MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
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February 20, 2017

Firetide, Inc.
2105 South Bascom Avenue Suite 220
Campbell, CA 95008

Dear Prasant Hota,

Enclosed is the EMC Wireless test report for compliance testing of the Firetide, Inc., 7010(W), as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15 Subpart C 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: (\Firetide, Inc.\EMCS92597-FCC247 Rev. 1)

Electromagnetic Compatibility Criteria
Test Report

for the

Firetide, Inc.
7010(W)

Tested under
the FCC Certification Rules
contained in
15.247 Subpart C for Intentional Radiators

MET Report: EMCS92597-FCC247 Rev. 1

February 20, 2017

Prepared For:

Firetide, Inc.
2105 South Bascom Avenue Suite 220
Campbell, CA 95008

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

Electromagnetic Compatibility Criteria
Test Report

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the FCC Certification Rules
contained in
15.247 Subpart C for Intentional Radiators

Kristine Cabrera, 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 the FCC Rules Part 15.247 under normal use and maintenance.

Asad Bajwa,
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	February 14, 2017	Initial Issue.
1	February 20, 2017	Engineer corrections.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**er**z**
kPa	**k**ilo**pa**scal
kV	**k**ilovolt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**micro**henry
µ	**micro**farad
µs	**micro**seconds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
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 Firetide, Inc. 7010(W), with the requirements of Part 15, §15.247. 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 7010(W). Firetide, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the 7010(W), 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, §15.247, in accordance with Firetide, Inc., purchase order number PO-3987. All tests were conducted using measurement procedure ANSI C63.4-2014 and ANSI C63.10-2013.

FCC Reference 47 CFR Part 15.247:2005	Description	Compliance
Title 47 of the CFR, Part 15 §15.203	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(2)	6dB Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	Radiated Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RF Conducted Spurious Emissions Requirements	Compliant
Title 47 of the CFR, Part 15 §15.247(d)	RF Conducted Band Edge	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	Peak Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	Maximum Permissible Exposure (MPE)	Compliant

Table 1. Executive Summary of EMC Part 15.247 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Firetide, Inc. to perform testing on the 7010(W), under Firetide, Inc.'s purchase order number PO-3987.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Firetide, Inc., 7010(W).

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

Model(s) Tested:	7010(W)	
Model(s) Covered:	7010(W)	
EUT Specifications:	Primary Power: 120 VAC, 60 Hz	
	FCC ID: REP-7100-W	
	Type of Modulations:	OFDM
	Equipment Code:	DTS
	Peak RF Output Power:	9dBi Omni Antenna: 23.63 dBm 13dBi Panel Antenna: 20.55 dBm
	EUT Frequency Ranges:	2412.0 MHz – 2462.0 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Kristine Cabrera	
Report Date(s):	February 20, 2017	

Table 2. EUT Summary Table

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
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

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 13501 McCallen Pass, Austin, TX 78753. 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 10m 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 Firetide, Inc. 7010(W), Equipment Under Test (EUT), is a Firetide Mesh Network, which is composed of two or more Mesh Nodes, gives you the convenience of a wired- Ethernet switch combined with the deployment flexibility of wireless technology. Each Mesh Node in the network can accept a wired Ethernet connection. That connection's Ethernet data is sent wirelessly to another Mesh Node. If the receiving Mesh Node is connected to the wired destination for the data packet, the Node routes that packet to its Ethernet connection. If it is not the final destination, the packet is forwarded wirelessly to the next Mesh Node and ultimately to its final destination. Depending on the network topology, a Mesh Node can be set up to operate as a point to point device (in which directional antennas would be used) or as a point to multipoint device (in which a combination of omnidirectional and directional antennas would be used). The Radio technology incorporated into the Mesh Node is based on the 802.11a/b/g/n standard. The Radio can be configured to operate in standard 802.11g mode or 802.11n mode, referred to as MIMO.

The HotPort Node is housed in a weatherized, cast aluminum enclosure. External antennas connect to the four type N connectors (two per radio 2x2), two on each side of the enclosure.

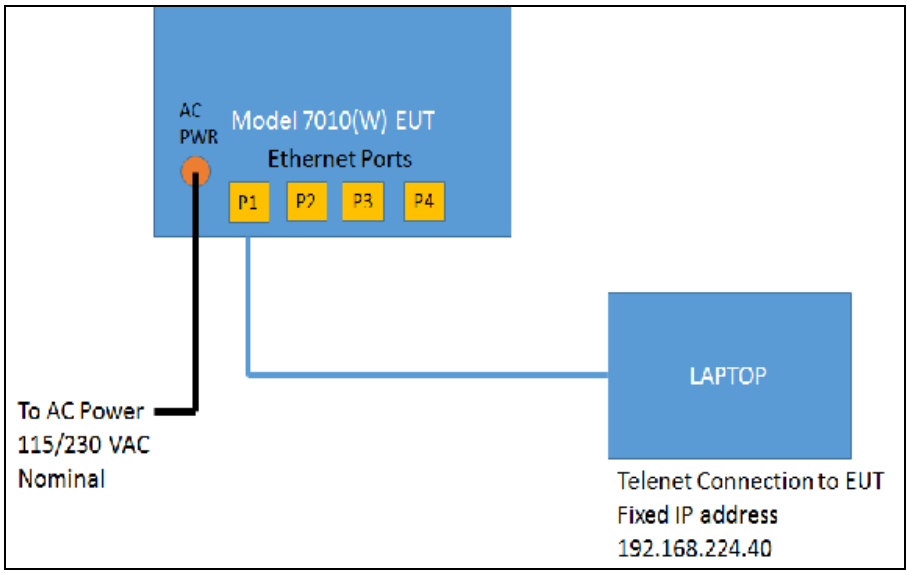


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

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

Ref. ID	Name / Description	Model Number	Part Number	Serial Number	Revision
1	HOTPORT Out Door Mesh Node	7010(W)	7010(W)	--	1.0

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
4	2.3 to 2.7G,2xN,13dBi Panel	Firetide	AS90-024-MIMO-13
5	2.4 to 2.5G,3 Port,9dBi,Omini	Firetide	AO-024-MIMO-8

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	Antenna Ports,Radio1: Ant1,Ant2 Radio2: Ant1,Ant2	CB-C-015-N(LMR400)	4	1.5Meter	Yes	Antenna Ports
2	Power Input Port: AC	Power cord, 3 conductor, 18 awg	1	1 Meter	Yes	AC: Power Input Port (120v/60hz)
3	Port 1 (P1)	CAT 5E Ethernet cable	1	2 Meter	No	Port 1

Table 6. Ports and Cabling Information

H. Mode of Operation

Once the AC power/POE Power is applied LED indicates to mention that the 7010(W) unit is powered on properly. Proper IP address should be set in the PC prior to the Ethernet cable connection. The Ethernet connectivity needs to be made by connecting an Ethernet cable. Once the connection is established, you can verify this in the PC's LAN connectivity status. Proper IP address should be set in the PC prior to the Ethernet cable connection.

I. Method of Monitoring EUT Operation

Electrical Indication: Power and Status LED's on the front panel to verify whether the EUT is power ON, if the EUT is ON the Power LED will glow Green.

Status LED Glows when the firmware is up. When the unit meshes with another unit using single radio configuration Radio1 LED will glow and when the unit meshes with another unit with dual radio configuration both Radio 1 and Radio 2 LED will glow.

With the Ethernet cable connected to PC or Laptop Ping the EUT with the IP address 192.168.224.xxx (150) for 7010(W).

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 Firetide, Inc. upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.203 Antenna Requirement

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

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

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

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

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

Results: The EUT as tested is compliant the criteria of §15.203. The EUT has an outdoor unit that must be professionally installed.

Test Engineer(s): Kristine Cabrera

Test Date(s): 11/11/16

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 by reference ground planes. 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 C63.4-2014 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on.

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

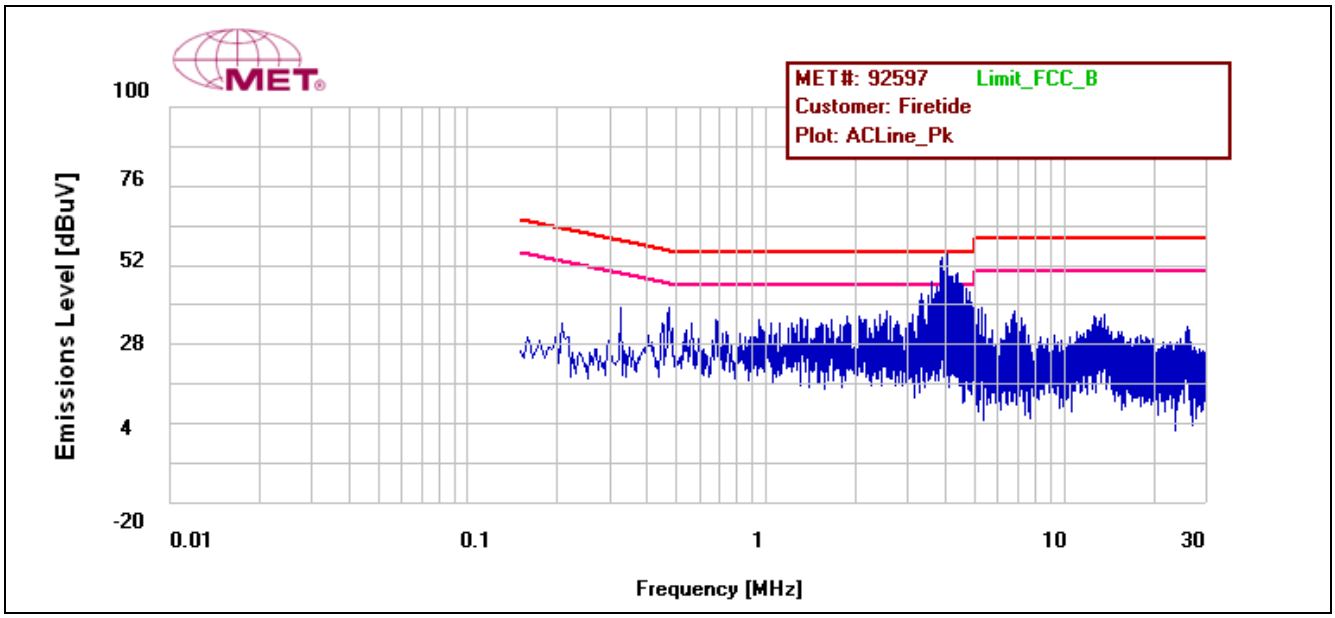
Test Engineer(s): Giuliano Messina

Test Date(s): 11/21/16

15.207(a) Conducted Emissions Test Results, 9 dBi Antenna

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
AC Line	0.326	33.05	59.57	-26.52	Pass	22.26	49.57	-27.31	Pass
AC Line	0.474	38.13	56.456	-18.326	Pass	26.05	46.456	-20.406	Pass
AC Line	2.542	30.91	56	-25.09	Pass	19.79	46	-26.21	Pass
AC Line	4.062	51.86	56	-4.14	Pass	34.02	46	-11.98	Pass
AC Line	4.406	46.45	56	-9.55	Pass	28.24	46	-17.76	Pass
AC Line	6.826	32.27	60	-27.73	Pass	22.03	50	-27.97	Pass

Table 8. Conducted Emissions, 15.207(a), Phase Line, Test Results, 9 dBi Antenna

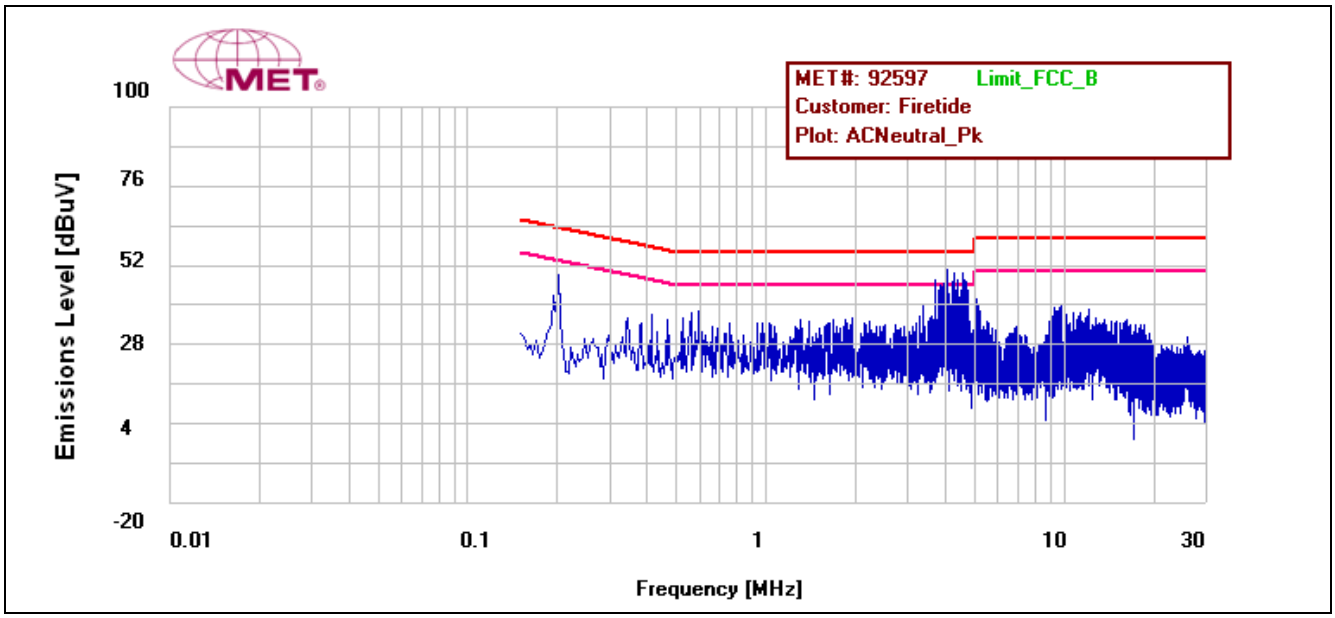


Plot 1. Conducted Emissions, 15.207(a), Phase Line, 9 dBi Antenna

15.207(a) Conducted Emissions Test Results, 9 dBi Antenna

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
AC Neutral	0.202	47.92	63.535	-15.615	Pass	32.16	53.535	-21.375	Pass
AC Neutral	0.598	34.26	56	-21.74	Pass	27.35	46	-18.65	Pass
AC Neutral	3.694	39.45	56	-16.55	Pass	24.35	46	-21.65	Pass
AC Neutral	4.434	41.83	56	-14.17	Pass	25.24	46	-20.76	Pass
AC Neutral	4.582	41.23	56	-14.77	Pass	24.05	46	-21.95	Pass
AC Neutral	9.874	30.07	60	-29.93	Pass	20.31	50	-29.69	Pass

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

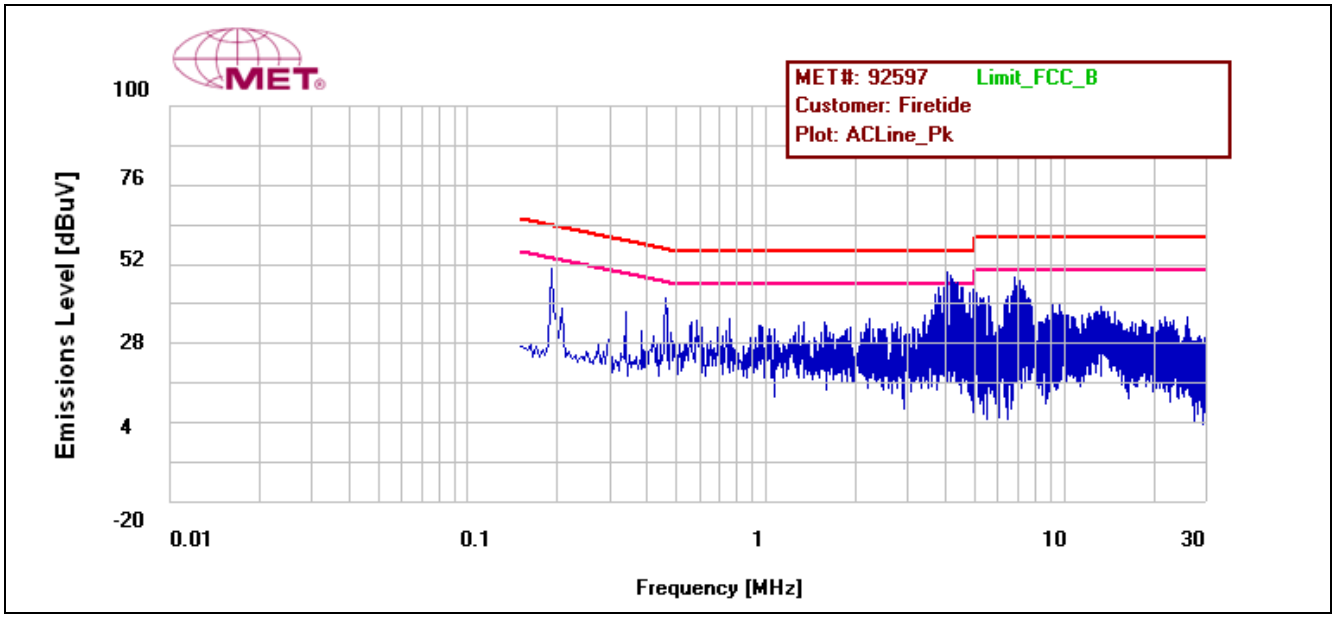


Plot 2. Conducted Emissions, 15.207(a), Neutral Line, 9 dBi Antenna

15.207(a) Conducted Emissions Test Results, 13 dBi Antenna

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
AC Line	0.190	48.67	64.042	-15.372	Pass	30.02	54.042	-24.022	Pass
AC Line	0.338	35.01	59.271	-24.261	Pass	22.85	49.271	-26.421	Pass
AC Line	0.462	38.1	56.675	-18.575	Pass	24.97	46.675	-21.705	Pass
AC Line	4.082	44.12	56	-11.88	Pass	25.44	46	-20.56	Pass
AC Line	4.958	40.81	56	-15.19	Pass	25.12	46	-20.88	Pass
AC Line	6.898	41.64	60	-18.36	Pass	29.05	50	-20.95	Pass

Table 10. Conducted Emissions, 15.207(a), Phase Line, Test Results, 13 dBi Antenna

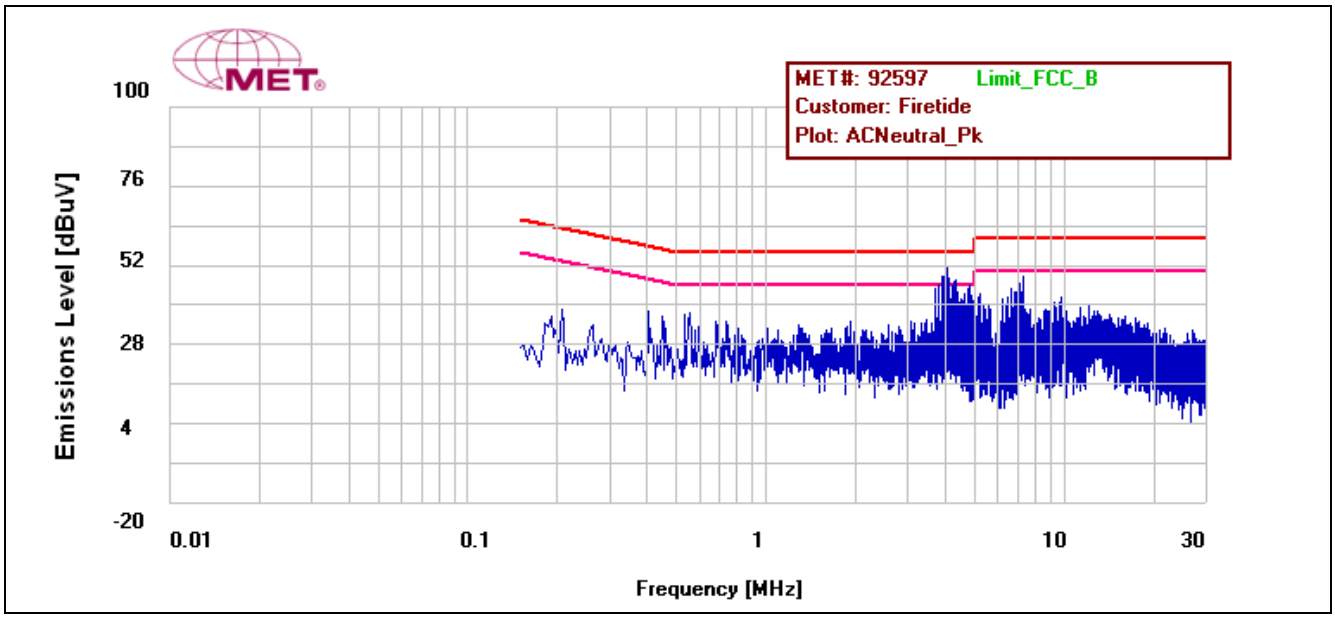


Plot 3. Conducted Emissions, 15.207(a), Phase Line, 13 dBi Antenna

15.207(a) Conducted Emissions Test Results, 13 dBi Antenna

Line	Freq. (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
AC Neutral	0.406	34.43	57.752	-23.322	Pass	23.02	47.752	-24.732	Pass
AC Neutral	0.554	35.61	56	-20.39	Pass	25.24	46	-20.76	Pass
AC Neutral	4.062	47.72	56	-8.28	Pass	28.23	46	-17.77	Pass
AC Neutral	4.838	41.05	56	-14.95	Pass	25.1	46	-20.9	Pass
AC Neutral	7.342	40.97	60	-19.03	Pass	27.68	50	-22.32	Pass
AC Neutral	9.810	35.96	60	-24.04	Pass	26.32	50	-23.68	Pass

Table 11. Conducted Emissions, 15.207(a), Neutral Line, Test Results, 13 dBi Antenna



Plot 4. Conducted Emissions, 15.207(a), Neutral Line, 13 dBi Antenna

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a)(2) 6 dB Bandwidth

Test Requirements: **§ 15.247(a)(2):** Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

Test Procedure: The transmitter was on and transmitting at the highest output power. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately 1% of the total emission bandwidth, VBW > RBW. The 6 dB Bandwidth was measured and recorded. The measurements were performed on the low, mid and high channels.

Test Results The EUT was compliant with § 15.247 (a)(2).

The 6 dB Bandwidth was determined from the plots on the following pages.

Test Engineer(s): Kristine Cabrera

Test Date(s): 11/18/16

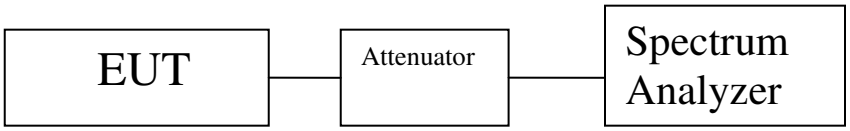


Figure 2. Block Diagram, Occupied Bandwidth Test Setup

Occupied Bandwidth Test Results

Occupied Bandwidth 802.11b			
	Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)
Ant 1	Low	2412	12.022
	Mid	2437	11.783
	High	2462	10.469
Ant 2	Low	2412	12.056
	Mid	2437	11.418
	High	2462	12.190

Table 12. 6 dB Occupied Bandwidth, Test Results, 802.11b

Occupied Bandwidth 802.11g			
	Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)
Ant 1	Low	2412	16.511
	Mid	2437	16.567
	High	2462	16.539
Ant 2	Low	2412	16.559
	Mid	2437	16.528
	High	2462	16.525

Table 13. 6 dB Occupied Bandwidth, Test Results, 802.11g

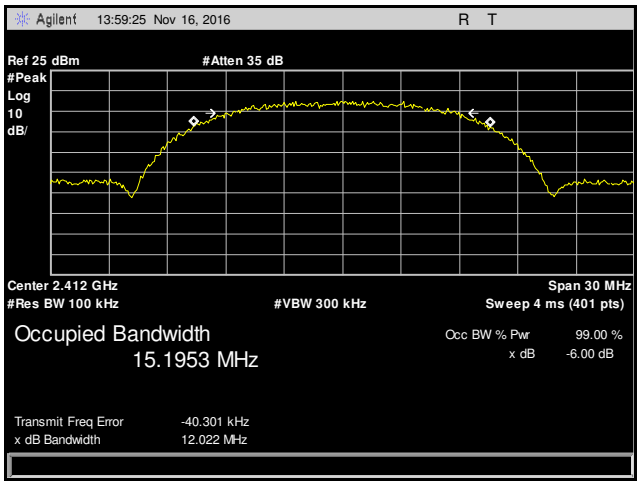
Occupied Bandwidth 802.11n HT20			
	Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)
Ant 1	Low	2412	17.748
	Mid	2437	17.748
	High	2462	17.726
Ant 2	Low	2412	17.722
	Mid	2437	17.763
	High	2462	17.617

Table 14. 6 dB Occupied Bandwidth, Test Results, 802.11n 20 MHz

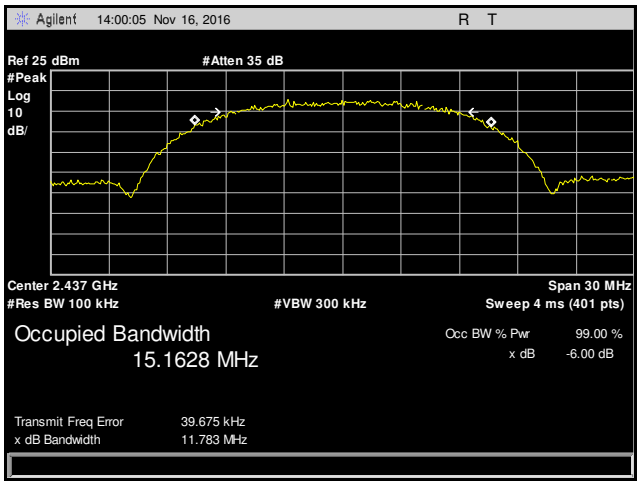
Occupied Bandwidth 802.11n HT40			
	Carrier Channel	**Frequency (MHz)**	**Measured 6 dB Bandwidth (MHz)**
Ant 1	Low	2422	36.591
	Mid	2437	36.600
	High	2452	36.550
Ant 2	Low	2422	36.713
	Mid	2437	36.605
	High	2452	36.516

Table 15. 6 dB Occupied Bandwidth, Test Results, 802.11n 40 MHz

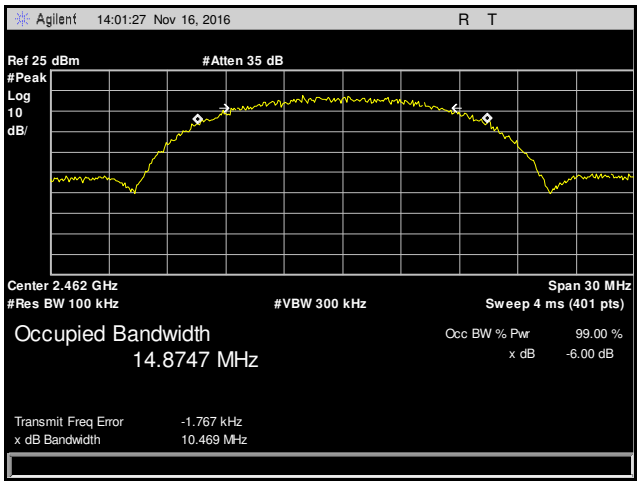
6 dB Occupied Bandwidth Test Results, 802.11b, Antenna 1



Plot 5. 6 dB Occupied Bandwidth, Low Channel, 802.11b, Antenna 1

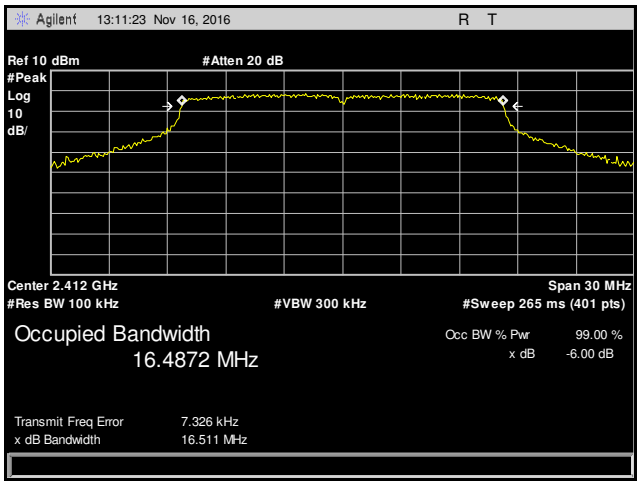


Plot 6. 6 dB Occupied Bandwidth, Mid Channel, 802.11b, Antenna 1

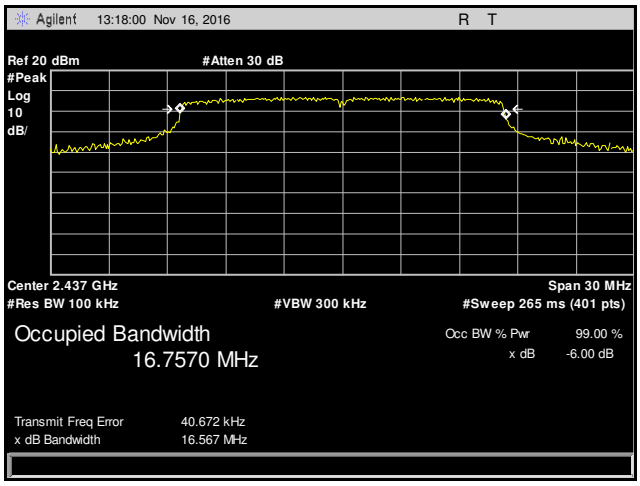


Plot 7. 6 dB Occupied Bandwidth, High Channel, 802.11b, Antenna 1

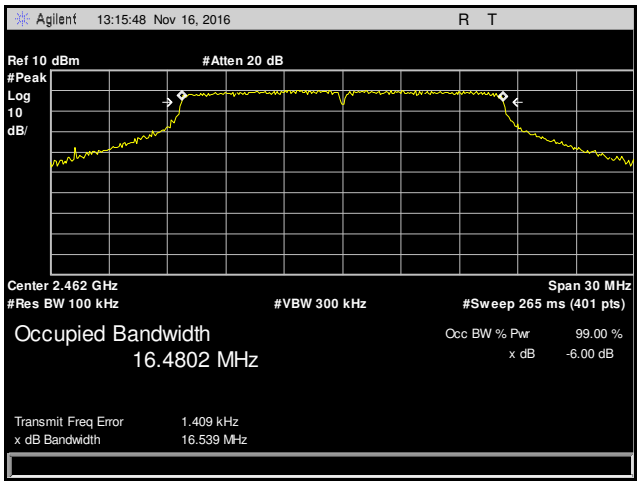
6 dB Occupied Bandwidth Test Results, 802.11g, Antenna 1



Plot 8. 6 dB Occupied Bandwidth, Low Channel, 802.11g, Antenna 1

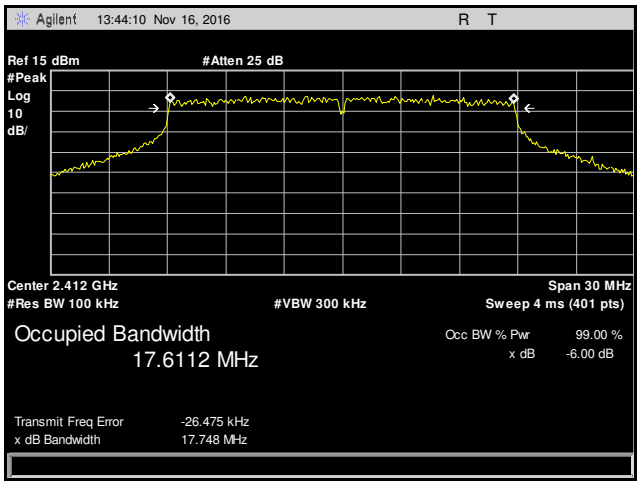


Plot 9. 6 dB Occupied Bandwidth, Mid Channel, 802.11g, Antenna 1

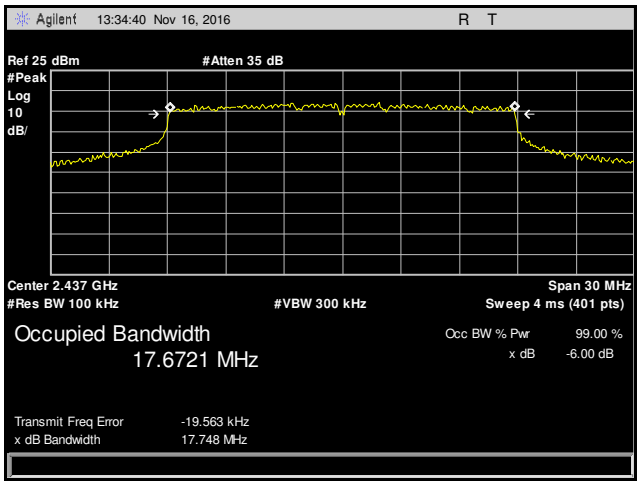


Plot 10. 6 dB Occupied Bandwidth, High Channel, 802.11g, Antenna 1

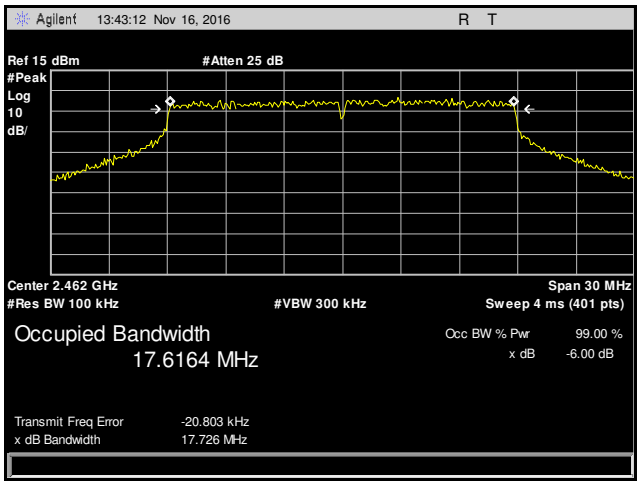
6 dB Occupied Bandwidth Test Results, 802.11n 20 MHz, Antenna 1



Plot 11. 6 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, Antenna 1

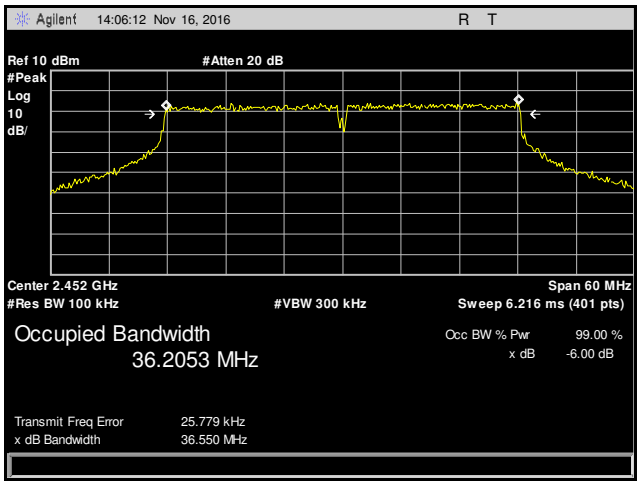


Plot 12. 6 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, Antenna 1

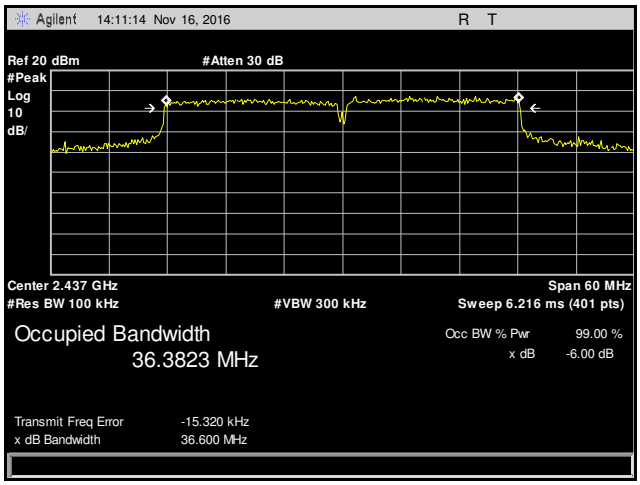


Plot 13. 6 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, Antenna 1

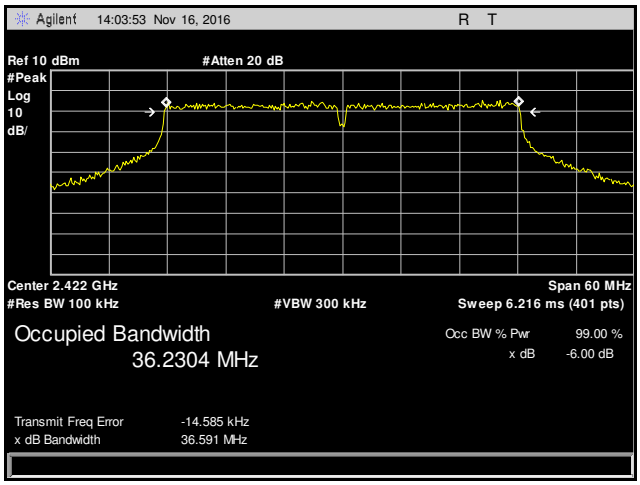
6 dB Occupied Bandwidth Test Results, 802.11n 40 MHz, Antenna 1



Plot 14. 6 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, Antenna 1

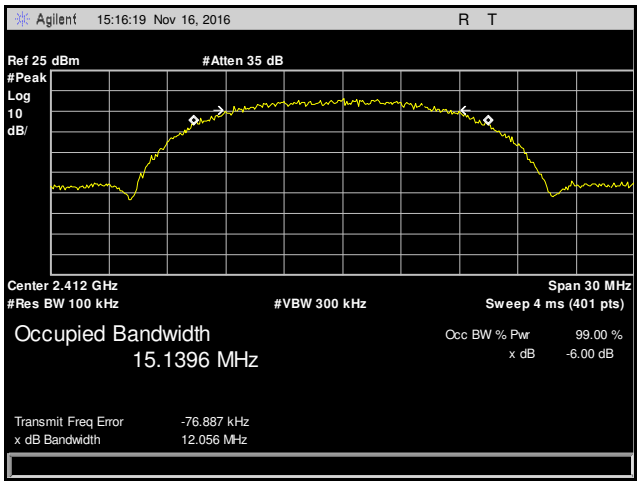


Plot 15. 6 dB Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, Antenna 1

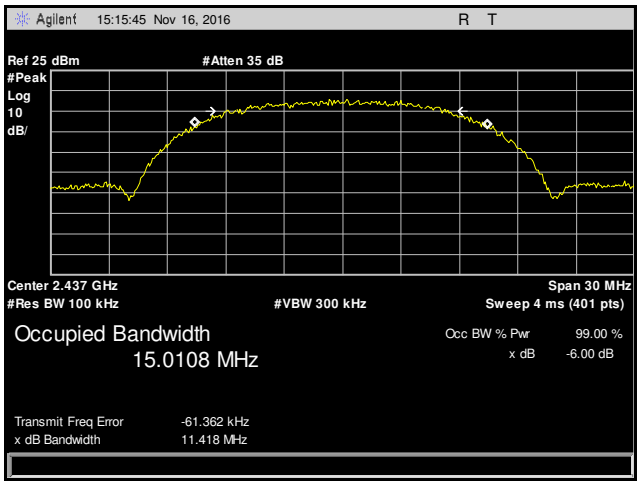


Plot 16. 6 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, Antenna 1

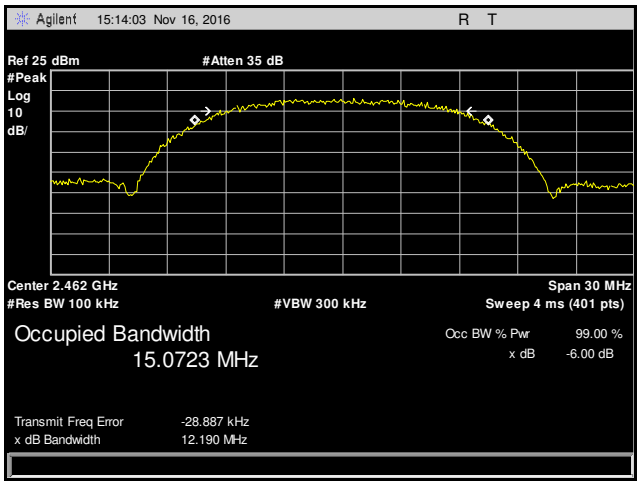
6 dB Occupied Bandwidth Test Results, 802.11b, Antenna 2



Plot 17. 6 dB Occupied Bandwidth, Low Channel, 802.11b, Antenna 2

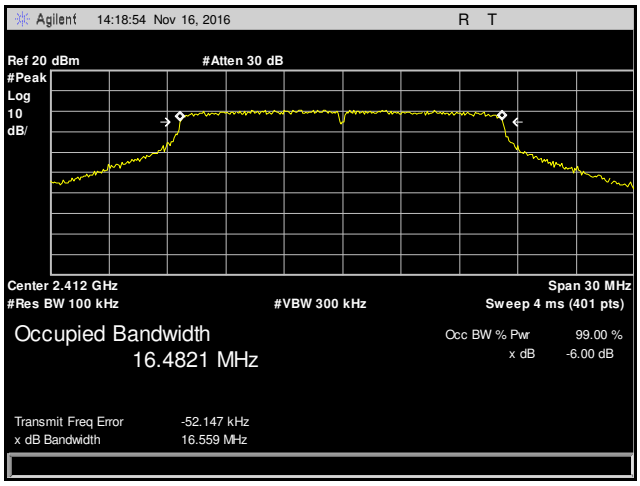


Plot 18. 6 dB Occupied Bandwidth, Mid Channel, 802.11b, Antenna 2

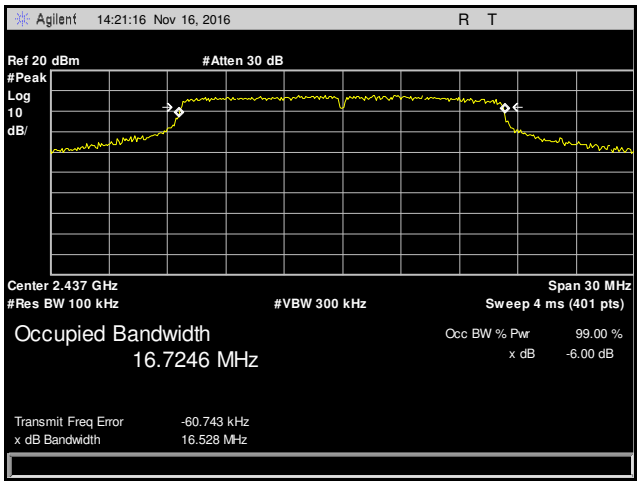


Plot 19. 6 dB Occupied Bandwidth, High Channel, 802.11b, Antenna 2

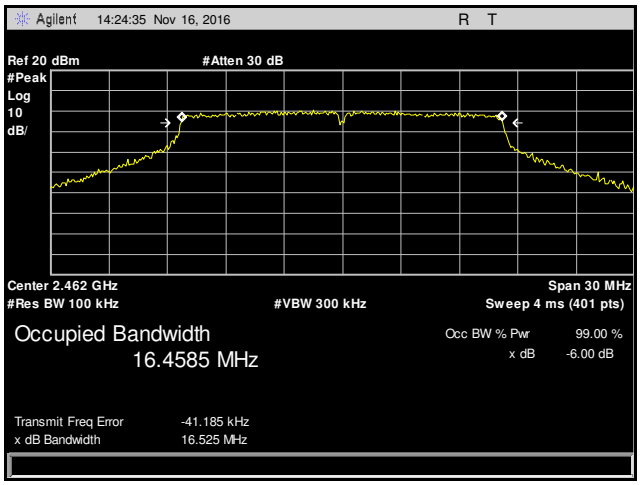
6 dB Occupied Bandwidth Test Results, 802.11g, Antenna 2



Plot 20. 6 dB Occupied Bandwidth, Low Channel, 802.11g, Antenna 2

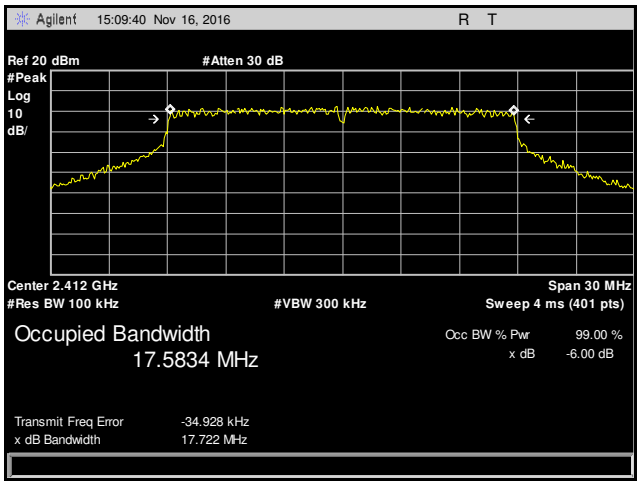


Plot 21. 6 dB Occupied Bandwidth, Mid Channel, 802.11g, Antenna 2

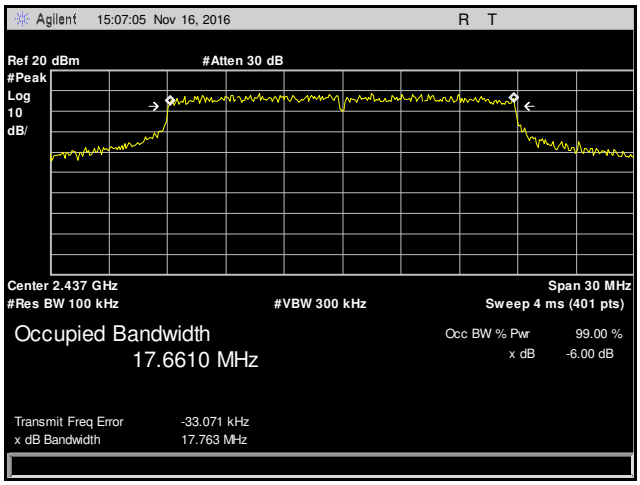


Plot 22. 6 dB Occupied Bandwidth, High Channel, 802.11g, Antenna 2

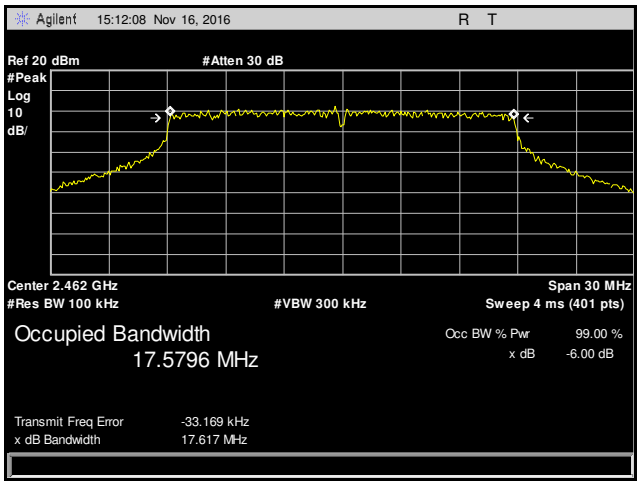
6 dB Occupied Bandwidth Test Results, 802.11n 20 MHz, Antenna 2



Plot 23. 6 dB Occupied Bandwidth, Low Channel, 802.11n 20 MHz, Antenna 2

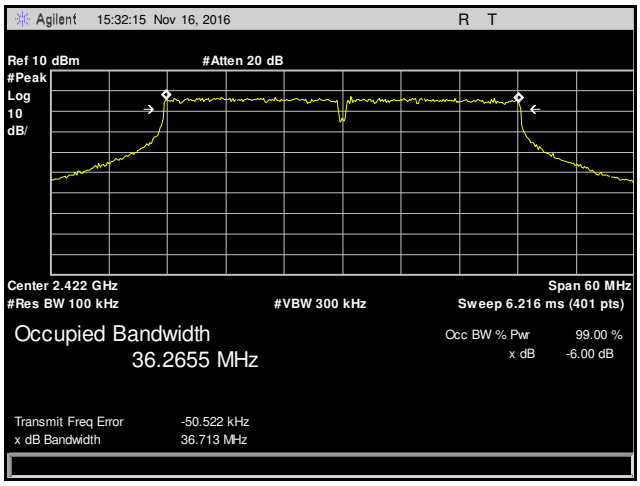


Plot 24. 6 dB Occupied Bandwidth, Mid Channel, 802.11n 20 MHz, Antenna 2

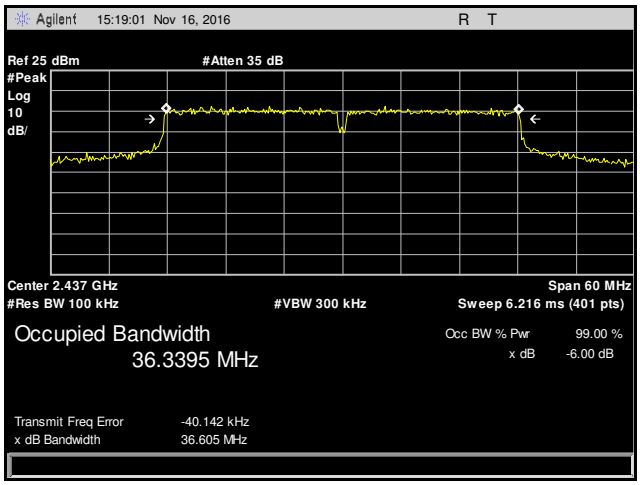


Plot 25. 6 dB Occupied Bandwidth, High Channel, 802.11n 20 MHz, Antenna 2

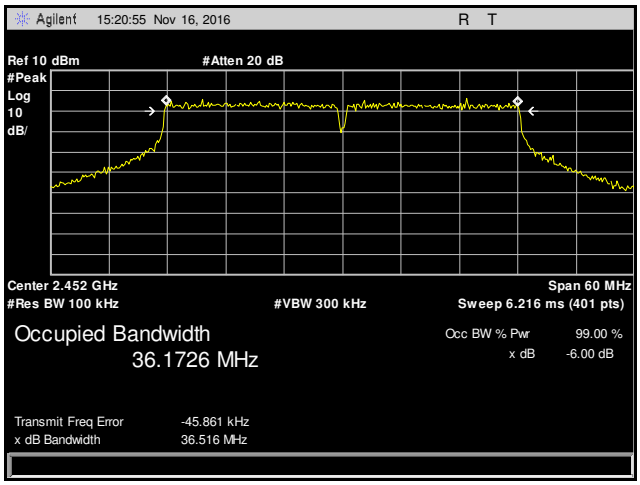
6 dB Occupied Bandwidth Test Results, 802.11n 40 MHz, Antenna 2



Plot 26. 6 dB Occupied Bandwidth, Low Channel, 802.11n 40 MHz, Antenna 2



Plot 27. 6 dB Occupied Bandwidth, Mid Channel, 802.11n 40 MHz, Antenna 2



Plot 28. 6 dB Occupied Bandwidth, High Channel, 802.11n 40 MHz, Antenna 2

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output

Test Requirements: **§15.247(b):** The maximum peak output power of the intentional radiator shall not exceed the following:

Digital Transmission Systems (MHz)	Output Limit (Watts)
902-928	1.000
2400–2483.5	1.000
5725– 5850	1.000

Table 16. Output Power Requirements from §15.247(b)

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 16, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400 – 2483.5 MHz band and using a point to point application may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Fixed, point-to-point operation excludes the use of point-to-multipoint systems, Omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

Test Procedure: The transmitter was connected to a calibrated spectrum analyzer. The EUT was measured at the low, mid and high channels of each band at the maximum power level.

Per KDB 558074, Section 7.0, for transmitting antennas which exceed 6 dBi, the applicable output power limit shall be calculated as follows:
$P_{out} = P_{limit} - (G_{Tx} - 6)$, where P_{out} is the maximum conduct output power in dBm, P_{limit} is the output power limit in dBm, and G_{Tx} is the maximum transmitting antenna directional gain in dBi.

Test Results: The EUT was compliant with the Peak Power Output limits of **§15.247(b)**.

Test Engineer(s): Kristine Cabrera

Test Date(s): 11/18/16

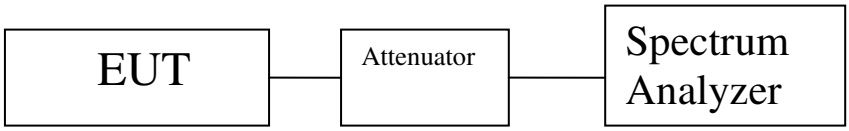


Figure 3. Peak Power Output Test Setup

Peak Power Output Test Results

Total Gain (dBi)	Limit (dBm)
9	27
13	23

Table 17. Total Gain of System

For the 9dBi antenna, it is 3dB greater than 6 dBi. Therefore, the final level for the total power limit is 27 dBm.
For the 13dBi antenna, it is 7dB greater than 6 dBi. Therefore, the final level for the total power limit is 23 dBm.

Peak Conducted Output Power						
Carrier Channel	Frequency (MHz)	Measured PCOP (dBm) Ant 1	Measured PCOP (dBm) Ant 2	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	18.95	20.22	22.65	27	-4.35
Mid	2437	19.43	19.08	22.27	27	-4.73
High	2462	19.91	19.21	22.59	27	-4.41

Table 18. Peak Power Output, Test Results, 802.11b, 9 dBi Antenna

Peak Conducted Output Power						
Carrier Channel	Frequency (MHz)	Measured PCOP (dBm) Ant 1	Measured PCOP (dBm) Ant 2	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	16.37	16.91	19.66	27	-7.34
Mid	2437	18.98	19.74	22.39	27	-4.61
High	2462	17.05	17.34	20.21	27	-6.79

Table 19. Peak Power Output, Test Results, 802.11g, 9 dBi Antenna

Peak Conducted Output Power						
Carrier Channel	Frequency (MHz)	Measured PCOP (dBm) Ant 1	Measured PCOP (dBm) Ant 2	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	15.99	16.84	19.45	27	-7.55
Mid	2437	19.95	19.34	22.67	27	-4.33
High	2462	16.44	16.63	19.55	27	-7.45

Table 20. Peak Power Output, Test Results, 802.11n 20 MHz, 9 dBi Antenna

Peak Conducted Output Power						
Carrier Channel	Frequency (MHz)	Measured PCOP (dBm) Ant 1	Measured PCOP (dBm) Ant 2	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2422	15.94	16.05	19.01	27	-7.99
Mid	2437	20.25	20.96	23.63	27	-3.37
High	2452	14.78	15.4	18.12	27	-8.88

Table 21. Peak Power Output, Test Results, 802.11n 40 MHz, 9 dBi Antenna

Peak Conducted Output Power						
Carrier Channel	Frequency (MHz)	Measured PCOP (dBm) Ant 1	Measured PCOP (dBm) Ant 2	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	15.18	16.08	18.67	23	-4.33
Mid	2437	17.4	16.99	20.22	23	-2.78
High	2462	17.44	17.63	20.55	23	-2.45

Table 22. Peak Power Output, Test Results, 802.11b, 13 dBi Antenna

Peak Conducted Output Power						
Carrier Channel	Frequency (MHz)	Measured PCOP (dBm) Ant 1	Measured PCOP (dBm) Ant 2	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	11.41	13.63	15.68	23	-7.32
Mid	2437	16.51	16.1	19.33	23	-3.67
High	2462	12.47	12.98	15.75	23	-7.25

Table 23. Peak Power Output, Test Results, 802.11g, 13 dBi Antenna

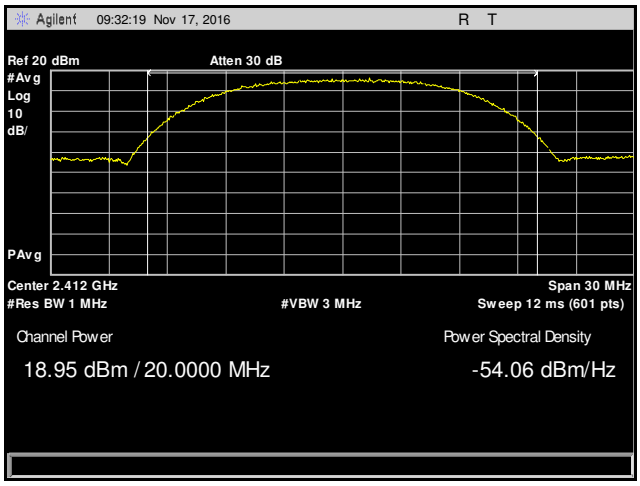
Peak Conducted Output Power						
Carrier Channel	Frequency (MHz)	Measured PCOP (dBm) Ant 1	Measured PCOP (dBm) Ant 2	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	12.35	13.55	16.01	23	-6.99
Mid	2437	15.79	16.05	18.94	23	-4.06
High	2462	12.46	12.29	15.39	23	-7.61

Table 24. Peak Power Output, Test Results, 802.11n 20 MHz, 13 dBi Antenna

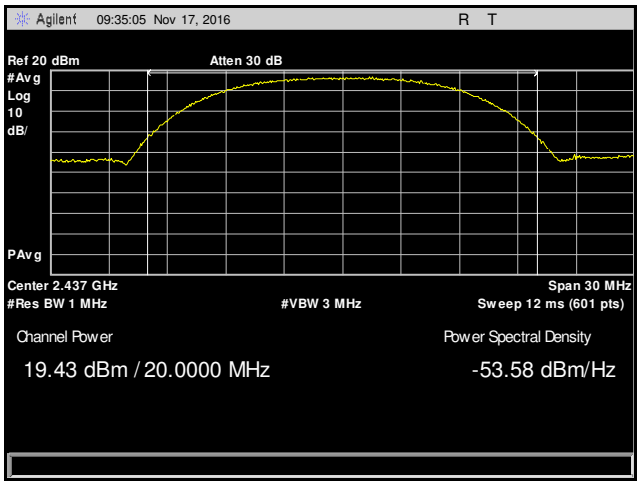
Peak Conducted Output Power						
Carrier Channel	Frequency (MHz)	Measured PCOP (dBm) Ant 1	Measured PCOP (dBm) Ant 2	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	2422	8.76	9.30	12.05	23	-10.95
Mid	2437	16.39	16.5	19.46	23	-3.54
High	2452	8.61	9.29	11.98	23	-11.02

Table 25. Peak Power Output, Test Results, 802.11n 40 MHz, 13 dBi Antenna

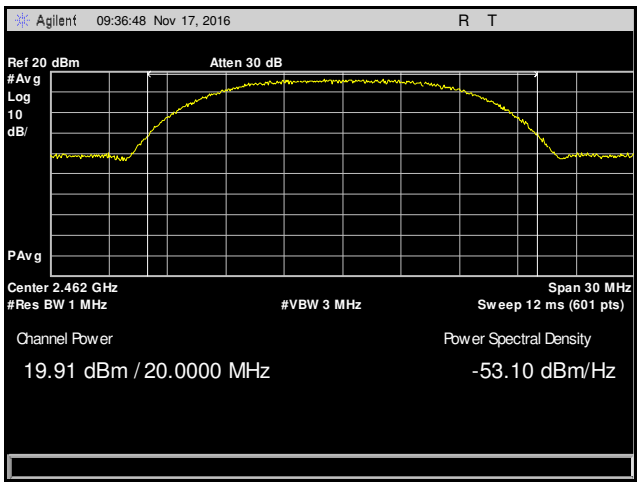
Peak Power Output Test Results, 802.11b, Antenna 1, 9 dBi Antenna



Plot 29. Peak Power Output, Low Channel, 802.11b, Antenna 1, 9 dBi Antenna

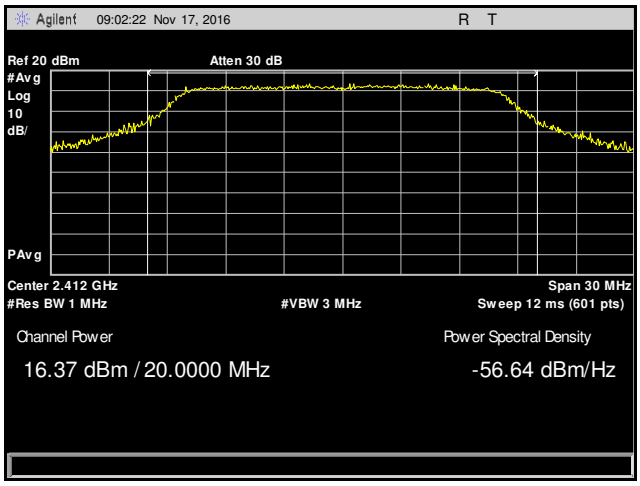


Plot 30. Peak Power Output, Mid Channel, 802.11b, Antenna 1, 9 dBi Antenna

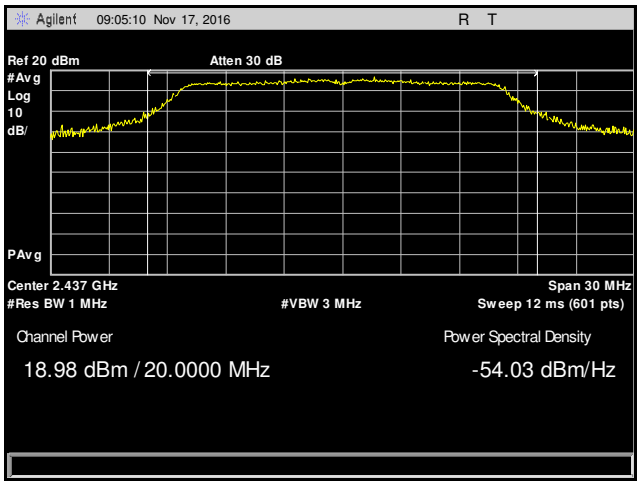


Plot 31. Peak Power Output, High Channel, 802.11b, Antenna 1, 9 dBi Antenna

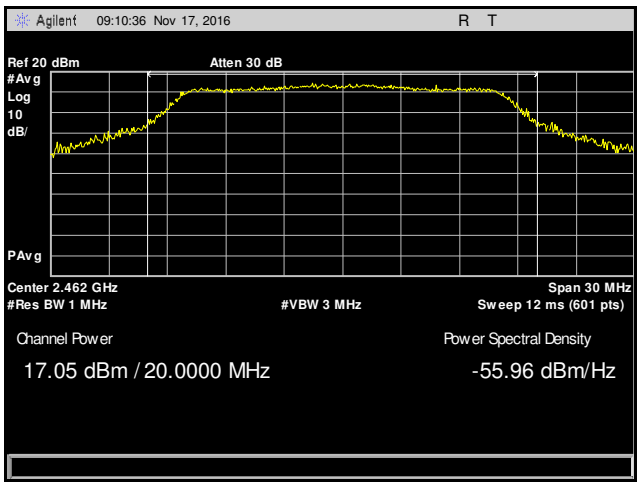
Peak Power Output Test Results, 802.11g, Antenna 1, 9 dBi Antenna



Plot 32. Peak Power Output, Low Channel, 802.11g, Antenna 1, 9 dBi Antenna

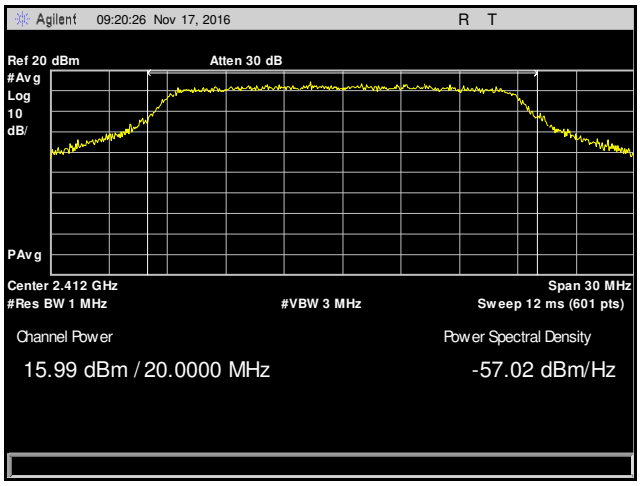


Plot 33. Peak Power Output, Mid Channel, 802.11g, Antenna 1, 9 dBi Antenna

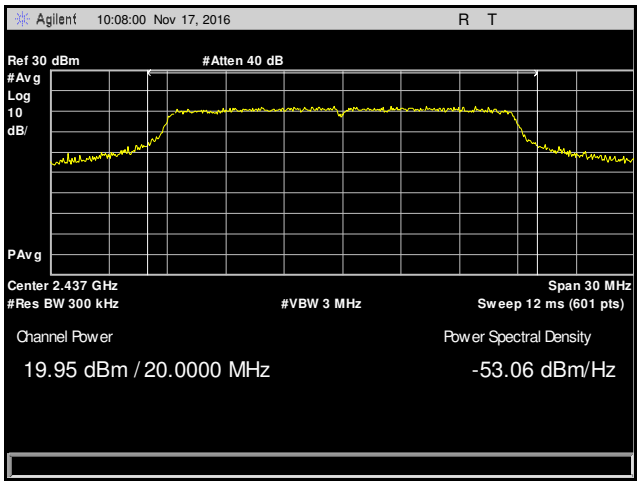


Plot 34. Peak Power Output, High Channel, 802.11g, Antenna 1, 9 dBi Antenna

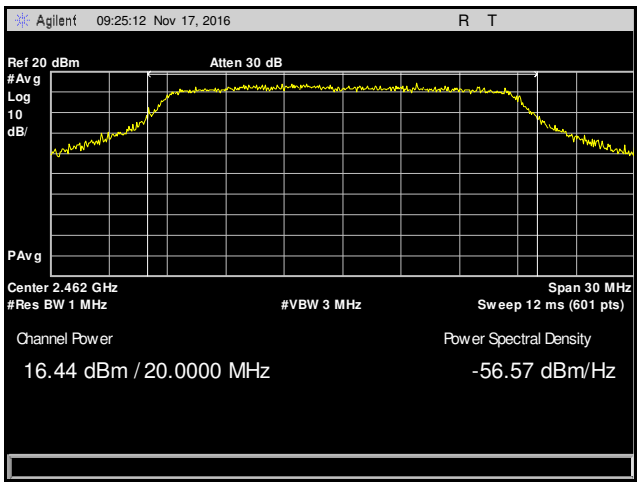
Peak Power Output Test Results, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna



Plot 35. Peak Power Output, Low Channel, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

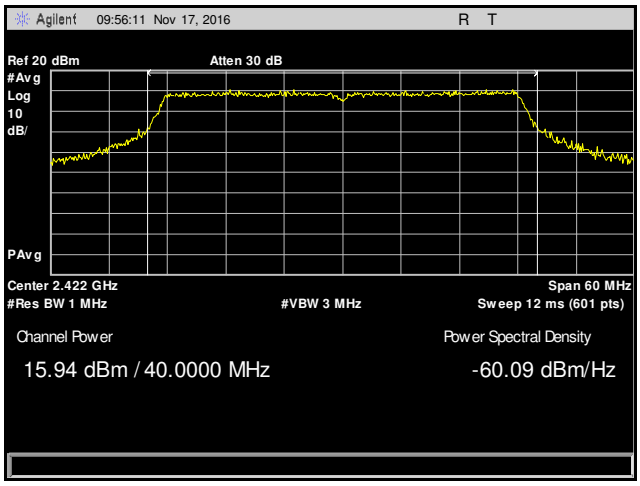


Plot 36. Peak Power Output, Mid Channel, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

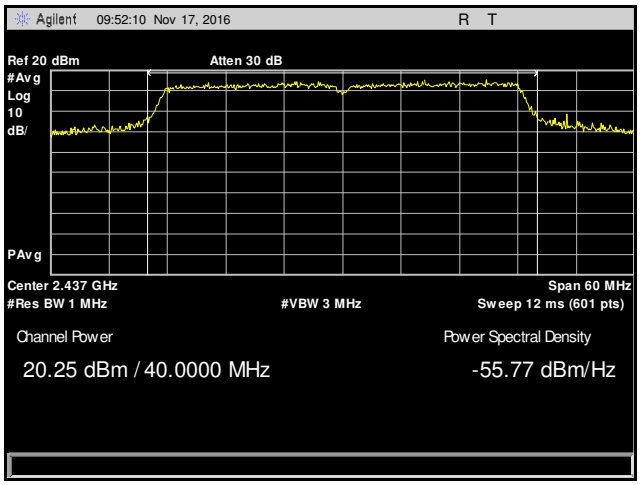


Plot 37. Peak Power Output, High Channel, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

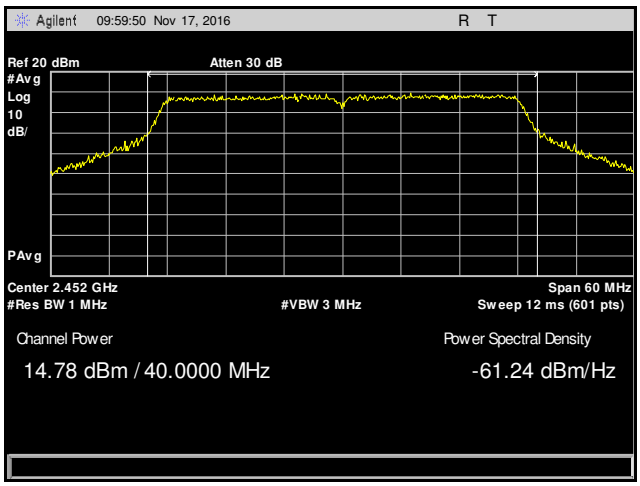
Peak Power Output Test Results, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna



Plot 38. Peak Power Output, Low Channel, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

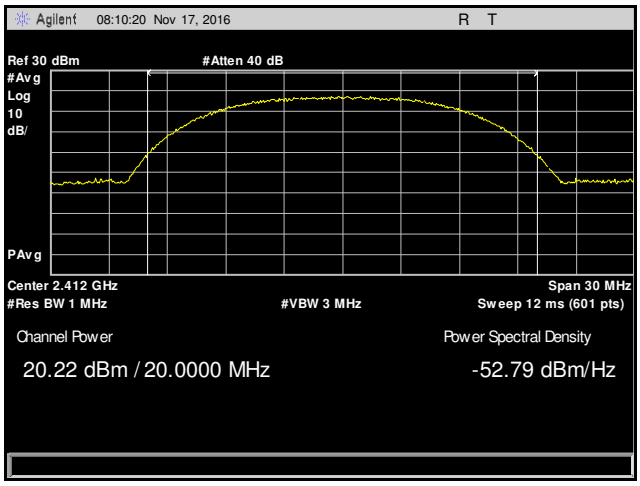


Plot 39. Peak Power Output, Mid Channel, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

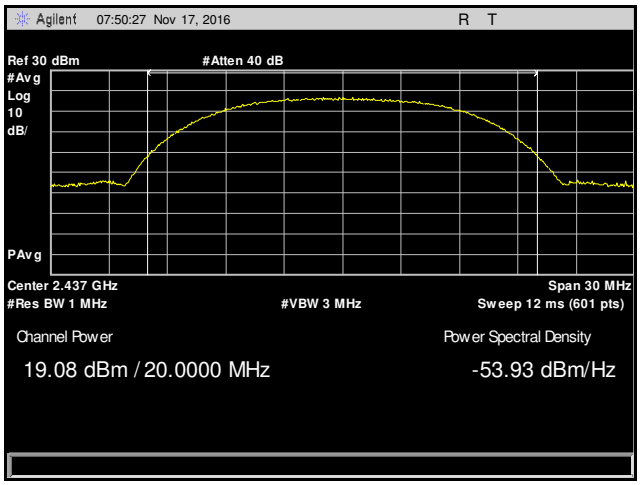


Plot 40. Peak Power Output, High Channel, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

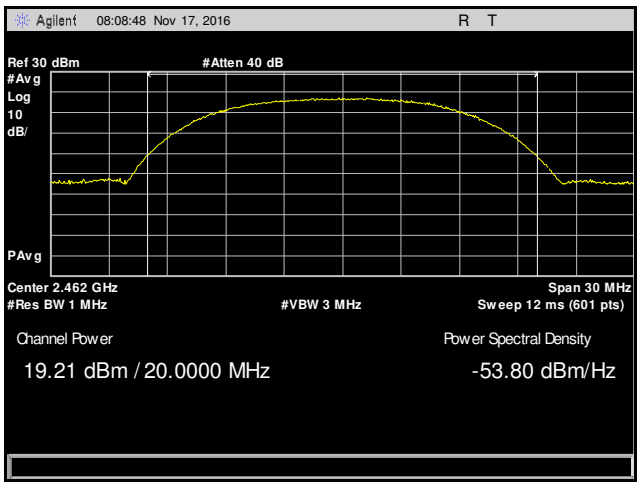
Peak Power Output Test Results, 802.11b, Antenna 2, 9 dBi Antenna



Plot 41. Peak Power Output, Low Channel, 802.11b, Antenna 2, 9 dBi Antenna

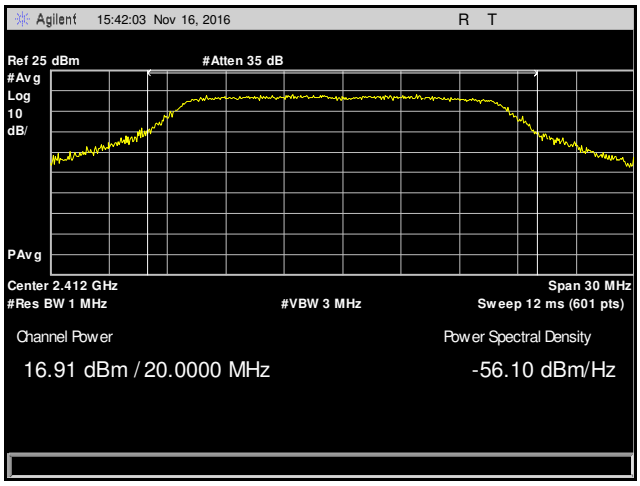


Plot 42. Peak Power Output, Mid Channel, 802.11b, Antenna 2, 9 dBi Antenna

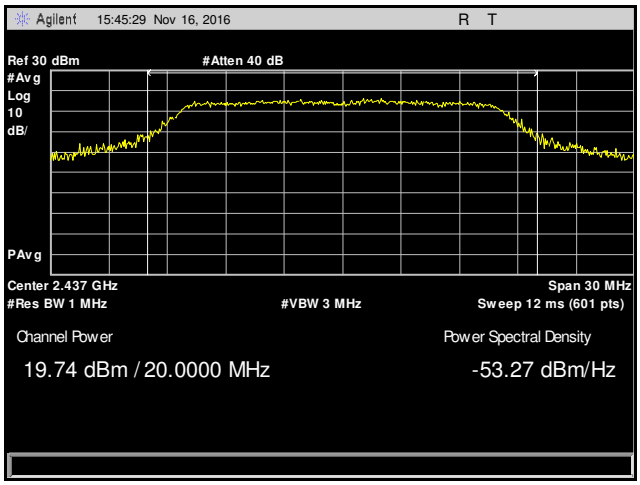


Plot 43. Peak Power Output, High Channel, 802.11b, Antenna 2, 9 dBi Antenna

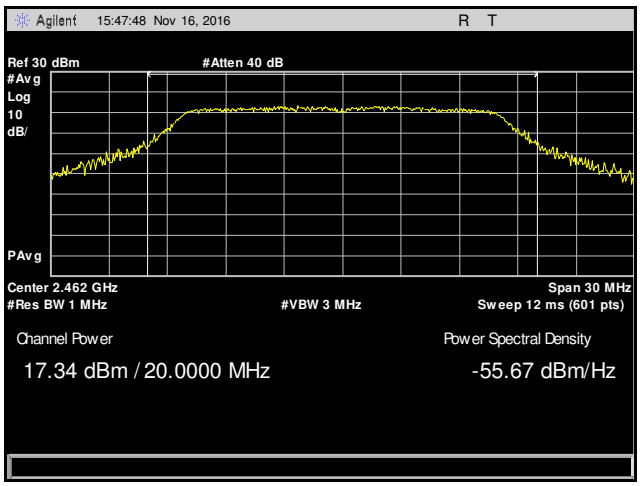
Peak Power Output Test Results, 802.11g, Antenna 2, 9 dBi Antenna



Plot 44. Peak Power Output, Low Channel, 802.11g, Antenna 2, 9 dBi Antenna

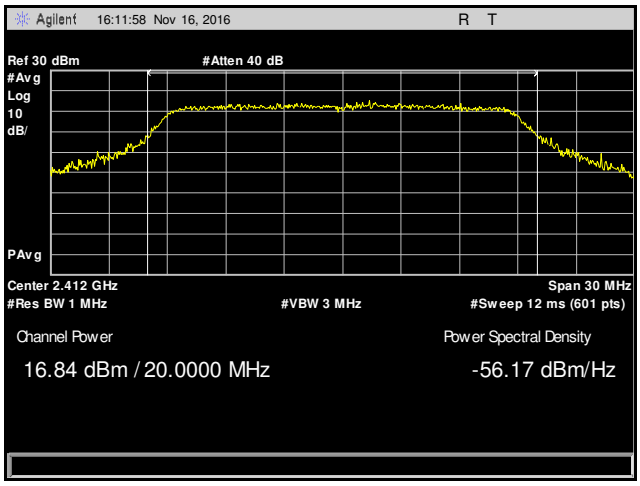


Plot 45. Peak Power Output, Mid Channel, 802.11g, Antenna 2, 9 dBi Antenna

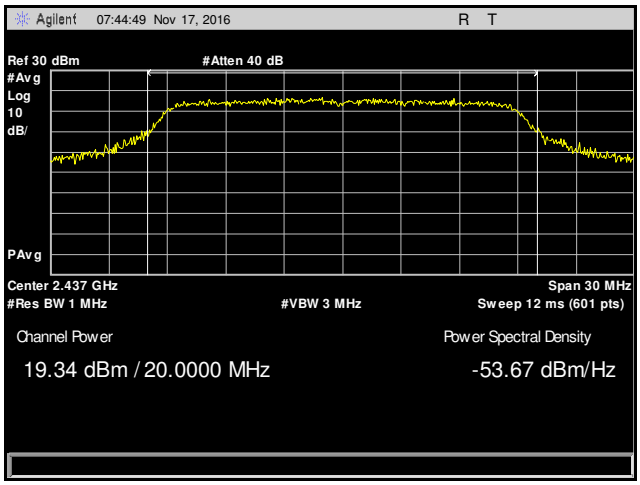


Plot 46. Peak Power Output, High Channel, 802.11g, Antenna 2, 9 dBi Antenna

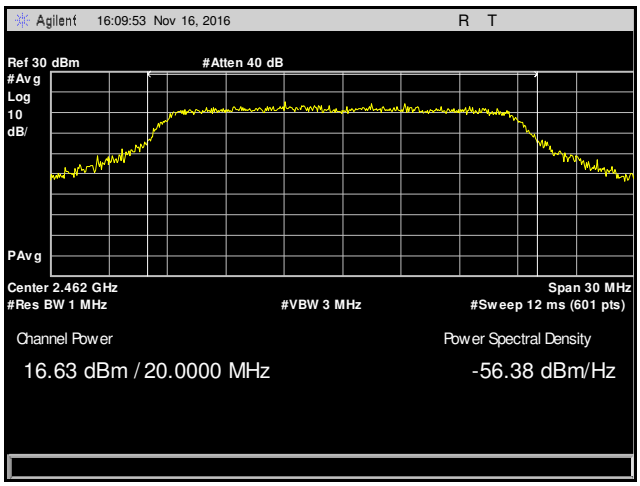
Peak Power Output Test Results, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna



Plot 47. Peak Power Output, Low Channel, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

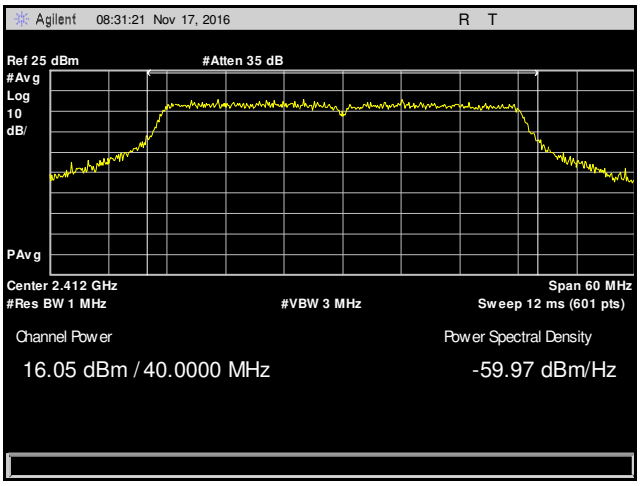


Plot 48. Peak Power Output, Mid Channel, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

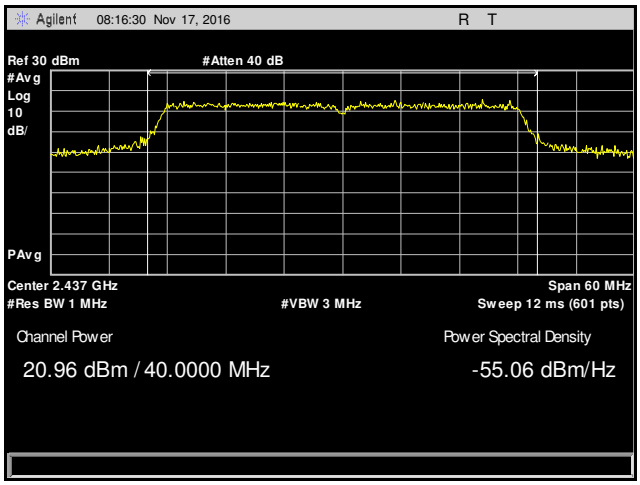


Plot 49. Peak Power Output, High Channel, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

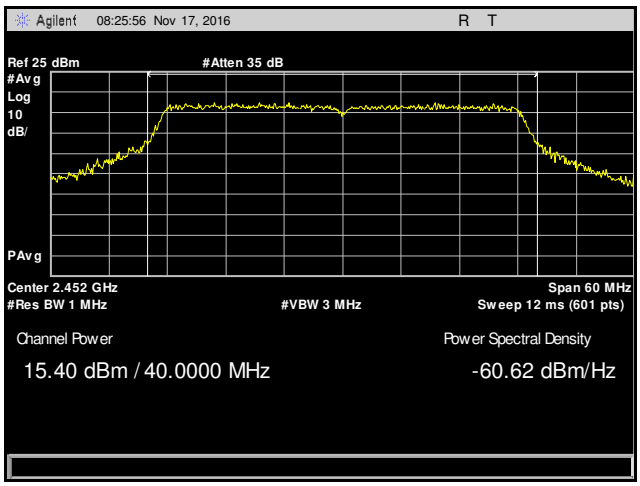
Peak Power Output Test Results, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna



Plot 50. Peak Power Output, Low Channel, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

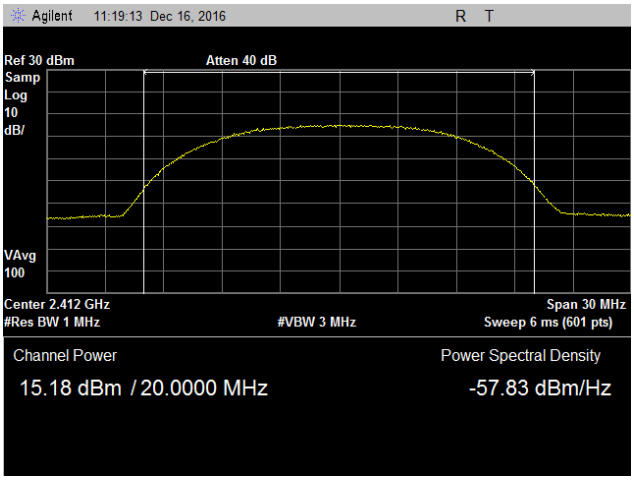


Plot 51. Peak Power Output, Mid Channel, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

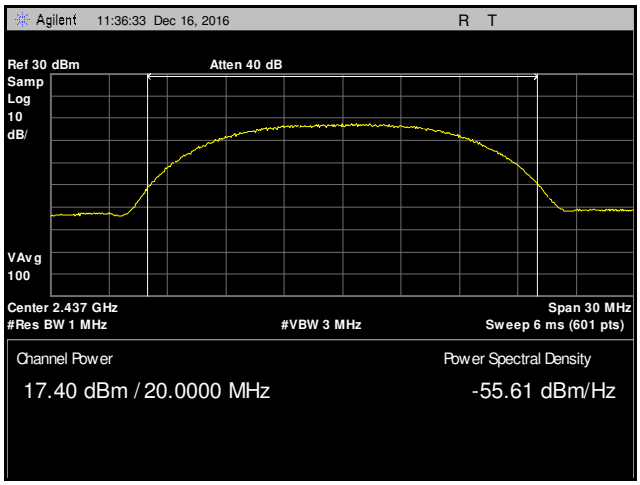


Plot 52. Peak Power Output, High Channel, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

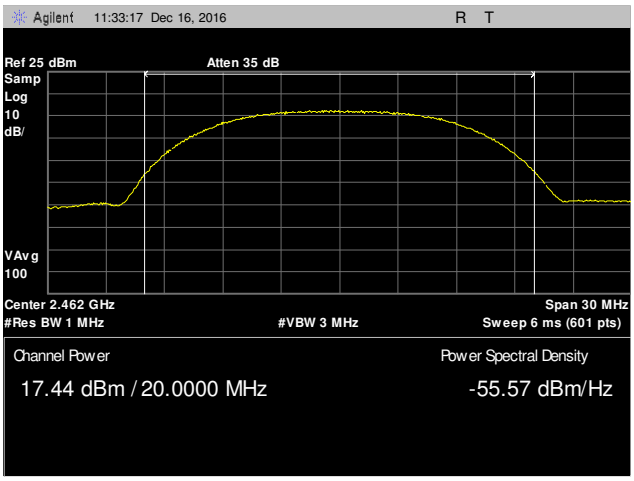
Peak Power Output Test Results, 802.11b, Antenna 1, 13 dBi Antenna



Plot 53. Peak Power Output, Low Channel, 802.11b, Antenna 1, 13 dBi Antenna

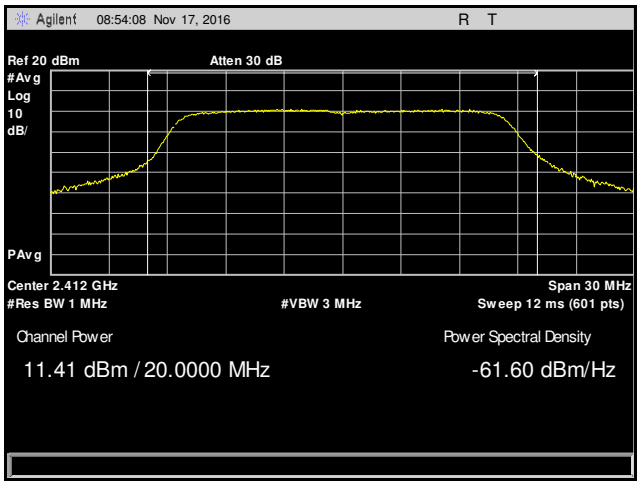


Plot 54. Peak Power Output, Mid Channel, 802.11b, Antenna 1, 13 dBi Antenna

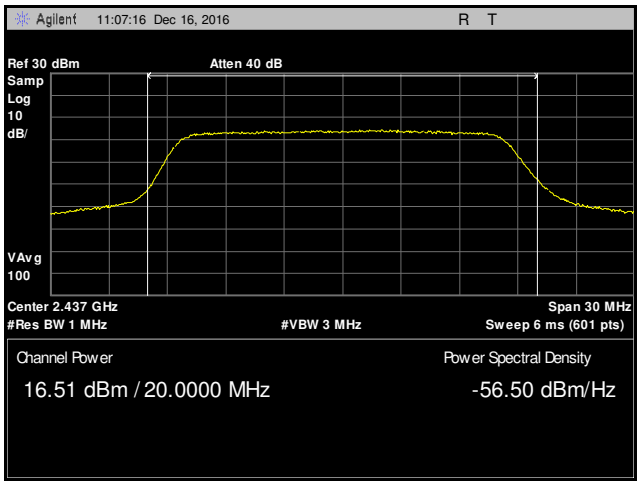


Plot 55. Peak Power Output, High Channel, 802.11b, Antenna 1, 13 dBi Antenna

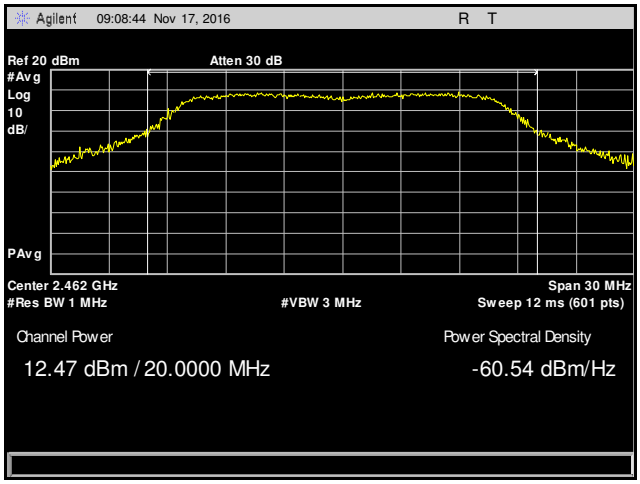
Peak Power Output Test Results, 802.11g, Antenna 1, 13 dBi Antenna



Plot 56. Peak Power Output, Low Channel, 802.11g, Antenna 1, 13 dBi Antenna

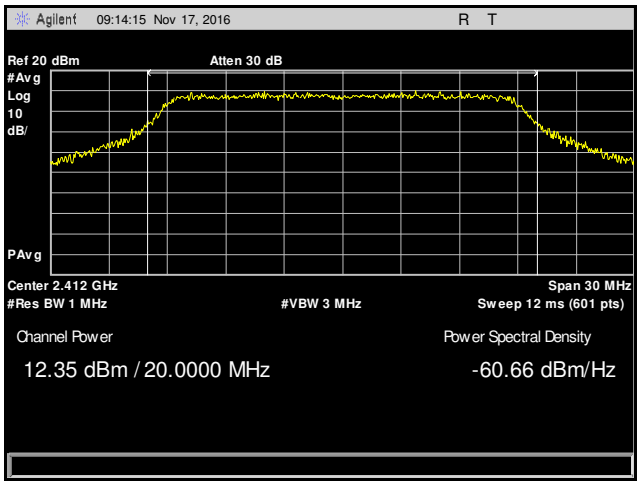


Plot 57. Peak Power Output, Mid Channel, 802.11g, Antenna 1, 13 dBi Antenna

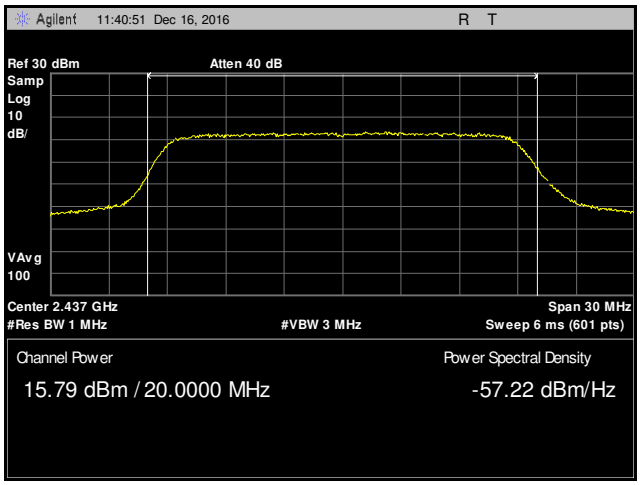


Plot 58. Peak Power Output, High Channel, 802.11g, Antenna 1, 13 dBi Antenna

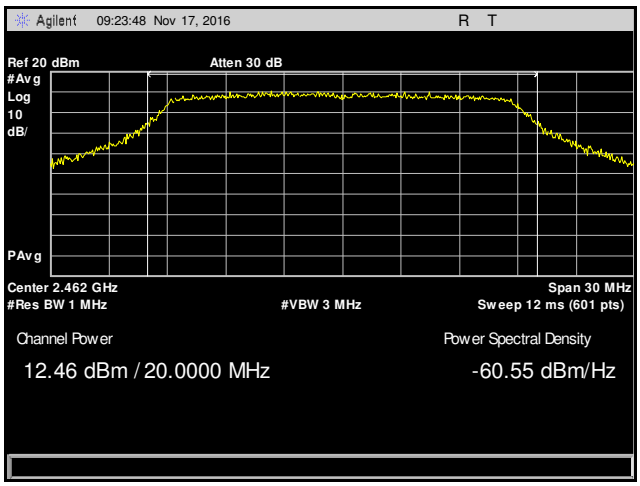
Peak Power Output Test Results, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna



Plot 59. Peak Power Output, Low Channel, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

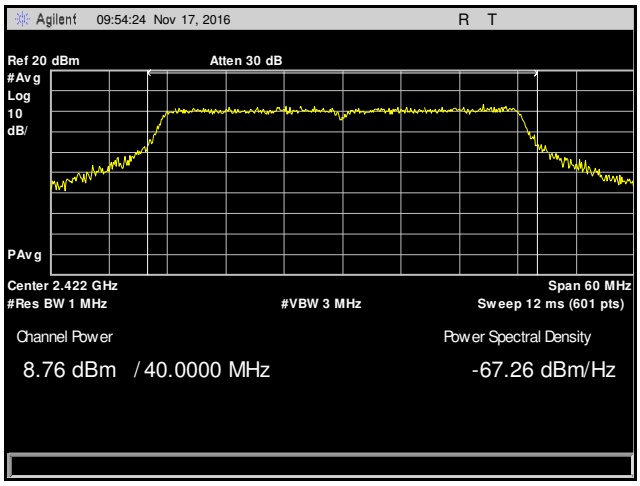


Plot 60. Peak Power Output, Mid Channel, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

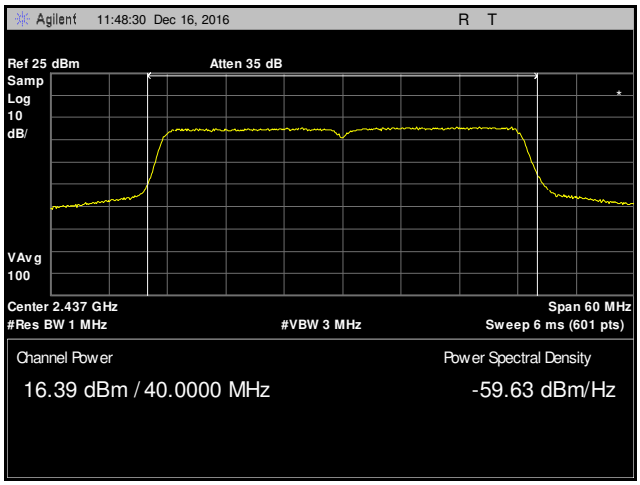


Plot 61. Peak Power Output, High Channel, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

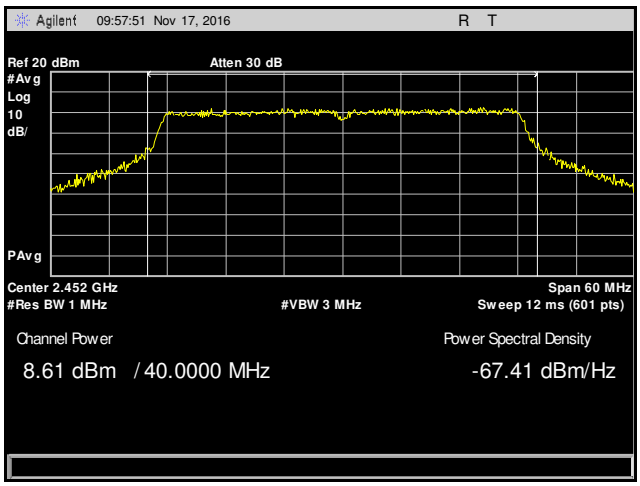
Peak Power Output Test Results, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna



Plot 62. Peak Power Output, Low Channel, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

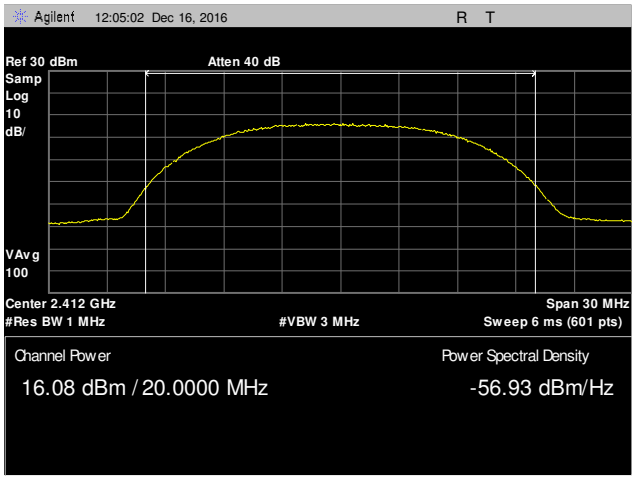


Plot 63. Peak Power Output, Mid Channel, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

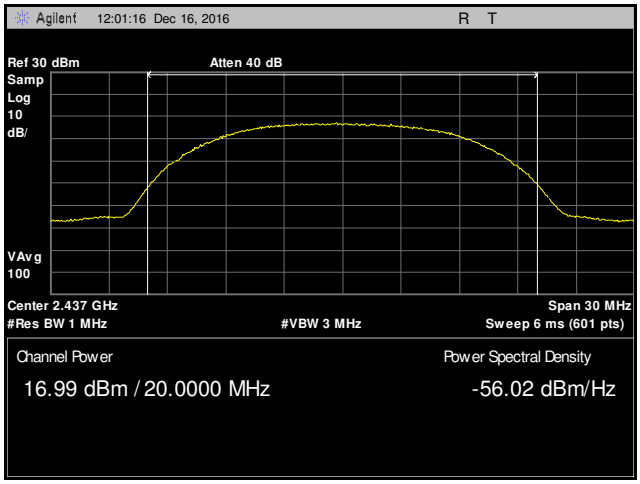


Plot 64. Peak Power Output, High Channel, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

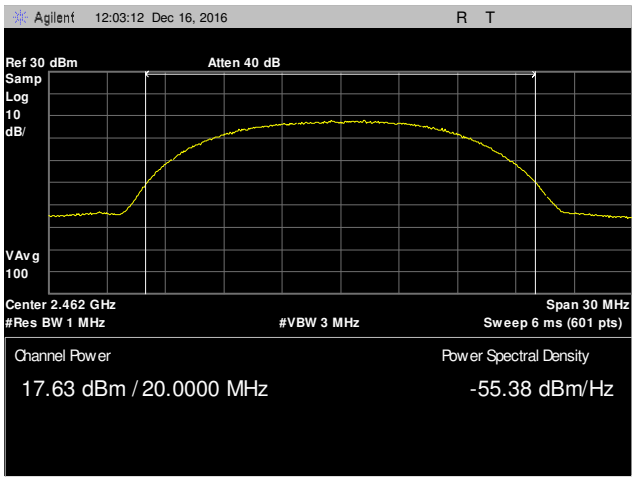
Peak Power Output Test Results, 802.11b, Antenna 2, 13 dBi Antenna



Plot 65. Peak Power Output, Low Channel, 802.11b, Antenna 2, 13 dBi Antenna

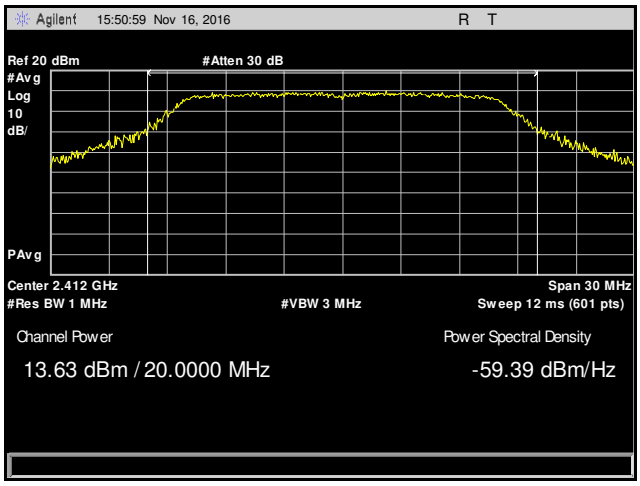


Plot 66. Peak Power Output, Mid Channel, 802.11b, Antenna 2, 13 dBi Antenna

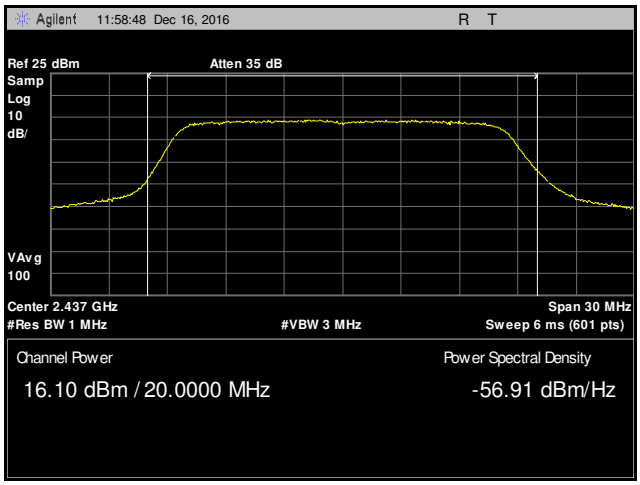


Plot 67. Peak Power Output, High Channel, 802.11b, Antenna 2, 13 dBi Antenna

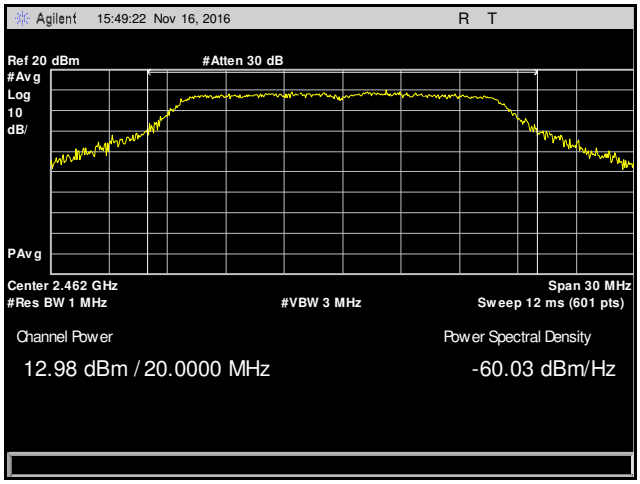
Peak Power Output Test Results, 802.11g, Antenna 2, 13 dBi Antenna



Plot 68. Peak Power Output, Low Channel, 802.11g, Antenna 2, 13 dBi Antenna

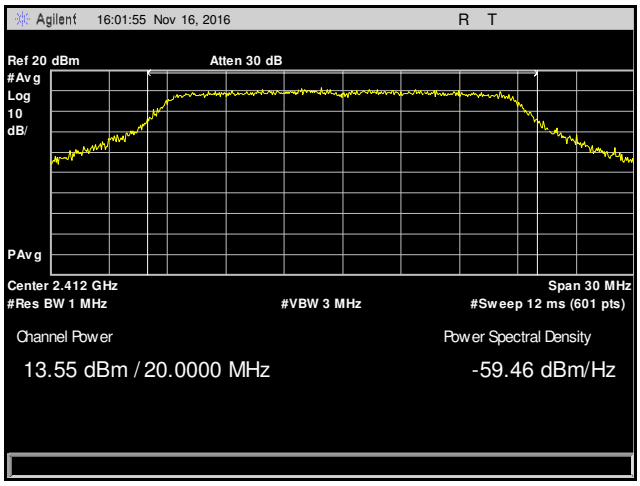


Plot 69. Peak Power Output, Mid Channel, 802.11g, Antenna 2, 13 dBi Antenna

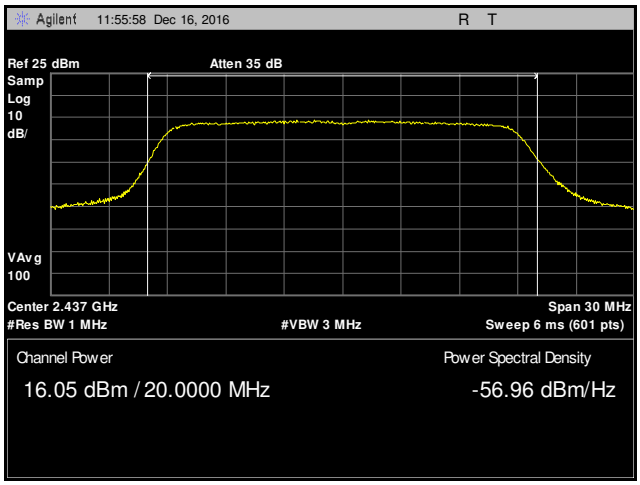


Plot 70. Peak Power Output, High Channel, 802.11g, Antenna 2, 13 dBi Antenna

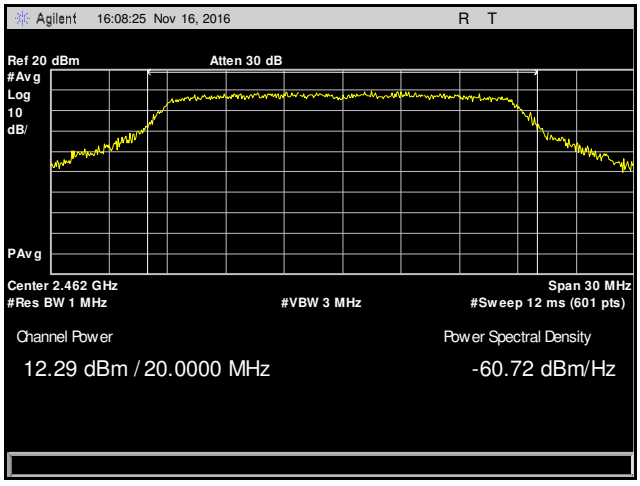
Peak Power Output Test Results, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna



Plot 71. Peak Power Output, Low Channel, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

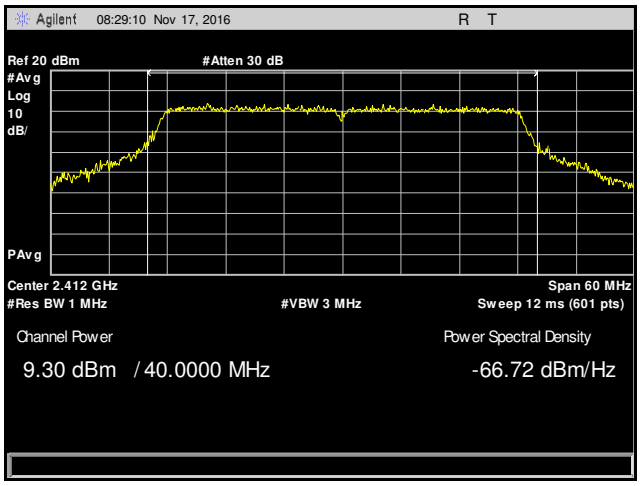


Plot 72. Peak Power Output, Mid Channel, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

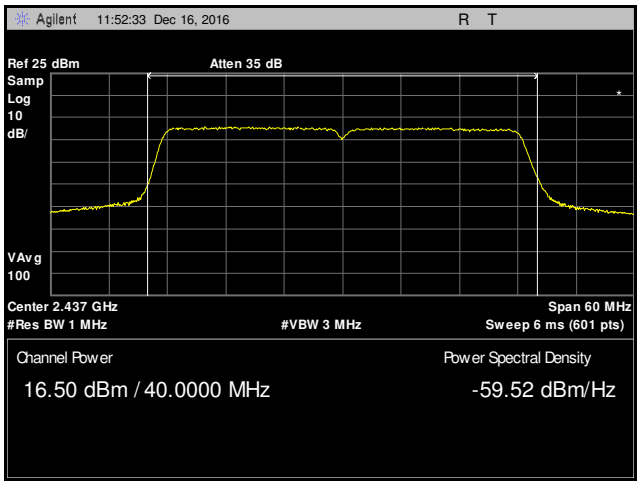


Plot 73. Peak Power Output, High Channel, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

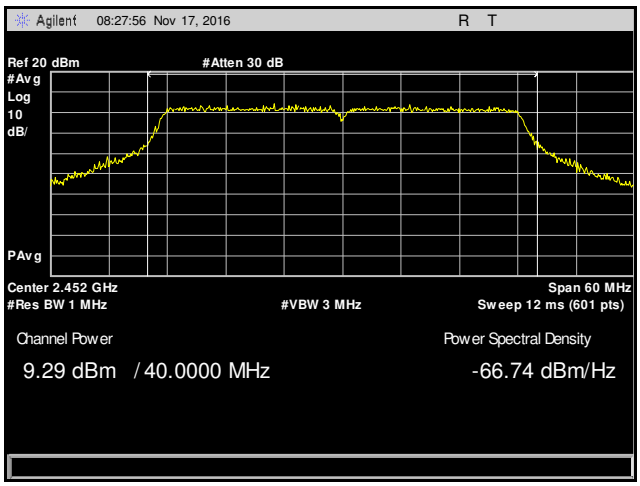
Peak Power Output Test Results, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



Plot 74. Peak Power Output, Low Channel, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



Plot 75. Peak Power Output, Mid Channel, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



Plot 76. Peak Power Output, High Channel, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) Radiated Spurious Emissions Requirements and Band Edge

Test Requirements: **§15.247(d); §15.205:** Emissions outside the frequency band.

§15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

§15.205(a): Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110----------	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505----------	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905----------	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128----------	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775----------	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775----------	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218----------	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825----------	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225----------	123–138	2200–2300	14.47–14.5
8.291–8.294----------	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366----------	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675----------	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475----------	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293----------	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025----------	240–285	3345.8–3358 36.	43–36.5
12.57675–12.57725----------	322–335.4	3600–4400	([2])

Table 26. Restricted Bands of Operation

[1] Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.
[2] Above 38.6

Test Requirement(s): **§ 15.209 (a):** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 27.

Frequency (MHz)	§ 15.209(a),Radiated Emission Limits (dBµV) @ 3m
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Table 27. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)

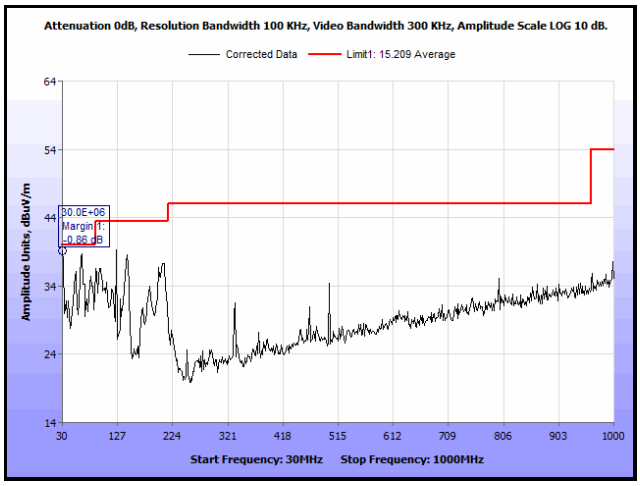
Test Procedures: The transmitter was turned on. Both ports were transmitting at the same time. Measurements were performed of the low, mid, and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured above 18 GHz.

Test Results: The EUT was compliant with the Radiated Spurious Emission limits of **§ 15.247(d)**.

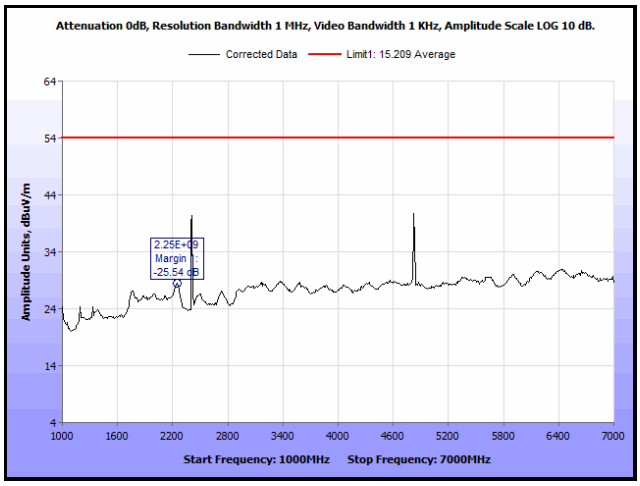
Test Engineer(s): Kristine Cabrera and Giuliano Messina

Test Date(s): 11/28/16

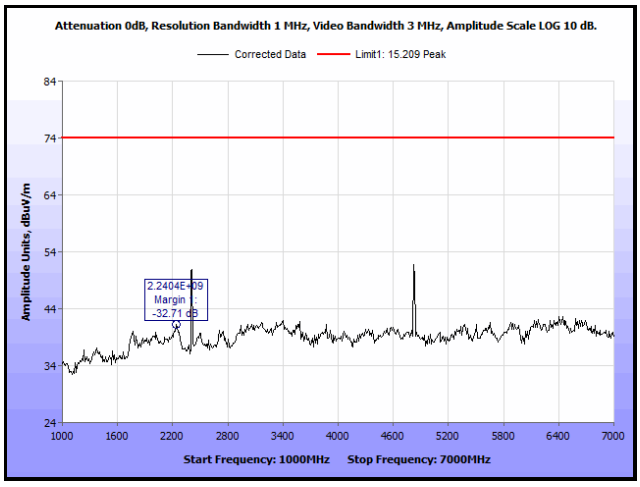
Radiated Spurious Emissions Test Results, 802.11b, 9 dBi Antenna



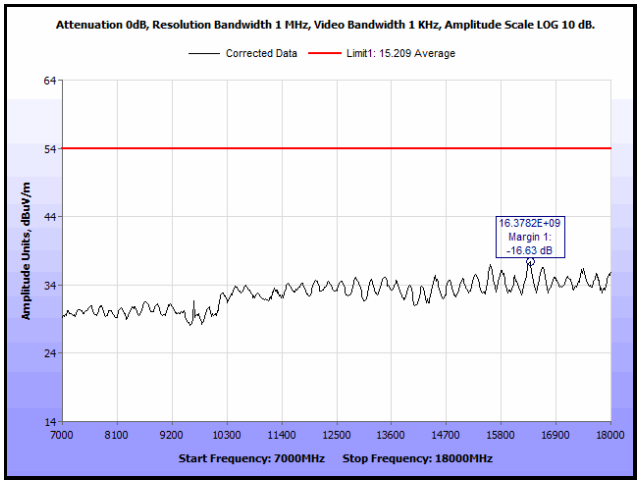
Plot 77. Radiated Spurious Emissions, Low Channel, 802.11b, 30 MHz – 1 GHz, 9 dBi Antenna



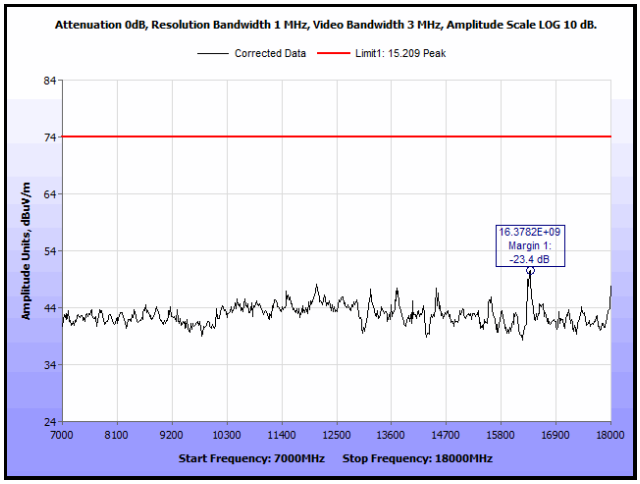
Plot 78. Radiated Spurious Emissions, Low Channel, 802.11b, 1 GHz – 7 GHz, Average, 9 dBi Antenna



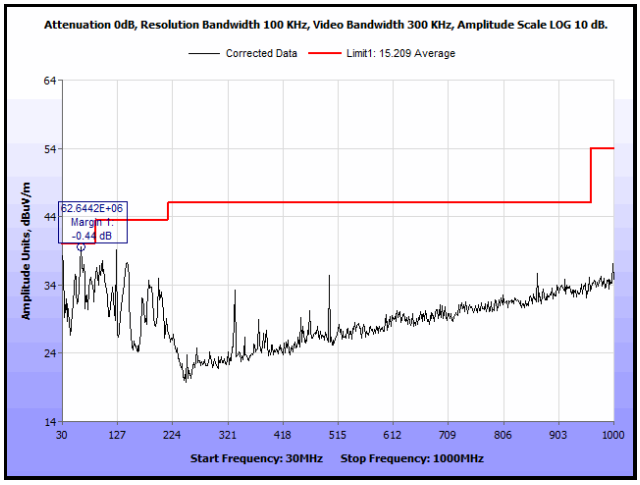
Plot 79. Radiated Spurious Emissions, Low Channel, 802.11b, 1 GHz – 7 GHz, Peak, 9 dBi Antenna



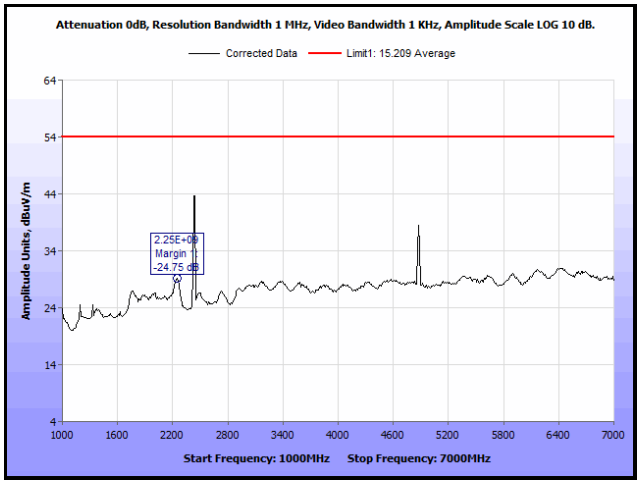
Plot 80. Radiated Spurious Emissions, Low Channel, 802.11b, 7 GHz – 18 GHz, Average, 9 dBi Antenna



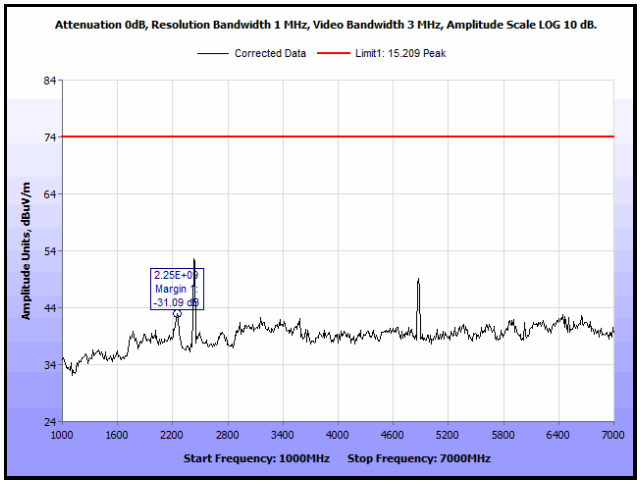
Plot 81. Radiated Spurious Emissions, Low Channel, 802.11b, 7 GHz – 18 GHz, Peak, 9 dBi Antenna



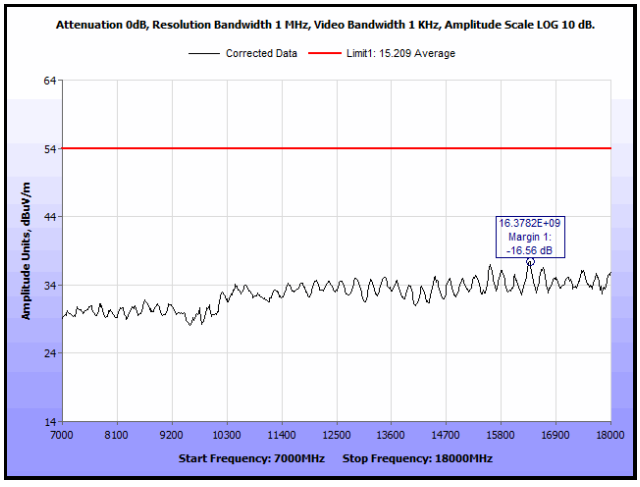
Plot 82. Radiated Spurious Emissions, Mid Channel, 802.11b, 30 MHz – 1 GHz, 9 dBi Antenna



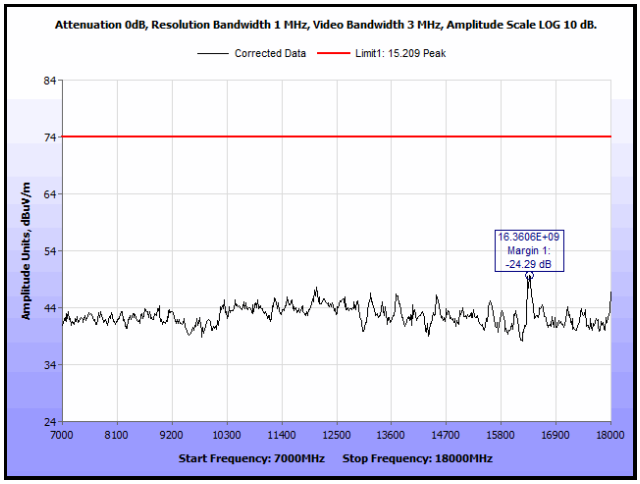
Plot 83. Radiated Spurious Emissions, Mid Channel, 802.11b, 1 GHz – 7 GHz, Average, 9 dBi Antenna



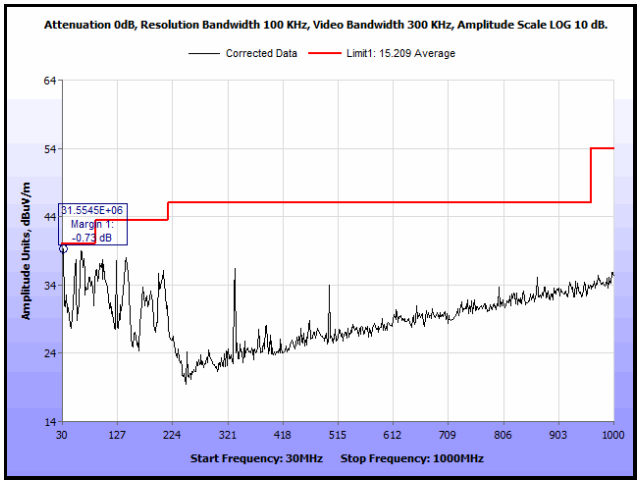
Plot 84. Radiated Spurious Emissions, Mid Channel, 802.11b, 1 GHz – 7 GHz, Peak, 9 dBi Antenna



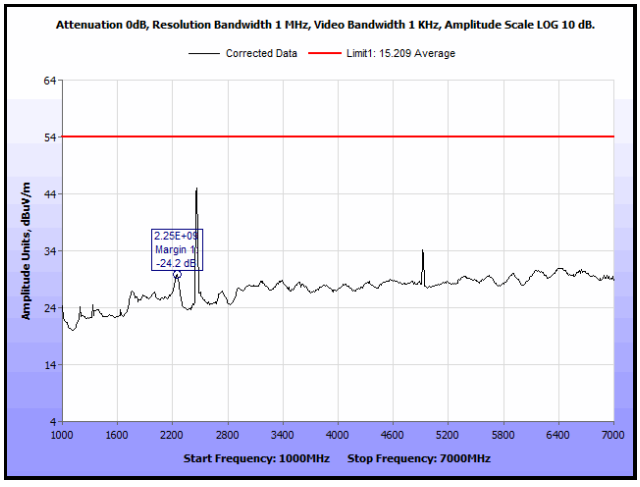
Plot 85. Radiated Spurious Emissions, Mid Channel, 802.11b, 7 GHz – 18 GHz, Average, 9 dBi Antenna



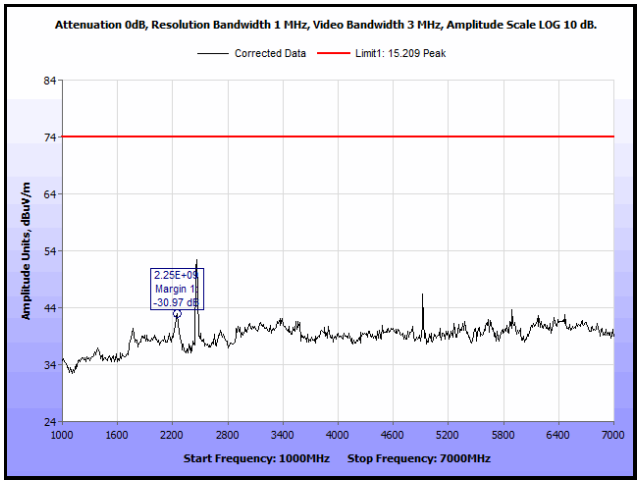
Plot 86. Radiated Spurious Emissions, Mid Channel, 802.11b, 7 GHz – 18 GHz, Peak, 9 dBi Antenna



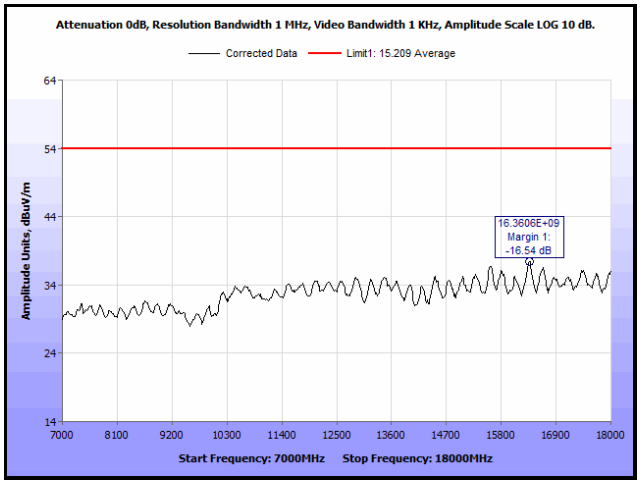
Plot 87. Radiated Spurious Emissions, High Channel, 802.11b, 30 MHz – 1 GHz, 9 dBi Antenna



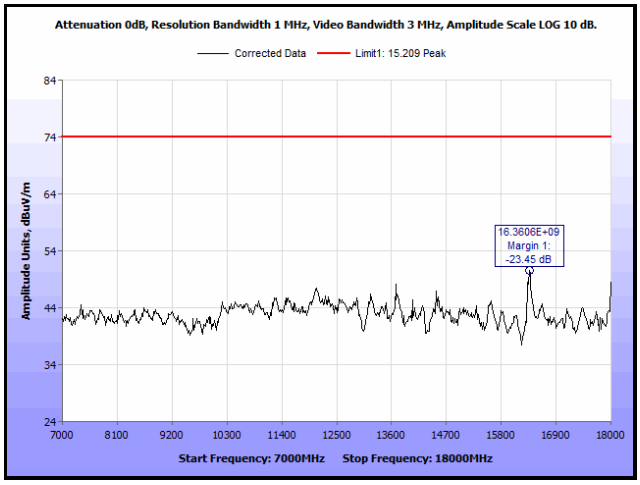
Plot 88. Radiated Spurious Emissions, High Channel, 802.11b, 1 GHz – 7 GHz, Average, 9 dBi Antenna



Plot 89. Radiated Spurious Emissions, High Channel, 802.11b, 1 GHz – 7 GHz, Peak, 9 dBi Antenna

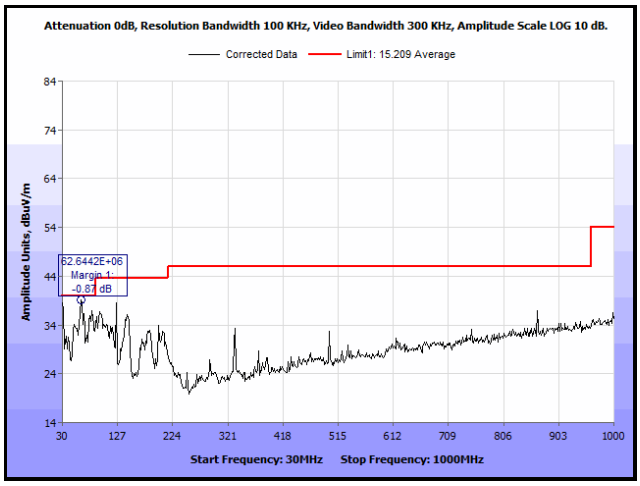


Plot 90. Radiated Spurious Emissions, High Channel, 802.11b, 7 GHz – 18 GHz, Average, 9 dBi Antenna

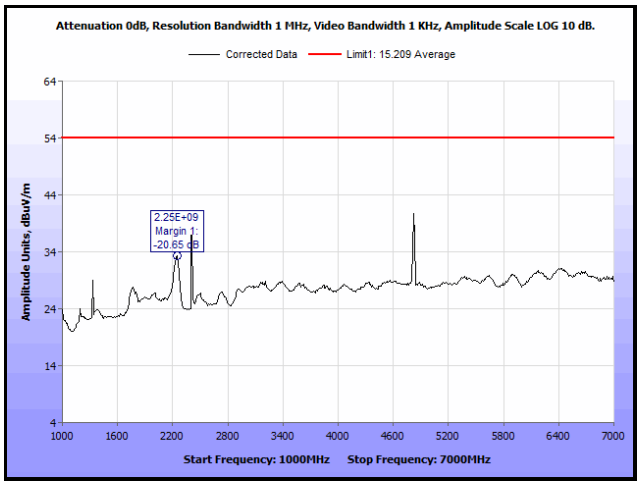


Plot 91. Radiated Spurious Emissions, High Channel, 802.11b, 7 GHz – 18 GHz, Peak, 9 dBi Antenna

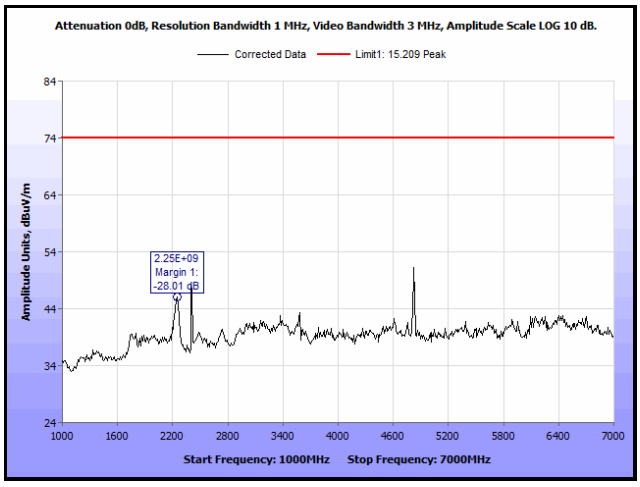
Radiated Spurious Emissions Test Results, 802.11g, 9 dBi Antenna



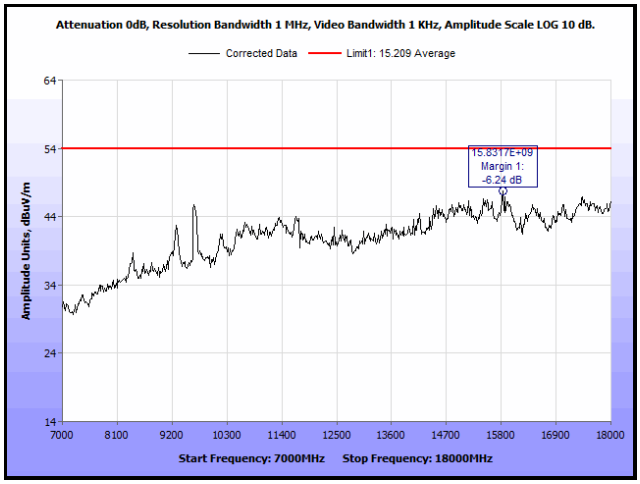
Plot 92. Radiated Spurious Emissions, Low Channel, 802.11g, 30 MHz – 1 GHz, 9 dBi Antenna



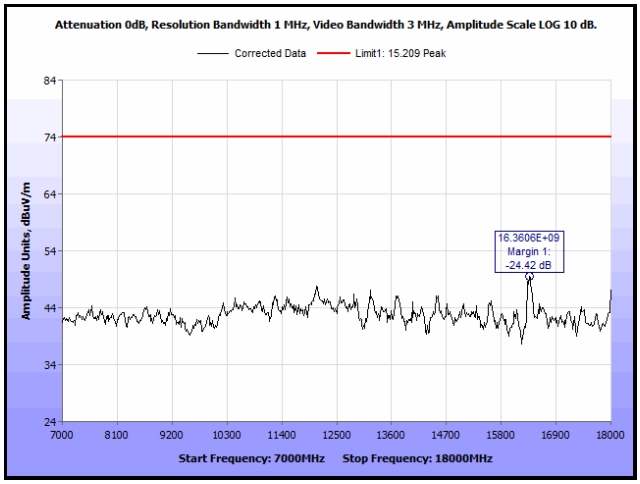
Plot 93. Radiated Spurious Emissions, Low Channel, 802.11g, 1 GHz – 7 GHz, Average, 9 dBi Antenna



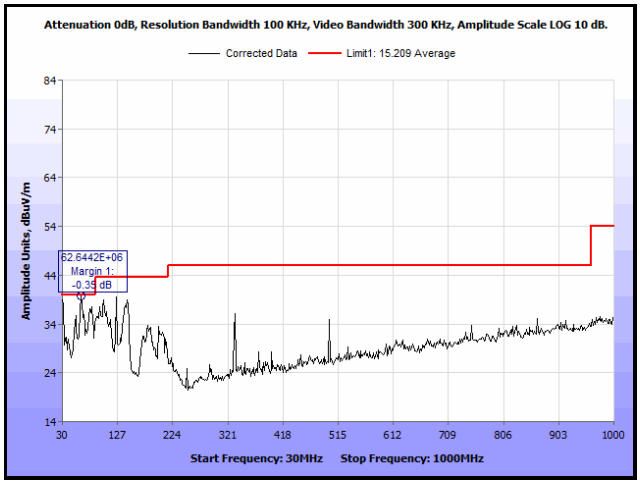
Plot 94. Radiated Spurious Emissions, Low Channel, 802.11g, 1 GHz – 7 GHz, Peak, 9 dBi Antenna



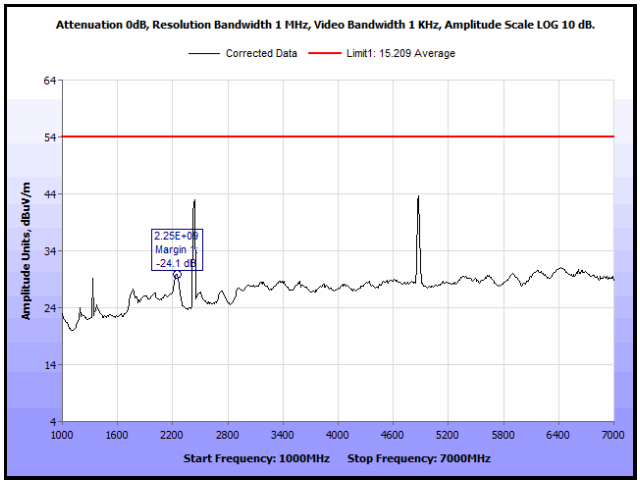
Plot 95. Radiated Spurious Emissions, Low Channel, 802.11g, 7 GHz – 18 GHz, Average, 9 dBi Antenna



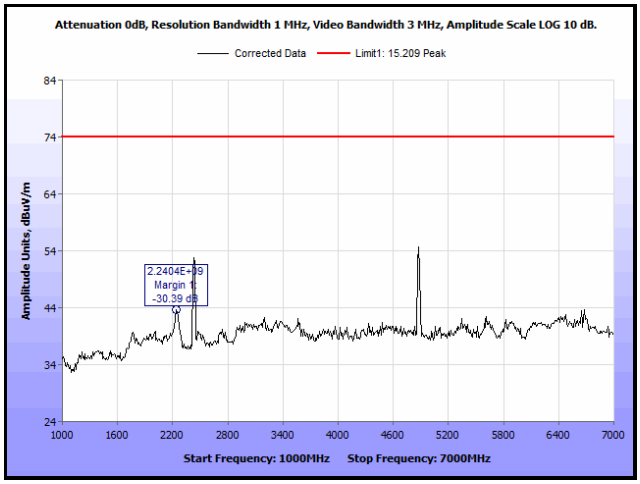
Plot 96. Radiated Spurious Emissions, Low Channel, 802.11g, 7 GHz – 18 GHz, Peak, 9 dBi Antenna



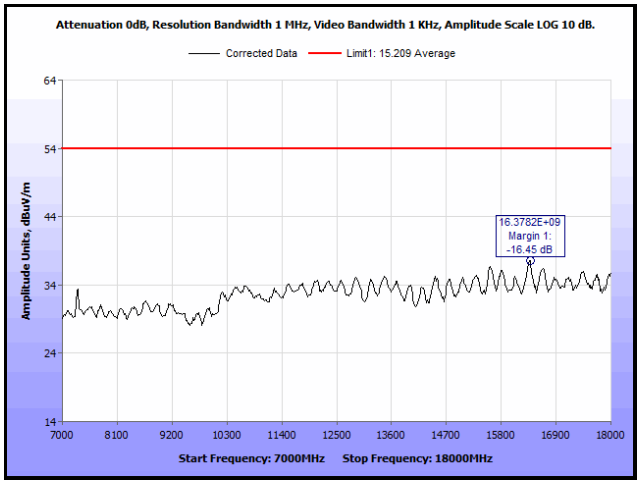
Plot 97. Radiated Spurious Emissions, Mid Channel, 802.11g, 30 MHz – 1 GHz, 9 dBi Antenna



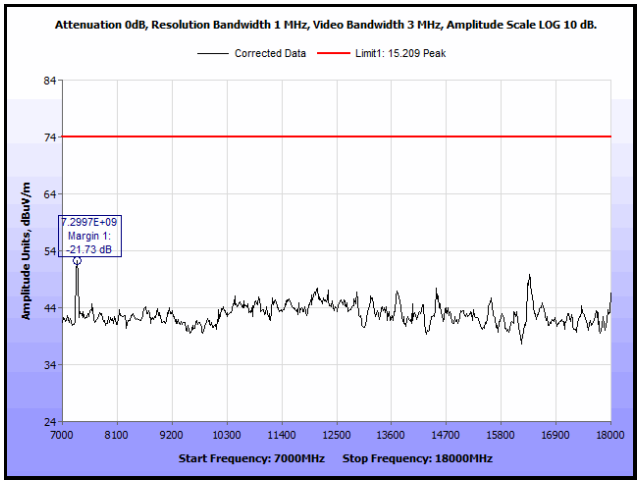
Plot 98. Radiated Spurious Emissions, Mid Channel, 802.11g, 1 GHz – 7 GHz, Average, 9 dBi Antenna



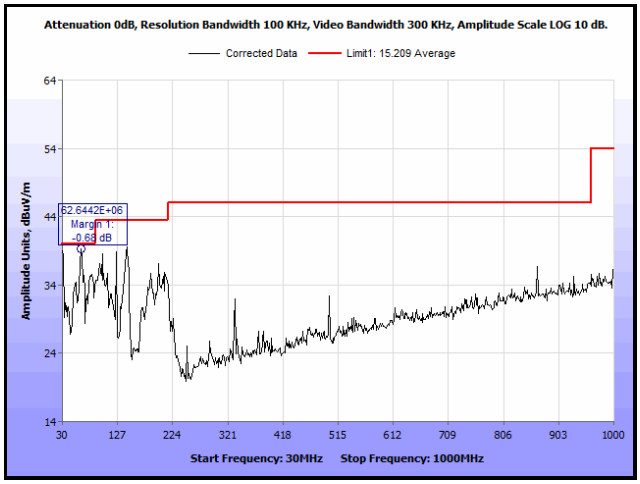
Plot 99. Radiated Spurious Emissions, Mid Channel, 802.11g, 1 GHz – 7 GHz, Peak, 9 dBi Antenna



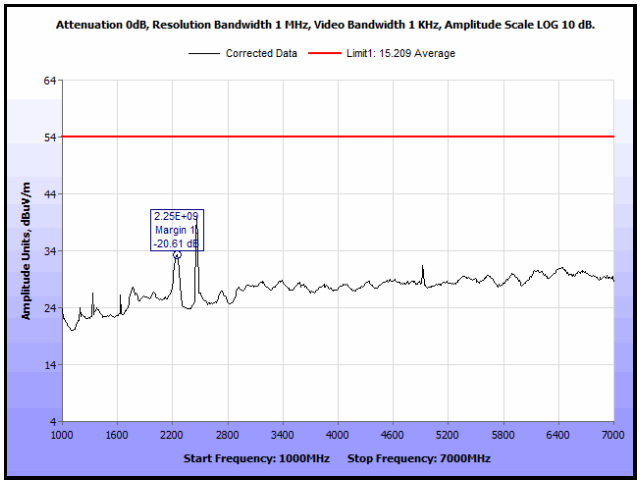
Plot 100. Radiated Spurious Emissions, Mid Channel, 802.11g, 7 GHz – 18 GHz, Average, 9 dBi Antenna



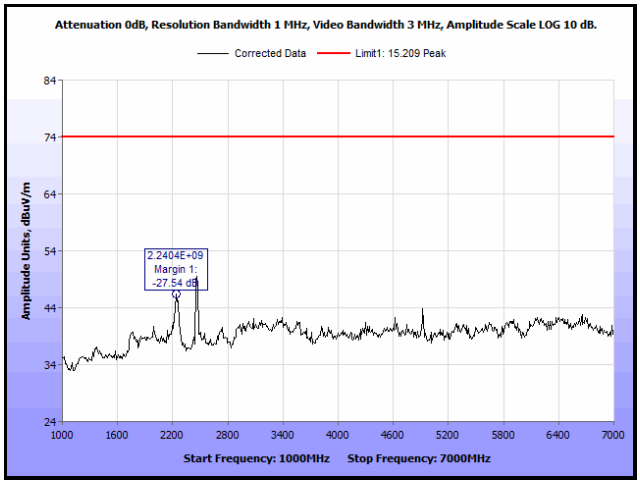
Plot 101. Radiated Spurious Emissions, Mid Channel, 802.11g, 7 GHz – 18 GHz, Peak, 9 dBi Antenna



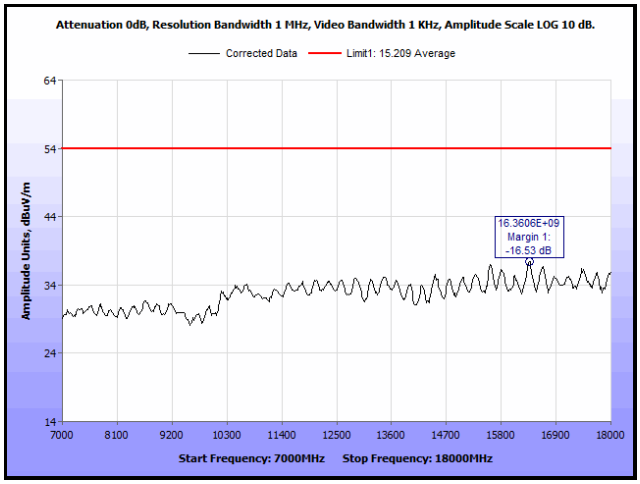
Plot 102. Radiated Spurious Emissions, High Channel, 802.11g, 30 MHz – 1 GHz, 9 dBi Antenna



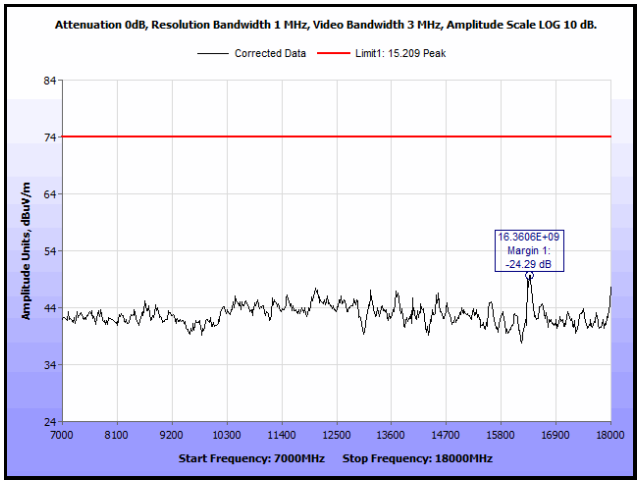
Plot 103. Radiated Spurious Emissions, High Channel, 802.11g, 1 GHz – 7 GHz, Average, 9 dBi Antenna



Plot 104. Radiated Spurious Emissions, High Channel, 802.11g, 1 GHz – 7 GHz, Peak, 9 dBi Antenna

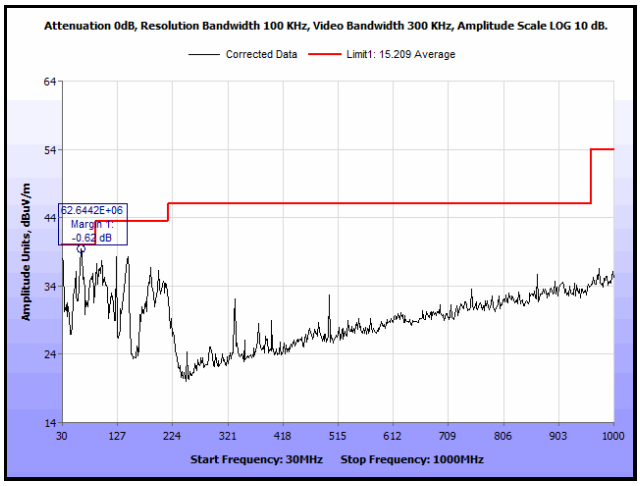


Plot 105. Radiated Spurious Emissions, High Channel, 802.11g, 7 GHz – 18 GHz, Average, 9 dBi Antenna

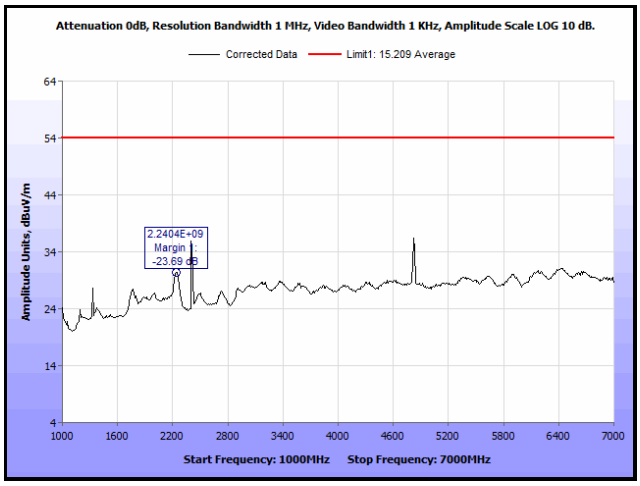


Plot 106. Radiated Spurious Emissions, High Channel, 802.11g, 7 GHz – 18 GHz, Peak, 9 dBi Antenna

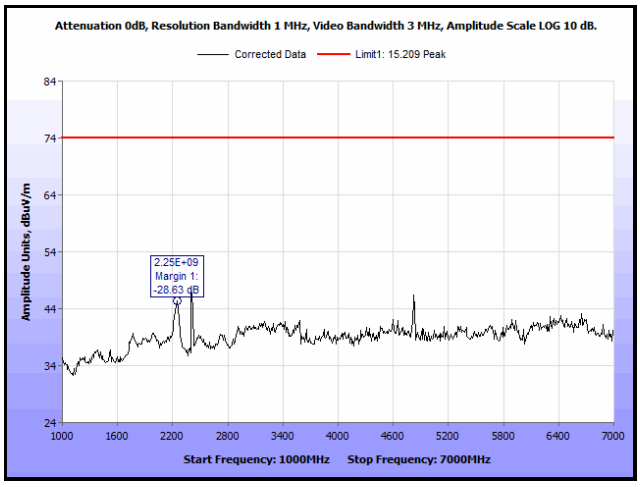
Radiated Spurious Emissions Test Results, 802.11n 20 MHz, 9 dBi Antenna



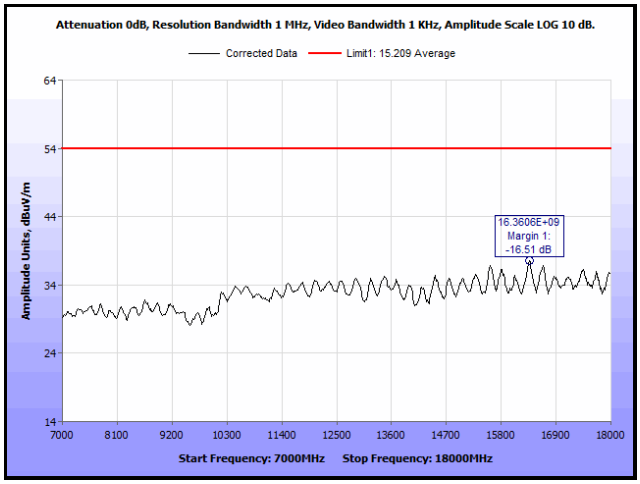
Plot 107. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 30 MHz – 1 GHz, 9 dBi Antenna



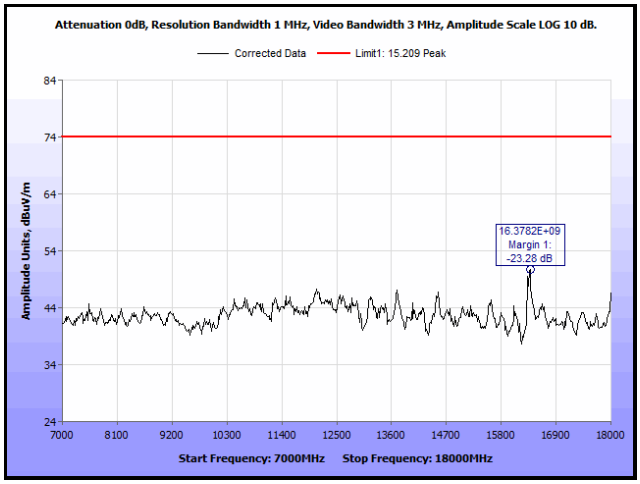
Plot 108. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average, 9 dBi Antenna



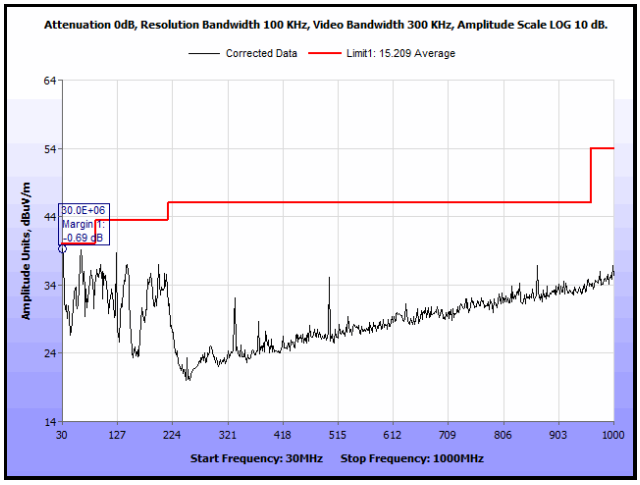
Plot 109. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak, 9 dBi Antenna



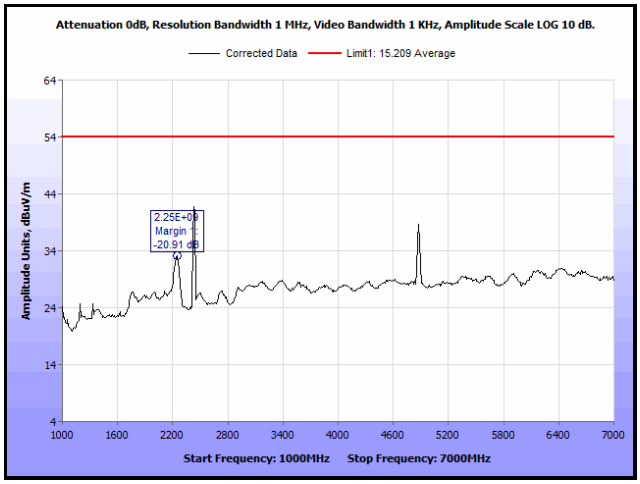
Plot 110. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Average, 9 dBi Antenna



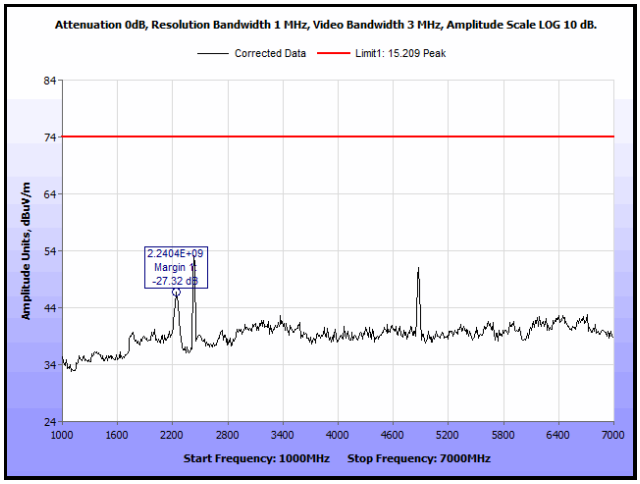
Plot 111. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Peak, 9 dBi Antenna



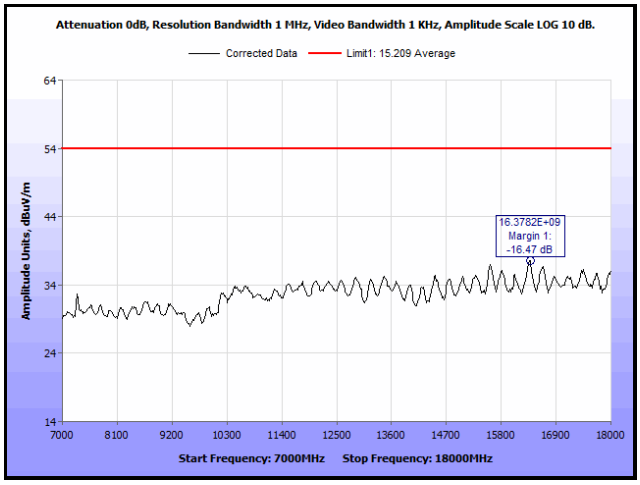
Plot 112. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 30 MHz – 1 GHz, 9 dBi Antenna



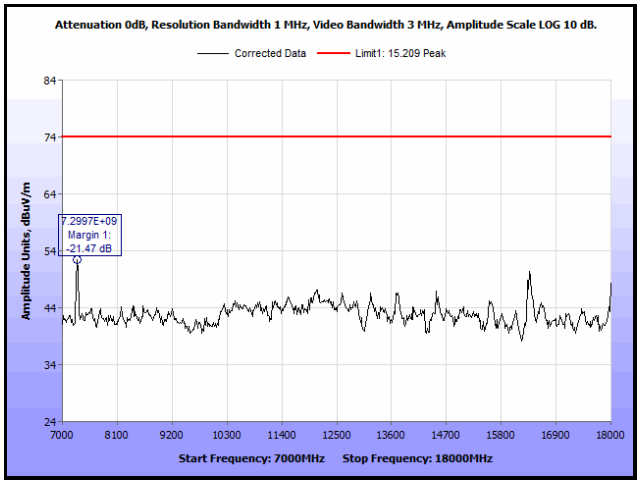
Plot 113. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average, 9 dBi Antenna



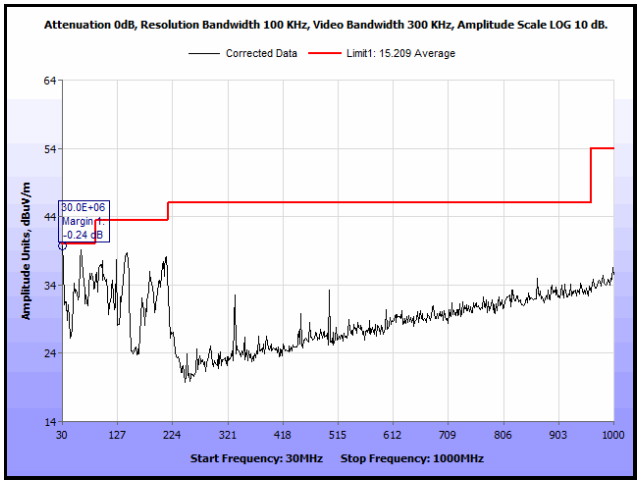
Plot 114. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak, 9 dBi Antenna



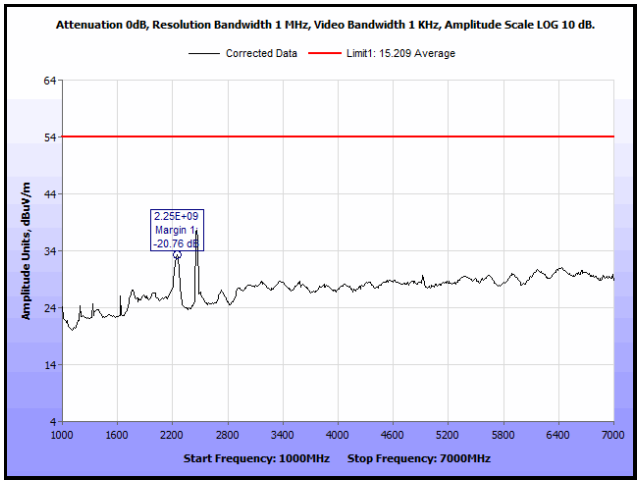
Plot 115. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Average, 9 dBi Antenna



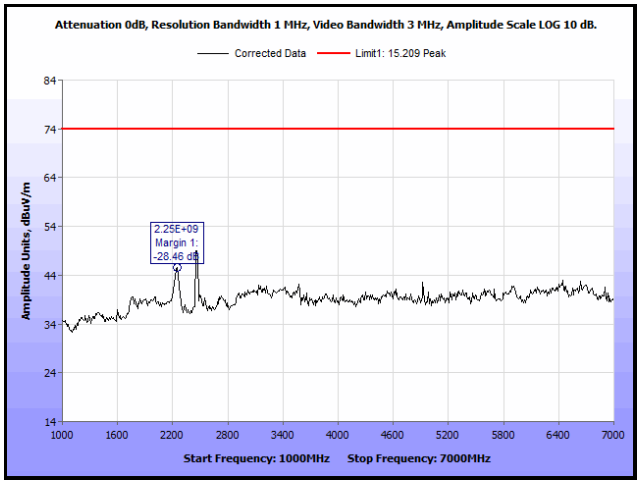
Plot 116. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Peak, 9 dBi Antenna



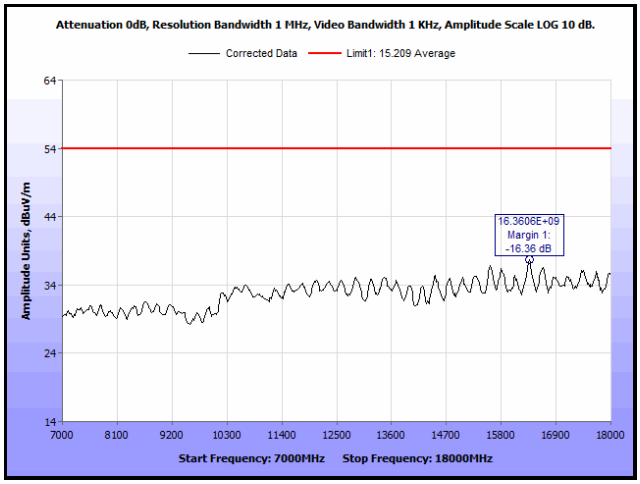
Plot 117. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 30 MHz – 1 GHz, 9 dBi Antenna



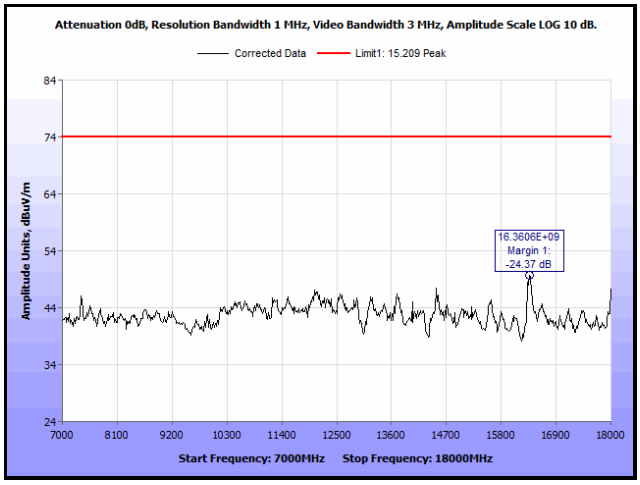
Plot 118. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average, 9 dBi Antenna



Plot 119. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak, 9 dBi Antenna

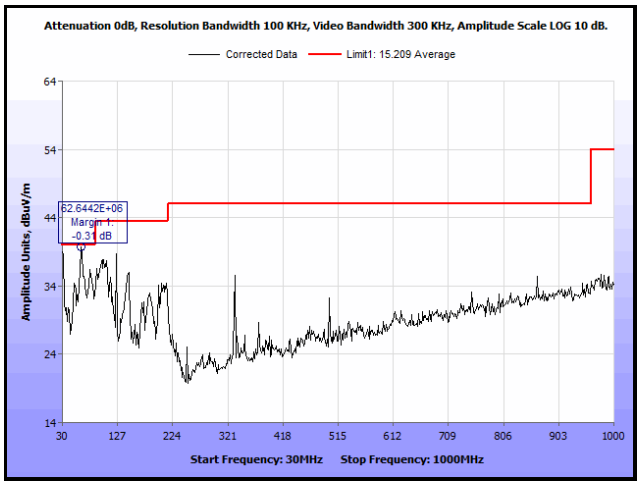


Plot 120. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Average, 9 dBi Antenna

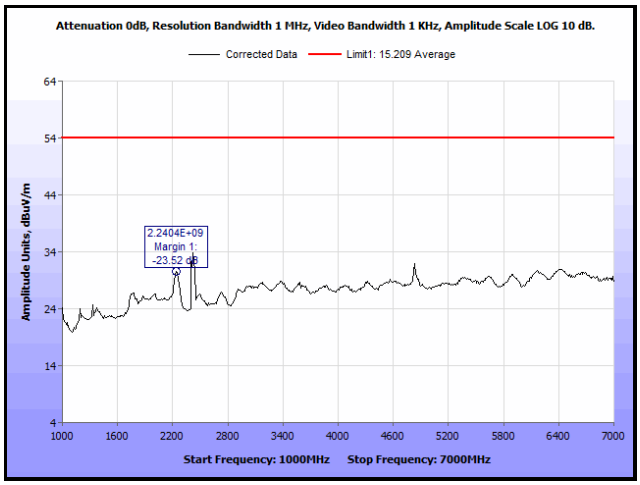


Plot 121. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Peak, 9 dBi Antenna

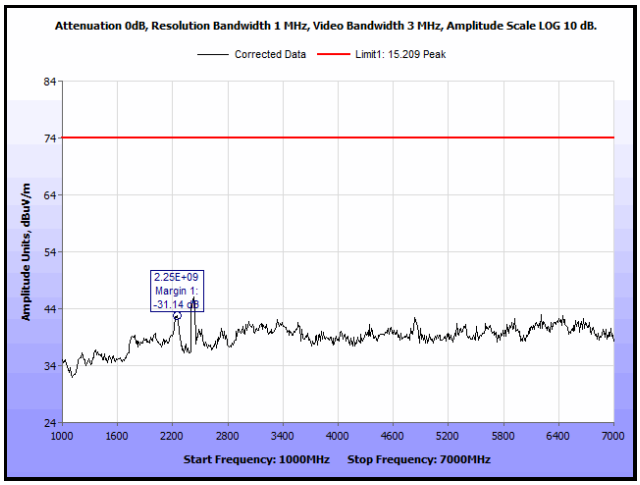
Radiated Spurious Emissions Test Results, 802.11n 40 MHz, 9 dBi Antenna



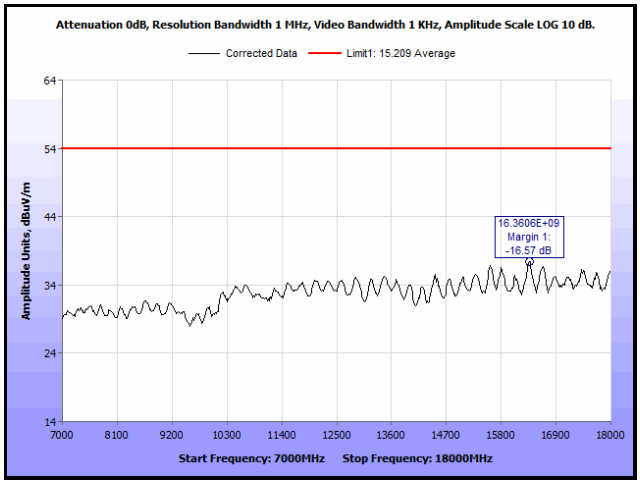
Plot 122. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 30 MHz – 1 GHz, 9 dBi Antenna



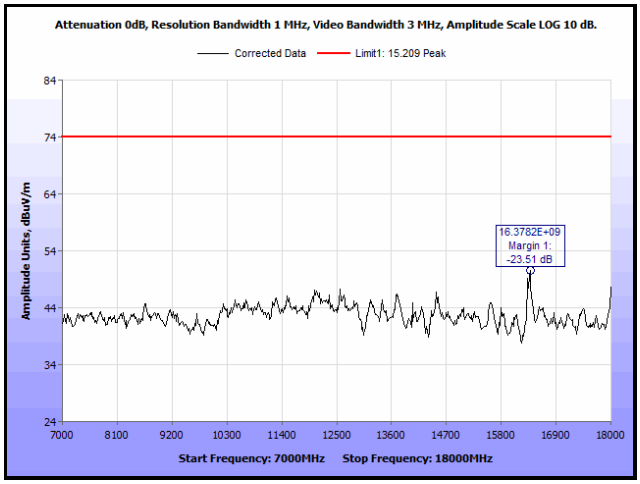
Plot 123. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Average, 9 dBi Antenna



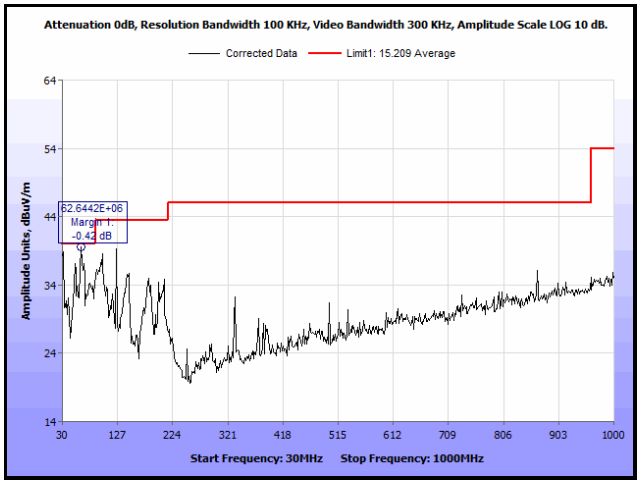
Plot 124. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Peak, 9 dBi Antenna



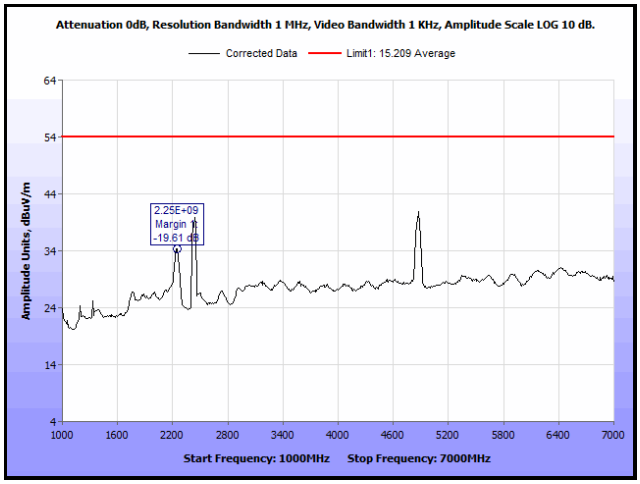
Plot 125. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Average, 9 dBi Antenna



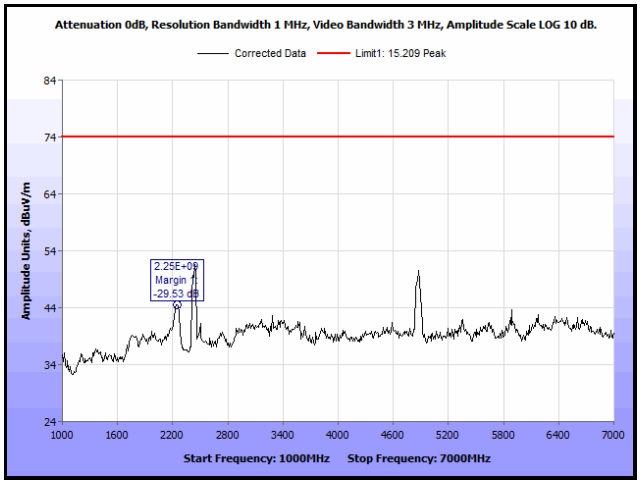
Plot 126. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Peak, 9 dBi Antenna



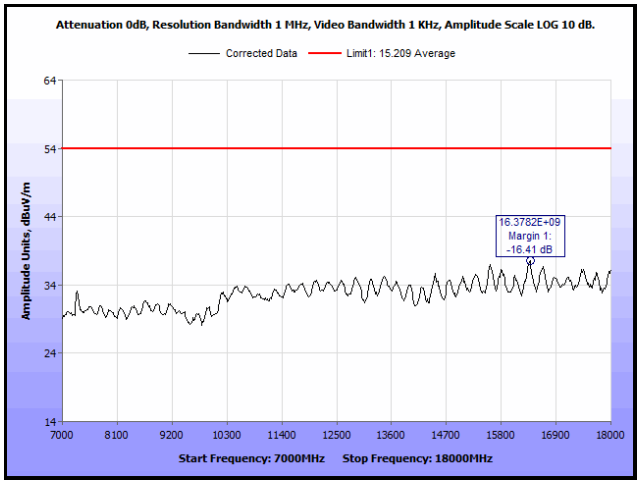
Plot 127. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 30 MHz – 1 GHz, 9 dBi Antenna



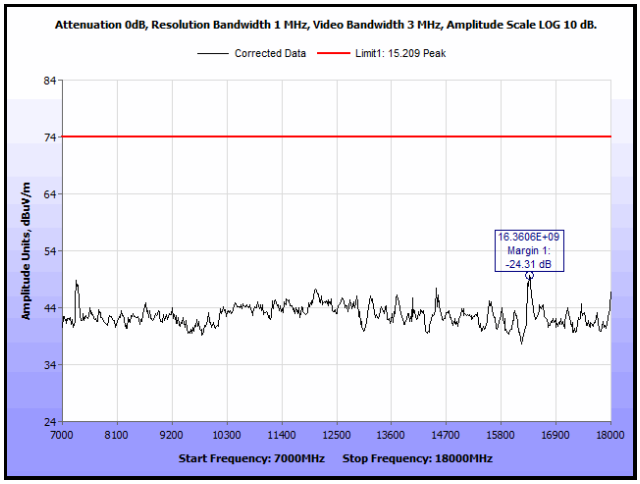
Plot 128. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Average, 9 dBi Antenna



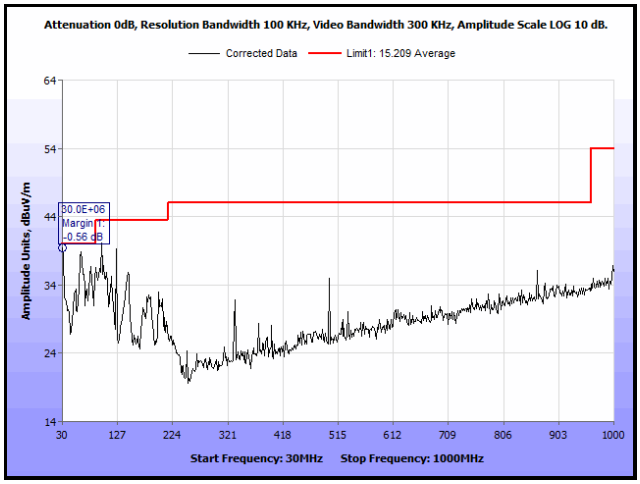
Plot 129. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Peak, 9 dBi Antenna



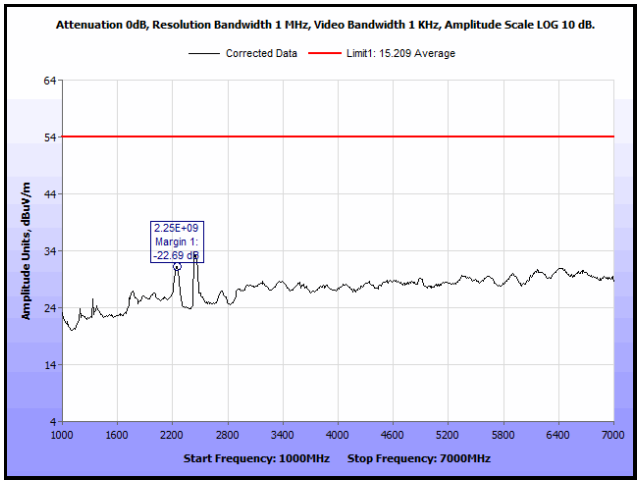
Plot 130. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Average, 9 dBi Antenna



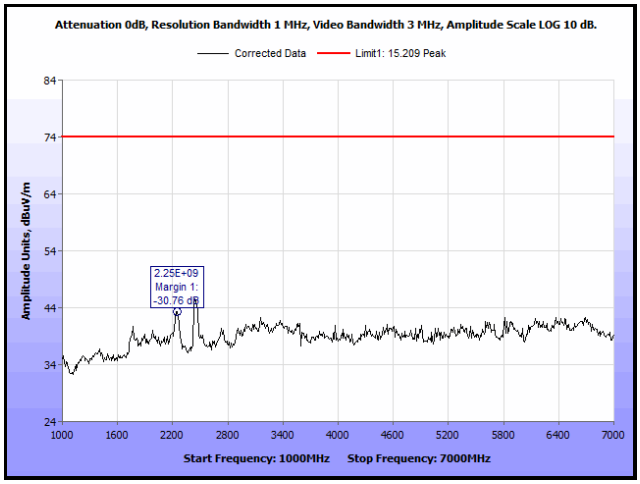
Plot 131. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Peak, 9 dBi Antenna



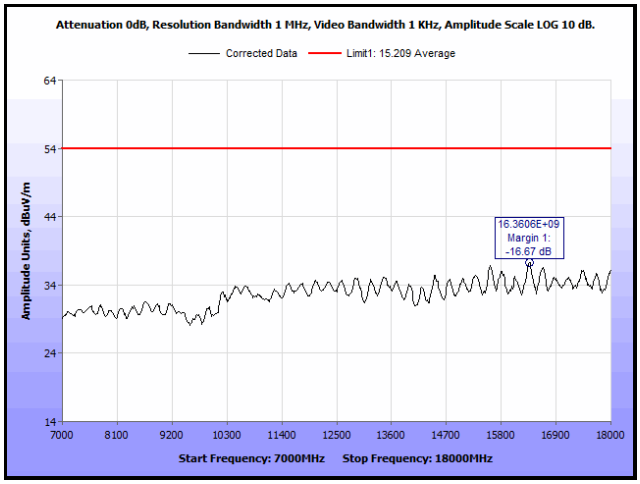
Plot 132. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 30 MHz – 1 GHz, 9 dBi Antenna



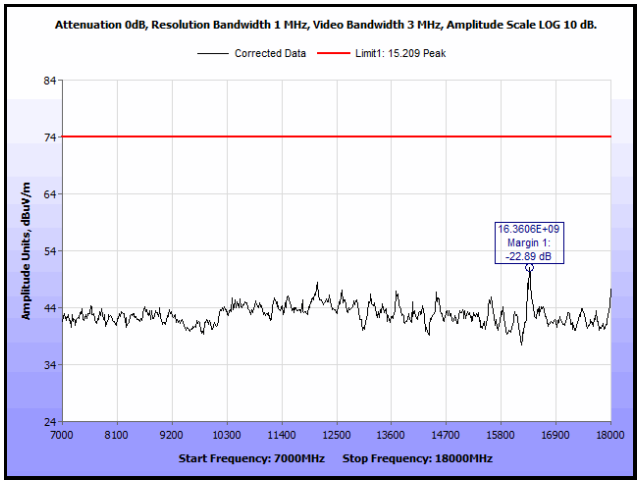
Plot 133. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Average, 9 dBi Antenna



Plot 134. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Peak, 9 dBi Antenna

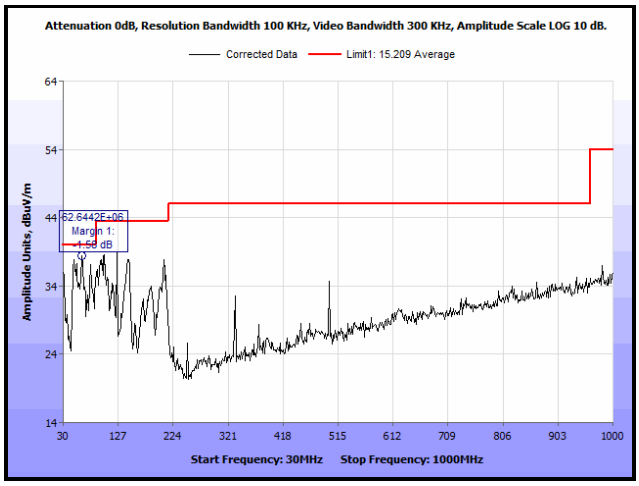


Plot 135. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Average, 9 dBi Antenna

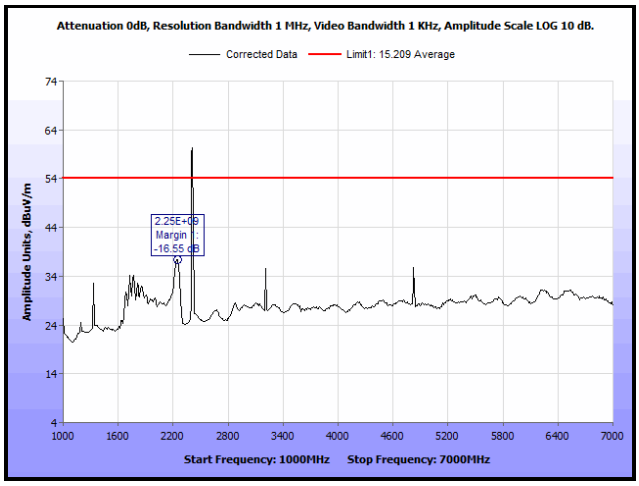


Plot 136. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Peak, 9 dBi Antenna

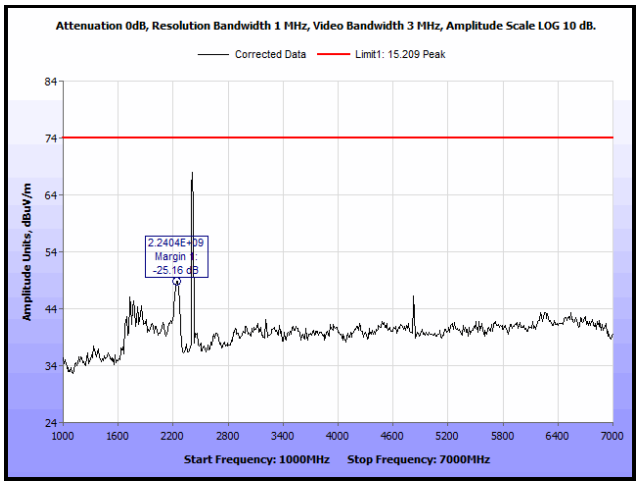
Radiated Spurious Emissions Test Results, 802.11b, 13 dBi Antenna



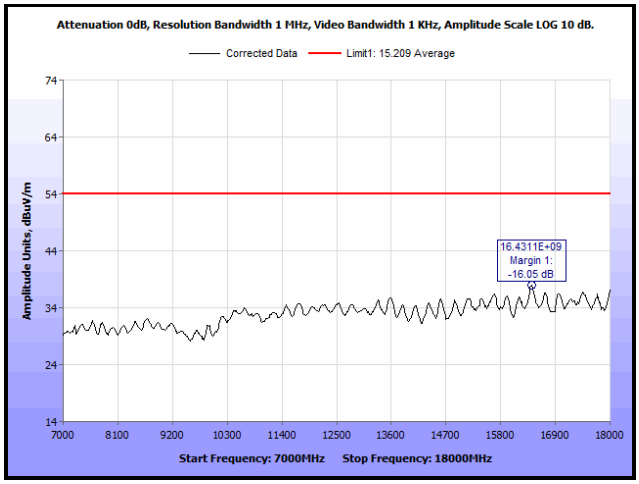
Plot 137. Radiated Spurious Emissions, Low Channel, 802.11b, 30 MHz – 1 GHz, 13 dBi Antenna



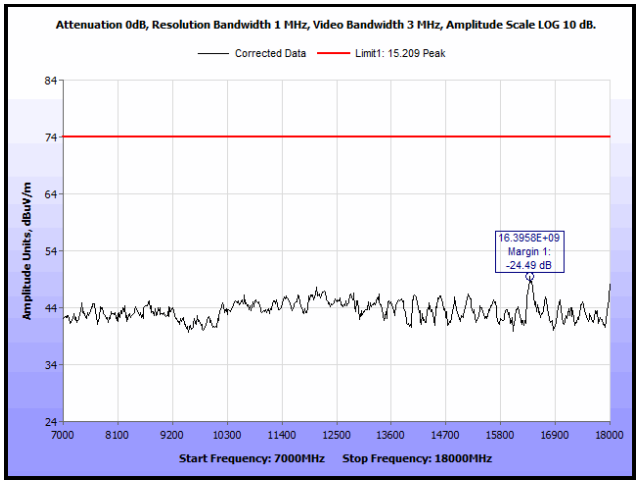
Plot 138. Radiated Spurious Emissions, Low Channel, 802.11b, 1 GHz – 7 GHz, Average, 13 dBi Antenna



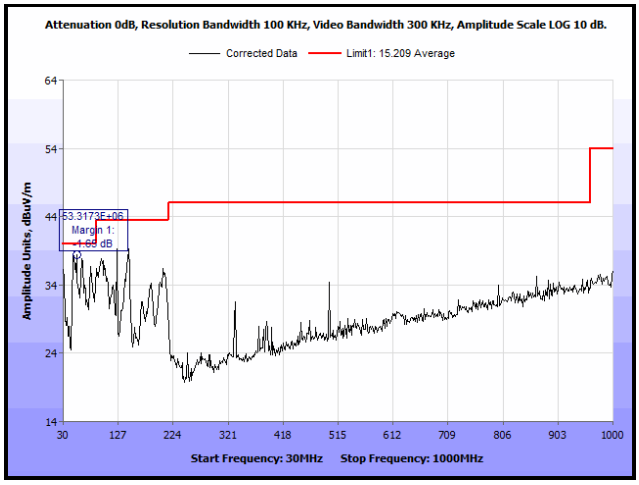
Plot 139. Radiated Spurious Emissions, Low Channel, 802.11b, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



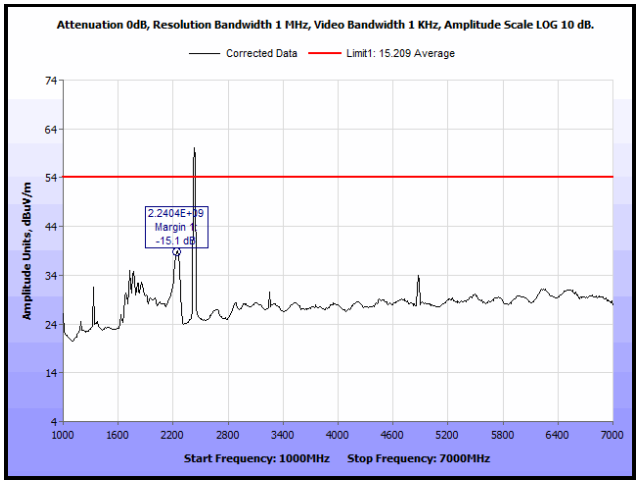
Plot 140. Radiated Spurious Emissions, Low Channel, 802.11b, 7 GHz – 18 GHz, Average, 13 dBi Antenna



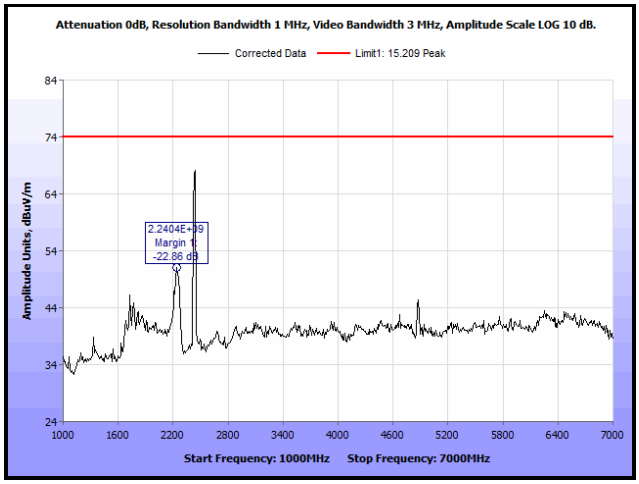
Plot 141. Radiated Spurious Emissions, Low Channel, 802.11b, 7 GHz – 18 GHz, Peak, 13 dBi Antenna



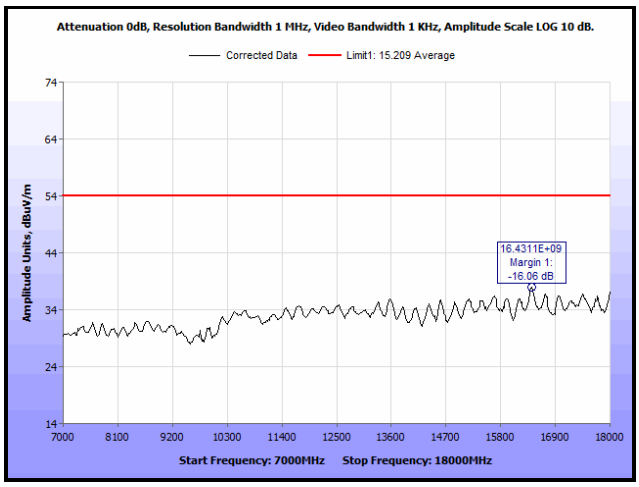
Plot 142. Radiated Spurious Emissions, Mid Channel, 802.11b, 30 MHz – 1 GHz, 13 dBi Antenna



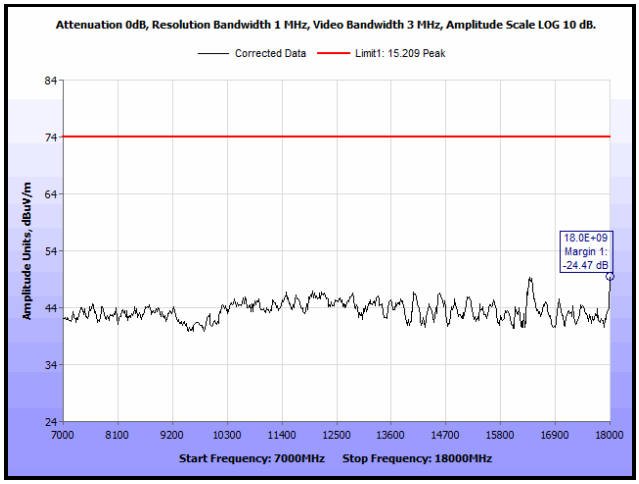
Plot 143. Radiated Spurious Emissions, Mid Channel, 802.11b, 1 GHz – 7 GHz, Average, 13 dBi Antenna



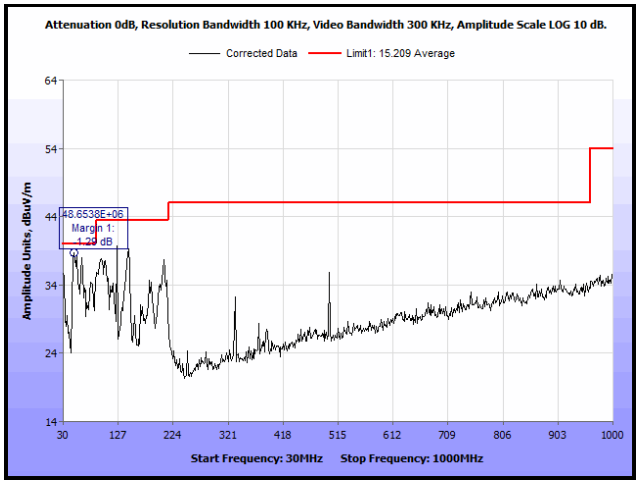
Plot 144. Radiated Spurious Emissions, Mid Channel, 802.11b, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



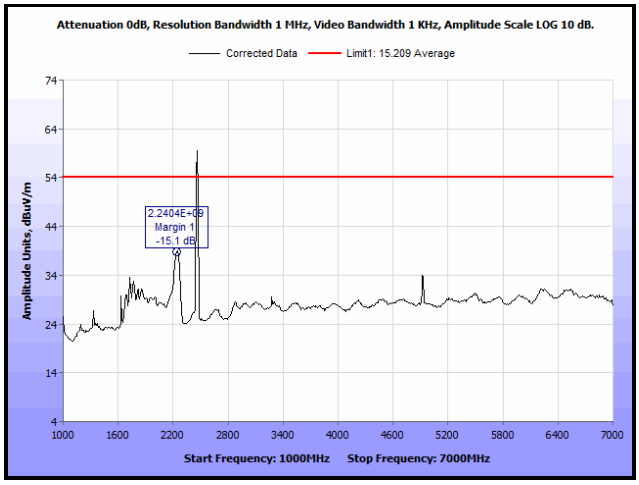
Plot 145. Radiated Spurious Emissions, Mid Channel, 802.11b, 7 GHz – 18 GHz, Average, 13 dBi Antenna



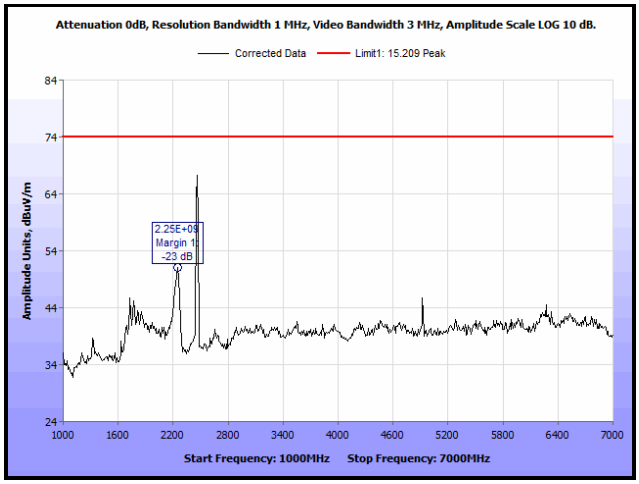
Plot 146. Radiated Spurious Emissions, Mid Channel, 802.11b, 7 GHz – 18 GHz, Peak, 13 dBi Antenna



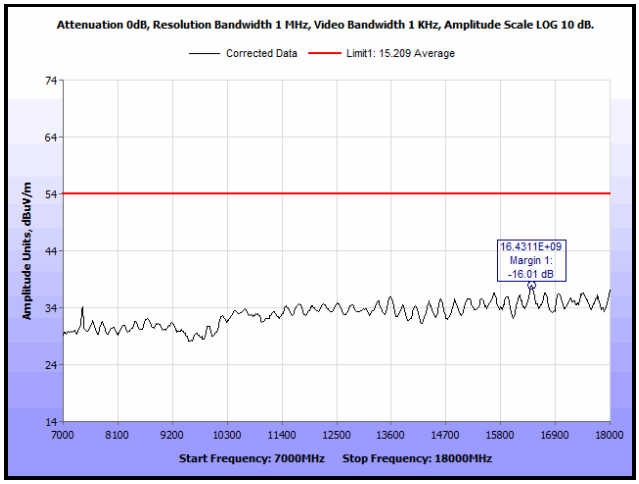
Plot 147. Radiated Spurious Emissions, High Channel, 802.11b, 30 MHz – 1 GHz, 13 dBi Antenna



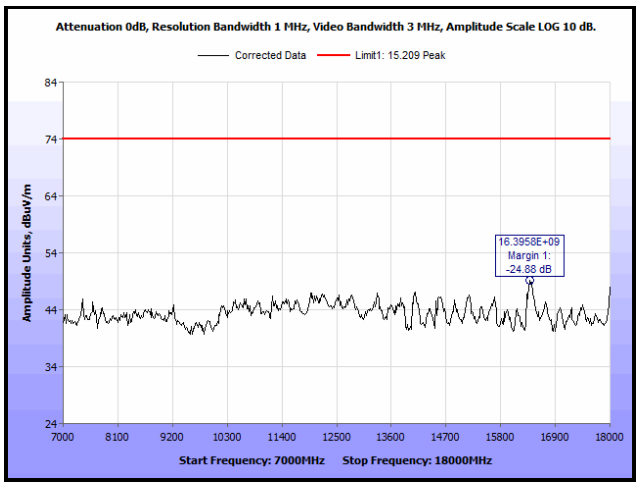
Plot 148. Radiated Spurious Emissions, High Channel, 802.11b, 1 GHz – 7 GHz, Average, 13 dBi Antenna



Plot 149. Radiated Spurious Emissions, High Channel, 802.11b, 1 GHz – 7 GHz, Peak, 13 dBi Antenna

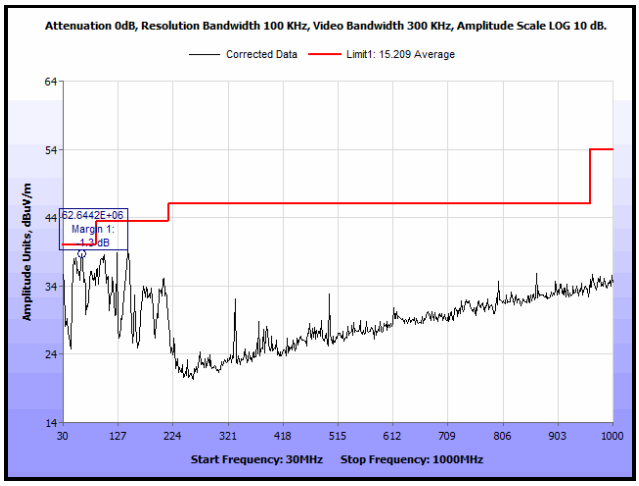


Plot 150. Radiated Spurious Emissions, High Channel, 802.11b, 7 GHz – 18 GHz, Average, 13 dBi Antenna

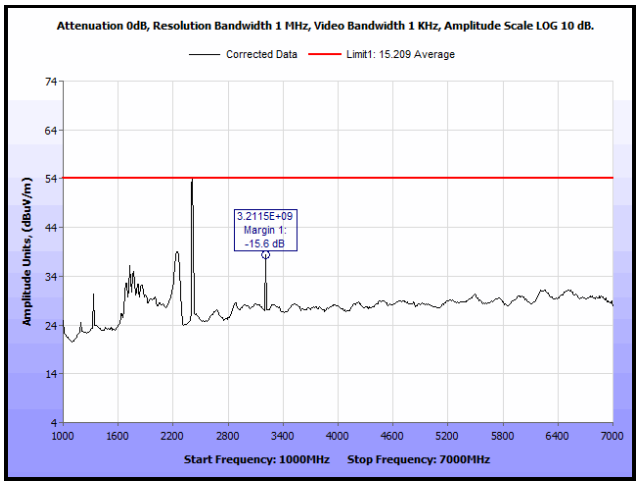


Plot 151. Radiated Spurious Emissions, High Channel, 802.11b, 7 GHz – 18 GHz, Peak, 13 dBi Antenna

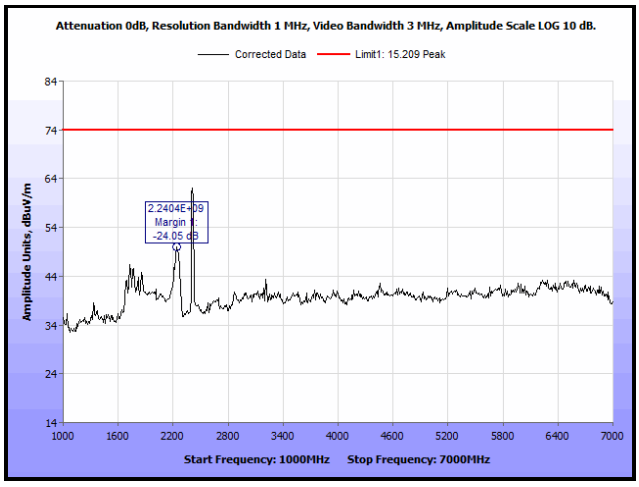
Radiated Spurious Emissions Test Results, 802.11g, 13 dBi Antenna



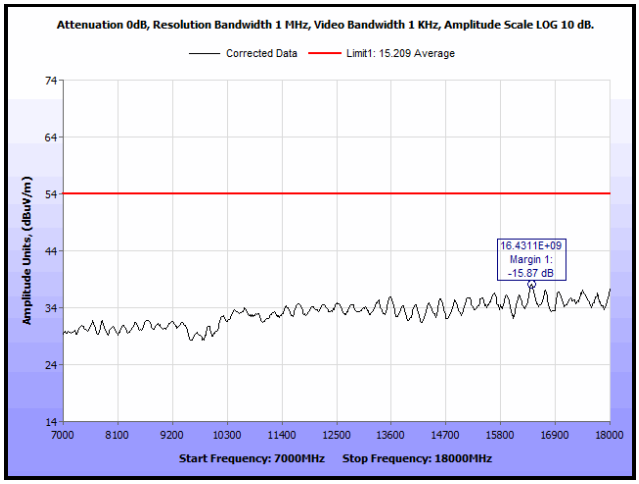
Plot 152. Radiated Spurious Emissions, Low Channel, 802.11g, 30 MHz – 1 GHz, 13 dBi Antenna



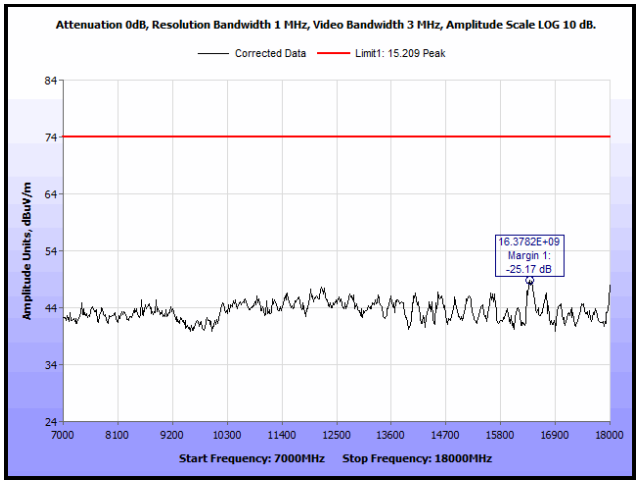
Plot 153. Radiated Spurious Emissions, Low Channel, 802.11g, 1 GHz – 7 GHz, Average, 13 dBi Antenna



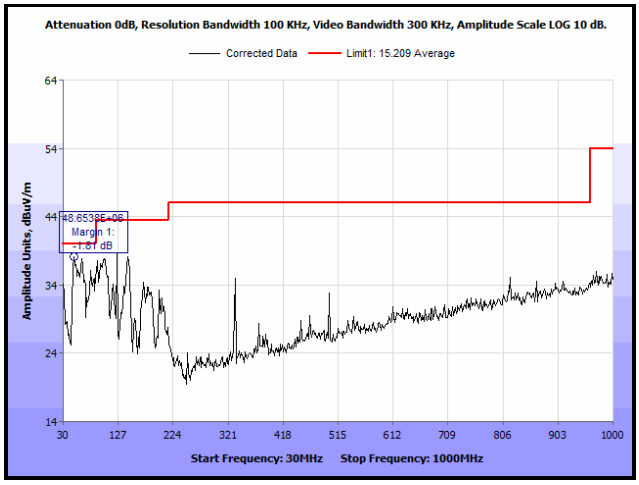
Plot 154. Radiated Spurious Emissions, Low Channel, 802.11g, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



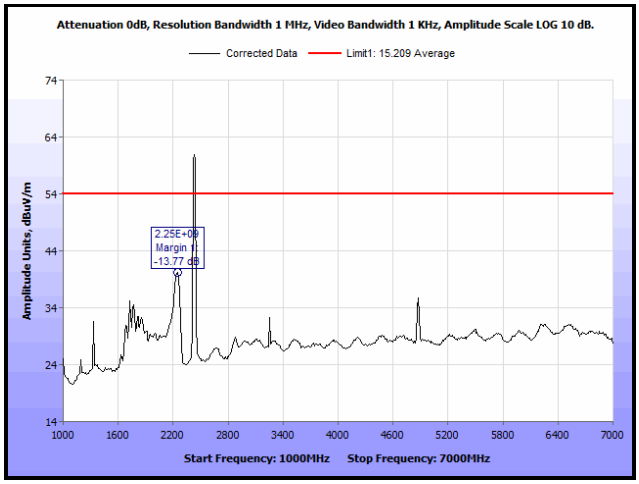
Plot 155. Radiated Spurious Emissions, Low Channel, 802.11g, 7 GHz – 18 GHz, Average, 13 dBi Antenna



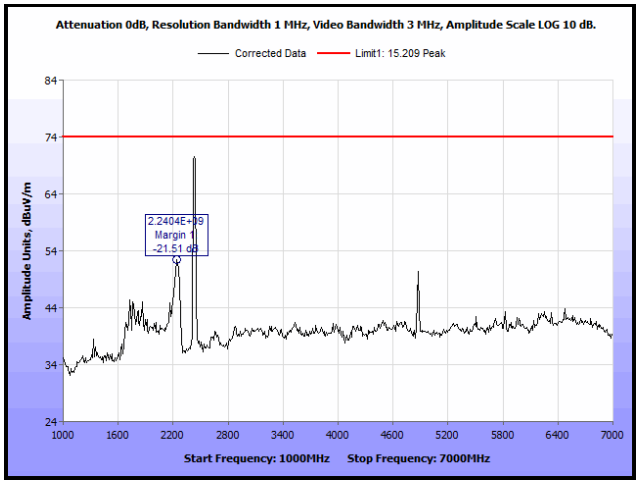
Plot 156. Radiated Spurious Emissions, Low Channel, 802.11g, 7 GHz – 18 GHz, Peak, 13 dBi Antenna



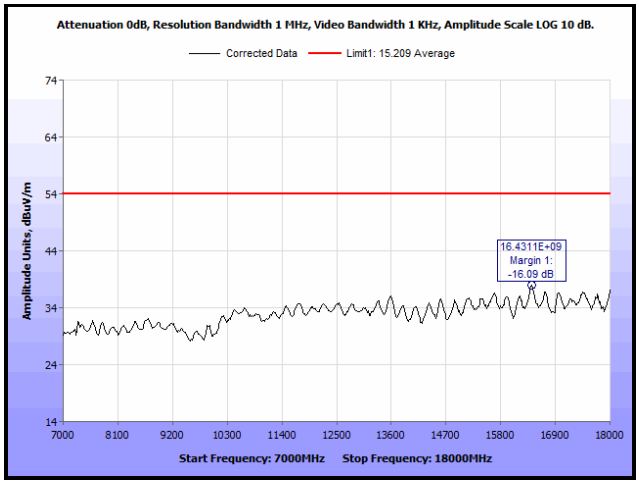
Plot 157. Radiated Spurious Emissions, Mid Channel, 802.11g, 30 MHz – 1 GHz, 13 dBi Antenna



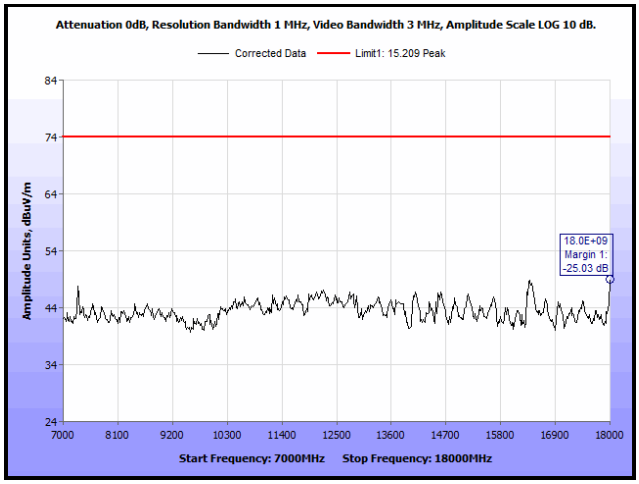
Plot 158. Radiated Spurious Emissions, Mid Channel, 802.11g, 1 GHz – 7 GHz, Average, 13 dBi Antenna



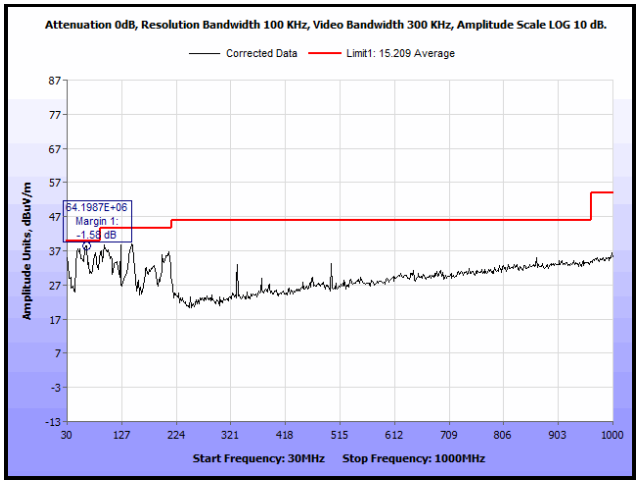
Plot 159. Radiated Spurious Emissions, Mid Channel, 802.11g, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



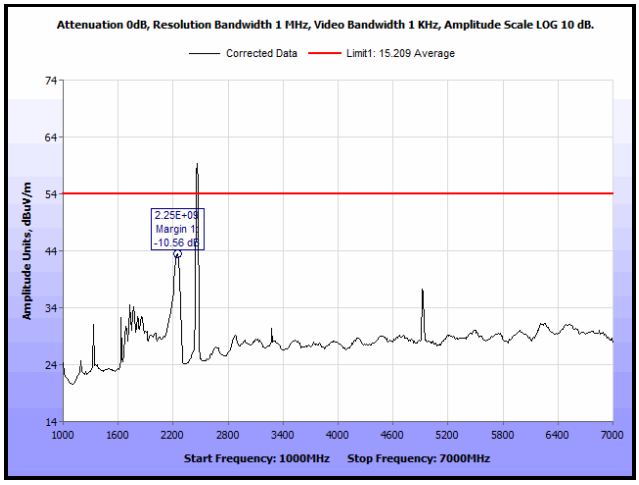
Plot 160. Radiated Spurious Emissions, Mid Channel, 802.11g, 7 GHz – 18 GHz, Average, 13 dBi Antenna



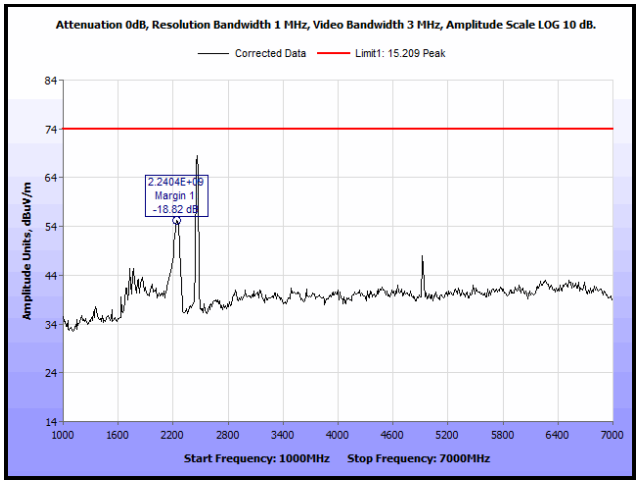
Plot 161. Radiated Spurious Emissions, Mid Channel, 802.11g, 7 GHz – 18 GHz, Peak, 13 dBi Antenna



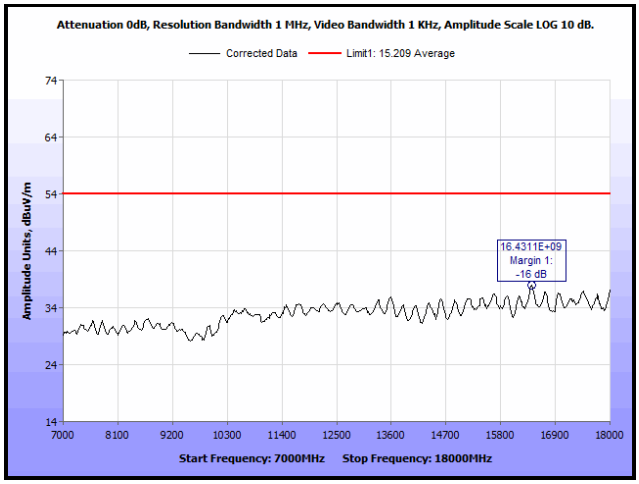
Plot 162. Radiated Spurious Emissions, High Channel, 802.11g, 30 MHz – 1 GHz, 13 dBi Antenna



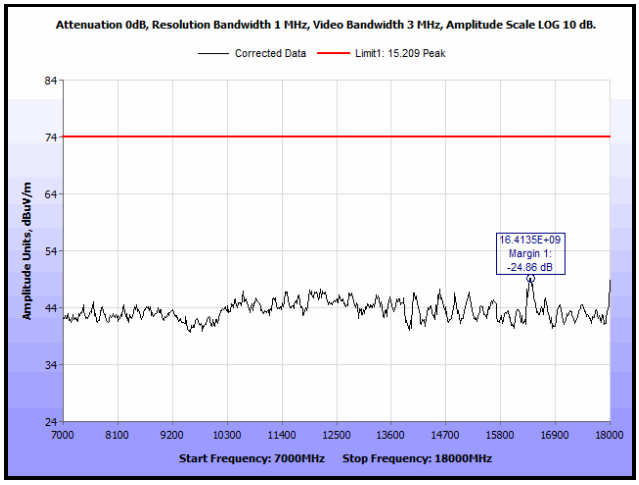
Plot 163. Radiated Spurious Emissions, High Channel, 802.11g, 1 GHz – 7 GHz, Average, 13 dBi Antenna



Plot 164. Radiated Spurious Emissions, High Channel, 802.11g, 1 GHz – 7 GHz, Peak, 13 dBi Antenna

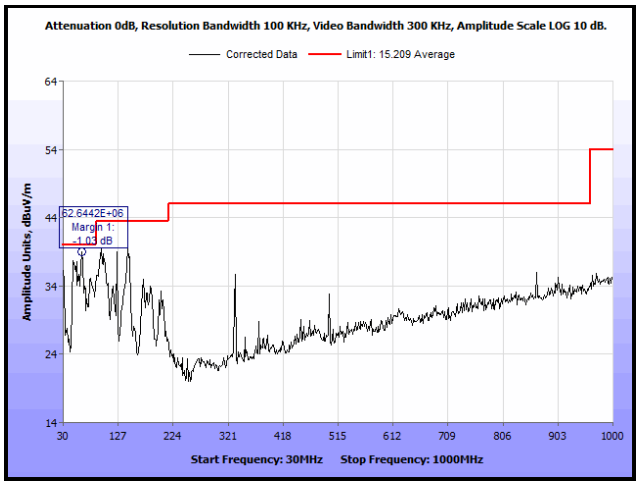


Plot 165. Radiated Spurious Emissions, High Channel, 802.11g, 7 GHz – 18 GHz, Average, 13 dBi Antenna

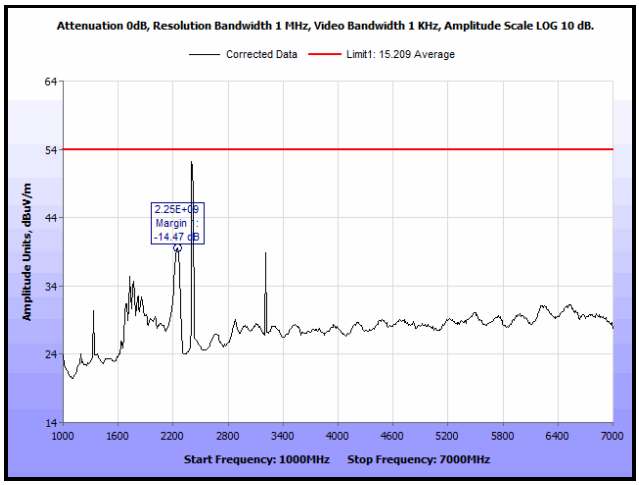


Plot 166. Radiated Spurious Emissions, High Channel, 802.11g, 7 GHz – 18 GHz, Peak, 13 dBi Antenna

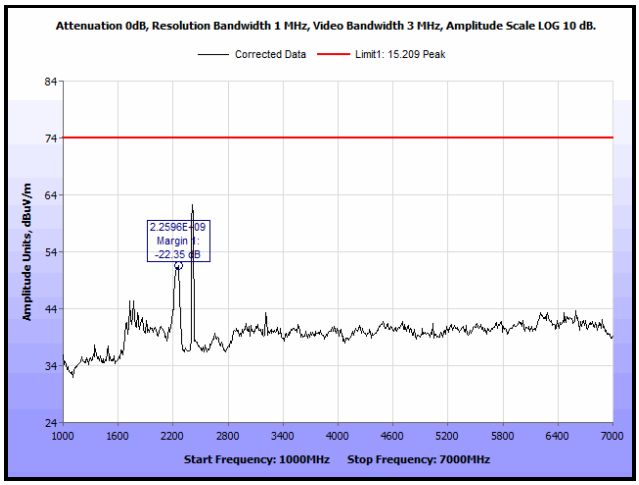
Radiated Spurious Emissions Test Results, 802.11n 20 MHz, 13 dBi Antenna



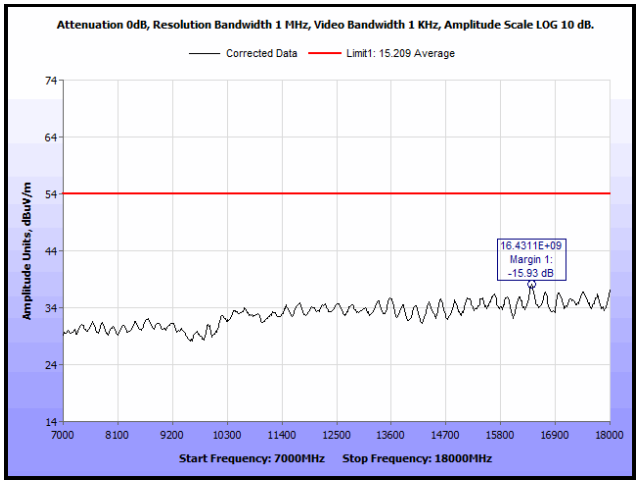
Plot 167. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 30 MHz – 1 GHz, 13 dBi Antenna



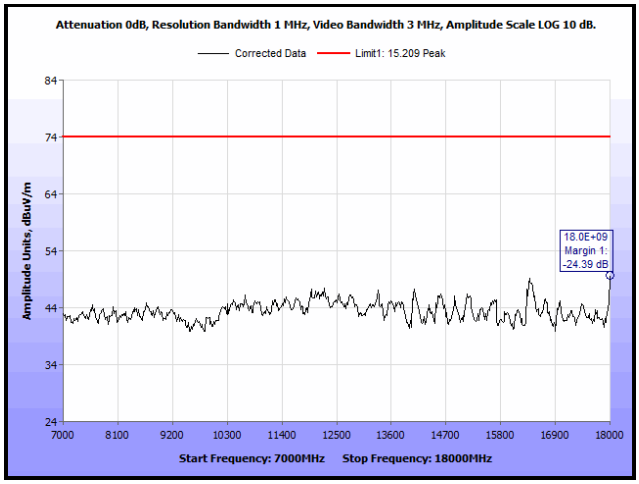
Plot 168. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average, 13 dBi Antenna



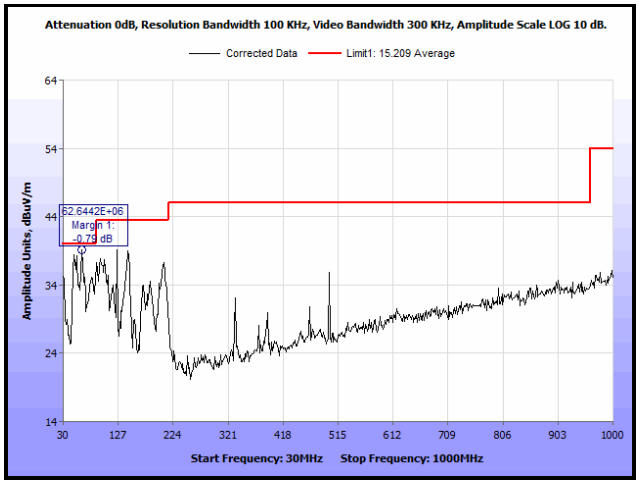
Plot 169. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



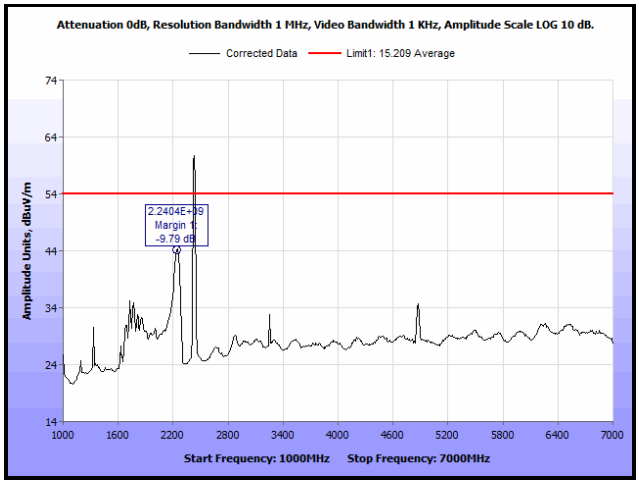
Plot 170. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Average, 13 dBi Antenna



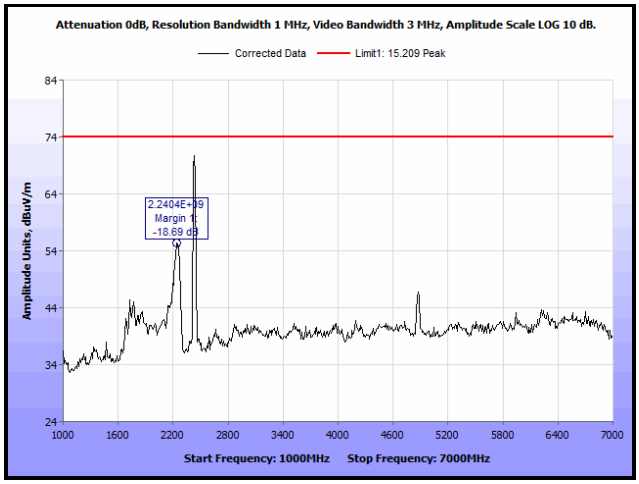
Plot 171. Radiated Spurious Emissions, Low Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Peak, 13 dBi Antenna



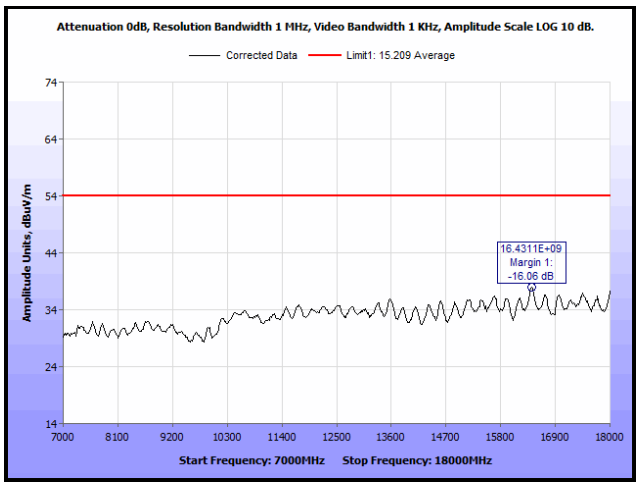
Plot 172. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 30 MHz – 1 GHz, 13 dBi Antenna



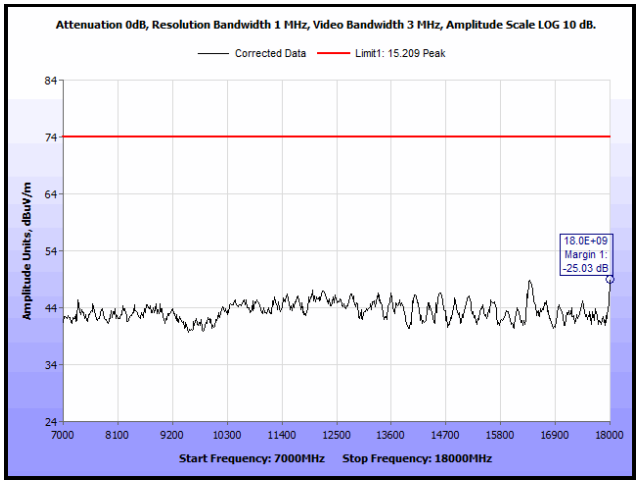
Plot 173. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average, 13 dBi Antenna



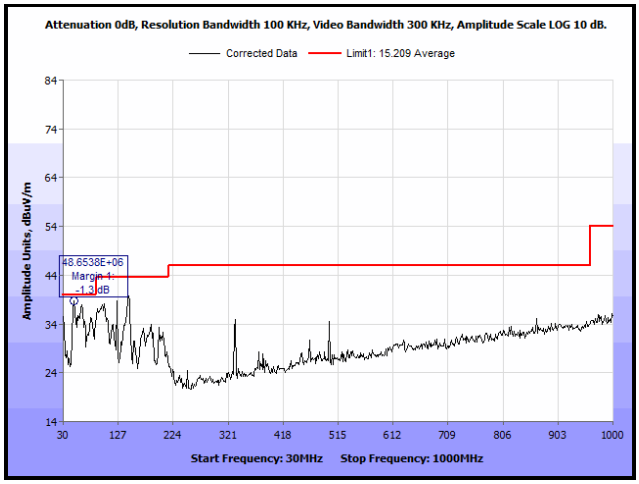
Plot 174. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



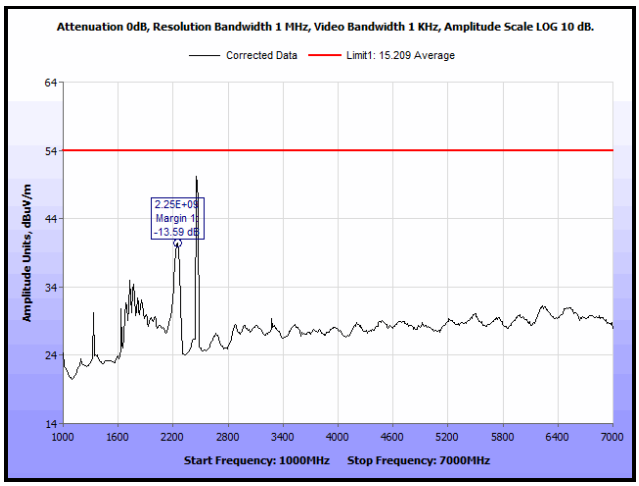
Plot 175. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Average, 13 dBi Antenna



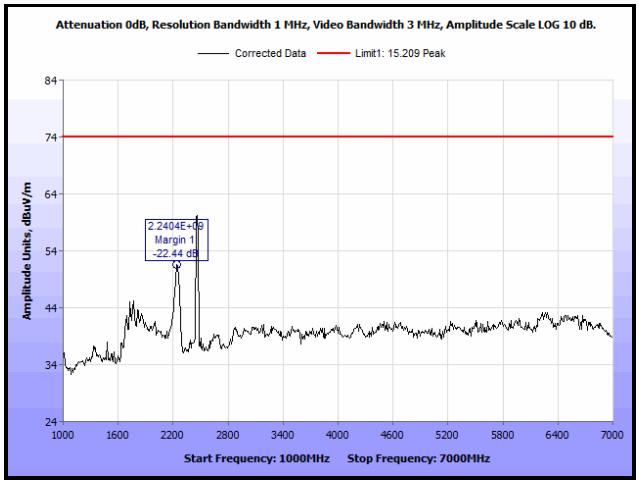
Plot 176. Radiated Spurious Emissions, Mid Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Peak, 13 dBi Antenna



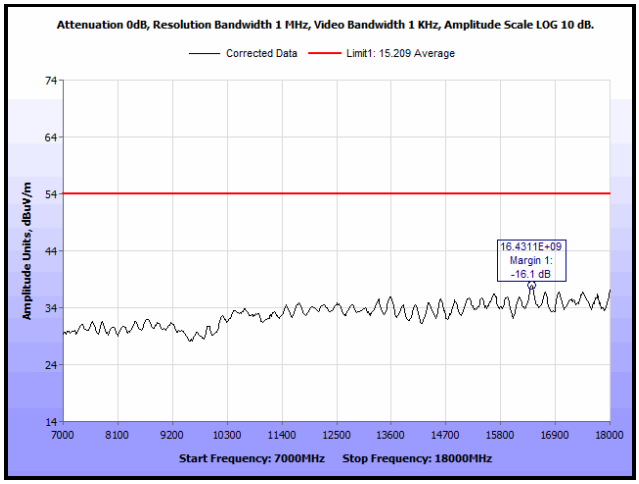
Plot 177. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 30 MHz – 1 GHz, 13 dBi Antenna



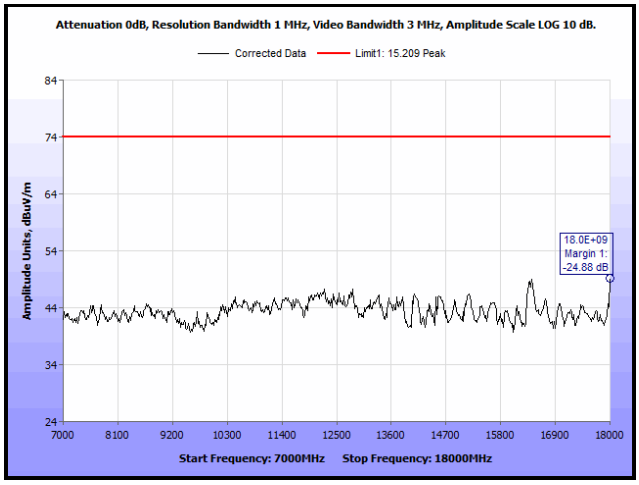
Plot 178. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Average, 13 dBi Antenna



Plot 179. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 1 GHz – 7 GHz, Peak, 13 dBi Antenna

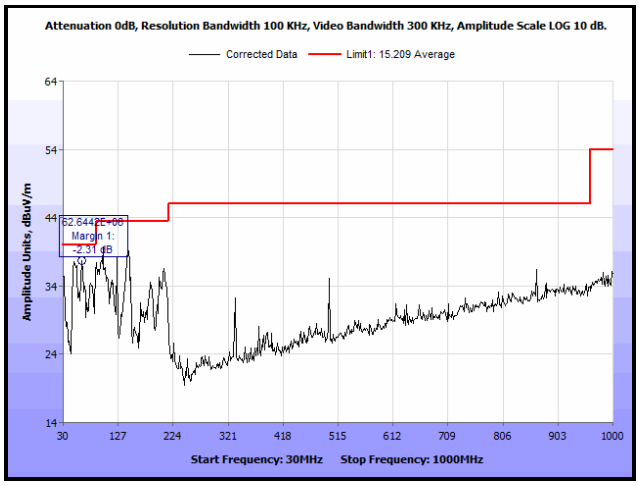


Plot 180. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Average, 13 dBi Antenna

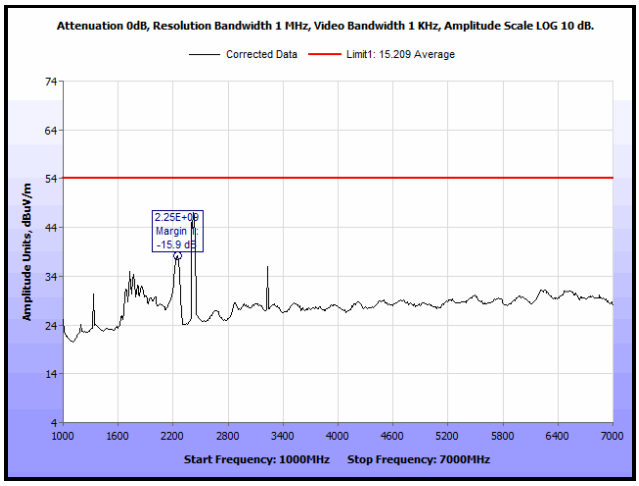


Plot 181. Radiated Spurious Emissions, High Channel, 802.11n 20 MHz, 7 GHz – 18 GHz, Peak, 13 dBi Antenna

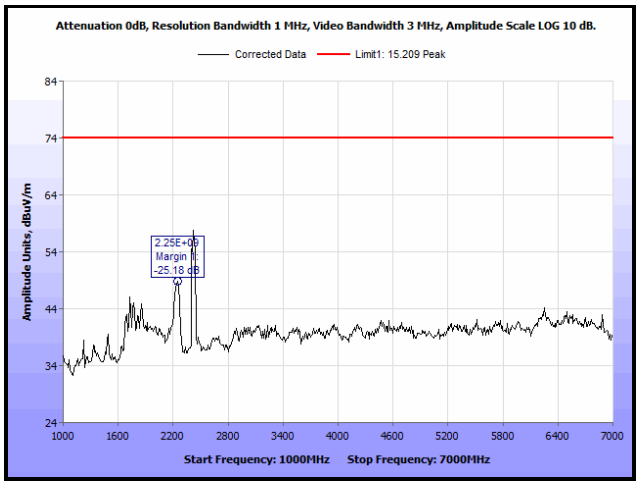
Radiated Spurious Emissions Test Results, 802.11n 40 MHz, 13 dBi Antenna



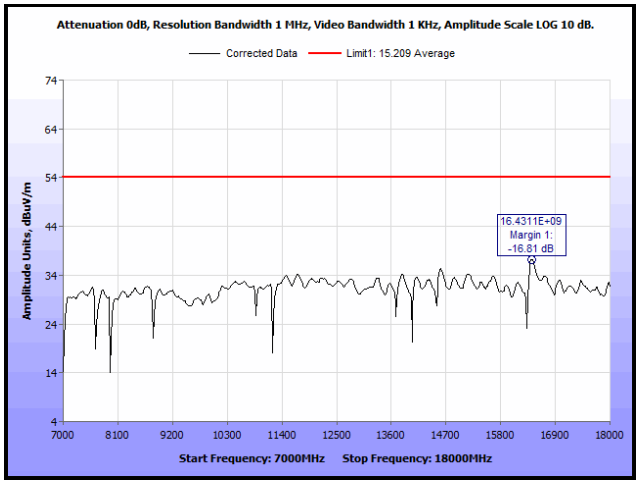
Plot 182. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 30 MHz – 1 GHz, 13 dBi Antenna



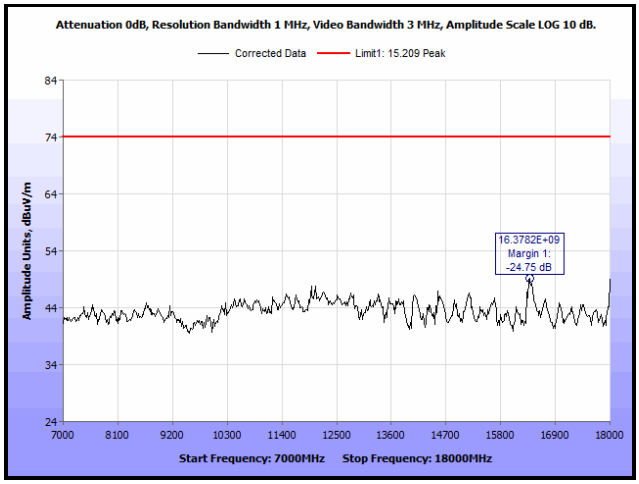
Plot 183. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Average, 13 dBi Antenna



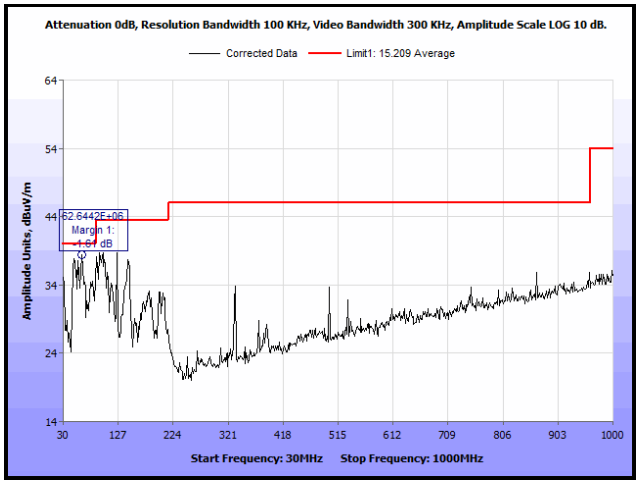
Plot 184. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



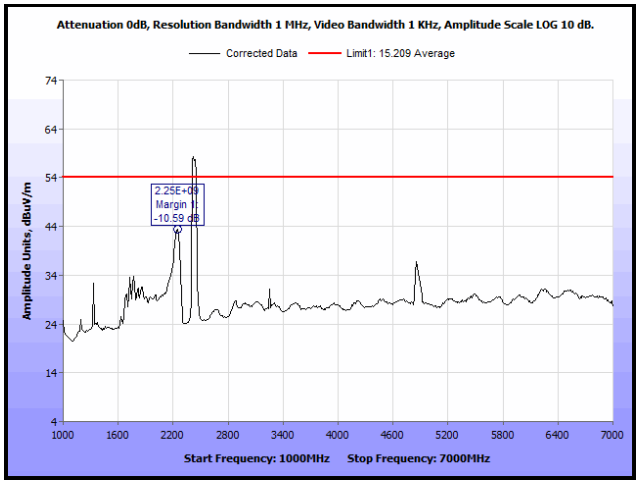
Plot 185. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Average, 13 dBi Antenna



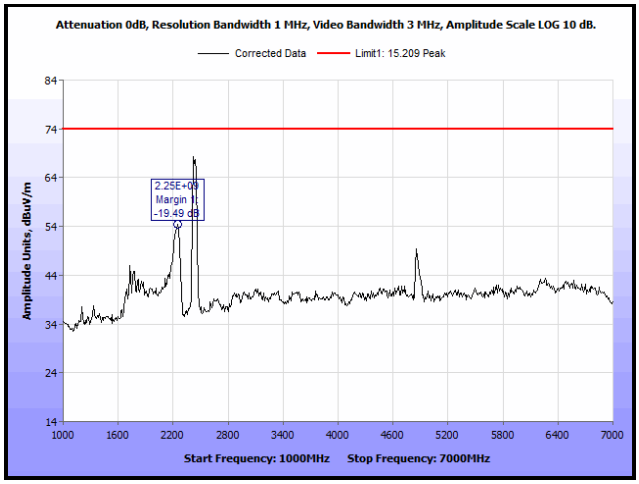
Plot 186. Radiated Spurious Emissions, Low Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Peak, 13 dBi Antenna



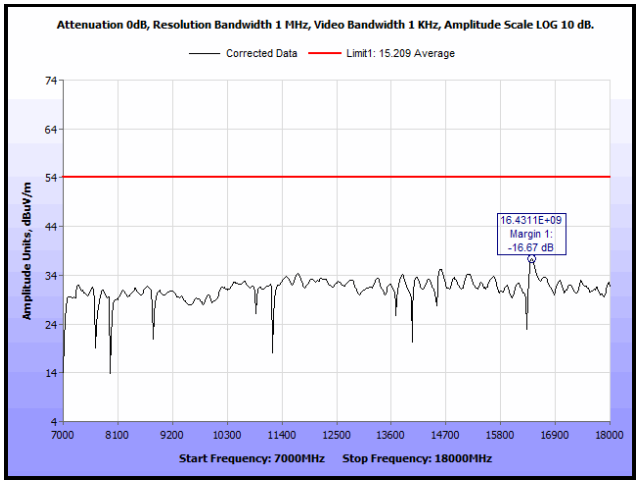
Plot 187. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 30 MHz – 1 GHz, 13 dBi Antenna



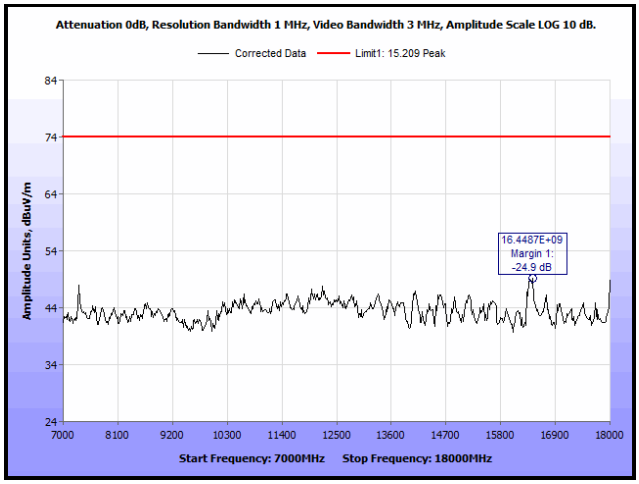
Plot 188. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Average, 13 dBi Antenna



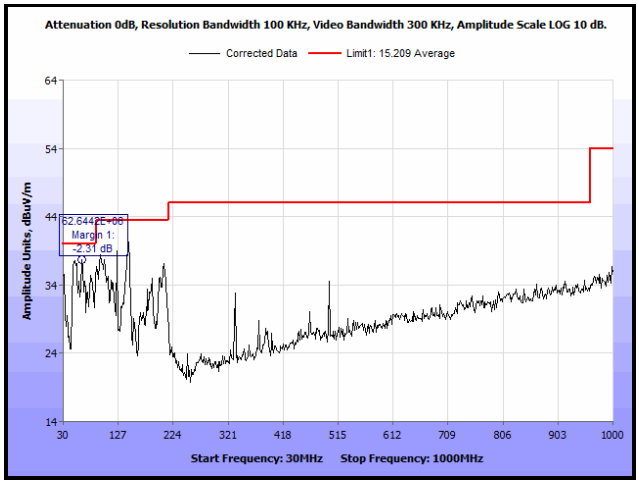
Plot 189. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



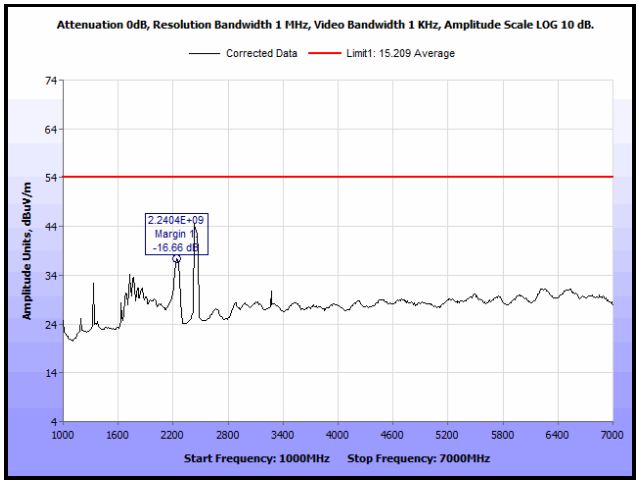
Plot 190. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Average, 13 dBi Antenna



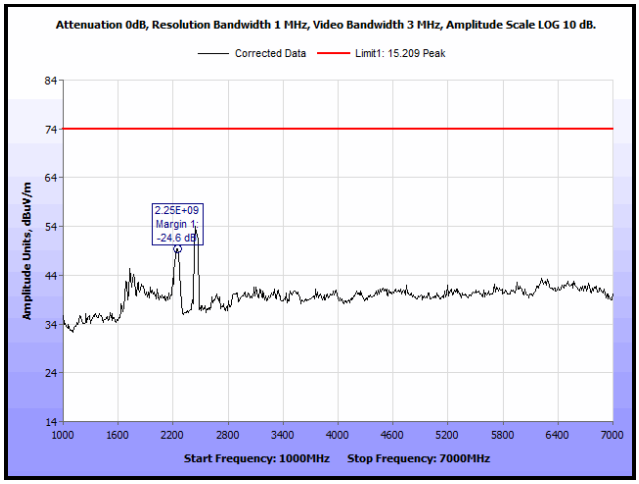
Plot 191. Radiated Spurious Emissions, Mid Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Peak, 13 dBi Antenna



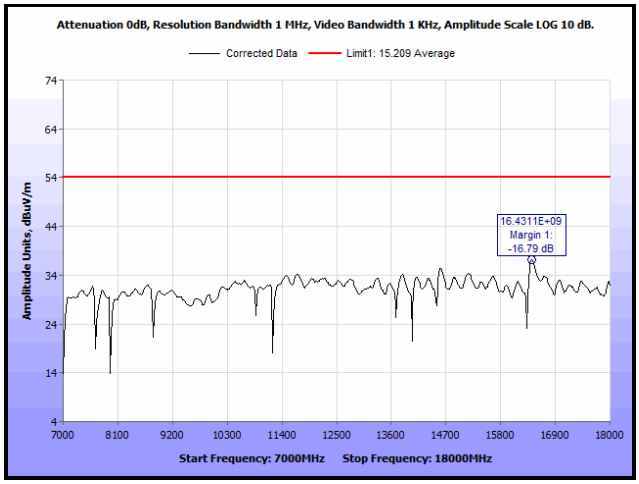
Plot 192. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 30 MHz – 1 GHz, 13 dBi Antenna



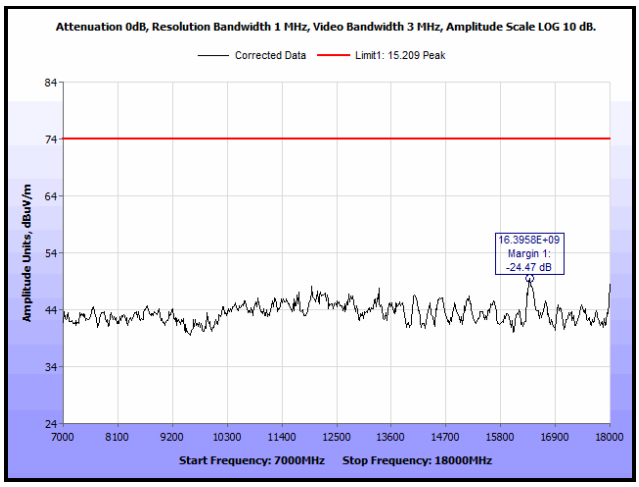
Plot 193. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Average, 13 dBi Antenna



Plot 194. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 1 GHz – 7 GHz, Peak, 13 dBi Antenna



Plot 195. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Average, 13 dBi Antenna

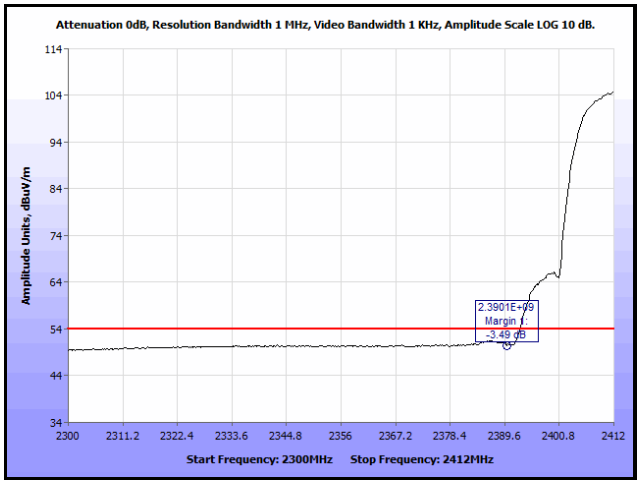


Plot 196. Radiated Spurious Emissions, High Channel, 802.11n 40 MHz, 7 GHz – 18 GHz, Peak, 13 dBi Antenna

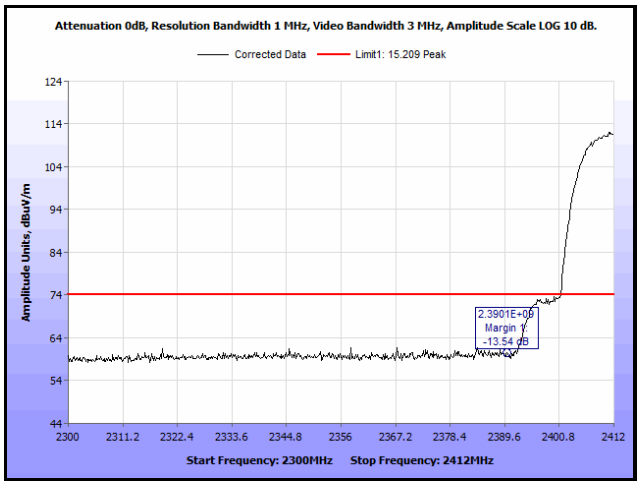
Radiated Band Edge Measurements

Test Procedures: The transmitter was turned on. Both ports were transmitting at the same time. Measurements were performed of the low, mid, and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.

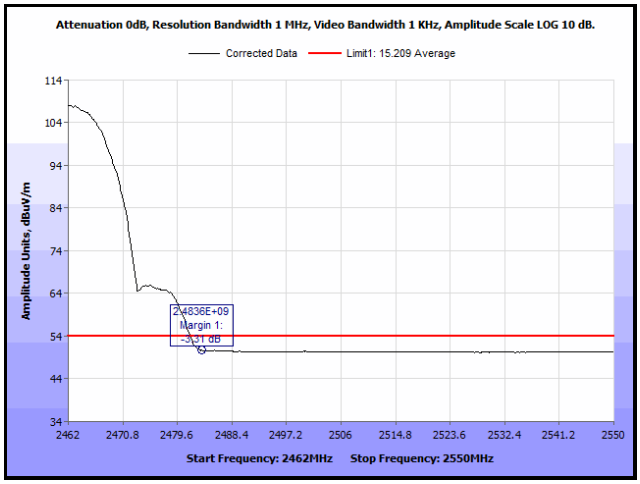
Radiated Band Edge Measurements, 802.11b, 9 dBi Antenna



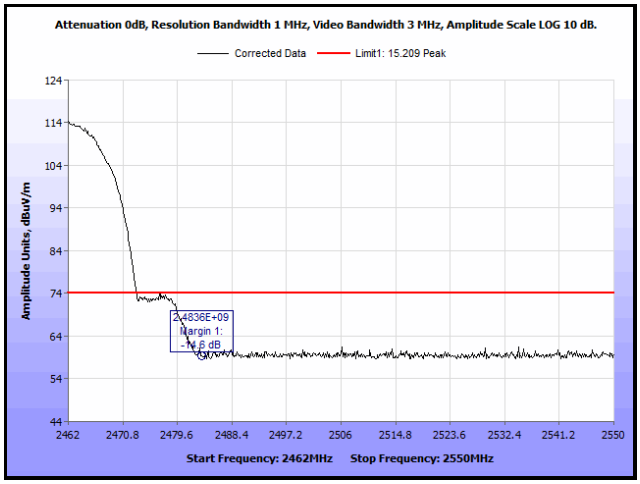
Plot 197. Radiated Restricted Band Edge, Low Channel, 802.11b, Average, 9 dBi Antenna



Plot 198. Radiated Restricted Band Edge, Low Channel, 802.11b, Peak, 9 dBi Antenna

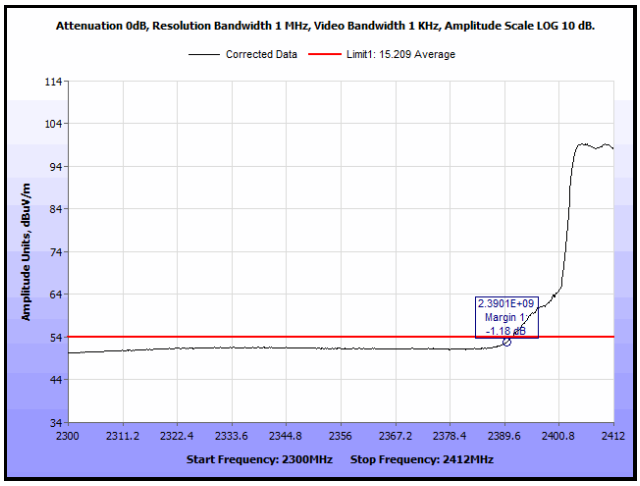


Plot 199. Radiated Restricted Band Edge, High Channel, 802.11b, Average, 9 dBi Antenna

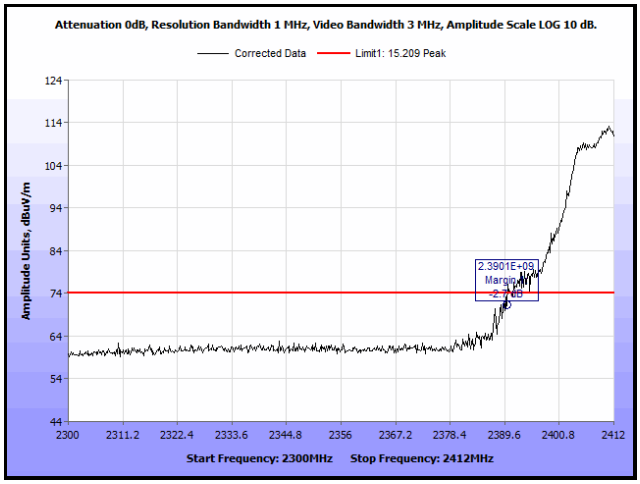


Plot 200. Radiated Restricted Band Edge, High Channel, 802.11b, Peak, 9 dBi Antenna

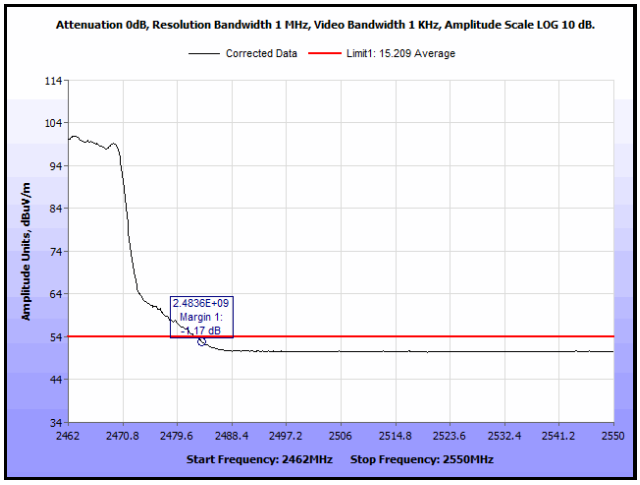
Radiated Band Edge Measurements, 802.11g, 9 dBi Antenna



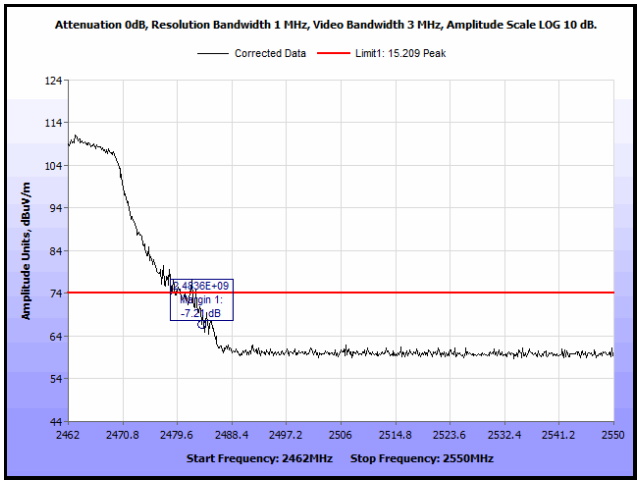
Plot 201. Radiated Restricted Band Edge, Low Channel, 802.11g, Average, 9 dBi Antenna



Plot 202. Radiated Restricted Band Edge, Low Channel, 802.11g, Peak, 9 dBi Antenna

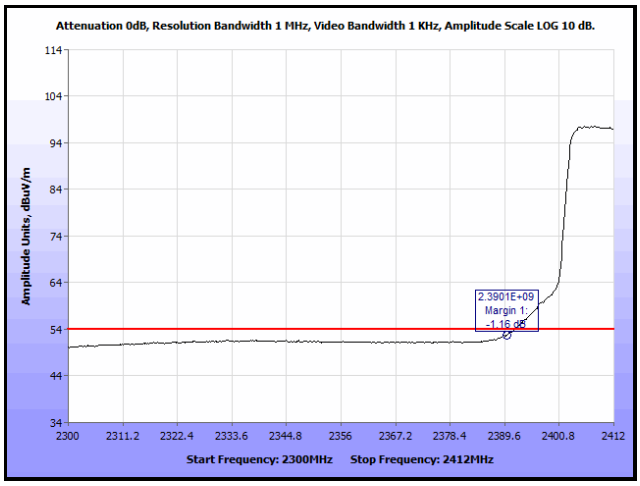


Plot 203. Radiated Restricted Band Edge, High Channel, 802.11g, Average, 9 dBi Antenna

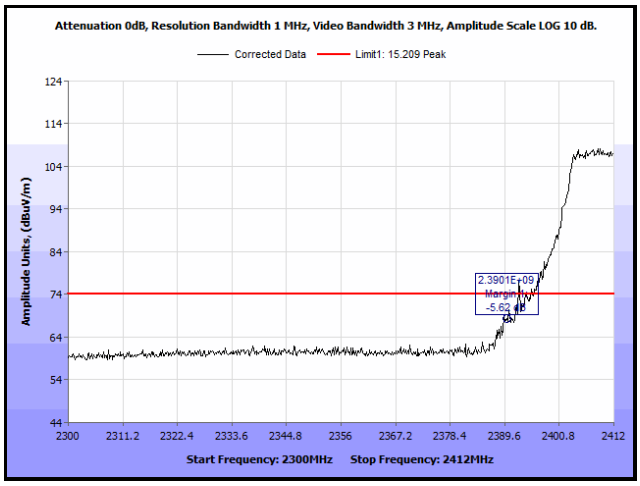


Plot 204. Radiated Restricted Band Edge, High Channel, 802.11g, Peak, 9 dBi Antenna

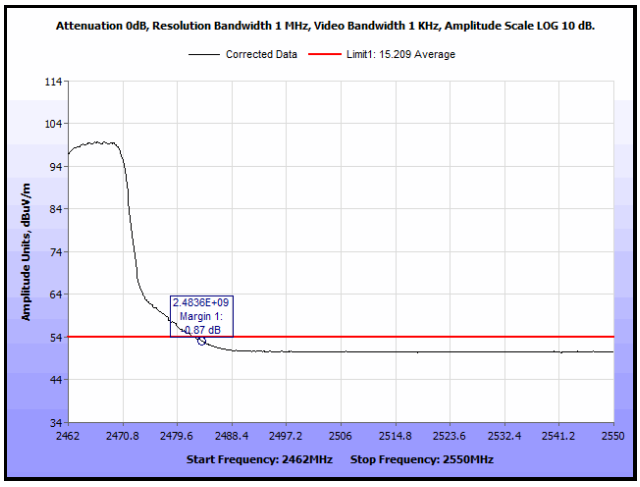
Radiated Band Edge Measurements, 802.11n 20 MHz, 9 dBi Antenna



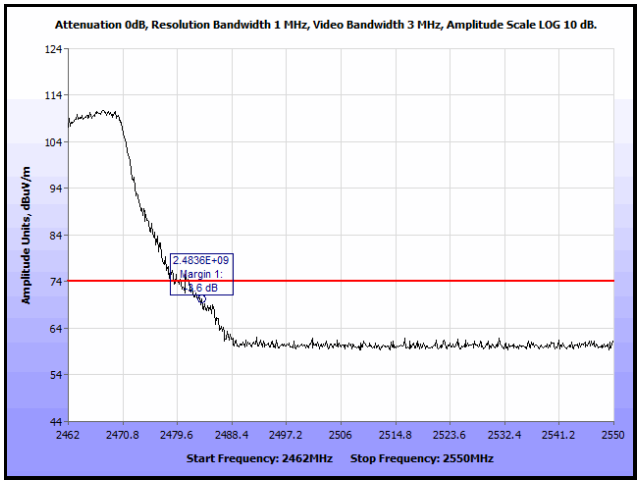
Plot 205. Radiated Restricted Band Edge, Low Channel, 802.11n 20 MHz, Average, 9 dBi Antenna



Plot 206. Radiated Restricted Band Edge, Low Channel, 802.11n 20 MHz, Peak, 9 dBi Antenna

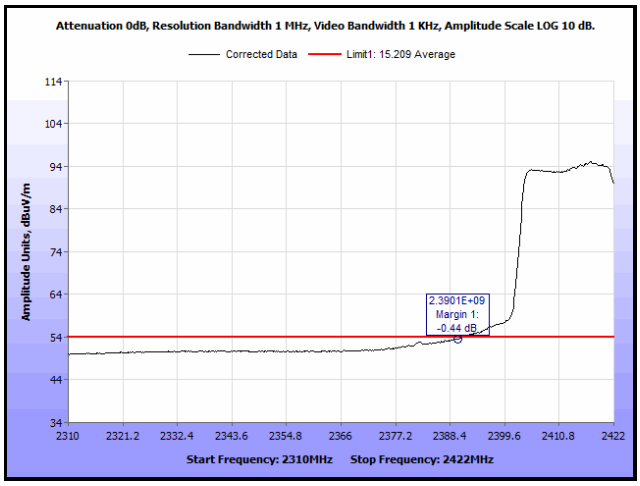


Plot 207. Radiated Restricted Band Edge, High Channel, 802.11n 20 MHz, Average, 9 dBi Antenna

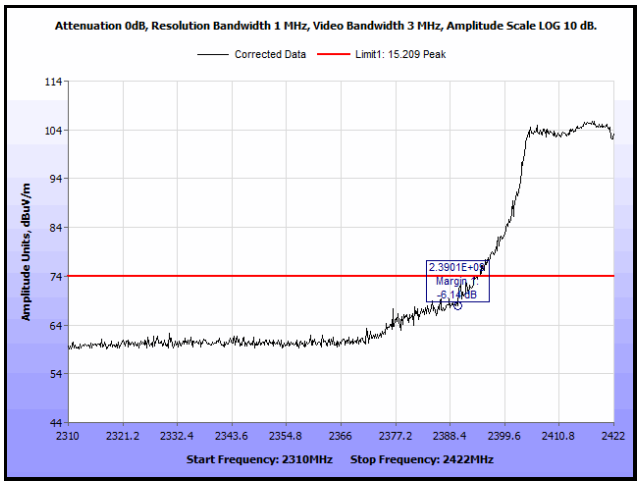


Plot 208. Radiated Restricted Band Edge, High Channel, 802.11n 20 MHz, Peak, 9 dBi Antenna

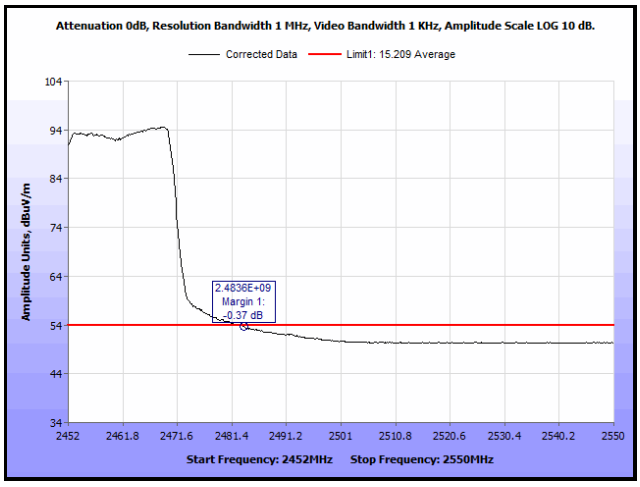
Radiated Band Edge Measurements, 802.11n 40 MHz, 9 dBi Antenna



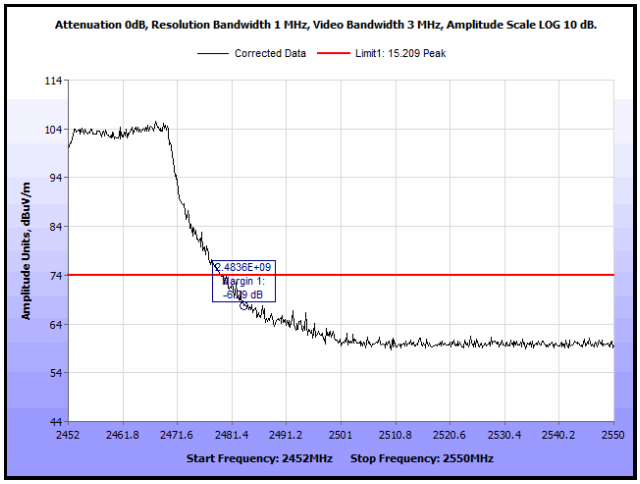
Plot 209. Radiated Restricted Band Edge, Low Channel, 802.11n 40 MHz, Average, 9 dBi Antenna



Plot 210. Radiated Restricted Band Edge, Low Channel, 802.11n 40 MHz, Peak, 9 dBi Antenna

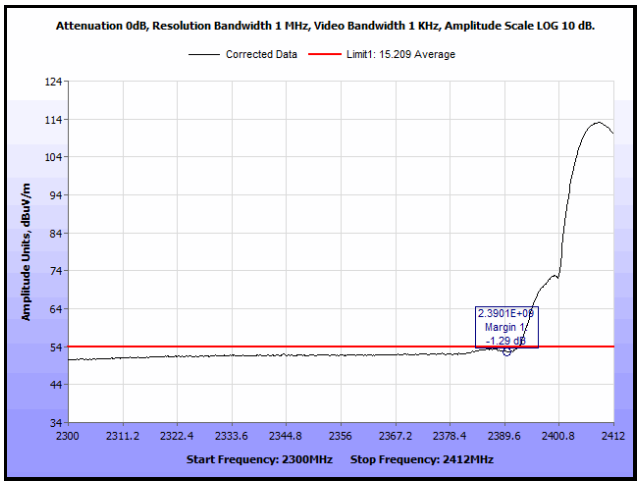


Plot 211. Radiated Restricted Band Edge, High Channel, 802.11n 40 MHz, Average, 9 dBi Antenna

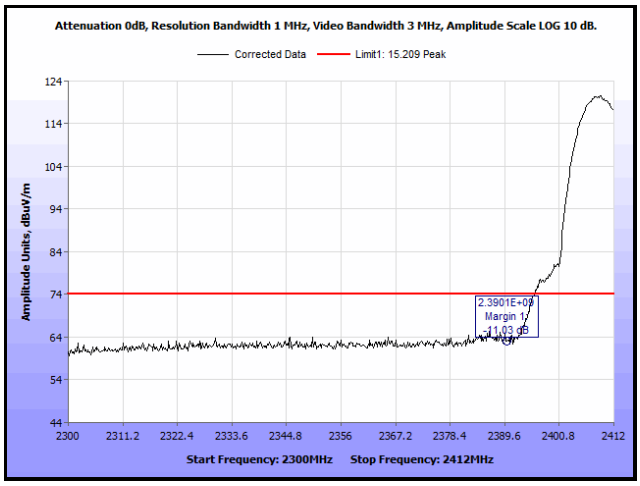


Plot 212. Radiated Restricted Band Edge, High Channel, 802.11n 40 MHz, Peak, 9 dBi Antenna

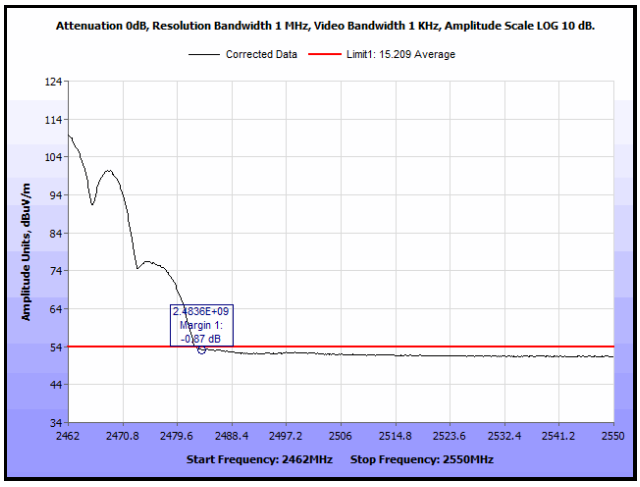
Radiated Band Edge Measurements, 802.11b, 13 dBi Antenna



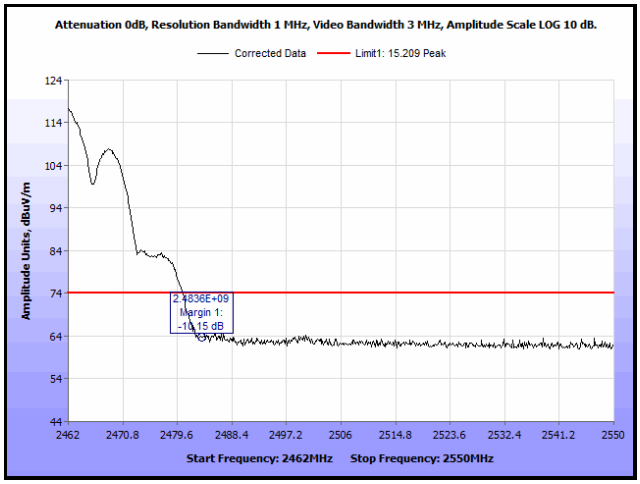
Plot 213. Radiated Restricted Band Edge, Low Channel, 802.11b, Average, 13 dBi Antenna



Plot 214. Radiated Restricted Band Edge, Low Channel, 802.11b, Peak, 13 dBi Antenna

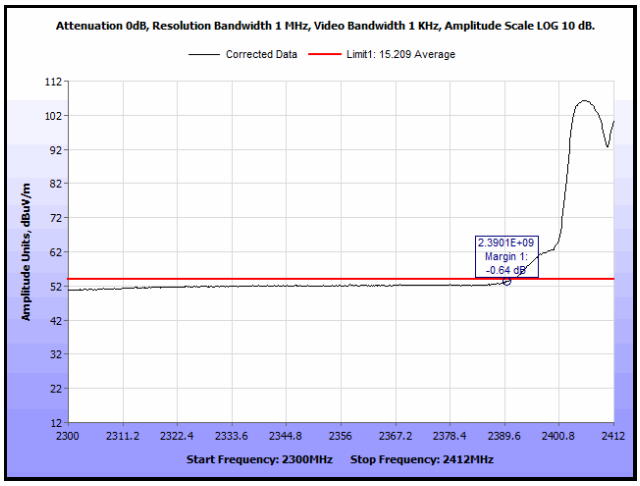


Plot 215. Radiated Restricted Band Edge, High Channel, 802.11b, Average, 13 dBi Antenna

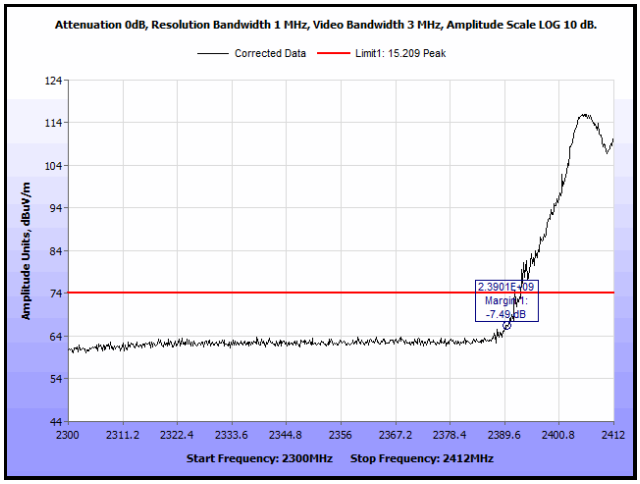


Plot 216. Radiated Restricted Band Edge, High Channel, 802.11b, Peak, 13 dBi Antenna

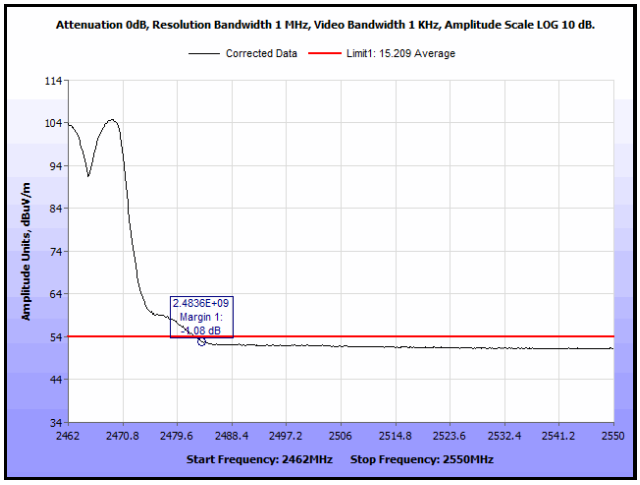
Radiated Band Edge Measurements, 802.11g, 13 dBi Antenna



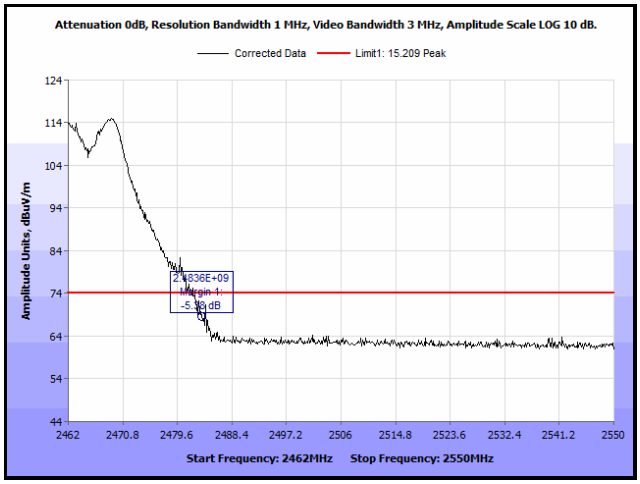
Plot 217. Radiated Restricted Band Edge, Low Channel, 802.11g, Average, 13 dBi Antenna



Plot 218. Radiated Restricted Band Edge, Low Channel, 802.11g, Peak, 13 dBi Antenna

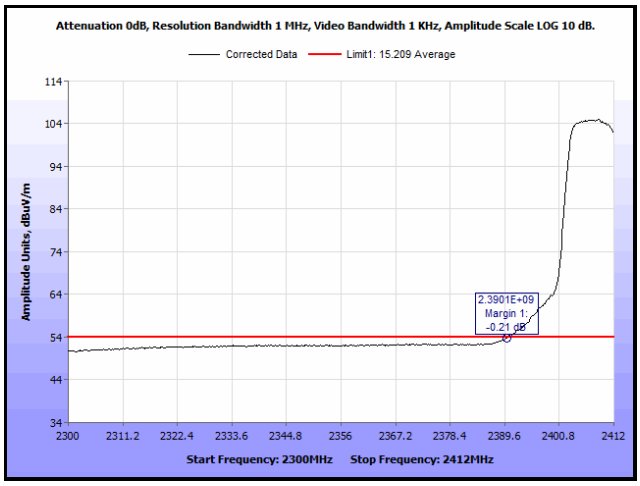


Plot 219. Radiated Restricted Band Edge, High Channel, 802.11g, Average, 13 dBi Antenna

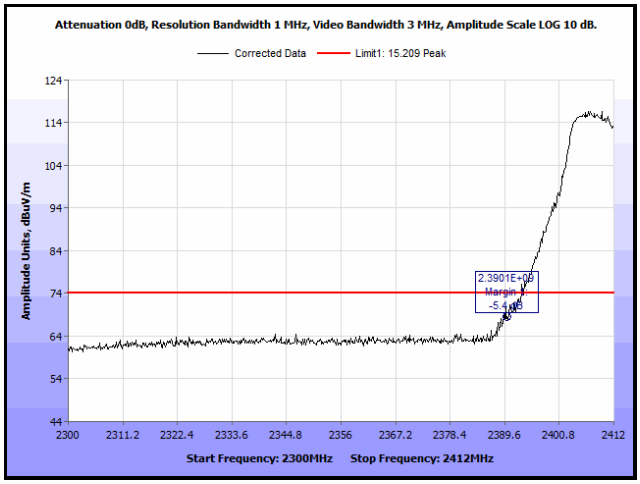


Plot 220. Radiated Restricted Band Edge, High Channel, 802.11g, Peak, 13 dBi Antenna

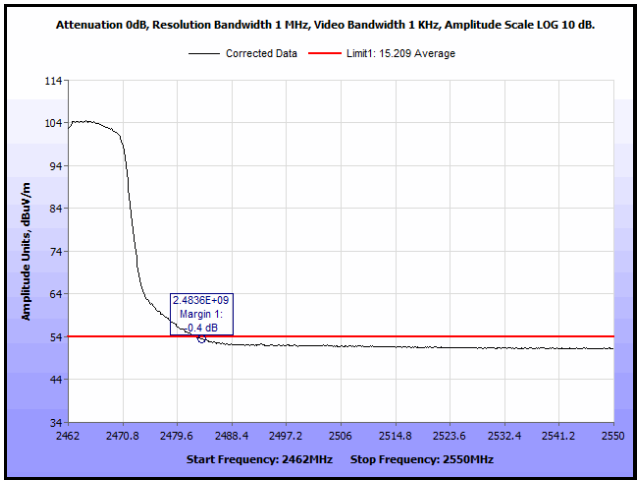
Radiated Band Edge Measurements, 802.11n 20 MHz, 13 dBi Antenna



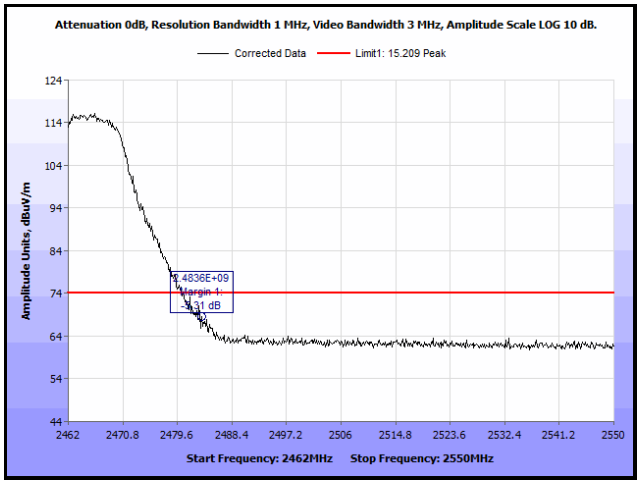
Plot 221. Radiated Restricted Band Edge, Low Channel, 802.11n 20 MHz, Average, 13 dBi Antenna



Plot 222. Radiated Restricted Band Edge, Low Channel, 802.11n 20 MHz, Peak, 13 dBi Antenna

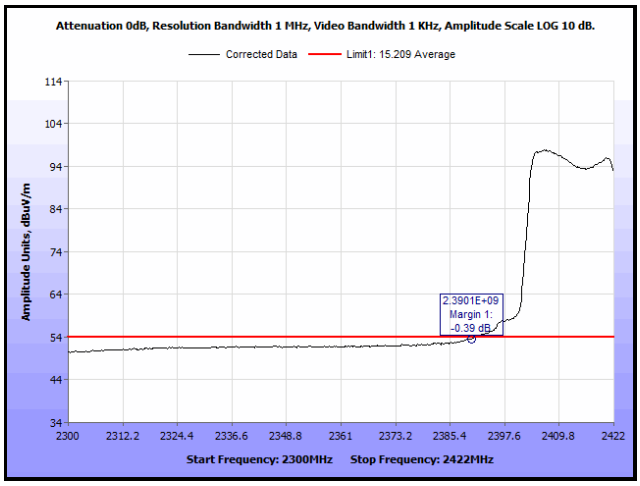


Plot 223. Radiated Restricted Band Edge, High Channel, 802.11n 20 MHz, Average, 13 dBi Antenna

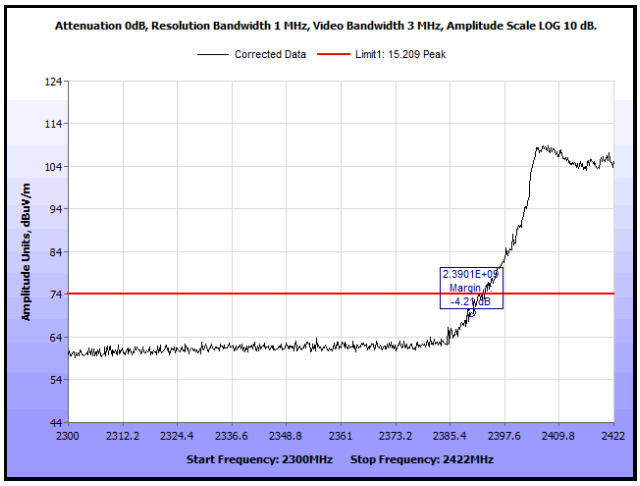


Plot 224. Radiated Restricted Band Edge, High Channel, 802.11n 20 MHz, Peak, 13 dBi Antenna

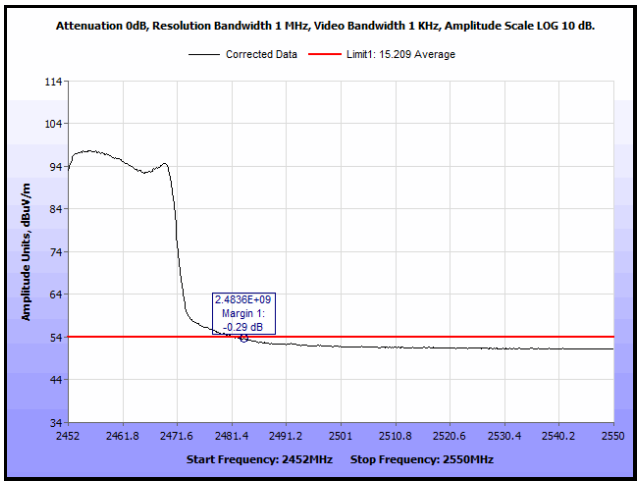
Radiated Band Edge Measurements, 802.11n 40 MHz, 13 dBi Antenna



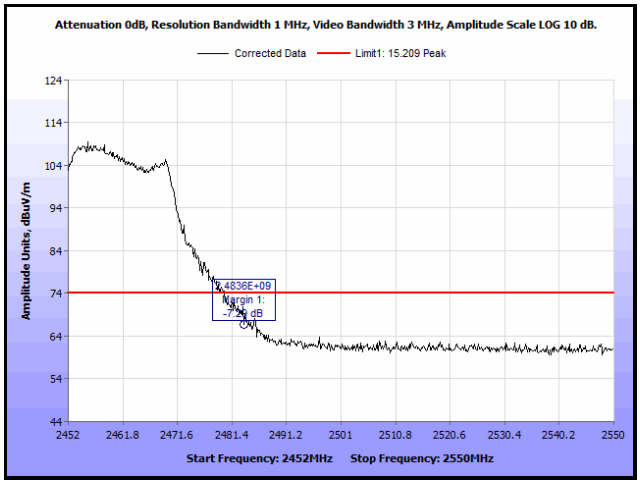
Plot 225. Radiated Restricted Band Edge, Low Channel, 802.11n 40 MHz, Average, 13 dBi Antenna



Plot 226. Radiated Restricted Band Edge, Low Channel, 802.11n 40 MHz, Peak, 13 dBi Antenna



Plot 227. Radiated Restricted Band Edge, High Channel, 802.11n 40 MHz, Average, 13 dBi Antenna



Plot 228. Radiated Restricted Band Edge, High Channel, 802.11n 40 MHz, Peak, 13 dBi Antenna

Radiated Spurious Emissions Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(d) RF Conducted Spurious Emissions Requirements and Band Edge

Test Requirement: **15.247(d)** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Procedure: For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

See following pages for detailed test results with RF Conducted Spurious Emissions.

Test Results: The EUT was compliant with the Conducted Spurious Emission limits of **§15.247(d)**.

Test Engineer(s): Kristine Cabrera

Test Date(s): 11/18/16

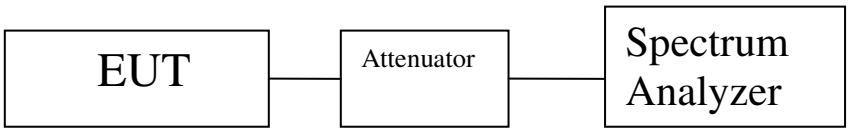
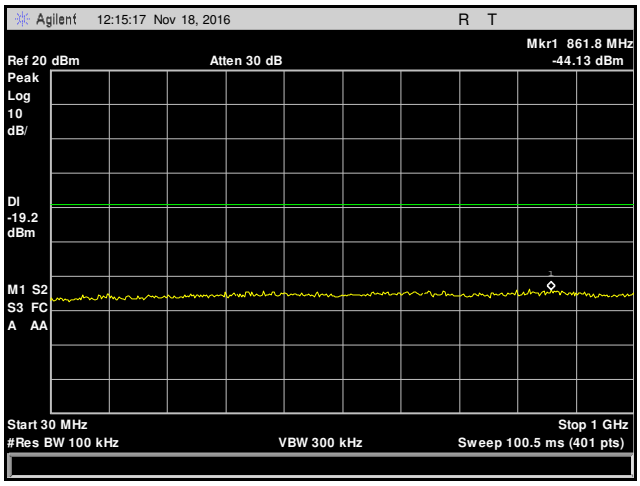
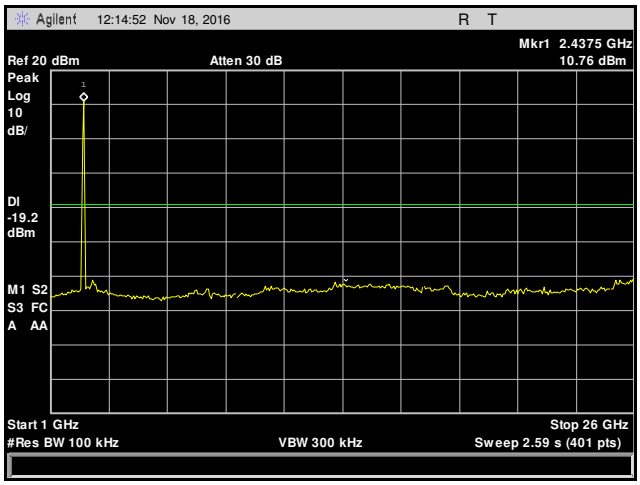


Figure 4. Block Diagram, Conducted Spurious Emissions Test Setup

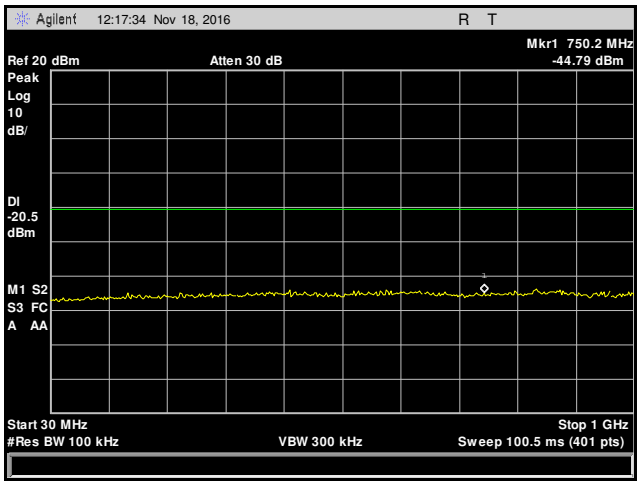
Conducted Spurious Emissions Test Results, 802.11b, Antenna 1, 9 dBi Antenna



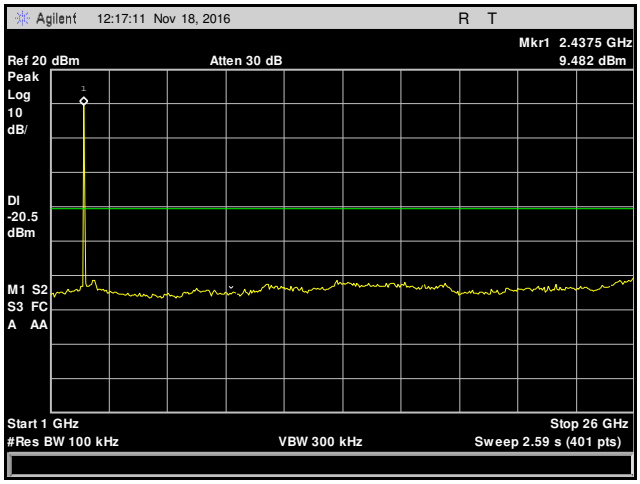
Plot 229. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11b, Antenna 1, 9 dBi Antenna



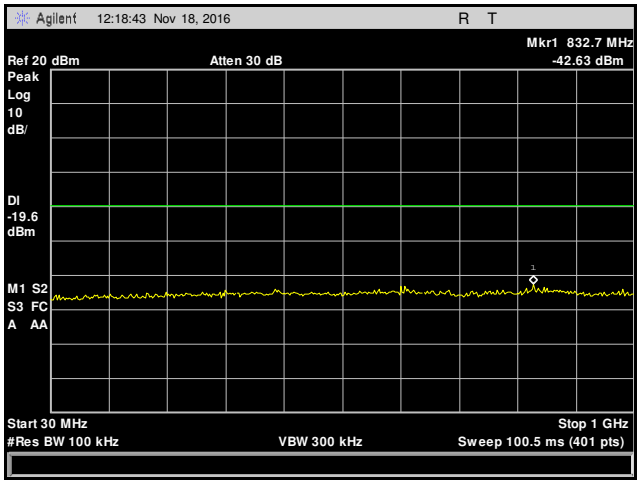
Plot 230. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11b, Antenna 1, 9 dBi Antenna



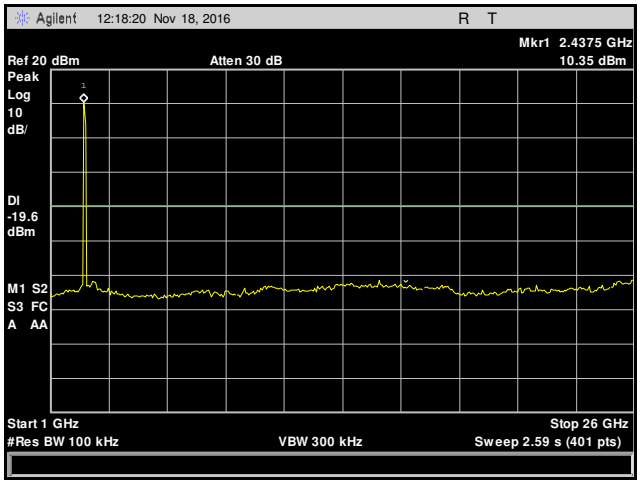
Plot 231. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11b, Antenna 1, 9 dBi Antenna



Plot 232. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11b, Antenna 1, 9 dBi Antenna

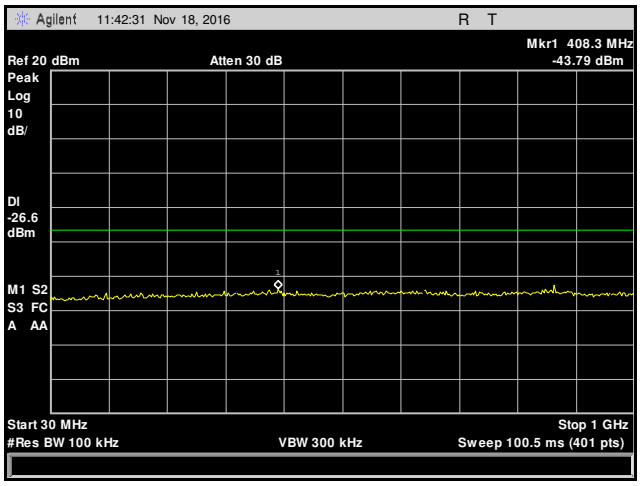


Plot 233. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11b, Antenna 1, 9 dBi Antenna

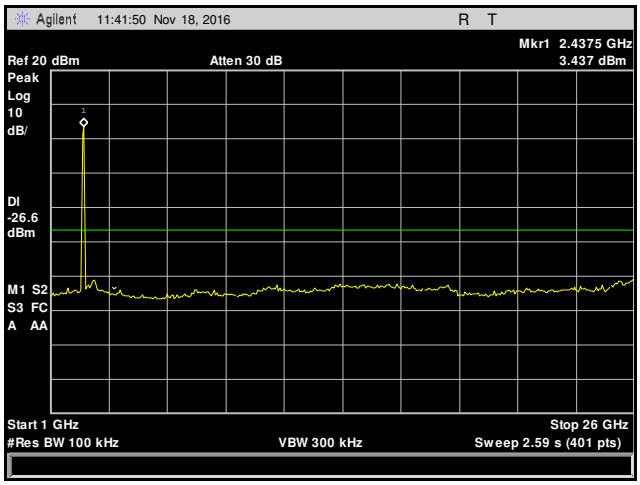


Plot 234. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11b, Antenna 1, 9 dBi Antenna

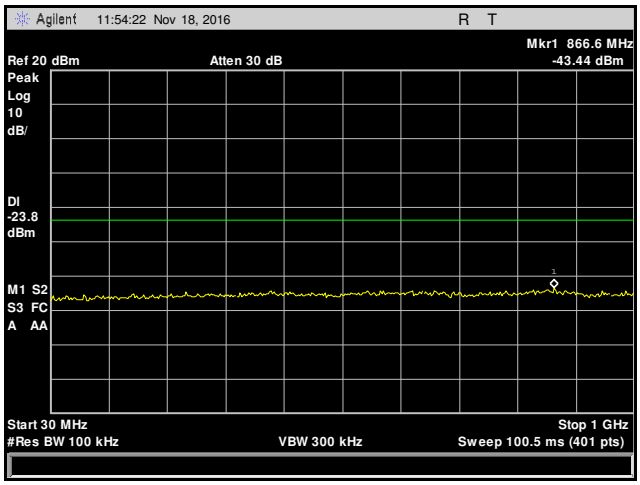
Conducted Spurious Emissions Test Results, 802.11g, Antenna 1, 9 dBi Antenna



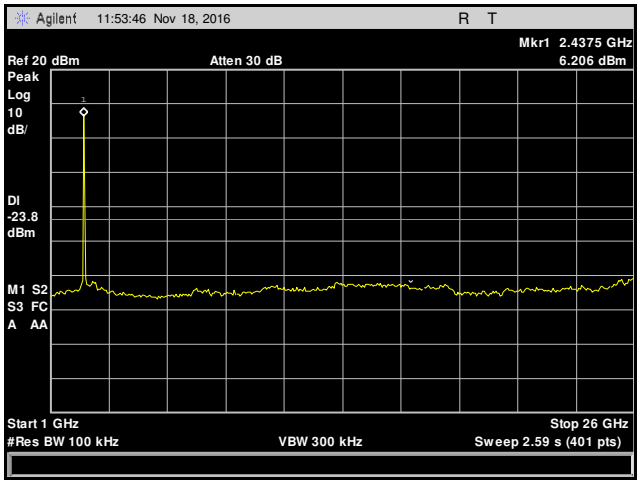
Plot 235. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11g, Antenna 1, 9 dBi Antenna



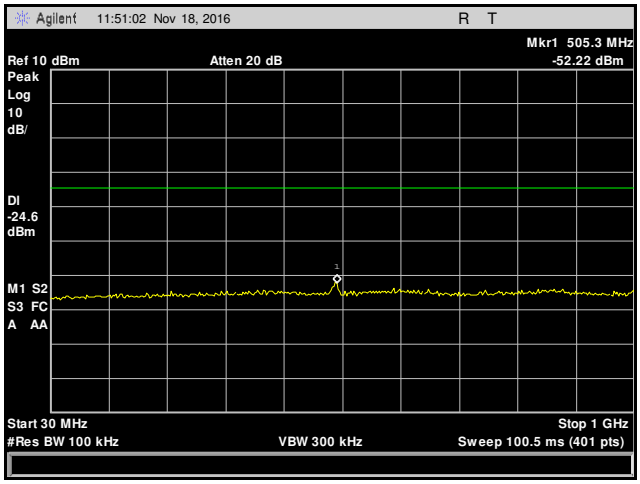
Plot 236. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11g, Antenna 1, 9 dBi Antenna



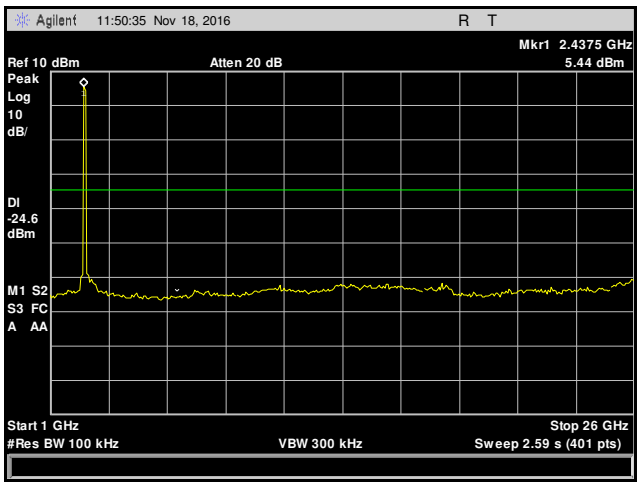
Plot 237. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11g, Antenna 1, 9 dBi Antenna



Plot 238. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11g, Antenna 1, 9 dBi Antenna

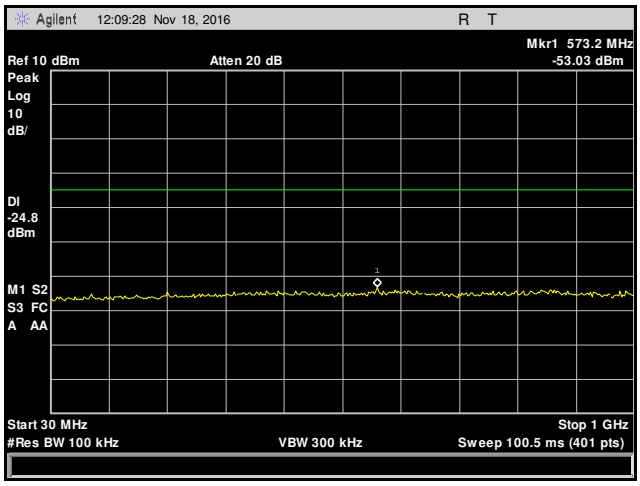


Plot 239. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11g, Antenna 1, 9 dBi Antenna

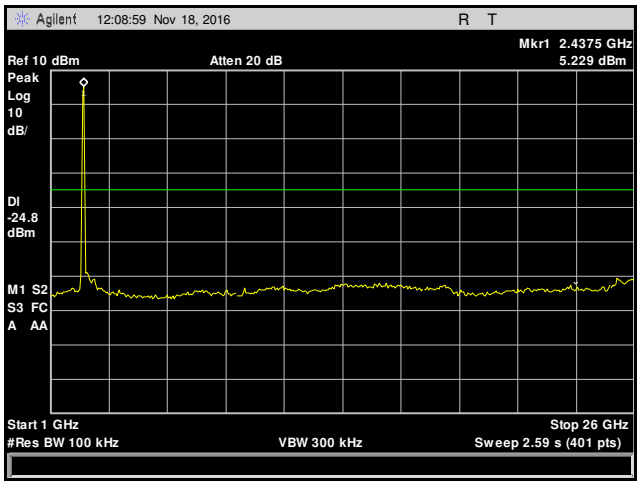


Plot 240. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11g, Antenna 1, 9 dBi Antenna

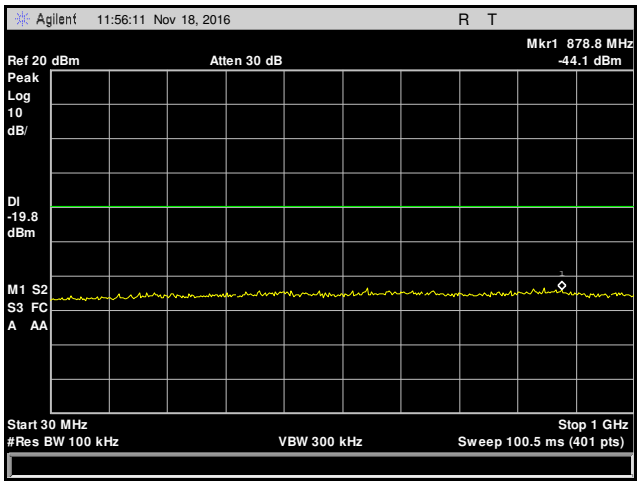
Conducted Spurious Emissions Test Results, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna



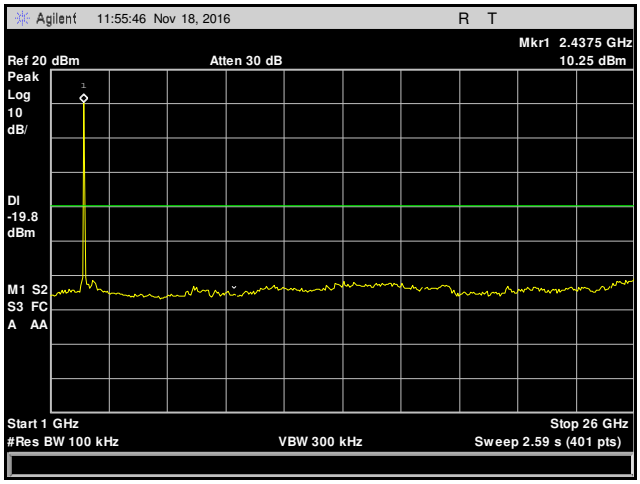
Plot 241. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna



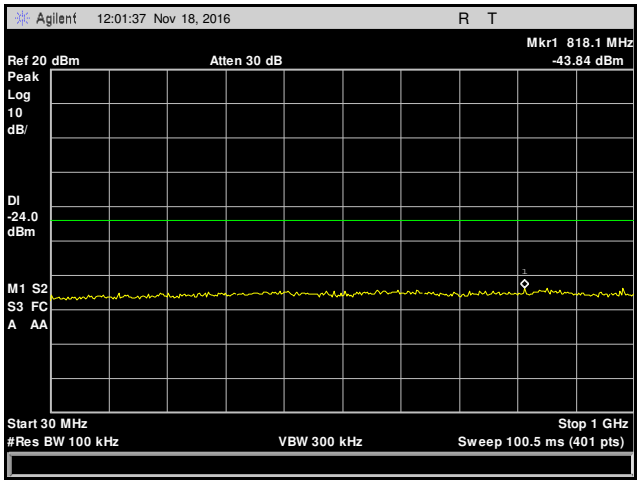
Plot 242. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna



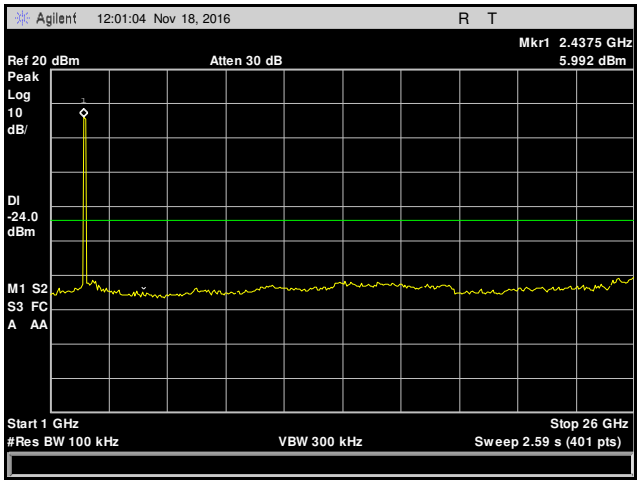
Plot 243. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna



Plot 244. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

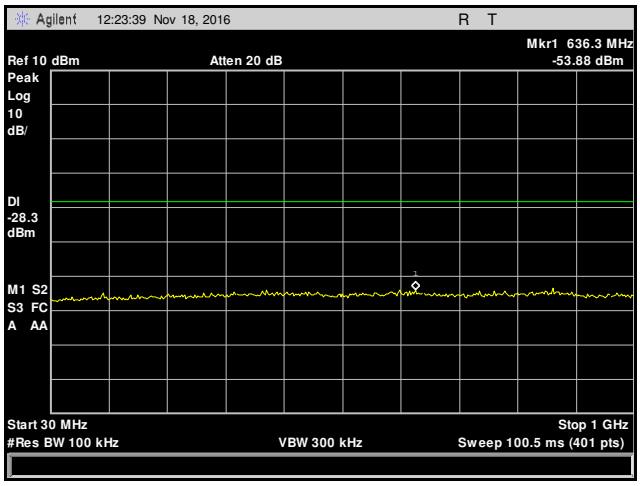


Plot 245. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

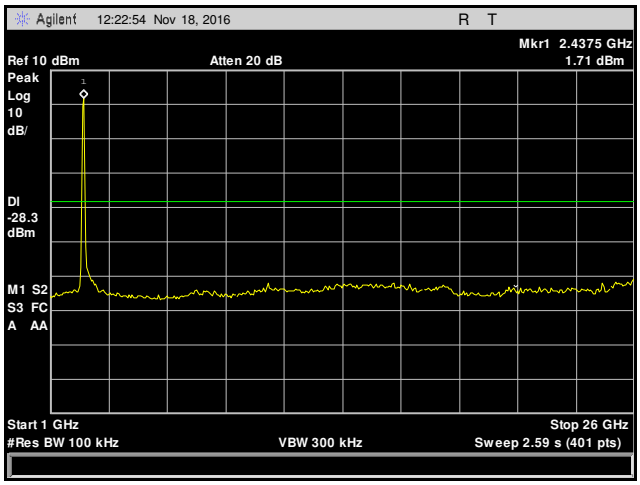


Plot 246. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

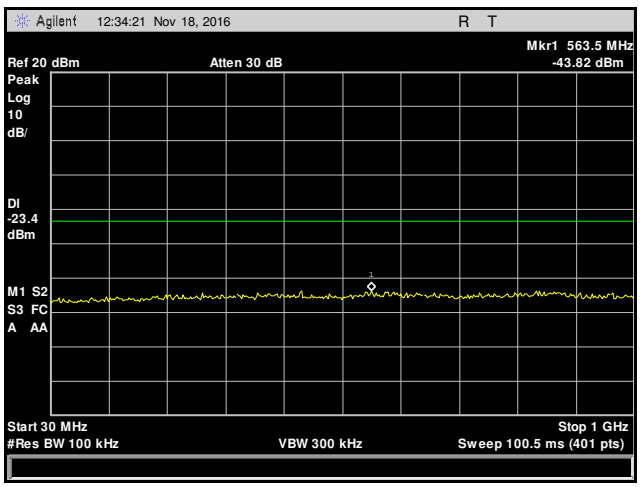
Conducted Spurious Emissions Test Results, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna



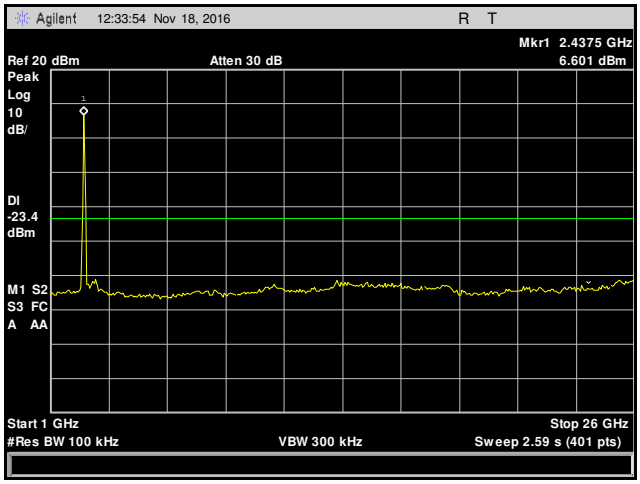
Plot 247. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna



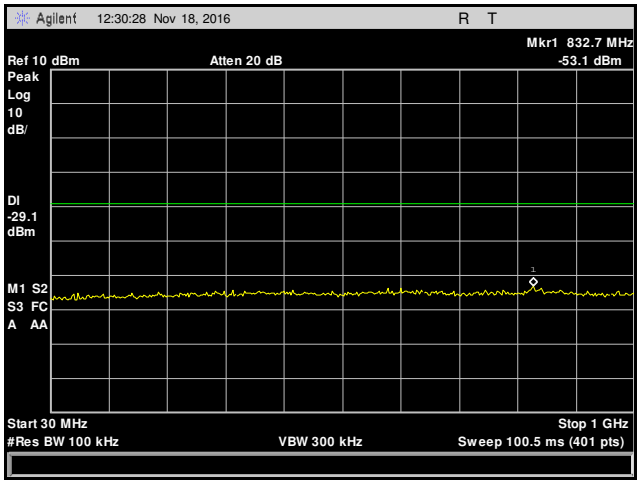
Plot 248. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna



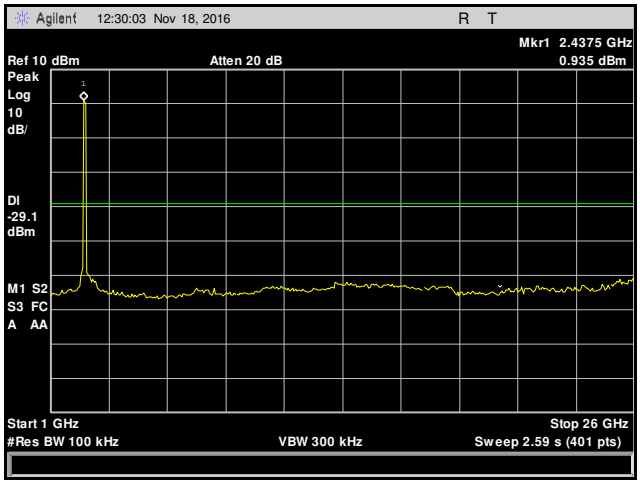
Plot 249. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna



Plot 250. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

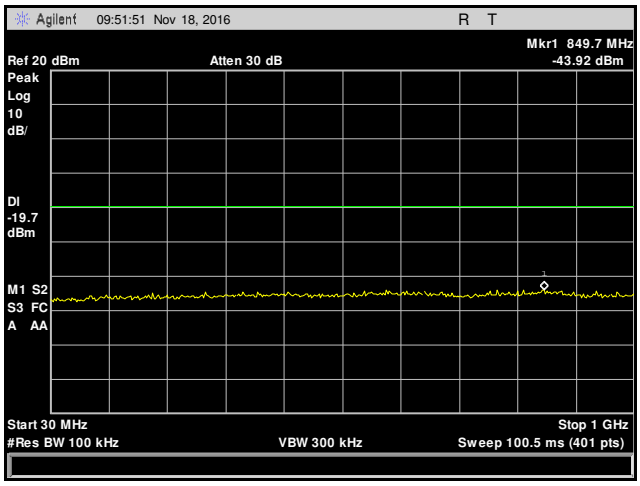


Plot 251. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

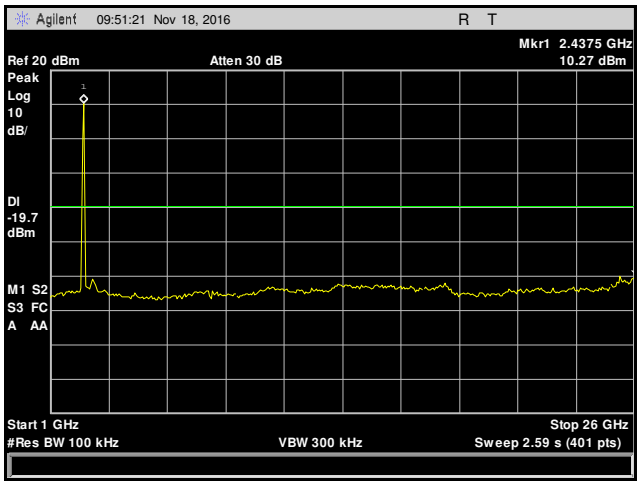


Plot 252. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

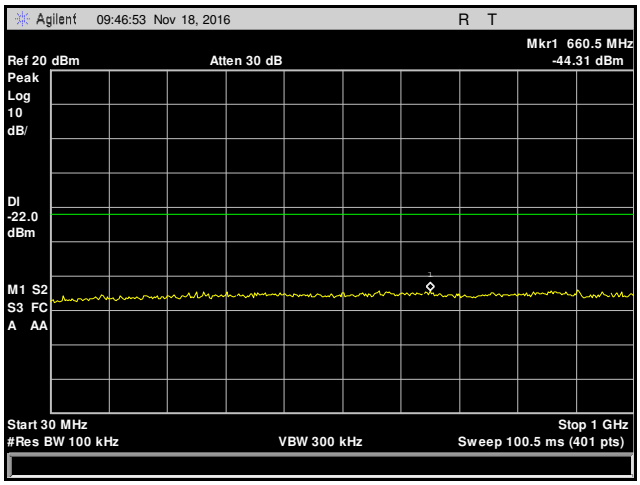
Conducted Spurious Emissions Test Results, 802.11b, Antenna 2, 9 dBi Antenna



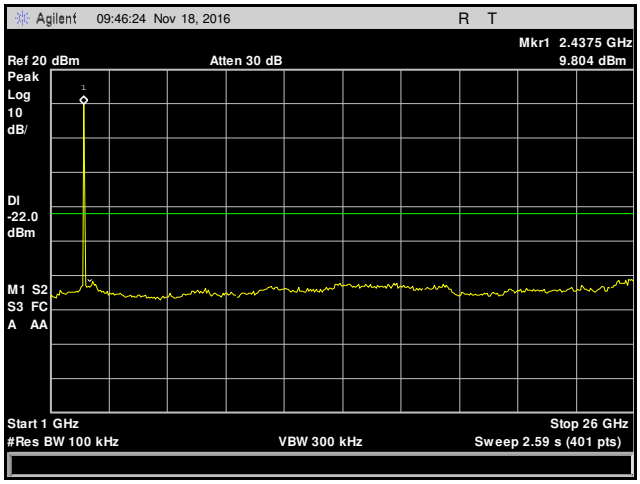
Plot 253. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11b, Antenna 2, 9 dBi Antenna



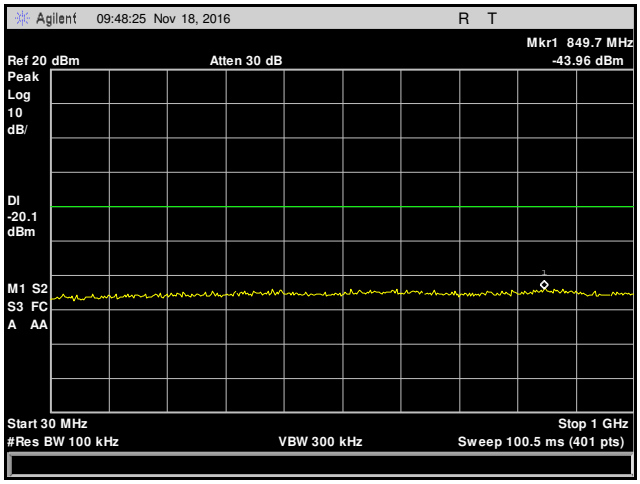
Plot 254. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11b, Antenna 2, 9 dBi Antenna



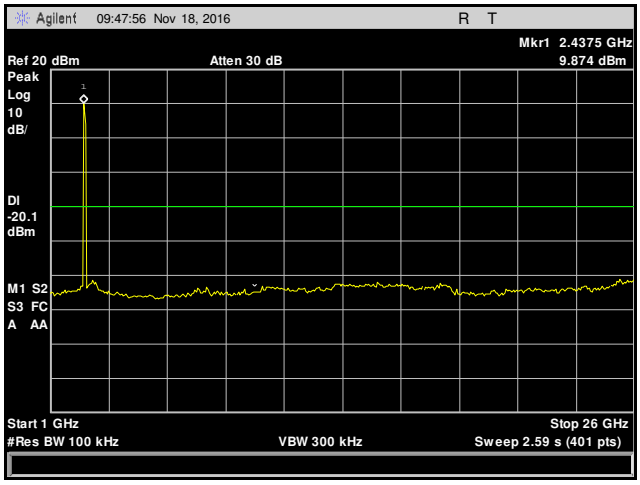
Plot 255. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11b, Antenna 2, 9 dBi Antenna



Plot 256. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11b, Antenna 2, 9 dBi Antenna

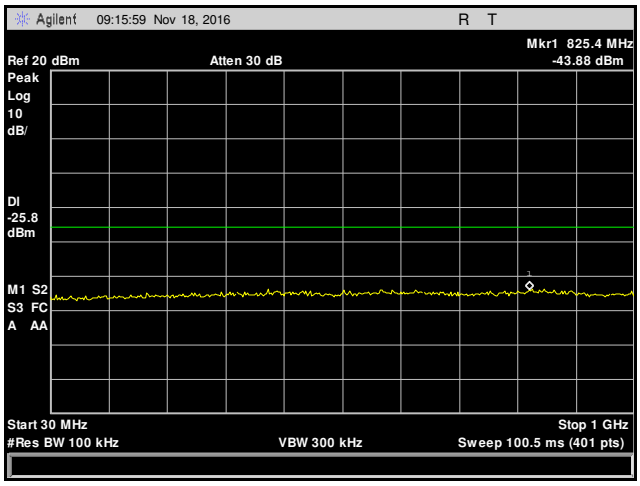


Plot 257. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11b, Antenna 2, 9 dBi Antenna

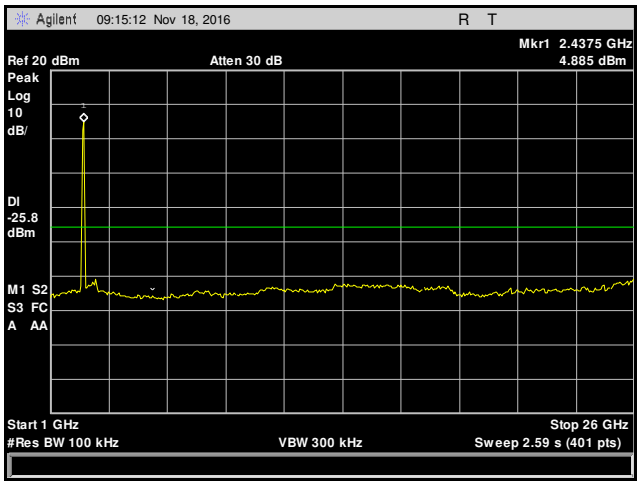


Plot 258. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11b, Antenna 2, 9 dBi Antenna

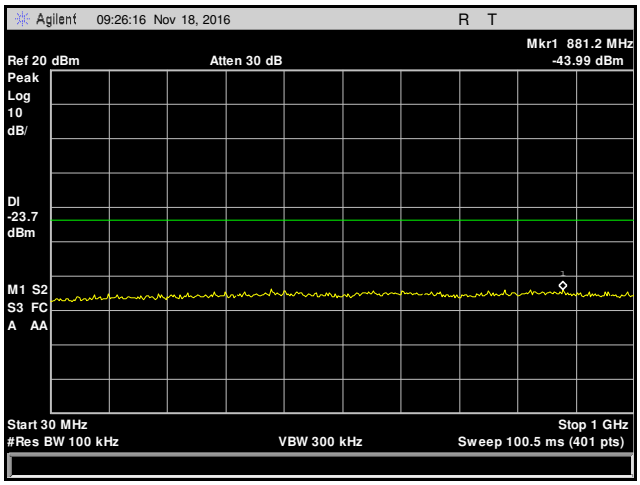
Conducted Spurious Emissions Test Results, 802.11g, Antenna 2, 9 dBi Antenna



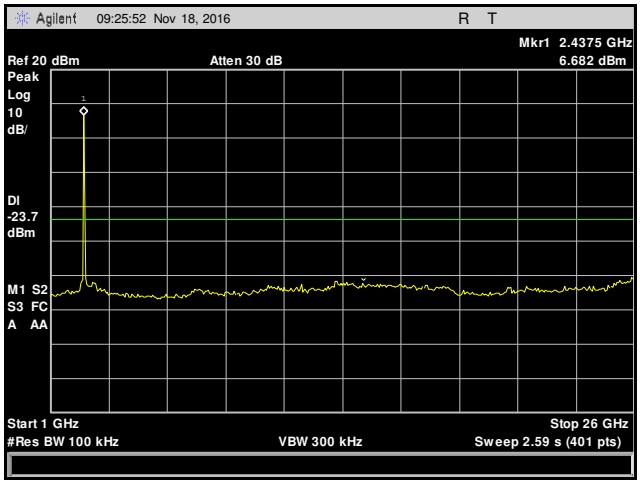
Plot 259. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11g, Antenna 2, 9 dBi Antenna



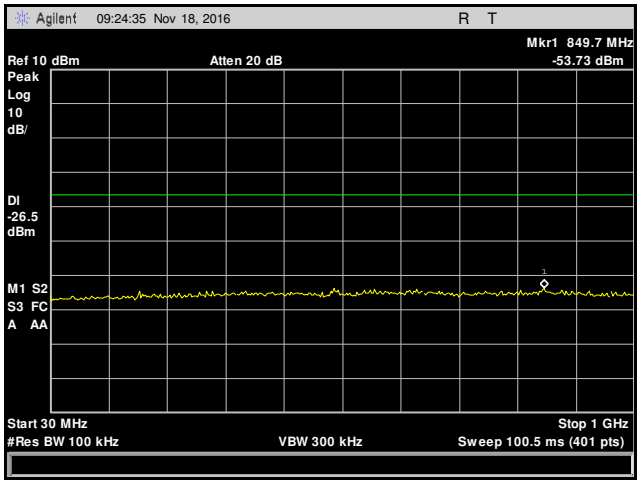
Plot 260. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11g, Antenna 2, 9 dBi Antenna



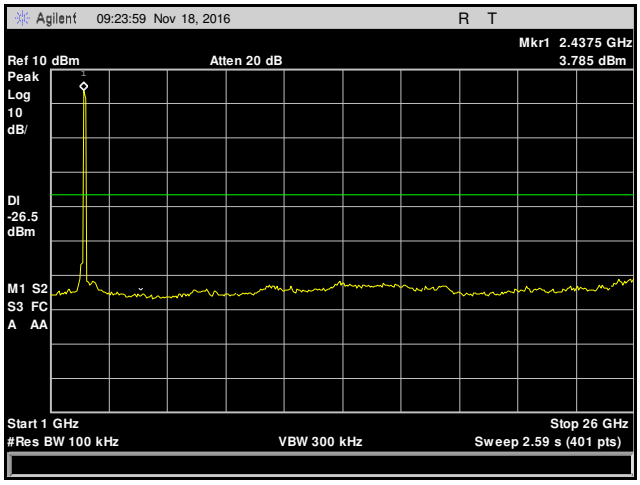
Plot 261. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11g, Antenna 2, 9 dBi Antenna



Plot 262. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11g, Antenna 2, 9 dBi Antenna

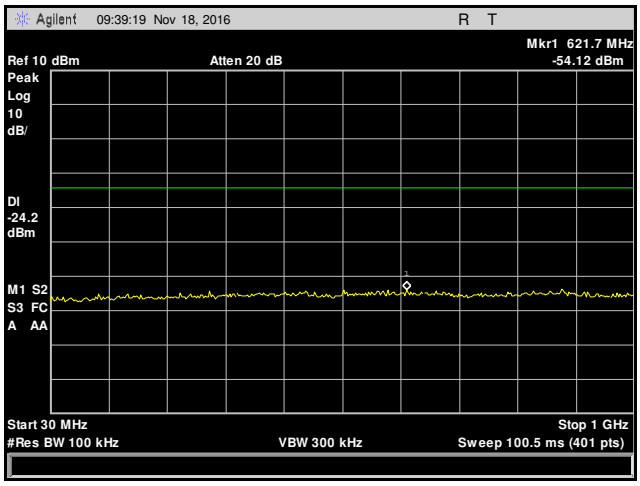


Plot 263. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11g, Antenna 2, 9 dBi Antenna

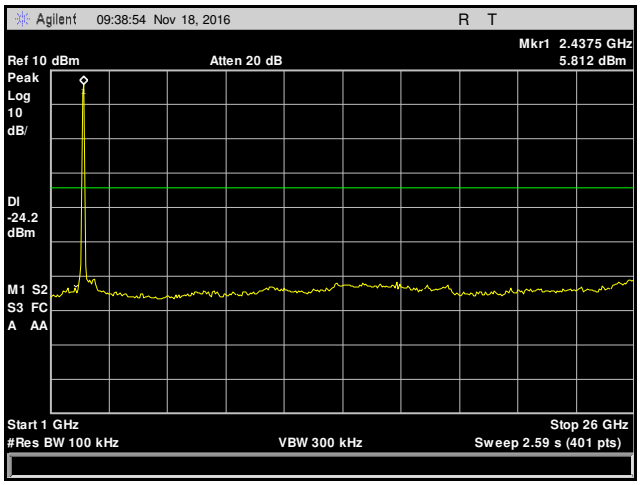


Plot 264. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11g, Antenna 2, 9 dBi Antenna

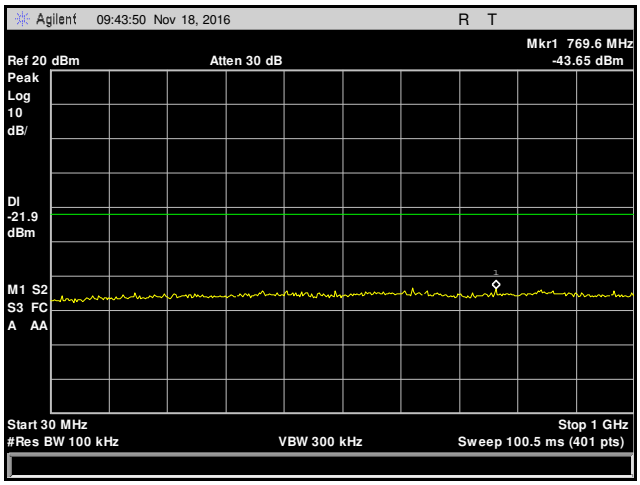
Conducted Spurious Emissions Test Results, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna



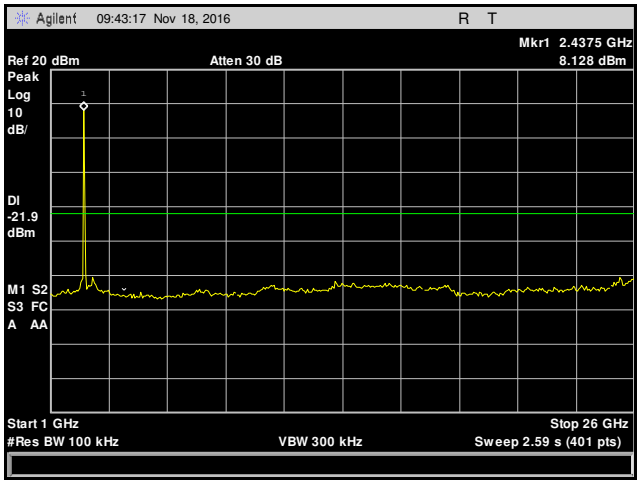
Plot 265. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna



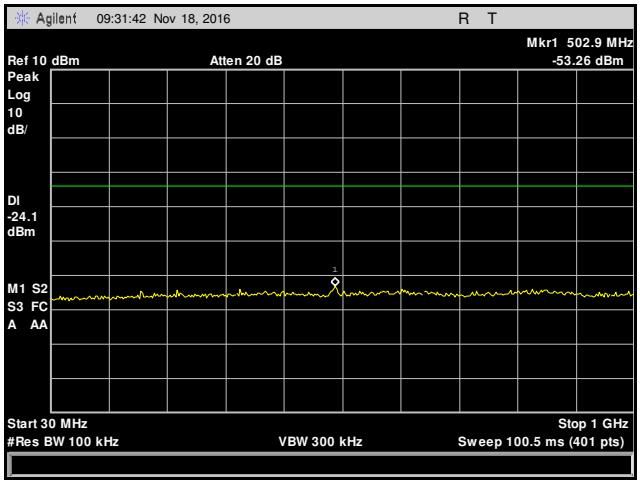
Plot 266. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna



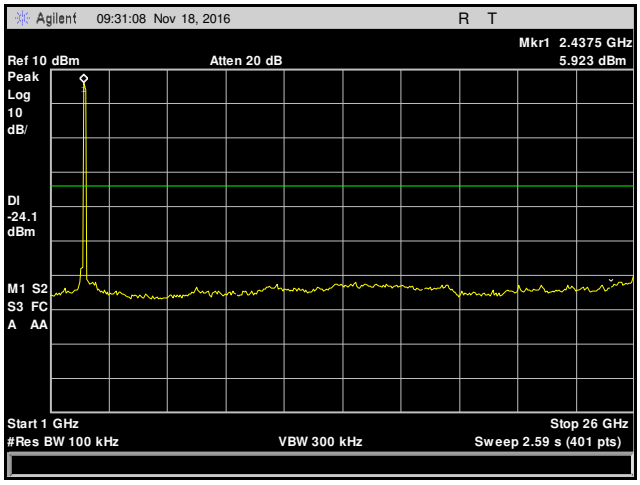
Plot 267. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna



Plot 268. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

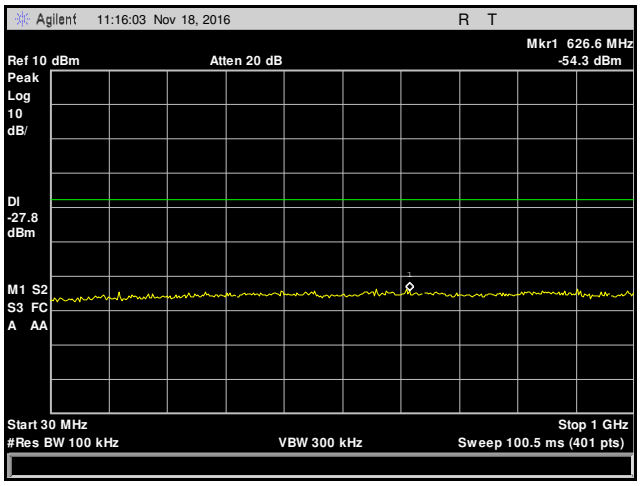


Plot 269. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

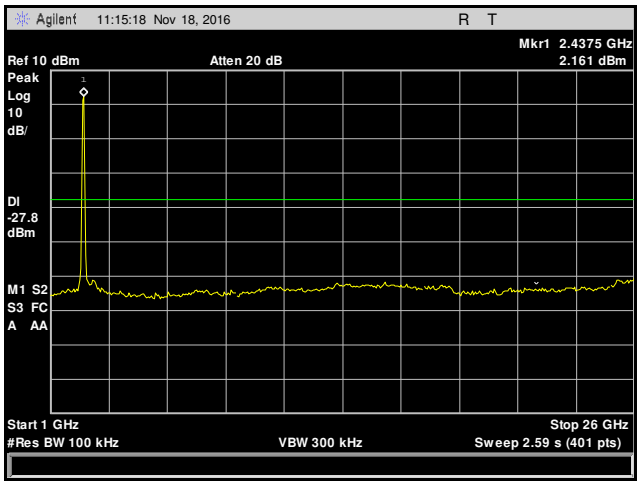


Plot 270. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

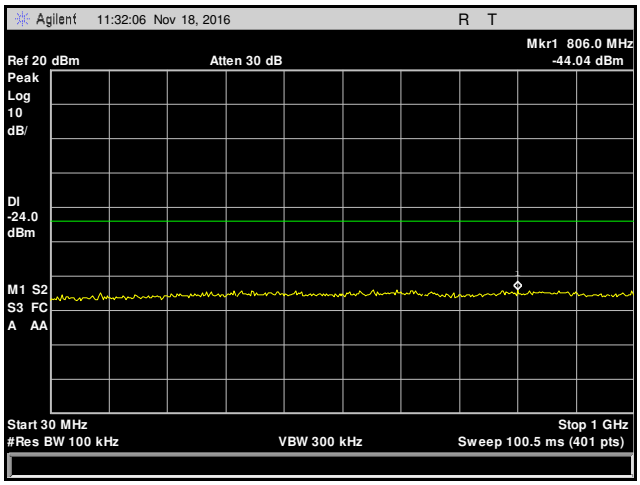
Conducted Spurious Emissions Test Results, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna



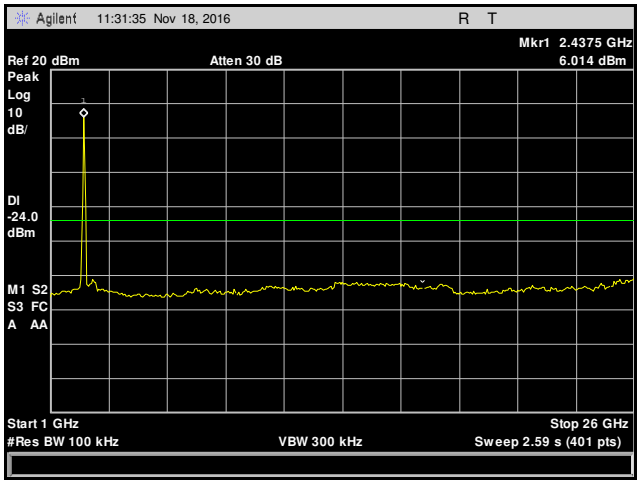
Plot 271. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna



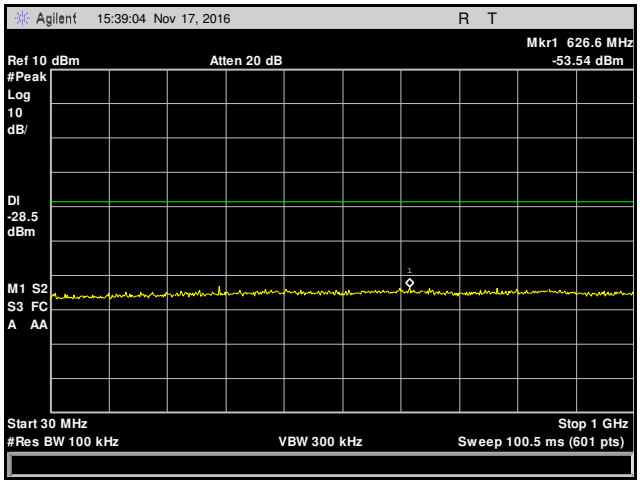
Plot 272. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna



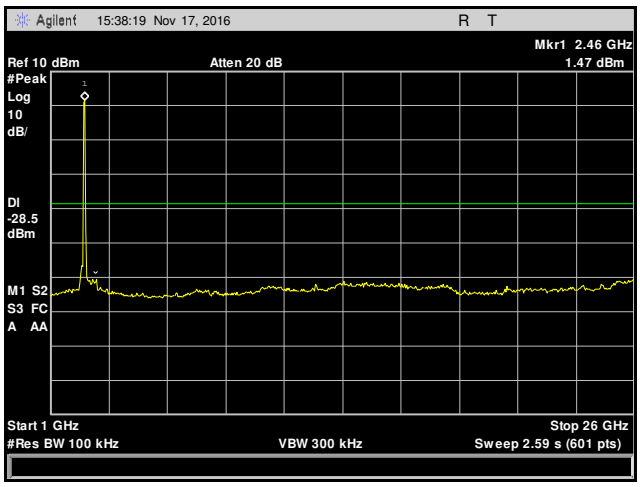
Plot 273. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna



Plot 274. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

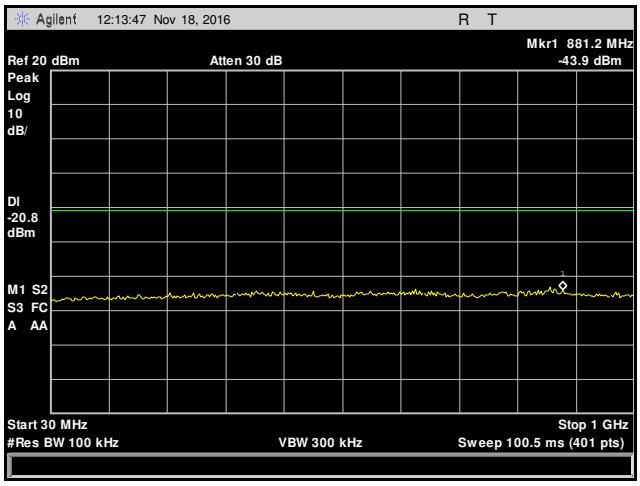


Plot 275. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

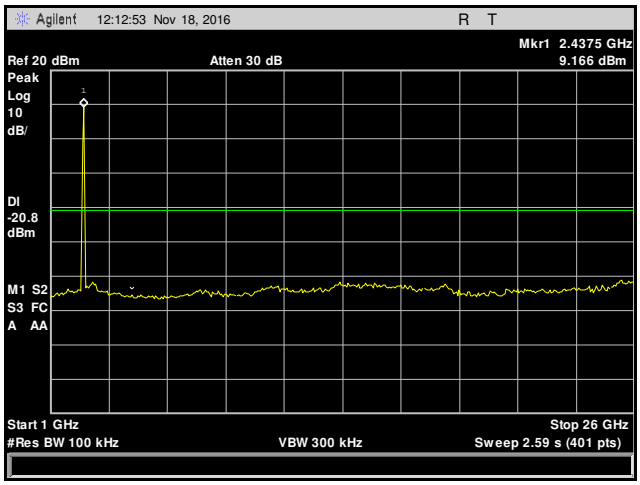


Plot 276. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

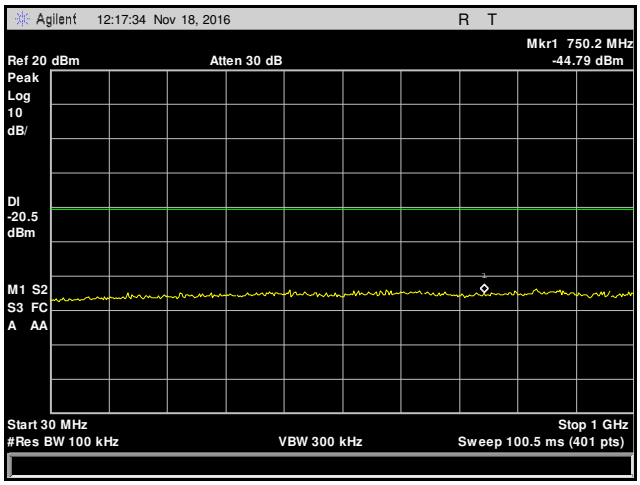
Conducted Spurious Emissions Test Results, 802.11b, Antenna 1, 13 dBi Antenna



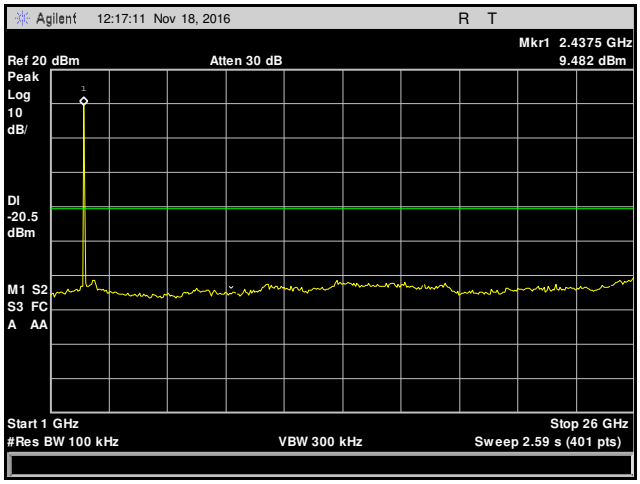
Plot 277. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11b, Antenna 1, 13 dBi Antenna



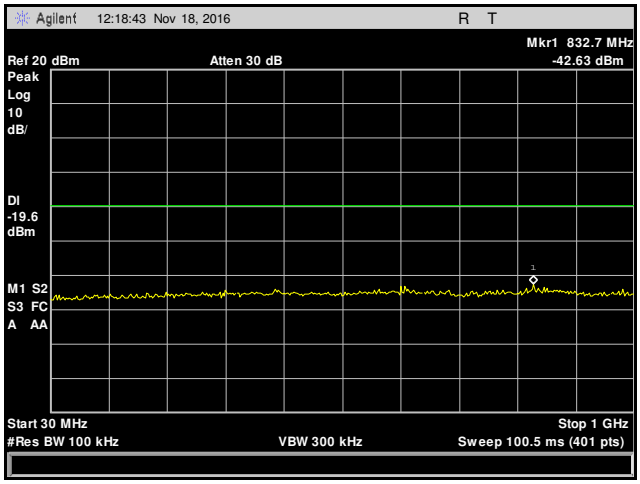
Plot 278. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11b, Antenna 1, 13 dBi Antenna



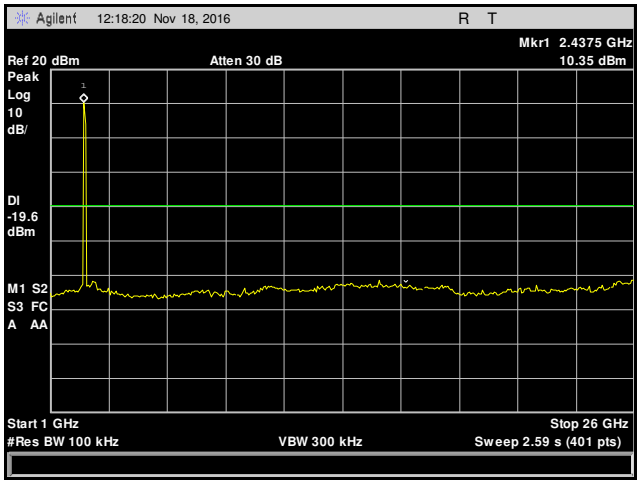
Plot 279. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11b, Antenna 1, 13 dBi Antenna



Plot 280. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11b, Antenna 1, 13 dBi Antenna

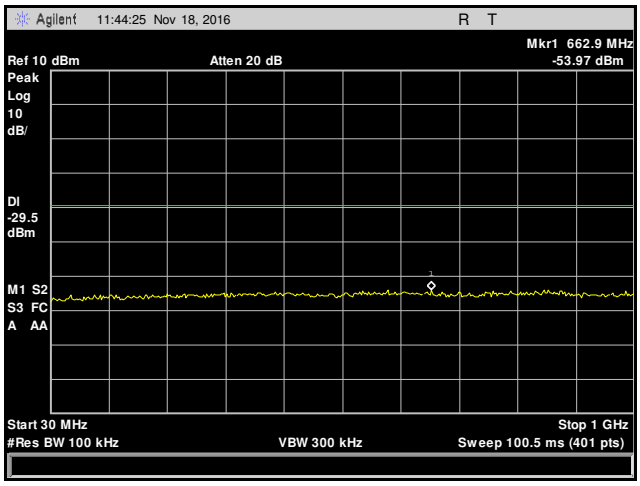


Plot 281. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11b, Antenna 1, 13 dBi Antenna

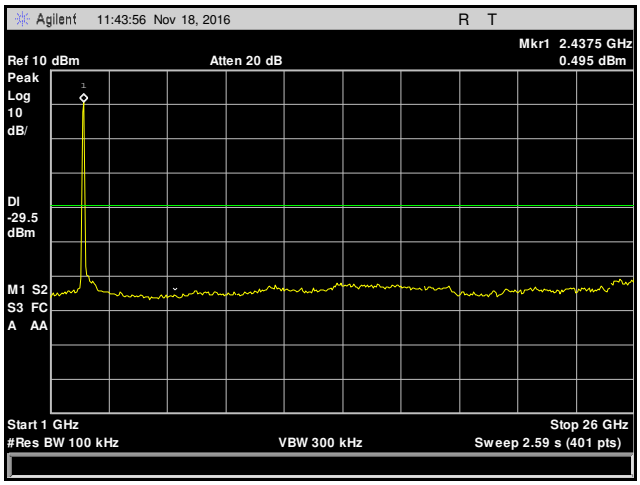


Plot 282. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11b, Antenna 1, 13 dBi Antenna

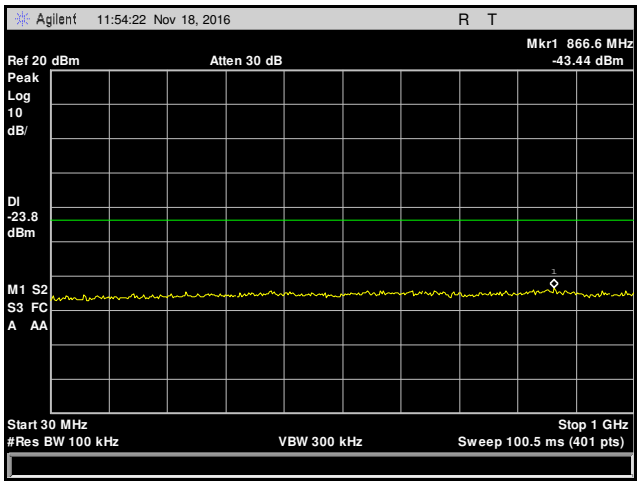
Conducted Spurious Emissions Test Results, 802.11g, Antenna 1, 13 dBi Antenna



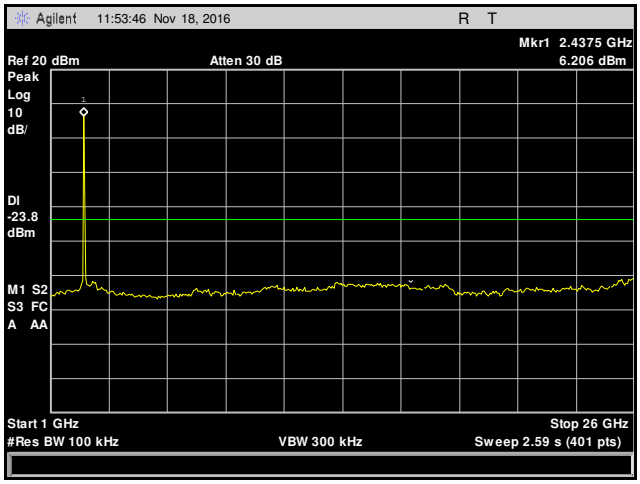
Plot 283. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11g, Antenna 1, 13 dBi Antenna



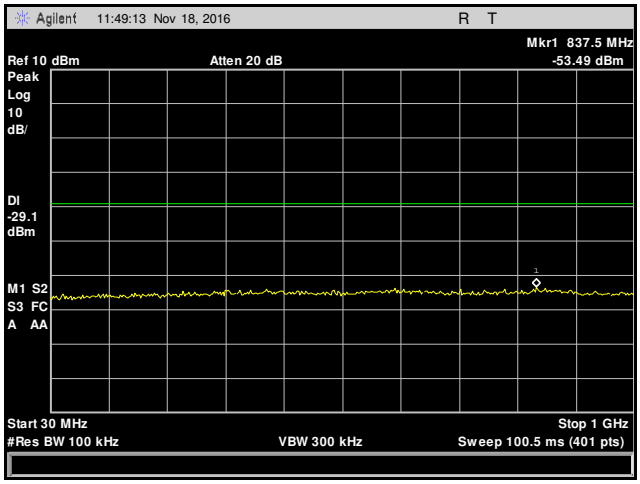
Plot 284. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11g, Antenna 1, 13 dBi Antenna



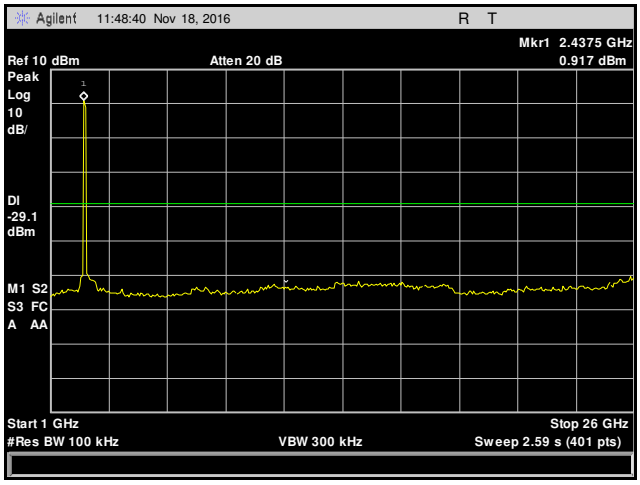
Plot 285. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11g, Antenna 1, 13 dBi Antenna



Plot 286. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11g, Antenna 1, 13 dBi Antenna

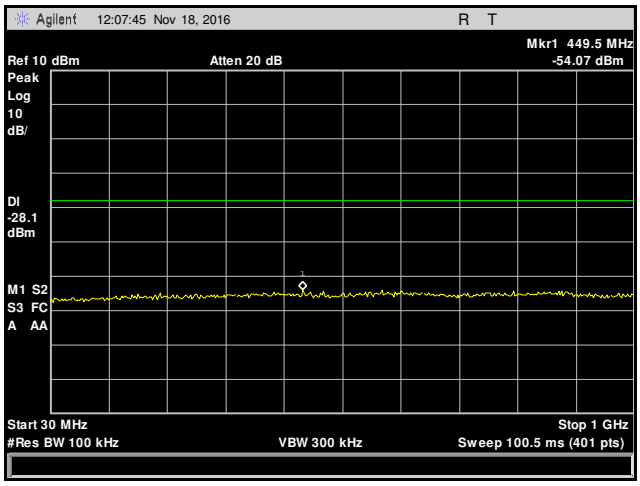


Plot 287. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11g, Antenna 1, 13 dBi Antenna

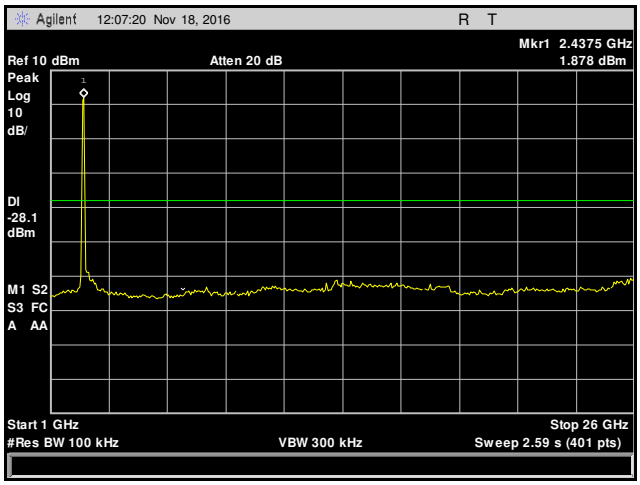


Plot 288. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11g, Antenna 1, 13 dBi Antenna

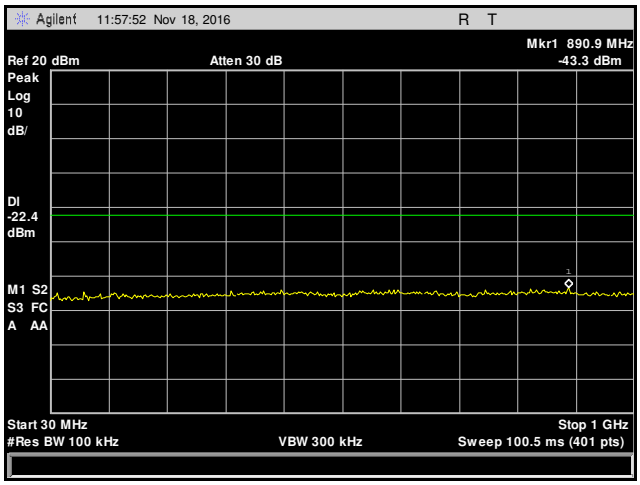
Conducted Spurious Emissions Test Results, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna



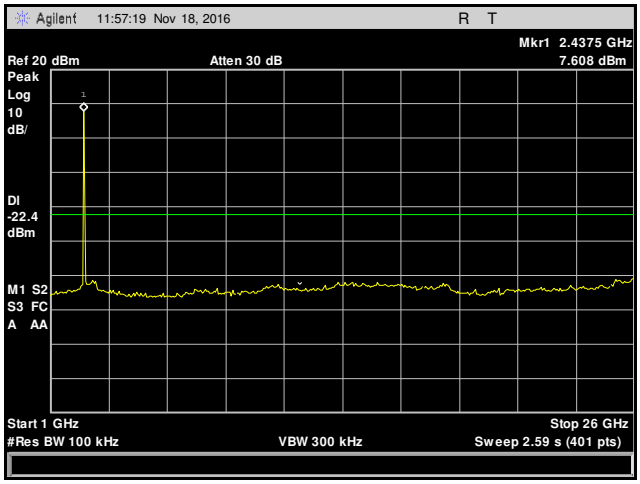
Plot 289. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna



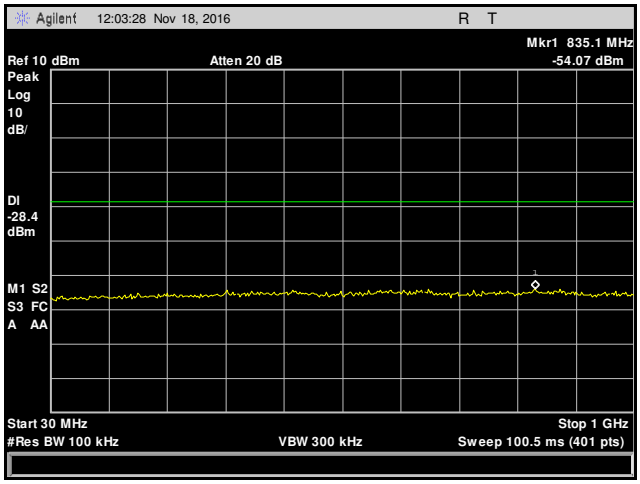
Plot 290. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna



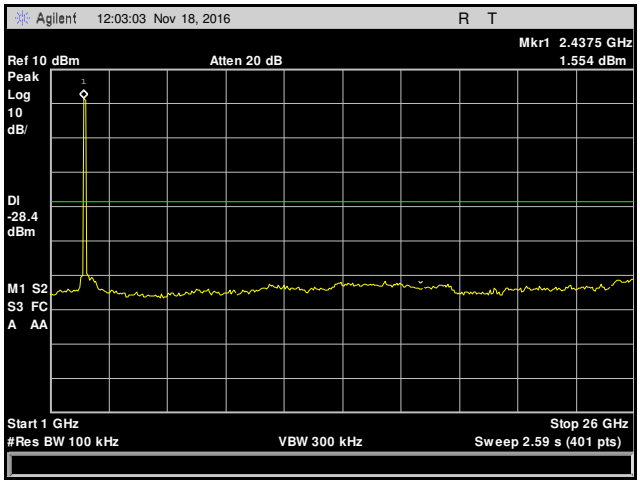
Plot 291. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna



Plot 292. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

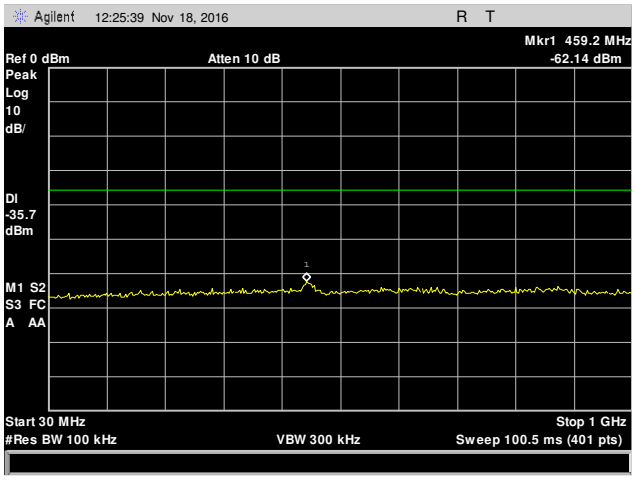


Plot 293. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

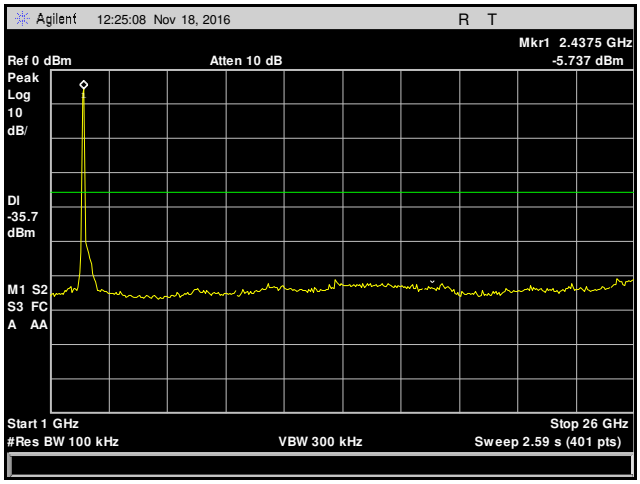


Plot 294. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

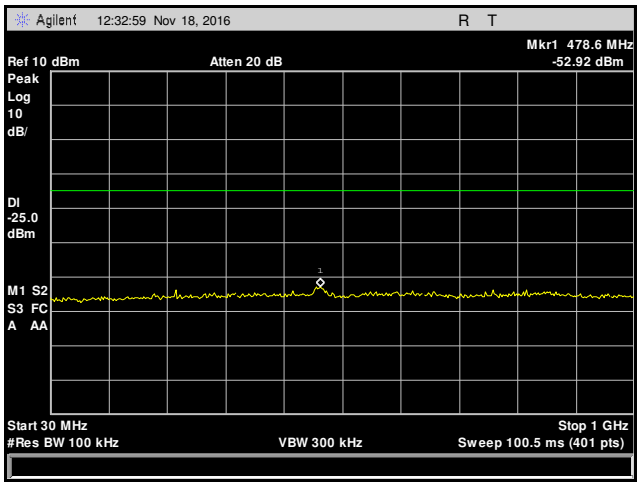
Conducted Spurious Emissions Test Results, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna



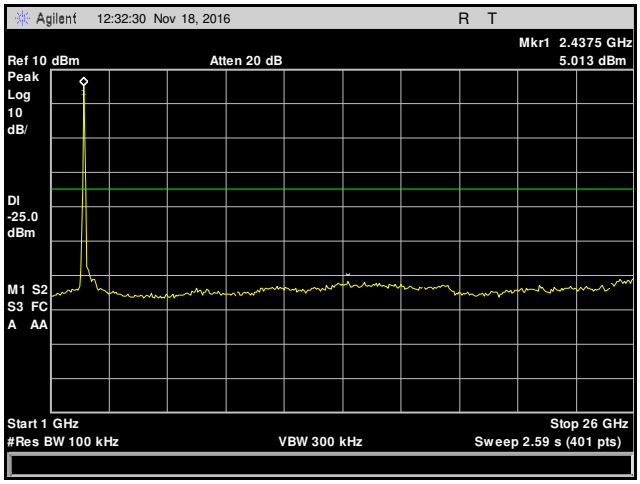
Plot 295. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna



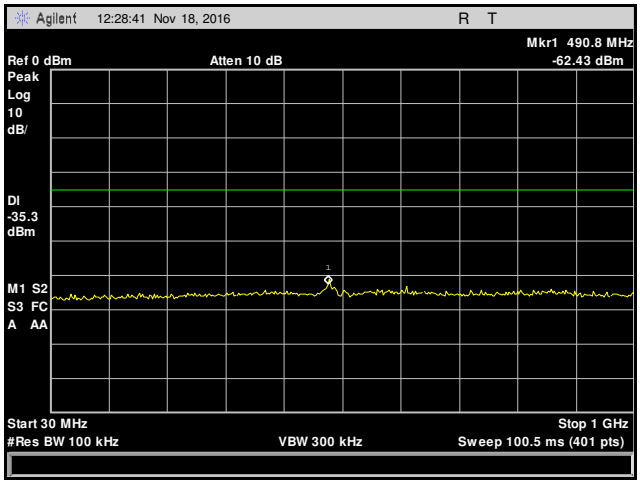
Plot 296. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna



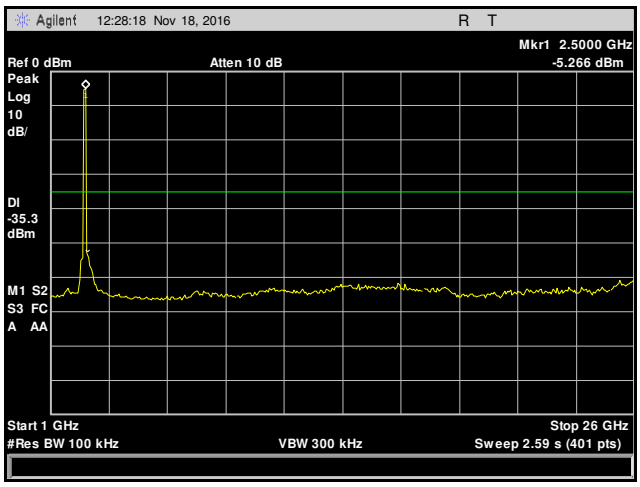
Plot 297. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna



Plot 298. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

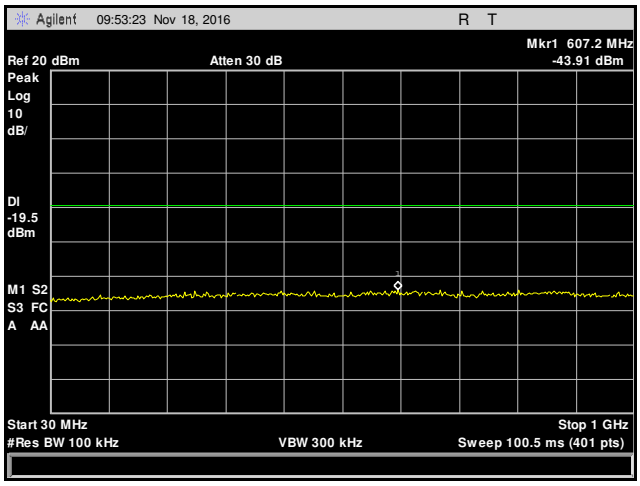


Plot 299. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

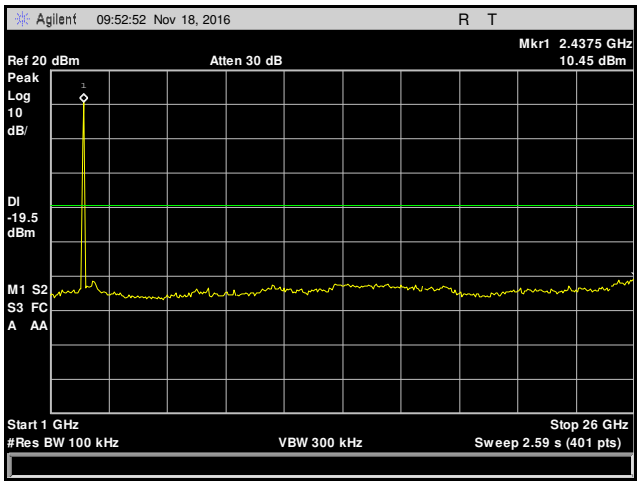


Plot 300. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

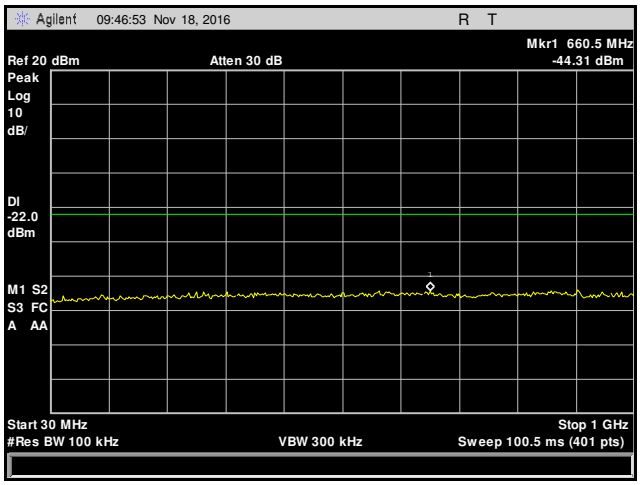
Conducted Spurious Emissions Test Results, 802.11b, Antenna 2, 13 dBi Antenna



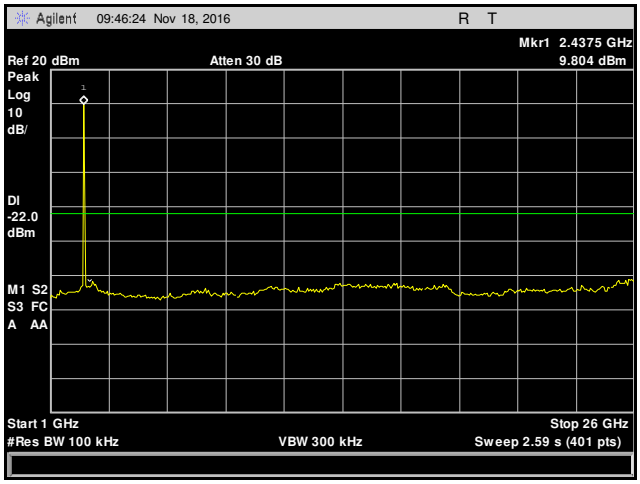
Plot 301. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11b, Antenna 2, 13 dBi Antenna



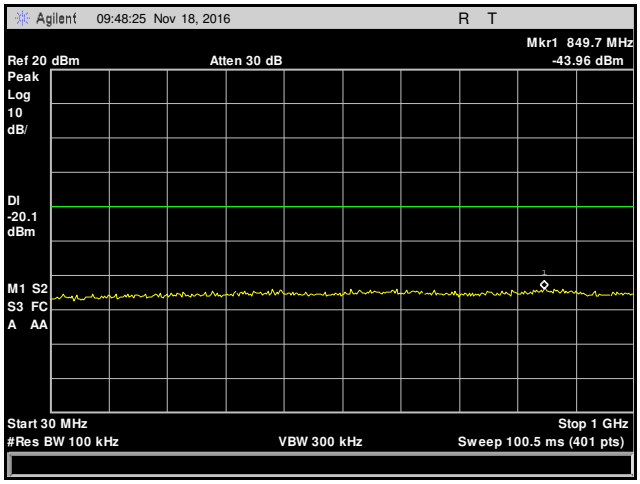
Plot 302. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11b, Antenna 2, 13 dBi Antenna



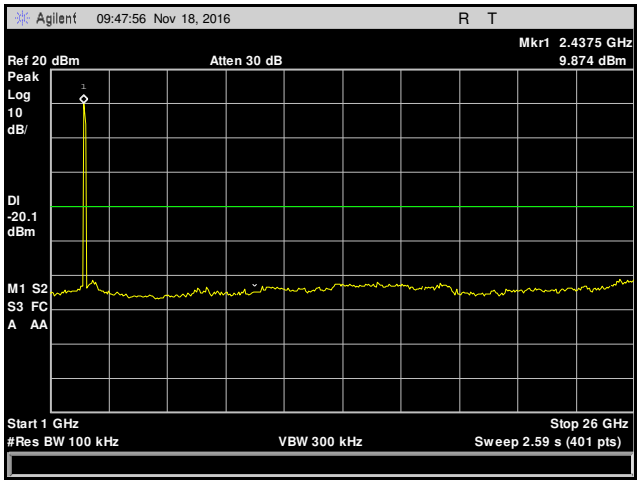
Plot 303. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11b, Antenna 2, 13 dBi Antenna



Plot 304. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11b, Antenna 2, 13 dBi Antenna

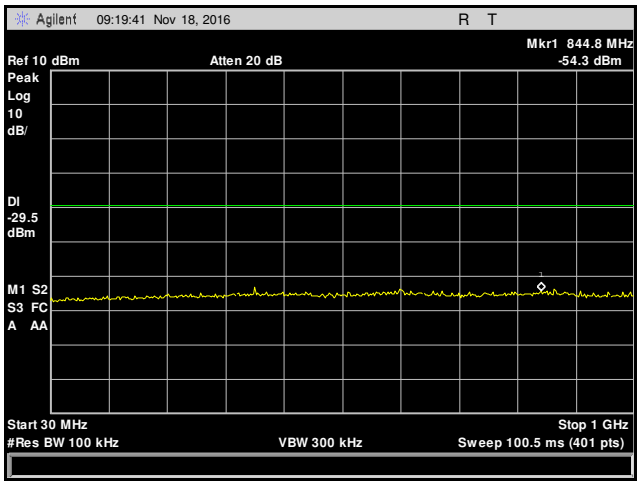


Plot 305. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11b, Antenna 2, 13 dBi Antenna

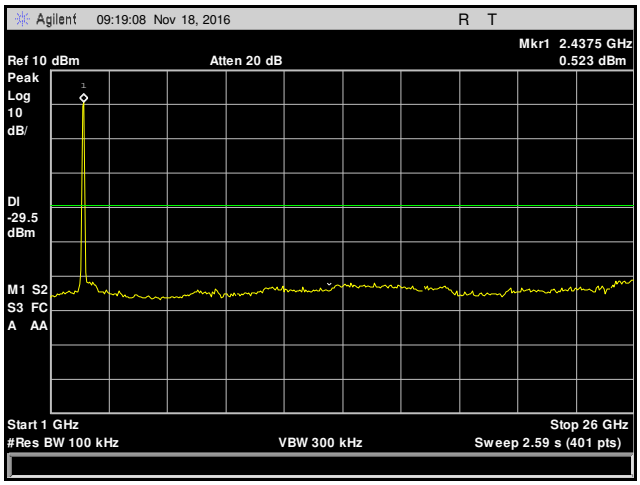


Plot 306. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11b, Antenna 2, 13 dBi Antenna

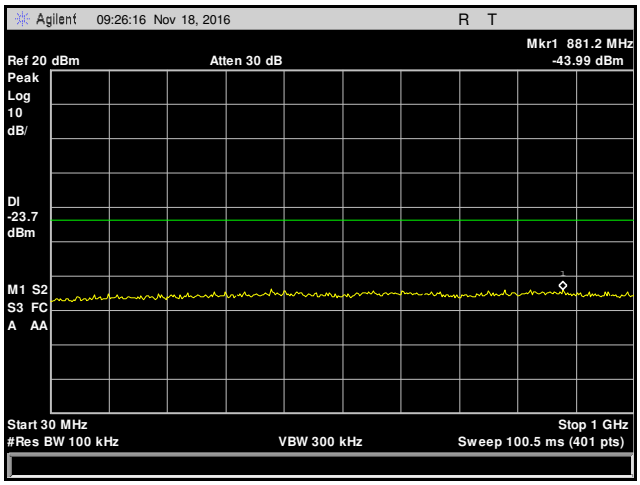
Conducted Spurious Emissions Test Results, 802.11g, Antenna 2, 13 dBi Antenna



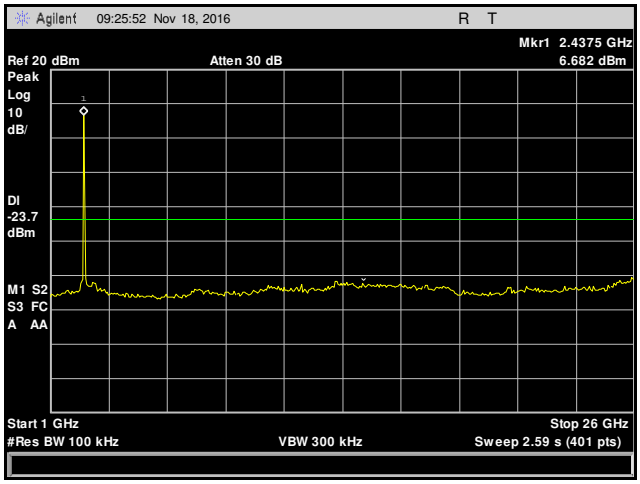
Plot 307. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11g, Antenna 2, 13 dBi Antenna



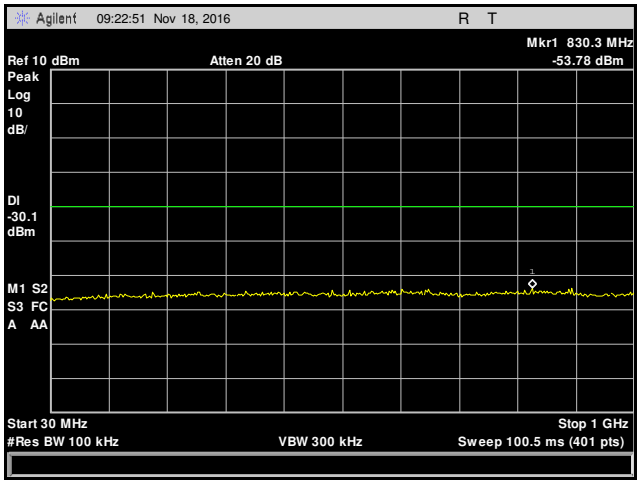
Plot 308. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11g, Antenna 2, 13 dBi Antenna



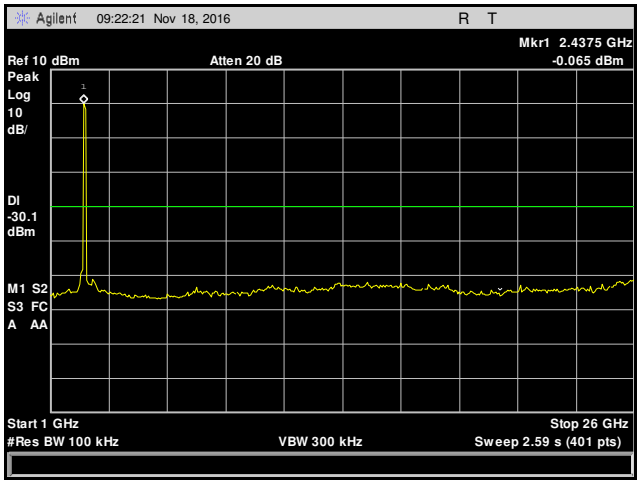
Plot 309. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11g, Antenna 2, 13 dBi Antenna



Plot 310. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11g, Antenna 2, 13 dBi Antenna

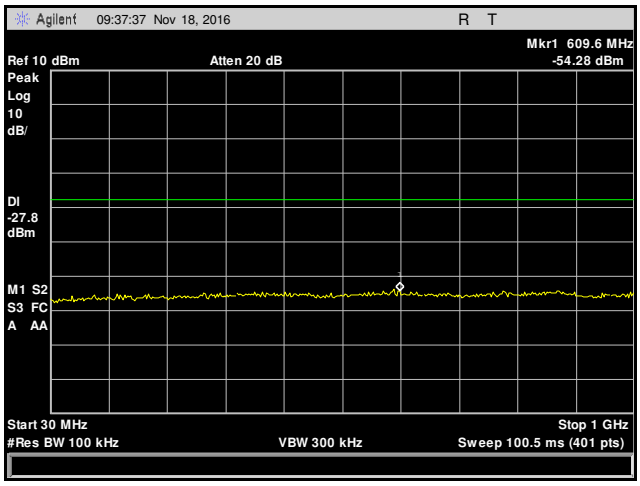


Plot 311. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11g, Antenna 2, 13 dBi Antenna

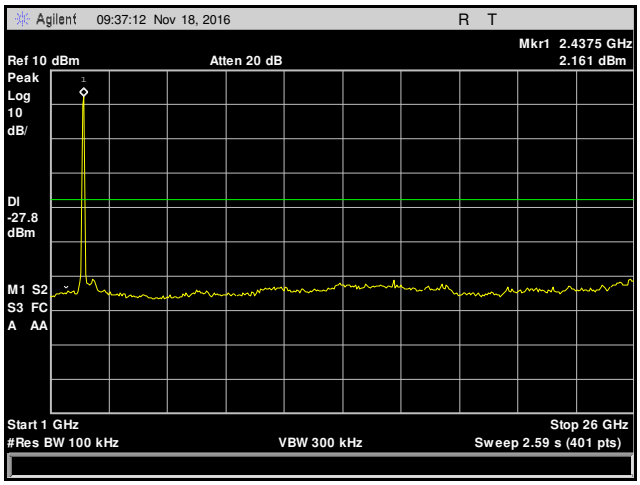


Plot 312. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11g, Antenna 2, 13 dBi Antenna

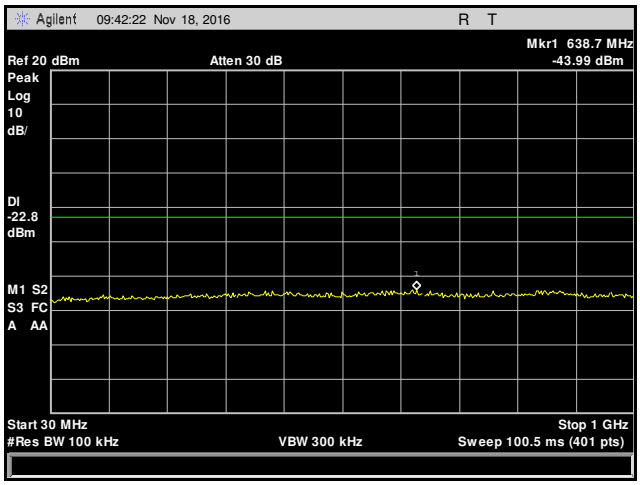
Conducted Spurious Emissions Test Results, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna



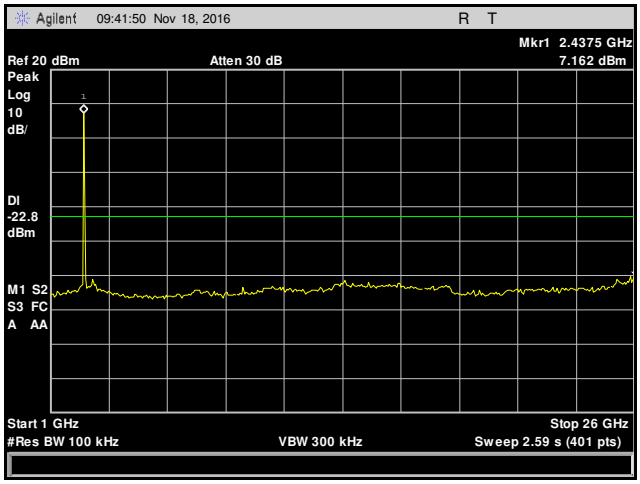
Plot 313. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna



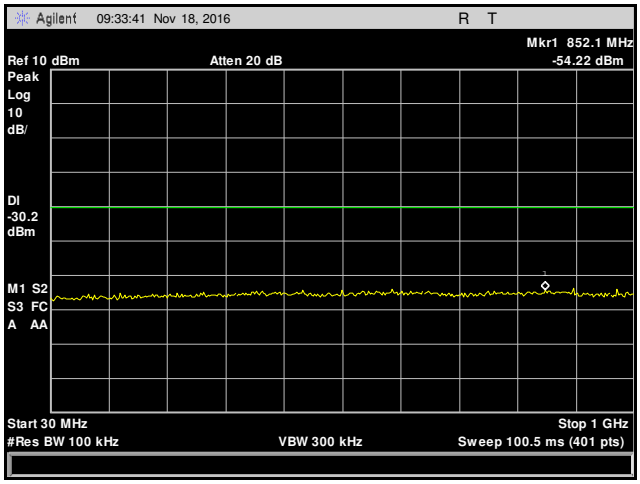
Plot 314. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna



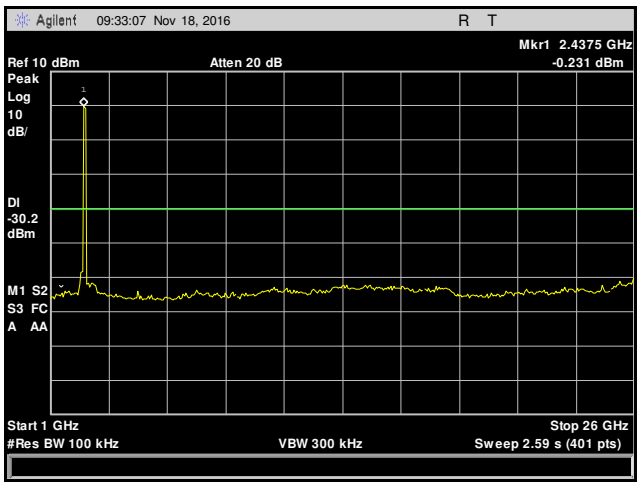
Plot 315. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna



Plot 316. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

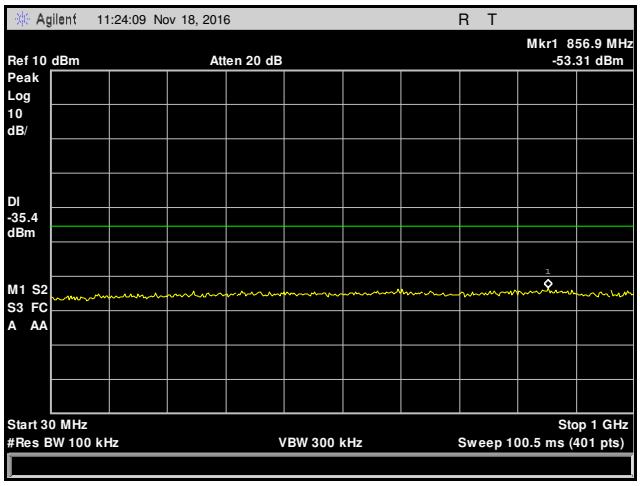


Plot 317. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

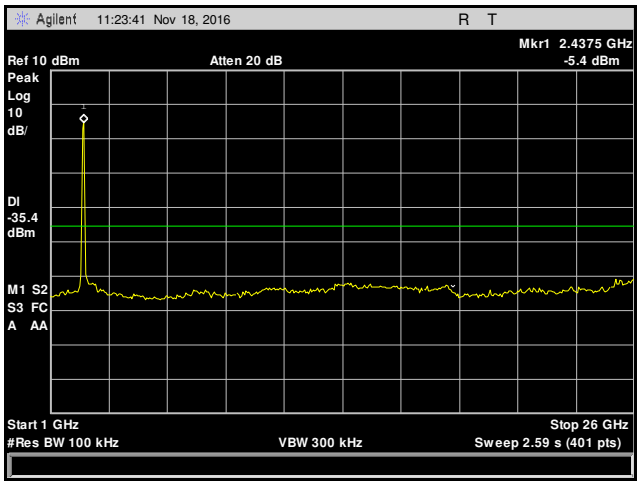


Plot 318. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

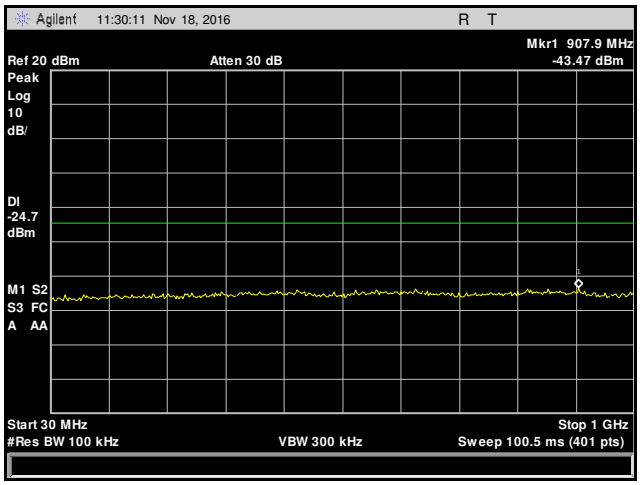
Conducted Spurious Emissions Test Results, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



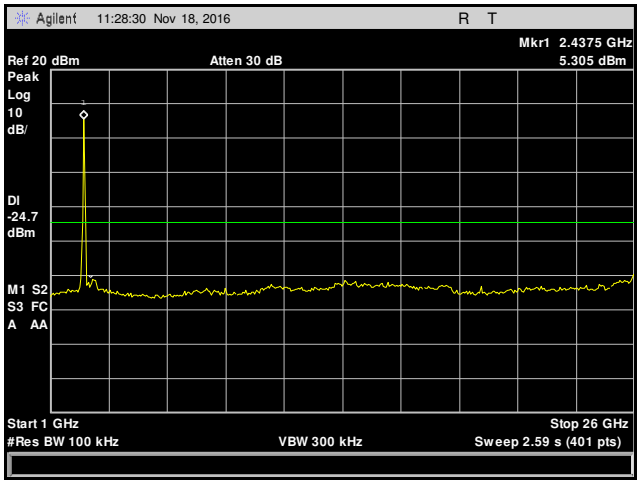
Plot 319. Conducted Spurious Emissions, Low Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



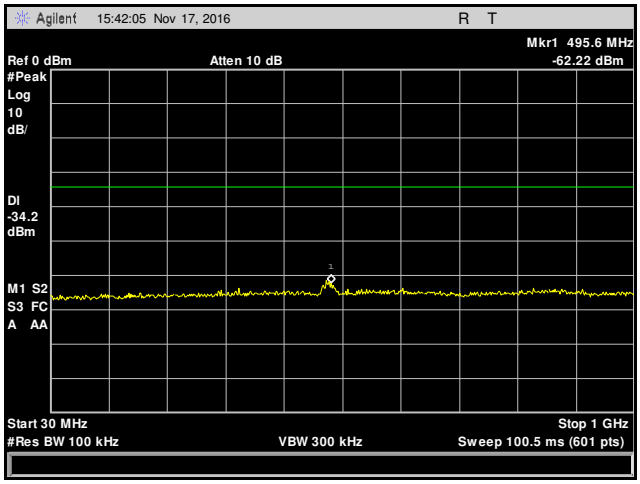
Plot 320. Conducted Spurious Emissions, Low Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



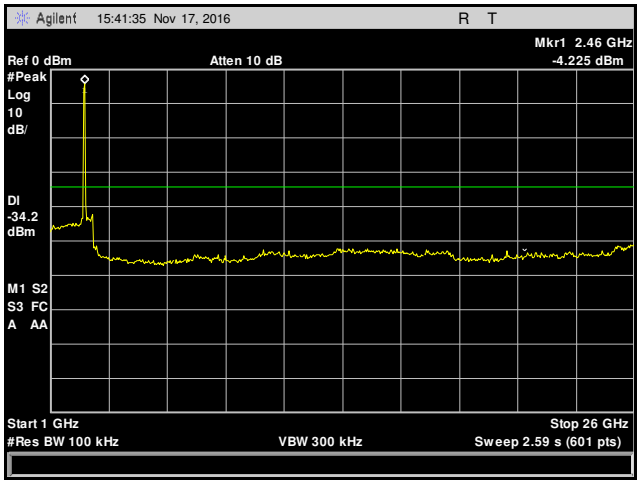
Plot 321. Conducted Spurious Emissions, Mid Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



Plot 322. Conducted Spurious Emissions, Mid Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna

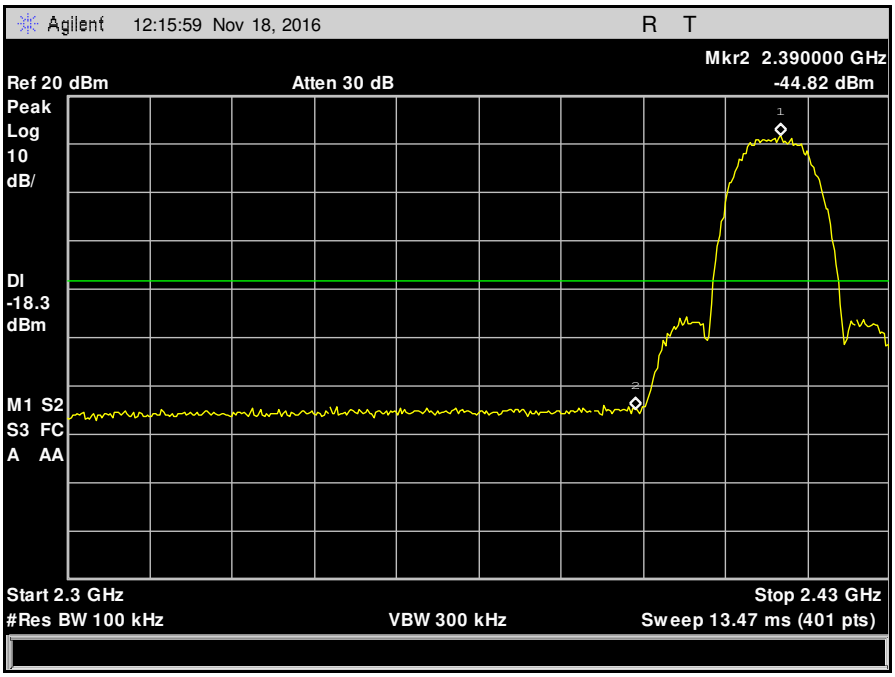


Plot 323. Conducted Spurious Emissions, High Channel, 30 MHz – 1 GHz, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna

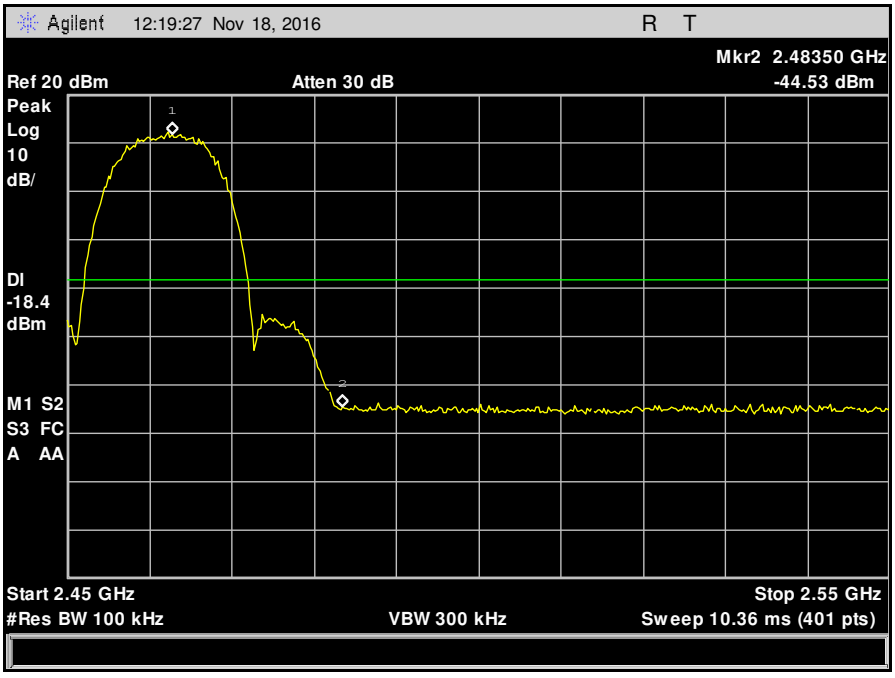


Plot 324. Conducted Spurious Emissions, High Channel, 1 GHz – 26 GHz, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna

Conducted Band Edge Test Results, 802.11b, Antenna 1, 9 dBi Antenna

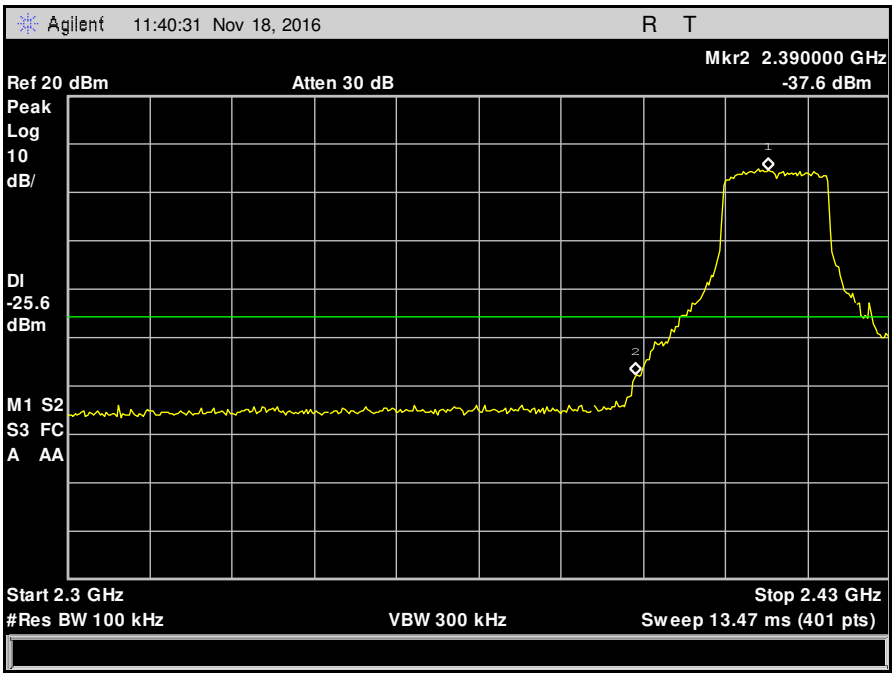


Plot 325. Conducted Band Edge, Low Channel, 802.11b, Antenna 1, 9 dBi Antenna

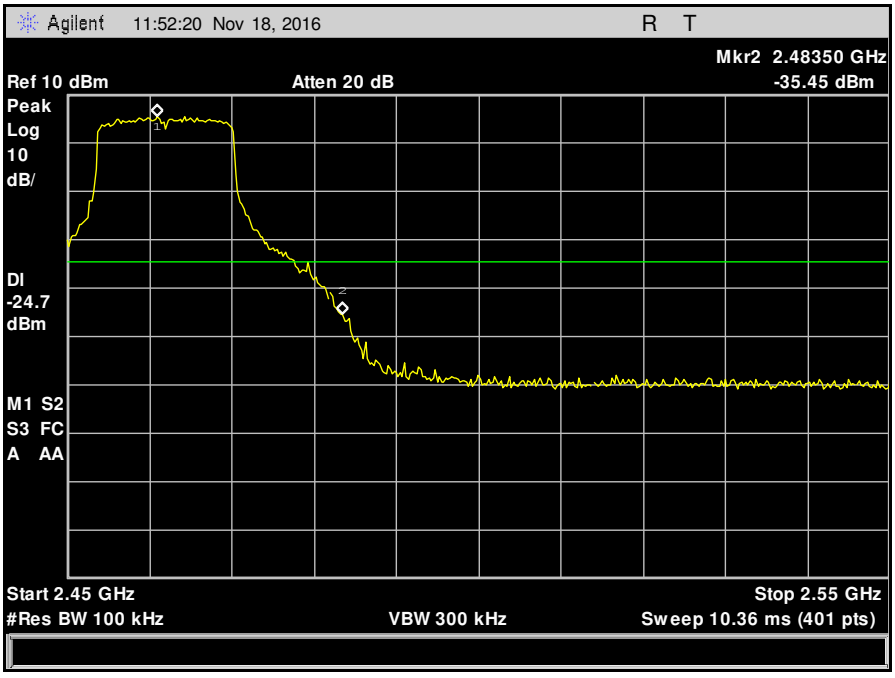


Plot 326. Conducted Band Edge, High Channel, 802.11b, Antenna 1, 9 dBi Antenna

Conducted Band Edge Test Results, 802.11g, Antenna 1, 9 dBi Antenna

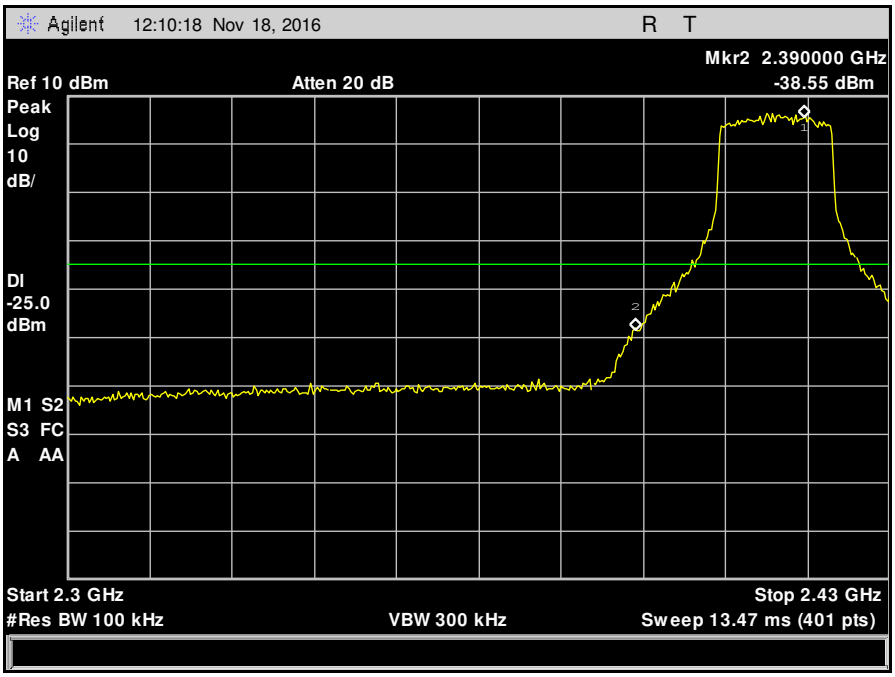


Plot 327. Conducted Band Edge, Low Channel, 802.11g, Antenna 1, 9 dBi Antenna

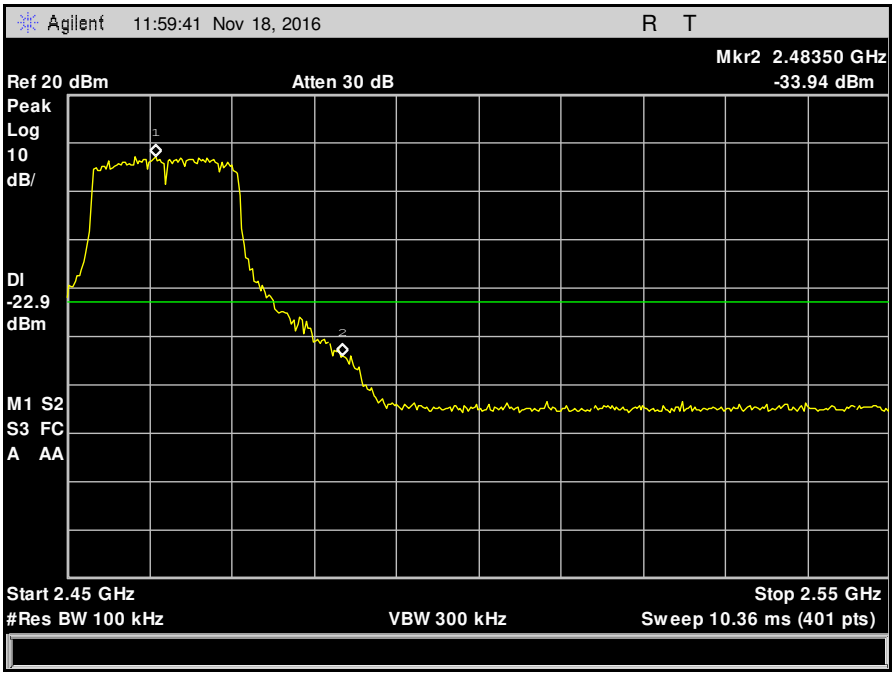


Plot 328. Conducted Band Edge, High Channel, 802.11g, Antenna 1, 9 dBi Antenna

Conducted Band Edge Test Results, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

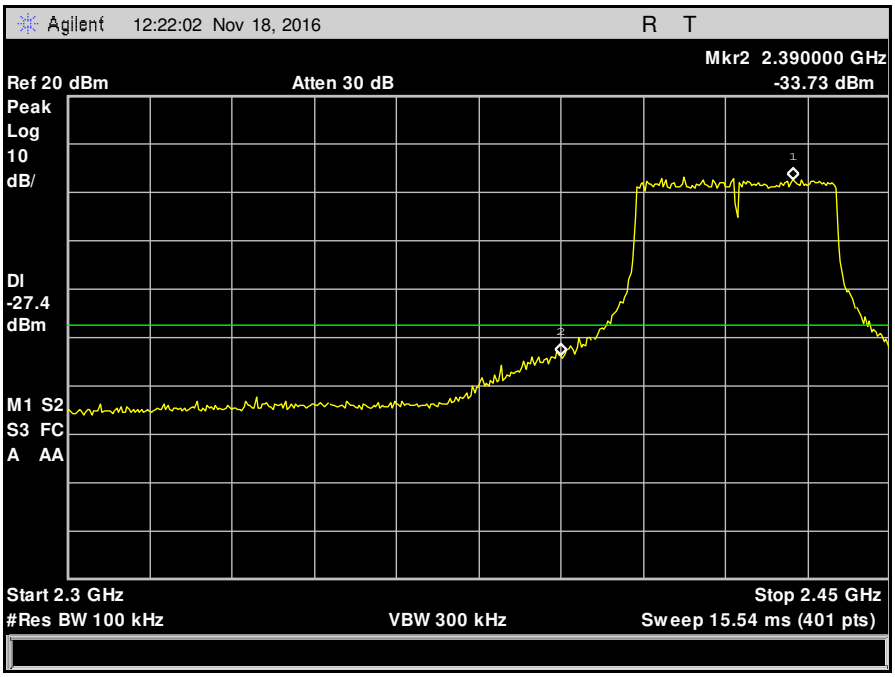


Plot 329. Conducted Band Edge, Low Channel, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

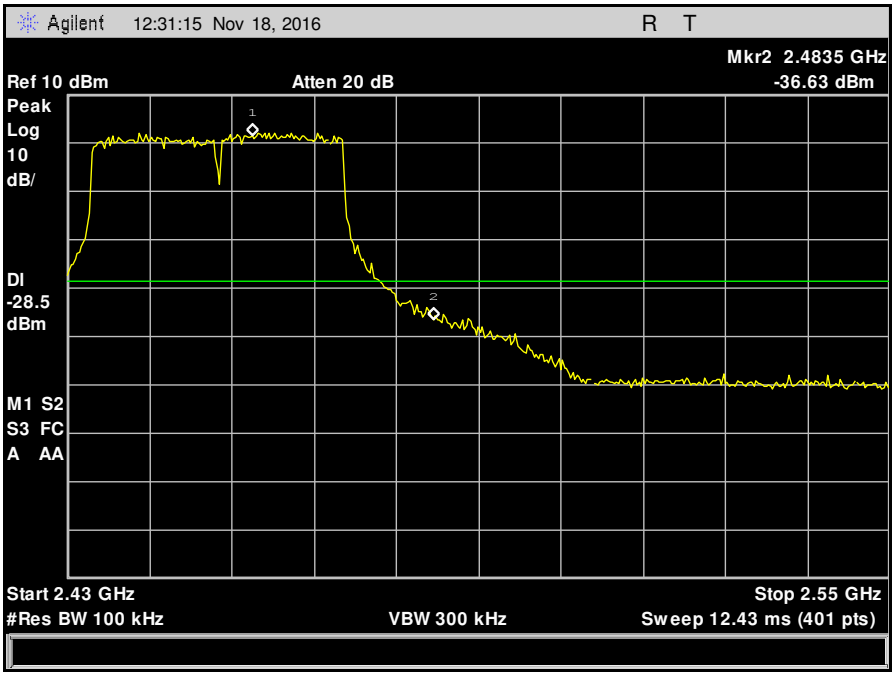


Plot 330. Conducted Band Edge, High Channel, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna

Conducted Band Edge Test Results, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

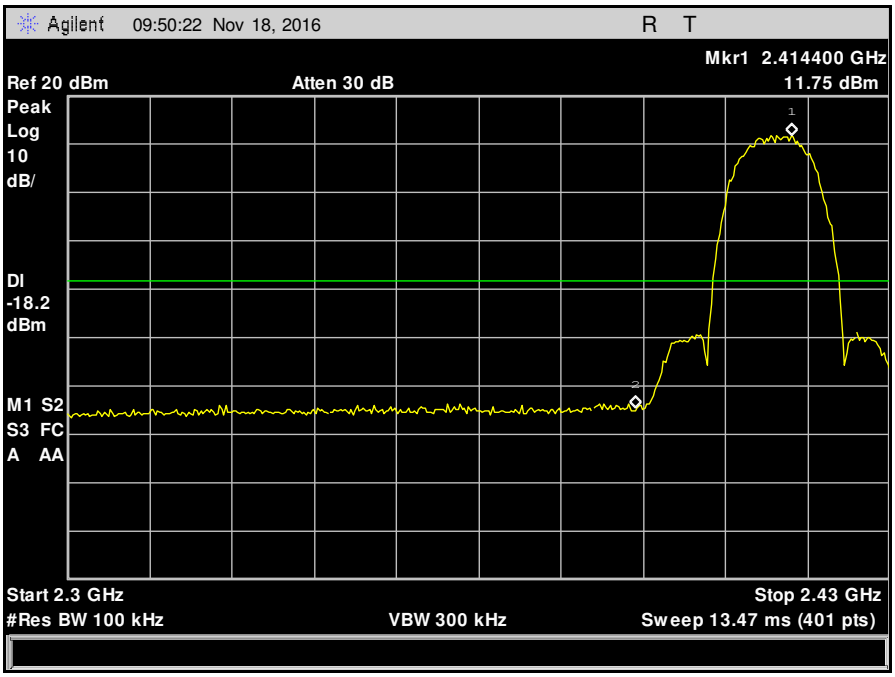


Plot 331. Conducted Band Edge, Low Channel, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

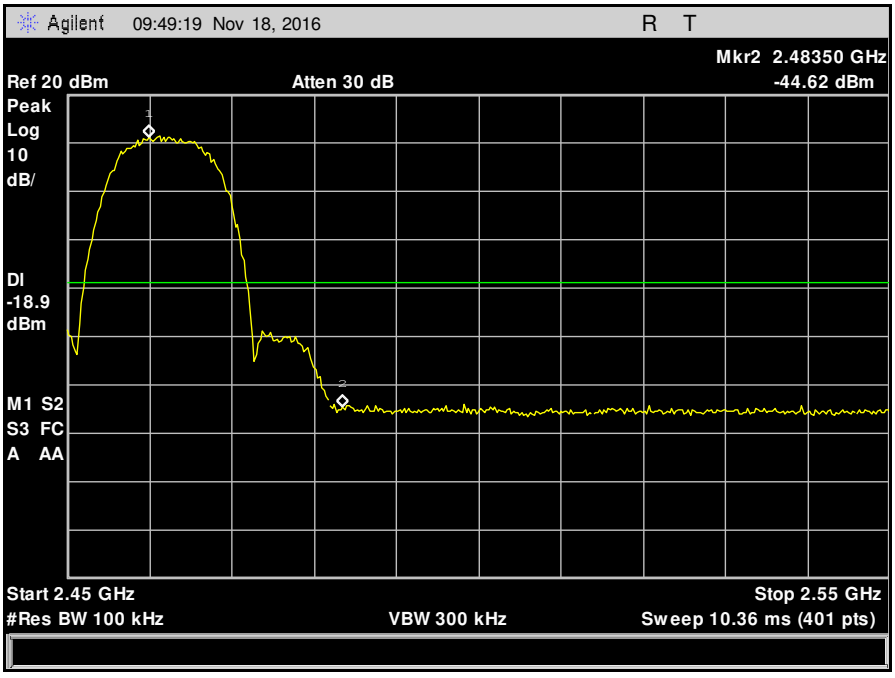


Plot 332. Conducted Band Edge, High Channel, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna

Conducted Band Edge Test Results, 802.11b, Antenna 2, 9 dBi Antenna

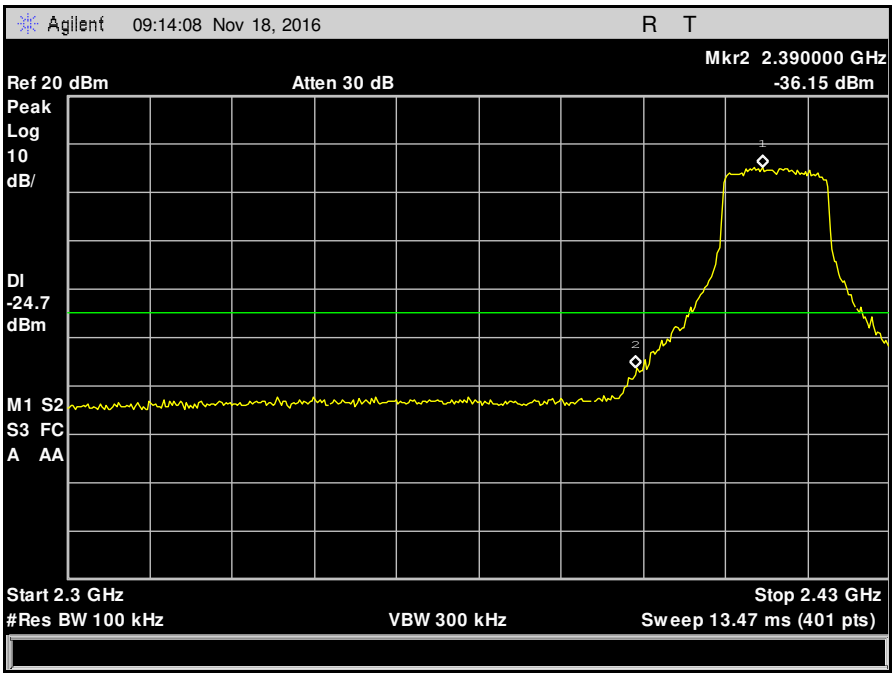


Plot 333. Conducted Band Edge, Low Channel, 802.11b, Antenna 2, 9 dBi Antenna

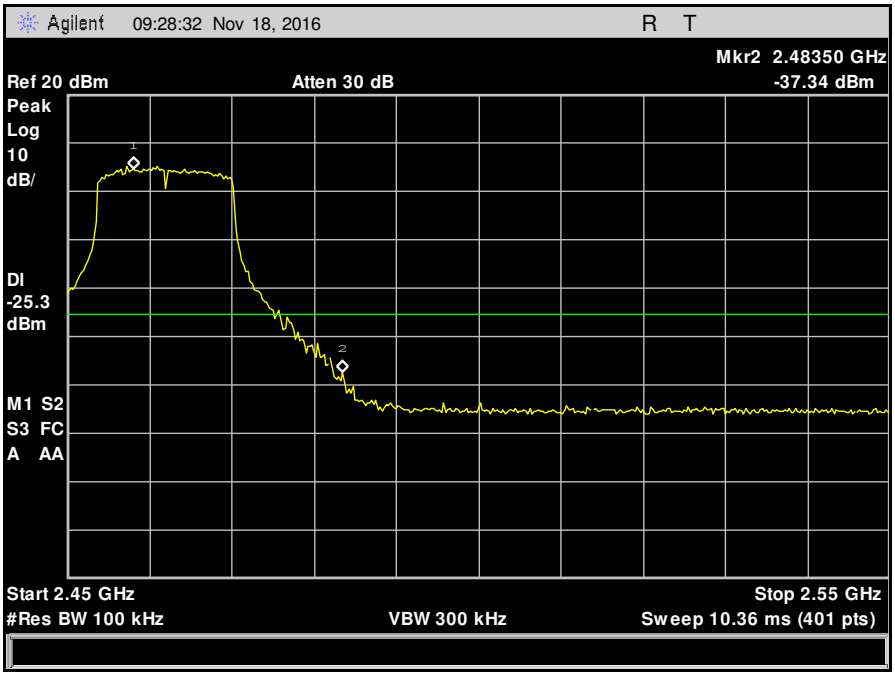


Plot 334. Conducted Band Edge, High Channel, 802.11b, Antenna 2, 9 dBi Antenna

Conducted Band Edge Test Results, 802.11g, Antenna 2, 9 dBi Antenna

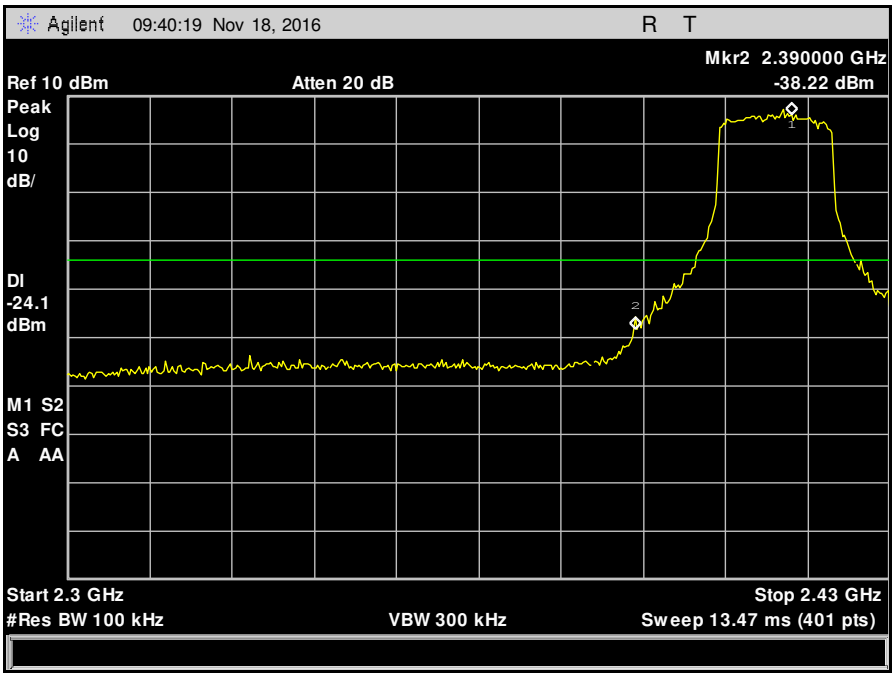


Plot 335. Conducted Band Edge, Low Channel, 802.11g, Antenna 2, 9 dBi Antenna

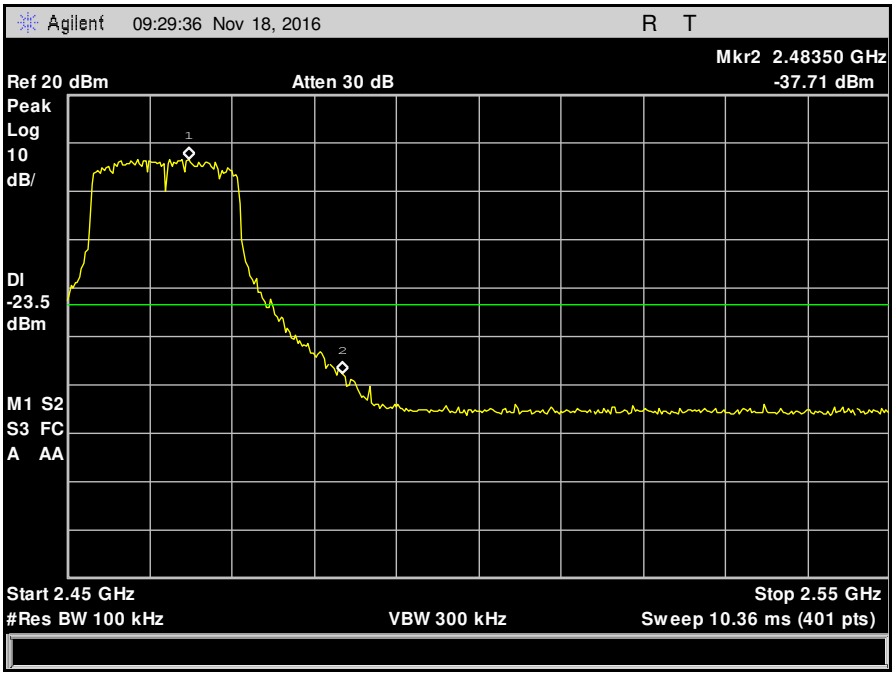


Plot 336. Conducted Band Edge, High Channel, 802.11g, Antenna 2, 9 dBi Antenna

Conducted Band Edge Test Results, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

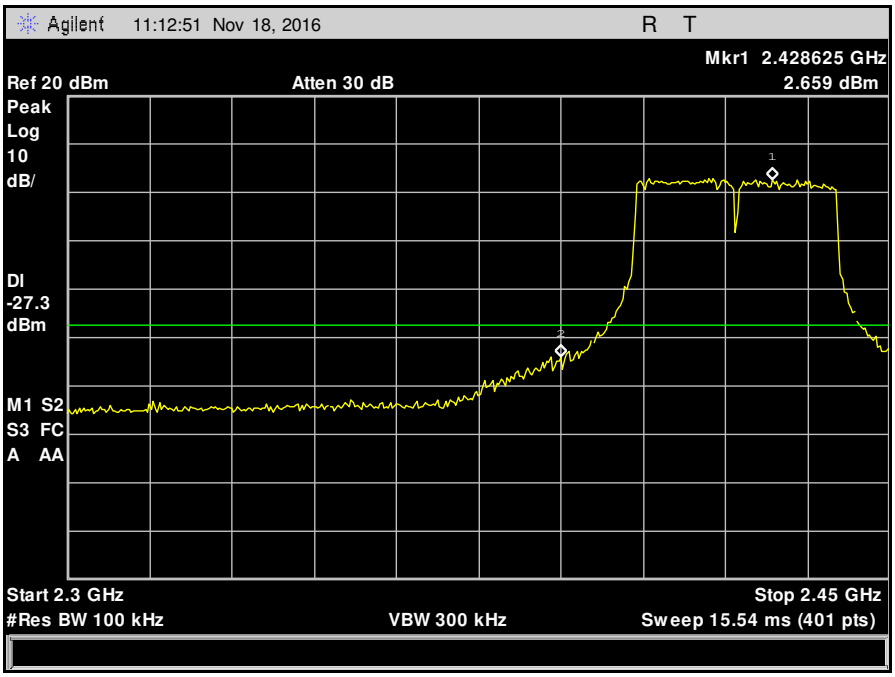


Plot 337. Conducted Band Edge, Low Channel, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

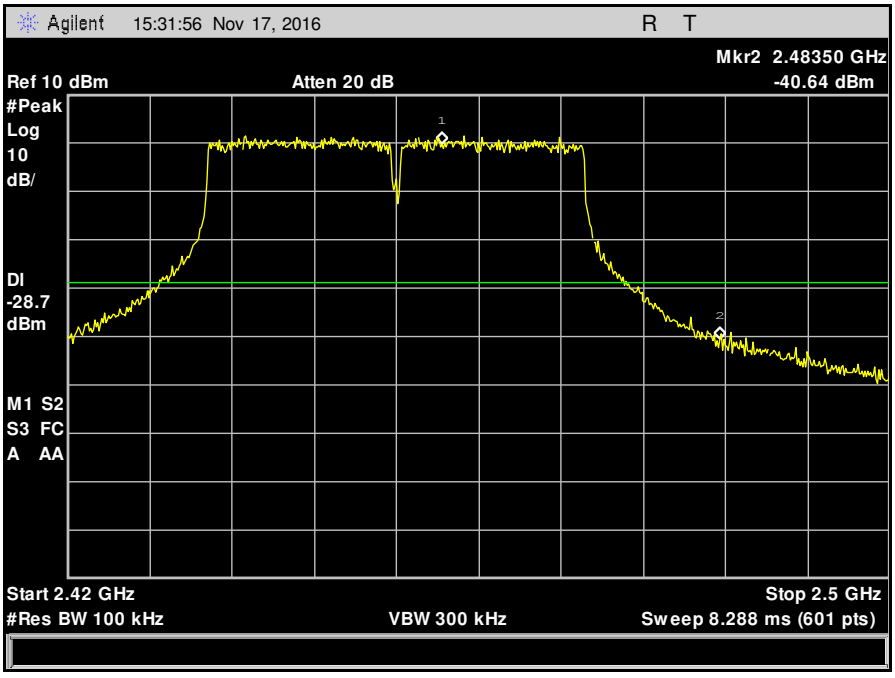


Plot 338. Conducted Band Edge, High Channel, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna

Conducted Band Edge Test Results, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

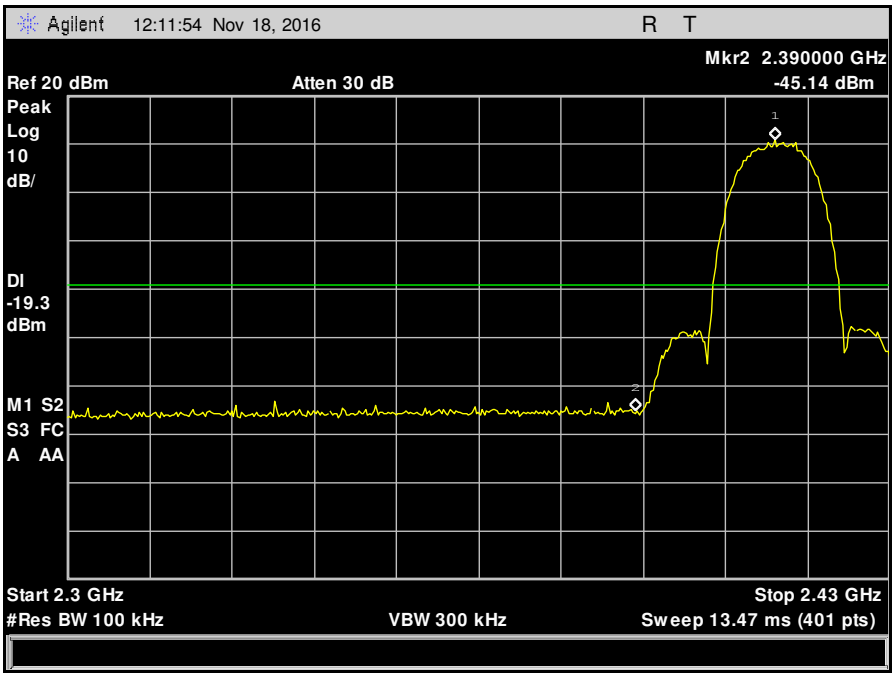


Plot 339. Conducted Band Edge, Low Channel, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

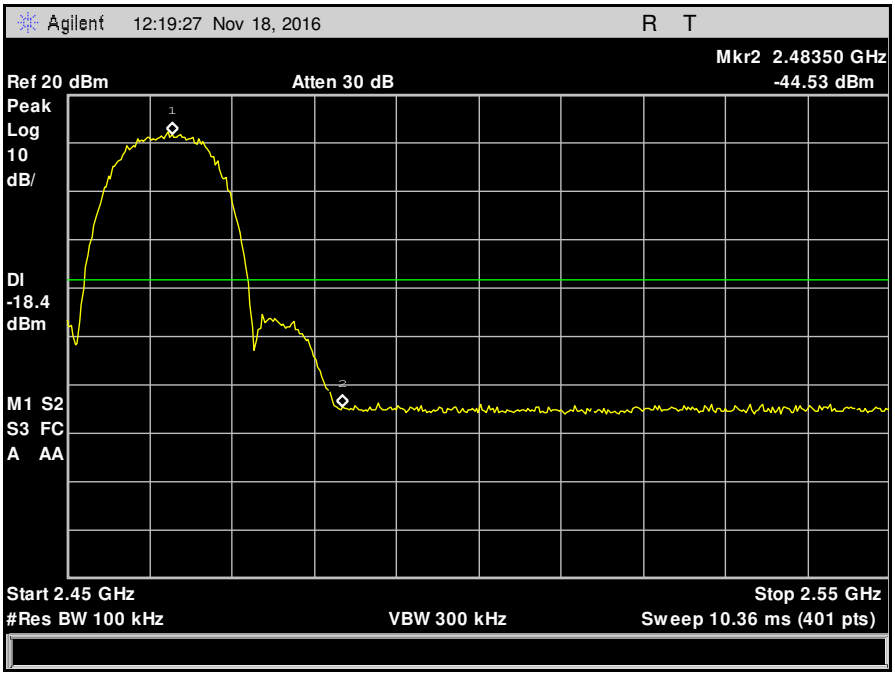


Plot 340. Conducted Band Edge, High Channel, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna

Conducted Band Edge Test Results, 802.11b, Antenna 1, 13 dBi Antenna

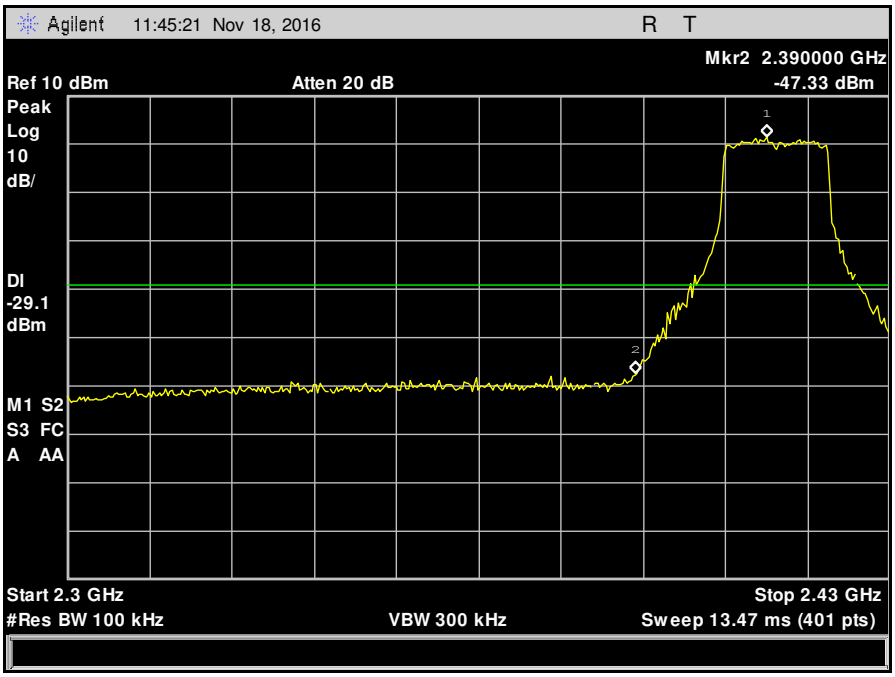


Plot 341. Conducted Band Edge, Low Channel, 802.11b, Antenna 1, 13 dBi Antenna

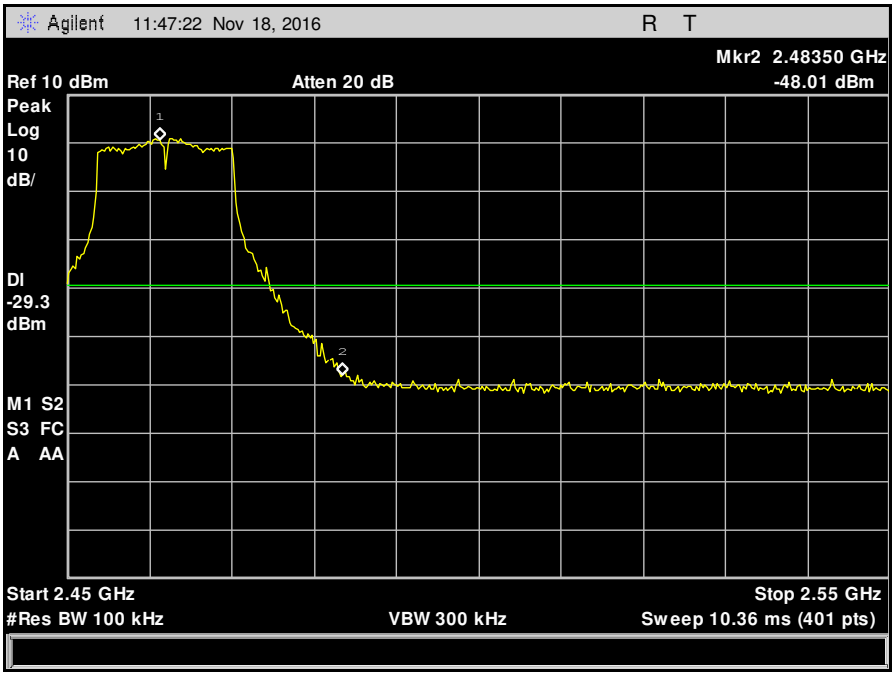


Plot 342. Conducted Band Edge, High Channel, 802.11b, Antenna 1, 13 dBi Antenna

Conducted Band Edge Test Results, 802.11g, Antenna 1, 13 dBi Antenna

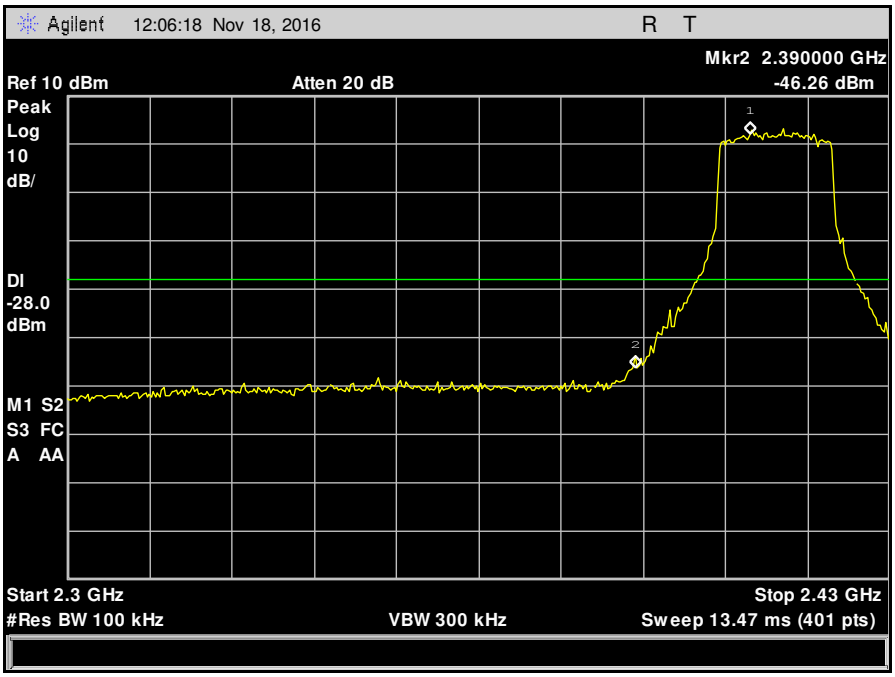


Plot 343. Conducted Band Edge, Low Channel, 802.11g, Antenna 1, 13 dBi Antenna

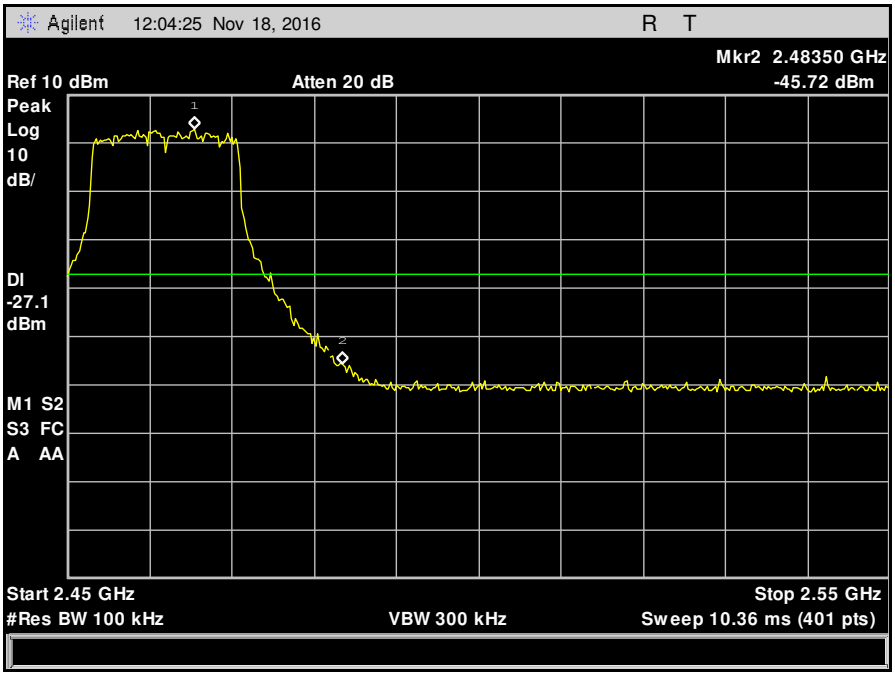


Plot 344. Conducted Band Edge, High Channel, 802.11g, Antenna 1, 13 dBi Antenna

Conducted Band Edge Test Results, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

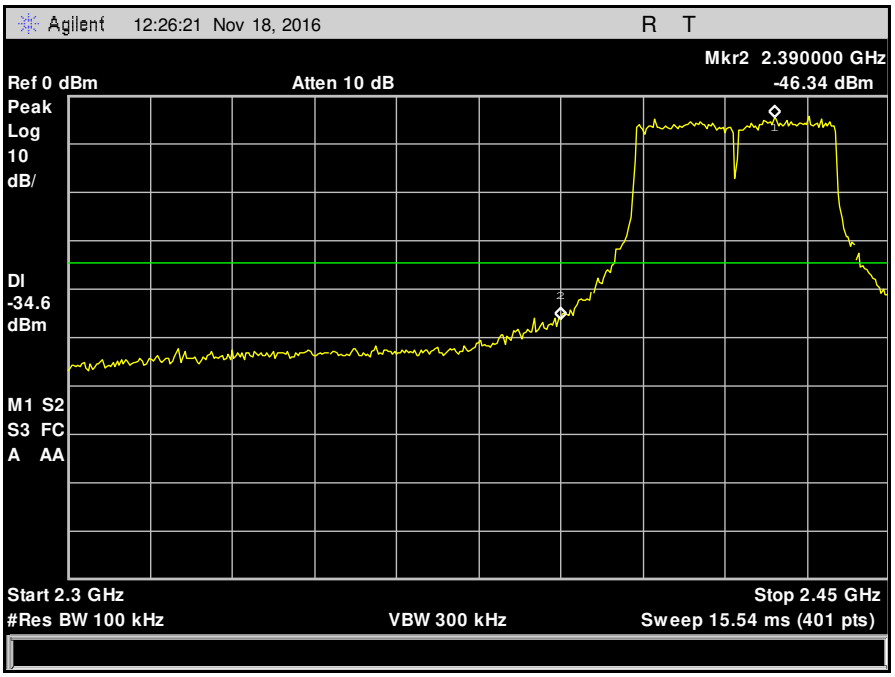


Plot 345. Conducted Band Edge, Low Channel, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

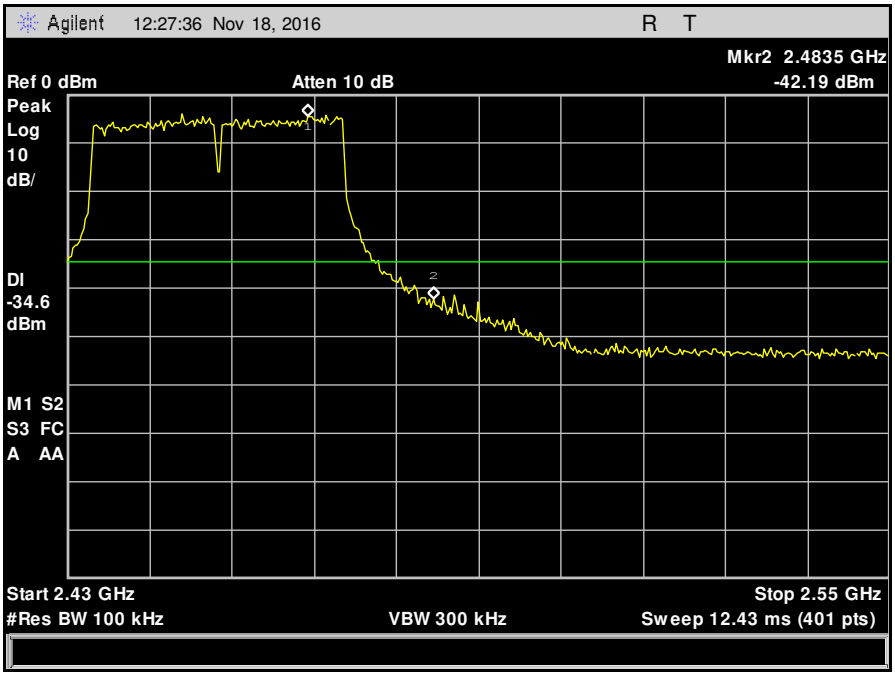


Plot 346. Conducted Band Edge, High Channel, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna

Conducted Band Edge Test Results, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

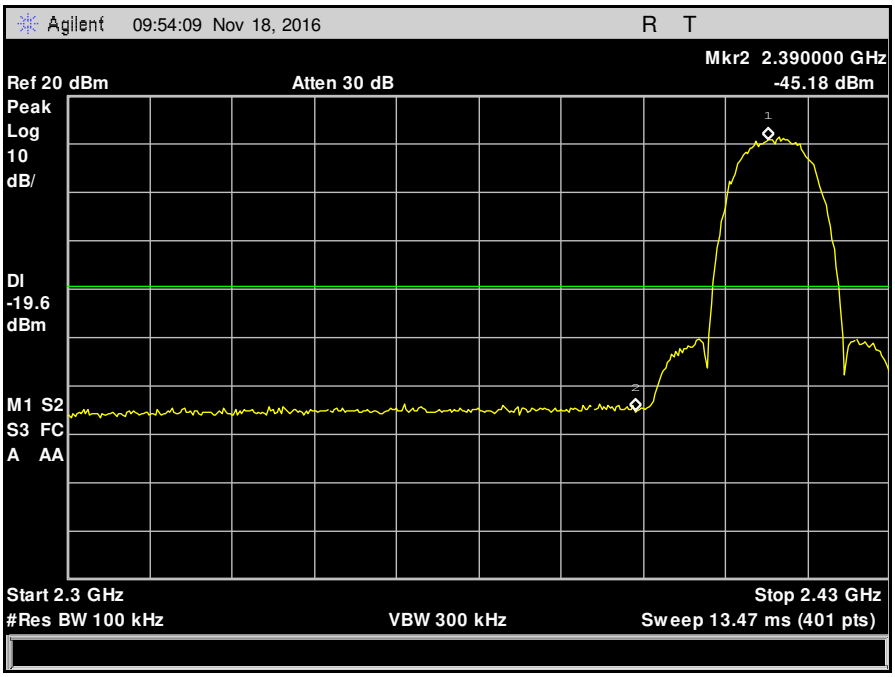


Plot 347. Conducted Band Edge, Low Channel, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

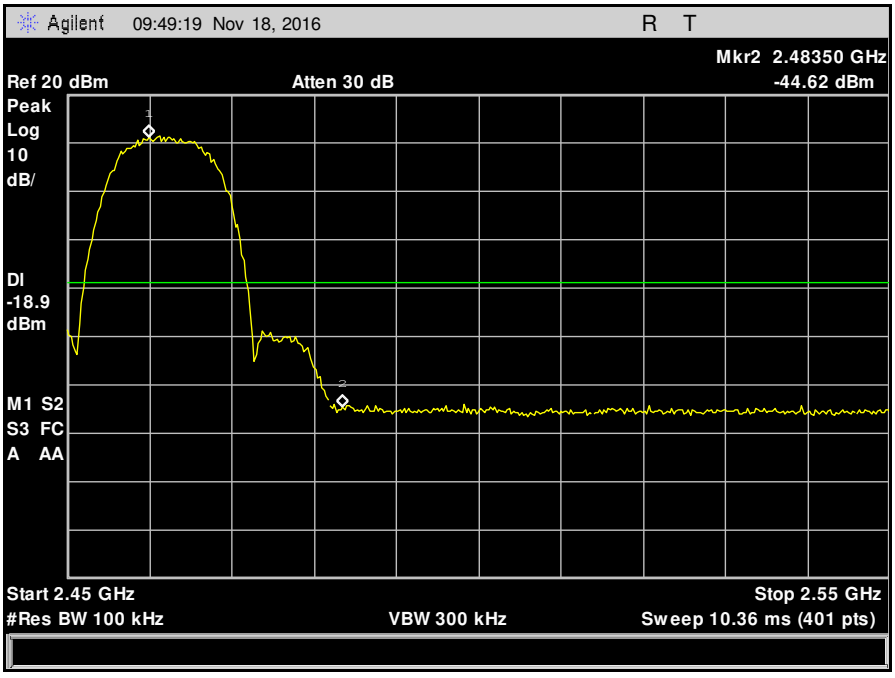


Plot 348. Conducted Band Edge, High Channel, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna

Conducted Band Edge Test Results, 802.11b, Antenna 2, 13 dBi Antenna

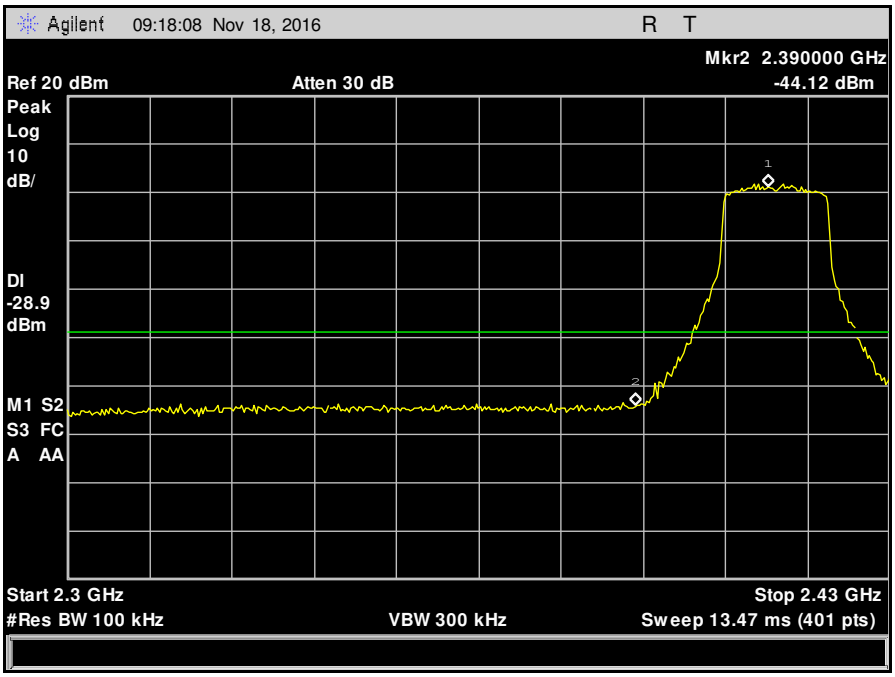


Plot 349. Conducted Band Edge, Low Channel, 802.11b, Antenna 2, 13 dBi Antenna

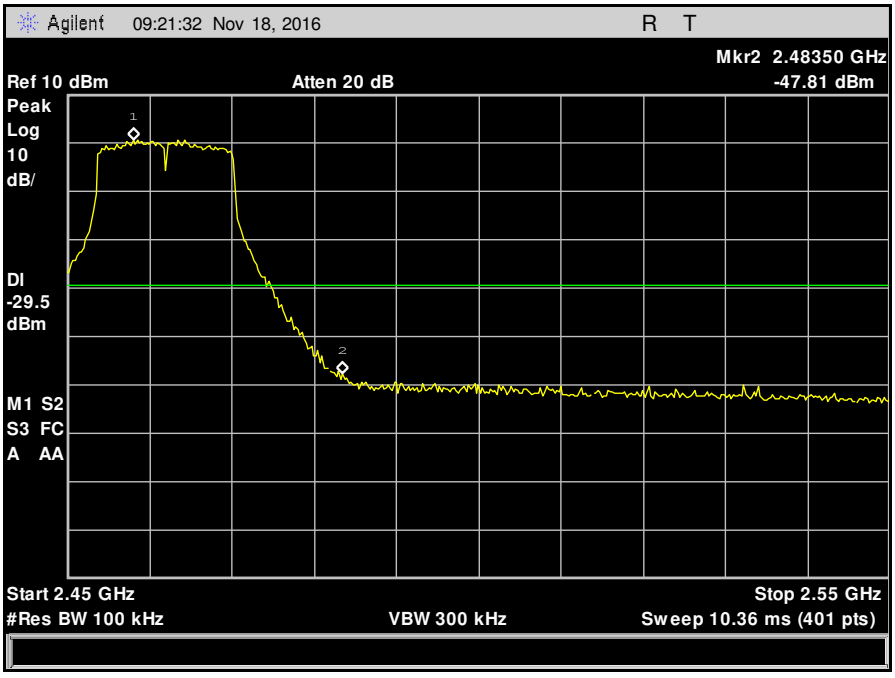


Plot 350. Conducted Band Edge, High Channel, 802.11b, Antenna 2, 13 dBi Antenna

Conducted Band Edge Test Results, 802.11g, Antenna 2, 13 dBi Antenna

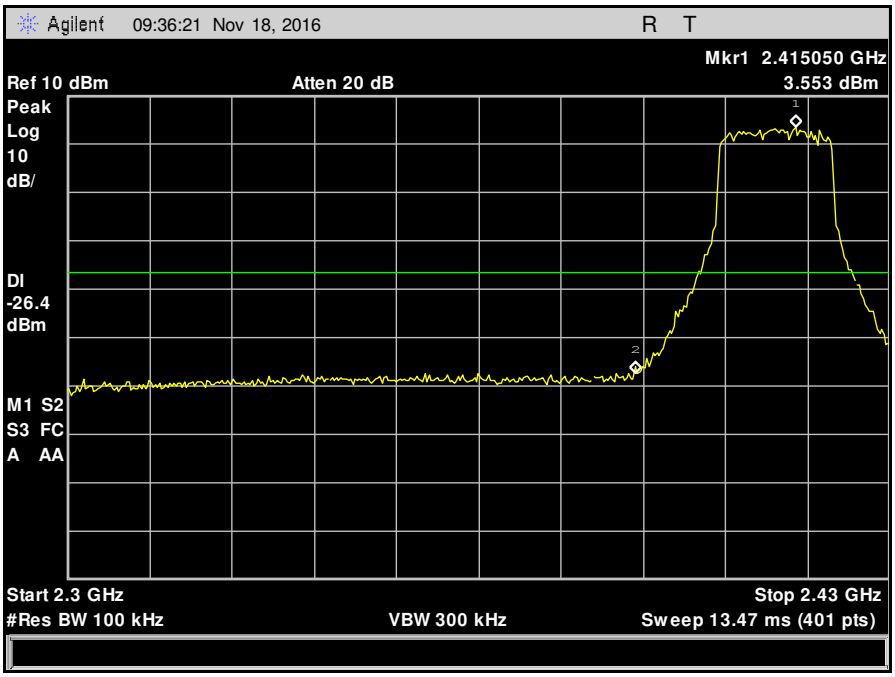


Plot 351. Conducted Band Edge, Low Channel, 802.11g, Antenna 2, 13 dBi Antenna

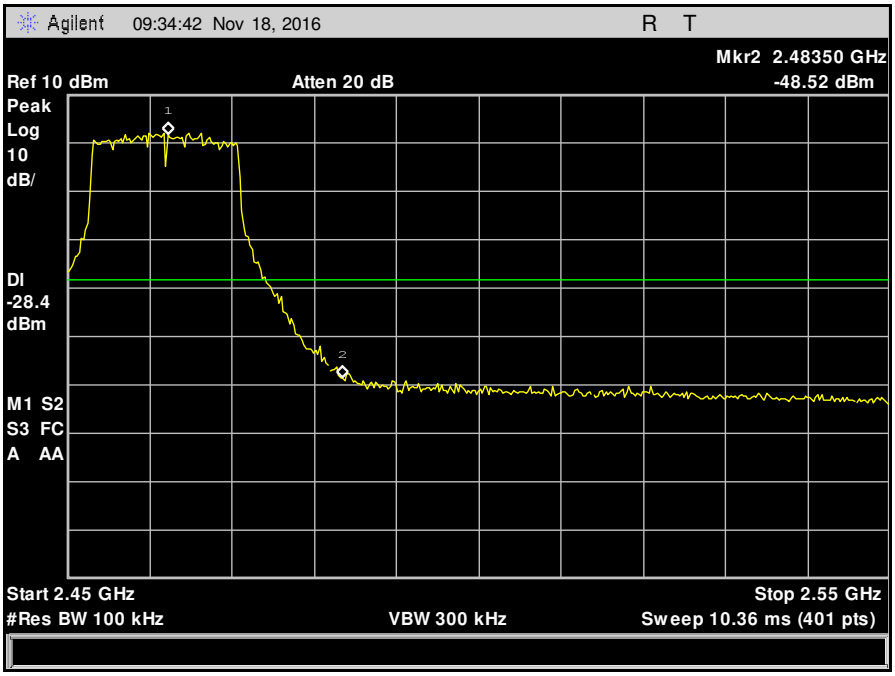


Plot 352. Conducted Band Edge, High Channel, 802.11g, Antenna 2, 13 dBi Antenna

Conducted Band Edge Test Results, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

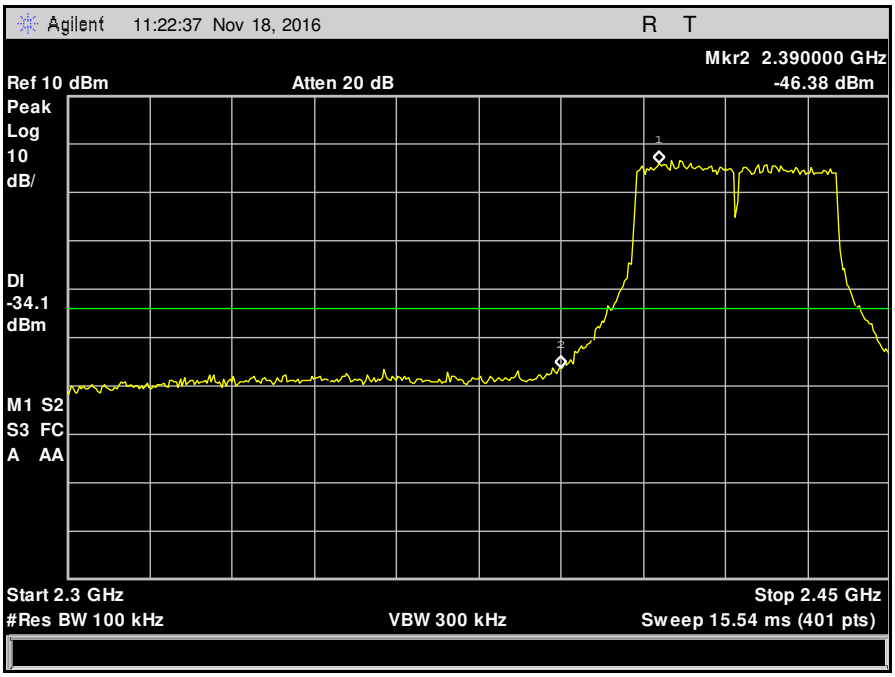


Plot 353. Conducted Band Edge, Low Channel, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

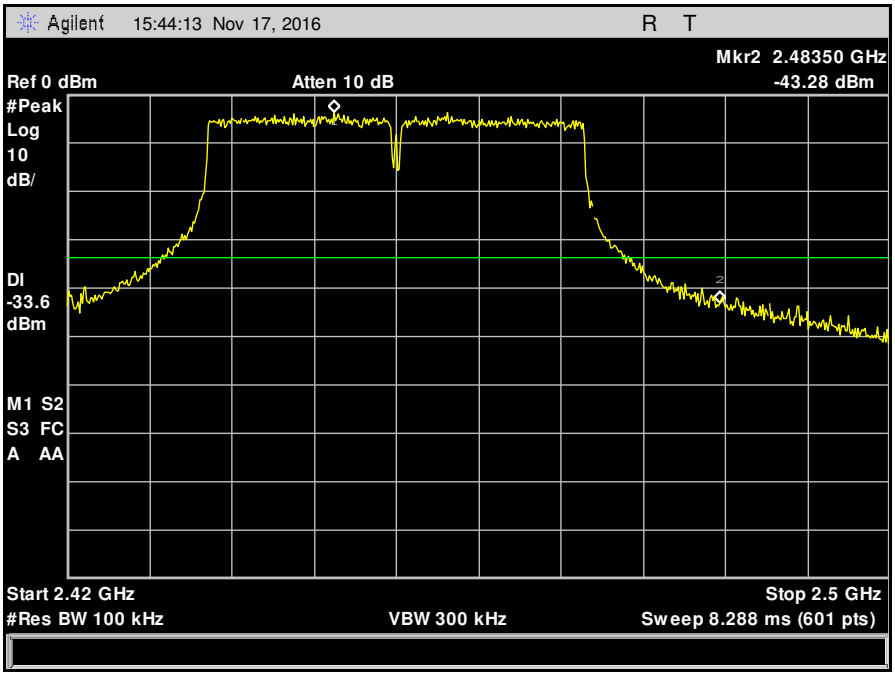


Plot 354. Conducted Band Edge, High Channel, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna

Conducted Band Edge Test Results, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



Plot 355. Conducted Band Edge, Low Channel, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



Plot 356. Conducted Band Edge, High Channel, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

Test Requirements: **§15.247(e):** For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level throughout each of the 100 sweeps of power averaging. The RBW was set to 3 kHz and a VBW set to 9 kHz or greater. The spectrum analyzer was set to an auto sweep time and a peak detector was used. Measurements were carried out at the low, mid and high channels.

Test Results: The EUT was compliant with the peak power spectral density limits of **§ 15.247 (e)**.

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

Per **§ 15.247 (e)**, the peak power spectral density shall be determined using the same method of conducted output power. In other words, using the following method:

Per KDB 558074, Section 7.0, for transmitting antennas which exceed 6 dBi, the applicable output power limit shall be calculated as follows:
$P_{out} = P_{limit} - (G_{Tx} - 6)$, where P_{out} is the maximum conduct output power in dBm, P_{limit} is the output power limit in dBm, and G_{Tx} is the maximum transmitting antenna directional gain in dBi.

Test Engineer: Kristine Cabrera

Test Date: 11/18/16

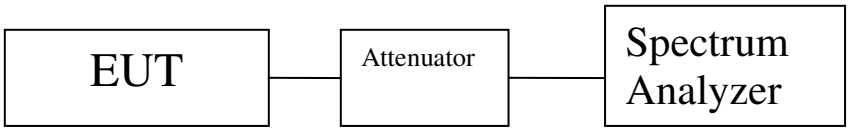


Figure 5. Block Diagram, Peak Power Spectral Density Test Setup

Peak Power Spectral Density Test Results

Total Gain (dBi)	Limit (dBm)
9	5
13	1

Table 28. Total Gain of System

For the 9dBi antenna, it is 3dB greater than 6 dBi. Therefore, the final level for the total power limit is 5 dBm.
For the 13dBi antenna, it is 7dB greater than 6 dBi. Therefore, the final level for the total power limit is 1 dBm.

Peak Power Spectral Density						
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm) Ant 1	Measured PPSD (dBm) Ant 2	Total PSD	Limit (dBm)	Margin (dB)
Low	2412	-3.729	1.844	2.91	5	-2.09
Mid	2437	-4.232	-3.093	-0.61	5	-5.61
High	2462	-2.221	-2.711	0.56	5	-4.44

Table 29. Peak Power Spectral Density, Test Results, 802.11b, 9 dBi Antenna

Peak Power Spectral Density						
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm) Ant 1	Measured PPSD (dBm) Ant 2	Total PSD	Limit (dBm)	Margin (dB)
Low	2412	-2.041	-1.68	1.16	5	-3.84
Mid	2437	1.232	0.918	4.09	5	-0.91
High	2462	-1.568	2.651	4.05	5	-0.95

Table 30. Peak Power Spectral Density, Test Results, 802.11g, 9 dBi Antenna

Peak Power Spectral Density						
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm) Ant 1	Measured PPSD (dBm) Ant 2	Total PSD	Limit (dBm)	Margin (dB)
Low	2412	-2.957	-2.291	0.4	5	-4.6
Mid	2437	0.819	-0.015	3.44	5	-1.56
High	2462	-1.769	1.77	3.37	5	-1.63

Table 31. Peak Power Spectral Density, Test Results, 802.11n 20 MHz, 9 dBi Antenna

Peak Power Spectral Density						
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm) Ant 1	Measured PPSD (dBm) Ant 2	Total PSD	Limit (dBm)	Margin (dB)
Low	2422	-6.95	-7.205	-4.06	5	-9.06
Mid	2437	-2.165	-0.474	1.78	5	-3.22
High	2452	-7.106	-7.881	-4.46	5	-9.46

Table 32. Peak Power Spectral Density, Test Results, 802.11n 40 MHz, 9 dBi Antenna

Peak Power Spectral Density						
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm) Ant 1	Measured PPSD (dBm) Ant 2	Total PSD	Limit (dBm)	Margin (dB)
Low	2412	-3.729	-3.273	-0.48	1	-1.48
Mid	2437	-4.232	-3.093	-0.61	1	-1.61
High	2462	-2.221	-2.711	0.56	1	-0.44

Table 33. Peak Power Spectral Density, Test Results, 802.11b, 13 dBi Antenna

Peak Power Spectral Density						
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm) Ant 1	Measured PPSD (dBm) Ant 2	Total PSD	Limit (dBm)	Margin (dB)
Low	2412	-4.37	-5.137	-1.72	1	-2.72
Mid	2437	-3.672	-3.687	-0.66	1	-1.66
High	2462	-5.62	-6.038	-2.81	1	-3.81

Table 34. Peak Power Spectral Density, Test Results, 802.11g, 13 dBi Antenna

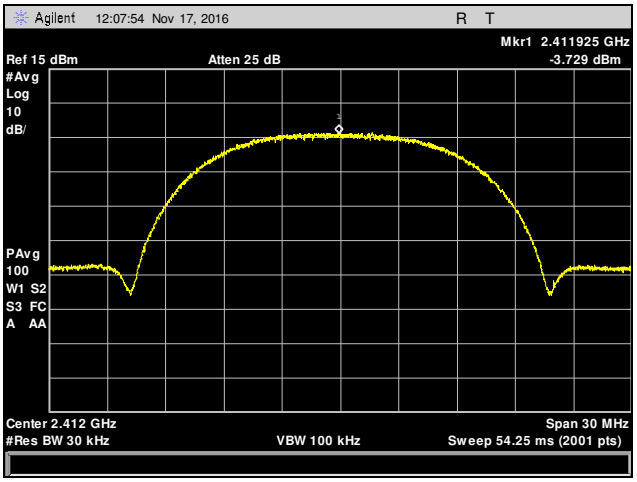
Peak Power Spectral Density						
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm) Ant 1	Measured PPSD (dBm) Ant 2	Total PSD	Limit (dBm)	Margin (dB)
Low	2412	-6.589	-0.797	0.22	1	-0.78
Mid	2437	-4.526	-4.395	-1.44	1	-2.44
High	2462	-6.191	-1.7	-0.37	1	-1.37

Table 35. Peak Power Spectral Density, Test Results, 802.11n 20 MHz, 13 dBi Antenna

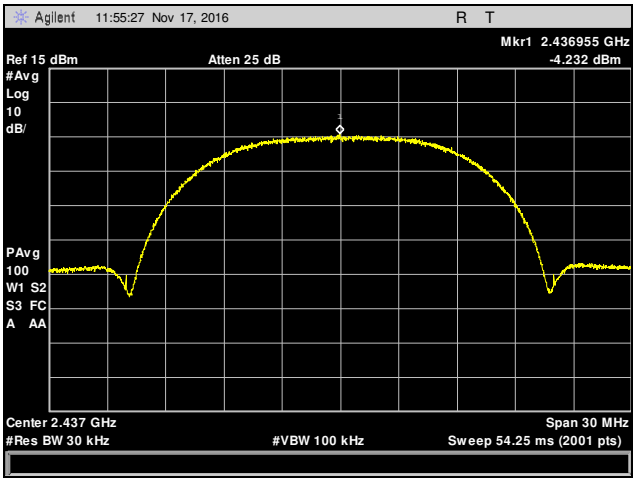
Peak Power Spectral Density						
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm) Ant 1	Measured PPSD (dBm) Ant 2	Total PSD	Limit (dBm)	Margin (dB)
Low	2422	-13.73	-13.37	-10.53	1	-11.53
Mid	2437	-5.235	-2.989	-0.95	1	-1.95
High	2452	-13.33	-13.49	-10.39	1	-11.39

Table 36. Peak Power Spectral Density, Test Results, 802.11n 40 MHz, 13 dBi Antenna

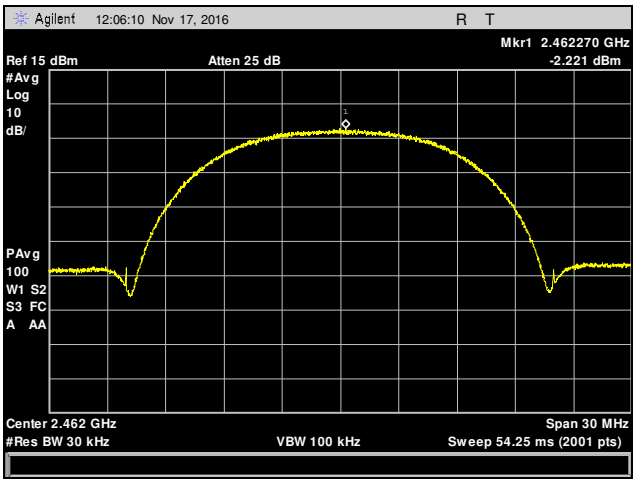
Peak Power Spectral Density, 802.11b, Antenna 1, 9 dBi Antenna



Plot 357. Peak Power Spectral Density, Low Channel, 802.11b, Antenna 1, 9 dBi

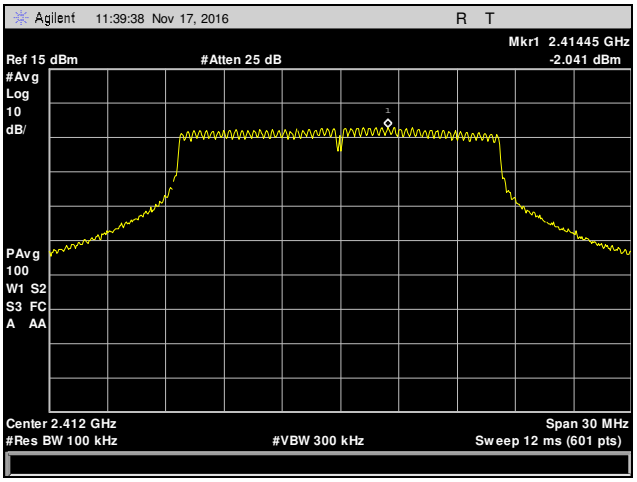


Plot 358. Peak Power Spectral Density, Mid Channel, 802.11b, Antenna 1, 9 dBi

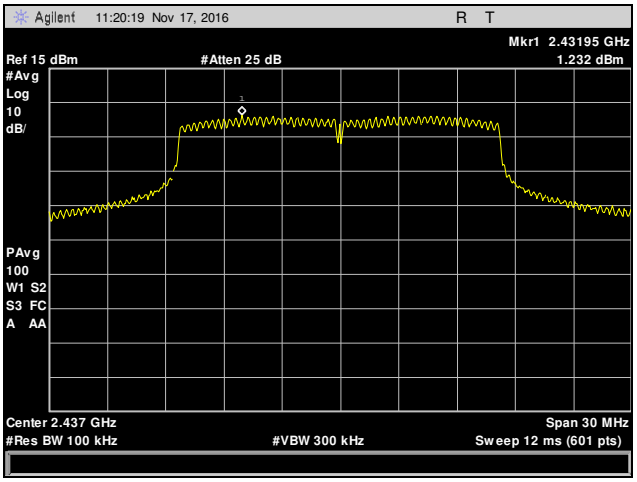


Plot 359. Peak Power Spectral Density, High Channel, 802.11b, Antenna 1, 9 dBi

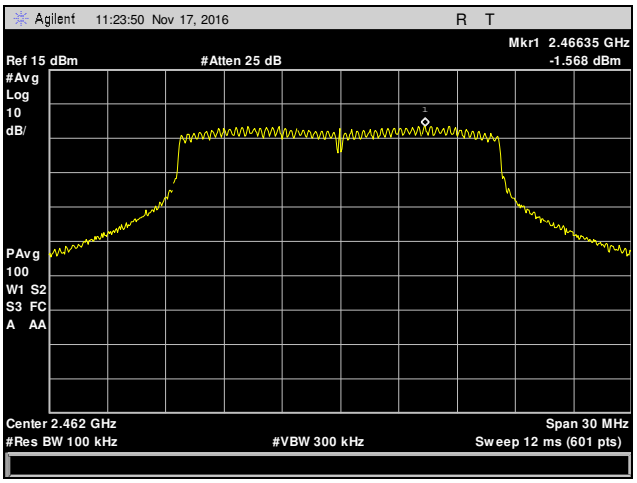
Peak Power Spectral Density, 802.11g, Antenna 1, 9 dBi Antenna



Plot 360. Peak Power Spectral Density, Low Channel, 802.11g, Antenna 1, 9 dBi

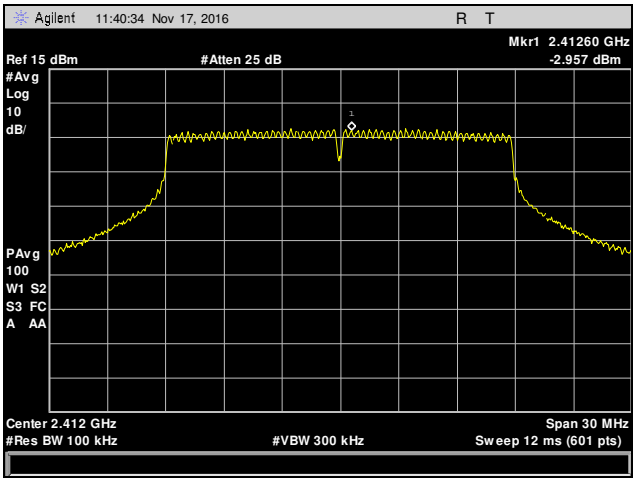


Plot 361. Peak Power Spectral Density, Mid Channel, 802.11g, Antenna 1, 9 dBi

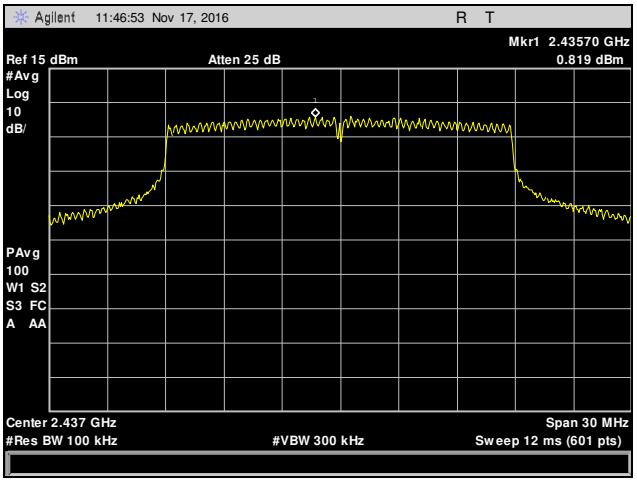


Plot 362. Peak Power Spectral Density, High Channel, 802.11g, Antenna 1, 9 dBi

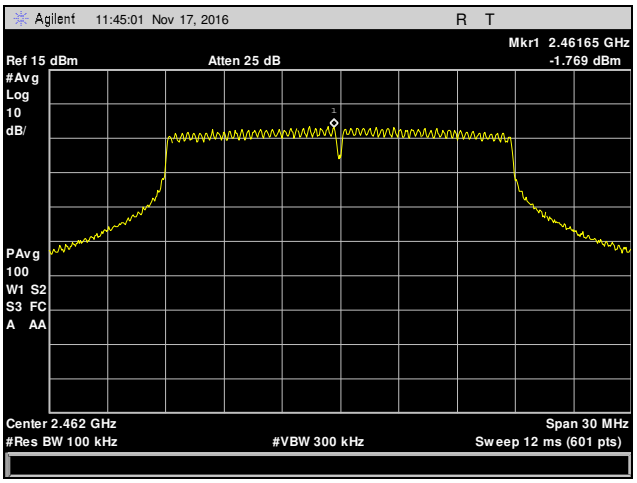
Peak Power Spectral Density, 802.11n 20 MHz, Antenna 1, 9 dBi Antenna



Plot 363. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, Antenna 1, 9 dBi

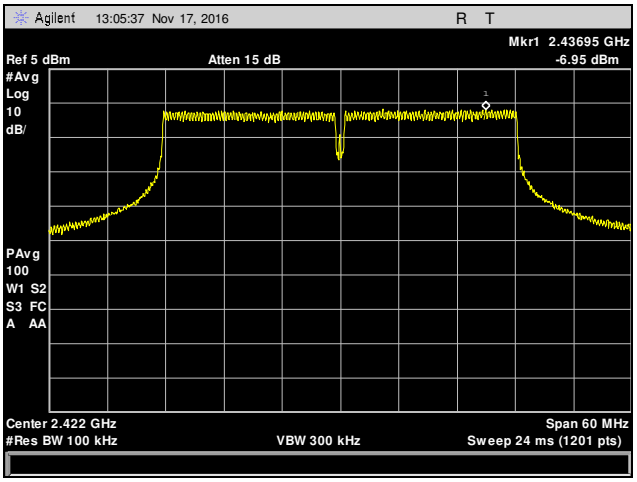


Plot 364. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz, Antenna 1, 9 dBi

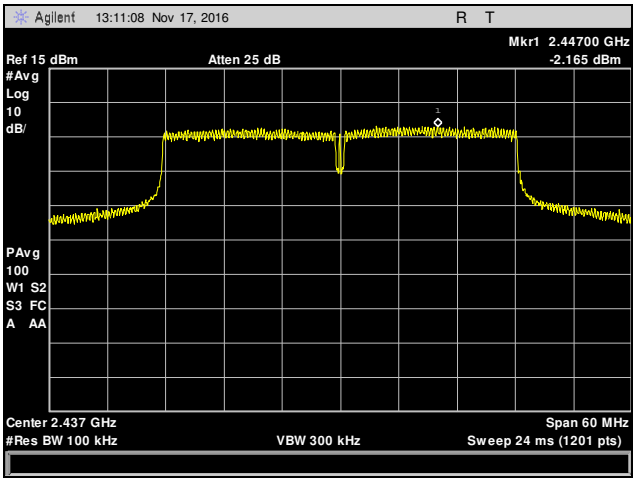


Plot 365. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, Antenna 1, 9 dBi

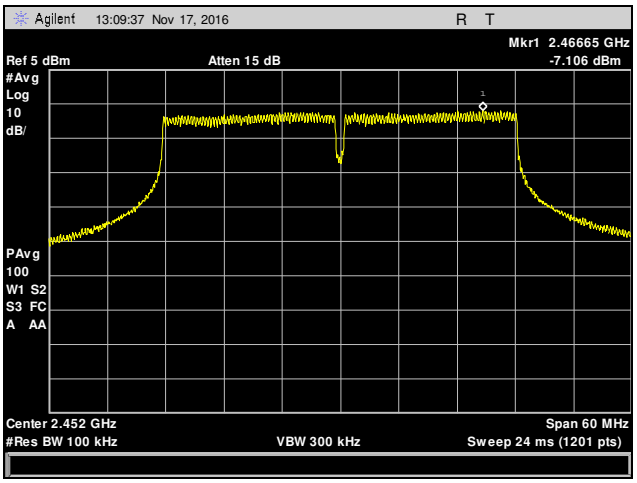
Peak Power Spectral Density, 802.11n 40 MHz, Antenna 1, 9 dBi Antenna



Plot 366. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, Antenna 1, 9 dBi

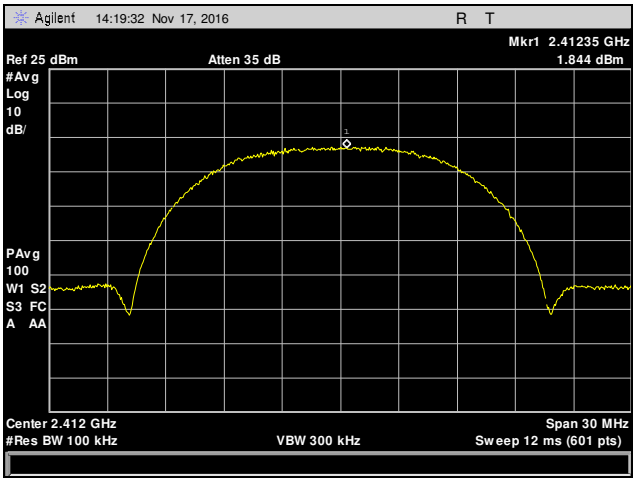


Plot 367. Peak Power Spectral Density, Mid Channel, 802.11n 40 MHz, Antenna 1, 9 dBi

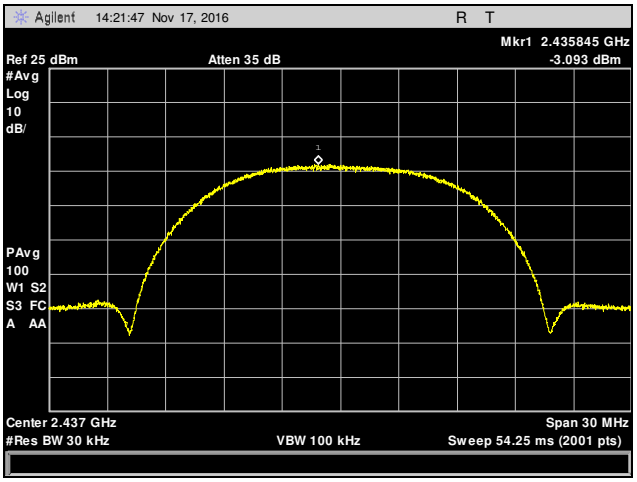


Plot 368. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, Antenna 1, 9 dBi

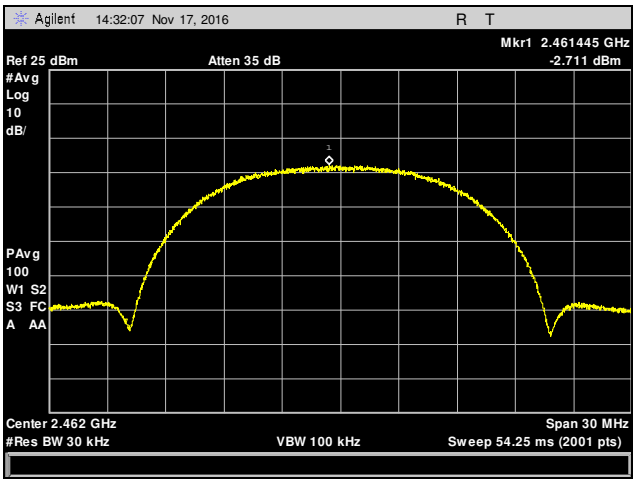
Peak Power Spectral Density, 802.11b, Antenna 2, 9 dBi Antenna



Plot 369. Peak Power Spectral Density, Low Channel, 802.11b, Antenna 2, 9 dBi

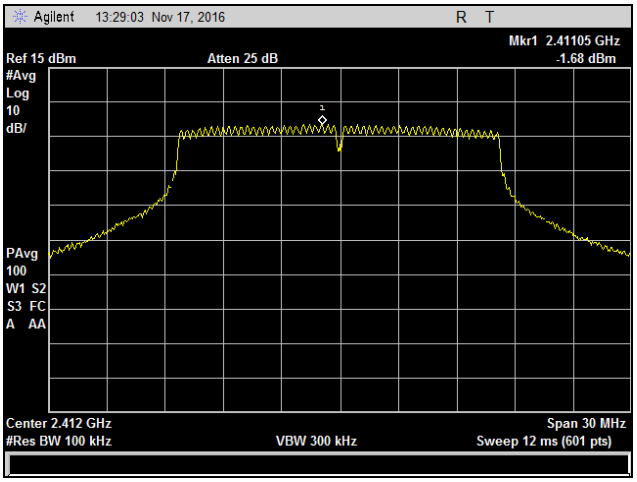


Plot 370. Peak Power Spectral Density, Mid Channel, 802.11b, Antenna 2, 9 dBi

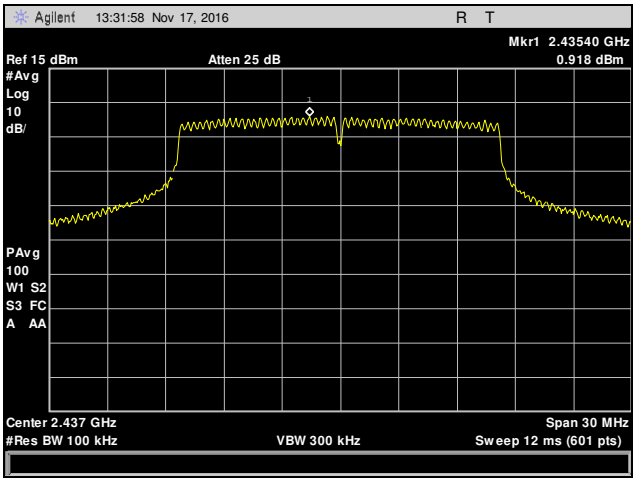


Plot 371. Peak Power Spectral Density, High Channel, 802.11b, Antenna 2, 9 dBi

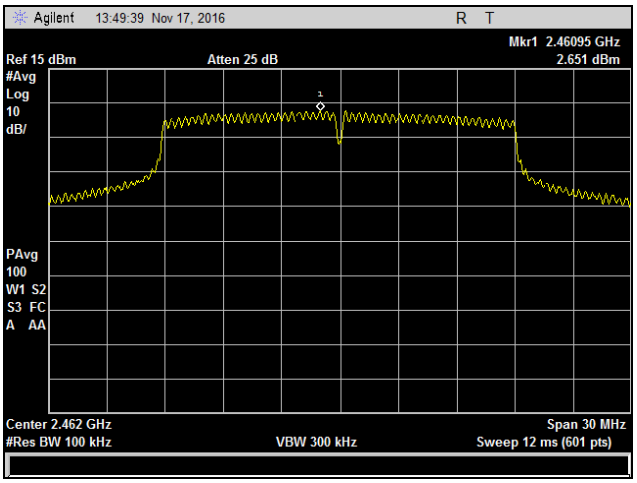
Peak Power Spectral Density, 802.11g, Antenna 2, 9 dBi Antenna



Plot 372. Peak Power Spectral Density, Low Channel, 802.11g, Antenna 2, 9 dBi

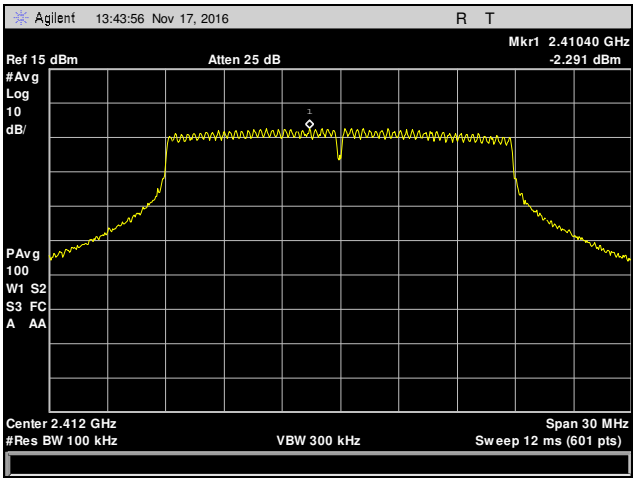


Plot 373. Peak Power Spectral Density, Mid Channel, 802.11g, Antenna 2, 9 dBi

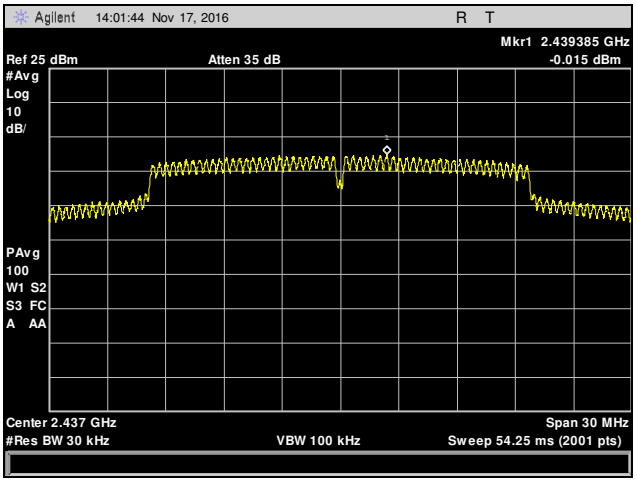


Plot 374. Peak Power Spectral Density, High Channel, 802.11g, Antenna 2, 9 dBi

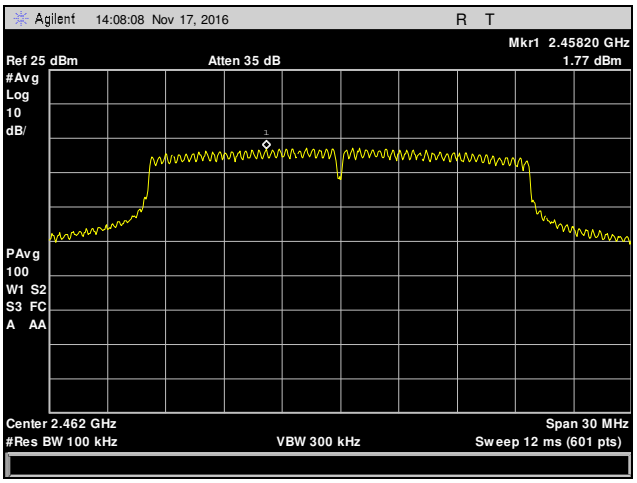
Peak Power Spectral Density, 802.11n 20 MHz, Antenna 2, 9 dBi Antenna



Plot 375. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, Antenna 2, 9 dBi

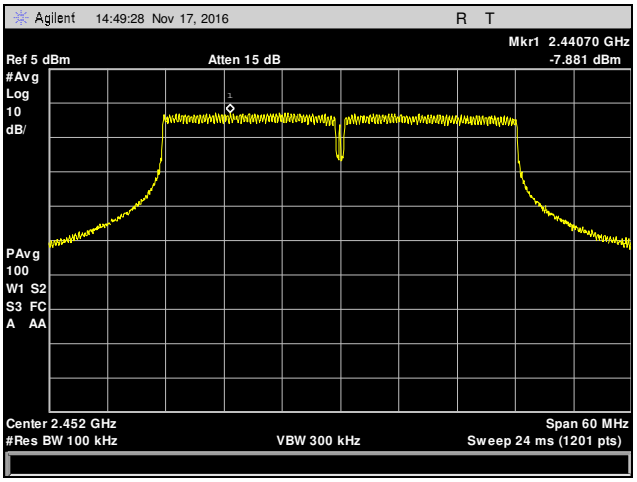


Plot 376. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz, Antenna 2, 9 dBi

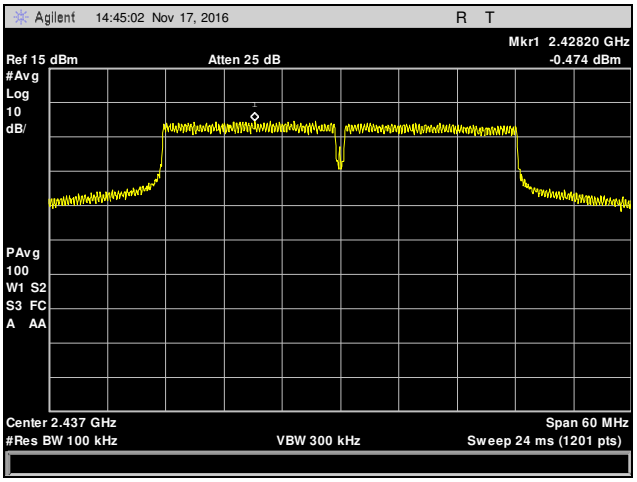


Plot 377. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, Antenna 2, 9 dBi

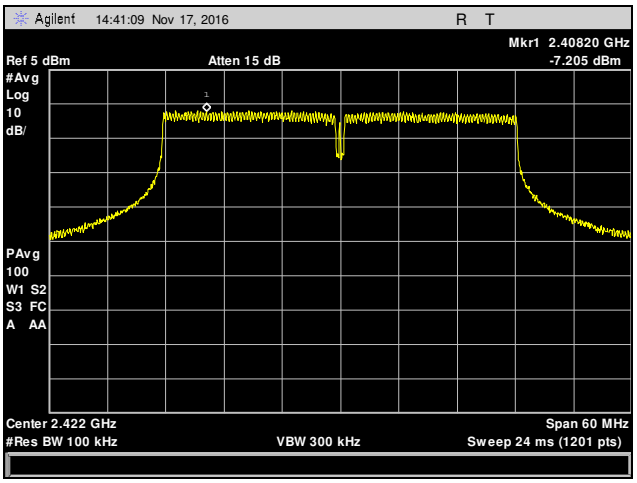
Peak Power Spectral Density, 802.11n 40 MHz, Antenna 2, 9 dBi Antenna



Plot 378. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, Antenna 2, 9 dBi

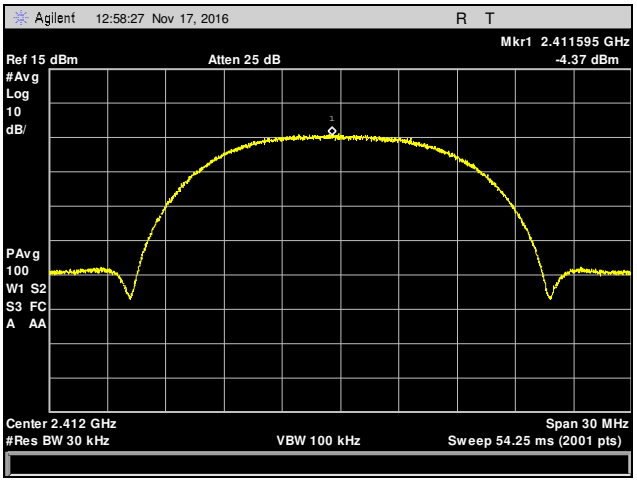


Plot 379. Peak Power Spectral Density, Mid Channel, 802.11n 40 MHz, Antenna 2, 9 dBi

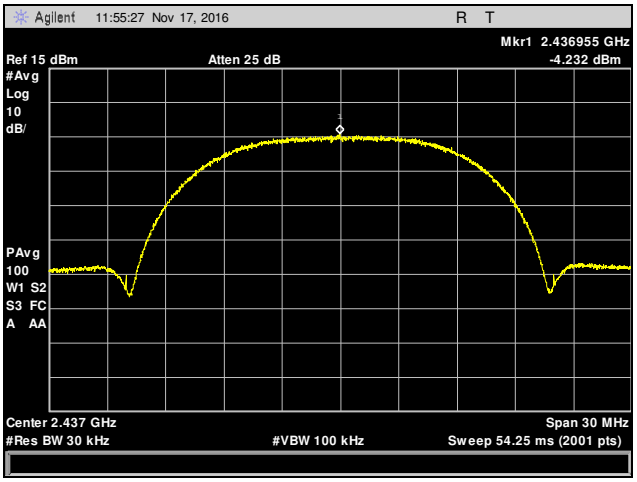


Plot 380. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, Antenna 2, 9 dBi

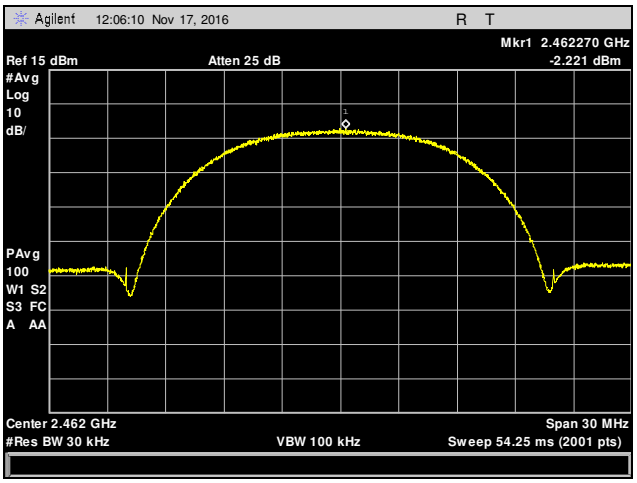
Peak Power Spectral Density, 802.11b, Antenna 1, 13 dBi Antenna



Plot 381. Peak Power Spectral Density, Low Channel, 802.11b, Antenna 1, 13 dBi

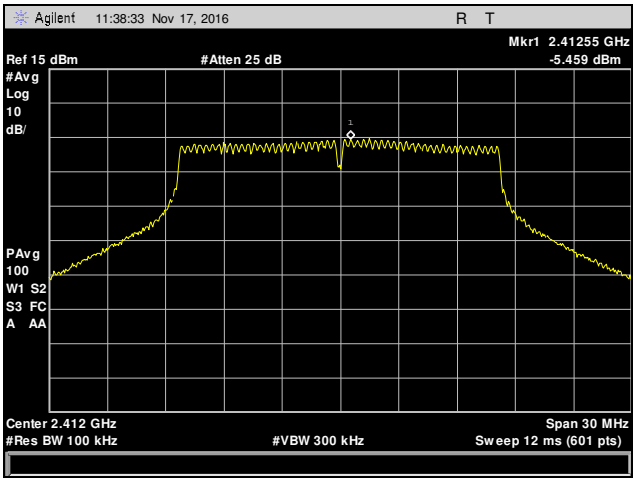


Plot 382. Peak Power Spectral Density, Mid Channel, 802.11b, Antenna 1, 13 dBi

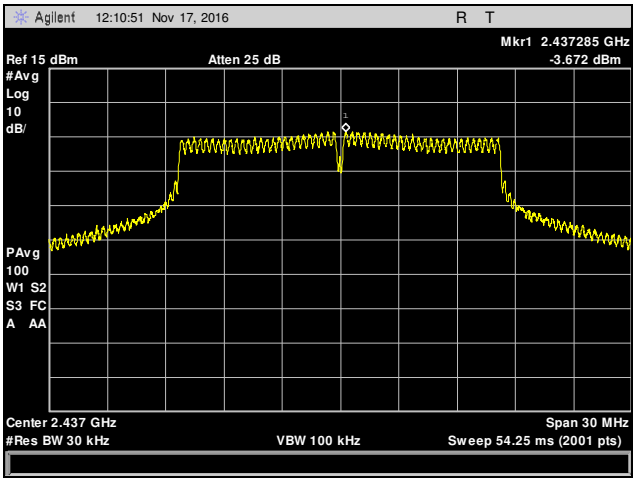


Plot 383. Peak Power Spectral Density, High Channel, 802.11b, Antenna 1, 13 dBi

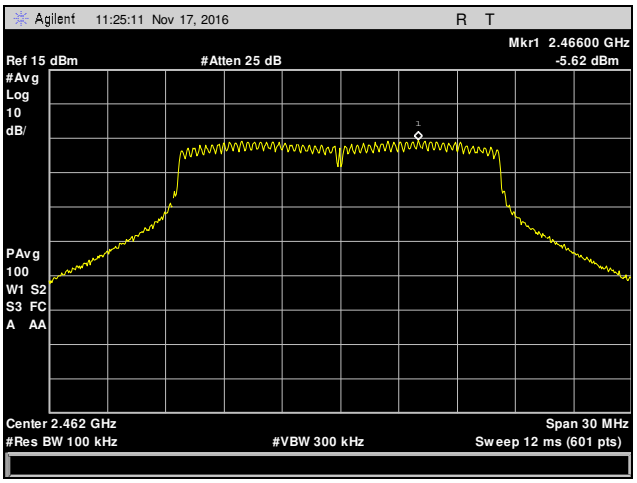
Peak Power Spectral Density, 802.11g, Antenna 1, 13 dBi Antenna



Plot 384. Peak Power Spectral Density, Low Channel, 802.11g, Antenna 1, 13 dBi

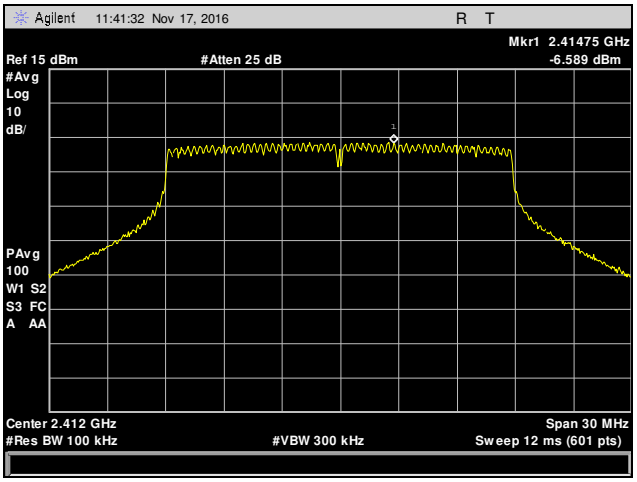


Plot 385. Peak Power Spectral Density, Mid Channel, 802.11g, Antenna 1, 13 dBi

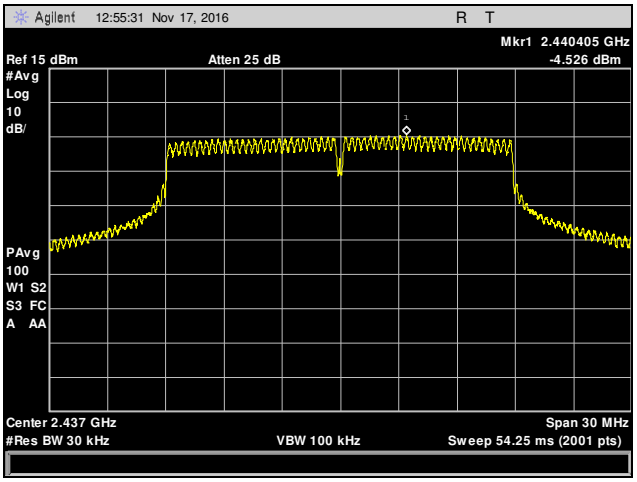


Plot 386. Peak Power Spectral Density, High Channel, 802.11g, Antenna 1, 13 dBi

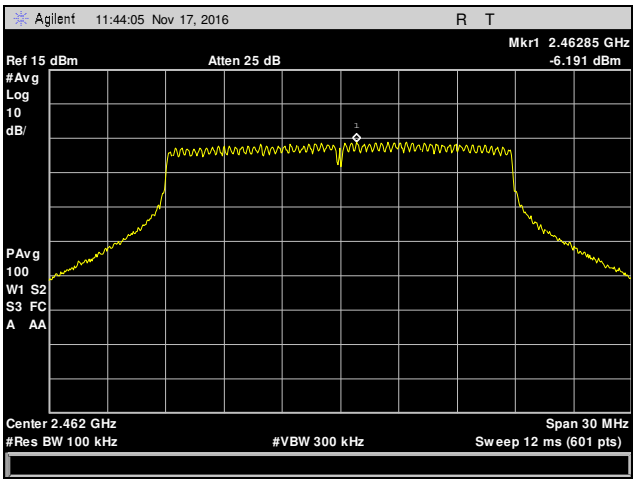
Peak Power Spectral Density, 802.11n 20 MHz, Antenna 1, 13 dBi Antenna



Plot 387. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, Antenna 1, 13 dBi

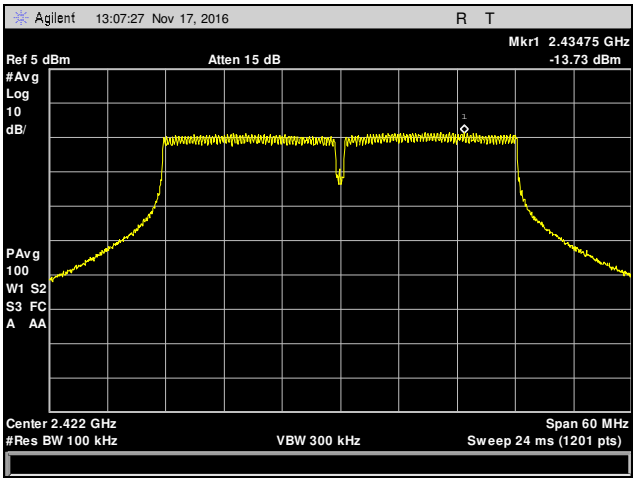


Plot 388. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz, Antenna 1, 13 dBi

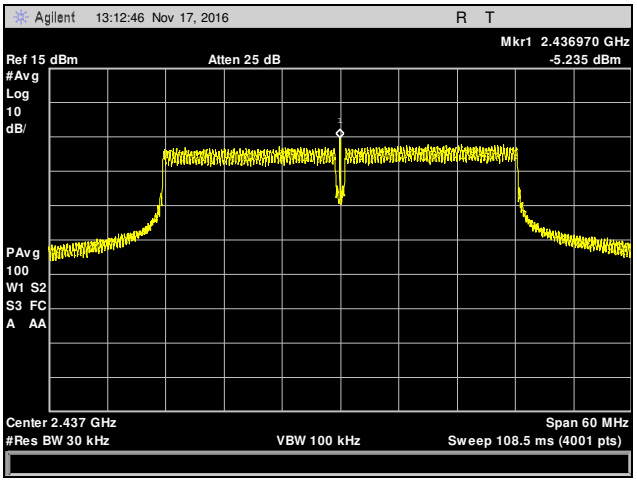


Plot 389. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, Antenna 1, 13 dBi

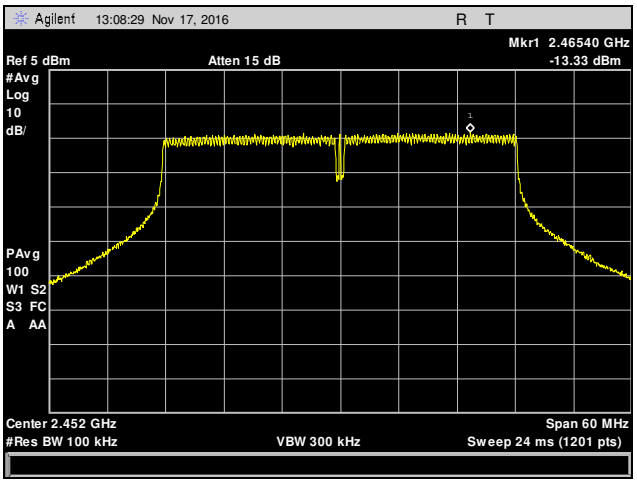
Peak Power Spectral Density, 802.11n 40 MHz, Antenna 1, 13 dBi Antenna



Plot 390. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, Antenna 1, 13 dBi

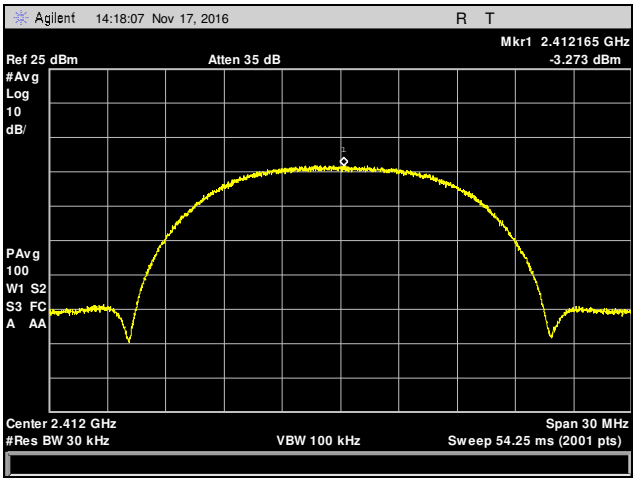


Plot 391. Peak Power Spectral Density, Mid Channel, 802.11n 40 MHz, Antenna 1, 13 dBi

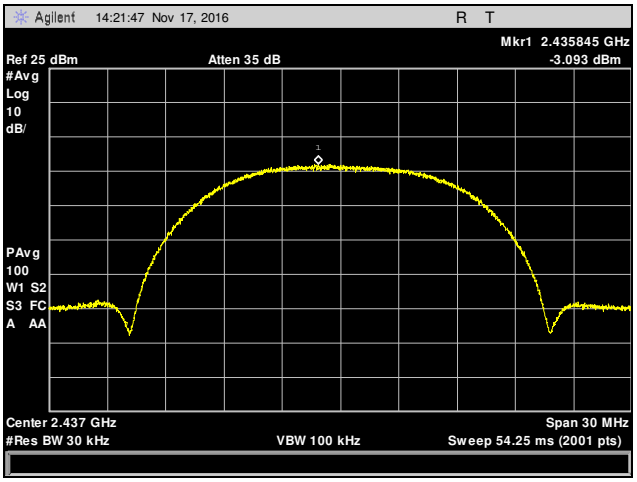


Plot 392. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, Antenna 1, 13 dBi

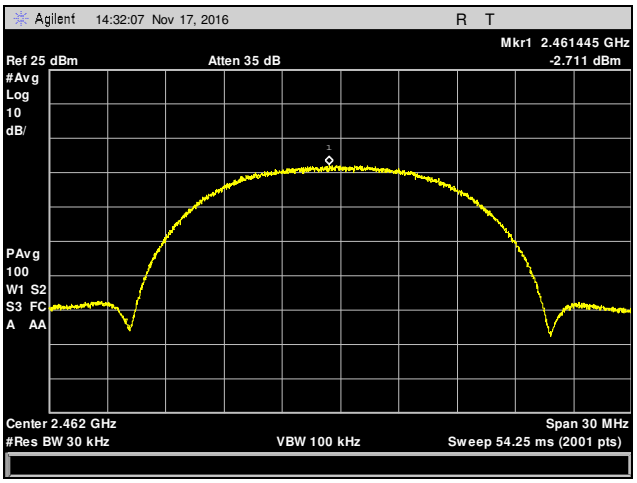
Peak Power Spectral Density, 802.11b, Antenna 2, 13 dBi Antenna



Plot 393. Peak Power Spectral Density, Low Channel, 802.11b, Antenna 2, 13 dBi

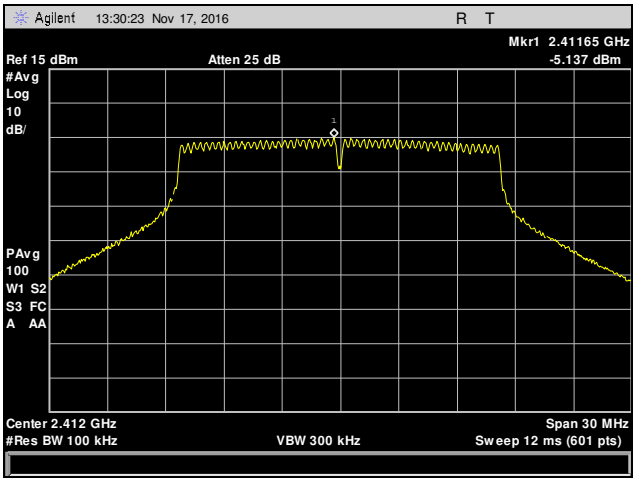


Plot 394. Peak Power Spectral Density, Mid Channel, 802.11b, Antenna 2, 13 dBi

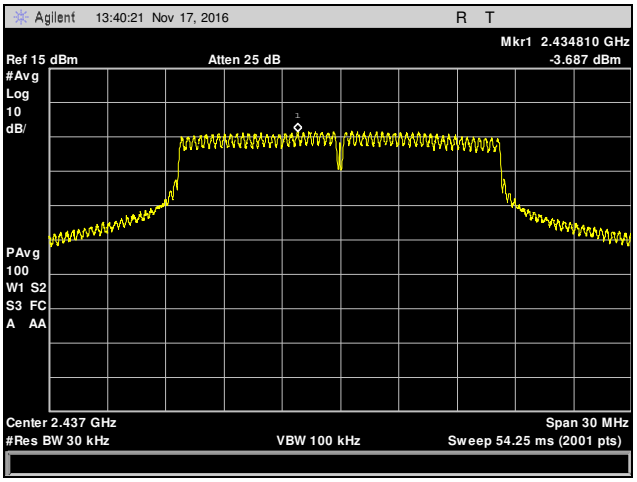


Plot 395. Peak Power Spectral Density, High Channel, 802.11b, Antenna 2, 13 dBi

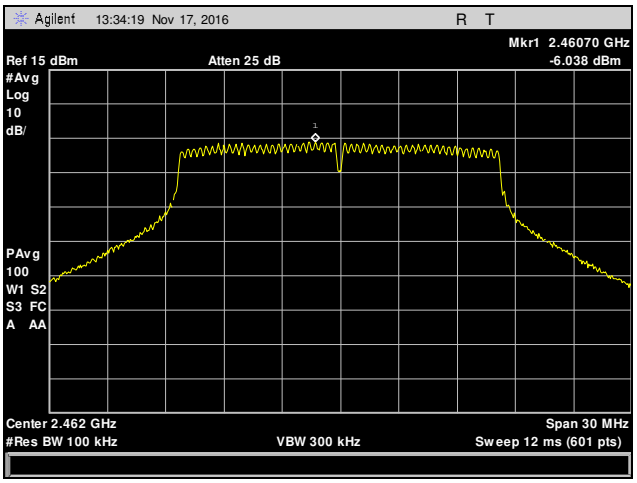
Peak Power Spectral Density, 802.11g, Antenna 2, 13 dBi Antenna



Plot 396. Peak Power Spectral Density, Low Channel, 802.11g, Antenna 2, 13 dBi

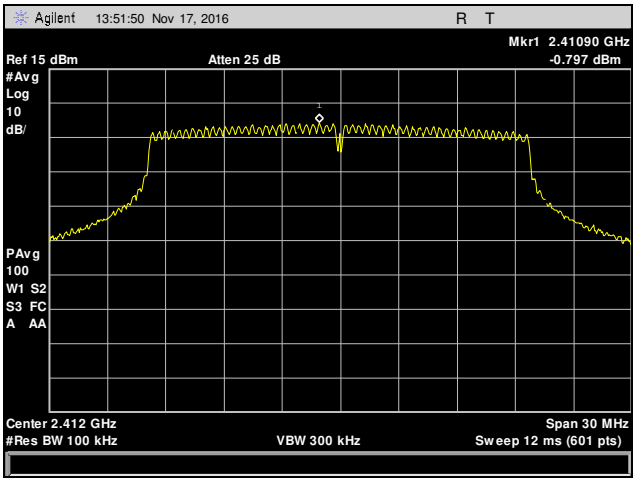


Plot 397. Peak Power Spectral Density, Mid Channel, 802.11g, Antenna 2, 13 dBi

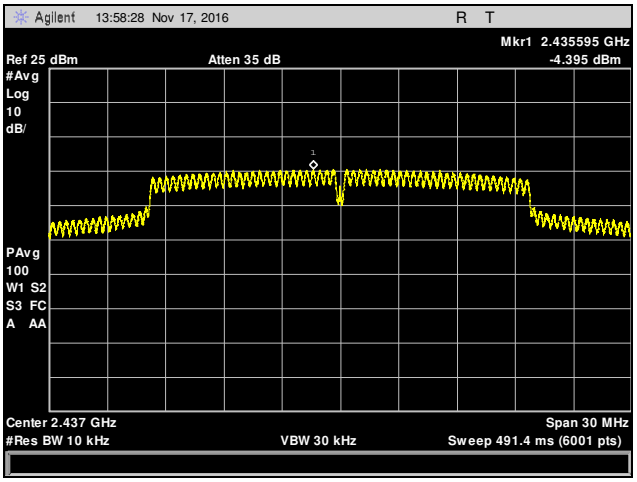


Plot 398. Peak Power Spectral Density, High Channel, 802.11g, Antenna 2, 13 dBi

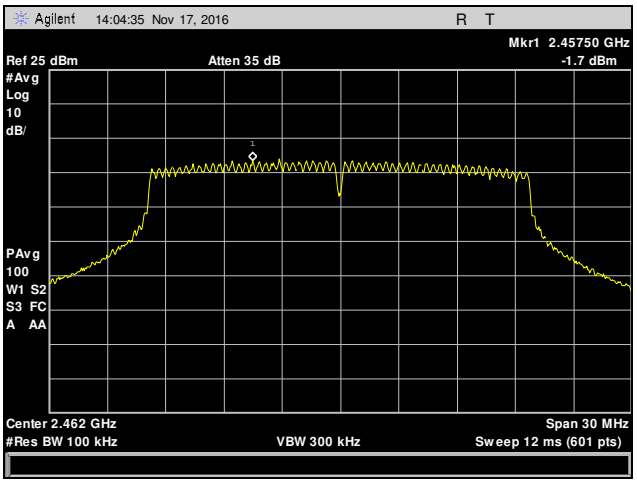
Peak Power Spectral Density, 802.11n 20 MHz, Antenna 2, 13 dBi Antenna



Plot 399. Peak Power Spectral Density, Low Channel, 802.11n 20 MHz, Antenna 2, 13 dBi

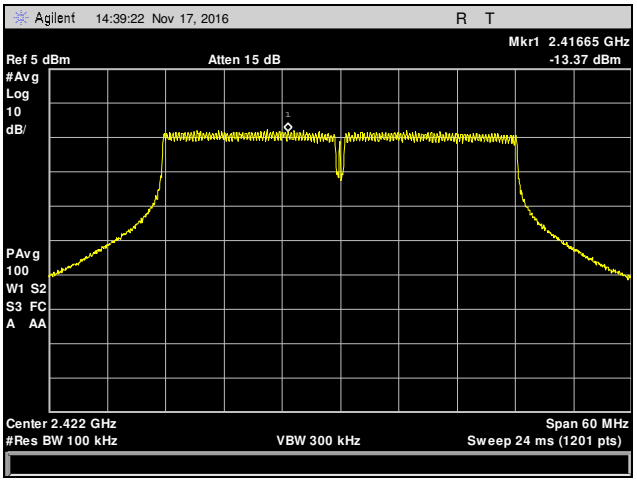


Plot 400. Peak Power Spectral Density, Mid Channel, 802.11n 20 MHz, Antenna 2, 13 dBi

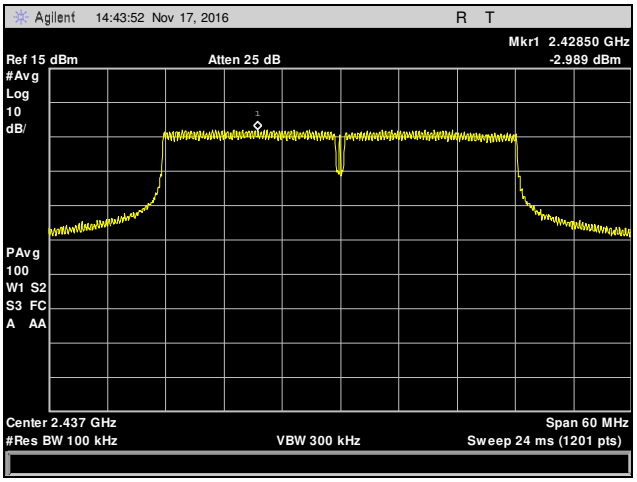


Plot 401. Peak Power Spectral Density, High Channel, 802.11n 20 MHz, Antenna 2, 13 dBi

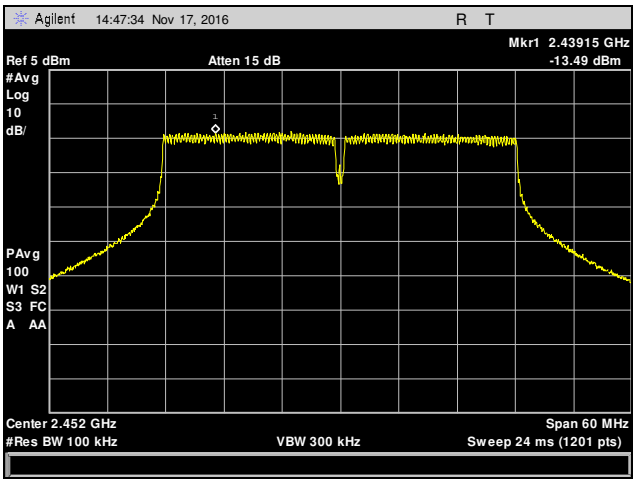
Peak Power Spectral Density, 802.11n 40 MHz, Antenna 2, 13 dBi Antenna



Plot 402. Peak Power Spectral Density, Low Channel, 802.11n 40 MHz, Antenna 2, 13 dBi



Plot 403. Peak Power Spectral Density, Mid Channel, 802.11n 40 MHz, Antenna 2, 13 dBi



Plot 404. Peak Power Spectral Density, High Channel, 802.11n 40 MHz, Antenna 2, 13 dBi

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(i) Maximum Permissible 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: EUT's operating frequencies @ 2400-2483.5 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

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

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

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

Test Results:

FCC									
Frequency (MHz)	**Con. Pwr. (dBm)**	**Con. Pwr. (mW)**	**Ant. Gain (dBi)**	**Ant. Gain numeric**	**Pwr. Density (mW/cm^2)**	**Limit (mW/cm^2)**	**Margin**	**Distance (cm)**	**Result**
2462	20.55	113.501	13	19.953	0.45054	1	0.54946	20	Pass
2437	23.63	230.675	9	7.943	0.36453	1	0.63547	20	Pass

The safe distance where Power Density is less than the MPE Limit listed above was found to be 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
1A1065	EMI RECEIVER	ROHDE & SCHWARZ	ESCI	3/24/2016	3/4/2017
1A1177	PULSE LIMITER	ROHDE & SCHWARZ	ESH3Z2	6/30/2015	12/30/2016
1A1119	TEST AREA	CUSTOM MADE	N/A	8/14/2015	8/14/2017
1A1122	LISN	TESEQ	NNB 51	5/26/2016	5/26/2017
1A1149	MILLIOHM METER	GW INSTEK	GOM-802	4/19/2016	4/19/2017
1A1065	EMI RECEIVER	ROHDE & SCHWARZ	ESCI	3/24/2016	3/4/2017
1A1079	CONDUCTED COMB GENERATOR	COM-POWER CORP	CGC-255	SEE NOTE	
1A1044	GENERATOR	COM-POWER CORP	CG-520	SEE NOTE	
1A1047	HORN ANTENNA	ETS	3117	08/03/2015	02/03/2017
1A1073	MULTI DEVICE CONTROLLER	ETS EMCO	2090	SEE NOTE	
1A1074	SYSTEM CONTROLLER	PANASONIC	WV-CU101	SEE NOTE	
1A1075	SYSTEM CONTROLLER	PANASONIC	WV-CU101	SEE NOTE	
1A1080	MULTI DEVICE CONTROLLER	ETS EMCO	2090	SEE NOTE	
1A1088	PRE-AMP	RHODE & SCHWARZ	TS-PR1	SEE NOTE	
1A1099	GENERATOR	COM-POWER CORP	CGO-51000	SEE NOTE	
1A1106A	10M CHAMBER (FCC)	ETS	SEMI-ANECHOIC	03/31/2015	03/31/2017
1A1147	BILOG ANTENNA (30MHZ TO 1GHZ)	SUNOL SCIENCES CORP	JB3	08/14/2015	02/14/2017
1A1161	HORN ANTENNA (18-40GHz)	ETS-LINDGREN	3116C-PA	07/20/2015	01/20/2017
1A1180	PRE-AMP	MITEQ	AMF-7D-01001800-22-10P	SEE NOTE	
1A1184	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	02/03/2016	02/03/2017
1A1141	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	03/31/2016	03/31/2017

Table 37. Test Equipment List

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

V. Certification & User's Manual Information

Certification & User's Manual Information

A. 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

1. 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 user's 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.

End of Report

