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

914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408) 748-3585 ● FAX (510) 489-6372
13301 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

March 13, 2015

ARRIS Group
3871 Lakefield Drive Suite 300
Suwanee, GA 30024

Dear Tony Figueiredo,

Enclosed is the EMC Wireless test report for compliance testing of the ARRIS Group, DG2470A as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15, Subpart B for Unintentional Radiators and Part 15.407, Subpart E (UNII 1 and 3) 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\ EMC84582-FCC407 UNII 1 and 3 Rev. 2)

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

914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CALIFORNIA 95054 ● PHONE (408) 748-3585 ● FAX (510) 489-6372
13301 MCCALLEN PASS ● AUSTIN, TX 78753 ● PHONE (512) 287-2500 ● FAX (512) 287-2513

Electromagnetic Compatibility Criteria
Test Report

for the

ARRIS Group
Model DG2470A

Tested under
The FCC Certification Rules
contained in
Title 47 of the CFR, Parts 15 Subpart B
for Class B Digital Devices
&
FCC Part 15.407 for Intentional Radiators

MET Report: EMC84582-FCC407 UNII 1 and 3 Rev. 2

March 13, 2015

Prepared For:

ARRIS Group
3871 Lakefield Drive Suite 300
Suwanee, GA 30024

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

Electromagnetic Compatibility Criteria
Test Report

for the

ARRIS Group
Model DG2470A

Tested under
The FCC Certification Rules
contained in
Title 47 of the CFR, Parts 15 Subpart B for Class B Digital Devices
&
FCC 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 Parts 15B, 15.407, of the FCC Rules under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	February 24, 2015	Initial Issue.
1	March 11, 2015	Revised to add models to “Models Covered” section.
2	March 13, 2015	Revised to reflect engineer corrections.

Table of Contents

List of Tables

List of Figures

List of Photographs

List of Plots

List of Terms and Abbreviations

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

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the ARRIS Group DG2470A, 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 DG2470A. ARRIS Group should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the DG2470A, 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, purchase order number 0008078781. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	Description	Results
§15.107	Conducted Emissions	Compliant
§15.109	Radiated Emissions	Compliant
§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) & (a)(3)	Conducted Transmitter Output Power	Compliant
§15.407 (a)(1)(ii) & (a)(3)	Power Spectral Density	Compliant
§15.407 (b)(1), (4), (6), (7)	Undesirable Emissions (15.205/15.209 - General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
§15.407 (e)	6 dB Bandwidth	Compliant
§15.407(f)	RF Exposure	Compliant
§15.407(g)	Frequency stability	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by ARRIS Group to perform testing on the DG2470A, under ARRIS Group's purchase order number 0008078781.

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 DG2470A.

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

Model(s) Tested:	DG2470	
Model(s) Covered:	DG2470,DG2460 and DG1680	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: UIDDG2470	
	Type of Modulations:	CCK, OFDM, MCS
	Equipment Code:	NII
	Peak RF Output Power:	28.31dBm , 28.37dBm
	EUT Frequency Ranges:	5.180 - 5.240 GHz, 5.745 - 5.825 GHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Surinder Singh	
Report Date(s):	March 13, 2015	

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
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

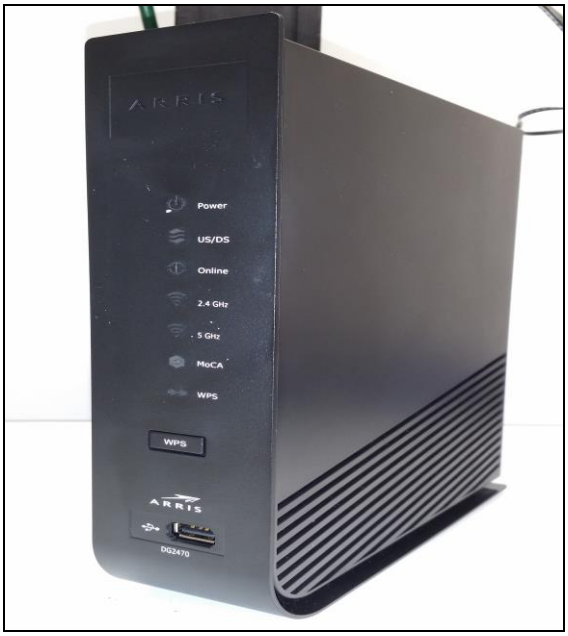
C. Test Site

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 DG2470A, Equipment Under Test (EUT), is an indoor2.4 & 5G indoor data gateway. Model DG2460A is similar to DG2470A except it does not have MOCA capability. Model DG1680A is identical to DG2470A, simply a different model number per customer request.



Photograph 1. ARRIS Group DG2470A

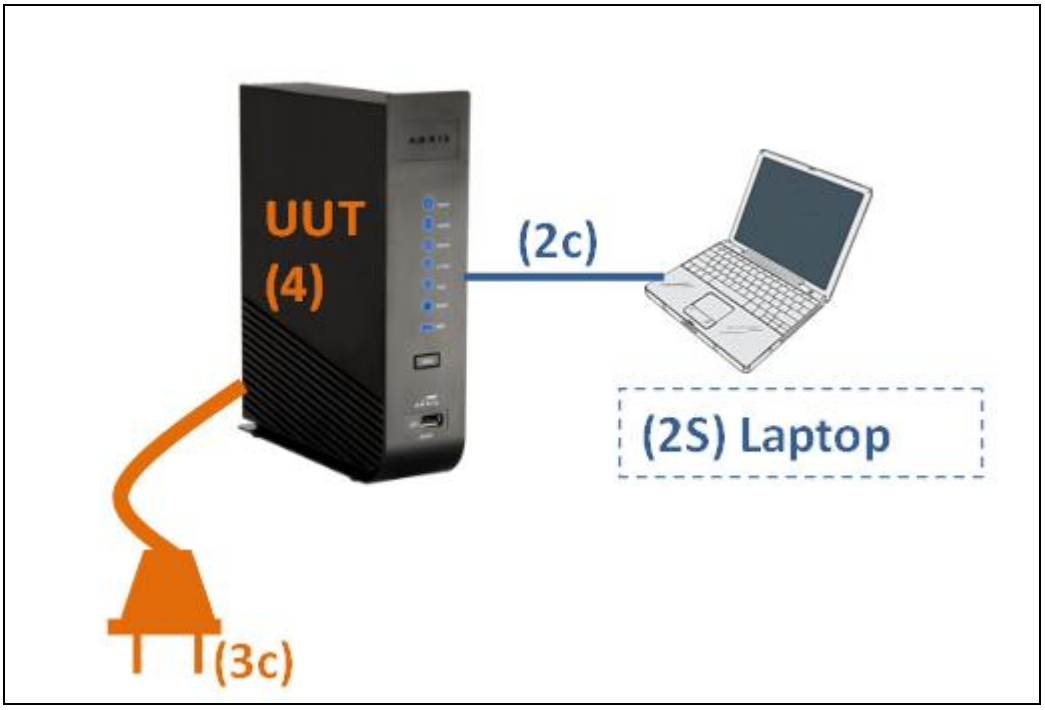


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

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

Name / Description	Model Number
DG2470	DG2470/DG2460/DG1680

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
2s	Laptop	Assorted	N/A

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
2C	Ethernet	5e Modular 8 pin	1	1	No	NA
3C	AC Input	2 conductor, 18 AWG	1	2	No	(115v/60hz)

Table 6. Ports and Cabling Information

H. Mode of Operation

The provided instructions and software will configure the DG2470A for operation at each required test mode.

I. Method of Monitoring EUT Operation

The measured emission value is over the specified FCC/IC 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 upon completion of testing.

III. Electromagnetic Compatibility Criteria for Unintentional Radiators

Electromagnetic Compatibility Criteria

§ 15.107 Conducted Emissions Limits

Test Requirement(s):

15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 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.

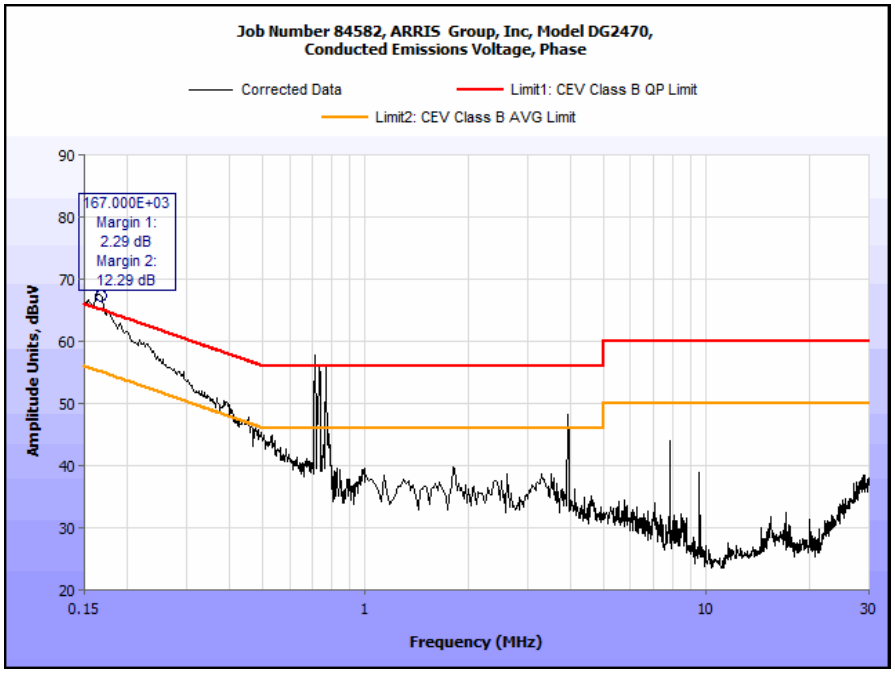
Test Engineer(s): Surinder Singh

Test Date(s): 01/16/15

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
0.158	59.12	0	59.12	65.57	-6.45	38.84	0	38.84	55.57	-16.73
0.713	37.84	0	37.84	56	-18.16	28.11	0	28.11	46	-17.89
3.81	32.74	0	32.74	56	-23.26	25.37	0	25.37	46	-20.63
7.81	34.49	0	34.49	60	-25.51	23.85	0	23.85	50	-26.15
9.55	39.45	0	39.45	60	-20.55	32.26	0	32.26	50	-17.74
26.48	26.11	0	26.11	60	-33.89	16.45	0	16.45	50	-33.55
1.1	34.89	0	34.89	56	-21.11	22.64	0	22.64	46	-23.36

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

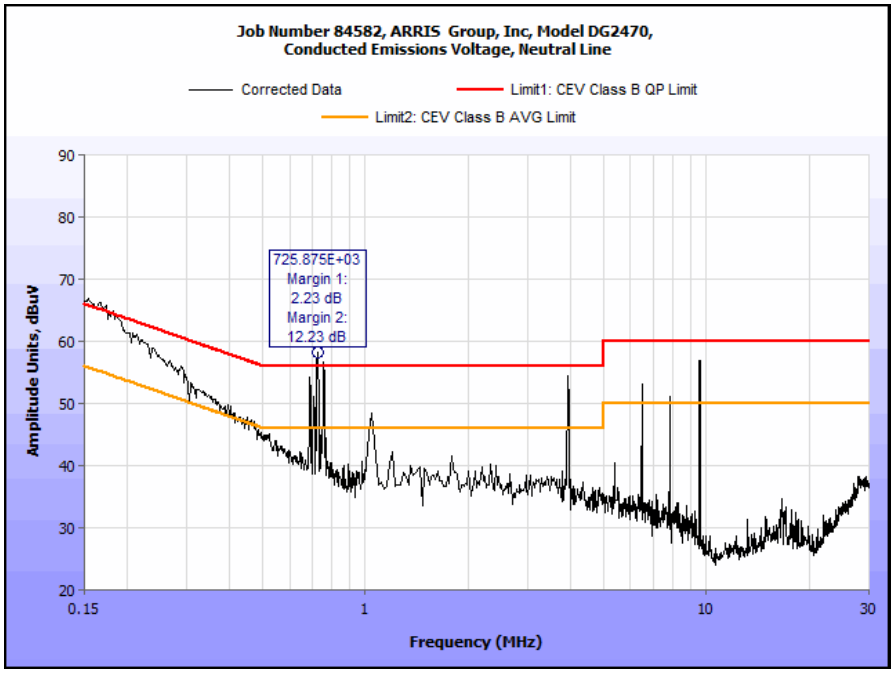


Plot 1. Conducted Emission, Phase Line Plot

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
0.178	61.45	0	61.45	64.58	-3.13	42.19	0	42.19	54.58	-12.39
0.725	41.26	0	41.26	56	-14.74	25.84	0	25.84	46	-20.16
3.96	34.84	0	34.84	56	-21.16	21.84	0	21.84	46	-24.16
6.54	29.47	0	29.47	60	-30.53	19.83	0	19.83	50	-30.17
7.92	37.19	0	37.19	60	-22.81	20.05	0	20.05	50	-29.95
9.81	25.66	0	25.66	60	-34.34	11.67	0	11.67	50	-38.33
0.178	61.45	0	61.45	64.58	-3.13	42.19	0	42.19	54.58	-12.39

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



Plot 2. Conducted Emission, Neutral Line Plot

Conducted Emission Limits Test Setup

Photograph 2. 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 for frequencies between 30MHz to 1GHz. For frequencies between 1GHz and 6GHz, an average detector with a 1MHz bandwidth was used.

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

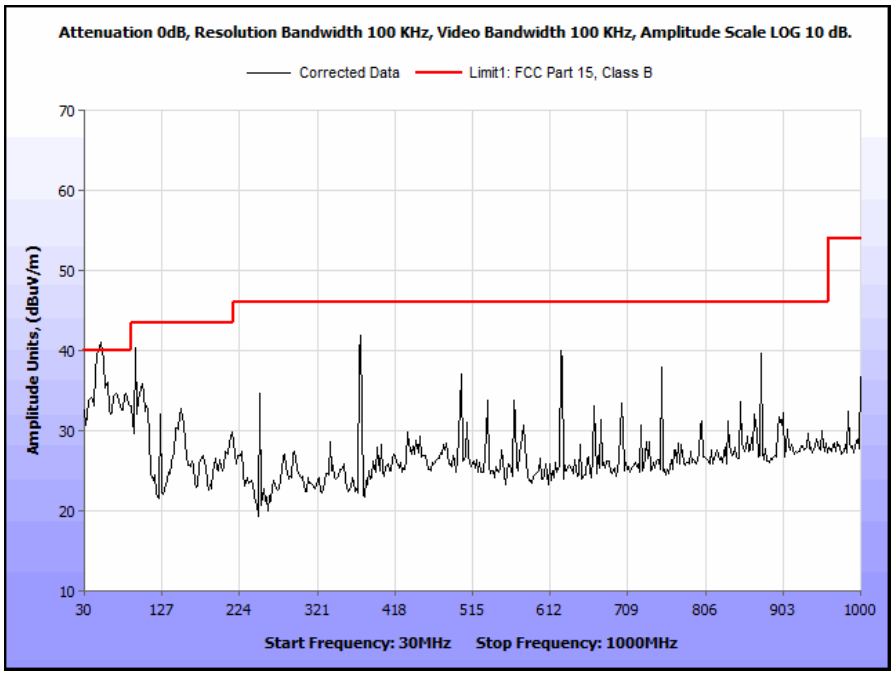
Test Engineer(s): Surinder Singh

Test Date(s): 01/19/15

Radiated Emissions Limits Test Results, Class B

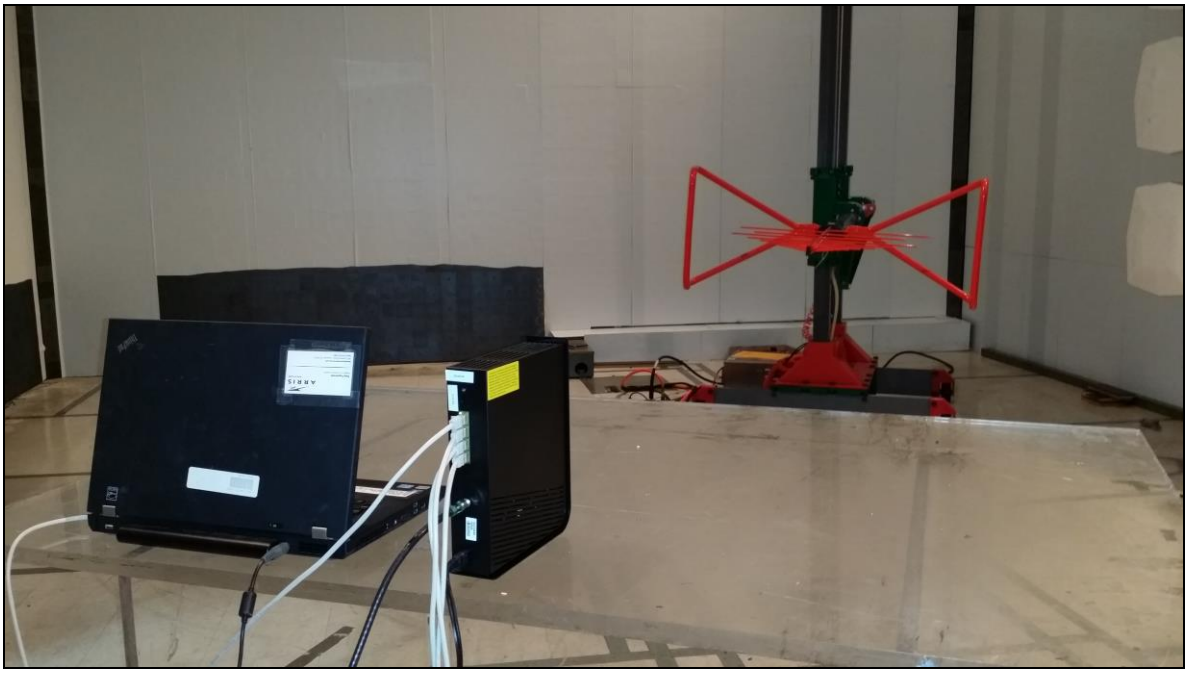
Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBµV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
48.980962	239	H	1.54	16.90	9.21	0.73	0.00	26.84	40.00	-13.16
48.980962	195	V	1.25	23.62	9.21	0.73	0.00	33.56	40.00	-6.44
86.372745	24	H	1.54	18.29	7.70	1.01	0.00	27.00	40.00	-13.00
86.372745	134	V	1.25	20.26	7.70	1.01	0.00	28.97	40.00	-11.03
263.2635	207	H	1.38	13.06	13.09	1.66	0.00	27.81	46.00	-18.19
263.2635	90	V	1.03	16.94	13.09	1.66	0.00	31.69	46.00	-14.31
448.35165	11	H	1.55	13.68	17.27	2.18	0.00	33.13	46.00	-12.87
448.35165	315	V	1.08	16.45	17.27	2.18	0.00	35.90	46.00	-10.10
668.23752	188	H	1.57	15.32	20.56	2.53	0.00	38.41	46.00	-7.59
668.23752	356	V	1.19	16.34	20.56	2.53	0.00	39.43	46.00	-6.57
872.16349	246	H	1.35	16.90	22.76	2.77	0.00	42.43	46.00	-3.57
872.16349	140	V	1.06	17.23	22.76	2.77	0.00	42.76	46.00	-3.24

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

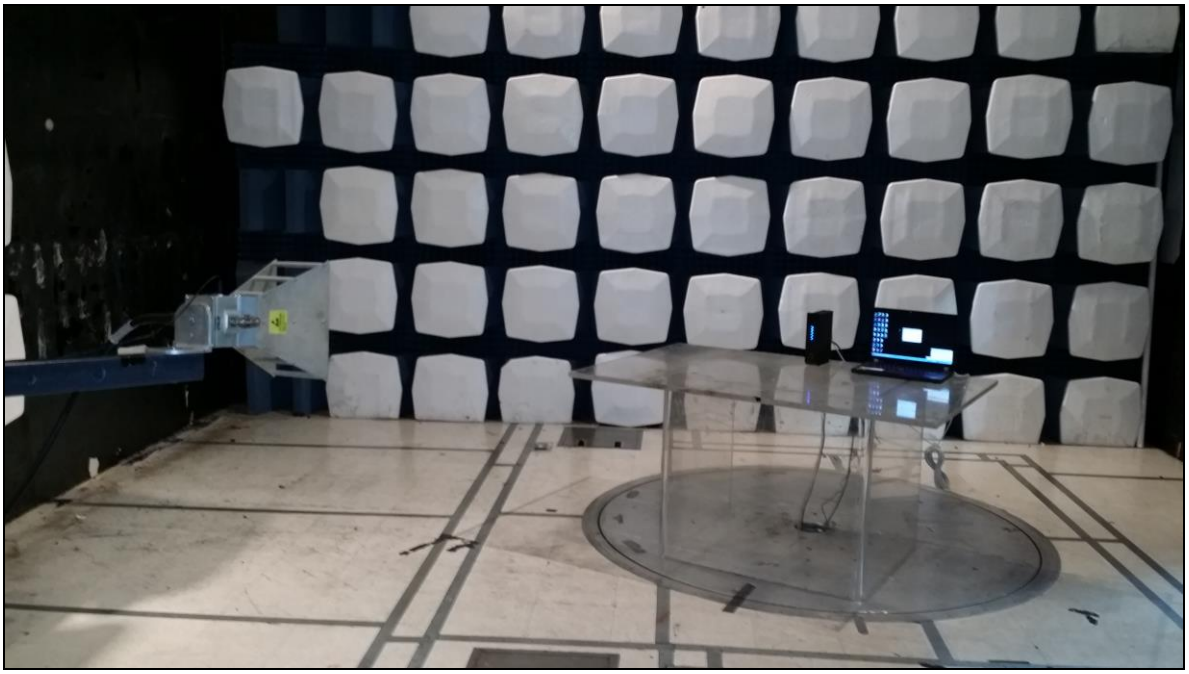


Plot 3. Radiated Emissions, Pre-Scan, 30 MHz – 1 GHz

Radiated Emission Limits Test Setup



Photograph 3. Radiated Emission, Test Setup, 30 MHz – 1 GHz



Photograph 4. Radiated Emission, Test Setup, Above 1 GHz

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 to the criteria of §15.203. EUT has multiple internal antennas.

Test Engineer(s): Surinder Singh

Test Date(s): 01/18/2015

DG2470 SR2 5GHz Peak Gain		
Antenna	**5150-5250 MHz**	**5725-5850 MHz**
5.1G1	6.29 dBi	7.04 dBi
5.1G2	5.74 dBi	6.42 dBi
5.1G3	5.03 dBi	4.08 dBi
3Tx Composite	10.47 dBi	10.71 dBi

Table 12. Antenna List

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.

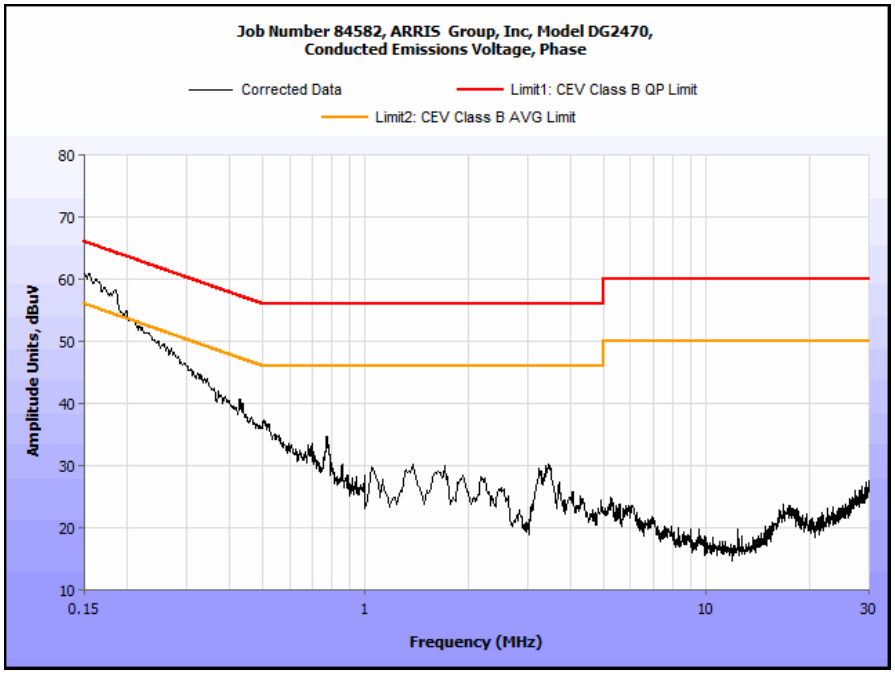
Test Engineer(s): Surinder Singh

Test Date(s): 01/20/15

15.207(a) Conducted Emissions Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBµV) QP	Cable Loss (dB)	Corrected Measurement (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBµV) Avg.	Cable Loss (dB)	Corrected Measurement (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.15	53.45	0	53.45	66	-12.55	49.28	0	49.28	56	-6.72
0.32	44.09	0	44.09	59.71	-15.62	38.46	0	38.46	49.71	-11.25
1.44	35.77	0	35.77	56	-20.23	30.89	0	30.89	46	-15.11
6.78	27.56	0	27.56	60	-32.44	19.22	0	19.22	50	-30.78
13.75	26.48	0	26.48	60	-33.52	15.89	0	15.89	50	-34.11
24.73	25.38	0	25.38	60	-34.62	14.67	0	14.67	50	-35.33

Table 14. Conducted Emissions, 15.207(a), Phase Line, Test Results

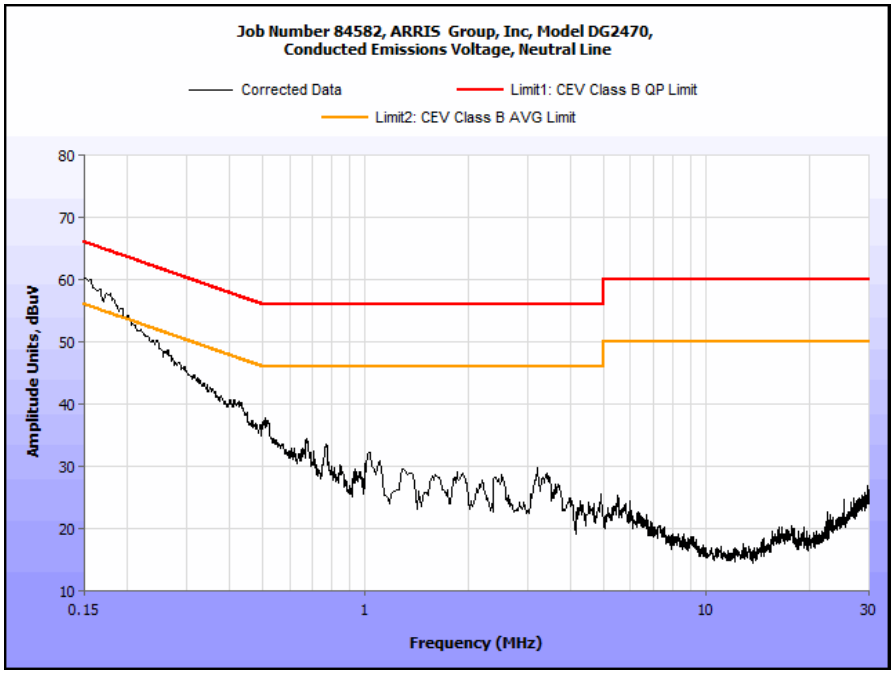


Plot 4. Conducted Emissions, 15.207(a), Phase Line

15.207(a) Conducted Emissions Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBµV) QP	Cable Loss (dB)	Corrected Measurement (dBµV) QP	Limit (dBµV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBµV) Avg.	Cable Loss (dB)	Corrected Measurement (dBµV) AVG	Limit (dBµV) AVG	Margin (dB) AVG
0.15	54.69	0	54.69	66	-11.31	50.38	0	50.38	56	-5.62
0.43	45.32	0	45.32	57.25	-11.93	32.43	0	32.43	47.25	-14.82
2.49	33.21	0	33.21	56	-22.79	20.06	0	20.06	46	-25.94
7.79	29.34	0	29.34	60	-30.66	22.43	0	22.43	50	-27.57
16.39	24.96	0	24.96	60	-35.04	14.52	0	14.52	50	-35.48
26.95	20.02	0	20.02	60	-39.98	11.74	0	11.74	50	-38.26

Table 15. Conducted Emissions, 15.207(a), Neutral Line, Test Results



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

15.207(a) Conducted Emissions Test Setup Photo

Photograph 5. Conducted Emissions, 15.207(a), Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§15. 403(i) 26dB Bandwidth

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

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

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

Test Engineer(s): Surinder Singh

Test Date(s): 01/26/15

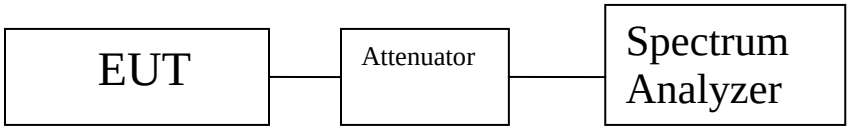


Figure 2. Occupied Bandwidth, Test Setup

Occupied Bandwidth Test Results

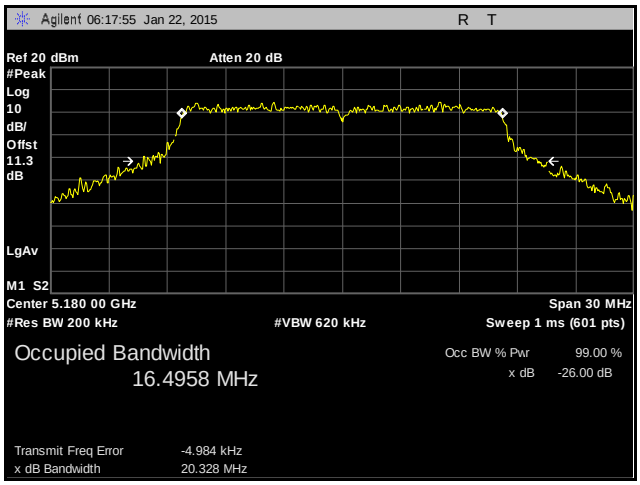
26dB Occupied Bandwidth, 5GHz, U-NII-1			
	Carrier Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
802.11a MIMO	Low	5180	20.328
	Mid	5200	20.849
	High	5240	20.770
802.11a SISO	Low	5180	21.166
	Mid	5200	21.464
	High	5240	21.317
802.11n 20 MHz MIMO	Low	5180	21.789
	Mid	5200	21.672
	High	5240	22.874
802.11n 20MHz SISO	Low	5180	21.680
	Mid	5200	21.748
	High	5240	21.641
802.11n 40MHz MIMO	Low	5190	42.878
	High	5230	42.340
802.11n 40 MHz SISO	Low	5190	44.748
	High	5230	44.231
802.11ac 20 MHz MIMO	Low	5180	21.497
	Mid	5200	21.599
	High	5240	21.076
802.11ac 20MHz SISO	Low	5180	21.445
	Mid	5200	21.309
	High	5240	22.280
802.11ac 40MHz MIMO	Low	5190	42.125
	High	5230	42.793
802.11ac 40 MHz SISO	Low	5190	44.599
	High	5230	42.314
802.11ac 80MHz MIMO	mid	5210	85.453
802.11ac 80 MHz SISO	mid	5210	85.953

Table 16. 26 dB Occupied Bandwidth, Test Results, UNII 1

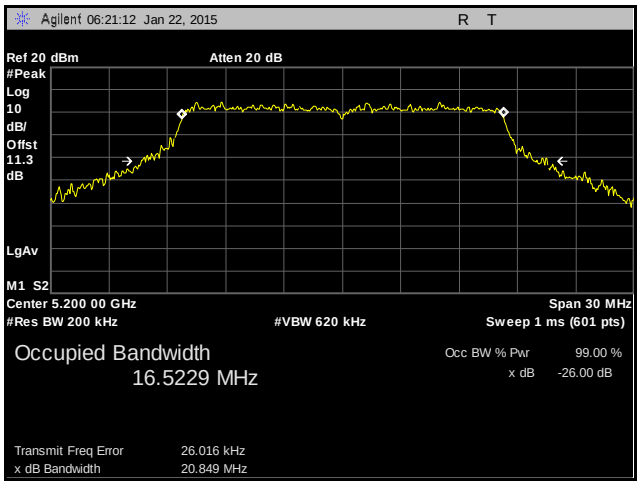
26dB Occupied Bandwidth, 5GHz, U-NII-3			
	Carrier Channel	**Frequency (MHz)**	**Occupied Bandwidth (MHz)**
802.11a MIMO	Low	5745	22.187
	Mid	5785	20.714
	High	5825	20.771
802.11a SISO	Low	5745	21.306
	Mid	5785	20.483
	High	5825	20.917
802.11n 20 MHz MIMO	Low	5745	20.859
	Mid	5785	21.903
	High	5825	22.049
802.11n 20MHz SISO	Low	5745	21.574
	Mid	5785	21.529
	High	5825	20.941
802.11n 40MHz MIMO	Low	5725	41.374
	High	5825	43.945
802.11n 40 MHz SISO	Low	5725	42.297
	High	5825	43.481
802.11ac 20 MHz MIMO	Low	5745	21.350
	Mid	5785	21.603
	High	5825	21.293
802.11ac 20MHz SISO	Low	5745	21.239
	Mid	5785	21.205
	High	5825	21.450
802.11ac 40MHz MIMO	Low	5725	42.596
	High	5825	42.447
802.11ac 40 MHz SISO	Low	5725	42.047
	High	5825	43.351
802.11ac 80MHz MIMO	mid	5775	85.401
802.11ac 80 MHz SISO	mid	5775	84.746

Table 17. 26 dB Occupied Bandwidth, Test Results, UNII 3

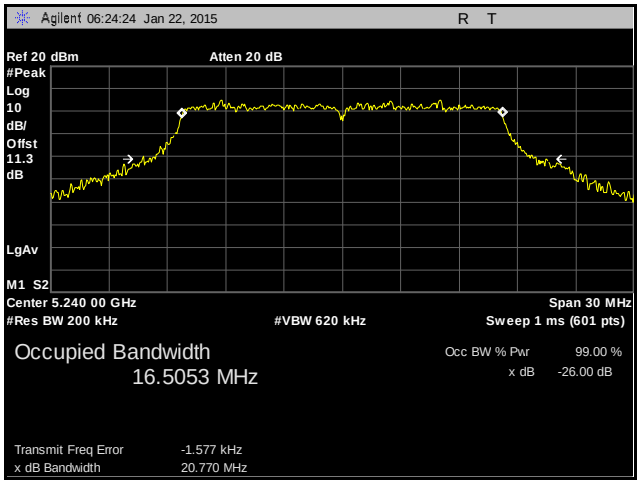
26 dB Occupied Bandwidth Test Results, 802.11a, MIMO, UNII 1



Plot 6. 26 dB Occupied Bandwidth, Low Channel, 802.11a, MIMO, UNII 1

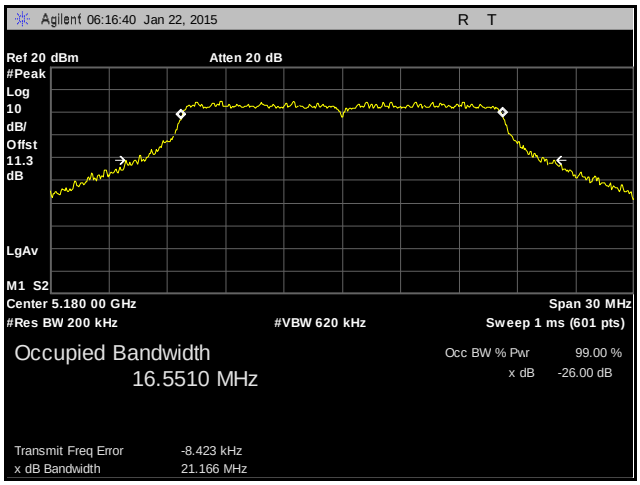


Plot 7. 26 dB Occupied Bandwidth, Mid Channel, 802.11a, MIMO, UNII 1

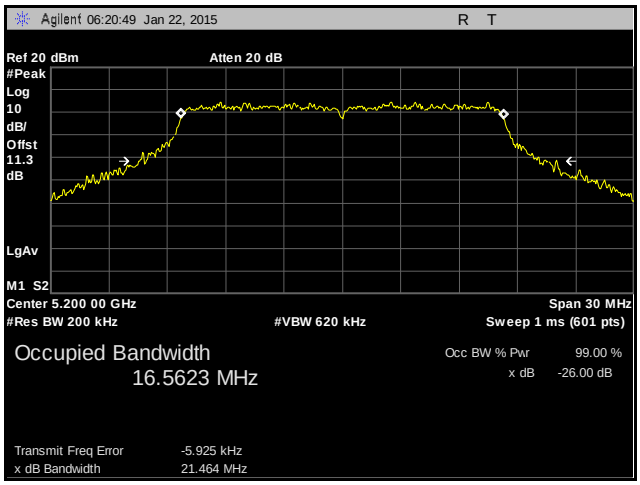


Plot 8. 26 dB Occupied Bandwidth, High Channel, 802.11a, MIMO, UNII 1

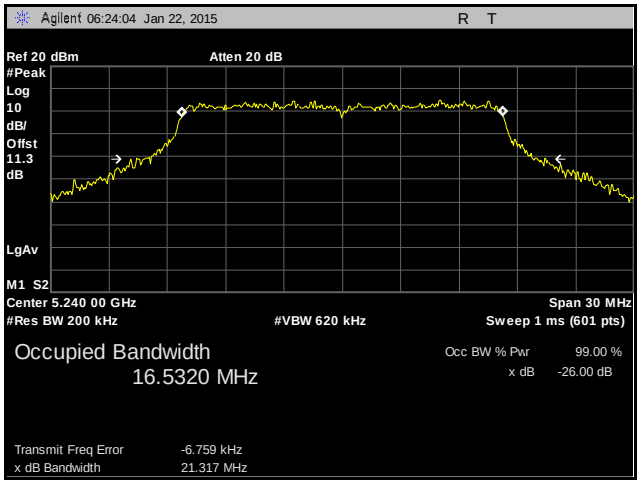
26 dB Occupied Bandwidth Test Results, 802.11a, SISO, UNII 1



Plot 9. 26 dB Occupied Bandwidth, Low Channel, 802.11a, SISO, UNII 1

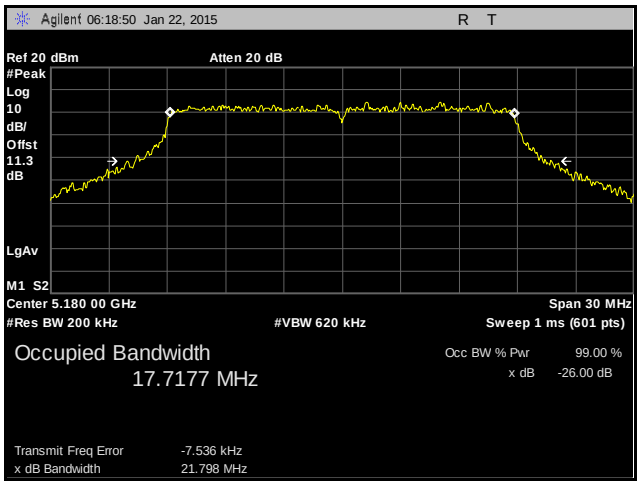


Plot 10. 26 dB Occupied Bandwidth, Mid Channel, 802.11a, SISO, UNII 1

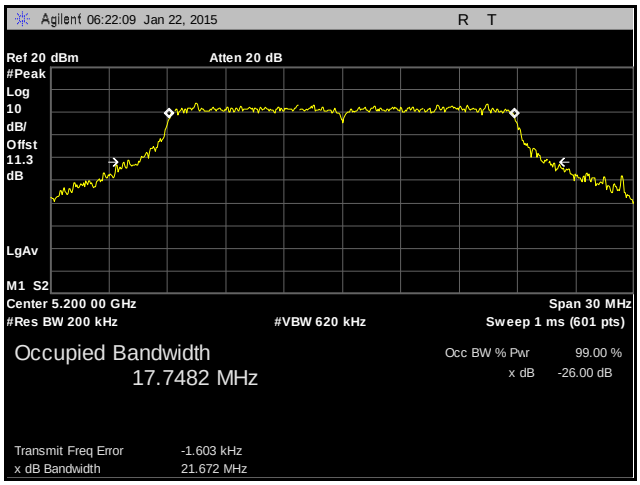


Plot 11. 26 dB Occupied Bandwidth, High Channel, 802.11a, SISO, UNII 1

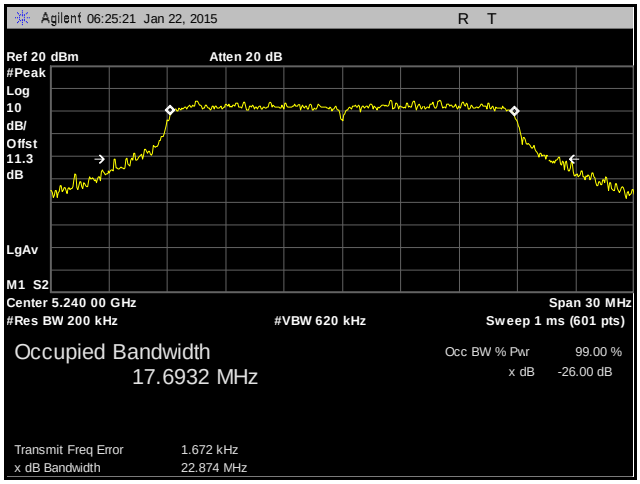
26 dB Occupied Bandwidth Test Results, 802.11n 20 MHz, MIMO, UNII 1



Plot 12. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, MIMO, UNII 1

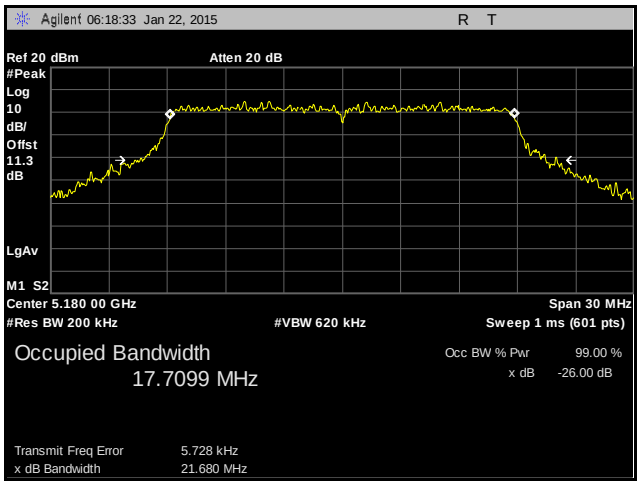


Plot 13. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, MIMO, UNII 1

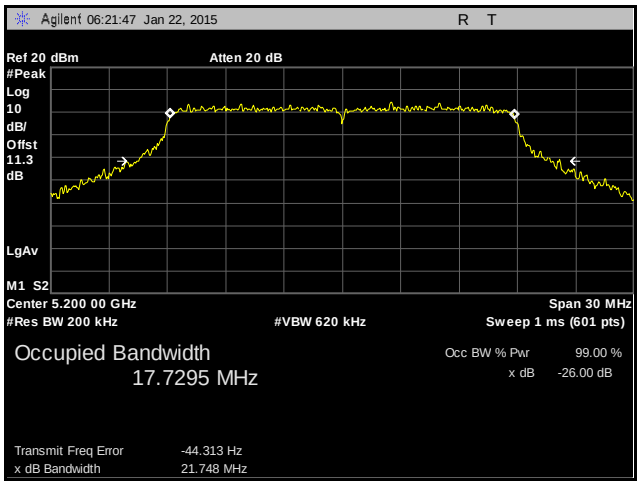


Plot 14. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, MIMO, UNII 1

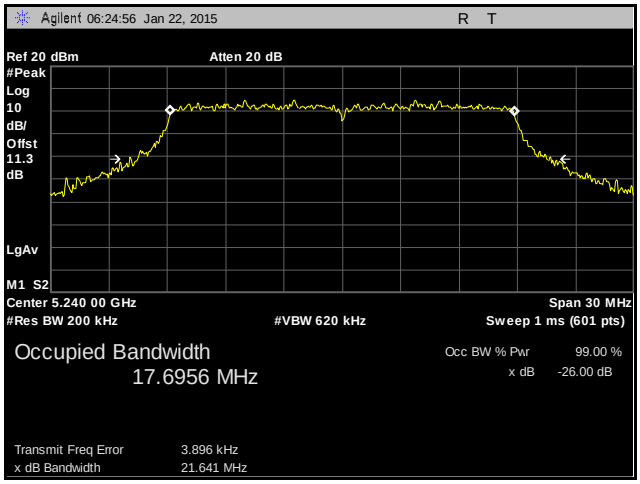
26 dB Occupied Bandwidth Test Results, 802.11n 20 MHz, SISO, UNII 1



Plot 15. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, SISO, UNII 1

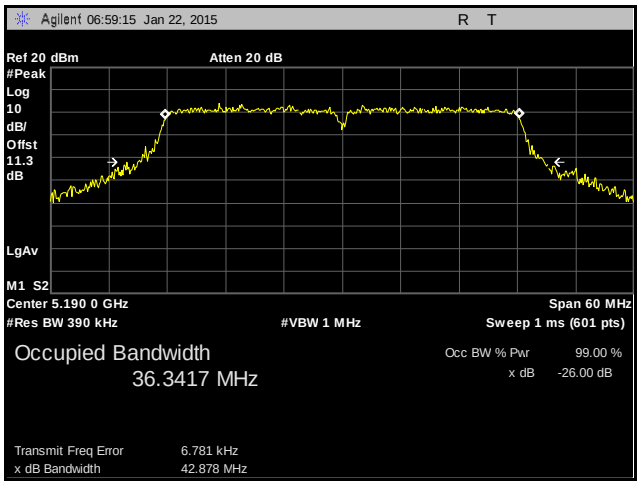


Plot 16. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, SISO, UNII 1

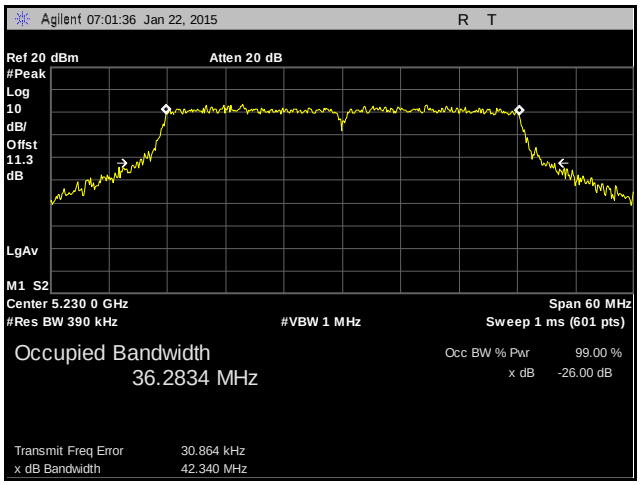


Plot 17. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, SISO, UNII 1

26 dB Occupied Bandwidth Test Results, 802.11n 40 MHz, MIMO, UNII 1

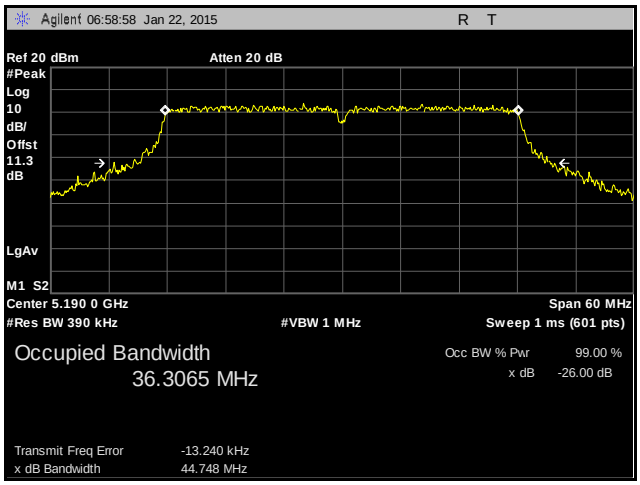


Plot 18. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, MIMO, UNII 1

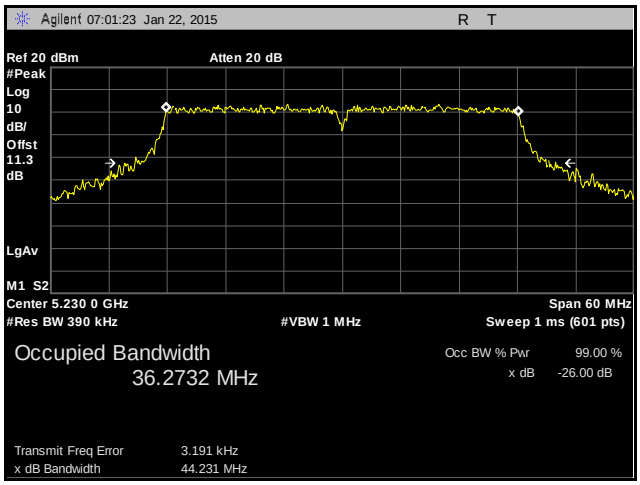


Plot 19. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, MIMO, UNII 1

26 dB Occupied Bandwidth Test Results, 802.11n 40 MHz, SISO, UNII 1

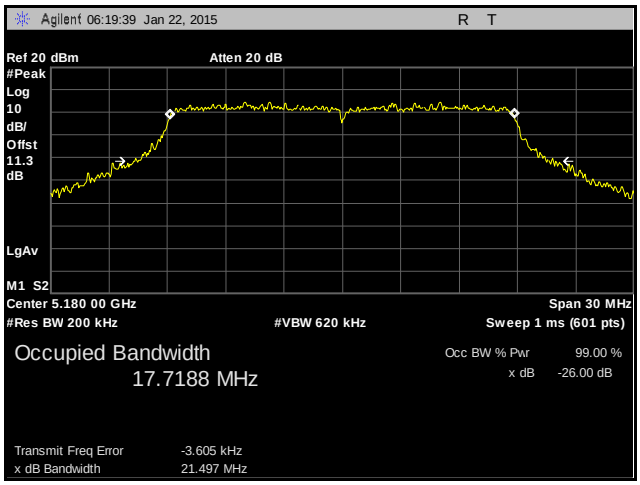


Plot 20. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, SISO, UNII 1

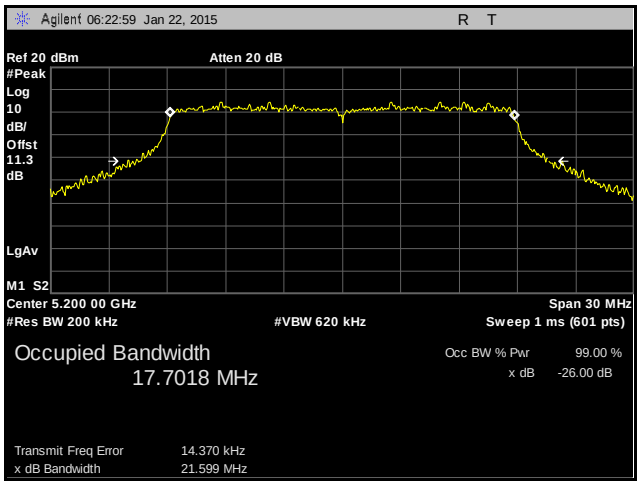


Plot 21. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, SISO, UNII 1

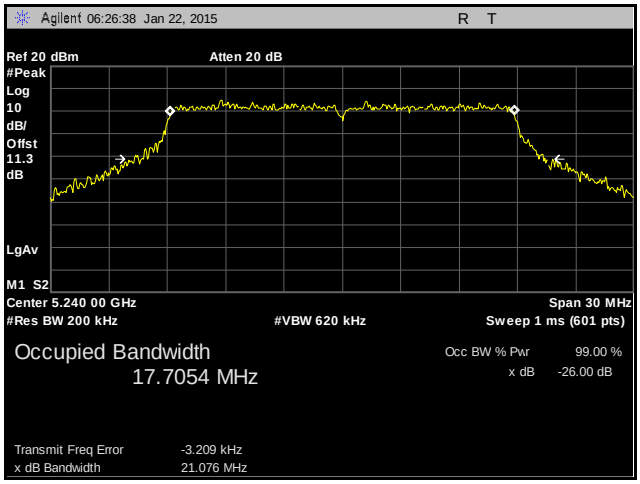
26 dB Occupied Bandwidth Test Results, 802.11ac 20 MHz, MIMO, UNII 1



Plot 22. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 20 MHz, MIMO, UNII 1

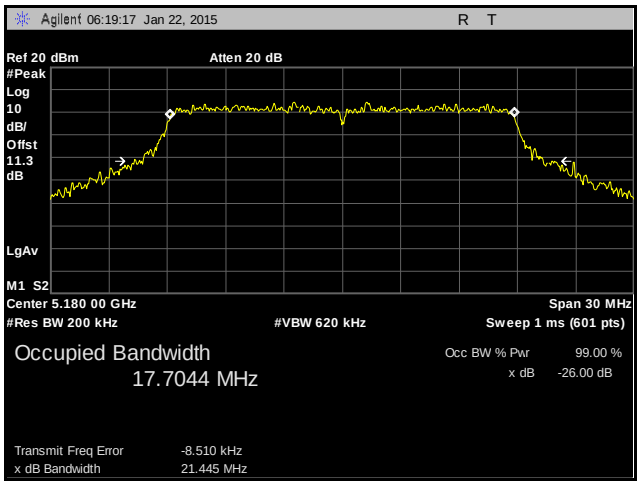


Plot 23. 26 dB Occupied Bandwidth, Mid Channel, 802.11ac 20 MHz, MIMO, UNII 1

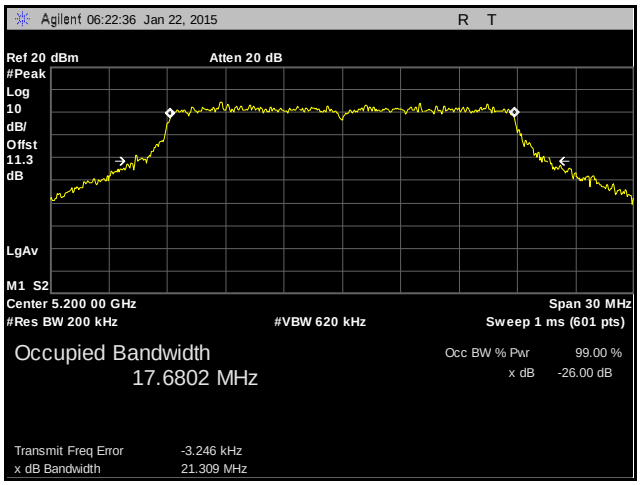


Plot 24. 26 dB Occupied Bandwidth, High Channel, 802.11ac 20 MHz, MIMO, UNII 1

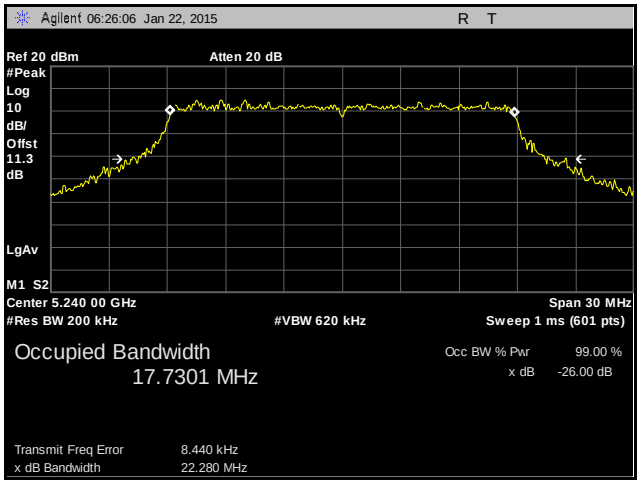
26 dB Occupied Bandwidth Test Results, 802.11ac 20 MHz, SISO, UNII 1



Plot 25. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 20 MHz, SISO, UNII 1

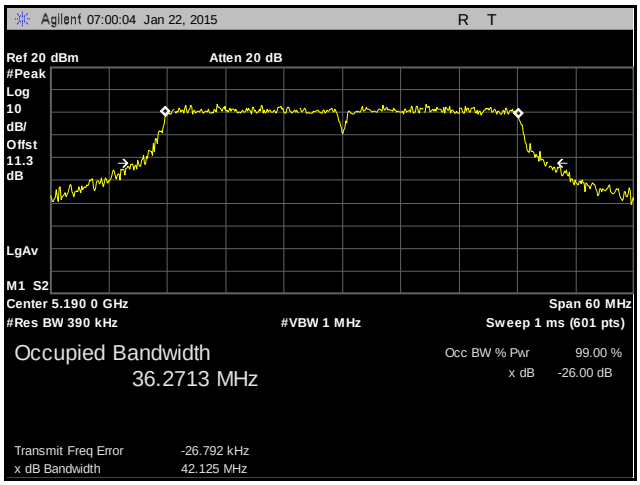


Plot 26. 26 dB Occupied Bandwidth, Mid Channel, 802.11ac 20 MHz, SISO, UNII 1

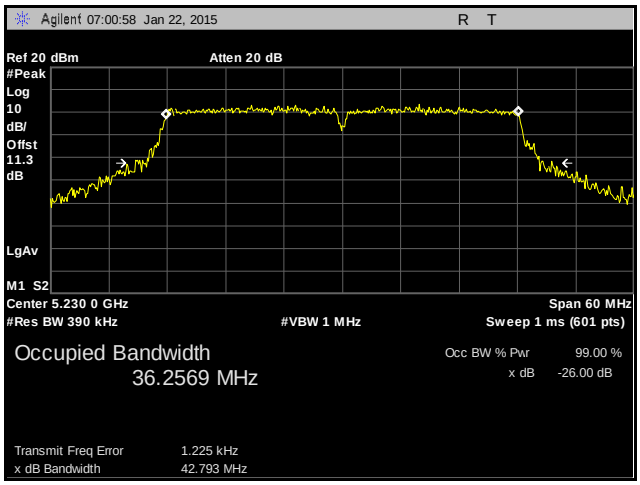


Plot 27. 26 dB Occupied Bandwidth, High Channel, 802.11ac 20 MHz, SISO, UNII 1

26 dB Occupied Bandwidth Test Results, 802.11ac 40 MHz, MIMO, UNII 1

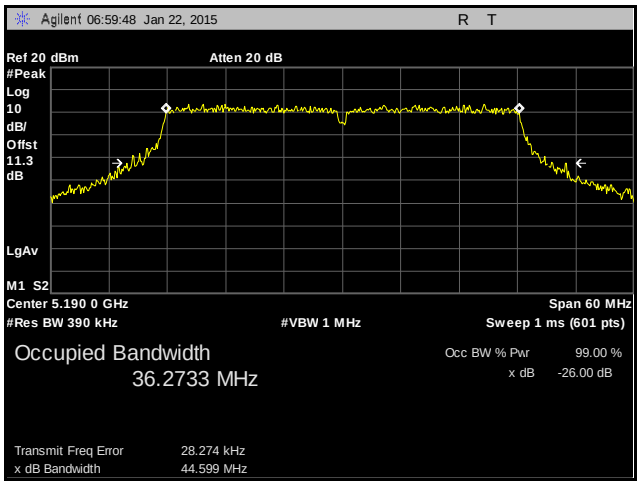


Plot 28. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 40 MHz, MIMO, UNII 1

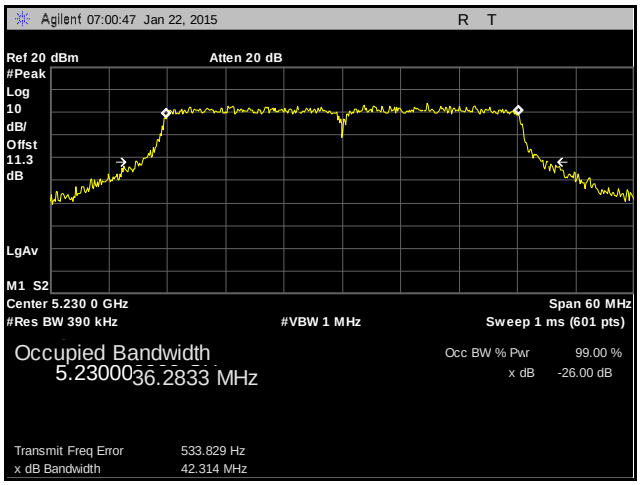


Plot 29. 26 dB Occupied Bandwidth, High Channel, 802.11ac 40 MHz, MIMO, UNII 1

26 dB Occupied Bandwidth Test Results, 802.11ac 40 MHz, SISO, UNII 1

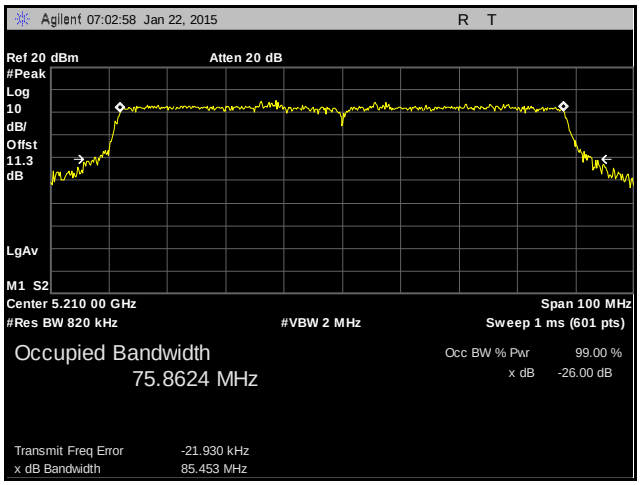


Plot 30. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 40 MHz, SISO, UNII 1

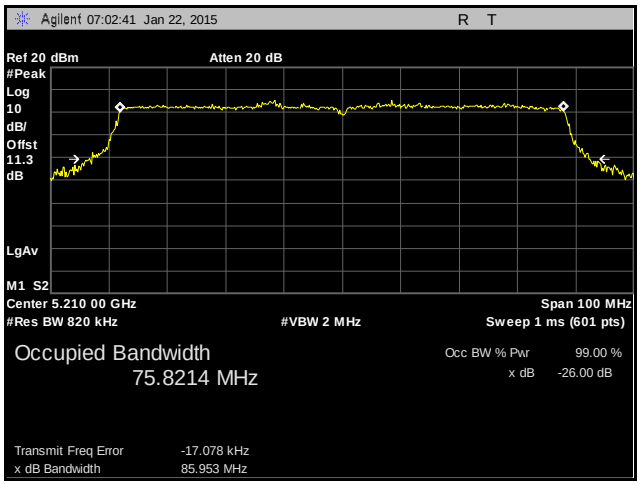


Plot 31. 26 dB Occupied Bandwidth, High Channel, 802.11ac 40 MHz, SISO, UNII 1

26 dB Occupied Bandwidth Test Results, 802.11ac 80 MHz, UNII 1

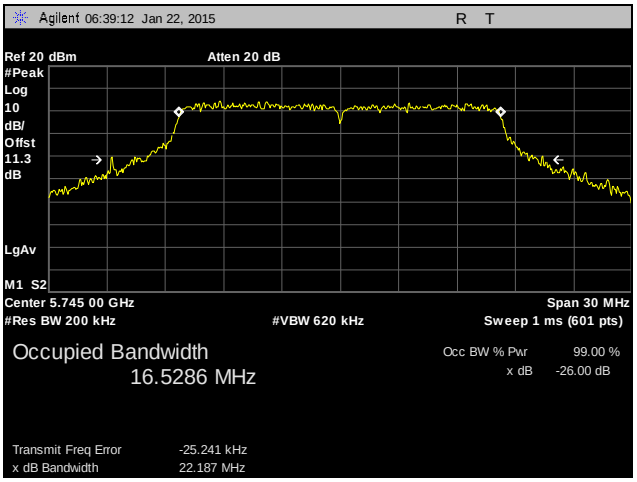


Plot 32. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, MIMO, UNII 1

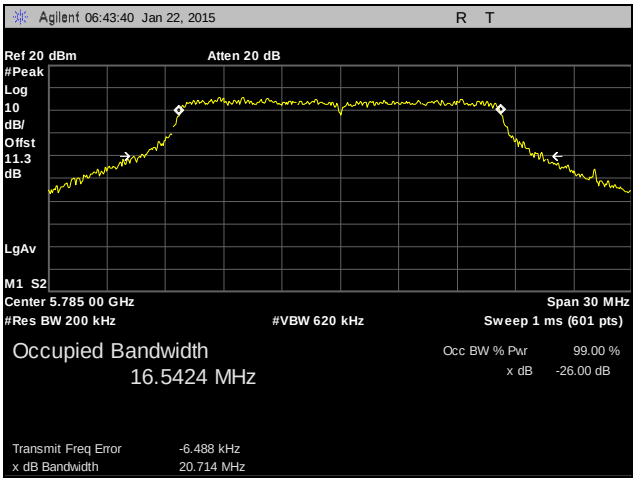


Plot 33. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, SISO, UNII 1

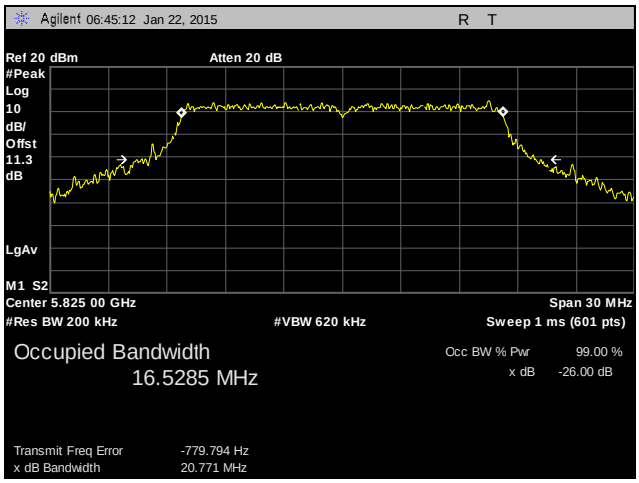
26 dB Occupied Bandwidth Test Results, 802.11a, MIMO, UNII 3



Plot 34. 26 dB Occupied Bandwidth, Low Channel, 802.11a, MIMO, UNII 3

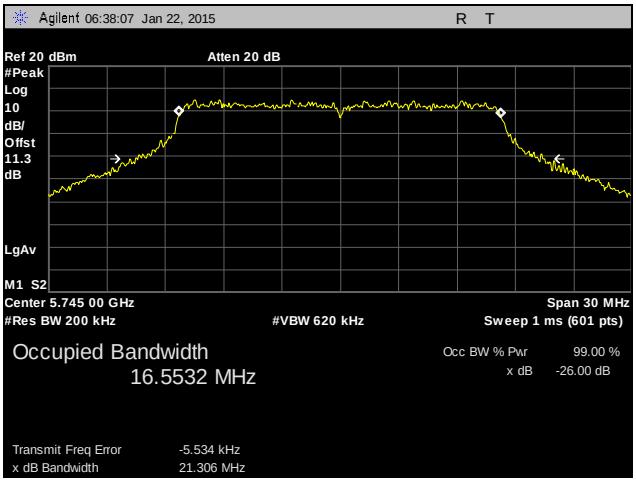


Plot 35. 26 dB Occupied Bandwidth, Mid Channel, 802.11a, MIMO, UNII 3

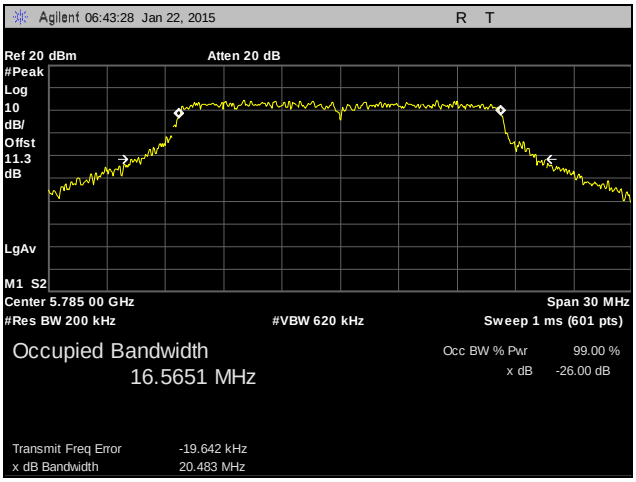


Plot 36. 26 dB Occupied Bandwidth, High Channel, 802.11a, MIMO, UNII 3

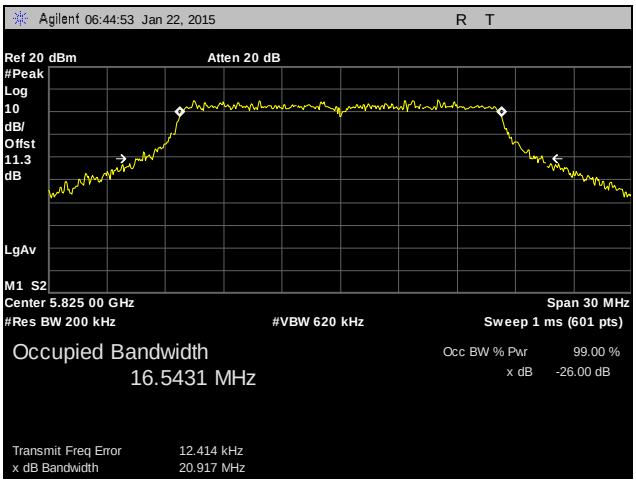
26 dB Occupied Bandwidth Test Results, 802.11a, SISO, UNII 3



Plot 37. 26 dB Occupied Bandwidth, Low Channel, 802.11a, SISO, UNII 3

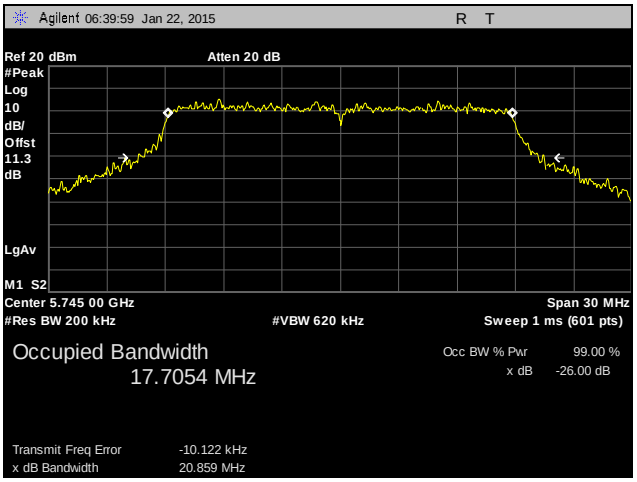


Plot 38. 26 dB Occupied Bandwidth, Mid Channel, 802.11a, SISO, UNII 3

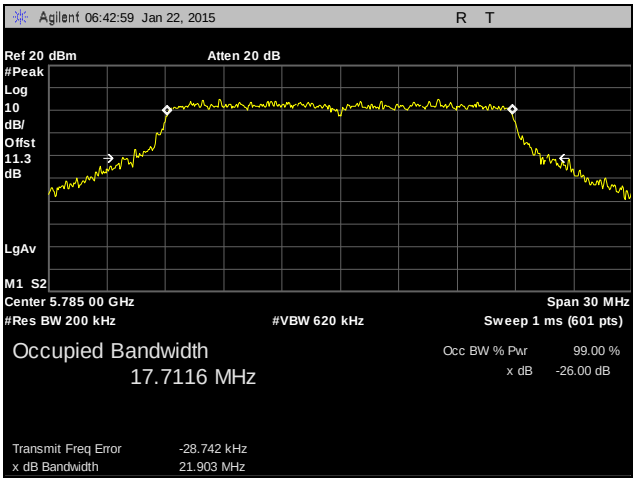


Plot 39. 26 dB Occupied Bandwidth, High Channel, 802.11a, SISO, UNII 3

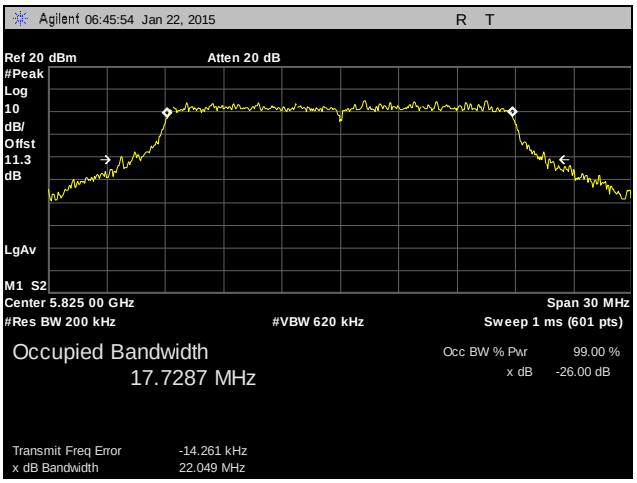
26 dB Occupied Bandwidth Test Results, 802.11n 20 MHz, MIMO, UNII 3



Plot 40. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, MIMO, UNII 3

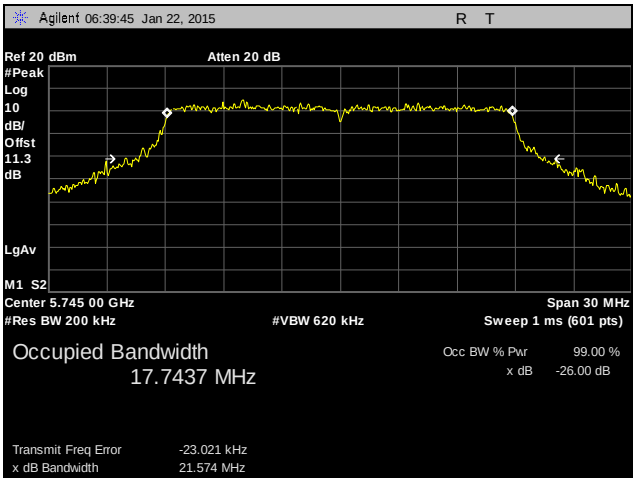


Plot 41. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, MIMO, UNII 3

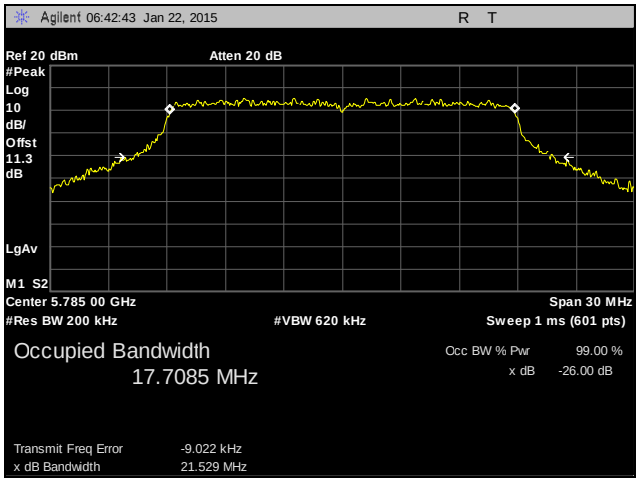


Plot 42. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, MIMO, UNII 3

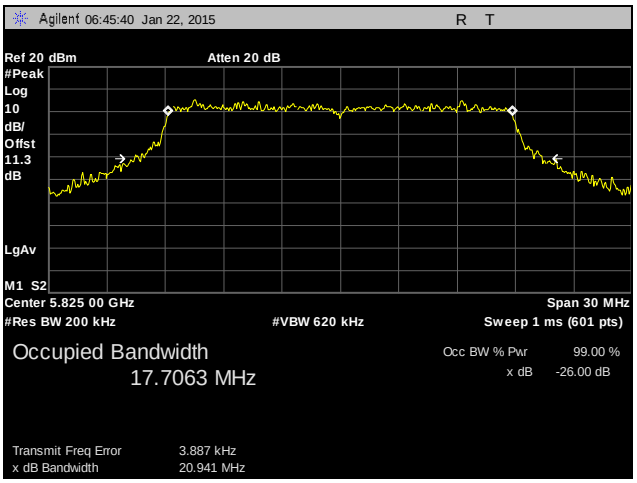
26 dB Occupied Bandwidth Test Results, 802.11n 20 MHz, SISO, UNII 3



Plot 43. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, SISO, UNII 3

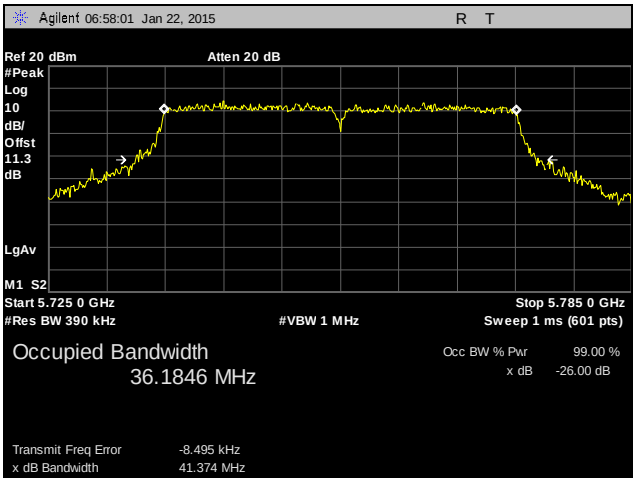


Plot 44. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, SISO, UNII 3

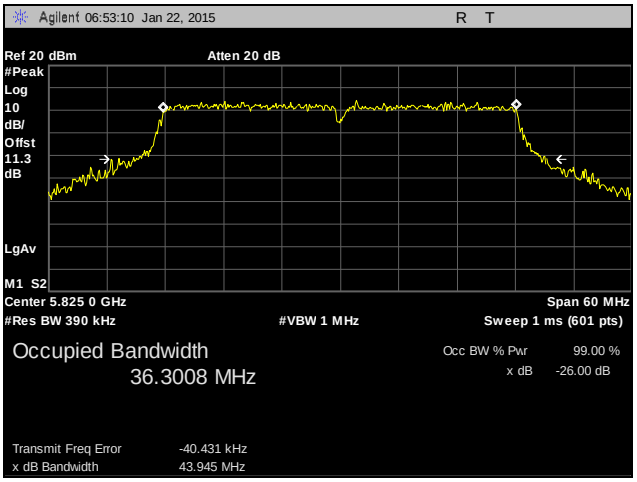


Plot 45. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, SISO, UNII 3

26 dB Occupied Bandwidth Test Results, 802.11n 40 MHz, MIMO, UNII 3

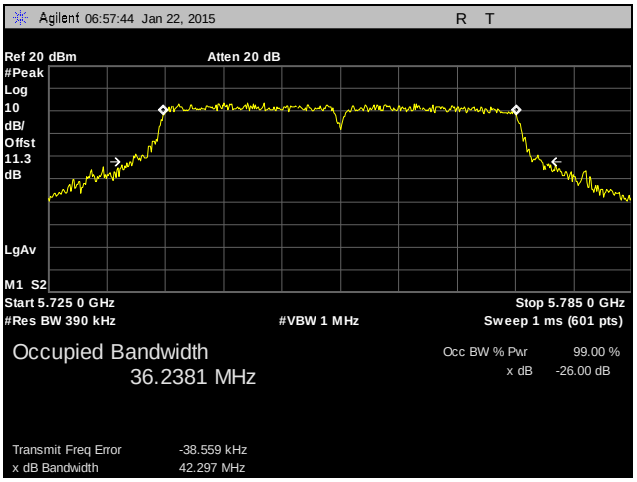


Plot 46. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, MIMO, UNII 3

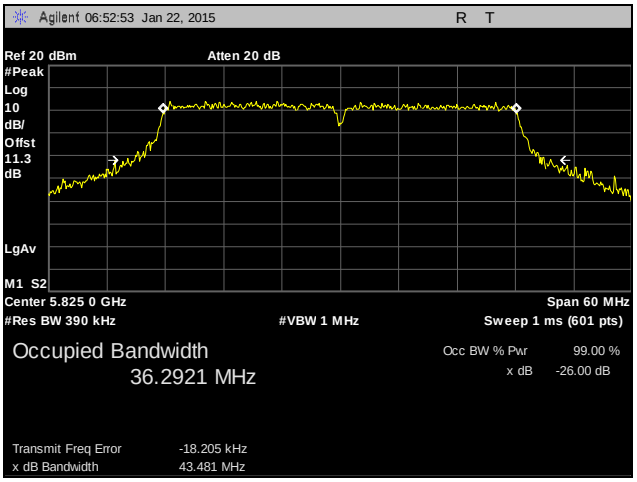


Plot 47. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, MIMO, UNII 3

26 dB Occupied Bandwidth Test Results, 802.11n 40 MHz, SISO, UNII 3

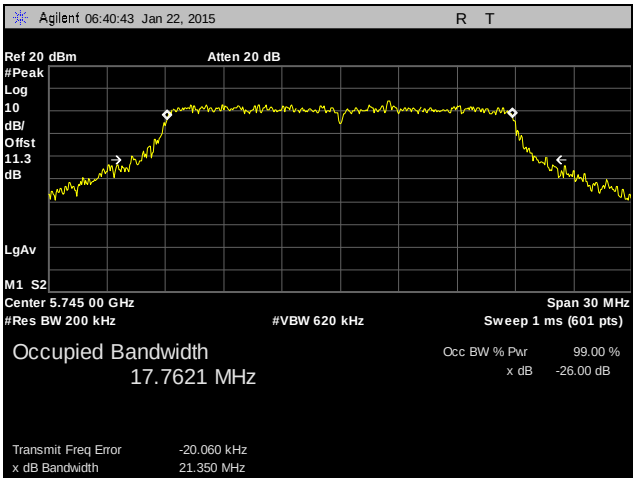


Plot 48. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, SISO, UNII 3

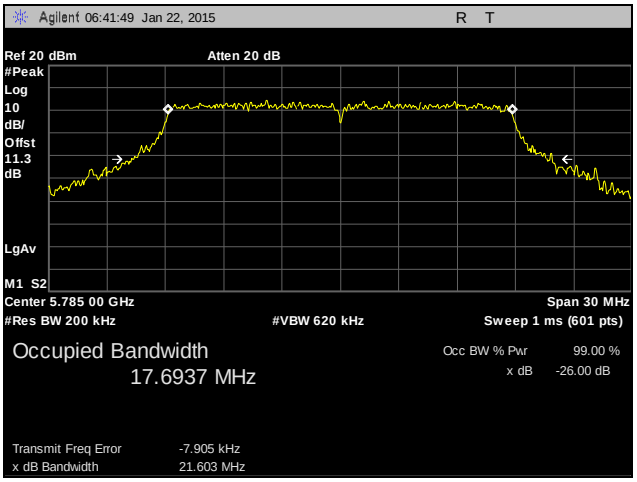


Plot 49. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, SISO, UNII 3

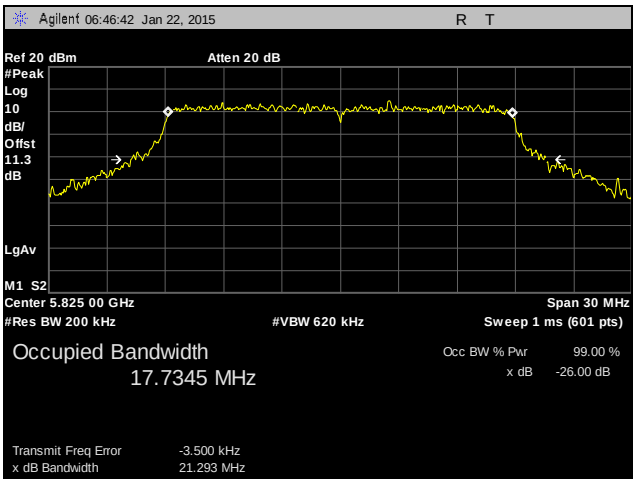
26 dB Occupied Bandwidth Test Results, 802.11ac 20 MHz, MIMO, UNII 3



Plot 50. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 20 MHz, MIMO, UNII 3

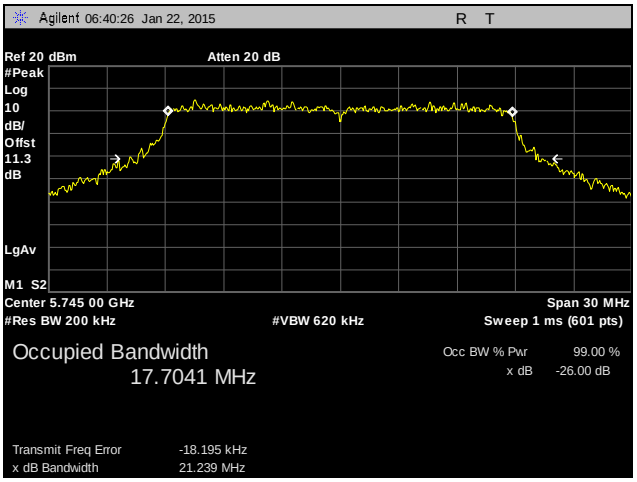


Plot 51. 26 dB Occupied Bandwidth, Mid Channel, 802.11ac 20 MHz, MIMO, UNII 3

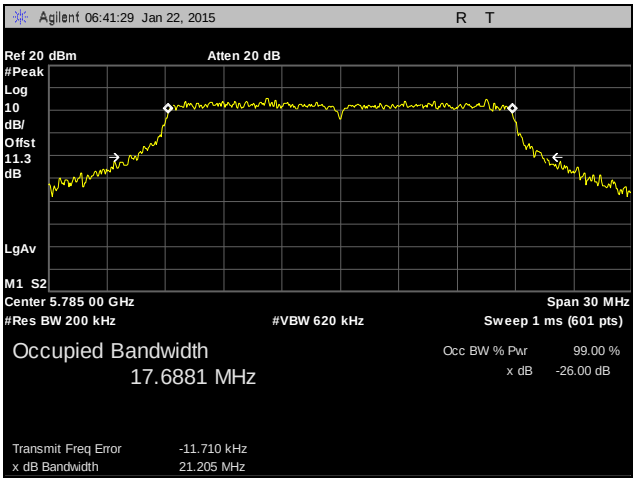


Plot 52. 26 dB Occupied Bandwidth, High Channel, 802.11ac 20 MHz, MIMO, UNII 3

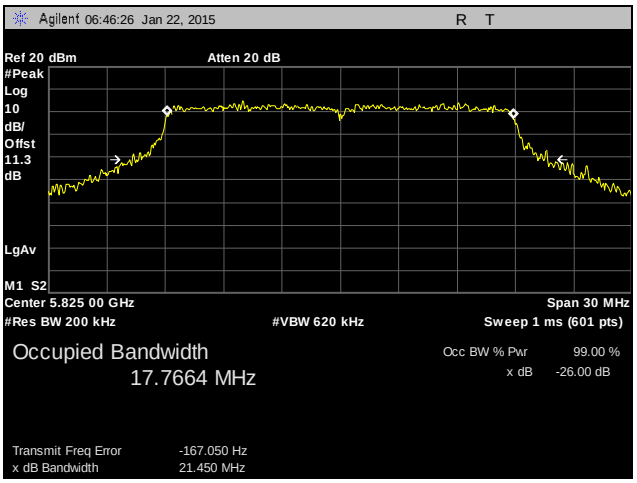
26 dB Occupied Bandwidth Test Results, 802.11ac 20 MHz, SISO, UNII 3



Plot 53. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 20 MHz, SISO, UNII 3

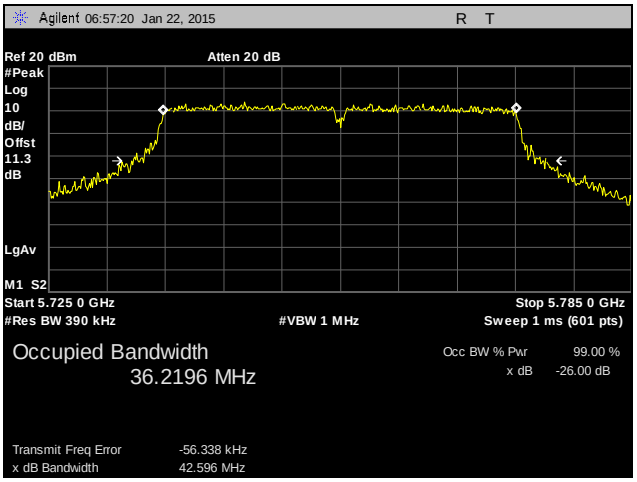


Plot 54. 26 dB Occupied Bandwidth, Mid Channel, 802.11ac 20 MHz, SISO, UNII 3

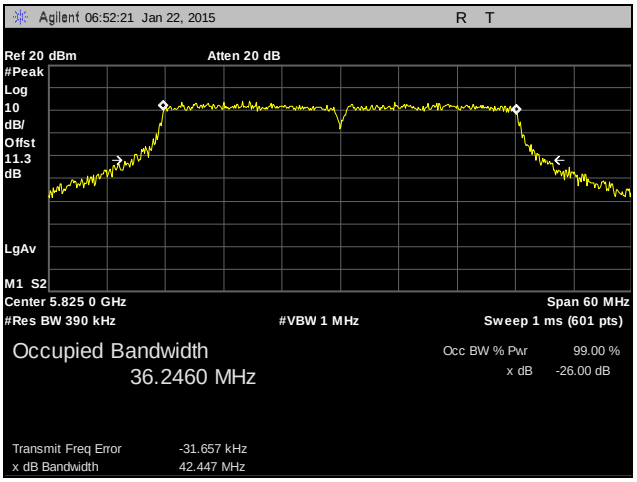


Plot 55. 26 dB Occupied Bandwidth, High Channel, 802.11ac 20 MHz, SISO, UNII 3

26 dB Occupied Bandwidth Test Results, 802.11ac 40 MHz, MIMO, UNII 3

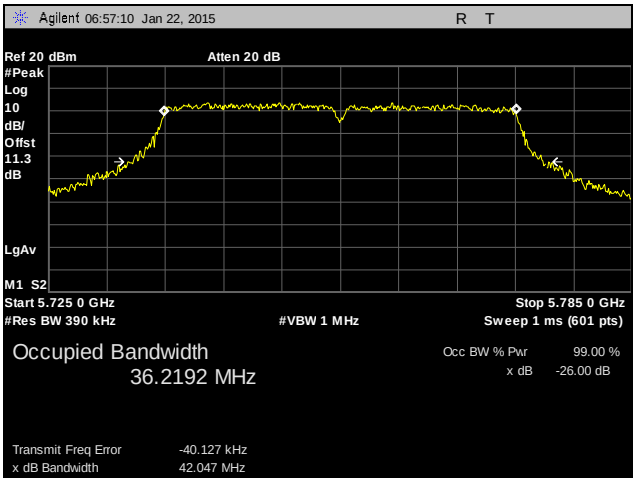


Plot 56. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 40 MHz, MIMO, UNII 3

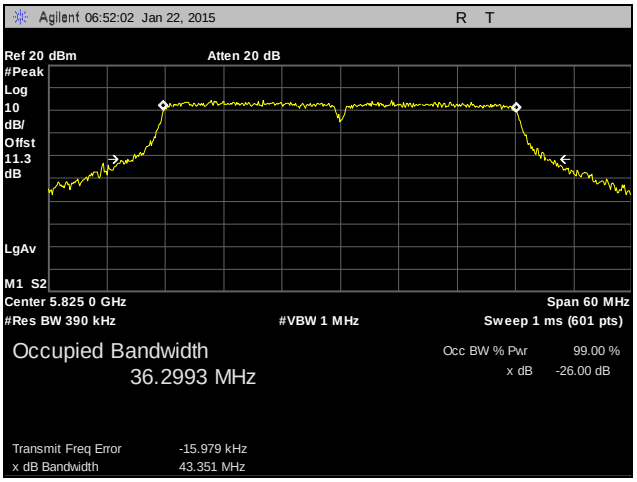


Plot 57. 26 dB Occupied Bandwidth, High Channel, 802.11ac 40 MHz, MIMO, UNII 3

26 dB Occupied Bandwidth Test Results, 802.11ac 40 MHz, SISO, UNII 3

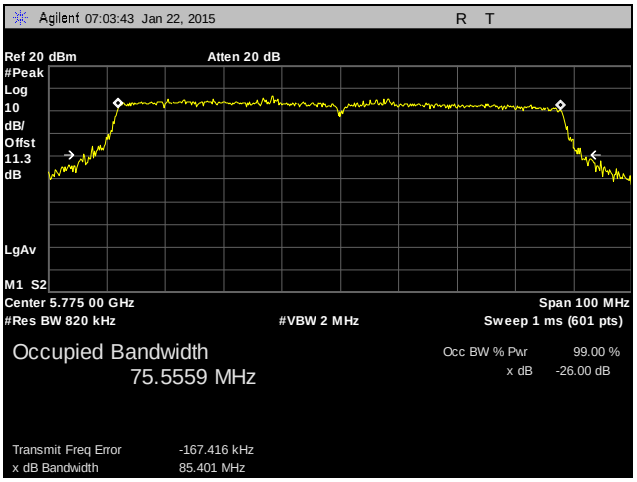


Plot 58. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 40 MHz, SISO, UNII 3

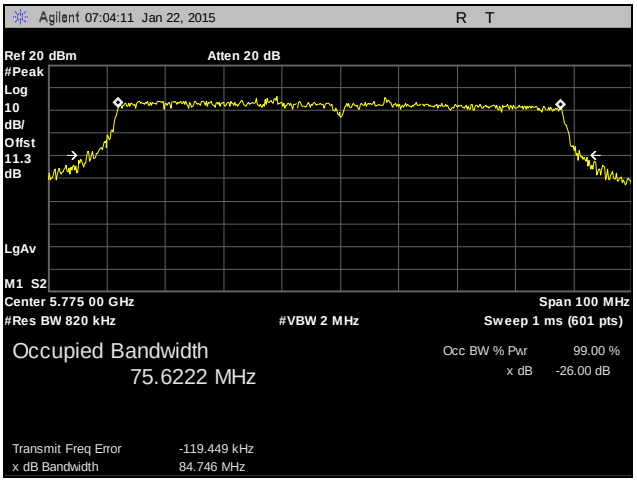


Plot 59. 26 dB Occupied Bandwidth, High Channel, 802.11ac 40 MHz, SISO, UNII 3

26 dB Occupied Bandwidth Test Results, 802.11ac 80 MHz, UNII 3



Plot 60. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, MIMO, UNII 3



Plot 61. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, SISO, UNII 3

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(1)(ii) & §15.407(a)(3) 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.

§15.407(a)(3): For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

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

Test Results: Equipment was compliant with the Peak Power Output limits of §15.401(a)(1)(ii) and §15.407(a)(3).

Test Engineer(s): Surinder Singh

Test Date(s): 02/02/15

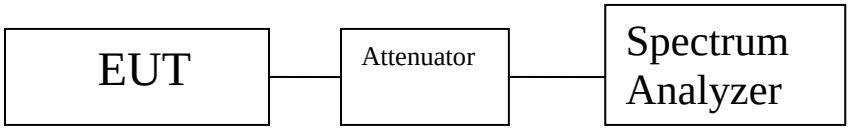


Figure 3. Power Output Test Setup

Peak Power Output Test Results, UNII 1

Conducted Output Power 20MHz Band 802.11b/g/n Mode SISO						
Channel	**Frequency MHz**	**Measured Peak Output Power (dBm)/20MHz**	**Mode**	**Power Limit (dBm)**	**Antenna Gain dBi**	**Margin dB**
36	5180	23.03	a	29.71	6.29	-6.68
36	5180	22.93	n	29.71	6.29	-6.78
36	5180	23	ac	29.71	6.29	-6.71
40	5200	23.55	a	29.71	6.29	-6.16
40	5200	23.77	n	29.71	6.29	-5.94
40	5200	23.65	ac	29.71	6.29	-6.06
48	5240	23.43	a	29.71	6.29	-6.28
48	5240	23.62	n	29.71	6.29	-6.09
48	5240	23.49	ac	29.71	6.29	-6.22

Table 18. Peak Power Output, Test Results, 802.11b/g/n 20 MHz, SISO, UNII 1

Peak Conducted Output Power 20MHz Band 802.11b/g/n Mode MIMO									
Channel	**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 power dBm**	**Power Limit (dBm)**	**Antenna Gain dBi**	**Margin dB**
36	5180	19.24	19.18	19.05	a	23.92	25.53	10.47	-1.60
36	5180	17.24	17.54	17.46	n	22.18	29.71	6.29	-7.52
36	5180	17.21	17.44	17.09	ac	22.02	29.71	6.29	-7.68
40	5200	19.07	19.22	19.34	a	23.98	25.53	10.47	-1.54
40	5200	23.37	23.59	23.67	n	28.31	29.71	6.29	-1.39
40	5200	23.17	23.54	23.29	ac	28.10	29.71	6.29	-1.60
48	5240	19.11	19.43	19.71	a	24.19	25.53	10.47	-1.33
48	5240	23.12	23.38	23.46	n	28.09	29.71	6.29	-1.61
48	5240	23.55	23.27	23.59	ac	28.24	29.71	6.29	-1.46

Table 19. Peak Power Output, Test Results, 802.11b/g/n 20 MHz, MIMO, UNII 1

*Note: In 802.11n and ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Conducted Output Power 40MHz Band n and ac Mode SISO						
Channel	**Frequency MHz**	**Measured Peak Output Power (dBm)/40MHz**	**Power Limit (dBm)**	**Antenna Gain dBi**	**mode**	**Margin dB**
36	5190	17.37	29.71	6.29	n	-12.34
36	5190	17.59	29.71	6.29	ac	-12.12
44	5230	22.2	29.71	6.29	n	-7.51
44	5230	22.41	29.71	6.29	ac	-7.3

Table 20. Peak Power Output, Test Results, 802.11n/ac 40 MHz, SISO, UNII 1

Conducted Output Power 80MHz Band ac Mode SISO						
Channel	**Frequency MHz**	**Measured Peak Output Power (dBm)/80MHz**	**Power Limit (dBm)**	**Antenna Gain dBi**	**mode**	**Margin dB**
36	5210	13.88	29.71	6.29	ac	-15.83

Table 21. Peak Power Output, Test Results, 802.11ac 80 MHz, SISO, UNII 1

Peak Conducted Output Power 40MHz Band n and ac Mode MIMO (3*3)									
Chanel Carrier	**Frequency MHz**	**Measured Peak Output Power (dBm)/40MHz Ant 0**	**Measured Peak Output Power (dBm)/40MHz Ant 1**	**Measured Peak Output Power (dBm)/40MHz Ant 2**	**mode**	**Total Output Power**	**Antenna Gain dBi**	**Power Limit (dBm)**	**Margin dB**
36	5190	16.43	16.67	16.28	n	21.23	6.29	29.71	-8.47
36	5190	16.27	16.32	16.39	ac	21.09	6.29	29.71	-8.61
44	5230	22.77	22.06	22.46	n	27.21	6.29	29.71	-2.49
44	5230	22.43	22.34	22.49	ac	27.19	6.29	29.71	-2.51

Table 22. Peak Power Output, Test Results, 802.11n/ac 40 MHz, MIMO, UNII 1

*Note: In 802.11n and ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Peak Conducted Output Power 80MHz Band n Mode MIMO (3*3)									
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**	**mode**	**Total Output Power**	**Antenna Gain dBi**	**Power Limit (dBm)**	**Margin dB**
36	5210	13.72	13.89	13.67	ac	18.53	6.29	29.71	-11.17

Table 23. Peak Power Output, Test Results, 802.11n 80 MHz, MIMO, UNII 1

*Note: In 802.11ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Peak Power Output Test Results, UNII 3

Conducted Output Power 20MHz Band 802.11a/n/ac Mode SISO						
Channel	**Frequency MHz**	**Measured Peak Output Power (dBm)/20MHz**	**Mode**	**Power Limit (dBm)**	**Antenna Gain dBi**	**Margin Ant**
149	5745	20.3	a	28.96	7.04	-8.66
149	5745	20.59	n	28.96	7.04	-8.37
149	5745	20.56	ac	28.96	7.04	-8.4
157	5785	23.63	a	28.96	7.04	-5.33
157	5785	23.63	n	28.96	7.04	-5.33
157	5785	23.96	ac	28.96	7.04	-5
165	5825	22	a	28.96	7.04	-6.96
165	5825	22.02	n	28.96	7.04	-6.94
165	5825	21.95	ac	28.96	7.04	-7.01

Table 24. Peak Power Output, Test Results, 802.11a/n/ac 20 MHz, SISO, UNII 3

Peak Conducted Output Power 20MHz Band 802.11a/n/ac Mode MIMO									
Channel	**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 power dBm**	**Power Limit (dBm)**	**Antenna Gain dBi**	**Margin**
149	5745	18.34	18.94	18.45	a	23.35	25.29	10.71	-1.93
149	5745	18.47	18.05	18.64	n	23.16	28.96	7.04	-5.79
149	5745	17.49	18.09	18.22	ac	22.71	28.96	7.04	-6.24
157	5785	19.65	19.61	19.32	a	24.3	25.29	10.71	-0.98
157	5785	23.77	23.45	23.14	n	28.23	28.96	7.04	-0.72
157	5785	23.43	23.74	23.65	ac	28.37	28.96	7.04	-0.58
165	5825	19.64	19.85	18.99	a	24.27	25.29	10.71	-1.01
165	5825	20.01	19.75	19.84	n	24.63	28.96	7.04	-4.32
165	5825	19.87	19.48	19.28	ac	24.32	28.96	7.04	-4.63

Table 25. Peak Power Output, Test Results, 802.11a/n/ac 20 MHz, MIMO, UNII 3

*Note: In 802.11n and ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Conducted Output Power 40MHz Band n and ac Mode SISO						
Channel	**Frequency MHz**	**Measured Peak Output Power (dBm)/40MHz**	**Power Limit (dBm)**	**Antenna Gain dBi**	**mode**	**Margin**
151	5755	16.6	28.96	7.04	n	-12.36
151	5755	16.25	28.96	7.04	ac	-12.71
159	5795	23.11	28.96	7.04	n	-5.85
159	5795	22.76	28.96	7.04	ac	-6.2

Table 26. Peak Power Output, Test Results, 802.11n/ac 40 MHz, SISO, UNII 3

Conducted Output Power 80MHz Band ac Mode SISO						
Channel	**Frequency MHz**	**Measured Peak Output Power (dBm)/80MHz**	**Power Limit (dBm)**	**Antenna Gain dBi**	**mode**	**Margin**
155	5775	13.46	28.96	7.04	ac	-15.5

Table 27. Peak Power Output, Test Results, 802.11ac 80 MHz, SISO, UNII 3

Peak Conducted Output Power 40MHz Band n and ac Mode MIMO (3*3)									
Chanel Carrier	**Frequency MHz**	**Measured Peak Output Power (dBm)/40MHz Ant 0**	**Measured Peak Output Power (dBm)/40MHz Ant 1**	**Measured Peak Output Power (dBm)/40MHz Ant 2**	**mode**	**Total Output Power**	**Antenna Gain dBi**	**Power Limit (dBm)**	**Margin**
151	5755	15.14	15.49	15.84	n	20.27	7.04	28.96	-8.68
151	5755	15.38	15.46	15.84	ac	20.33	7.04	28.96	-8.62
159	5795	23.05	23.11	23.61	n	28.03	7.04	28.96	-0.92
159	5795	22.86	22.72	22.48	ac	27.46	7.04	28.96	-1.49

Table 28. Peak Power Output, Test Results, 802.11n/ac 40 MHz, MIMO, UNII 3

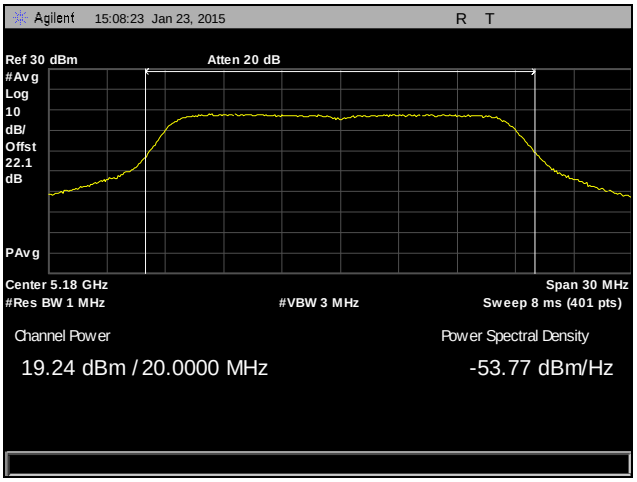
*Note: In 802.11n and ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Peak Conducted Output Power 80MHz Band n Mode MIMO (3*3)									
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**	**mode**	**Total Output Power**	**Antenna Gain dBi**	**Power Limit (dBm)**	**Margin**
155	5775	8.72	8.94	8.26	ac	13.42	7.04	28.96	-15.53

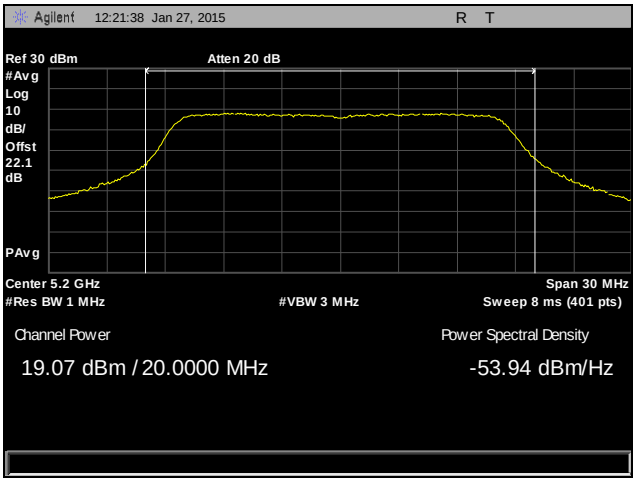
Table 29. Peak Power Output, Test Results, 802.11n 80 MHz, MIMO, UNII 3

*Note: In 802.11ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

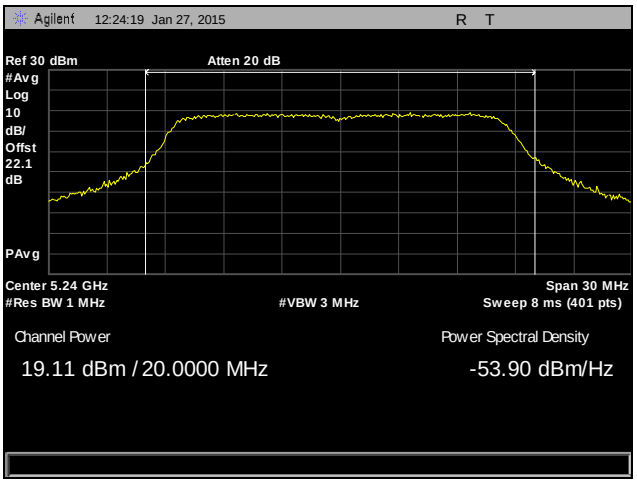
Peak Output Power, 802.11a, MIMO, UNII 1



Plot 62. Peak Output Power, 802.11a, Low Channel, MIMO, UNII 1

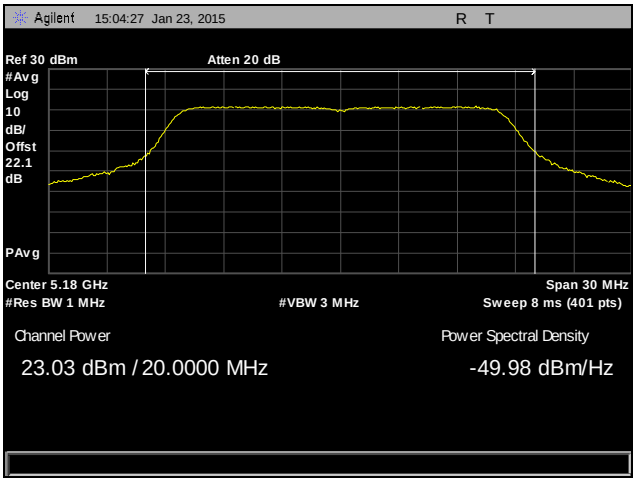


Plot 63. Peak Output Power, 802.11a, Mid Channel, MIMO, UNII 1

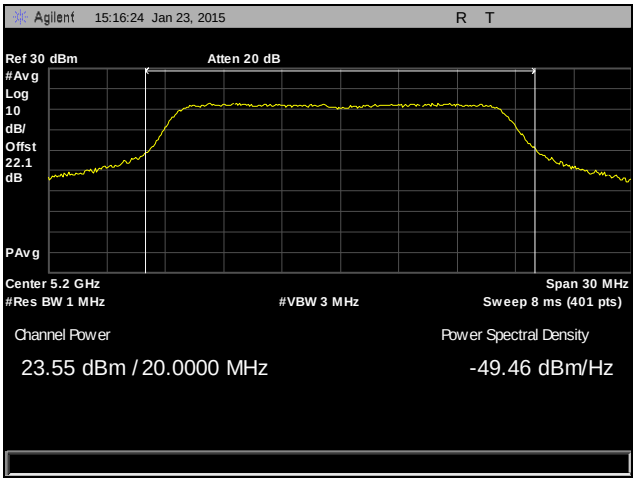


Plot 64. Peak Output Power, 802.11a, High Channel, MIMO, UNII 1

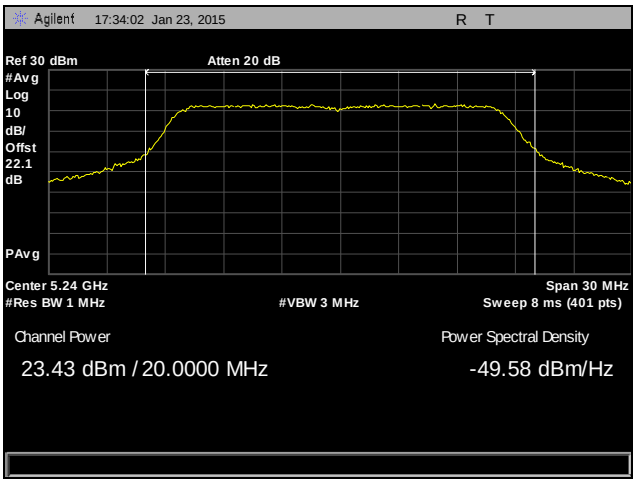
Peak Output Power, 802.11a, SISO, UNII 1



Plot 65. Peak Output Power, 802.11a, Low Channel, SISO, UNII 1

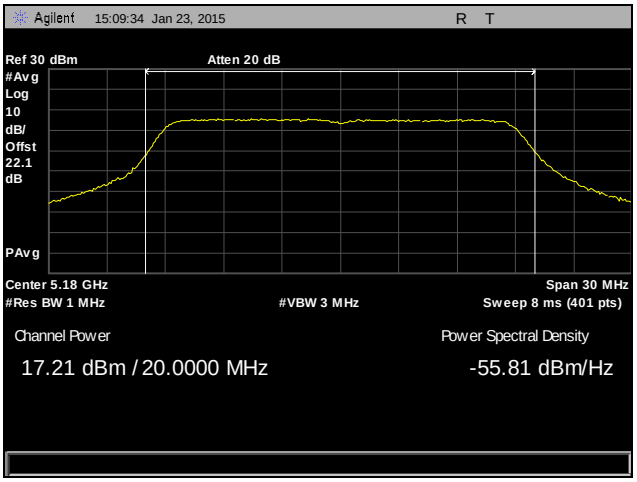


Plot 66. Peak Output Power, 802.11a, Mid Channel, SISO, UNII 1

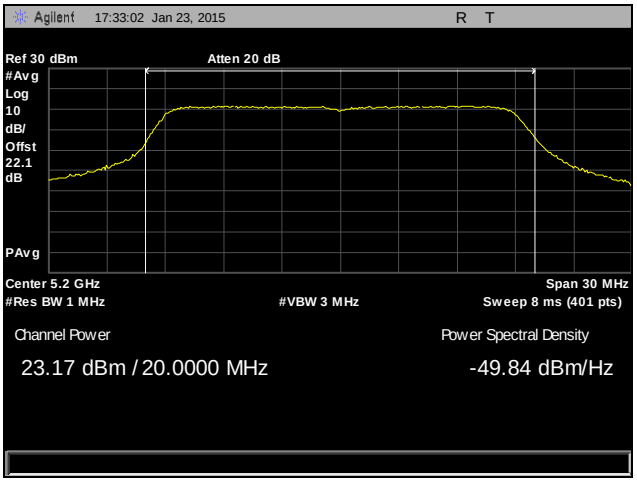


Plot 67. Peak Output Power, 802.11a, High Channel, SISO, UNII 1

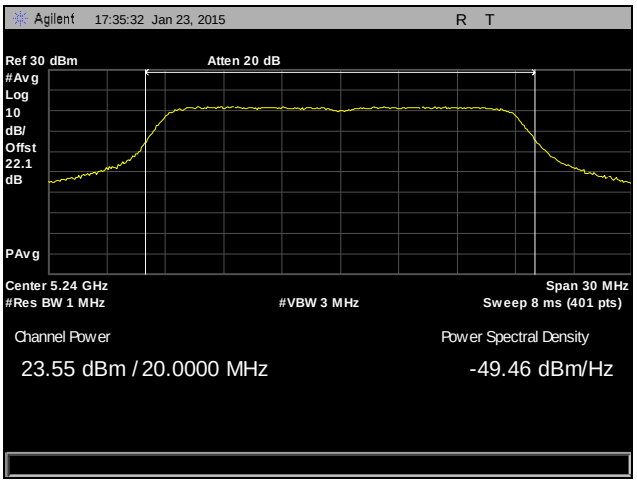
Peak Output Power, 802.11ac 20 MHz, MIMO, UNII 1



Plot 68. Peak Output Power, 802.11ac 20 MHz, Low Channel, MIMO, UNII 1

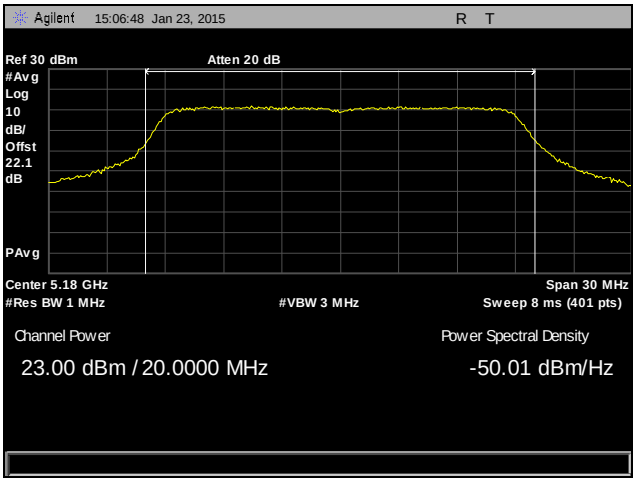


Plot 69. Peak Output Power, 802.11ac 20 MHz, Mid Channel, MIMO, UNII 1

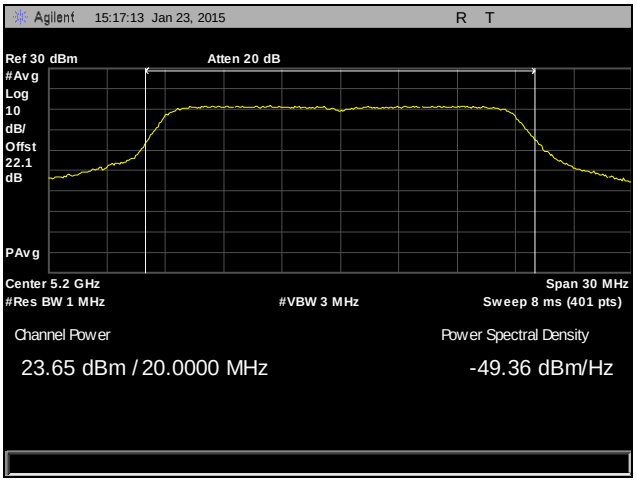


Plot 70. Peak Output Power, 802.11ac 20 MHz, High Channel, MIMO, UNII 1

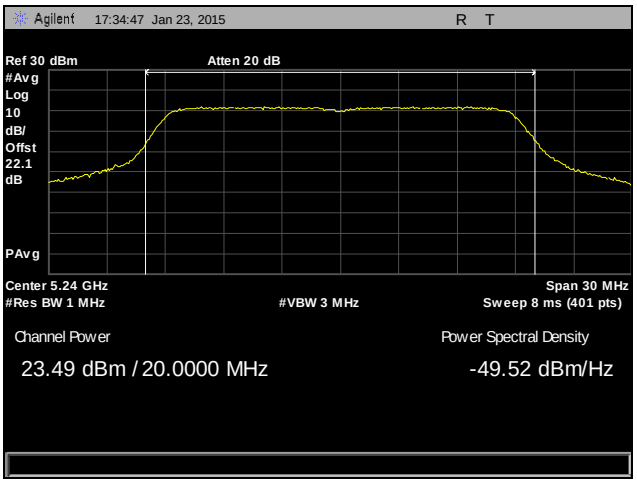
Peak Output Power, 802.11ac 20 MHz, SISO, UNII 1



Plot 71. Peak Output Power, 802.11ac 20 MHz, Low Channel, SISO, UNII 1

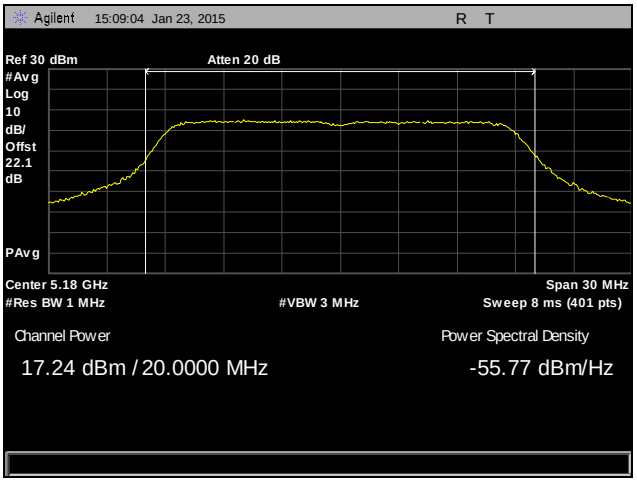


Plot 72. Peak Output Power, 802.11ac 20 MHz, Mid Channel, SISO, UNII 1

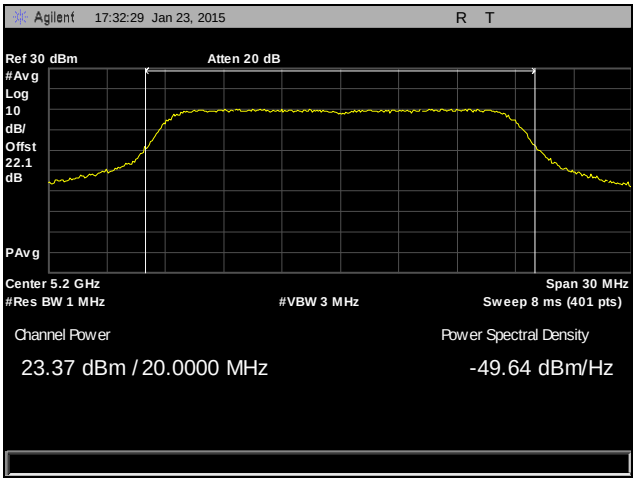


Plot 73. Peak Output Power, 802.11ac 20 MHz, High Channel, SISO, UNII 1

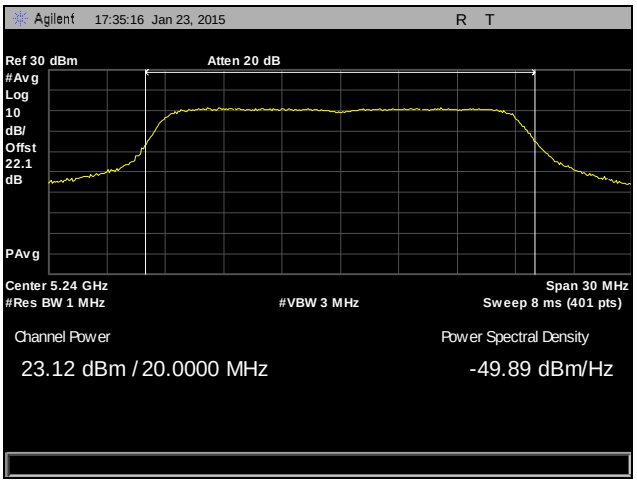
Peak Output Power, 802.11n 20 MHz, MIMO, UNII 1



Plot 74. Peak Output Power, 802.11n 20 MHz, Low Channel, MIMO, UNII 1

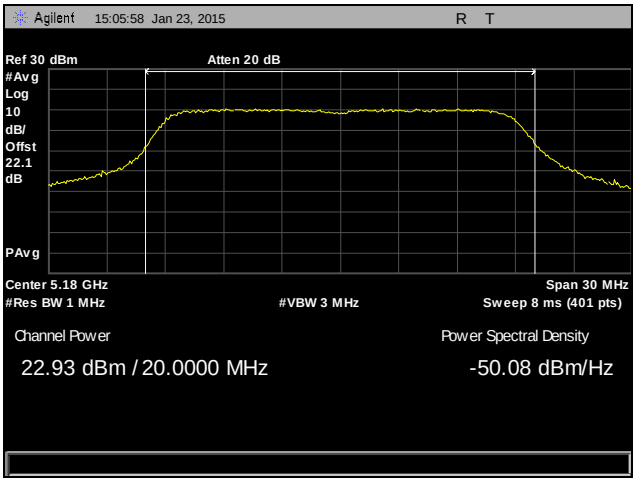


Plot 75. Peak Output Power, 802.11n 20 MHz, Mid Channel, MIMO, UNII 1

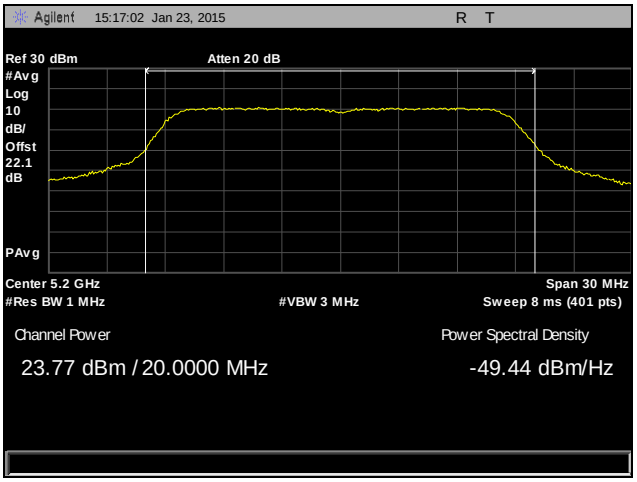


Plot 76. Peak Output Power, 802.11n 20 MHz, High Channel, MIMO, UNII 1

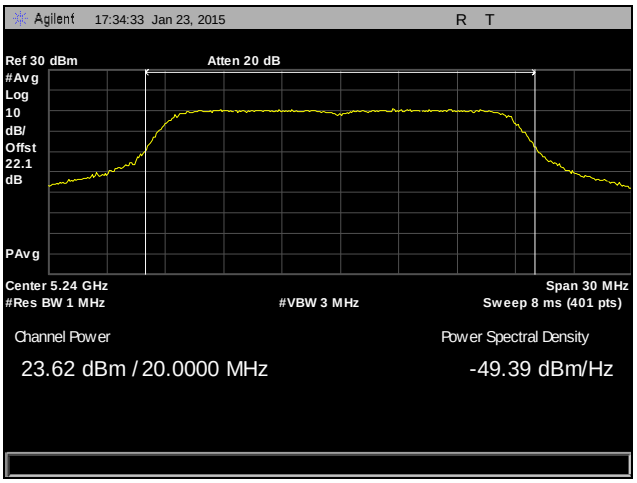
Peak Output Power, 802.11n 20 MHz, SISO, UNII 1



Plot 77. Peak Output Power, 802.11n 20 MHz, Low Channel, SISO, UNII 1

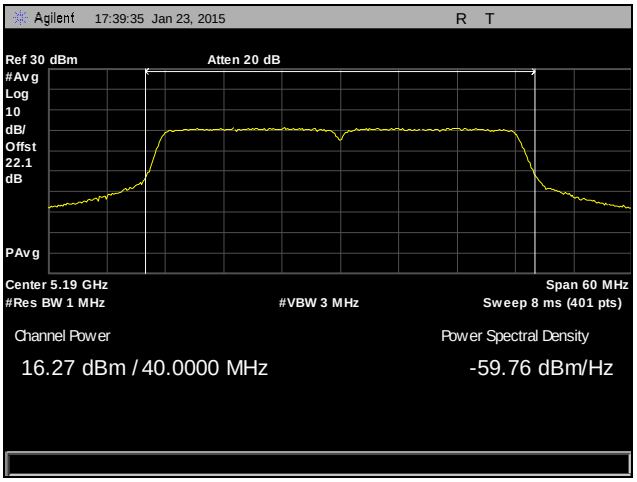


Plot 78. Peak Output Power, 802.11n 20 MHz, Mid Channel, SISO, UNII 1

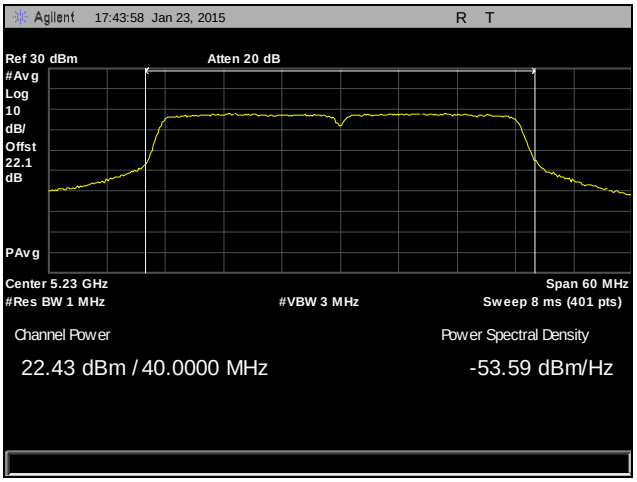


Plot 79. Peak Output Power, 802.11n 20 MHz, High Channel, SISO, UNII 1

Peak Output Power, 802.11ac 40 MHz, MIMO, UNII 1

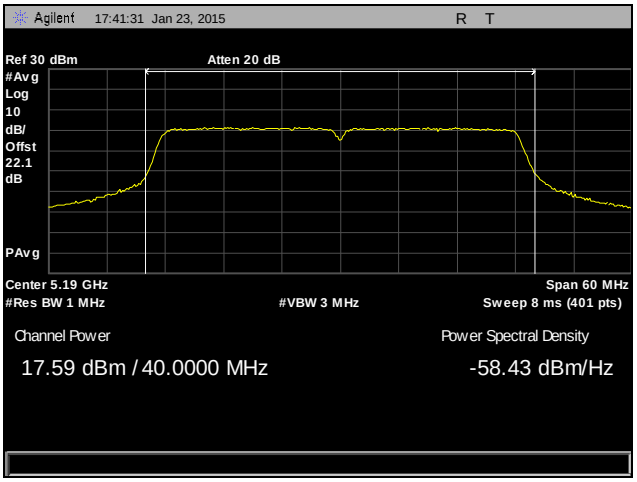


Plot 80. Peak Output Power, 802.11ac 40 MHz, Low Channel, MIMO, UNII 1

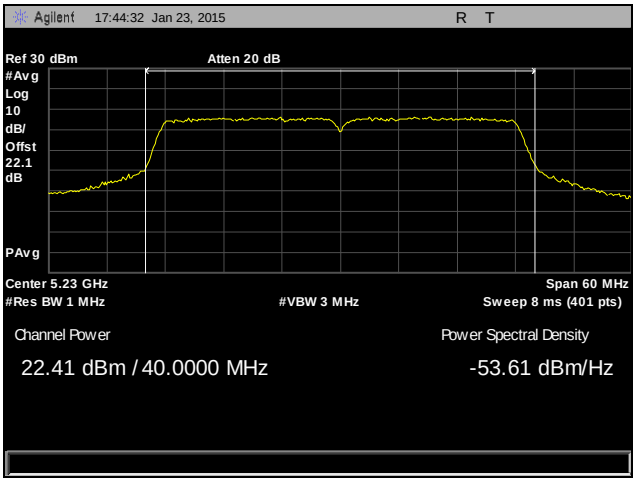


Plot 81. Peak Output Power, 802.11ac 40 MHz, High Channel, MIMO, UNII 1

Peak Output Power, 802.11ac 40 MHz, SISO, UNII 1

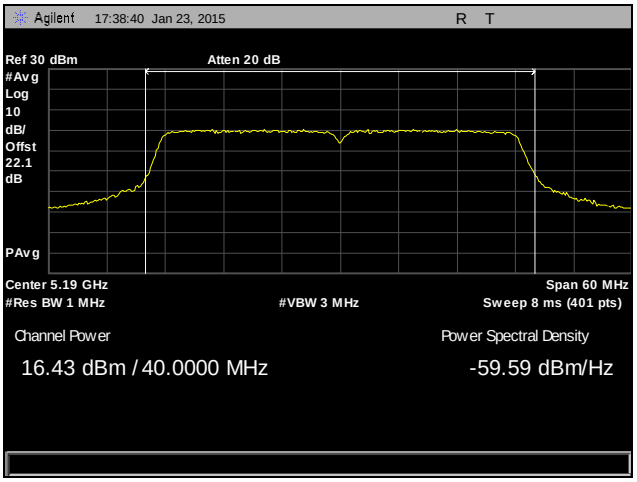


Plot 82. Peak Output Power, 802.11ac 40 MHz, Low Channel, SISO, UNII 1

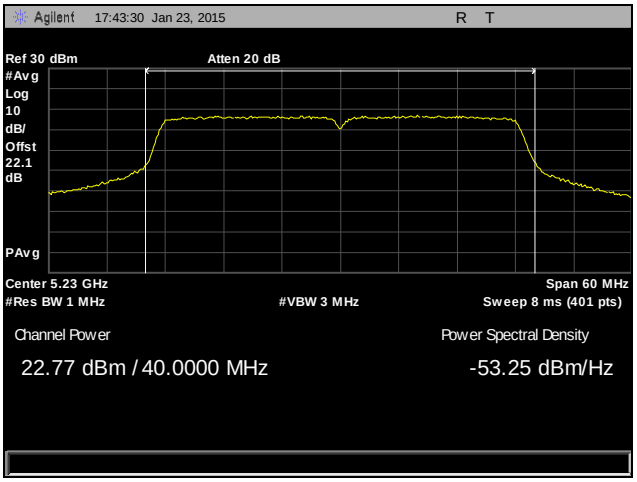


Plot 83. Peak Output Power, 802.11ac 40 MHz, High Channel, SISO, UNII 1

Peak Output Power, 802.11n 40 MHz, MIMO, UNII 1

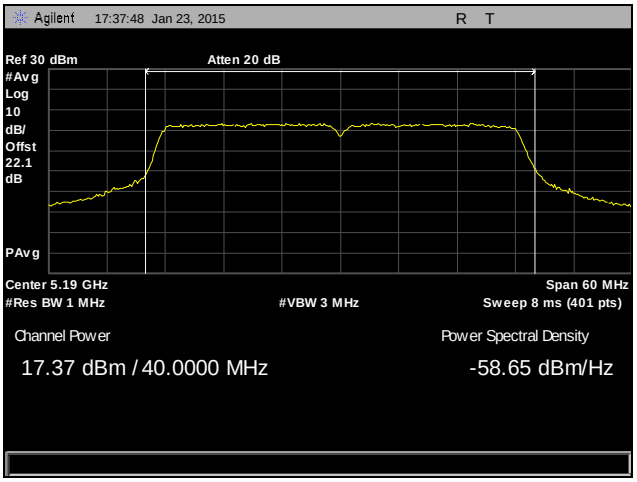


Plot 84. Peak Output Power, 802.11n 40 MHz, Low Channel, MIMO, UNII 1

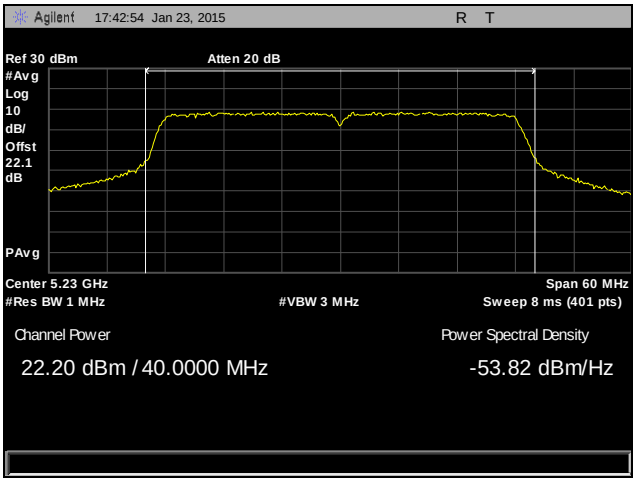


Plot 85. Peak Output Power, 802.11n 40 MHz, High Channel, MIMO, UNII 1

Peak Output Power, 802.11n 40 MHz, SISO, UNII 1

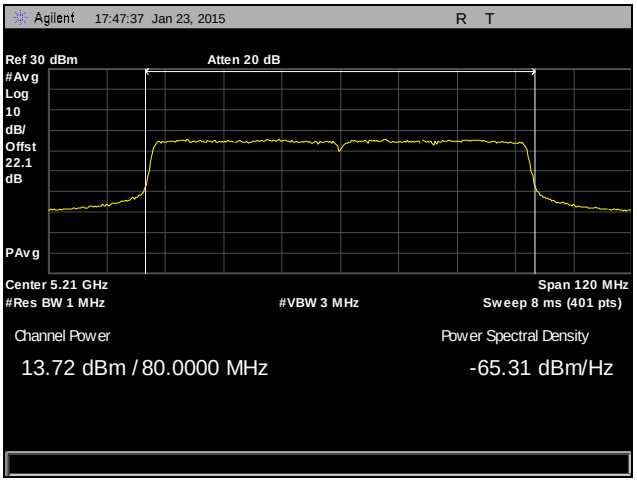


Plot 86. Peak Output Power, 802.11n 40 MHz, Low Channel, SISO, UNII 1

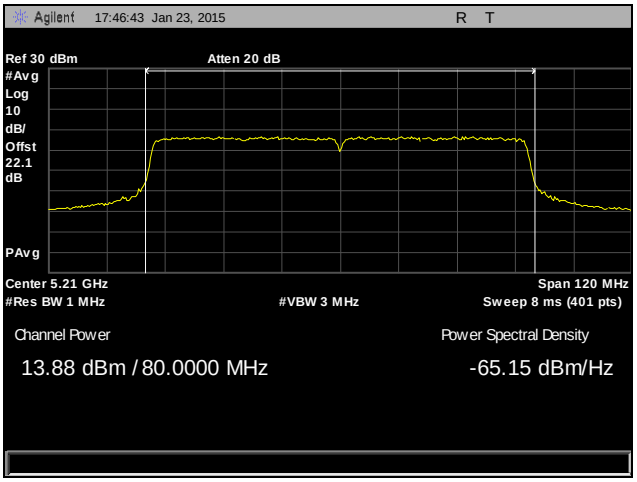


Plot 87. Peak Output Power, 802.11n 40 MHz, High Channel, SISO, UNII 1

Peak Output Power, 802.11ac 80 MHz, UNII 1

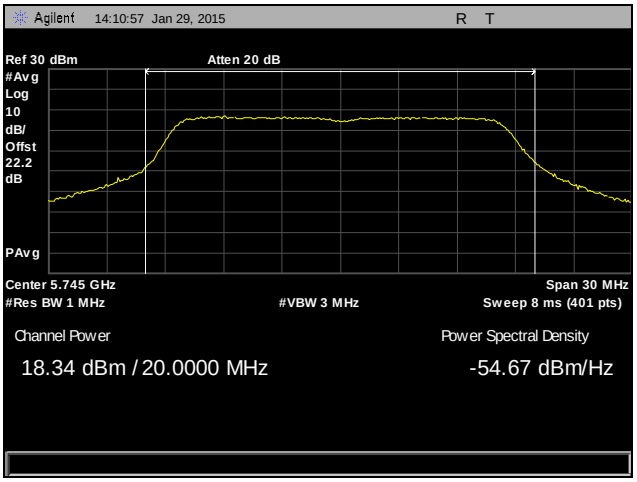


Plot 88. Peak Output Power, 802.11ac 80 MHz, MIMO, UNII 1

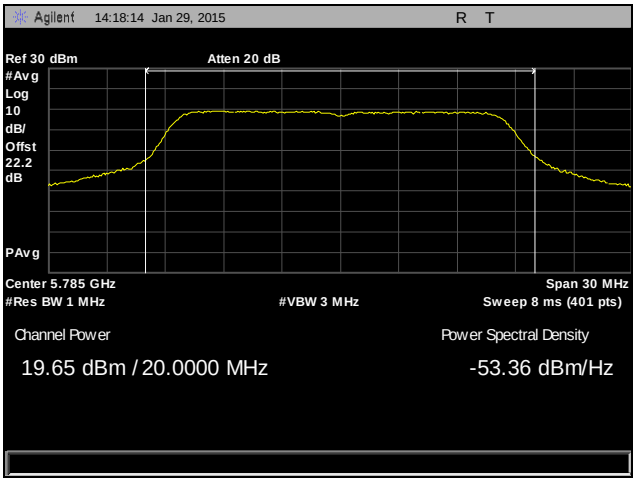


Plot 89. Peak Output Power, 802.11ac 80 MHz, SISO, UNII 1

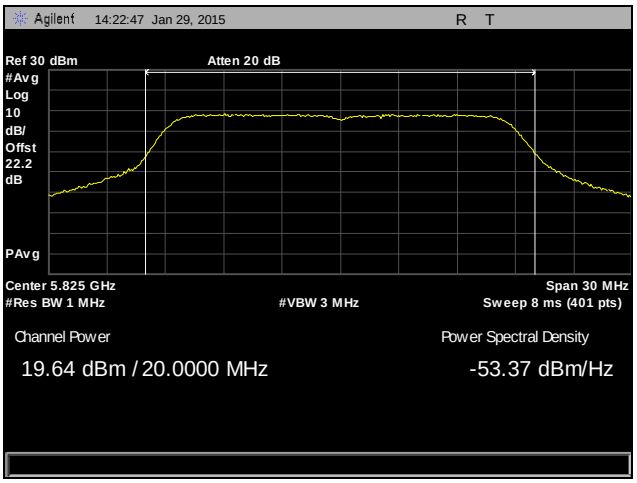
Peak Output Power, 802.11a, MIMO, UNII 3



Plot 90. Peak Output Power, 802.11a, Low Channel, MIMO, UNII 3

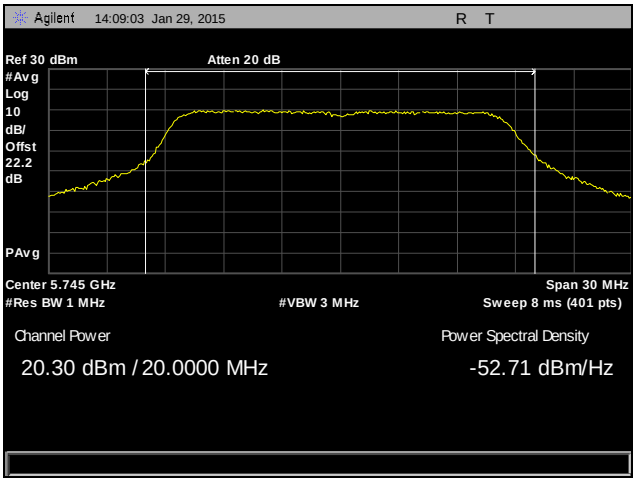


Plot 91. Peak Output Power, 802.11a, Mid Channel, MIMO, UNII 3

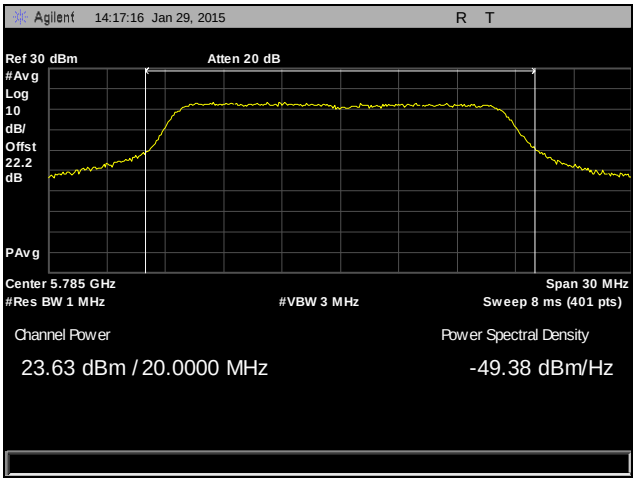


Plot 92. Peak Output Power, 802.11a, High Channel, MIMO, UNII 3

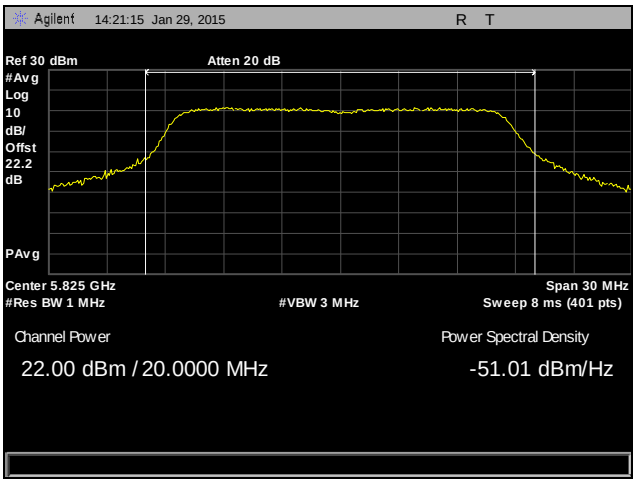
Peak Output Power, 802.11a, SISO, UNII 3



Plot 93. Peak Output Power, 802.11a, Low Channel, SISO, UNII 3

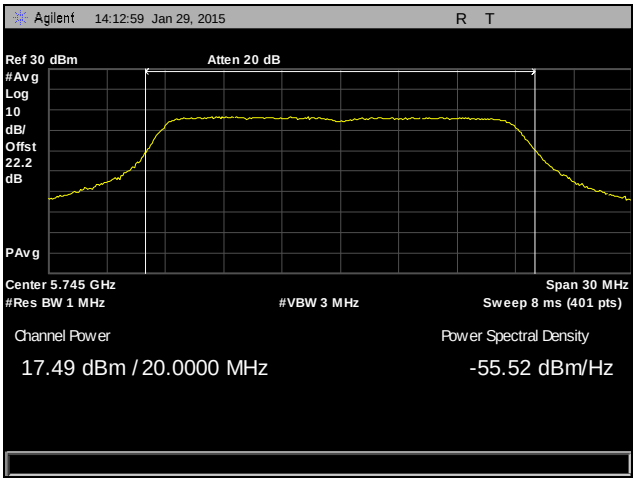


Plot 94. Peak Output Power, 802.11a, Mid Channel, SISO, UNII 3

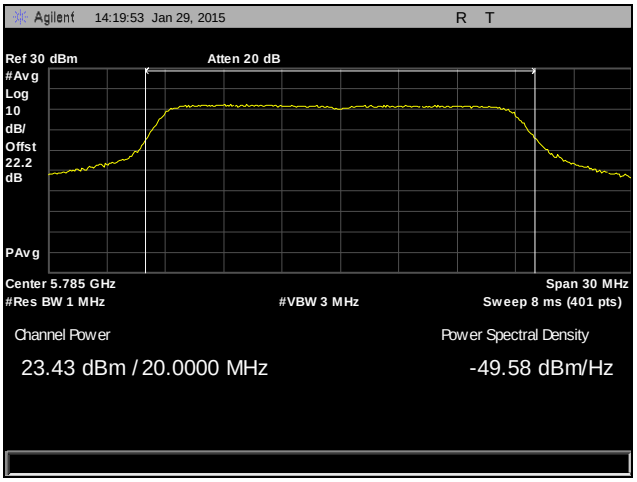


Plot 95. Peak Output Power, 802.11a, High Channel, SISO, UNII 3

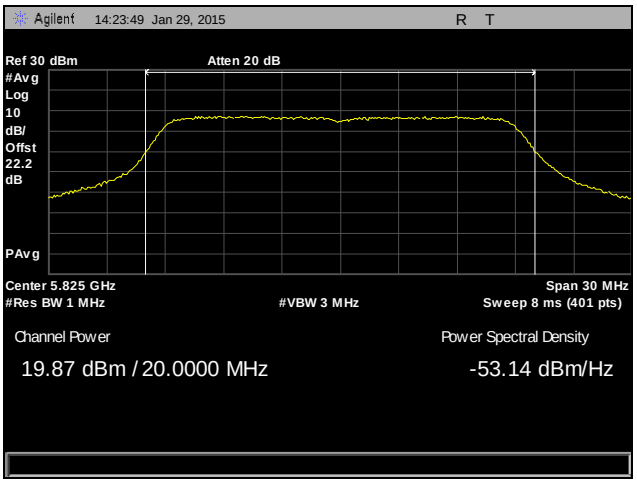
Peak Output Power, 802.11ac 20 MHz, MIMO, UNII 3



Plot 96. Peak Output Power, 802.11ac 20 MHz, Low Channel, MIMO, UNII 3

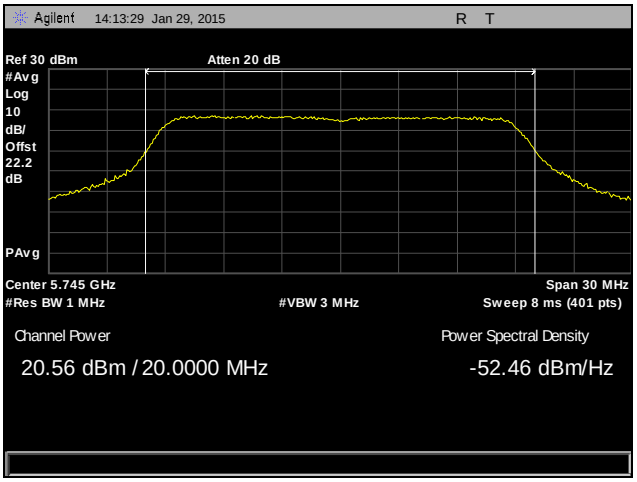


Plot 97. Peak Output Power, 802.11ac 20 MHz, Mid Channel, MIMO, UNII 3

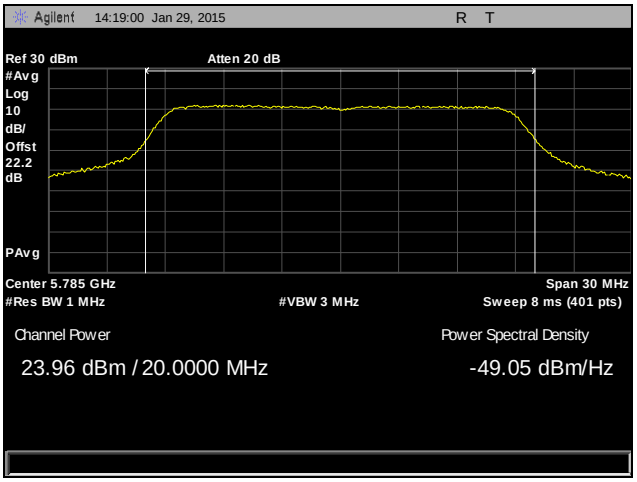


Plot 98. Peak Output Power, 802.11ac 20 MHz, High Channel, MIMO, UNII 3

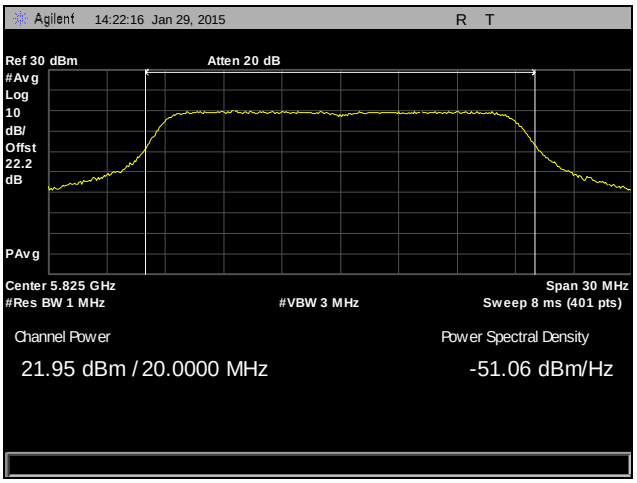
Peak Output Power, 802.11ac 20 MHz, SISO, UNII 3



Plot 99. Peak Output Power, 802.11ac 20 MHz, Low Channel, SISO, UNII 3

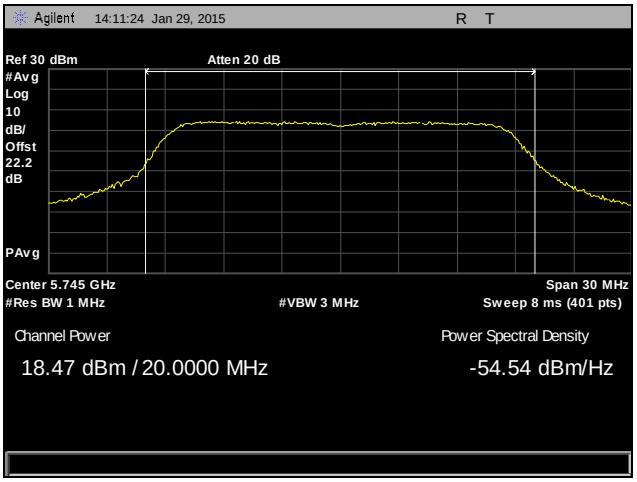


Plot 100. Peak Output Power, 802.11ac 20 MHz, Mid Channel, SISO, UNII 3

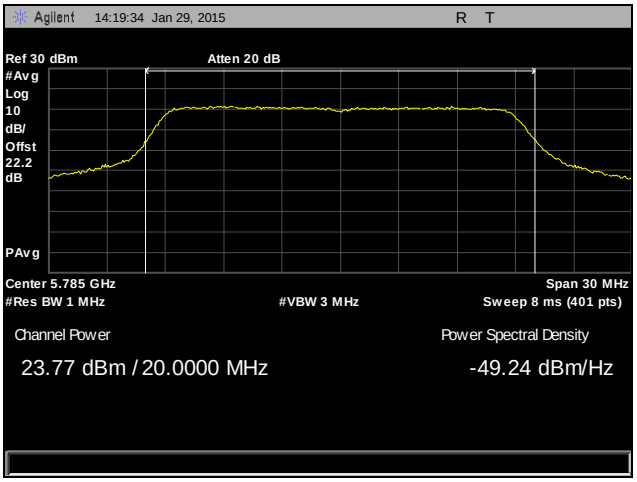


Plot 101. Peak Output Power, 802.11ac 20 MHz, High Channel, SISO, UNII 3

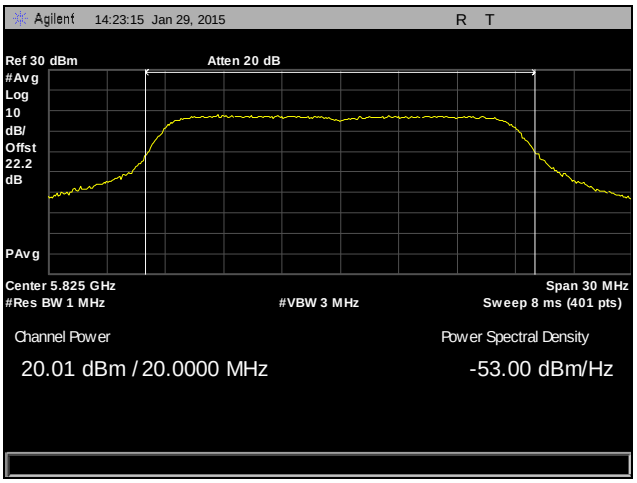
Peak Output Power, 802.11n 20 MHz, MIMO, UNII 3



Plot 102. Peak Output Power, 802.11n 20 MHz, Low Channel, MIMO, UNII 3

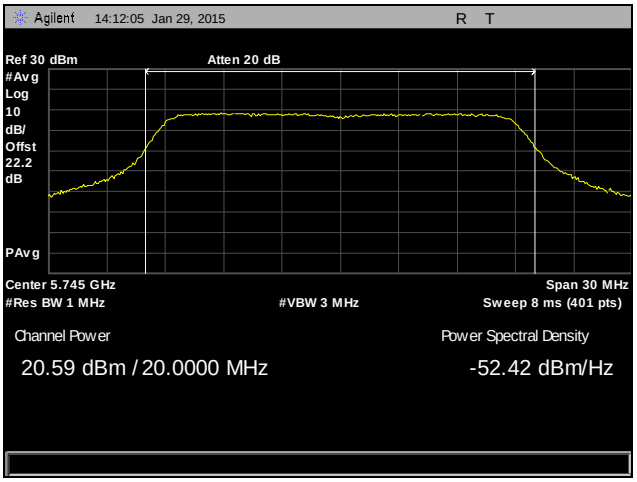


Plot 103. Peak Output Power, 802.11n 20 MHz, Mid Channel, MIMO, UNII 3

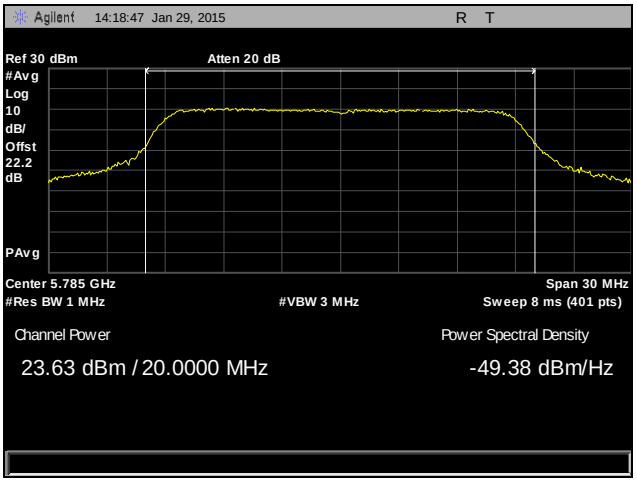


Plot 104. Peak Output Power, 802.11n 20 MHz, High Channel, MIMO, UNII 3

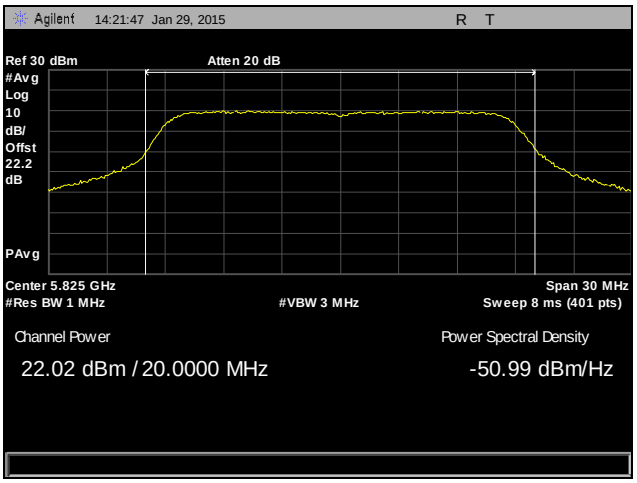
Peak Output Power, 802.11n 20 MHz, SISO, UNII 3



Plot 105. Peak Output Power, 802.11n 20 MHz, Low Channel, SISO, UNII 3

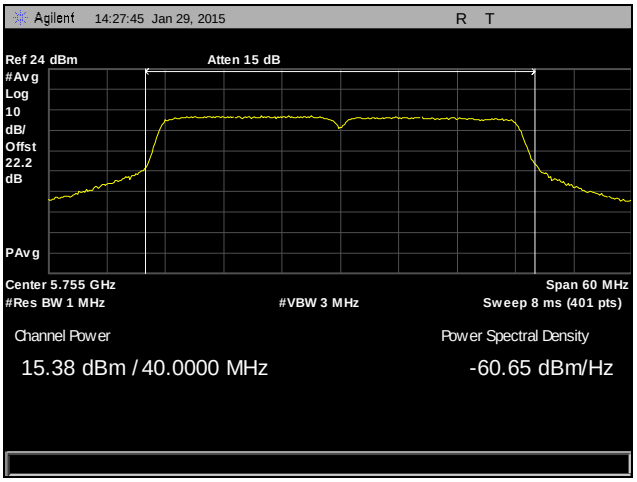


Plot 106. Peak Output Power, 802.11n 20 MHz, Mid Channel, SISO, UNII 3

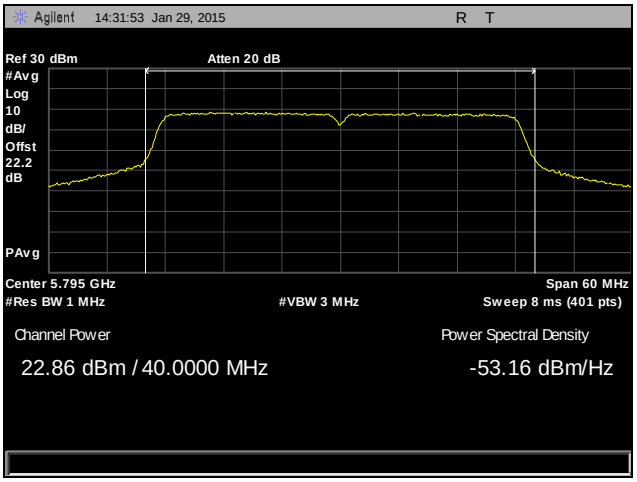


Plot 107. Peak Output Power, 802.11n 20 MHz, High Channel, SISO, UNII 3

Peak Output Power, 802.11ac 40 MHz, MIMO, UNII 3

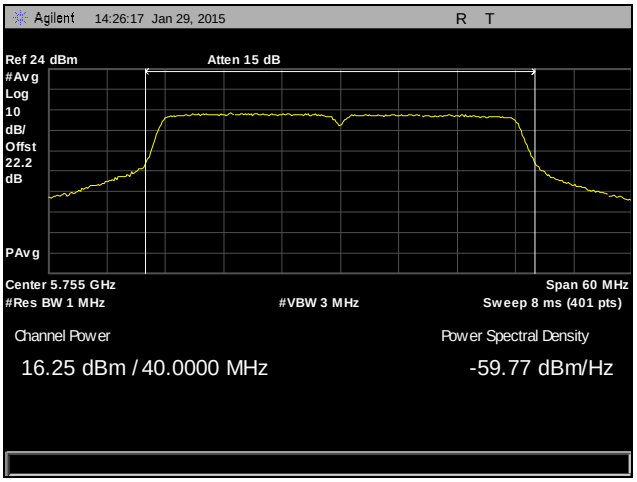


Plot 108. Peak Output Power, 802.11ac 40 MHz, Low Channel, MIMO, UNII 3

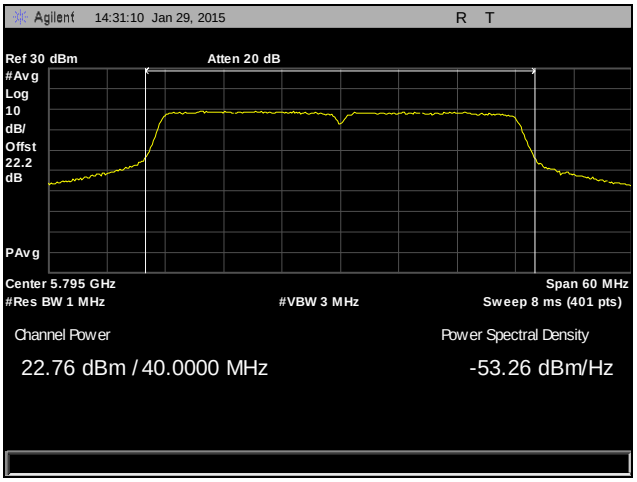


Plot 109. Peak Output Power, 802.11ac 40 MHz, High Channel, MIMO, UNII 3

Peak Output Power, 802.11ac 40 MHz, SISO, UNII 3

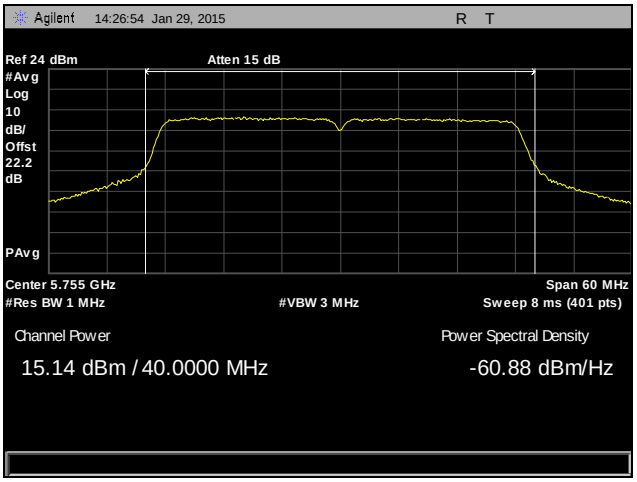


Plot 110. Peak Output Power, 802.11ac 40 MHz, Low Channel, SISO, UNII 3

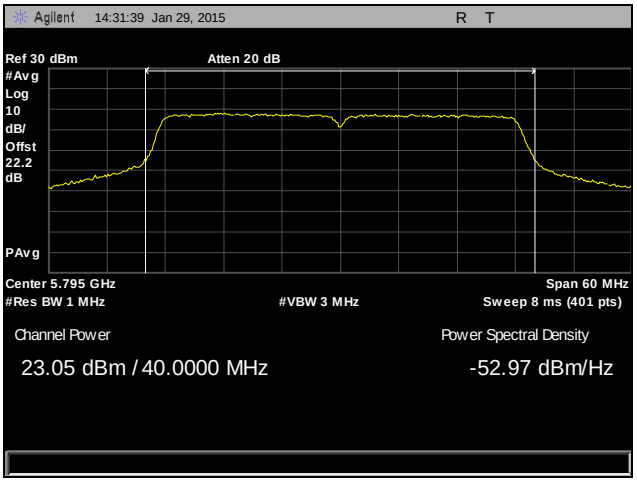


Plot 111. Peak Output Power, 802.11ac 40 MHz, High Channel, SISO, UNII 3

Peak Output Power, 802.11n 40 MHz, MIMO, UNII 3

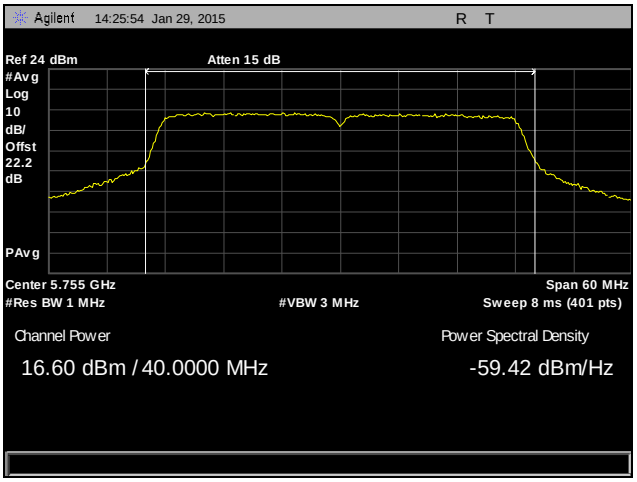


Plot 112. Peak Output Power, 802.11n 40 MHz, Low Channel, MIMO, UNII 3

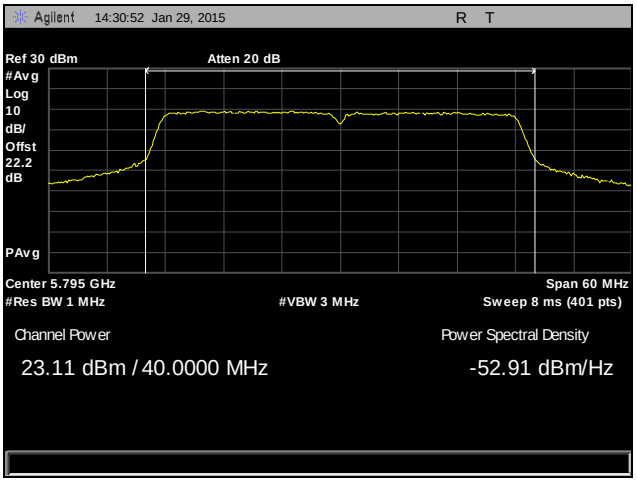


Plot 113. Peak Output Power, 802.11n 40 MHz, High Channel, MIMO, UNII 3

Peak Output Power, 802.11n 40 MHz, SISO, UNII 3

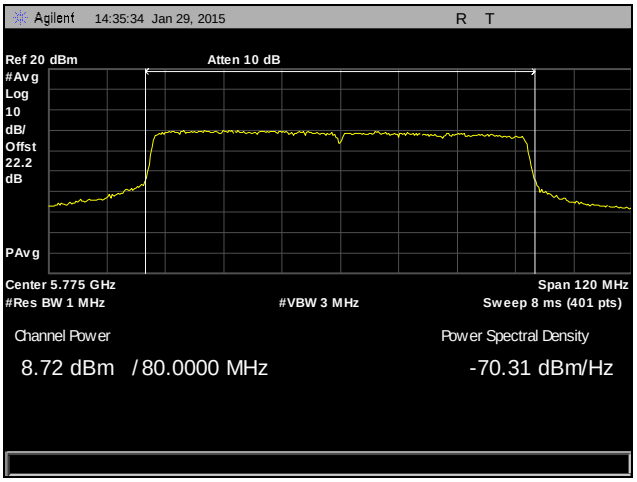


Plot 114. Peak Output Power, 802.11n 40 MHz, Low Channel, SISO, UNII 3

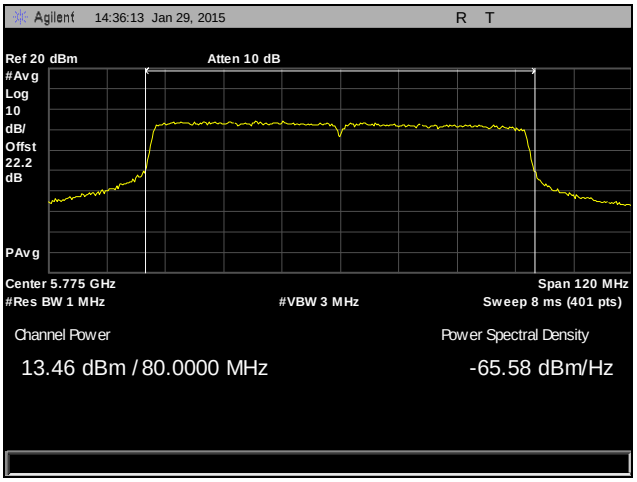


Plot 115. Peak Output Power, 802.11n 40 MHz, High Channel, SISO, UNII 3

Peak Output Power, 802.11ac 80 MHz, UNII 3



Plot 116. Peak Output Power, 802.11ac 80 MHz, MIMO, UNII 3



Plot 117. Peak Output Power, 802.11ac 80 MHz, SISO, UNII 3

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements:

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

§15.407(a)(3): In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement used was method SA-1 from 789033 D02 General UNII Test Procedures New Rule v01. Plots are correct for attenuators and cable loss.

Test Results: Equipment was compliant with the peak power spectral density limits of §15.407 (a)(1)(ii) and §15.407(a)(3) The peak power spectral density was determined from plots on the following page(s).

Test Engineer(s): Surinder Singh

Test Date(s): 02/03/15

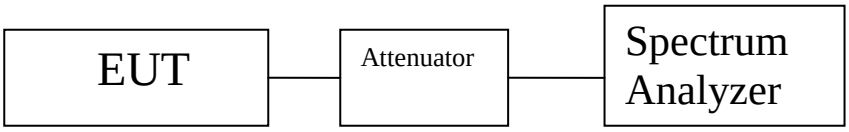


Figure 4. Power Spectral Density Test Setup

Conducted Output PSD 20MHz Band 802.11b/g/n Mode SISO						
Channel	**Frequency MHz**	**Measured PSD (dBm)/1MHz**	**Mode**	**PSD Limit (dBm)**	**Antenna Gain (dBi)**	**Margin Ant**
36	5180	11.09	a	16.71	6.29	-5.62
36	5180	9.91	n	16.71	6.29	-6.8
36	5180	10.49	ac	16.71	6.29	-6.22
40	5200	12.16	a	16.71	6.29	-4.55
40	5200	11.1	n	16.71	6.29	-5.61
40	5200	11.83	ac	16.71	6.29	-4.88
48	5240	12.44	a	16.71	6.29	-4.27
48	5240	12.02	n	16.71	6.29	-4.69
48	5240	12.1	ac	16.71	6.29	-4.61

Table 30. Peak Power Spectral Density, Test Results, 802.11b/g/n 20 MHz Mode SISO, UNII 1

Conducted Output PSD 20MHz Band 802.11b/g/n Mode MIMO									
Channel	**Frequency MHz**	**Measured PSD (dBm)/1MHz Ant0**	**Measured PSD (dBm)/1MHz Ant1**	**Measured PSD (dBm)/1MHz Ant2**	**Mode**	**Total PSD(dBm)**	**PSD Limit (dBm)**	**Antenna Gain (dBi)**	**Margin**
36	5180	8.2	6.68	6.24	a	11.89	12.53	10.47	-0.63
36	5180	5.79	5.49	6.08	n	10.56	16.71	6.29	-6.14
36	5180	6.08	5.94	5.87	ac	10.73	16.71	6.29	-5.97
40	5200	7.48	7.79	7.83	a	12.47	12.53	10.47	-0.05
40	5200	11.39	11.64	11.48	n	16.27	16.71	6.29	-0.43
40	5200	11.8	11.84	11.64	ac	16.53	16.71	6.29	-0.17
48	5240	7.61	7.39	7.84	a	12.38	12.53	10.47	-0.14
48	5240	11.08	11.32	11.37	n	16.02	16.71	6.29	-0.68
48	5240	11.64	11.83	12.03	ac	16.60	16.71	6.29	-0.10

Table 31. Peak Power Spectral Density, Test Results, 802.11b/g/n 20 MHz Mode MIMO, UNII 1

*Note: In 802.11n and ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Conducted Output PSD 40MHz Band n and ac Mode SISO						
Channel	**Frequency MHz**	**Measured PSD (dBm)/1MHz**	**PSD Limit (dBm)**	**Antenna Gain (dBi)**	**mode**	**Margin**
36	5190	3.13	16.71	6.29	n	-13.58
36	5190	3.34	16.71	6.29	ac	-13.37
44	5230	7.7	16.71	6.29	n	-9.01
44	5230	7.5	16.71	6.29	ac	-9.21

Table 32. Peak Power Spectral Density, Test Results, 802.11n/ac 40 MHz Mode SISO, UNII 1

Conducted Output PSD 80MHz Band ac Mode SISO						
Channel	**Frequency MHz**	**Measured PSD (dBm)/1MHz**	**PSD Limit (dBm)**	**Antenna Gain (dBi)**	**mode**	**Margin**
36	5210	-4.26	16.71	6.29	ac	-20.97

Table 33. Peak Power Spectral Density, Test Results, 802.11ac 80 MHz Mode SISO, UNII 1

Conducted Output PSD 40MHz Band n and ac Mode MIMO (3*3)									
Chanel Carrier	**Frequency MHz**	**Measured PSD (dBm)/1MHz Ant0**	**Measured PSD (dBm)/1MHz Ant1**	**Measured PSD (dBm)/1MHz Ant2**	**mode**	**Total PSD(dBm)**	**Antenna Gain (dBi)**	**PSD Limit (dBm)**	**Margin**
36	5190	2.177	2.38	2.98	n	7.29	6.29	16.71	-9.4
36	5190	1.73	1.88	1.94	ac	6.62	6.29	16.71	-10.08
44	5230	6.5	6.85	6.97	n	11.54	6.29	16.71	-5.16
44	5230	7.8	7.84	7.59	ac	12.51	6.29	16.71	-4.19

Table 34. Peak Power Spectral Density, Test Results, 802.11n/ac 40 MHz Mode MIMO, UNII 1

*Note: In 802.11n and ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Conducted Output PSD 80MHz Band n Mode MIMO (3*3)									
Chanel Carrier	**Frequency MHz**	**Measured PSD (dBm)/1MHz Ant0**	**Measured PSD (dBm)/1MHz Ant1**	**Measured PSD (dBm)/1MHz Ant2**	**mode**	**Total PSD(dBm)**	**Antenna Gain (dBi)**	**PSD Limit (dBm)**	**Margin**
36	5210	-3.8	-3.94	-3.51	ac	1.02	6.29	16.71	-15.68

Table 35. Peak Power Spectral Density, Test Results, 802.11ac 80 MHz Mode MIMO, UNII 1

*Note: In 802.11ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Conducted Output PSD 20MHz Band 802.11b/g/n Mode SISO						
Channel	**Frequency MHz**	**Measured PSD (dBm)/1MHz**	**Mode**	**PSD Limit (dBm)**	**Antenna Gain (dBi)**	**Margin Ant**
149	5745	9.42	a	28.96	7.04	-19.54
149	5745	8.75	n	28.96	7.04	-20.21
149	5745	8.27	ac	28.96	7.04	-20.69
157	5785	13.09	a	28.96	7.04	-15.87
157	5785	13.33	n	28.96	7.04	-15.63
157	5785	12.67	ac	28.96	7.04	-16.29
165	5825	11.31	a	28.96	7.04	-17.65
165	5825	11.02	n	28.96	7.04	-17.94
165	5825	9.95	ac	28.96	7.04	-19.01

Table 36. Peak Power Spectral Density, Test Results, 802.11b/g/n 20 MHz Mode SISO, UNII 3

Conducted Output PSD 20MHz Band 802.11b/g/n Mode MIMO									
Channel	**Frequency MHz**	**Measured PSD (dBm)/1MHz Ant0**	**Measured PSD (dBm)/1MHz Ant1**	**Measured PSD (dBm)/1MHz Ant2**	**Mode**	**Total PSD(dBm)**	**PSD Limit (dBm)**	**Antenna Gain (dBi)**	**Margin**
149	5745	9.18	9.45	10.02	a	14.33	25.29	10.71	-10.95
149	5745	6.7	6.29	6.15	n	11.15	28.96	7.04	-17.80
149	5745	6.922	6.82	6.45	ac	11.5	28.96	7.04	-17.45
157	5785	10.5	10.08	10.22	a	15.04	25.29	10.71	-10.24
157	5785	12.58	12.39	12.36	n	17.21	28.96	7.04	-11.74
157	5785	10.39	10.37	10.48	ac	15.18	28.96	7.04	-13.77
165	5825	9.4	9.58	9.84	a	14.38	25.29	10.71	-10.9
165	5825	8.88	8.84	8.07	n	13.38	28.96	7.04	-15.57
165	5825	8.3	8.28	8.64	ac	13.18	28.96	7.04	-15.77

Table 37. Peak Power Spectral Density, Test Results, 802.11b/g/n 20 MHz Mode MIMO, UNII 3

*Note: In 802.11n and ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Conducted Output PSD 40MHz Band n and ac Mode SISO						
Channel	**Frequency MHz**	**Measured PSD (dBm)/1MHz**	**PSD Limit (dBm)**	**Antenna Gain (dBi)**	**mode**	**Margin**
151	5755	2.8	28.96	7.04	n	-26.16
151	5755	2.49	28.96	7.04	ac	-26.47
159	5795	4.505	28.96	7.04	n	-24.455
159	5795	4.453	28.96	7.04	ac	-24.507

Table 38. Peak Power Spectral Density, Test Results, 802.11n/ac 40 MHz Mode SISO, UNII 3

Conducted Output PSD 80MHz Band ac Mode SISO						
Channel	**Frequency MHz**	**Measured PSD (dBm)/1MHz**	**PSD Limit (dBm)**	**Antenna Gain (dBi)**	**mode**	**Margin**
155	5775	-3.36	28.96	7.04	ac	-32.32

Table 39. Peak Power Spectral Density, Test Results, 802.11ac 80 MHz Mode SISO, UNII 3

Conducted Output PSD 40MHz Band n and ac Mode MIMO (3*3)									
Chanel Carrier	**Frequency MHz**	**Measured PSD (dBm)/1MHz Ant0**	**Measured PSD (dBm)/1MHz Ant1**	**Measured PSD (dBm)/1MHz Ant2**	**mode**	**Total PSD(dBm)**	**Antenna Gain (dBi)**	**PSD Limit (dBm)**	**Margin**
151	5755	2.138	1.935	1.982	n	6.79	7.04	28.96	-22.1
151	5755	1.11	2.05	2.15	ac	6.56	7.04	28.96	-22.39
159	5795	5.08	4.92	4.48	n	9.6	7.04	28.96	-19.35
159	5795	4.259	4.11	4.382	ac	9.02	7.04	28.96	-19.93

Table 40. Peak Power Spectral Density, Test Results, 802.11n/ac 40 MHz Mode MIMO, UNII 3

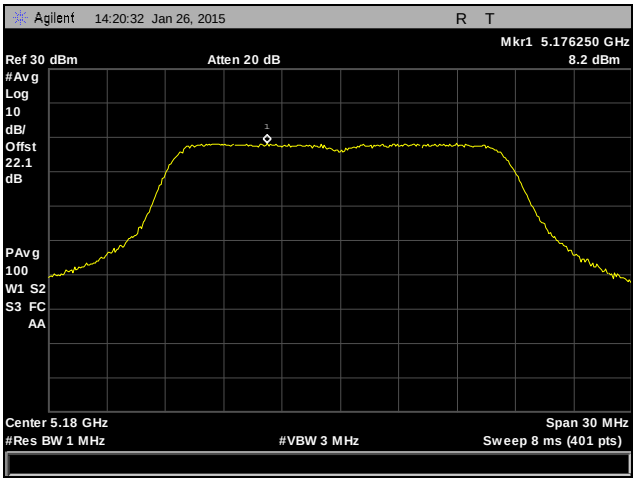
*Note: In 802.11n and ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

Conducted Output PSD 80MHz Band n Mode MIMO (3*3)									
Chanel Carrier	**Frequency MHz**	**Measured PSD (dBm)/1MHz Ant0**	**Measured PSD (dBm)/1MHz Ant1**	**Measured PSD (dBm)/1MHz Ant2**	**mode**	**Total PSD(dBm)**	**Antenna Gain (dBi)**	**PSD Limit (dBm)**	**Margin**
155	5775	-7.77	-7.38	-8.12	ac	-2.97	7.04	28.96	-31.93

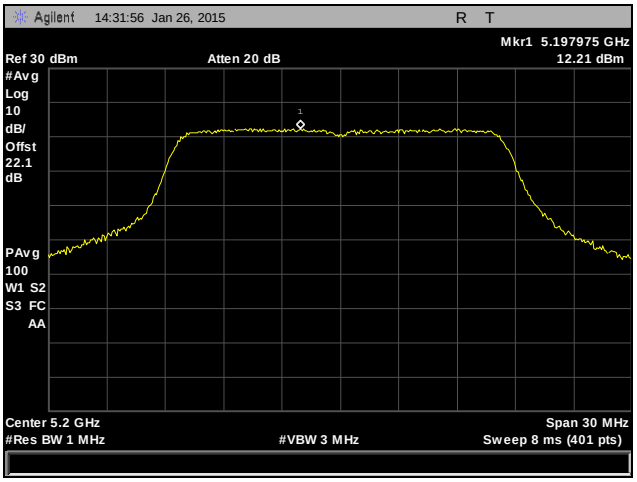
Table 41. Peak Power Spectral Density, Test Results, 802.11ac 80 MHz Mode MIMO, UNII 3

*Note: In 802.11ac mode- radio was transmitting uncorrelated data across MIMO system and therefore does not account for array gain in overall antenna assembly gain calculation.

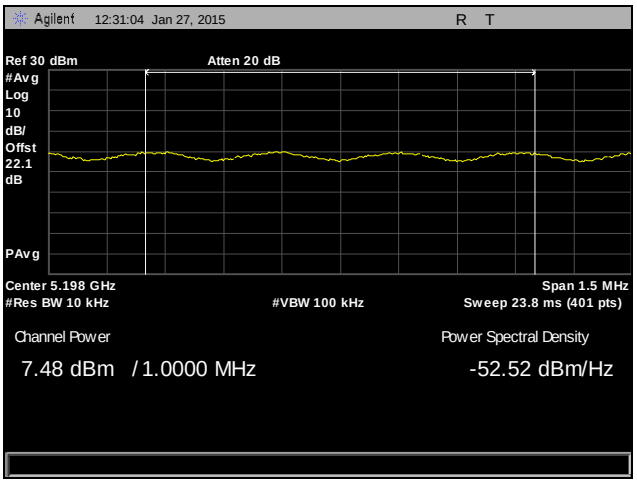
Peak Power Spectral Density, 802.11a, MIMO, UNII 1



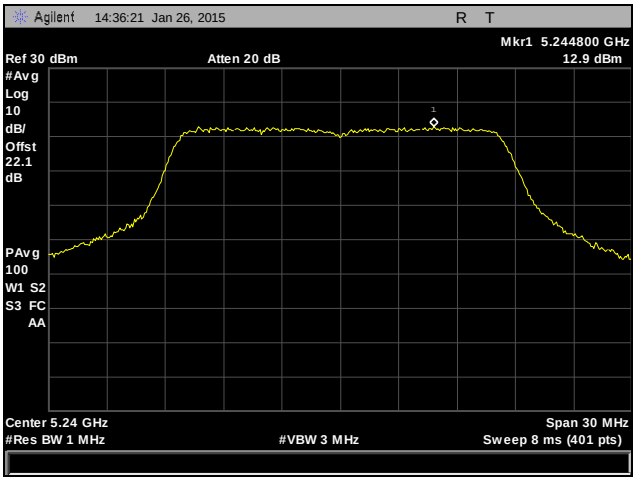
Plot 118. Peak Power Spectral Density, 802.11a, Low Channel, MIMO, UNII 1



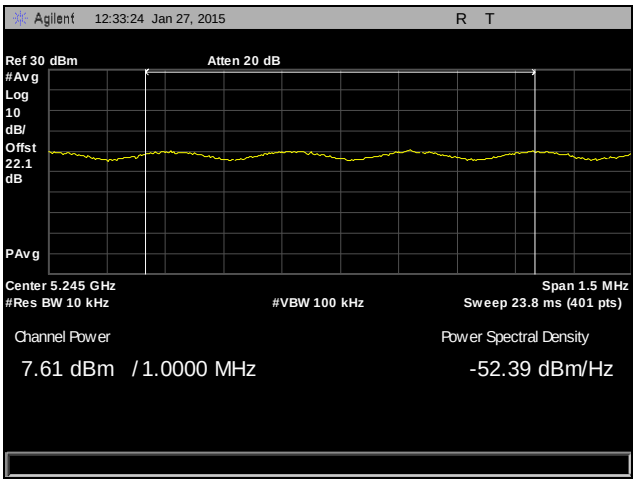
Plot 119. Peak Power Spectral Density, 802.11a, Mid Channel, MIMO, UNII 1



Plot 120. Peak Power Spectral Density, 802.11a, Mid Channel, MIMO, 1 MHz Integration, UNII 1

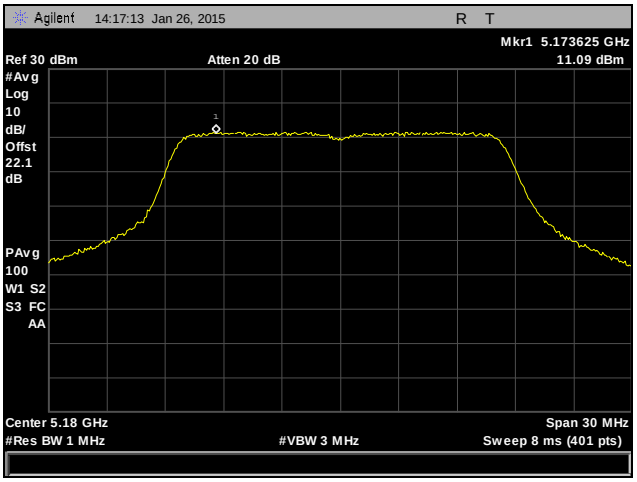


Plot 121. Peak Power Spectral Density, 802.11a, High Channel, MIMO, UNII 1

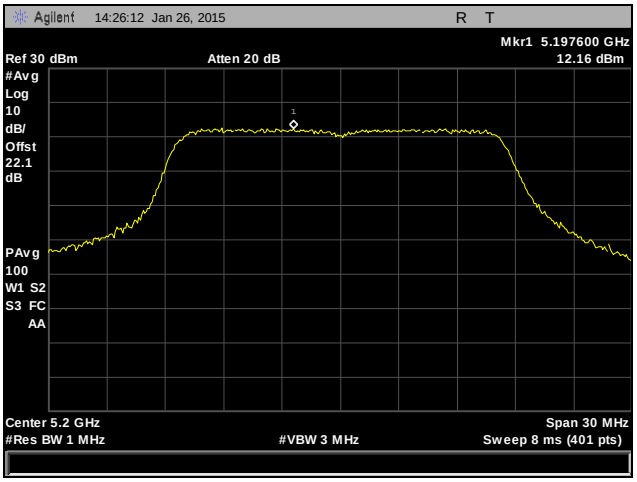


Plot 122. Peak Power Spectral Density, 802.11a, High Channel, MIMO, 1 MHz Integration, UNII 1

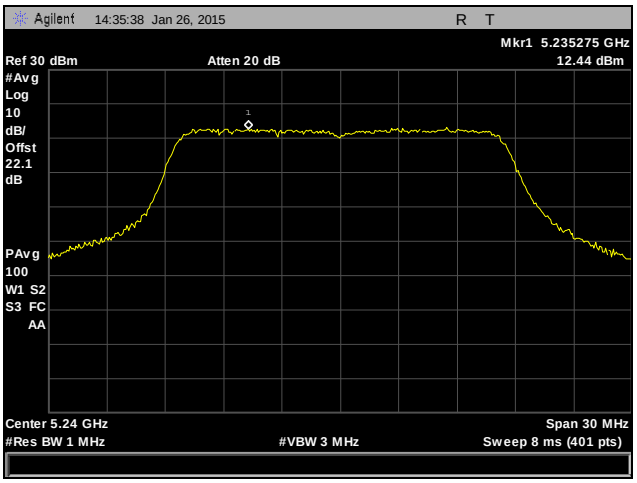
Peak Power Spectral Density, 802.11a, SISO, UNII 1



Plot 123. Peak Power Spectral Density, 802.11a, Low Channel, SISO, UNII 1

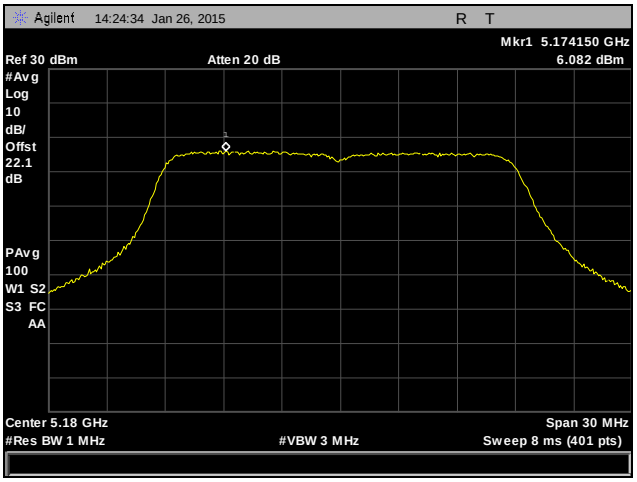


Plot 124. Peak Power Spectral Density, 802.11a, Mid Channel, SISO, UNII 1

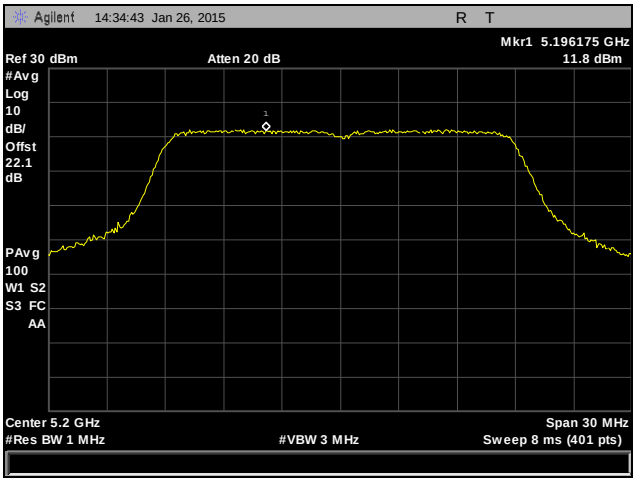


Plot 125. Peak Power Spectral Density, 802.11a, High Channel, SISO, UNII 1

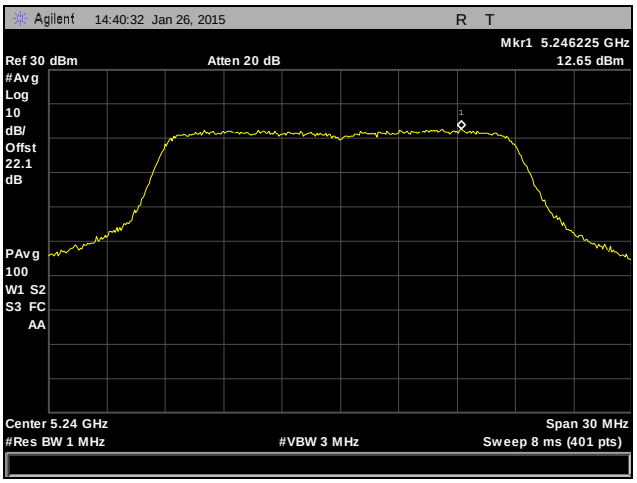
Peak Power Spectral Density, 802.11ac 20 MHz, MIMO, UNII 1



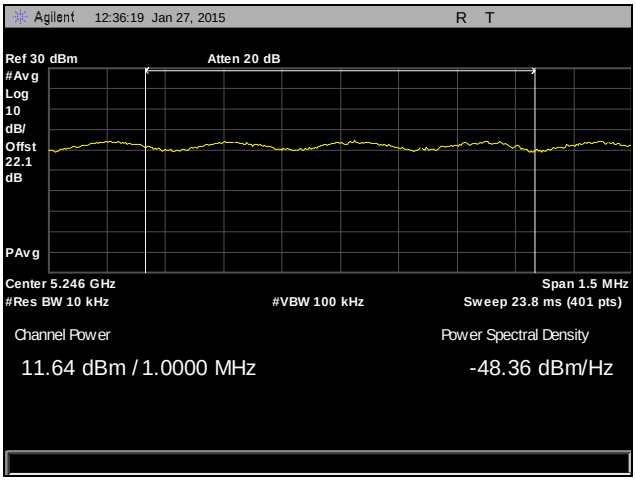
Plot 126. Peak Power Spectral Density, 802.11ac 20 MHz, Low Channel, MIMO, UNII 1



Plot 127. Peak Power Spectral Density, 802.11ac 20 MHz, Mid Channel, MIMO, UNII 1

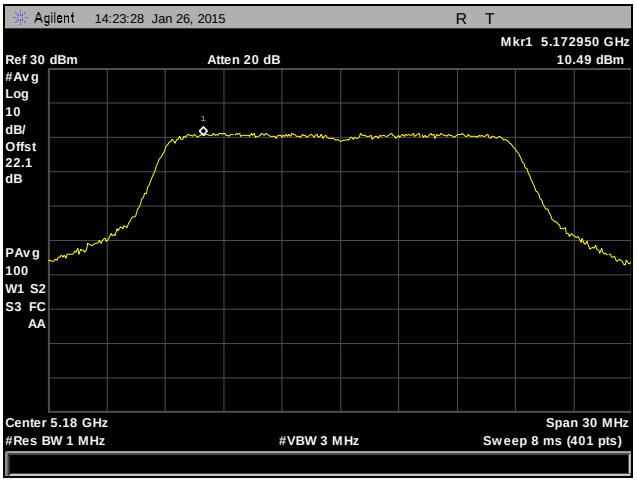


Plot 128. Peak Power Spectral Density, 802.11ac 20 MHz, High Channel, MIMO, UNII 1

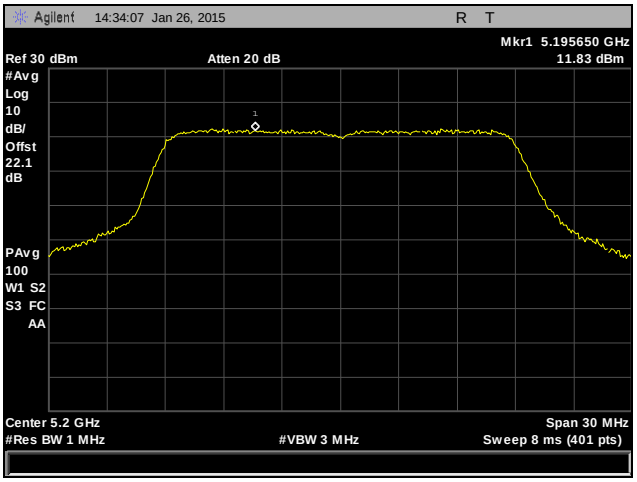


Plot 129. Peak Power Spectral Density, 802.11ac 20 MHz, High Channel, MIMO, 1 MHz Integration, UNII 1

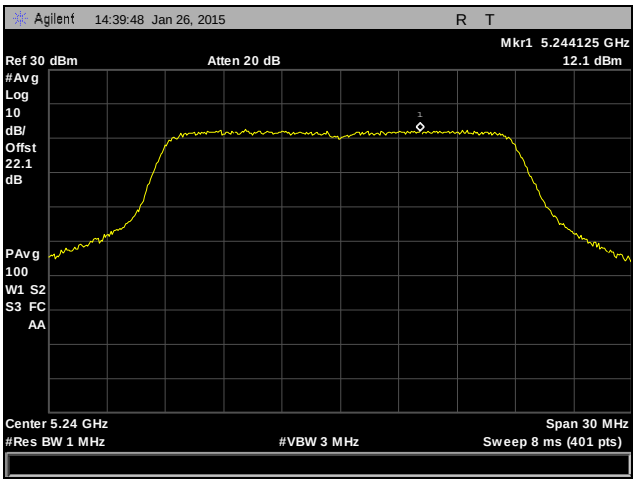
Peak Power Spectral Density, 802.11ac 20 MHz, SISO, UNII 1



Plot 130. Peak Power Spectral Density, 802.11ac 20 MHz, Low Channel, SISO, UNII 1

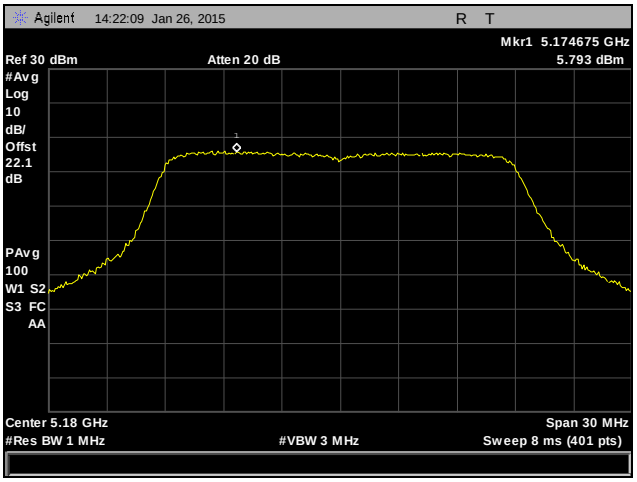


Plot 131. Peak Power Spectral Density, 802.11ac 20 MHz, Mid Channel, SISO, UNII 1

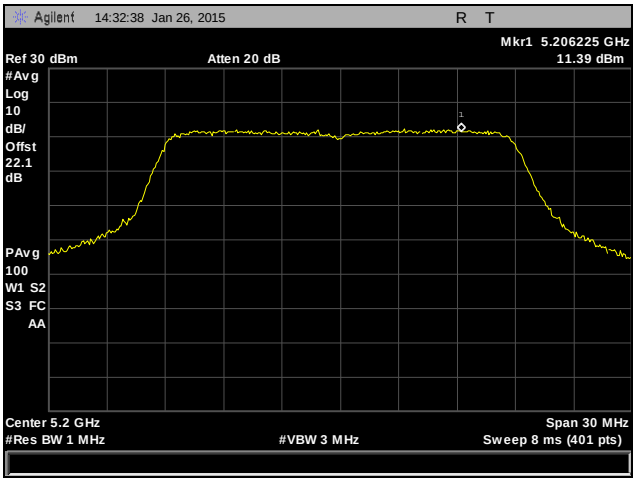


Plot 132. Peak Power Spectral Density, 802.11ac 20 MHz, High Channel, SISO, UNII 1

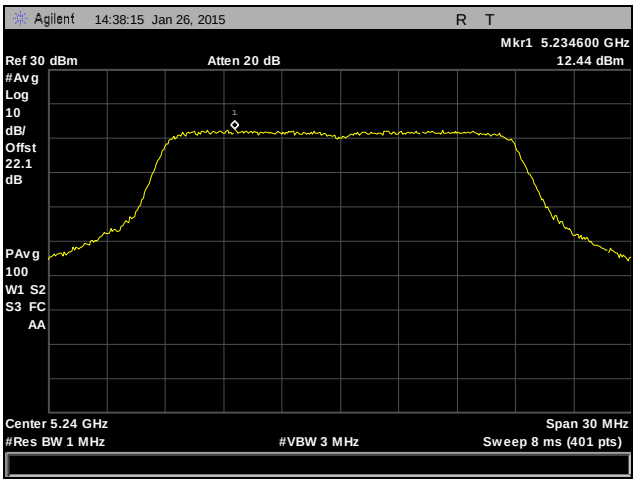
Peak Power Spectral Density, 802.11n 20 MHz, MIMO, UNII 1



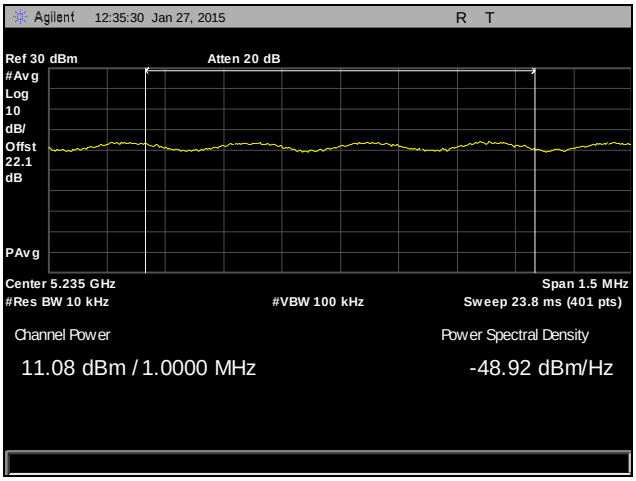
Plot 133. Peak Power Spectral Density, 802.11n 20 MHz, Low Channel, MIMO, UNII 1



Plot 134. Peak Power Spectral Density, 802.11n 20 MHz, Mid Channel, MIMO, UNII 1

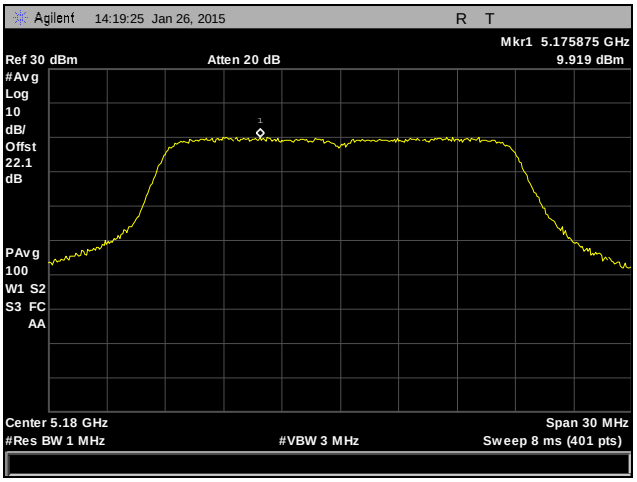


Plot 135. Peak Power Spectral Density, 802.11n 20 MHz, High Channel, MIMO, UNII 1

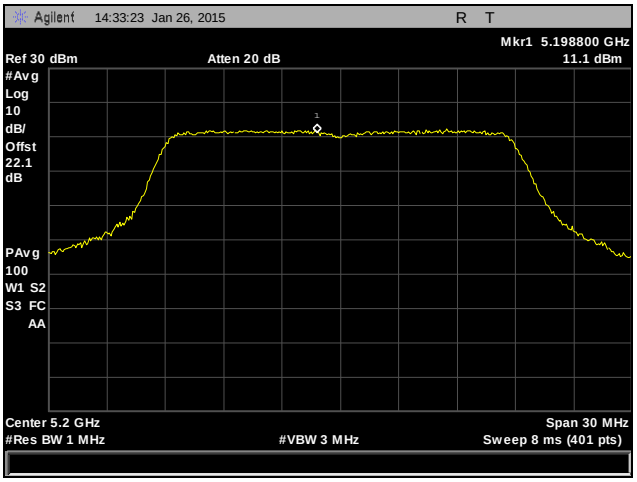


Plot 136. Peak Power Spectral Density, 802.11n 20 MHz, High Channel, MIMO, 1 MHz Integration, UNII 1

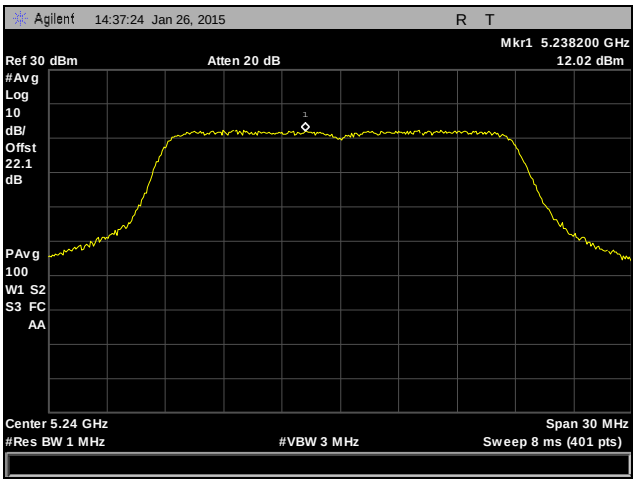
Peak Power Spectral Density, 802.11n 20 MHz, SISO, UNII 1



Plot 137. Peak Power Spectral Density, 802.11n 20 MHz, Low Channel, SISO, UNII 1

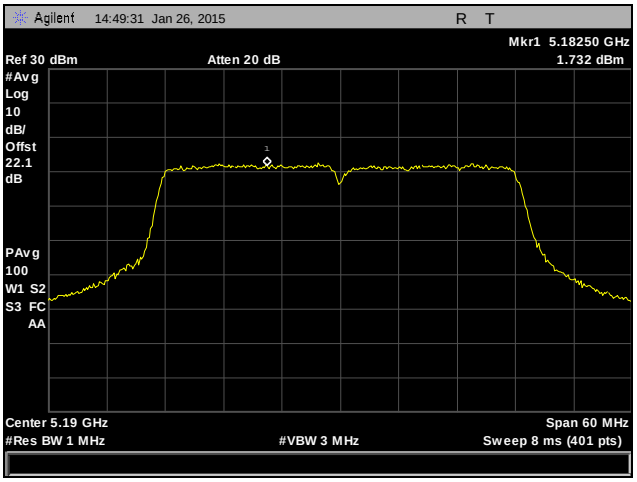


Plot 138. Peak Power Spectral Density, 802.11n 20 MHz, Mid Channel, SISO, UNII 1

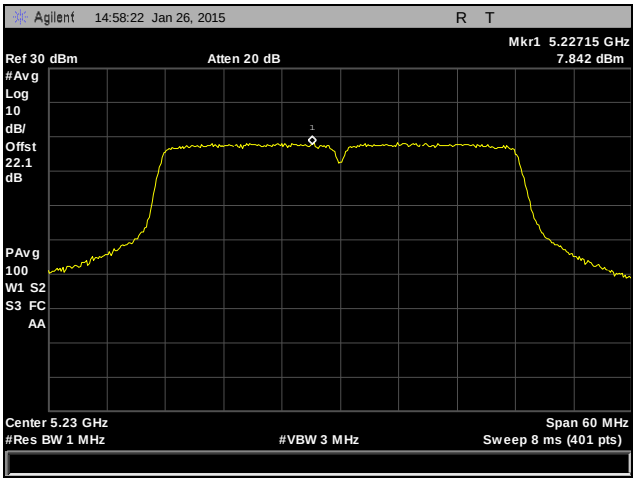


Plot 139. Peak Power Spectral Density, 802.11n 20 MHz, High Channel, SISO, UNII 1

Peak Power Spectral Density, 802.11ac 40 MHz, MIMO, UNII 1

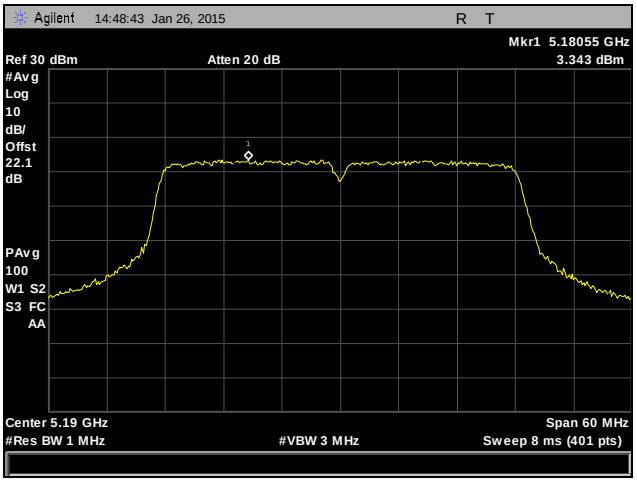


Plot 140. Peak Power Spectral Density, 802.11ac 40 MHz, Low Channel, MIMO, UNII 1

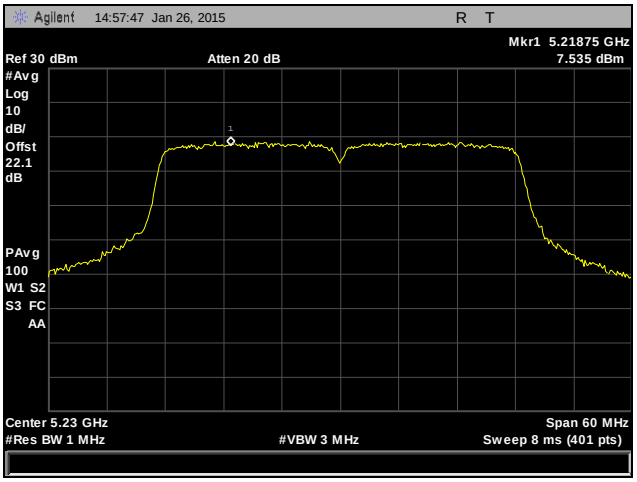


Plot 141. Peak Power Spectral Density, 802.11ac 40 MHz, High Channel, MIMO, UNII 1

Peak Power Spectral Density, 802.11ac 40 MHz, SISO, UNII 1

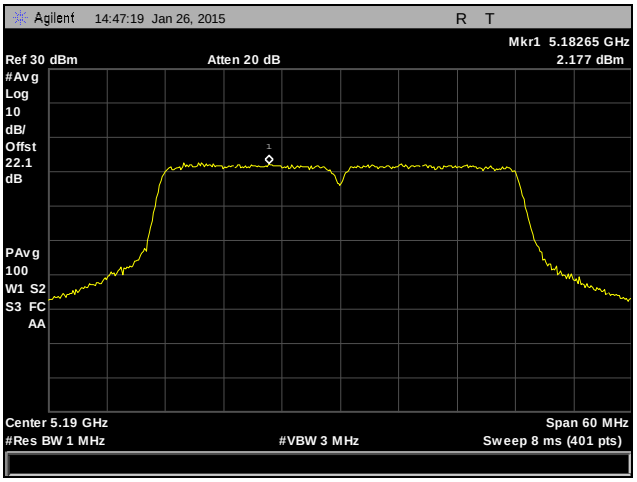


Plot 142. Peak Power Spectral Density, 802.11ac 40 MHz, Low Channel, SISO, UNII 1

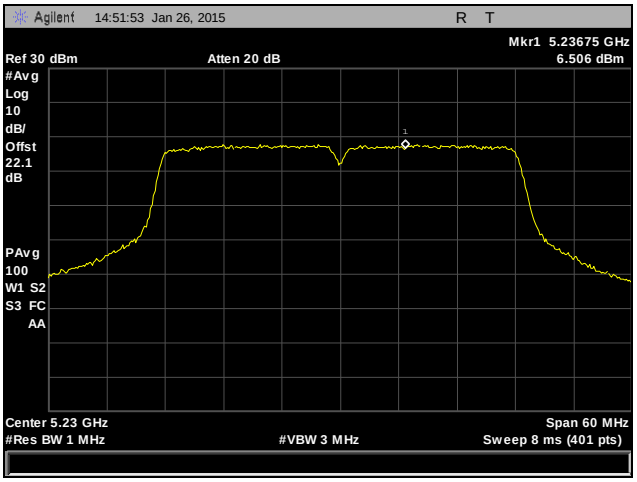


Plot 143. Peak Power Spectral Density, 802.11ac 40 MHz, High Channel, SISO, UNII 1

Peak Power Spectral Density, 802.11n 40 MHz, MIMO, UNII 1

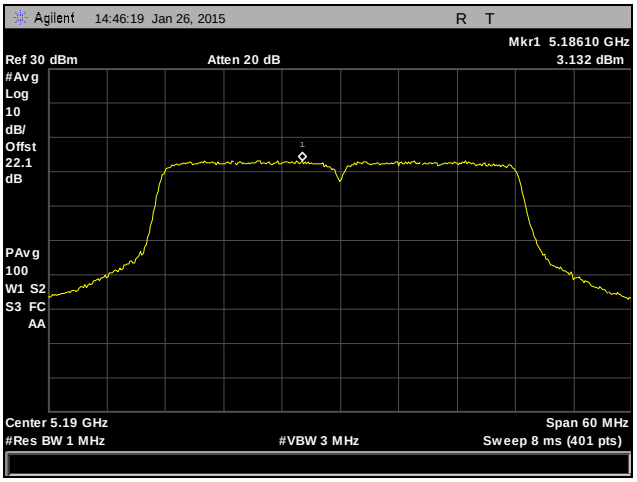


Plot 144. Peak Power Spectral Density, 802.11n 40 MHz, Low Channel, MIMO, UNII 1

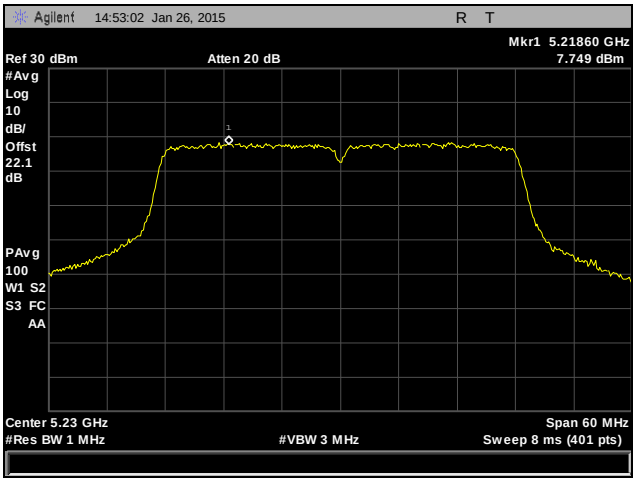


Plot 145. Peak Power Spectral Density, 802.11n 40 MHz, High Channel, MIMO, UNII 1

Peak Power Spectral Density, 802.11n 40 MHz, SISO, UNII 1

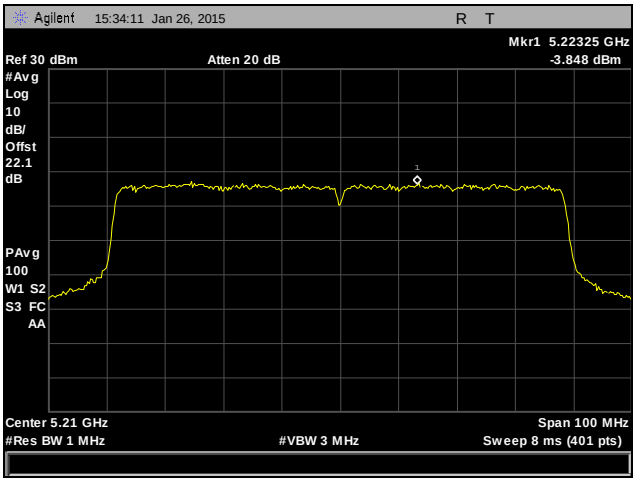


Plot 146. Peak Power Spectral Density, 802.11n 40 MHz, Low Channel, SISO, UNII 1

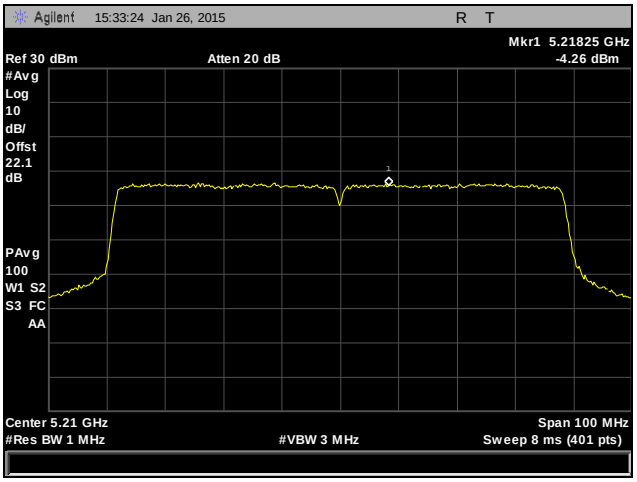


Plot 147. Peak Power Spectral Density, 802.11n 40 MHz, High Channel, SISO, UNII 1

Peak Power Spectral Density, 802.11ac 80 MHz, UNII 1

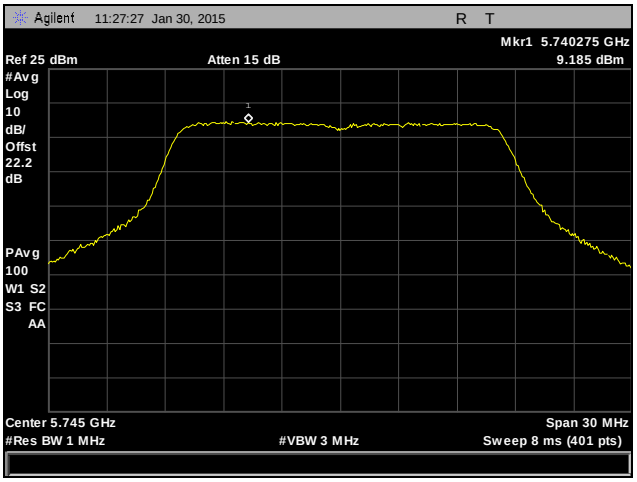


Plot 148. Peak Power Spectral Density, 802.11ac 80 MHz, MIMO, UNII 1

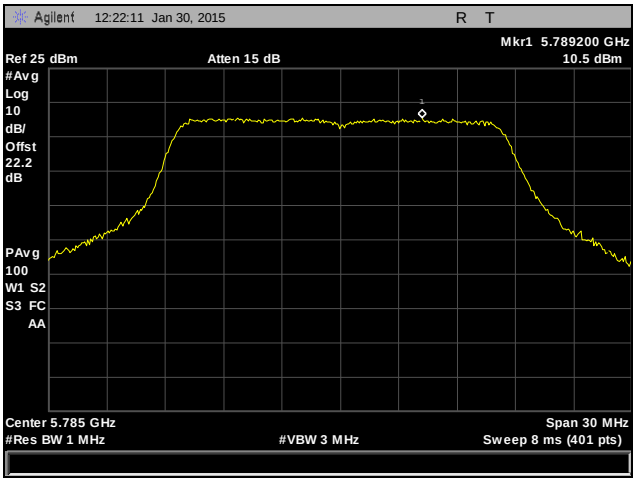


Plot 149. Peak Power Spectral Density, 802.11ac 80 MHz, SISO, UNII 1

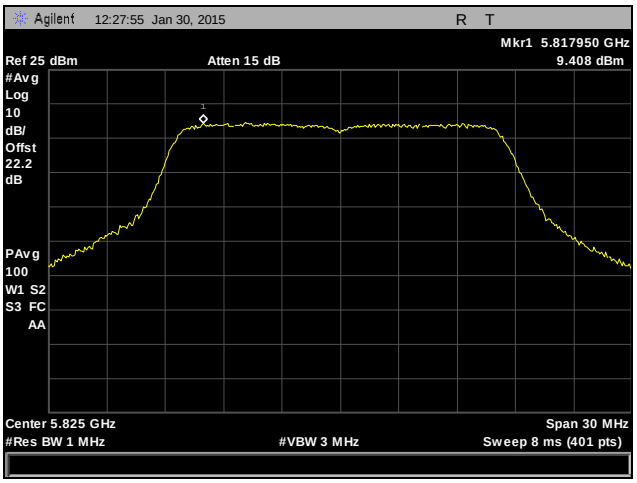
Peak Power Spectral Density, 802.11a, MIMO, UNII 3



Plot 150. Peak Power Spectral Density, 802.11a, Low Channel, MIMO, UNII 3

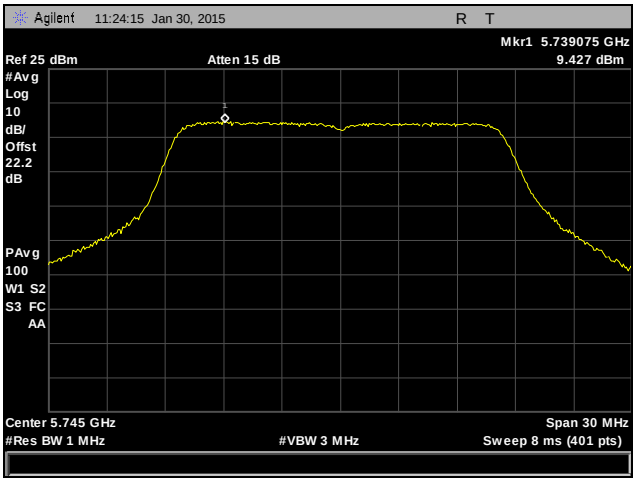


Plot 151. Peak Power Spectral Density, 802.11a, Mid Channel, MIMO, UNII 3

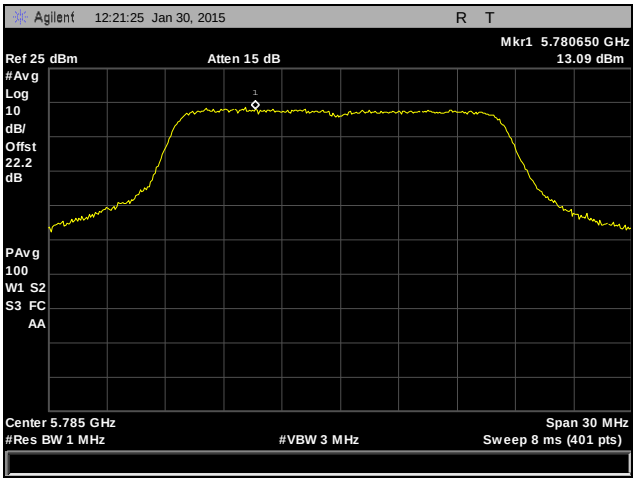


Plot 152. Peak Power Spectral Density, 802.11a, High Channel, MIMO, UNII 3

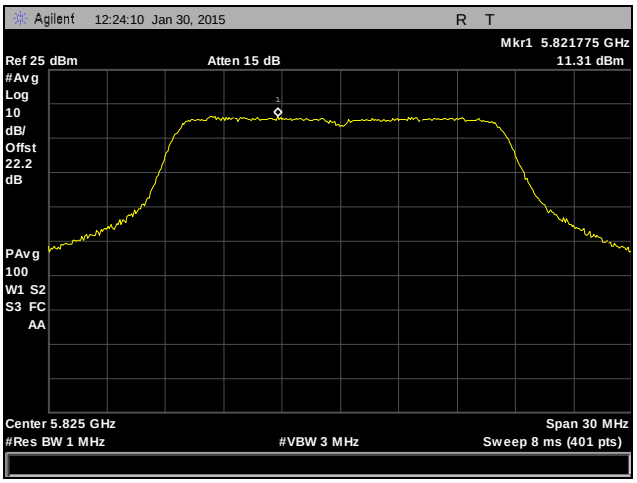
Peak Power Spectral Density, 802.11a, SISO, UNII 3



Plot 153. Peak Power Spectral Density, 802.11a, Low Channel, SISO, UNII 3

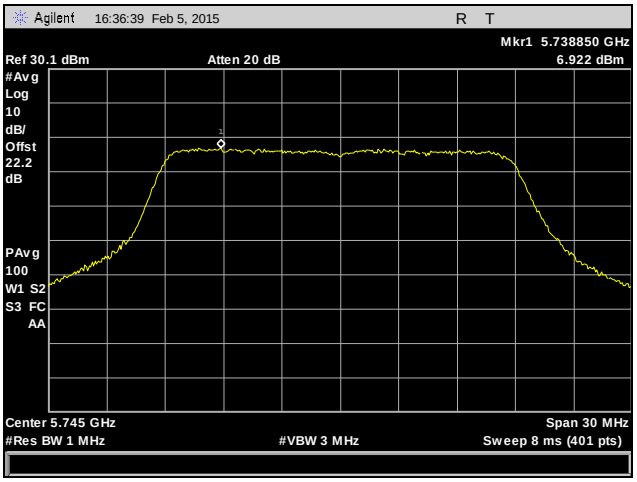


Plot 154. Peak Power Spectral Density, 802.11a, Mid Channel, SISO, UNII 3

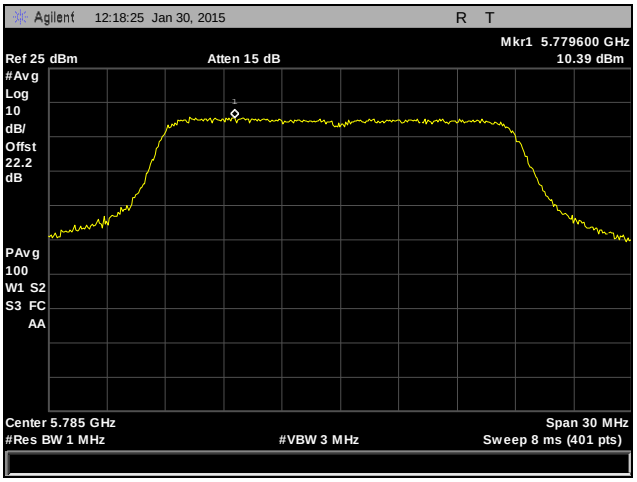


Plot 155. Peak Power Spectral Density, 802.11a, High Channel, SISO, UNII 3

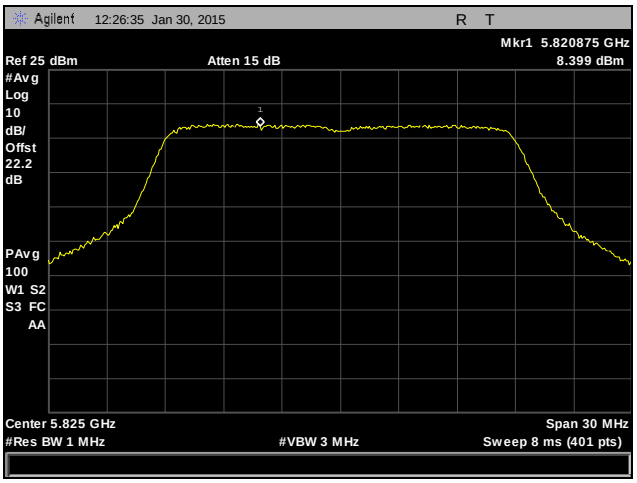
Peak Power Spectral Density, 802.11ac 20 MHz, MIMO, UNII 3



Plot 156. Peak Power Spectral Density, 802.11ac 20 MHz, Low Channel, MIMO, UNII 3

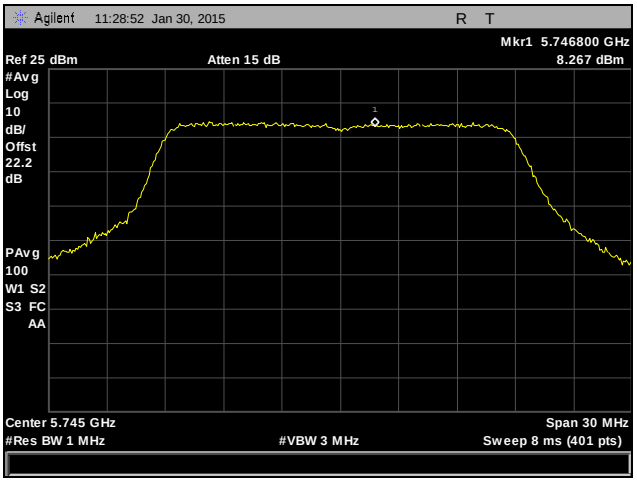


Plot 157. Peak Power Spectral Density, 802.11ac 20 MHz, Mid Channel, MIMO, UNII 3

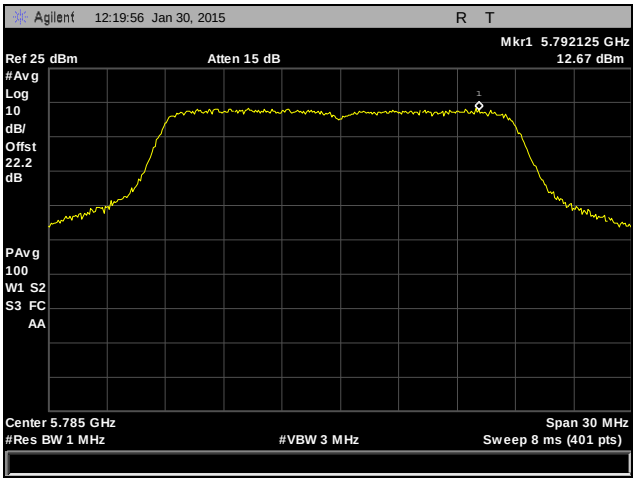


Plot 158. Peak Power Spectral Density, 802.11ac 20 MHz, High Channel, MIMO, UNII 3

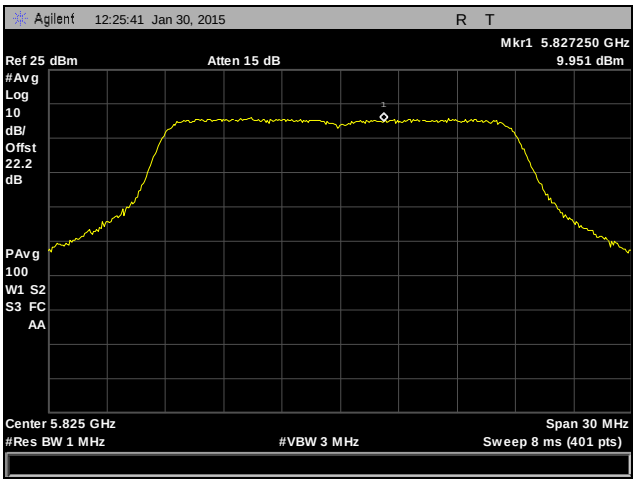
Peak Power Spectral Density, 802.11ac 20 MHz, SISO, UNII 3



Plot 159. Peak Power Spectral Density, 802.11ac 20 MHz, Low Channel, SISO, UNII 3

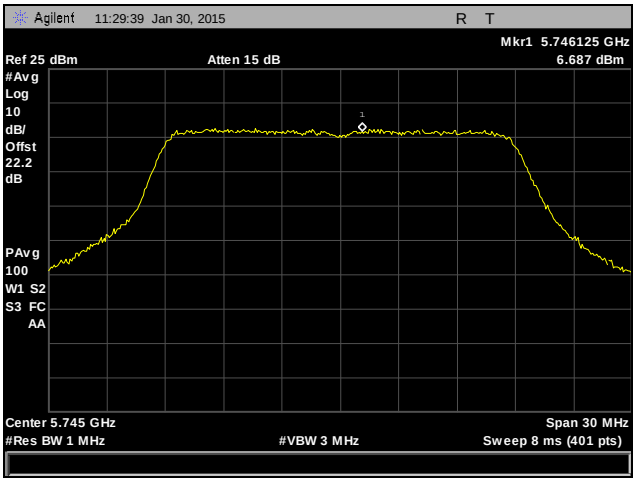


Plot 160. Peak Power Spectral Density, 802.11ac 20 MHz, Mid Channel, SISO, UNII 3

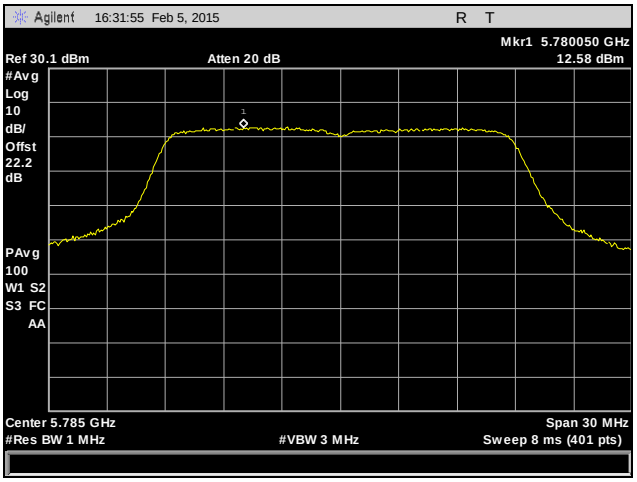


Plot 161. Peak Power Spectral Density, 802.11ac 20 MHz, High Channel, SISO, UNII 3

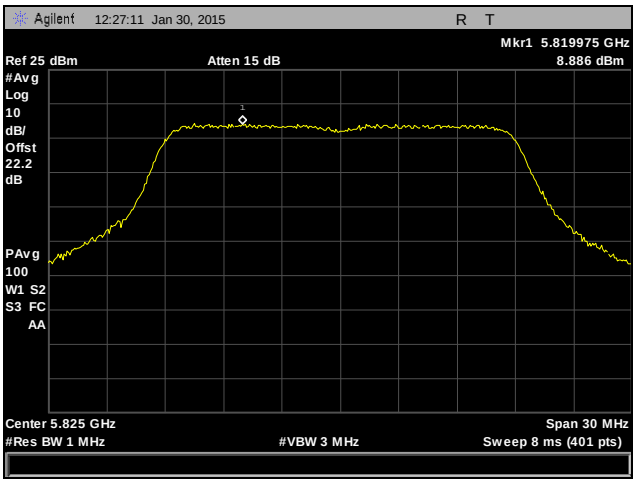
Peak Power Spectral Density, 802.11n 20 MHz, MIMO, UNII 3



Plot 162. Peak Power Spectral Density, 802.11n 20 MHz, Low Channel, MIMO, UNII 3

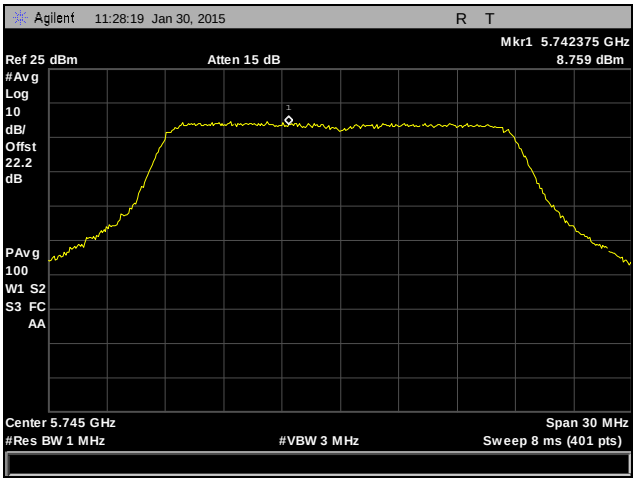


Plot 163. Peak Power Spectral Density, 802.11n 20 MHz, Mid Channel, MIMO, UNII 3

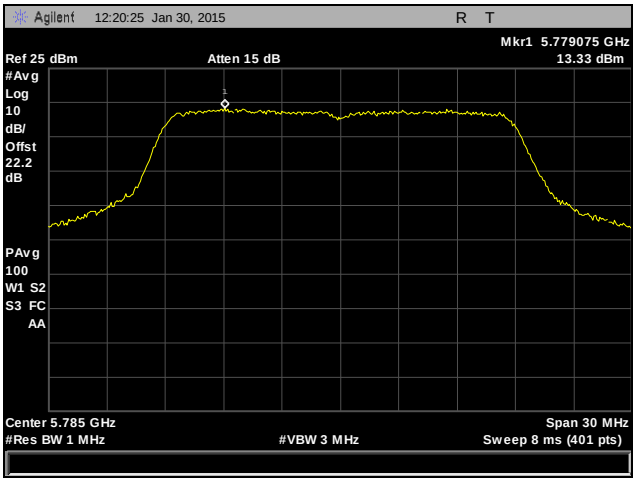


Plot 164. Peak Power Spectral Density, 802.11n 20 MHz, High Channel, MIMO, UNII 3

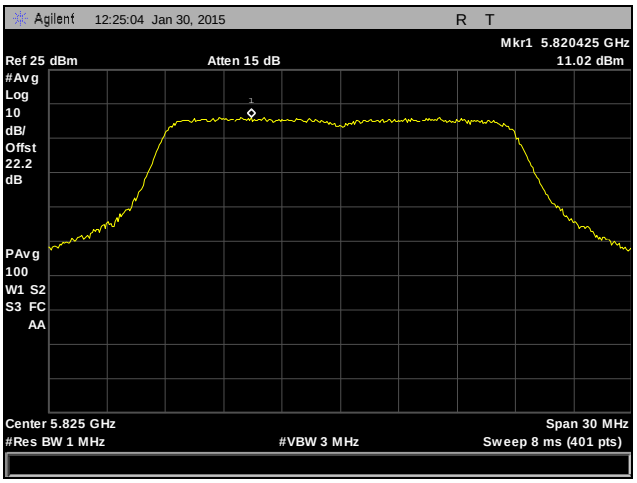
Peak Power Spectral Density, 802.11n 20 MHz, SISO, UNII 3



Plot 165. Peak Power Spectral Density, 802.11n 20 MHz, Low Channel, SISO, UNII 3

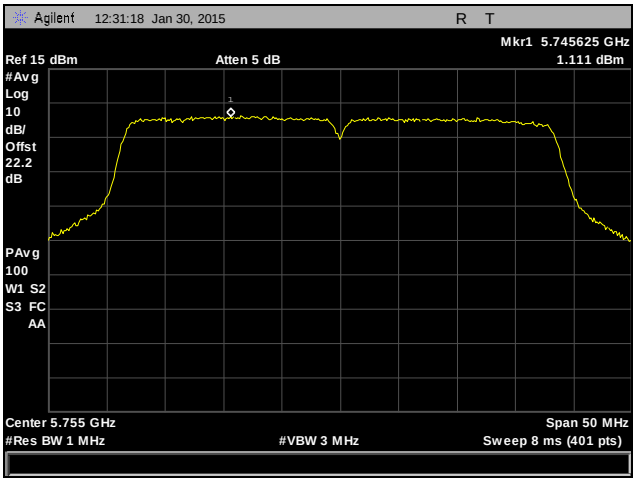


Plot 166. Peak Power Spectral Density, 802.11n 20 MHz, Mid Channel, SISO, UNII 3

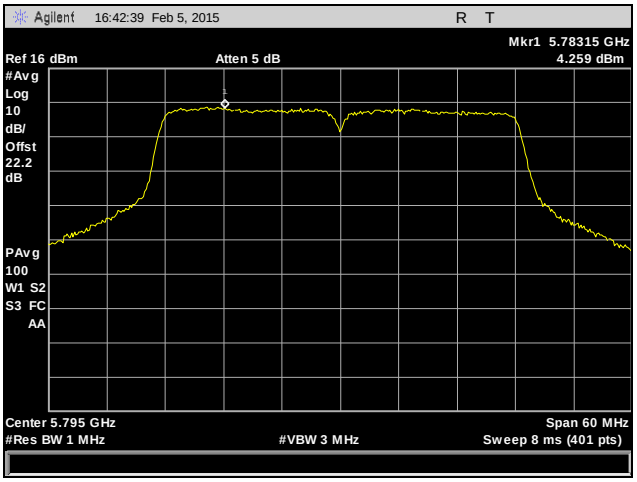


Plot 167. Peak Power Spectral Density, 802.11n 20 MHz, High Channel, SISO, UNII 3

Peak Power Spectral Density, 802.11ac 40 MHz, MIMO, UNII 3

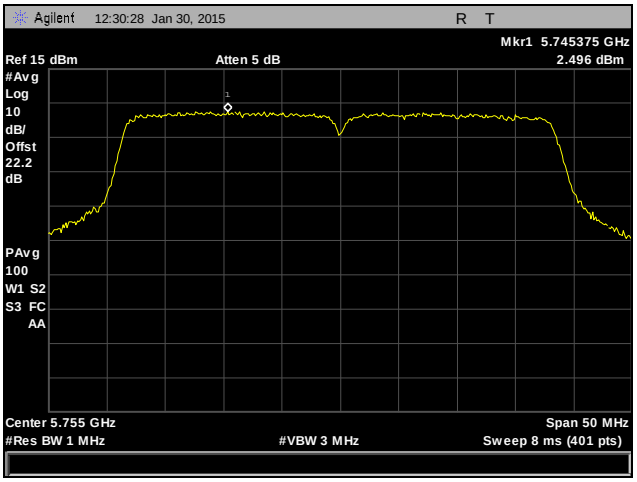


Plot 168. Peak Power Spectral Density, 802.11ac 40 MHz, Low Channel, MIMO, UNII 3

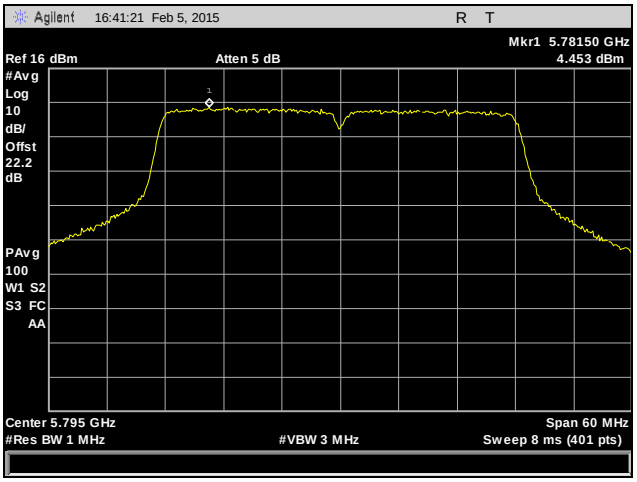


Plot 169. Peak Power Spectral Density, 802.11ac 40 MHz, High Channel, MIMO, UNII 3

Peak Power Spectral Density, 802.11ac 40 MHz, SISO, UNII 3

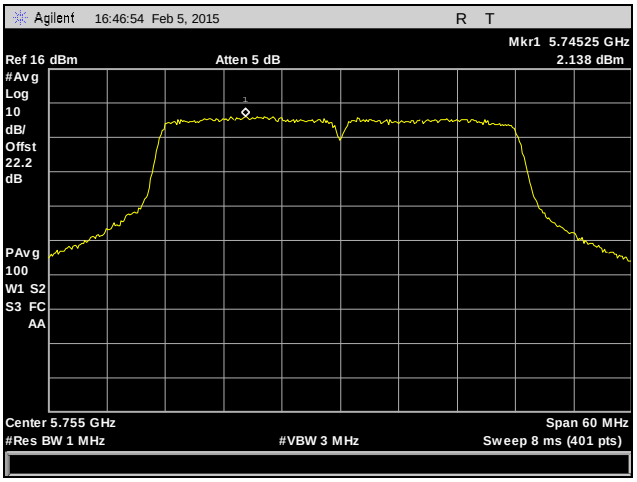


Plot 170. Peak Power Spectral Density, 802.11ac 40 MHz, Low Channel, SISO, UNII 3

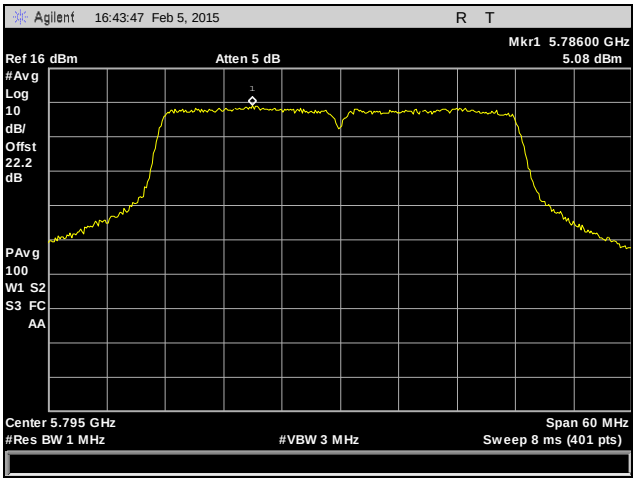


Plot 171. Peak Power Spectral Density, 802.11ac 40 MHz, High Channel, SISO, UNII 3

Peak Power Spectral Density, 802.11n 40 MHz, MIMO, UNII 3

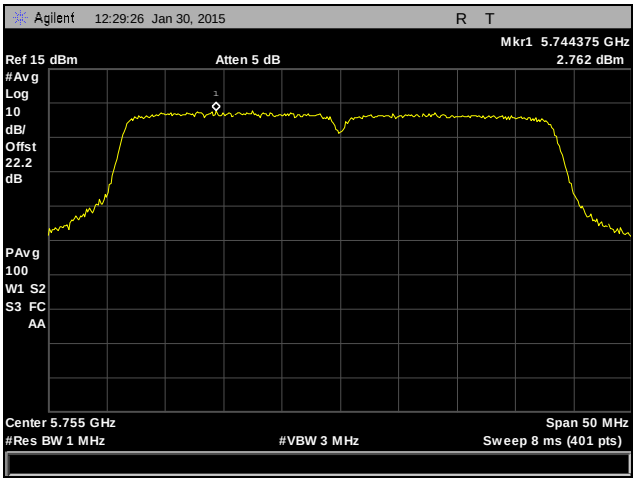


Plot 172. Peak Power Spectral Density, 802.11n 40 MHz, Low Channel, MIMO, UNII 3

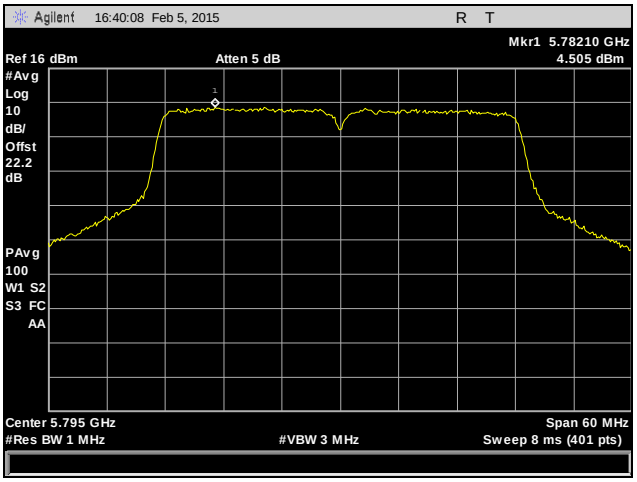


Plot 173. Peak Power Spectral Density, 802.11n 40 MHz, High Channel, MIMO, UNII 3

Peak Power Spectral Density, 802.11n 40 MHz, SISO, UNII 3

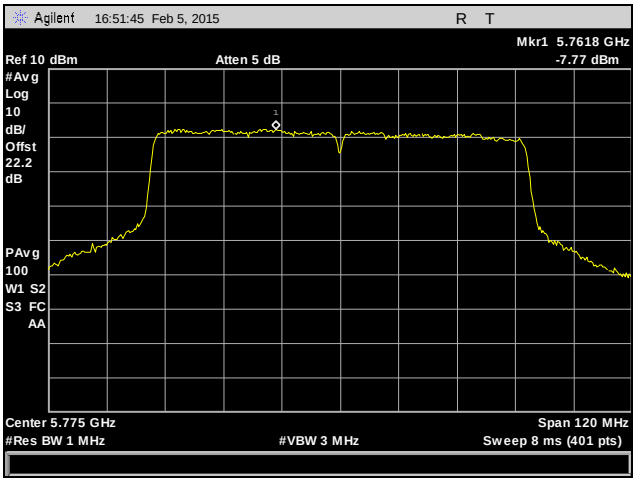


Plot 174. Peak Power Spectral Density, 802.11n 40 MHz, Low Channel, SISO, UNII 3

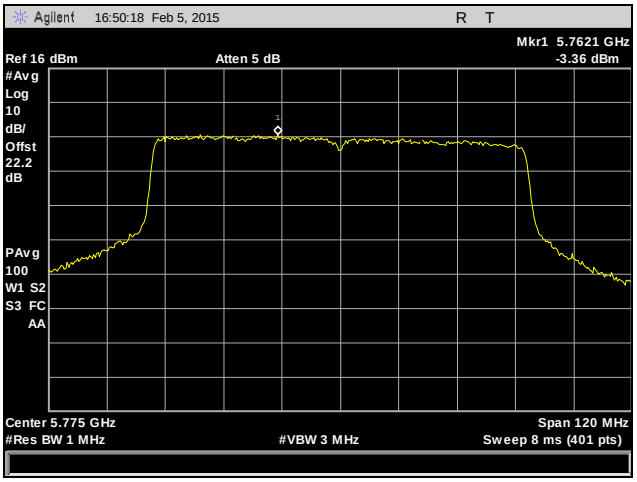


Plot 175. Peak Power Spectral Density, 802.11n 40 MHz, High Channel, SISO, UNII 3

Peak Power Spectral Density, 802.11ac 80 MHz, UNII 3



Plot 176. Peak Power Spectral Density, 802.11ac 80 MHz, MIMO, UNII 3



Plot 177. Peak Power Spectral Density, 802.11ac 80 MHz, SISO, UNII 3

Electromagnetic Compatibility Criteria for Intentional Radiators

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

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

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

§15.407(b)(4): For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

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

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

For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth. The procedure was used for average.

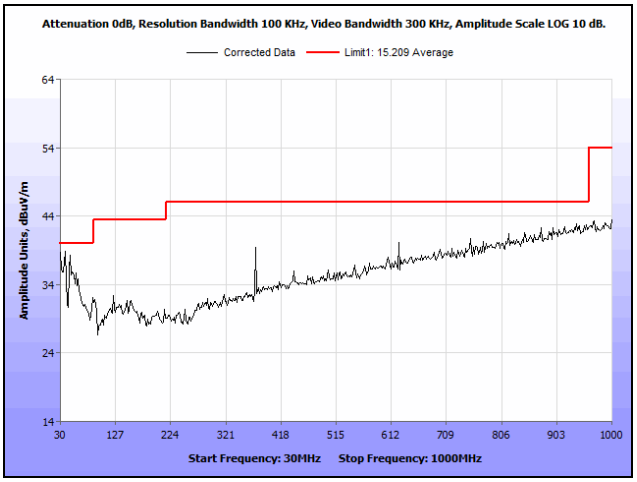
For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. A notch filter was use to filter out the transmitting channel. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Only noise floor was seen above 18 GHz. Worst case emissions shown by antenna.

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

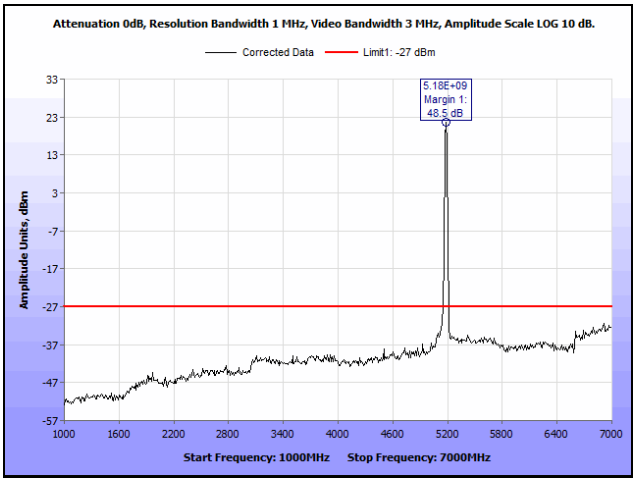
Test Engineer(s): Surinder Singh

Test Date(s): 02/03/015

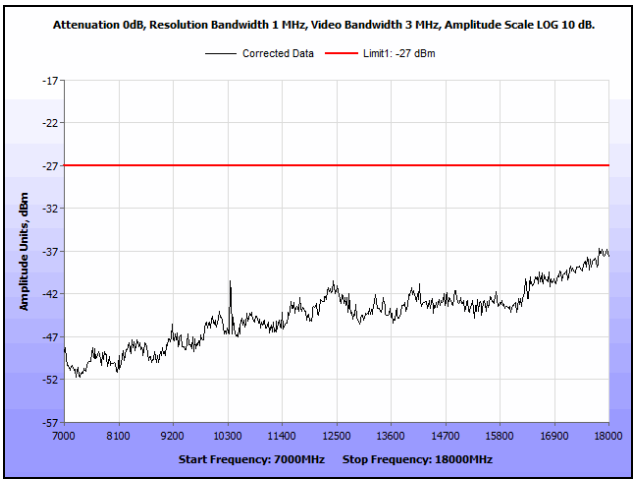
Radiated Spurious Emissions, 802.11a, MIMO, UNII 1



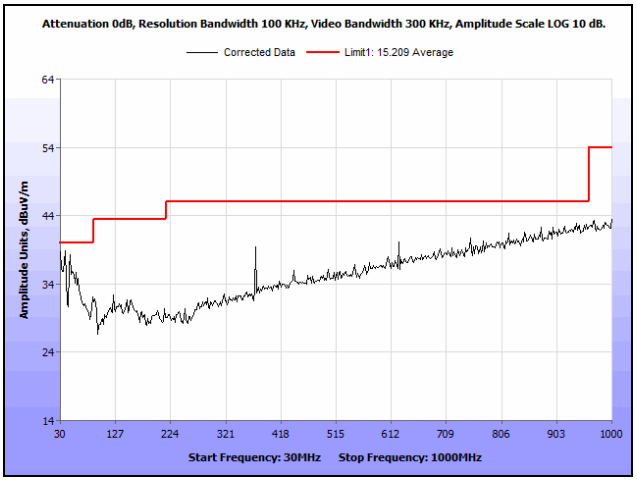
Plot 178. Radiated Spurious Emissions, Low Channel, 802.11a, MIMO, 30 MHz – 1 GHz, UNII 1



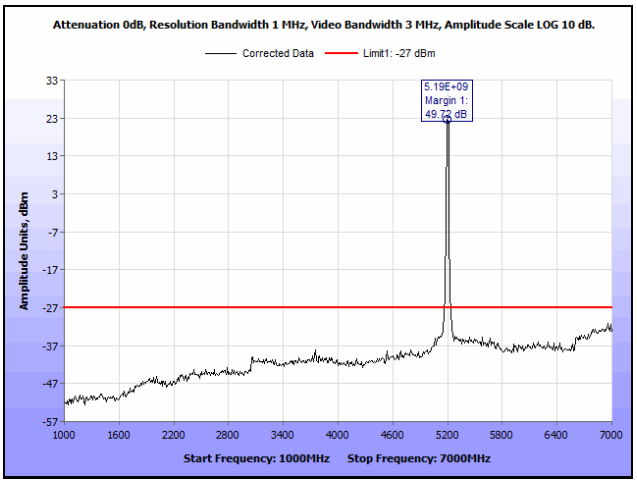
Plot 179. Radiated Spurious Emissions, Low Channel, 802.11a, MIMO, 1 GHz – 7 GHz, UNII 1



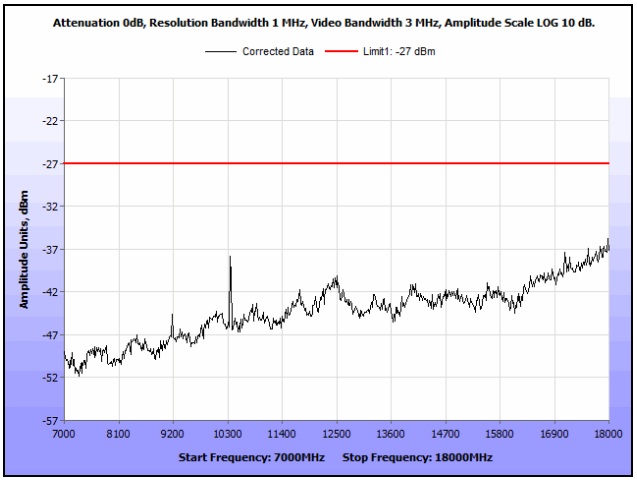
Plot 180. Radiated Spurious Emissions, Low Channel, 802.11a, MIMO, 7 GHz – 18 GHz, UNII 1



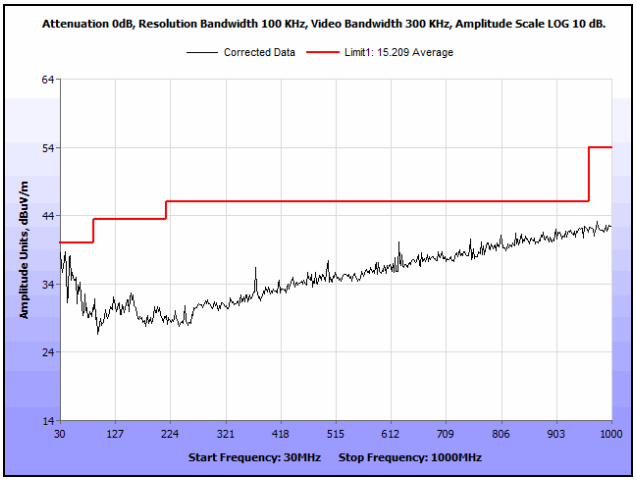
Plot 181. Radiated Spurious Emissions, Mid Channel, 802.11a, MIMO, 30 MHz – 1 GHz, UNII 1



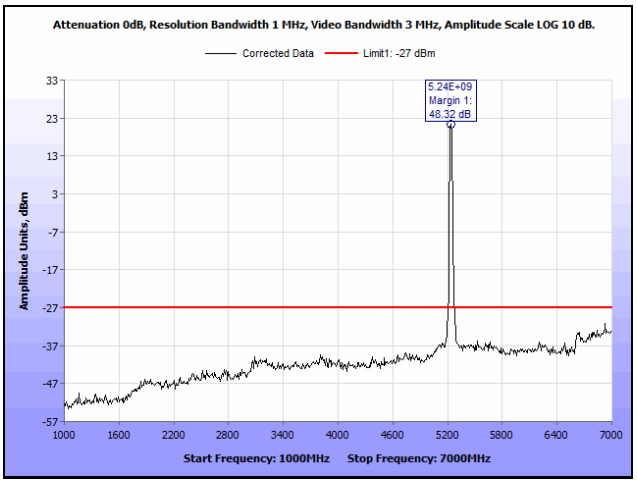
Plot 182. Radiated Spurious Emissions, Mid Channel, 802.11a, MIMO, 1 GHz – 7 GHz, UNII 1



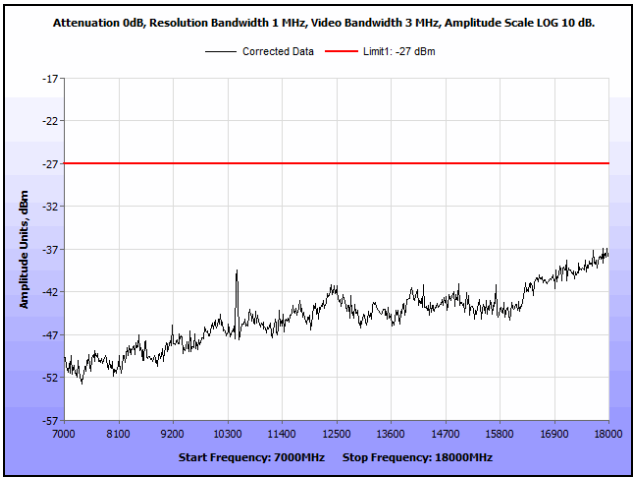
Plot 183. Radiated Spurious Emissions, Mid Channel, 802.11a, MIMO, 7 GHz – 18 GHz, UNII 1



Plot 184. Radiated Spurious Emissions, High Channel, 802.11a, MIMO, 30 MHz – 1 GHz, UNII 1

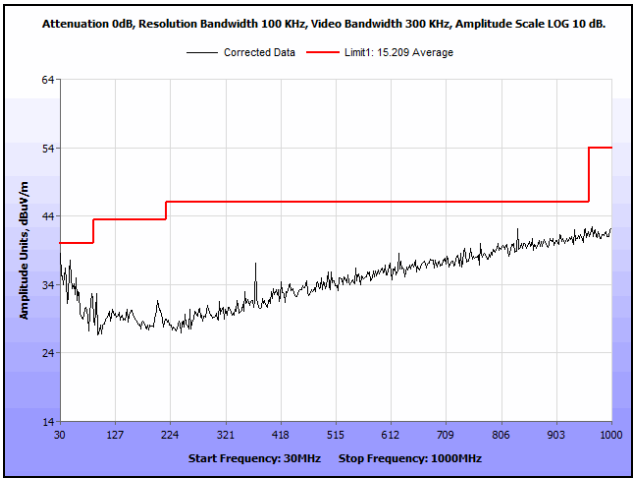


Plot 185. Radiated Spurious Emissions, High Channel, 802.11a, MIMO, 1 GHz – 7 GHz, UNII 1

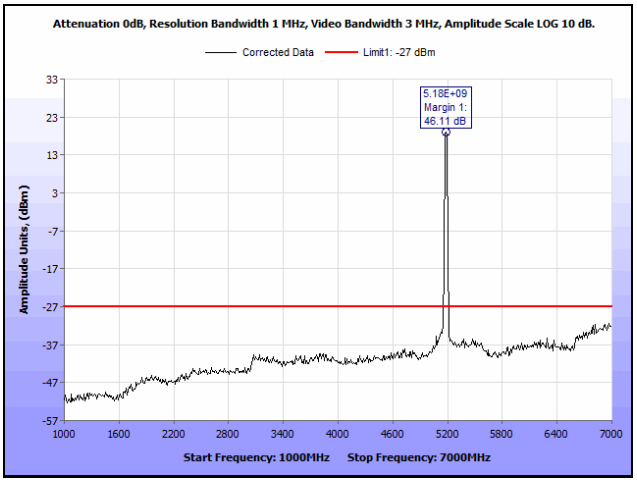


Plot 186. Radiated Spurious Emissions, High Channel, 802.11a, MIMO, 7 GHz – 18 GHz, UNII 1

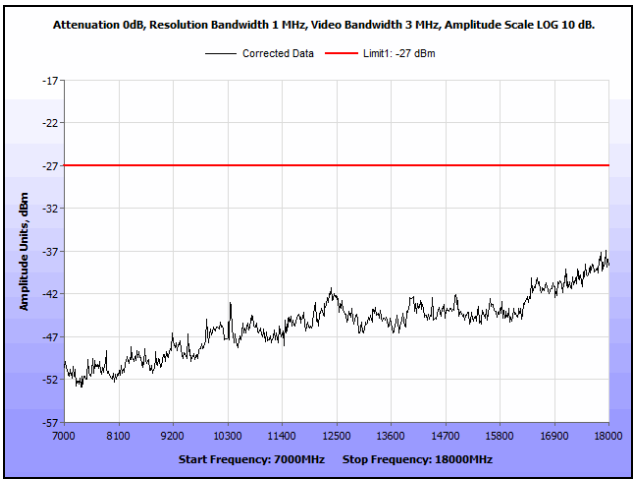
Radiated Spurious Emissions, 802.11a, SISO, UNII 1



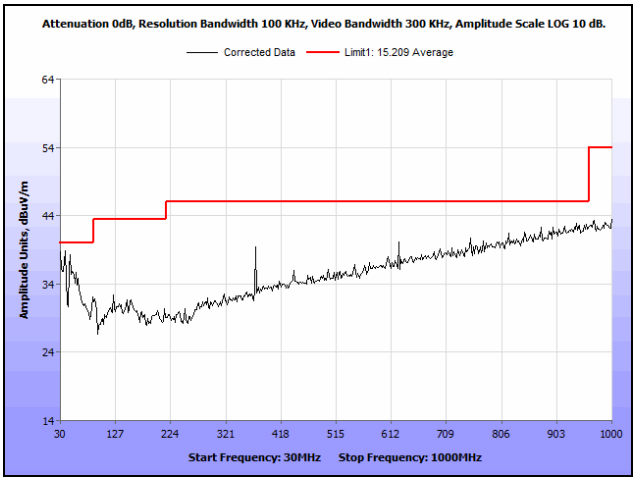
Plot 187. Radiated Spurious Emissions, Low Channel, 802.11a, SISO, 30 MHz – 1 GHz, UNII 1



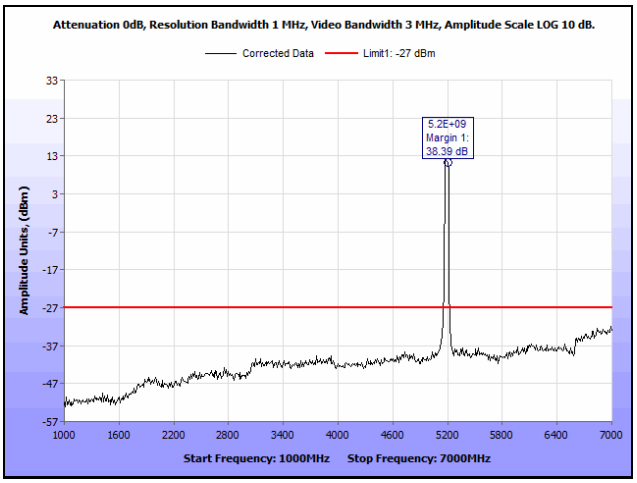
Plot 188. Radiated Spurious Emissions, Low Channel, 802.11a, SISO, 1 GHz – 7 GHz, UNII 1



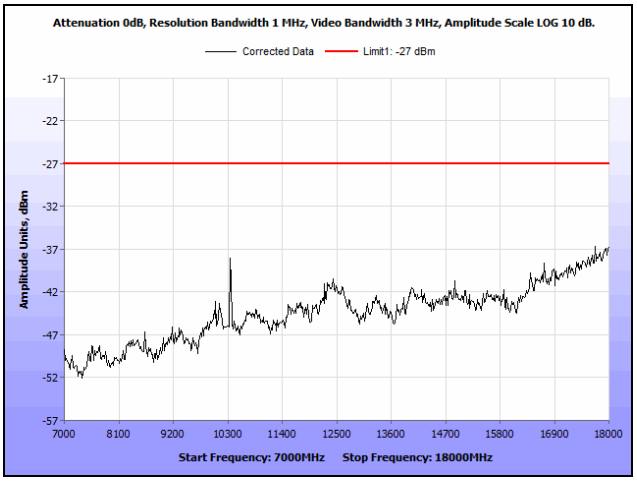
Plot 189. Radiated Spurious Emissions, Low Channel, 802.11a, SISO, 7 GHz – 18 GHz, UNII 1



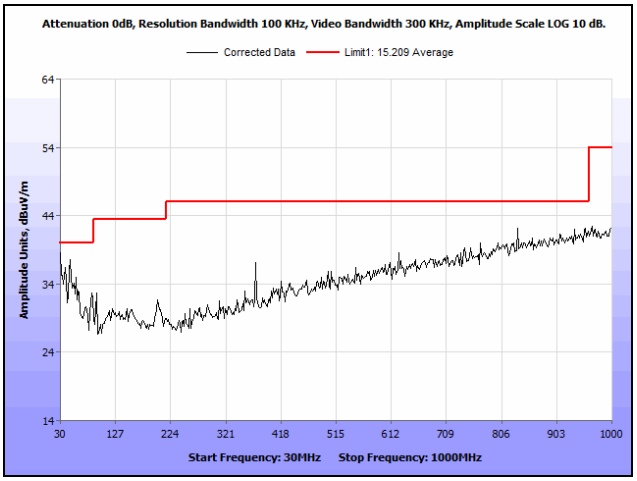
Plot 190. Radiated Spurious Emissions, Mid Channel, 802.11a, SISO, 30 MHz – 1 GHz, UNII 1



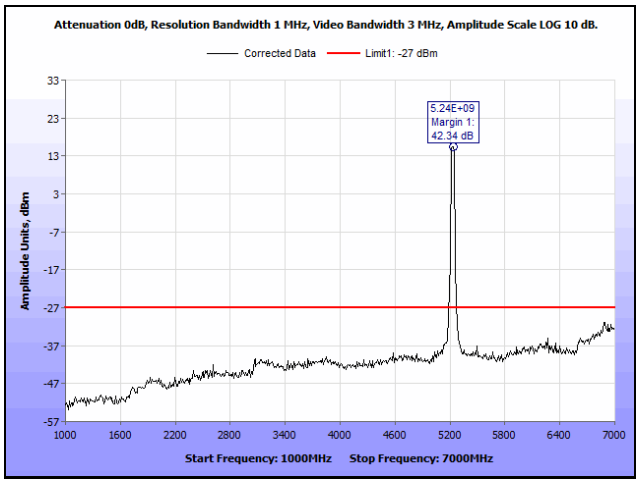
Plot 191. Radiated Spurious Emissions, Mid Channel, 802.11a, SISO, 1 GHz – 7 GHz, UNII 1



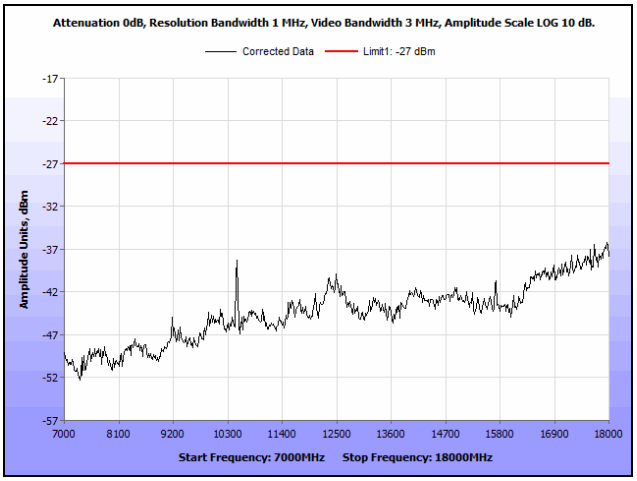
Plot 192. Radiated Spurious Emissions, Mid Channel, 802.11a, SISO, 7 GHz – 18 GHz, UNII 1



Plot 193. Radiated Spurious Emissions, High Channel, 802.11a, SISO, 30 MHz – 1 GHz, UNII 1

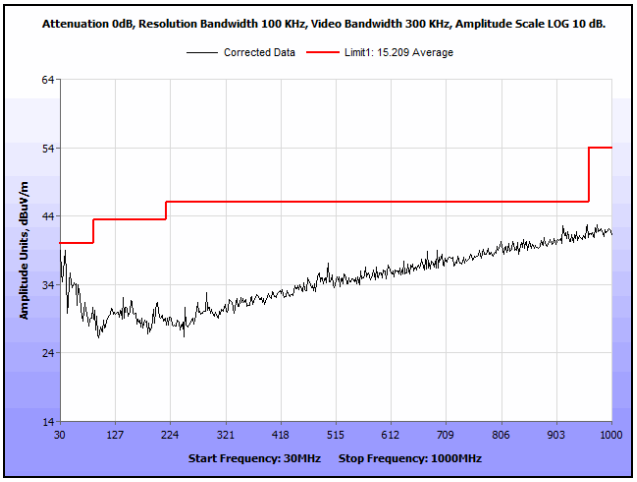


Plot 194. Radiated Spurious Emissions, High Channel, 802.11a, SISO, 1 GHz – 7 GHz, UNII 1

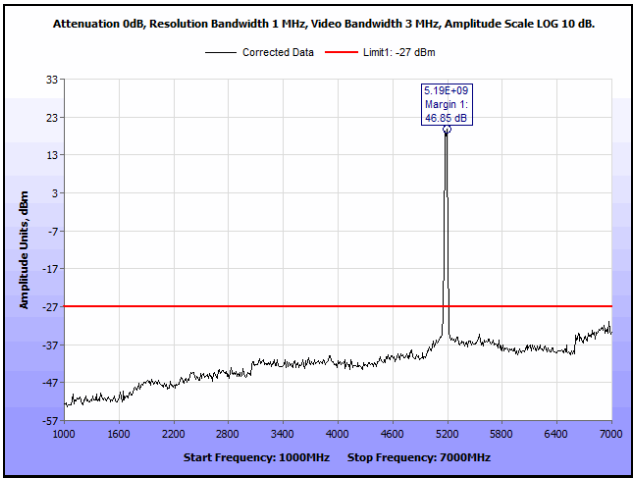


Plot 195. Radiated Spurious Emissions, High Channel, 802.11a, SISO, 7 GHz – 18 GHz, UNII 1

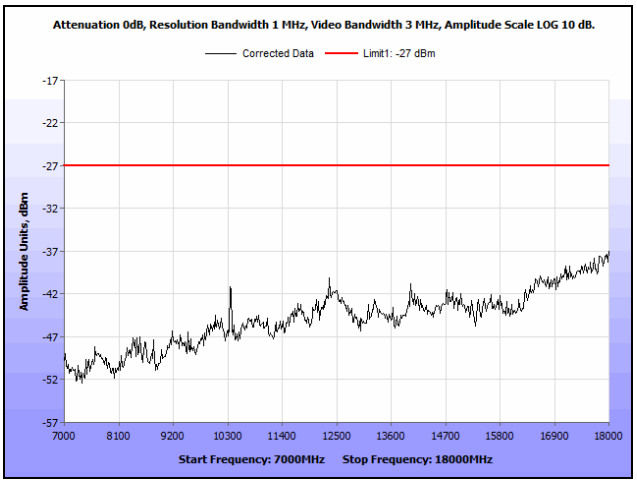
Radiated Spurious Emissions, 802.11ac 20 MHz, MIMO, UNII 1



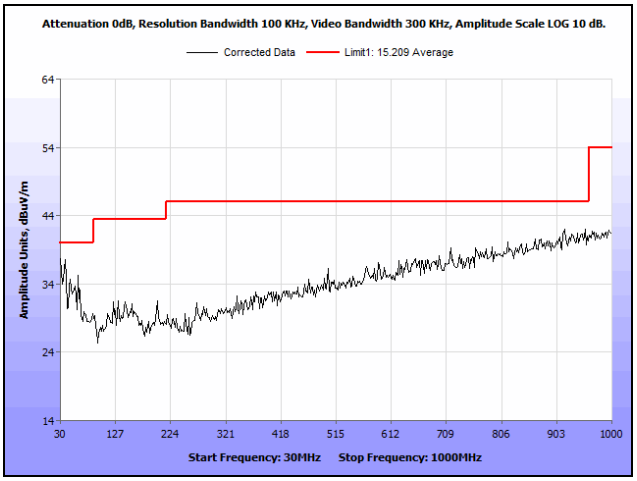
Plot 196. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 1



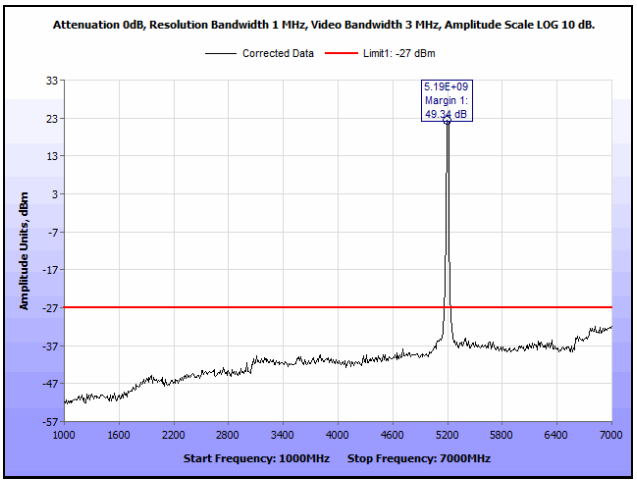
Plot 197. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 1



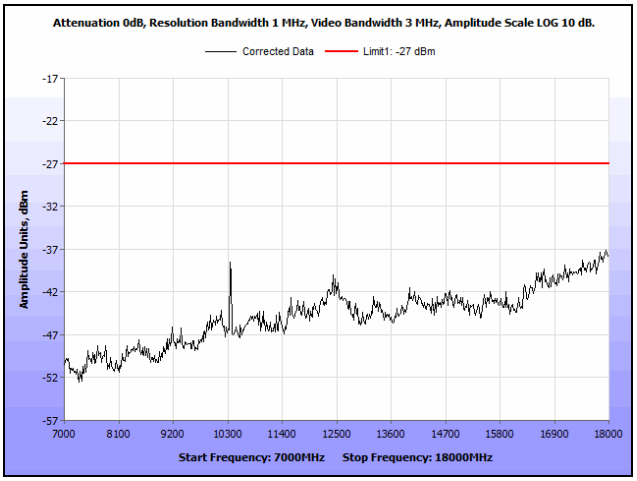
Plot 198. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 1



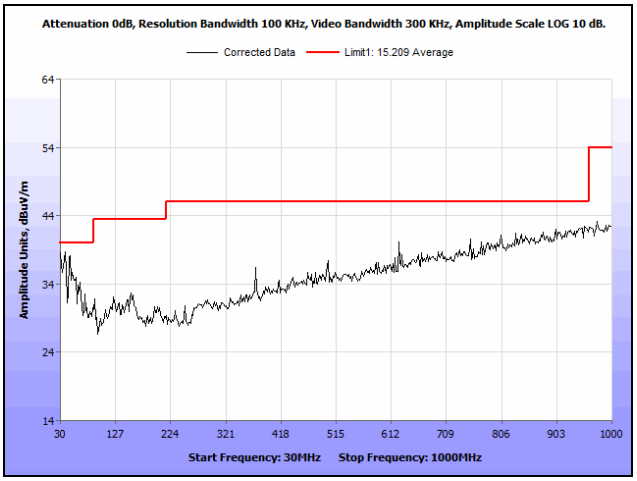
Plot 199. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 1



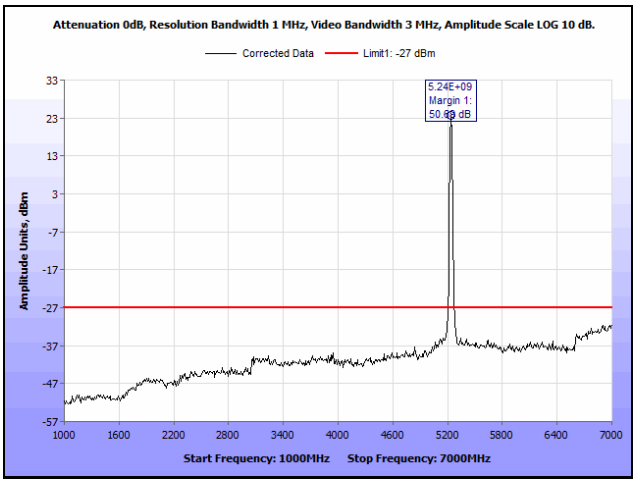
Plot 200. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 1



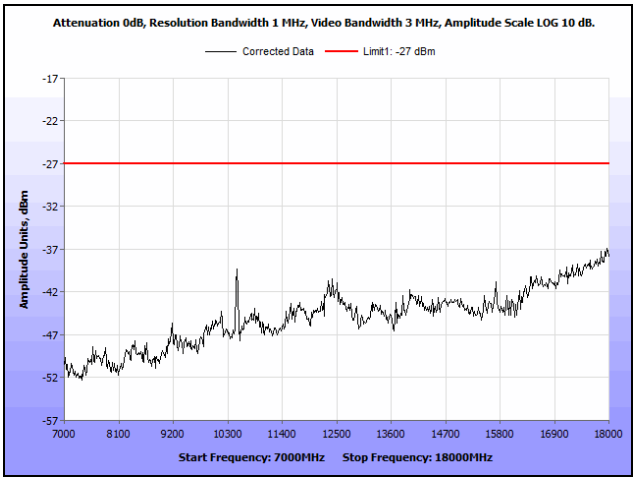
Plot 201. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 1



Plot 202. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 1

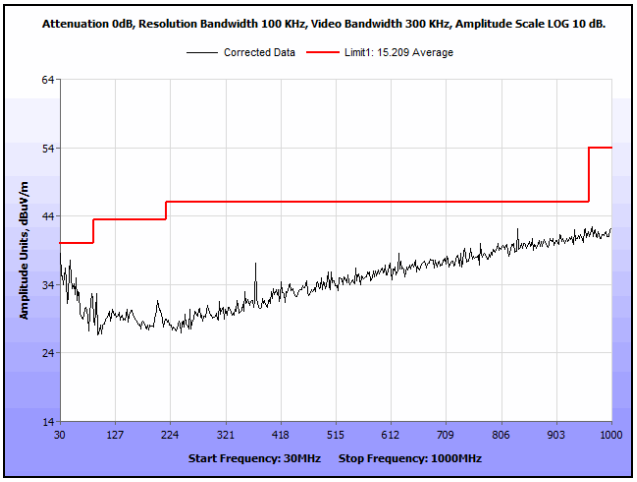


Plot 203. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 1

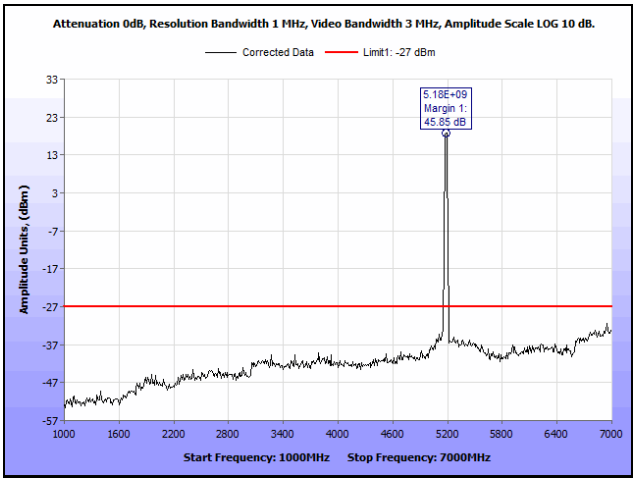


Plot 204. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 1

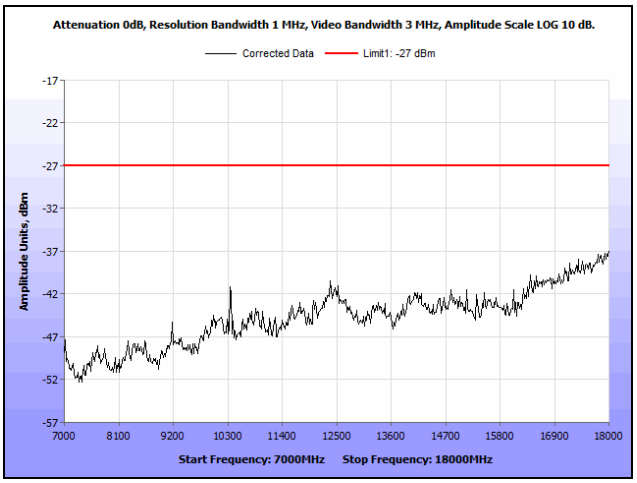
Radiated Spurious Emissions, 802.11ac 20 MHz, SISO, UNII 1



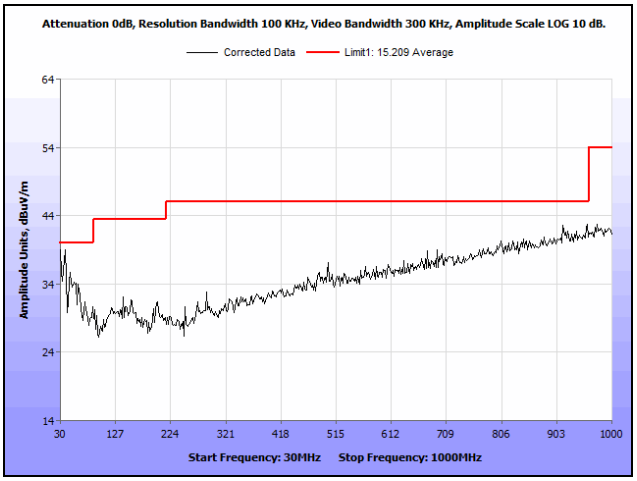
Plot 205. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, 30 MHz – 1 GHz, UNII 1



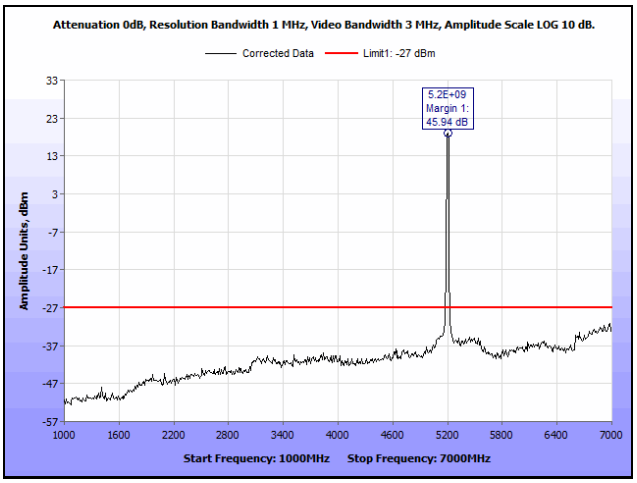
Plot 206. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, 1 GHz – 7 GHz, UNII 1



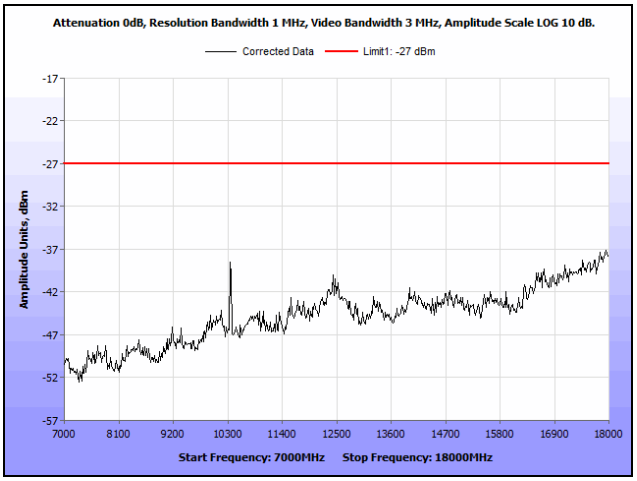
Plot 207. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, 7 GHz – 18 GHz, UNII 1



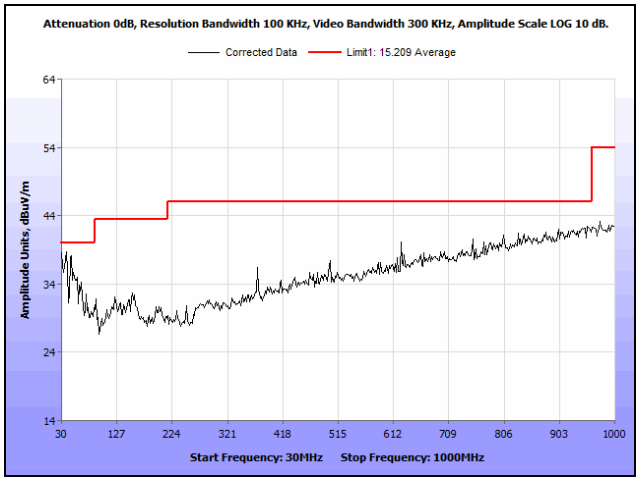
Plot 208. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, 30 MHz – 1 GHz, UNII 1



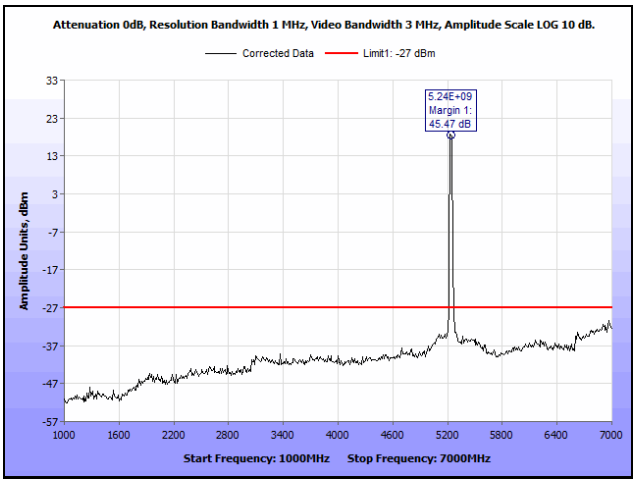
Plot 209. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, 1 GHz – 7 GHz, UNII 1



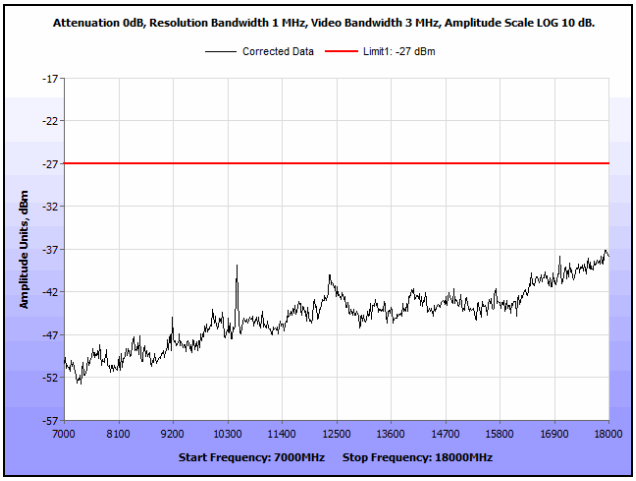
Plot 210. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, 7 GHz – 18 GHz, UNII 1



Plot 211. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, 30 MHz – 1 GHz, UNII 1

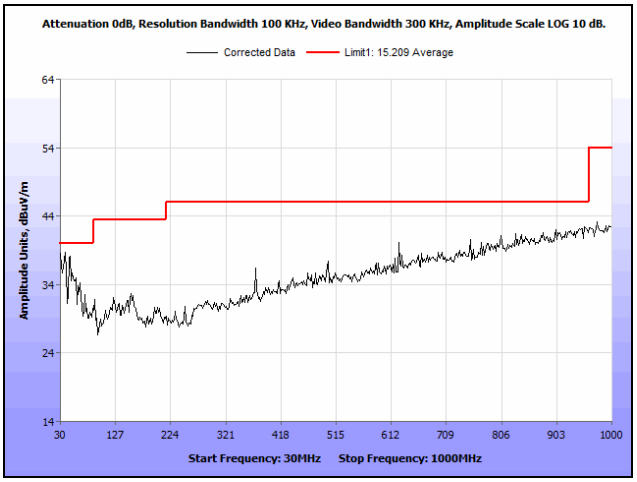


Plot 212. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, 1 GHz – 7 GHz, UNII 1

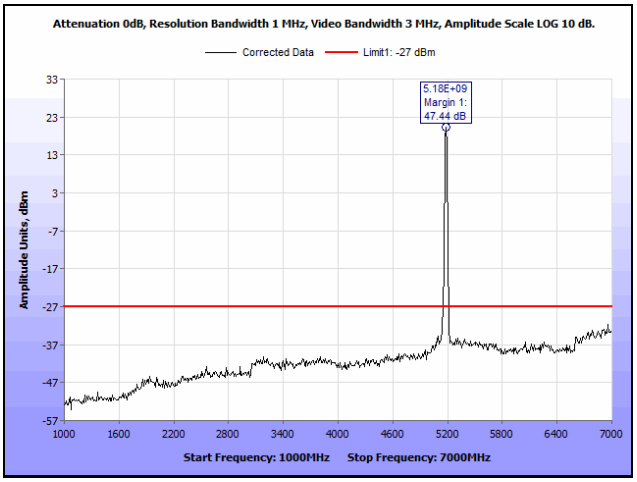


Plot 213. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, 7 GHz – 18 GHz, UNII 1

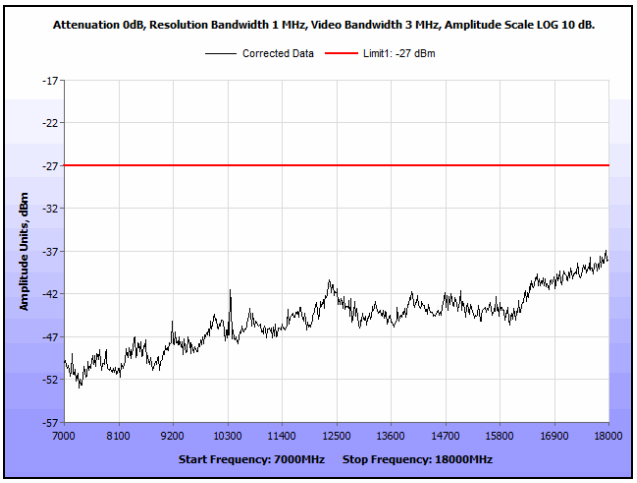
Radiated Spurious Emissions, 802.11n 20 MHz, MIMO, UNII 1



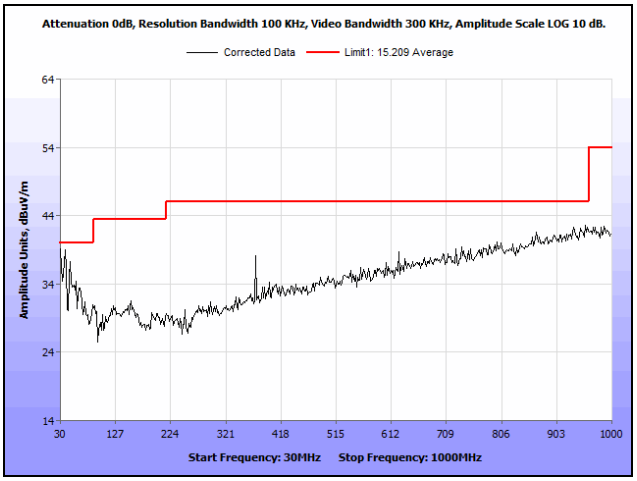
Plot 214. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 1



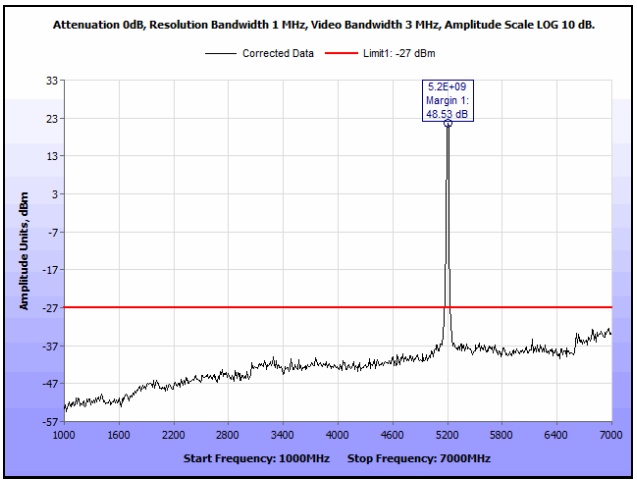
Plot 215. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 1



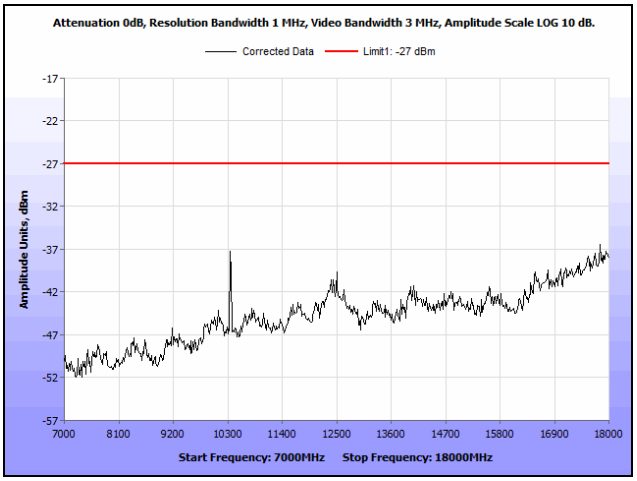
Plot 216. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 1



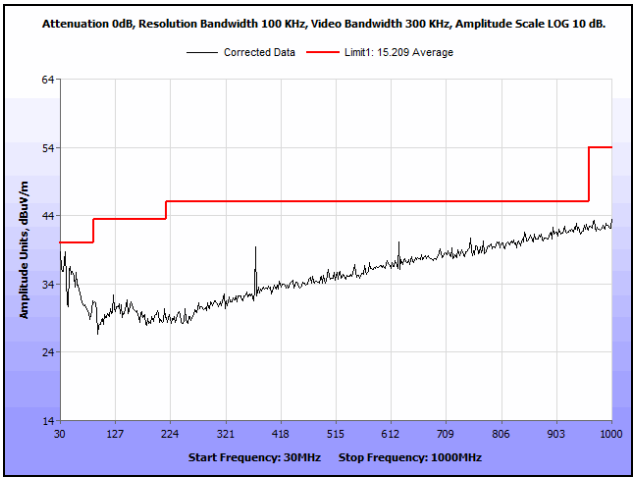
Plot 217. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 1



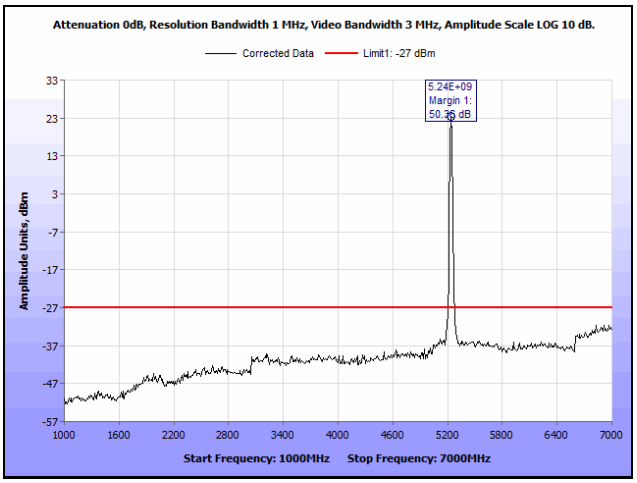
Plot 218. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 1



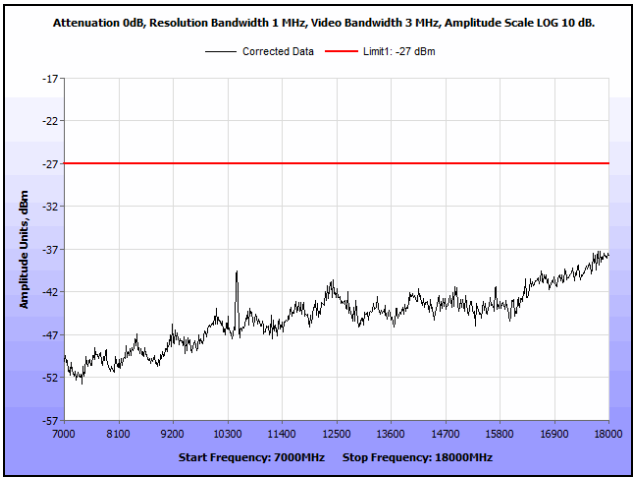
Plot 219. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 1



Plot 220. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 1

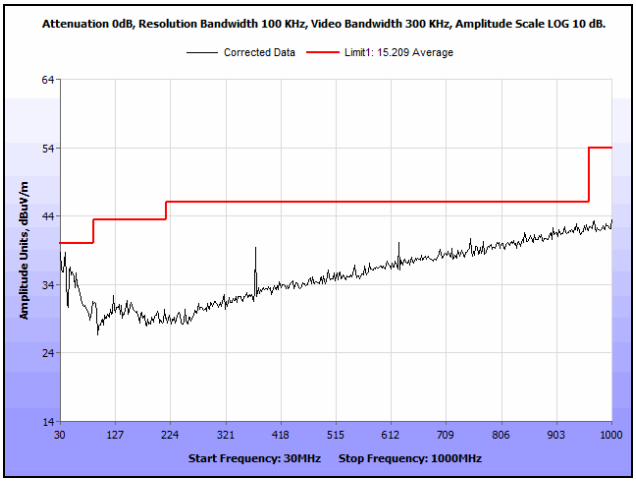


Plot 221. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 1

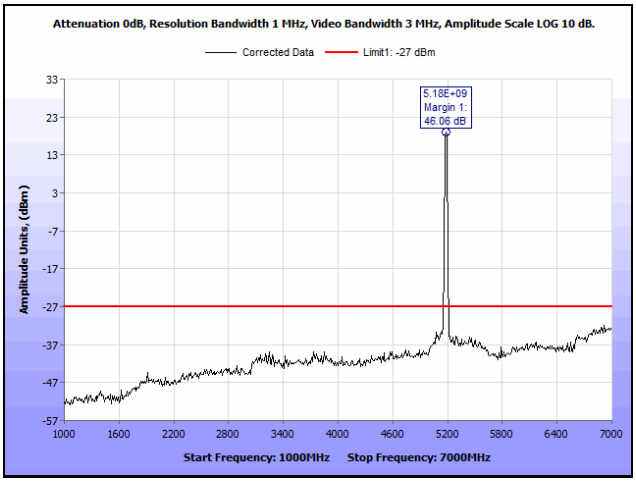


Plot 222. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 1

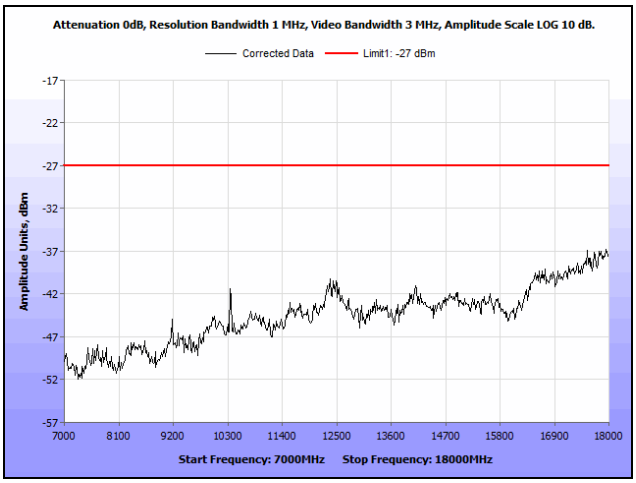
Radiated Spurious Emissions, 802.11n 20 MHz, SISO, UNII 1



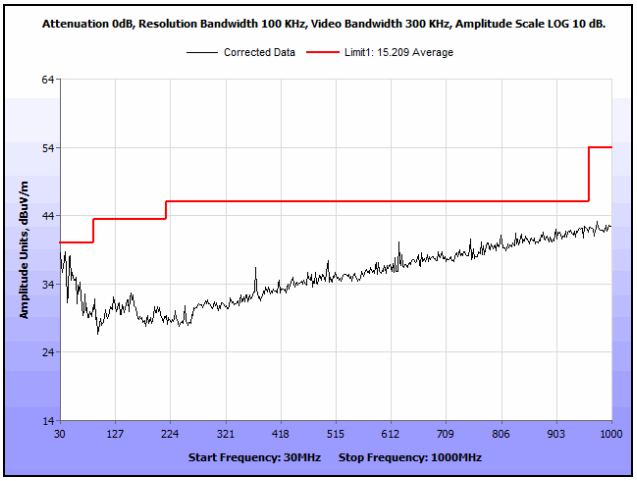
Plot 223. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, 30 MHz – 1 GHz, UNII 1



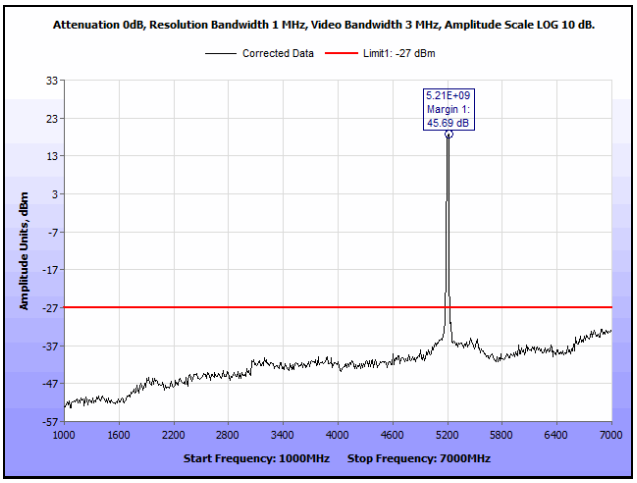
Plot 224. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, 1 GHz – 7 GHz, UNII 1



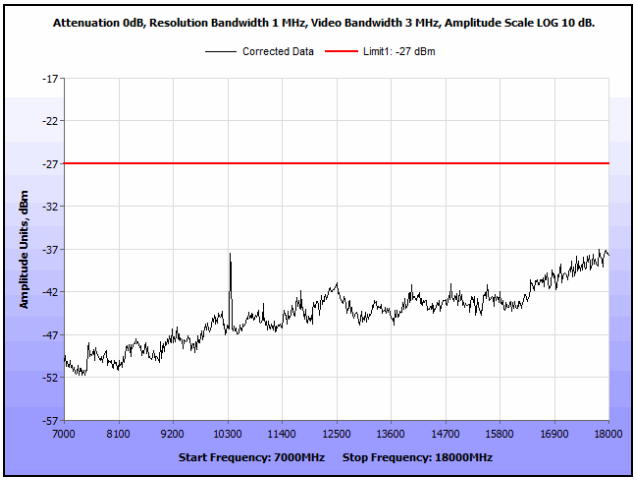
Plot 225. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, 7 GHz – 18 GHz, UNII 1



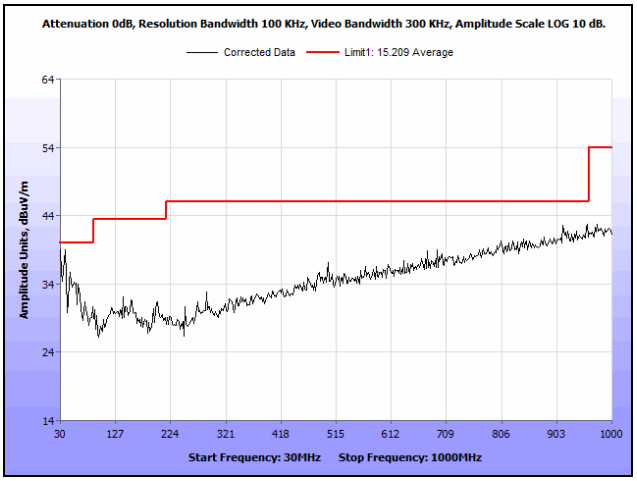
Plot 226. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, 30 MHz – 1 GHz, UNII 1



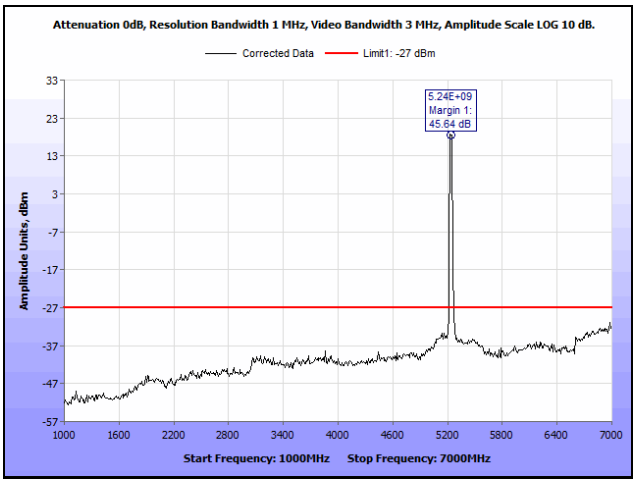
Plot 227. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, 1 GHz – 7 GHz, UNII 1



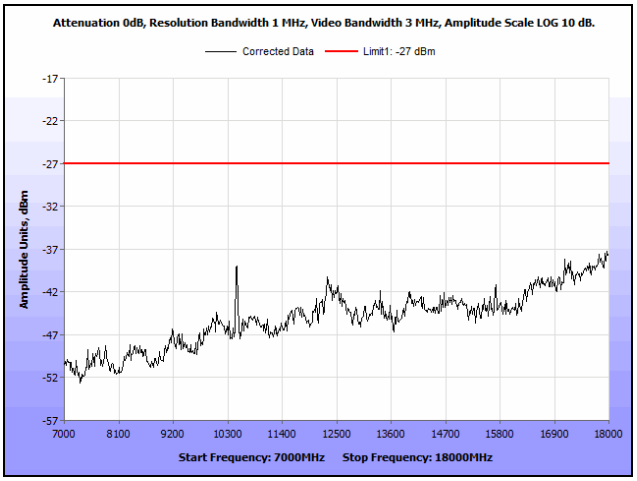
Plot 228. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, 7 GHz – 18 GHz, UNII 1



Plot 229. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, 30 MHz – 1 GHz, UNII 1

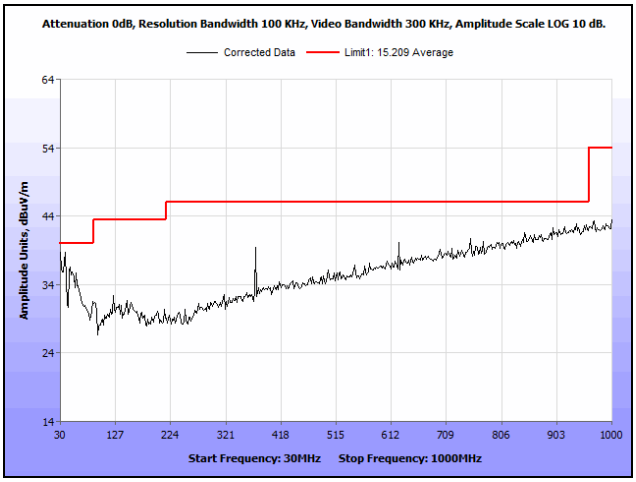


Plot 230. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, 1 GHz – 7 GHz, UNII 1

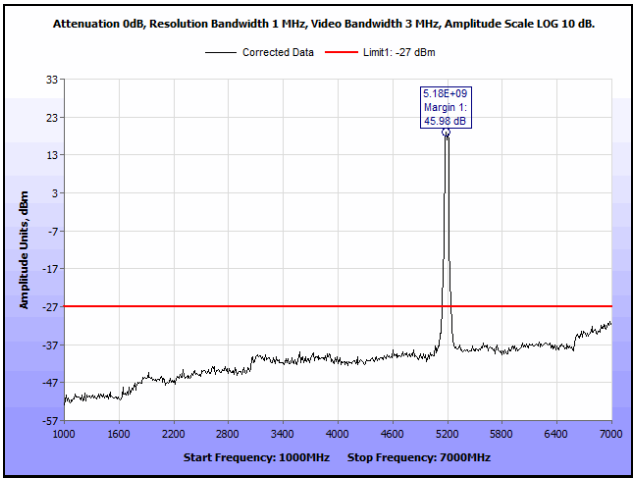


Plot 231. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, 7 GHz – 18 GHz, UNII 1

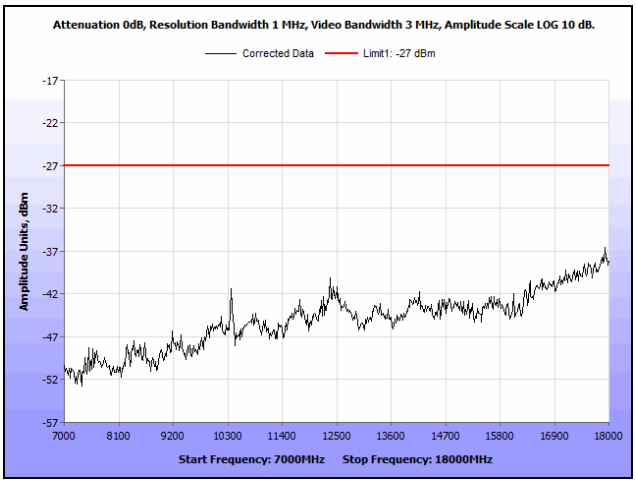
Radiated Spurious Emissions, 802.11ac 40 MHz, MIMO, UNII 1



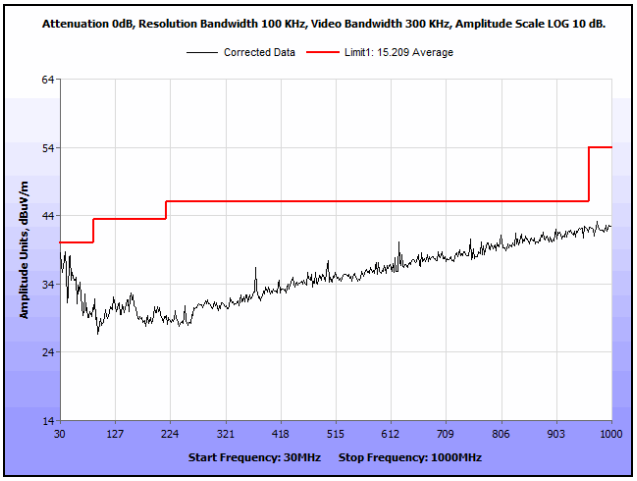
Plot 232. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, 30 MHz – 1 GHz, UNII 1



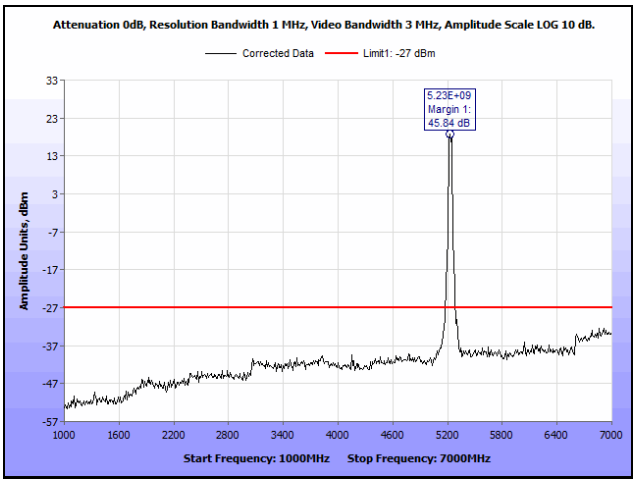
Plot 233. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, 1 GHz – 7 GHz, UNII 1



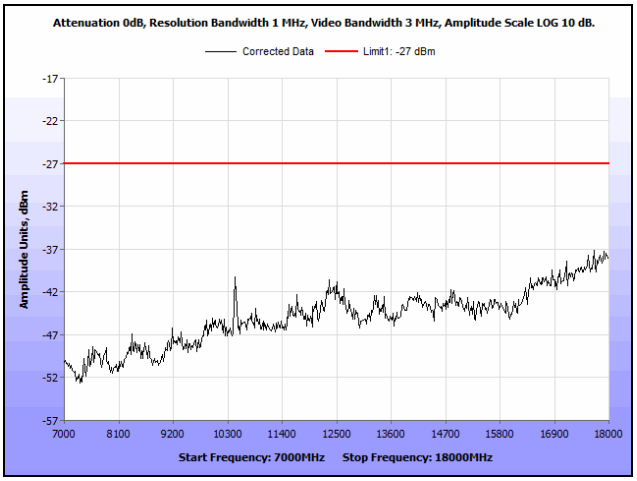
Plot 234. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, 7 GHz – 18 GHz, UNII 1



Plot 235. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, 30 MHz – 1 GHz, UNII 1

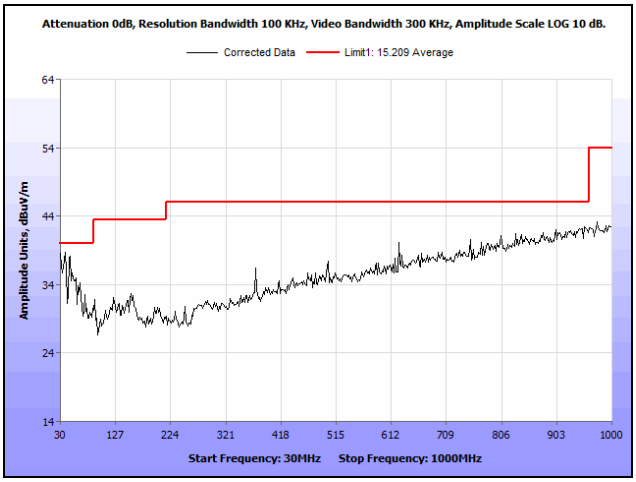


Plot 236. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, 1 GHz – 7 GHz, UNII 1

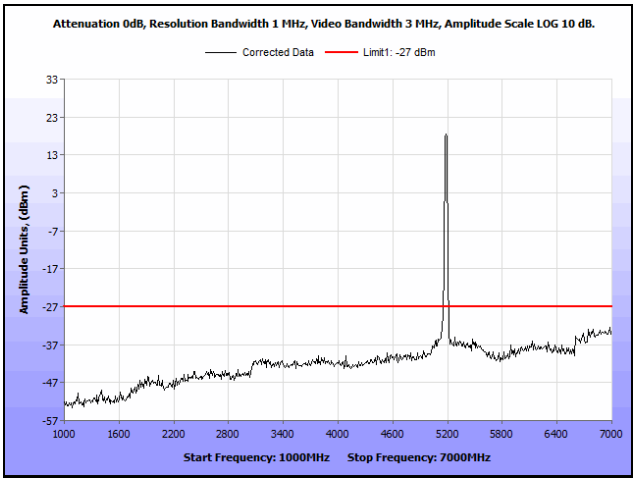


Plot 237. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, 7 GHz – 18 GHz, UNII 1

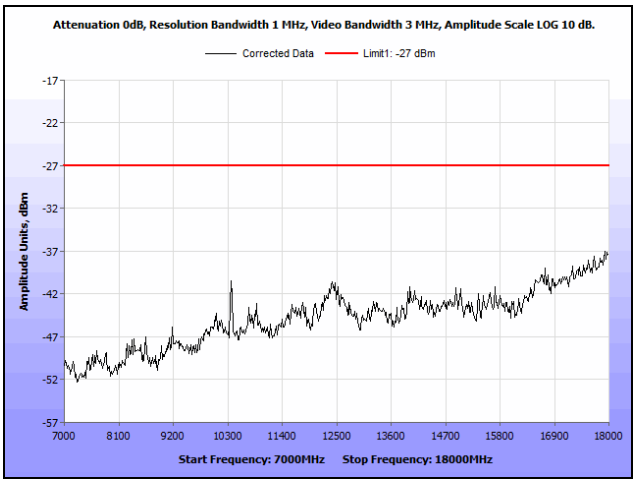
Radiated Spurious Emissions, 802.11ac 40 MHz, SISO, UNII 1



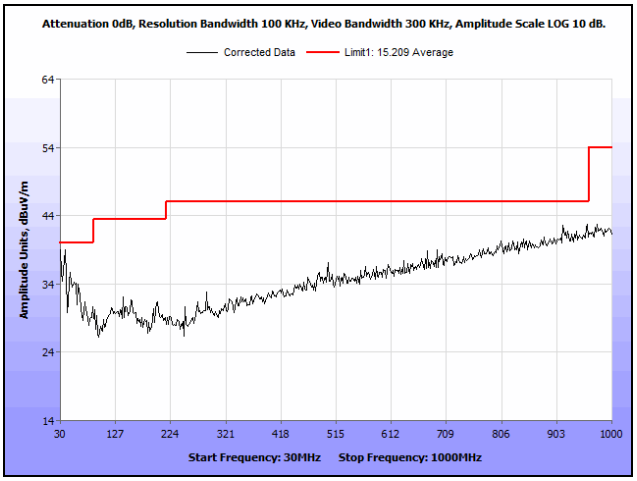
Plot 238. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, 30 MHz – 1 GHz, UNII 1



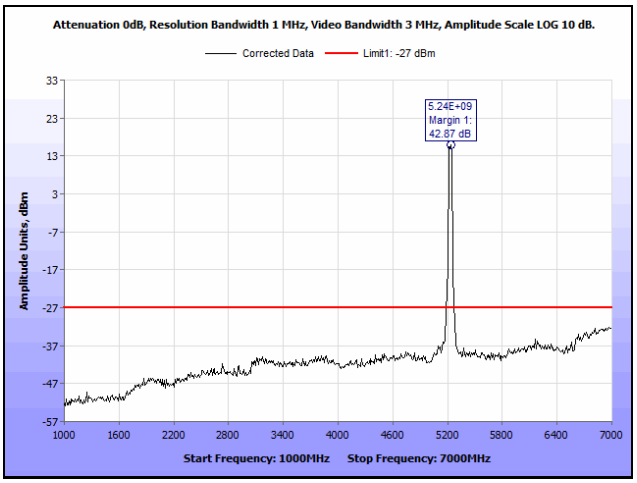
Plot 239. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, 1 GHz – 7 GHz, UNII 1



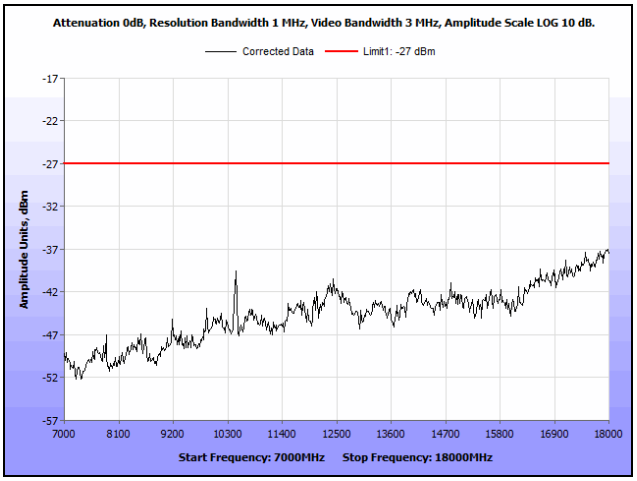
Plot 240. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, 7 GHz – 18 GHz, UNII 1



Plot 241. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, 30 MHz – 1 GHz, UNII 1

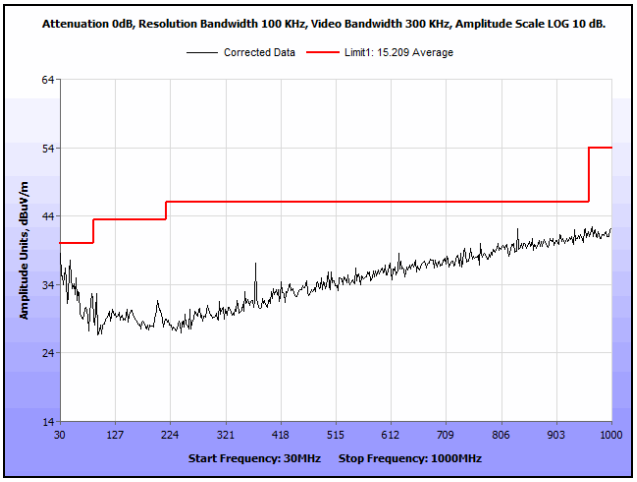


Plot 242. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, 1 GHz – 7 GHz, UNII 1

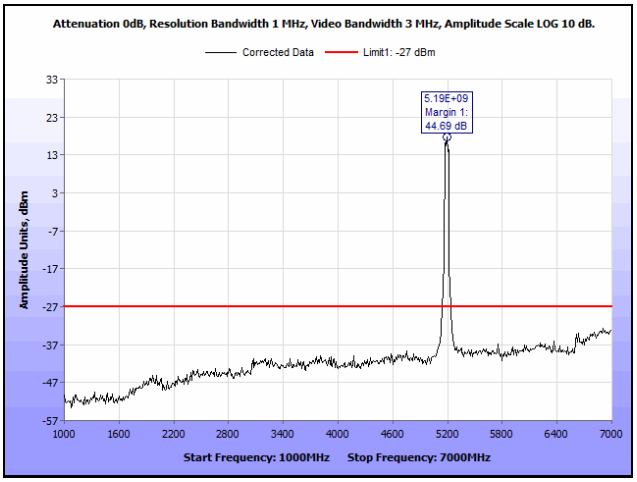


Plot 243. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, 7 GHz – 18 GHz, UNII 1

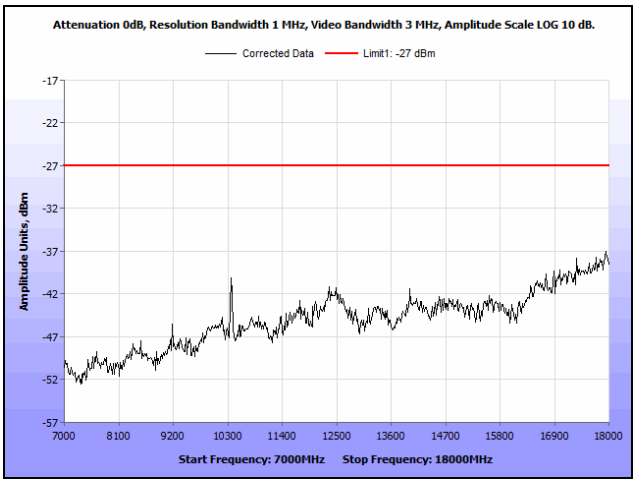
Radiated Spurious Emissions, 802.11n 40 MHz, MIMO, UNII 1



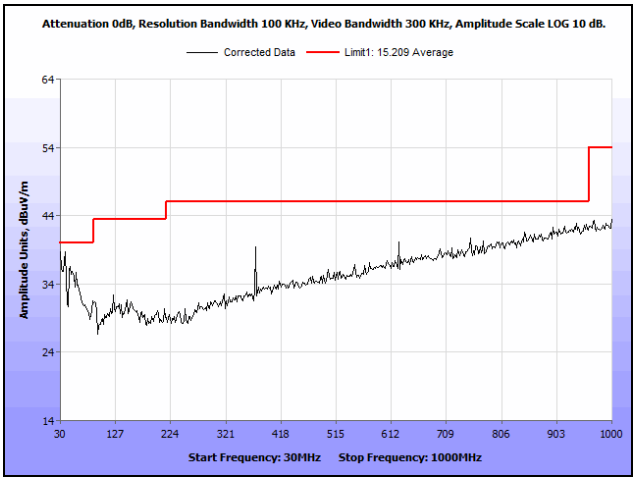
Plot 244. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, 30 MHz – 1 GHz, UNII 1



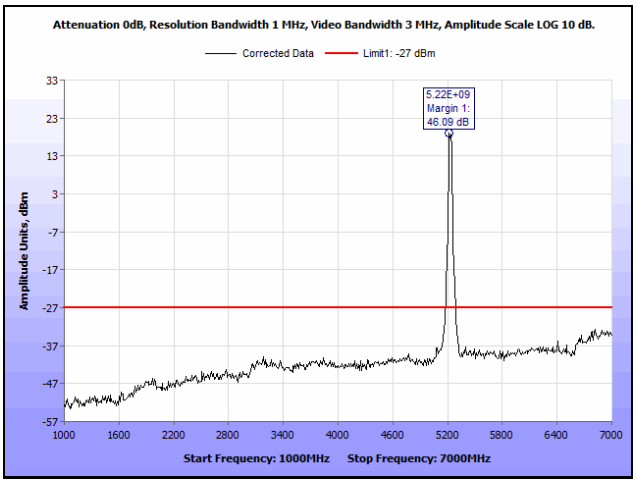
Plot 245. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, 1 GHz – 7 GHz, UNII 1



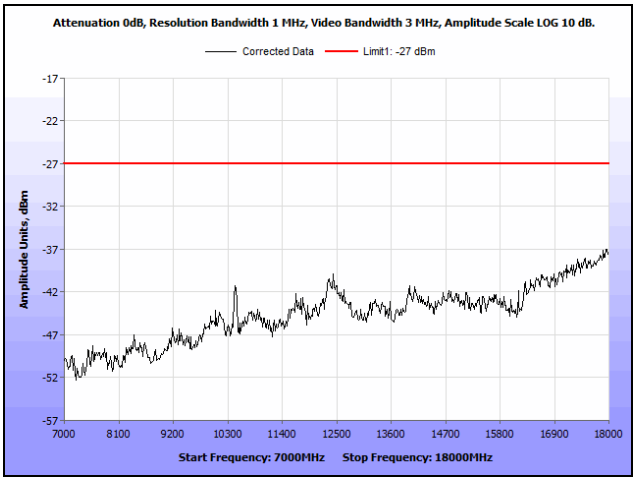
Plot 246. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, 7 GHz – 18 GHz, UNII 1



Plot 247. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, 30 MHz – 1 GHz, UNII 1

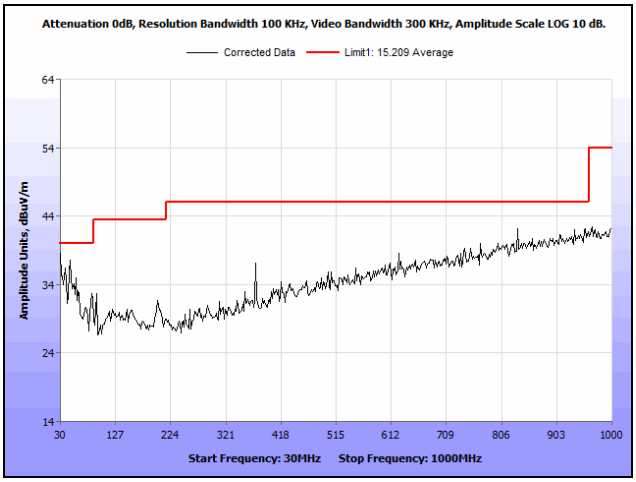


Plot 248. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, 1 GHz – 7 GHz, UNII 1

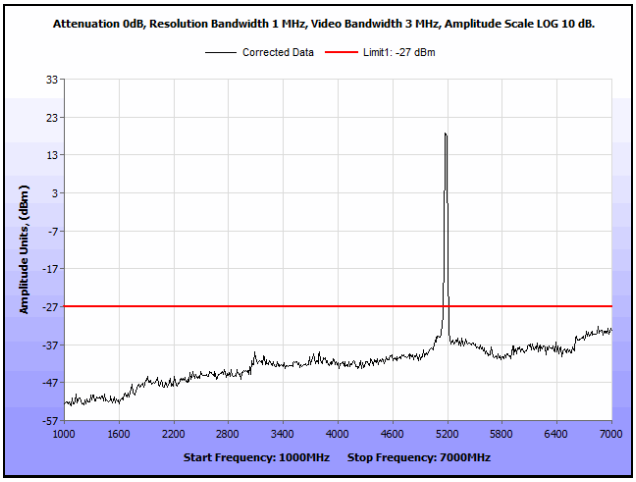


Plot 249. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, 7 GHz – 18 GHz, UNII 1

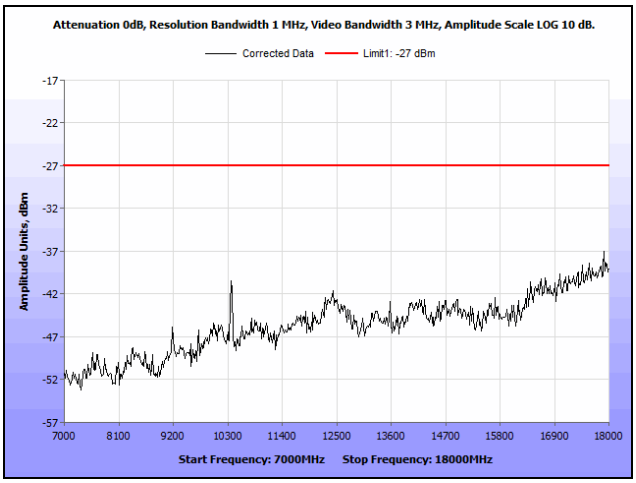
Radiated Spurious Emissions, 802.11n 40 MHz, SISO, UNII 1



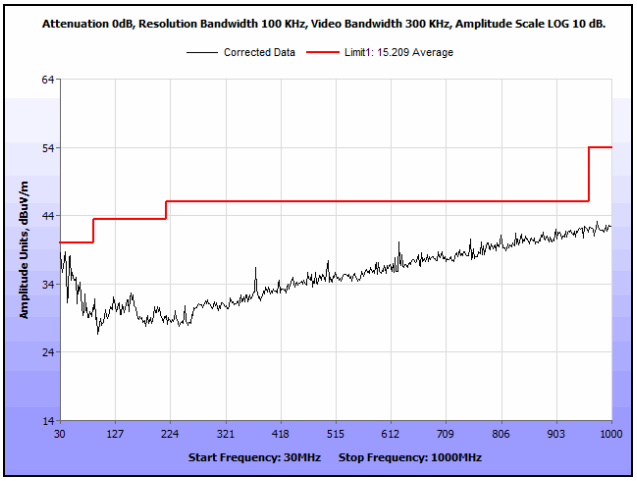
Plot 250. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, 30 MHz – 1 GHz, UNII 1



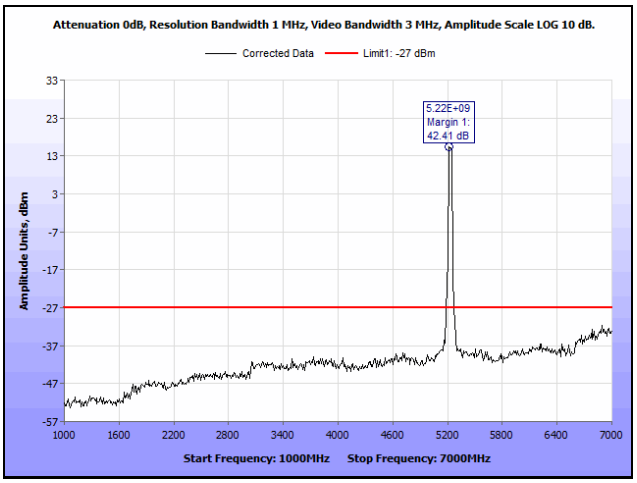
Plot 251. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, 1 GHz – 7 GHz, UNII 1



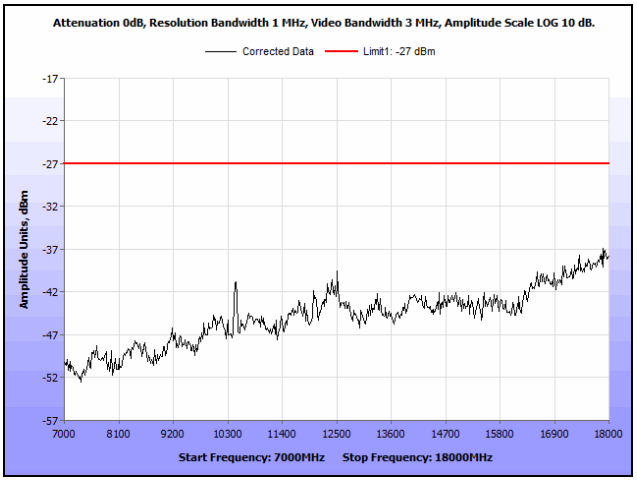
Plot 252. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, 7 GHz – 18 GHz, UNII 1



Plot 253. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, 30 MHz – 1 GHz, UNII 1

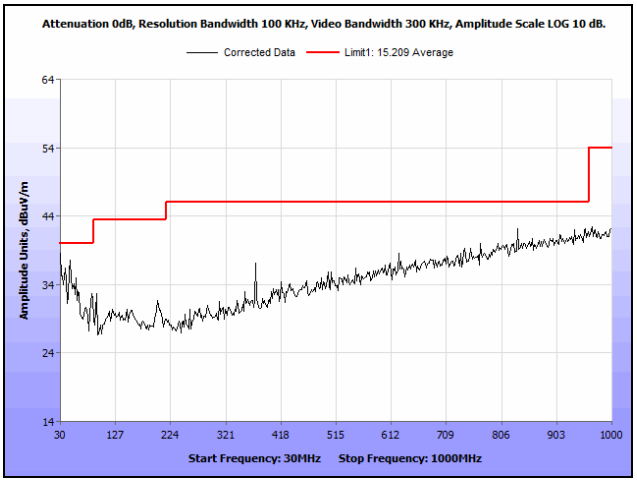


Plot 254. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, 1 GHz – 7 GHz, UNII 1

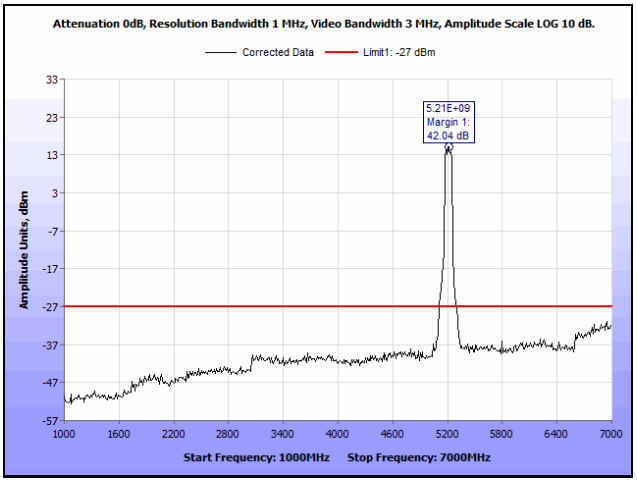


Plot 255. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, 7 GHz – 18 GHz, UNII 1

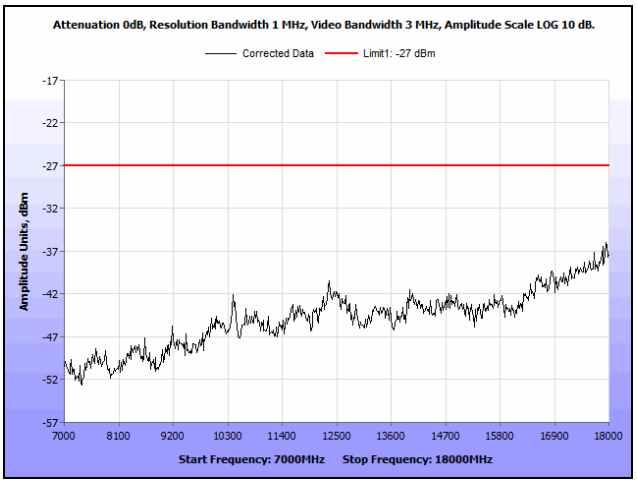
Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, UNII 1



Plot 256. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, 30 MHz – 1 GHz, UNII 1

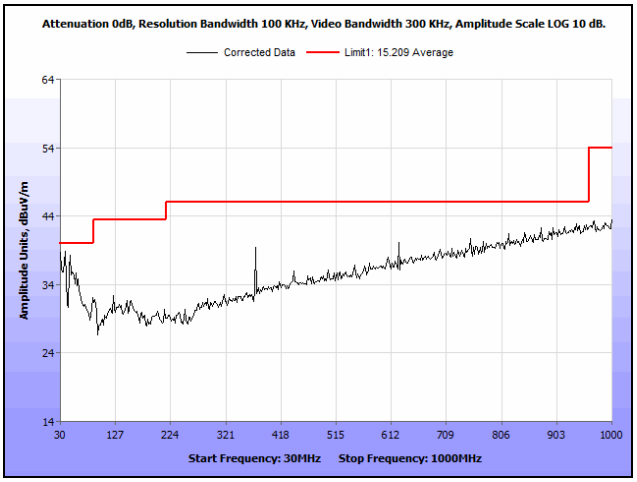


Plot 257. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, 1 GHz – 7 GHz, UNII 1

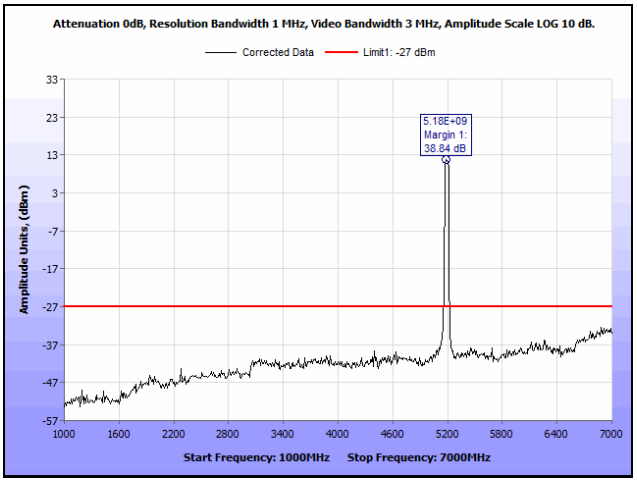


Plot 258. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, 7 GHz – 18 GHz, UNII 1

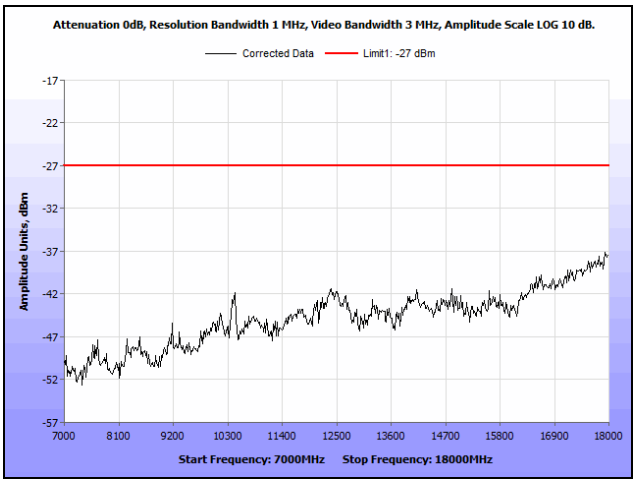
Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, UNII 1



Plot 259. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, 30 MHz – 1 GHz, UNII 1

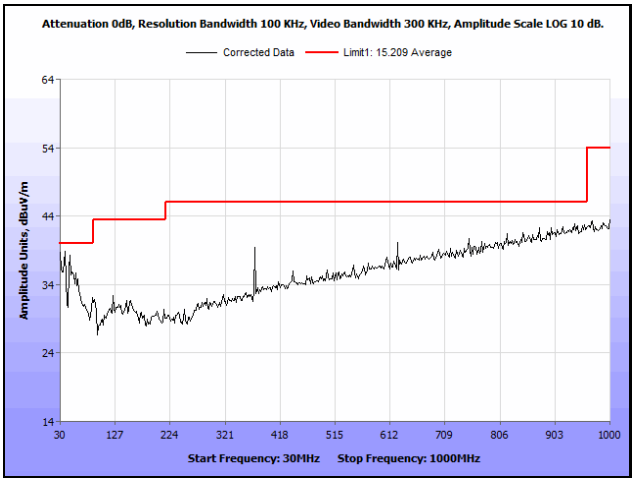


Plot 260. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, 1 GHz – 7 GHz, UNII 1

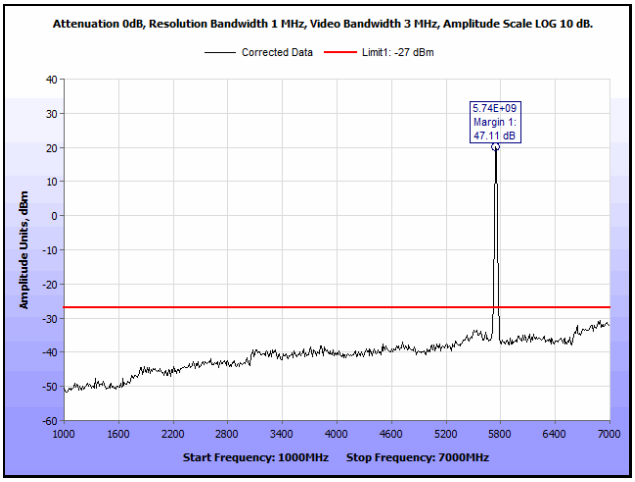


Plot 261. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, 7 GHz – 18 GHz, UNII 1

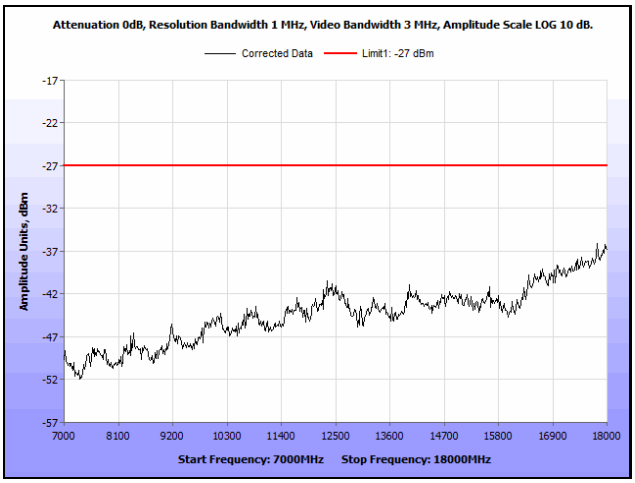
Radiated Spurious Emissions, 802.11a, MIMO, UNII 3



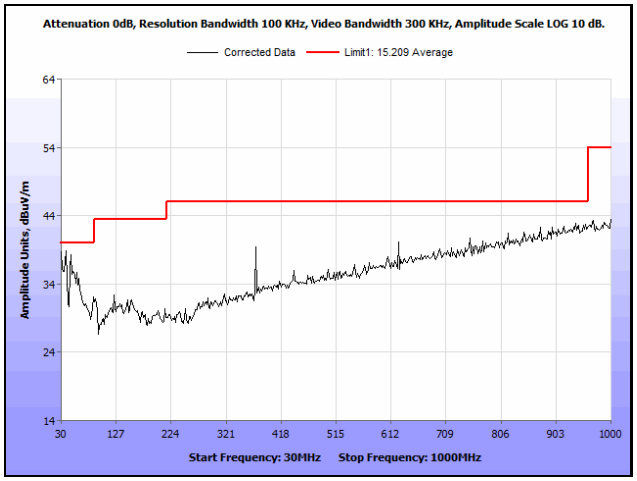
Plot 262. Radiated Spurious Emissions, Low Channel, 802.11a, MIMO, 30 MHz – 1 GHz, UNII 3



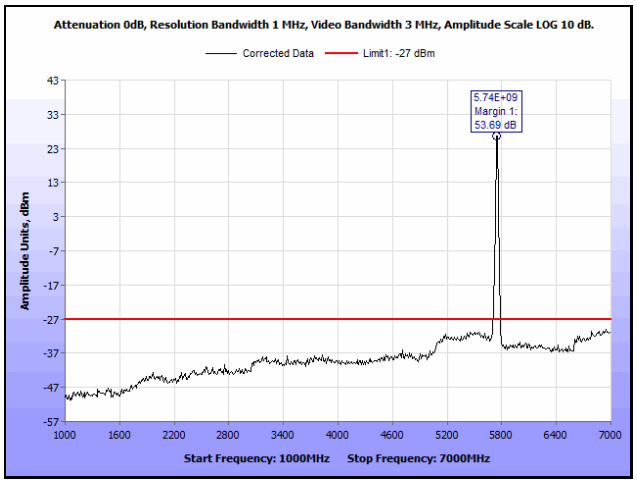
Plot 263. Radiated Spurious Emissions, Low Channel, 802.11a, MIMO, 1 GHz – 7 GHz, UNII 3



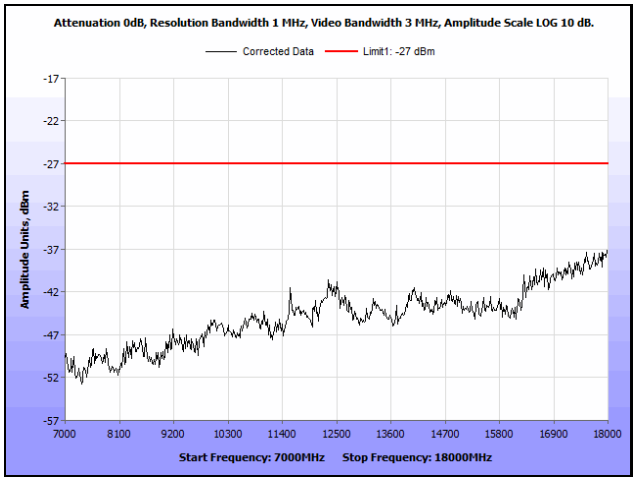
Plot 264. Radiated Spurious Emissions, Low Channel, 802.11a, MIMO, 7 GHz – 18 GHz, UNII 3



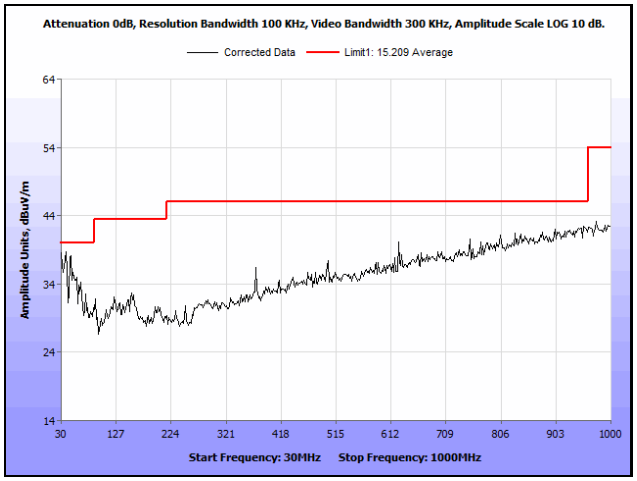
Plot 265. Radiated Spurious Emissions, Mid Channel, 802.11a, MIMO, 30 MHz – 1 GHz, UNII 3



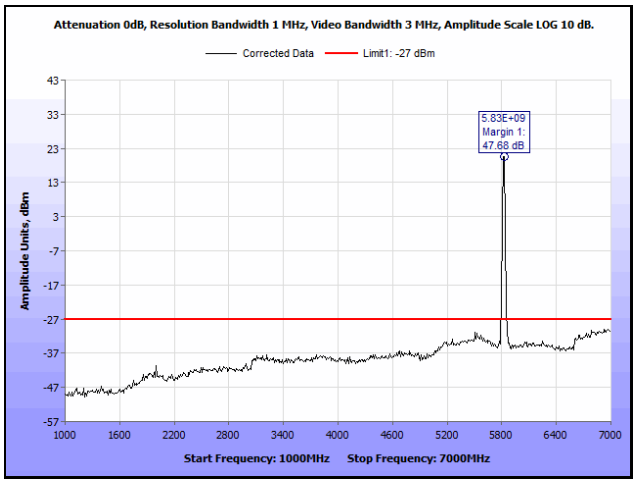
Plot 266. Radiated Spurious Emissions, Mid Channel, 802.11a, MIMO, 1 GHz – 7 GHz, UNII 3



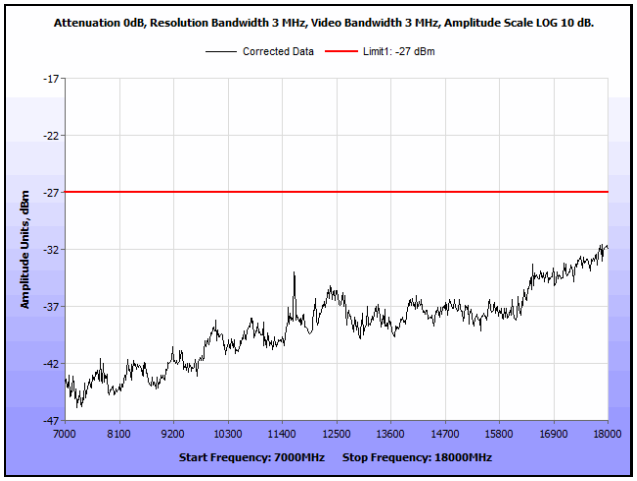
Plot 267. Radiated Spurious Emissions, Mid Channel, 802.11a, MIMO, 7 GHz – 18 GHz, UNII 3



Plot 268. Radiated Spurious Emissions, High Channel, 802.11a, MIMO, 30 MHz – 1 GHz, UNII 3

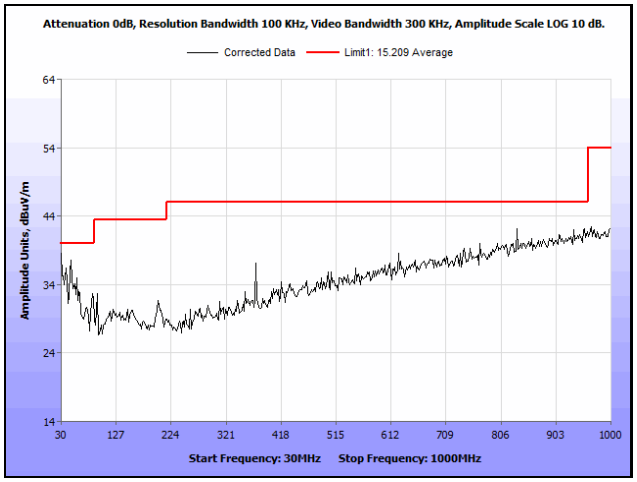


Plot 269. Radiated Spurious Emissions, High Channel, 802.11a, MIMO, 1 GHz – 7 GHz, UNII 3

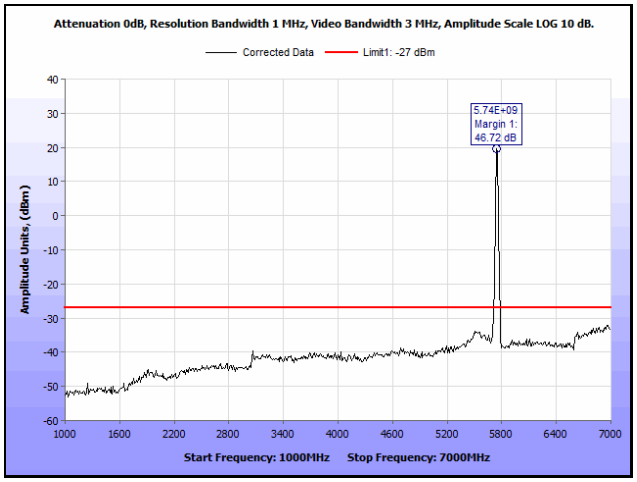


Plot 270. Radiated Spurious Emissions, High Channel, 802.11a, MIMO, 7 GHz – 18 GHz, UNII 3

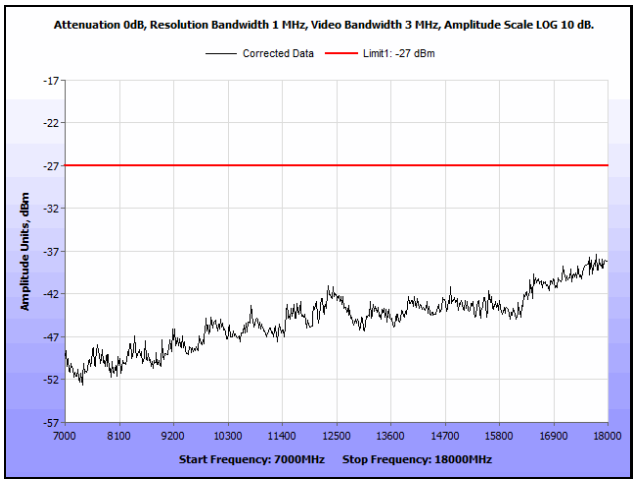
Radiated Spurious Emissions, 802.11a, SISO, UNII 3



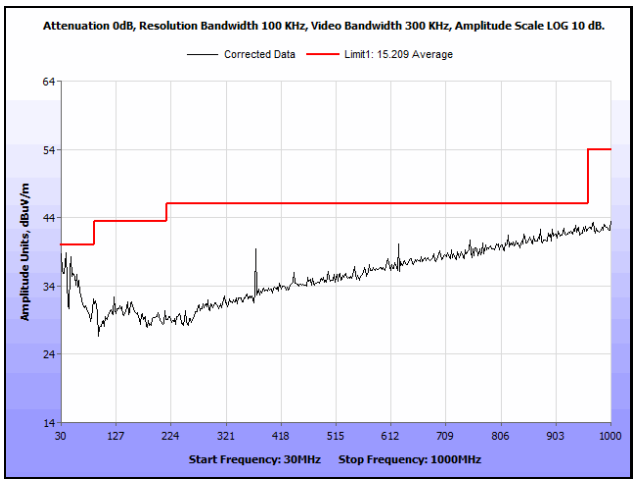
Plot 271. Radiated Spurious Emissions, Low Channel, 802.11a, SISO, 30 MHz – 1 GHz, UNII 3



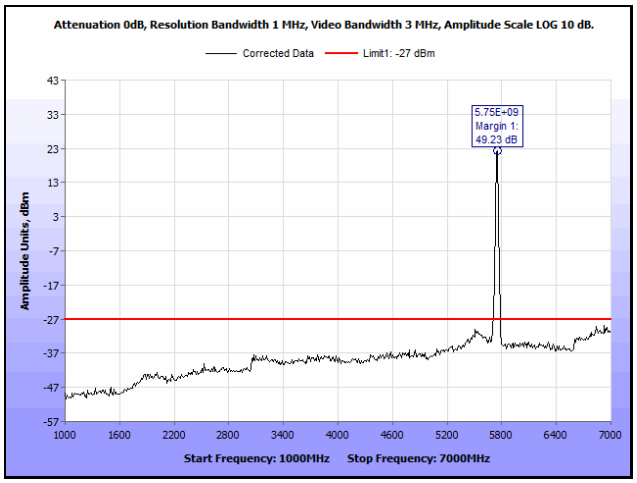
Plot 272. Radiated Spurious Emissions, Low Channel, 802.11a, SISO, 1 GHz – 7 GHz, UNII 3



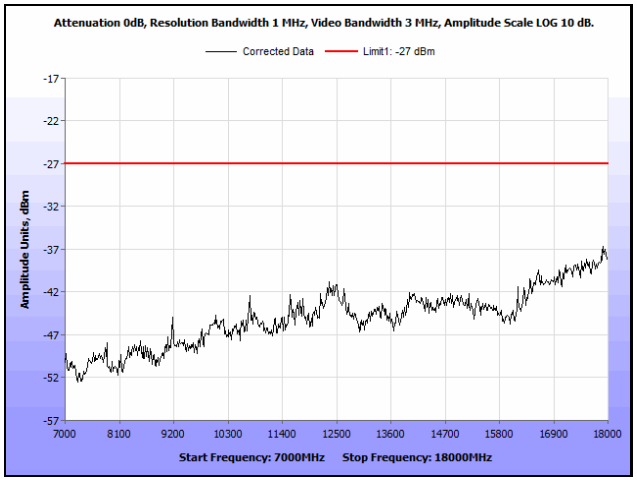
Plot 273. Radiated Spurious Emissions, Low Channel, 802.11a, SISO, 7 GHz – 18 GHz, UNII 3



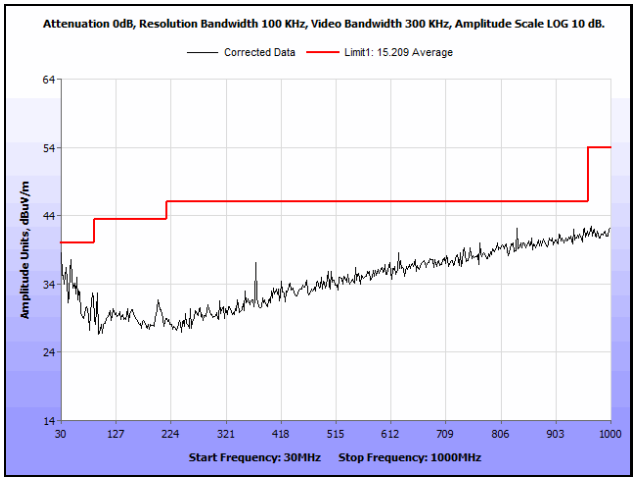
Plot 274. Radiated Spurious Emissions, Mid Channel, 802.11a, SISO, 30 MHz – 1 GHz, UNII 3



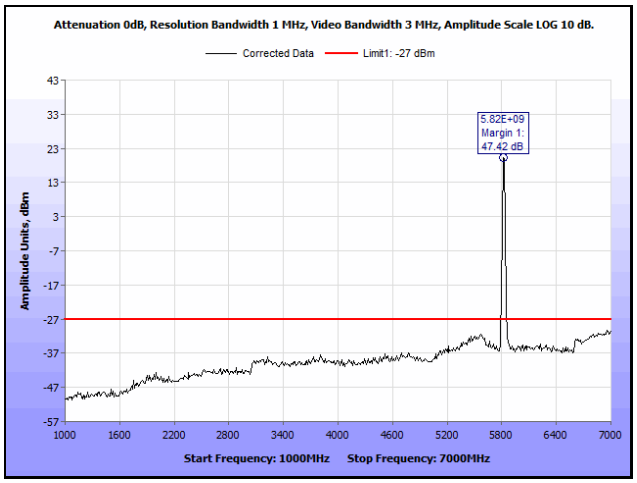
Plot 275. Radiated Spurious Emissions, Mid Channel, 802.11a, SISO, 1 GHz – 7 GHz, UNII 3



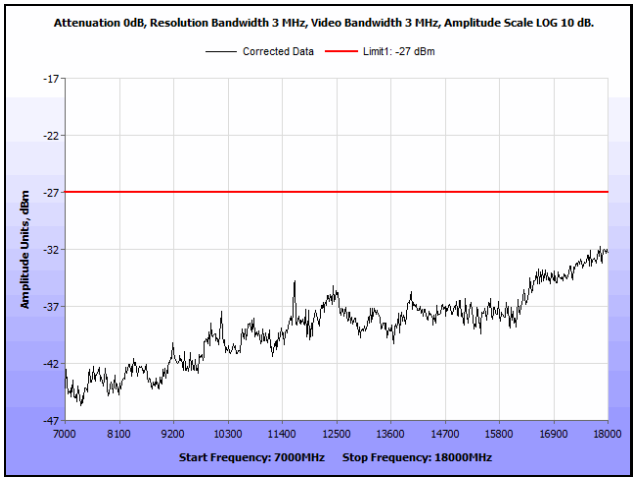
Plot 276. Radiated Spurious Emissions, Mid Channel, 802.11a, SISO, 7 GHz – 18 GHz, UNII 3



Plot 277. Radiated Spurious Emissions, High Channel, 802.11a, SISO, 30 MHz – 1 GHz, UNII 3

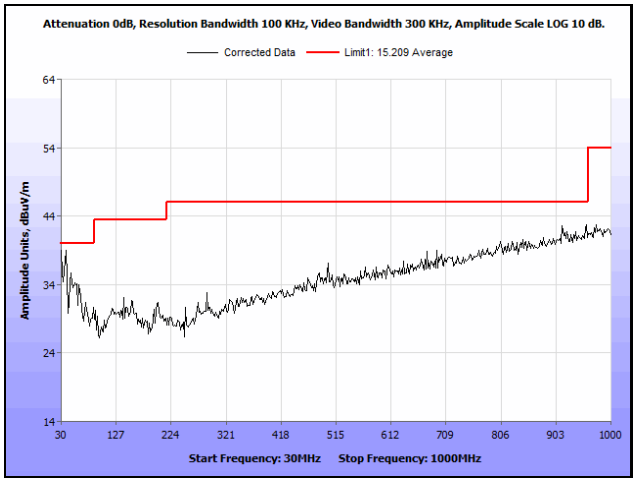


Plot 278. Radiated Spurious Emissions, High Channel, 802.11a, SISO, 1 GHz – 7 GHz, UNII 3

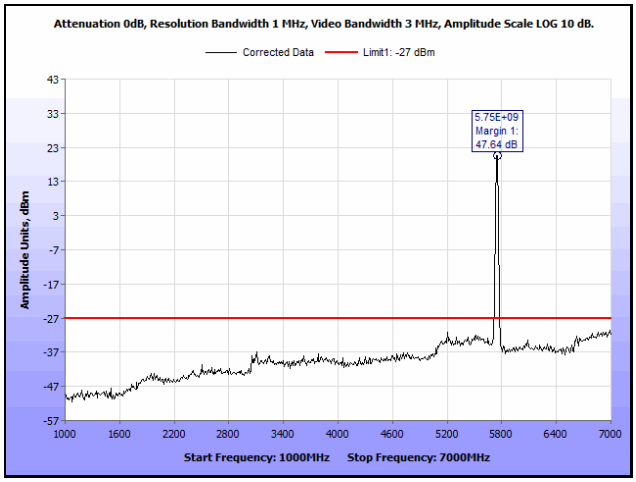


Plot 279. Radiated Spurious Emissions, High Channel, 802.11a, SISO, 7 GHz – 18 GHz, UNII 3

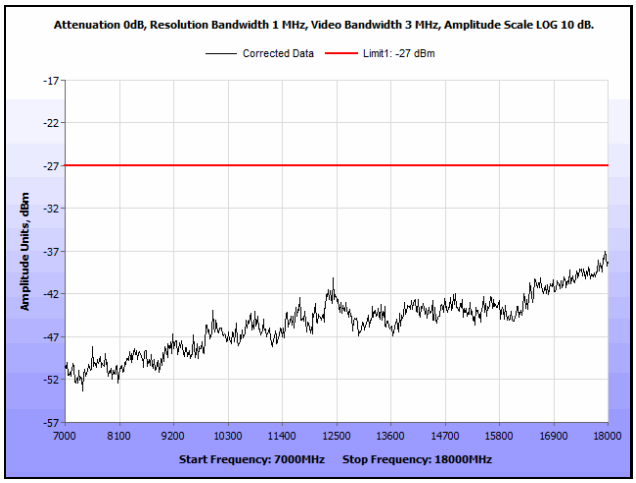
Radiated Spurious Emissions, 802.11ac 20 MHz, MIMO, UNII 3



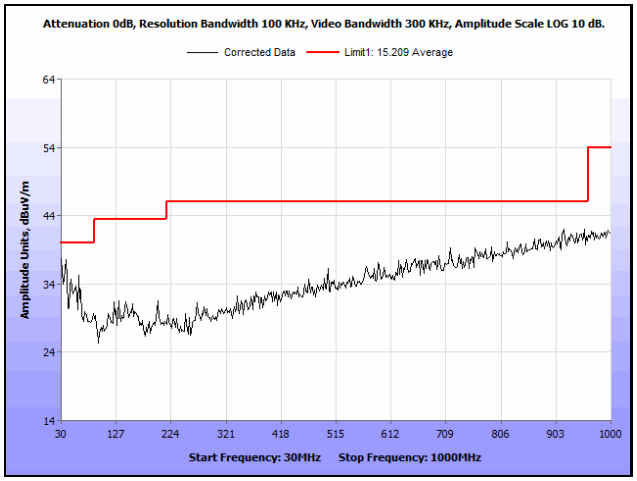
Plot 280. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 3



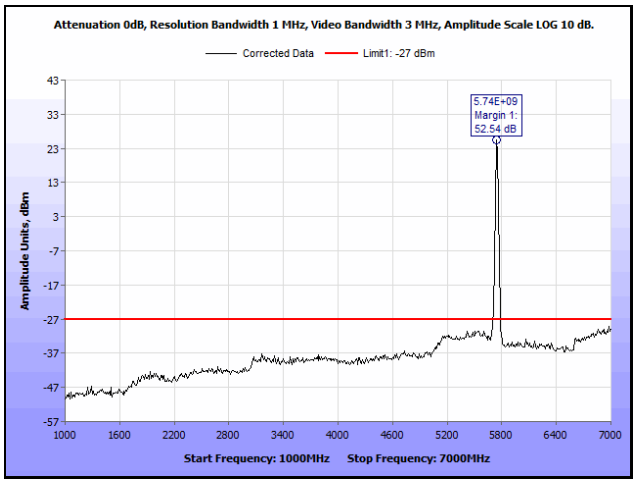
Plot 281. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 3



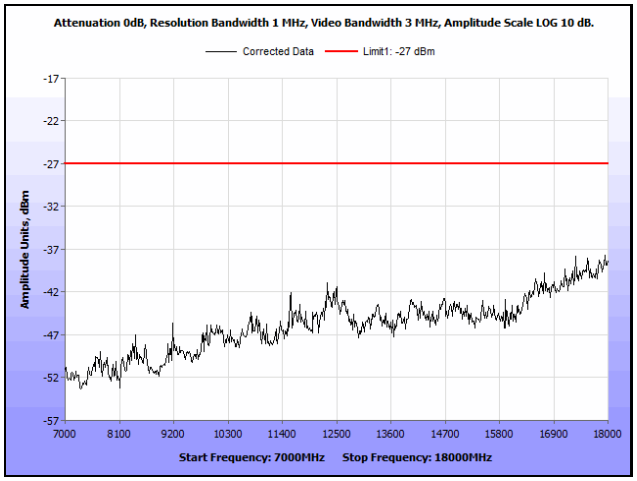
Plot 282. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 3



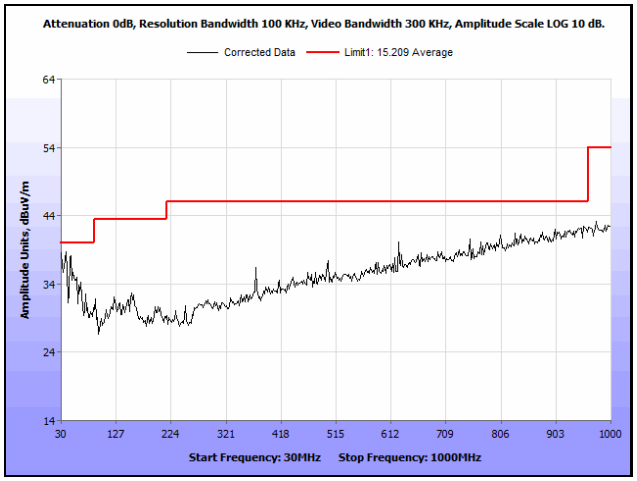
Plot 283. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 3



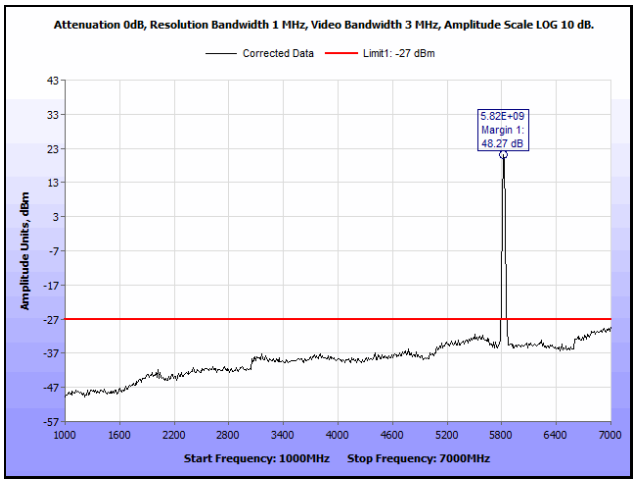
Plot 284. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 3



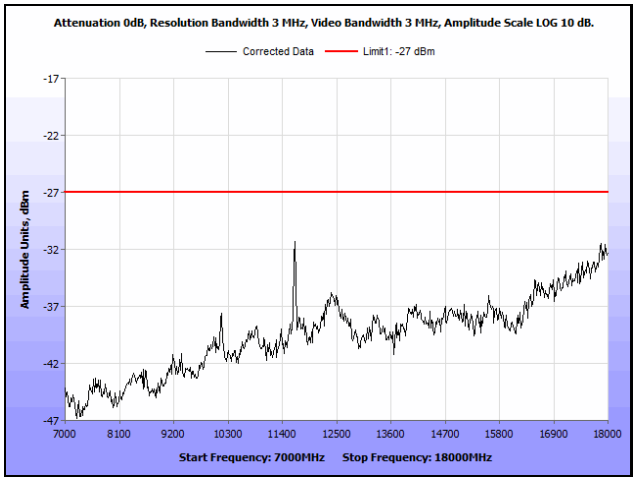
Plot 285. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 3



Plot 286. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 3

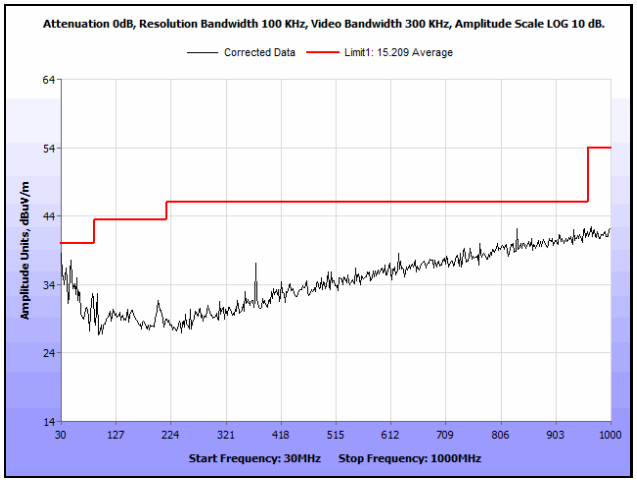


Plot 287. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 3

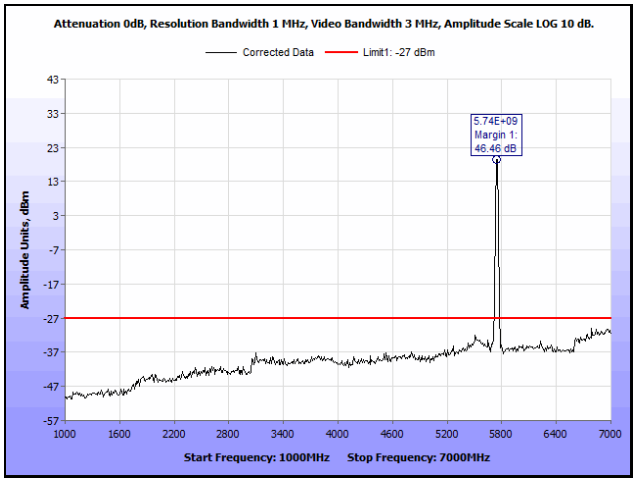


Plot 288. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 3

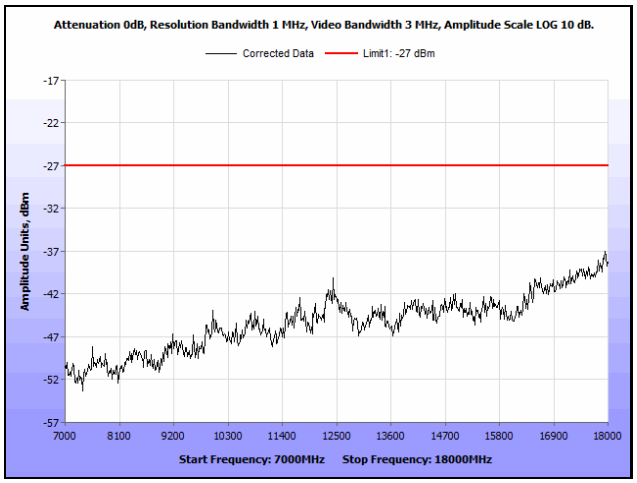
Radiated Spurious Emissions, 802.11ac 20 MHz, SISO, UNII 3



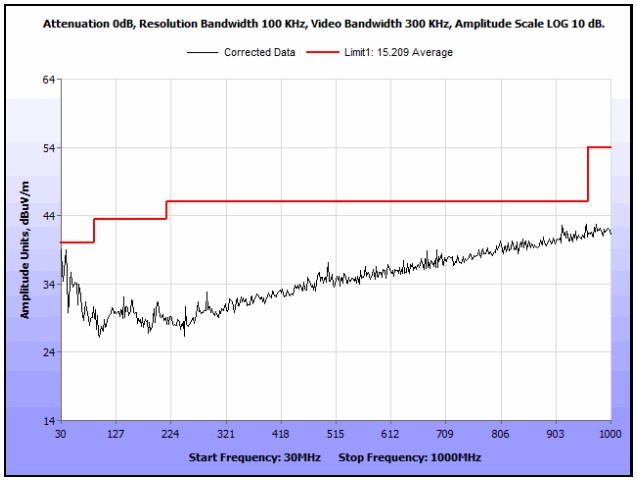
Plot 289. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, 30 MHz – 1 GHz, UNII 3



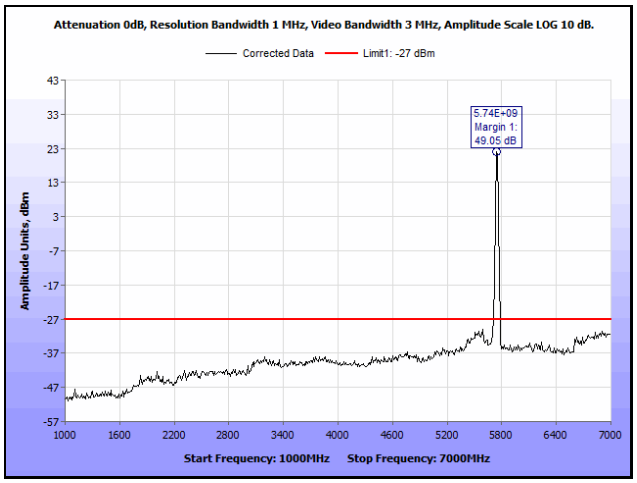
Plot 290. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, 1 GHz – 7 GHz, UNII 3



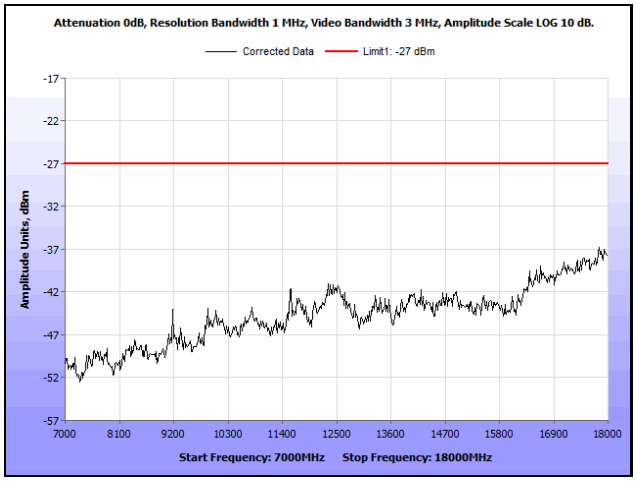
Plot 291. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, 7 GHz – 18 GHz, UNII 3



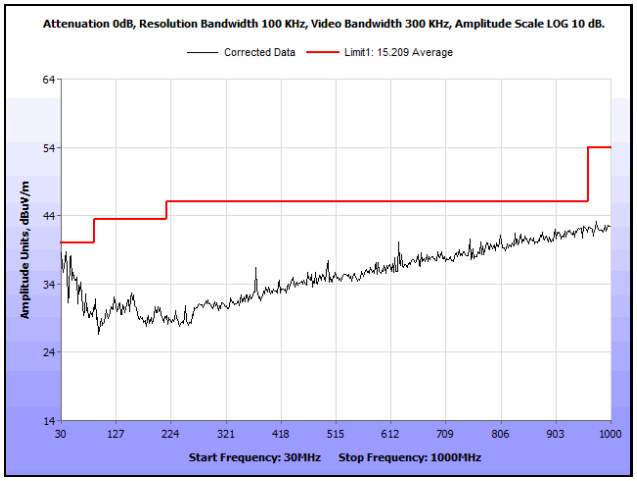
Plot 292. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, 30 MHz – 1 GHz, UNII 3



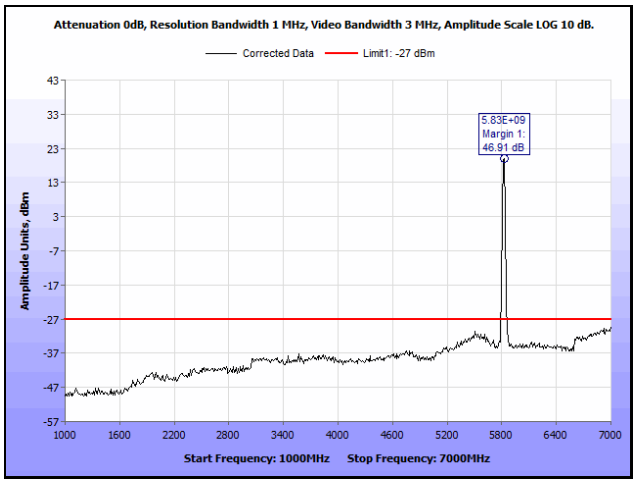
Plot 293. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, 1 GHz – 7 GHz, UNII 3



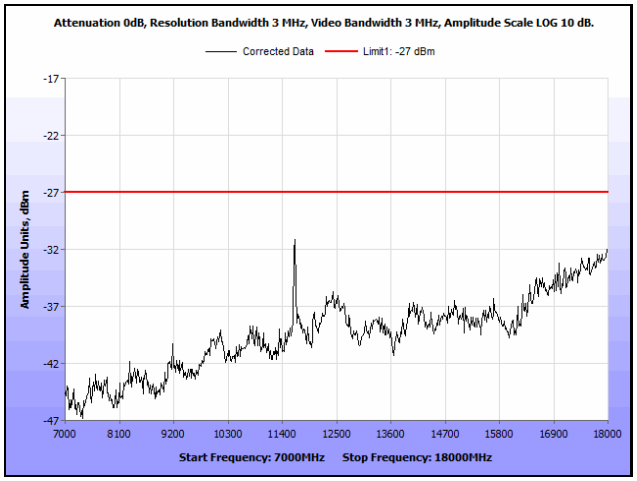
Plot 294. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, 7 GHz – 18 GHz, UNII 3



Plot 295. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, 30 MHz – 1 GHz, UNII 3

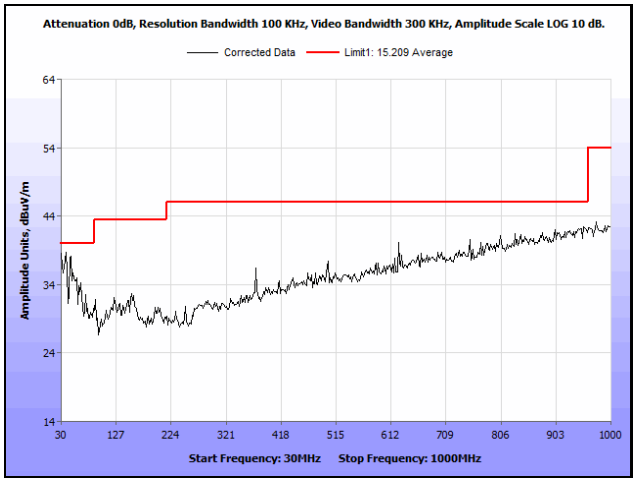


Plot 296. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, 1 GHz – 7 GHz, UNII 3

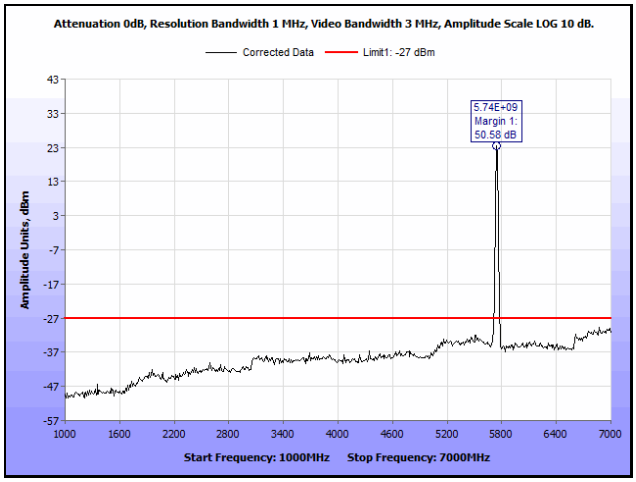


Plot 297. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, 7 GHz – 18 GHz, UNII 3

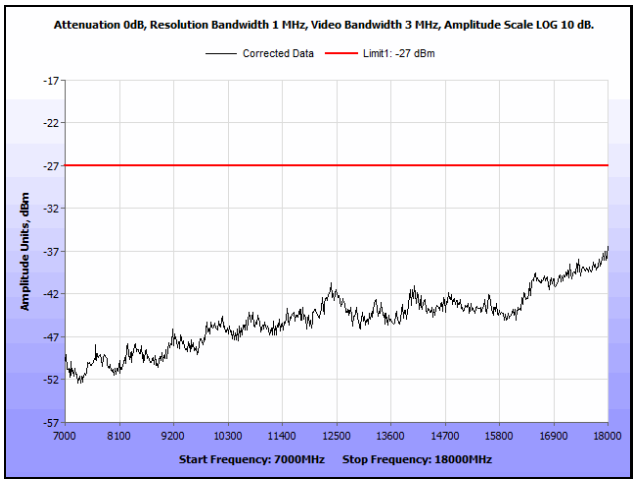
Radiated Spurious Emissions, 802.11n 20 MHz, MIMO, UNII 3



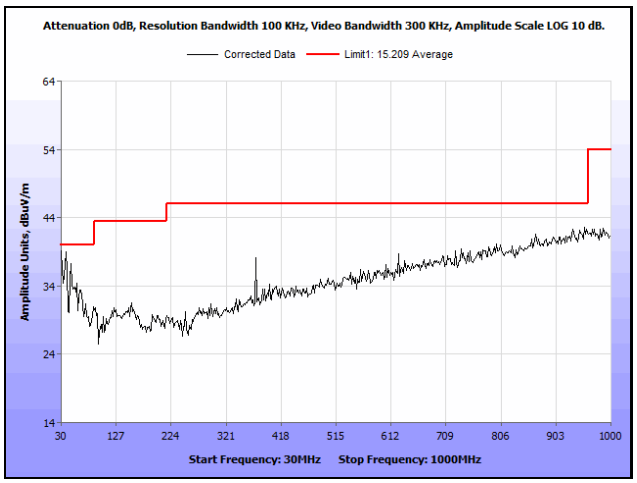
Plot 298. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 3



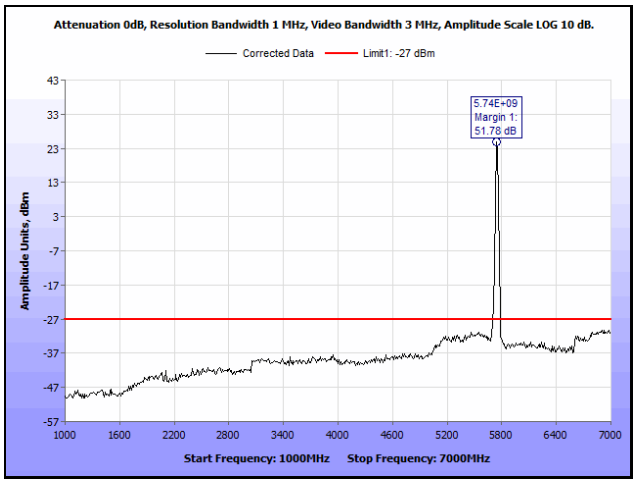
Plot 299. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 3



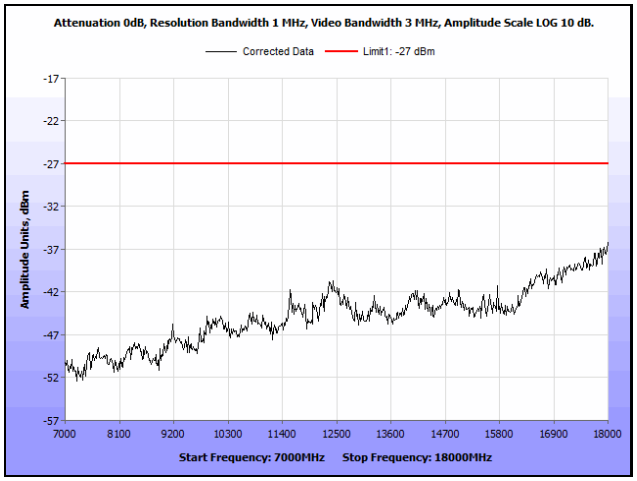
Plot 300. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 3



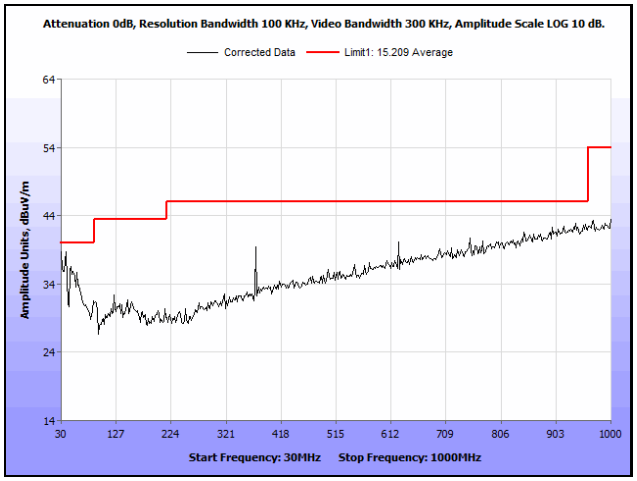
Plot 301. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 3



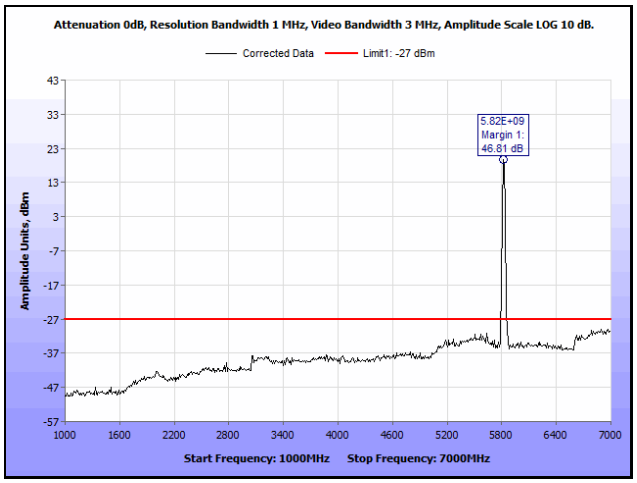
Plot 302. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 3



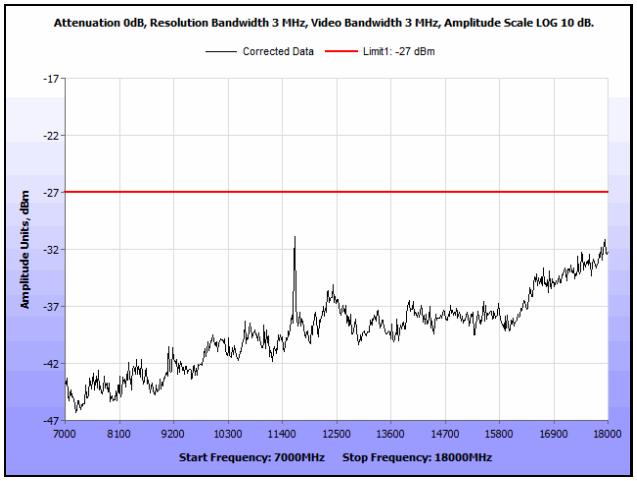
Plot 303. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 3



Plot 304. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, 30 MHz – 1 GHz, UNII 3

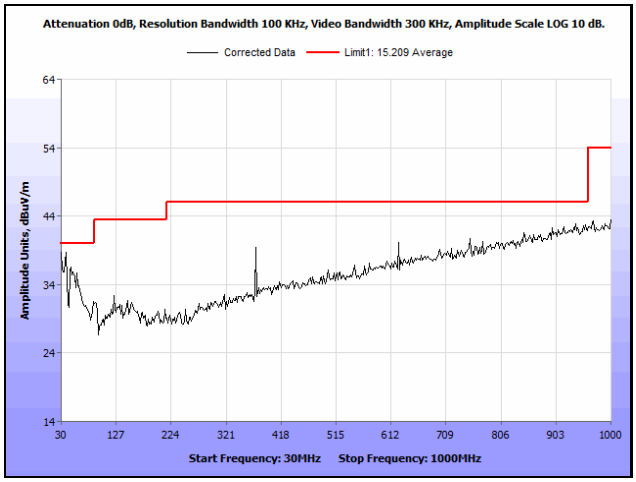


Plot 305. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, 1 GHz – 7 GHz, UNII 3

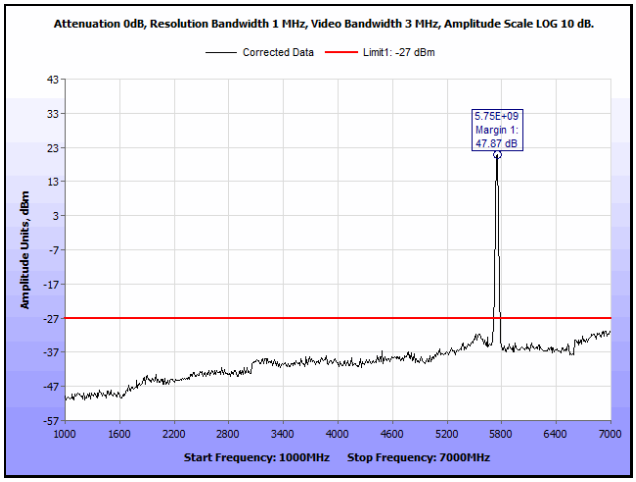


Plot 306. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, 7 GHz – 18 GHz, UNII 3

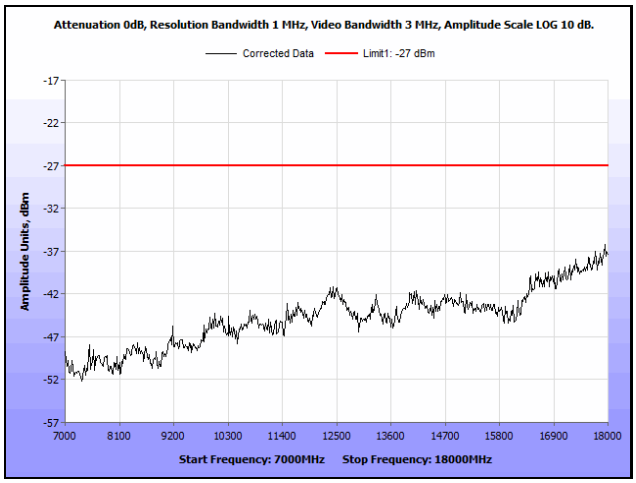
Radiated Spurious Emissions, 802.11n 20 MHz, SISO, UNII 3



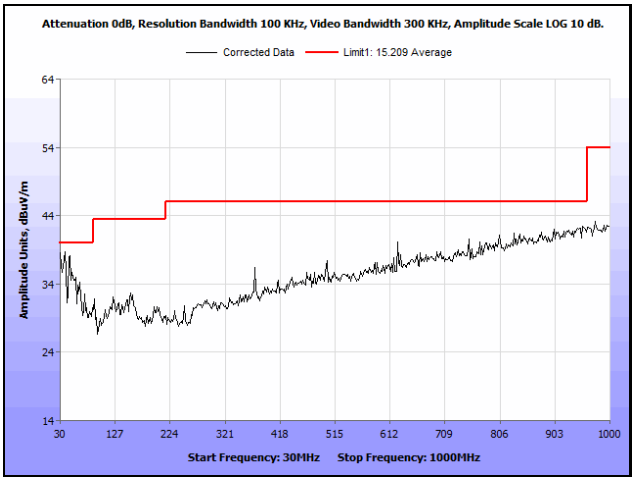
Plot 307. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, 30 MHz – 1 GHz, UNII 3



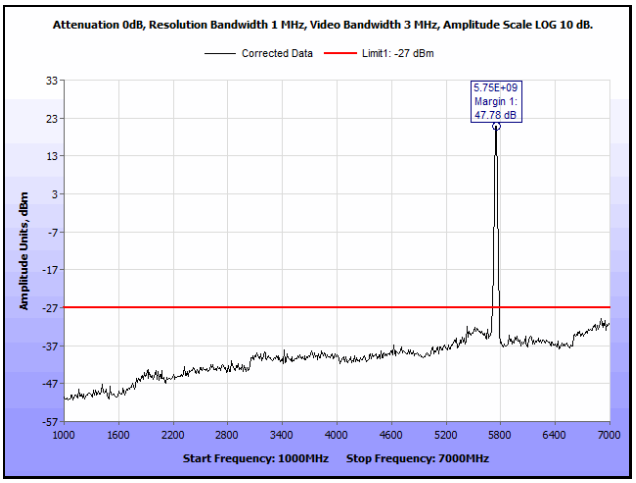
Plot 308. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, 1 GHz – 7 GHz, UNII 3



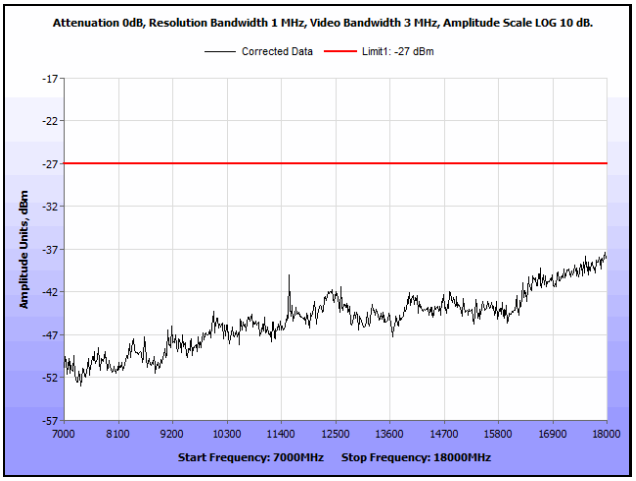
Plot 309. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, 7 GHz – 18 GHz, UNII 3



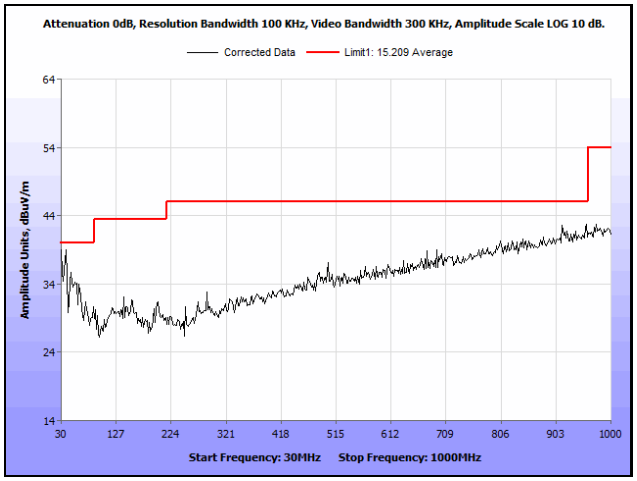
Plot 310. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, 30 MHz – 1 GHz, UNII 3



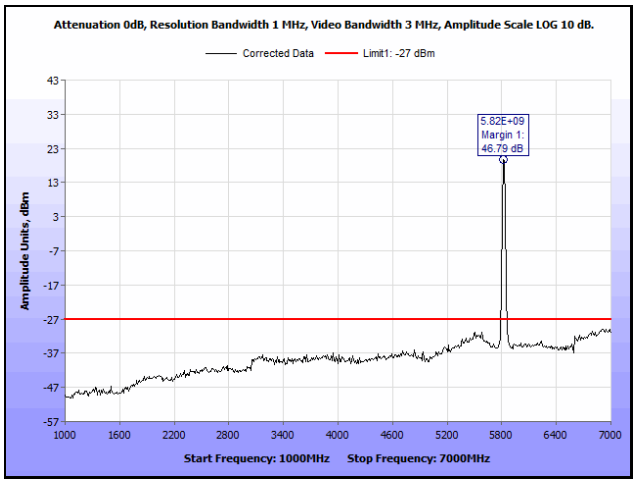
Plot 311. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, 1 GHz – 7 GHz, UNII 3



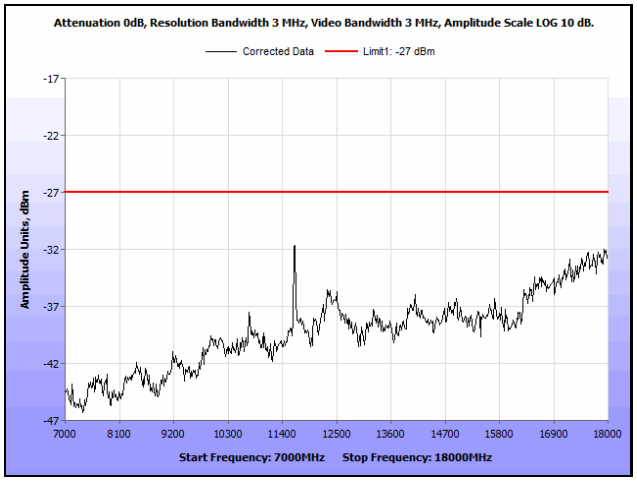
Plot 312. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, 7 GHz – 18 GHz, UNII 3



Plot 313. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, 30 MHz – 1 GHz, UNII 3

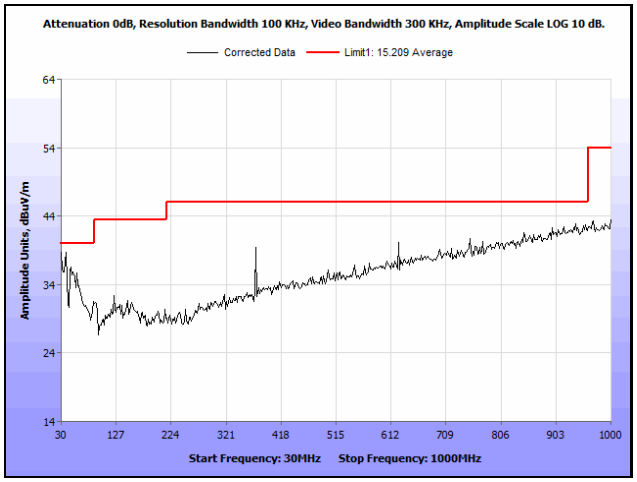


Plot 314. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, 1 GHz – 7 GHz, UNII 3

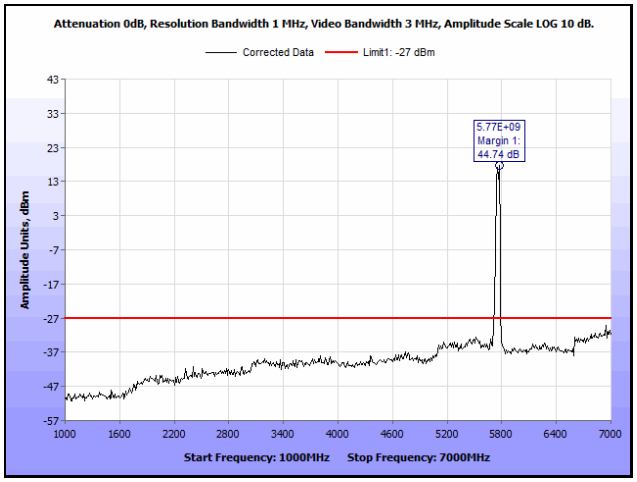


Plot 315. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, 7 GHz – 18 GHz, UNII 3

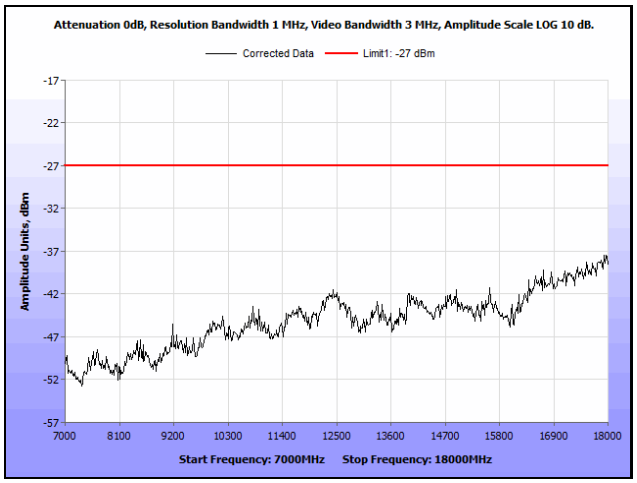
Radiated Spurious Emissions, 802.11ac 40 MHz, MIMO, UNII 3



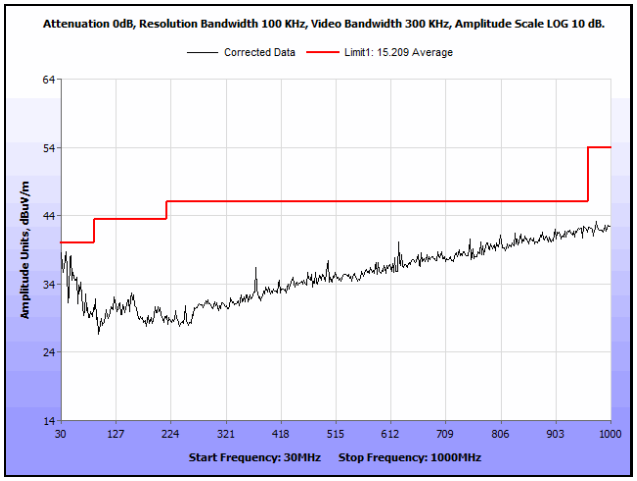
Plot 316. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, 30 MHz – 1 GHz, UNII 3



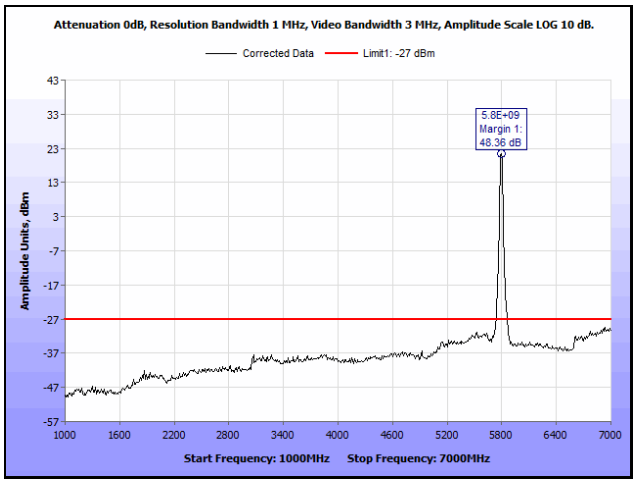
Plot 317. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, 1 GHz – 7 GHz, UNII 3



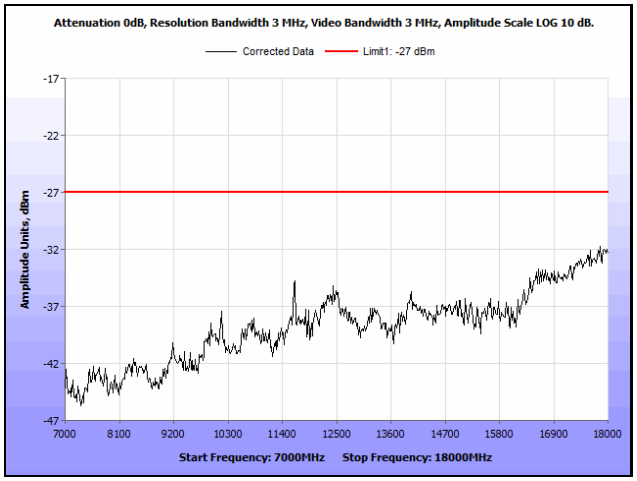
Plot 318. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, 7 GHz – 18 GHz, UNII 3



Plot 319. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, 30 MHz – 1 GHz, UNII 3

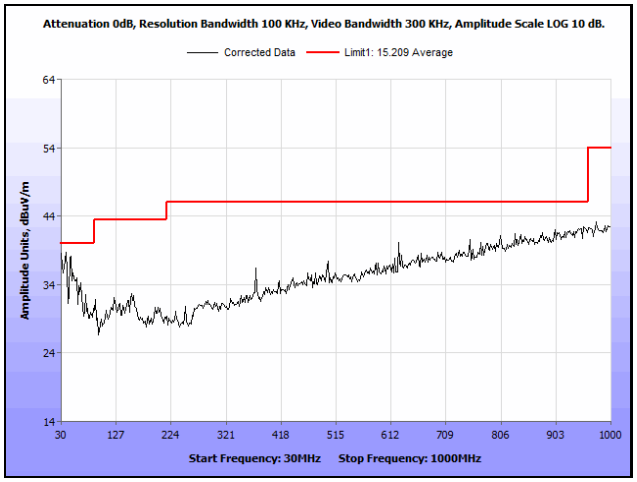


Plot 320. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, 1 GHz – 7 GHz, UNII 3

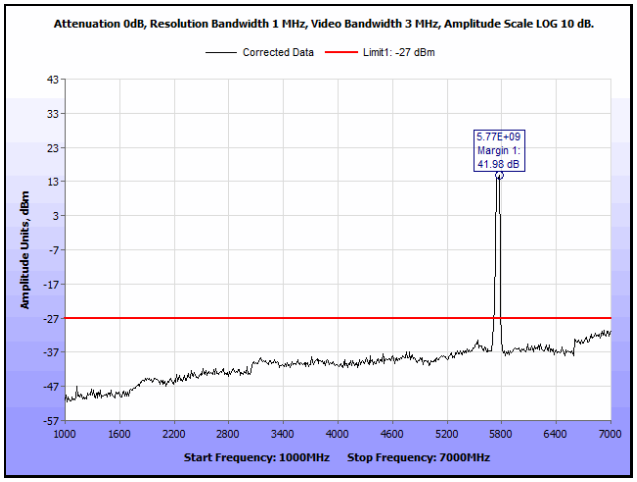


Plot 321. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, 7 GHz – 18 GHz, UNII 3

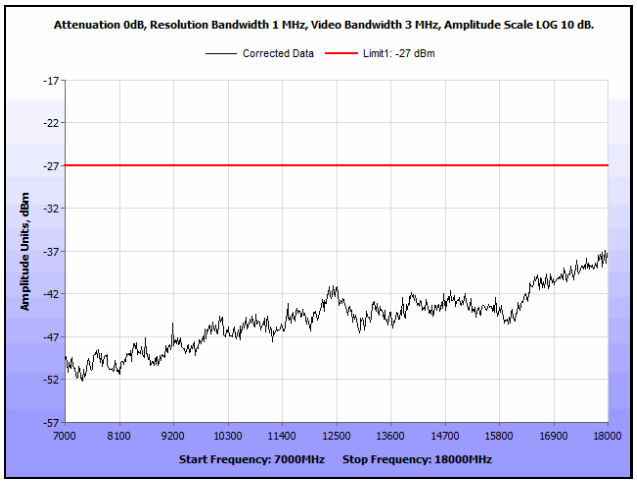
Radiated Spurious Emissions, 802.11ac 40 MHz, SISO, UNII 3



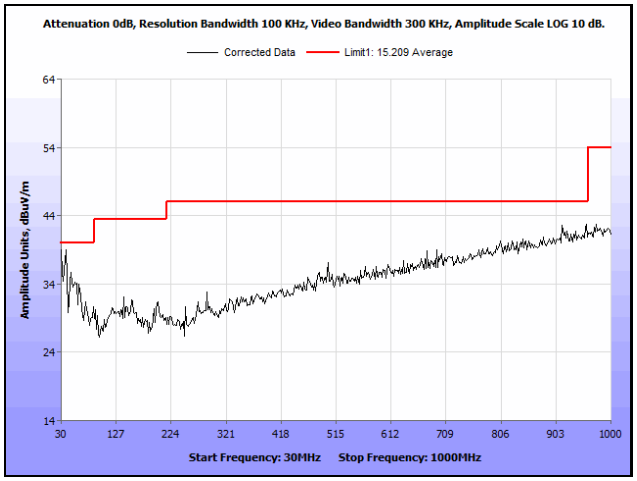
Plot 322. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, 30 MHz – 1 GHz, UNII 3



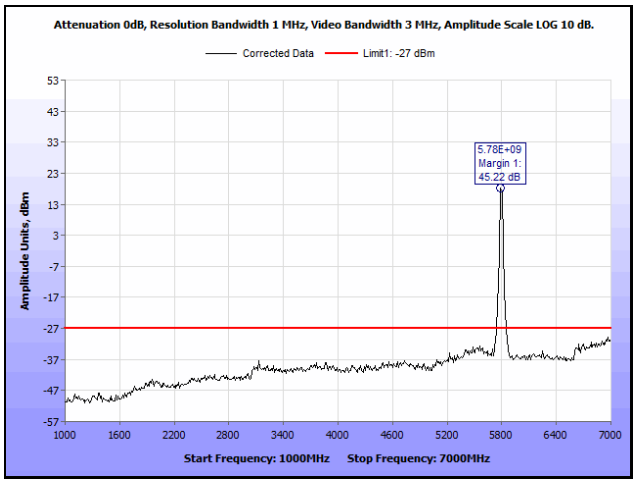
Plot 323. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, 1 GHz – 7 GHz, UNII 3



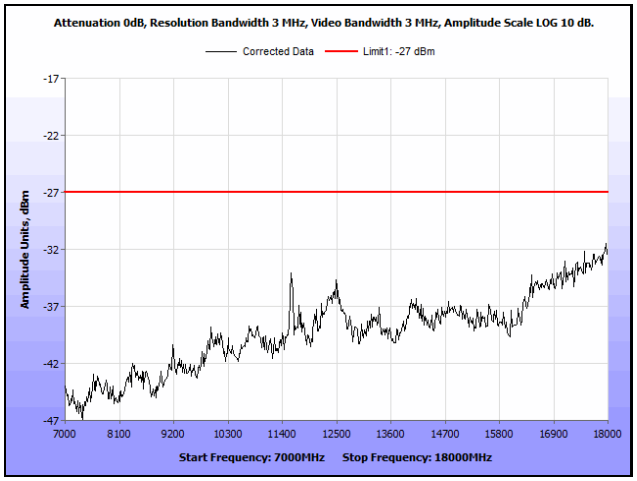
Plot 324. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, 7 GHz – 18 GHz, UNII 3



Plot 325. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, 30 MHz – 1 GHz, UNII 3

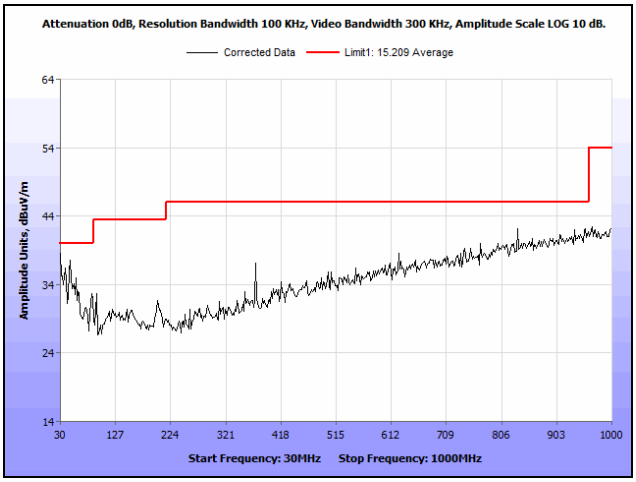


Plot 326. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, 1 GHz – 7 GHz, UNII 3

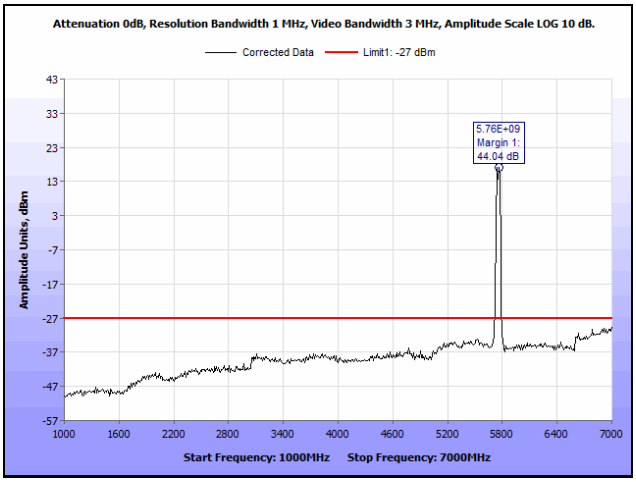


Plot 327. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, 7 GHz – 18 GHz, UNII 3

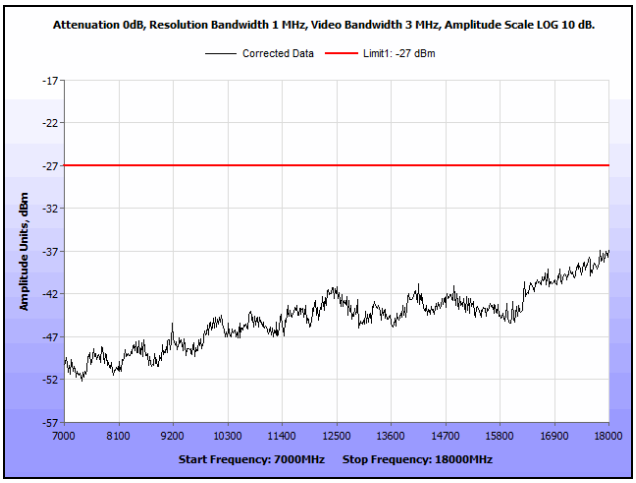
Radiated Spurious Emissions, 802.11n 40 MHz, MIMO, UNII 3



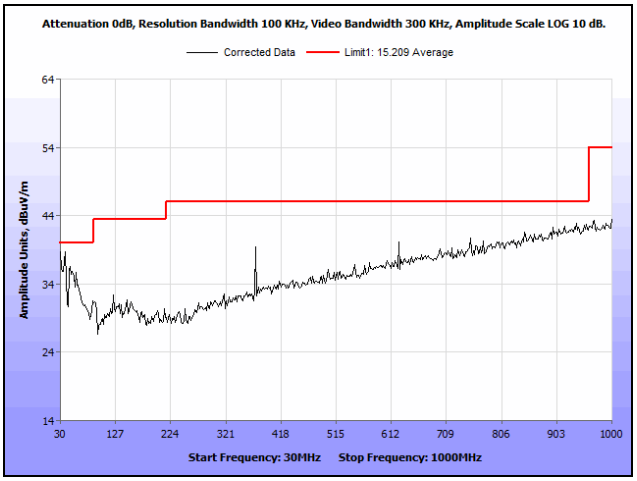
Plot 328. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, 30 MHz – 1 GHz, UNII 3



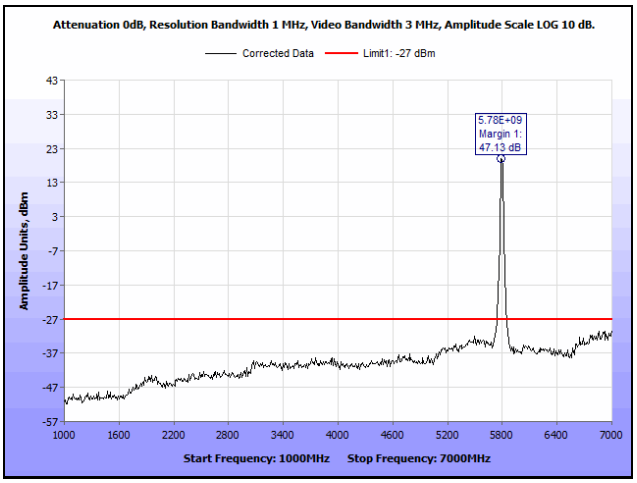
Plot 329. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, 1 GHz – 7 GHz, UNII 3



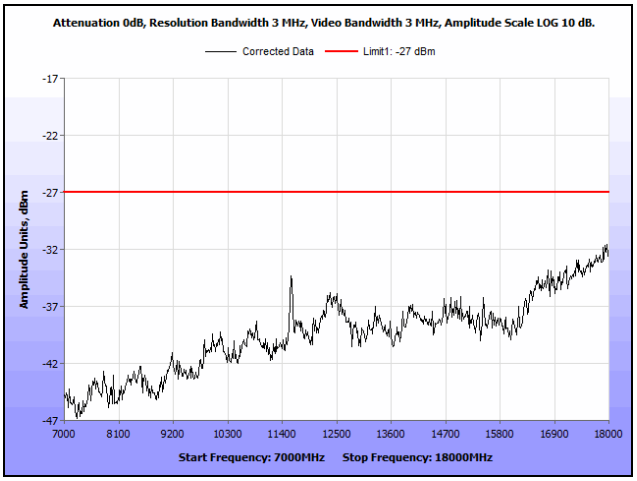
Plot 330. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, 7 GHz – 18 GHz, UNII 3



Plot 331. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, 30 MHz – 1 GHz, UNII 3

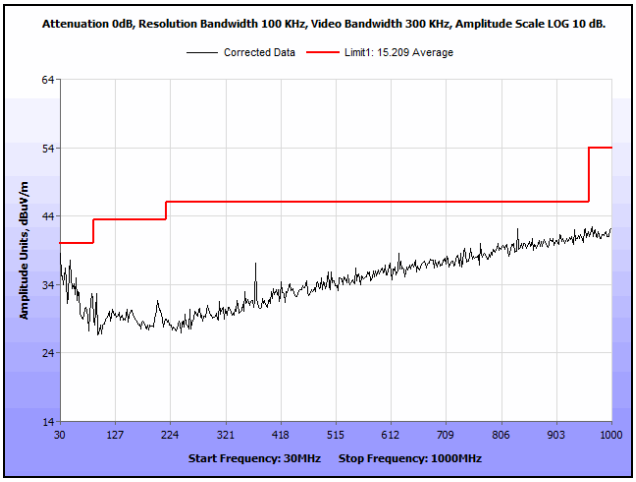


Plot 332. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, 1 GHz – 7 GHz, UNII 3

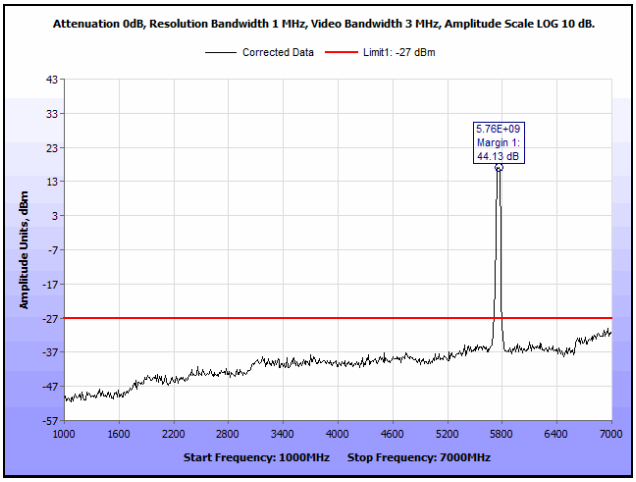


Plot 333. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, 7 GHz – 18 GHz, UNII 3

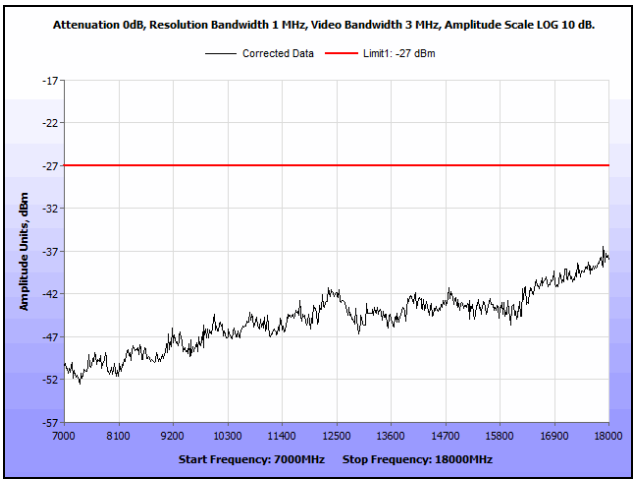
Radiated Spurious Emissions, 802.11n 40 MHz, SISO, UNII 3



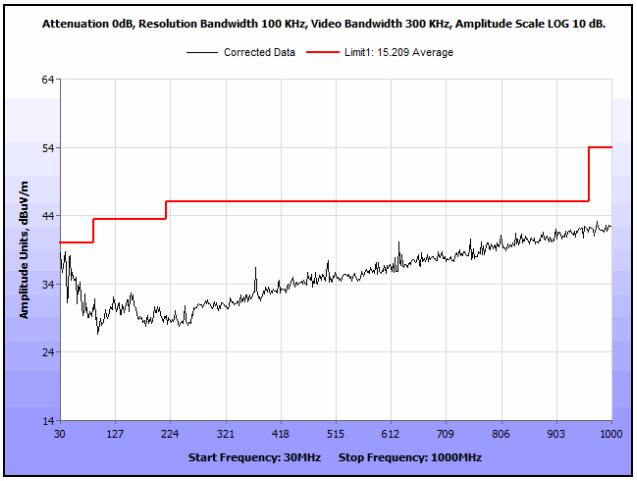
Plot 334. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, 30 MHz – 1 GHz, UNII 3



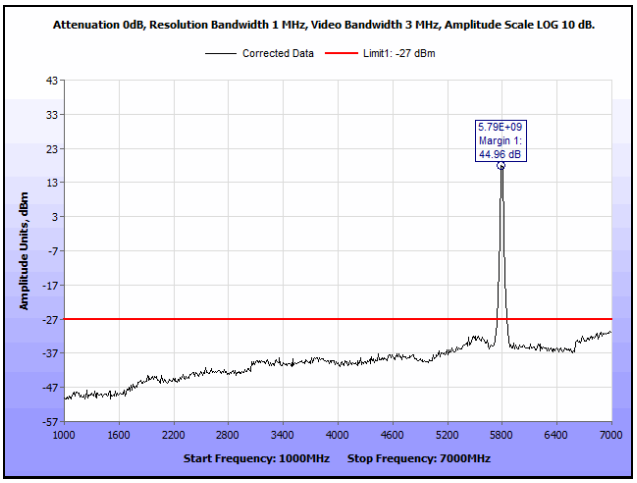
Plot 335. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, 1 GHz – 7 GHz, UNII 3



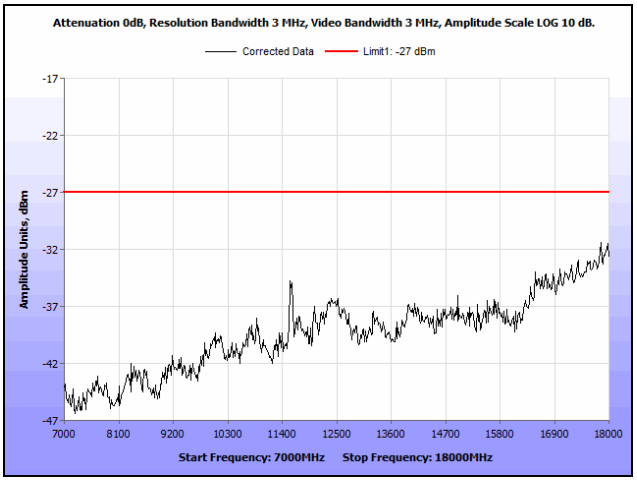
Plot 336. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, 7 GHz – 18 GHz, UNII 3



Plot 337. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, 30 MHz – 1 GHz, UNII 3

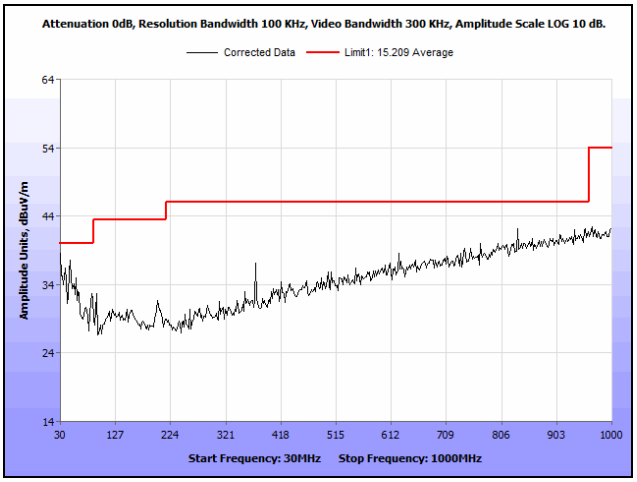


Plot 338. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, 1 GHz – 7 GHz, UNII 3

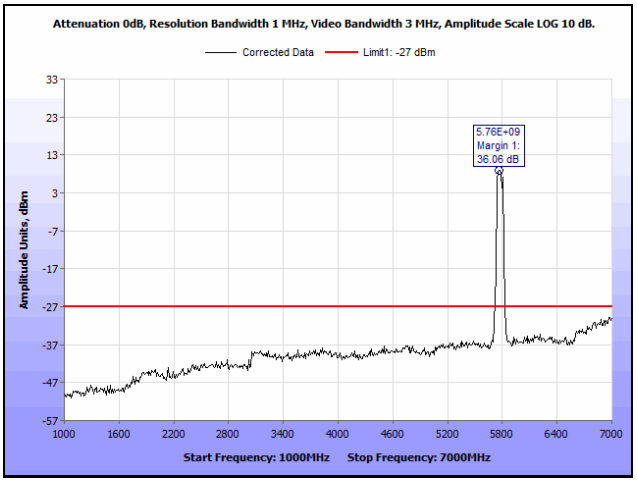


Plot 339. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, 7 GHz – 18 GHz, UNII 3

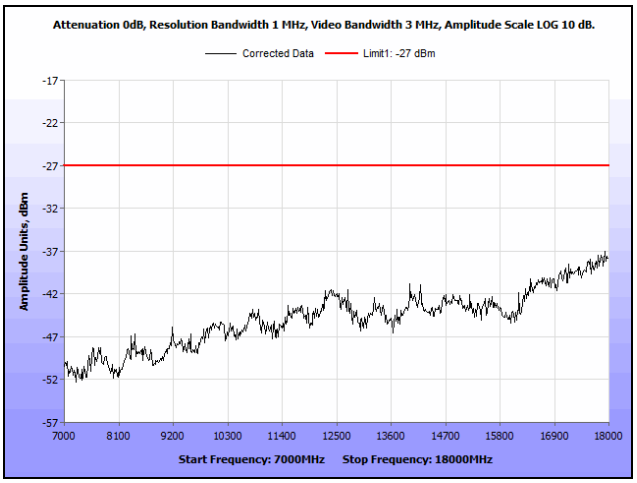
Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, UNII 3



Plot 340. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, 30 MHz – 1 GHz, UNII 3

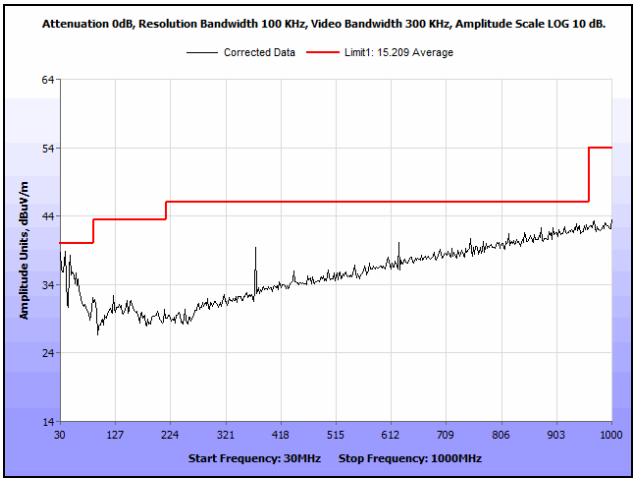


Plot 341. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, 1 GHz – 7 GHz, UNII 3

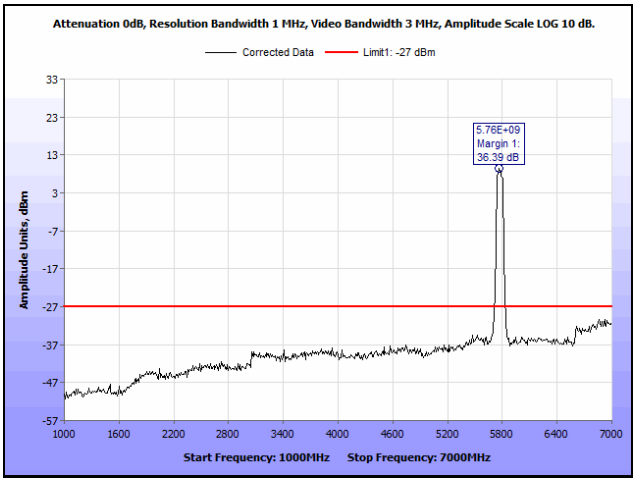


Plot 342. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, 7 GHz – 18 GHz, UNII 3

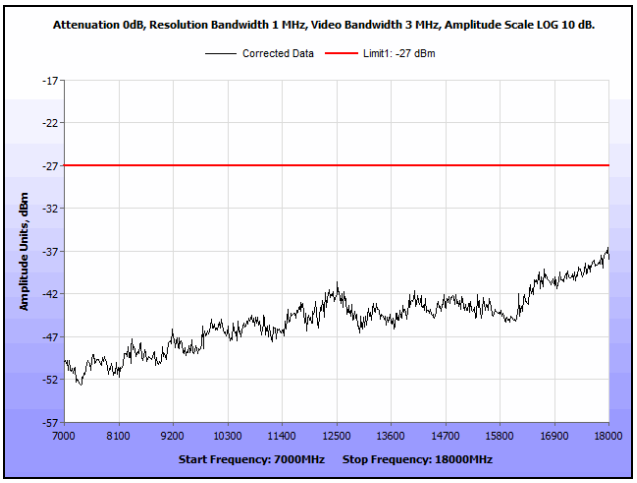
Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, UNII 3



Plot 343. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, 30 MHz – 1 GHz, UNII 3

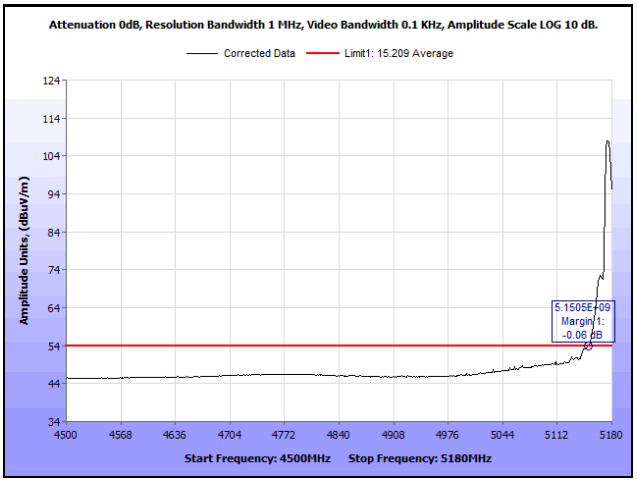


Plot 344. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, 1 GHz – 7 GHz, UNII 3

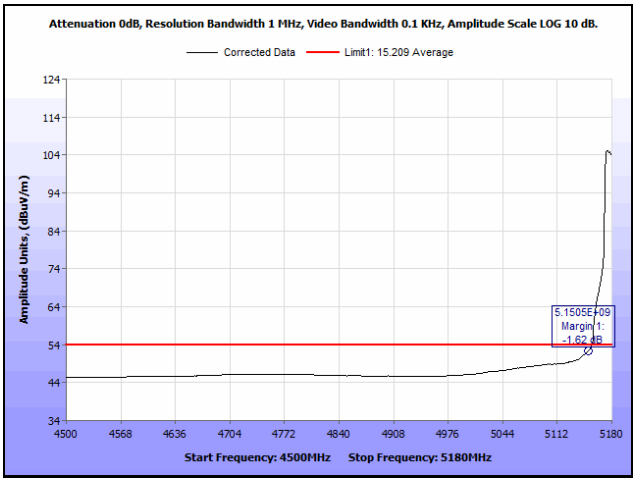


Plot 345. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, 7 GHz – 18 GHz, UNII 3

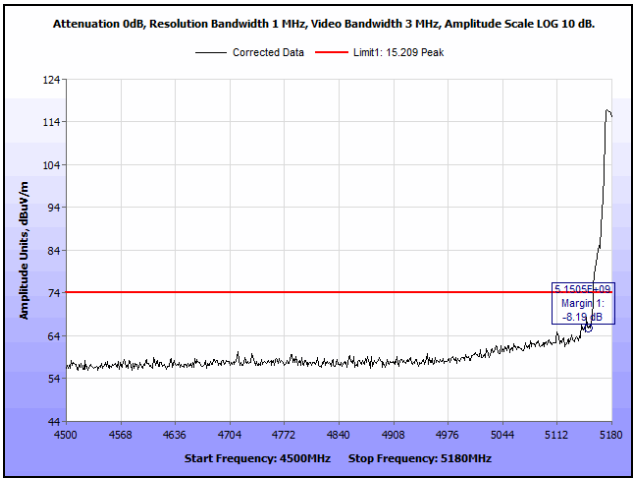
Band Edge, 802.11a, UNII 1



Plot 346. Radiated Band Edge, 802.11a, Low Channel, Average, MIMO, UNII 1

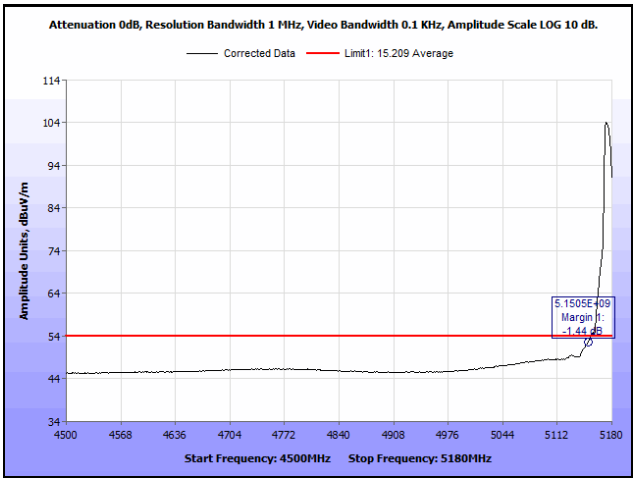


Plot 347. Radiated Band Edge, 802.11a, Low Channel, Average, SISO, UNII 1

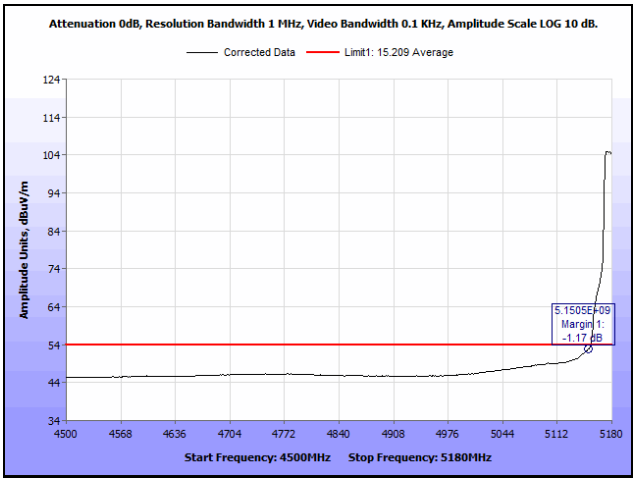


Plot 348. Radiated Band Edge, 802.11a, Low Channel, Peak, SISO, UNII 1

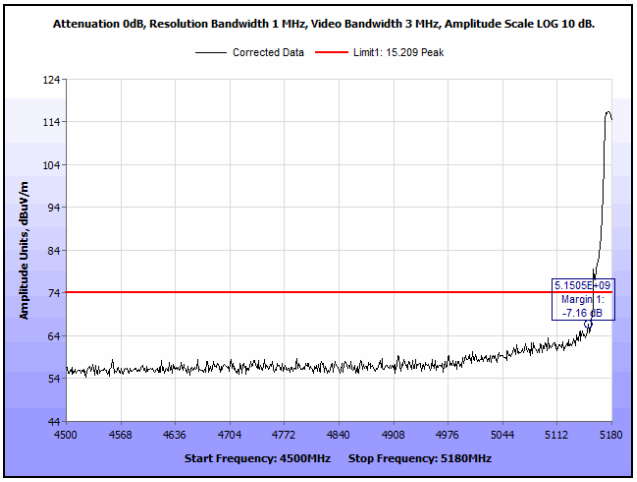
Band Edge, 802.11ac 20 MHz, UNII 1



Plot 349. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, Average, MIMO, UNII 1

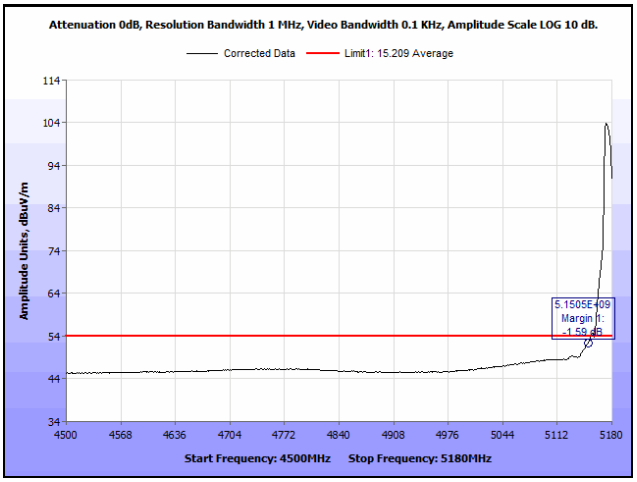


Plot 350. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, Average, SISO, UNII 1

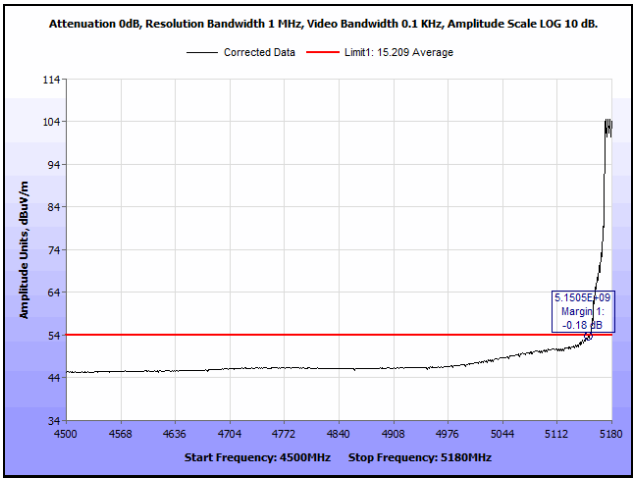


Plot 351. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, Peak, SISO, UNII 1

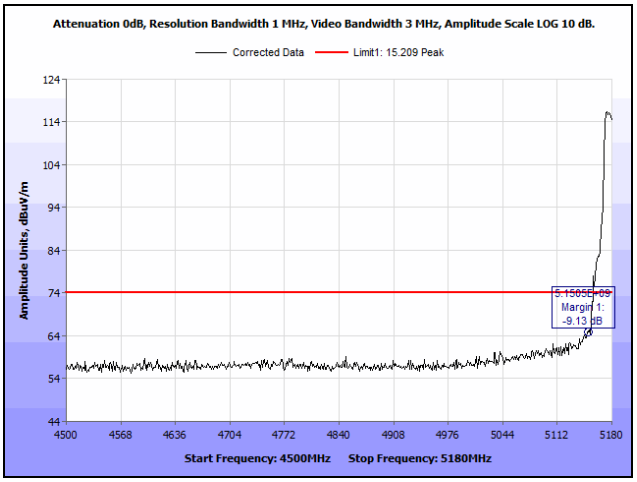
Band Edge, 802.11n 20 MHz, UNII 1



Plot 352. Radiated Band Edge, 802.11n 20 MHz, Low Channel, Average, MIMO, UNII 1

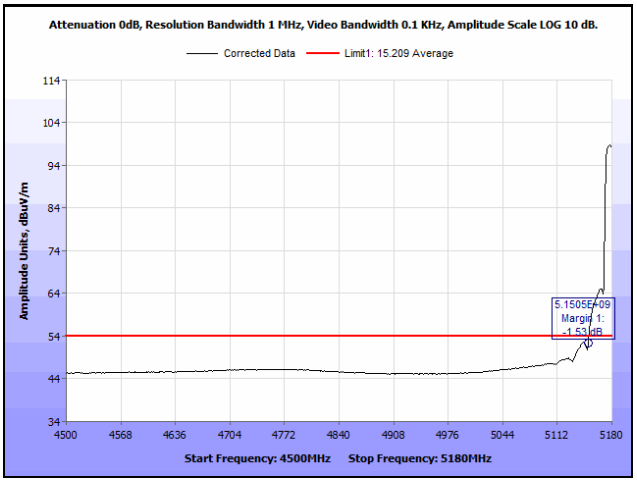


Plot 353. Radiated Band Edge, 802.11n 20 MHz, Low Channel, Average, SISO, UNII 1

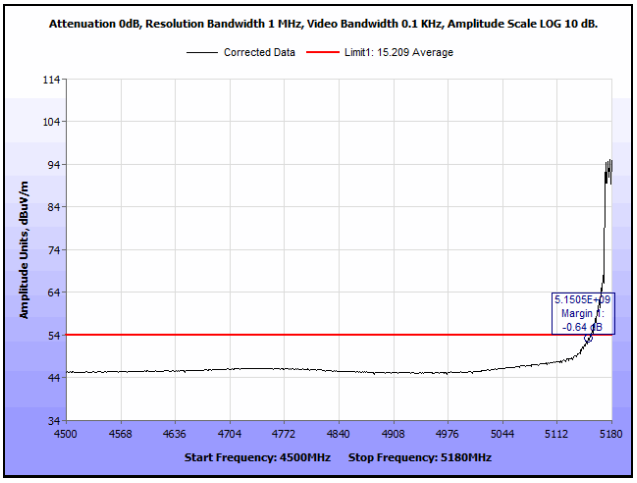


Plot 354. Radiated Band Edge, 802.11n 20 MHz, Low Channel, Peak, SISO, UNII 1

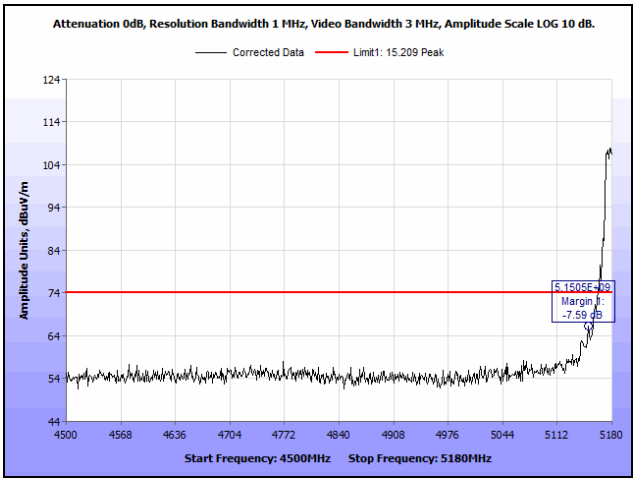
Band Edge, 802.11ac 40 MHz, UNII 1



Plot 355. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, Average, MIMO, UNII 1

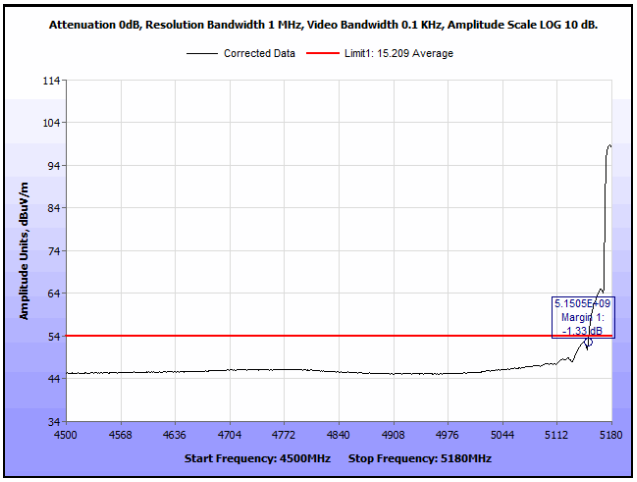


Plot 356. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, Average, SISO, UNII 1

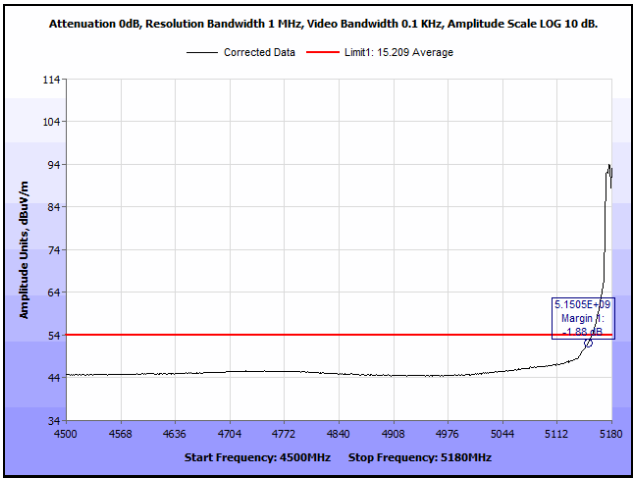


Plot 357. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, Peak, SISO, UNII 1

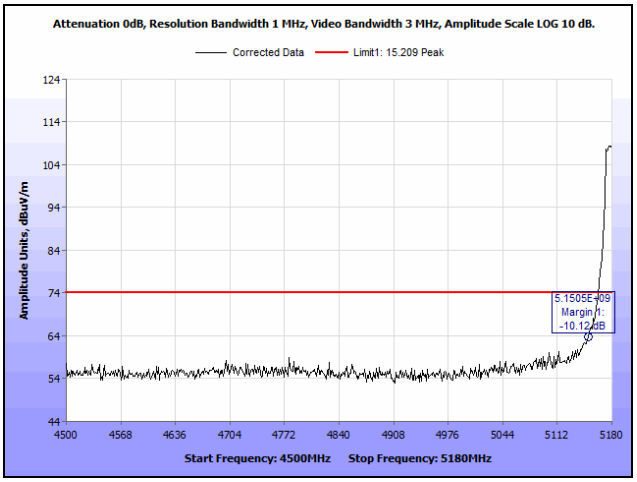
Band Edge, 802.11n 40 MHz, UNII 1



Plot 358. Radiated Band Edge, 802.11n 40 MHz, Low Channel, Average, MIMO, UNII 1

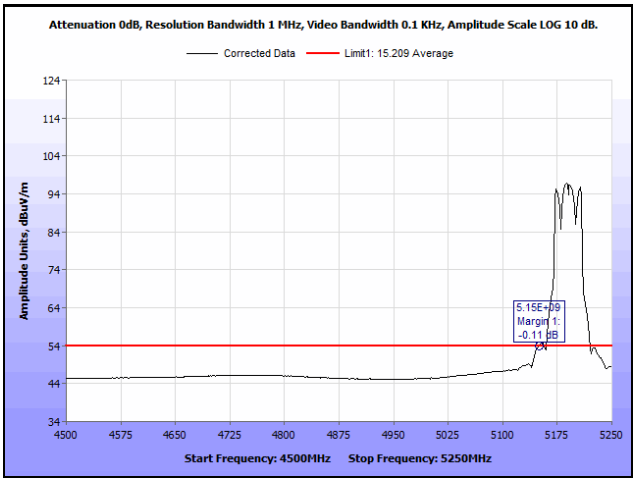


Plot 359. Radiated Band Edge, 802.11n 40 MHz, Low Channel, Average, SISO, UNII 1

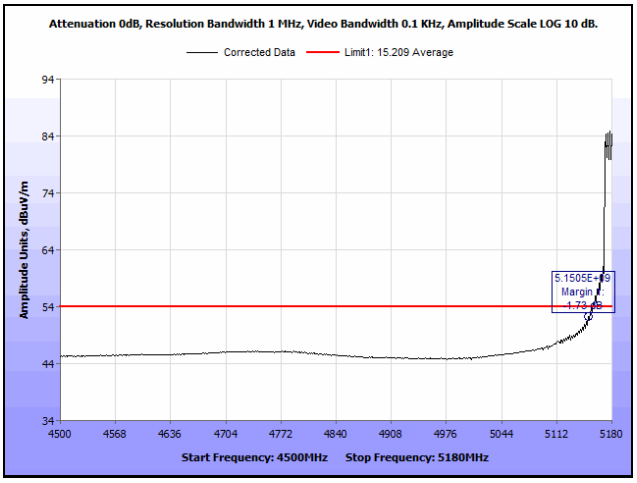


Plot 360. Radiated Band Edge, 802.11n 40 MHz, Low Channel, Peak, SISO, UNII 1

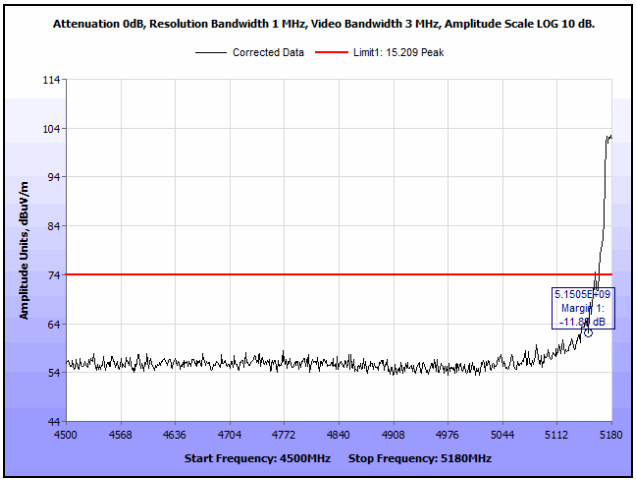
Band Edge, 802.11ac 80 MHz, UNII 1



Plot 361. Radiated Band Edge, 802.11ac 80 MHz, Average, MIMO, UNII 1

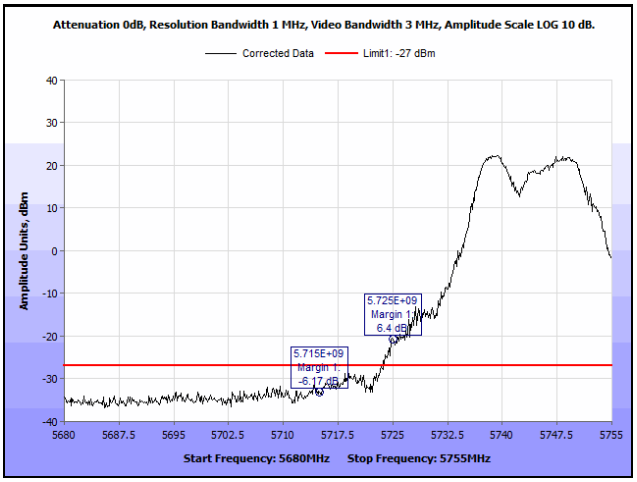


Plot 362. Radiated Band Edge, 802.11ac 80 MHz, Average, SISO, UNII 1

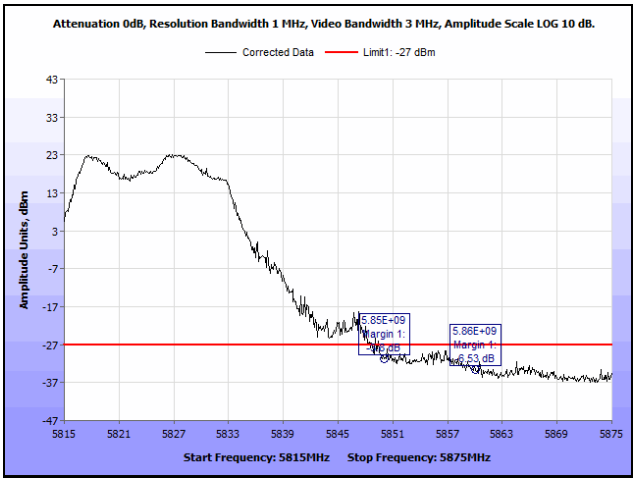


Plot 363. Radiated Band Edge, 802.11ac 80 MHz, Peak, SISO, UNII 1

Band Edge, 802.11a, MIMO, UNII 3

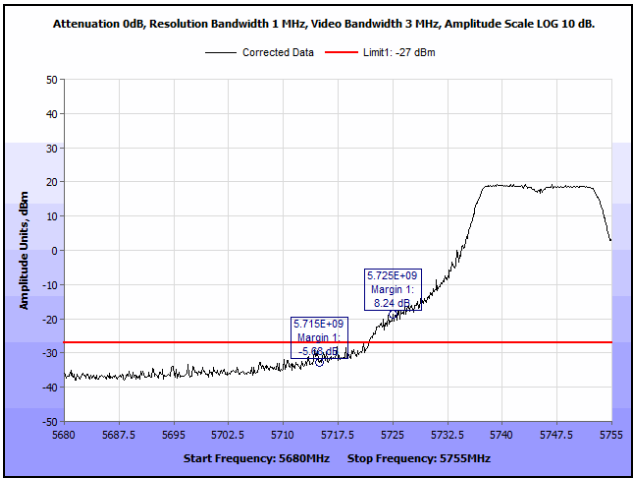


Plot 364. Radiated Band Edge, 802.11a, Low Channel, MIMO, UNII 3

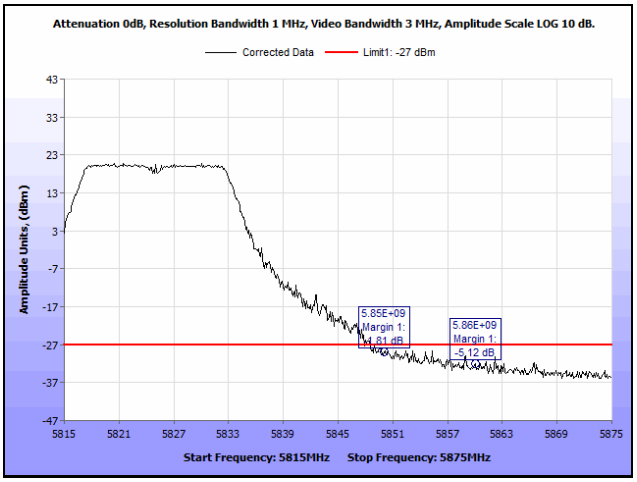


Plot 365. Radiated Band Edge, 802.11a, High Channel, MIMO, UNII 3

Band Edge, 802.11a, SISO, UNII 3

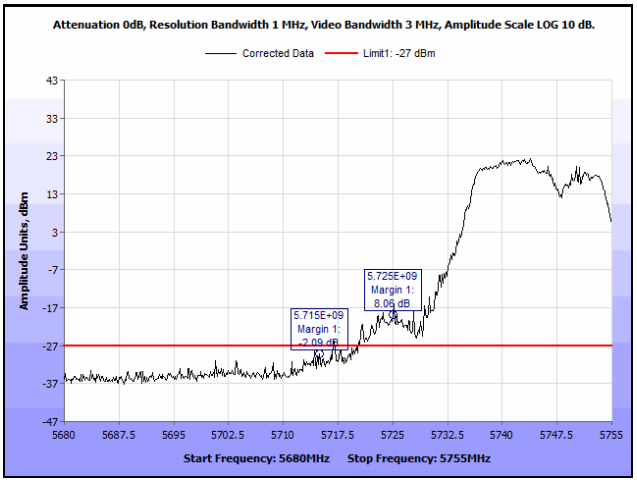


Plot 366. Radiated Band Edge, 802.11a, Low Channel, SISO, UNII 3

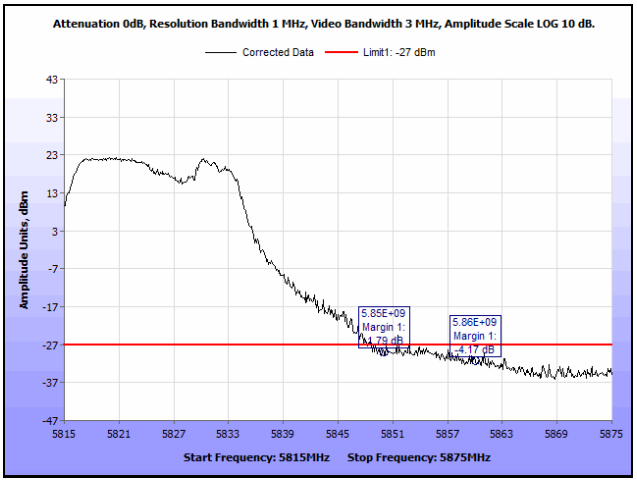


Plot 367. Radiated Band Edge, 802.11a, High Channel, SISO, UNII 3

Band Edge, 802.11ac 20 MHz, MIMO, UNII 3

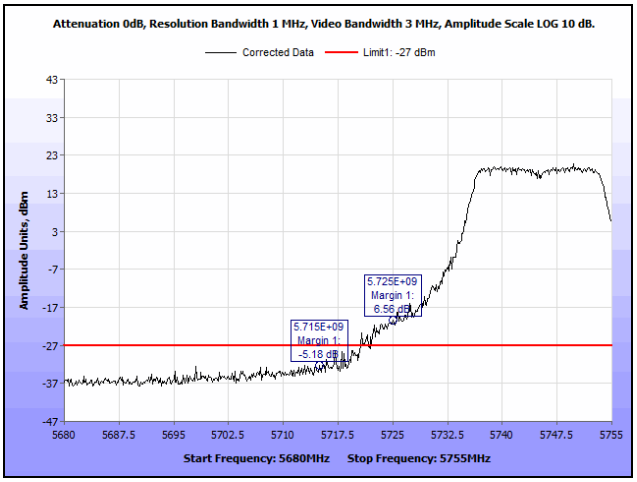


Plot 368. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, MIMO, UNII 3

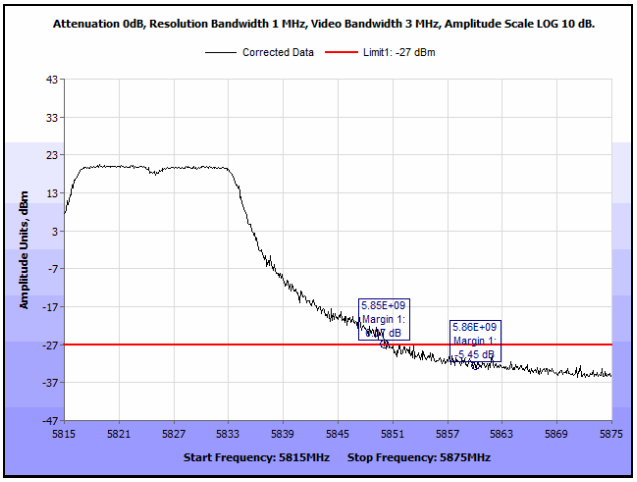


Plot 369. Radiated Band Edge, 802.11ac 20 MHz, High Channel, MIMO, UNII 3

Band Edge, 802.11ac 20 MHz, SISO, UNII 3

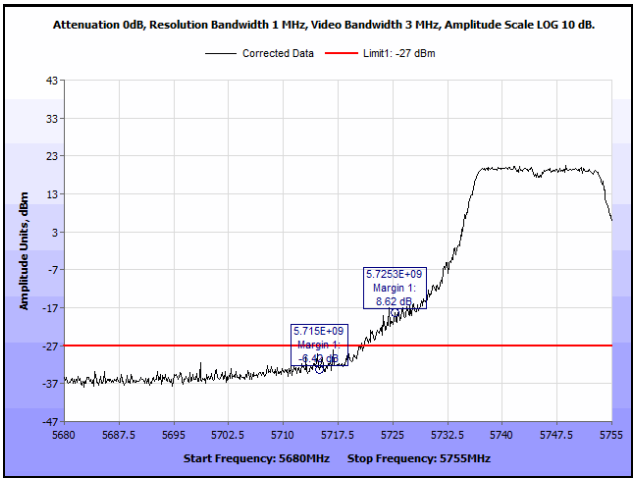


Plot 370. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, SISO, UNII 3

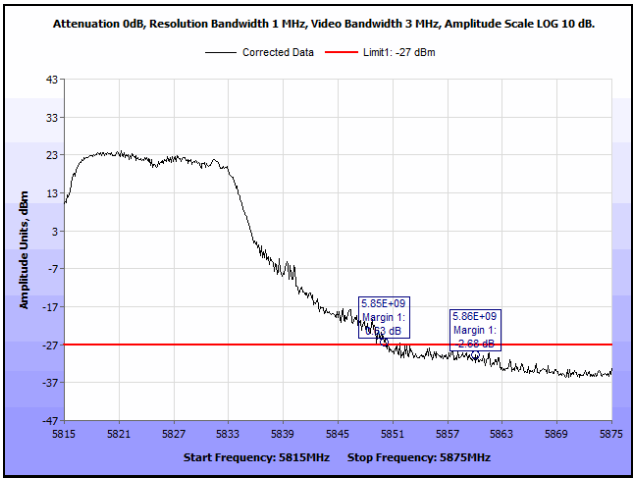


Plot 371. Radiated Band Edge, 802.11ac 20 MHz, High Channel, SISO, UNII 3

Band Edge, 802.11n 20 MHz, MIMO, UNII 3

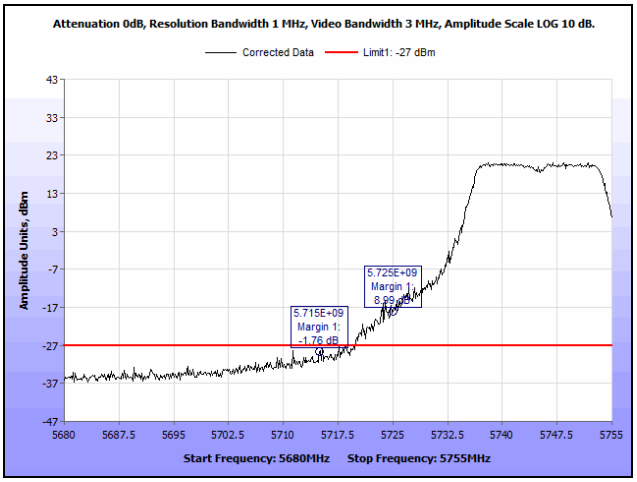


Plot 372. Radiated Band Edge, 802.11n 20 MHz, Low Channel, MIMO, UNII 3

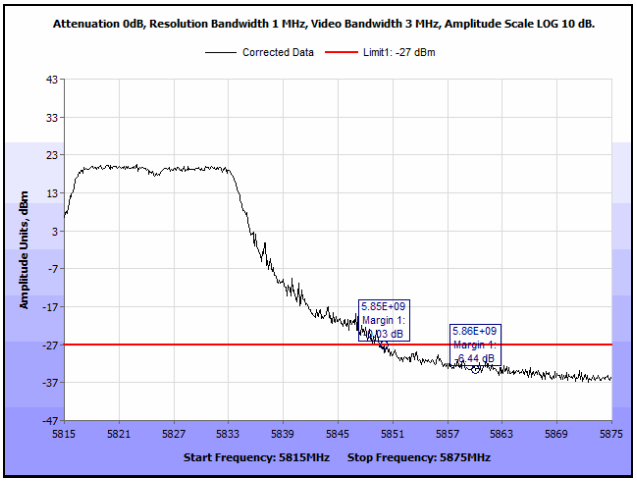


Plot 373. Radiated Band Edge, 802.11n 20 MHz, High Channel, MIMO, UNII 3

Band Edge, 802.11n 20 MHz, SISO, UNII 3

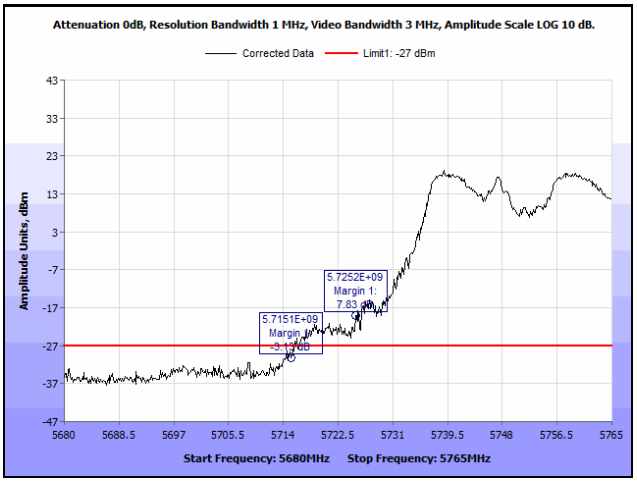


Plot 374. Radiated Band Edge, 802.11n 20 MHz, Low Channel, SISO, UNII 3

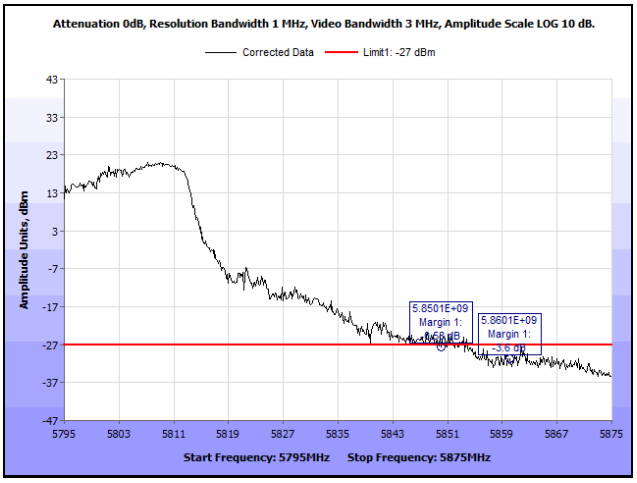


Plot 375. Radiated Band Edge, 802.11n 20 MHz, High Channel, SISO, UNII 3

Band Edge, 802.11ac 40 MHz, MIMO, UNII 3

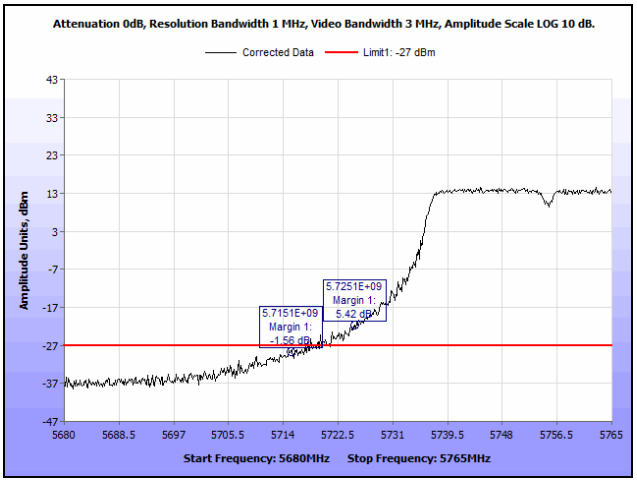


Plot 376. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, MIMO, UNII 3

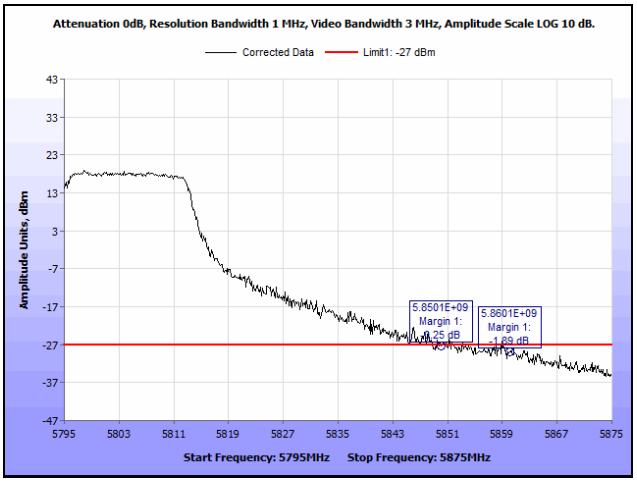


Plot 377. Radiated Band Edge, 802.11ac 40 MHz, High Channel, MIMO, UNII 3

Band Edge, 802.11ac 40 MHz, SISO, UNII 3

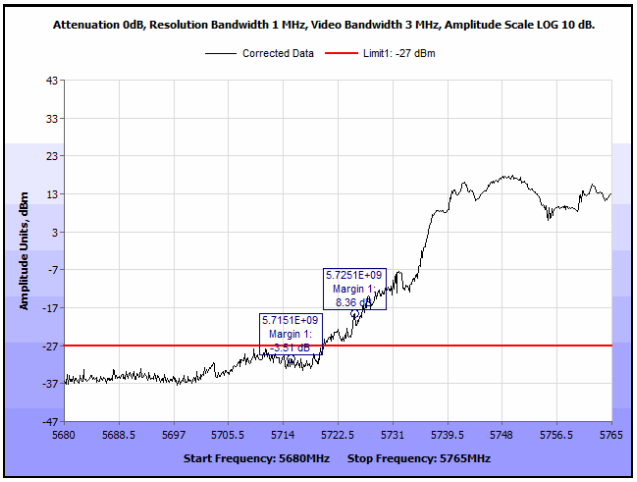


Plot 378. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, SISO, UNII 3

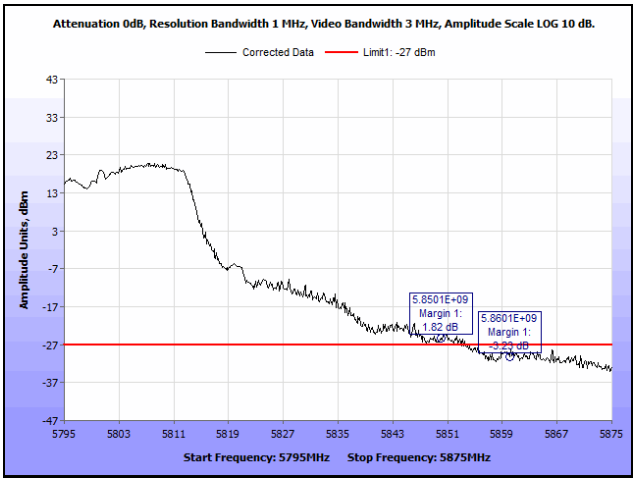


Plot 379. Radiated Band Edge, 802.11ac 40 MHz, High Channel, SISO, UNII 3

Band Edge, 802.11n 40 MHz, MIMO, UNII 3

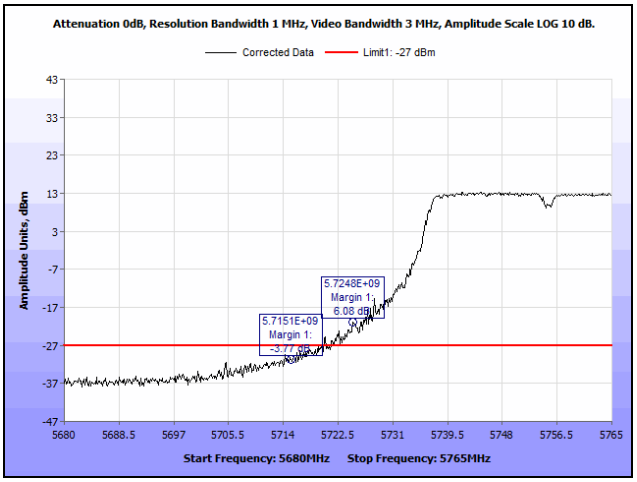


Plot 380. Radiated Band Edge, 802.11n 40 MHz, Low Channel, MIMO, UNII 3

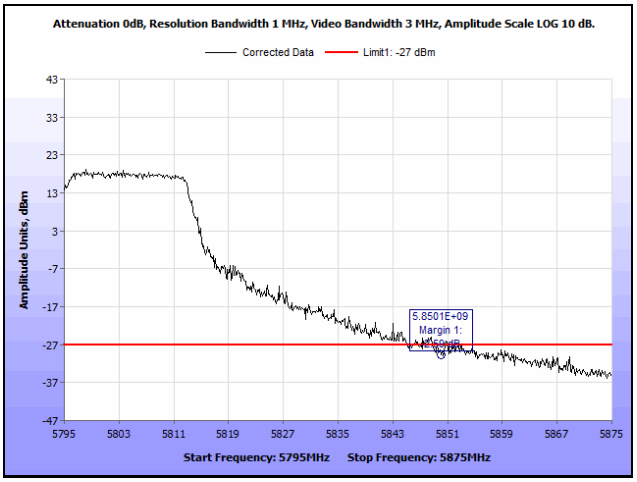


Plot 381. Radiated Band Edge, 802.11n 40 MHz, High Channel, MIMO, UNII 3

Band Edge, 802.11n 40 MHz, SISO, UNII 3

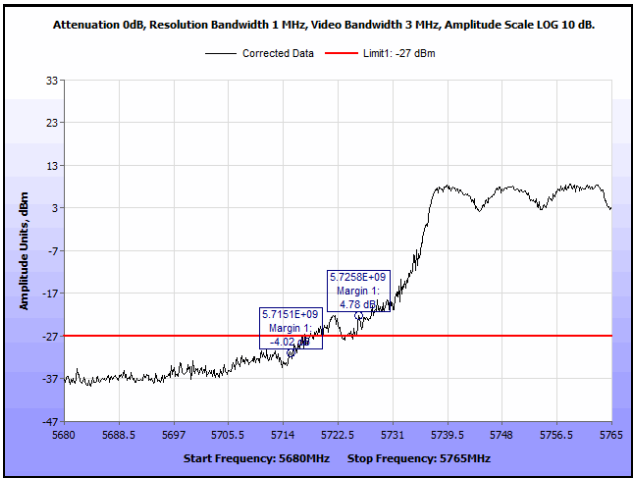


Plot 382. Radiated Band Edge, 802.11n 40 MHz, Low Channel, SISO, UNII 3

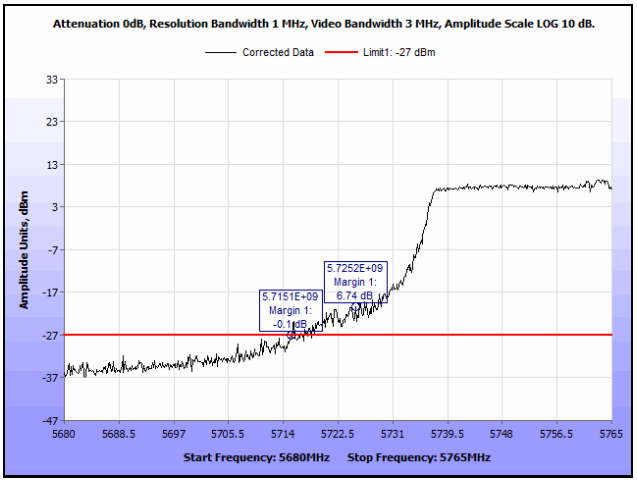


Plot 383. Radiated Band Edge, 802.11n 40 MHz, High Channel, SISO, UNII 3

Band Edge, 802.11ac 80 MHz, UNII 3

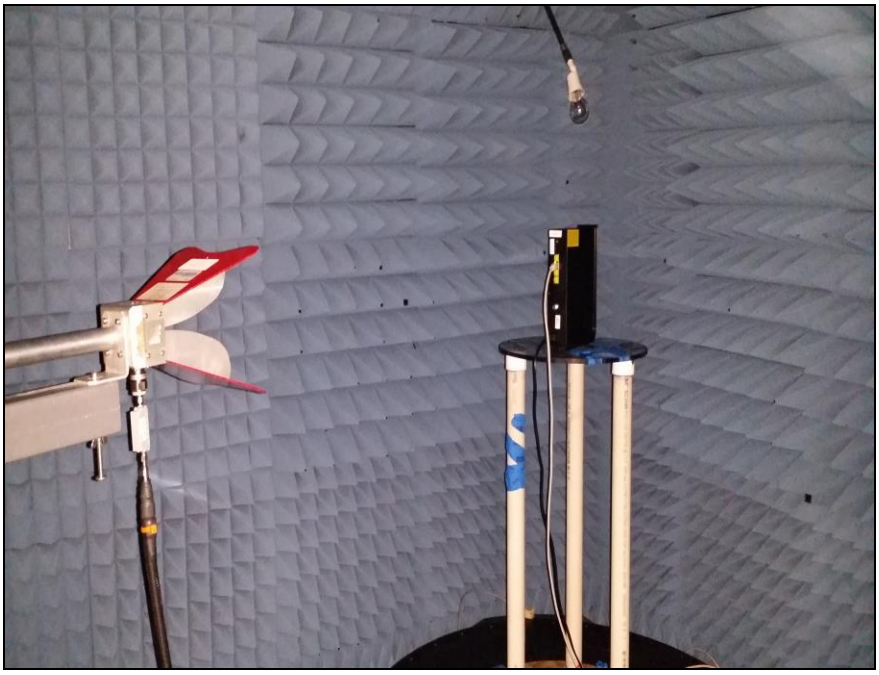


Plot 384. Radiated Band Edge, 802.11ac 80 MHz, MIMO, UNII 3



Plot 385. Radiated Band Edge, 802.11ac 80 MHz, SISO, UNII 3

Photograph 6. Radiated Spurious Emissions, Test Setup, 30 MHz – 1 GHz



Photograph 7. Radiated Spurious Emissions, Test Setup, Above 1 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(f) RF Exposure

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

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

MPE Limit Calculation: EUT's operating frequencies @ 5150-5250 MHz and 5725-5850 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

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

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

where, S = Power Density
P = Power Input to antenna
G = Antenna Gain
R = Minimum Distance between User and Antenna

Band 5150-5250 MHz

The limit for maximum RF exposure for 5.1GHz device is 1mW/cm^2
The formula for calculating RF exposure is given as $S= \frac{PG}{4\pi R^2}$
Output Power = 24.19 dBm

Antenna Gain = 10.47 dBi

Power density is equal to 0.5817 mW/cm^2.
R=20cm

Band 5725-5850 MHz

The limit for maximum RF exposure for 5.8GHz device is 1mW/cm^2
The formula for calculating RF exposure is given as $S= \frac{PG}{4\pi R^2}$
Output Power = 28.37 dBm

Antenna Gain = 7.04 dBi

Power density is equal to 0.69140 mW/cm^2.
R=20cm

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(g) Frequency Stability

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

Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The resolution band width of the spectrum analyzer was set to 10 KHz. The traces were used to show the drift of -26dB band edge of low and high channel respectively at normal and extreme conditions. The two frequencies (i.e. 5180 MHz and 5240 MHz in UNII-1) and (5745MHz and 5825MHz in UNII-3) are derived to demonstrate compliance with frequency stability requirement.

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

Test Engineer(s): Surinder Singh

Test Date(s): 02/11/15

Frequency		5180MHz	5240MHz	Test result
Temperature (C)	Voltage (V)	Lower Frequency (MHz)	Upper Frequency (MHz)	
-20	120	5168.2	5251.6	Within UNII band
-10	120	5168	5252	Within UNII band
0	120	5168.3	5251.5	Within UNII band
10	120	5167.7	5251.9	Within UNII band
20	108	5169	5252	Within UNII band
20	120	5168.8	5251.2	Within UNII band
20	132	5167.1	5252.2	Within UNII band
30	120	5168.2	5252.6	Within UNII band
40	120	5167.1	5251.5	Within UNII band
50	120	5168.8	5251.1	Within UNII band
55	120	5168.1	5252.3	Within UNII band

Table 42. Frequency Stability, Test Results, UNII 1

Frequency		5745MHz	5825MHz	Test result
Temperature (C)	Voltage (V)	Lower Frequency (MHz)	Upper Frequency (MHz)	
-20	120	5731.5	5840.9	Within UNII-3 band
-10	120	5730.4	5840.2	Within UNII-3 band
0	120	5731.8	5839.2	Within UNII-3 band
10	120	5730.2	5840.1	Within UNII-3 band
20	108	5731	5841.3	Within UNII-3 band
20	120	5729.8	5840.6	Within UNII-3 band
20	132	5730.7	5840.8	Within UNII-3 band
30	120	5728.8	5839.5	Within UNII-3 band
40	120	5729.3	5840.1	Within UNII-3 band
50	120	5730.6	5840.8	Within UNII-3 band
55	120	5729.3	5840.6	Within UNII-3 band

Table 43. Frequency Stability, Test Results, UNII 3

Photograph 8. Frequency Stability, Test Setup

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.

MET #	Equipment	Manufacturer	Model#	Cal Date	Cal Due
1T4681	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4448A	2/26/2014	2/26/2015
1T4829	SPECTRUM ANALYZER	AGILENT	E4407B	9/30/2014	9/30/2015
1T4483	ANTENNA; HORN	ETS-LINDGREN	7/13/1908	2/28/2014	8/28/2015
1T4564	LISN (24 AMP)	SOLAR ELECTRONICS	9252-50-R-24-BNC	6/3/2014	6/3/2015
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	
1T4870	THERM./CLOCK/HUMIDITY MONITOR	CONTROL COMPANY	06-662-4, FB70258	03/14/2014	03/14/2016
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	07/20/2014	01/20/2016
1T4300C	SEMI-ANECHOIC 3M CHAMBER # 1 (VCCI)	EMC TEST SYSTEMS	NONE	01/31/2012	01/31/2015
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	07/18/2014	07/18/2016
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	3/21/1900	NOT REQUIRED	
1T2665	ANTENNA; HORN	EMCO	7/11/1908	4/3/2014	10/3/2015
1T4871	VECTOR SIGNAL GENERATOR	AGILENT	N5172B	6/16/2014	12/16/2015
1T4829	SPECTRUM ANALYZER	AGILENT	E4407B	9/30/2014	3/30/2016
1T4817	PREAMPLIFIER	A.H. SYSTEMS, INC.	PAM-0118P	SEE NOTE	

Table 44. Test Equipment List

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

VI. Certification & User's Manual Information

Certification & User's Manual Information

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.