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

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April 14, 2015

Arris Group Inc.
3871 Lakefield Drive, Suite 300
Suwanee, GA 30024

Dear Tony Figueiredo,

Enclosed is the EMC Wireless test report for Class II Permissive Change compliance testing of the Arris Group Inc., SBG 6700AC 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 1) 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: (\Arris Group Inc.\ EMC85104-FCC407 UNII 1 Rev. 1)

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Electromagnetic Compatibility Criteria
Class II Permissive Change Test Report

for the

Arris Group Inc.
Model SBG 6700AC

Tested under
The FCC Certification Rules
contained in
Title 47 of the CFR
Part 15.407 for Intentional Radiators

MET Report: EMC85104-FCC407 UNII 1 Rev. 1

April 14, 2015

Prepared For:

Arris Group Inc.
3871 Lakefield Drive, Suite 300
Suwanee, GA 30024

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

Electromagnetic Compatibility Criteria
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contained in
Title 47 of the CFR
Part 15.407 for Intentional Radiators

Surinder Singh, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

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

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

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Report Status Sheet

Revision	Report Date	Reason for Revision
∅	April 1, 2015	Initial Issue.
1	May 14, 2015	Engineer corrections.

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List of Terms and Abbreviations

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

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I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Arris Group Inc. SBG 6700AC, 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 SBG 6700AC. Arris Group Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the SBG 6700AC, 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 Arris Group Inc., purchase order number AR1056767. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	Description	Results
§15.203	Antenna Requirements	Compliant
§15.207	AC Conducted Emissions 150KHz – 30MHz	Compliant
§15.403 (i)	26dB Occupied Bandwidth	Compliant
§15.407 (a)(1)(ii)	Conducted Transmitter Output Power	Compliant
§15.407 (a)(1)(ii)	Power Spectral Density	Compliant
§15.407 (b)(1), (6), (7)	Undesirable Emissions (15.205/15.209 - General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
§15.407(f)	RF Exposure	Compliant
§15.407(g)	Frequency Stability	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

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II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Arris Group Inc. to perform testing on the SBG 6700AC, under Arris Group Inc.'s purchase order number AR1056767.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Arris Group Inc. SBG 6700AC.

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

Model(s) Tested:	SBG 6700AC	
Model(s) Covered:	SBG 6700AC	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	Class II Permissive Change FCC ID: UIDSBG6700	
	Type of Modulations:	CCK, BPSK, QPSK, 16-QAM, 64-QAM and 256-QAM
	Equipment Code:	NII
	Peak RF Output Power:	24.16dBm
	EUT Frequency Ranges:	5.180 to 5.240 GHz
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:	Surinder Singh	
Report Date(s):	April 14, 2015	

Table 2. EUT Summary

**Note: This report has Class II Permissive Change testing data to support transmit Beam Forming functionality of SBG6700.

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B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
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
KDB 789033 D02	General UNII Test Procedures New Rules V01

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 Arris Group Inc. SBG 6700AC, Equipment Under Test (EUT), is an indoor 5G indoor data gateway

E. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number	Rev. #
NA	SBG6700	SBG6700	NA	NA

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
NA	Laptop	Dell	Vostro
NA	Laptop Mouse	Logitech	NA
NA	RF Cable	NA	NA
NA	Ethernet cable	NA	NA
NA	12 Vdc PS	Asian Power Devices	WA-24I12FU
NA	CMTS	ARRIS C4	NA

Table 5. Support Equipment

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G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
1	RF	RG6 Coax	1	8	NA	Yes	NA
2	DC	12Vdc, 22 AWG x 2C	1	2	NA	No	NA
3	Ethernet	Cat 5E 24AWG/4P	1	2	NA	No	NA

Table 6. Ports and Cabling Information

H. Mode of Operation

The provided test tool will configure the SBG6700 for operation at each required test mode. Test modes have been previously supplied. See Configuration – Wireless – SBG6700.

I. Method of Monitoring EUT Operation

The measured emission value is over the specified FCC limits.

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 Arris Group Inc. upon completion of testing.

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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 to the criteria of §15.203. EUT has an internal antenna.

Test Engineer(s): Surinder Pal Singh

Test Date(s): 03/04/15

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions Limits

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

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

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

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

Test Results: The EUT was compliant with this requirement.

Test Engineer(s): Surinder Singh

Test Date(s): 03/04/15

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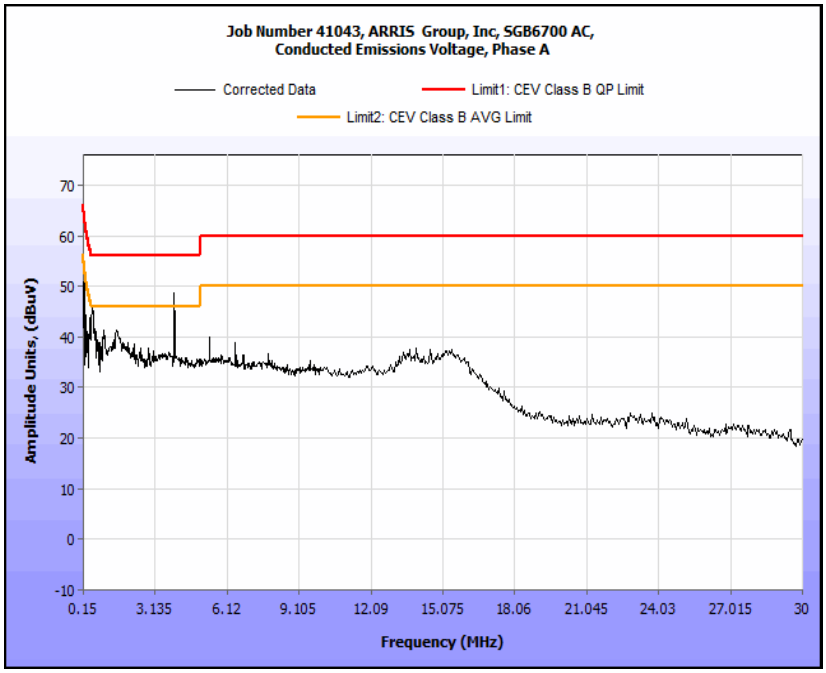
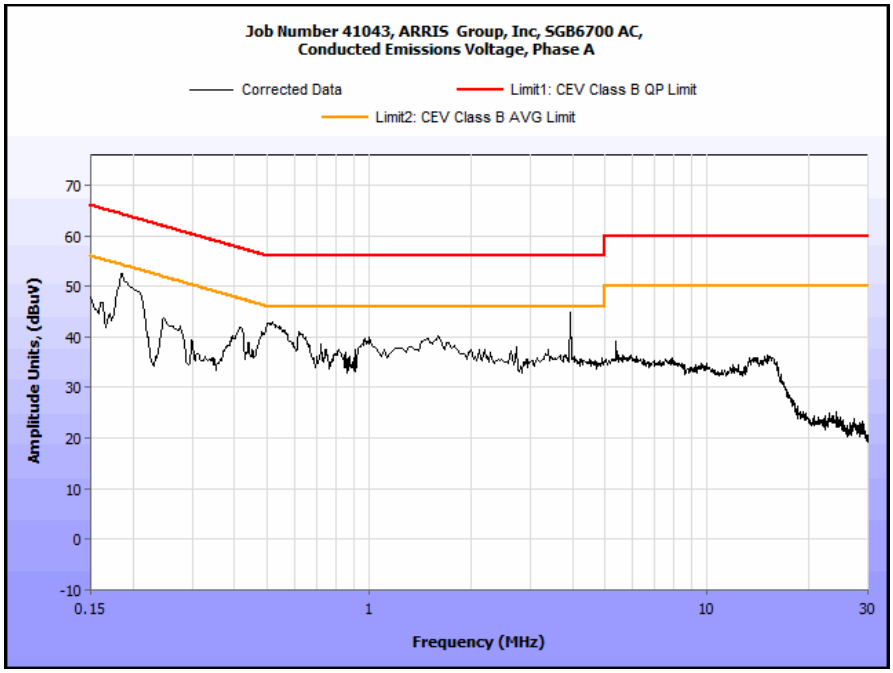
15.207(a) Conducted Emissions Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBµV) QP	Cable Loss (dB)	Corrected Measurement (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBµV) Avg.	Cable Loss (dB)	Corrected Measurement (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.186	47.76	0	47.76	64.21	-16.45	34.2	0	34.2	54.21	-20.01
0.512	40.09	0	40.09	56	-15.91	29.03	0	29.03	46	-16.97
1.492	35.82	0	35.82	56	-20.18	23.46	0	23.46	46	-22.54
3.926	35.5	0.11	35.61	56	-20.39	20.27	0.11	20.38	46	-25.62
7.775	30.49	0.17	30.66	60	-29.34	22.76	0.17	22.93	50	-27.07
24.892	27.38	0.17	27.55	60	-32.45	19.03	0.17	19.2	50	-30.8

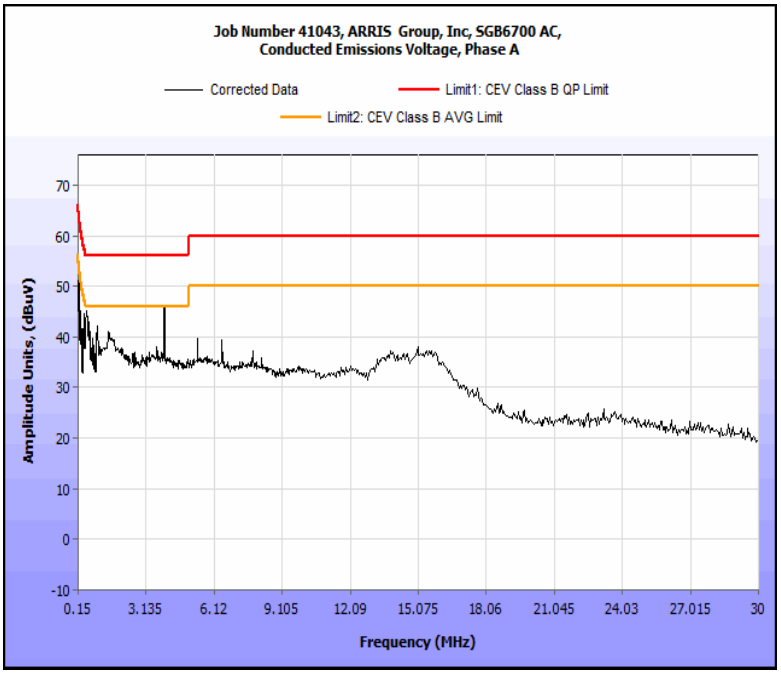
Table 8. Conducted Emissions, 15.207(a), Phase Line, Test Results



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



Plot 2. Conducted Emissions, 15.207(a), Phase Line, Mid Channel



Plot 3. Conducted Emissions, 15.207(a), Phase Line, High Channel

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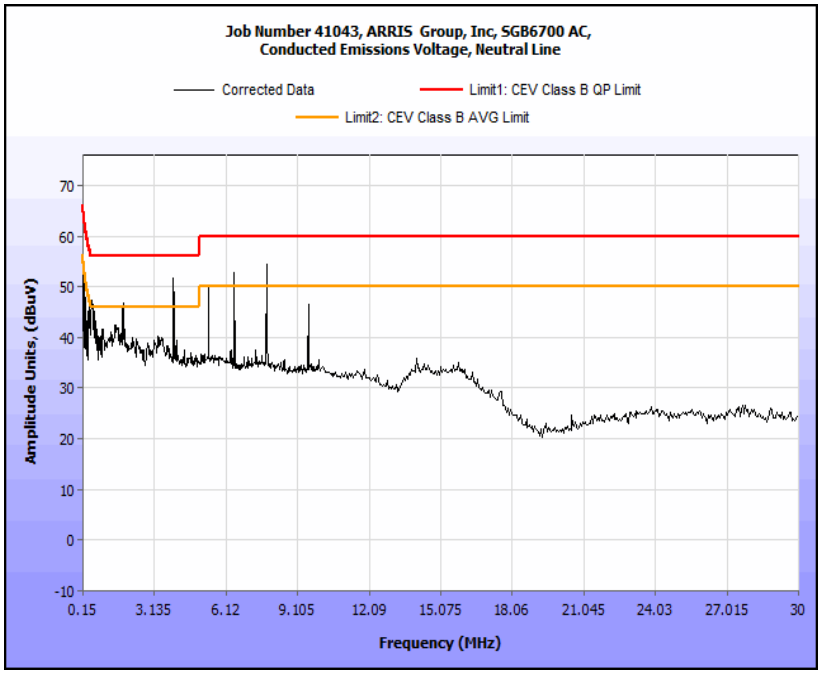
15.207(a) Conducted Emissions Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBµV) QP	Cable Loss (dB)	Corrected Measurement (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBµV) Avg.	Cable Loss (dB)	Corrected Measurement (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.154	50.69	0	50.69	65.78	-15.09	41.14	0	41.14	55.78	-14.64
0.418	45.64	0	45.64	57.49	-11.85	32.65	0	32.65	47.49	-14.84
1.232	35.57	0	35.57	56	-20.43	24.42	0	24.42	46	-21.58
3.927	49.41	0.11	49.52	56	-6.48	24.9	0.11	25.01	46	-20.99
7.818	48.48	0.17	48.65	60	-11.35	26	0.17	26.17	50	-23.83
25.16	20.29	0.17	20.46	60	-39.54	15.57	0.17	15.74	50	-34.26

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



Plot 4. Conducted Emissions, 15.207(a), Neutral Line, Low Channel

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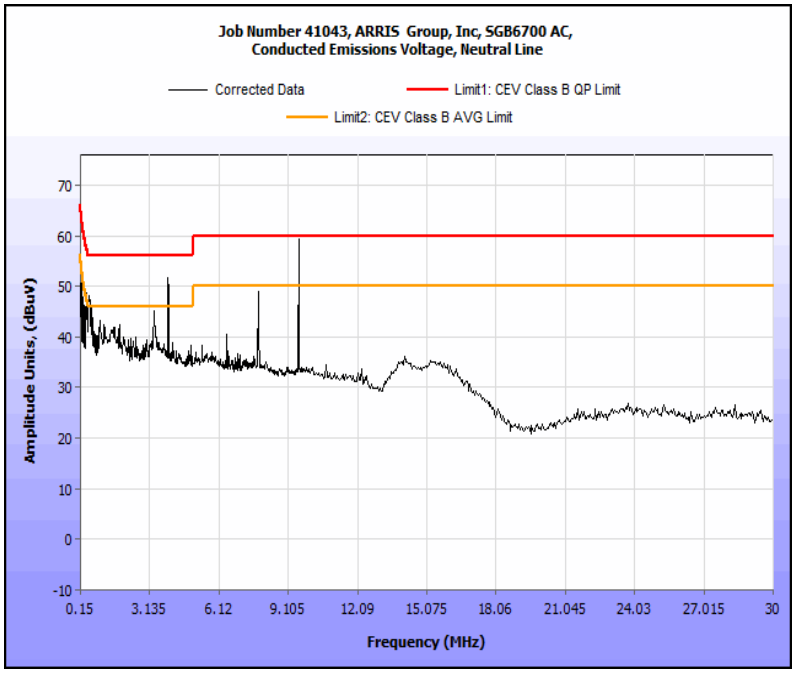
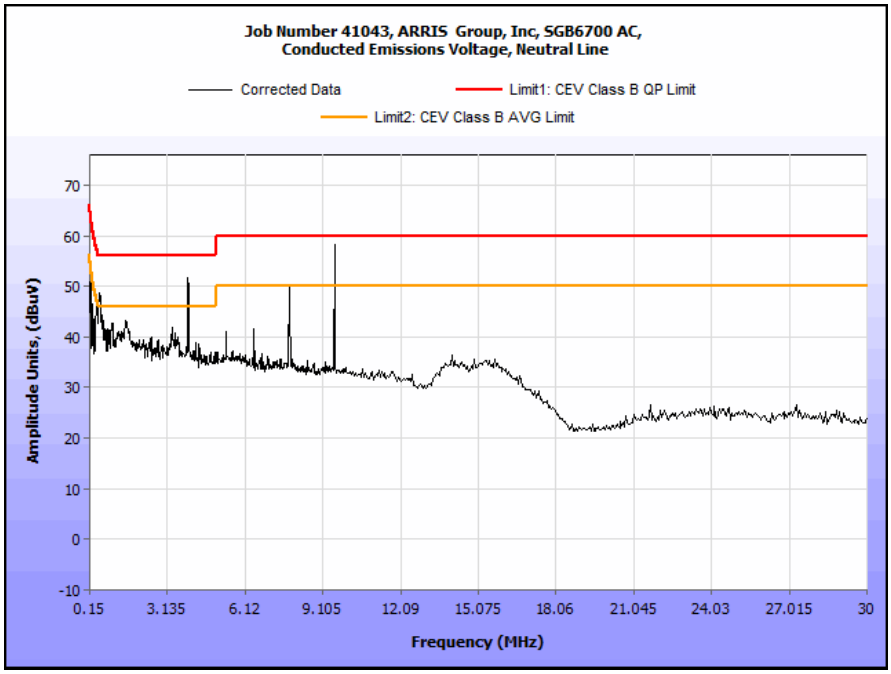


Plot 5. Conducted Emissions, 15.207(a), Neutral Line, Mid Channel



Plot 6. Conducted Emissions, 15.207(a), Neutral Line, High Channel

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15.207(a) Conducted Emissions Test Setup Photo

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

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26dB Bandwidth

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

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

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

Test Engineer(s): Surinder Singh

Test Date(s): 03/04/15

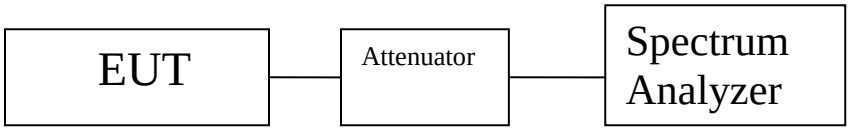

Figure 1. Occupied Bandwidth, Test Setup

Occupied Bandwidth Test Results

26dB Occupied Bandwidth, 5GHz, U-NII-1			
	Carrier Channel	**Frequency (MHz)**	**Occupied Bandwidth (MHz)**
802.11n 20 MHz	Low	5180	20.168
	Mid	5200	20.131
	High	5240	20.115
802.11n 40MHz	Low	5190	39.958
	High	5230	39.674
802.11ac 20 MHz	Low	5180	20.321
	Mid	5200	20.289
	High	5240	20.555
802.11ac 40MHz	Low	5190	39.938
	High	5230	39.862
802.11ac 80MHz	mid	5210	81.517

Table 8. 26 dB Occupied Bandwidth, Test Results

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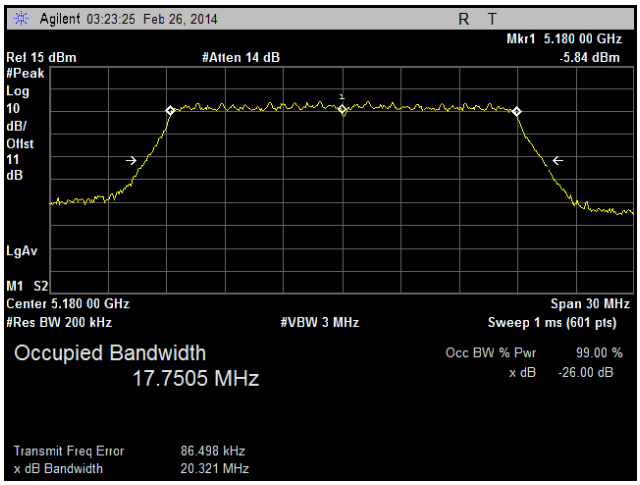
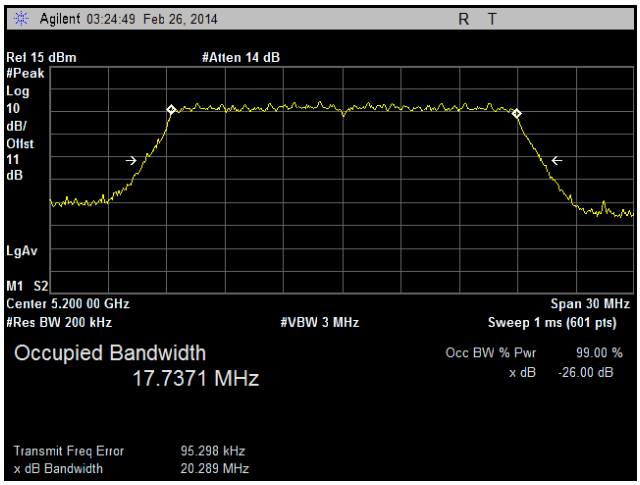
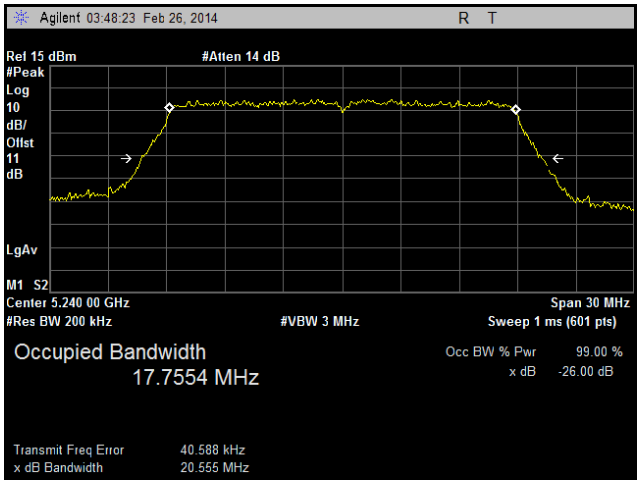
26 dB Occupied Bandwidth Test Results, 802.11ac 20 MHz



Plot 1. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 20 MHz



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



Plot 3. 26 dB Occupied Bandwidth, High Channel, 802.11ac 20 MHz

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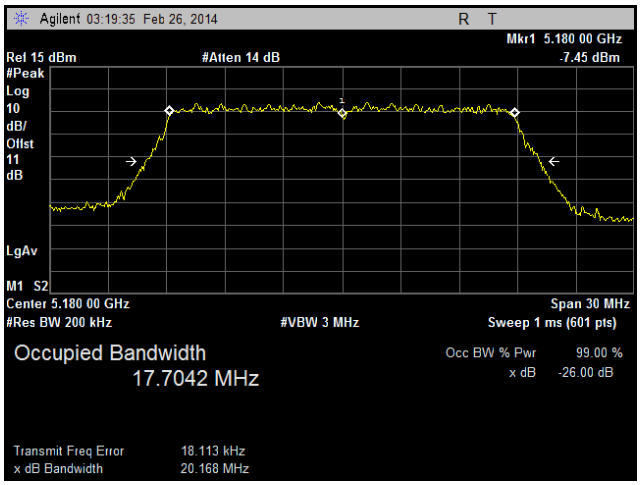
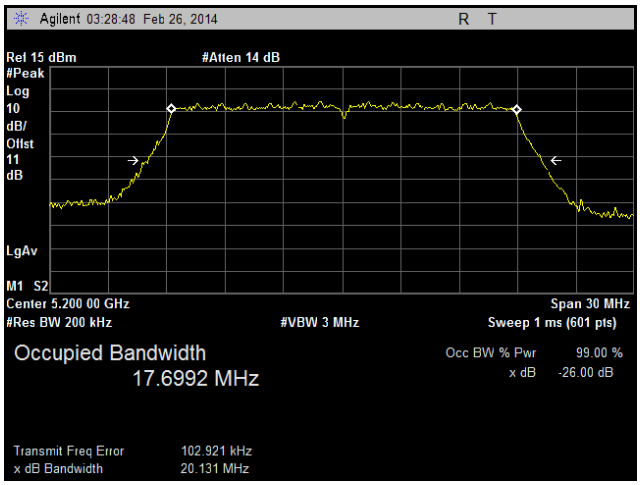
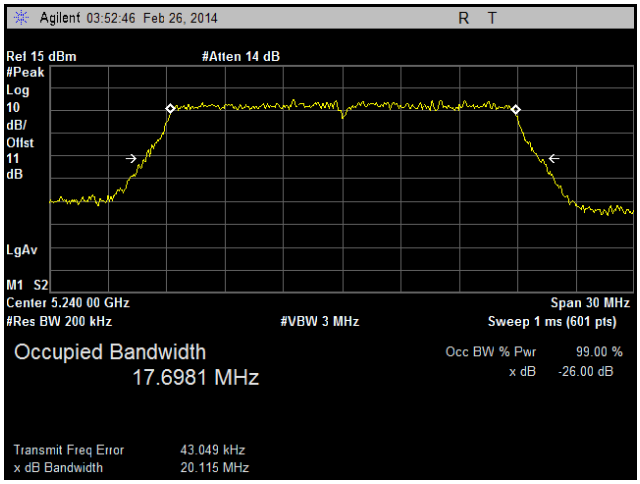
26 dB Occupied Bandwidth Test Results, 802.11n 20 MHz



Plot 4. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz



Plot 5. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz



Plot 6. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz

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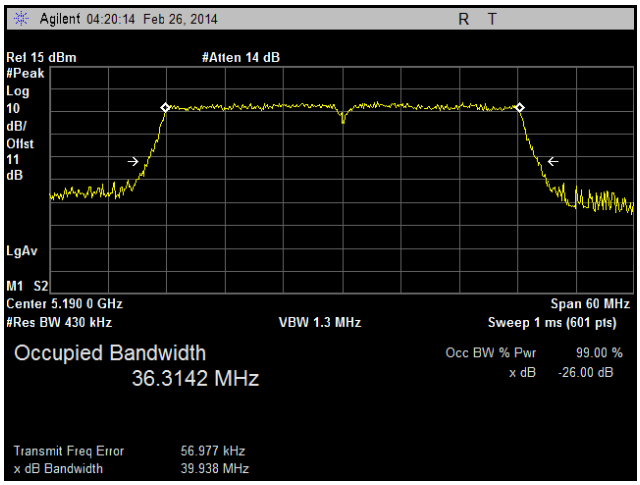
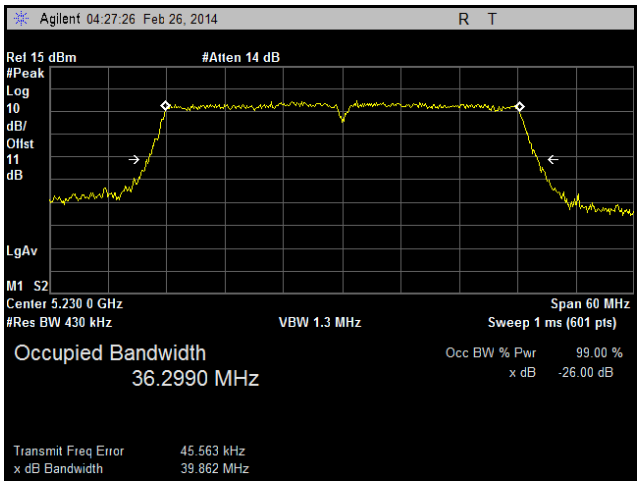
26 dB Occupied Bandwidth Test Results, 802.11ac 40 MHz

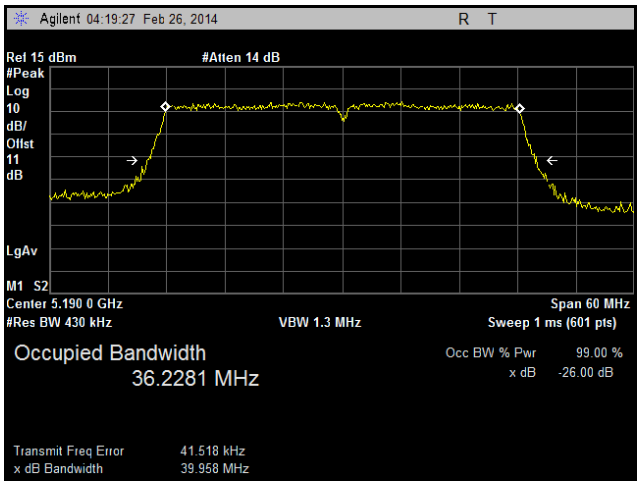


Plot 7. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 40 MHz

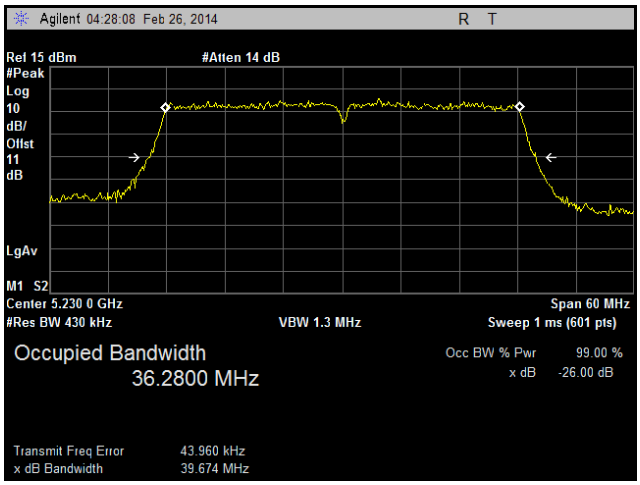


Plot 8. 26 dB Occupied Bandwidth, High Channel, 802.11ac 40 MHz

26 dB Occupied Bandwidth Test Results, 802.11n 40 MHz



Plot 9. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz



Plot 10. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz

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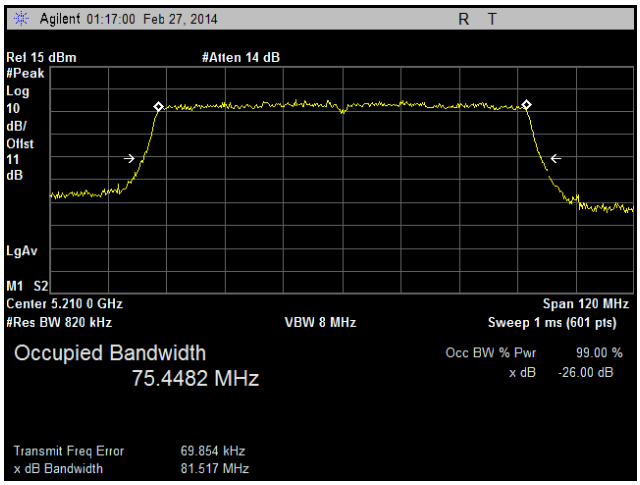
26 dB Occupied Bandwidth Test Results, 802.11ac 80 MHz



Plot 11. 26 dB Occupied Bandwidth, High Channel, 802.11ac 80 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(1)(i) & §15.407(a)(3) RF Power Output

Test Requirements: **§15.407(a)(1)(ii):** For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

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 D02 General UNII Test Procedures New Rule v01. Plots were corrected for attenuator and cable loss. Power levels shown in tables below are the maximum that will be used for each type of antenna in 15.203. Power across the antenna ports was summed. Only antenna port 0 plots had been added in test report.

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

Test Engineer(s): Surinder Singh

Test Date(s): 03/04/15

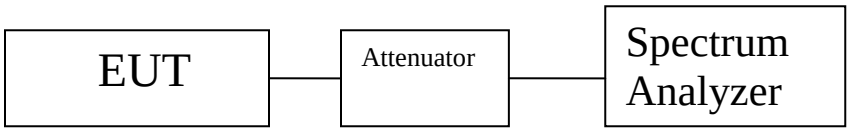


Figure 2. Power Output Test Setup

Maximum conducted power 20MHz Band 802.11n and ac Mode MIMO									
Channel	**Frequency GHz**	**Measured Power (dBm) Ant 0**	**Measured Power (dBm) Ant 1**	**Measured Power (dBm) Ant 2**	**Mode**	**Total power dBm**	**PSD Limit**	**Antenna Gain**	**Margin**
36	5180	15.11	15.38	15.65	n	20.16	27.29	8.71	-7.13
36	5180	15.88	15.99	16.02	ac	20.74	27.29	8.71	-6.55
40	5200	18.84	19.06	19.19	n	23.81	27.29	8.71	-3.48
40	5200	19.1	19.22	19.36	ac	24	27.29	8.71	-3.29
48	5240	19.1	19.24	19.43	n	24.03	27.29	8.71	-3.26
48	5240	19.12	19.28	19.55	ac	24.1	27.29	8.71	-3.19

Table 9. Maximum Conducted Power, 20 MHz

Maximum conducted power 40MHz Band n and ac Mode MIMO (3*3)								
Chanel Carrier	**Frequency MHz**	**Measured Power (dBm) Ant 0**	**Measured Power (dBm) Ant 1**	**Measured Power (dBm) Ant 2**	**Total Output Power**	**Antenna Gain**	**PSD Limit**	**Margin**
36	5190	11.88	11.97	12.11	16.76	8.71	27.29	-10.53
36	5190	12.08	12.43	12.64	17.17	8.71	27.29	-10.12
48	5230	19.11	19.26	19.24	23.98	8.71	27.29	-3.31
48	5230	19.19	19.42	19.55	24.17	8.71	27.29	-3.12

Table 10. Maximum Conducted Power, 40 MHz

Maximum conducted power 80MHz Band ac Mode MIMO (3*3)								
Chanel Carrier	**Frequency MHz**	**Measured Power (dBm) Ant 0**	**Measured Power (dBm) Ant 1**	**Measured Power (dBm) Ant 2**	**Total Output Power**	**Antenna Gain**	**PSD Limit**	**Margin**
36	5210	8.47	8.54	8.53	13.29	8.71	27.29	-14

Table 11. Maximum Conducted Power, 80 MHz

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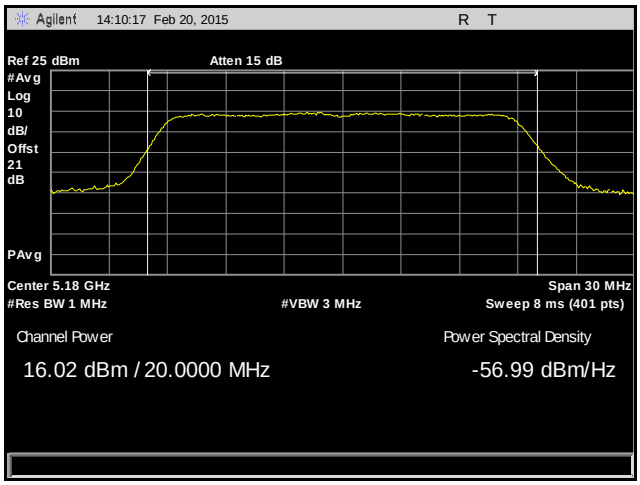
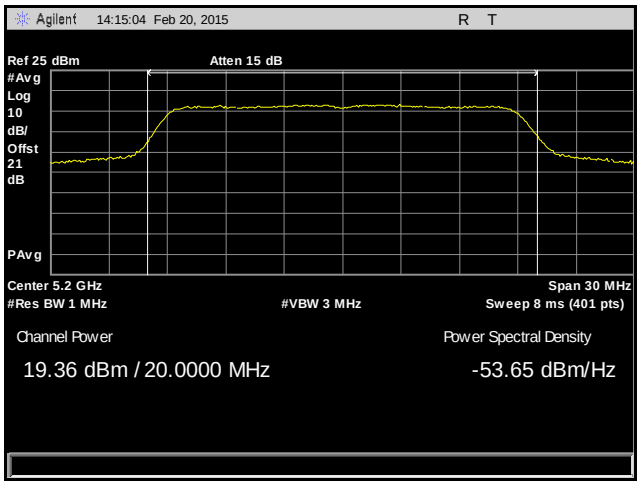
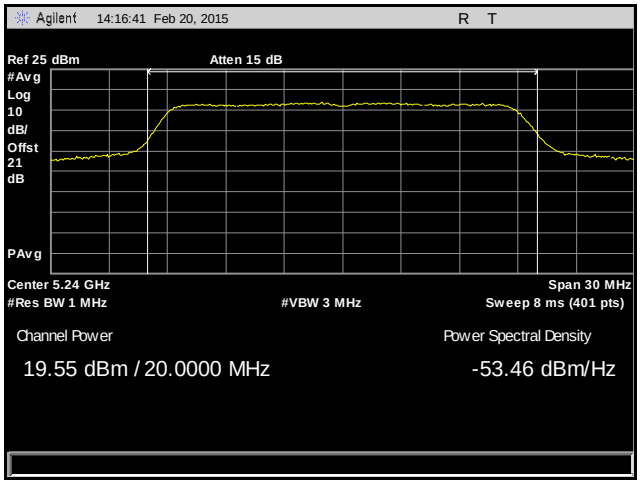
Peak Output Power Test Results, 802.11ac 20 MHz



Plot 12. Peak Output Power, Low Channel, 802.11ac 20 MHz



Plot 13. Peak Output Power, Mid Channel, 802.11ac 20 MHz



Plot 14. Peak Output Power, High Channel, 802.11ac 20 MHz

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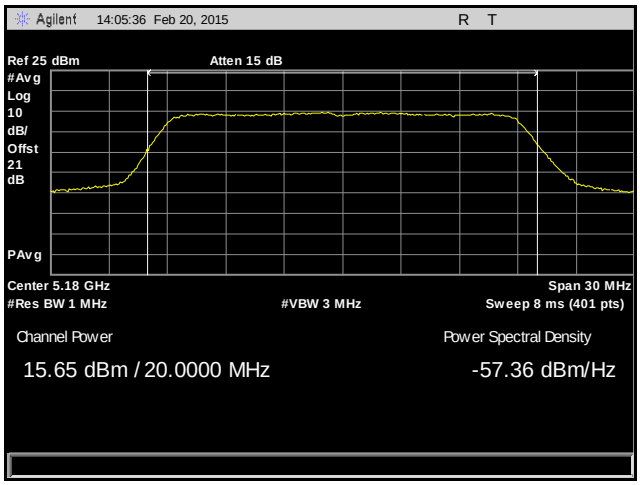
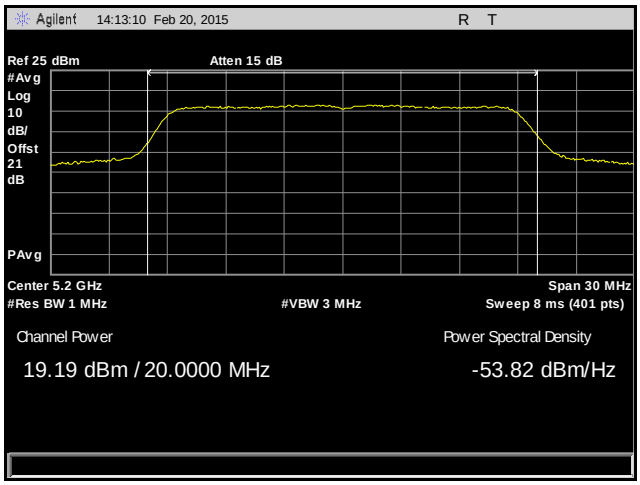
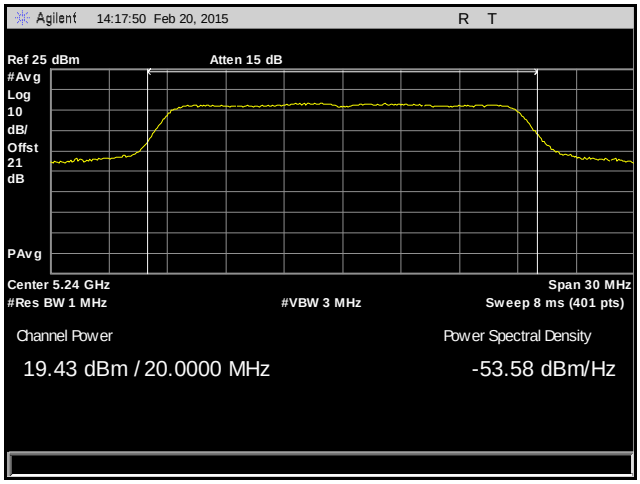
Peak Output Power Test Results, 802.11n 20 MHz



Plot 15. Peak Output Power, Low Channel, 802.11n 20 MHz



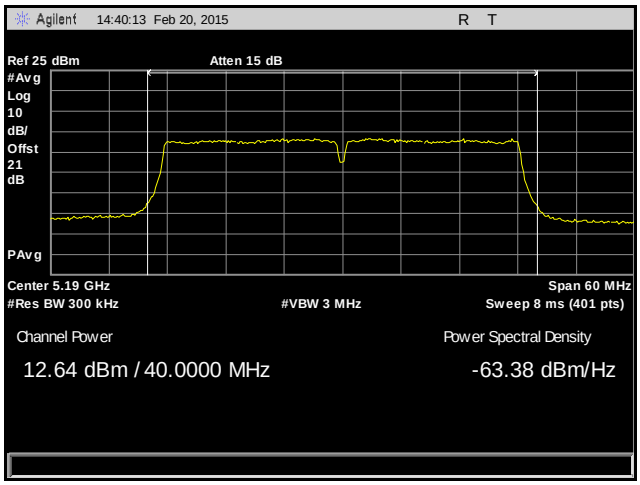
Plot 16. Peak Output Power, Mid Channel, 802.11n 20 MHz



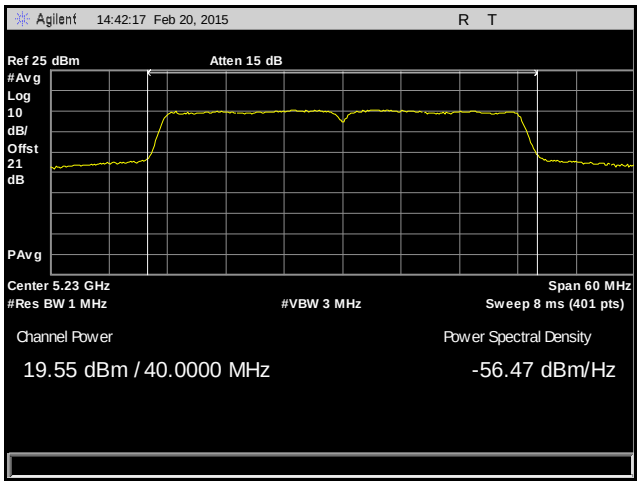
Plot 17. Peak Output Power, High Channel, 802.11n 20 MHz

 © 2015, MET Laboratories, Inc.

Peak Output Power Test Results, 802.11ac 40 MHz



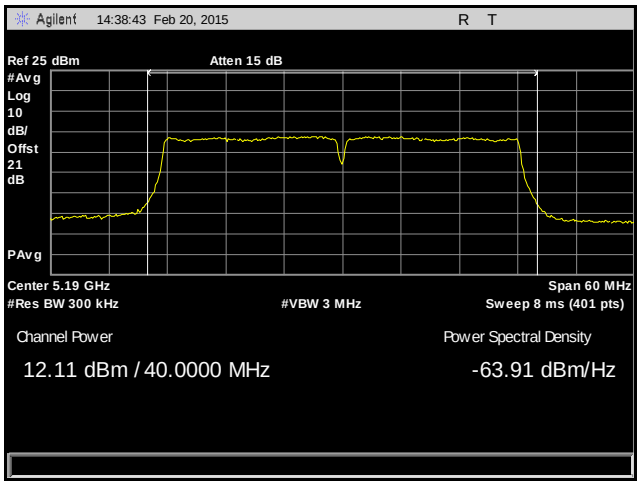
Plot 18. Peak Output Power, Low Channel, 802.11ac 40 MHz



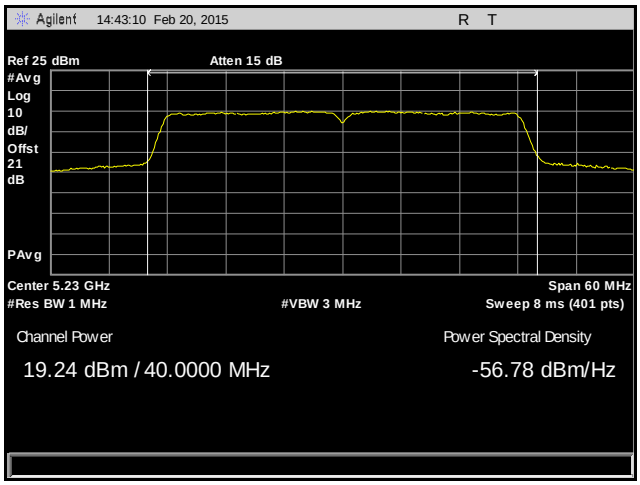
Plot 19. Peak Output Power, High Channel, 802.11ac 40 MHz

 © 2015, MET Laboratories, Inc.

Peak Output Power Test Results, 802.11n 40 MHz



Plot 20. Peak Output Power, Low Channel, 802.11n 40 MHz



Plot 21. Peak Output Power, High Channel, 802.11n 40 MHz

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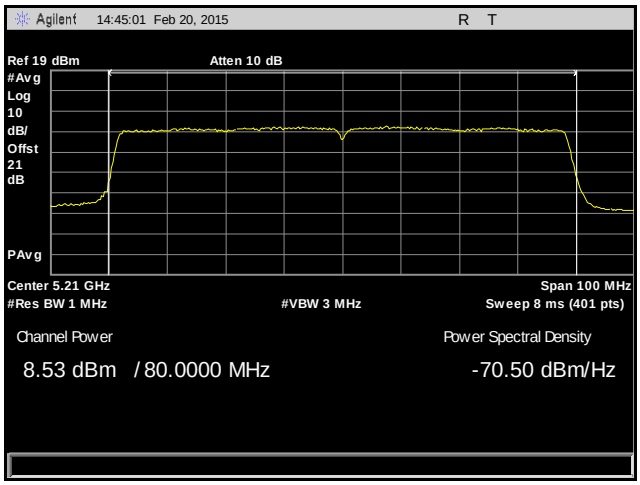
Peak Output Power Test Results, 802.11ac 80 MHz



Plot 22. Peak Output Power, High Channel, 802.11ac 80 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(a)(1)(i) & §15.407(a)(3) Peak Power Spectral Density

Test Requirements: **§ 15.407(a)(1)(ii):** In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz 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.

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 D02 General UNII Test Procedures New Rule v01. Plots are correct for attenuators and cable loss. . PSD across the antenna ports was summed. Only antenna port 0 plots had been added in test report.

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

Test Engineer(s): Surinder Singh

Test Date(s): 03/04/15

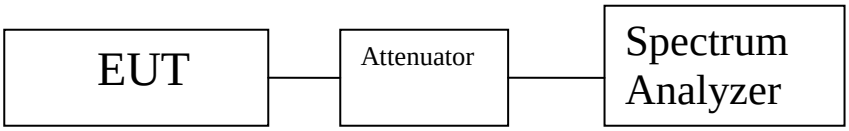


Figure 3. Power Spectral Density Test Setup

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Peak Conducted PSD 20MHz Band 802.11 n and ac Mode SISO									
Channel	Frequency GHz	Measured PSD (dBm) Ant 0	Measured PSD (dBm) Ant 1	Measured PSD (dBm) Ant 2	Mode	Total power dBm	PSD Limit	Antenna Gain	Margin
36	5180	2.847	2.961	3.06	n	7.72	14.29	8.71	-6.56
36	5180	3.915	4.08	4.11	ac	8.8	14.29	8.71	-5.48
40	5200	7.983	7.985	8.05	n	12.7	14.29	8.71	-1.51
40	5200	8.176	8.162	8.254	ac	12.96	14.29	8.71	-1.32
48	5240	8.06	8.175	8.345	n	12.9	14.29	8.71	-1.32
48	5240	7.837	7.864	8.124	ac	12.7	14.29	8.71	-1.57

Table 12. Peak Power Spectral Density, Test Results, 802.11 20 MHz

Peak Conducted PSD 40MHz Band n and ac Mode MIMO (3*3)								
Chanel Carrier	Frequency MHz	Measured PSD (dBm) Ant 0	Measured PSD (dBm) Ant 1	Measured PSD (dBm) Ant 2	Total Output Power	Antenna Gain	PSD Limit	Margin
36	5190	-4.233	-4.125	-4.056	0.63	8.71	14.29	-13.6
36	5190	-3.548	-3.455	-3.421	1.29	8.71	14.29	-12.9
48	5230	4.819	4.967	5.064	9.72	8.71	14.29	-4.5
48	5230	5.342	5.412	5.619	10.2	8.71	14.29	-4.05

Table 13. Peak Power Spectral Density, Test Results, 802.11 40 MHz

Peak Conducted PSD 80MHz Band ac Mode MIMO (3*3)								
Chanel Carrier	Frequency MHz	Measured PSD (dBm) Ant 0	Measured PSD (dBm) Ant 1	Measured PSD (dBm) Ant 2	Total Output Power	Antenna Gain	PSD Limit	Margin
36	5210	-9.936	-9.568	-9.164	-4.77	8.71	14.29	-19.06

Table 14. Peak Power Spectral Density, Test Results, 802.11 80 MHz

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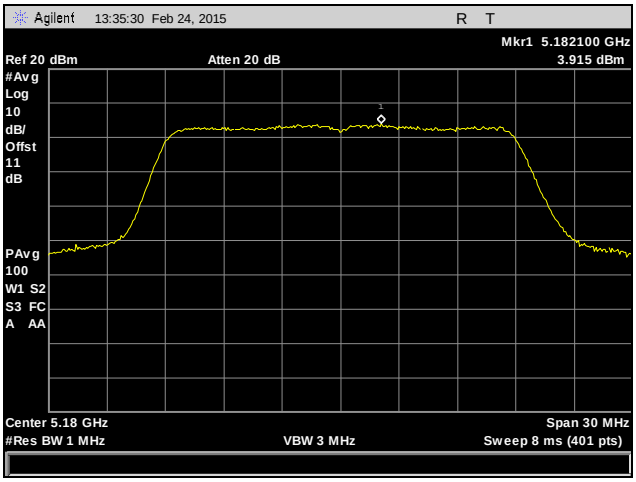
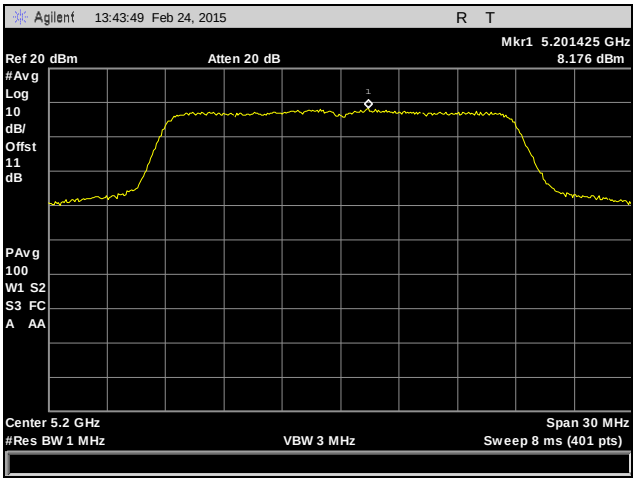
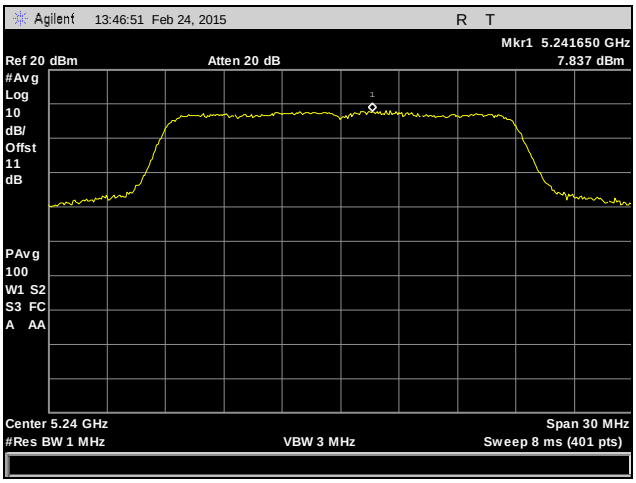
Peak Power Spectral Density Test Results, 802.11ac 20 MHz



Plot 23. Peak Power Spectral Density, Low Channel, 802.11ac 20 MHz



Plot 24. Peak Power Spectral Density, Mid Channel, 802.11ac 20 MHz



Plot 25. Peak Power Spectral Density, High Channel, 802.11ac 20 MHz

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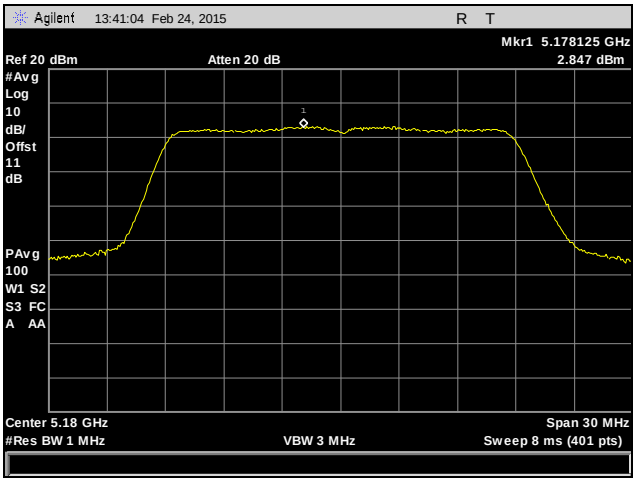
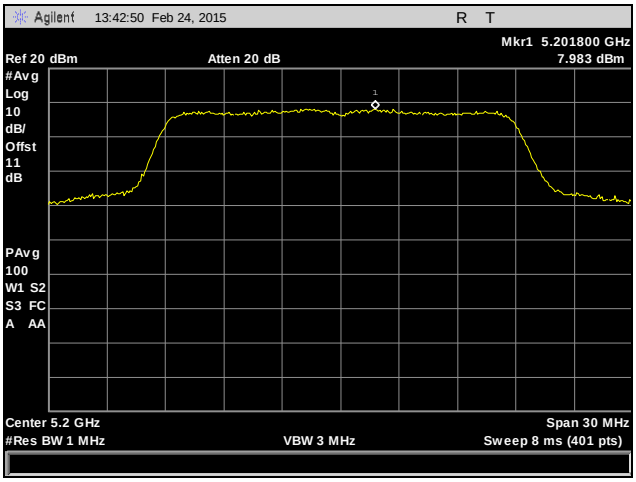
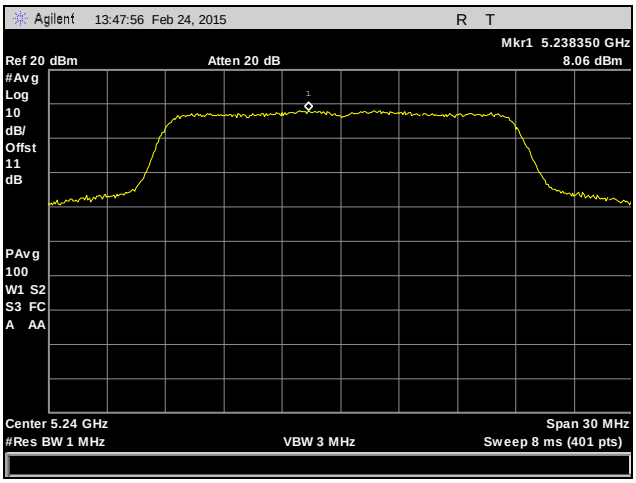
Peak Power Spectral Density Test Results, 802.11n 20 MHz



Plot 26. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz



Plot 27. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz



Plot 28. Peak Power Spectral Density, High Channel, 802.11n 20 MHz

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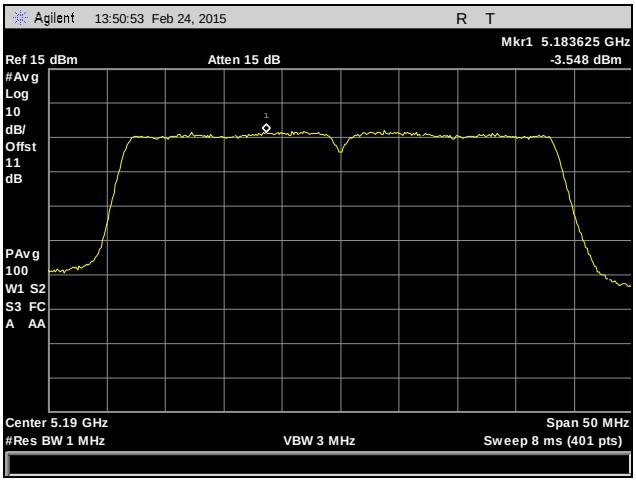
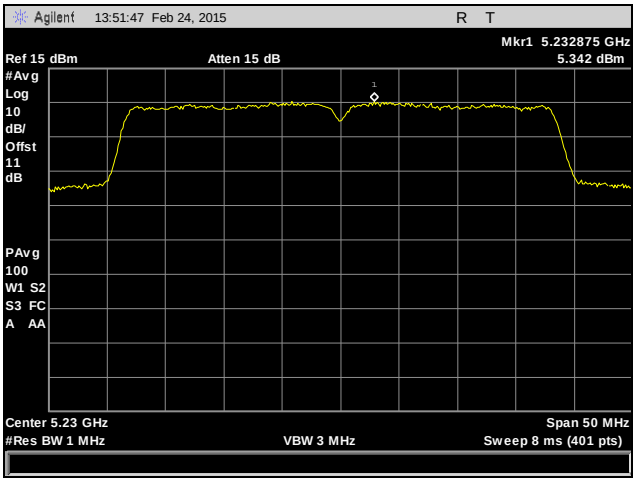
Peak Power Spectral Density Test Results, 802.11ac 40 MHz

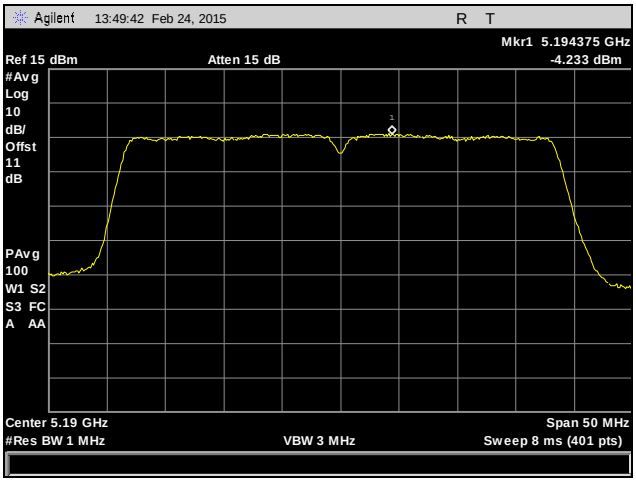


Plot 29. Peak Power Spectral Density, Low Channel, 802.11ac 40 MHz

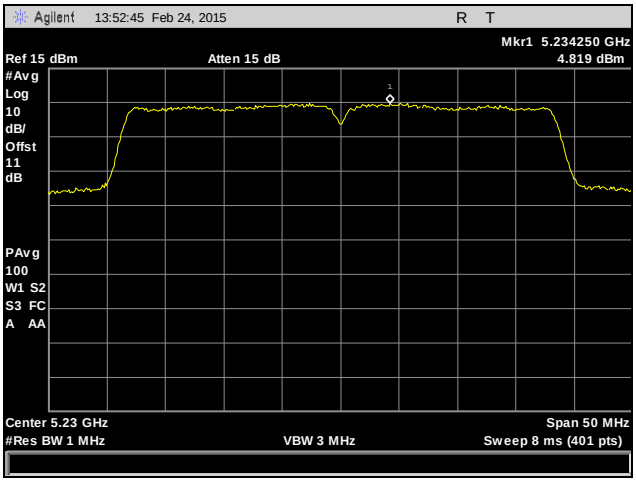


Plot 30. Peak Power Spectral Density, High Channel, 802.11ac 40 MHz

Peak Power Spectral Density Test Results, 802.11n 40 MHz



Plot 31. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz



Plot 32. Peak Power Spectral Density, High Channel, 802.11n 40 MHz

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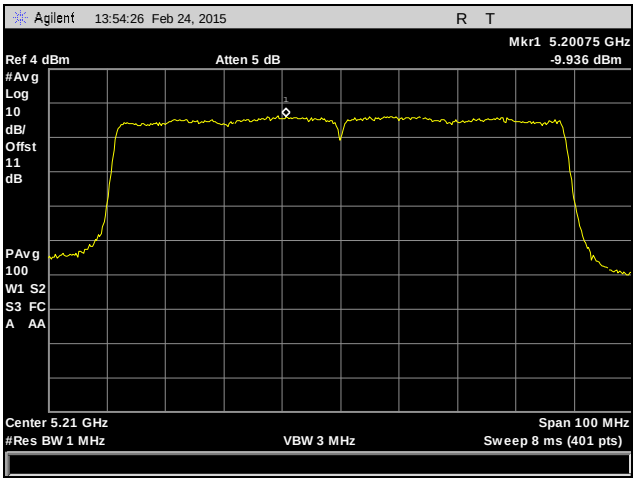
Peak Power Spectral Density Test Results, 802.11ac 80 MHz



Plot 33. Peak Power Spectral Density, High Channel, 802.11ac 80 MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

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

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

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

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

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

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

For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. A notch filter was use to filter out the transmitting channel. 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. Worst case emissions shown by antenna.

Test Results: The EUT was compliant with the Radiated Emission limits for Intentional Radiators. See following pages for detailed test results. All emissions above 18 GHz were at the noise floor of the receiver.

Test Engineer(s): Surinder Singh

Test Date(s): 03/04/15

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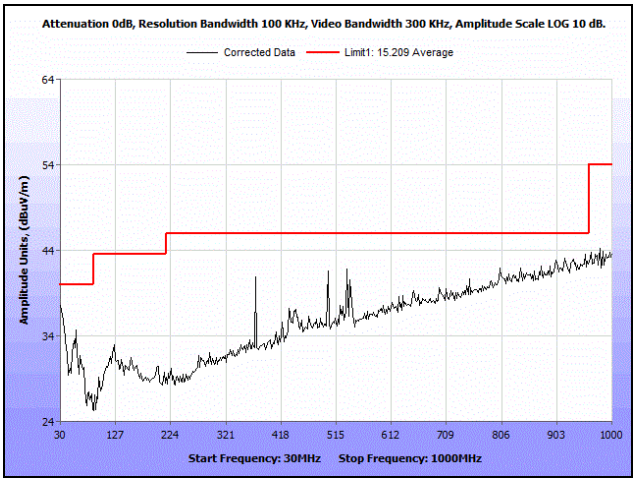
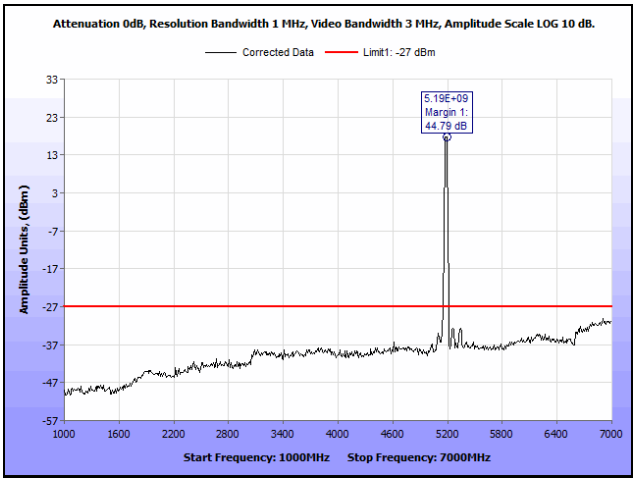
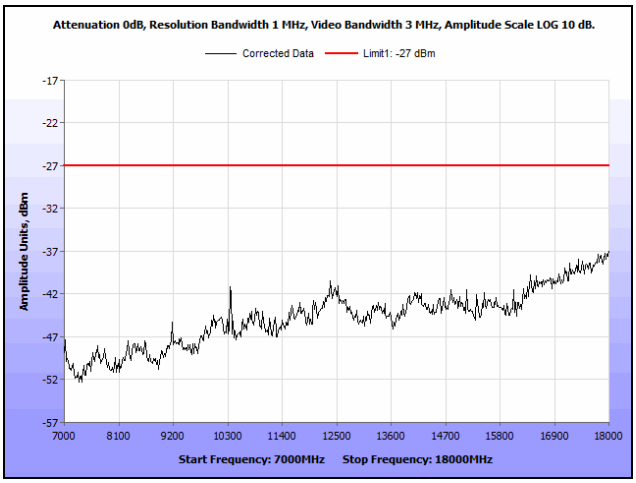
Radiated Spurious Emissions, 802.11ac 20 MHz



Plot 34. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, 30 MHz – 1 GHz



Plot 35. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz



Plot 36. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz7 GHz – 18 GHz

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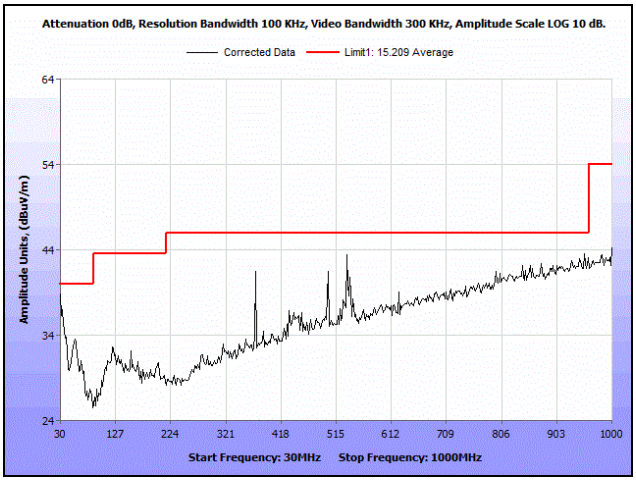
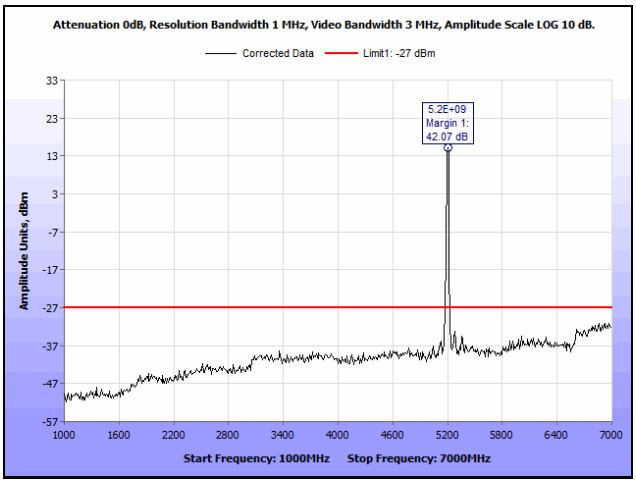
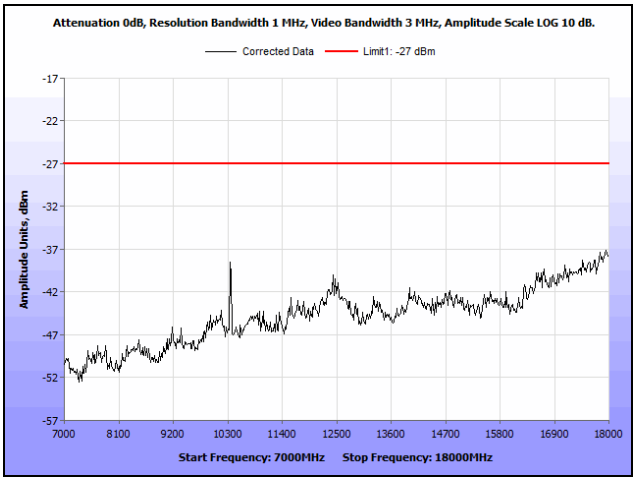


Plot 37. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, 30 MHz – 1 GHz



Plot 38. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz



Plot 39. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, 7 GHz – 18 GHz

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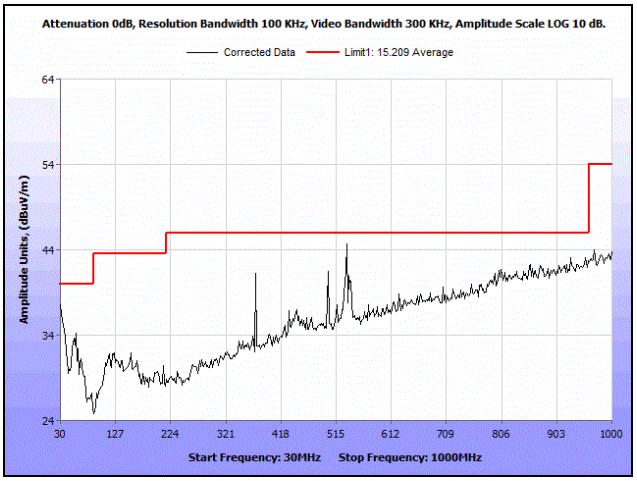
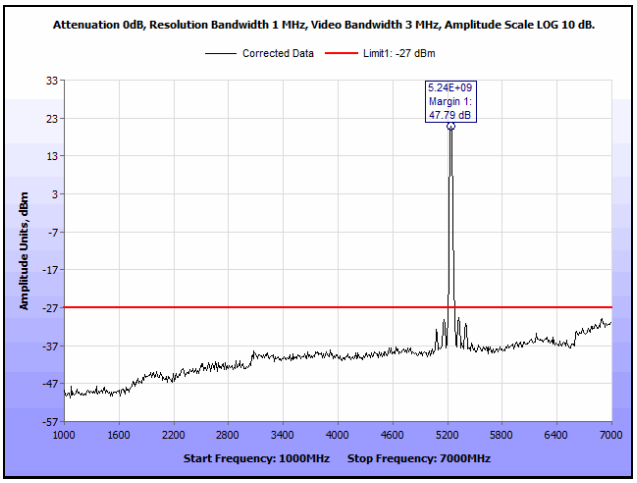
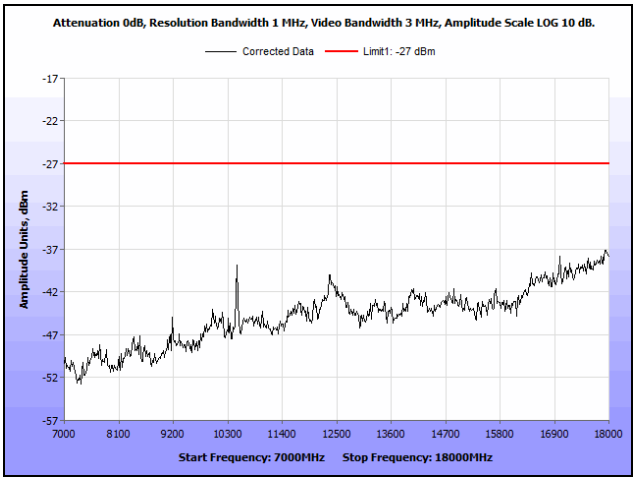


Plot 40. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, 30 MHz – 1 GHz



Plot 41. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, 1 GHz – 7 GHz



Plot 42. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, 7 GHz – 18 GHz

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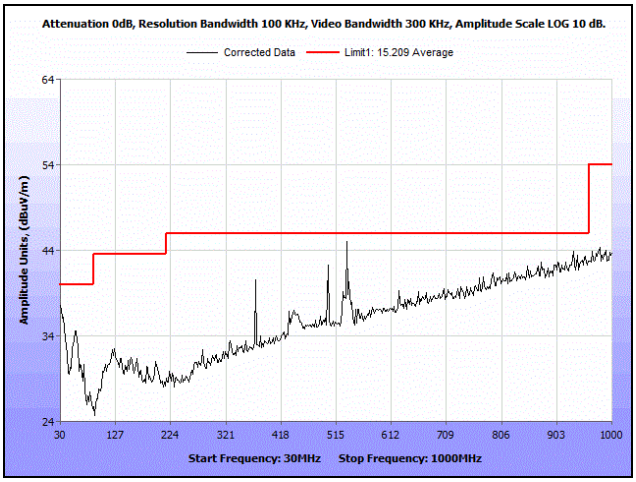
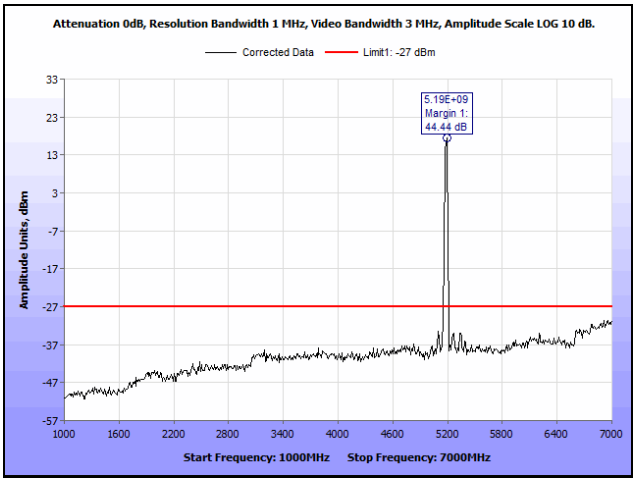
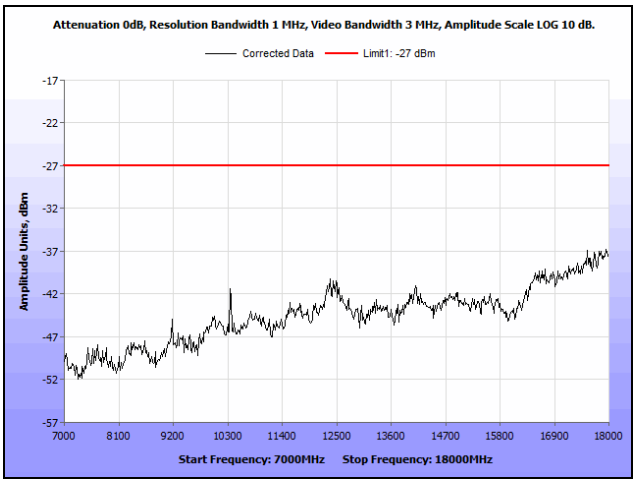
Radiated Spurious Emissions, 802.11n 20 MHz



Plot 43. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 30 MHz – 1 GHz



Plot 44. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 1 GHz – 7 GHz



Plot 45. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 7 GHz – 18 GHz

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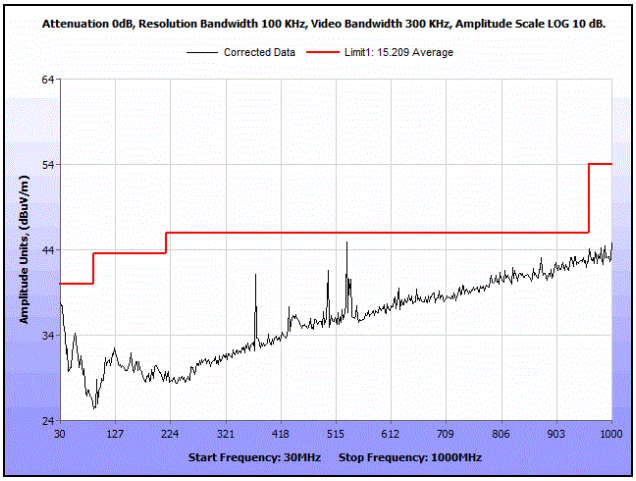
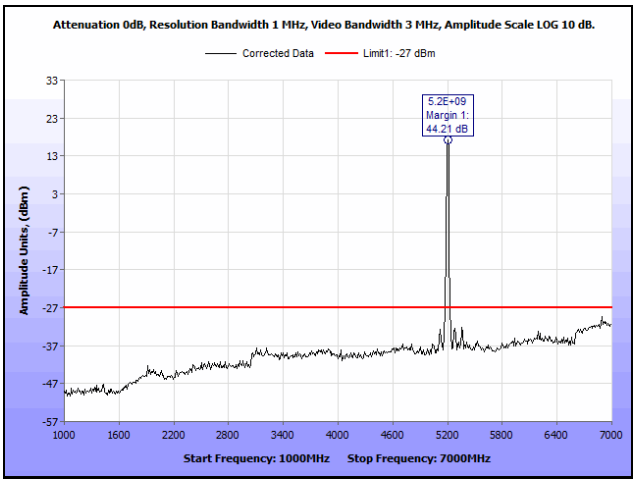
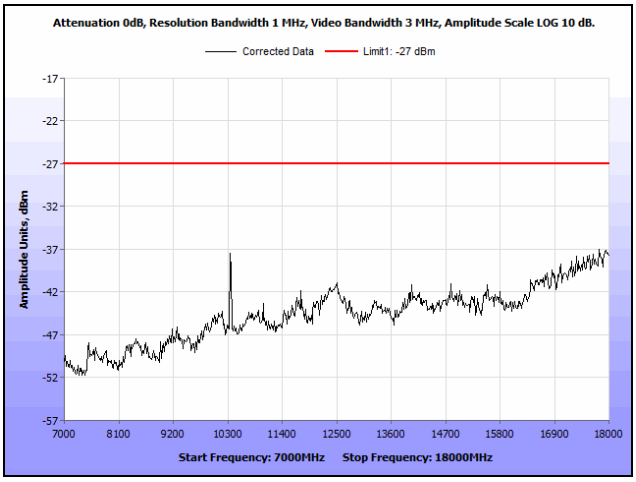


Plot 46. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 30 MHz – 1 GHz



Plot 47. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 1 GHz – 7 GHz



Plot 48. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 7 GHz – 18 GHz

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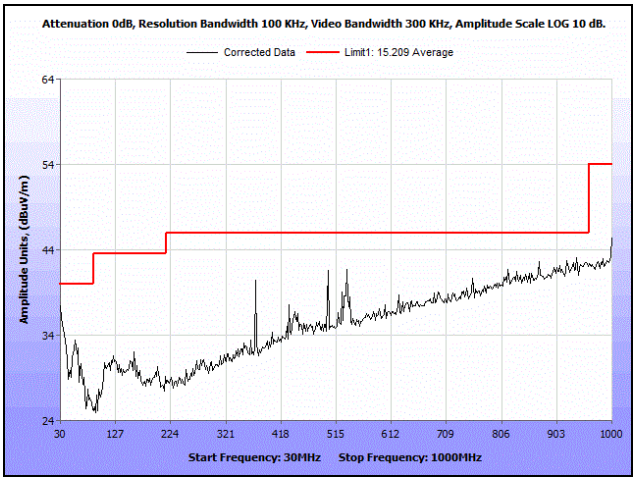
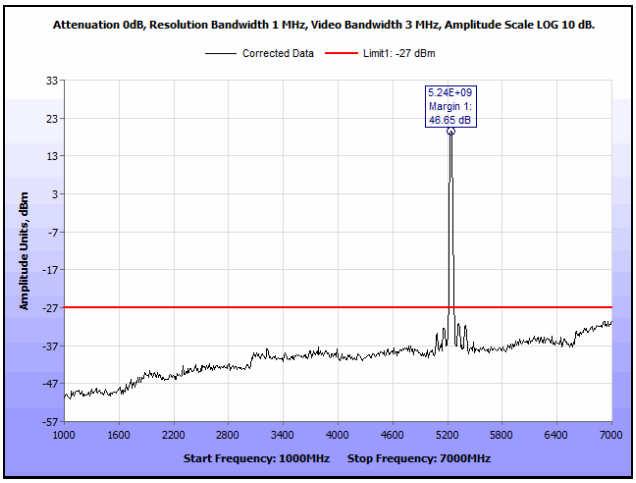
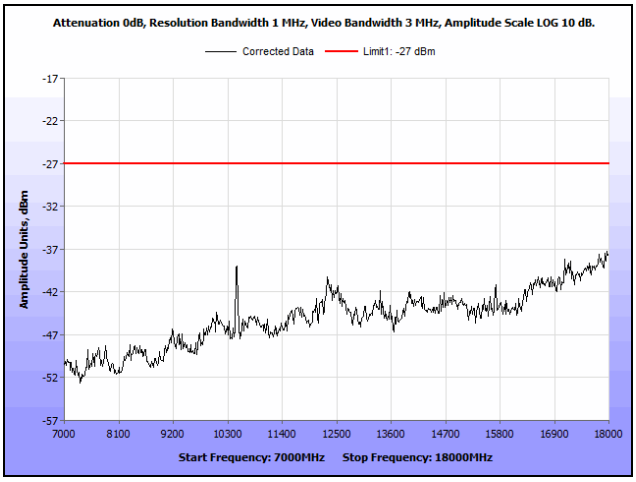


Plot 49. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 30 MHz – 1 GHz



Plot 50. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, 1 GHz – 7 GHz



Plot 51. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 7 GHz – 18 GHz

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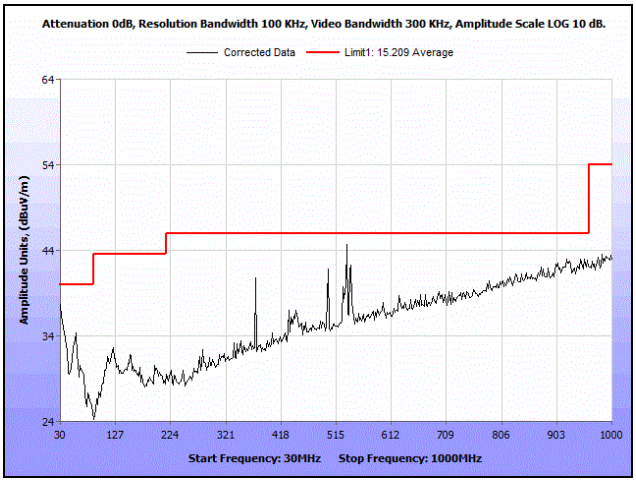
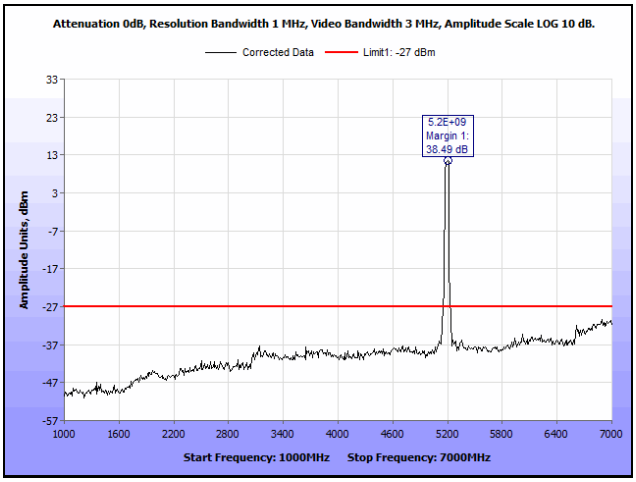
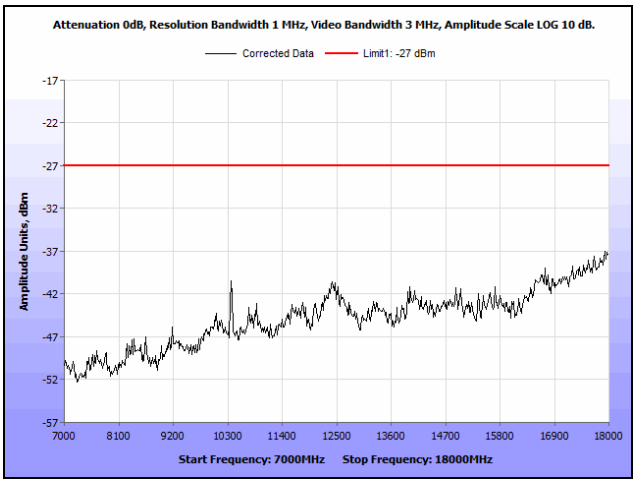
Radiated Spurious Emissions, 802.11ac 40 MHz



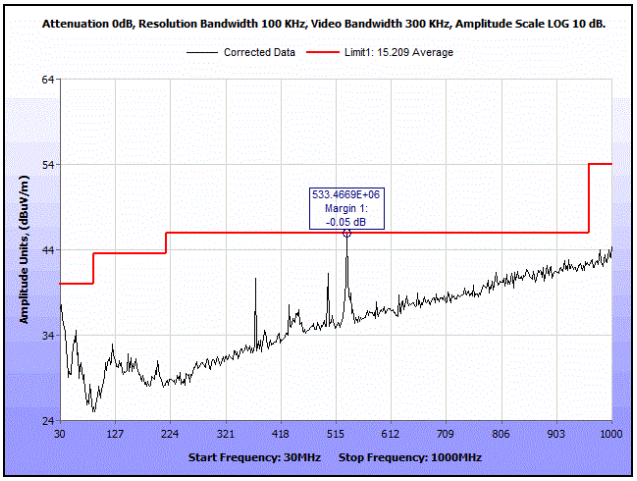
Plot 52. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, 30 MHz – 1 GHz



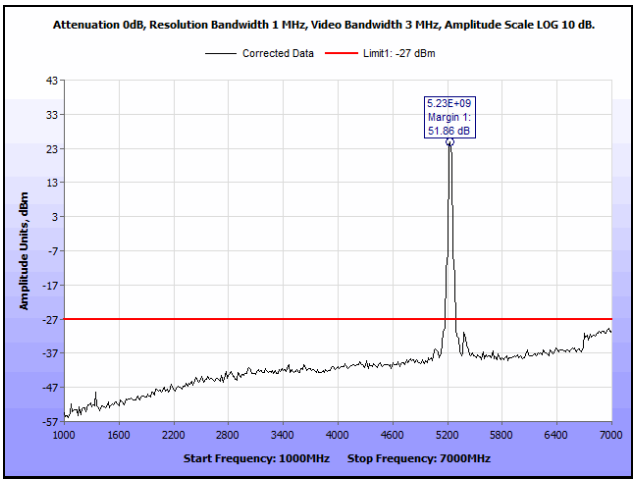
Plot 53. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, 1 GHz – 7 GHz



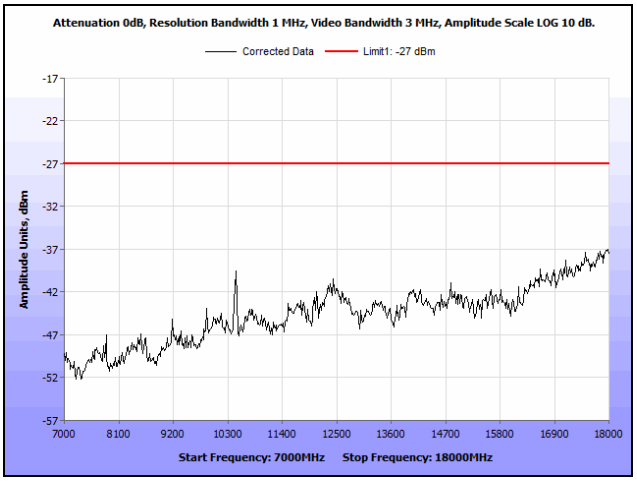
Plot 54. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, 7 GHz – 18 GHz



Plot 55. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, 30 MHz – 1 GHz



Plot 56. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, 1 GHz – 7 GHz



Plot 57. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, 7 GHz – 18 GHz

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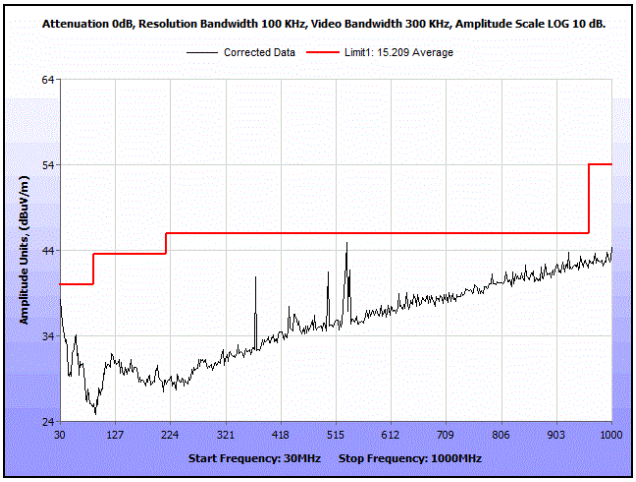
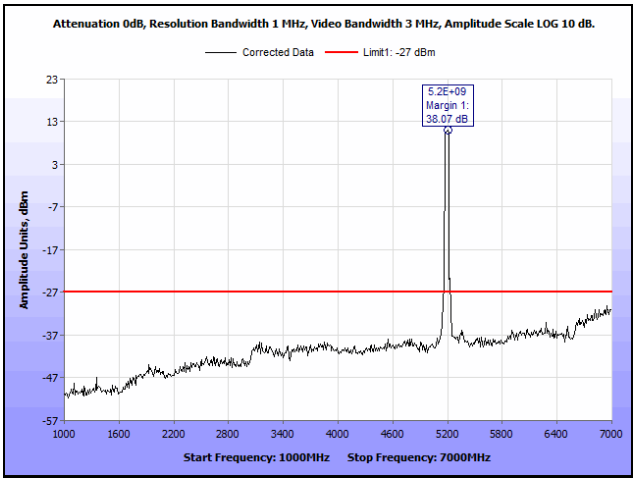
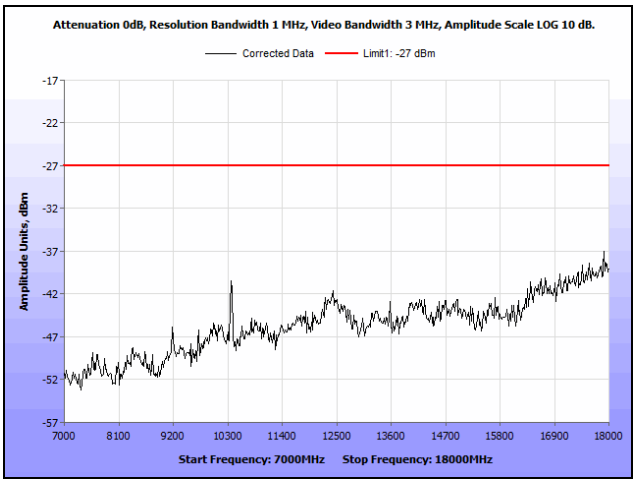
Radiated Spurious Emissions, 802.11n 40 MHz



Plot 58. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, 30 MHz – 1 GHz



Plot 59. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 1 GHz – 7 GHz



Plot 60. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 7 GHz – 18 GHz

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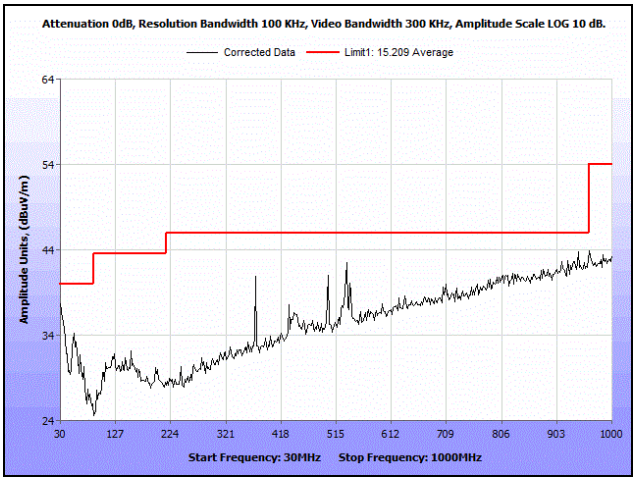
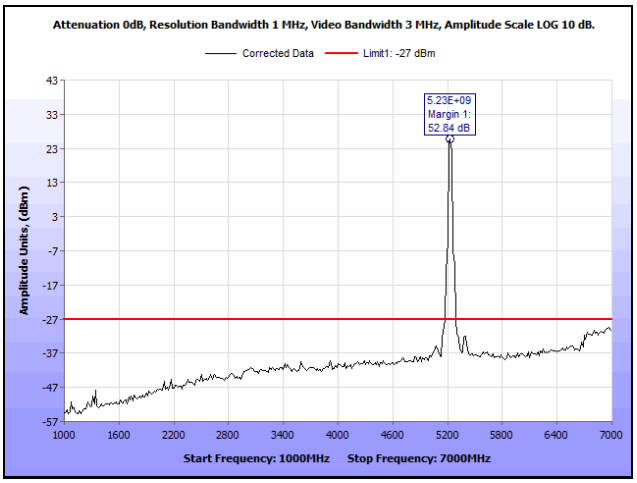
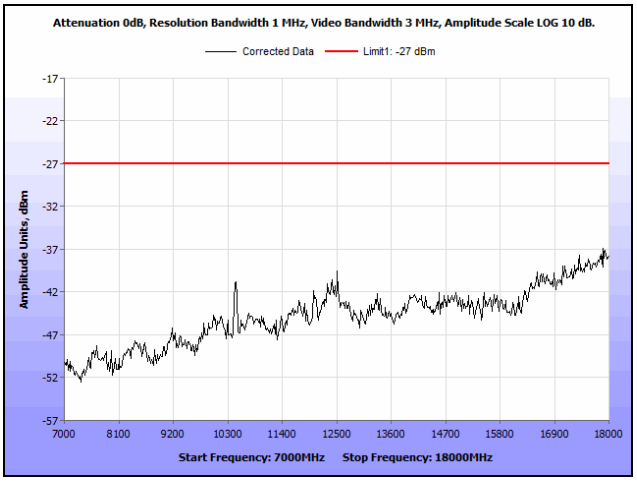


Plot 61. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 30 MHz – 1 GHz



Plot 62. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 1 GHz – 7 GHz



Plot 63. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 7 GHz – 18 GHz

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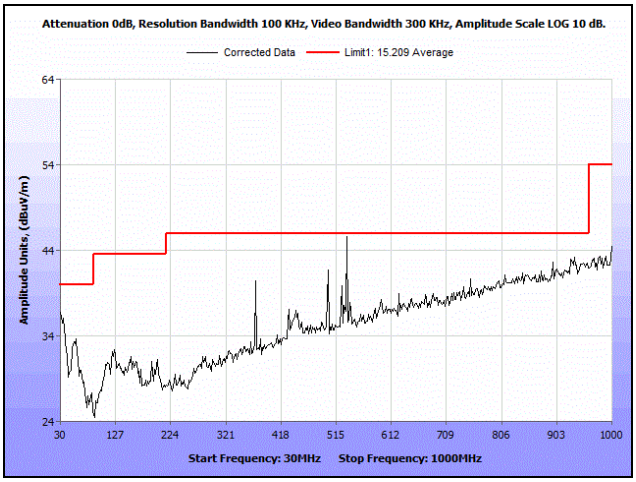
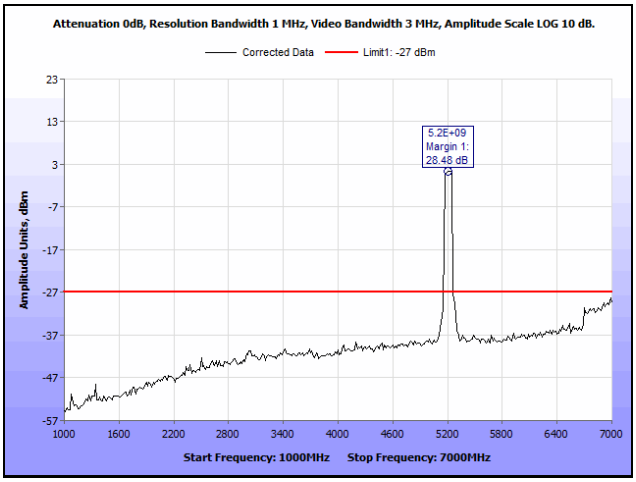
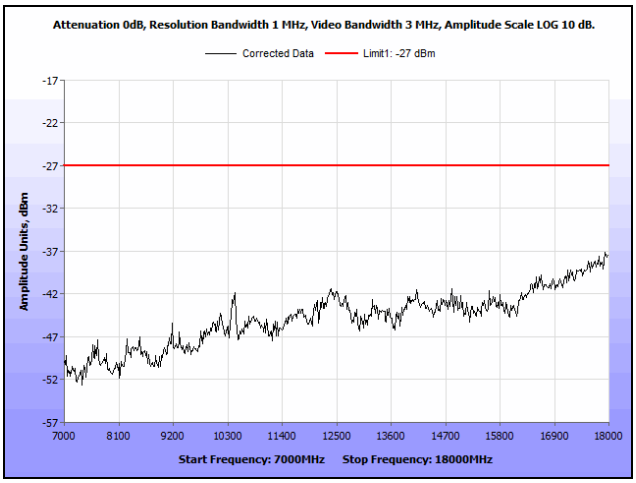
Radiated Spurious Emissions, 802.11ac 80 MHz



Plot 64. Radiated Spurious Emissions, 802.11ac 80 MHz, 30 MHz – 1 GHz



Plot 65. Radiated Spurious Emissions, 802.11ac 80 MHz, 1 GHz – 7 GHz



Plot 66. Radiated Spurious Emissions, 802.11ac 80 MHz, 7 GHz – 18 GHz

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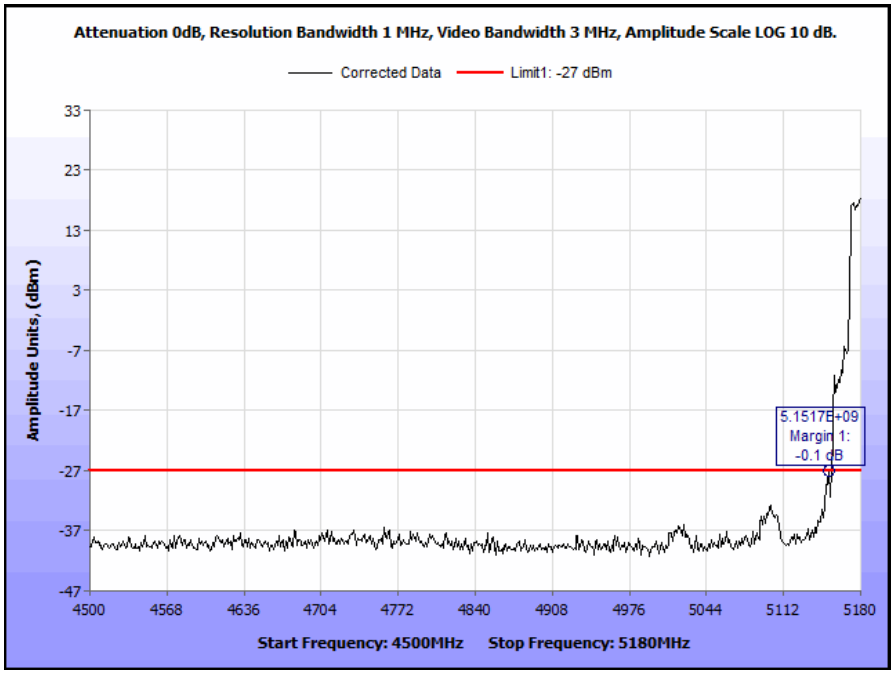
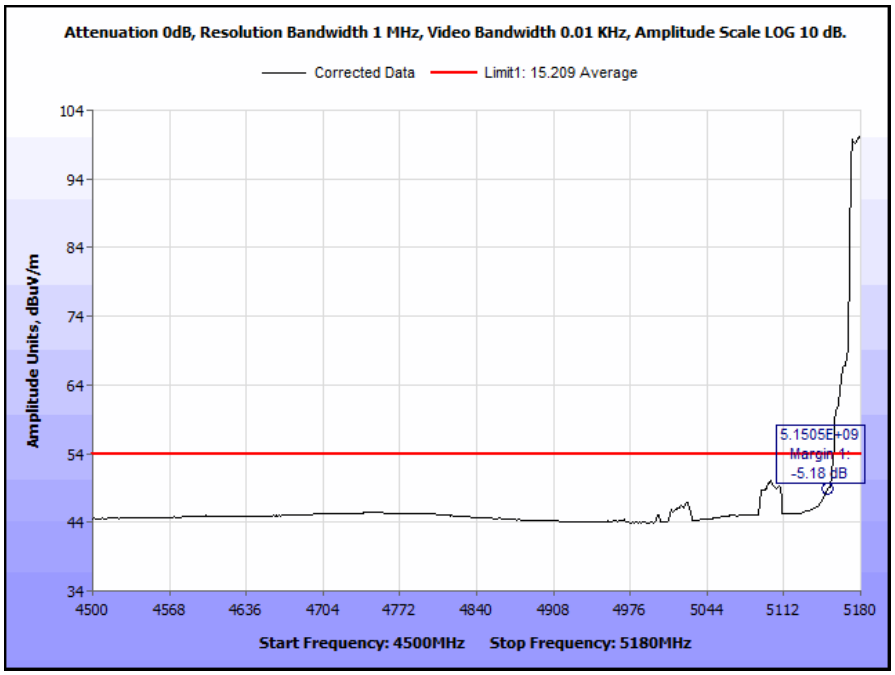
Band Edge, 802.11ac 20 MHz



Plot 67. Radiated Band Edge, 802.11ac 20 MHz, Low Channel



Plot 68. Restricted Band Edge, 802.11ac 20 MHz, Low Channel

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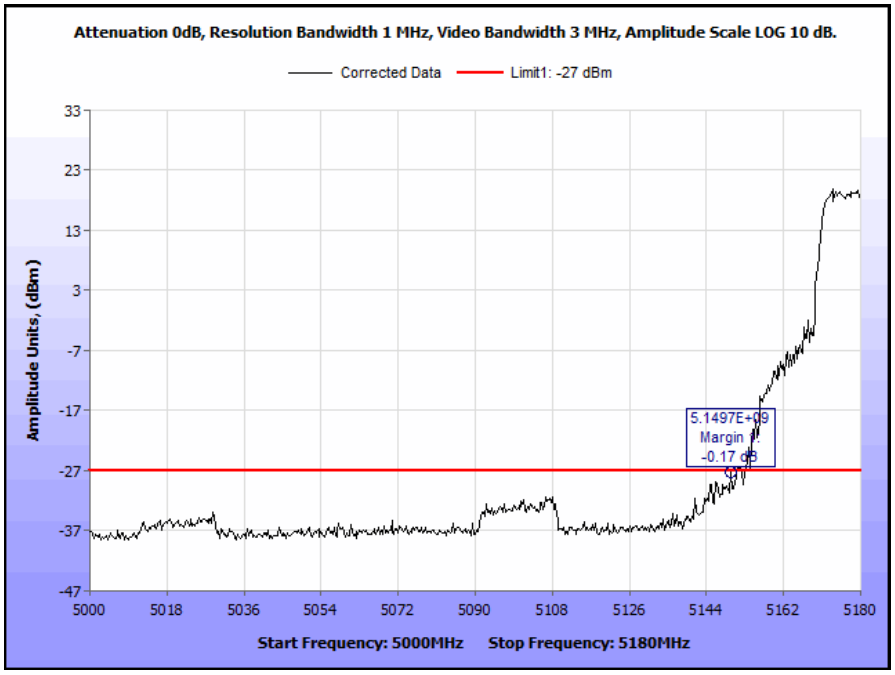
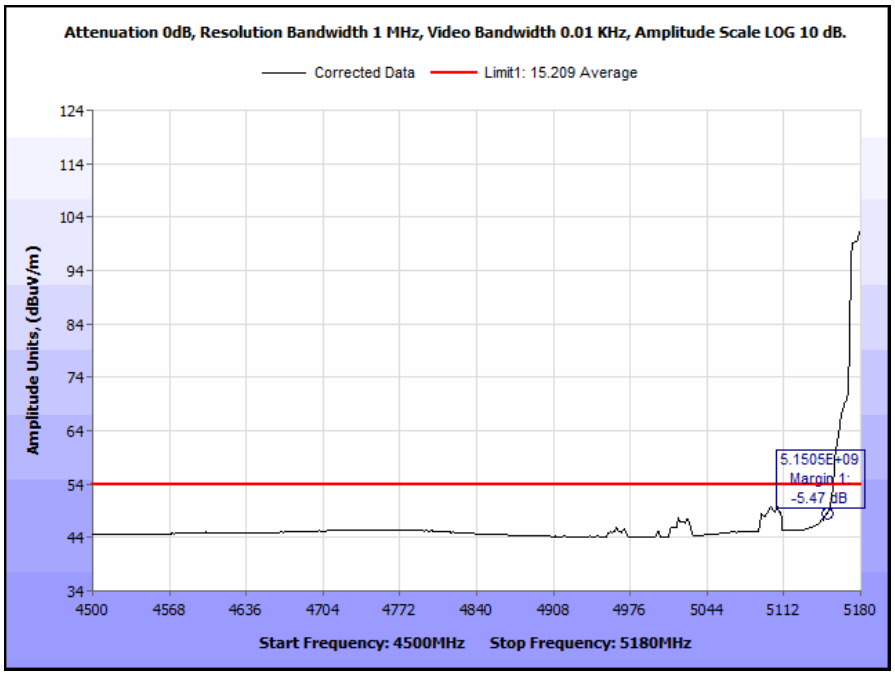
Band Edge, 802.11n 20 MHz



Plot 69. Radiated Band Edge, 802.11n 20 MHz, Low Channel



Plot 70. Restricted Band Edge, 802.11n 20 MHz, Low Channel

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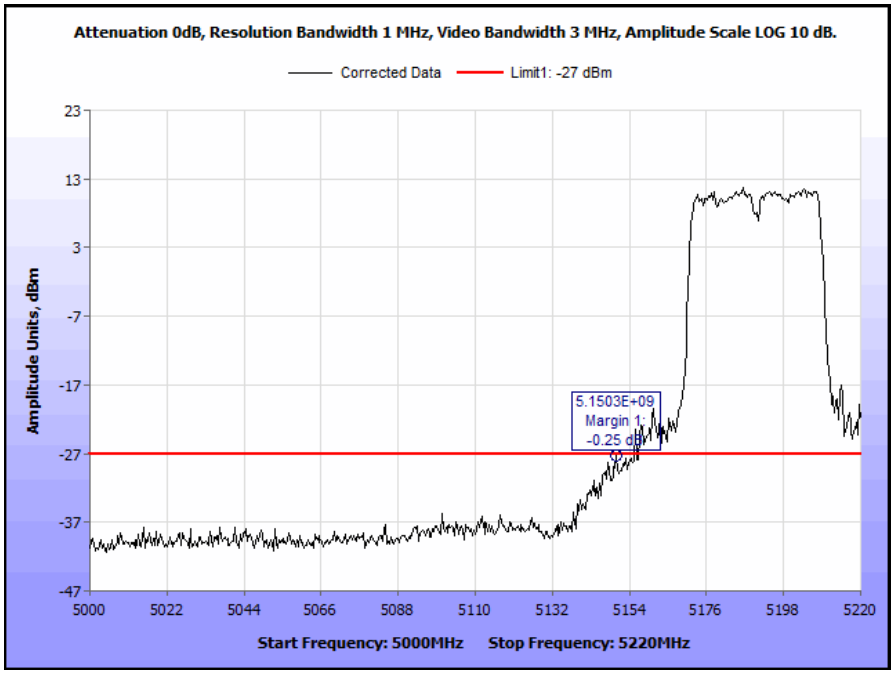
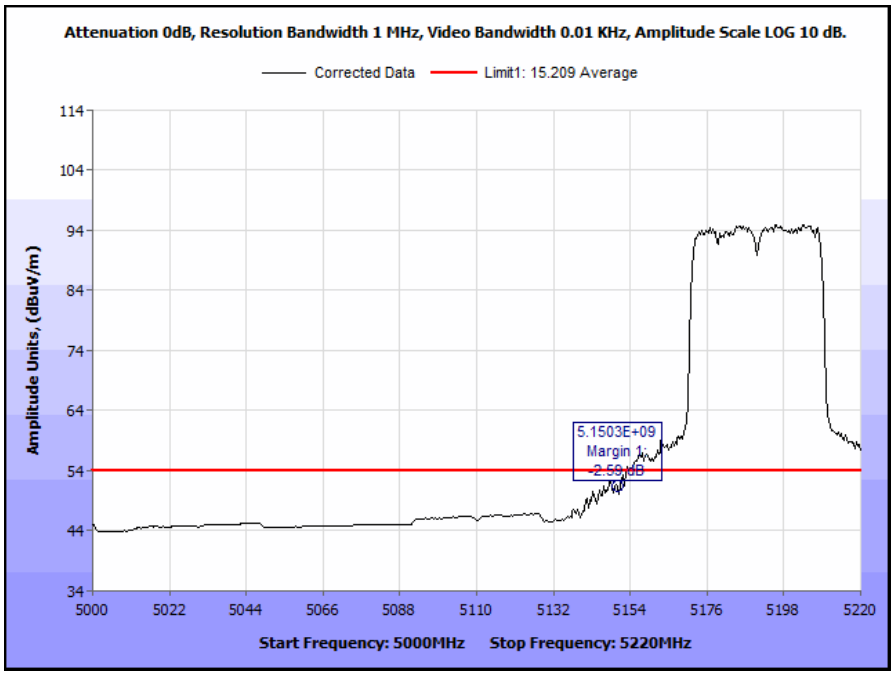
Band Edge, 802.11ac 40 MHz



Plot 71. Radiated Band Edge, 802.11ac 40 MHz, Low Channel



Plot 72. Restricted Band Edge, 802.11ac 40 MHz, Low Channel

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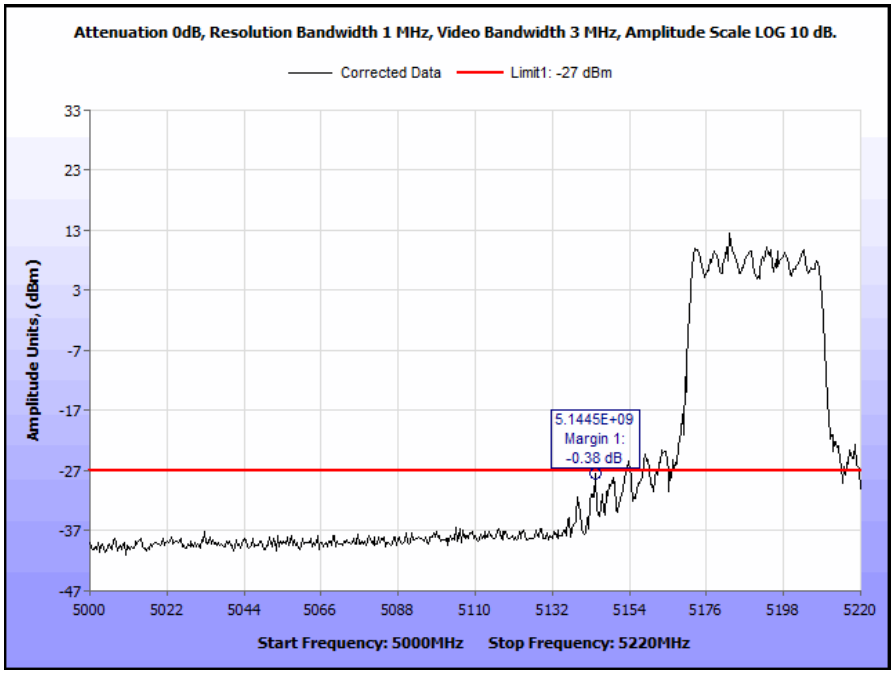
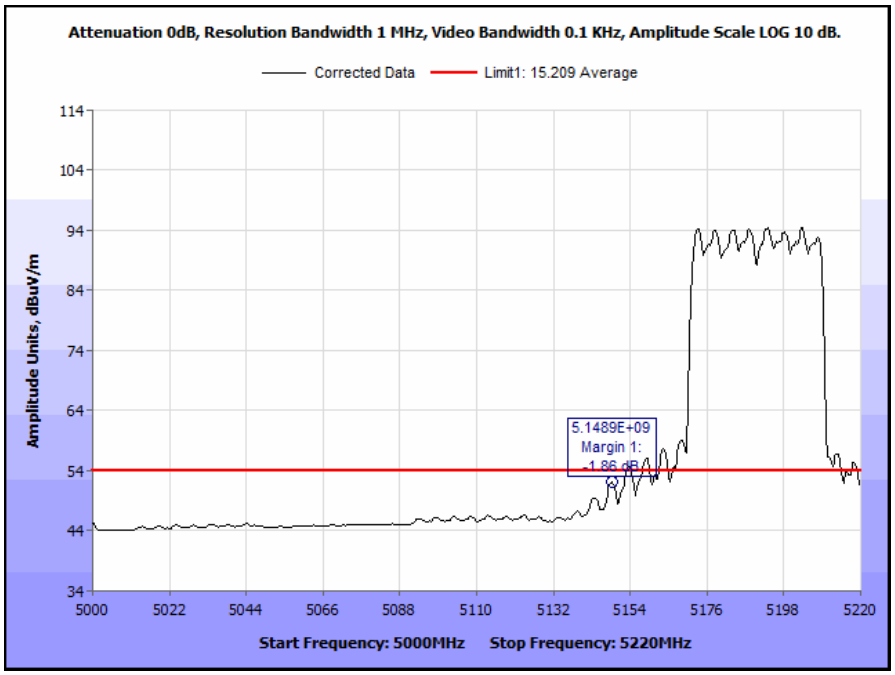
Band Edge, 802.11n 40 MHz



Plot 73. Radiated Band Edge, 802.11n 40 MHz, Low Channel



Plot 74. Restricted Band Edge, 802.11n 40 MHz, Low Channel

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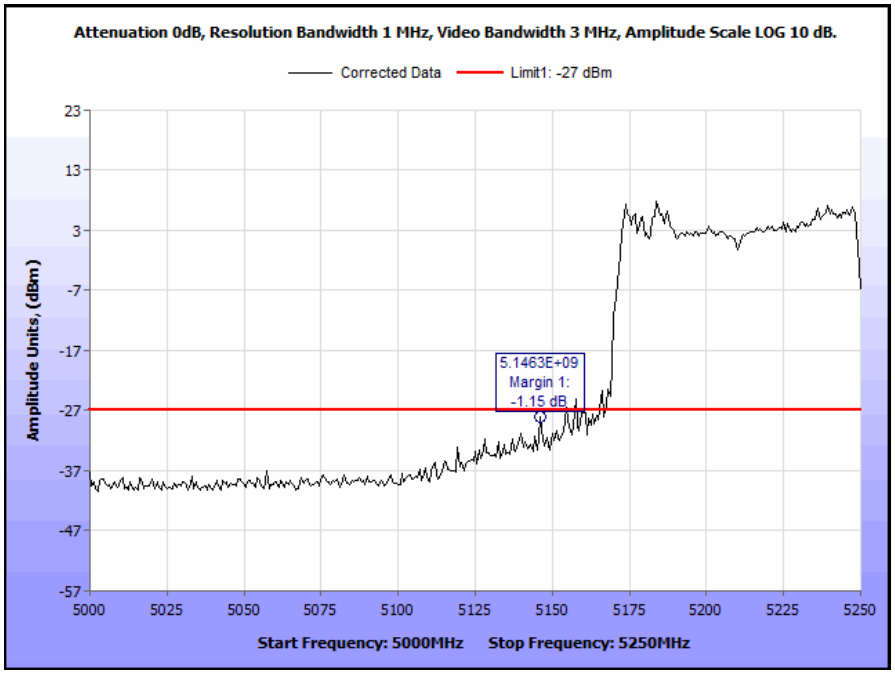
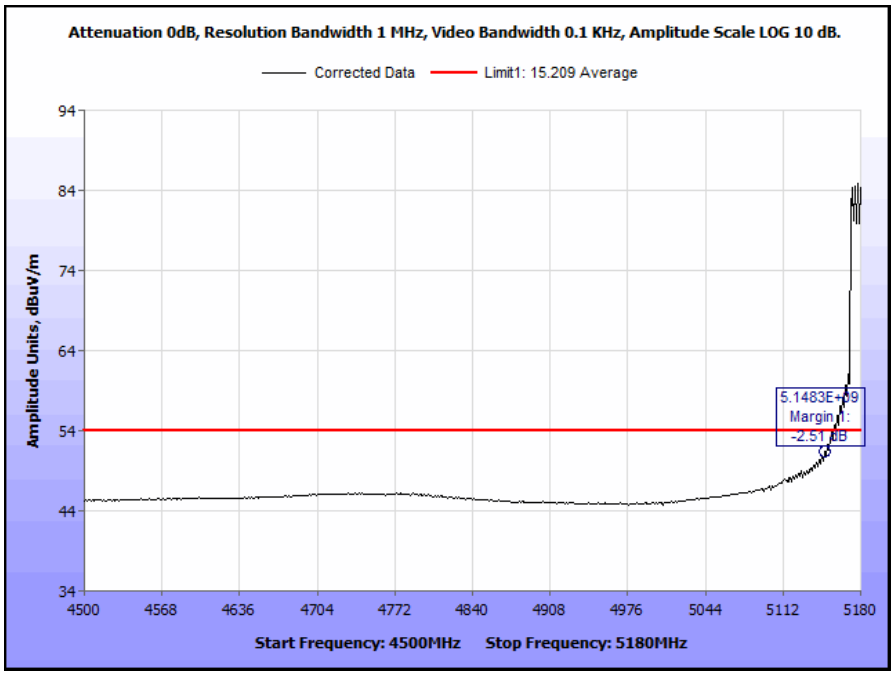
Band Edge, 802.11ac 80 MHz



Plot 75. Radiated Band Edge, 802.11ac 80 MHz, Low Channel



Plot 76. Restricted Band Edge, 802.11ac 80 MHz, Low Channel

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Photograph 2. Radiated Spurious Emissions, Test Setup

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

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

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

MPE Limit Calculation: EUT's operating frequencies @ 5150-5250 MHz; Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2

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

$$S = PG / 4\pi R2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where, S = Power Density
P = Power Input to antenna
G = Antenna Gain 8 dBi, Array gain
R = Minimum Distance between User and Antenna (25cm)

Output Power = 24.16 dBm

Antenna Gain = 8.71 dBi

Power density is equal to 0.38 mW/cm^2.

At a distance of 20 cm.

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Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

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

Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The resolution band width of the spectrum analyzer was set to 10 KHz. The traces were used to show the drift of -26dB band edge of low and high channel respectively at normal and extreme conditions. The two frequencies 5180MHz and 5240 MHz in UNII-1 are derived to demonstrate compliance with frequency stability requirement.

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

Test Engineer(s): Surinder Singh

Test Date(s): 03/04/15

Frequency		5180MHz	5240MHz	Test result
Temperature (C)	Voltage (V)	Lower Frequency (MHz)	Upper Frequency (MHz)	
-20	120	5169.4	5251.6	Within UNII band
-10	120	5168.2	5251.9	Within UNII band
0	120	5167.9	5252.1	Within UNII band
10	120	5168.3	5252.3	Within UNII band
20	108	5169.3	5252	Within UNII band
20	120	5169.1	5252	Within UNII band
20	132	5168.4	5251.7	Within UNII band
30	120	5167.8	5251.9	Within UNII band
40	120	5168.4	5251.5	Within UNII band
50	120	5168.1	5251.5	Within UNII band
55	120	5168.6	5252.8	Within UNII band

Table 15. Frequency Stability, Test Results

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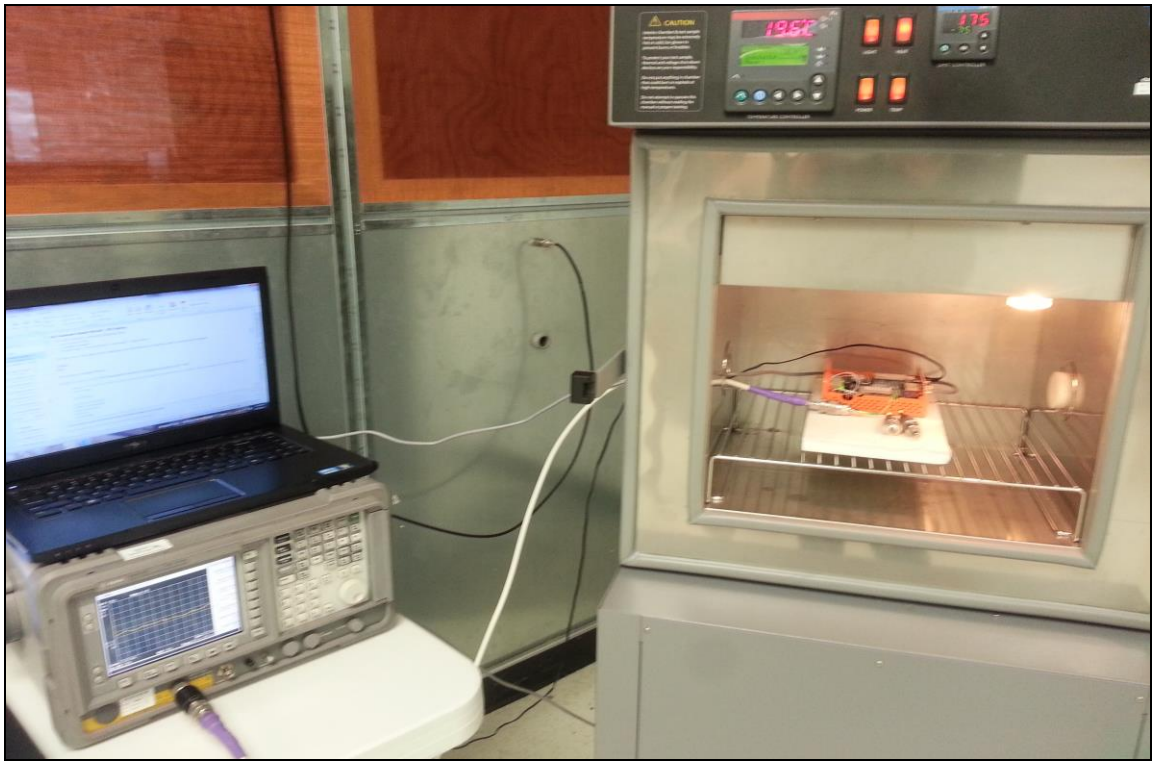

Photograph 3. Frequency Stability, Test Setup

IV. Test Equipment

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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
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1T4870	THERM./CLOCK/HUMIDITY MONITOR	CONTROL COMPANY	06-662-4, FB70258	3/14/2014	3/14/2016
1T4829	SPECTRUM ANALYZER	AGILENT	E4407B	9/30/2014	3/30/2016
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	7/29/2014	1/29/2016
1T4564	LISN (24 AMP)	SOLAR ELECTRONICS	9252-50-R-24-BNC	6/3/2014	6/3/2015
1T4505	TEMPERATURE CHAMBER	TEST EQUITY	115	2/11/2015	2/11/2016
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	2/28/2014	8/28/2015
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4418	LISN	SOLAR ELECTRONICS	9233-50-TS-50-N	10/24/2014	4/24/2016
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	7/18/2014	7/18/2016
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	7/24/2012	7/24/2015
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	NOT REQUIRED	
1T2665	ANTENNA; HORN	EMCO	3115	4/3/2014	10/3/2015

Table 16. Test Equipment List

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

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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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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.

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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.

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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.

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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.

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