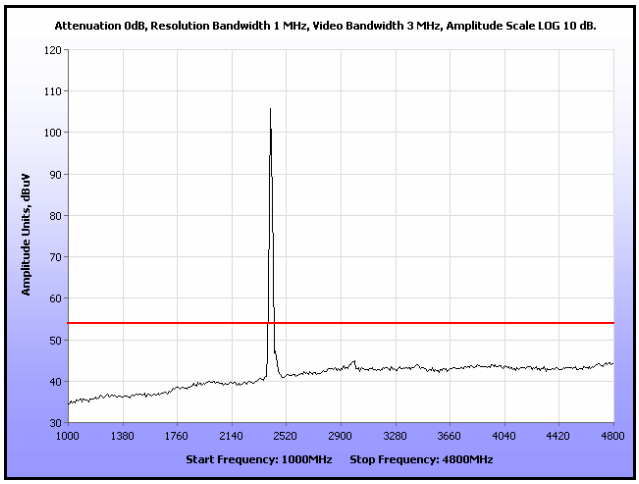
Test Engineer(s): Lionel Gabrillo

Test Date(s): 09/12/11

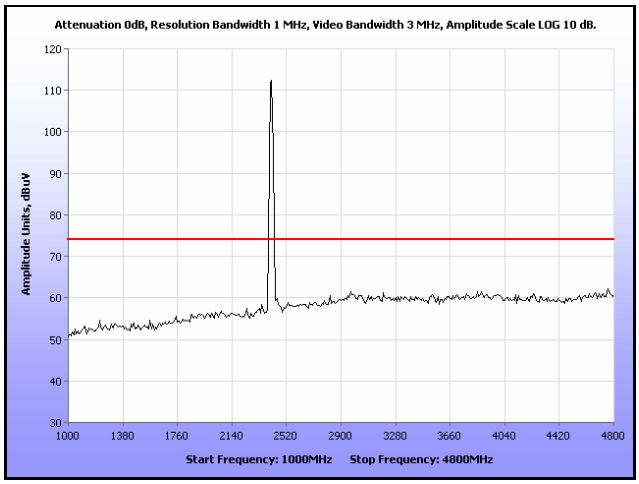
Radiated Spurious Emissions Test Results, 802.11b



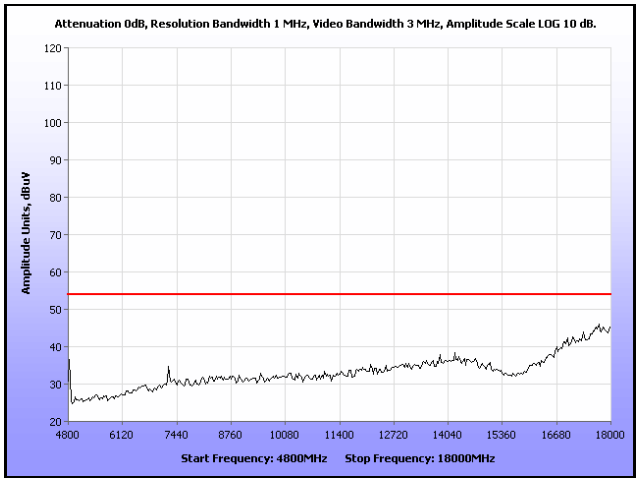
Plot 120. Radiated Spurious Emissions, Low Channel, 802.11b, 30 MHz – 1 GHz



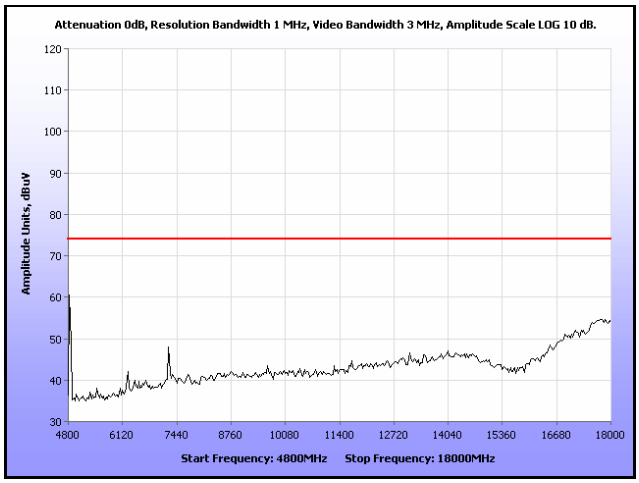
Plot 121. Radiated Spurious Emissions, Low Channel, 802.11b, 1 GHz – 4.8 GHz, Average



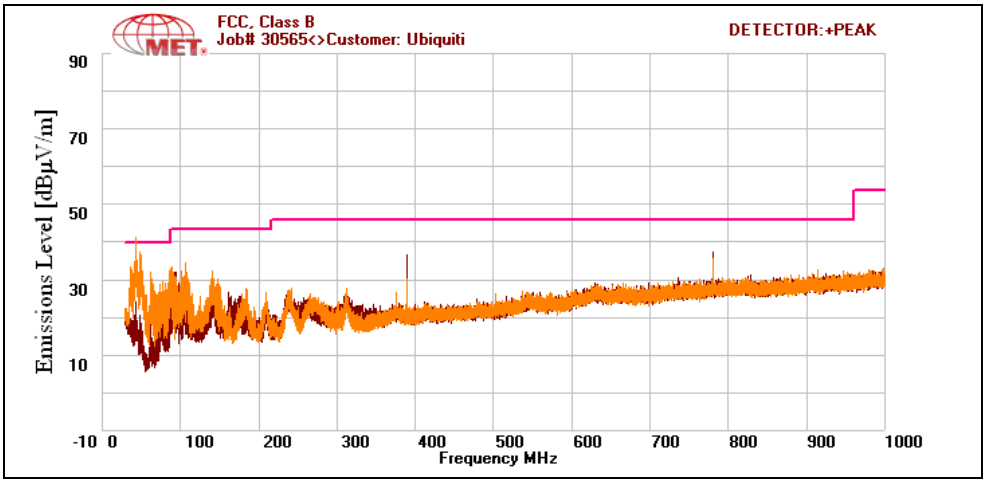
Plot 122. Radiated Spurious Emissions, Low Channel, 802.11b, 1 GHz – 4.8 GHz, Peak



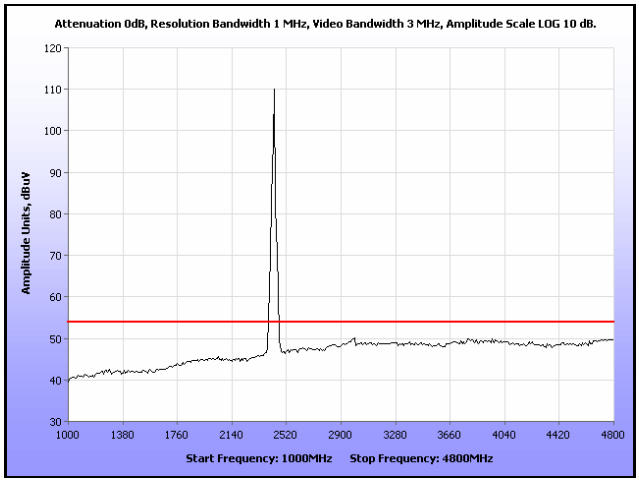
Plot 123. Radiated Spurious Emissions, Low Channel, 802.11b, 4.8 GHz – 18 GHz, Average



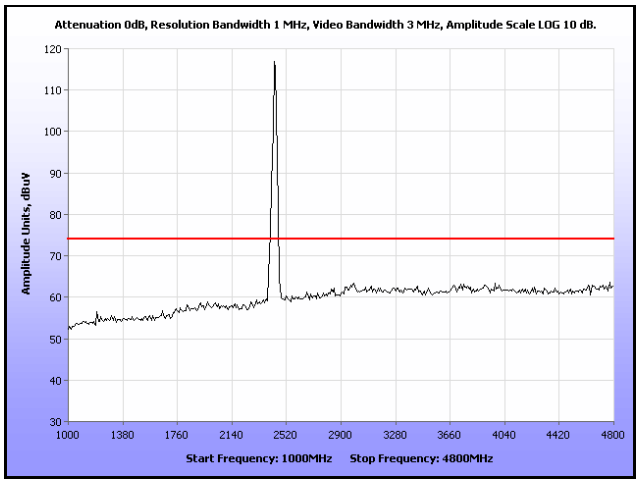
Plot 124. Radiated Spurious Emissions, Low Channel, 802.11b, 4.8 GHz – 18 GHz, Peak



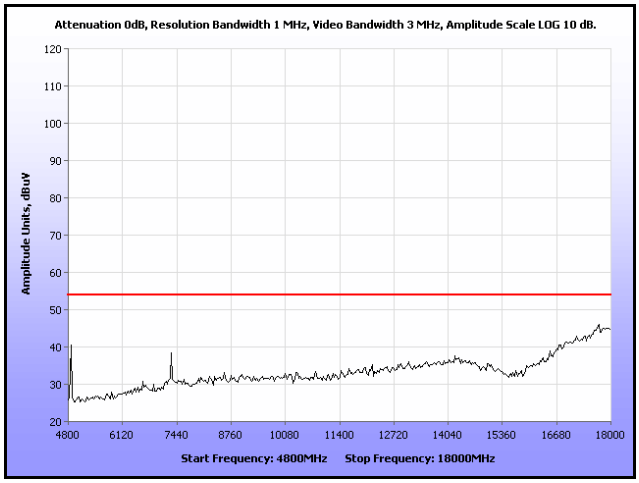
Plot 125. Radiated Spurious Emissions, Mid Channel, 802.11b, 30 MHz – 1 GHz



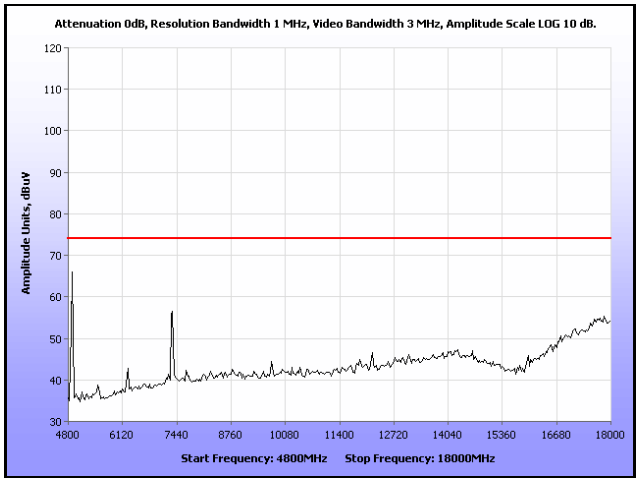
Plot 126. Radiated Spurious Emissions, Mid Channel, 802.11b, 1 GHz – 4.8 GHz, Average



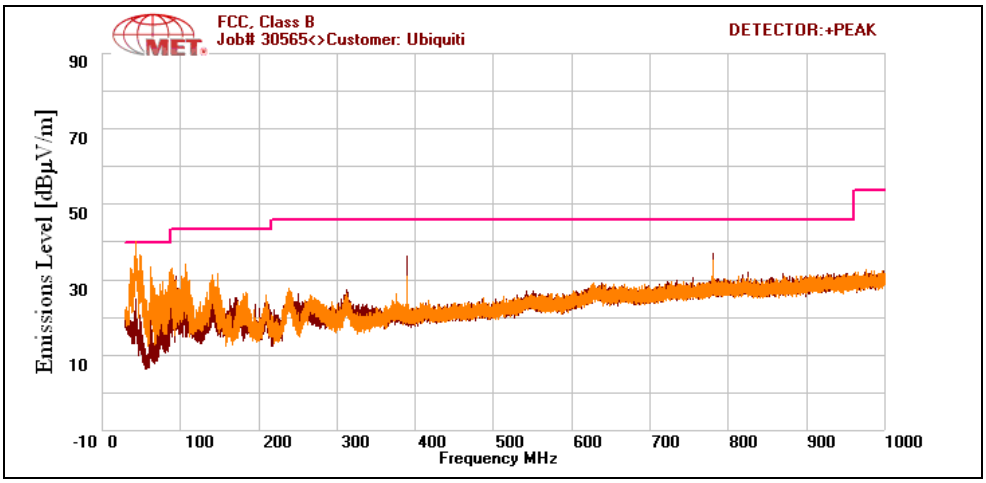
Plot 127. Radiated Spurious Emissions, Mid Channel, 802.11b, 1 GHz – 4.8 GHz, Peak



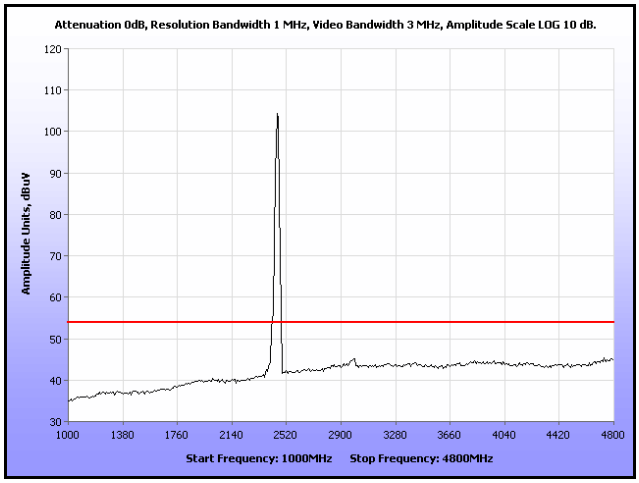
Plot 128. Radiated Spurious Emissions, Mid Channel, 802.11b, 4.8 GHz – 18 GHz, Average



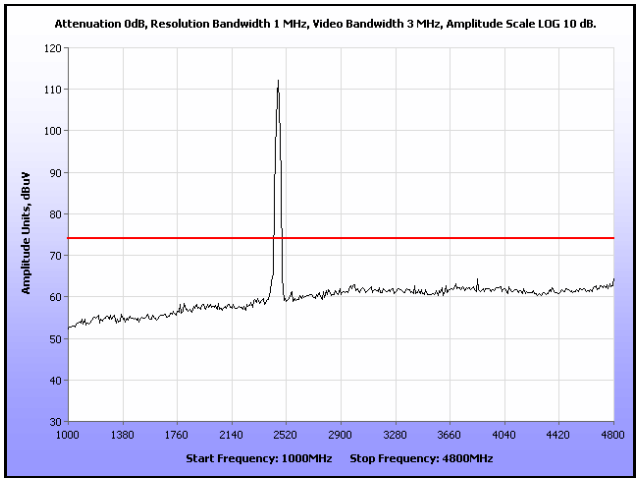
Plot 129. Radiated Spurious Emissions, Mid Channel, 802.11b, 4.8 GHz – 18 GHz, Peak



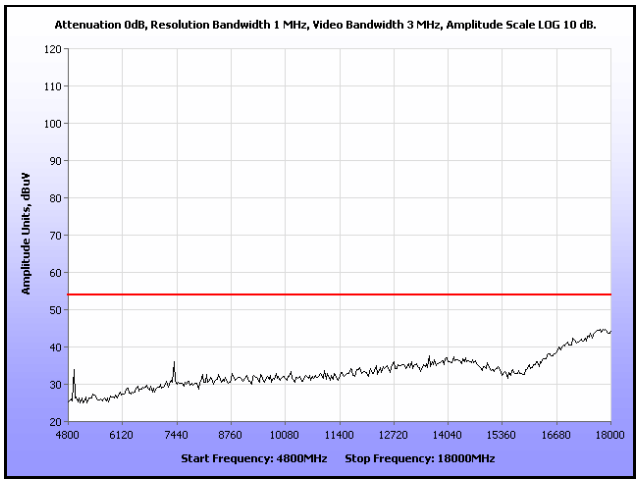
Plot 130. Radiated Spurious Emissions, High Channel, 802.11b, 30 MHz – 1 GHz



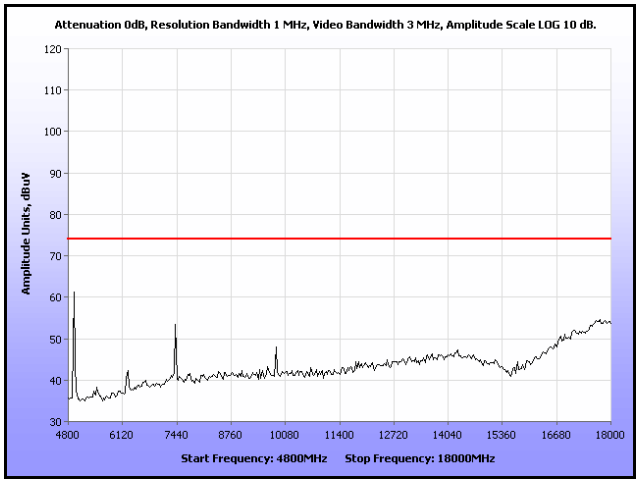
Plot 131. Radiated Spurious Emissions, High Channel, 802.11b, 1 GHz – 4.8 GHz, Average



Plot 132. Radiated Spurious Emissions, High Channel, 802.11b, 1 GHz – 4.8 GHz, Peak

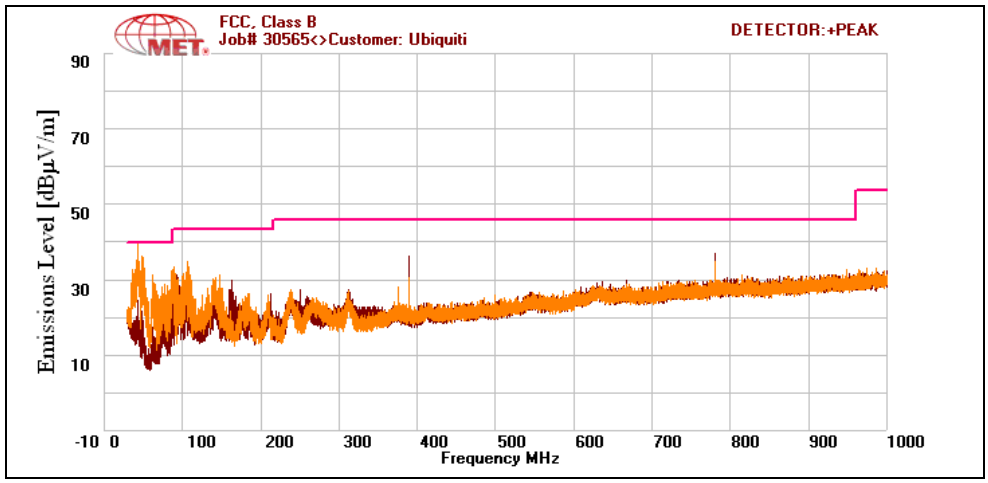


Plot 133. Radiated Spurious Emissions, High Channel, 802.11b, 4.8 GHz – 18 GHz, Average

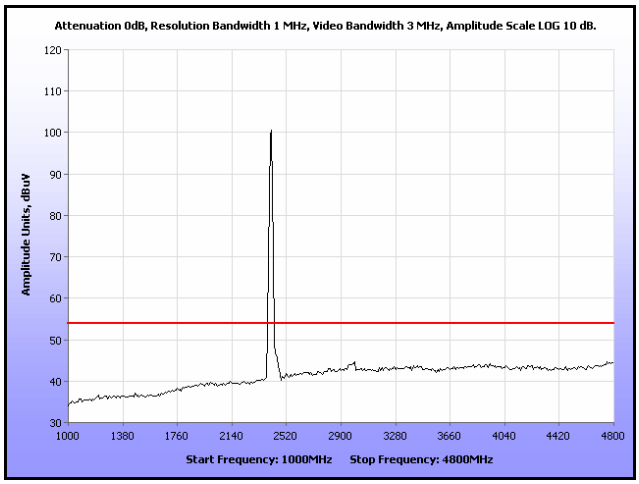


Plot 134. Radiated Spurious Emissions, High Channel, 802.11b, 4.8 GHz – 18 GHz, Peak

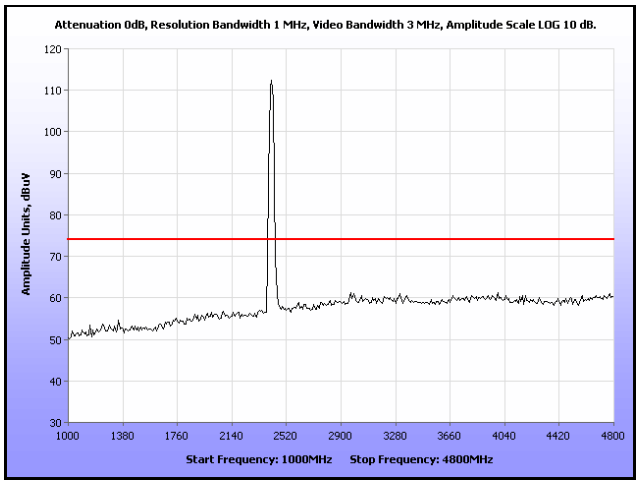
Radiated Spurious Emissions Test Results, 802.11g



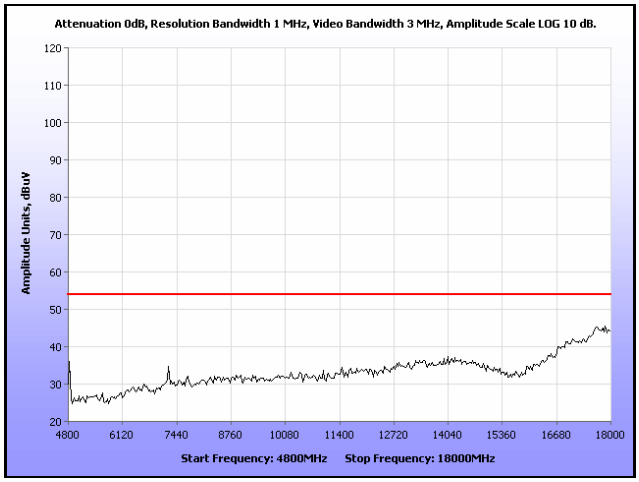
Plot 135. Radiated Spurious Emissions, Low Channel, 802.11g, 30 MHz – 1 GHz



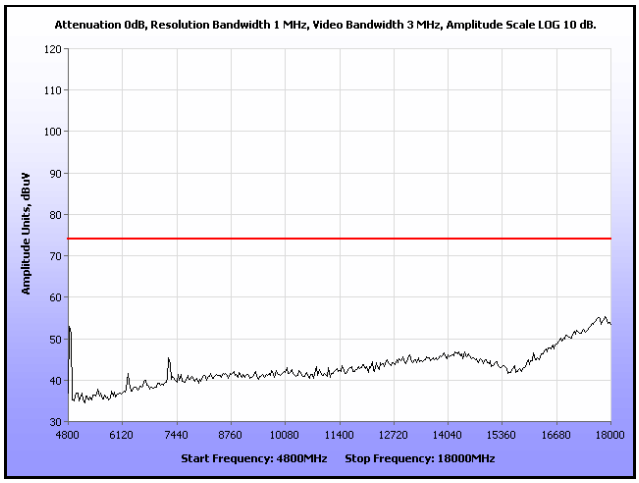
Plot 136. Radiated Spurious Emissions, Low Channel, 802.11g, 1 GHz – 4.8 GHz, Average



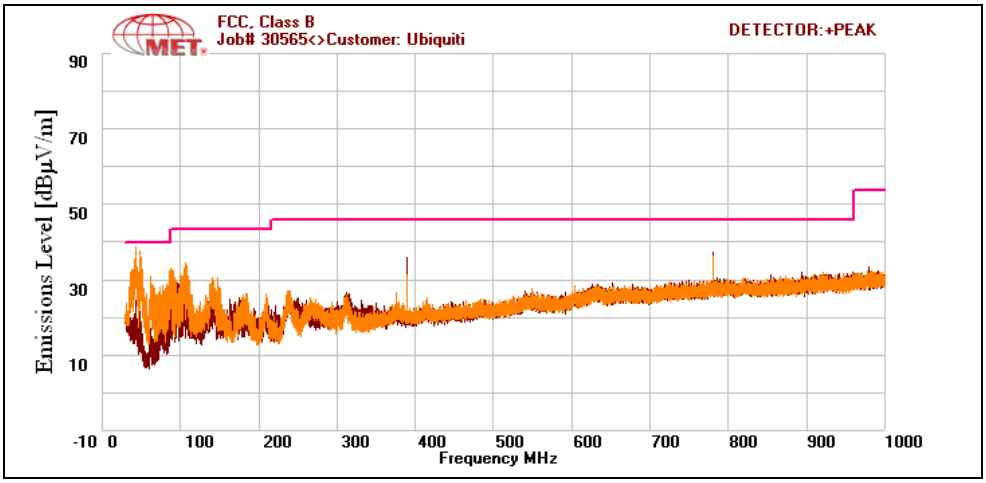
Plot 137. Radiated Spurious Emissions, Low Channel, 802.11g, 1 GHz – 4.8 GHz, Peak



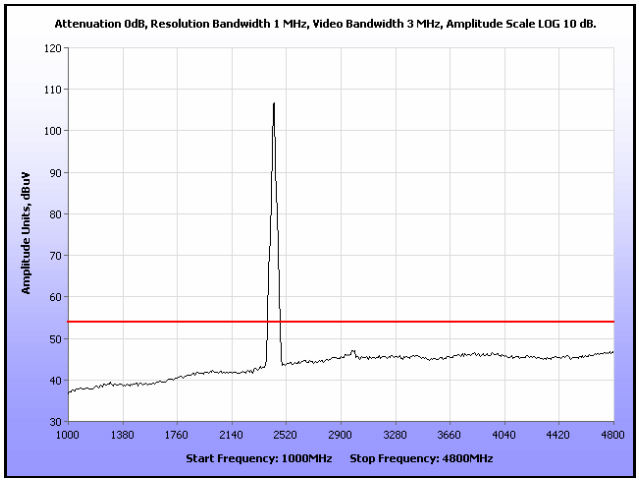
Plot 138. Radiated Spurious Emissions, Low Channel, 802.11g, 4.8 GHz – 18 GHz, Average



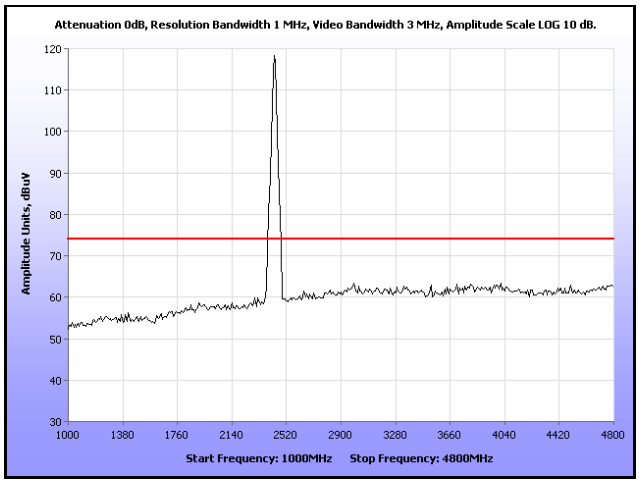
Plot 139. Radiated Spurious Emissions, Low Channel, 802.11g, 4.8 GHz – 18 GHz, Peak



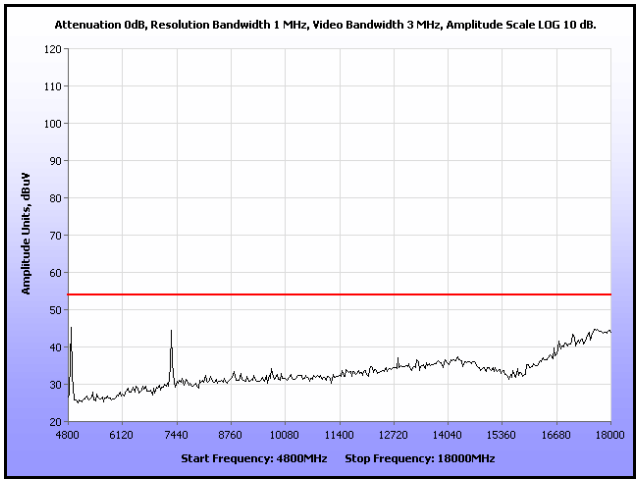
Plot 140. Radiated Spurious Emissions, Mid Channel, 802.11g, 30 MHz – 1 GHz



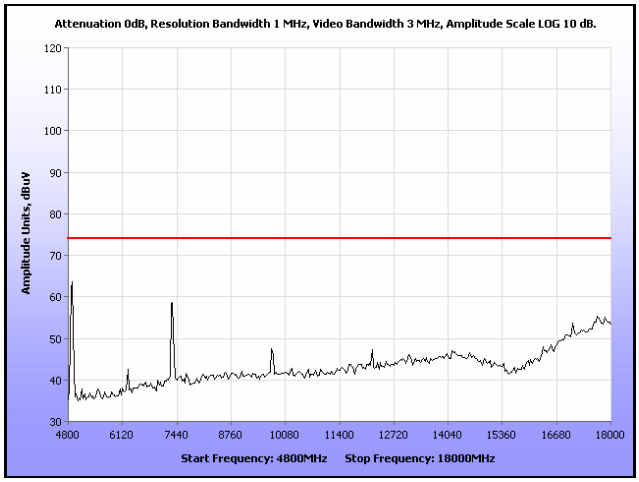
Plot 141. Radiated Spurious Emissions, Mid Channel, 802.11g, 1 GHz – 4.8 GHz, Average



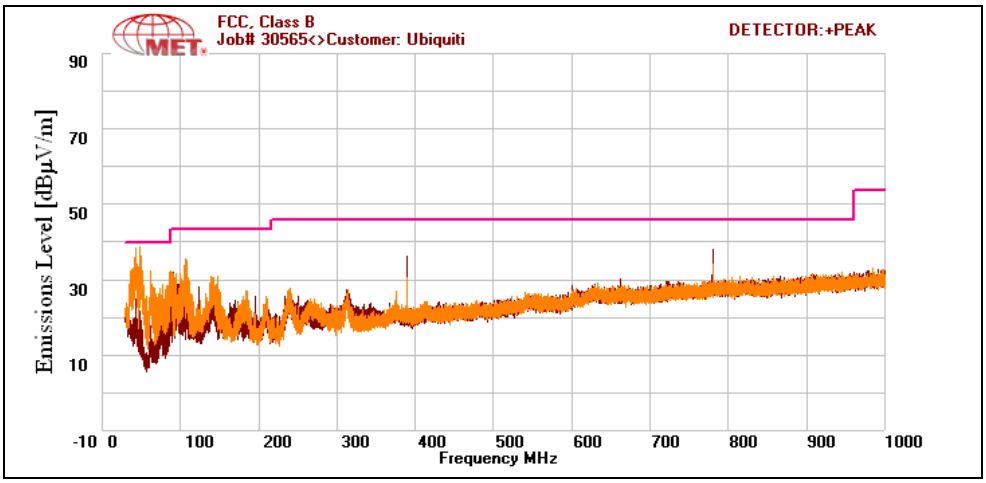
Plot 142. Radiated Spurious Emissions, Mid Channel, 802.11g, 1 GHz – 4.8 GHz, Peak



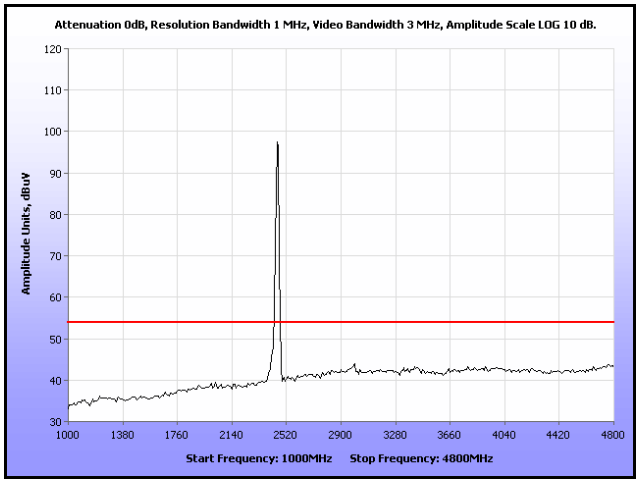
Plot 143. Radiated Spurious Emissions, Mid Channel, 802.11g, 4.8 GHz – 18 GHz, Average



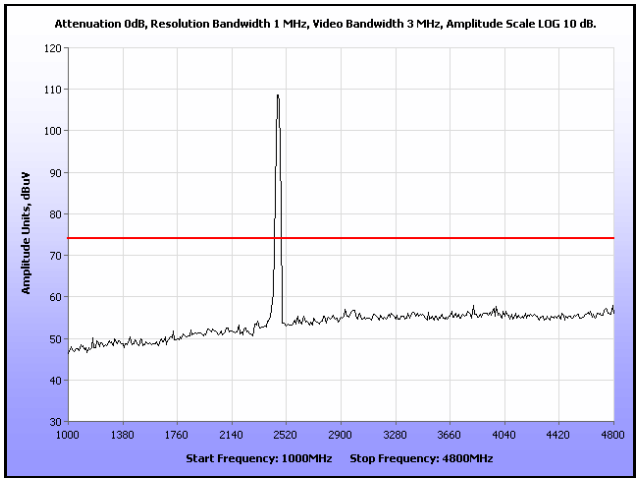
Plot 144. Radiated Spurious Emissions, Mid Channel, 802.11g, 4.8 GHz – 18 GHz, Peak



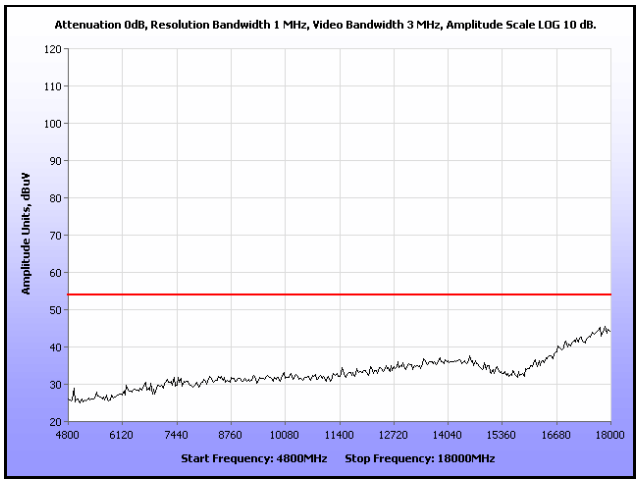
Plot 145. Radiated Spurious Emissions, High Channel, 802.11g, 30 MHz – 1 GHz



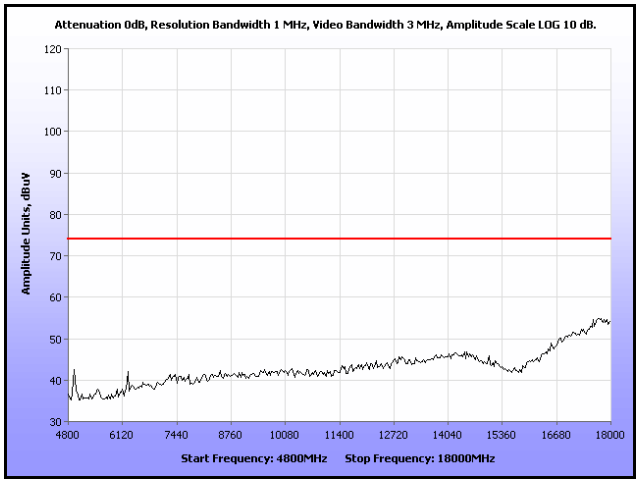
Plot 146. Radiated Spurious Emissions, High Channel, 802.11g, 1 GHz – 4.8 GHz, Average



Plot 147. Radiated Spurious Emissions, High Channel, 802.11g, 1 GHz – 4.8 GHz, Peak

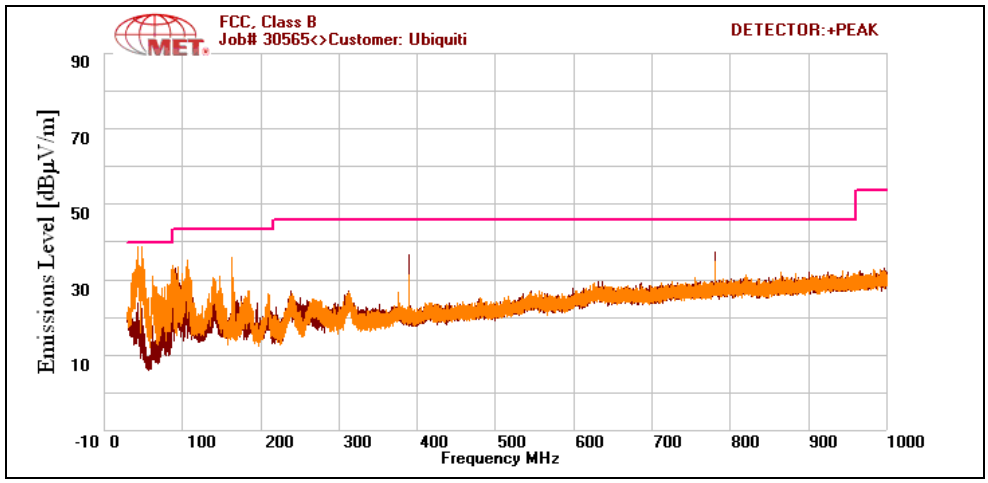


Plot 148. Radiated Spurious Emissions, High Channel, 802.11g, 4.8 GHz – 18 GHz, Average

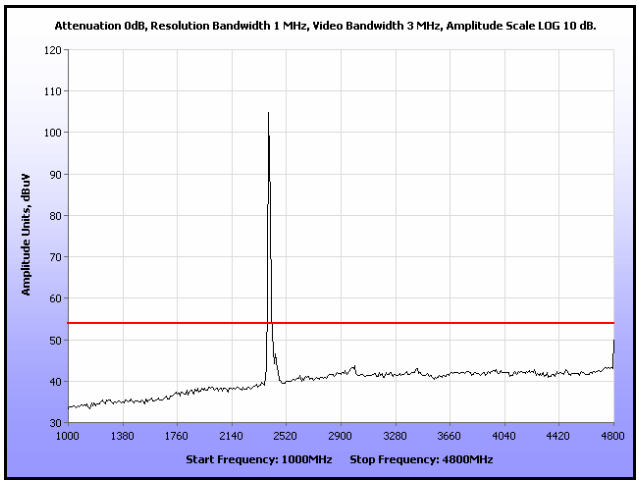


Plot 149. Radiated Spurious Emissions, High Channel, 802.11g, 4.8 GHz – 18 GHz, Peak

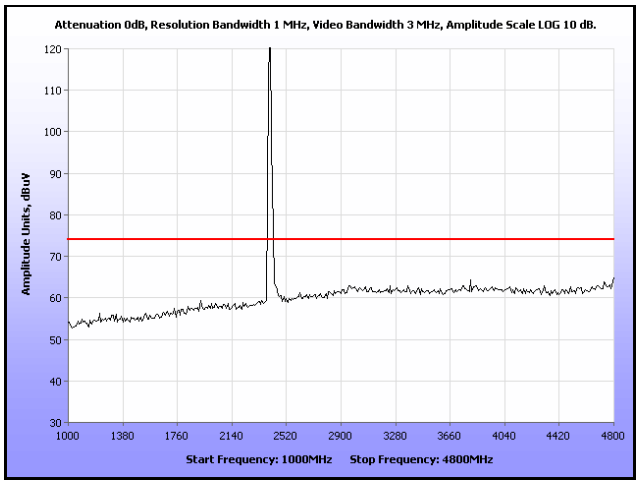
Radiated Spurious Emissions Test Results, 802.11n HT5



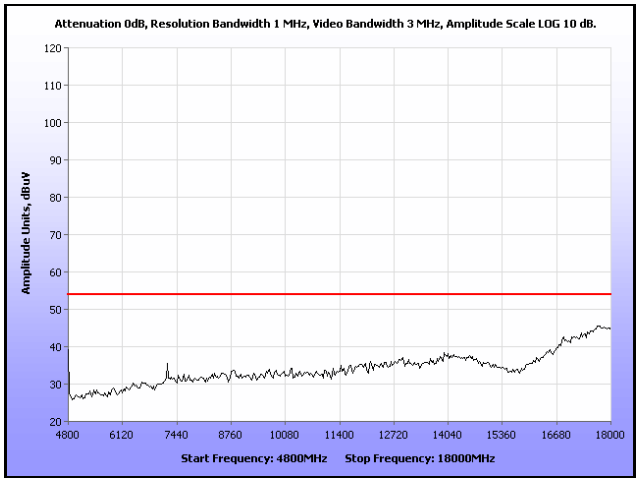
Plot 150. Radiated Spurious Emissions, Low Channel, 802.11n HT5, 30 MHz – 1 GHz



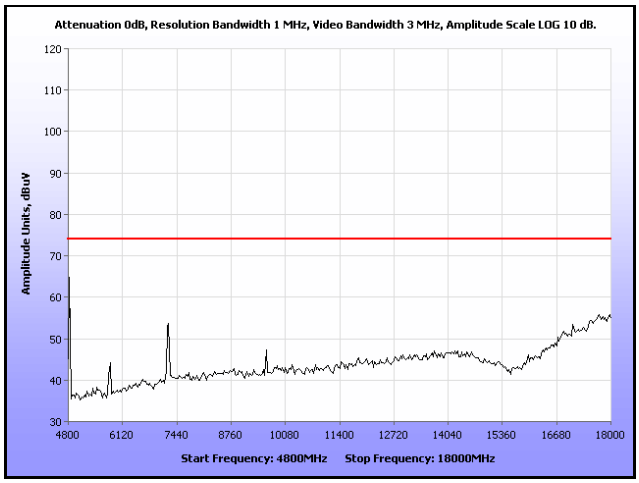
Plot 151. Radiated Spurious Emissions, Low Channel, 802.11n HT5, 1 GHz – 4.8 GHz, Average



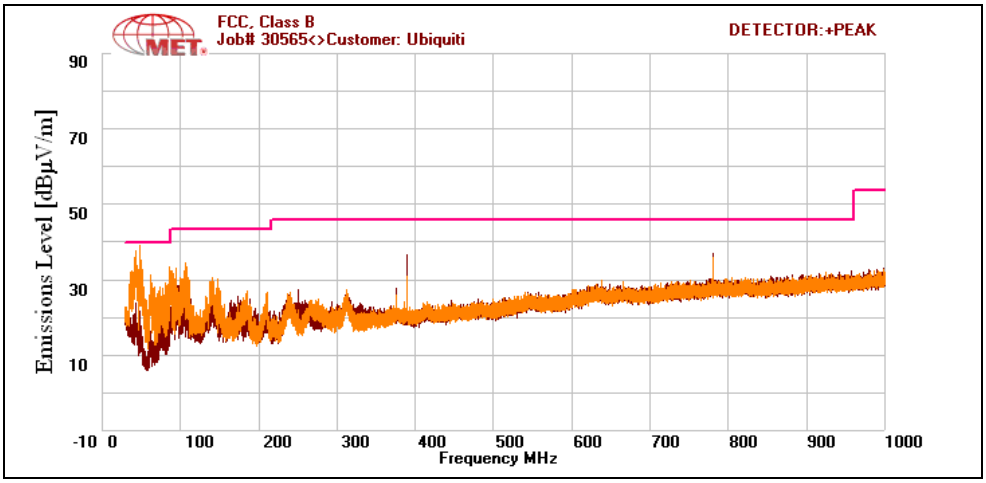
Plot 152. Radiated Spurious Emissions, Low Channel, 802.11n HT5, 1 GHz – 4.8 GHz, Peak



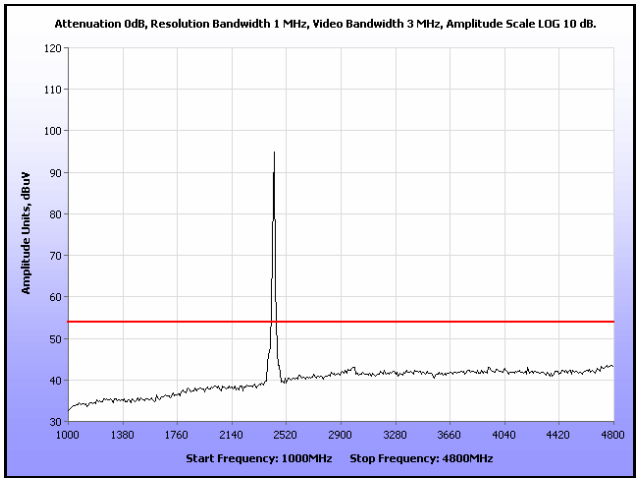
Plot 153. Radiated Spurious Emissions, Low Channel, 802.11n HT5, 4.8 GHz – 18 GHz, Average



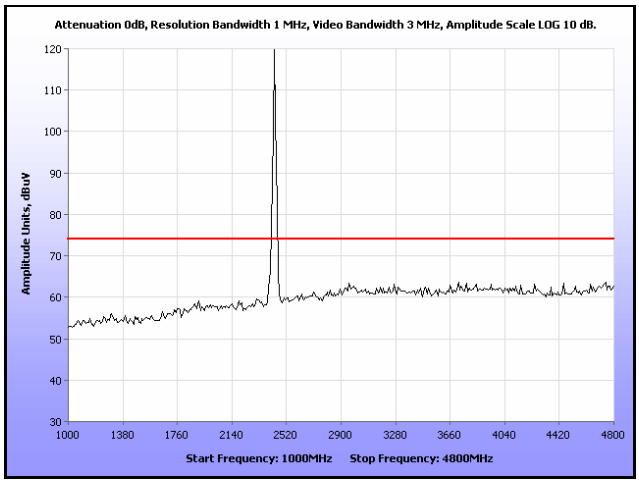
Plot 154. Radiated Spurious Emissions, Low Channel, 802.11n HT5, 4.8 GHz – 18 GHz, Peak



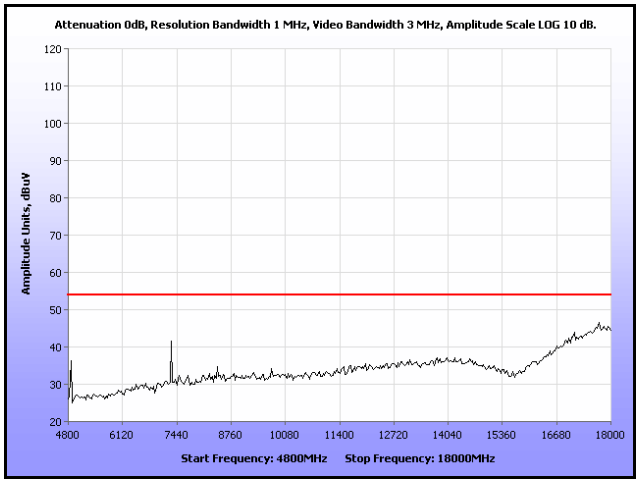
Plot 155. Radiated Spurious Emissions, Mid Channel, 802.11n HT5, 30 MHz – 1 GHz



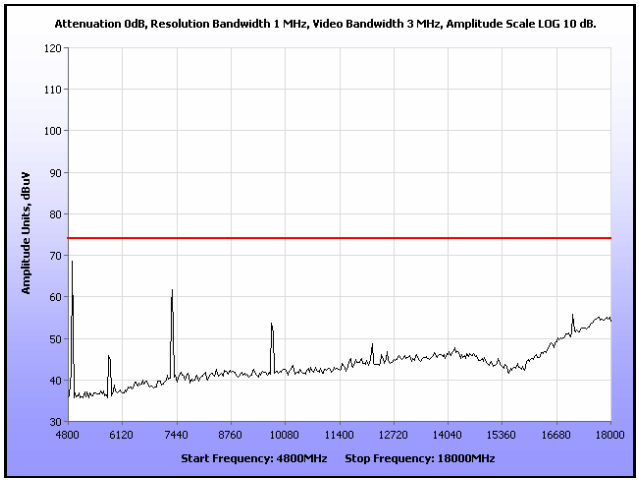
Plot 156. Radiated Spurious Emissions, Mid Channel, 802.11n HT5, 1 GHz – 4.8 GHz, Average



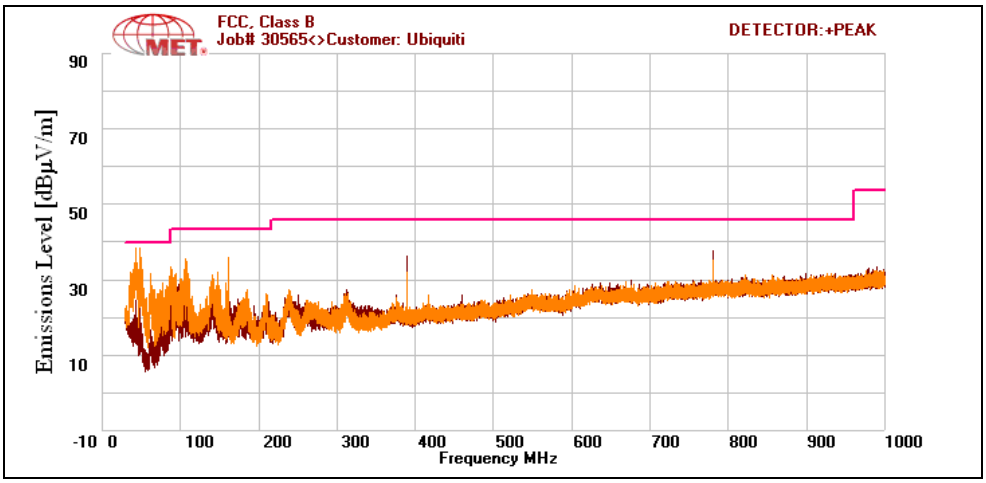
Plot 157. Radiated Spurious Emissions, Mid Channel, 802.11n HT5, 1 GHz – 4.8 GHz, Peak



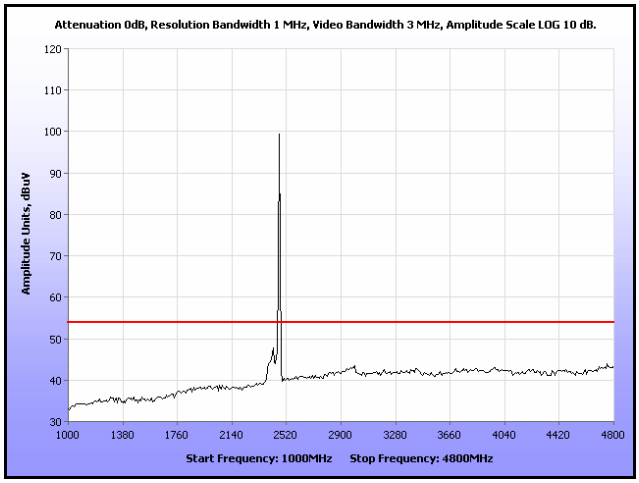
Plot 158. Radiated Spurious Emissions, Mid Channel, 802.11n HT5, 4.8 GHz – 18 GHz, Average



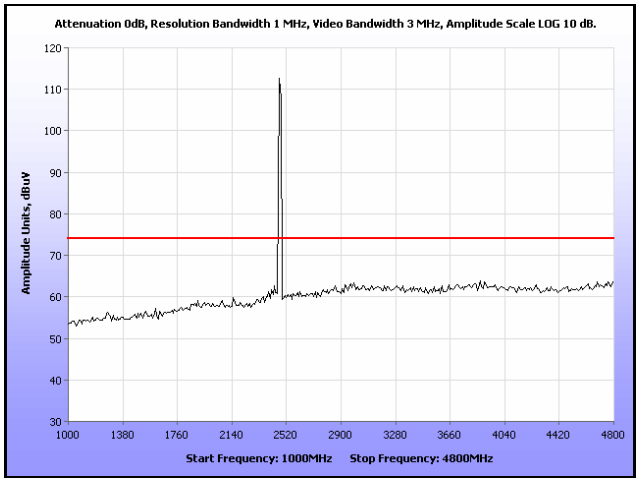
Plot 159. Radiated Spurious Emissions, Mid Channel, 802.11n HT5, 4.8 GHz – 18 GHz, Peak



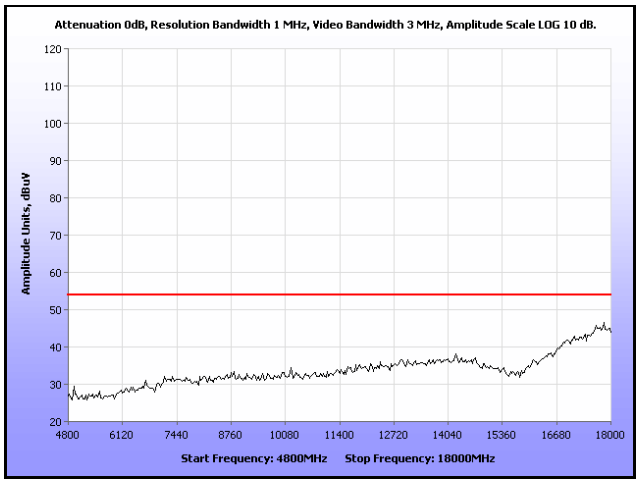
Plot 160. Radiated Spurious Emissions, High Channel, 802.11n HT5, 30 MHz – 1 GHz



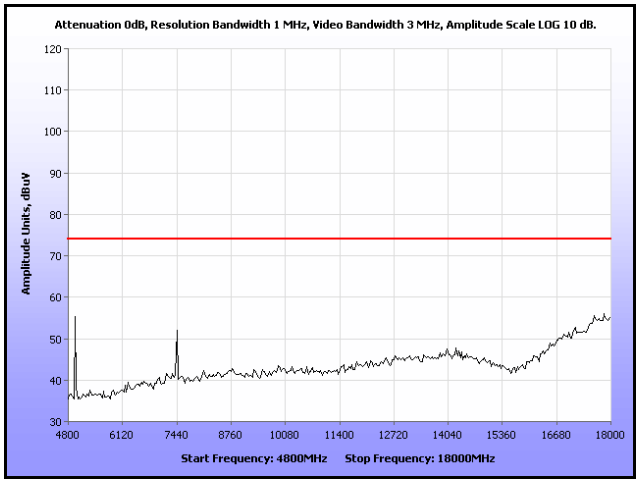
Plot 161. Radiated Spurious Emissions, High Channel, 802.11n HT5, 1 GHz – 4.8 GHz, Average



Plot 162. Radiated Spurious Emissions, High Channel, 802.11n HT5, 1 GHz – 4.8 GHz, Peak

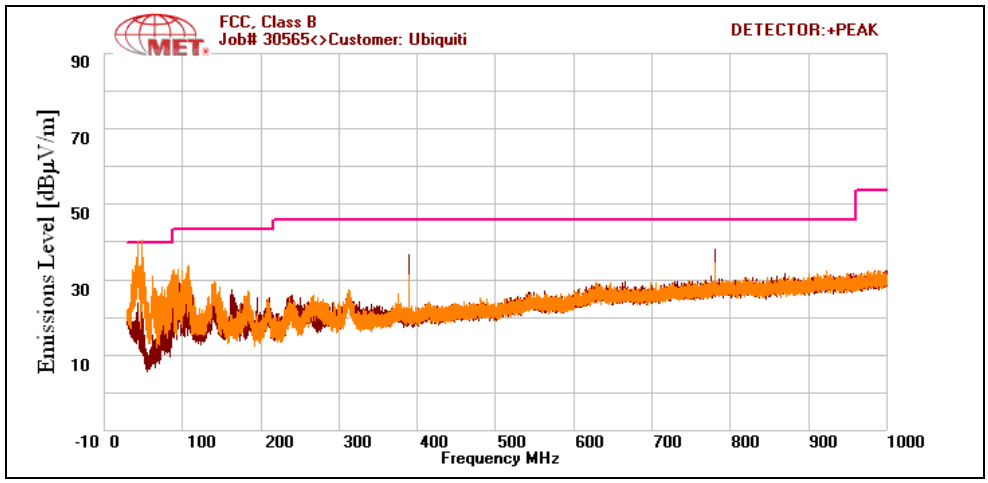


Plot 163. Radiated Spurious Emissions, High Channel, 802.11n HT5, 4.8 GHz – 18 GHz, Average

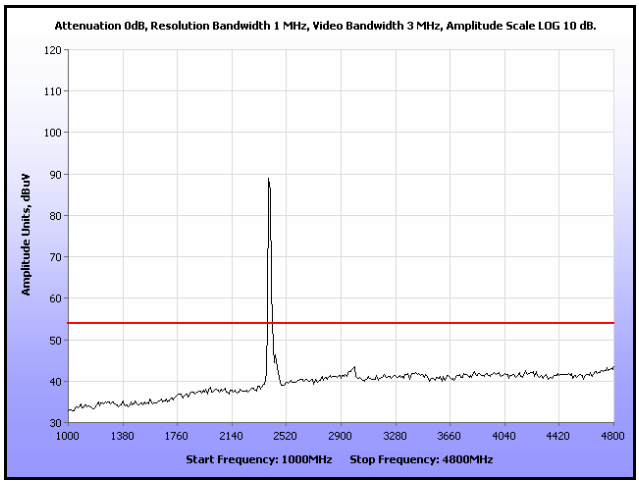


Plot 164. Radiated Spurious Emissions, High Channel, 802.11n HT5, 4.8 GHz – 18 GHz, Peak

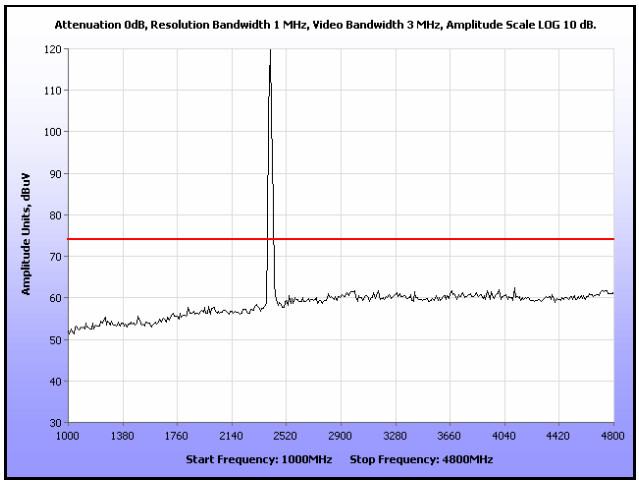
Radiated Spurious Emissions Test Results, 802.11n HT8



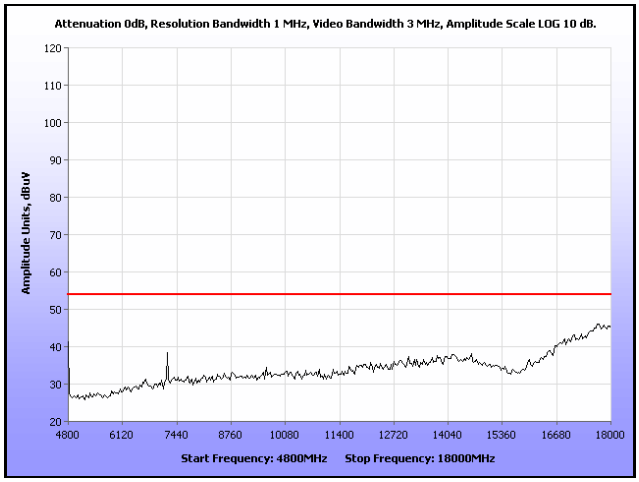
Plot 165. Radiated Spurious Emissions, Low Channel, 802.11n HT8, 30 MHz – 1 GHz



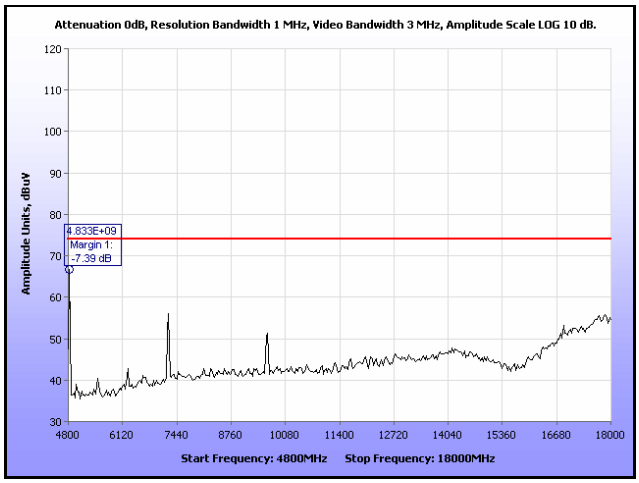
Plot 166. Radiated Spurious Emissions, Low Channel, 802.11n HT8, 1 GHz – 4.8 GHz, Average



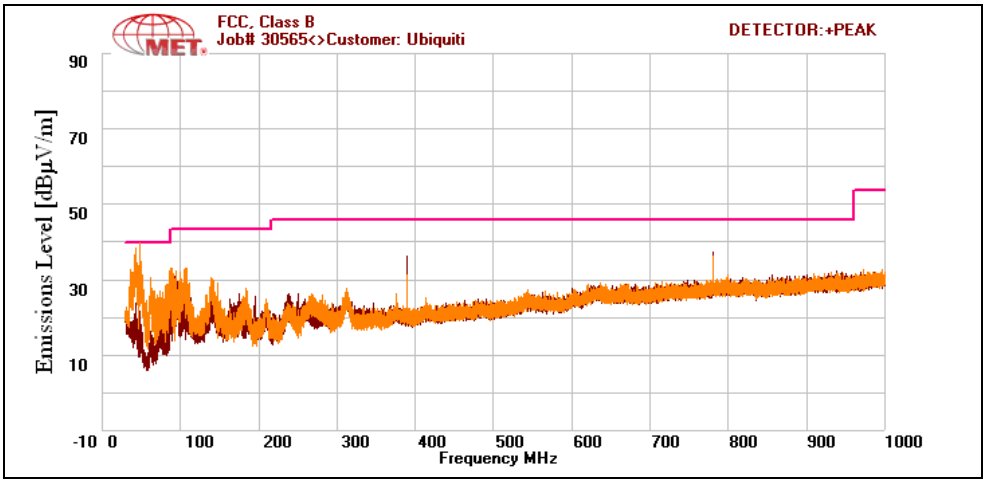
Plot 167. Radiated Spurious Emissions, Low Channel, 802.11n HT8, 1 GHz – 4.8 GHz, Peak



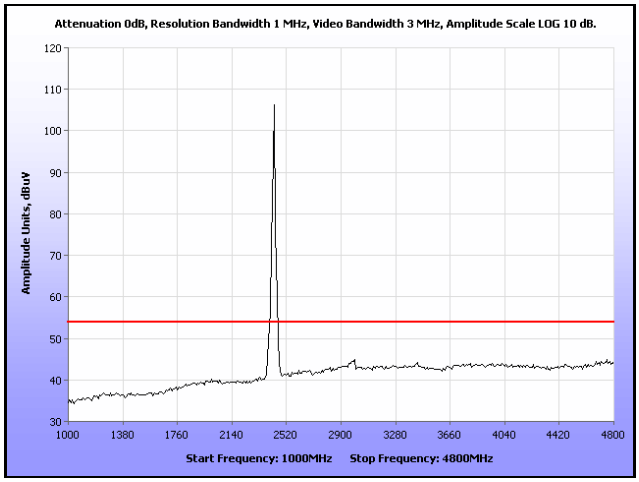
Plot 168. Radiated Spurious Emissions, Low Channel, 802.11n HT8, 4.8 GHz – 18 GHz, Average



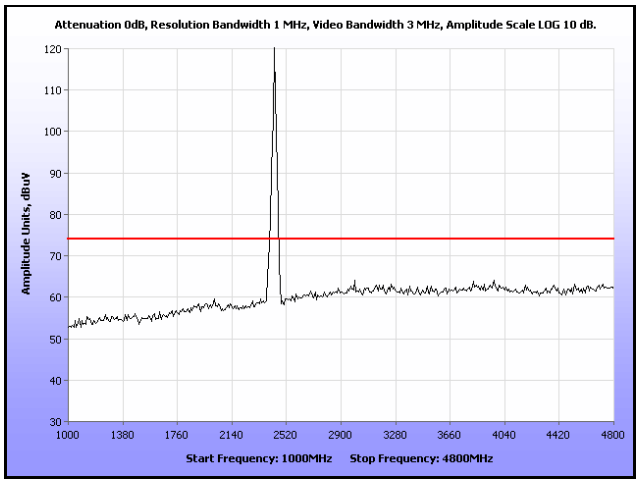
Plot 169. Radiated Spurious Emissions, Low Channel, 802.11n HT8, 4.8 GHz – 18 GHz, Peak



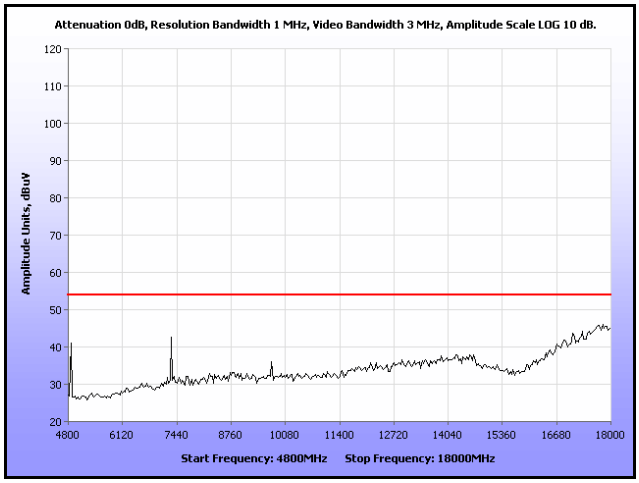
Plot 170. Radiated Spurious Emissions, Mid Channel, 802.11n HT8, 30 MHz – 1 GHz



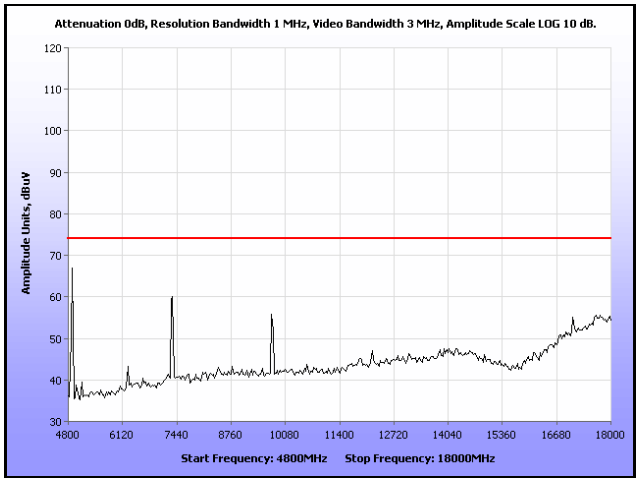
Plot 171. Radiated Spurious Emissions, Mid Channel, 802.11n HT8, 1 GHz – 4.8 GHz, Average



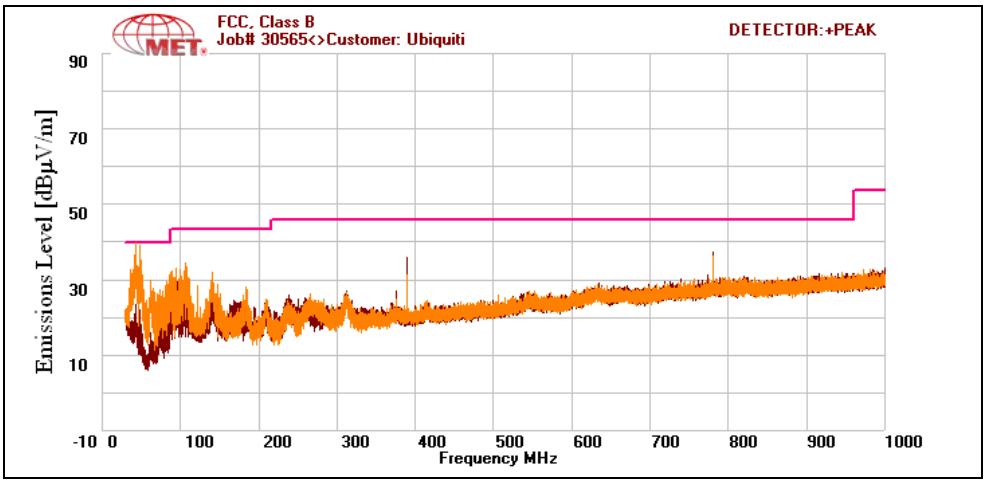
Plot 172. Radiated Spurious Emissions, Mid Channel, 802.11n HT8, 1 GHz – 4.8 GHz, Peak



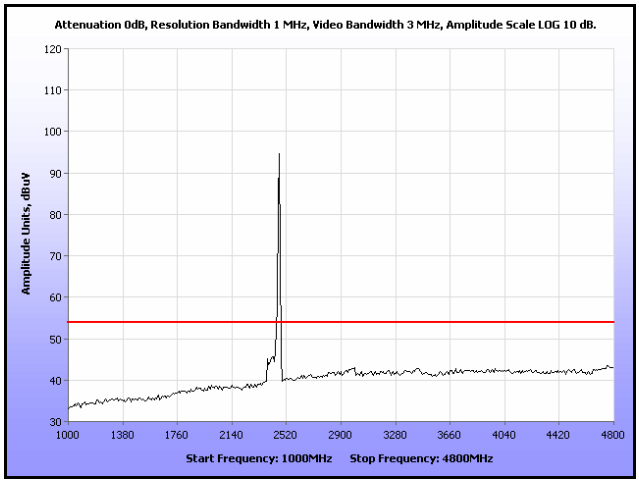
Plot 173. Radiated Spurious Emissions, Mid Channel, 802.11n HT8, 4.8 GHz – 18 GHz, Average



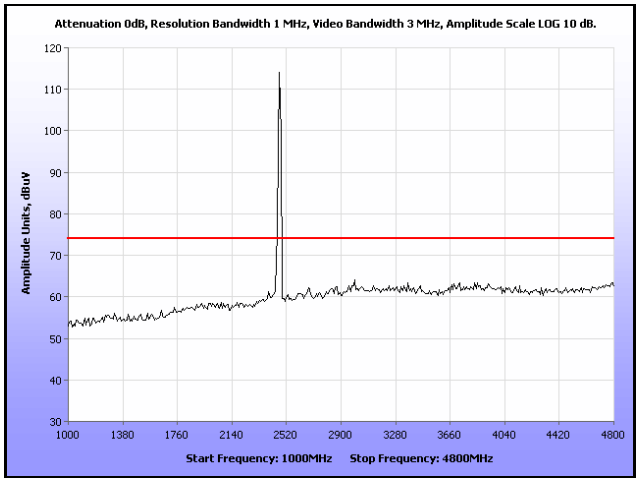
Plot 174. Radiated Spurious Emissions, Mid Channel, 802.11n HT8, 4.8 GHz – 18 GHz, Peak



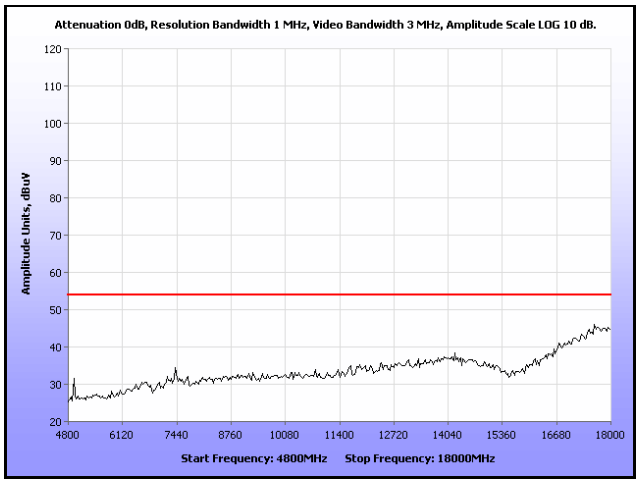
Plot 175. Radiated Spurious Emissions, High Channel, 802.11n HT8, 30 MHz – 1 GHz



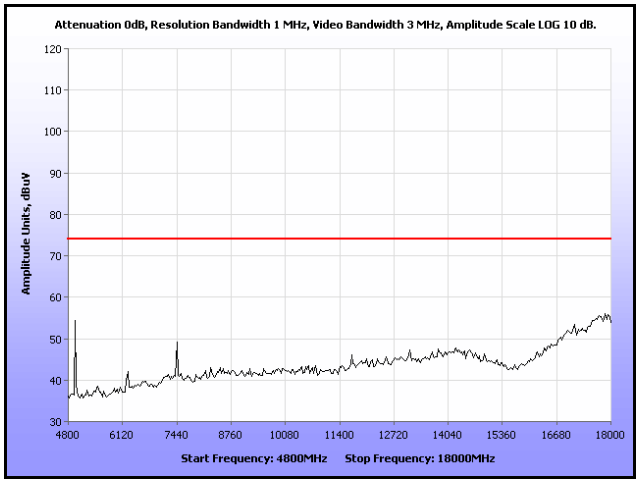
Plot 176. Radiated Spurious Emissions, High Channel, 802.11n HT8, 1 GHz – 4.8 GHz, Average



Plot 177. Radiated Spurious Emissions, High Channel, 802.11n HT8, 1 GHz – 4.8 GHz, Peak

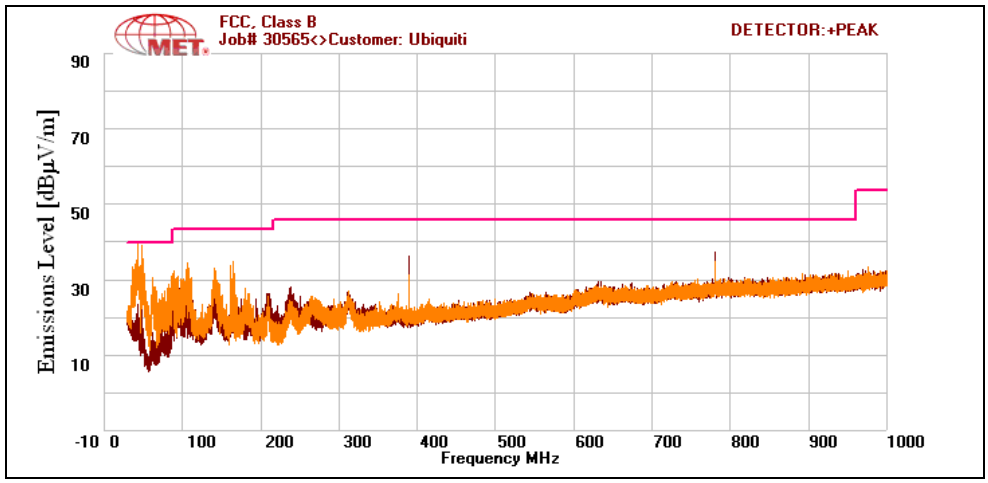


Plot 178. Radiated Spurious Emissions, High Channel, 802.11n HT8, 4.8 GHz – 18 GHz, Average

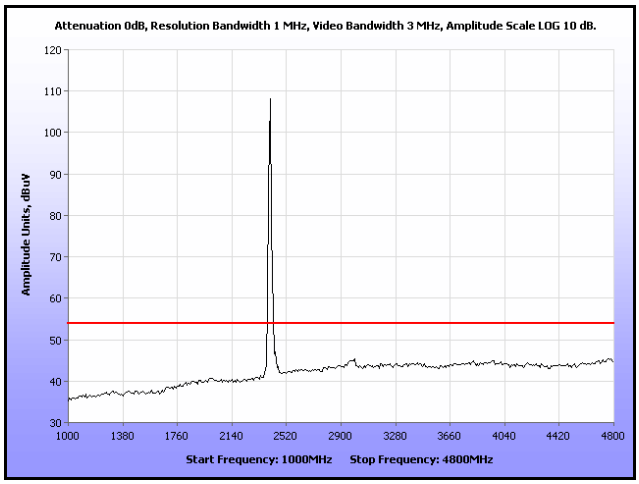


Plot 179. Radiated Spurious Emissions, High Channel, 802.11n HT8, 4.8 GHz – 18 GHz, Peak

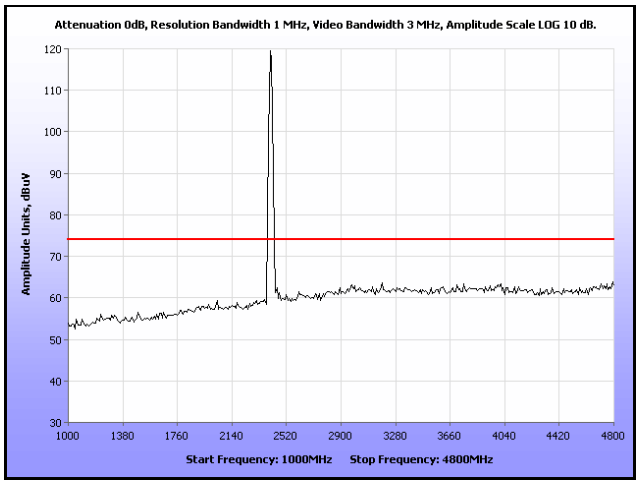
Radiated Spurious Emissions Test Results, 802.11n HT10



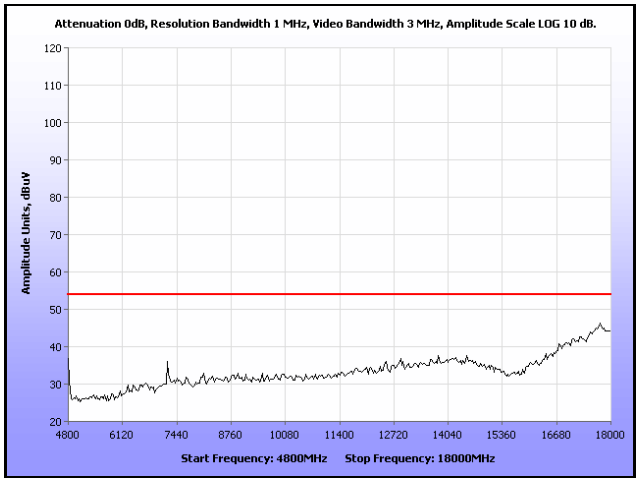
Plot 180. Radiated Spurious Emissions, Low Channel, 802.11n HT10, 30 MHz – 1 GHz



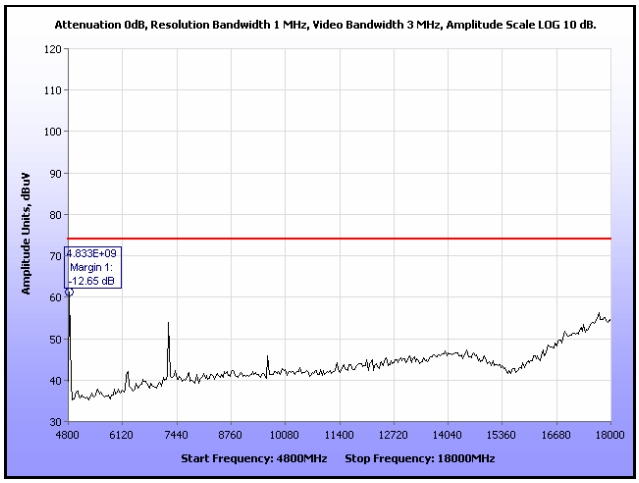
Plot 181. Radiated Spurious Emissions, Low Channel, 802.11n HT10, 1 GHz – 4.8 GHz, Average



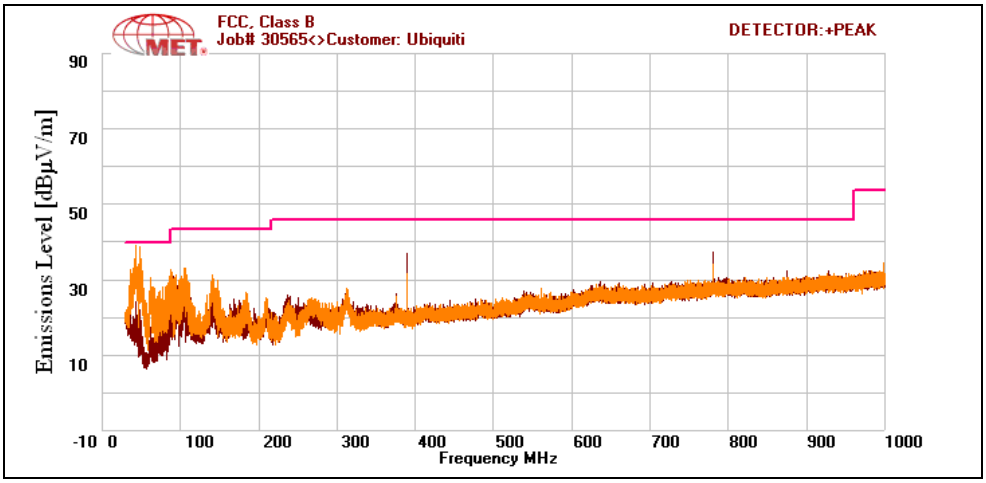
Plot 182. Radiated Spurious Emissions, Low Channel, 802.11n HT10, 1 GHz – 4.8 GHz, Peak



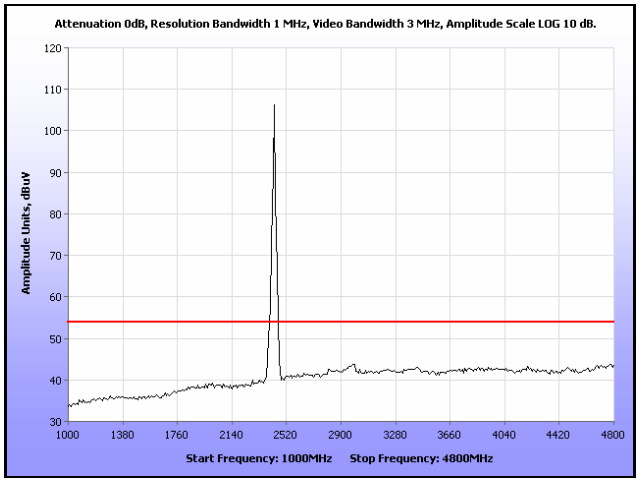
Plot 183. Radiated Spurious Emissions, Low Channel, 802.11n HT10, 4.8 GHz – 18 GHz, Average



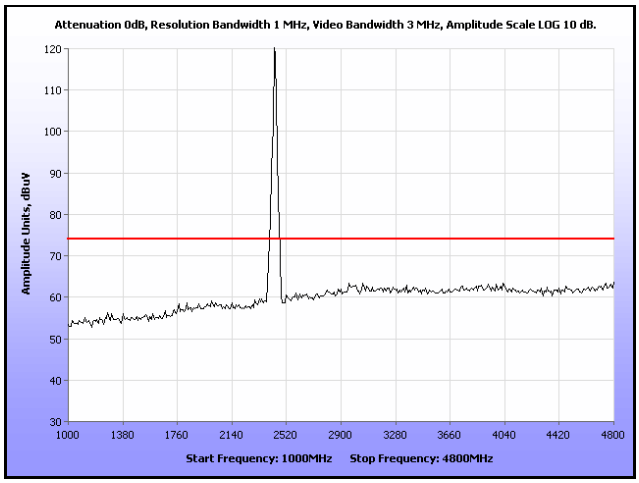
Plot 184. Radiated Spurious Emissions, Low Channel, 802.11n HT10, 4.8 GHz – 18 GHz, Peak



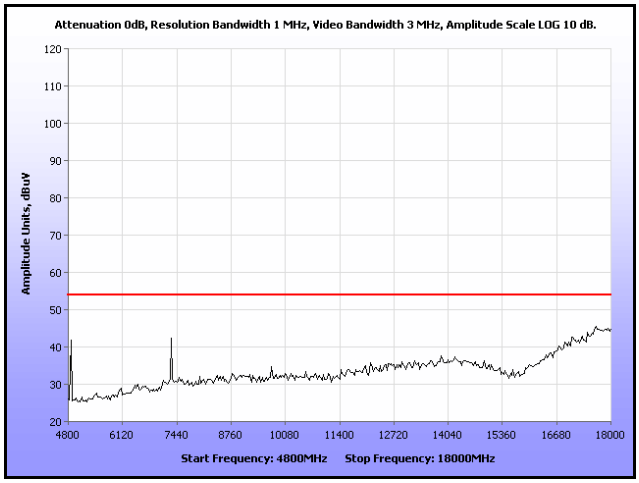
Plot 185. Radiated Spurious Emissions, Mid Channel, 802.11n HT10, 30 MHz – 1 GHz



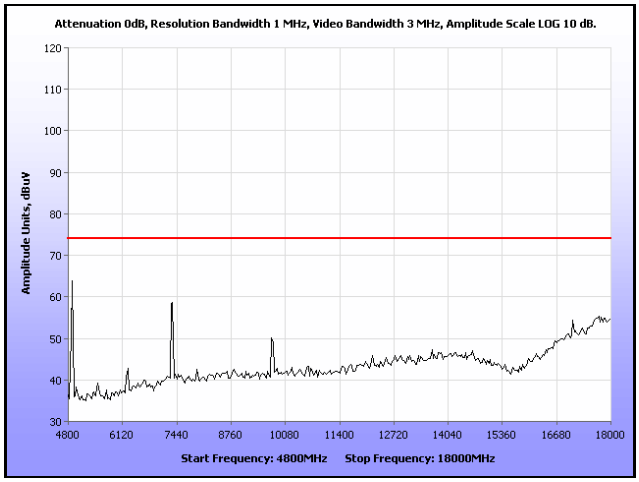
Plot 186. Radiated Spurious Emissions, Mid Channel, 802.11n HT10, 1 GHz – 4.8 GHz, Average



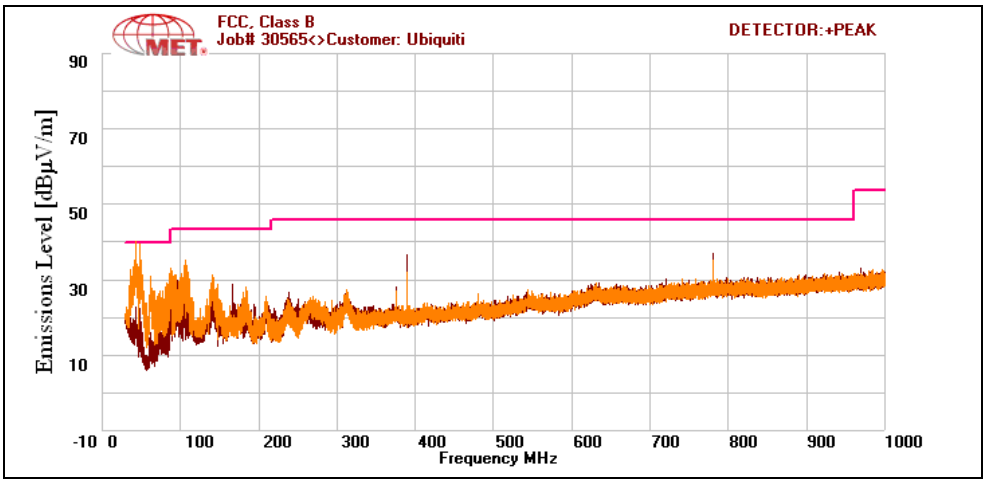
Plot 187. Radiated Spurious Emissions, Mid Channel, 802.11n HT10, 1 GHz – 4.8 GHz, Peak



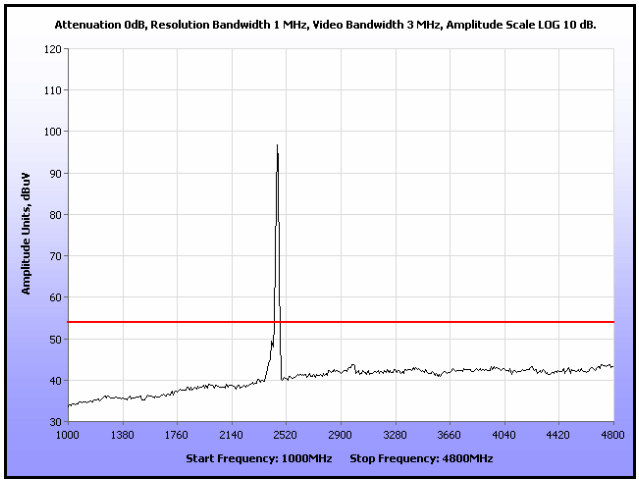
Plot 188. Radiated Spurious Emissions, Mid Channel, 802.11n HT10, 4.8 GHz – 18 GHz, Average



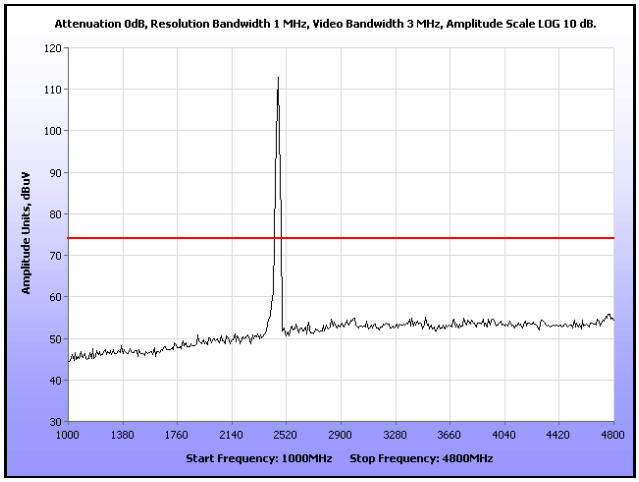
Plot 189. Radiated Spurious Emissions, Mid Channel, 802.11n HT10, 4.8 GHz – 18 GHz, Peak



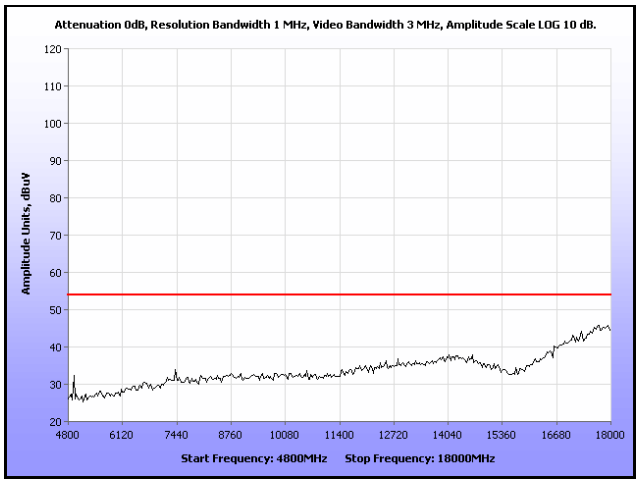
Plot 190. Radiated Spurious Emissions, High Channel, 802.11n HT10, 30 MHz – 1 GHz



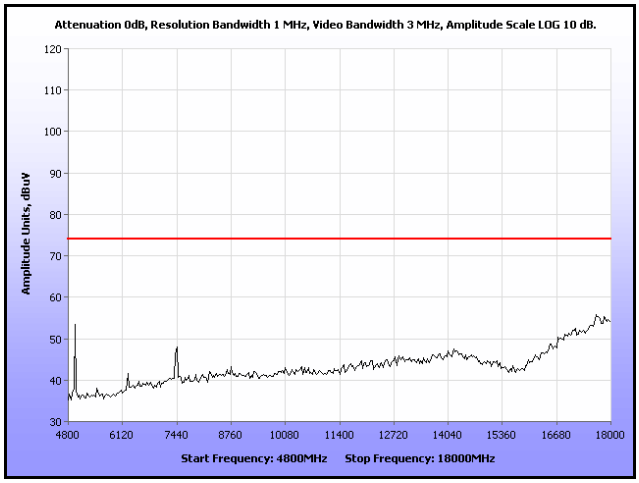
Plot 191. Radiated Spurious Emissions, High Channel, 802.11n HT10, 1 GHz – 4.8 GHz, Average



Plot 192. Radiated Spurious Emissions, High Channel, 802.11n HT10, 1 GHz – 4.8 GHz, Peak

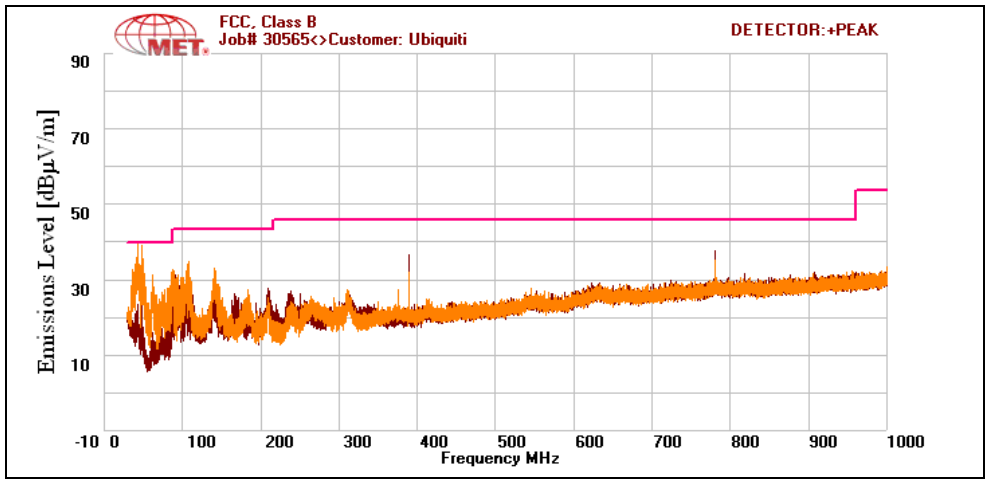


Plot 193. Radiated Spurious Emissions, High Channel, 802.11n HT10, 4.8 GHz – 18 GHz, Average

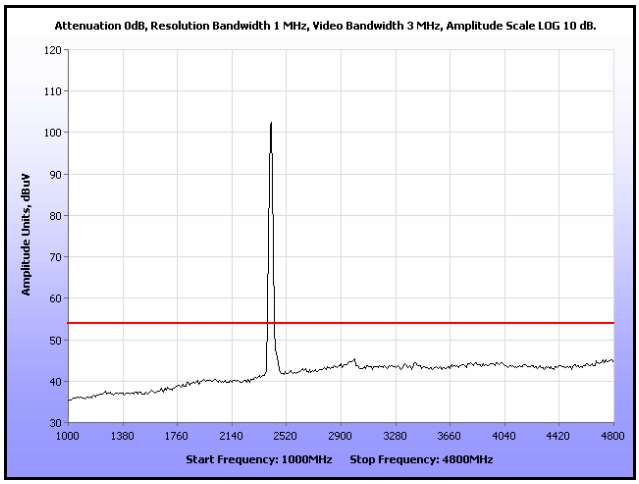


Plot 194. Radiated Spurious Emissions, High Channel, 802.11n HT10, 4.8 GHz – 18 GHz, Peak

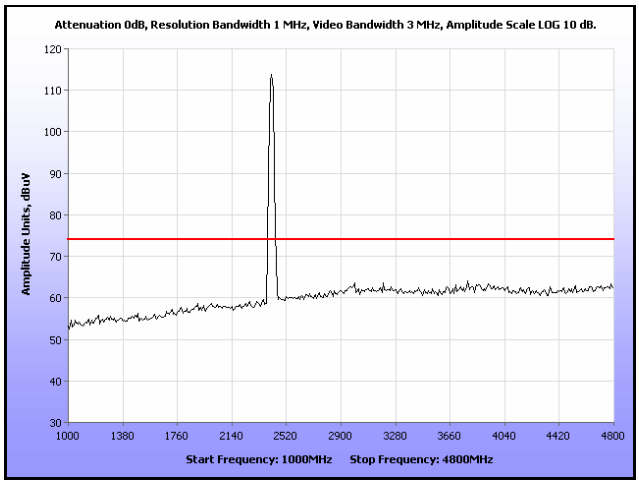
Radiated Spurious Emissions Test Results, 802.11n HT20



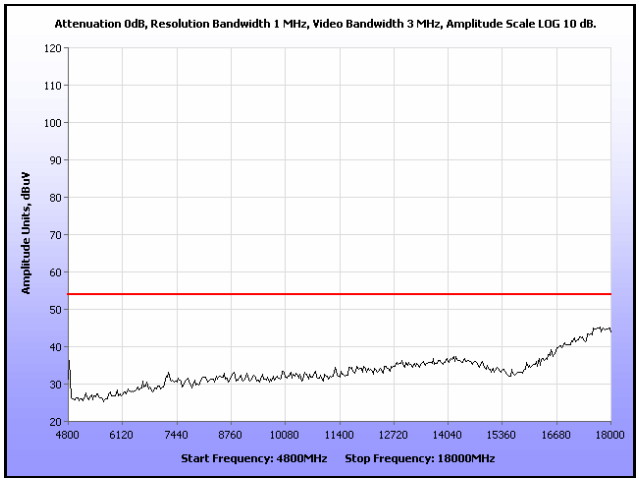
Plot 195. Radiated Spurious Emissions, Low Channel, 802.11n HT20, 30 MHz – 1 GHz



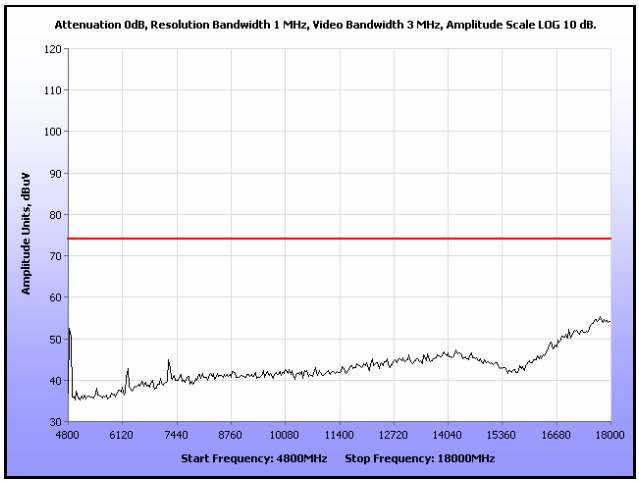
Plot 196. Radiated Spurious Emissions, Low Channel, 802.11n HT20, 1 GHz – 4.8 GHz, Average



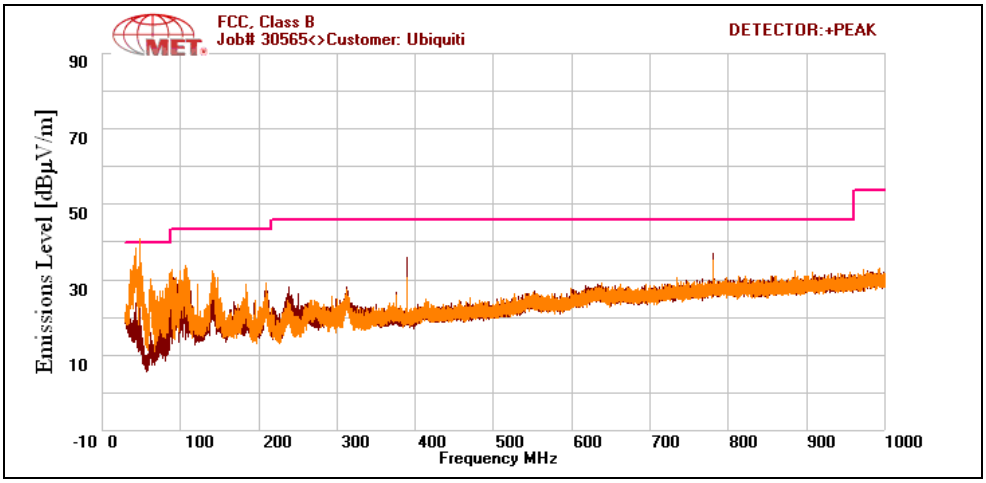
Plot 197. Radiated Spurious Emissions, Low Channel, 802.11n HT20, 1 GHz – 4.8 GHz, Peak



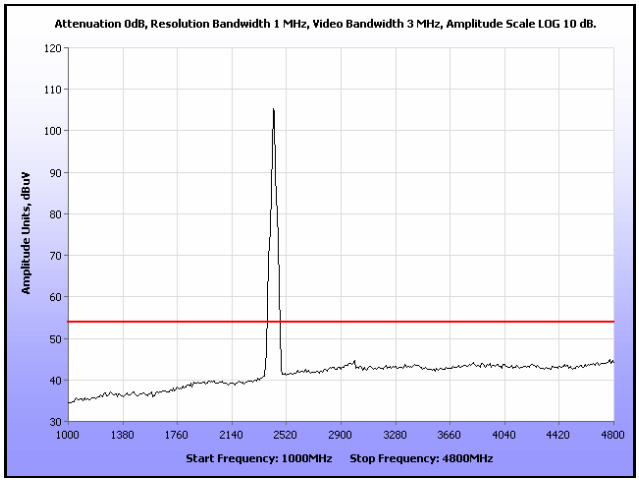
Plot 198. Radiated Spurious Emissions, Low Channel, 802.11n HT20, 4.8 GHz – 18 GHz, Average



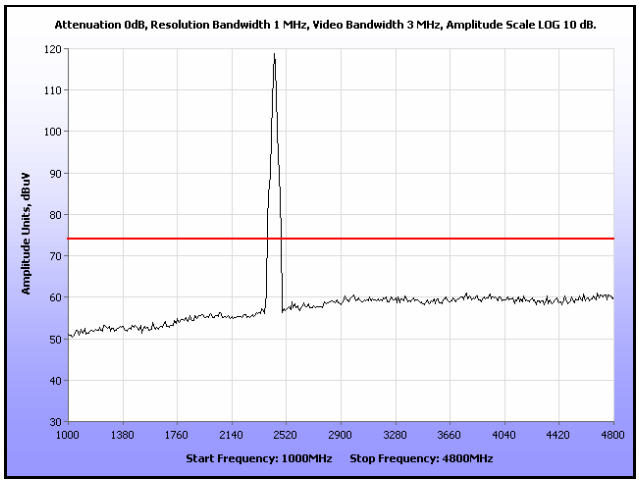
Plot 199. Radiated Spurious Emissions, Low Channel, 802.11n HT20, 4.8 GHz – 18 GHz, Peak



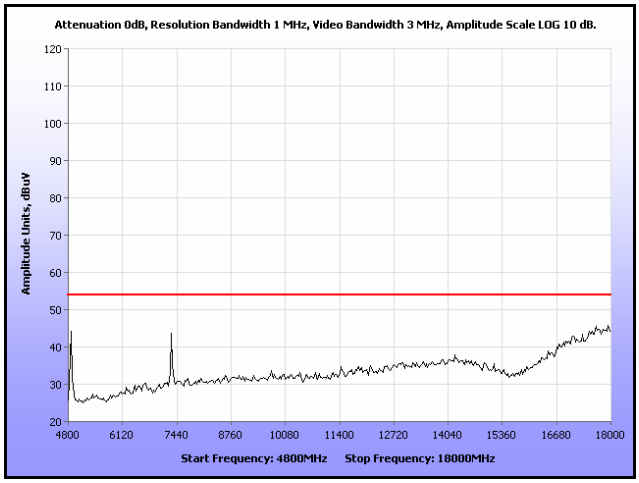
Plot 200. Radiated Spurious Emissions, Mid Channel, 802.11n HT20, 30 MHz – 1 GHz



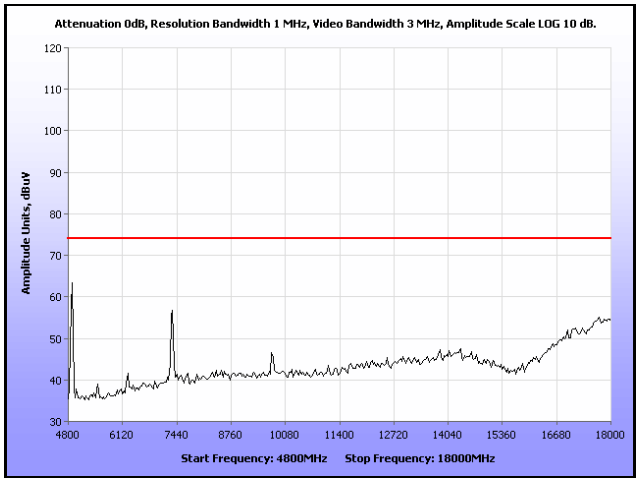
Plot 201. Radiated Spurious Emissions, Mid Channel, 802.11n HT20, 1 GHz – 4.8 GHz, Average



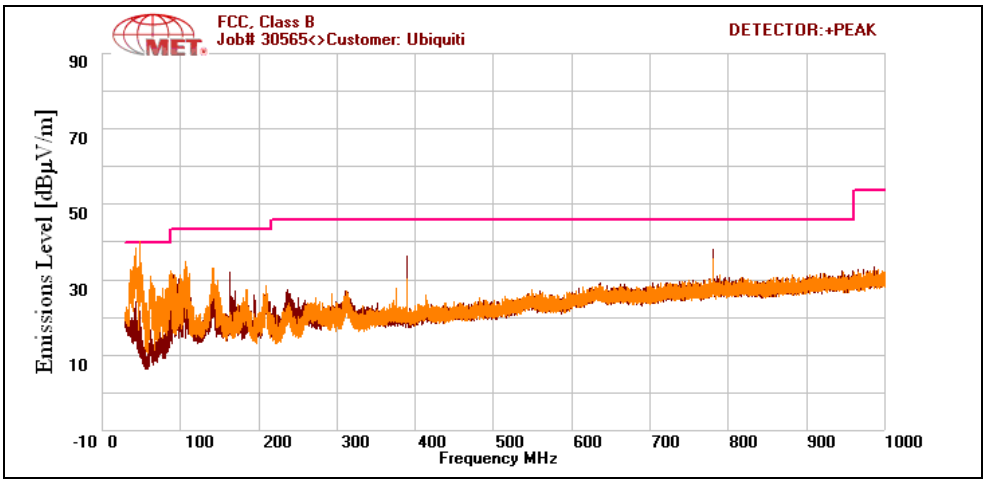
Plot 202. Radiated Spurious Emissions, Mid Channel, 802.11n HT20, 1 GHz – 4.8 GHz, Peak



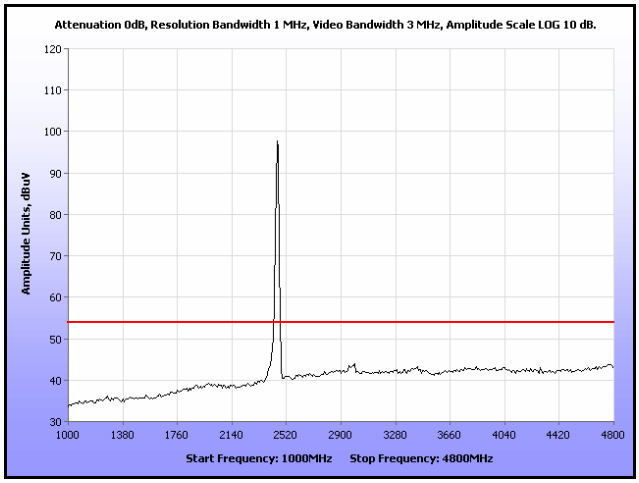
Plot 203. Radiated Spurious Emissions, Mid Channel, 802.11n HT20, 4.8 GHz – 18 GHz, Average



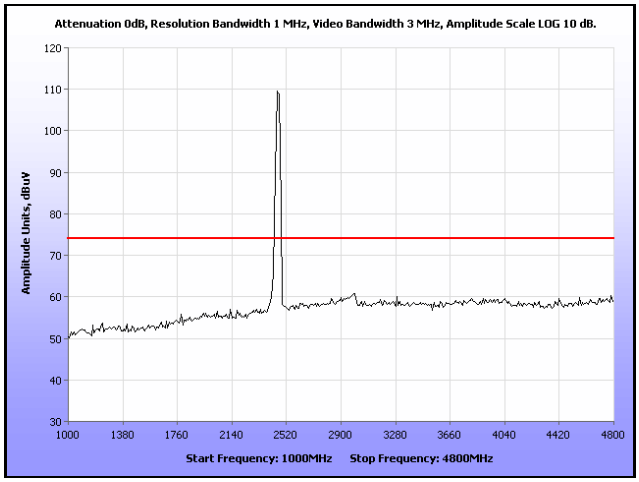
Plot 204. Radiated Spurious Emissions, Mid Channel, 802.11n HT20, 4.8 GHz – 18 GHz, Peak



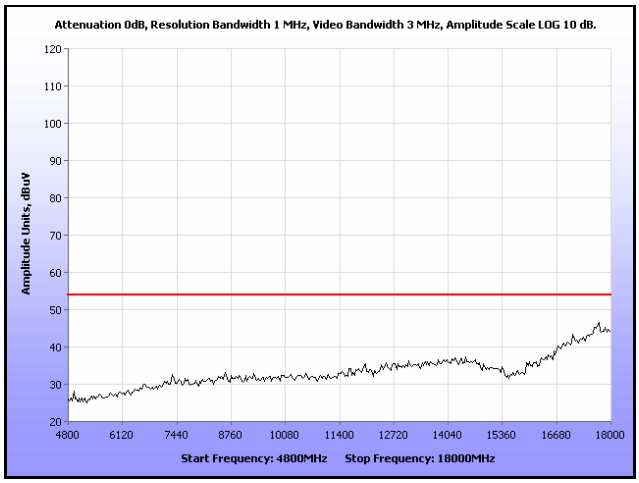
Plot 205. Radiated Spurious Emissions, High Channel, 802.11n HT20, 30 MHz – 1 GHz



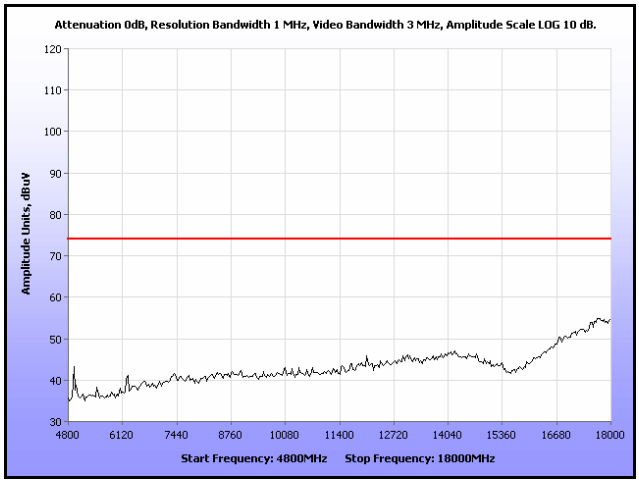
Plot 206. Radiated Spurious Emissions, High Channel, 802.11n HT20, 1 GHz – 4.8 GHz, Average



Plot 207. Radiated Spurious Emissions, High Channel, 802.11n HT20, 1 GHz – 4.8 GHz, Peak

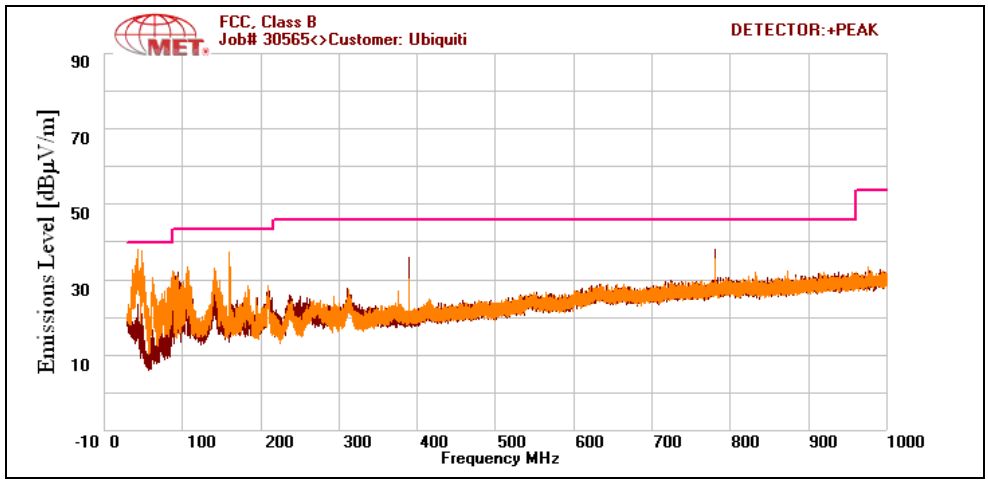


Plot 208. Radiated Spurious Emissions, High Channel, 802.11n HT20, 4.8 GHz – 18 GHz, Average

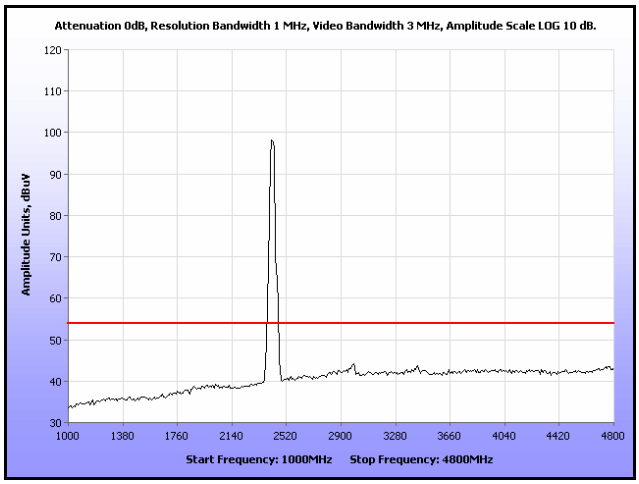


Plot 209. Radiated Spurious Emissions, High Channel, 802.11n HT20, 4.8 GHz – 18 GHz, Peak

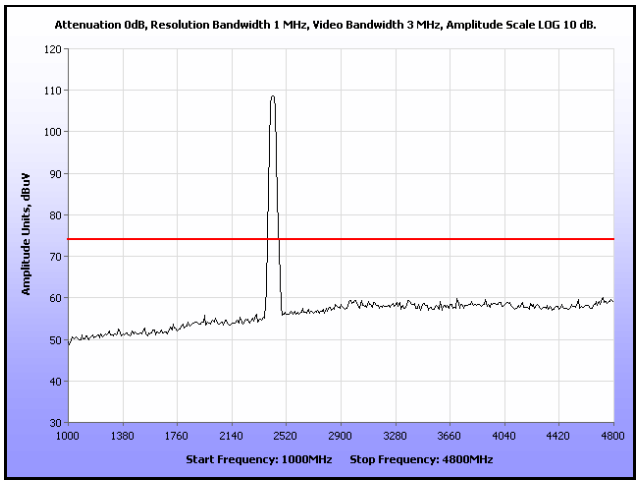
Radiated Spurious Emissions Test Results, 802.11n HT40



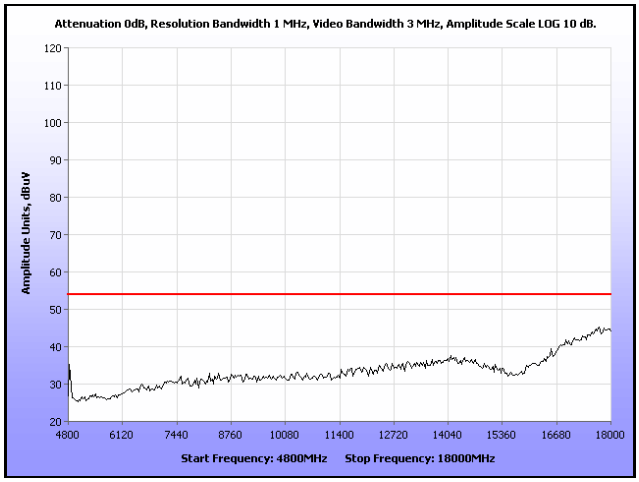
Plot 210. Radiated Spurious Emissions, Low Channel, 802.11n HT40, 30 MHz – 1 GHz



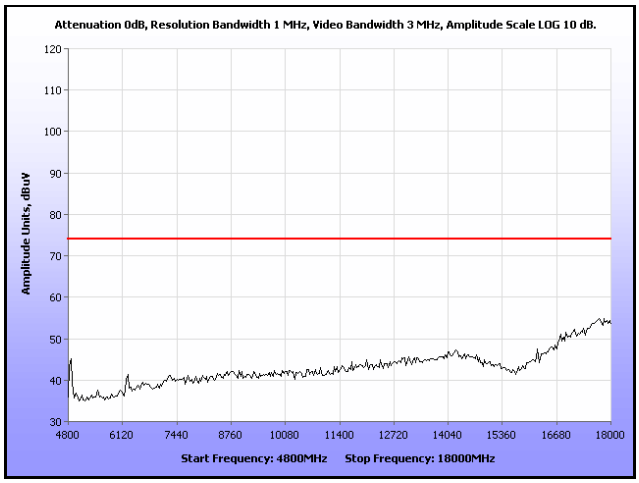
Plot 211. Radiated Spurious Emissions, Low Channel, 802.11n HT40, 1 GHz – 4.8 GHz, Average



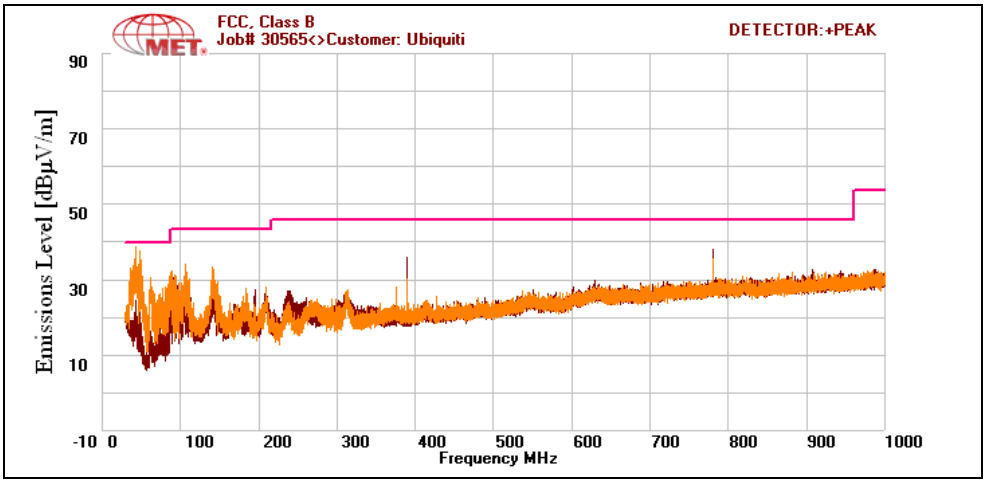
Plot 212. Radiated Spurious Emissions, Low Channel, 802.11n HT40, 1 GHz – 4.8 GHz, Peak



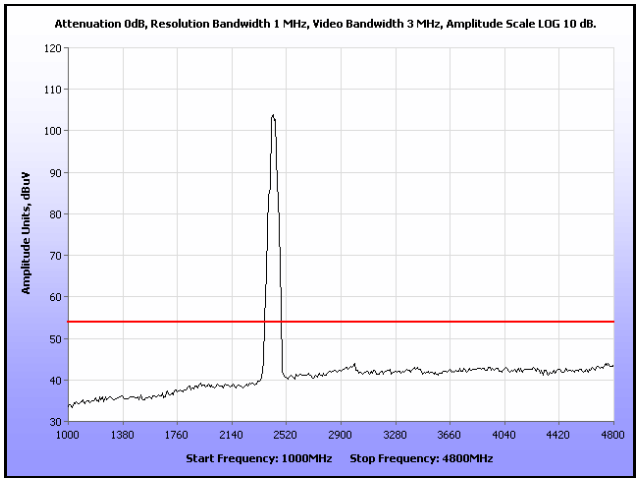
Plot 213. Radiated Spurious Emissions, Low Channel, 802.11n HT40, 4.8 GHz – 18 GHz, Average



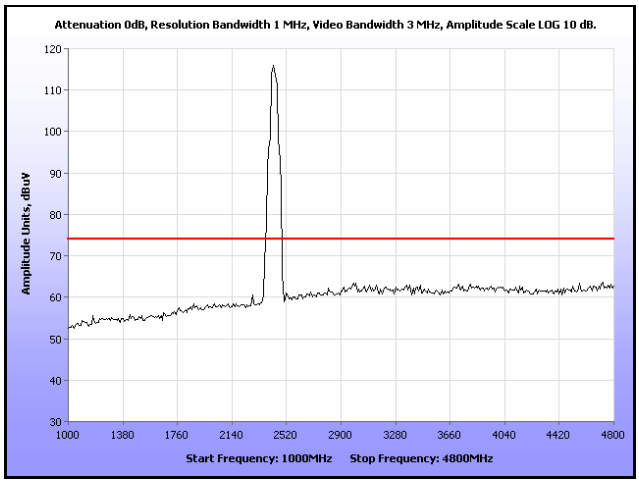
Plot 214. Radiated Spurious Emissions, Low Channel, 802.11n HT40, 4.8 GHz – 18 GHz, Peak



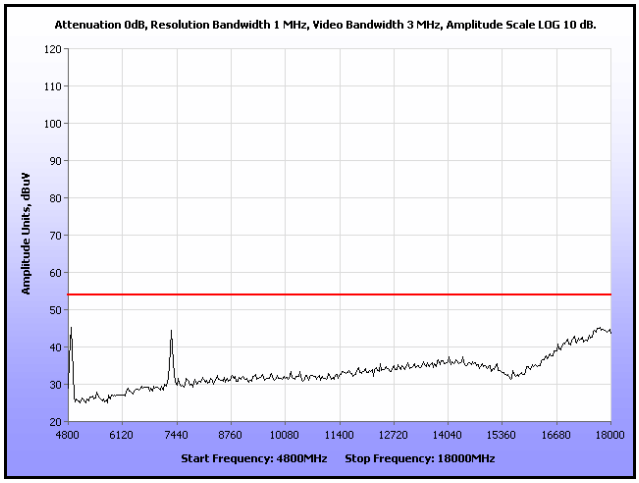
Plot 215. Radiated Spurious Emissions, Mid Channel, 802.11n HT40, 30 MHz – 1 GHz



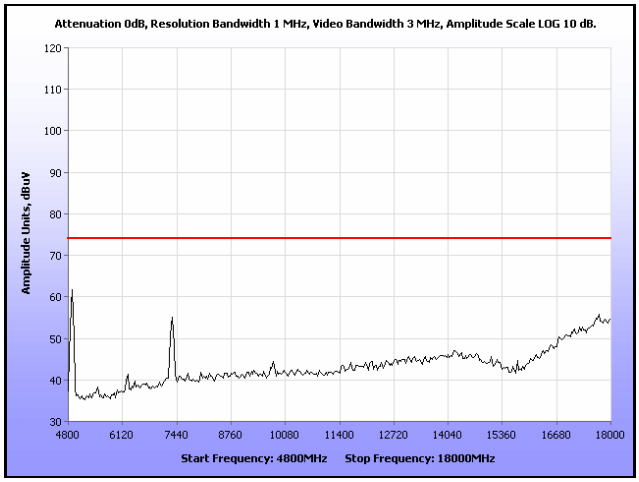
Plot 216. Radiated Spurious Emissions, Mid Channel, 802.11n HT40, 1 GHz – 4.8 GHz, Average



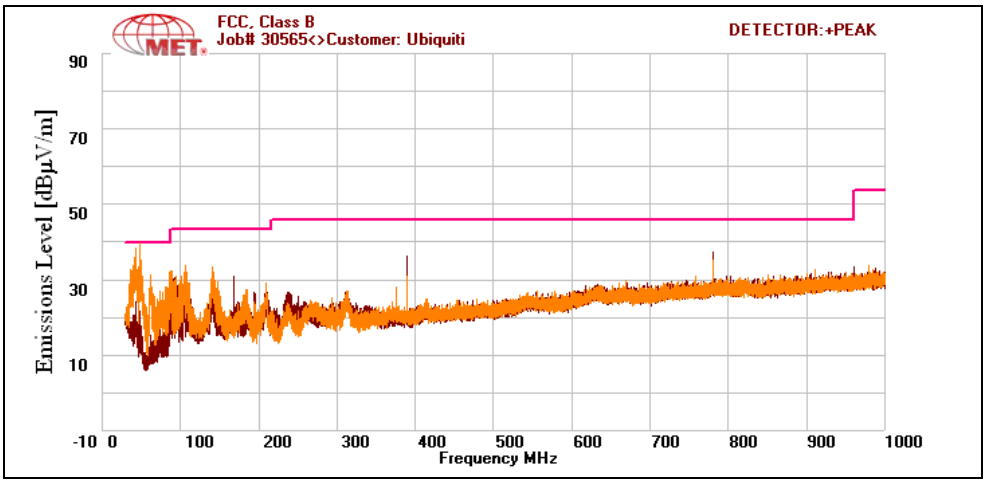
Plot 217. Radiated Spurious Emissions, Mid Channel, 802.11n HT40, 1 GHz – 4.8 GHz, Peak



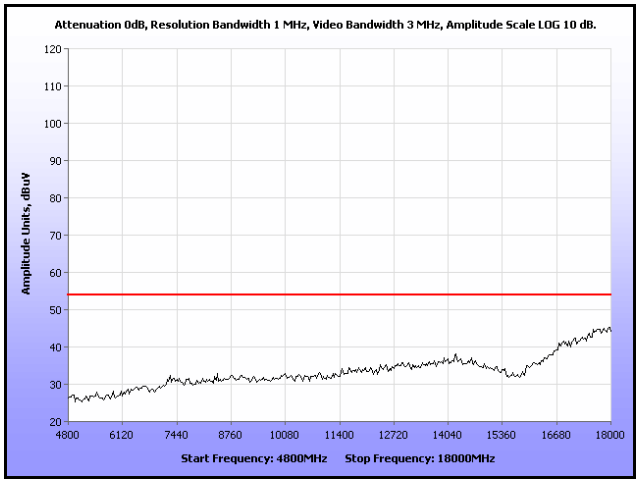
Plot 218. Radiated Spurious Emissions, Mid Channel, 802.11n HT40, 4.8 GHz – 18 GHz, Average



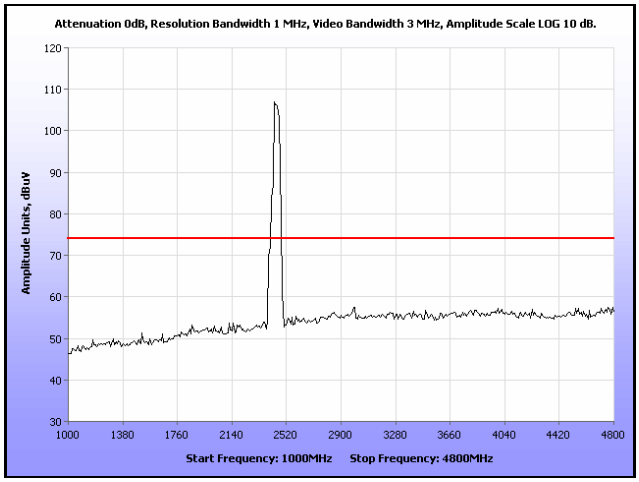
Plot 219. Radiated Spurious Emissions, Mid Channel, 802.11n HT40, 4.8 GHz – 18 GHz, Peak



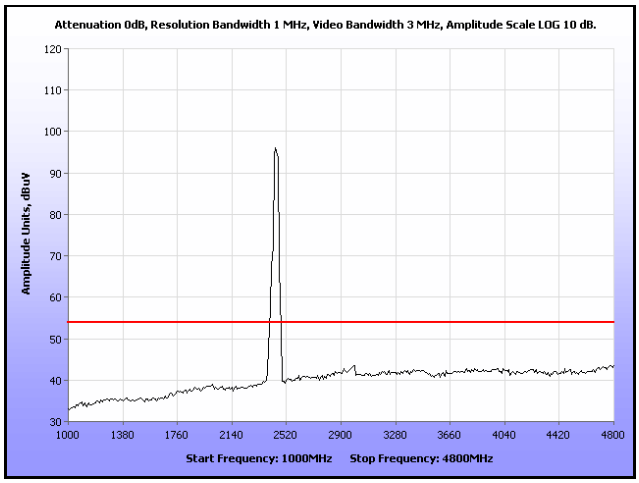
Plot 220. Radiated Spurious Emissions, High Channel, 802.11n HT40, 30 MHz – 1 GHz



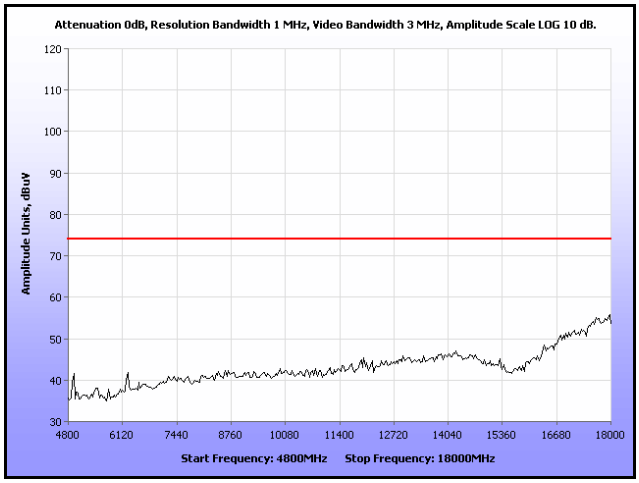
Plot 221. Radiated Spurious Emissions, High Channel, 802.11n HT40, 1 GHz – 4.8 GHz, Average



Plot 222. Radiated Spurious Emissions, High Channel, 802.11n HT40, 1 GHz – 4.8 GHz, Peak



Plot 223. Radiated Spurious Emissions, High Channel, 802.11n HT40, 4.8 GHz – 18 GHz, Average

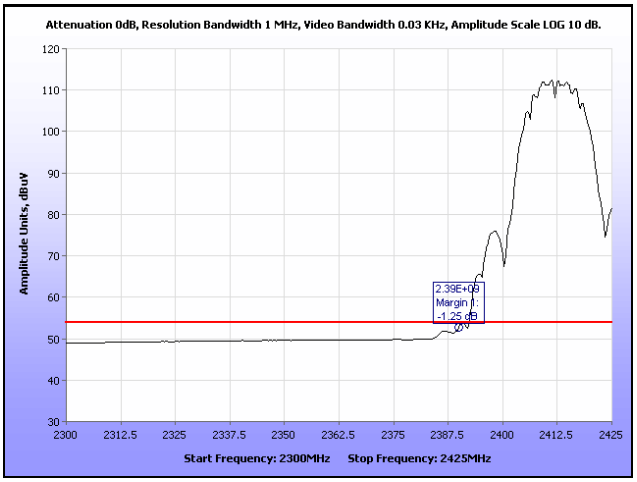


Plot 224. Radiated Spurious Emissions, High Channel, 802.11n HT40, 4.8 GHz – 18 GHz, Peak

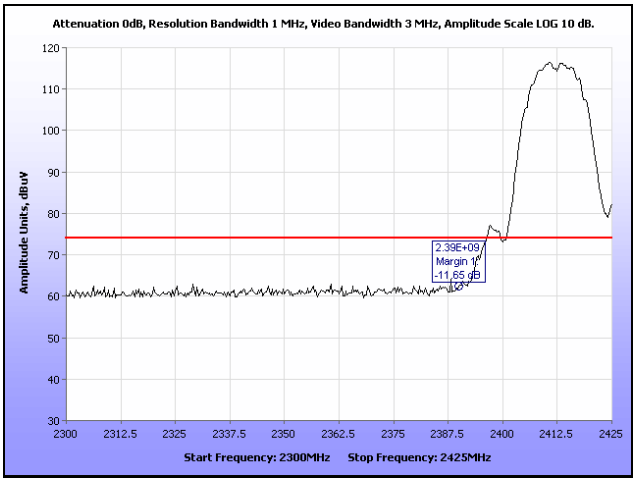
Radiated Band Edge Measurements

Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.

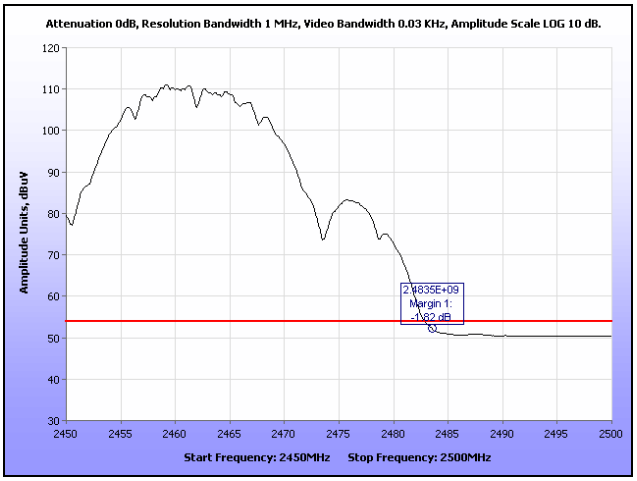
Radiated Restricted Band Edge, 802.11b



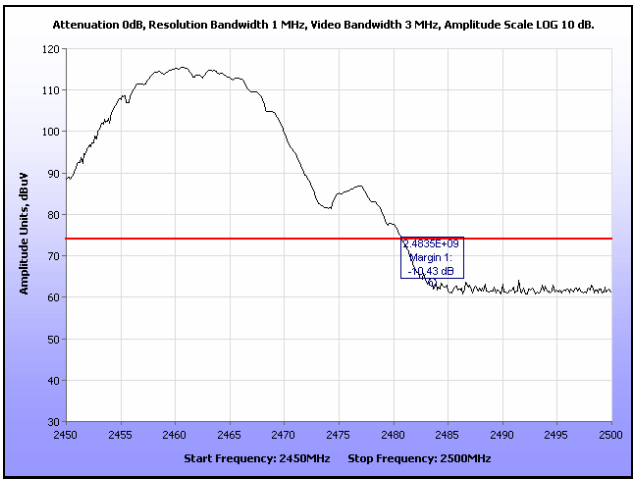
Plot 225. Radiated Restricted Band Edge, Low Channel, 802.11b, Average



Plot 226. Radiated Restricted Band Edge, Low Channel, 802.11b, Peak

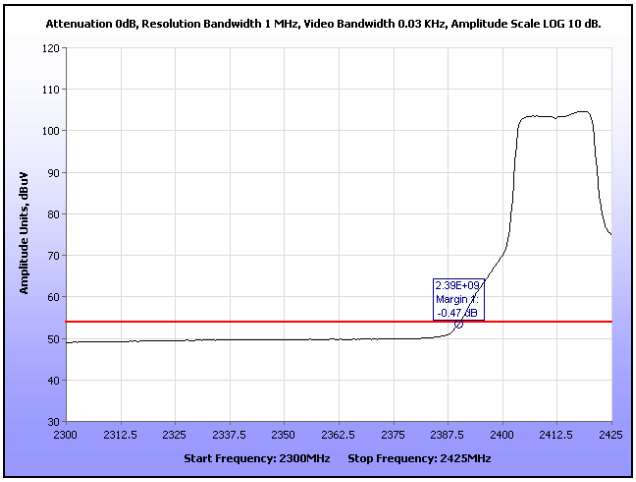


Plot 227. Radiated Restricted Band Edge, High Channel, 802.11b, Average

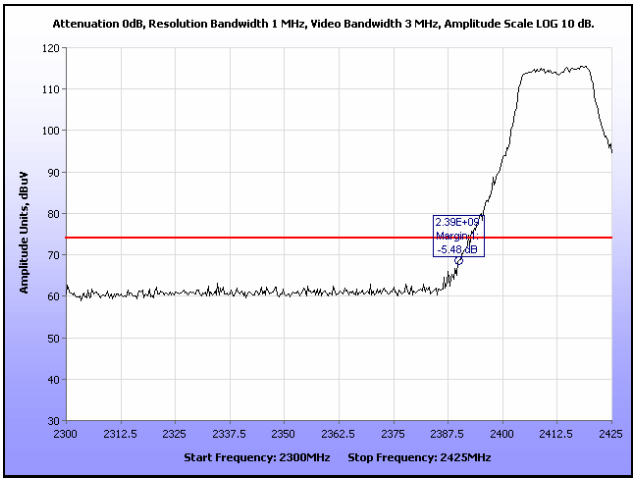


Plot 228. Radiated Restricted Band Edge, High Channel, 802.11b, Peak

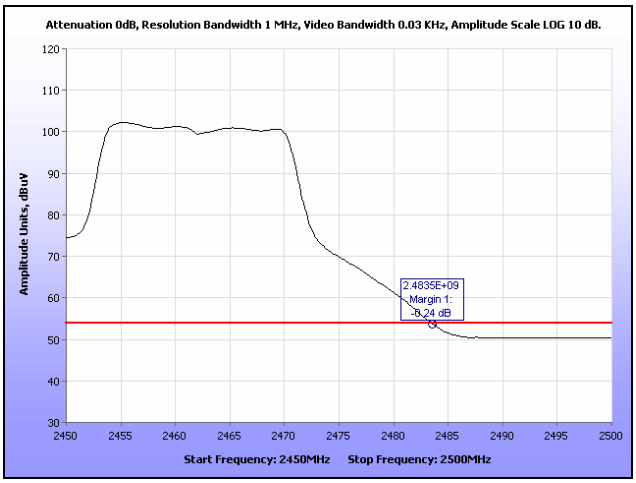
Radiated Restricted Band Edge, 802.11g



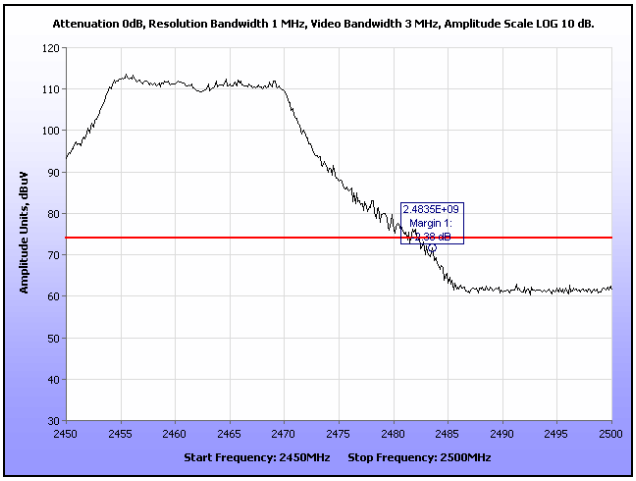
Plot 229. Radiated Restricted Band Edge, Low Channel, 802.11g, Average



Plot 230. Radiated Restricted Band Edge, Low Channel, 802.11g, Peak

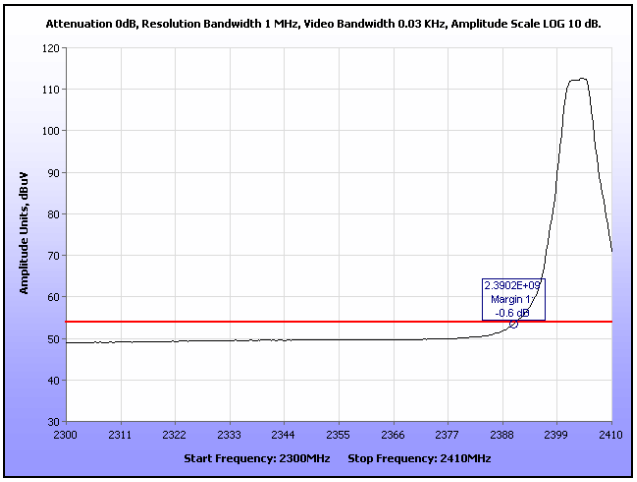


Plot 231. Radiated Restricted Band Edge, High Channel, 802.11g, Average

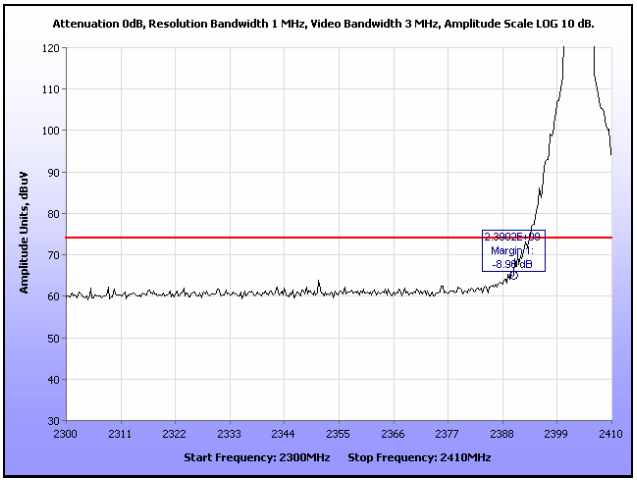


Plot 232. Radiated Restricted Band Edge, High Channel, 802.11g, Peak

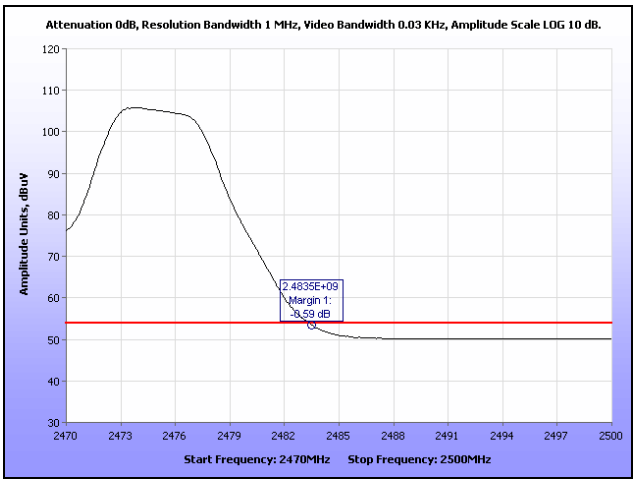
Radiated Restricted Band Edge, 802.11n HT5



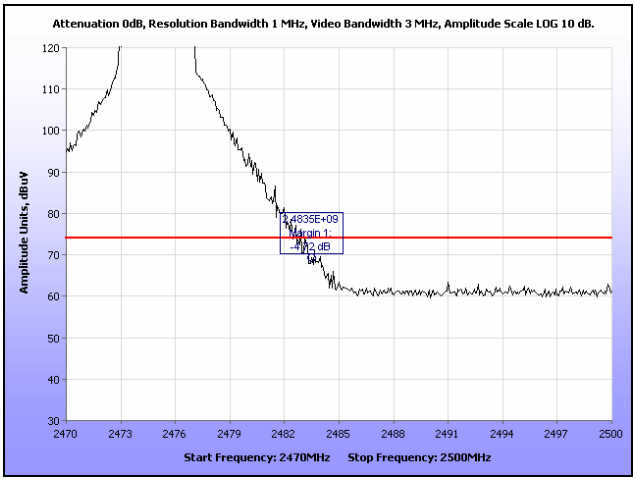
Plot 233. Radiated Restricted Band Edge, Low Channel, 802.11n HT5, Average



Plot 234. Radiated Restricted Band Edge, Low Channel, 802.11n HT5, Peak

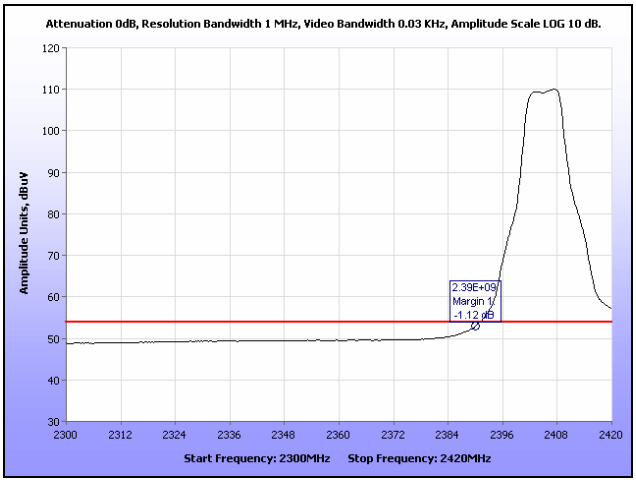


Plot 235. Radiated Restricted Band Edge, High Channel, 802.11n HT5, Average

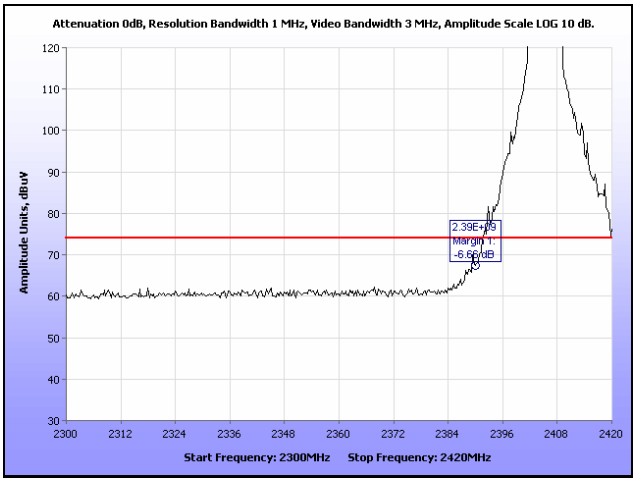


Plot 236. Radiated Restricted Band Edge, High Channel, 802.11n HT5, Peak

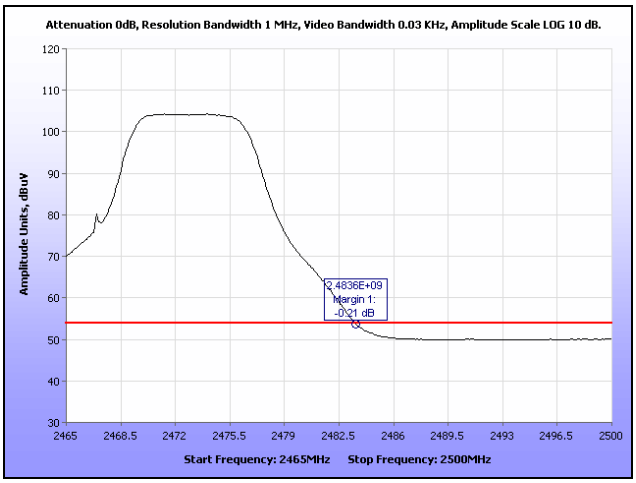
Radiated Restricted Band Edge, 802.11n HT8



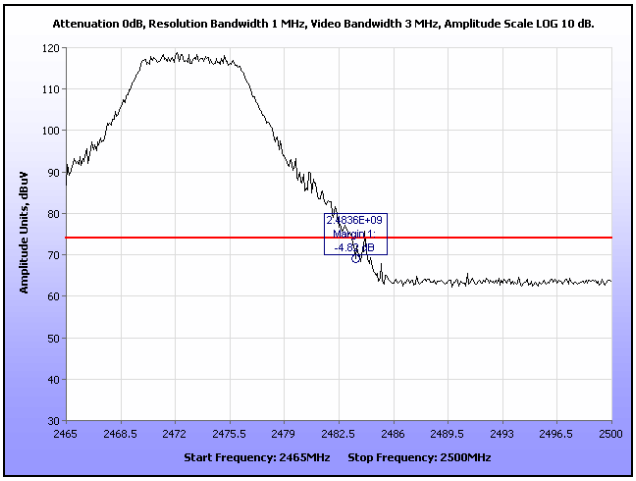
Plot 237. Radiated Restricted Band Edge, Low Channel, 802.11n HT8, Average



Plot 238. Radiated Restricted Band Edge, Low Channel, 802.11n HT8, Peak

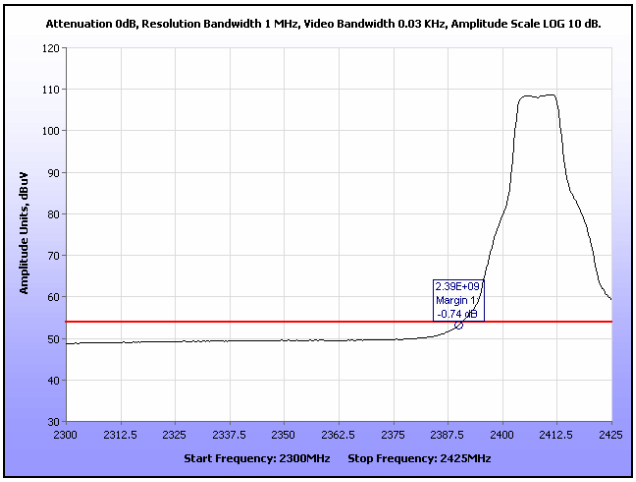


Plot 239. Radiated Restricted Band Edge, High Channel, 802.11n HT8, Average

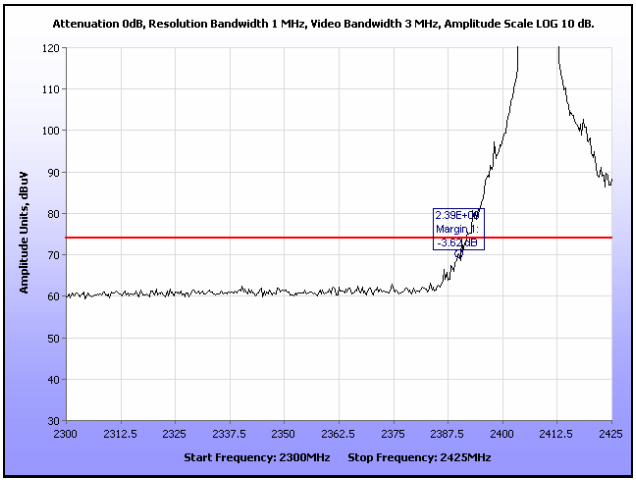


Plot 240. Radiated Restricted Band Edge, High Channel, 802.11n HT8, Peak

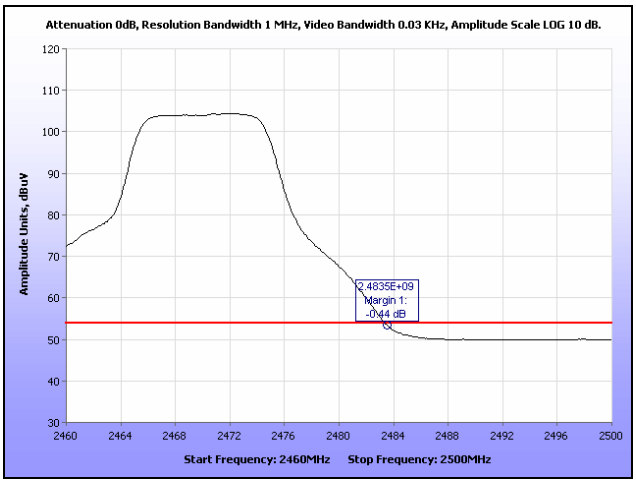
Radiated Restricted Band Edge, 802.11n HT10



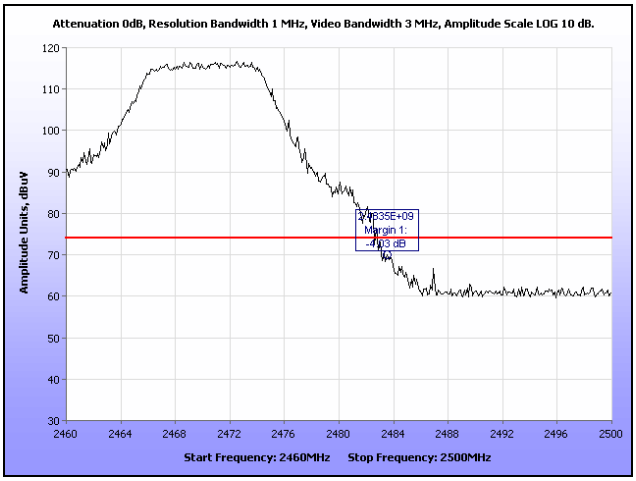
Plot 241. Radiated Restricted Band Edge, Low Channel, 802.11n HT10, Average



Plot 242. Radiated Restricted Band Edge, Low Channel, 802.11n HT10, Peak

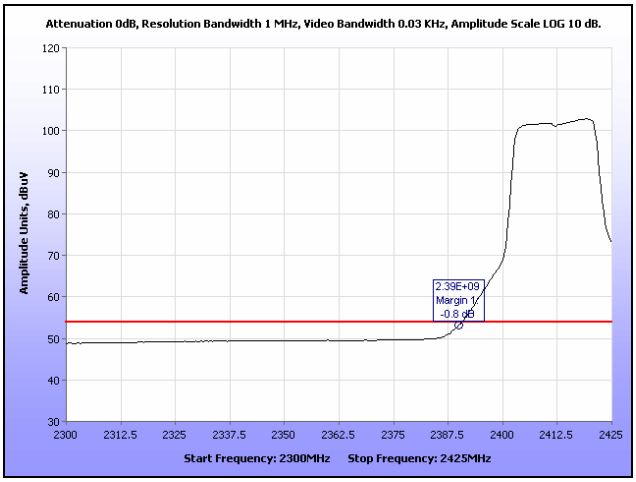


Plot 243. Radiated Restricted Band Edge, High Channel, 802.11n HT10, Average

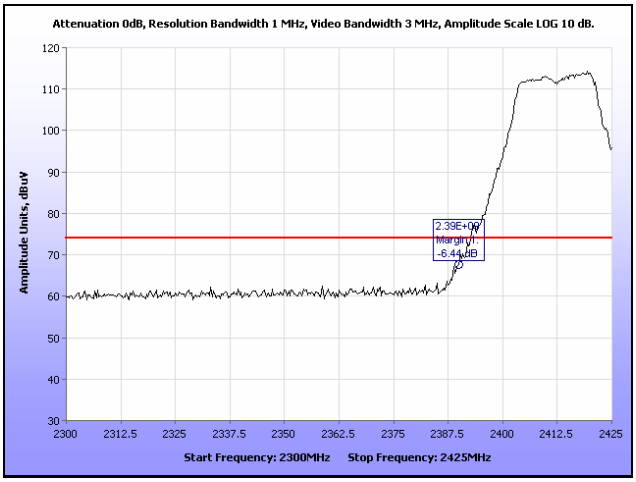


Plot 244. Radiated Restricted Band Edge, High Channel, 802.11n HT10, Peak

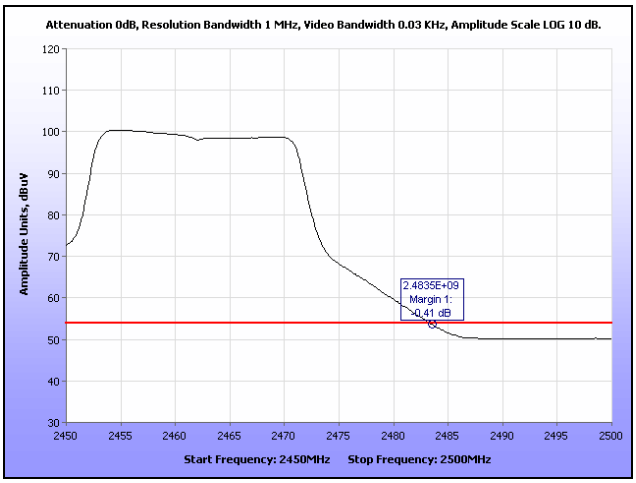
Radiated Restricted Band Edge, 802.11n HT20



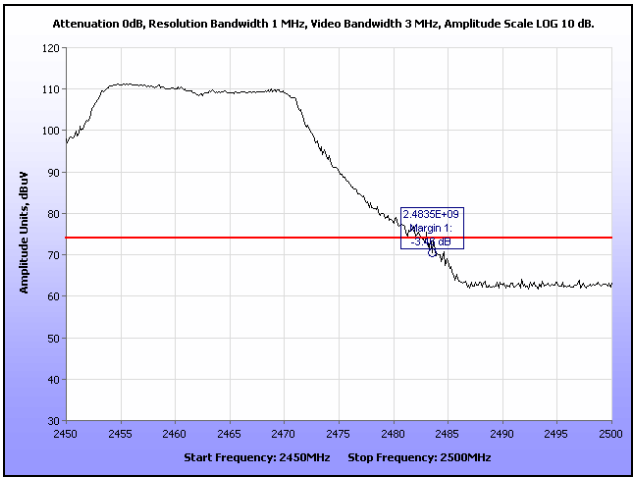
Plot 245. Radiated Restricted Band Edge, Low Channel, 802.11n HT20, Average



Plot 246. Radiated Restricted Band Edge, Low Channel, 802.11n HT20, Peak

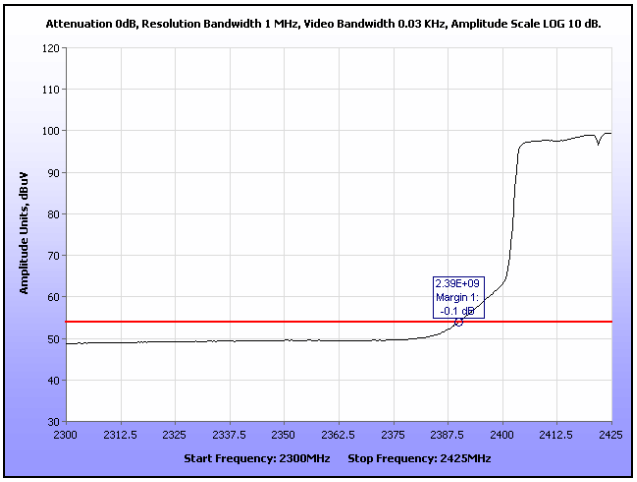


Plot 247. Radiated Restricted Band Edge, High Channel, 802.11n HT20, Average

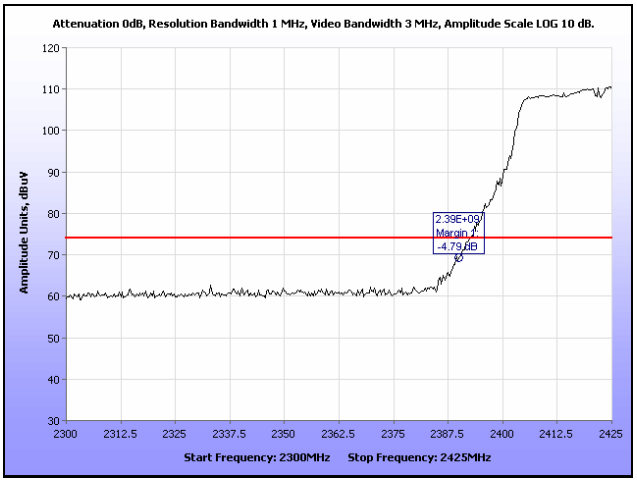


Plot 248. Radiated Restricted Band Edge, High Channel, 802.11n HT20, Peak

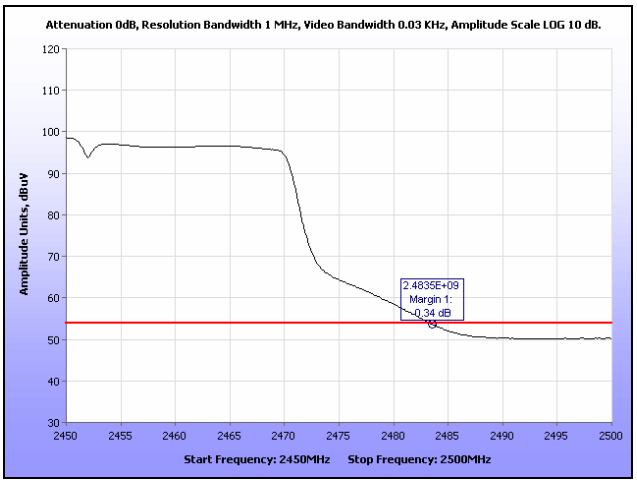
Radiated Restricted Band Edge, 802.11n HT40



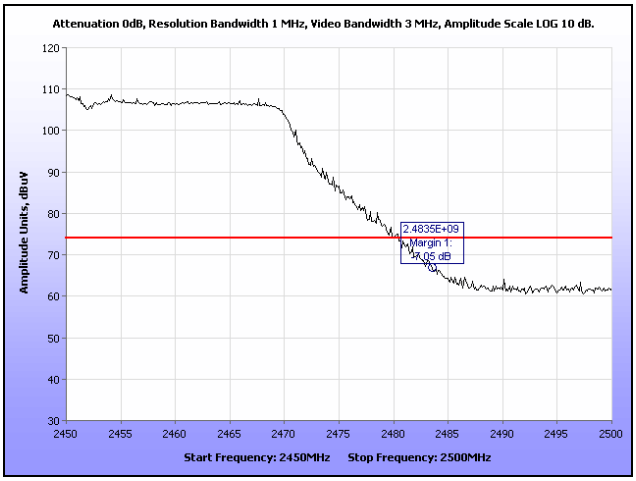
Plot 249. Radiated Restricted Band Edge, Low Channel, 802.11n HT40, Average



Plot 250. Radiated Restricted Band Edge, Low Channel, 802.11n HT40, Peak



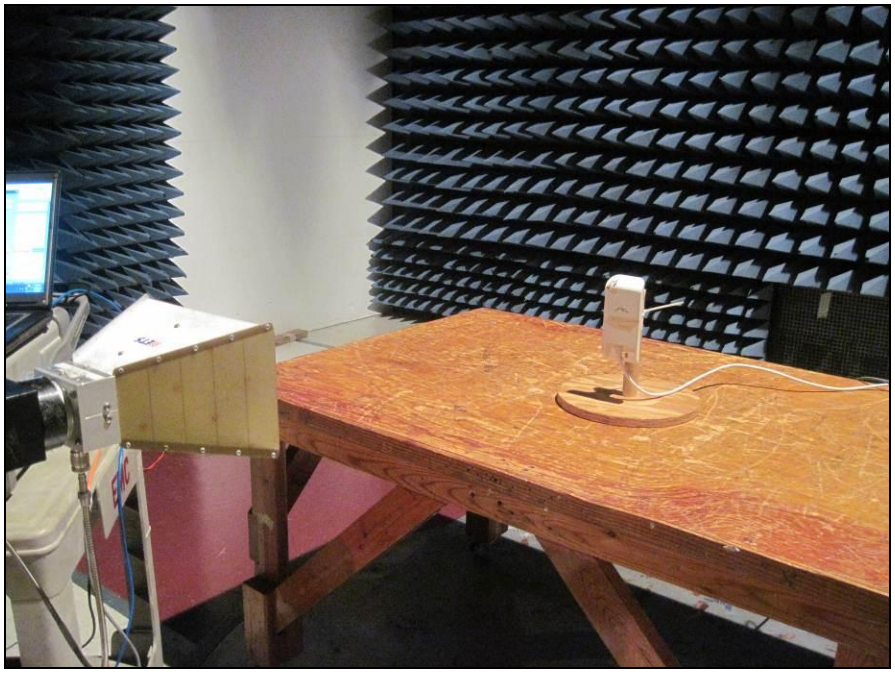
Plot 251. Radiated Restricted Band Edge, High Channel, 802.11n HT40, Average



Plot 252. Radiated Restricted Band Edge, High Channel, 802.11n HT40, Peak

Radiated Spurious Emissions Test Setup

Photograph 6. Radiated Spurious Emissions, Test Setup, 30 MHz – 1 GHz



Photograph 7. Radiated Spurious Emissions, Test Setup, 1 GHz – 18 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) RF Conducted Spurious Emissions Requirements and Band Edge

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

Test Procedure: For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Since the EUT had an integral antenna, conducted measurements could not be performed. Measurements needed to be taken radiated. An antenna was located 3 m away from the EUT and plots were taken. The EUT was rotated through all three orthogonal axes. The plots were corrected for both antenna correction factor and cable lost.

See following pages for detailed test results with RF Conducted Spurious Emissions.

Test Results: The EUT was compliant with the Conducted Spurious Emission limits of **§15.247(d)**.

Test Engineer(s): Lionel Gabrillo

Test Date(s): 09/09/11

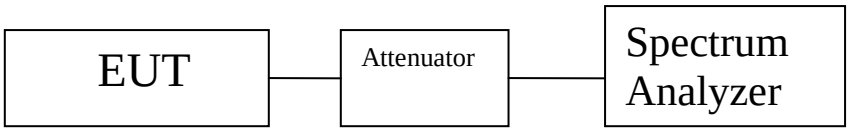
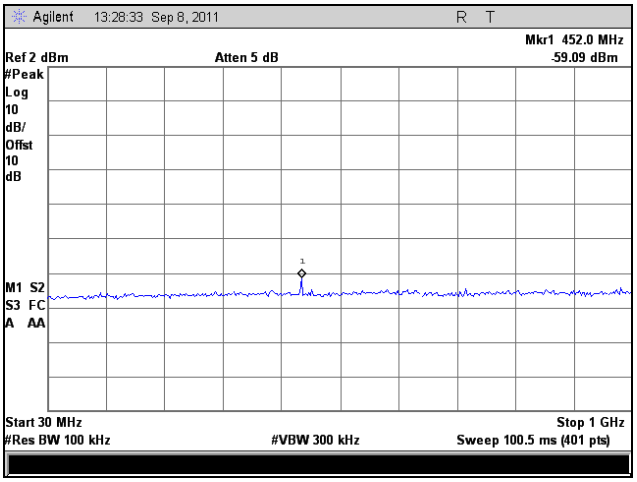
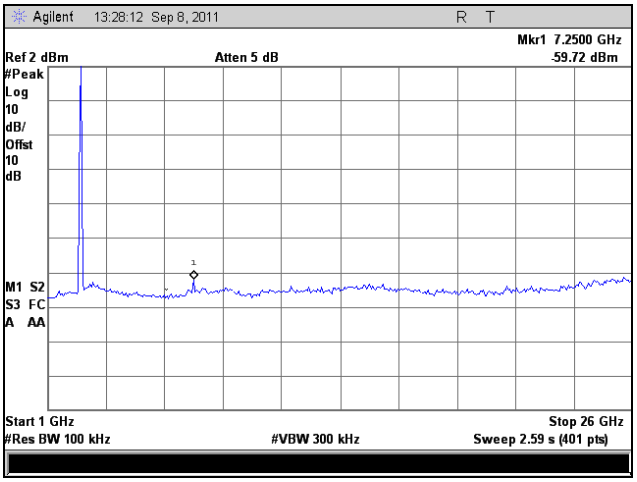


Figure 4. Block Diagram, Conducted Spurious Emissions Test Setup

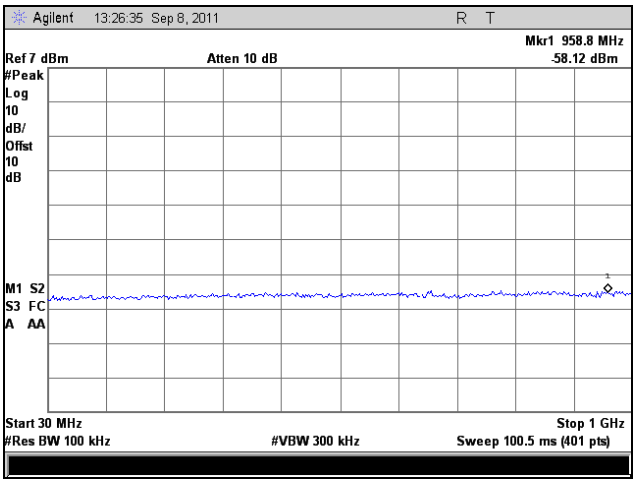
Conducted Spurious Emissions Test Results, 802.11b



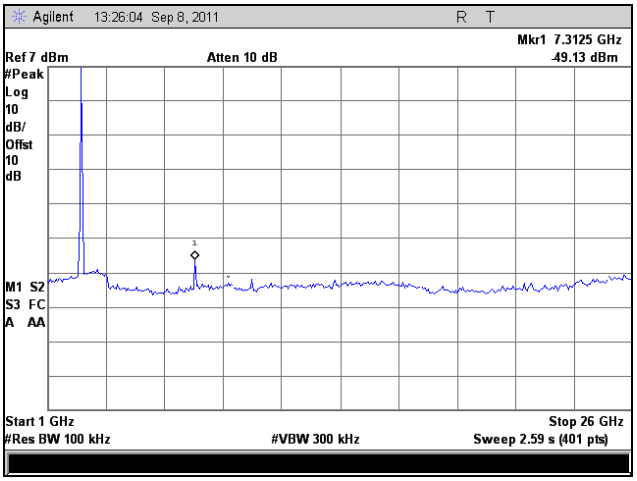
Plot 253. Conducted Spurious Emissions, Low Channel, 802.11b, 30 MHz – 1 GHz



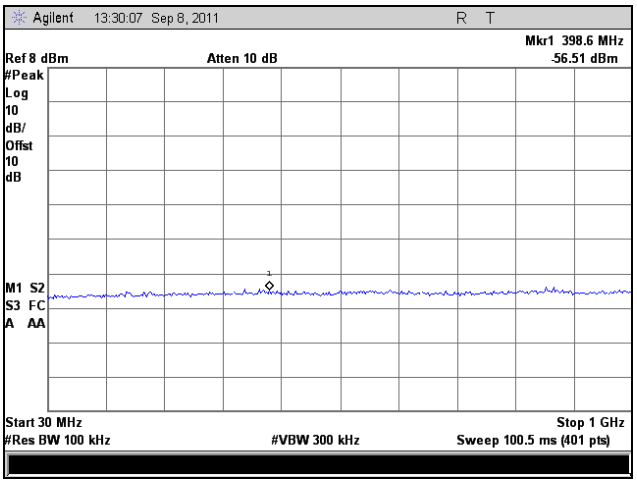
Plot 254. Conducted Spurious Emissions, Low Channel, 802.11b, 1 GHz – 26 GHz



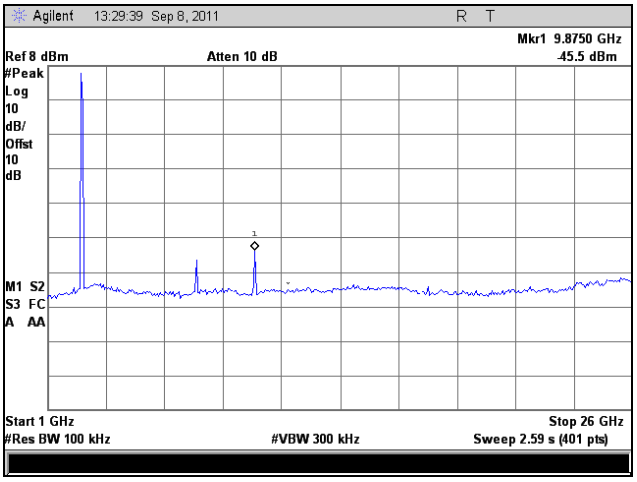
Plot 255. Conducted Spurious Emissions, Mid Channel, 802.11b, 30 MHz – 1 GHz



Plot 256. Conducted Spurious Emissions, Mid Channel, 802.11b, 1 GHz – 26 GHz

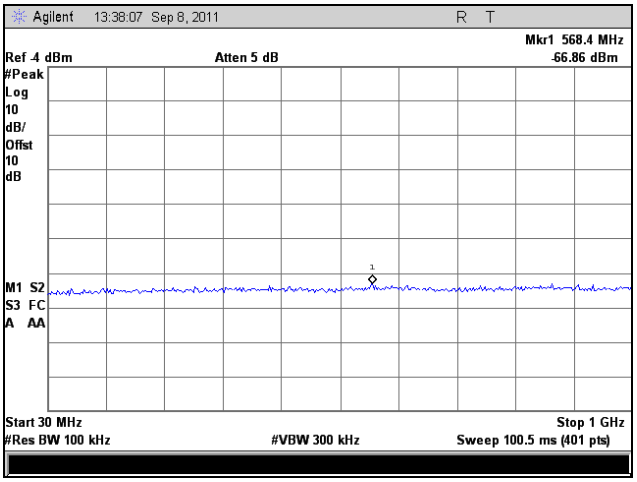


Plot 257. Conducted Spurious Emissions, High Channel, 802.11b, 30 MHz – 1 GHz

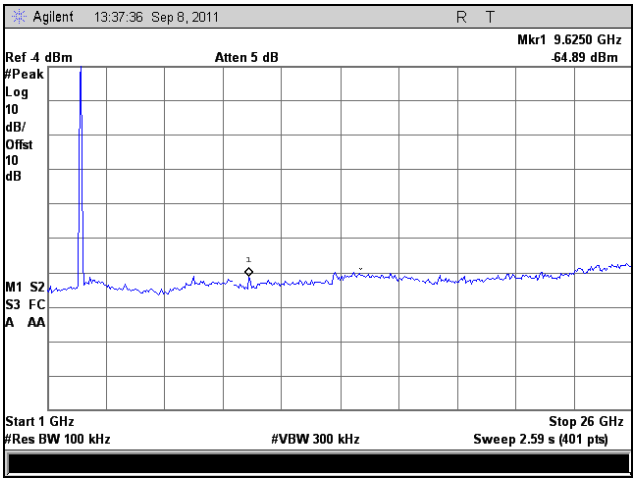


Plot 258. Conducted Spurious Emissions, High Channel, 802.11b, 1 GHz – 26 GHz

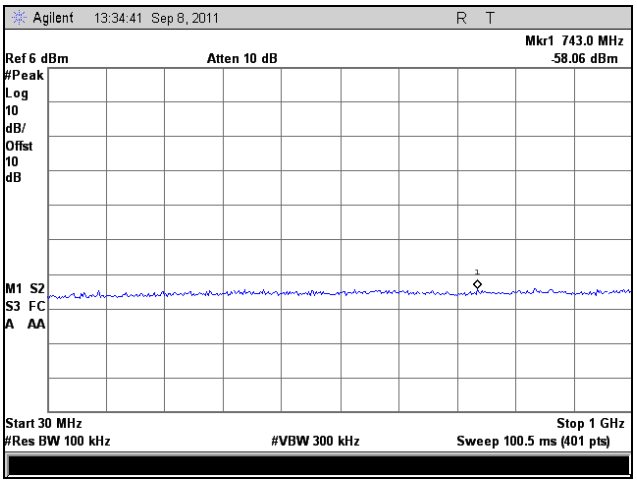
Conducted Spurious Emissions Test Results, 802.11g



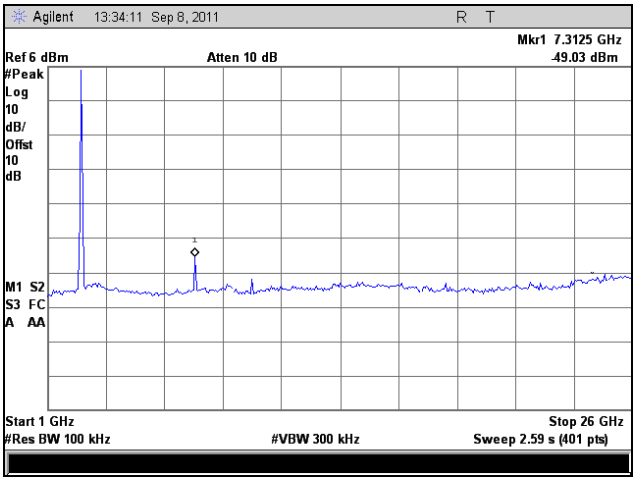
Plot 259. Conducted Spurious Emissions, Low Channel, 802.11g, 30 MHz – 1 GHz



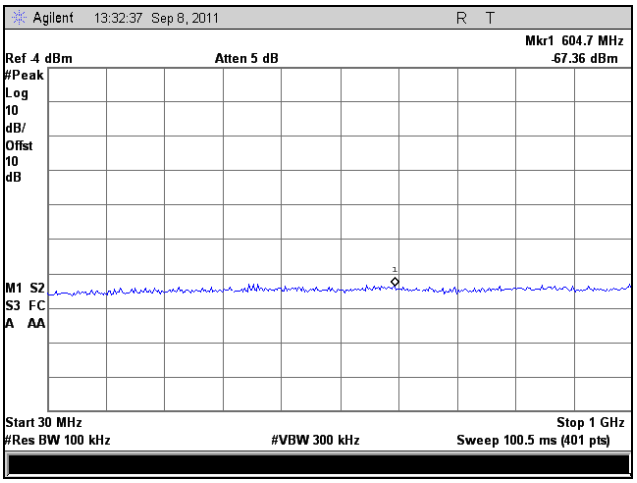
Plot 260. Conducted Spurious Emissions, Low Channel, 802.11g, 1 GHz – 26 GHz



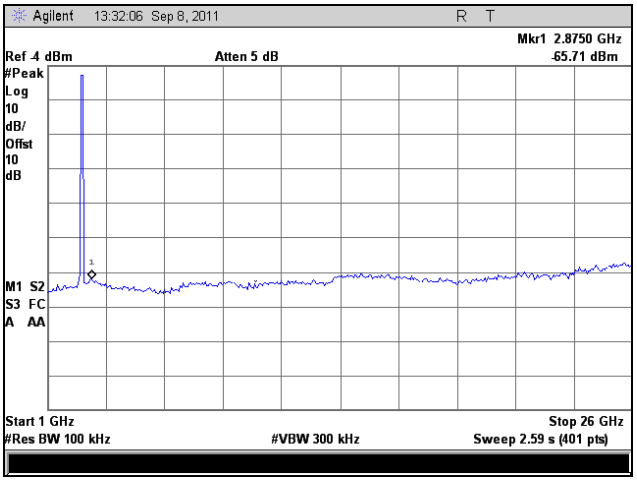
Plot 261. Conducted Spurious Emissions, Mid Channel, 802.11g, 30 MHz – 1 GHz



Plot 262. Conducted Spurious Emissions, Mid Channel, 802.11g, 1 GHz – 26 GHz

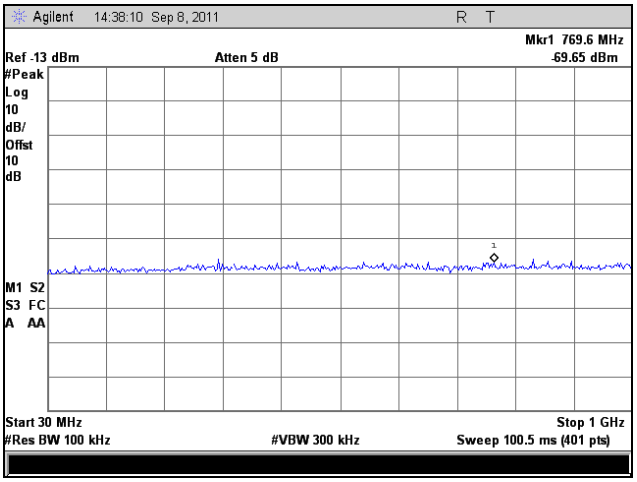


Plot 263. Conducted Spurious Emissions, High Channel, 802.11g, 30 MHz – 1 GHz

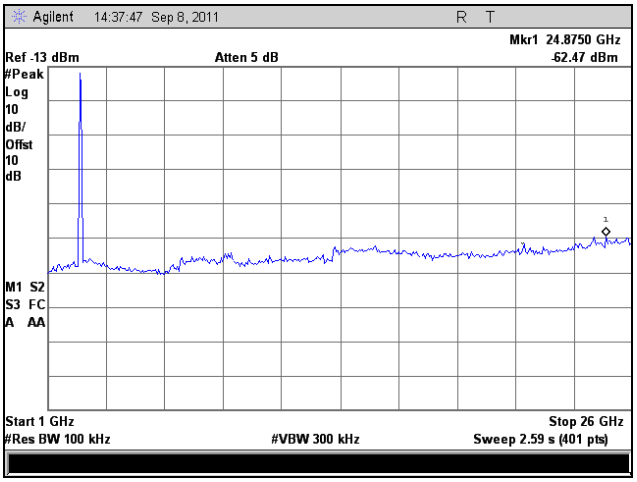


Plot 264. Conducted Spurious Emissions, High Channel, 802.11g, 1 GHz – 26 GHz

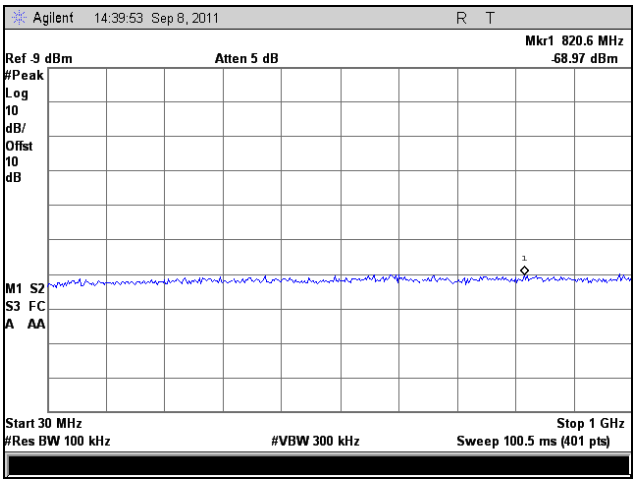
Conducted Spurious Emissions Test Results, 802.11n HT5, Port 0



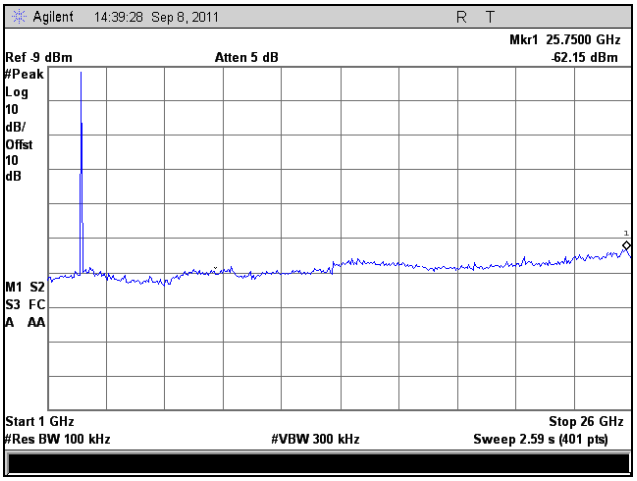
Plot 265. Conducted Spurious Emissions, Low Channel, 802.11n HT5, Port 0, 30 MHz – 1 GHz



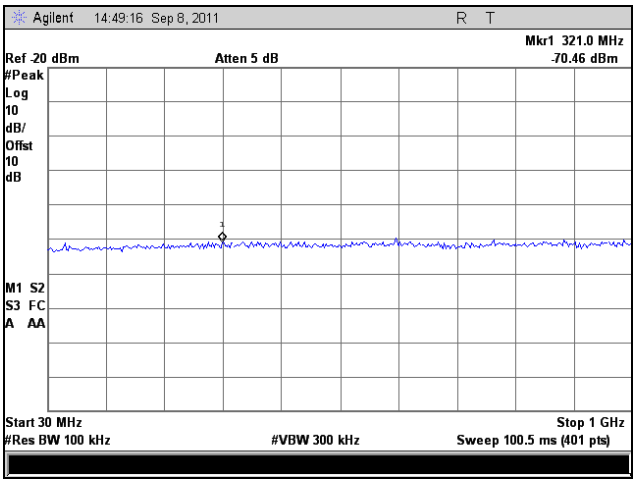
Plot 266. Conducted Spurious Emissions, Low Channel, 802.11n HT5, Port 0, 1 GHz – 26 GHz



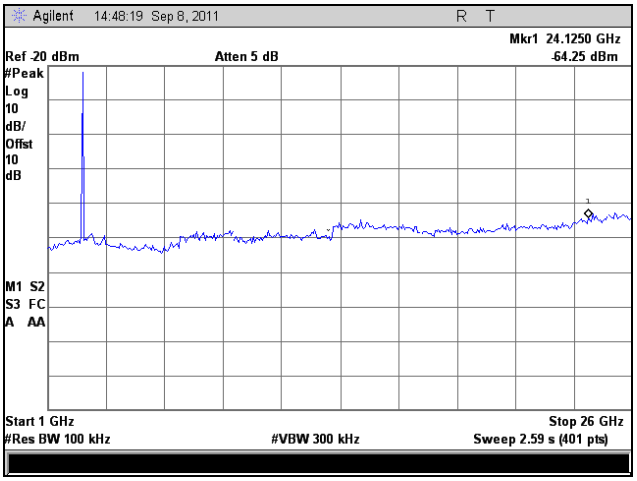
Plot 267. Conducted Spurious Emissions, Mid Channel, 802.11n HT5, Port 0, 30 MHz – 1 GHz



Plot 268. Conducted Spurious Emissions, Mid Channel, 802.11n HT5, Port 0, 1 GHz – 26 GHz

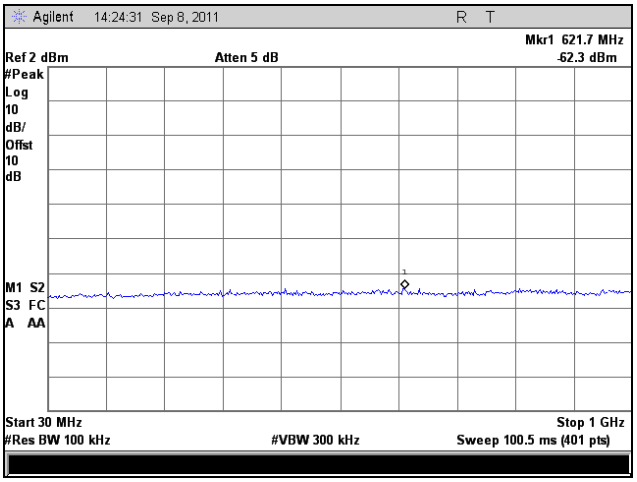


Plot 269. Conducted Spurious Emissions, High Channel, 802.11n HT5, Port 0, 30 MHz – 1 GHz

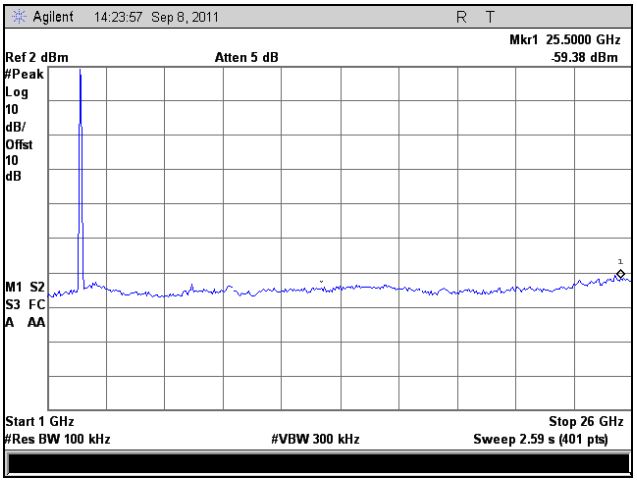


Plot 270. Conducted Spurious Emissions, High Channel, 802.11n HT5, Port 0, 1 GHz – 26 GHz

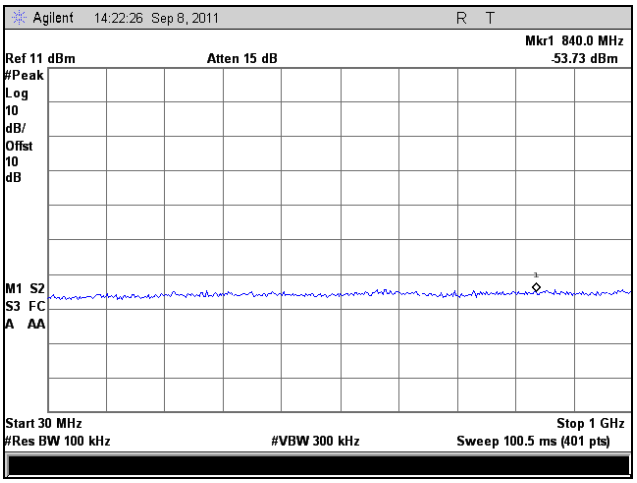
Conducted Spurious Emissions Test Results, 802.11n HT5, Port 1



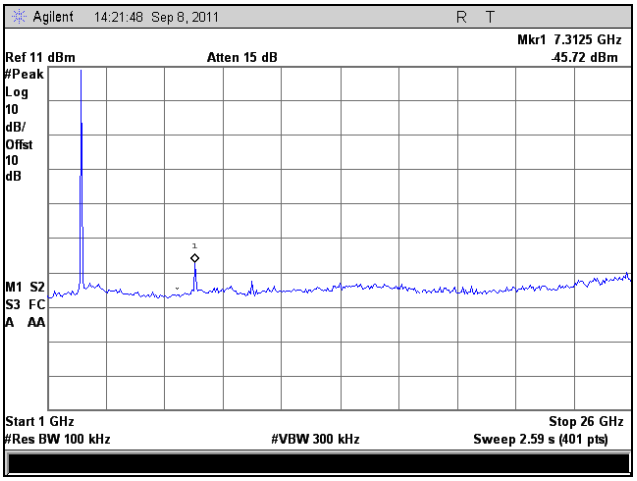
Plot 271. Conducted Spurious Emissions, Low Channel, 802.11n HT5, Port 1, 30 MHz – 1 GHz



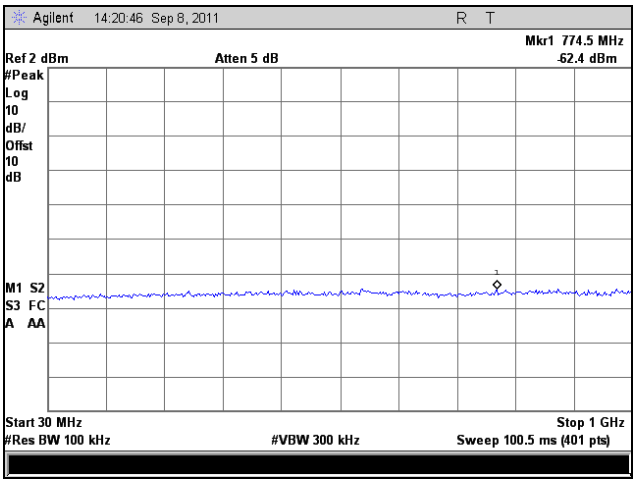
Plot 272. Conducted Spurious Emissions, Low Channel, 802.11n HT5, Port 1, 1 GHz – 26 GHz



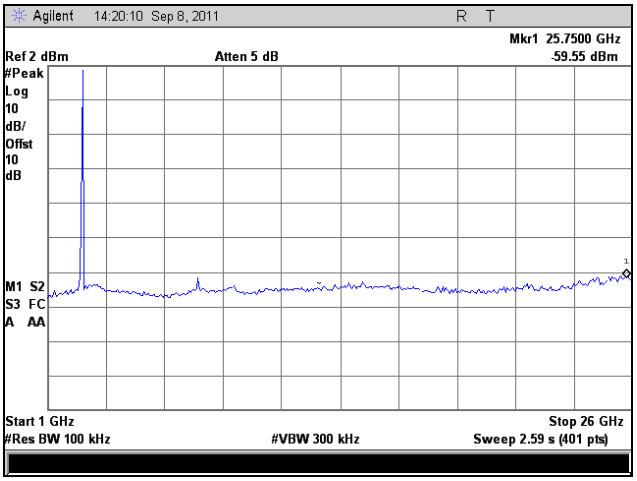
Plot 273. Conducted Spurious Emissions, Mid Channel, 802.11n HT5, Port 1, 30 MHz – 1 GHz



Plot 274. Conducted Spurious Emissions, Mid Channel, 802.11n HT5, Port 1, 1 GHz – 26 GHz

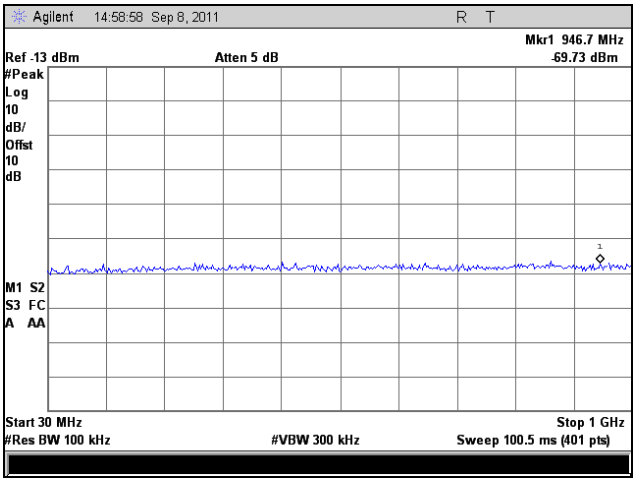


Plot 275. Conducted Spurious Emissions, High Channel, 802.11n HT5, Port 1, 30 MHz – 1 GHz

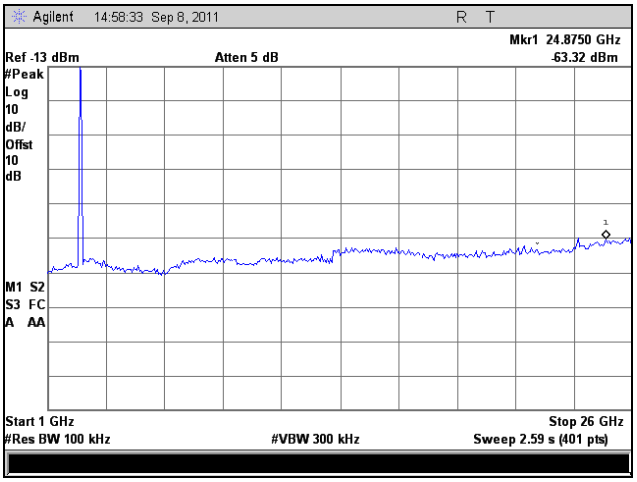


Plot 276. Conducted Spurious Emissions, High Channel, 802.11n HT5, Port 1, 1 GHz – 26 GHz

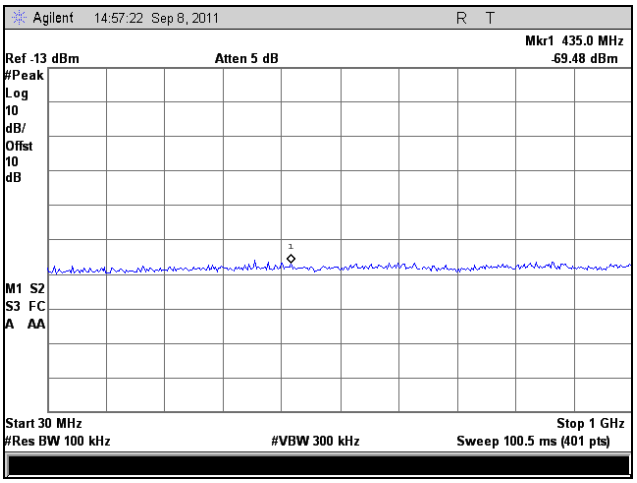
Conducted Spurious Emissions Test Results, 802.11n HT8, Port 0



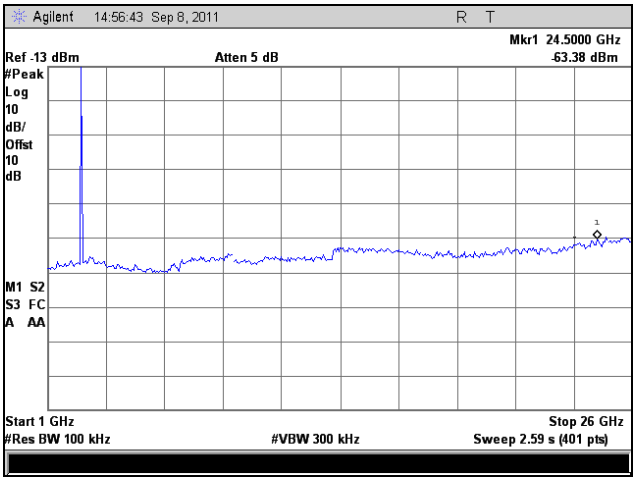
Plot 277. Conducted Spurious Emissions, Low Channel, 802.11n HT8, Port 0, 30 MHz – 1 GHz



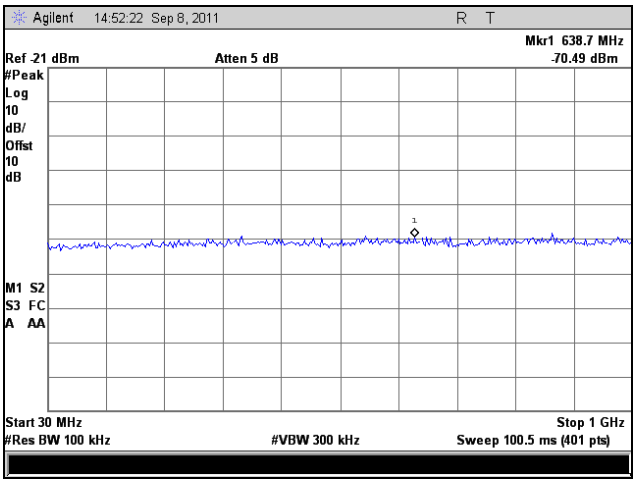
Plot 278. Conducted Spurious Emissions, Low Channel, 802.11n HT8, Port 0, 1 GHz – 26 GHz



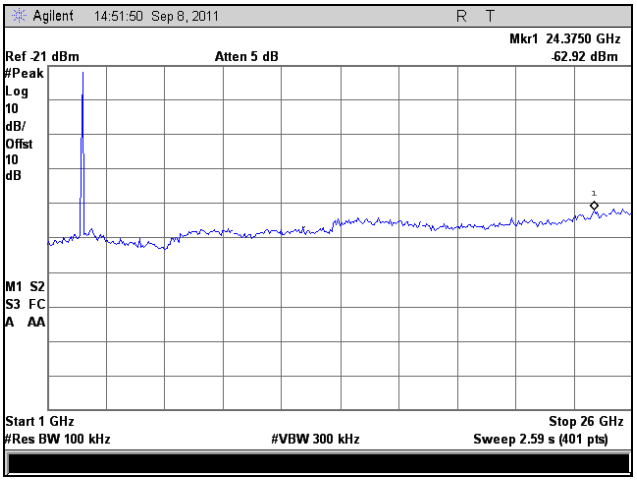
Plot 279. Conducted Spurious Emissions, Mid Channel, 802.11n HT8, Port 0, 30 MHz – 1 GHz



Plot 280. Conducted Spurious Emissions, Mid Channel, 802.11n HT8, Port 0, 1 GHz – 26 GHz

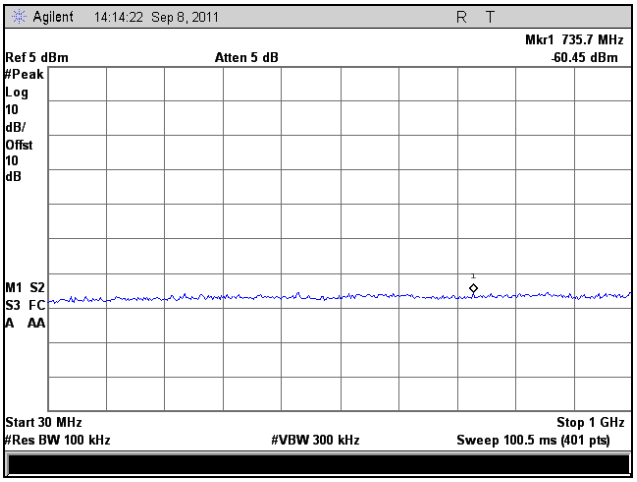


Plot 281. Conducted Spurious Emissions, High Channel, 802.11n HT8, Port 0, 30 MHz – 1 GHz

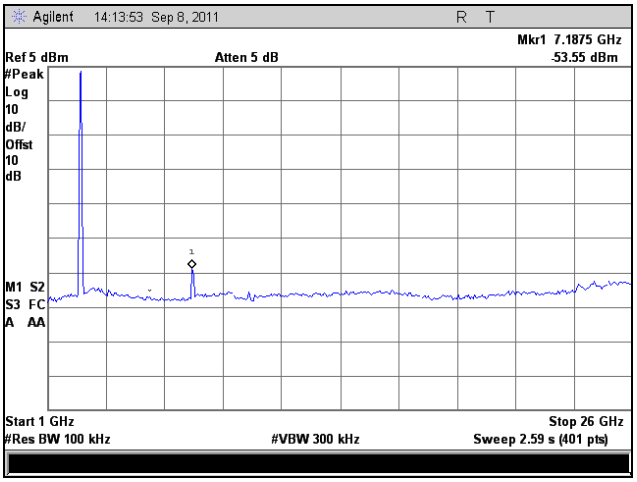


Plot 282. Conducted Spurious Emissions, High Channel, 802.11n HT8, Port 0, 1 GHz – 26 GHz

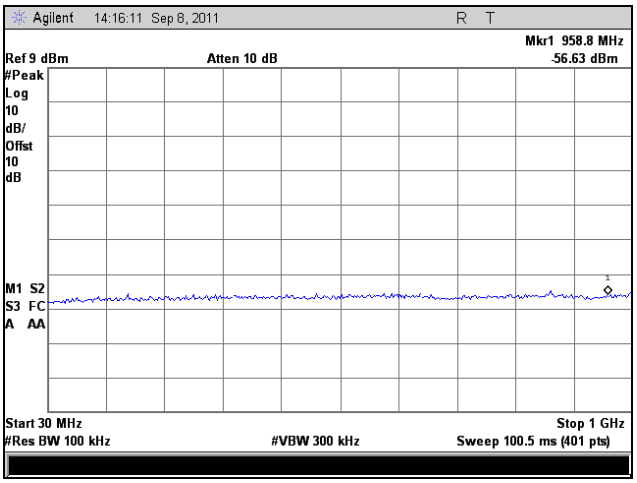
Conducted Spurious Emissions Test Results, 802.11n HT8, Port 1



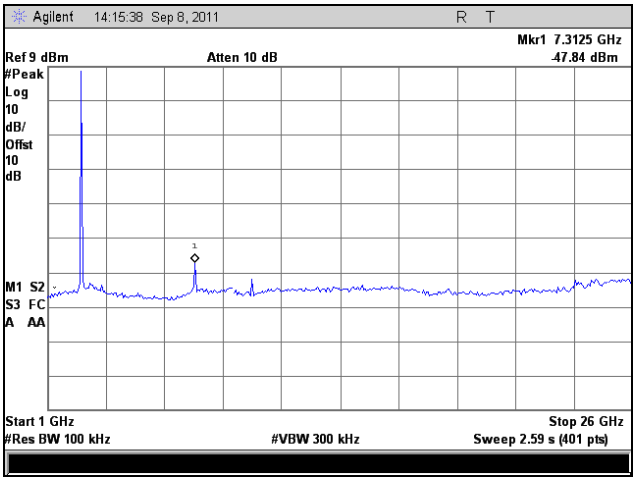
Plot 283. Conducted Spurious Emissions, Low Channel, 802.11n HT8, Port 1, 30 MHz – 1 GHz



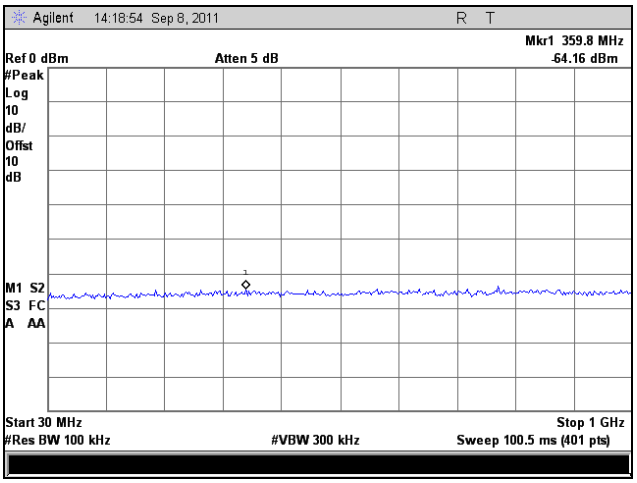
Plot 284. Conducted Spurious Emissions, Low Channel, 802.11n HT8, Port 1, 1 GHz – 26 GHz



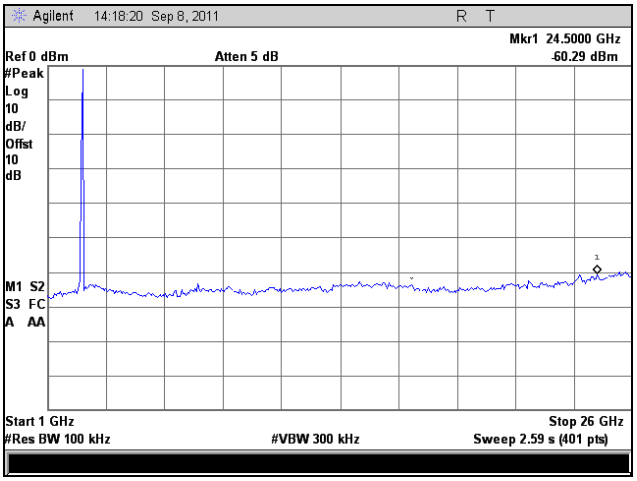
Plot 285. Conducted Spurious Emissions, Mid Channel, 802.11n HT8, Port 1, 30 MHz – 1 GHz



Plot 286. Conducted Spurious Emissions, Mid Channel, 802.11n HT8, Port 1, 1 GHz – 26 GHz

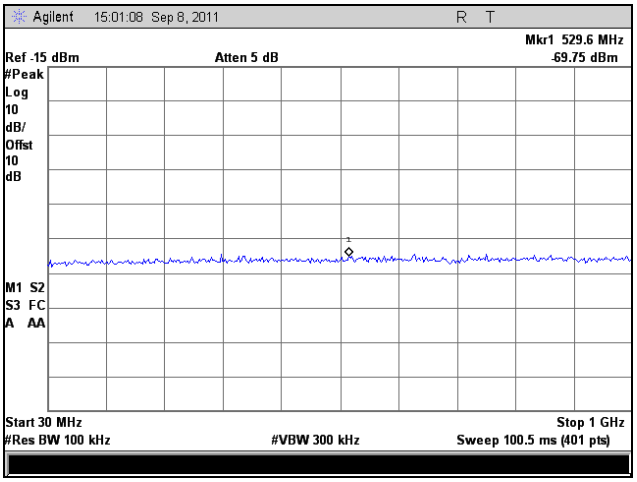


Plot 287. Conducted Spurious Emissions, High Channel, 802.11n HT8, Port 1, 30 MHz – 1 GHz

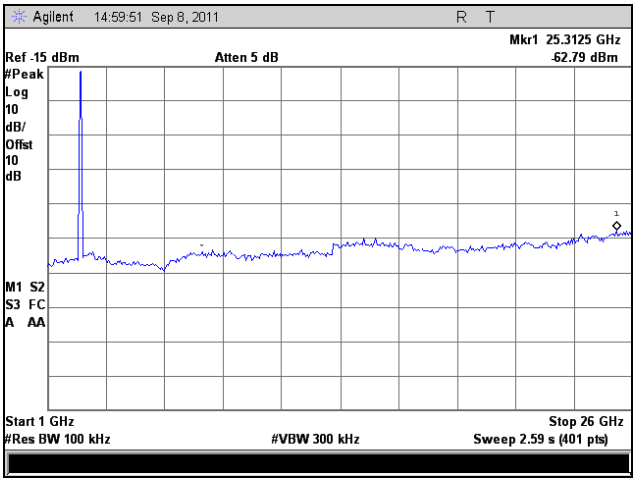


Plot 288. Conducted Spurious Emissions, High Channel, 802.11n HT8, Port 1, 1 GHz – 26 GHz

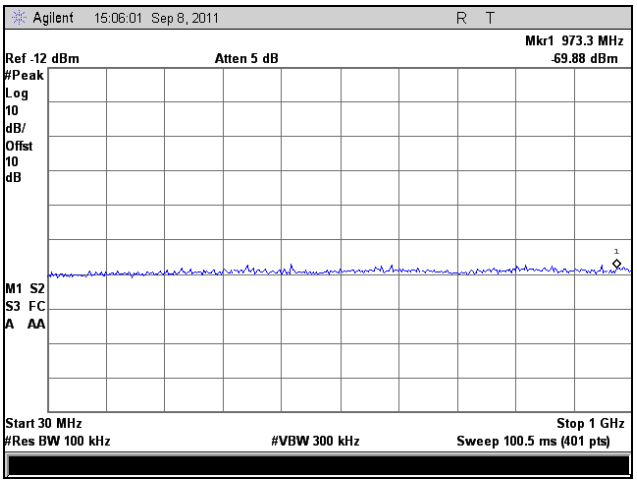
Conducted Spurious Emissions Test Results, 802.11n HT10, Port 0



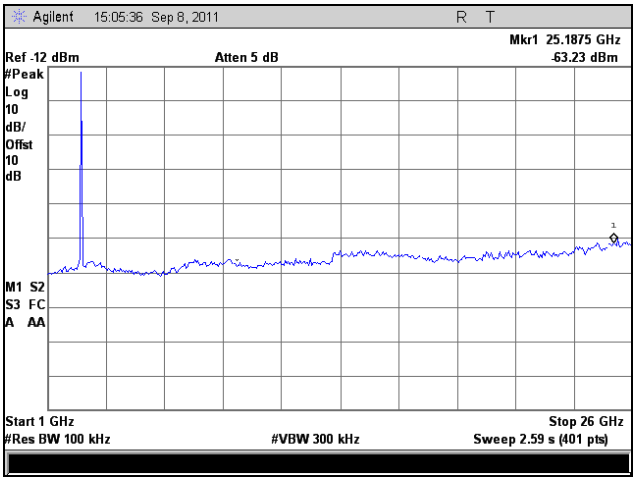
Plot 289. Conducted Spurious Emissions, Low Channel, 802.11n HT10, Port 0, 30 MHz – 1 GHz



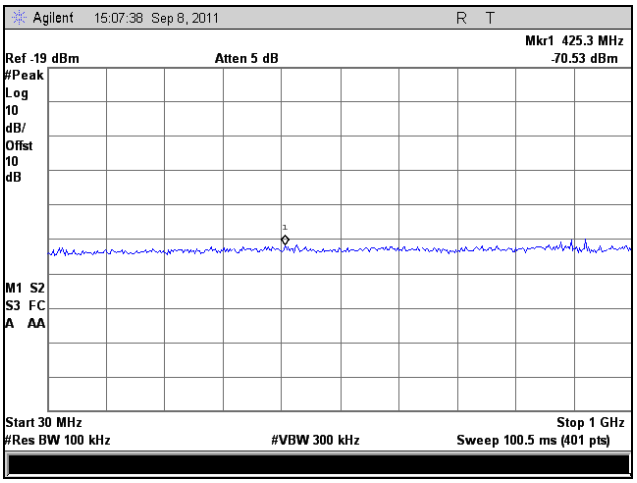
Plot 290. Conducted Spurious Emissions, Low Channel, 802.11n HT10, Port 0, 1 GHz – 26 GHz



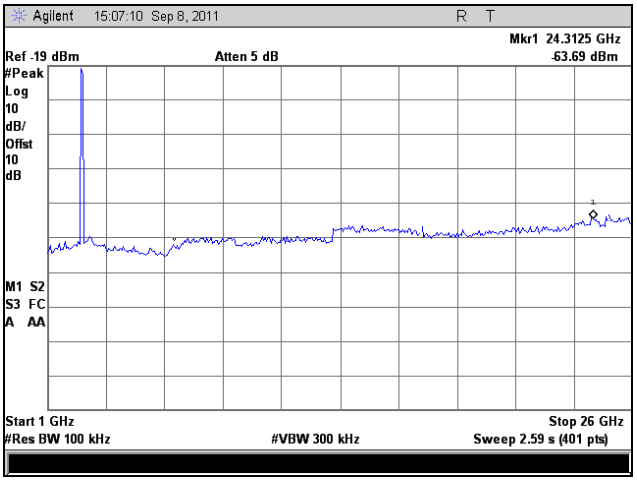
Plot 291. Conducted Spurious Emissions, Mid Channel, 802.11n HT10, Port 0, 30 MHz – 1 GHz



Plot 292. Conducted Spurious Emissions, Mid Channel, 802.11n HT10, Port 0, 1 GHz – 26 GHz

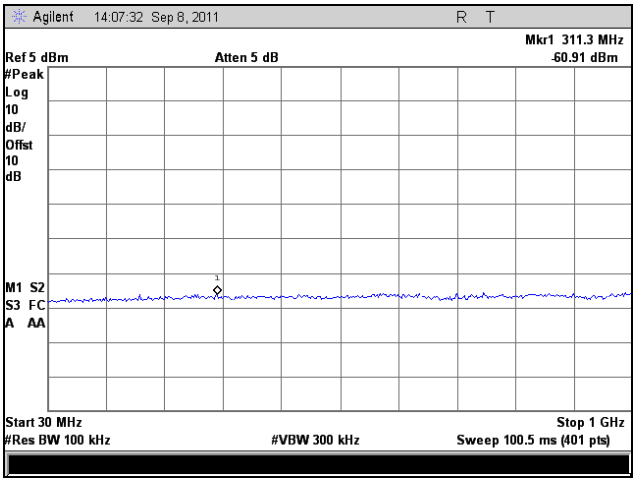


Plot 293. Conducted Spurious Emissions, High Channel, 802.11n HT10, Port 0, 30 MHz – 1 GHz

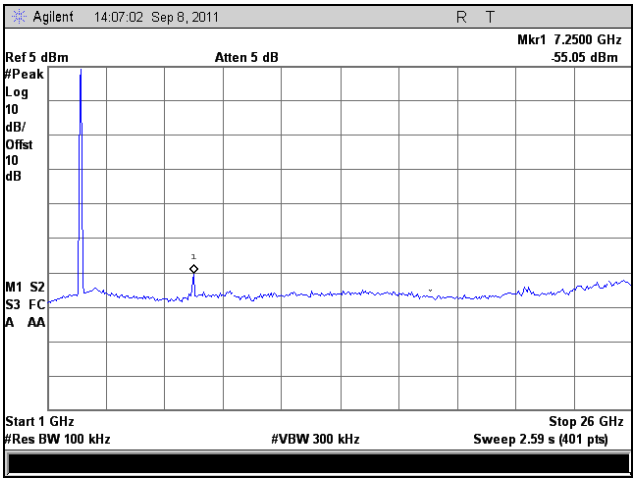


Plot 294. Conducted Spurious Emissions, High Channel, 802.11n HT10, Port 0, 1 GHz – 26 GHz

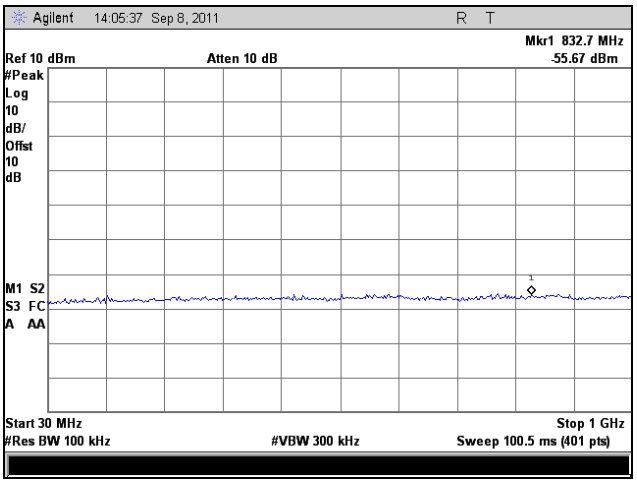
Conducted Spurious Emissions Test Results, 802.11n HT10, Port 1



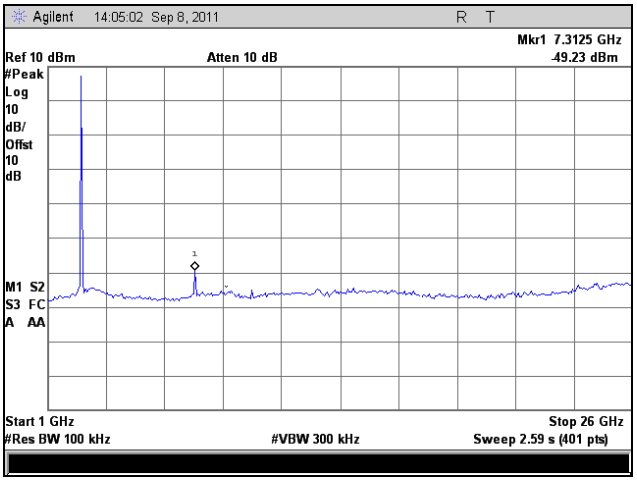
Plot 295. Conducted Spurious Emissions, Low Channel, 802.11n HT10, Port 1, 30 MHz – 1 GHz



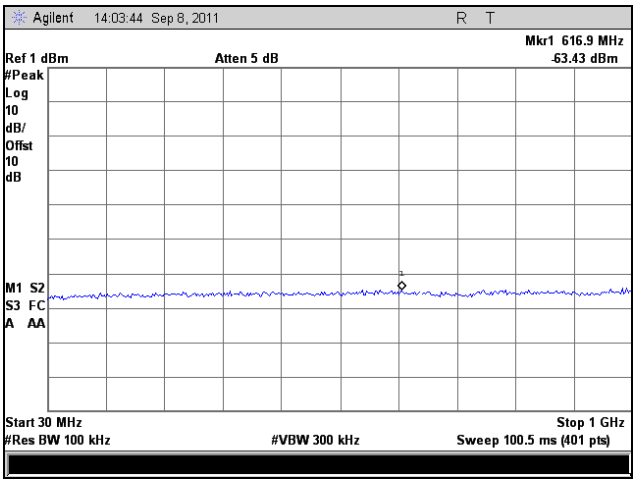
Plot 296. Conducted Spurious Emissions, Low Channel, 802.11n HT10, Port 1, 1 GHz – 26 GHz



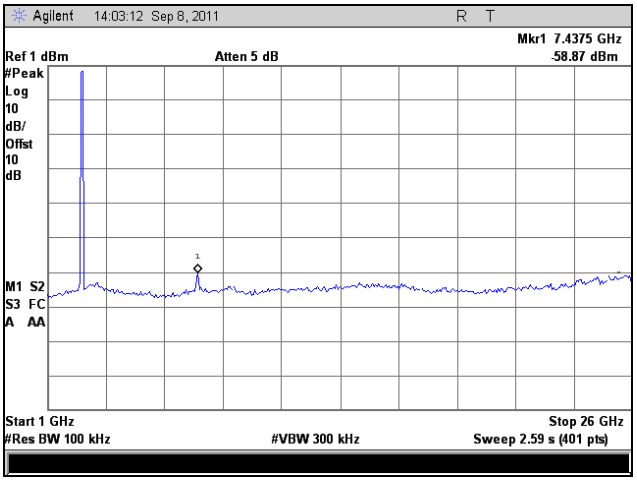
Plot 297. Conducted Spurious Emissions, Mid Channel, 802.11n HT10, Port 1, 30 MHz – 1 GHz



Plot 298. Conducted Spurious Emissions, Mid Channel, 802.11n HT10, Port 1, 1 GHz – 26 GHz

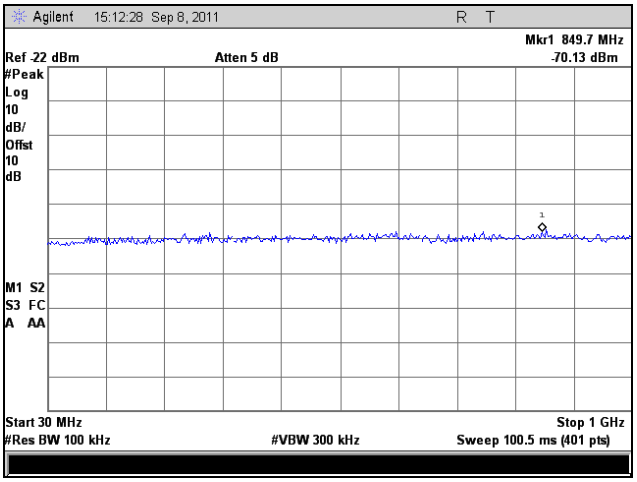


Plot 299. Conducted Spurious Emissions, High Channel, 802.11n HT10, Port 1, 30 MHz – 1 GHz

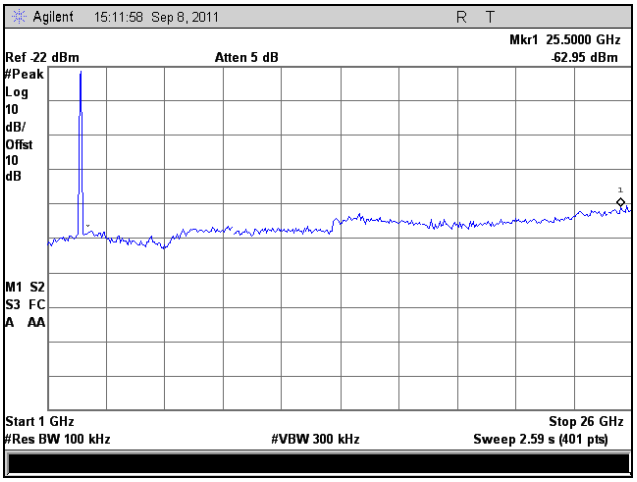


Plot 300. Conducted Spurious Emissions, High Channel, 802.11n HT10, Port 1, 1 GHz – 26 GHz

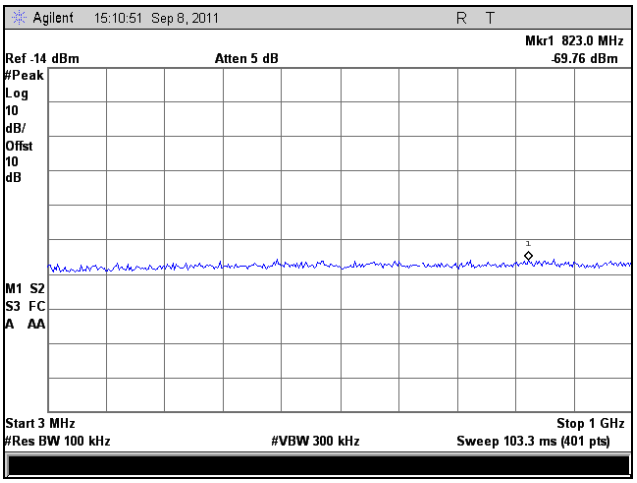
Conducted Spurious Emissions Test Results, 802.11n HT20, Port 0



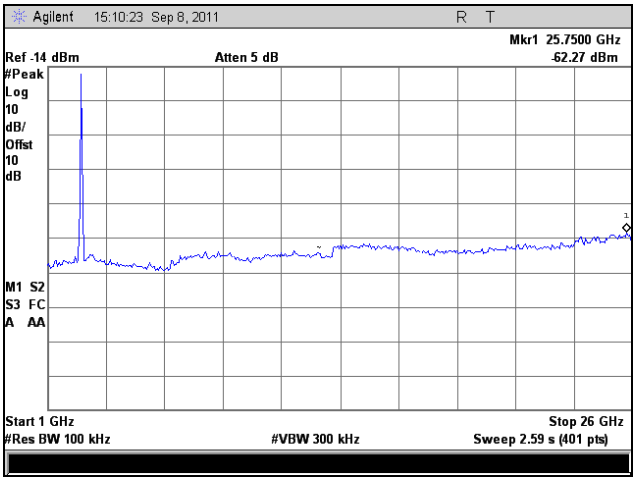
Plot 301. Conducted Spurious Emissions, Low Channel, 802.11n HT20, Port 0, 30 MHz – 1 GHz



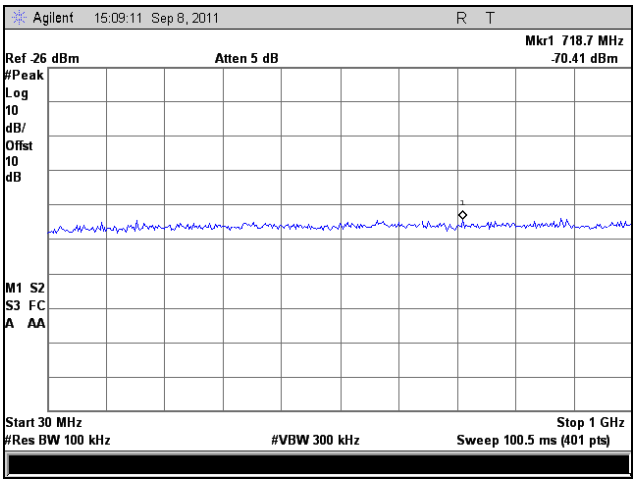
Plot 302. Conducted Spurious Emissions, Low Channel, 802.11n HT20, Port 0, 1 GHz – 26 GHz



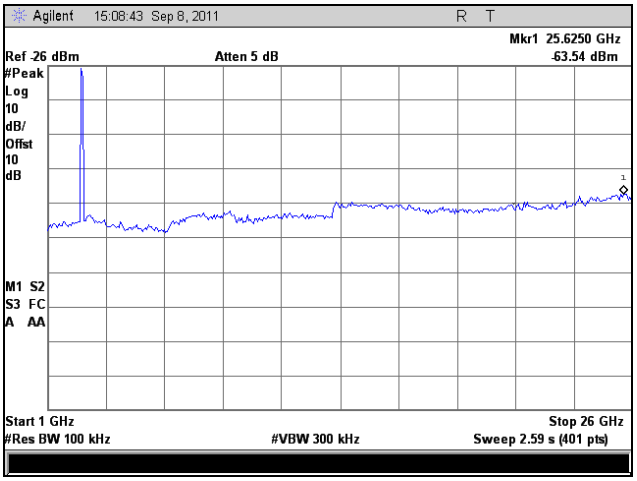
Plot 303. Conducted Spurious Emissions, Mid Channel, 802.11n HT20, Port 0, 30 MHz – 1 GHz



Plot 304. Conducted Spurious Emissions, Mid Channel, 802.11n HT20, Port 0, 1 GHz – 26 GHz

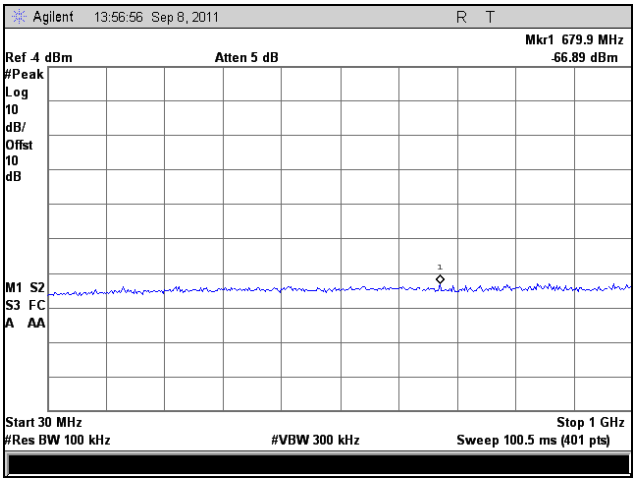


Plot 305. Conducted Spurious Emissions, High Channel, 802.11n HT20, Port 0, 30 MHz – 1 GHz

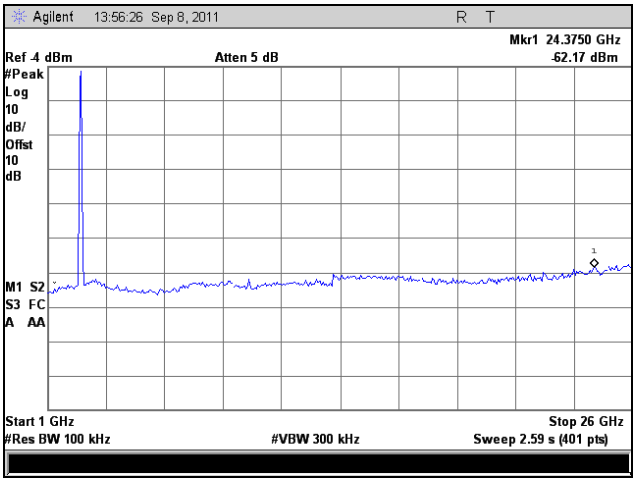


Plot 306. Conducted Spurious Emissions, High Channel, 802.11n HT20, Port 0, 1 GHz – 26 GHz

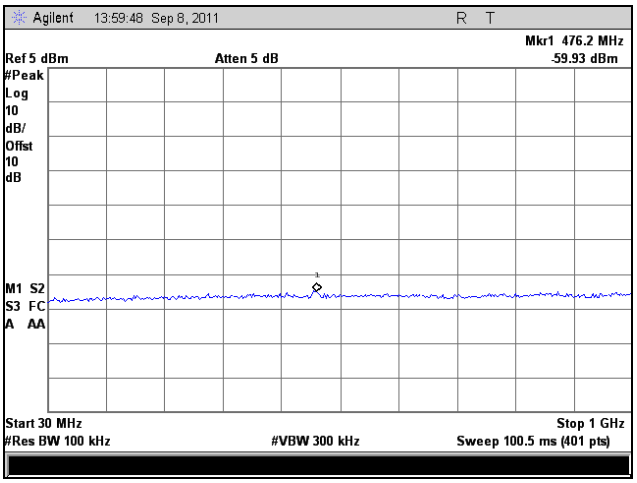
Conducted Spurious Emissions Test Results, 802.11n HT20, Port 1



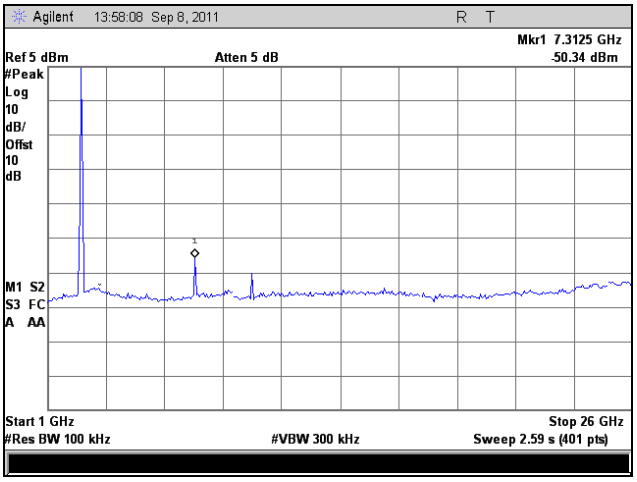
Plot 307. Conducted Spurious Emissions, Low Channel, 802.11n HT20, Port 1, 30 MHz – 1 GHz



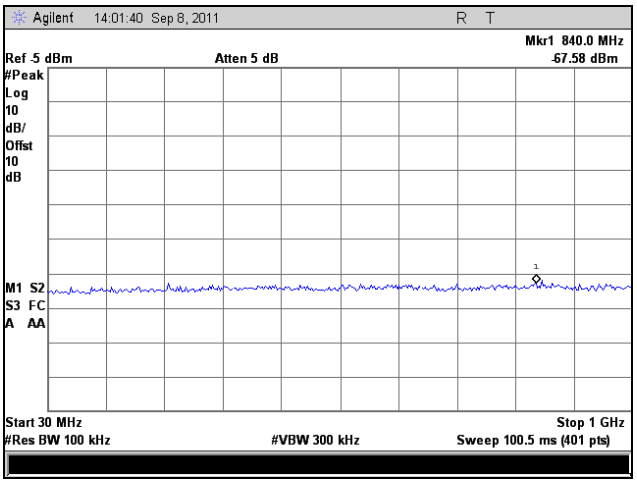
Plot 308. Conducted Spurious Emissions, Low Channel, 802.11n HT20, Port 1, 1 GHz – 26 GHz



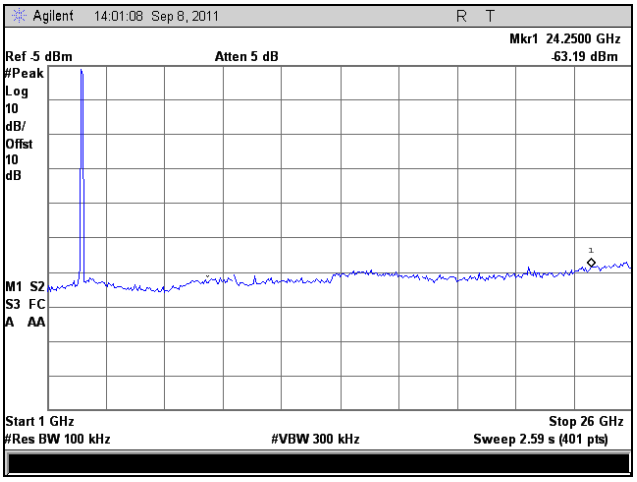
Plot 309. Conducted Spurious Emissions, Mid Channel, 802.11n HT20, Port 1, 30 MHz – 1 GHz



Plot 310. Conducted Spurious Emissions, Mid Channel, 802.11n HT20, Port 1, 1 GHz – 26 GHz

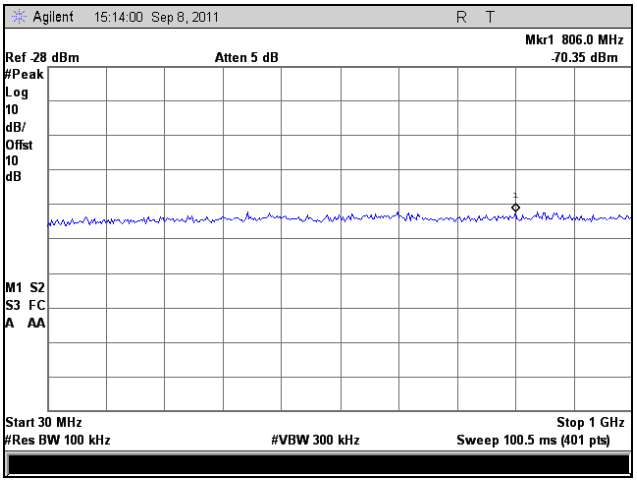


Plot 311. Conducted Spurious Emissions, High Channel, 802.11n HT20, Port 1, 30 MHz – 1 GHz

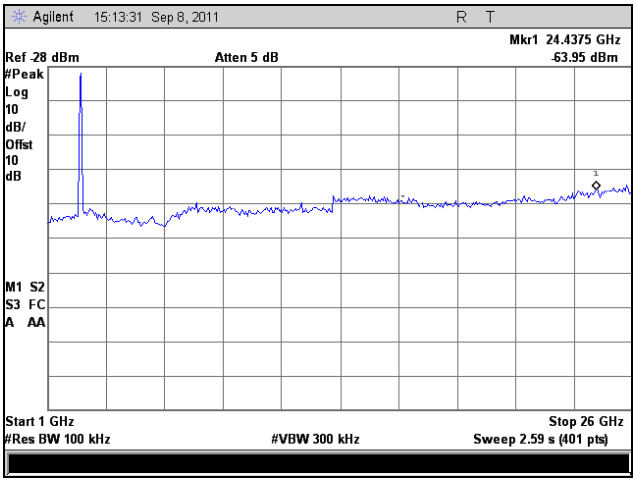


Plot 312. Conducted Spurious Emissions, High Channel, 802.11n HT20, Port 1, 1 GHz – 26 GHz

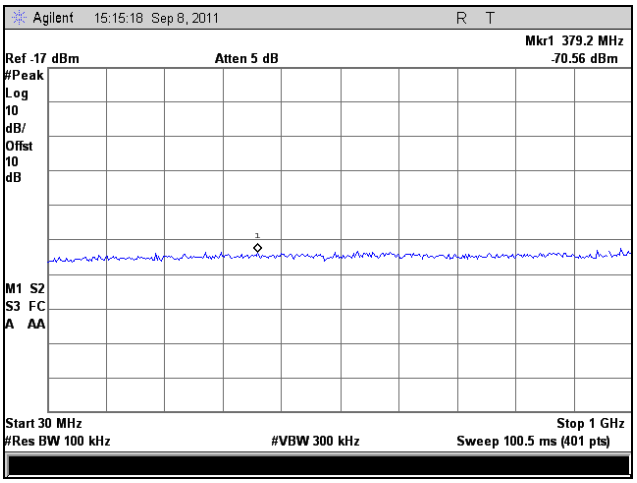
Conducted Spurious Emissions Test Results, 802.11n HT40, Port 0



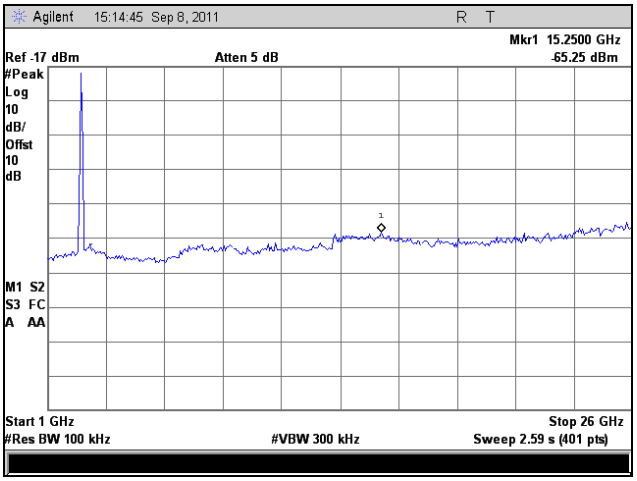
Plot 313. Conducted Spurious Emissions, Low Channel, 802.11n HT40, Port 0, 30 MHz – 1 GHz



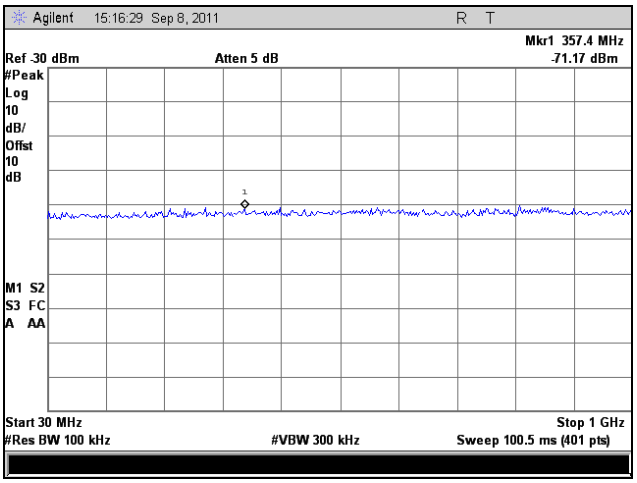
Plot 314. Conducted Spurious Emissions, Low Channel, 802.11n HT40, Port 0, 1 GHz – 26 GHz



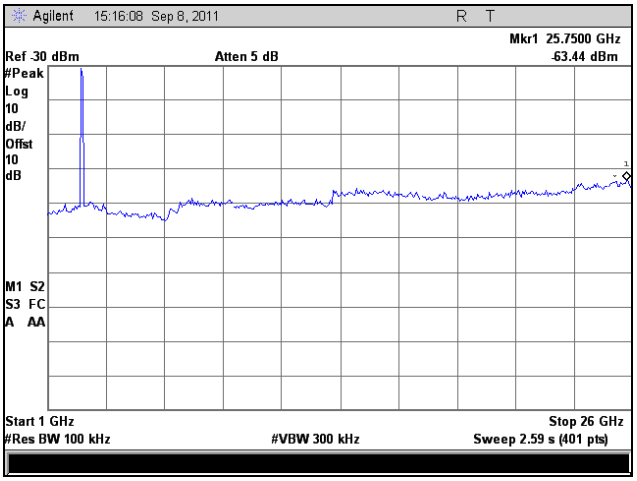
Plot 315. Conducted Spurious Emissions, Mid Channel, 802.11n HT40, Port 0, 30 MHz – 1 GHz



Plot 316. Conducted Spurious Emissions, Mid Channel, 802.11n HT40, Port 0, 1 GHz – 26 GHz

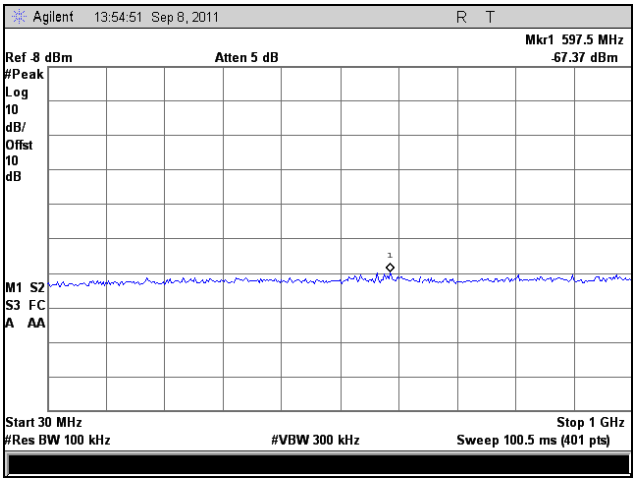


Plot 317. Conducted Spurious Emissions, High Channel, 802.11n HT40, Port 0, 30 MHz – 1 GHz

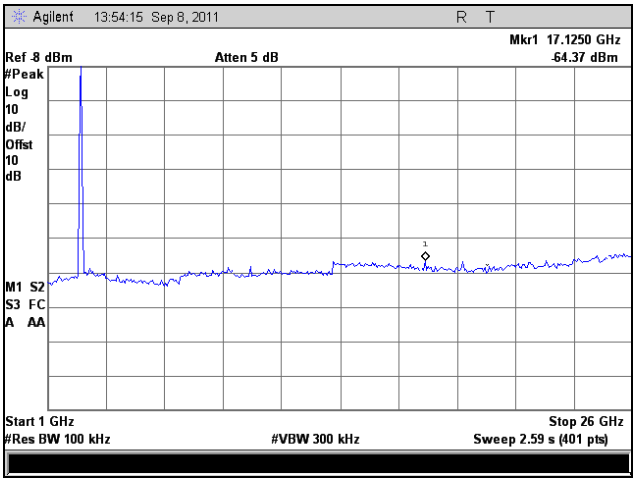


Plot 318. Conducted Spurious Emissions, High Channel, 802.11n HT40, Port 0, 1 GHz – 26 GHz

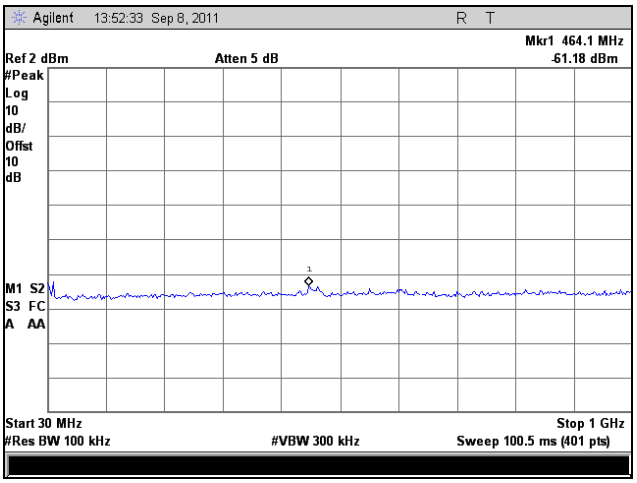
Conducted Spurious Emissions Test Results, 802.11n HT40, Port 1



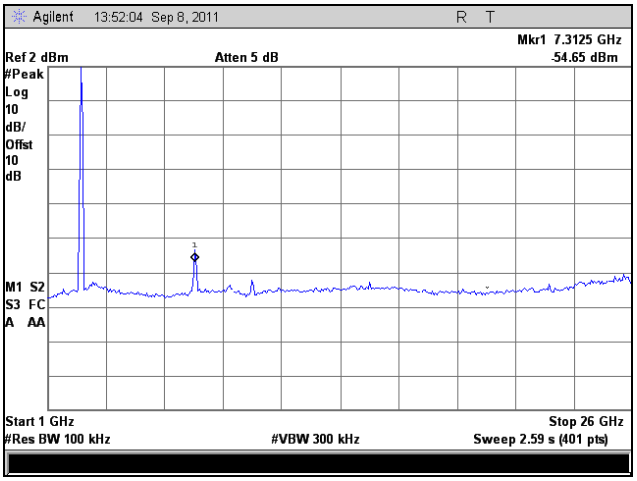
Plot 319. Conducted Spurious Emissions, Low Channel, 802.11n HT40, Port 1, 30 MHz – 1 GHz



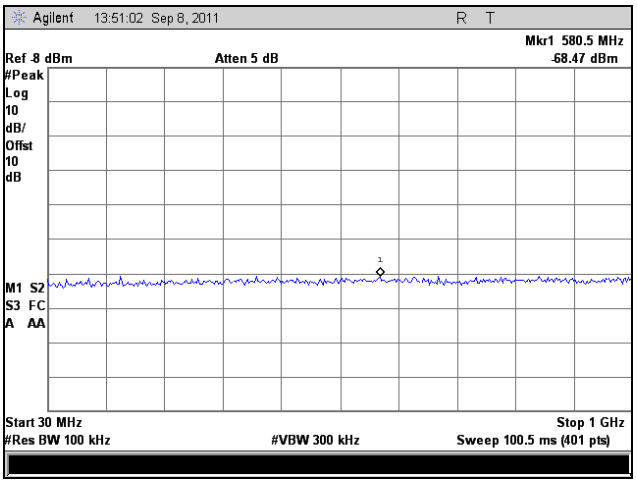
Plot 320. Conducted Spurious Emissions, Low Channel, 802.11n HT40, Port 1, 1 GHz – 26 GHz



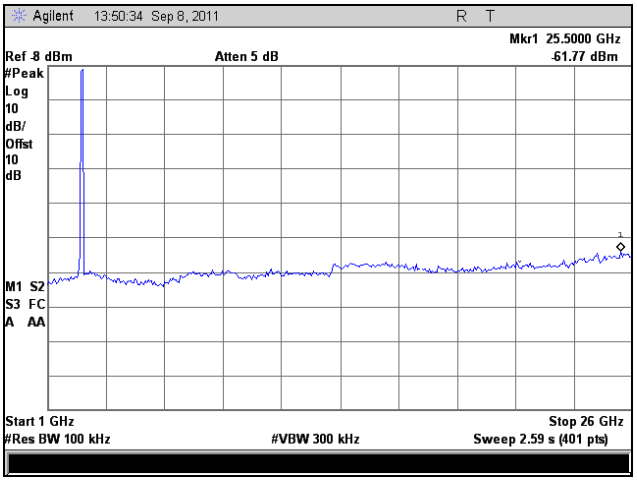
Plot 321. Conducted Spurious Emissions, Mid Channel, 802.11n HT40, Port 1, 30 MHz – 1 GHz



Plot 322. Conducted Spurious Emissions, Mid Channel, 802.11n HT40, Port 1, 1 GHz – 26 GHz

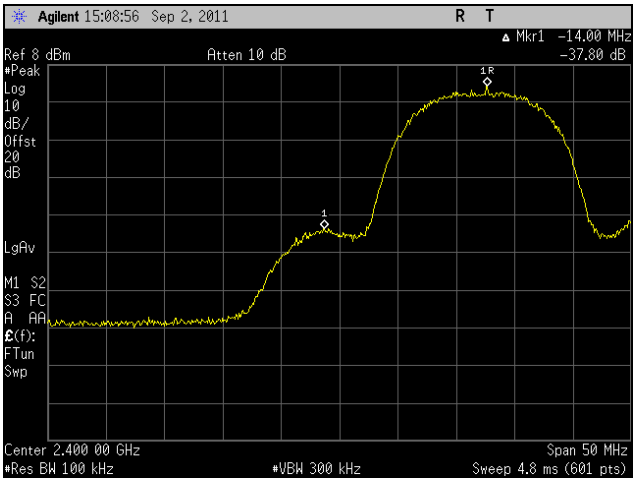


Plot 323. Conducted Spurious Emissions, High Channel, 802.11n HT40, Port 1, 30 MHz – 1 GHz

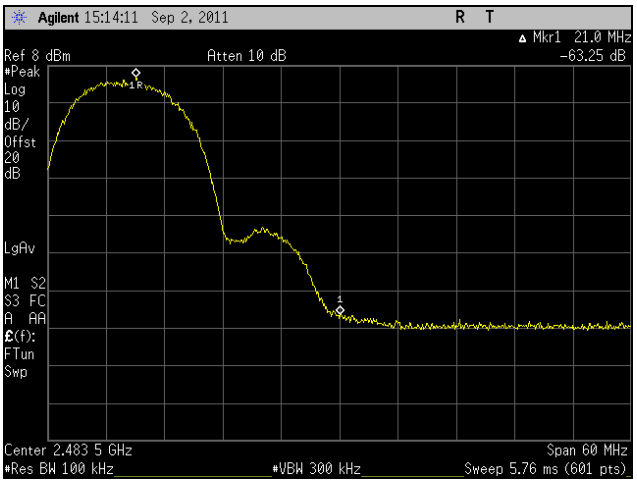


Plot 324. Conducted Spurious Emissions, High Channel, 802.11n HT40, Port 1, 1 GHz – 26 GHz

Conducted Band Edge Test Results, 802.11b

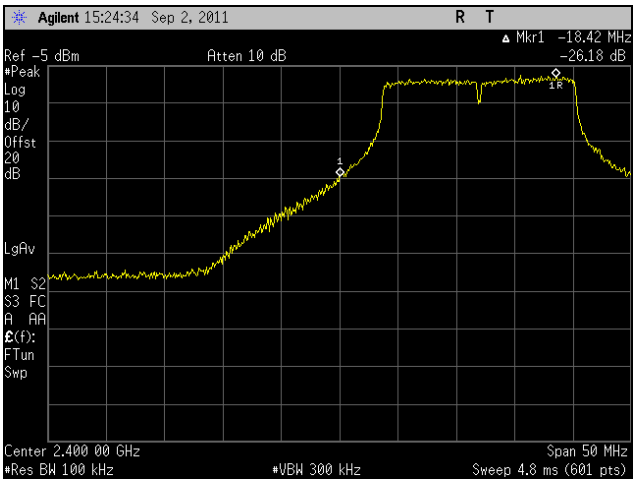


Plot 325. Conducted Band Edge, Low Channel, 802.11b

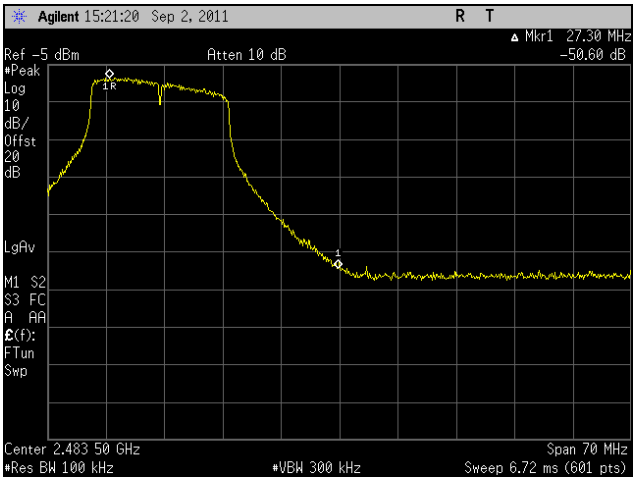


Plot 326. Conducted Band Edge, High Channel, 802.11b

Conducted Band Edge Test Results, 802.11g

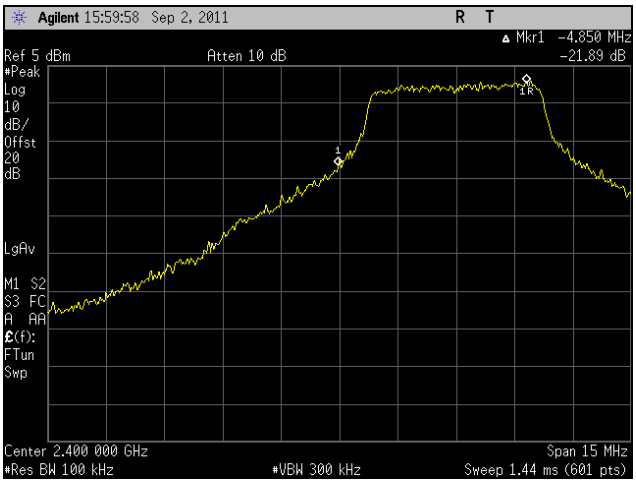


Plot 327. Conducted Band Edge, Low Channel, 802.11g 20 MHz

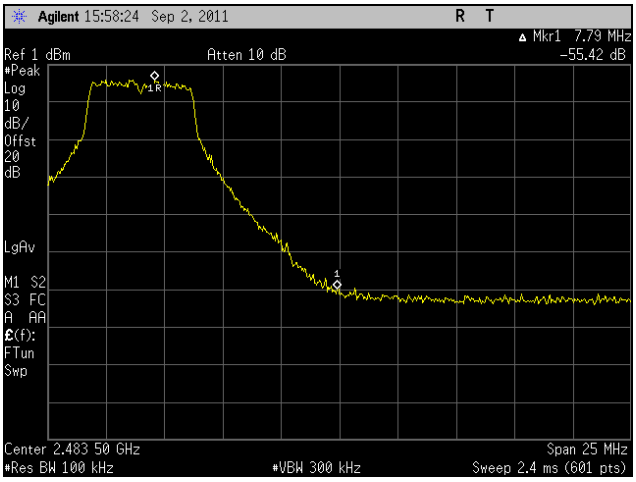


Plot 328. Conducted Band Edge, High Channel, 802.11g 20 MHz

Conducted Band Edge Test Results, 802.11n HT5, Port 0

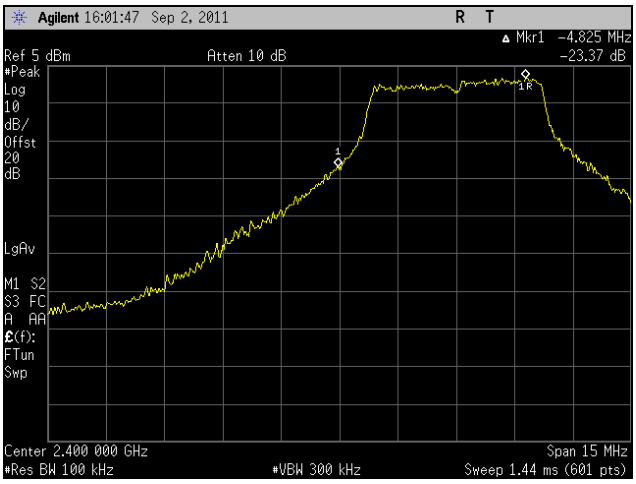


Plot 329. Conducted Band Edge, Low Channel, 802.11n HT5, Port 0

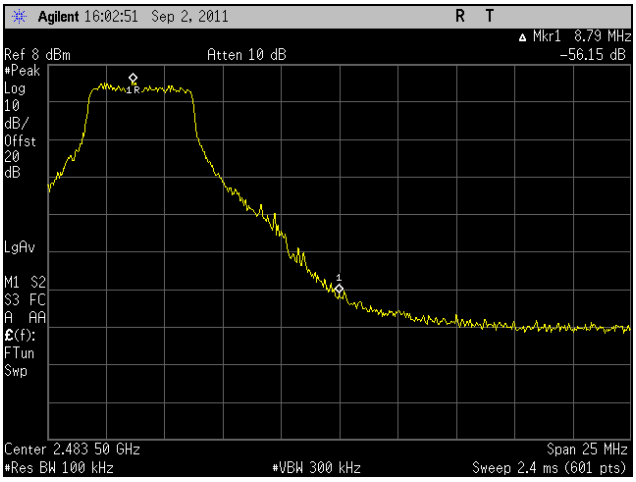


Plot 330. Conducted Band Edge, High Channel, 802.11n HT5, Port 0

Conducted Band Edge Test Results, 802.11n HT5, Port 1

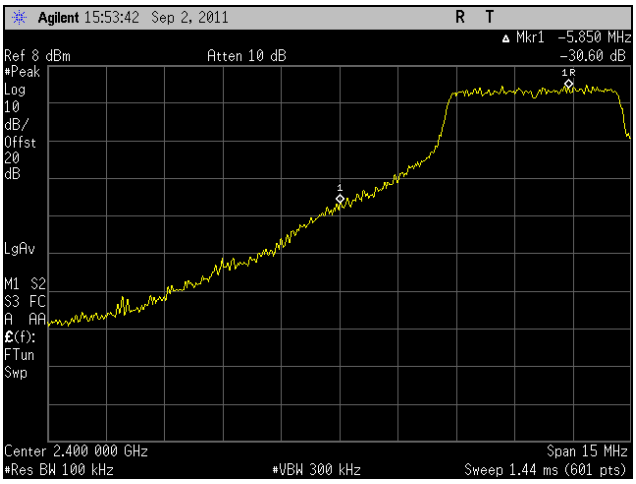


Plot 331. Conducted Band Edge, Low Channel, 802.11n HT5, Port 1

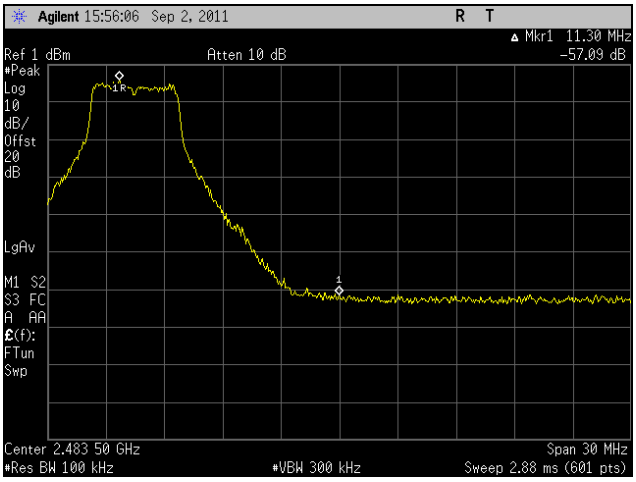


Plot 332. Conducted Band Edge, High Channel, 802.11n HT5, Port 1

Conducted Band Edge Test Results, 802.11n HT8, Port 0

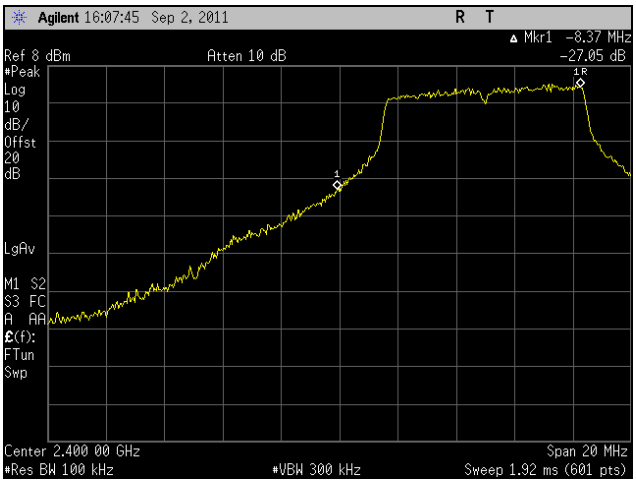


Plot 333. Conducted Band Edge, Low Channel, 802.11n HT8, Port 0

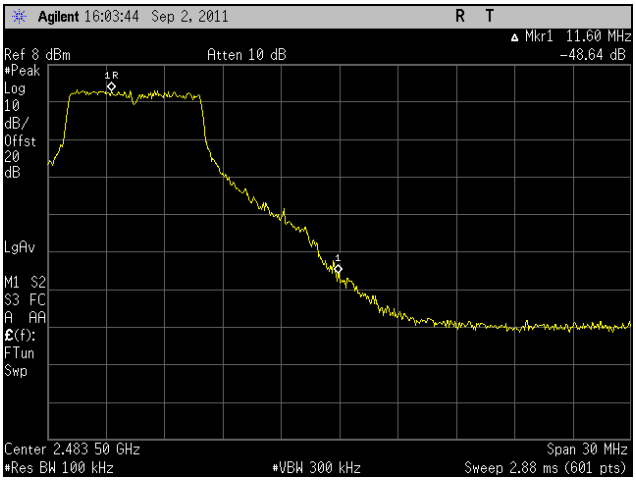


Plot 334. Conducted Band Edge, High Channel, 802.11n HT8, Port 0

Conducted Band Edge Test Results, 802.11n HT8, Port 1

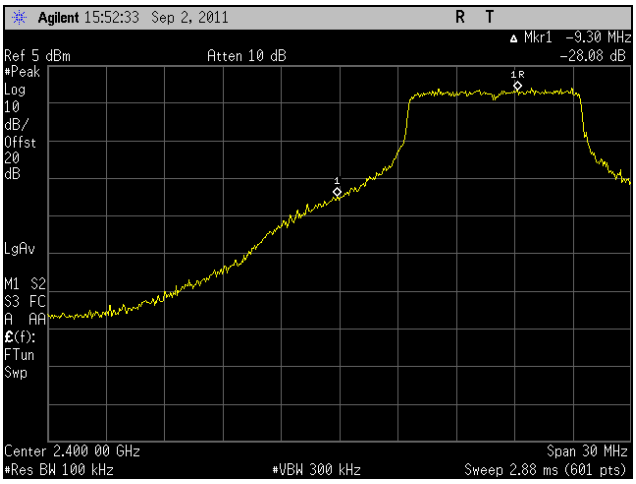


Plot 335. Conducted Band Edge, Low Channel, 802.11n HT8, Port 1

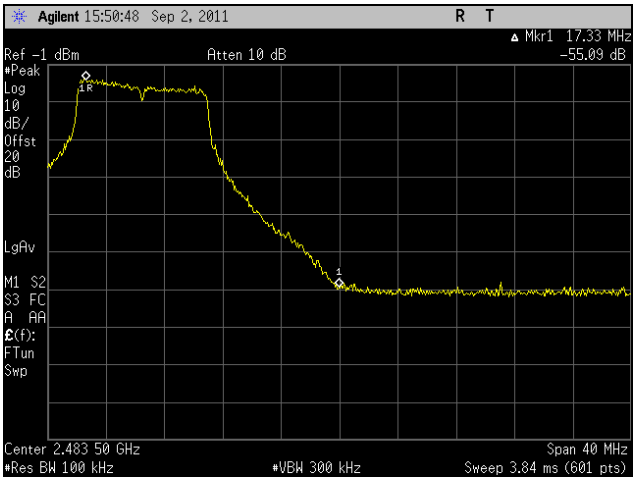


Plot 336. Conducted Band Edge, High Channel, 802.11n HT8, Port 1

Conducted Band Edge Test Results, 802.11n HT10, Port 0

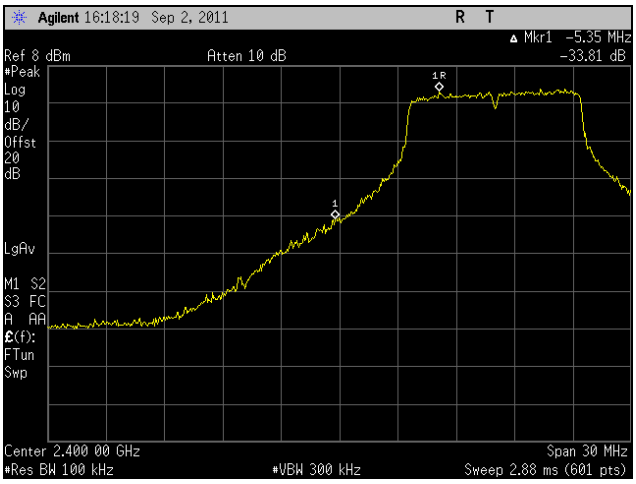


Plot 337. Conducted Band Edge, Low Channel, 802.11n HT10, Port 0

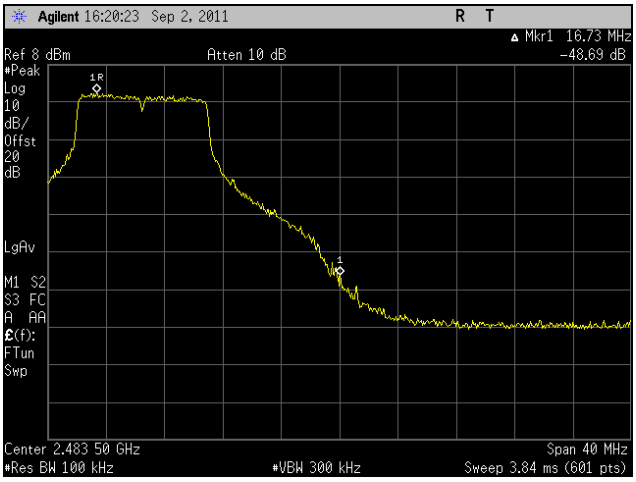


Plot 338. Conducted Band Edge, High Channel, 802.11n HT10, Port 0

Conducted Band Edge Test Results, 802.11n HT10, Port 1

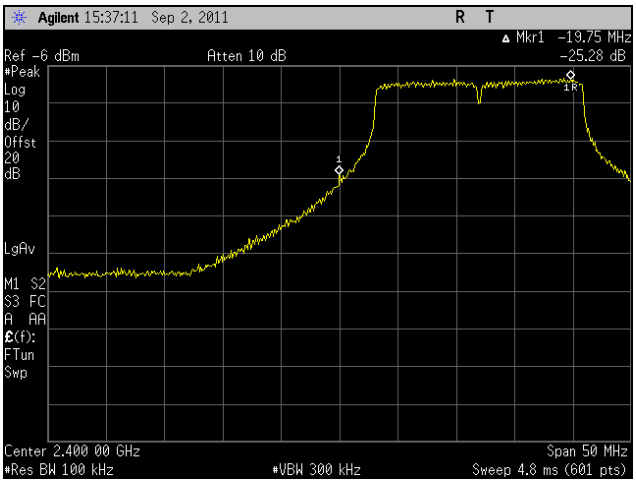


Plot 339. Conducted Band Edge, Low Channel, 802.11n HT10, Port 1

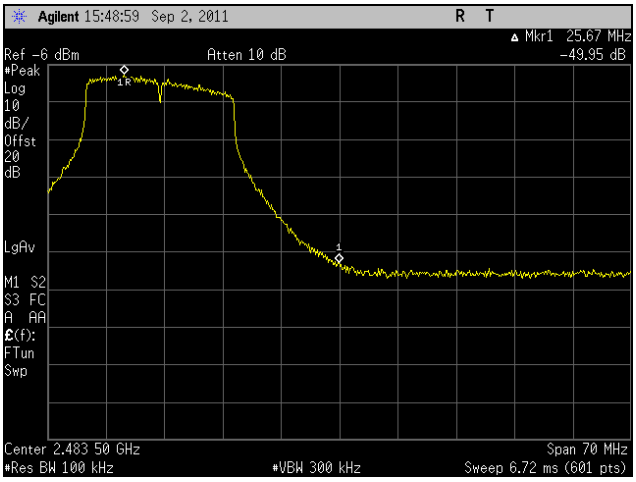


Plot 340. Conducted Band Edge, High Channel, 802.11n HT10, Port 1

Conducted Band Edge Test Results, 802.11n HT20, Port 0

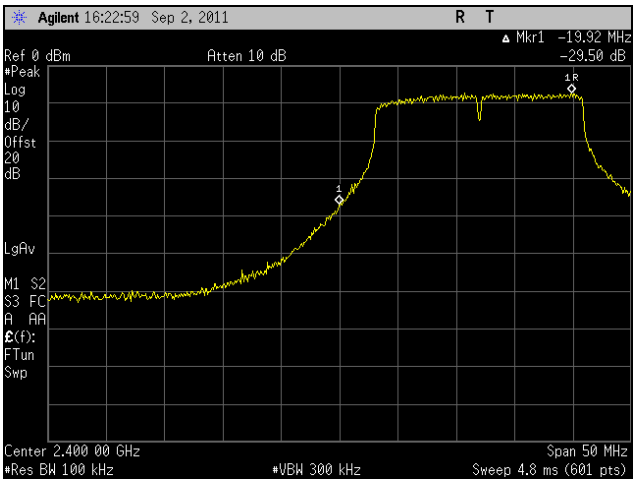


Plot 341. Conducted Band Edge, Low Channel, 802.11n HT20, Port 0

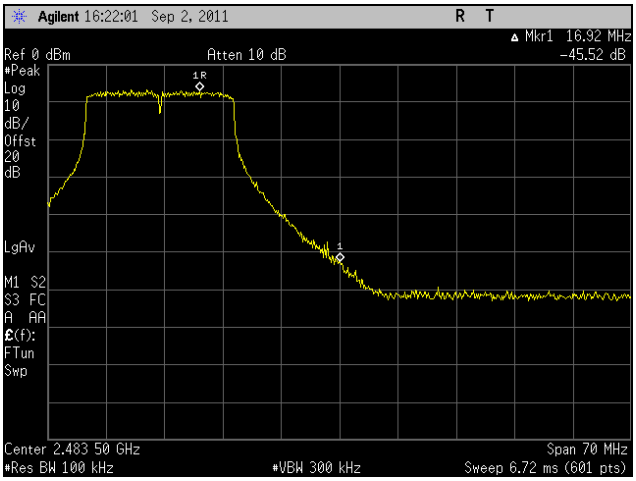


Plot 342. Conducted Band Edge, High Channel, 802.11n HT20, Port 0

Conducted Band Edge Test Results, 802.11n HT20, Port 1

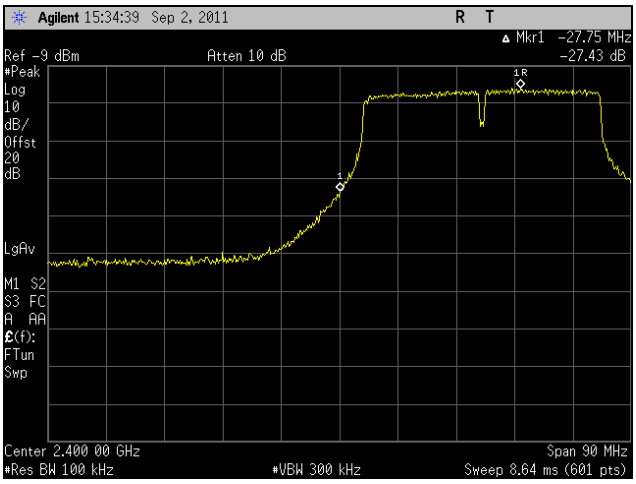


Plot 343. Conducted Band Edge, Low Channel, 802.11n HT20, Port 1

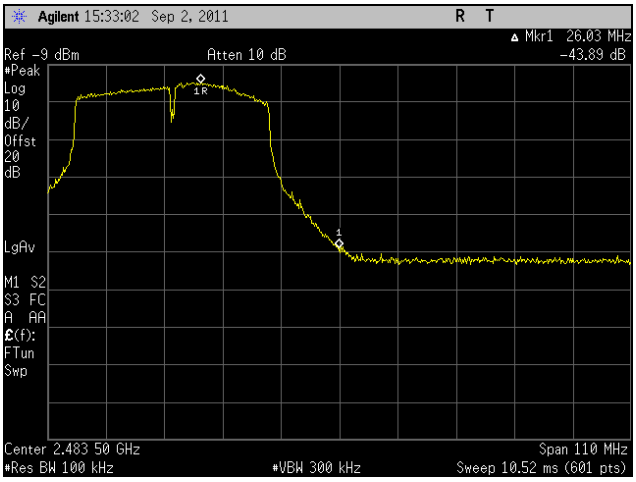


Plot 344. Conducted Band Edge, High Channel, 802.11n HT20, Port 1

Conducted Band Edge Test Results, 802.11n HT40, Port 0

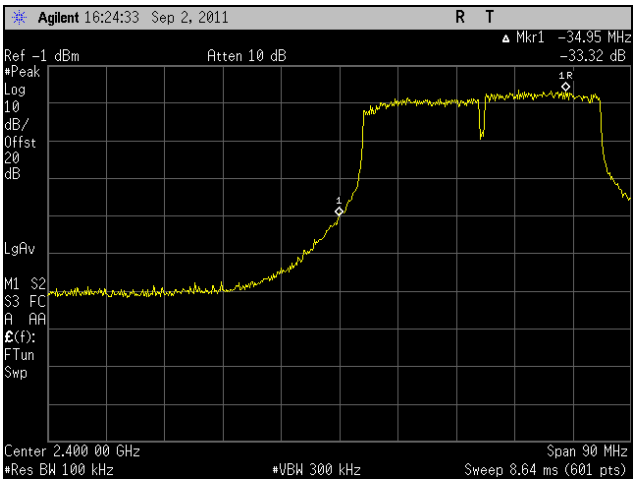


Plot 345. Conducted Band Edge, Low Channel, 802.11n HT40, Port 0

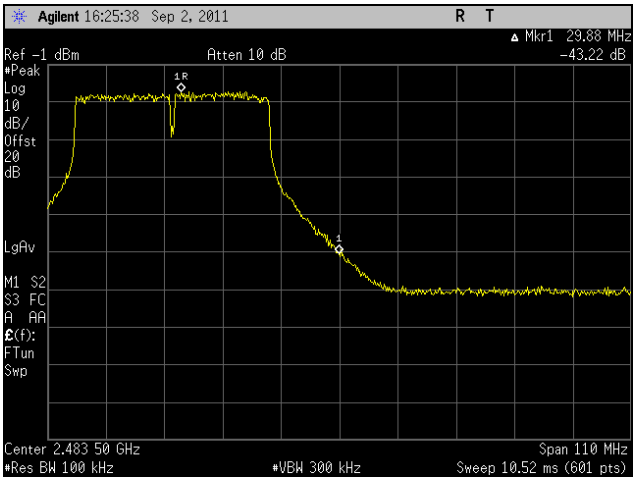


Plot 346. Conducted Band Edge, High Channel, 802.11n HT40, Port 0

Conducted Band Edge Test Results, 802.11n HT40, Port 1



Plot 347. Conducted Band Edge, Low Channel, 802.11n HT40, Port 1



Plot 348. Conducted Band Edge, High Channel, 802.11n HT40, Port 1

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

Test Requirements: **§15.247(e):** For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level. A RBW of 1 MHz and VBW of 3 MHz were used to determine the peak emissions within the band. The Spectrum analyzer was then set to a RBW of 3 kHz and VBW was set to 10 kHz. The SPAN of the analyzer was set to 1 MHz with a 333.3 second sweep. Measurements were carried out at the low, mid and high channels.

Test Results: The EUT was compliant with the peak power spectral density limits of **§ 15.247 (e)**.

The peak power spectral density was determined from plots on the following page(s).

Test Engineer: Lionel Gabrillo

Test Date: 09/08/11

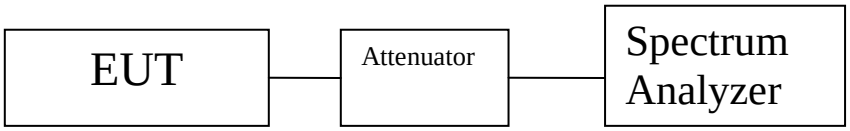


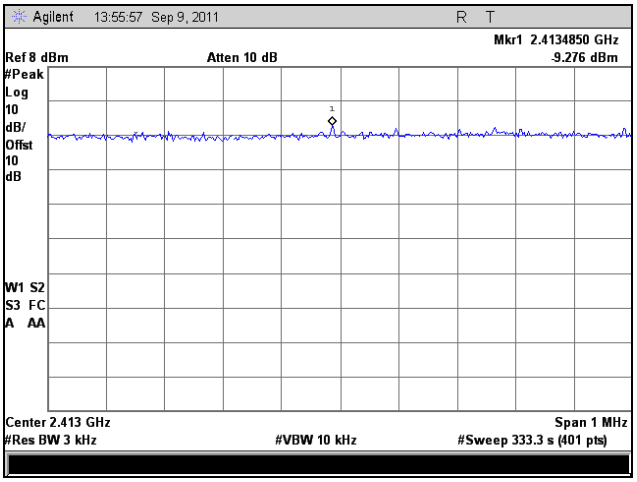
Figure 5. Block Diagram, Peak Power Spectral Density Test Setup

Peak Power Spectral Density Test Results

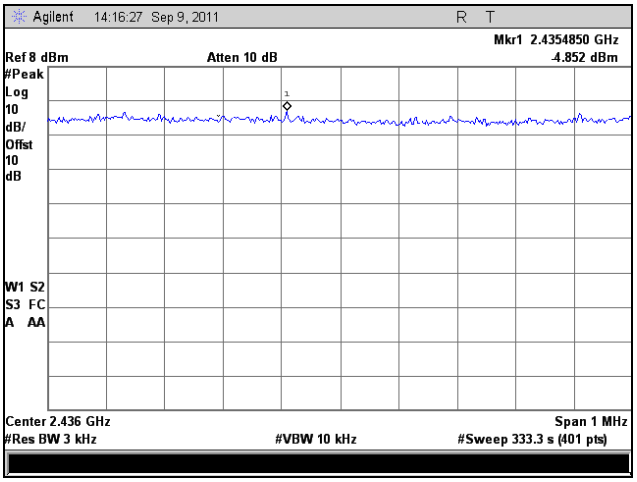
Peak Power Spectral Density						
Mode	**Carrier Channel**	**Frequency (MHz)**	**Measured PPSD (dBm)**	**Measured PPSD + 10log(# of Ports)**	**Limit (dBm)**	**Margin (dB)**
802.11b	Low	2412	-9.276	-	8	-17.276
	Mid	2437	-4.852	-	8	-12.852
	High	2462	-7.401	-	8	-15.401
802.11g	Low	2412	-14.98	-	8	-23.98
	Mid	2431	-6.35	-	8	-14.35
	High	2462	-17.57	-	8	-25.57
802.11n HT5	Low	2403	-9.227	-6.217	8	-14.217
	Mid	2437	-1.093	1.917	8	-6.083
	High	2475	-10.06	-7.050	8	-15.050
802.11n HT8	Low	2405	-10.52	-7.510	8	-15.510
	Mid	2437	-2.554	0.456	8	-7.544
	High	2473	-11.73	-8.720	8	-16.720
802.11n HT10	Low	2408	-9.696	-6.686	8	-14.686
	Mid	2437	-3.789	-0.779	8	-8.779
	High	2470	-10.28	-7.270	8	-15.270
802.11n HT20	Low	2412	-17.05	-14.040	8	-22.040
	Mid	2437	-7.173	-4.163	8	-12.163
	High	2462	-18.59	-15.580	8	-23.580
802.11n HT40	Low	2422	-19.73	-16.720	8	-24.720
	Mid	2437	-8.975	-5.965	8	-13.965
	High	2452	-20.94	-17.930	8	-25.930

Table 28. Peak Power Spectral Density, Test Results

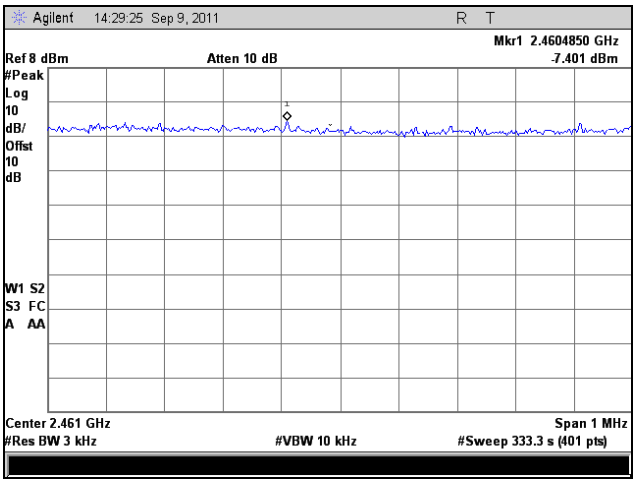
Peak Power Spectral Density, 802.11b



Plot 349. Peak Power Spectral Density, Low Channel, 802.11b

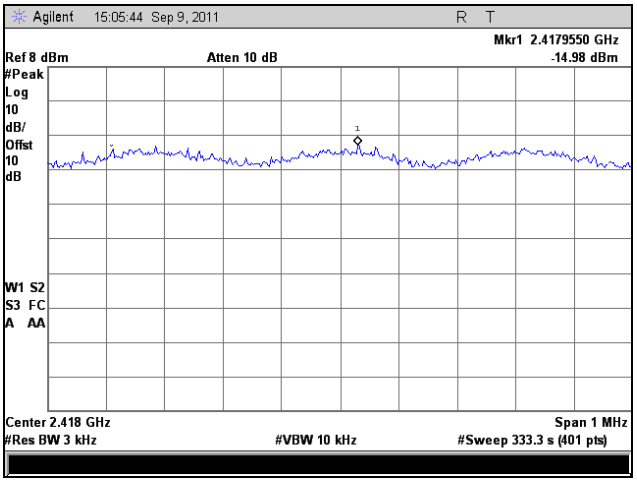


Plot 350. Peak Power Spectral Density, Mid Channel, 802.11b

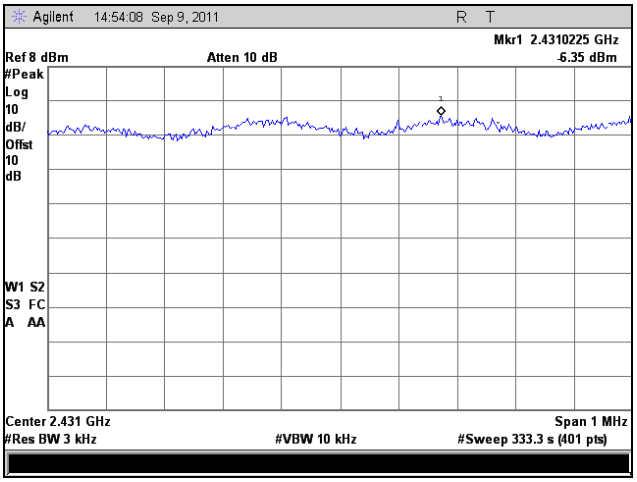


Plot 351. Peak Power Spectral Density, High Channel, 802.11b

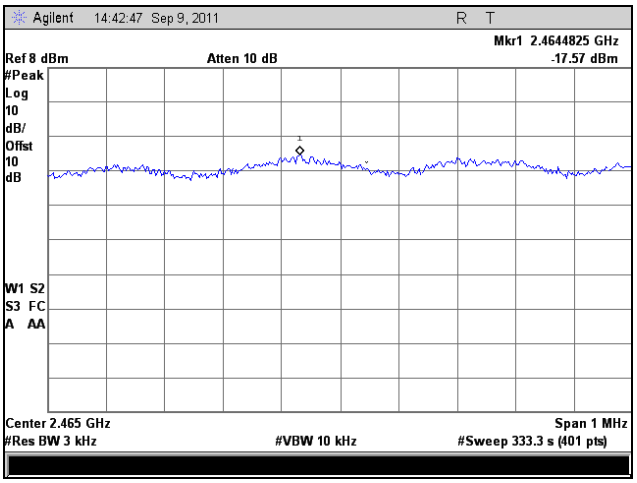
Peak Power Spectral Density, 802.11g



Plot 352. Peak Power Spectral Density, Low Channel, 802.11g

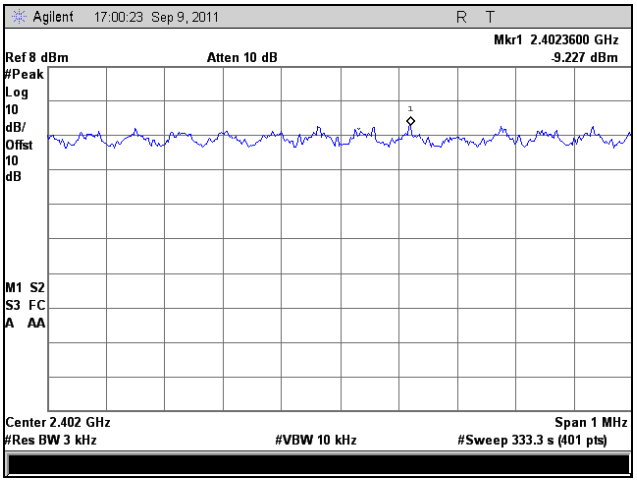


Plot 353. Peak Power Spectral Density, Mid Channel, 802.11g

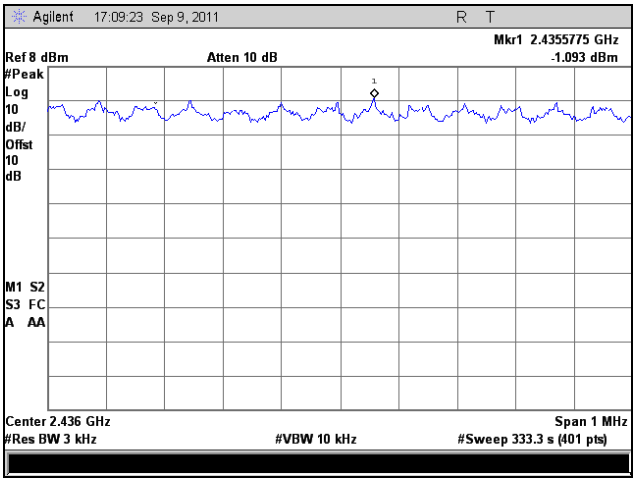


Plot 354. Peak Power Spectral Density, High Channel, 802.11g

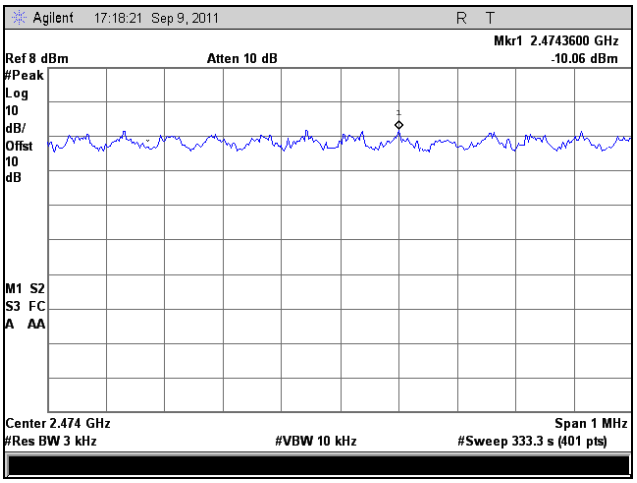
Peak Power Spectral Density, 802.11n HT5



Plot 355. Peak Power Spectral Density, Low Channel, 802.11n HT5

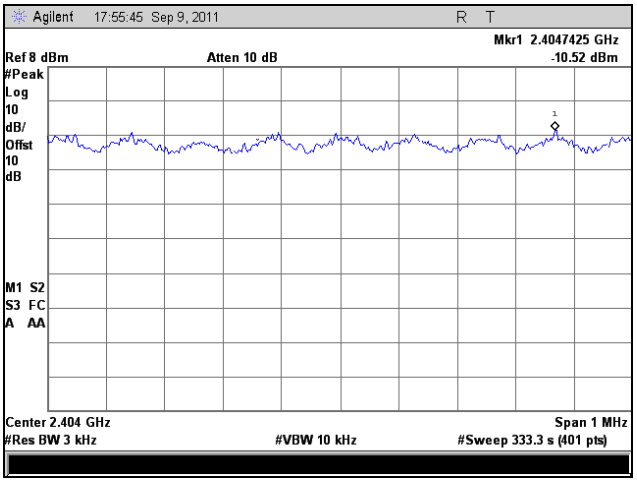


Plot 356. Peak Power Spectral Density, Mid Channel, 802.11n HT5

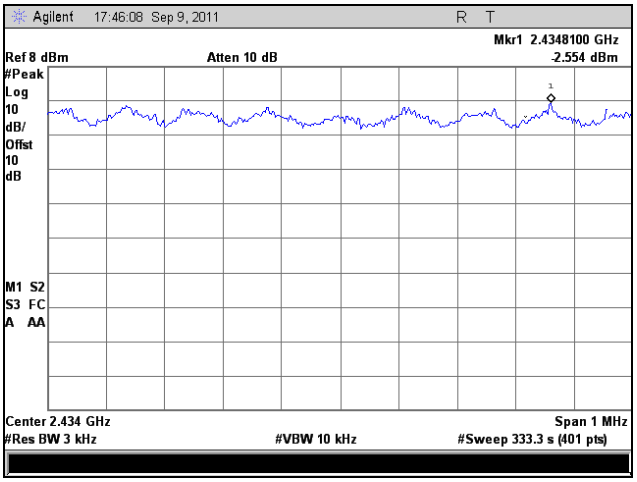


Plot 357. Peak Power Spectral Density, High Channel, 802.11n HT5

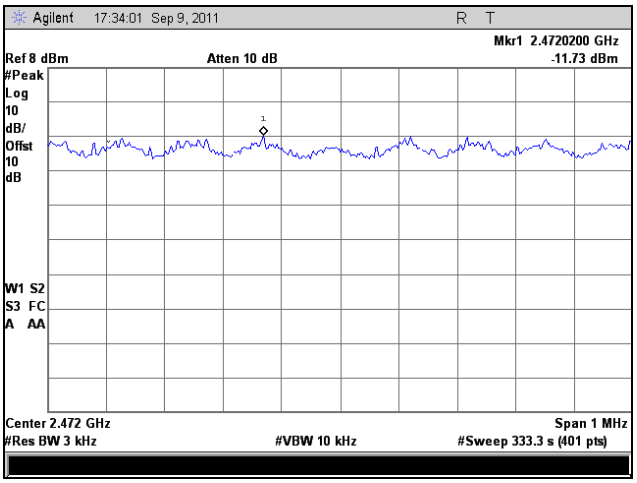
Peak Power Spectral Density, 802.11n HT8



Plot 358. Peak Power Spectral Density, Low Channel, 802.11n HT8

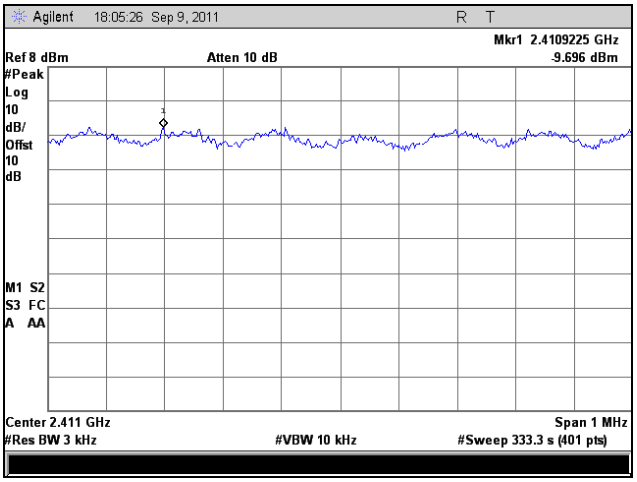


Plot 359. Peak Power Spectral Density, Mid Channel, 802.11n HT8

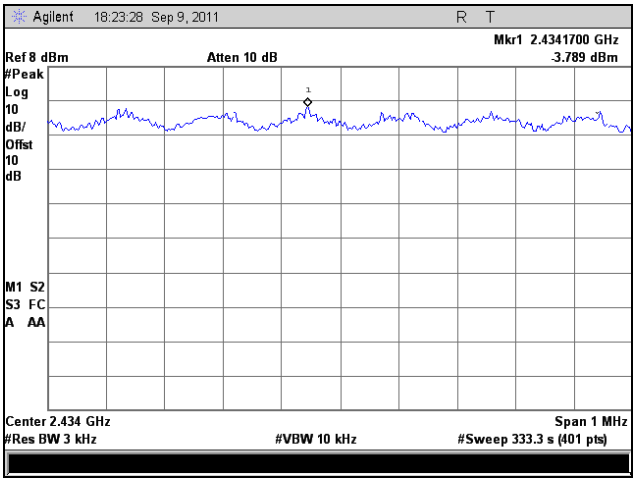


Plot 360. Peak Power Spectral Density, High Channel, 802.11n HT8

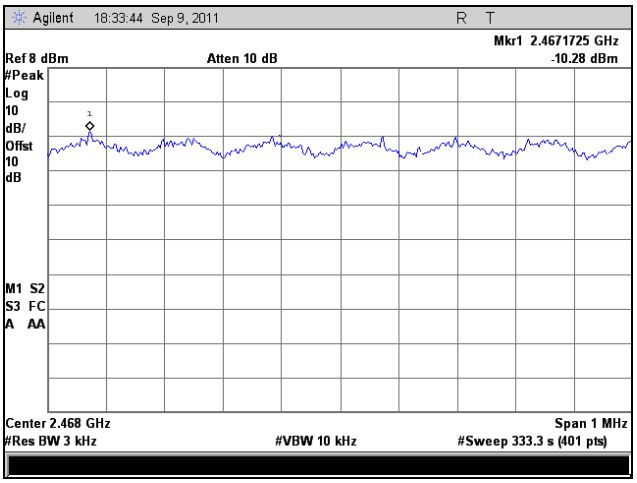
Peak Power Spectral Density, 802.11n HT10



Plot 361. Peak Power Spectral Density, Low Channel, 802.11n HT10

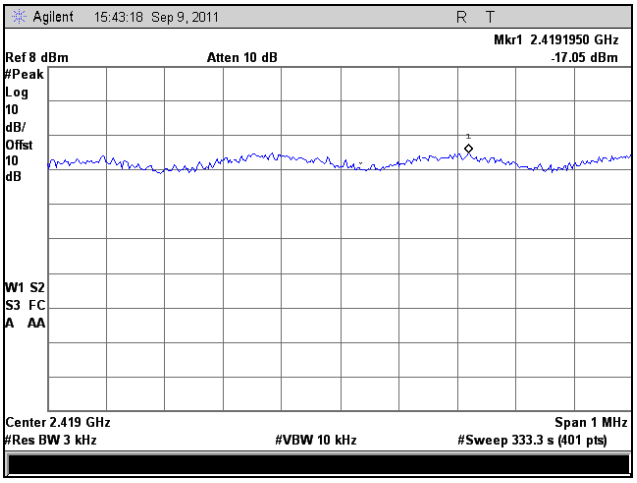


Plot 362. Peak Power Spectral Density, Mid Channel, 802.11n HT10

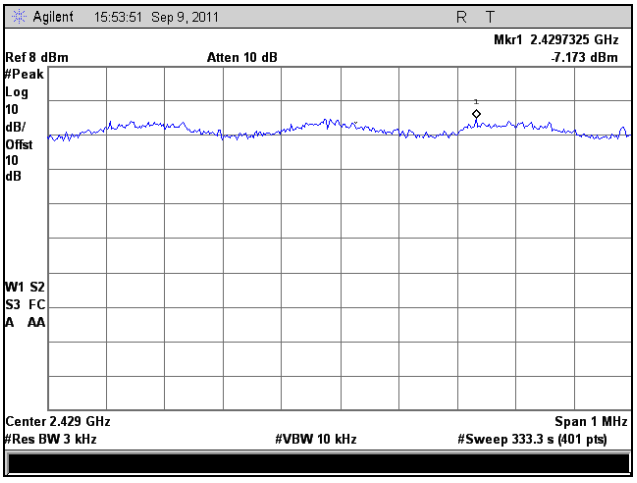


Plot 363. Peak Power Spectral Density, High Channel, 802.11n HT10

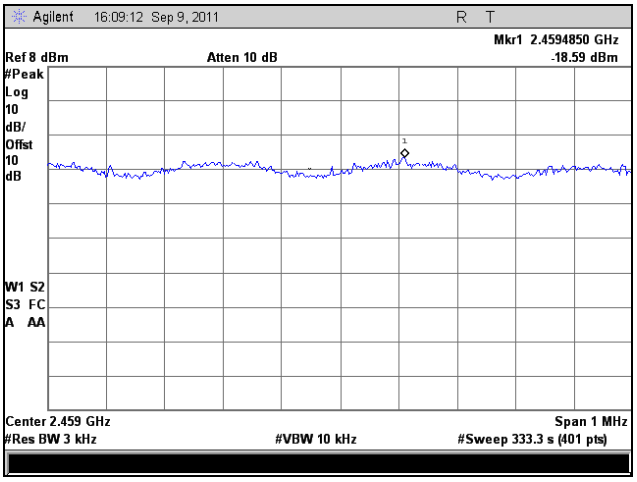
Peak Power Spectral Density, 802.11n HT20



Plot 364. Peak Power Spectral Density, Low Channel, 802.11n HT20

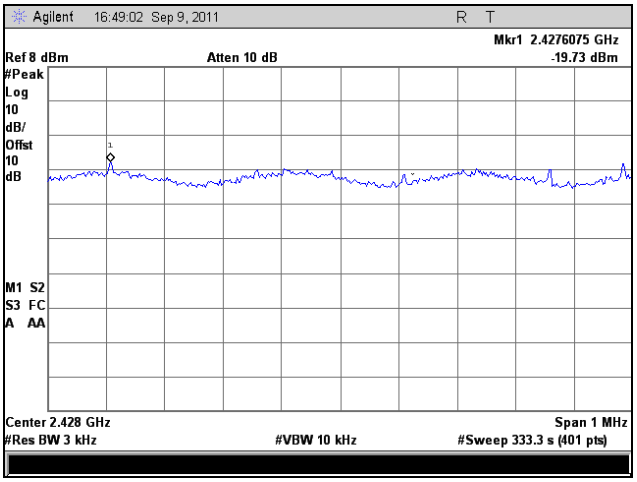


Plot 365. Peak Power Spectral Density, Mid Channel, 802.11n HT20

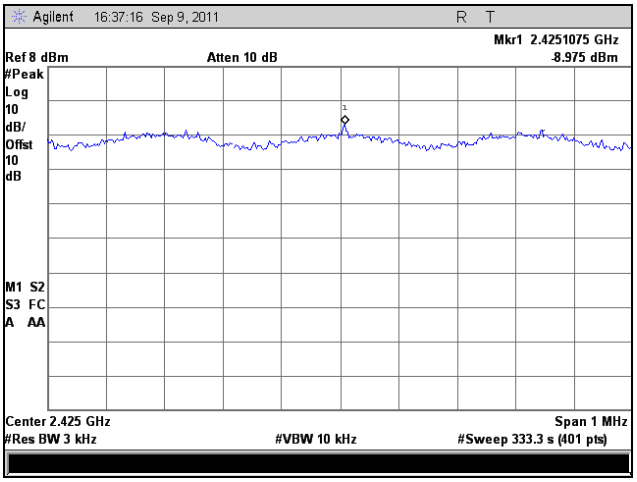


Plot 366. Peak Power Spectral Density, High Channel, 802.11n HT20

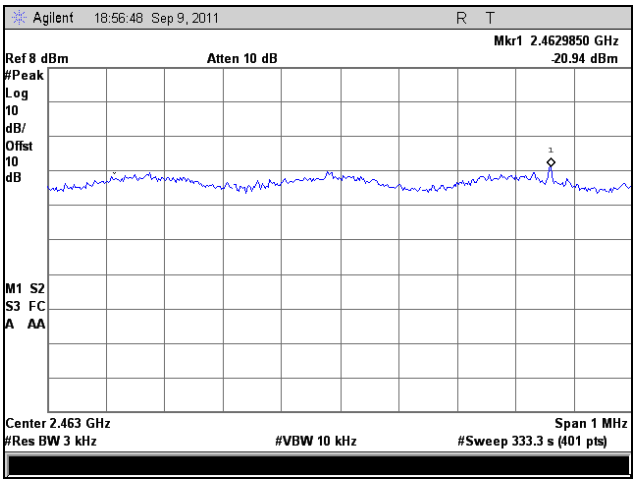
Peak Power Spectral Density, 802.11n HT40



Plot 367. Peak Power Spectral Density, Low Channel, 802.11n HT40



Plot 368. Peak Power Spectral Density, Mid Channel, 802.11n HT40



Plot 369. Peak Power Spectral Density, High Channel, 802.11n HT40

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(i) Maximum Permissible 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 @ 2400-2483.5 MHz; highest conducted power = *28.025 dBm* (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = *8 dBi.*

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

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

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (636.11mW)
G = Antenna Gain (6.309 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S = (636.11*6.309)/(4*3.14*20^2) = 4013.22/5024 = 0.799$ mW/cm^2

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

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN Receiver Spurious Emissions Requirements

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

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 29.

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

Table 29. Spurious Emission Limits for Receivers

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

Test Procedures: The EUT was programmed for receive mode only. Conducted measurements were taken at the antenna port of the EUT. 100 kHz resolution bandwidth was used from 30 MHz - 1 GHz and 300 kHz resolution was used for measurements done above 1 GHz. All plots are corrected for cable loss.

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

Test Engineer(s): Lionel Gabrillo

Test Date(s): 9/8/2011

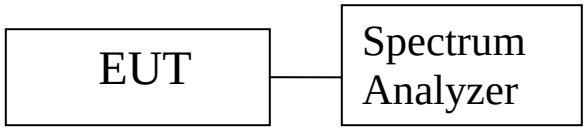
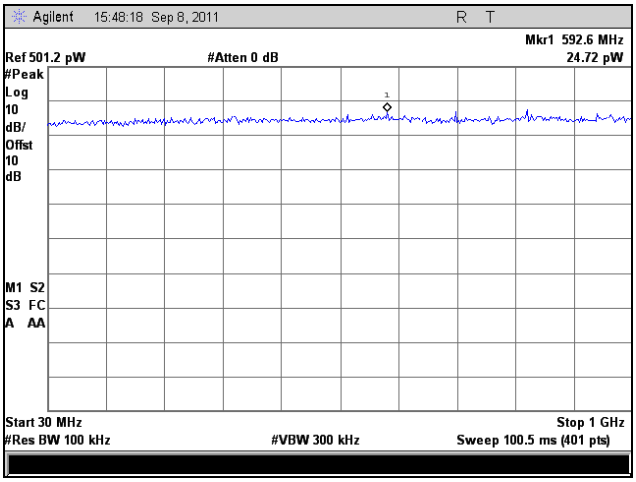
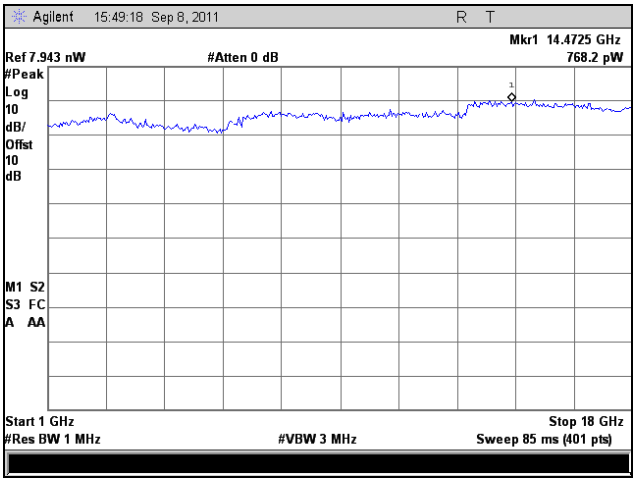


Figure 6. Block Diagram, Conducted Receiver Spurious Emissions Test Setup

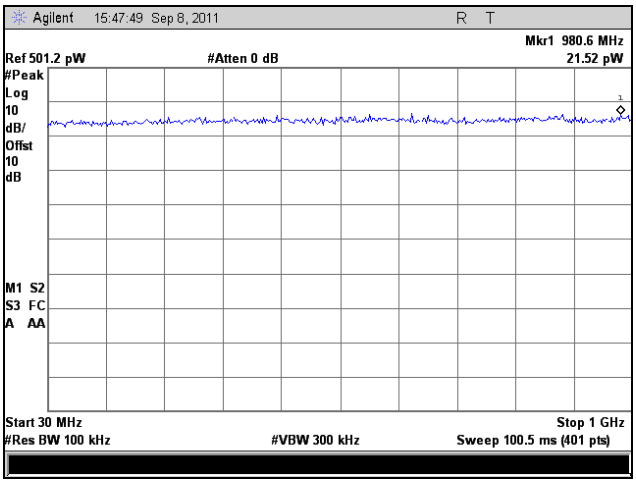
Conducted Receiver Spurious Emissions



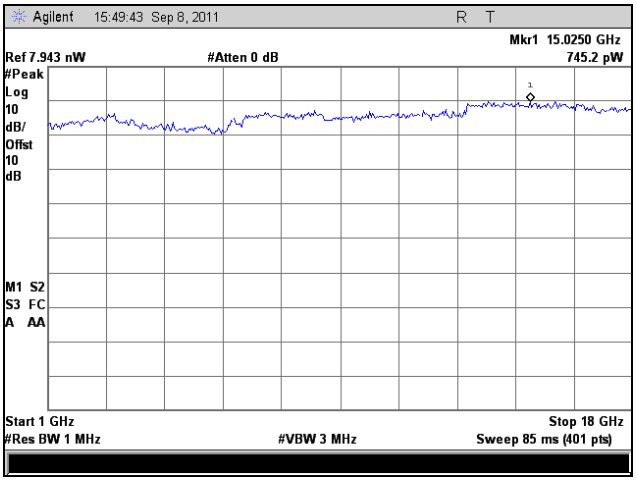
Plot 370. Receiver Spurious Emission, 30MHz - 1 GHz, Port 0



Plot 371. Receiver Spurious Emission, 1 GHz – 18 GHz, Port 0



Plot 372. Receiver Spurious Emission, 30 MHz – 1 GHz, Port 1



Plot 373. Receiver Spurious Emission, 1 GHz – 18 GHz, Port 1

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2460	SPECTRUM ANALYZER	AGILENT	E4407B	7/13/2010	7/13/2011
1U0259	LISN, DUAL-LINE V-NETWORK	TESEQ	9252-50-R-24-BNC	5/24/2010	5/24/2011
1S2399	TURNTABLE CONTROLLER	SUNOL SCIENCE	SC99V	NO CALIBRATION REQUIRED	
1S2501	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU40	06/03/2010	06/03/2011
1S2485	BILOG ANTENNA	TESEQ	CBL6112D	05/07/2010	05/07/2011
1S2482	5 METER CHAMBER	PANASHIELD	641431	11/13/2010	11/13/2011
1S2481	10M CHAMBER	ETS-LINDGREN	DKE 8X8 DBL	11/6/2010	11/6/2011
1S2607	SPECTRUM ANALYZER	AGILENT	E4407B	08/09/2011	08/09/2012
1S2600	BILOG ANTENNA	TESEQ	CBL6112D	4/14/2010	4/14/2013
1S2501	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESU40	06/09/2011	06/09/2012
1S2198	HORN ANTENNA	EMCO	3115	9/22/2010	9/22/2011
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13147	SEE NOTE	
1S2521	THERMO-HYGROMETER	FISHER SCIENTIFIC	11-661-7D	12/2/2009	12/2/2011
1S2523	PREAMP (1-26.5GHZ)	AGILENT	8449B	SEE NOTE	

Table 30. 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

1. 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.

ICES-003 Procedural & Labeling Requirements

From the Industry Canada Electromagnetic Compatibility Advisory Bulletin entitled, "Implementation and Interpretation of the Interference-Causing Equipment Standard for Digital Apparatus, ICES-003" (EMCAB-3, Issue 2, July 1995):

> "At present, CISPR 22: 2002 and ICES technical requirements are essentially equivalent. Therefore, if you have CISPR 22: 2002 approval by meeting CISPR Publication 22, the only additional requirements are: to attach a note to the report of the test results for compliance, indicating that these results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations; to maintain these records on file for the requisite five year period; and to provide the device with a notice of compliance in accordance with ICES-003."

Procedural Requirements:

According to Industry Canada's Interference Causing Equipment Standard for Digital Apparatus ICES-003 Issue 4, February 2004:

Section 6.1: A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for a period of at least five years from the date shown in the record and made available for examination on the request of the Minister.

Section 6.2: A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other constraints it is not feasible to affix a label to the apparatus, the notice may be in the form of a statement in the user's manual.

Labeling Requirements:

The suggested text for the notice, in English and in French, is provided below, from the Annex of ICES-003:

> This Class [2] digital apparatus complies with Canadian ICES-003.
>
> Cet appareil numérique de la classe [1] est conforme à la norme NMB-003 du Canada.

[2] Insert either A or B but not both as appropriate for the equipment requirements.

End of Report

