



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

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March 23, 2017

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

Dear Tony Figueiredo,

Enclosed is the EMC Wireless test report for compliance testing of the ARRIS Group, Inc., SBG7400 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).

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.

Joel Huna
Documentation Department

Reference: (\ARRIS Group, Inc.\ EMC89524B-FCC407 UNII 1 Rev. 1)

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Electromagnetic Compatibility Criteria Test Report

for the

**ARRIS Group, Inc.
Model SBG7400**

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

MET Report: EMC89524B-FCC407 UNII 1 Rev. 1

March 23, 2017

Prepared For:

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

Prepared By:
MET Laboratories, Inc.
914 West Patapsco Avenue,
Baltimore, MD 21230

Electromagnetic Compatibility Criteria Test Report

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Model SBG7400

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



Hadid Jones, Project Engineer
Electromagnetic Compatibility Lab



Joel Huna
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

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	March 13, 2017	Initial Issue.
1	March 23, 2017	Engineer corrections.

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List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dBμA	Decibels above one microamp
dBμV	Decibels above one microvolt
dBμA/m	Decibels above one microamp per meter
dBμV/m	Decibels above one microvolt per meter
DC	Direct Current
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	Kilohertz
kPa	Kilopascal
kV	Kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
μH	Microhenry
μ	Microfarad
μs	Microseconds
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the ARRIS Group, Inc. SBG7400, 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 SBG7400. 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 SBG7400, 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 AR1098306. All tests were conducted using measurement procedure ANSI C63.4-2014.

FCC Reference	Description	Results
§15.203	Antenna Requirement	Compliant
§15.403(i)	26dB Occupied Bandwidth	Compliant
§15.407 (a)(1)	Maximum Conducted Output Power	Compliant
§15.407 (a)(1)	Maximum Power Spectral Density	Compliant
§15.407 (b)(1)& (6 - 7)	Undesirable Emissions	Compliant
§15.407(b)(6)	Conducted Emission Limits	Compliant
§15.407(f)	RF Exposure	Compliant
§15.407(g)	Frequency Stability	Compliant

Table 1. Executive Summary of EMC Part 15.407 Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by ARRIS Group, Inc. to perform testing on the SBG7400, under ARRIS Group, Inc.'s purchase order number AR1098306.

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. SBG7400.

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

Model(s) Tested:	SBG7400	
Model(s) Covered:	SBG7400	
EUT Specifications:	Primary Power: 12VDC, 2.5A via 115V/60Hz Adapter	
	FCC ID: UIDSBG7400	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Max. RF Output Power:	22.63dBm
	EUT Frequency Ranges:	5150-5240MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Type of Filing:	Original	
Evaluated by:	Hadid Jones	
Report Date(s):	March 23, 2017	

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., 914 West Patapsco Avenue, 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. SBG7400, Equipment Under Test (EUT), is identical to TG2482 except no telephony circuitry.

The TG2482 is Telephony Gateway with 802.11ac Dual Band Wireless radios; 3x3 2.4GHz 802.11n and 4x4 5GHz 802.11ac Wave 2.

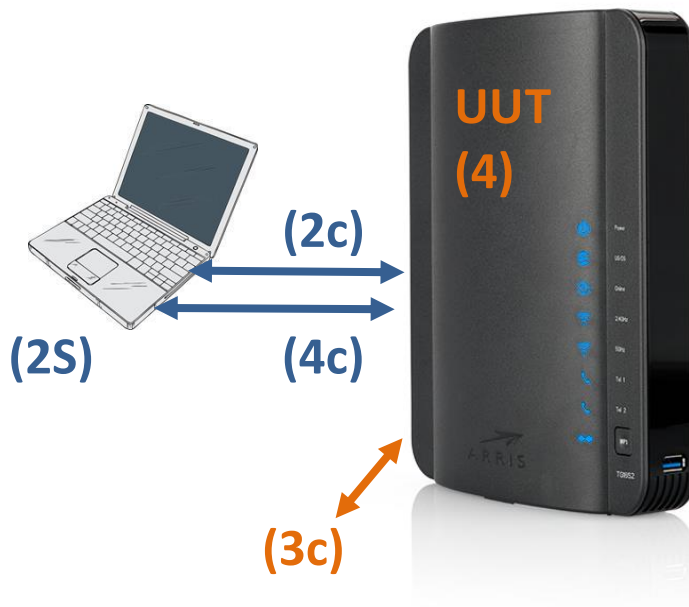


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

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

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
4		UUT	SBG7400		G93BX9333300844	

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	*Customer Supplied Calibration Data
2s	Laptop	Assorted	N/A	N/A

The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

Table 5. Support Equipment

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
2C	Ethernet	5e Modular 8 pin	1	1	1	No	
3C	DC Input	2 conductor	1	2		No	
4C	Serial	USB to 9 pin D-Sub	1	0.25		No	

Table 6. Ports and Cabling Information

H. Mode of Operation

The provided instructions and software will configure the unit for operation at each required test mode. See Configuration.

I. Method of Monitoring EUT Operation

All indicator lights are active, both Wi-Fi 2.4G and 5 G passing traffic.

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.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

- a.) Antenna must be permanently attached to the unit.
- b.) Antenna must use a unique type of connector to attach to the EUT.
- c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

Results: The EUT as tested is compliant the criteria of §15.203.

The EUT as tested is compliant the criteria of §15.203. The EUT has integral antennas. The EUT also has test ports for conducted measurements.

Test Engineer(s): Hadid Jones

Test Date(s): February 26, 2017

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26dB Bandwidth

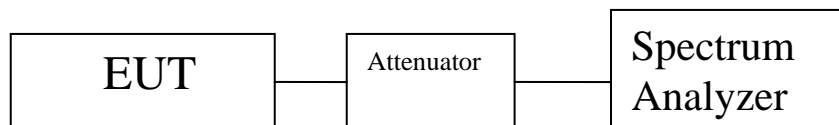
Test Requirements: § 15.403(i): For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the 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 26dB bandwidth was measured according to KDB789033 v01r03 Procedure C**
The EUT was connected to the spectrum analyzer through an attenuator. The spectrum analyzer was configured in the following manner. The RBW was set to approximately 1% of the emission bandwidth. The VBW was set to a value greater than or equal to the RBW. The detector was set to peak and trace to max hold. The EUT was operated at its maximum power level on the low, mid, and high test channels. The width of the emission that was 26dB down from the maximum emission was measured.

Test Results The 26 dB Bandwidth was compliant with the requirements of this section. Data is presented for chain 0.

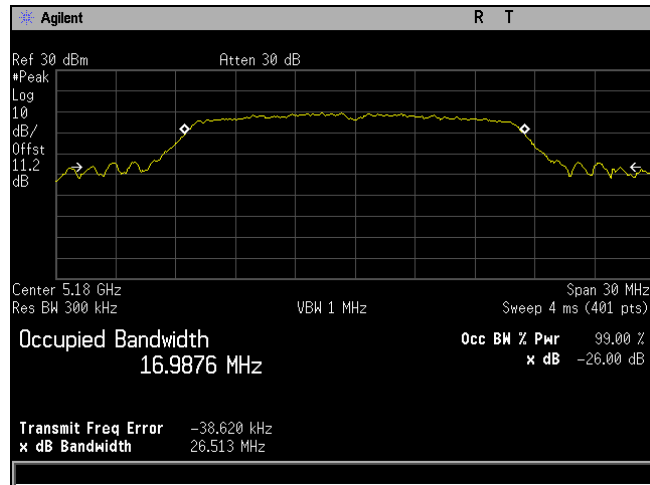
Test Engineer(s): Hadid Jones

Test Date(s): February 26, 2017

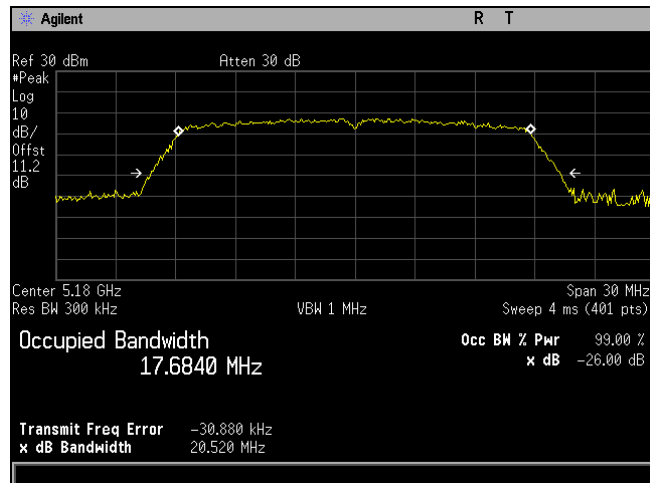


EUT Mode	26dB	99%
OBW_99Percent_BW 20M_Ch 5180M_802.11a	26.513	16.98
OBW_99Percent_BW 20M_Ch 5180M_802.11ac	20.52	17.68
OBW_99Percent_BW 20M_Ch 5180M_802.11n	20.551	17.65
OBW_99Percent_BW 20M_Ch 5200M_802.11a	24.688	16.84
OBW_99Percent_BW 20M_Ch 5200M_802.11ac	20.441	17.65
OBW_99Percent_BW 20M_Ch 5200M_802.11n	20.502	17.68
OBW_99Percent_BW 20M_Ch 5240M_802.11a	28.187	16.89
OBW_99Percent_BW 20M_Ch 5240M_802.11ac	20.46	17.69
OBW_99Percent_BW 20M_Ch 5240M_802.11n	20.592	17.65
OBW_99Percent_BW 40M_Ch 5190M_802.11ac	39.835	35.95
OBW_99Percent_BW 40M_Ch 5190M_802.11n	40.08	35.94
OBW_99Percent_BW 40M_Ch 5230M_802.11ac	40.204	35.93
OBW_99Percent_BW 40M_Ch 5230M_802.11n	40.054	35.92
OBW_99Percent_BW 80M_Ch 5210M_802.11ac	81.366	75.08

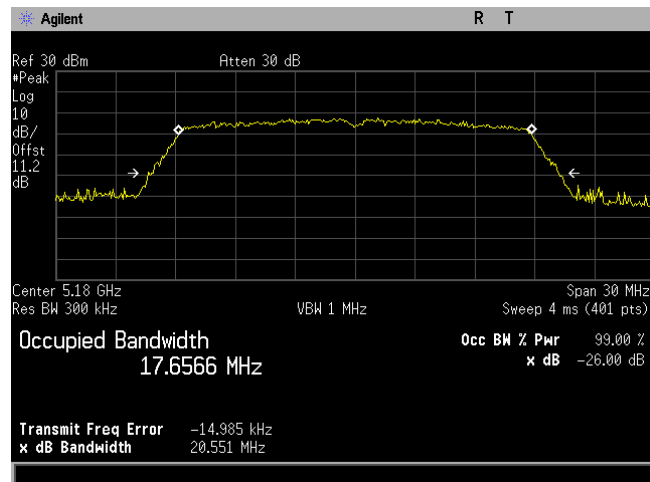
Table 7. 26 dB Occupied Bandwidth, Test Results



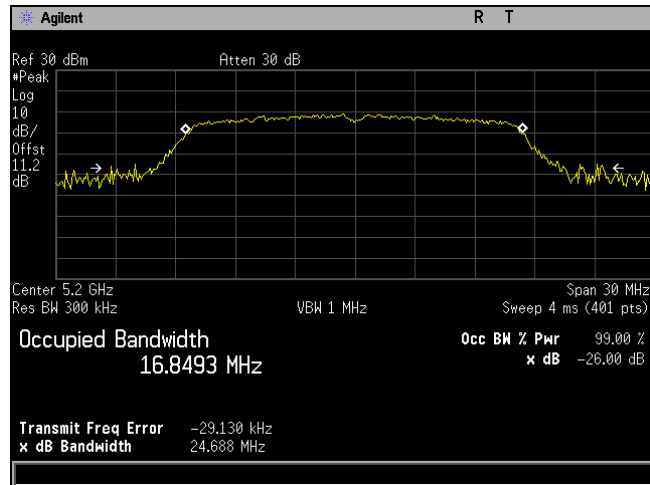
Plot 1. 99%Occupied Bandwidth, BW 20M, Ch. 5180M, 802.11 a



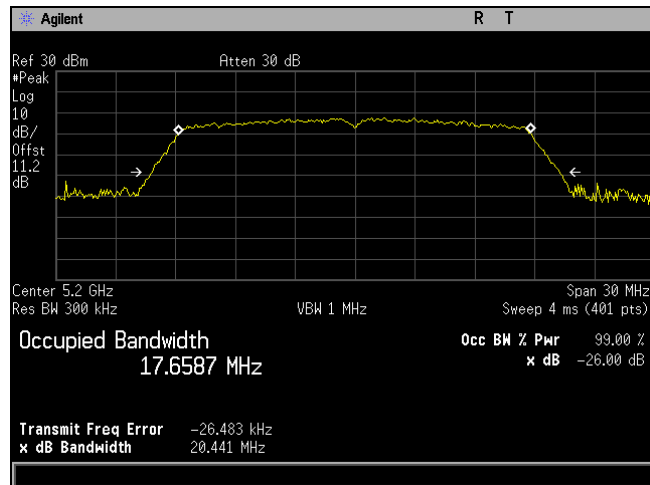
Plot 2. 99%Occupied Bandwidth, BW 20M, Ch. 5180M, 802.11 ac



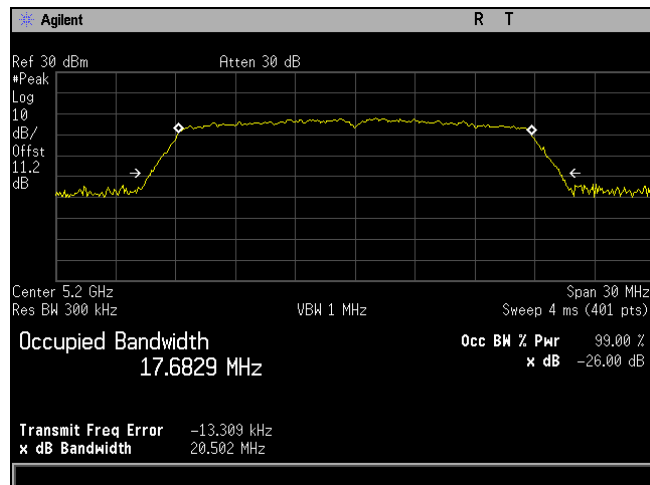
Plot 3. 99%Occupied Bandwidth, BW 20M, Ch. 5180M, 802.11 n



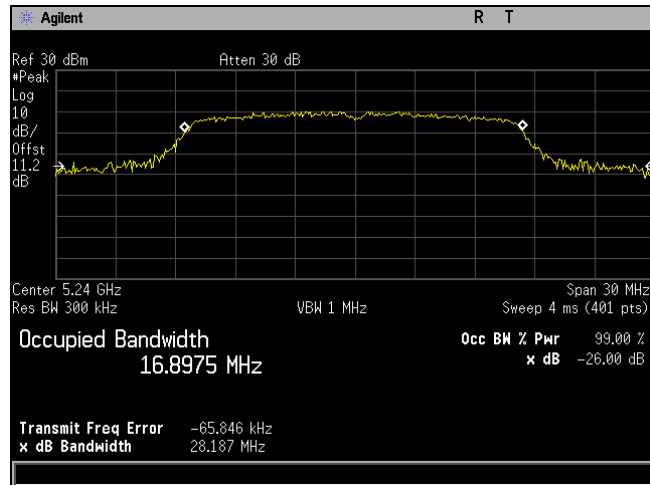
Plot 4. 99%Occupied Bandwidth, BW 20M, Ch. 5200M, 802.11 a



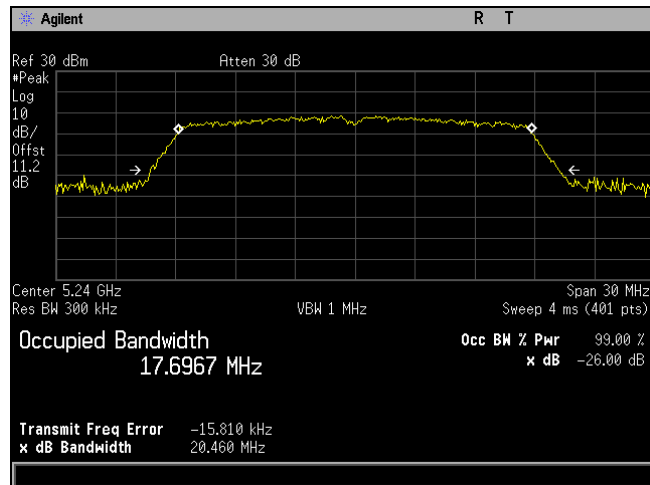
Plot 5. 99%Occupied Bandwidth, BW 20M, Ch. 5200M, 802.11 ac



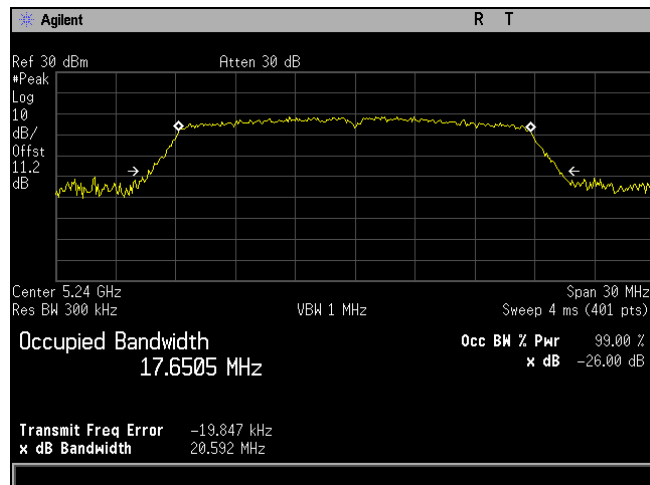
Plot 6. 99%Occupied Bandwidth, BW 20M, Ch. 5200M, 802.11 n



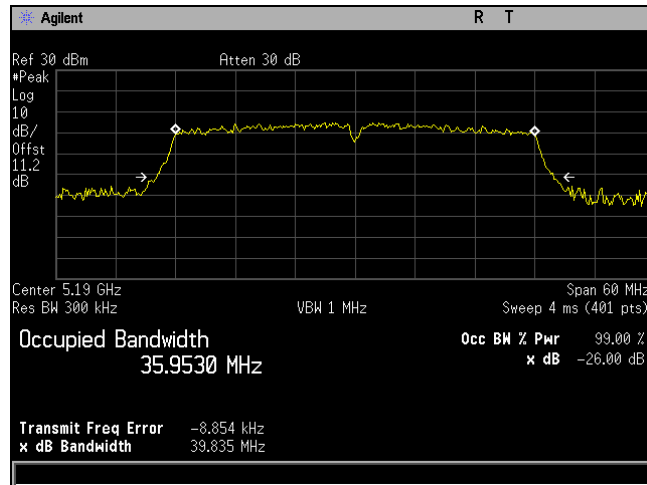
Plot 7. 99%Occupied Bandwidth, BW 20M, Ch. 5240M, 802.11 a



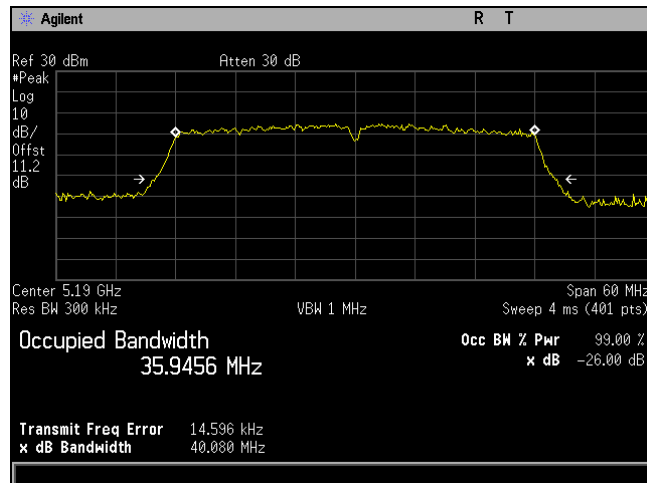
Plot 8. 99%Occupied Bandwidth, BW 20M, Ch. 5240M, 802.11 ac



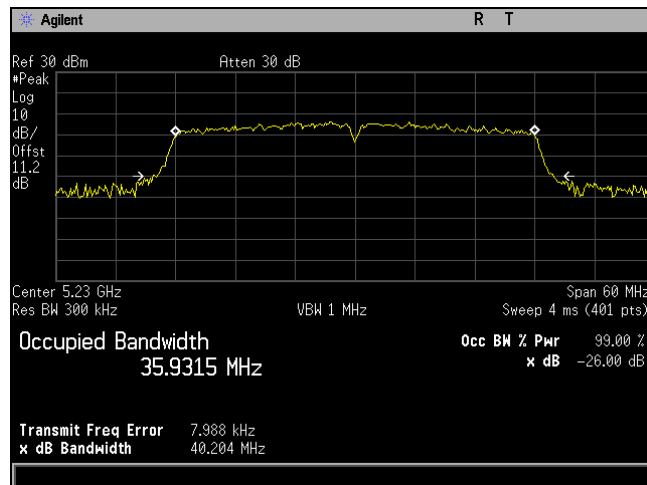
Plot 9. 99%Occupied Bandwidth, BW 20M, Ch. 5240M, 802.11 n



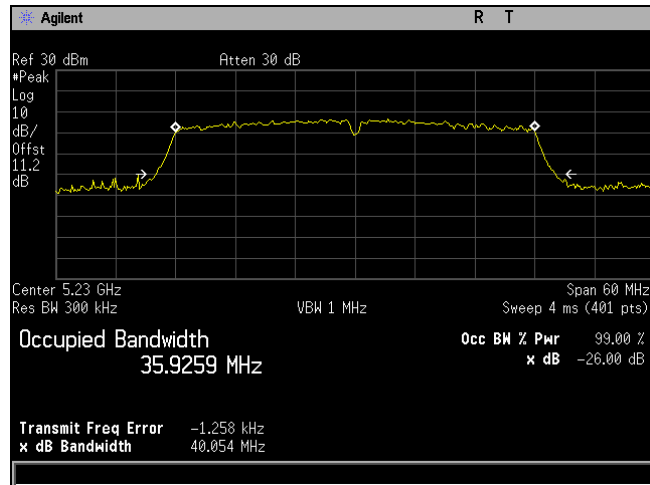
Plot 10. 99%Occupied Bandwidth, BW 40M, Ch. 5190M, 802.11 ac



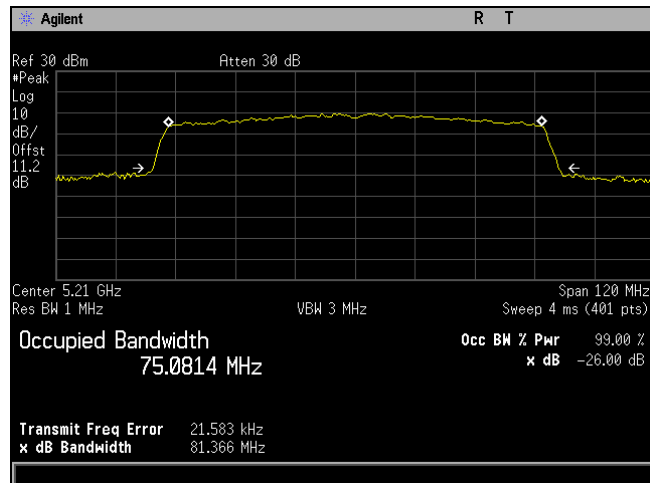
Plot 11. 99%Occupied Bandwidth, BW 40M, Ch. 5190M, 802.11 n



Plot 12. 99%Occupied Bandwidth, BW 40M, Ch. 5230M, 802.11 ac



Plot 13. 99%Occupied Bandwidth, BW 40M, Ch. 5230M, 802.11 n



Plot 14. 99%Occupied Bandwidth, BW 80M, Ch. 5210M, 802.11, ac

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(a)(1) Maximum Conducted Output Power

Test Requirements: **§15.407(a)(1)(i):** 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.
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.

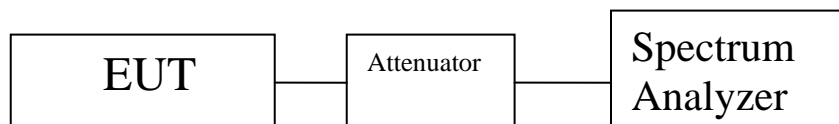
§15.407(a)(1)(ii): For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.
If transmitting antennas of directional gain greater than 6 dBi are 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 Maximum Conducted Output Power was measured according to KDB789033 v01r03 Method SA-1. The EUT was connected to the spectrum analyzer through an attenuator. The spectrum analyzer was configured in the following manner. The span was set to encompass the entire emission bandwidth of the signal. The RBW was set to 1MHz and the VBW was set to a value greater than or equal to 3x the RBW. An average detector was used with an auto sweep time. The trace was averaged over at least 100 traces. Power was computed by integrating the spectrum across the EBW of the signal using the instruments band power measurement function.

Test Results: The EUT as tested is compliant with the requirements of this section. Graphical data is presented for chain 0. Tabular data is presented for all chains. Data is uncorrelated for n and ac modes.

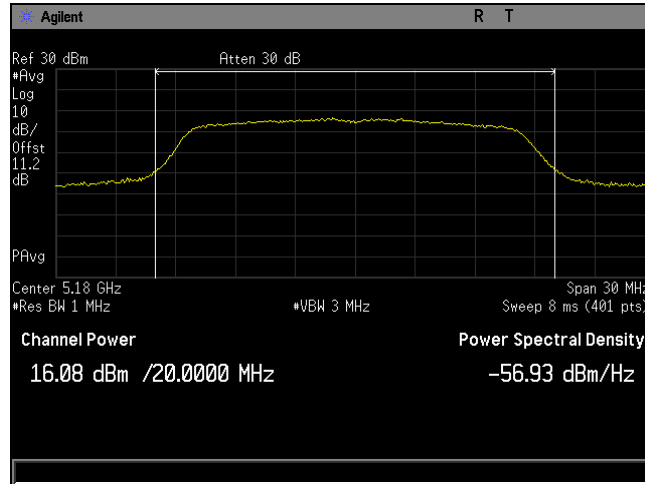
Test Engineer(s): Hadid Jones

Test Date(s): February 26, 2017

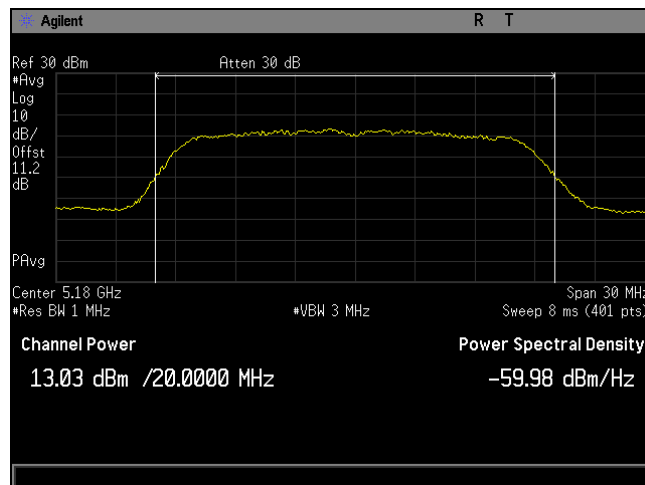


OutPut Power												
EUT MODE & PWR Setting	CH0 (dBm)	CH1 (dBm)	CH2 (dBm)	CH3 (dBm)	Duty Cycle CF (dB)	Σ (dBm)	Limit (dBm)	Gain (dBi)	Final Limit (dBm)	Margin (dB)		
BW 20M_Ch 5180M_80211a MCS0 P3230	16.08	15.27	15.57	14.74	1.02	22.48	30	10.52	25.48	-3.00		
BW 20M_Ch 5180M_80211ac MCS24 P3230	13.03	12.32	11.66	11.66	1.08	19.31	30	4.5	30	-10.69		
BW 20M_Ch 5180M_80211n MCS16 P3230	9.3	10.53	10.5	10.25	0.96	17.15	30	4.5	30	-12.85		
BW 20M_Ch 5200M_80211a MCS0 P3230	16.37	15.48	15.24	14.15	1.02	22.42	30	10.52	25.48	-3.06		
BW 20M_Ch 5200M_80211ac MCS24 P3230	12.55	12.54	12.12	11.84	1.08	19.37	30	4.5	30	-10.63		
BW 20M_Ch 5200M_80211n MCS16 P3230	9.67	11.3	9.25	10.37	0.96	17.20	30	4.5	30	-12.80		
BW 20M_Ch 5240M_80211a MCS0 P3230	16.87	14.39	14.96	15.73	1.02	22.63	30	10.52	25.48	-2.85		
BW 20M_Ch 5240M_80211ac MCS24 P3230	12.68	11.43	11.9	12.08	1.08	19.15	30	4.5	30	-10.85		
BW 20M_Ch 5240M_80211n MCS16 P3230	13.2	11.59	11.85	12.6	0.96	19.34	30	4.5	30	-10.66		
BW 40M_Ch 5190M_80211ac MCS24 P3230	12.93	12.16	12.16	11.42	1.08	19.30	30	4.5	30	-10.70		
BW 40M_Ch 5190M_80211n MCS16 P3230	12.26	10.85	10.16	11	0.96	18.12	30	4.5	30	-11.88		
BW 40M_Ch 5230M_80211ac MCS24 P3230	12.33	12.59	11.85	12.32	1.08	19.38	30	4.5	30	-10.62		
BW 40M_Ch 5230M_80211n MCS16 P3230	12.44	10.66	11.02	9.57	0.96	18.03	30	4.5	30	-11.97		
BW 80M_Ch 5210M_80211ac MCS24 P3230	12.74	12.33	11.95	12.48	1.08	19.48	30	4.5	30	-10.52		

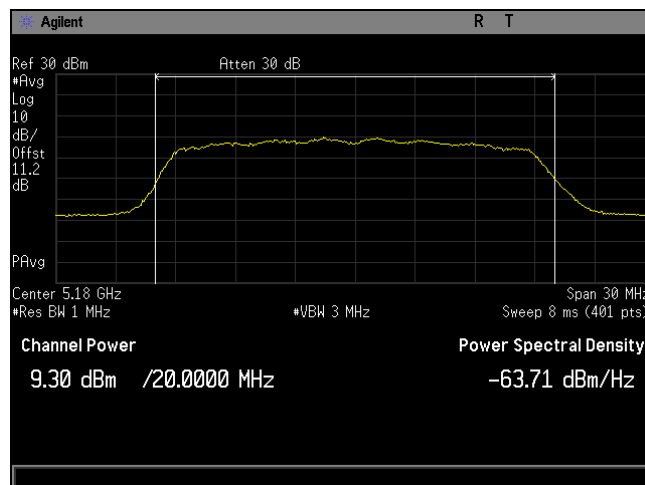
Table 8. Maximum Conducted Power, Test Results



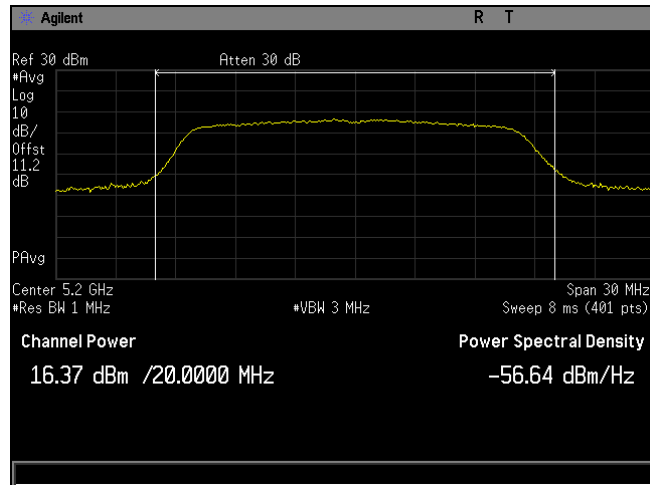
Plot 15. Maximum Conducted Output Power, BW 20M, Ch. 5180M, 80211a, MCS0, P3230, CH0



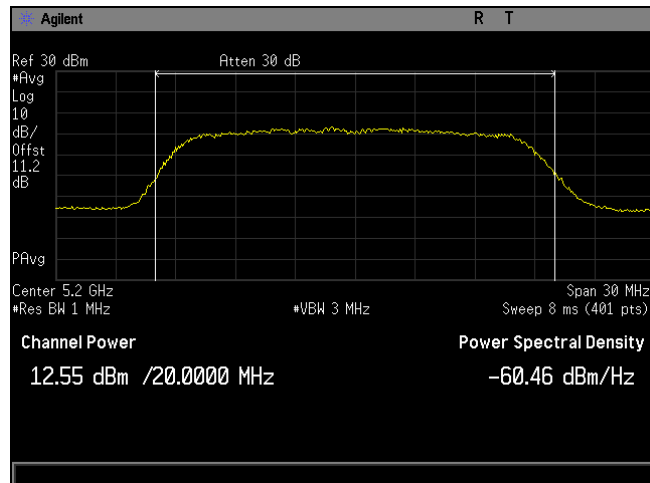
Plot 16. Maximum Conducted Output Power, BW 20M, Ch. 5180M, 80211ac, MSC24, P3230, CH0



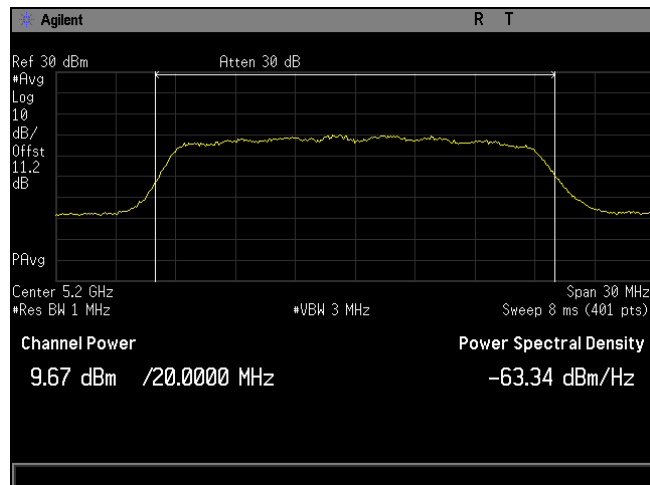
Plot 17. Maximum Conducted Output Power, BW 20M, Ch. 5180M, 80211n, MCS24, P3230, CH0



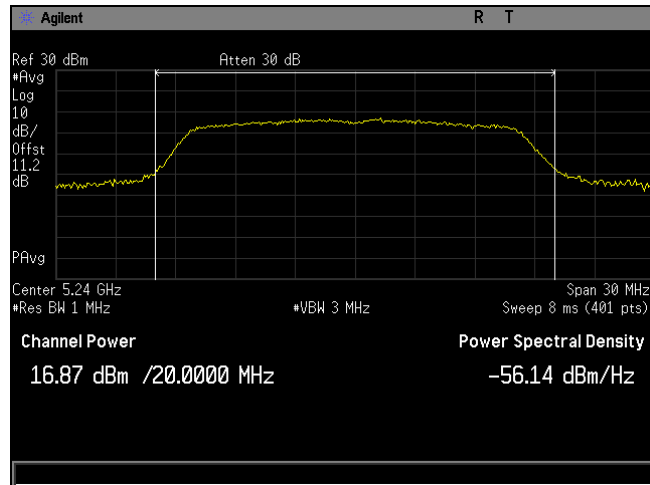
Plot 18. Maximum Conducted Output Power, BW 20M, Ch. 5200M, 80211a, MCS0, P3230, CH0



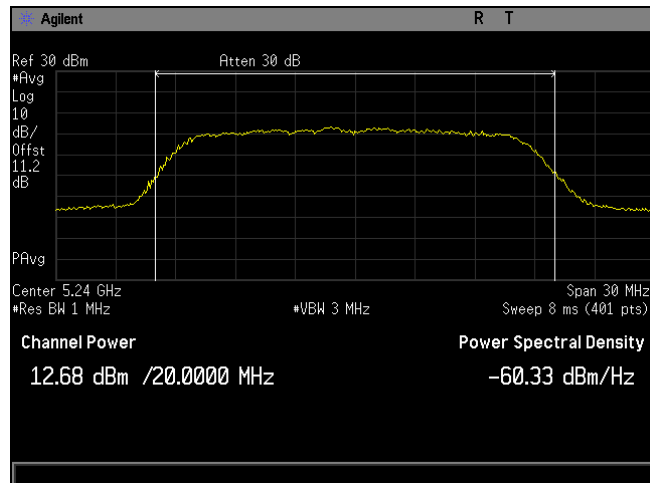
Plot 19. Maximum Conducted Output Power, BW 20M, Ch. 5200M, 80211ac, MSC24, P3230, CH0



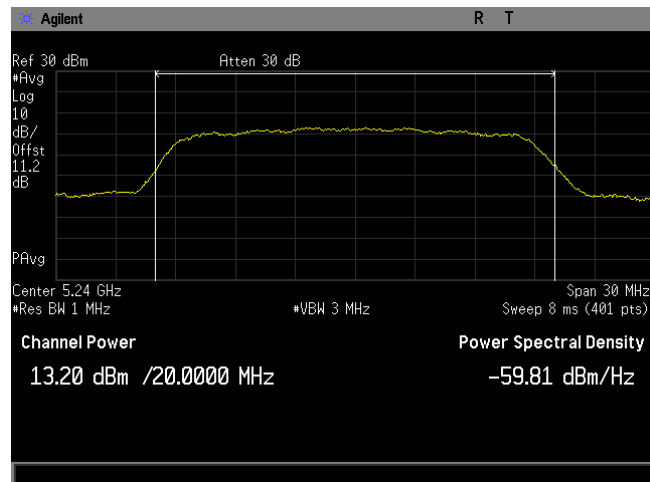
Plot 20. Maximum Conducted Output Power, BW 20M, Ch. 5200M, 80211n, MCS24, P3230, CH0



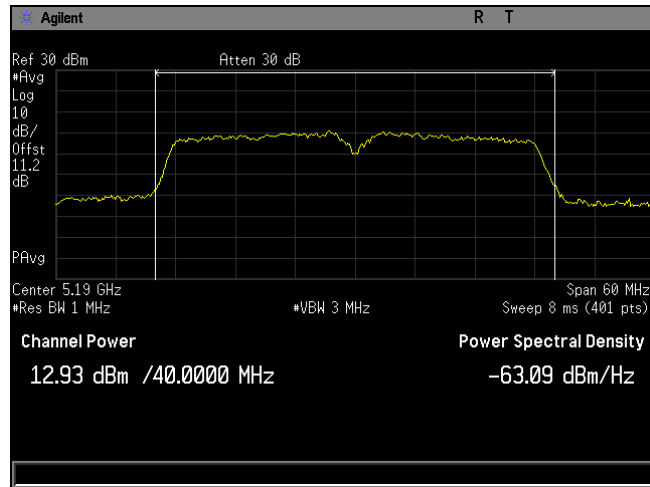
Plot 21. Maximum Conducted Output Power, BW 20M, Ch. 5240M, 80211a, MCS0, P3230, CH0



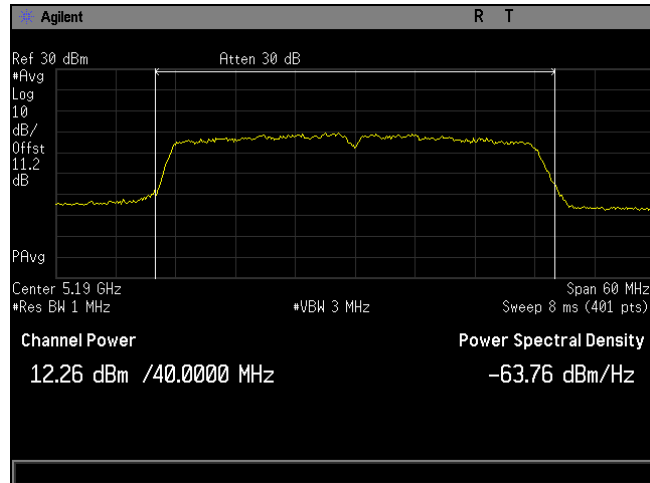
Plot 22. Maximum Conducted Output Power, BW 20M, Ch. 5240M, 80211ac, MSC24, P3230, CH0



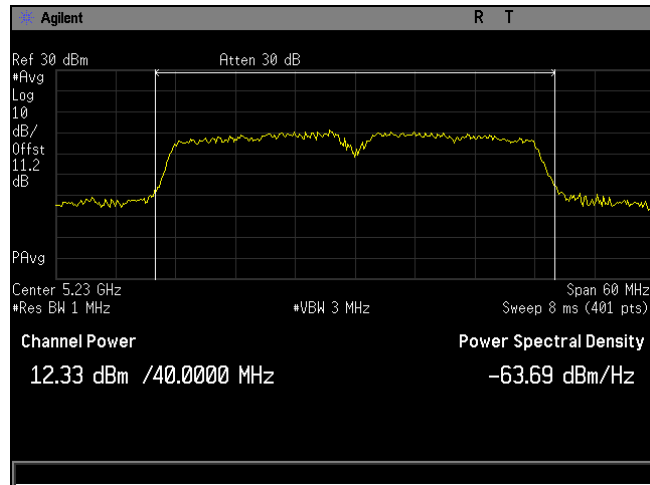
Plot 23. Maximum Conducted Output Power, BW 20M, Ch. 5240M, 80211n, MSC24, P3230, CH0



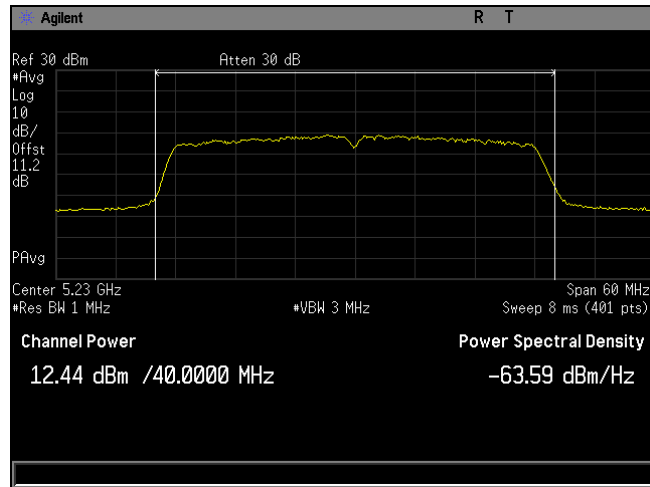
Plot 24. Maximum Conducted Output Power, BW 40M, Ch. 5190M, 80211ac, MCS4, P3230, CH0



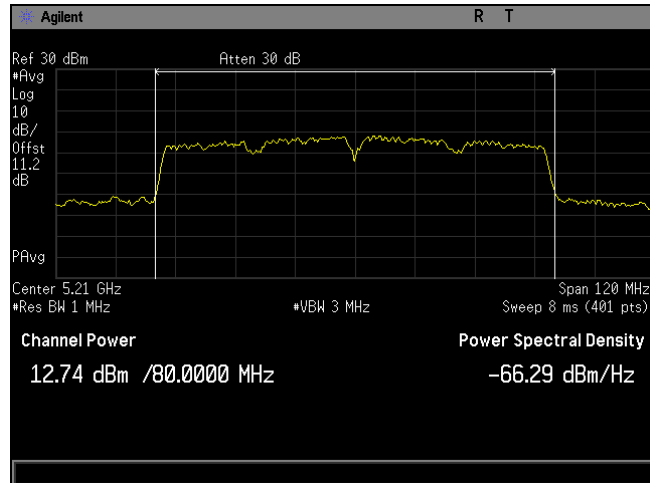
Plot 25. Maximum Conducted Output Power, BW 40M, Ch. 5190M, 80211n, MSC24, P3230, CH0



Plot 26. Maximum Conducted Output Power, BW 40M, Ch. 5230M, 80211ac, MCS24, P3230, CH0



Plot 27. Maximum Conducted Output Power, BW 40M, Ch. 5230M, 80211n, MSC24, P3230, CH0



Plot 28. Maximum Conducted Output Power, BW 80M, Ch. 5210M, 80211ac, MCS24, P3230, CH0

Electromagnetic Compatibility Criteria for Intentional Radiators

§15.407(a)(1) Maximum Power Spectral Density

Test Requirements: §15.407(a)(1)(i): 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.

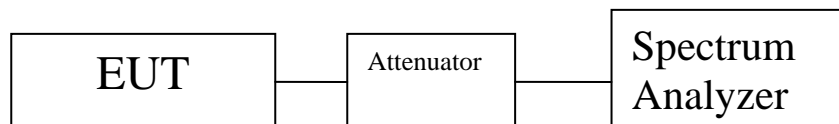
§15.407(a)(1)(ii): In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi..

Test Procedure: The Maximum Power Spectral Density was measured according to KDB789033 v01r03 Procedure F. The EUT was connected to the spectrum analyzer through an attenuator. The spectrum analyzer was configured in the following manner. The span was set to encompass the entire emission bandwidth of the signal. The RBW was set to 1MHz and the VBW was set to a value greater than or equal to 3 times the RBW. An average detector was used with an auto sweep time. The trace was averaged over at least 100 traces. The peak search function was used to find the Maximum PSD over the 1MHz reference bandwidth.

Test Results: The EUT as tested is compliant with the requirements of this section. Graphical data is presented for chain 0. Tabular data is presented for all chains. Data is uncorrelated for n and ac modes.

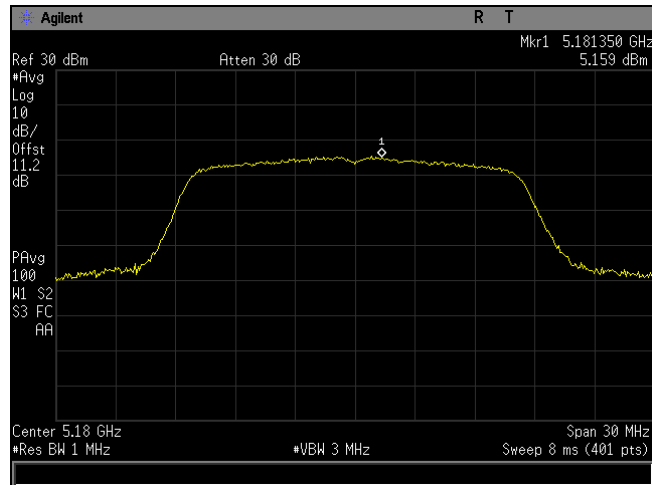
Test Engineer(s): Hadid Jones

Test Date(s): February 26, 2017

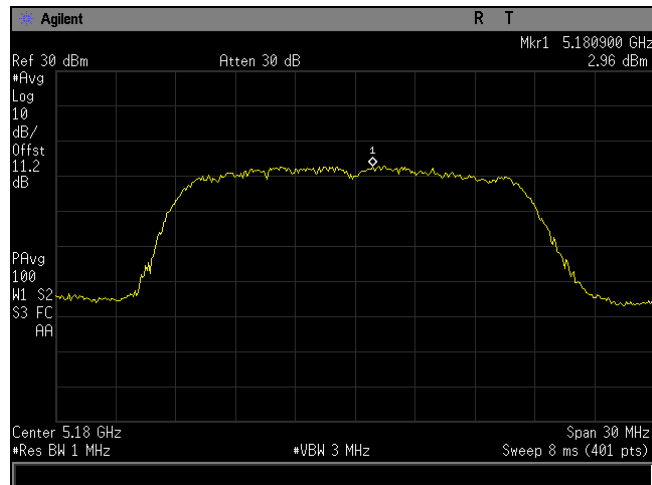


Power Spectral Density											
EUT MODE & PWR Setting	CH0 (dBm)	CH1 (dBm)	CH2 (dBm)	CH 3 (dBm)	Duty Cycle CF (dB)	Σ (dBm)	Limit (dBm)	Gain (dBi)	Final Limit (dBm)	Margin (dB)	
BW 20M_Ch 5180M_80211a MCS0 P3230	5.15	5.81	5.42	5.18	1.02	12.44	17	11	12	-0.04	
BW 20M_Ch 5180M_80211ac MCS24 P3230	2.96	3.19	2.40	1.70	1.08	9.70	17	5	17	-7.30	
BW 20M_Ch 5180M_80211n MCS16 P3230	-0.69	1.35	0.27	0.31	0.96	7.35	17	5	17	-9.65	
BW 20M_Ch 5200M_80211a MCS0 P3230	4.66	5.56	5.47	4.79	1.02	12.18	17	11	12	-0.30	
BW 20M_Ch 5200M_80211ac MCS24 P3230	3.56	2.74	1.70	2.37	1.08	9.75	17	5	17	-7.25	
BW 20M_Ch 5200M_80211n MCS16 P3230	-1.24	1.63	-0.34	1.09	0.96	7.41	17	5	17	-9.59	
BW 20M_Ch 5240M_80211a MCS0 P3230	4.42	4.78	5.23	5.64	1.02	12.08	17	11	12	-0.40	
BW 20M_Ch 5240M_80211ac MCS24 P3230	3.26	3.50	2.51	2.22	1.08	10.00	17	5	17	-7.00	
BW 20M_Ch 5240M_80211n MCS16 P3230	3.41	1.59	0.85	3.17	0.96	9.36	17	5	17	-7.64	
BW 40M_Ch 5190M_80211ac MCS24 P3230	0.57	-0.53	0.10	-0.36	1.08	7.07	17	5	17	-9.93	
BW 40M_Ch 5190M_80211n MCS16 P3230	-1.40	-1.44	-1.21	-1.33	0.96	5.64	17	5	17	-11.36	
BW 40M_Ch 5230M_80211ac MCS24 P3230	-0.44	-0.49	-0.33	-0.86	1.08	6.57	17	5	17	-10.43	
BW 40M_Ch 5230M_80211n MCS16 P3230	-0.86	-2.16	-1.94	-1.90	0.96	5.30	17	5	17	-11.70	
BW 80M_Ch 5210M_80211ac MCS24 P3230	-1.88	-2.25	-2.69	-2.55	1.08	4.77	17	5	17	-12.23	

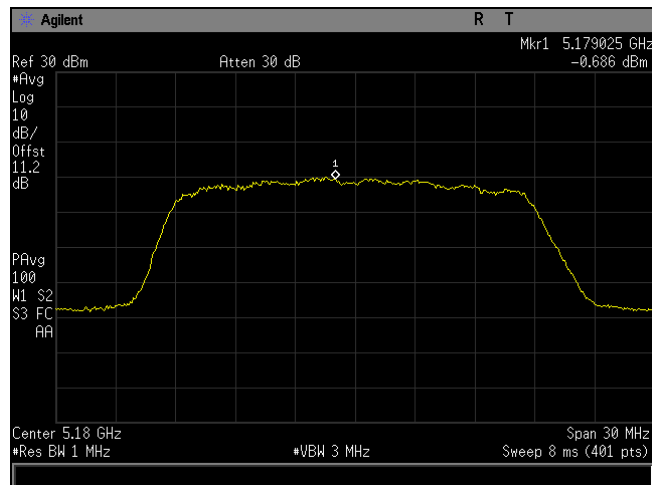
Table 9. Power Spectral Density, Test Results



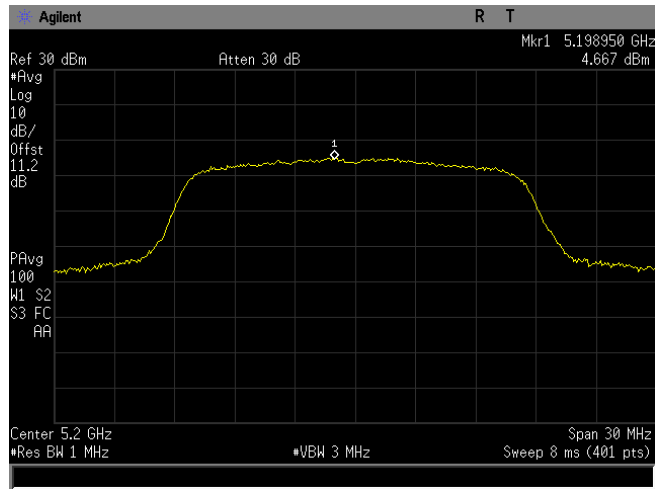
Plot 29. Power Spectral Density, BW 20M, Ch. 5180M, 80211a, MCS0, P3230, CH0



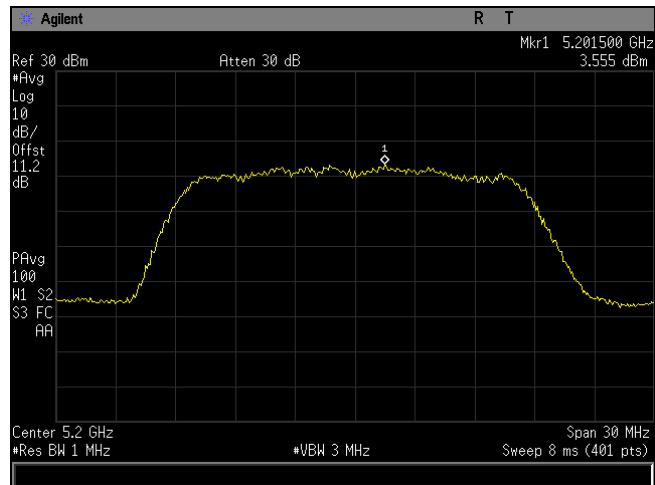
Plot 30. Power Spectral Density, BW 20M, Ch. 5180M, 80211ac, MSC24, P3230, CH0



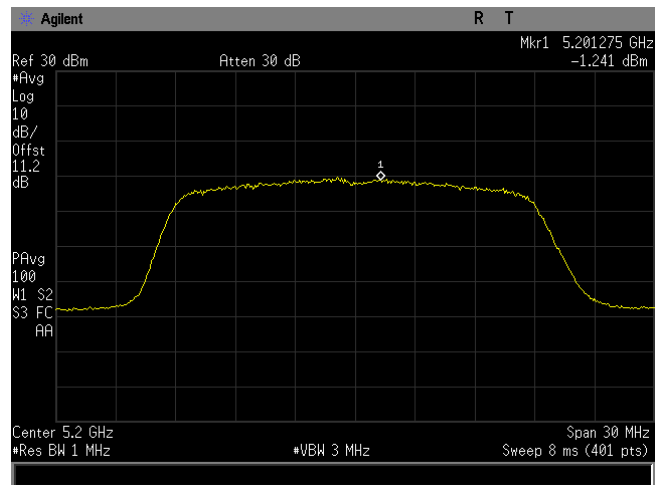
Plot 31. Power Spectral Density, BW 20M, Ch. 5180M, 80211n, MCS24, P3230, CH0



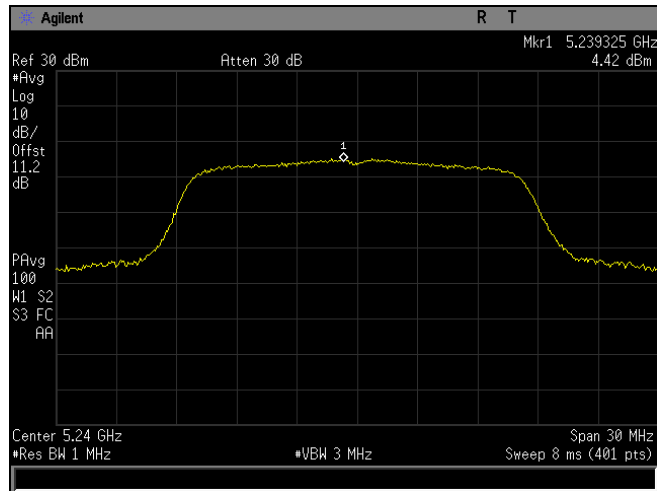
Plot 32. Power Spectral Density, BW 20M, Ch. 5200M, 80211a, MCS0, P3230, CH0



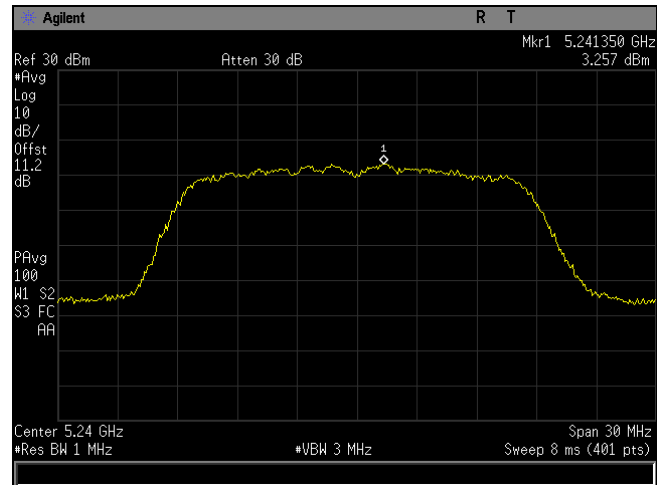
Plot 33. Power Spectral Density, BW 20M, Ch. 5200M, 80211ac, MSC24, P3230, CH0



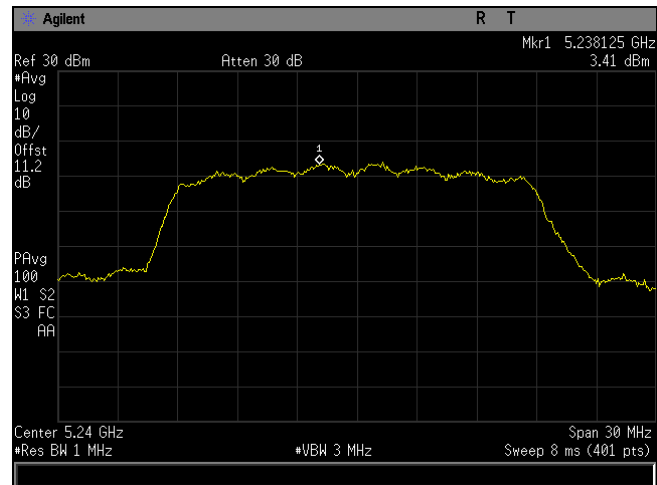
Plot 34. Power Spectral Density, BW 20M, Ch. 5200M, 80211n, MCS24, P3230, CH0



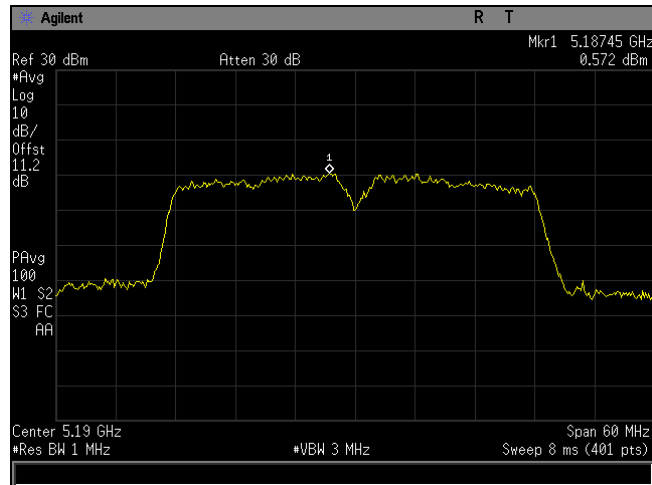
Plot 35. Power Spectral Density, BW 20M, Ch. 5240M, 80211a, MCS0, P3230, CH0



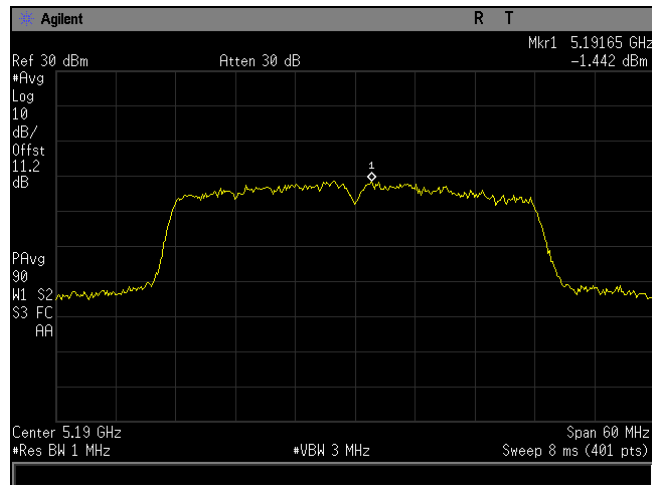
Plot 36. Power Spectral Density, BW 20M, Ch. 5240M, 80211ac, MSC24, P3230, CH0



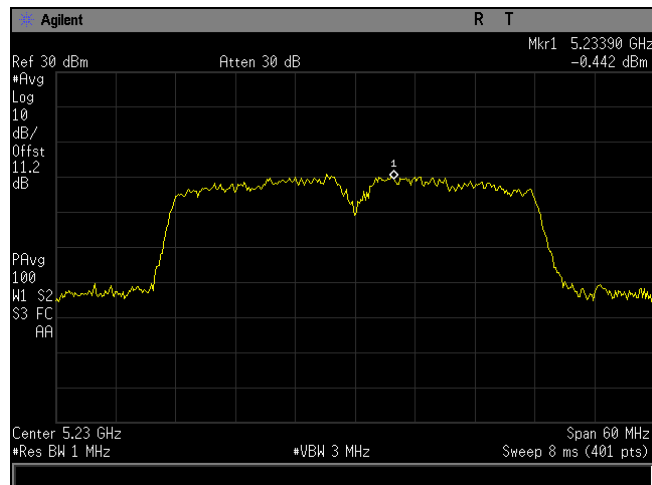
Plot 37. Power Spectral Density, BW 20M, Ch. 5240M, 80211n, MSC24, P3230, CH0



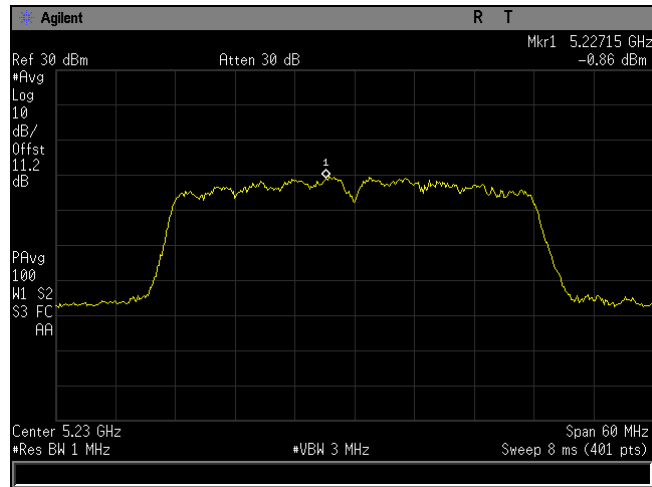
Plot 38. Power Spectral Density, BW 40M, Ch. 5190M, 80211ac, MCS24, P3230, CH0



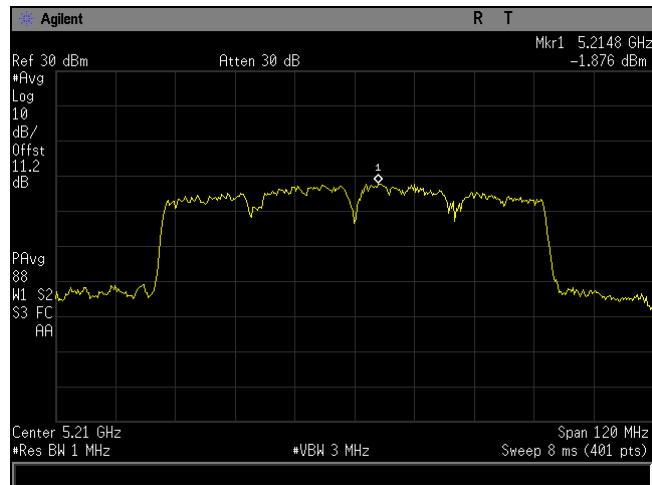
Plot 39. Power Spectral Density, BW 40M, Ch. 5190M, 80211n, MSC24, P3230, CH0



Plot 40. Power Spectral Density, BW 40M, Ch. 5230M, 80211ac, MCS24, P3230, CH0



Plot 41. Power Spectral Density, BW 40M, Ch. 5230M, 80211n, MSC24, P3230, CH0

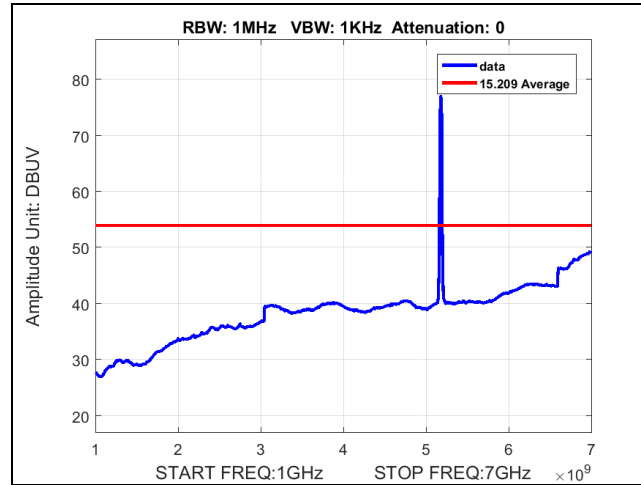


Plot 42. Power Spectral Density, BW 80M, Ch. 5210M, 80211ac, MCS24, P3230, CH0

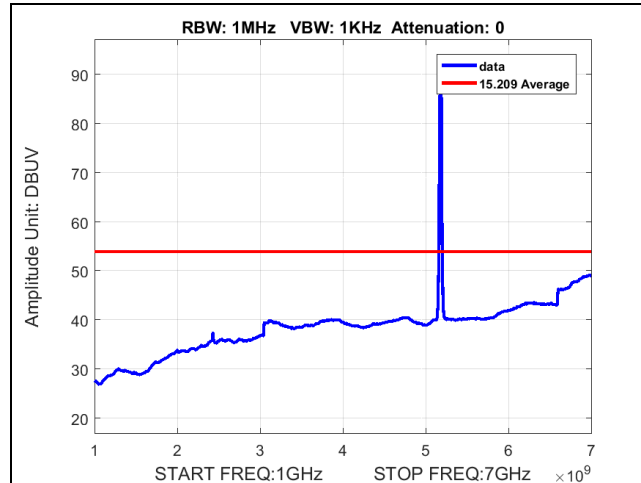
Electromagnetic Compatibility Criteria for Intentional Radiators

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

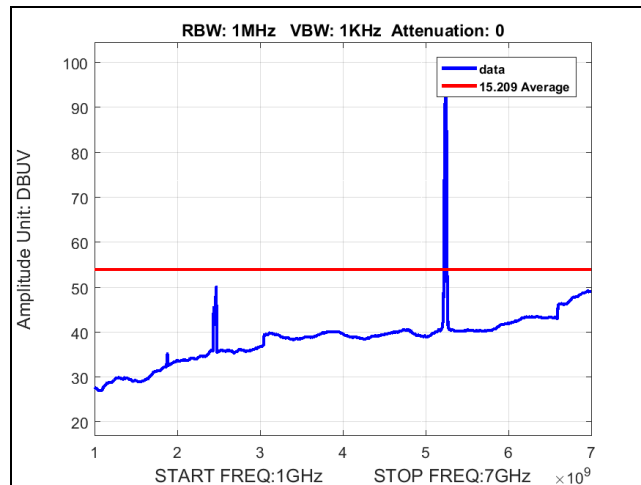
Test Requirements:	<p>§ 15.407(b)(1): For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.</p> <p>§ 15.407(b)(6): Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 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.</p> <p>§ 15.407(b)(7): The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.</p>
Test Procedure:	<p>Unwanted Emissions were measured according to KDB789033 v01r03 Procedure G. Measurements below 1GHz were made with the EUT on a non-conducting stand 80cm above the ground plane of a semi-anechoic chamber. To find the direction of maximum emissions, the EUT was oriented through its three orthogonal axes while rotating the turntable 360 degrees and varying the height of the receive antenna. Measurements were made with the EUT transmitting on the low, mid, and high channels of each configuration. Final measurements from 30MHz to 1GHz were made using a quasi-peak detector with a RBW of 120 kHz.</p> <p>Measurements above 1GHz were made with the EUT on a non-conducting stand 1.5m above the ground plane of a fully-anechoic chamber. To find the direction of maximum emissions, the EUT was oriented through its three orthogonal axes while rotating the chamber's turntable 360 degrees and varying the height of the receive antenna. Measurements were made with the EUT transmitting on the low, mid, and high channels of each configuration. Final measurements were made using peak and average detectors. Average measurements were made using a RBW of 1MHz and VBW less than the RBW but not less than 10Hz. Peak Measurements were made with a RBW of 1MHz and a VBW greater than or equal to 3 times the RBW.</p> <p>Emissions below 30MHz and above 18GHz that were greater than 20dB below the limit are not reported.</p> <p>The worse-case configuration is reported below 1GHz and above 7GHz</p>
Test Results:	<p>The EUT was compliant with the Radiated Emission limits for Intentional Radiators. See following pages for detailed test results. The data presented is corrected field-strength.</p>
Test Engineer(s):	<p>Hadid Jones</p>
Test Date(s):	<p>February 27, 2017</p>



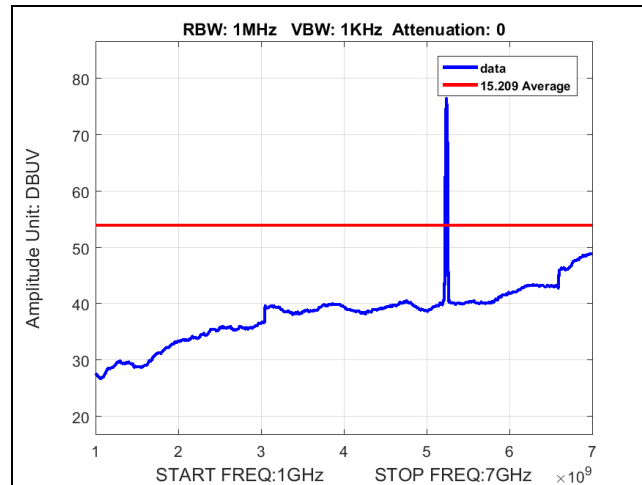
Plot 43. Average Spurious Emission, 1-7 GHz, BW 20M, Ch. 5180M, 80211ac, MCS24, P3230



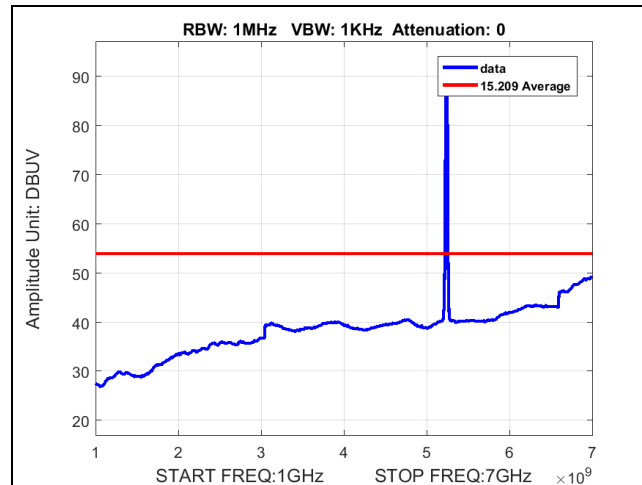
Plot 44. Average Spurious Emission, 1-7 GHz, BW 20M, Ch. 5180M, 80211n, MCS24, P3230



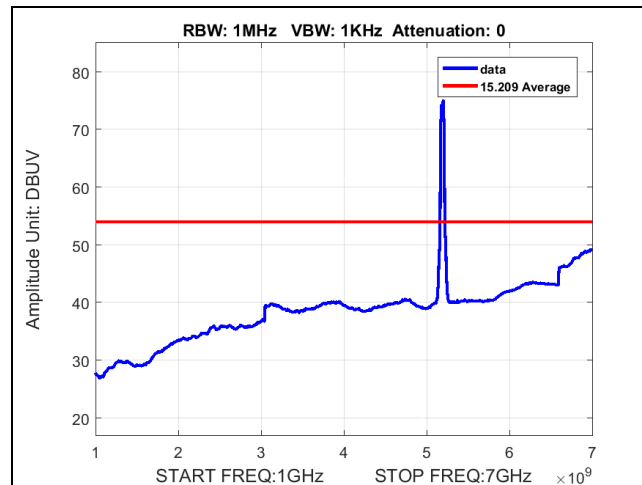
Plot 45. Average Spurious Emission, 1-7 GHz, BW 20M, Ch. 5240M, 80211a, MCS0, P3230



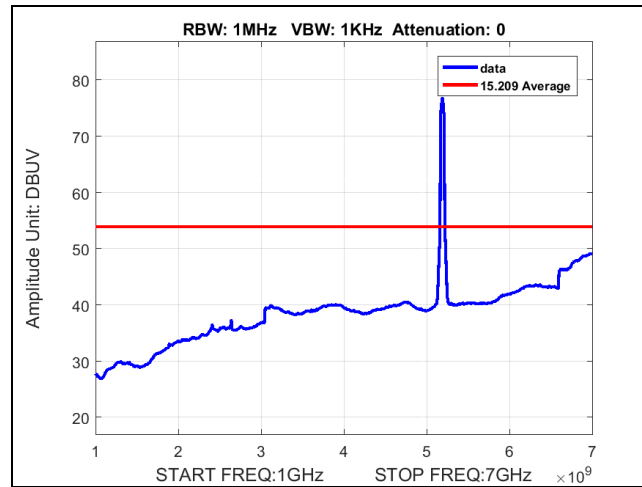
Plot 46. Average Spurious Emission, 1-7 GHz, BW 20M, Ch. 5240M, 80211ac, MCS24, P3230



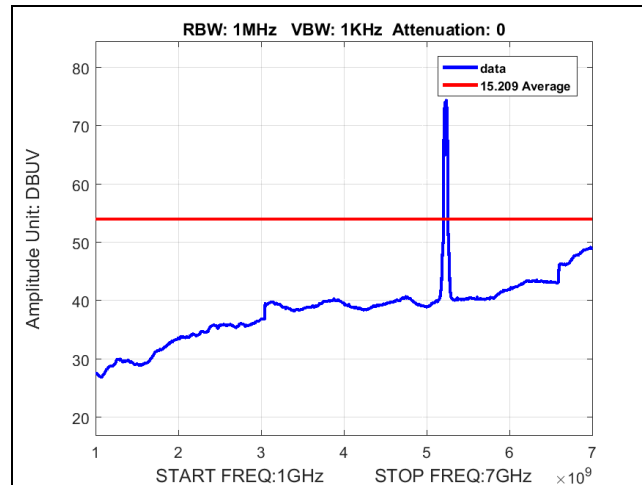
Plot 47. Average Spurious Emission, 1-7 GHz, BW 20M, Ch. 5240M, 80211n, MCS24, P3230



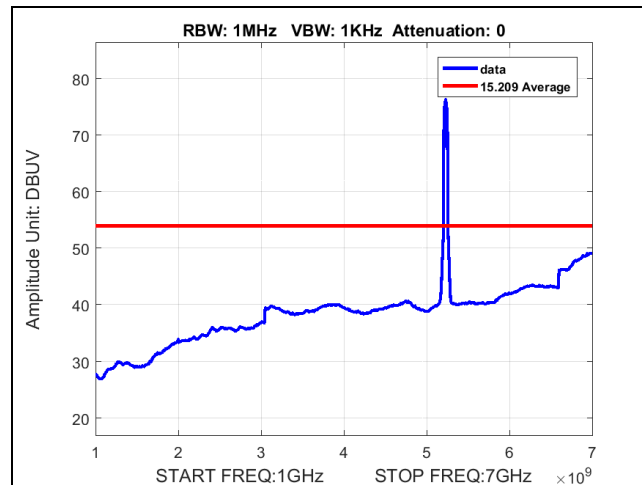
Plot 48. Average Spurious Emission, 1-7 GHz, BW 40M, Ch. 5190M, 80211ac, MCS24, P3230



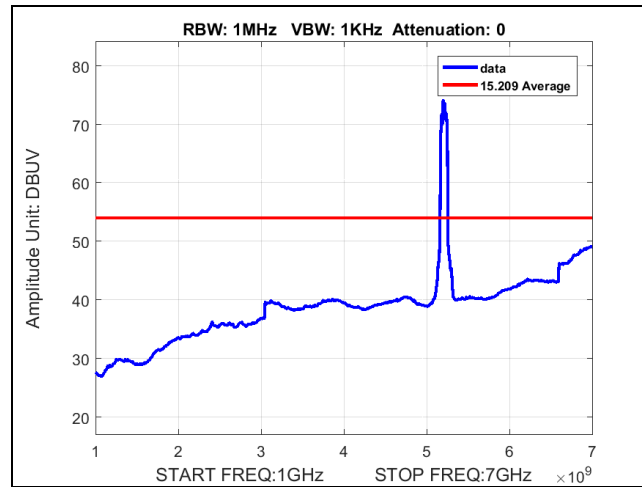
Plot 49. Average Spurious Emission, 1-7 GHz, BW 40M, Ch. 5190M, 80211n, MCS24, P3230



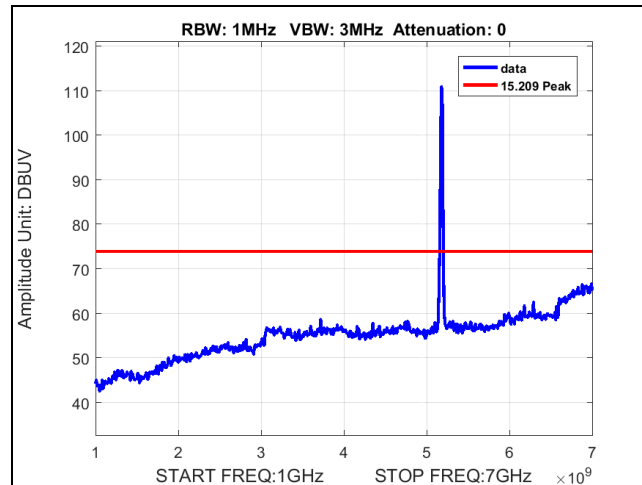
Plot 50. Average Spurious Emission, 1-7 GHz, BW 40M, Ch. 5230M, 80211ac, MCS24, P3230



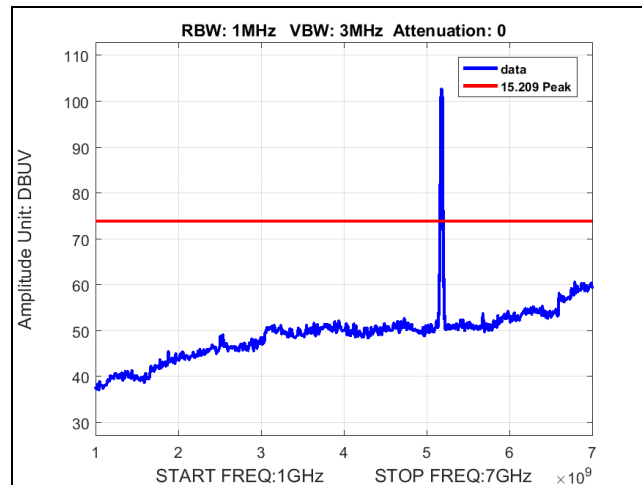
Plot 51. Average Spurious Emission, 1-7 GHz, BW 40M, Ch. 5230M, 80211n, MCS24, P3230



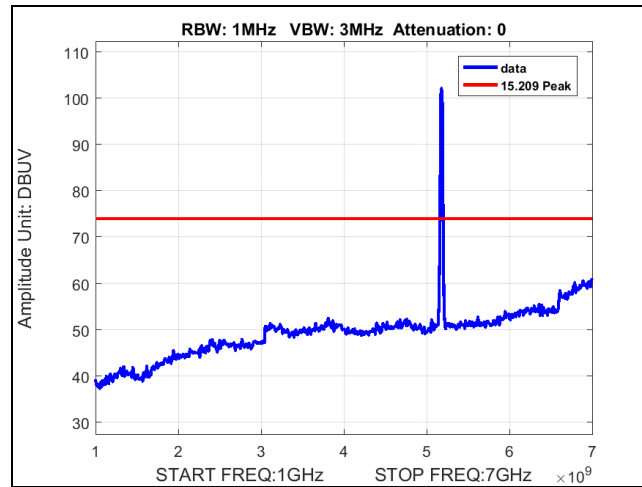
Plot 52. Average Spurious Emission, 1-7 GHz, BW 80M, Ch. 5210M, 80211ac, MCS24, P3230



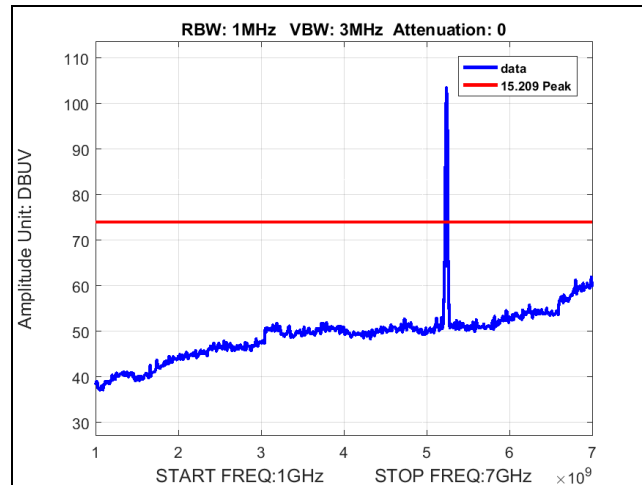
Plot 53. Peak Spurious Emission, 1-7 GHz, BW 20M, Ch. 5180M, 80211a, MCS0, P3230



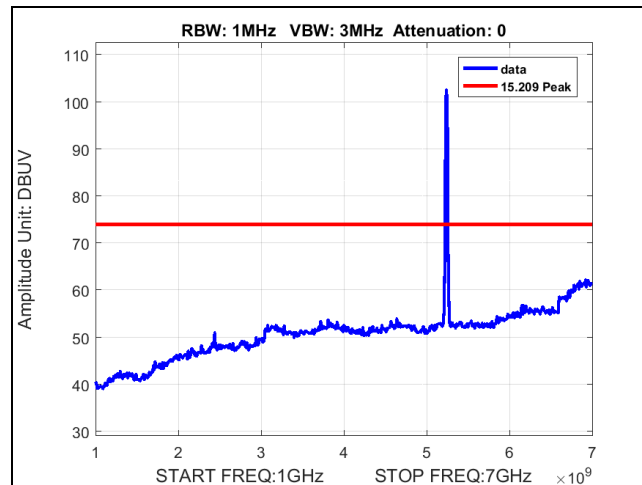
Plot 54. Peak Spurious Emission, 1-7 GHz, BW 20M, Ch. 5180M, 80211ac, MCS24, P3230



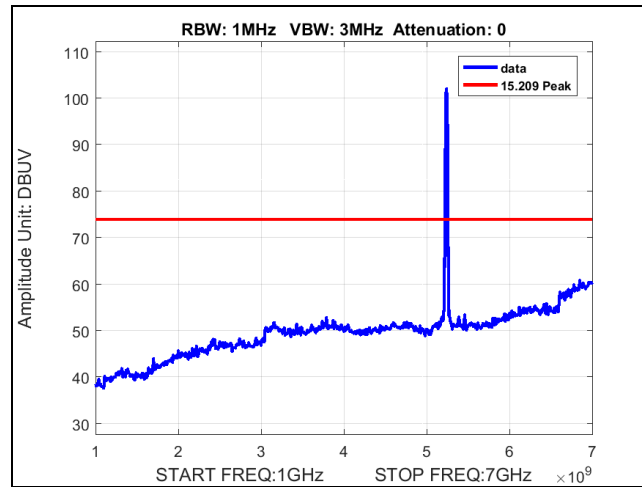
Plot 55. Peak Spurious Emission, 1-7 GHz, BW 20M, Ch. 5180M, 80211n, MCS24, P3230



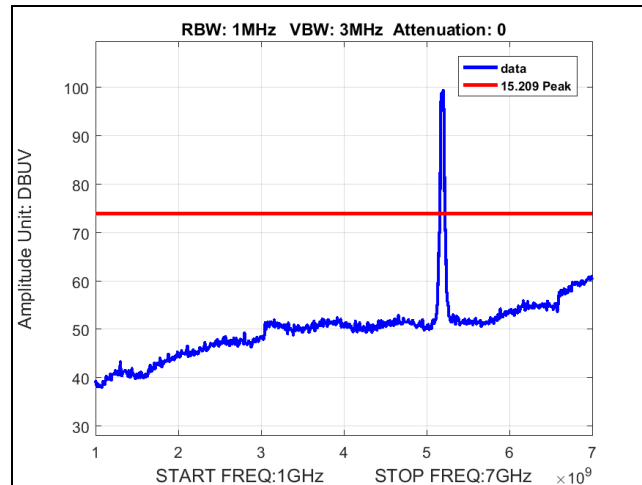
Plot 56. Peak Spurious Emission, 1-7 GHz, BW 20M, Ch. 5240M, 80211a, MCS0, P3230



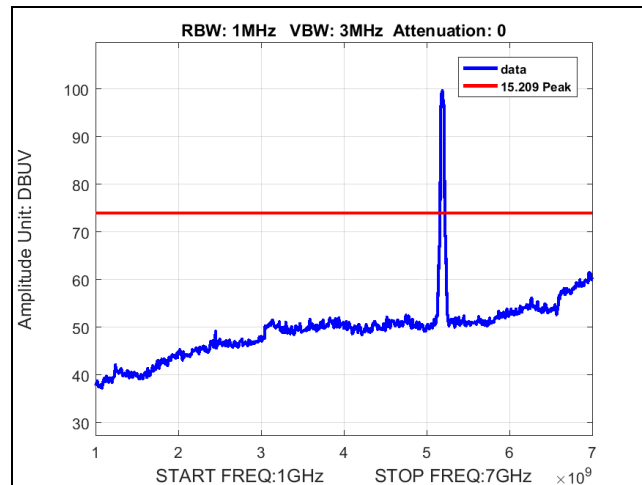
Plot 57. Peak Spurious Emission, 1-7 GHz, BW 20M, Ch. 5240M, 80211ac, MCS24, P3230



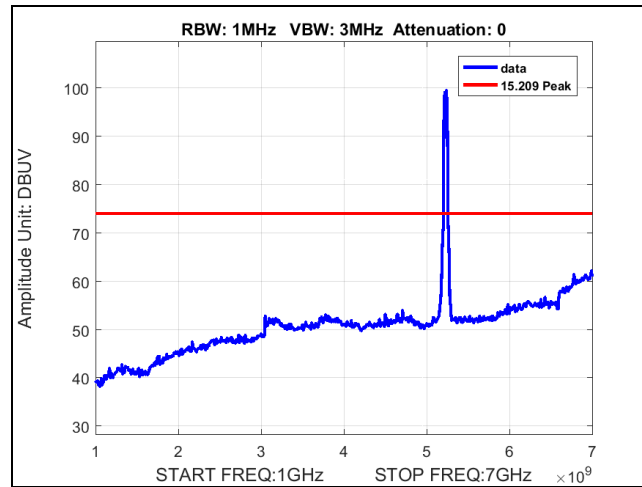
Plot 58. Peak Spurious Emission, 1-7 GHz, BW 20M, Ch. 5240M, 80211n, MCS24, P3230



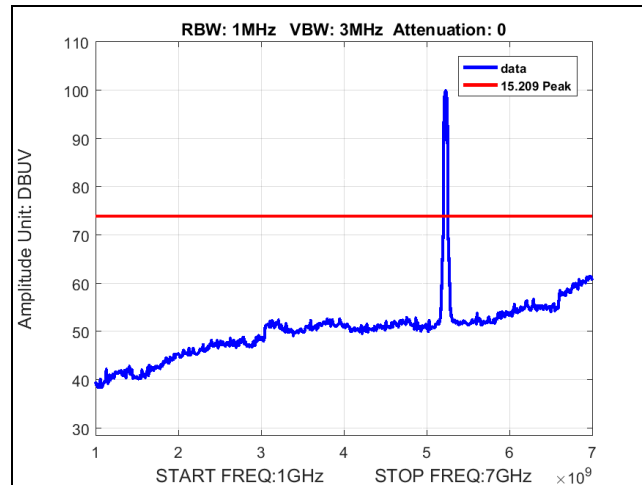
Plot 59. Peak Spurious Emission, 1-7 GHz, BW 40M, Ch. 5190M, 80211ac, MCS24, P3230



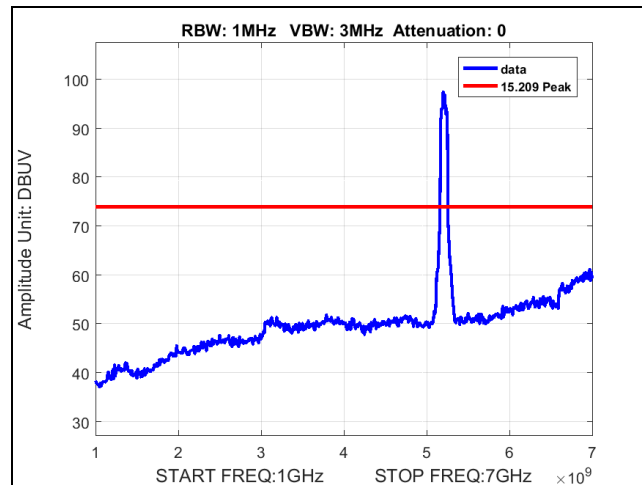
Plot 60. Peak Spurious Emission, 1-7 GHz, BW 40M, Ch. 5190M, 80211n, MCS24, P3230



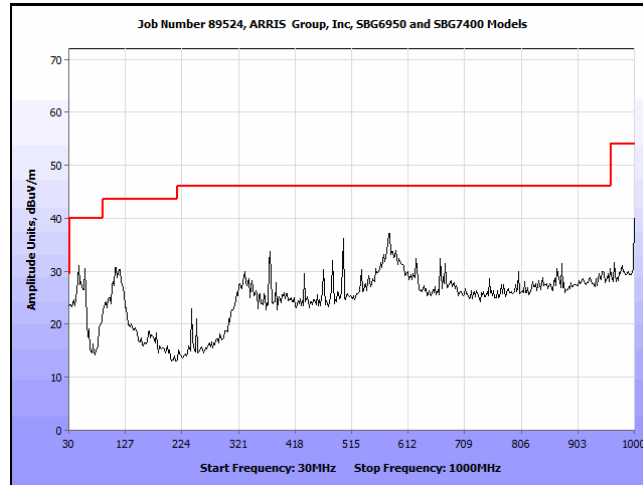
Plot 61. Peak Spurious Emission, 1-7 GHz, BW 40M, Ch. 5230M, 80211ac, MCS24, P3230



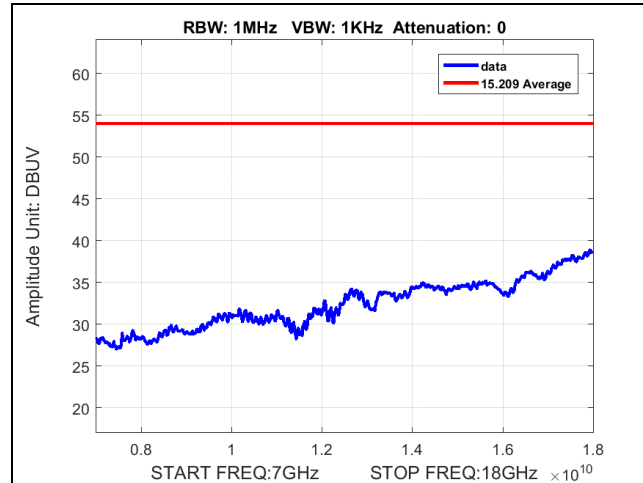
Plot 62. Peak Spurious Emission, 1-7 GHz, BW 40M, Ch. 5230M, 80211n, MCS24, P3230



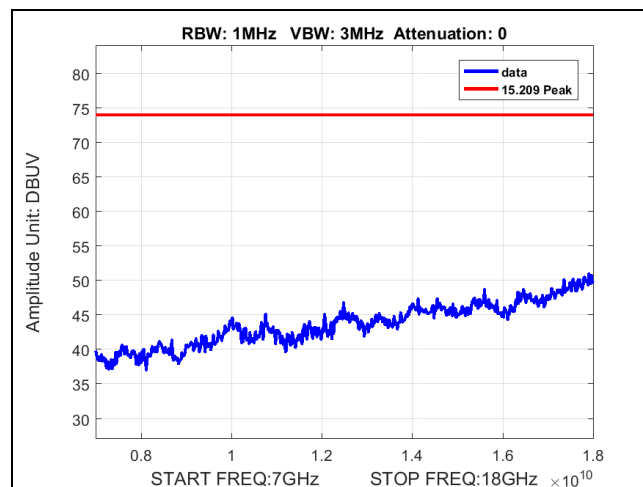
Plot 63. Peak Spurious Emission, 1-7 GHz, BW 80M, Ch. 5210M, 80211ac, MCS24, P3230



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

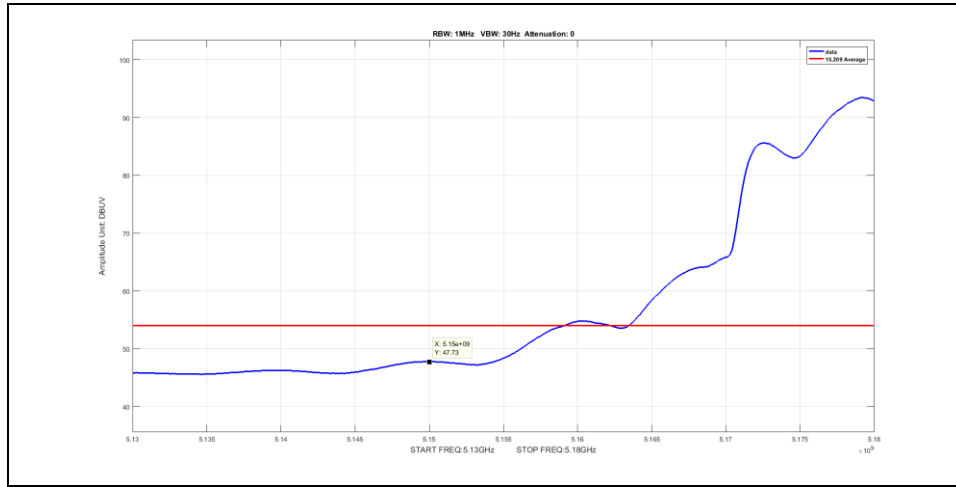


Plot 65. Average Radiated Spurious Emissions, 802.11ac, 7-18GHz

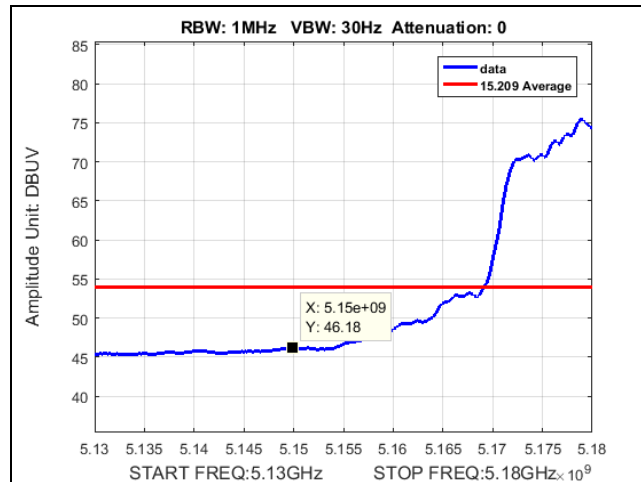


Plot 66. Peak Radiated Spurious Emissions, 802.11ac, 7-18GHz

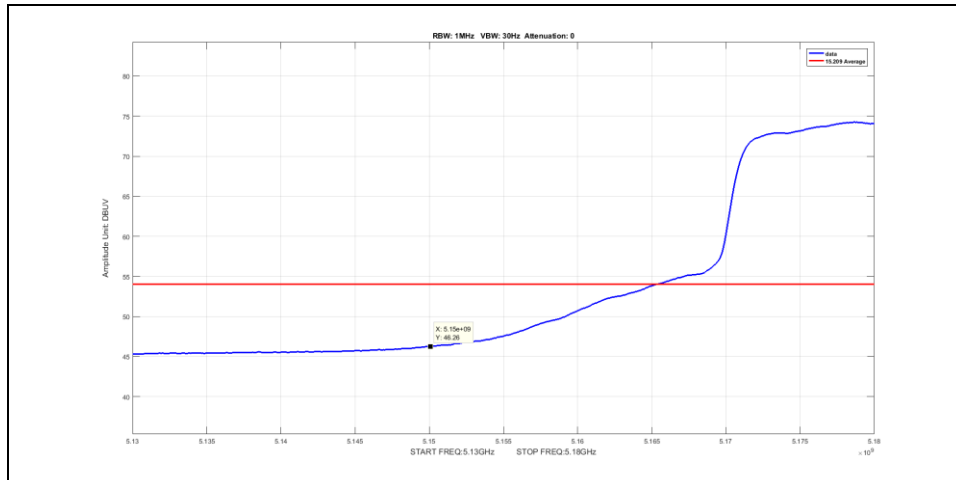
Radiated Band Edge



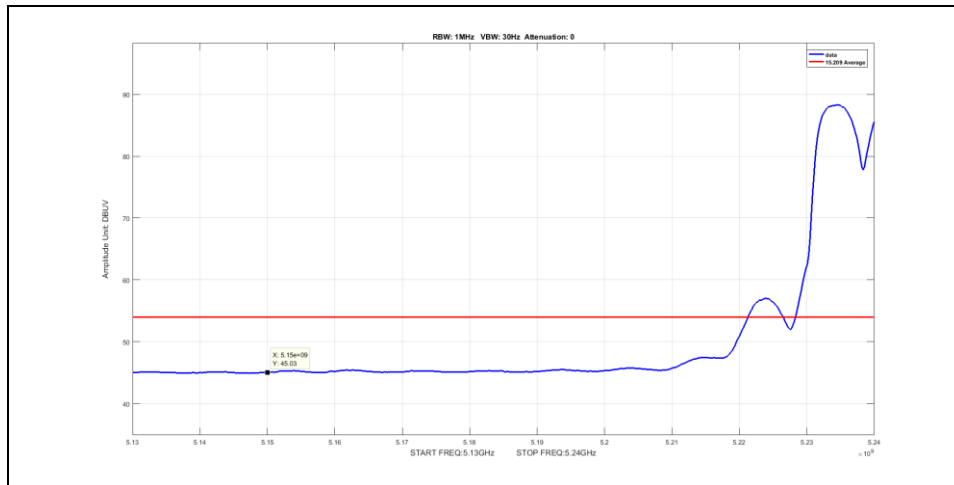
Plot 67. Average Band Edge Spurious, BW 20M, Ch. 5180M, 80211a, MCS0, P3230



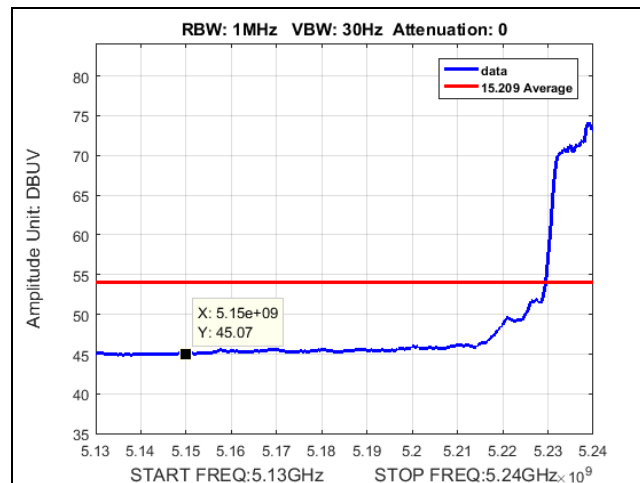
Plot 68. Average Band Edge Spurious, BW 20M, Ch. 5180M, 80211ac, MCS24, P3230



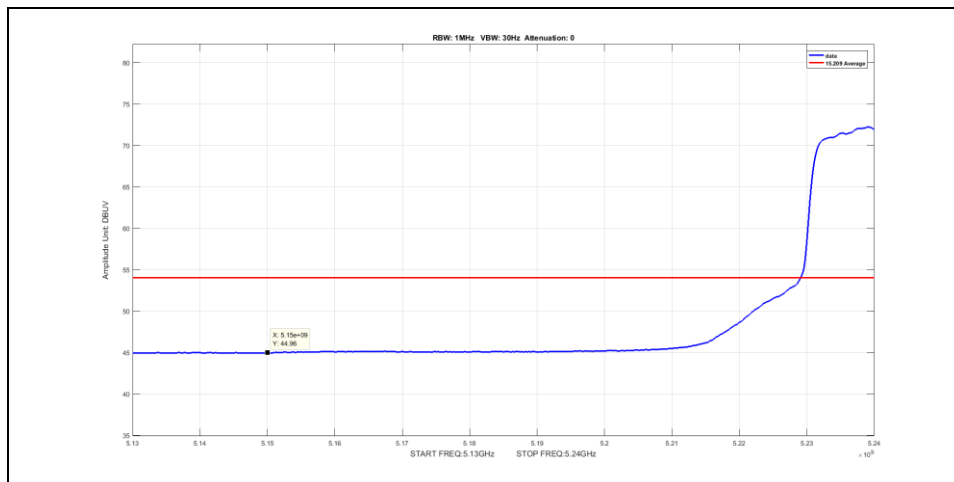
Plot 69. Average Band Edge Spurious, BW 20M, Ch. 5180M, 80211n, MCS24, P3230



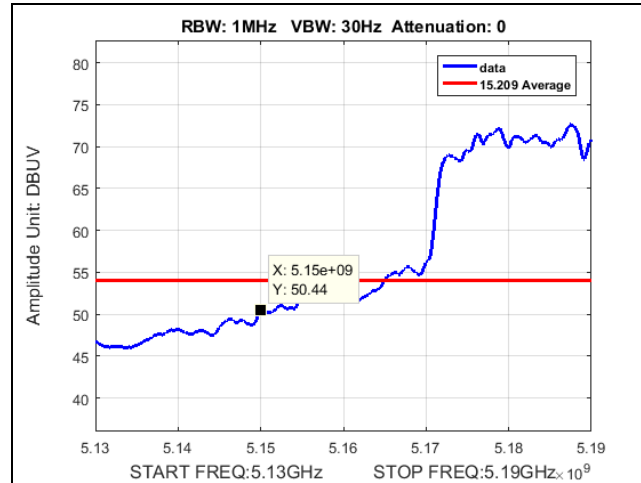
Plot 70. Average Band Edge Spurious, BW 20M, Ch. 5240M, 80211a, MCS0, P3230



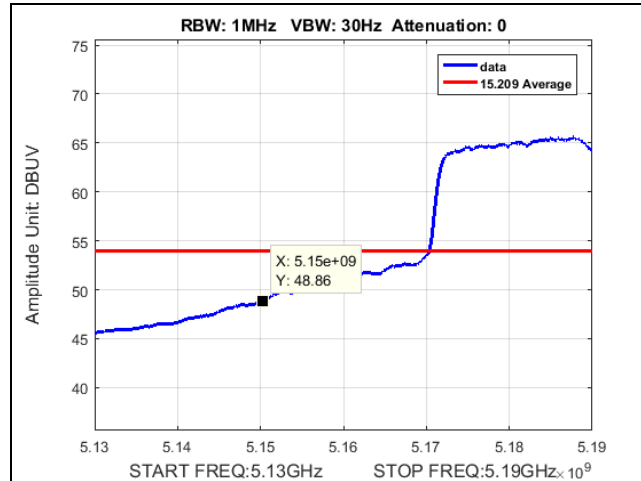
Plot 71. Average Band Edge Spurious, BW 20M, Ch. 5240M, 80211ac, MCS24, P3230



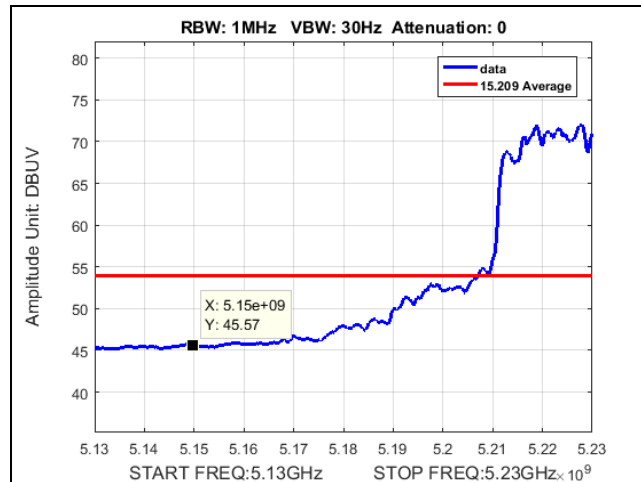
Plot 72. Average Band Edge Spurious, BW 20M, Ch. 5240M, 80211n, MCS24, P3230



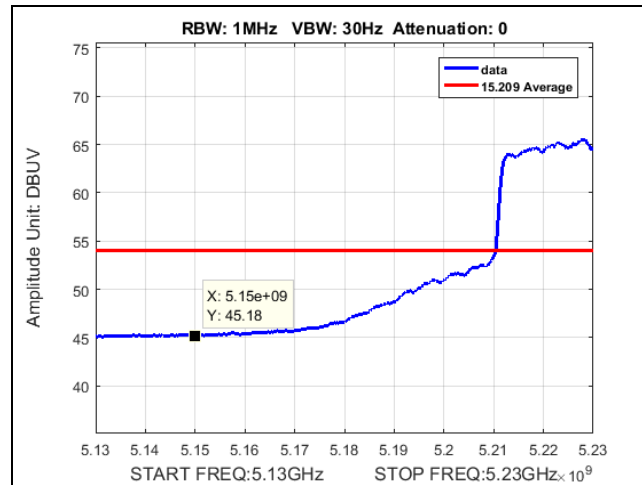
Plot 73. Average Band Edge Spurious, BW 40M, Ch. 5190M, 80211ac, MCS24, P3230



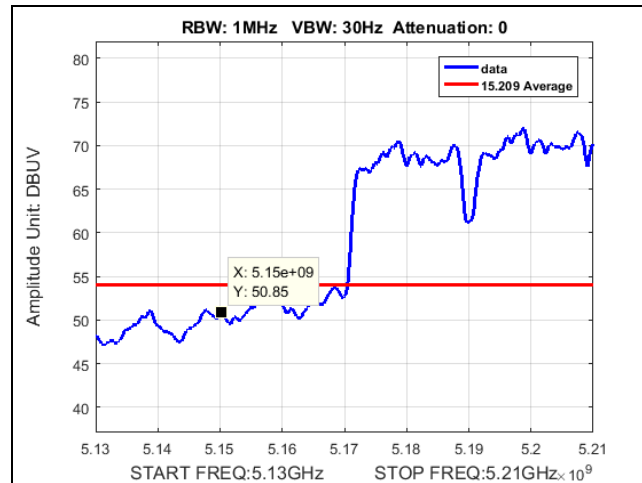
Plot 74. Average Band Edge Spurious, BW 40M, Ch. 5190M, 80211n, MCS24, P3230



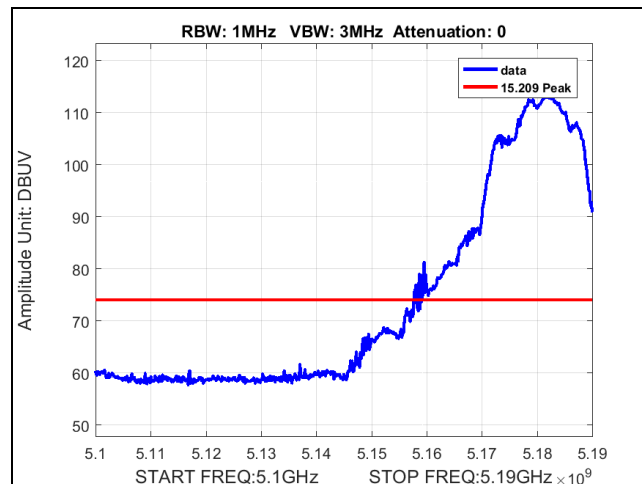
Plot 75. Average Band Edge Spurious, BW 40M, Ch. 5230M, 80211ac, MCS24, P3230



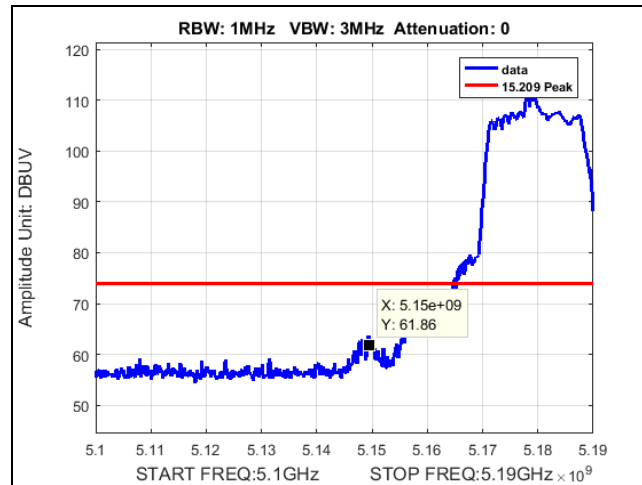
Plot 76. Average Band Edge Spurious, BW40M, Ch. 5230M, 80211n, MCS24, P3230



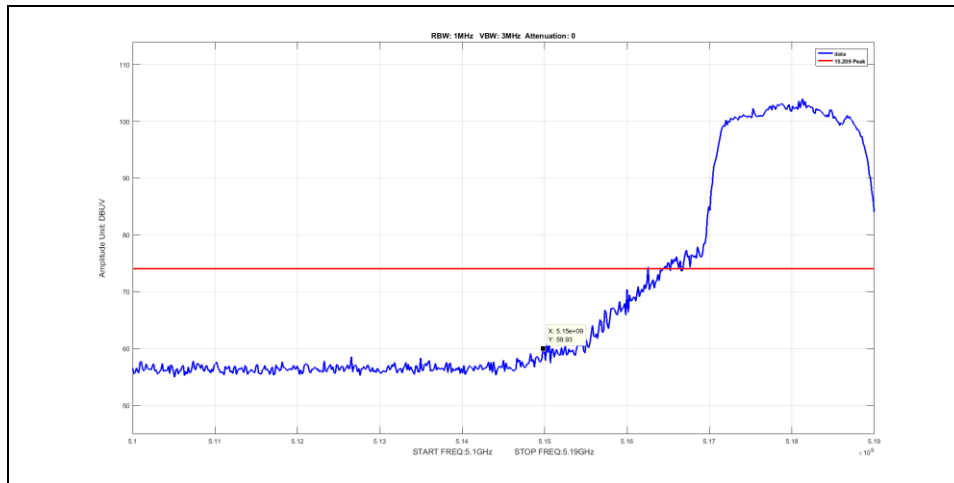
Plot 77. Average Band Edge Spurious, BW 80M, Ch. 5210M, 80211ac, MCS24, P3230



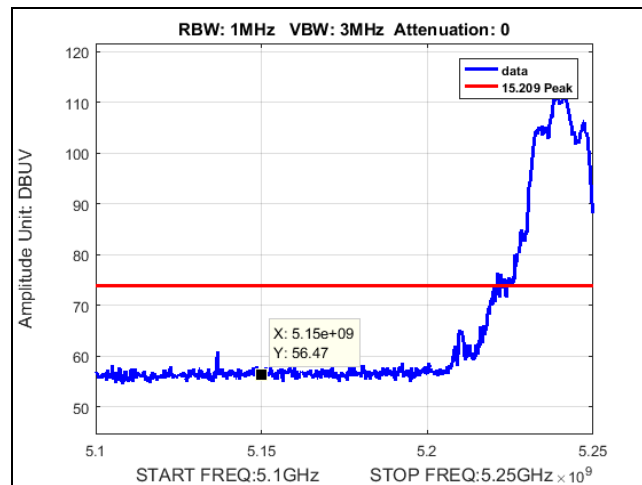
Plot 78. Peak Band Edge Spurious, BW 20M, Ch. 5180M, 80211a, MCS0, P3230



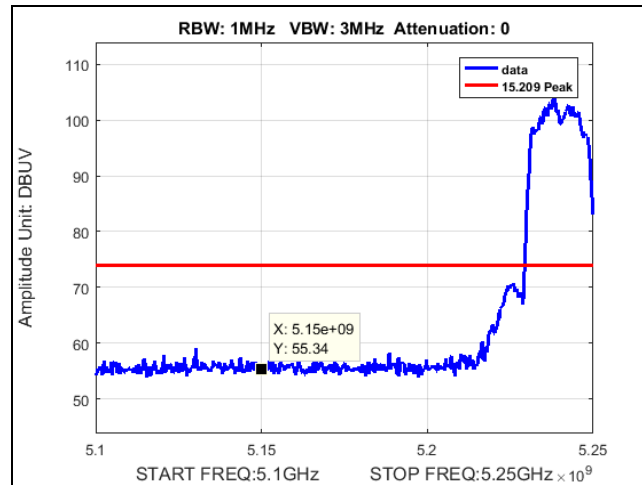
Plot 79. Peak Band Edge Spurious, BW 20M, Ch. 5180M, 80211ac, MCS24, P3230



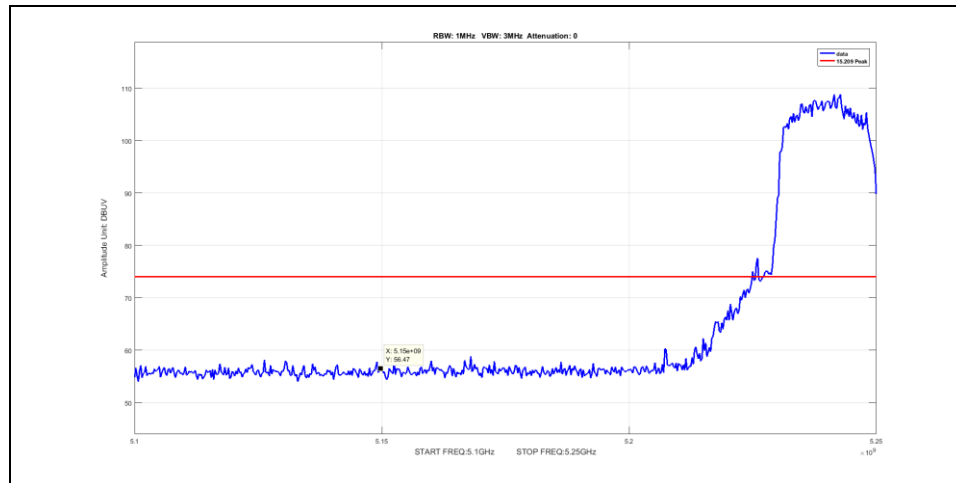
Plot 80. Peak Band Edge Spurious, BW 20M, Ch. 5180M, 80211n, MCS24, P3230



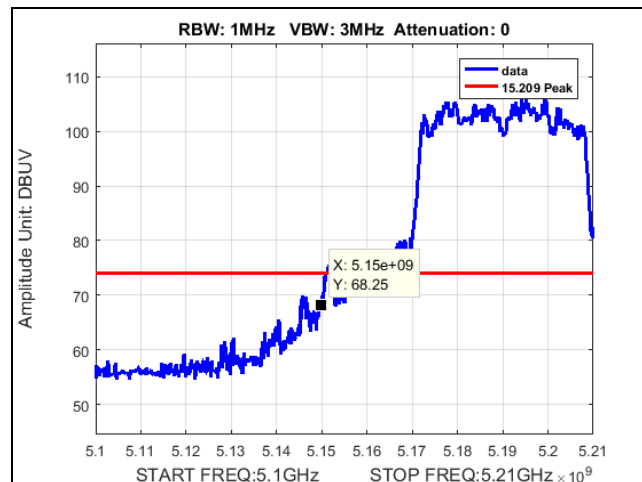
Plot 81. Peak Band Edge Spurious, BW 20M, Ch. 5240M, 80211a, MCS0, P3230



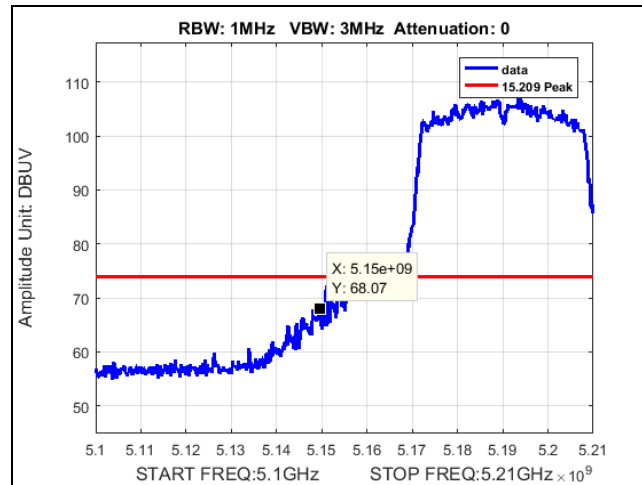
Plot 82. Peak Band Edge Spurious, BW 20M, Ch. 5240M, 80211ac, MCS24, P3230



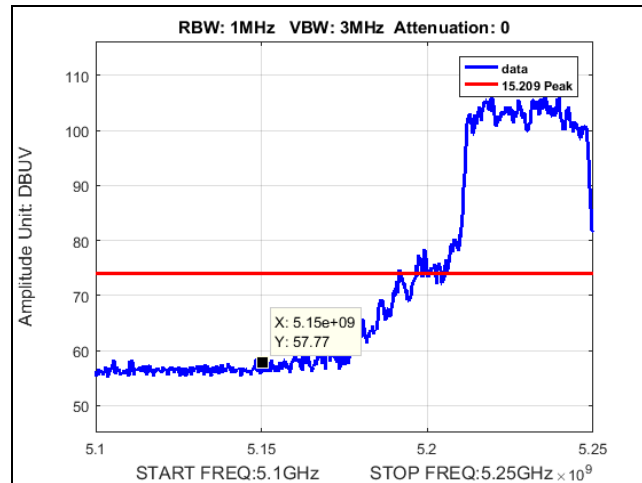
Plot 83. Peak Band Edge Spurious, BW 20M, Ch. 5240M, 80211n, MCS24, P3230



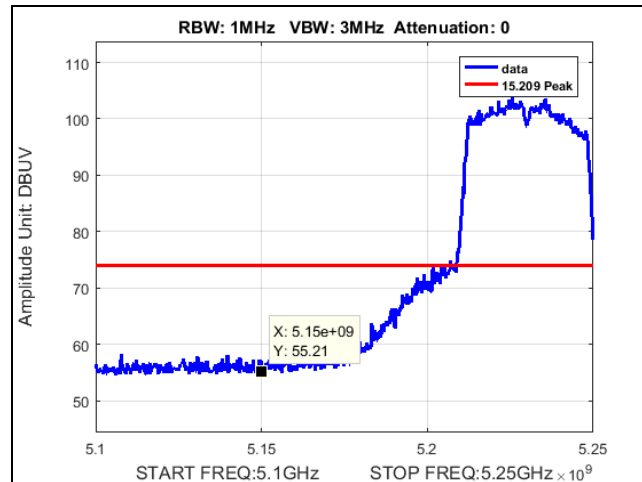
Plot 84. Peak Band Edge Spurious, BW 40M, Ch. 5190M, 80211ac, MCS24, P3230



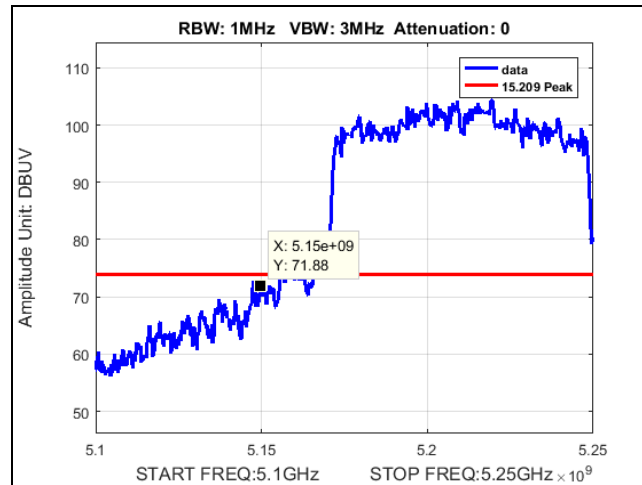
Plot 85. Peak Band Edge Spurious, BW 40M, Ch. 5190M, 80211n, MCS24, P3230



Plot 86. Peak Band Edge Spurious, BW 40M, Ch. 5230M, 80211ac, MCS24, P3230



Plot 87. Peak Band Edge Spurious, BW 40M, Ch. 5230M, 80211n, MCS24, P3230



Plot 88. Peak Band Edge Spurious, BW 80M, Ch. 5210M, 80211ac, MCS24, P3230

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 30MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/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 (dB μ V)	
	Quasi-Peak	Average
* 0.15- 0.45	66 – 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 10. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

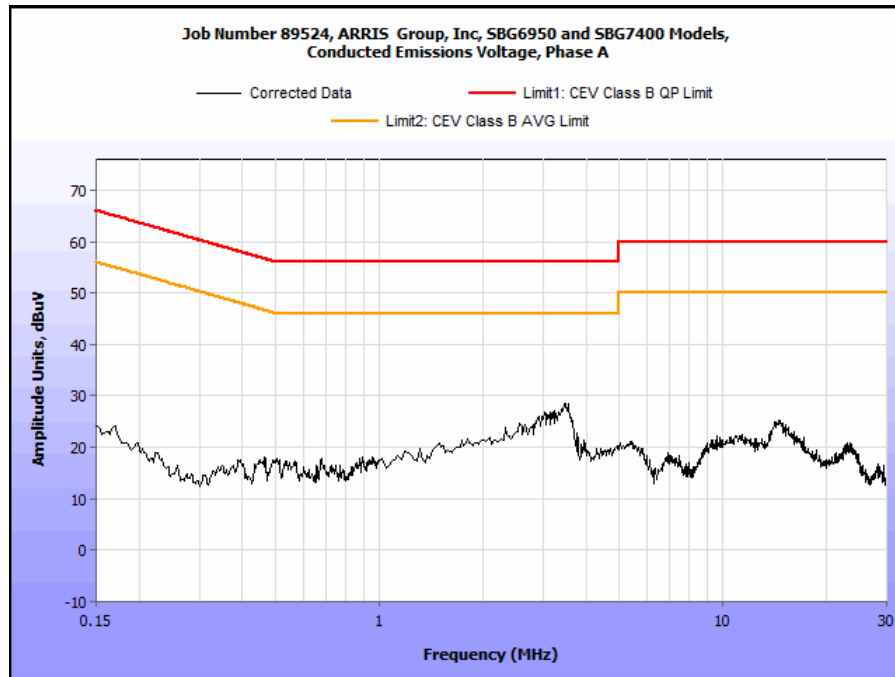
Test Procedure: The EUT was placed on a non-metallic table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω /50 μ H 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.

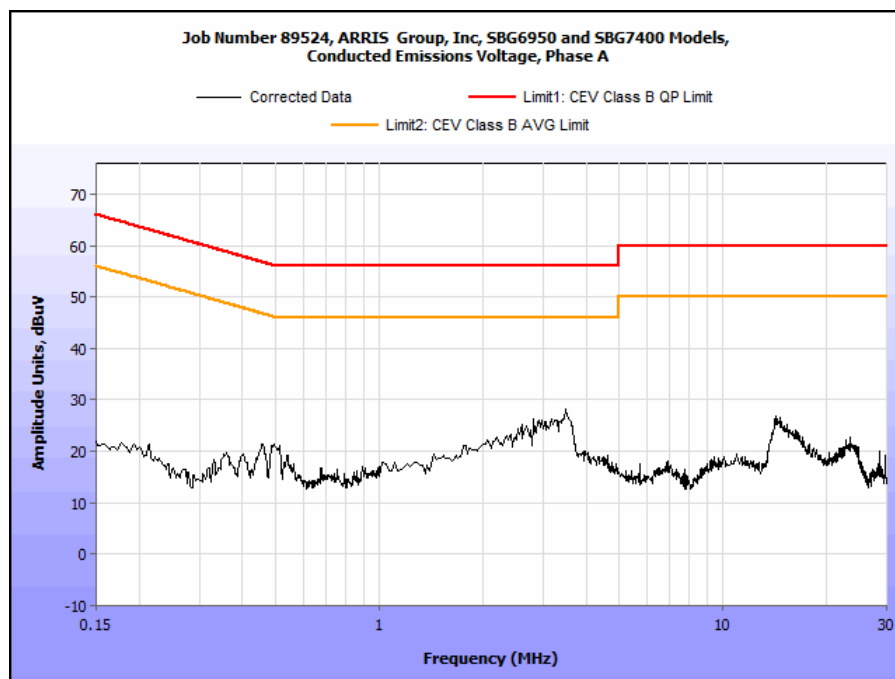
Measured peak emissions were greater than 20dB below the quasi-peak limit in the worst-case configuration.

Test Engineer(s): Hadid Jones

Test Date(s): February 26, 2017



Plot 89. Conducted Emissions, Phase Line



Plot 90. Conducted Emissions, Neutral Line

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.

MPE Limit: EUT’s operating frequencies @ 5150-5250 MHz; **Limit for Uncontrolled exposure: 1 mW/cm² or 10 W/m²**

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

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

where, S = Power Density (mW/cm²)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

Test Results:

FCC									
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
2462	26.18	414.954	7.8	6.026	0.49743	1	0.50257	20	Pass
5240	24.63	290.402	10.52	11.272	0.65122	1	0.34878	20	Pass
MPE for co-location					1.14865			25	Pass

FCC									
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
5240	24.63	290.402	10.52	11.272	0.65122	1	0.34878	20	Pass

Con. Pwr. = max power + 2dBm tune-up tolerance.

The safe distance where Power Density is less than the MPE Limit listed above was found to be 25 cm.

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.

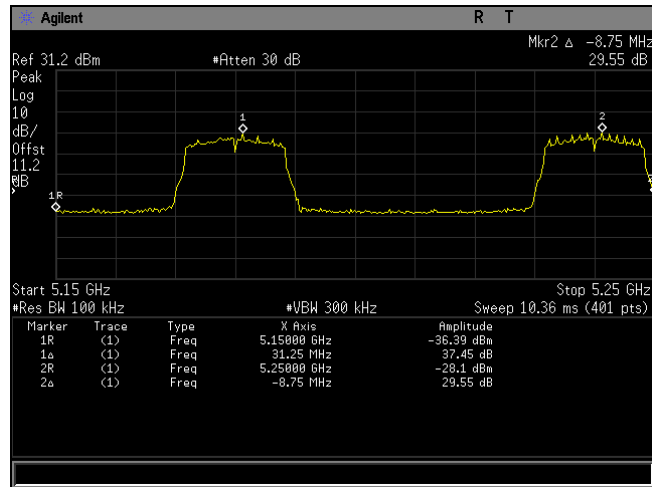
Test Procedure: The EUT was placed in an environmental chamber and powered through a variable supply. The RF port was connected to a spectrum analyzer through an attenuator. The EUT was set to transmit at the low and high channels and evaluated using the marker delta method. For the low channel, marker 1 was placed at the lower band edge frequency and marker 2 at the channels peak amplitude. This was repeated for the high channel. The EUT is considered compliant if the amplitude difference between markers 1 and 2 is at least 26dB. The EUT was evaluated at its extreme operating voltages and temperature conditions in 10 degree C increments. Data is presented for normal and extreme conditions.

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

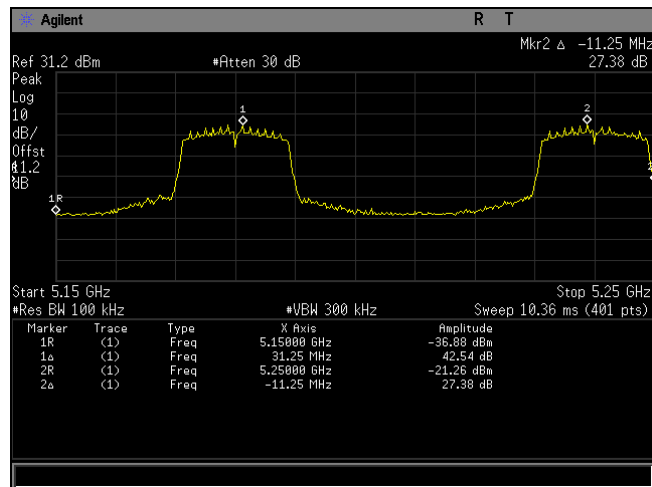
Test Engineer(s): Hadid Jones

Test Date(s): March 10, 2017

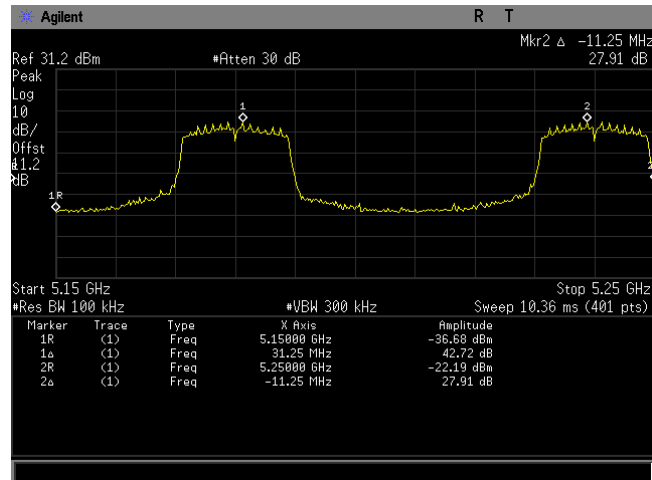
Frequency Stability -20C 97VAC



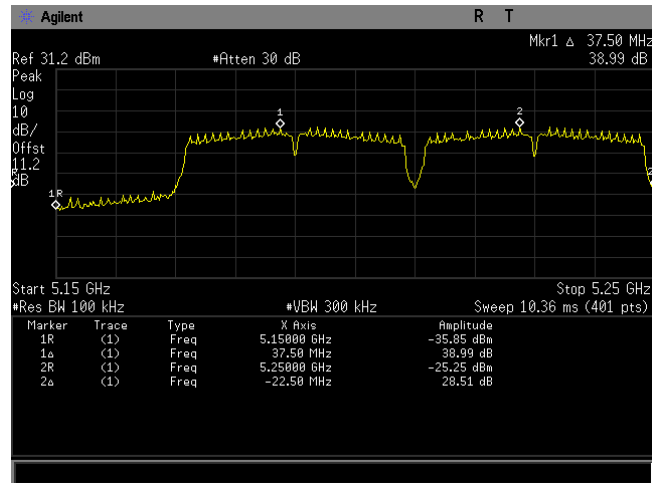
Plot 91. Frequency Stability, 80211a BW 20MHz



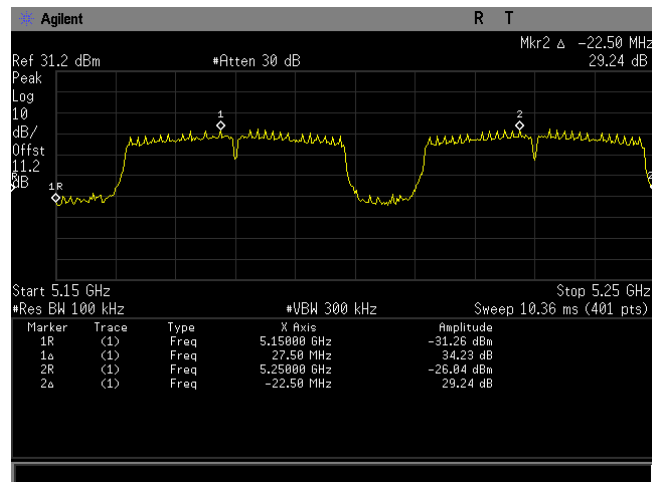
Plot 92. Frequency Stability, 80211ac BW 20MHz



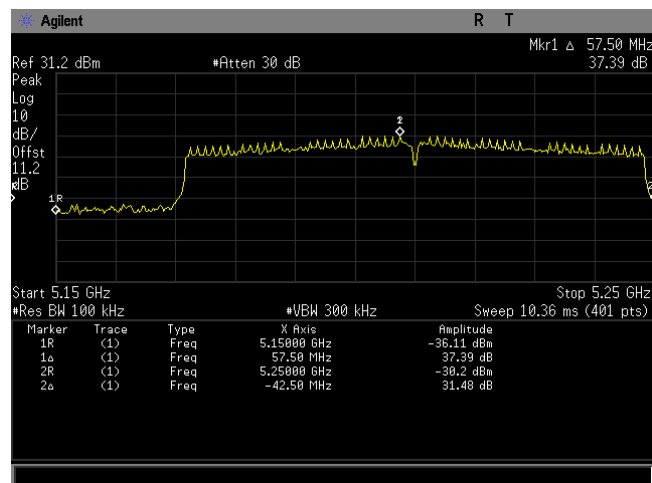
Plot 93. Frequency Stability, 80211n BW 20MHz



Plot 94. Frequency Stability, 80211n BW 40MHz

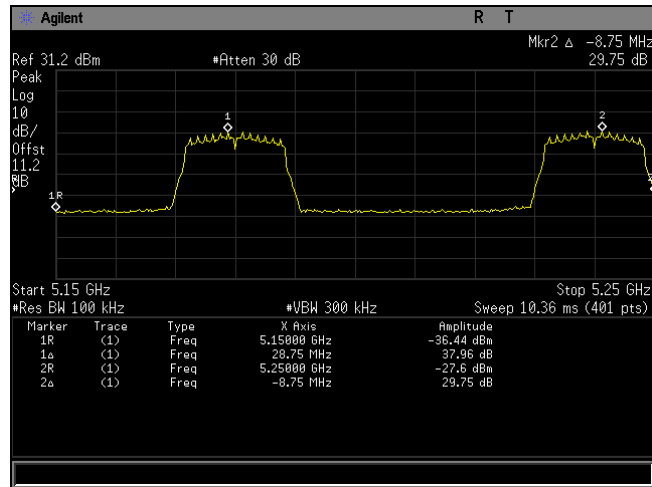


Plot 95. Frequency Stability, 80211ac BW 40MHz

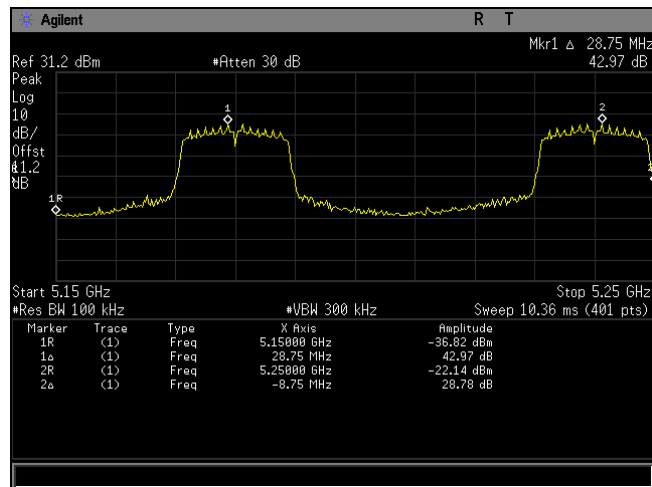


Plot 96. Frequency Stability, 80211ac BW 80MHz

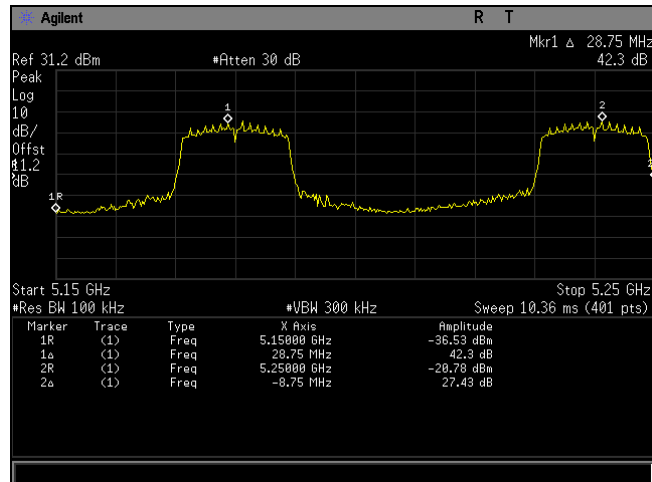
Frequency Stability 20C 115VAC



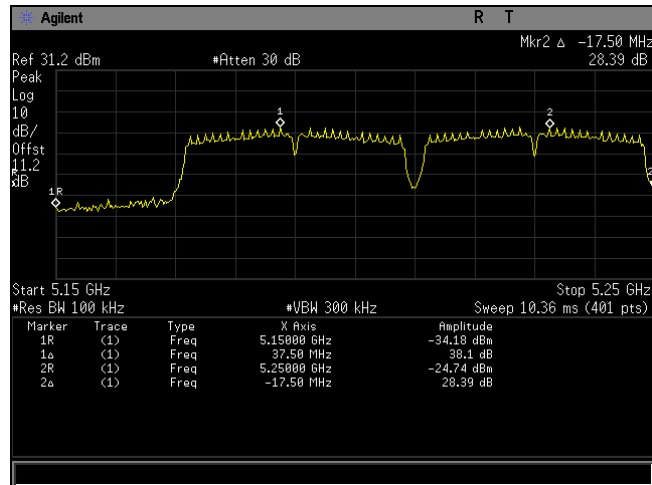
Plot 97. Frequency Stability, 80211a BW 20MHz



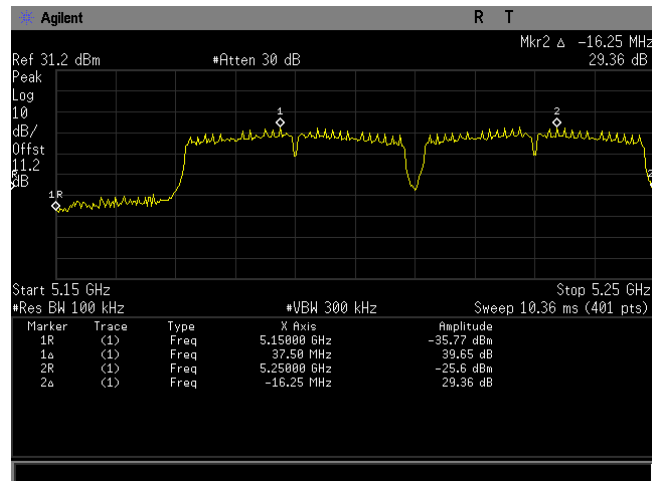
Plot 98. Frequency Stability, 80211ac BW 20MHz



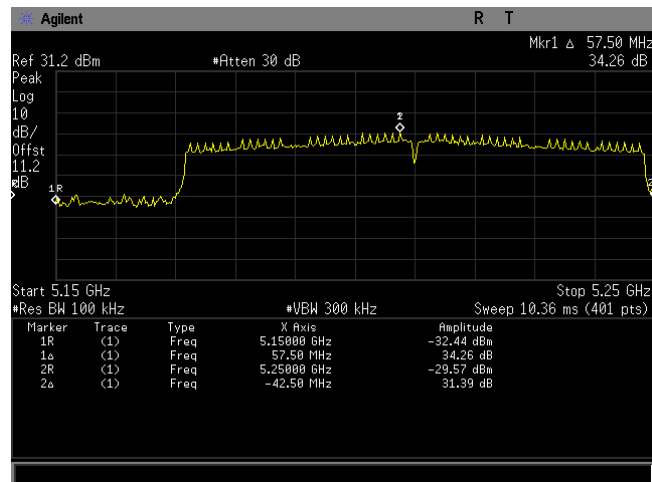
Plot 99. Frequency Stability, 80211n BW 20MHz



Plot 100. Frequency Stability, 80211n BW 40MHz

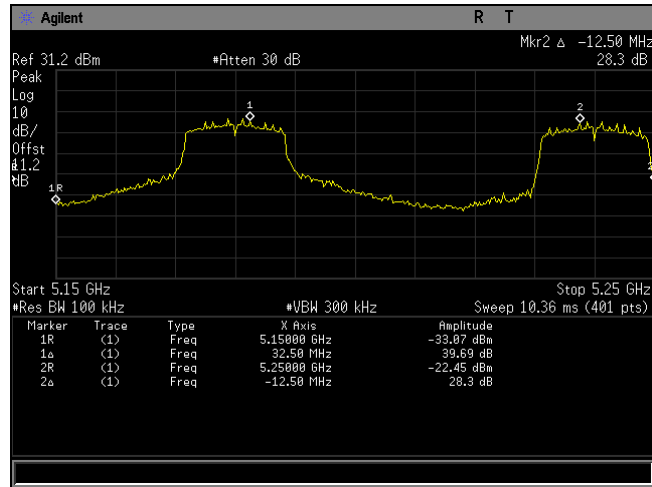


Plot 101. Frequency Stability, 80211ac BW 40MHz

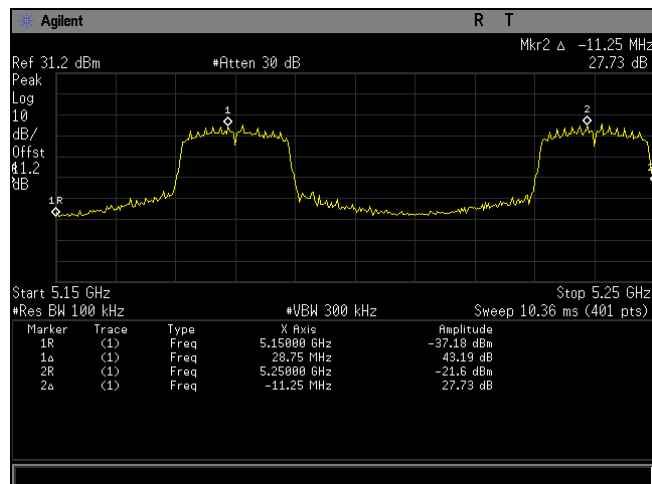


Plot 102. Frequency Stability, 80211ac BW 80MHz

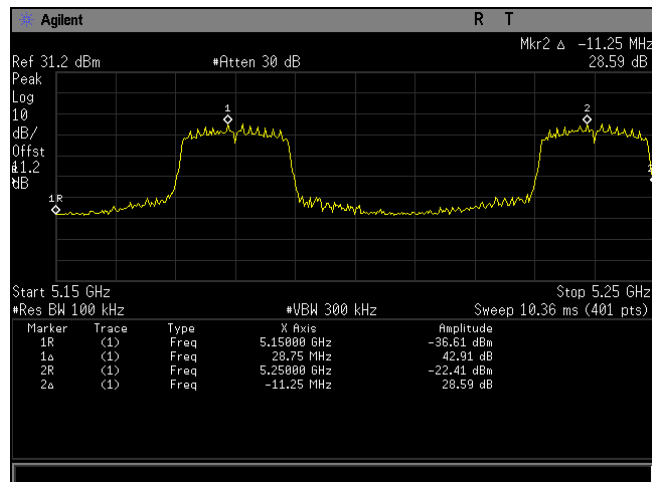
Frequency Stability 20C 115VAC



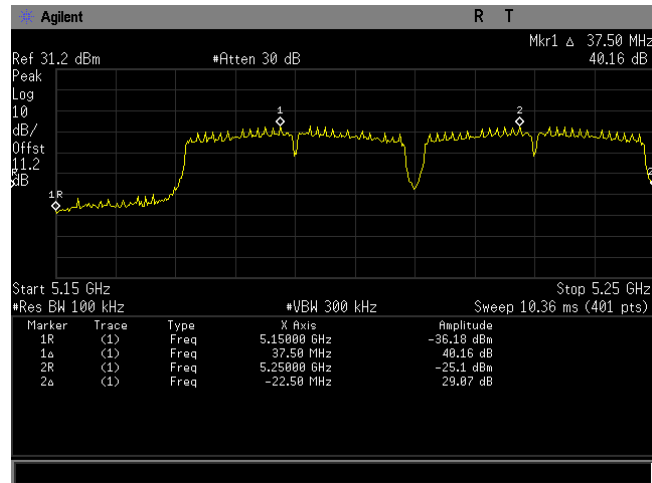
Plot 103. Frequency Stability, 80211a BW 20MHz



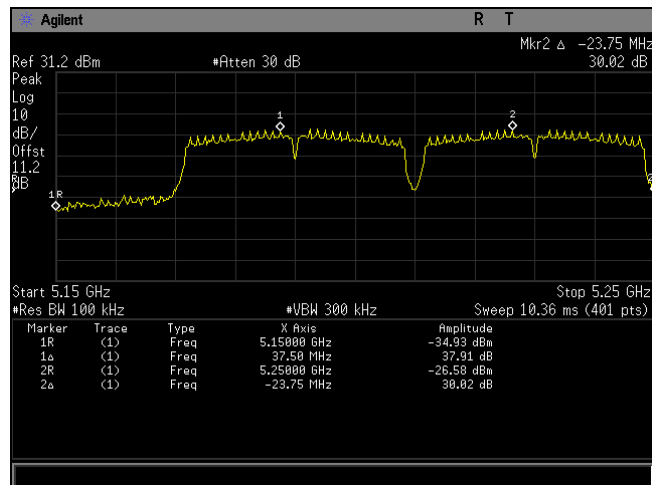
Plot 104. Frequency Stability, 80211ac BW 20MHz



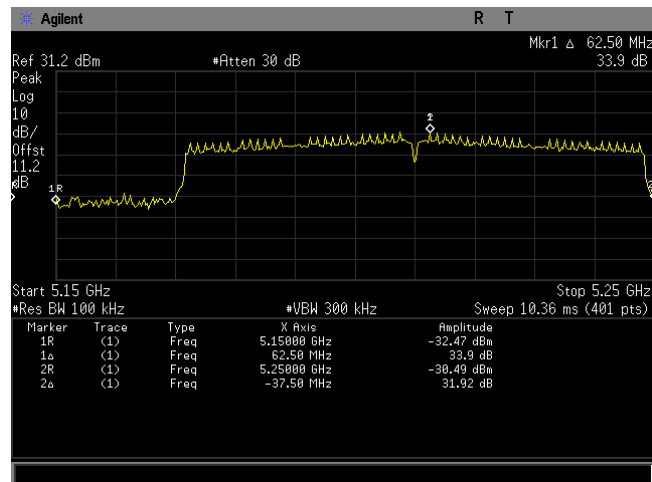
Plot 105. Frequency Stability, 80211n BW 20MHz



Plot 106. Frequency Stability, 80211n BW 40MHz



Plot 107. Frequency Stability, 80211ac BW 40MHz



Plot 108. Frequency Stability, 80211ac BW 80MHz

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
1T4300A	SEMI-ANECHOIC CHAMBER # 1 (FCC)	EMC TEST SYSTEMS	NONE	1/31/2014	1/31/2017
1T4563	LISN (10 AMP)	SOLAR ELECTRONICS COMPANY	9322-50-R-10-BNC	8/27/2015	2/27/2017
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY PROOF	81	NOT REQUIRED	
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	2/26/2016	8/26/2017
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	10/8/2015	4/8/2017
1T4745	ANTENNA, HORN	ETS-LINDGREN	3116	1/21/2017	7/21/2018
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	9/1/2015	3/1/2017

Table 11. 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.

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

§ 2.907 Certification.

- (a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

- (a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.
 - (1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.
 - (i) *If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.*
 - (ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.
 - (2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.