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February 17, 2014

7Signal Solutions, Inc.  
526 S. Main Street  
Akron, OH 44311

Dear Don Sloan,

Enclosed is the EMC Wireless test report for compliance testing of the 7Signal Solutions, Inc., Indoor Eye / INDR-EYE01 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B and ICES-003, Issue 5 August 2012 for a Class A Digital Device, and FCC Part 15 Subpart C and RSS-210, Issue 8, Dec. 2010 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: (\7Signal Solutions, Inc.\EMC39456-FCC247)

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## **Electromagnetic Compatibility Criteria Test Report**

for the

**7Signal Solutions, Inc.  
Indoor Eye / INDR-EYE01**

**Tested under**  
the FCC Certification Rules  
contained in  
Title 47 of the CFR, Parts 15 Subpart B & ICES-003  
for Class A Digital Devices  
&  
15.247 Subpart C & RSS-210, Issue 8, Dec. 2010  
for Intentional Radiators

**MET Report: EMC39456-FCC247**

February 17, 2014

**Prepared For:**

**7Signal Solutions, Inc.  
526 S. Main Street  
Akron, OH 44311**

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

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for Intentional Radiators



Shawn McMillen, Project Engineer  
Electromagnetic Compatibility Lab



Jennifer Warnell  
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**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 Parts 15B, 15.247 and Industry Canada standards ICES-003, Issue 5 August 2012, RSS-210, Issue 8, Dec. 2010 under normal use and maintenance.



Asad Bajwa,  
Director, Electromagnetic Compatibility Lab



## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	February 17, 2014	Initial Issue.

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## List of Terms and Abbreviations

<b>AC</b>	<b>Alternating Current</b>
<b>ACF</b>	<b>Antenna Correction Factor</b>
<b>Cal</b>	<b>Calibration</b>
<b><i>d</i></b>	<b>Measurement Distance</b>
<b>dB</b>	<b>Decibels</b>
<b>dB<math>\mu</math>A</b>	<b>Decibels above one microamp</b>
<b>dB<math>\mu</math>V</b>	<b>Decibels above one microvolt</b>
<b>dB<math>\mu</math>A/m</b>	<b>Decibels above one microamp per meter</b>
<b>dB<math>\mu</math>V/m</b>	<b>Decibels above one microvolt per meter</b>
<b>DC</b>	<b>Direct Current</b>
<b>E</b>	<b>Electric Field</b>
<b>DSL</b>	<b>Digital Subscriber Line</b>
<b>ESD</b>	<b>Electrostatic Discharge</b>
<b>EUT</b>	<b>Equipment Under Test</b>
<b><i>f</i></b>	<b>Frequency</b>
<b>FCC</b>	<b>Federal Communications Commission</b>
<b>GRP</b>	<b>Ground Reference Plane</b>
<b>H</b>	<b>Magnetic Field</b>
<b>HCP</b>	<b>Horizontal Coupling Plane</b>
<b>Hz</b>	<b>Hertz</b>
<b>IEC</b>	<b>International Electrotechnical Commission</b>
<b>kHz</b>	<b>kilohertz</b>
<b>kPa</b>	<b>kilopascal</b>
<b>kV</b>	<b>kilovolt</b>
<b>LISN</b>	<b>Line Impedance Stabilization Network</b>
<b>MHz</b>	<b>Megahertz</b>
<b><math>\mu</math>H</b>	<b>microhenry</b>
<b><math>\mu</math></b>	<b>microfarad</b>
<b><math>\mu</math>s</b>	<b>microseconds</b>
<b>NEBS</b>	<b>Network Equipment-Building System</b>
<b>PRF</b>	<b>Pulse Repetition Frequency</b>
<b>RF</b>	<b>Radio Frequency</b>
<b>RMS</b>	<b>Root-Mean-Square</b>
<b>TWT</b>	<b>Traveling Wave Tube</b>
<b>V/m</b>	<b>Volts per meter</b>
<b>VCP</b>	<b>Vertical Coupling Plane</b>

# **I. Executive Summary**

## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the 7Signal Solutions, Inc. Indoor Eye / INDR-EYE01, 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 Indoor Eye / INDR-EYE01. 7Signal Solutions, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Indoor Eye / INDR-EYE01, 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 7Signal Solutions, Inc., purchase order number 0813001. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference 47 CFR Part 15.247:2005	IC Reference RSS-210 Issue 8: 2010; RSS-GEN Issue 3: 2010	Description	Compliance
47 CFR Part 15.107 (a)	ICES-003 Issue 5 August 2012	Conducted Emission Limits for a Class A Digital Device	Compliant
47 CFR Part 15.109 (a)	ICES-003 Issue 5 August 2012	Radiated Emission Limits for a Class A Digital Device	Compliant
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	Compliant
Title 47 of the CFR, Part 15 §15.207(a)	RSS-GEN (7.2.4)	Conducted Emission Limits	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	Peak Power Output	Compliant
Title 47 of the CFR, Part 15 §15.247(d); §15.209; §15.205	RSS-210(A8.5)	Radiated Spurious Emissions Requirements	Compliant

**Table 1. Executive Summary of EMC Part 15.247 Compliance Testing**

## **II. Equipment Configuration**

## A. Overview

MET Laboratories, Inc. was contracted by 7Signal Solutions, Inc. to perform testing on the Indoor Eye / INDR-EYE01, under 7Signal Solutions, Inc.'s purchase order number 0813001.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the 7Signal Solutions, Inc., Indoor Eye / INDR-EYE01.

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

<b>Model(s) Tested:</b>	Indoor Eye / INDR-EYE01		
<b>Model(s) Covered:</b>	Indoor Eye / INDR-EYE01		
<b>EUT Specifications:</b>	Primary Power: 120 VAC, 60 Hz		
	FCC ID: YLF-INDR-EYE01		
	Type of Modulations:	DSSS, OFDM	
	Equipment Code:	DTS	
	Peak RF Output Power:	2.4 GHz: 20.56 dBm 5.8 GHz: 21.09 dBm	
	EUT Frequency Ranges:	2412-2462 MHz 5745-5825 MHz	
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.		
<b>Environmental Test Conditions:</b>	Temperature: 15-35° C		
	Relative Humidity: 30-60%		
	Barometric Pressure: 860-1060 mbar		
<b>Evaluated by:</b>	Shawn McMillen		
<b>Report Date(s):</b>	February 17, 2014		

**Table 2. EUT Summary Table**



## B. References

<b>CFR 47, Part 15, Subpart C</b>	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
<b>CFR 47, Part 15, Subpart B</b>	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
<b>RSS-210, Issue 8, Dec. 2010</b>	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
<b>RSS-GEN, Issue 3, Dec. 2010</b>	General Requirements and Information for the Certification of Radio Apparatus
<b>ICES-003, Issue 5 August 2012</b>	Information Technology Equipment (ITE) — Limits and methods of measurement
<b>ANSI C63.4:2003</b>	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>ISO/IEC 17025:2005</b>	General Requirements for the Competence of Testing and Calibration Laboratories
<b>ANSI C63.10-2009</b>	American National Standard for Testing Unlicensed Wireless Devices

**Table 3. References**

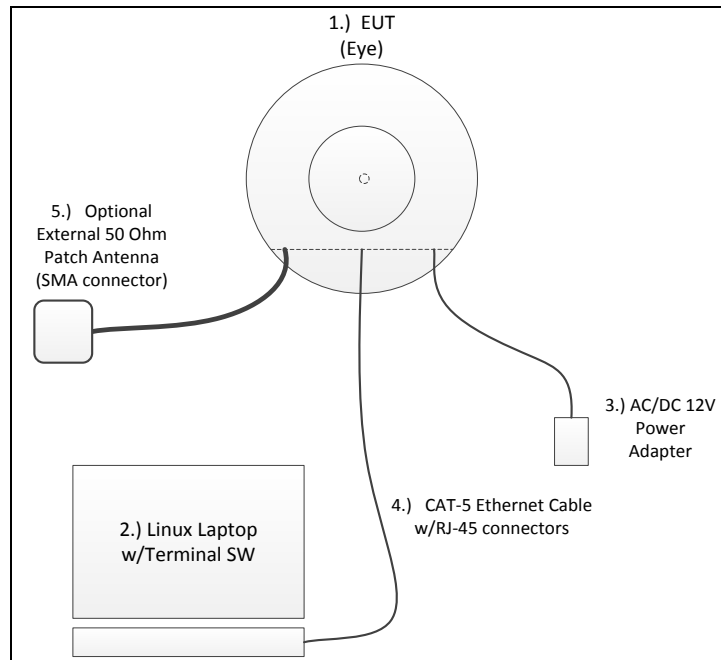
## C. Test Site

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

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

## D. Description of Test Sample

The 7Signal Solutions, Inc. Indoor Eye / INDR-EYE01, Equipment Under Test (EUT), is a Wi-Fi monitoring component of the Sapphire wireless network optimization system. This device (Eye) is a Wi-Fi network client device operating in the standard IEEE802.11 FCC bands at 2.4 GHz and 5 GHz. The Eye mounts in the ceiling among Wi-Fi access points and continually collects over-the-air traffic data which it forwards to a Carat server for analysis and user presentation. The Eye contains one off-the-shelf Wi-Fi radio module and a 6-sector switched antenna system. It associates as a client device to access points, one at a time in round-robin fashion, to conduct throughput tests as well as monitoring and collecting key performance parameters of the wi-fi system.



**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	Indoor Eye	INDR-EYE01	--	L46130002	2.7
5	2.4GHz External Antenna	Cushcraft S2406P	--	--	--
5	5GHz External Antenna	Cisco ANT5195P	--	--	--

**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
2	Linux Laptop	Asus	--

**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
3	DC Input	Power cable and adapter	1	2	No	(117v/60Hz)
4	RJ-45 Ethernet Jack	CAT-5 cable	1	10	No	Laptop Ethernet port

**Table 6. Ports and Cabling Information**

## **H. Mode of Operation**

The EUT is provided with special software to put it in a debugger mode where a laptop computer can connect via SSH through the Ethernet port. A menu is provided that prompts for transmitter parameters such as frequency, modulation and bandwidth settings. The radio will transmit packets continuously by command in this test mode.

The EUT can also be put into normal operating mode using the 7signal graphical user interface.

## **I. Method of Monitoring EUT Operation**

The primary feedback of the operating state of the EUT is the connected laptop debugger program.

The red LED indicates communication through Ethernet is active when flashing.

## **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 7Signal Solutions, Inc. upon completion of testing.



### **III. Electromagnetic Compatibility Criteria for Unintentional Radiators**



## Electromagnetic Compatibility Criteria

### § 15.107 Conducted Emissions Limits

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

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

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

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

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

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

**Test Engineer(s):** Shawn McMillen

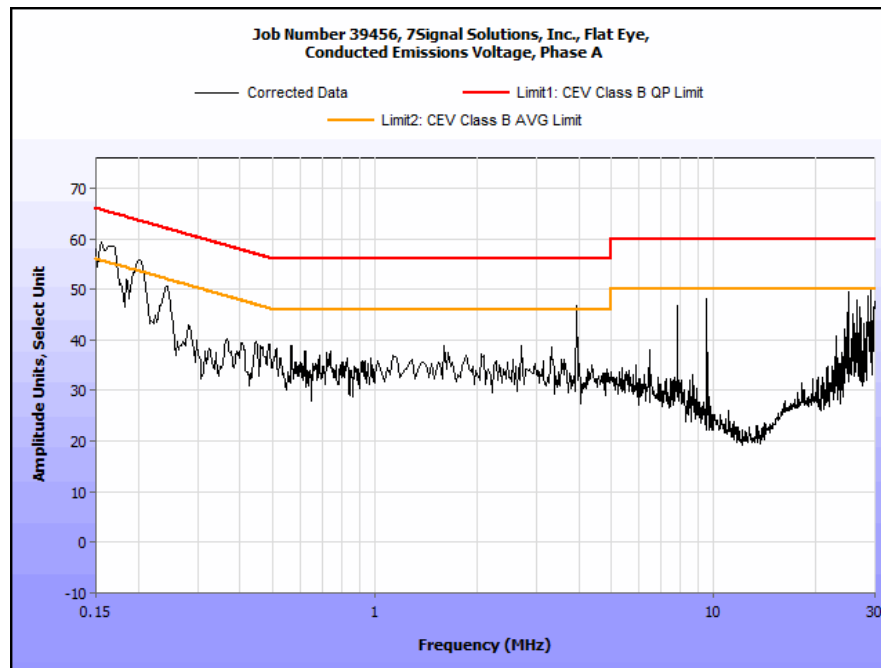
**Test Date(s):** 01/09/14



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

Frequency (MHz)	Uncorrected Meter Reading (dBμV) QP	Cable Loss (dB)	Corrected Measurement (dBμV) QP	Limit (dBμV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBμV) Avg.	Cable Loss (dB)	Corrected Measurement (dBμV) AVG	Limit (dBμV) AVG	Margin (dB) AVG
0.163	56.14	0	56.14	65.31	-9.17	41.07	0	41.07	55.31	-14.24
1.818	29.88	0	29.88	56	-26.12	11.28	0	11.28	46	-34.72
3.926	41.81	0	41.81	56	-14.19	16.98	0	16.98	46	-29.02
7.818	40.63	0	40.63	60	-19.37	11.56	0	11.56	50	-38.44
9.555	36.47	0	36.47	60	-23.53	15.38	0	15.38	50	-34.62
25	48.6	0	48.6	60	-11.4	45.68	0	45.68	50	-4.32

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



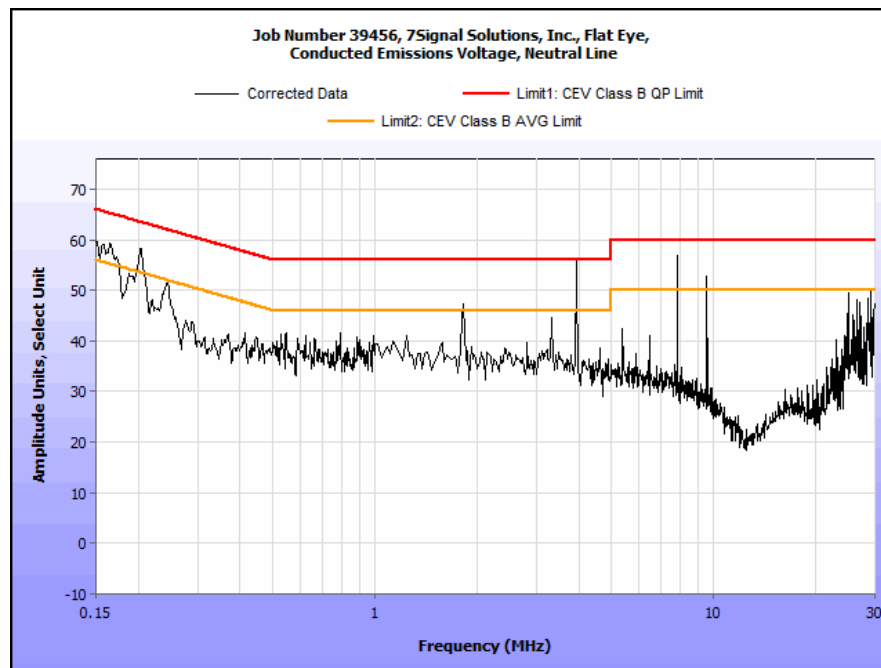
Plot 1. Conducted Emissions, Phase Line Plot



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

Frequency (MHz)	Uncorrected Meter Reading (dBμV) QP	Cable Loss (dB)	Corrected Measurement (dBμV) QP	Limit (dBμV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBμV) Avg.	Cable Loss (dB)	Corrected Measurement (dBμV) AVG	Limit (dBμV) AVG	Margin (dB) AVG
0.151	47.88	0	47.88	65.95	-18.07	29.08	0	29.08	55.95	-26.87
3.927	51.46	0	51.46	56	-4.54	21.46	0	21.46	46	-24.54
6.458	44.21	0	44.21	60	-15.79	15.79	0	15.79	50	-34.21
7.817	47.8	0	47.8	60	-12.2	18.14	0	18.14	50	-31.86
9.555	52.83	0	52.83	60	-7.17	22.04	0	22.04	50	-27.96
29.23	49.77	0	49.77	60	-10.23	46.09	0	46.09	50	-3.91

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



Plot 2. Conducted Emissions, Neutral Line Plot





## Radiated Emission Limits

### § 15.109 Radiated Emissions Limits

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

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

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

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

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

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

**Test Engineer(s):** Surinder Singh

**Test Date(s):** 01/09/14

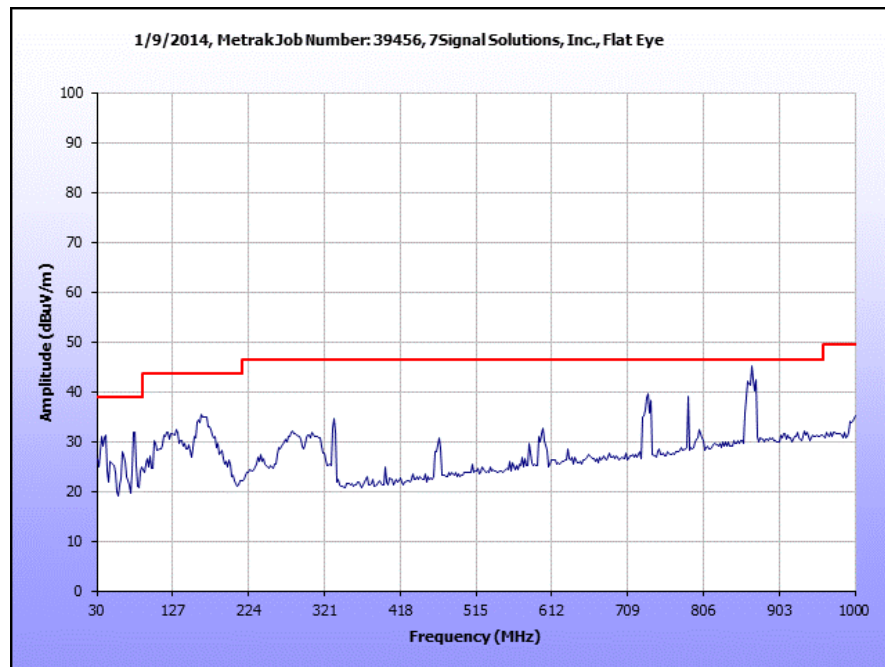


## Radiated Emissions Limits Test Results, Class A

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBμV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
78.928858	27	H	1.0317	23.62	7.90	0.69	10.46	21.75	39	-17.25
78.928858	108	V	1.1195	27.66	7.90	0.69	10.46	25.79	39	-13.21
134.62826	-39	H	1.0386	18.75	13.54	0.92	10.46	22.75	43.5	-20.75
134.62826	124	V	1.0704	23.32	13.54	0.92	10.46	27.32	43.5	-16.18
180.61184	80	H	1.0947	25.57	11.20	0.93	10.46	27.24	43.5	-16.26
180.61184	167	V	1.0386	26.58	11.20	0.93	10.46	28.25	43.5	-15.25
781.67	179	H	1.0891	16.03	21.73	2.41	10.46	29.71	46.4	-16.69
781.67	109	V	1.1304	17.19	21.73	2.41	10.46	30.87	46.4	-15.53
861.49	44	H	1.0547	22.6	22.60	2.50	10.46	37.24	46.4	-9.16
861.49	332	V	1.0547	17.5	22.60	2.50	10.46	32.14	46.4	-14.26

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

Note: The EUT was tested at 3 m.



**Plot 3. Radiated Emissions, 30 MHz - 1 GHz**

## **IV. Electromagnetic Compatibility Criteria for Intentional Radiators**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.203      Antenna Requirement

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

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

- a.) Antenna must be permanently attached to the unit.
- b.) Antenna must use a unique type of connector to attach to the EUT.
- c.) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

**Results:**      The EUT as tested is compliant the criteria of §15.203. The EUT has an integral antenna and the external antenna has a unique connector.

**Test Engineer(s):**      Shawn McMillen

**Test Date(s):**      01/08/14

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.207(a) Conducted Emissions Limits

**Test Requirement(s):** § 15.207 (a): For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50  $\Sigma$  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 (dB $\mu$ V)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

**Table 12. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)**

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

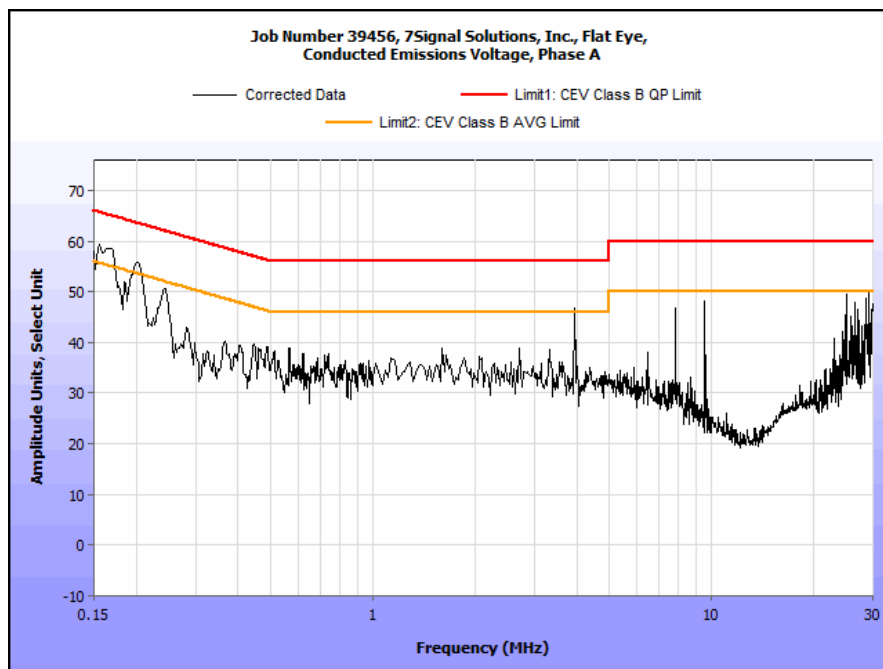
**Test Engineer(s):** Shawn McMillen

**Test Date(s):** 01/09/14

## 15.207(a) Conducted Emissions Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBμV) QP	Cable Loss (dB)	Corrected Measurement (dBμV) QP	Limit (dBμV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBμV) Avg.	Cable Loss (dB)	Corrected Measurement (dBμV) AVG	Limit (dBμV) AVG	Margin (dB) AVG
0.163	56.14	0	56.14	65.31	-9.17	41.07	0	41.07	55.31	-14.24
1.818	29.88	0	29.88	56	-26.12	11.28	0	11.28	46	-34.72
3.926	41.81	0	41.81	56	-14.19	16.98	0	16.98	46	-29.02
7.818	40.63	0	40.63	60	-19.37	11.56	0	11.56	50	-38.44
9.555	36.47	0	36.47	60	-23.53	15.38	0	15.38	50	-34.62
25	48.6	0	48.6	60	-11.4	45.68	0	45.68	50	-4.32

**Table 13. Conducted Emissions, 15.207(a), Phase Line, Test Results**

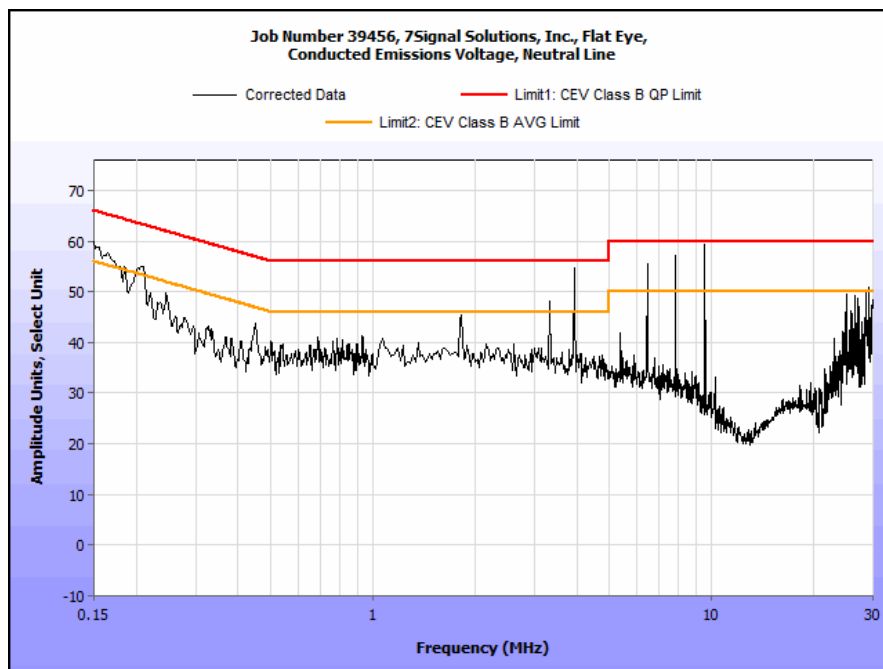


**Plot 4. Conducted Emissions, 15.207(a), Phase Line**

## 15.207(a) Conducted Emissions Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBμV) QP	Cable Loss (dB)	Corrected Measurement (dBμV) QP	Limit (dBμV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBμV) Avg.	Cable Loss (dB)	Corrected Measurement (dBμV) AVG	Limit (dBμV) AVG	Margin (dB) AVG
0.151	47.88	0	47.88	65.95	-18.07	29.08	0	29.08	55.95	-26.87
3.927	51.46	0	51.46	56	-4.54	21.46	0	21.46	46	-24.54
6.458	44.21	0	44.21	60	-15.79	15.79	0	15.79	50	-34.21
7.817	47.8	0	47.8	60	-12.2	18.14	0	18.14	50	-31.86
9.555	52.83	0	52.83	60	-7.17	22.04	0	22.04	50	-27.96
29.23	49.77	0	49.77	60	-10.23	46.09	0	46.09	50	-3.91

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



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

## 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 15. Output Power Requirements from §15.247(b)**

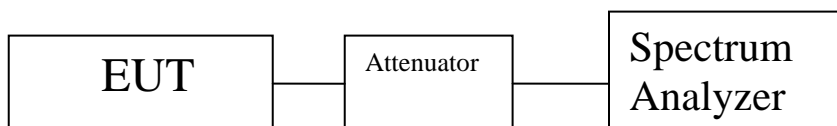
§15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**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.

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

**Test Engineer(s):** Shawn McMillen

**Test Date(s):** 01/07/14



**Figure 2. Peak Power Output Test Setup**



## Peak Power Output Test Results

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11b Port A	Low	2412	15.54
	Mid	2437	17.41
	High	2462	15.32
802.11b Port B	Low	2412	15.34
	Mid	2437	16.98
	High	2462	15.32

**Table 16. Peak Power Output, Test Results, 802.11b, 2.4 GHz**

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11g Port A	Low	2412	13.89
	Mid	2437	19.73
	High	2462	12.98
802.11g Port B	Low	2412	13.91
	Mid	2437	19.34
	High	2462	12.45

**Table 17. Peak Power Output, Test Results, 802.11g, 2.4 GHz**

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11n 20 MHz Port A	Low	2412	13.57
	Mid	2437	17.72
	High	2462	12.29
802.11n 20 MHz Port B	Low	2412	13.58
	Mid	2437	17.38
	High	2462	11.72

**Table 18. Peak Power Output, Test Results, 802.11n 20 MHz, 2.4 GHz**

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11n 20 MHz summed ports	Low	2412	16.59
	Mid	2437	20.56
	High	2462	15.02

**Table 19. Peak Power Output, 802.11n 20 MHz, Summed Ports, 2.4 GHz**

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11n 40 MHz Port A	Low	2422	9.76
	Mid	2437	14.70
	High	2452	8.27
802.11n 40 MHz Port B	Low	2422	10.04
	Mid	2437	14.15
	High	2452	8.73

**Table 20. Peak Power Output, Test Results, 802.11n 40 MHz, 2.4 GHz**

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11n 40 MHz summed ports	Low	2422	12.91
	Mid	2437	17.44
	High	2452	11.52

**Table 21. Peak Power Output, 802.11n 40 MHz, Summed Ports, 2.4 GHz**

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11a Port A	Low	5745	18.10
	Mid	5785	17.67
	High	5825	17.18
802.11a Port B	Low	5745	18.06
	Mid	5785	17.28
	High	5825	16.84

**Table 22. Peak Power Output, Test Results, 802.11a, 5.8 GHz**

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11n 20 MHz Port A	Low	5745	17.02
	Mid	5785	16.23
	High	5825	16.03
802.11n 20 MHz Port B	Low	5745	16.37
	Mid	5785	15.61
	High	5825	15.21

**Table 23. Peak Power Output, Test Results, 802.11n 20 MHz, 5.8 GHz**

Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11n 20 MHz summed ports	Low	5745	19.71
	Mid	5785	18.94
	High	5825	18.65

**Table 24. Peak Power Output, 802.11n 20 MHz, Summed Ports, 5.8 GHz**

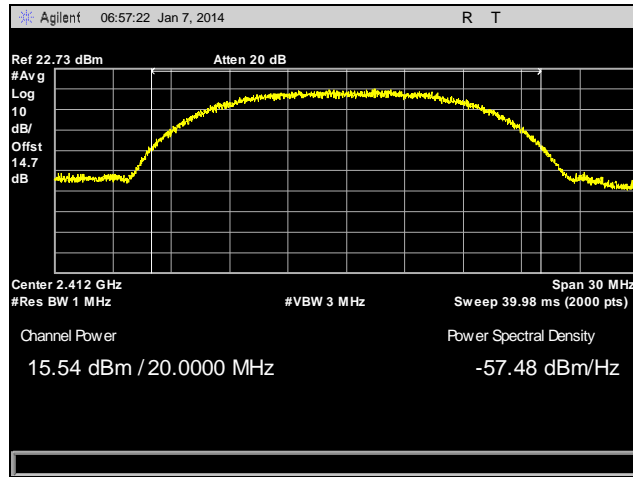
Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11n 40 MHz Port A	Low	5755	15.32
	High	5795	14.72
802.11n 40 MHz Port B	Low	5755	14.60
	High	5795	13.91

**Table 25. Peak Power Output, Test Results, 802.11n 40 MHz, 5.8 GHz**

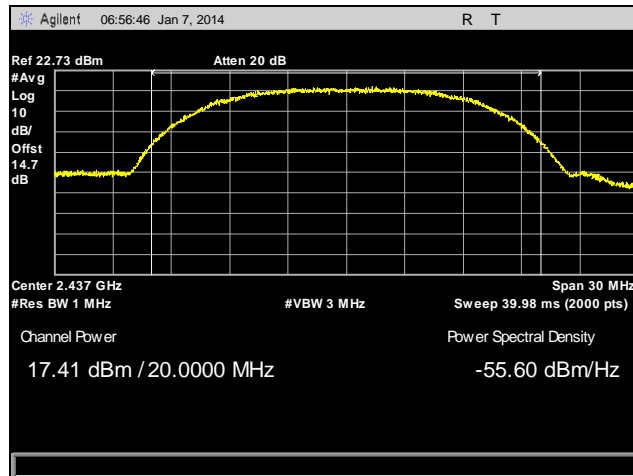
Peak Conducted Output Power			
	Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
802.11n 40 MHz summed ports	Low	5755	17.99
	High	5795	17.34

**Table 26. Peak Power Output, 802.11n 40 MHz, Summed Ports, 5.8 GHz**

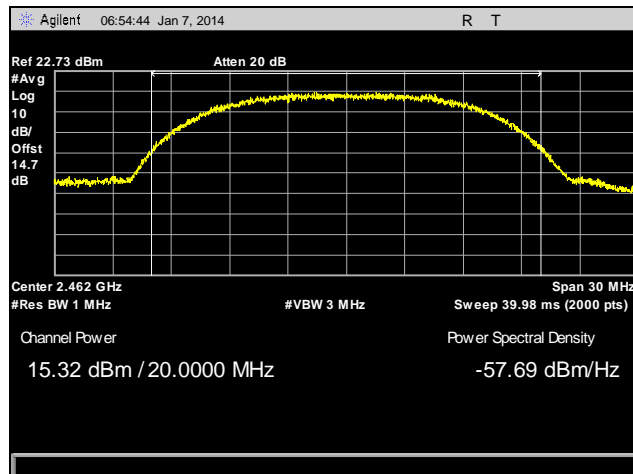
## Peak Power Output Test Results



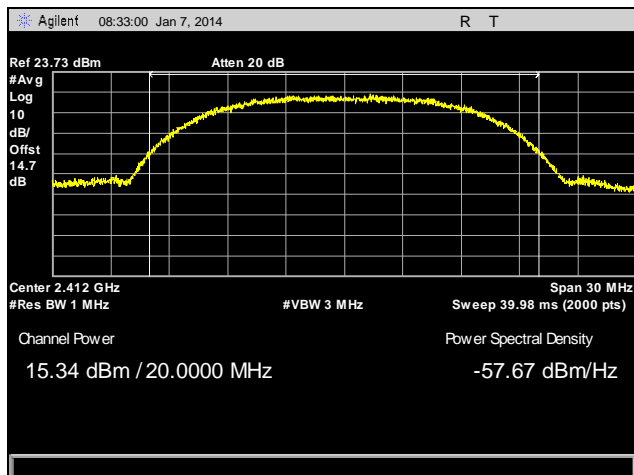
Plot 6. Peak Power Output, 802.11b, Low Channel, 2412 MHz, Port A



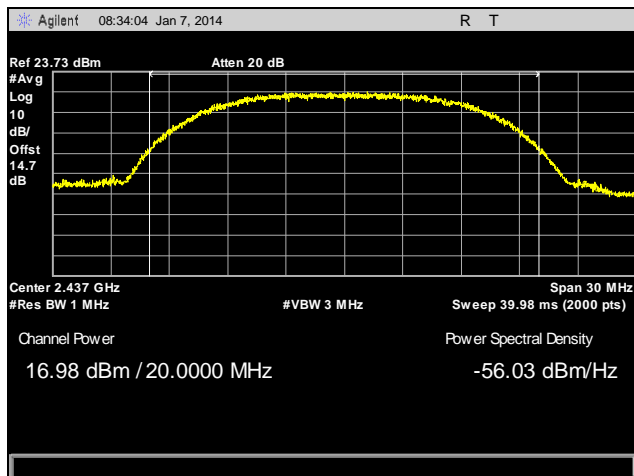
Plot 7. Peak Power Output, 802.11b, Mid Channel, 2437 MHz, Port A



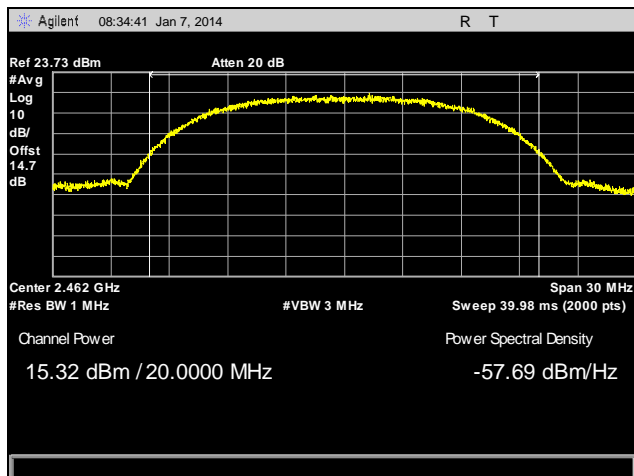
Plot 8. Peak Power Output, 802.11b, High Channel, 2462 MHz, Port A



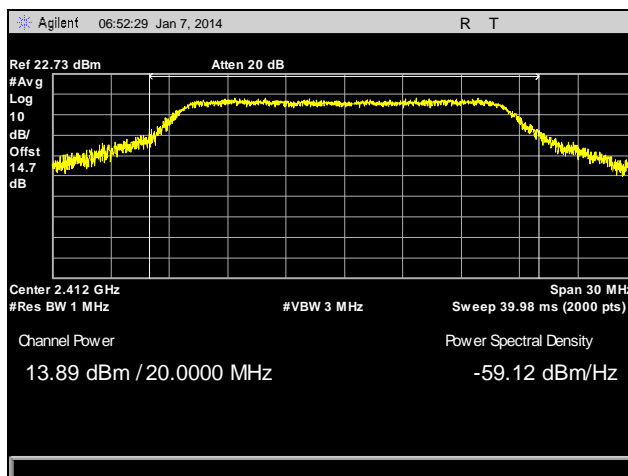
Plot 9. Peak Power Output, 802.11b, Low Channel, 2412 MHz, Port B



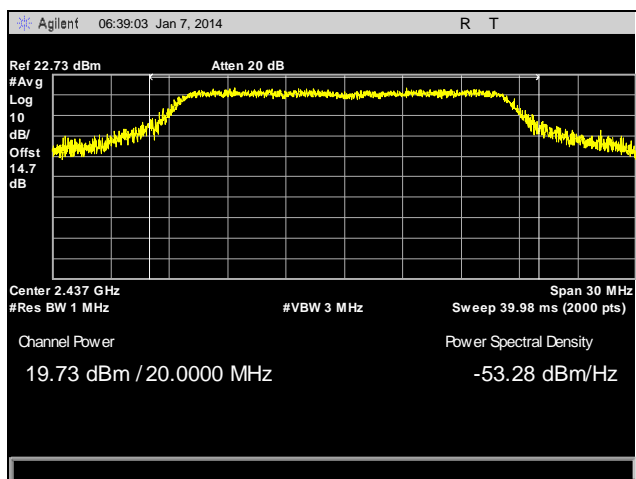
Plot 10. Peak Power Output, 802.11b, Mid Channel, 2437 MHz, Port B



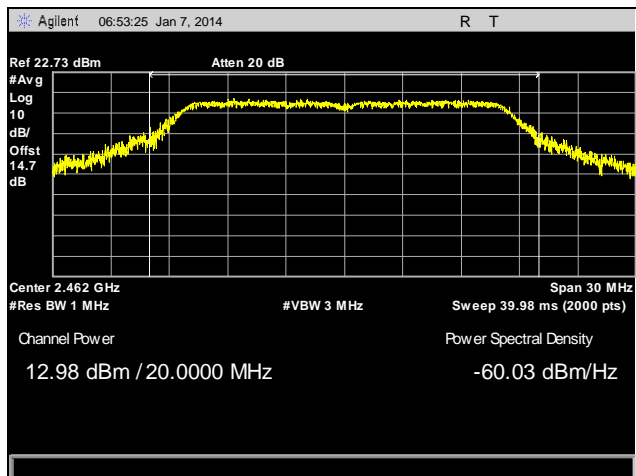
Plot 11. Peak Power Output, 802.11b, High Channel, 2462 MHz, Port B



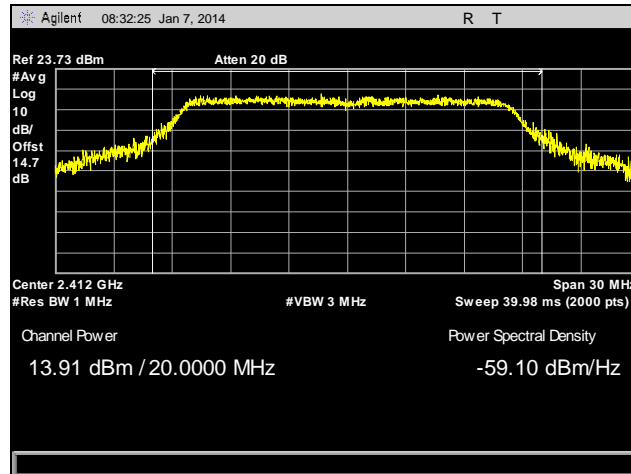
Plot 12. Peak Power Output, 802.11g, Low Channel, 2412 MHz, Port A



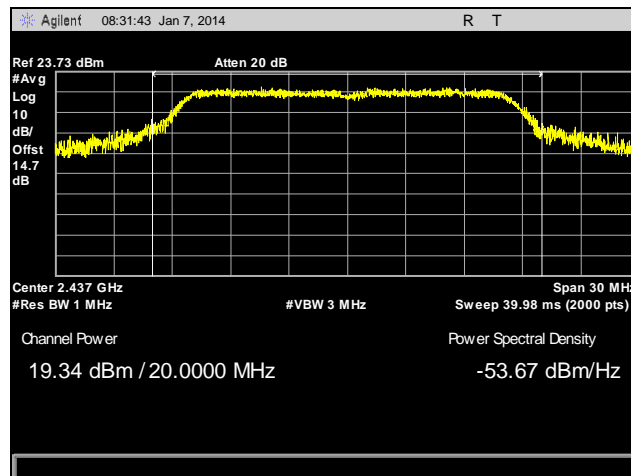
Plot 13. Peak Power Output, 802.11g, Mid Channel, 2437 MHz, Port A



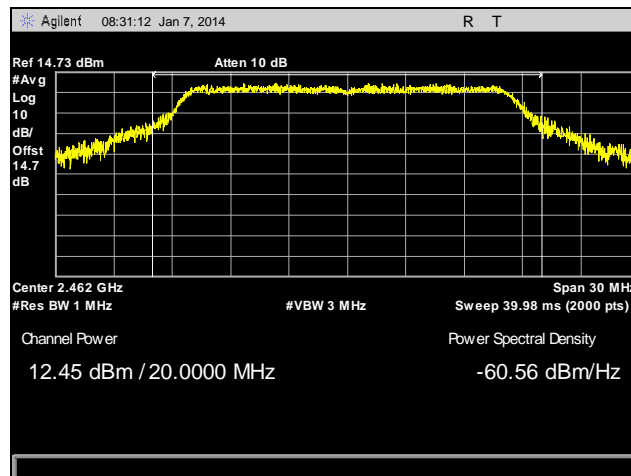
Plot 14. Peak Power Output, 802.11g, High Channel, 2462 MHz, Port A



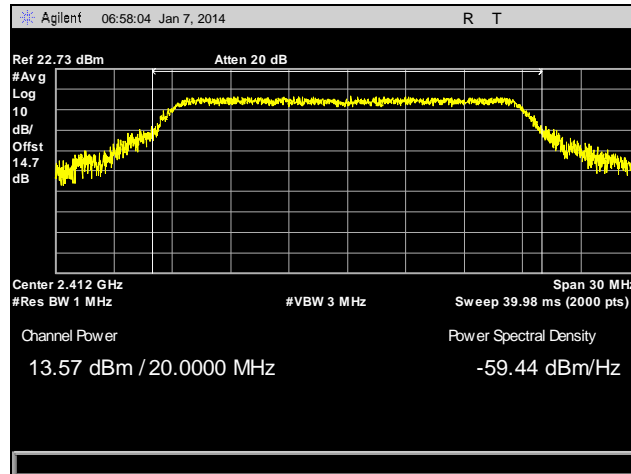
**Plot 15. Peak Power Output, 802.11g, Low Channel, 2412 MHz, Port B**



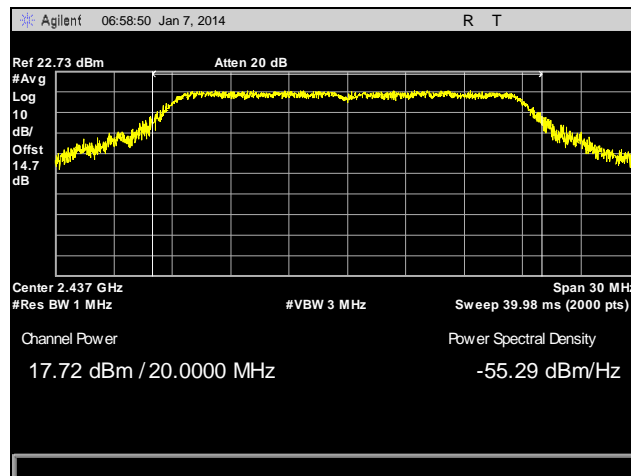
**Plot 16. Peak Power Output, 802.11g, Mid Channel, 2437 MHz, Port B**



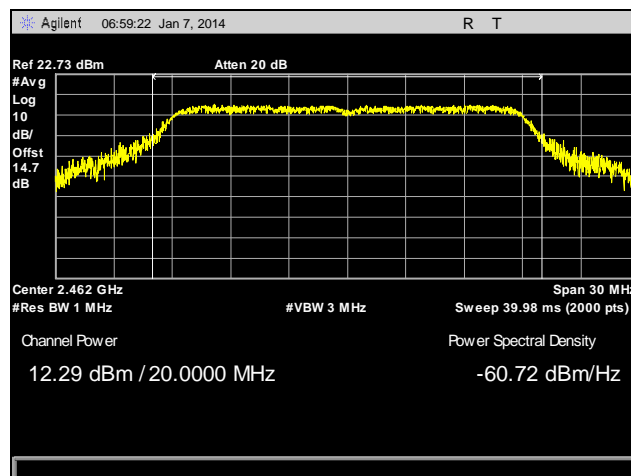
**Plot 17. Peak Power Output, 802.11g, High Channel, 2462 MHz, Port B**



**Plot 18. Peak Power Output, 802.11n 20 MHz, Low Channel, 2412 MHz, Port A**

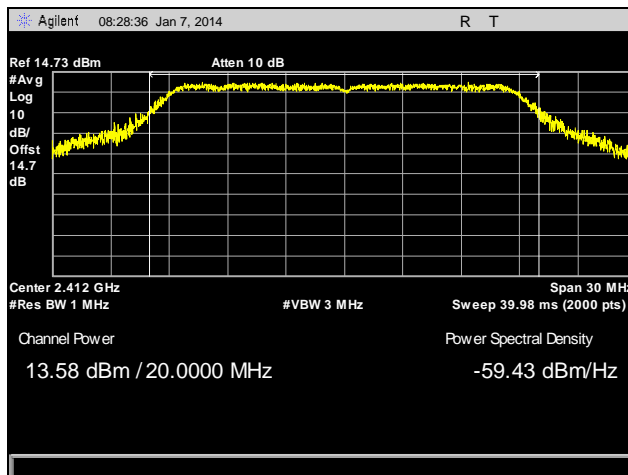


**Plot 19. Peak Power Output, 802.11n 20 MHz, Mid Channel, 2437 MHz, Port A**

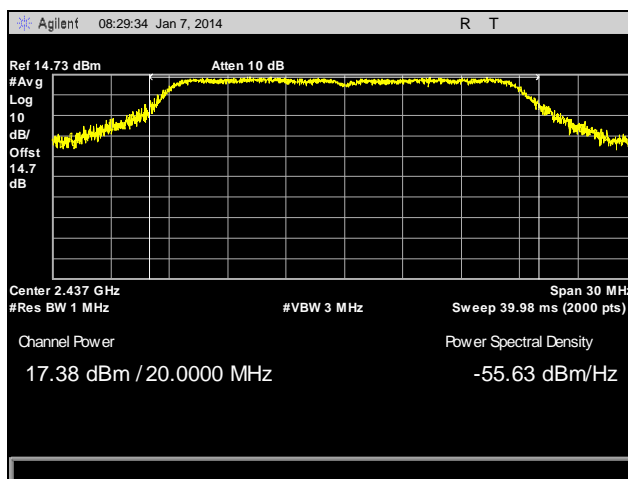


**Plot 20. Peak Power Output, 802.11n 20 MHz, High Channel, 2462 MHz, Port A**

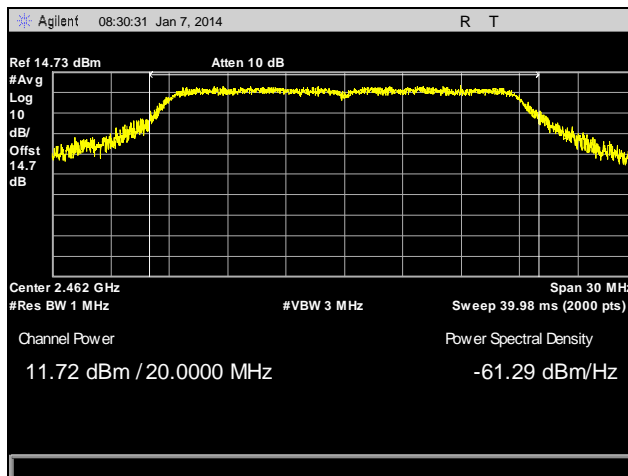




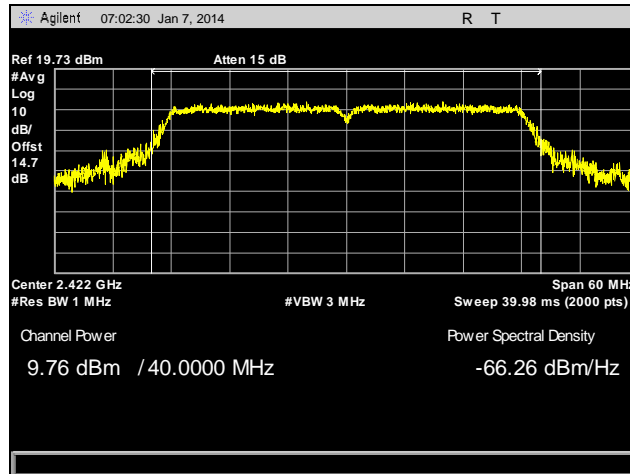
**Plot 21. Peak Power Output, 802.11n 20 MHz, Low Channel, 2412 MHz, Port B**



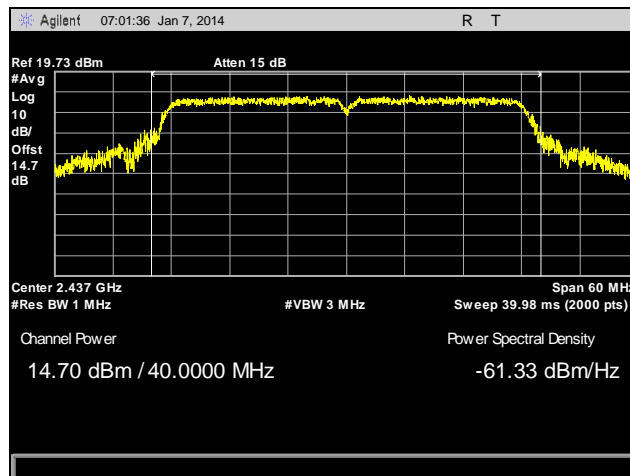
**Plot 22. Peak Power Output, 802.11n 20 MHz, Mid Channel, 2437 MHz, Port B**



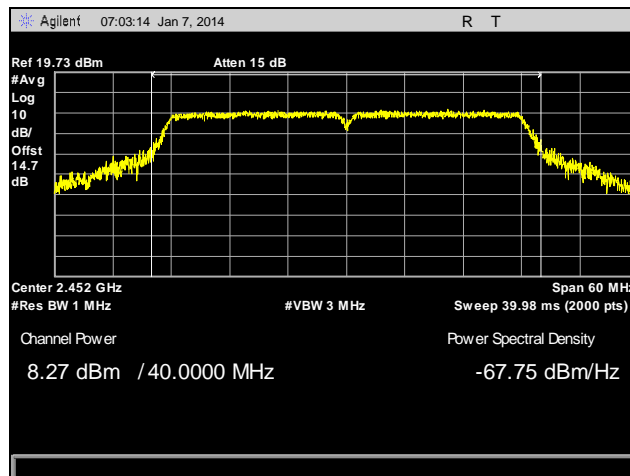
**Plot 23. Peak Power Output, 802.11n 20 MHz, High Channel, 2462 MHz, Port B**



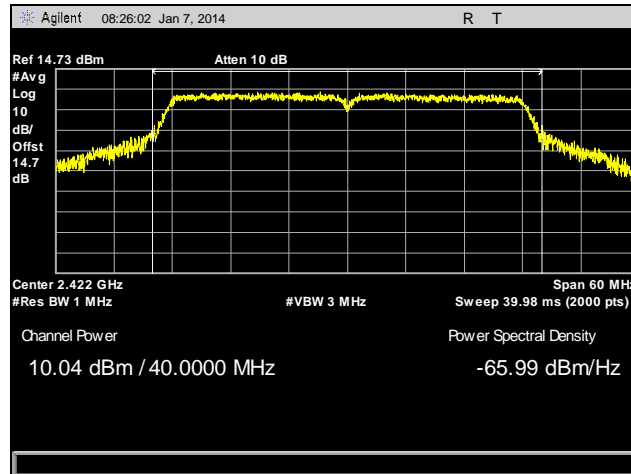
**Plot 24. Peak Power Output, 802.11n 40 MHz, Low Channel, 2422 MHz, Port A**



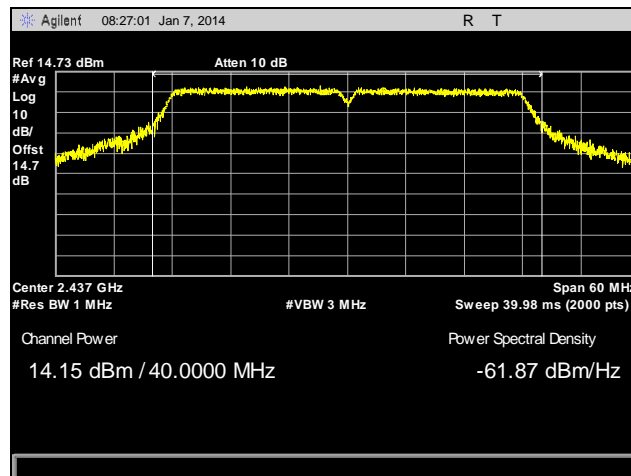
**Plot 25. Peak Power Output, 802.11n 40 MHz, Mid Channel, 2437 MHz, Port A**



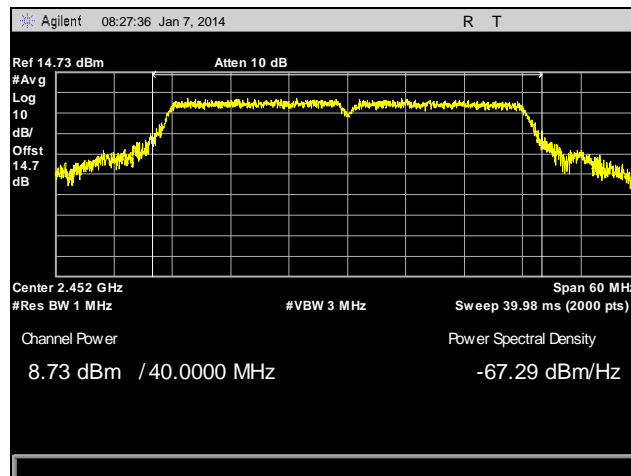
**Plot 26. Peak Power Output, 802.11n 40 MHz, High Channel, 2452 MHz, Port A**



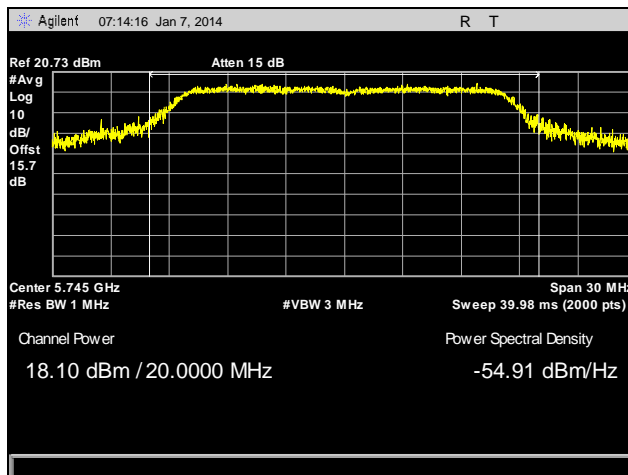
**Plot 27. Peak Power Output, 802.11n 40 MHz, Low Channel, 2422 MHz, Port B**



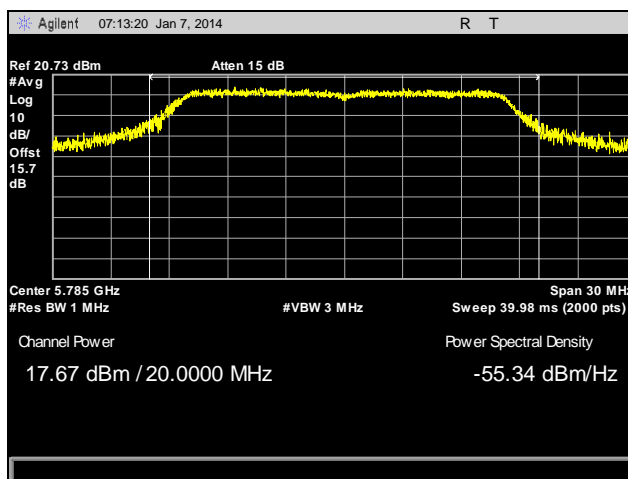
**Plot 28. Peak Power Output, 802.11n 40 MHz, Mid Channel, 2437 MHz, Port B**



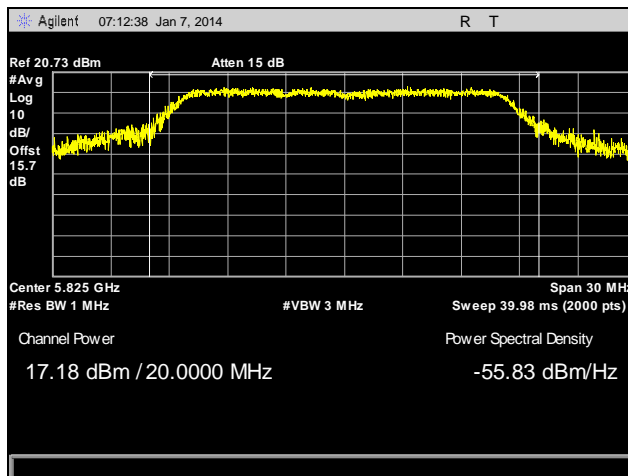
**Plot 29. Peak Power Output, 802.11n 40 MHz, High Channel, 2452 MHz, Port B**



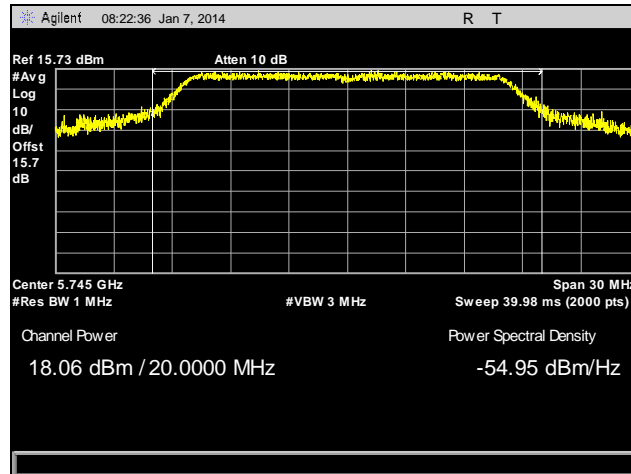
Plot 30. Peak Power Output, 802.11a, Low Channel, 5745 MHz, Port A



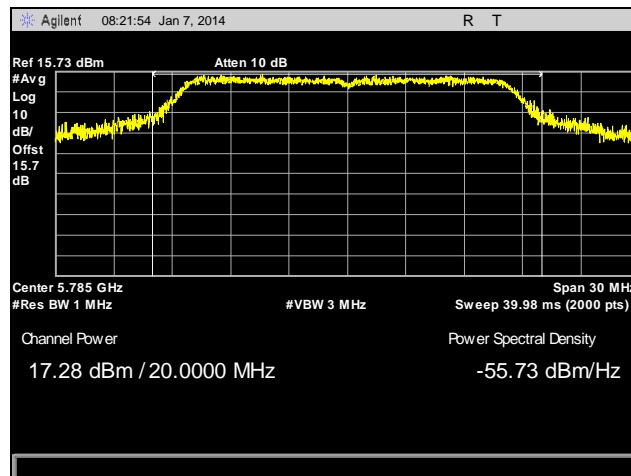
Plot 31. Peak Power Output, 802.11a, Mid Channel, 5785 MHz, Port A



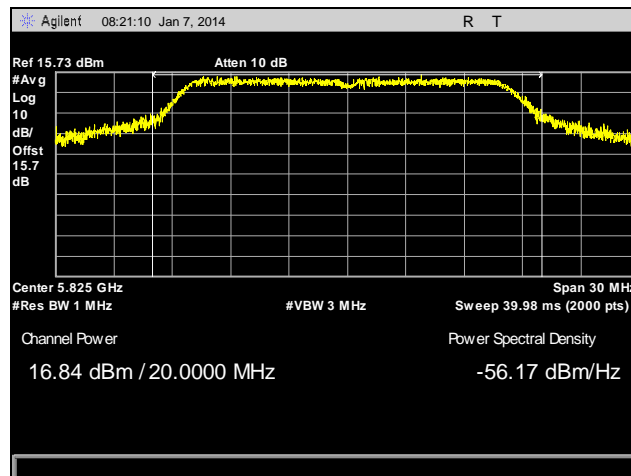
Plot 32. Peak Power Output, 802.11a, High Channel, 5825 MHz, Port A



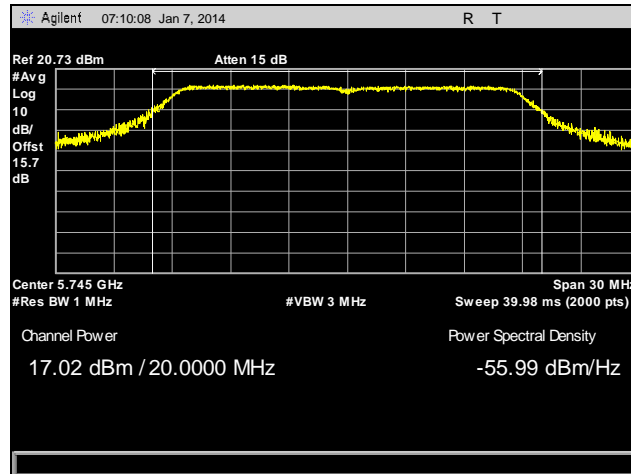
**Plot 33. Peak Power Output, 802.11a, Low Channel, 5745 MHz, Port B**



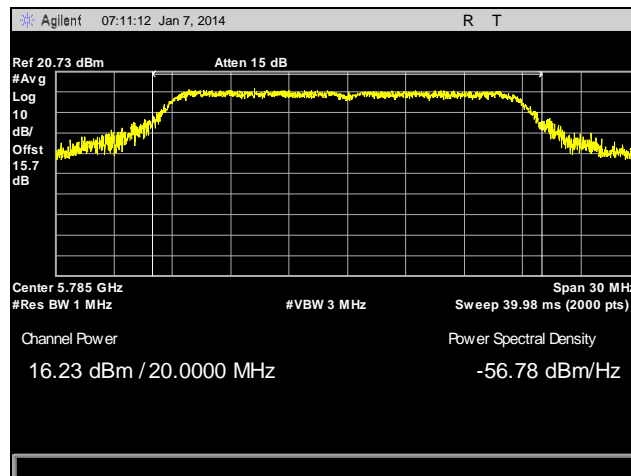
**Plot 34. Peak Power Output, 802.11a, Mid Channel, 5785 MHz, Port B**



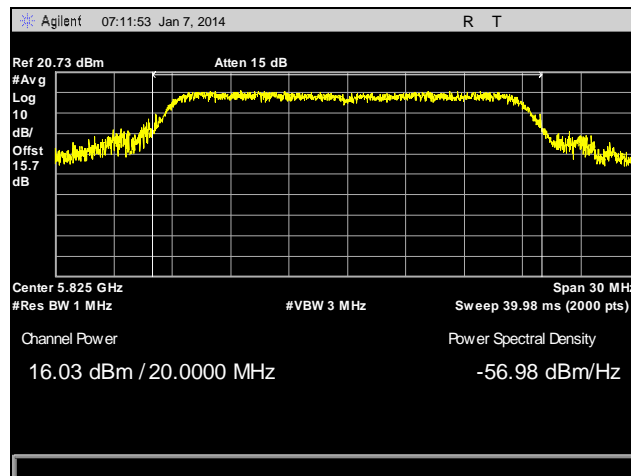
**Plot 35. Peak Power Output, 802.11a, High Channel, 5825 MHz, Port B**



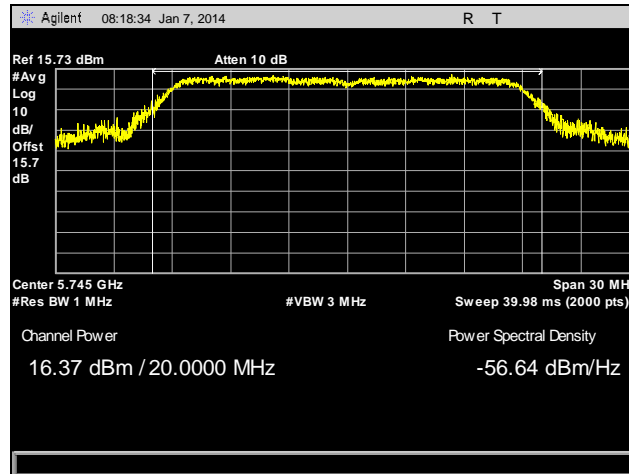
**Plot 36. Peak Power Output, 802.11n 20 MHz, Low Channel, 5745 MHz, Port A**



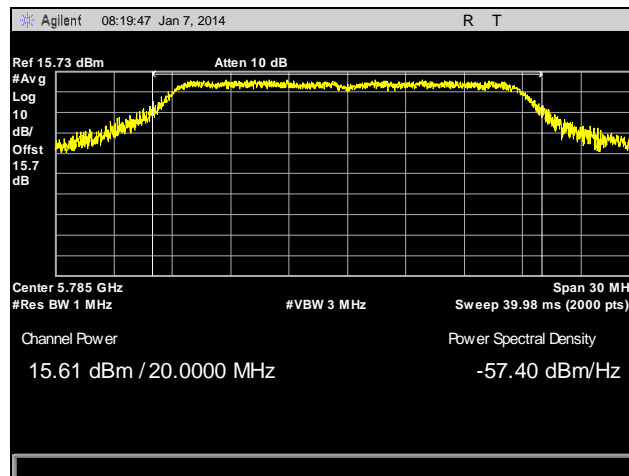
**Plot 37. Peak Power Output, 802.11n 20 MHz, Mid Channel, 5785 MHz, Port A**



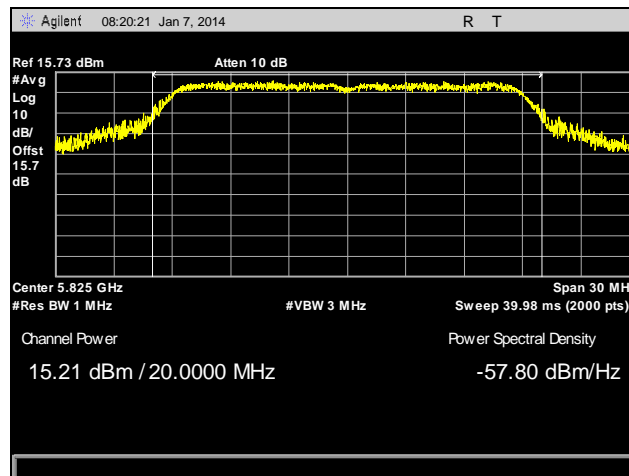
**Plot 38. Peak Power Output, 802.11n 20 MHz, High Channel, 5825 MHz, Port A**



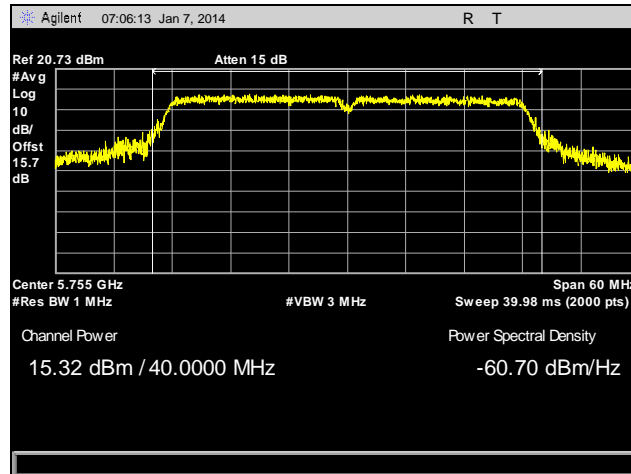
**Plot 39. Peak Power Output, 802.11n 20 MHz, Low Channel, 5745 MHz, Port B**



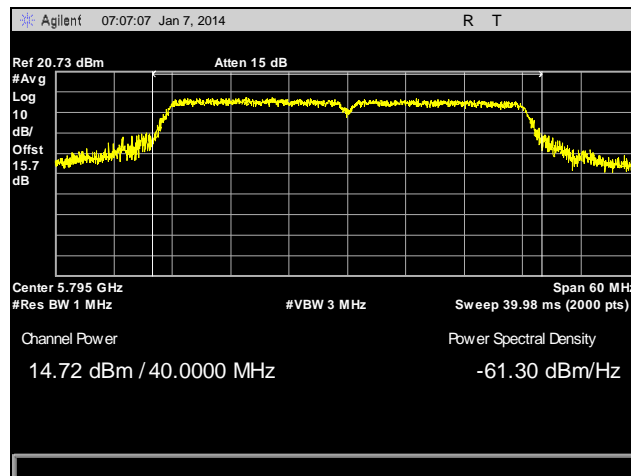
**Plot 40. Peak Power Output, 802.11n 20 MHz, Mid Channel, 5785 MHz, Port B**



**Plot 41. Peak Power Output, 802.11n 20 MHz, High Channel, 5825 MHz, Port B**

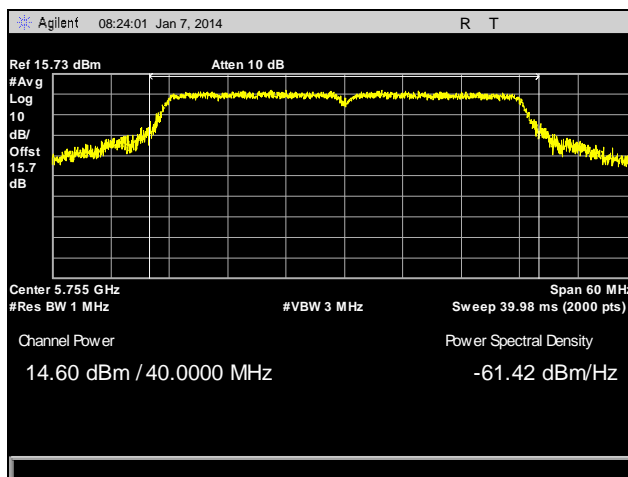


**Plot 42. Peak Power Output, 802.11n 40 MHz, Low Channel, 5755 MHz, Port A**

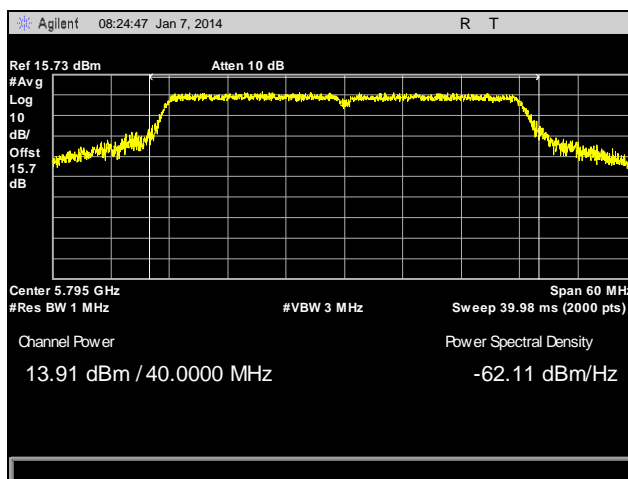


**Plot 43. Peak Power Output, 802.11n 40 MHz, High Channel, 5795 MHz, Port A**





**Plot 44. Peak Power Output, 802.11n 40 MHz, Low Channel, 5755 MHz, Port B**



**Plot 45. Peak Power Output, 802.11n 40 MHz, High Channel, 5795 MHz, Port B**

## 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
<sup>1</sup> 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	( <sup>2</sup> )

**Table 27. Restricted Bands of Operation**

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490 – 0.510 MHz.

<sup>2</sup> 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 28.

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

**Table 28. Radiated Emissions Limits Calculated from FCC Part 15, § 15.209 (a)**

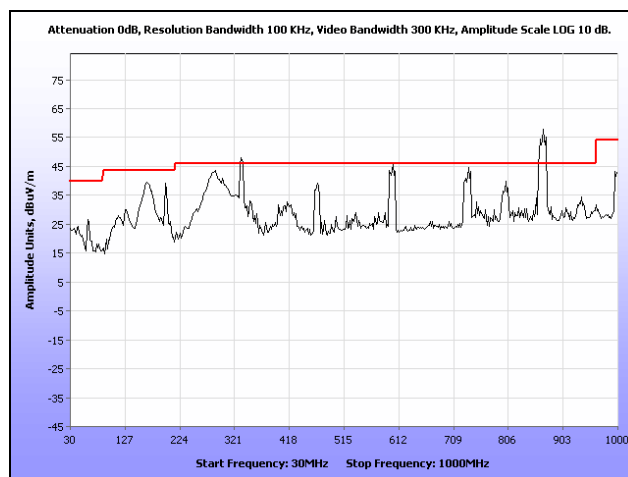
**Test Procedures:** The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was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

**Test Results:** The EUT was compliant with the Radiated Spurious Emission limits of § 15.247(d). No emissions were found above 18GHz therefore only mid channels were reported above 18GHz.

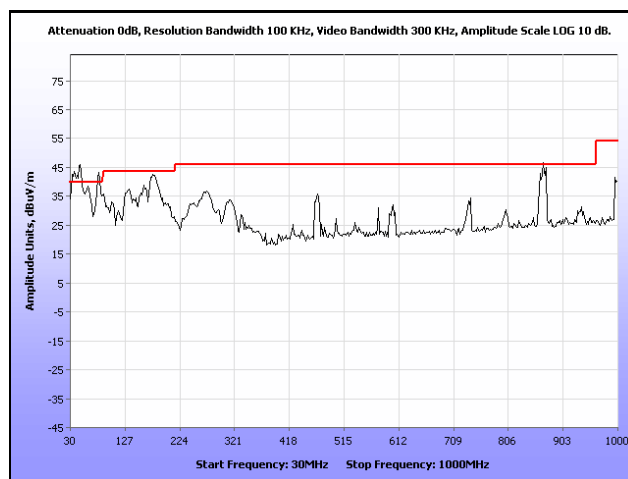
**Test Engineer(s):** Shawn McMillen

**Test Date(s):** 01/08/14

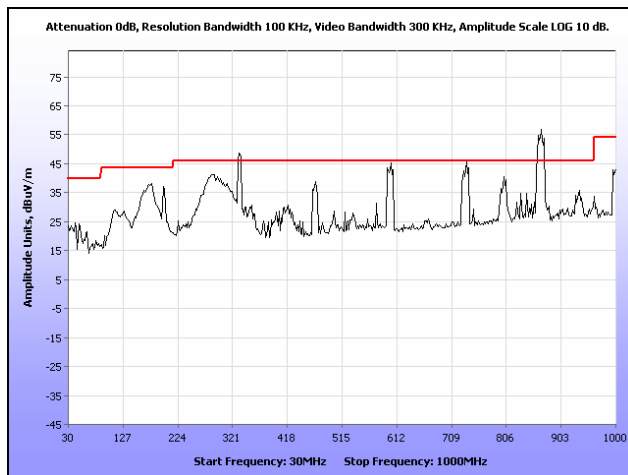
## Radiated Spurious Emissions Test Results – Internal 2.4 GHz



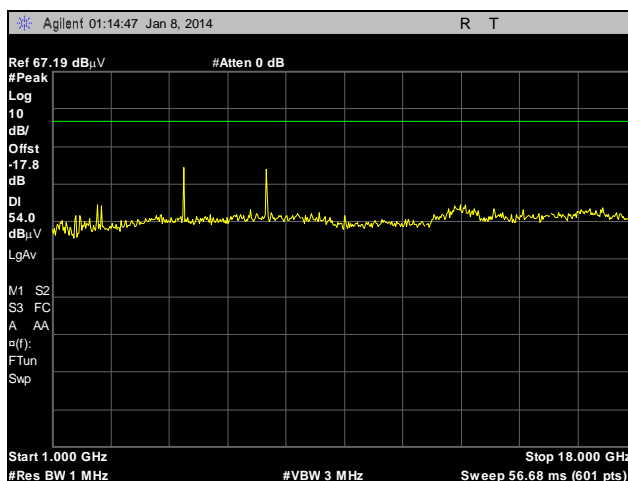
**Plot 46. Radiated Spurious Emissions, Internal Antenna, 2.4 GHz, Digital Pre-Scan, Radio Off, Horizontal**



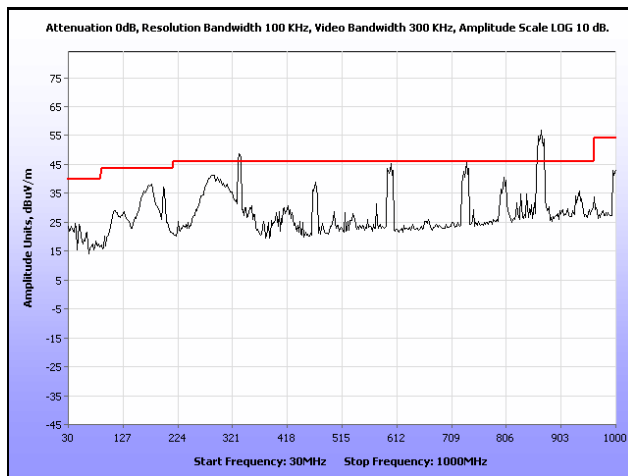
**Plot 47. Radiated Spurious Emissions, Internal Antenna, 2.4 GHz, Digital Pre-Scan, Radio Off, Vertical**



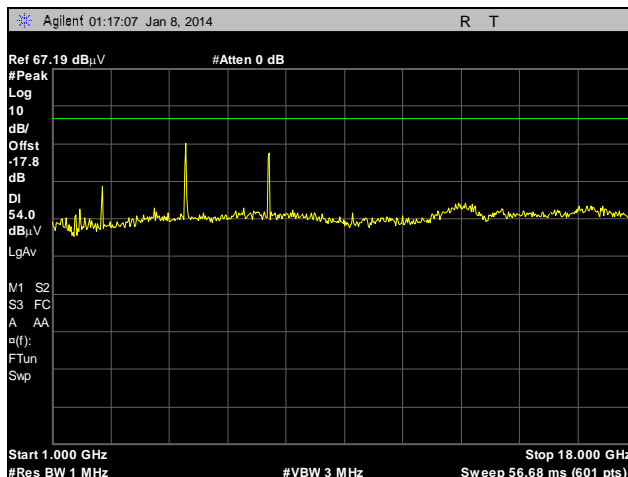
**Plot 48. Radiated Spurious Emissions, Internal Antenna, 802.11b, 2412 MHz, 30 MHz – 1 GHz**



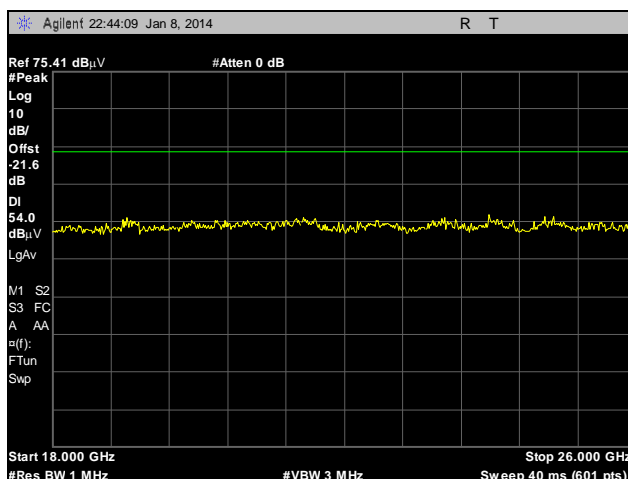
**Plot 49. Radiated Spurious Emissions, Internal Antenna, 802.11b, 2412 MHz, 1 GHz – 18 GHz, Peak under Average**



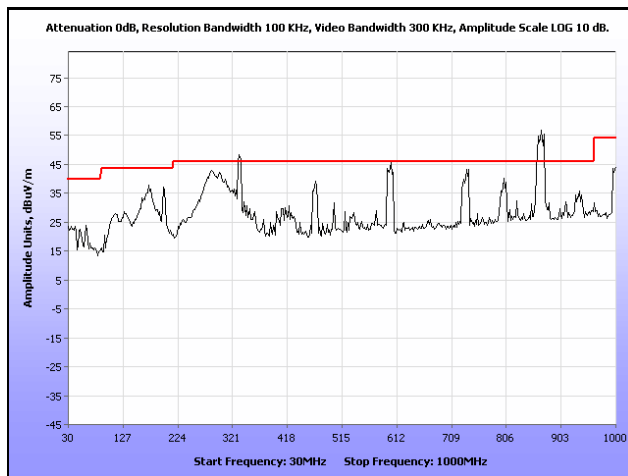
**Plot 50. Radiated Spurious Emissions, Internal Antenna, 802.11b, 2437 MHz, 30 MHz – 1 GHz**



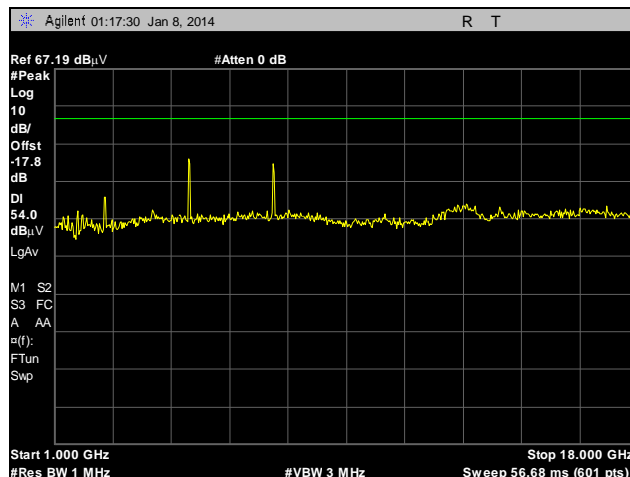
Plot 51. Radiated Spurious Emissions, Internal Antenna, 802.11b, 2437 MHz, 1 GHz – 18 GHz, Peak under Average



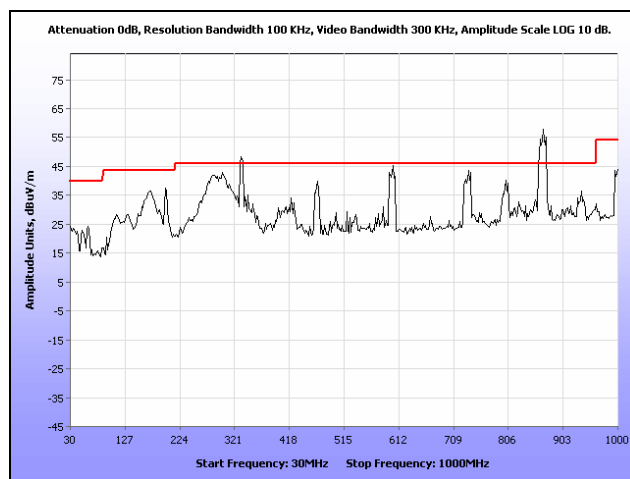
Plot 52. Radiated Spurious Emissions, Internal Antenna, 802.11b, 2437 MHz, 18 GHz – 26 GHz, Peak under Average



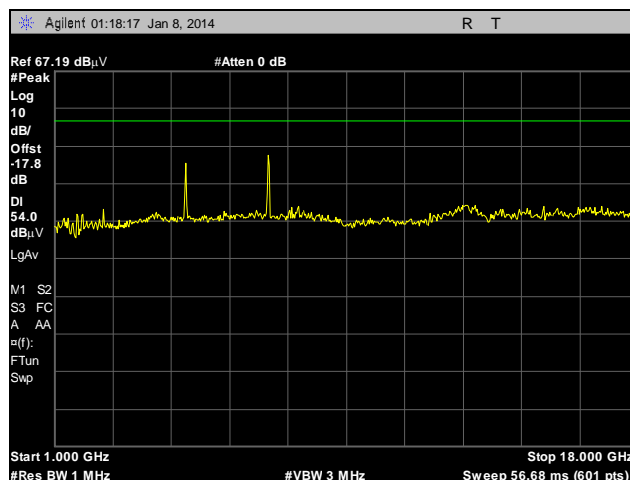
Plot 53. Radiated Spurious Emissions, Internal Antenna, 802.11b, 2462 MHz, 30 MHz – 1 GHz



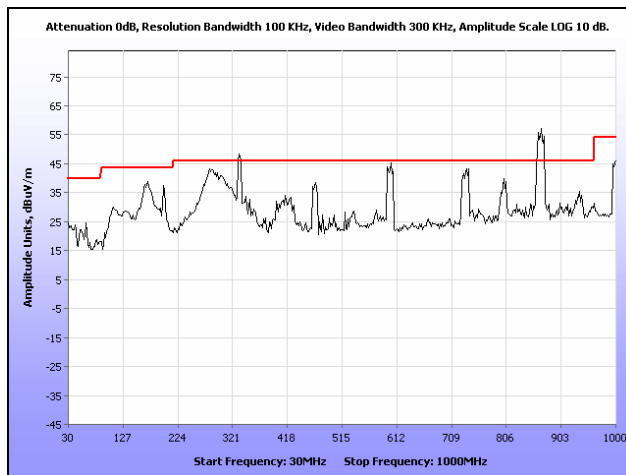
**Plot 54. Radiated Spurious Emissions, Internal Antenna, 802.11b, 2462 MHz, 1 GHz – 18 GHz, Peak under Average**



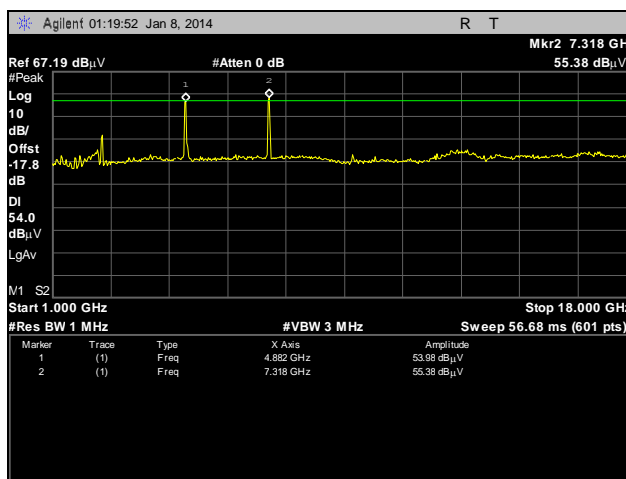
**Plot 55. Radiated Spurious Emissions, Internal Antenna, 802.11g, 2412 MHz, 30 MHz – 1 GHz**



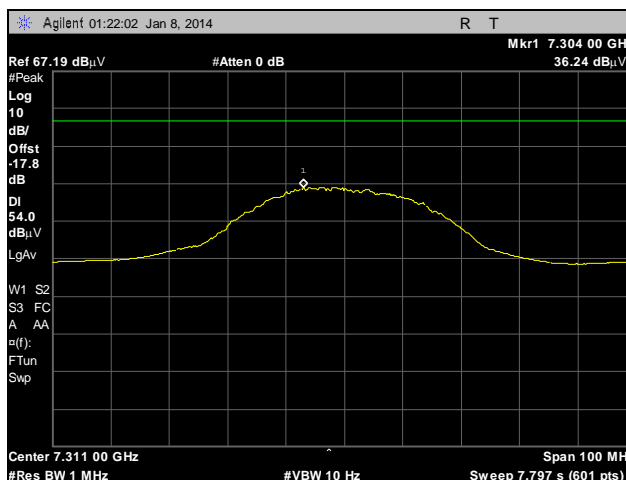
**Plot 56. Radiated Spurious Emissions, Internal Antenna, 802.11g, 2412 MHz, 1 GHz – 18 GHz, Peak under Average**



Plot 57. Radiated Spurious Emissions, Internal Antenna, 802.11g, 2437 MHz, 30 MHz – 1 GHz

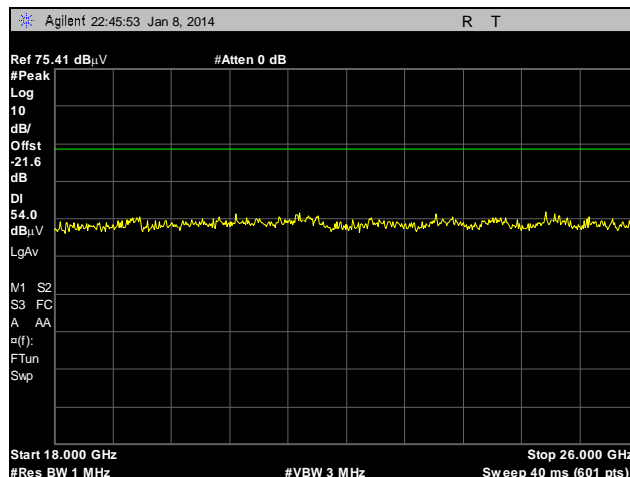


Plot 58. Radiated Spurious Emissions, Internal Antenna, 802.11g, 2437 MHz, 1 GHz – 18 GHz, Peak under Average

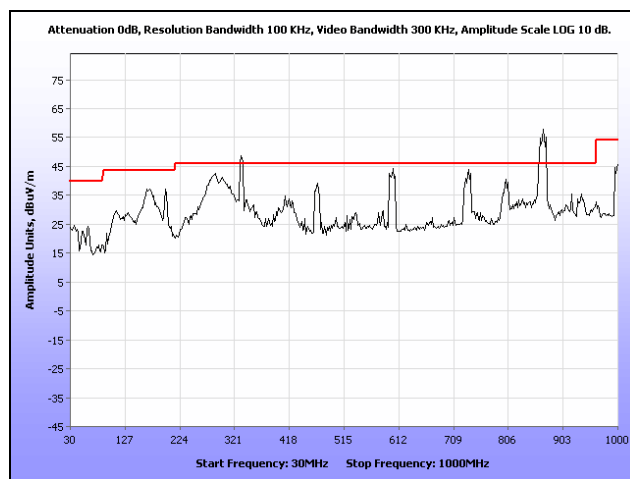


Plot 59. Radiated Spurious Emissions, Internal Antenna, 802.11g, 2437 MHz, 3<sup>rd</sup> Harmonic, Average

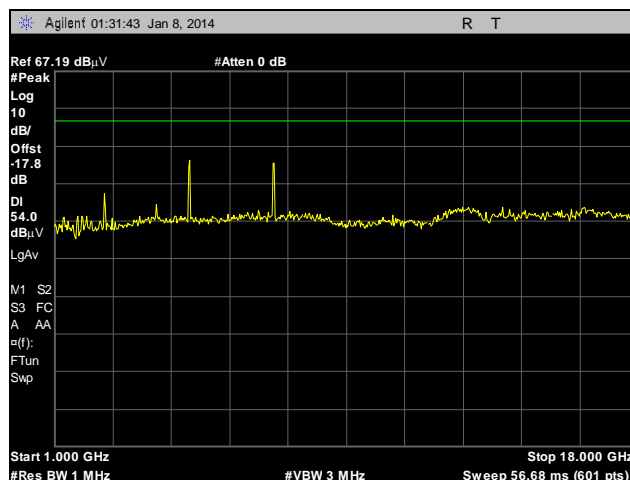




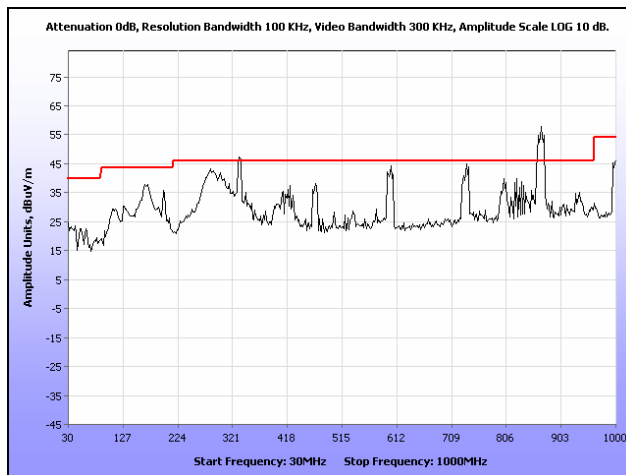
Plot 60. Radiated Spurious Emissions, Internal Antenna, 802.11g, 2437 MHz, 18 GHz – 26 GHz, Peak under Average



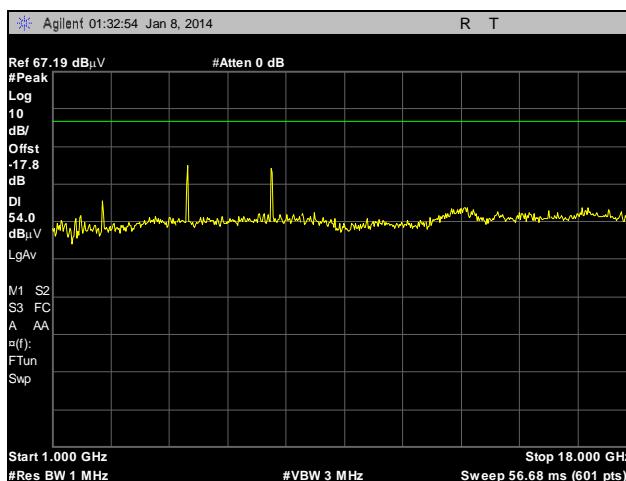
Plot 61. Radiated Spurious Emissions, Internal Antenna, 802.11g, 2462 MHz, 30 MHz – 1 GHz



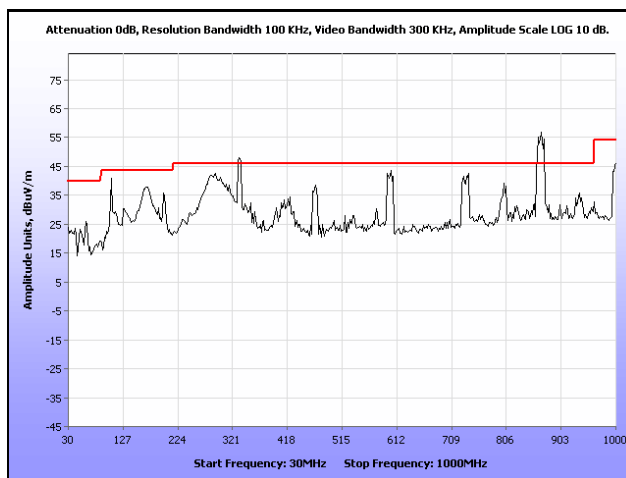
Plot 62. Radiated Spurious Emissions, Internal Antenna, 802.11g, 2462 MHz, 1 GHz – 18 GHz, Peak under Average



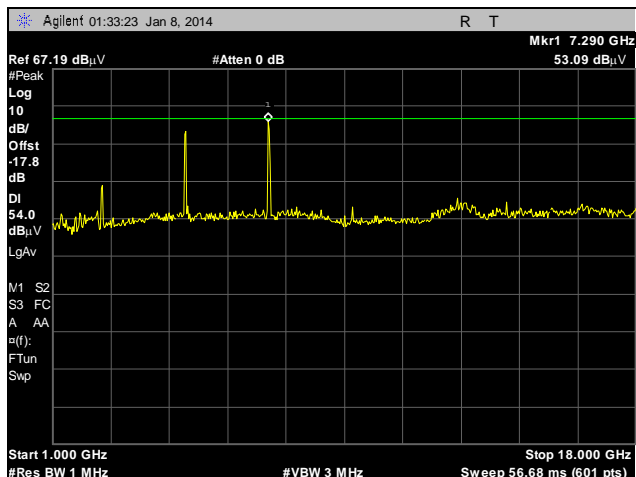
**Plot 63. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 2412 MHz, 30 MHz – 1 GHz**



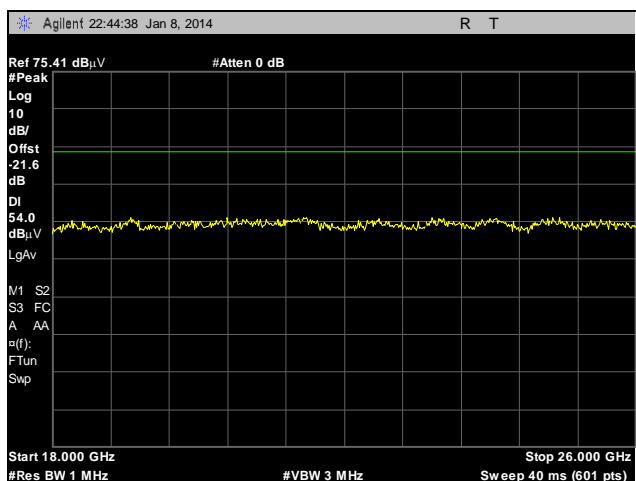
**Plot 64. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 2412 MHz, 1 GHz – 18 GHz, Peak under Average**



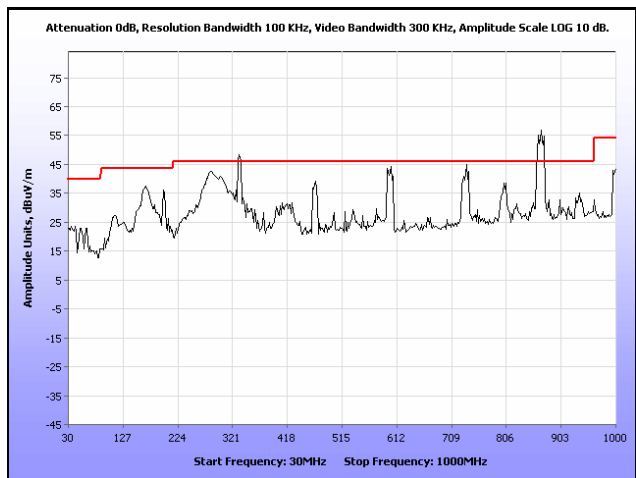
**Plot 65. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 2437 MHz, 30 MHz – 1 GHz**



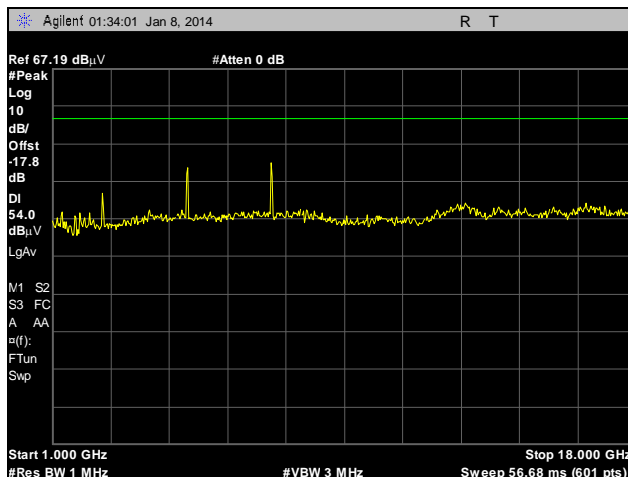
**Plot 66. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 2437 MHz, 1 GHz – 18 GHz, Peak under Average**



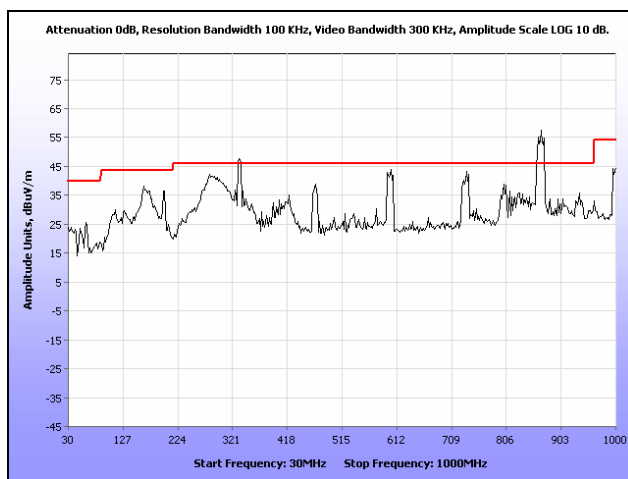
**Plot 67. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 2437 MHz, 18 GHz – 26 GHz, Peak under Average**



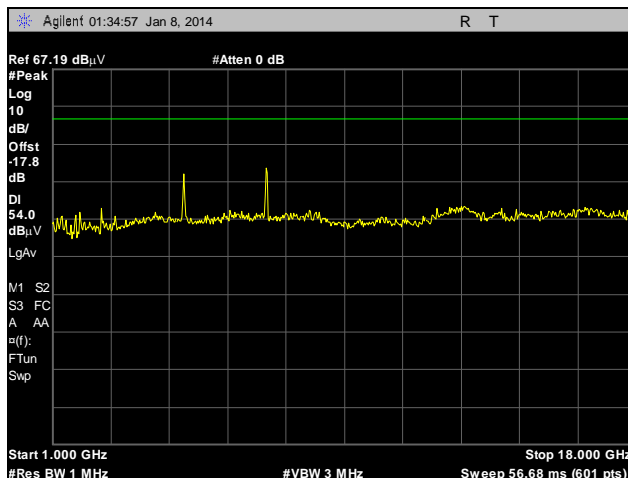
**Plot 68. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 2462 MHz, 30 MHz – 1 GHz**



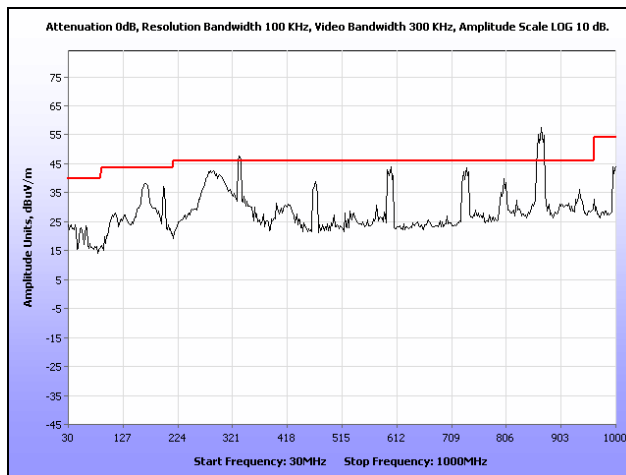
**Plot 69. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 2462 MHz, 1 GHz – 18 GHz, Peak under Average**



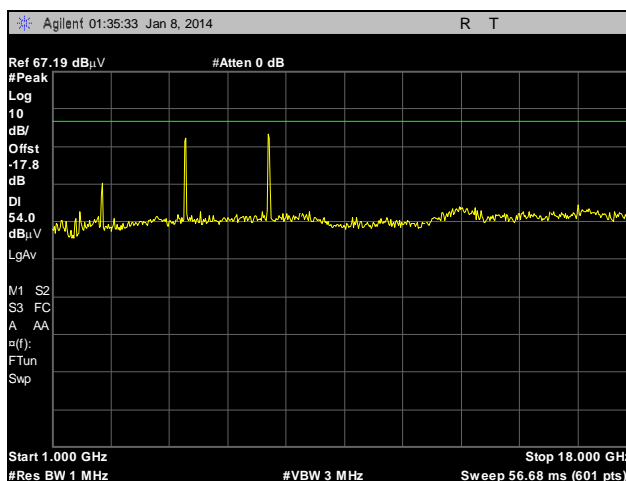
**Plot 70. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 2422 MHz, 30 MHz – 1 GHz**



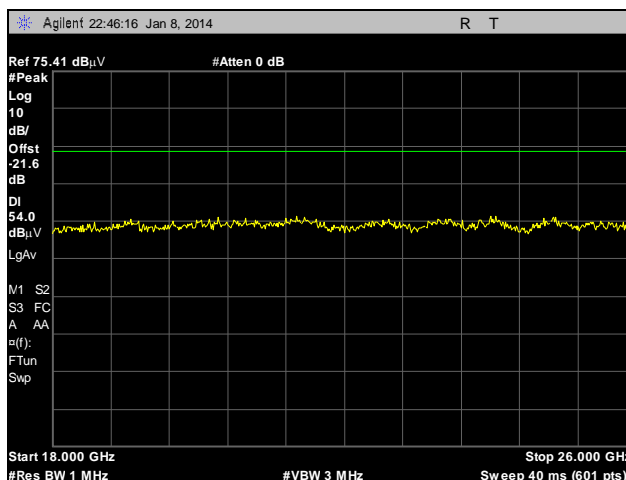
**Plot 71. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 2422 MHz, 1 GHz – 18 GHz, Peak under Average**



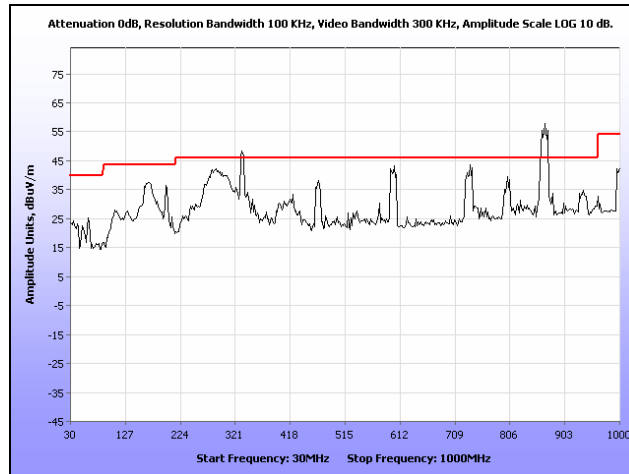
**Plot 72. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 2437 MHz, 30 MHz – 1 GHz**



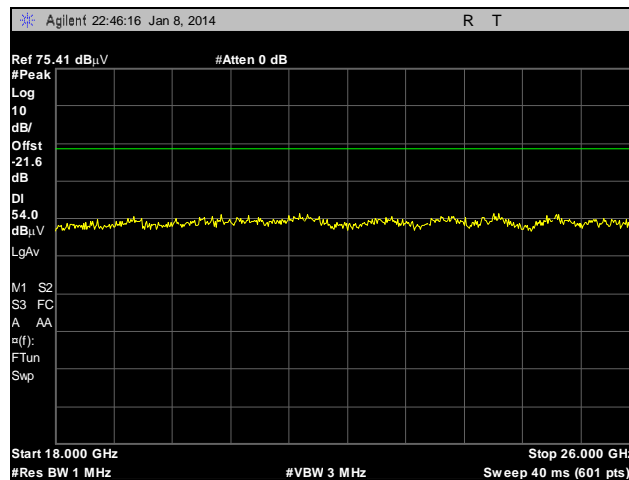
**Plot 73. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 2437 MHz, 1 GHz – 18 GHz, Peak under Average**



**Plot 74. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 2437 MHz, 18 GHz – 26 GHz, Peak under Average**

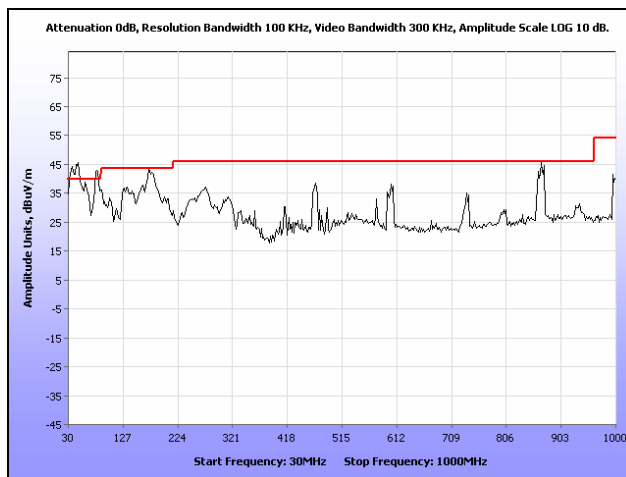


**Plot 75. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 2452 MHz, 30 MHz – 1 GHz**

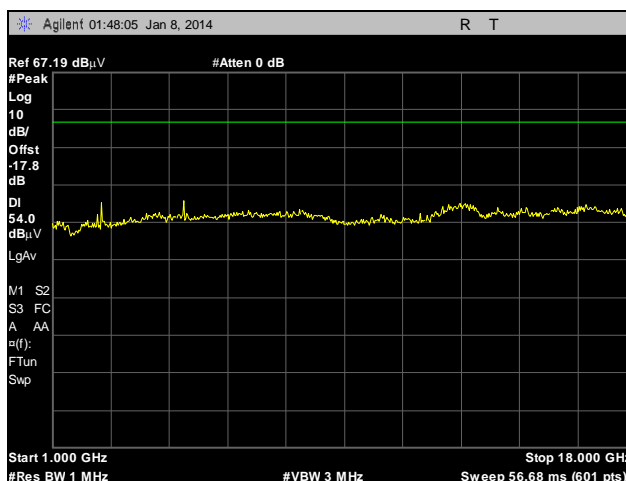


**Plot 76. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 2452 MHz, 1 GHz – 18 GHz, Peak under Average**

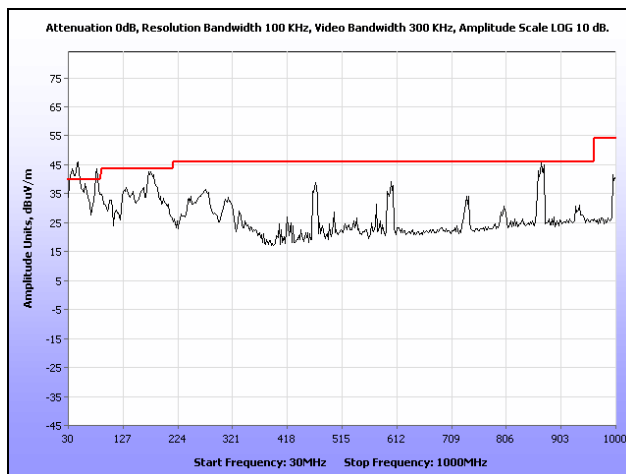
## Radiated Spurious Emissions Test Results – External 2.4 GHz



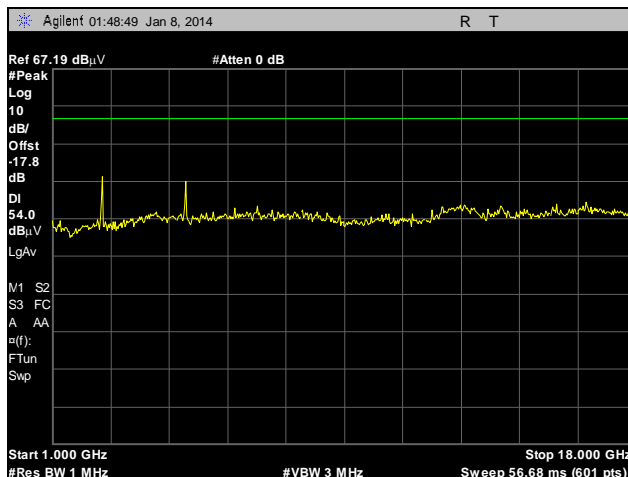
Plot 77. Radiated Spurious Emissions, External Antenna, 802.11b, 2412 MHz, 30 MHz – 1 GHz



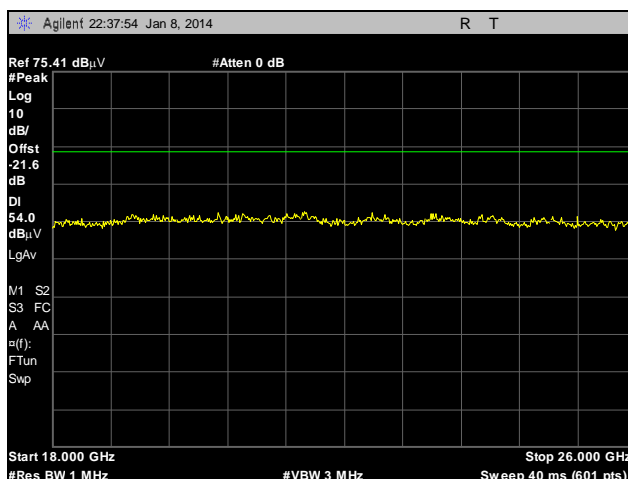
Plot 78. Radiated Spurious Emissions, External Antenna, 802.11b, 2412 MHz, 1 GHz – 18 GHz, Peak under Average



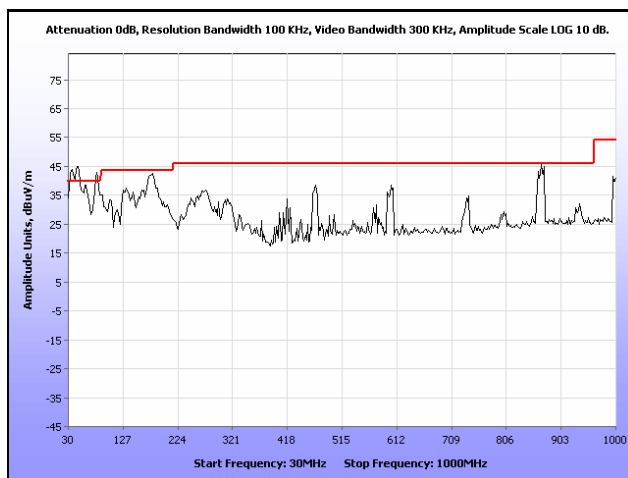
Plot 79. Radiated Spurious Emissions, External Antenna, 802.11b, 2437 MHz, 30 MHz – 1 GHz



Plot 80. Radiated Spurious Emissions, External Antenna, 802.11b, 2437 MHz, 1 GHz – 18 GHz, Peak under Average

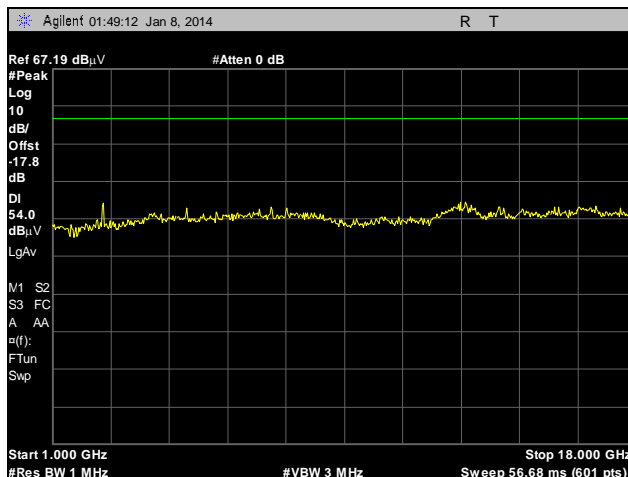


Plot 81. Radiated Spurious Emissions, External Antenna, 802.11b, 2437 MHz, 18 GHz – 26 GHz, Peak under Average

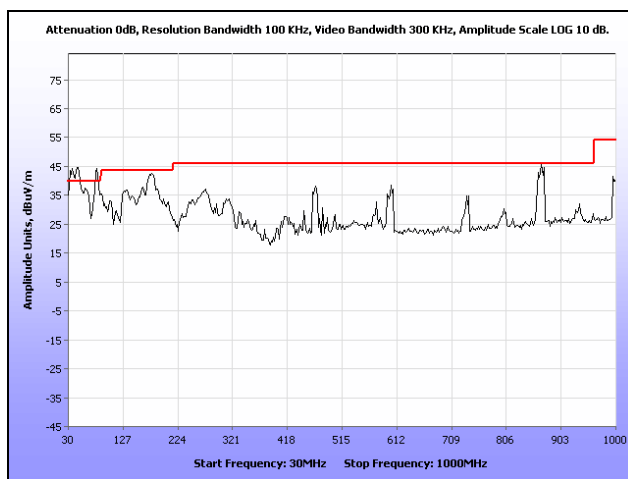


Plot 82. Radiated Spurious Emissions, External Antenna, 802.11b, 2462 MHz, 30 MHz – 1 GHz

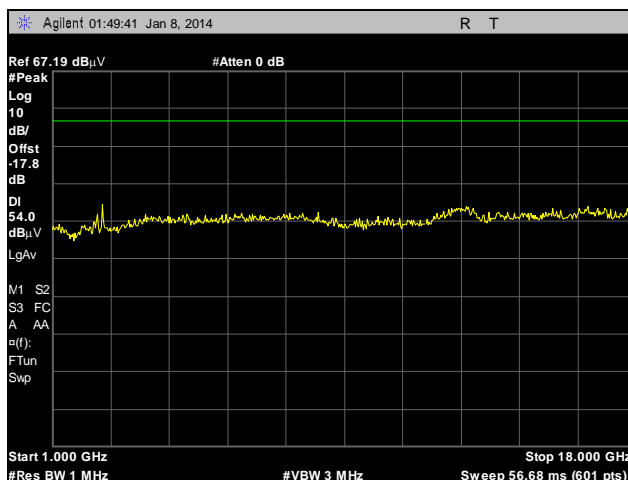




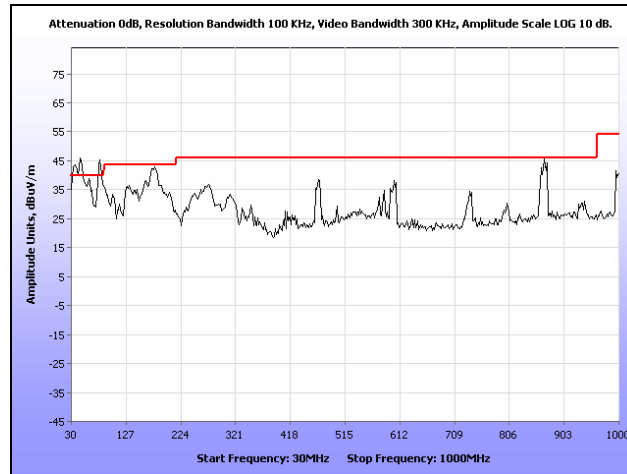
**Plot 83. Radiated Spurious Emissions, External Antenna, 802.11b, 2462 MHz, 1 GHz – 18 GHz, Peak under Average**



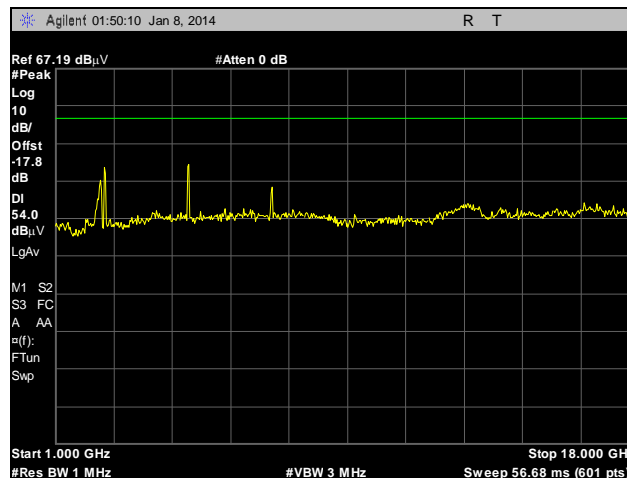
**Plot 84. Radiated Spurious Emissions, External Antenna, 802.11g, 2412 MHz, 30 MHz – 1 GHz**



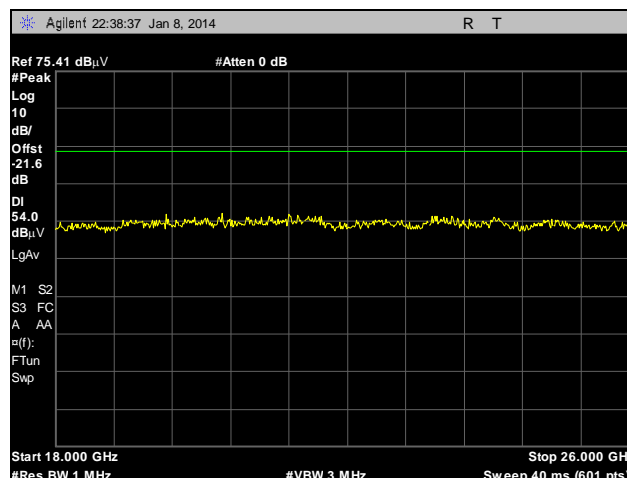
**Plot 85. Radiated Spurious Emissions, External Antenna, 802.11g, 2412 MHz, 1 GHz – 18 GHz, Peak under Average**



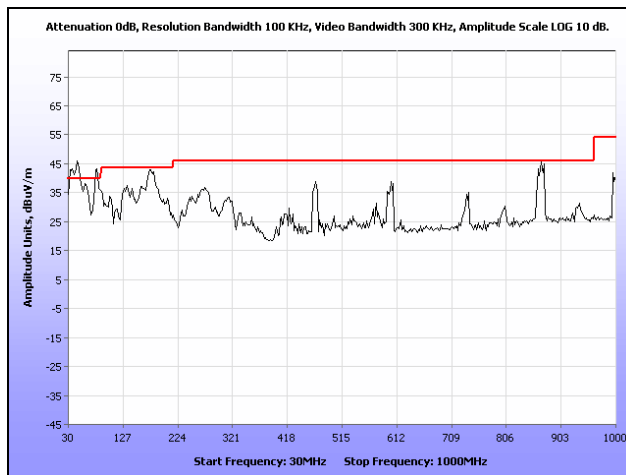
**Plot 86. Radiated Spurious Emissions, External Antenna, 802.11g, 2437 MHz, 30 MHz – 1 GHz**



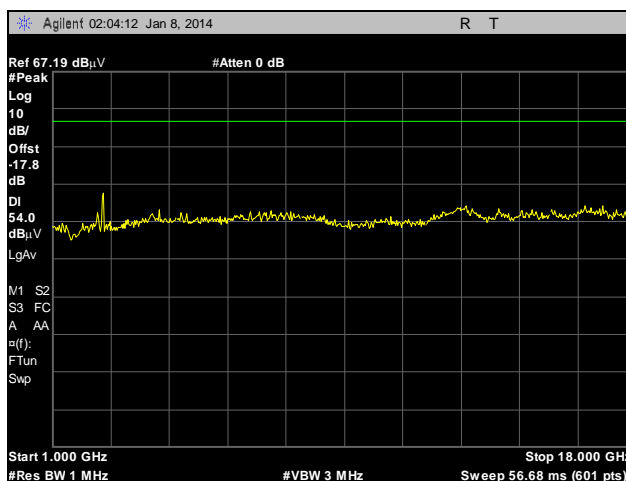
**Plot 87. Radiated Spurious Emissions, External Antenna, 802.11g, 2437 MHz, 1 GHz – 18 GHz, Peak under Average**



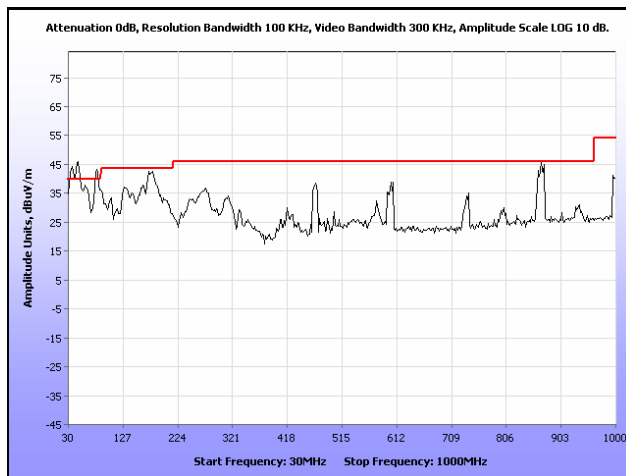
**Plot 88. Radiated Spurious Emissions, External Antenna, 802.11g, 2437 MHz, 18 GHz – 26 GHz, Peak under Average**



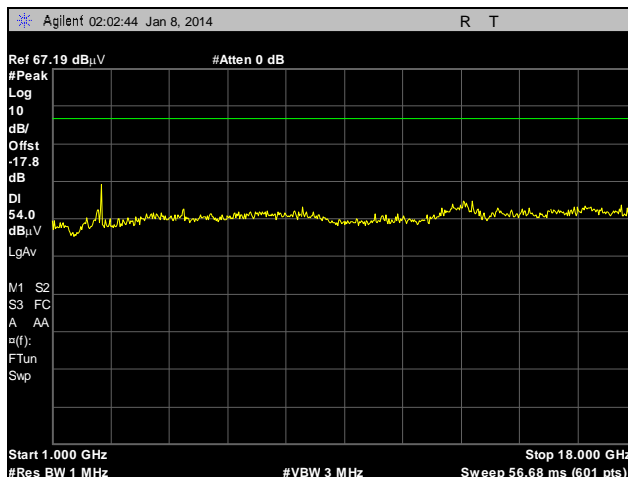
**Plot 89. Radiated Spurious Emissions, External Antenna, 802.11g, 2462 MHz, 30 MHz – 1 GHz**



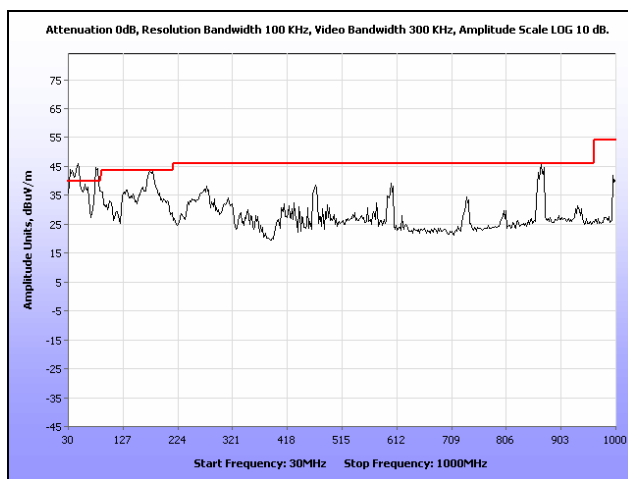
**Plot 90. Radiated Spurious Emissions, External Antenna, 802.11g, 2462 MHz, 1 GHz – 18 GHz, Peak under Average**



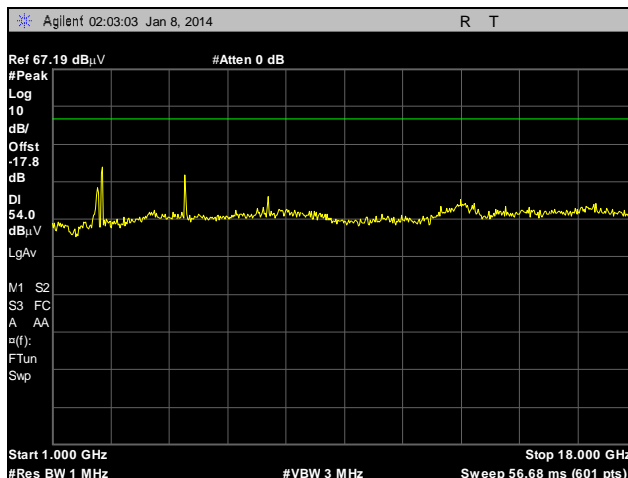
**Plot 91. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 2412 MHz, 30 MHz – 1 GHz**



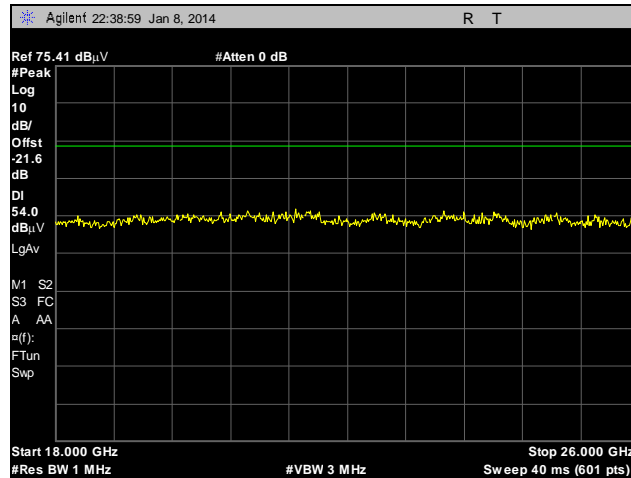
**Plot 92. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 2412 MHz, 1 GHz – 18 GHz, Peak under Average**



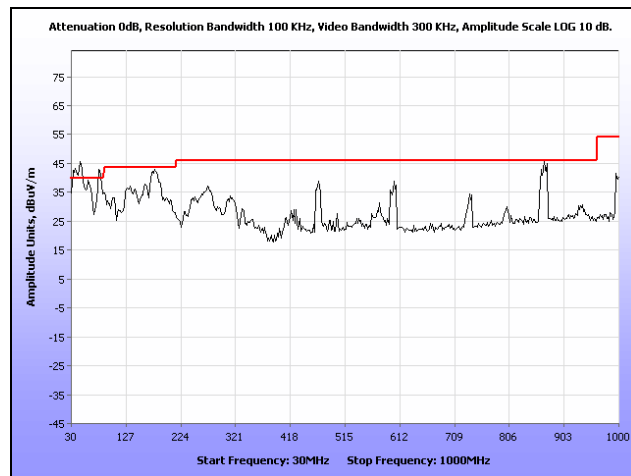
**Plot 93. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 2437 MHz, 30 MHz – 1 GHz**



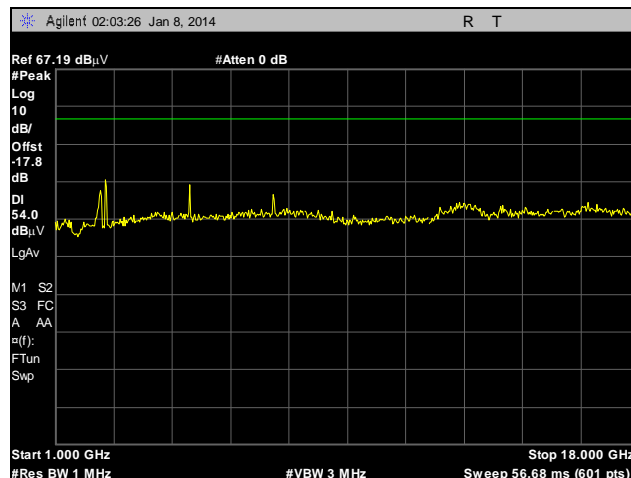
**Plot 94. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 2437 MHz, 1 GHz – 18 GHz, Peak under Average**



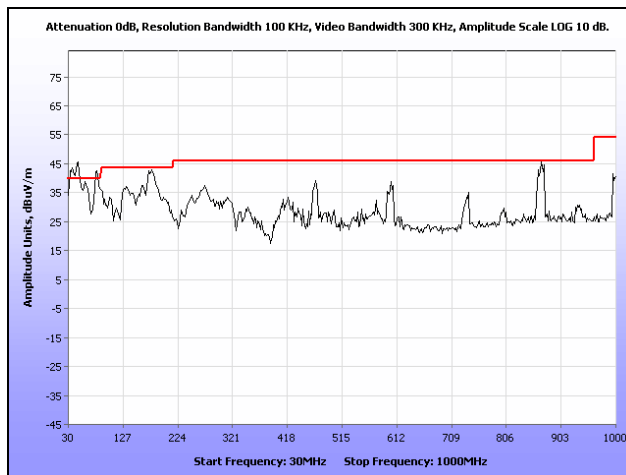
Plot 95. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 2437 MHz, 18 GHz – 26 GHz, Peak under Average



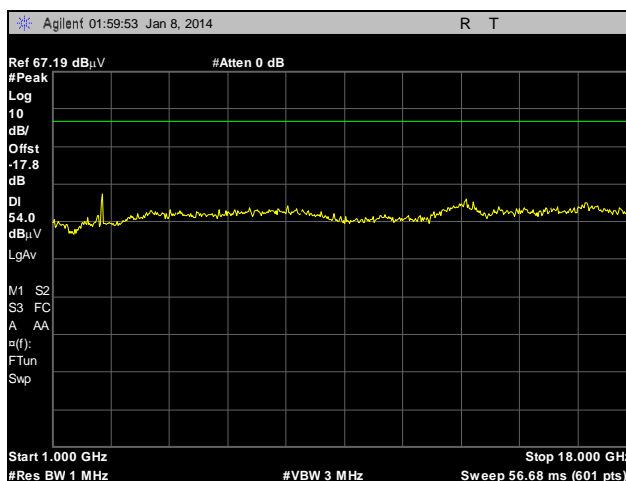
Plot 96. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 2462 MHz, 30 MHz – 1 GHz



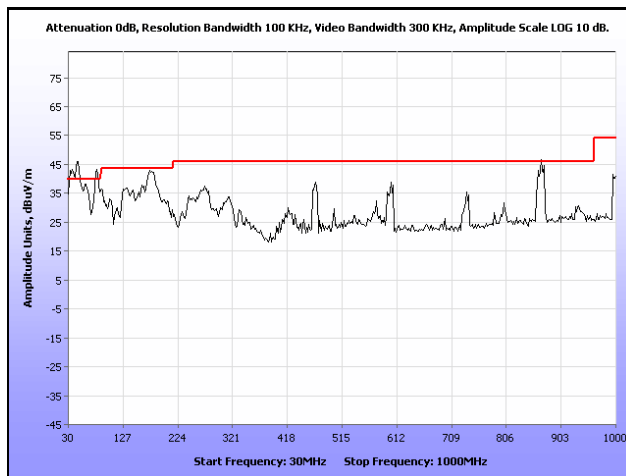
Plot 97. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 2462 MHz, 1 GHz – 18 GHz, Peak under Average



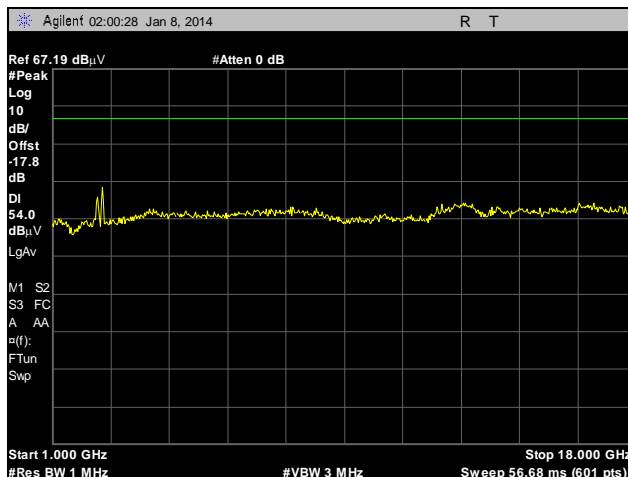
Plot 98. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 2422 MHz, 30 MHz – 1 GHz



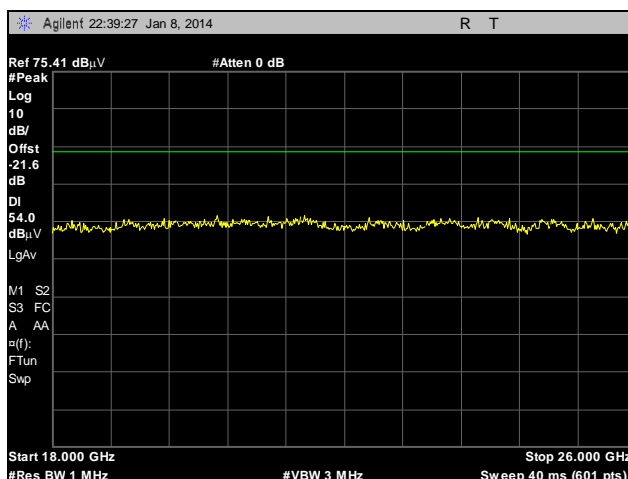
Plot 99. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 2422 MHz, 1 GHz – 18 GHz, Peak under Average



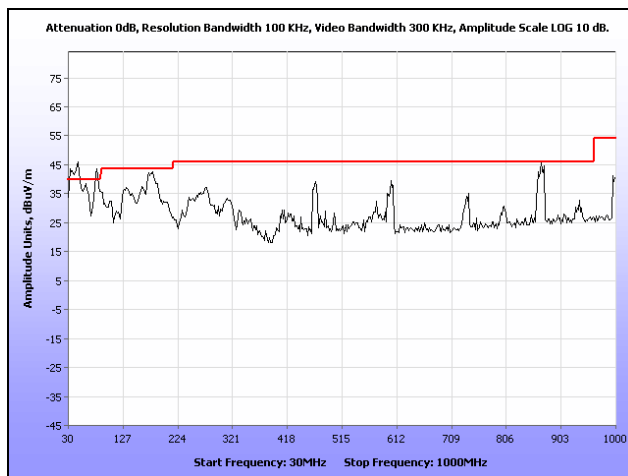
Plot 100. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 2437 MHz, 30 MHz – 1 GHz



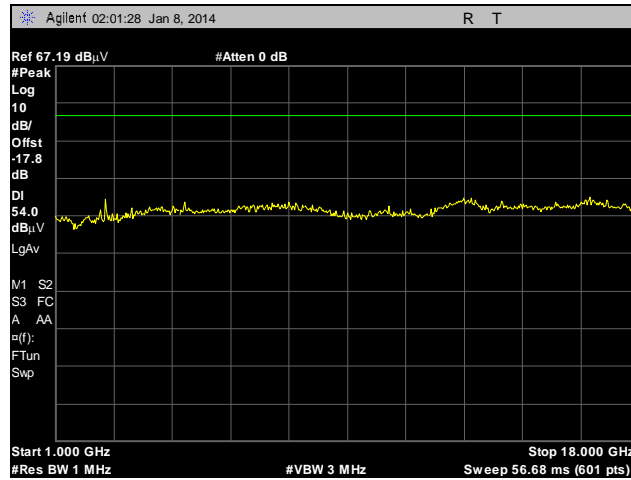
Plot 101. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 2437 MHz, 1 GHz – 18 GHz, Peak under Average



Plot 102. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 2437 MHz, 18 GHz – 26 GHz, Peak under Average



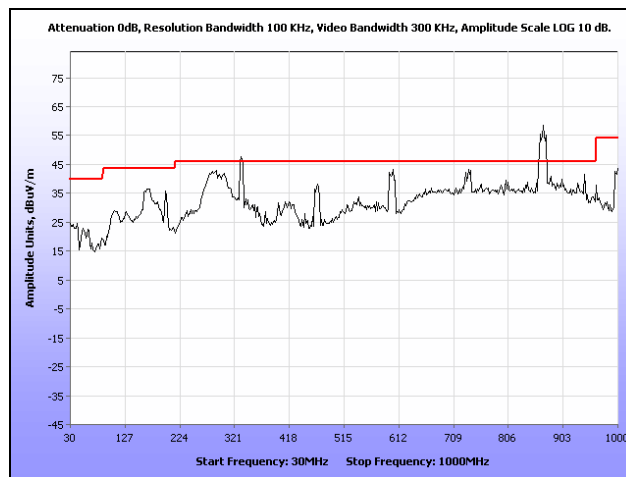
Plot 103. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 2452 MHz, 30 MHz – 1 GHz



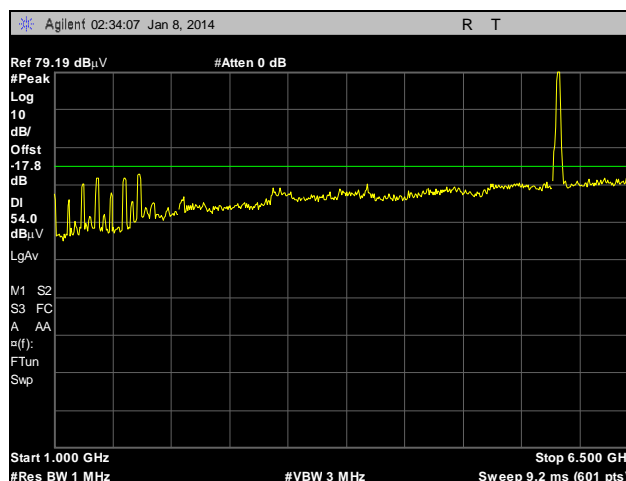
**Plot 104. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 2452 MHz, 1 GHz – 18 GHz, Peak under Average**



## Radiated Spurious Emissions Test Results – Internal 5 GHz



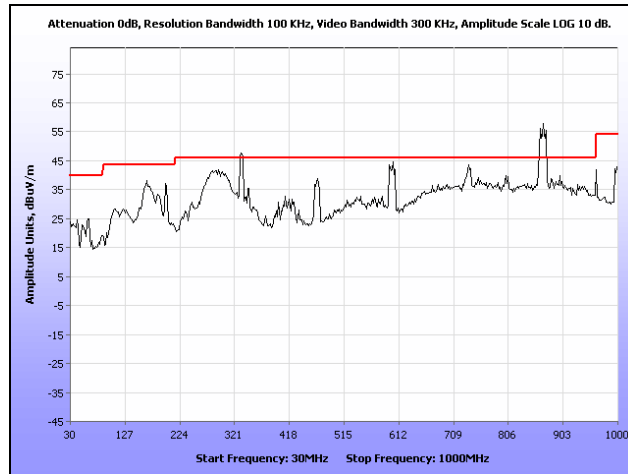
Plot 105. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5745 MHz, 30 MHz – 1 GHz



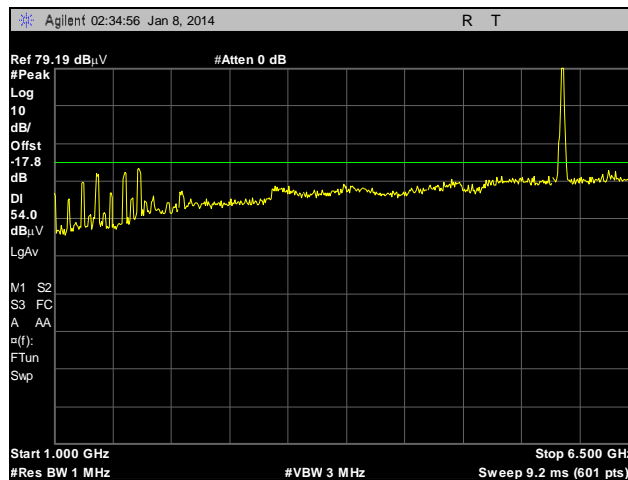
Plot 106. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5745 MHz, 1 GHz – 6.5 GHz, Peak under Average



Plot 107. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5745 MHz, 6.5 GHz – 18 GHz, Peak under Average



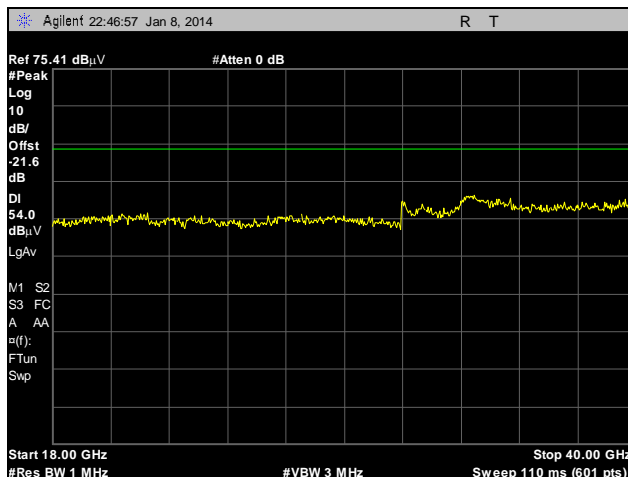
**Plot 108. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5785 MHz, 30 MHz – 1 GHz**



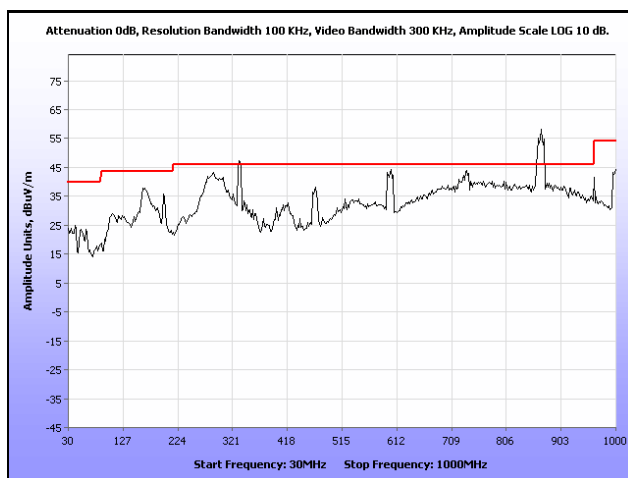
**Plot 109. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5785 MHz, 1 GHz – 6.5 GHz, Peak under Average**



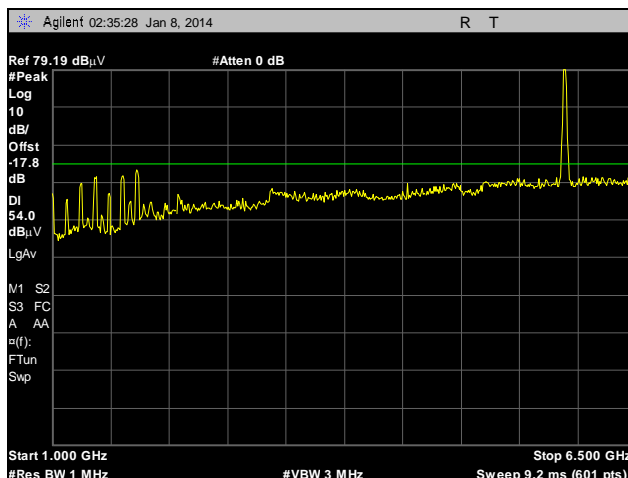
**Plot 110. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5785 MHz, 6.5 GHz – 18 GHz, Peak under Average**



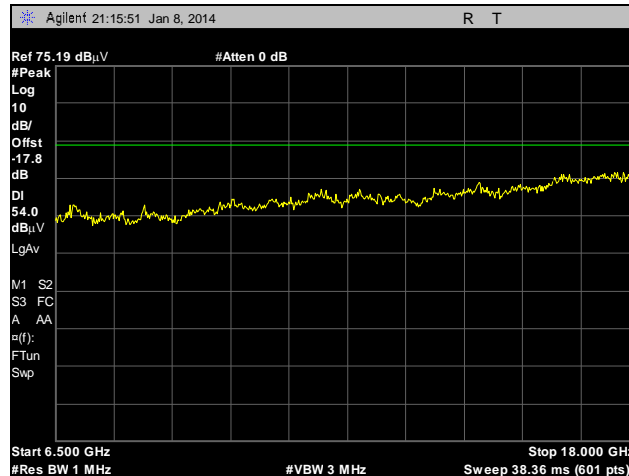
**Plot 111. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5785 MHz, 18 GHz – 40 GHz, Peak under Average**



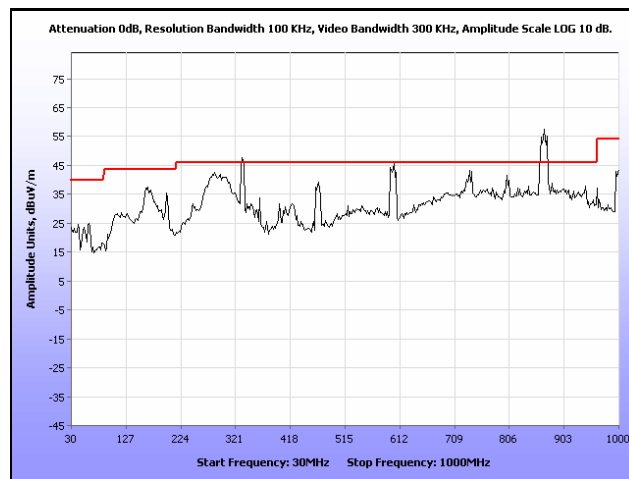
**Plot 112. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5825 MHz, 30 MHz – 1 GHz**



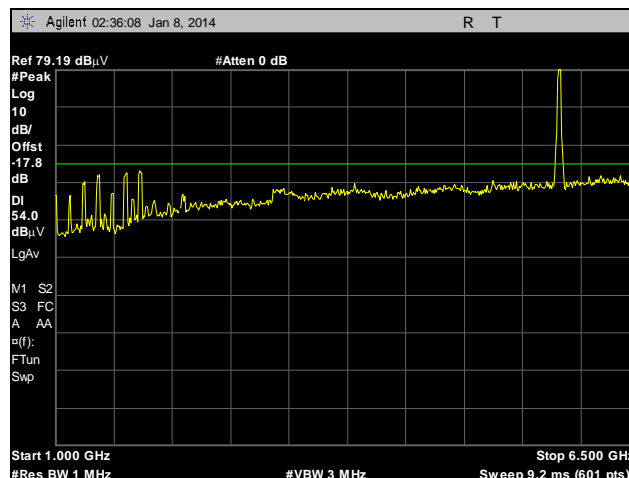
**Plot 113. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5825 MHz, 1 GHz – 6.5 GHz, Peak under Average**



**Plot 114. Radiated Spurious Emissions, Internal Antenna, 802.11a, 5825 MHz, 6.5 GHz – 18 GHz, Peak under Average**



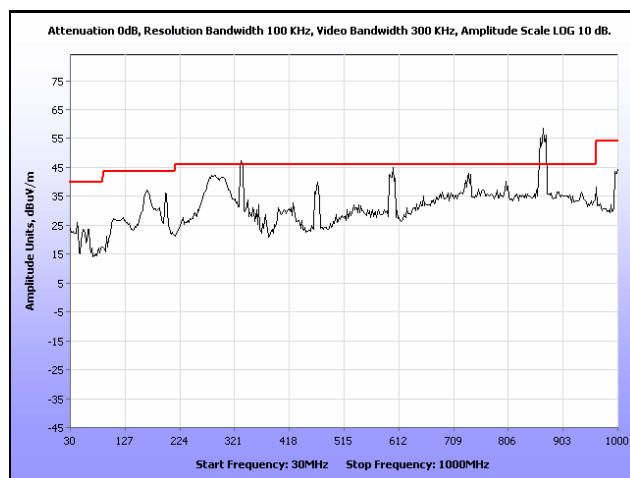
**Plot 115. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5745 MHz, 30 MHz – 1 GHz**



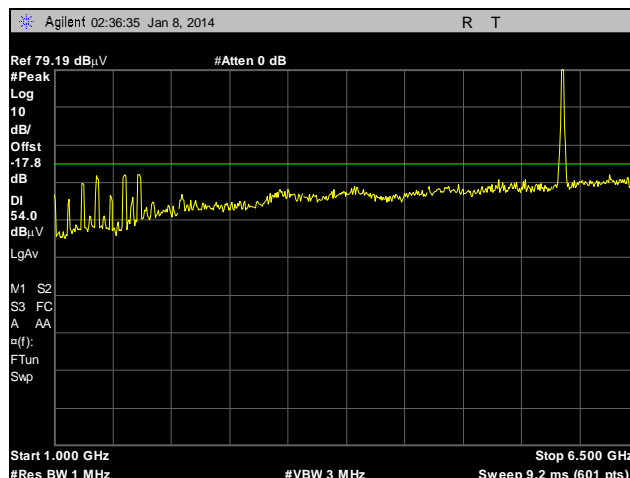
**Plot 116. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5745 MHz, 1 GHz – 6.5 GHz, Peak under Average**



**Plot 117. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5745 MHz, 6.5 GHz – 18 GHz, Peak under Average**



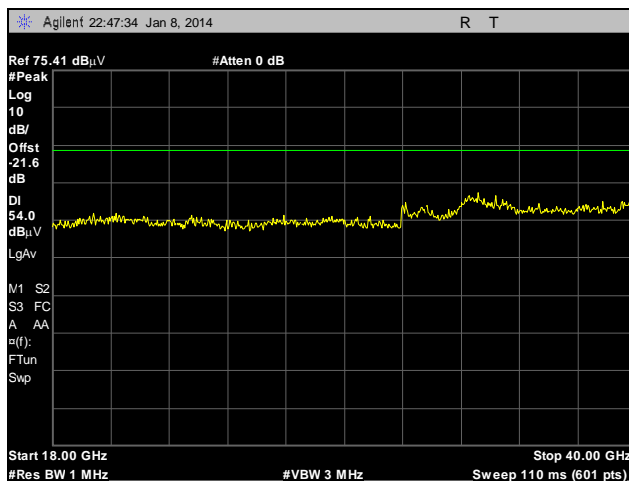
**Plot 118. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5785 MHz, 30 MHz – 1 GHz**



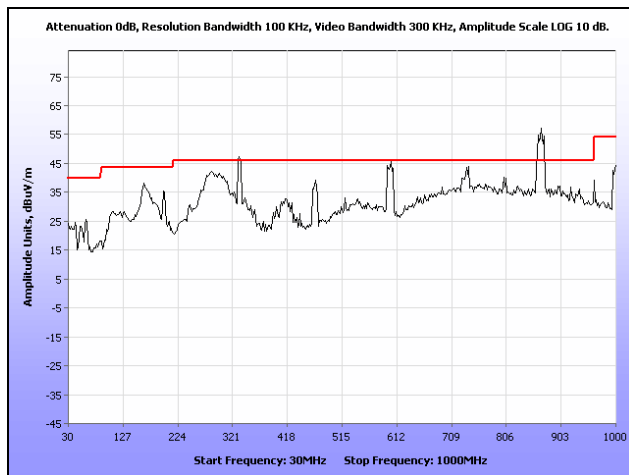
**Plot 119. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5785 MHz, 1 GHz – 6.5 GHz, Peak under Average**



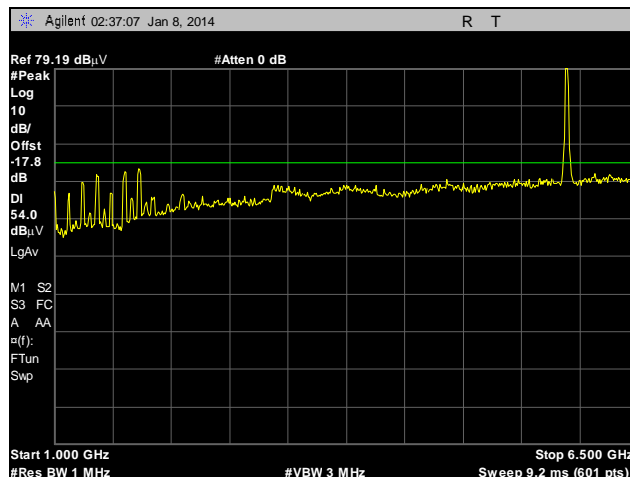
**Plot 120. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5785 MHz, 6.5 GHz – 18 GHz, Peak under Average**



**Plot 121. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5785 MHz, 18 GHz – 40 GHz, Peak under Average**



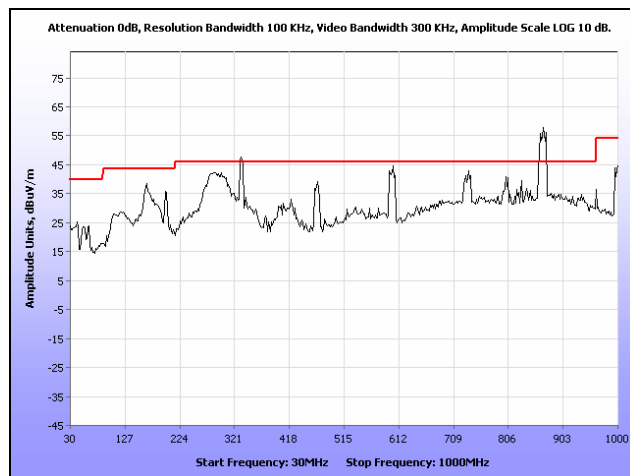
**Plot 122. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5825 MHz, 30 MHz – 1 GHz**



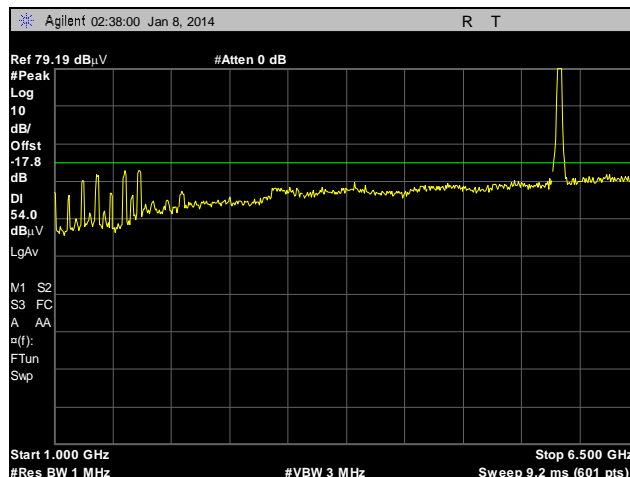
**Plot 123. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5825 MHz, 1 GHz – 6.5 GHz, Peak under Average**



**Plot 124. Radiated Spurious Emissions, Internal Antenna, 802.11n 20 MHz, 5825 MHz, 6.5 GHz – 18 GHz, Peak under Average**



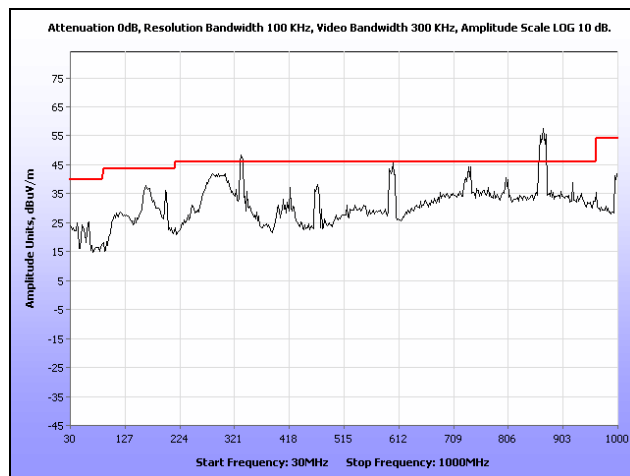
**Plot 125. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 5755 MHz, 30 MHz – 1 GHz**



Plot 126. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 5755 MHz, 1 GHz – 6.5 GHz, Peak under Average

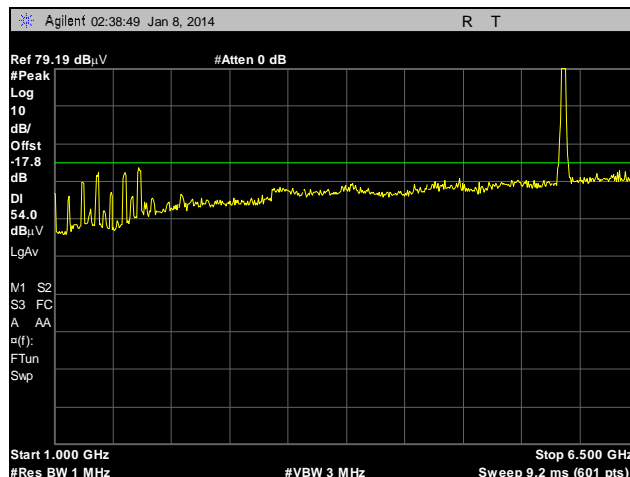


Plot 127. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 5755 MHz, 6.5 GHz – 18 GHz, Peak under Average

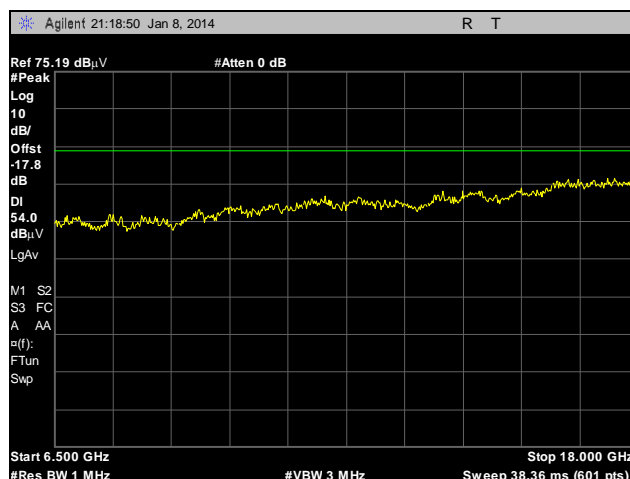


Plot 128. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 5795 MHz, 30 MHz – 1 GHz

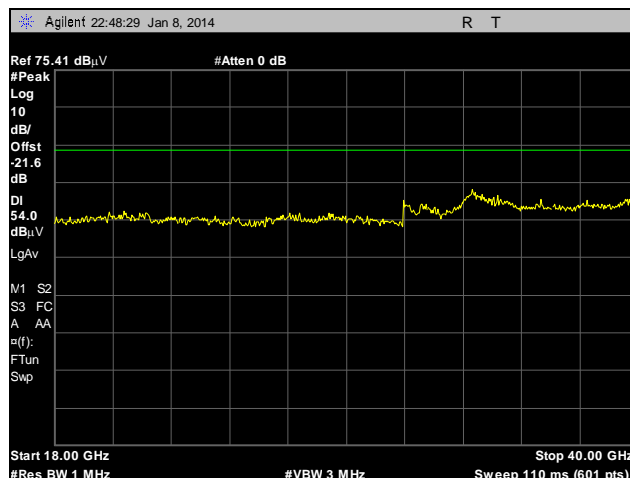




Plot 129. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 5795 MHz, 1 GHz – 6.5 GHz, Peak under Average

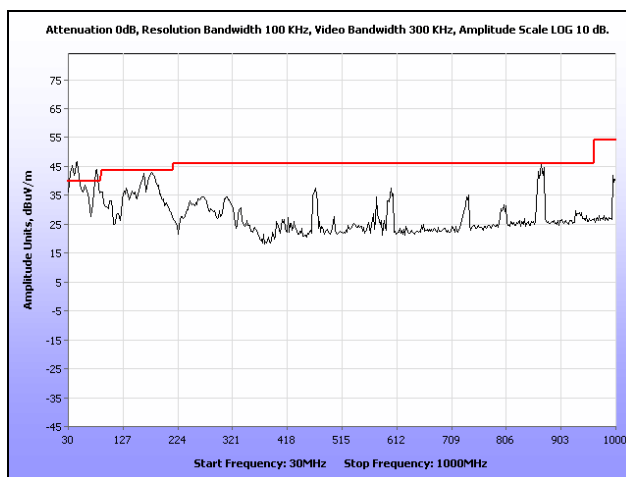


Plot 130. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 5795 MHz, 6.5 GHz – 18 GHz, Peak under Average



Plot 131. Radiated Spurious Emissions, Internal Antenna, 802.11n 40 MHz, 5795 MHz, 18 GHz – 40 GHz, Peak under Average

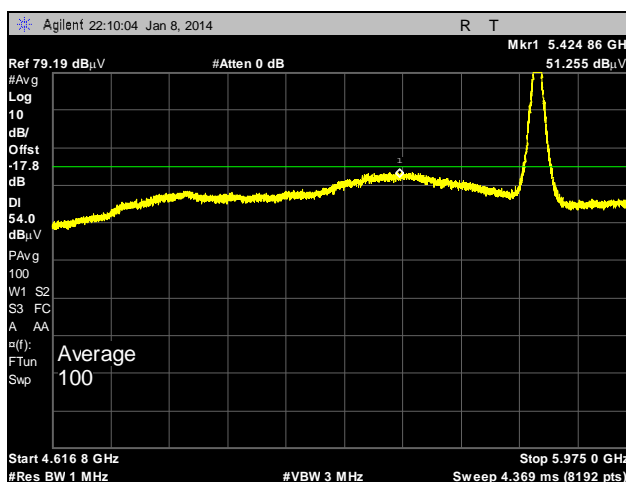
## Radiated Spurious Emissions Test Results – External 5 GHz



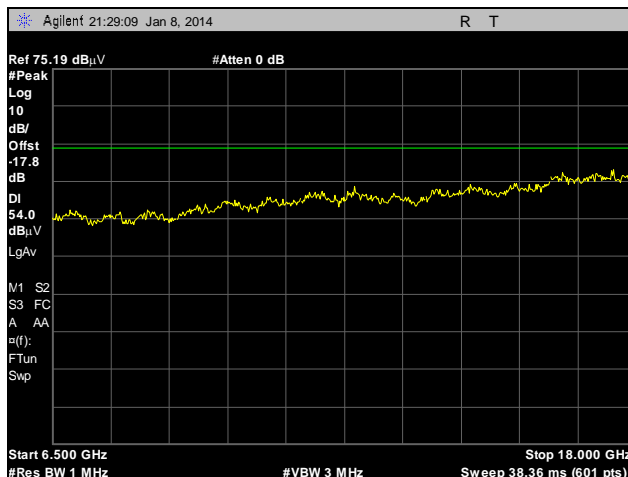
Plot 132. Radiated Spurious Emissions, External Antenna, 802.11a, 5745 MHz, 30 MHz – 1 GHz



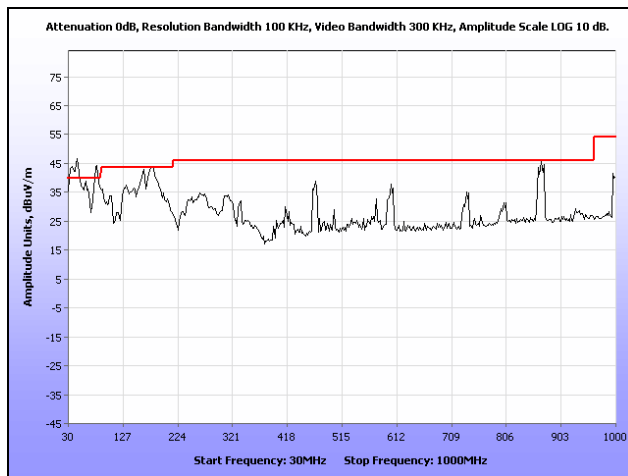
Plot 133. Radiated Spurious Emissions, External Antenna, 802.11a, 5745 MHz, 1 GHz – 6.5 GHz, Peak under Average



Plot 134. Radiated Spurious Emissions, External Antenna, 802.11a, 5745 MHz, Average



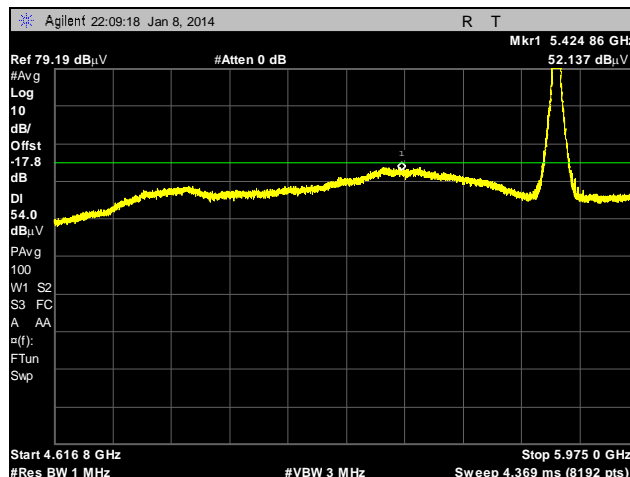
Plot 135. Radiated Spurious Emissions, External Antenna, 802.11a, 5745 MHz, 6.5 GHz – 18 GHz, Peak under Average



Plot 136. Radiated Spurious Emissions, External Antenna, 802.11a, 5785 MHz, 30 MHz – 1 GHz



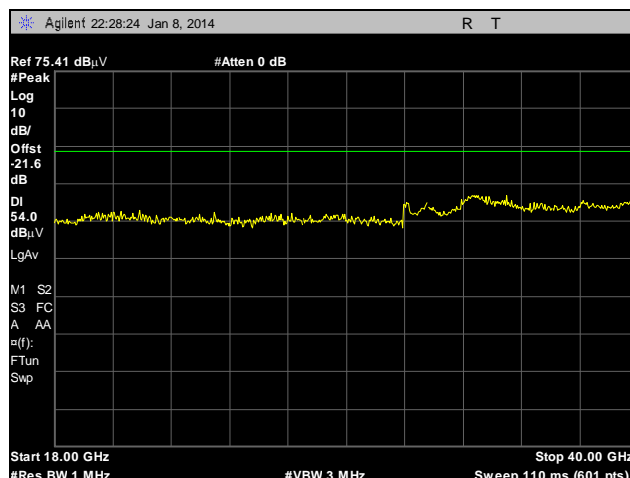
Plot 137. Radiated Spurious Emissions, External Antenna, 802.11a, 5785 MHz, 1 GHz – 6.5 GHz, Peak under Average



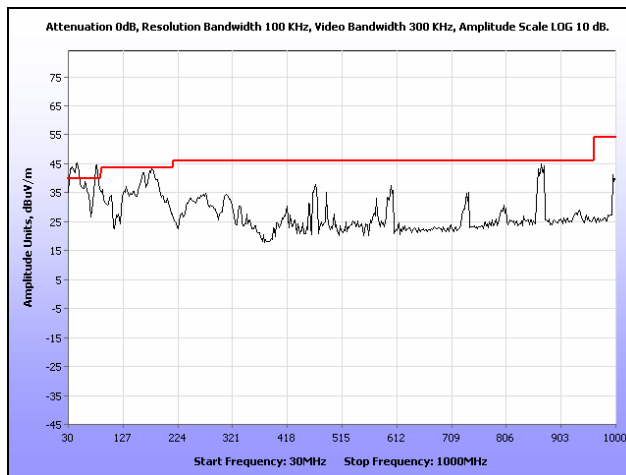
Plot 138. Radiated Spurious Emissions, External Antenna, 802.11a, 5785 MHz, Average



Plot 139. Radiated Spurious Emissions, External Antenna, 802.11a, 5785 MHz, 6.5 GHz – 18 GHz, Peak under Average



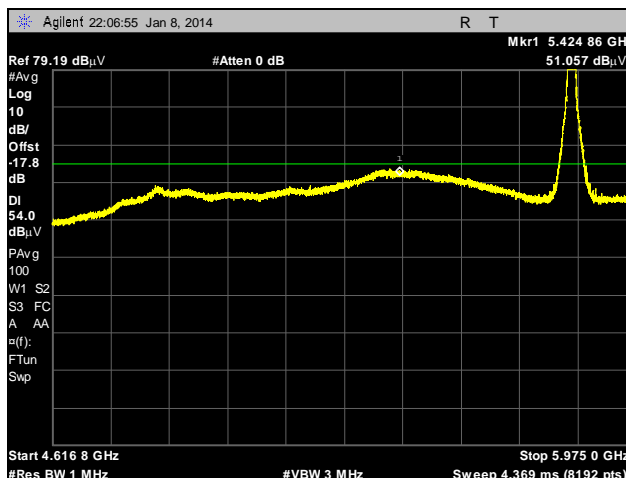
Plot 140. Radiated Spurious Emissions, External Antenna, 802.11a, 5785 MHz, 18 GHz – 40 GHz, Peak under Average



Plot 141. Radiated Spurious Emissions, External Antenna, 802.11a, 5825 MHz, 30 MHz – 1 GHz



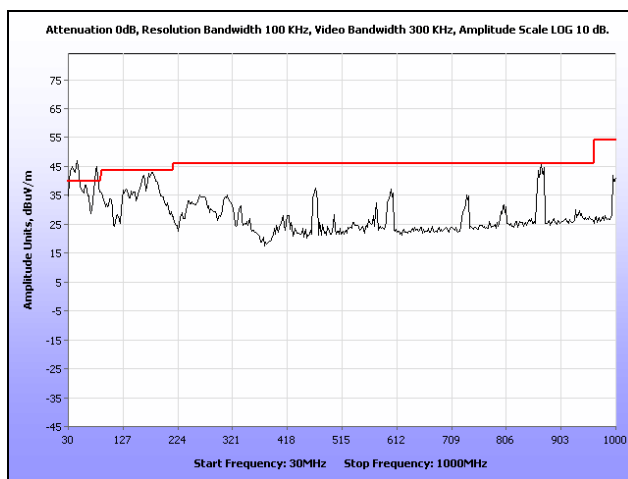
Plot 142. Radiated Spurious Emissions, External Antenna, 802.11a, 5825 MHz, 1 GHz – 6.5 GHz, Peak under Average



Plot 143. Radiated Spurious Emissions, External Antenna, 802.11a, 5825 MHz, Average



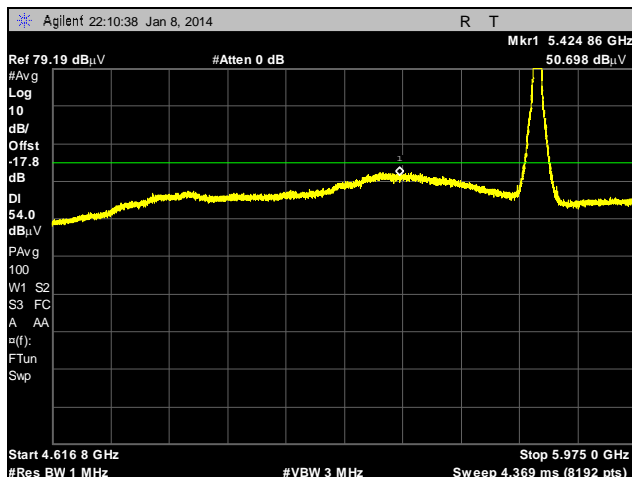
Plot 144. Radiated Spurious Emissions, External Antenna, 802.11a, 5825 MHz, 6.5 GHz – 18 GHz, Peak under Average



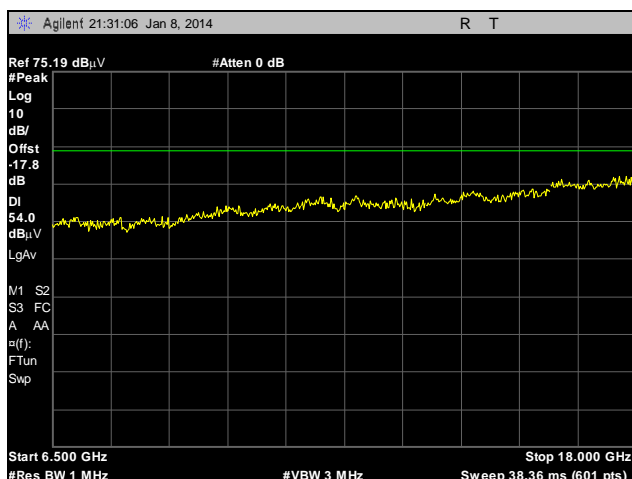
Plot 145. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5745 MHz, 30 MHz – 1 GHz



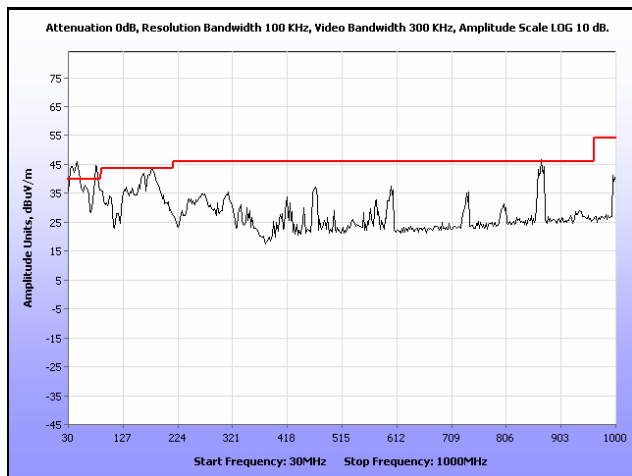
Plot 146. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5745 MHz, 1 GHz – 6.5 GHz, Peak under Average



Plot 147. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5745 MHz, Average



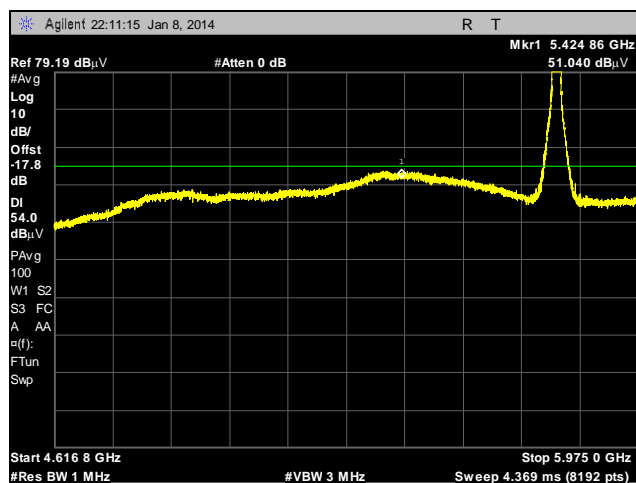
Plot 148. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5745 MHz, 6.5 GHz – 18 GHz, Peak under Average



Plot 149. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5785 MHz, 30 MHz – 1 GHz



**Plot 150. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5785 MHz, 1 GHz – 6.5 GHz, Peak under Average**

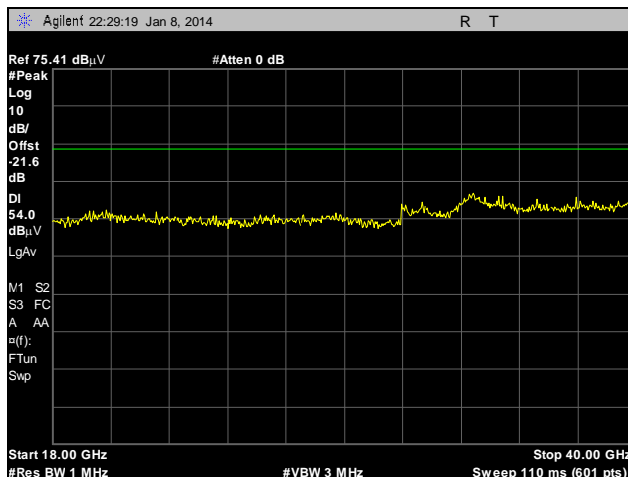


**Plot 151. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5785 MHz, Average**

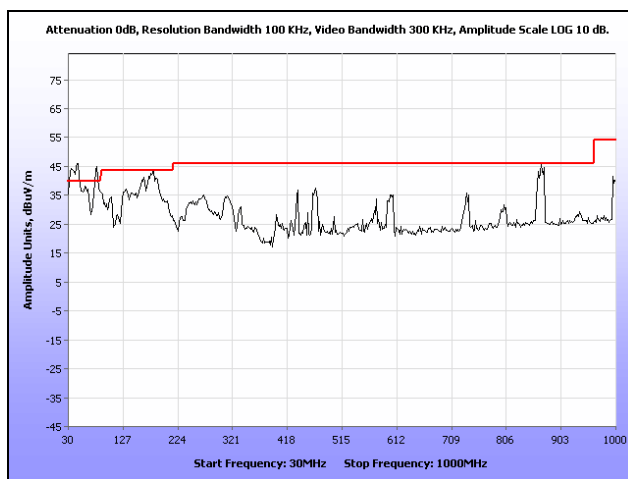


**Plot 152. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5785 MHz, 6.5 GHz – 18 GHz, Peak under Average**





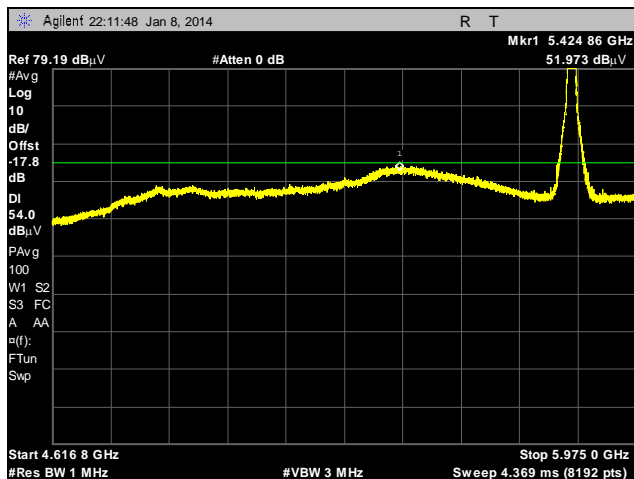
**Plot 153. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5785 MHz, 18 GHz – 40 GHz, Peak under Average**



**Plot 154. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5825 MHz, 30 MHz – 1 GHz**



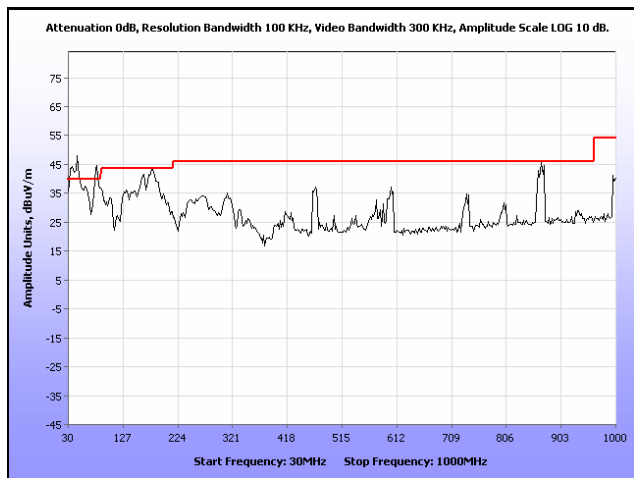
**Plot 155. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5825 MHz, 1 GHz – 6.5 GHz, Peak under Average**



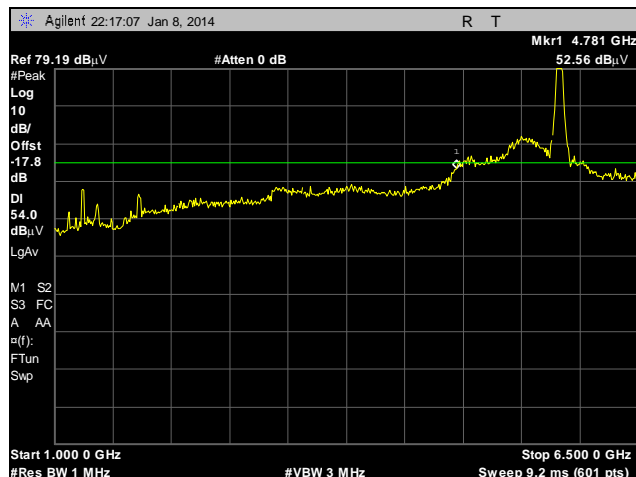
Plot 156. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5825 MHz, Average



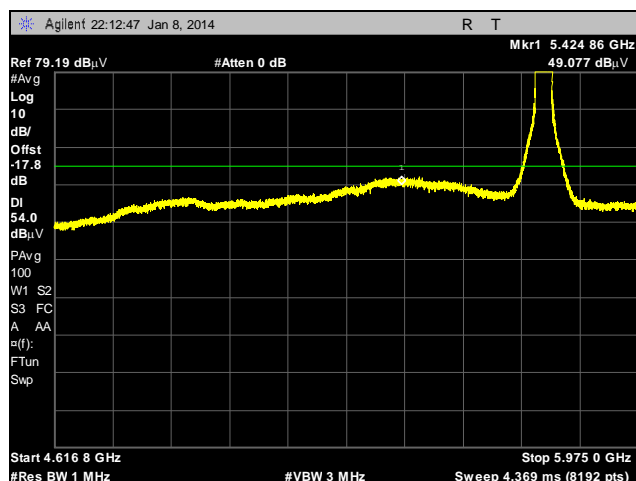
Plot 157. Radiated Spurious Emissions, External Antenna, 802.11n 20 MHz, 5825 MHz, 6.5 GHz – 18 GHz, Peak under Average



Plot 158. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5755 MHz, 30 MHz – 1 GHz



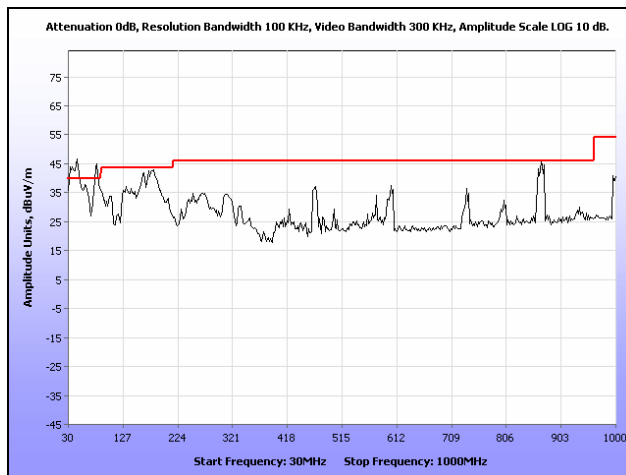
**Plot 159. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5755 MHz, 1 GHz – 6.5 GHz, Peak under Average**



**Plot 160. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5755 MHz, Average**



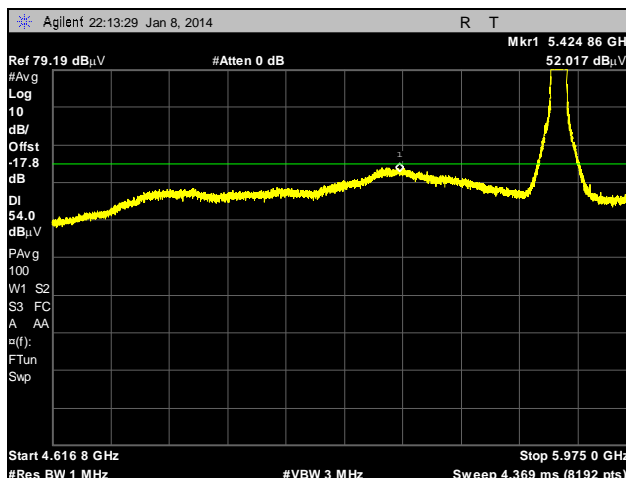
**Plot 161. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5755 MHz, 6.5 GHz – 18 GHz, Peak under Average**



Plot 162. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5795 MHz, 30 MHz – 1 GHz



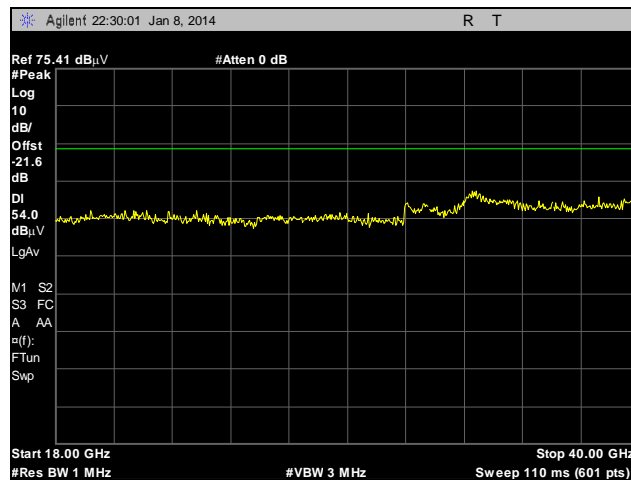
Plot 163. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5795 MHz, 1 GHz – 6.5 GHz, Peak under Average



Plot 164. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5795 MHz, Average



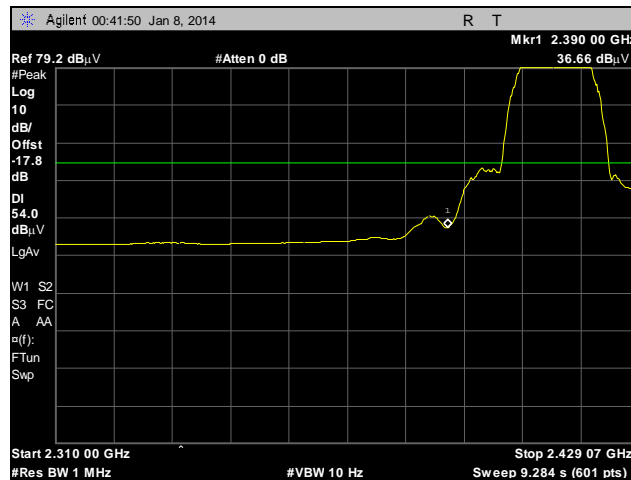
Plot 165. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5795 MHz, 6.5 GHz – 18 GHz, Peak under Average



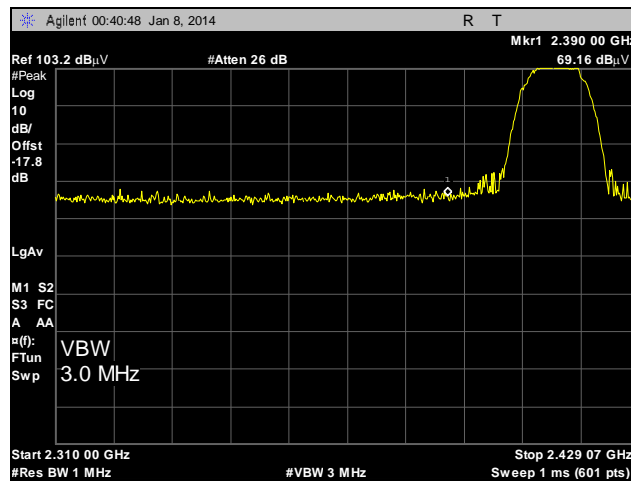
Plot 166. Radiated Spurious Emissions, External Antenna, 802.11n 40 MHz, 5795 MHz, 18 GHz – 40 GHz, Peak under Average

## Radiated Band Edge Measurements

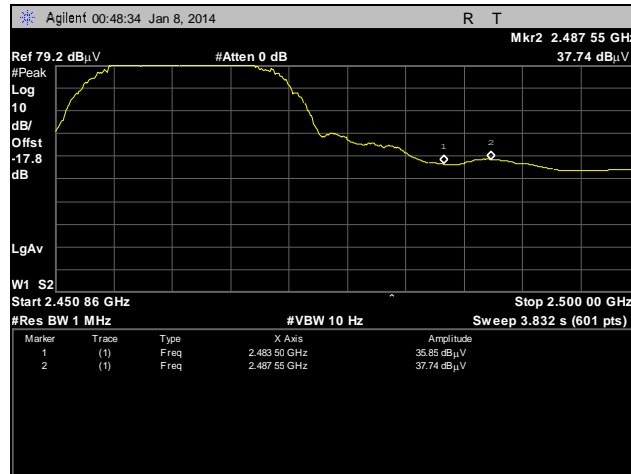
**Test Procedures:** The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.



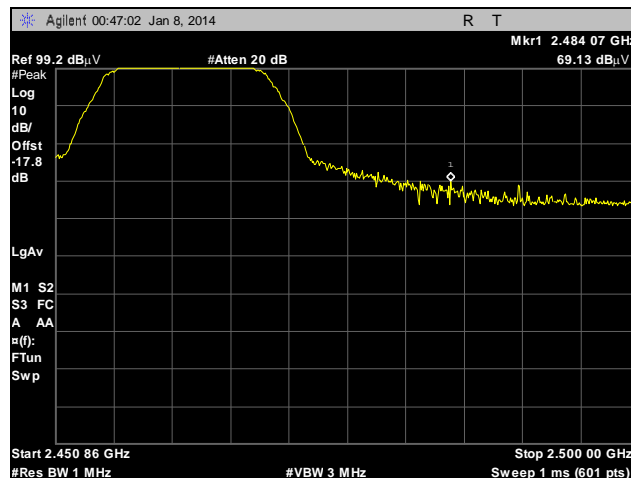
**Plot 167. Radiated Restricted Band Edge, Internal Antenna, 802.11b, Low Channel, Average**



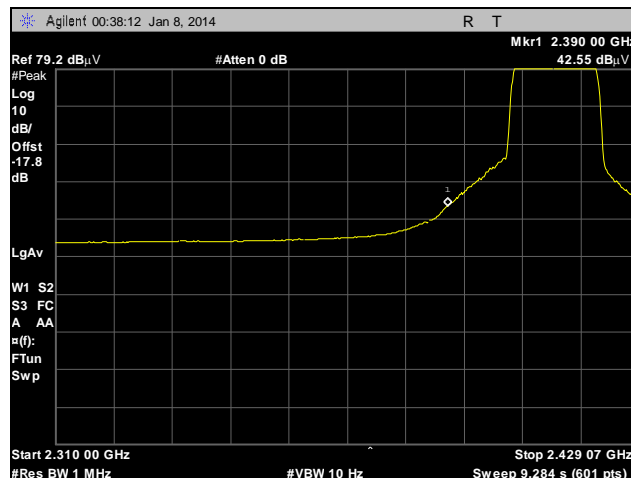
**Plot 168. Radiated Restricted Band Edge, Internal Antenna, 802.11b, Low Channel, Peak**



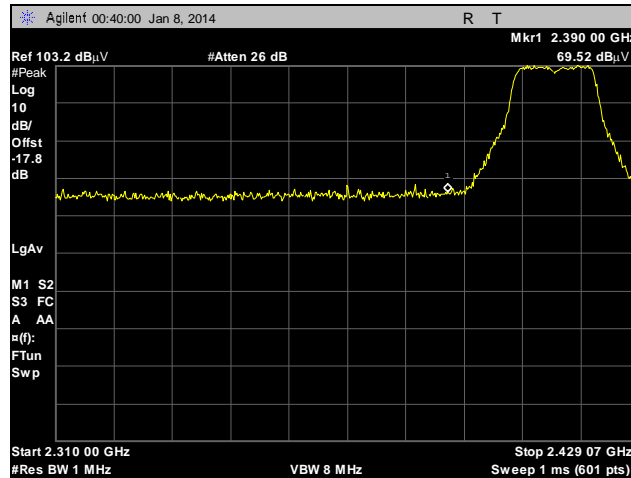
Plot 169. Radiated Restricted Band Edge, Internal Antenna, 802.11b, High Channel, Average



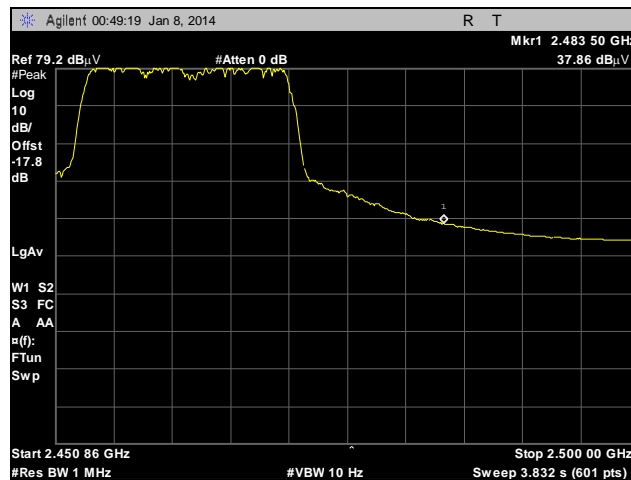
Plot 170. Radiated Restricted Band Edge, Internal Antenna, 802.11b, High Channel, Peak



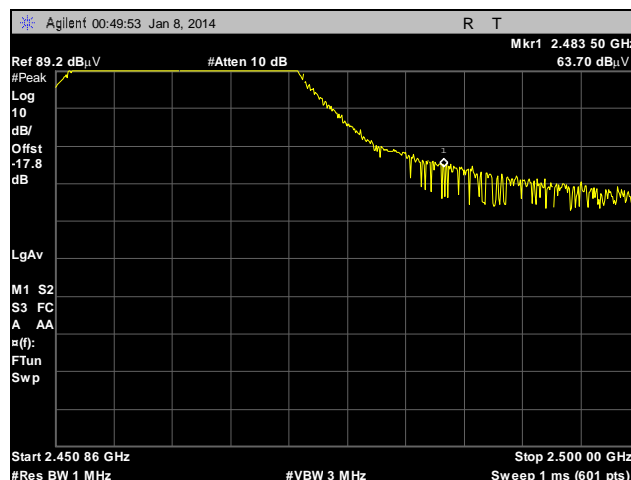
Plot 171. Radiated Restricted Band Edge, Internal Antenna, 802.11g, Low Channel, Average



Plot 172. Radiated Restricted Band Edge, Internal Antenna, 802.11g, Low Channel, Peak

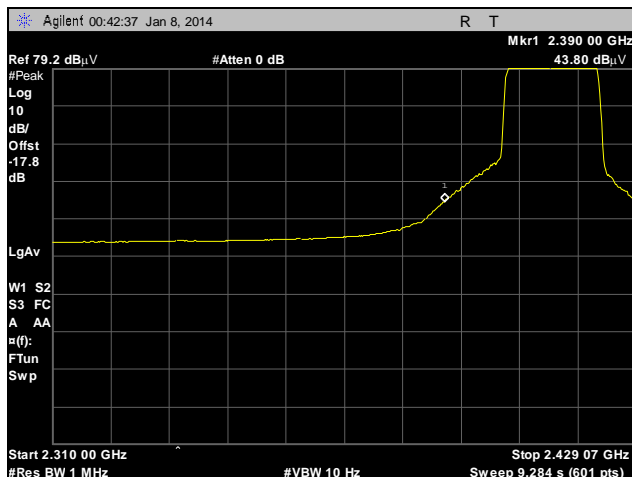


Plot 173. Radiated Restricted Band Edge, Internal Antenna, 802.11g, High Channel, Average

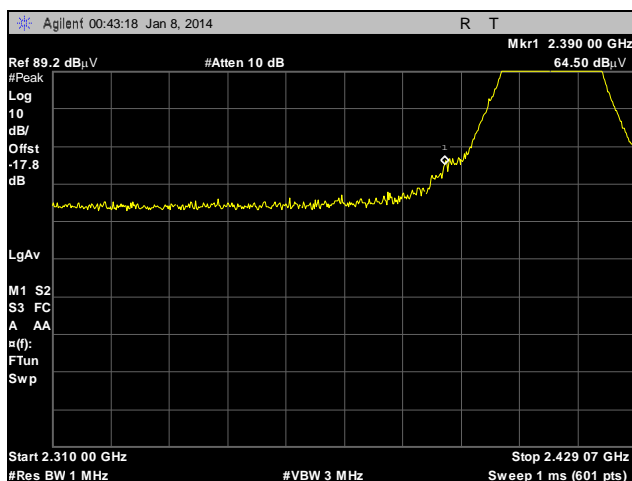


Plot 174. Radiated Restricted Band Edge, Internal Antenna, 802.11g, High Channel, Peak

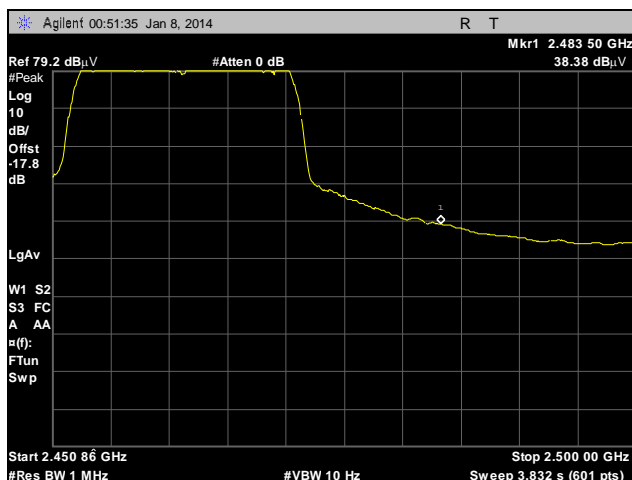




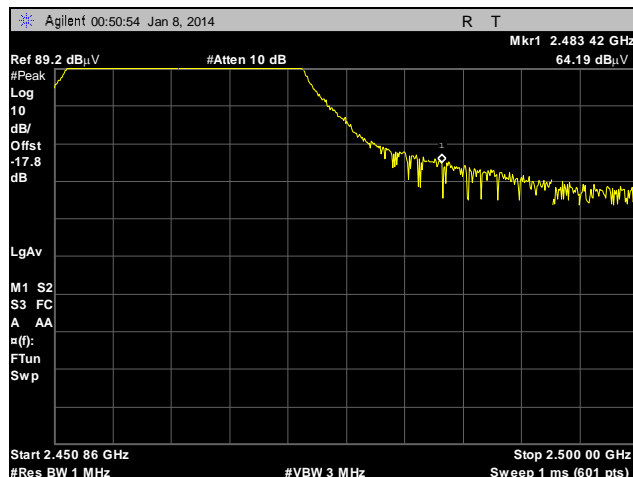
Plot 175. Radiated Restricted Band Edge, Internal Antenna, 802.11n 20 MHz, Low Channel, Average



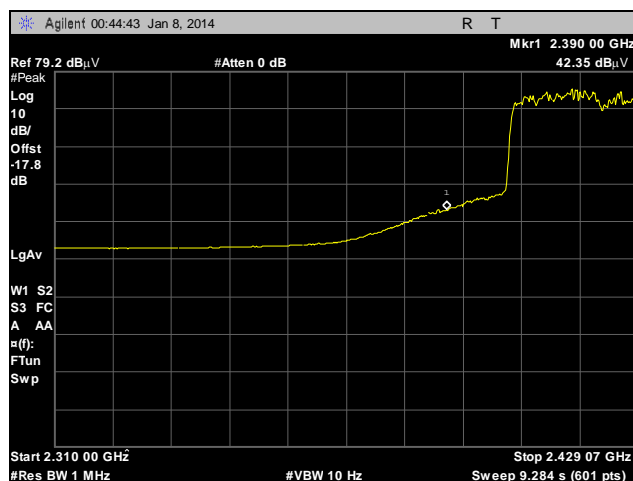
Plot 176. Radiated Restricted Band Edge, Internal Antenna, 802.11n 20 MHz, Low Channel, Peak



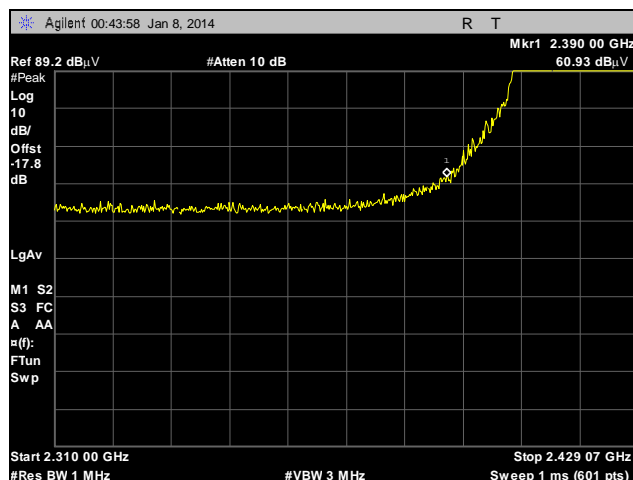
Plot 177. Radiated Restricted Band Edge, Internal Antenna, 802.11n 20 MHz, High Channel, Average



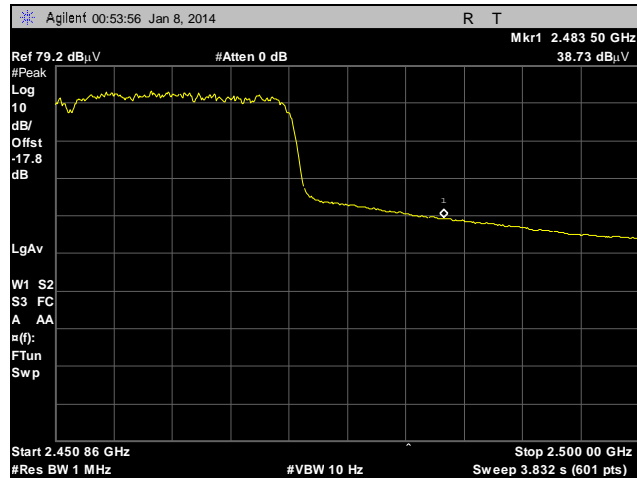
Plot 178. Radiated Restricted Band Edge, Internal Antenna, 802.11n 20 MHz, High Channel, Peak



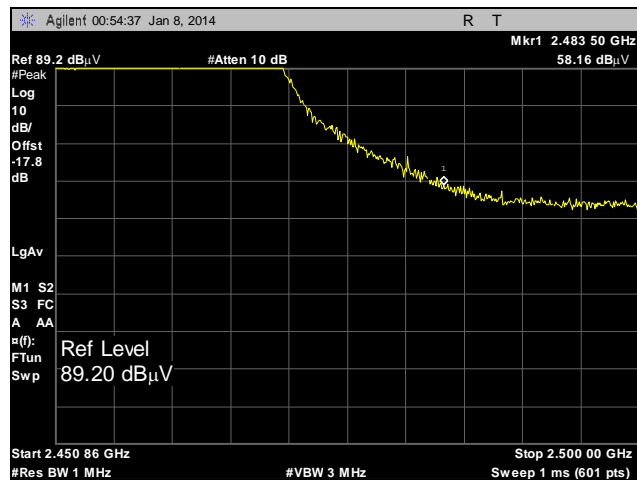
Plot 179. Radiated Restricted Band Edge, Internal Antenna, 802.11n 40 MHz, Low Channel, Average



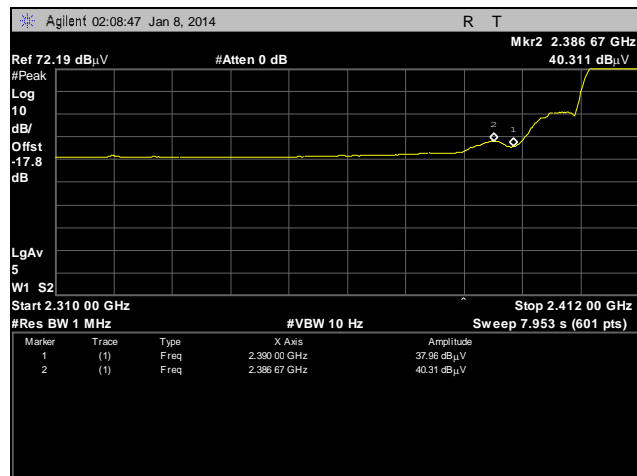
Plot 180. Radiated Restricted Band Edge, Internal Antenna, 802.11n 40 MHz, Low Channel, Peak



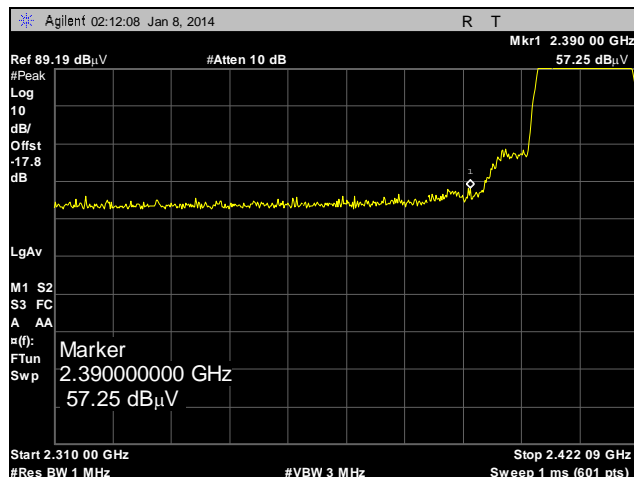
Plot 181. Radiated Restricted Band Edge, Internal Antenna, 802.11n 40 MHz, High Channel, Average



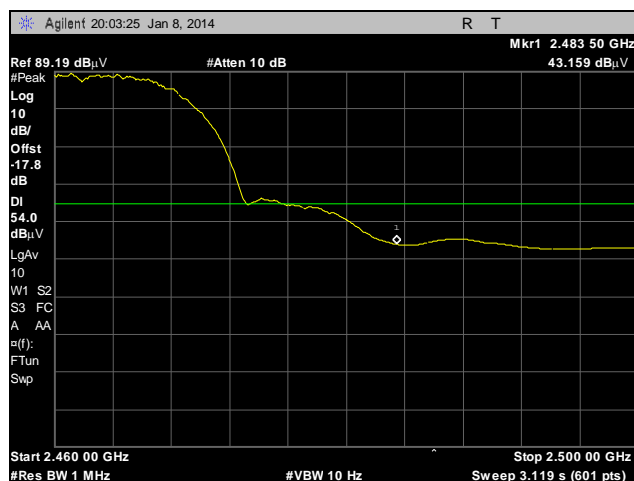
Plot 182. Radiated Restricted Band Edge, Internal Antenna, 802.11n 40 MHz, High Channel, Peak



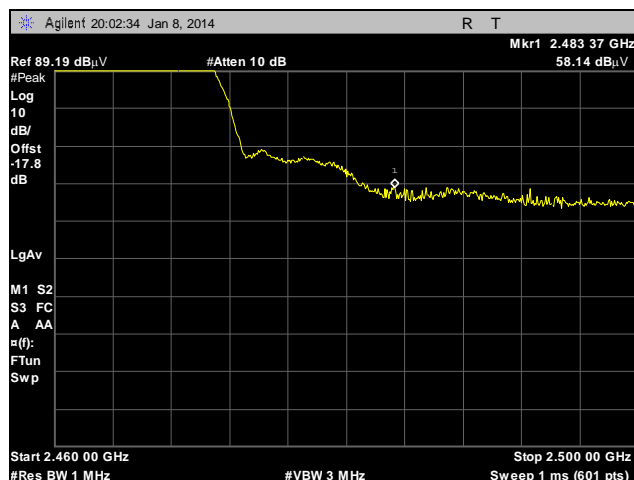
Plot 183. Radiated Restricted Band Edge, External Antenna, 802.11b, Low Channel, Average



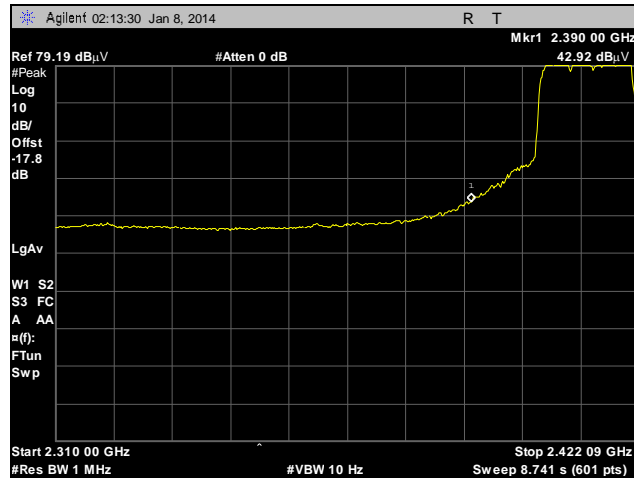
Plot 184. Radiated Restricted Band Edge, External Antenna, 802.11b, Low Channel, Peak



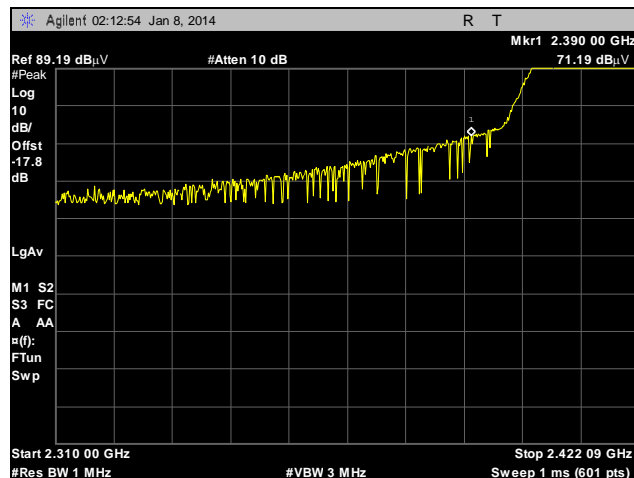
Plot 185. Radiated Restricted Band Edge, External Antenna, 802.11b, High Channel, Average



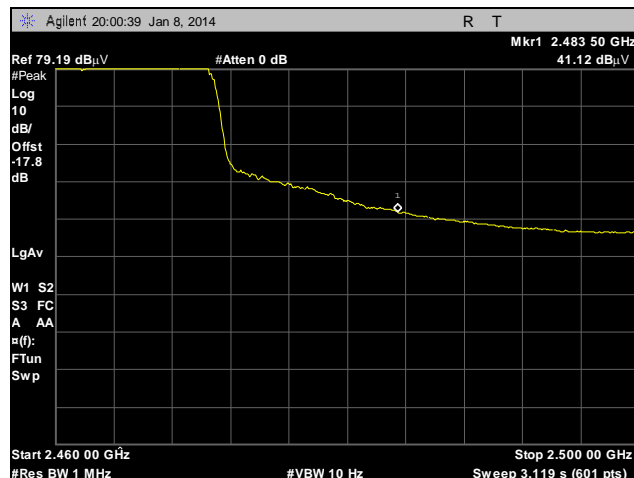
Plot 186. Radiated Restricted Band Edge, External Antenna, 802.11b, High Channel, Peak



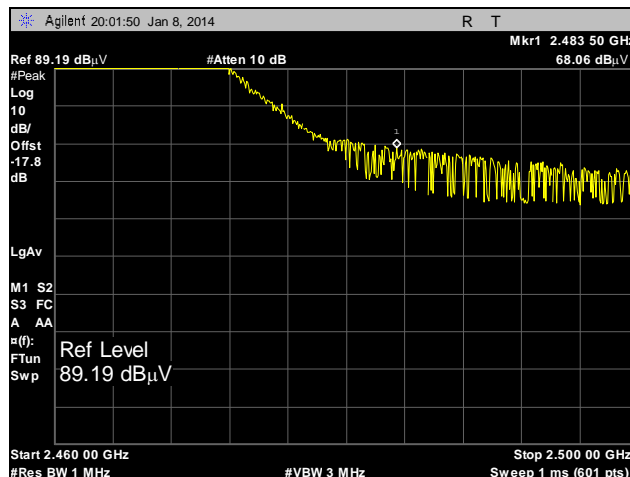
Plot 187. Radiated Restricted Band Edge, External Antenna, 802.11g, Low Channel, Average



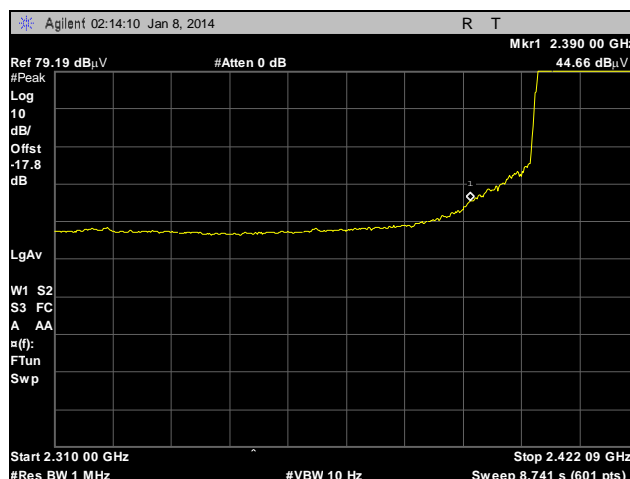
Plot 188. Radiated Restricted Band Edge, External Antenna, 802.11g, Low Channel, Peak



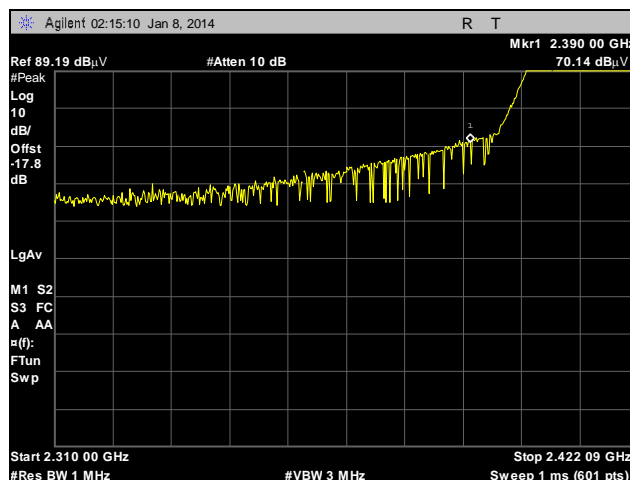
Plot 189. Radiated Restricted Band Edge, External Antenna, 802.11g, High Channel, Average



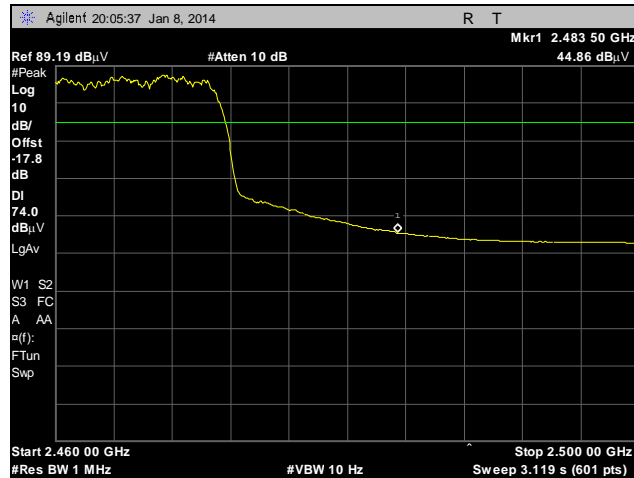
Plot 190. Radiated Restricted Band Edge, External Antenna, 802.11g, High Channel, Peak



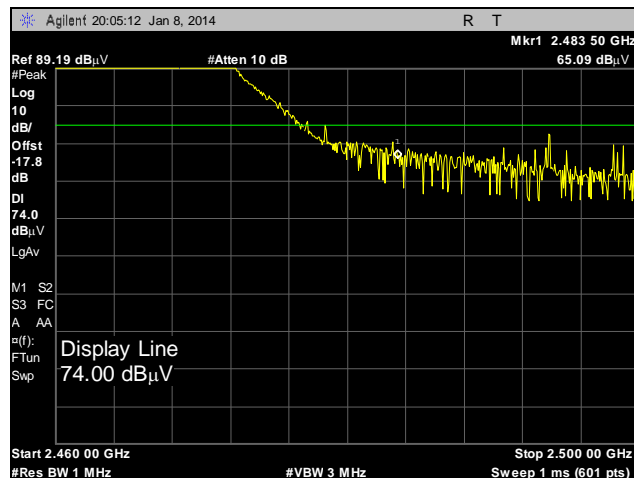
Plot 191. Radiated Restricted Band Edge, External Antenna, 802.11n 20 MHz, Low Channel, Average



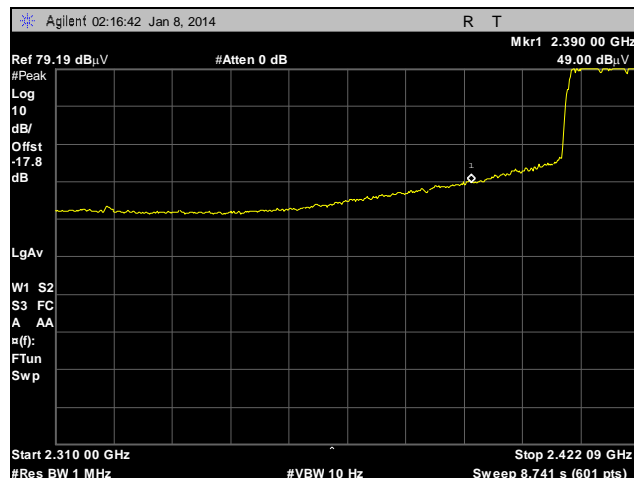
Plot 192. Radiated Restricted Band Edge, External Antenna, 802.11n 20 MHz, Low Channel, Peak



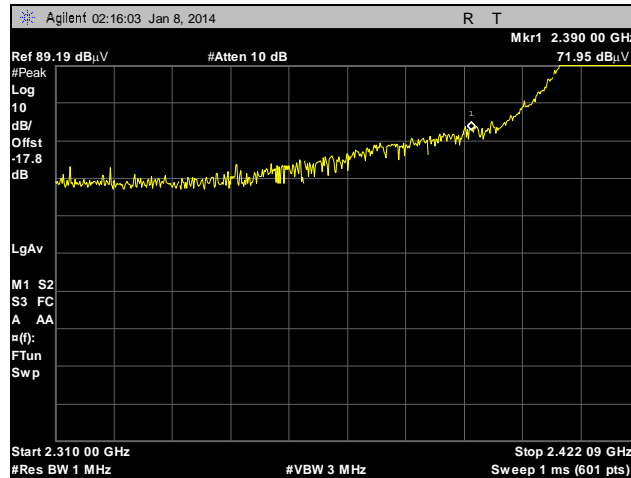
Plot 193. Radiated Restricted Band Edge, External Antenna, 802.11n 20 MHz, High Channel, Average



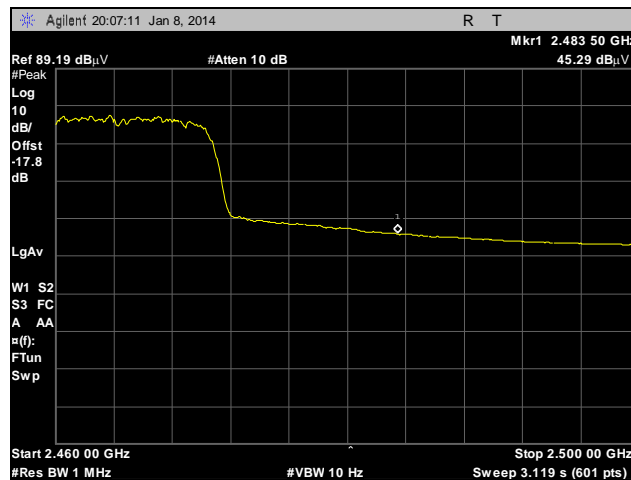
Plot 194. Radiated Restricted Band Edge, External Antenna, 802.11n 20 MHz, High Channel, Peak



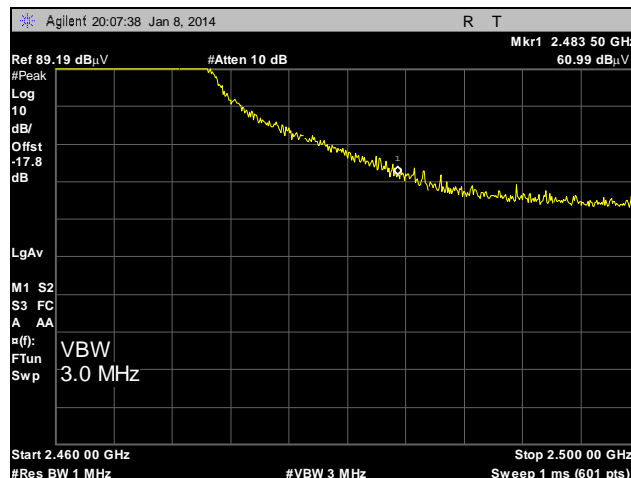
Plot 195. Radiated Restricted Band Edge, External Antenna, 802.11n 40 MHz, Low Channel, Average



**Plot 196. Radiated Restricted Band Edge, External Antenna, 802.11n 40 MHz, Low Channel, Peak**



**Plot 197. Radiated Restricted Band Edge, External Antenna, 802.11n 40 MHz, High Channel, Average**



**Plot 198. Radiated Restricted Band Edge, External Antenna, 802.11n 40 MHz, High Channel, Peak**



## 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
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	07/24/2012	07/24/2015
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	01/08/2013	07/08/2014
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	07/16/2012	07/16/2014
1T4818	COMB GENERATOR	COM-POWER	CGO-520	SEE NOTE	
1T4786	HYGROMETER / THERMOMETER / BAROMETER / DEW POINT PEN	CONTROL COMPANY	15-078-198, FB70423, 245CD	02/01/2012	02/01/2014
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	NOT REQUIRED	
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	07/30/2013	01/30/2015
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800- 30-10P	SEE NOTE	
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	08/06/2012	02/06/2014

**Table 29. 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.<sup>1</sup> *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.

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<sup>1</sup> 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.

## ICES-003 Procedural & Labeling Requirements

From the Industry Canada Electromagnetic Compatibility Advisory Bulletin entitled, "Implementation and Interpretation of the Interference-Causing Equipment Standard for Digital Apparatus, ICES-003" (EMCAB-3, Issue 2, July 1995):

"At present, CISPR 22: 2002 and ICES technical requirements are essentially equivalent. Therefore, if you have CISPR 22: 2002 approval by meeting CISPR Publication 22, the only additional requirements are: to attach a note to the report of the test results for compliance, indicating that these results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations; to maintain these records on file for the requisite five year period; and to provide the device with a notice of compliance in accordance with ICES-003."

### Procedural Requirements:

According to Industry Canada's Interference Causing Equipment Standard for Digital Apparatus ICES-003 Issue 5 August 2012:

- Section 6.1: A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for a period of at least five years from the date shown in the record and made available for examination on the request of the Minister.
- Section 6.2: A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other constraints it is not feasible to affix a label to the apparatus, the notice may be in the form of a statement in the users' manual.

### Labeling Requirements:

The suggested text for the notice, in English and in French, is provided below, from the Annex of ICES-003:

CAN ICES-3 (A)/NMB-3(A)

# End of Report