MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
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13301 MCCALLEN PASS ● AUSTIN, TEXAS 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

January 9, 2014

Meru Networks, Inc.
894 Ross Dr.
Sunnyvale, CA 94089

Dear Rajendran Chary,

Enclosed is the EMC Wireless test report for compliance testing of the Meru Networks, Inc., AP832i and AP822i as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15, Subpart B and ICES-003, Issue 5 August 2012 for Unintentional Radiators and Part 15.407 and Industry Canada RSS-210, Annex 9, Issue 8, December 2010 for Intentional Radiators.

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

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Meru Networks, Inc.\EMCS40810B-FCC407 (UNII 3))

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Electromagnetic Compatibility Criteria
Test Report

for the

Meru Networks, Inc.
Model AP832i and AP822i

Tested under
the FCC Certification Rules
contained in
Title 47 of the CFR, Parts 15 Subpart B & ICES-003
for Class B Digital Devices
&
FCC Part 15.407 & RSS-210, Annex 9
for Intentional Radiators

MET Report: EMCS40810B-FCC407 (UNII 3)

January 9, 2014

Prepared For:

Meru Networks, Inc.
894 Ross Dr.
Sunnyvale, CA 94089

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

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for Intentional Radiators

Jonathan Chao, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Parts 15B, 15.407, of the FCC Rules and Industry Canada standards ICES-003, Issue 5 August 2012, RSS-210 Annex 9 under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	January 9, 2014	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
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

IV. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Meru Networks, Inc. AP832i and AP822i, with the requirements of Part 15, §15.407. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the AP832i and AP822i. Meru Networks, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the AP832i and AP822i, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.407, in accordance with Meru Networks, Inc., purchase order number 106321. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	Industry Canada Reference	Description	Results
§15.107	ICES-003 Issue 5 August 2012	Conducted Emissions	Compliant
§15.109	ICES-003 Issue 5 August 2012	Radiated Emissions	Compliant
§15.203	RSS-GEN 7.1.4	Antenna Requirements	Compliant
§15.207	RSS-GEN 7.2.2; RSS-210 2.2	AC Conducted Emissions 150KHz – 30MHz	Compliant
§15.403 (i)	A8.2	26dB Occupied Bandwidth	Compliant
§15.407 (a)(2)	A9.2(3)	Conducted Transmitter Output Power	Compliant
§15.407 (a)(2)	A9.2(3)	Power Spectral Density	Compliant
§15.407 (a)(6)	N/A	Peak Excursion	Compliant
§15.407 (b)(2), (3), (5), (6)	A9.3(4)	Undesirable Emissions (15.205/15.209 - General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
§15.407(f)	RSS-GEN	RF Exposure	Compliant
§15.407(g)	2.1	Frequency Stability	Compliant
N/A	RSS-Gen(4.8)	Receiver Spurious Emissions	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

V. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Meru Networks, Inc. to perform testing on the AP832i and AP822i, under Meru Networks, Inc.'s purchase order number 106321.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Meru Networks, Inc. AP832i and AP822i.

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

Model(s) Tested:	AP832i and AP822i	
Model(s) Covered:	AP832i and AP822i	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: RE7-AP832I IC: 6749A-AP832I	
	Type of Modulations:	OFDM/DSSS
	Equipment Code:	NII
	Peak RF Output Power:	22.39dBm
	EUT Frequency Ranges:	5745-5805MHz
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:	Jonathan Chao	
Report Date(s):	January 9, 2014	

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
RSS-210, Issue 8, Dec. 2010	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
RSS-GEN, Issue 3, Dec. 2010	General Requirements and Information for the Certification of Radio Apparatus
ICES-003, Issue 5 August 2012	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
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices

Table 3. References

C. Test Site

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

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

D. Description of Test Sample

The Meru Networks, Inc. AP832i and AP822i, Equipment Under Test (EUT), is an 802.11AC wireless access point (WAP) that allows wireless devices to connect to a wired network using Wi-Fi, standard. The WAP usually connects to a router (via a wired network), and can relay data between the wireless devices (such as computers or printers) and wired devices on the network.

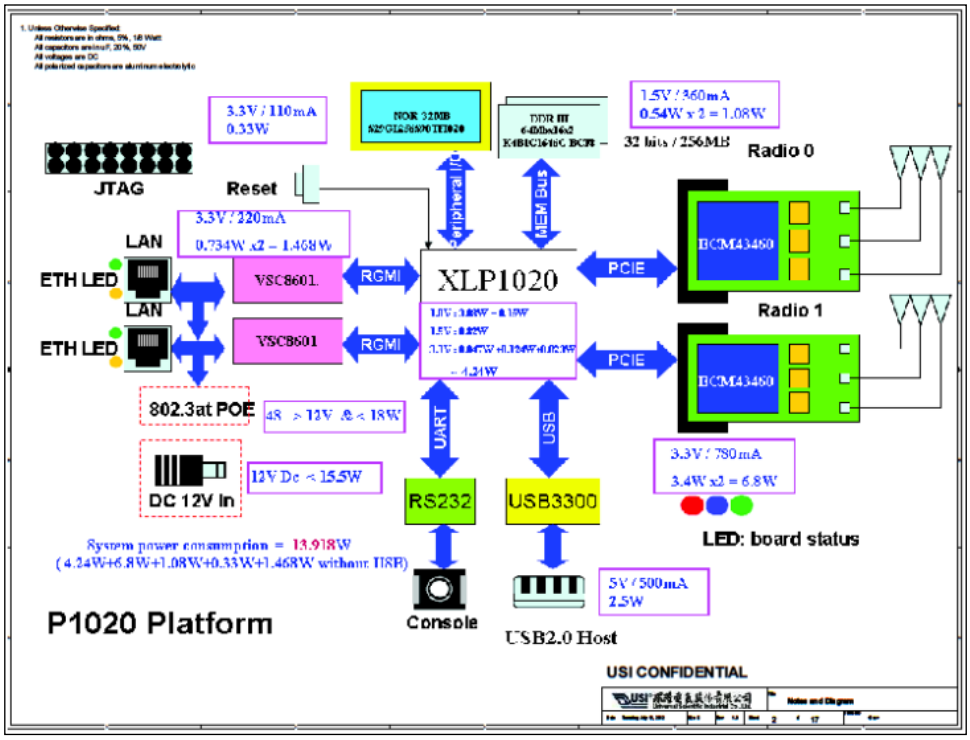


Figure 1. Block Diagram of Test Configuration

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.

Ref. ID	Name / Description	Model Number	Serial Number
1	Dual Radio Access Point	AP832i	4812A832i112533
2	Dual Radio Access Point	AP832i	4812A832i112523

Table 4. Equipment Configuration

F. Support Equipment

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

Type	Model and Serial Number
POE	PD-9001GR/AC
AC	GS18A12-P1J
Cable	Serial cable
Cable	Ethernet cable

Table 5. Support Equipment

G. Ports and Cabling Information

The EUT did not require any ports and cabling information for operation or monitoring.

H. Mode of Operation

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

I. Method of Monitoring EUT Operation

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

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 Meru 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 6. 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 6. 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.

Frequency range (MHz)	Class A Conducted Limits (dBµV)		*Class B Conducted Limits (dBµV)	
	Quasi-Peak	Avg.	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 6. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)

Test Procedures:

The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a screen room. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were re-measured using a quasi-peak and/or average detector as appropriate.

Test Results:

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

Test Engineer(s):

Joseph Dizon

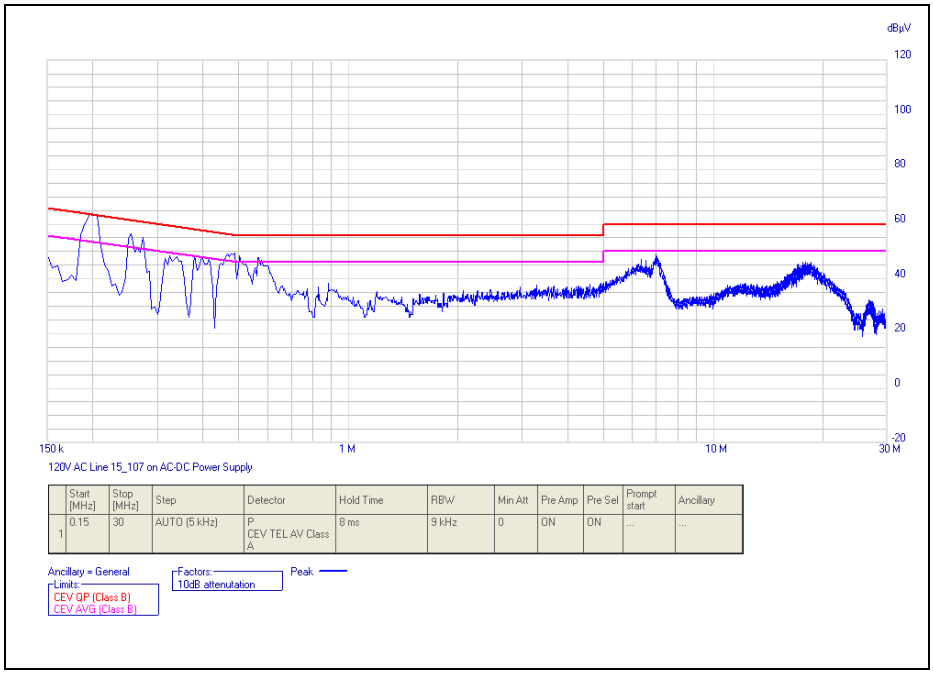
Test Date(s):

01/31/13 & 02/01/13

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V AC Line 15.107	0.195	63.56	63.827	-0.267	Pass	42.56	53.827	-11.267	Pass
120V AC Line 15.107	0.255	55.66	61.605	-5.945	Pass	33.14	51.605	-18.465	Pass
120V AC Line 15.107	0.275	54.34	60.979	-6.639	Pass	32.31	50.979	-18.669	Pass

Table 7. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC, 60 Hz), AC-DC Power Supply

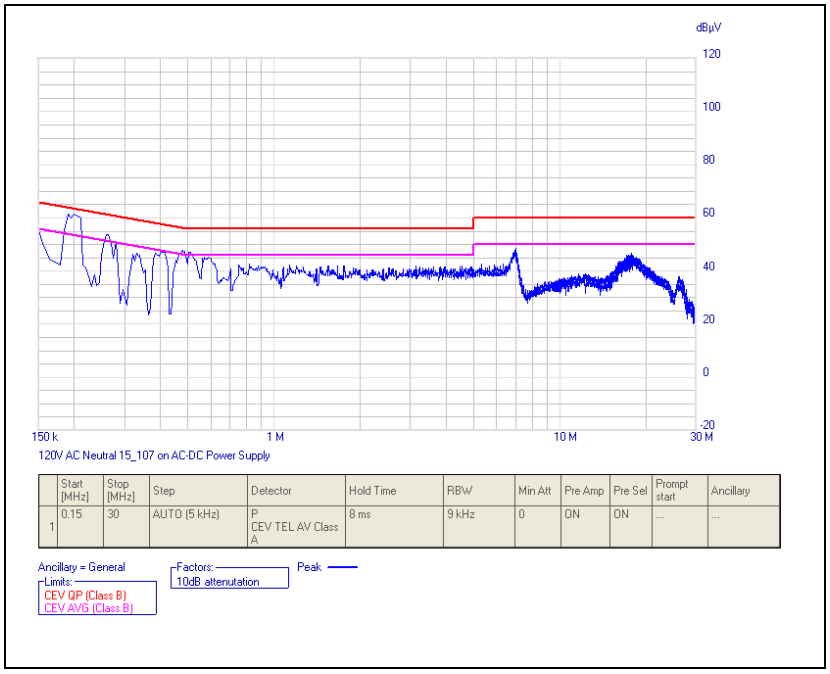


Plot 1. Conducted Emission, Phase Line Plot, AC-DC Power Supply

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V AC Neutral 15.107	0.15	53.23	66	-12.77	Pass	23.71	56	-32.29	Pass
120V AC Neutral 15.107	0.2	57.39	63.617	-6.227	Pass	38.46	53.617	-15.157	Pass
120V AC Neutral 15.107	0.265	48.4	61.286	-12.886	Pass	33.07	51.286	-18.216	Pass

Table 8. Conducted Emissions - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz), AC-DC Power Supply

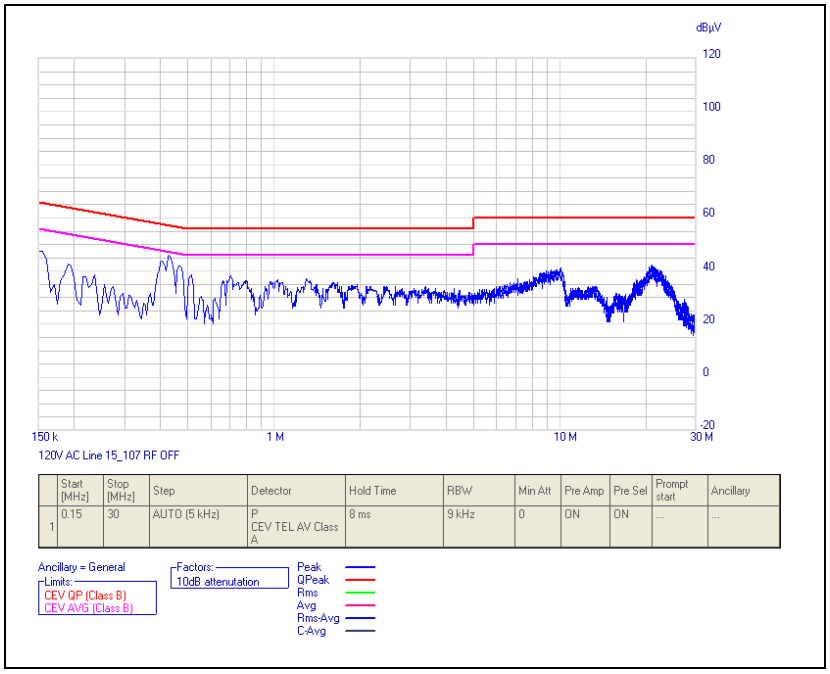


Plot 2. Conducted Emission, Neutral Line Plot, AC-DC Power Supply

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V AC Line 15.107	0.155	51.05	65.728	-14.678	Pass	34.3	55.728	-21.428	Pass
120V AC Line 15.107	0.405	44	57.773	-13.773	Pass	34.78	47.773	-12.993	Pass
120V AC Line 15.107	0.43	46.68	57.277	-10.597	Pass	39	47.277	-8.277	Pass

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

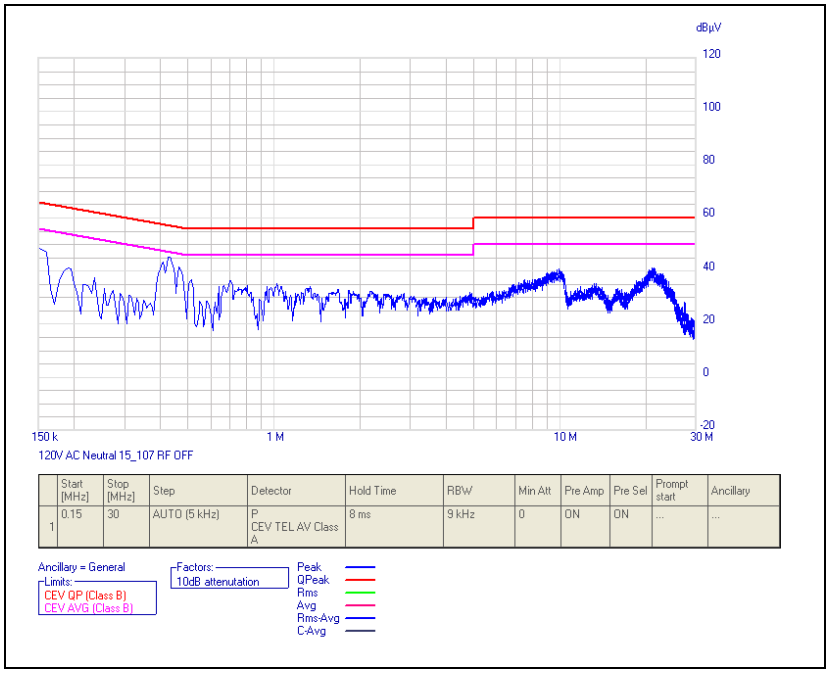


Plot 3. Conducted Emission, Phase Line Plot, PoE

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

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V AC Neutral 15.107	0.15	53.73	66	-12.27	Pass	31.84	56	-24.16	Pass
120V AC Neutral 15.107	0.41	43.5	57.671	-14.171	Pass	28.96	47.671	-18.711	Pass
120V AC Neutral 15.107	0.43	46.04	57.277	-11.237	Pass	38.26	47.277	-9.017	Pass

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



Plot 4. Conducted Emission, Neutral Line Plot, PoE

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 11.

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 11.

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 11. 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 10m 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 B requirement(s) of this section. Measured emissions were below applicable limits.

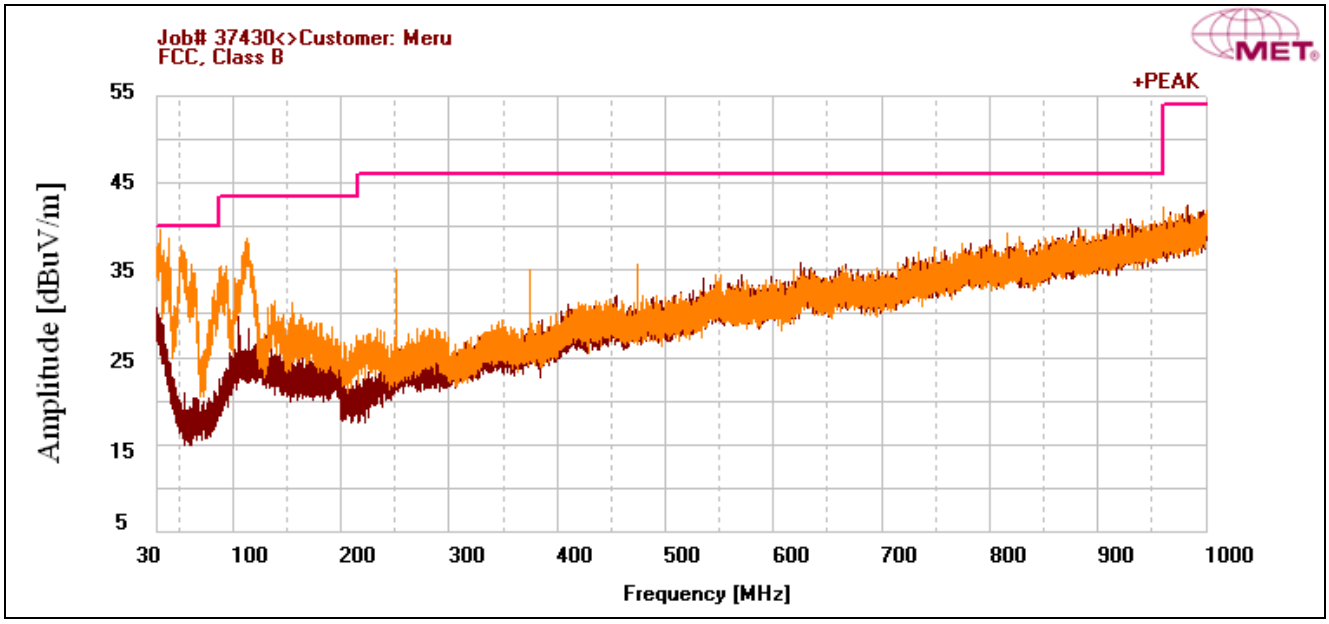
Test Engineer(s): John Frank & Joseph Dizon

Test Date(s): 01/18/13

Radiated Emissions Limits Test Results, Class B

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)
32.64	V	330	100	38.854	17.116	30.506	0	10.46	35.924	40	-4.076
53.244	V	190	100	48.646	7.051	30.299	0	10.46	35.858	40	-4.142
113.707	V	235	100	44.356	12.3	29.496	0	10.46	37.62	43.5	-5.88
249.977	V	150	100	28.837	12.098	28.335	0	10.46	23.06	46	-22.94
374.978	V	150	100	28.837	12.098	28.335	0	10.46	23.06	46	-22.94
475.008	V	172	100	34.121	16.801	27.167	0	10.46	34.215	46	-11.785

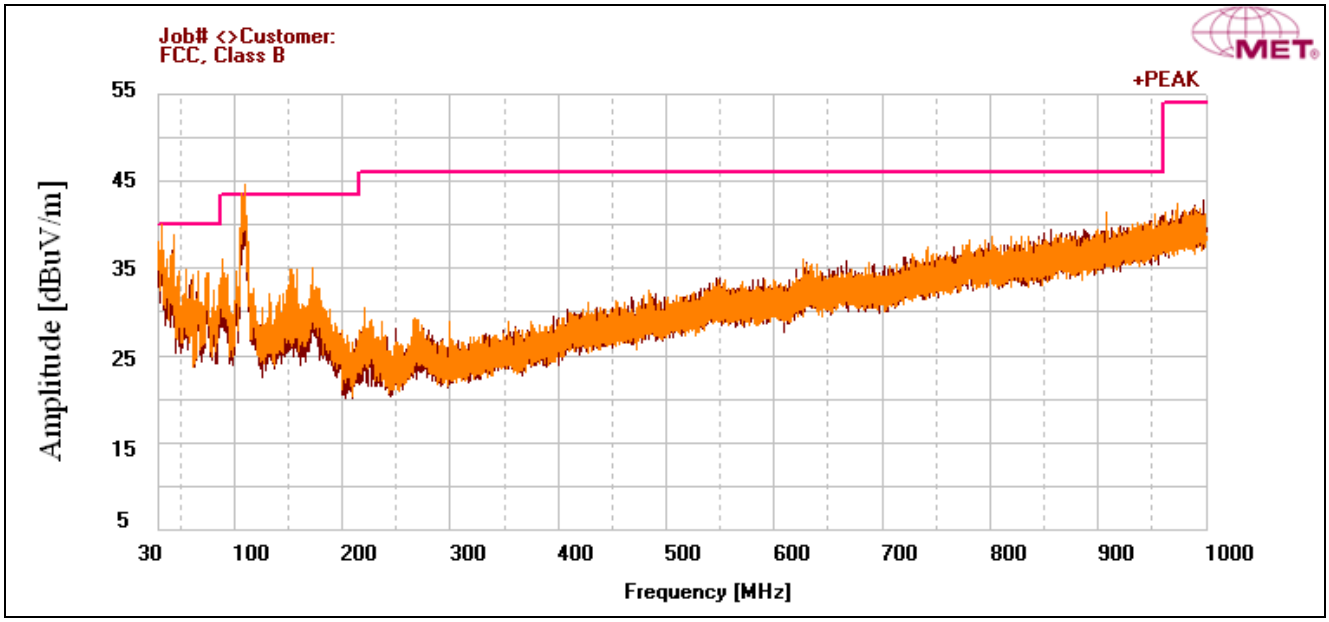
Table 12. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz, FCC Limits



Plot 5. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits, AC-DC Power Supply

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)
109.416	V	227	100	47.163	12.1	29.538	0	10.46	40.185	43.5	-3.315
109.696	V	260	100	47.27	12.1	29.535	0	10.46	40.295	43.5	-3.205
32.68	V	35	100	38.483	17.092	30.505	0	10.46	35.53	40	-4.47
43.826	V	337	100	45.557	10.722	30.399	0	10.46	36.34	40	-3.66
157.394	V	296	100	37.557	10	29.068	0	10.46	28.949	43.5	-14.551
173.118	V	43	100	41.059	9.7	28.913	0	10.46	32.306	43.5	-11.194

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

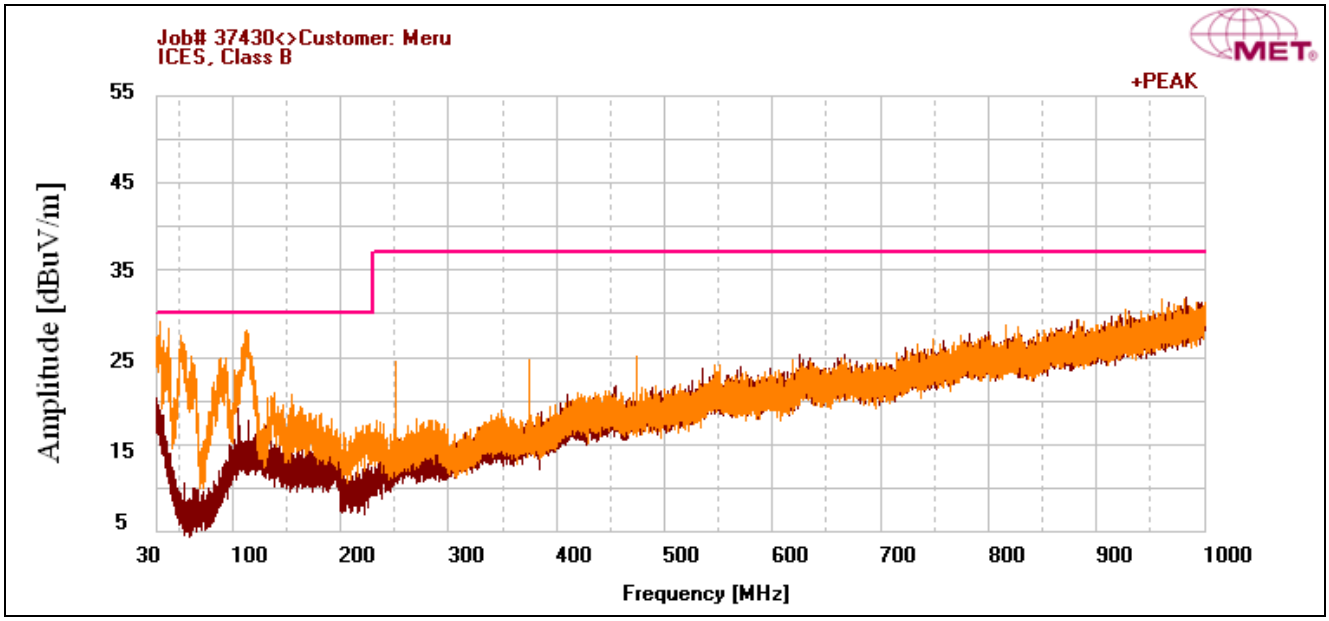


Plot 6. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits, PoE

Radiated Emissions Limits Test Results, Class B

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)
32.64	V	330	100	38.854	17.116	30.506	0	0	25.464	30	-4.536
53.244	V	190	100	48.646	7.051	30.299	0	0	25.398	30	-4.602
113.707	V	235	100	44.356	12.3	29.496	0	0	27.16	30	-2.84
249.977	V	150	100	28.837	12.098	28.335	0	0	12.6	37	-24.4
374.978	V	150	100	28.837	12.098	28.335	0	0	12.6	37	-24.4
475.008	V	172	100	34.121	16.801	27.167	0	0	23.755	37	-13.245

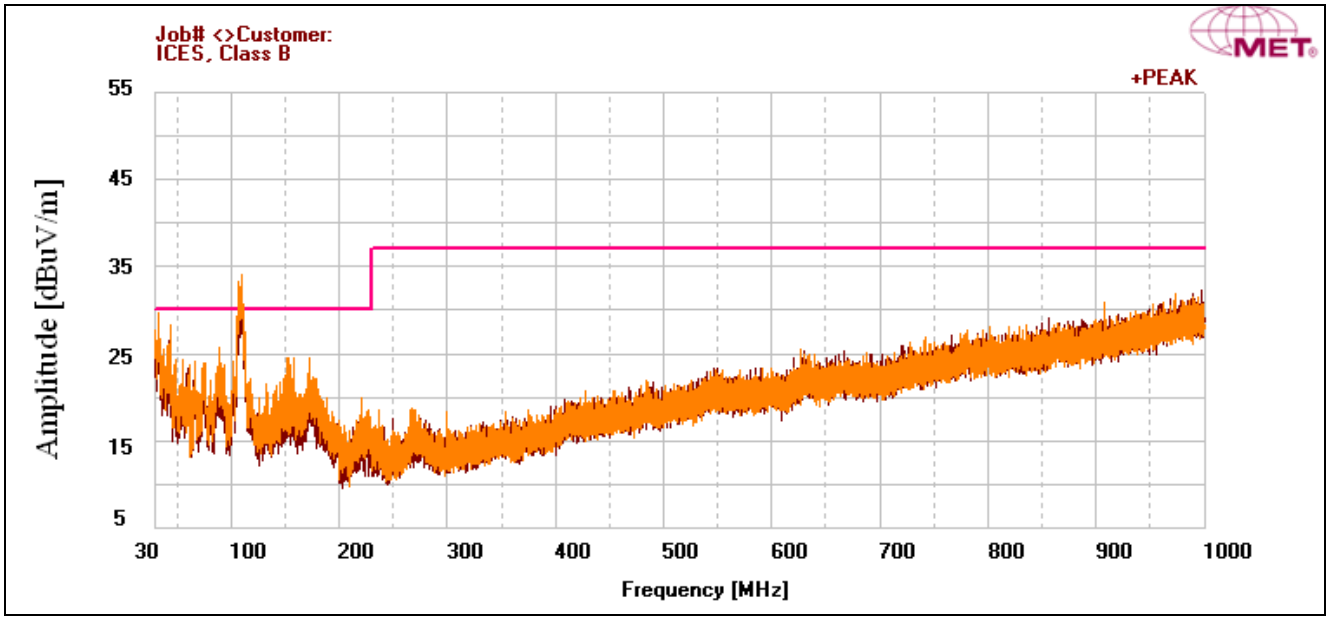
Table 14. Radiated Emissions Limits, Test Results, ICES-003 Limits



Plot 7. Radiated Emissions, ICES-003 Limits, AC-DC Power Supply

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)
109.416	V	227	100	47.163	12.1	29.538	0	0	29.725	30	-0.275
109.696	V	260	100	47.27	12.1	29.535	0	0	29.835	30	-0.165
32.68	V	35	100	38.483	17.092	30.505	0	0	25.07	30	-4.93
43.826	V	337	100	45.557	10.722	30.399	0	0	25.88	30	-4.12
157.394	V	296	100	37.557	10	29.068	0	0	18.489	30	-11.511
173.118	V	43	100	41.059	9.7	28.913	0	0	21.846	30	-8.154

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



Plot 8. Radiated Emissions, ICES-003 Limits, PoE

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. Antenna is permanently attached to unit and requires professional installation.

Test Engineer(s): Jonathan Chao

Test Date(s): 02/18/13

Gain (dBi)		Antenna Type	Antenna Description	Manufacturer	Model Number
2.4 GHz	5 GHz				
3	4	Dipole	Internal PIFA Dual-Band 3 x 3	Meru	MERU-PI623

Table 16. Antenna List

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207 Conducted Emissions Limits

Test Requirement(s): **§ 15.207 (a):** For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Σ line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 17. 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.

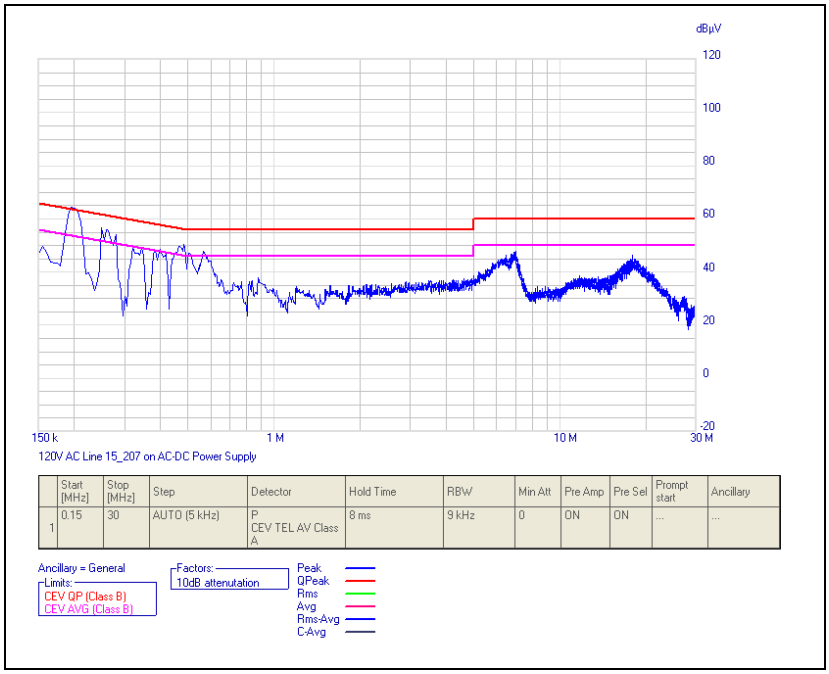
Test Engineer(s): Joseph Dizon

Test Date(s): 01/31/13 & 02/01/13

15.207(a) Conducted Emissions Test Results, AC-DC Power Supply

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V AC Line 15.207	0.195	63.35	63.827	-0.477	Pass	43.02	53.827	-10.807	Pass
120V AC Line 15.207	0.25	55.66	61.769	-6.109	Pass	30.01	51.769	-21.759	Pass
120V AC Line 15.207	0.485	51.48	56.26	-4.78	Pass	32.42	46.26	-13.84	Pass

Table 18. Conducted Emissions, 15.207(a), Phase Line, Test Results, AC-DC Power Supply

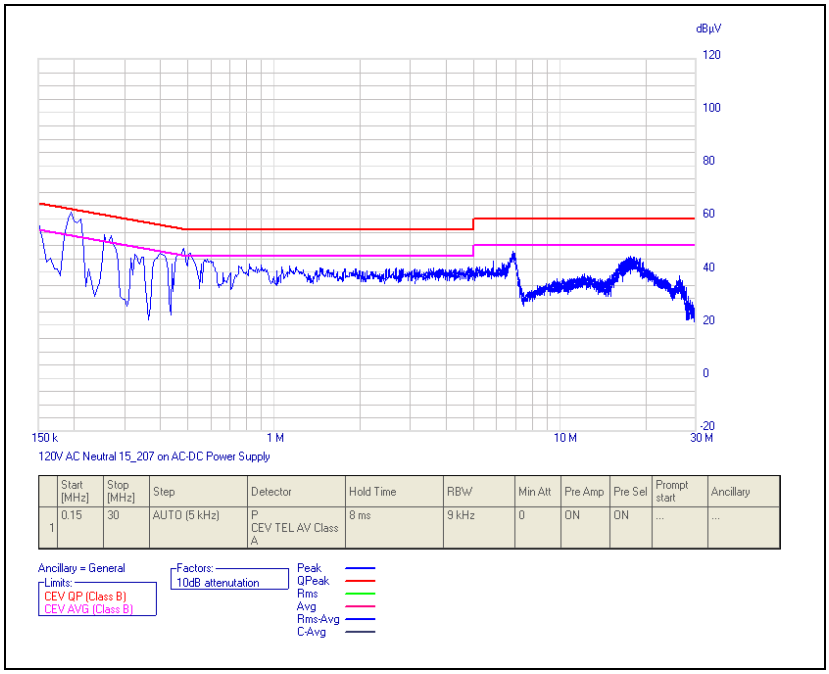


Plot 9. Conducted Emissions, 15.207(a), Phase Line, AC-DC Power Supply

15.207(a) Conducted Emissions Test Results, AC-DC Power Supply

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V AC Neutral 15.207	0.15	53.37	66	-12.63	Pass	23.86	56	-32.14	Pass
120V AC Neutral 15.207	0.195	62.75	63.827	-1.077	Pass	39.32	53.827	-14.507	Pass
120V AC Neutral 15.207	0.255	54.71	61.605	-6.895	Pass	30.65	51.605	-20.955	Pass

Table 19. Conducted Emissions, 15.207(a), Neutral Line, Test Results, AC-DC Power Supply

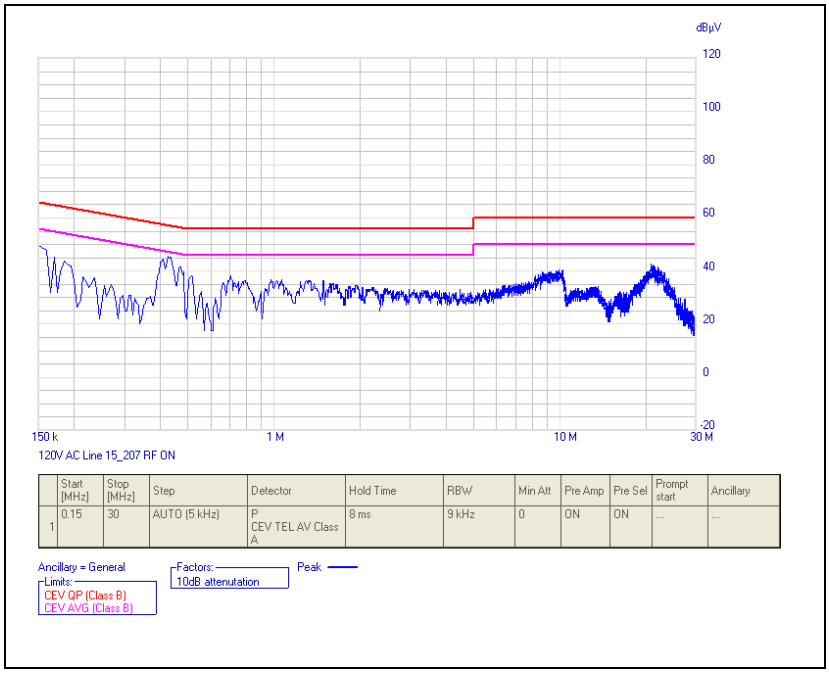


Plot 10. Conducted Emissions, 15.207(a), Neutral Line, AC-DC Power Supply

15.207(a) Conducted Emissions Test Results, PoE

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V AC Line 15.207	0.15	62.57	66	-3.43	Pass	45.33	56	-10.67	Pass
120V AC Line 15.207	0.17	45.72	64.963	-19.243	Pass	18.68	54.963	-36.283	Pass
120V AC Line 15.207	0.425	46.58	57.373	-10.793	Pass	33.82	47.373	-13.553	Pass

Table 20. Conducted Emissions, 15.207(a), Phase Line, Test Results, PoE

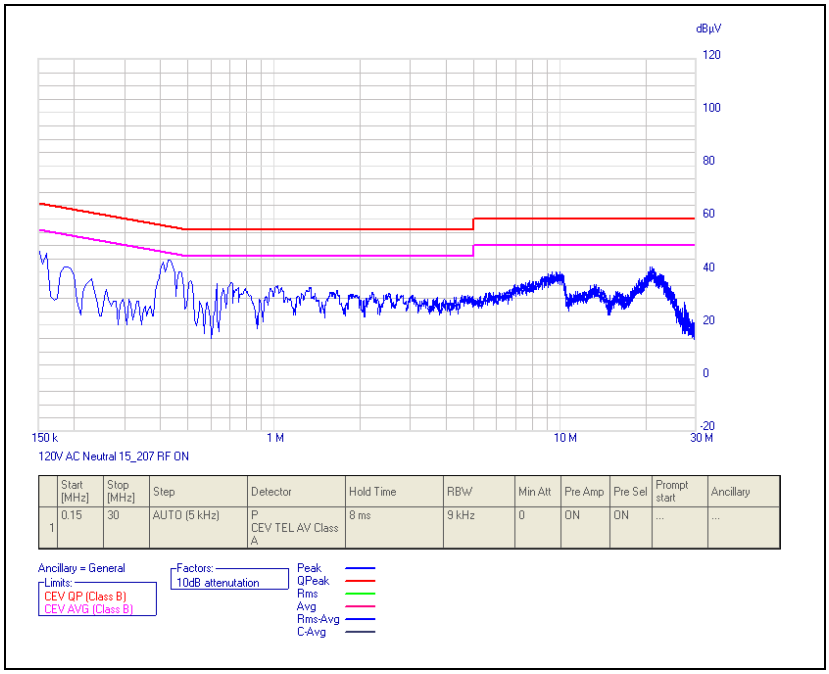


Plot 11. Conducted Emissions, 15.207(a), Phase Line, PoE

15.207(a) Conducted Emissions Test Results, PoE

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120V AC Neutral 15.207	0.15	62.65	66	-3.35	Pass	44.02	56	-11.98	Pass
120V AC Neutral 15.207	0.43	43.2	57.277	-14.077	Pass	38.2	47.277	-9.077	Pass
120V AC Neutral 15.207	21.095	56.84	60	-3.16	Pass	48.62	50	-1.38	Pass

Table 21. Conducted Emissions, 15.207(a), Neutral Line, Test Results, PoE



Plot 12. Conducted Emissions, 15.207(a), Neutral Line, PoE

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(c) 26dB Bandwidth

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

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

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

Test Engineer(s): Jonathan Chao

Test Date(s): 02/18/13

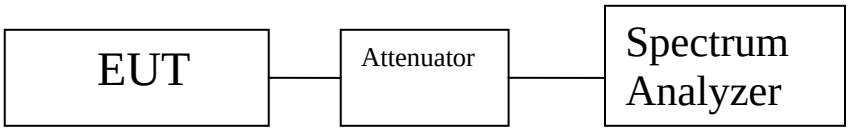


Figure 2. Occupied Bandwidth, Test Setup

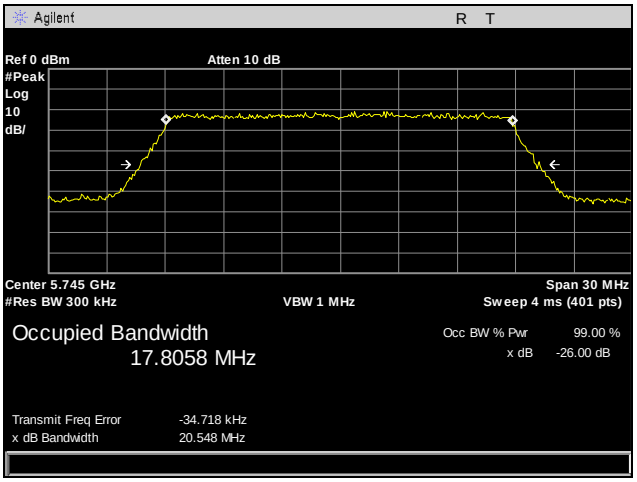
Mode	Channel	Frequency (MHz)	Port	26dB Bandwidth (MHz)
802.11a	Low	5745	1	20.548
	Mid	5785	1	20.444
	High	5805	1	20.477
802.11n HT20	Low	5745	1	20.635
			2	20.417
			3	20.569
	Mid	5785	1	20.861
			2	20.501
			3	20.557
	High	5805	1	20.715
			2	20.444
			3	20.660
802.11n HT40	Low	5755	1	40.942
			2	40.997
			3	40.939
	High	5795	1	40.696
			2	40.852
			3	40.759

Table 22. 26 dB Occupied Bandwidth, Test Results

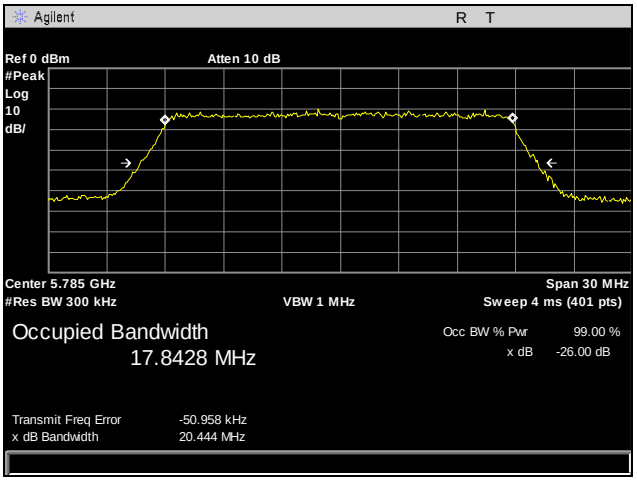
Mode	Channel	Frequency (MHz)	Port	99% Bandwidth (MHz)
802.11a	Low	5745	1	16.6367
	Mid	5785	1	16.6167
	High	5805	1	16.6085
802.11n HT20	Low	5745	1	17.7302
			2	17.6674
			3	17.6864
	Mid	5785	1	17.6918
			2	17.4407
			3	17.5893
	High	5805	1	17.5954
			2	17.6505
			3	17.7345
802.11n HT40	Low	5755	1	36.4493
			2	36.4084
			3	36.7361
	High	5795	1	36.4876
			2	36.4669
			3	36.4122

Table 23. 99% Occupied Bandwidth, Test Results

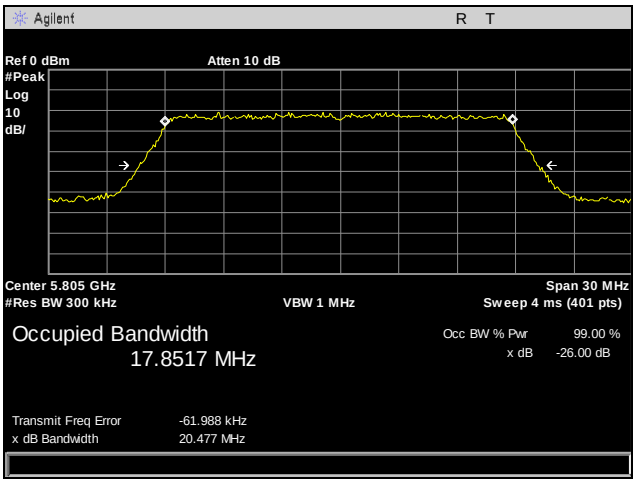
26 dB Occupied Bandwidth, 802.11a



Plot 13. 26 dB Occupied Bandwidth, 802.11a, Port 1, Low Channel

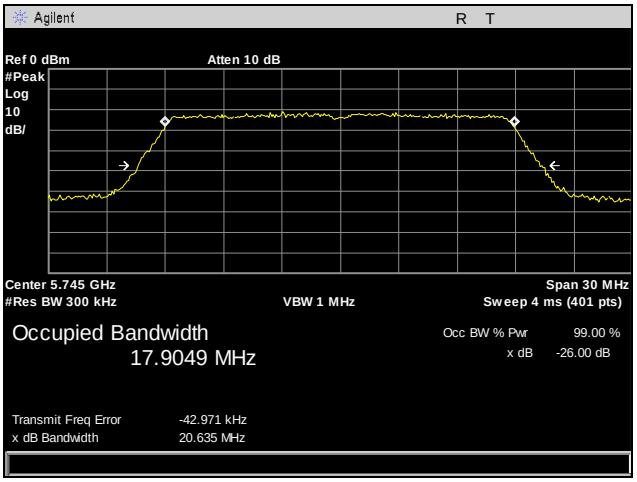


Plot 14. 26 dB Occupied Bandwidth, 802.11a, Port 1, Mid Channel

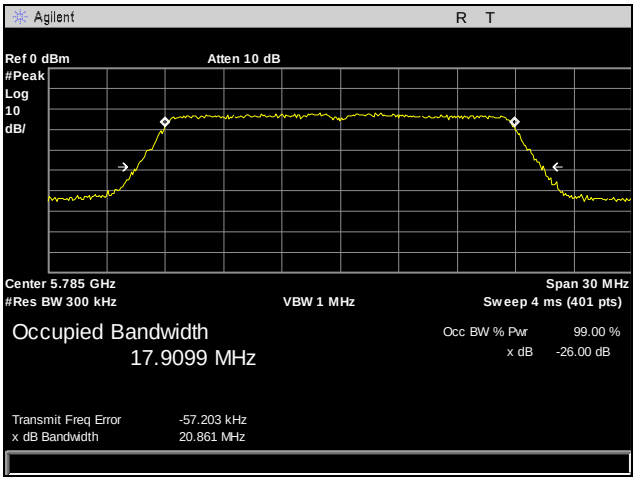


Plot 15. 26 dB Occupied Bandwidth, 802.11a, Port 1, High Channel

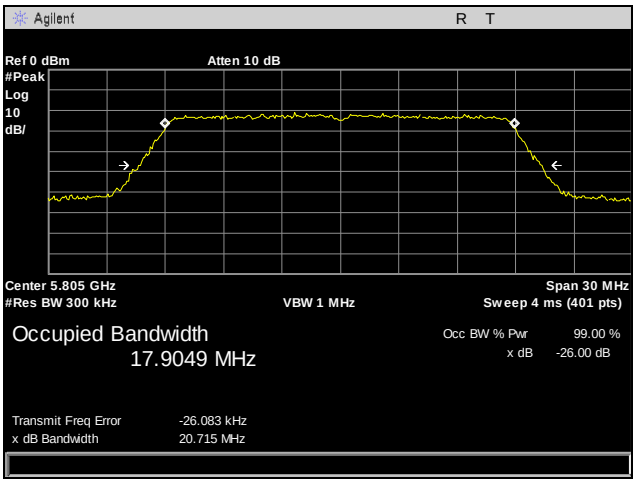
26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 1



Plot 16. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 1, Low Channel

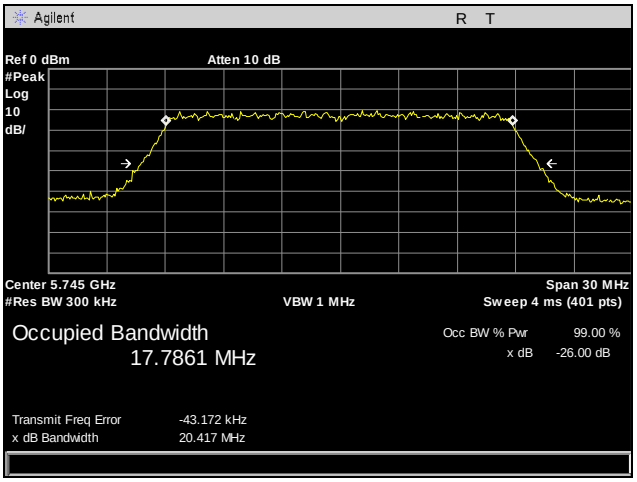


Plot 17. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 1, Mid Channel

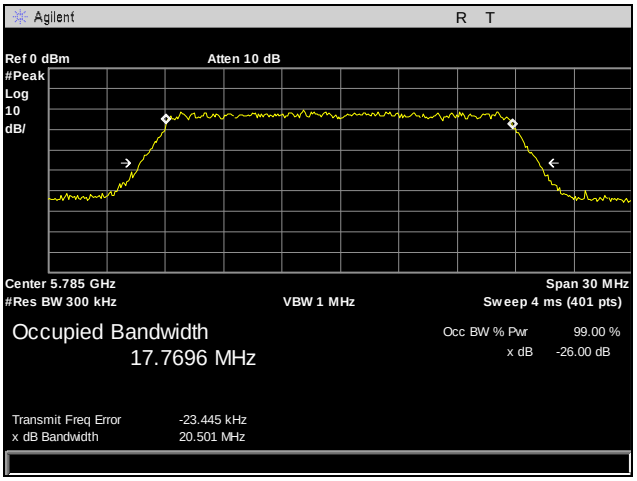


Plot 18. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 1, High Channel

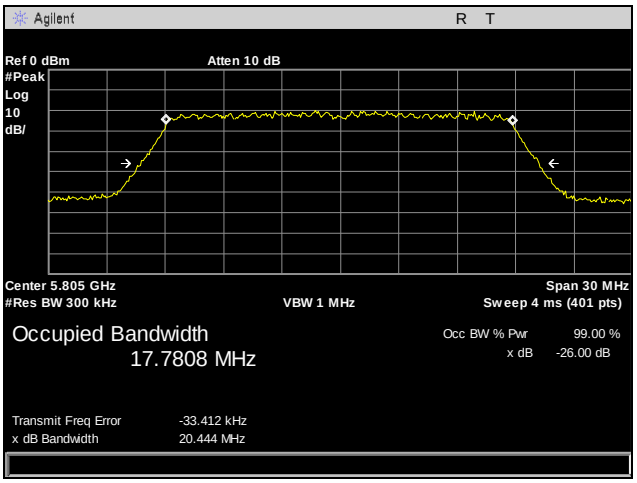
26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 2



Plot 19. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 2, Low Channel

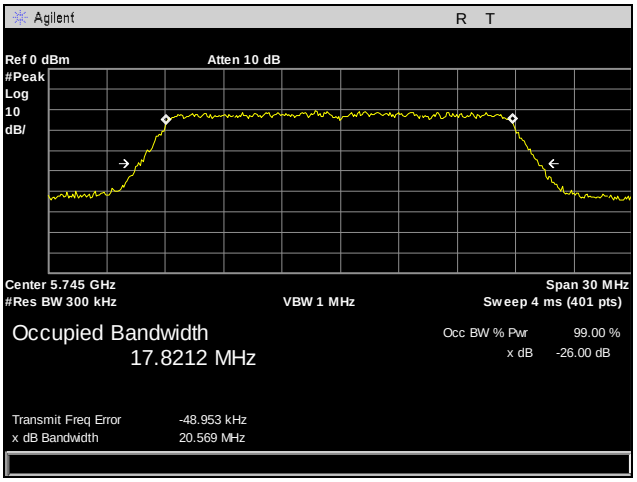


Plot 20. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 2, Mid Channel

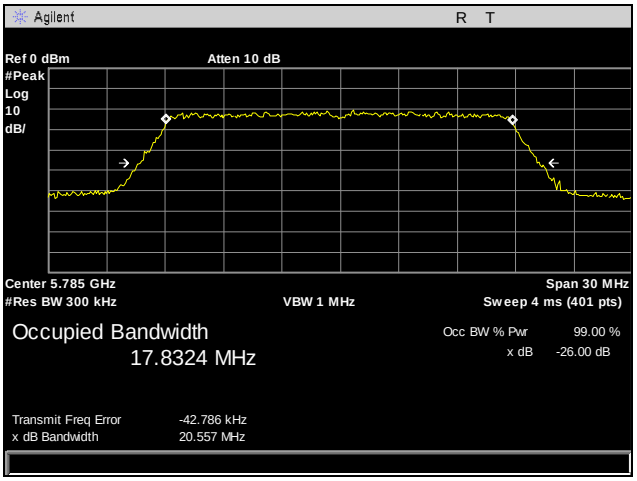


Plot 21. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 2, High Channel

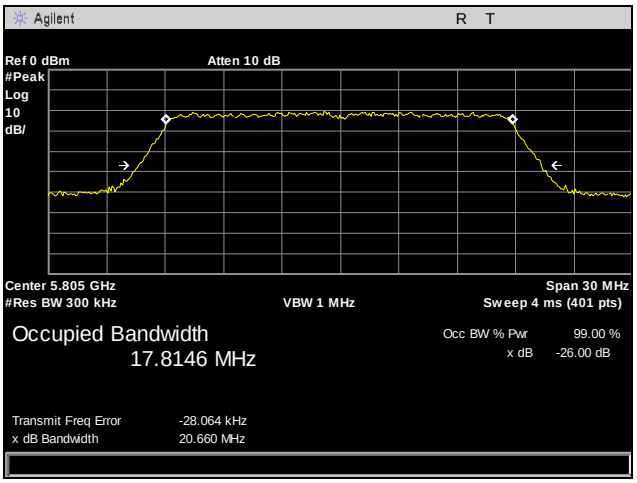
26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 3



Plot 22. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 3, Low Channel

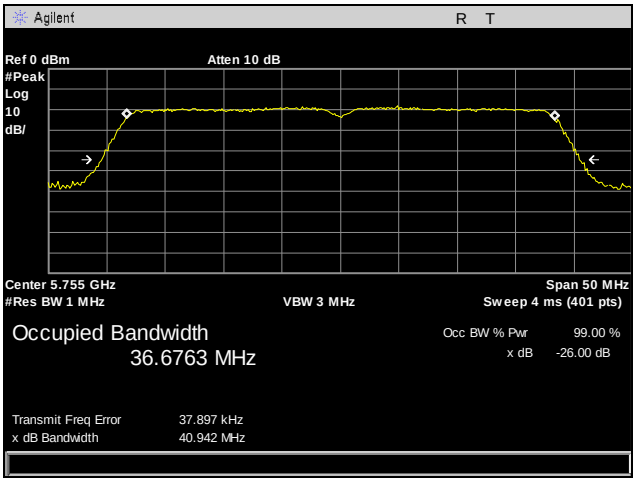


Plot 23. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 3, Mid Channel

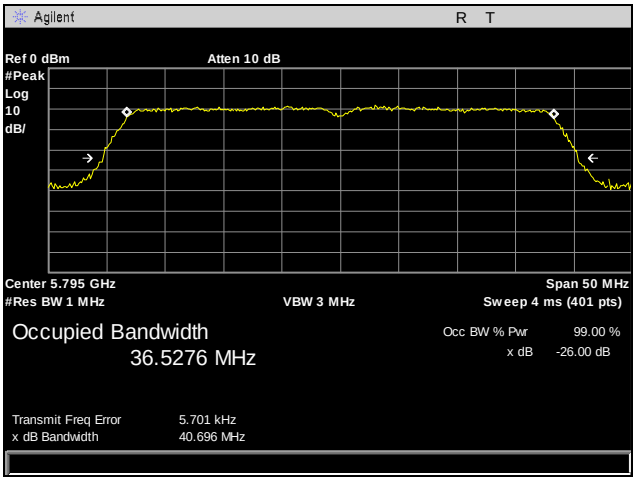


Plot 24. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Port 3, High Channel

26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 1

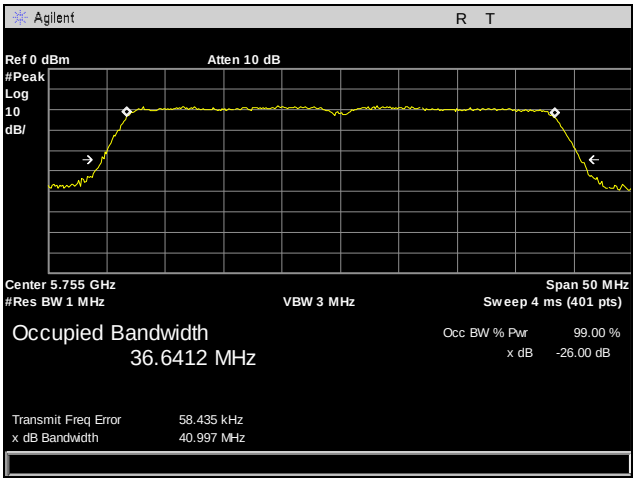


Plot 25. 26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 1, Low Channel

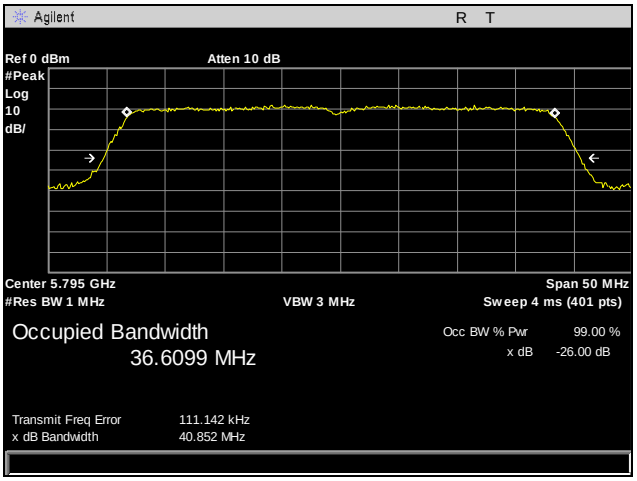


Plot 26. 26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 1, High Channel

26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 2

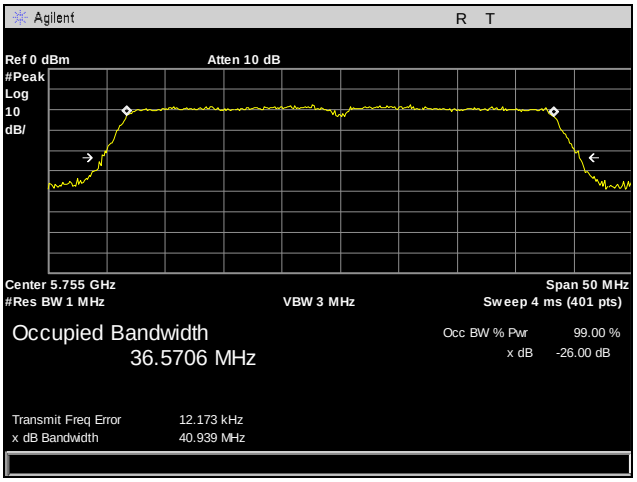


Plot 27. 26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 2, Low Channel

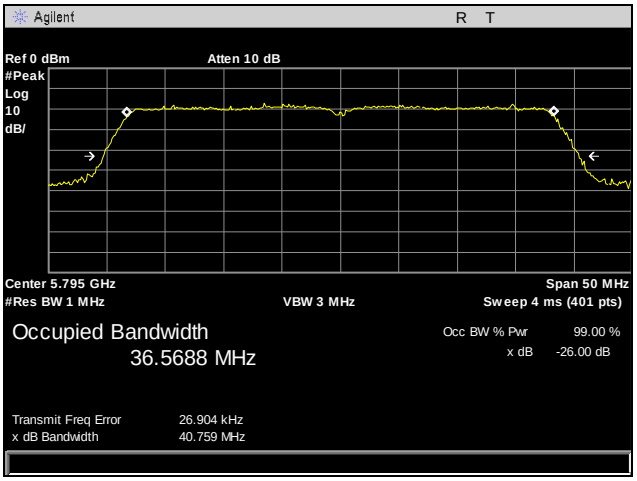


Plot 28. 26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 2, High Channel

26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 3

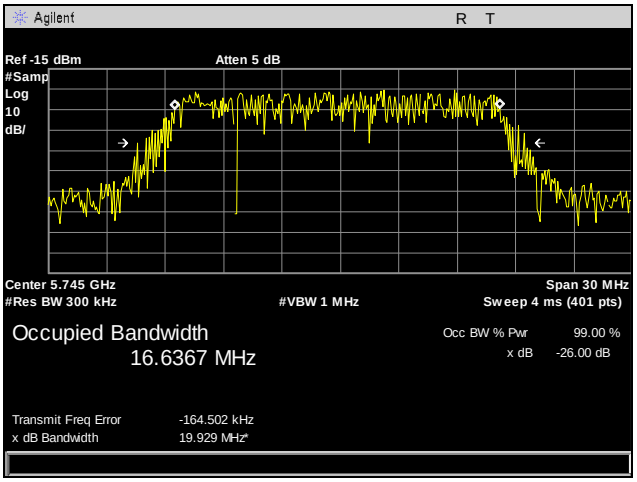


Plot 29. 26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 3, Low Channel

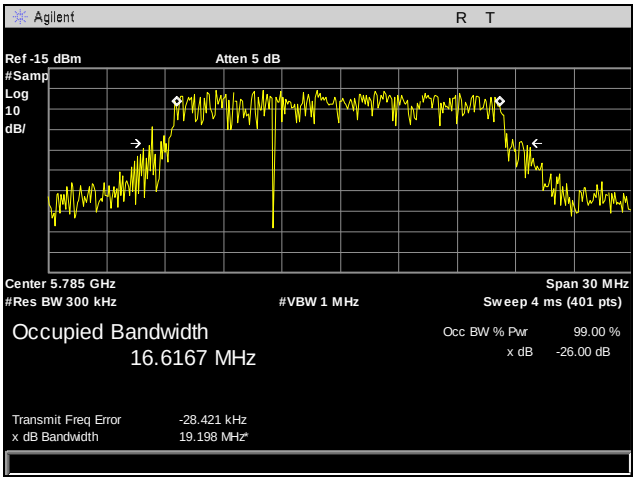


Plot 30. 26 dB Occupied Bandwidth, 802.11n 40 MHz, Port 3, High Channel

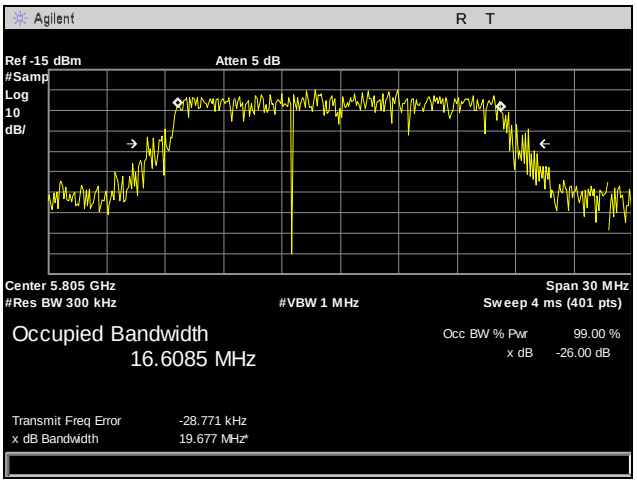
99% Occupied Bandwidth, 802.11a



Plot 31. 99% Occupied Bandwidth, 802.11a, Port 1, Low Channel

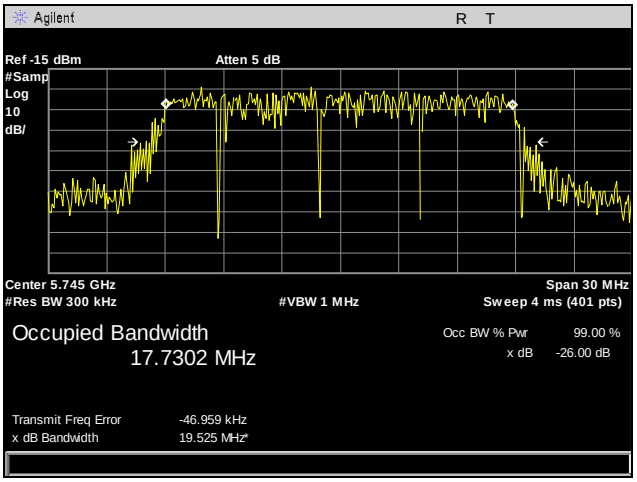


Plot 32. 99% Occupied Bandwidth, 802.11a, Port 1, Mid Channel

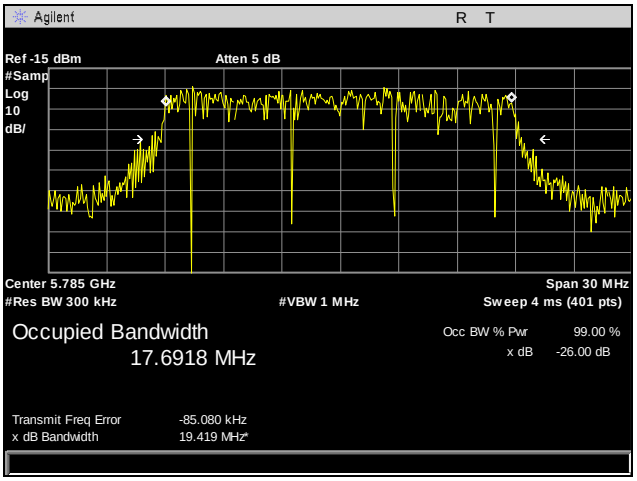


Plot 33. 99% Occupied Bandwidth, 802.11a, Port 1, High Channel

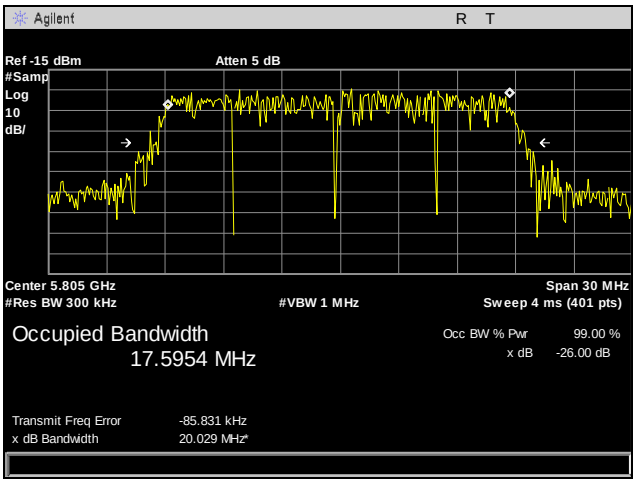
99% Occupied Bandwidth, 802.11n 20 MHz, Port 1



Plot 34. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 1, Low Channel

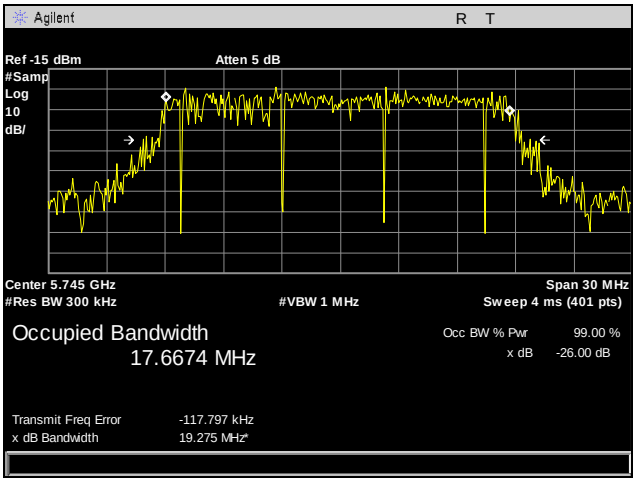


Plot 35. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 1, Mid Channel

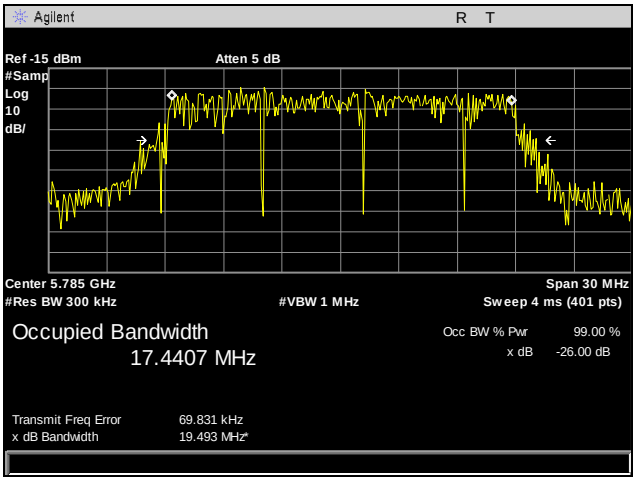


Plot 36. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 1, High Channel

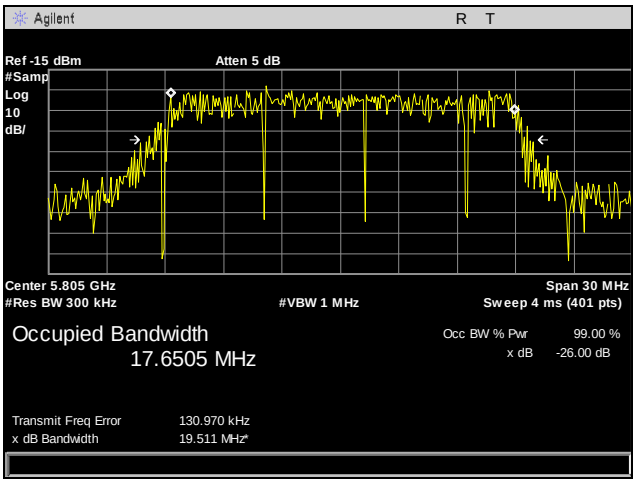
99% Occupied Bandwidth, 802.11n 20 MHz, Port 2



Plot 37. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 2, Low Channel

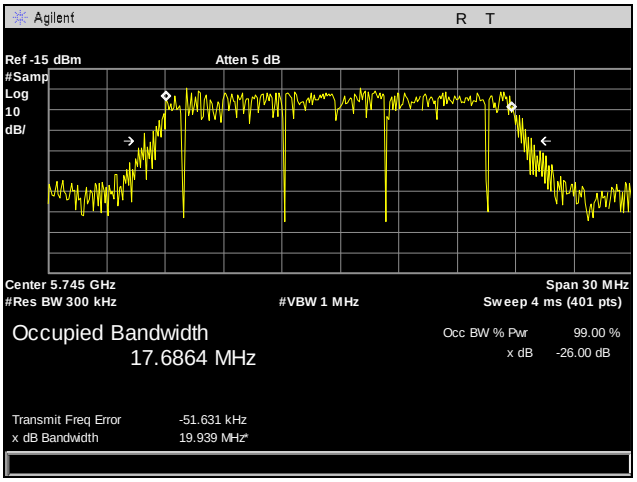


Plot 38. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 2, Mid Channel

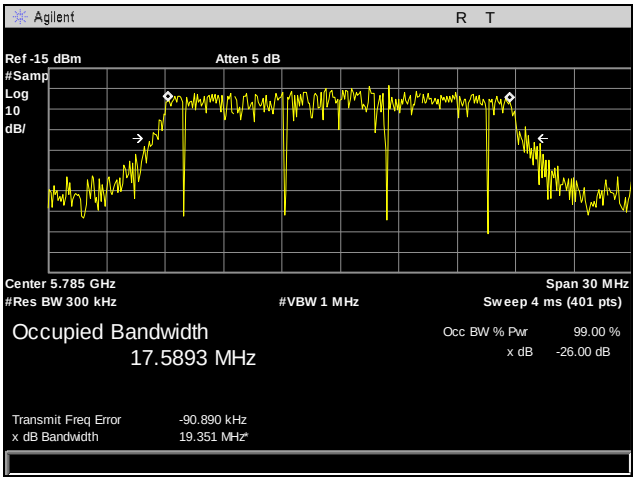


Plot 39. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 2, High Channel

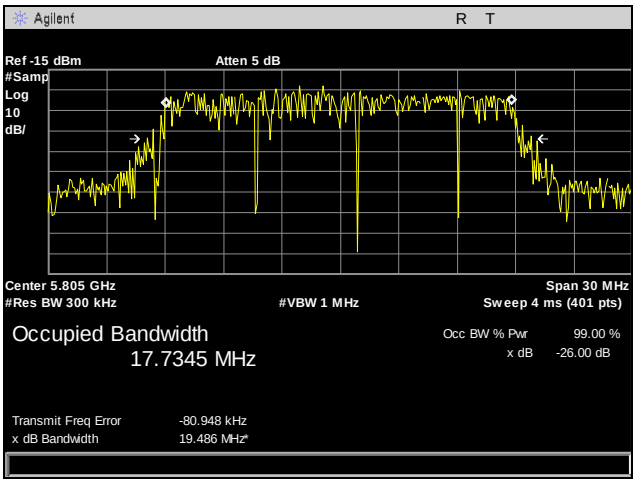
99% Occupied Bandwidth, 802.11n 20 MHz, Port 3



Plot 40. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 3, Low Channel

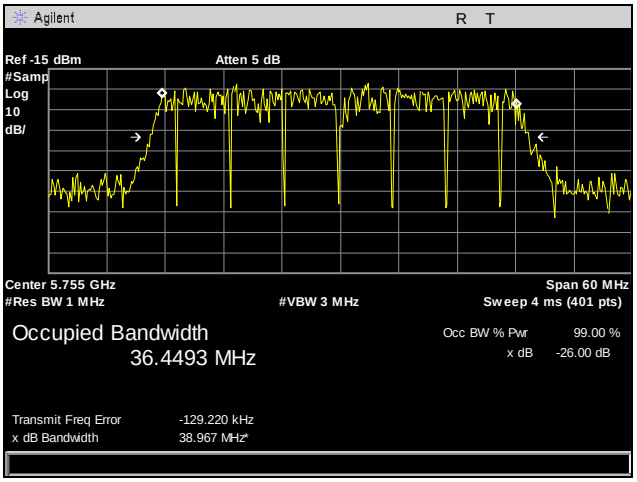


Plot 41. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 3, Mid Channel

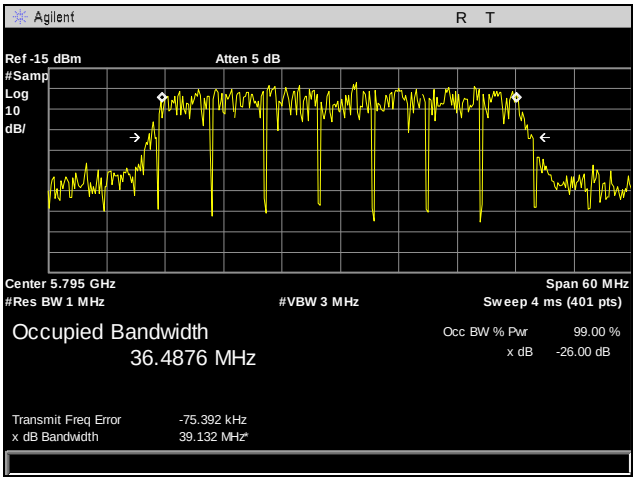


Plot 42. 99% Occupied Bandwidth, 802.11n 20 MHz, Port 3, High Channel

99% Occupied Bandwidth, 802.11n 40 MHz, Port 1

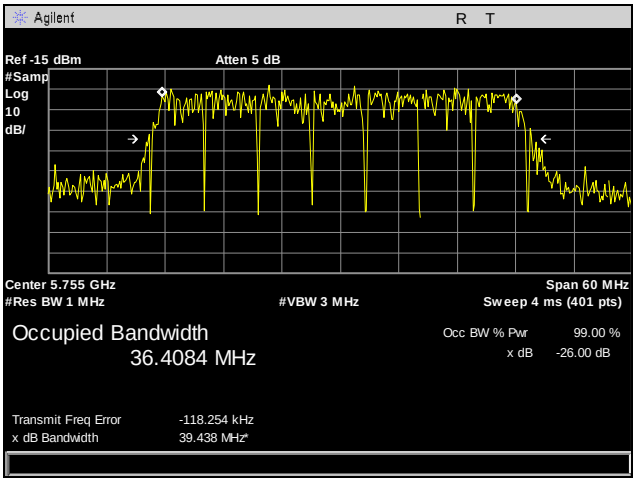


Plot 43. 99% Occupied Bandwidth, 802.11n 40 MHz, Port 1, Low Channel

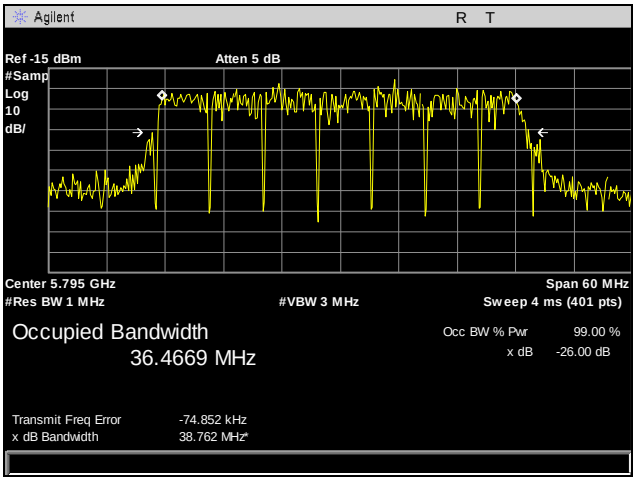


Plot 44. 99% Occupied Bandwidth, 802.11n 40 MHz, Port 1, High Channel

99% Occupied Bandwidth, 802.11n 40 MHz, Port 2

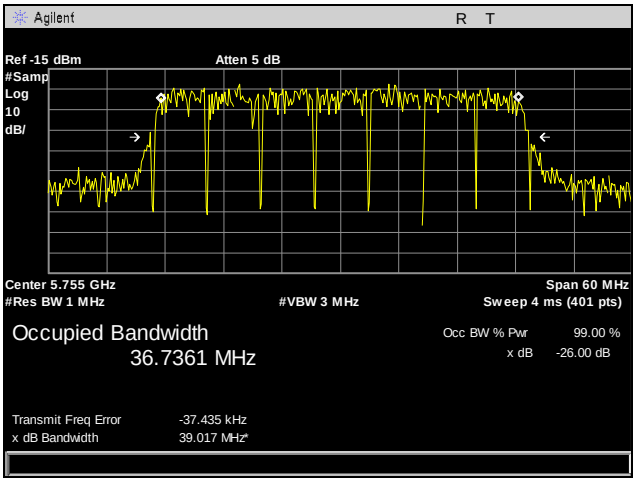


Plot 45. 99% Occupied Bandwidth, 802.11n 40 MHz, Port 2, Low Channel

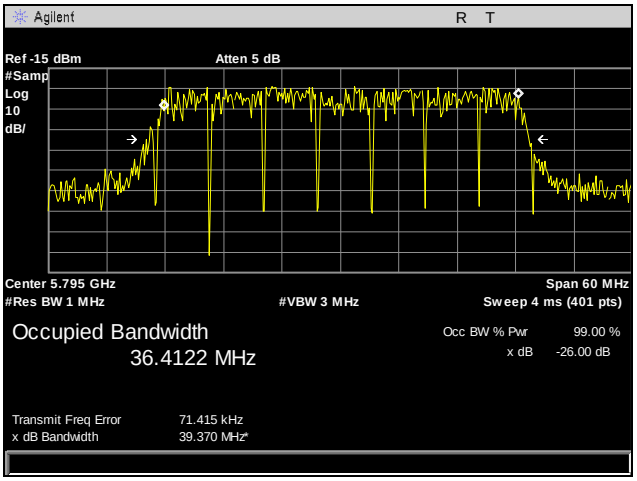


Plot 46. 99% Occupied Bandwidth, 802.11n 40 MHz, Port 2, High Channel

99% Occupied Bandwidth, 802.11n 40 MHz, Port 3



Plot 47. 99% Occupied Bandwidth, 802.11n 40 MHz, Port 3, Low Channel



Plot 48. 99% Occupied Bandwidth, 802.11n 40 MHz, Port 3, High Channel

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(3) RF Power Output

Test Requirements: **§15.407(a)(3):** For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz.

Test Procedure: The EUT was connected to a spectrum analyzer through an attenuator and set to transmit continuously on the low, mid, and high channels. Its power was measured according to measurement method SA-1, as described in 789033 D01 General UNII Test Procedures v01r02. Plots were corrected for attenuator and cable loss. For Co-Located operation, output power will be lowered accordingly from those shown in this section.

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

Test Engineer(s): Jonathan Chao

Test Date(s): 02/18/13

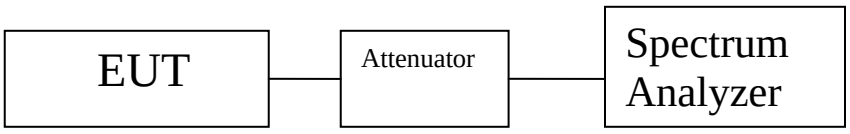
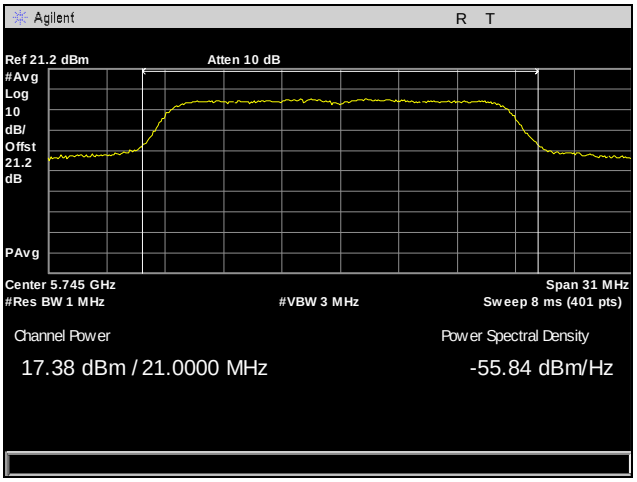


Figure 3. Power Output Test Setup

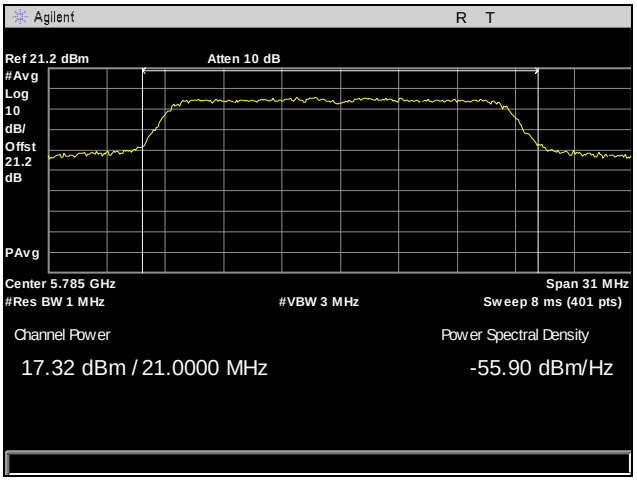
Frequency (MHz)	Mode/Modulation Type	Port 1 (dBm)	Port 2 (dBm)	Port 3 (dBm)	Sum power (dBm)
5745	802.11a	17.38	--	--	
5785	802.11a	17.32	--	--	
5805	802.11a	17.55	--	--	
5745	802.11n HT20	17.27	17.21	18.01	22.28
5785	802.11n HT20	17.45	17.82	17.57	22.38
5805	802.11n HT20	17.34	17.35	17.49	22.16
5755	802.11n HT40	16.55	16.23	17.14	21.42
5795	802.11n HT40	16.82	15.99	16.57	21.24
5775	802.11n HT80	10.79	10.53	10.27	15.30

Table 24. Output Power, Test Results

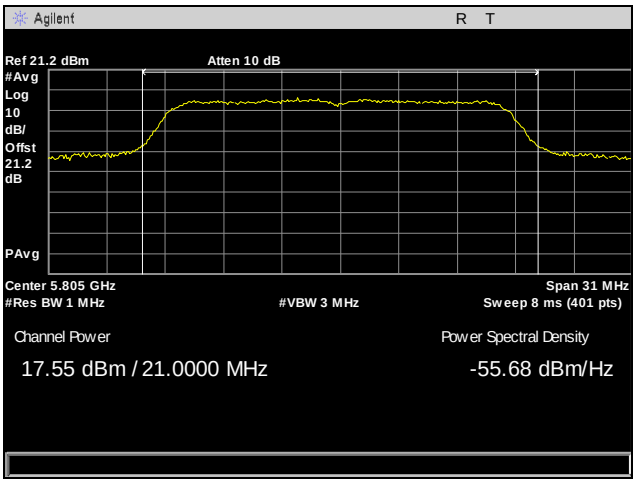
RF Power Output, 802.11a



Plot 49. RF Power Output, Low Channel, 802.11a

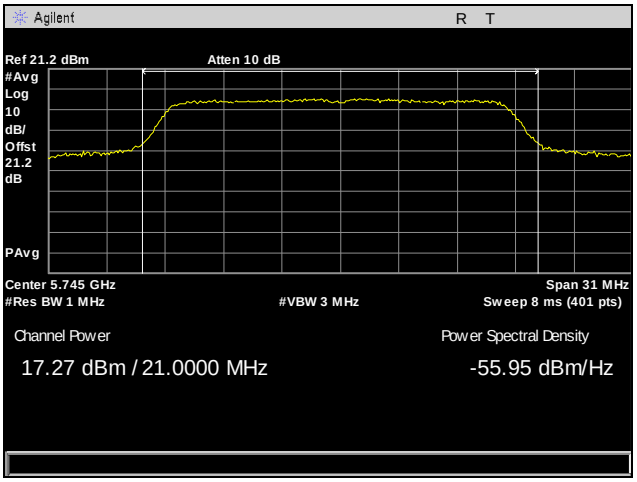


Plot 50. RF Power Output, Mid Channel, 802.11a

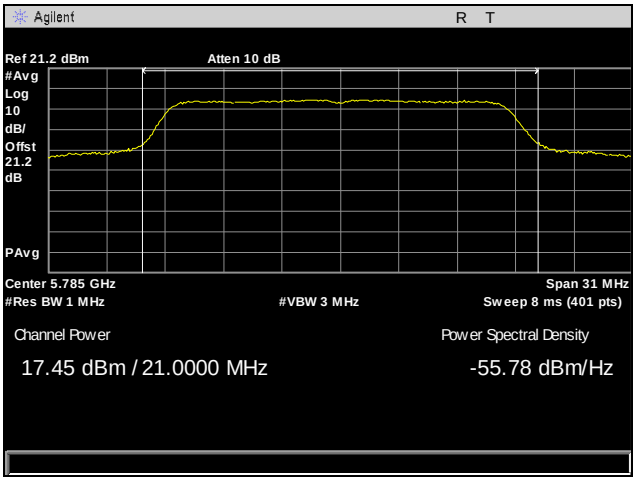


Plot 51. RF Power Output, High Channel, 802.11a

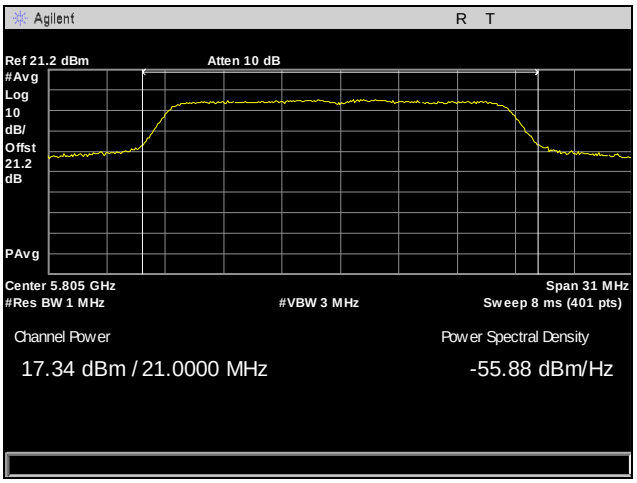
RF Power Output, 802.11n 20 MHz, Port 1



Plot 52. RF Power Output, Low Channel, 802.11n 20 MHz, Port 1

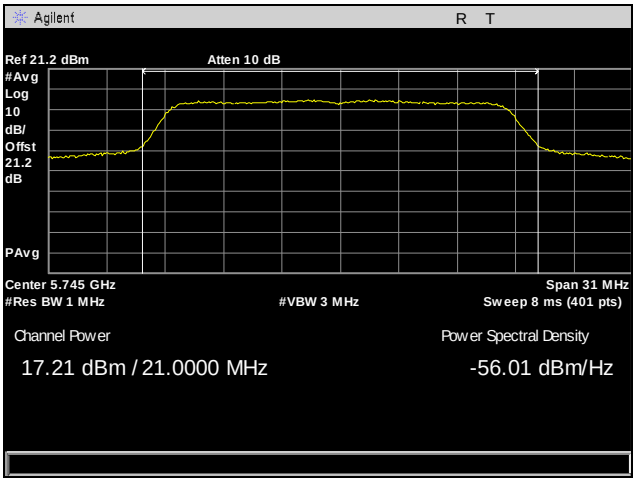


Plot 53. RF Power Output, Mid Channel, 802.11n 20 MHz, Port 1

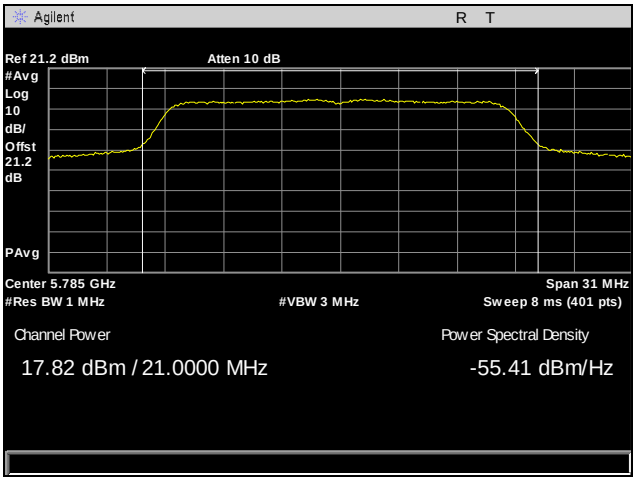


Plot 54. RF Power Output, High Channel, 802.11n 20 MHz, Port 1

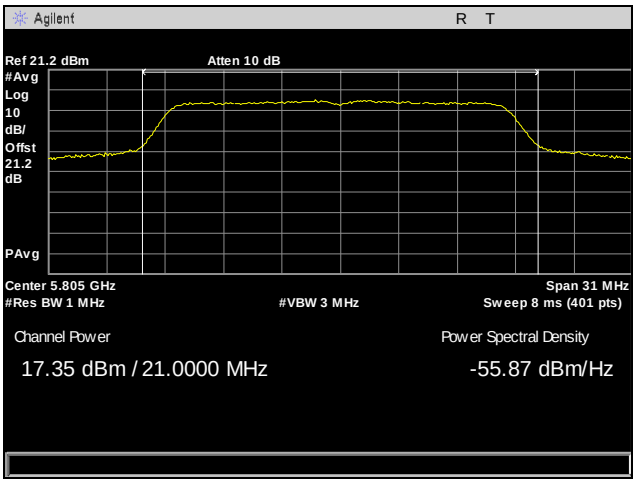
RF Power Output, 802.11n 20 MHz, Port 2



Plot 55. RF Power Output, Low Channel, 802.11n 20 MHz, Port 2

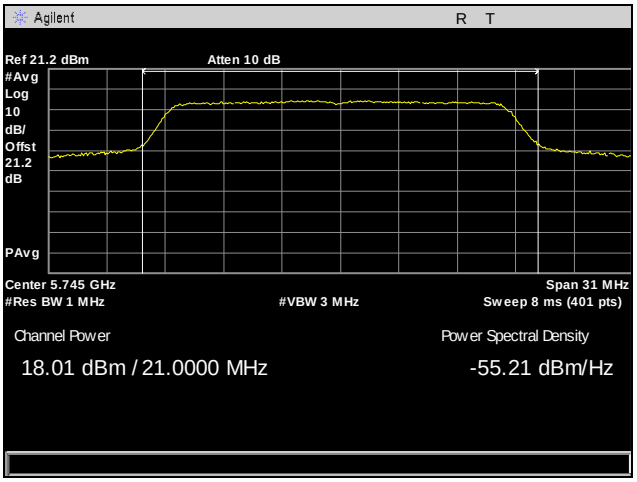


Plot 56. RF Power Output, Mid Channel, 802.11n 20 MHz, Port 2

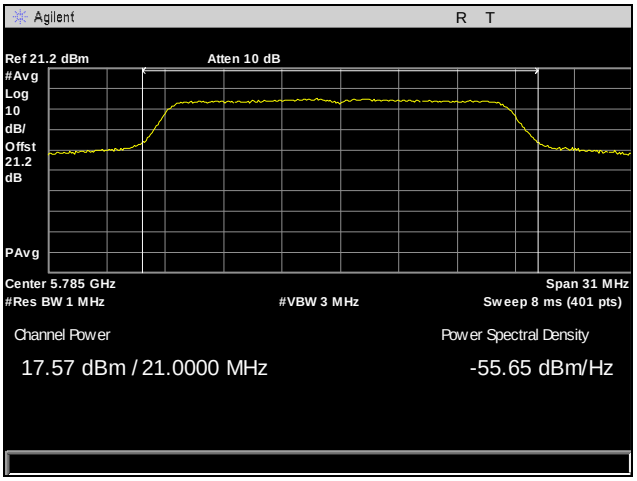


Plot 57. RF Power Output, High Channel, 802.11n 20 MHz, Port 2

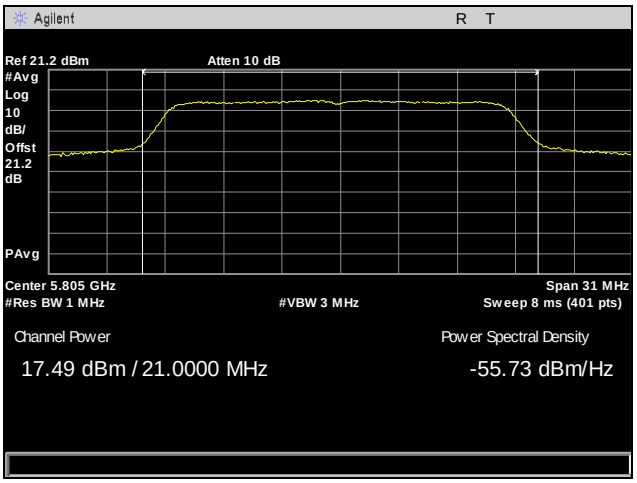
RF Power Output, 802.11n 20 MHz, Port 3



Plot 58. RF Power Output, Low Channel, 802.11n 20 MHz, Port 3

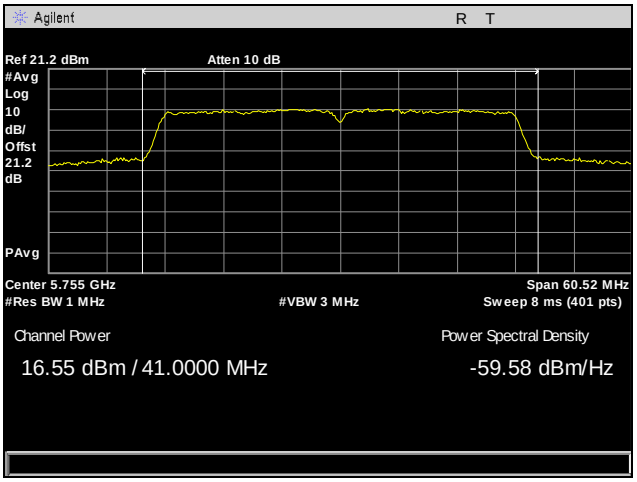


Plot 59. RF Power Output, Mid Channel, 802.11n 20 MHz, Port 3

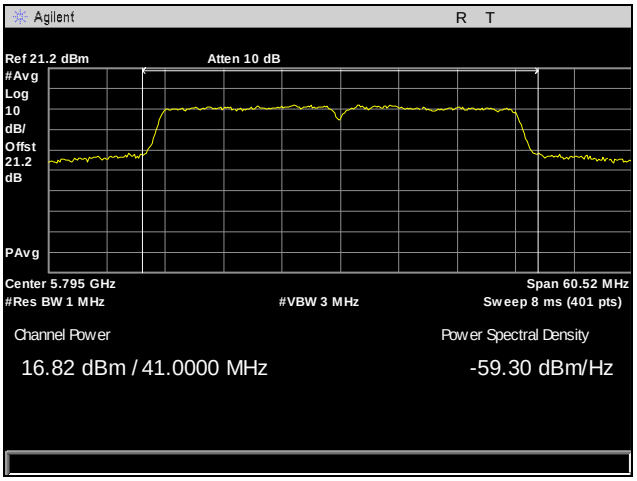


Plot 60. RF Power Output, High Channel, 802.11n 20 MHz, Port 3

RF Power Output, 802.11n 40 MHz, Port 1

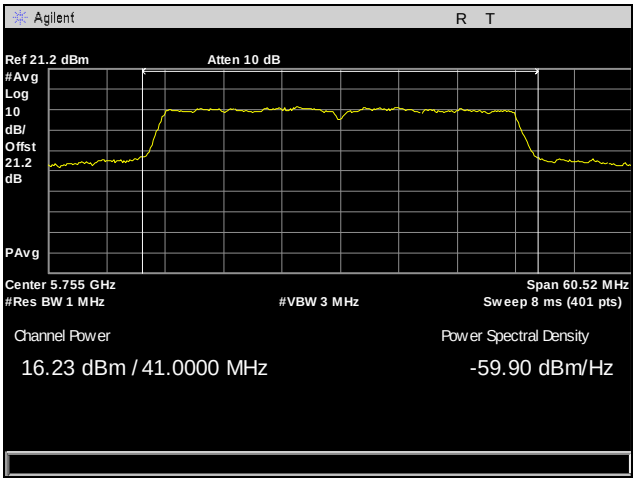


Plot 61. RF Power Output, Low Channel, 802.11n 40 MHz, Port 1

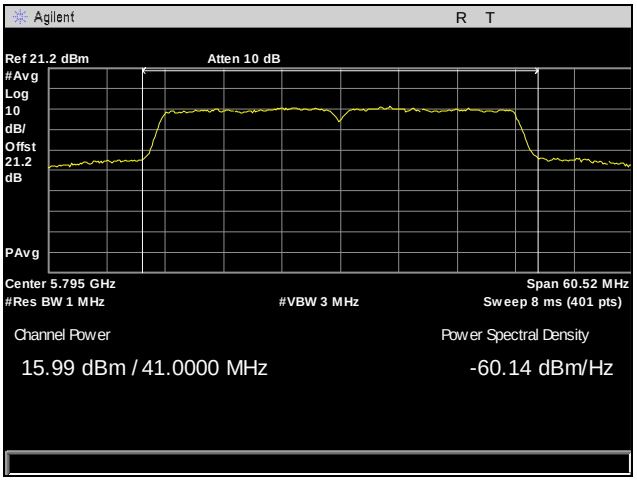


Plot 62. RF Power Output, High Channel, 802.11n 40 MHz, Port 1

RF Power Output, 802.11n 40 MHz, Port 2

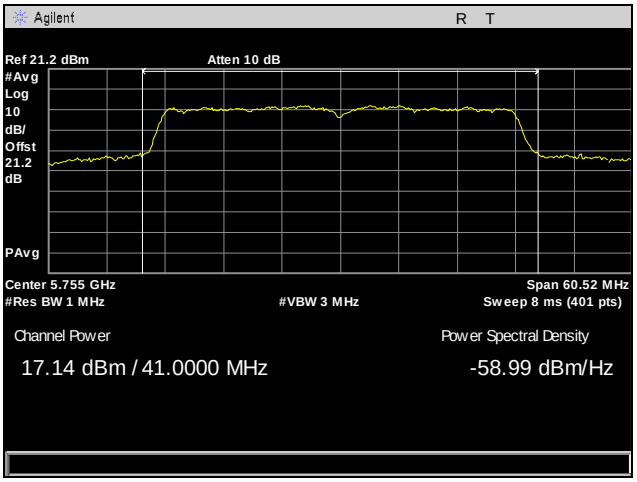


Plot 63. RF Power Output, Low Channel, 802.11n 40 MHz, Port 2

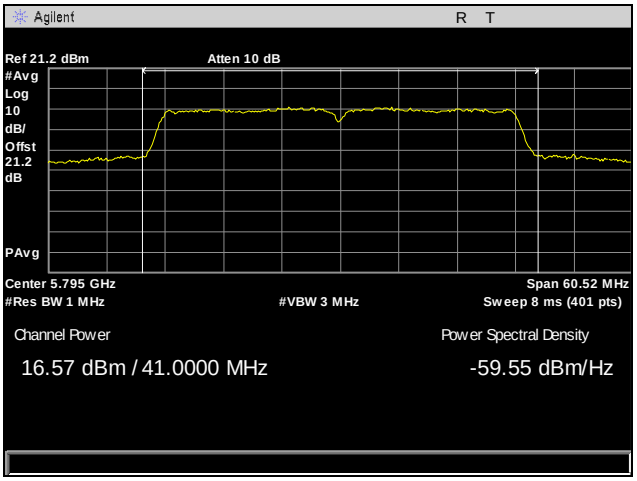


Plot 64. RF Power Output, High Channel, 802.11n 40 MHz, Port 2

RF Power Output, 802.11n 40 MHz, Port 3

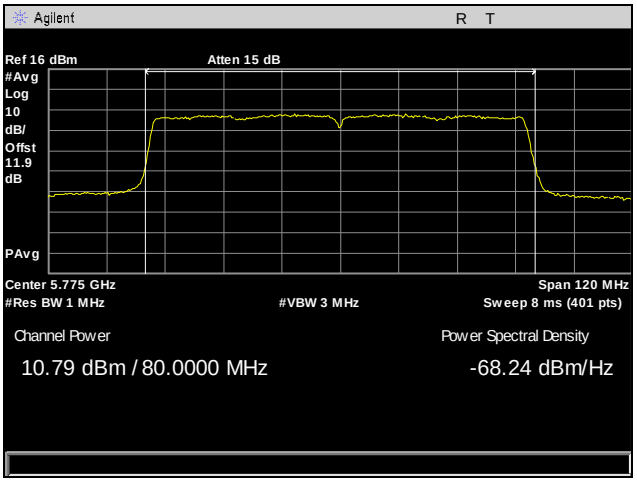


Plot 65. RF Power Output, Low Channel, 802.11n 40 MHz, Port 3

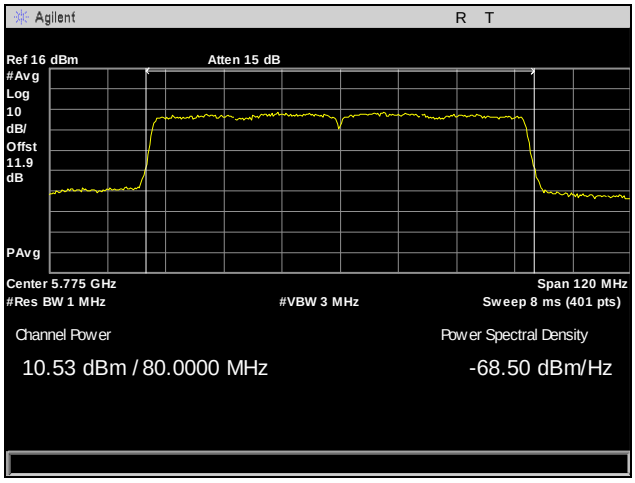


Plot 66. RF Power Output, High Channel, 802.11n 40 MHz, Port 3

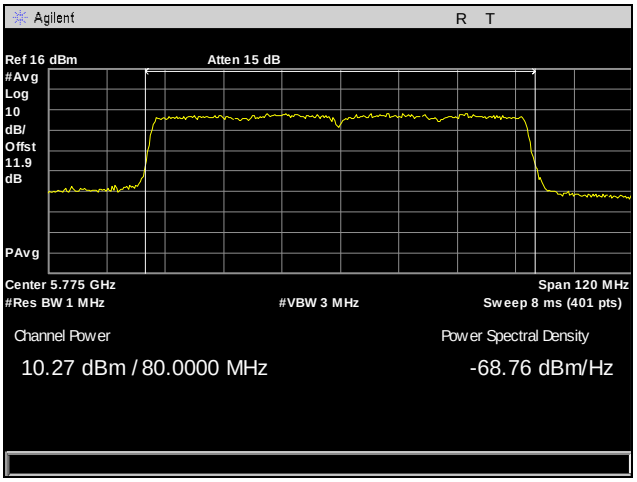
RF Power Output, 802.11n 80 MHz



Plot 67. RF Power Output, 802.11n 80 MHz, Port 1



Plot 68. RF Power Output, 802.11n 80 MHz, Port 2



Plot 69. RF Power Output, 802.11n 80 MHz, Port 3

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(3) Peak Power Spectral Density

Test Requirements: **§ 15.407(a)(3):** In addition, the peak power spectral density shall not exceed 17 dBm in any 1–MHz band.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement used was method SA-1 from 789033 D01 General UNII Test Procedures v01r02. Plots are correct for attenuators and cable loss.

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

Test Engineer(s): Jonathan Chao

Test Date(s): 02/18/13

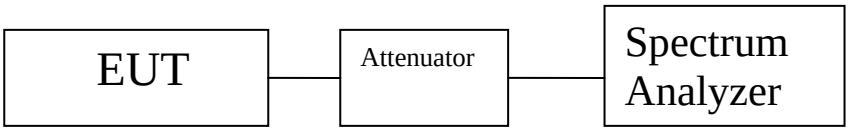
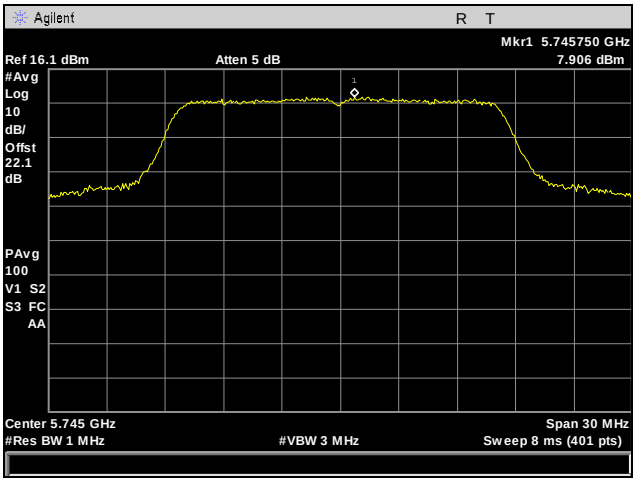


Figure 4. Power Spectral Density Test Setup

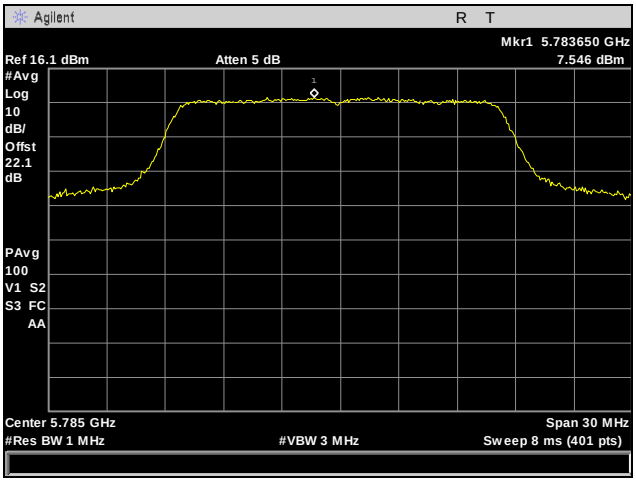
Frequency (MHz)	Mode/Modulation Type	Port 1 (dBm)	Port 2 (dBm)	Port 3 (dBm)	Sum(dBm)
5745	802.11a	7.906	--	--	
5785	802.11a	7.546	--	--	
5805	802.11a	8.077	--	--	
5745	802.11n HT20	7.204	6.981	7.945	12.16775
5785	802.11n HT20	7.521	7.109	7.399	12.11763
5805	802.11n HT20	7.606	7.594	7.54	12.35131
5755	802.11n HT40	4.645	4.152	5.02	9.391348
5795	802.11n HT40	4.366	4.236	4.438	9.118682
5775	802.11n HT80	4.744	3.983	4.063	9.048196

Table 25. Peak Spectral Density, Test Results Based of 3x 2dBi Antenna, Aggregate gain of 6.77dBi

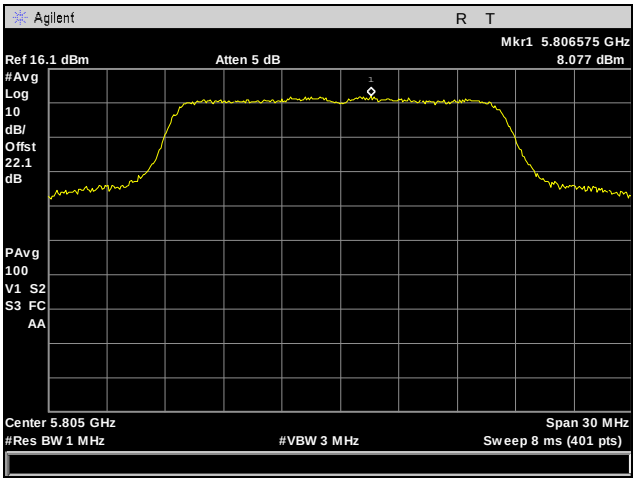
Power Spectral Density, 802.11a



Plot 70. Power Spectral Density, Low Channel, 802.11a

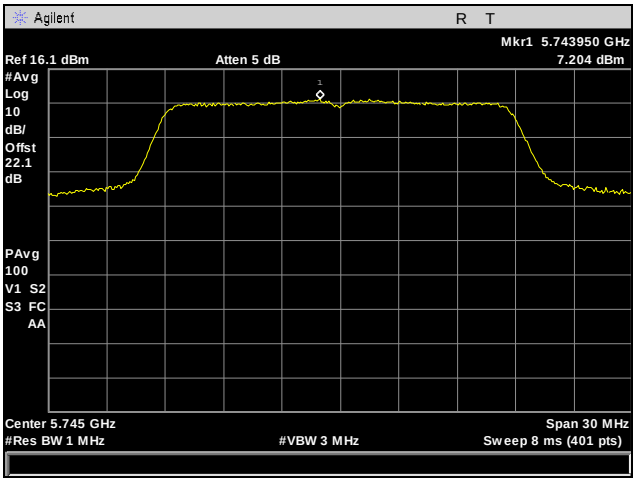


Plot 71. Power Spectral Density, Mid Channel, 802.11a

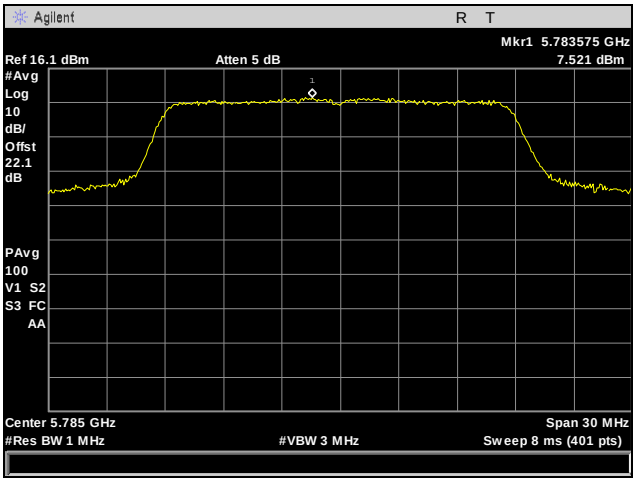


Plot 72. Power Spectral Density, High Channel, 802.11a

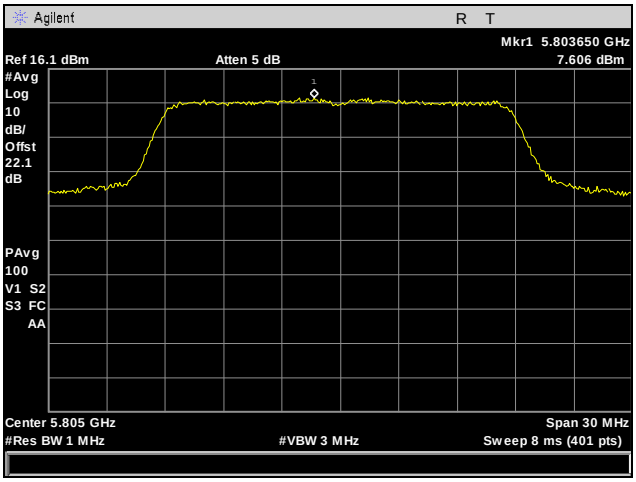
Power Spectral Density, 802.11n 20 MHz, Port 1



Plot 73. Power Spectral Density, Low Channel, 802.11n 20 MHz, Port 1

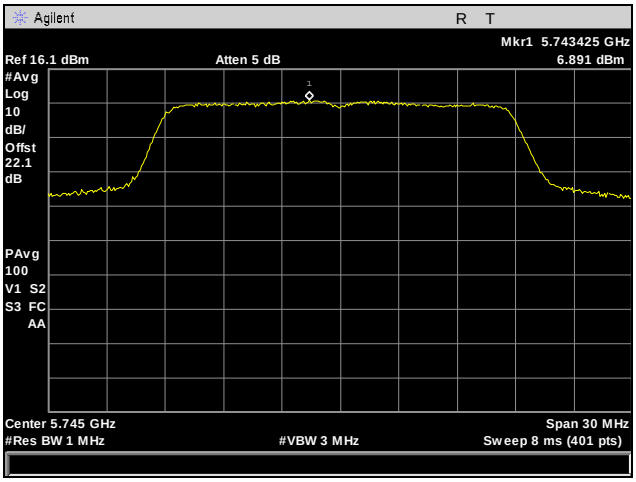


Plot 74. Power Spectral Density, Mid Channel, 802.11n 20 MHz, Port 1

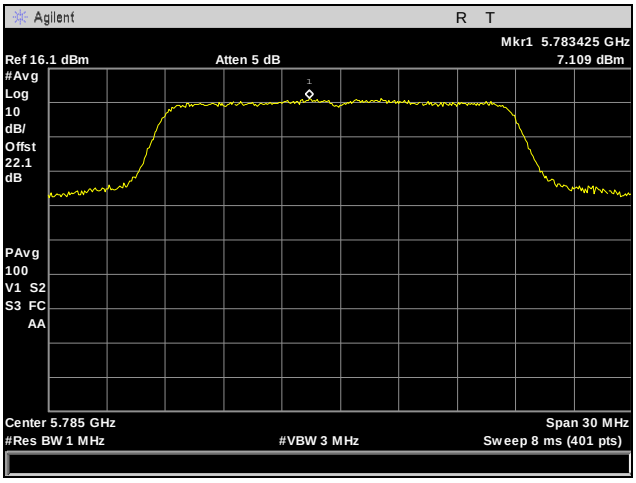


Plot 75. Power Spectral Density, High Channel, 802.11n 20 MHz, Port 1

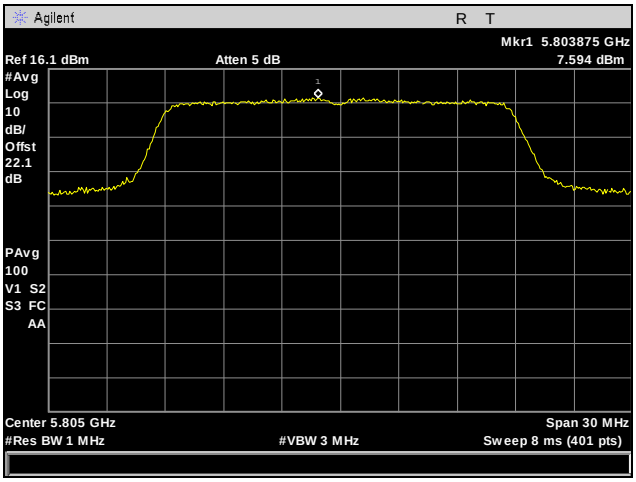
Power Spectral Density, 802.11n 20 MHz, Port 2



Plot 76. Power Spectral Density, Low Channel, 802.11n 20 MHz, Port 2

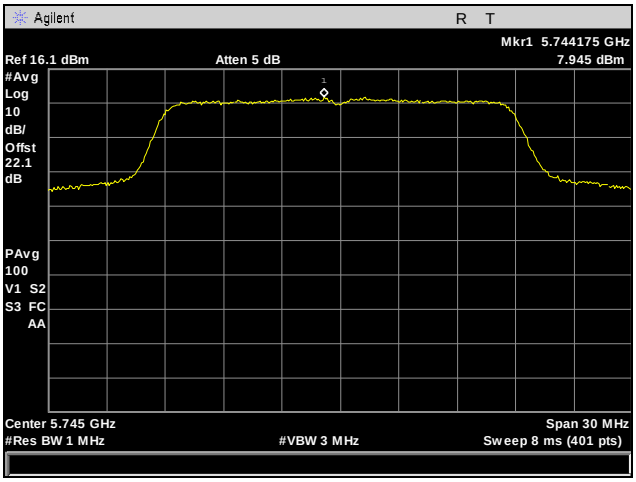


Plot 77. Power Spectral Density, Mid Channel, 802.11n 20 MHz, Port 2

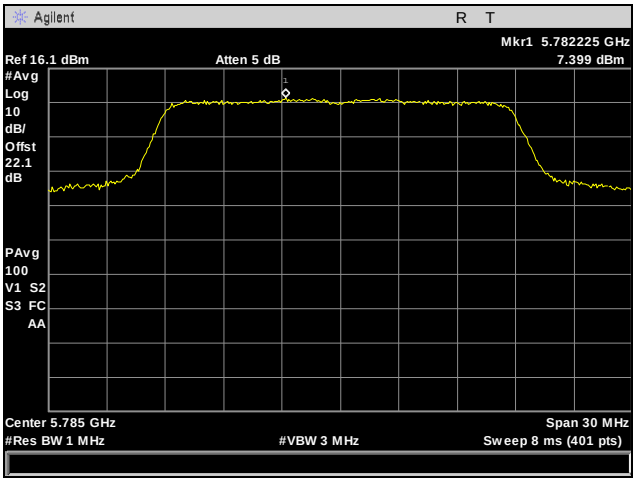


Plot 78. Power Spectral Density, High Channel, 802.11n 20 MHz, Port 2

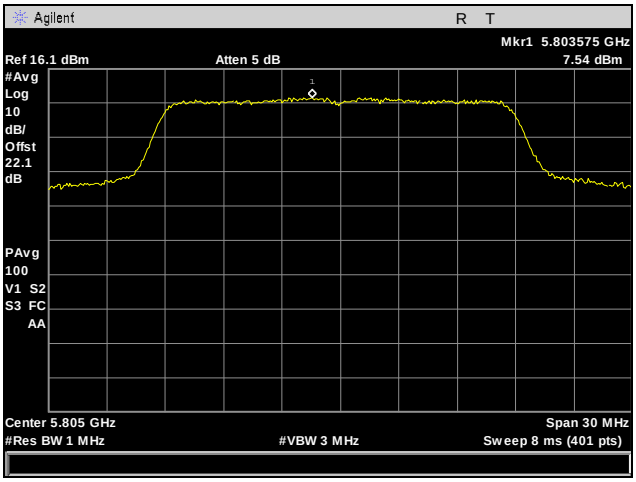
Power Spectral Density, 802.11n 20 MHz, Port 3



Plot 79. Power Spectral Density, Low Channel, 802.11n 20 MHz, Port 3

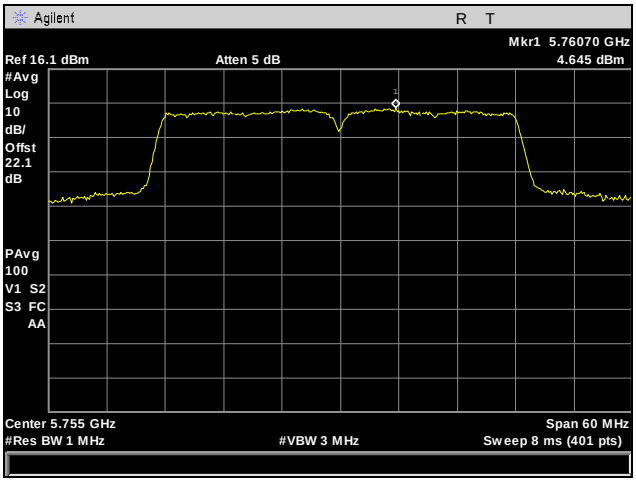


Plot 80. Power Spectral Density, Mid Channel, 802.11n 20 MHz, Port 3

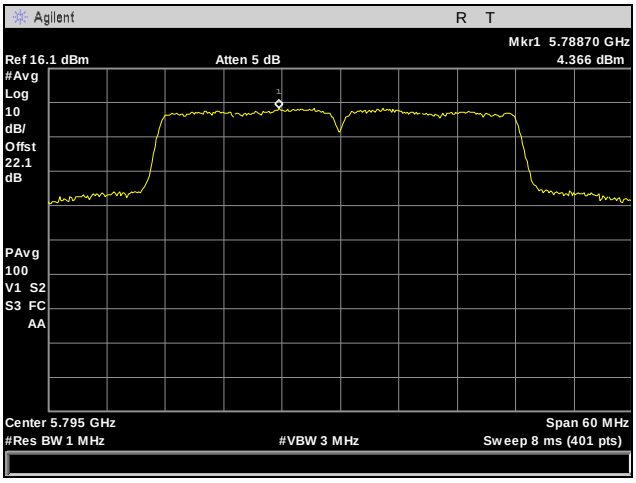


Plot 81. Power Spectral Density, High Channel, 802.11n 20 MHz, Port 3

Power Spectral Density, 802.11n 40 MHz, Port 1

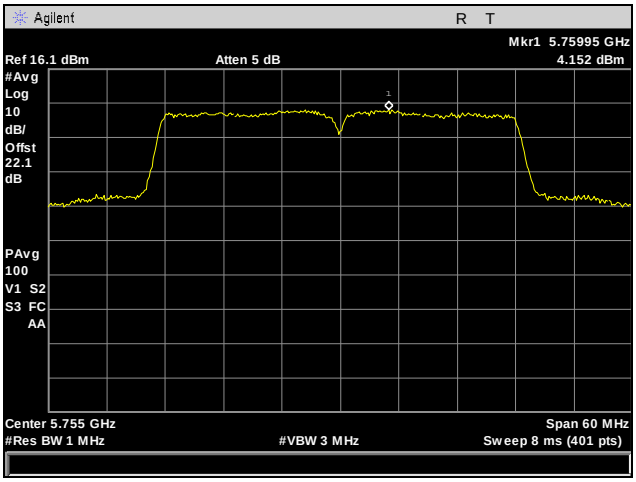


Plot 82. Power Spectral Density, Low Channel, 802.11n 40 MHz, Port 1

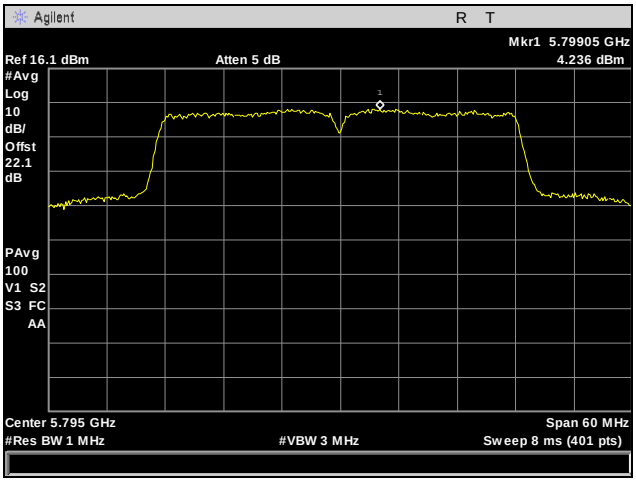


Plot 83. Power Spectral Density, High Channel, 802.11n 40 MHz, Port 1

Power Spectral Density, 802.11n 40 MHz, Port 2

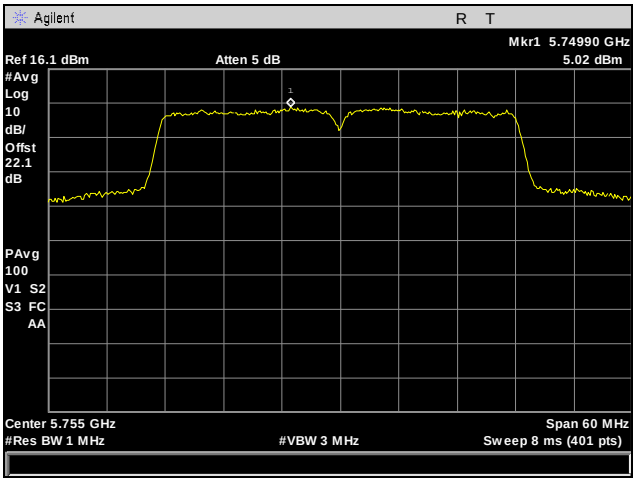


Plot 84. Power Spectral Density, Low Channel, 802.11n 40 MHz, Port 2

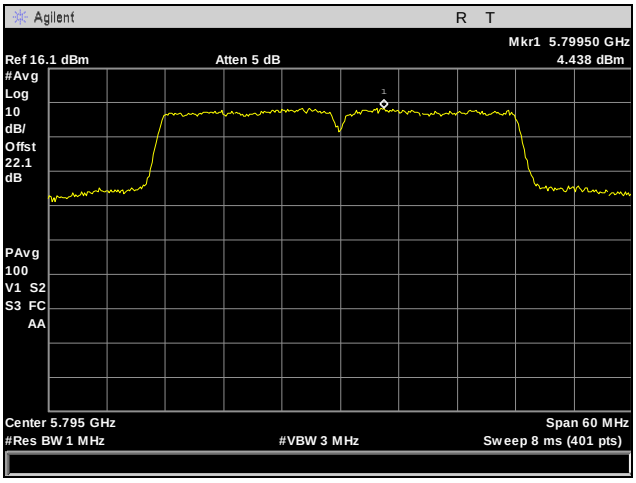


Plot 85. Power Spectral Density, High Channel, 802.11n 40 MHz, Port 2

Power Spectral Density, 802.11n 40 MHz, Port 3

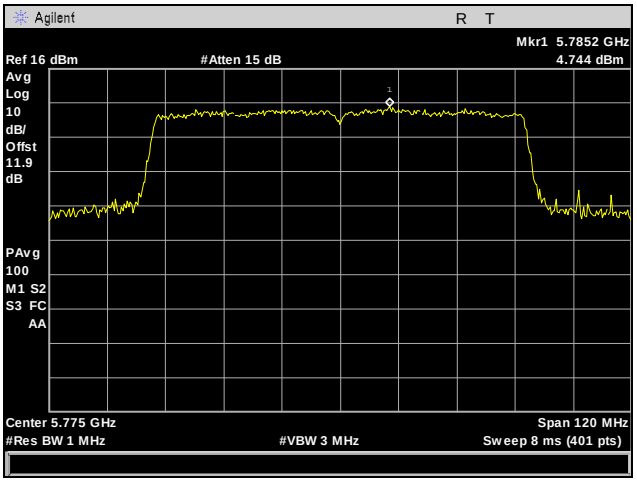


Plot 86. Power Spectral Density, Low Channel, 802.11n 40 MHz, Port 3

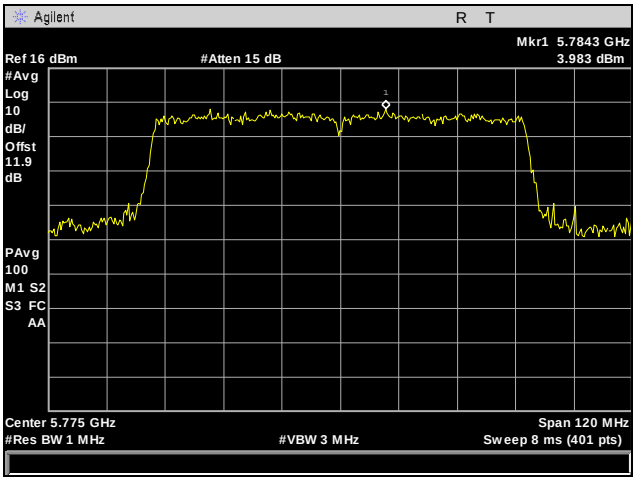


Plot 87. Power Spectral Density, High Channel, 802.11n 40 MHz, Port 3

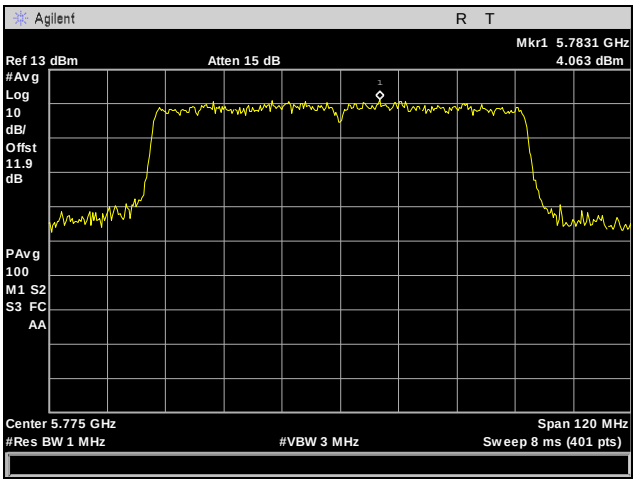
Power Spectral Density, 802.11n 80 MHz



Plot 88. Power Spectral Density 802.11n 80 MHz Port 1



Plot 89. Power Spectral Density 802.11n 80 MHz Port 2



Plot 90. Power Spectral Density 802.11n 80 MHz Port 3

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(6) Peak Excursion Ratio

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

Test Procedure: The EUT was connected directly to the spectrum analyzer through cabling and attenuation. The 1st trace on the spectrum analyzer was set to RBW=1MHz, VBW=3MHz. A peak detector was used and the trace max held. The 2nd trace on the spectrum analyzer was set according to measurement Method SA-1 from 789033 D01 General UNII Test Procedures v01r02 for making conducted power measurements.

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

Test Engineer(s): Jonathan Chao

Test Date(s): 02/18/13

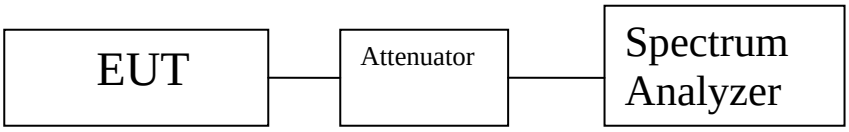
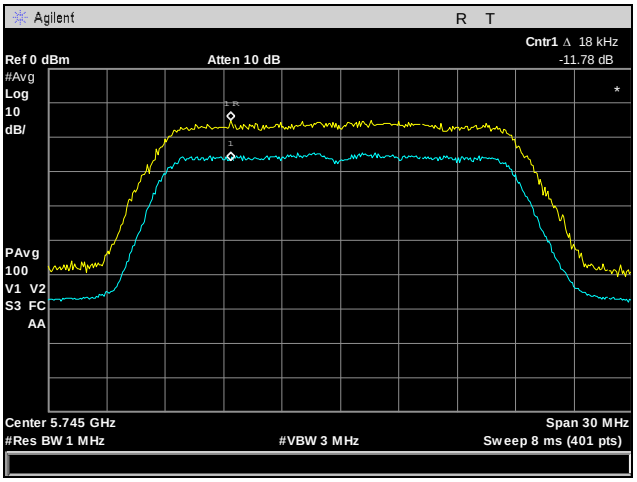
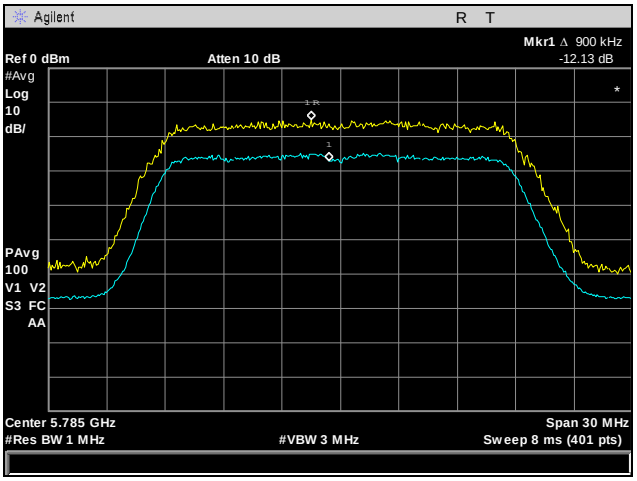


Figure 5. Peak Excursion Ration Test Setup

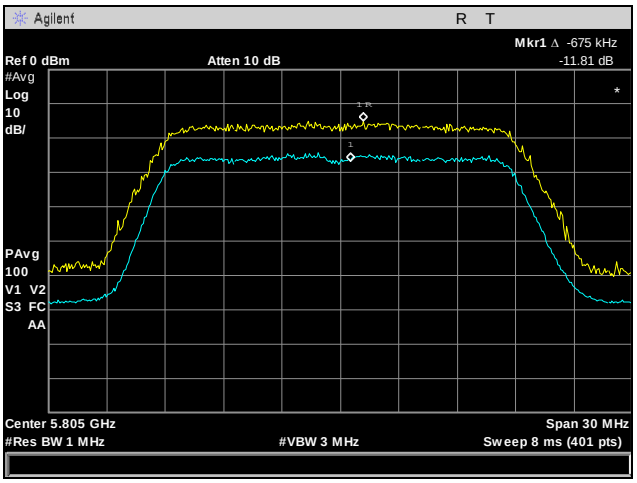
Peak Excursion Ratio, 802.11a



Plot 91. Peak Excursion Ratio, Low Channel, 802.11a

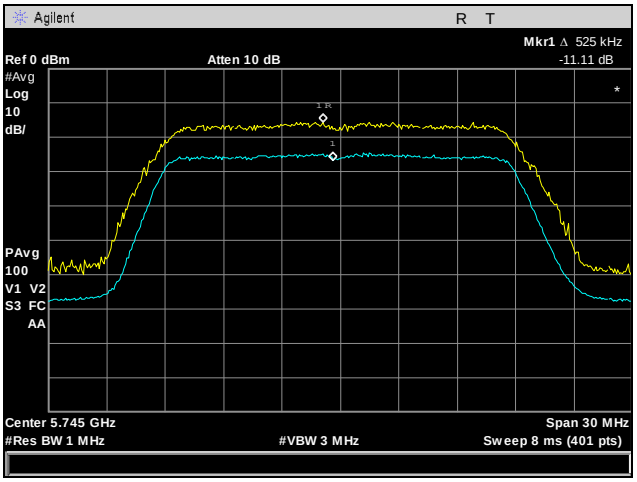


Plot 92. Peak Excursion Ratio, Mid Channel, 802.11a

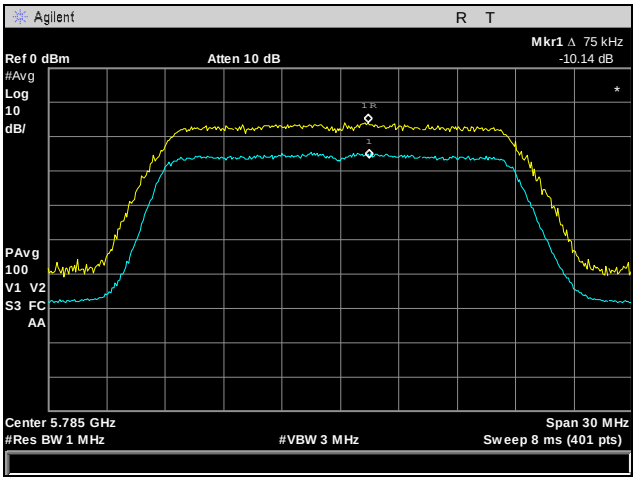


Plot 93. Peak Excursion Ratio, High Channel, 802.11a

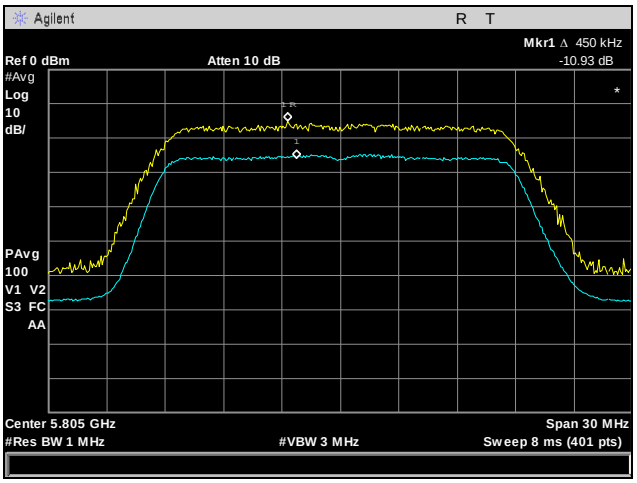
Peak Excursion Ratio, 802.11n 20 MHz, Port 1



Plot 94. Peak Excursion Ratio, Low Channel, 802.11n 20 MHz, Port 1

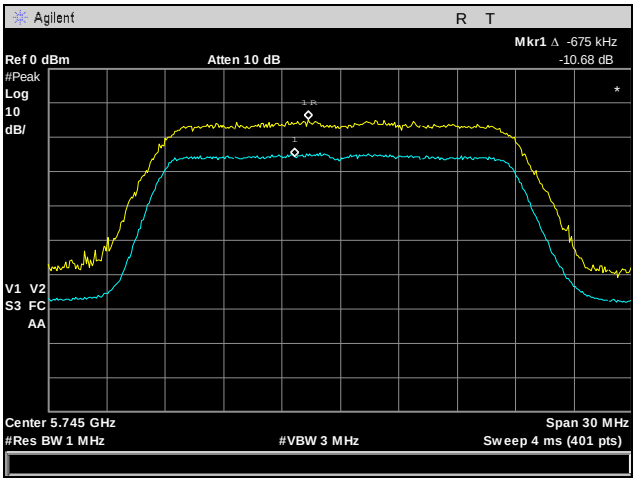


Plot 95. Peak Excursion Ratio, Mid Channel, 802.11n 20 MHz, Port 1

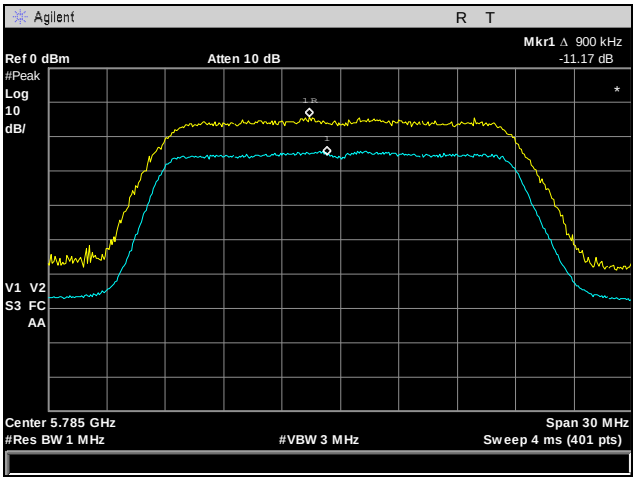


Plot 96. Peak Excursion Ratio, High Channel, 802.11n 20 MHz, Port 1

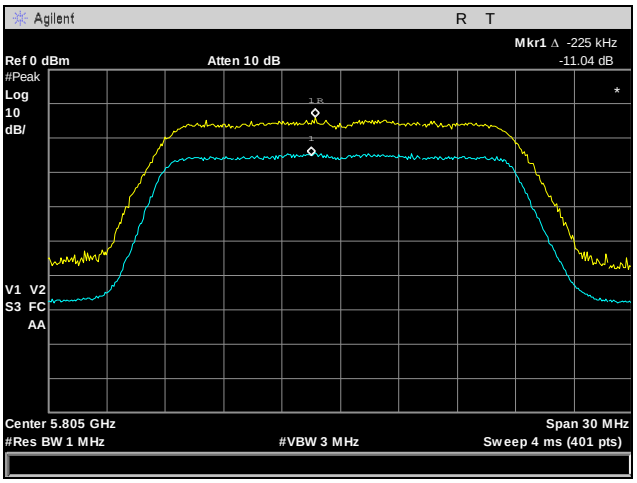
Peak Excursion Ratio, 802.11n 20 MHz, Port 2



Plot 97. Peak Excursion Ratio, Low Channel, 802.11n 20 MHz, Port 2

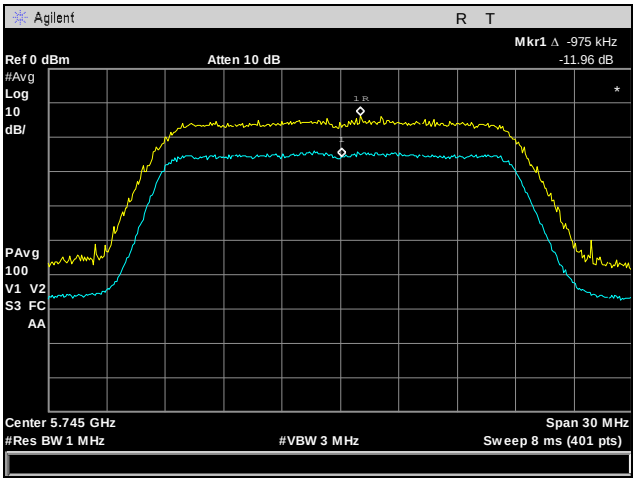


Plot 98. Peak Excursion Ratio, Mid Channel, 802.11n 20 MHz, Port 2

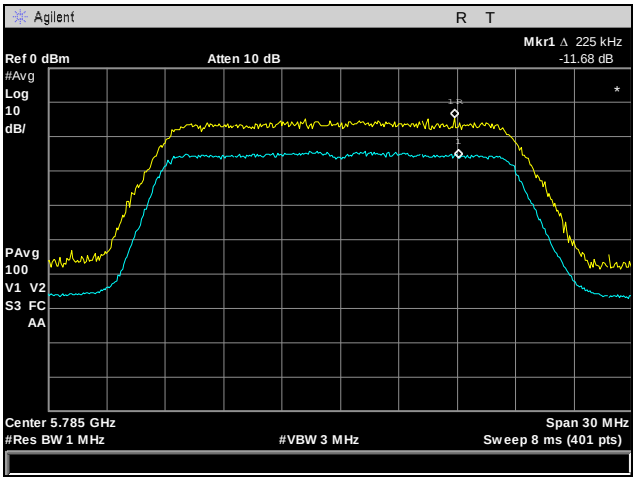


Plot 99. Peak Excursion Ratio, High Channel, 802.11n 20 MHz, Port 2

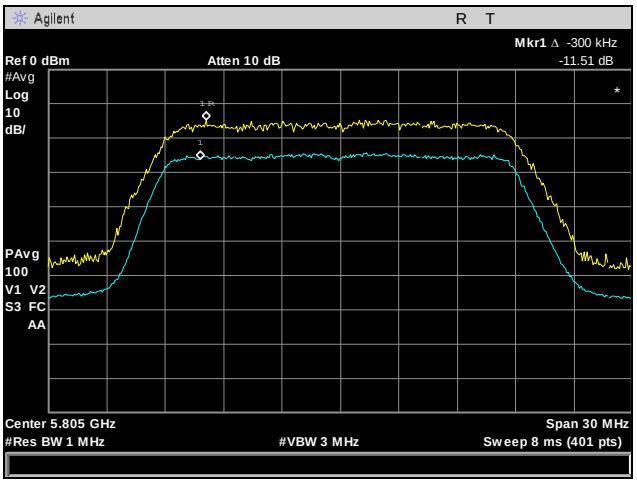
Peak Excursion Ratio, 802.11n 20 MHz, Port 3



Plot 100. Peak Excursion Ratio, Low Channel, 802.11n 20 MHz, Port 3

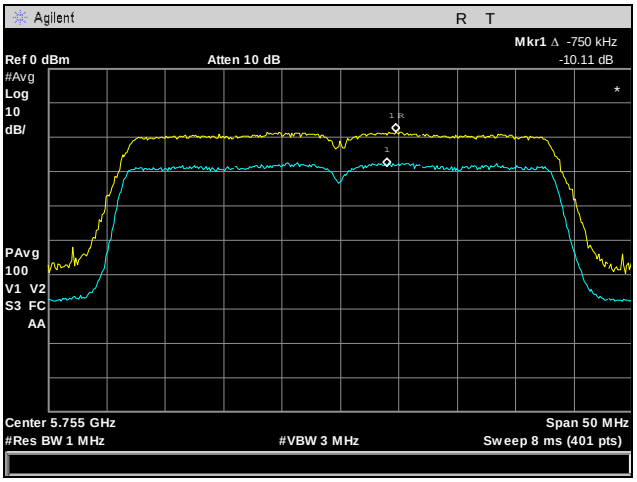


Plot 101. Peak Excursion Ratio, Mid Channel, 802.11n 20 MHz, Port 3

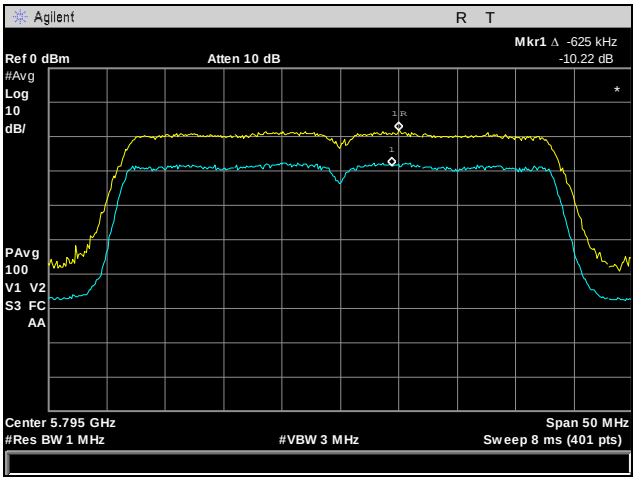


Plot 102. Peak Excursion Ratio, High Channel, 802.11n 20 MHz, Port 3

Peak Excursion Ratio, 802.11n 40 MHz, Port 1

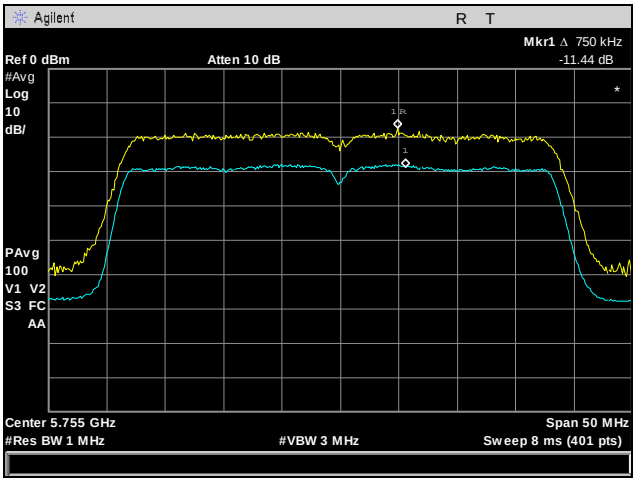


Plot 103. Peak Excursion Ratio, Low Channel, 802.11n 40 MHz, Port 1

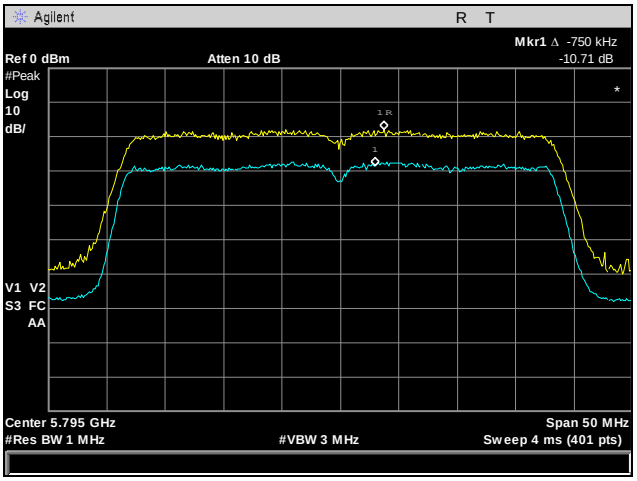


Plot 104. Peak Excursion Ratio, High Channel, 802.11n 40 MHz, Port 1

Peak Excursion Ratio, 802.11n 40 MHz, Port 2

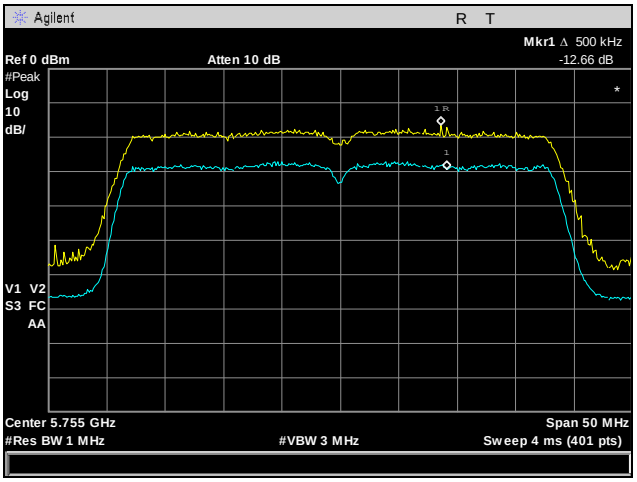


Plot 105. Peak Excursion Ratio, Low Channel, 802.11n 40 MHz, Port 1

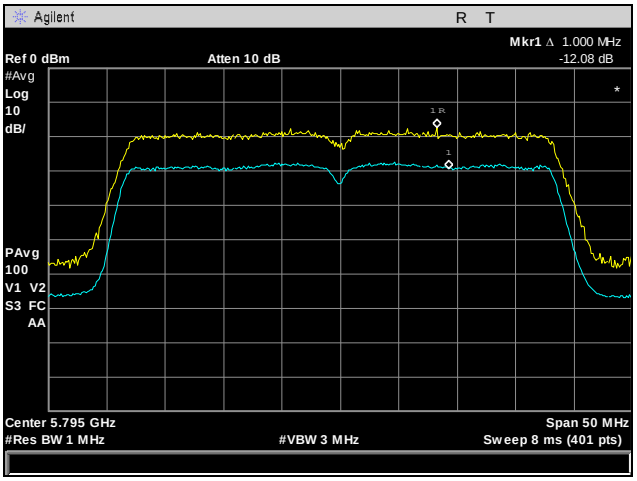


Plot 106. Peak Excursion Ratio, High Channel, 802.11n 40 MHz, Port 1

Peak Excursion Ratio, 802.11n 40 MHz, Port 3

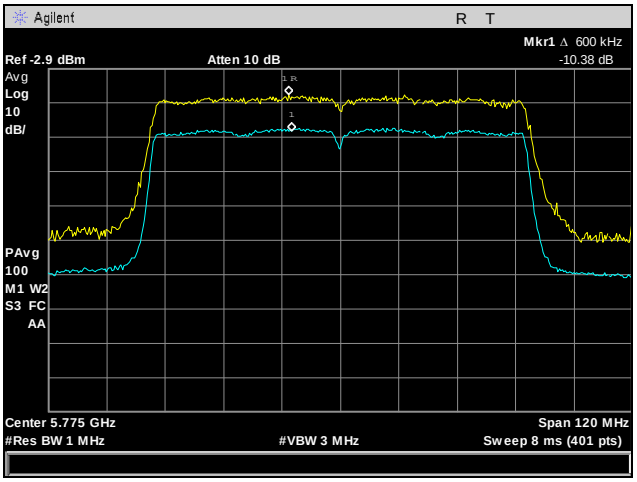


Plot 107. Peak Excursion Ratio, Low Channel, 802.11n 40 MHz, Port 3

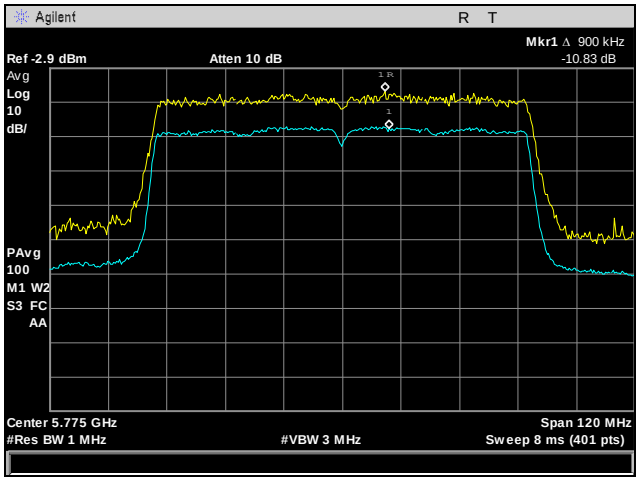


Plot 108. Peak Excursion Ratio, High Channel, 802.11n 40 MHz, Port 3

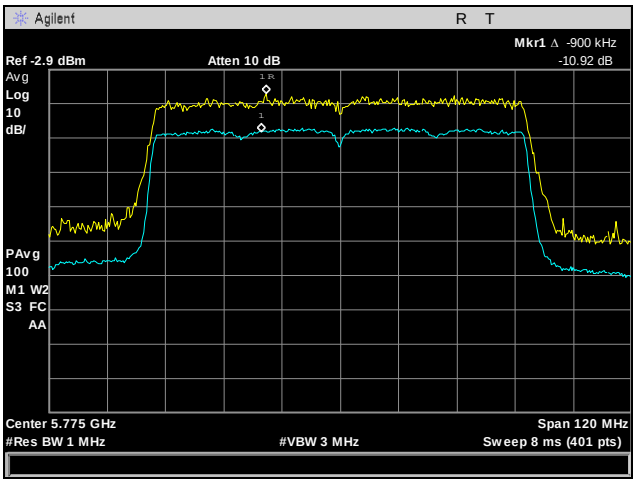
Peak Excursion Ratio, 802.11n 80 MHz



Plot 109. Peak Excursion Ratio, 802.11n 80 MHz, Port 1



Plot 110. Peak Excursion Ratio, 802.11n 80 MHz, Port 2



Plot 111. Peak Excursion Ratio, 802.11n 80 MHz, Port 3

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(4), (6), (7) Undesirable Emissions

Test Requirements: **§ 15.407(b)(4), (6), (7)**; **§15.205:** Emissions outside the frequency band.

§ 15.407(b)(4): For transmitters operating in the 5.725–5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of –17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of –27 dBm/MHz.

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

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

Test Procedure: The transmitter was placed on an 80cm non-metallic table inside in a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast height to determine worst case orientation for maximum emissions. A preamp was used in the range from 7-18GHz to improve noise floor. Plots were corrected for cable loss, antenna, and preamp gain.

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

For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Only noise floor was observed above 18 GHz.

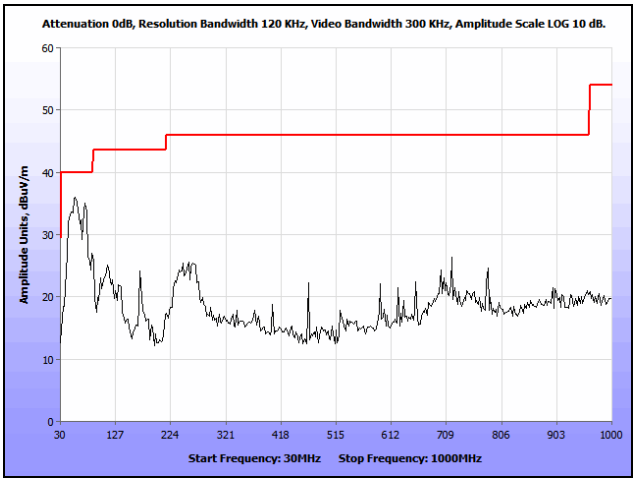
For Radiated Band Edge:
The equation, **EIRP= E + 20 log D – 104.8** was used to convert an EIRP limit to a field strength limit.
E = field strength (dBUv/m)
D = Reference measurement distance

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

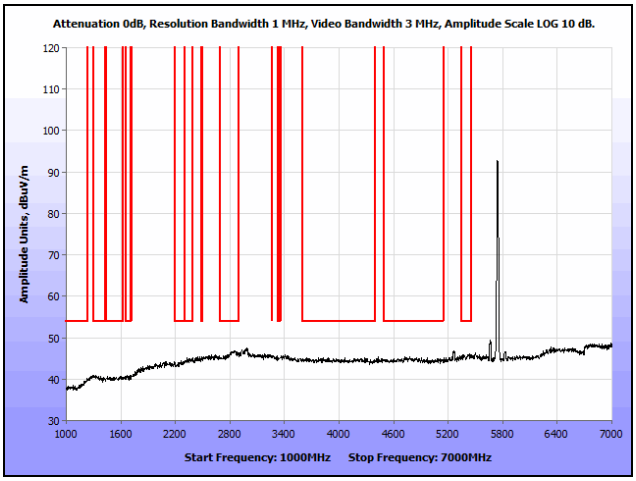
Test Engineer(s): Jonathan Chao

Test Date(s): 01/18/13 – 01/21/13

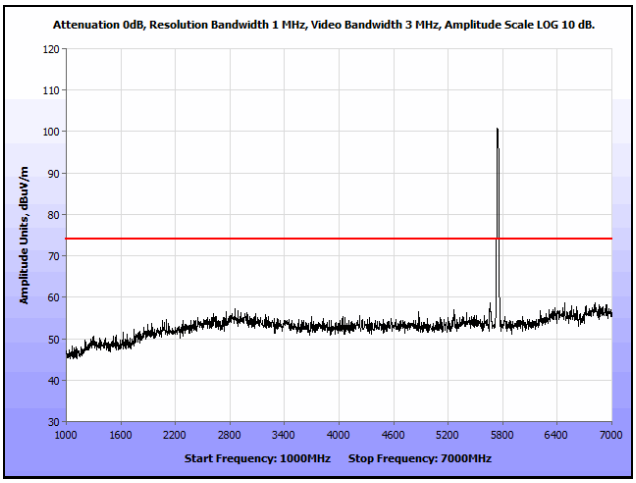
Radiated Spurious Emissions, 802.11a, Internal Antenna



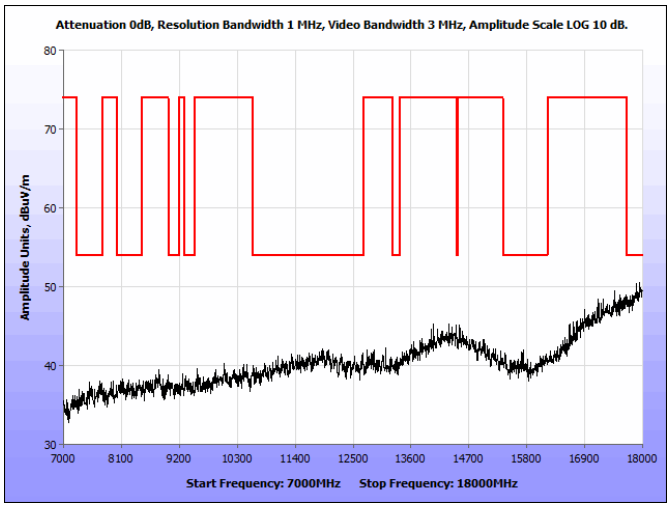
Plot 112. Radiated Spurious Emissions, 802.11a, Low Channel, 30 MHz – 1 GHz, Internal



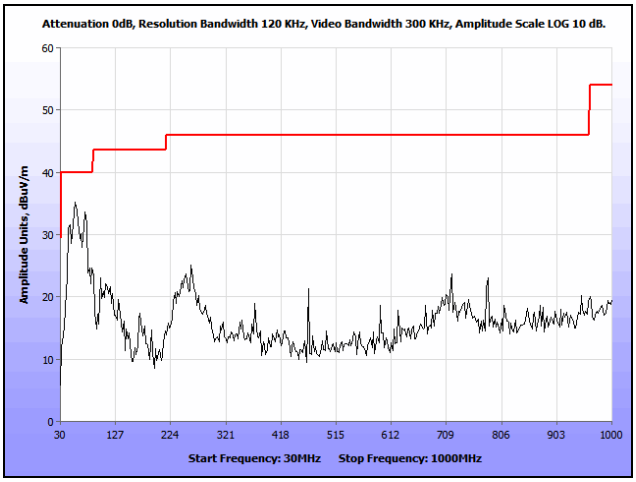
Plot 113. Radiated Spurious Emissions, 802.11a, Low Channel, 1 GHz – 7 GHz, Avg., Internal



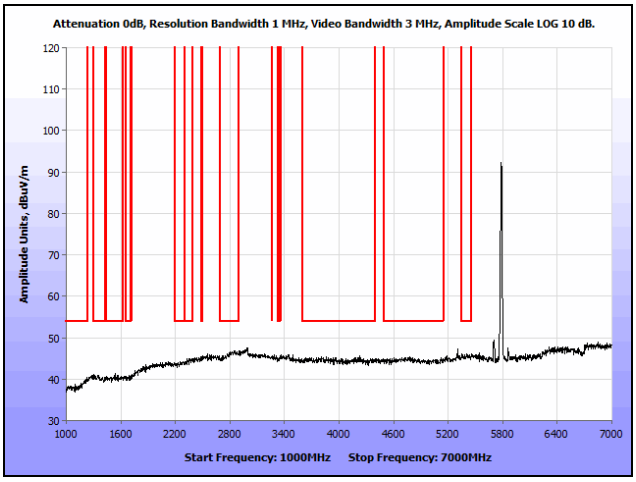
Plot 114. Radiated Spurious Emissions, 802.11a, Low Channel, 1 GHz – 7 GHz, Peak, Internal



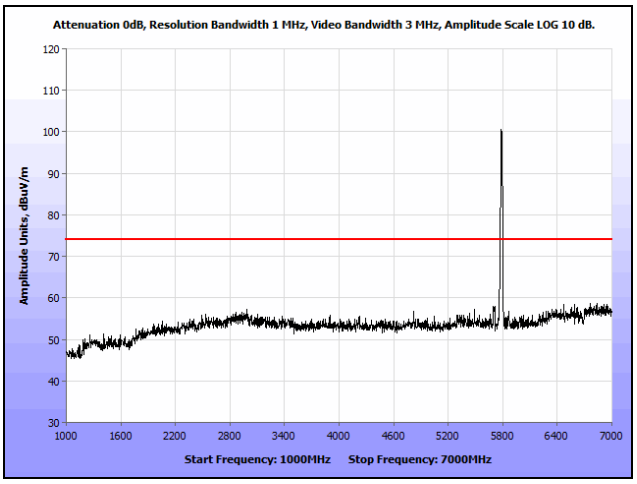
Plot 115. Radiated Spurious Emissions, 802.11a, Low Channel, 7 GHz – 18 GHz, Peak, Internal



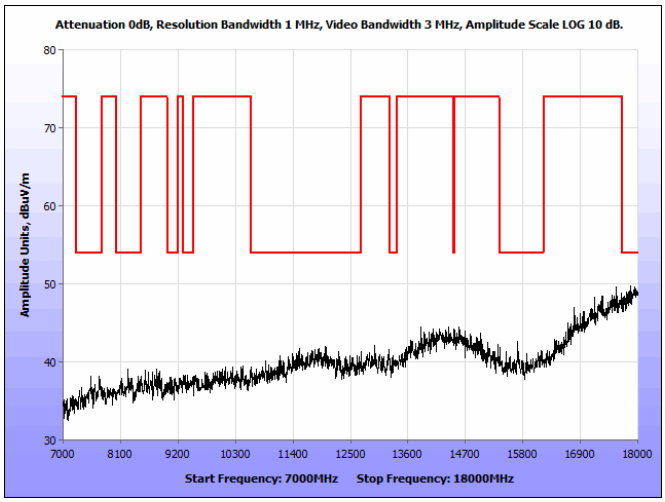
Plot 116. Radiated Spurious Emissions, 802.11a, Mid Channel, 30 MHz – 1 GHz, Internal



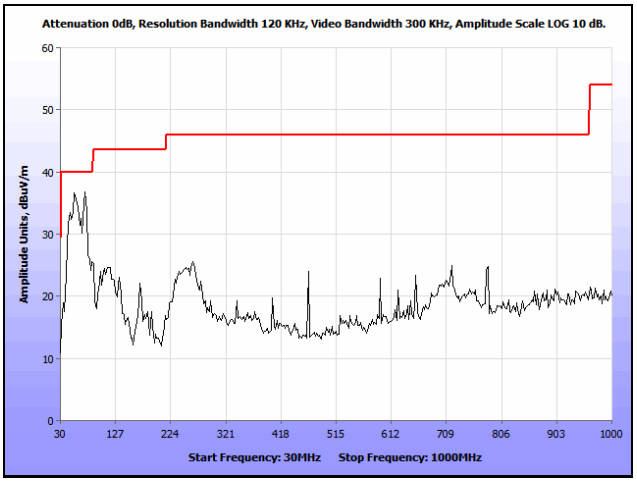
Plot 117. Radiated Spurious Emissions, 802.11a, Mid Channel, 1 GHz – 7 GHz, Avg., Internal



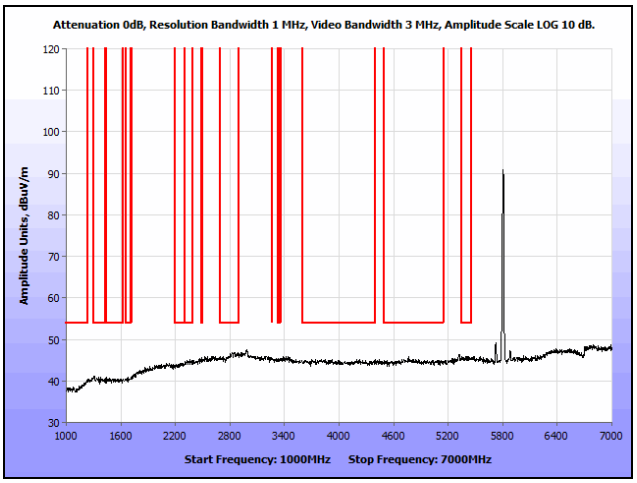
Plot 118. Radiated Spurious Emissions, 802.11a, Mid Channel, 1 GHz – 7 GHz, Peak, Internal



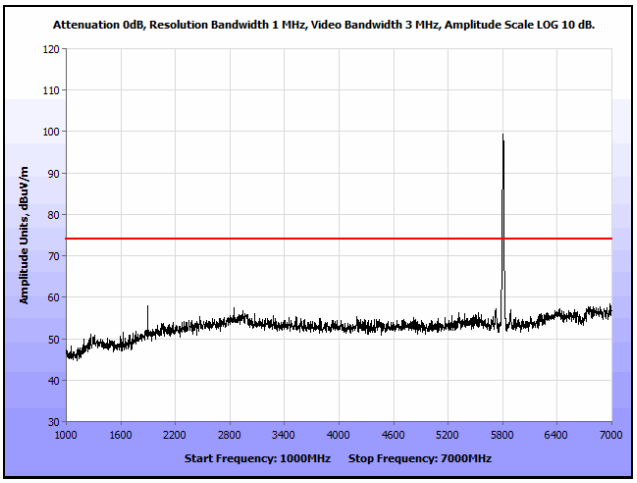
Plot 119. Radiated Spurious Emissions, 802.11a, Mid Channel, 7 GHz – 18 GHz, Peak, Internal



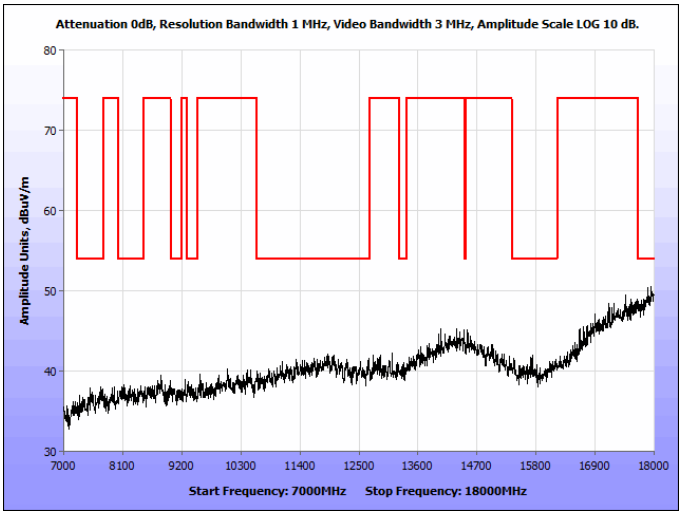
Plot 120. Radiated Spurious Emissions, 802.11a, High Channel, 30 MHz – 1 GHz, Internal



Plot 121. Radiated Spurious Emissions, 802.11a, High Channel, 1 GHz – 7 GHz, Avg., Internal

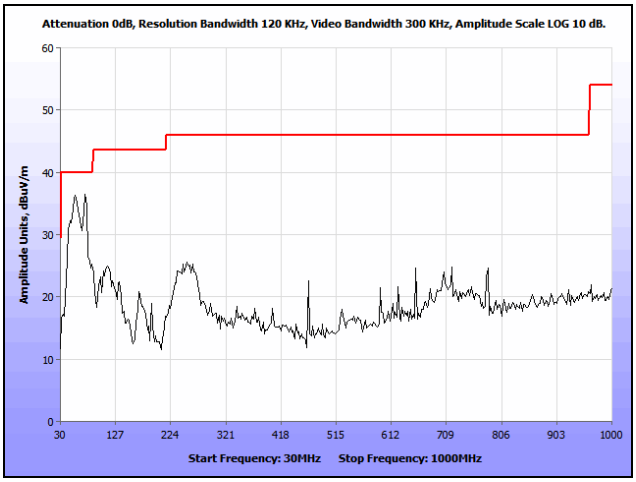


Plot 122. Radiated Spurious Emissions, 802.11a, High Channel, 1 GHz – 7 GHz, Peak, Internal

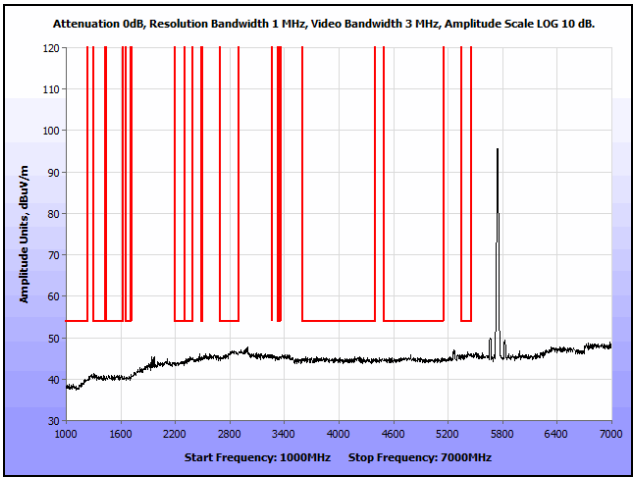


Plot 123. Radiated Spurious Emissions, 802.11a, High Channel, 7 GHz – 18 GHz, Peak, Internal

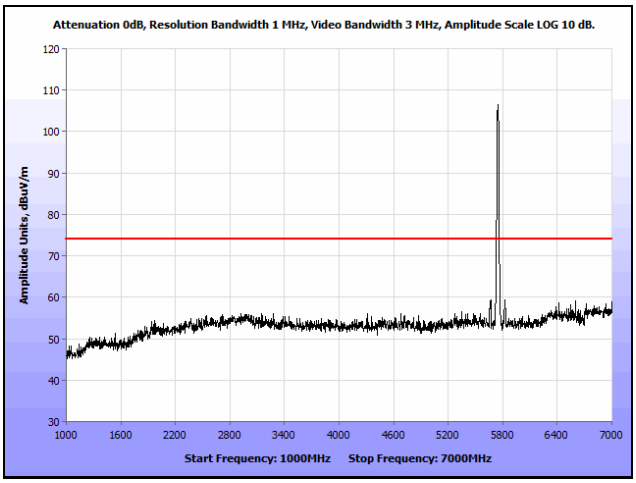
Radiated Spurious Emissions, 802.11n 20 MHz, Internal Antenna



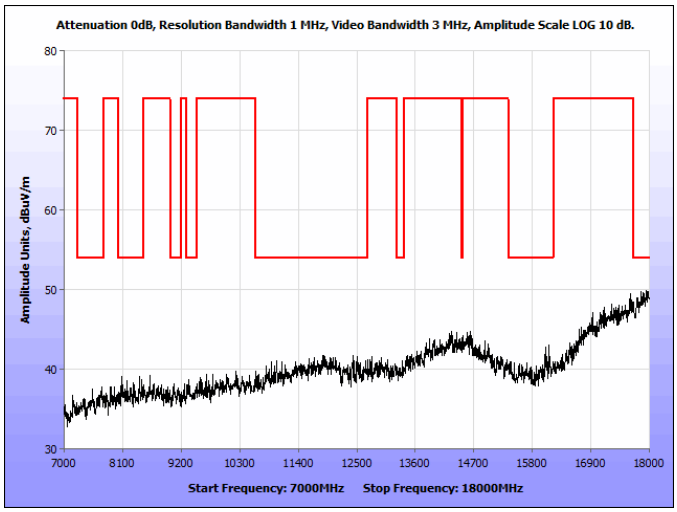
Plot 124. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, Internal



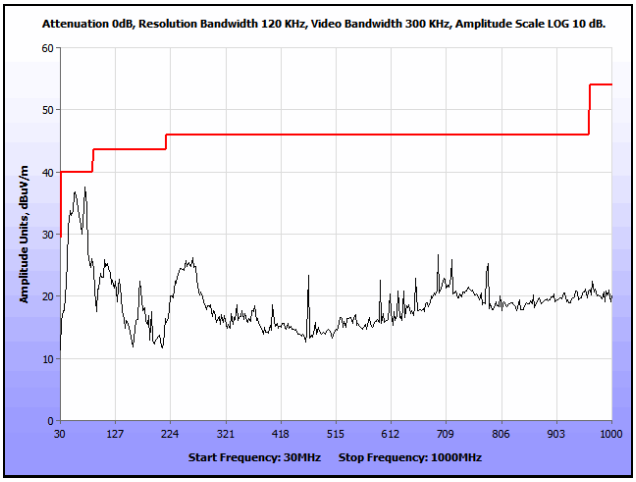
Plot 125. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, Avg., Internal



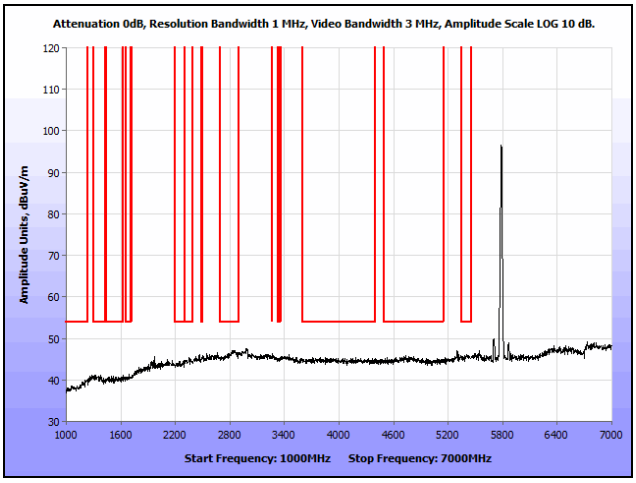
Plot 126. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Internal



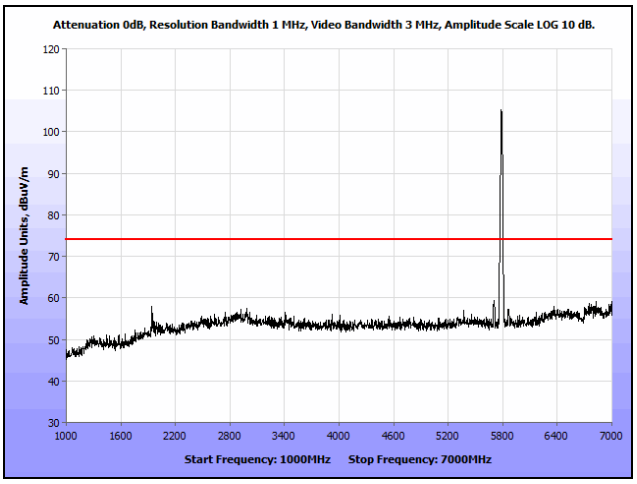
Plot 127. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, Peak , Internal



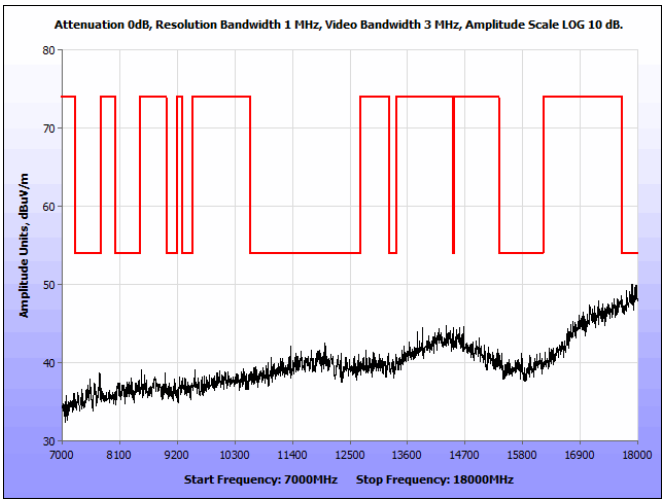
Plot 128. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, Internal



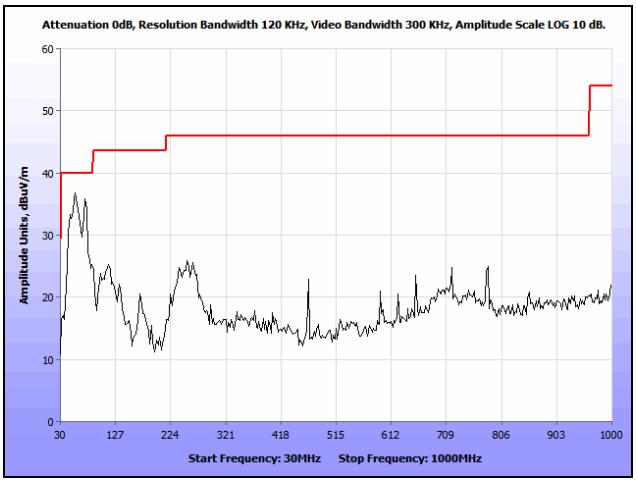
Plot 129. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, Avg., Internal



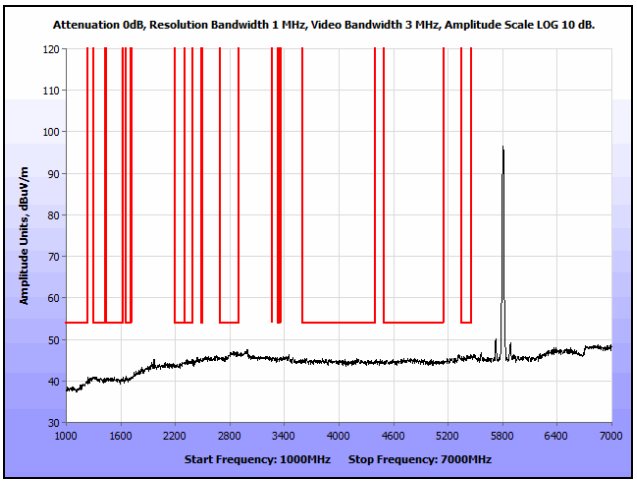
Plot 130. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Internal



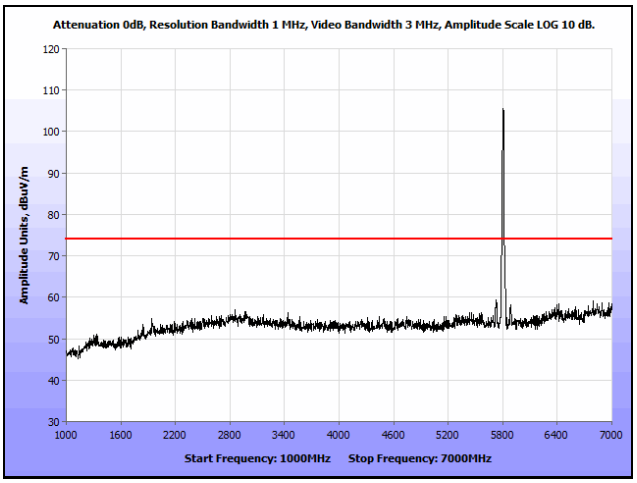
Plot 131. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, Peak, Internal



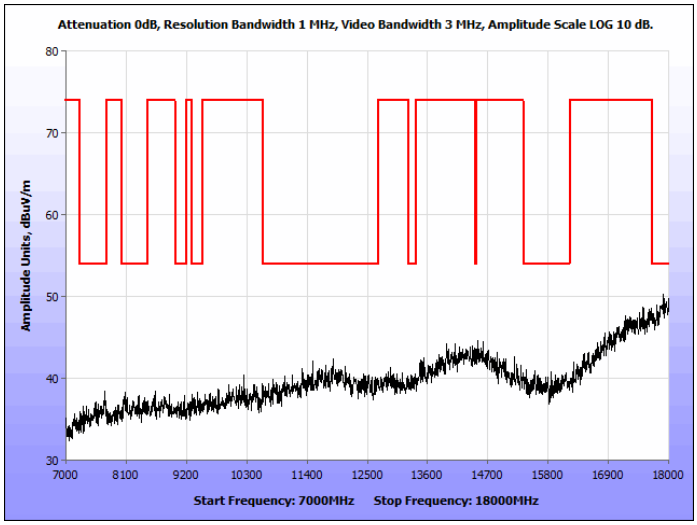
Plot 132. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, Internal



Plot 133. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, Avg., Internal

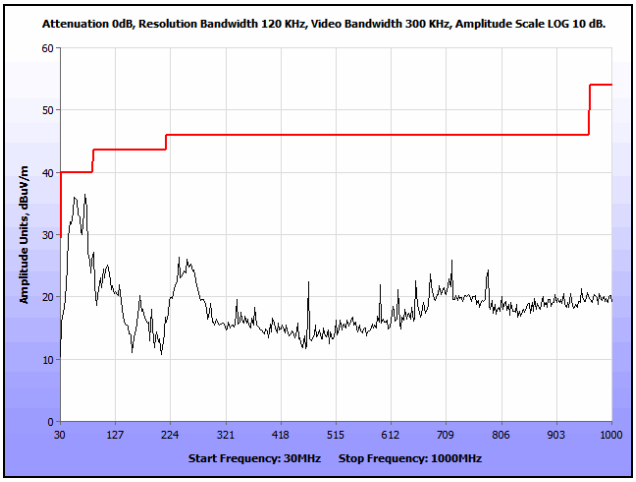


Plot 134. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Internal

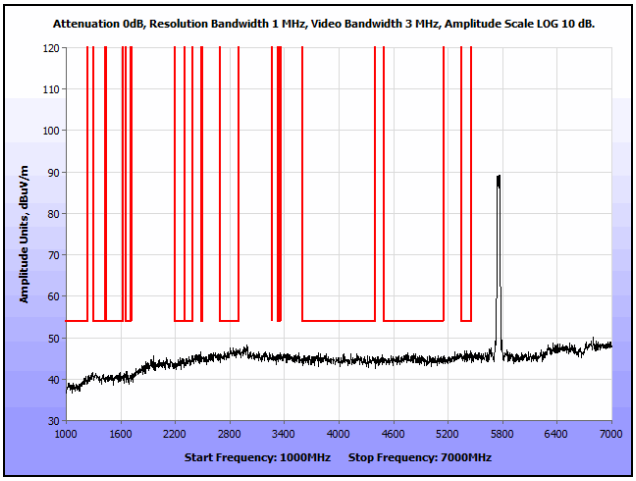


Plot 135. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, Peak, Internal

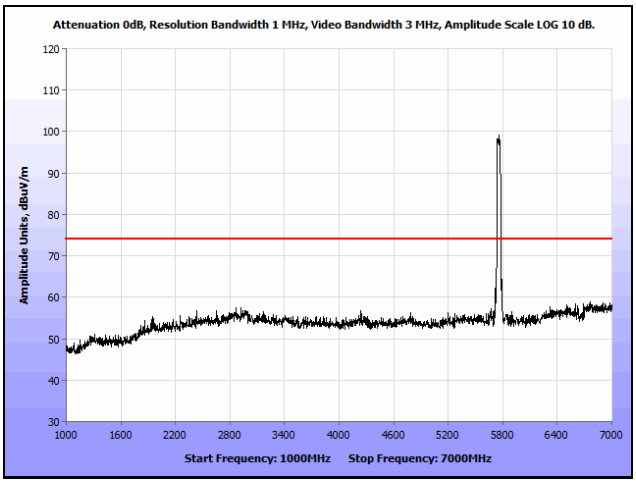
Radiated Spurious Emissions, 802.11n 40 MHz, Internal Antenna



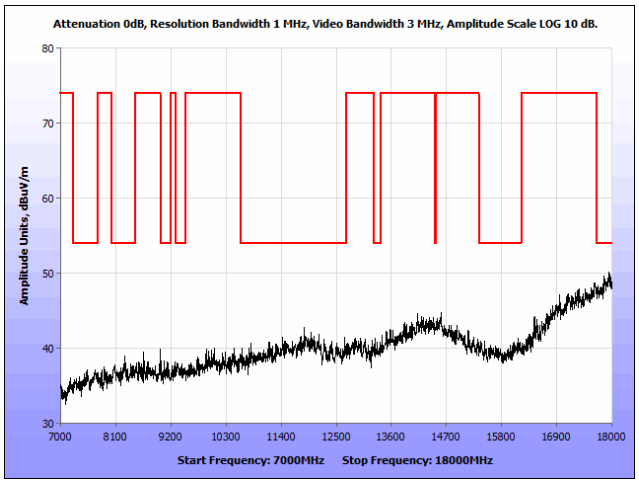
Plot 136. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, Internal



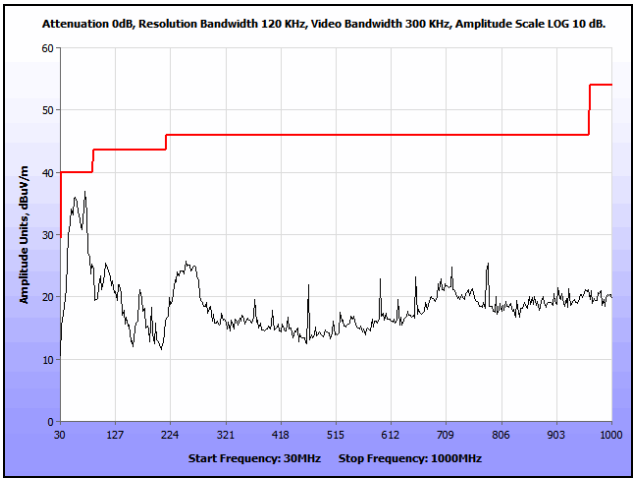
Plot 137. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, Avg., Internal



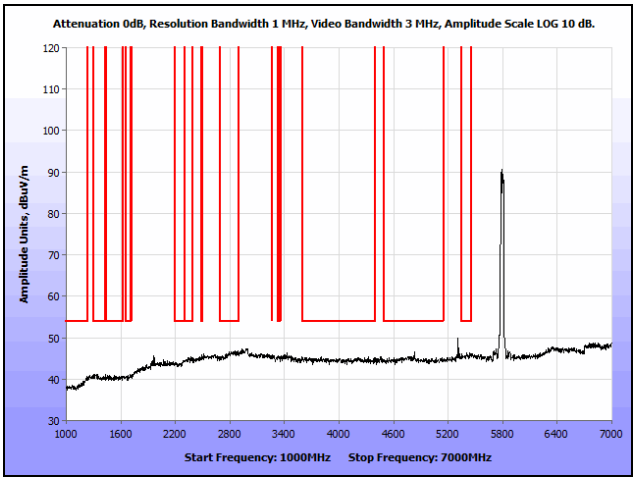
Plot 138. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Internal



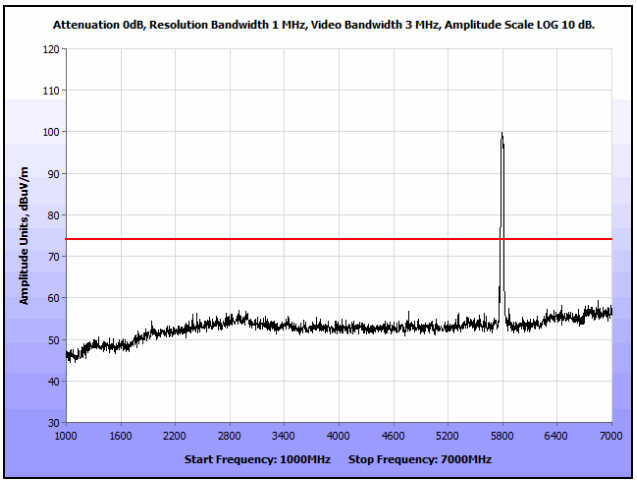
Plot 139. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, Peak, Internal



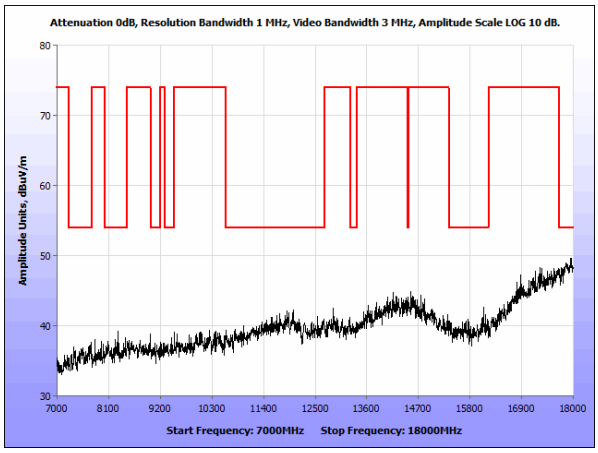
Plot 140. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, Internal



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

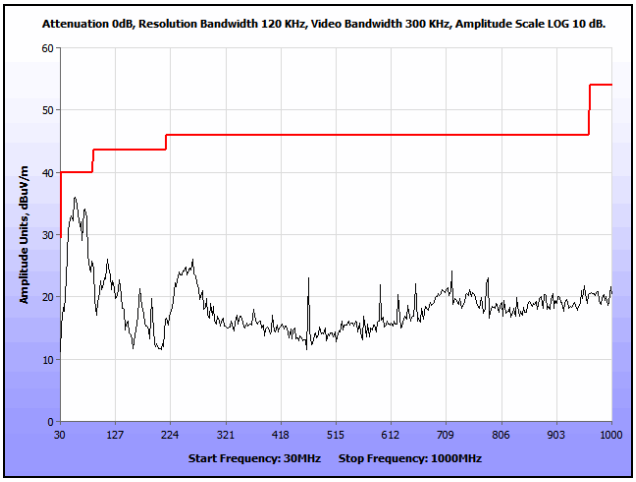


Plot 142. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, Internal

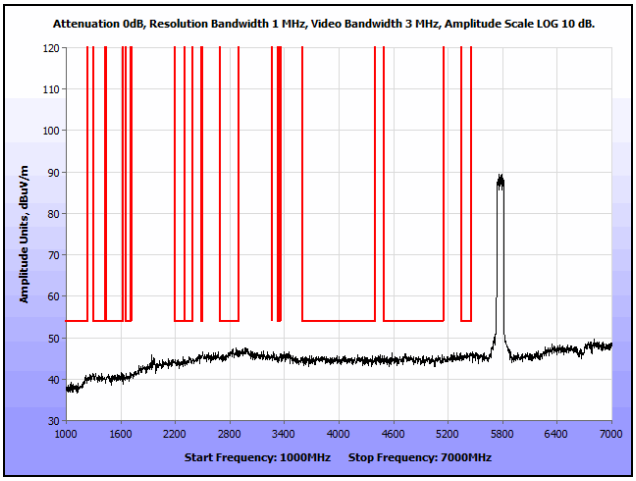


Plot 143. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, Peak, Internal

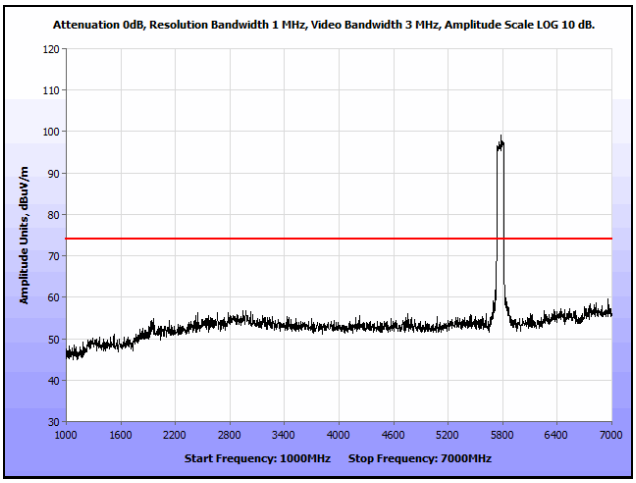
Radiated Spurious Emissions, 802.11n 80 MHz, Internal Antenna



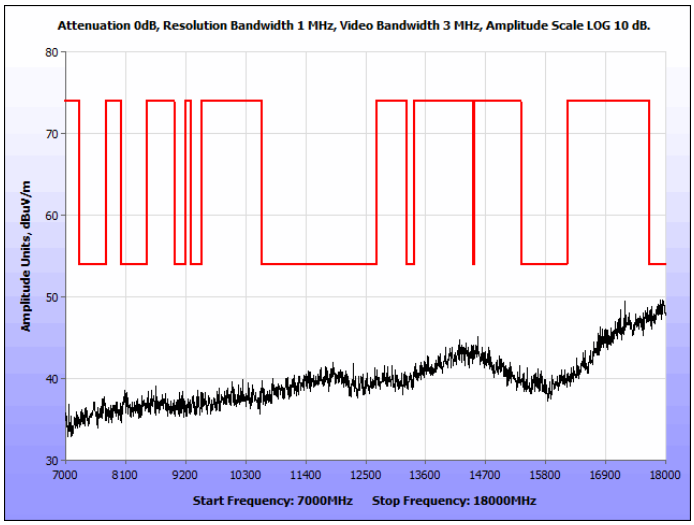
Plot 144. Radiated Spurious Emissions, 802.11n 80 MHz, 30 MHz – 1 GHz, Internal



Plot 145. Radiated Spurious Emissions, 802.11n 80 MHz, 1 GHz – 7 GHz, Avg., Internal

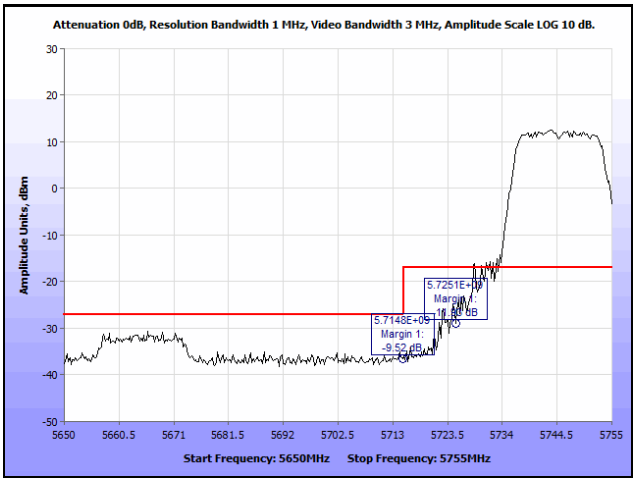


Plot 146. Radiated Spurious Emissions, 802.11n 80 MHz, 1 GHz – 7 GHz, Peak, Internal

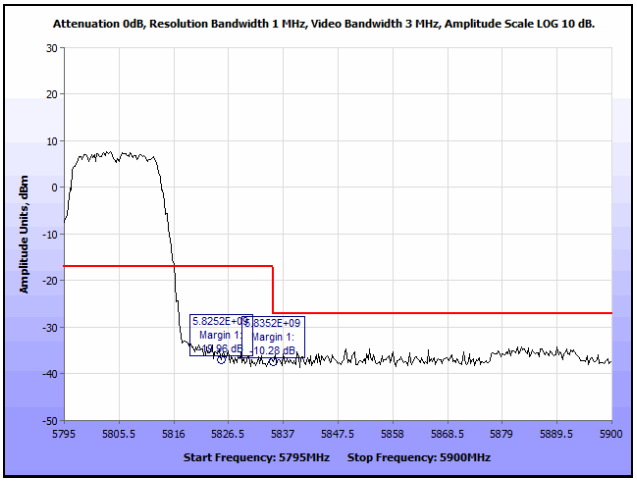


Plot 147. Radiated Spurious Emissions, 802.11n 80 MHz, 7 GHz – 18 GHz, Internal

EIRP, 802.11a, Internal Antenna

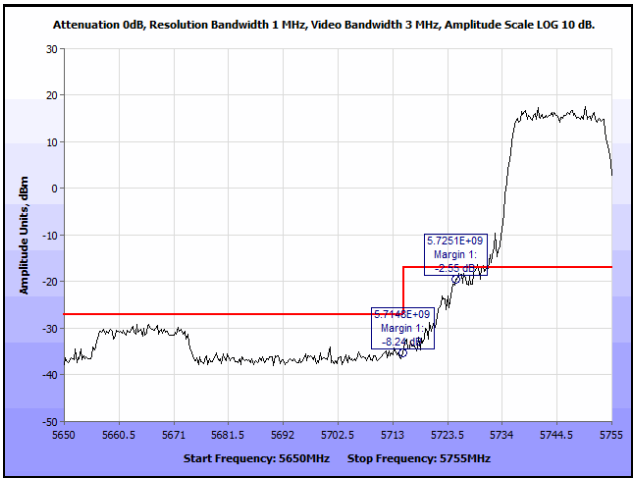


Plot 148. Radiated Band Edge, 802.11a, Low Channel, Internal Antenna (Band Edge @ 5715 & 5725 MHz)

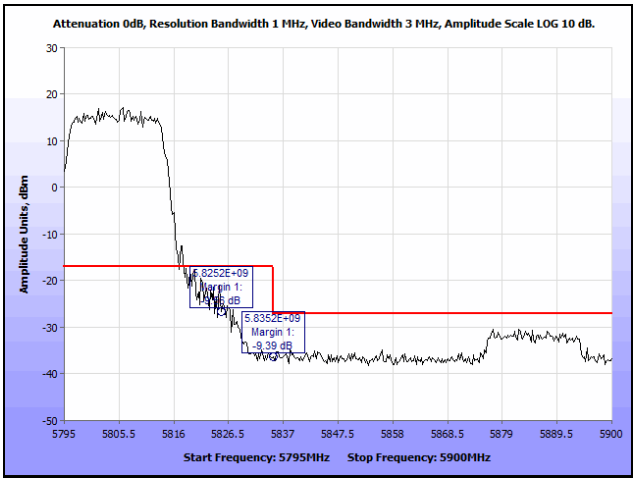


Plot 149. Radiated Band Edge, 802.11a, High Channel, Internal Antenna (Band Edge @ 5825 & 5835 MHz)

EIRP, 802.11n 20 MHz, Internal Antenna

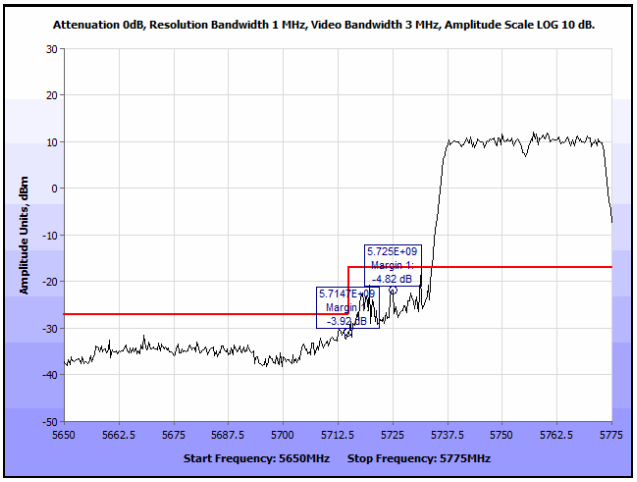


Plot 150. Radiated Band Edge, 802.11n 20 MHz, Low Channel, Internal Antenna (Band Edge @ 5715 & 5725 MHz)

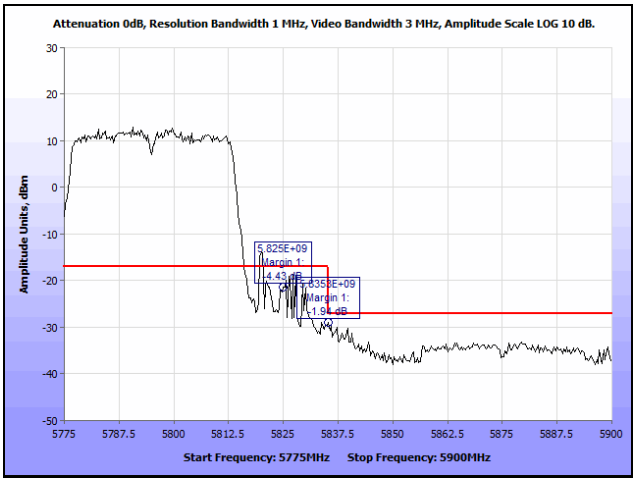


Plot 151. Radiated Band Edge, 802.11n 20 MHz, High Channel, Internal Antenna (Band Edge @ 5825 & 5835 MHz)

EIRP, 802.11n 40 MHz, Internal Antenna

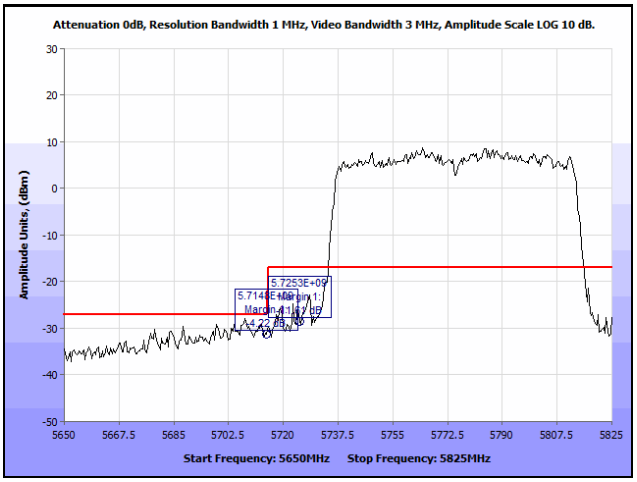


Plot 152. Radiated Band Edge, 802.11n 40 MHz, Low Channel, Internal Antenna (Band Edge @ 5715 & 5725 MHz)

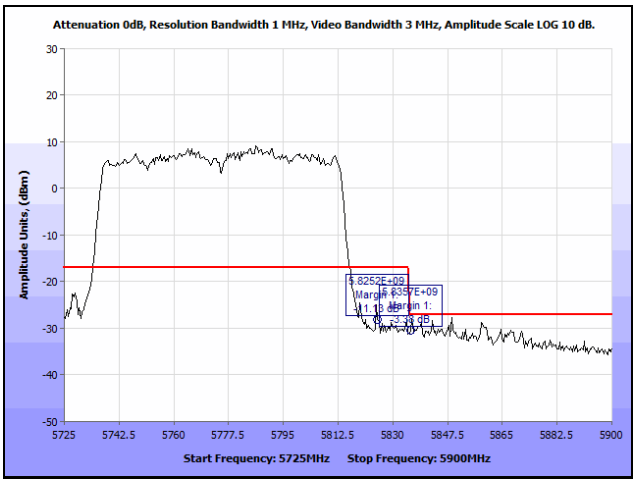


Plot 153. Radiated Band Edge, 802.11n 40 MHz, High Channel, Internal Antenna (Band Edge @ 5825 & 5835 MHz)

EIRP, 802.11n 80 MHz, Internal Antenna



Plot 154. Radiated Band Edge, 802.11n 80 MHz, Internal Antenna (Band Edge @ 5725 & 5715 MHz)



Plot 155. Radiated Band Edge, 802.11n 80 MHz, Internal Antenna (Band Edge @ 5825 & 5835 MHz)

Electromagnetic Compatibility Criteria for Intentional Radiators

Co-location

Test Requirements: Devices designed to transmit simultaneously in multiple channels in single or multiple frequency bands or those using new "carrier aggregation techniques", excluding cellular base stations or where specific guidance has been proved.

All devices that are capable of transmitting simultaneously in more than one Part-15 band between 5 and 6 GHz (*i.e.,* in two or more of the four U-NII bands or in the 5.8 GHz 15.247 band and at least one U-NII band) are subject to Permit But Ask provisions. This includes devices marketed as IEEE Std 802.11acor "pre-standard" IEEE Std 802.11ac.

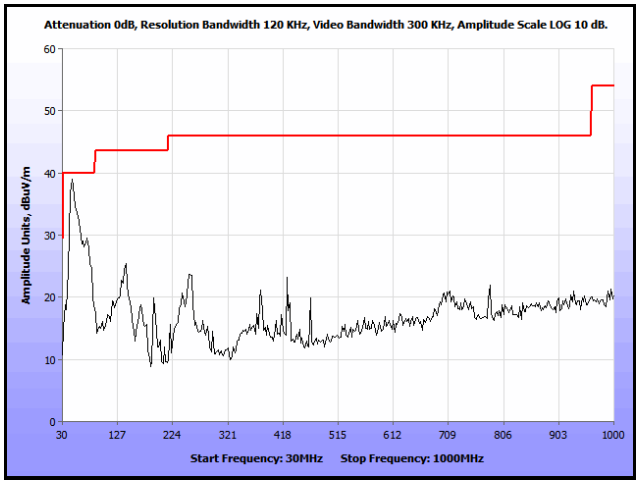
Test Procedure: The transmitter was placed on an 80cm wooden table inside in a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast height to determine worst case orientation for maximum emissions. A preamp was used in the range from 7-18GHz to improve noise floor. Plots were corrected for cable loss, antenna, and preamp gain.

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

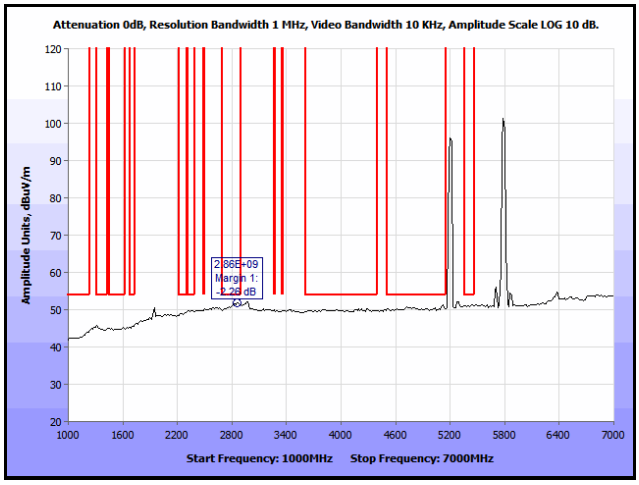
For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Only noise floor was seen above 18 GHz.

The EUT uses 2 radios that are co-located. The EUT was set to transmit on both radios using the following matrix below.

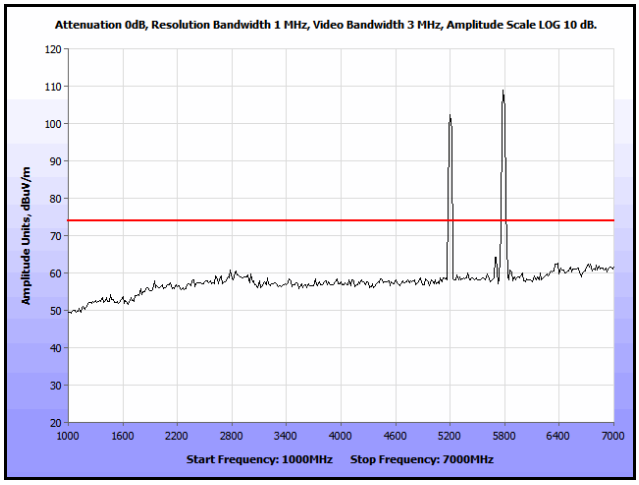
Radio 1	Radio 2
802.11n 20MHz	802.11n 20MHz
5200	5200
5300	5300
5580	5580
5785	5785



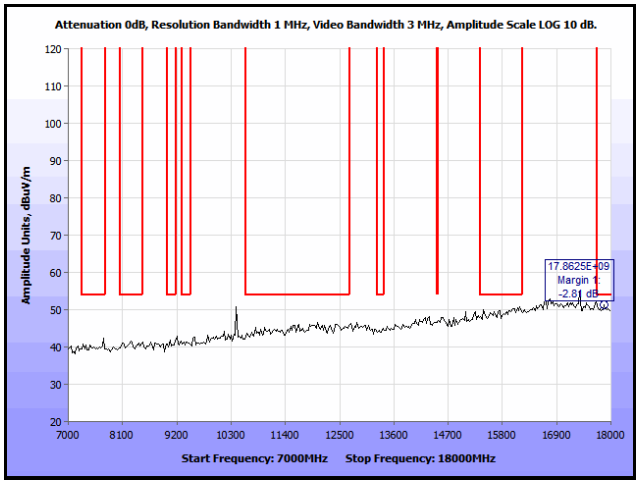
Plot 156. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5200 & 5785 MHz, 30 MHz – 1 GHz



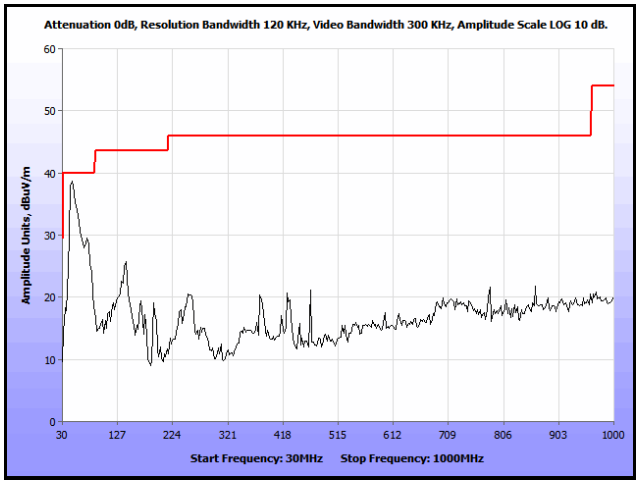
Plot 157. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5200 & 5785 MHz, 1 GHz – 7 GHz, Avg.



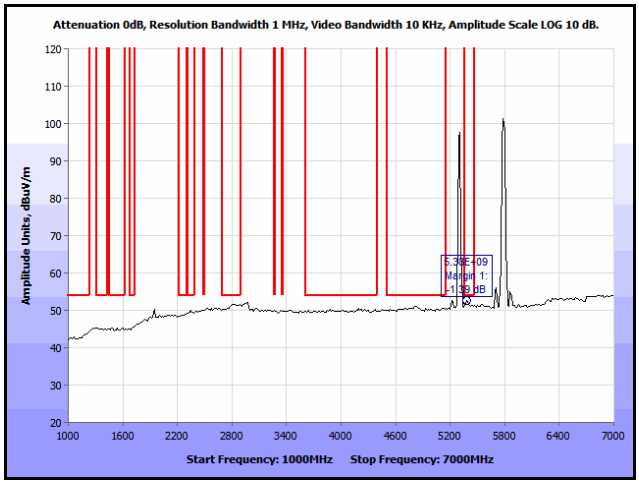
Plot 158. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5200 & 5785 MHz, 1 GHz – 7 GHz, Peak



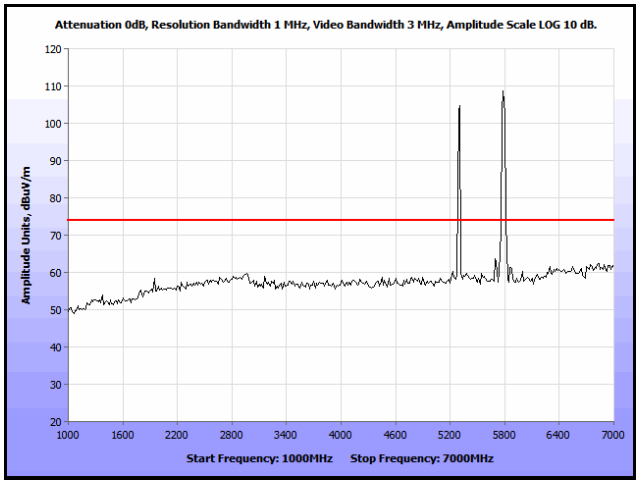
Plot 159. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5200 & 5785 MHz, 7 GHz – 18 GHz, Peak



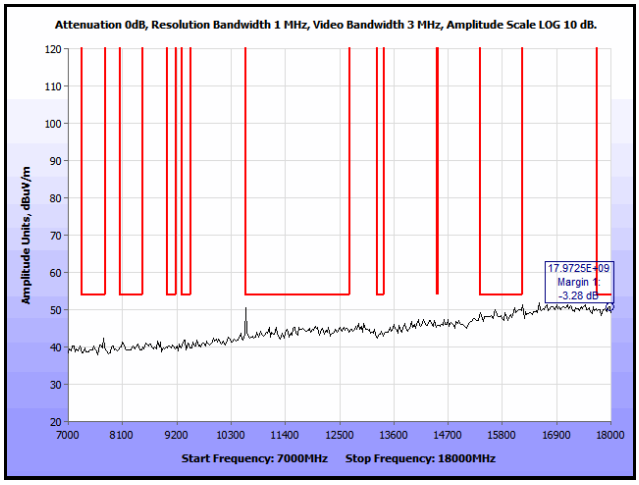
Plot 160. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5300 & 5785 MHz, 30 MHz – 1 GHz



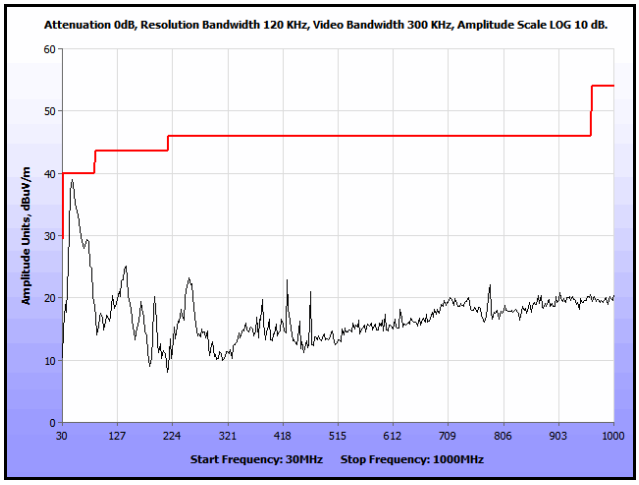
Plot 161. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5300 & 5785 MHz, 1 GHz – 7 GHz, Avg.



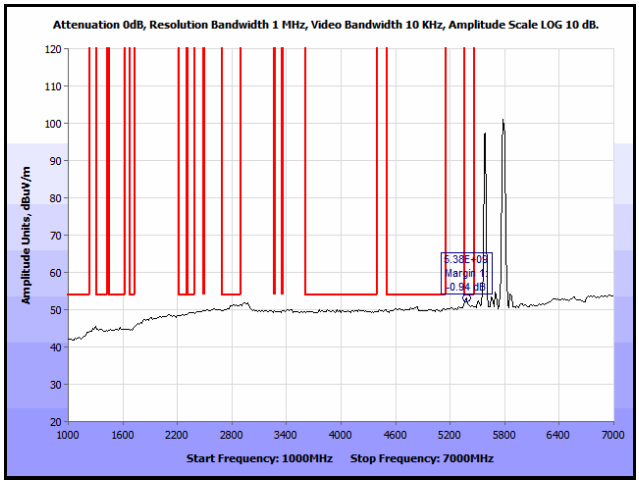
Plot 162. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5300 & 5785 MHz, 1 GHz – 7 GHz, Peak



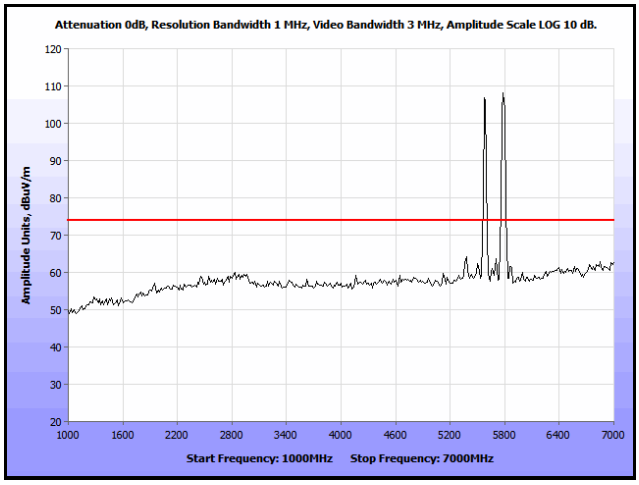
Plot 163. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5300 & 5785 MHz, 7 GHz – 18 GHz, Peak



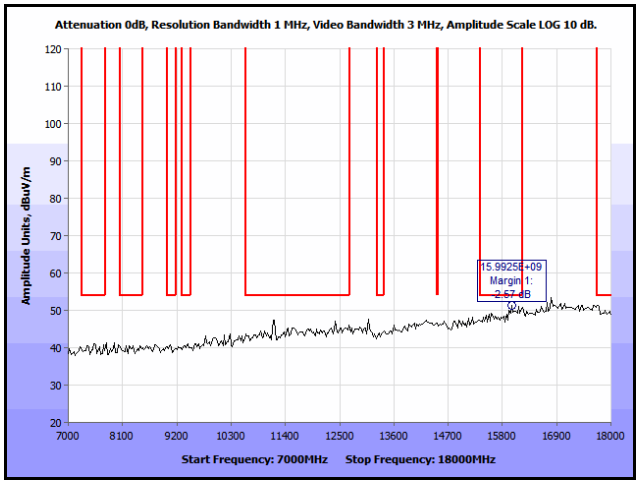
Plot 164. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5580 & 5785 MHz, 30 MHz – 1 GHz



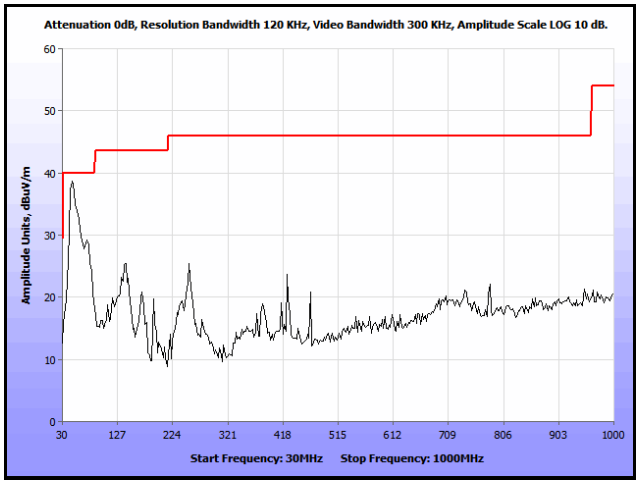
Plot 165. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5580 & 5785 MHz, 1 GHz – 7 GHz, Avg.



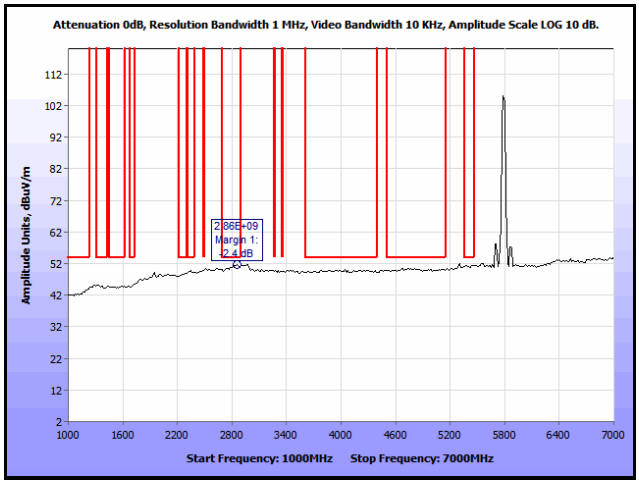
Plot 166. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5580 & 5785 MHz, 1 GHz – 7 GHz, Peak



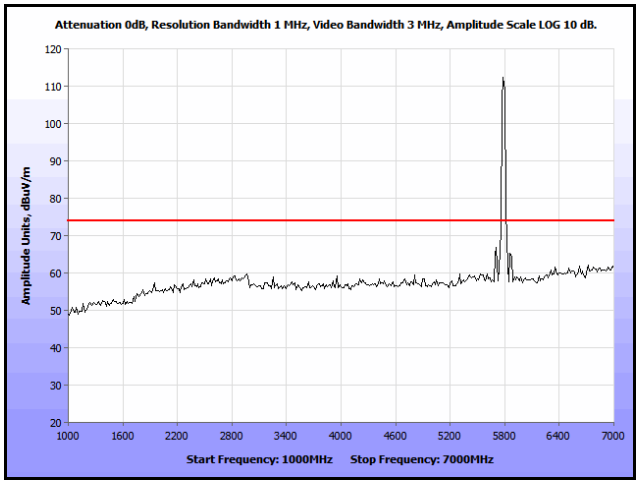
Plot 167. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5580 & 5785 MHz, 7 GHz – 18 GHz, Peak



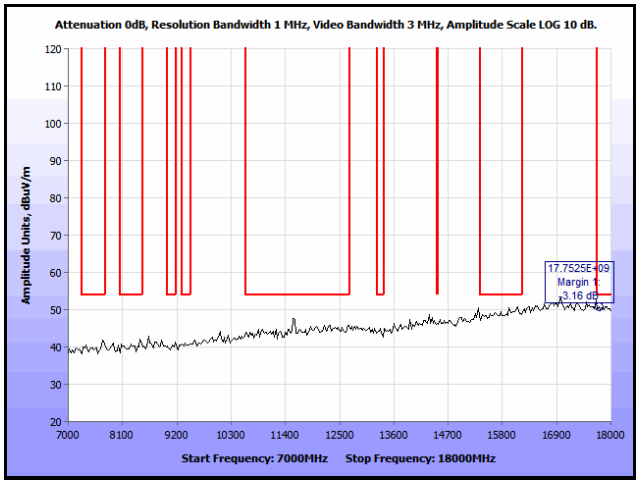
Plot 168. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5785 & 5785 MHz, 30 MHz – 1 GHz



Plot 169. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5785 & 5785 MHz, 1 GHz – 7 GHz, Avg.



Plot 170. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5785 & 5785 MHz, 1 GHz – 7 GHz, Peak



Plot 171. Co-location, Radiated Spurious Emissions, PIFA, 802.11n 20 MHz, 5785 & 5785 MHz, 7 GHz – 18 GHz, Peak

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

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

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

MPE Limit Calculation: EUT's operating frequencies @ 5745-5805 MHz; highest conducted power = 22.39 dBm (Sample) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

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

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

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (173.38mW)
G = Antenna Gain (4dBi Antenna x3) 8.77dBi (7.53 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S = (173.38 * 7.53)/(4 * 3.14 * 20^2) = 0.2599$ mW/cm^2

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

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

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

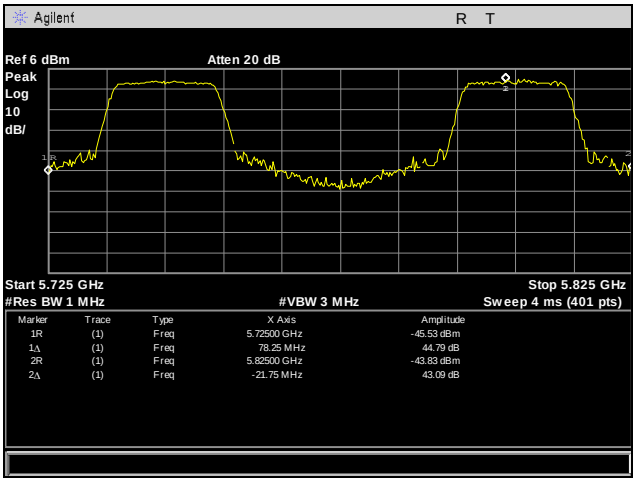
Test Procedure: The EUT was connected directly to a spectrum analyzer through a attenuator. The transmitter was set to low and high channels and the emissions were observed. The Low and High channels were transmitted and viewed from the 5150MHz and 5350MHz edge.

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

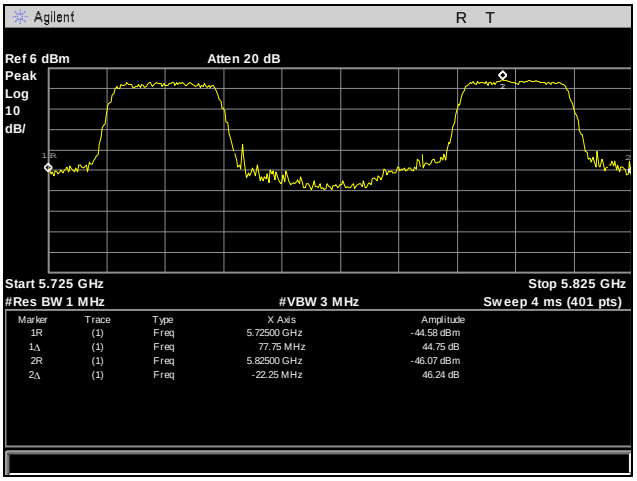
Test Engineer(s): Jonathan Chao

Test Date(s): 02/15/13

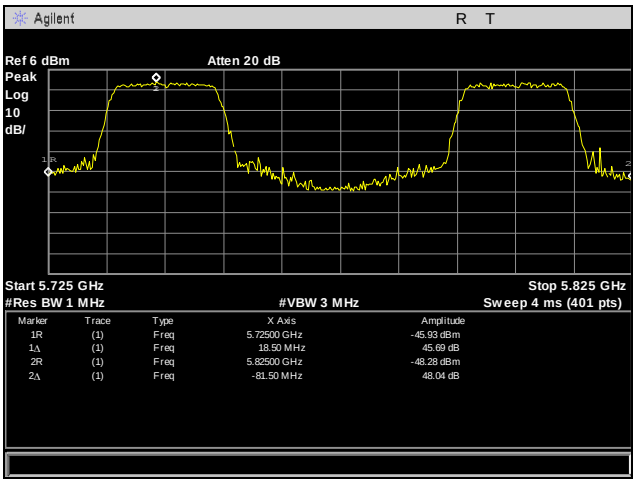
Frequency Stability



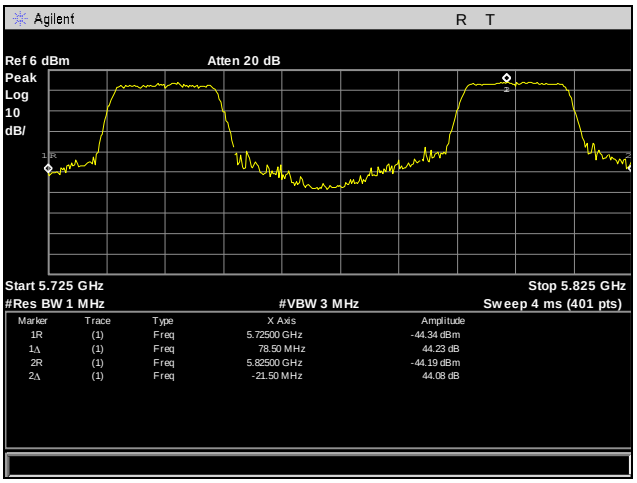
Plot 172. Frequency Stability, 5725 – 5825 MHz, -40°C, 120 V



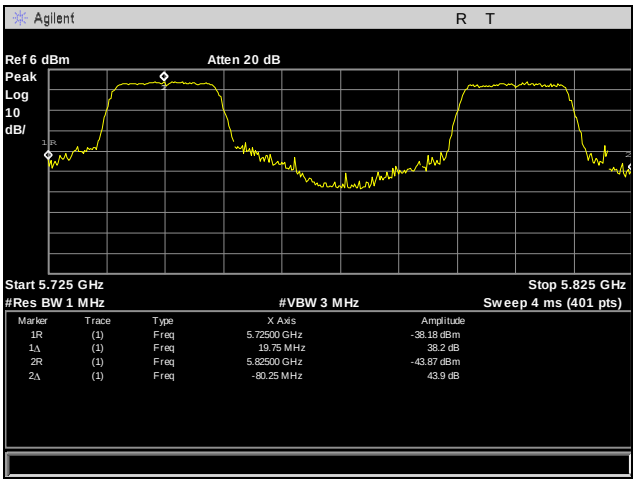
Plot 173. Frequency Stability, 5725 – 5825 MHz, -30°C, 120 V



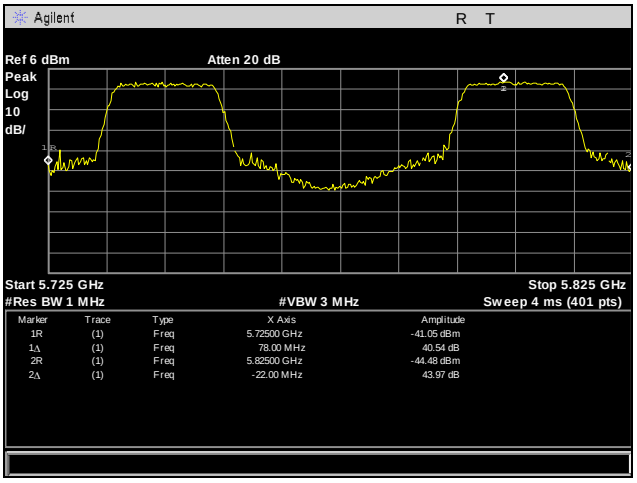
Plot 174. Frequency Stability, 5725 – 5825 MHz, -20°C, 120 V



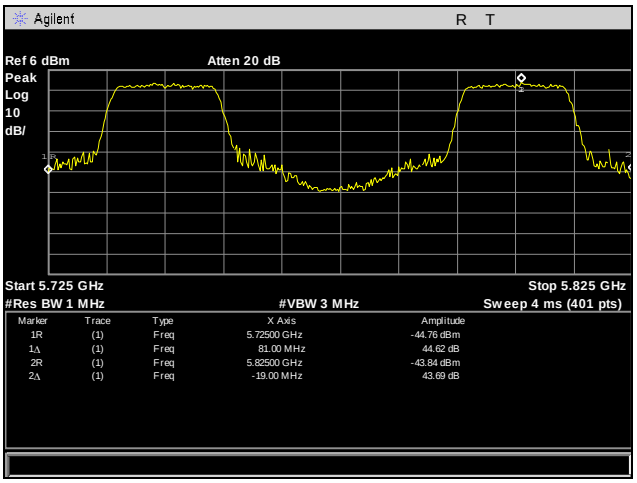
Plot 175. Frequency Stability, 5725 – 5825 MHz, -10°C, 120 V



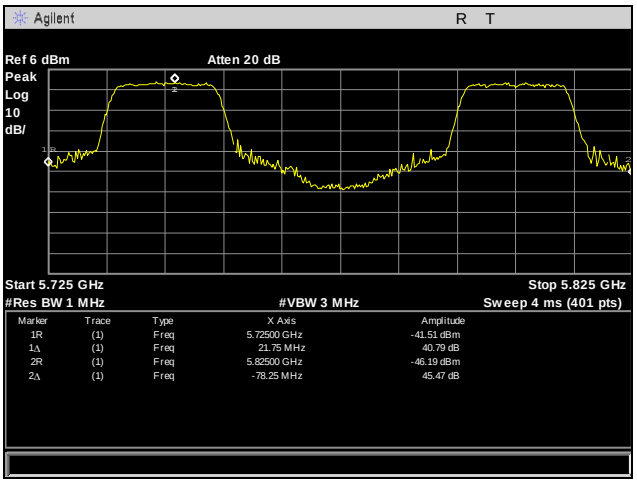
Plot 176. Frequency Stability, 5725 – 5825 MHz, 0°C, 120 V



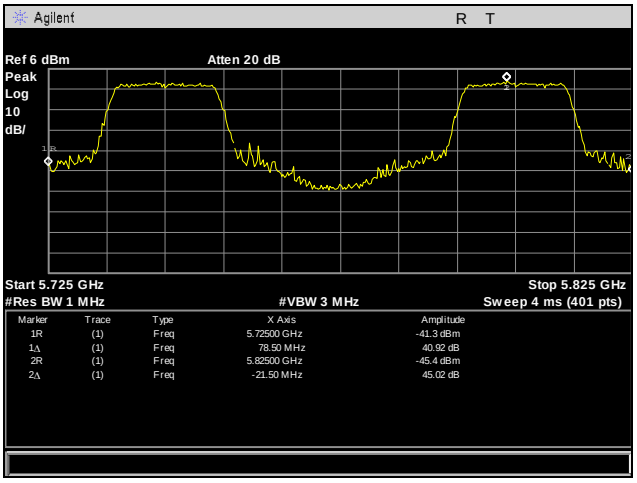
Plot 177. Frequency Stability, 5725 – 5825 MHz, 10°C, 120 V



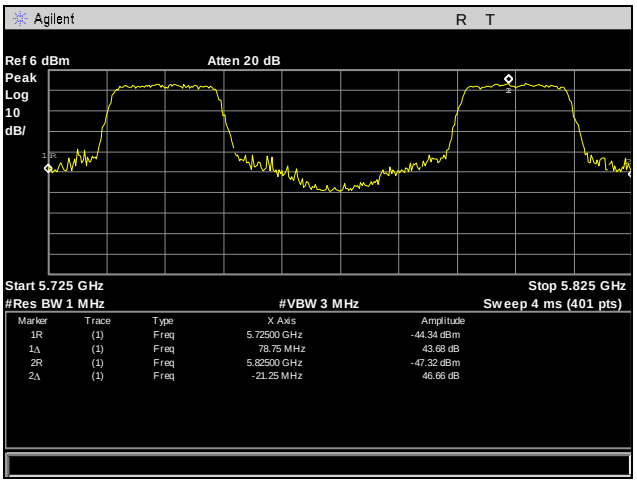
Plot 178. Frequency Stability, 5725 – 5825 MHz, 20°C, 108 V



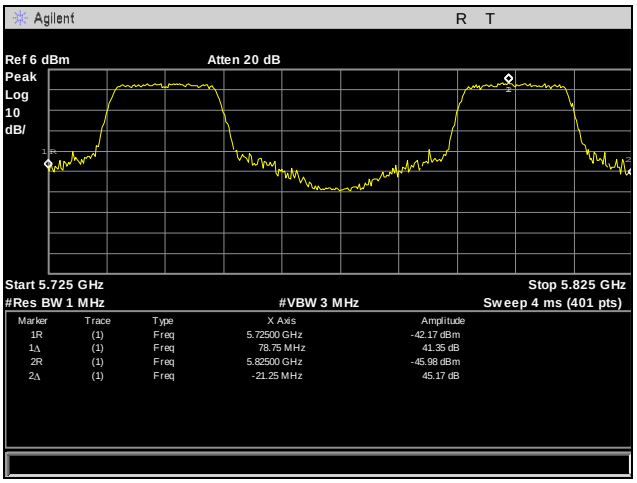
Plot 179. Frequency Stability, 5725 – 5825 MHz, 20°C, 120 V



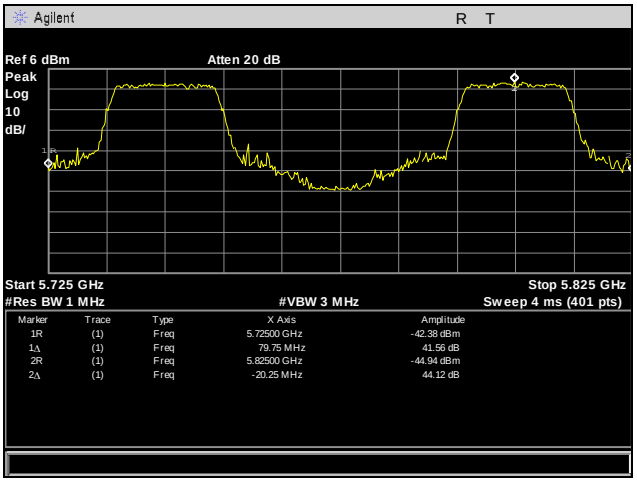
Plot 180. Frequency Stability, 5725 – 5825 MHz, 20°C, 132 V



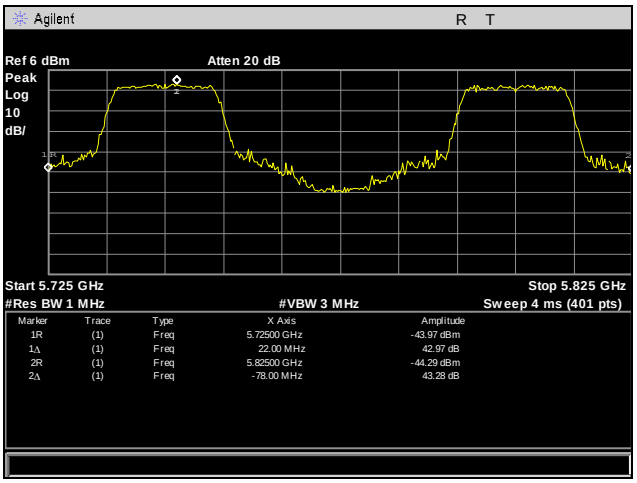
Plot 181. Frequency Stability, 5725 – 5825 MHz, 30°C, 120 V



Plot 182. Frequency Stability, 5725 – 5825 MHz, 40°C, 120 V



Plot 183. Frequency Stability, 5725 – 5825 MHz, 50°C, 120 V



Plot 184. Frequency Stability, 5725 – 5825 MHz, 55°C, 120 V

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN Receiver Spurious Emissions Requirements

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

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 26.

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

Table 26. 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. 300 kHz resolution bandwidth was used from 30 MHz - 1 GHz and 1 MHz resolution was used for measurements done above 1 GHz. All plots are corrected for cable loss.

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

Test Engineer(s): Jonathan Chao

Test Date(s): 02/18/13

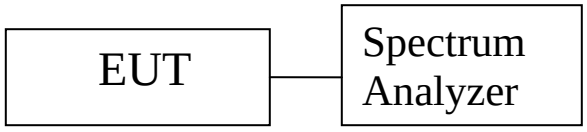
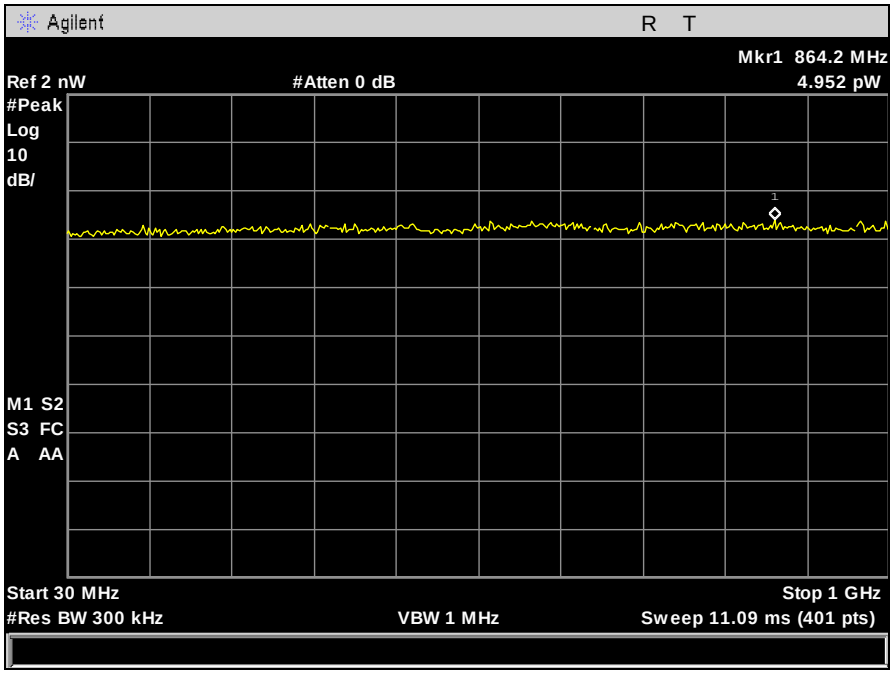
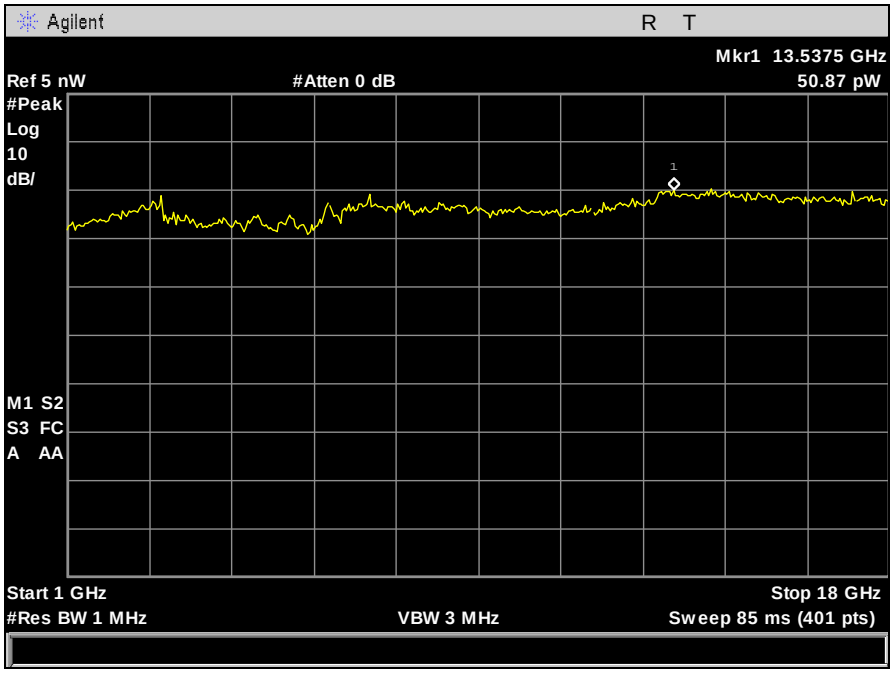


Figure 6. Block Diagram, Conducted Receiver Spurious Emissions Test Setup

Conducted Receiver Spurious Emissions, Port 1

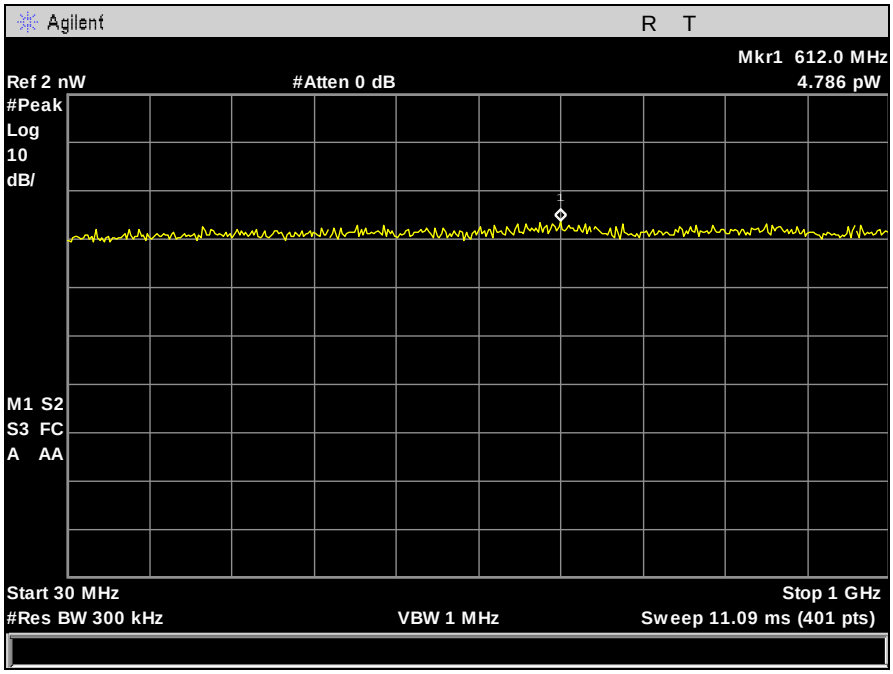


Plot 185. Receiver Spurious Emission, 30 MHz – 1 GHz, Port 1

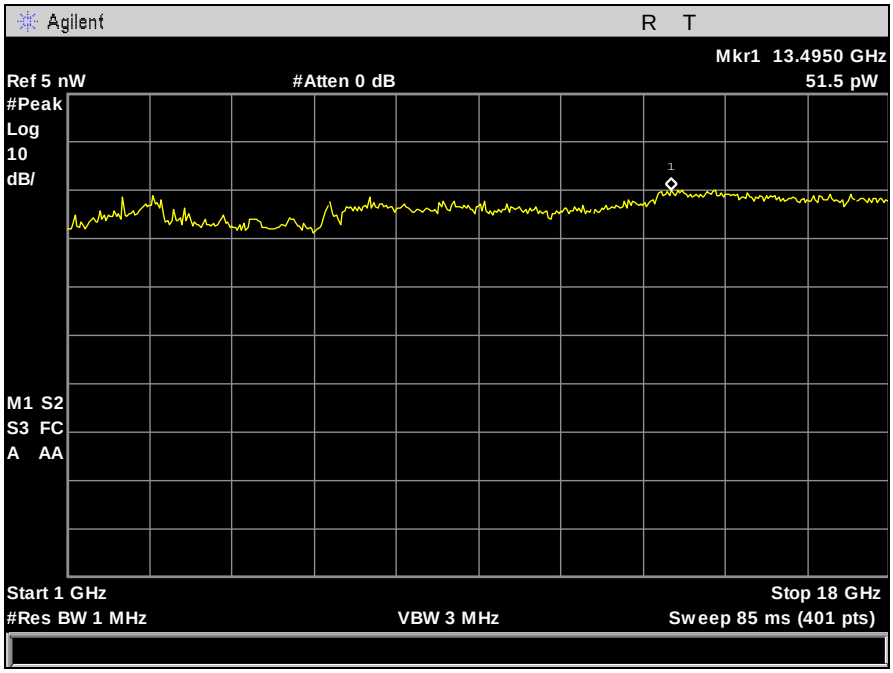


Plot 186. Receiver Spurious Emission, 1 GHz – 18 GHz, Port 1

Conducted Receiver Spurious Emissions, Port 2

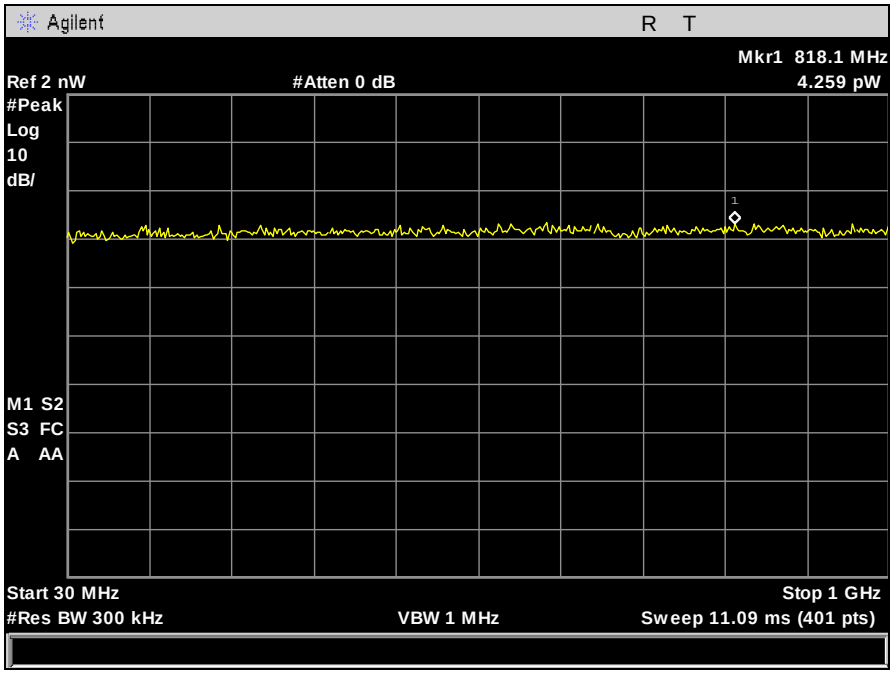


Plot 187. Receiver Spurious Emission, 30 MHz – 1 GHz, Port 2

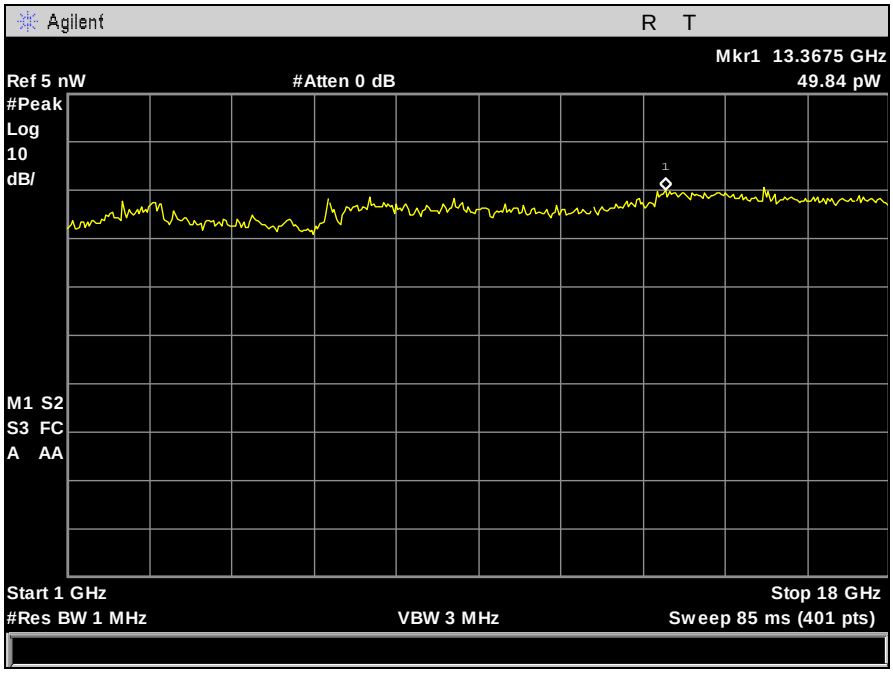


Plot 188. Receiver Spurious Emission, 1 GHz – 18 GHz, Port 2

Conducted Receiver Spurious Emissions, Port 3



Plot 189. Receiver Spurious Emission, 30 MHz – 1 GHz, Port 3



Plot 190. Receiver Spurious Emission, 1 GHz – 18 GHz, Port 3

V. Test Equipment

Test Equipment

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

Asset	Equipment	Manufacturer	Model	Calibration Date	Calibration Due Date
1S2600	BILOG ANTENNA	TESEQ	CBL6112D	4/14/2010	4/14/2013
1S2482	5 METER CHAMBER (NSA)	PANASHIELD	5 METER SEMI-ANECHOIC CHAMBER	11/22/2011	5/22/2013
1S2583	SPECTRUM ANALYZER	AGILENT/HP	E4447A	3/27/2012	9/27/2013
1S2460	1-26GHZ SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	7/27/2012	1/27/2014
1S2202	HORN ANTENNA (1 METER)	EMCO	3116	4/23/2010	4/23/2013
1S2523	PREAMPLIFIER	AGILENT TECHNOLOGIES	8449B	SEE NOTE	
1S2603	DOUBLE RIDGED WAVEGUIDE HORN	ETS-LINDGREN	3117	4/15/2011	4/15/2013
1S2729	SONOMA AMPLIFIER	SONOMA INSTRUMENT	310N	4/18/2012	10/18/2013
1S2229	TEMPERATURE CHAMBER	TENNY ENGINEERING	T63C	2/18/2012	8/18/2013
NA	HIGH PASS FILTER	MICRO-TRONICS	HPM13147	SEE NOTE	

Table 27. Test Equipment List

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

VI. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

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

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

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

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

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

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

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

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

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

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

(i) Compliance testing;

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

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

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

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

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

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

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

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

§ 2.907 Certification.

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

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

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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

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

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

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

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

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

– Reorient or relocate the receiving antenna.

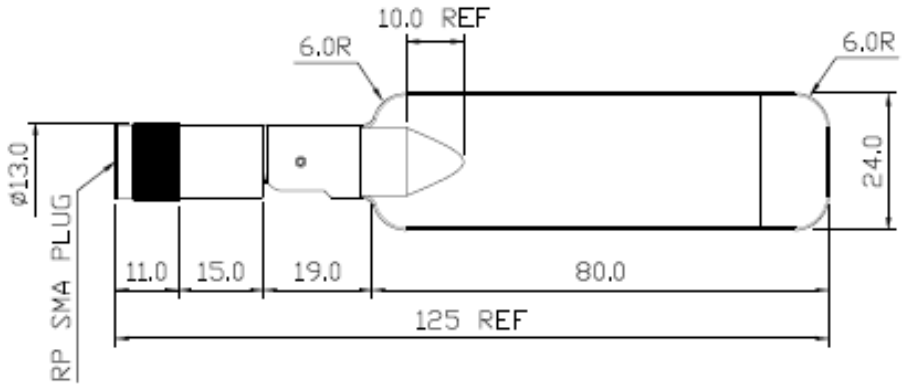
– Increase the separation between the equipment and receiver.

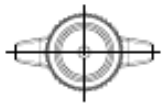
– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

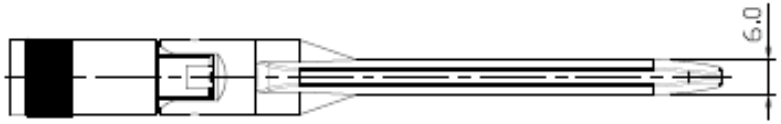
– Consult the dealer or an experienced radio/TV technician for help.

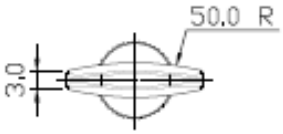
VII. Appendix

REVISION		
ISS	ZONE	DESCRIPTION









NOTE :
1.Freq : 2.4~2.5GHz & 5~5.9GHz
2.Gain : 2.4~2.5 GHz 3.5 dBi
5.0~5.9 GHz 6.0 dBi
3.SWR : 2.0 Max
4.Pattern : Omni
5.Flammability Class : UL-94 HB

NO.	DESCRIPTION	MATERIAL	FINISH	Q'TY	DRAWN NO.
5	TWIN ADHESIVE TAPE	AP7000	NONE	1	D-0171
4	PCB	FR4	NONE	1	P-0020
3	M-DUAL BAND PADDLE ANTENNA TB	ABS	IVORY	1	I-0123
2	M-DUAL BAND PADDLE ANTENNA JB	ABS	IVORY	1	I-0122
1	RP-SMA (P) FOR RG.32 CABLE ASSY.			1	CA-0038

TOLERANCES
DIMENSIONS ARE IN MILLIMETER
UNLESS OTHERWISE SPECIFIED
.X ±0.2
.XX ±0.1
.XXX ±0.05
ANGLES ±5°

SCALE 1/1 | ISSUE A-0

TITLE: ANT-ABGN-0406-W

PART NO.: 831-00043

REVISION: A

FILE PATH:

Meru Networks

APPROVED DATE

CHECKED DATE

DRAWN DATE