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

May 21, 2015

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

Dear Tony Figueiredo,

Enclosed is the EMC Wireless test report for Class II Permissive Change compliance testing of the Arris Group Inc., SBG 6700AC as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Title 47 of the CFR, Part 15.407, Subpart E (UNII 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 Inc.\ EMC85104-FCC407 UNII 3)

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Electromagnetic Compatibility Criteria
Class II Permissive Change Test Report

for the

Arris Group Inc.
Model SBG 6700AC

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

MET Report: EMC85104-FCC407 UNII 3

May 21, 2015

Prepared For:

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

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

Electromagnetic Compatibility Criteria
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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
∅	May 21, 2015	Initial Issue.

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List of Terms and Abbreviations

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

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Arris Group Inc. SBG 6700AC, with the requirements of Part 15, §15.407. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the SBG 6700AC. Arris Group Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the SBG 6700AC, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.407, in accordance with Arris Group Inc., purchase order number AR1056767. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	Description	Results
§15.203	Antenna Requirements	Compliant
§15.207	AC Conducted Emissions 150KHz – 30MHz	Compliant
§15.403 (i)	26dB Occupied Bandwidth	Compliant
§15.407 (a)(3)	Conducted Transmitter Output Power	Compliant
§15.407 (a)(3)	Power Spectral Density	Compliant
§15.407 (b)(4), (6), (7)	Undesirable Emissions (15.205/15.209 - General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
§15.407(f)	RF Exposure	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

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

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

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

Model(s) Tested:	SBG 6700AC	
Model(s) Covered:	SBG 6700AC	
EUT Specifications:	Primary Power: DC	
	Class II Permissive Change FCC ID: UIDSBG6700	
	Type of Modulations:	CCK, BPSK, QPSK, 16-QAM, 64-QAM and 256-QAM
	Equipment Code:	NII
	Peak RF Output Power:	25.35dBm
	EUT Frequency Ranges:	5745MHz-5825 MHz
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):	May 21, 2015	

Table 2. EUT Summary

**Note: This report has Class II Permissive Change testing data to demonstrate compliance with the NEW UNII-3 requirements and beam forming functionality.

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices
KDB 789033 D02	General UNII Test Procedures

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

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

D. Description of Test Sample

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

E. Equipment Configuration

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

Table 4. Equipment Configuration

F. Support Equipment

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

Ref. ID	Name / Description	Manufacturer	Model Number
NA	Laptop	Dell	Vostro
NA	Laptop Mouse	Logitech	NA
NA	RF Cable	NA	NA
NA	Ethernet cable	NA	NA
NA	12 Vdc PS	Asian Power Devices	WA-24I12FU
NA	CMTS	ARRIS C4	NA

Table 5. Support Equipment

G. Ports and Cabling Information

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

Table 6. Ports and Cabling Information

H. Mode of Operation

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

I. Method of Monitoring EUT Operation

The measured emission value is over the specified FCC limits.

J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Arris Group Inc. upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

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

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

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

Results: The EUT as tested is Compliant to the criteria of §15.203. EUT has an internal antenna.

Test Engineer(s): Surinder Pal Singh

Test Date(s): 03/04/15

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207(a) Conducted Emissions Limits

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

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

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

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

Test Results: The EUT was compliant with this requirement.

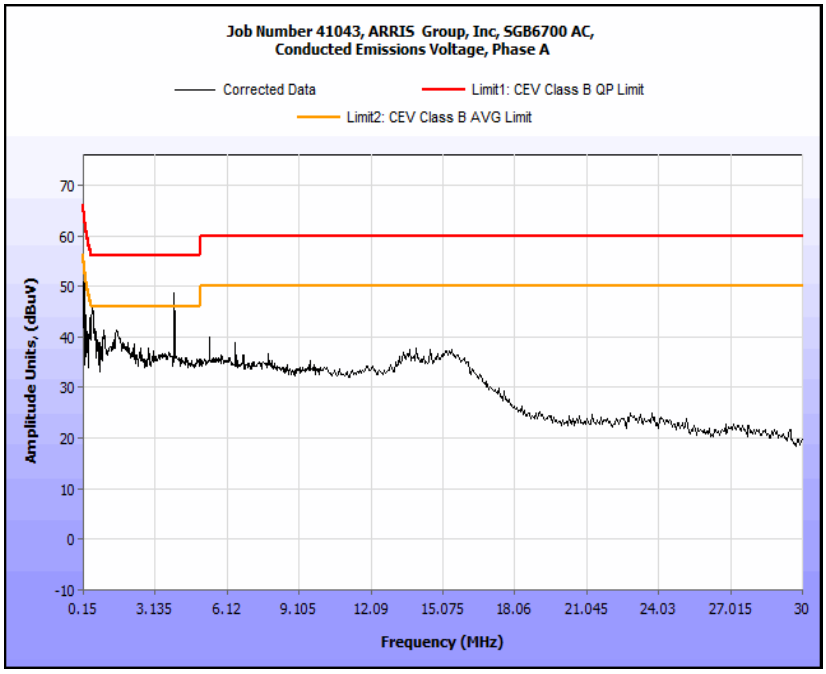
Test Engineer(s): Surinder Singh

Test Date(s): 03/04/15

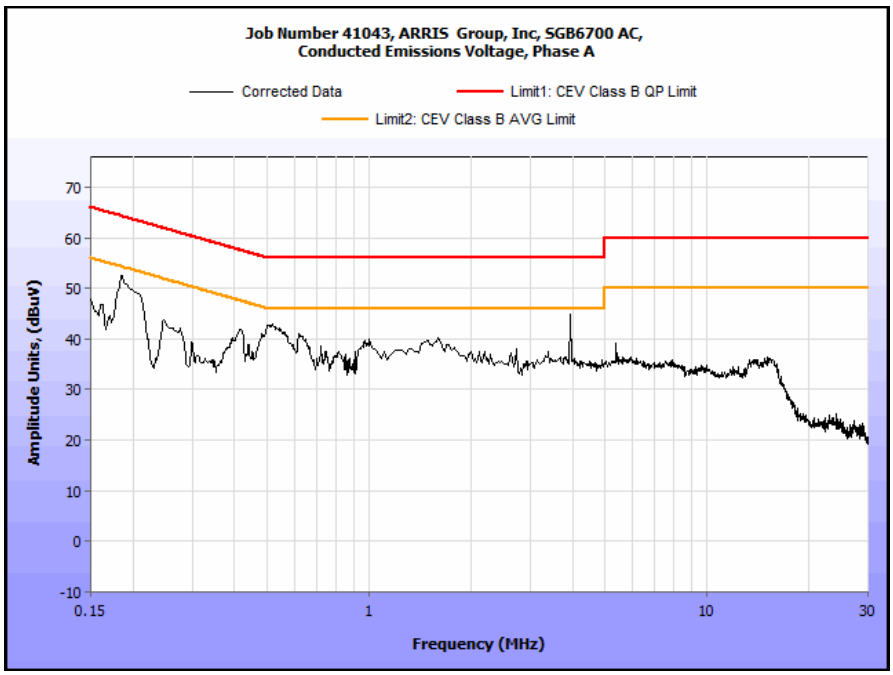
15.207(a) Conducted Emissions Test Results

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

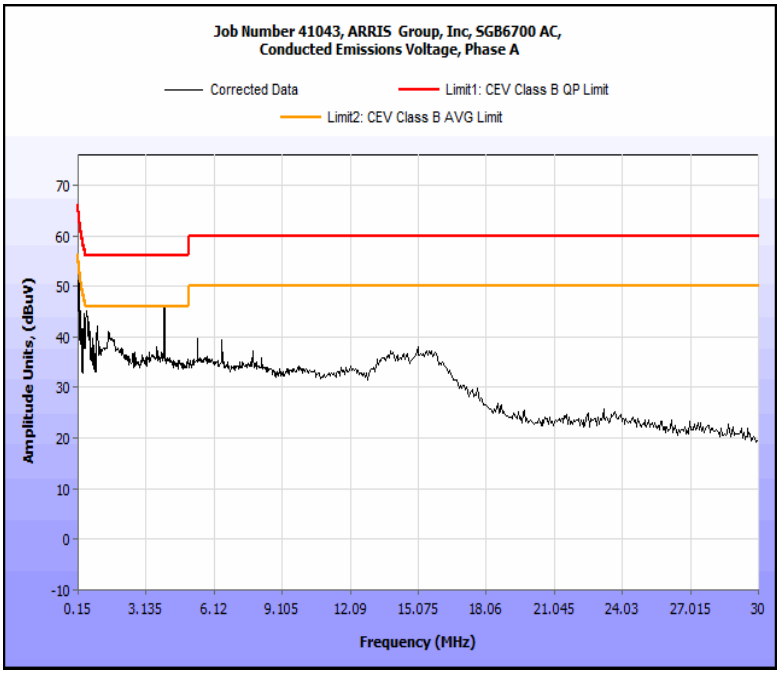
Table 8. Conducted Emissions, 15.207(a), Phase Line, Test Results



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



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

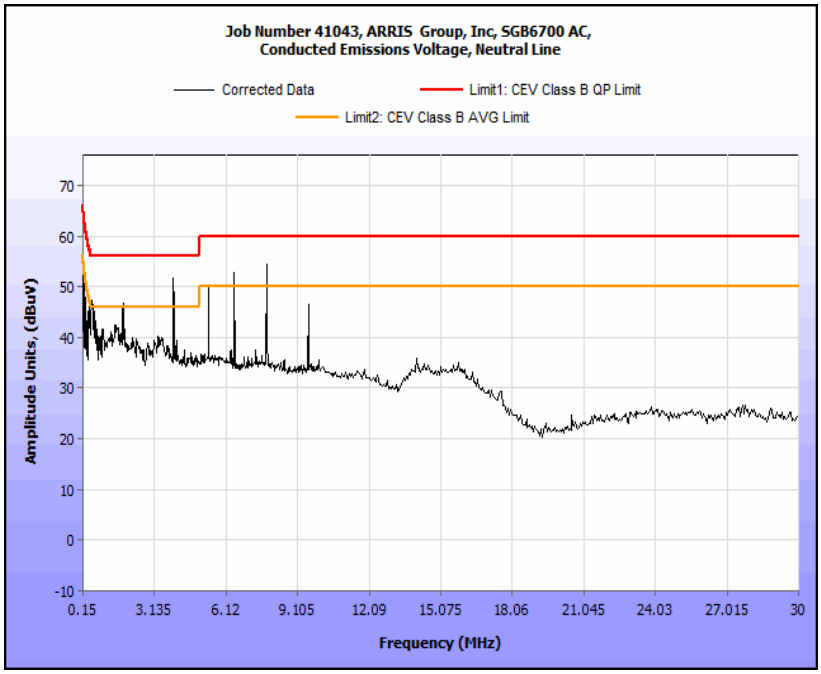


Plot 3. Conducted Emissions, 15.207(a), Phase Line, High Channel

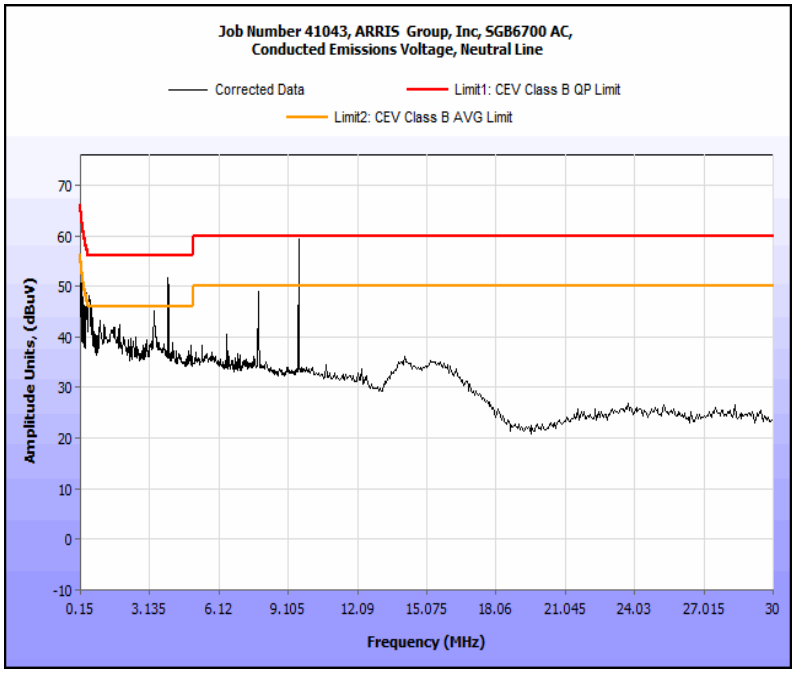
15.207(a) Conducted Emissions Test Results

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

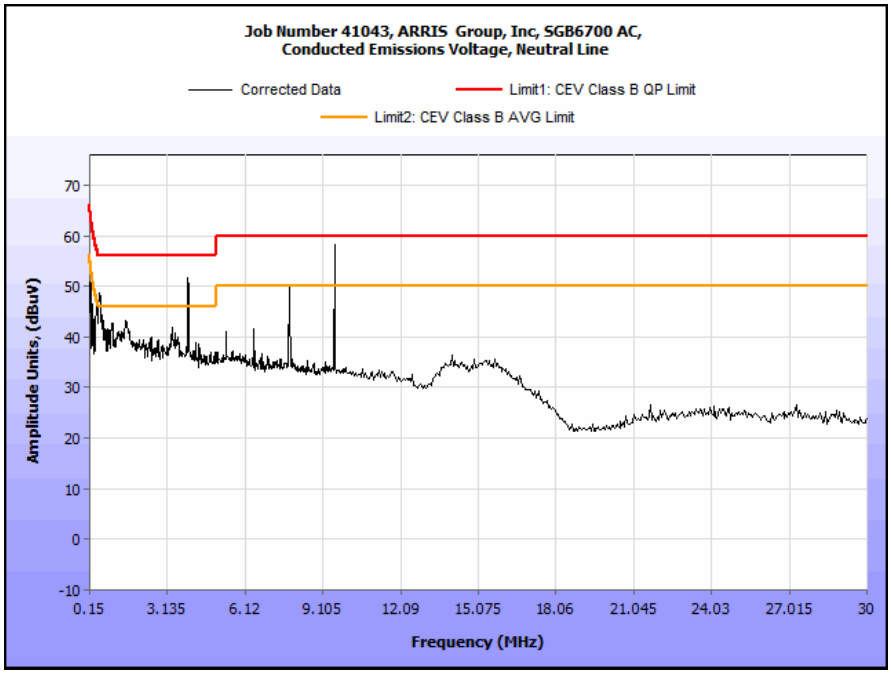
Table 9. Conducted Emissions, 15.207(a), Neutral Line, Test Results



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



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



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

15.207(a) Conducted Emissions Test Setup Photo

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

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(i) 26dB Bandwidth

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

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

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

Test Engineer(s): Surinder Singh

Test Date(s): 02/24/15

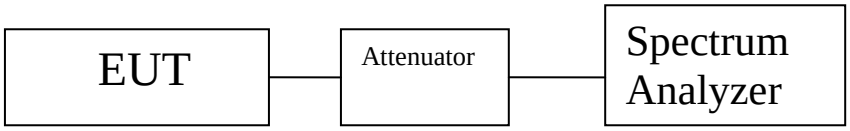
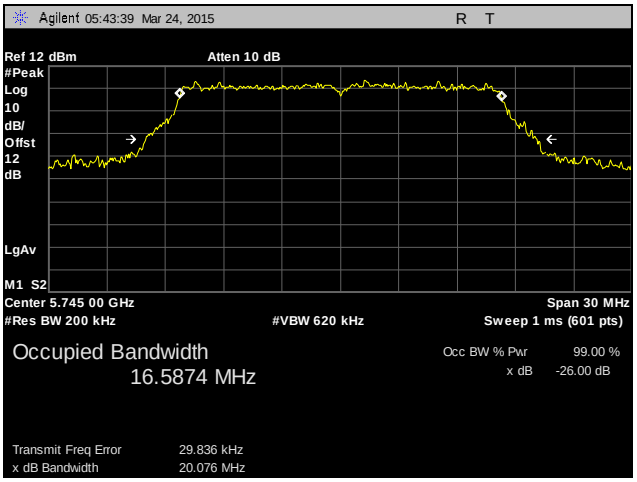
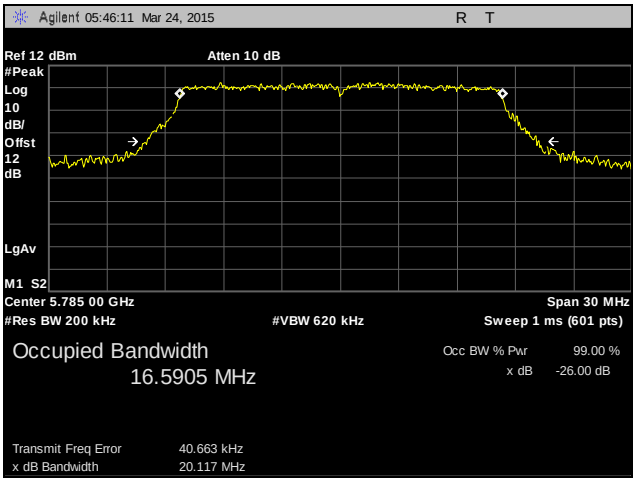


Figure 1. Occupied Bandwidth, Test Setup

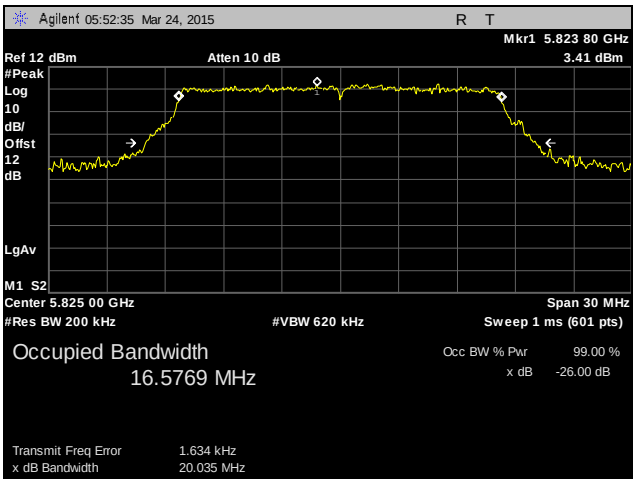
26 dB Occupied Bandwidth Test Results, Non-Transmitting Beam-Forming, MIMO



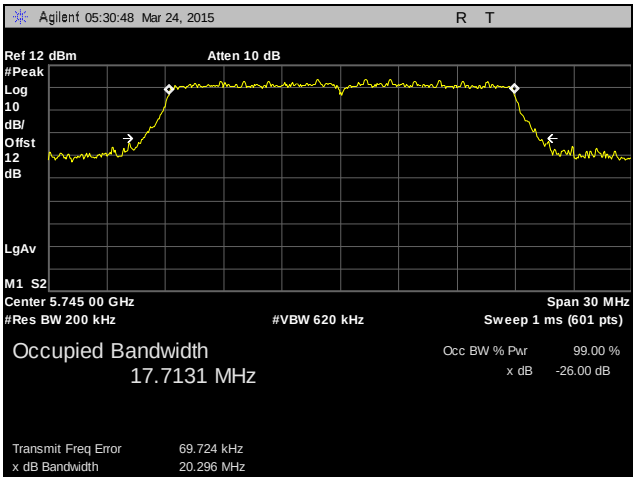
Plot 1. 26 dB Occupied Bandwidth, Low Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



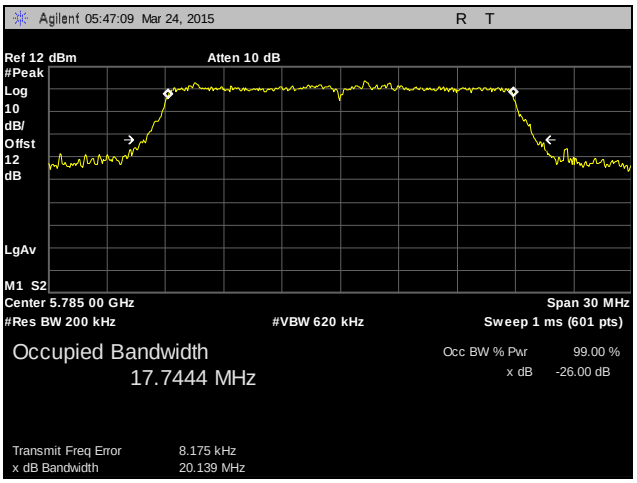
Plot 2. 26 dB Occupied Bandwidth, Mid Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



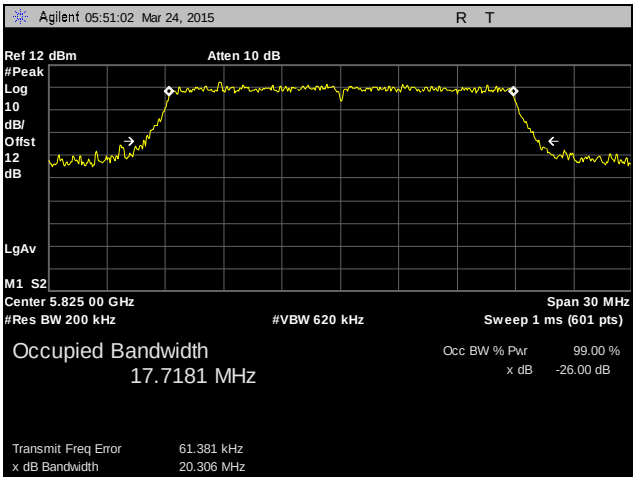
Plot 3. 26 dB Occupied Bandwidth, High Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



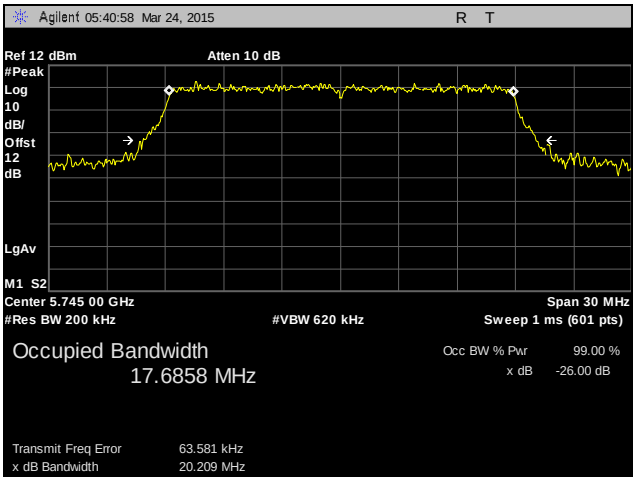
Plot 4. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



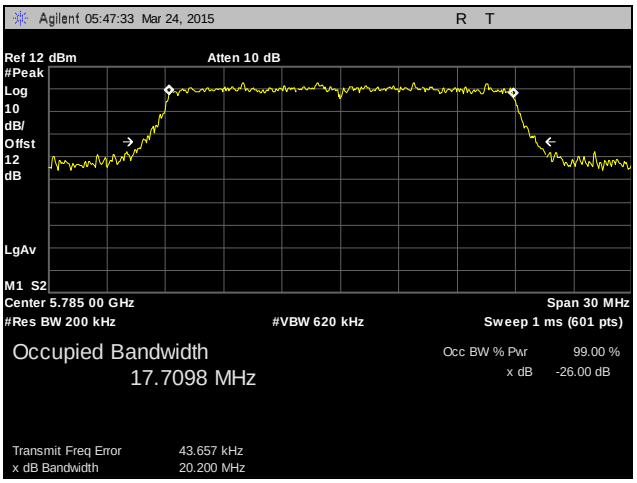
Plot 5. 26 dB Occupied Bandwidth, Mid Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



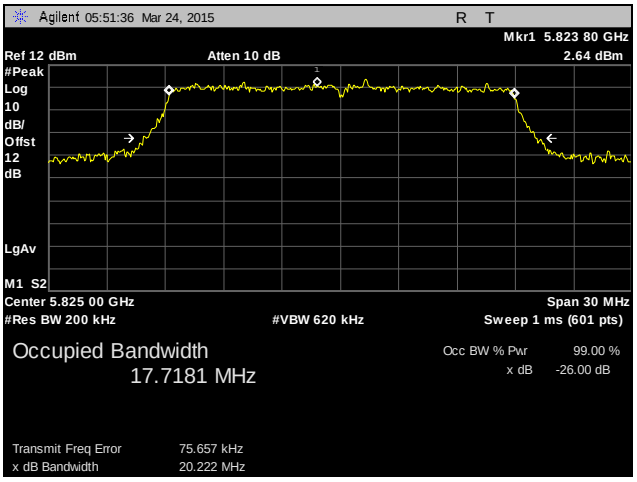
Plot 6. 26 dB Occupied Bandwidth, High Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



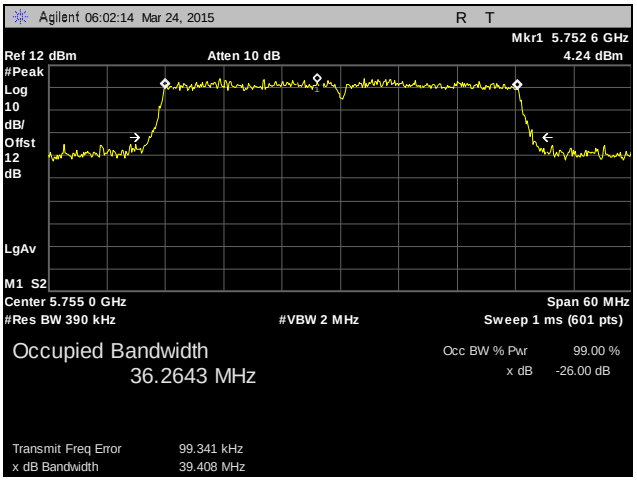
Plot 7. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



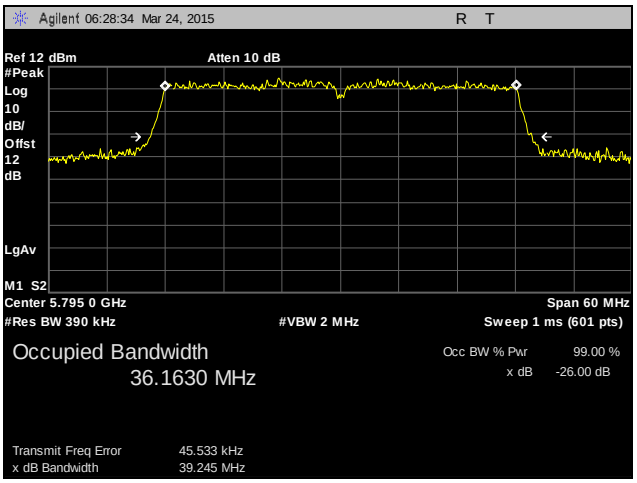
Plot 8. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



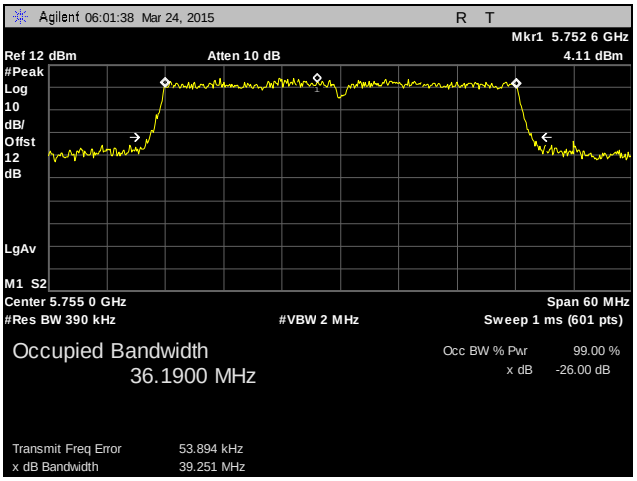
Plot 9. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



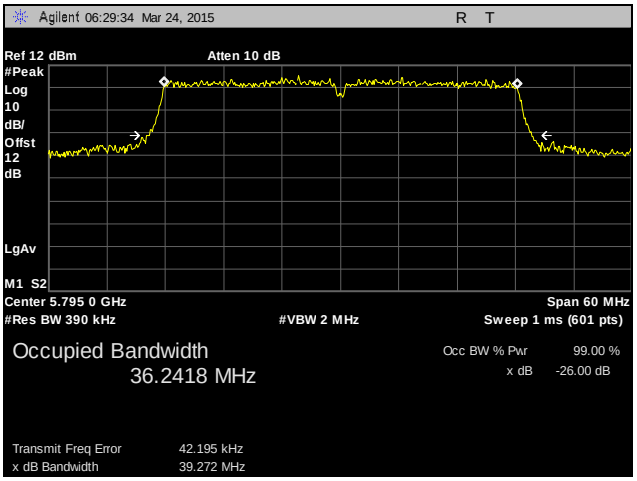
Plot 10. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 40 MHz, MIMO, Non-Transmitting Beam-Forming



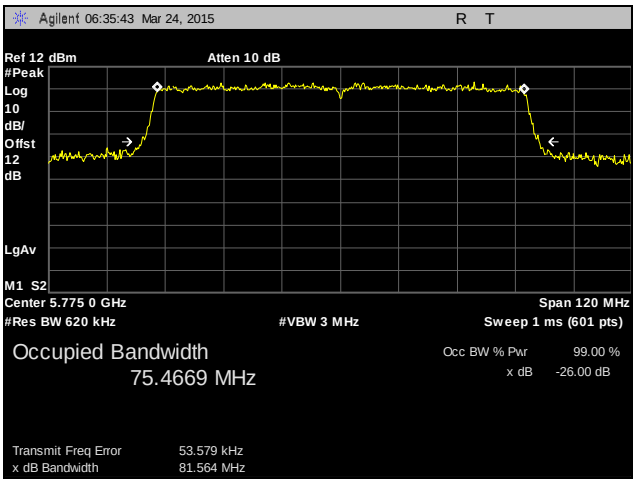
Plot 11. 26 dB Occupied Bandwidth, High Channel, 802.11ac 40 MHz, MIMO, Non-Transmitting Beam-Forming



Plot 12. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, MIMO, Non-Transmitting Beam-Forming

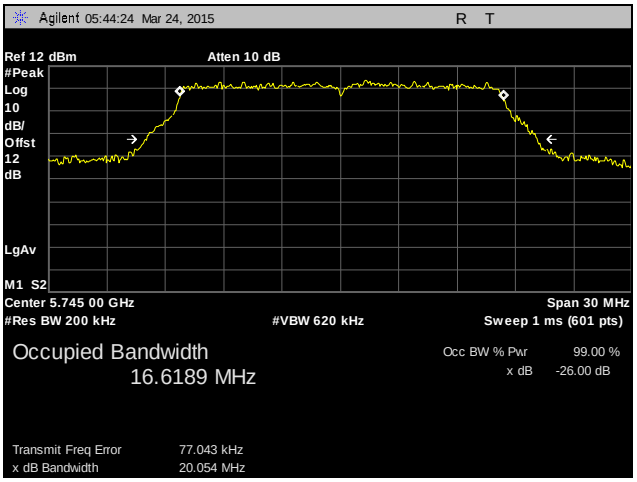


Plot 13. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, MIMO, Non-Transmitting Beam-Forming

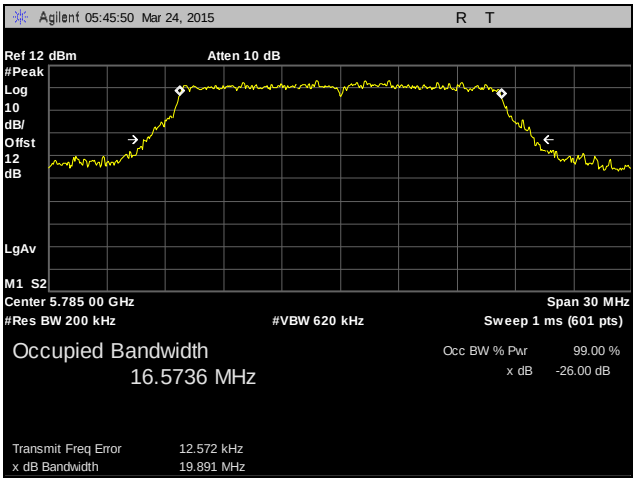


Plot 14. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, MIMO, Non-Transmitting Beam-Forming

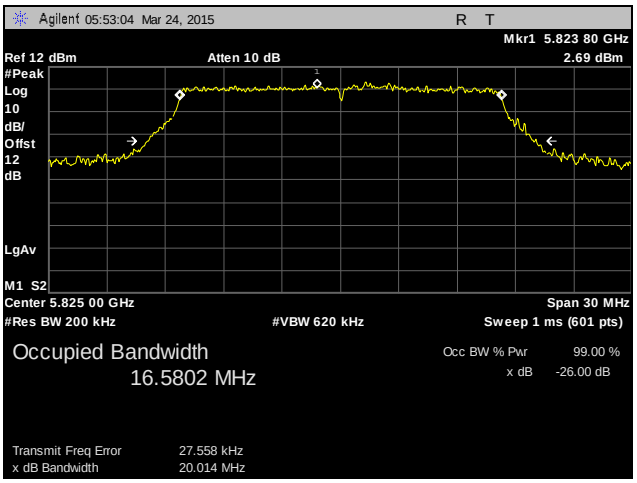
26 dB Occupied Bandwidth Test Results, Non-Transmitting Beam-Forming, SISO



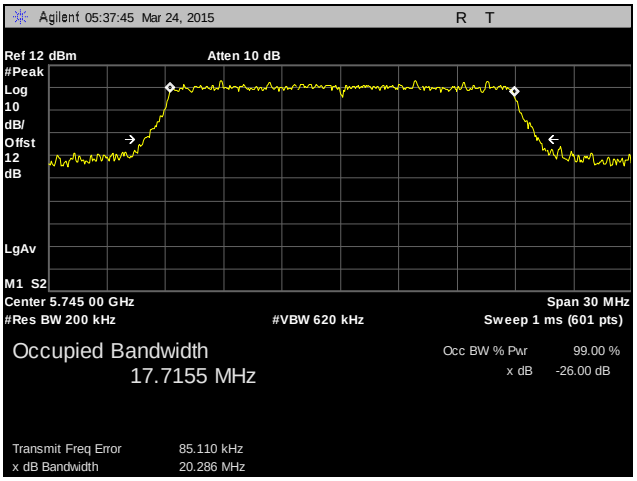
Plot 15. 26 dB Occupied Bandwidth, Low Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



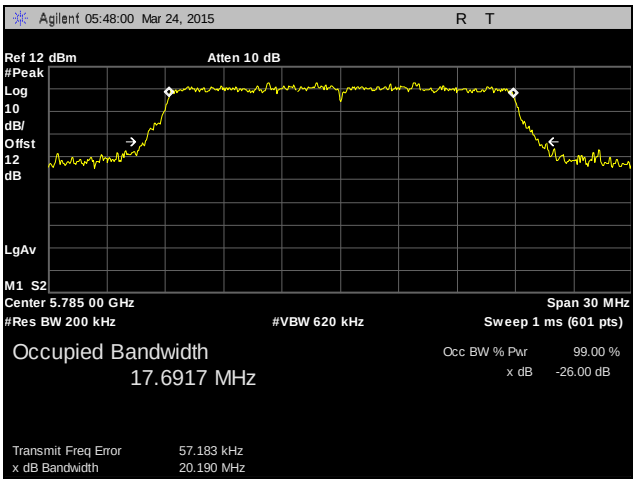
Plot 16. 26 dB Occupied Bandwidth, Mid Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



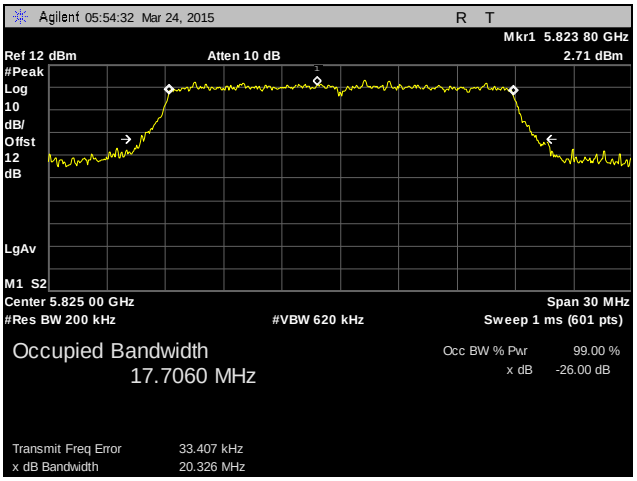
Plot 17. 26 dB Occupied Bandwidth, High Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



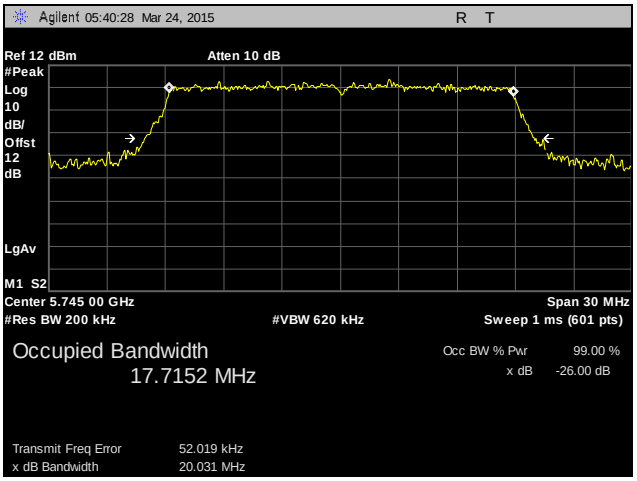
Plot 18. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



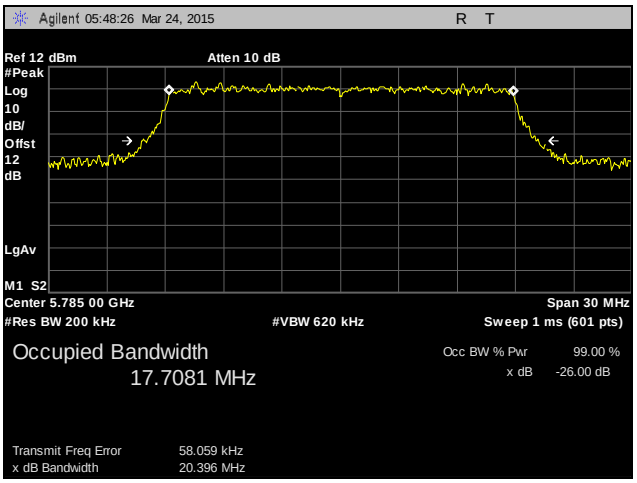
Plot 19. 26 dB Occupied Bandwidth, Mid Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



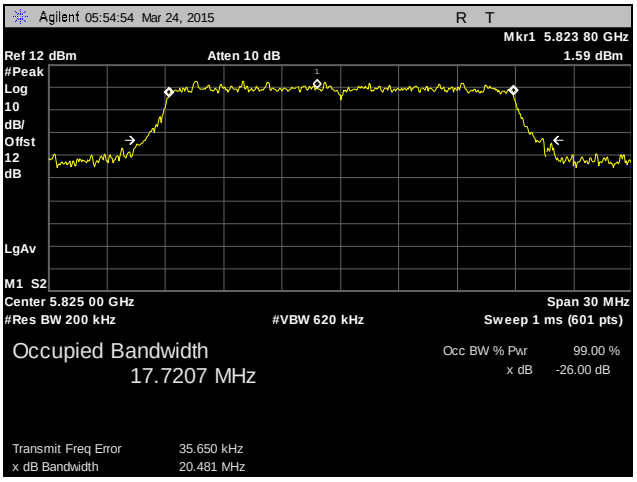
Plot 20. 26 dB Occupied Bandwidth, High Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



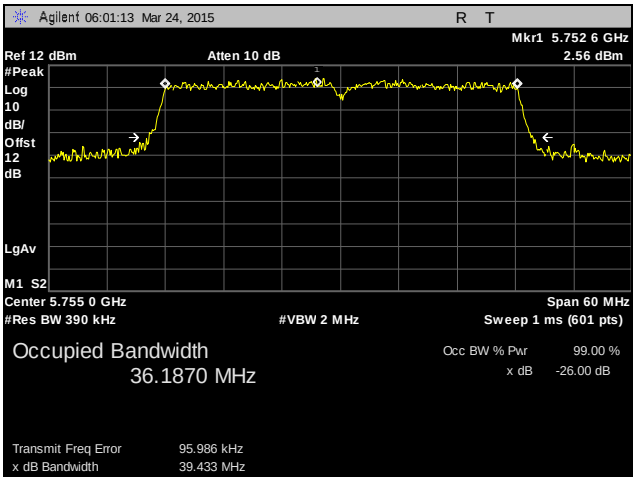
Plot 21. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



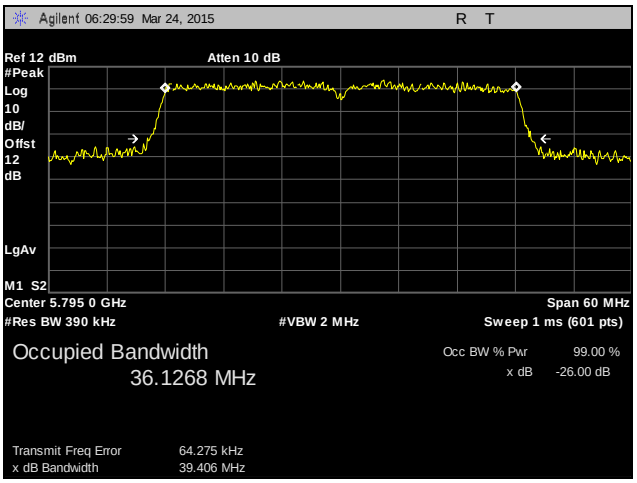
Plot 22. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



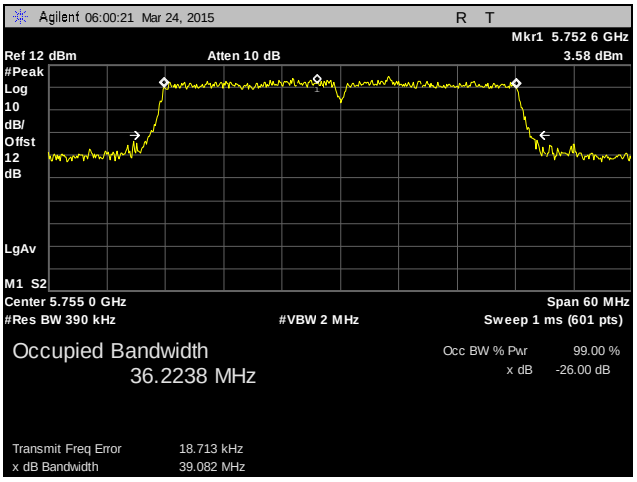
Plot 23. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



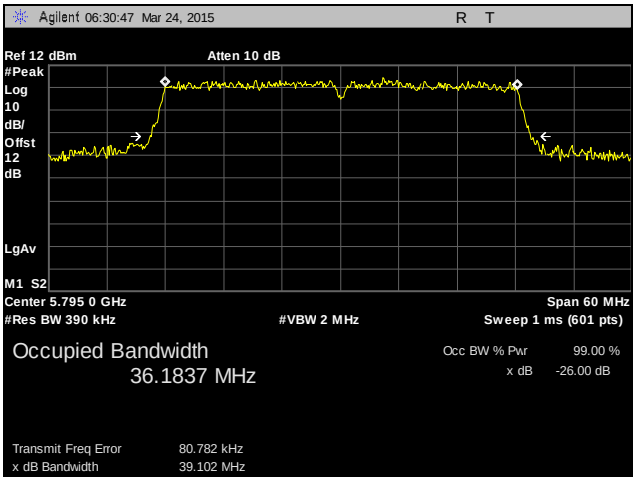
Plot 24. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 40 MHz, SISO, Non-Transmitting Beam-Forming



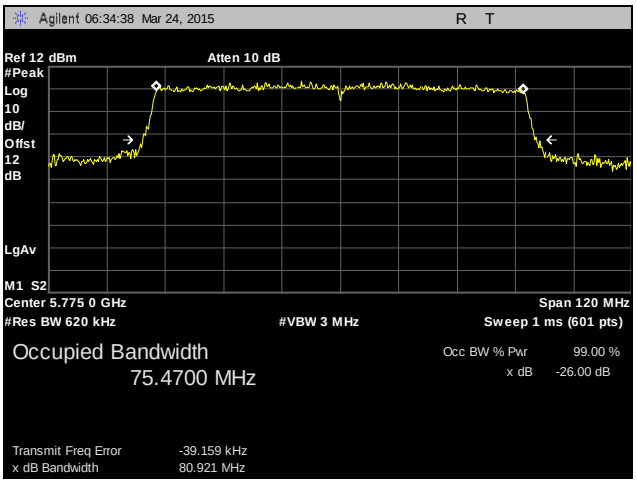
Plot 25. 26 dB Occupied Bandwidth, High Channel, 802.11ac 40 MHz, SISO, Non-Transmitting Beam-Forming



Plot 26. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, SISO, Non-Transmitting Beam-Forming

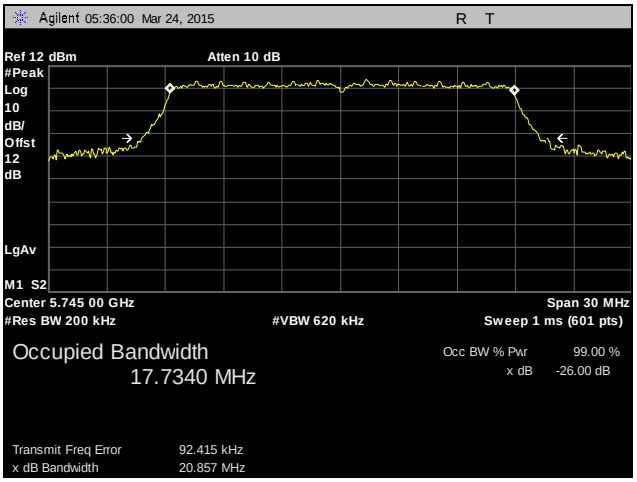


Plot 27. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, SISO, Non-Transmitting Beam-Forming

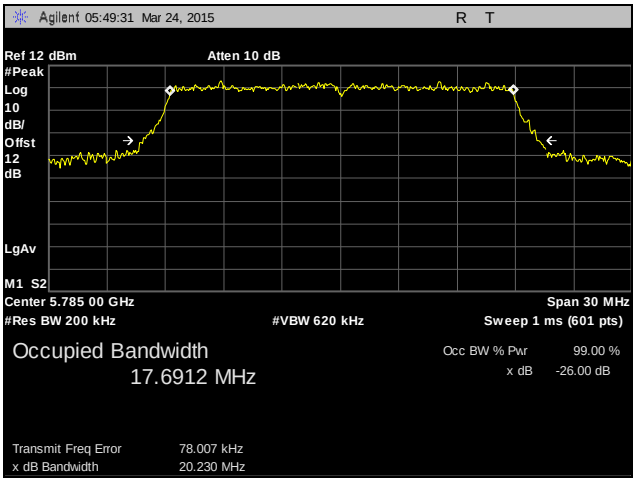


Plot 28. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, SISO, Non-Transmitting Beam-Forming

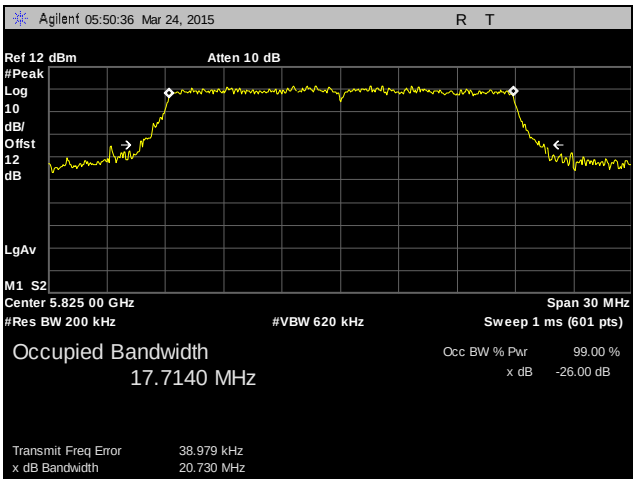
26 dB Occupied Bandwidth Test Results, Transmitting Beam-Forming, MIMO



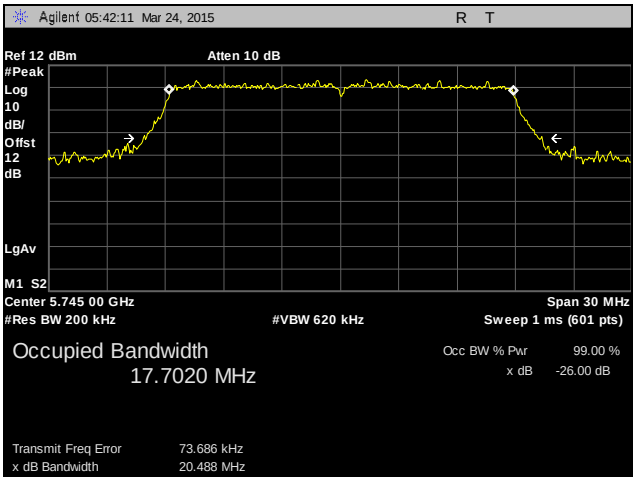
Plot 29. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



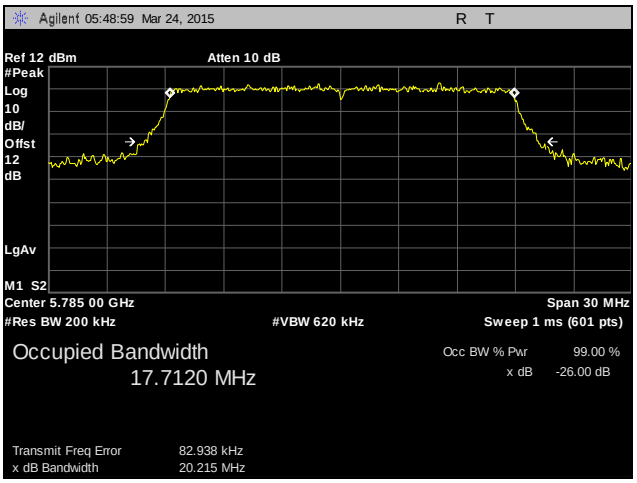
Plot 30. 26 dB Occupied Bandwidth, Mid Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



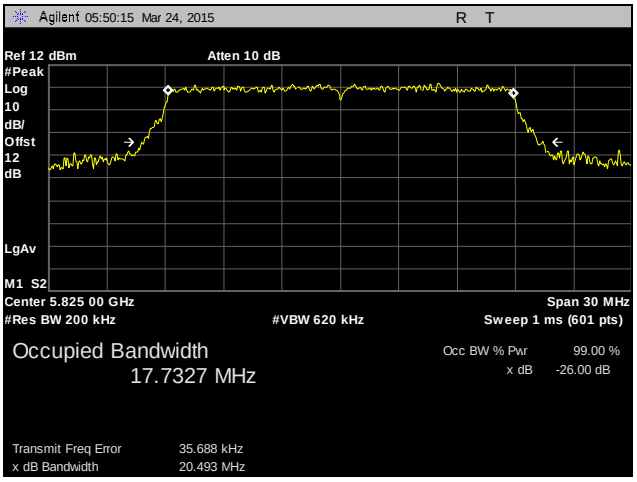
Plot 31. 26 dB Occupied Bandwidth, High Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



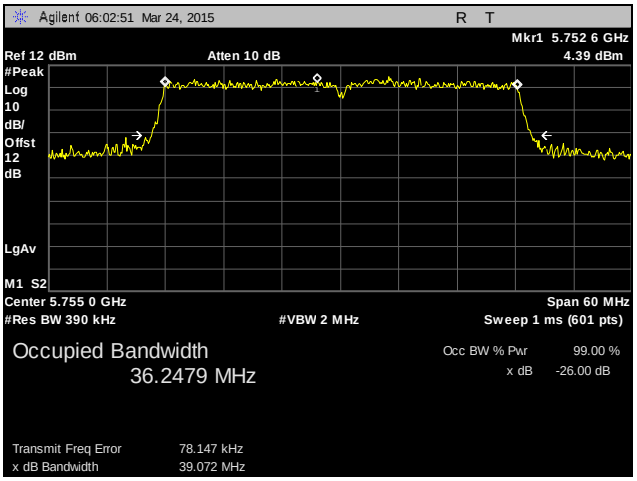
Plot 32. 26 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



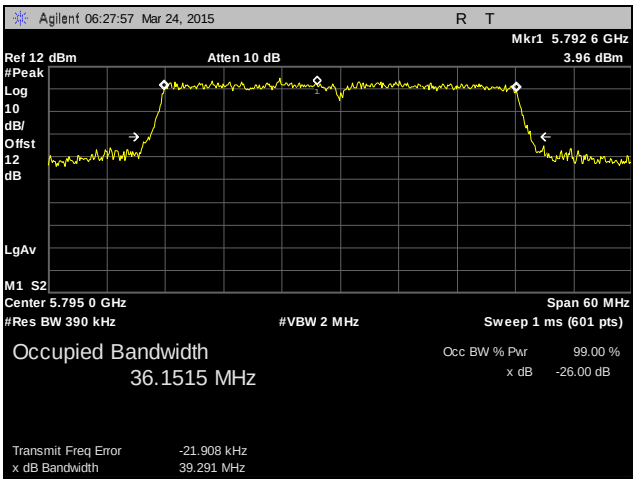
Plot 33. 26 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



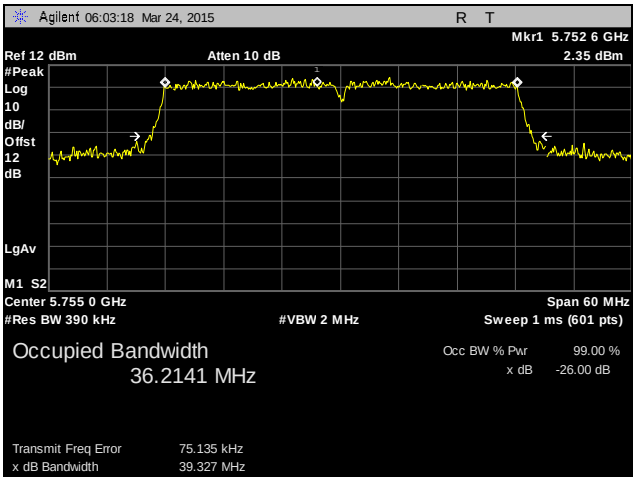
Plot 34. 26 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



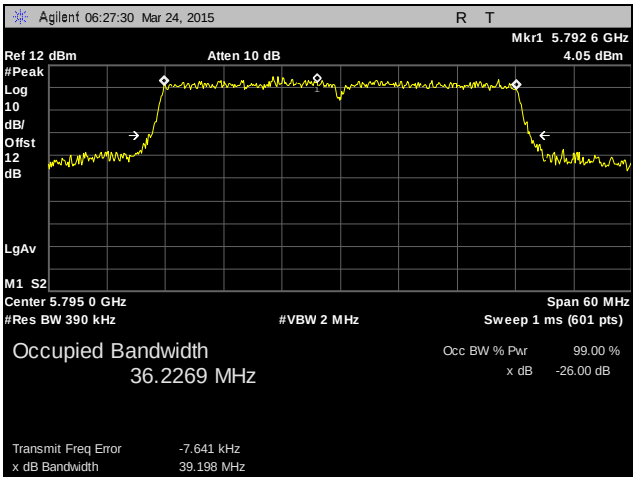
Plot 35. 26 dB Occupied Bandwidth, Low Channel, 802.11ac 40 MHz, MIMO, Transmitting Beam-Forming



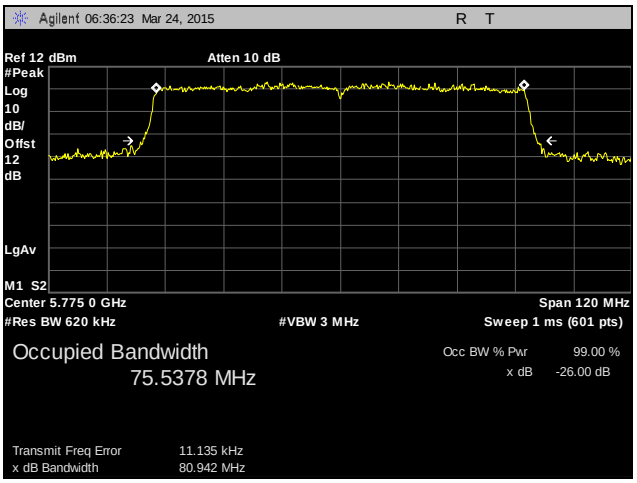
Plot 36. 26 dB Occupied Bandwidth, High Channel, 802.11ac 40 MHz, MIMO, Transmitting Beam-Forming



Plot 37. 26 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, MIMO, Transmitting Beam-Forming



Plot 38. 26 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, MIMO, Transmitting Beam-Forming



Plot 39. 26 dB Occupied Bandwidth, 802.11ac 80 MHz, MIMO, Transmitting Beam-Forming

Electromagnetic Compatibility Criteria for Intentional Radiators

§§15.407(a)(3) RF Power Output

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

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 §15.407(a)(3).

Test Engineer(s): Surinder Singh

Test Date(s): 03/23/15

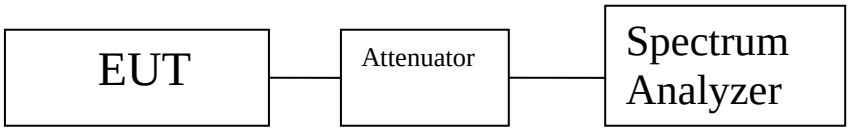


Figure 2. Power Output Test Setup

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	17.72	a	30	4.64	-12.28
149	5745	16.09	n	30	4.64	-13.91
149	5745	16.17	ac	30	4.64	-13.83
157	5785	19.8	a	30	4.64	-10.2
157	5785	19.5	n	30	4.64	-10.5
157	5785	20.1	ac	30	4.64	-9.9
165	5825	18.73	a	30	4.64	-11.27
165	5825	18.59	n	30	4.64	-11.41
165	5825	18.51	ac	30	4.64	-11.49

Table 8. Power Output Power, Non-Transmitting Beam-Forming, 20 MHz, SISO

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	14.02	30	4.64	n	-15.98
151	5755	13.89	30	4.64	ac	-16.11
159	5795	18.89	30	4.64	n	-11.11
159	5795	18.88	30	4.64	ac	-11.12

Table 9. Power Output Power, Non-Transmitting Beam-Forming, 40 MHz, SISO

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	12.25	30	4.64	ac	-17.75

Table 10. Power Output Power, Non-Transmitting Beam-Forming, 80 MHz, SISO

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	16.33	16.48	16.98	a	21.38	27.29	8.71	-5.91
149	5745	14.19	14.37	14.85	n	19.26	27.29	8.71	-8.03
149	5745	14.48	14.55	14.72	ac	19.36	27.29	8.71	-7.93
157	5785	19.05	19.28	19.5	a	24.06	27.29	8.71	-3.23
157	5785	19.58	19.84	20.13	n	24.63	27.29	8.71	-2.66
157	5785	19.22	19.48	19.8	ac	24.28	27.29	8.71	-3.01
165	5825	18.11	18.05	18.24	a	22.91	27.29	8.71	-4.38
165	5825	17.09	17.44	17.72	n	22.2	27.29	8.71	-5.09
165	5825	17.55	17.59	17.95	ac	22.48	27.29	8.71	-4.81

Table 11. Power Output Power, Non-Transmitting Beam-Forming, 20 MHz, MIMO

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	11.05	11.19	11.49	n	16.02	8.71	27.29	-11.27
151	5755	11.25	11.38	11.56	ac	16.17	8.71	27.29	-11.12
159	5795	17.14	17.34	17.75	n	22.19	8.71	27.29	-5.1
159	5795	17.04	17.29	17.88	ac	22.19	8.71	27.29	-5.1

Table 12. Power Output Power, Non-Transmitting Beam-Forming, 40 MHz, MIMO

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	9.81	10.02	10.28	ac	14.82	8.71	27.29	-12.47

Table 13. Power Output Power, Non-Transmitting Beam-Forming, 80 MHz, MIMO

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	14.23	14.56	14.7	n	19.28	27.29	8.71	-8.01
149	5745	14.09	14.25	14.64	ac	19.11	27.29	8.71	-8.18
157	5785	20.11	20.19	20.51	n	25.05	27.29	8.71	-2.24
157	5785	20.41	20.59	20.73	ac	25.35	27.29	8.71	-1.94
165	5825	18.01	18.06	18.2	n	22.87	27.29	8.71	-4.42
165	5825	17.45	17.87	18.02	ac	22.56	27.29	8.71	-4.73

Table 14. Power Output Power, Transmitting Beam-Forming, 20 MHz, MIMO

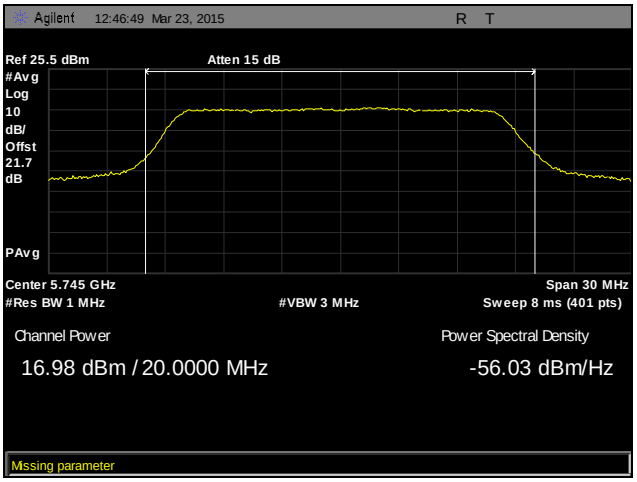
Conducted Output Power 40MHz Band n and ac Mode MIMO (3*3)									
Chanel Carrier	Frequency MHz	Measured Peak Output Power (dBm)/40MHz Ant 0	Measured Peak Output Power (dBm)/40MHz Ant 1	Measured Peak Output Power (dBm)/40MHz Ant 2	mode	Total Output Power	Antenna Gain dBi	Power Limit (dBm)	Margin
151	5755	11.95	12.09	12.26	n	16.88	8.71	27.29	-10.41
151	5755	11.51	11.82	12.04	ac	16.57	8.71	27.29	-10.72
159	5795	17.16	17.48	17.87	n	22.29	8.71	27.29	-5
159	5795	17.48	17.53	17.91	ac	22.42	8.71	27.29	-4.87

Table 15. Power Output Power, Transmitting Beam-Forming, 40 MHz, MIMO

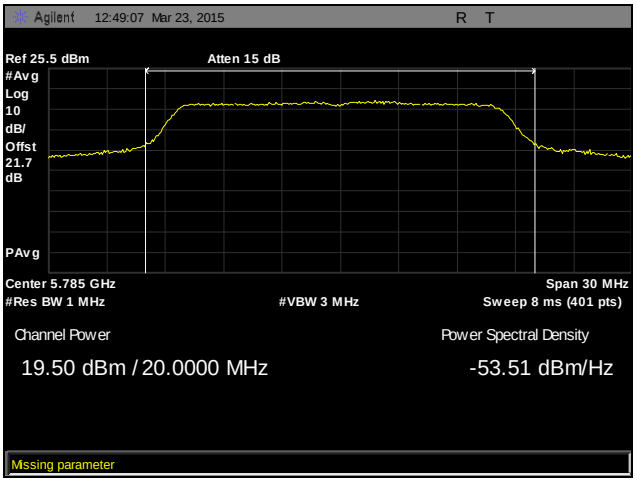
Conducted Output Power 80MHz Band n Mode MIMO (3*3)									
Chanel Carrier	Frequency MHz	Measured Peak Output Power (dBm)/80MHz Ant 0	Measured Peak Output Power (dBm)/80MHz Ant 1	Measured Peak Output Power (dBm)/80MHz Ant 2	mode	Total Output Power	Antenna Gain dBi	Power Limit (dBm)	Margin
155	5775	9.84	10.05	10.19	ac	14.81	8.71	27.29	-12.48

Table 16. Power Output Power, Transmitting Beam-Forming, 80 MHz, MIMO

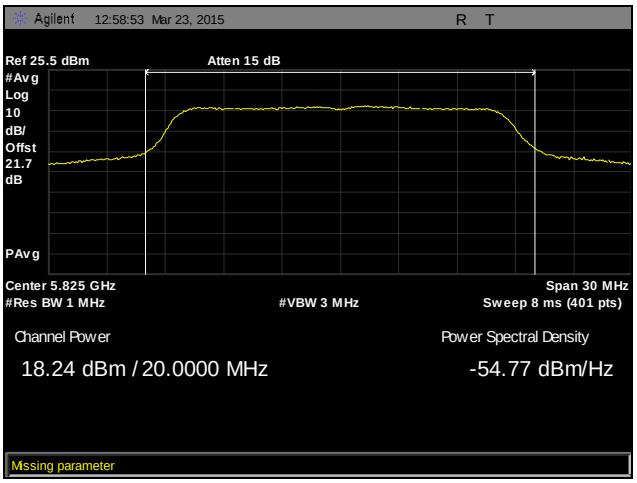
RF Output Power Test Results, Non-Transmitting Beam-Forming, MIMO



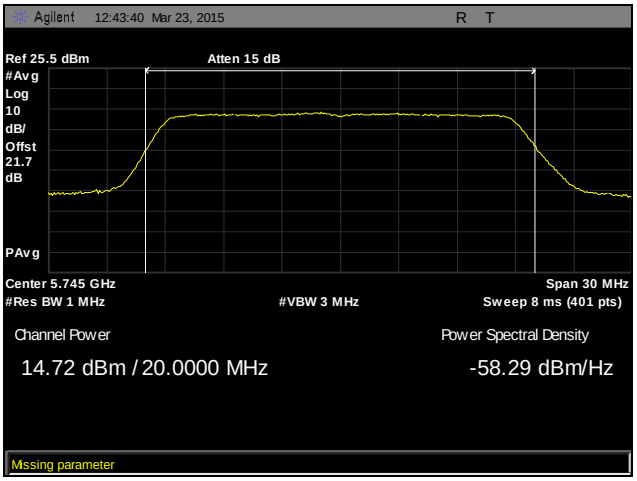
Plot 40. RF Output Power, Low Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



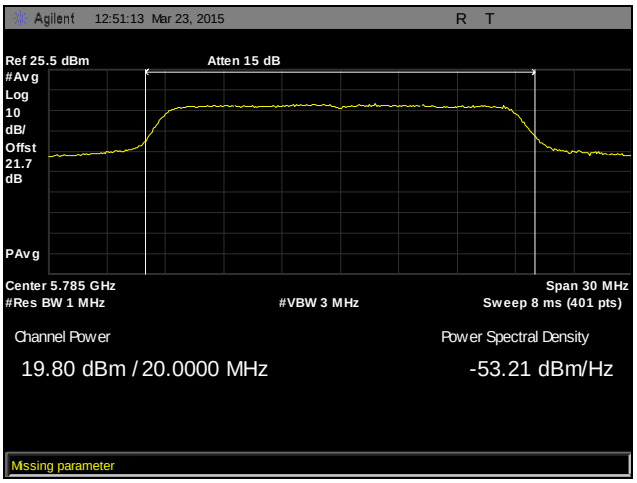
Plot 41. RF Output Power, Mid Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



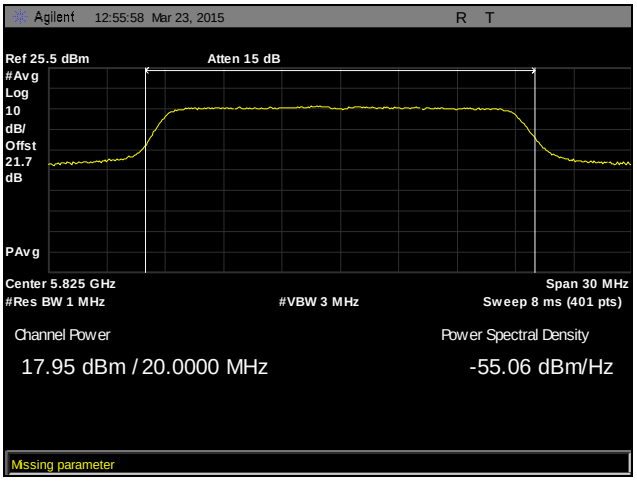
Plot 42. RF Output Power, High Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



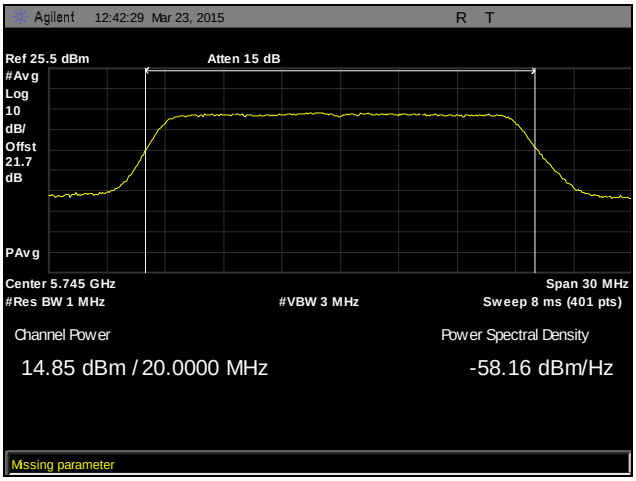
Plot 43. RF Output Power, Low Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



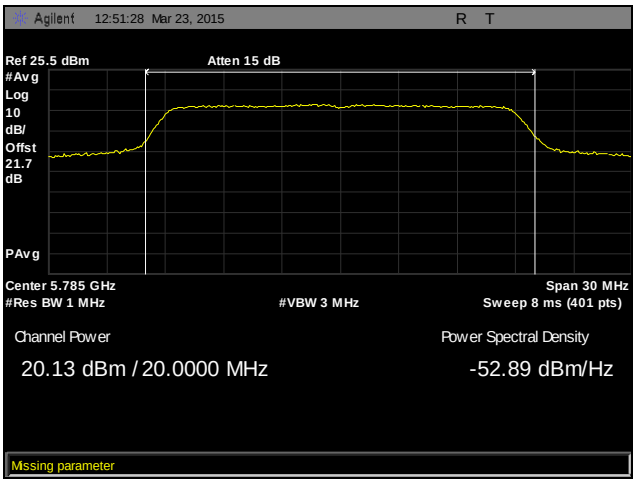
Plot 44. RF Output Power, Mid Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



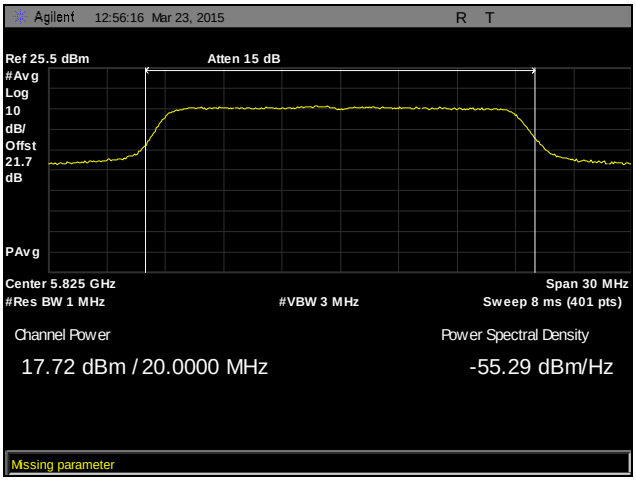
Plot 45. RF Output Power, High Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



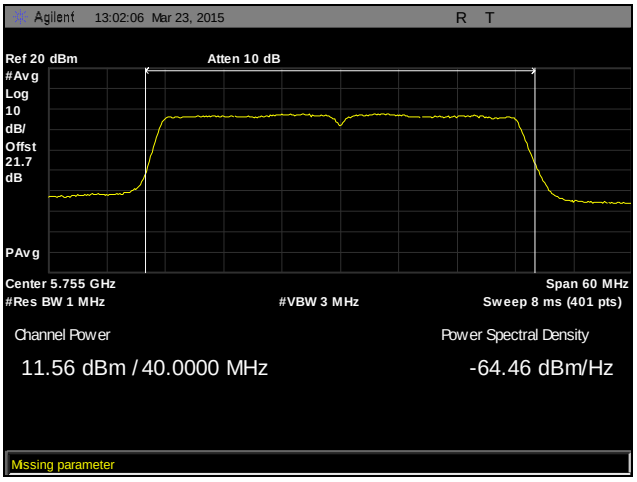
Plot 46. RF Output Power, Low Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



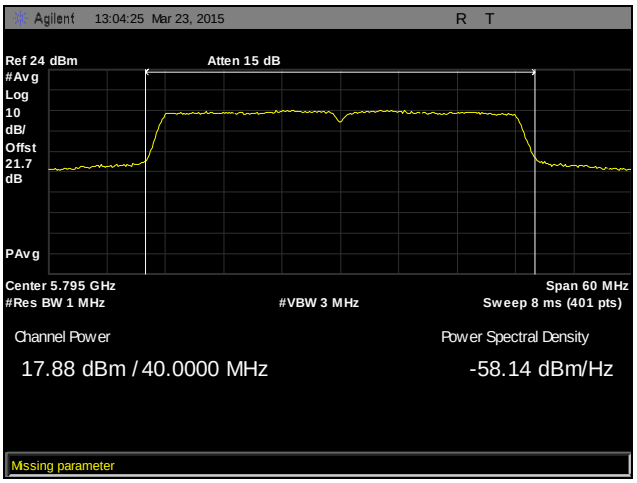
Plot 47. RF Output Power, Mid Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



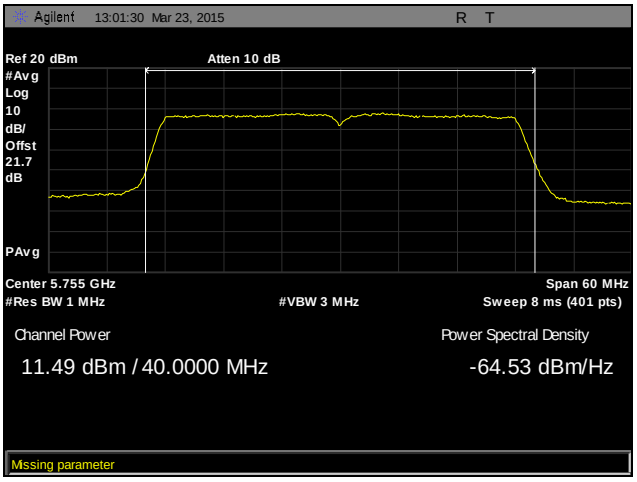
Plot 48. RF Output Power, High Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



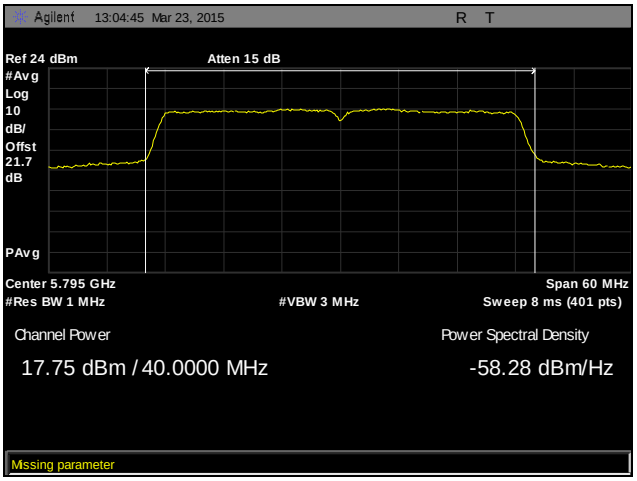
Plot 49. RF Output Power, Low Channel, 802.11ac 40 MHz, MIMO, Non-Transmitting Beam-Forming



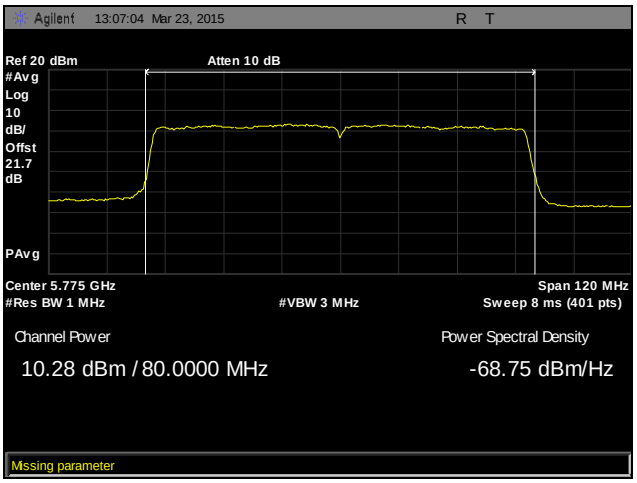
Plot 50. RF Output Power, High Channel, 802.11ac 40 MHz, MIMO, Non-Transmitting Beam-Forming



Plot 51. RF Output Power, Low Channel, 802.11n 40 MHz, MIMO, Non-Transmitting Beam-Forming

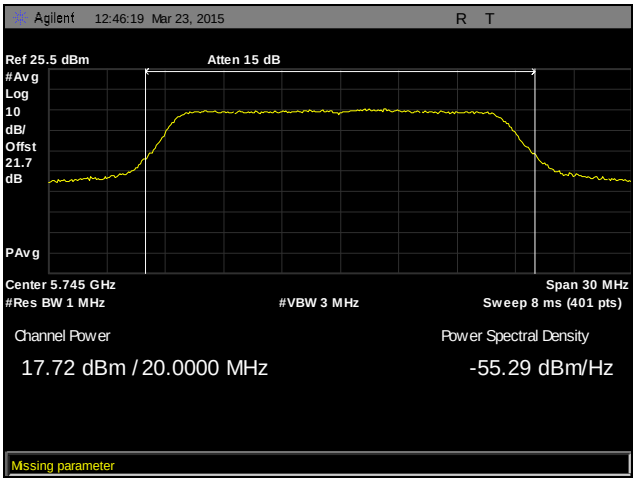


Plot 52. RF Output Power, High Channel, 802.11n 40 MHz, MIMO, Non-Transmitting Beam-Forming

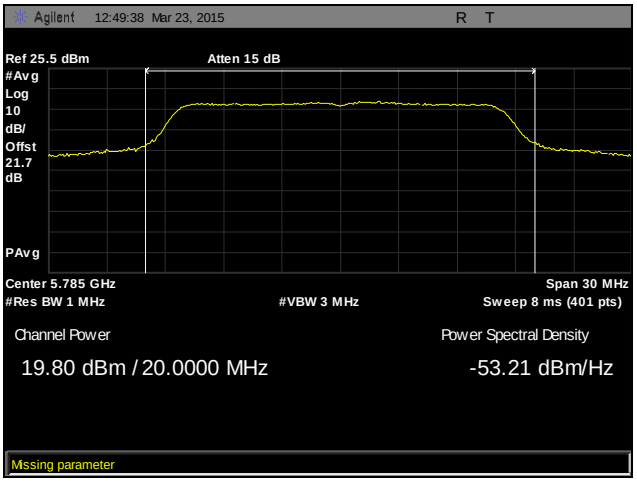


Plot 53. RF Output Power, 802.11ac 80 MHz, MIMO, Non-Transmitting Beam-Forming

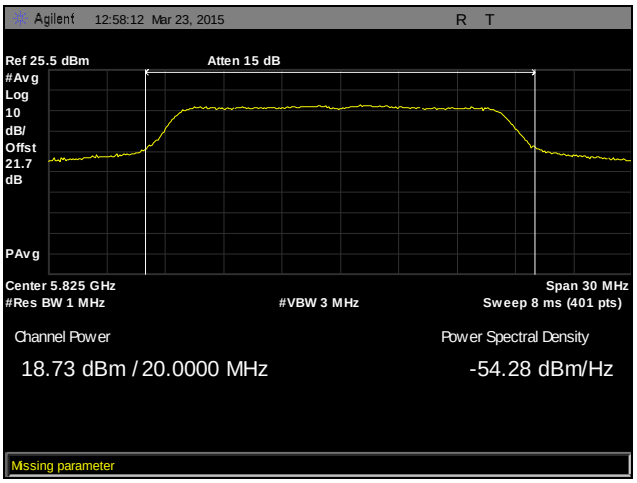
RF Output Power Test Results, Non-Transmitting Beam-Forming, SISO



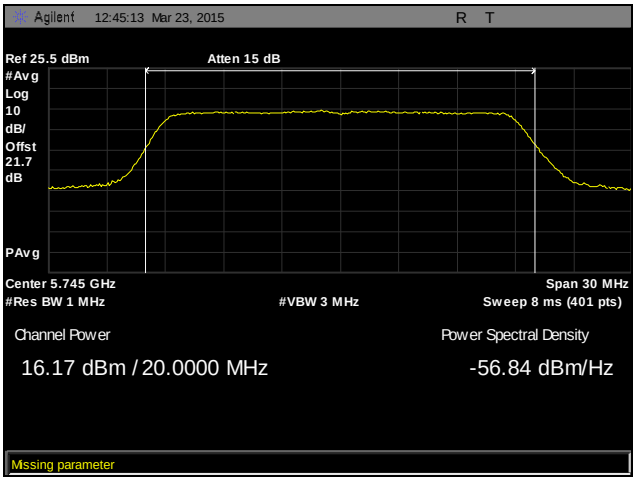
Plot 54. RF Output Power, Low Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



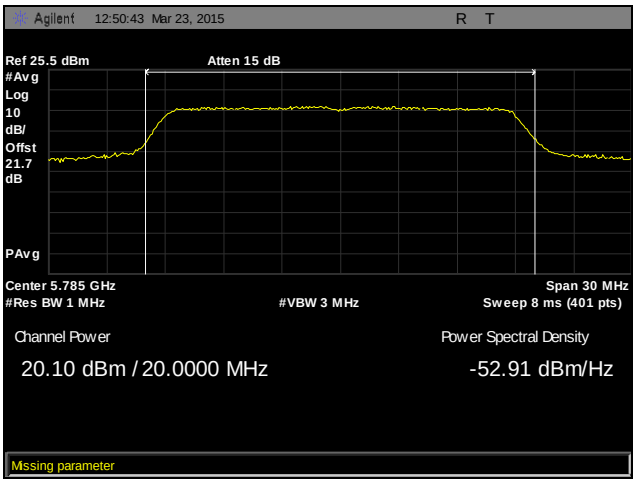
Plot 55. RF Output Power, Mid Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



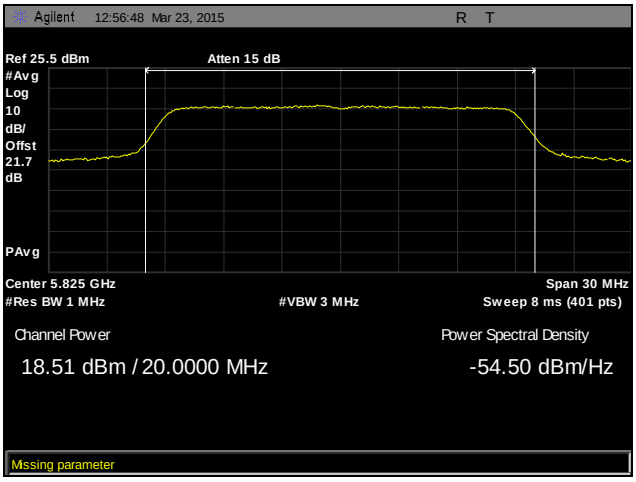
Plot 56. RF Output Power, High Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



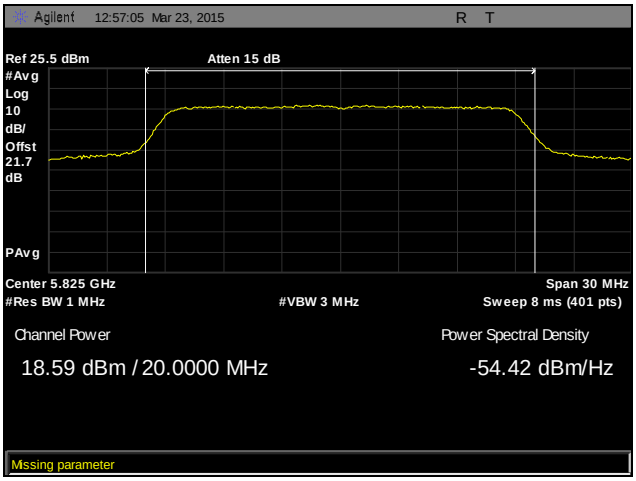
Plot 57. RF Output Power, Low Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



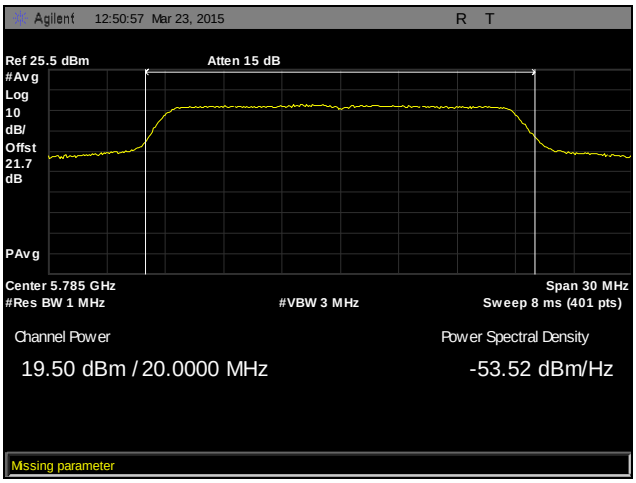
Plot 58. RF Output Power, Mid Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



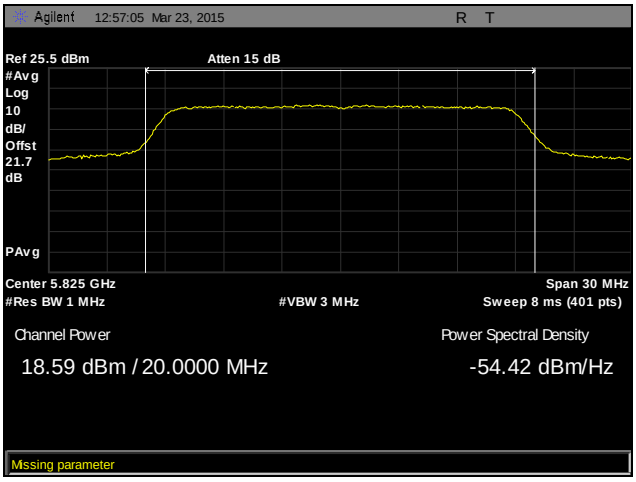
Plot 59. RF Output Power, High Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



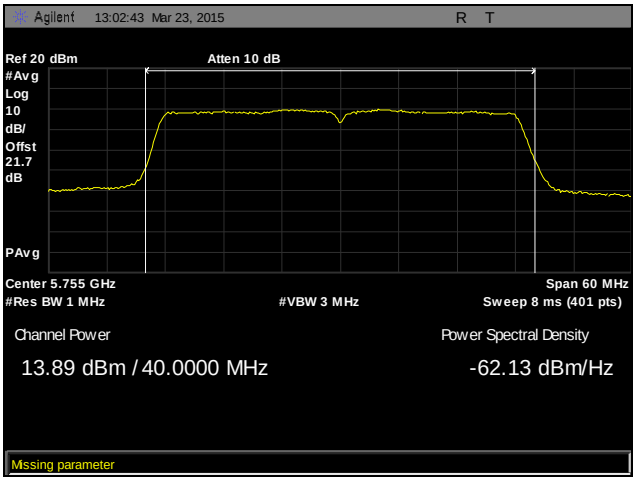
Plot 60. RF Output Power, Low Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



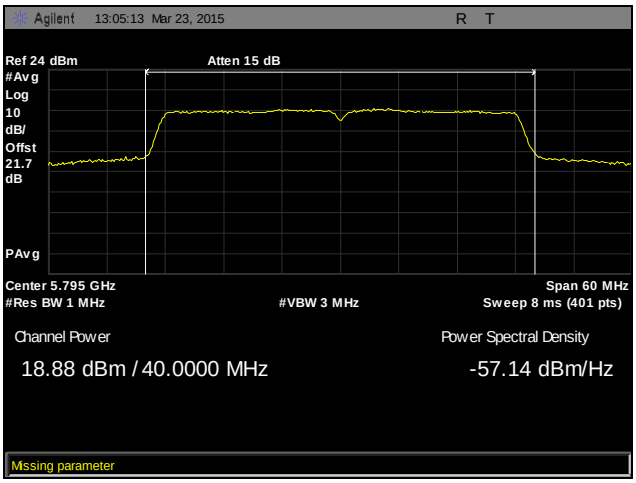
Plot 61. RF Output Power, Mid Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



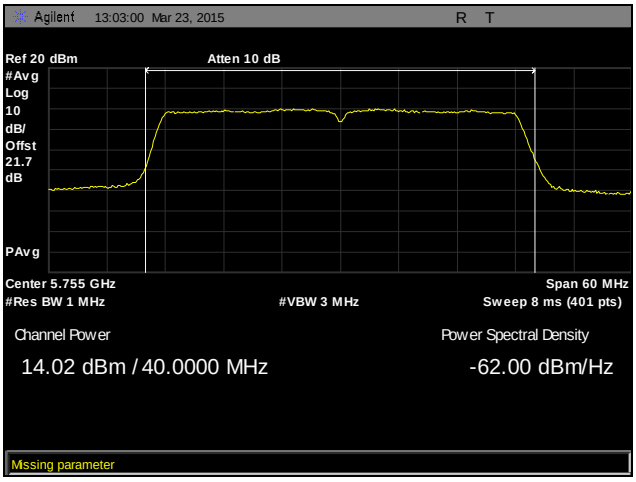
Plot 62. RF Output Power, High Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



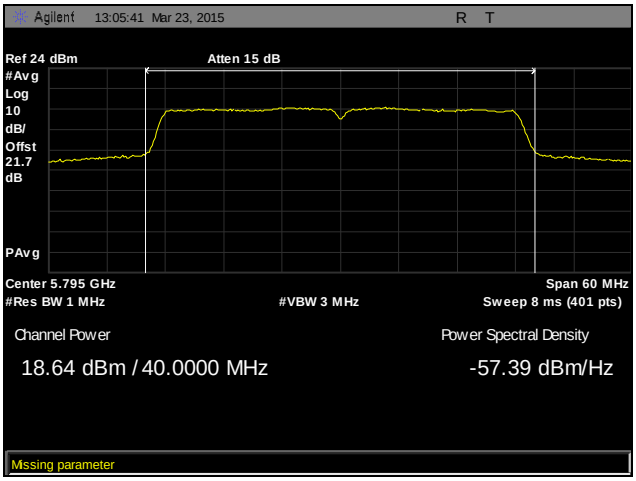
Plot 63. RF Output Power, Low Channel, 802.11ac 40 MHz, SISO, Non-Transmitting Beam-Forming



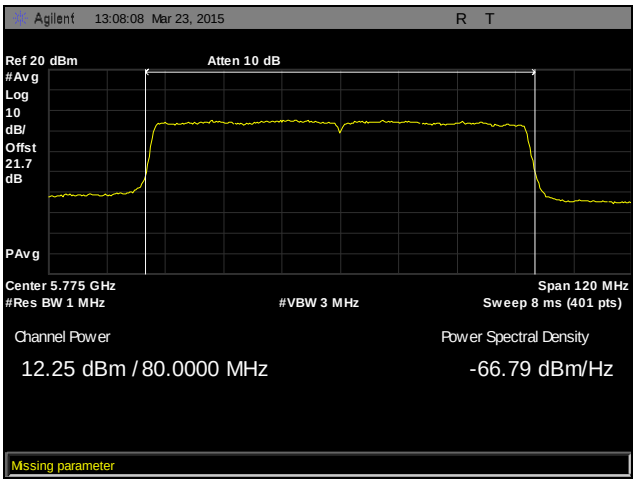
Plot 64. RF Output Power, High Channel, 802.11ac 40 MHz, SISO, Non-Transmitting Beam-Forming



Plot 65. RF Output Power, Low Channel, 802.11n 40 MHz, SISO, Non-Transmitting Beam-Forming

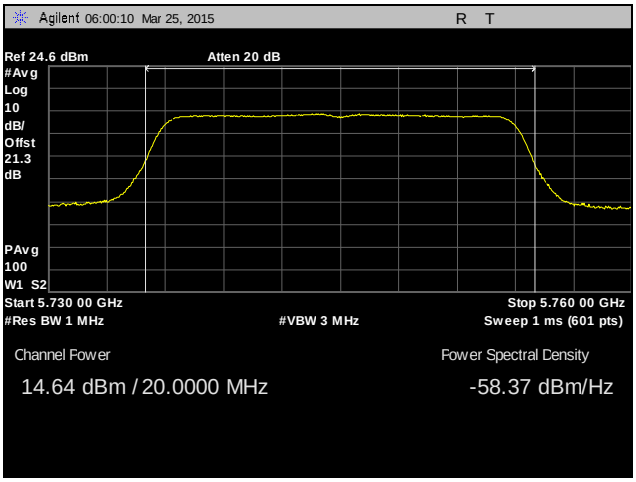


Plot 66. RF Output Power, High Channel, 802.11n 40 MHz, SISO, Non-Transmitting Beam-Forming

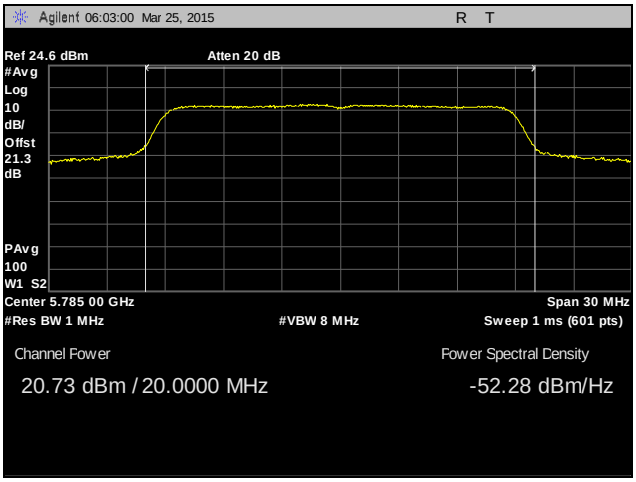


Plot 67. RF Output Power, 802.11ac 80 MHz, SISO, Non-Transmitting Beam-Forming

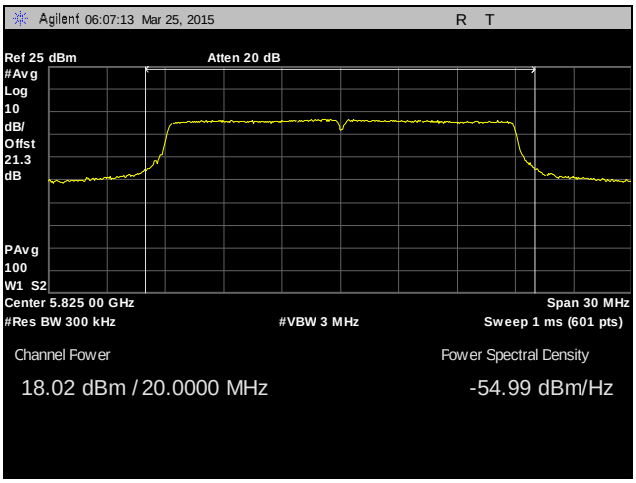
RF Output Power Test Results, Transmitting Beam-Forming, MIMO



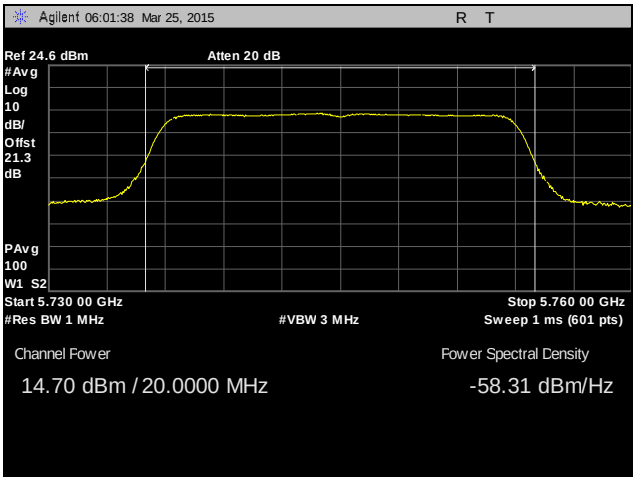
Plot 68. RF Output Power, Low Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



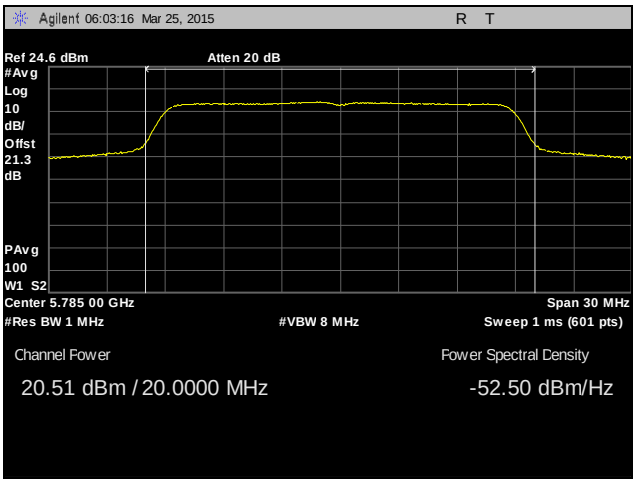
Plot 69. RF Output Power, Mid Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



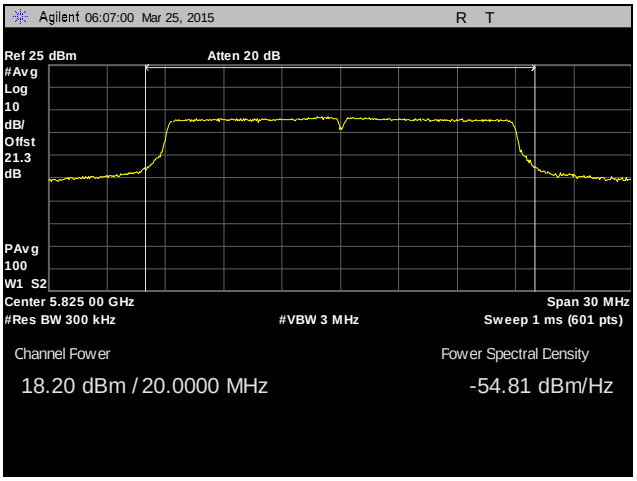
Plot 70. RF Output Power, High Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



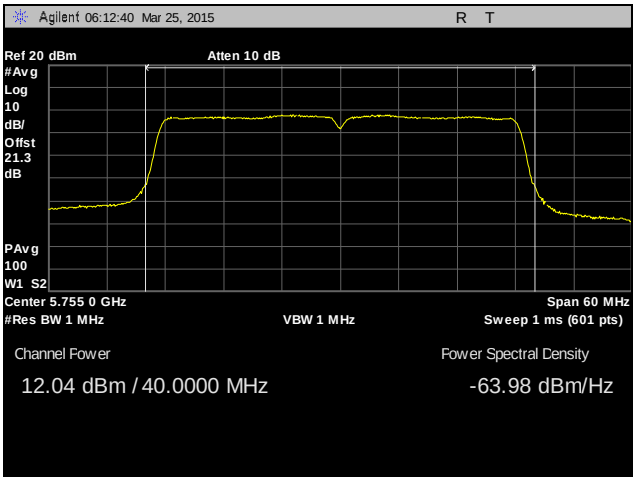
Plot 71. RF Output Power, Low Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



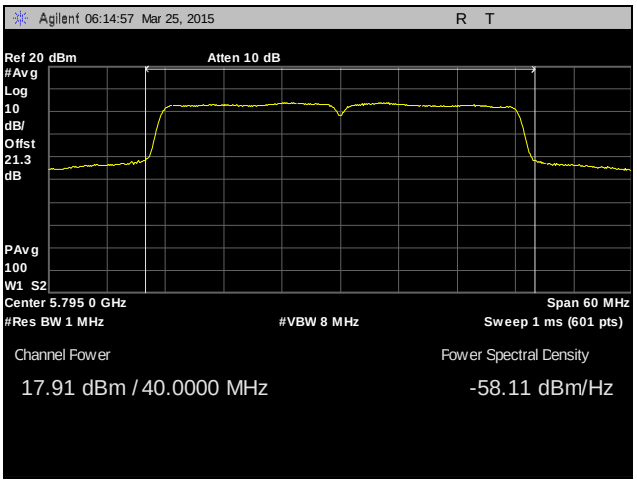
Plot 72. RF Output Power, Mid Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



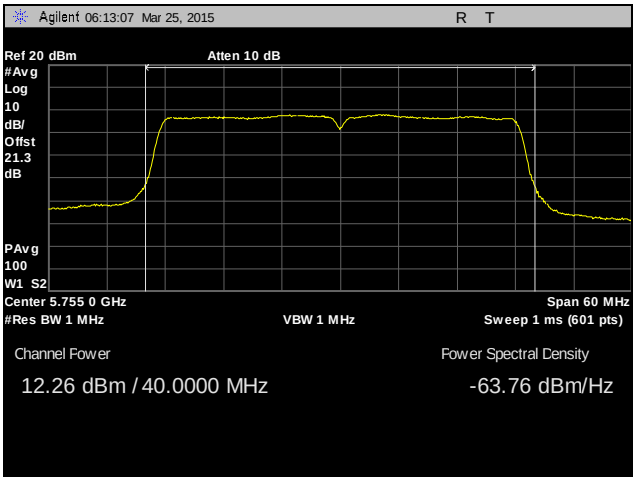
Plot 73. RF Output Power, High Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



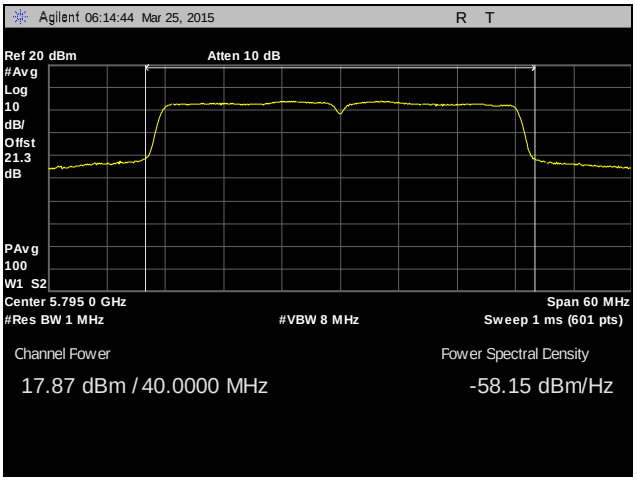
Plot 74. RF Output Power, Low Channel, 802.11ac 40 MHz, MIMO, Transmitting Beam-Forming



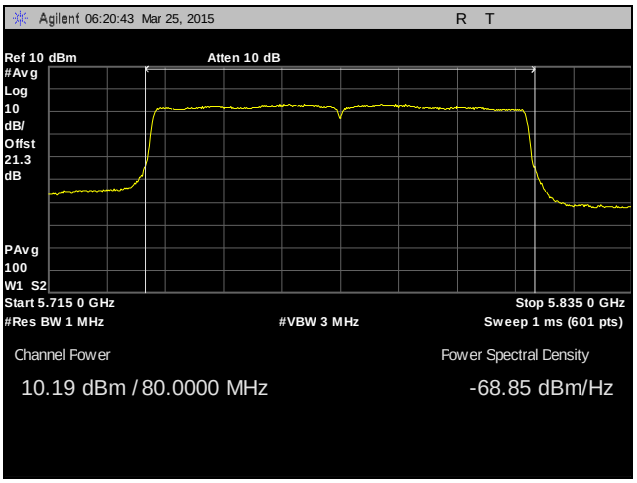
Plot 75. RF Output Power, High Channel, 802.11ac 40 MHz, MIMO, Transmitting Beam-Forming



Plot 76. RF Output Power, Low Channel, 802.11n 40 MHz, MIMO, Transmitting Beam-Forming



Plot 77. RF Output Power, High Channel, 802.11n 40 MHz, MIMO, Transmitting Beam-Forming



Plot 78. RF Output Power, 802.11ac 80 MHz, MIMO, Transmitting Beam-Forming

Electromagnetic Compatibility Criteria for Intentional Radiators

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

Test Requirements: **§15.407(a)(3):** In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

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)(3) The peak power spectral density was determined from plots on the following page(s).

Test Engineer(s): Surinder Singh

Test Date(s): 03/23/15

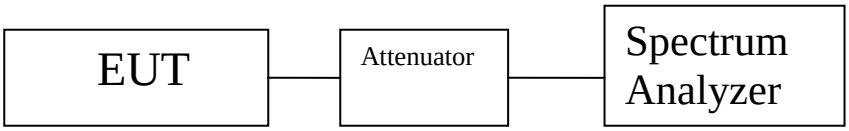


Figure 3. Power Spectral Density Test Setup

Conducted PSD Band 802.11a/n/ac Mode SISO						
Channel	**Frequency MHz**	**Measured Conducted PSD (dBm)/1MHz**	**Mode**	**Power Limit (dBm)**	**Antenna Gain dBi**	**Margin Ant**
149	5745	7.8	a	30	4.64	-22.2
149	5745	6.9	n	30	4.64	-23.1
149	5745	7.3	ac	30	4.64	-22.7
157	5785	8	a	30	4.64	-22
157	5785	6	n	30	4.64	-24
157	5785	6.8	ac	30	4.64	-23.2
165	5825	7.2	a	30	4.64	-22.8
165	5825	5.1	n	30	4.64	-24.9
165	5825	4.6	ac	30	4.64	-25.4

Table 17. Peak Power Spectral Density, Non-Transmitting Beam-Forming, 20 MHz, SISO

Conducted PSD 40MHz Band n and ac Mode SISO						
Channel	**Frequency MHz**	**Measured Conducted PSD (dBm)/1MHz**	**Power Limit (dBm)**	**Antenna Gain dBi**	**mode**	**Margin**
151	5755	4.2	30	4.64	n	-25.8
151	5755	1.6	30	4.64	ac	-28.4
159	5795	4.3	30	4.64	n	-25.7
159	5795	4.5	30	4.64	ac	-25.5

Table 18. Peak Power Spectral Density, Non-Transmitting Beam-Forming, 40 MHz, SISO

Conducted PSD 80MHz Band ac Mode SISO						
Channel	**Frequency MHz**	**Measured Conducted PSD (dBm)/1MHz**	**Power Limit (dBm)**	**Antenna Gain dBi**	**mode**	**Margin**
155	5775	-4.75	30	4.64	ac	-34.75

Table 19. Peak Power Spectral Density, Non-Transmitting Beam-Forming, 80 MHz, SISO

Conducted PSD 20MHz Band 802.11a/n/ac Mode MIMO									
Channel	Frequency MHz	Measured Conducted PSD (dBm)/1MHz Ant0	Measured Conducted PSD (dBm)/1MHz Ant1	Measured Conducted PSD (dBm)/1MHz Ant2	Mode	Total power dBm	Power Limit (dBm)	Antenna Gain dBi	Margin
149	5745	5.02	5.12	5.2	a	9.89	27.29	8.71	-17.4
149	5745	3.06	3.15	3.2	n	7.91	27.29	8.71	-19.38
149	5745	3.3	3.41	3.5	ac	8.18	27.29	8.71	-19.11
157	5785	8.16	8.29	8.4	a	13.06	27.29	8.71	-14.23
157	5785	7.19	7.3	7.4	n	12.07	27.29	8.71	-15.22
157	5785	7.04	7.23	7.3	ac	11.97	27.29	8.71	-15.32
165	5825	7.32	7.45	7.6	a	12.23	27.29	8.71	-15.06
165	5825	6.45	6.87	7	n	11.56	27.29	8.71	-15.73
165	5825	6.94	7.25	7.3	ac	11.94	27.29	8.71	-15.35

Table 20. Peak Power Spectral Density, Non-Transmitting Beam-Forming, 20 MHz, MIMO

Conducted PSD 40MHz Band n and ac Mode MIMO (3*3)									
Chanel Carrier	Frequency MHz	Measured Conducted PSD (dBm)/1MHz Ant0	Measured Conducted PSD (dBm)/1MHz Ant1	Measured Conducted PSD (dBm)/1MHz Ant2	mode	Total Output Power	Antenna Gain dBi	Power Limit (dBm)	Margin
151	5755	-2.15	-2.04	-1.9	n	2.75	8.71	27.29	-24.54
151	5755	-2.89	-2.46	-2.1	ac	2.3	8.71	27.29	-24.99
159	5795	3.44	3.67	3.8	n	8.42	8.71	27.29	-18.87
159	5795	3.38	3.47	3.86	ac	8.35	8.71	27.29	-18.94

Table 21. Peak Power Spectral Density, Non-Transmitting Beam-Forming, 40 MHz, MIMO

Conducted PSD 80MHz Band n Mode MIMO (3*3)									
Chanel Carrier	Frequency MHz	Measured Conducted PSD (dBm)/1MHz Ant0	Measured Conducted PSD (dBm)/1MHz Ant1	Measured Conducted PSD (dBm)/1MHz Ant2	mode	Total Output Power	Antenna Gain dBi	Power Limit (dBm)	Margin
155	5775	-7.09	-7.05	-6.94	ac	-2.25	8.71	27.29	-29.54

Table 22. Peak Power Spectral Density, Non-Transmitting Beam-Forming, 80 MHz, MIMO

Conducted PSD 20MHz Band 802.11a/n/ac Mode MIMO									
Channel	Frequency MHz	Measured Conducted PSD (dBm)/1MHz Ant0	Measured Conducted PSD (dBm)/1MHz Ant1	Measured Conducted PSD (dBm)/1MHz Ant2	Mode	Total power dBm	Power Limit (dBm)	Antenna Gain dBi	Margin
149	5745	3.15	3.28	3.37	n	8.04	27.29	8.71	-19.25
149	5745	2.98	3.05	3.13	ac	7.83	27.29	8.71	-19.46
157	5785	7.15	7.49	7.94	n	12.31	27.29	8.71	-14.98
157	5785	8.16	8.27	8.43	ac	13.06	27.29	8.71	-14.23
165	5825	5.49	5.68	5.94	n	10.48	27.29	8.71	-16.81
165	5825	6.7	6.84	6.9	ac	11.59	27.29	8.71	-15.7

Table 23. Peak Power Spectral Density, Transmitting Beam-Forming, 20 MHz, MIMO

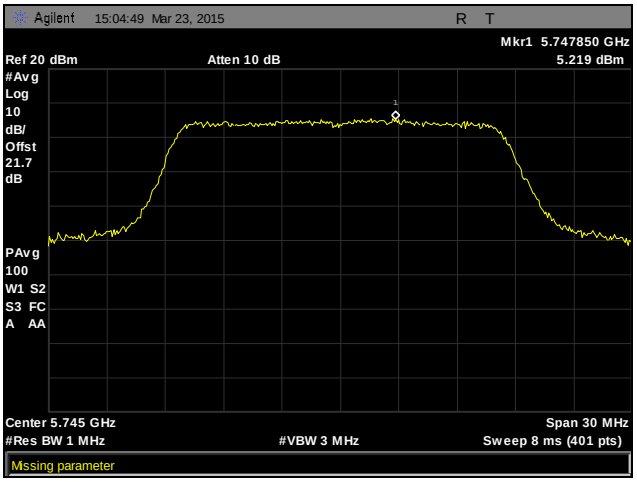
Conducted PSD 40MHz Band n and ac Mode MIMO (3*3)									
Chanel Carrier	Frequency MHz	Measured Conducted PSD (dBm)/1MHz Ant0	Measured Conducted PSD (dBm)/1MHz Ant1	Measured Conducted PSD (dBm)/1MHz Ant2	mode	Total Output Power	Antenna Gain dBi	Power Limit (dBm)	Margin
151	5755	-2.94	-2.64	-2.32	n	2.15	8.71	27.29	-25.14
151	5755	3.67	3.73	3.99	ac	8.58	8.71	27.29	-18.71
159	5795	-2.47	-2.35	-2.16	n	2.45	8.71	27.29	-24.84
159	5795	3.43	3.77	3.94	ac	8.49	8.71	27.29	-18.8

Table 24. Peak Power Spectral Density, Transmitting Beam-Forming, 40 MHz, MIMO

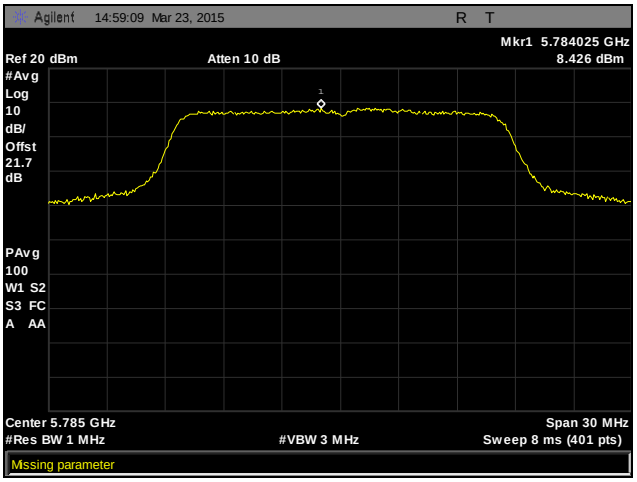
Conducted PSD 80MHz Band n Mode MIMO (3*3)									
Chanel Carrier	Frequency MHz	Measured Conducted PSD (dBm)/1MHz Ant0	Measured Conducted PSD (dBm)/1MHz Ant1	Measured Conducted PSD (dBm)/1MHz Ant2	mode	Total Output Power	Antenna Gain dBi	Power Limit (dBm)	Margin
155	5775	-7.05	-6.98	-6.9	ac	-2.2	8.71	27.29	-29.49

Table 25. Peak Power Spectral Density, Transmitting Beam-Forming, 80 MHz, MIMO

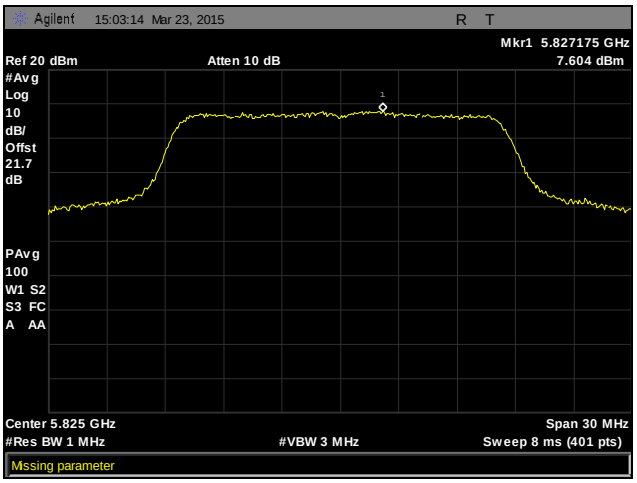
Peak Power Spectral Density Test Results, Non-Transmitting Beam-Forming, MIMO



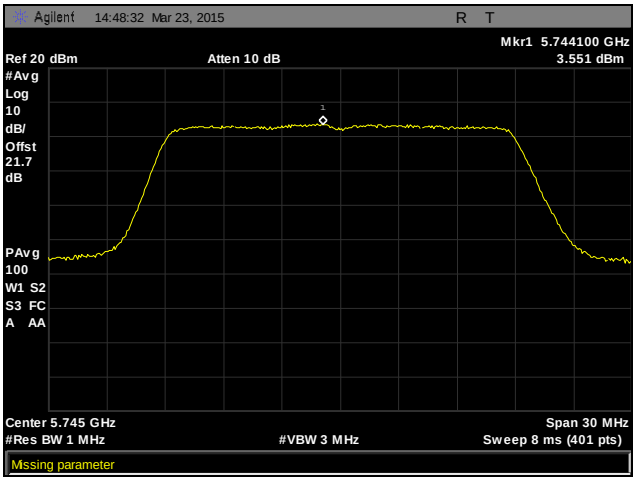
Plot 79. Peak Power Spectral Density, Low Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



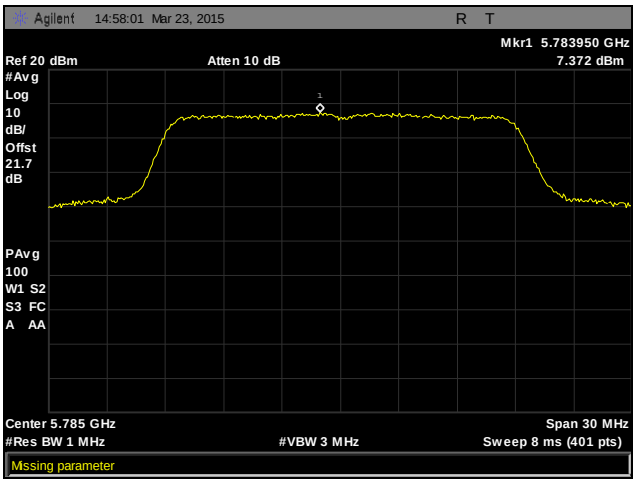
Plot 80. Peak Power Spectral Density, Mid Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



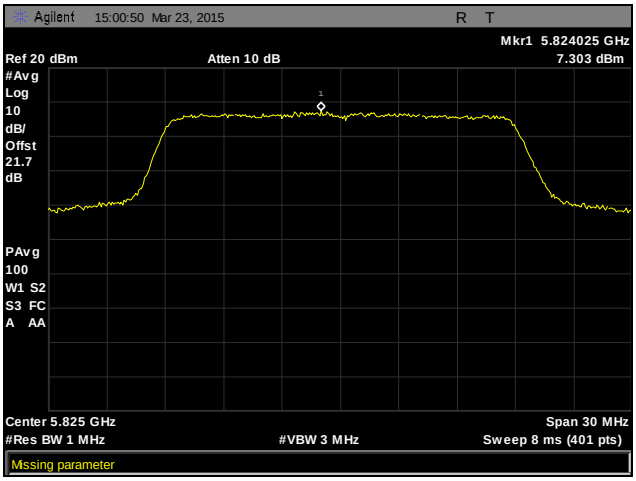
Plot 81. Peak Power Spectral Density, High Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



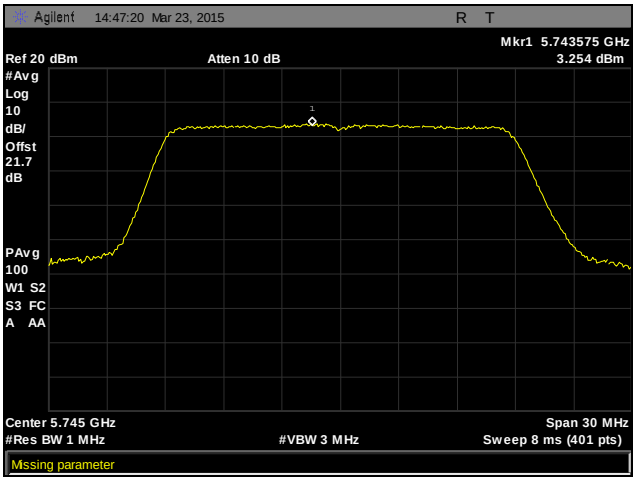
Plot 82. Peak Power Spectral Density, Low Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



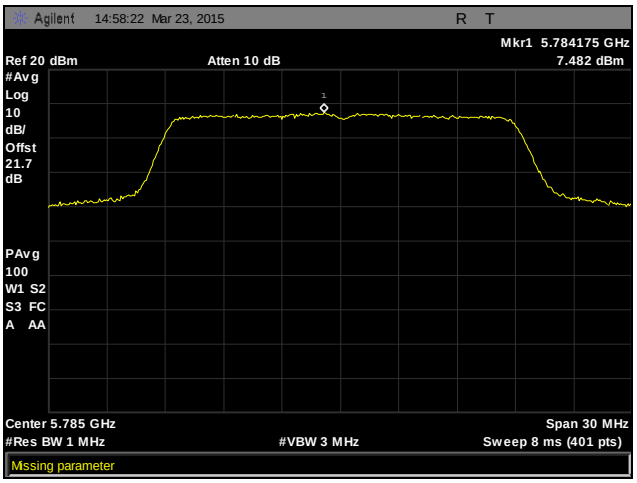
Plot 83. Peak Power Spectral Density, Mid Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



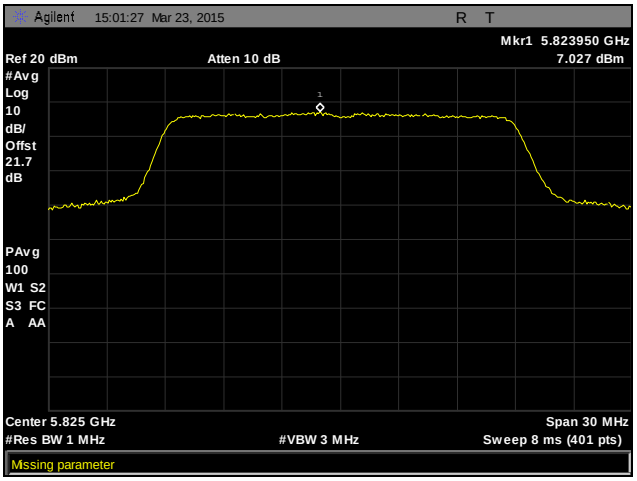
Plot 84. Peak Power Spectral Density, High Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



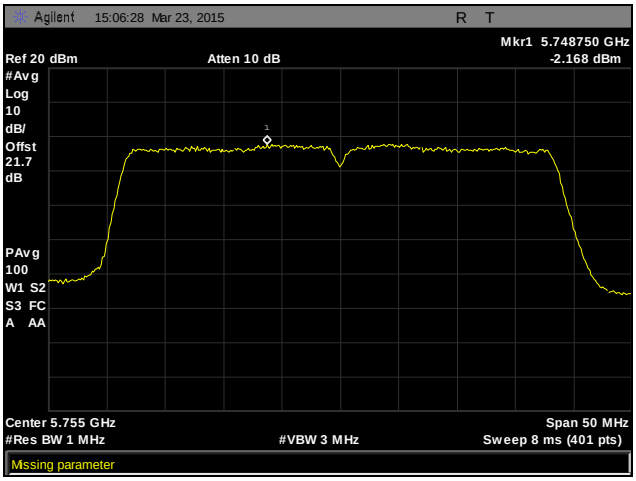
Plot 85. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



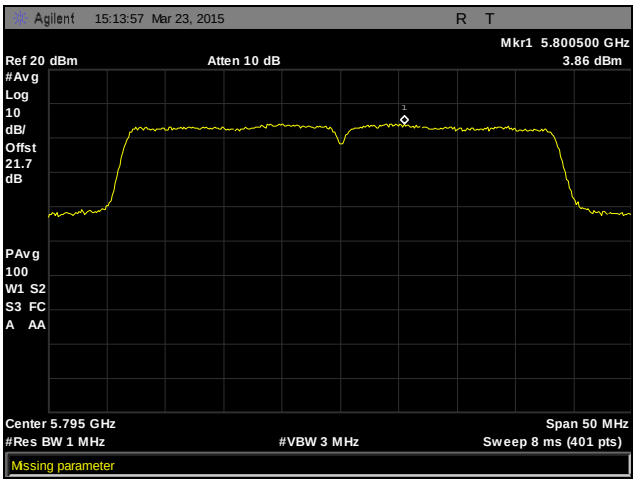
Plot 86. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



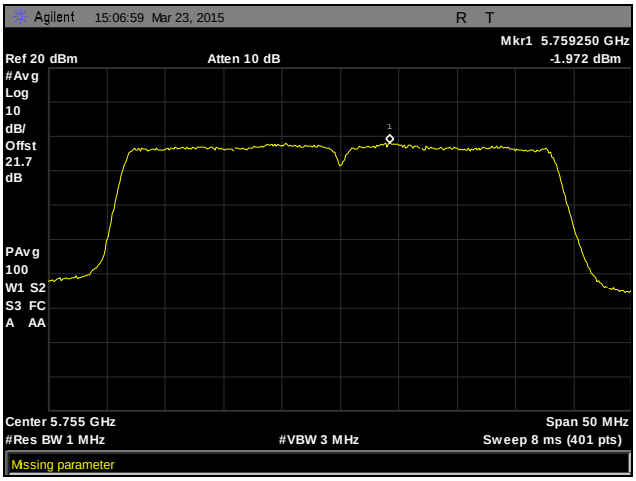
Plot 87. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



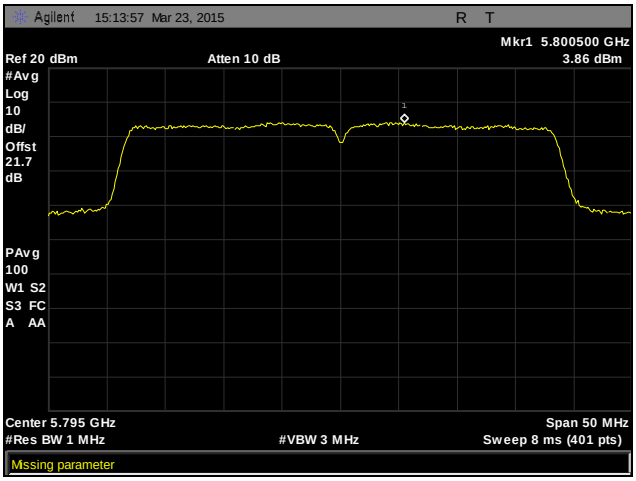
Plot 88. Peak Power Spectral Density, Low Channel, 802.11ac 40 MHz, MIMO, Non-Transmitting Beam-Forming



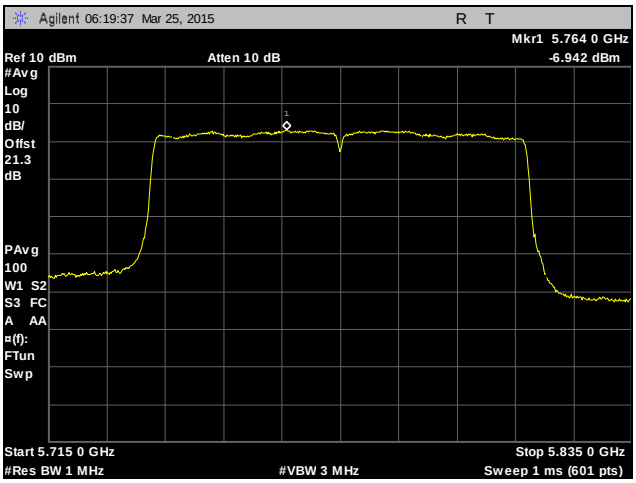
Plot 89. Peak Power Spectral Density, High Channel, 802.11ac 40 MHz, MIMO, Non-Transmitting Beam-Forming



Plot 90. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, MIMO, Non-Transmitting Beam-Forming

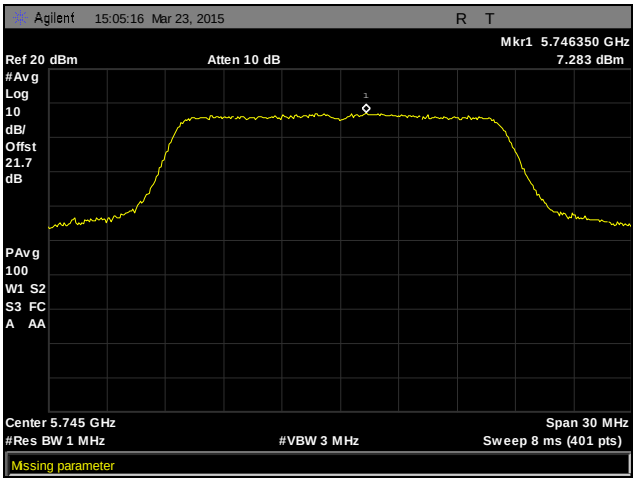


Plot 91. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, MIMO, Non-Transmitting Beam-Forming

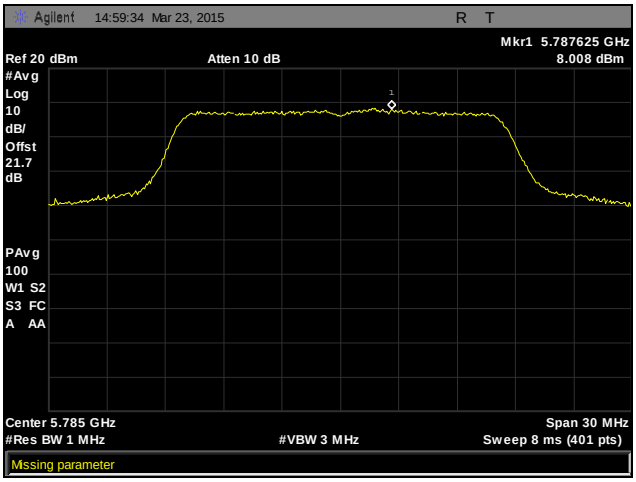


Plot 92. Peak Power Spectral Density, 802.11ac 80 MHz, MIMO, Non-Transmitting Beam-Forming

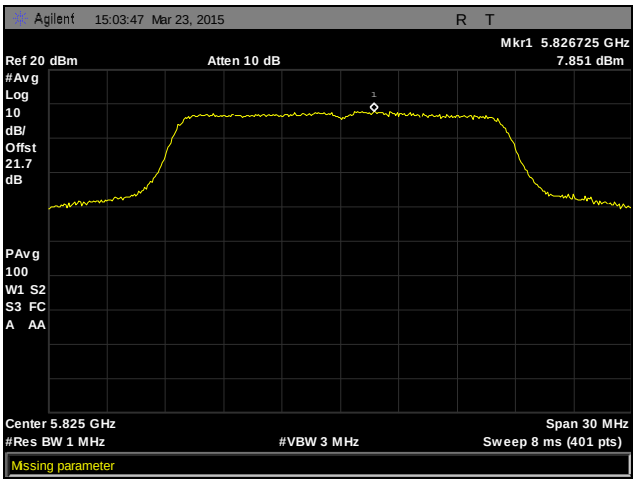
Peak Power Spectral Density Test Results, Non-Transmitting Beam-Forming, SISO



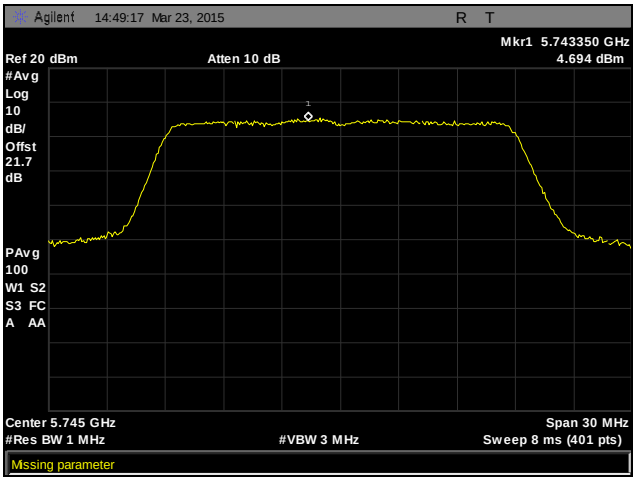
Plot 93. Peak Power Spectral Density, Low Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



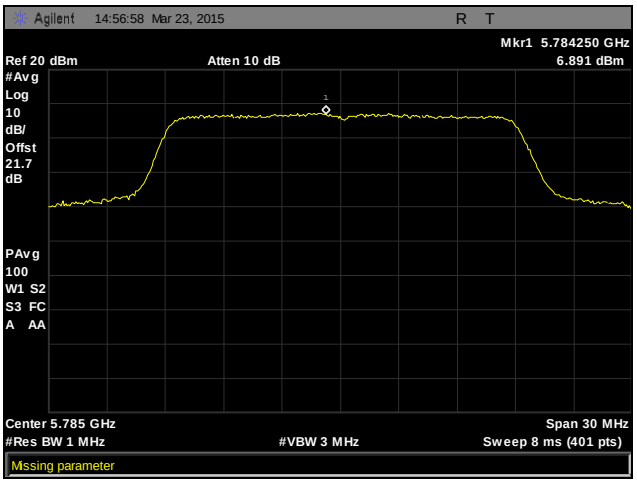
Plot 94. Peak Power Spectral Density, Mid Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



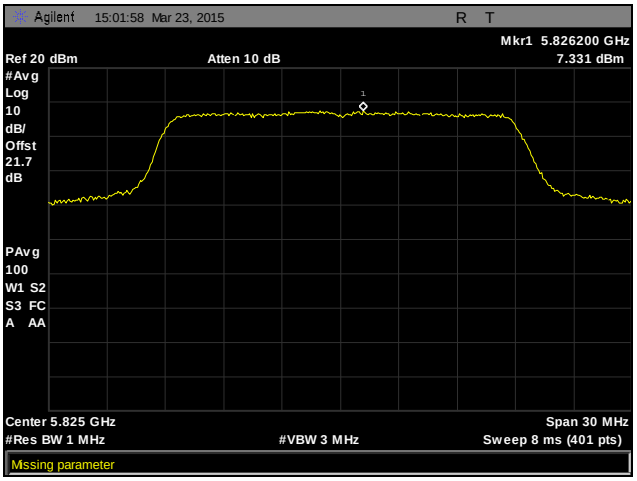
Plot 95. Peak Power Spectral Density, High Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



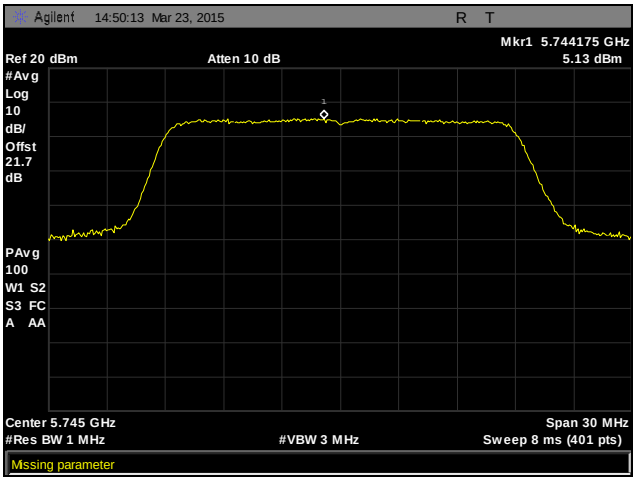
Plot 96. Peak Power Spectral Density, Low Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



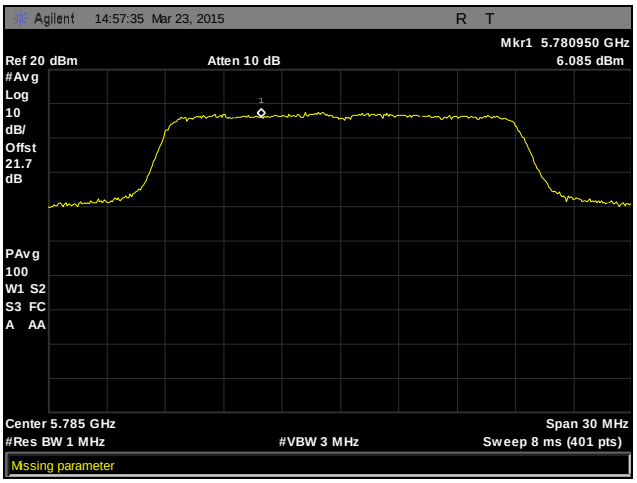
Plot 97. Peak Power Spectral Density, Mid Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



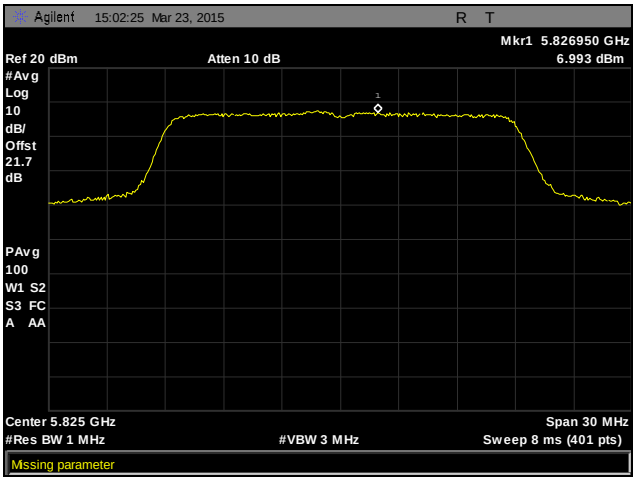
Plot 98. Peak Power Spectral Density, High Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



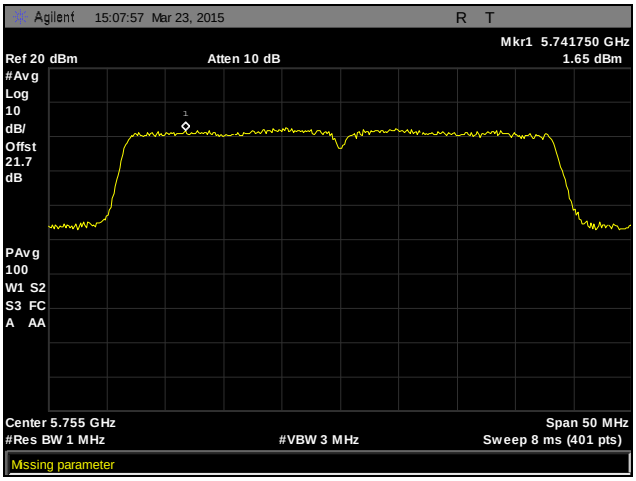
Plot 99. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



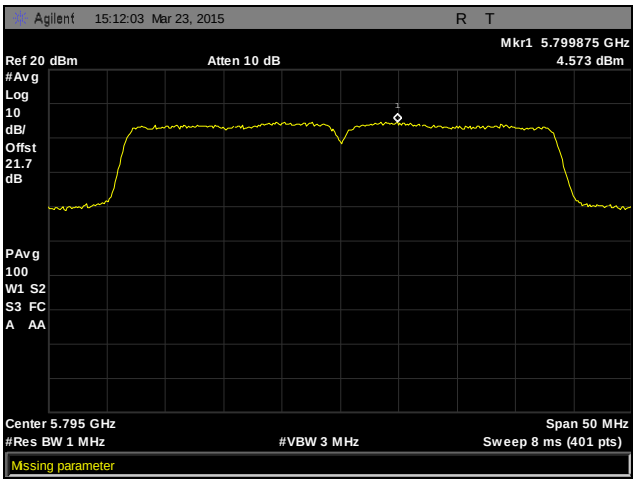
Plot 100. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



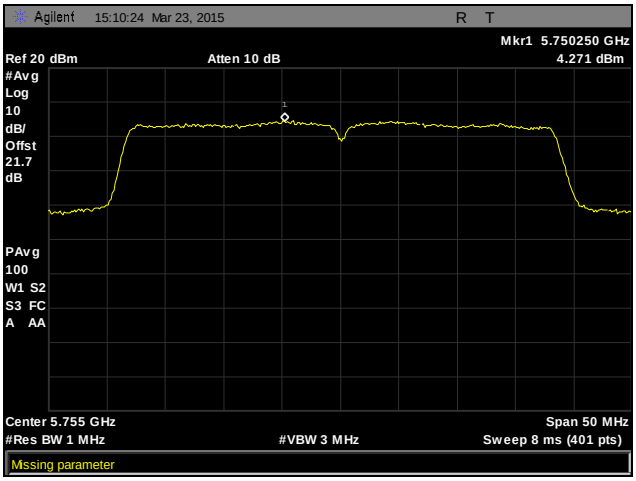
Plot 101. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



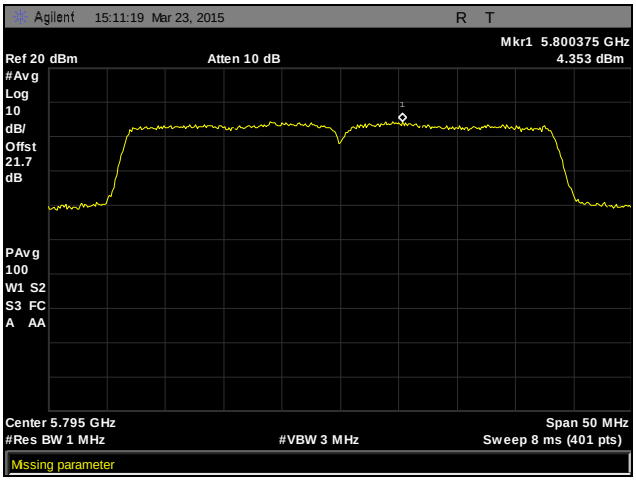
Plot 102. Peak Power Spectral Density, Low Channel, 802.11ac 40 MHz, SISO, Non-Transmitting Beam-Forming



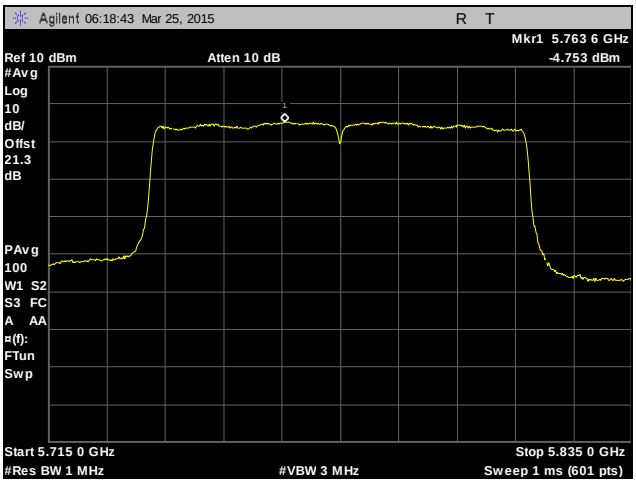
Plot 103. Peak Power Spectral Density, High Channel, 802.11ac 40 MHz, SISO, Non-Transmitting Beam-Forming



Plot 104. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, SISO, Non-Transmitting Beam-Forming

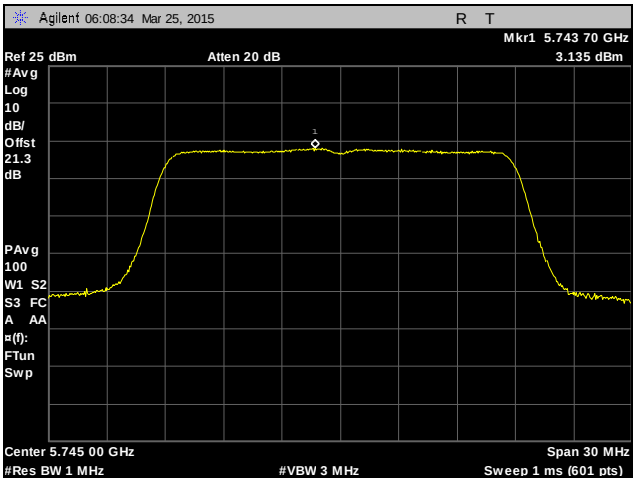


Plot 105. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, SISO, Non-Transmitting Beam-Forming

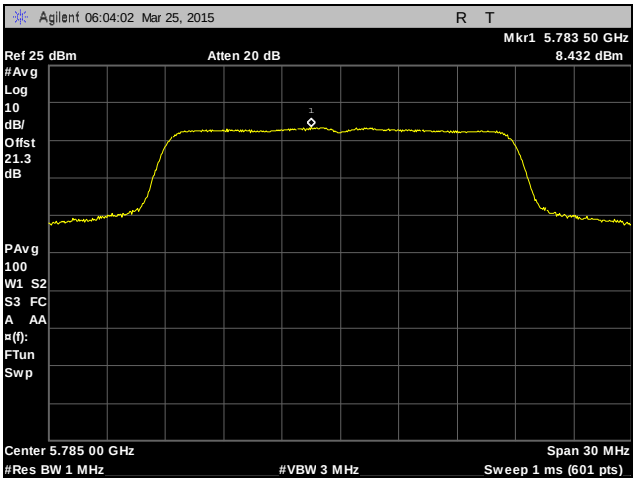


Plot 106. Peak Power Spectral Density, 802.11ac 80 MHz, SISO, Non-Transmitting Beam-Forming

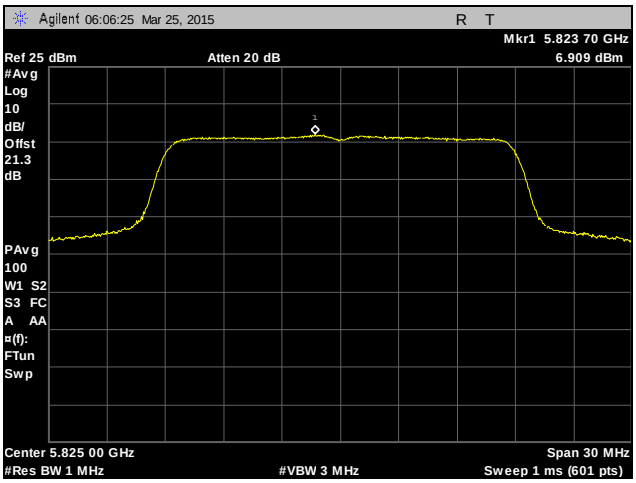
Peak Power Spectral Density Test Results, Transmitting Beam-Forming, MIMO



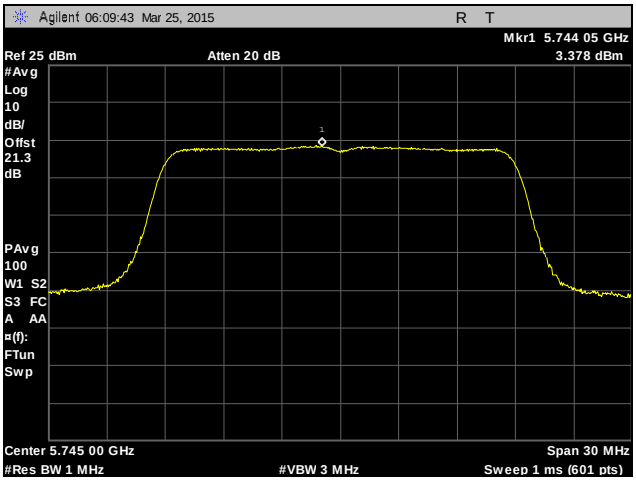
Plot 107. Peak Power Spectral Density, Low Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



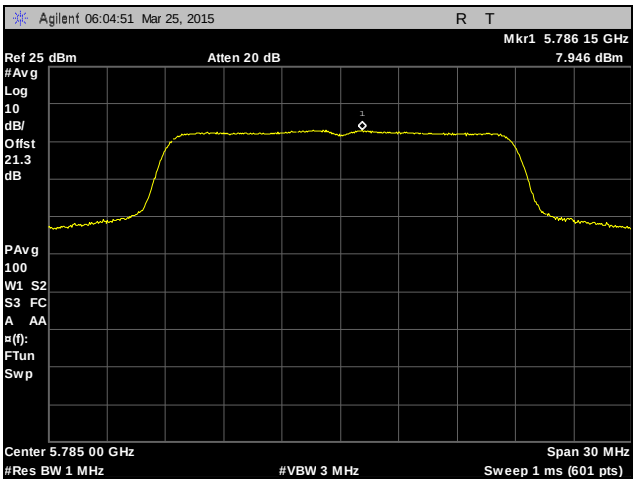
Plot 108. Peak Power Spectral Density, Mid Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



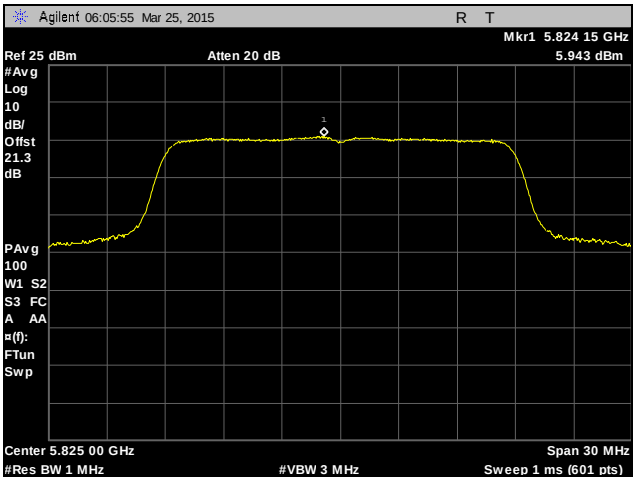
Plot 109. Peak Power Spectral Density, High Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



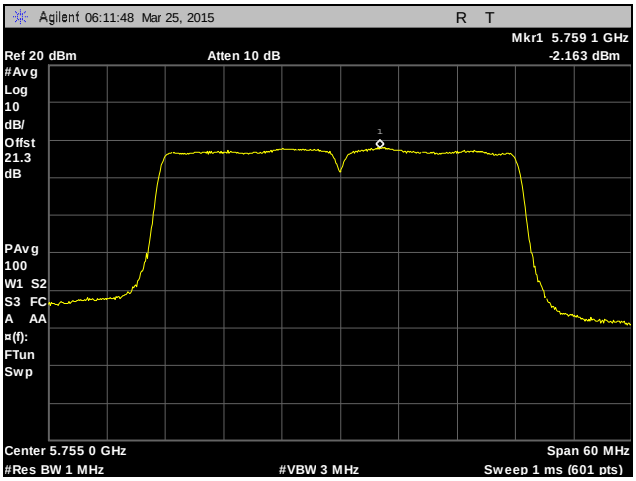
Plot 110. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



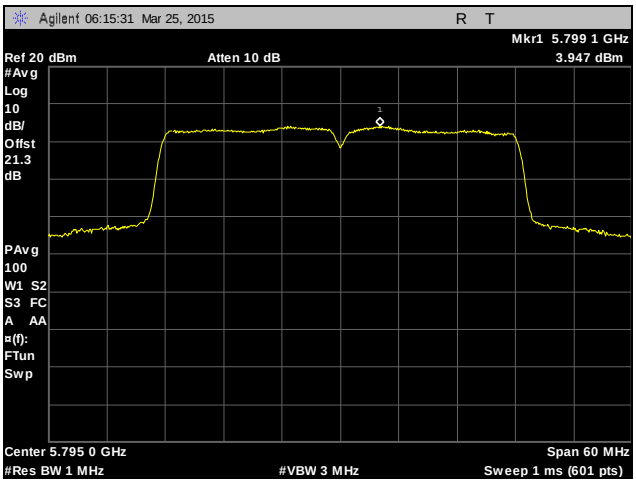
Plot 111. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



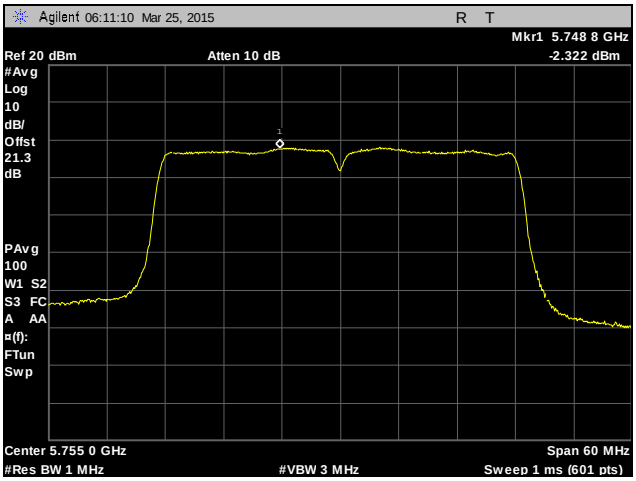
Plot 112. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



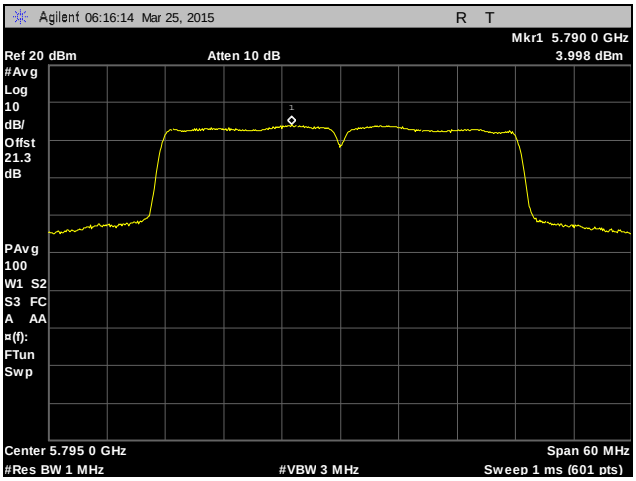
Plot 113. Peak Power Spectral Density, Low Channel, 802.11ac 40 MHz, MIMO, Transmitting Beam-Forming



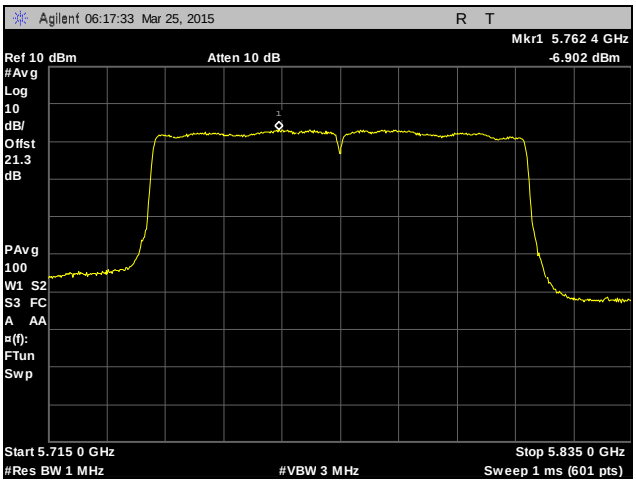
Plot 114. Peak Power Spectral Density, High Channel, 802.11ac 40 MHz, MIMO, Transmitting Beam-Forming



Plot 115. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, MIMO, Transmitting Beam-Forming



Plot 116. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, MIMO, Transmitting Beam-Forming



Plot 117. Peak Power Spectral Density, 802.11ac 80 MHz, MIMO, Transmitting Beam-Forming

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)(1): For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. 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.

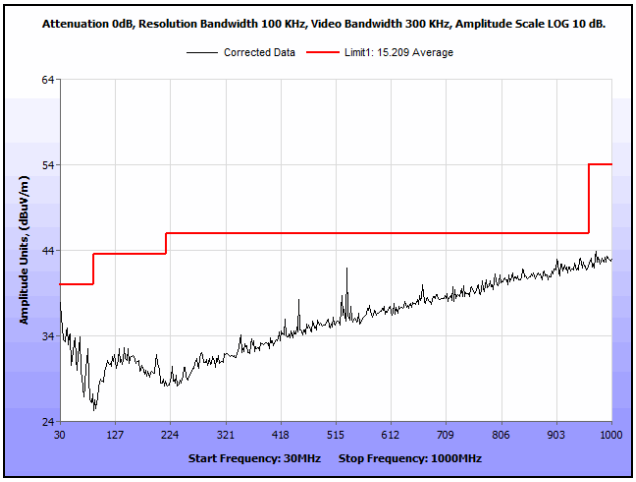
For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. A notch filter was use to filter out the transmitting channel. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied 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.

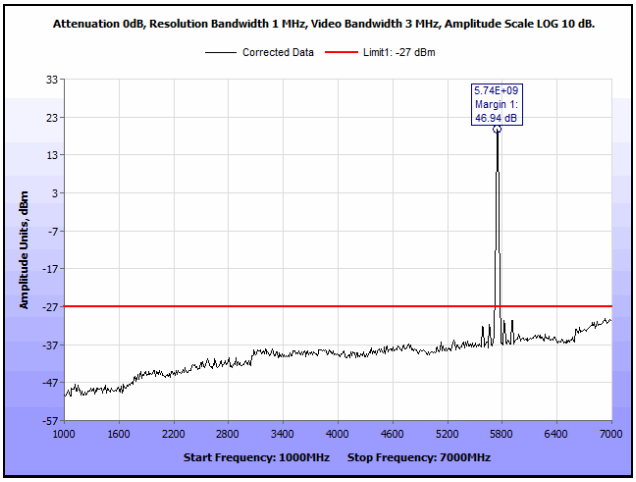
Test Engineer(s): Surinder Singh

Test Date(s): 03/19/15

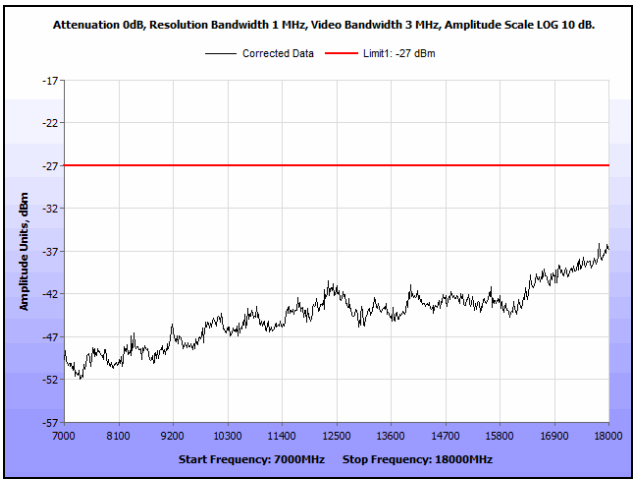
Radiated Spurious Emissions Test Results, Non-Transmitting Beam-Forming, MIMO



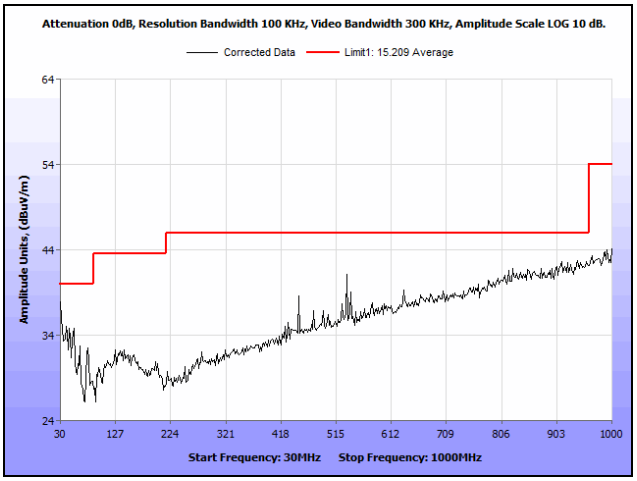
Plot 118. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



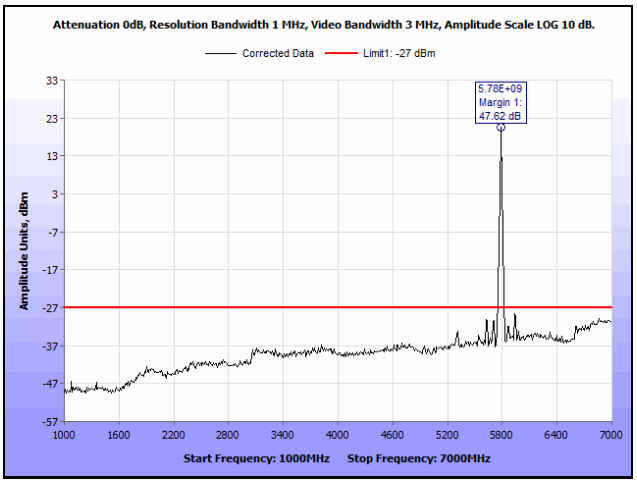
Plot 119. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



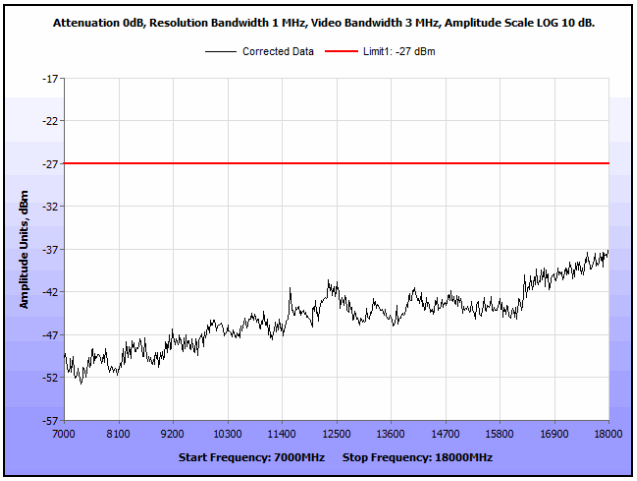
Plot 120. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



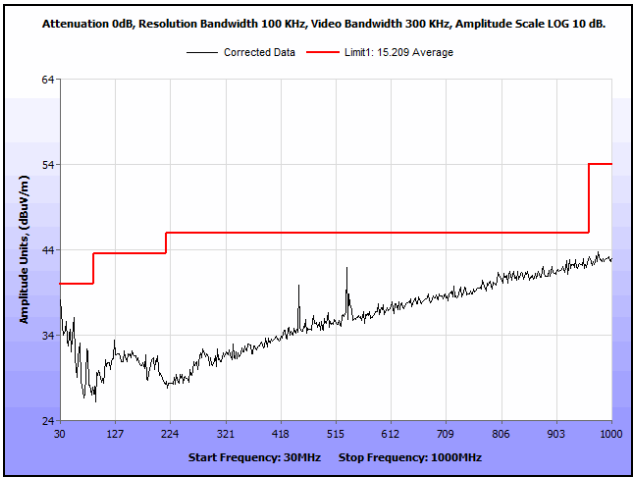
Plot 121. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



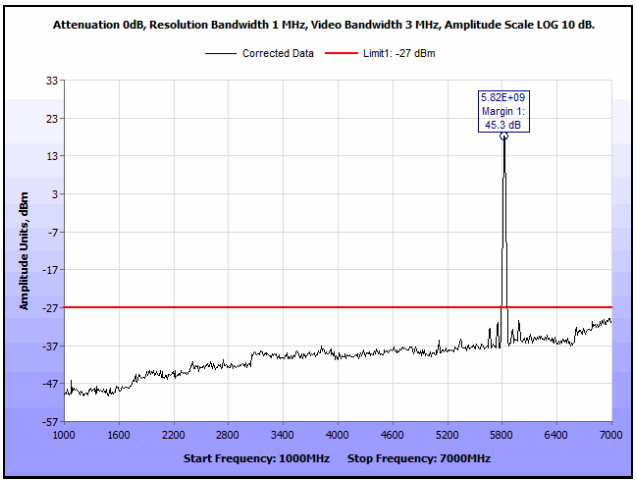
Plot 122. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



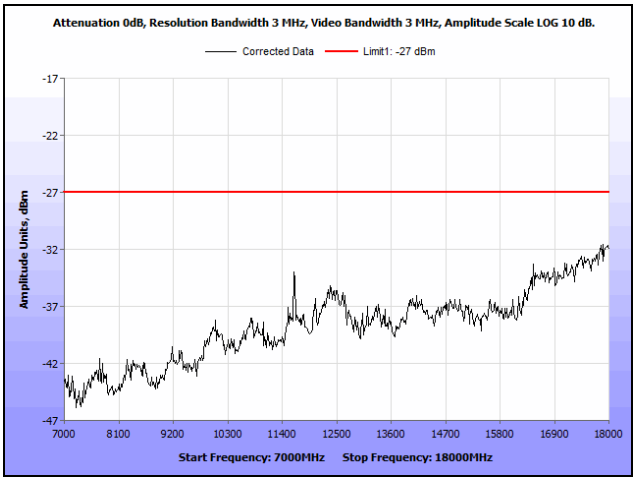
Plot 123. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



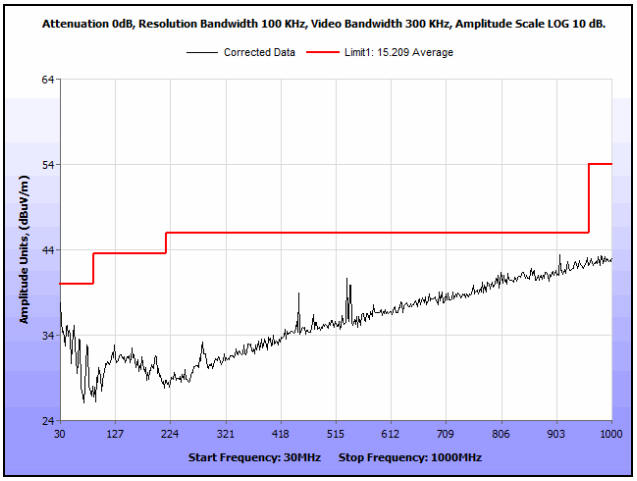
Plot 124. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



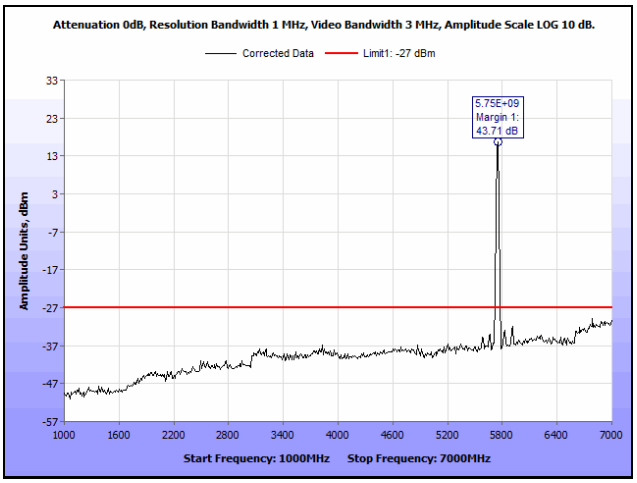
Plot 125. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



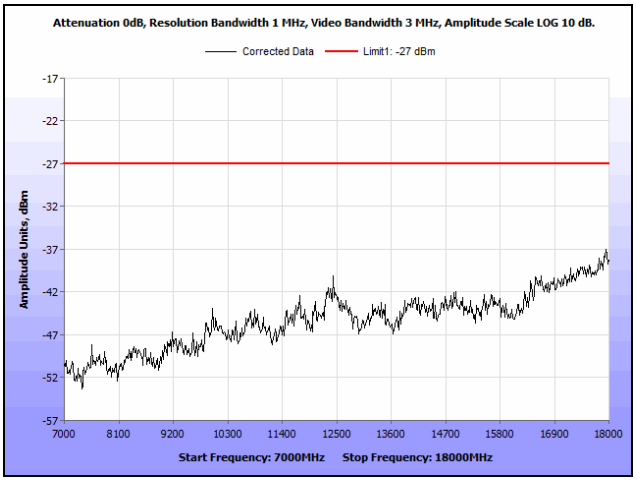
Plot 126. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



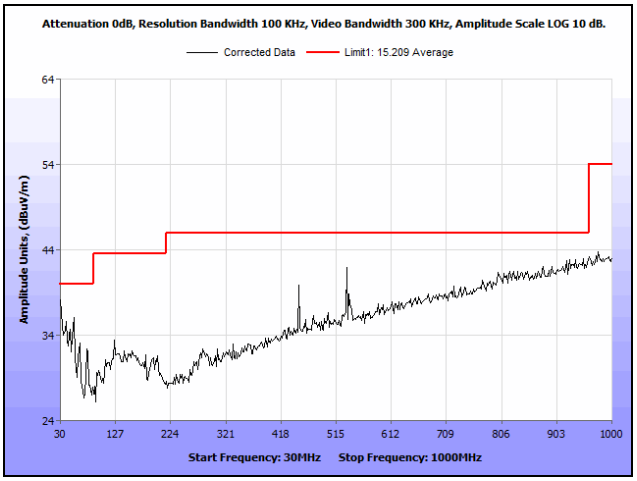
Plot 127. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



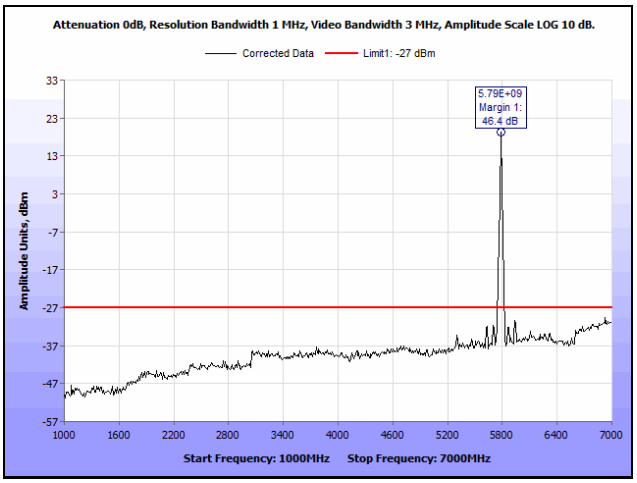
Plot 128. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



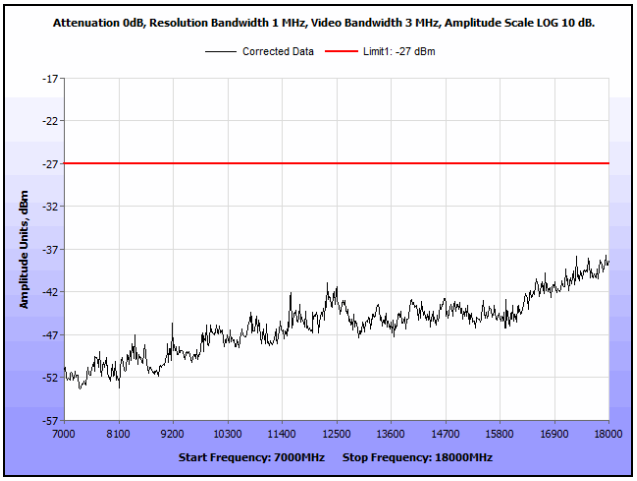
Plot 129. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



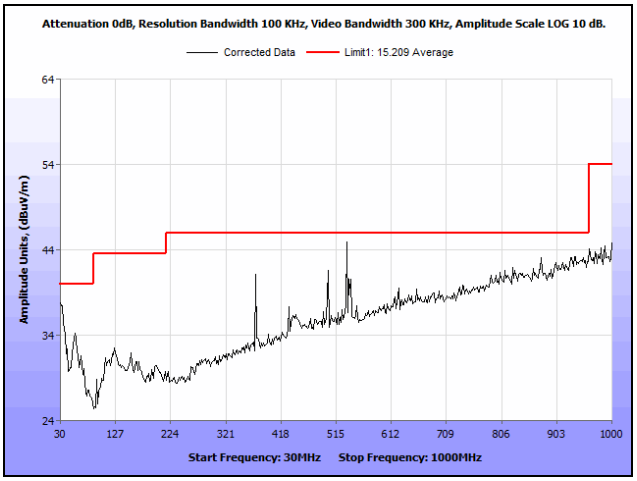
Plot 130. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



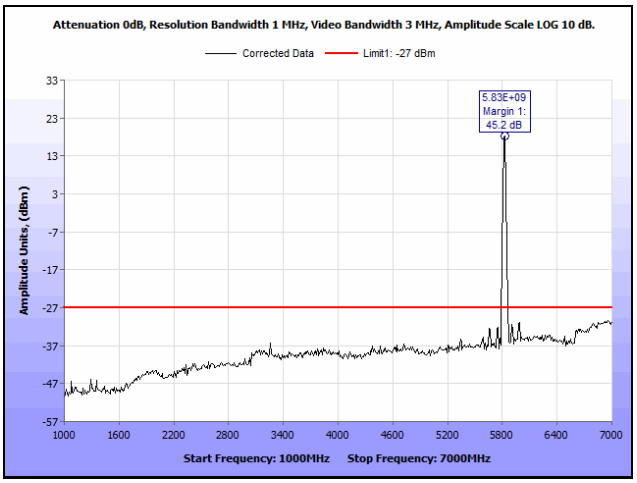
Plot 131. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



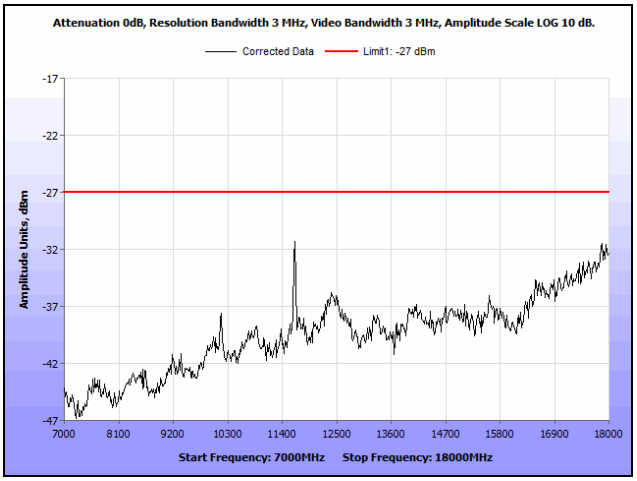
Plot 132. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



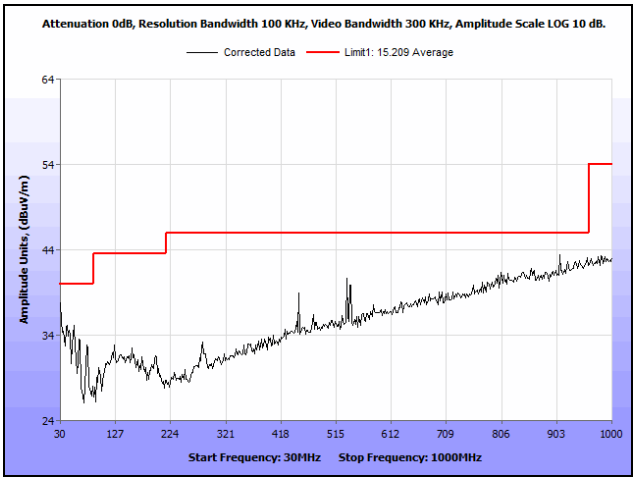
Plot 133. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



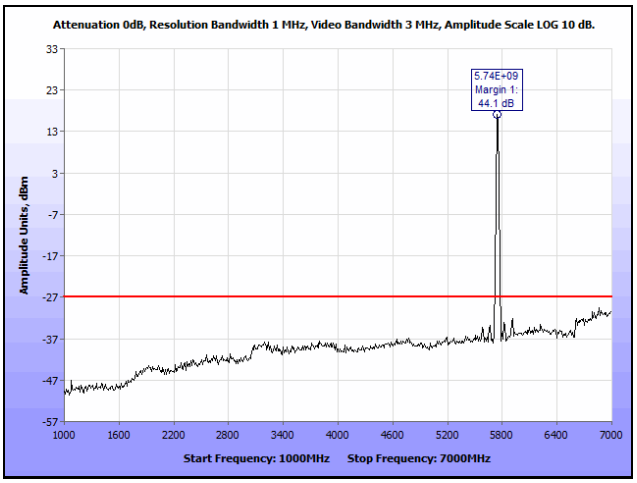
Plot 134. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



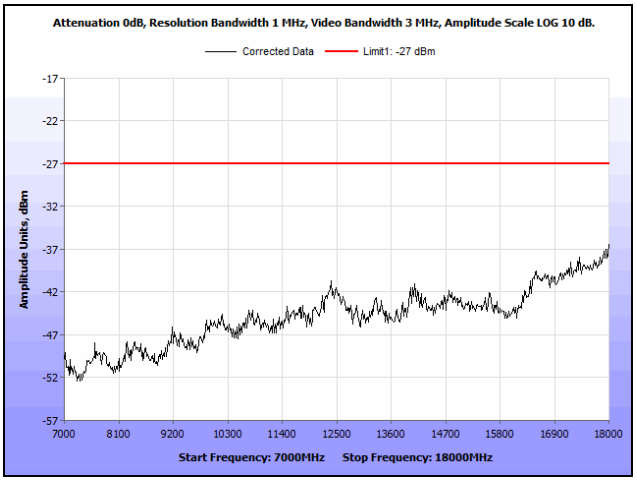
Plot 135. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



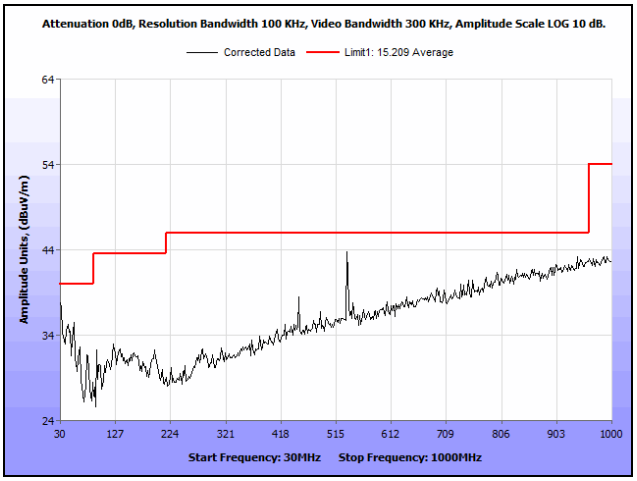
Plot 136. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



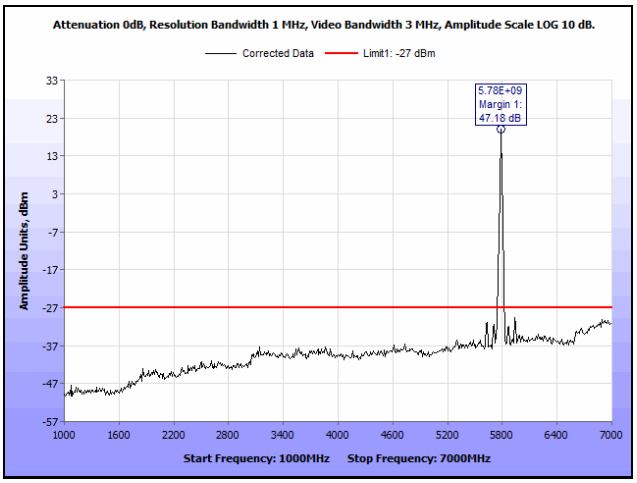
Plot 137. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



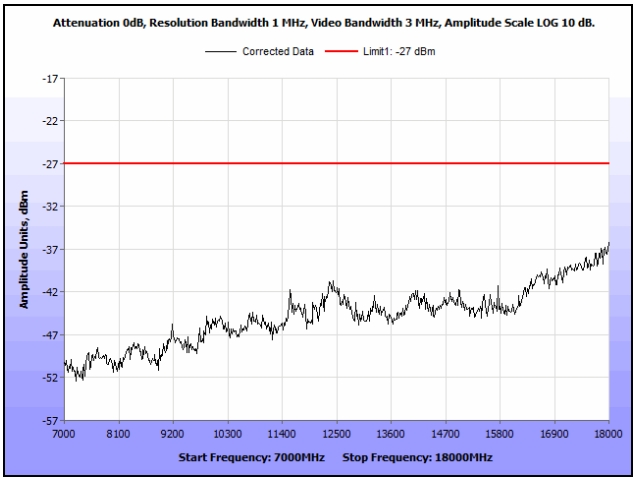
Plot 138. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



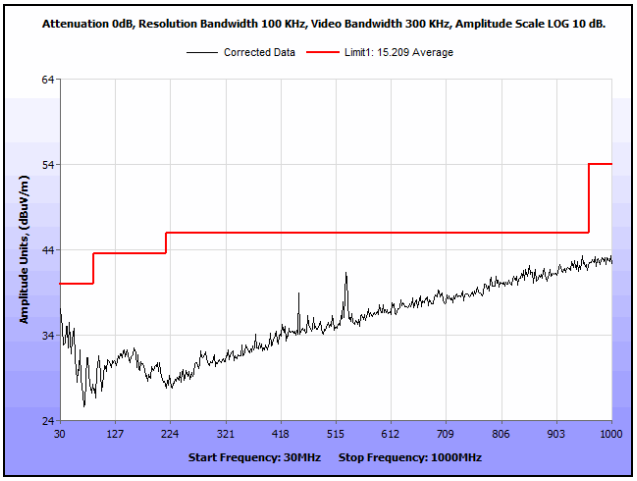
Plot 139. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



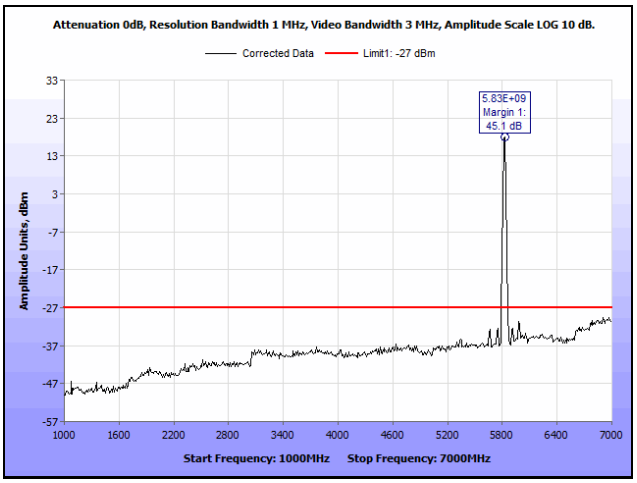
Plot 140. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



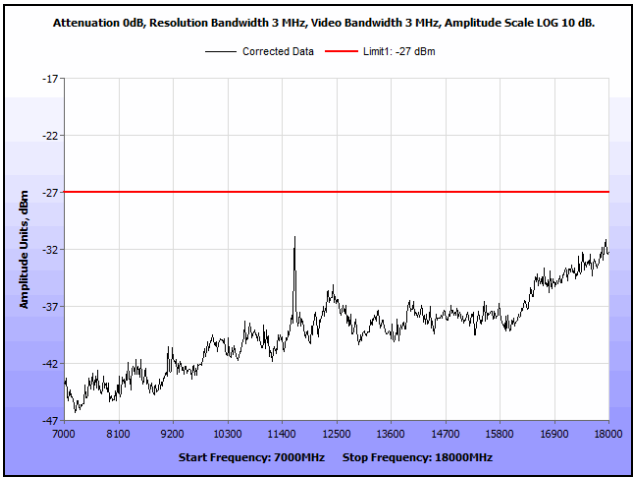
Plot 141. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



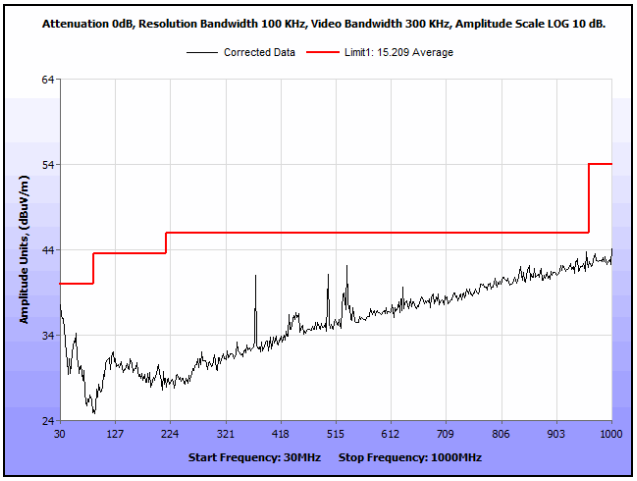
Plot 142. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



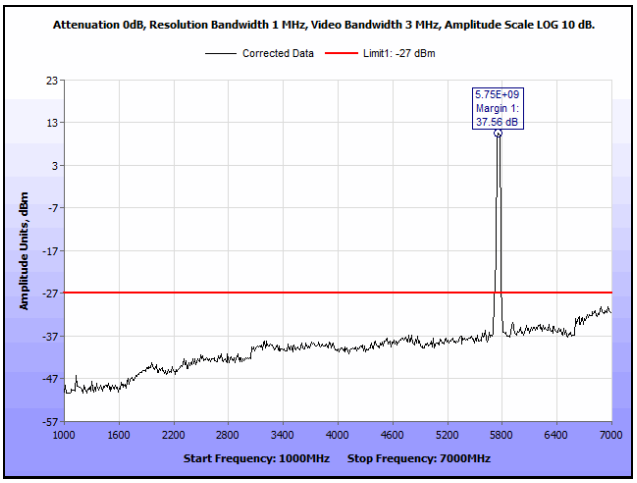
Plot 143. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



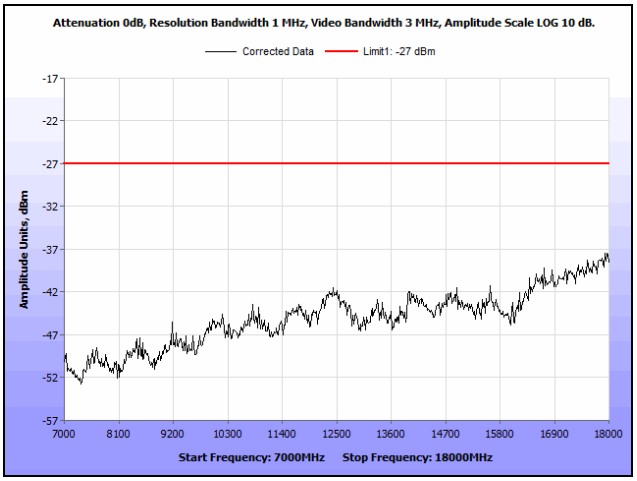
Plot 144. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



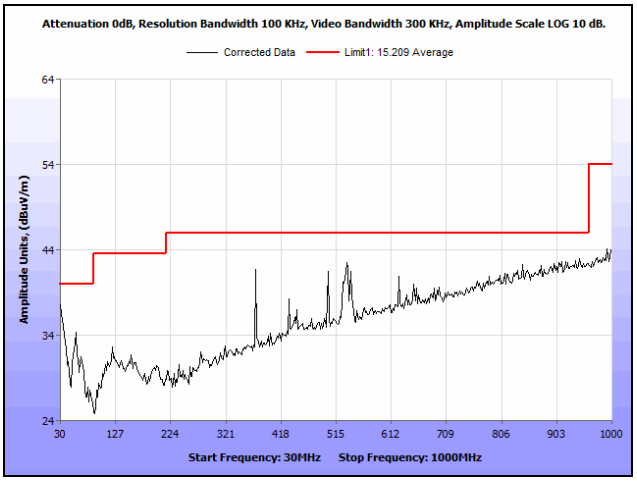
Plot 145. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



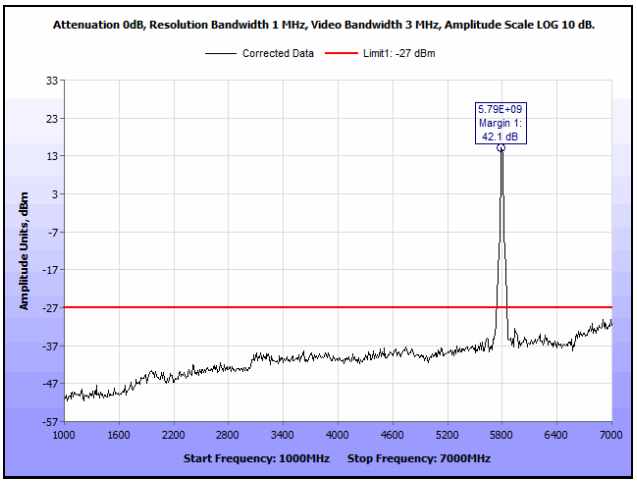
Plot 146. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



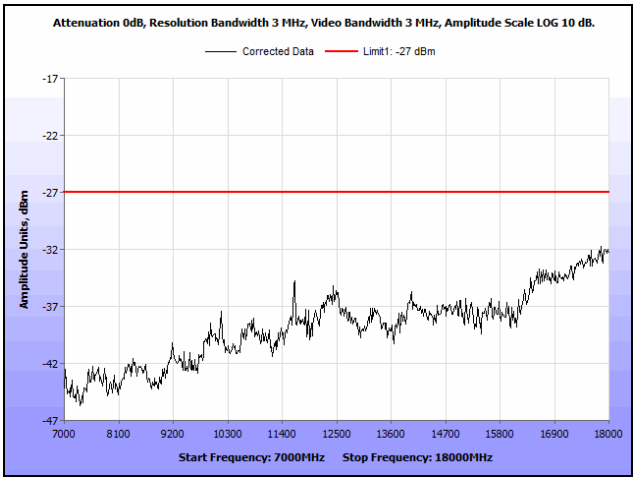
Plot 147. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



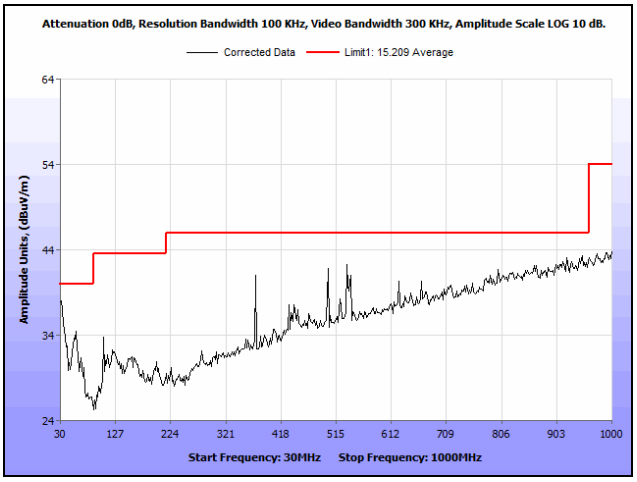
Plot 148. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



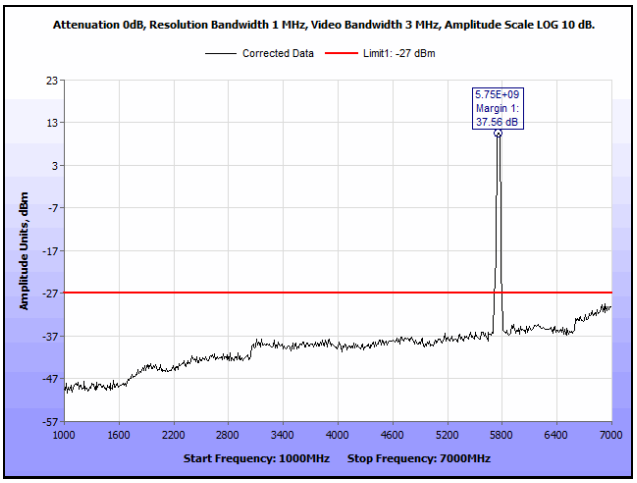
Plot 149. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



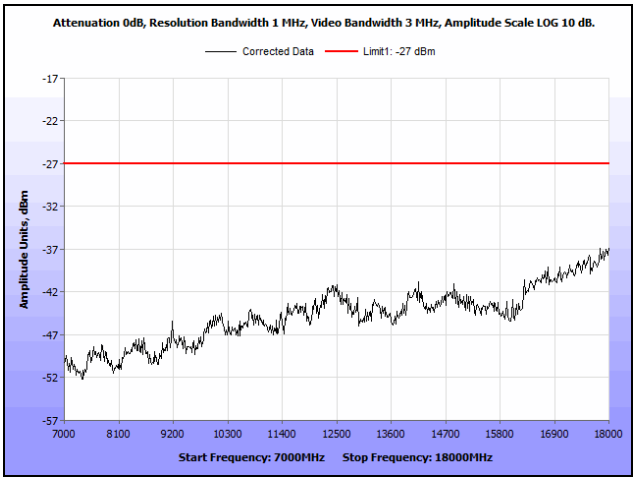
Plot 150. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



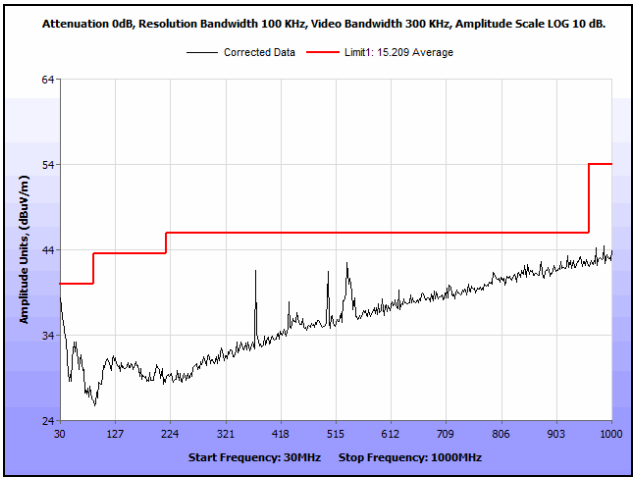
Plot 151. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



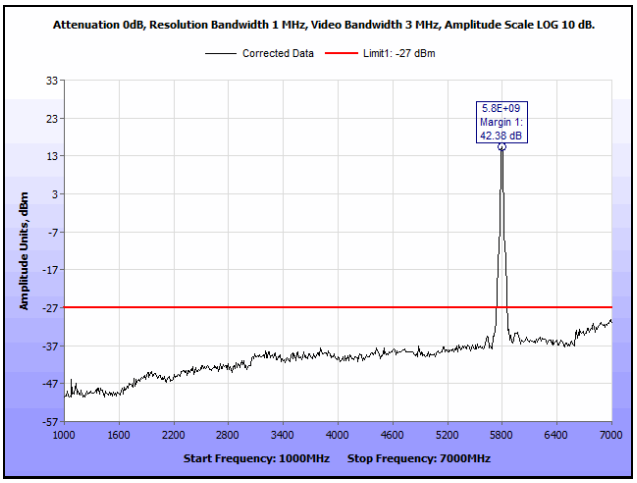
Plot 152. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



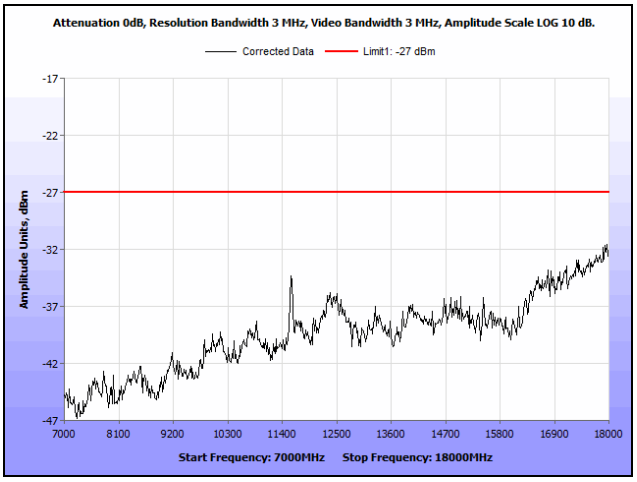
Plot 153. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



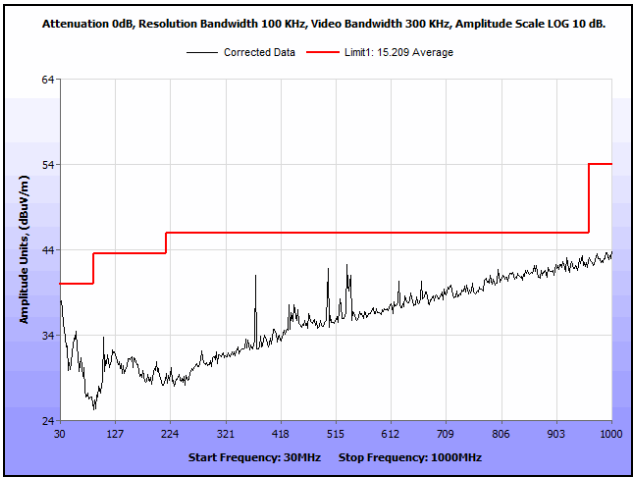
Plot 154. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz



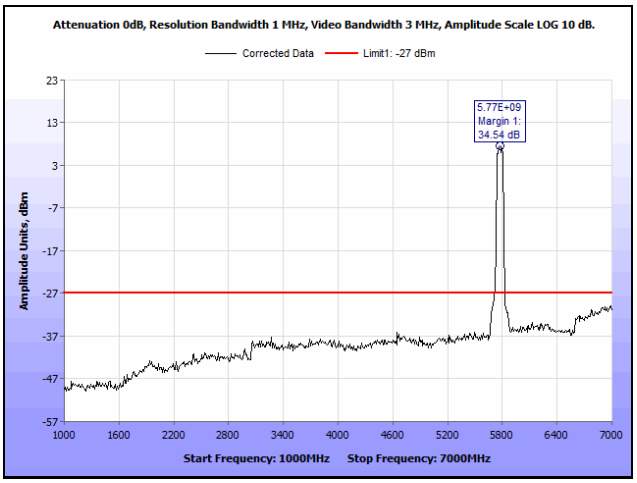
Plot 155. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz



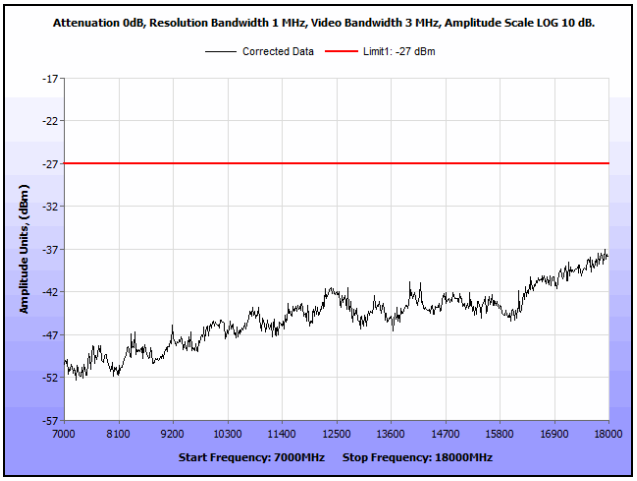
Plot 156. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz



Plot 157. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, Non-TX BF, 30 MHz – 1 GHz

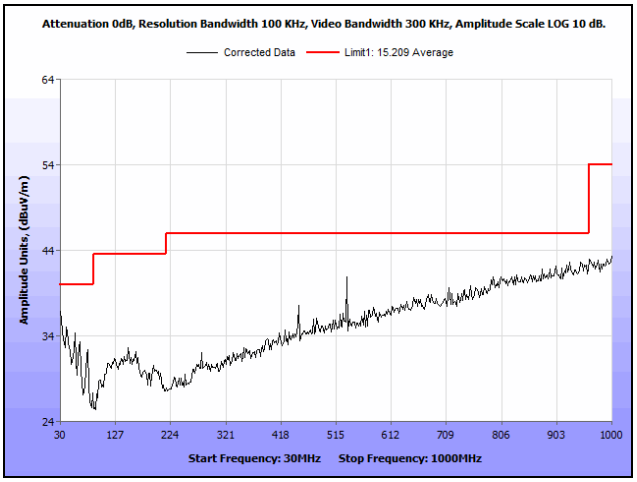


Plot 158. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, Non-TX BF, 1 GHz – 7 GHz

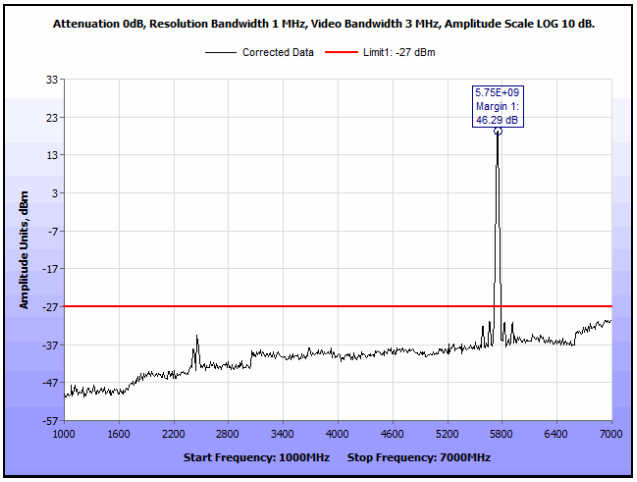


Plot 159. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, Non-TX BF, 7 GHz – 18 GHz

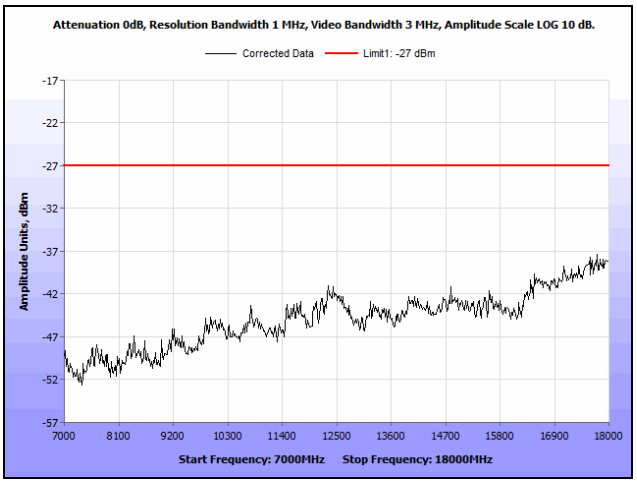
Radiated Spurious Emissions Test Results, Non-Transmitting Beam-Forming, SISO



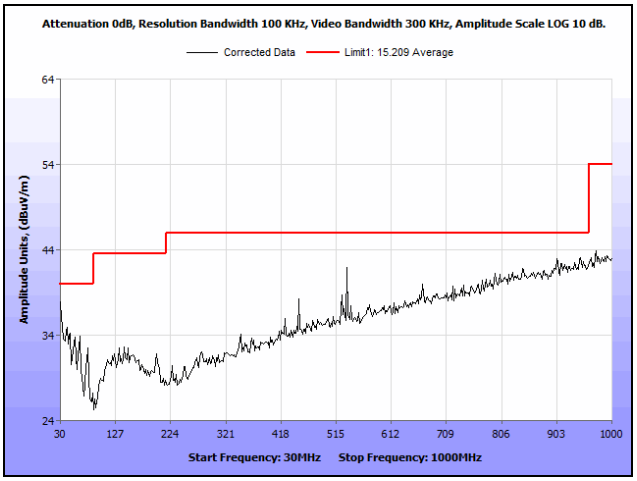
Plot 160. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



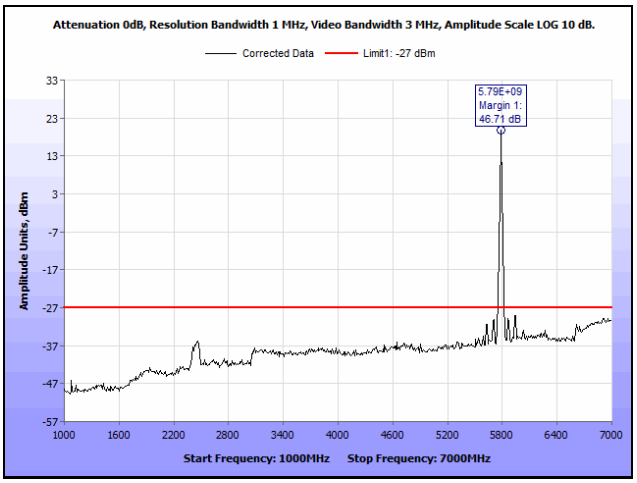
Plot 161. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



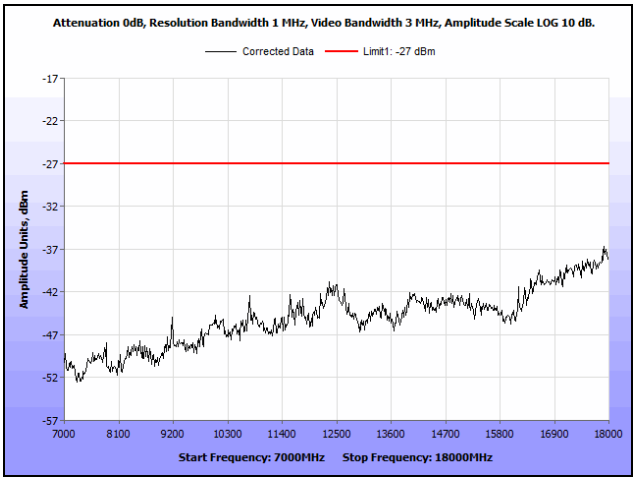
Plot 162. Radiated Spurious Emissions, Low Channel, 802.11a 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



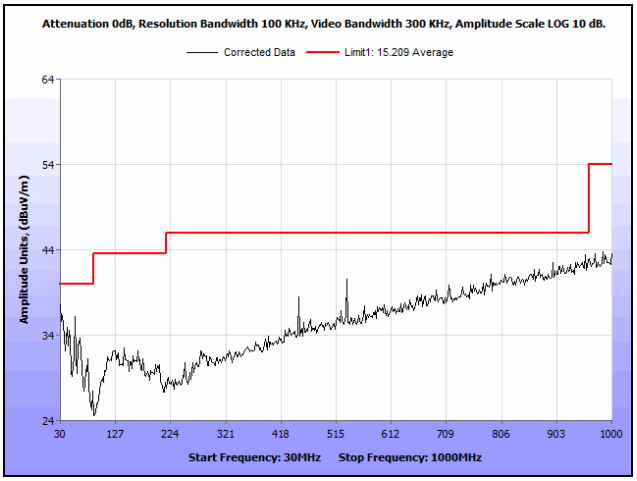
Plot 163. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



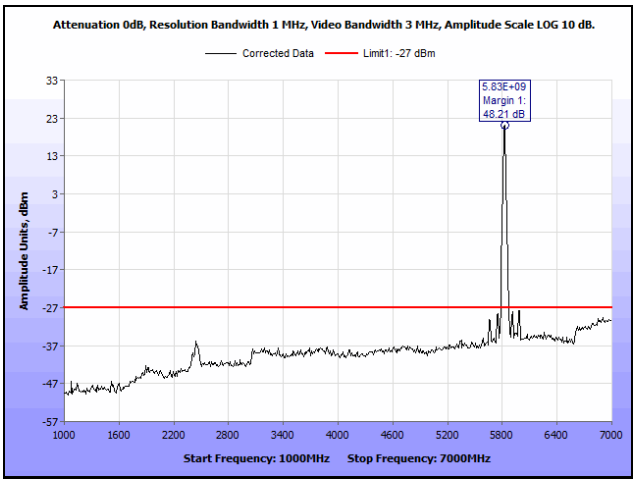
Plot 164. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



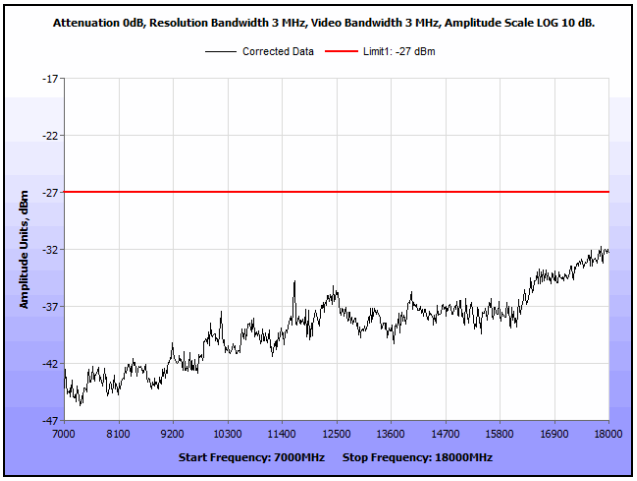
Plot 165. Radiated Spurious Emissions, Mid Channel, 802.11a 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



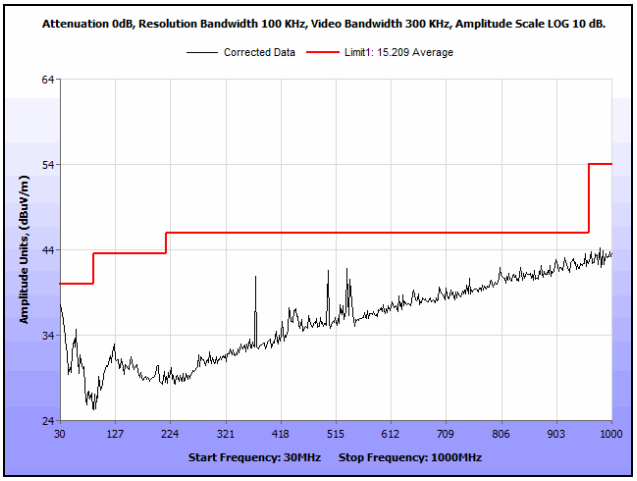
Plot 166. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



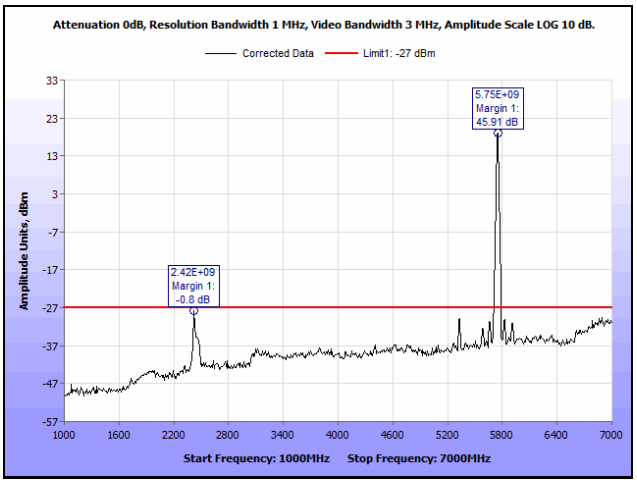
Plot 167. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



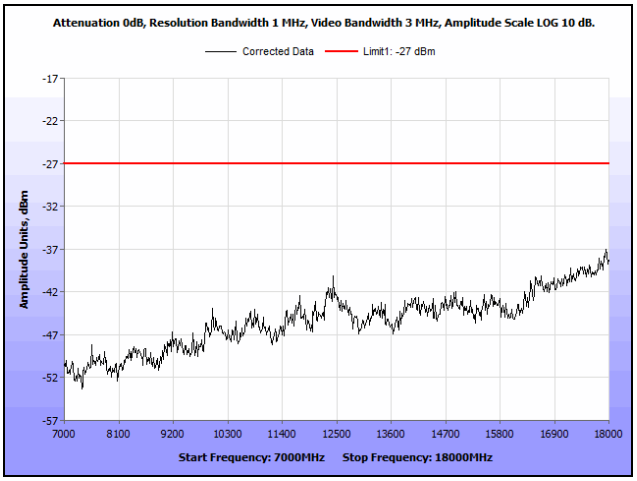
Plot 168. Radiated Spurious Emissions, High Channel, 802.11a 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



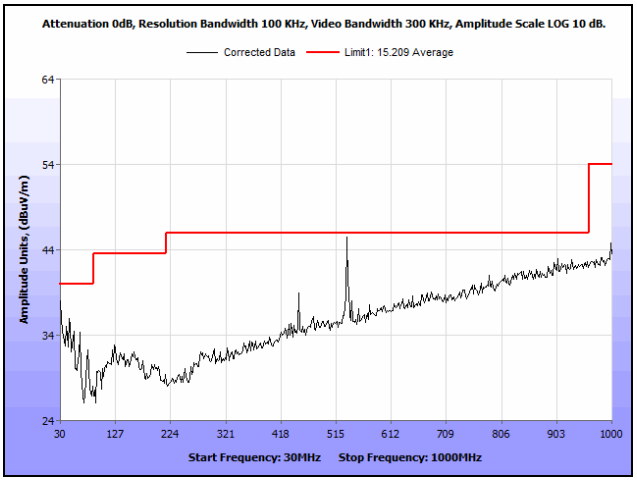
Plot 169. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



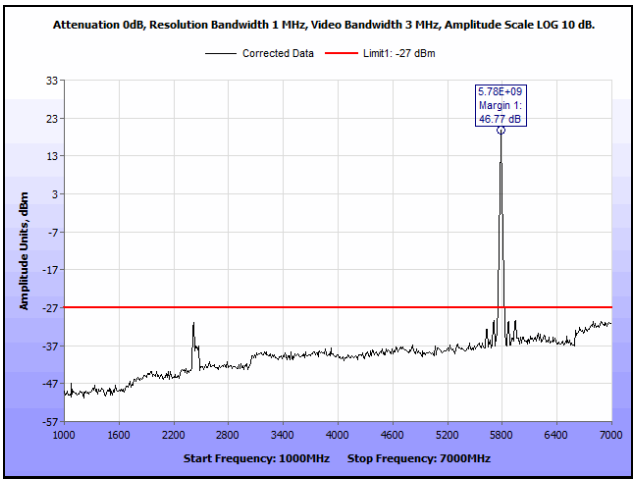
Plot 170. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



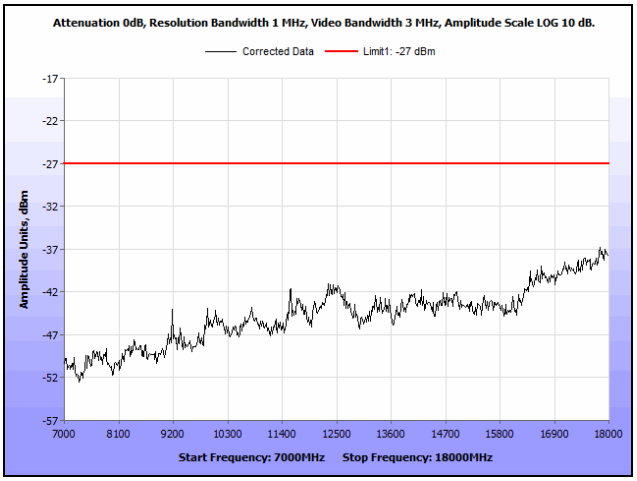
Plot 171. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



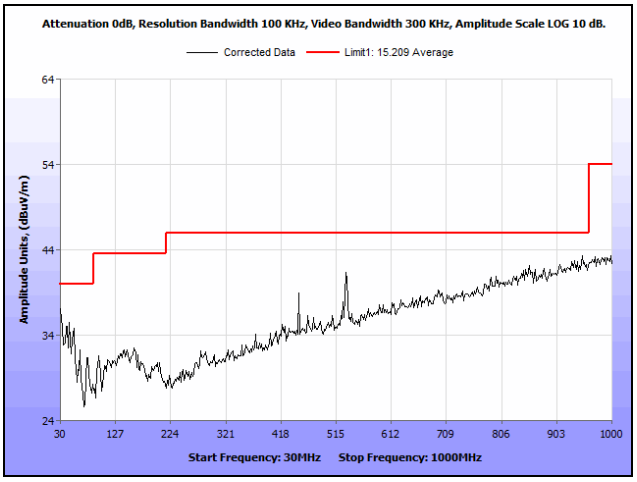
Plot 172. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



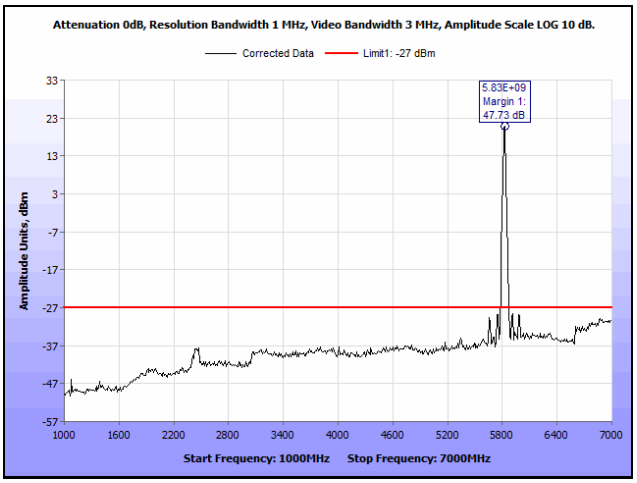
Plot 173. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



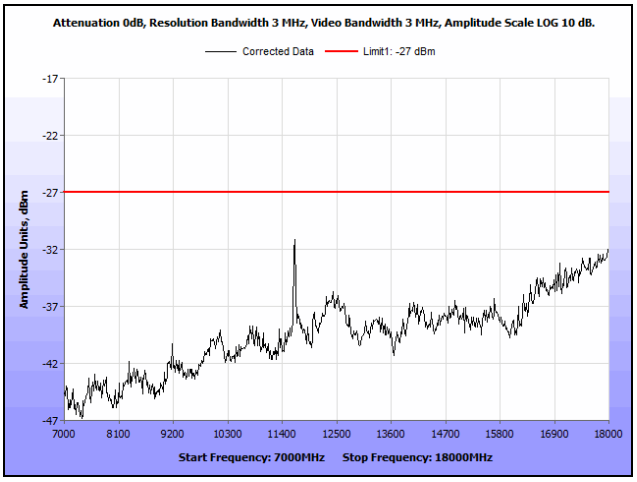
Plot 174. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



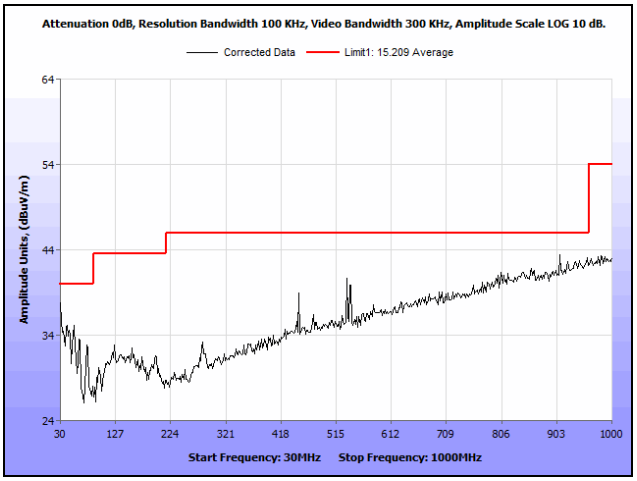
Plot 175. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



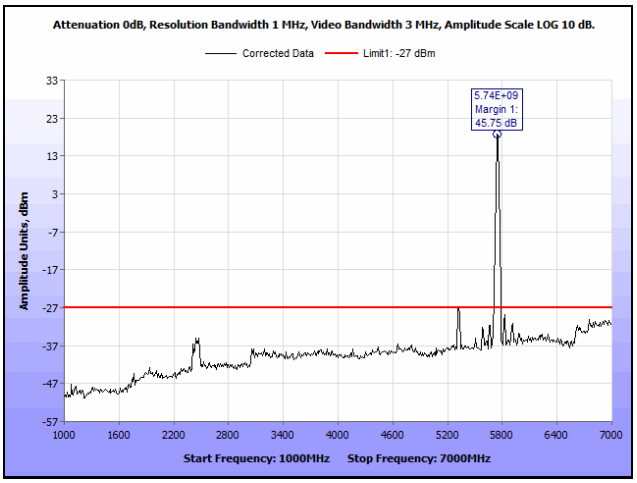
Plot 176. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



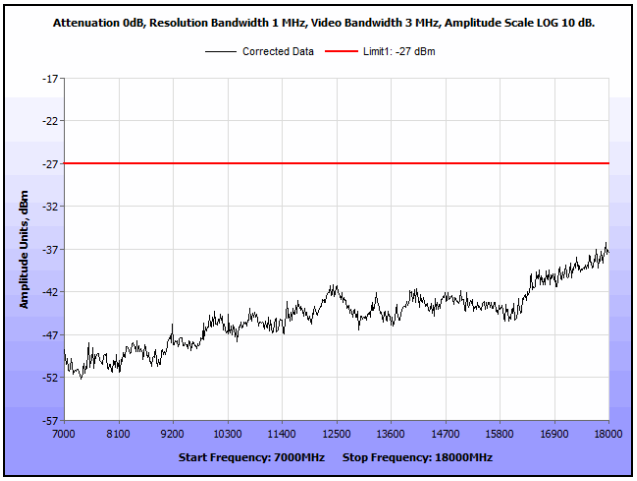
Plot 177. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



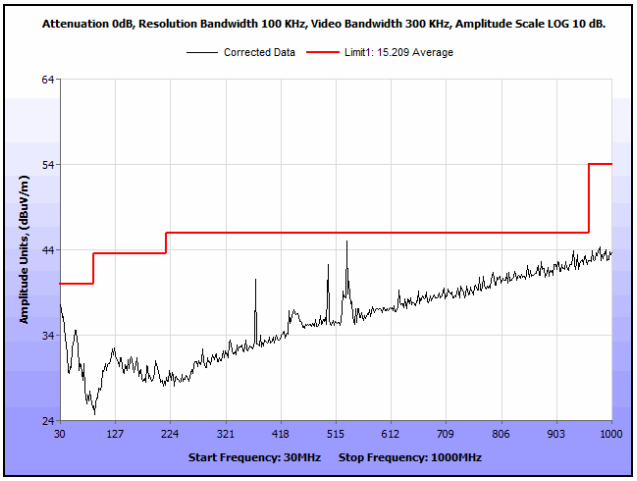
Plot 178. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



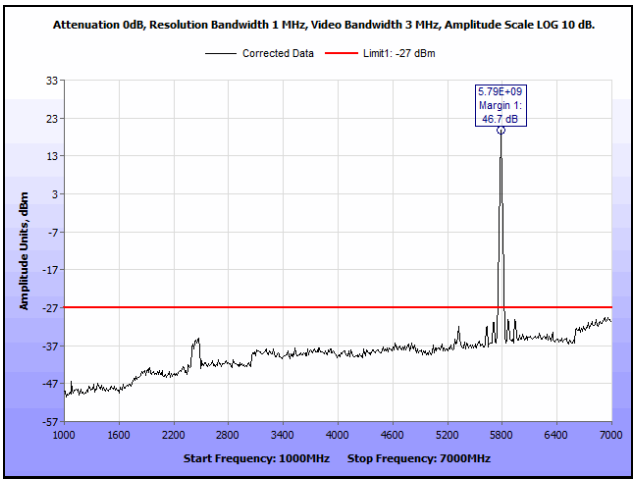
Plot 179. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



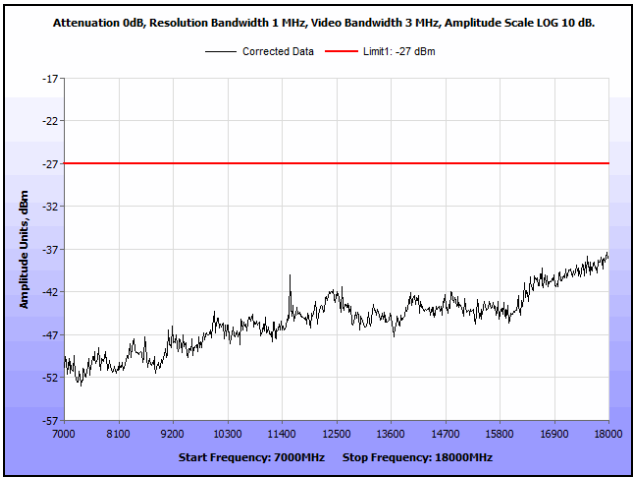
Plot 180. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



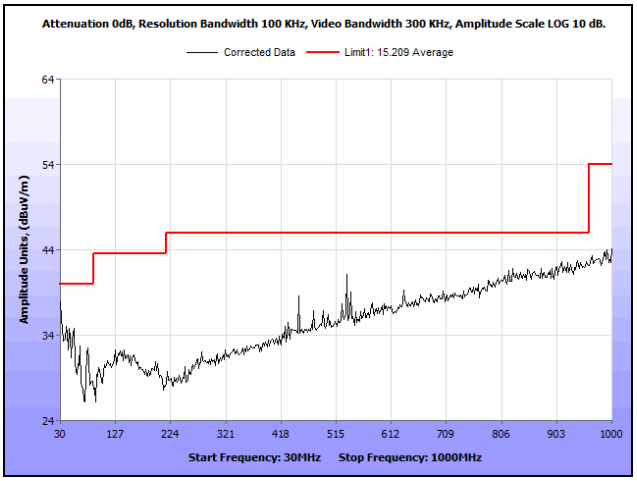
Plot 181. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



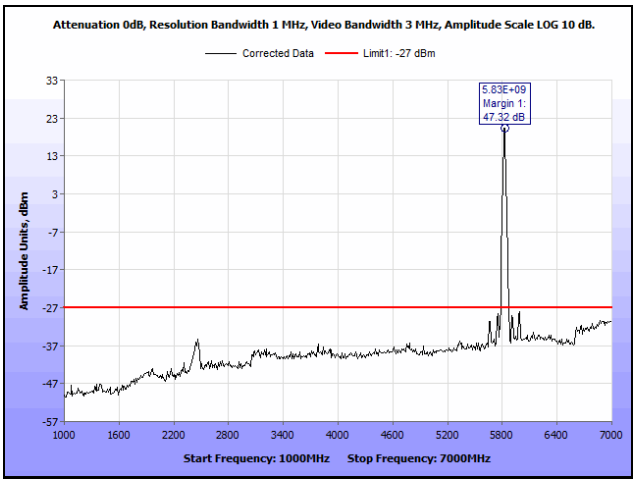
Plot 182. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



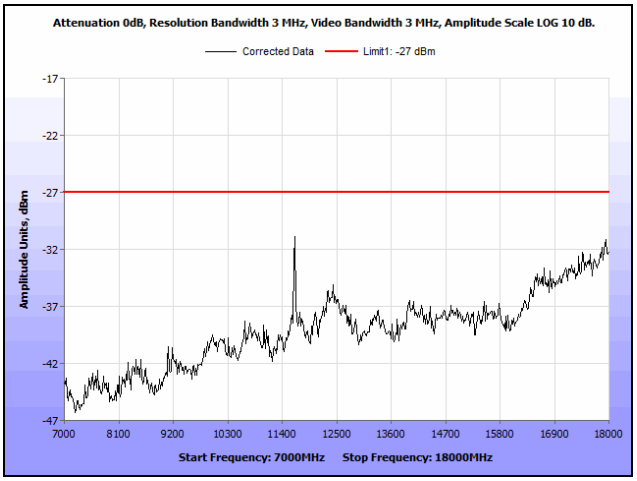
Plot 183. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



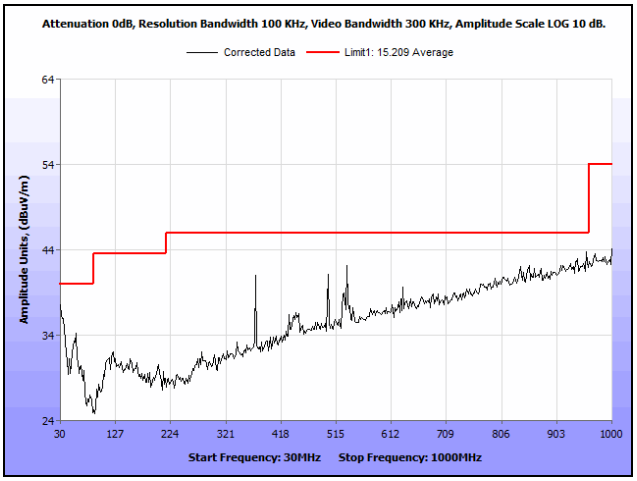
Plot 184. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



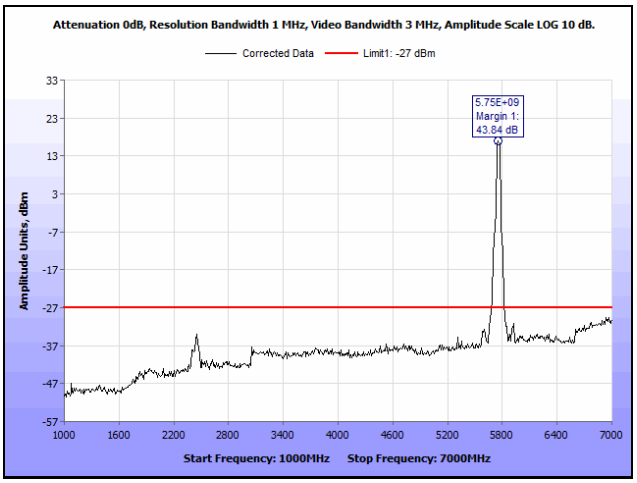
Plot 185. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



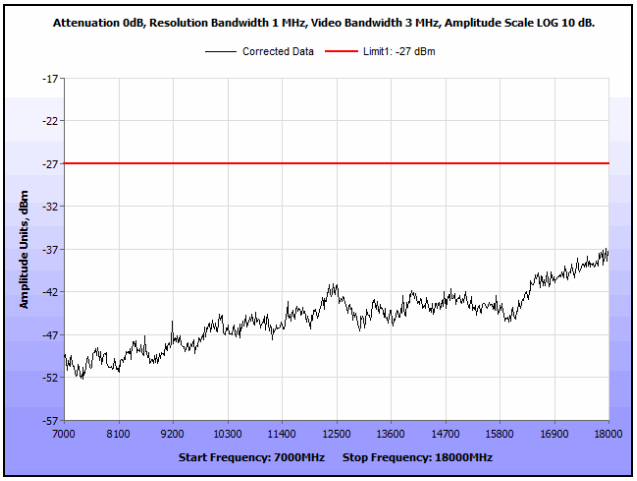
Plot 186. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



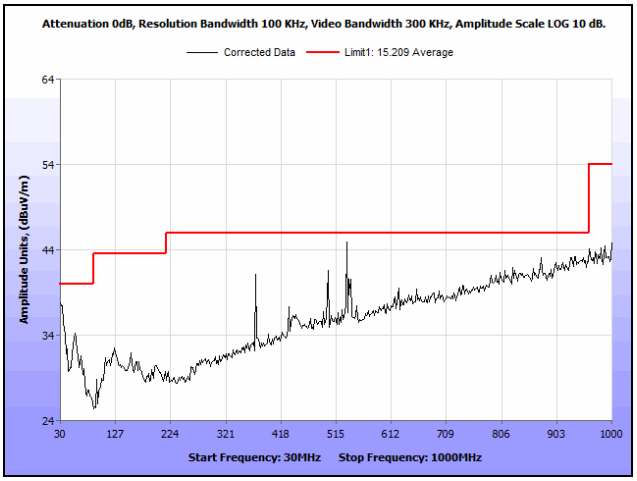
Plot 187. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



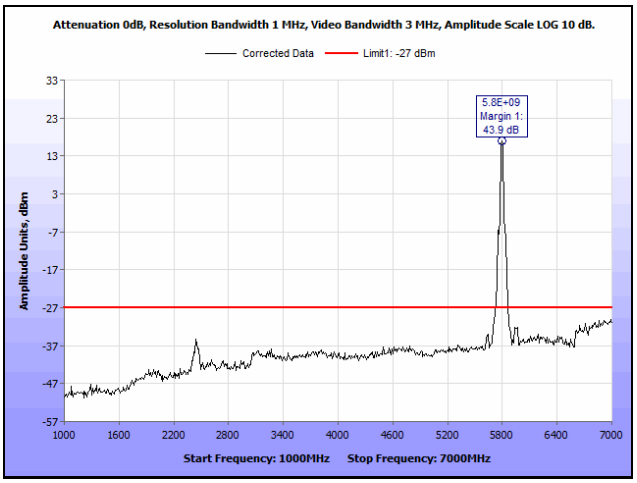
Plot 188. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



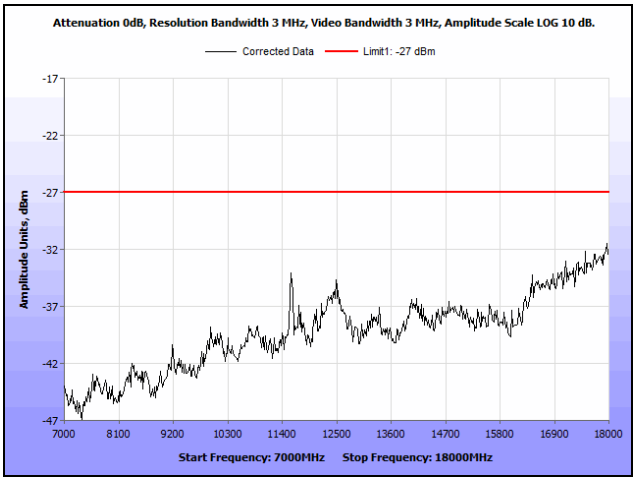
Plot 189. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



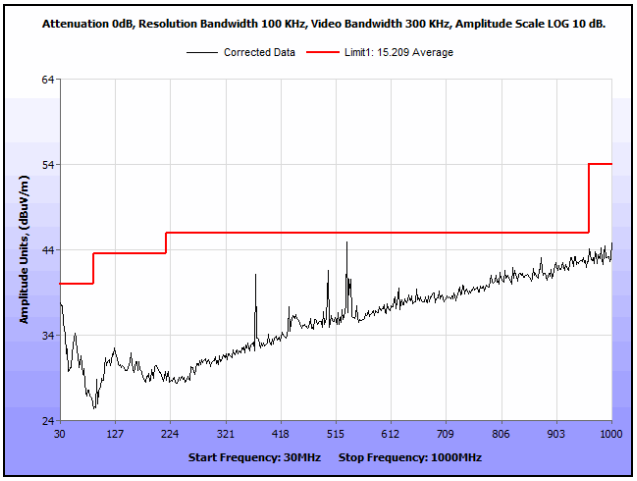
Plot 190. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



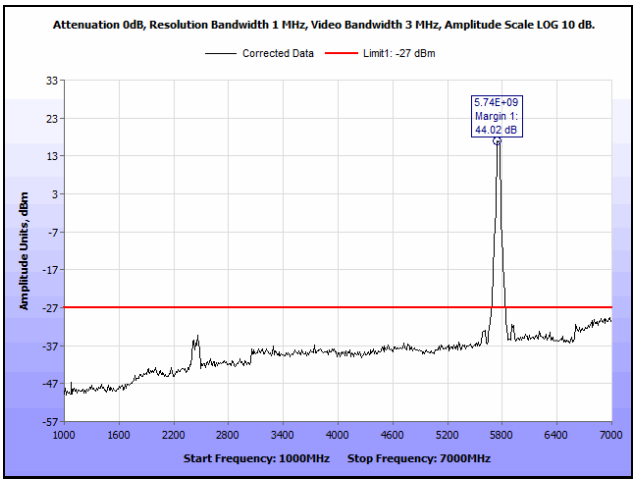
Plot 191. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



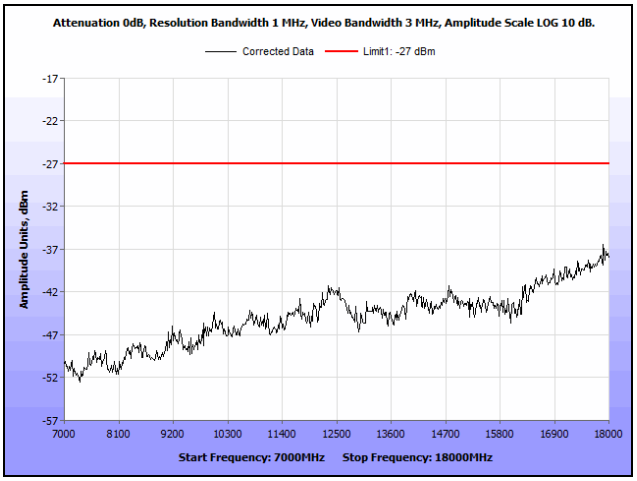
Plot 192. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



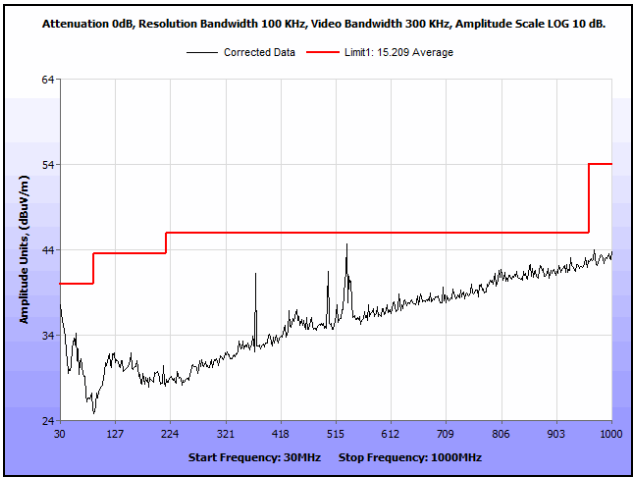
Plot 193. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



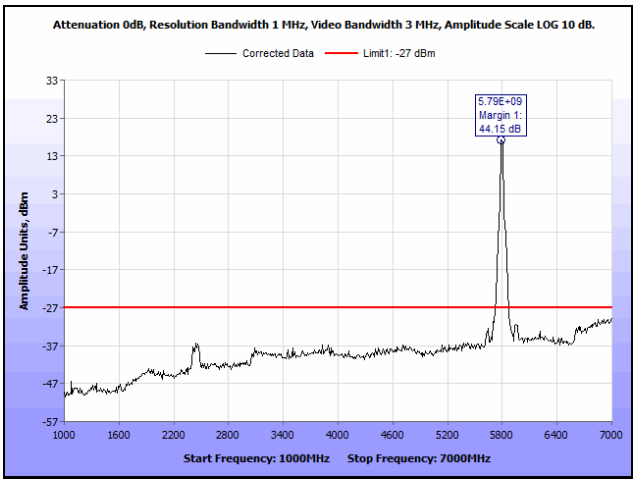
Plot 194. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



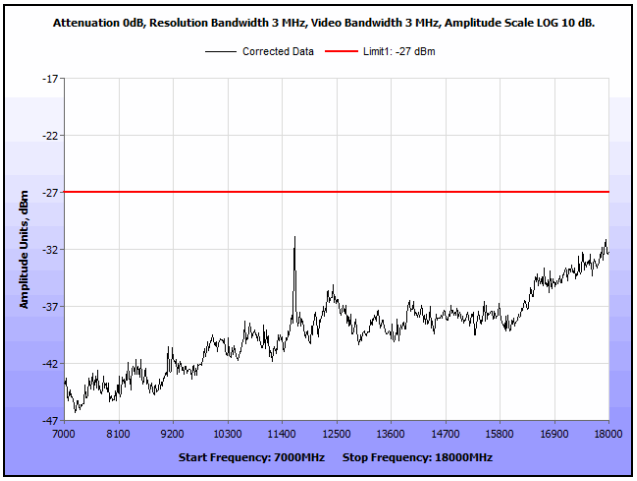
Plot 195. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



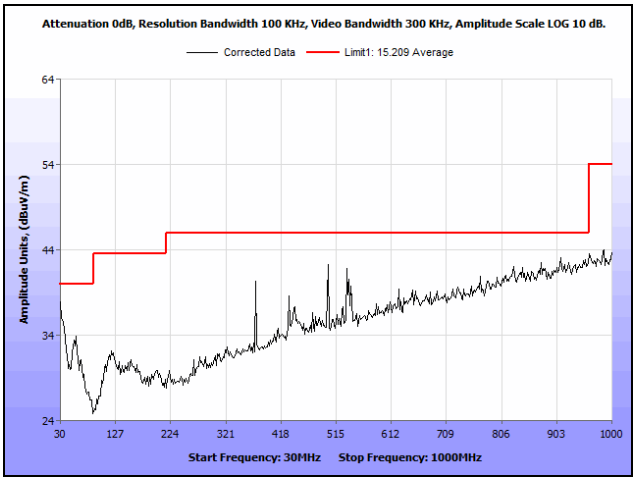
Plot 196. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz



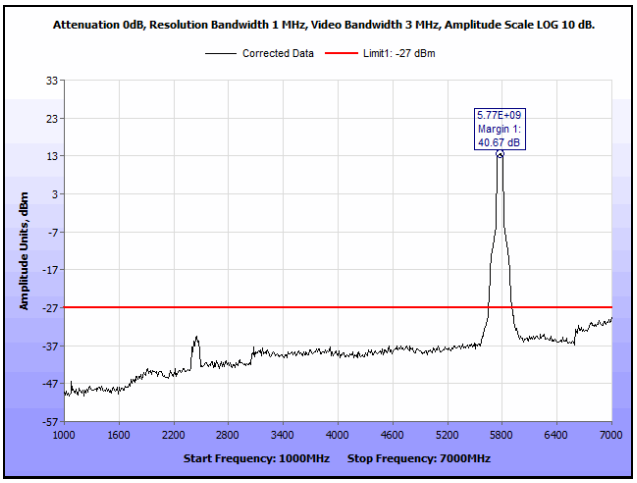
Plot 197. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz



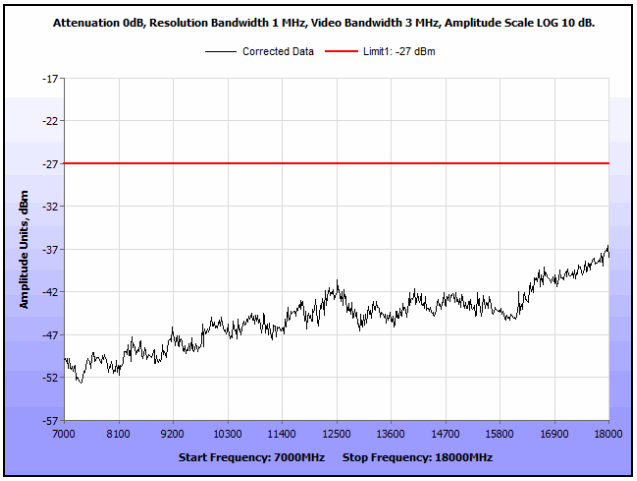
Plot 198. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz



Plot 199. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, Non-TX BF, 30 MHz – 1 GHz

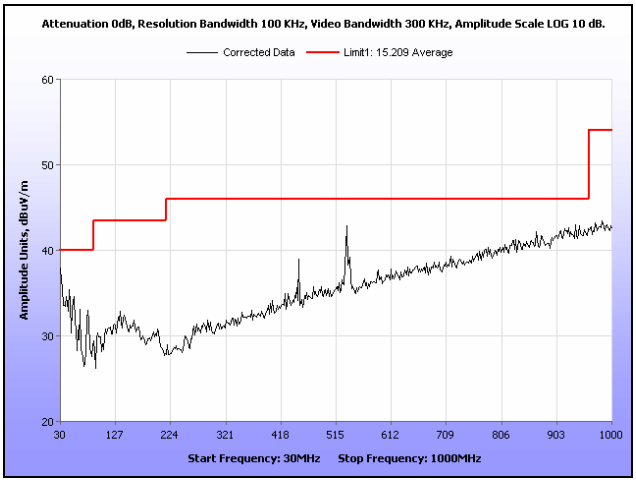


Plot 200. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, Non-TX BF, 1 GHz – 7 GHz

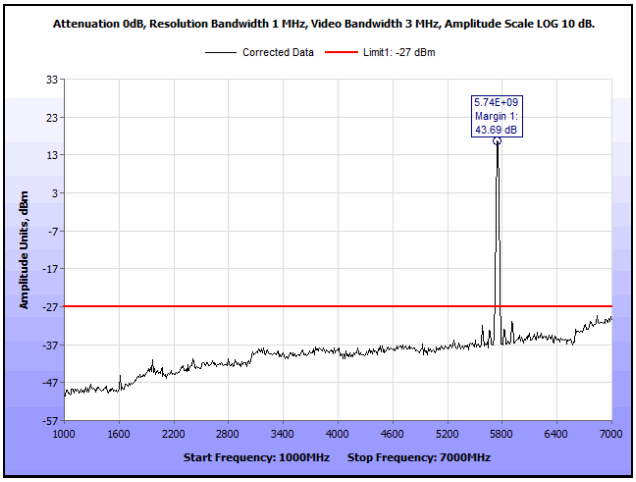


Plot 201. Radiated Spurious Emissions, 802.11ac 80 MHz, SISO, Non-TX BF, 7 GHz – 18 GHz

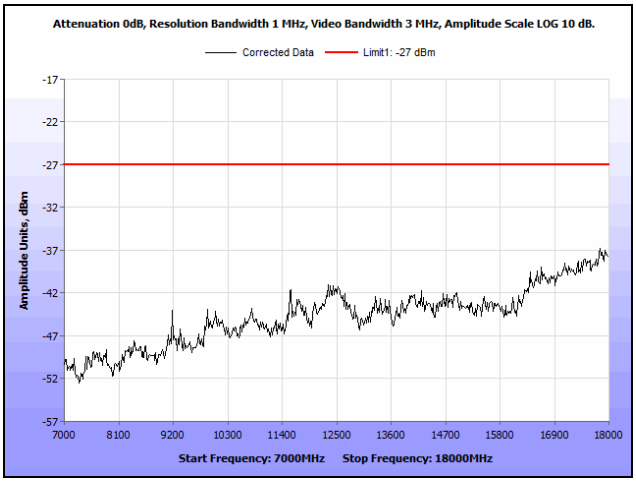
Radiated Spurious Emissions Test Results, Transmitting Beam-Forming, MIMO



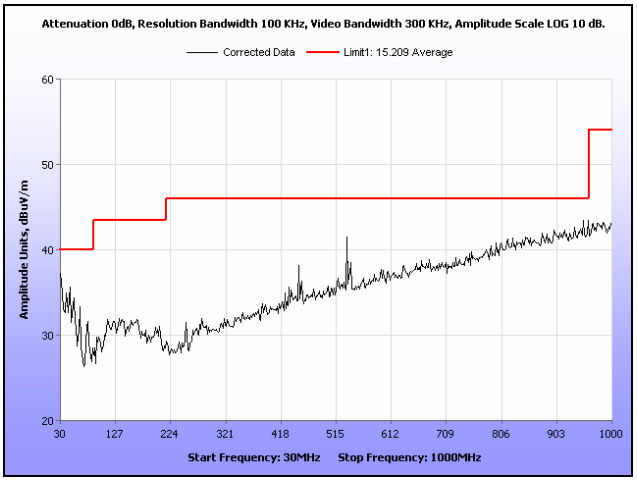
Plot 202. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, TX BF, 30 MHz – 1 GHz



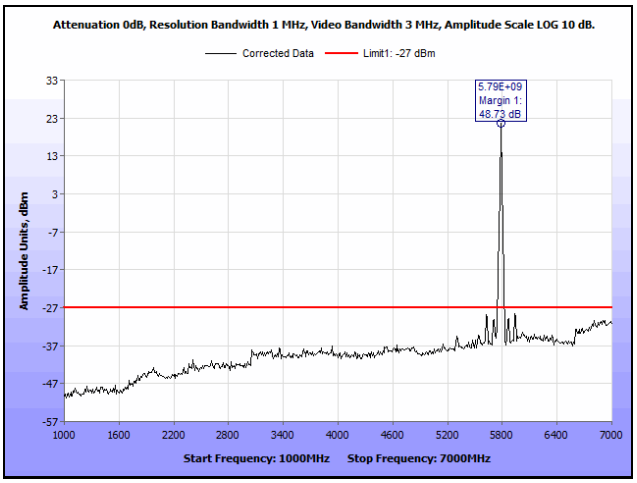
Plot 203. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, TX BF, 1 GHz – 7 GHz



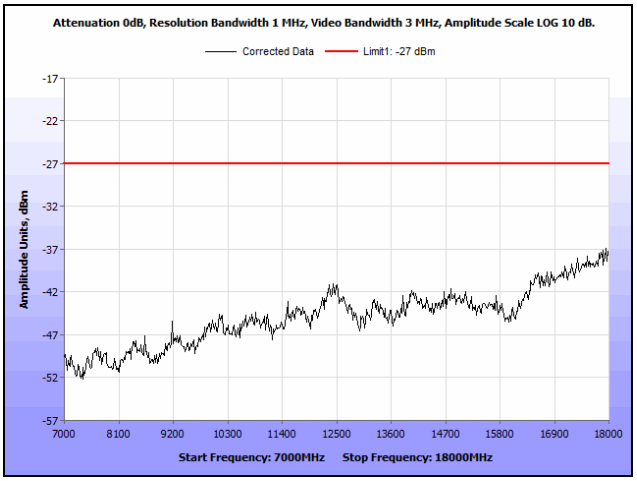
Plot 204. Radiated Spurious Emissions, Low Channel, 802.11ac 20 MHz, MIMO, TX BF, 7 GHz – 18 GHz



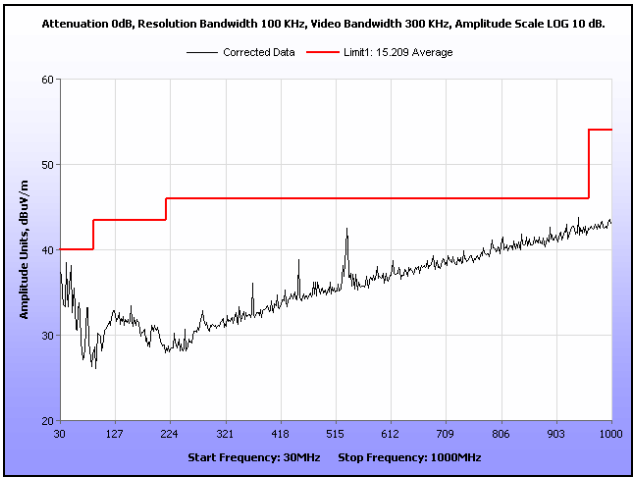
Plot 205. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, TX BF, 30 MHz – 1 GHz



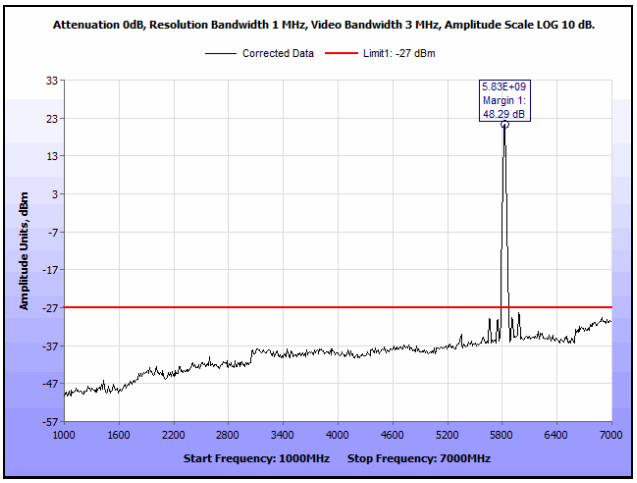
Plot 206. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, TX BF, 1 GHz – 7 GHz



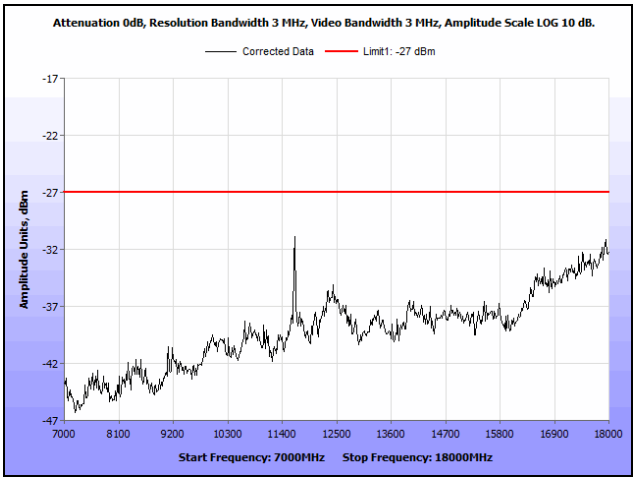
Plot 207. Radiated Spurious Emissions, Mid Channel, 802.11ac 20 MHz, MIMO, TX BF, 7 GHz – 18 GHz



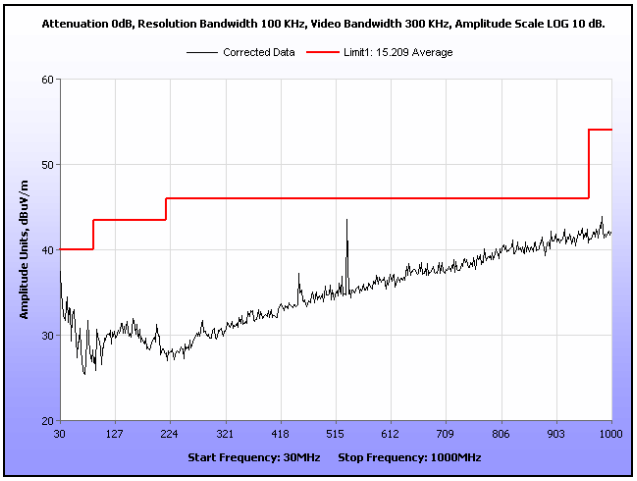
Plot 208. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, TX BF, 30 MHz – 1 GHz



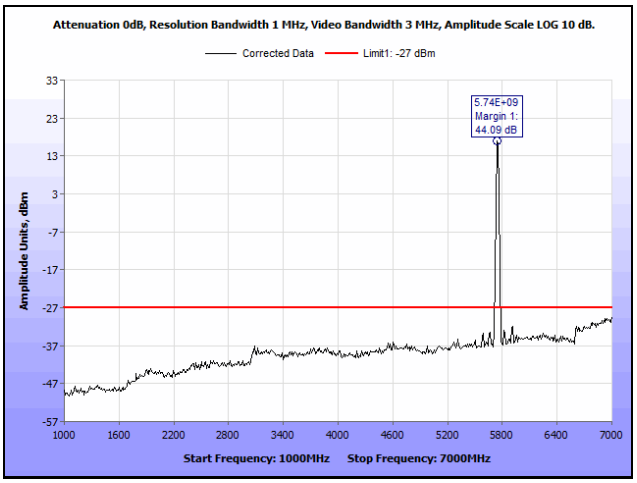
Plot 209. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, TX BF, 1 GHz – 7 GHz



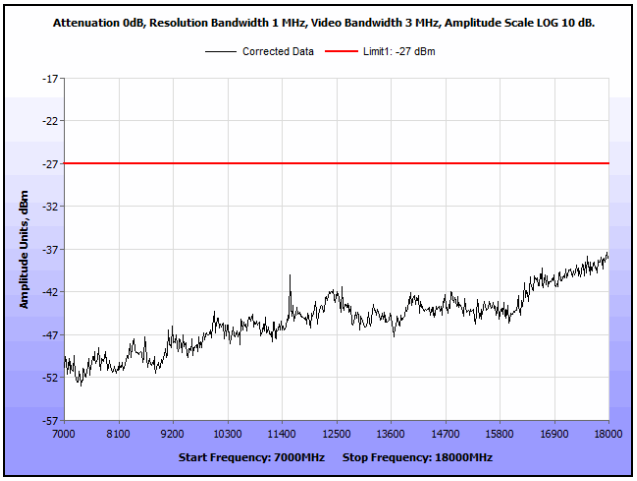
Plot 210. Radiated Spurious Emissions, High Channel, 802.11ac 20 MHz, MIMO, TX BF, 7 GHz – 18 GHz



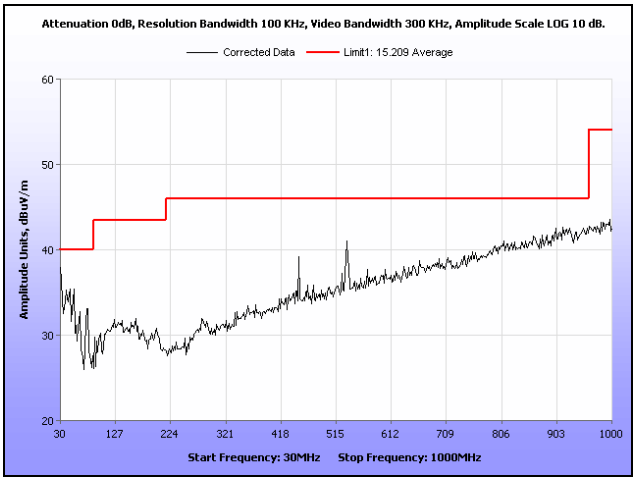
Plot 211. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, TX BF, 30 MHz – 1 GHz



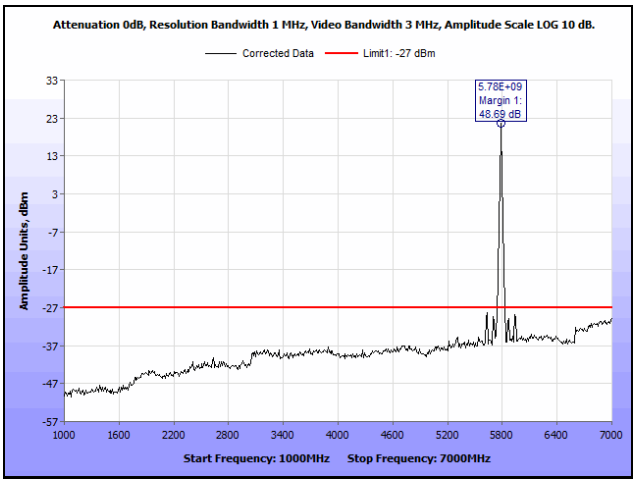
Plot 212. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, TX BF, 1 GHz – 7 GHz



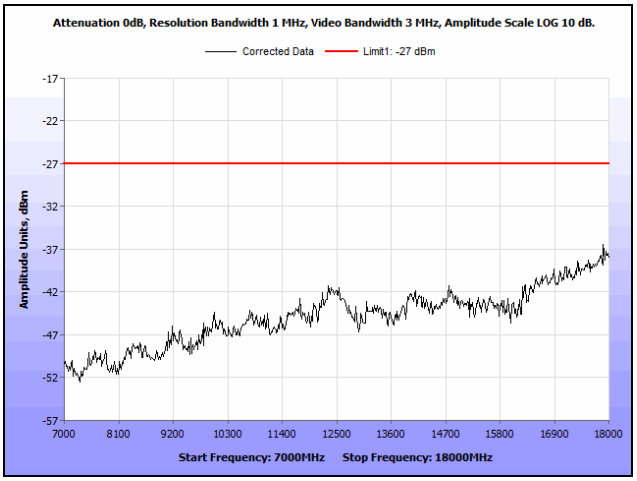
Plot 213. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, MIMO, TX BF, 7 GHz – 18 GHz



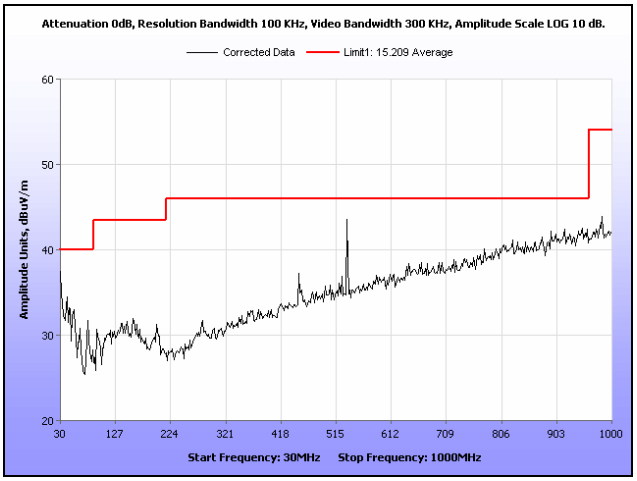
Plot 214. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, TX BF, 30 MHz – 1 GHz



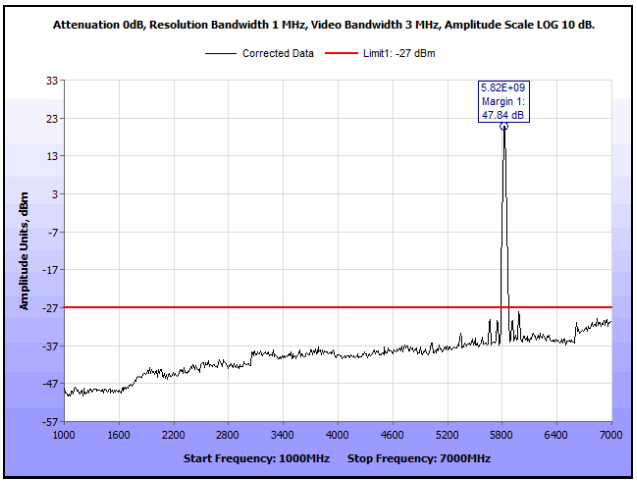
Plot 215. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, TX BF, 1 GHz – 7 GHz



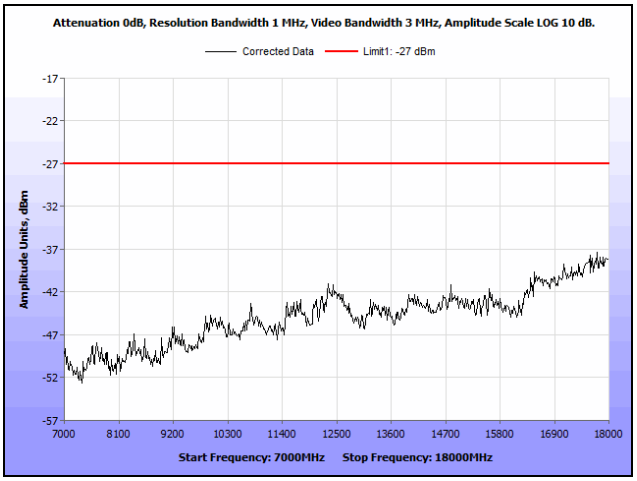
Plot 216. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, MIMO, TX BF, 7 GHz – 18 GHz



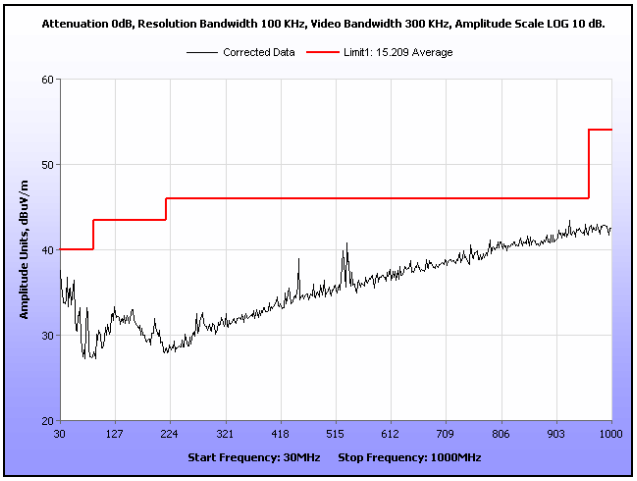
Plot 217. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, TX BF, 30 MHz – 1 GHz



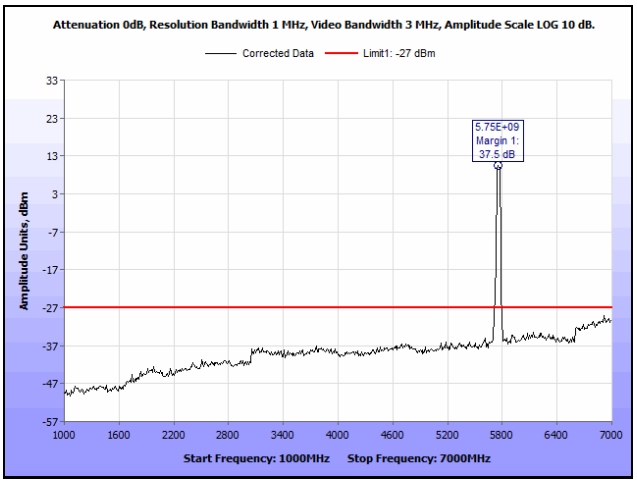
Plot 218. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, TX BF, 1 GHz – 7 GHz



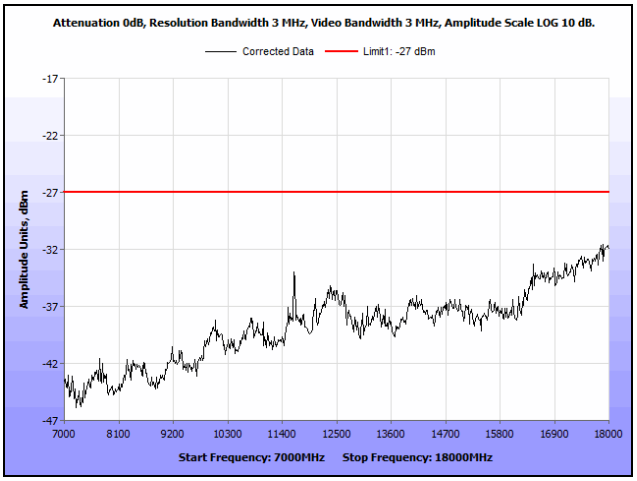
Plot 219. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, MIMO, TX BF, 7 GHz – 18 GHz



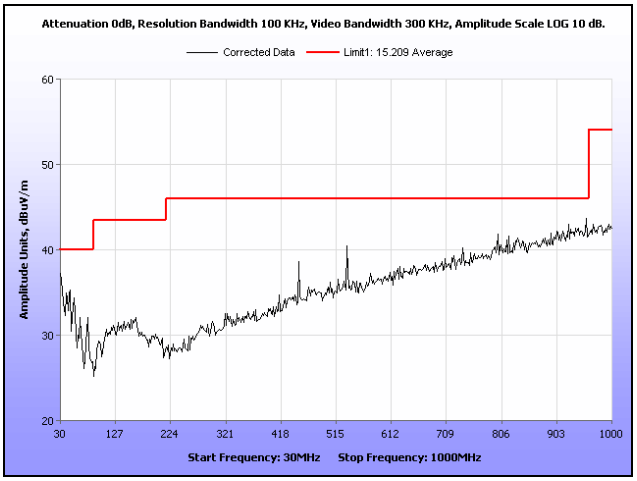
Plot 220. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, TX BF, 30 MHz – 1 GHz



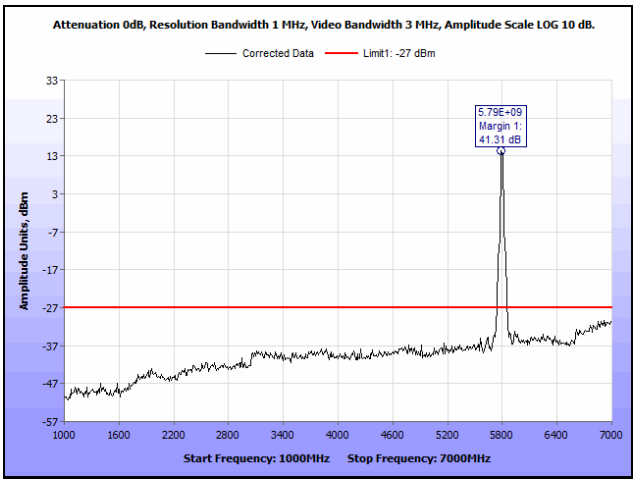
Plot 221. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, TX BF, 1 GHz – 7 GHz



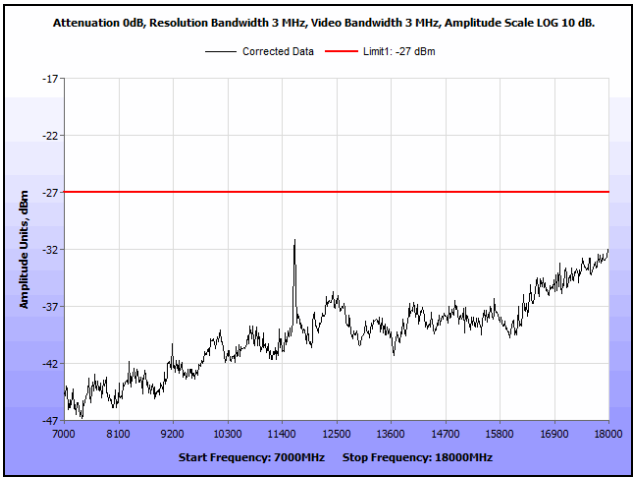
Plot 222. Radiated Spurious Emissions, Low Channel, 802.11ac 40 MHz, MIMO, TX BF, 7 GHz – 18 GHz



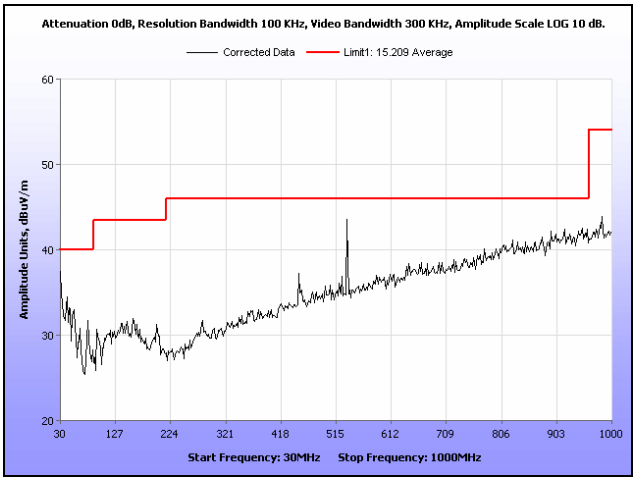
Plot 223. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, TX BF, 30 MHz – 1 GHz



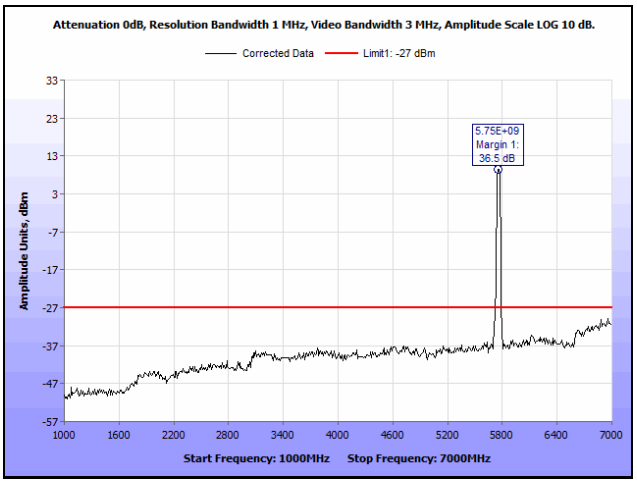
Plot 224. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, TX BF, 1 GHz – 7 GHz



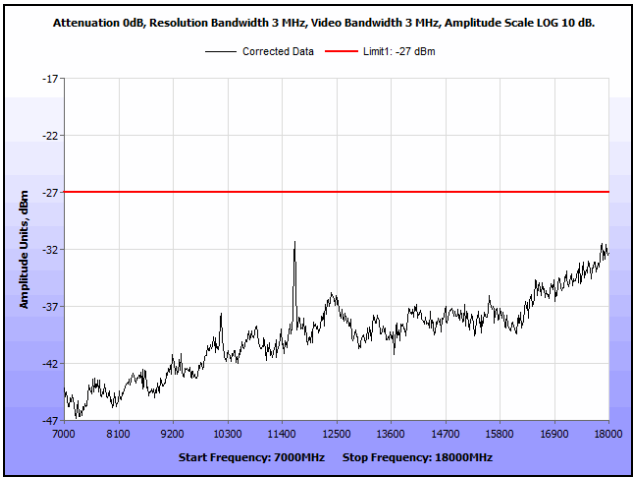
Plot 225. Radiated Spurious Emissions, High Channel, 802.11ac 40 MHz, MIMO, TX BF, 7 GHz – 18 GHz



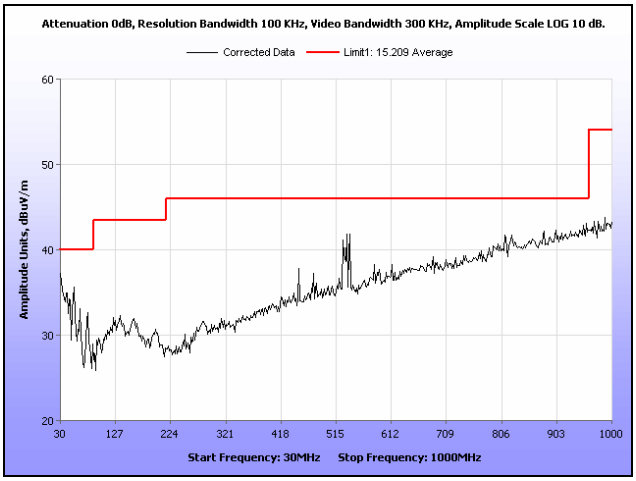
Plot 226. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, TX BF, 30 MHz – 1 GHz



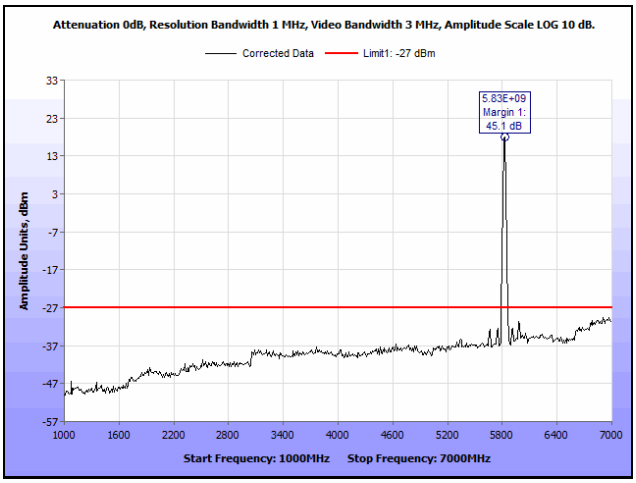
Plot 227. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, TX BF, 1 GHz – 7 GHz



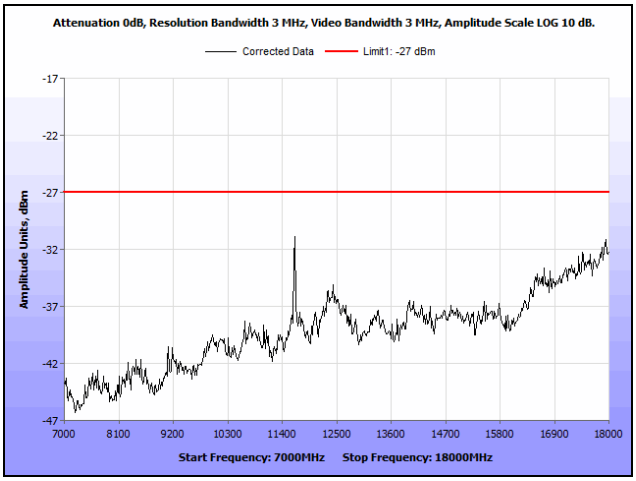
Plot 228. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, MIMO, TX BF, 7 GHz – 18 GHz



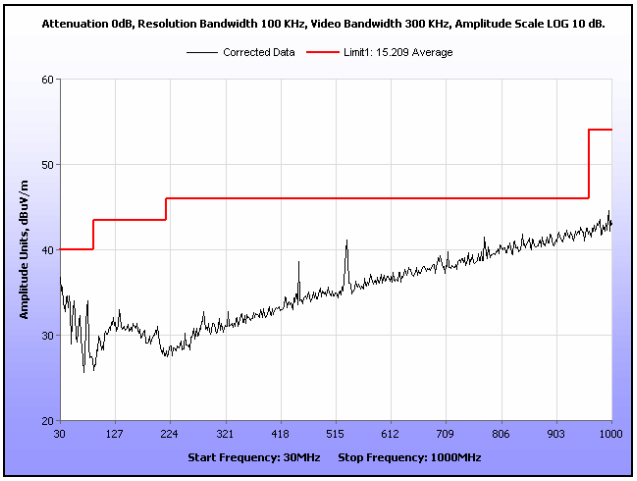
Plot 229. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, TX BF, 30 MHz – 1 GHz



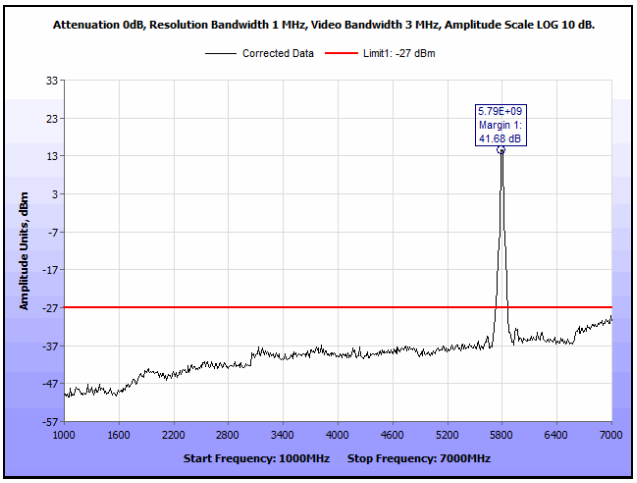
Plot 230. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, TX BF, 1 GHz – 7 GHz



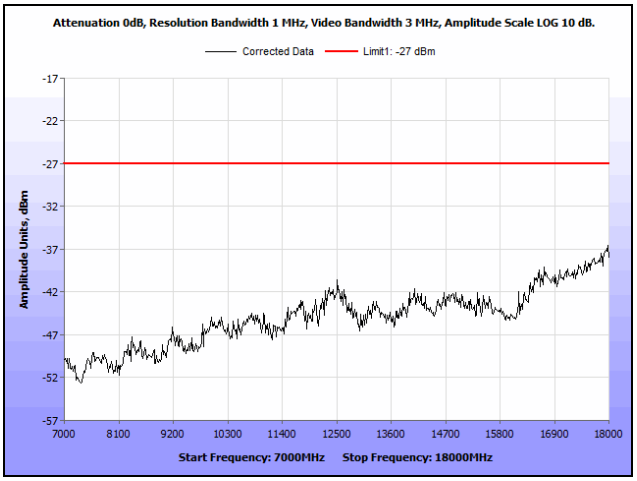
Plot 231. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, MIMO, TX BF, 7 GHz – 18 GHz



Plot 232. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, TX BF, 30 MHz – 1 GHz

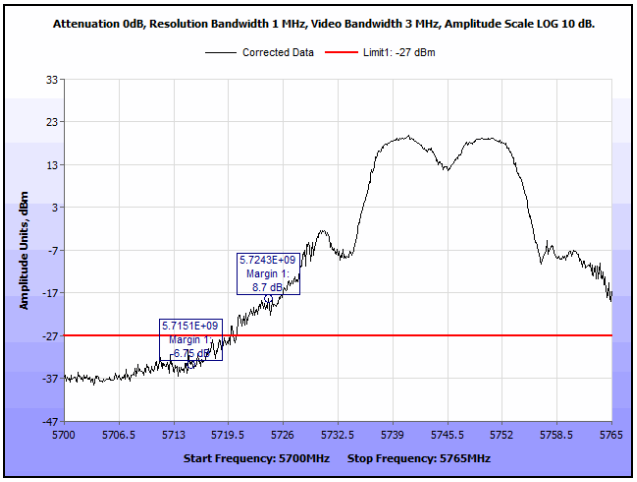


Plot 233. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, TX BF, 1 GHz – 7 GHz

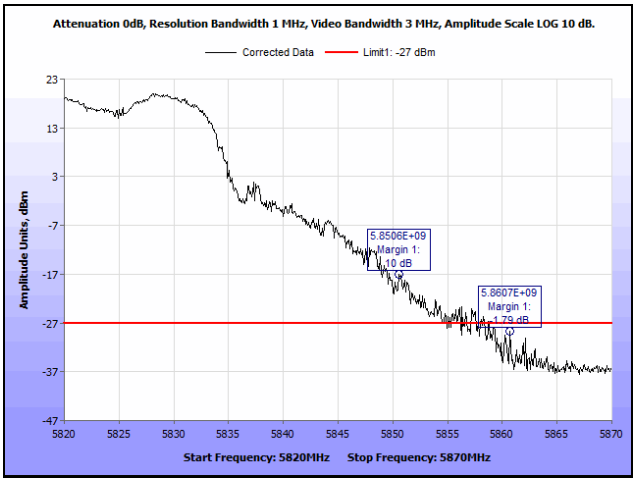


Plot 234. Radiated Spurious Emissions, 802.11ac 80 MHz, MIMO, TX BF, 7 GHz – 18 GHz

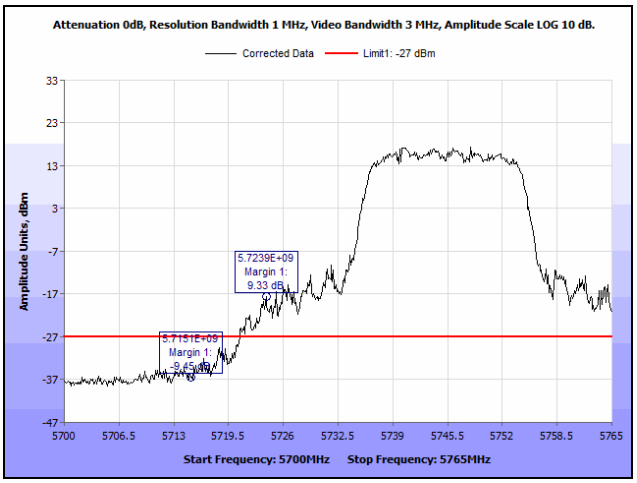
Radiated Band Edge Test Results, Non-Transmitting Beam-Forming, MIMO



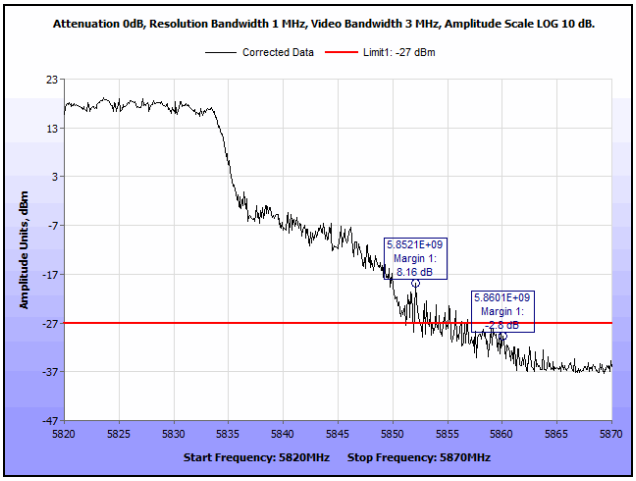
Plot 235. Radiated Band Edge, Low Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



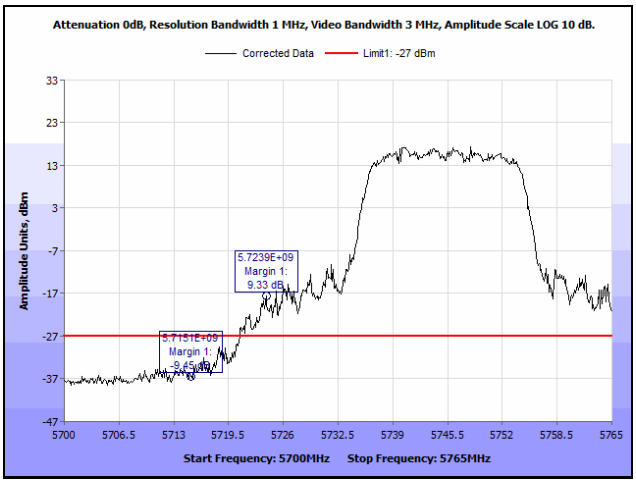
Plot 236. Radiated Band Edge, High Channel, 802.11a 20 MHz, MIMO, Non-Transmitting Beam-Forming



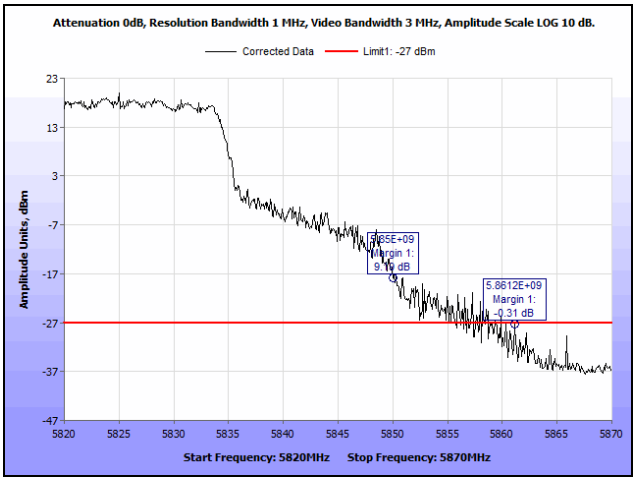
Plot 237. Radiated Band Edge, Low Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



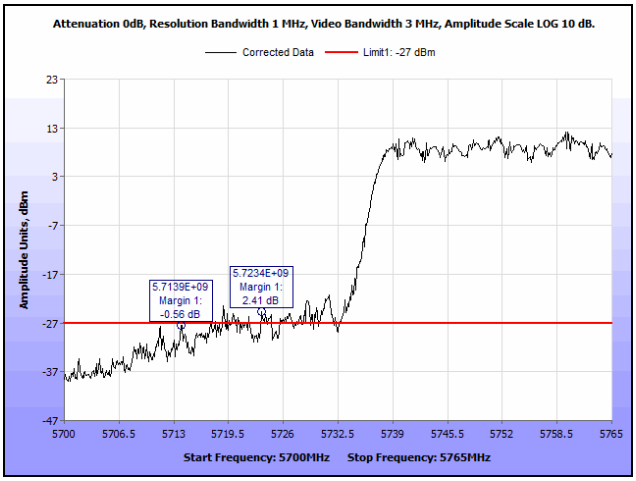
Plot 238. Radiated Band Edge, High Channel, 802.11ac 20 MHz, MIMO, Non-Transmitting Beam-Forming



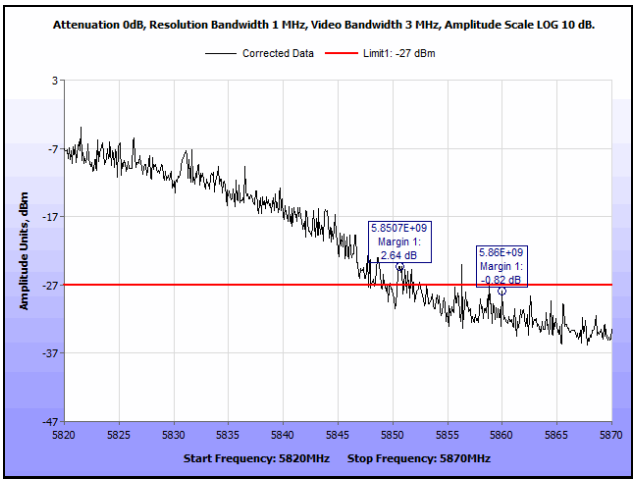
Plot 239. Radiated Band Edge, Low Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



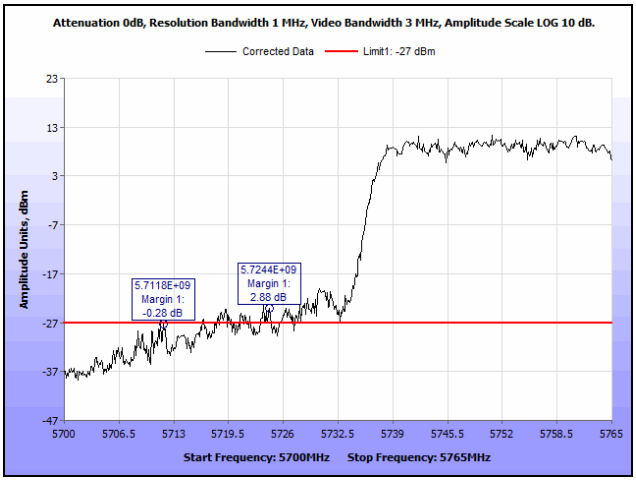
Plot 240. Radiated Band Edge, High Channel, 802.11n 20 MHz, MIMO, Non-Transmitting Beam-Forming



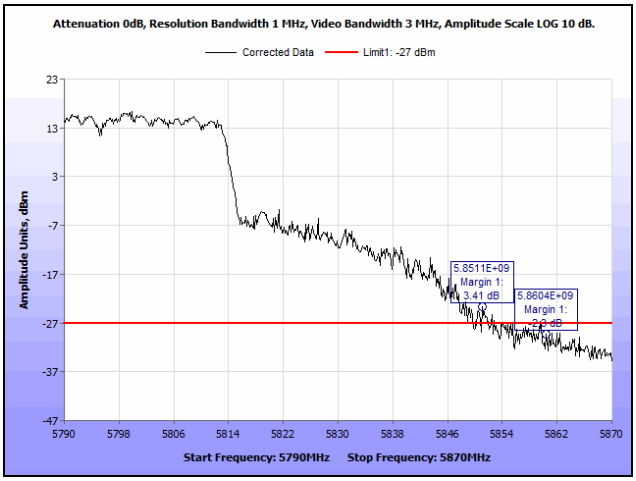
Plot 241. Radiated Band Edge, Low Channel, 802.11ac 40 MHz, MIMO, Non-Transmitting Beam-Forming



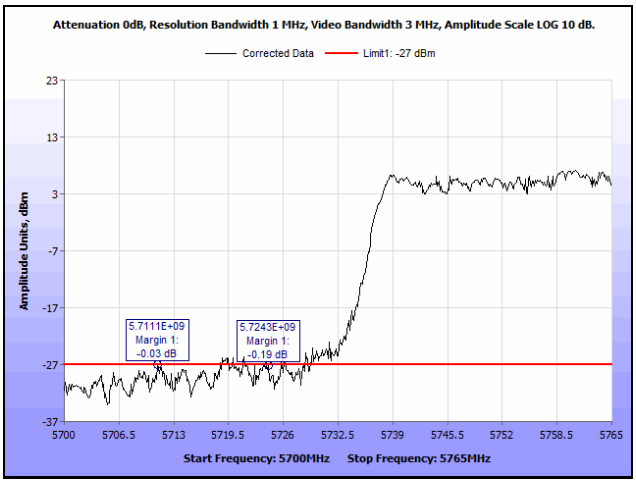
Plot 242. Radiated Band Edge, High Channel, 802.11ac 40 MHz, MIMO, Non-Transmitting Beam-Forming



Plot 243. Radiated Band Edge, Low Channel, 802.11n 40 MHz, MIMO, Non-Transmitting Beam-Forming

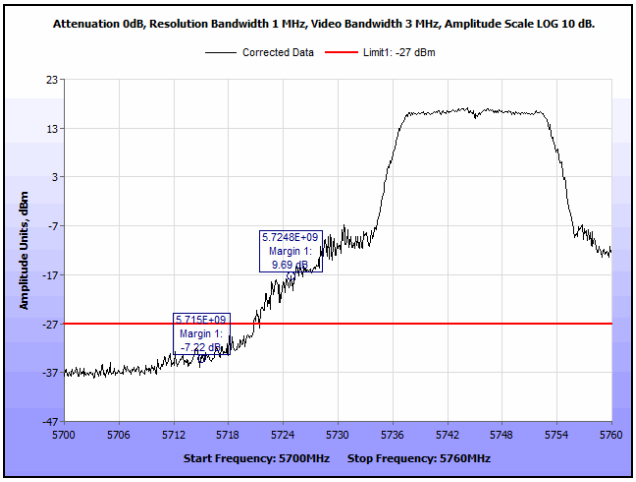


Plot 244. Radiated Band Edge, High Channel, 802.11n 40 MHz, MIMO, Non-Transmitting Beam-Forming

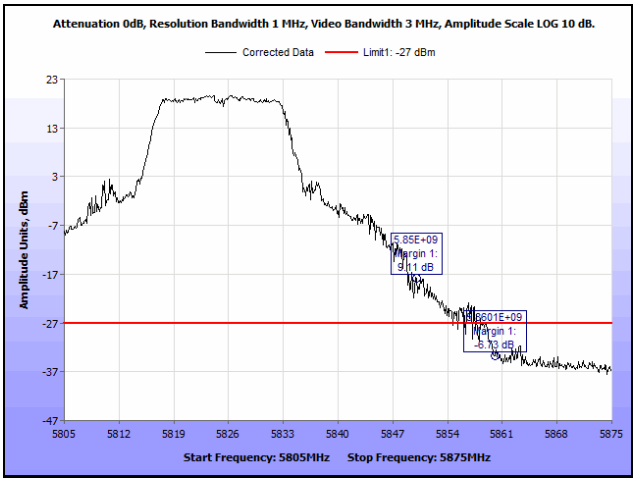


Plot 245. Radiated Band Edge, 802.11ac 80 MHz, MIMO, Non-Transmitting Beam-Forming

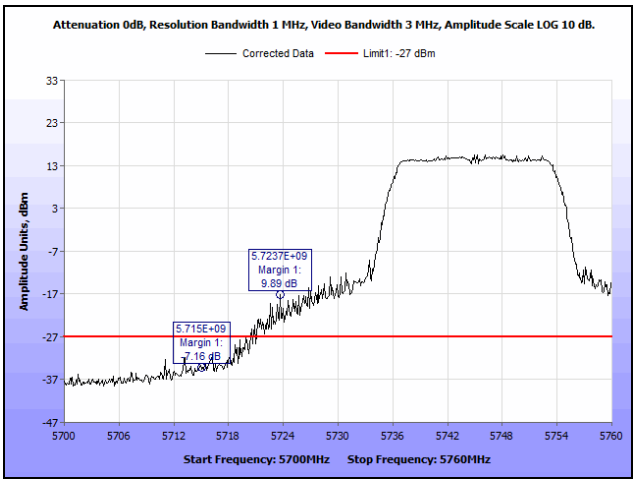
Radiated Band Edge Test Results, Non-Transmitting Beam-Forming, SISO



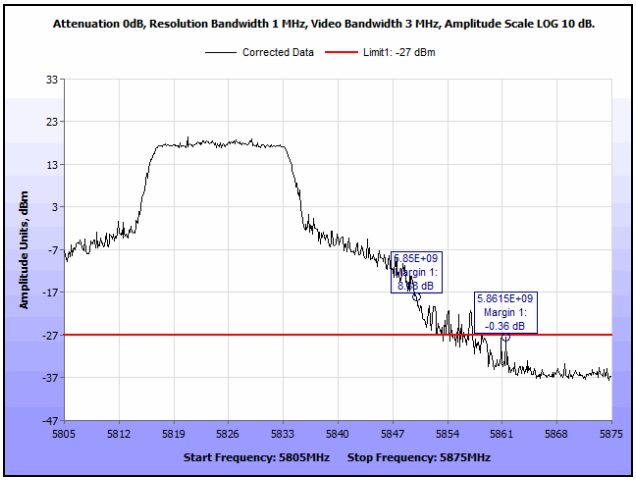
Plot 246. Radiated Band Edge, Low Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



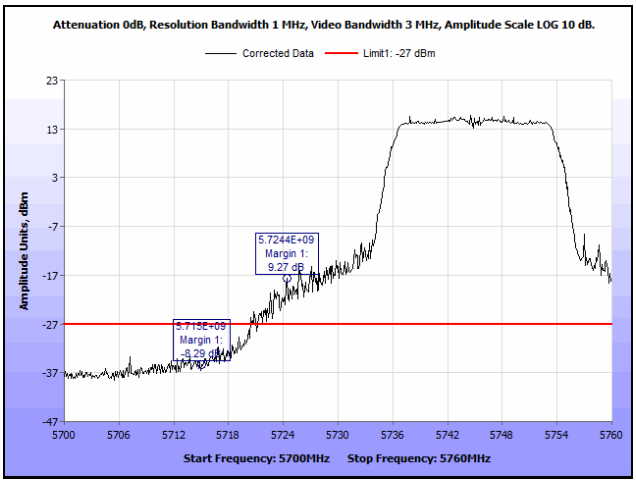
Plot 247. Radiated Band Edge, High Channel, 802.11a 20 MHz, SISO, Non-Transmitting Beam-Forming



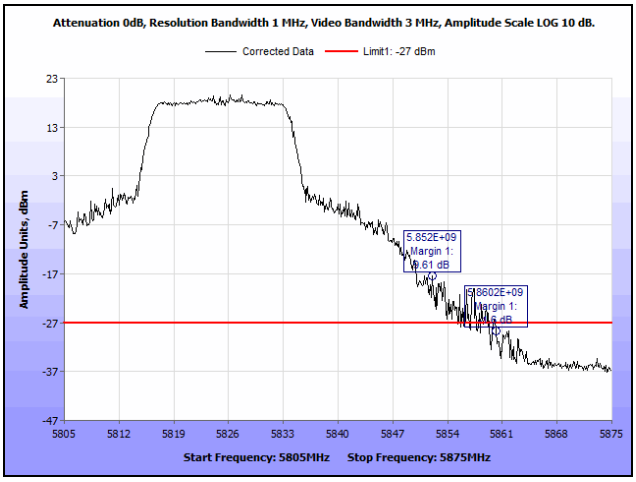
Plot 248. Radiated Band Edge, Low Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



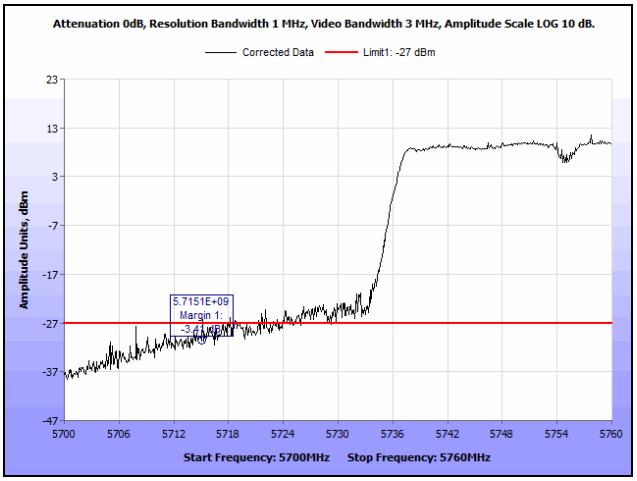
Plot 249. Radiated Band Edge, High Channel, 802.11ac 20 MHz, SISO, Non-Transmitting Beam-Forming



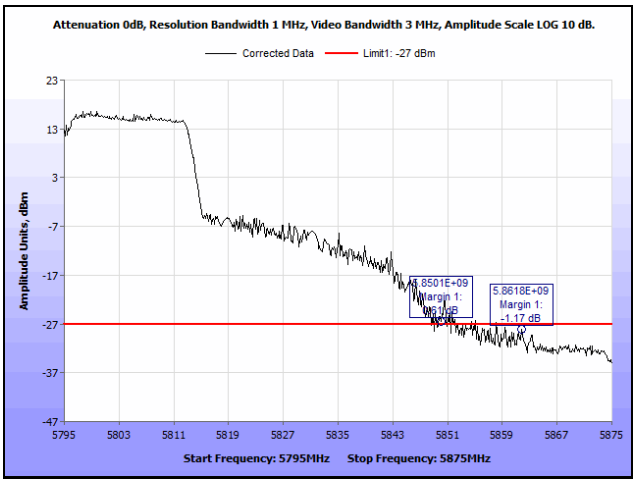
Plot 250. Radiated Band Edge, Low Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



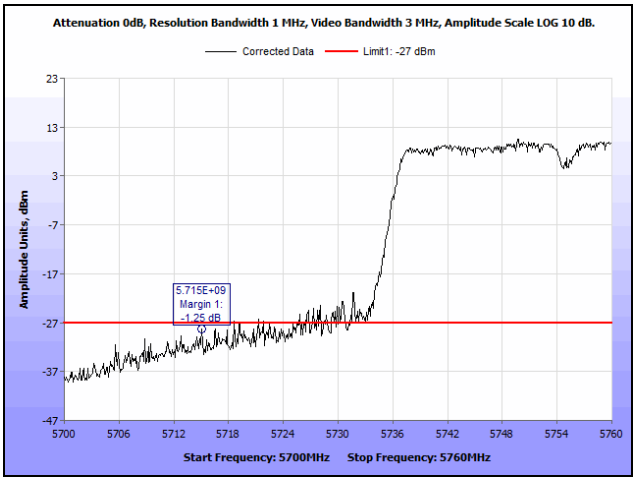
Plot 251. Radiated Band Edge, High Channel, 802.11n 20 MHz, SISO, Non-Transmitting Beam-Forming



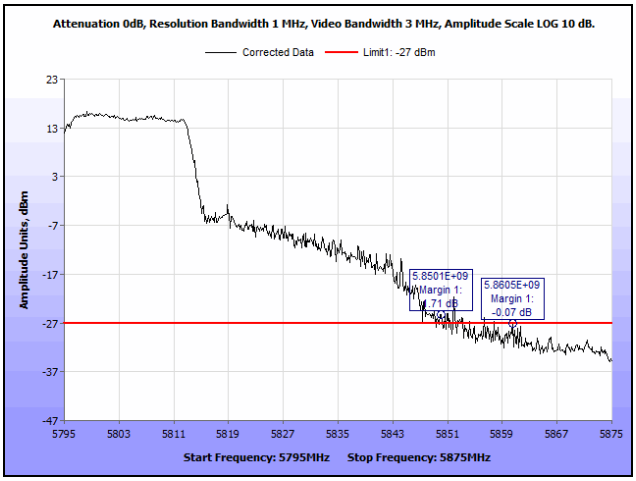
Plot 252. Radiated Band Edge, Low Channel, 802.11ac 40 MHz, SISO, Non-Transmitting Beam-Forming



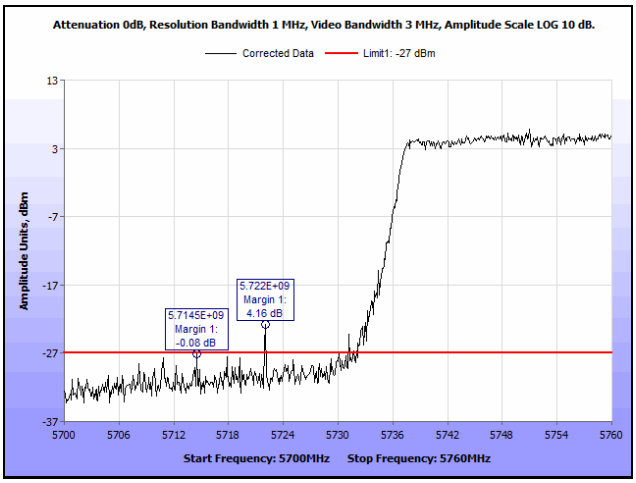
Plot 253. Radiated Band Edge, High Channel, 802.11ac 40 MHz, SISO, Non-Transmitting Beam-Forming



Plot 254. Radiated Band Edge, Low Channel, 802.11n 40 MHz, SISO, Non-Transmitting Beam-Forming

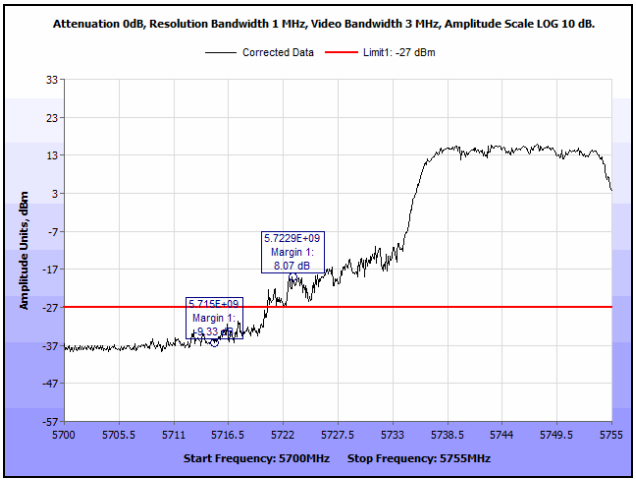


Plot 255. Radiated Band Edge, High Channel, 802.11n 40 MHz, SISO, Non-Transmitting Beam-Forming

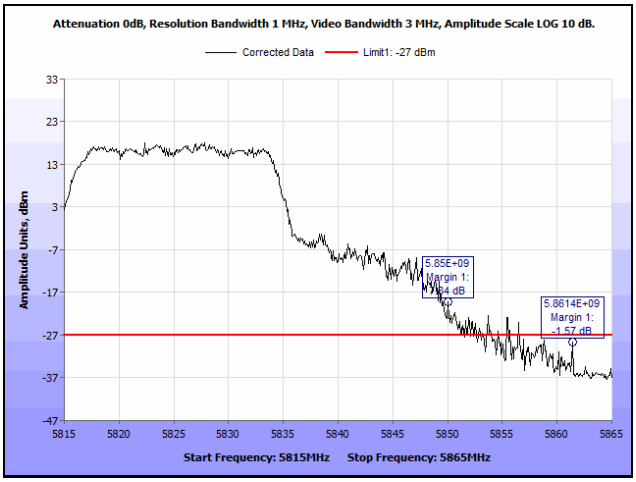


Plot 256. Radiated Band Edge, 802.11ac 80 MHz, SISO, Non-Transmitting Beam-Forming

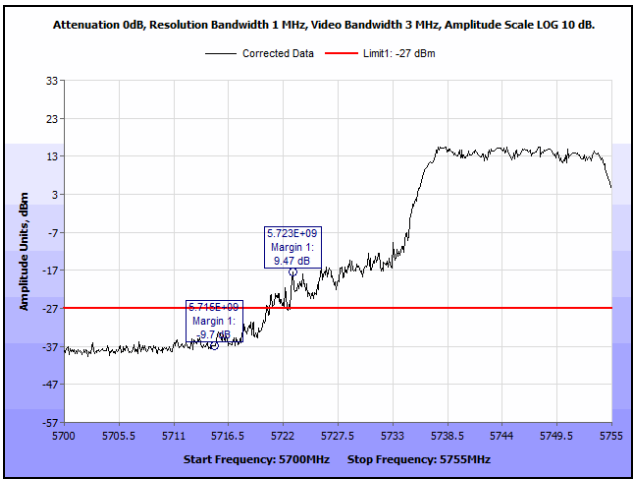
Radiated Band Edge Test Results, Transmitting Beam-Forming, MIMO



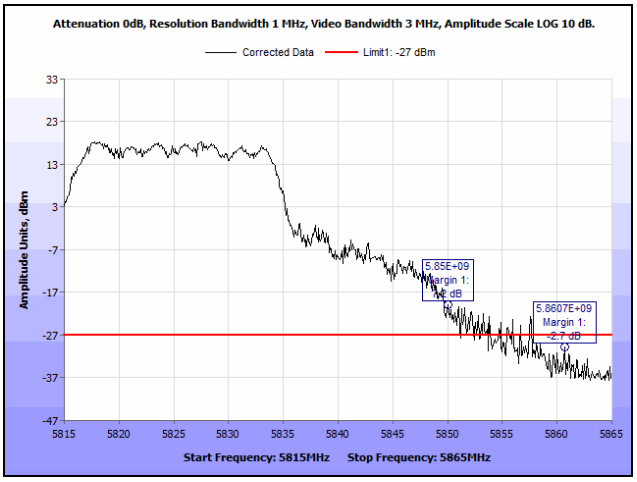
Plot 257. Radiated Band Edge, Low Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



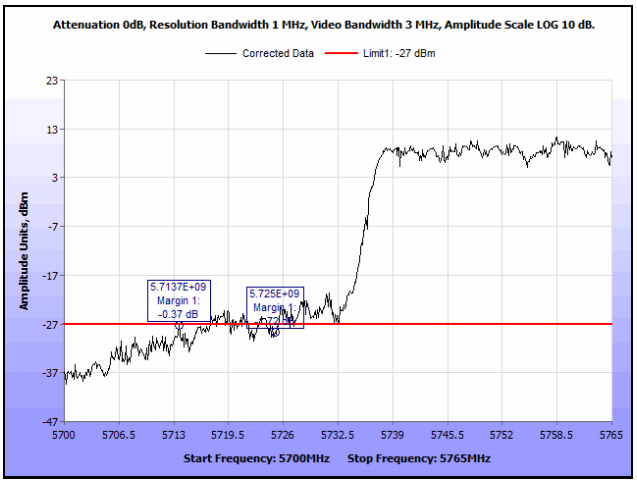
Plot 258. Radiated Band Edge, High Channel, 802.11ac 20 MHz, MIMO, Transmitting Beam-Forming



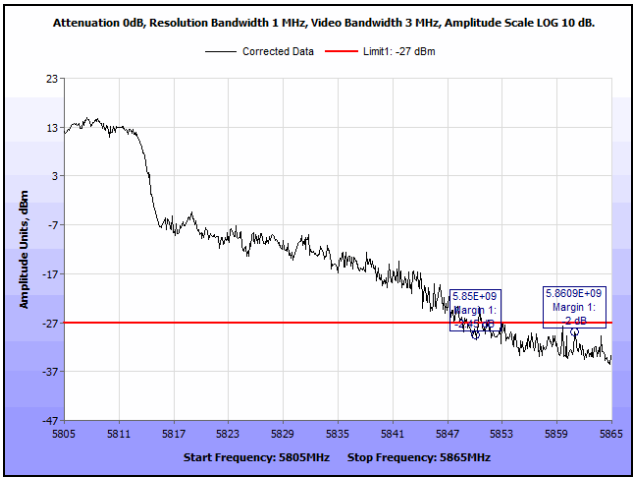
Plot 259. Radiated Band Edge, Low Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



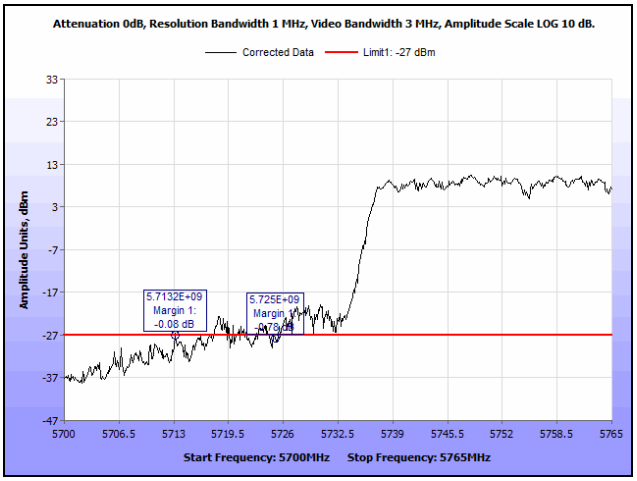
Plot 260. Radiated Band Edge, High Channel, 802.11n 20 MHz, MIMO, Transmitting Beam-Forming



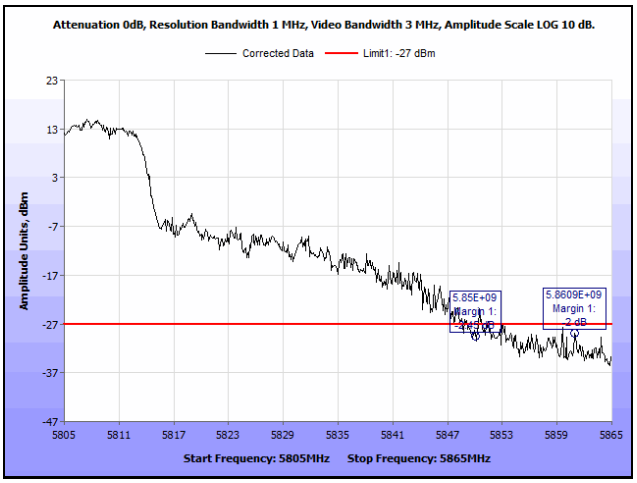
Plot 261. Radiated Band Edge, Low Channel, 802.11ac 40 MHz, MIMO, Transmitting Beam-Forming



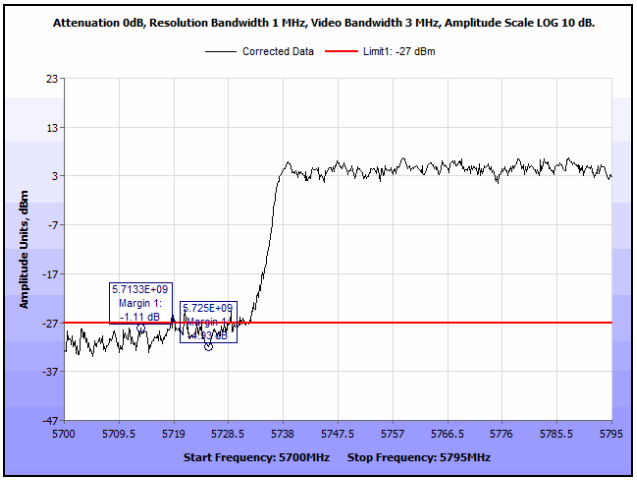
Plot 262. Radiated Band Edge, High Channel, 802.11ac 40 MHz, MIMO, Transmitting Beam-Forming



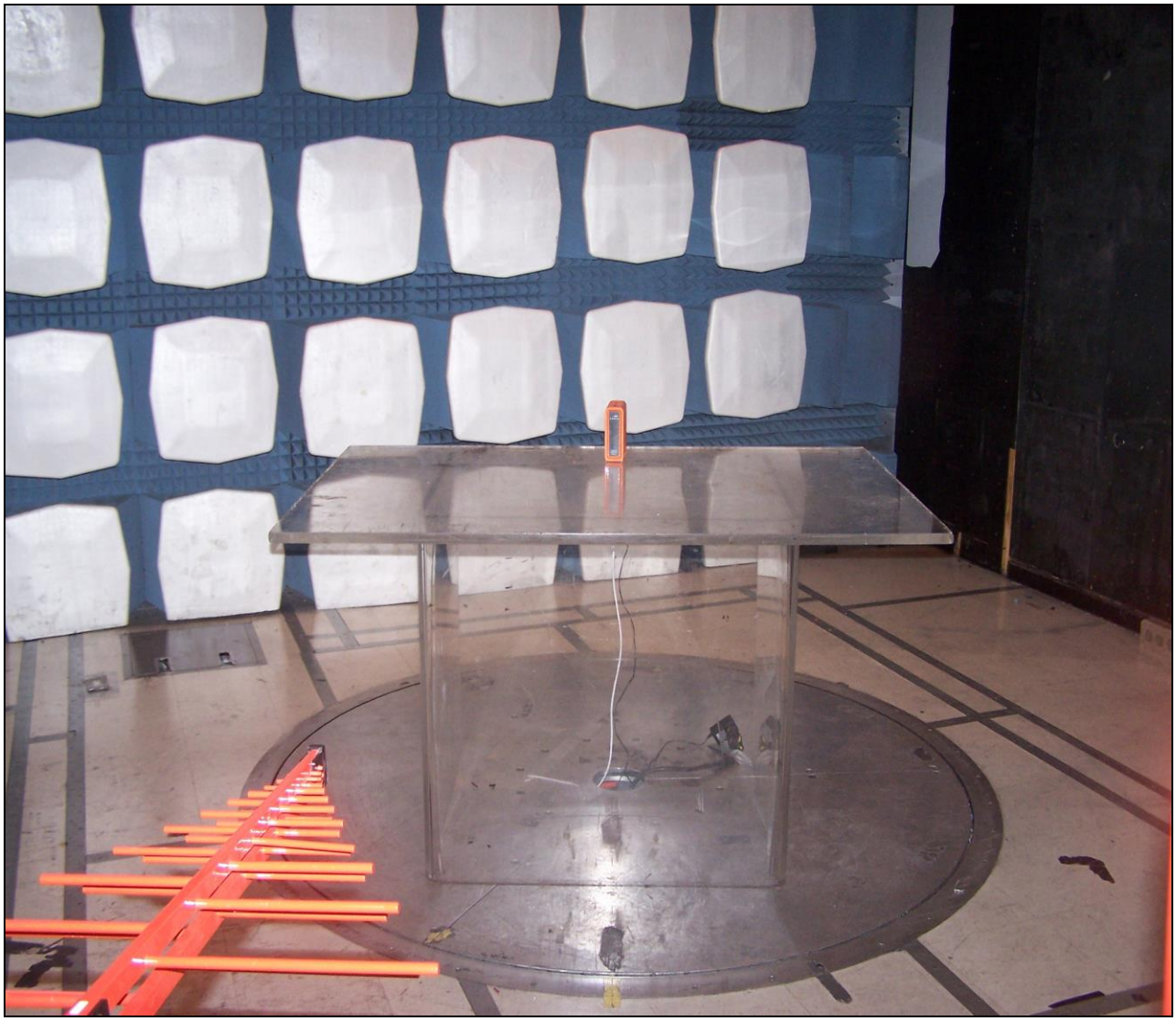
Plot 263. Radiated Band Edge, Low Channel, 802.11n 40 MHz, MIMO, Transmitting Beam-Forming



Plot 264. Radiated Band Edge, High Channel, 802.11n 40 MHz, MIMO, Transmitting Beam-Forming



Plot 265. Radiated Band Edge, 802.11ac 80 MHz, MIMO, Transmitting Beam-Forming



Photograph 2. Radiated Emissions, Test Setup

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 @ 5745-5825 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

Output Power = 25.35 dBm

Antenna Gain = 8.71 dBi

Power density is equal to 0.5 mW/cm^2.

At a distance of 20 cm.

IV. Test Equipment

Test Equipment

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

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4871	VECTOR SIGNAL GENERATOR	AGILENT	N5172B	6/16/2014	12/16/2015
1T4870	THERM./CLOCK/HUMIDITY MONITOR	CONTROL COMPANY	06-662-4, FB70258	3/14/2014	3/14/2016
1T4829	SPECTRUM ANALYZER	AGILENT	E4407B	9/30/2014	3/30/2016
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	7/29/2014	1/29/2016
1T4564	LISN (24 AMP)	SOLAR ELECTRONICS	9252-50-R-24-BNC	6/3/2014	6/3/2015
1T4505	TEMPERATURE CHAMBER	TEST EQUITY	115	2/11/2015	2/11/2016
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	2/28/2014	8/28/2015
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4418	LISN	SOLAR ELECTRONICS	9233-50-TS-50-N	10/24/2014	4/24/2016
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	7/18/2014	7/18/2016
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	7/24/2012	7/24/2015
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	NOT REQUIRED	
1T2665	ANTENNA; HORN	EMCO	3115	4/3/2014	10/3/2015

Table 26. Test Equipment List

V. Certification & User's Manual Information

Certification & User's Manual Information

L. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.907 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

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

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

