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

January 4, 2017

CommScope Technologies LLC
250 Apollo Drive
Chelmsford, MA 01824

Dear Gary Falk,

Enclosed is the EMC Wireless test report for compliance testing of the CommScope Technologies LLC, Small Cell/ Model S1000R 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 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: (\CommScope Technologies LLC\EMC91761-FCC407 UNII 2 Rev. 2)

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Electromagnetic Compatibility Criteria Test Report

for the

CommScope Technologies LLC
Small Cell/ Model S1000R

Tested under
the Certification Rules
contained in
Title 47 of the CFR, Part 15, Subpart B
for Unintentional Radiators
and
Title 47 of the CFR, Part 15.407
for Intentional Radiators

MET Report: EMC91761-FCC407 UNII 2 Rev. 2

January 4, 2017

Prepared For:

CommScope Technologies LLC
250 Apollo Drive
Chelmsford, MA 01824

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

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Benjamin Taylor, 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
∅	October 21, 2016	Initial Issue.
1	December 8, 2016	Editorial corrections.
2	January 4, 2017	Removed EUT Photos for Short Term Confidentiality

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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**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**er**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	**micro**henry
µ	**micro**farad
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 CommScope Technologies LLC Small Cell/ Model S1000R, 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 Small Cell/ Model S1000R. CommScope Technologies LLC should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Small Cell/ Model S1000R, 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 CommScope Technologies LLC, purchase order number 60521. 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)(2)	Conducted Transmitter Output Power	Compliant
15.407 (a)(2)	Power Spectral Density	Compliant
15.407 (b)(2), (3), (5), (6)	Undesirable Emissions (15.205/15.209 – General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
15.407(f)	RF Exposure	Compliant
15.407(h)(2)	DFS Channel Bandwidth	Compliant
15.407 (h)(2)(ii)	Initial Channel Availability Check Time (CACT)	Compliant
15.407 (h)(2)(ii)	Radar Burst at the Beginning of CACT	Compliant
15.407 (h)(2)(ii)	Radar Burst at the End of CACT	Compliant
15.407 (h)(2)(iii)	Channel Move and Closing Time	Compliant
15.407 (h)(2)(iv)	Non-Occupancy Period	Compliant
15.407 (h)(2)	Statistical Performance Check	Compliant

Table 1. Executive Summary of EMC Part 15.407 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by CommScope Technologies LLC to perform testing on the Small Cell/ Model S1000R, under CommScope Technologies LLC's purchase order number 60521.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the CommScope Technologies LLC Small Cell/ Model S1000R.

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

Model(s) Tested:	Small Cell/ Model S1000R	
Model(s) Covered:	Small Cell/ Model S1000R	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: QHY-S1000R	
	Type of Modulations:	OFDM
	Equipment Code:	NII
	Peak RF Output Power:	23.90 dBm
	EUT Frequency Ranges:	5260 – 5320 MHz 5500-5700 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:	Djed Mouada and Benjamin Taylor	
Report Date(s):	January 4, 2017	

Table 2. EUT Summary

B. References

CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
KDB 789033 D02	D02 General UNII Test Procedures New Rules v01

Table 3. References

C. Test Site

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

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

D. Description of Test Sample

The CommScope Technologies LLC Small Cell/ Model S1000R, Equipment Under Test (EUT), is a LTE/Wi-Fi Low Power Femto Backhaul Relay Base Station. It is intended to be use in the Small to Medium Business's to provide indoor voice and data coverage.

E. Equipment Configuration

All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Part Number
1	Femto Backhaul Relay Base Station	S1000R	800239
2	DYS Switching Mode Power Supply	DYS650-120400W-1	DYS650-120400-16419

Table 4. Equipment Configuration

F. Support Equipment

CommScope Technologies LLC supplied support equipment necessary for the operation and testing of the Small Cell/ Model S1000R. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	Customer Supplied Calibration Data
1	MXA Analyzer	Agilent	N9020A	10-14-2015
2	Rubidium	Stanford Research Systems	FS725	06-06-2016
3	Waveform Generator	Keysight	33500B	not applicable
4	Wi-Fi Router	Linksys	EA2700	not applicable
5	Laptop	Dell	Latitude E6440	not applicable
6	USB Optical Mouse	Dell		not applicable
7	AC Adapter for Laptop	Dell		not applicable
8	Cat5 cables			not applicable
9	RF Test cables	Murata	MXHS83QE3000	not applicable

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	Data	RG59 Coax	1	15	Yes	B. TX
2	AC Input	3 conductor, 18 awg	1	2	No	(230v/50hz)

Table 6. Ports and Cabling Information

H. Mode of Operation

The Femto Backhaul Relay Base station will be operating in 2 modes LTE and Wi-Fi.

LTE - The Backhaul relay radio transmits in Bands 25 & 26 (FDD) Bandwidth 3, 5 & 10 MHz & Band 41 (TDD) sub bands 2500-2570 MHz & 2620-2690 MHz. Test mode uses the suppliers test software CLI in order to be able to provide a continuous transmit stream for EMC testing. Transmitters shall be at max power of Band 25 (+22dBm), Band 26 (+20dBm) & Band 41(+22dBm).

LTE - The service radio transmits in Band 41 (TDD). Test mode uses the chipset suppliers test software TMU in order to be able to provide a continuous transmit stream for EMC testing. Transmitters shall be at max power of +20dBm.

Wi-Fi – The Wi-Fi radios, 2.4 & 5 MHz, will be tested uses the chipset suppliers test software ART. Transmitters shall be at max power of +17dBm.

A laptop using telnet sessions and test scripts will be used to control the radio for LTE and Wi-Fi during EMC testing.

A laptop using a serial connection and test scripts will be used during LTE Radio & Safety testing.

I. Method of Monitoring EUT Operation

Consistent with the Mode of Operation section above, there needs to be a means of continuously monitoring the operation of the EUT.

1. All radios can be monitored by the software indicating the state of the radio links via CLI. Also the DC power consumed is an indicator of the state of the system.
2. Same as above.

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 CommScope Technologies LLC upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

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

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

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

Results: The EUT as tested is compliant the criteria of §15.203. The EUT employs an integral antenna

Test Engineer(s): Benjamin Taylor

Test Date(s): 03/31/15

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207 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.

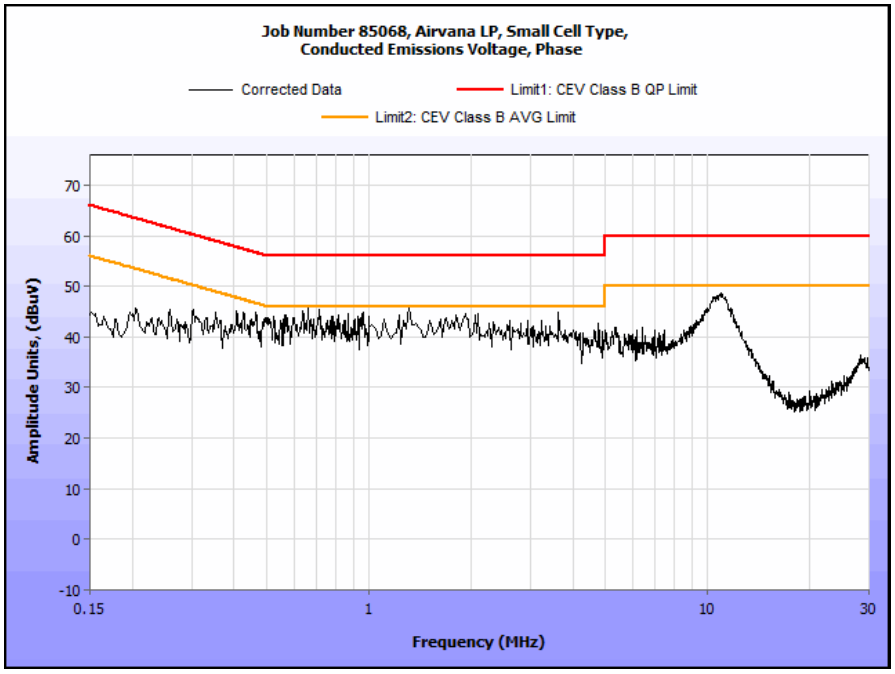
Test Engineer(s): Benjamin Taylor

Test Date(s): 05/01/15

15.207(a) Conducted Emissions Test Results

Line Under Test:		Phase								
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.248	43.61	0	43.61	56	-12.39	38.98	0	38.98	46	-7.02
0.441	45.19	0	45.19	56	-10.81	43.24	0	43.24	46	-2.76
0.559	49.51	0	49.51	56	-6.49	42.56	0	42.56	46	-3.44
1.32	48.68	0	48.68	56	-7.32	40.91	0	40.91	46	-5.09
5.67	49.12	0.17	49.29	60	-10.71	43.95	0.17	44.12	50	-5.88
11.91	50.5	0.17	50.67	60	-9.33	44.17	0.17	44.34	50	-5.66

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

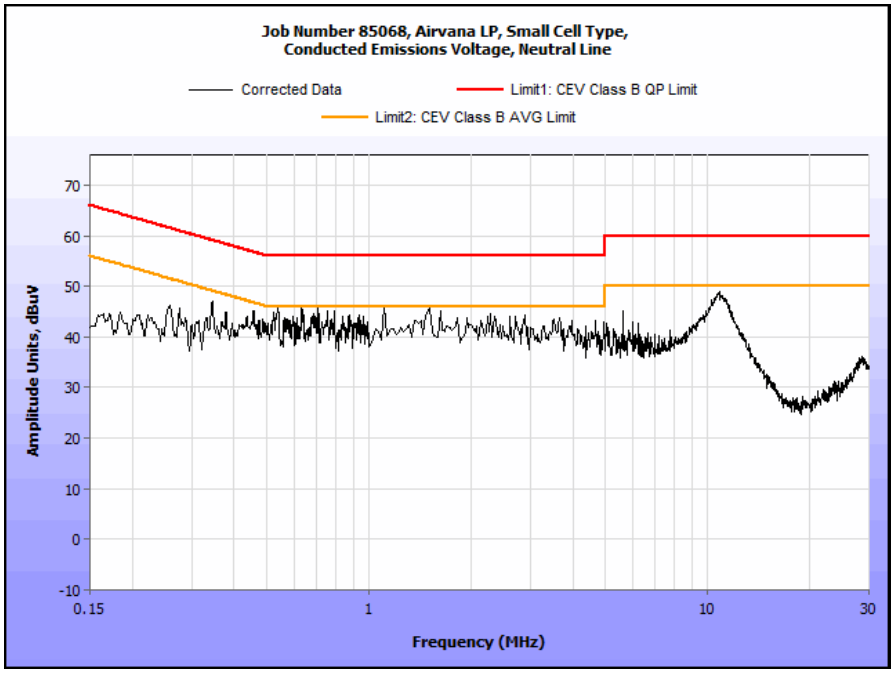


Plot 1. Conducted Emissions, 15.207(a), Phase Line

15.207(a) Conducted Emissions Test Results

Line Under Test:		Neutral								
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.249	42.56	0	42.56	56	-13.44	39.45	0	39.45	46	-6.55
0.339	46.18	0	46.18	56	-9.82	42.34	0	42.34	46	-3.66
0.541	48.65	0	48.65	56	-7.35	41.57	0	41.57	46	-4.43
1.29	49.63	0	49.63	56	-6.37	41.54	0	41.54	46	-4.46
5.68	48.6	0.17	48.77	60	-11.23	41.6	0.17	41.77	50	-8.23
11.99	49.66	0.17	49.83	60	-10.17	45.45	0.17	45.62	50	-4.38

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



Plot 2. Conducted Emissions, 15.207(a), Neutral Line

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): Benjamin Taylor

Test Date(s): 04/01/15

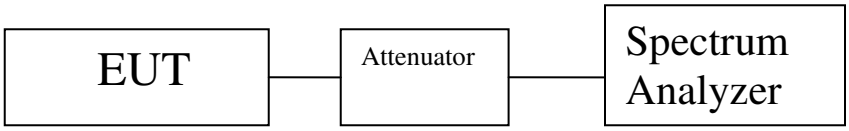
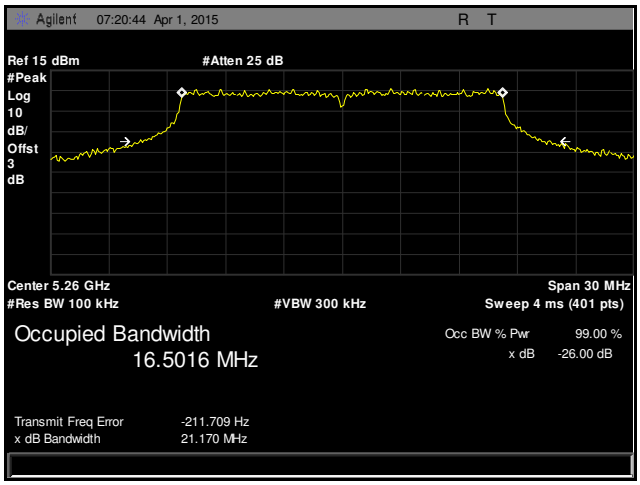


Figure 1. Occupied Bandwidth, Test Setup

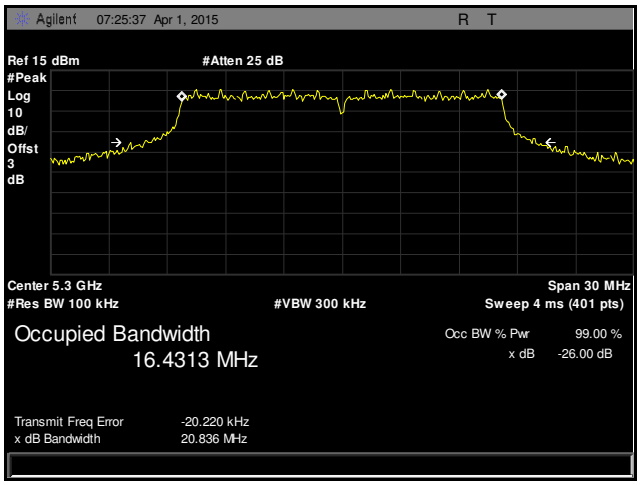
Occupied Bandwidth		
Carrier Channel Mode	**Frequency (MHz)**	**Measured 26 dB Bandwidth (MHz)**
802.11a 20MHz	5260	21.170
802.11a 20MHz	5300	20.836
802.11a 20MHz	5320	20.086
802.11ac 20MHz	5260	20.079
802.11ac 20MHz	5300	20.256
802.11ac 20MHz	5320	20.816
802.11n 20MHz	5260	20.993
802.11n 20MHz	5300	20.261
802.11n 20MHz	5320	20.795
802.11ac 40MHz	5270	43.791
802.11ac 40MHz	5310	43.442
802.11n 40MHz	5270	42.784
802.11n 40MHz	5310	42.045
802.11ac 80MHz	5290	88.768
802.11a 20MHz	5500	19.462
802.11a 20MHz	5580	19.540
802.11a 20MHz	5700	19.074
802.11ac 20MHz	5500	20.037
802.11ac 20MHz	5580	20.481
802.11ac 20MHz	5700	20.023
802.11n 20MHz	5500	20.525
802.11n 20MHz	5580	20.910
802.11n 20MHz	5700	20.499
802.11ac 40 MHz	5510	42.015
802.11ac 40 MHz	5550	42.987
802.11ac 40 MHz	5670	43.009
802.11n 40MHz	5510	42.471
802.11n 40MHz	5550	41.964
802.11n 40MHz	5670	42.271
802.11ac 80MHz	5530	95.117
802.11ac 80MHz	5610	94.403

Table 10. Occupied Bandwidth Test Results

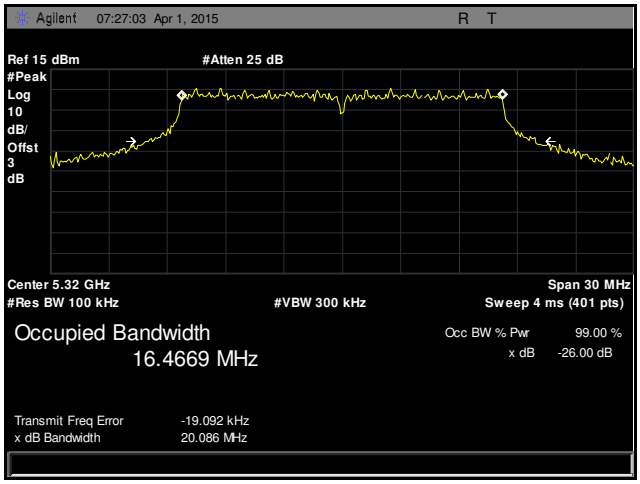
Occupied Bandwidth Test Results



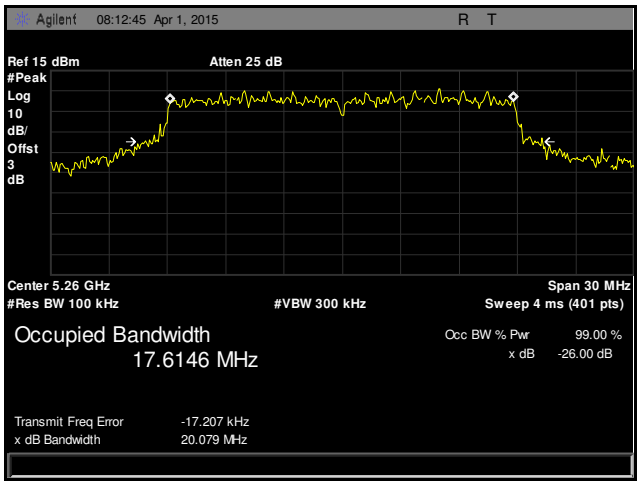
Plot 3. Occupied Bandwidth, 802.11a 20 MHz, Low Channel, 5260 MHz, Port A



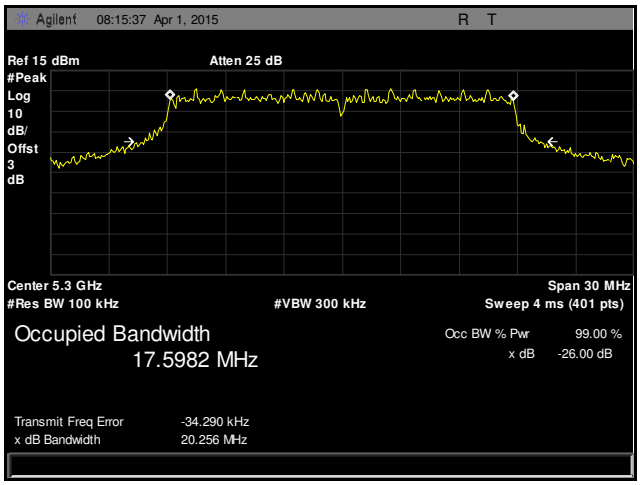
Plot 4. Occupied Bandwidth, 802.11a 20 MHz, Mid Channel, 5300 MHz, Port A



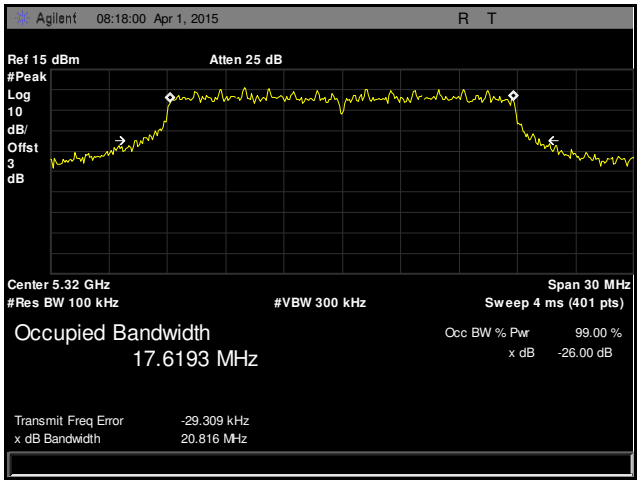
Plot 5. Occupied Bandwidth, 802.11a 20 MHz, High Channel, 5320 MHz, Port A



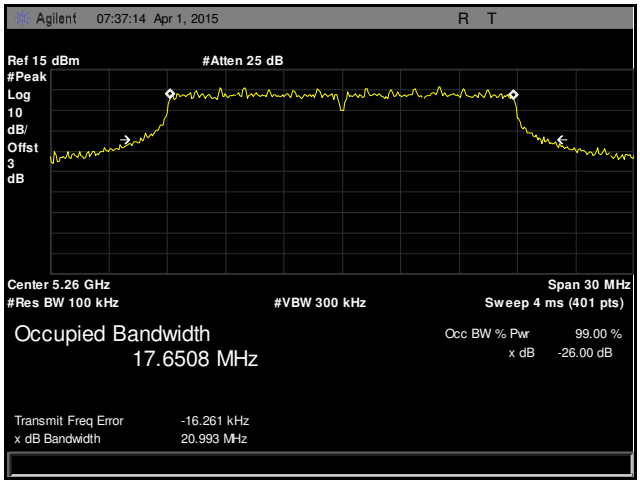
Plot 6. Occupied Bandwidth, 802.11ac 20 MHz, Low Channel, 5260 MHz, Port A



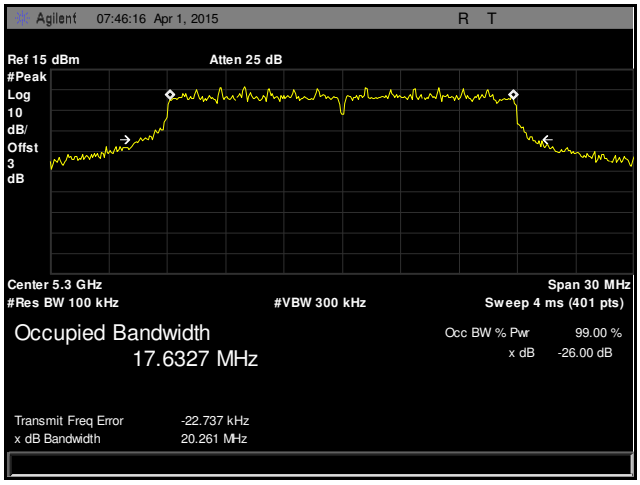
Plot 7. Occupied Bandwidth, 802.11ac 20 MHz, Mid Channel, 5300 MHz, Port A



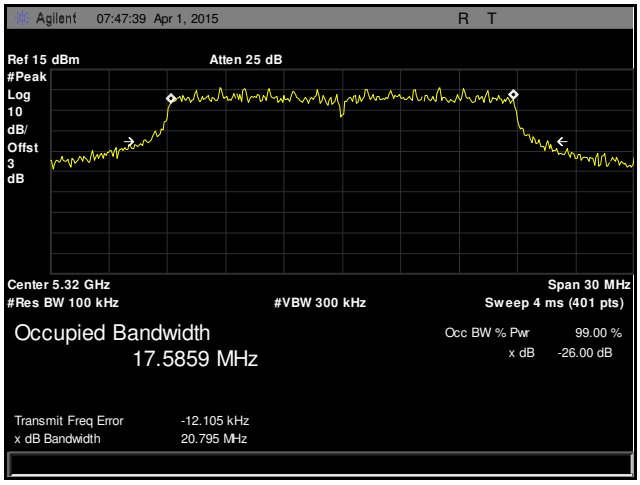
Plot 8. Occupied Bandwidth, 802.11ac 20 MHz, High Channel, 5320 MHz, Port A



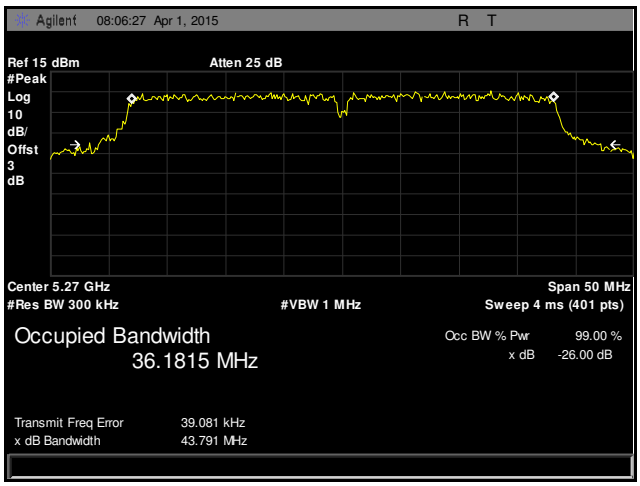
Plot 9. Occupied Bandwidth, 802.11n 20 MHz, Low Channel, 5260 MHz, Port A



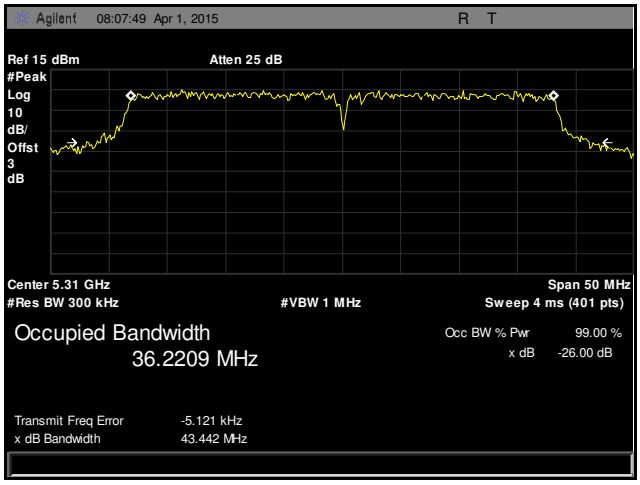
Plot 10. Occupied Bandwidth, 802.11n 20 MHz, Mid Channel, 5300 MHz, Port A



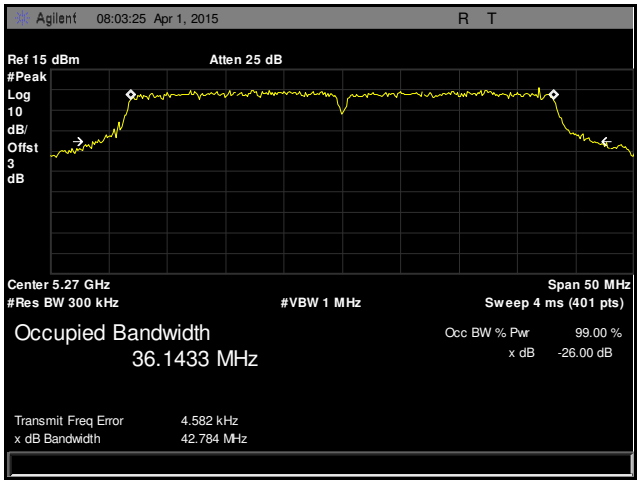
Plot 11. Occupied Bandwidth, 802.11n 20 MHz, High Channel, 5320 MHz, Port A



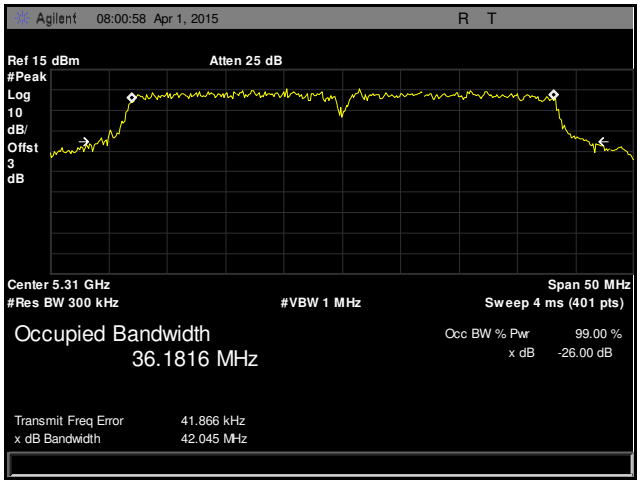
Plot 12. Occupied Bandwidth, 802.11ac 40 MHz, Low Channel, 5270 MHz, Port A



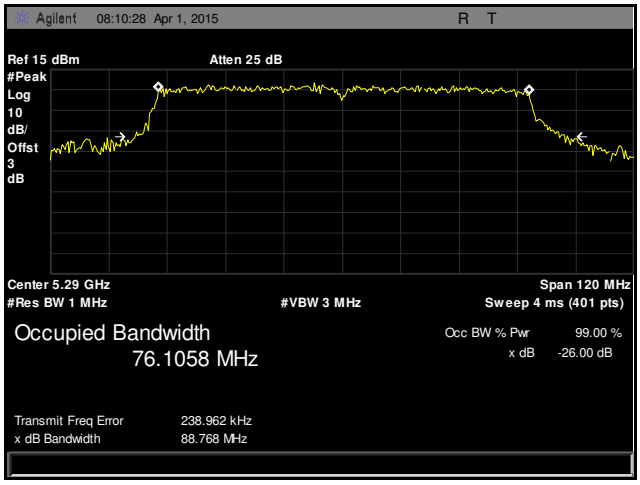
Plot 13. Occupied Bandwidth, 802.11ac 40 MHz, High Channel, 5310 MHz, Port A



Plot 14. Occupied Bandwidth, 802.11n 40 MHz, Low Channel, 5270 MHz, Port A

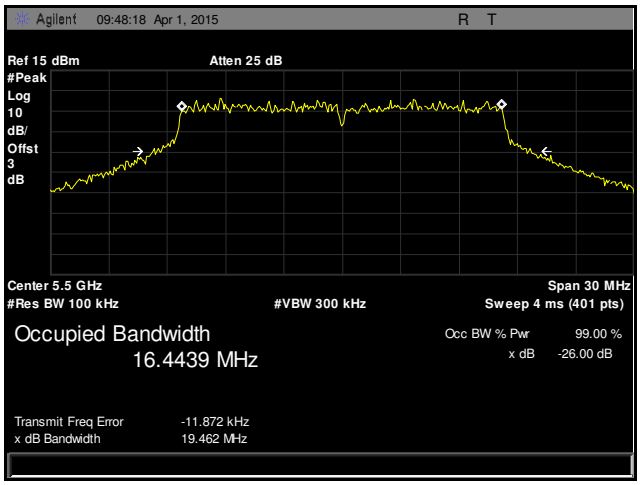


Plot 15. Occupied Bandwidth, 802.11n 40 MHz, High Channel, 5310 MHz, Port A

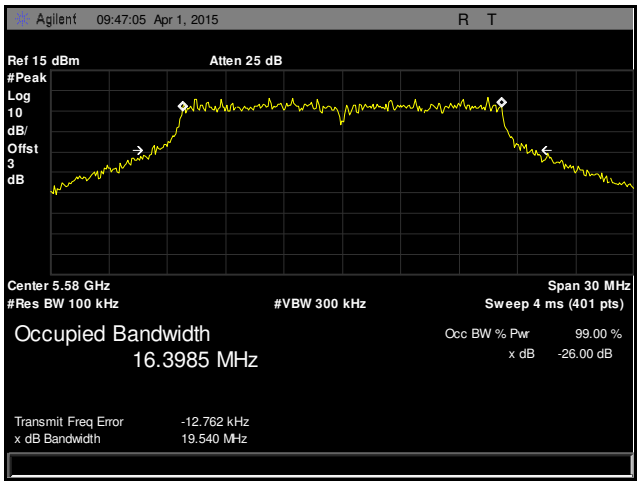


Plot 16. Occupied Bandwidth, 802.11ac 80 MHz, 5290 MHz, Port A

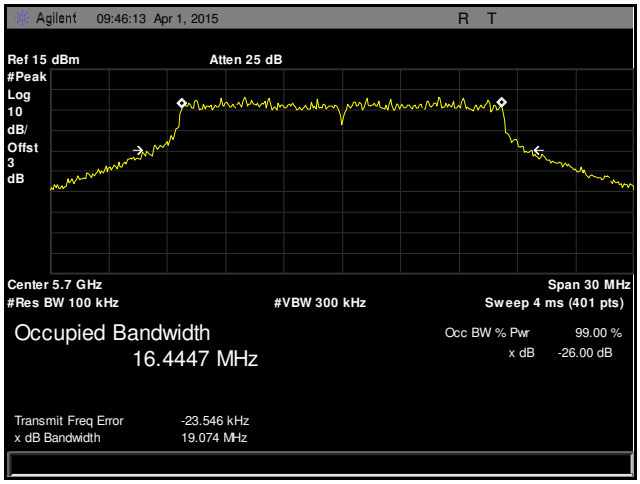
Occupied Bandwidth Test Results



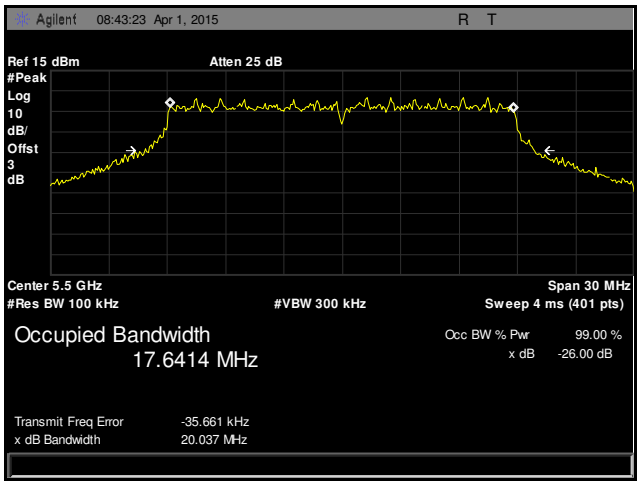
Plot 17. Occupied Bandwidth, 802.11a 20 MHz, Low Channel, 5500 MHz, Port A



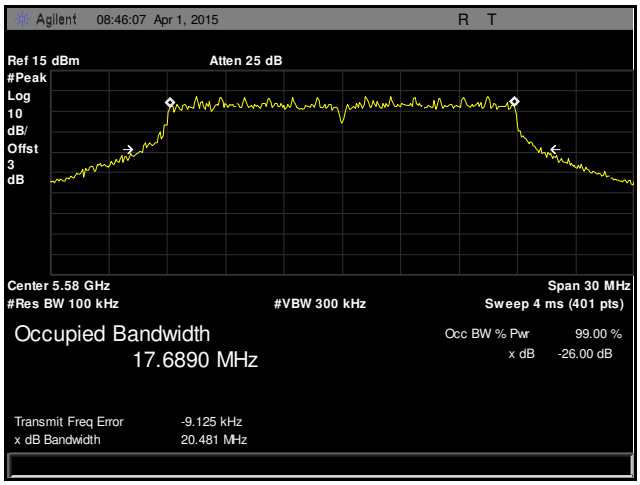
Plot 18. Occupied Bandwidth, 802.11a 20 MHz, Mid Channel, 5580 MHz, Port A



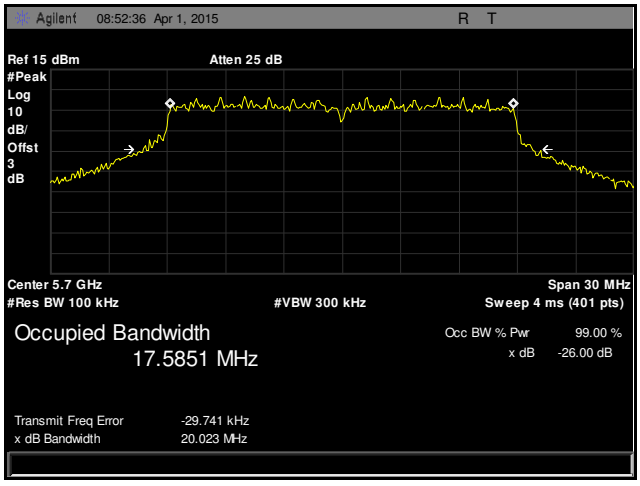
Plot 19. Occupied Bandwidth, 802.11a 20 MHz, High Channel, 5700 MHz, Port A



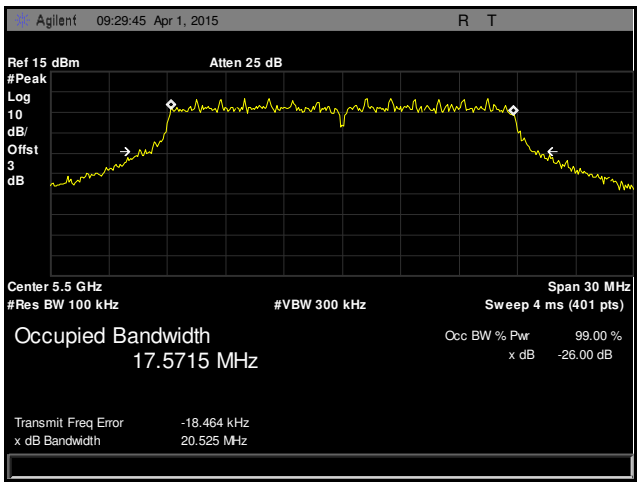
Plot 20. Occupied Bandwidth, 802.11ac 20 MHz, Low Channel, 5500 MHz, Port A



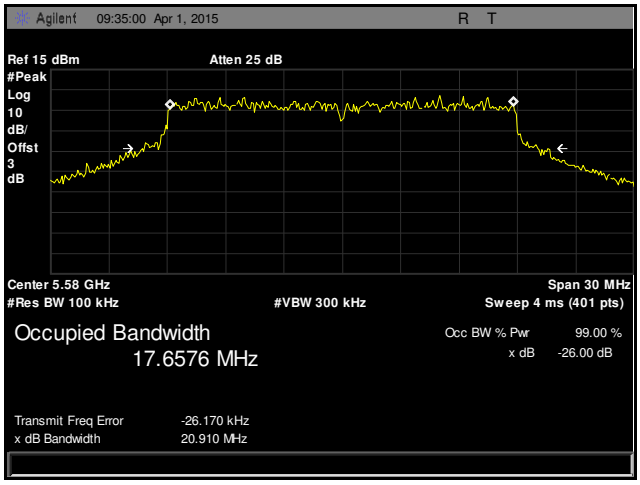
Plot 21. Occupied Bandwidth, 802.11ac 20 MHz, Mid Channel, 5580 MHz, Port A



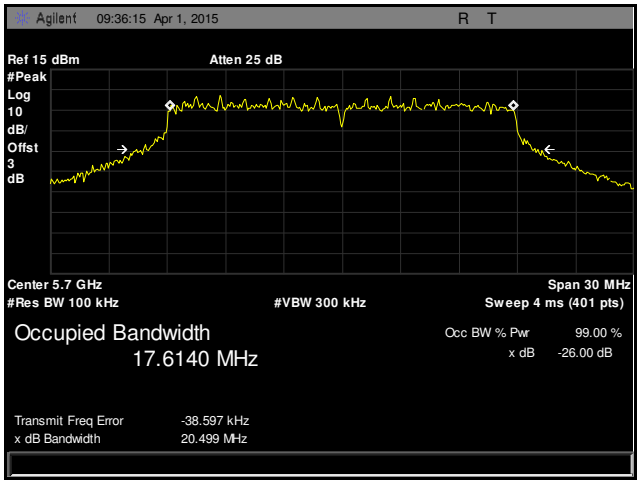
Plot 22. Occupied Bandwidth, 802.11ac 20 MHz, High Channel, 5700 MHz, Port A



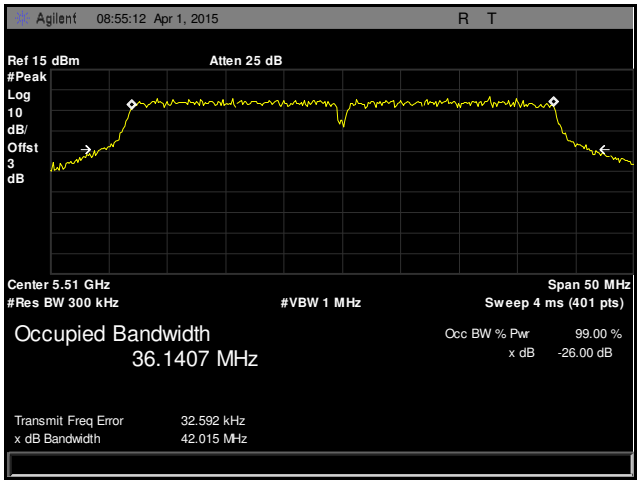
Plot 23. Occupied Bandwidth, 802.11n 20 MHz, Low Channel, 5500 MHz, Port A



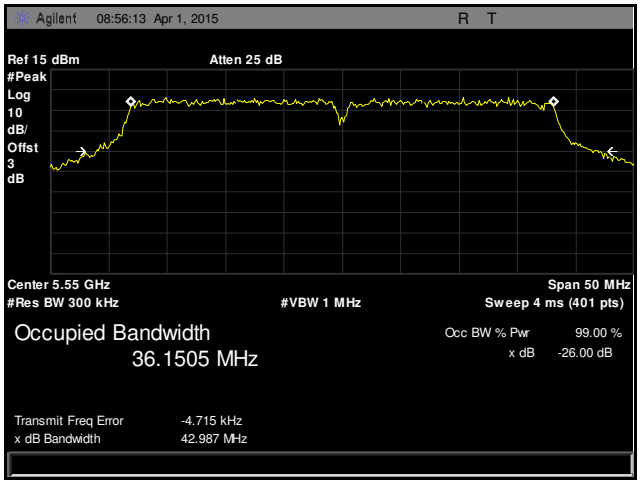
Plot 24. Occupied Bandwidth, 802.11n 20 MHz, Mid Channel, 5580 MHz, Port A



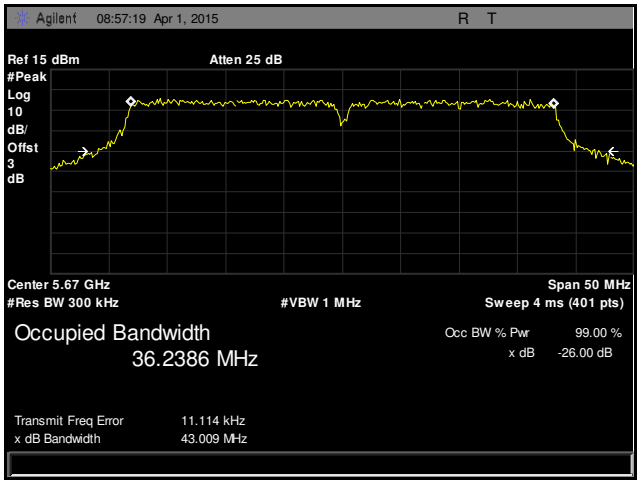
Plot 25. Occupied Bandwidth, 802.11n 20 MHz, High Channel, 5700 MHz, Port A



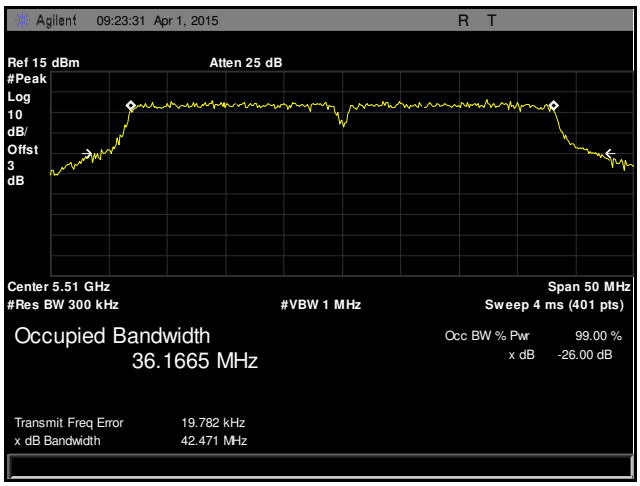
Plot 26. Occupied Bandwidth, 802.11ac 40 MHz, Low Channel, 5510 MHz, Port A



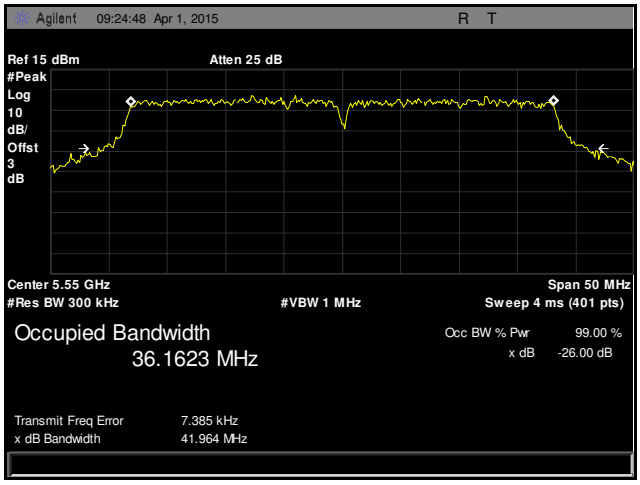
Plot 27. Occupied Bandwidth, 802.11ac 40 MHz, Mid Channel, 5550 MHz, Port A



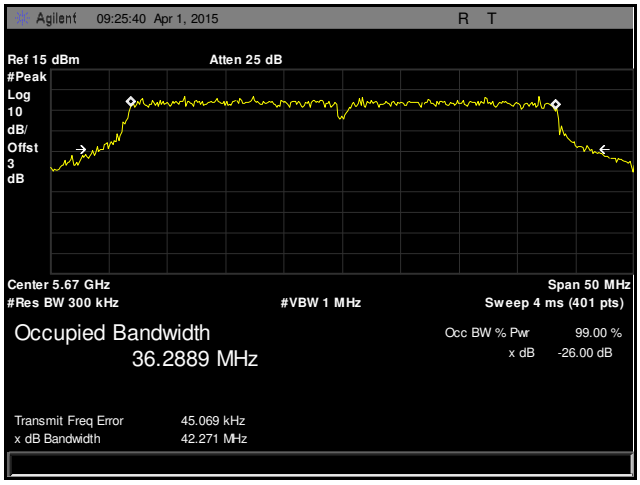
Plot 28. Occupied Bandwidth, 802.11ac 40 MHz, High Channel, 5670 MHz, Port A



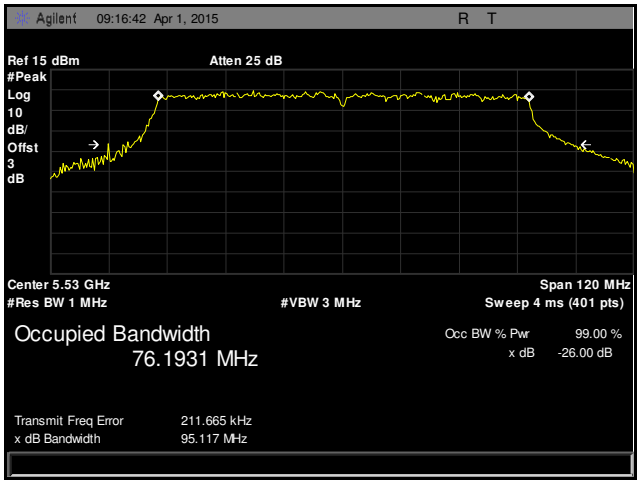
Plot 29. Occupied Bandwidth, 802.11n 40 MHz, Low Channel, 5510 MHz, Port A



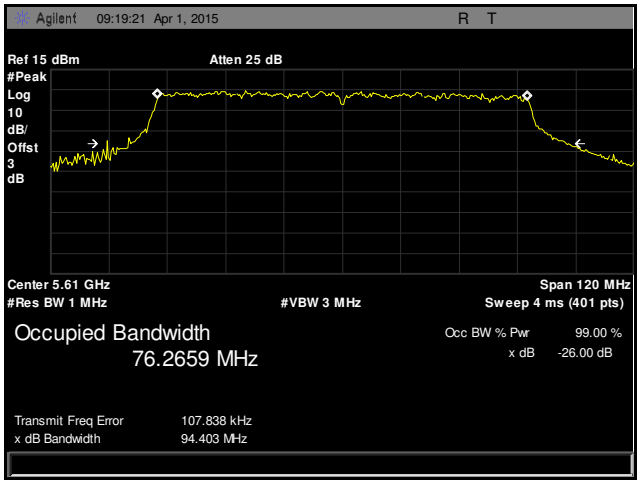
Plot 30. Occupied Bandwidth, 802.11n 40 MHz, Mid Channel, 5550 MHz, Port A



Plot 31. Occupied Bandwidth, 802.11n 40 MHz, High Channel, 5670 MHz, Port A



Plot 32. Occupied Bandwidth, 802.11ac 80 MHz, Low Channel, 5530 MHz, Port A



Plot 33. Occupied Bandwidth, 802.11ac 80 MHz, High Channel, 5610 MHz, Port A

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 407(a)(2) RF Power Output

Test Requirements: **§15.407(a)(2)**: For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz..

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

Test Engineer(s): Benjamin Taylor

Test Date(s): 05/01/15

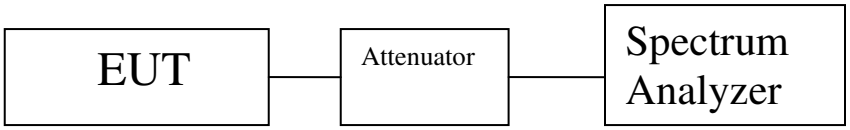


Figure 2. Power Output Test Setup

Peak Conducted Output Power			
	Carrier Channel	**Frequency (MHz)**	**Measured Output Power dBm**
802.11a Port 5GHz	Low	5260	22.19
	Mid	5300	22.35
	High	5320	20.21
802.11n 20 MHz Port 5GHz-P1	Low	5260	20.99
	Mid	5300	20.78
	High	5320	20.20
802.11n 20 MHz Port 5GHz-P2	Low	5260	20.78
	Mid	5300	20.01
	High	5320	17.24
802.11n 40MHz Port 5GHz-P1	Low	5270	19.38
	High	5310	13.68
802.11n 40 MHz Port 5GHz-P2	Low	5270	18.99
	High	5310	14.00
802.11ac 20 MHz Port 5GHz-P1	Low	5260	20.73
	Mid	5300	21.10
	High	5320	19.54
802.11ac 20 MHz Port 5GHz-P2	Low	5260	20.64
	Mid	5300	20.01
	High	5320	19.1
802.11ac 40MHz Port 5GHz-P1	Low	5270	20.96
	High	5310	16.10
802.11ac 40 MHz Port 5GHz-P2	Low	5270	20.09
	High	5310	15.57
802.11ac 80MHz Port 5GHz-P1		5290	14.23
802.11ac 80MHz Port 5GHz-P2		5290	13.85
Summed Conducted Output Power			
	Carrier Channel	**Frequency (MHz)**	**Measured Output Power dBm**
802.11n 20 MHz Summed	Low	5260	23.90
	Mid	5300	23.42
	High	5320	21.98
802.11n 40 MHz Summed	Low	5270	22.20
	High	5310	16.85
802.11ac 20MHz Summed	Low	5260	23.70
	Mid	5300	23.60
	High	5320	22.34
802.11ac 40MHz Summed	Low	5270	23.56
	High	5310	18.85
802.11ac 80MHz Summed	High	5290	17.05

Table 11. RF Power Output, UNII 2A, Test Results

Average Conducted Output Power			
	Carrier Channel	**Frequency (MHz)**	**Measured Output Power dBm**
802.11a Port 5GHz	Low	5500	18.23
	Mid	5580	21.08
	High	5700	14.94
802.11n 20 MHz Port 5GHz-P1	Low	5500	17.44
	Mid	5580	20.01
	High	5700	15.10
802.11n 20 MHz Port 5GHz-P2	Low	5500	18.08
	Mid	5580	20.16
	High	5700	15.87
802.11n 40MHz Port 5GHz-P1	Low	5510	15.27
	Mid	5550	20.07
	High	5670	15.70
802.11n 40 MHz Port 5GHz-P2	Low	5510	14.78
	Mid	5550	20.22
	High	5670	15.98
802.11ac 20 MHz Port 5GHz-P1	Low	5500	20.08
	Mid	5580	20.01
	High	5700	17.78
802.11ac 20 MHz Port 5GHz-P2	Low	5500	21.45
	Mid	5580	20.97
	High	5700	18.07
802.11ac 40MHz Port 5GHz-P1	Low	5510	18.78
	Mid	5550	20.09
	High	5670	19.01
802.11ac 40 MHz Port 5GHz-P2	Low	5510	19.01
	Mid	5550	20.01
	High	5670	19.05
802.11ac 80MHz Port 5GHz-P1	Low	5530	13.98
	High	5610	15.21
802.11ac 80MHz Port 5GHz-P2	Low	5530	14.00
	High	5610	15.87
Summed Conducted Output Power			
	Carrier Channel	**Frequency (MHz)**	**Measured Output Power dBm**
802.11n 20 MHz Summed	Low	5500	20.78
	Mid	5600	23.09
	High	5700	18.51
802.11n 40 MHz Summed	Low	5510	18.04
	Mid	5590	23.16
	High	5670	18.85
802.11ac 20MHz Summed	Low	5500	23.83
	Mid	5600	23.53
	High	5700	20.94
802.11ac 40MHz Summed	Low	5510	21.91
	Mid	5590	23.15
	High	5670	22.04
802.11ac 80MHz Summed	Low	5530	17.00
	High	5610	18.56

Table 12. RF Power Output, UNII 2C, Test Results

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(2) Peak Power Spectral Density

Test Requirements: **§ 15.407(a)(2):** In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement used was from 789033 D01 General UNII Test Procedures New Rules v01.

Test Results: Equipment was compliant with the peak power spectral density limits of **§ 15.407 (a)(2).** The peak power spectral density was determined from plots on the following page(s).

The following table presents the 99% bandwidth measurements and their average peak spectral density per MHz.

Test Engineer(s): Benjamin Taylor

Test Date(s): 04/02/15

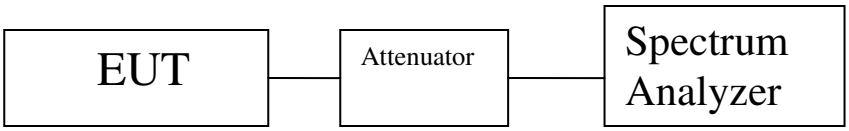


Figure 3. Power Spectral Density Test Setup

Frequency (MHz)	Mode	Port R1-A PSD (dBm)	Port R1-B PSD (dBm)	Summed PSD (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5260	802.11a 20MHz	10.98		10.98	3.20	11.00	-0.02
5300	802.11a 20MHz	10.79		10.79	3.20	11.00	-0.21
5320	802.11a 20MHz	10.93		10.93	3.20	11.00	-0.07
5260	802.11n 20MHz	8.01	7.78	10.91	3.20	11.00	-0.09
5300	802.11n 20MHz	7.98	7.87	10.94	3.20	11.00	-0.06
5320	802.11n 20MHz	7.79	8.01	10.91	3.20	11.00	-0.09
5270	802.11n 40MHz	7.51	8.41	10.99	3.20	11.00	-0.01
5310	802.11n 40MHz	7.43	8.26	10.87	3.20	11.00	-0.13
5260	802.11ac 20MHz	8.15	7.77	10.97	3.20	11.00	-0.03
5300	802.11ac 20MHz	8.57	7.27	10.98	3.20	11.00	-0.02
5320	802.11ac 20MHz	7.43	8.42	10.96	3.20	11.00	-0.04
5270	802.11ac 40MHz	8.00	7.98	11.00	3.20	11.00	0.00
5310	802.11ac 40MHz	7.94	7.31	10.65	3.20	11.00	-0.35
5290	802.11ac 80MHz	8.7	7.03	10.95508	3.20	11.00	-0.04492

Table 13. Peak Power Spectral Density, Test Results, Lower Bands

Frequency (MHz)	Mode	Port R1-A PSD (dBm)	Port R1-B PSD (dBm)	Summed PSD (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5500	802.11a 20MHz	10.79		10.79	3.20	11.00	-0.21
5580	802.11a 20MHz	10.85		10.85	3.20	11.00	-0.15
5700	802.11a 20MHz	10.96		10.96	3.20	11.00	-0.04
5500	802.11n 20MHz	9.53	9.53	9.53	3.20	11.00	-1.47
5580	802.11n 20MHz	10.29	9.97	10.29	3.20	11.00	-0.71
5700	802.11n 20MHz	7.79	8.07	10.94	3.20	11.00	-0.06
5510	802.11n 40MHz	6.94	7.84	10.42	3.20	11.00	-0.58
5550	802.11n 40MHz	6.90	7.05	9.98	3.20	11.00	-1.02
5670	802.11n 40MHz	8.12	7.32	10.75	3.20	11.00	-0.25
5500	802.11ac 20MHz	8.02	7.78	10.91	3.20	11.00	-0.09
5580	802.11ac 20MHz	7.63	8.27	10.97208	3.20	11.00	-0.02792
5700	802.11ac 20MHz	7.98	7.85	10.92579	3.20	11.00	-0.07421
5510	802.11ac 40MHz	7.252	6.972	10.12456	3.20	11.00	-0.87544
5550	802.11ac 40MHz	8.46	7.067	10.82941	3.20	11.00	-0.17059
5670	802.11ac 40MHz	8.178	7.684	10.94832	3.20	11.00	-0.05168
5530	802.11ac 80MHz	5.507	5.41	8.469071	3.20	11.00	-2.53093
5610	802.11ac 80MHz	5.507	5.596	8.562028	3.20	11.00	-2.43797

Table 14. Peak Power Spectral Density, Test Results, Upper Bands

Electromagnetic Compatibility Criteria for Intentional Radiators
§ 15.407(b)(2), (3), (7) Undesirable Emissions

Test Requirements: **§ 15.407(b)(2), (3), (7)**; **§15.205:** Emissions outside the frequency band.

§ 15.407(b)(2): For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

§ 15.407(b)(3): 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)(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 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.

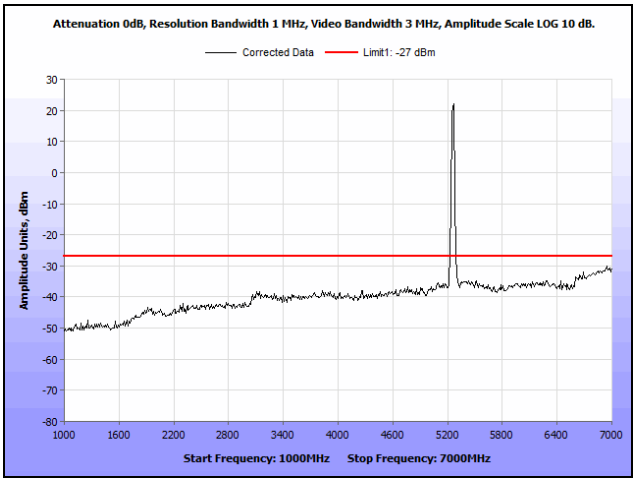
For measurements above 1 GHz, measurements were made with a Peak detector with 1 MHz resolution bandwidth. A notch filter was use to filter out the transmitting channel. Where the spurious emissions fell into a restricted band, measurements were also made with an average detector to make sure they complied with 15.209 limits. Only noise floor was seen above 18 GHz. Worst case emissions shown by antenna. Measurements in the 30 MHz to 1 GHz range proved to not change between different modes of operation; only the mid-channel per mode plots are displayed in this report.

Test Results: The EUT was compliant with the Radiated Emission limits for Intentional Radiators. See following pages for detailed test results.

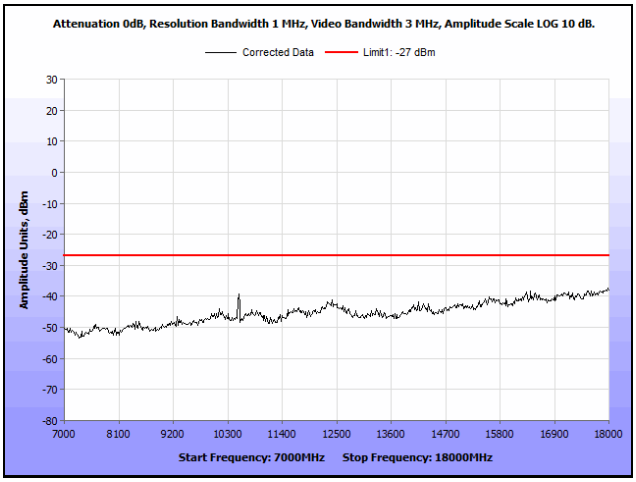
Test Engineer(s): Benjamin Taylor

Test Date(s): 05/01/15

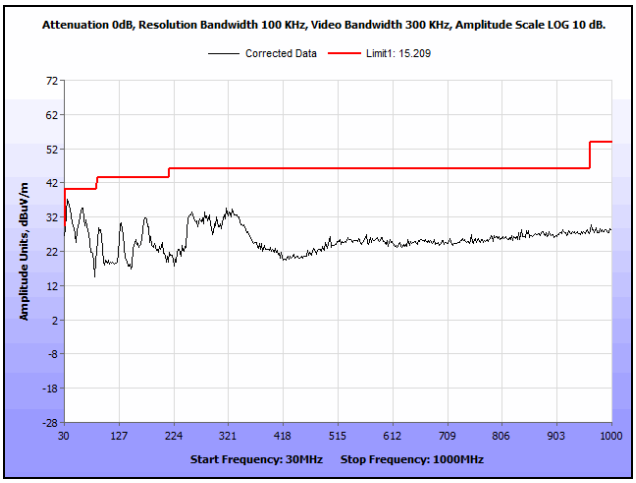
Radiated Spurious Emissions



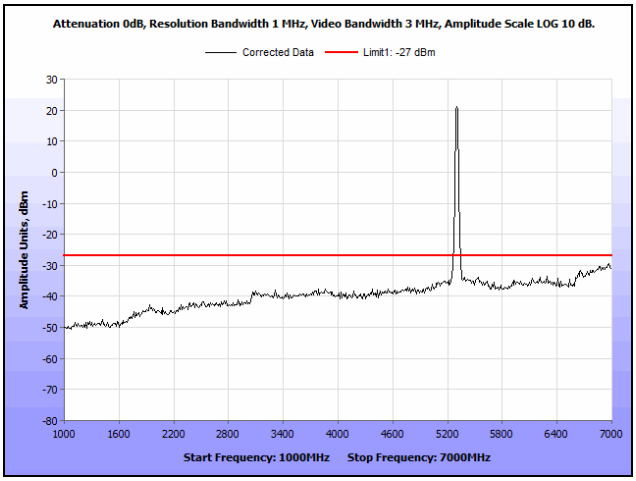
Plot 34. Radiated Spurious Emissions, 5260 MHz, 802.11a 20 MHz, 1 GHz – 7 GHz



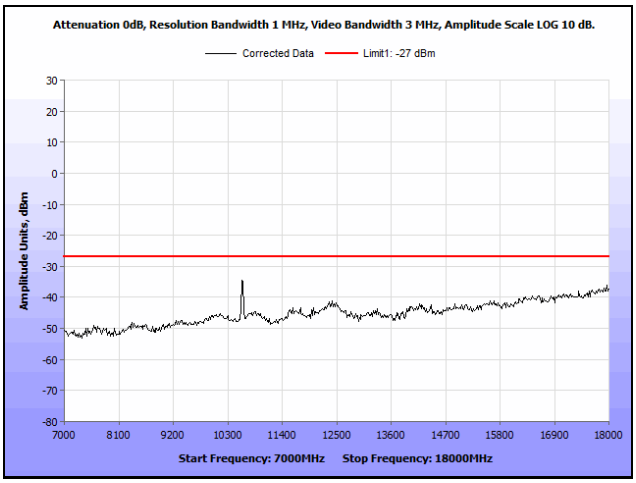
Plot 35. Radiated Spurious Emissions, 5260 MHz, 802.11a 20 MHz, 7 GHz – 18 GHz



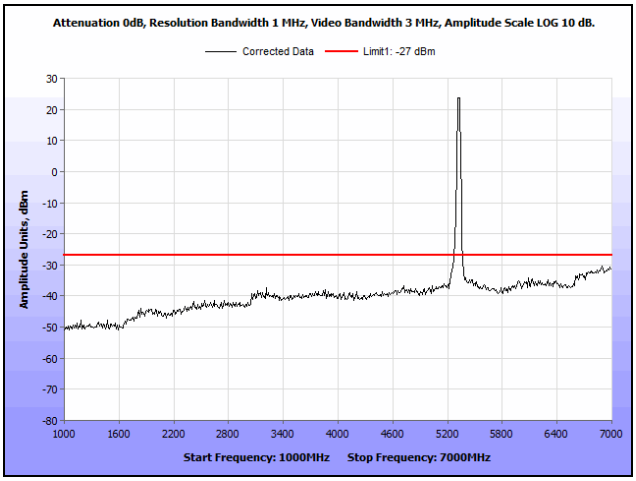
Plot 36. Radiated Spurious Emissions, 5300 MHz, 802.11a 20 MHz, 30 MHz – 1 GHz



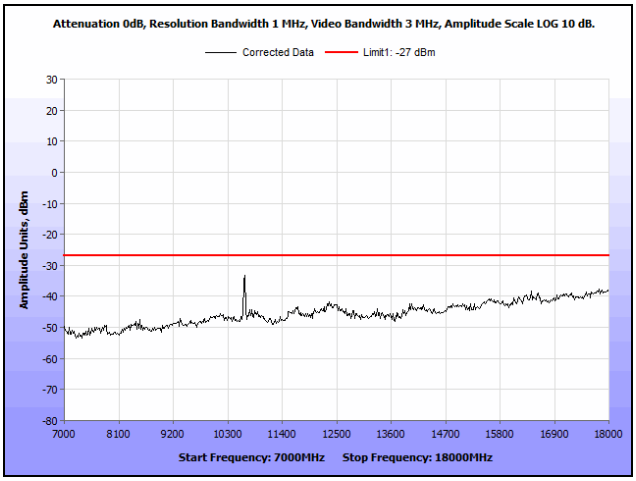
Plot 37. Radiated Spurious Emissions, 5300 MHz, 802.11a 20 MHz, 1 GHz – 7 GHz



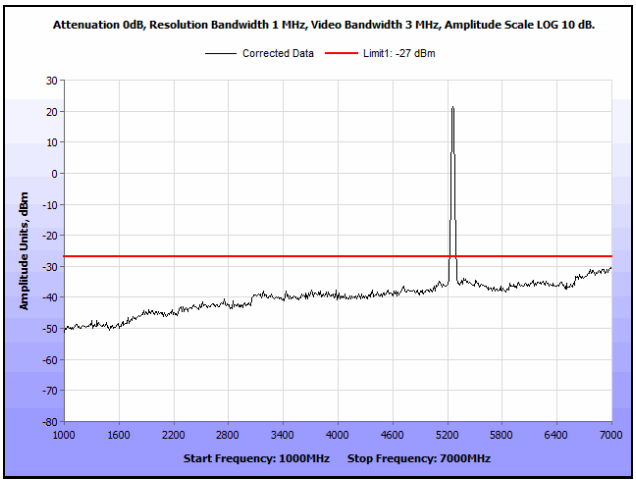
Plot 38. Radiated Spurious Emissions, 5300 MHz, 802.11a 20 MHz, 7 GHz – 18 GHz



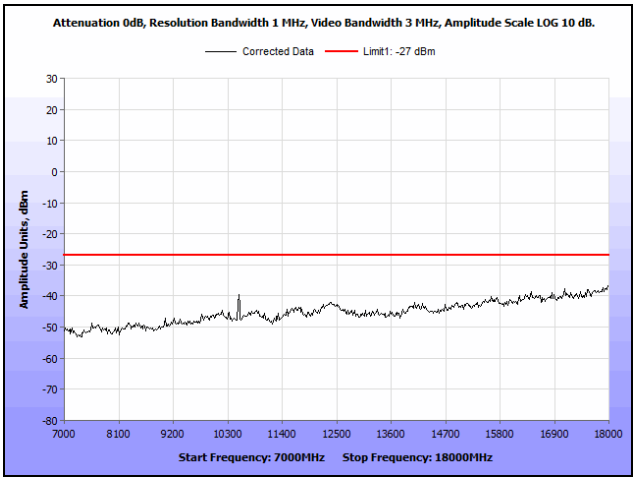
Plot 39. Radiated Spurious Emissions, 5320 MHz, 802.11a 20 MHz, 1 GHz – 7 GHz



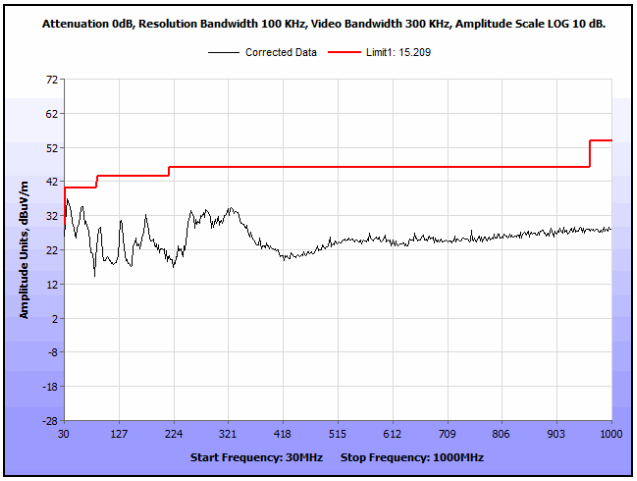
Plot 40. Radiated Spurious Emissions, 5320 MHz, 802.11a 20 MHz, 7 GHz – 18 GHz



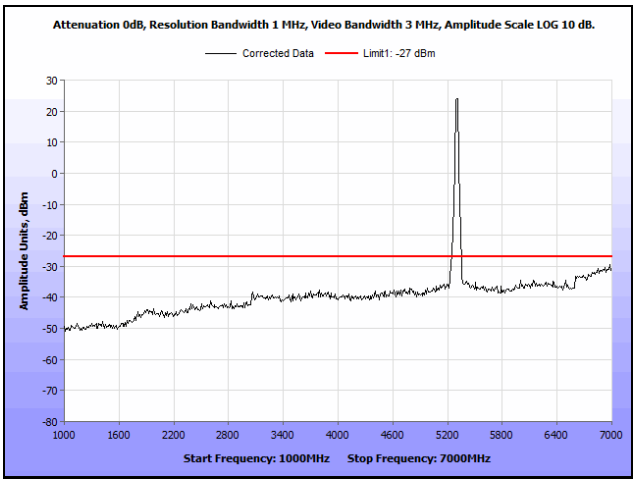
Plot 41. Radiated Spurious Emissions, 5260 MHz, 802.11ac 20 MHz, 1 GHz – 7 GHz



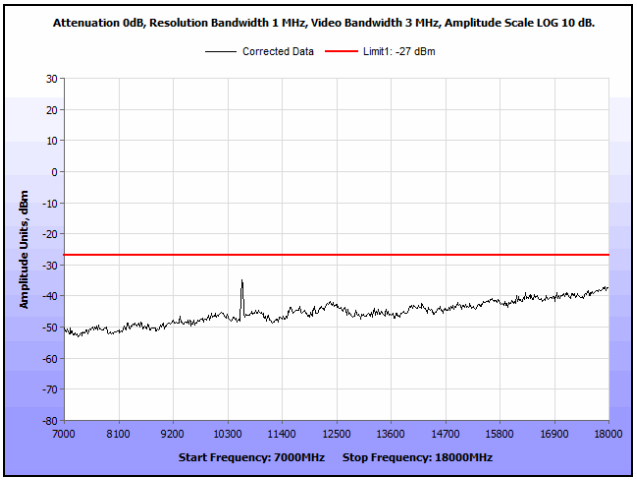
Plot 42. Radiated Spurious Emissions, 5260 MHz, 802.11ac 20 MHz, 7 GHz – 18 GHz



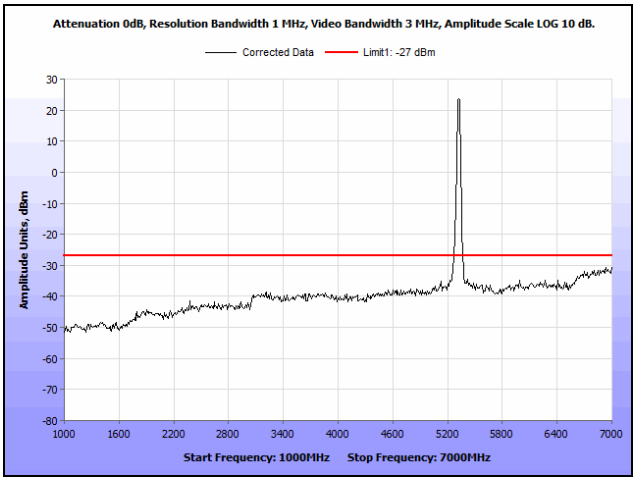
Plot 43. Radiated Spurious Emissions, 5300 MHz, 802.11ac 20 MHz, 30 MHz – 1 GHz



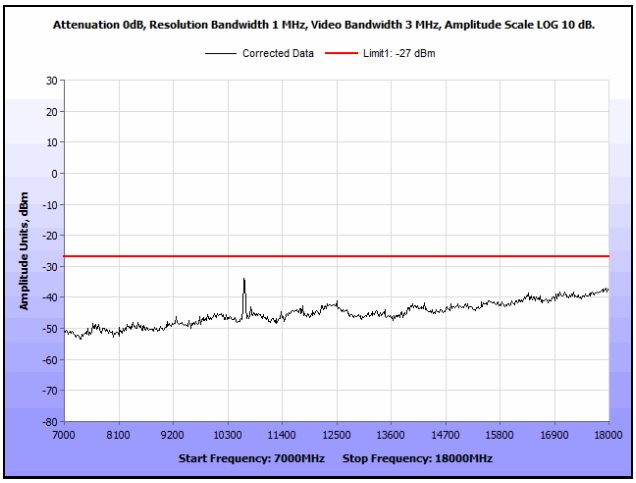
Plot 44. Radiated Spurious Emissions, 5300 MHz, 802.11ac 20 MHz, 1 GHz – 7 GHz



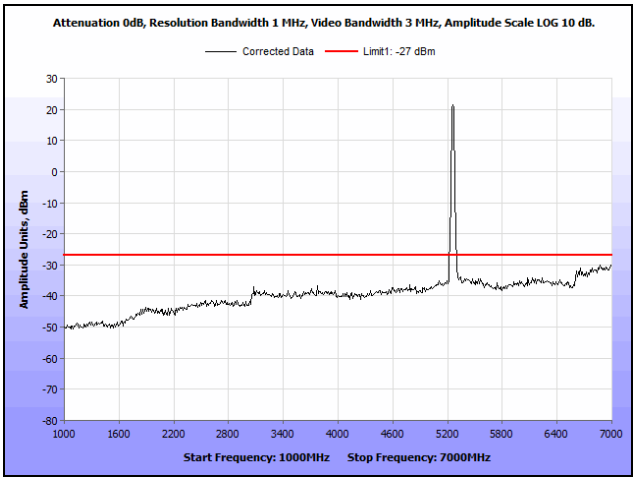
Plot 45. Radiated Spurious Emissions, 5300 MHz, 802.11ac 20 MHz, 7 GHz – 18 GHz



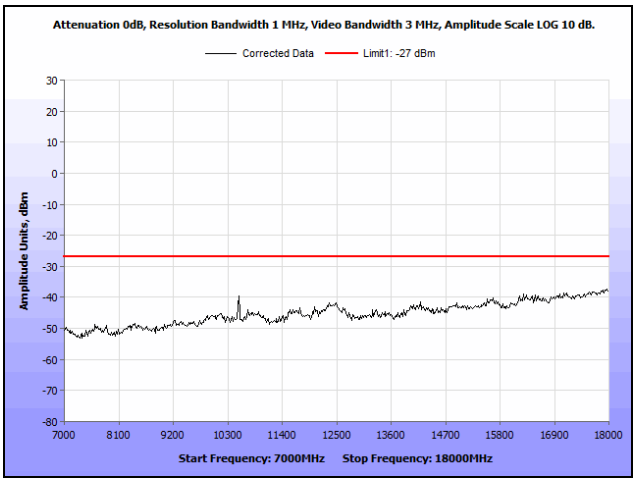
Plot 46. Radiated Spurious Emissions, 5320 MHz, 802.11ac 20 MHz, 1 GHz – 7 GHz



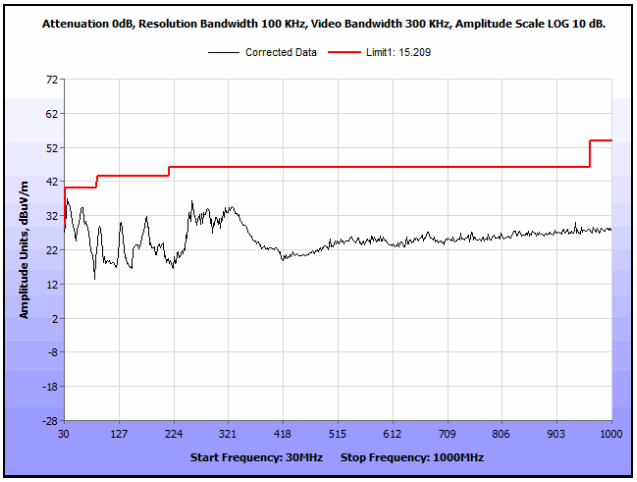
Plot 47. Radiated Spurious Emissions, 5320 MHz, 802.11ac 20 MHz, 7 GHz – 18 GHz



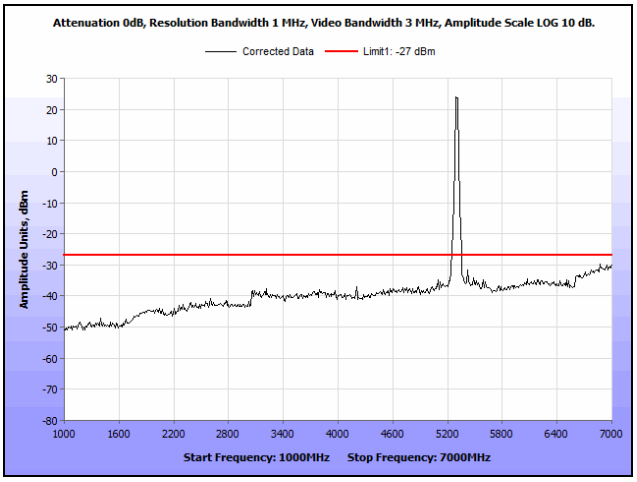
Plot 48. Radiated Spurious Emissions, 5260 MHz, 802.11n 20 MHz, 1 GHz – 7 GHz



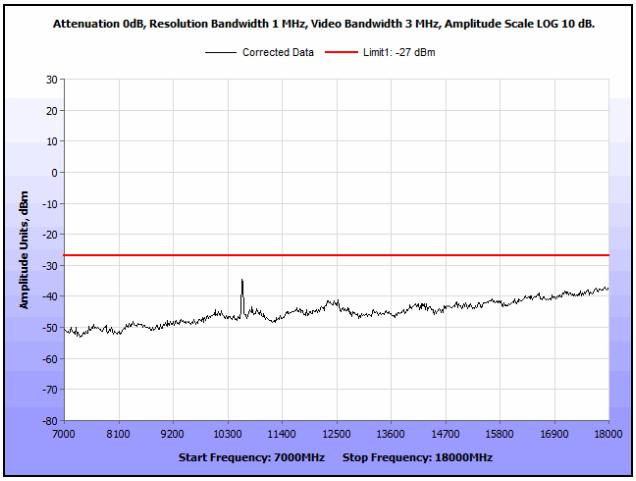
Plot 49. Radiated Spurious Emissions, 5260 MHz, 802.11n 20 MHz, 7 GHz – 18 GHz



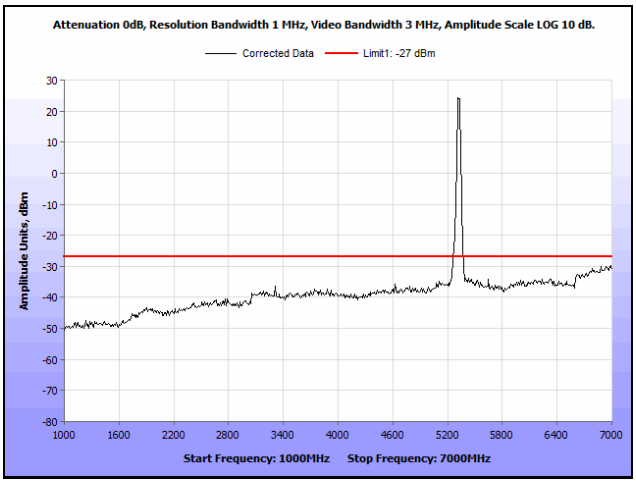
Plot 50. Radiated Spurious Emissions, 5300 MHz, 802.11n 20 MHz, 30 MHz – 1 GHz



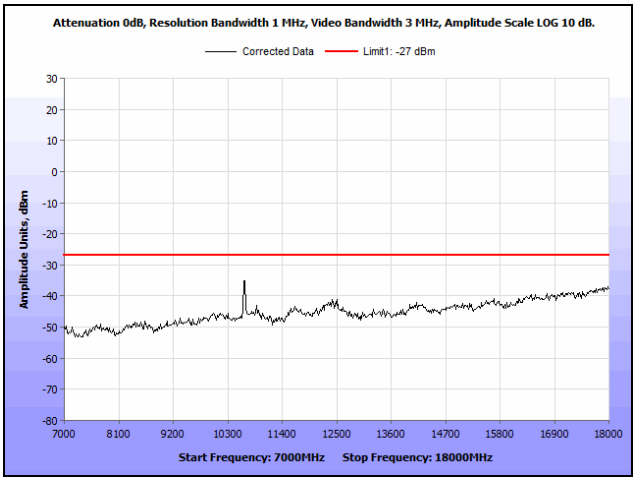
Plot 51. Radiated Spurious Emissions, 5300 MHz, 802.11n 20 MHz, 1 GHz – 7 GHz



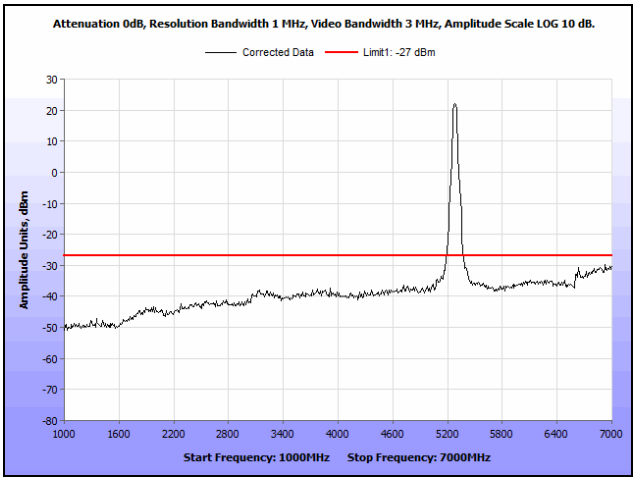
Plot 52. Radiated Spurious Emissions, 5300 MHz, 802.11n 20 MHz, 7 GHz – 18 GHz



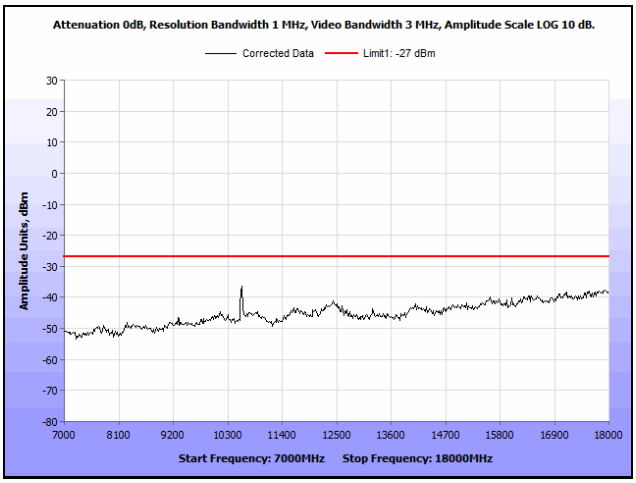
Plot 53. Radiated Spurious Emissions, 5320 MHz, 802.11n 20 MHz, 1 GHz – 7 GHz



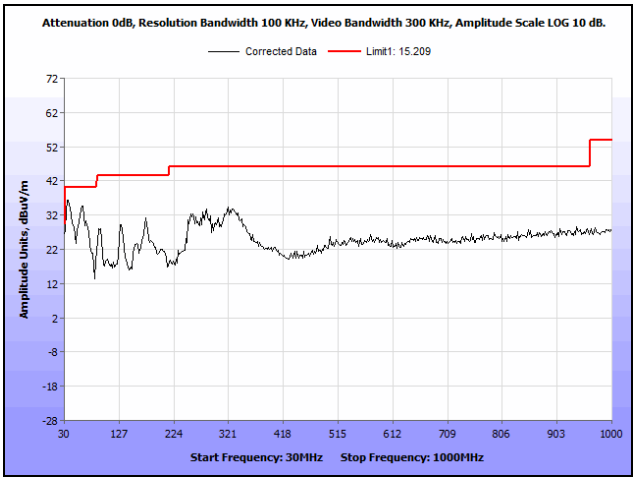
Plot 54. Radiated Spurious Emissions, 5320 MHz, 802.11n 20 MHz, 7 GHz – 18 GHz



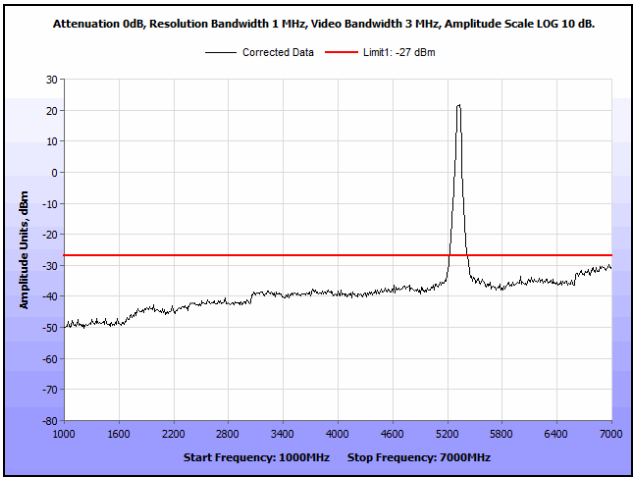
Plot 55. Radiated Spurious Emissions, 5270 MHz, 802.11ac 40 MHz, 1 GHz – 7 GHz



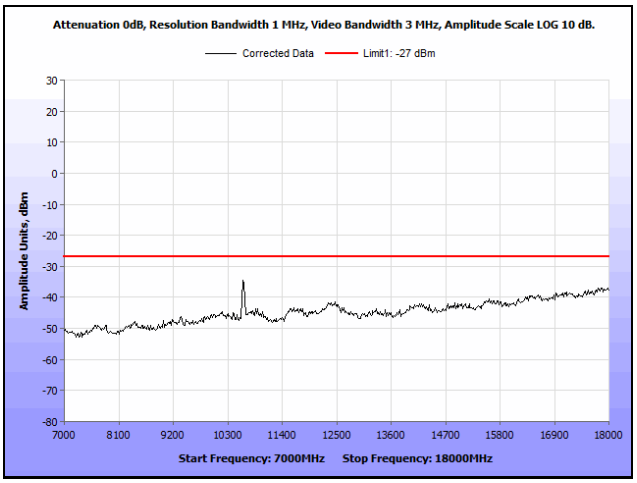
Plot 56. Radiated Spurious Emissions, 5270 MHz, 802.11ac 40 MHz, 7 GHz – 18 GHz



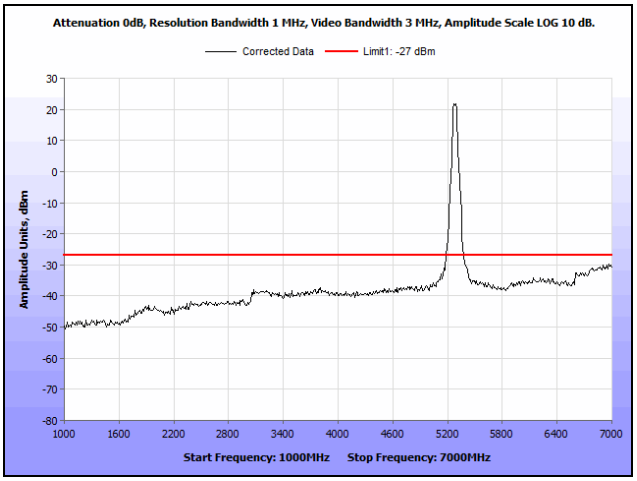
Plot 57. Radiated Spurious Emissions, 5310 MHz, 802.11ac 40 MHz, 30 MHz – 1 GHz



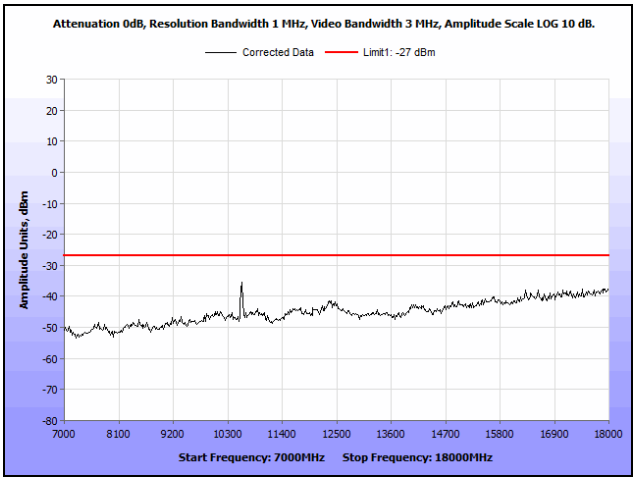
Plot 58. Radiated Spurious Emissions, 5310 MHz, 802.11ac 40 MHz, 1 GHz – 7 GHz



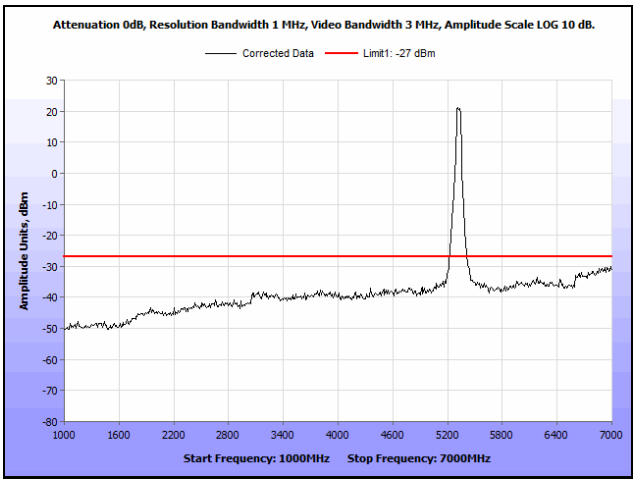
Plot 59. Radiated Spurious Emissions, 5310 MHz, 802.11ac 40 MHz, 7 GHz – 18 GHz



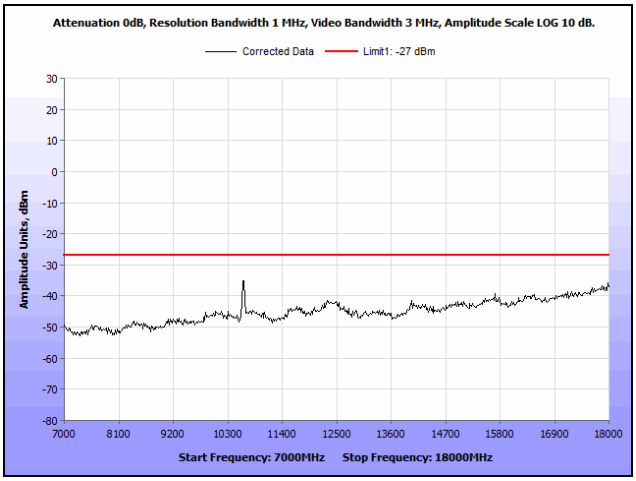
Plot 60. Radiated Spurious Emissions, 5270 MHz, 802.11n 40 MHz, 1 GHz – 7 GHz



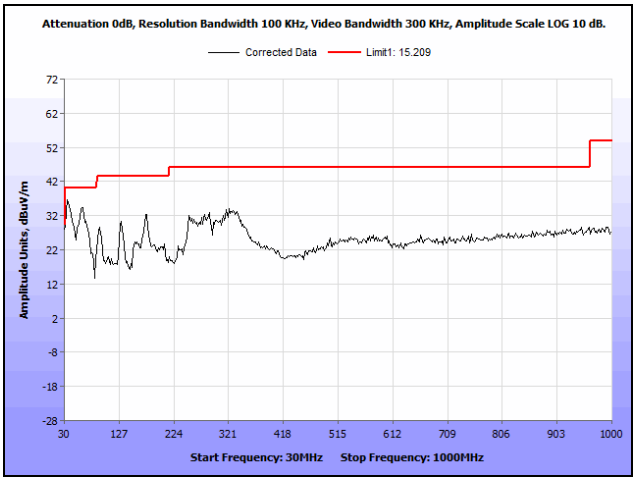
Plot 61. Radiated Spurious Emissions, 5270 MHz, 802.11n 40 MHz, 7 GHz – 18 GHz



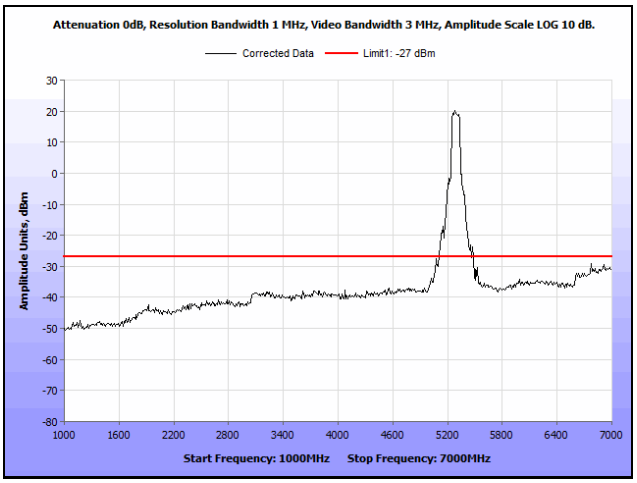
Plot 62. Radiated Spurious Emissions, 5310 MHz, 802.11n 40 MHz, 1 GHz – 7 GHz



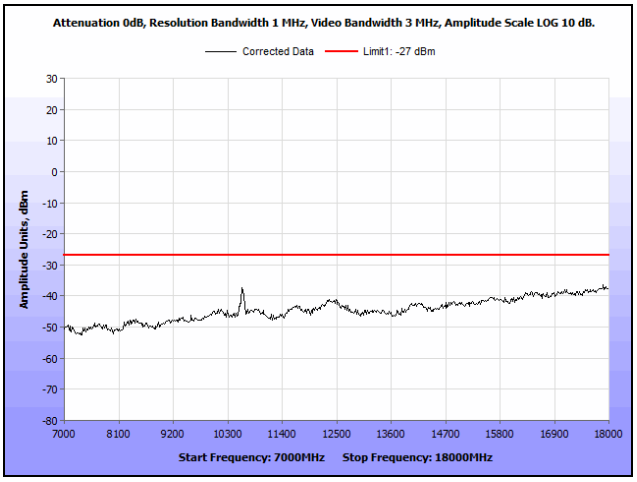
Plot 63. Radiated Spurious Emissions, 5310 MHz, 802.11n 40 MHz, 7 GHz – 18 GHz



Plot 64. Radiated Spurious Emissions, 5290 MHz, 802.11ac 80 MHz, 30 MHz – 1 GHz

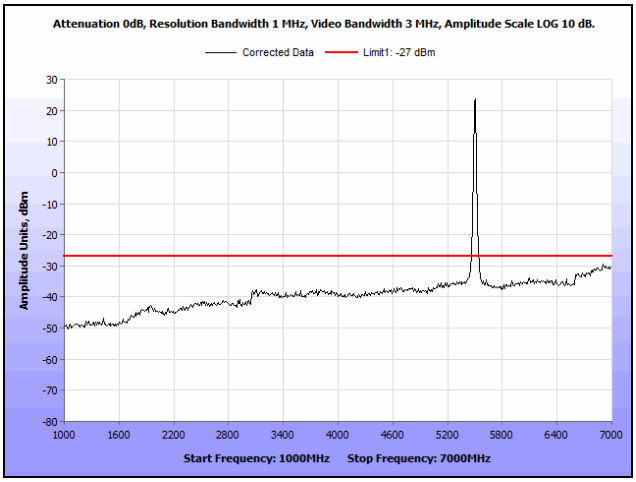


Plot 65. Radiated Spurious Emissions, 5290 MHz, 802.11ac 80 MHz, 1 GHz – 7 GHz

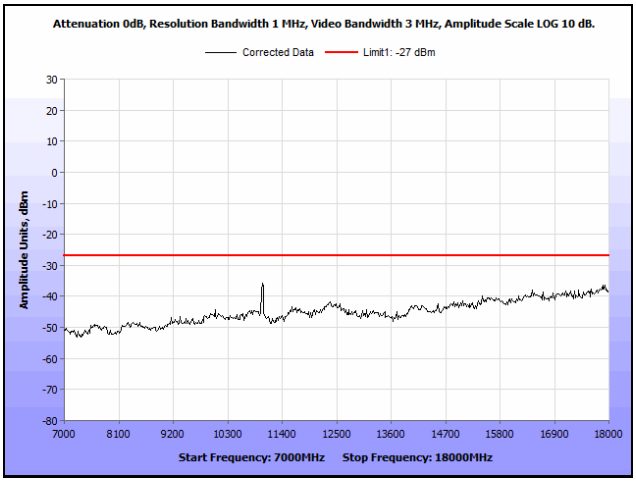


Plot 66. Radiated Spurious Emissions, 5290 MHz, 802.11ac 80 MHz, 7 GHz – 18 GHz

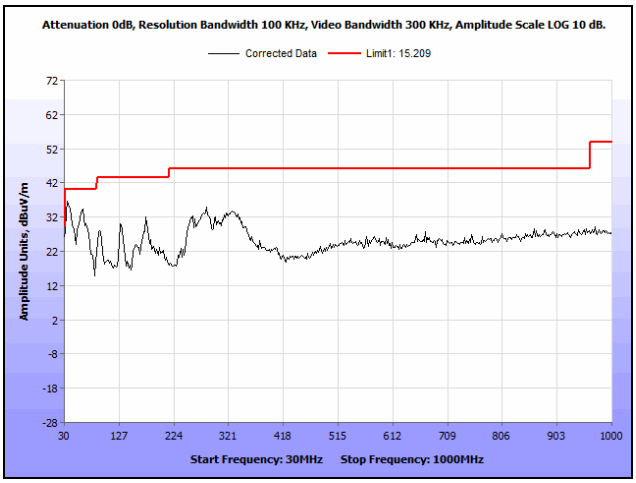
Radiated Spurious Emissions



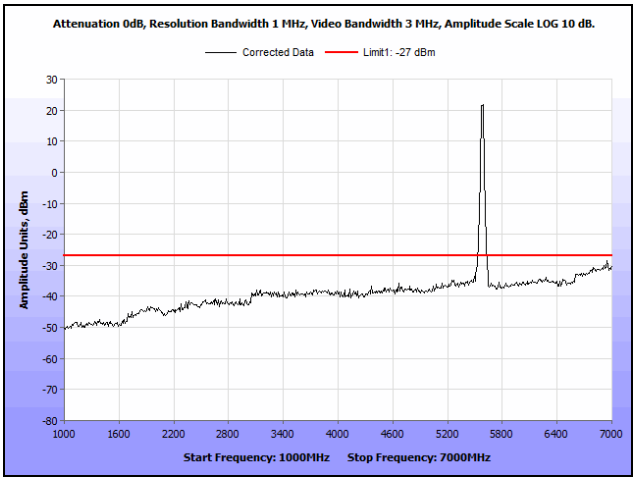
Plot 67. Radiated Spurious Emissions, 5500 MHz, 802.11a 20 MHz, 1 GHz – 7 GHz



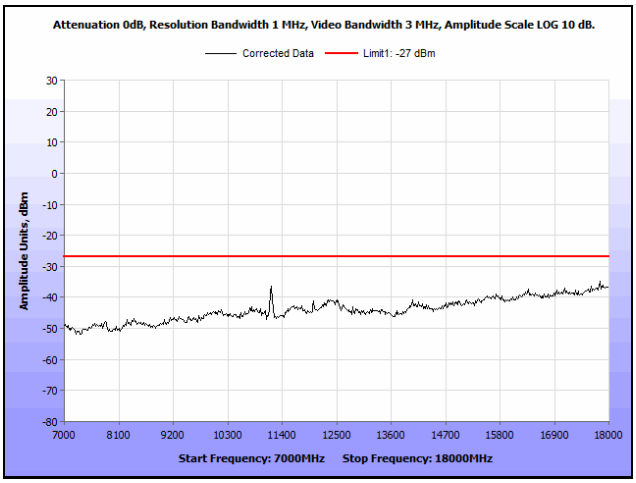
Plot 68. Radiated Spurious Emissions, 5500 MHz, 802.11a 20 MHz, 7 GHz – 18 GHz



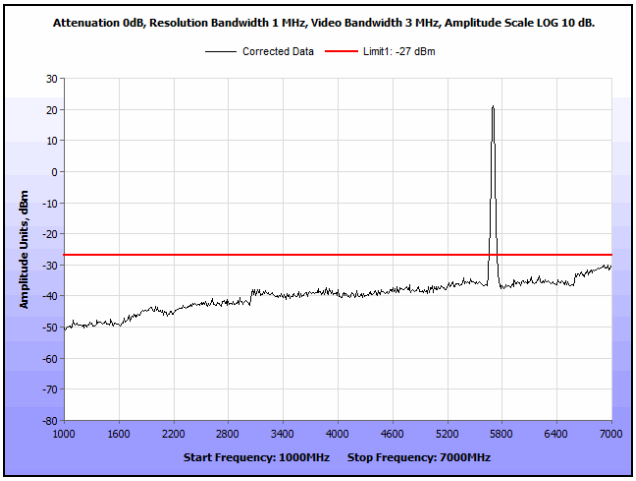
Plot 69. Radiated Spurious Emissions, 5580 MHz, 802.11a 20 MHz, 30 MHz – 1 GHz



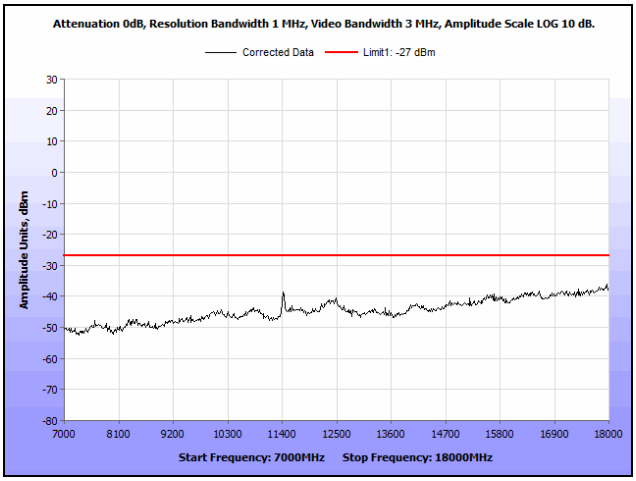
Plot 70. Radiated Spurious Emissions, 5580 MHz, 802.11a 20 MHz, 1 GHz – 7 GHz



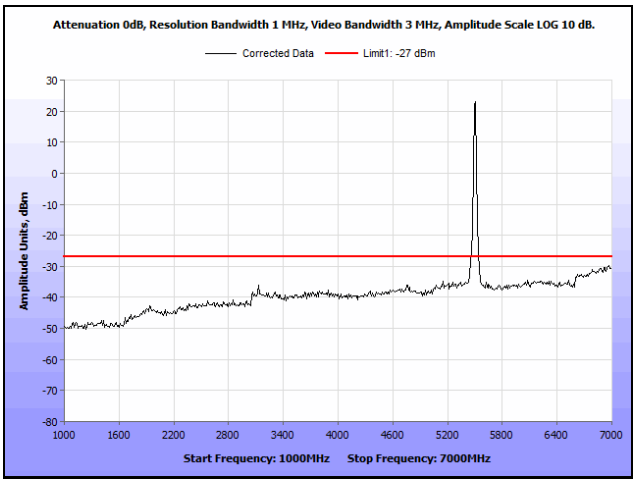
Plot 71. Radiated Spurious Emissions, 5580 MHz, 802.11a 20 MHz, 7 GHz – 18 GHz



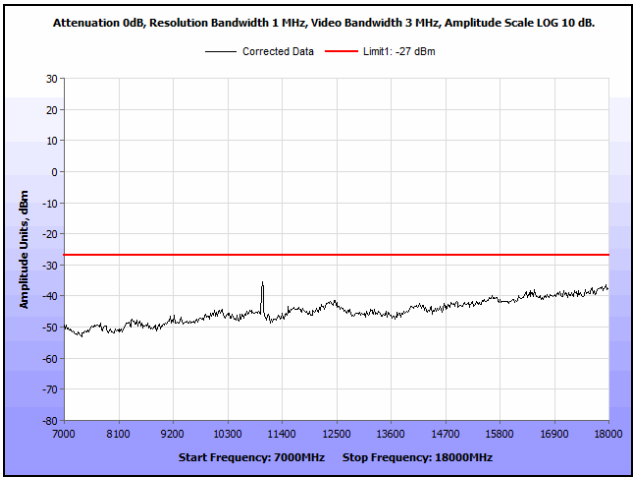
Plot 72. Radiated Spurious Emissions, 5700 MHz, 802.11a 20 MHz, 1 GHz – 7 GHz



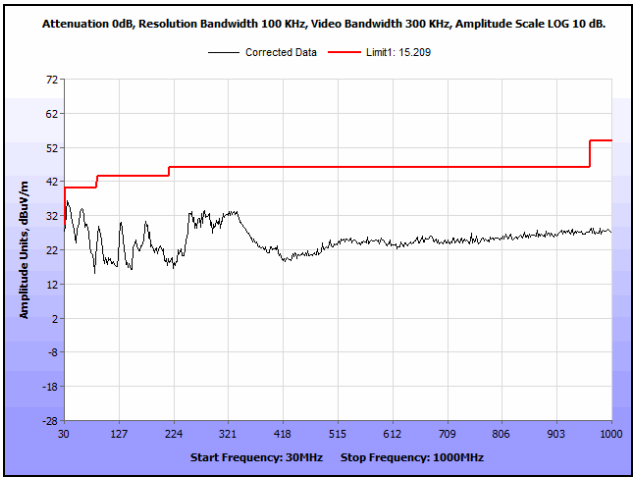
Plot 73. Radiated Spurious Emissions, 5700 MHz, 802.11a 20 MHz, 7 GHz – 18 GHz



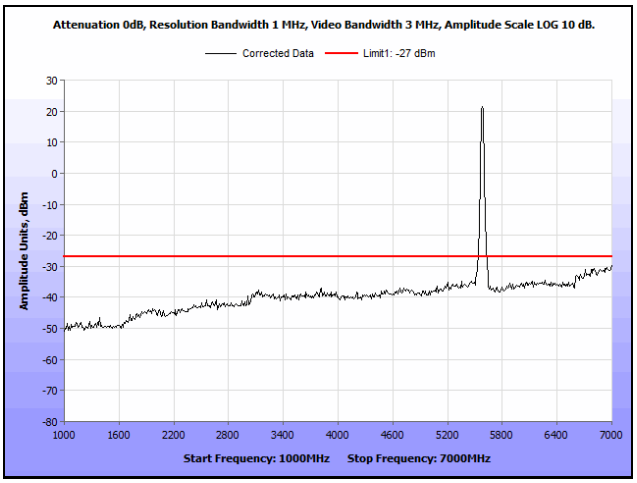
Plot 74. Radiated Spurious Emissions, 5500 MHz, 802.11ac 20 MHz, 1 GHz – 7 GHz



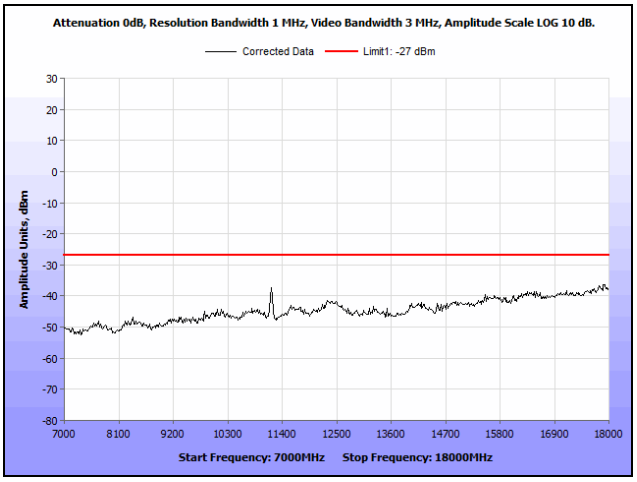
Plot 75. Radiated Spurious Emissions, 5500 MHz, 802.11ac 20 MHz, 7 GHz – 18 GHz



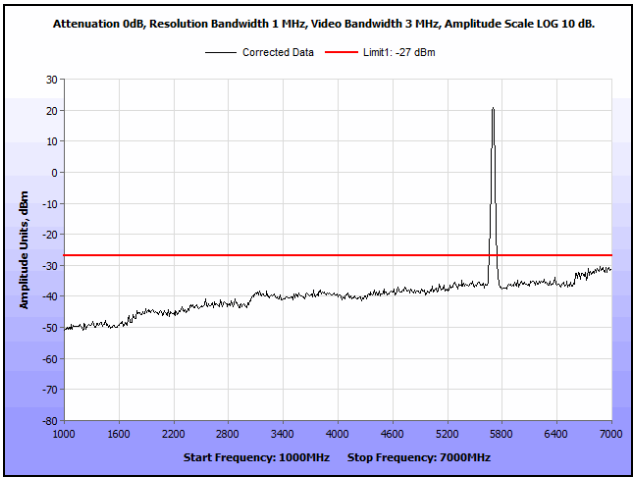
Plot 76. Radiated Spurious Emissions, 5580 MHz, 802.11ac 20 MHz, 30 MHz – 1 GHz



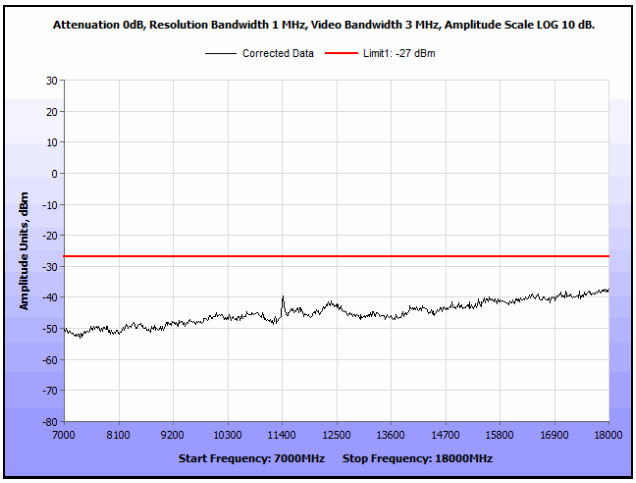
Plot 77. Radiated Spurious Emissions, 5580 MHz, 802.11ac 20 MHz, 1 GHz – 7 GHz



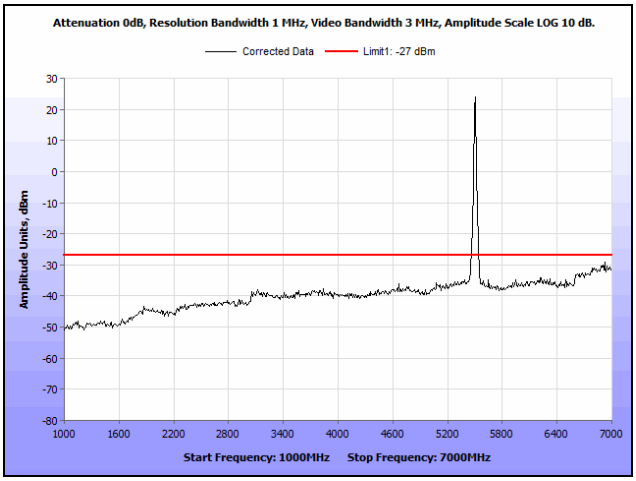
Plot 78. Radiated Spurious Emissions, 5580 MHz, 802.11ac 20 MHz, 7 GHz – 18 GHz



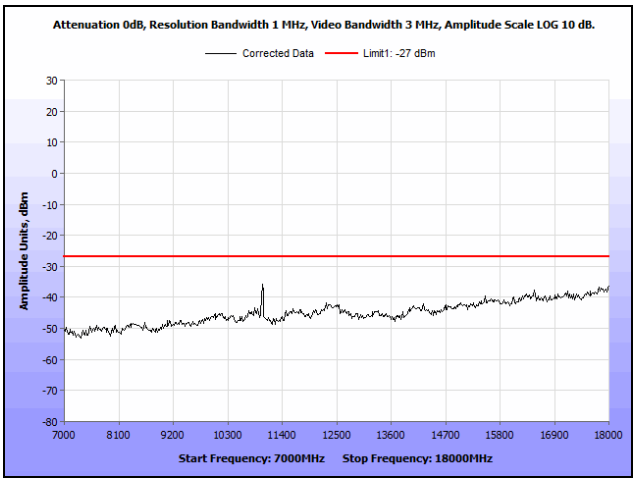
Plot 79. Radiated Spurious Emissions, 5700 MHz, 802.11ac 20 MHz, 1 GHz – 7 GHz



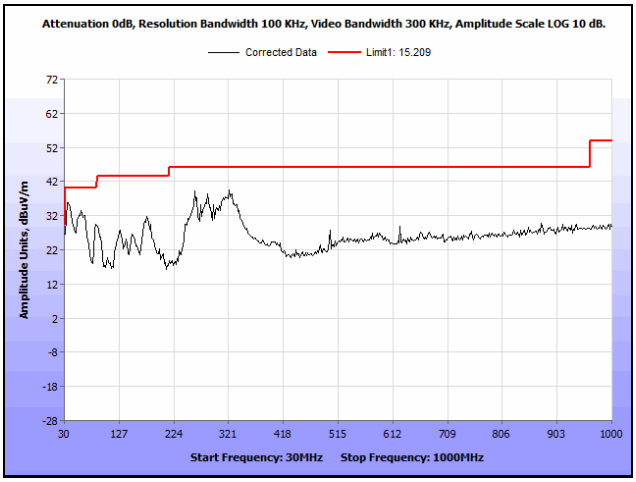
Plot 80. Radiated Spurious Emissions, 5700 MHz, 802.11ac 20 MHz, 7 GHz – 18 GHz



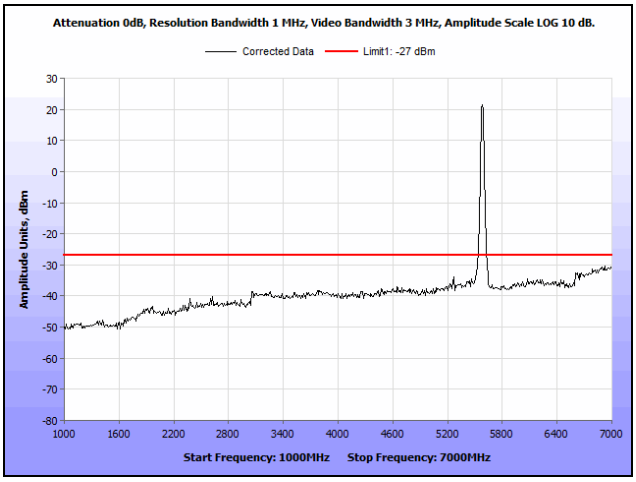
Plot 81. Radiated Spurious Emissions, 5500 MHz, 802.11n 20 MHz, 1 GHz – 7 GHz



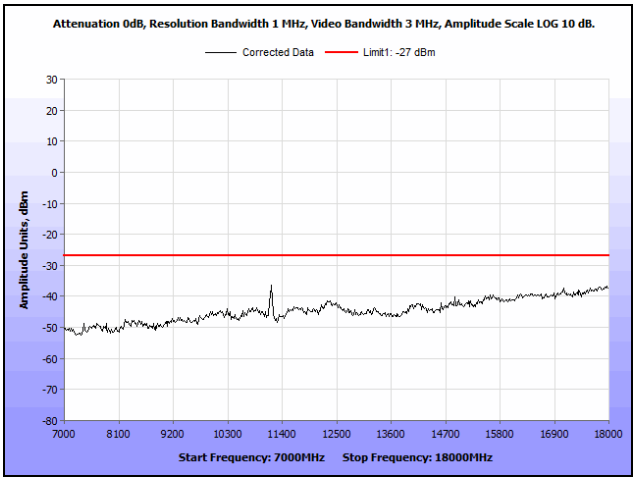
Plot 82. Radiated Spurious Emissions, 5500 MHz, 802.11n 20 MHz, 7 GHz – 18 GHz



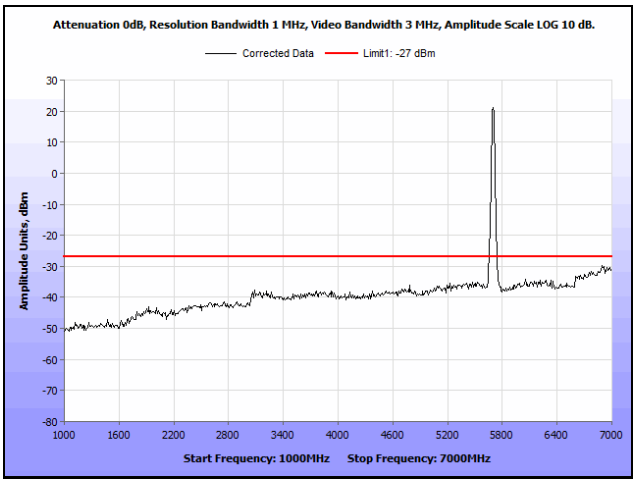
Plot 83. Radiated Spurious Emissions, 5580 MHz, 802.11n 20 MHz, 30 MHz – 1 GHz



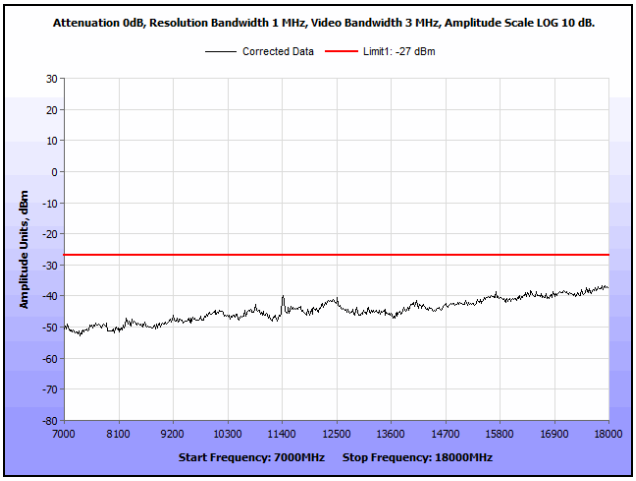
Plot 84. Radiated Spurious Emissions, 5580 MHz, 802.11n 20 MHz, 1 GHz – 7 GHz



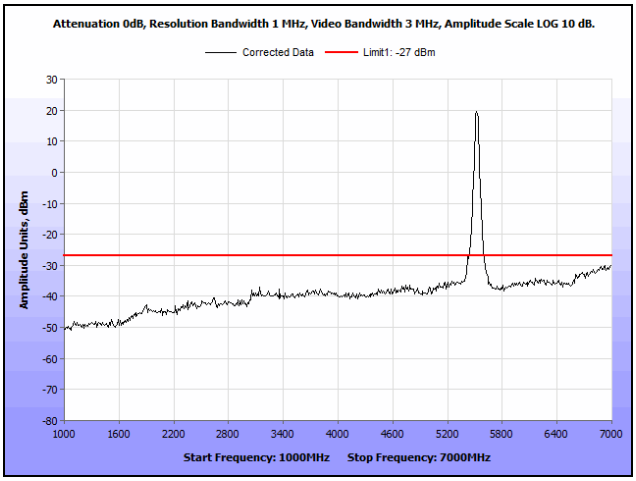
Plot 85. Radiated Spurious Emissions, 5580 MHz, 802.11n 20 MHz, 7 GHz – 18 GHz



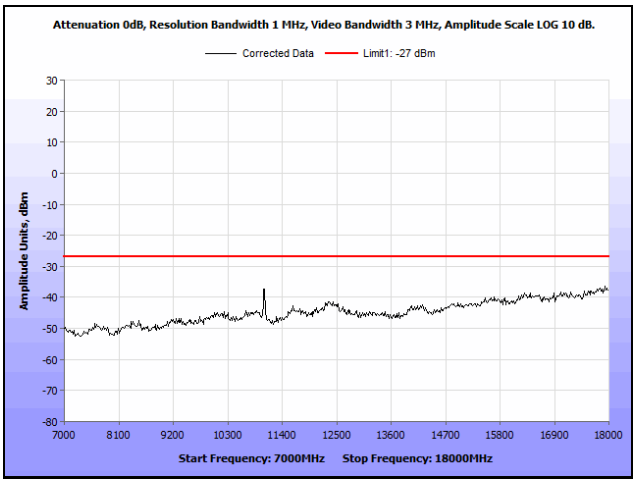
Plot 86. Radiated Spurious Emissions, 5700 MHz, 802.11n 20 MHz, 1 GHz – 7 GHz



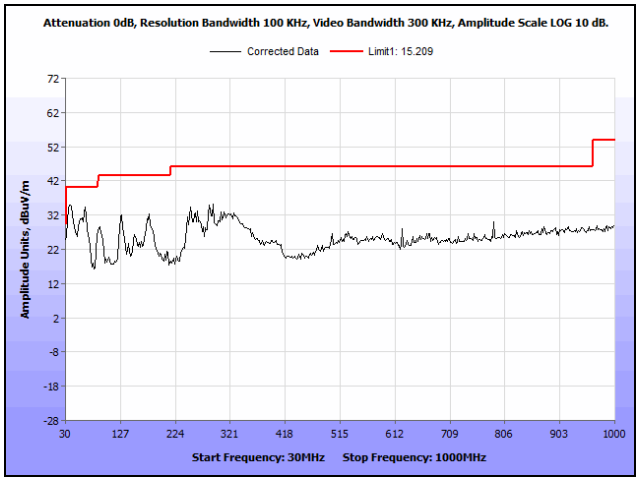
Plot 87. Radiated Spurious Emissions, 5700 MHz, 802.11n 20 MHz, 7 GHz – 18 GHz



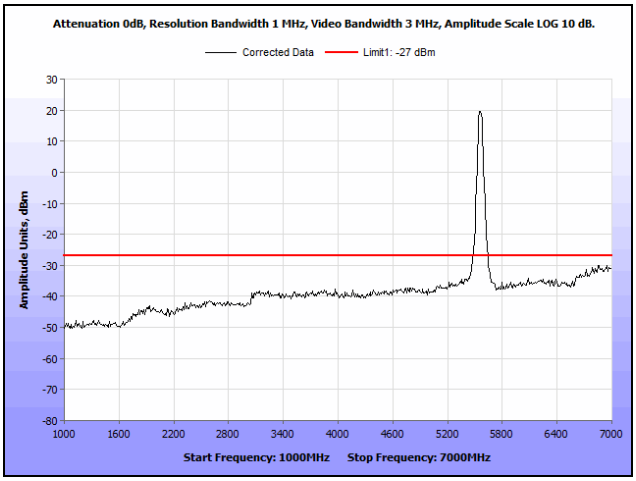
Plot 88. Radiated Spurious Emissions, 5510 MHz, 802.11ac 40 MHz, 1 GHz – 7 GHz



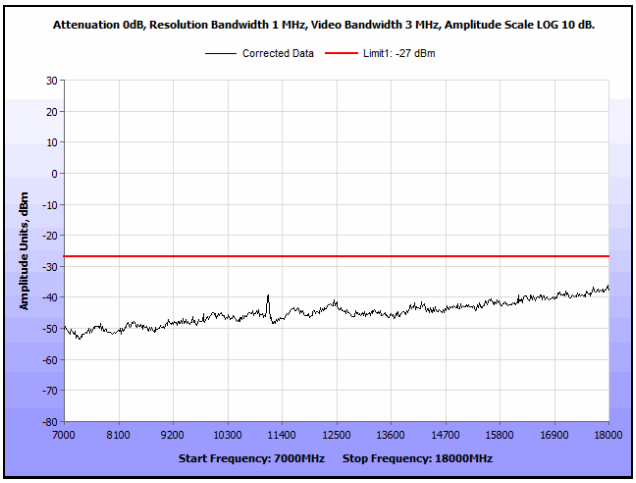
Plot 89. Radiated Spurious Emissions, 5510 MHz, 802.11ac 40 MHz, 7 GHz – 18 GHz



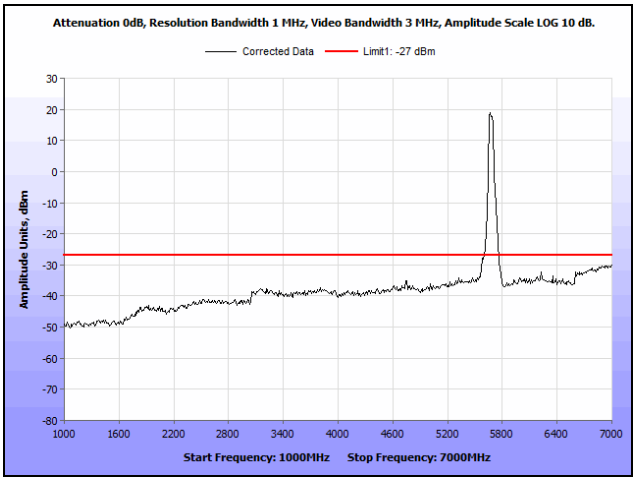
Plot 90. Radiated Spurious Emissions, 5550 MHz, 802.11ac 40 MHz, 30 MHz – 1 GHz



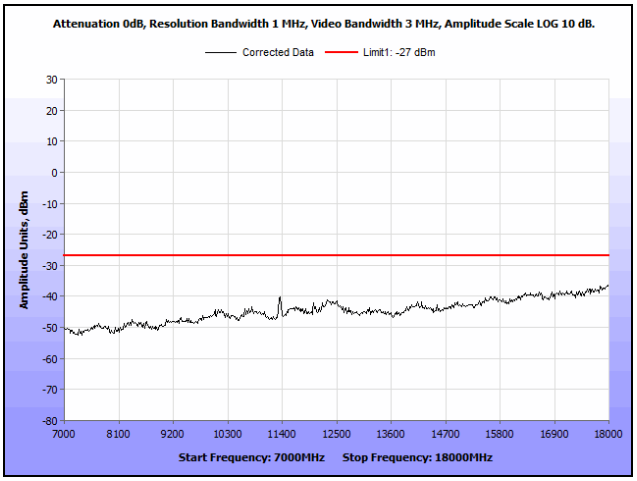
Plot 91. Radiated Spurious Emissions, 5550 MHz, 802.11ac 40 MHz, 1 GHz – 7 GHz



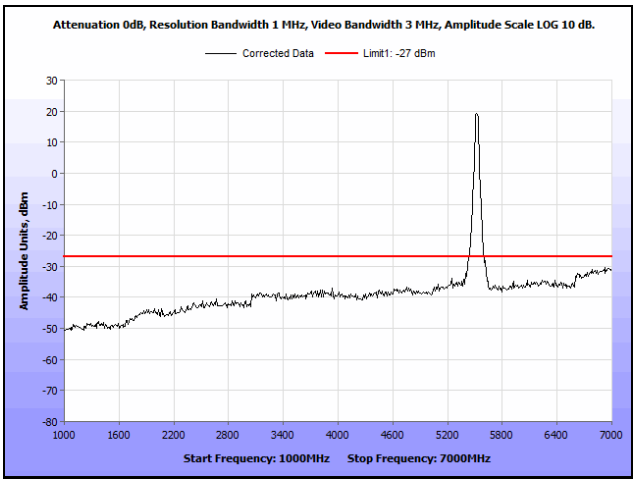
Plot 92. Radiated Spurious Emissions, 5550 MHz, 802.11ac 40 MHz, 7 GHz – 18 GHz



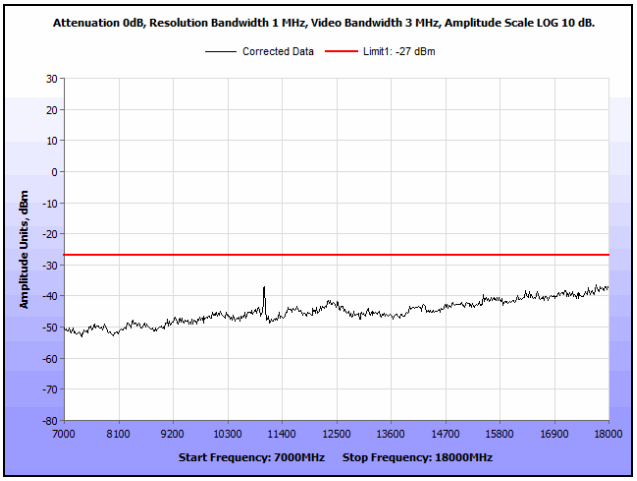
Plot 93. Radiated Spurious Emissions, 5670 MHz, 802.11ac 40 MHz, 1 GHz – 7 GHz



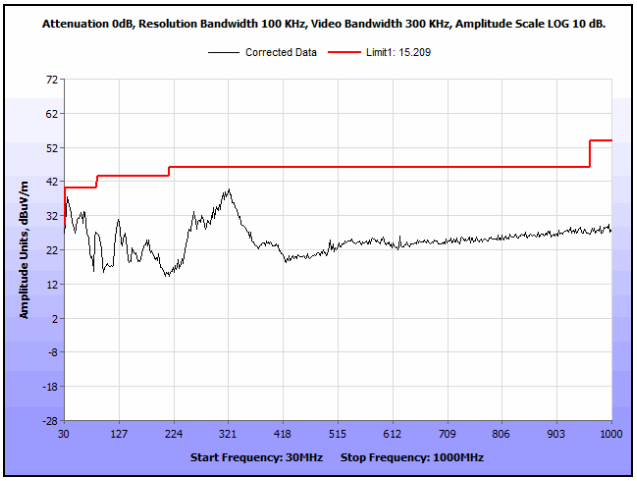
Plot 94. Radiated Spurious Emissions, 5670 MHz, 802.11ac 40 MHz, 7 GHz – 18 GHz



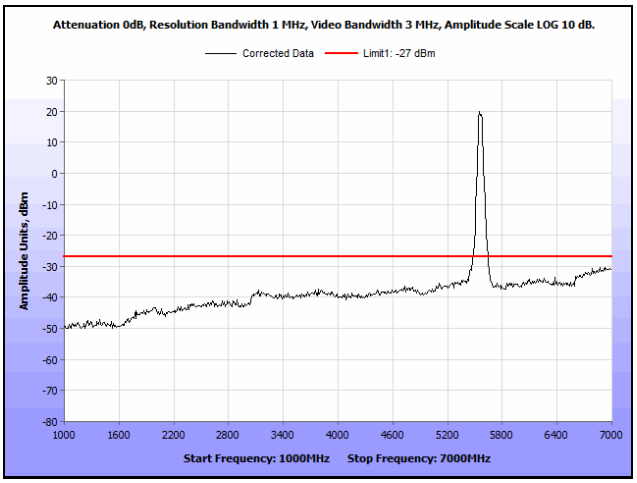
Plot 95. Radiated Spurious Emissions, 5510 MHz, 802.11n 40 MHz, 1 GHz – 7 GHz



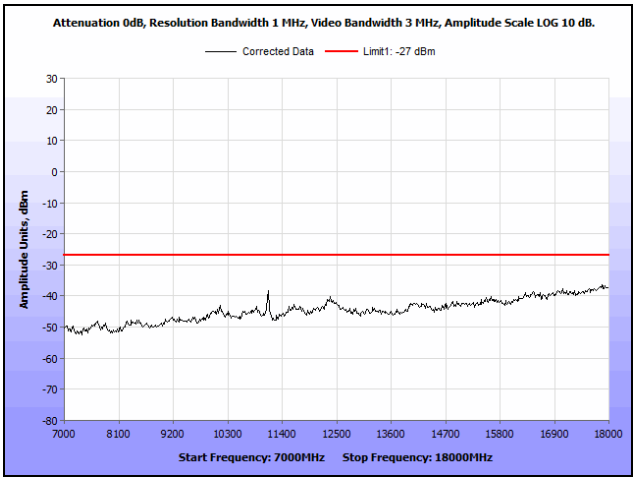
Plot 96. Radiated Spurious Emissions, 5510 MHz, 802.11n 40 MHz, 7 GHz – 18 GHz



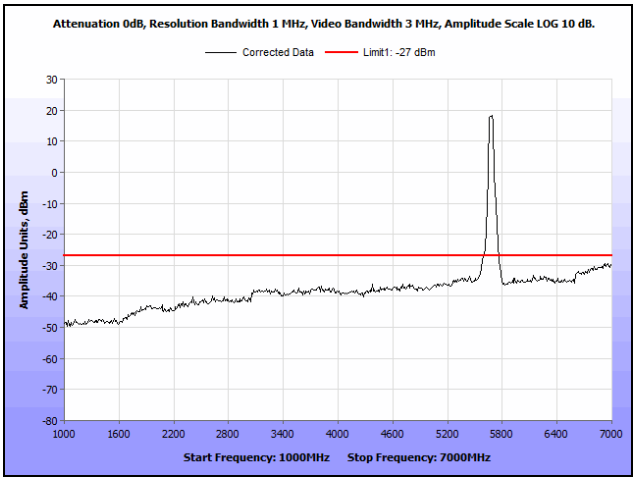
Plot 97. Radiated Spurious Emissions, 5550 MHz, 802.11n 40 MHz, 30 MHz – 1 GHz



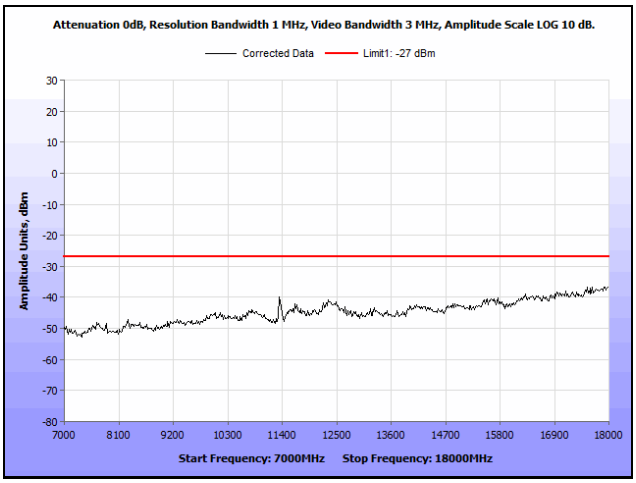
Plot 98. Radiated Spurious Emissions, 5550 MHz, 802.11n 40 MHz, 1 GHz – 7 GHz



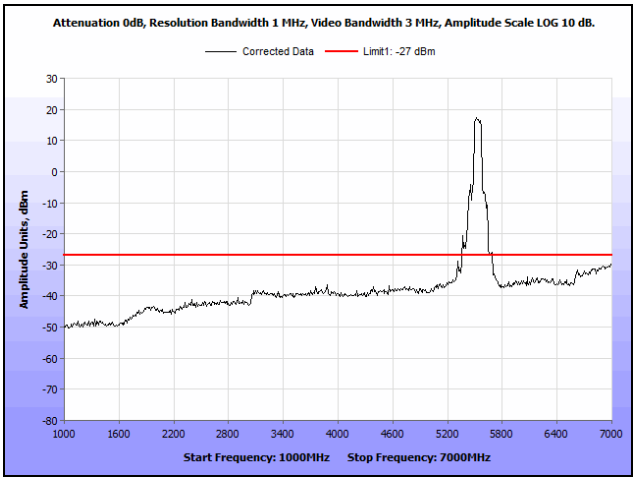
Plot 99. Radiated Spurious Emissions, 5550 MHz, 802.11n 40 MHz, 7 GHz – 18 GHz



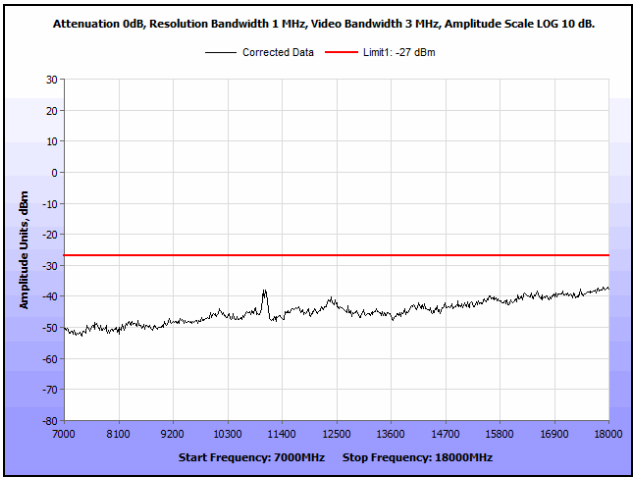
Plot 100. Radiated Spurious Emissions, 5670 MHz, 802.11n 40 MHz, 1 GHz – 7 GHz



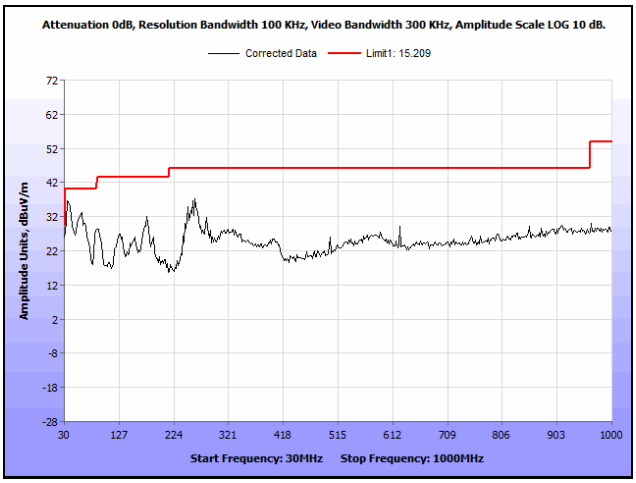
Plot 101. Radiated Spurious Emissions, 5670 MHz, 802.11n 40 MHz, 7 GHz – 18 GHz



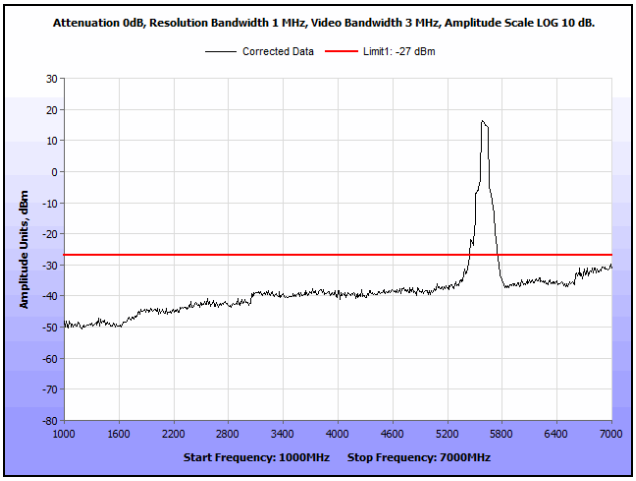
Plot 102. Radiated Spurious Emissions, 5530 MHz, 802.11ac 80 MHz, 1 GHz – 7 GHz



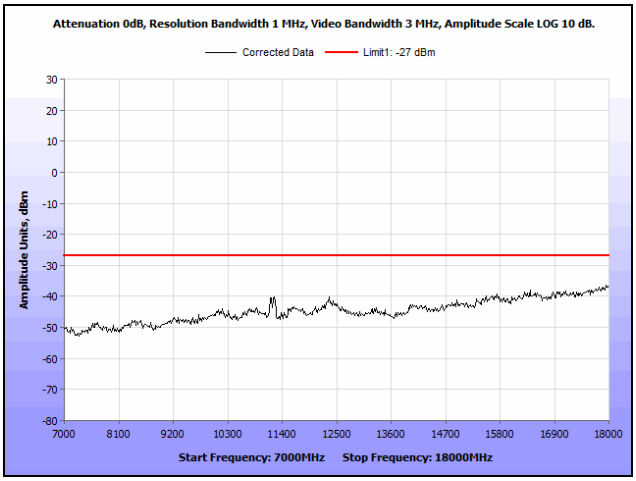
Plot 103. Radiated Spurious Emissions, 5530 MHz, 802.11ac 80 MHz, 7 GHz – 18 GHz



Plot 104. Radiated Spurious Emissions, 5610 MHz, 802.11ac 80 MHz, 30 MHz – 1 GHz

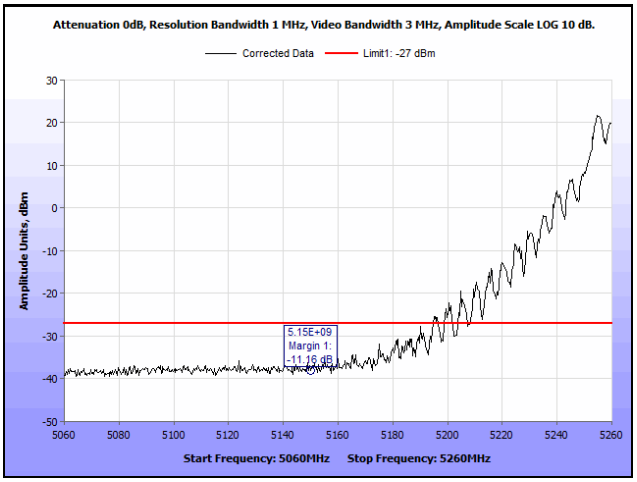


Plot 105. Radiated Spurious Emissions, 5610 MHz, 802.11ac 80 MHz, 1 GHz – 7 GHz

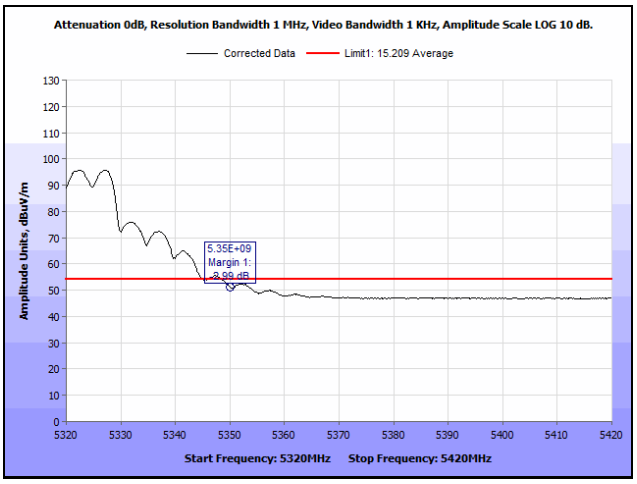


Plot 106. Radiated Spurious Emissions, 5610 MHz, 802.11ac 80 MHz, 7 GHz – 18 GHz

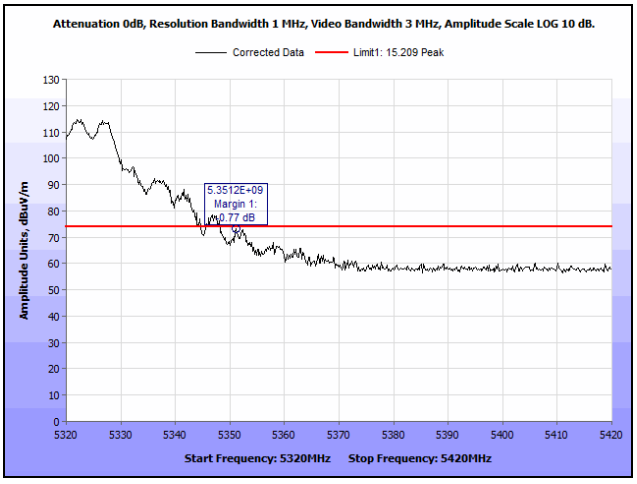
Radiated Band Edge



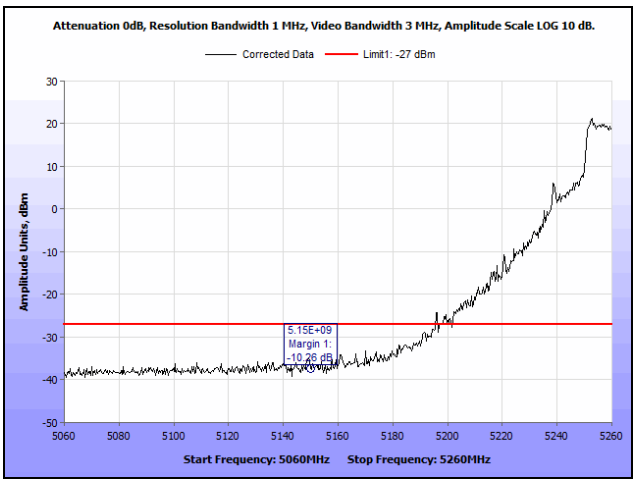
Plot 107. Radiated Band Edge, 802.11a 20 MHz, Low Channel, 5260 MHz @ 5150 MHz Edge



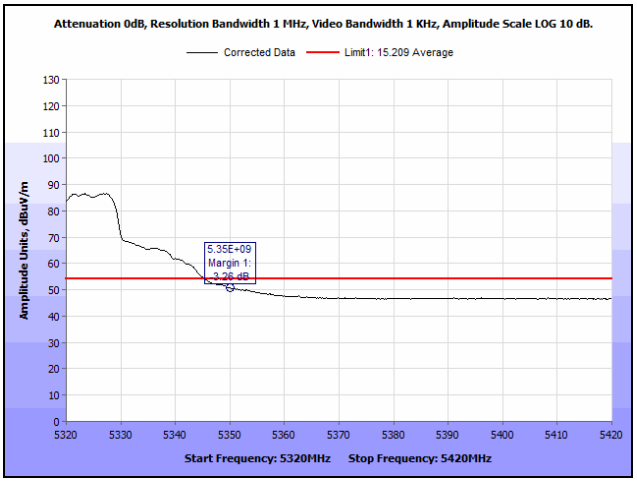
Plot 108. Radiated Band Edge, 802.11a 20 MHz, High Channel, 5320 MHz @ 5350 MHz Edge, Average



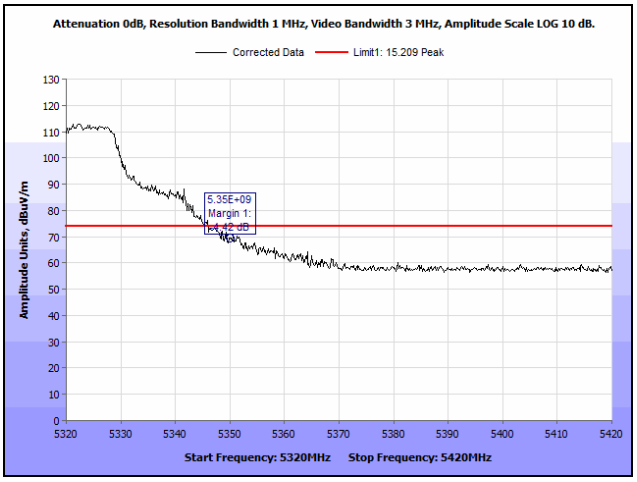
Plot 109. Radiated Band Edge, 802.11a 20 MHz, High Channel, 5320 MHz @ 5350 MHz Edge, Average



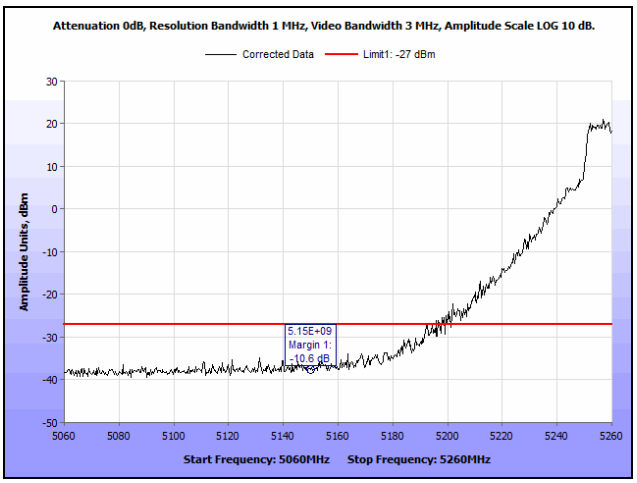
Plot 110. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, 5260 MHz @ 5150 MHz Edge



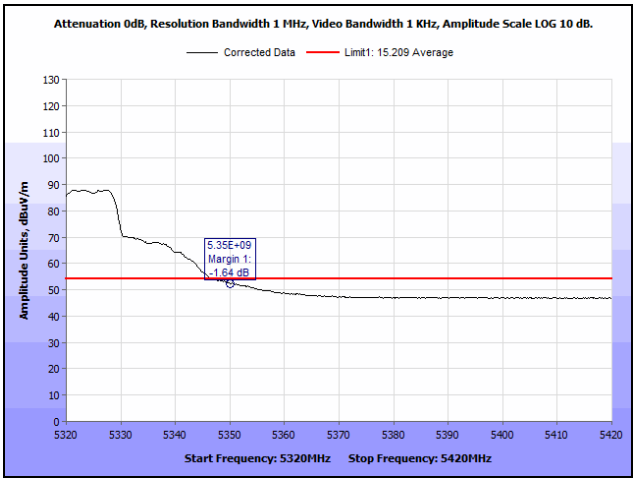
Plot 111. Radiated Band Edge, 802.11ac 20 MHz, High Channel, 5320 MHz @ 5350 MHz Edge, Average



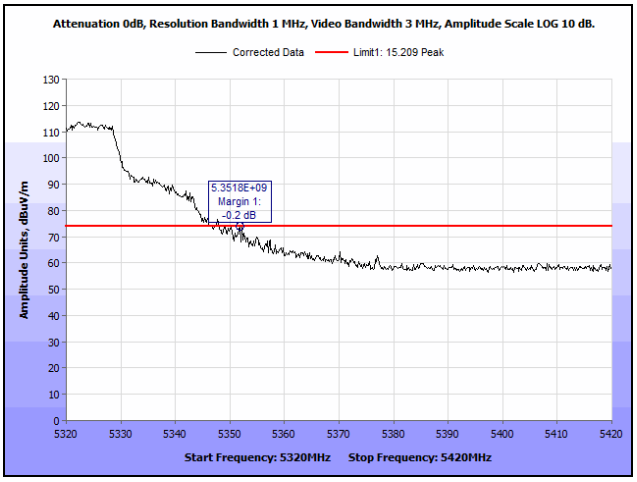
Plot 112. Radiated Band Edge, 802.11ac 20 MHz, High Channel, 5320 MHz @ 5350 MHz Edge, Average



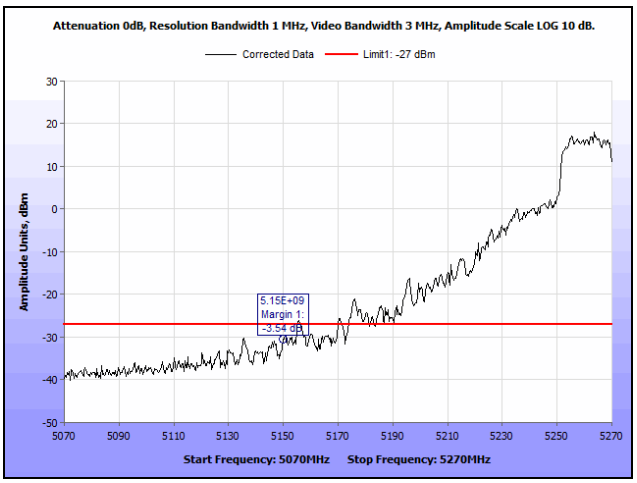
Plot 113. Radiated Band Edge, 802.11n 20 MHz, Low Channel, 5260 MHz @ 5150 MHz Edge



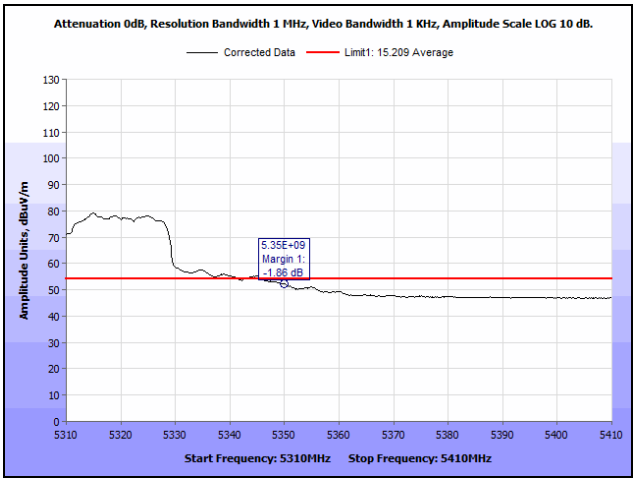
Plot 114. Radiated Band Edge, 802.11n 20 MHz, High Channel, 5320 MHz @ 5350 MHz Edge, Average



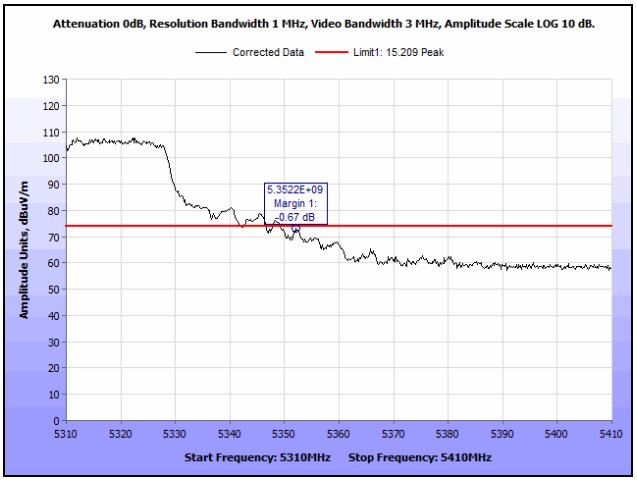
Plot 115. Radiated Band Edge, 802.11n 20 MHz, High Channel, 5320 MHz @ 5350 MHz Edge, Average



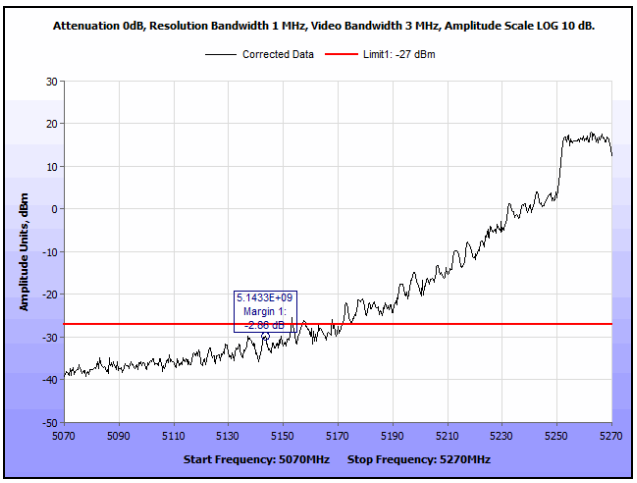
Plot 116. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, 5270 MHz @ 5150 MHz Edge



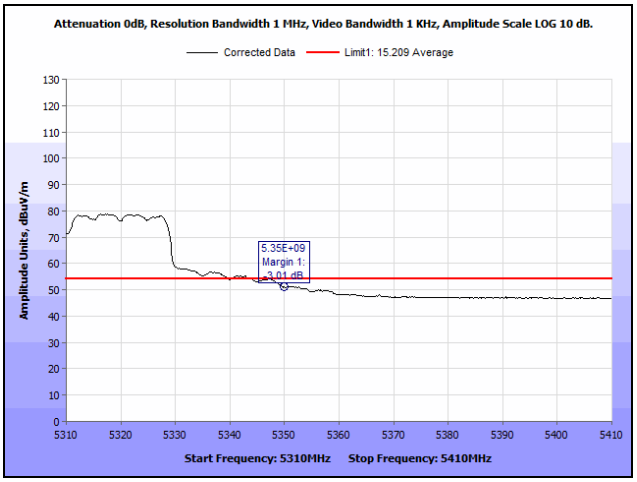
Plot 117. Radiated Band Edge, 802.11ac 40 MHz, High Channel, 5310 MHz @ 5350 MHz Edge, Average



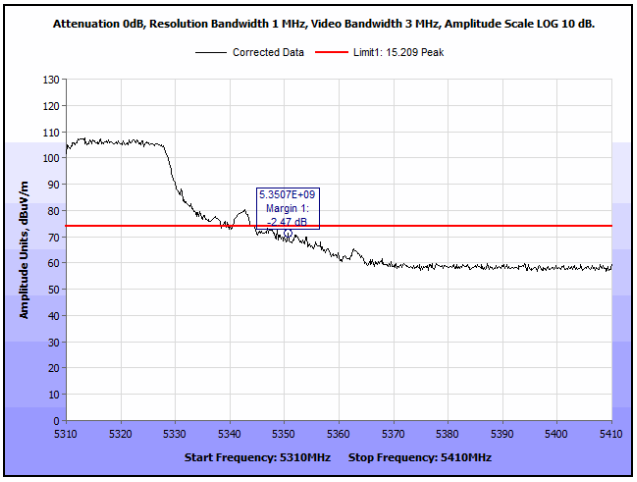
Plot 118. Radiated Band Edge, 802.11ac 40 MHz, High Channel, 5310 MHz @ 5350 MHz Edge, Average



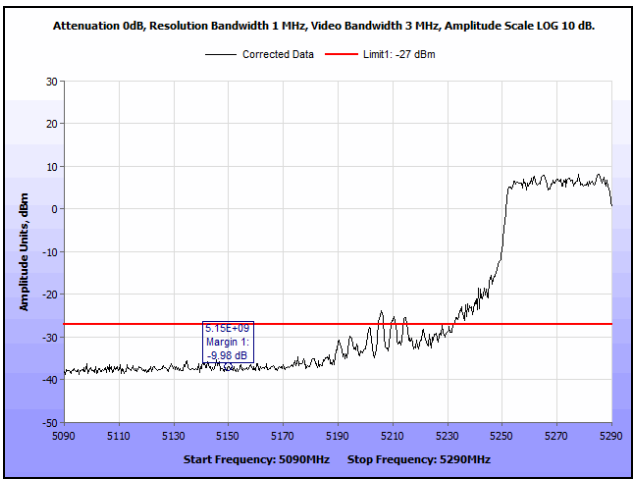
Plot 119. Radiated Band Edge, 802.11n 40 MHz, Low Channel, 5270 MHz @ 5150 MHz Edge



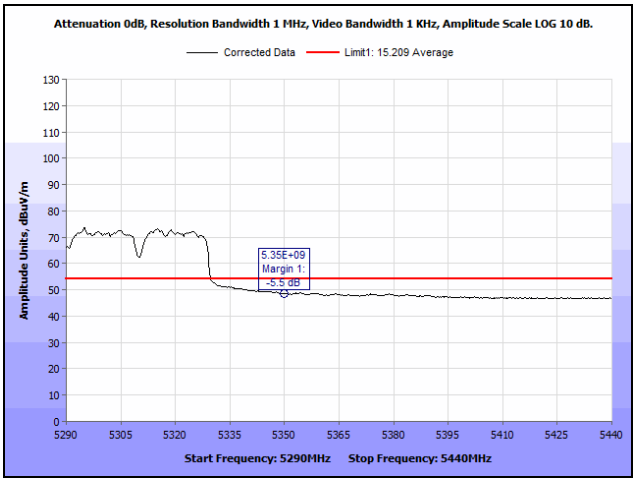
Plot 120. Radiated Band Edge, 802.11n 40 MHz, High Channel, 5310 MHz @ 5350 MHz Edge, Average



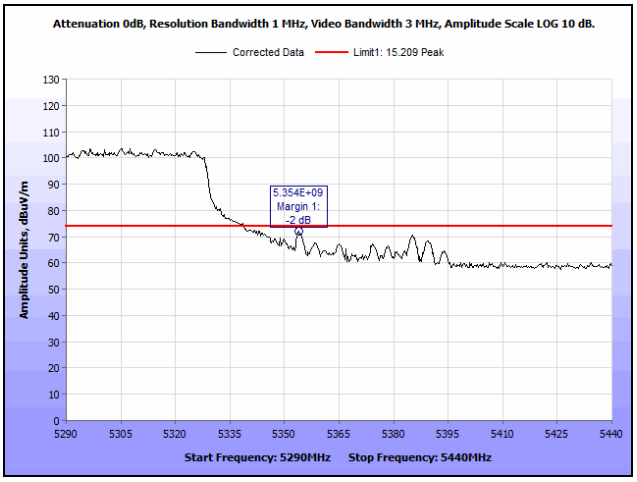
Plot 121. Radiated Band Edge, 802.11n 40 MHz, High Channel, 5310 MHz @ 5350 MHz Edge, Average



Plot 122. Radiated Band Edge, 802.11ac 80 MHz, Low Channel, 5290 MHz @ 5150 MHz Edge

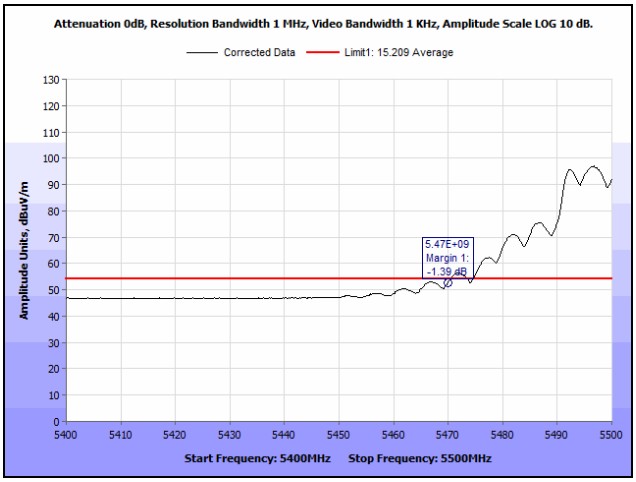


Plot 123. Radiated Band Edge, 802.11ac 80 MHz, High Channel, 5290 MHz @ 5350 MHz Edge, Average

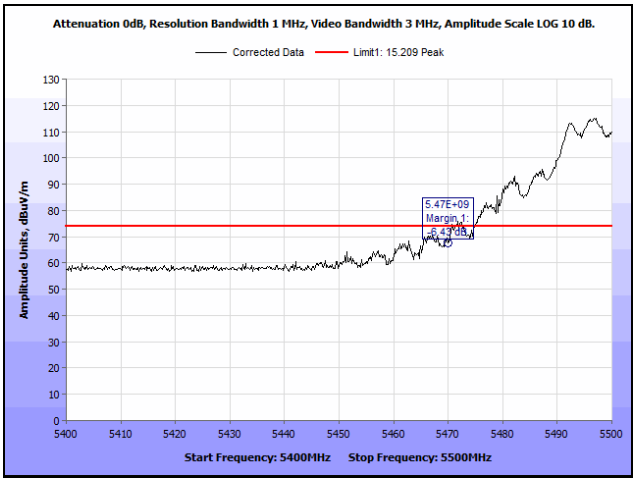


Plot 124. Radiated Band Edge, 802.11ac 80 MHz, High Channel, 5290 MHz @ 5350 MHz Edge, Average

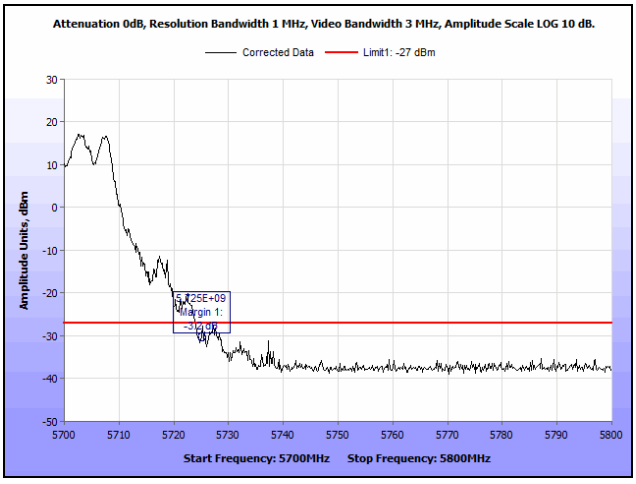
Radiated Band Edge



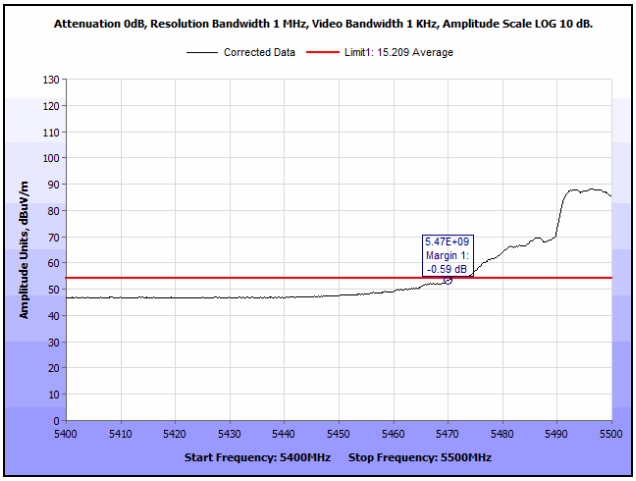
Plot 125. Radiated Band Edge, 802.11a 20 MHz, Low Channel, 5500 MHz @ 5470 MHz Edge, Average



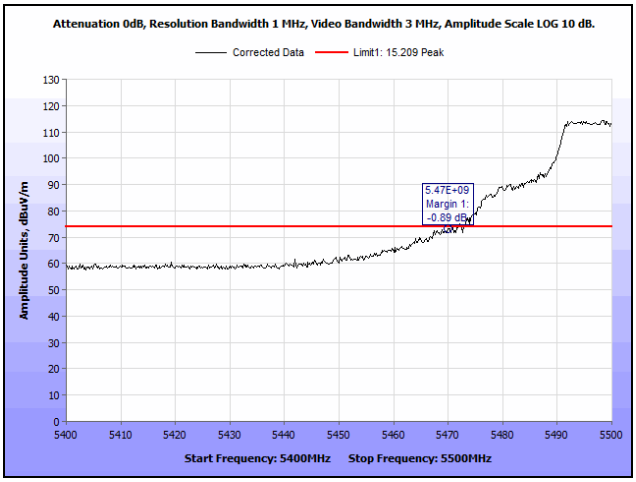
Plot 126. Radiated Band Edge, 802.11a 20 MHz, Low Channel, 5500 MHz @ 5470 MHz Edge, Peak



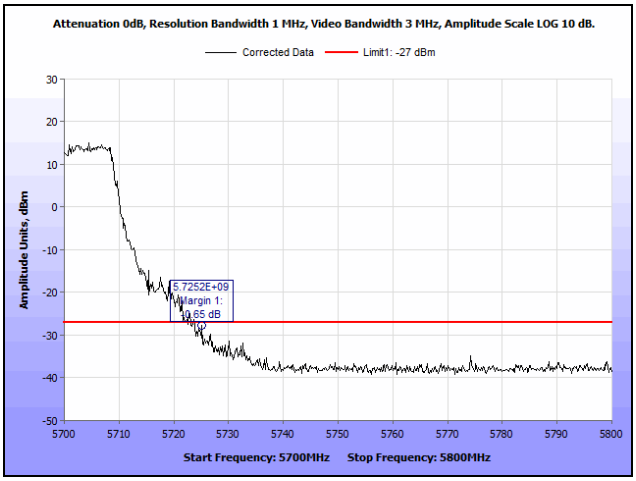
Plot 127. Radiated Band Edge, 802.11a 20 MHz, High Channel, 5700 MHz @ 5725 MHz Edge



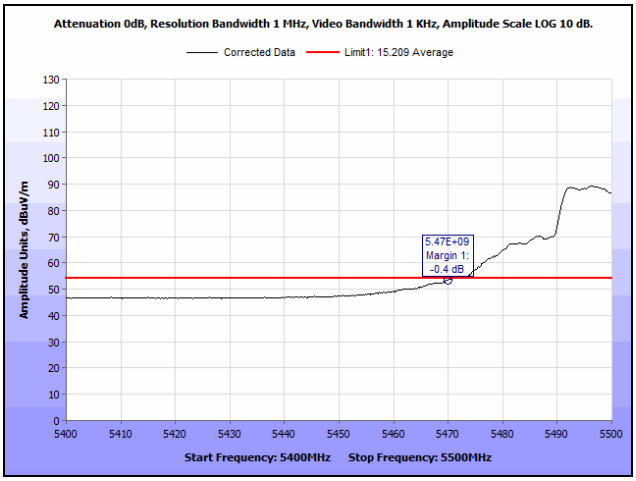
Plot 128. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, 5500 MHz @ 5470 MHz Edge, Average



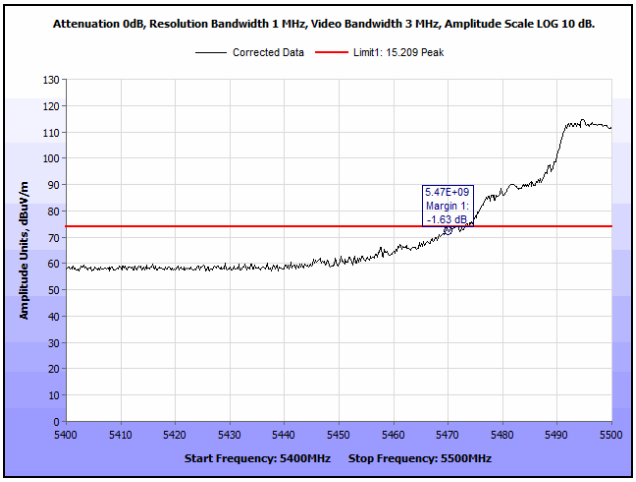
Plot 129. Radiated Band Edge, 802.11ac 20 MHz, Low Channel, 5500 MHz @ 5470 MHz Edge, Peak



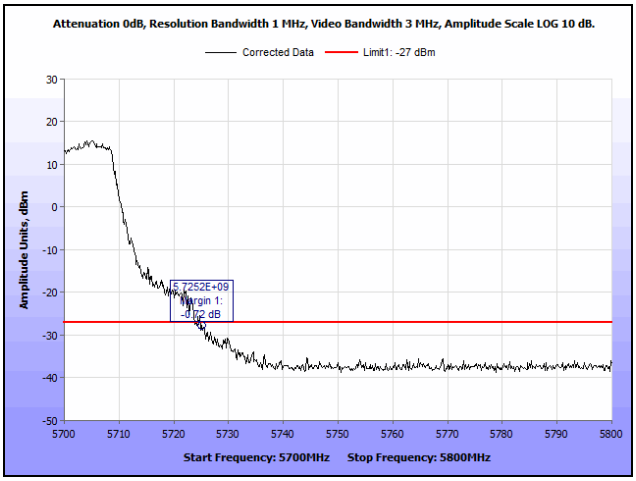
Plot 130. Radiated Band Edge, 802.11ac 20 MHz, High Channel, 5700 MHz @ 5725 MHz Edge



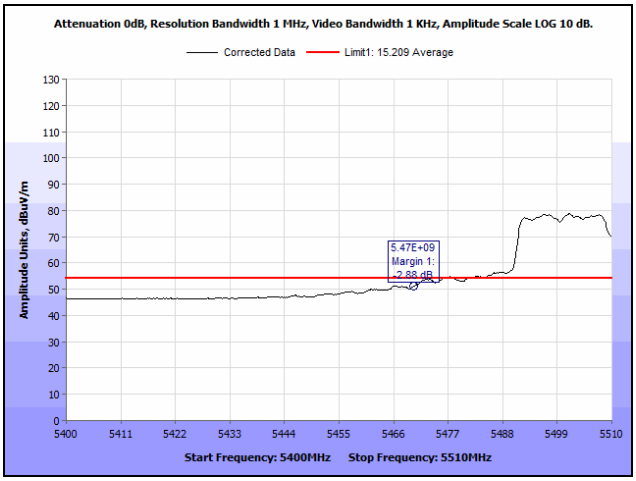
Plot 131. Radiated Band Edge, 802.11n 20 MHz, Low Channel, 5500 MHz @ 5470 MHz Edge, Average



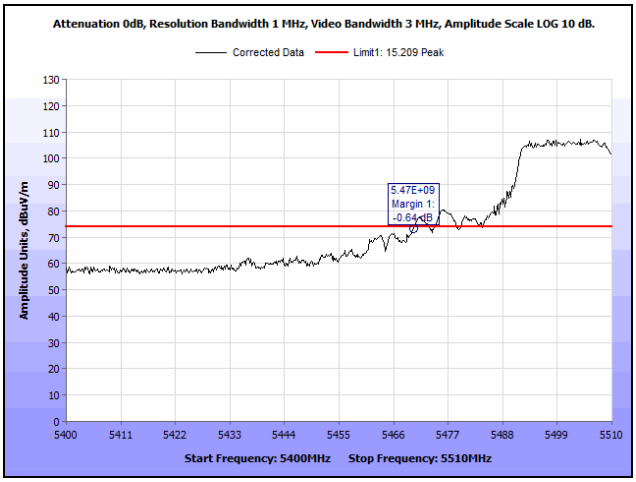
Plot 132. Radiated Band Edge, 802.11n 20 MHz, Low Channel, 5500 MHz @ 5470 MHz Edge, Peak



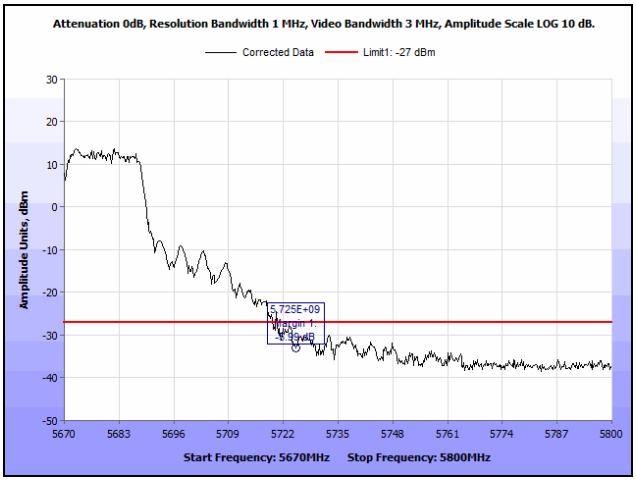
Plot 133. Radiated Band Edge, 802.11n 20 MHz, High Channel, 5700 MHz @ 5725 MHz Edge



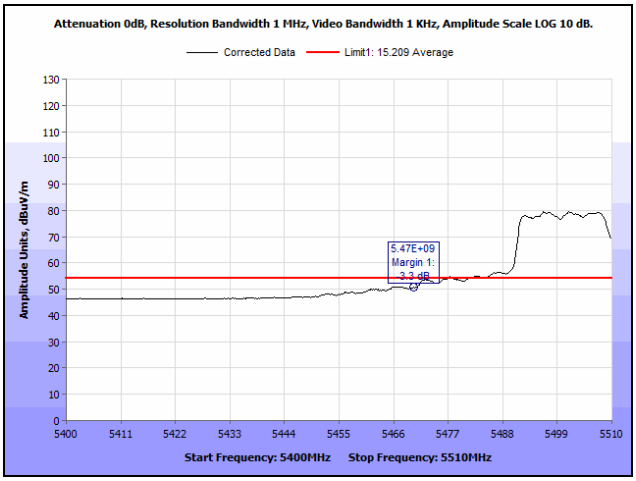
Plot 134. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, 5510 MHz @ 5470 MHz Edge, Average



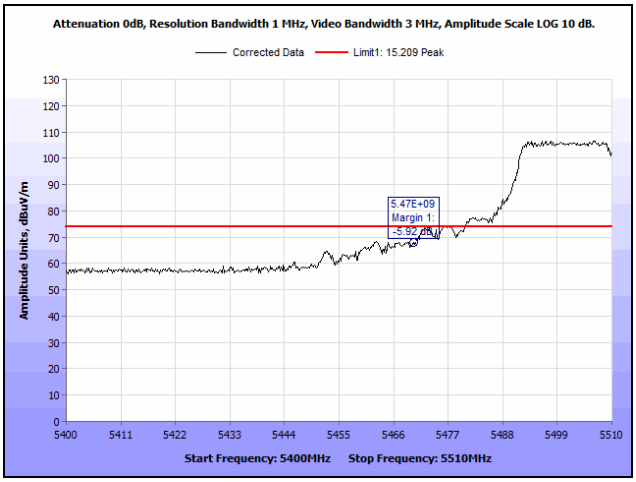
Plot 135. Radiated Band Edge, 802.11ac 40 MHz, Low Channel, 5510 MHz @ 5470 MHz Edge, Peak



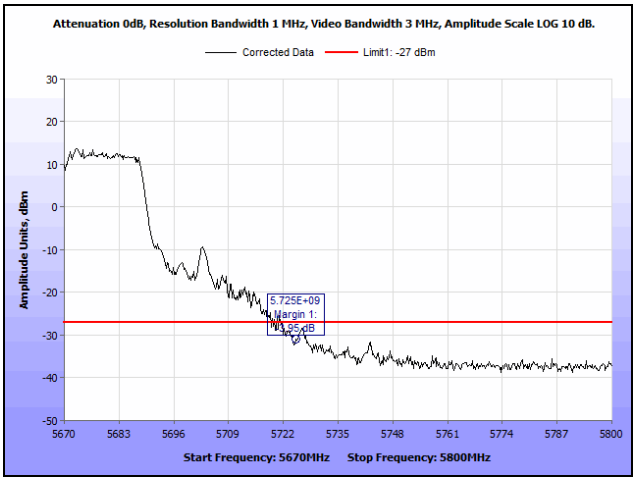
Plot 136. Radiated Band Edge, 802.11ac 40 MHz, High Channel, 5670 MHz @ 5725 MHz Edge



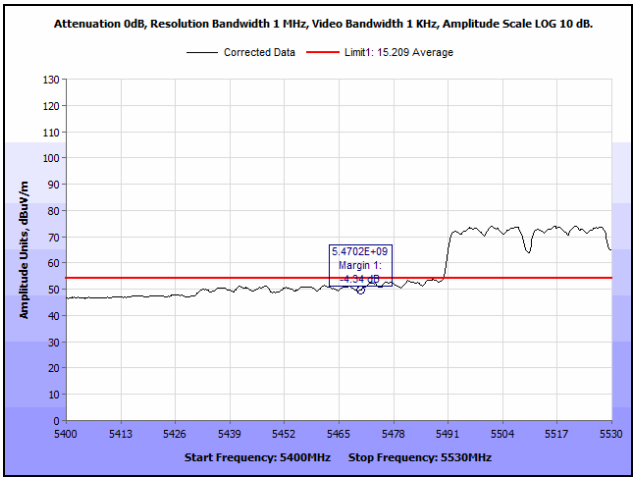
Plot 137. Radiated Band Edge, 802.11n 40 MHz, Low Channel, 5510 MHz @ 5470 MHz Edge, Average



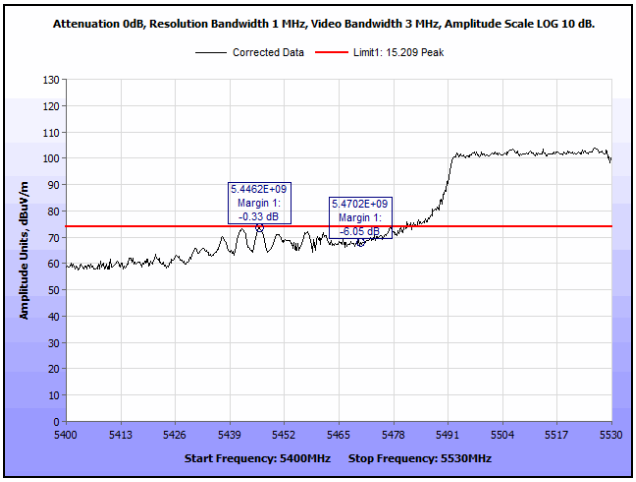
Plot 138. Radiated Band Edge, 802.11n 40 MHz, Low Channel, 5510 MHz @ 5470 MHz Edge, Peak



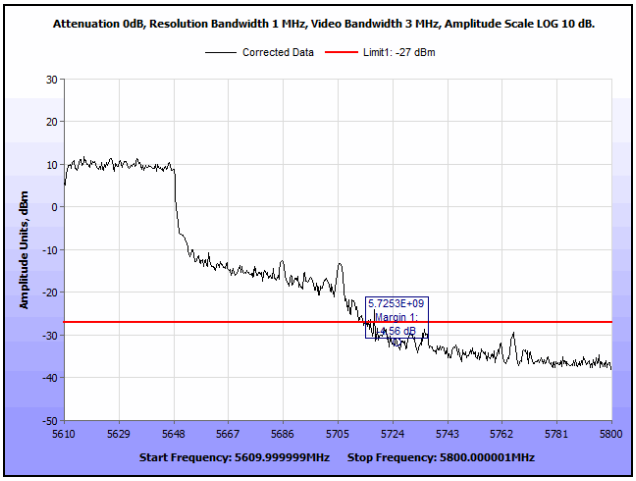
Plot 139. Radiated Band Edge, 802.11n 40 MHz, High Channel, 5670 MHz @ 5725 MHz Edge



Plot 140. Radiated Band Edge, 802.11n 80 MHz, Low Channel, 5530 MHz @ 5470 MHz Edge, Average



Plot 141. Radiated Band Edge, 802.11n 80 MHz, Low Channel, 5530 MHz @ 5470 MHz Edge, Peak



Plot 142. Radiated Band Edge, 802.11n 80 MHz, High Channel, 5610 MHz @ 5725 MHz Edge

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 @ 5.25-5.35 GHz and 5.47-5.725 GHz; highest conducted power = 23.90dBm (Avg) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

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

$S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (<1 mW/cm^2)
P = Power Input to antenna (245.47 mW)
G = Antenna Gain (3.2 dBi, 2.09 numeric)
R = Minimum Distance between User and Antenna (20 cm)

$S = (245.47*2.09*2.09)/ (4*3.14*20^2) = 0.2134$ mW/cm^2

Since S < 1 mW/cm^2, the minimum distance (R) is 20cm

