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

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13501 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

September 26, 2016

Firetide, Inc. A Division of UNICOM Global
2105 South Bascom Avenue Suite 220
Campbell, CA 95008

Dear Prasant Hota,

Enclosed is the EMC Wireless test report for compliance testing of the Firetide, Inc. A Division of UNICOM Global, HotPort 7100 (Indoor Mesh) as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15.407, Subpart E (UNII 3).

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: (\Firetide, Inc. A Division of UNICOM Global\ EMCS89652A-FCC407 UNII 3 Rev. 7)

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Electromagnetic Compatibility Criteria
Test Report

for the

Firetide, Inc. A Division of UNICOM Global
HotPort 7100 (Indoor Mesh)

Tested under
The FCC Certification Rules
contained in
Title 47 of the CFR
15.407 Subpart E

MET Report: EMCS89652A-FCC407 UNII 3 Rev. 7

September 26, 2016

Prepared For:

Firetide, Inc. A Division of UNICOM Global
2105 South Bascom Avenue Suite 220
Campbell, CA 95008

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

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15.407 Subpart E

Ajaz Khan, 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 under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	July 14, 2016	Initial Issue.
1	July 20, 2016	EUT Name Change, Customer Provided Corrections, Corrected Typographical Errors
2	July 26, 2016	Updated equipment configuration table.
3	August 9, 2016	Updated KDB references.
4	August 30, 2016	Editorial correction.
5	September 14, 2016	Updated antenna gain to 9.77 dBi.
6	September 19, 2016	Updated Output power.
7	September 26, 2016	Editorial corrections.

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List of Terms and Abbreviations

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

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Firetide, Inc. A Division of UNICOM Global HotPort 7100, 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 HotPort 7100. Firetide, Inc. A Division of UNICOM Global should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the HotPort 7100, 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 Firetide, Inc. A Division of UNICOM Global, purchase order number PO-3956. All tests were conducted using measurement procedure ANSI C63.4-2014.

FCC Reference	Description	Results
§15.203	Antenna Requirement	Compliant
§15.407 (a)(3)	Maximum Conducted Output Power	Compliant
§15.407 (a)(3)	Maximum Power Spectral Density	Compliant
§15.407 (b)(4)& (6 - 7)	Undesirable Emissions	Compliant
§15.407(b)(6)	Conducted Emission Limits	Compliant
§15.407(c)	Automatic Discontinue of Transmitter	Compliant per vendor declaration
§15.407(e)	6 dB Bandwidth	Compliant
§15.407(f)	RF Exposure	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Firetide, Inc. A Division of UNICOM Global to perform testing on the HotPort 7100, under Firetide, Inc. A Division of UNICOM Global's purchase order number PO-3956.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Firetide, Inc. A Division of UNICOM Global HotPort 7100.

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

Model(s) Tested:	HotPort 7100		
Model(s) Covered:	HotPort 7100		
EUT Specifications:	Primary Power: 12 VDC		
	FCC ID: REP-7100-1		
	Type of Modulations:	OFDM	
	Equipment Code:	NII	
	Max. RF Output Power:	802.11a 20 MHz: 5745 MHz	26.19 dBm
	EUT Frequency Ranges:	5745– 5825MHz	
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:	Ajaz Khan		
Report Date(s):	September 26, 2016		

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
ANSI C63.4:2014	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 C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
789033 D02 General UNII Test Procedures New Rules v01r03	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick Street, Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 5 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Description of Test Sample

The Firetide, Inc. A Division of UNICOM, Global HotPort 7100, Equipment Under Test (EUT), is a Firetide Mesh Network, which is composed of two or more Mesh Nodes, gives you the convenience of a wired-Ethernet switch combined with the deployment flexibility of wireless technology. Each Mesh Node in the network can accept a wired Ethernet connection. That connection's Ethernet data is sent wirelessly to another Mesh Node. If the receiving Mesh Node is connected to the wired destination for the data packet, the Node routes that packet to its Ethernet connection. If it is not the final destination, the packet is forwarded wirelessly to the next Mesh Node and ultimately to its final destination. It also can be used as Point to Point link.

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
1	Hotport Indoor Mesh Node	7100	7100	--	1

Table 4. Equipment Configuration

F. Support Equipment

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

Ref. ID	Name / Description	Manufacturer	Model Number
1	AC-DC Adaptor	--	--
2	Antenna	WHA Yu	C812-510010-A C812-510012-A

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	Antenna Ports	--	3*2	--	Y	Antenna Ports
2	RJ45 Port and Cable	--	4	--	NA	RJ45 Port and Cable
4	DC Power Input Port	--	1	--	Y	DC Power Input Port
n/a	Port 1	Ethernet	1	1.5	N	Laptop
n/a	Port 2 – 4	Not connected; only 1 Ethernet connection is necessary to communicate with EUT	n/a	n/a	n/a	n/a
n/a	USB	Not Used; disabled	n/a	n/a	n/a	n/a

Table 6. Ports and Cabling Information

H. Mode of Operation

Once the DC power/POE Power is applied LED indicates to mention that the unit is powered on properly. . Proper IP address should be set in the PC prior to the Ethernet cable connection. The Ethernet connectivity needs to be made by connecting an Ethernet cable. Once the connection is established, you can verify this in the PC's LAN connectivity status. Proper IP address should be set in the PC prior to the Ethernet cable connection.

I. Method of Monitoring EUT Operation

Mechanical Dimension: Dimensions: 9.4" X 5.9" X 1.6"Indoor

Electrical Indication: Power and Status LED's on the front t panel To verify whether the EUT is power ON , if the EUT is ON the Power LED will glow Green.

Status LED Glows when the firmware is up. When the unit meshes with another unit the Radio 1 and Radio 2 LED will glow.

With the Ethernet cable connected to PC or Laptop Ping the EUT with the IP address 192.168.224.xxx (150) for 7100.

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 Firetide, Inc. A Division of UNICOM Global upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

Test Requirement: **§ 15.203:** An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

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

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

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

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

Results: The EUT as tested is compliant the criteria A of §15.203. The EUT has a unique type of antenna connector attached to the EUT.

Gain/Type	Model	Manufacturer
5dBi Omni (5GHz)	C812-510012-A	Wha Yu

Test Engineer(s): Minh Ly

Test Date(s): 08/11/09

Electromagnetic Compatibility Criteria for Intentional Radiators

§15. 407 Duty Cycle Check

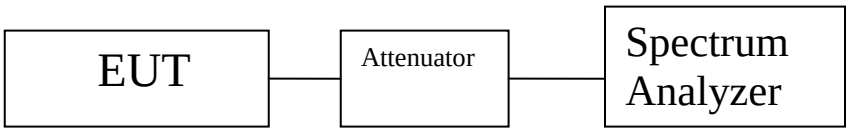
Test Requirements: **789033 D02 General UNII Test Procedures New Rules v01r03:** All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation.

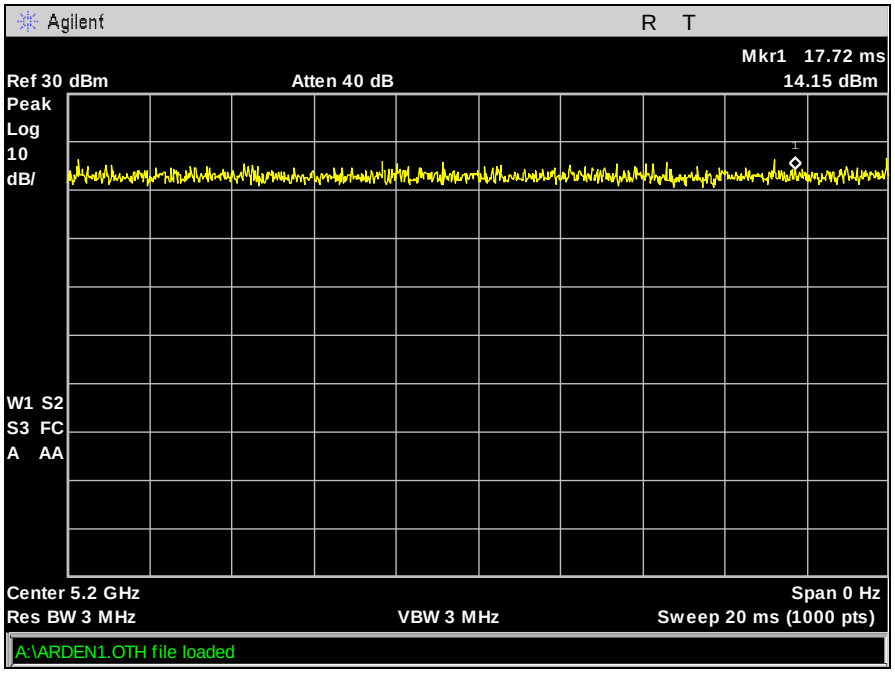
Test Procedure: The zero-span mode on a spectrum analyzer or EMI receiver, if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ EBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T, where T is defined in section II.B.1.a), and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

Test Results: The duty cycle of EUT is 100%

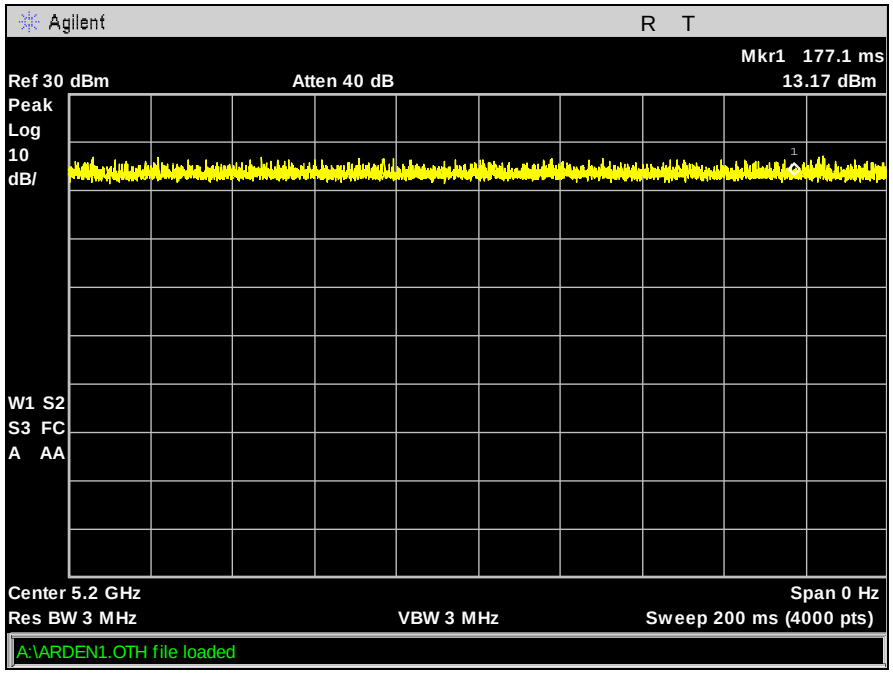
Test Engineer(s): Jun Qi

Test Date(s): 8/12/2016





Plot 1. Duty Cycle 20ms



Plot 2. Duty Cycle 200ms

Electromagnetic Compatibility Criteria for Intentional Radiators

§15. 407(a)(3) Maximum Conducted Output Power

Test Requirements: **§15.407(a)(3):** For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according to measurement method SA-1, as described in 789033 D02 General UNII Test Procedures v01.

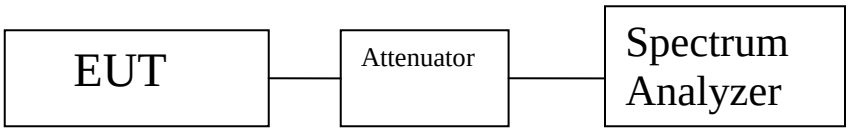
The EUT has 2 radio modules and each module has 3 5 dBi antennas and 2 radio modules are uncorrelated, so the limit is reduced to 26.23dBm. Only 3 antennas are correlated.
Gt = Ga + 10logNant = 5 + 10log3 = 9.77 dBi
Limit = 30dBm –(Gt-6) = 26.23 dBm

Output Power combining equation: Pout = 10 log (10^(Pout11/10) + 10^(Pout12/10) + 10^(Pout13/10) + 10^(Pout21/10) + 10^(Pout22/10) + 10^(Pout23/10))

Test Results: The EUT as tested is compliant with the requirements of this section.

Test Engineer(s): Ajaz Khan

Test Date(s): 05/24/16



Peak Conducted Output Power – Omni Directional Antenna			
	Carrier	**Frequency**	**Measured Peak Output Power**
	Channel	**(MHz)**	**dBm**
802.11n 20 MHz Port R11	Low	5745	15.90
	Mid	5785	14.10
	High	5825	13.10
802.11n 20 MHz Port R12	Low	5745	18.10
	Mid	5785	15.70
	High	5825	14.90
802.11n 20 MHz Port R13	Low	5745	16.00
	Mid	5785	14.20
	High	5825	14.30
802.11n 20 MHz Port R21	Low	5745	14.40
	Mid	5785	14.20
	High	5825	13.90
802.11n 20 MHz Port R22	Low	5745	16.10
	Mid	5785	15.90
	High	5825	15.60
802.11n 20 MHz Port R23	Low	5745	14.80
	Mid	5785	12.10
	High	5825	10.40
802.11a 20 MHz Port R11	Low	5745	14.00
	Mid	5785	14.10
	High	5825	14.30
802.11a 20 MHz Port R12	Low	5745	15.10
	Mid	5785	15.70
	High	5825	14.10
802.11a 20 MHz Port R13	Low	5745	14.20
	Mid	5785	14.70
	High	5825	13.30
802.11a 20 MHz Port R21	Low	5745	15.80
	Mid	5785	16.20
	High	5825	14.90
802.11a 20 MHz Port R22	Low	5745	16.40
	Mid	5785	17.00
	High	5825	17.10
802.11a 20 MHz Port R23	Low	5745	13.20
	Mid	5785	13.50
	High	5825	12.10

Table 7. Peak Output Power, Test Results, 20 MHz

Summed Peak Conducted Output Power – Omni Directional Antenna			
	Carrier	Frequency	Measured Peak Output Power
	Channel	(MHz)	dBm
802.11n 20 MHz Summed	Low	5745	23.83
	Mid	5785	22.32
	High	5825	21.76
802.11a 20 MHz Summed	Low	5745	26.19
	Mid	5785	23.77
	High	5825	22.37

Table 8. Summed Peak Output Power, Test Results, 20 MHz

Peak Conducted Output Power – Omni Directional Antenna			
	Carrier	Frequency	Measured Peak Output Power
	Channel	(MHz)	dBm
802.11n 40 MHz Port R11	Low	5755	12.40
	High	5795	13.20
802.11n 40 MHz Port R12	Low	5755	13.30
	High	5795	15.00
802.11n 40 MHz Port R13	Low	5755	12.10
	High	5795	14.70
802.11n 40 MHz Port R21	Low	5755	13.20
	High	5795	15.70
802.11n 40 MHz Port R22	Low	5755	14.30
	High	5795	17.00
802.11n 40 MHz Port R23	Low	5755	8.50
	High	5795	12.10

Table 9. Peak Output Power, Test Results, 40 MHz

Summed Peak Conducted Output Power – Omni Directional Antenna			
	Carrier	Frequency	Measured Peak Output Power
	Channel	(MHz)	dBm
802.11n 40 MHz Summed	Low	5755	20.41
	High	5795	22.68

Table 10. Summed Peak Output Power, Test Results, 40 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements: **§15.407(a)(3):** In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

Test Procedure: The EUT was connected to a spectrum analyzer through a cable and attenuator. Measurements were taken with the EUT set to transmit continuously on its low, mid, and high channels. Its power was measured according KDB 789033 D02 General UNII Test Procedures v01. A 1 MHz RBW was used during testing, as this provides a worst-case scenario.

The EUT has 2 radio modules and each module has 3 5 dBi antennas and 2 radio modules are uncorrelated, so the limit is reduced to 26.23dBm. Only 3 antennas are correlated.

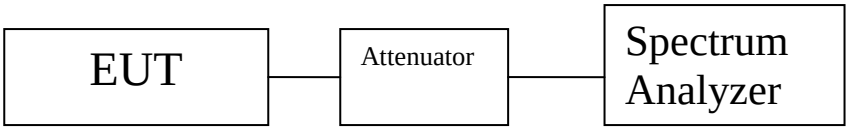
Gt = Ga + 10logNant = 5 + 10log3 = 9.77 dBi
Limit = 30dBm –(Gt-6) = 26.23 dBm

PSD combining equation: PSD_{total} = 10 log (10^(PSD_{11}/10) + 10^(PSD_{12}/10) + 10^(PSD_{13}/10) + 10^(PSD_{21}/10) + 10^(PSD_{22}/10) + 10^(PSD_{23}/10))

Test Results: The EUT as tested is compliant with the requirements of this section.

Test Engineer: Ajaz Khan

Test Date: 06/01/16



Max Conducted Power Spectral Density (PSD) – Omni Directional Antenna			
	Carrier Channel	Frequency (MHz)	Measured PSD dBm
802.11n 20 MHz Port R11	Low	5745	4.18
	Mid	5785	2.50
	High	5825	0.20
802.11n 20 MHz Port R12	Low	5745	5.40
	Mid	5785	3.60
	High	5825	1.50
802.11n 20 MHz Port R13	Low	5745	2.90
	Mid	5785	1.40
	High	5825	3.30
802.11n 20 MHz Port R21	Low	5745	4.80
	Mid	5785	2.67
	High	5825	3.60
802.11n 20 MHz Port R22	Low	5745	4.90
	Mid	5785	5.00
	High	5825	4.60
802.11n 20 MHz Port R23	Low	5745	3.10
	Mid	5785	1.10
	High	5825	1.69
802.11a 20 MHz Port R11	Low	5745	5.30
	Mid	5785	2.40
	High	5825	2.30
802.11a 20 MHz Port R12	Low	5745	6.80
	Mid	5785	4.88
	High	5825	2.90
802.11a 20 MHz Port R13	Low	5745	4.10
	Mid	5785	3.40
	High	5825	1.00
802.11a 20 MHz Port R21	Low	5745	4.99
	Mid	5785	4.70
	High	5825	2.91
802.11a 20 MHz Port R22	Low	5745	7.10
	Mid	5785	6.00
	High	5825	5.30
802.11a 20 MHz Port R23	Low	5745	5.90
	Mid	5785	2.71
	High	5825	0.80

Table 11. Power Spectral Density, Test Results, 20 MHz

Summed Max Conducted Power Spectral Density – Omni Directional Antenna			
	Carrier Channel	Frequency (MHz)	Measured PSD dBm
802.11n 20 MHz Summed	Low	5745	12.09
	Mid	5785	10.70
	High	5825	10.51
802.11a 20 MHz Summed	Low	5745	13.60
	Mid	5785	11.99
	High	5825	10.59

Table 12. Summed Power Spectral Density, Test Results, 20 MHz

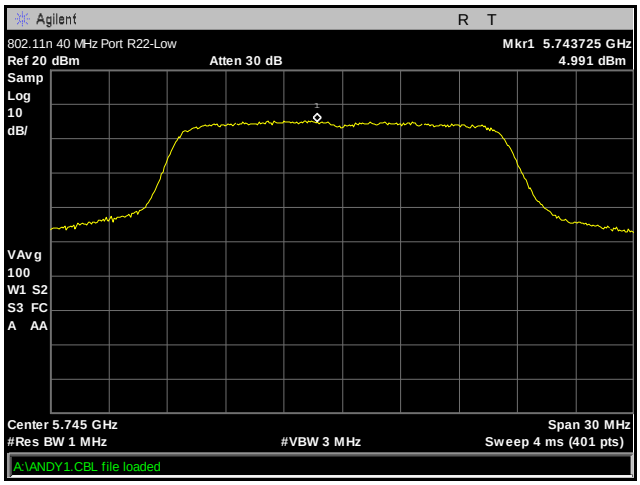
Max Conducted Power Spectral Density (PSD) – Omni Directional Antenna			
	Carrier Channel	Frequency (MHz)	Measured PSD dBm
802.11n 40 MHz Port R11	Low	5755	-4.60
	High	5795	-2.10
802.11n 40 MHz Port R12	Low	5755	-3.50
	High	5795	0.50
802.11n 40 MHz Port R13	Low	5755	-3.00
	High	5795	-0.61
802.11n 40 MHz Port R21	Low	5755	-2.40
	High	5795	-0.52
802.11n 40 MHz Port R22	Low	5755	-0.65
	High	5795	1.70
802.11n 40 MHz Port R23	Low	5755	-4.70
	High	5795	-3.00

Table 13. Power Spectral Density, Test Results, 40 MHz

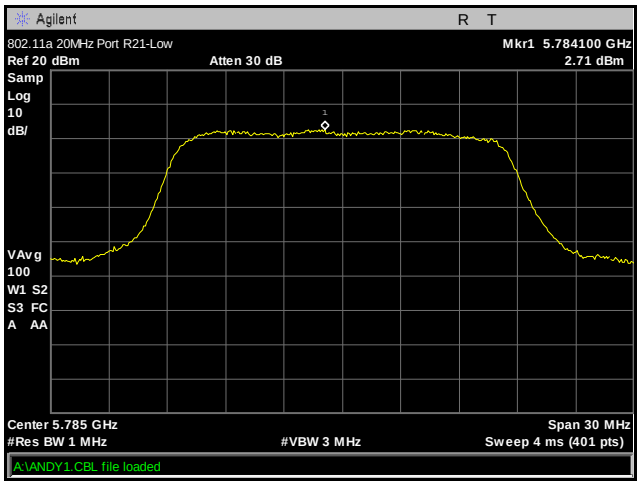
Summed Max Conducted Power Spectral Density – Omni Directional Antenna			
	Carrier Channel	Frequency (MHz)	Measured PSD dBm
802.11n 40 MHz Summed	Low	5755	4.87
	High	5795	7.38

Table 14. Summed Power Spectral Density, Test Results, 40 MHz

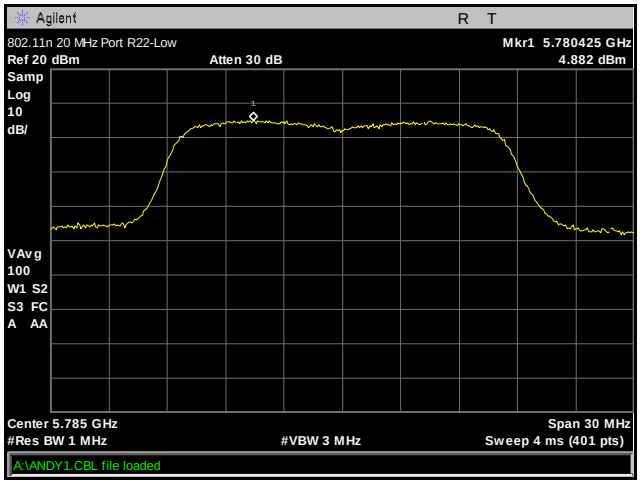
Peak Power Spectral Density, 802.11a 20 MHz



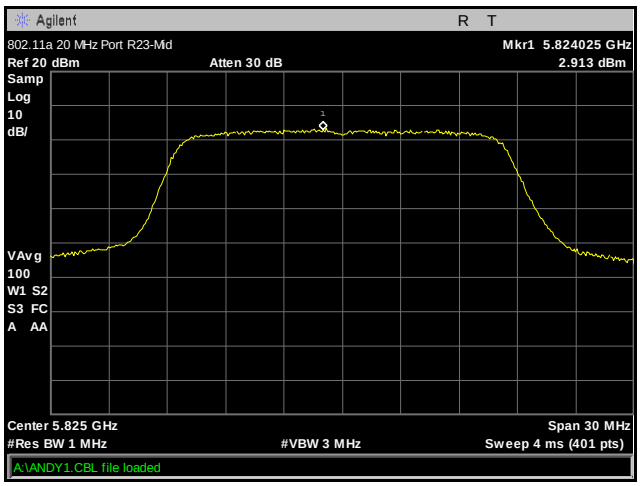
Plot 3. Peak Power Spectral Density, Low Channel, 802.11a 20 MHz, 5745 MHz, Port R21



Plot 4. Peak Power Spectral Density, Mid Channel, 802.11a 20 MHz, 5785 MHz, Port R23

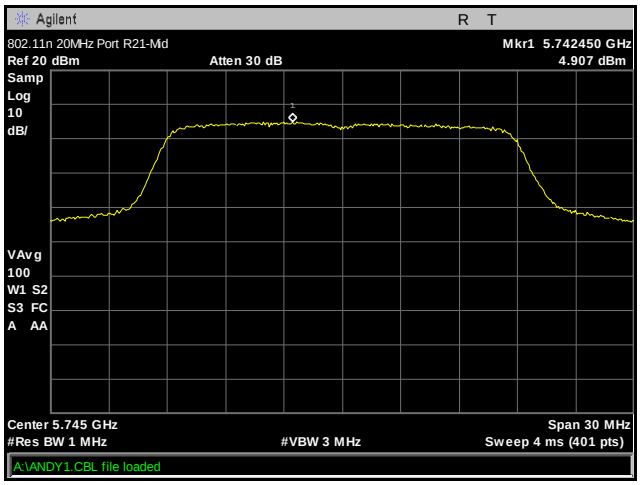


Plot 5. Peak Power Spectral Density, Mid Channel, 802.11a 20 MHz, 5785 MHz, Port R12

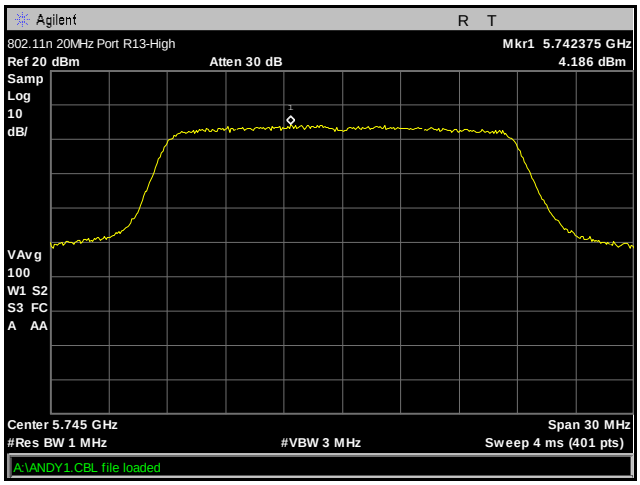


Plot 6. Peak Power Spectral Density, High Channel, 802.11a 20 MHz, 5825 MHz, Port R12

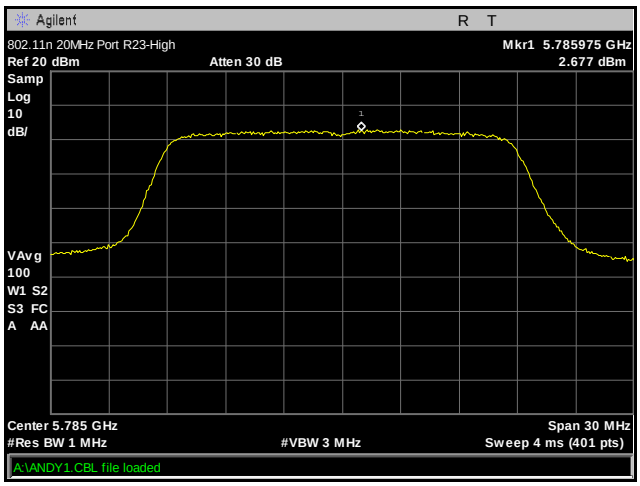
Peak Power Spectral Density, 802.11n 20 MHz



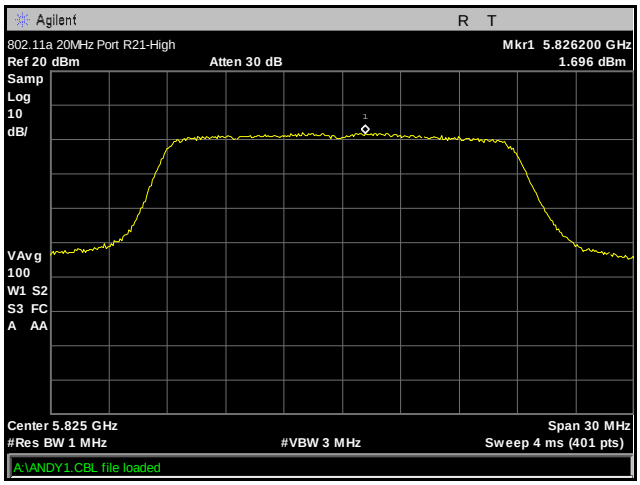
Plot 7. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, 5745 MHz, Port R22



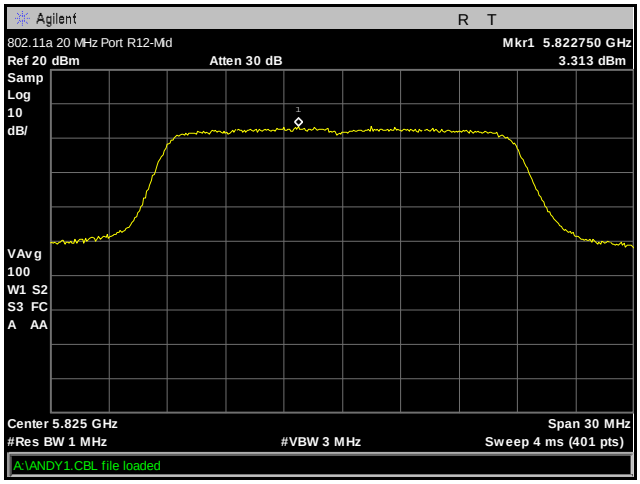
Plot 8. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, 5745 MHz, Port R11



Plot 9. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz, 5785 MHz, Port R21

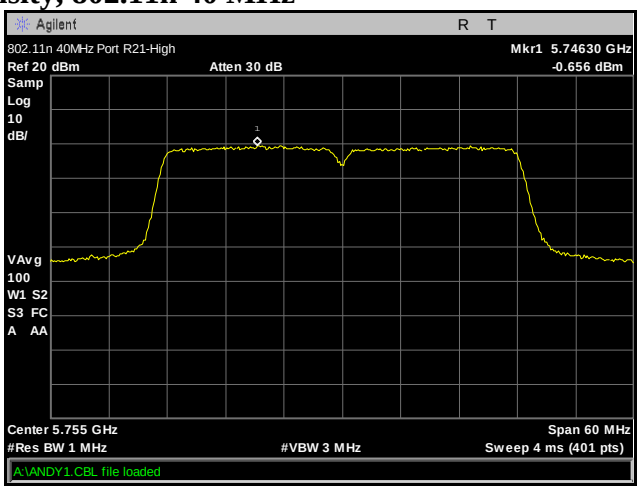


Plot 10. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, 5825 MHz, Port R23

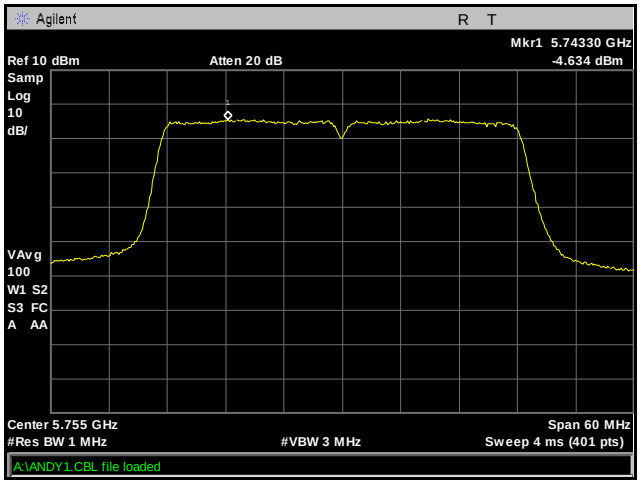


Plot 11. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, 5825 MHz, Port R13

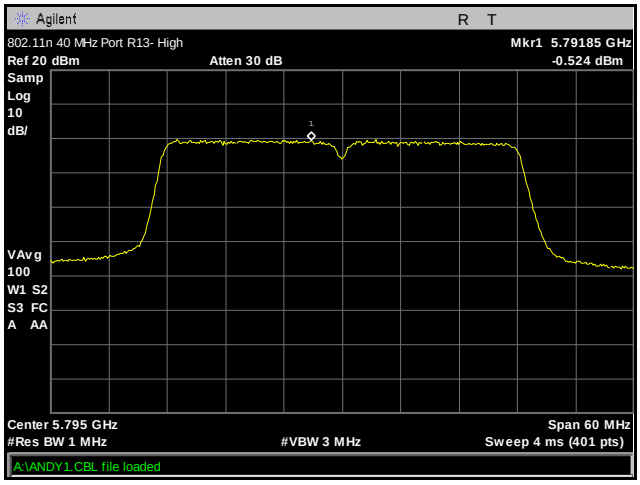
Peak Power Spectral Density, 802.11n 40 MHz



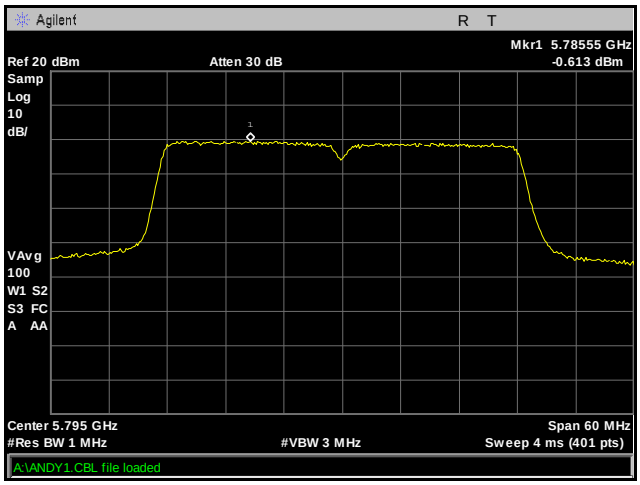
Plot 12. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, 5755 MHz, Port R22



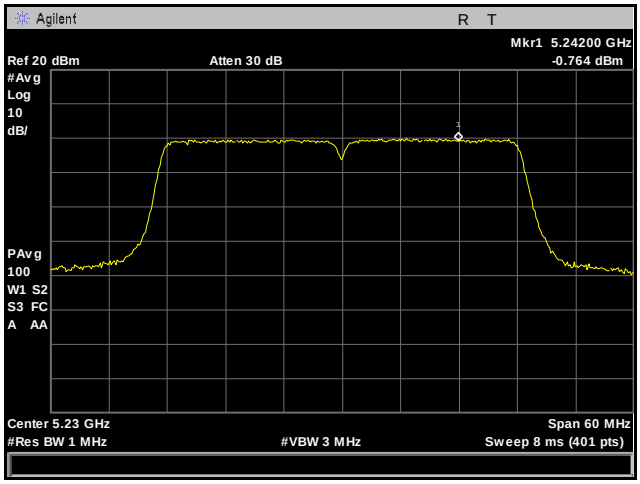
Plot 13. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, 5755 MHz, Port R13



Plot 14. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, 5795 MHz, Port R21



Plot 15. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, 5795 MHz, Port R13



Plot 16. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, 5230 MHz, Port R22

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(b)(4) & (6 – 7) Undesirable Emissions

Test Requirements:

§ 15.407(b)(4): For transmitters operating in the 5.725-5.85 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 e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. 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 EUT was placed on a non-conducting stand on a turntable in a chamber. To find the maximum emission the EUT was set to transmit on low, mid, and high channels. Additionally, the turntable was rotated 360 degrees, the EUT was oriented through its three orthogonal axes, and the receive antenna height was varied in order to maximize emissions.

For frequencies from 30 MHz to 1 GHz, measurements were first made using a peak detector with a 100 kHz resolution bandwidth. Emissions which exceeded the limits were re-measured using a quasi-peak detector with a 120 kHz resolution bandwidth.

Above 1 GHz, measurements were made pursuant the method described in FCC KDB 789033 v01r02 General UNII Test Procedure New Rules v01. The equation, **EIRP= E + 20 log D – 104.8** was used to convert field strength to EIRP (**E** = field strength (dBµV/m) and **D** = Reference measurement distance**).**

For emissions above 1 GHz and in restricted bands, measurements of the field strength were made with a peak detector and an average detector and compared with the limits of 15.209.

Above 1 GHz, a notch filter(5725 MHz – 5850 MHz) is used for filter the fundamental signal.

As an alternative, according to FCC KDB 789033 v01r02 General UNII Test Procedure New Rules v01, all emissions above 1 GHz that comply with the peak and average limits of 15.209 satisfy the requirements of unwanted emissions in 15.407.

Test Results:

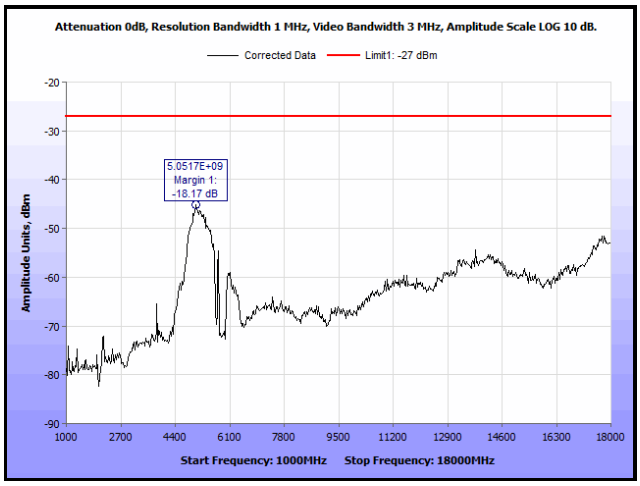
For below 1 GHz, the EUT was compliant with the requirements of this section.

For above 1 GHz, the EUT was compliant with the requirements of this section.

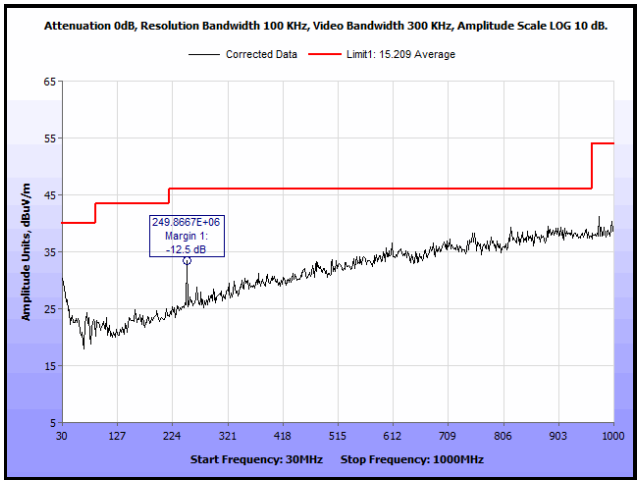
Test Engineer(s): Jun Qi

Test Date(s): 05/26/16

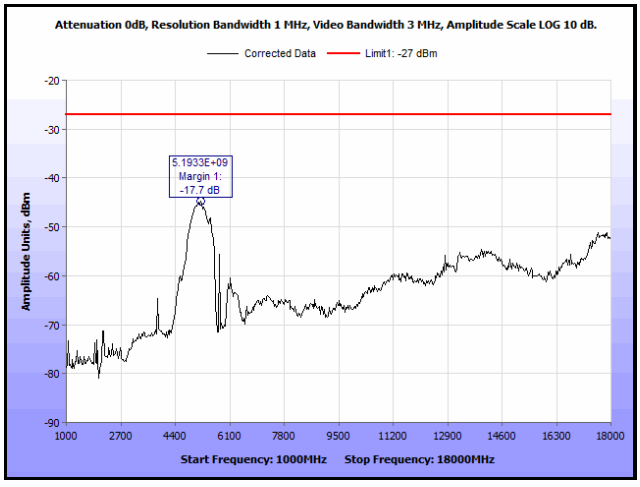
Radiated Spurious Emissions, 802.11a 20 MHz



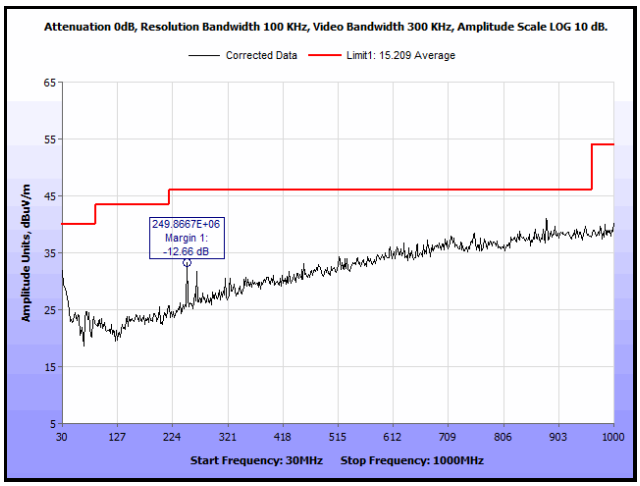
Plot 17. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, OP 21dB, -27 dBm



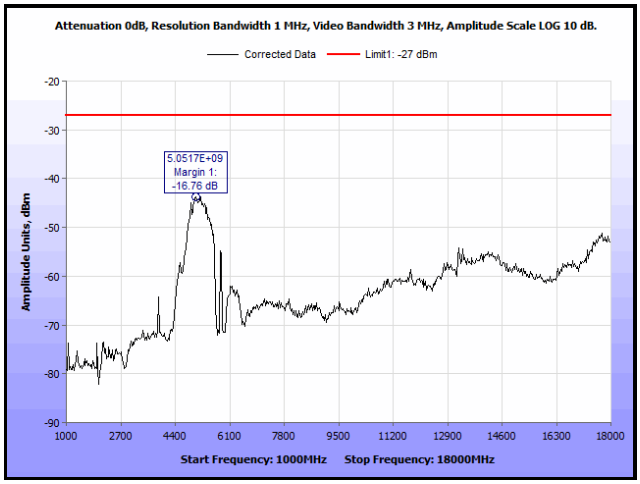
Plot 18. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, OP 21dB, Average



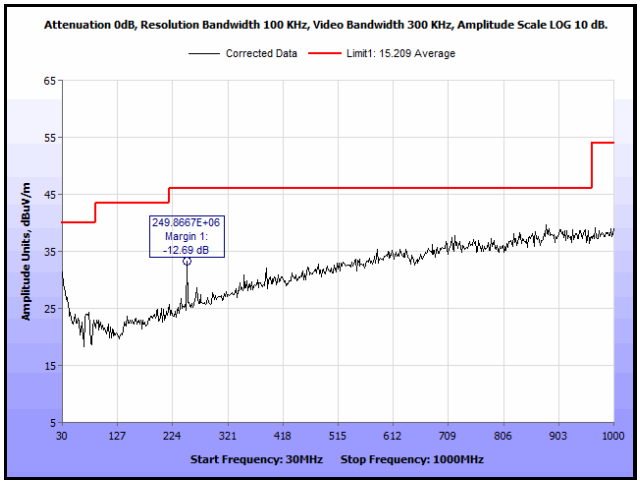
Plot 19. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, OP 21dB, -27 dBm



Plot 20. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, OP 21dB, Average

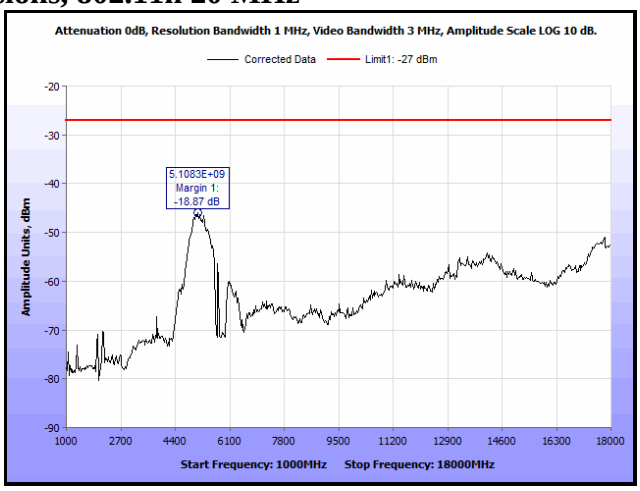


Plot 21. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, OP 21dB, -27 dBm

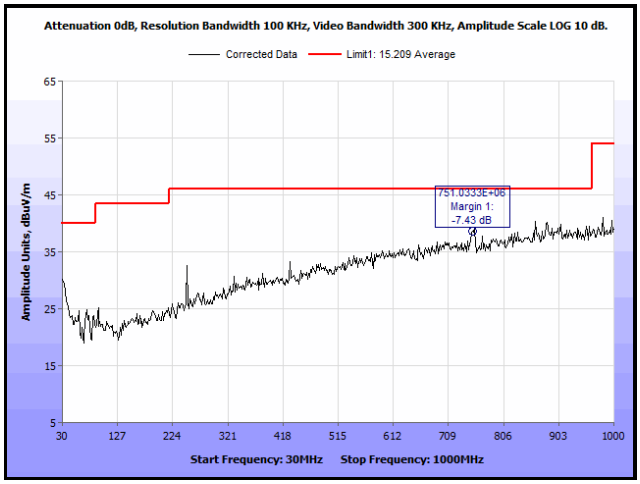


Plot 22. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, OP 21dB, Average

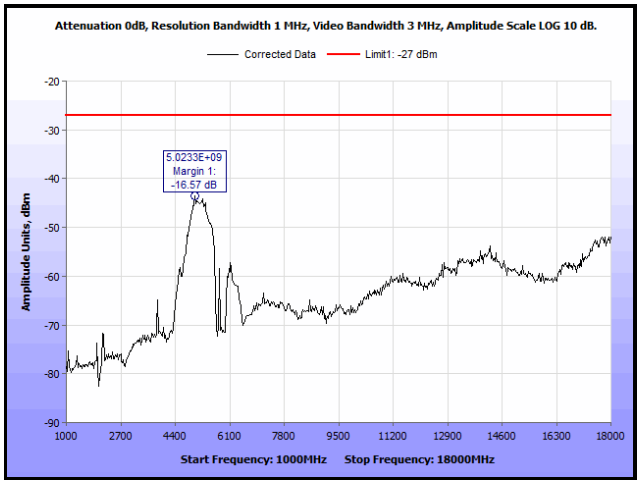
Radiated Spurious Emissions, 802.11n 20 MHz



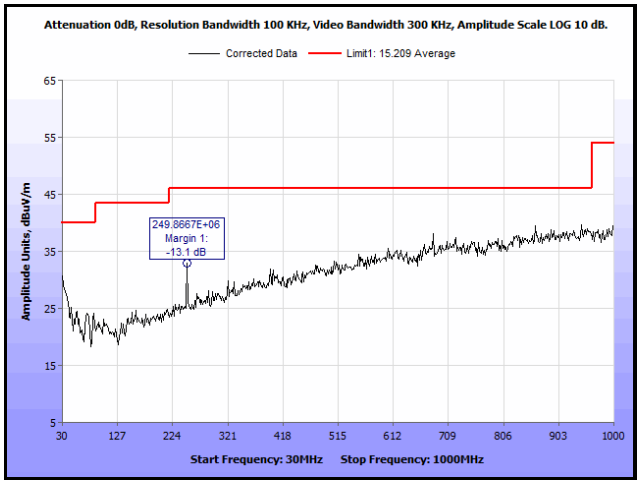
Plot 23. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, OP 21.5dB, -27 dBm



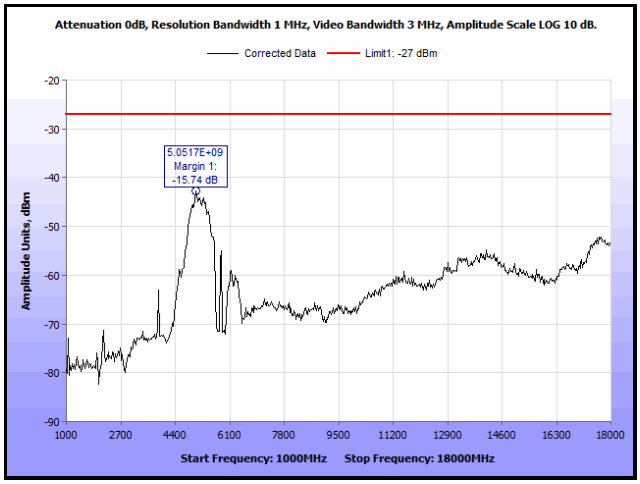
Plot 24. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, OP 21.5dB, Average



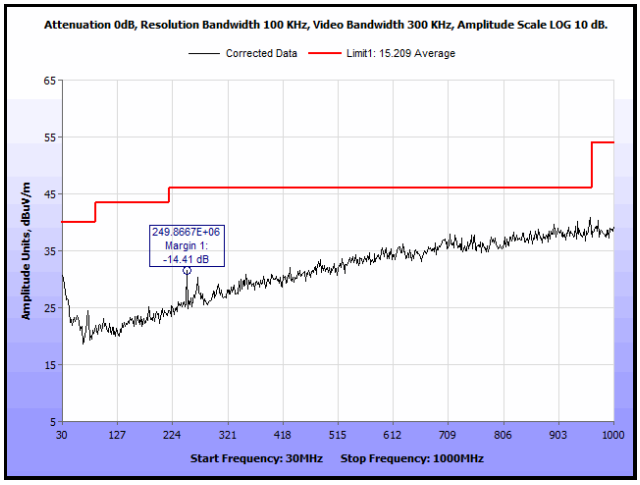
Plot 25. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, OP 21.5dB, -27 dBm



Plot 26. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, OP 21.5dB, Average

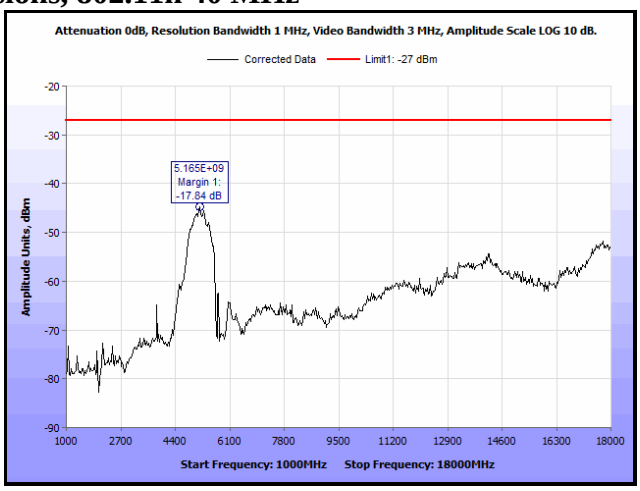


Plot 27. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, OP 21.5dB, -27 dBm

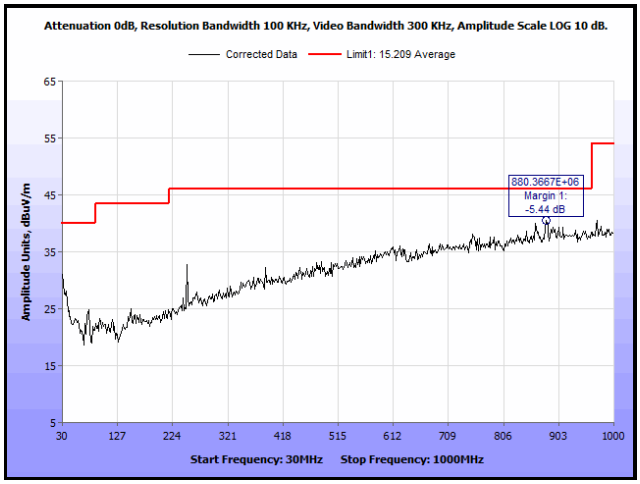


Plot 28. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, OP 21.5dB, Average

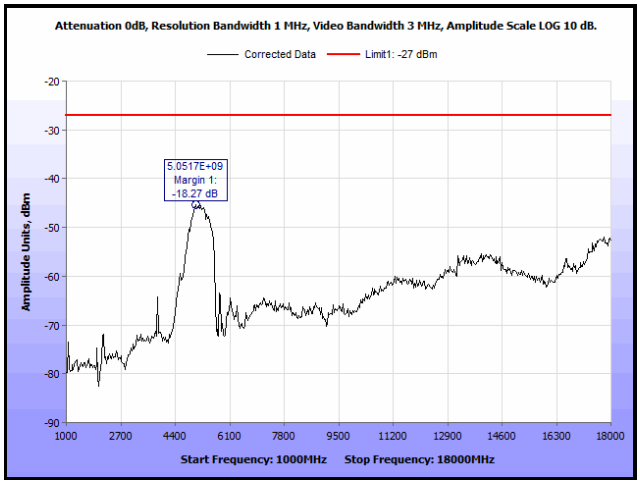
Radiated Spurious Emissions, 802.11n 40 MHz



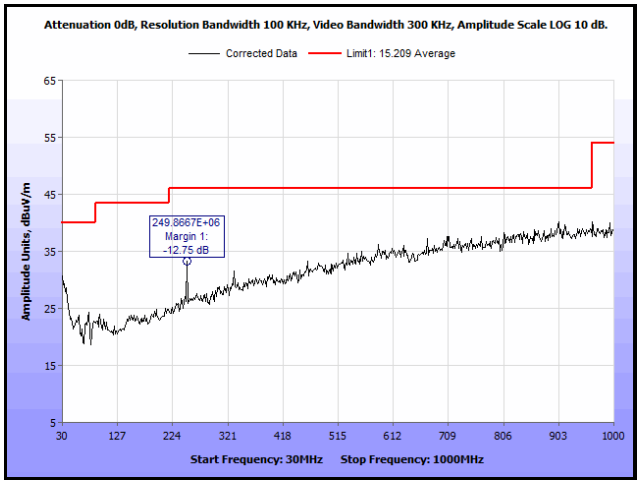
Plot 29. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, OP 18dB, -27 dBm



Plot 30. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, OP 18dB, Average

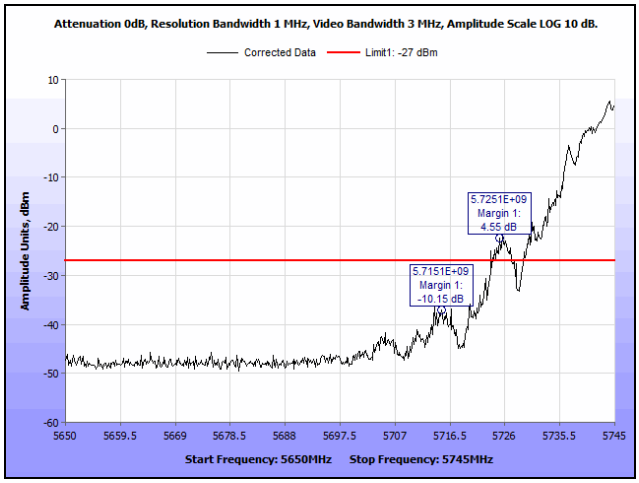


Plot 31. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, OP 18dB, -27 dBm

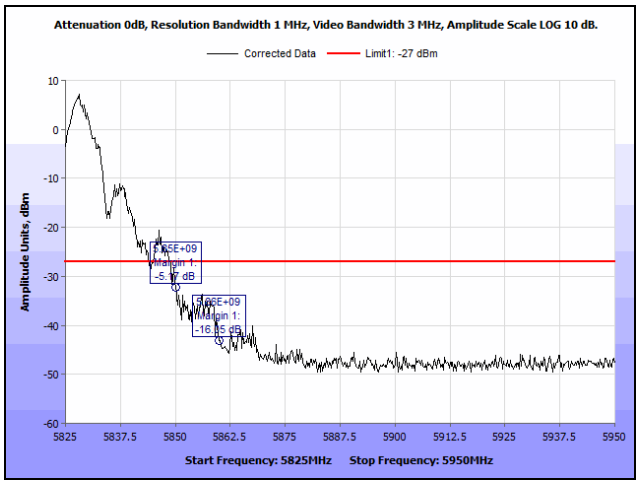


Plot 32. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, OP 18dB, Average

Restricted Band of Operation, 802.11a 20 MHz

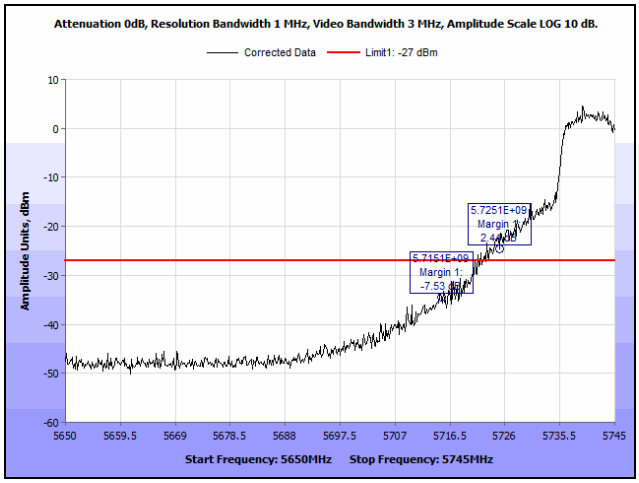


Plot 33. Restricted band of operation, 802.11a, 20 MHz, 5745Mhz

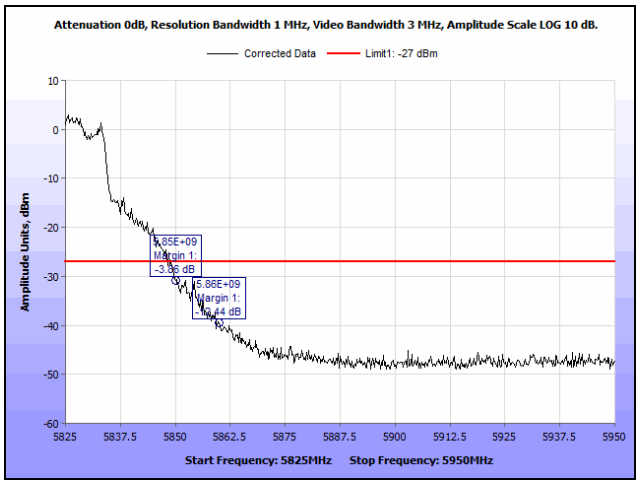


Plot 34 Restricted band of operation, 802.11a, 20 MHz, 5825Mhz

Restricted Band of Operation, 802.11n 20 MHz

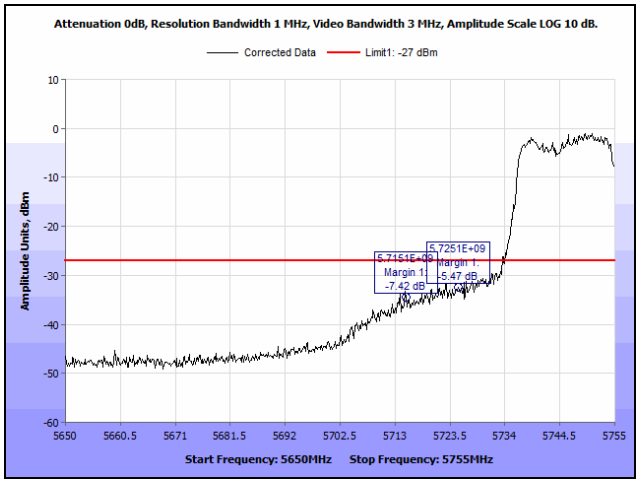


Plot 35. Restricted band of operation, 802.11n, 20 MHz, 5745Mhz

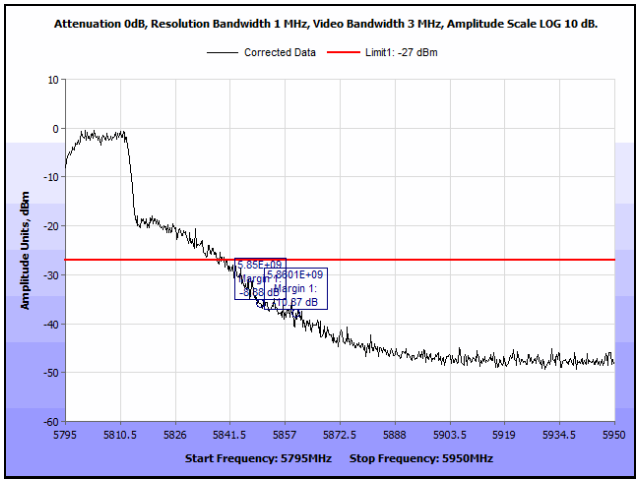


Plot 36. Restricted band of operation, 802.11n, 20 MHz, 5830 MHz

Restricted Band of Operation, 802.11n 40 MHz



Plot 37. Restricted band of operation, 802.11n, 40 MHz, 5755Mhz



Plot 38. Restricted band of operation, 802.11n, 40 MHz, 5795Mhz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(6) Conducted Emissions

Test Requirement(s): **§ 15.407 (b)(6):** Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

§ 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 30 MHz, 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 15. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a non-metallic 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 C63.4-2014 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. Scans were performed with the transmitter on.

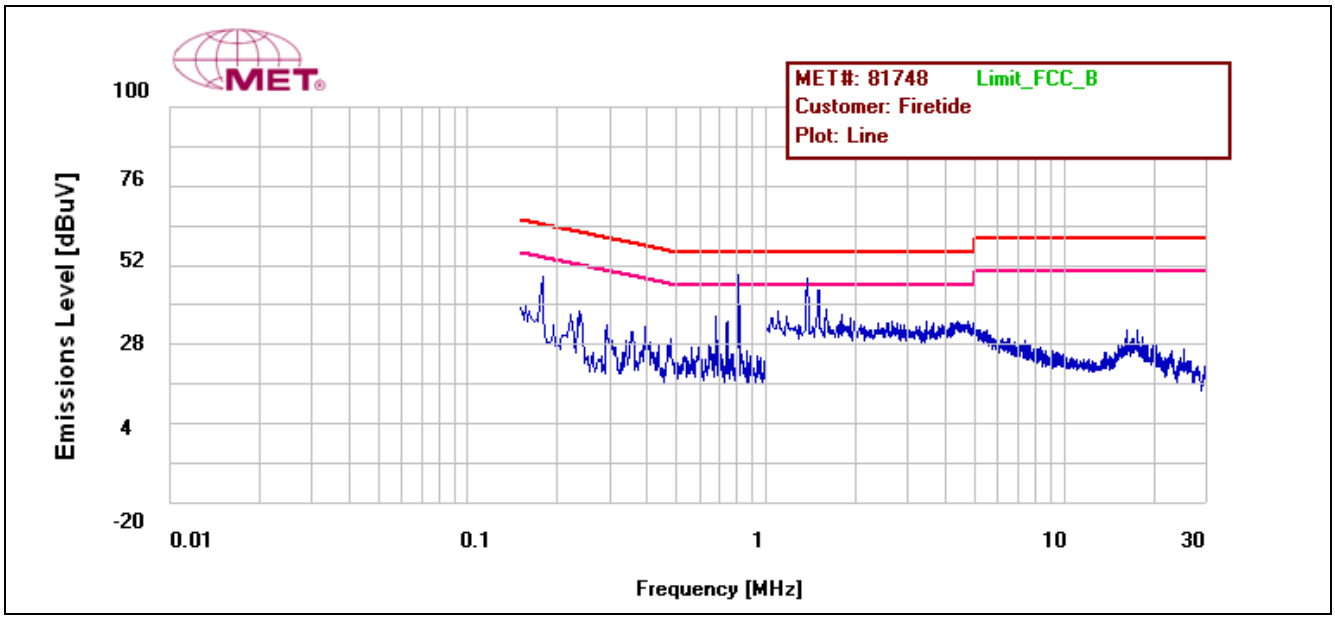
Test Results: The EUT was compliant with requirements of this section.

Test Engineer(s): Minh Ly

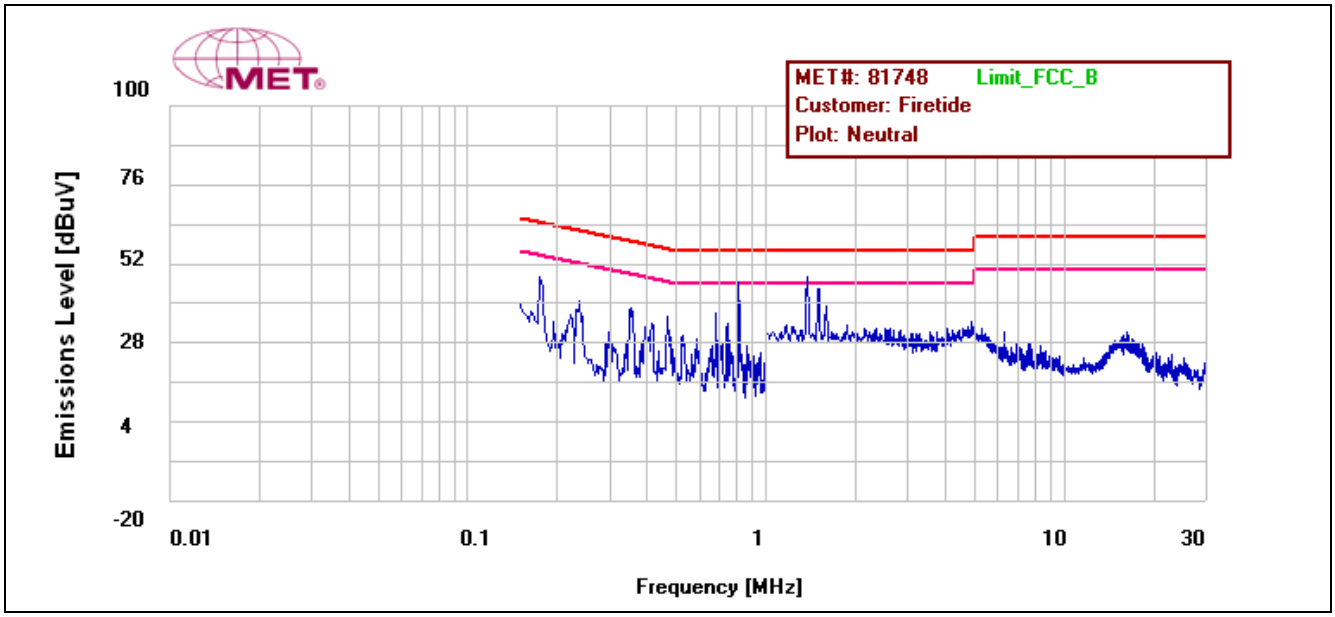
Test Date(s): 08/06/09

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
Line	0.81	48.12	56	-7.88	Pass	44.49	46	-1.51	Pass
Line	1.37	45.92	56	-10.08	Pass	41.87	46	-4.13	Pass
Line	1.5	40.81	56	-15.19	Pass	40.63	46	-5.37	Pass
Neutral	0.809	45.55	56	-10.45	Pass	43.78	46	-2.22	Pass
Neutral	1.37	46.16	56	-9.84	Pass	41.91	46	-4.09	Pass
Neutral	1.5	43.79	56	-12.21	Pass	40.02	46	-5.98	Pass

Table 16. Conducted Emissions, Test Results



Plot 39. Conducted Emissions, Phase Line



Plot 40. Conducted Emissions, Neutral Line

QP LIMIT
AVG LIMIT

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(e) 6 dB Bandwidth

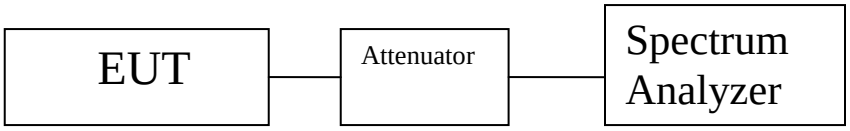
Test Requirements: **§ 15.407(e):** Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure: The transmitter was set to low, mid, and high operating frequencies at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately equal to 1% of the total emission bandwidth, VBW > RBW. The 6 dB Bandwidth was measured and recorded.

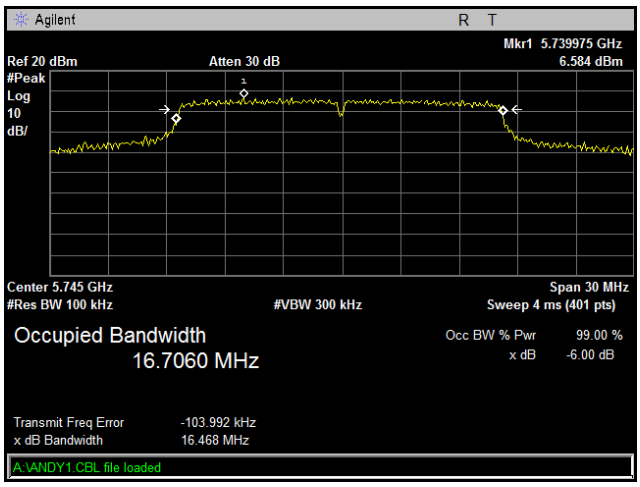
Test Results The 6 dB Bandwidth was compliant with the requirements of this section.

Test Engineer(s): Ajaz Khan

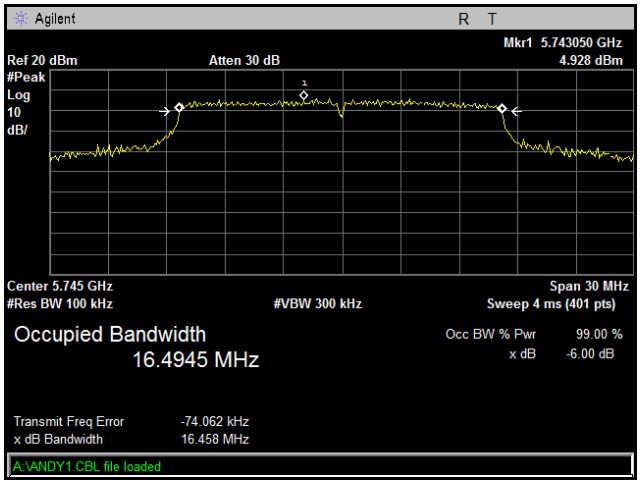
Test Date(s): 06/01/16



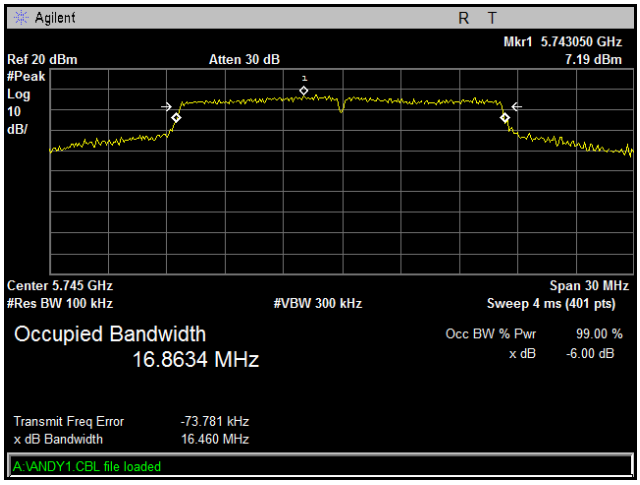
Occupied Bandwidth, 802.11a 20 MHz



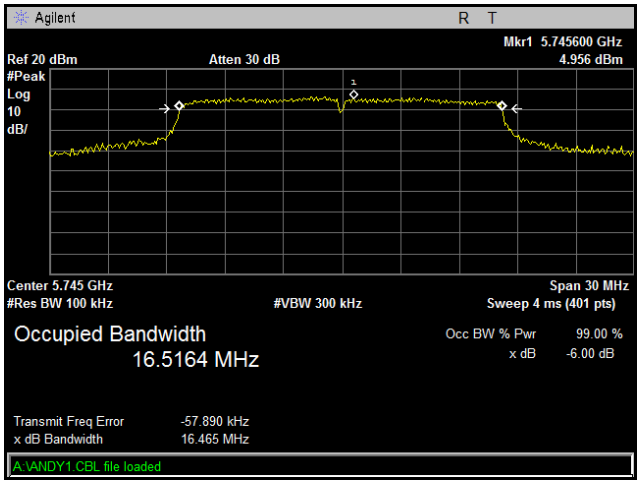
Plot 41. Occupied Band Width, Low Channel, 802.11a 20 MHz, Port R21



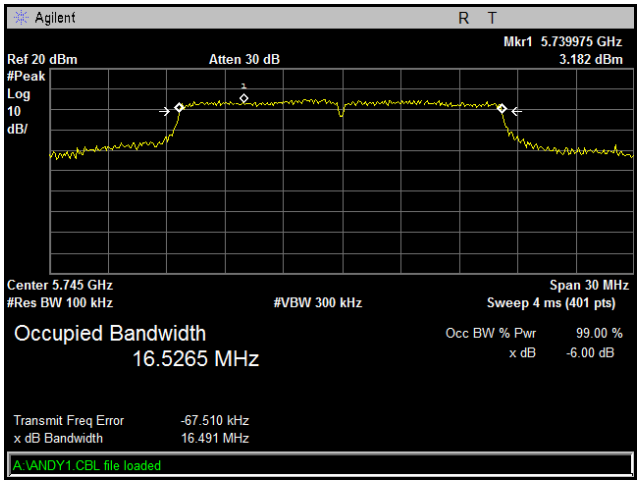
Plot 42. Occupied Band Width, Low Channel, 802.11a 20 MHz, Port R13



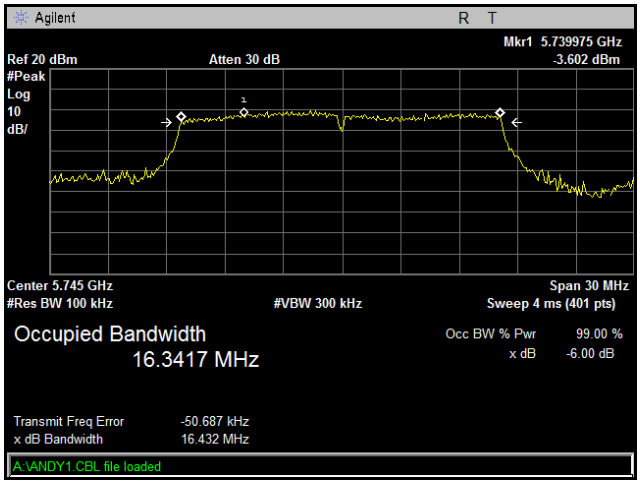
Plot 43. Occupied Band Width, Low Channel, 802.11a 20 MHz, Port R12



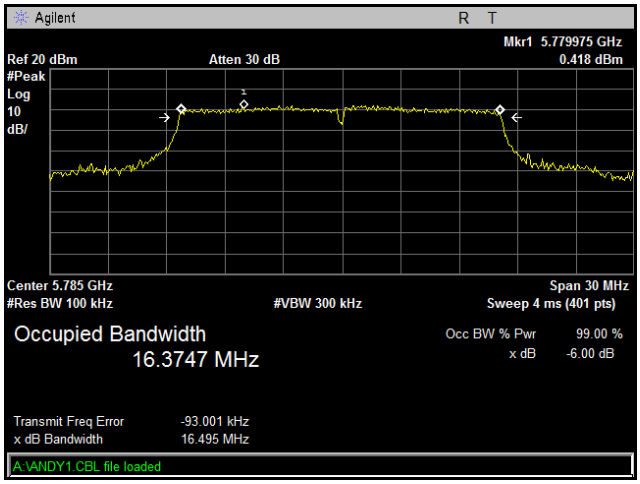
Plot 44. Occupied Band Width, Low Channel, 802.11a 20 MHz, Port R11



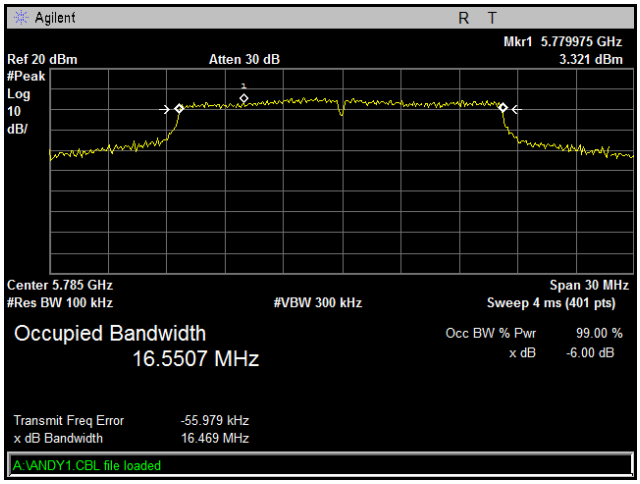
Plot 45. Occupied Band Width, Low Channel, 802.11a 20 MHz, Port R23



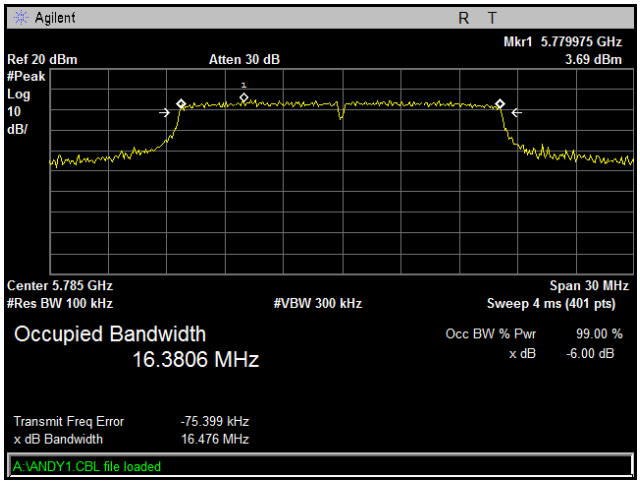
Plot 46. Occupied Band Width, Low Channel, 802.11a 20 MHz, Port R22



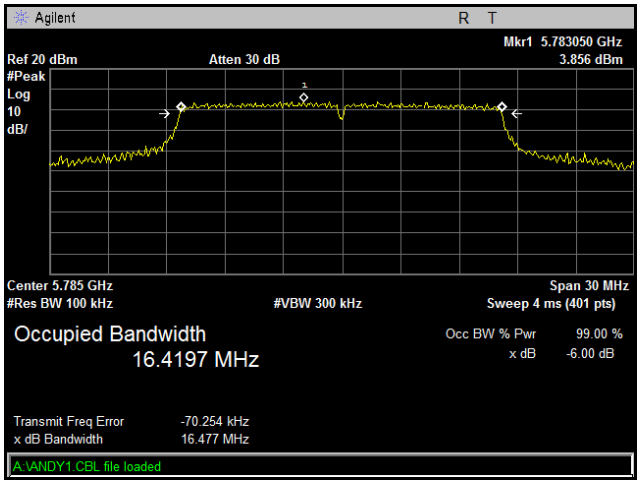
Plot 47. Occupied Band Width, Mid Channel, 802.11a 20 MHz, Port R23



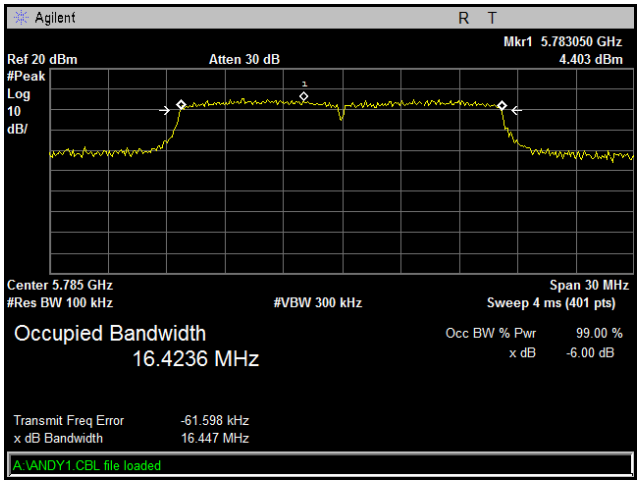
Plot 48. Occupied Band Width, Mid Channel, 802.11a 20 MHz, Port R22



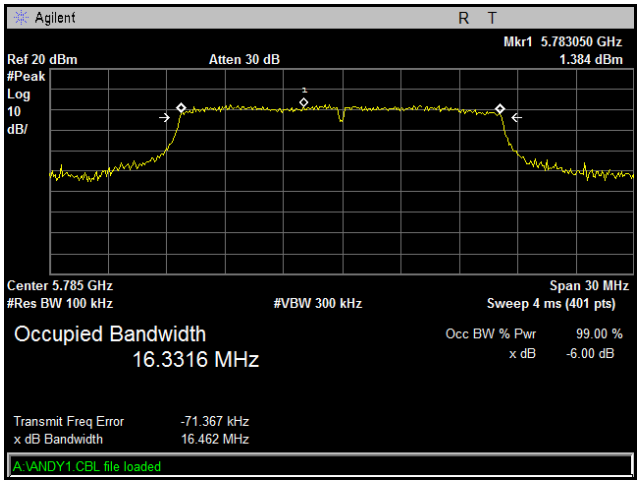
Plot 49. Occupied Band Width, Mid Channel, 802.11a 20 MHz, Port R21



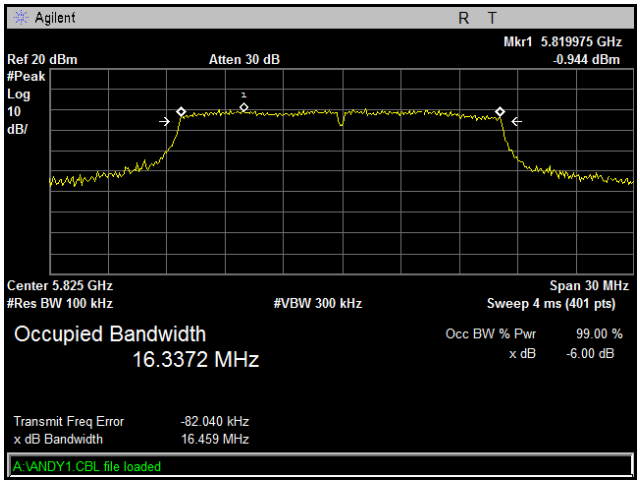
Plot 50. Occupied Band Width, Mid Channel, 802.11a 20 MHz, Port R13



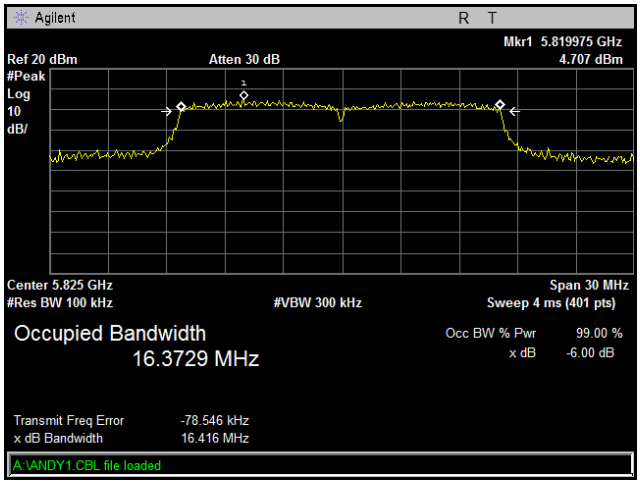
Plot 51. Occupied Band Width, Mid Channel, 802.11a 20 MHz, Port R12



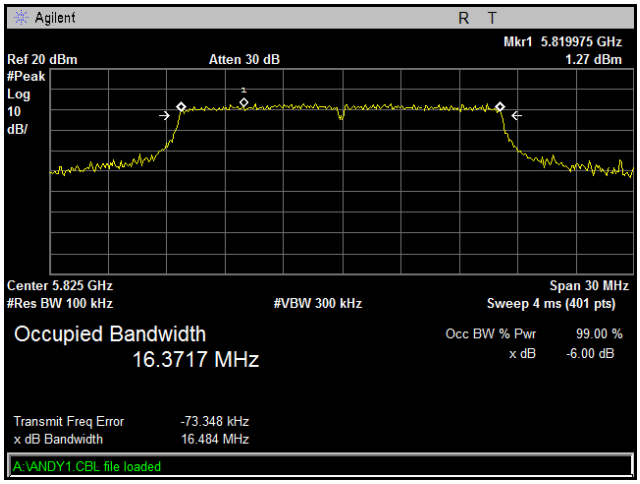
Plot 52. Occupied Band Width, Mid Channel, 802.11a 20 MHz, Port R11



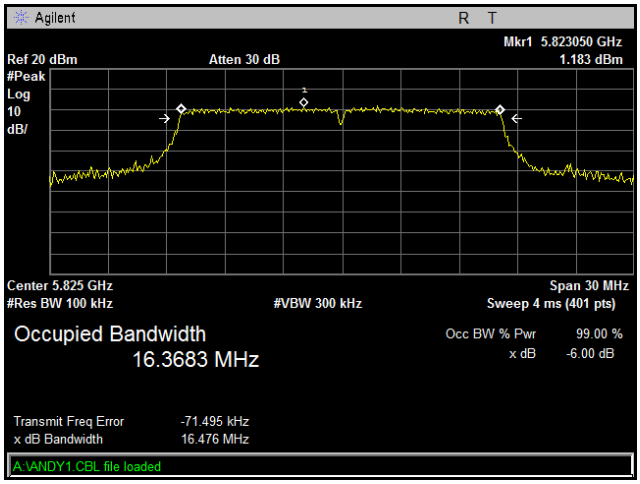
Plot 53. Occupied Band Width, High Channel, 802.11a 20 MHz, Port R23



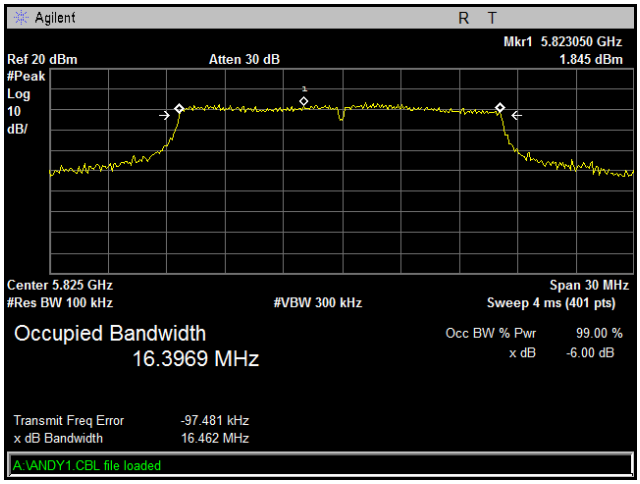
Plot 54. Occupied Band Width, High Channel, 802.11a 20 MHz, Port R22



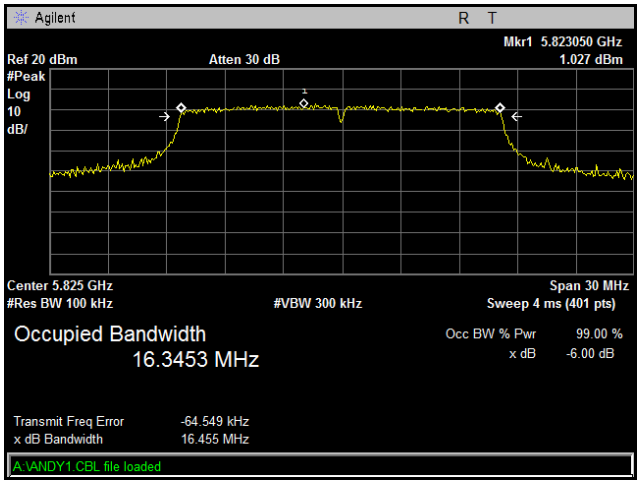
Plot 55. Occupied Band Width, High Channel, 802.11a 20 MHz, Port R21



Plot 56. Occupied Band Width, High Channel, 802.11a 20 MHz, Port R13

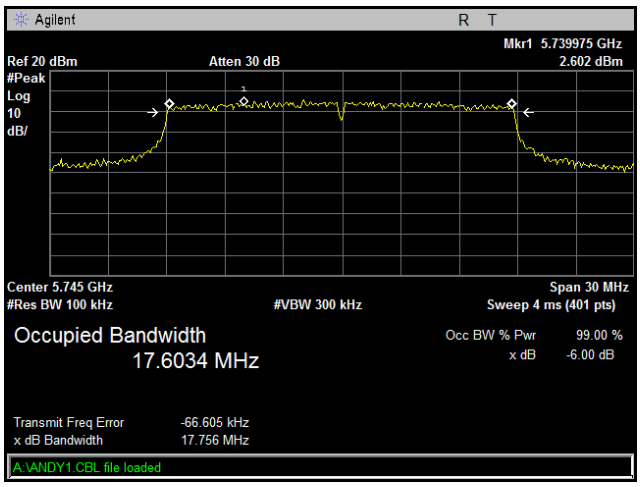


Plot 57. Occupied Band Width, High Channel, 802.11a 20 MHz, Port R12

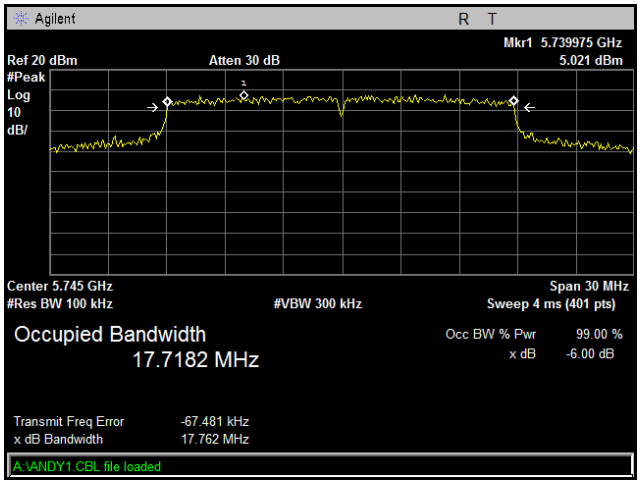


Plot 58. Occupied Band Width, High Channel, 802.11a 20 MHz, Port R11

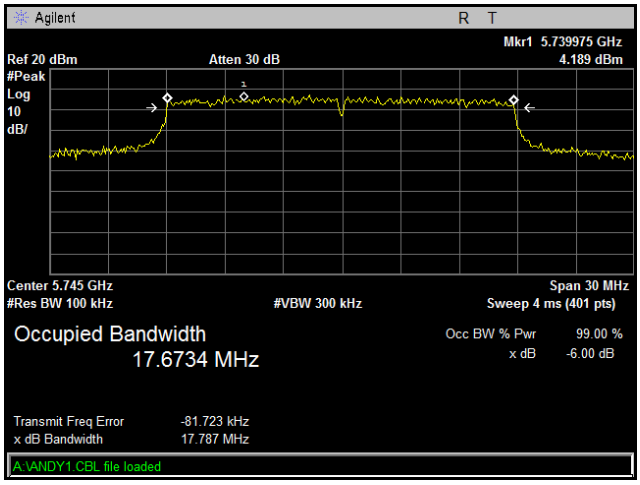
Occupied Bandwidth, 802.11n 20 MHz



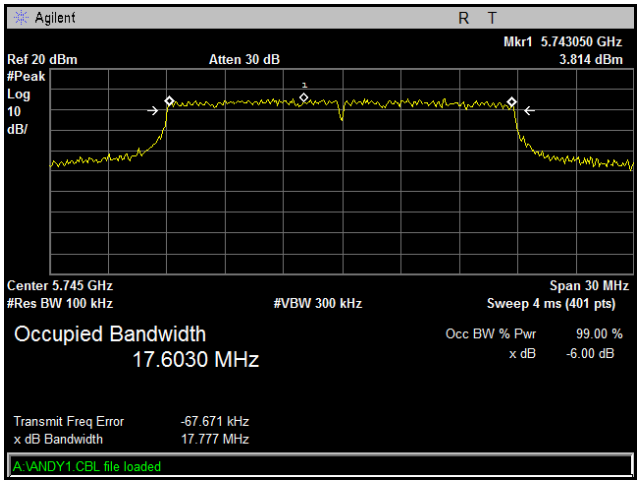
Plot 59. Occupied Band Width, Low Channel, 802.11n 20 MHz, Port R23



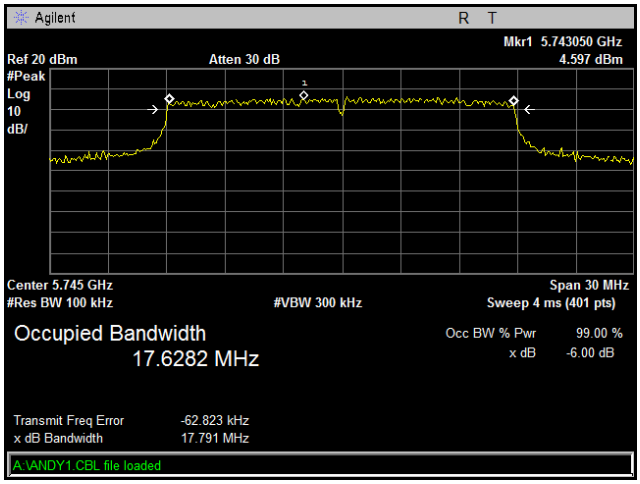
Plot 60. Occupied Band Width, Low Channel, 802.11n 20 MHz, Port R22



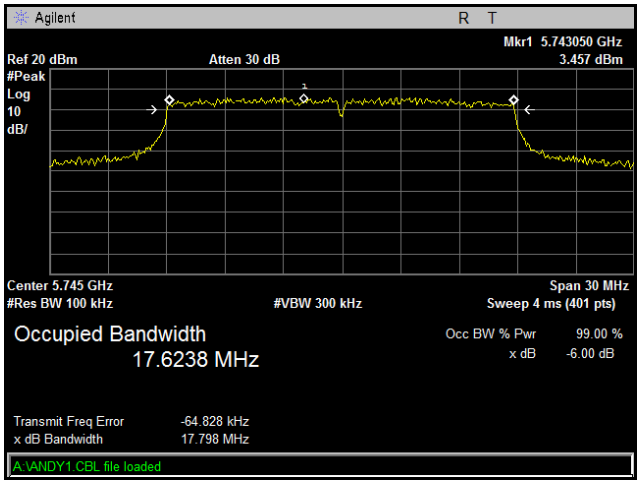
Plot 61. Occupied Band Width, Low Channel, 802.11n 20 MHz, Port R21



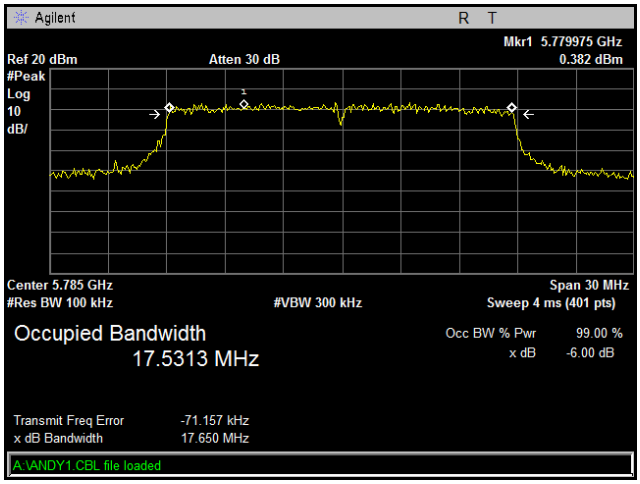
Plot 62. Occupied Band Width, Low Channel, 802.11n 20 MHz, Port R13



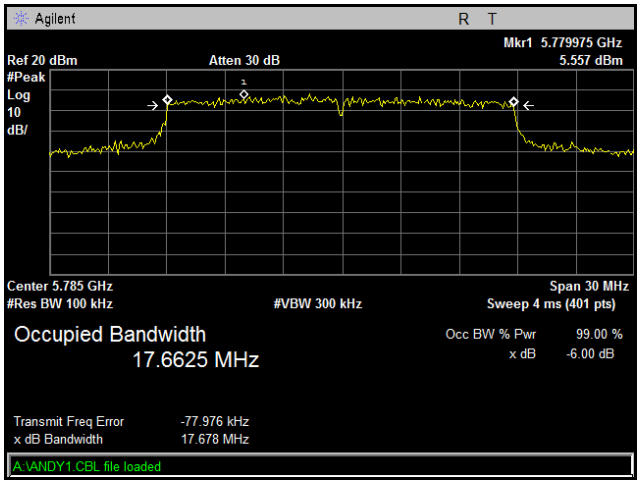
Plot 63. Occupied Band Width, Low Channel, 802.11n 20 MHz, Port R12



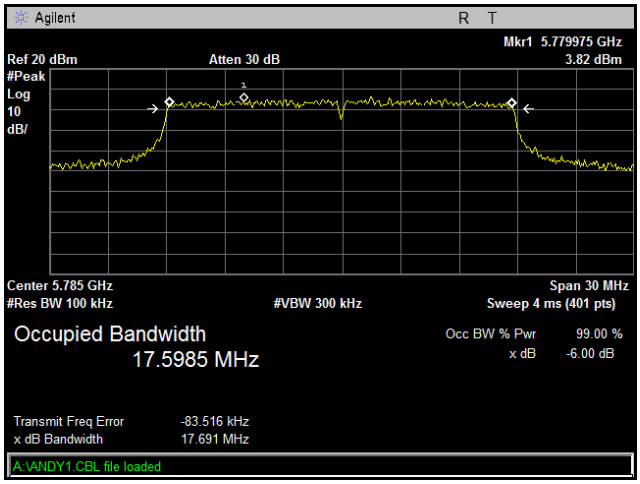
Plot 64. Occupied Band Width, Low Channel, 802.11n 20 MHz, Port R11



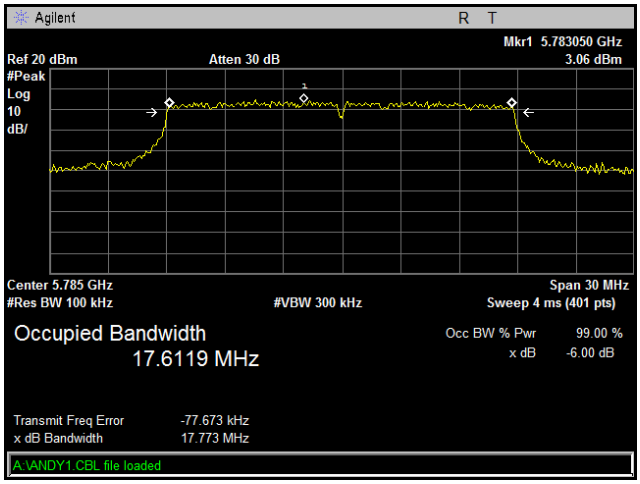
Plot 65. Occupied Band Width, Mid Channel, 802.11n 20 MHz, Port R23



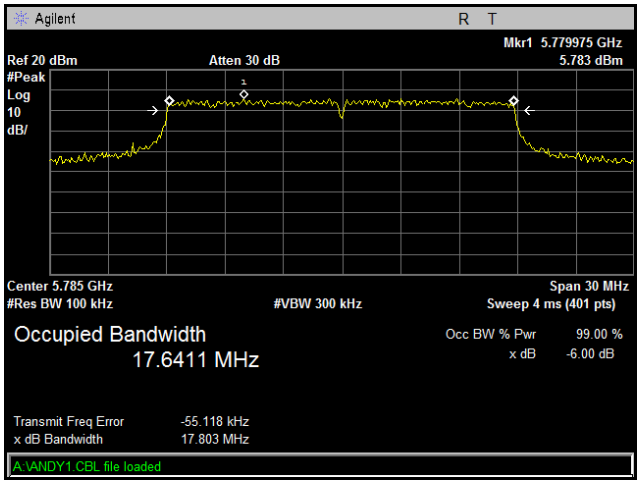
Plot 66. Occupied Band Width, Mid Channel, 802.11n 20 MHz, Port R22



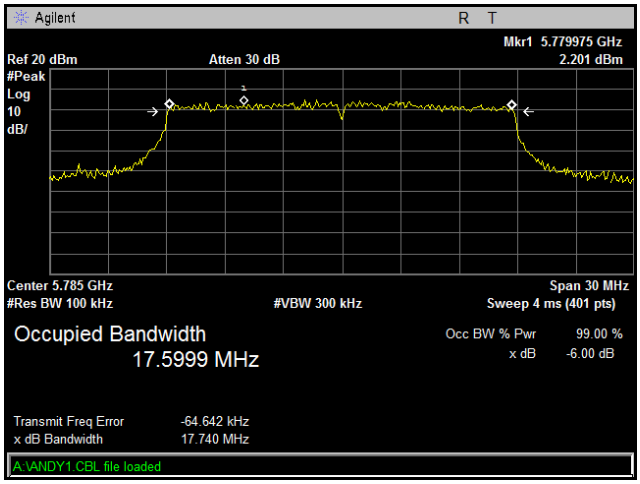
Plot 67. Occupied Band Width, Mid Channel, 802.11n 20 MHz, Port R21



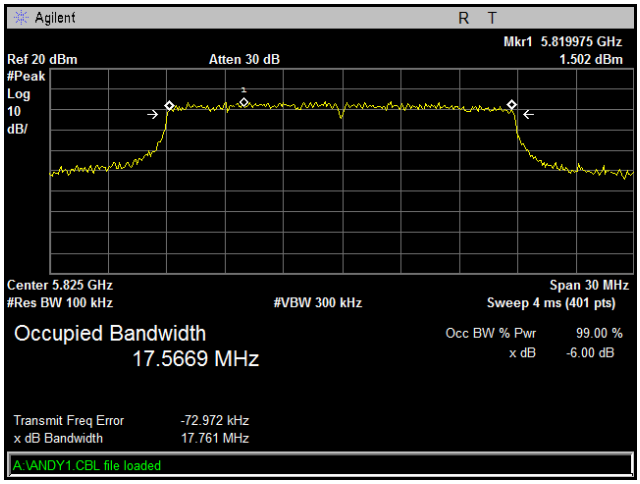
Plot 68. Occupied Band Width, Mid Channel, 802.11n 20 MHz, Port R13



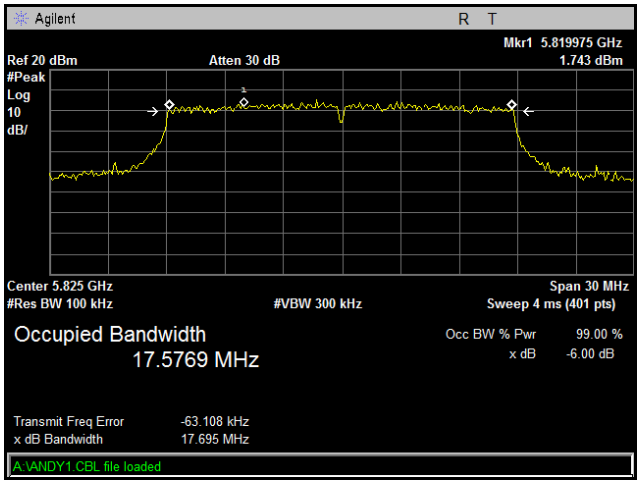
Plot 69. Occupied Band Width, Mid Channel, 802.11n 20 MHz, Port R12



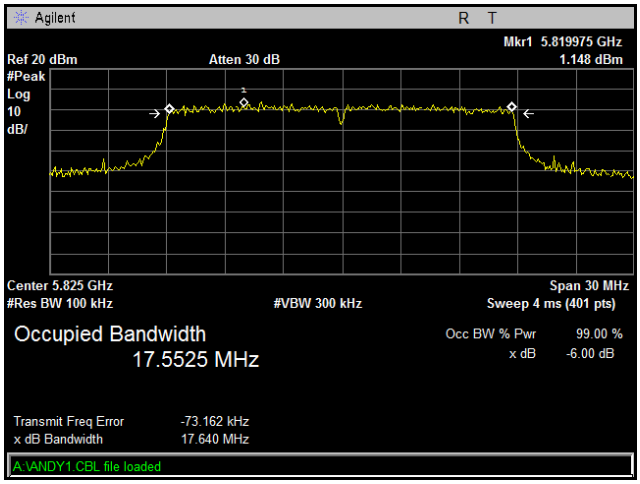
Plot 70. Occupied Band Width, Mid Channel, 802.11n 20 MHz, Port R11



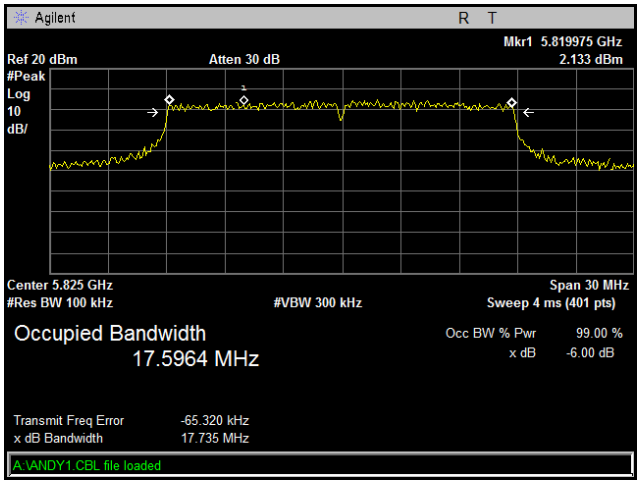
Plot 71. Occupied Band Width, High Channel, 802.11n 20 MHz, Port R12



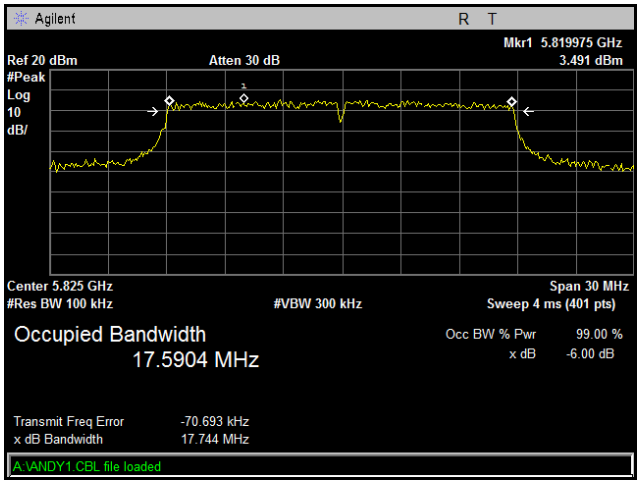
Plot 72. Occupied Band Width, High Channel, 802.11n 20 MHz, Port R11



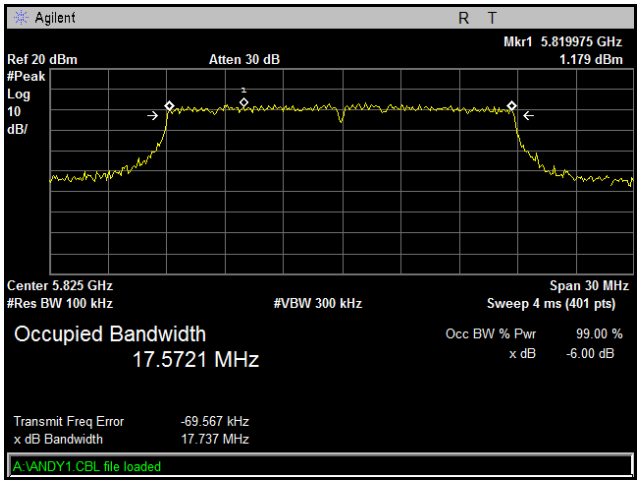
Plot 73. Occupied Band Width, High Channel, 802.11n 20 MHz, Port R23



Plot 74. Occupied Band Width, High Channel, 802.11n 20 MHz, Port R22

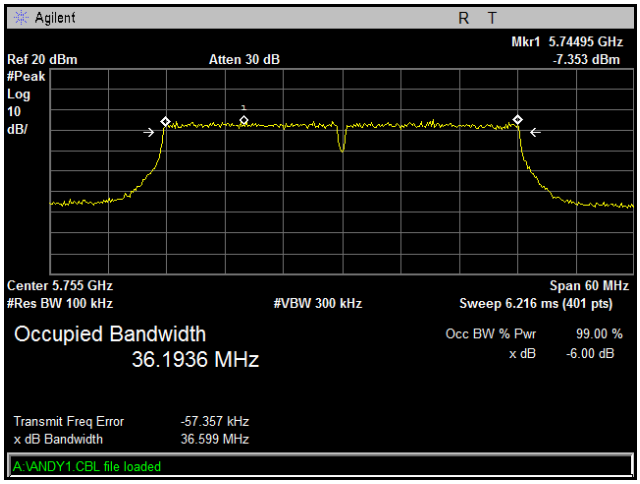


Plot 75. Occupied Band Width, High Channel, 802.11n 20 MHz, Port R21

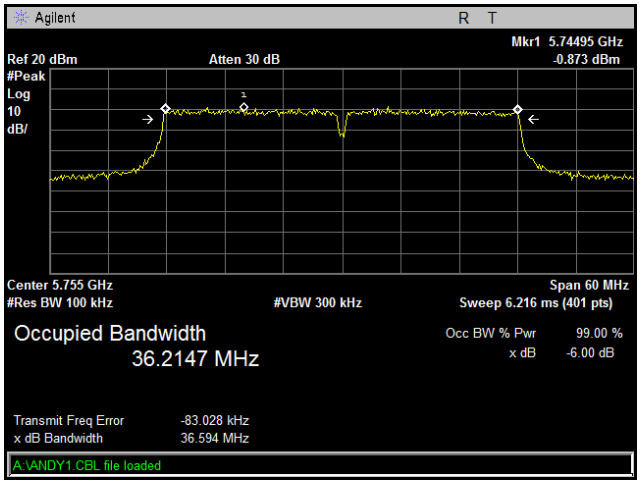


Plot 76. Occupied Band Width, High Channel, 802.11n 20 MHz, Port R13

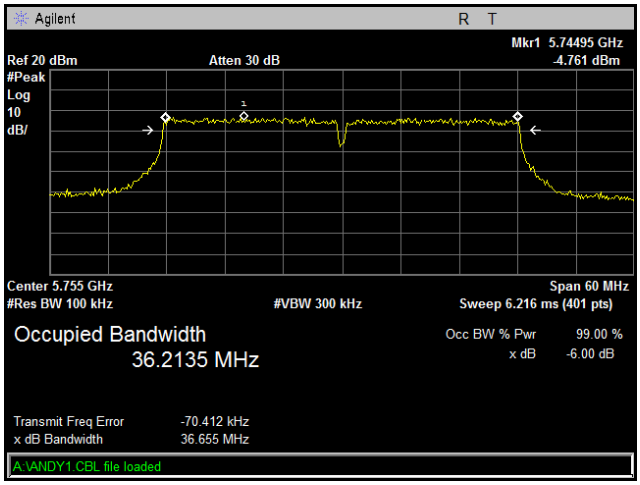
Occupied Bandwidth, 802.11n 40 MHz



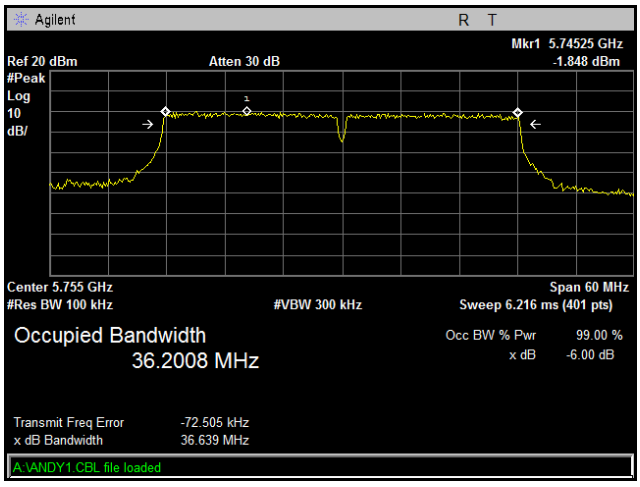
Plot 77. Occupied Band Width, Low Channel, 802.11n 40 MHz, Port R23



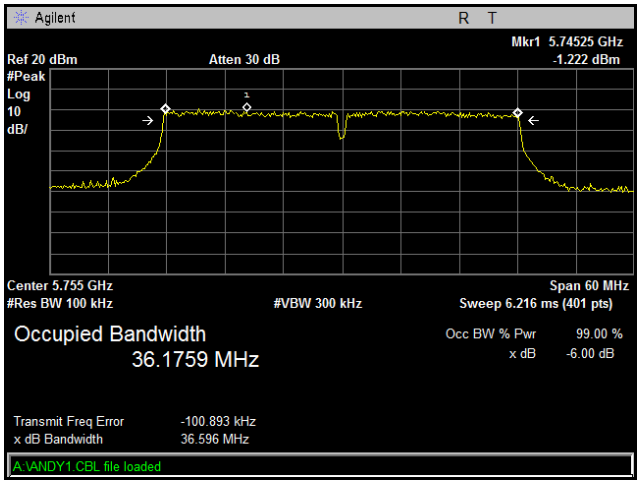
Plot 78. Occupied Band Width, Low Channel, 802.11n 40 MHz, Port R22



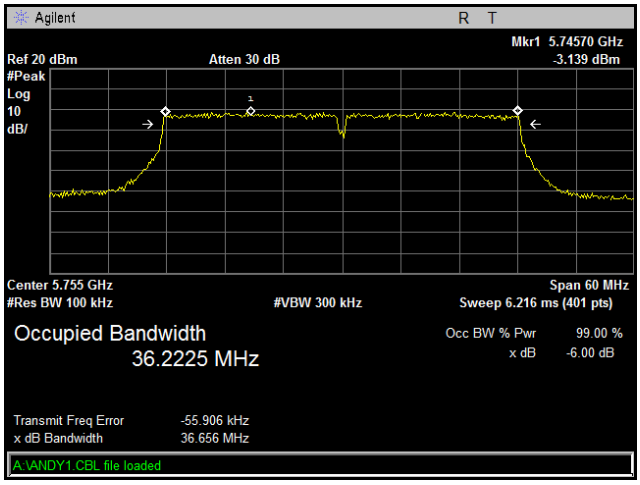
Plot 79. Occupied Band Width, Low Channel, 802.11n 40 MHz, Port R21



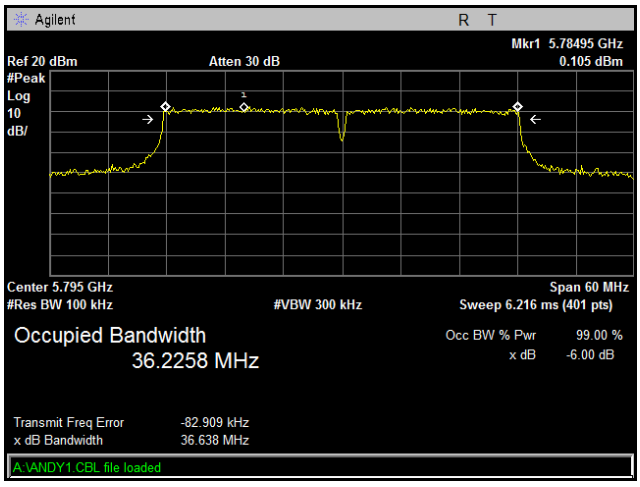
Plot 80. Occupied Band Width, Low Channel, 802.11n 40 MHz, Port R13



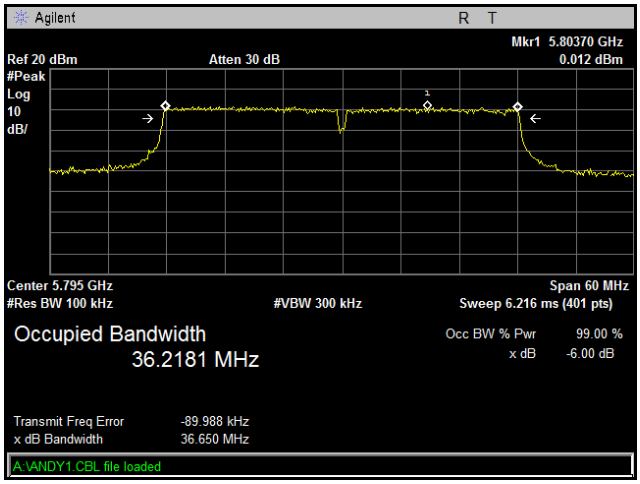
Plot 81. Occupied Band Width, Low Channel, 802.11n 40 MHz, Port R12



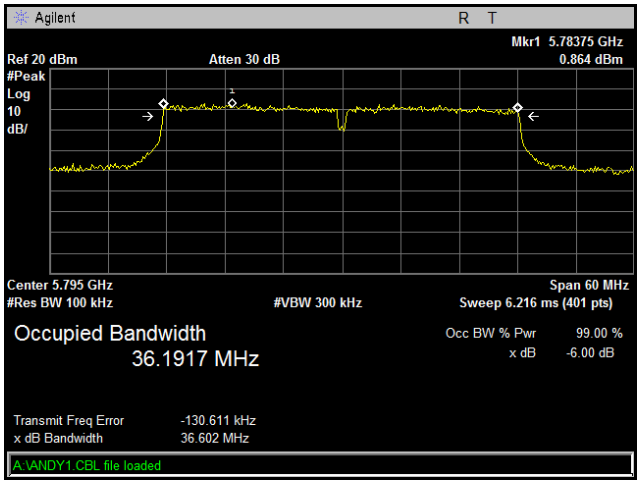
Plot 82. Occupied Band Width, Low Channel, 802.11n 40 MHz, Port R11



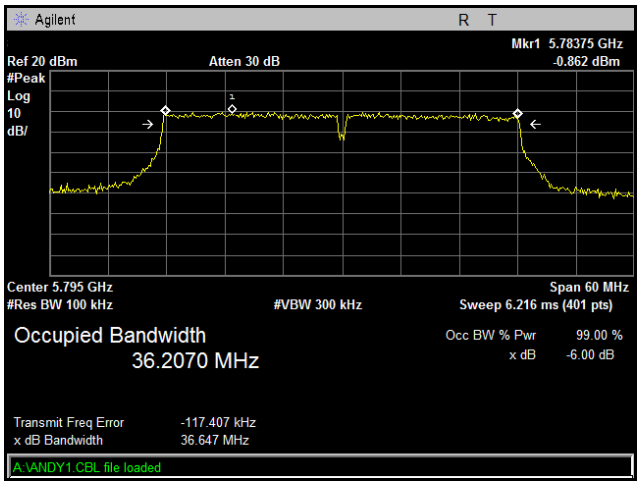
Plot 83. Occupied Band Width, High Channel, 802.11n 40 MHz, Port R21



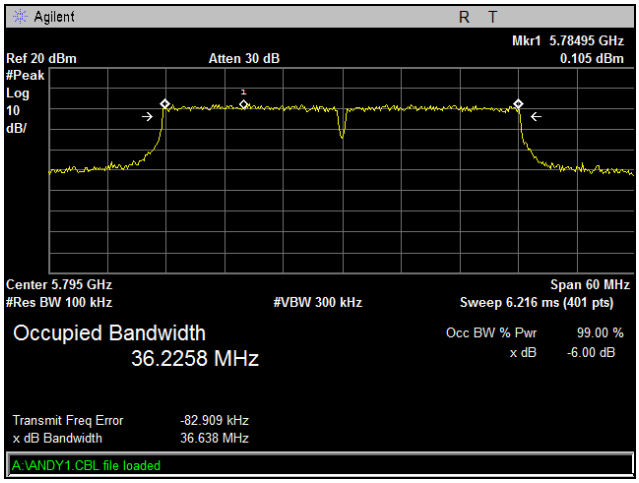
Plot 84. Occupied Band Width, High Channel, 802.11n 40 MHz, Port R13



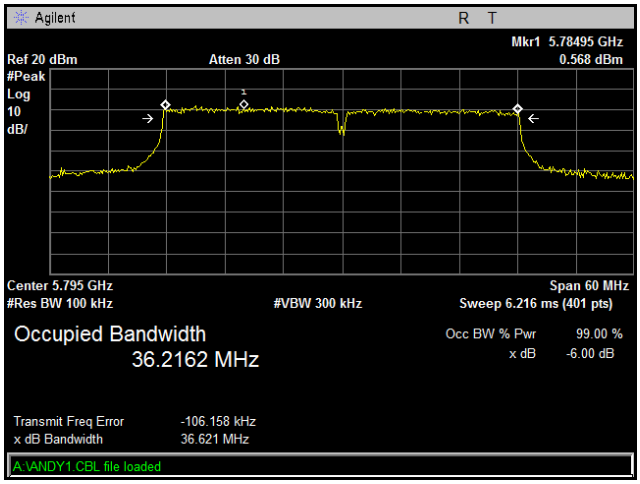
Plot 85. Occupied Band Width, High Channel, 802.11n 40 MHz, Port R12



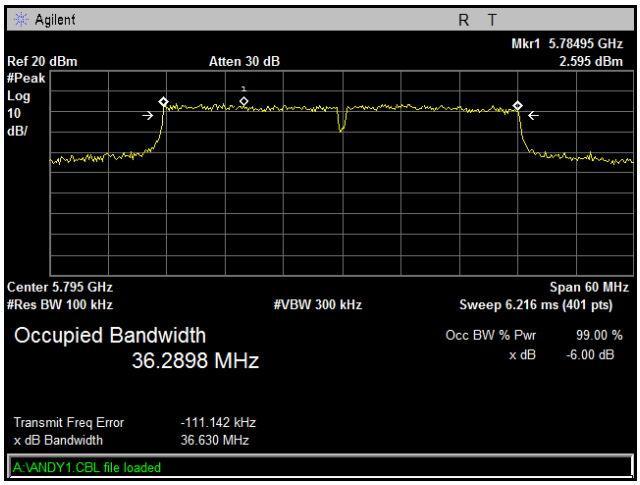
Plot 86. Occupied Band Width, High Channel, 802.11n 40 MHz, Port R11



Plot 87. Occupied Band Width, High Channel, 802.11n 40 MHz, Port R21



Plot 88. Occupied Band Width, High Channel, 802.11n 40 MHz, Port R23



Plot 89. Occupied Band Width, High Channel, 802.11n 40 MHz, Port R22

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) Maximum Permissible Exposure

Test Requirement(s): **§15.407(f):** U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment.

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.

Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm^2)	Limit (mW/cm^2)	Margin	Distance (cm)	Result
5745	26.19	415.911	5	3.162	0.26166	1	0.73834	20	Pass

IV. Test Equipment

Test Equipment

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

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1U0150	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	6/9/2016	6/9/2017
1U0286	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	5/10/2016	5/10/2017
1U0027	PREAMPLIFIER	HEWLETT PACKARD	08449B H02	SEE NOTE	SEE NOTE
1U0007	ANTENNA, HORN	EMCO	3115	4/5/2016	4/5/2018
1U0032	SEMI- ANECHOIC 5M CHAMBER (FACT 4) (NSA)	LINDGREN ENCLOSURES	FACT 4	11/20/2015	11/20/2016
1S2438	TRANSIENT LIMITER (9KHZ-200 MHZ)	AGILENT	11947A	SEE NOTE	
1S2460	1-26GHZ SPECTRUM ANALYZER	AGILENT	E4407B	4/14/2009	4/14/2010
1S2464	LINE IMPEDANCE STABILIZATION NETWORK	SOLAR ELECTRONICS	9252-50-R24-BNC	9/26/2008	9/26/2009
1S2490	GROUND PLANE 2	MET LABS	N/A	1/27/2009	1/27/2010
1S2460	ANALYZER, SPECTRUM 9 KHZ-26.5GHZ	AGILENT	E4407B	10/27/2015	10/27/2016

Table 17. Test Equipment List

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

V. Certification & User's Manual Information

Certification & User's Manual Information

L. 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.

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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.

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§ 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.

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Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

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

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

End of Report

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