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October 13, 2014

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

Dear Alan Hoover,

Enclosed is the EMC Wireless test report for compliance testing of the Arris Group Inc., SBG6700 as tested to the NEW FCC 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.\EMC83415A-FCC407 Rev. 2 (UNII 1))

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Electromagnetic Compatibility Criteria
Test Report

for the

Arris Group Inc.
Model SBG6700

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

MET Report: EMC83415A-FCC407 Rev. 2 (UNII 1)

October 13, 2014

Prepared For:

Arris Group Inc.
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Prepared By:
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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
∅	September 26, 2014	Initial Issue.
1	October 6, 2014	Revised to reflect engineer corrections.
2	October 13, 2014	Revised to reflect 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. SBG6700, 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 SBG6700. 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 SBG6700, 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 0008077459. 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), (5), (6)	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 SBG6700, under Arris Group Inc.'s purchase order number 0008077459.

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. SBG6700.

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

Model(s) Tested:	SBG6700	
Model(s) Covered:	SBG6700	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: UIDSBG6700	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Peak RF Output Power:	25.01dBm
	EUT Frequency Ranges:	5180-5240MHz
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):	October 13, 2014	

Table 2. EUT Summary

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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

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. SBG6700, Equipment Under Test (EUT), is an indoor2.4 & 5G indoor data gateway.

E. Equipment Configuration

The EUT was set up as outlined in **Error! Reference source not found.**, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Serial Number	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

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 Unintentional Radiators

Electromagnetic Compatibility Criteria

§ 15.107 Conducted Emissions Limits

Test Requirement(s):

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

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

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

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

Test Procedures:

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

Test Results:

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

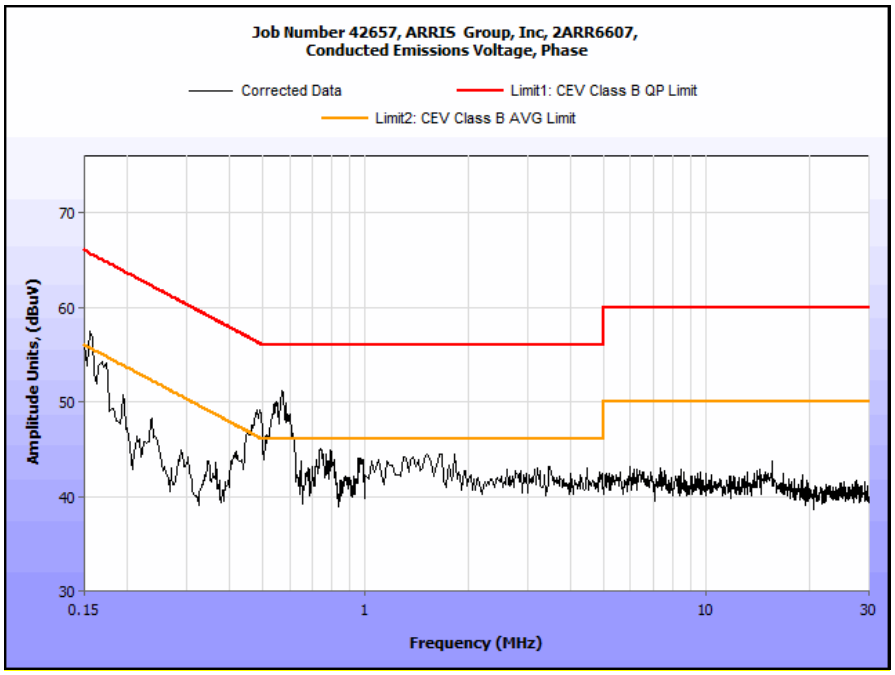
Test Engineer(s): Surinder Singh

Test Date(s): 08/21/14

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

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
0.157	56.85	0	56.85	65.62	-8.77	47.31	0	47.31	55.62	-8.31
0.545	45.52	0	45.52	56	-10.48	36.38	0	36.38	46	-9.62
3.91	46.03	0	46.03	56	-9.97	39.25	0	39.25	46	-6.75
9.33	46.1	0	46.1	60	-13.9	39.68	0	39.68	50	-10.32
14.65	45.88	0	45.88	60	-14.12	33.98	0	33.98	50	-16.02
23.75	28.5	0	28.5	60	-31.5	20.11	0	20.11	50	-29.89

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

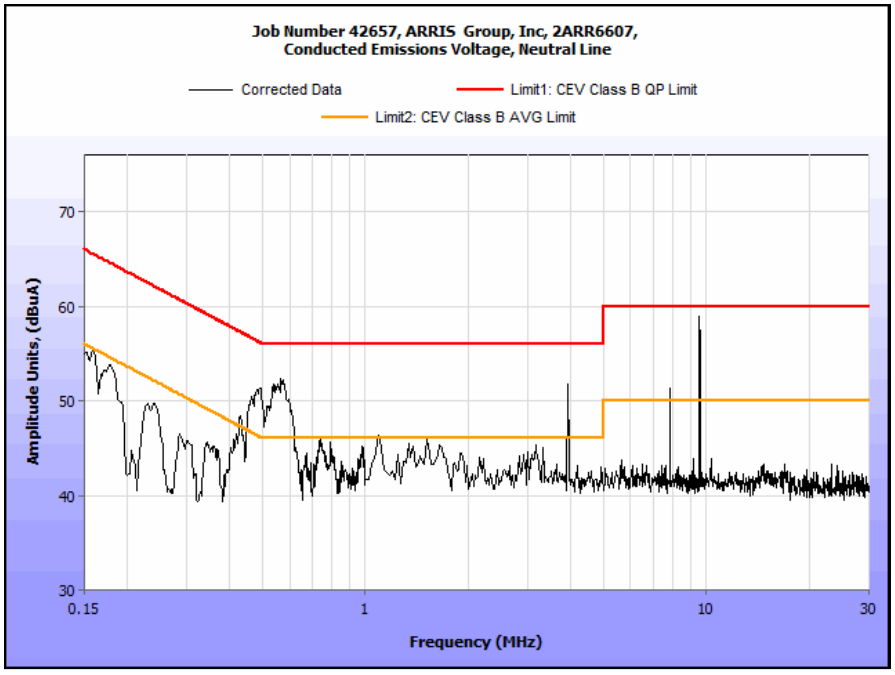


Plot 1. Conducted Emissions, Phase Line Plot

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

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
0.194	54.93	0	54.93	63.86	-8.93	48.04	0	48.04	53.86	-5.82
0.667	43.65	0	43.65	56	-12.35	38.29	0	38.29	46	-7.71
3.89	42.87	0	42.87	56	-13.13	35.49	0	35.49	46	-10.51
7.84	41.28	0	41.28	60	-18.72	29.54	0	29.54	50	-20.46
15.49	44.95	0	44.95	60	-15.05	25.46	0	25.46	50	-24.54
24.56	24.06	0	24.06	60	-35.94	13.85	0	13.85	50	-36.15

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



Plot 2. Conducted Emissions, Neutral Line Plot

Conducted Emission Limits Test Setup

Photograph 1. Conducted Emissions, Test Setup

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 10.

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

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

Table 10. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

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

Test Engineer(s): Surinder Singh

Test Date(s): 08/19/14

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Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBµV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
38.566132	318	H	1.50	11.56	15.20	0.58	0.00	27.34	40.00	-12.66
38.566132	181	V	1.27	19.24	15.20	0.58	0.00	35.02	40.00	-4.98
154.92485	101	H	2.30	11.74	12.91	1.04	0.00	25.69	43.50	-17.81
154.92485	120	V	1.02	17.99	12.91	1.04	0.00	31.94	43.50	-11.56
248.98323	299	H	1.74	24.33	12.12	1.33	0.00	37.78	46.00	-8.22
248.98323	185	V	1.02	23.16	12.12	1.33	0.00	36.61	46.00	-9.39
533.21242	68	H	1.13	13.50	18.60	1.95	0.00	34.05	46.00	-11.95
533.21242	289	V	1.02	16.73	18.60	1.95	0.00	37.28	46.00	-8.72
623.28467	354	H	1.98	9.30	19.87	2.13	0.00	31.30	46.00	-14.70
623.28467	104	V	1.01	15.09	19.87	2.13	0.00	37.09	46.00	-8.91
774.95779	324	H	1.92	12.46	21.50	2.37	0.00	36.33	46.00	-9.67
774.95779	129	V	1.36	12.73	21.50	2.37	0.00	36.60	46.00	-9.40

Table 11. Radiated Emissions Limits, Test Results, 30 MHz – 1 GHz

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBµV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1.0802	195	H	235	24.82	-0.37	3.1	0	27.55	54	-26.45
1.0802	345	V	142.43	24.49	-0.62	3.1	0	26.97	54	-27.03
1.24474	340	H	138.73	23.9	-1.21	3.34	0	26.03	54	-27.97
1.24474	220	V	190.34	19.48	-1.43	3.34	0	21.39	54	-32.61
1.3507	188	H	136.82	19.26	-0.67	3.48	0	22.07	54	-31.93
1.3507	316	V	125.96	22.16	-0.83	3.48	0	24.81	54	-29.19
1.497	244	H	213.26	14.82	-0.19	3.73	0	18.36	54	-35.64
1.497	104	V	112.36	17.84	-0.18	3.73	0	21.39	54	-32.61
1.6713	360	H	101.91	17.26	0.33	3.92	0	21.51	54	-32.49
1.6713	112	V	163.45	14.52	0.33	3.92	0	18.77	54	-35.23
1.996	28	H	134.56	18.21	2.03	4.36	0	24.6	54	-29.4
1.996	309	V	116.46	19.55	1.92	4.36	0	25.83	54	-28.17

Table 12. Radiated Emissions Limits, Test Results, 1 GHz – 2 GHz

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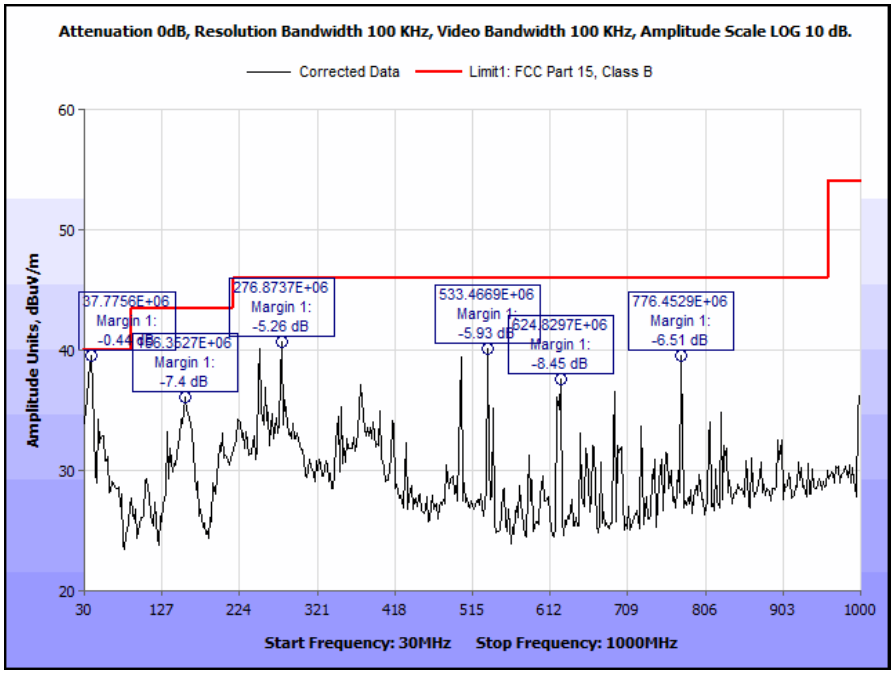
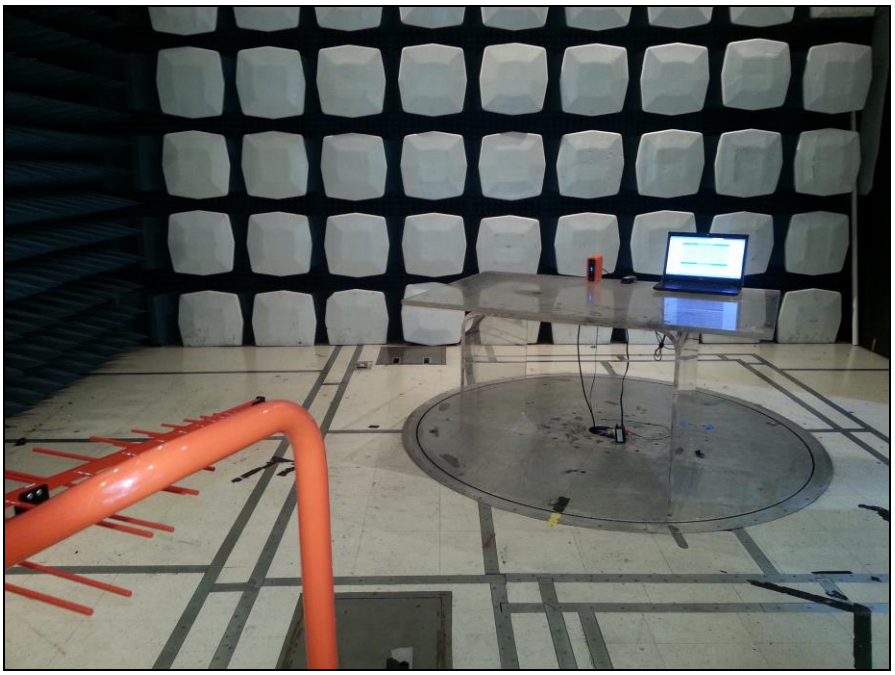
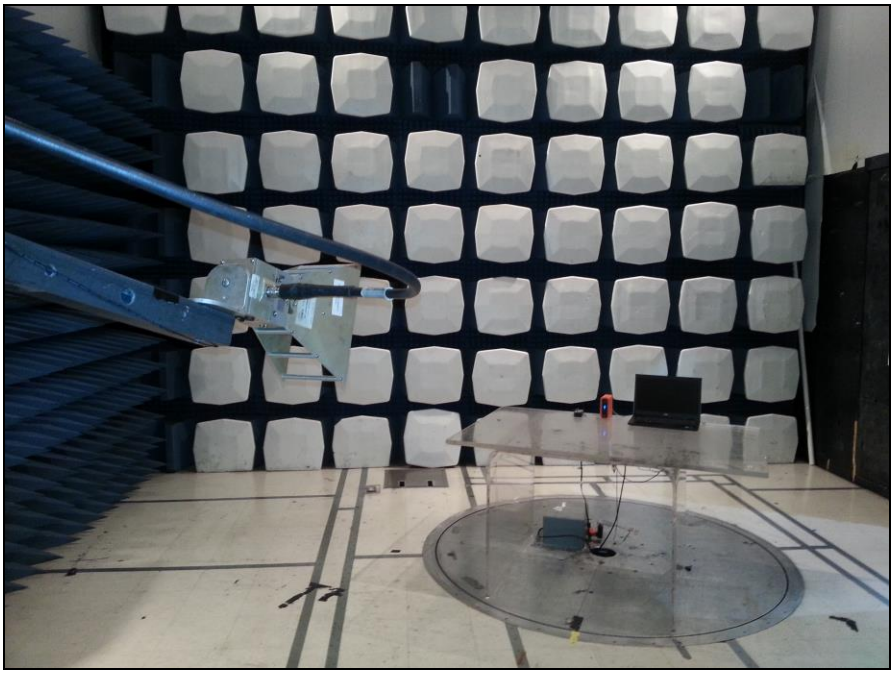


Plot 3. Radiated Emissions, 30 MHz - 1 GHz

Radiated Emissions Limits Test Setup



Photograph 2. Radiated Emissions, Test Setup, 30 MHz – 1 GHz



Photograph 3. Radiated Emissions, Test Setup, 1 GHz – 2 GHz

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IV. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

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

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

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

Results: The EUT as tested is compliant the criteria of §15.203 because it has permanently attached antennas.

Test Engineer(s): Surinder Singh

Test Date(s): 01/31/14

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

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

Test Results: The EUT was compliant with this requirement. Measured emissions were below applicable limits.

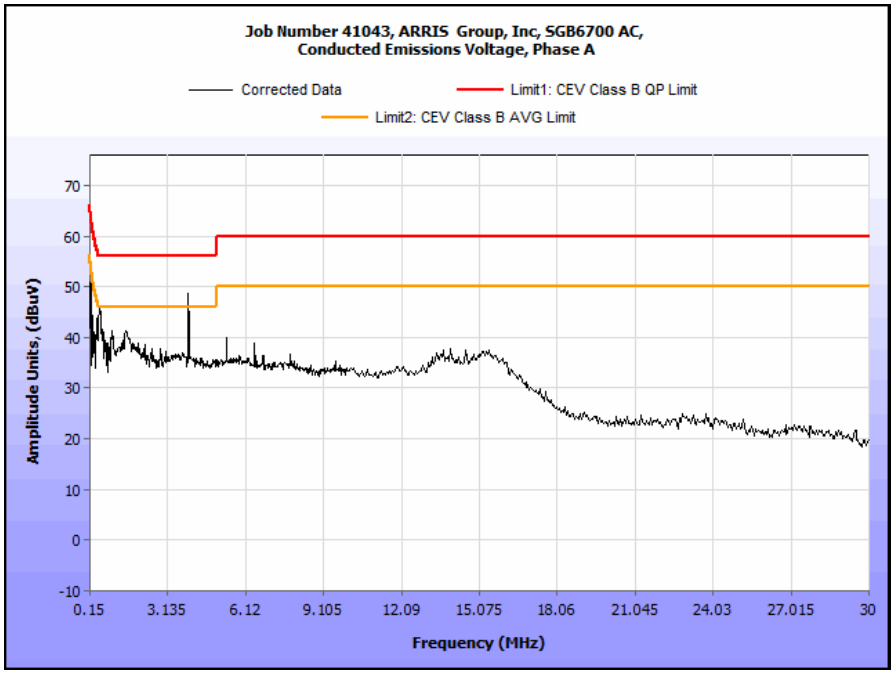
Test Engineer(s): Surinder Singh

Test Date(s): 01/31/14

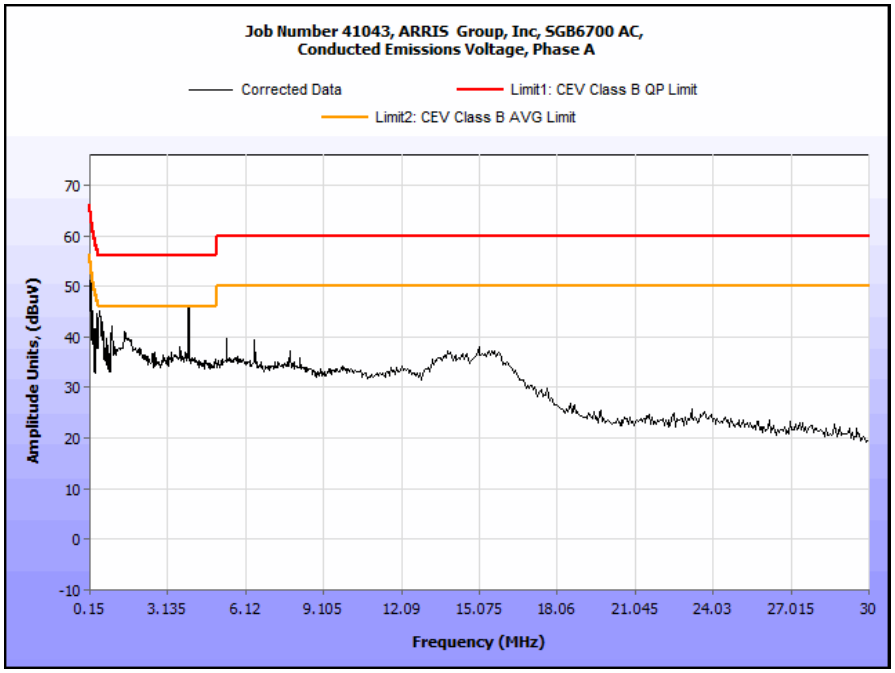
Conducted Emissions 15.207(a) - Voltage, AC Power, Phase Line (120 VAC, 60 Hz)

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

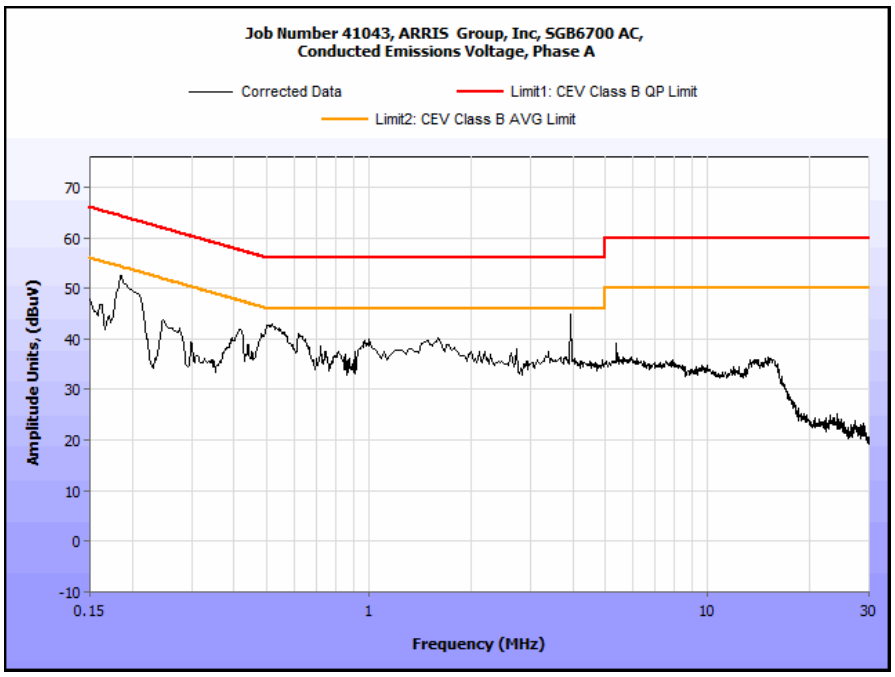
Table 14. Conducted Emissions - Voltage, AC Power, 15.207(a), Phase Line (120 VAC, 60 Hz)



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



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

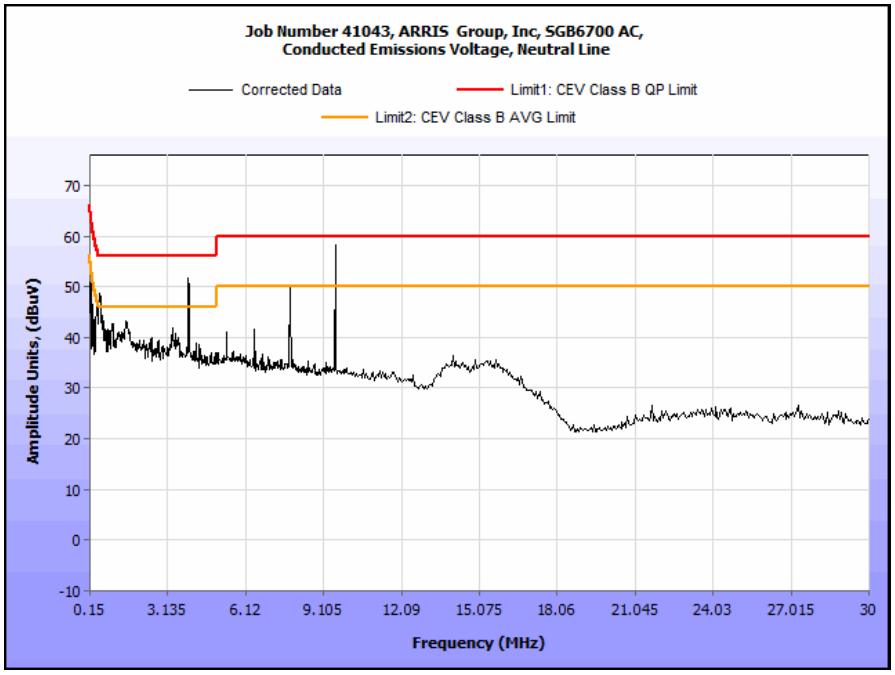


Plot 6. Conducted Emissions, 15.207(a), Phase Line, High Channel

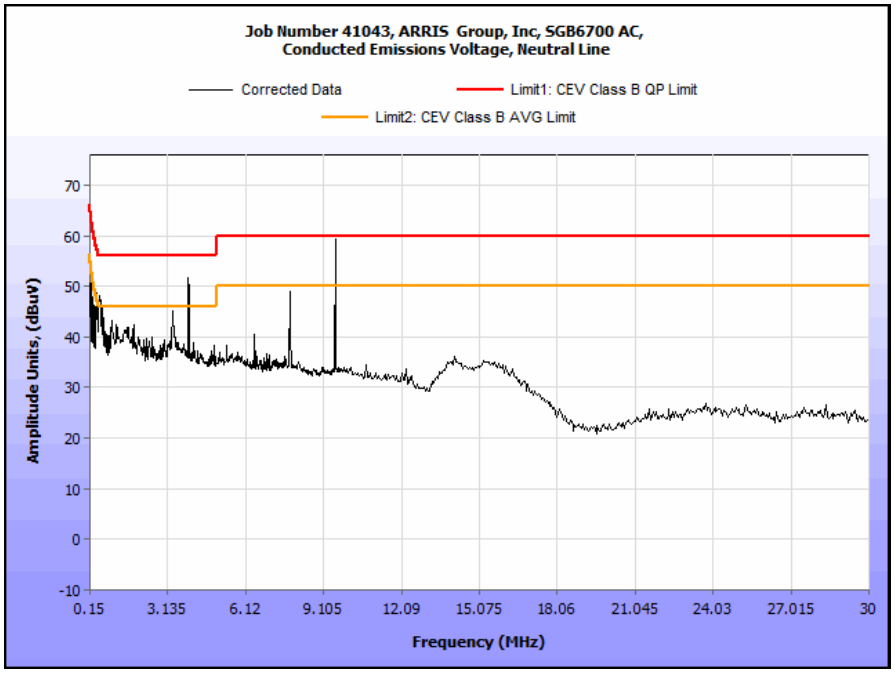
Conducted Emissions 15.207(a) - Voltage, AC Power, Neutral Line (120 VAC, 60 Hz)

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

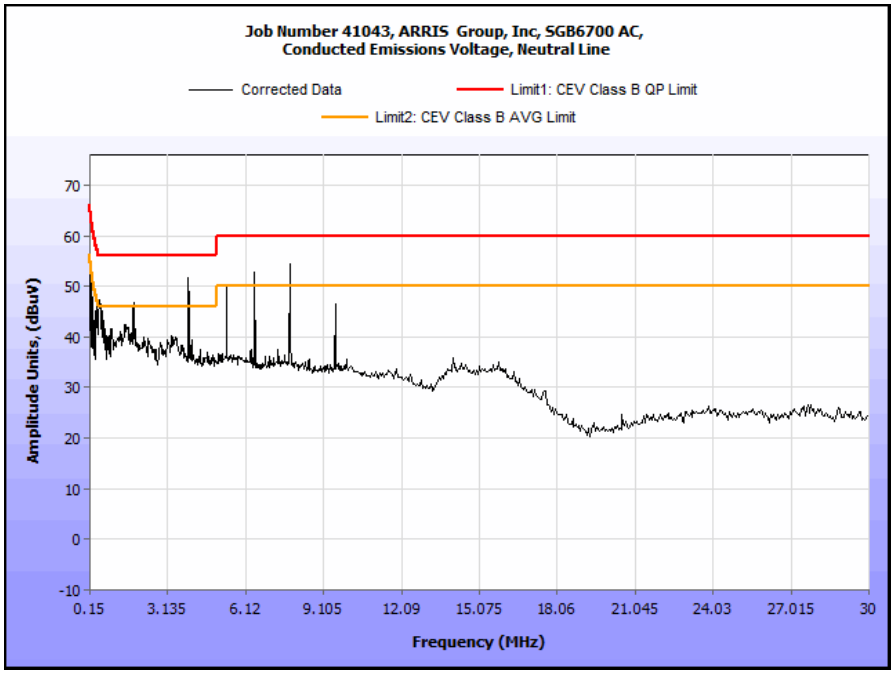
Table 15. Conducted Emissions - Voltage, AC Power, 15.207(a), Neutral Line (120 VAC, 60 Hz)



Plot 7. Conducted Emissions, 15.207(a), Neutral Line, Low Channel



Plot 8. Conducted Emissions, 15.207(a), Neutral Line, Mid Channel



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

Photograph 4. Conducted Emissions, 15.207(a), Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(c) 26dB Bandwidth

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

Test Procedure: The transmitter was set to low, mid, and high 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): 09/05/14

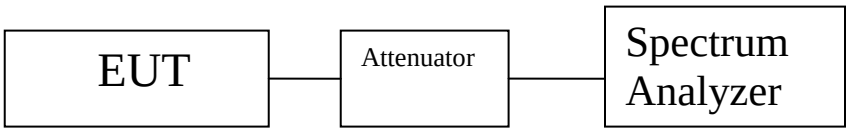
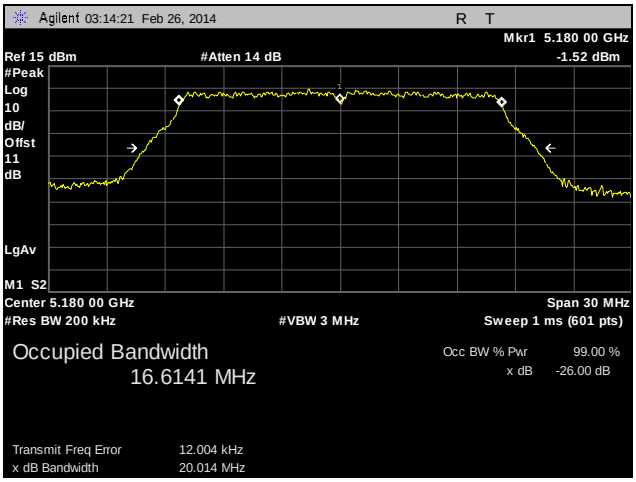
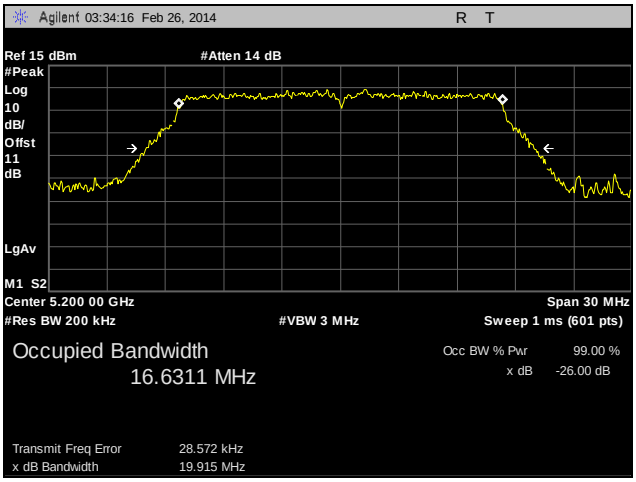


Figure 1. Occupied Bandwidth, Test Setup

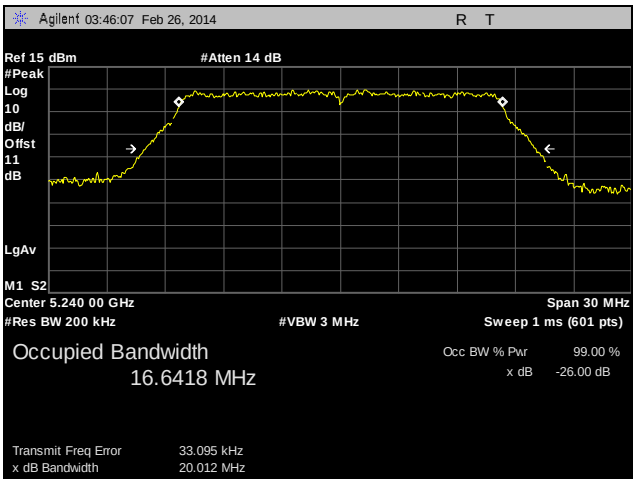
26 dB Occupied Bandwidth, 802.11a 20 MHz, SISO



Plot 10. 26 dB Occupied Bandwidth, 802.11a 20 MHz, Low Channel, SISO

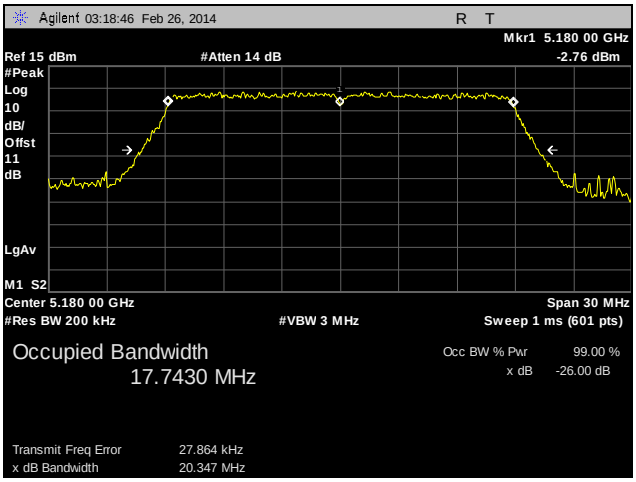


Plot 11. 26 dB Occupied Bandwidth, 802.11a 20 MHz, Mid Channel, SISO

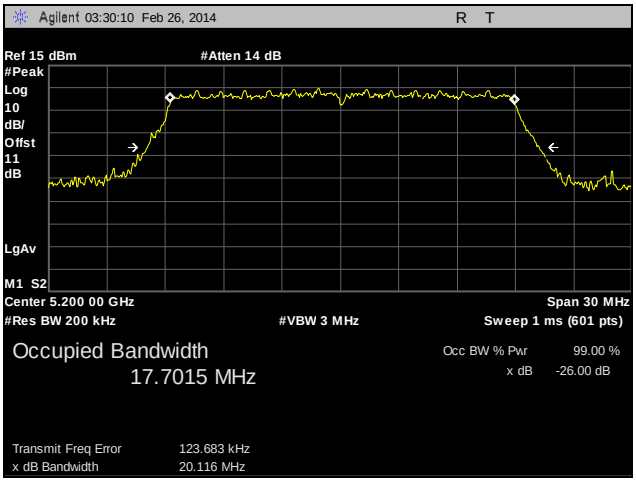


Plot 12. 26 dB Occupied Bandwidth, 802.11a 20 MHz, High Channel, SISO

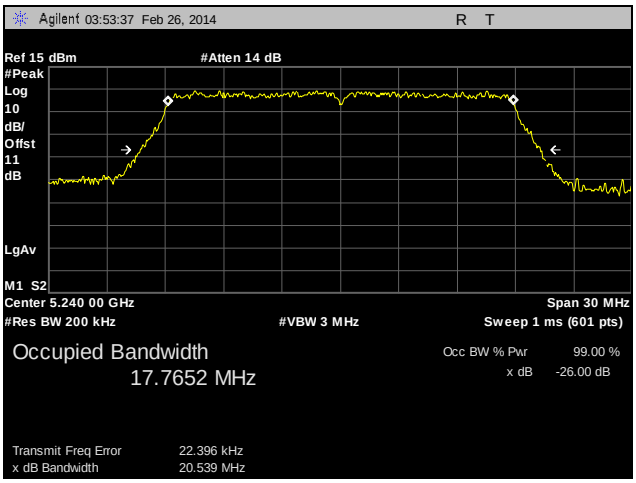
26 dB Occupied Bandwidth, 802.11n 20 MHz, SISO



Plot 13. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Low Channel, SISO

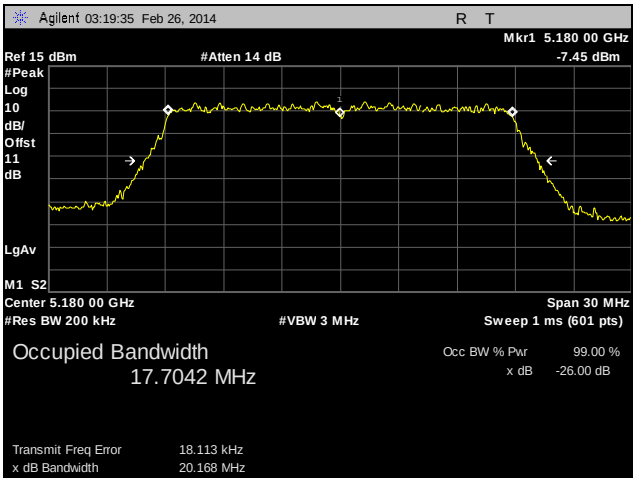


Plot 14. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Mid Channel, SISO

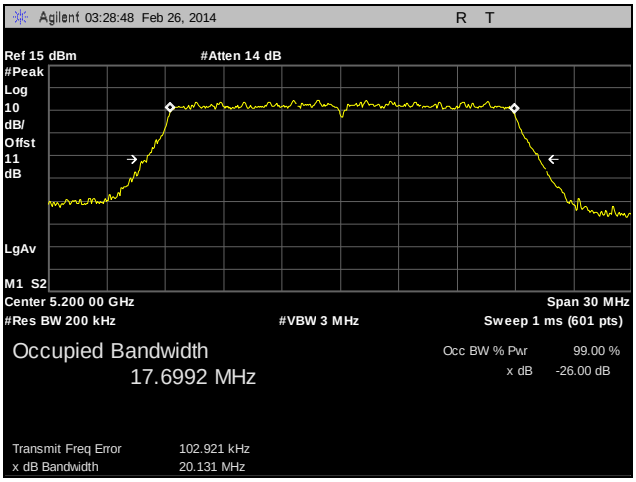


Plot 15. 26 dB Occupied Bandwidth, 802.11n 20 MHz, High Channel, SISO

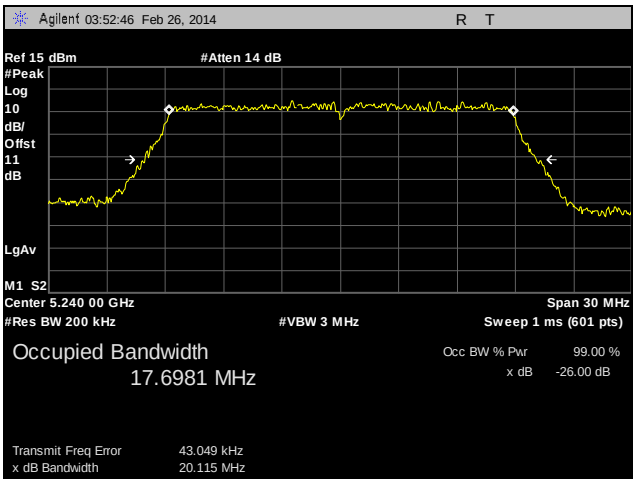
26 dB Occupied Bandwidth, 802.11n 20 MHz, MIMO



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

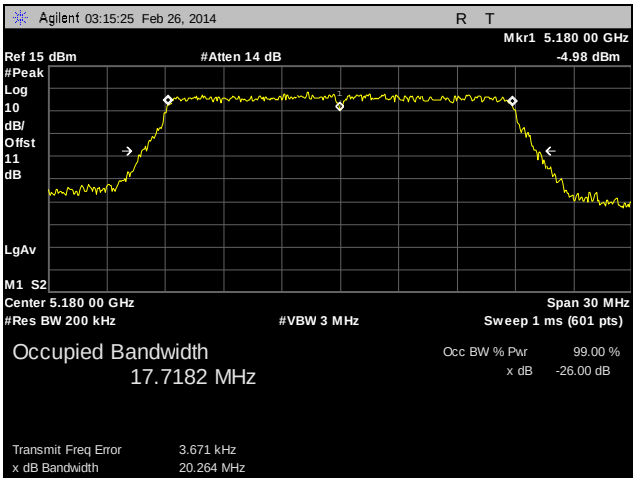


Plot 17. 26 dB Occupied Bandwidth, 802.11n 20 MHz, Mid Channel, MIMO

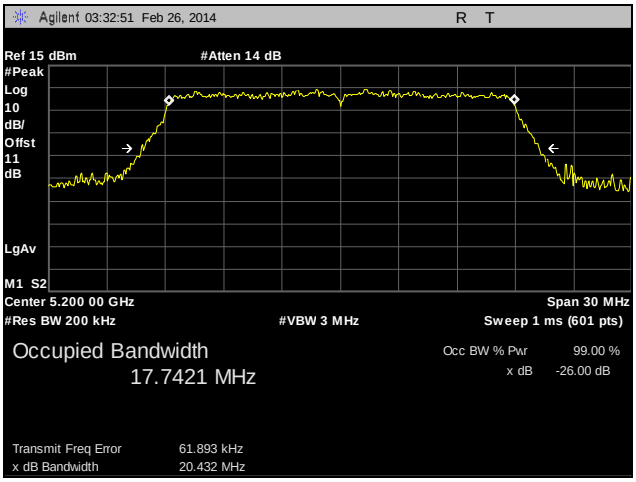


Plot 18. 26 dB Occupied Bandwidth, 802.11n 20 MHz, High Channel, MIMO

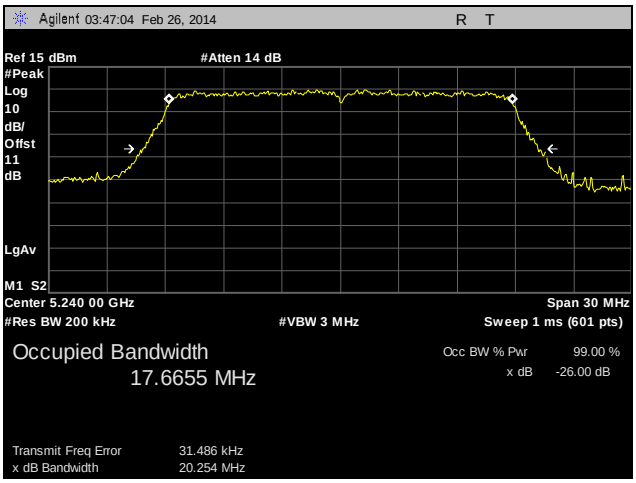
26 dB Occupied Bandwidth, 802.11ac 20 MHz, SISO



Plot 19. 26 dB Occupied Bandwidth, 802.11ac 20 MHz, Low Channel, SISO

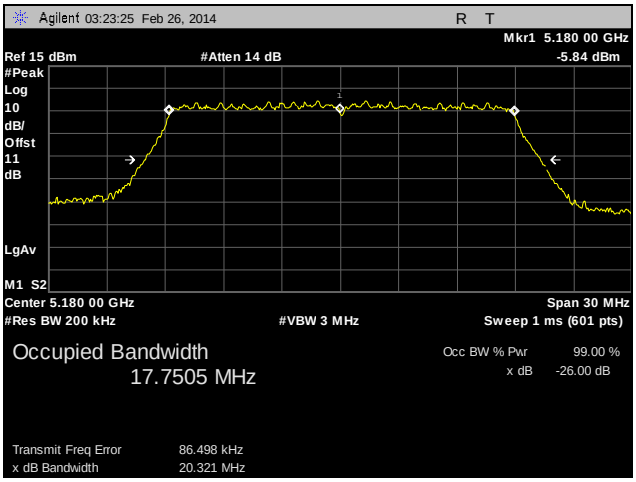


Plot 20. 26 dB Occupied Bandwidth, 802.11ac 20 MHz, Mid Channel, SISO

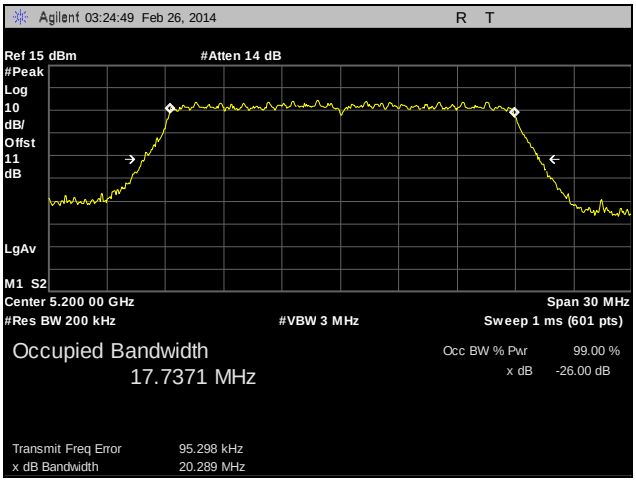


Plot 21. 26 dB Occupied Bandwidth, 802.11ac 20 MHz, High Channel, SISO

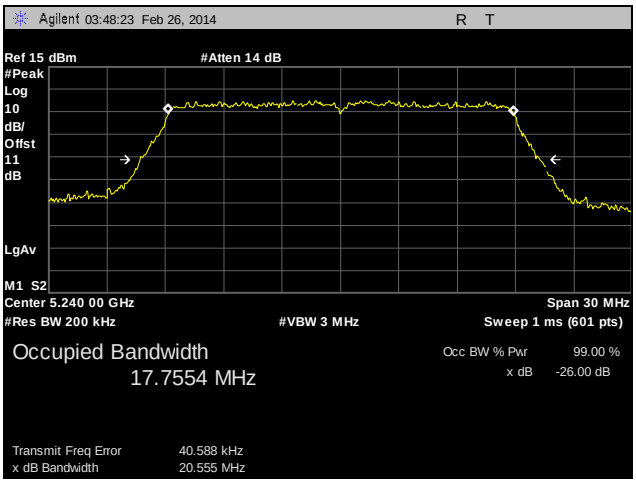
26 dB Occupied Bandwidth, 802.11ac 20 MHz, MIMO



Plot 22. 26 dB Occupied Bandwidth, 802.11ac 20 MHz, Low Channel, MIMO

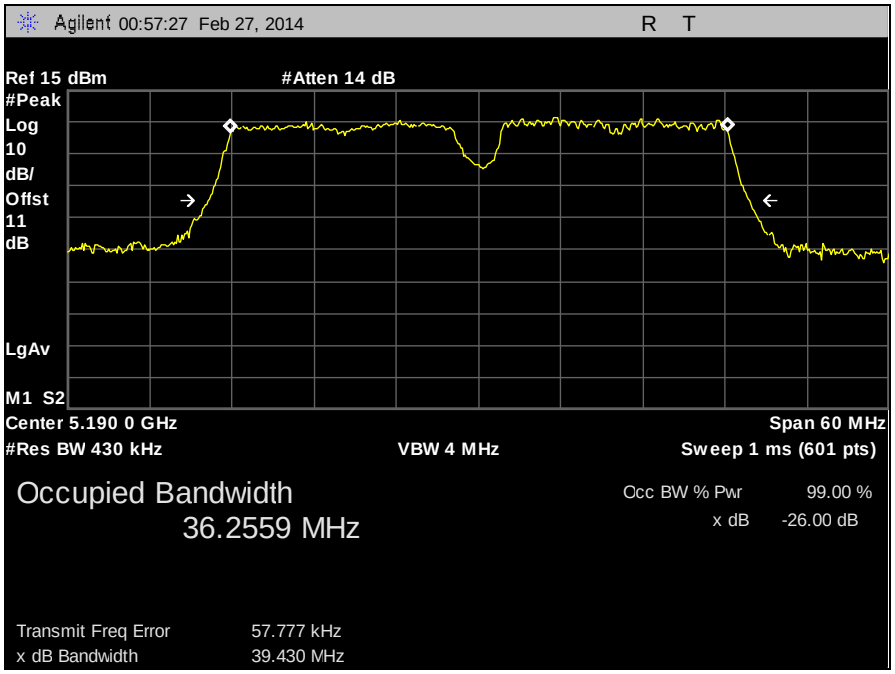


Plot 23. 26 dB Occupied Bandwidth, 802.11ac 20 MHz, Mid Channel, MIMO

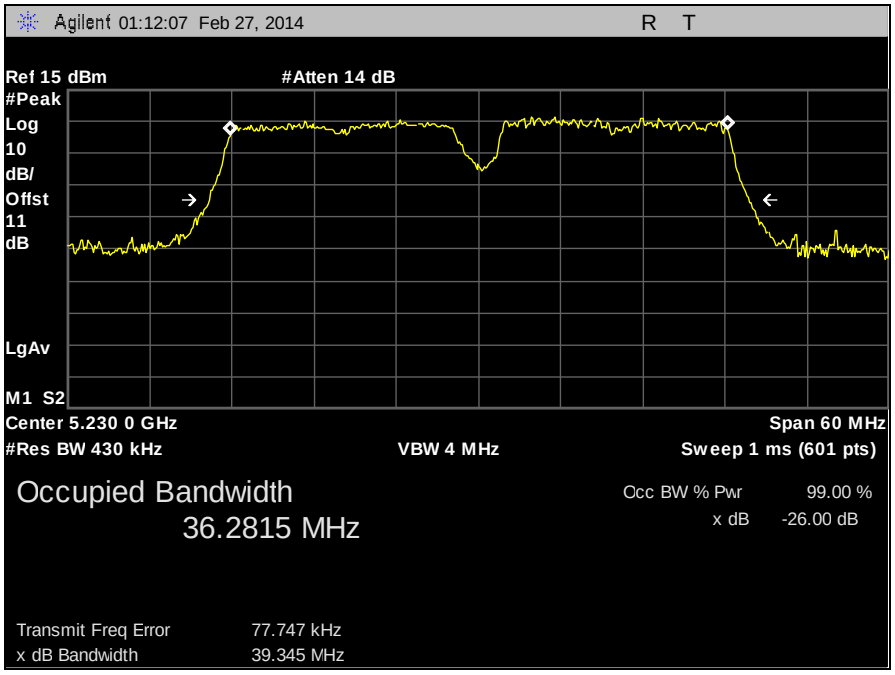


Plot 24. 26 dB Occupied Bandwidth, 802.11ac 20 MHz, High Channel, MIMO

26 dB Occupied Bandwidth, 802.11a 40 MHz, SISO

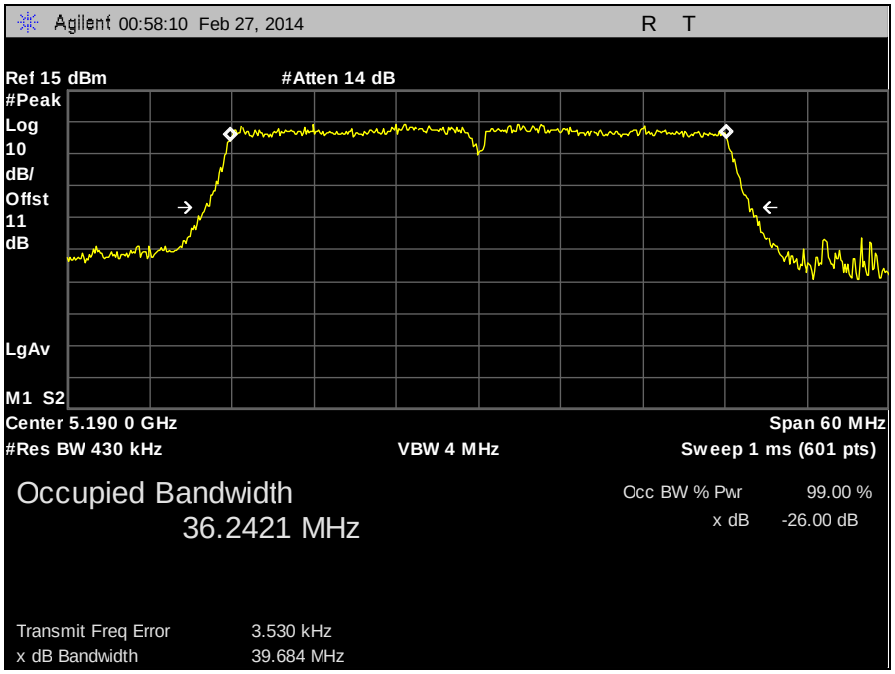


Plot 25. 26 dB Occupied Bandwidth, 802.11a 40 MHz, Low Channel, SISO

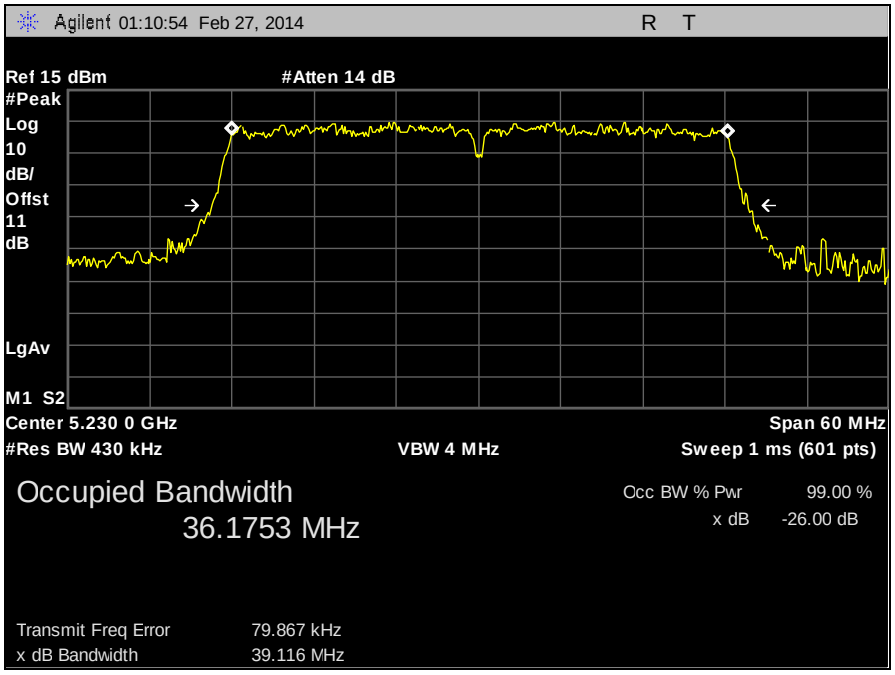


Plot 26. 26 dB Occupied Bandwidth, 802.11a 40 MHz, High Channel, SISO

26 dB Occupied Bandwidth, 802.11n 40 MHz, SISO

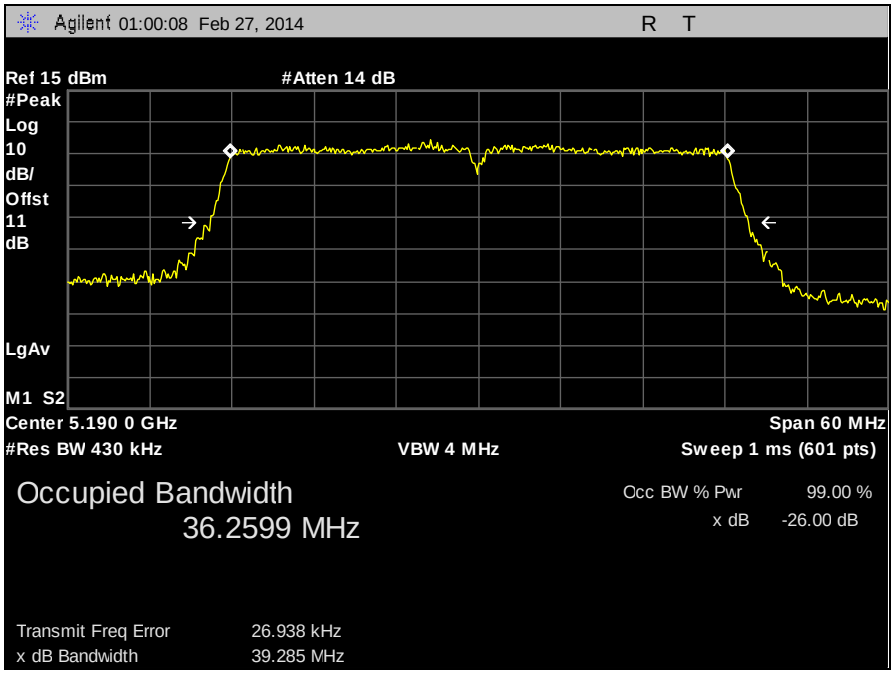


Plot 27. 26 dB Occupied Bandwidth, 802.11n 40 MHz, Low Channel, SISO

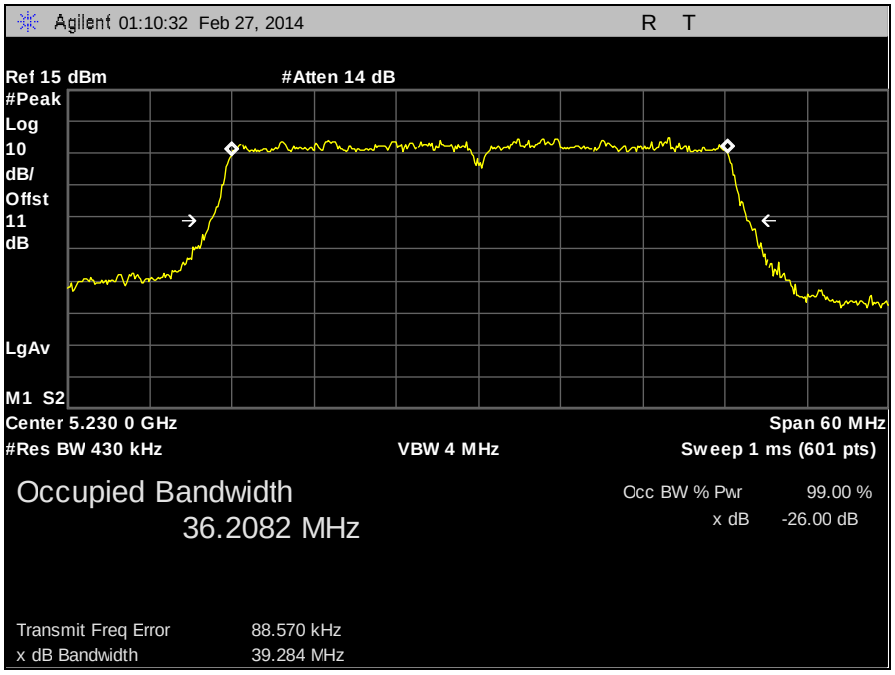


Plot 28. 26 dB Occupied Bandwidth, 802.11n 40 MHz, High Channel, SISO

26 dB Occupied Bandwidth, 802.11n 40 MHz, MIMO

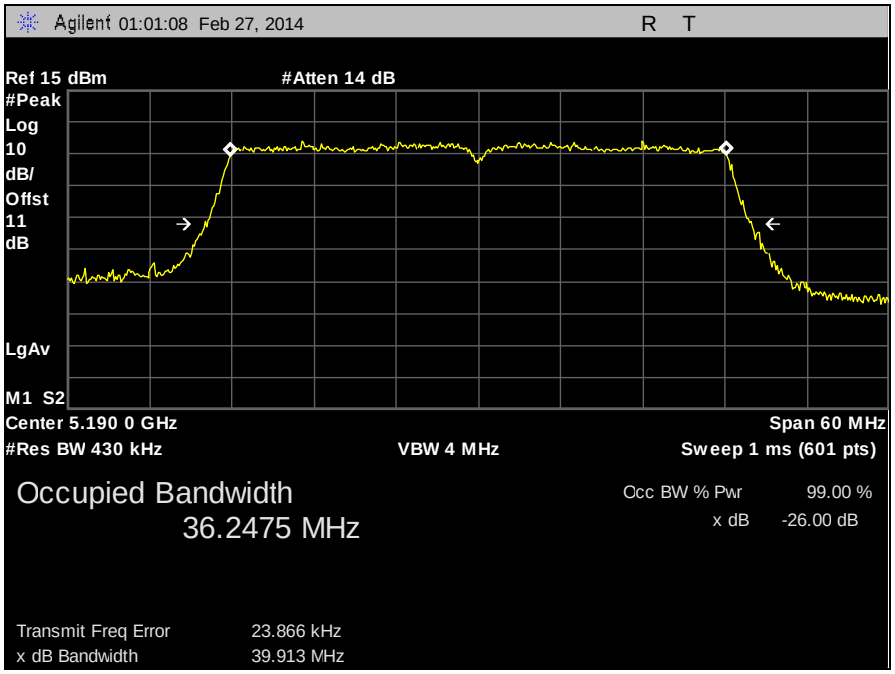


Plot 29. 26 dB Occupied Bandwidth, 802.11n 40 MHz, Low Channel, MIMO

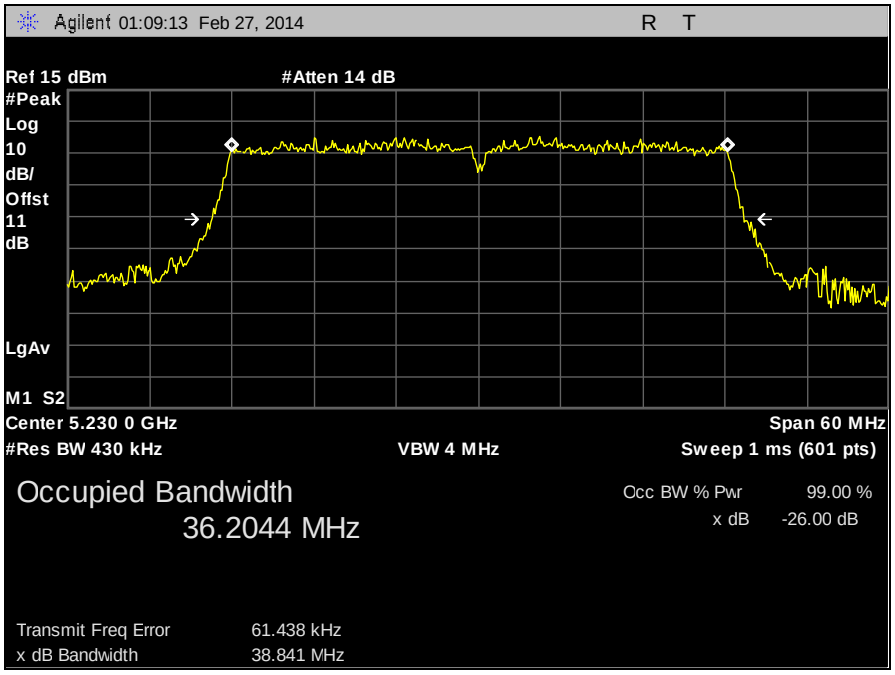


Plot 30. 26 dB Occupied Bandwidth, 802.11n 40 MHz, High Channel, MIMO

26 dB Occupied Bandwidth, 802.11ac 40 MHz, MIMO

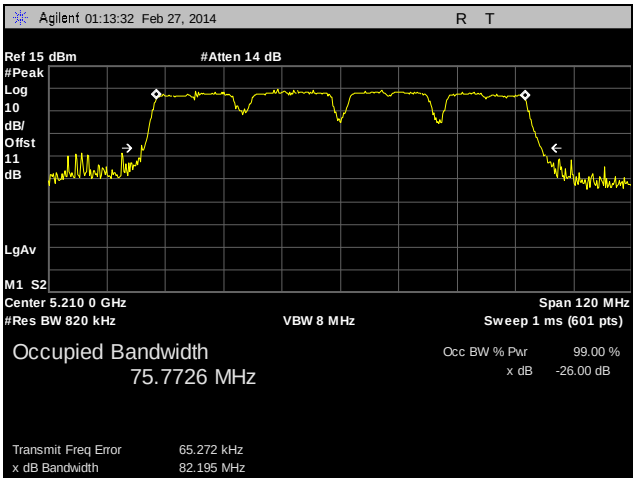


Plot 31. 26 dB Occupied Bandwidth, 802.11ac 40 MHz, Low Channel, MIMO

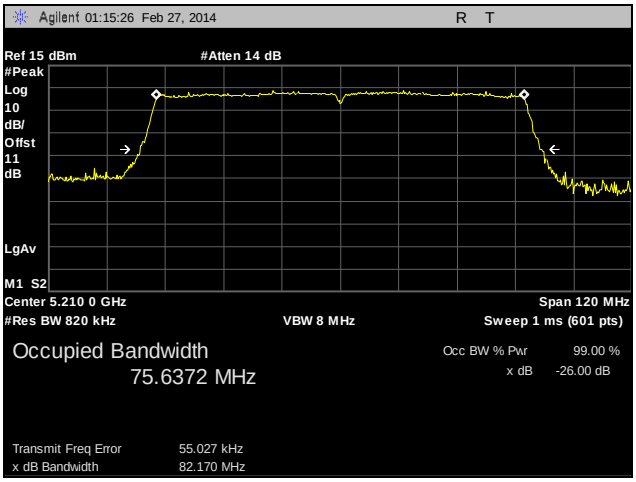


Plot 32. 26 dB Occupied Bandwidth, 802.11ac 40 MHz, High Channel, MIMO

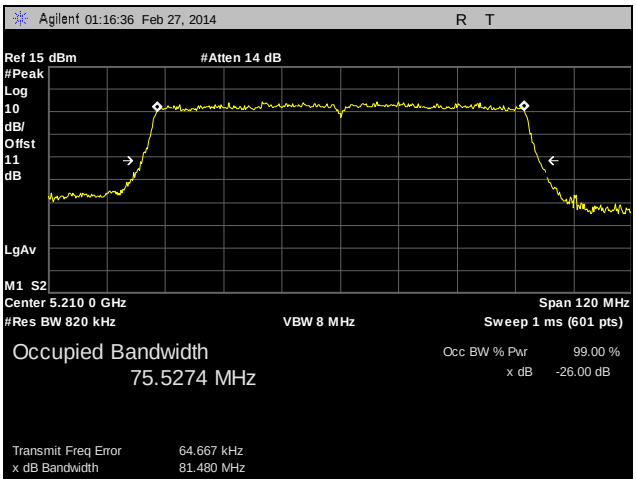
26 dB Occupied Bandwidth, 80 MHz



Plot 33. 26 dB Occupied Bandwidth, 802.11a 80 MHz, SISO



Plot 34. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, SISO



Plot 35. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, MIMO

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(1)(ii) RF Power Output

Test Requirements: **§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.

Test Procedure: The EUT was connected to a spectrum analyzer through a 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 KBD Guidance 789033 D02 General UNII Test Procedures v01. Plots were corrected for attenuator and cable Loss. Single input Single output measurement was taken on antenna port whose antenna has highest gain value.

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): 09/04/14

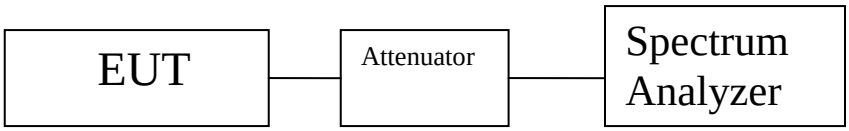


Figure 2. Power Output Test Setup

Peak Power Output Test Result 5GHz Radio - UNII Band -1						
Peak Conducted Output Power 20MHz Band 802.11a/ac/n Mode (dBm)						
Channel	**Frequency GHz**	**Measured Peak Output Power (dBm)/20MHz Ant 1**	**Mode**	**Power Limit (dBm)**	**Antenna Gain (dB)**	**Margin Ant1 (dB)**
36	5180	16.26	a	30	3.83	-13.74
36	5180	16.2	ac	30	3.83	-13.8
36	5180	16.13	n	30	3.83	-13.87
40	5200	18.97	a	30	3.83	-11.03
40	5200	19.83	ac	30	3.83	-10.17
40	5200	20.12	n	30	3.83	-9.88
48	5240	21.12	a	30	3.83	-8.88
48	5240	20.71	ac	30	3.83	-9.29
48	5240	20.61	n	30	3.83	-9.39

Table 16. RF Output Power, Test Results, 802.11a/ac/n 20 MHz SISO

Peak Conducted Output Power 20MHz Band 802.11n/ac Mode MIMO (3*3) (dBm)									
Chanel Carrier	Frequency MHz	Measured Peak Output Power (dBm)/20MHz Ant 0	Measured Peak Output Power (dBm)/20MHz Ant 1	Measured Peak Output Power (dBm)/20MHz Ant 2	Mode	Total Output Power (dBm)	Antenna Gain (dB)	Power Limit (dBm)	Margin (dB)
36	5180	16.57	15.64	15.01	ac	20.55	8.21	30	-7.23
40	5200	20.72	20.09	19.87	ac	25.01	8.21	30	-2.77
48	5240	20.46	19.87	19.53	ac	24.74	8.21	30	-3.04
36	5180	16.23	15.12	14.83	n	20.20	8.21	30	-7.58
40	5200	20.11	19.53	19.15	n	24.38	8.21	30	-3.40
48	5240	20.47	19.95	19.71	n	24.82	8.21	30	-2.96

Table 17. RF Output Power, Test Results, 802.11n/ac 20 MHz, MIMO

Peak Power Output Test Result 5GHz Radio - UNII Band -1						
Peak Conducted Output Power 40MHz Band 802.11a/ac/n Mode (dBm)						
Channel	Frequency GHz	Measured Peak Output Power (dBm)/40MHz Ant 1	Mode	Power Limit (dBm)	Antenna Gain (dB)	Margin Ant1 (dB)
36	5190	12.64	a	30	3.83	-17.36
36	5190	12.76	n	30	3.83	-17.24
44	5230	20.5	a	30	3.83	-9.5
44	5230	20.3	n	30	3.83	-9.7

Table 18. RF Output Power, Test Results, 802.11a/ac/n 40 MHz SISO

Peak Conducted Output Power 40MHz Band 11n mode MIMO (3*3) (dBm)									
Chanel Carrier	Frequency MHz	Measured Peak Output Power (dBm)/20MHz Ant 0	Measured Peak Output Power (dBm)/20MHz Ant 1	Measured Peak Output Power (dBm)/20MHz Ant 2	Mode	Total Output Power (dBm)	Antenna Gain (dB)	Power Limit (dBm)	Margin (dB)
36	5190	10.24	10.32	10.06	ac	14.97	8.21	30	-12.81
36	5190	10.33	10.4	9.97	n	15.00	8.21	30	-12.78
44	5230	20.39	19.81	19.45	ac	24.67	8.21	30	-3.11
44	5230	20.37	19.84	19.37	n	24.65	8.21	30	-3.13

Table 19. RF Output Power, Test Results, 802.11n/ac 40 MHz, MIMO

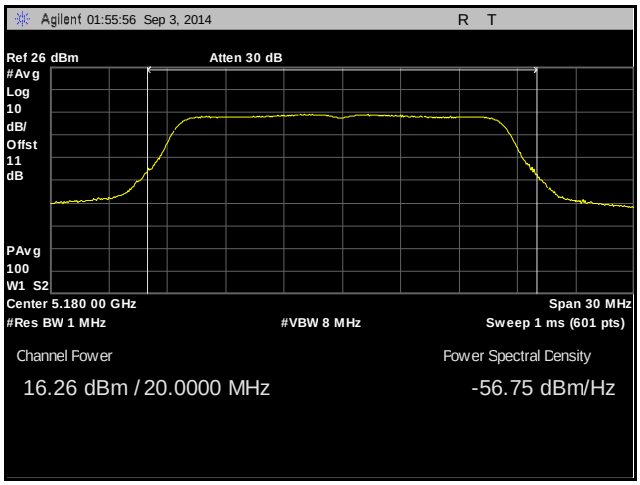
Peak Power Output Test Result 5GHz Radio - UNII Band -1						
Peak Conducted Output Power 80MHz Band 802.11a/ac Mode (dBm)						
Channel	**Frequency GHz**	**Measured Peak Output Power (dBm)/80MHz Ant 1**	**Mode**	**Power Limit (dBm)**	**Antenna Gain (dB)**	**Margin Ant1 (dB)**
36	5210	12.91	a	30	3.83	-17.09
36	5210	13.39	ac	30	3.83	-16.61

Table 20. RF Output Power, Test Results, 802.11a/ac 80 MHz SISO

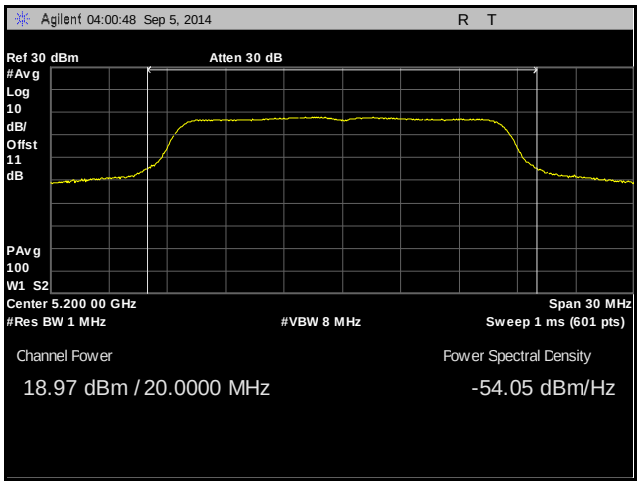
Peak Conducted Output Power 80MHz Band 802.11ac mode MIMO (3*3) (dBm)								
Chanel Carrier	**Frequency MHz**	**Measured Peak Output Power (dBm)/80MHz Ant 0**	**Measured Peak Output Power (dBm)/80MHz Ant 1**	**Measured Peak Output Power (dBm)/80MHz Ant 2**	**Total Output Power (dBm)**	**Antenna Gain (dB)**	**Power Limit (dBm)**	**Margin (dB)**
36	5210	12.23	12.07	12.18	17	8.21	30	-10.79

Table 21. RF Output Power, Test Results, 802.11ac 80 MHz, MIMO

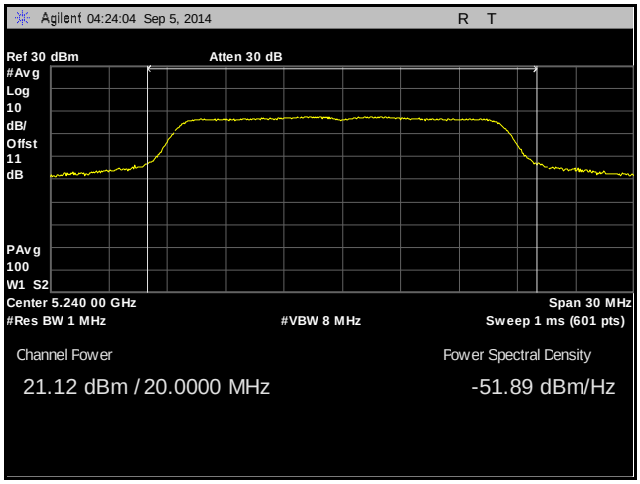
Output Power, 802.11a 20 MHz, SISO



Plot 36. Output Power, 802.11a 20 MHz, Low Channel, SISO, Ant 1

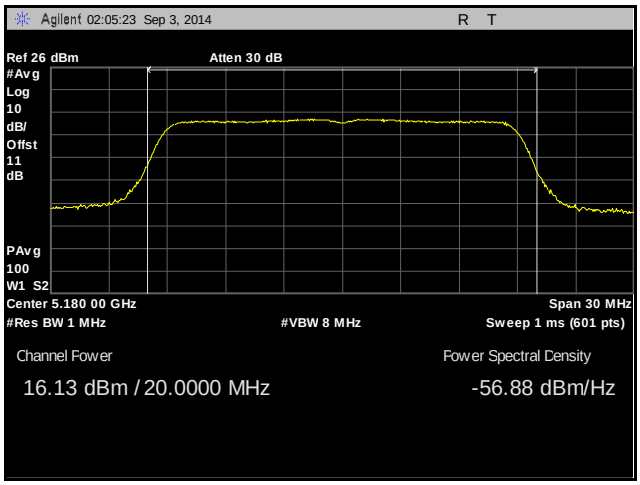


Plot 37. Output Power, 802.11a 20 MHz, Mid Channel, SISO, Ant 1

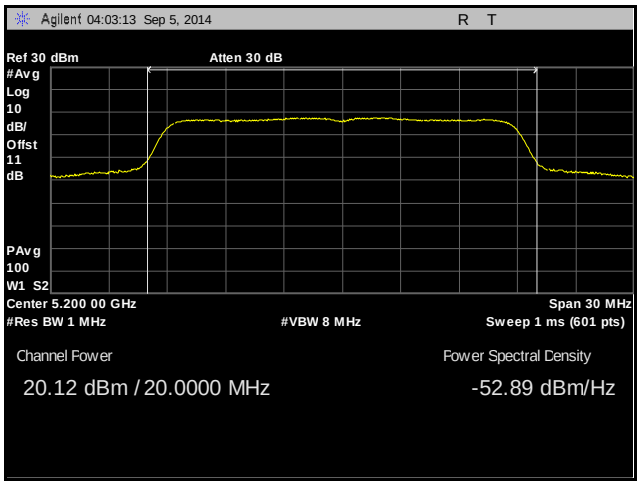


Plot 38. Output Power, 802.11a 20 MHz, High Channel, SISO, Ant 1

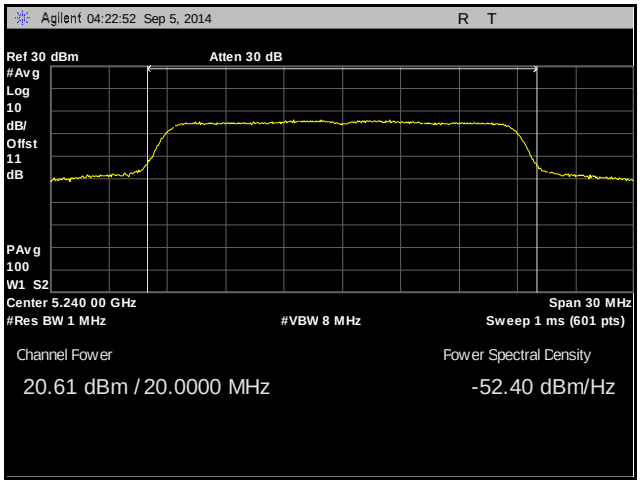
Output Power, 802.11n 20 MHz, SISO, Antenna 1



Plot 39. Output Power, 802.11n 20 MHz, Low Channel, SISO, Antenna 1

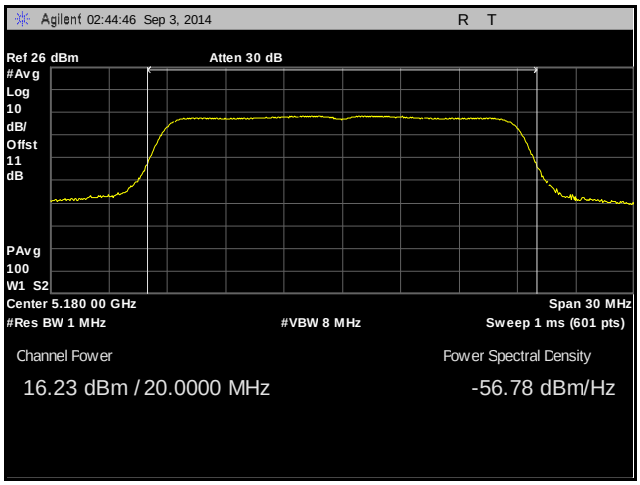


Plot 40. Output Power, 802.11n 20 MHz, Mid Channel, SISO, Antenna 1

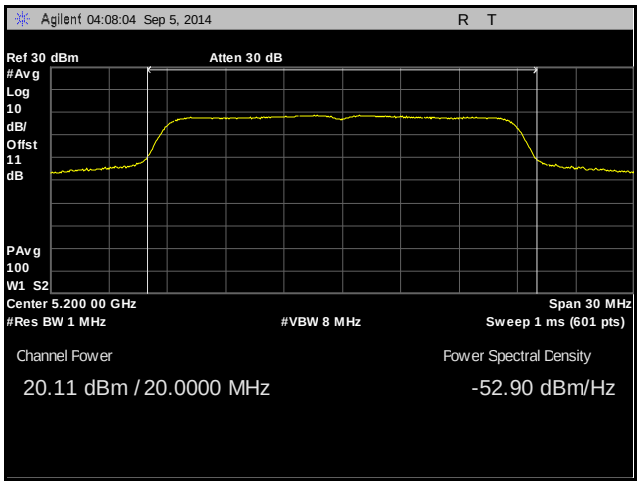


Plot 41. Output Power, 802.11n 20 MHz, High Channel, SISO, Antenna 1

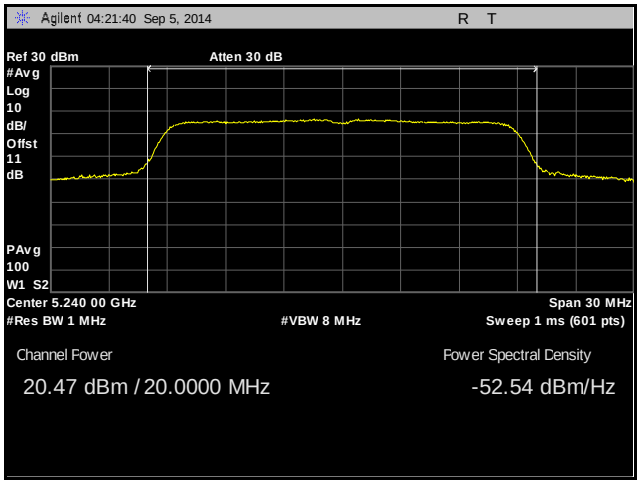
Output Power, 802.11n 20 MHz, MIMO, Antenna 0



Plot 42. Output Power, 802.11n 20 MHz, Low Channel, MIMO, Antenna 0

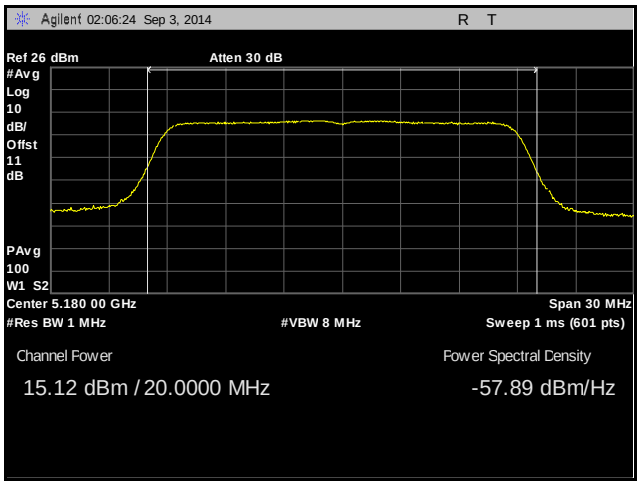


Plot 43. Output Power, 802.11n 20 MHz, Mid Channel, MIMO, Antenna 0

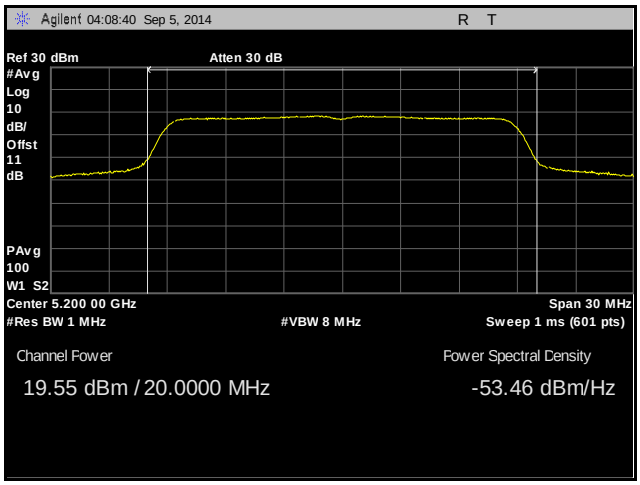


Plot 44. Output Power, 802.11n 20 MHz, High Channel, MIMO, Antenna 0

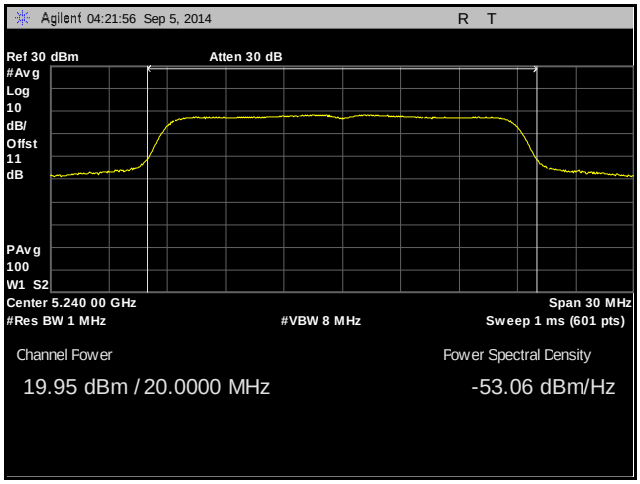
Output Power, 802.11n 20 MHz, MIMO, Antenna 1



Plot 45. Output Power, 802.11n 20 MHz, Low Channel, MIMO, Antenna 1

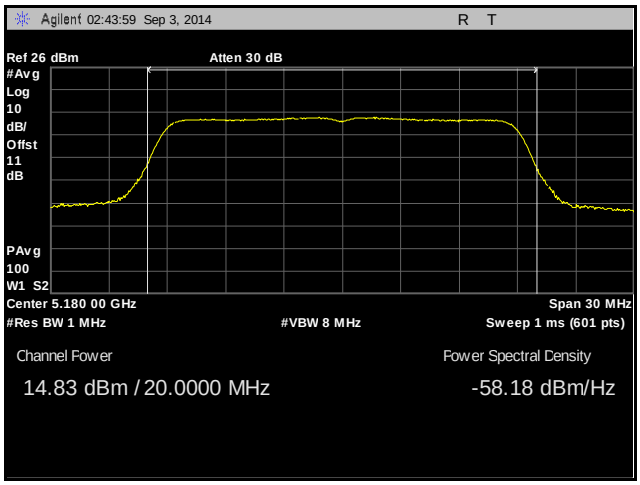


Plot 46. Output Power, 802.11n 20 MHz, Mid Channel, MIMO, Antenna 1

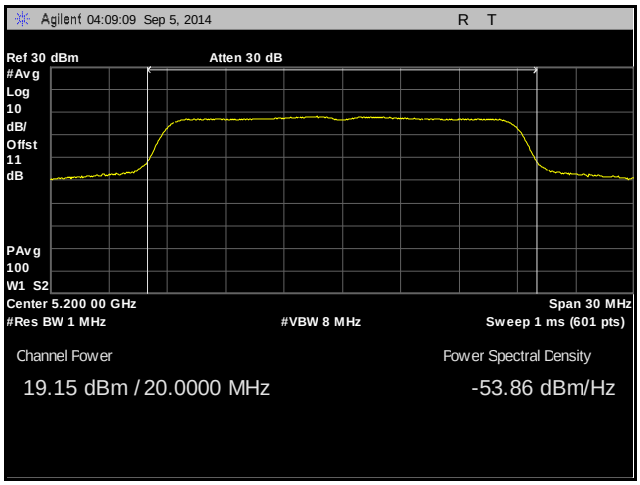


Plot 47. Output Power, 802.11n 20 MHz, High Channel, MIMO, Antenna 1

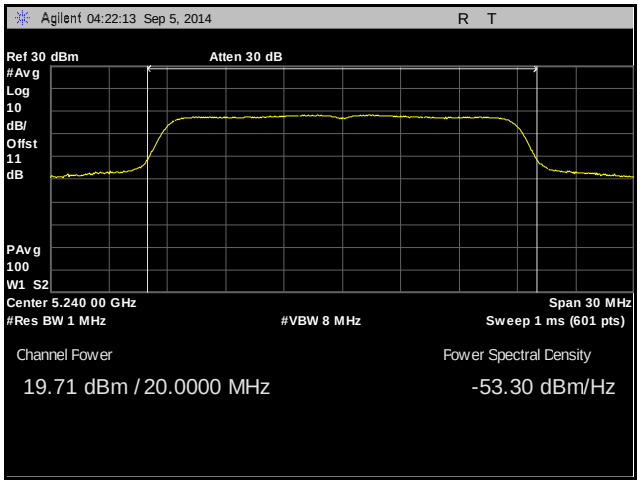
Output Power, 802.11n 20 MHz, MIMO, Antenna 2



Plot 48. Output Power, 802.11n 20 MHz, Low Channel, MIMO, Antenna 2

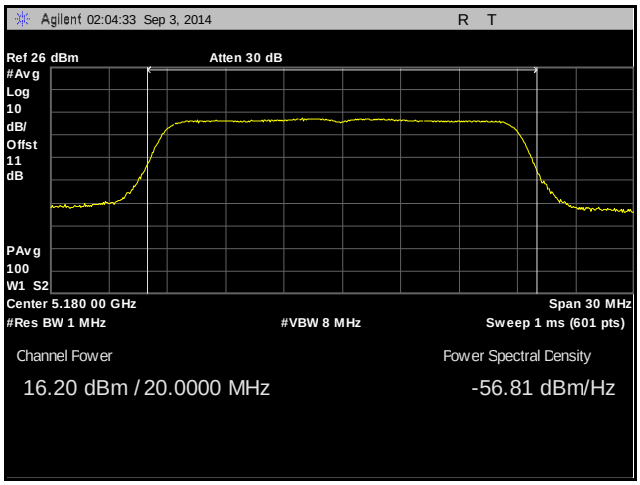


Plot 49. Output Power, 802.11n 20 MHz, Mid Channel, MIMO, Antenna 2

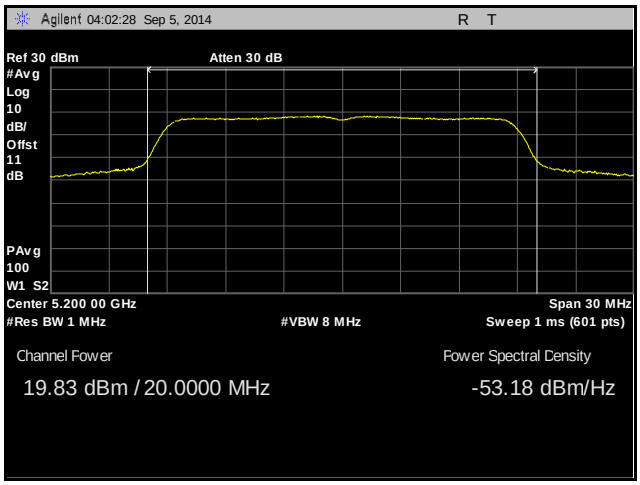


Plot 50. Output Power, 802.11n 20 MHz, High Channel, MIMO, Antenna 2

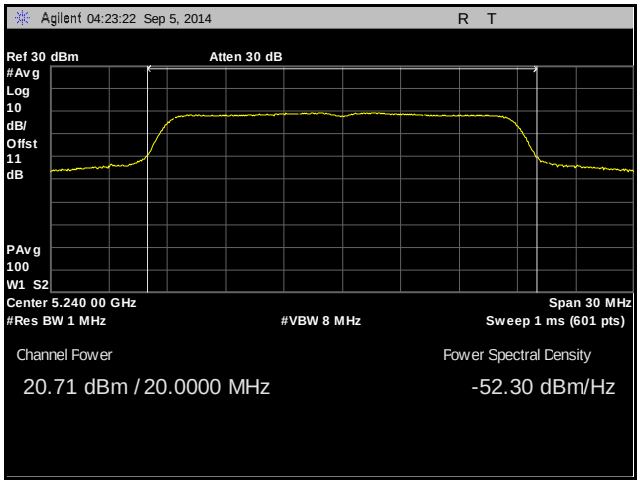
Output Power, 802.11ac 20 MHz, SISO



Plot 51. Output Power, 802.11ac 20 MHz, Low Channel, SISO, Ant 1

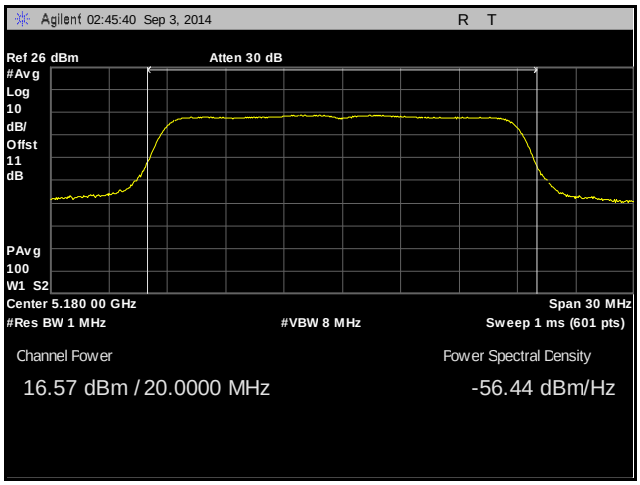


Plot 52. Output Power, 802.11ac 20 MHz, Mid Channel, SISO, Ant 1

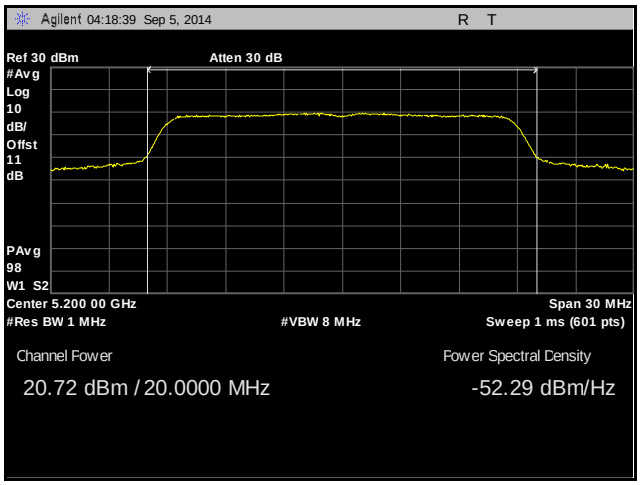


Plot 53. Output Power, 802.11ac 20 MHz, High Channel, SISO, Ant 1

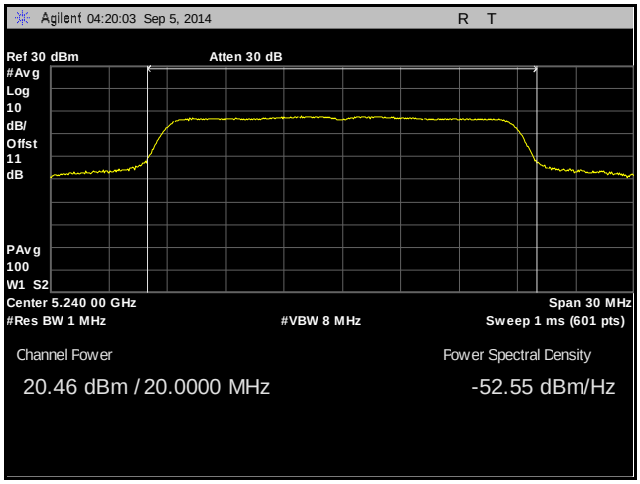
Output Power, 802.11ac 20 MHz, MIMO, Antenna 0



Plot 54. Output Power, 802.11ac 20 MHz, Low Channel, MIMO, Antenna 0

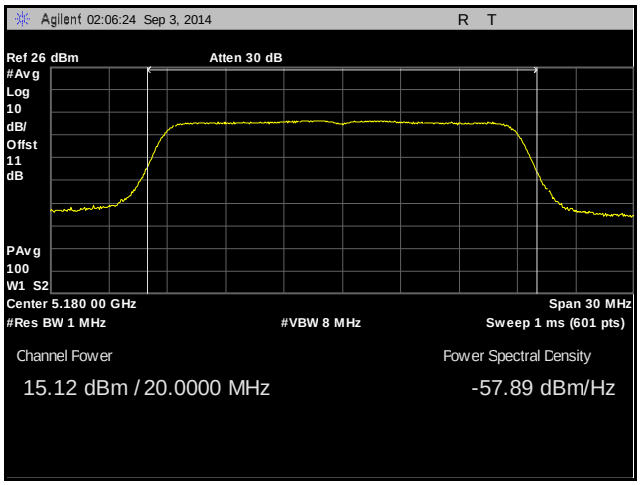


Plot 55. Output Power, 802.11ac 20 MHz, Mid Channel, MIMO, Antenna 0

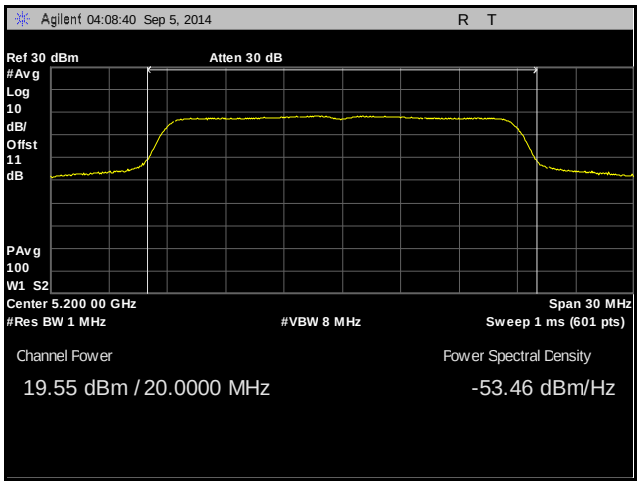


Plot 56. Output Power, 802.11ac 20 MHz, High Channel, MIMO, Antenna 0

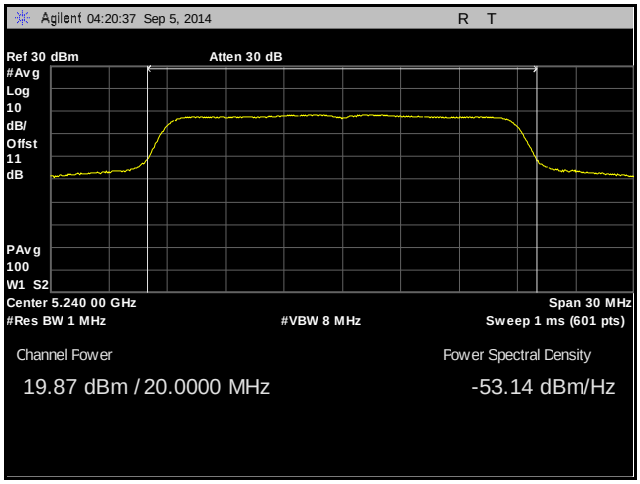
Output Power, 802.11ac 20 MHz, MIMO, Antenna 1



Plot 57. Output Power, 802.11ac 20 MHz, Low Channel, MIMO, Antenna 1

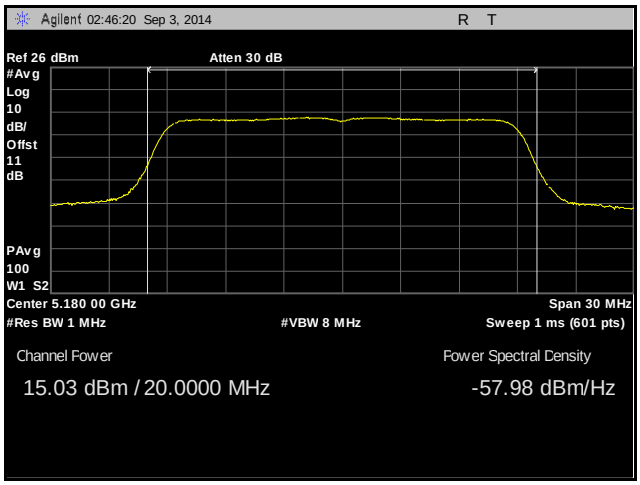


Plot 58. Output Power, 802.11ac 20 MHz, Mid Channel, MIMO, Antenna 1

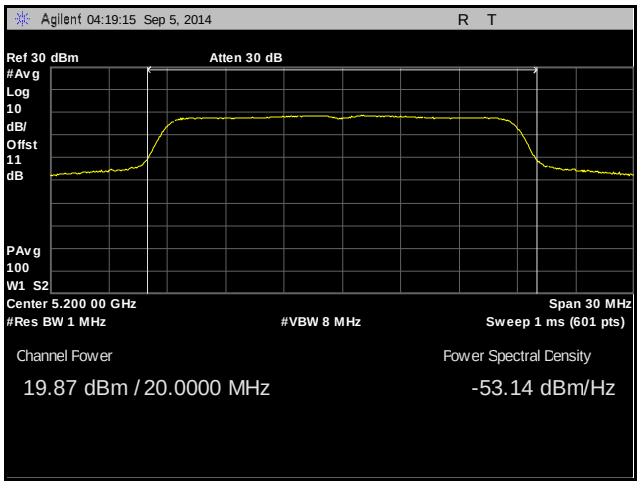


Plot 59. Output Power, 802.11ac 20 MHz, High Channel, MIMO, Antenna 1

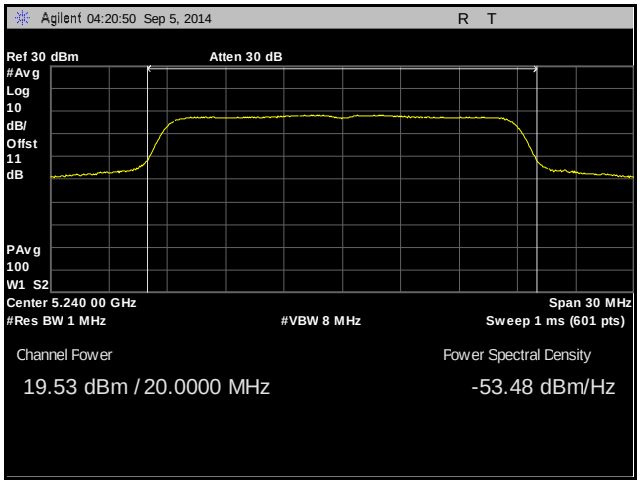
Output Power, 802.11ac 20 MHz, MIMO, Antenna 2



Plot 60. Output Power, 802.11ac 20 MHz, Low Channel, MIMO, Antenna 2

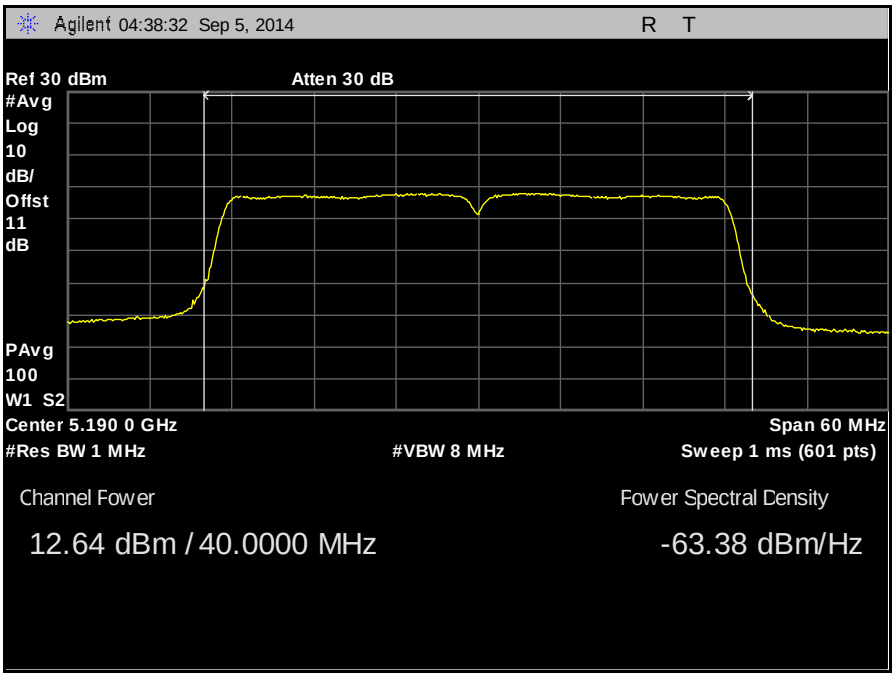


Plot 61. Output Power, 802.11ac 20 MHz, Mid Channel, MIMO, Antenna 2

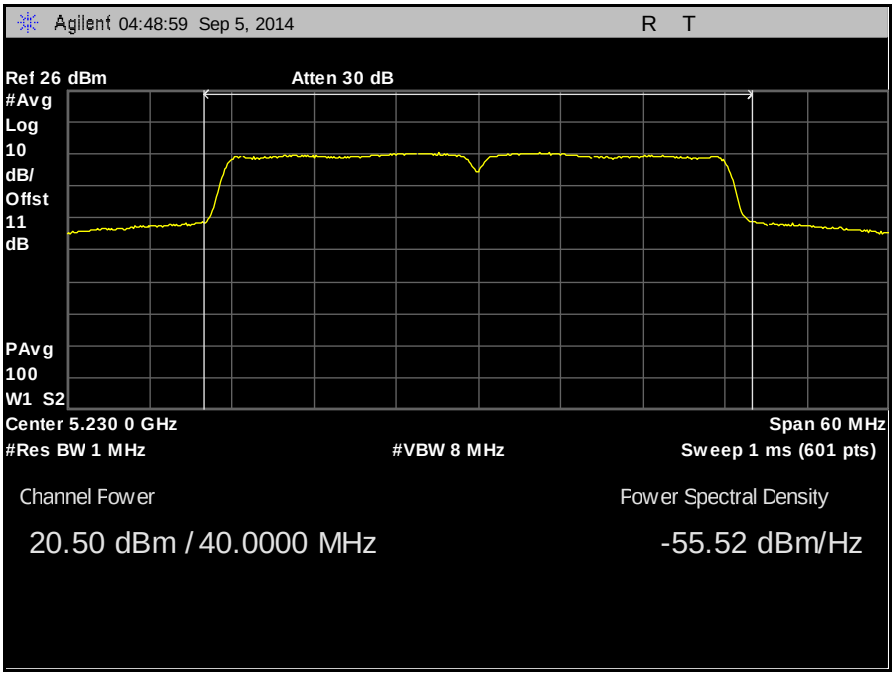


Plot 62. Output Power, 802.11ac 20 MHz, High Channel, MIMO, Antenna 2

Output Power, 802.11a 40 MHz, SISO

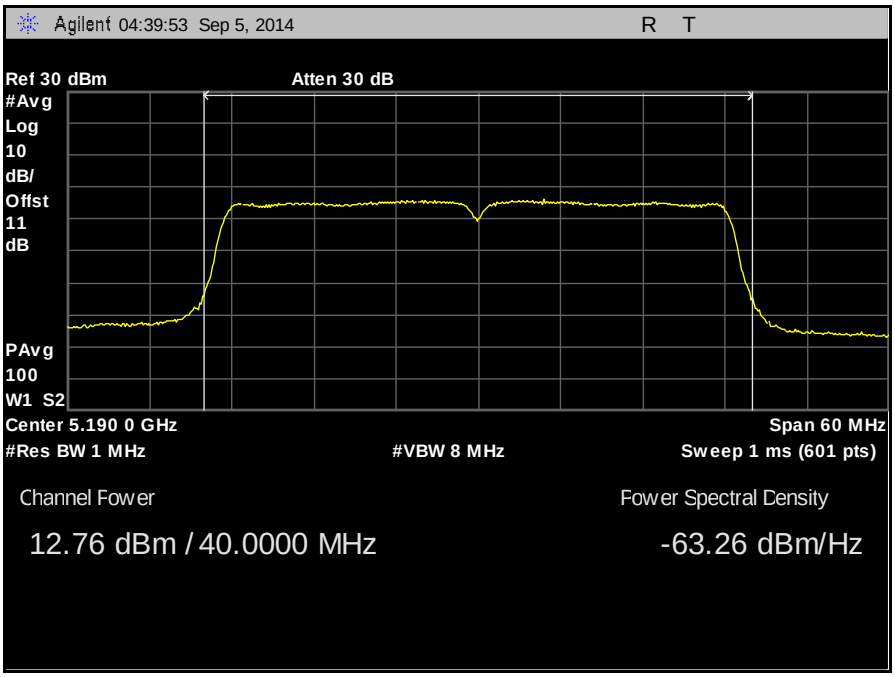


Plot 63. Output Power, 802.11a 40 MHz, Low Channel, SISO

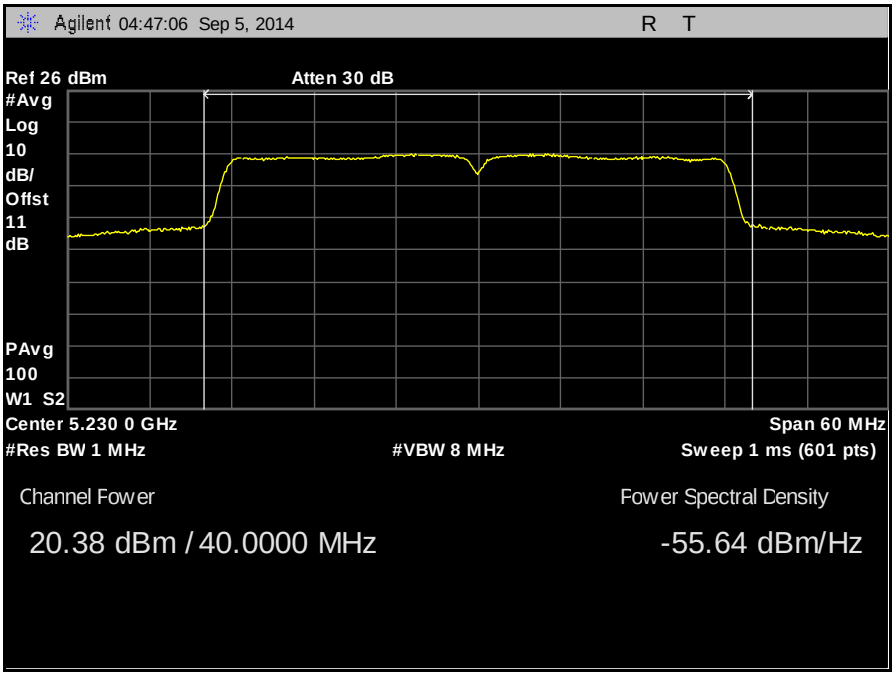


Plot 64. Output Power, 802.11a 40 MHz, High Channel, SISO

Output Power, 802.11n 40 MHz, SISO

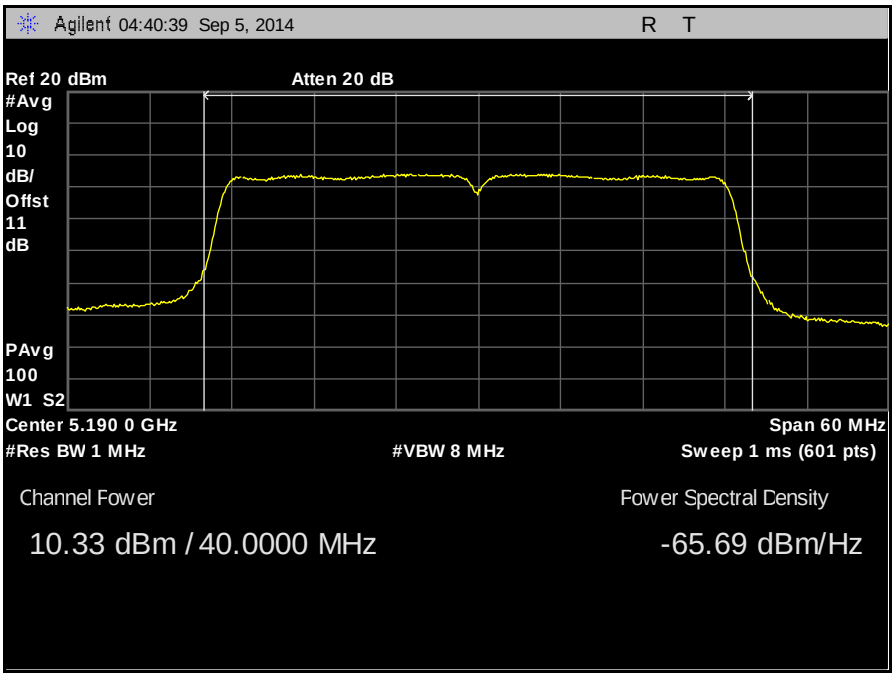


Plot 65. Output Power, 802.11n 40 MHz, Low Channel, SISO

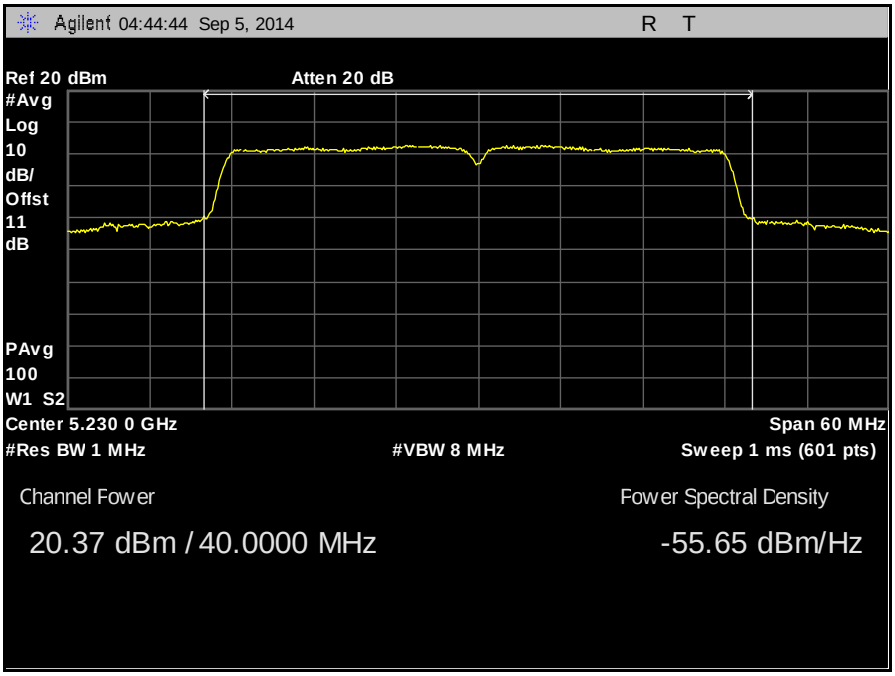


Plot 66. Output Power, 802.11n 40 MHz, High Channel, SISO

Output Power, 802.11n 40 MHz, MIMO, Antenna 0

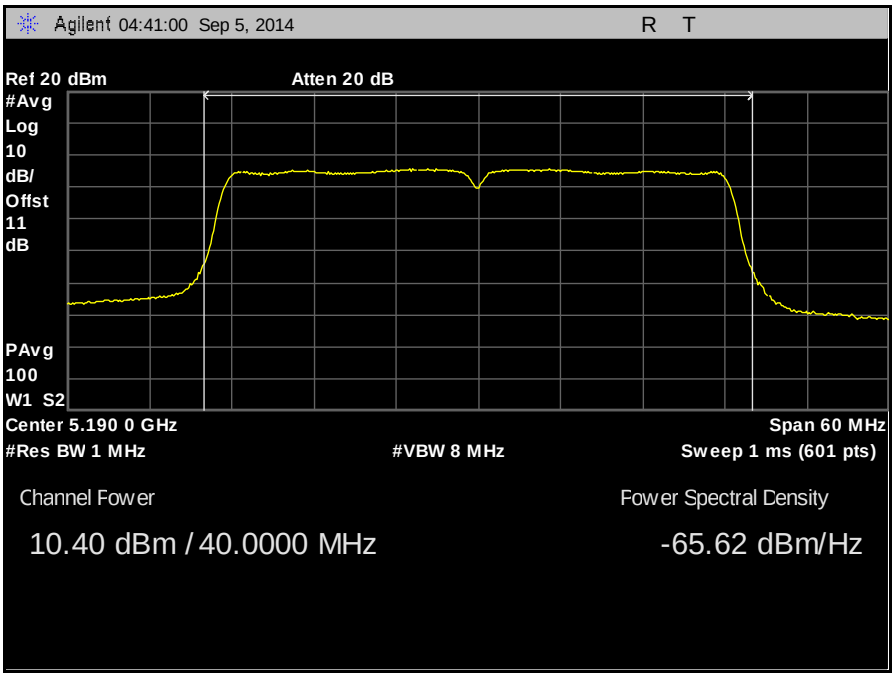


Plot 67. Output Power, 802.11n 40 MHz, Low Channel, MIMO, Antenna 0

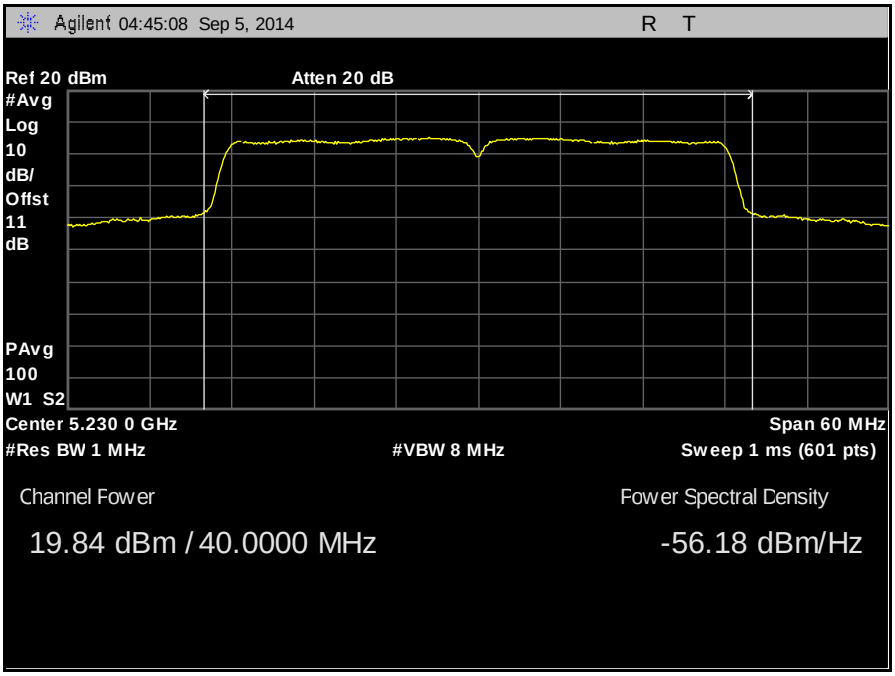


Plot 68. Output Power, 802.11n 40 MHz, High Channel, MIMO, Antenna 0

Output Power, 802.11n 40 MHz, MIMO, Antenna 1

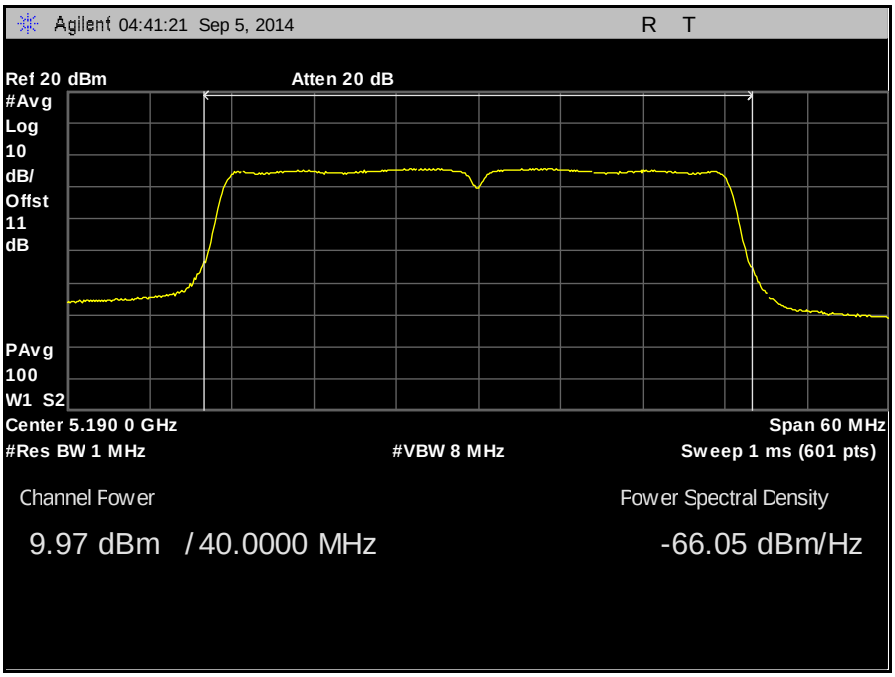


Plot 69. Output Power, 802.11n 40 MHz, Low Channel, MIMO, Antenna 1

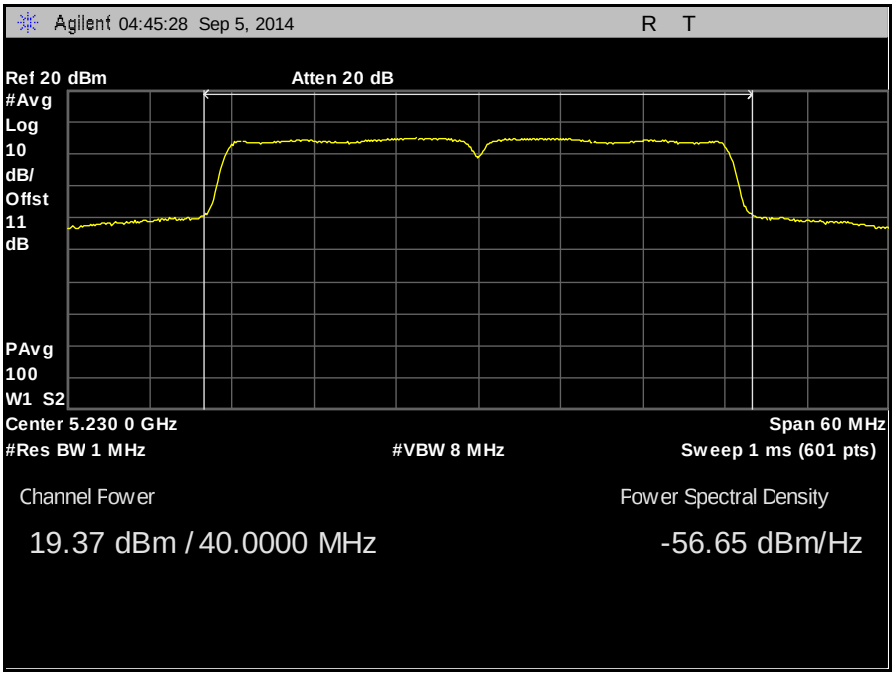


Plot 70. Output Power, 802.11n 40 MHz, High Channel, MIMO, Antenna 1

Output Power, 802.11n 40 MHz, MIMO, Antenna 2

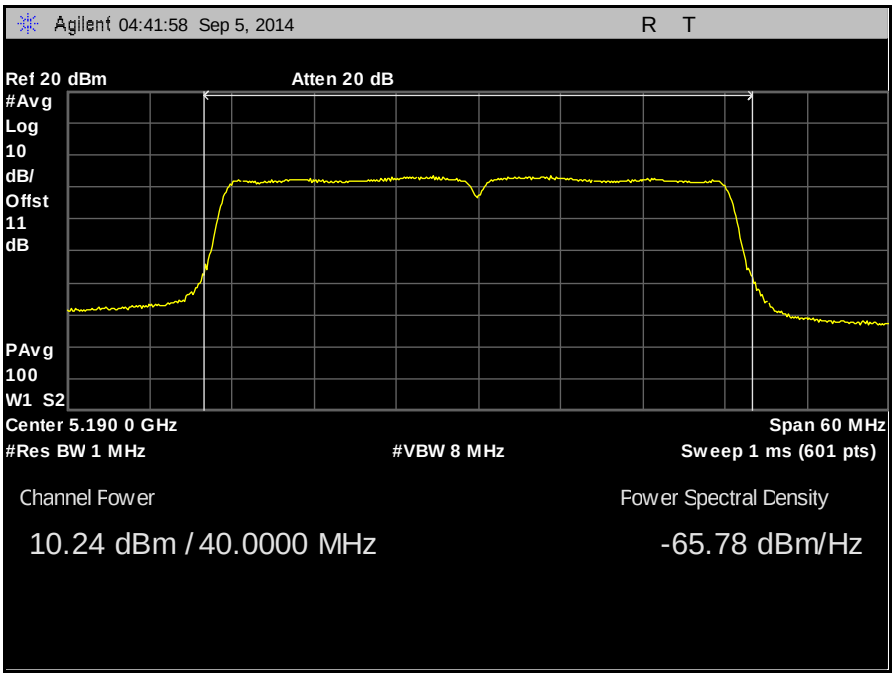


Plot 71. Output Power, 802.11n 40 MHz, Low Channel, MIMO, Antenna 2

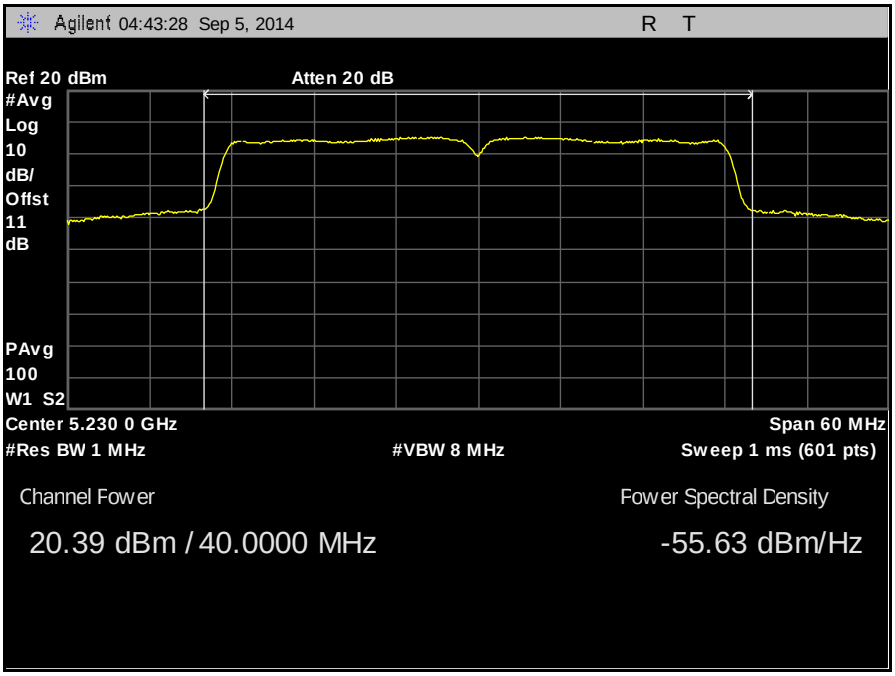


Plot 72. Output Power, 802.11n 40 MHz, High Channel, MIMO, Antenna 2

Output Power, 802.11ac 40 MHz, MIMO, Antenna 0

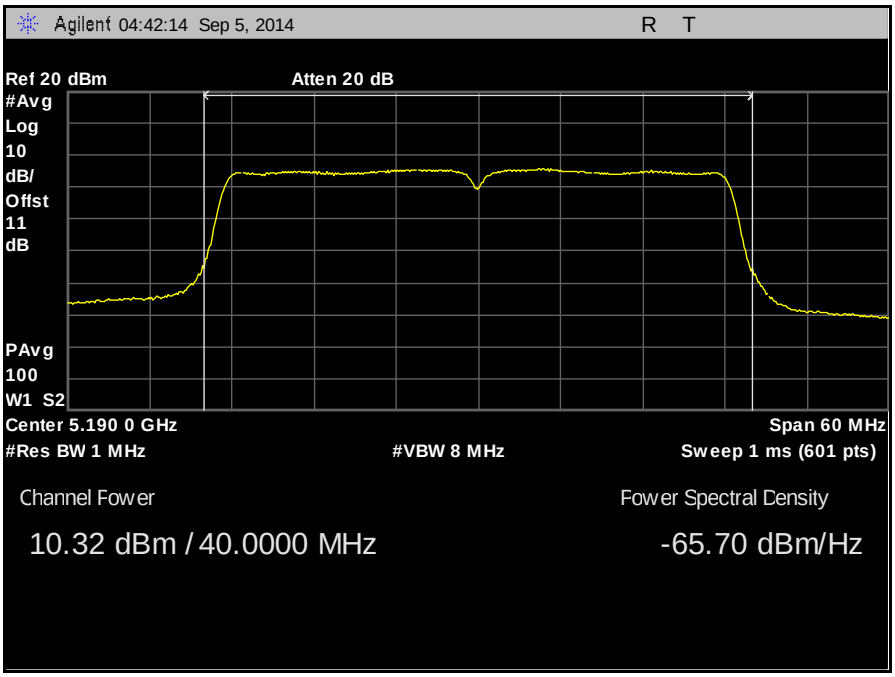


Plot 73. Output Power, 802.11ac 40 MHz, Low Channel, MIMO, Antenna 0

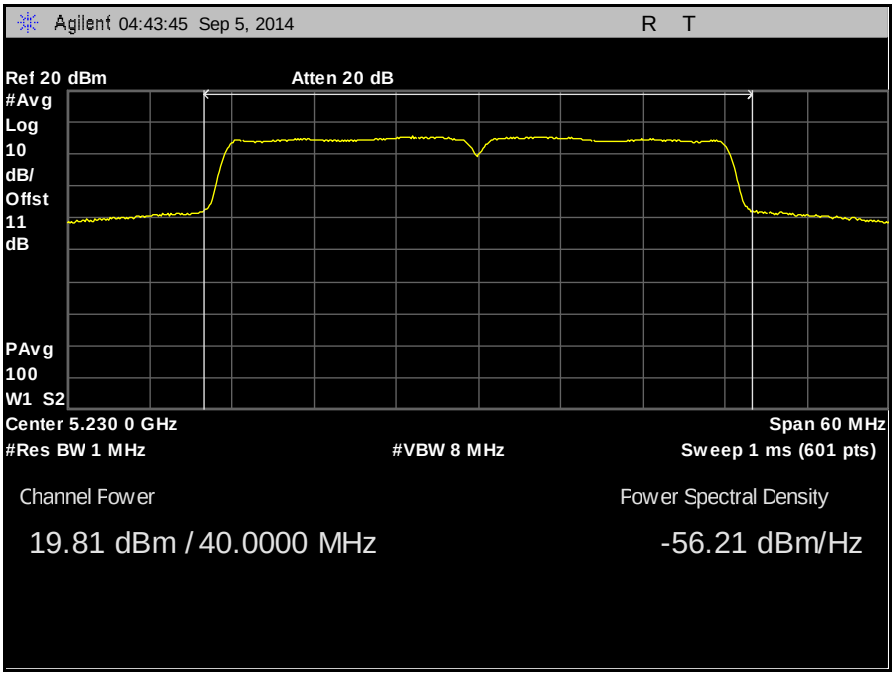


Plot 74. Output Power, 802.11ac 40 MHz, High Channel, MIMO, Antenna 0

Output Power, 802.11ac 40 MHz, MIMO, Antenna 1

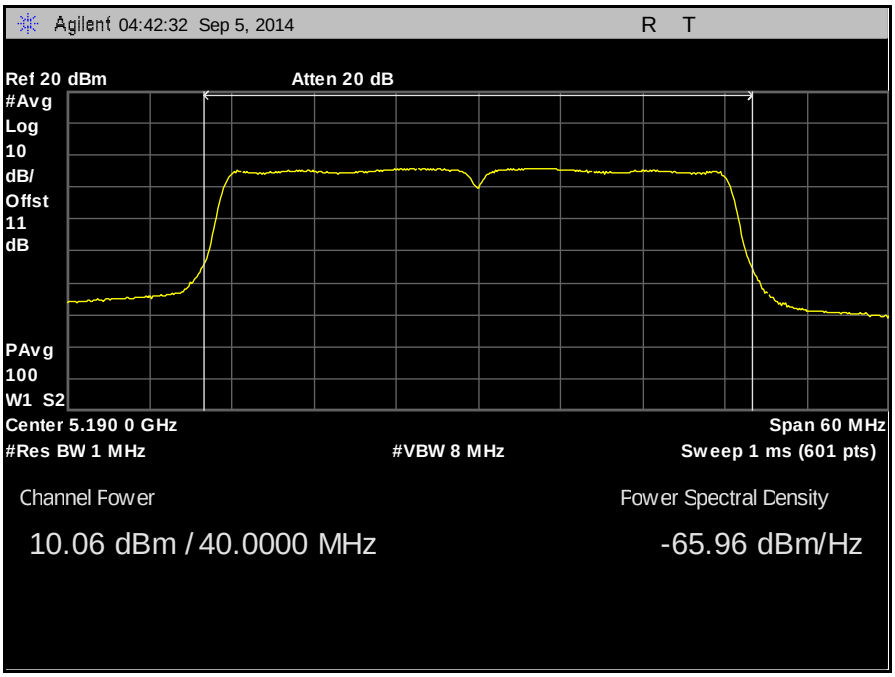


Plot 75. Output Power, 802.11ac 40 MHz, Low Channel, MIMO, Antenna 1

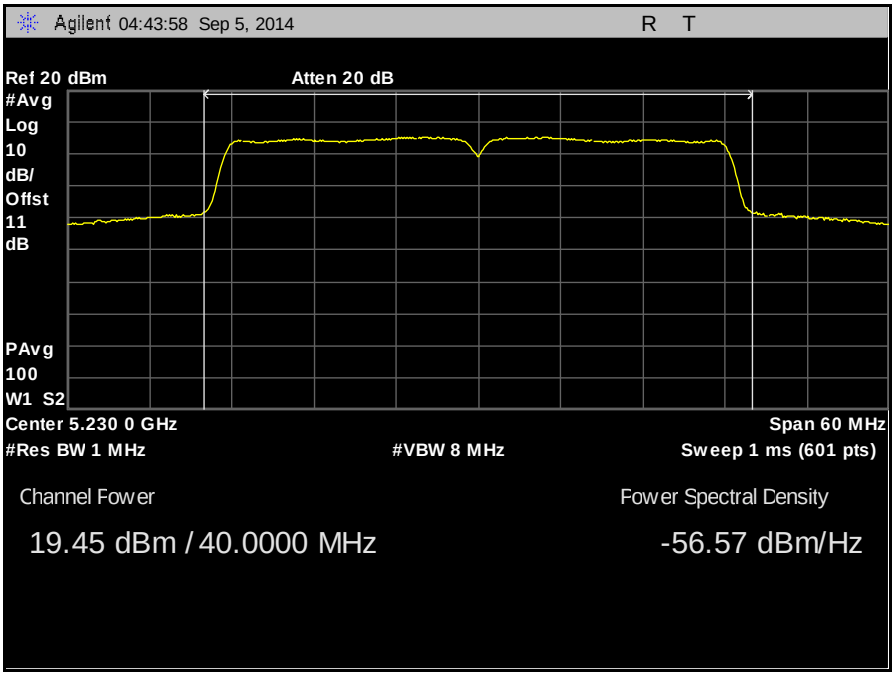


Plot 76. Output Power, 802.11ac 40 MHz, High Channel, MIMO, Antenna 1

Output Power, 802.11ac 40 MHz, MIMO, Antenna 2

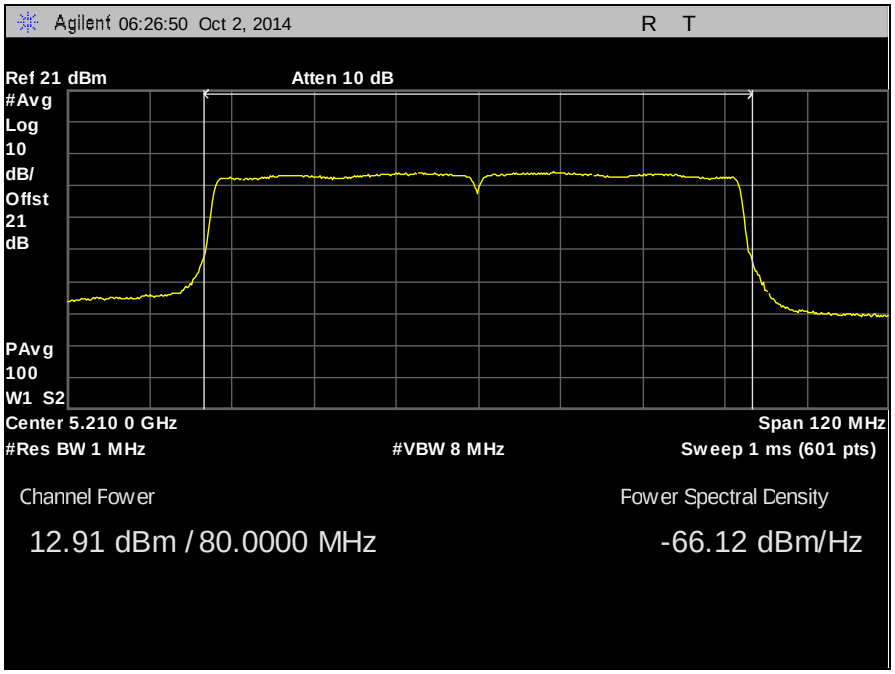


Plot 77. Output Power, 802.11ac 40 MHz, Low Channel, MIMO, Antenna 2

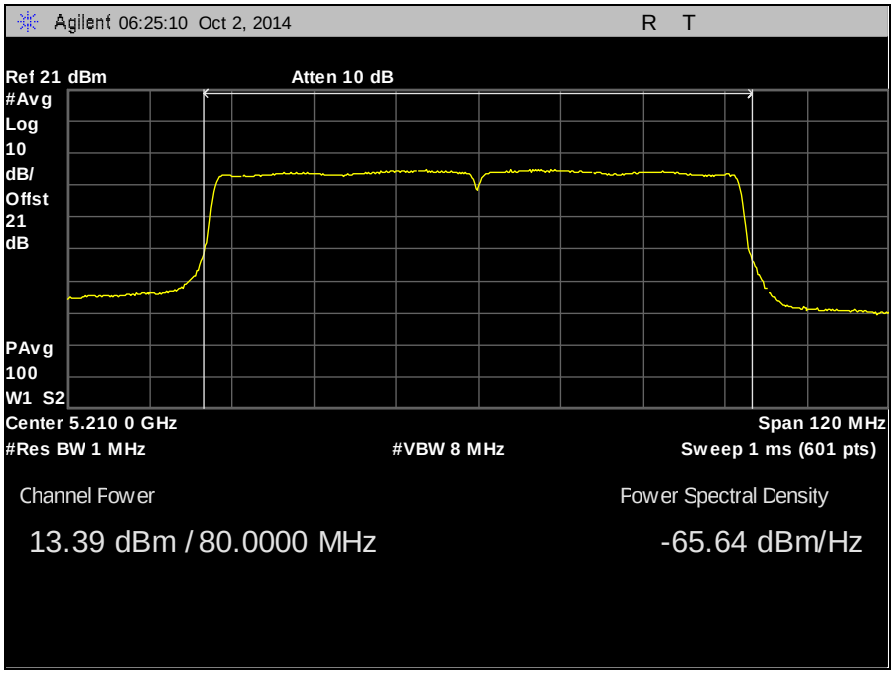


Plot 78. Output Power, 802.11ac 40 MHz, High Channel, MIMO, Antenna 2

Output Power, 80 MHz, SISO

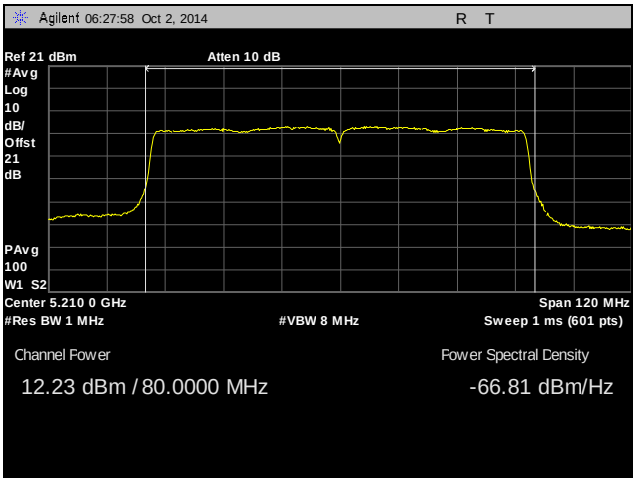


Plot 79. Output Power, 802.11a 80 MHz, SISO

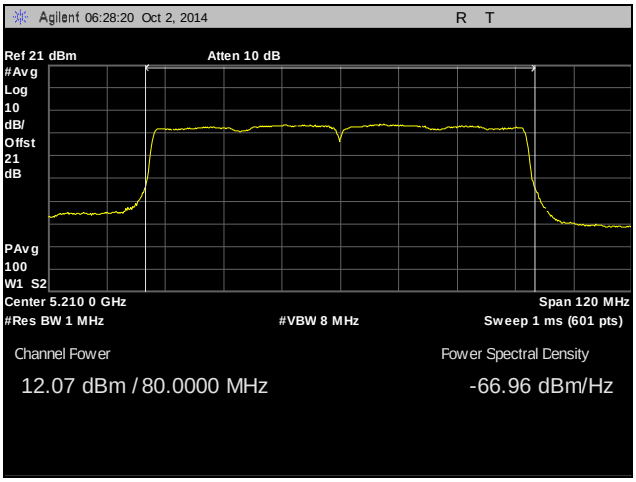


Plot 80. Output Power, 802.11ac 80 MHz, SISO

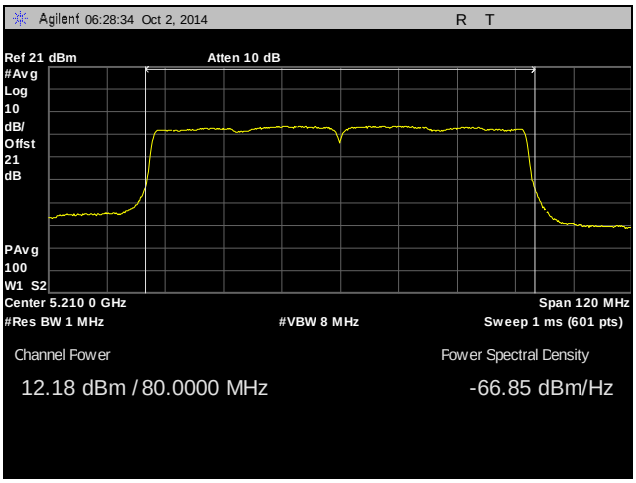
Output Power, 802.11ac 80 MHz, MIMO



Plot 81. Output Power, 802.11ac 80 MHz, MIMO, Antenna 0



Plot 82. Output Power, 802.11ac 80 MHz, MIMO, Antenna 1



Plot 83. Output Power, 802.11ac 80 MHz, MIMO, Antenna 2

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(1)(ii) Peak Power Spectral Density

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

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement used was method SA-1 from 789033 D02 General UNII Test Procedures v01. Plots are correct for attenuators and cable loss. Single input Single output measurement was taken on antenna port whose antenna has highest gain value.

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): 09/05/14

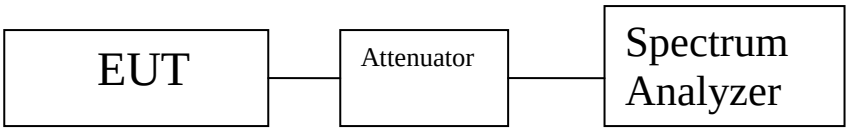
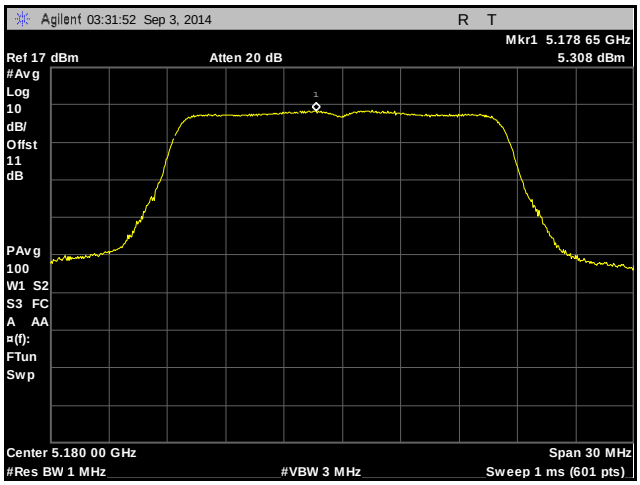
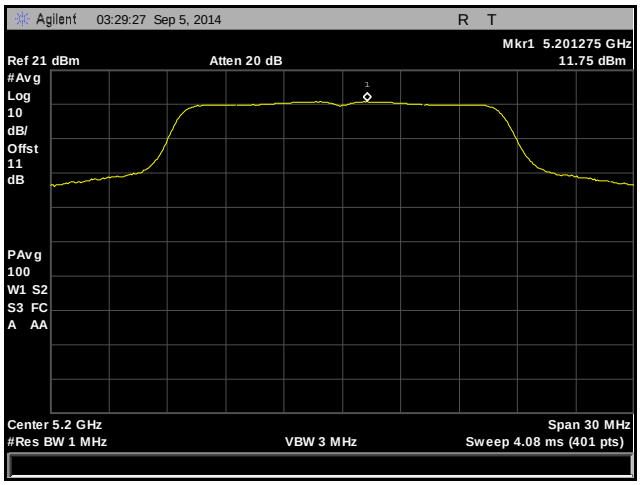


Figure 3. Power Spectral Density Test Setup

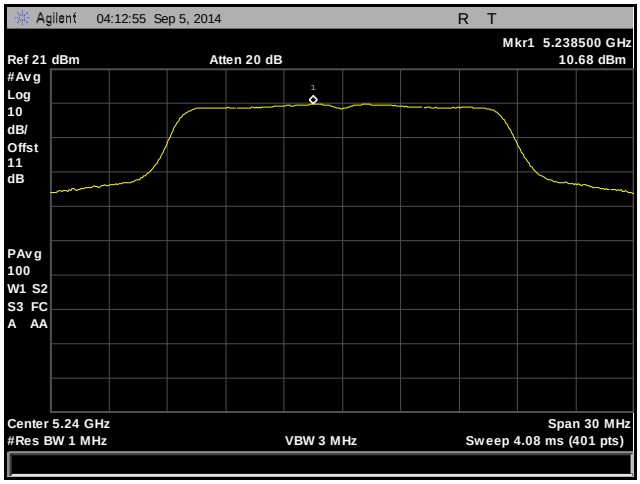
Peak Spectral Density, 802.11a 20 MHz, SISO



Plot 84. Peak Spectral Density, 802.11a 20 MHz, Low Channel, SISO

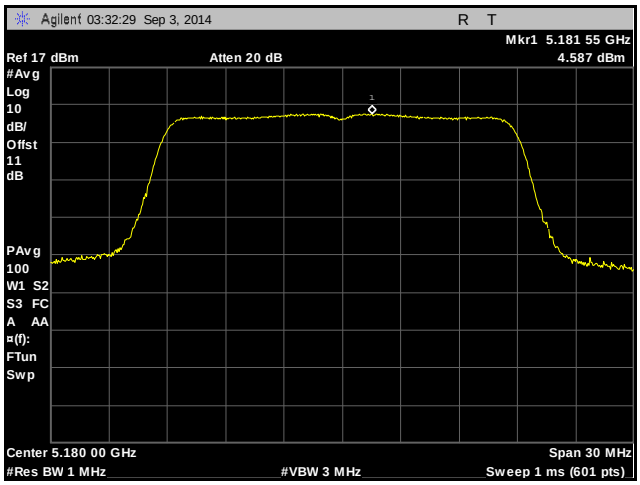


Plot 85. Peak Spectral Density, 802.11a 20 MHz, Mid Channel, SISO

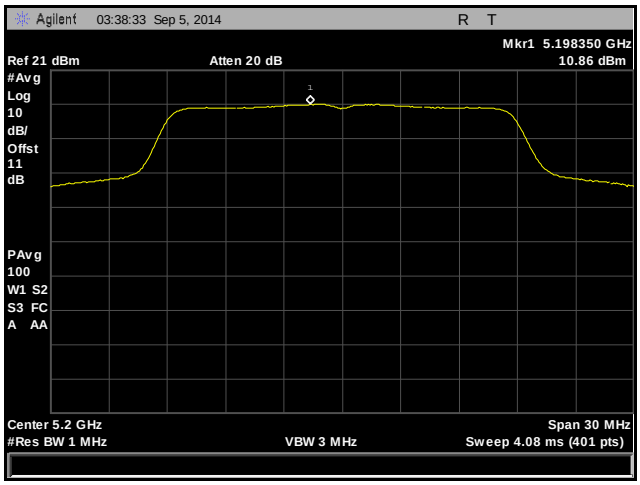


Plot 86. Peak Spectral Density, 802.11a 20 MHz, High Channel, SISO

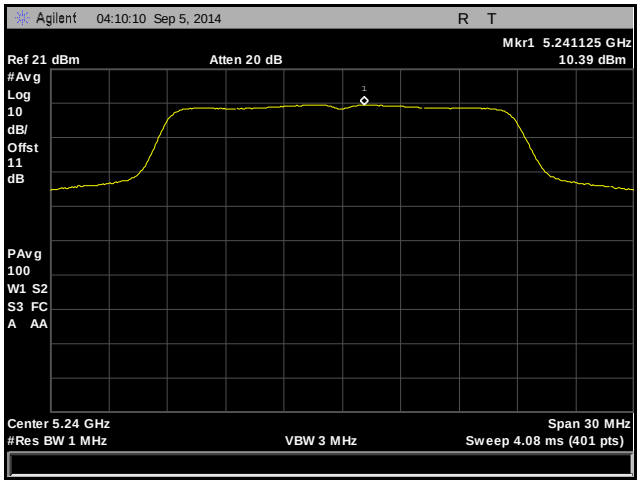
Peak Spectral Density, 802.11n 20 MHz, SISO



Plot 87. Peak Spectral Density, 802.11n 20 MHz, Low Channel, SISO

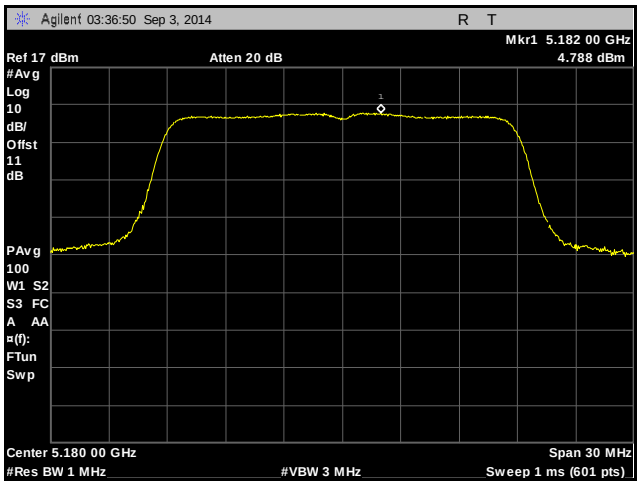


Plot 88. Peak Spectral Density, 802.11n 20 MHz, Mid Channel, SISO

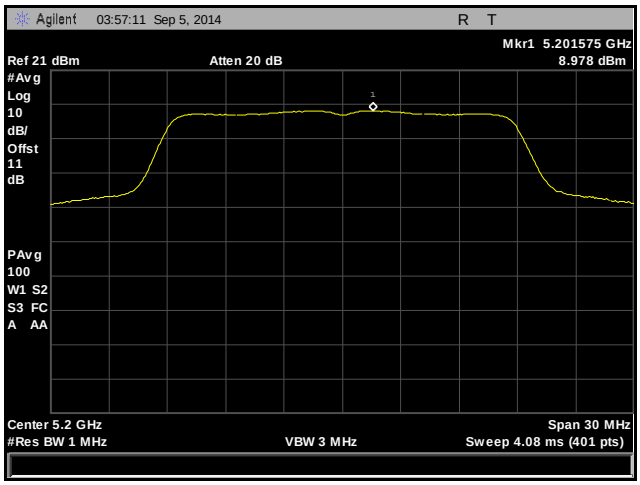


Plot 89. Peak Spectral Density, 802.11n 20 MHz, High Channel, SISO

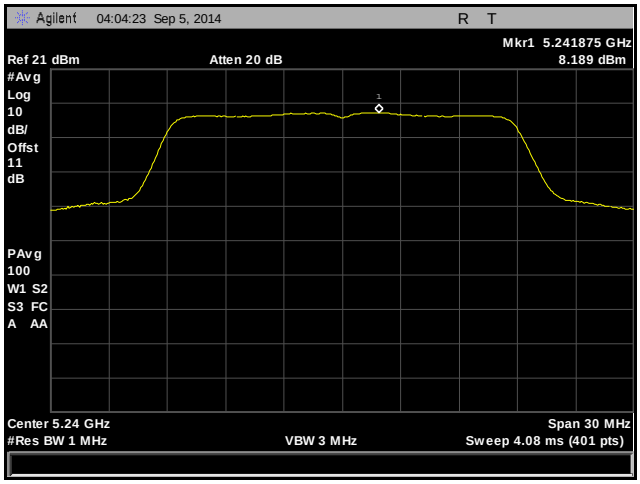
Peak Spectral Density, 802.11n 20 MHz, MIMO, Antenna 0



Plot 90. Peak Spectral Density, 802.11n 20 MHz, Low Channel, MIMO, Antenna 0

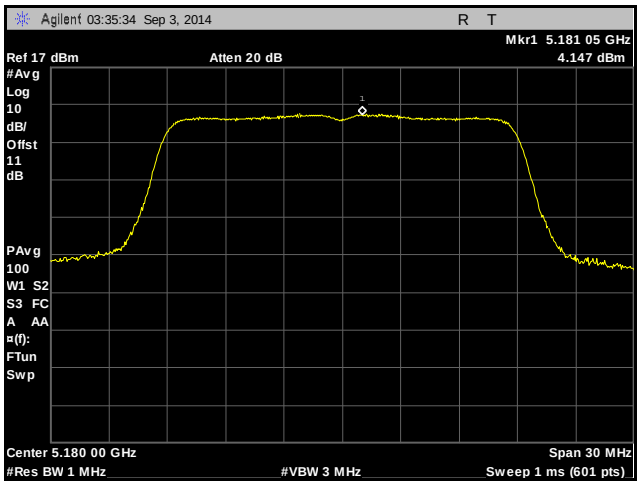


Plot 91. Peak Spectral Density, 802.11n 20 MHz, Mid Channel, MIMO, Antenna 0

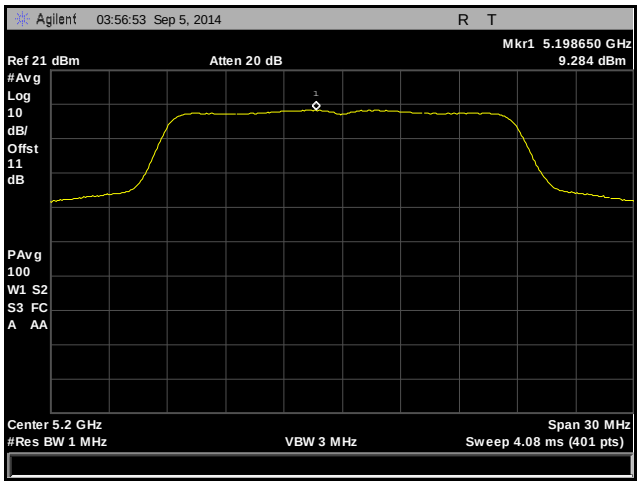


Plot 92. Peak Spectral Density, 802.11n 20 MHz, High Channel, MIMO, Antenna 0

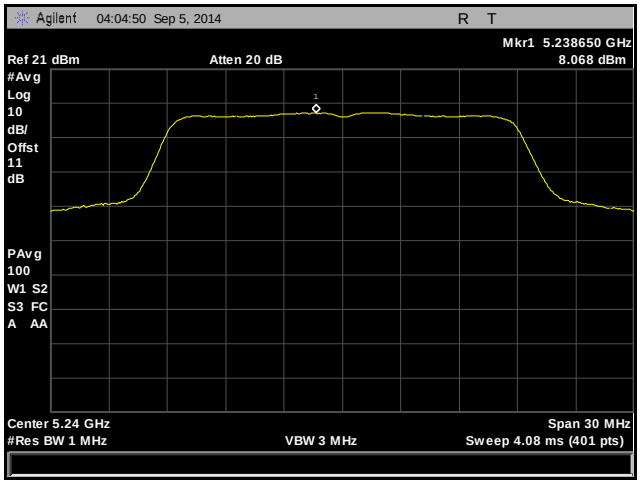
Peak Spectral Density, 802.11n 20 MHz, MIMO, Antenna 1



Plot 93. Peak Spectral Density, 802.11n 20 MHz, Low Channel, MIMO, Antenna 1

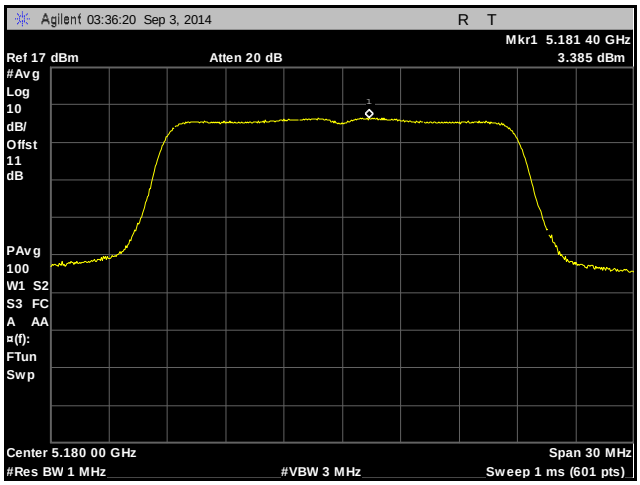


Plot 94. Peak Spectral Density, 802.11n 20 MHz, Mid Channel, MIMO, Antenna 1

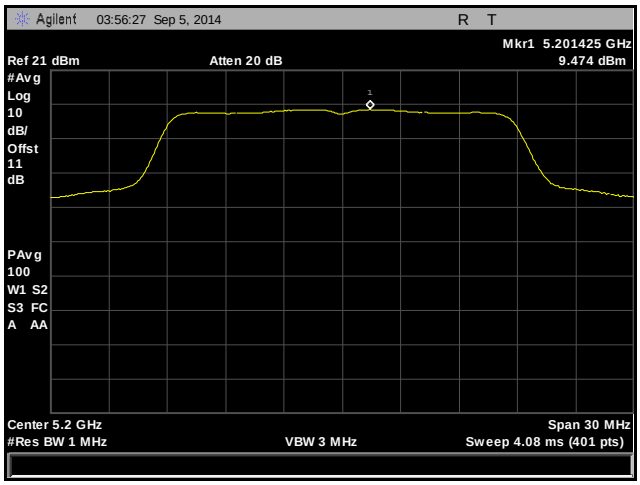


Plot 95. Peak Spectral Density, 802.11n 20 MHz, High Channel, MIMO, Antenna 1

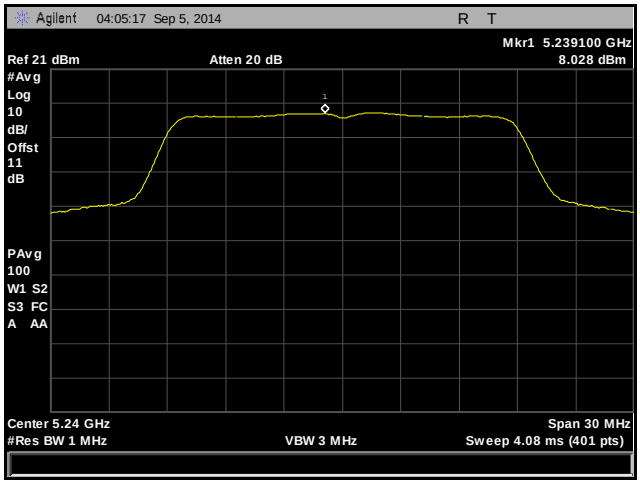
Peak Spectral Density, 802.11n 20 MHz, MIMO, Antenna 2



Plot 96. Peak Spectral Density, 802.11n 20 MHz, Low Channel, MIMO, Antenna 2

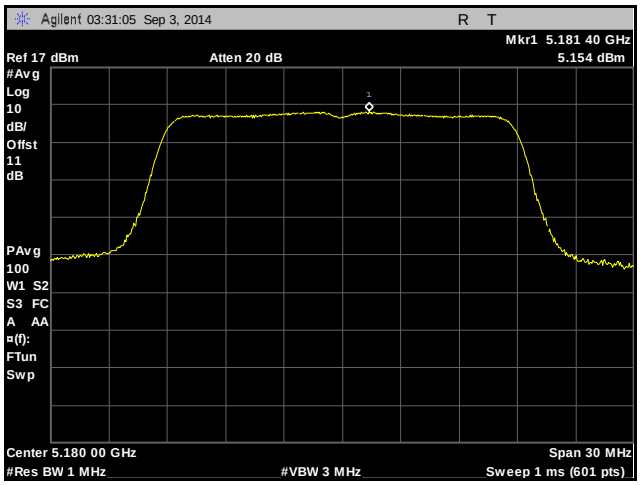


Plot 97. Peak Spectral Density, 802.11n 20 MHz, Mid Channel, MIMO, Antenna 2

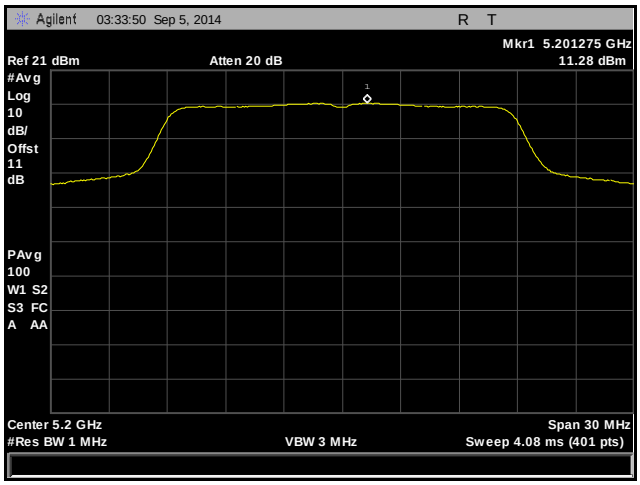


Plot 98. Peak Spectral Density, 802.11n 20 MHz, High Channel, MIMO, Antenna 2

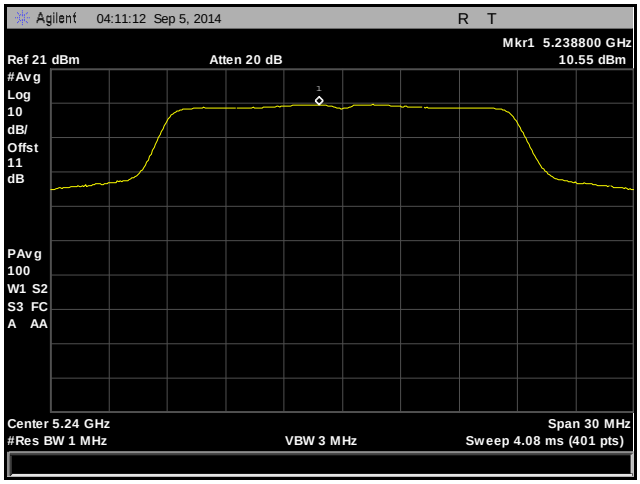
Peak Spectral Density, 802.11ac 20 MHz, SISO



Plot 99. Peak Spectral Density, 802.11ac 20 MHz, Low Channel, SISO

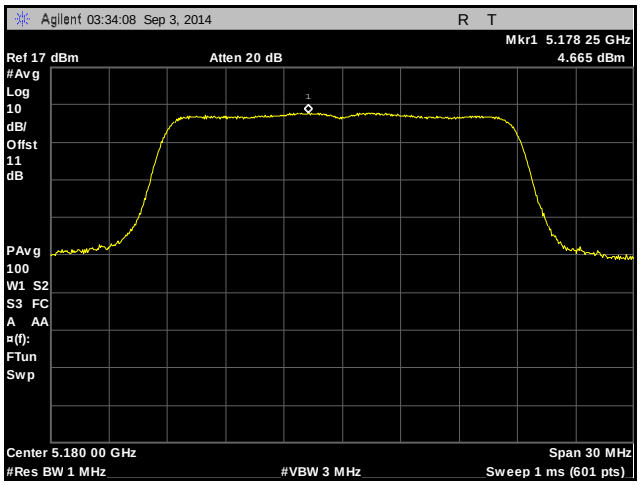


Plot 100. Peak Spectral Density, 802.11ac 20 MHz, Mid Channel, SISO

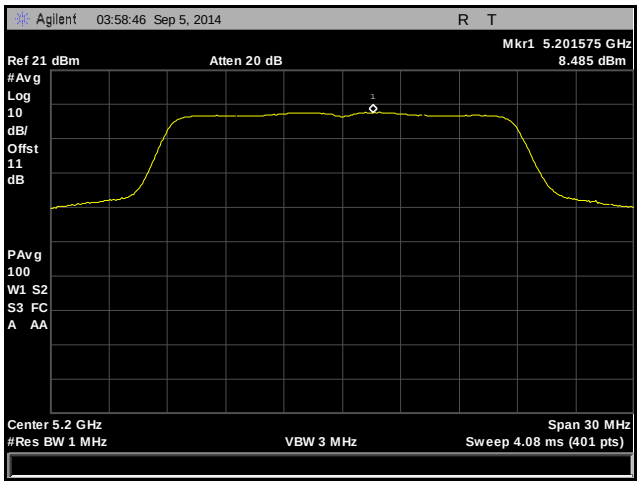


Plot 101. Peak Spectral Density, 802.11ac 20 MHz, High Channel, SISO

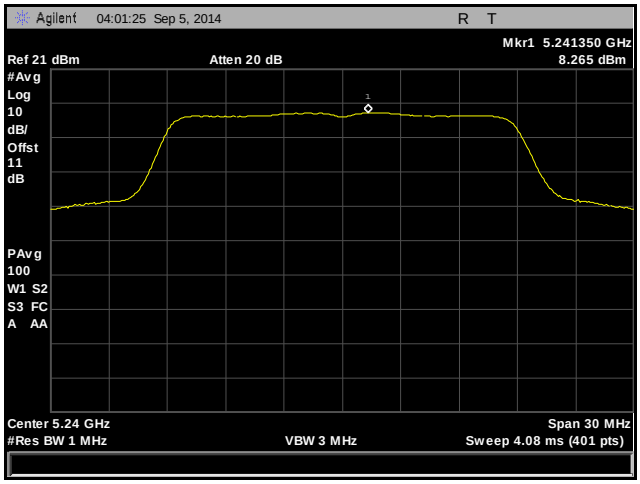
Peak Spectral Density, 802.11ac 20 MHz, MIMO, Antenna 0



Plot 102. Peak Spectral Density, 802.11ac 20 MHz, Low Channel, MIMO, Antenna 0

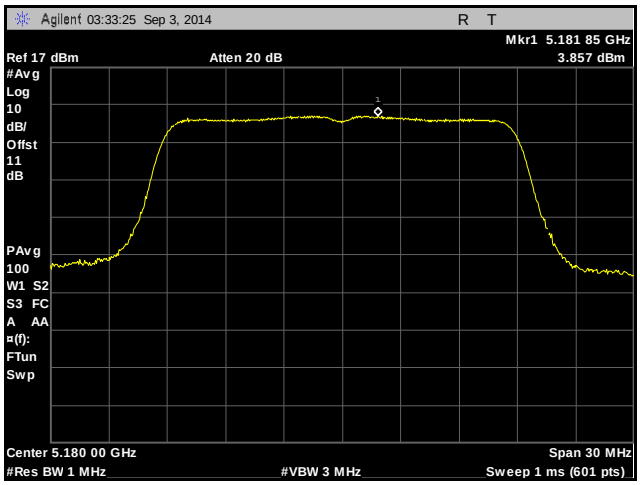


Plot 103. Peak Spectral Density, 802.11ac 20 MHz, Mid Channel, MIMO, Antenna 0

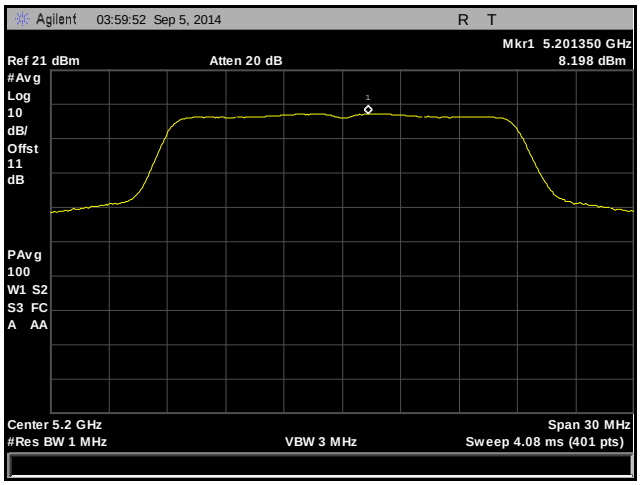


Plot 104. Peak Spectral Density, 802.11ac 20 MHz, High Channel, MIMO, Antenna 0

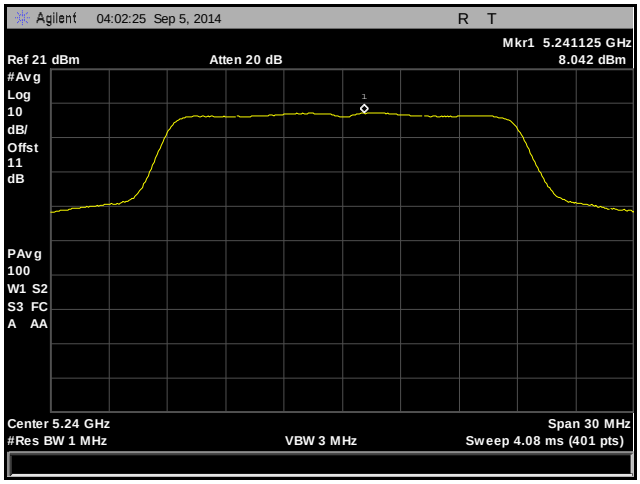
Peak Spectral Density, 802.11ac 20 MHz, MIMO, Antenna 1



Plot 105. Peak Spectral Density, 802.11ac 20 MHz, Low Channel, MIMO, Antenna 1

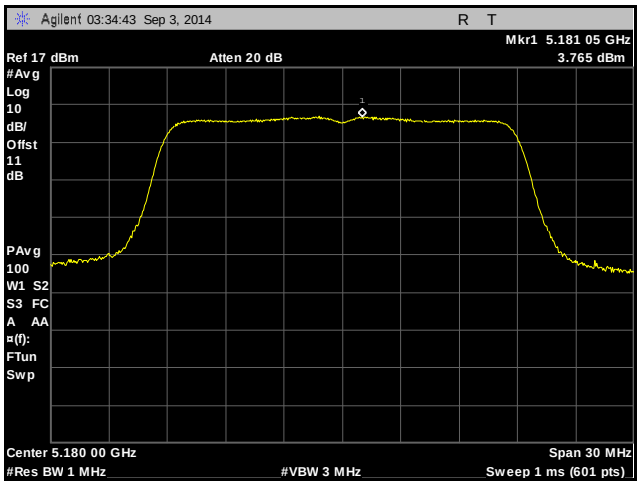


Plot 106. Peak Spectral Density, 802.11ac 20 MHz, Mid Channel, MIMO, Antenna 1

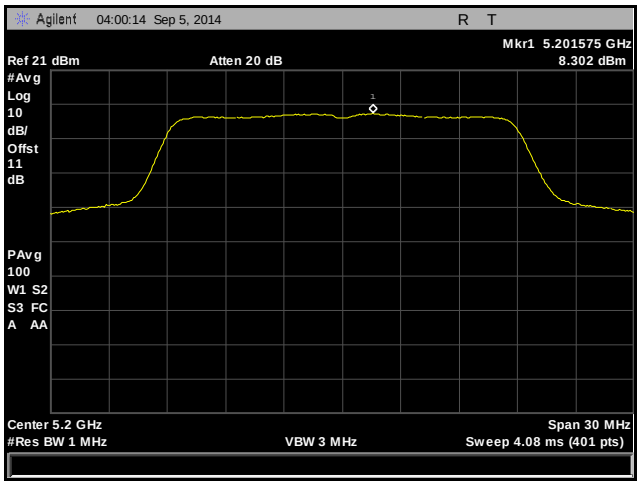


Plot 107. Peak Spectral Density, 802.11ac 20 MHz, High Channel, MIMO, Antenna 1

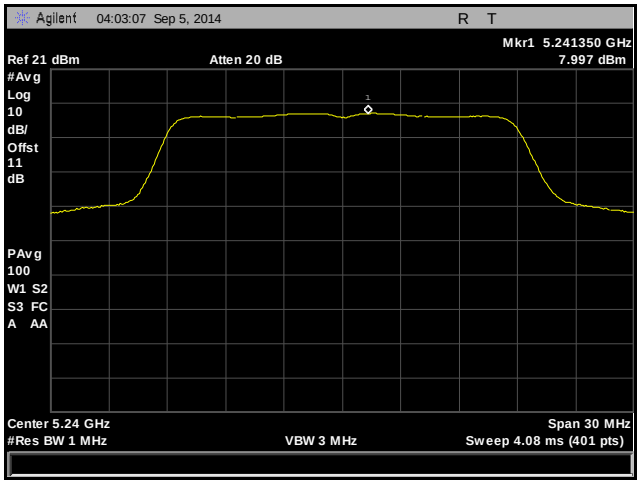
Peak Spectral Density, 802.11ac 20 MHz, MIMO, Antenna 2



Plot 108. Peak Spectral Density, 802.11ac 20 MHz, Low Channel, MIMO, Antenna 2

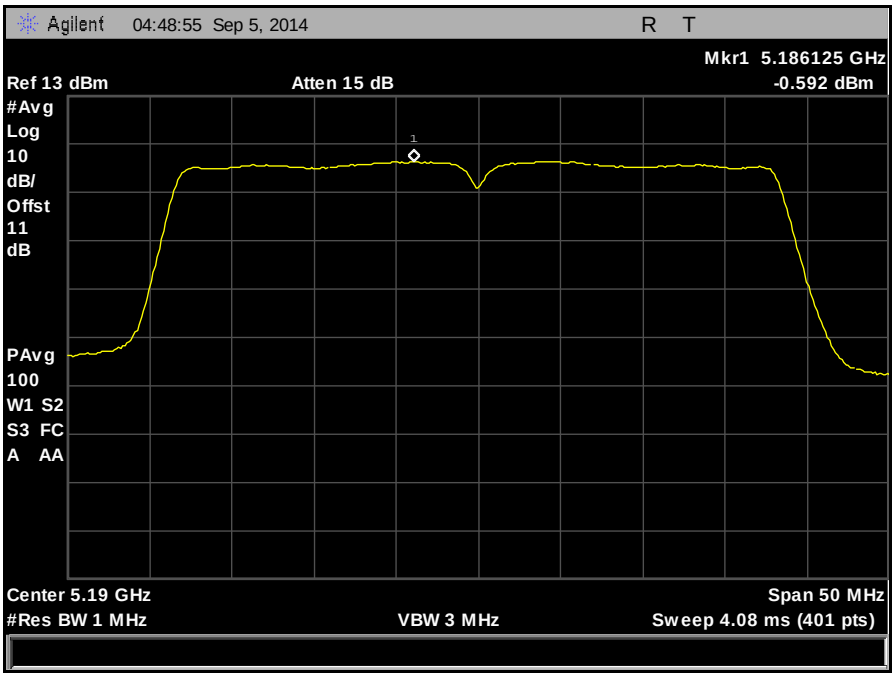


Plot 109. Peak Spectral Density, 802.11ac 20 MHz, Mid Channel, MIMO, Antenna 2

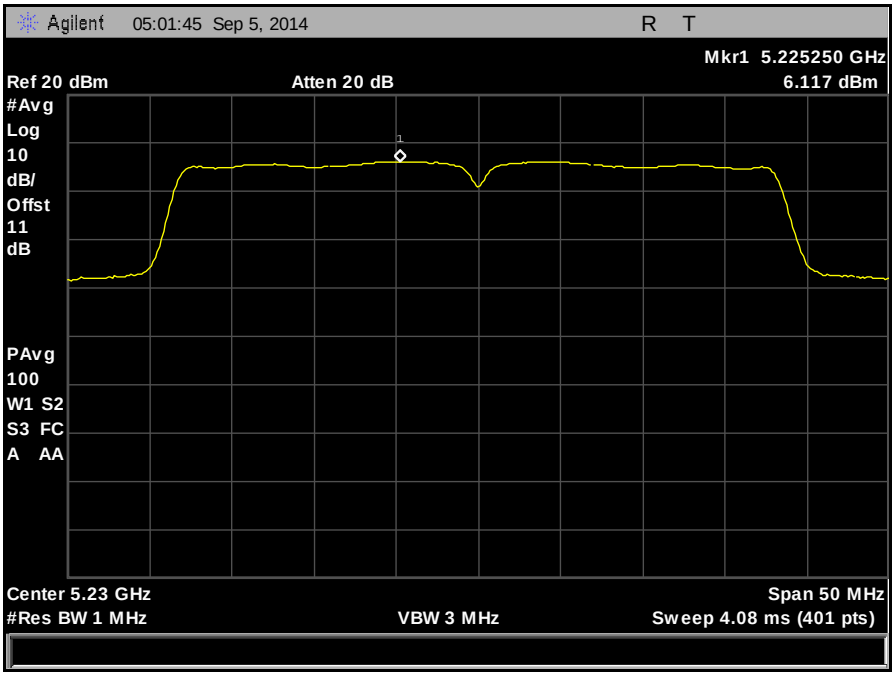


Plot 110. Peak Spectral Density, 802.11ac 20 MHz, High Channel, MIMO, Antenna 2

Peak Spectral Density, 802.11a 40 MHz, SISO

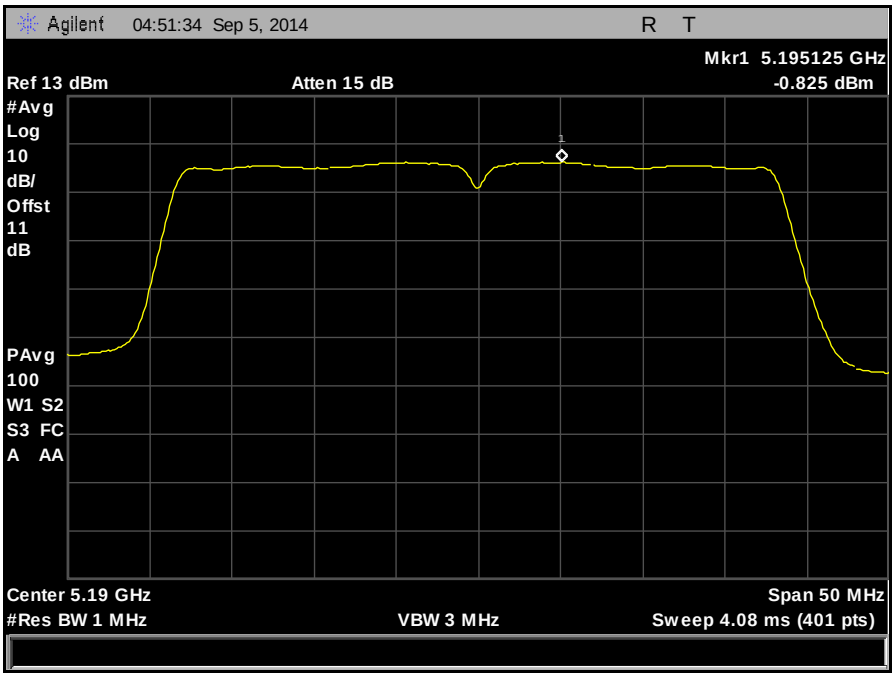


Plot 111. Peak Spectral Density, 802.11a 40 MHz, Low Channel, SISO

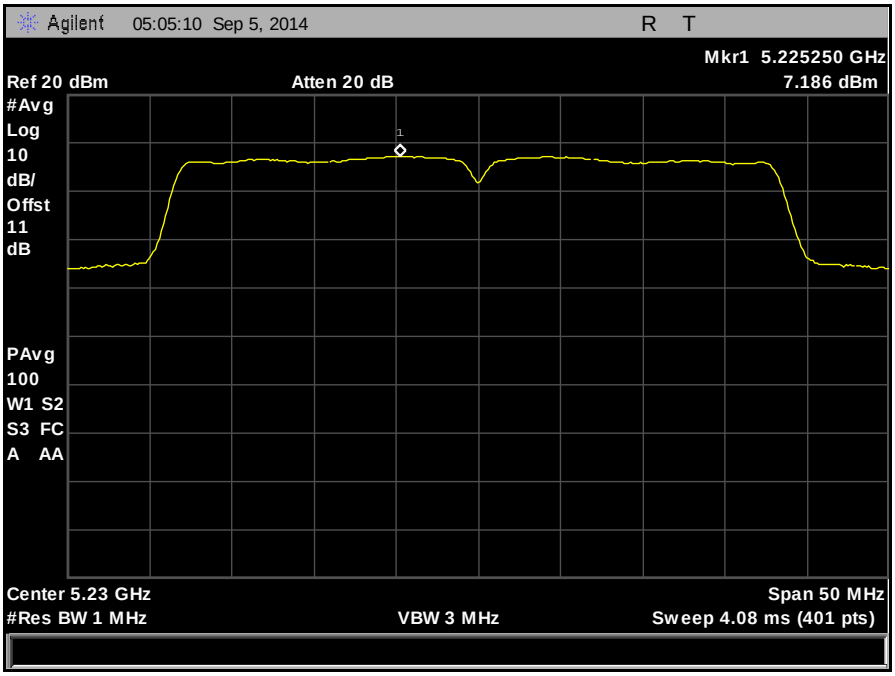


Plot 112. Peak Spectral Density, 802.11a 40 MHz, High Channel, SISO

Peak Spectral Density, 802.11n 40 MHz, SISO

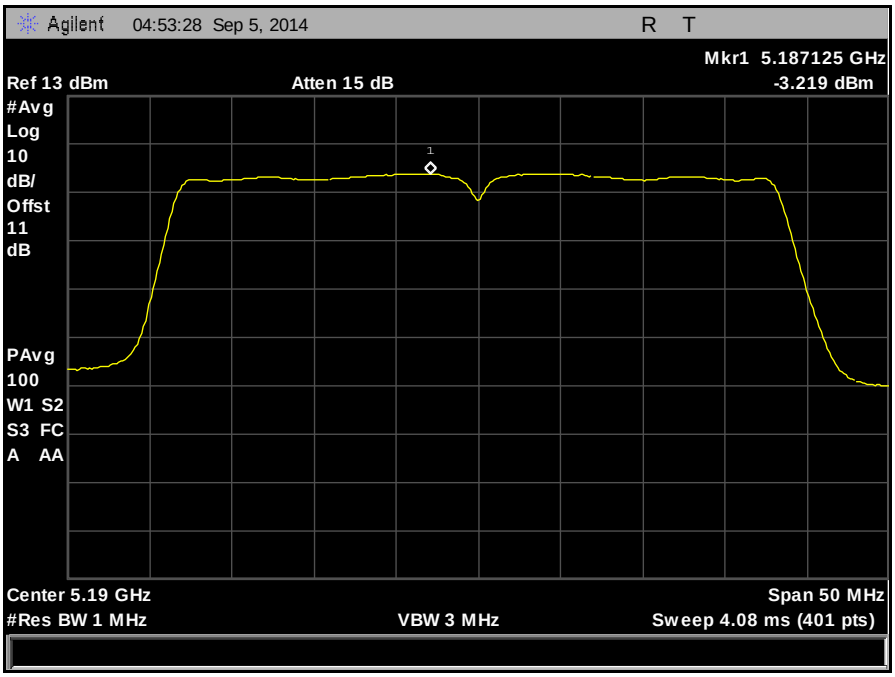


Plot 113. Peak Spectral Density, 802.11n 40 MHz, Low Channel, SISO

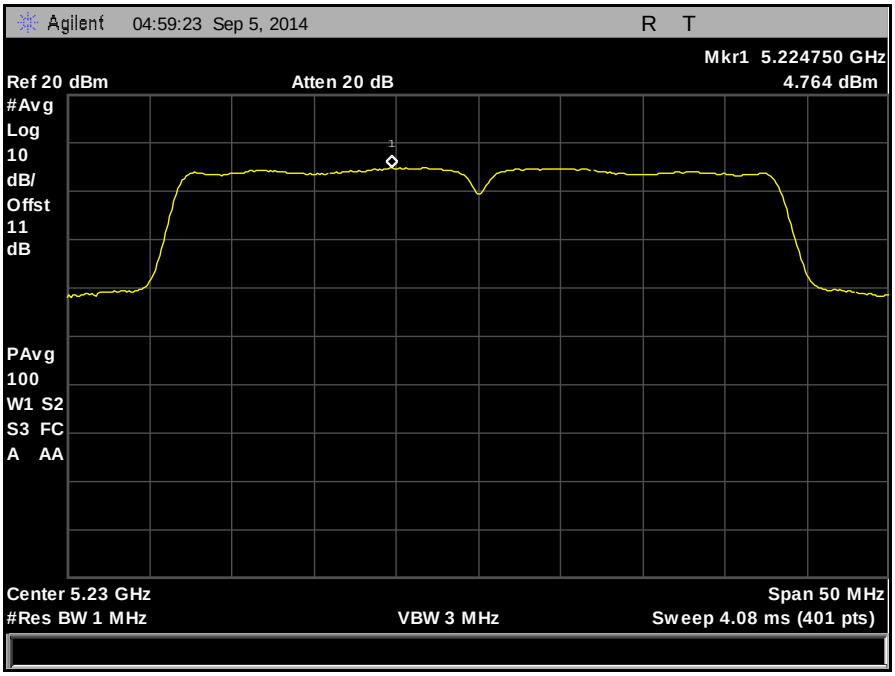


Plot 114. Peak Spectral Density, 802.11n 40 MHz, High Channel, SISO

Peak Spectral Density, 802.11n 40 MHz, MIMO, Antenna 0

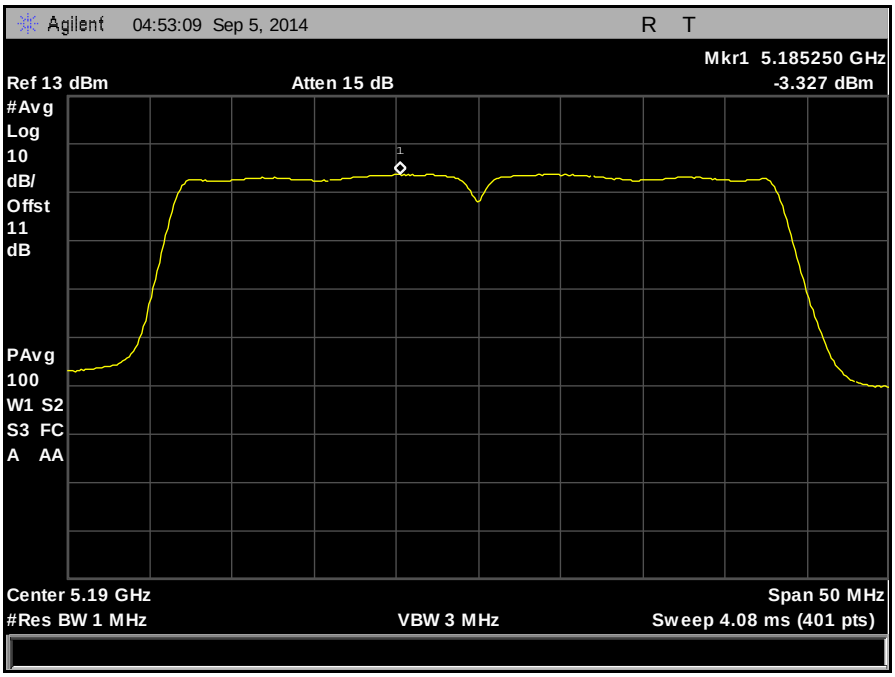


Plot 115. Peak Spectral Density, 802.11n 40 MHz, Low Channel, MIMO, Antenna 0

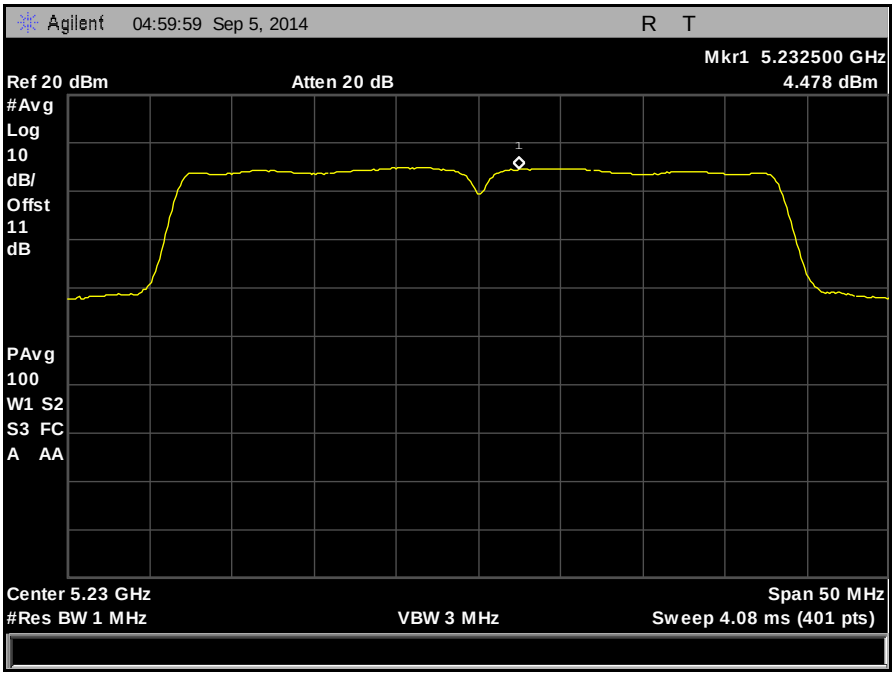


Plot 116. Peak Spectral Density, 802.11n 40 MHz, High Channel, MIMO, Antenna 0

Peak Spectral Density, 802.11n 40 MHz, MIMO, Antenna 1

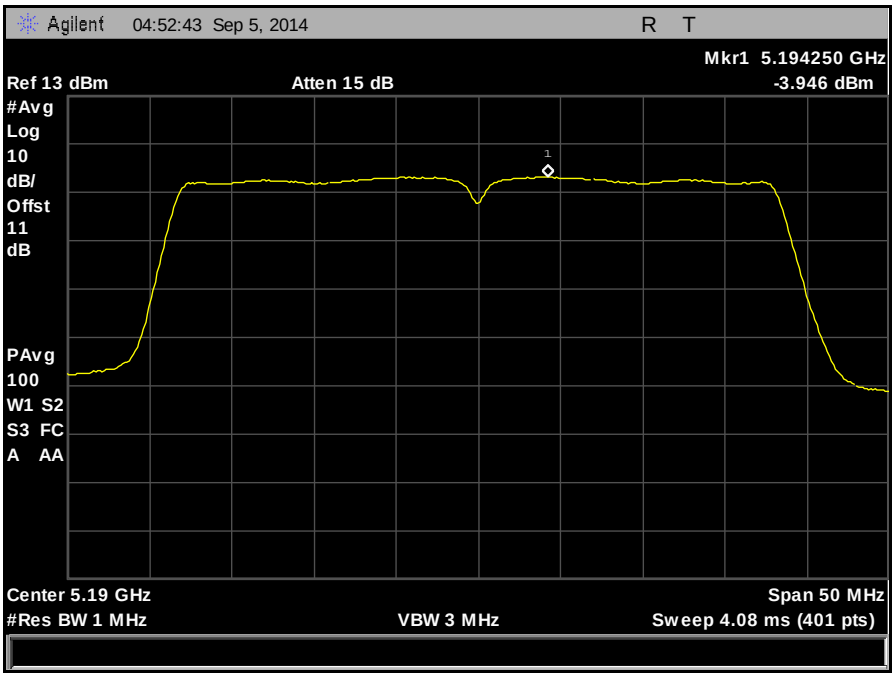


Plot 117. Peak Spectral Density, 802.11n 40 MHz, Low Channel, MIMO, Antenna 1

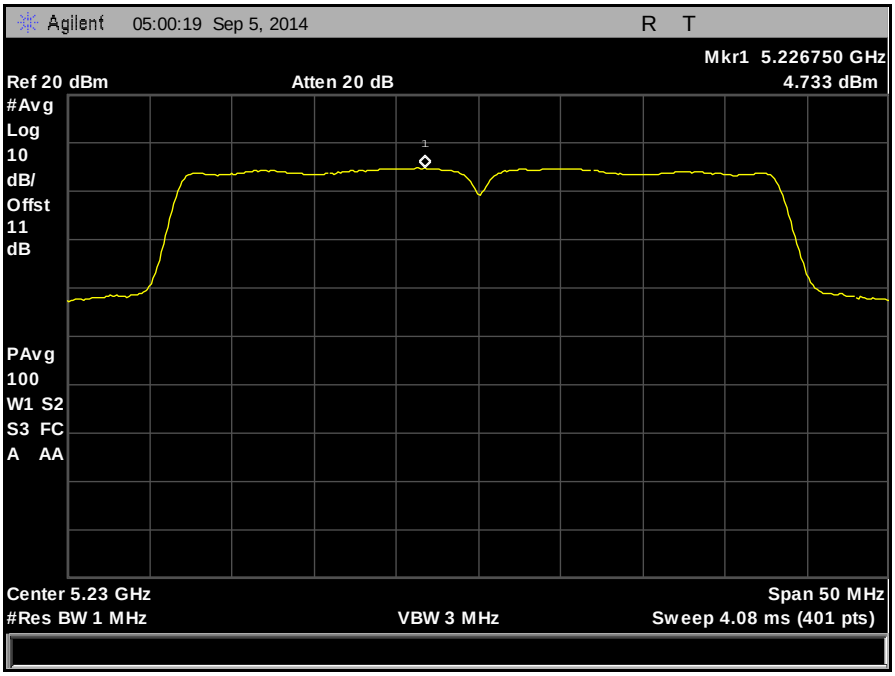


Plot 118. Peak Spectral Density, 802.11n 40 MHz, High Channel, MIMO, Antenna 1

Peak Spectral Density, 802.11n 40 MHz, MIMO, Antenna 2

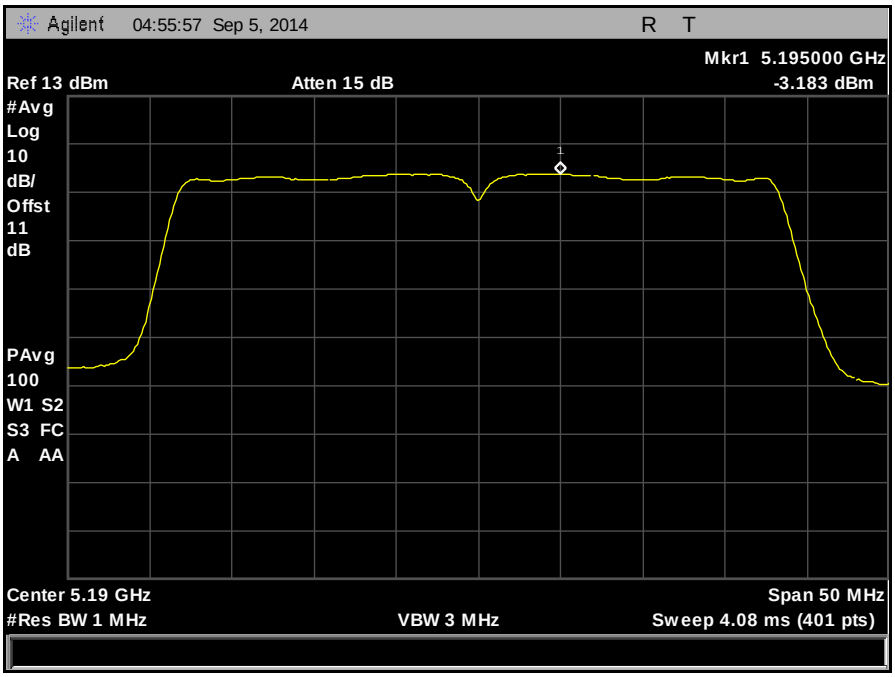


Plot 119. Peak Spectral Density, 802.11n 40 MHz, Low Channel, MIMO, Antenna 2

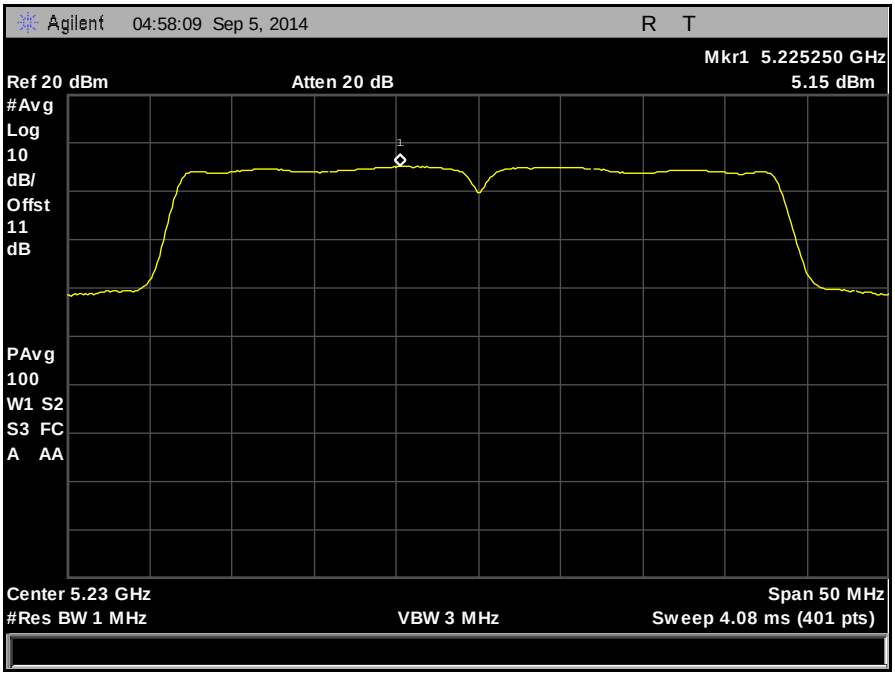


Plot 120. Peak Spectral Density, 802.11n 40 MHz, High Channel, MIMO, Antenna 2

Peak Spectral Density, 802.11ac 40 MHz, MIMO, Antenna 0

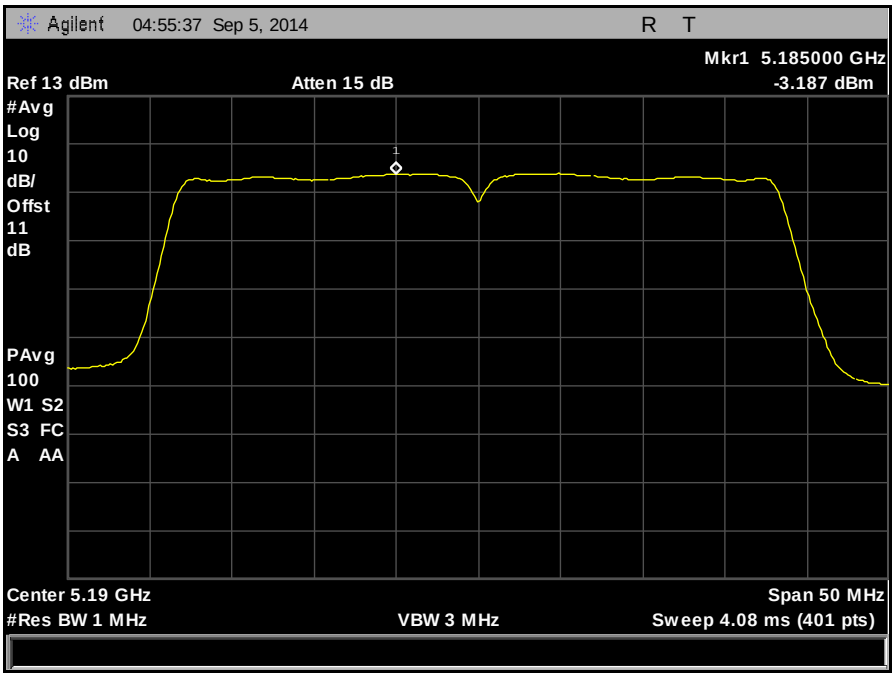


Plot 121. Peak Spectral Density, 802.11ac 40 MHz, Low Channel, MIMO, Antenna 0

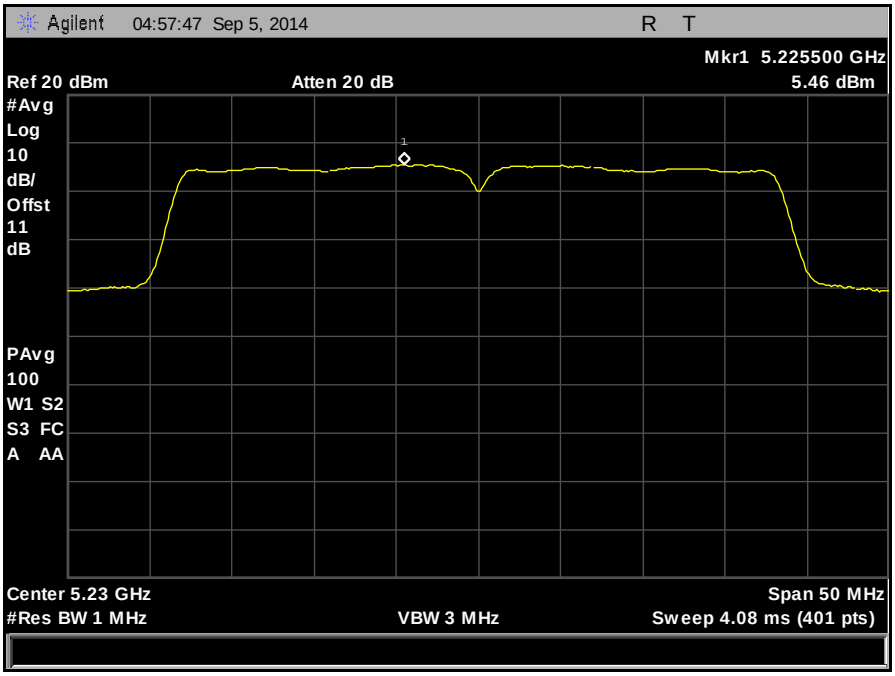


Plot 122. Peak Spectral Density, 802.11ac 40 MHz, High Channel, MIMO, Antenna 0

Peak Spectral Density, 802.11ac 40 MHz, MIMO, Antenna 1

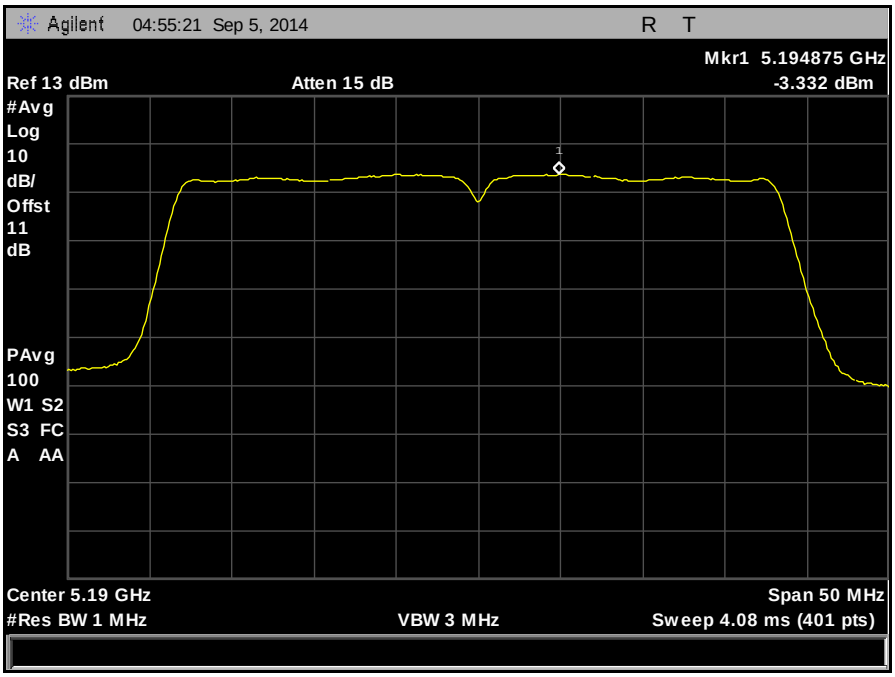


Plot 123. Peak Spectral Density, 802.11ac 40 MHz, Low Channel, MIMO, Antenna 1

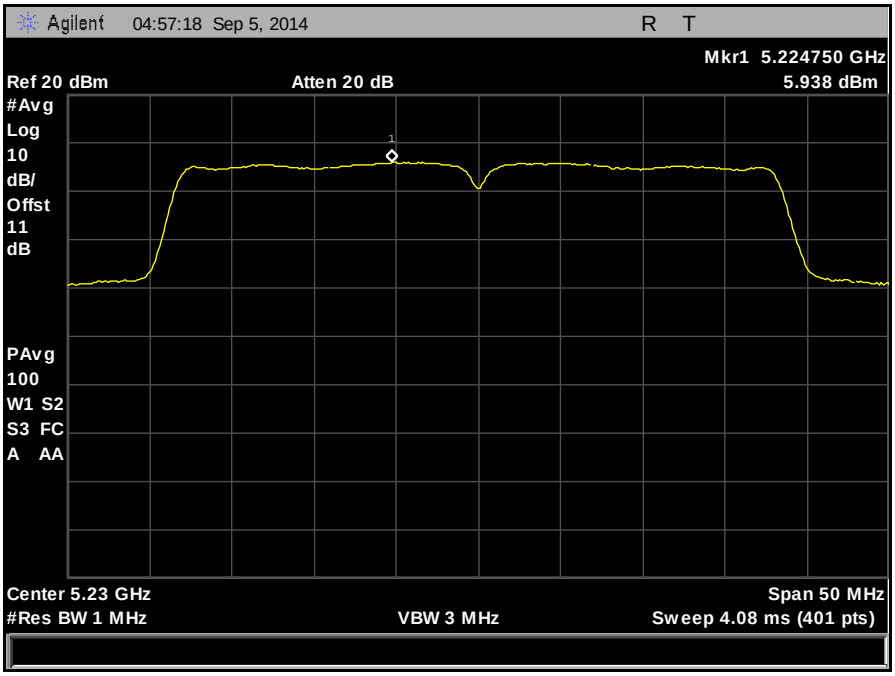


Plot 124. Peak Spectral Density, 802.11ac 40 MHz, High Channel, MIMO, Antenna 1

Peak Spectral Density, 802.11ac 40 MHz, MIMO, Antenna 2

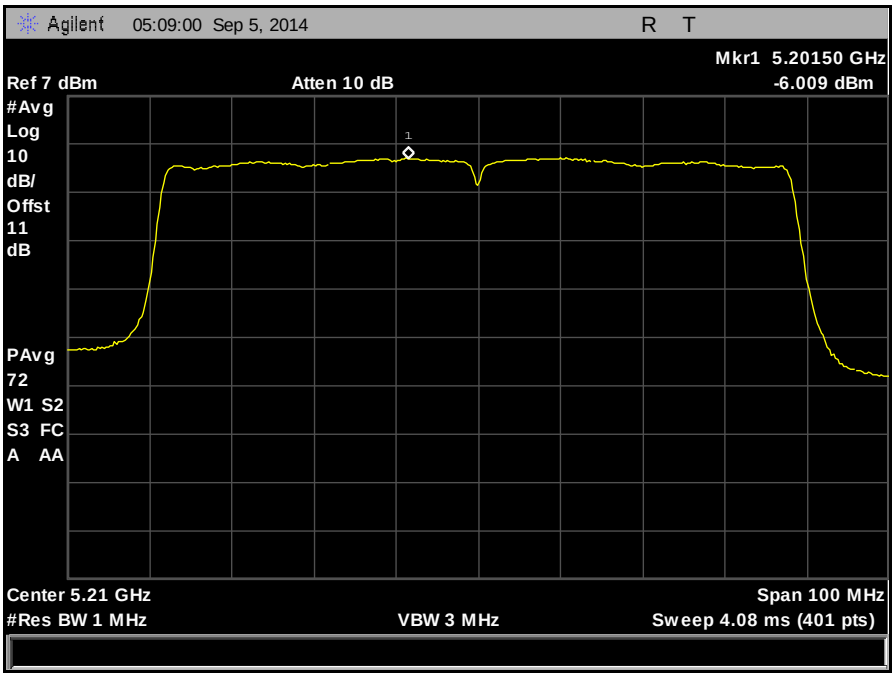


Plot 125. Peak Spectral Density, 802.11ac 40 MHz, Low Channel, MIMO, Antenna 2

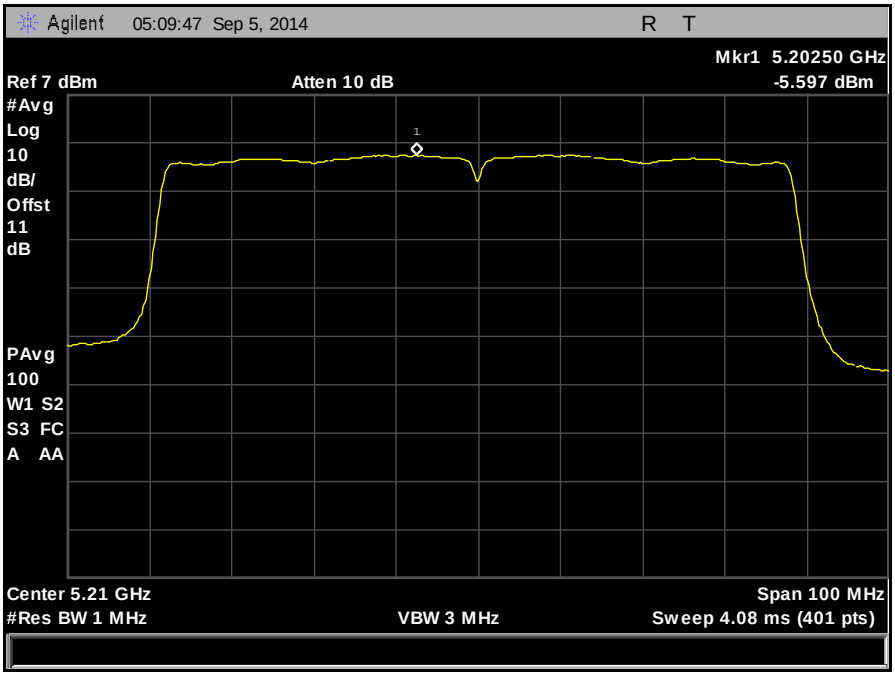


Plot 126. Peak Spectral Density, 802.11ac 40 MHz, High Channel, MIMO, Antenna 2

Peak Spectral Density, 80 MHz, SISO

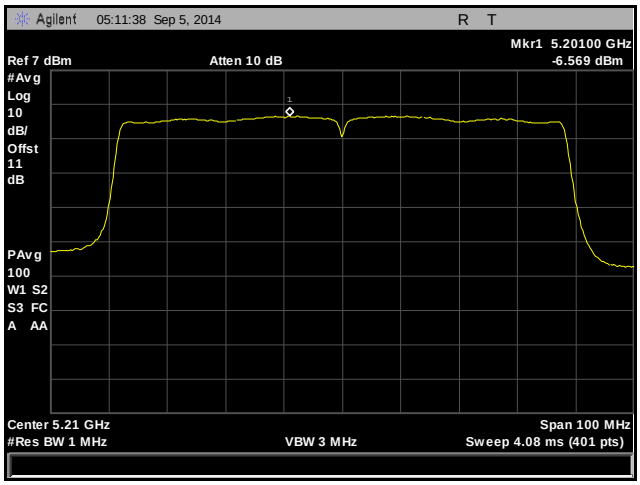


Plot 127. Peak Spectral Density, 802.11a 80 MHz, SISO

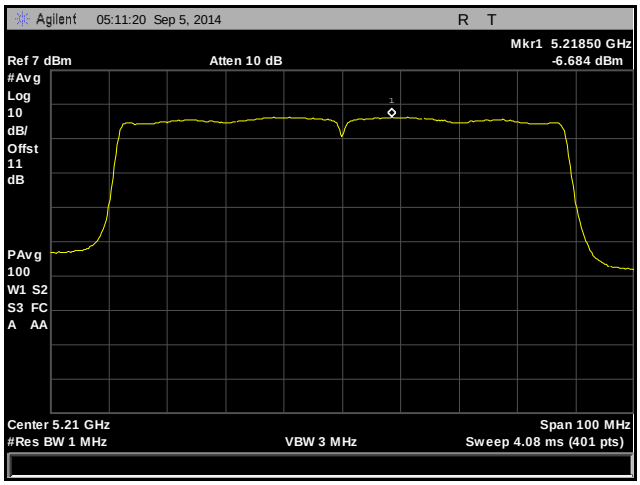


Plot 128. Peak Spectral Density, 802.11ac 80 MHz, SISO

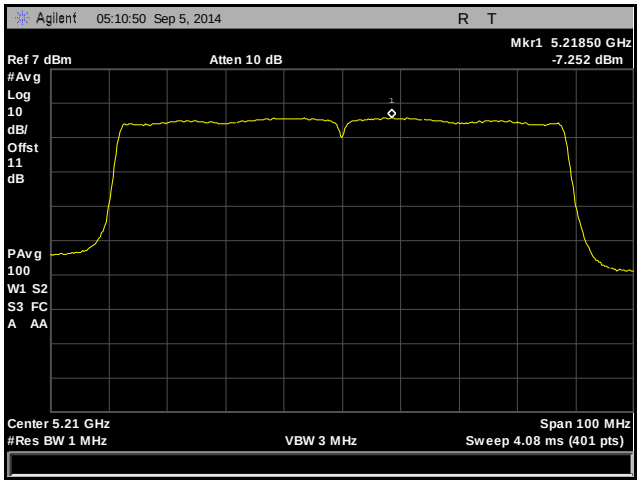
Peak Spectral Density, 802.11ac 80 MHz, MIMO



Plot 129. Peak Spectral Density, 802.11ac 80 MHz, MIMO, Antenna 0



Plot 130. Peak Spectral Density, 802.11ac 80 MHz, MIMO, Antenna 1



Plot 131. Peak Spectral Density, 802.11ac 80 MHz, MIMO, Antenna 2

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements: **§ 15.407(b)(1), (6), (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 according to FCC 15.109

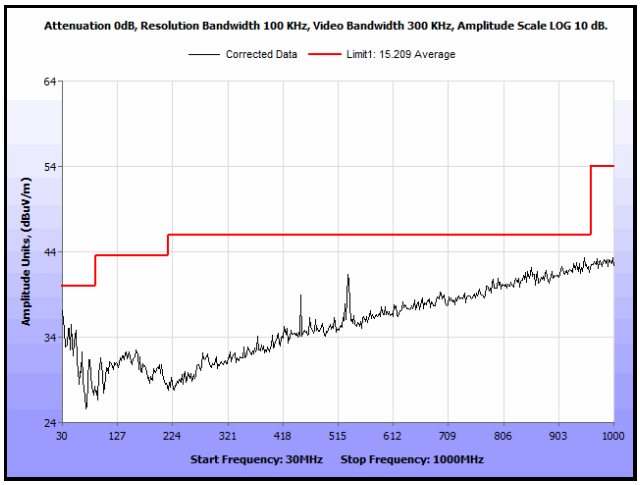
For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Only noise floor was seen above 18 GHz.

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.

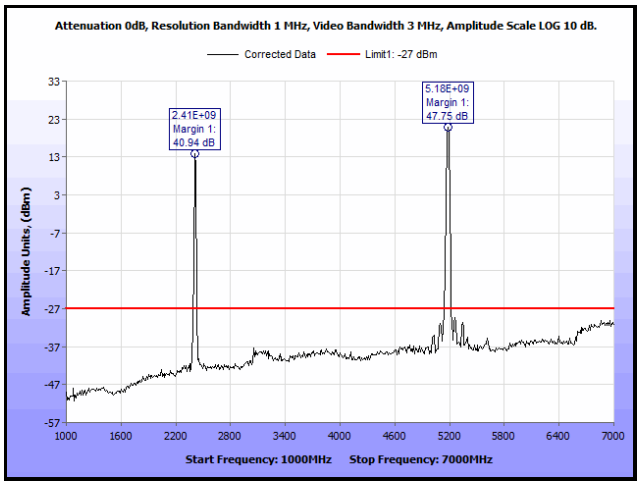
Test Engineer(s): Surinder Singh

Test Date(s): 09/08/14

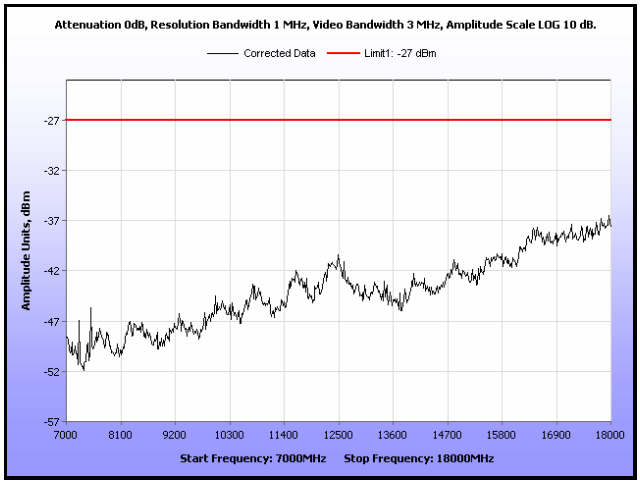
Radiated Spurious Emissions, 802.11a 20 MHz, Antenna 0



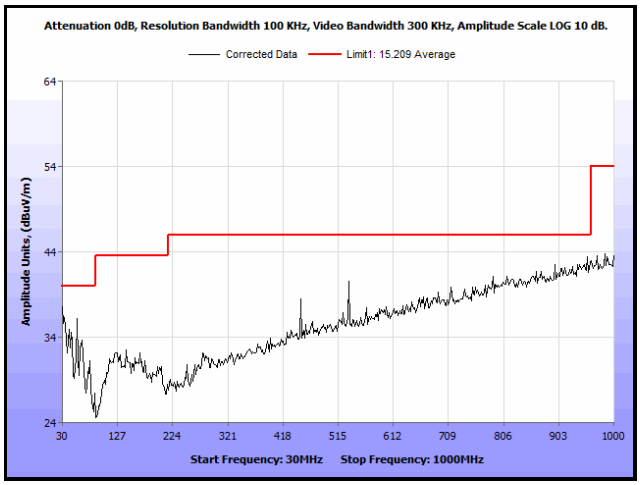
Plot 132. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 0



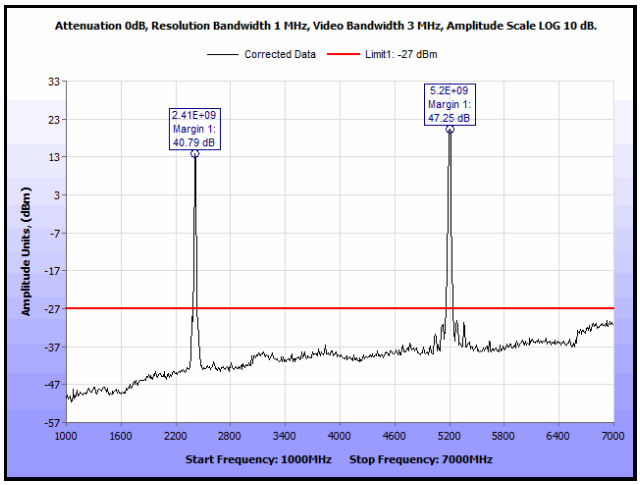
Plot 133. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 0



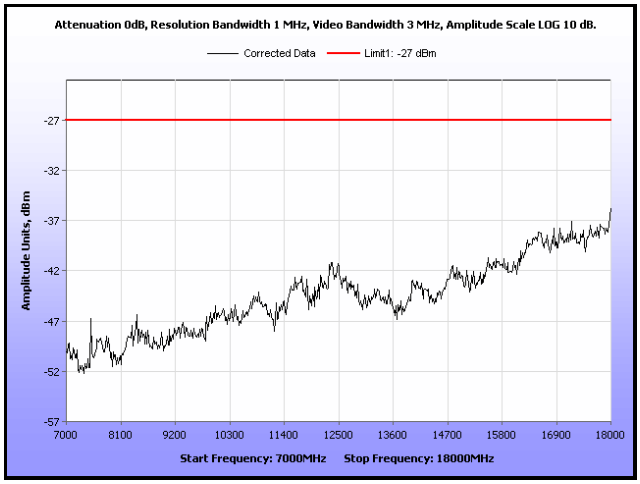
Plot 134. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 0



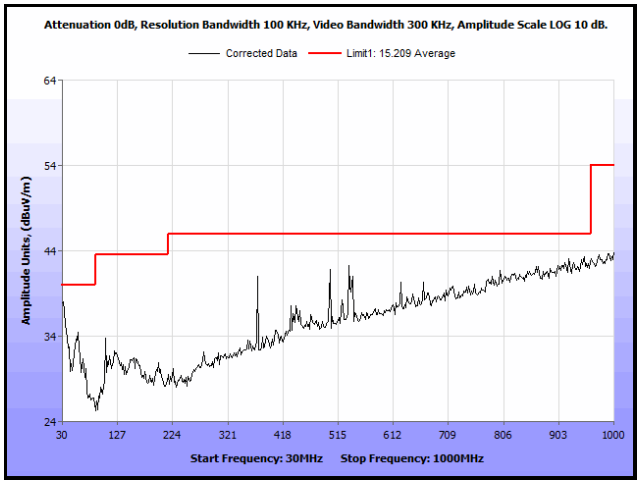
Plot 135. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 0



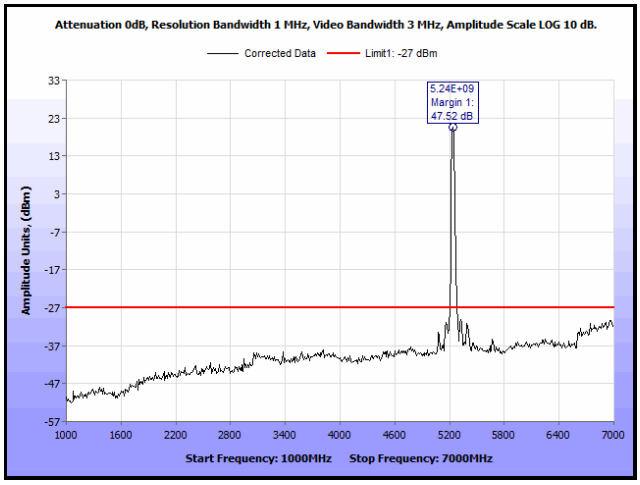
Plot 136. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 0



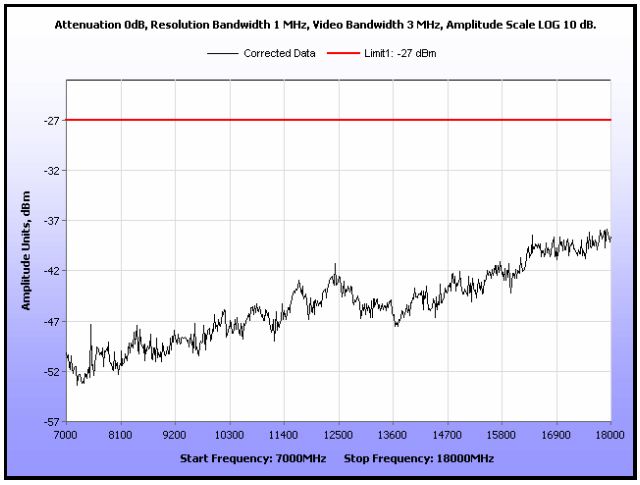
Plot 137. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 0



Plot 138. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 0

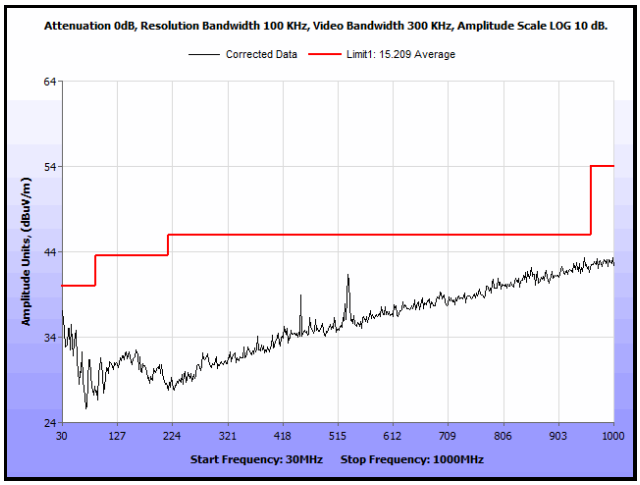


Plot 139. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 0

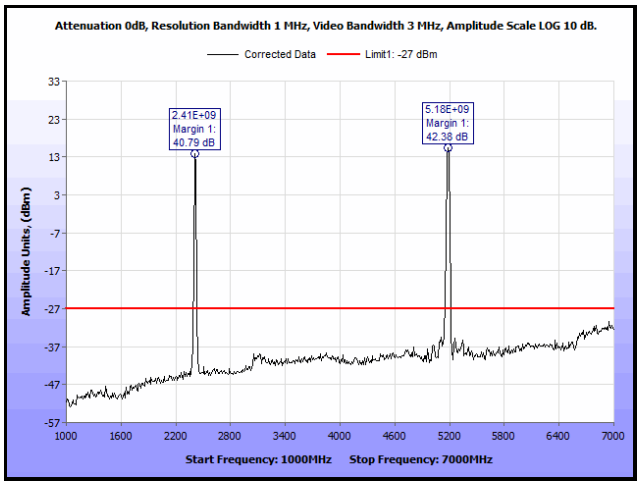


Plot 140. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 0

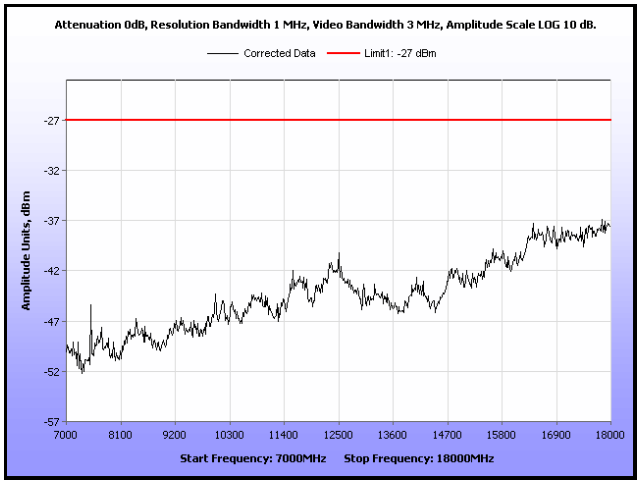
Radiated Spurious Emissions, 802.11a 20 MHz, Antenna 1



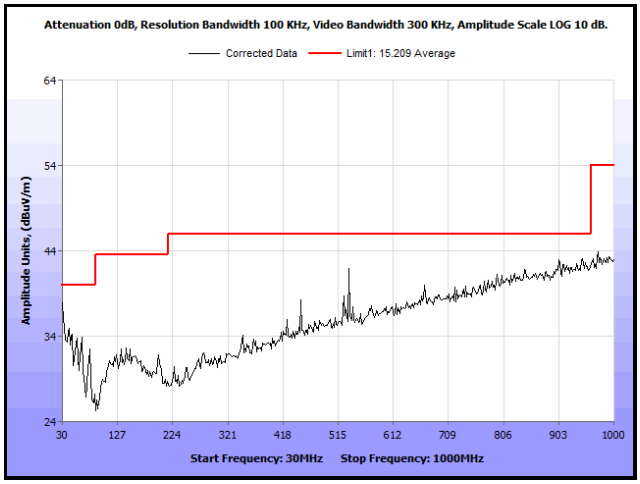
Plot 141. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 1



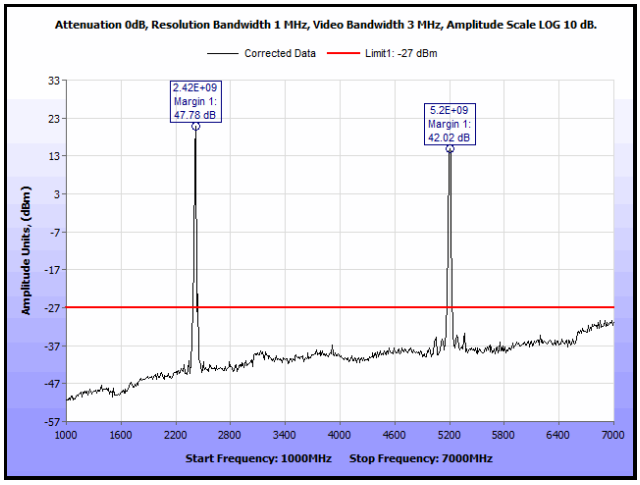
Plot 142. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 1



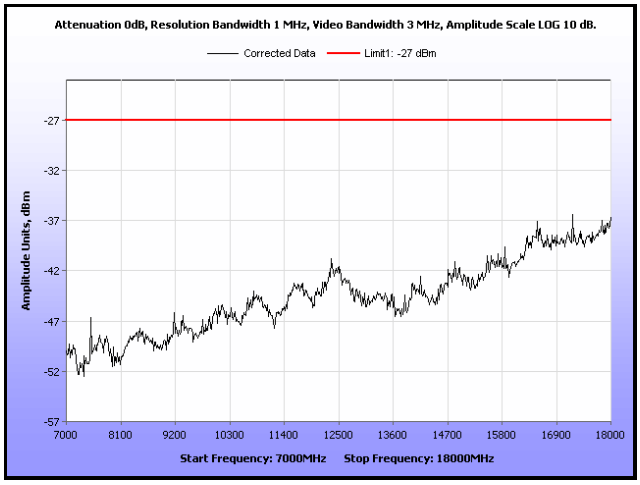
Plot 143. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 1



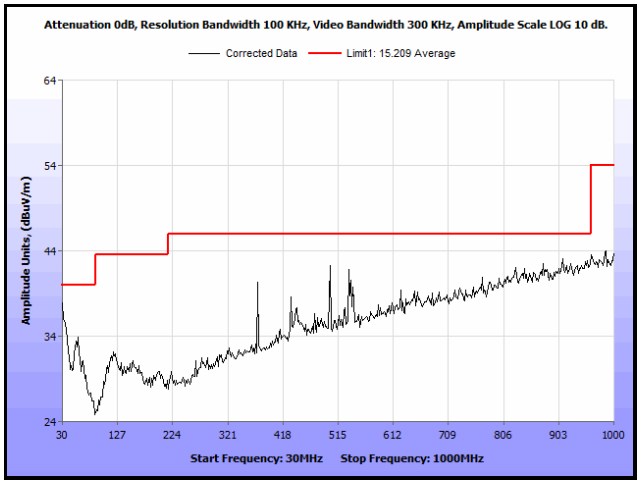
Plot 144. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 1



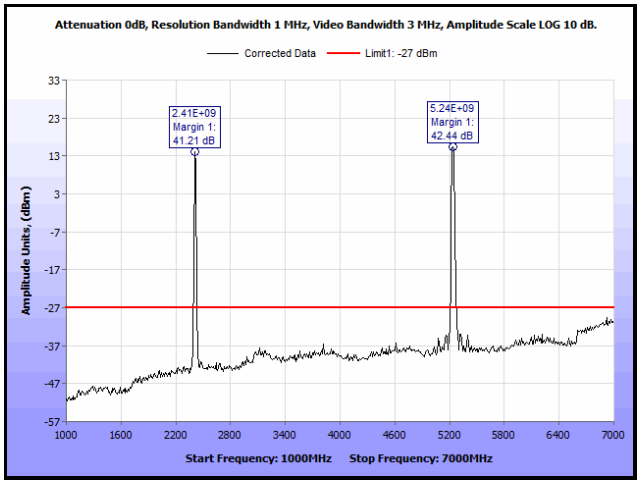
Plot 145. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 1



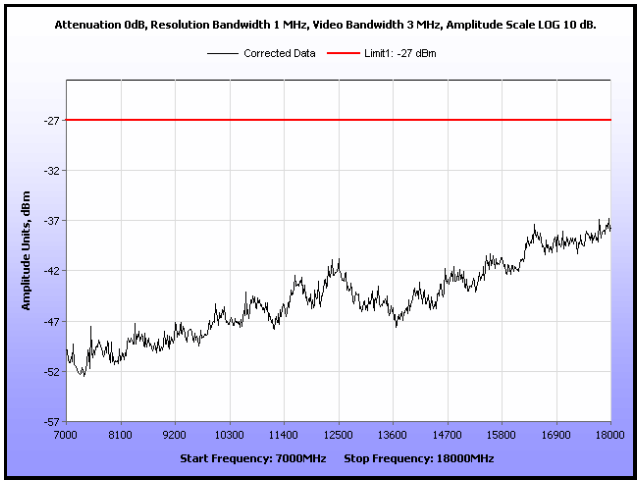
Plot 146. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 1



Plot 147. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 1

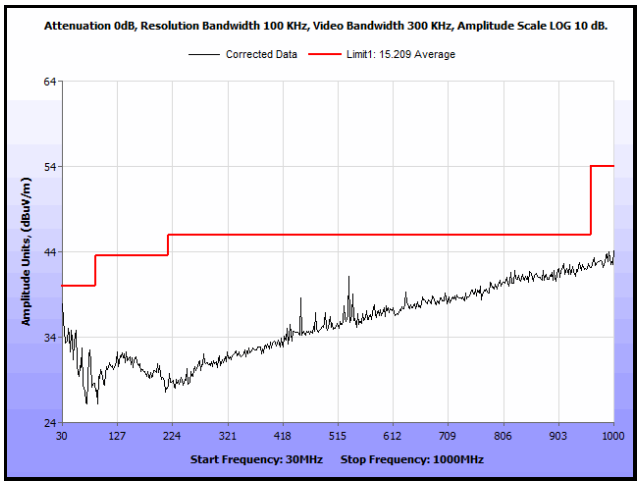


Plot 148. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 1

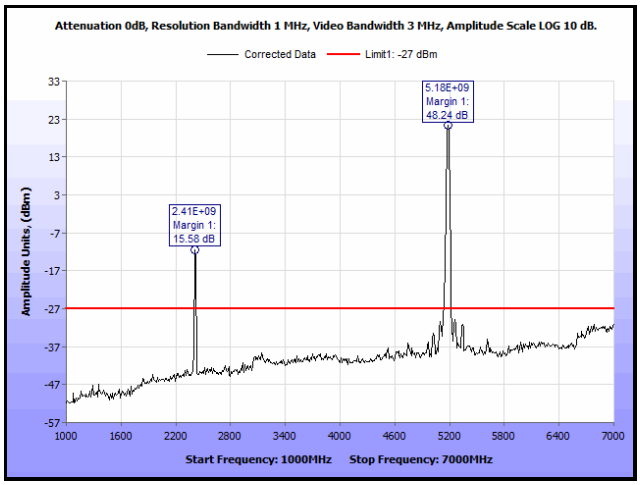


Plot 149. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 1

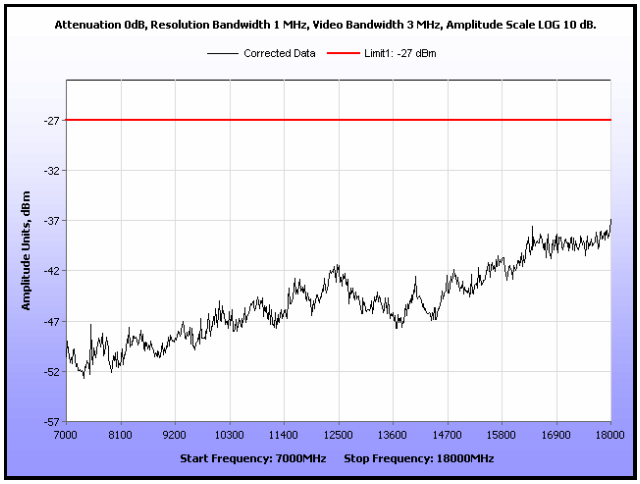
Radiated Spurious Emissions, 802.11a 20 MHz, Antenna 2



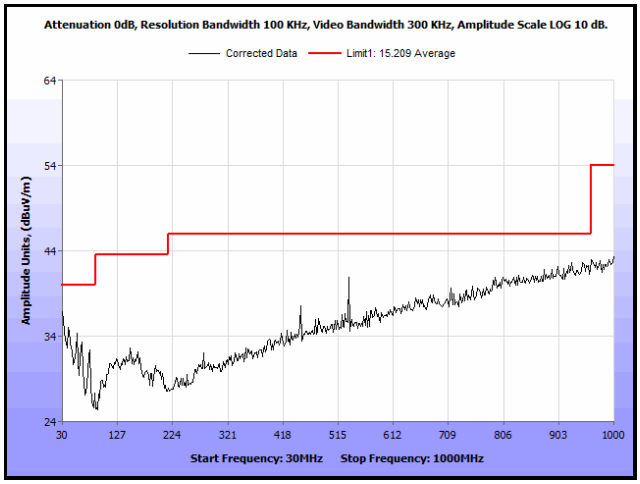
Plot 150. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 2



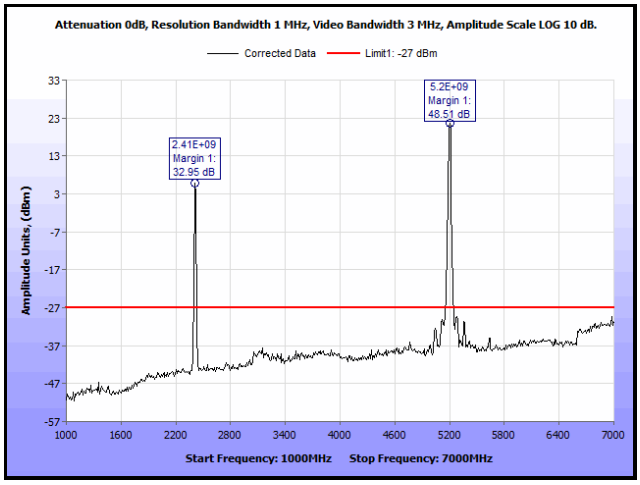
Plot 151. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 2



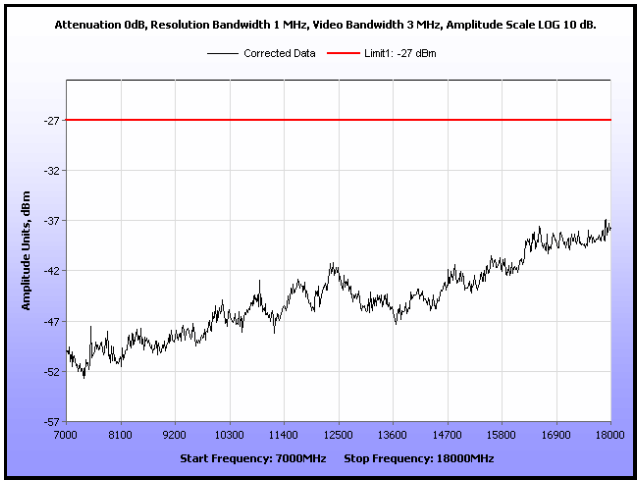
Plot 152. Radiated Spurious Emissions, 802.11a 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 2



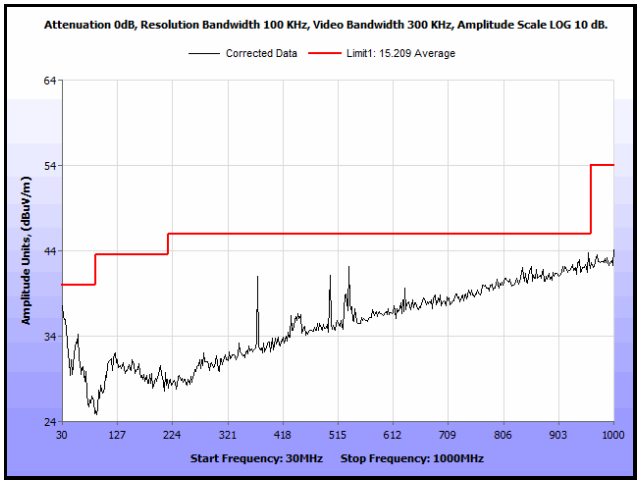
Plot 153. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 2



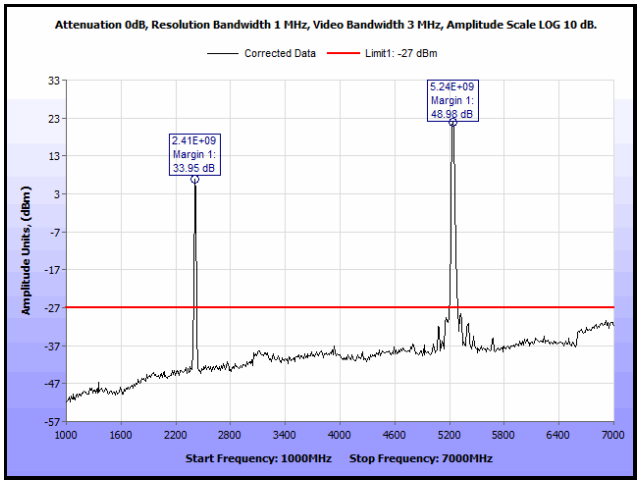
Plot 154. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 2



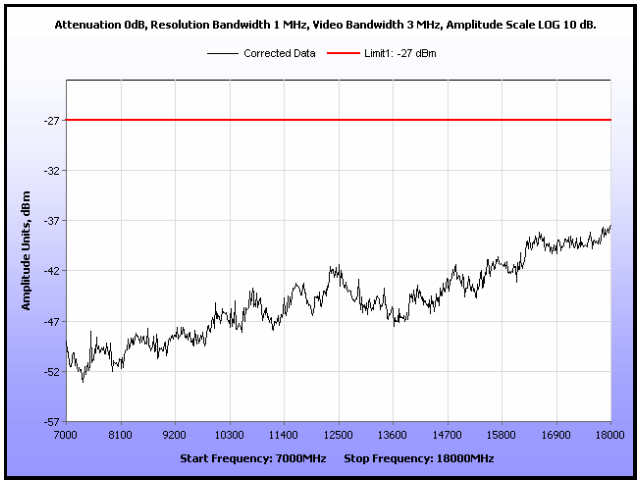
Plot 155. Radiated Spurious Emissions, 802.11a 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 2



Plot 156. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 2

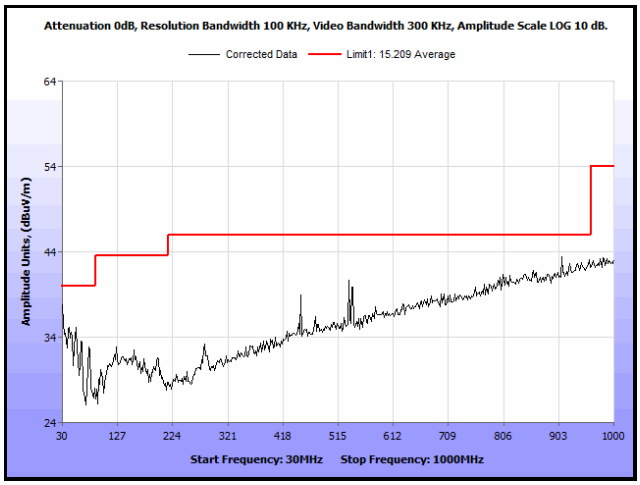


Plot 157. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 2

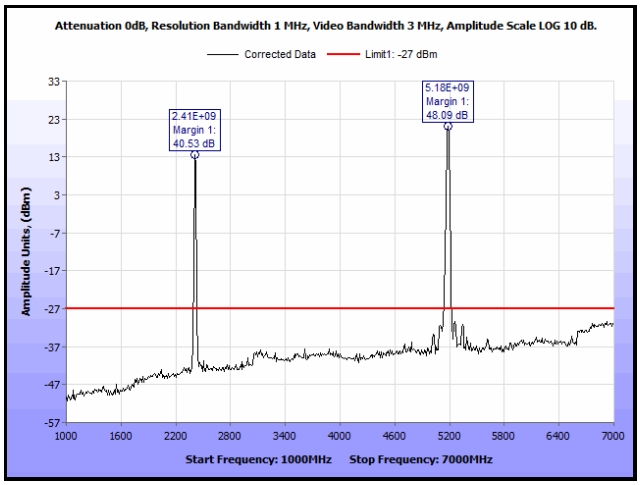


Plot 158. Radiated Spurious Emissions, 802.11a 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 2

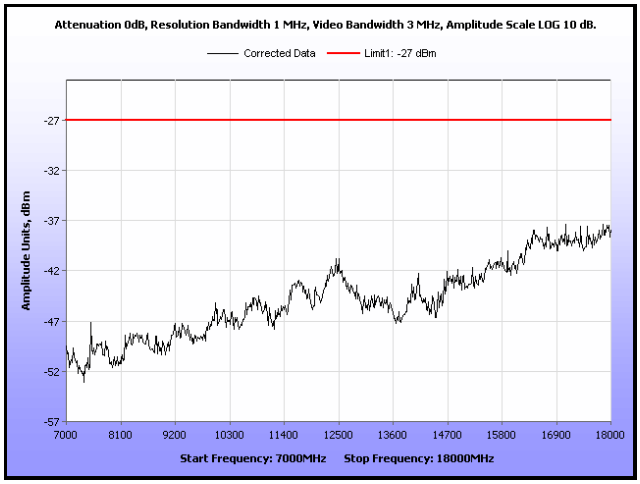
Radiated Spurious Emissions, 802.11n 20 MHz, Antenna 0



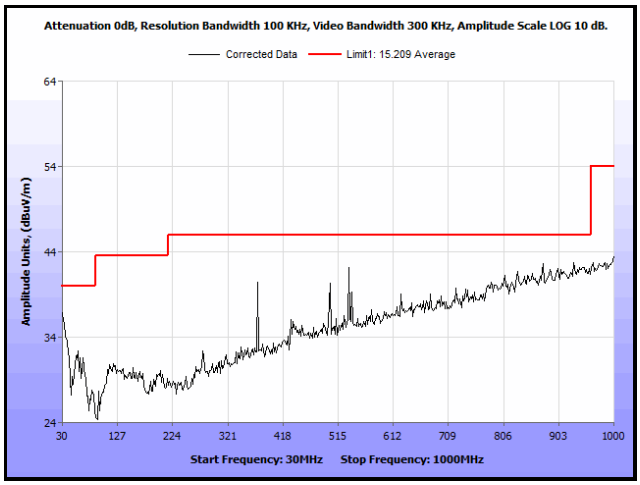
Plot 159. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 0



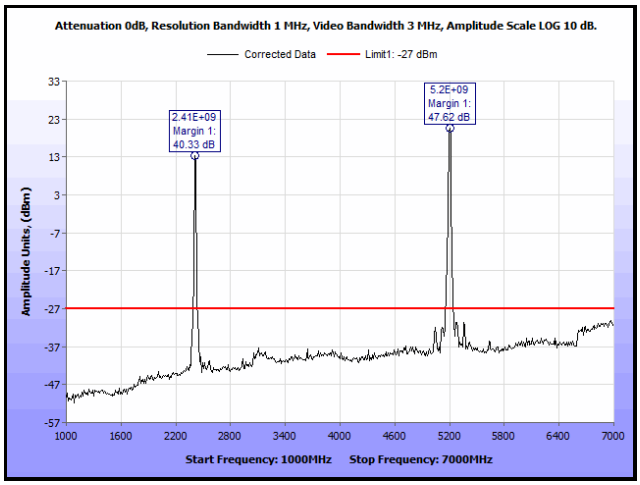
Plot 160. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 0



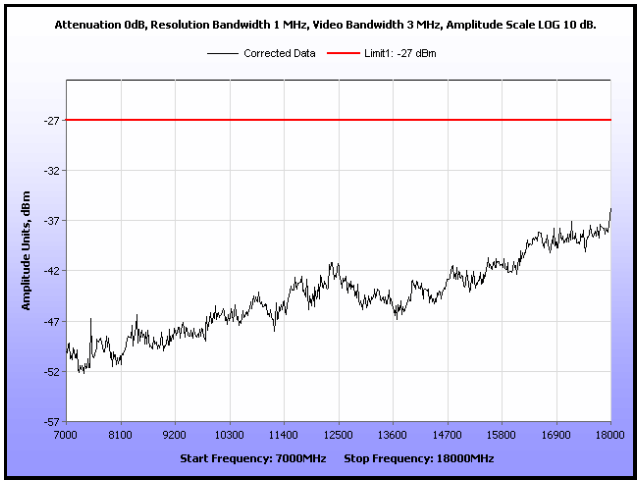
Plot 161. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 0



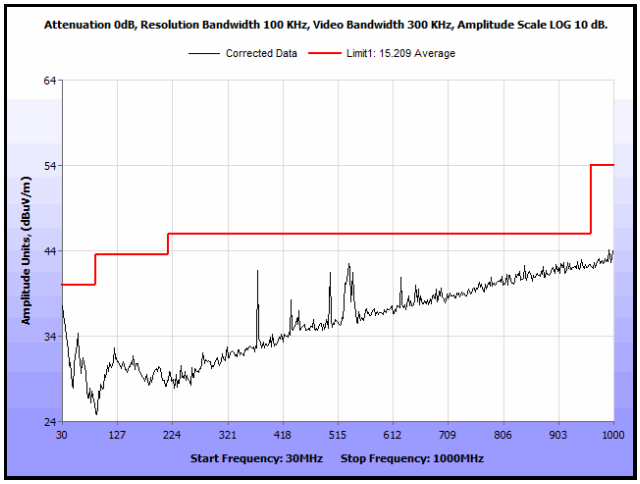
Plot 162. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 0



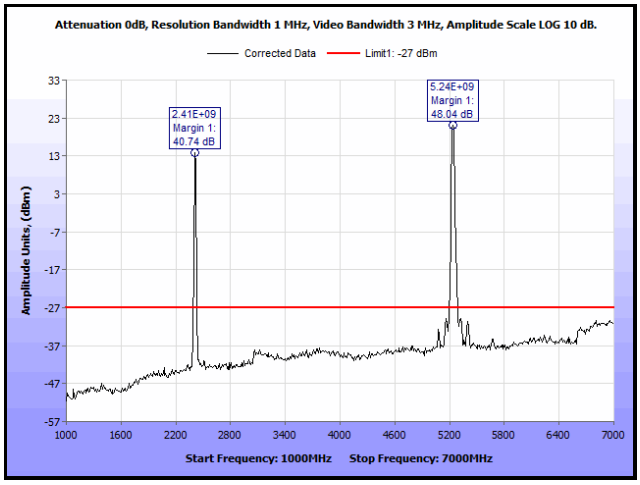
Plot 163. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 0



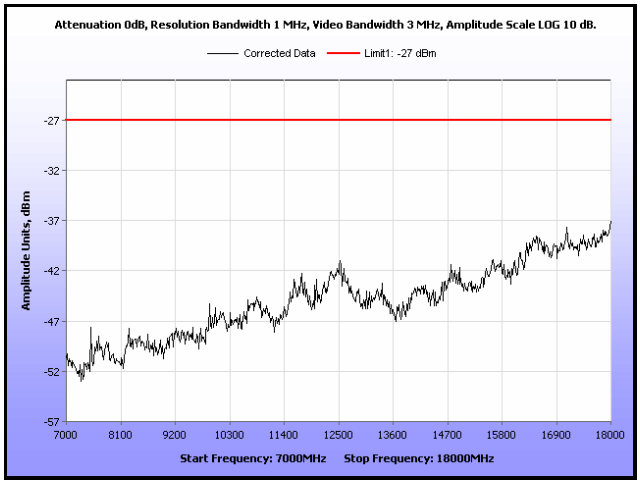
Plot 164. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 0



Plot 165. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 0

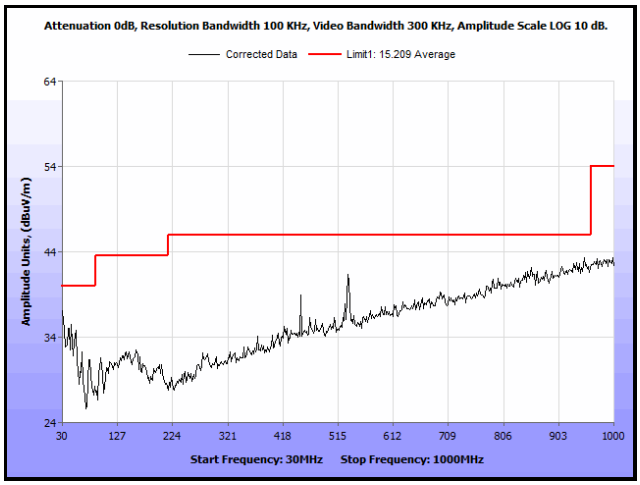


Plot 166. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 0

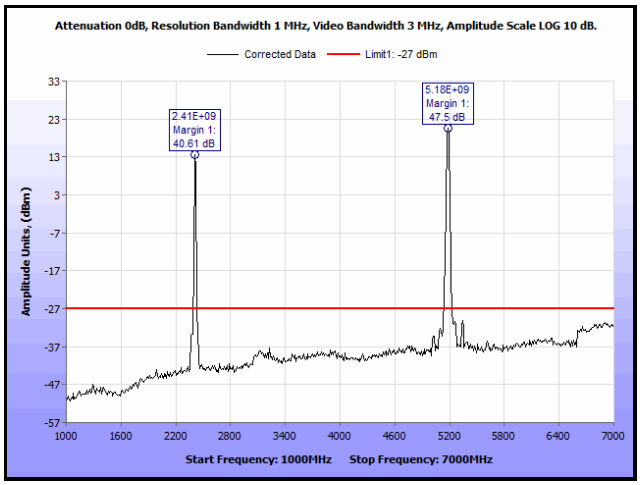


Plot 167. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 0

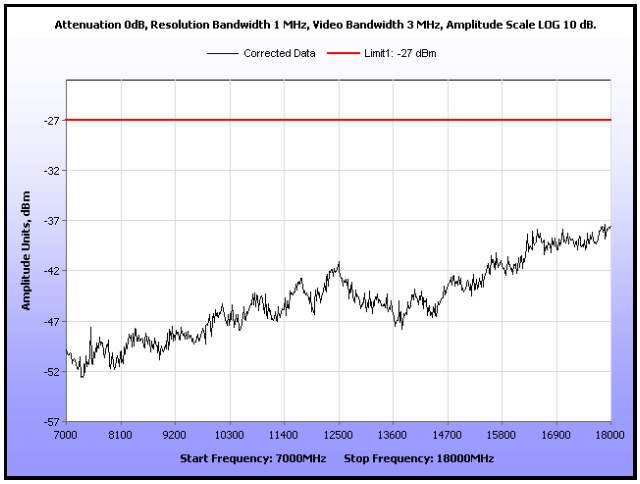
Radiated Spurious Emissions, 802.11n 20 MHz, Antenna 1



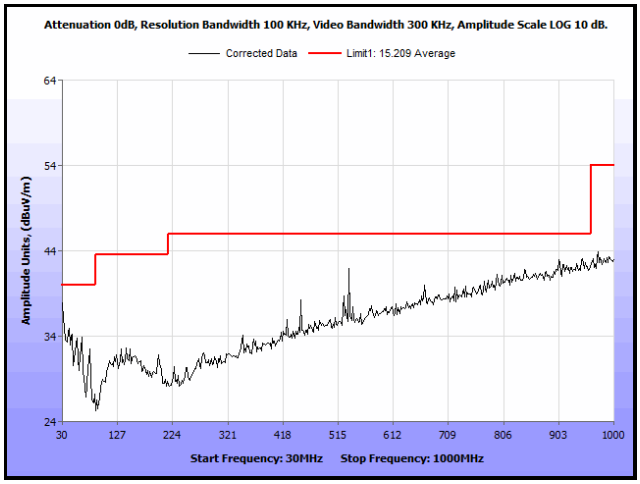
Plot 168. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 1



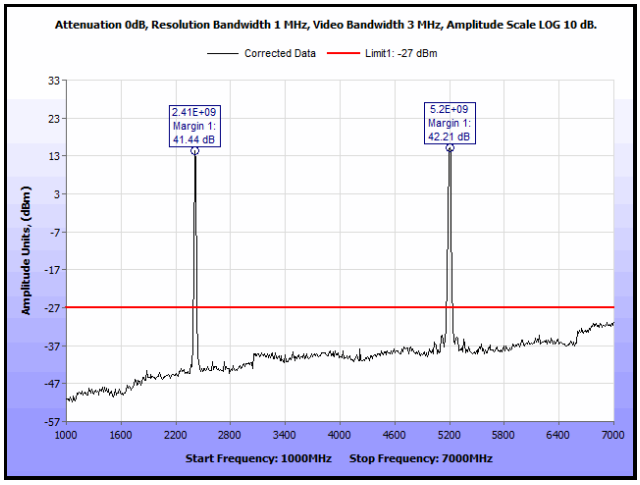
Plot 169. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 1



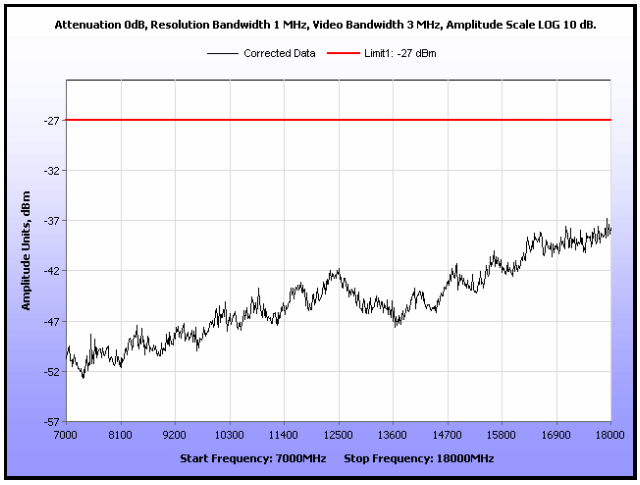
Plot 170. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 1



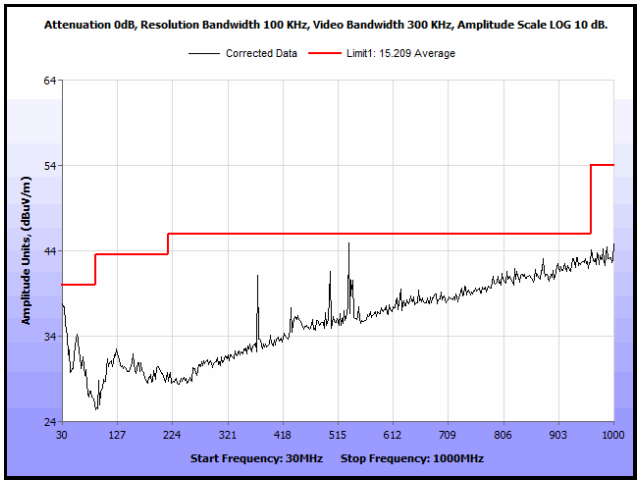
Plot 171. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 1



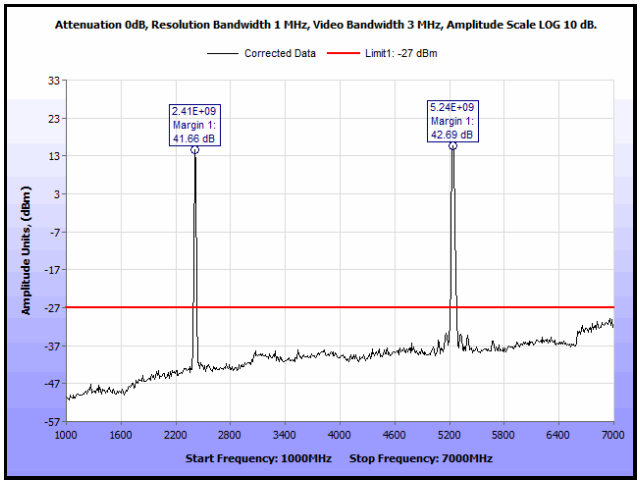
Plot 172. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 1



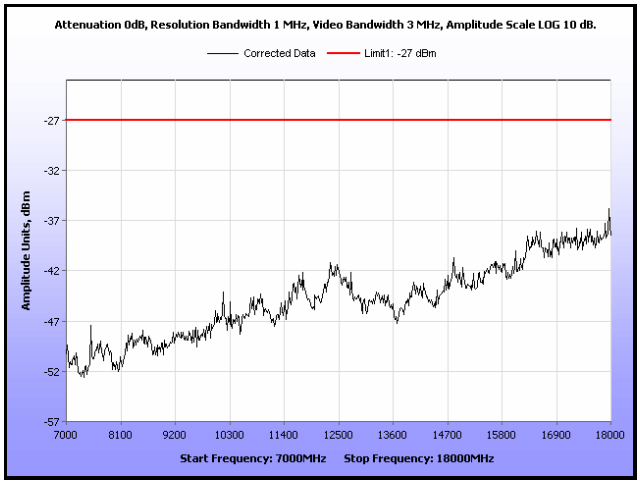
Plot 173. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 1



Plot 174. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 1

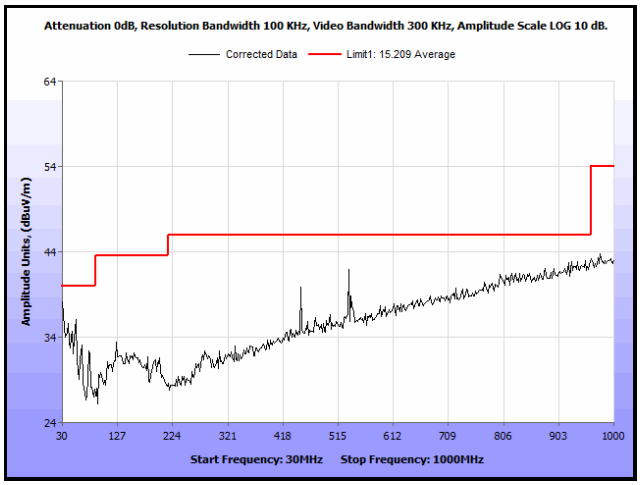


Plot 175. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 1

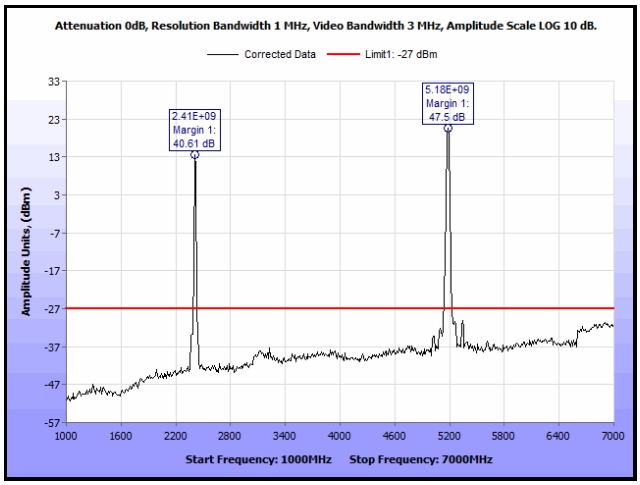


Plot 176. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 1

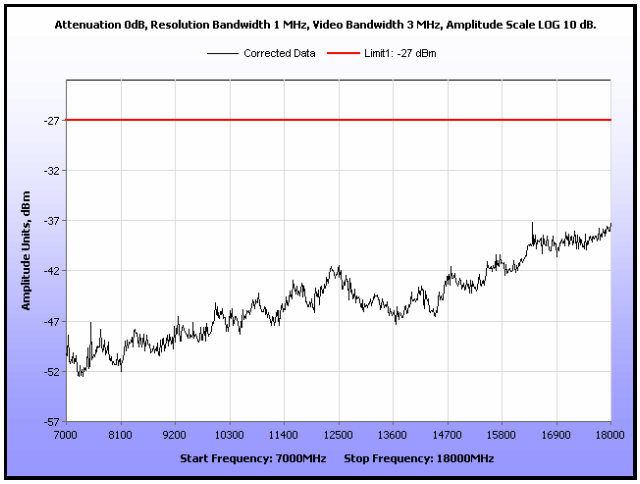
Radiated Spurious Emissions, 802.11n 20 MHz, Antenna 2



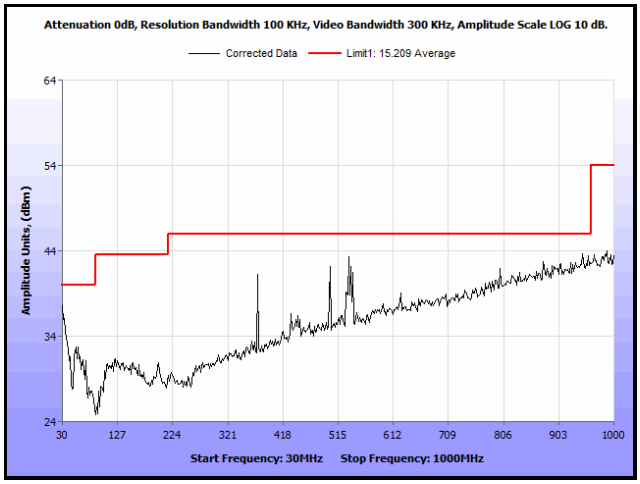
Plot 177. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 2



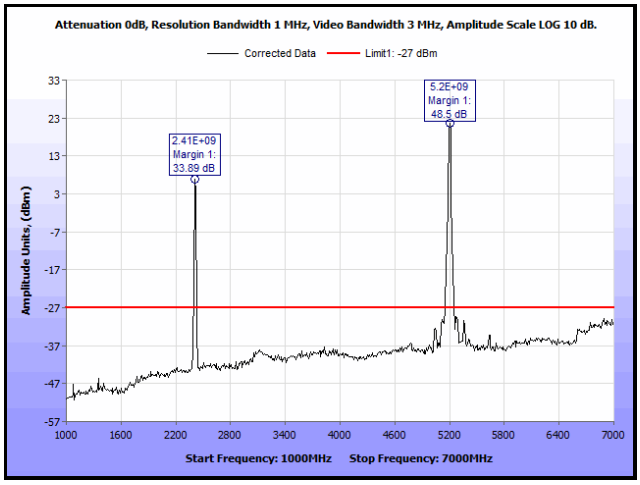
Plot 178. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 2



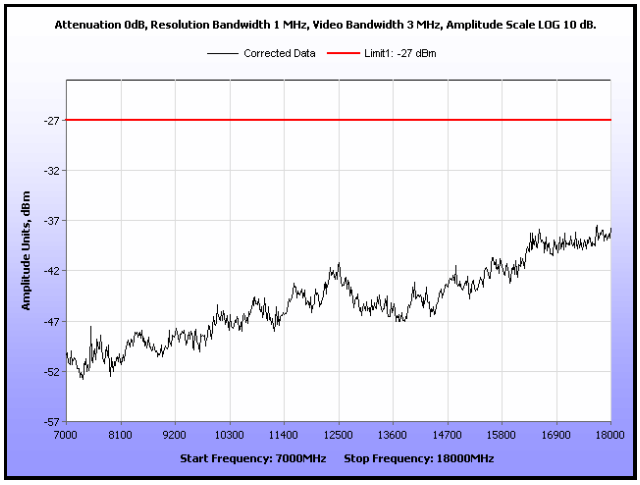
Plot 179. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 2



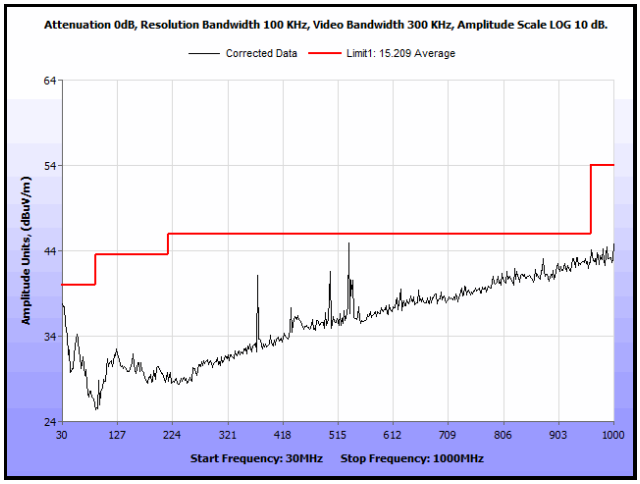
Plot 180. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 2



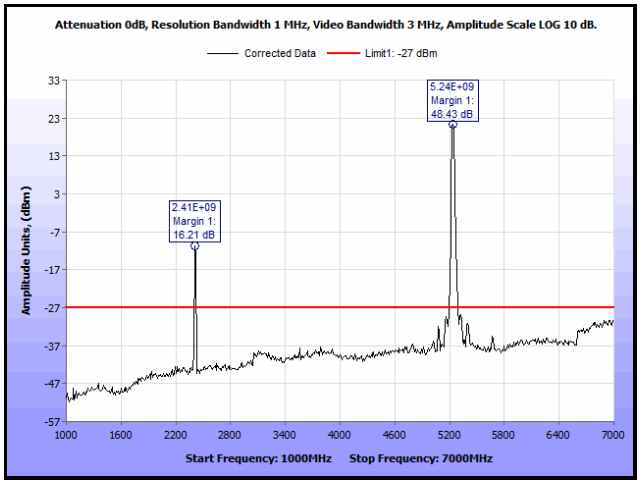
Plot 181. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 2



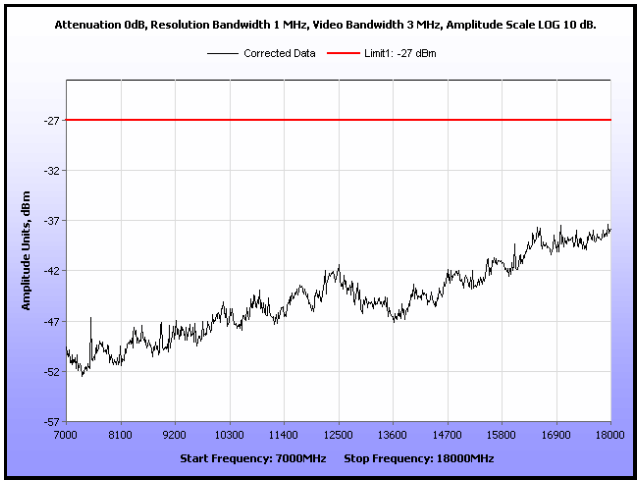
Plot 182. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 2



Plot 183. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 2

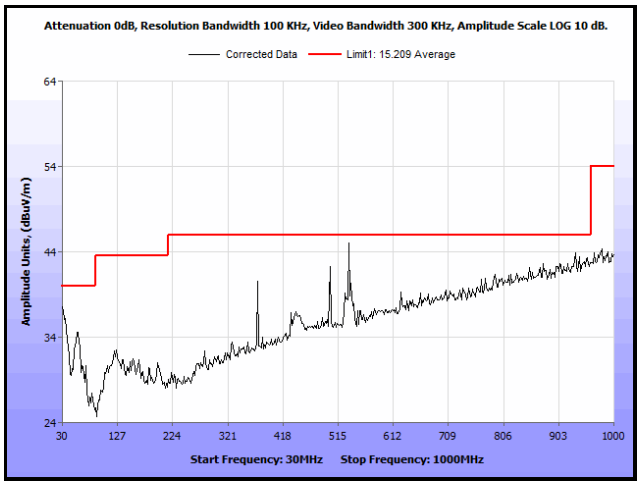


Plot 184. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 2

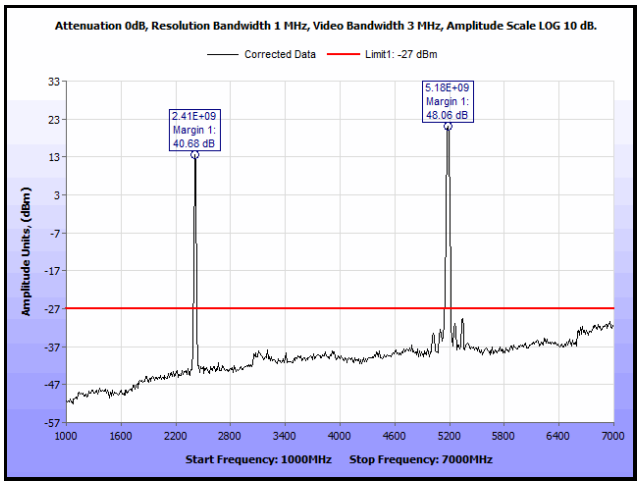


Plot 185. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 2

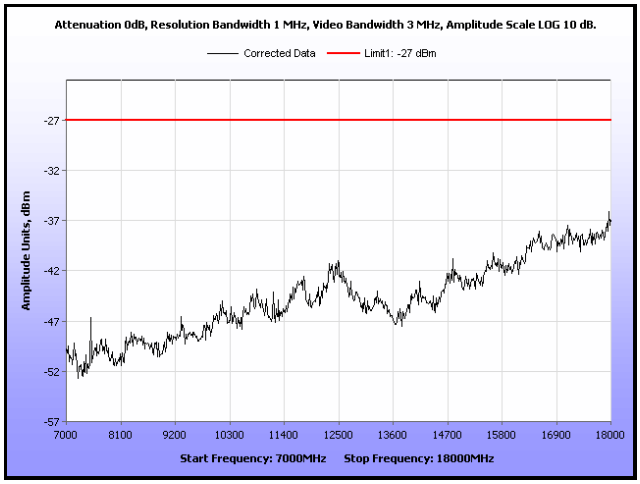
Radiated Spurious Emissions, 802.11n 20 MHz, MIMO



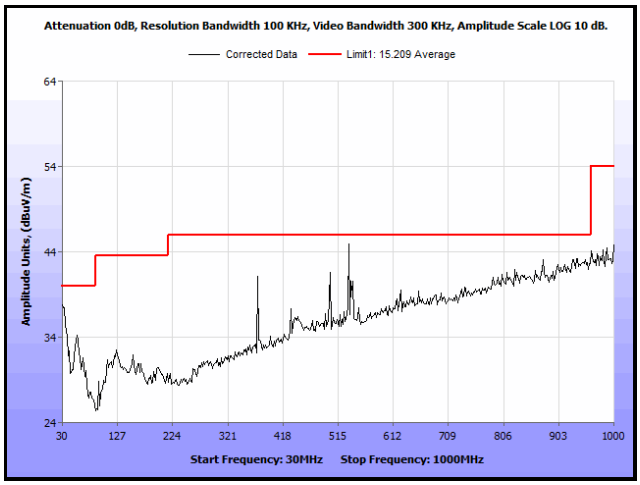
Plot 186. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 30 MHz – 1 GHz, MIMO



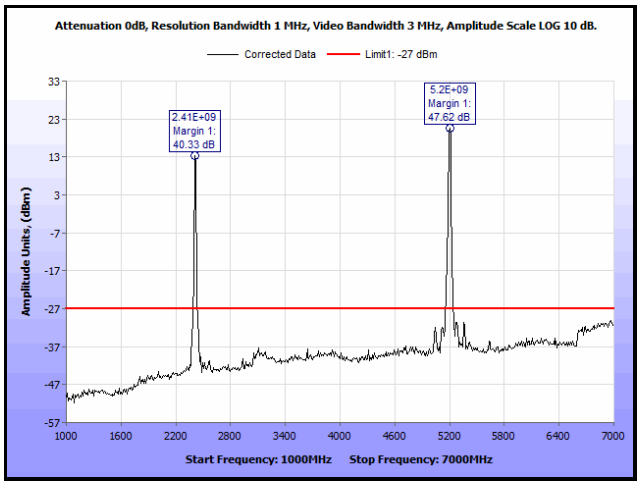
Plot 187. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, MIMO



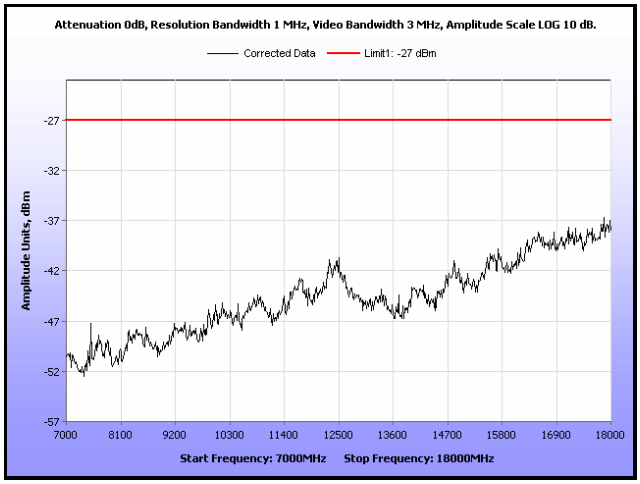
Plot 188. Radiated Spurious Emissions, 802.11n 20 MHz, Low Channel, 7 GHz – 18 GHz, MIMO



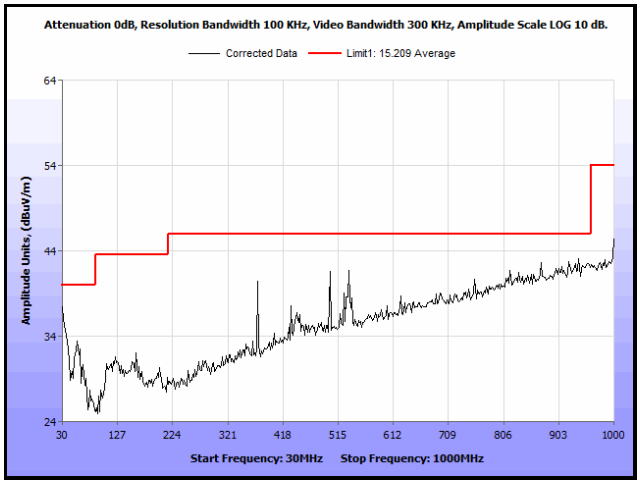
Plot 189. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 30 MHz – 1 GHz, MIMO



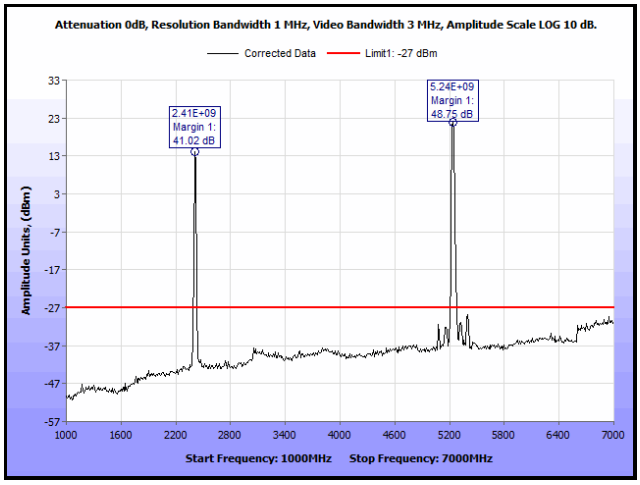
Plot 190. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, MIMO



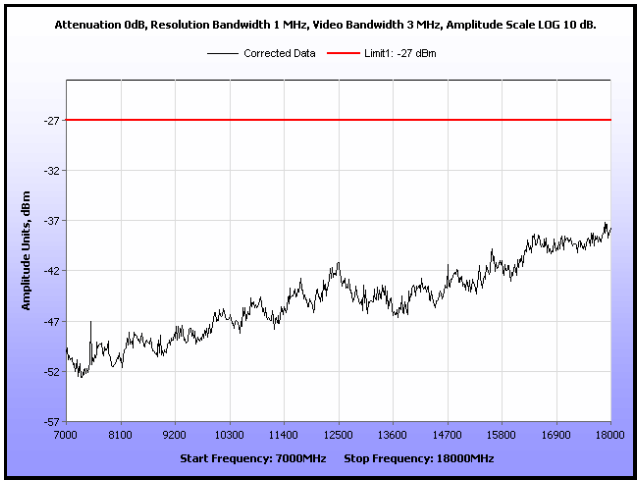
Plot 191. Radiated Spurious Emissions, 802.11n 20 MHz, Mid Channel, 7 GHz – 18 GHz, MIMO



Plot 192. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 30 MHz – 1 GHz, MIMO

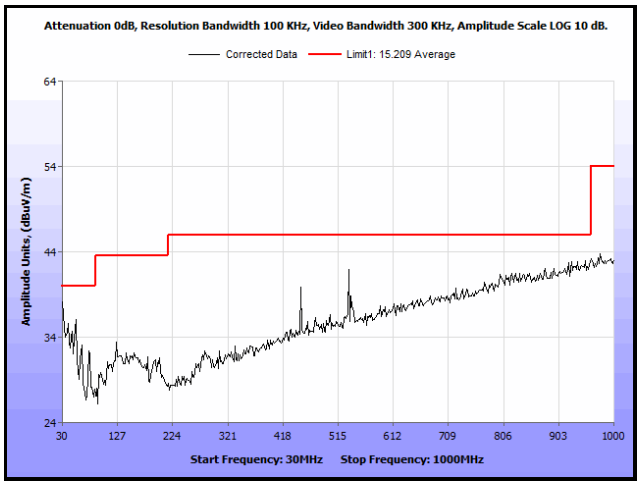


Plot 193. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, MIMO

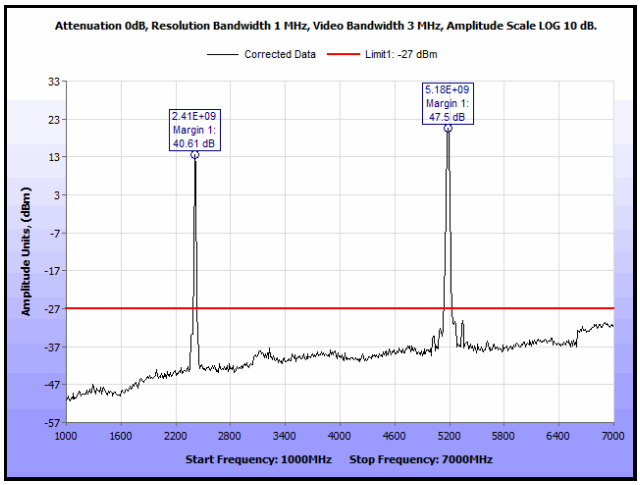


Plot 194. Radiated Spurious Emissions, 802.11n 20 MHz, High Channel, 7 GHz – 18 GHz, MIMO

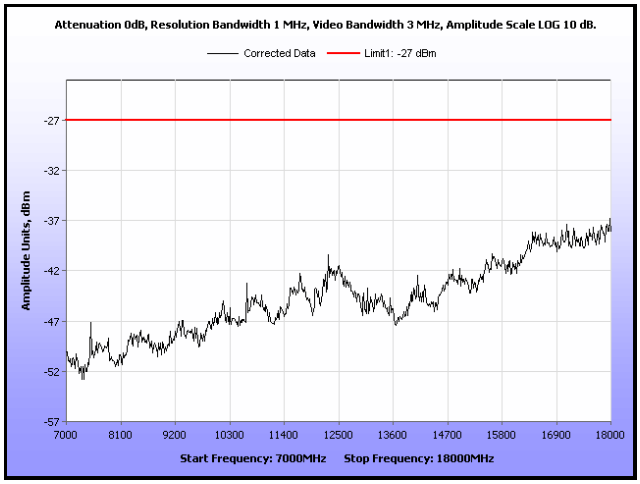
Radiated Spurious Emissions, 802.11ac 20 MHz, Antenna 0



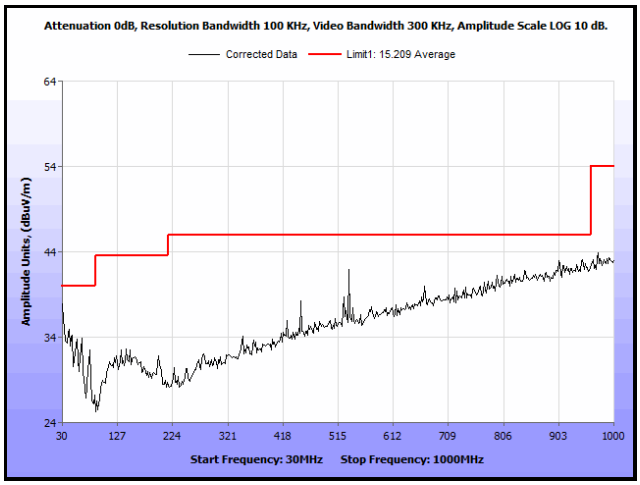
Plot 195. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 0



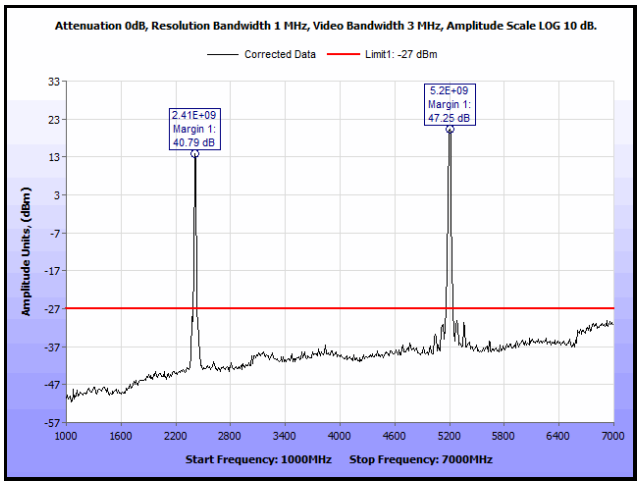
Plot 196. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 0



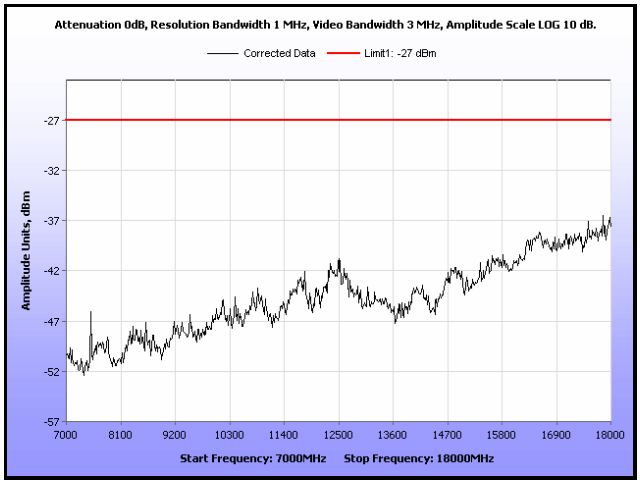
Plot 197. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 0



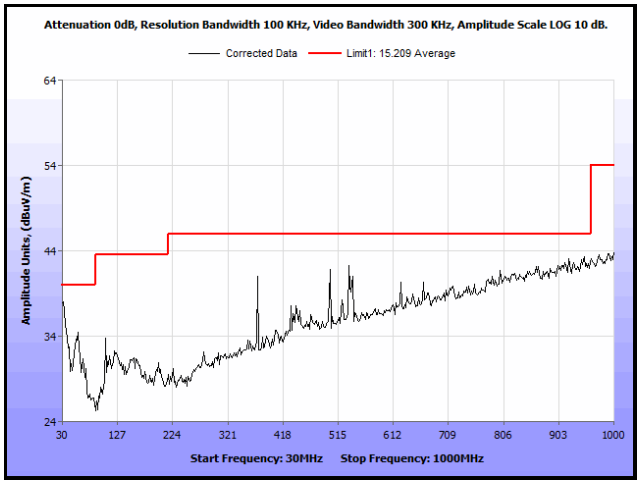
Plot 198. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 0



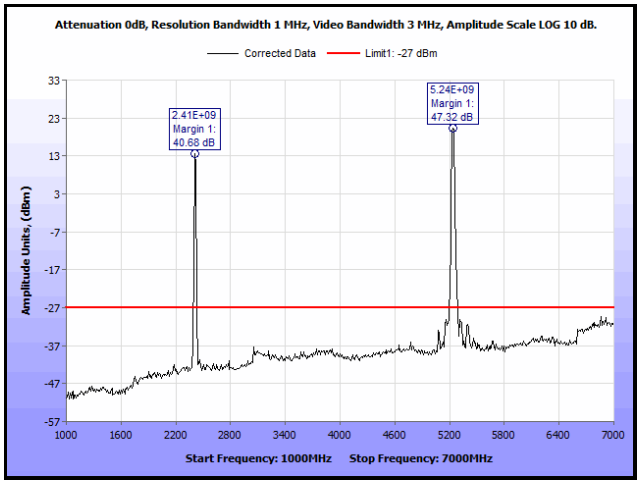
Plot 199. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 0



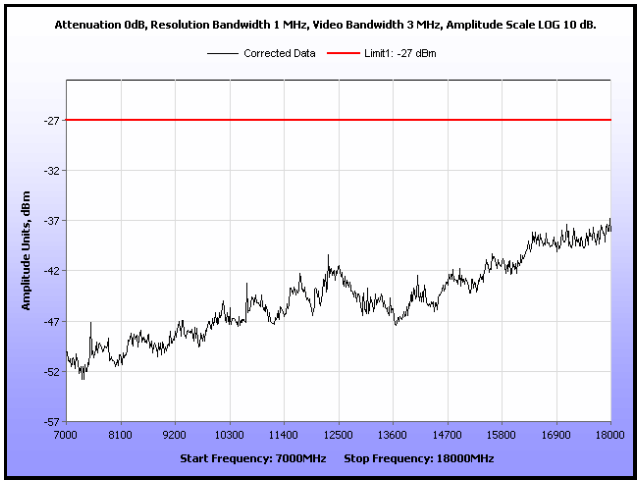
Plot 200. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 0



Plot 201. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 0

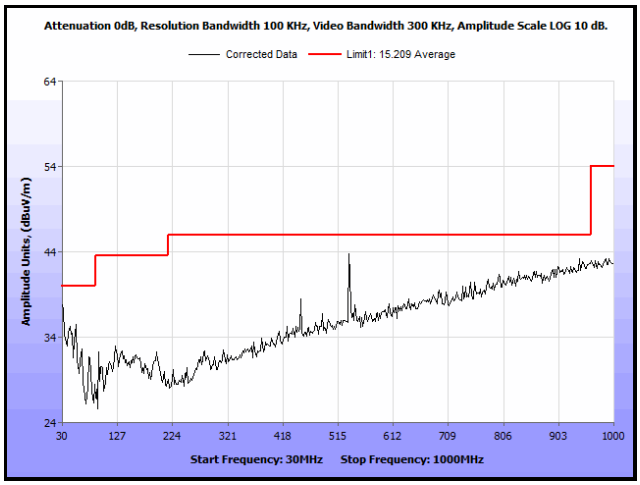


Plot 202. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 0

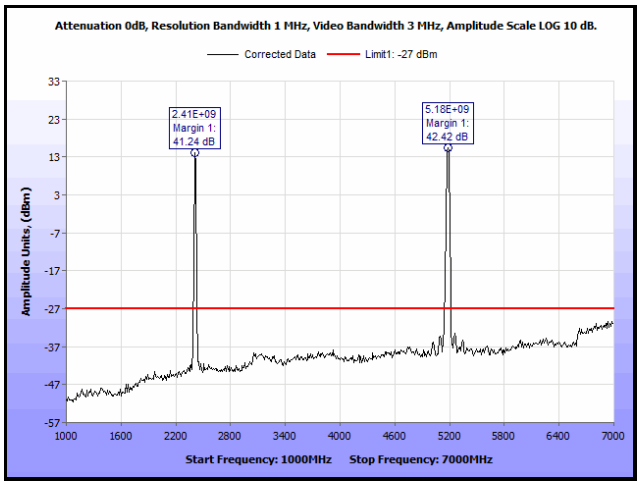


Plot 203. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 0

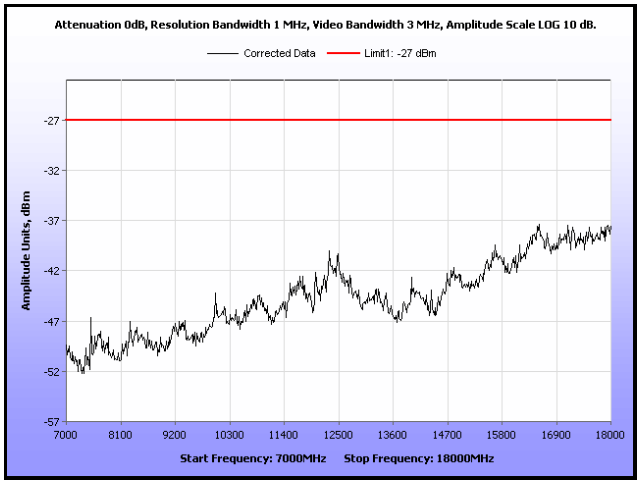
Radiated Spurious Emissions, 802.11ac 20 MHz, Antenna 1



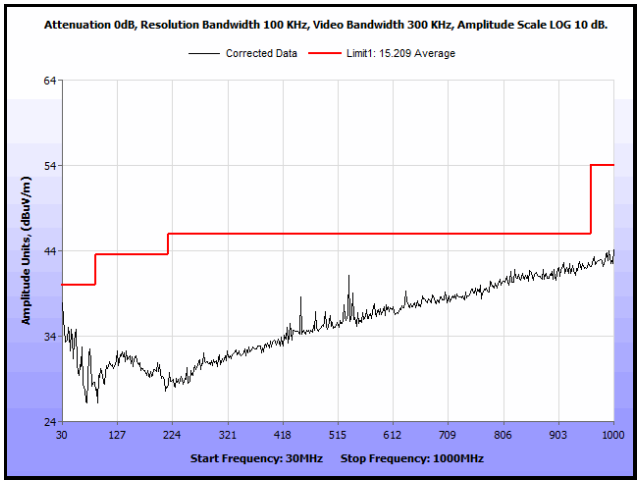
Plot 204. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 1



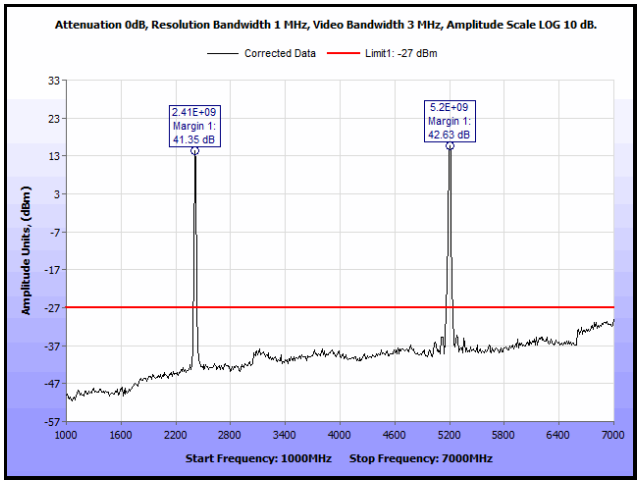
Plot 205. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 1



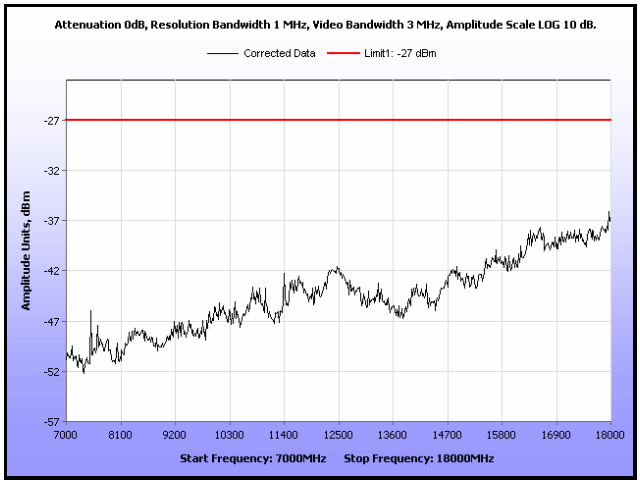
Plot 206. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 1



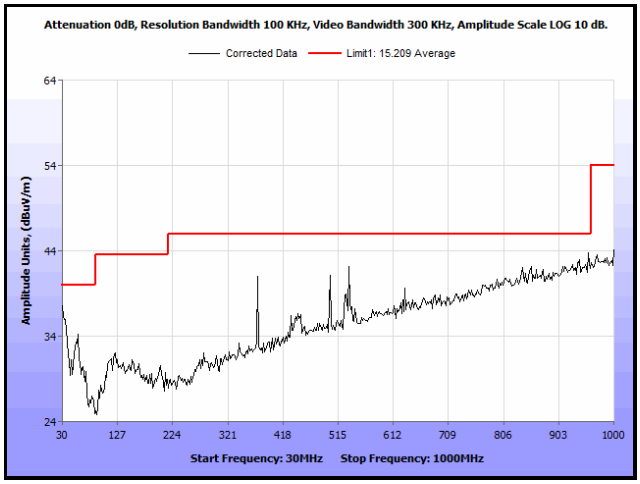
Plot 207. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 1



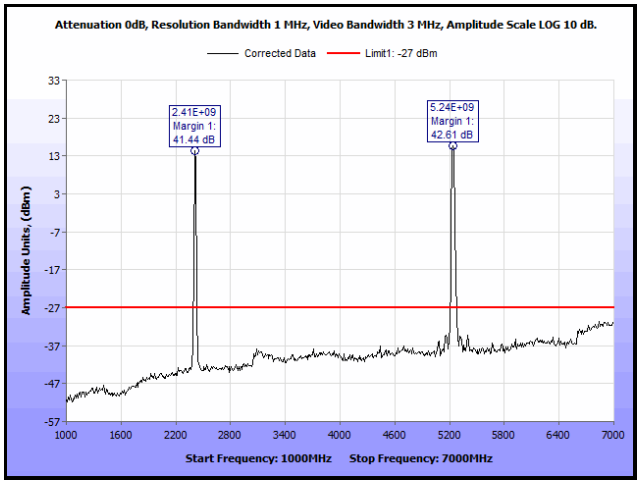
Plot 208. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 1



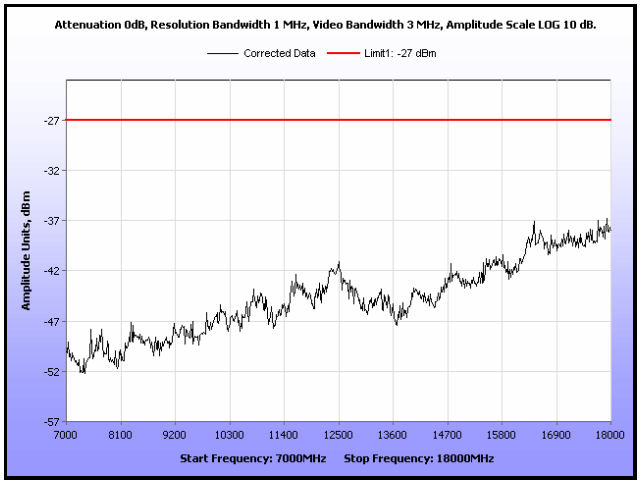
Plot 209. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 1



Plot 210. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 1

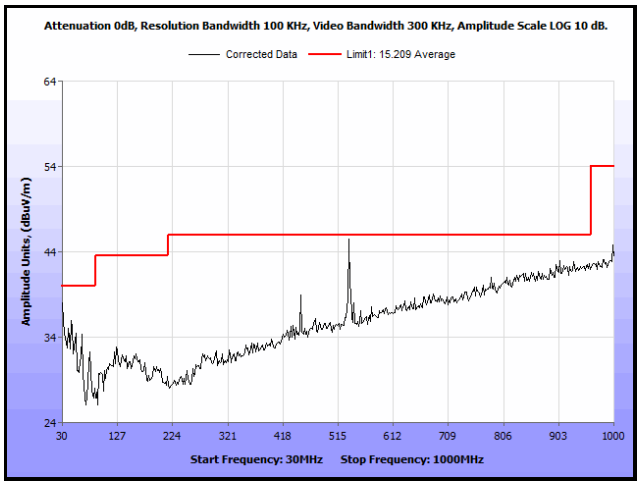


Plot 211. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 1

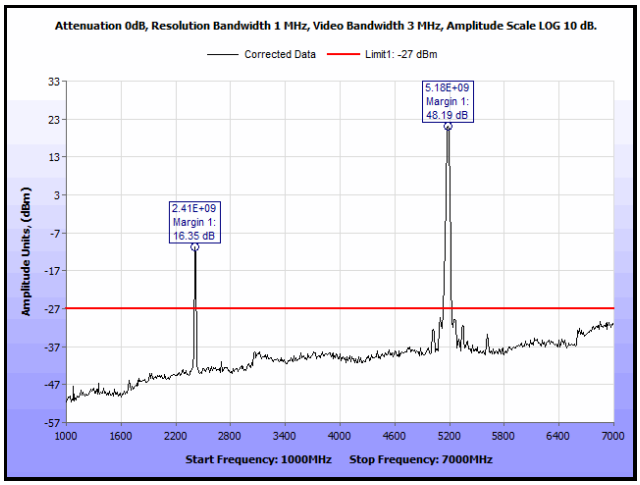


Plot 212. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 1

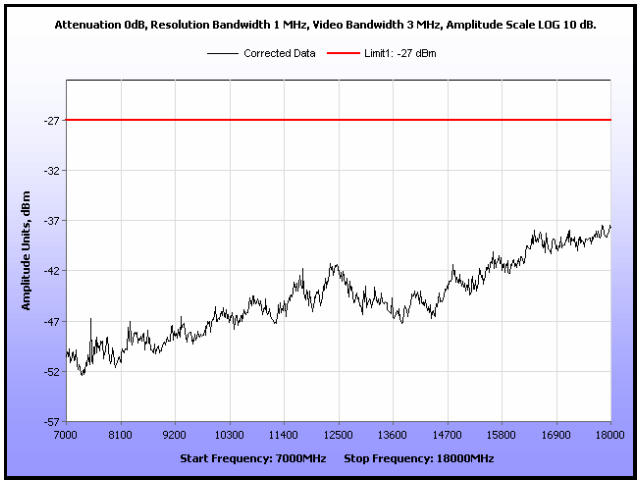
Radiated Spurious Emissions, 802.11ac 20 MHz, Antenna 2



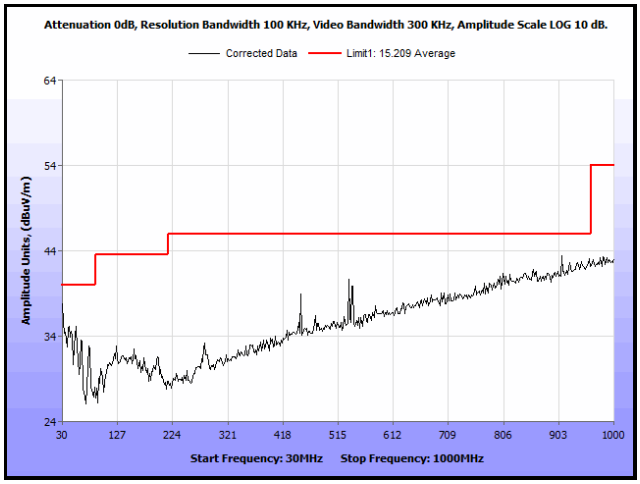
Plot 213. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 2



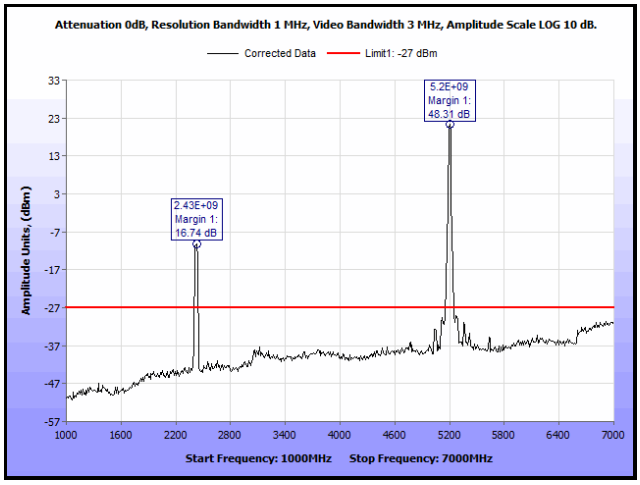
Plot 214. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 2



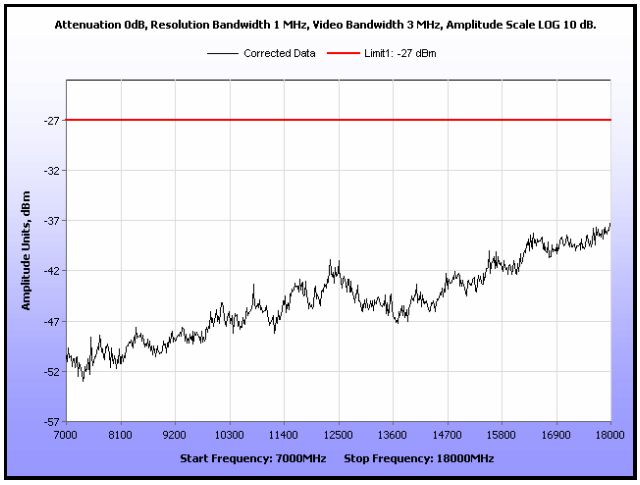
Plot 215. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 2



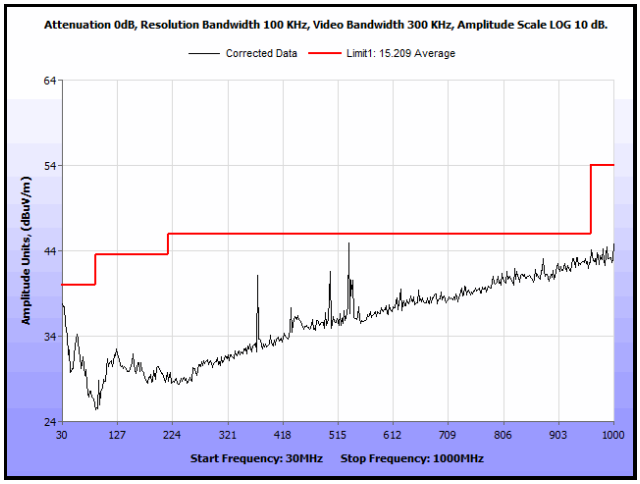
Plot 216. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 30 MHz – 1 GHz, Antenna 2



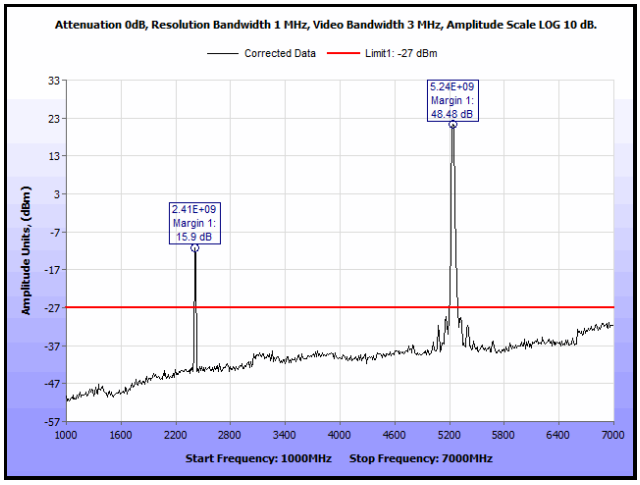
Plot 217. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, Antenna 2



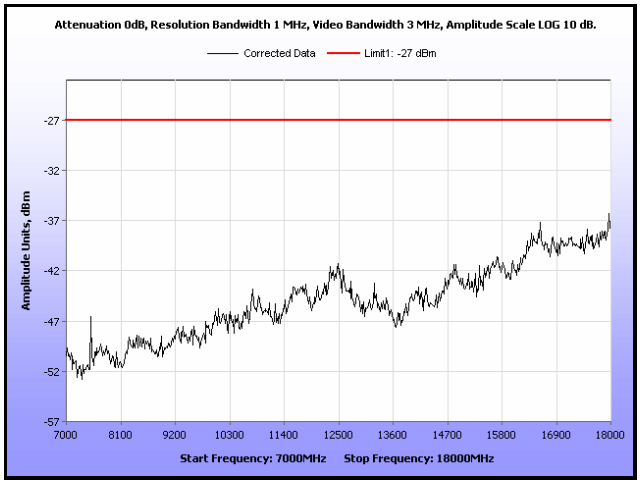
Plot 218. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 7 GHz – 18 GHz, Antenna 2



Plot 219. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 30 MHz – 1 GHz, Antenna 2

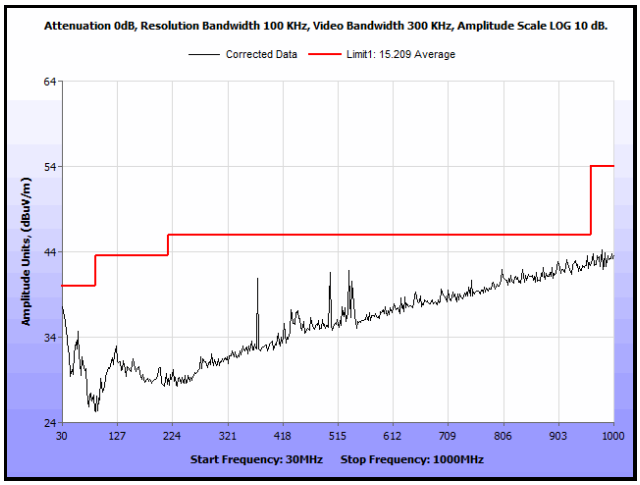


Plot 220. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 2

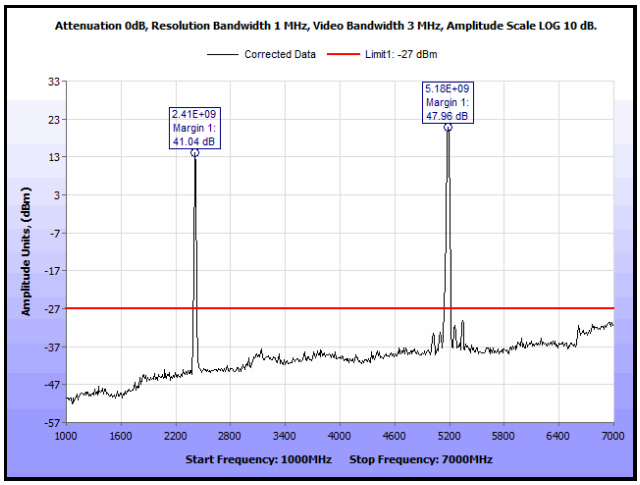


Plot 221. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 7 GHz – 18 GHz, Antenna 2

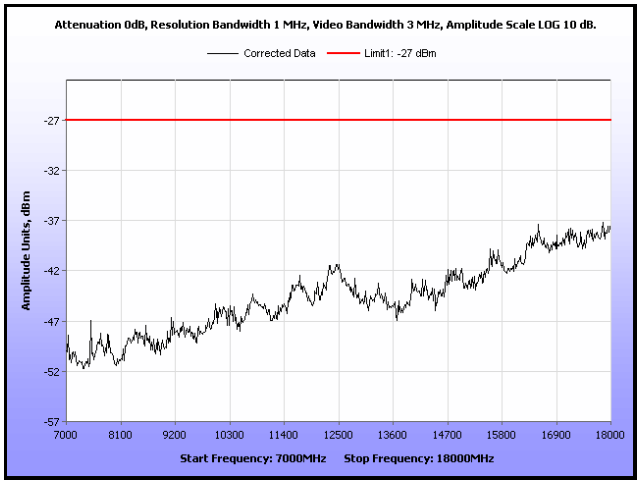
Radiated Spurious Emissions, 802.11ac 20 MHz, MIMO



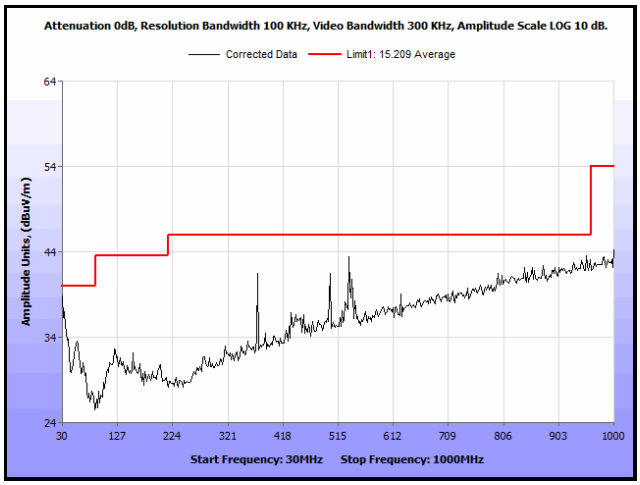
Plot 222. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 30 MHz – 1 GHz, MIMO



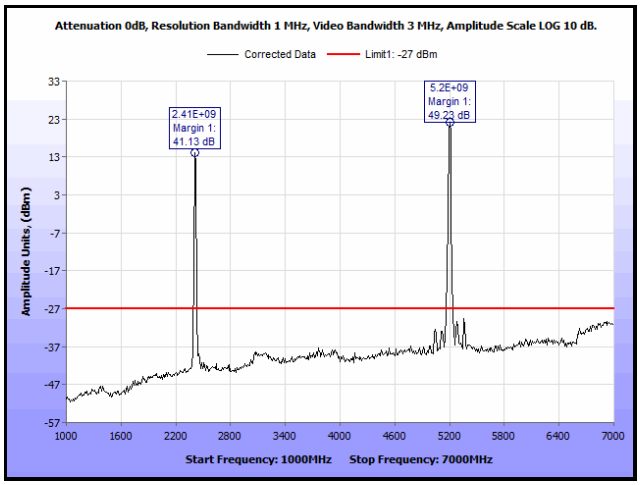
Plot 223. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 1 GHz – 7 GHz, Peak, MIMO



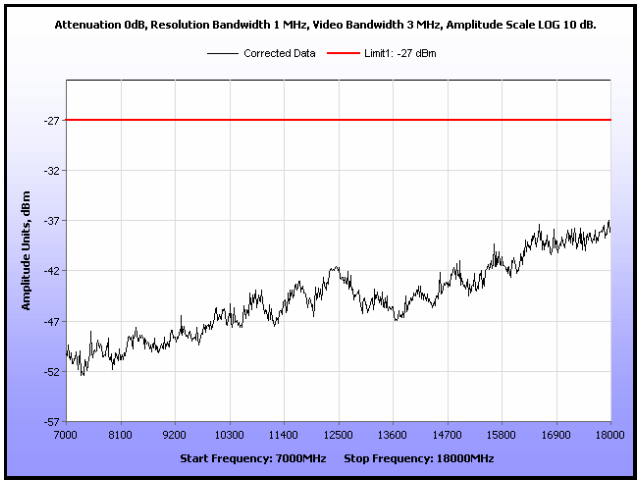
Plot 224. Radiated Spurious Emissions, 802.11ac 20 MHz, Low Channel, 7 GHz – 18 GHz, MIMO



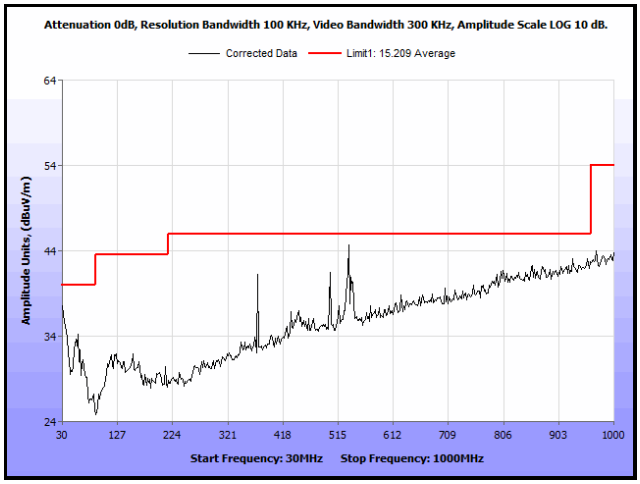
Plot 225. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 30 MHz – 1 GHz, MIMO



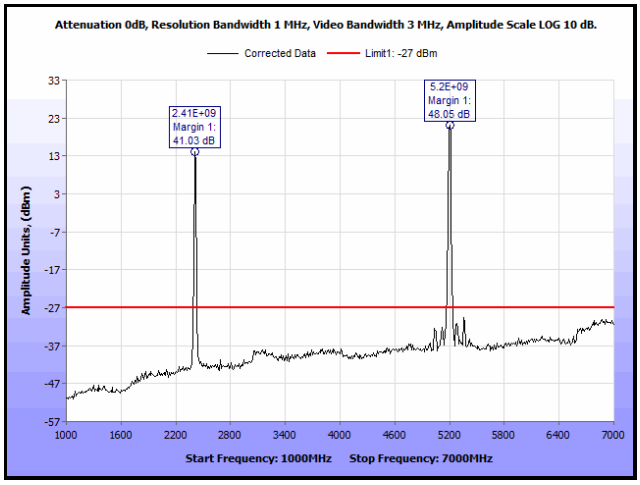
Plot 226. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 1 GHz – 7 GHz, Peak, MIMO



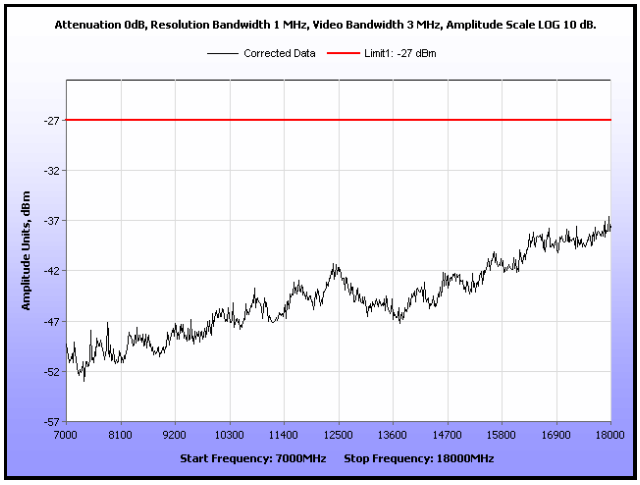
Plot 227. Radiated Spurious Emissions, 802.11ac 20 MHz, Mid Channel, 7 GHz – 18 GHz, MIMO



Plot 228. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 30 MHz – 1 GHz, MIMO

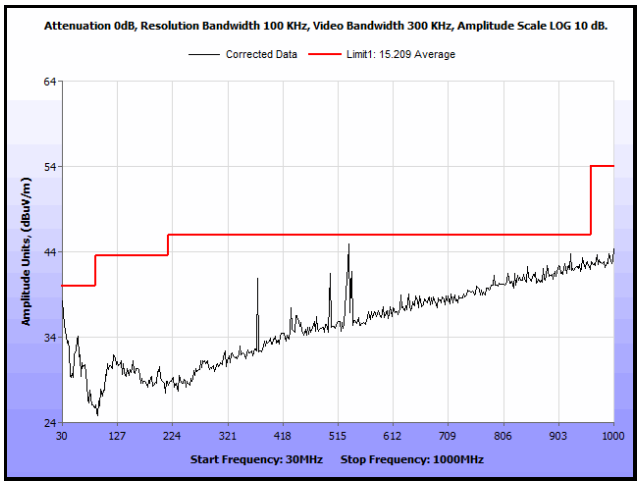


Plot 229. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 1 GHz – 7 GHz, Peak, MIMO

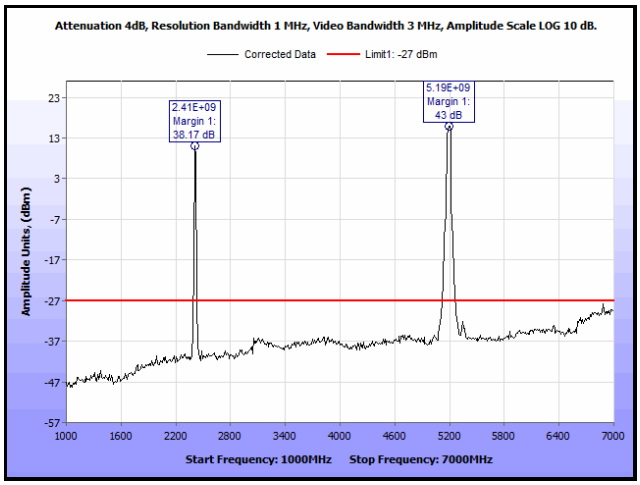


Plot 230. Radiated Spurious Emissions, 802.11ac 20 MHz, High Channel, 7 GHz – 18 GHz, MIMO

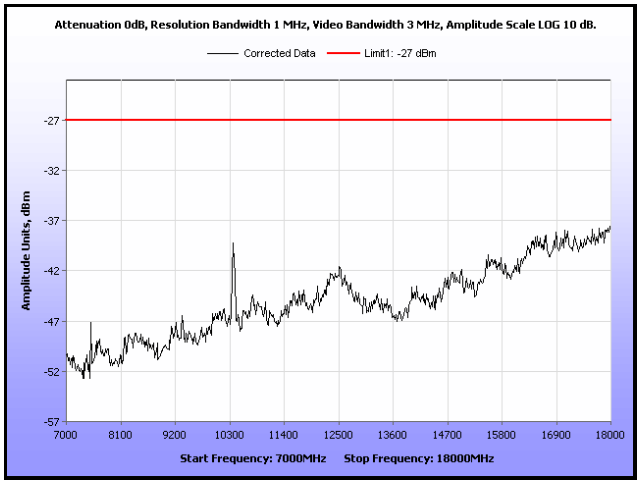
Radiated Spurious Emissions, 802.11a 40 MHz, Antenna 0



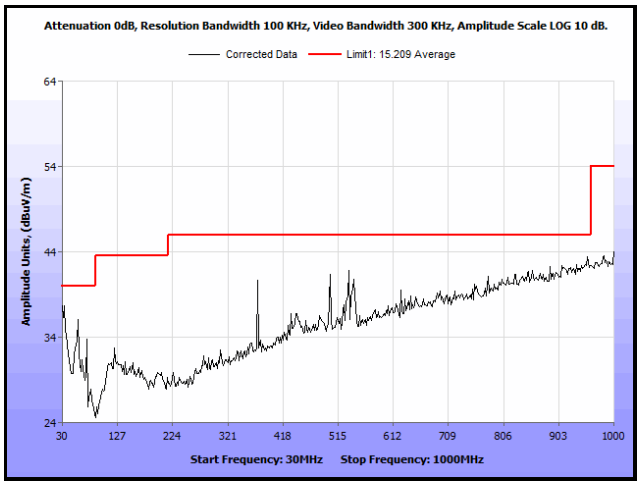
Plot 231. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 0



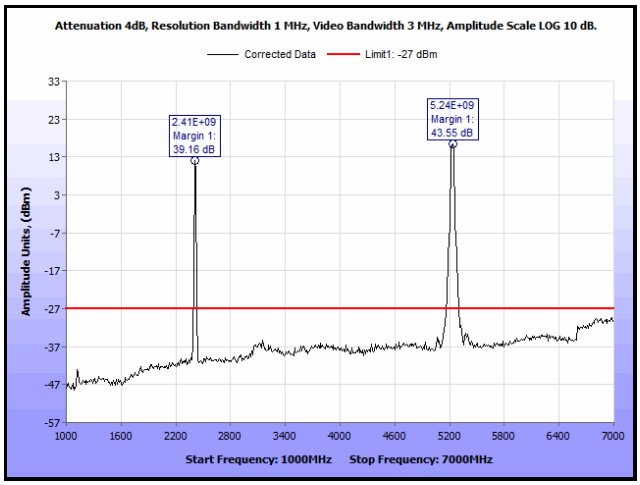
Plot 232. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 0



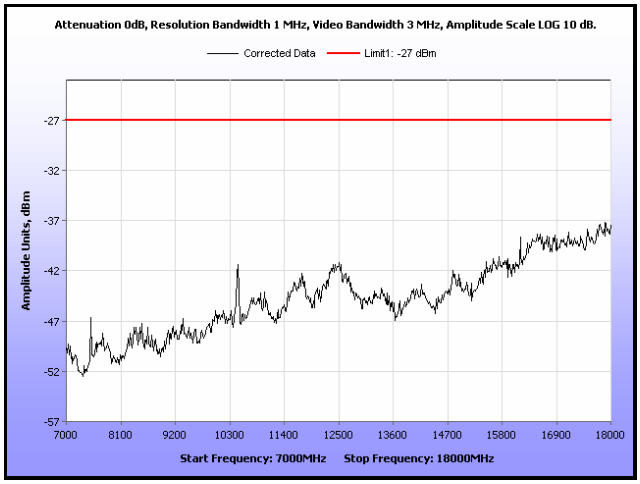
Plot 233. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 0



Plot 234. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 30 MHz – 1 GHz, Antenna 0

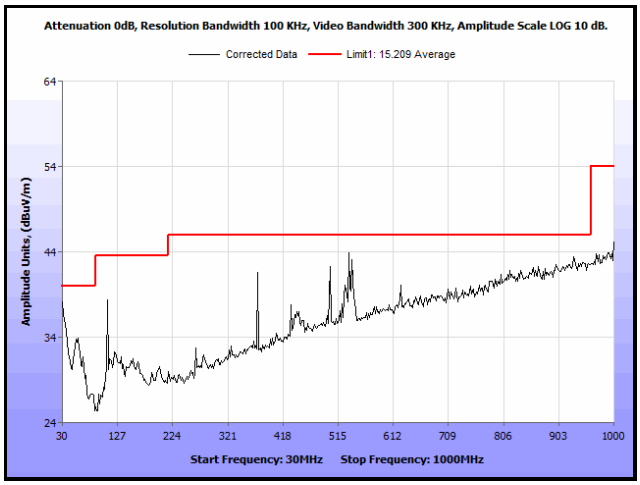


Plot 235. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 0

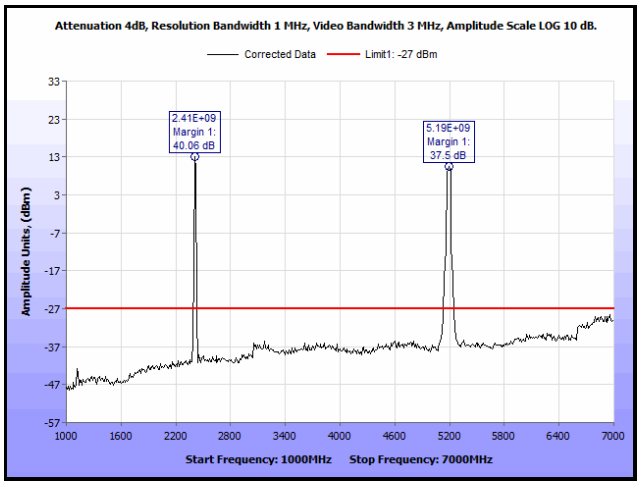


Plot 236. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 7 GHz – 18 GHz, Antenna 0

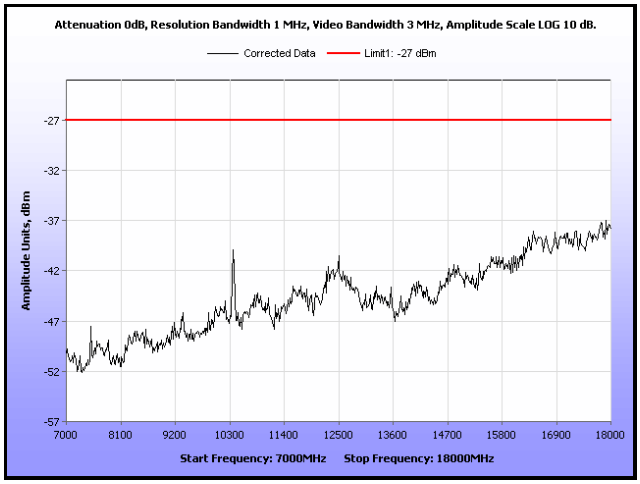
Radiated Spurious Emissions, 802.11a 40 MHz, Antenna 1



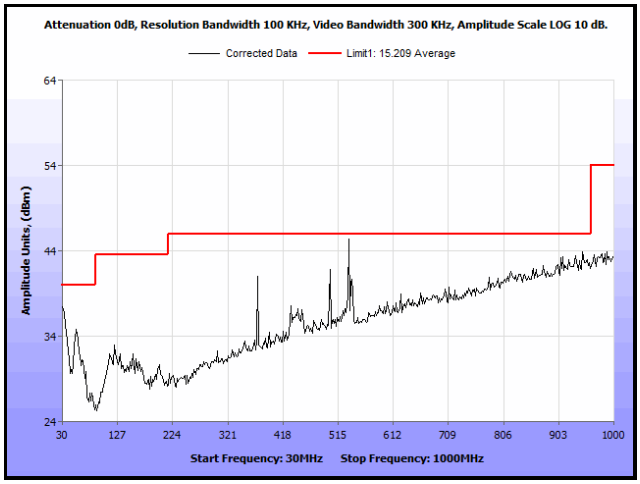
Plot 237. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 1



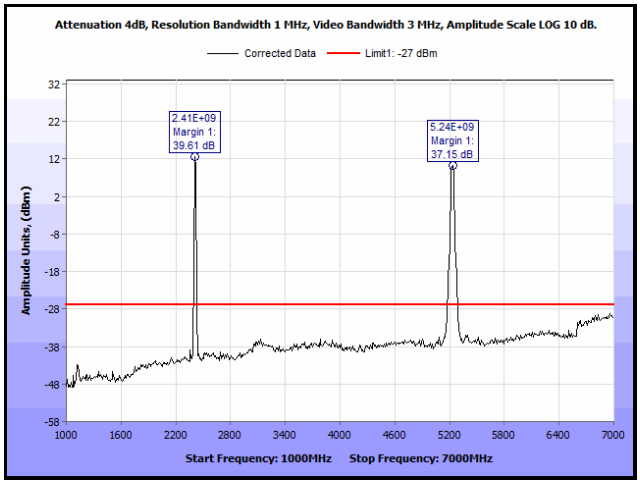
Plot 238. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 1



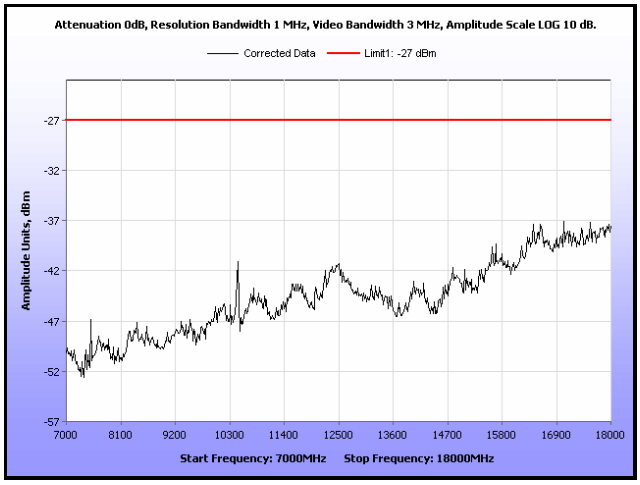
Plot 239. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 1



Plot 240. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 30 MHz – 1 GHz, Antenna 1

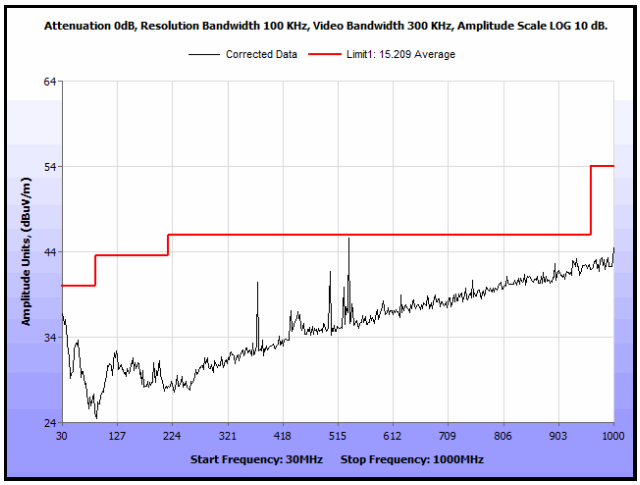


Plot 241. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 1

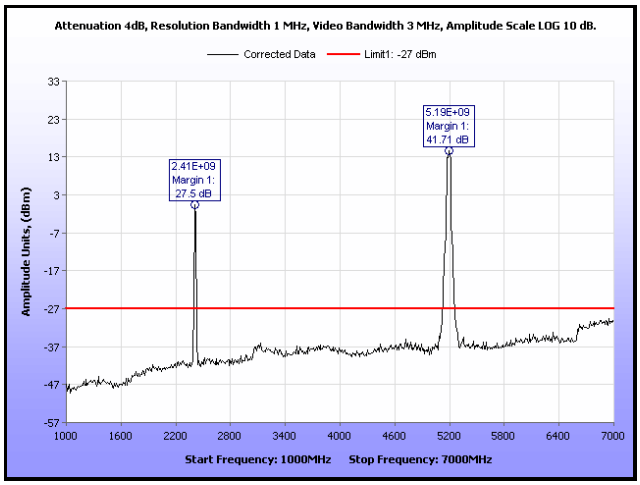


Plot 242. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 7 GHz – 18 GHz, Antenna 1

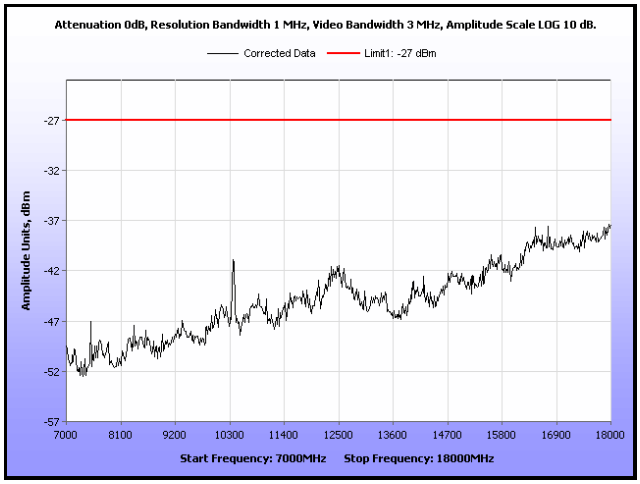
Radiated Spurious Emissions, 802.11a 40 MHz, Antenna 2



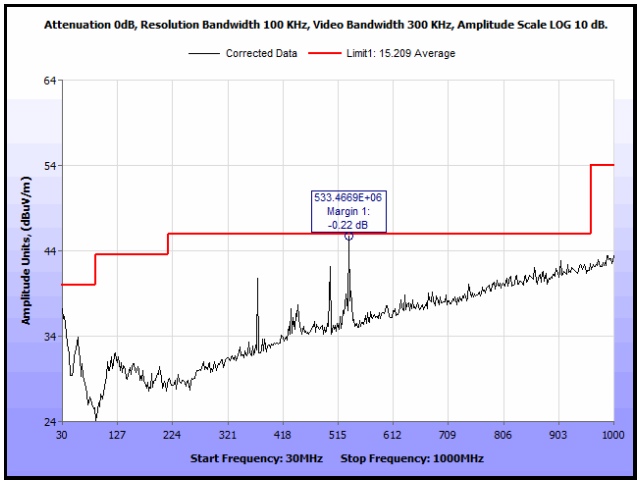
Plot 243. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 2



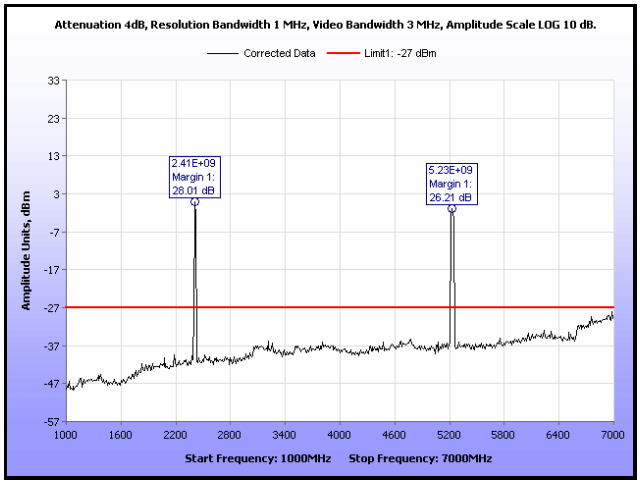
Plot 244. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 2



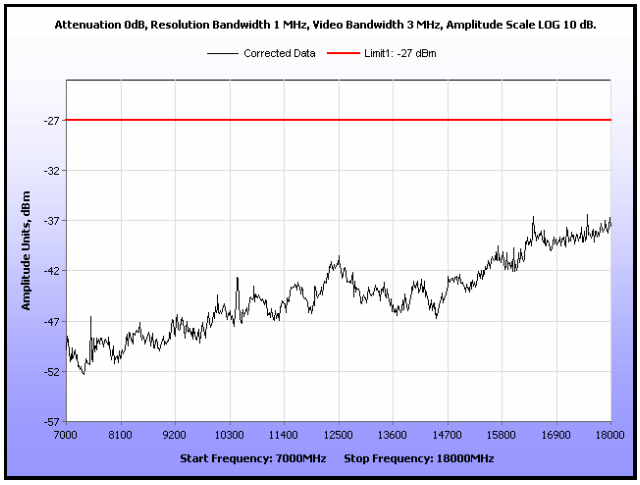
Plot 245. Radiated Spurious Emissions, 802.11a 40 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 2



Plot 246. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 30 MHz – 1 GHz, Antenna 2

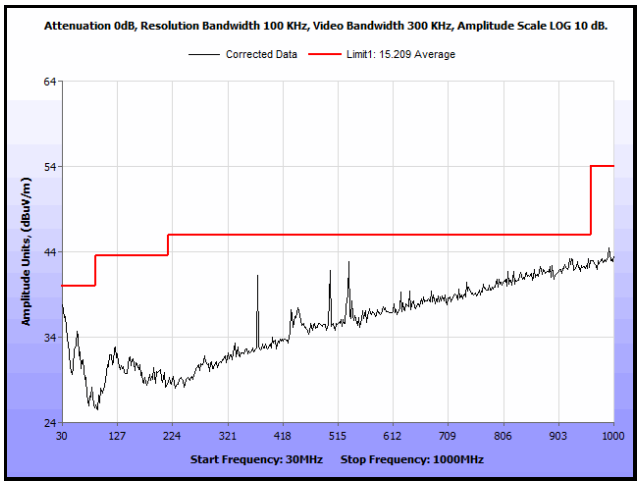


Plot 247. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 2

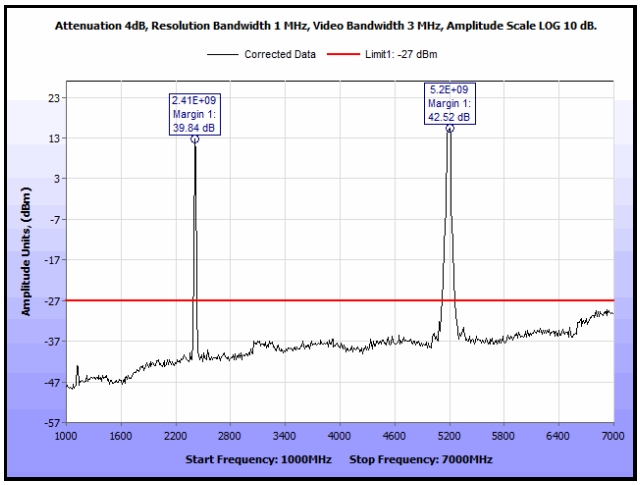


Plot 248. Radiated Spurious Emissions, 802.11a 40 MHz, High Channel, 7 GHz – 18 GHz, Antenna 2

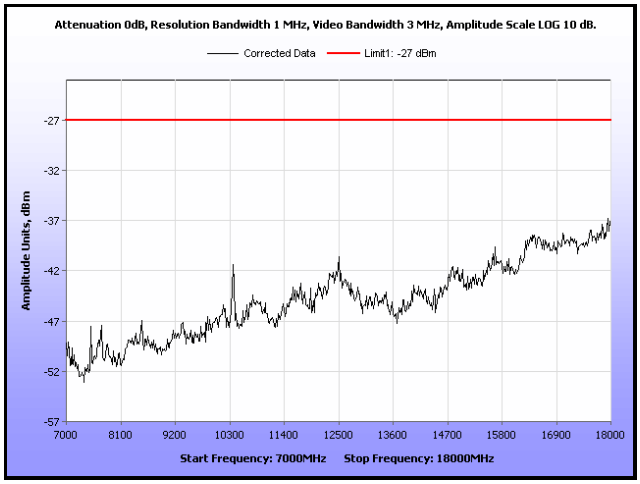
Radiated Spurious Emissions, 802.11n 40 MHz, Antenna 0



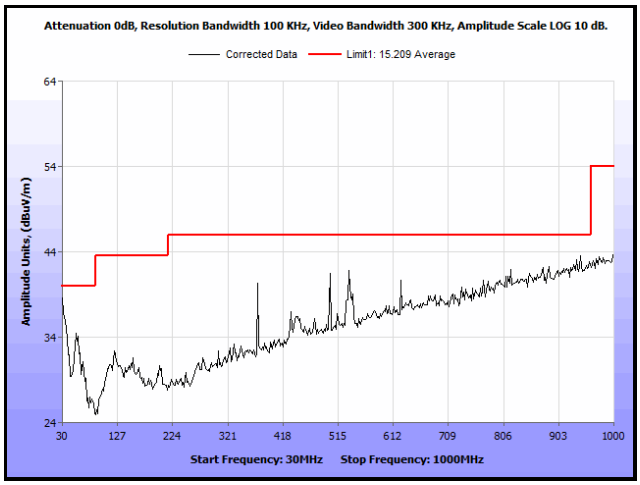
Plot 249. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 0



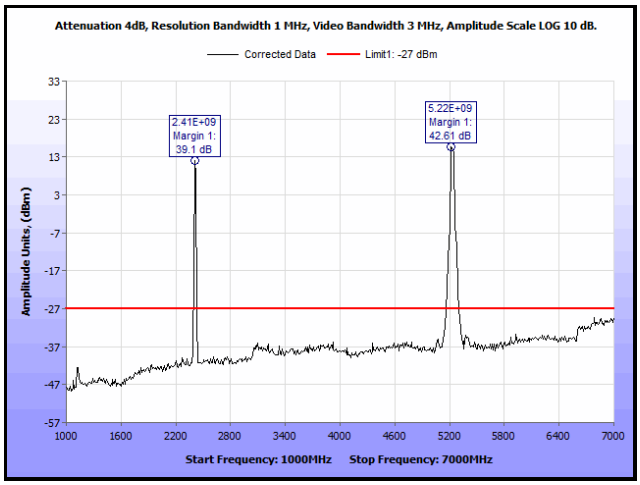
Plot 250. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 0



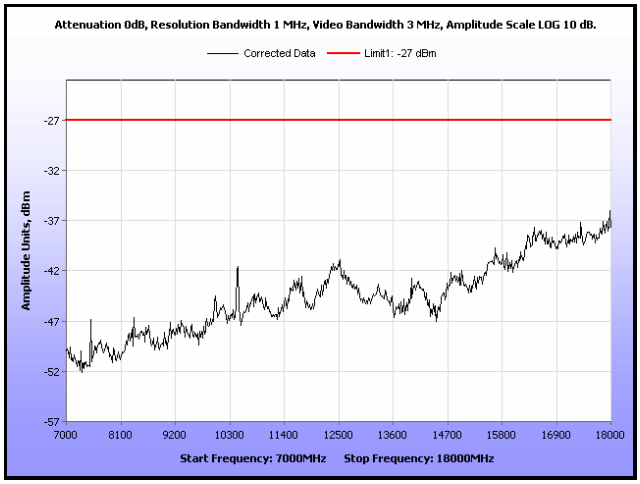
Plot 251. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 0



Plot 252. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, Antenna 0

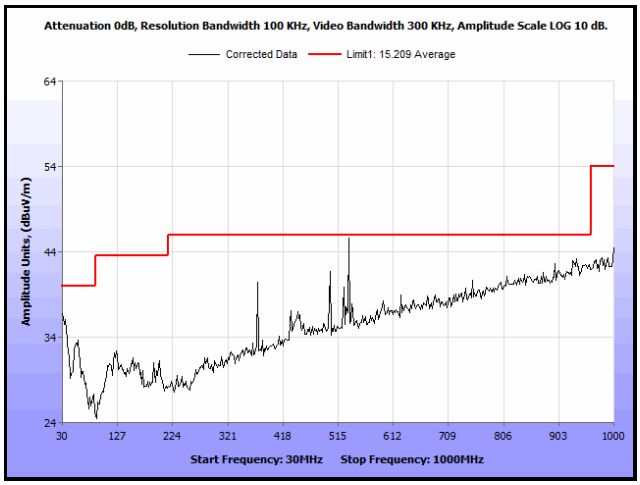


Plot 253. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 0

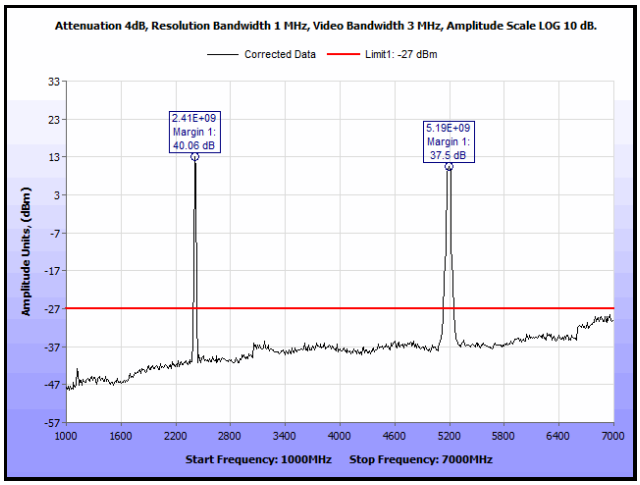


Plot 254. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, Antenna 0

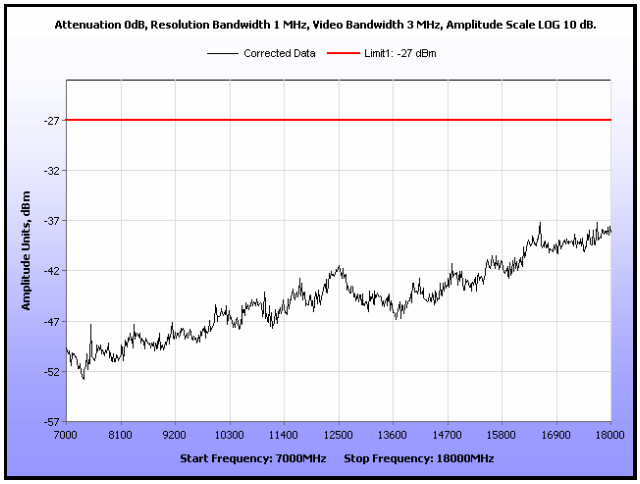
Radiated Spurious Emissions, 802.11n 40 MHz, Antenna 1



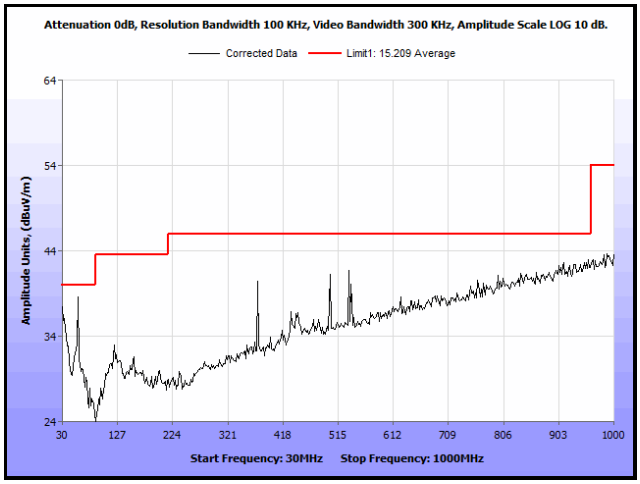
Plot 255. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 1



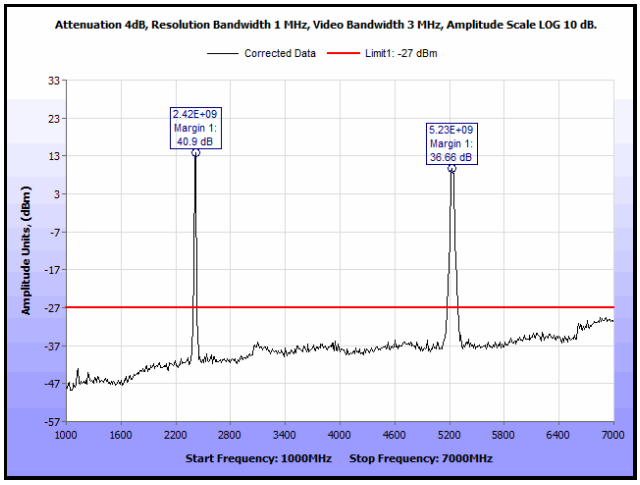
Plot 256. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 1



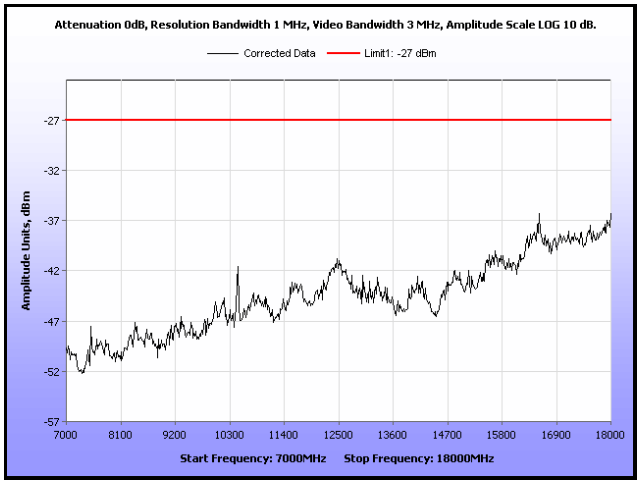
Plot 257. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 1



Plot 258. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, Antenna 1

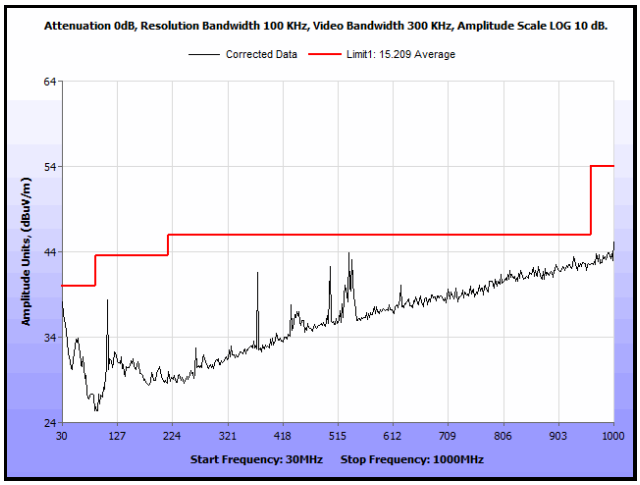


Plot 259. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 1

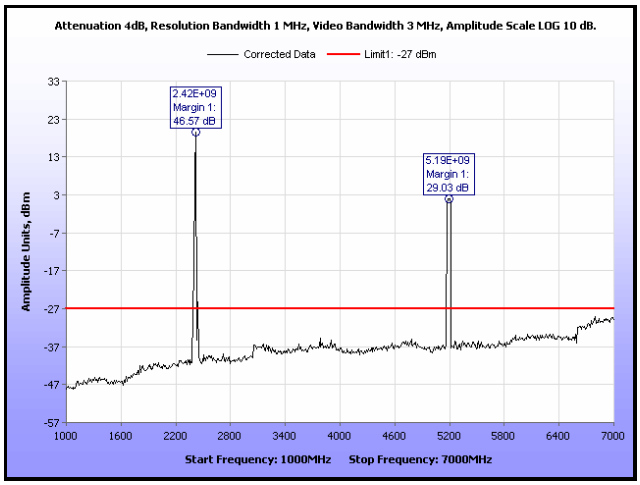


Plot 260. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, Antenna 1

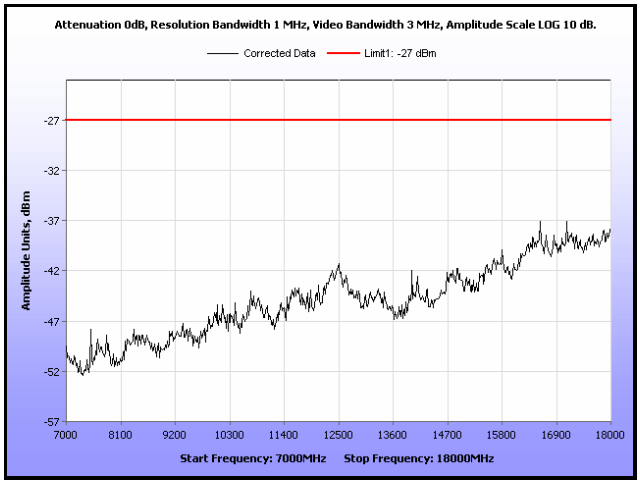
Radiated Spurious Emissions, 802.11n 40 MHz, Antenna 2



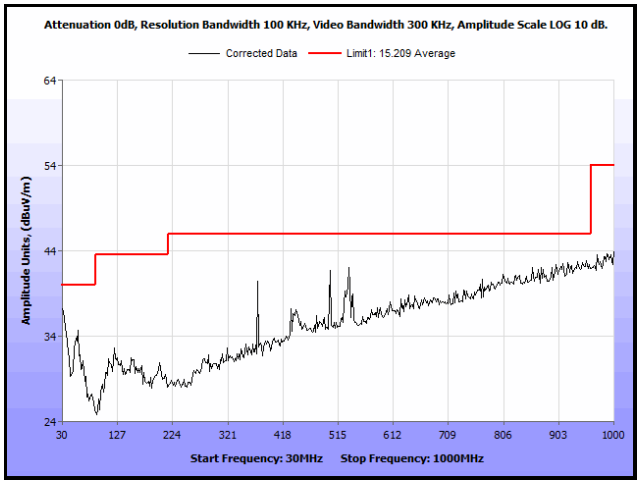
Plot 261. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, Antenna 2



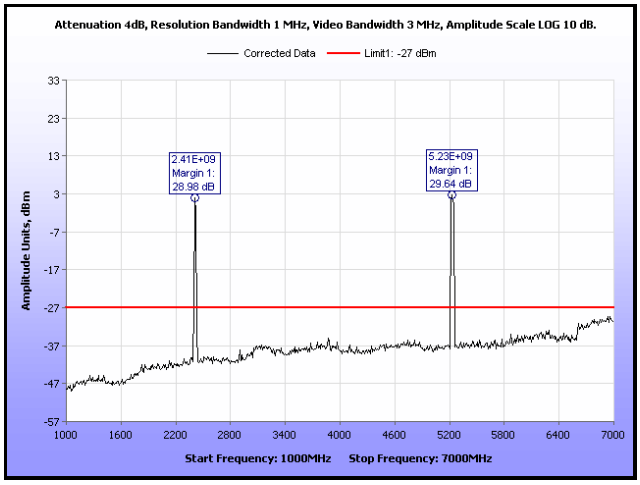
Plot 262. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, Antenna 2



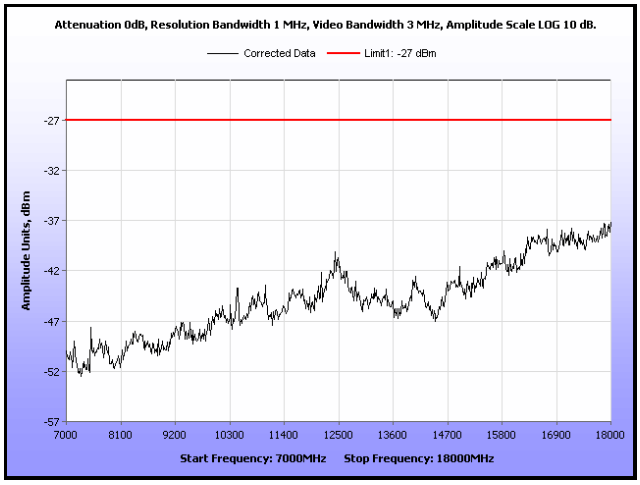
Plot 263. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, Antenna 2



Plot 264. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, Antenna 2

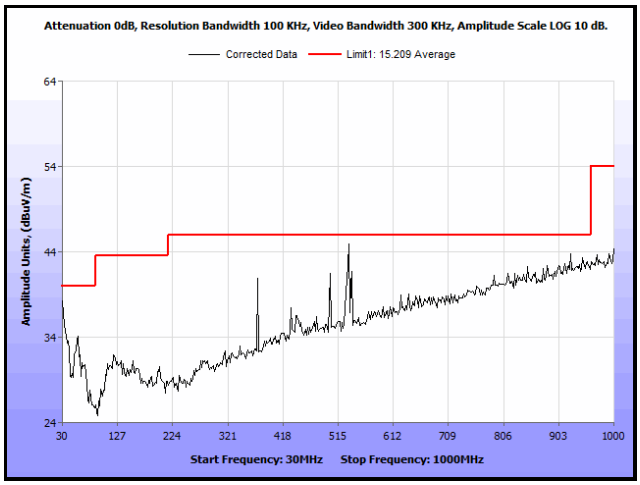


Plot 265. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, Antenna 2

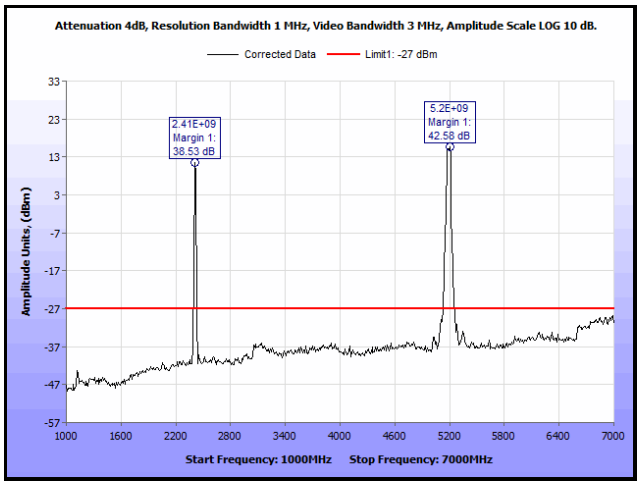


Plot 266. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, Antenna 2

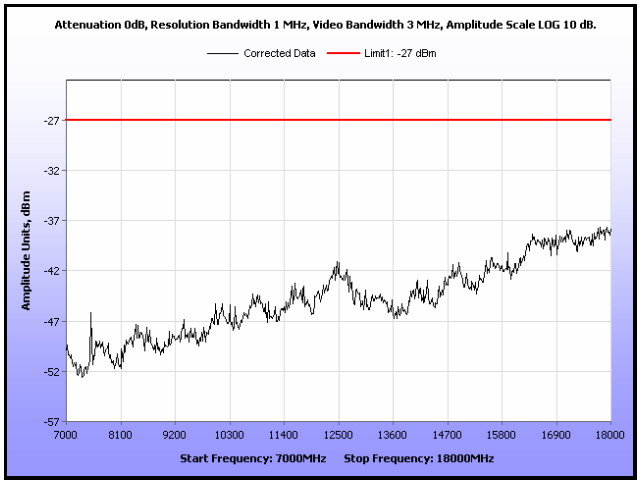
Radiated Spurious Emissions, 802.11n 40 MHz, MIMO



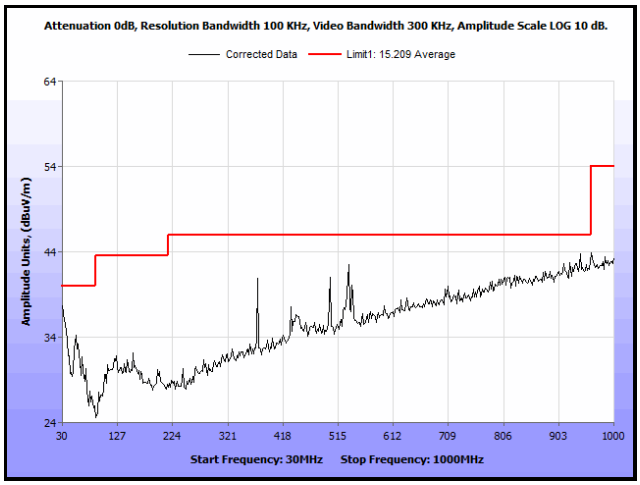
Plot 267. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 30 MHz – 1 GHz, MIMO



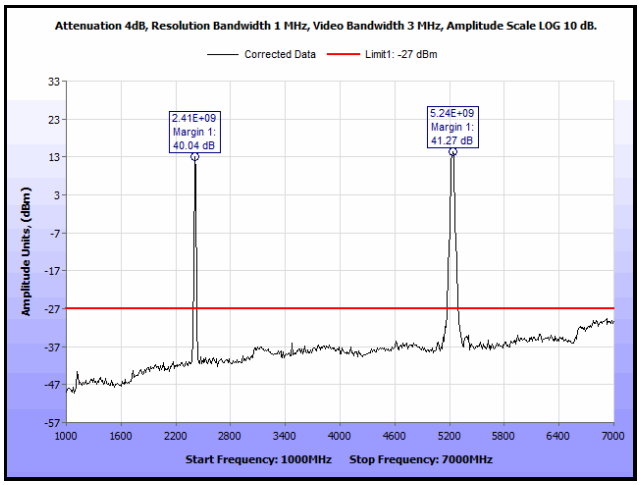
Plot 268. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, MIMO



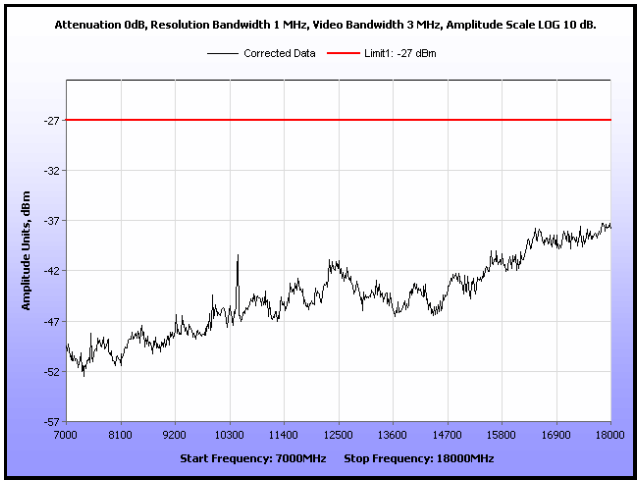
Plot 269. Radiated Spurious Emissions, 802.11n 40 MHz, Low Channel, 7 GHz – 18 GHz, MIMO



Plot 270. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 30 MHz – 1 GHz, MIMO

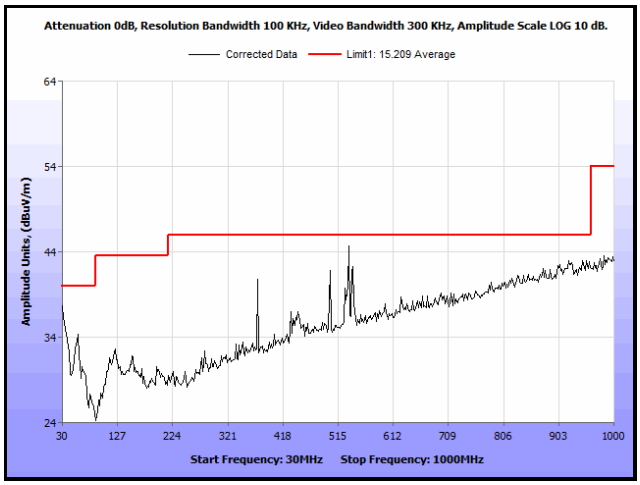


Plot 271. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, MIMO

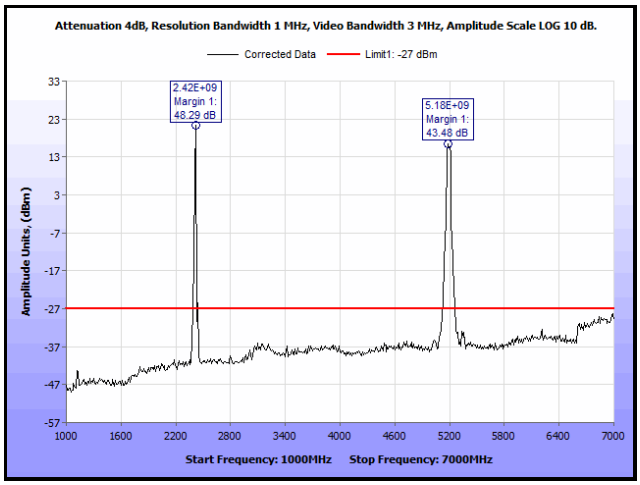


Plot 272. Radiated Spurious Emissions, 802.11n 40 MHz, High Channel, 7 GHz – 18 GHz, MIMO

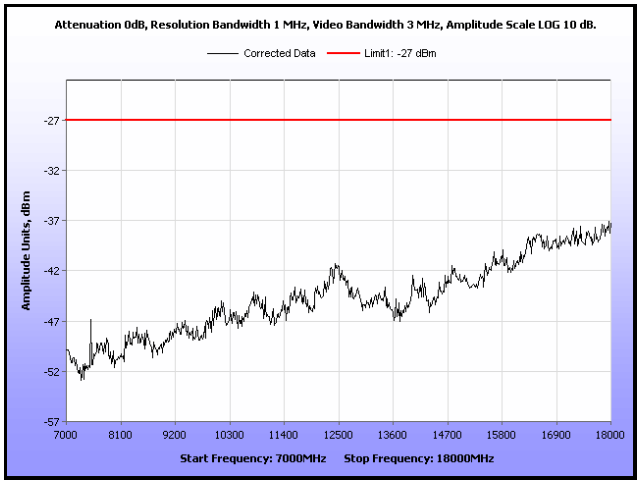
Radiated Spurious Emissions, 802.11ac 40 MHz, MIMO



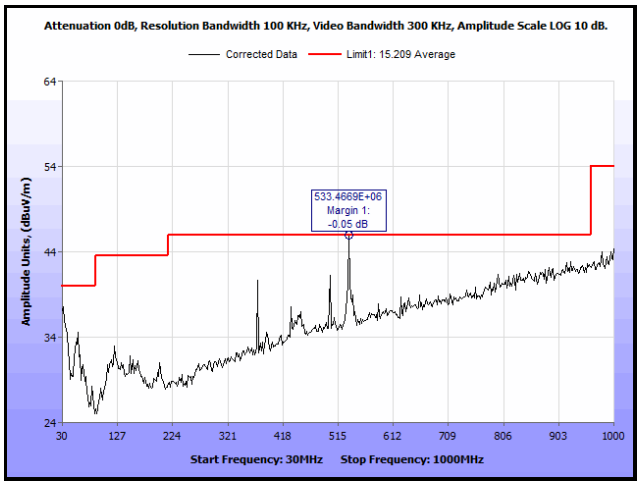
Plot 273. Radiated Spurious Emissions, 802.11ac 40 MHz, Low Channel, 30 MHz – 1 GHz, MIMO



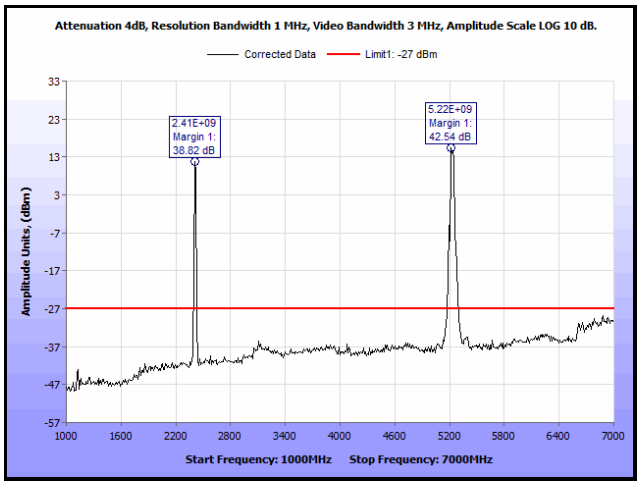
Plot 274. Radiated Spurious Emissions, 802.11ac 40 MHz, Low Channel, 1 GHz – 7 GHz, Peak, MIMO



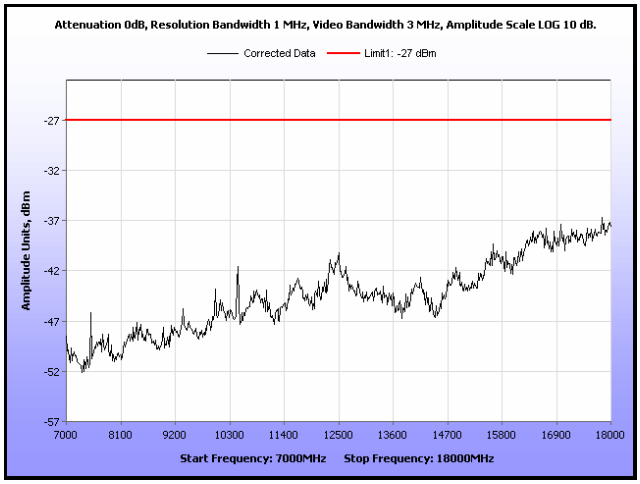
Plot 275. Radiated Spurious Emissions, 802.11ac 40 MHz, Low Channel, 7 GHz – 18 GHz, MIMO



Plot 276. Radiated Spurious Emissions, 802.11ac 40 MHz, High Channel, 30 MHz – 1 GHz, MIMO

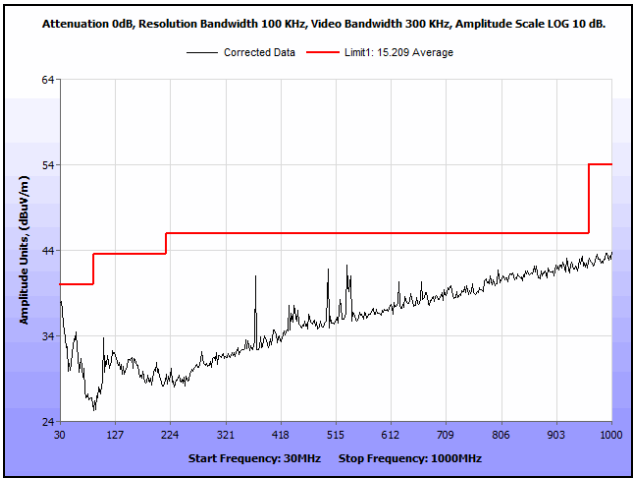


Plot 277. Radiated Spurious Emissions, 802.11ac 40 MHz, High Channel, 1 GHz – 7 GHz, Peak, MIMO

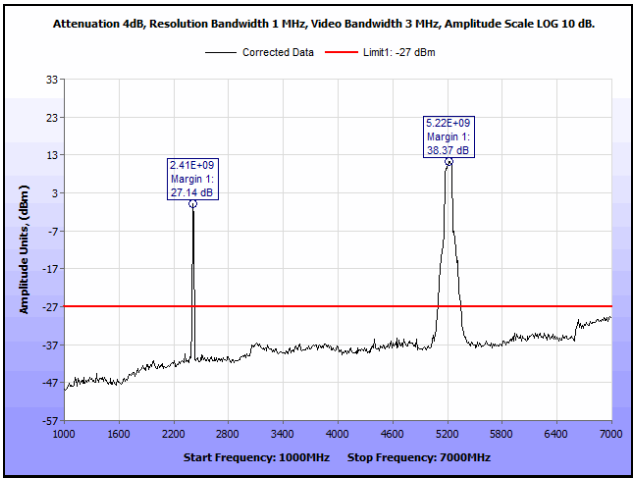


Plot 278. Radiated Spurious Emissions, 802.11ac 40 MHz, High Channel, 7 GHz – 18 GHz, MIMO

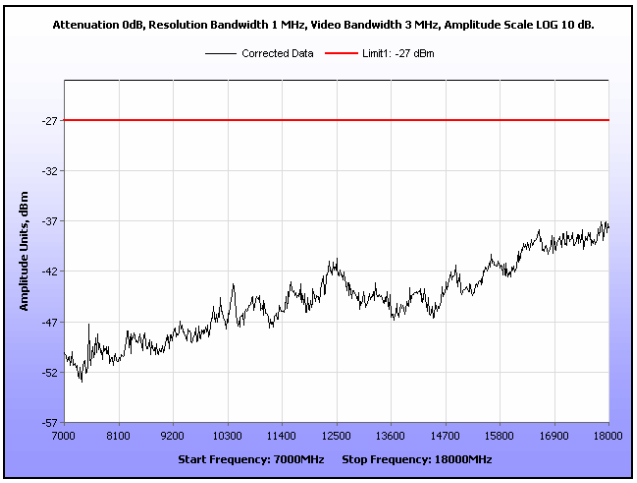
Radiated Spurious Emissions, 802.11a 80 MHz, Antenna 0



Plot 279. Radiated Spurious Emissions, 802.11a 80 MHz, 30 MHz – 1 GHz, Antenna 0

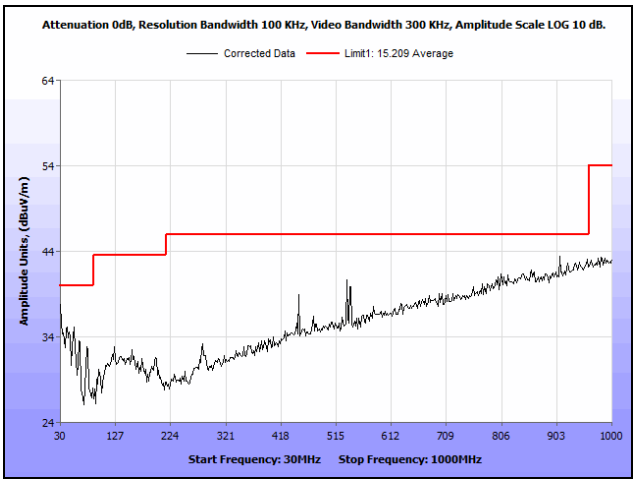


Plot 280. Radiated Spurious Emissions, 802.11a 80 MHz, 1 GHz – 7 GHz, Peak, Antenna 0

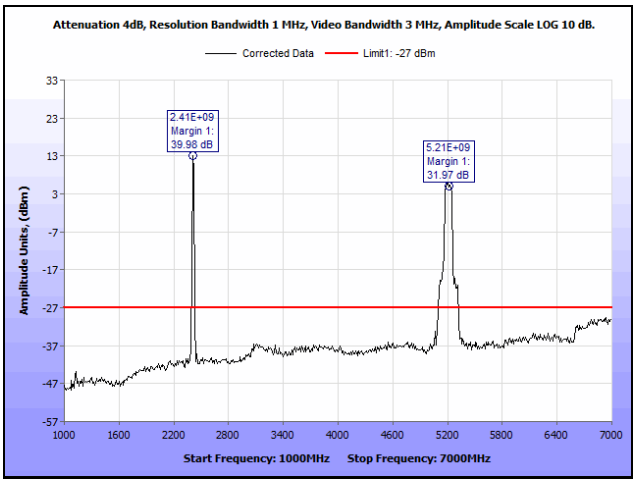


Plot 281. Radiated Spurious Emissions, 802.11a 80 MHz, 7 GHz – 18 GHz, Antenna 0

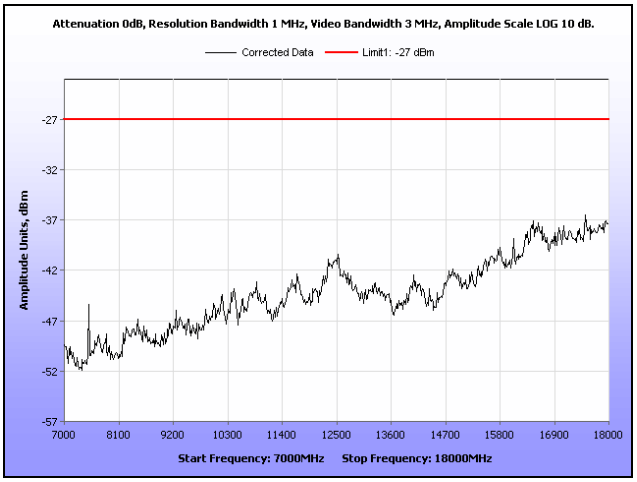
Radiated Spurious Emissions, 802.11a 80 MHz, Antenna 1



Plot 282. Radiated Spurious Emissions, 802.11a 80 MHz, 30 MHz – 1 GHz, Antenna 1

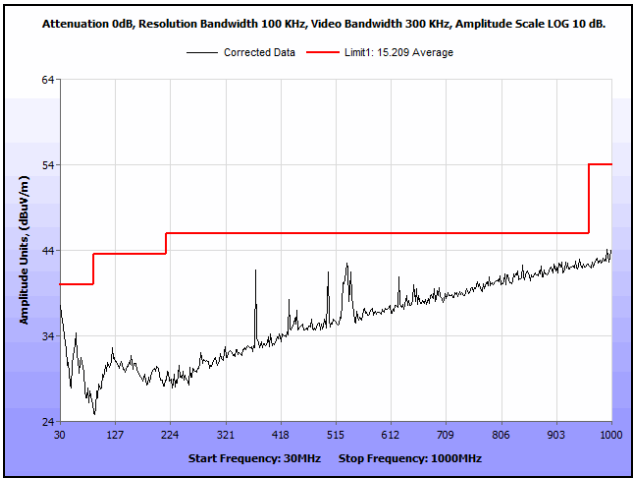


Plot 283. Radiated Spurious Emissions, 802.11a 80 MHz, 1 GHz – 7 GHz, Peak, Antenna 1

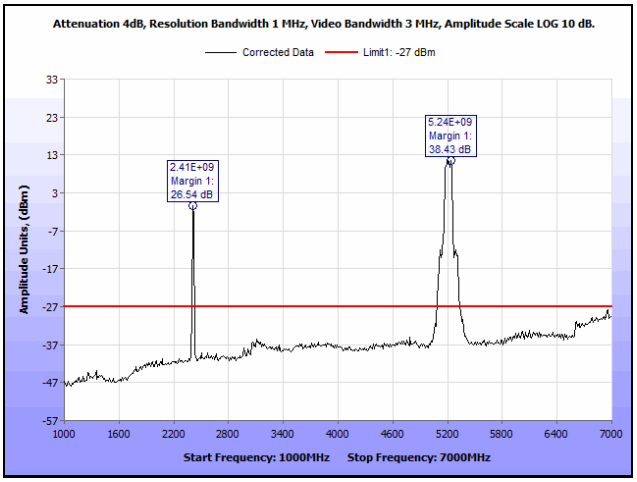


Plot 284. Radiated Spurious Emissions, 802.11a 80 MHz, 7 GHz – 18 GHz, Antenna 1

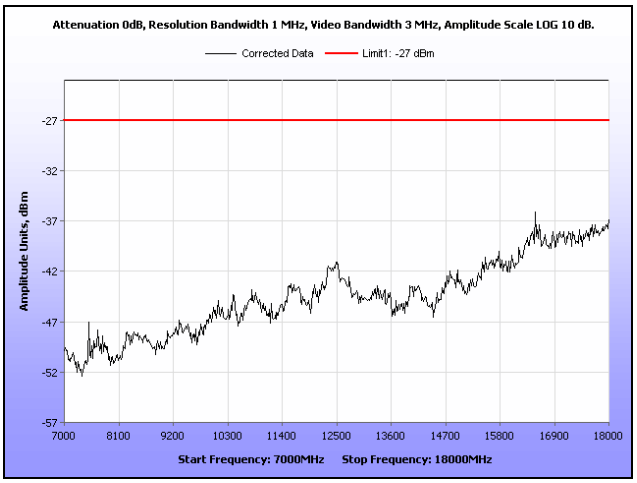
Radiated Spurious Emissions, 802.11a 80 MHz, Antenna 2



Plot 285. Radiated Spurious Emissions, 802.11a 80 MHz, 30 MHz – 1 GHz, Antenna 2

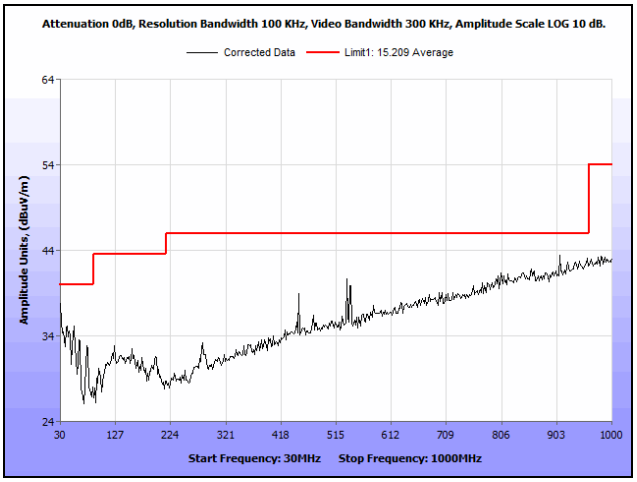


Plot 286. Radiated Spurious Emissions, 802.11a 80 MHz, 1 GHz – 7 GHz, Peak, Antenna 2

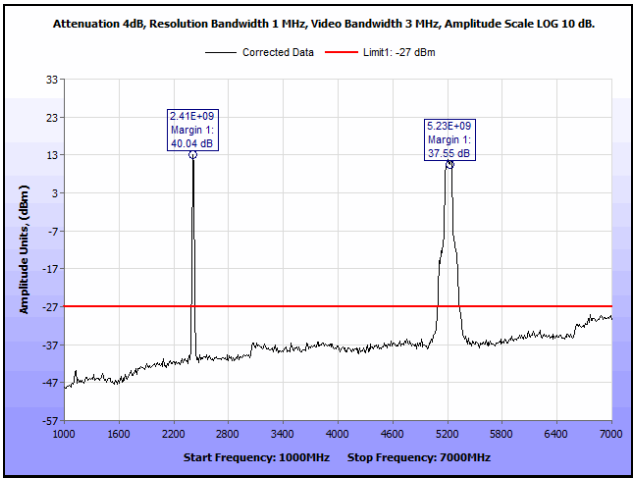


Plot 287. Radiated Spurious Emissions, 802.11a 80 MHz, 7 GHz – 18 GHz, Antenna 2

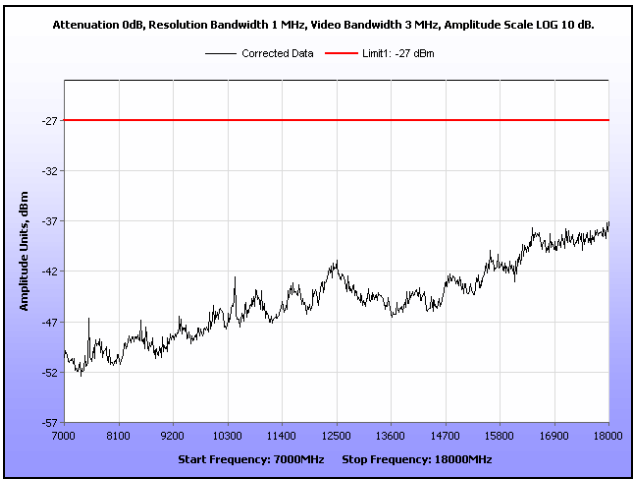
Radiated Spurious Emissions, 802.11ac 80 MHz, Antenna 0



Plot 288. Radiated Spurious Emissions, 802.11ac 80 MHz, 30 MHz – 1 GHz, Antenna 0

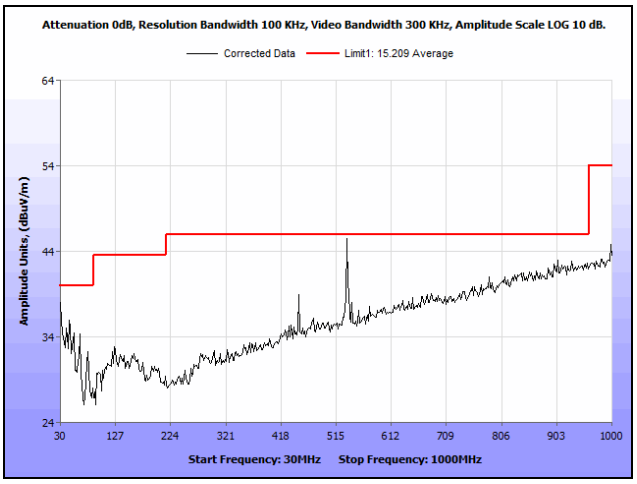


Plot 289. Radiated Spurious Emissions, 802.11ac 80 MHz, 1 GHz – 7 GHz, Peak, Antenna 0

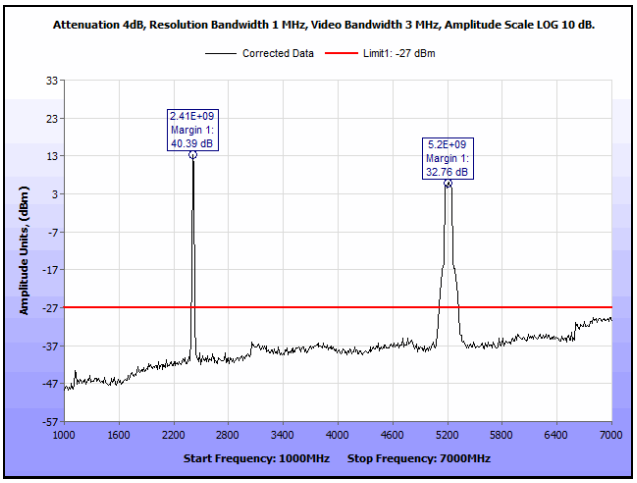


Plot 290. Radiated Spurious Emissions, 802.11ac 80 MHz, 7 GHz – 18 GHz, Antenna 0

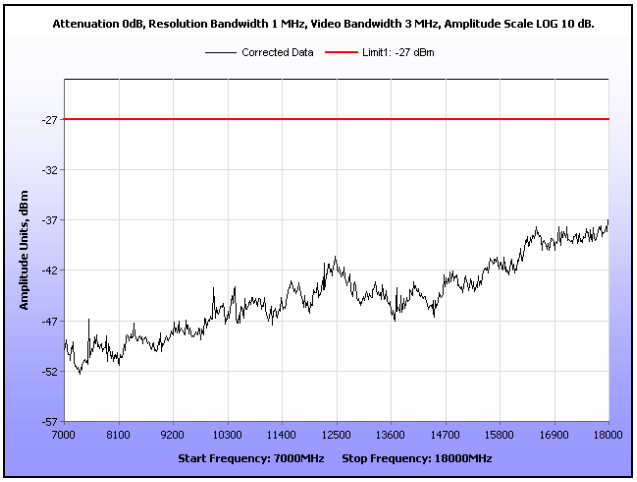
Radiated Spurious Emissions, 802.11n 80 MHz, Antenna 1



Plot 291. Radiated Spurious Emissions, 802.11ac 80 MHz, 30 MHz – 1 GHz, Antenna 1

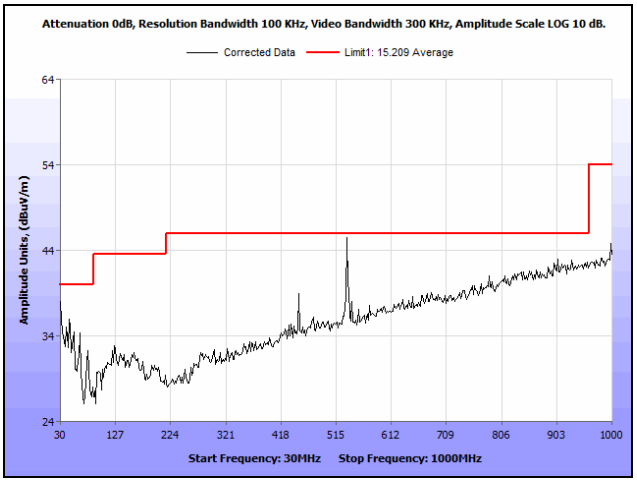


Plot 292. Radiated Spurious Emissions, 802.11ac 80 MHz, 1 GHz – 7 GHz, Peak, Antenna 1

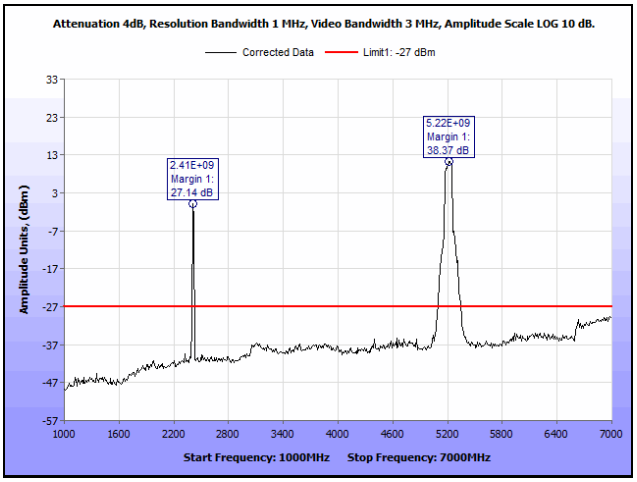


Plot 293. Radiated Spurious Emissions, 802.11ac 80 MHz, 7 GHz – 18 GHz, Antenna 1

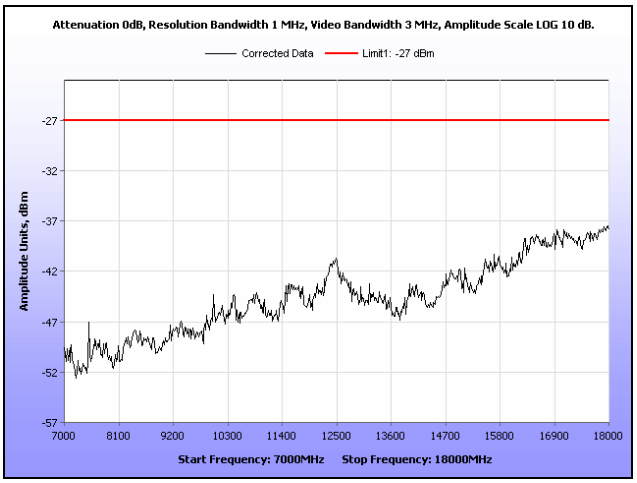
Radiated Spurious Emissions, 802.11n 80 MHz, Antenna 2



Plot 294. Radiated Spurious Emissions, 802.11ac 80 MHz, 30 MHz – 1 GHz, Antenna 2

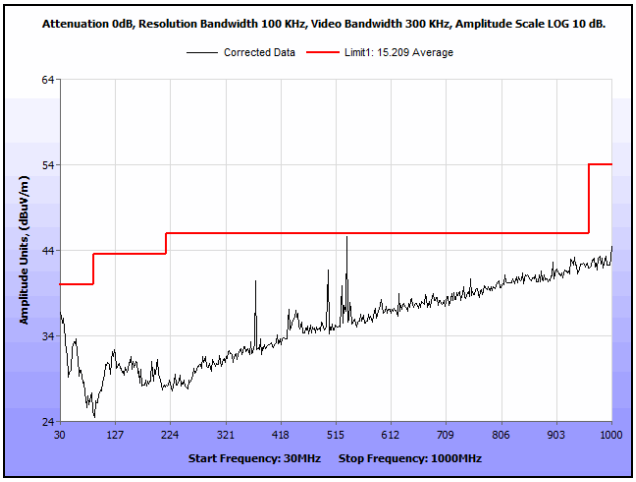


Plot 295. Radiated Spurious Emissions, 802.11ac 80 MHz, 1 GHz – 7 GHz, Peak, Antenna 2

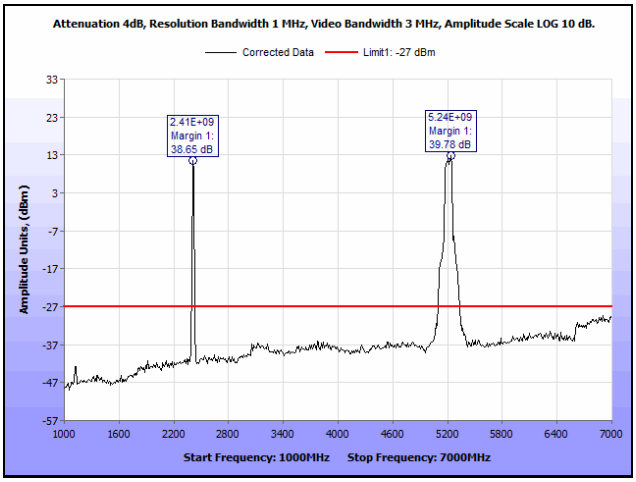


Plot 296. Radiated Spurious Emissions, 802.11ac 80 MHz, 7 GHz – 18 GHz, Antenna 2

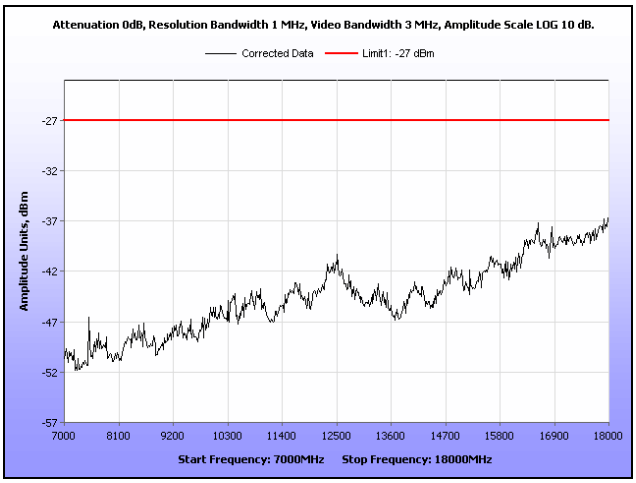
Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO



Plot 297. Radiated Spurious Emissions, 802.11ac 80 MHz, 30 MHz – 1 GHz, MIMO

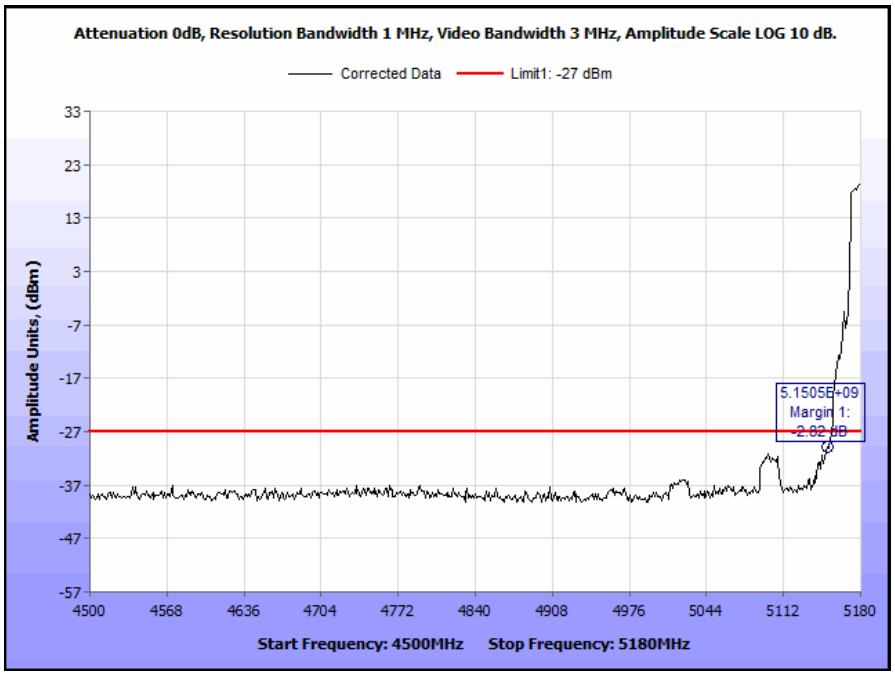


Plot 298. Radiated Spurious Emissions, 802.11ac 80 MHz, 1 GHz – 7 GHz, Peak, MIMO

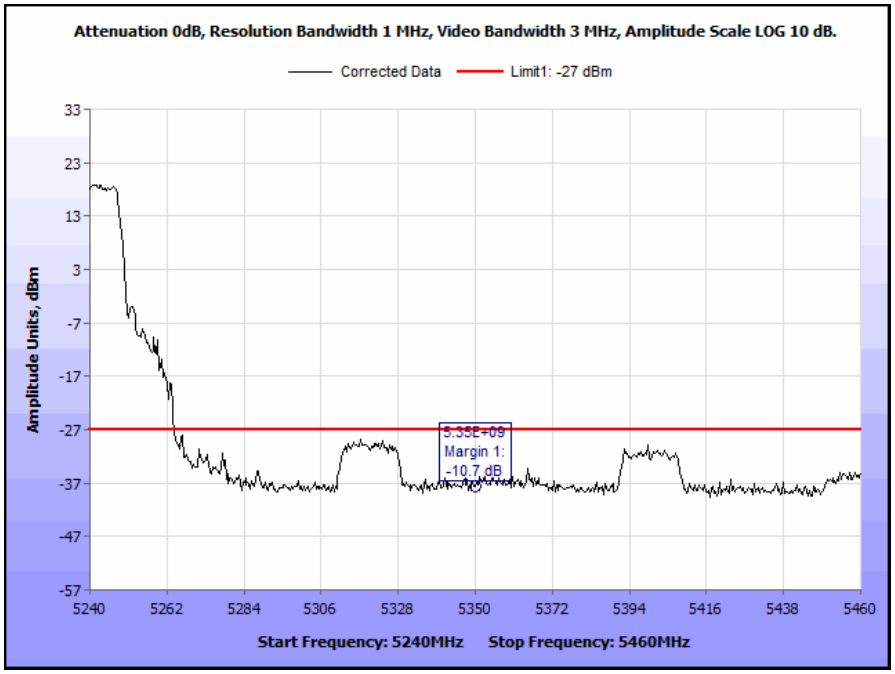


Plot 299. Radiated Spurious Emissions, 802.11ac 80 MHz, 7 GHz – 18 GHz, MIMO

Band Edge, 802.11a 20 MHz, SISO

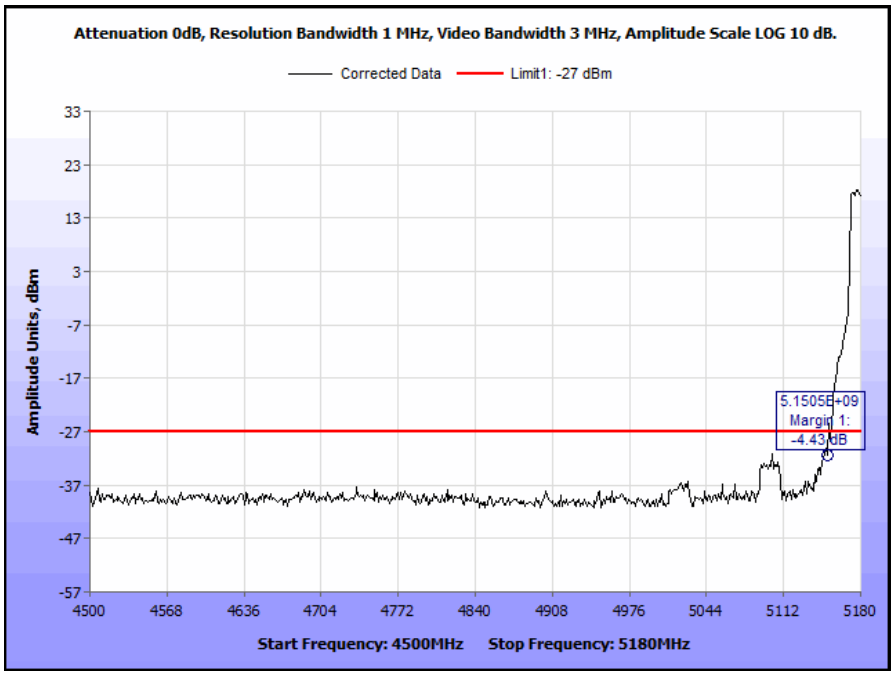


Plot 300. Radiated Band Edge, 802.11a 20 MHz, Low Channel, SISO

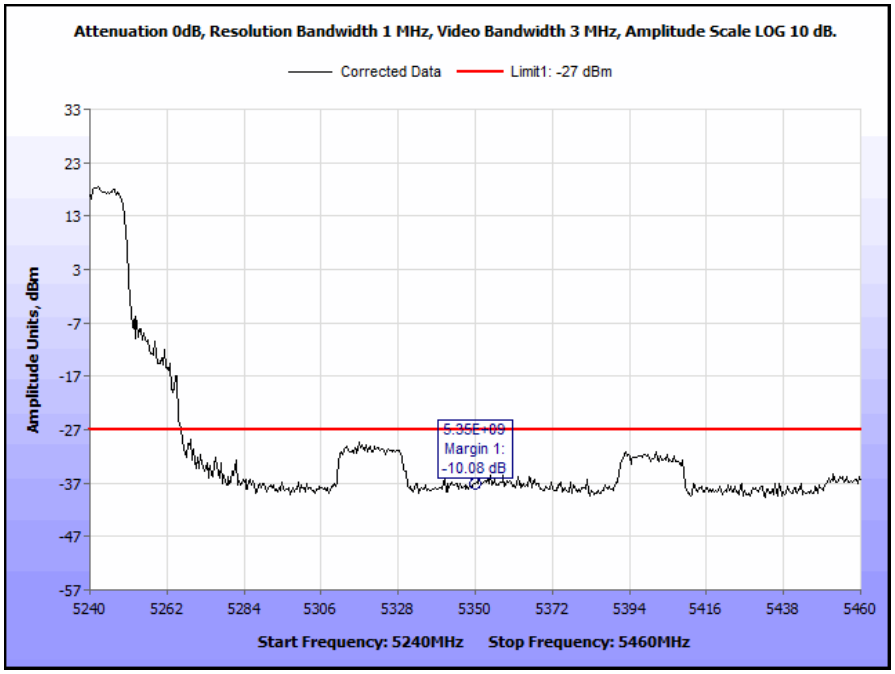


Plot 301. Radiated Band Edge, 802.11a 20 MHz, High Channel, SISO

Band Edge, 802.11n 20 MHz, SISO

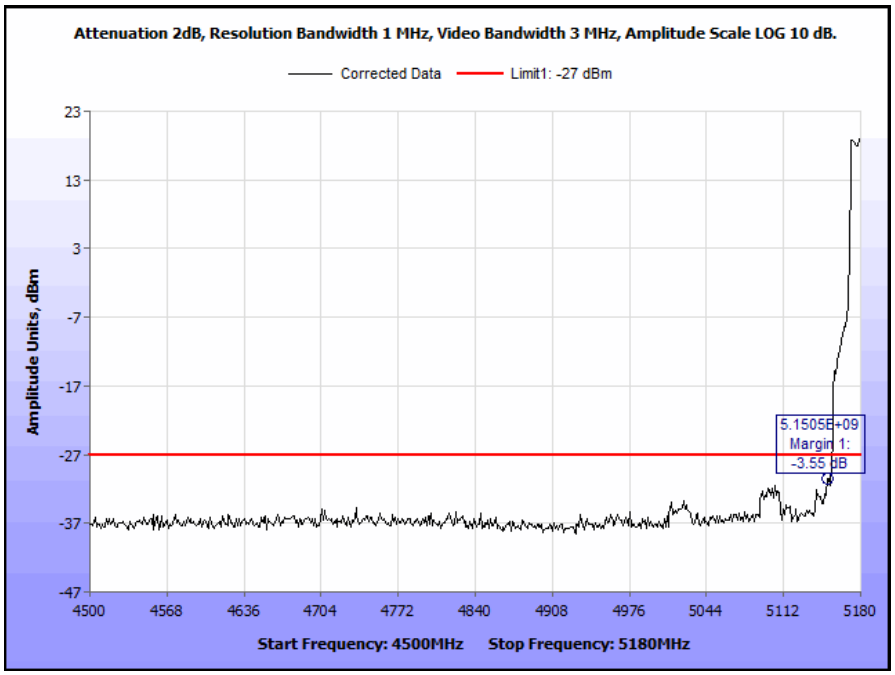


Plot 302. Radiated Band Edge, 802.11n 20 MHz, Low Channel, SISO

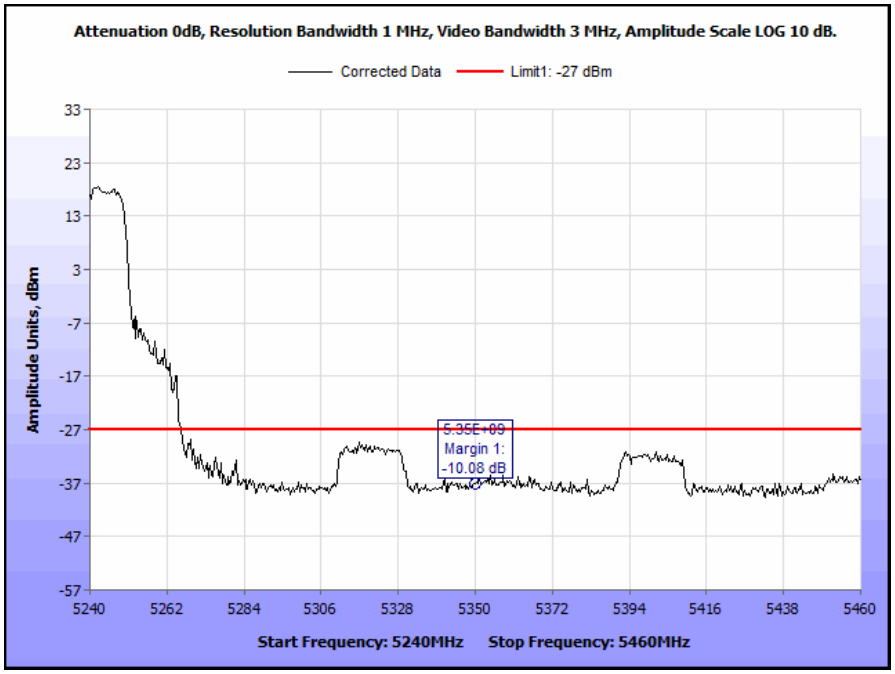


Plot 303. Radiated Band Edge, 802.11n 20 MHz, High Channel, SISO

Band Edge, 802.11n 20 MHz, MIMO

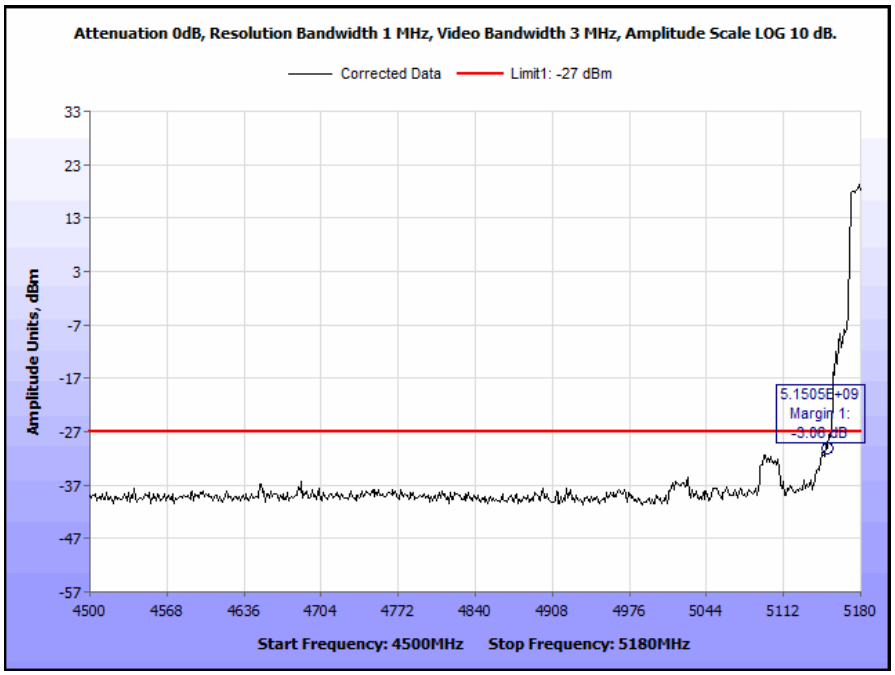


Plot 304. Radiated Band Edge, 802.11n 20 MHz, Low Channel, MIMO

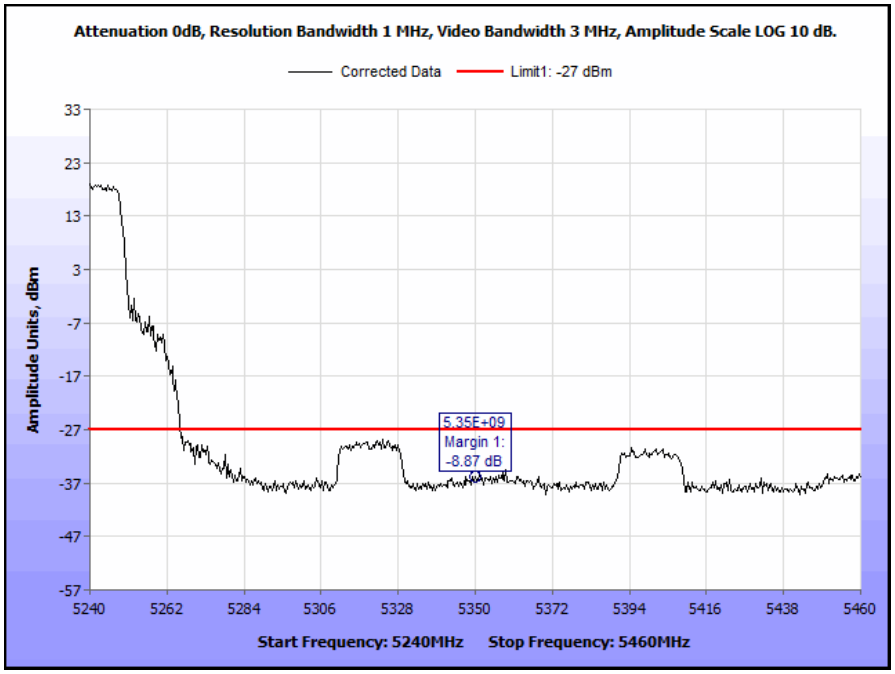


Plot 305. Radiated Band Edge, 802.11n 20 MHz, High Channel, MIMO

Band Edge, 802.11ac 20 MHz, SISO

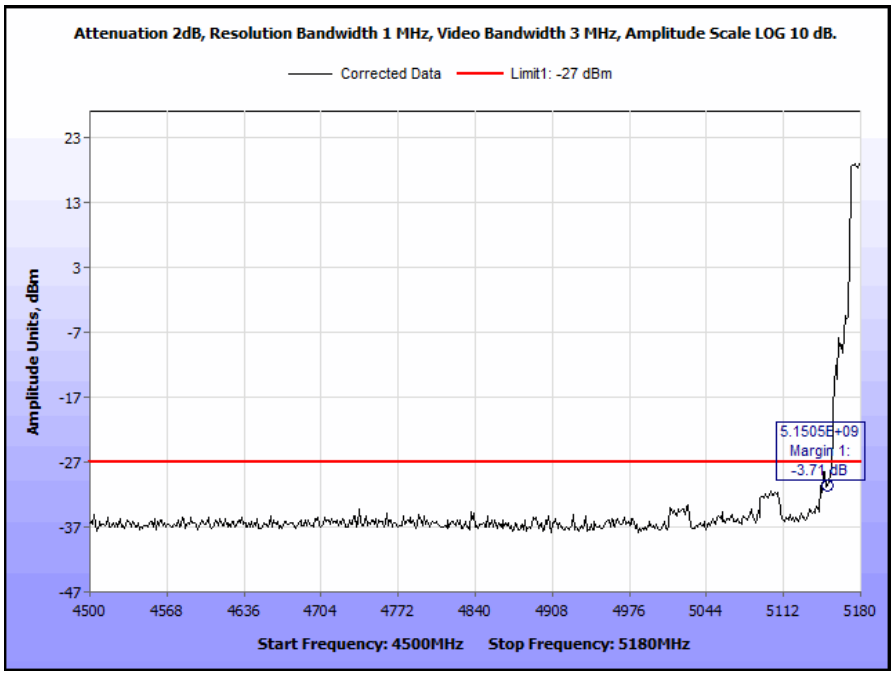


Plot 306. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, SISO

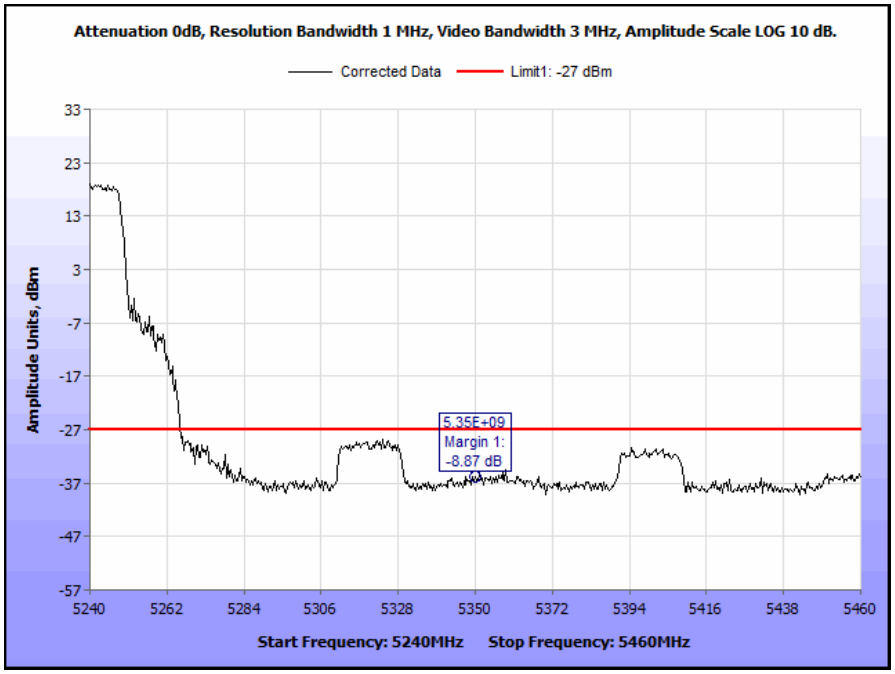


Plot 307. Radiated Band Edge, 802.11ac 20 MHz, High Channel, SISO

Band Edge, 802.11ac 20 MHz, MIMO

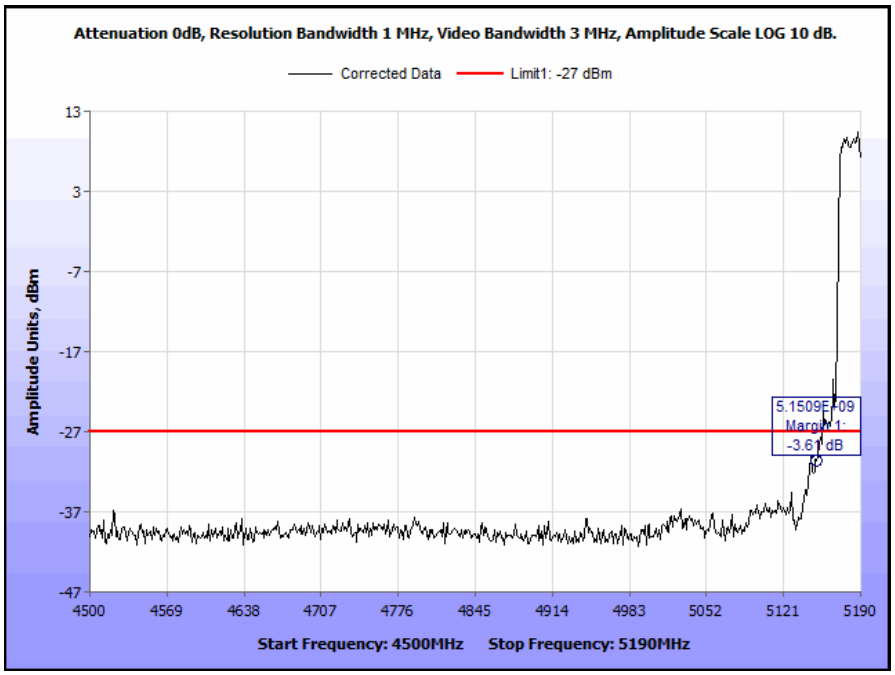


Plot 308. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, MIMO

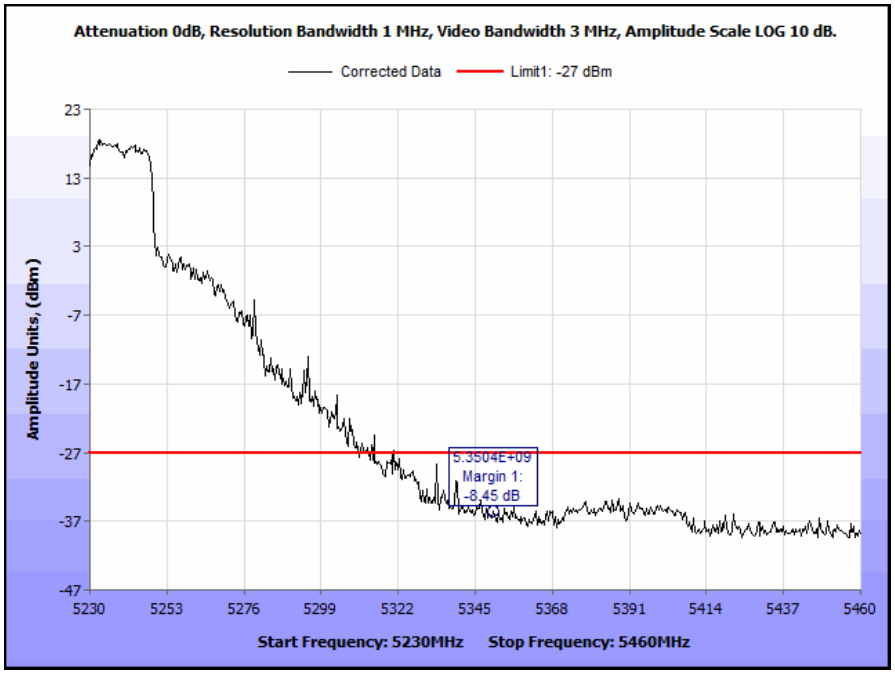


Plot 309. Radiated Band Edge, 802.11ac 20 MHz, High Channel, MIMO

Band Edge, 802.11a 40 MHz, SISO

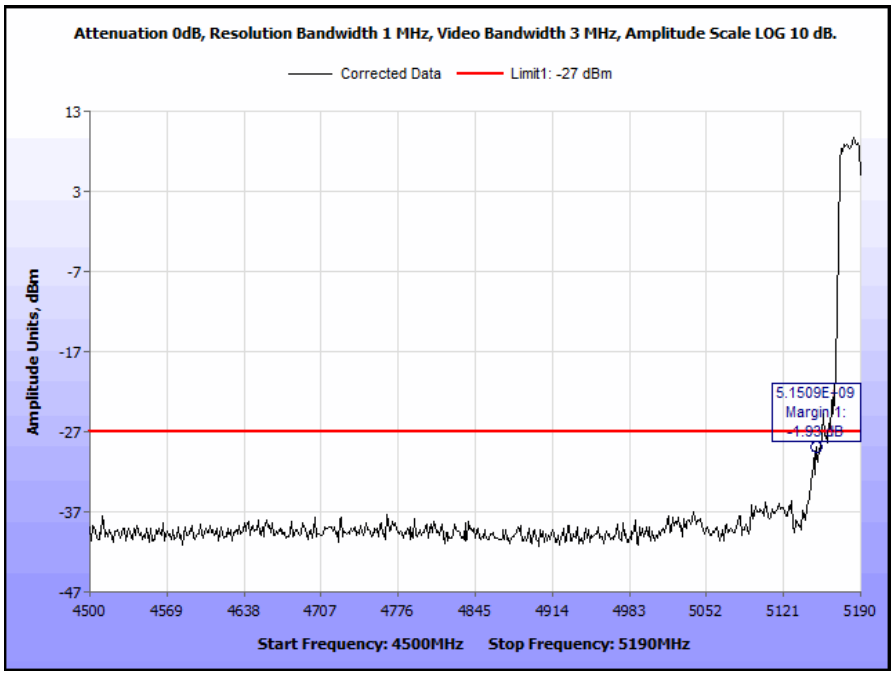


Plot 310. Radiated Band Edge, 802.11a 40 MHz, Low Channel, SISO

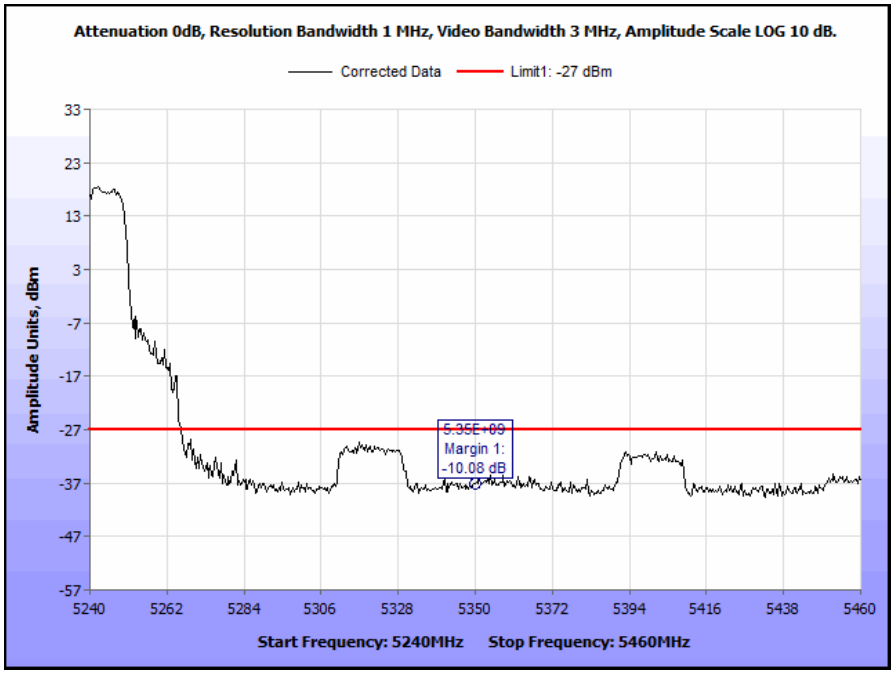


Plot 311. Radiated Band Edge, 802.11a 40 MHz, High Channel, SISO

Band Edge, 802.11n 40 MHz, SISO

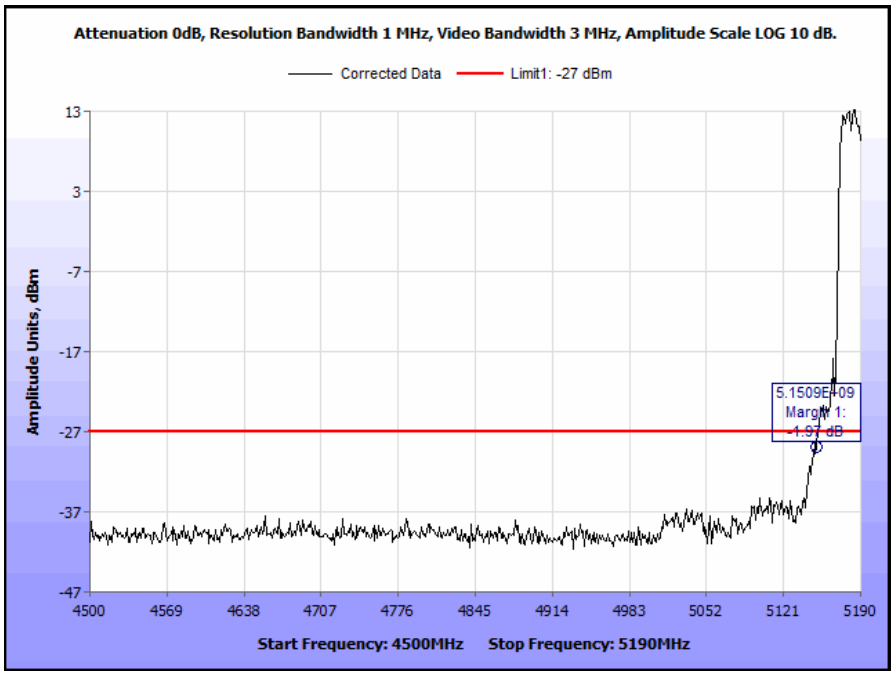


Plot 312. Radiated Band Edge, 802.11n 40 MHz, Low Channel, SISO

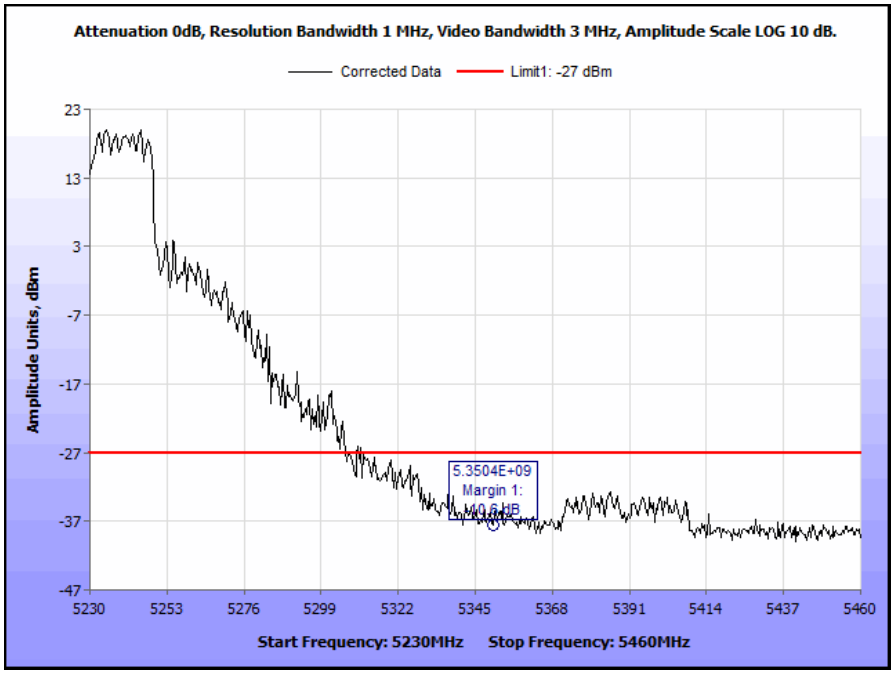


Plot 313. Radiated Band Edge, 802.11n 40 MHz, High Channel, SISO

Band Edge, 802.11n 40 MHz, MIMO

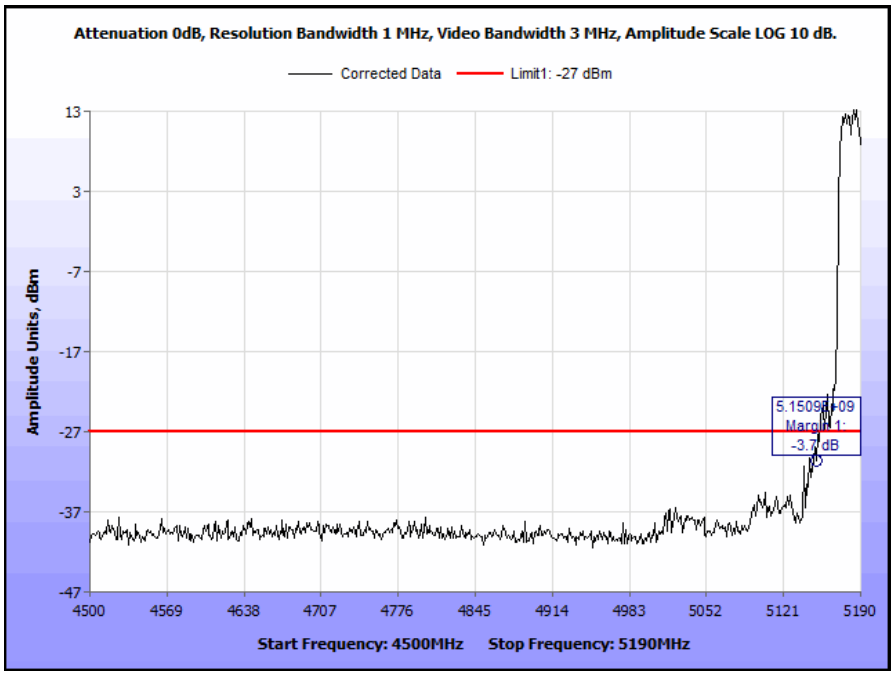


Plot 314. Radiated Band Edge, 802.11n 40 MHz, Low Channel, MIMO

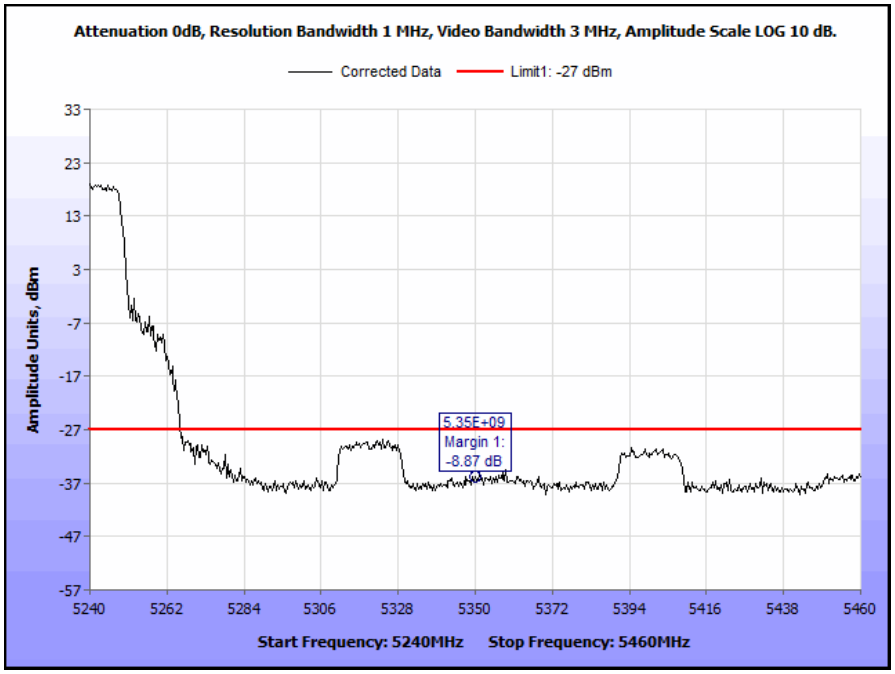


Plot 315. Radiated Band Edge, 802.11n 40 MHz, High Channel, MIMO

Band Edge, 802.11ac 40 MHz, MIMO

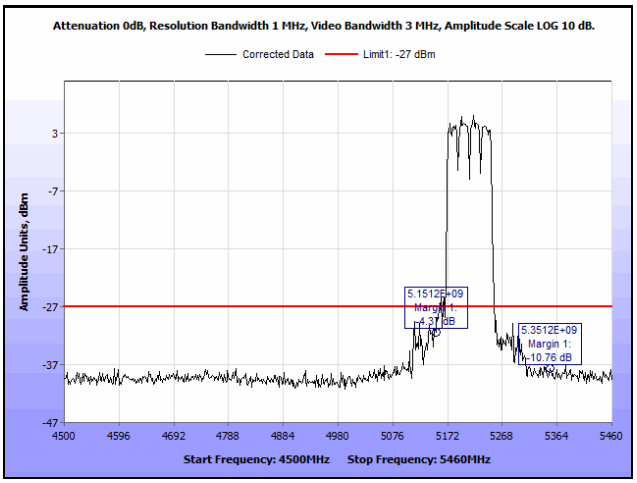


Plot 316. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, MIMO

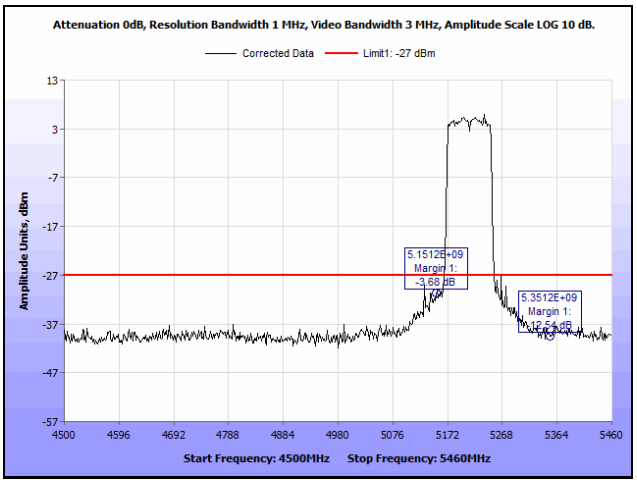


Plot 317. Radiated Band Edge, 802.11ac 40 MHz, High Channel, MIMO

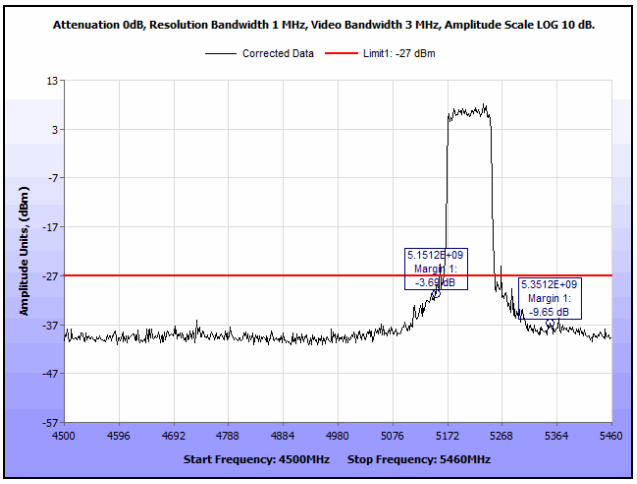
Band Edge, 802.11ac 80 MHz



Plot 318. Radiated Band Edge, 802.11a 80 MHz, SISO

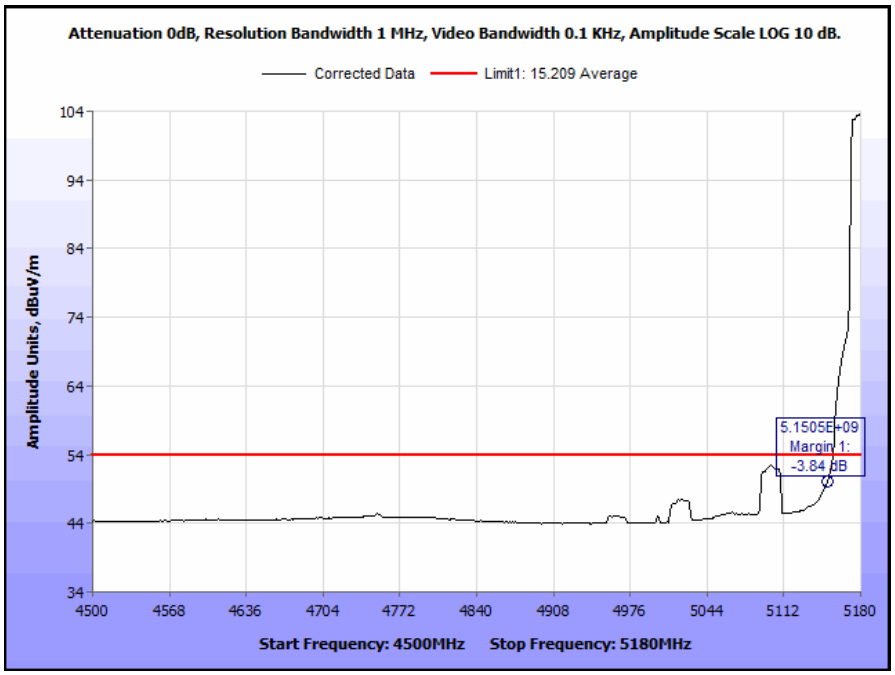


Plot 319. Radiated Band Edge, 802.11ac 80 MHz, SISO

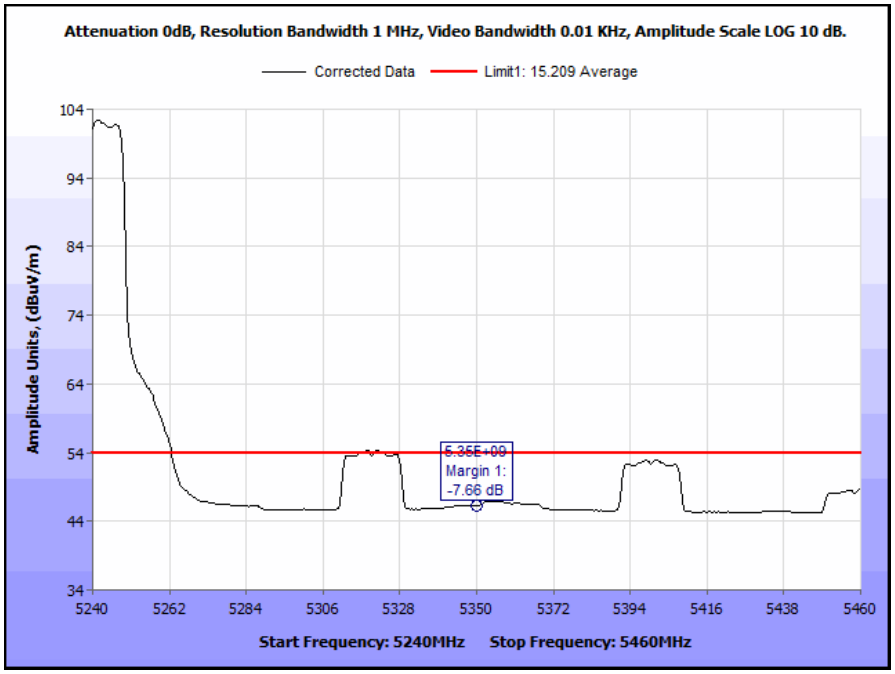


Plot 320. Radiated Band Edge, 802.11ac 80 MHz, MIMO

Restricted Band Edge, 802.11a 20 MHz, SISO

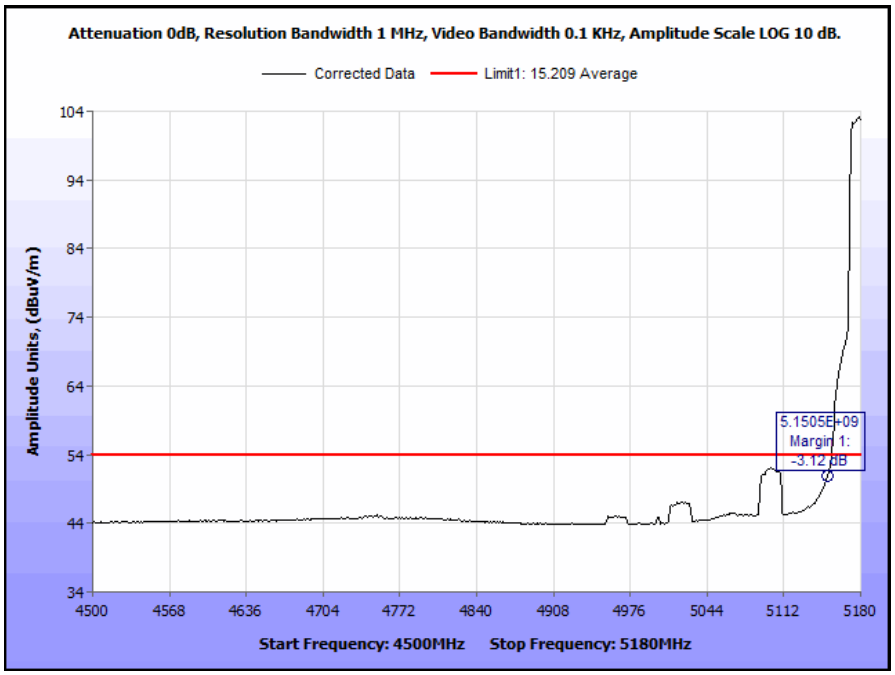


Plot 321. Radiated Restricted Band Edge, 802.11a 20 MHz, Low Channel, SISO

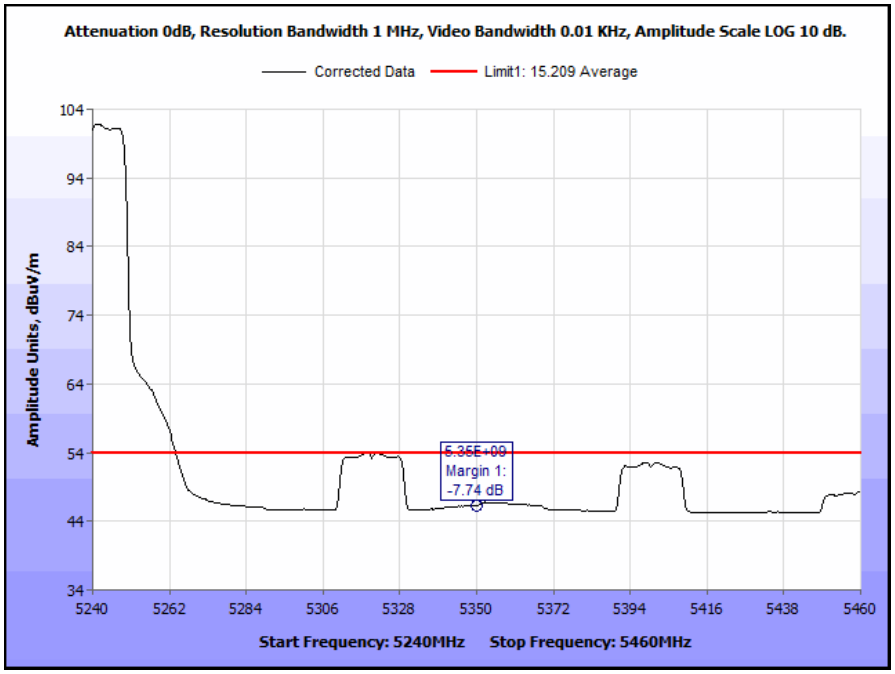


Plot 322. Radiated Restricted Band Edge, 802.11a 20 MHz, High Channel, SISO

Restricted Band Edge, 802.11n 20 MHz, SISO

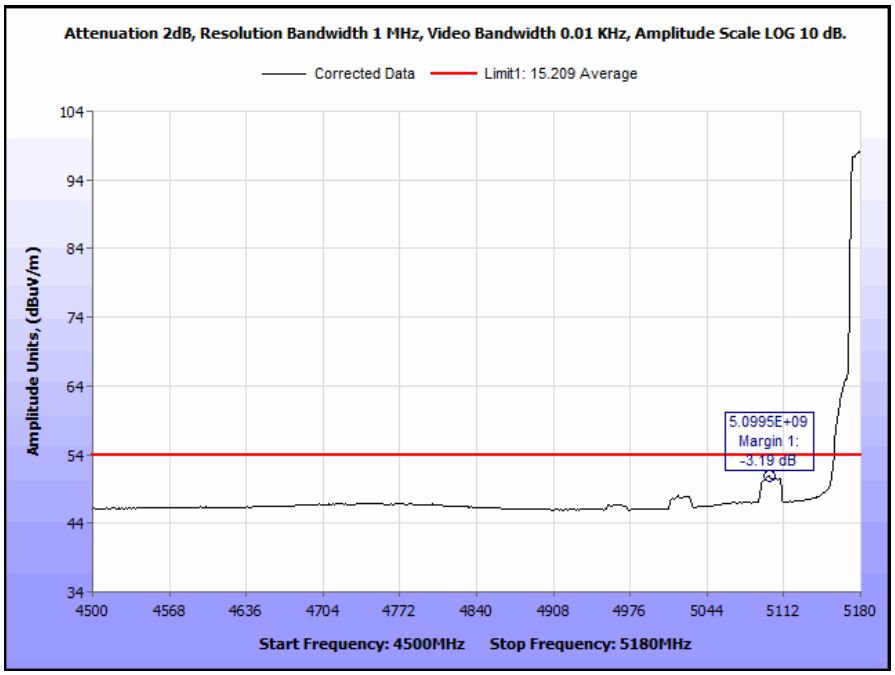


Plot 323. Radiated Restricted Band Edge, 802.11n 20 MHz, Low Channel, SISO

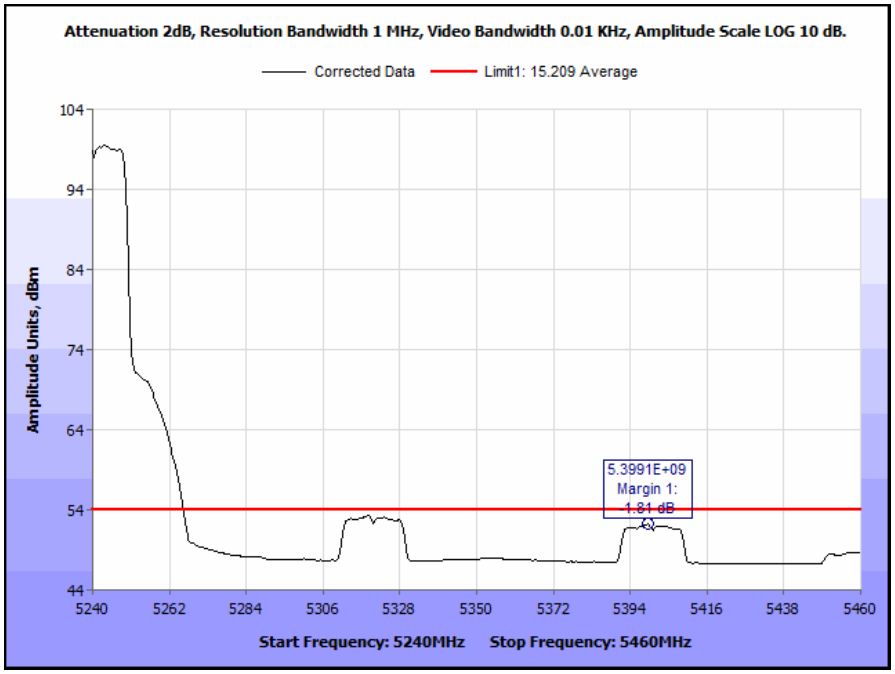


Plot 324. Radiated Restricted Band Edge, 802.11n 20 MHz, High Channel, SISO

Restricted Band Edge, 802.11n 20 MHz, MIMO

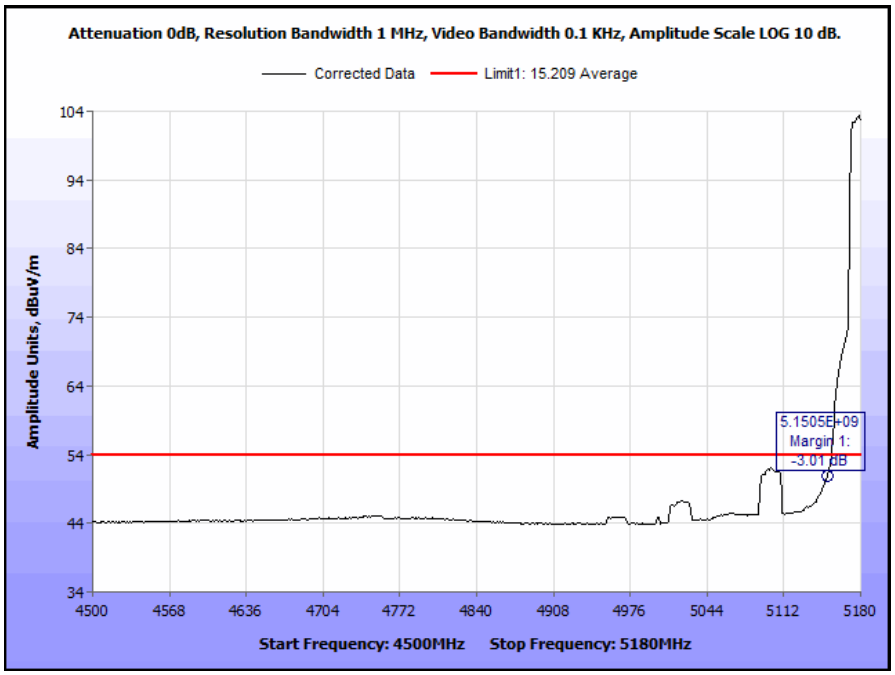


Plot 325. Radiated Restricted Band Edge, 802.11n 20 MHz, Low Channel, MIMO

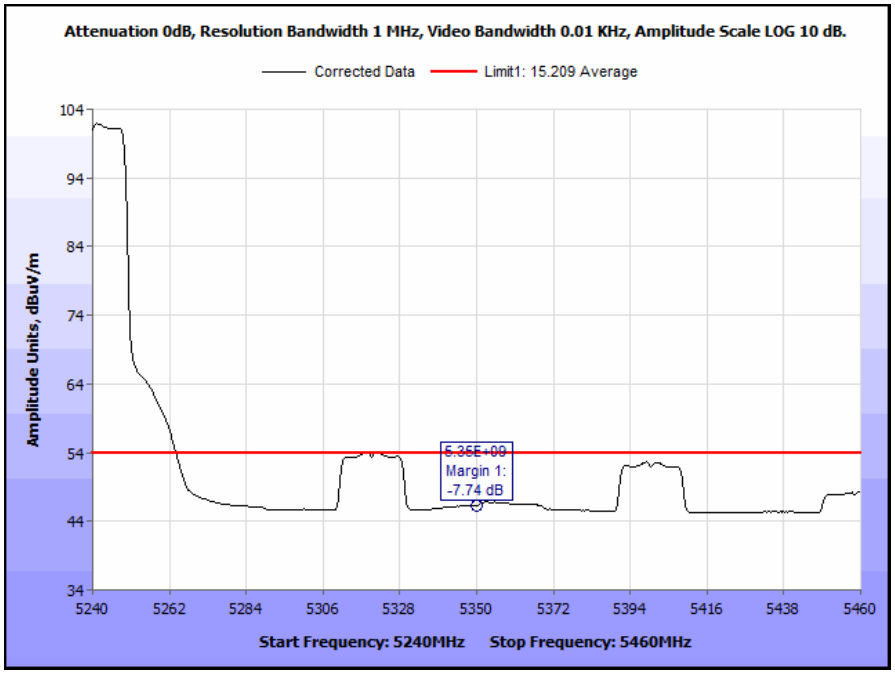


Plot 326. Radiated Restricted Band Edge, 802.11n 20 MHz, High Channel, MIMO

Restricted Band Edge, 802.11ac 20 MHz, SISO

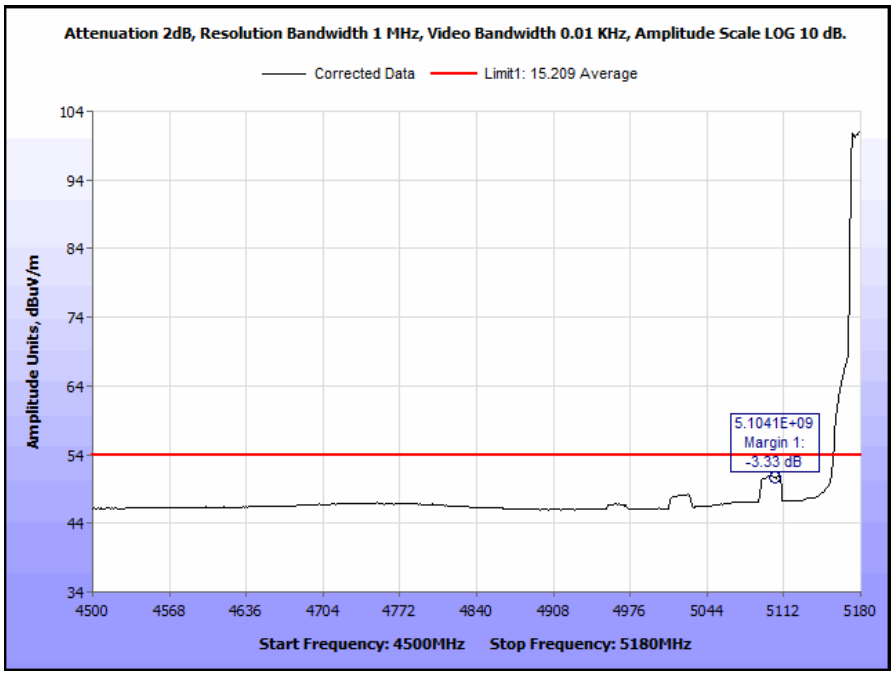


Plot 327. Radiated Restricted Band Edge, 802.11ac 20 MHz, Low Channel, SISO

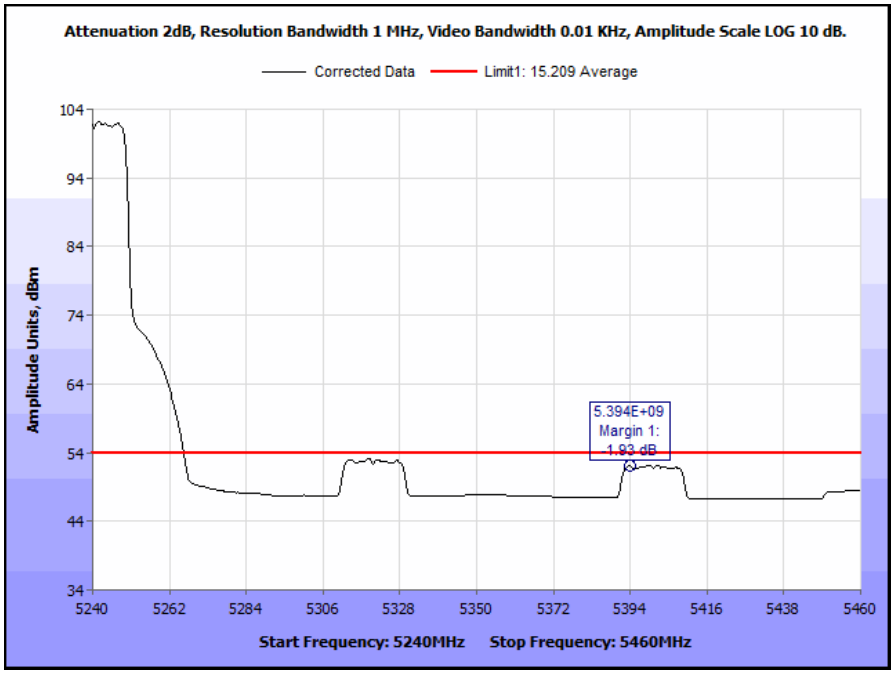


Plot 328. Radiated Restricted Band Edge, 802.11ac 20 MHz, High Channel, SISO

Restricted Band Edge, 802.11ac 20 MHz, MIMO

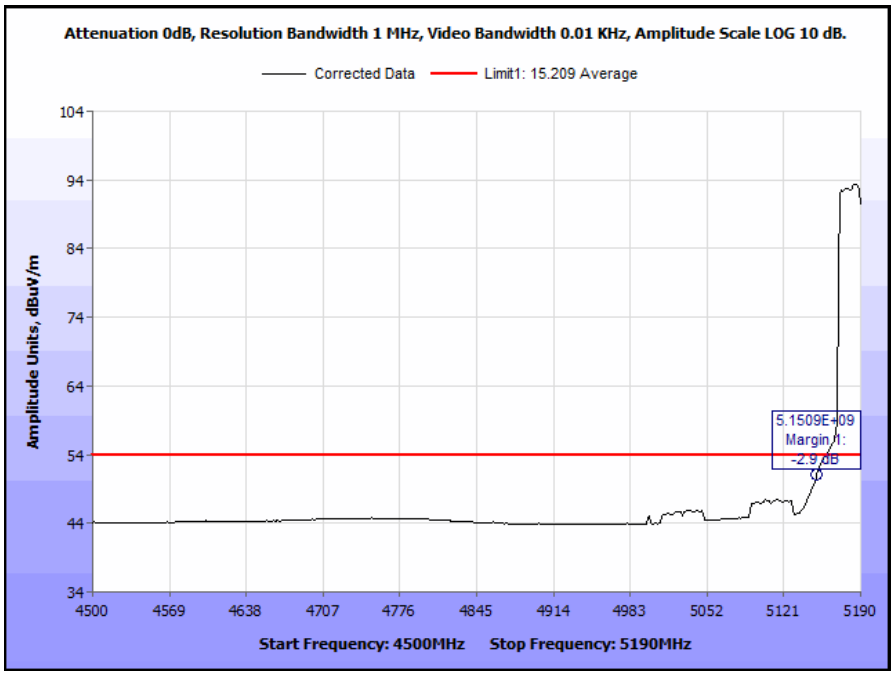


Plot 329. Radiated Restricted Band Edge, 802.11ac 20 MHz, Low Channel, MIMO

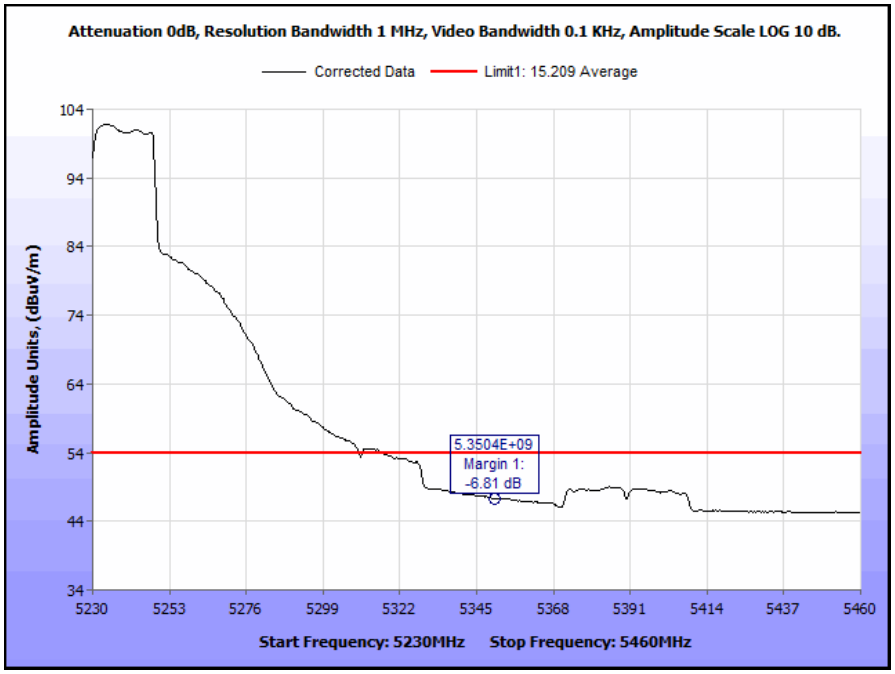


Plot 330. Radiated Restricted Band Edge, 802.11ac 20 MHz, High Channel, MIMO

Restricted Band Edge, 802.11a 40 MHz, SISO

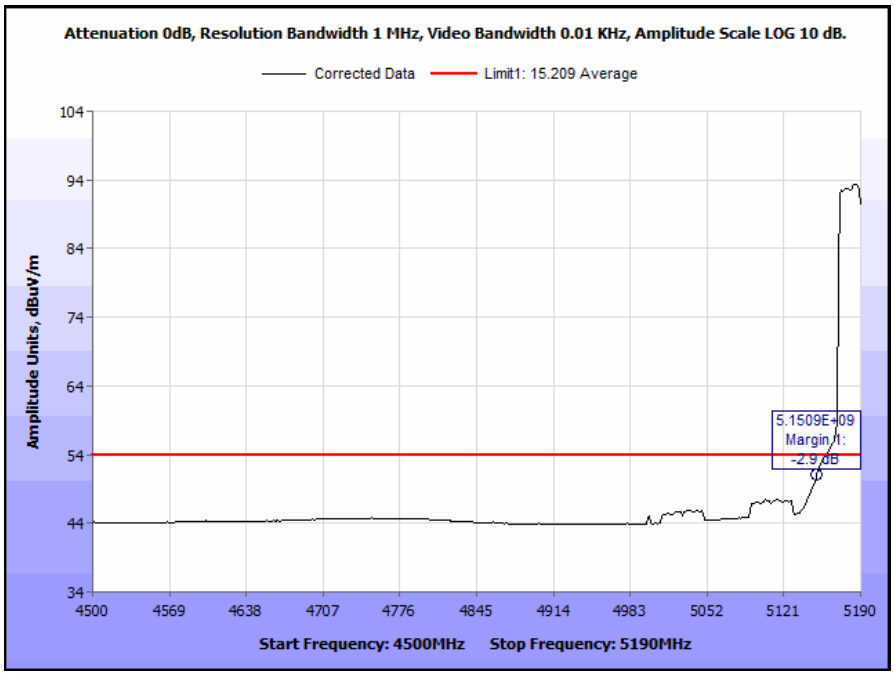


Plot 331. Radiated Restricted Band Edge, 802.11a 40 MHz, Low Channel, SISO

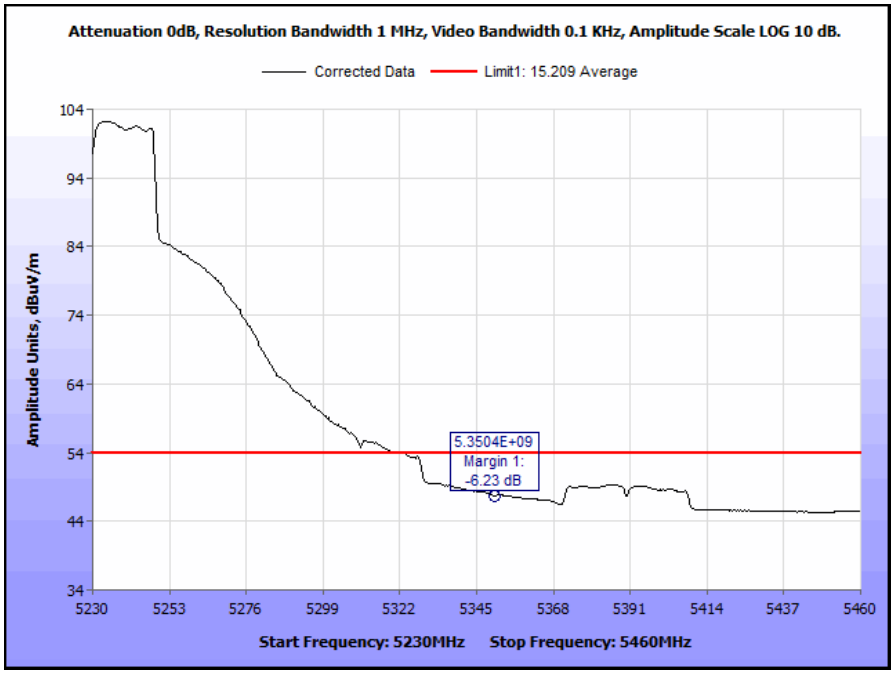


Plot 332. Radiated Restricted Band Edge, 802.11a 40 MHz, High Channel, SISO

Restricted Band Edge, 802.11n 40 MHz, SISO

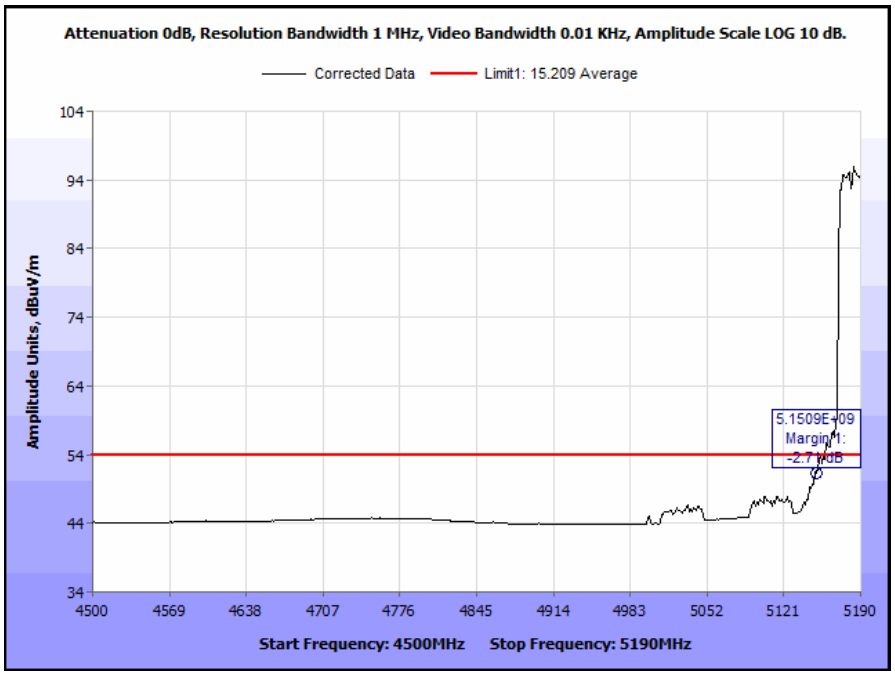


Plot 333. Radiated Restricted Band Edge, 802.11n 40 MHz, Low Channel, SISO

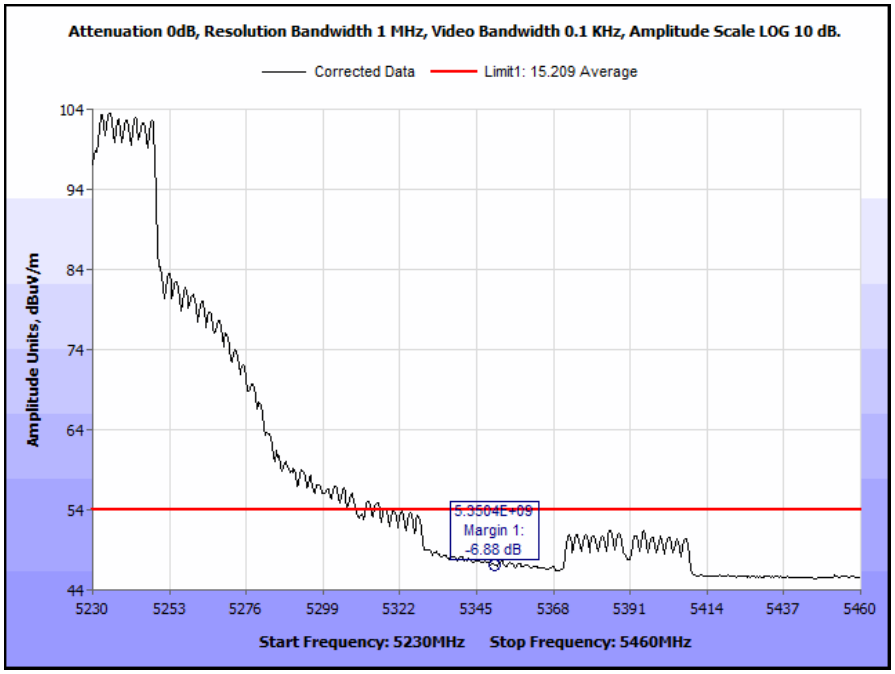


Plot 334. Radiated Restricted Band Edge, 802.11n 40 MHz, High Channel, SISO

Restricted Band Edge, 802.11n 40 MHz, MIMO

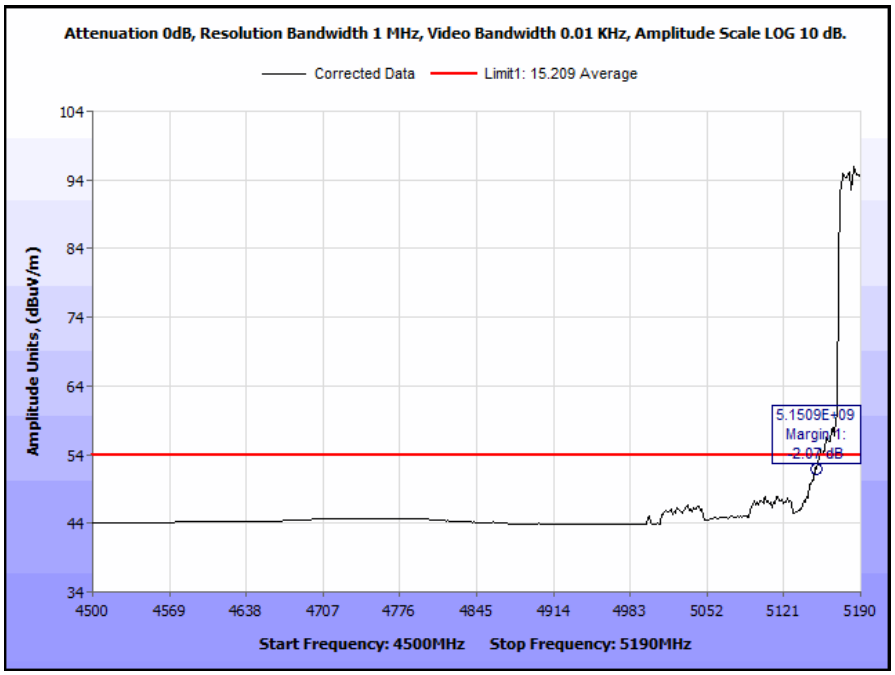


Plot 335. Radiated Restricted Band Edge, 802.11n 40 MHz, Low Channel, MIMO

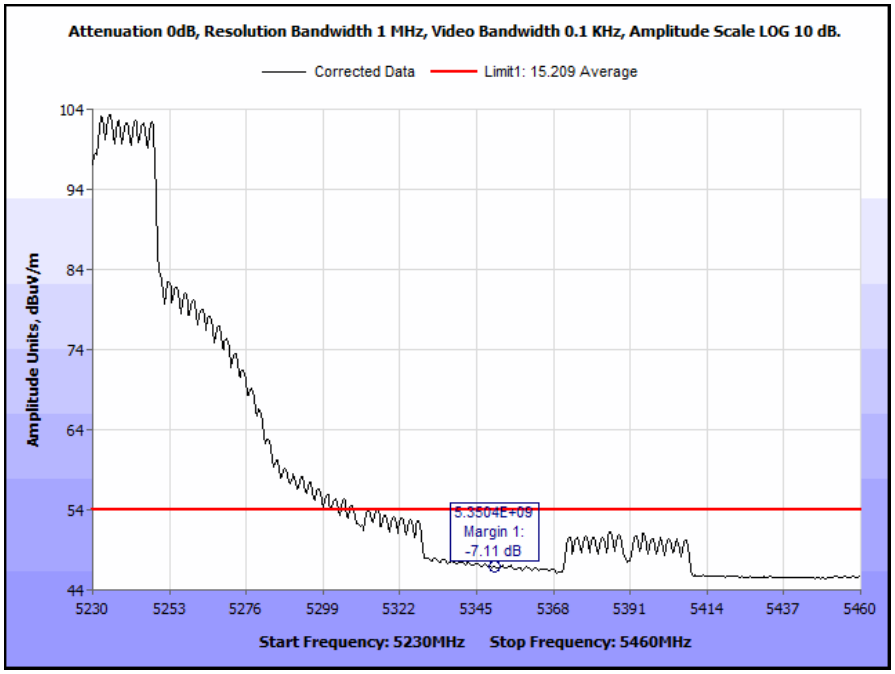


Plot 336. Radiated Restricted Band Edge, 802.11n 40 MHz, High Channel, MIMO

Restricted Band Edge, 802.11ac 40 MHz, MIMO

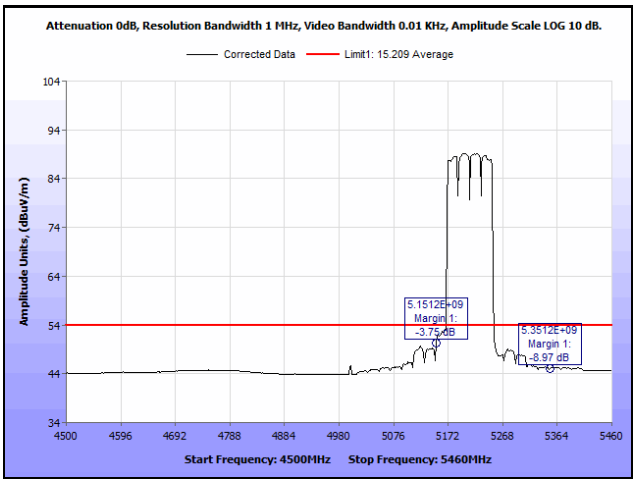


Plot 337. Radiated Restricted Band Edge, 802.11ac 40 MHz, Low Channel, MIMO

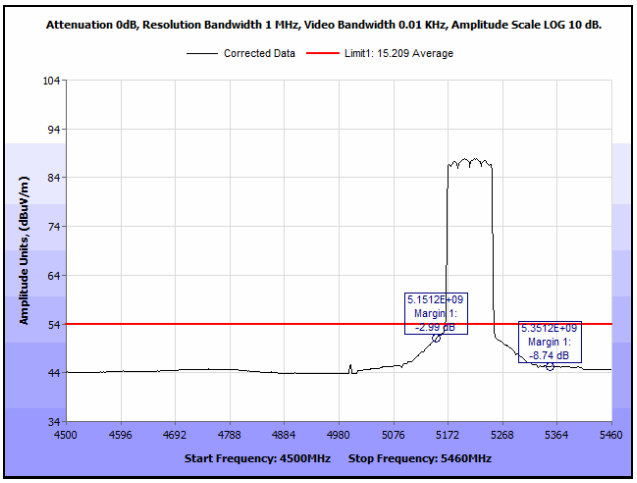


Plot 338. Radiated Restricted Band Edge, 802.11ac 40 MHz, High Channel, MIMO

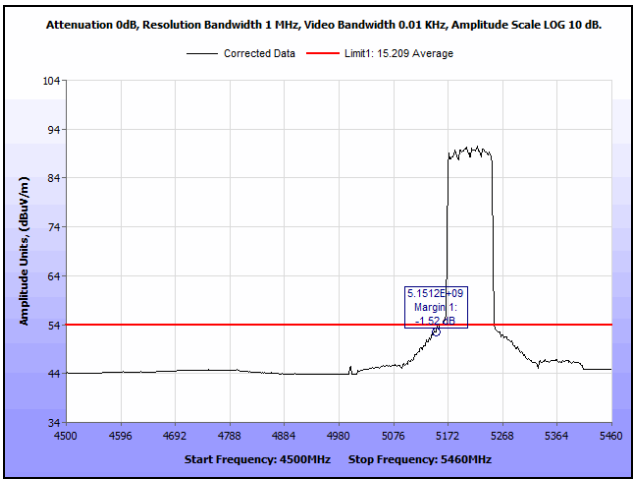
Restricted Band Edge, 802.11ac 80 MHz



Plot 339. Radiated Restricted Band Edge, 802.11a 80 MHz, SISO



Plot 340. Radiated Restricted Band Edge, 802.11ac 80 MHz, SISO



Plot 341. Radiated Restricted Band Edge, 802.11ac 80 MHz, MIMO

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.

Peak Conducted Power = 25.01dBm =316.95mW
Antenna Array gain = 8.21 dBi = 6.62
The limit for maximum RF exposure for 5GHz device is 1mW/cm2
The formula for calculating RF exposure is given as S= $\frac{PG}{4\pi R^2}$
P=316.95mW, G= 6.62 & R=20cm, then S = 0.417mW/cm^2 which was under the limit specified in 1.1310

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.

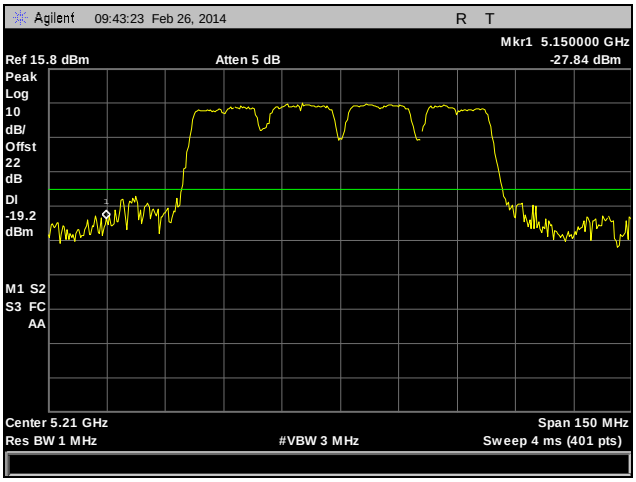
Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The resolution band width of the spectrum analyzer was set to 1 MHz. 80MHz wide channel was investigated for this testing and viewed from the 5150MHz and 5350MHz edge. . The 26dB display line from peak value of the carrier was used to show that all emissions were suppressed below that display line outside the band.

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

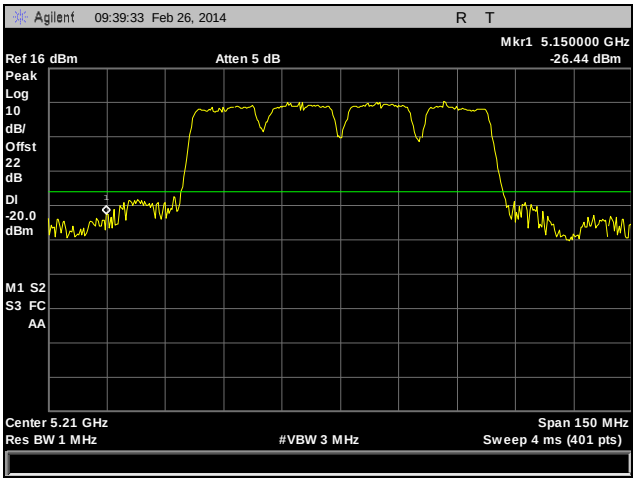
Test Engineer(s): Surinder Singh

Test Date(s): 09/08/14

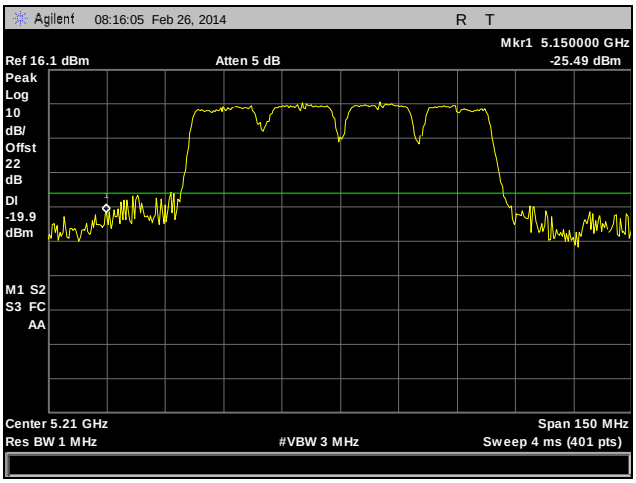
Frequency Stability



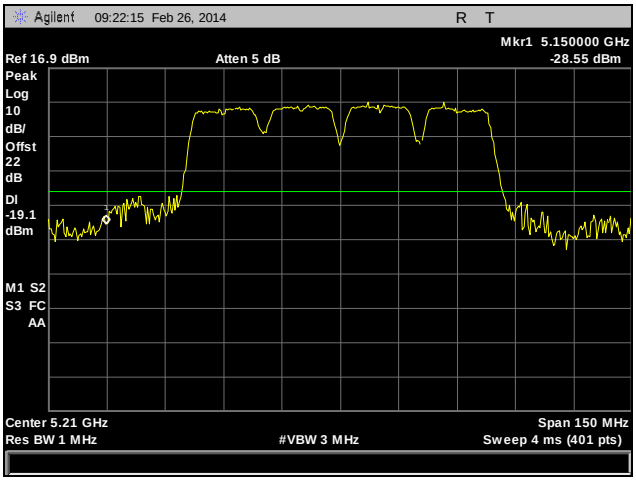
Plot 342. Frequency Stability, 80 MHz, -20°C, 120 V, Center 5210 MHz



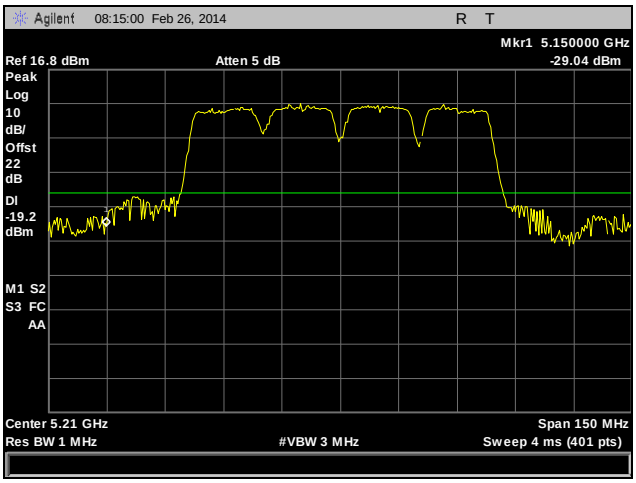
Plot 343. Frequency Stability, 80 MHz, -10°C, 120 V, Center 5210 MHz



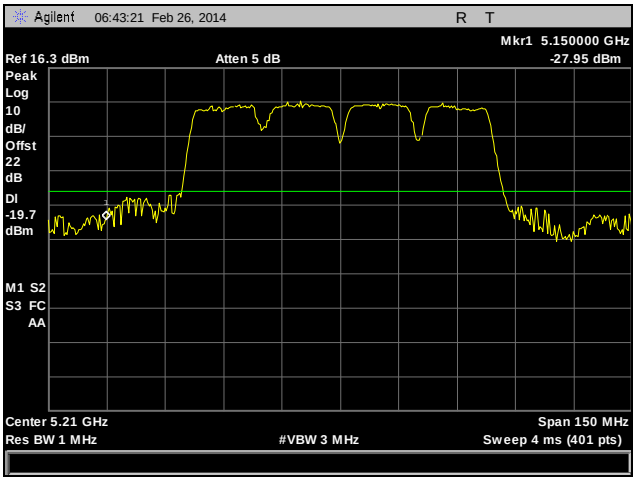
Plot 344. Frequency Stability, 80 MHz, 0°C, 120 V, Center 5210 MHz



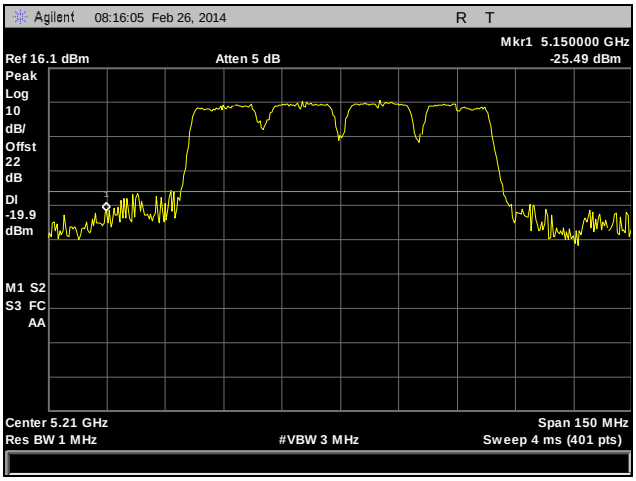
Plot 345. Frequency Stability, 80 MHz, 10°C, 120 V, Center 5210 MHz



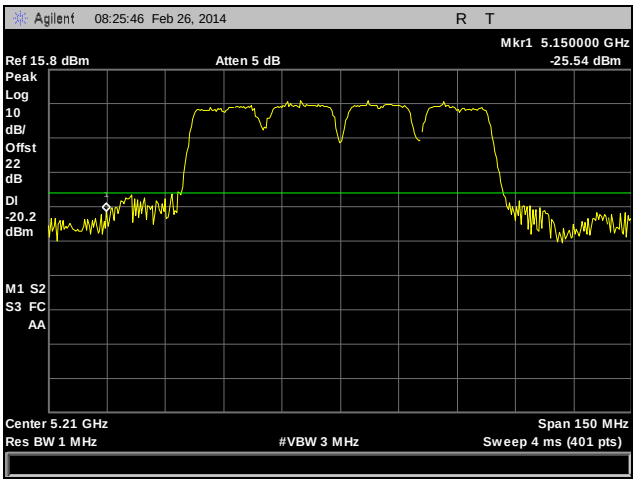
Plot 346. Frequency Stability, 80 MHz, 20°C, 108 V, Center 5210 MHz



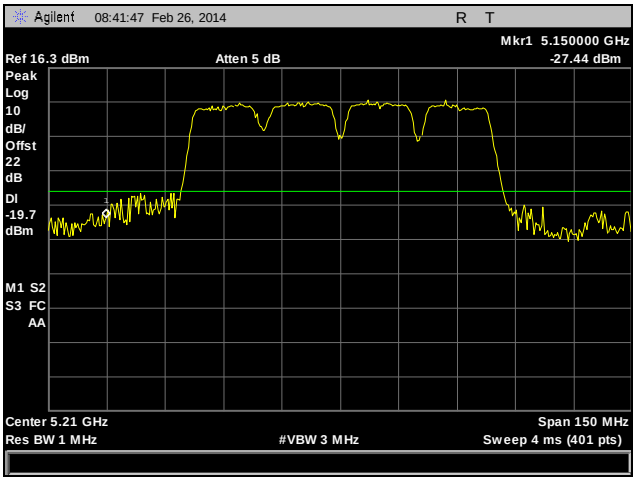
Plot 347. Frequency Stability, 80 MHz, 20°C, 120 V, Center 5210 MHz



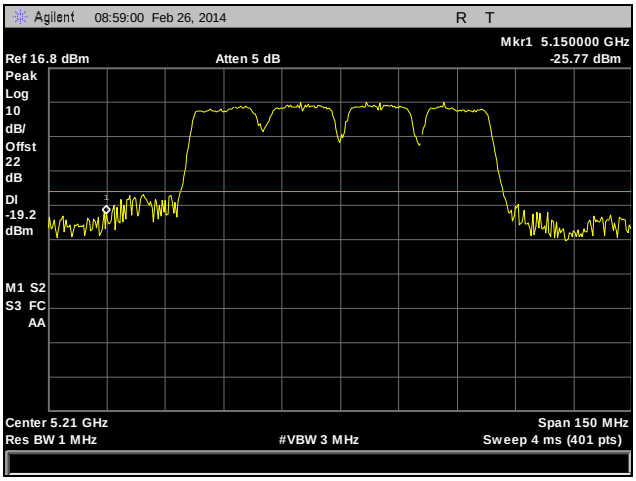
Plot 348. Frequency Stability, 80 MHz, 20°C, 132 V, Center 5210 MHz



Plot 349. Frequency Stability, 80 MHz, 30°C, 120 V, Center 5210 MHz



Plot 350. Frequency Stability, 80 MHz, 40°C, 120 V, Center 5210 MHz



Plot 351. Frequency Stability, 80 MHz, 55°C, 120 V, Center 5210 MHz

V. Test Equipment

Test Equipment

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

Asset	Equipment	Manufacturer	Model	Calibration Date	Calibration Due Date
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	7/18/2014	7/18/2016
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	
1T4870	THERM. / CLOCK / HUMIDITY MONITOR	CONTROL COMPANY	06-662-4, FB70258	3/14/2014	3/14/2016
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	2/28/2014	8/28/2015
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4753	ANTENNA - BILOG	SUNOL SCIENCES	JB6	7/24/2013	1/24/2015
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	7/25/2014	1/25/2016
1T4300B	SEMI-ANECHOIC 3M CHAMBER # 1 D (2043A-1) (IC)	EMC TEST SYSTEMS	NONE	1/25/2012	1/25/2015

Table 22. Test Equipment List

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

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VI. 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.