MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
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December 10, 2010

Ubiquiti Networks
91 E. Tasman
San Jose, CA 95134

Dear Robert Pera,

Enclosed is the EMC Wireless test report for compliance testing of the Ubiquiti Networks, UAP-LR as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-06 ed.), Part 15, Subpart B, ICES-003, Issue 4 February 2004 for a B Digital Device and FCC Part 15 Subpart C, RSS-210, Issue 7, June 2007 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.

Roseline Onyeagwu
Documentation Department

Reference: (\Ubiquiti Networks\EMCS82657-FCC247 Rev. 1)

Electromagnetic Compatibility Criteria
Test Report

for the

Ubiquiti Networks
UAP-LR

Tested under
the FCC Certification Rules
contained in
Title 47 of the CFR, Parts 15 Subpart B & ICES-003
for B Digital Devices
&
15.247 Subpart C & RSS-210, Issue 7, June 2007
for Intentional Radiators

MET Report: EMCS82657-FCC247 Rev. 1

December 10, 2010

Prepared For:

Ubiquiti Networks
91 E. Tasman
San Jose, CA 95134

Prepared By:
MET Laboratories, Inc.
3162 Belick St.
Santa Clara, CA 95054

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Minh Ly, Project Engineer
Electromagnetic Compatibility Lab

Roseline Onyeagwu
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules Parts 15B, 15.247 and Industry Canada standards ICES-003, Issue 4 February 2004, RSS-210, Issue 7, June 2007 under normal use and maintenance.

Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	November 30, 2010	Initial Issue.
1	December 10, 2010	Revised per engineer corrections.

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List of Terms and Abbreviations

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

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Ubiquiti Networks UAP-LR, 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 UAP-LR. Ubiquiti Networks should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the UAP-LR, 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 Ubiquiti Networks, purchase order number US100091. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference 47 CFR Part 15.247:2005	IC Reference RSS-210 Issue 7: 2007	Description	Compliance
47 CFR Part 15.107 (a)	ICES-003 Issue 4 February 2004	Conducted Emission Limits for a B Digital Device	Compliant
47 CFR Part 15.109 (a)	ICES-003 Issue 4 February 2004	Radiated Emission Limits for a B 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-210(7.2.2)	Conducted Emission Voltage	Compliant
Title 47 of the CFR, Part 15 §15.247(a)(1)	RSS-210(A8.1)	Occupied Bandwidth	Compliant
Title 47 of the CFR, Part 15 §15.247(b)	RSS-210(A8.4)	RF Output Power	Compliant
Title 47 of the CFR, Part 15 §15.209, §15.247(d)	RSS-210(A8.5)	Radiated Spurious Emissions	Compliant
Title 47 of the CFR, Part 15 §15.205	RSS-210(A8.5)	Emissions at Restricted Band	Compliant
Title 47 of the CFR, Part 15 §15.209, §15.247(d)	RSS-210(A8.5)	Conducted Spurious Emissions	Compliant
Title 47 of the CFR, Part 15; §15.247(e)	RSS-210(A8.3)	Power Spectral Density	Compliant
Title 47 of the CFR, Part 15 §15.247(i)	RSS-Gen(5.5)	Maximum Permissible Exposure	Compliant
N/A	RSS-Gen(4.8)	Receiver Spurious Emissions	Compliant

Table 1. Executive Summary of EMC Part 15.247 ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Ubiquiti Networks to perform testing on the UAP-LR, under Ubiquiti Networks's purchase order number US100091.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Ubiquiti Networks, UAP-LR.

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

Model(s) Tested:	UAP-LR	
Model(s) Covered:	UAP-LR	
EUT Specifications:	Primary Power: 110VAC – 240VAC	
	FCC ID: SWX-UAP IC: 6545A-UAP	
	Type of Modulations:	DSSS, OFDM
	Equipment Code:	DTS
	Peak Power:	29.68dBm
	EUT Frequency Ranges:	2412 MHz to 2462MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Minh Ly	
Report Date(s):	December 10, 2010	

Table 2. EUT Summary Table

B. References

CFR 47, Part 15, Subpart C	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
RSS-210, Issue 7, June 2007	Low-power Licence-exempt Radiocommunications Devices (All Frequency Bands): Category I Equipment
CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ICES-003, Issue 4 February 2004	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
ANSI C63.4:2003	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/NCSL Z540-1-1994	Calibration Laboratories and Measuring and Test Equipment - General Requirements
ANSI/ISO/IEC 17025:2000	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick St., Santa Clara, CA 95054. 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 10 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 Ubiquiti Networks UAP-LR, Equipment Under Test (EUT), is a high performance 802.11b/g/n radio with 20 and 40MHz bandwidths.

Photograph 1. Front View of EUT

Photograph 2. Rear View of EUT

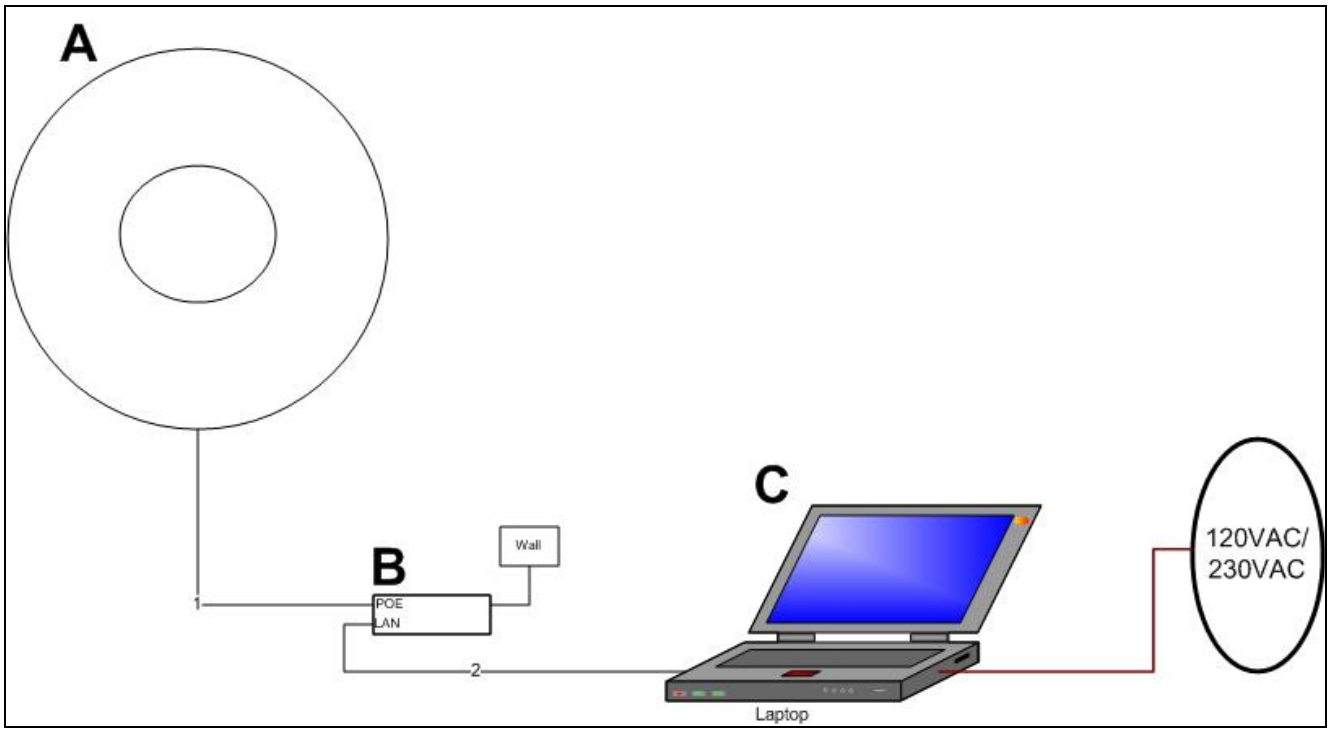


Figure 1. Block Diagram of Test Configuration

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
A	EUT	UAP-LR	Prototype	NA	NA
B	POE Adapter	UBI-POE-2405	NA	0912-0007220	NA

Table 4. Equipment Configuration

F. Support Equipment

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

Ref. ID	Name / Description	Manufacturer	Model Number
C	Laptop	Dell	Vostro

Table 5. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	POE	RJ45	1	1	Y	B
2	LAN	RJ45	1	2	Y	C

Table 6. Ports and Cabling Information

H. Mode of Operation

Using Atheros Radio Test Software.

I. Method of Monitoring EUT Operation

Ping Times out and doesn't return. Unit locks up requires power down is a fail.

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 Ubiquiti Networks 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.

15.207(a), Except as shown in paragraphs (b) and (c) of this section*, charging, AC adapters or battery eliminators 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 the Table 7, as measured using a 50 µH/50 ohms 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 frequencies ranges.

Frequency range (MHz)	Class A Conducted Limits (dBµV)		*Class B Conducted Limits (dBµV)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz. * -- Limits per Subsection 15.207(a).				

Table 7. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Subsections 15.107(a) (b) and 15.207(a)

Test Results: The EUT was compliant with the B requirement(s) of this section.

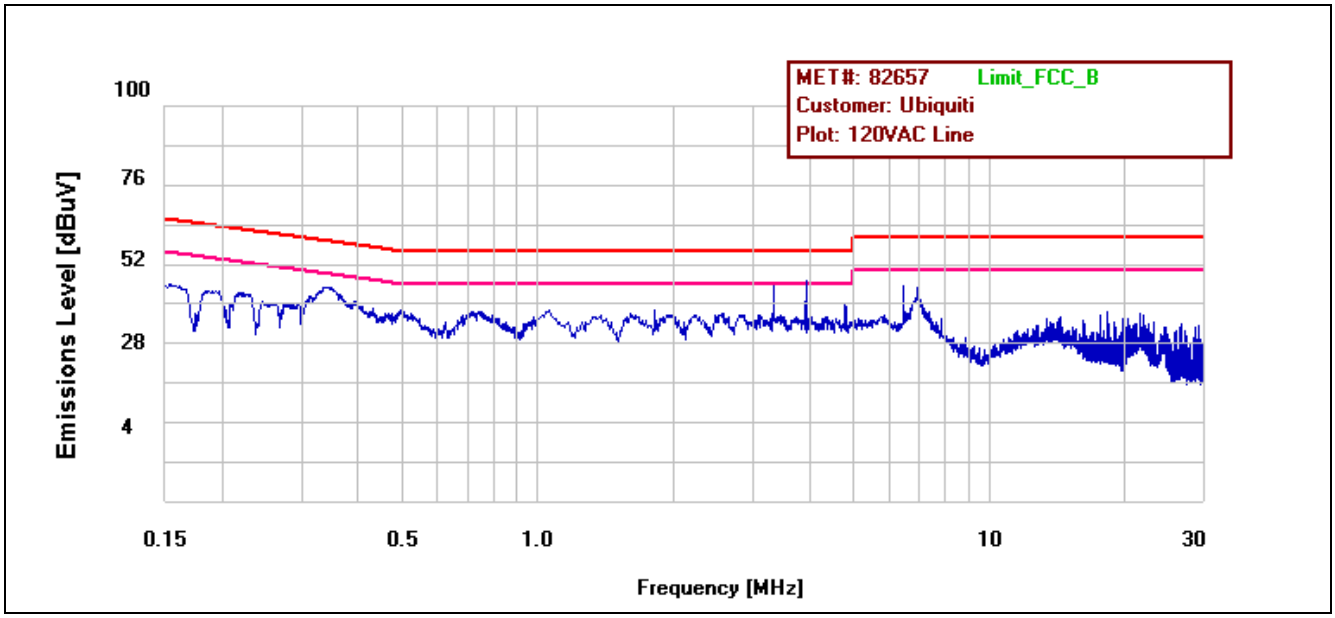
Test Engineer(s): Lionel Gabrillo

Test Date(s): 10/19/10

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

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120VAC Line	3.928	43.86	56	-12.14	Pass	22.08	46	-23.92	Pass
120VAC Line	3.322	37.94	56	-18.06	Pass	19.34	46	-26.66	Pass
120VAC Line	0.3425	41.45	59.161	-17.711	Pass	29.85	49.161	-19.311	Pass

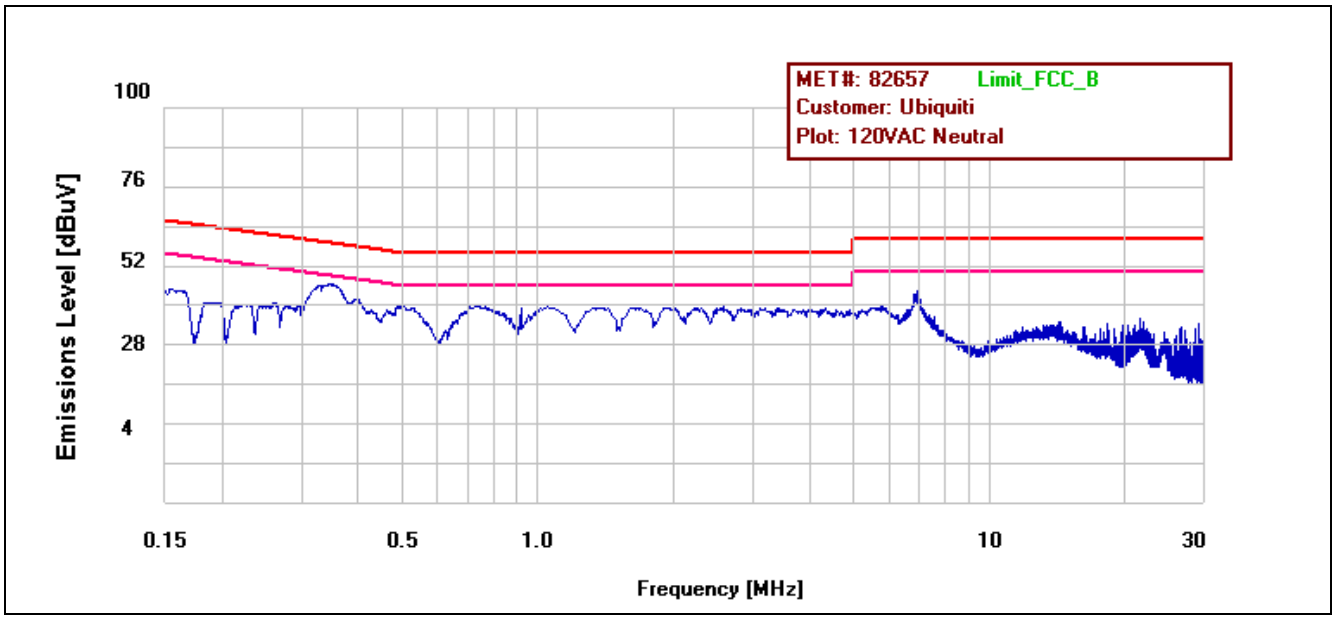
Table 8. Conducted Emissions - Voltage, AC Power, Phase Line (120 VAC)



Plot 1. Conducted Emissions, Phase Line Plot

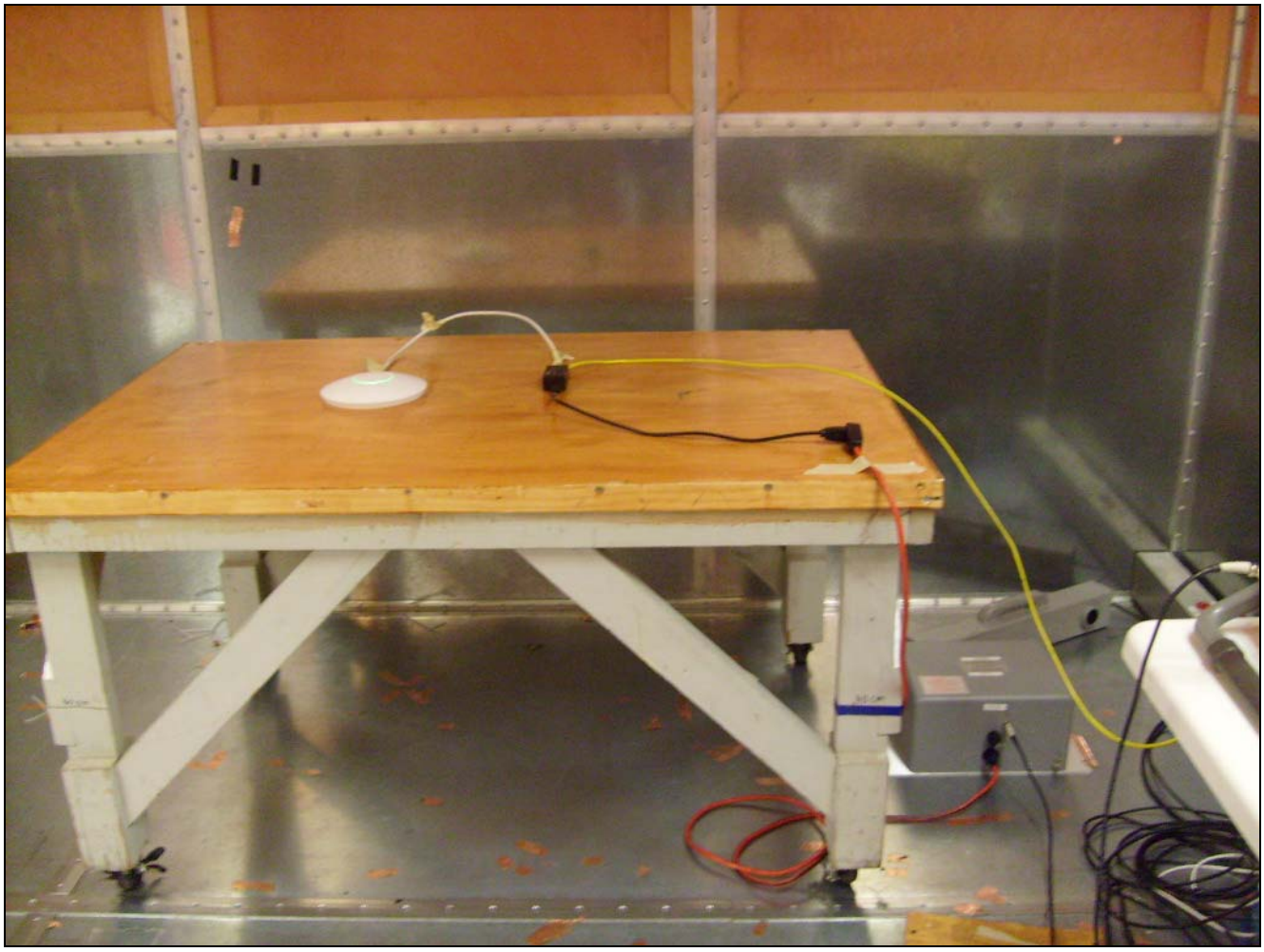
Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120VAC Neutral	0.3482	45.17	59.024	-13.854	Pass	37.81	49.024	-11.214	Pass
120VAC Neutral	1.046	37.77	56	-18.23	Pass	29.61	46	-16.39	Pass
120VAC Neutral	6.925	41.68	60	-18.32	Pass	37.21	50	-12.79	Pass

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



Plot 2. Conducted Emission, Neutral Line Plot

Conducted Emission Limits Test Setup



Photograph 3. Conducted Emissions, Test Setup

Radiated Emission Limits

§ 15.109 Radiated Emissions Limits

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

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

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

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

Test Procedures: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3m 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 B requirement(s) of this section.

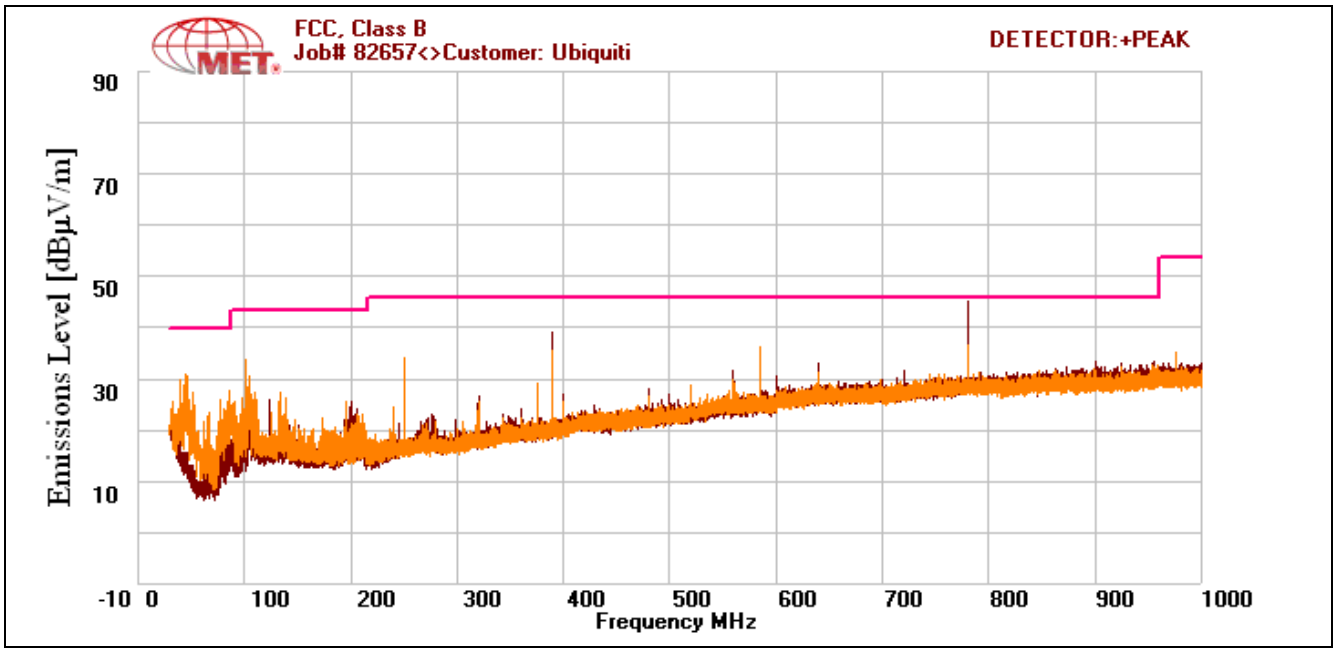
Test Engineer(s): Lionel Gabrillo

Test Date(s): 10/19/10

Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
45.24	V	89.0	100.0	18.46	9.404	0	1.684	0	29.548	40	-10.452
780	H	152.0	107.29	18.64	20.5	0	6.132	0	45.272	46	-0.728
780	V	228.0	100.0	10.02	20.2	0	6.132	0	36.352	46	-9.648
389.98	H	320.0	140.88	18.28	16.099	0	4.092	0	38.471	46	-7.529
389.98	V	122.0	136.64	16.62	15.7	0	4.092	0	36.412	46	-9.588
101.88	V	358.0	100.0	15.22	12.7	0	2.87	0	30.79	43.5	-12.71

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



Plot 3. Radiated Emissions, 30 MHz - 1 GHz, FCC Limits

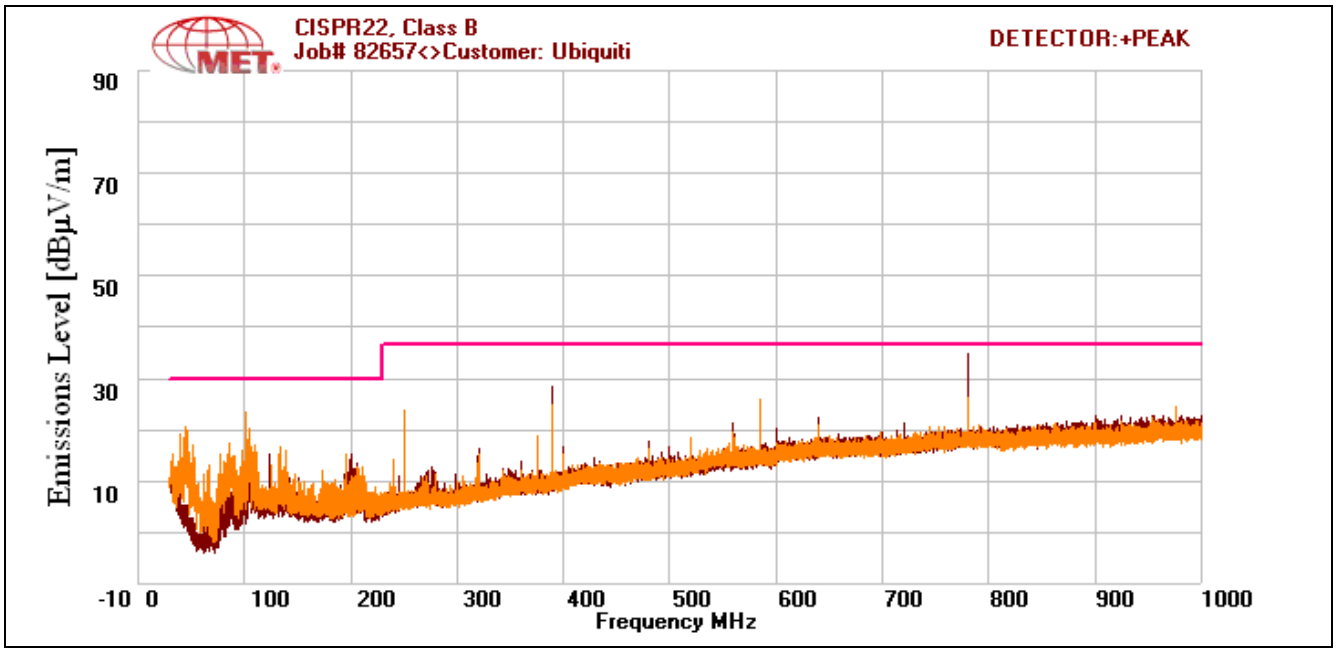
Radiated Emissions Limits Test Results, Class B

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
45.24	89.0	V	100.0	18.46	9.404	1.684	-10.46	19.088	30	-10.912
101.88	358.0	V	100.0	15.22	12.7	2.87	-10.46	20.33	30	-9.67
389.98	320.0	H	140.88	18.28	16.099	4.092	-10.46	28.011	37	-8.989
389.98	122.0	V	136.64	16.62	15.7	4.092	-10.46	25.952	37	-11.048
780*	152.0	H	107.29	18.64	20.5	6.132	-10.46	34.812	37	-2.188
780	228.0	V	100.0	10.02	20.2	6.132	-10.46	25.892	37	-11.108

Table 12. Radiated Emissions Limits, Test Results, ICES-003 Limits

Note 1: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, have at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

Note 2: The EUT was tested at 3 m.



Plot 4. Radiated Emissions, ICES-003 Limits

Radiated Emission Limits Test Setup

Photograph 4. Radiated Emission, Test Setup

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 with the criteria of §15.203 by virtue of criteria A.

Test Engineer(s): Minh Ly

Test Date(s): 09/28/10 & 09/29/10

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.207 Conducted Emissions Limits

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

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

Table 13. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

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

Test Results: The EUT was compliant with this requirement.

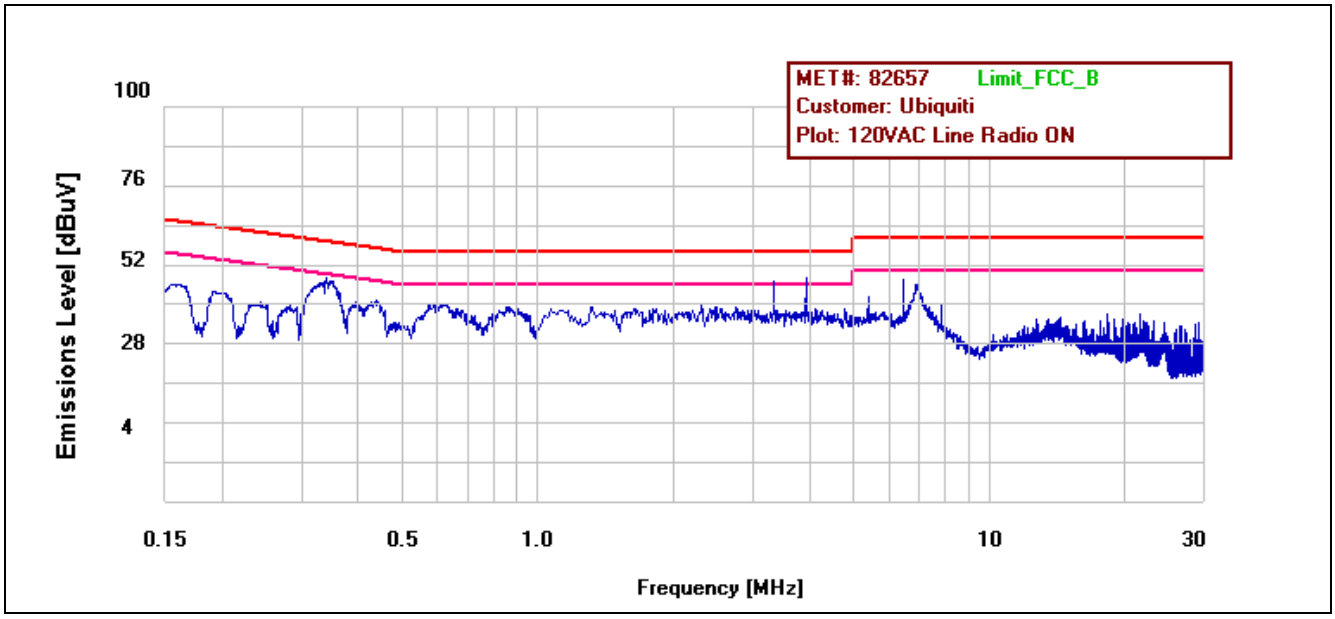
Test Engineer(s): Lionel Gabrillo

Test Date(s): 10/19/10

15.207 Conducted Emissions Test Results

Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120VAC Line Radio ON	0.3402	41.76	59.217	-17.457	Pass	23.88	49.217	-25.337	Pass
120VAC Line Radio ON	3.322	38.05	56	-17.95	Pass	22.7	46	-23.3	Pass
120VAC Line Radio ON	3.928	43.71	56	-12.29	Pass	24.15	46	-21.85	Pass

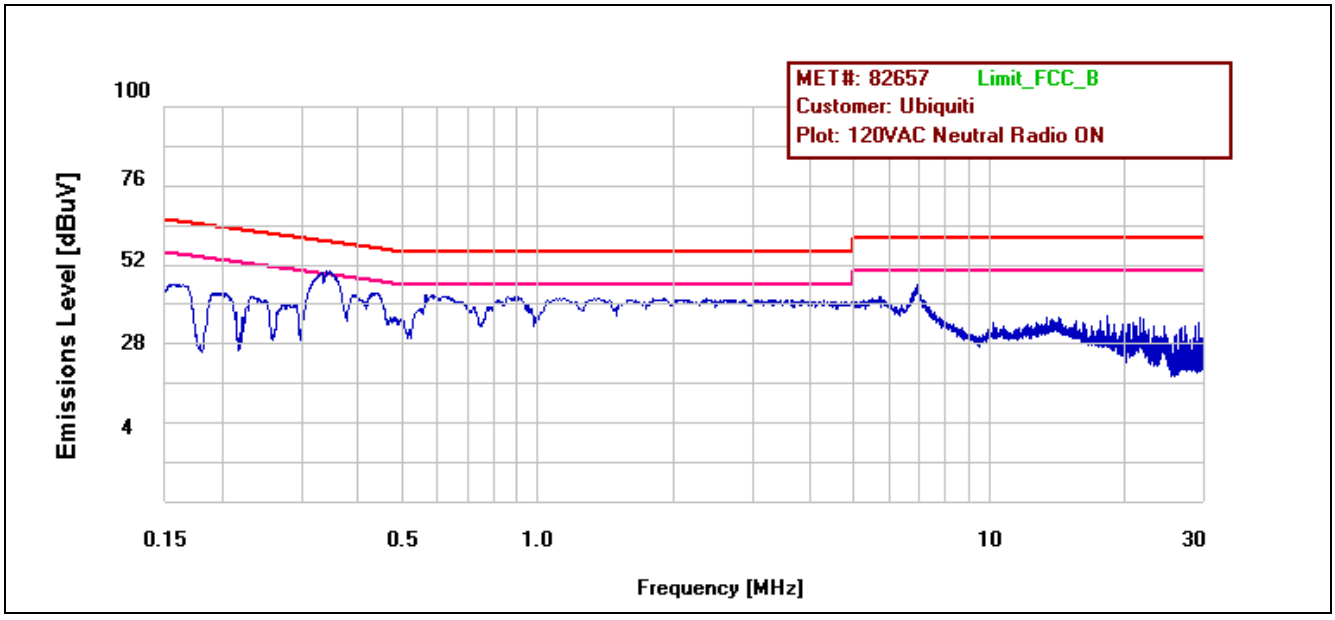
Table 14. Conducted Emissions, 15.207, Phase Line, Test Results



Plot 5. Conducted Emissions, Phase Line Plot

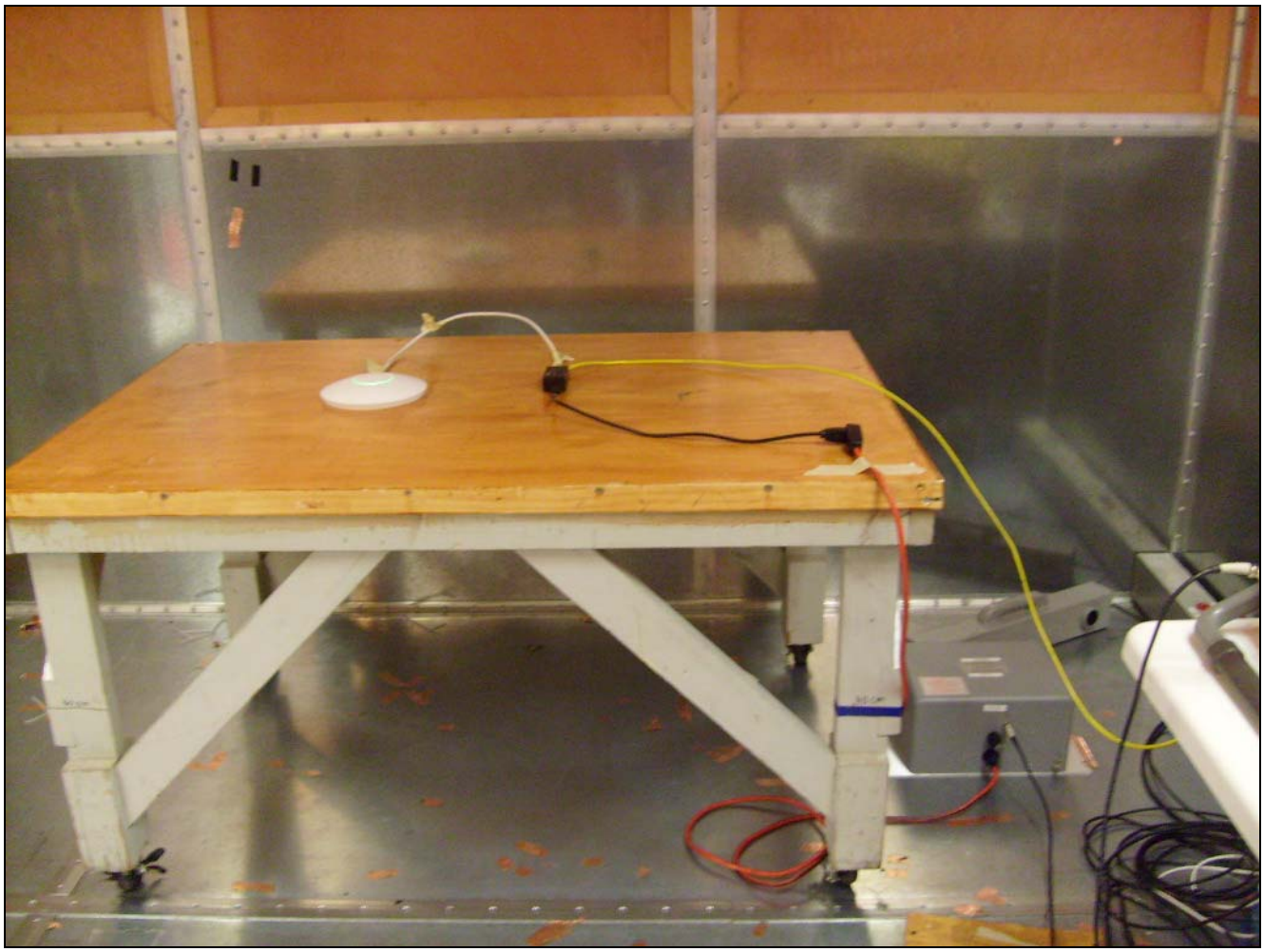
Line	Freq (MHz)	QP Amplitude	QP Limit	Delta	Pass	Average Amplitude	Average Limit	Delta	Pass
120VAC Neutral Radio ON	0.3408	46.49	59.202	-12.712	Pass	30.49	49.202	-18.712	Pass
120VAC Neutral Radio ON	0.578	39.92	56	-16.08	Pass	29.19	46	-16.81	Pass
120VAC Neutral Radio ON	6.925	42.89	60	-17.11	Pass	37.55	50	-12.45	Pass

Table 15. Conducted Emissions, 15.207, Neutral Line, Test Results



Plot 6. Conducted Emissions, Neutral Line Plot

15.207 Conducted Emissions Test Setup Photo



Photograph 5. Conducted Emissions, 15.207, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(a) 6 dB and 99% Bandwidth

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

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

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

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

The 6 dB and 99% Bandwidth was determined from the plots on the following pages.

Test Engineer(s): Minh Ly

Test Date(s): 09/28/10 to 10/20/10

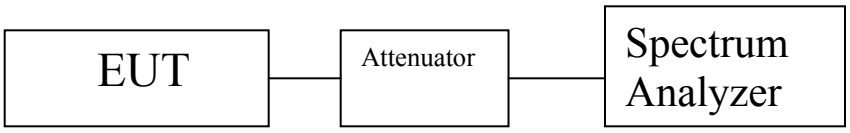


Figure 2. Block Diagram, Occupied Bandwidth Test Setup

Occupied Bandwidth Test Results

Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	2412	9.919	15.6797
Mid	2437	11.066	15.5615
High	2462	12.101	15.5969

Table 16. Occupied Bandwidth 802.11b Mode, Canada, Test Results

Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	2412	11.077	16.0095
Mid	2437	8.469	15.6011
High	2462	11.675	15.7565

Table 17. Occupied Bandwidth 802.11b Mode, FCC, Test Results

Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	2412	16.438	16.5033
Mid	2437	16.332	16.5135
High	2462	16.218	16.5711

Table 18. Occupied Bandwidth 802.11g Mode, Canada, Test Results

Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	2412	16.539	16.4660
Mid	2437	16.462	16.4025
High	2462	16.441	16.4521

Table 19. Occupied Bandwidth 802.11g Mode, FCC, Test Results

Occupied Bandwidth			
Carrier Channel	**Frequency (MHz)**	**Measured 6 dB Bandwidth (MHz)**	**Measured 99% Bandwidth (MHz)**
Low	2412	17.047	17.7290
Mid	2437	17.351	17.7502
High	2462	16.542	17.7016

Table 20. Occupied Bandwidth HT20 Mode, Canada, Test Results, Port 1

Occupied Bandwidth			
Carrier Channel	**Frequency (MHz)**	**Measured 6 dB Bandwidth (MHz)**	**Measured 99% Bandwidth (MHz)**
Low	2412	17.634	17.6452
Mid	2437	17.744	17.7074
High	2462	17.603	17.5553

Table 21. Occupied Bandwidth HT20 Mode, FCC, Test Results, Port 1

Occupied Bandwidth			
Carrier Channel	**Frequency (MHz)**	**Measured 6 dB Bandwidth (MHz)**	**Measured 99% Bandwidth (MHz)**
Low	2412	17.684	17.6699
Mid	2437	17.757	17.7977
High	2462	17.788	17.7790

Table 22. Occupied Bandwidth HT20 Mode, Canada, Test Results, Port 2

Occupied Bandwidth			
Carrier Channel	**Frequency (MHz)**	**Measured 6 dB Bandwidth (MHz)**	**Measured 99% Bandwidth (MHz)**
Low	2412	17.777	17.7158
Mid	2437	17.488	17.6414
High	2462	17.660	17.6999

Table 23. Occupied Bandwidth HT20 Mode, FCC, Test Results, Port 2

Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Mid	2437	35.448	36.3057

Table 24. Occupied Bandwidth HT40 Mode, Canada, Test Results, Port 1

Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Mid	2437	36.490	36.2360

Table 25. Occupied Bandwidth HT40 Mode, FCC, Test Results, Port 1

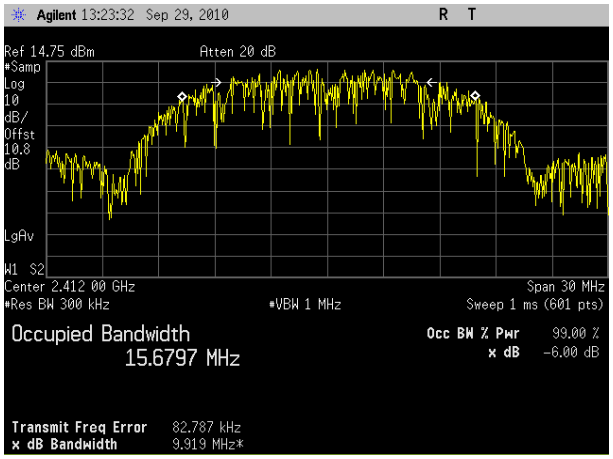
Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Mid	2437	35.167	36.5777

Table 26. Occupied Bandwidth HT40 Mode, Canada, Test Results, Port 2

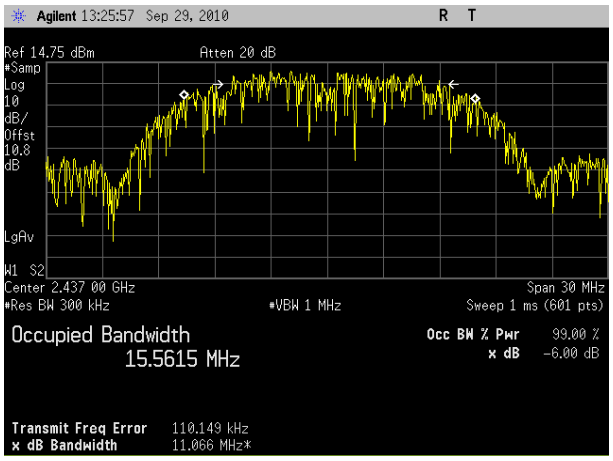
Occupied Bandwidth			
Carrier Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Mid	2437	36.450	36.2054

Table 27. Occupied Bandwidth HT40 Mode, FCC, Test Results, Port 2

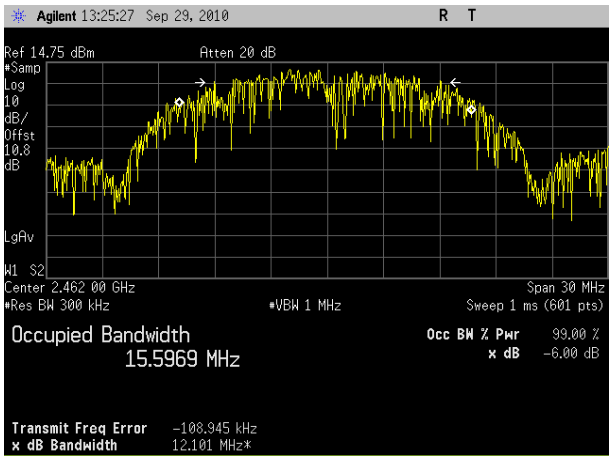
Occupied Bandwidth Test Results



Plot 7. Canada-Occupied Bandwidth, 802.11b, Port 1, Low Channel

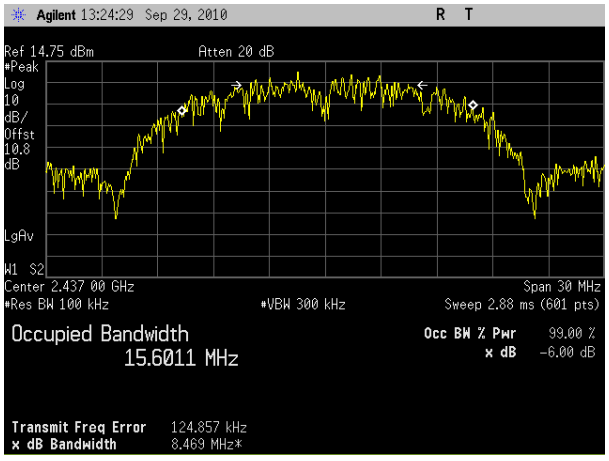


Plot 8. Canada-Occupied Bandwidth, 802.11b, Port 1, Mid Channel

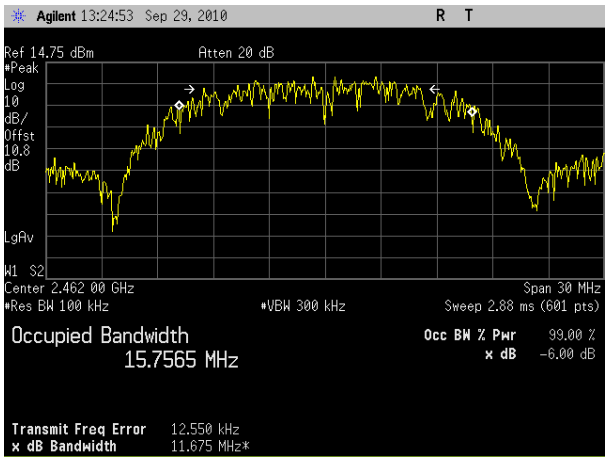


Plot 9. Canada-Occupied Bandwidth, 802.11b, Port 1, High Channel

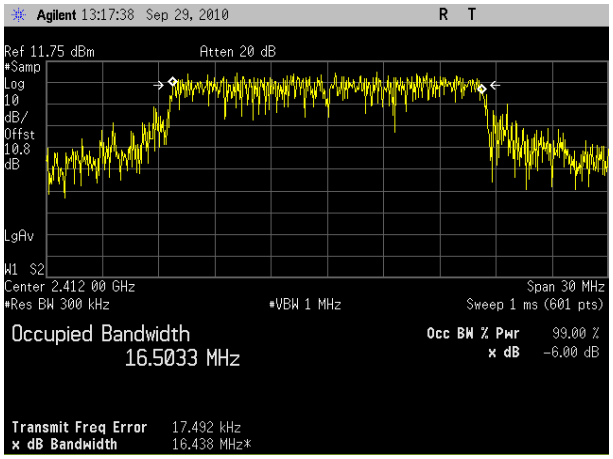
Plot 10. FCC-Occupied Bandwidth, 802.11b, Port 1, Low Channel



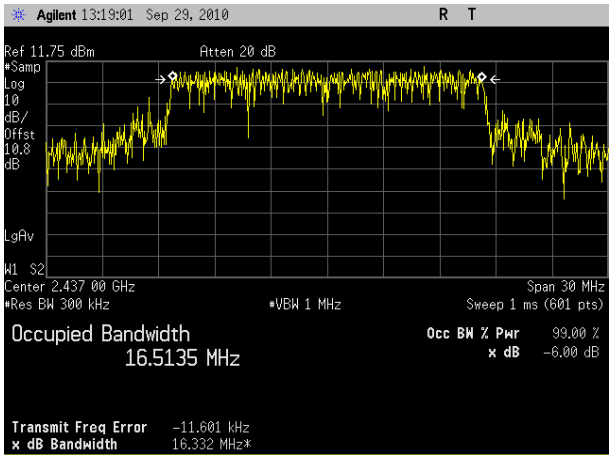
Plot 11. FCC-Occupied Bandwidth, 802.11b, Port 1, Mid Channel



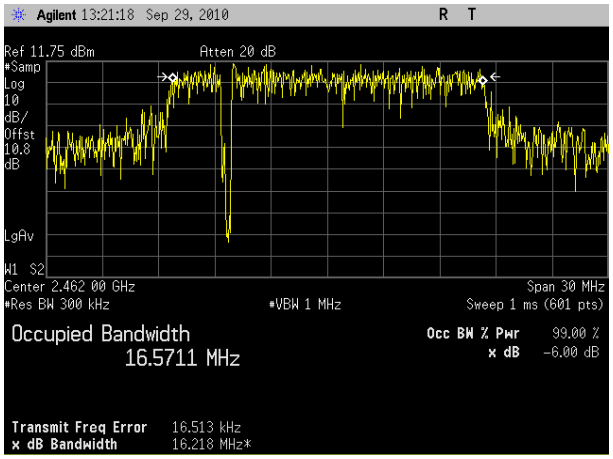
Plot 12. FCC-Occupied Bandwidth, 802.11b, Port 1, High Channel



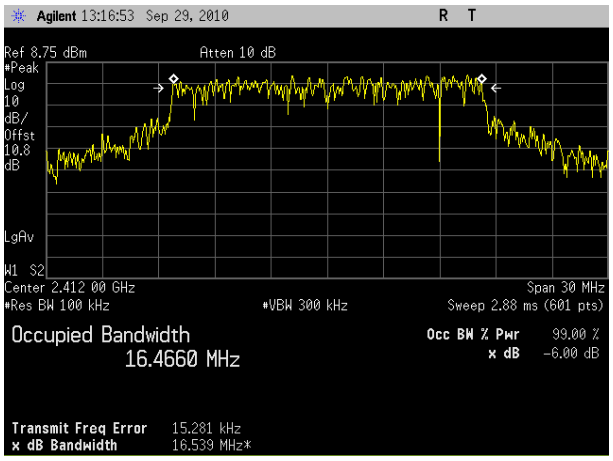
Plot 13. Canada-Occupied Bandwidth, 802.11g, Port 1, Low Channel



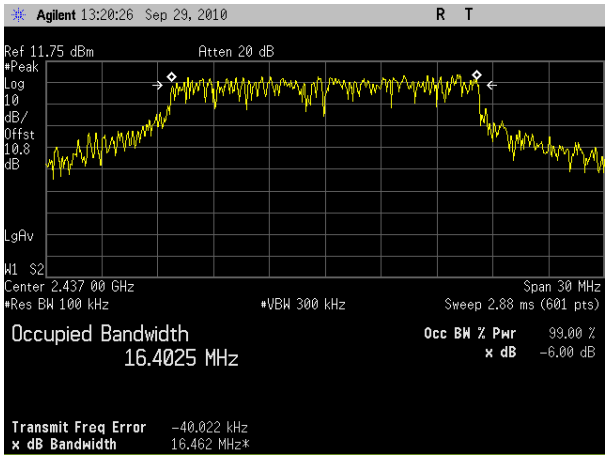
Plot 14. Canada-Occupied Bandwidth, 802.11g, Port 1, Mid Channel



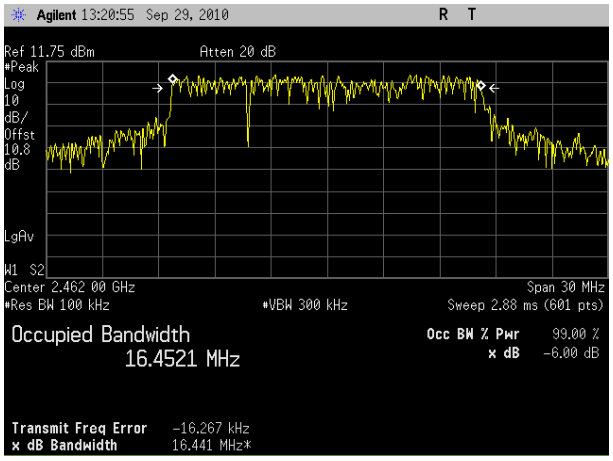
Plot 15. Canada-Occupied Bandwidth, 802.11g, Port 1, High Channel



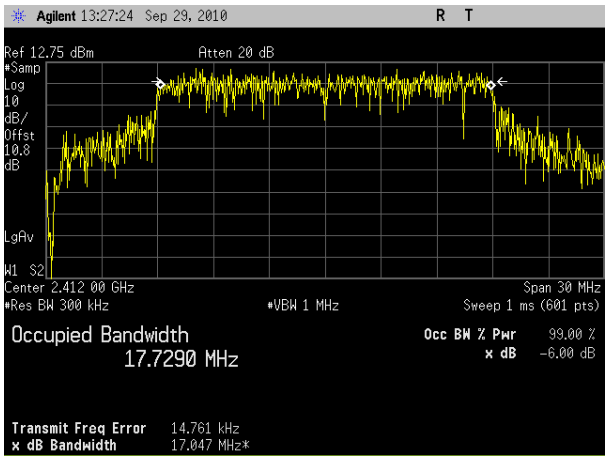
Plot 16. FCC-Occupied Bandwidth, 802.11g, Port 1, Low Channel



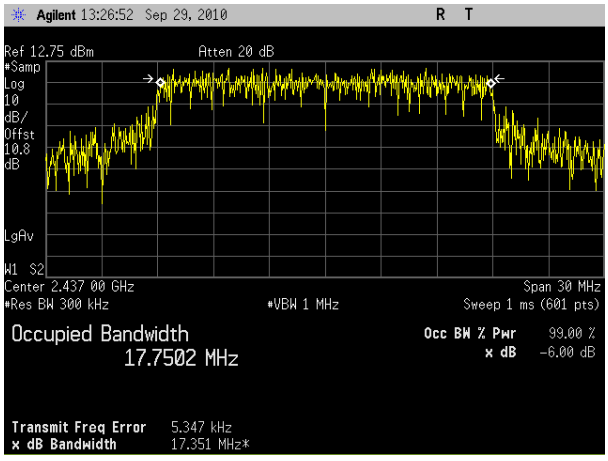
Plot 17. FCC-Occupied Bandwidth, 802.11g, Port 1, Mid Channel



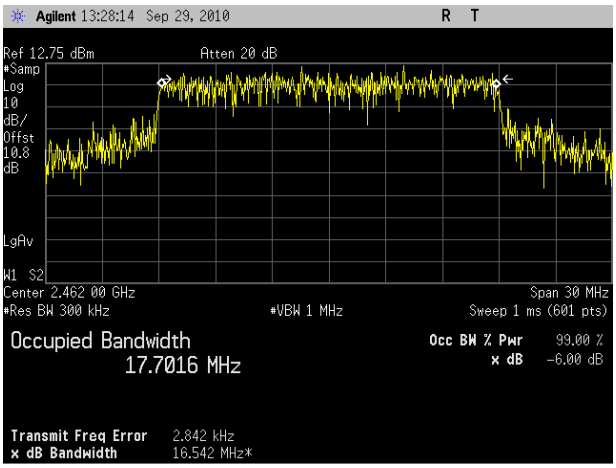
Plot 18. FCC-Occupied Bandwidth, 802.11g, Port 1, High Channel



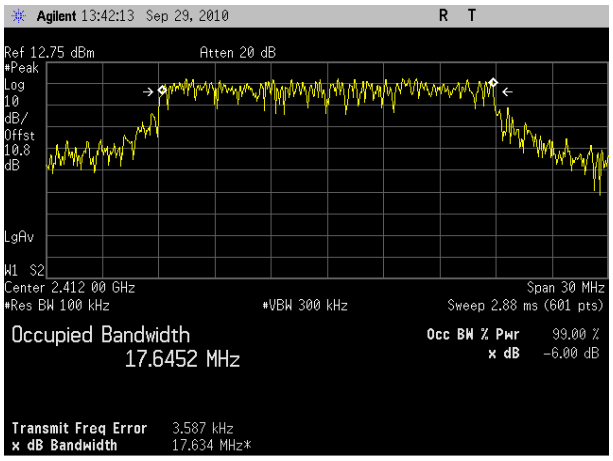
Plot 19. Canada-Occupied Bandwidth, HT20, 2412MHz, Port 1, Low Channel



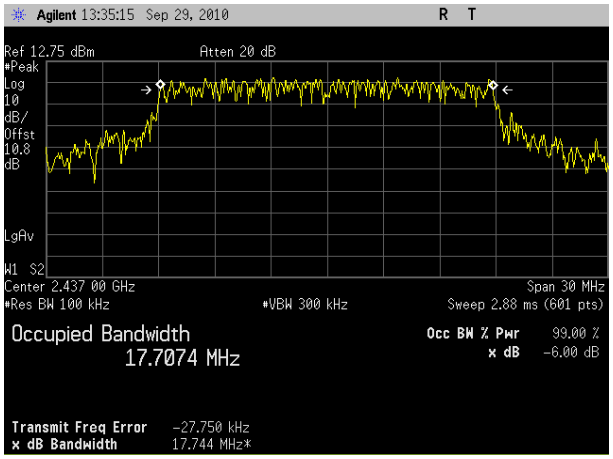
Plot 20. Canada-Occupied Bandwidth, HT20, Port 1, Mid Channel



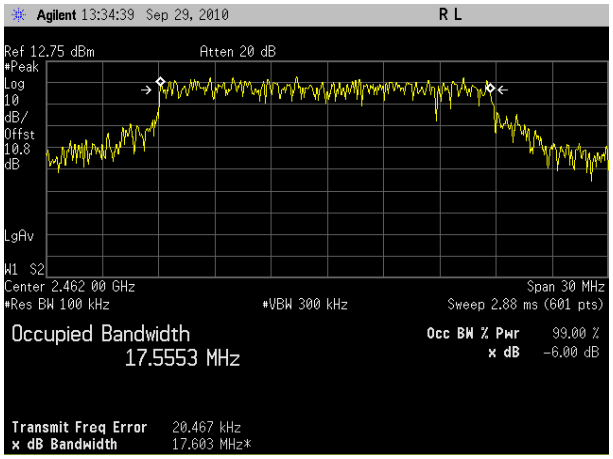
Plot 21. Canada-Occupied Bandwidth, HT20, Port 1, High Channel



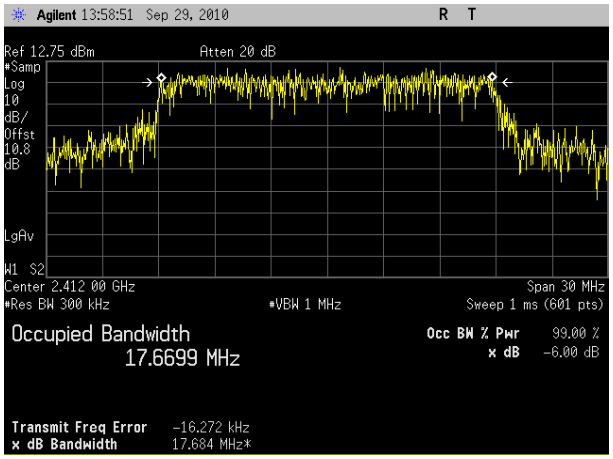
Plot 22. FCC-Occupied Bandwidth, HT20, Port 1, Low Channel



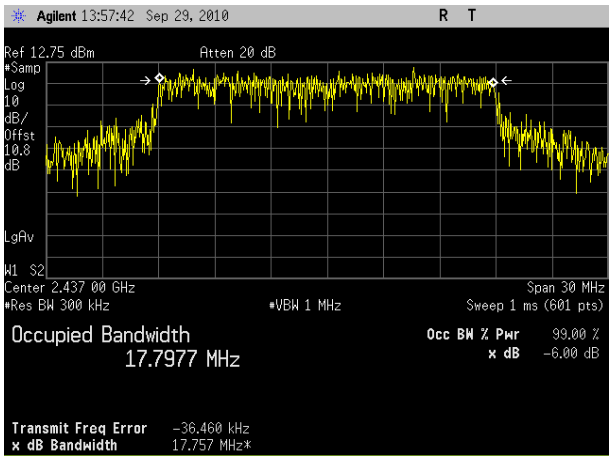
Plot 23. FCC-Occupied Bandwidth, HT20, Port 1, Mid Channel



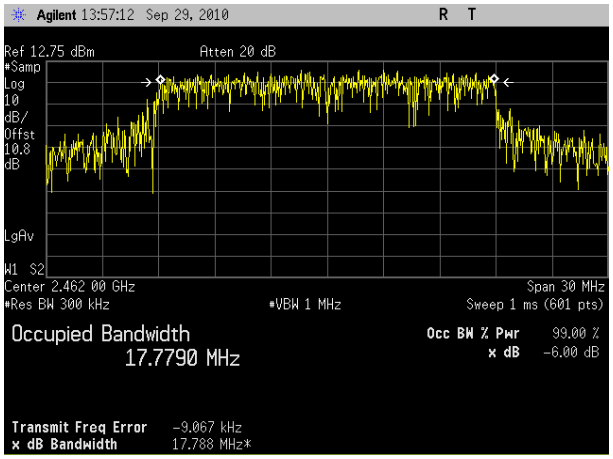
Plot 24. FCC-Occupied Bandwidth, HT20, Port 1, High Channel



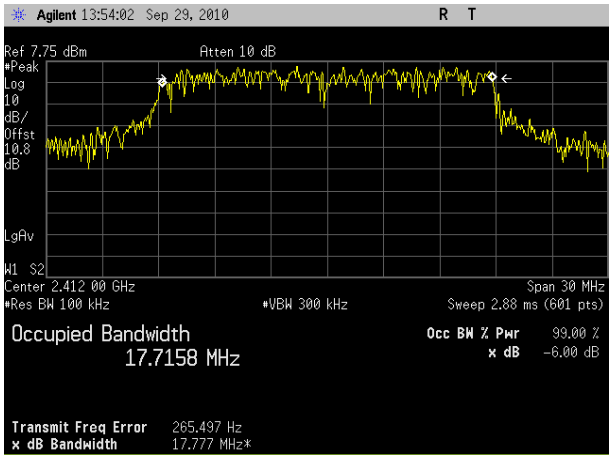
Plot 25. Canada-Occupied Bandwidth, HT20, Port 2, Low Channel



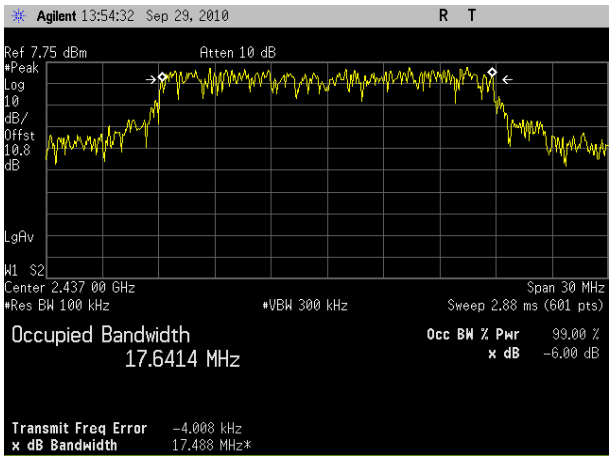
Plot 26. Canada-Occupied Bandwidth, HT20, Port 2, Mid Channel



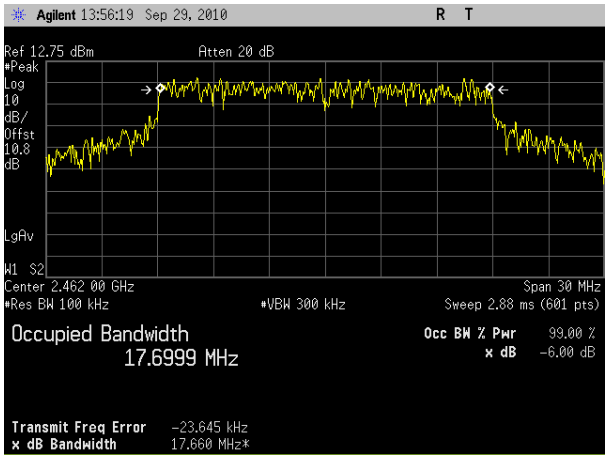
Plot 27. Canada-Occupied Bandwidth, HT20, Port 2, High Channel



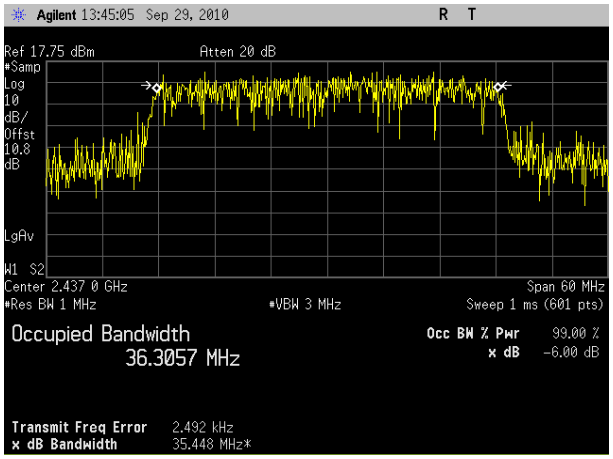
Plot 28. FCC-Occupied Bandwidth, HT20, Port 2, Low Channel



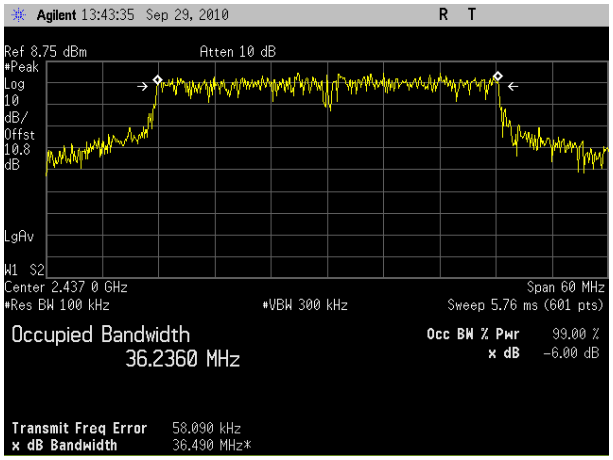
Plot 29. FCC-Occupied Bandwidth, HT20, Port 2, Mid Channel



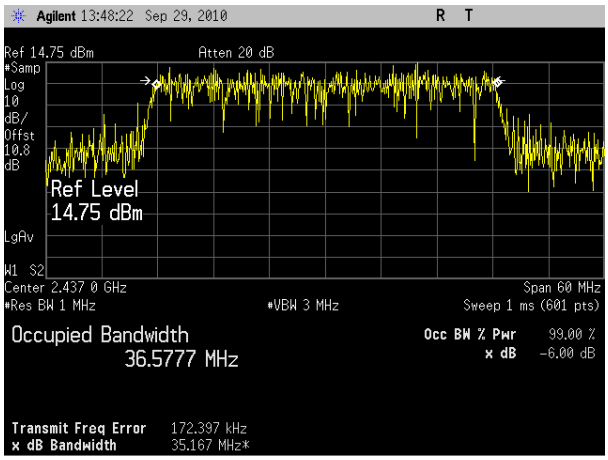
Plot 30. FCC-Occupied Bandwidth, HT20, Port 2, High Channel



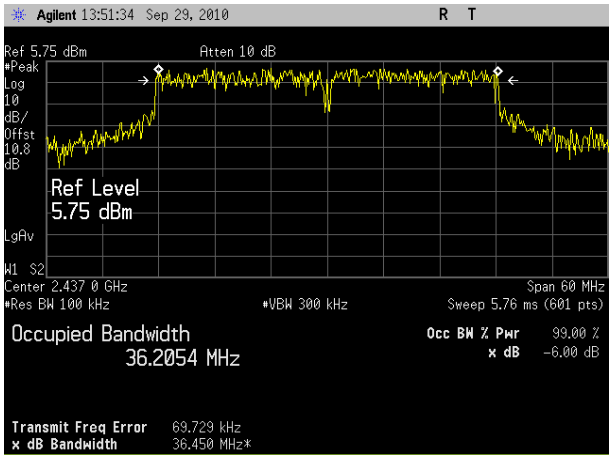
Plot 31. Canada-Occupied Bandwidth, HT40, 2437MHz, Port 1



Plot 32. FCC-Occupied Bandwidth, HT40, 2437MHz, Port 1



Plot 33. Canada-Occupied Bandwidth, HT40, 2437MHz, Port 2



Plot 34. FCC-Occupied Bandwidth, HT40, 2437MHz, Port 2

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) Peak Power Output and RF Exposure

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 28. Output Power Requirements from §15.247

§15.247(c): if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in the Table 28, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

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

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

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

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

Test Engineer(s): Lionel Gabrillo

Test Date(s): 10/12/10

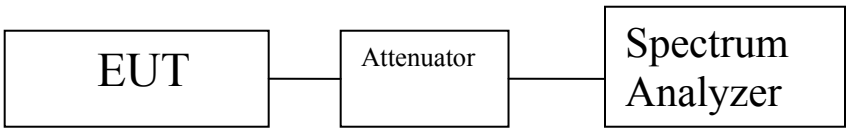


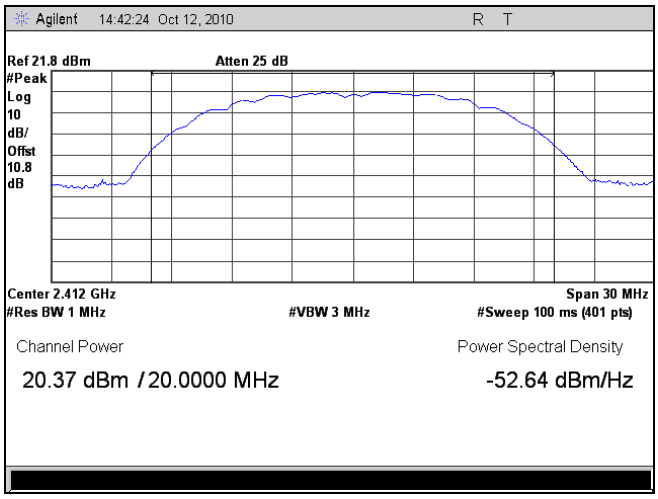
Figure 3. Peak Power Output Test Setup

RF Power Output Test Results

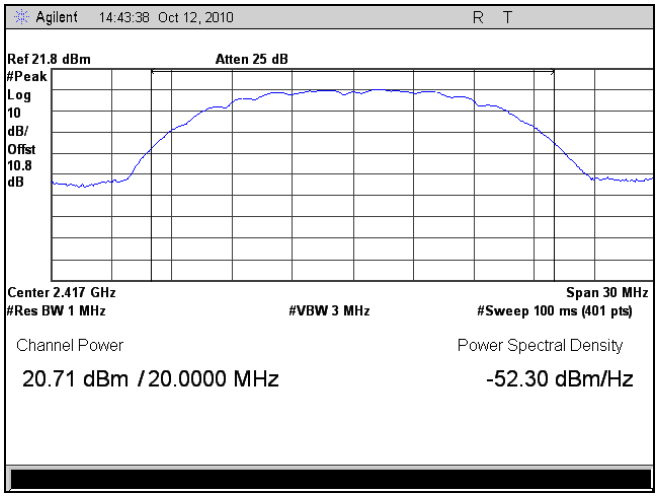
Peak Conducted Output Power, 2.4 GHz				
Mode/Antenna	**Carrier Channel**	**Frequency (MHz)**	**Measured Peak Output Power dBm**	**Measured Peak Output Power (W)**
802.11b	Low	2412	20.37	0.109
	Mid	2437	20.39	0.109
	High	2462	19.86	0.097
802.11g	Low	2412	27.58	0.574
	Mid	2437	29.36	0.865
	High	2462	28.18	0.659

Peak Conducted Output Power, 2.4 GHz					
Mode/Antenna	**Frequency (MHz)**	**Port J5 (dBm)**	**Port J6 (dBm)**	**Total (dBm)**	**Total (W)**
802.11n 20MHz	2412	26.42	26.73	29.58	0.911
	2437	26.65	26.69	29.68	0.93
	2462	25.20	25.48	28.35	0.68
802.11n 40MHz	2437	26.56	25.72	29.17	0.83

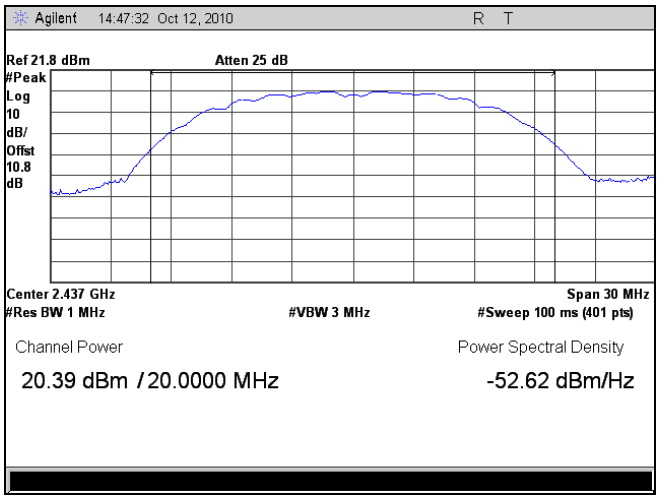
Table 29. RF Output Power Test Results



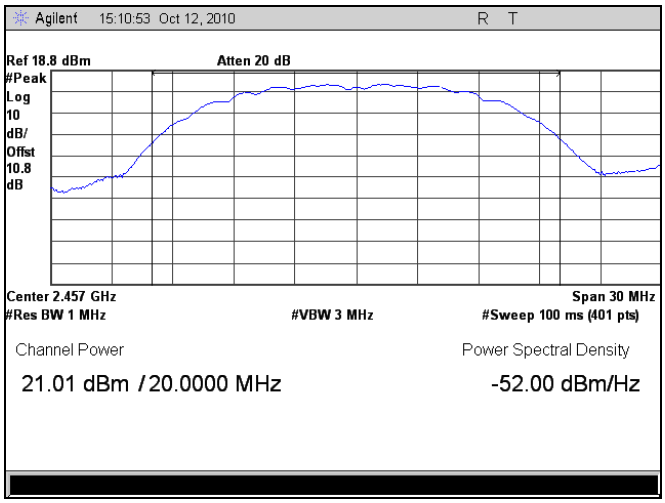
Plot 35. Conducted Power, 802.11b, 2412MHz



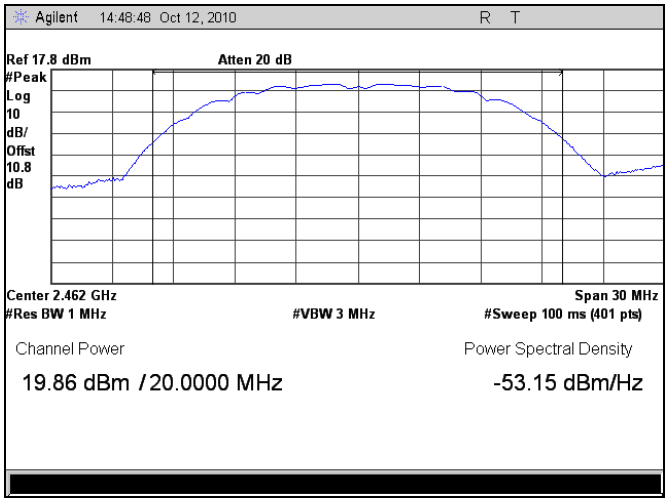
Plot 36. Conducted Power, 802.11b, 2417MHz



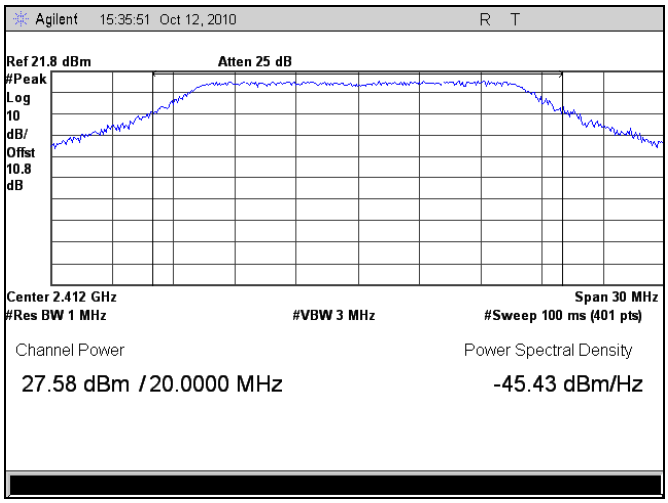
Plot 37. Conducted Power, 802.11b, 2437MHz



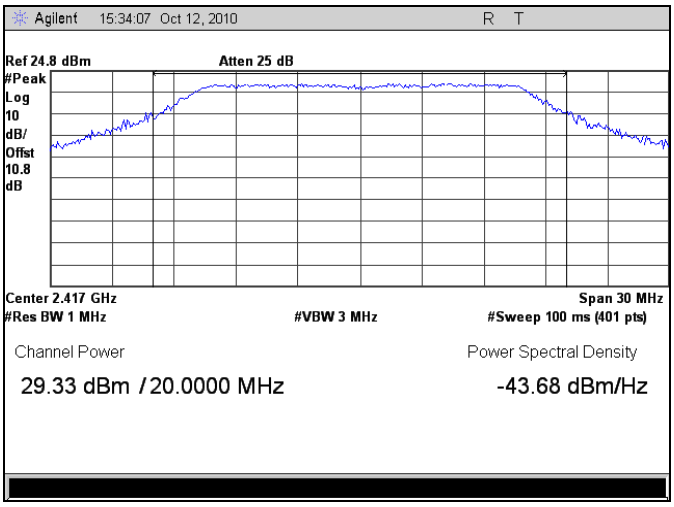
Plot 38. Conducted Power, 802.11b, 2457MHz



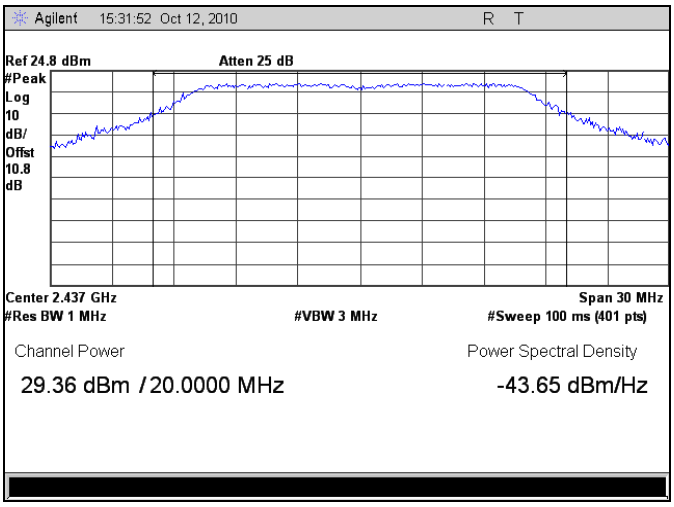
Plot 39. Conducted Power, 802.11b, 2462MHz



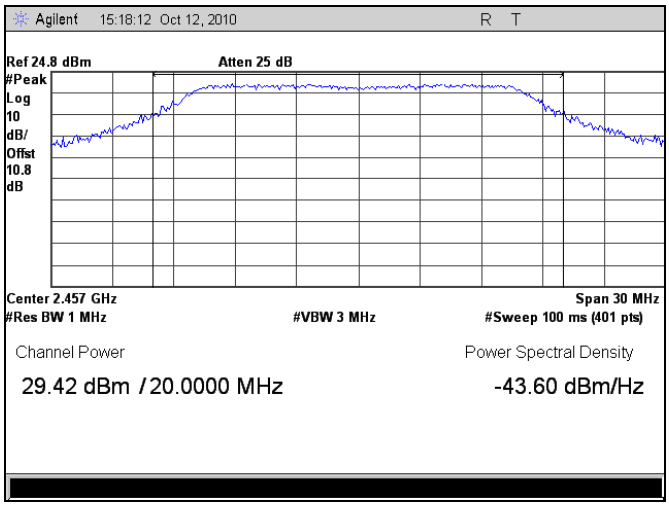
Plot 40. Conducted Power, 802.11g, 2412MHz



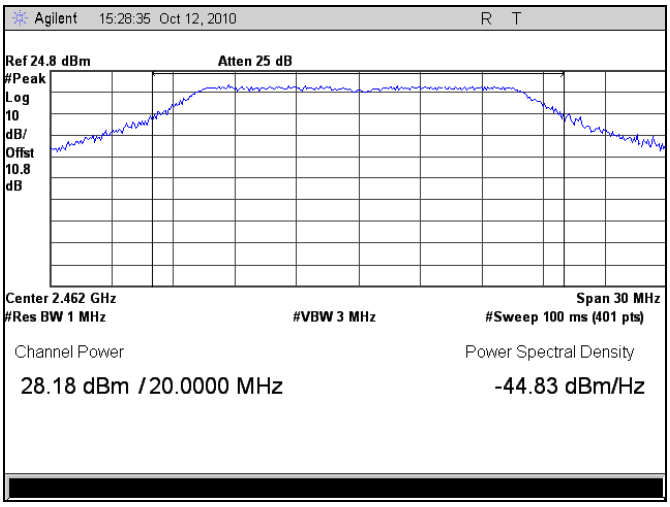
Plot 41. Conducted Power, 802.11g, 2417MHz



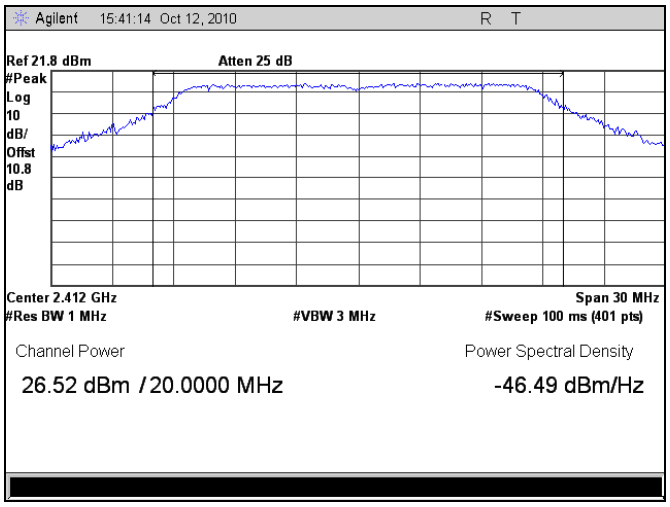
Plot 42. Conducted Power, 802.11g, 2437MHz



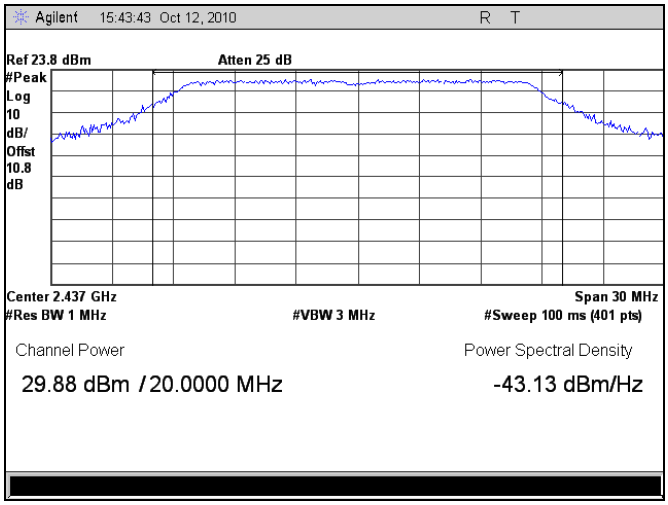
Plot 43. Conducted Power, 802.11g, 2457MHz



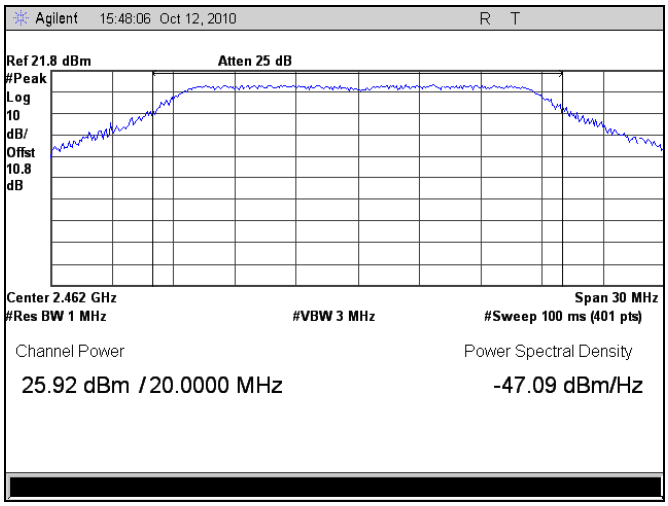
Plot 44. Conducted Power, 802.11g, 2462MHz



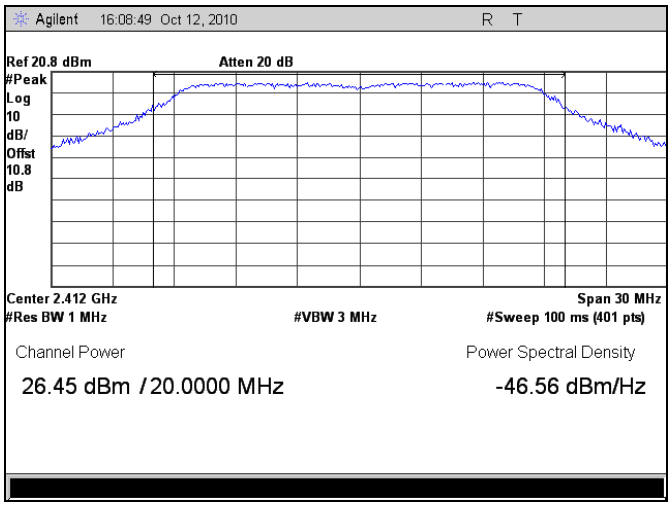
Plot 45. Conducted Power, HT20 J5, 2412MHz



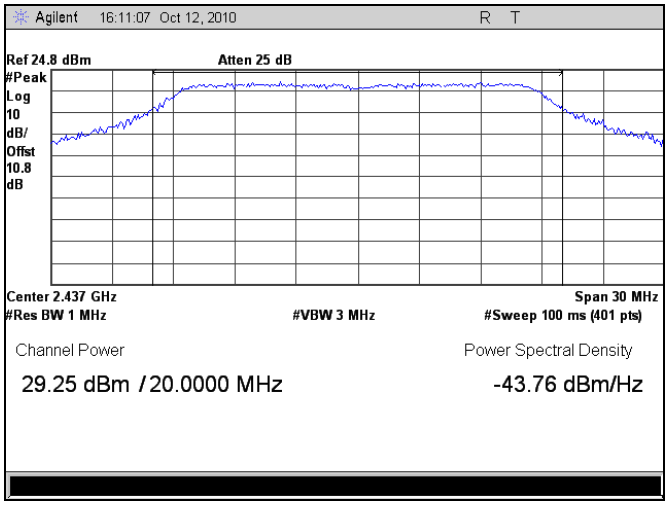
Plot 46. Conducted Power, HT20 J5, 2437MHz



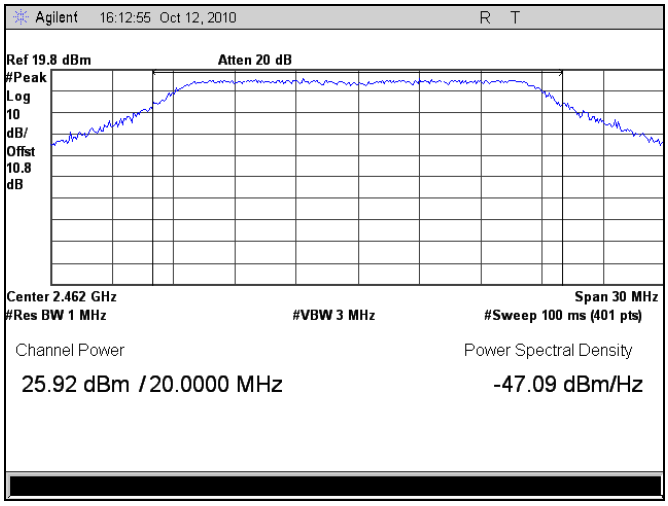
Plot 47. Conducted Power, HT20 J5, 2462MHz



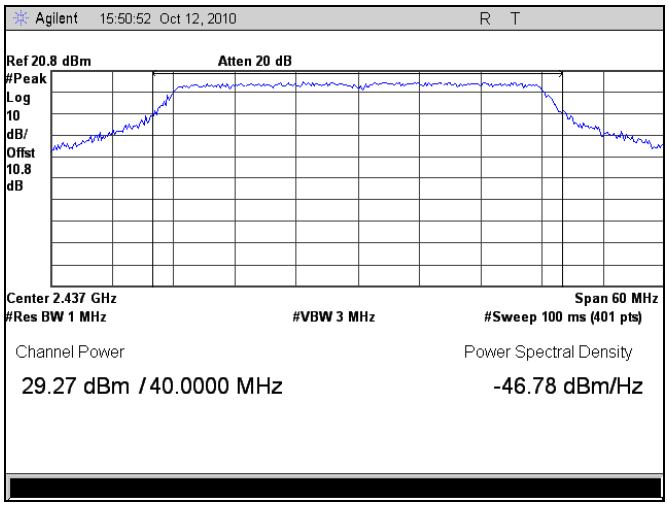
Plot 48. Conducted Power, HT20 J6, 2412MHz



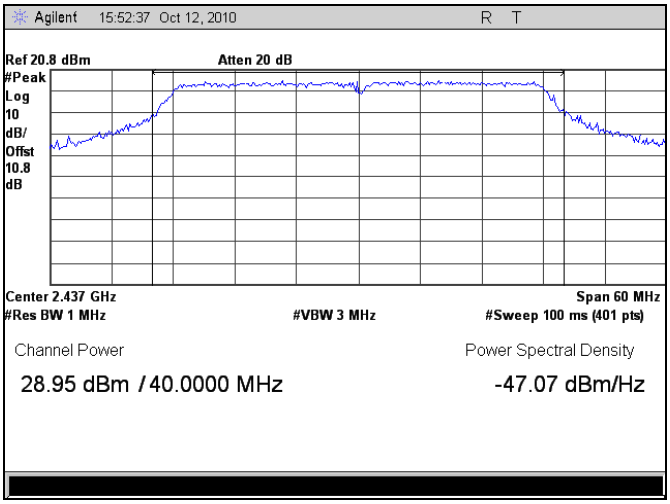
Plot 49. Conducted Power, HT20 J6, 2437MHz



Plot 50. Conducted Power, HT20 J6, 2462MHz



Plot 51. Conducted Power, HT40 J5, 2437MHz



Plot 52. Conducted Power, HT40 J6, 2437MHz

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(b) RF Exposure

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

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

MPE Limit Calculation: EUT's operating frequencies @ 2412 - 2462 MHz; highest conducted power = *29.68dBm* (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = 4 *dBi.*

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

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

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (928.966mW)
G = Antenna Gain (2.51 numeric)

$S = (928.96*2.51/ 4*3.14*20.0^2) = (2333.46 / 5024) =$ **0.46 mW/cm^2** @ 20cm separation

Electromagnetic Compatibility Criteria for Intentional Radiators

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

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

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

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

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

Table 30. Restricted Bands of Operation

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

Test Requirement(s): **§ 15.209 (a):** Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 31.

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

Table 31. 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)**.

Test Engineer(s): Lionel Gabrillo

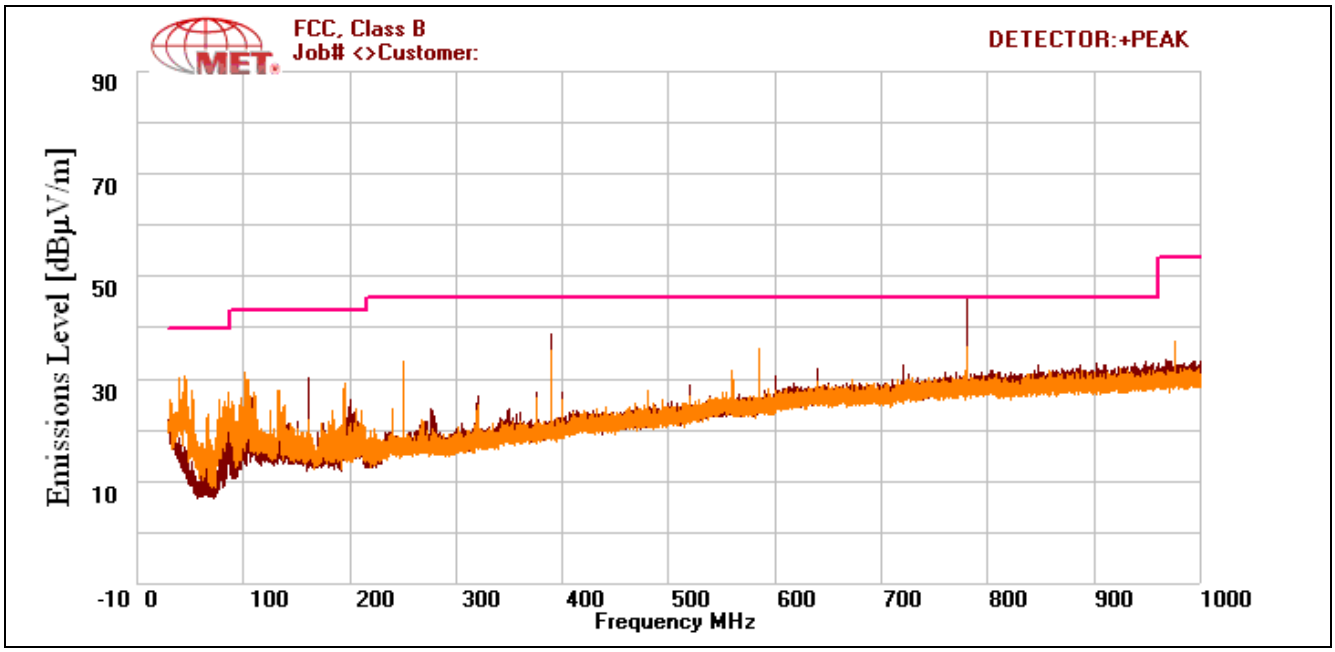
Test Date(s): 10/14/10

Harmonic Emissions Requirements – Radiated

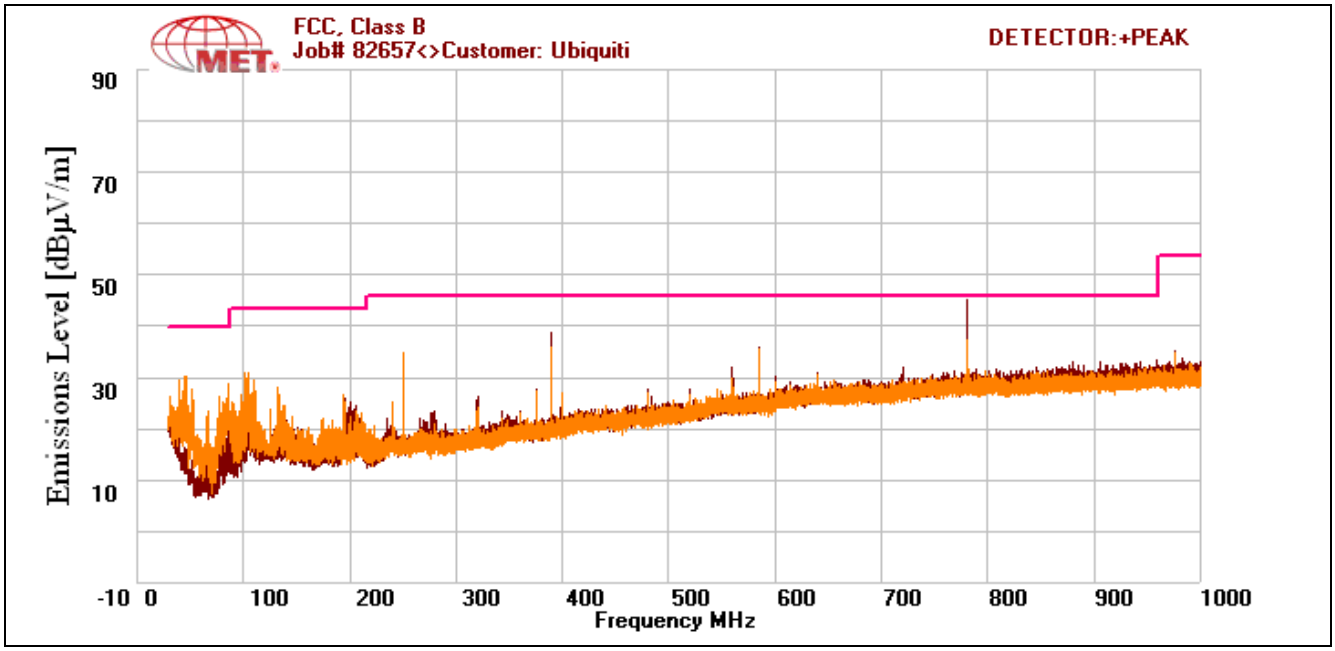
Low Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.824	H	50.77	34.66	33.94	5.06	55.12	Peak	74	-18.88
4.824	H	48.07	34.66	33.94	5.06	52.42	Avg	54	-1.58
7.236	H	40.43	35.03	35.62	6.26	47.28	Peak	74	-26.72
7.236	H	30.41	35.03	35.62	6.26	37.26	Avg	54	-16.74
9.648	H	42.12	35.34	36.62	7.29	50.68	Peak	74	-23.32
9.648	H	31.53	35.34	36.62	7.29	40.09	Avg	54	-13.91
Mid Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.874	H	51.67	34.72	33.93	5.06	55.94	Peak	74	-18.06
4.874	H	49.65	34.72	33.93	5.06	53.92	Avg	54	-0.08
7.311	H	42.05	35.11	35.64	6.33	48.90	Peak	74	-25.10
7.311	H	30.66	35.11	35.64	6.33	37.51	Avg	54	-16.49
9.748	H	41.29	35.47	36.75	7.42	49.99	Peak	74	-24.01
9.748	H	31.36	35.47	36.75	7.42	40.06	Avg	54	-13.94
High Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.924	H	47.94	34.78	33.93	5.06	52.15	Peak	74	-21.85
4.924	H	49.15	34.78	33.93	5.06	53.36	Avg	54	-0.64
7.386	H	42.01	35.25	35.65	6.38	48.79	Peak	74	-25.21
7.386	H	32.03	35.25	35.65	6.38	38.81	Avg	54	-15.19
9.848	H	40.02	35.51	36.89	7.54	48.94	Peak	74	-25.06
9.848	H	31.24	35.51	36.89	7.54	40.16	Avg	54	-13.84

Table 32. Radiated Harmonic Emissions, 802.11b

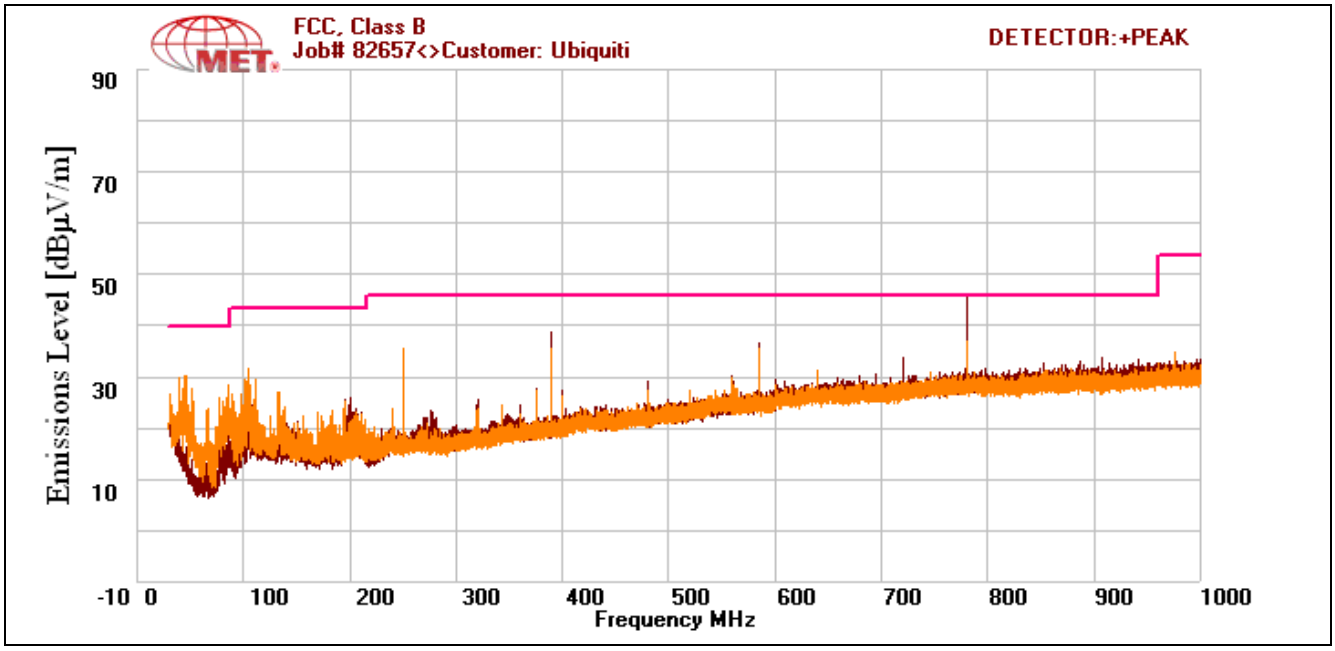
Note: All other emissions were measured at the noise floor of the spectrum analyzer.



Plot 53. Radiated Emissions 802.11b Mode, 2412 MHz, Low Channel

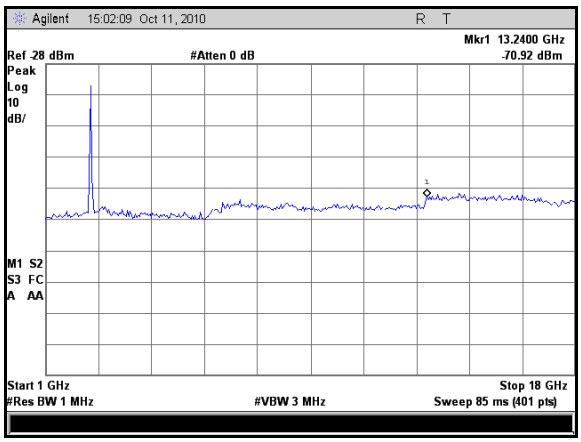


Plot 54. Radiated Emissions 802.11b Mode, 2437 MHz, Mid Channel

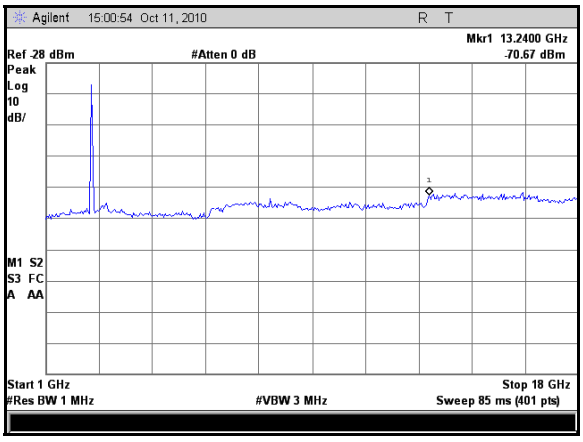


Plot 55. Radiated Emissions 802.11b Mode, 2462 MHz, High Channel

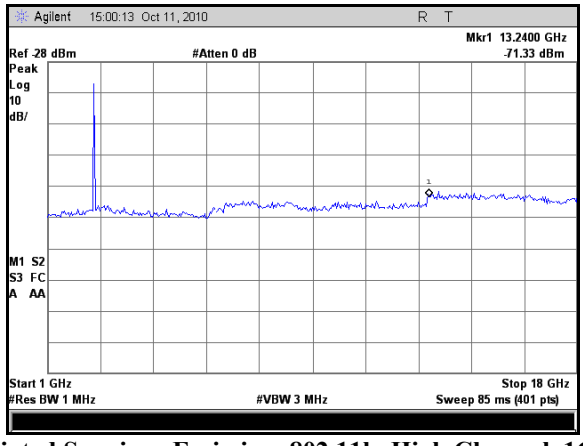
Radiated Spurious Emissions Test Results



Plot 56. Radiated Spurious Emission, 802.11b, Low Channel, 1GHz - 18GHz



Plot 57. Radiated Spurious Emission, 802.11b, Mid Channel, 1GHz - 18GHz

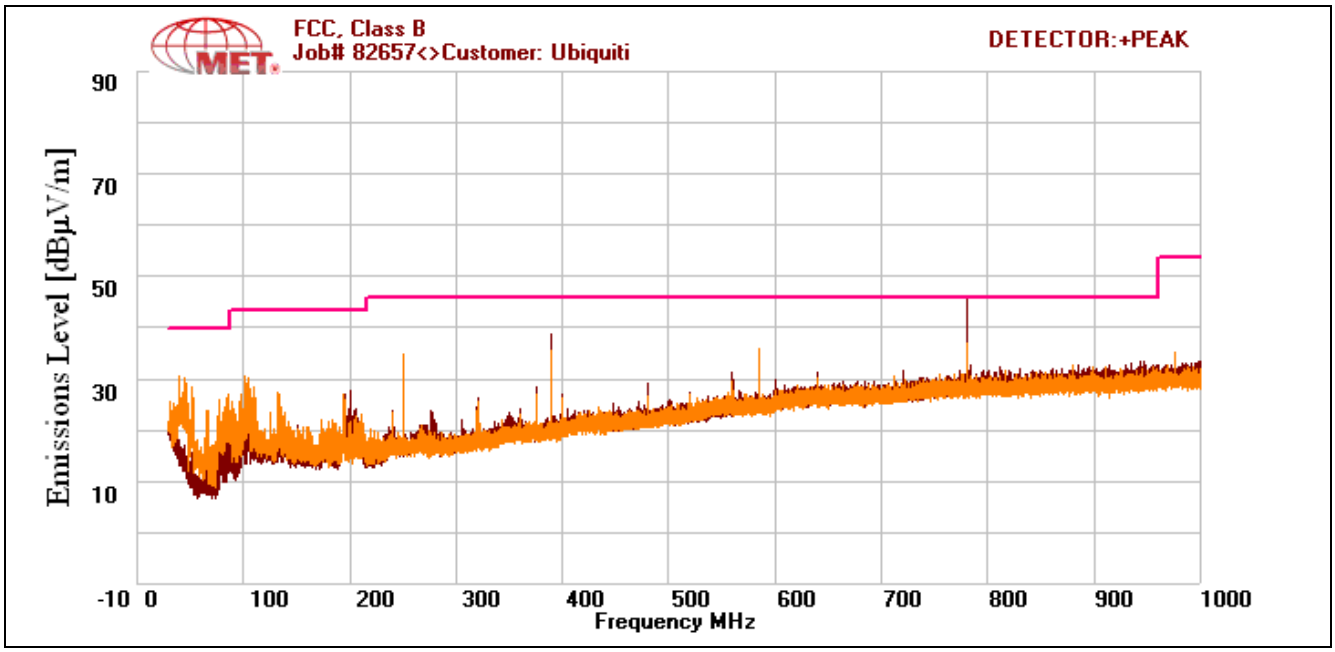


Plot 58. Radiated Spurious Emission, 802.11b, High Channel, 1GHz - 18GHz

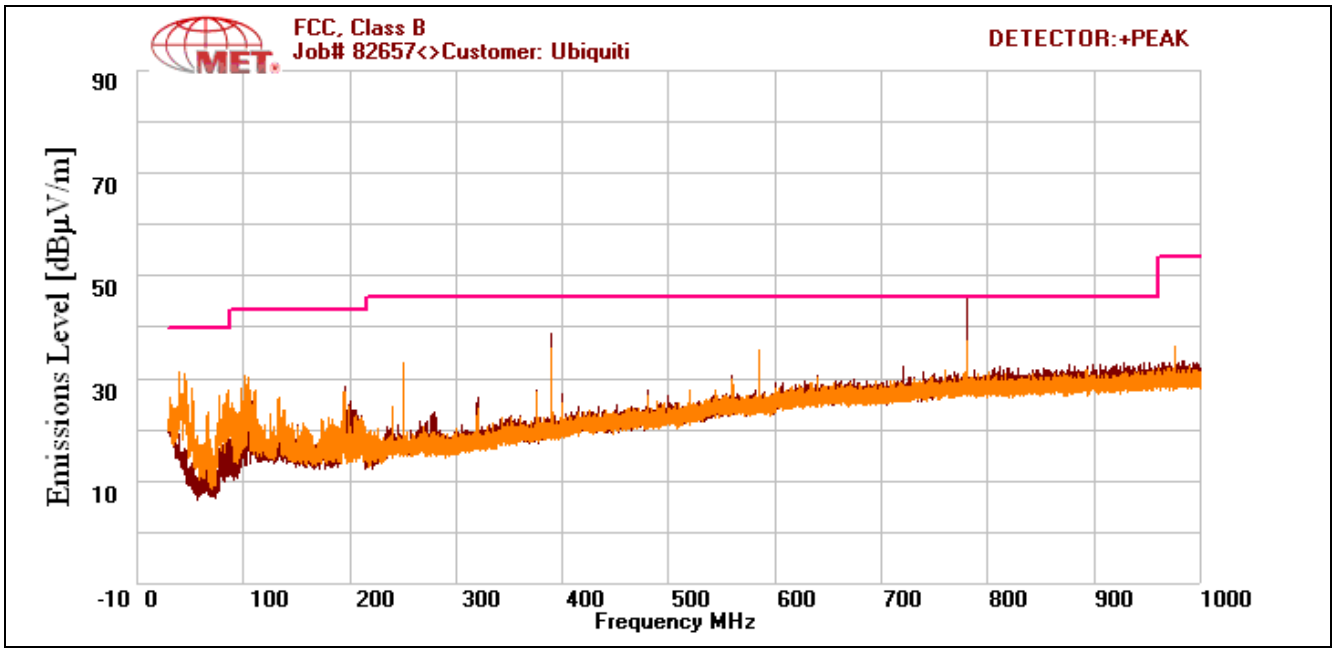
Low Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.824	**H**	53.95	34.66	33.94	5.06	58.30	Peak	74	-15.70
4.824	**H**	40.72	34.66	33.94	5.06	45.07	Avg	54	-8.93
7.236	**H**	44.82	35.03	35.62	6.26	51.67	Peak	74	-22.33
7.236	**H**	31.14	35.03	35.62	6.26	37.99	Avg	54	-16.01
9.648	**H**	45.11	35.34	36.62	7.29	53.67	Peak	74	-20.33
9.648	**H**	31.57	35.34	36.62	7.29	40.13	Avg	54	-13.87
Mid Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.874	H	57.12	34.72	33.93	5.06	61.39	Peak	74	-12.61
4.874	H	42.88	34.72	33.93	5.06	47.15	Avg	54	-6.85
7.311	H	46.28	35.11	35.64	6.33	53.13	Peak	74	-20.87
7.311	H	31.11	35.11	35.64	6.33	37.96	Avg	54	-16.04
9.748	H	44.3	35.47	36.75	7.42	53.00	Peak	74	-21.00
9.748	H	31.9	35.47	36.75	7.42	40.60	Avg	54	-13.40
High Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.924	H	52.55	34.78	33.93	5.06	56.76	Peak	74	-17.24
4.924	H	34.86	34.78	33.93	5.06	39.07	Avg	54	-14.93
7.386	H	45.78	35.25	35.65	6.38	52.56	Peak	74	-21.44
7.386	H	31.04	35.25	35.65	6.38	37.82	Avg	54	-16.18
9.848	H	44.2	35.51	36.89	7.54	53.12	Peak	74	-20.88
9.848	H	31.28	35.51	36.89	7.54	40.20	Avg	54	-13.80

Table 33. Radiated Harmonic Emissions, 802.11g

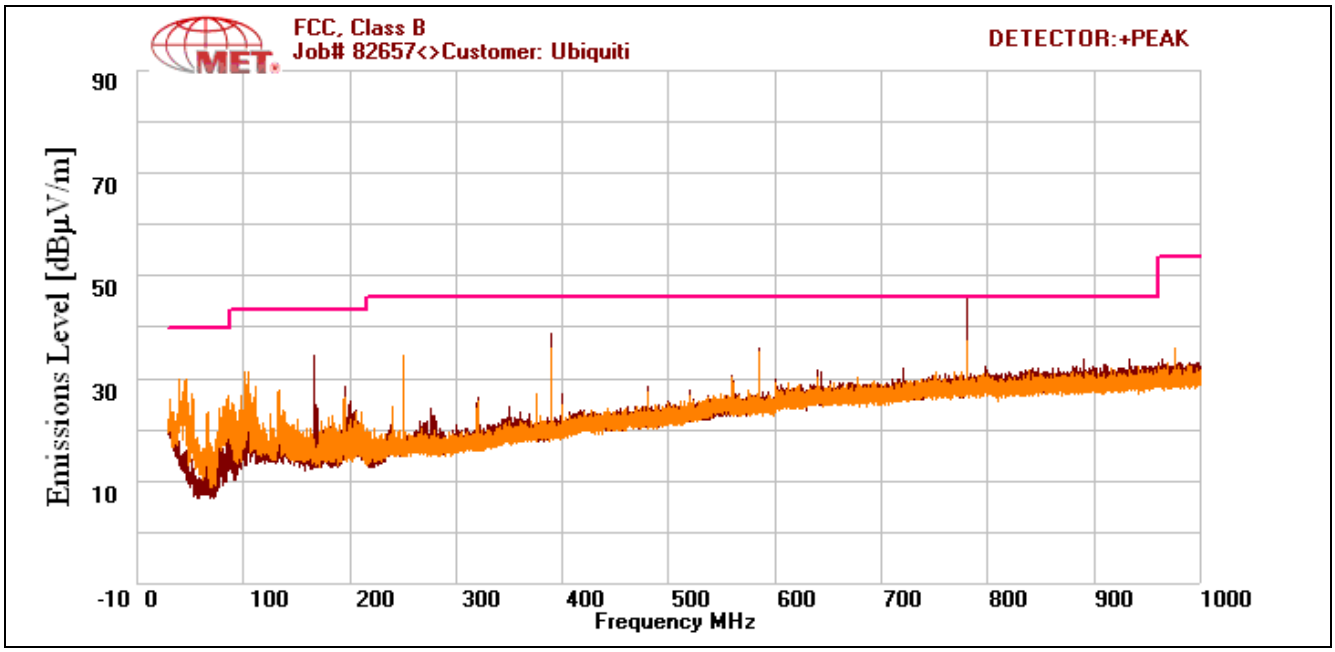
Note: All other emissions were measured at the noise floor of the spectrum analyzer.



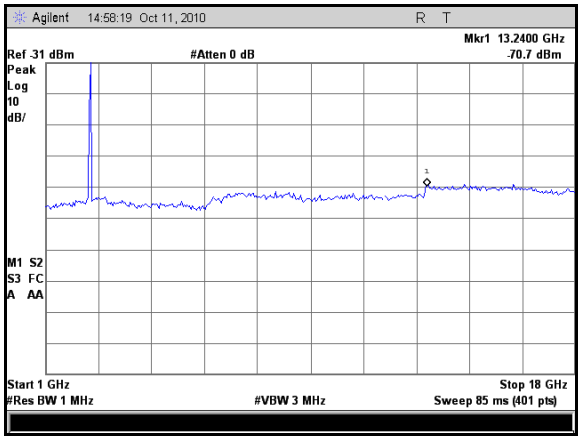
Plot 59. Radiated Emissions 802.11g Mode, Low Channel



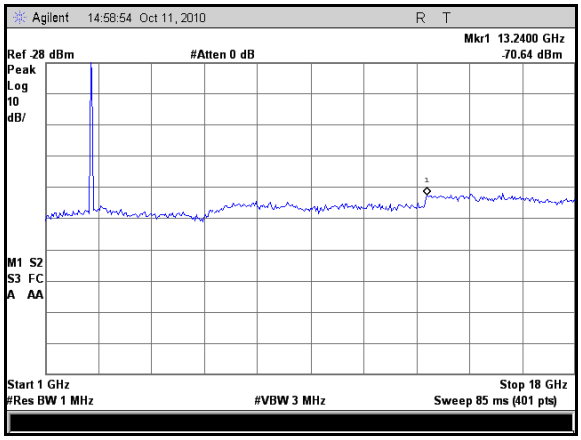
Plot 60. Radiated Emissions 802.11g Mode, Mid Channel



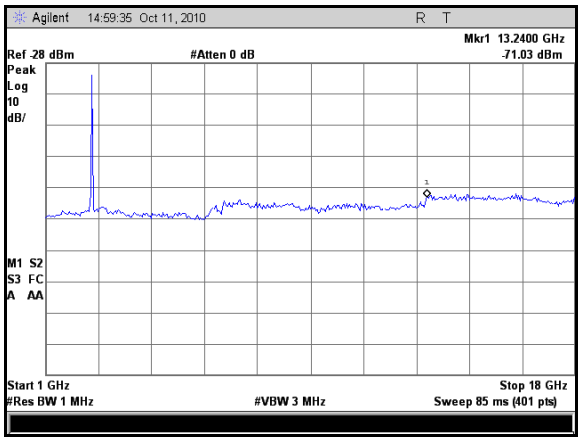
Plot 61. Radiated Emissions 802.11g Mode, High Channel



Plot 62. Radiated Spurious Emission, 802.11g, Low Channel, 1GHz - 18GHz



Plot 63. Radiated Spurious Emission, 802.11g, Mid Channel, 1GHz - 18GHz

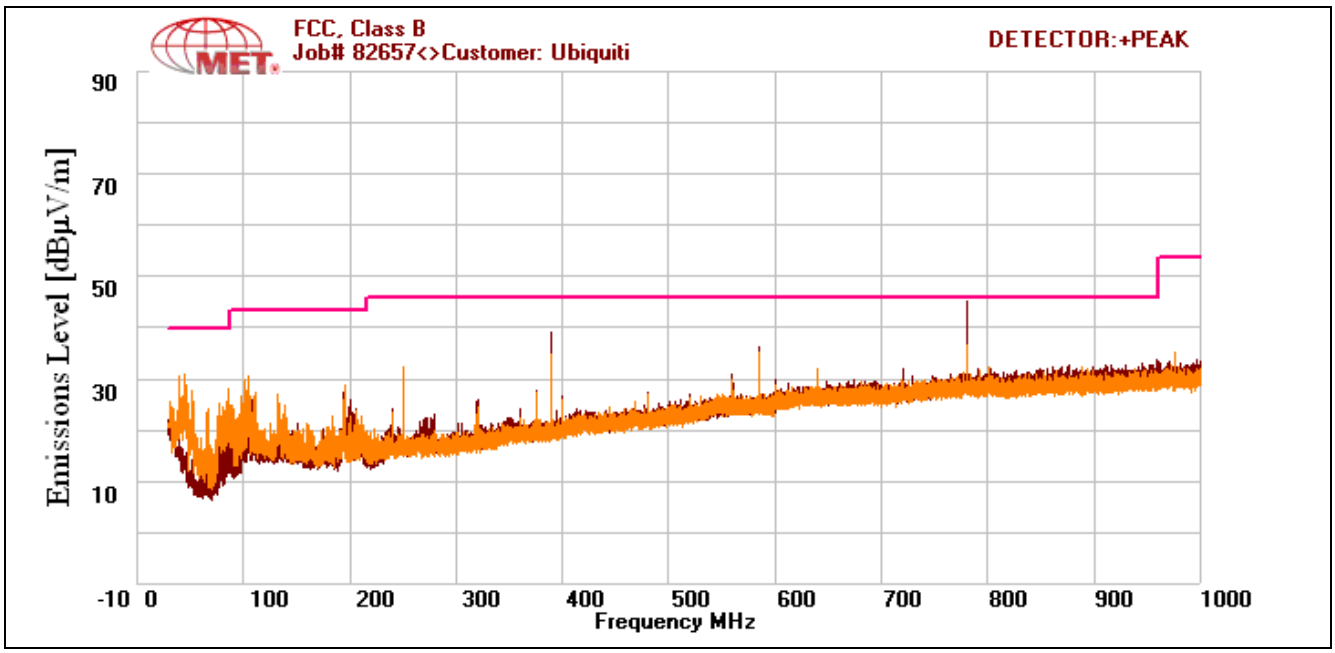


Plot 64. Radiated Spurious Emission, 802.11g, High Channel, 1GHz - 18GHz

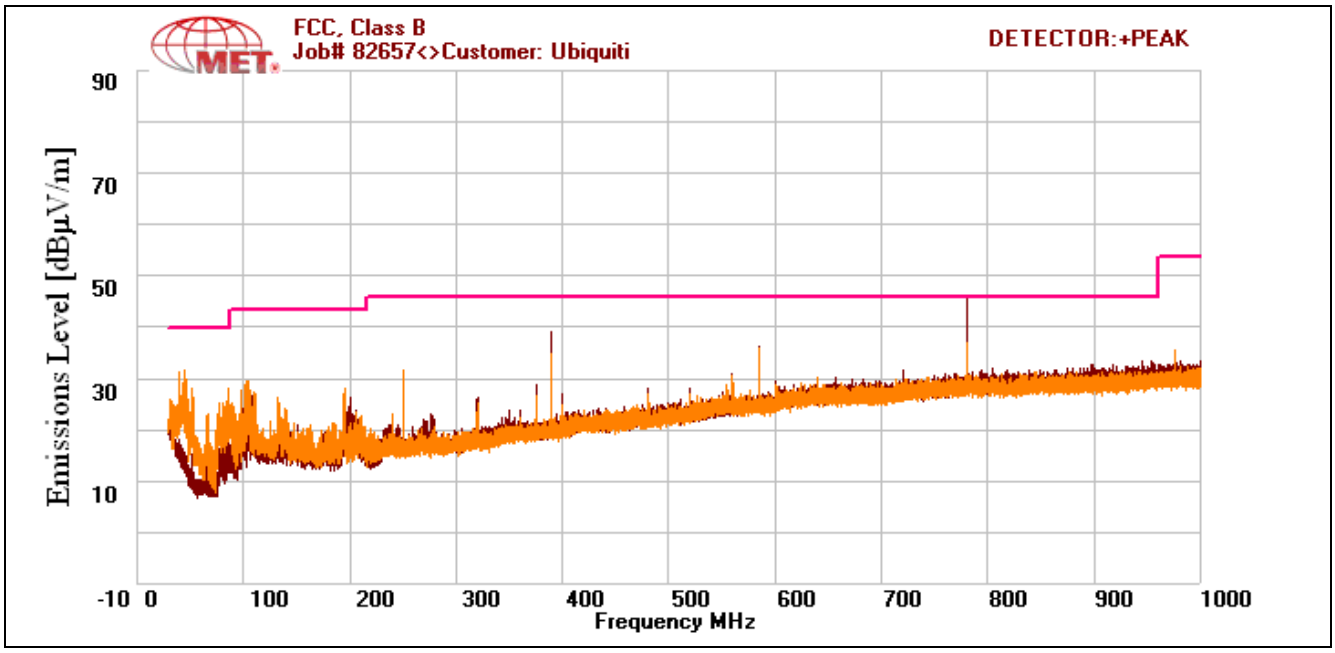
Low Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.824	H	47.9	34.66	33.94	5.06	52.25	Peak	74	-21.75
4.824	H	30.87	34.66	33.94	5.06	35.22	Avg	54	-18.78
7.236	H	41.7	35.03	35.62	6.26	48.55	Peak	74	-25.45
7.236	H	30.7	35.03	35.62	6.26	37.55	Avg	54	-16.45
9.648	H	41.33	35.34	36.62	7.29	49.89	Peak	74	-24.11
9.648	H	30.9	35.34	36.62	7.29	39.46	Avg	54	-14.54
Mid Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.874	H	56.92	34.72	33.93	5.06	61.19	Peak	74	-12.81
4.874	H	43.63	34.72	33.93	5.06	47.90	Avg	54	-6.10
7.311	H	43.01	35.11	35.64	6.33	49.86	Peak	74	-24.14
7.311	H	31.24	35.11	35.64	6.33	38.09	Avg	54	-15.91
9.748	H	40.96	35.47	36.75	7.42	49.66	Peak	74	-24.34
9.748	H	31.33	35.47	36.75	7.42	40.03	Avg	54	-13.97
High Channel									
Freq.	**Antenna Polarity**	**Raw Amp. @ 3 m**	**P.Amp**	**Ant. Cor. Factor**	**Cable Loss**	**EUT Field Strength Final Amp.**	**Limit Detector Peak / Avg**	**Limit @ 3 m**	**Delta**
(GHz)	**(H/V)**	**(Peak) / (Avg)**	**(dB)**	**(dB/m)**	**(dB)**	**(dBuV/m)**	**(Peak) / (Avg)**	**(dBuV/m)**	**(dB)**
4.924	H	51.77	34.78	33.93	5.06	55.98	Peak	74	-18.02
4.924	H	33.95	34.78	33.93	5.06	38.16	Avg	54	-15.84
7.386	H	43.02	35.25	35.65	6.38	49.80	Peak	74	-24.20
7.386	H	30.72	35.25	35.65	6.38	37.50	Avg	54	-16.50
9.848	H	39.8	35.51	36.89	7.54	48.72	Peak	74	-25.28
9.848	H	30.76	35.51	36.89	7.54	39.68	Avg	54	-14.32

Table 34. Radiated Harmonic Emissions, HT20

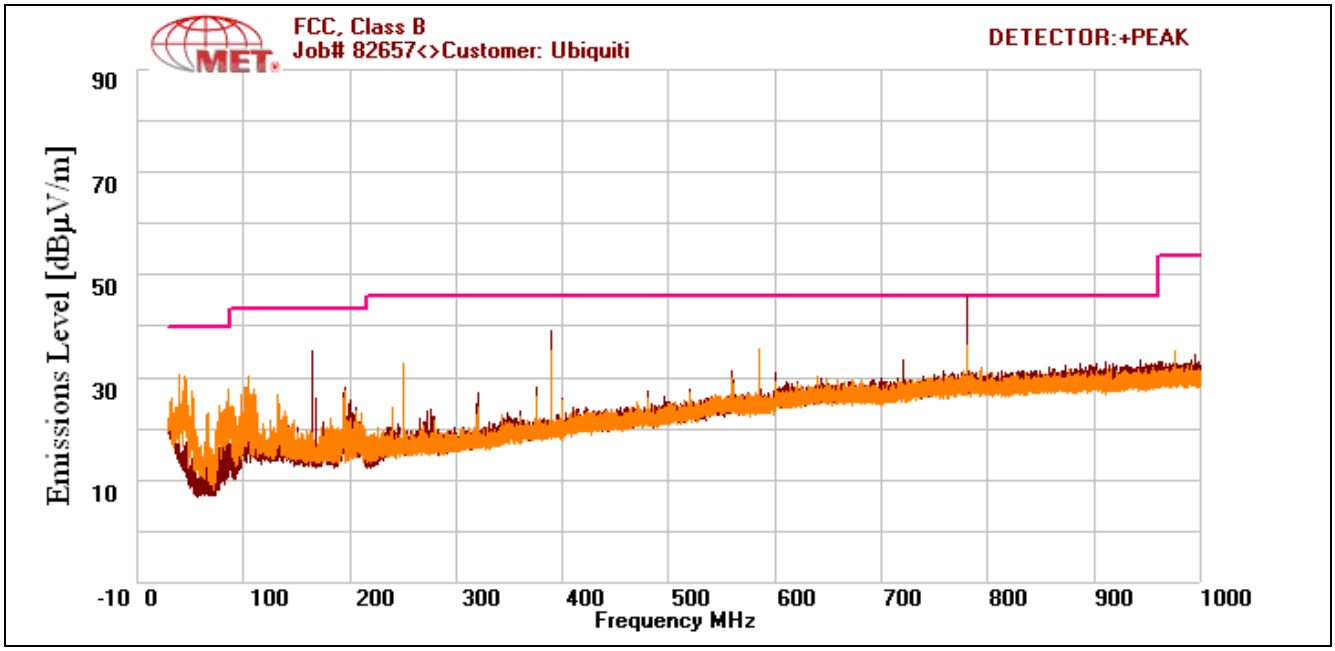
Note: All other emissions were measured at the noise floor of the spectrum analyzer.



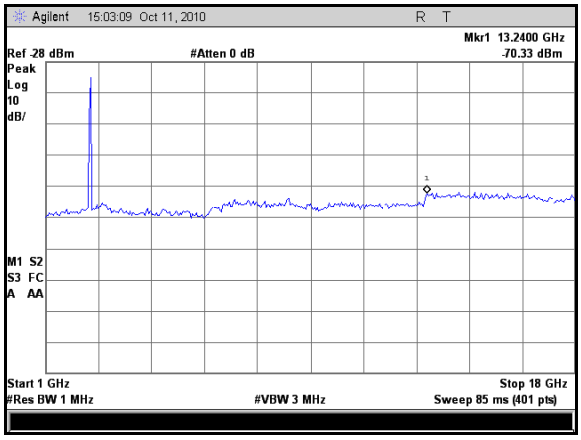
Plot 65. Radiated Emissions HT20 Mode, Low Channel



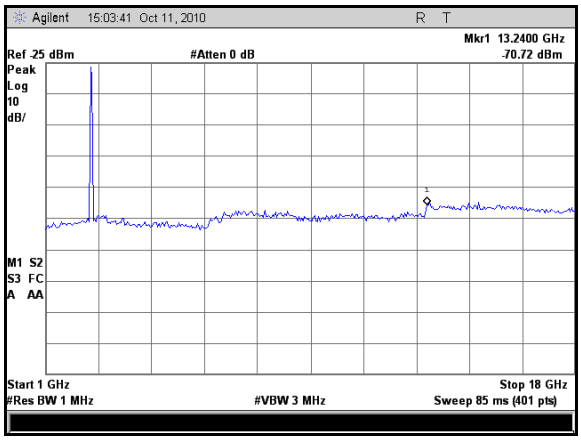
Plot 66. Radiated Emissions HT20 Mode, Mid Channel



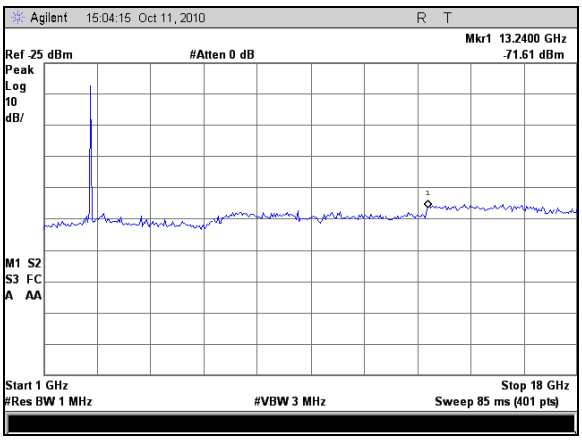
Plot 67. Radiated Emissions HT20 Mode, High Channel



Plot 68. Radiated Spurious Emission, HT20, Low Channel, 1GHz - 18GHz



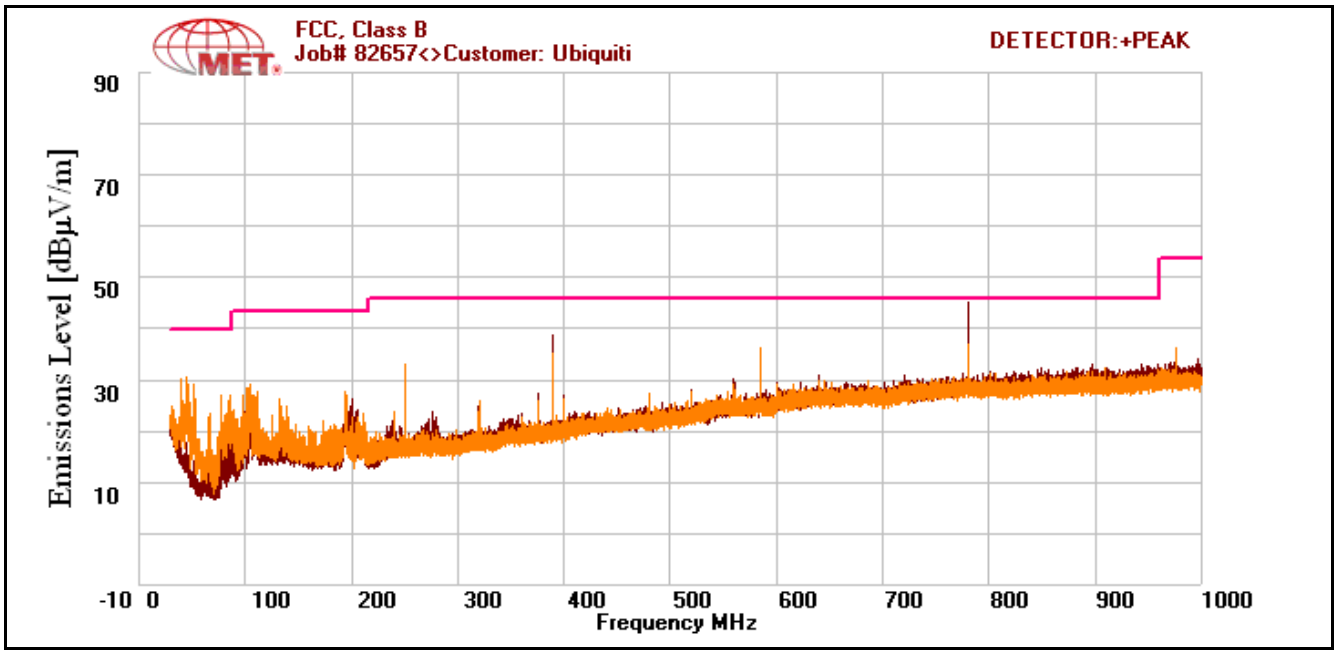
Plot 69. Radiated Spurious Emission, HT20, Mid Channel, 1GHz - 18GHz



Plot 70. Radiated Spurious Emission, HT20, High Channel, 1GHz - 18GHz

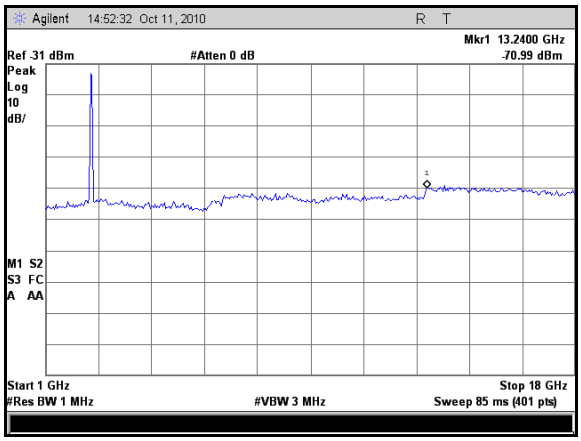
Freq.	Antenna Polarity	Raw Amp. @ 3 m	P.Amp	Ant. Cor. Factor	Cable Loss	EUT Field Strength Final Amp.	Limit Detector Peak / Avg	Limit @ 3 m	Delta
(GHz)	(H/V)	(Peak) / (Avg)	(dB)	(dB/m)	(dB)	(dBuV/m)	(Peak) / (Avg)	(dBuV/m)	(dB)
4.874	H	49.95	34.72	33.93	5.06	54.22	Peak	74	-19.78
4.874	H	38.9	34.72	33.93	5.06	43.17	Avg	54	-10.83
7.311	H	42.48	35.11	35.64	6.33	49.33	Peak	74	-24.67
7.311	H	30.45	35.11	35.64	6.33	37.30	Avg	54	-16.70
9.748	H	40.97	35.47	36.75	7.42	49.67	Peak	74	-24.33
9.748	H	30.86	35.47	36.75	7.42	39.56	Avg	54	-14.44

Table 35. Radiated Harmonic Emissions, HT40 Mode, Mid Channel



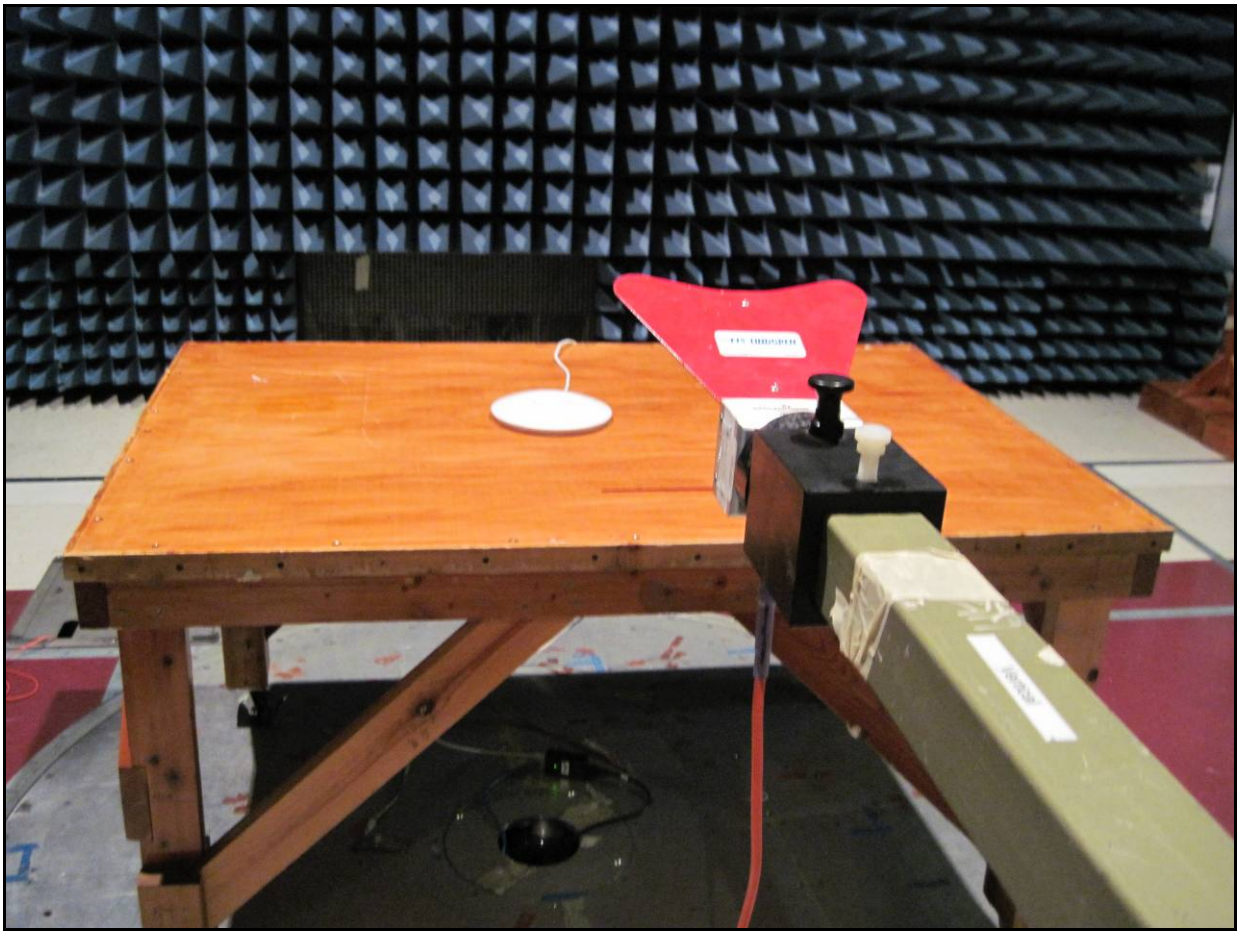
Plot 71. Radiated Emissions HT40 Mode, 2437 MHz, Mid Channel

Note: All other emissions were measured at the noise floor of the spectrum analyzer.



Plot 72. Radiated Spurious Emission, HT40, Mid Channel, 1GHz - 18GHz

Photograph 6. Radiated Emissions, Setup

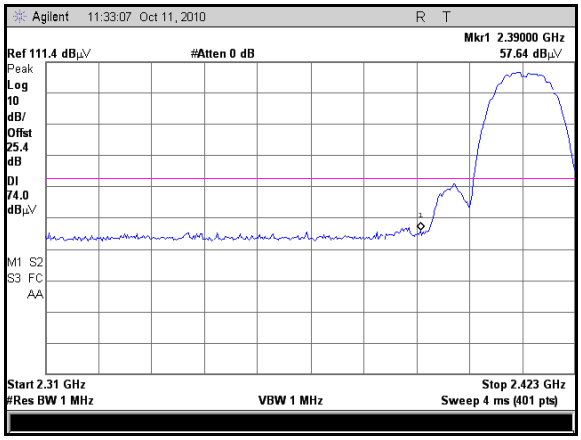


Photograph 7. Radiated Emissions, 1m Setup

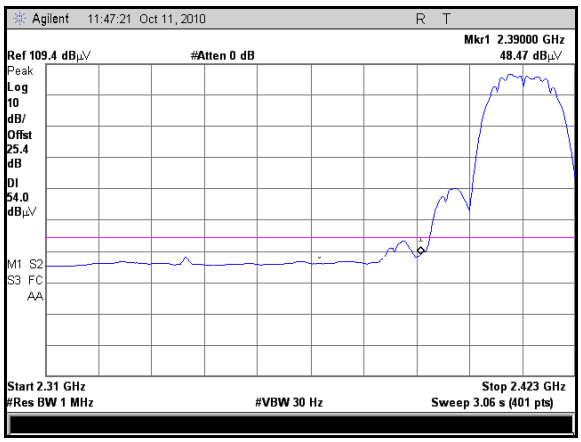
Photograph 8. Radiated Emissions, 3m Setup

Radiated Band Edge Measurements

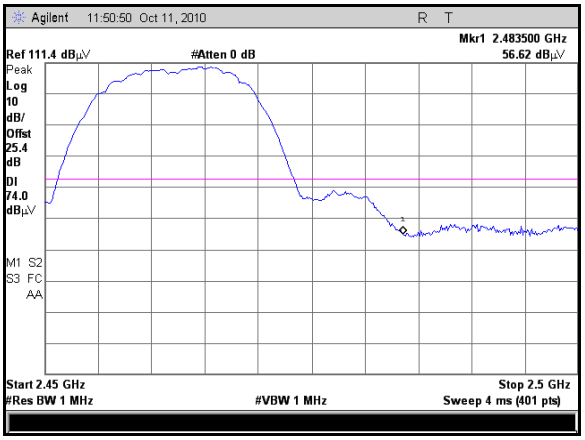
Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels at 1m distance. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line.



Plot 73. Restricted Band, 802.11b, Low Channel, Peak

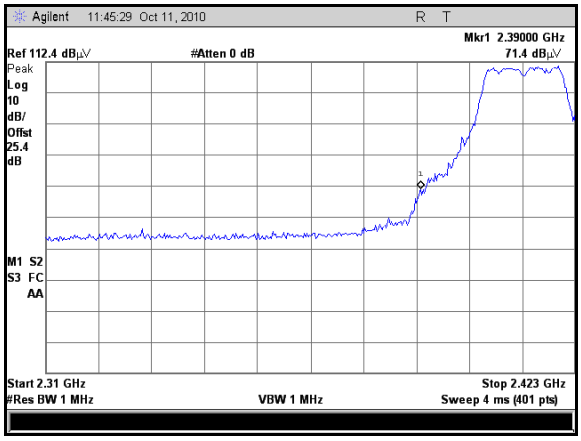


Plot 74. Restricted Band, 802.11b, Low Channel, Average



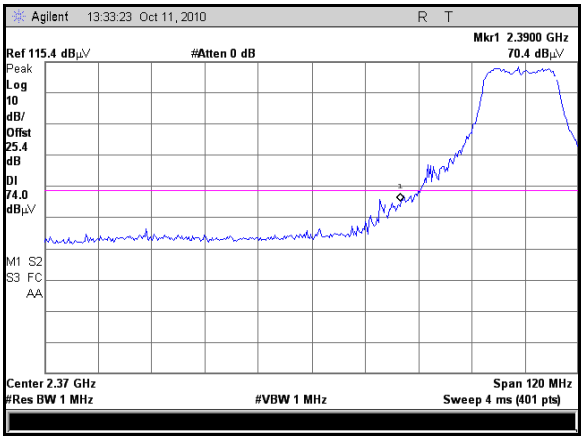
Plot 75. Restricted Band, 802.11b, High Channel, Peak

Plot 76. Restricted Band, 802.11b, High Channel, Average

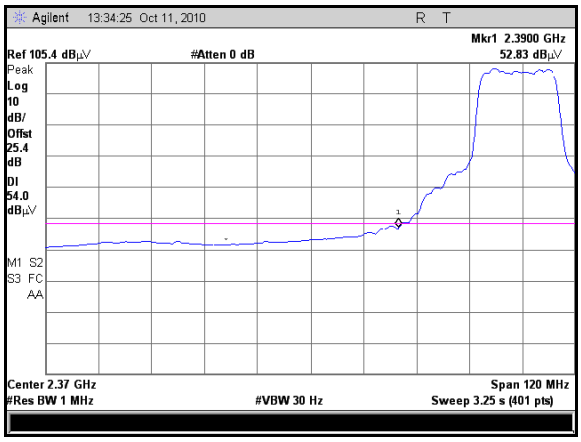


Plot 77. Restricted Band, 802.11g, Low Channel, Peak

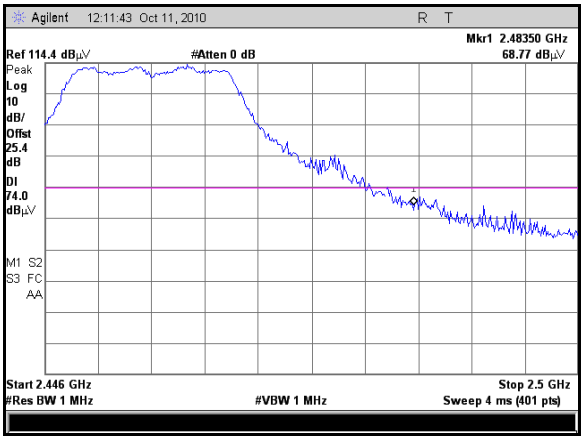
Plot 78. Restricted Band, 802.11g, Low Channel, Average



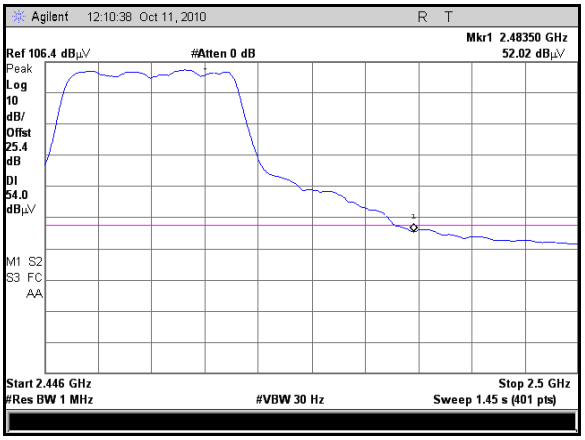
Plot 79. Restricted Band, 802.11g, Channel 2, Peak



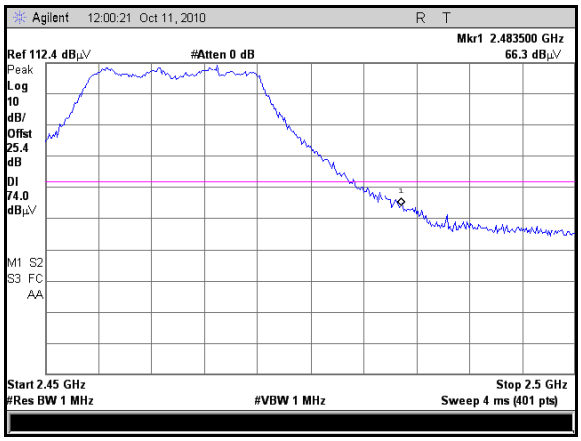
Plot 80. Restricted Band, 802.11g, Channel 2, Average



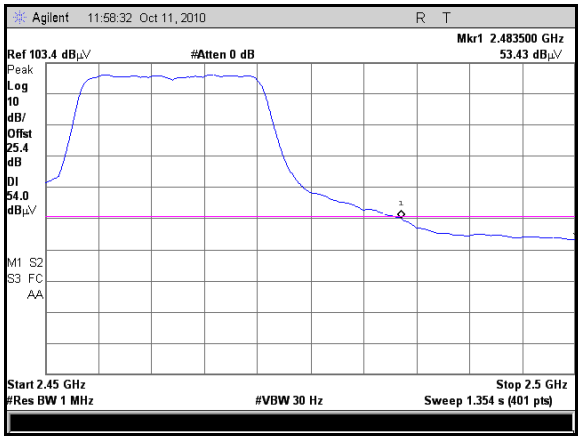
Plot 81. Restricted Band, 802.11g, Channel 10, Peak



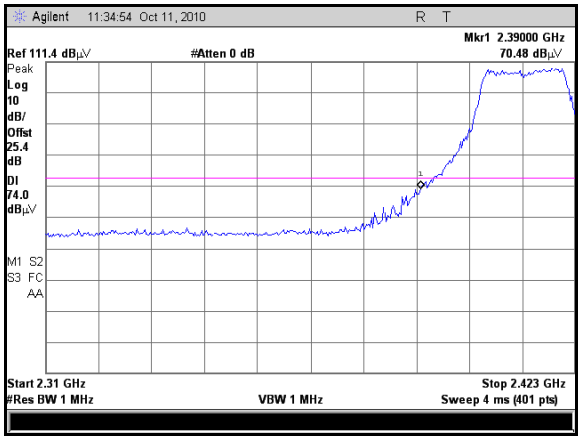
Plot 82. Restricted Band, 802.11g, Channel 10, Average



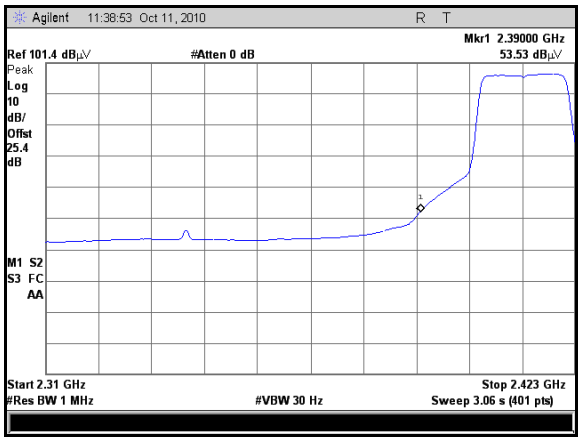
Plot 83. Restricted Band, 802.11g, High Channel, Peak



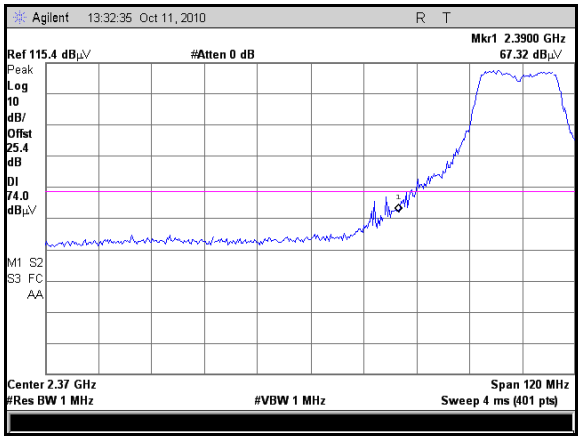
Plot 84. Restricted Band, 802.11g, High Channel, Average



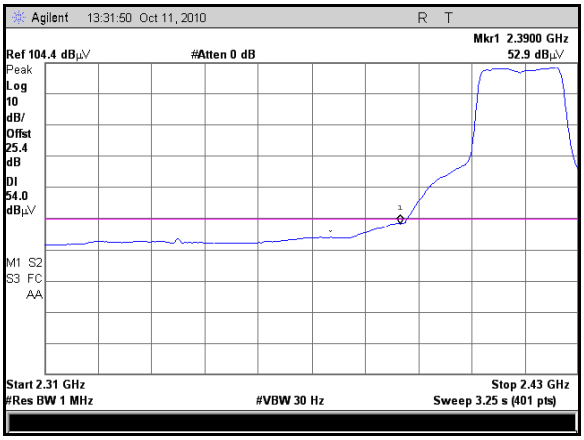
Plot 85. Restricted Band, 802.11n 20 MHz, Low Channel, Peak



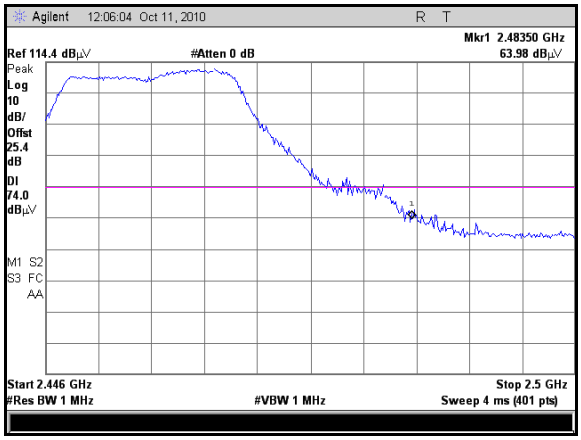
Plot 86. Restricted Band, 802.11n 20 MHz, Low Channel, Average



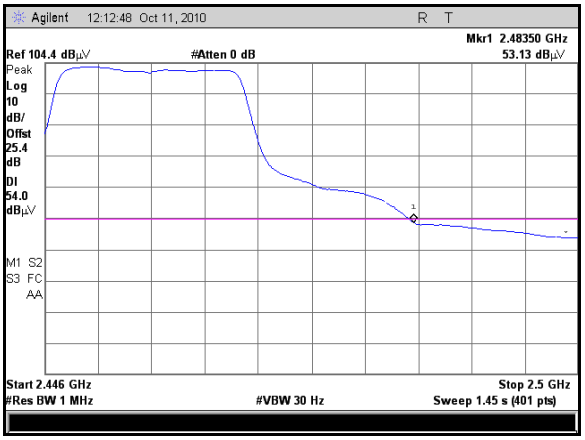
Plot 87. Restricted Band, 802.11n 20 MHz, Channel 2, Peak



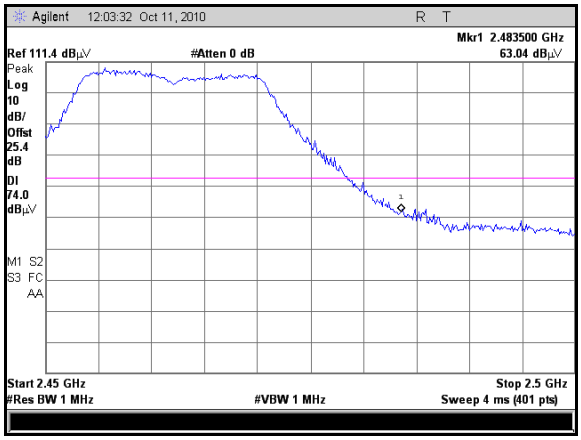
Plot 88. Restricted Band, 802.11n 20 MHz, Channel 2, Average



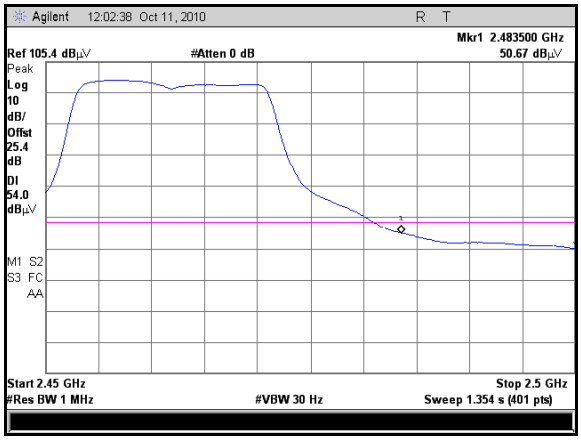
Plot 89. Restricted Band, 802.11n 20 MHz, Channel 10, Peak



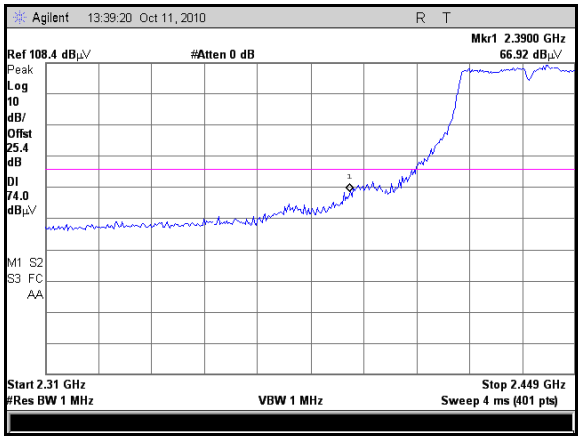
Plot 90. Restricted Band, 802.11n 20 MHz, Channel 10, Average



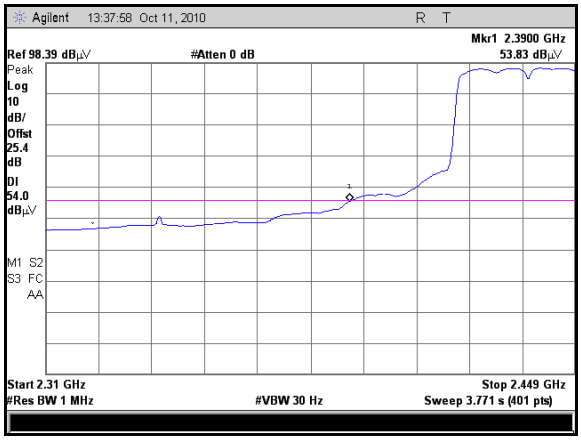
Plot 91. Restricted Band, 802.11n 20 MHz, High Channel, Peak



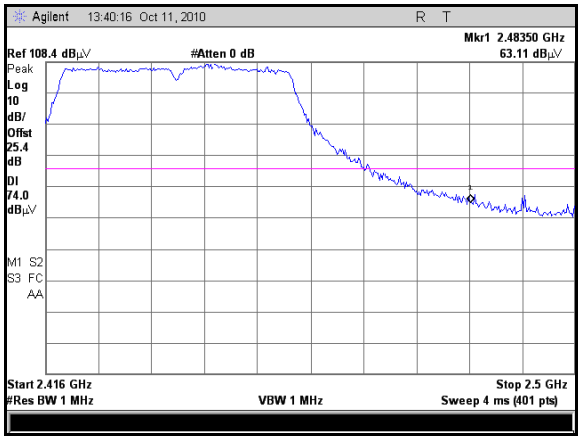
Plot 92. Restricted Band, 802.11n 20 MHz, High Channel, Average



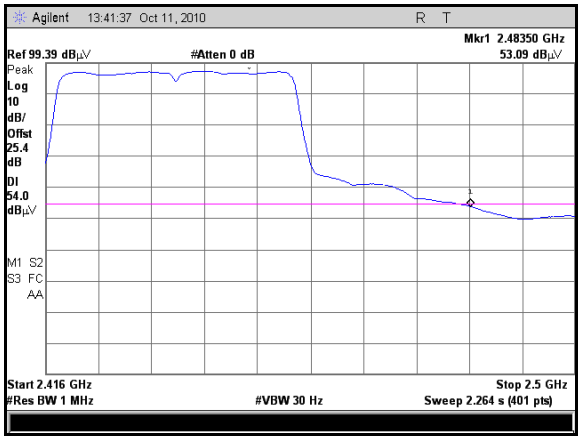
Plot 93. Restricted Band, 802.11n 40 MHz, Mid Channel, Low band, Peak



Plot 94. Restricted Band, 802.11n 40 MHz, Mid Channel, Low band, Average



Plot 95. Restricted Band, 802.11n 40 MHz, Mid Channel, High band, Peak



Plot 96. Restricted Band, 802.11n 40 MHz, Mid Channel, High band, Average

Radiated Spurious Emissions Test Setup

Photograph 9. Radiated Spurious Emissions, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

RSS-GEN Receiver Spurious Emissions Requirements

Test Requirements: The following receiver spurious emission limits shall be complied with:

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 36.

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 36. Spurious Emission Limits for Receivers

(b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

Test Procedures: The EUT was programmed for receive mode only. Conducted measurements were taken at the antenna port of the EUT. 100 kHz resolution bandwidth was used from 30 MHz - 1 GHz and 300 kHz resolution was used for measurements done above 1 GHz. All plots are corrected for cable loss.

Test Results: Equipment is compliant with the Receiver Spurious Emissions Requirements of RSS-GEN.

Test Engineer(s): Lionel Gabrillo

Test Date(s): 10/20/10

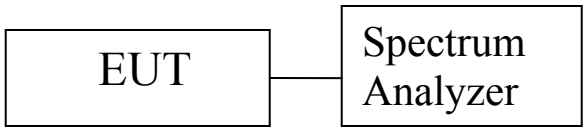
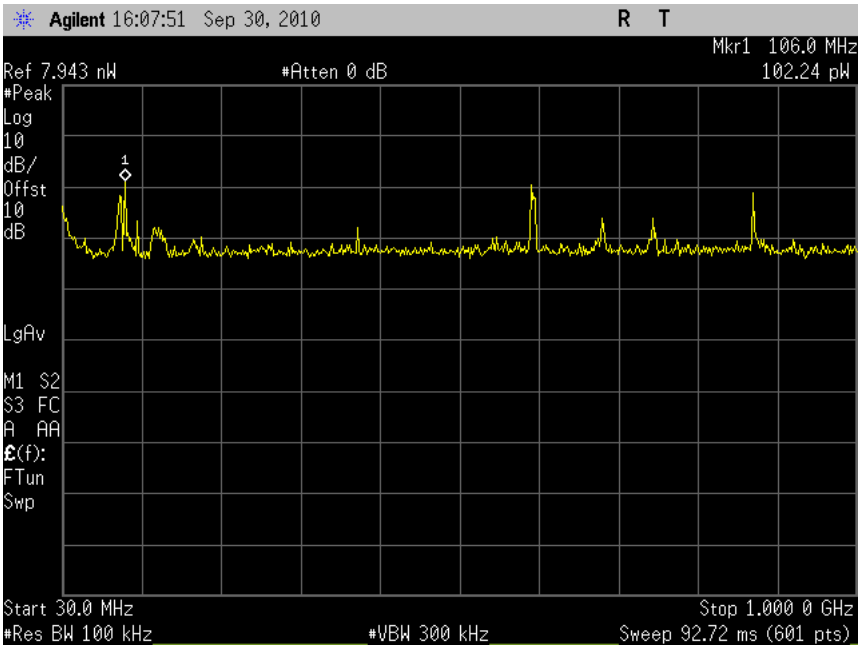
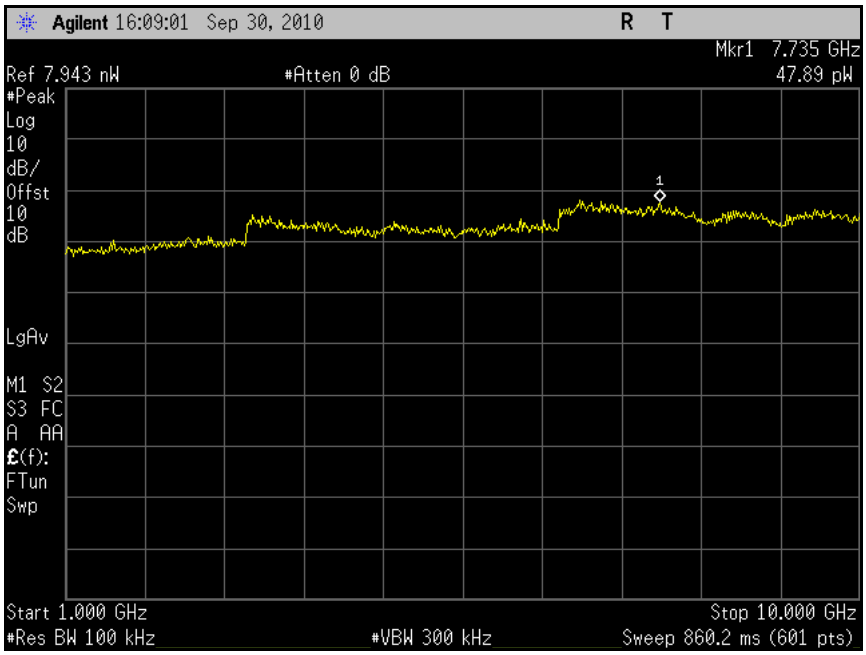


Figure 4. Block Diagram, Conducted Receiver Spurious Emissions Test Setup



Plot 97. RSS-GEN Receiver Spurious Emissions, 30 MHz to 1 GHz



Plot 98. RSS-GEN Receiver Spurious Emissions, 1 GHz to 10 GHz

Electromagnetic Compatibility Criteria for Intentional Radiators

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

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

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

A conducted version of the EUT was provided with a connector at the antenna port. The spectrum analyzer was set to a 100 kHz resolution bandwidth and 300 kHz video bandwidth. Measurements were taken at antenna port. Plots are corrected for external attenuation and cable loss.

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

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

Test Engineer(s): Lionel Gabrillo

Test Date(s): 10/20/10

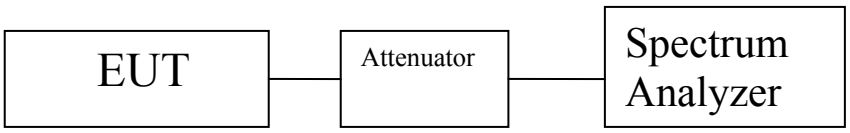
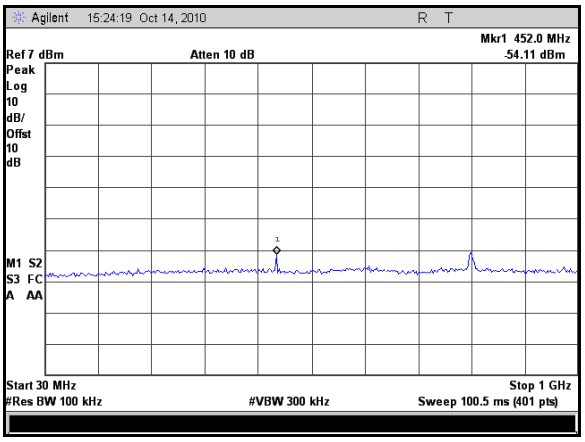
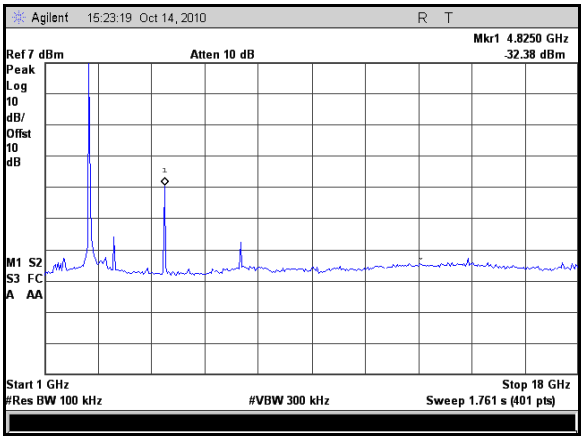


Figure 5. Block Diagram, Conducted Spurious Emissions Test Setup

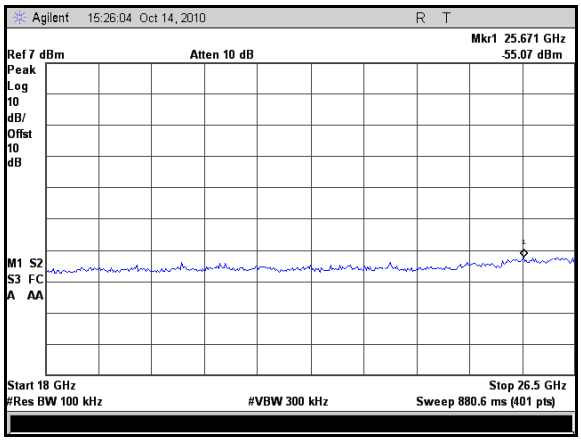
Conducted Spurious Emissions Test Results



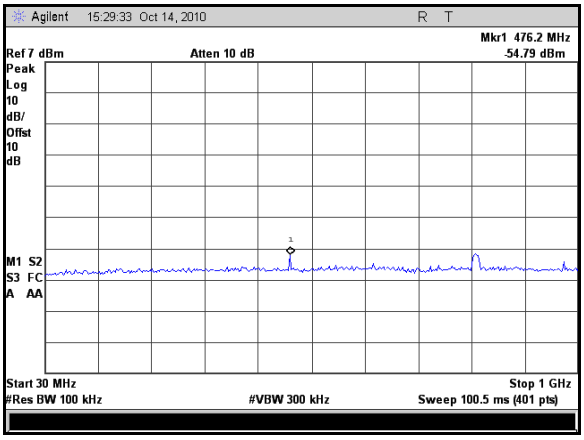
Plot 99. Conducted Spurious Emission, 802.11b, 2412MHz (30MHz - 1GHz)



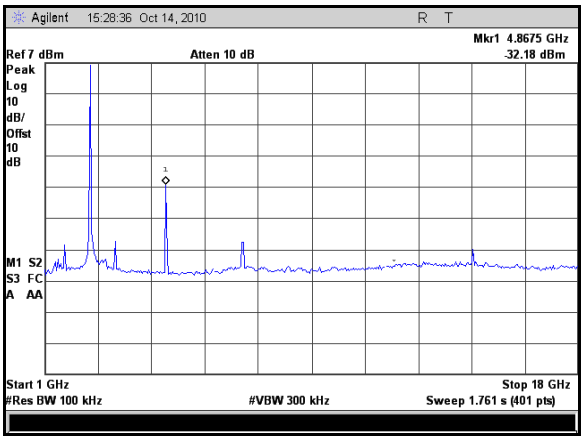
Plot 100. Conducted Spurious Emission, 802.11b, 2412MHz (1GHz - 18GHz)



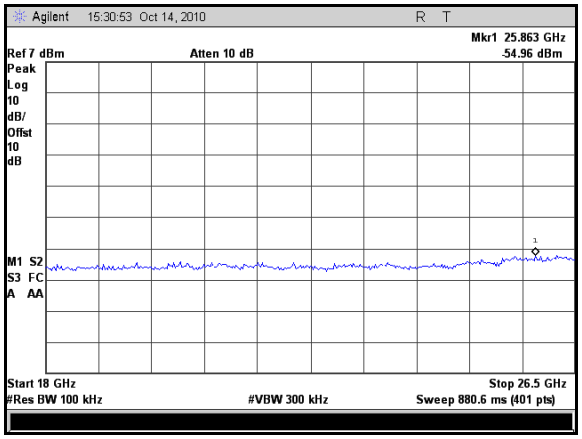
Plot 101. Conducted Spurious Emission, 802.11b, 2412MHz (18GHz - 26.5GHz)



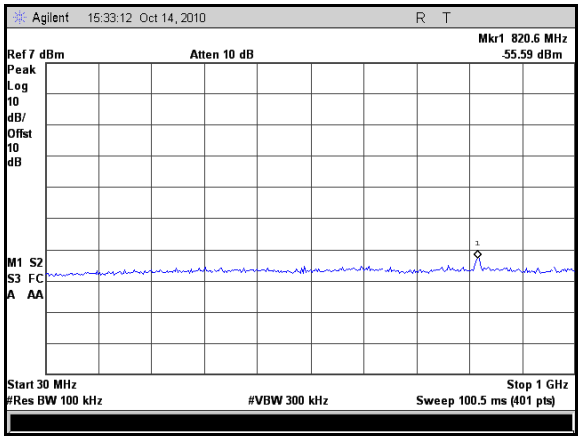
Plot 102. Conducted Spurious Emission, 802.11b, 2437MHz (30MHz - 1GHz)



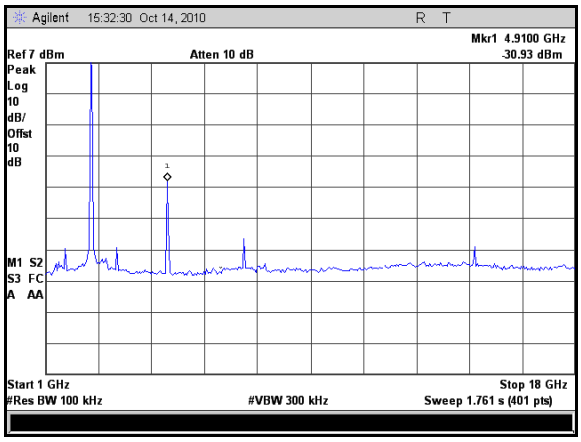
Plot 103. Conducted Spurious Emission, 802.11b, 2437MHz (1GHz - 18GHz)



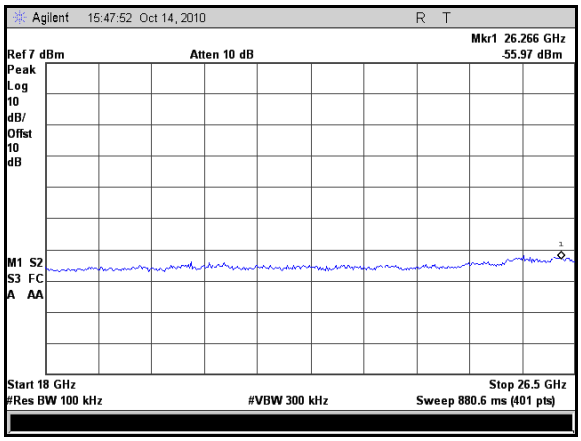
Plot 104. Conducted Spurious Emission, 802.11b, 2437MHz (18GHz - 26.5GHz)



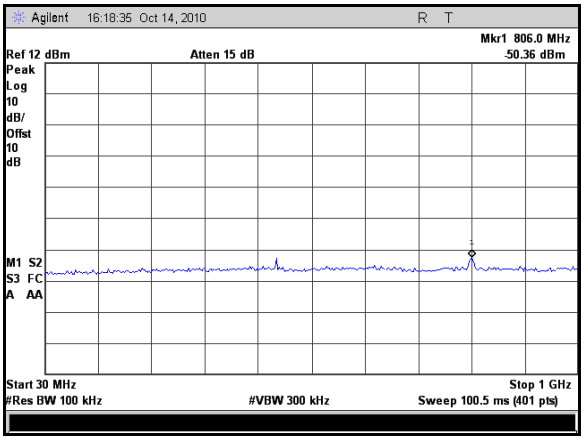
Plot 105. Conducted Spurious Emission, 802.11b, 2462MHz (30MHz - 1GHz)



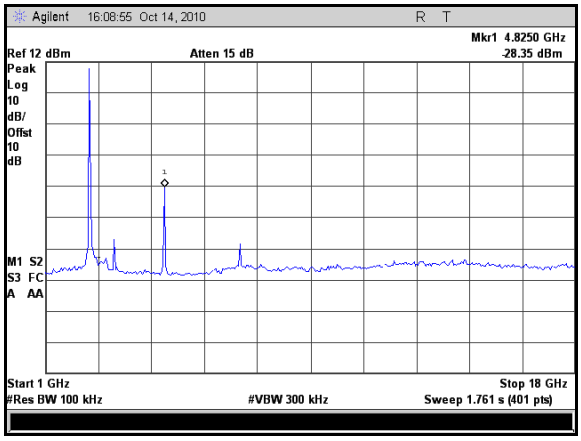
Plot 106. Conducted Spurious Emission, 802.11b, 2462MHz (1GHz - 18GHz)



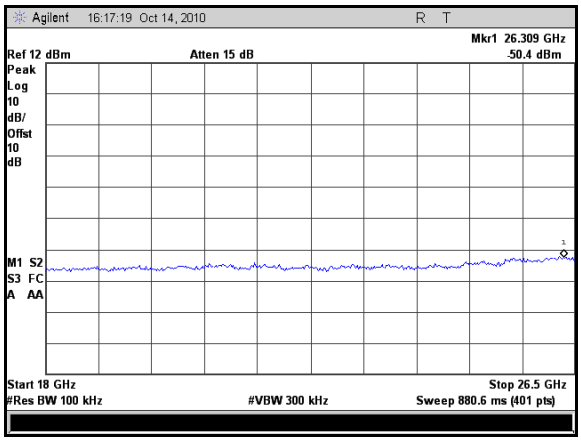
Plot 107. Conducted Spurious Emission, 802.11b, 2462MHz (18GHz - 26.5GHz)



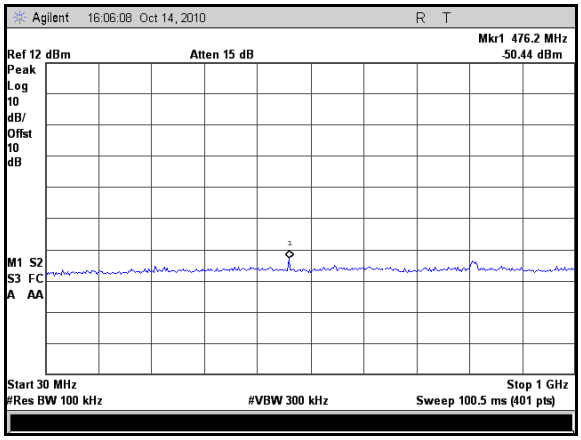
Plot 108. Conducted Spurious Emission, 802.11g, 2412MHz (30MHz - 1GHz)



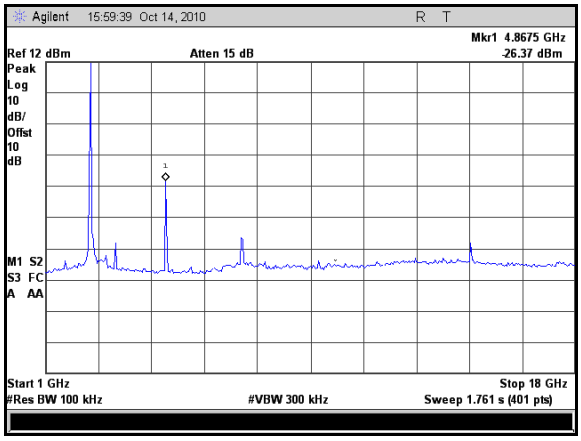
Plot 109. Conducted Spurious Emission, 802.11g, 2412MHz (1GHz - 18GHz)



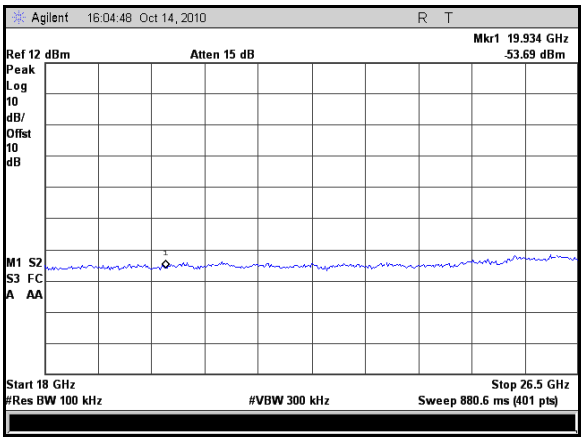
Plot 110. Conducted Spurious Emission, 802.11g, 2412MHz (18GHz - 26.5GHz)



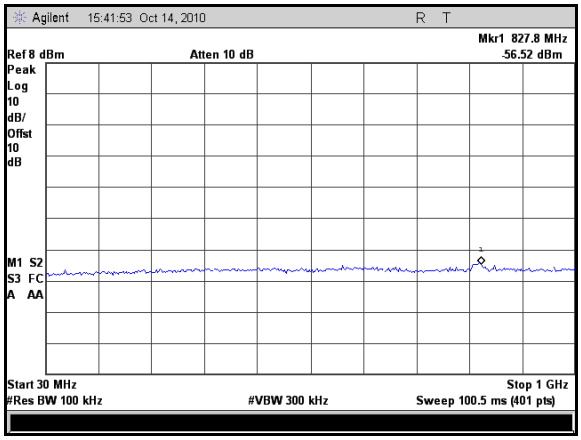
Plot 111. Conducted Spurious Emission, 802.11g, 2437MHz (30MHz - 1GHz)



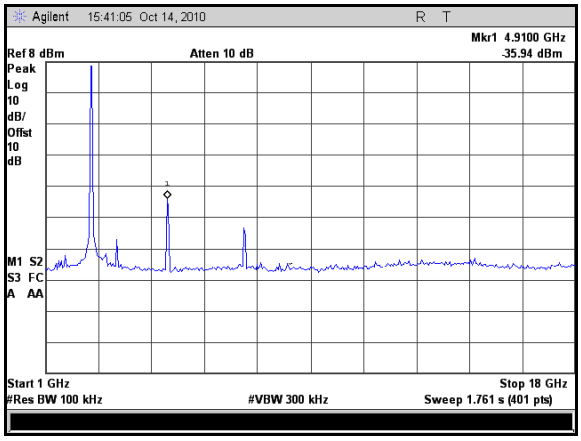
Plot 112. Conducted Spurious Emission, 802.11g, 2437MHz (1GHz - 18GHz)



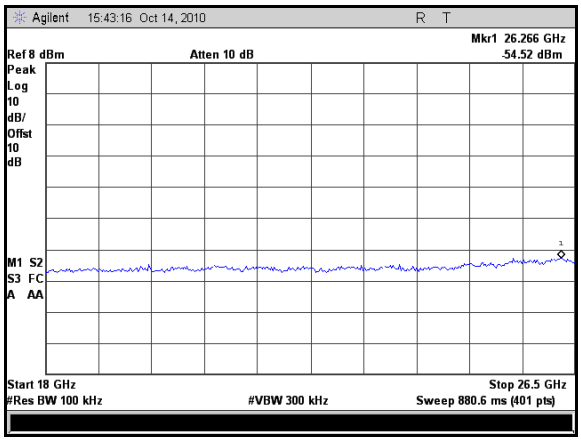
Plot 113. Conducted Spurious Emission, 802.11g, 2437MHz (18GHz - 26.5GHz)



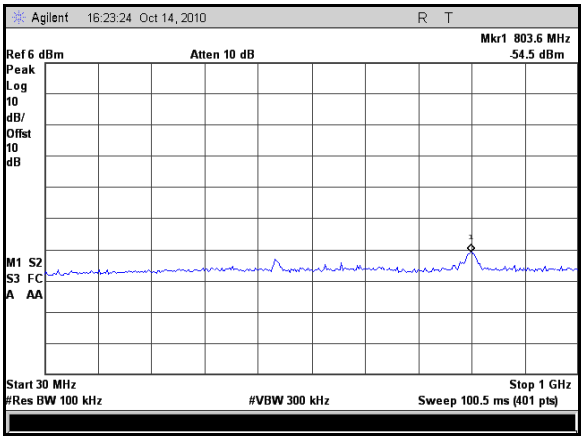
Plot 114. Conducted Spurious Emission, 802.11g, 2462MHz (30MHz - 1GHz)



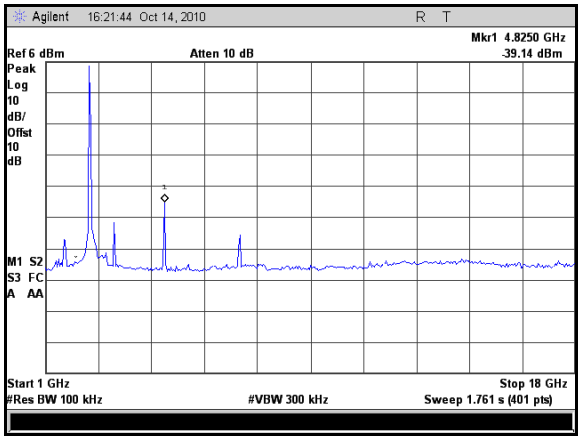
Plot 115. Conducted Spurious Emission, 802.11g, 2462MHz (1GHz - 18GHz)



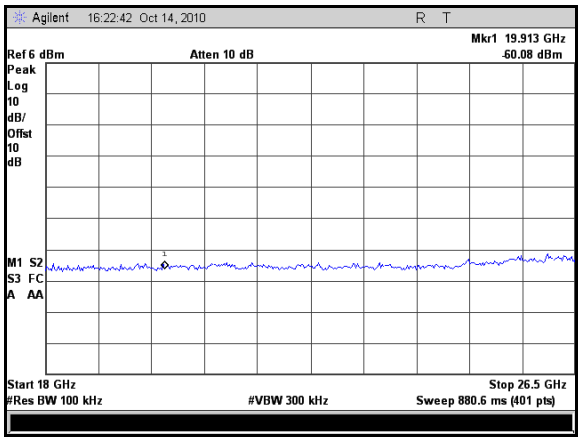
Plot 116. Conducted Spurious Emission, 802.11g, 2462MHz (18GHz - 26.5GHz)



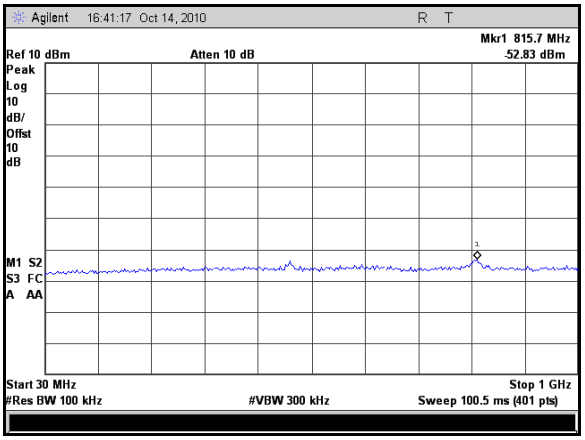
Plot 117. Conducted Spurious Emission, HT20 J5port, 2412MHz (30MHz - 1GHz)



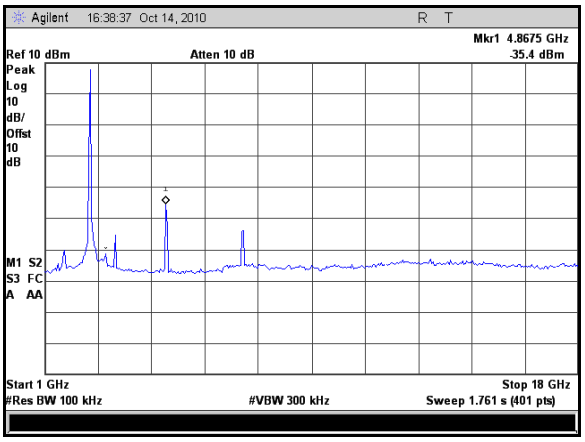
Plot 118. Conducted Spurious Emission, HT20 J5port, 2412MHz (1GHz - 18GHz)



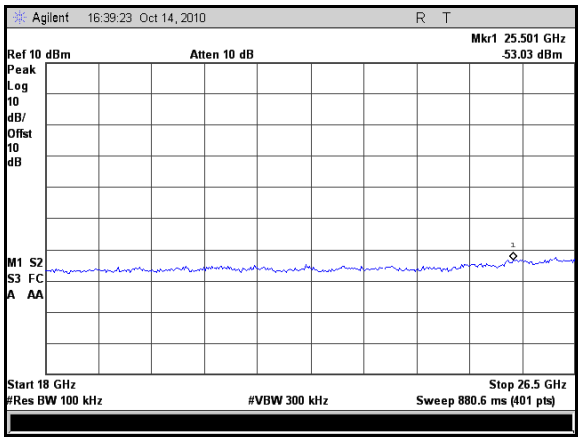
Plot 119. Conducted Spurious Emission, HT20 J5port, 2412MHz (18GHz - 26.5GHz)



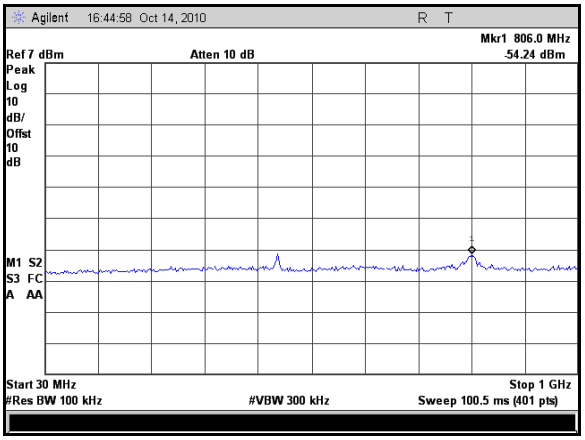
Plot 120. Conducted Spurious Emission, HT20 J5port, 2437MHz (30MHz - 1GHz)



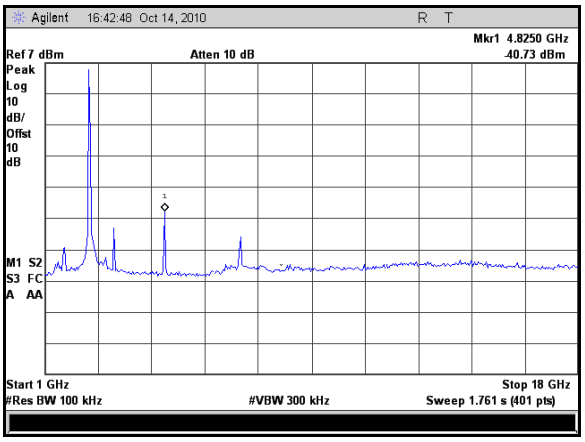
Plot 121. Conducted Spurious Emission, HT20 J5port, 2437MHz (1GHz - 18GHz)



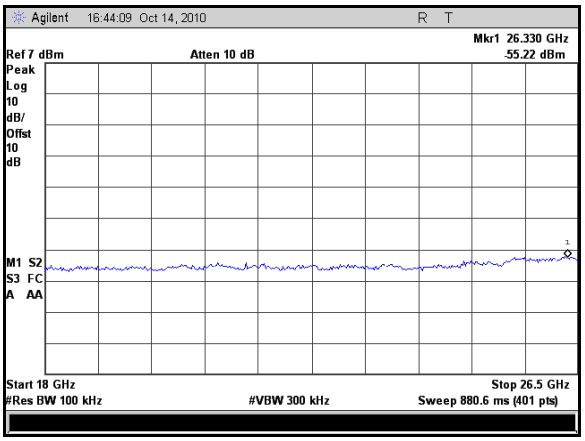
Plot 122. Conducted Spurious Emission, HT20 J5port, 2437MHz (18GHz - 26.5GHz)



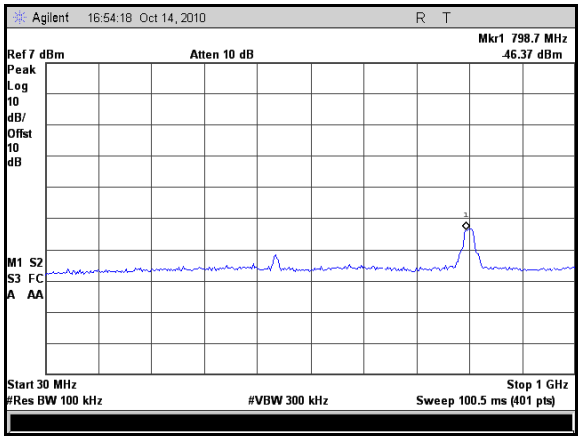
Plot 123. Conducted Spurious Emission, HT20 J5port, 2462MHz (30MHz - 1GHz)



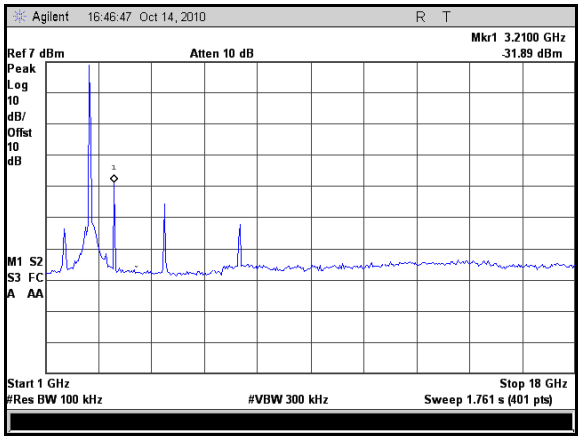
Plot 124. Conducted Spurious Emission, HT20 J5port, 2462MHz (1GHz - 18GHz)



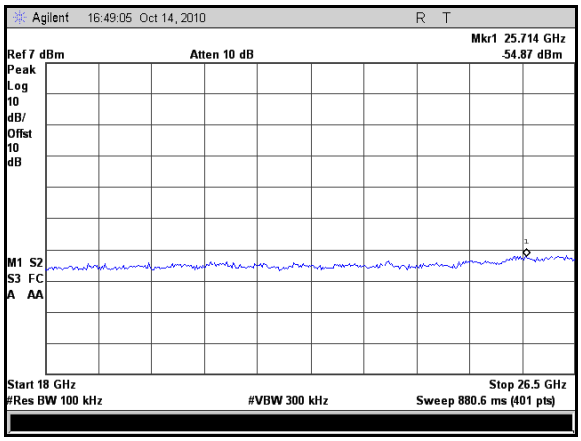
Plot 125. Conducted Spurious Emission, HT20 J5port, 2462MHz (18GHz - 26.5GHz)



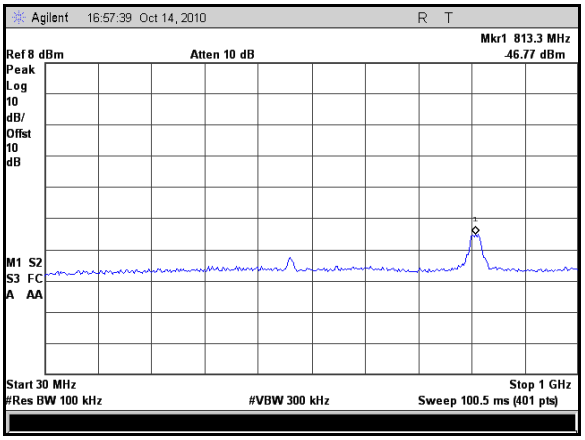
Plot 126. Conducted Spurious Emission, HT20 J6port, 2412MHz (30MHz - 1GHz)



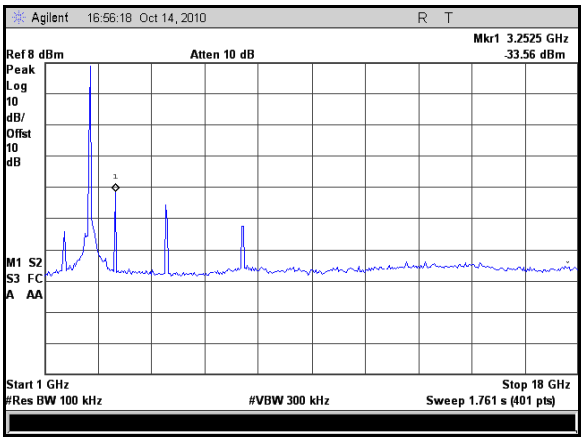
Plot 127. Conducted Spurious Emission, HT20 J6port, 2412MHz (1GHz - 18GHz)



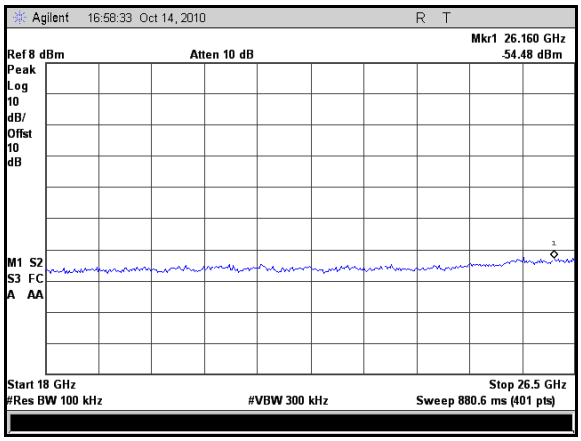
Plot 128. Conducted Spurious Emission, HT20 J6port, 2412MHz (18GHz - 26.5GHz)



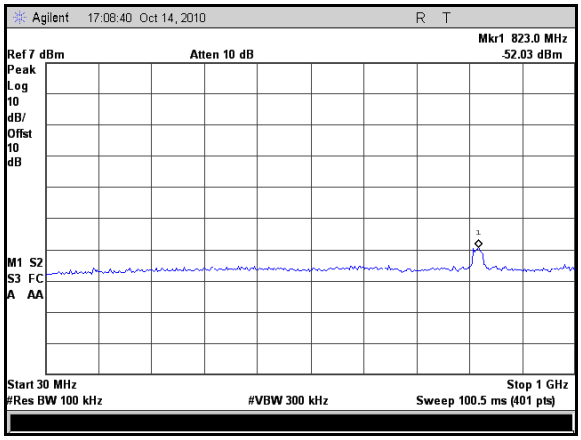
Plot 129. Conducted Spurious Emission, HT20 J6port, 2437MHz (30MHz - 1GHz)



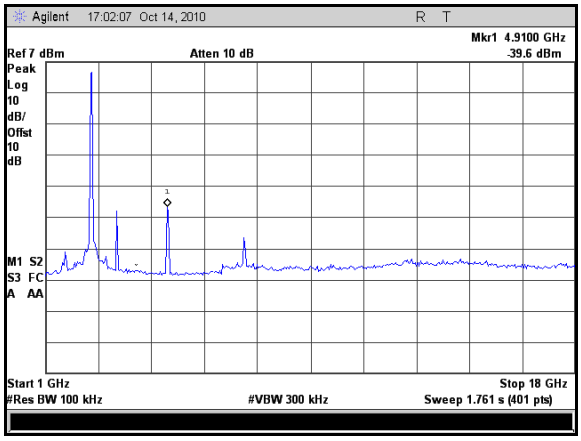
Plot 130. Conducted Spurious Emission, HT20 J6port, 2437MHz (1GHz - 18GHz)



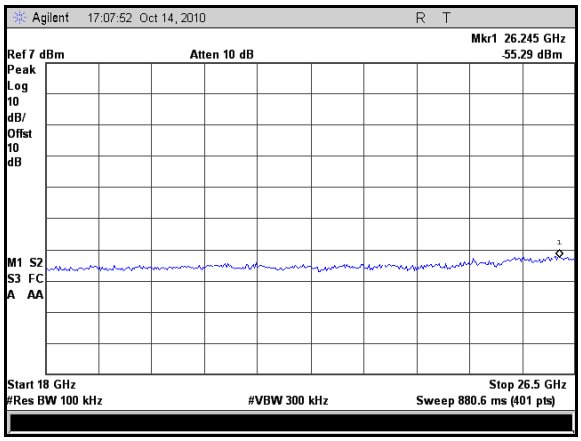
Plot 131. Conducted Spurious Emission, HT20 J6port, 2437MHz (18GHz - 26.5GHz)



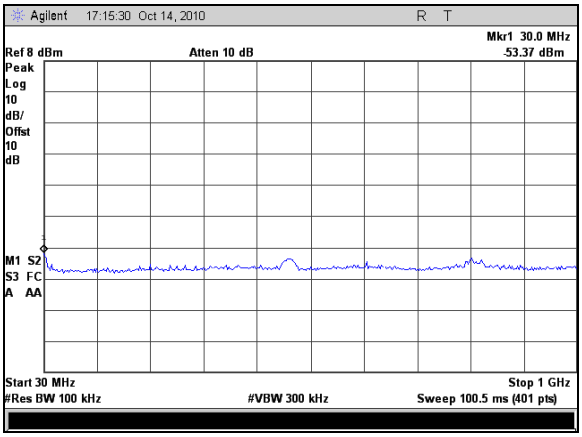
Plot 132. Conducted Spurious Emission, HT20 J6port, 2462MHz (30MHz - 1GHz)



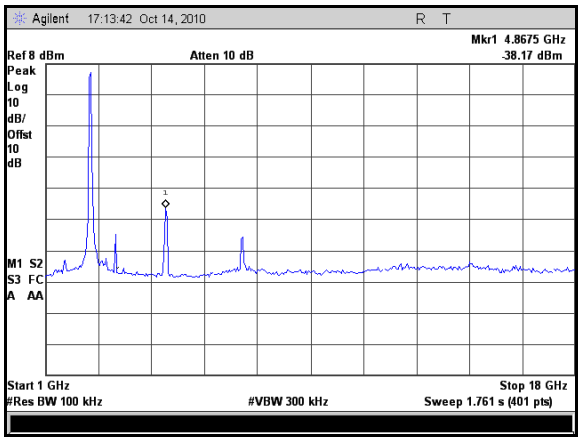
Plot 133. Conducted Spurious Emission, HT20 J6port, 2462MHz (1GHz - 18GHz)



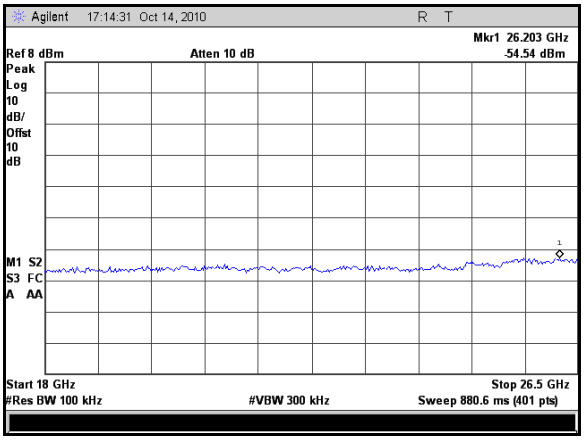
Plot 134. Conducted Spurious Emission, HT20 J6port, 2462MHz (18GHz - 26.5GHz)



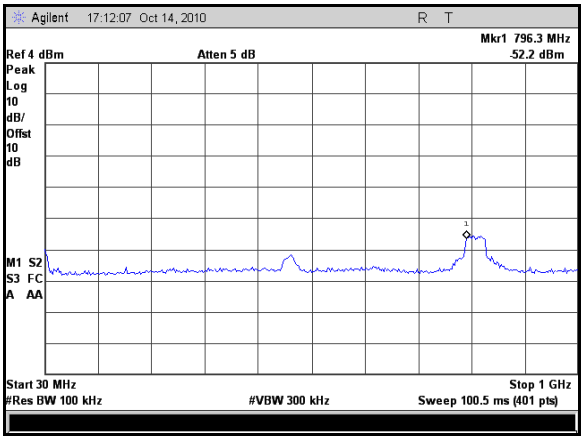
Plot 135. Conducted Spurious Emission, HT40 J5port, 2437MHz (30MHz - 1GHz)



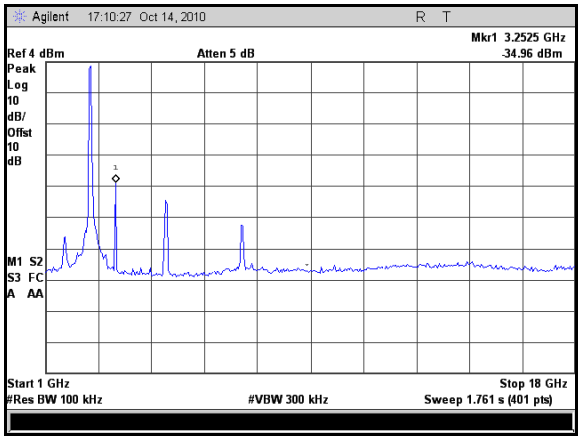
Plot 136. Conducted Spurious Emission, HT40 J5port, 2437MHz (1GHz - 18GHz)



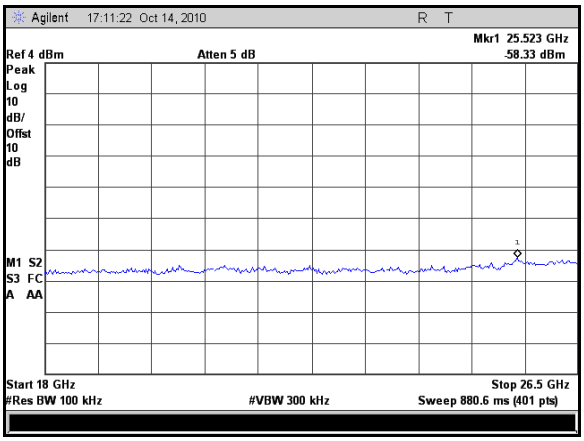
Plot 137. Conducted Spurious Emission, HT40 J5port, 2437MHz (18GHz - 26.5GHz)



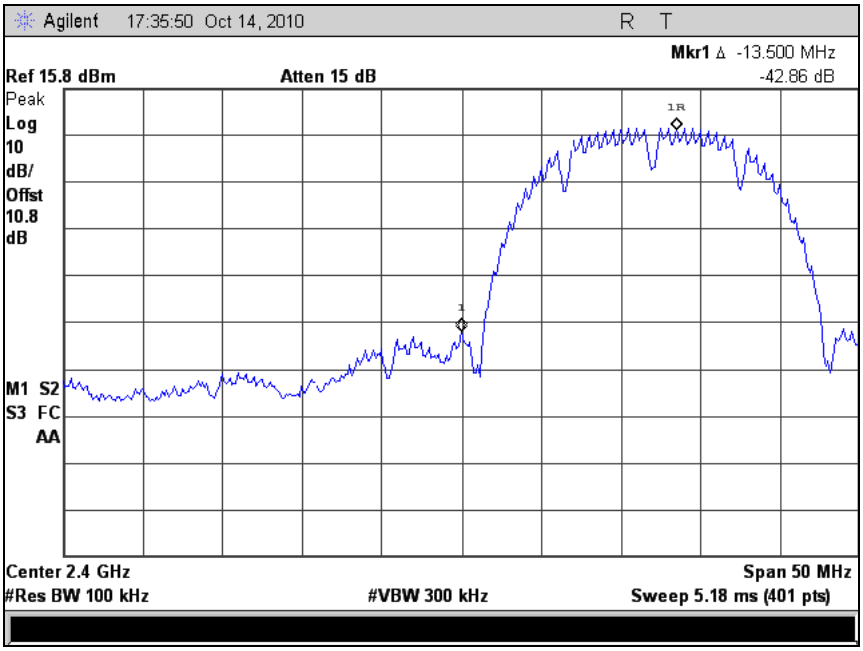
Plot 138. Conducted Spurious Emission, HT40 J6port, 2437MHz (30MHz - 1GHz)



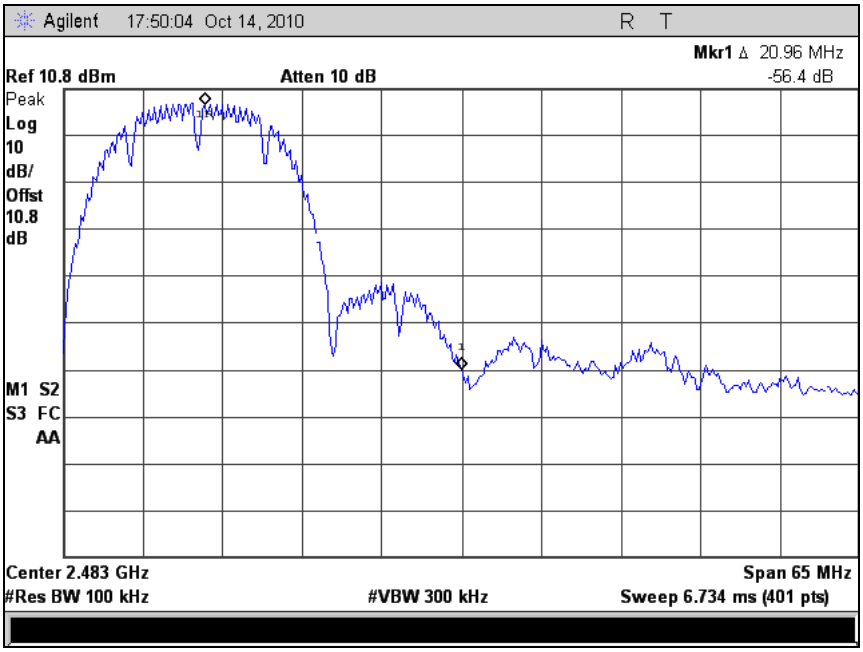
Plot 139. Conducted Spurious Emission, HT40 J6port, 2437MHz (1GHz - 18GHz)



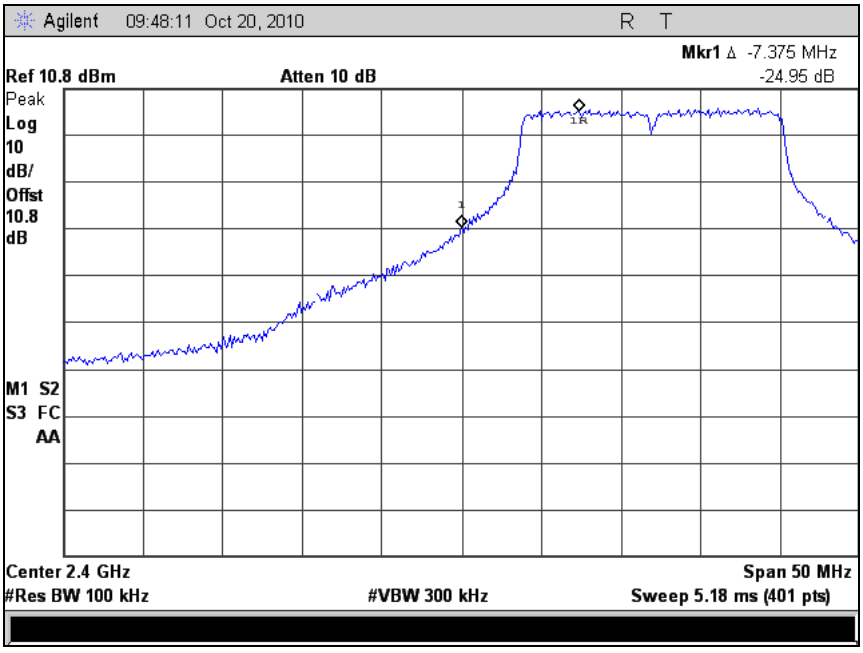
Plot 140. Conducted Spurious Emission, HT40 J6port, 2437MHz (18GHz - 26.5GHz)



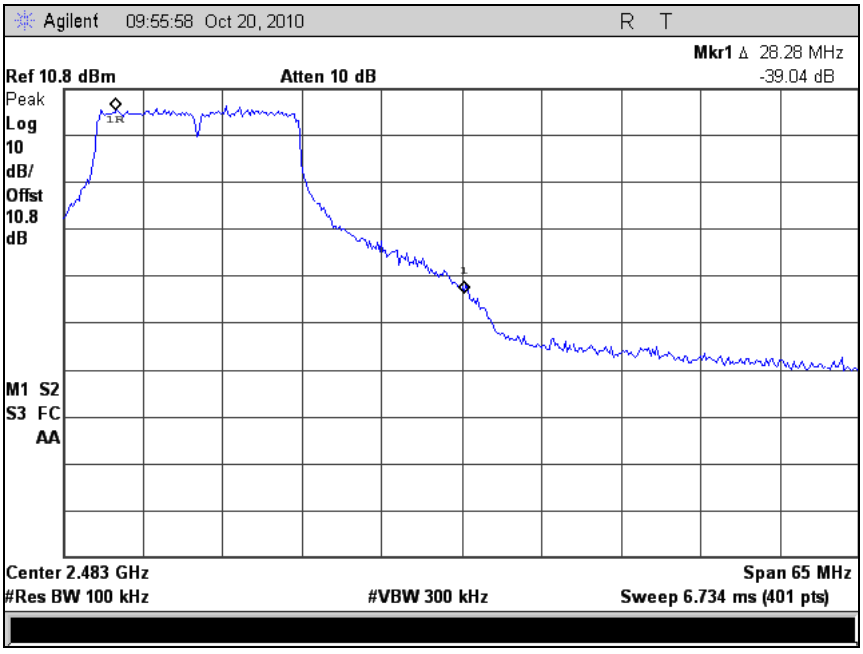
Plot 141. Conducted Band Edge, 802.11b, 2412MHz



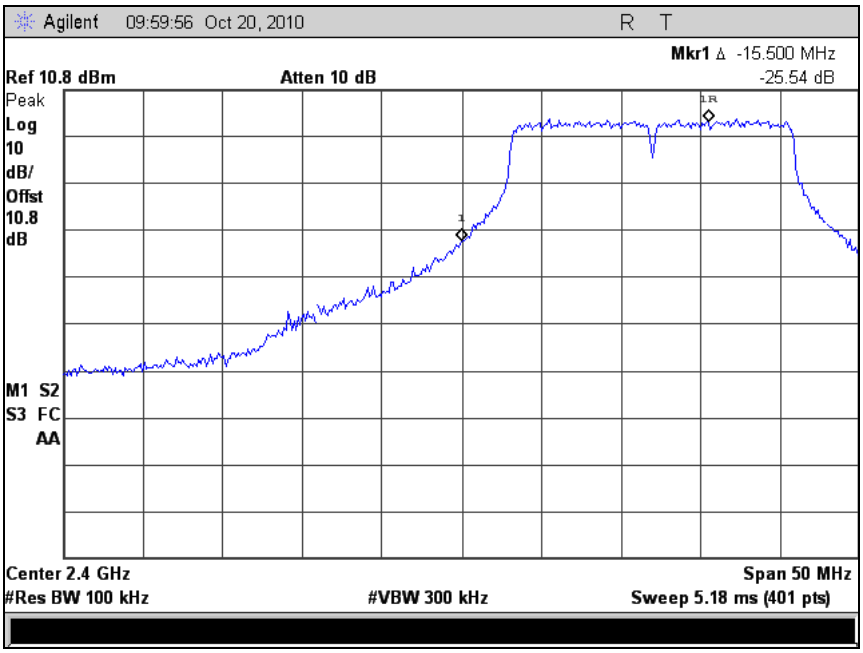
Plot 142. Conducted Band Edge, 802.11b, 2462MHz



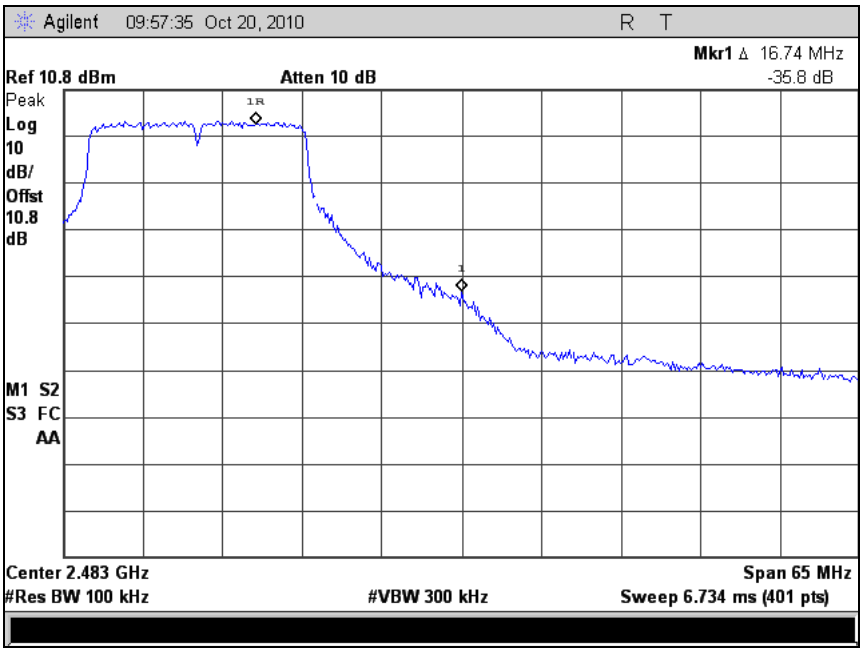
Plot 143. Conducted Band Edge, 802.11g, 2412MHz



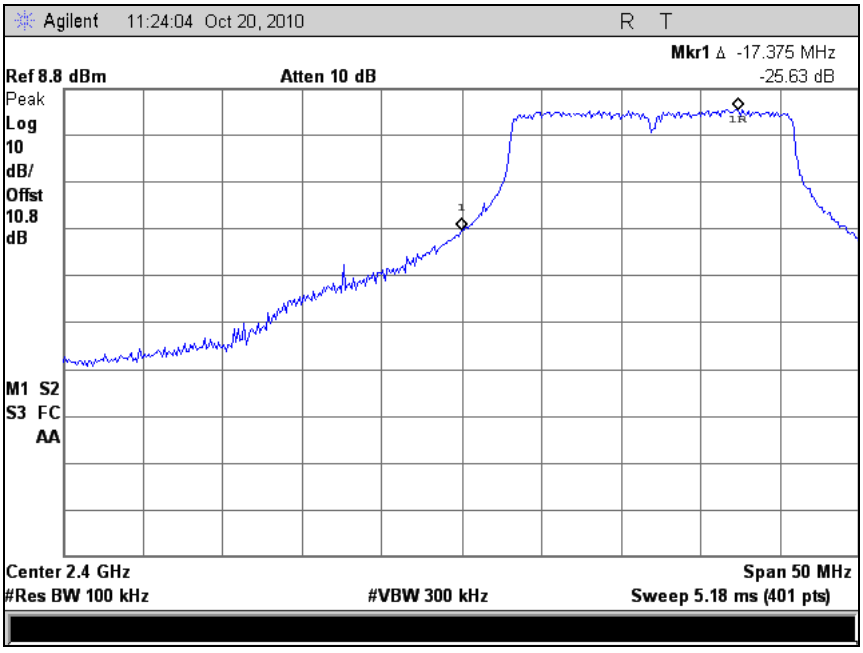
Plot 144. Conducted Band Edge, 802.11g, 2462MHz



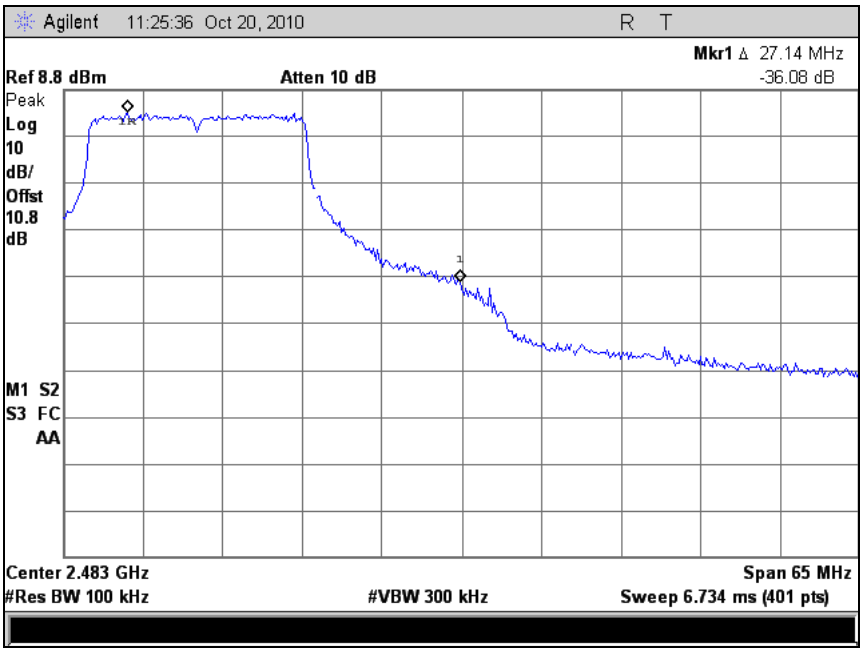
Plot 145. Conducted Band Edge, HT20 J5port, 2412MHz



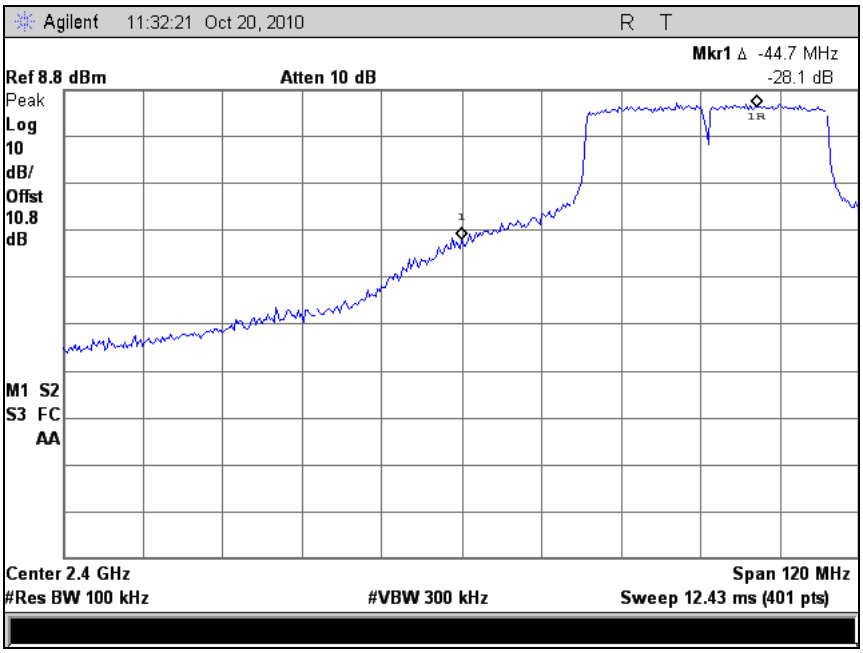
Plot 146. Conducted Band Edge, HT20 J5port, 2462MHz



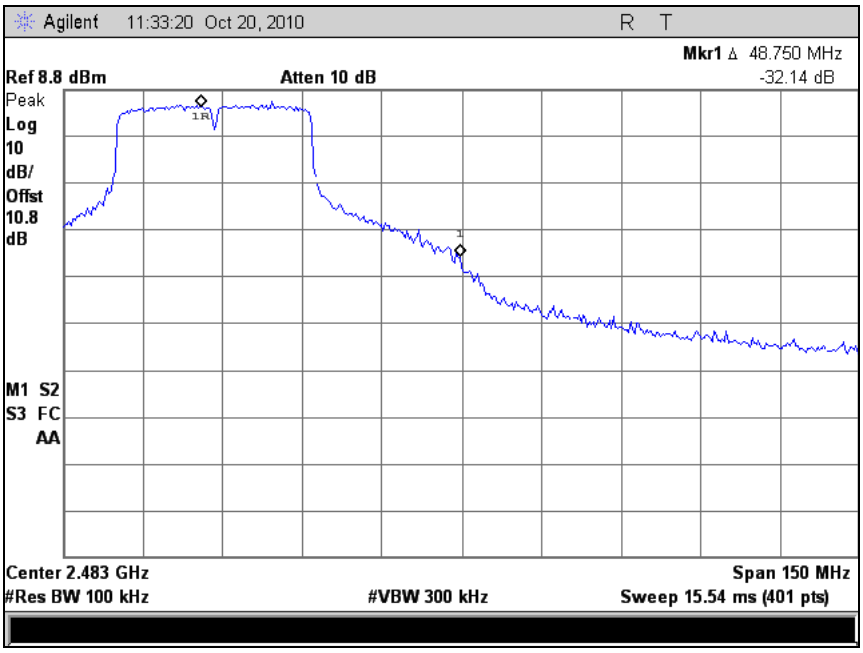
Plot 147. Conducted Band Edge, HT20 J6port, 2412MHz



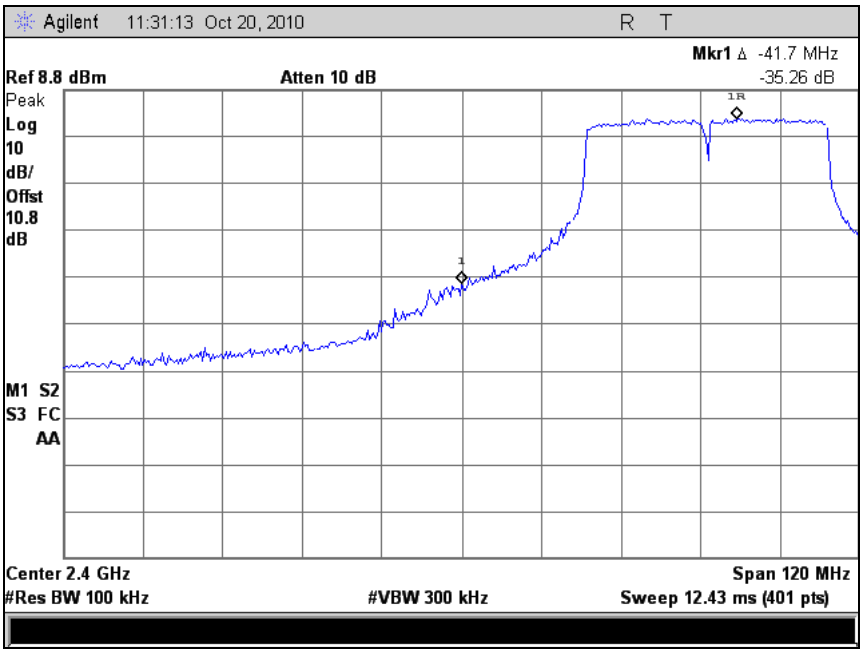
Plot 148. Conducted Band Edge, HT20 J6port, 2462MHz



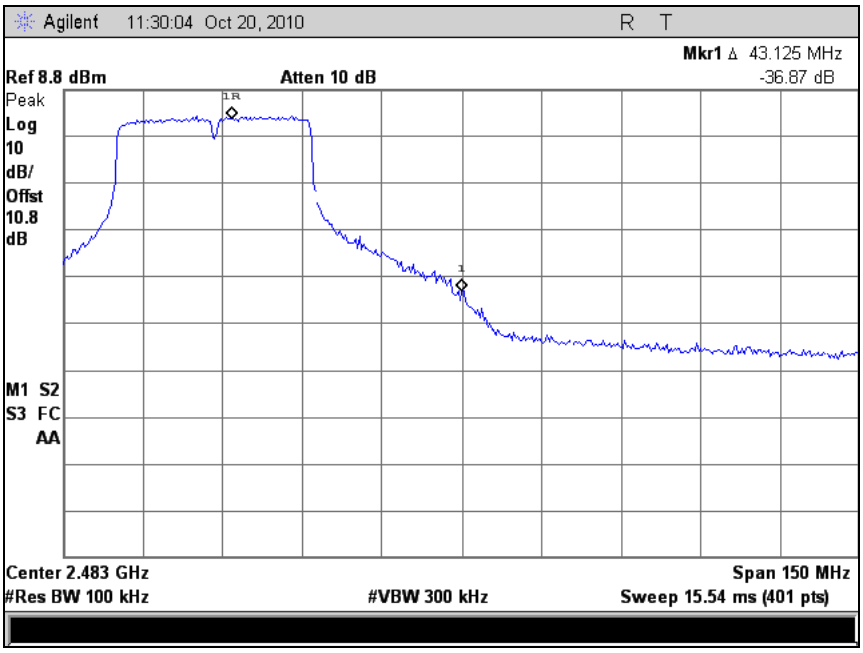
Plot 149. Conducted Band Edge, HT40 J5port, Low Band



Plot 150. Conducted Band Edge, HT40 J5port, High Band



Plot 151. Conducted Band Edge, HT40 J6port, Low Band



Plot 152. Conducted Band Edge, HT40 J6port, High Band

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.247(e) Peak Power Spectral Density

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

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through an attenuator. The power level was set to the maximum level. A RBW of 1 MHz and VBW of 3 MHz were used to determine the peak emissions within the band. The Spectrum analyzer was then set to a RBW of 3 kHz and VBW was set to 10 kHz. The SPAN of the analyzer was set to 1 MHz with a 333.3 second sweep. Measurements were carried out at the low, mid and high channels.

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

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

Test Engineer: Lionel Gabrillo

Test Date: 10/13/10 & 10/14/10

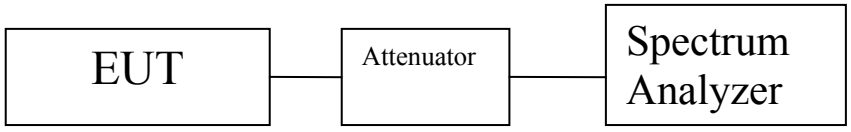


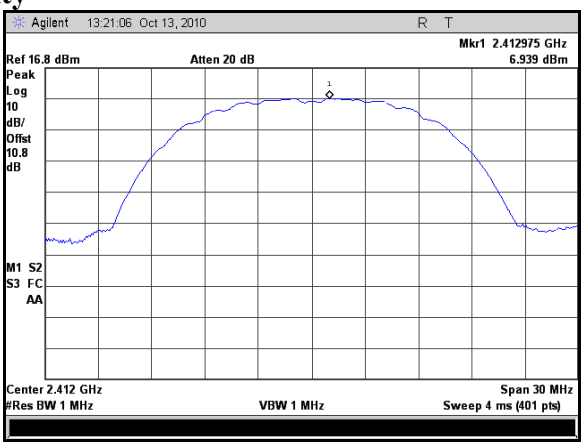
Figure 6. Block Diagram, Peak Power Spectral Density Test Setup

Peak Power Spectral Density Test Results

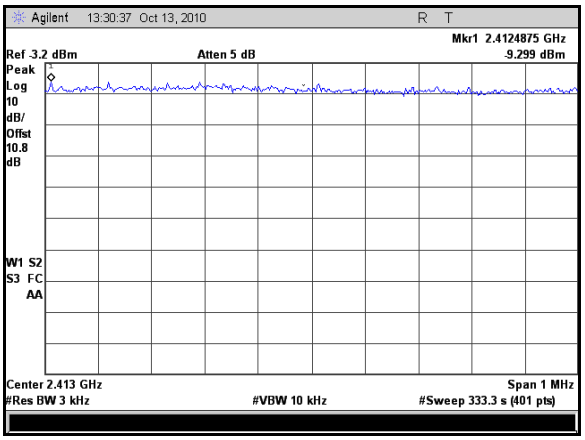
Peak Power Spectral Density				
Carrier Channel	**Frequency (MHz)**	**Measured PPSD (dBm)**	**Limit (dBm)**	**Margin (dB)**
802.11b				
1	2412	-9.29	8	-17.29
2	2417	-6.48	8	-14.48
3	2437	-5.89	8	-13.89
4	2457	-5.85	8	-13.85
5	2462	-7.16	8	-15.16
802.11g				
1	2412	-6.20	8	-14.2
2	2417	-4.82	8	-12.82
3	2437	-5.14	8	-13.14
4	2457	-4.17	8	-12.17
5	2462	-6.43	8	-14.43
HT20 J5 Port				
1	2412	-5.75	8	-13.75
3	2437	-5.13	8	-13.13
5	2462	-7.60	8	-15.6
HT20 J6 Port				
1	2412	-6.80	8	-14.8
3	2437	-3.31	8	-11.31
5	2462	-7.63	8	-15.63
HT20 Combined				
1	2412	-3.19	8	-11.19
3	2437	0.20	8	-7.8
5	2462	-3.72	8	-11.72
HT40 J5 Port				
3	2437	-5.85	8	-13.85
HT40 J6 Port				
3	2437	-7.02	8	-15.02
HT40 Combined				
3	2437	-4.65	8	-12.65

Table 37. Spectral Density, Test Results

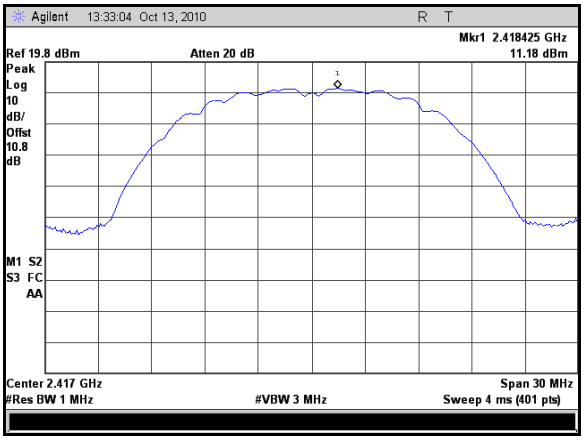
Peak Power Spectral Density



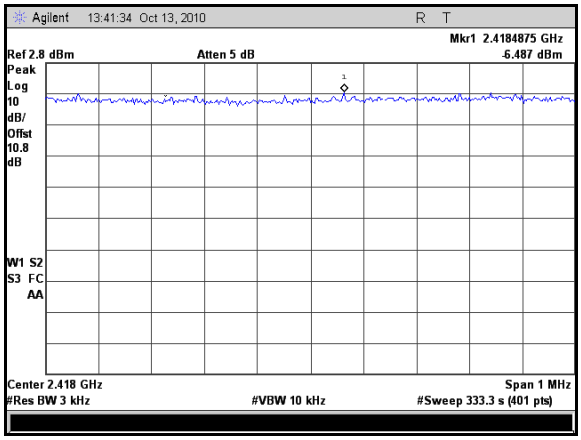
Plot 153. Power Spectral Density, 802.11b, 2412MHz, Peak



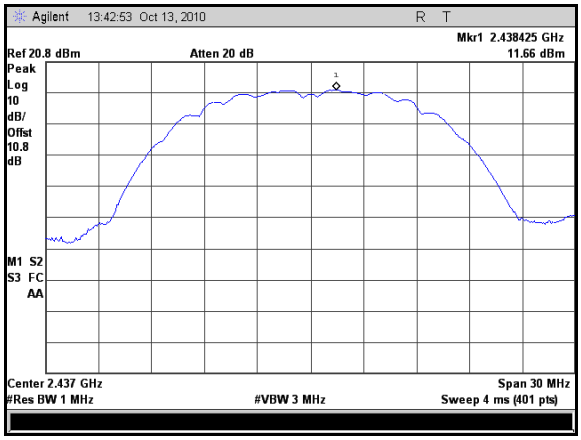
Plot 154. Power Spectral Density, 802.11b, 2412MHz



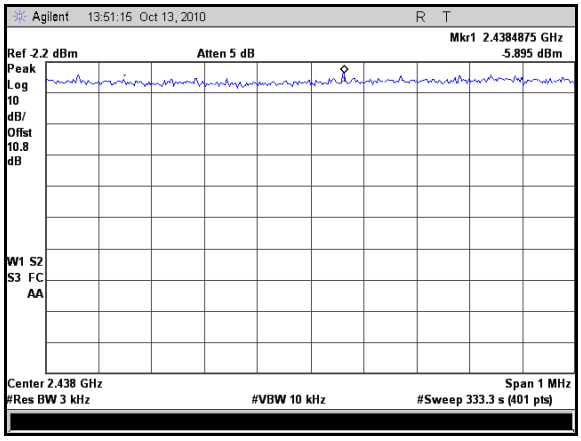
Plot 155. Power Spectral Density, 802.11b, 2417MHz, Peak



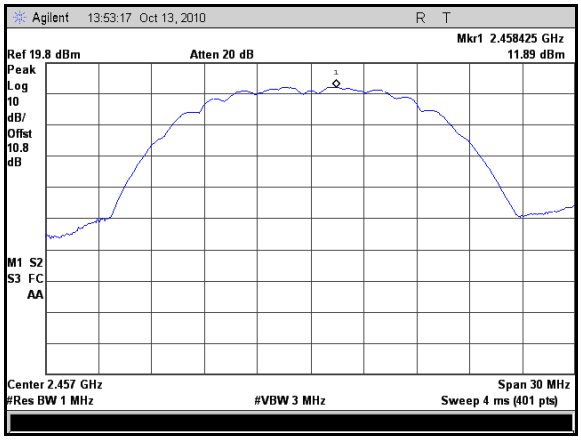
Plot 156. Power Spectral Density, 802.11b, 2417MHz



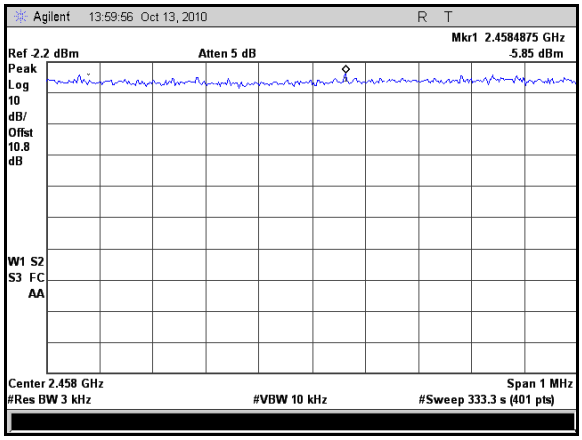
Plot 157. Power Spectral Density, 802.11b, 2437MHz, Peak



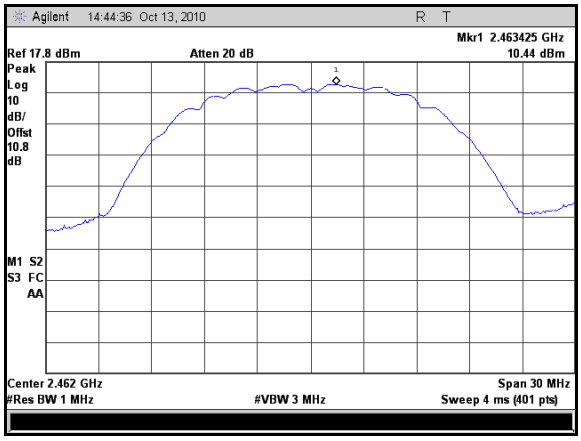
Plot 158. Power Spectral Density, 802.11b, 2437MHz



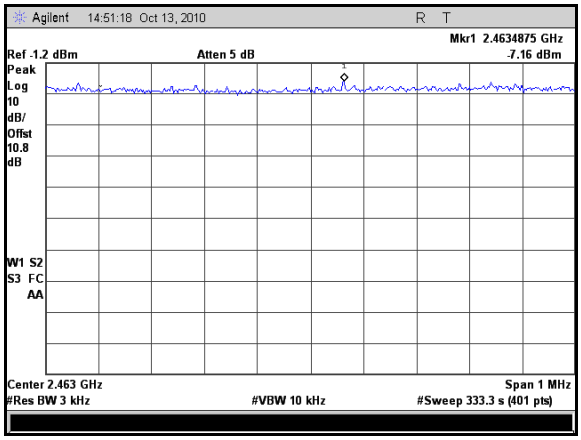
Plot 159. Power Spectral Density, 802.11b, 2457MHz, Peak



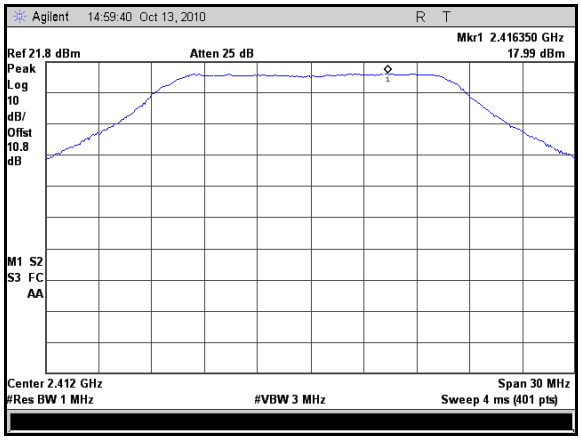
Plot 160. Power Spectral Density, 802.11b, 2457MHz



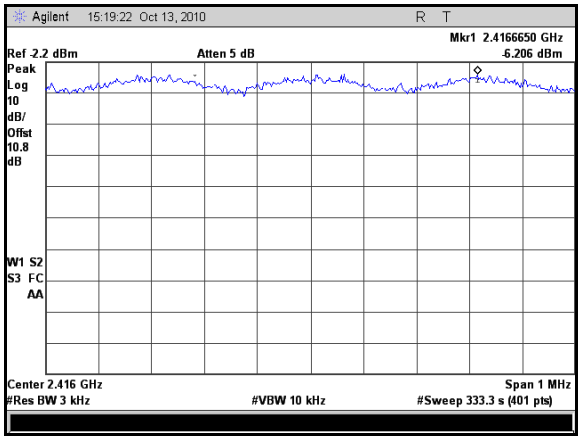
Plot 161. Power Spectral Density, 802.11b, 2462MHz, Peak



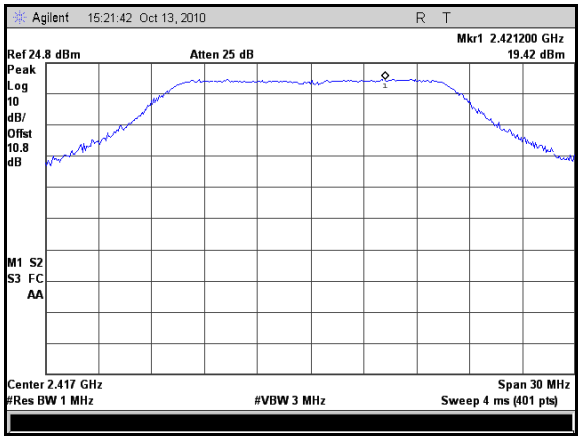
Plot 162. Power Spectral Density, 802.11b, 2462MHz



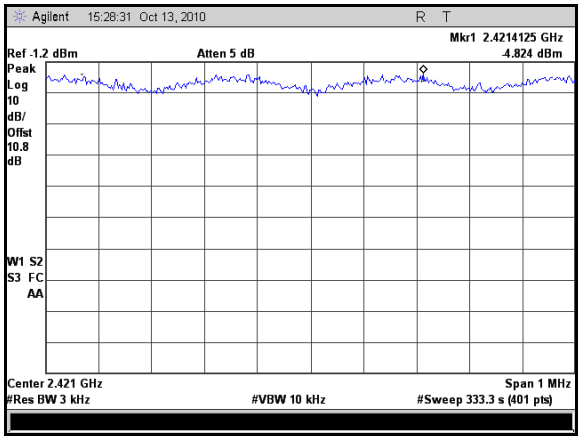
Plot 163. Power Spectral Density, 802.11g, 2412MHz, Peak



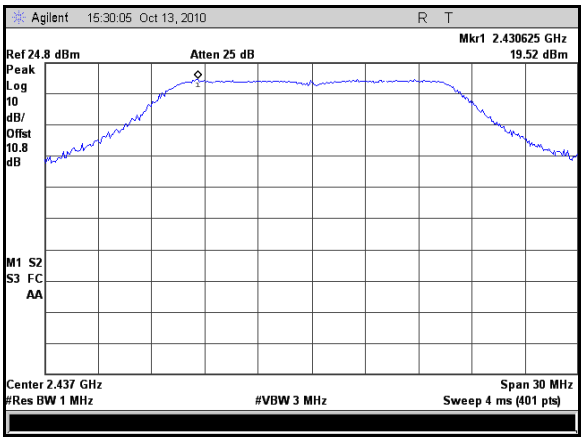
Plot 164. Power Spectral Density, 802.11g, 2412MHz



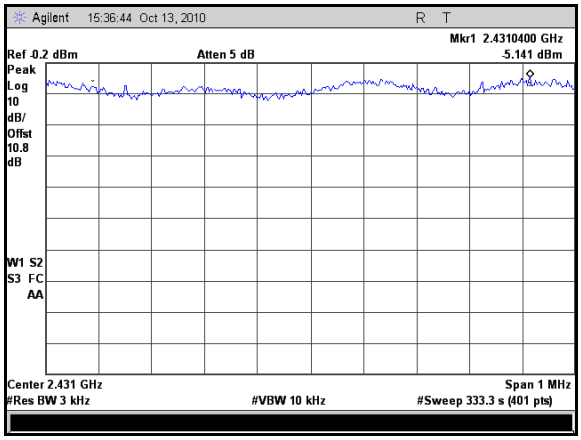
Plot 165. Power Spectral Density, 802.11g, 2417MHz, Peak



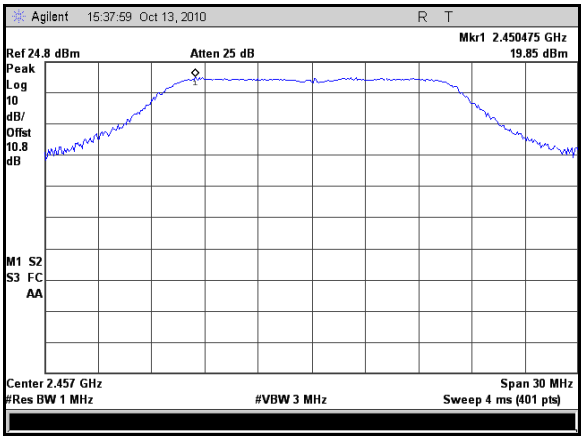
Plot 166. Power Spectral Density, 802.11g, 2417MHz



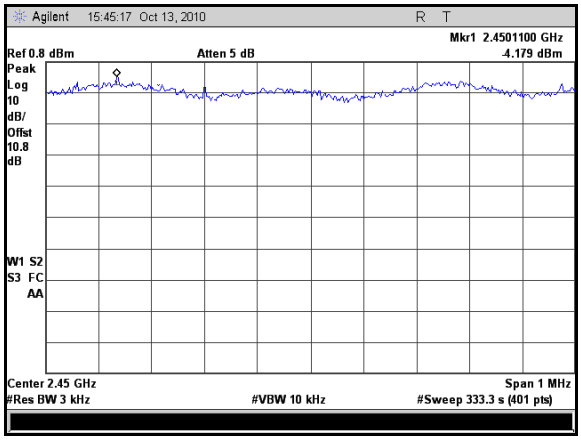
Plot 167. Power Spectral Density, 802.11g, 2437MHz, Peak



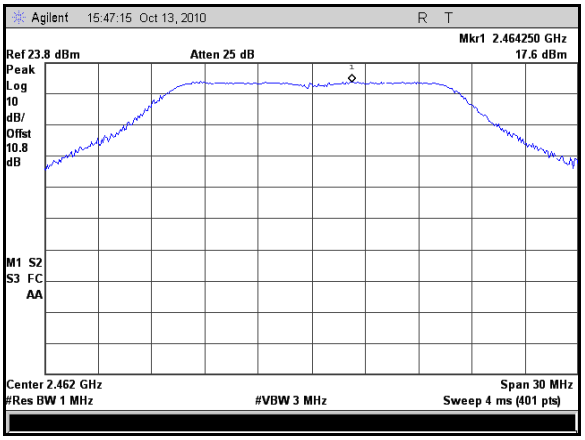
Plot 168. Power Spectral Density, 802.11g, 2437MHz



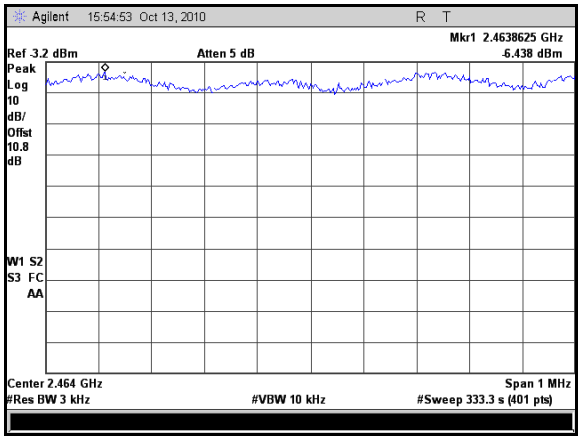
Plot 169. Power Spectral Density, 802.11g, 2457MHz, Peak



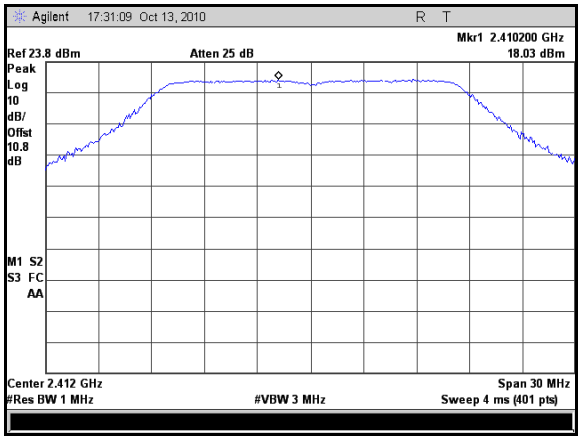
Plot 170. Power Spectral Density, 802.11g, 2457MHz



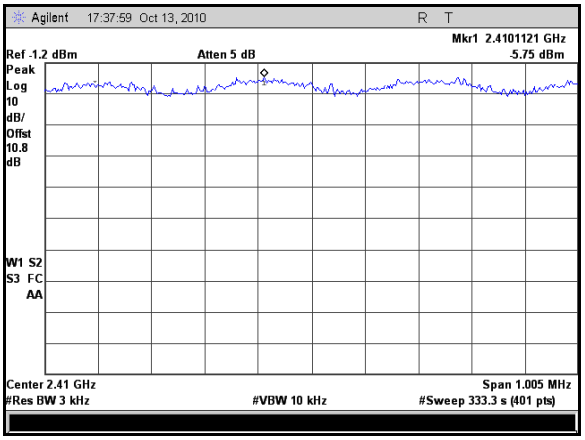
Plot 171. Power Spectral Density, 802.11g, 2462MHz, Peak



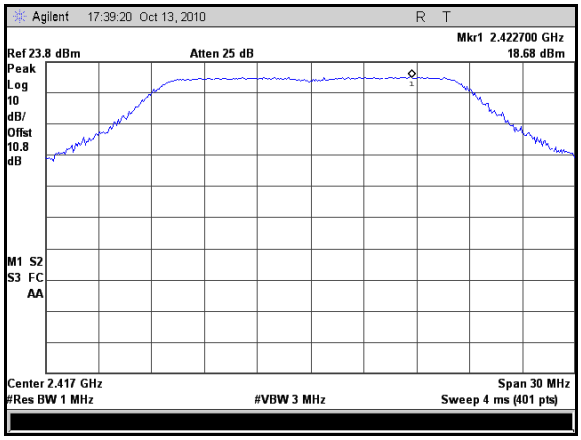
Plot 172. Power Spectral Density, 802.11g, 2462MHz



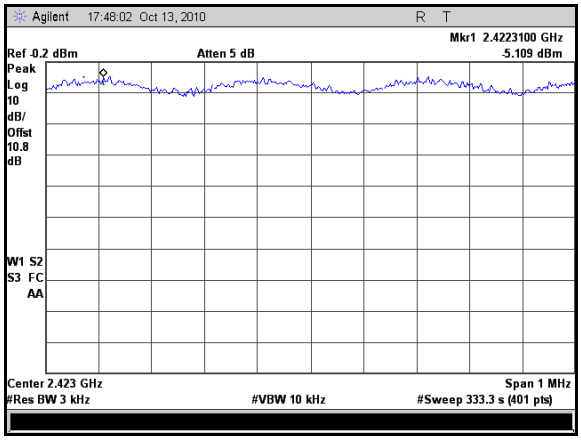
Plot 173. Power Spectral Density, HT20 J5port, 2412MHz, Peak



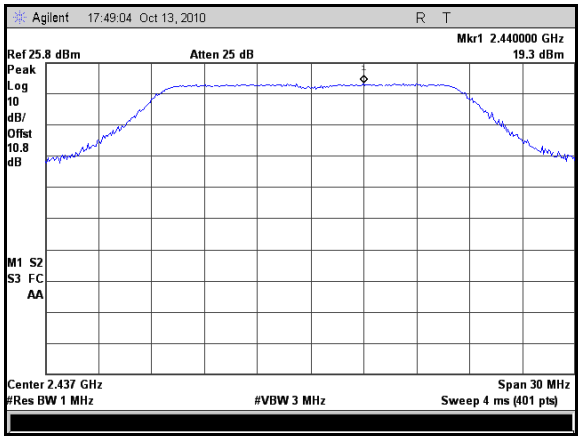
Plot 174. Power Spectral Density, HT20 J5port, 2412MHz



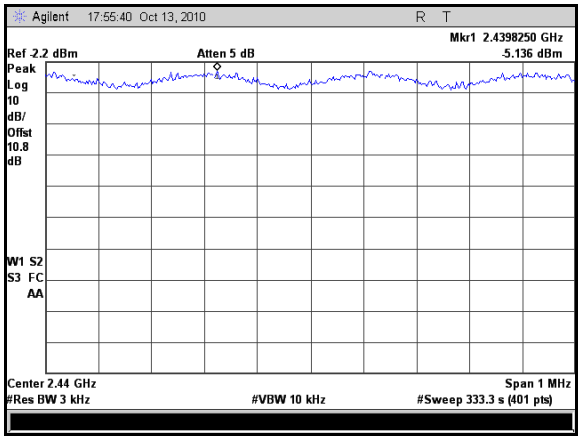
Plot 175. Power Spectral Density, HT20 J5port, 2417MHz, Peak



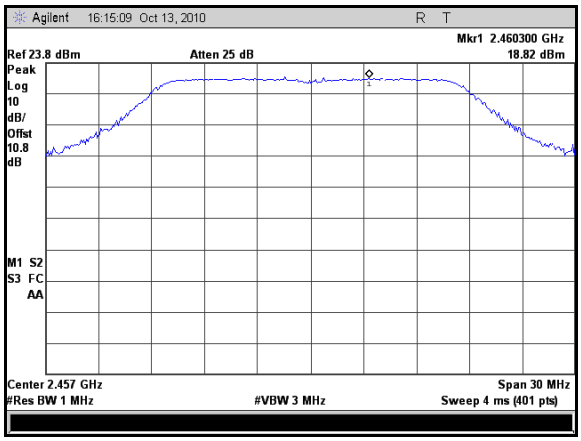
Plot 176. Power Spectral Density, HT20 J5port, 2417MHz



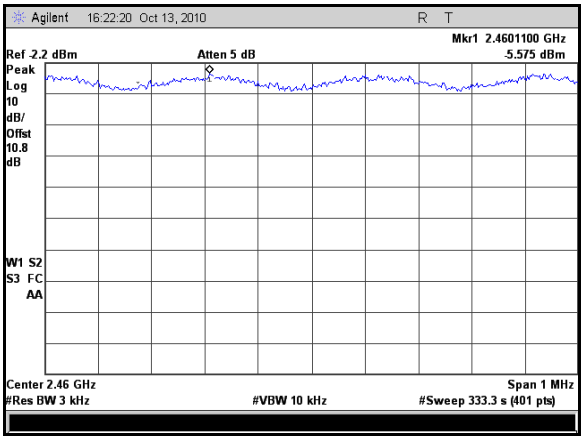
Plot 177. Power Spectral Density, HT20 J5port, 2437MHz, Peak



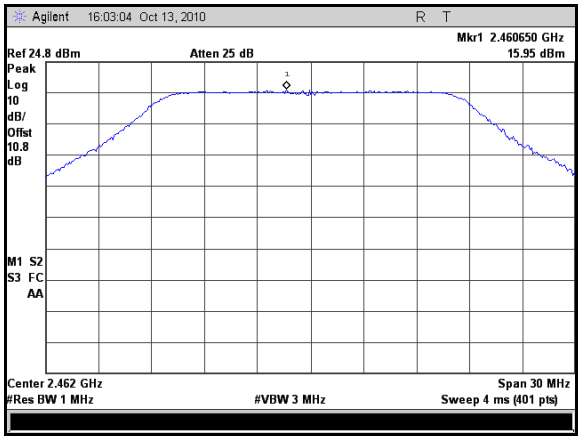
Plot 178. Power Spectral Density, HT20 J5port, 2437MHz



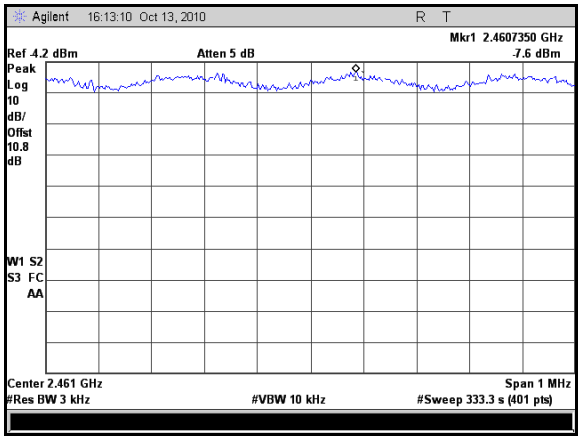
Plot 179. Power Spectral Density, HT20 J5port, 2457MHz, Peak



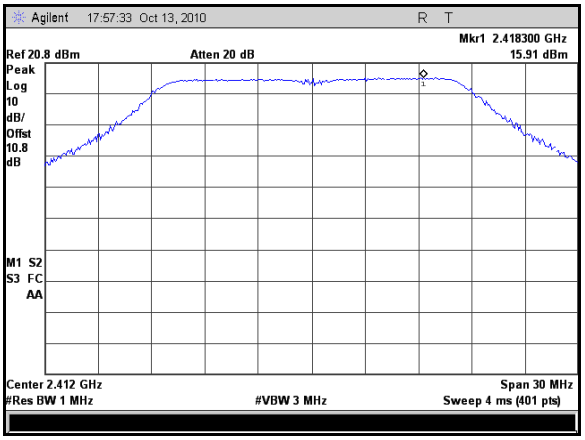
Plot 180. Power Spectral Density, HT20 J5port, 2457MHz



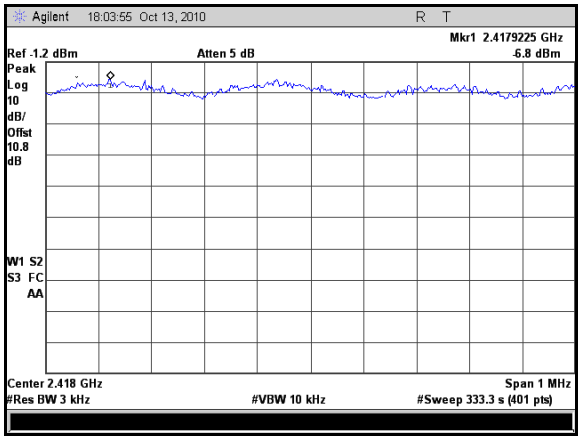
Plot 181. Power Spectral Density, HT20 J5port, 2462MHz, Peak



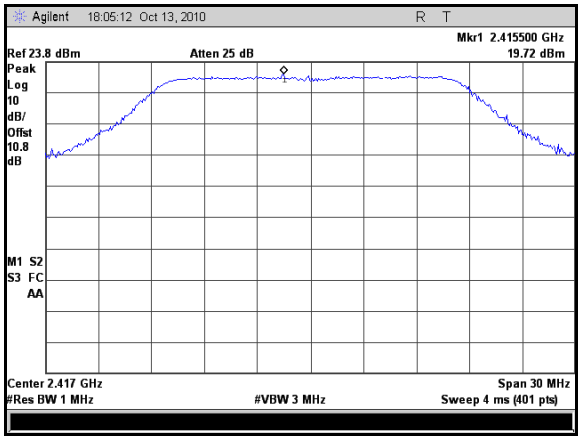
Plot 182. Power Spectral Density, HT20 J5port, 2462MHz



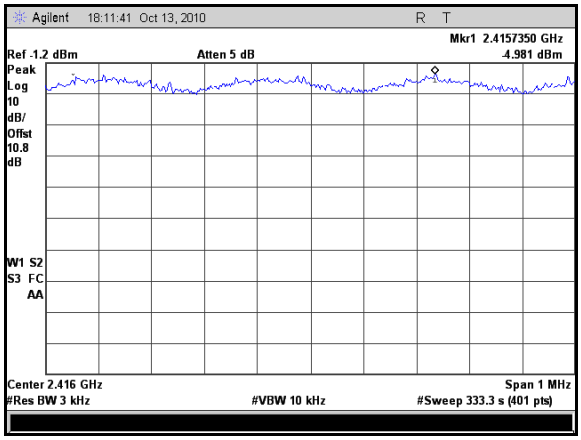
Plot 183. Power Spectral Density, HT20 J6port, 2412MHz, Peak



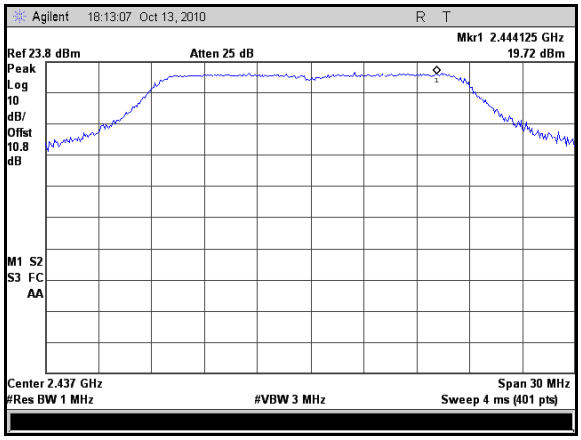
Plot 184. Power Spectral Density, HT20 J6port, 2412MHz



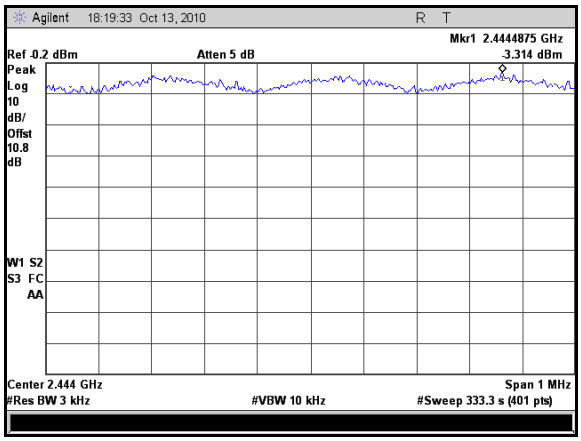
Plot 185. Power Spectral Density, HT20 J6port, 2417MHz, Peak



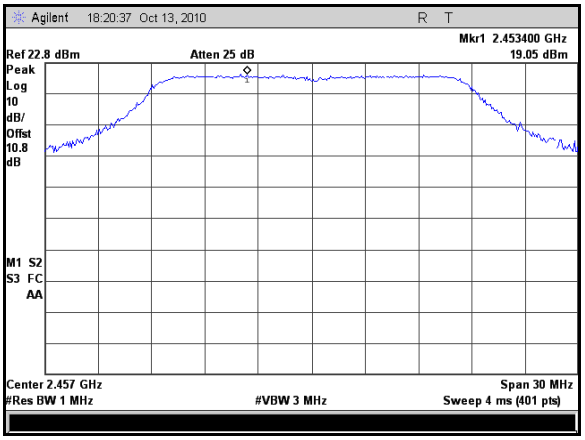
Plot 186. Power Spectral Density, HT20 J6port, 2417MHz



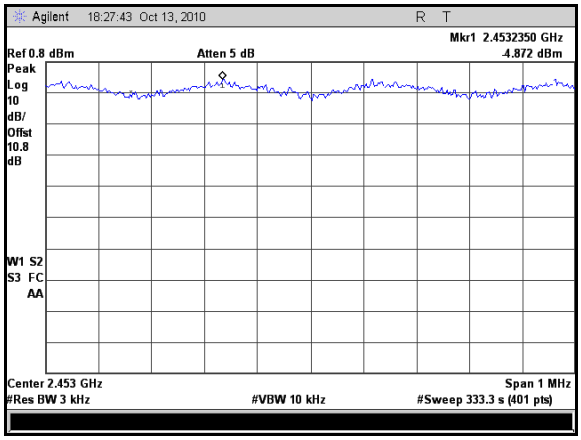
Plot 187. Power Spectral Density, HT20 J6port, 2437MHz, Peak



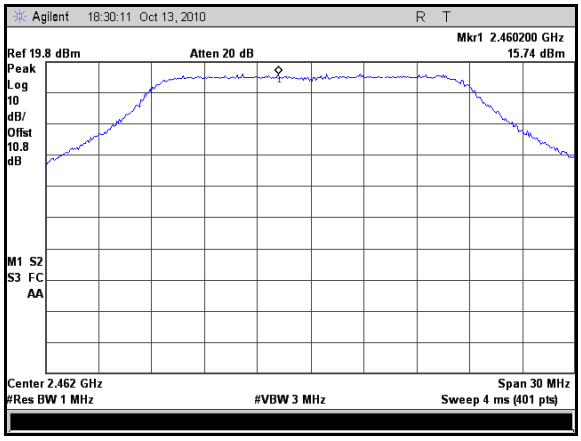
Plot 188. Power Spectral Density, HT20 J6port, 2437MHz



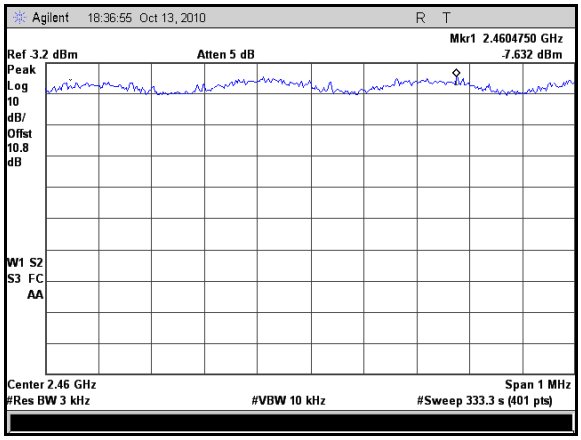
Plot 189. Power Spectral Density, HT20 J6port, 2457MHz, Peak



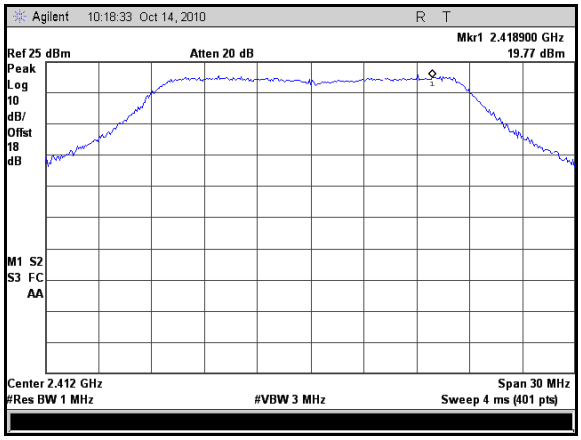
Plot 190. Power Spectral Density, HT20 J6port, 2457MHz



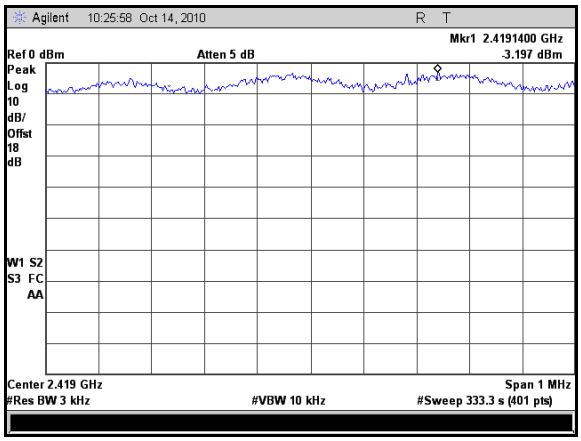
Plot 191. Power Spectral Density, HT20 J6port, 2462MHz, Peak



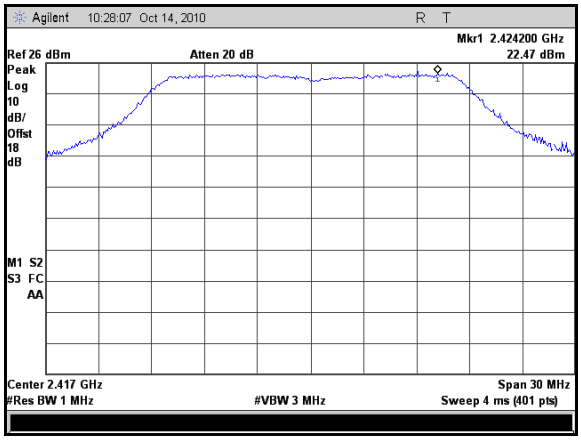
Plot 192. Power Spectral Density, HT20 J6port, 2462MHz



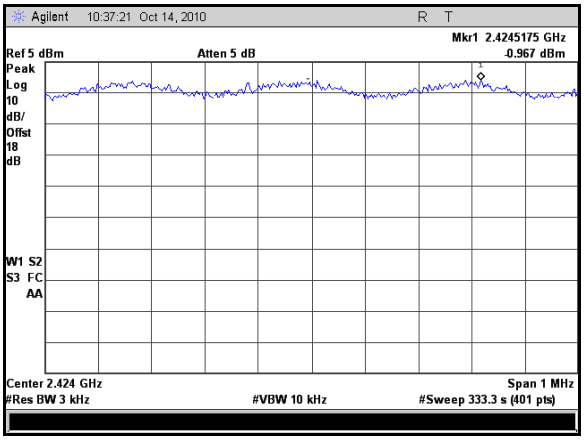
Plot 193. Power Spectral Density, HT20 J5+J6 ports, 2412MHz, Peak



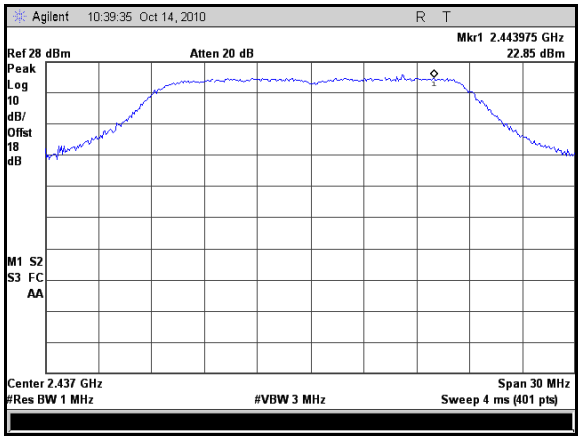
Plot 194. Power Spectral Density, HT20 J5+J6 ports, 2412MHz



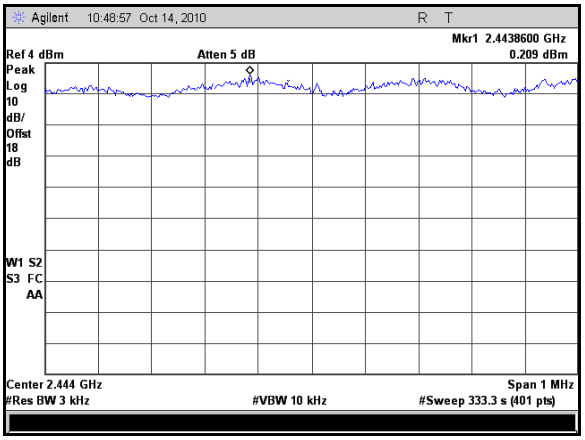
Plot 195. Power Spectral Density, HT20 J5+J6 ports, 2417MHz, Peak



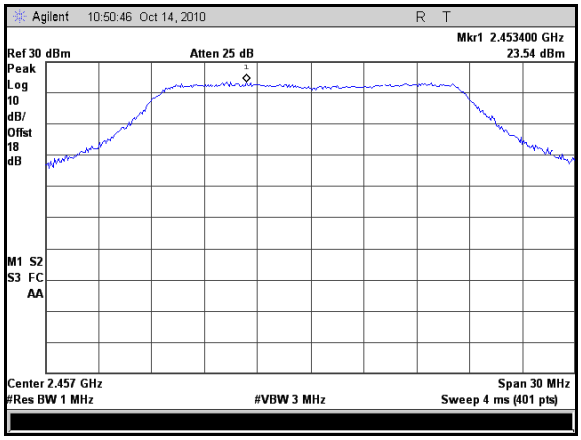
Plot 196. Power Spectral Density, HT20 J5+J6 ports, 2417MHz



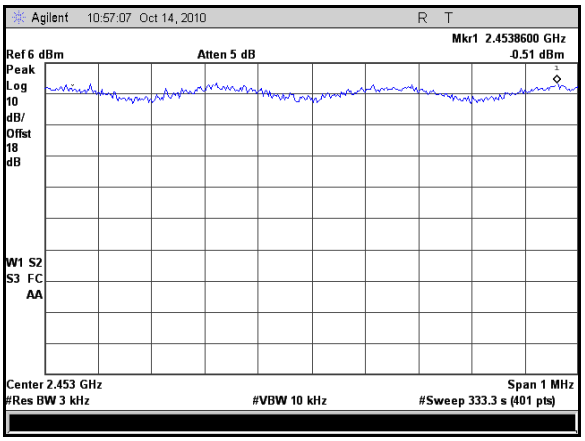
Plot 197. Power Spectral Density, HT20 J5+J6 ports, 2437MHz, Peak



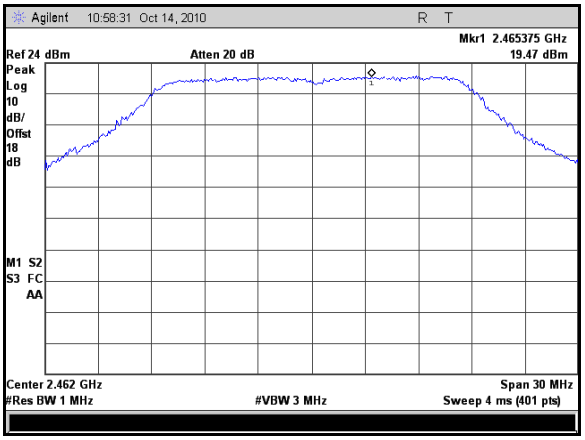
Plot 198. Power Spectral Density, HT20 J5+J6 ports, 2437MHz



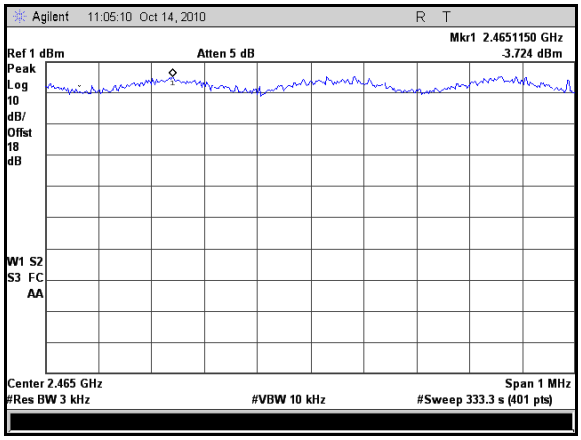
Plot 199. Power Spectral Density, HT20 J5+J6 ports, 2457MHz, Peak



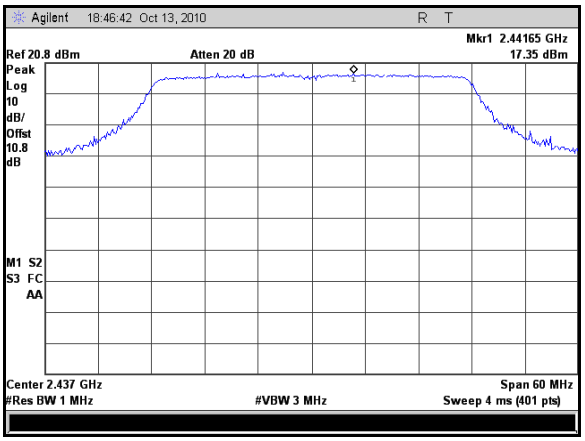
Plot 200. Power Spectral Density, HT20 J5+J6 ports, 2457MHz



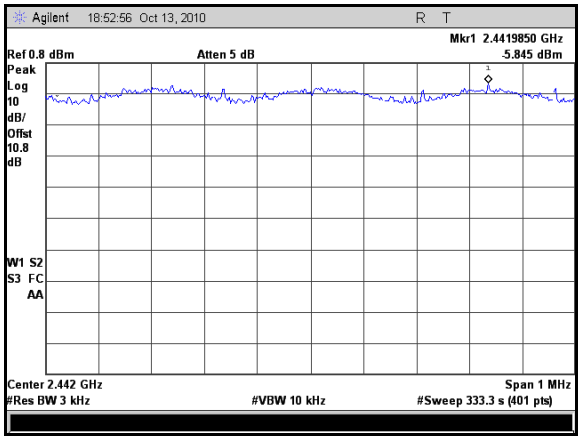
Plot 201. Power Spectral Density, HT20 J5+J6 ports, 2462MHz, Peak



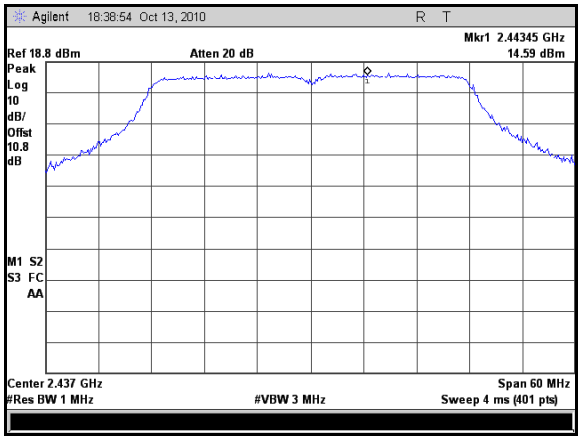
Plot 202. Power Spectral Density, HT20 J5+J6 ports, 2462MHz



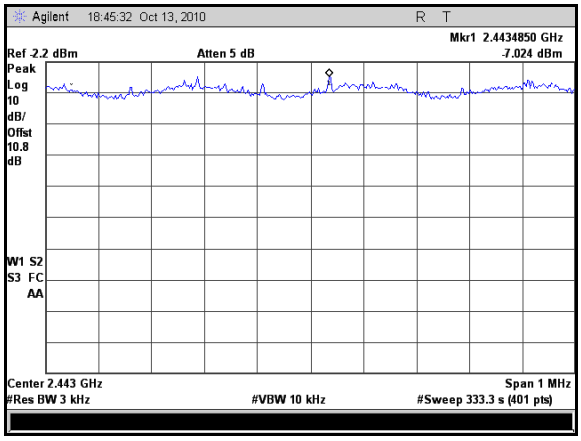
Plot 203. Power Spectral Density, HT40 J5port, 2437MHz, Peak



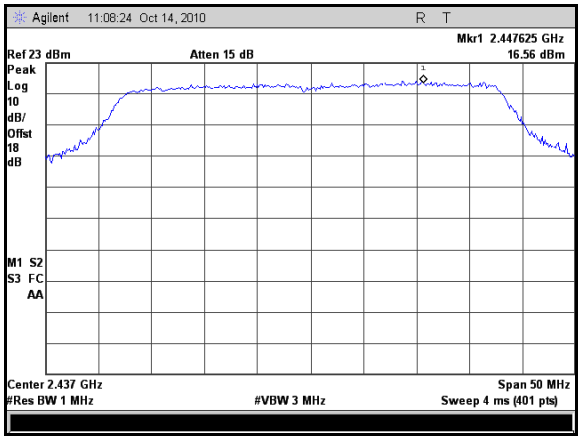
Plot 204. Power Spectral Density, HT40 J5port, 2437MHz



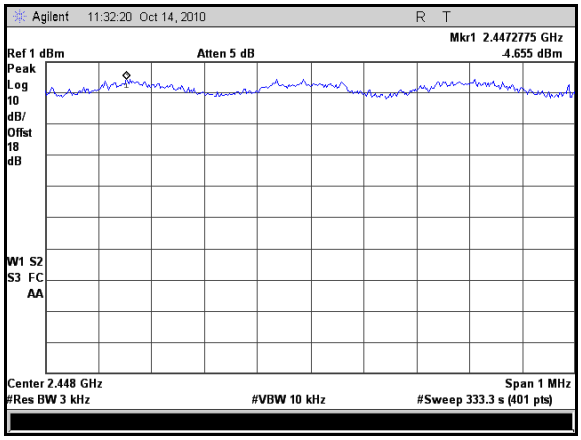
Plot 205. Power Spectral Density, HT40 J6port, 2437MHz, Peak



Plot 206. Power Spectral Density, HT40 J6port, 2437MHz



Plot 207. Power Spectral Density, HT40 J5+J6 ports, 2437MHz, Peak



Plot 208. Power Spectral Density, HT40 J5+J6 ports, 2437MHz

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2501	EMI RECEIVER	ROHDE&SCHWARZ	ESU40	06/03/2010	06/03/2011
1S2484	BILOG ANTENNA	TESEQ	CBL6112D	SEE NOTE	
1S2399	TURNTABLE CONTROLLER	SUNOL SCIENCE	SC99V	NOT REQUIRED	
1S2522	DIGITAL THERMO/HYGROMETER	CONTROL COMPANY	11-661-7D	11/11/2009	11/11/2010
1S2482	5M CHAMBER	PANASHIELD	N/A	10/16/2009	11/16/2010
1S2603	DOUBLE RIDGED WAVEGUIDE HORN	ETS-LINGREN	3117	04/09/2009	04/09/2011
1S2121	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	SEE NOTE	
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13146	SEE NOTE	
1S2583	SPECTRUM ANALYZER	AGILENT	E4447A	01/26/2010	01/26/2011
1S2460	ANALYZER, SPECTRUM 9 KHZ-40GHZ	AGILENT	E4407B	07/13/2010	07/13/2011
1S2229	TEMPERATURE CHAMBER	TENNY ENGINEERING	T63C	02/19/2010	02/19/2011
1S2128	HARMONIC MIXER	HEWLETT PACKARD	11970A	11/22/2008	11/22/2010
1S2129	HARMONIC MIXER	HEWLETT PACKARD	11970K	11/22/2008	11/22/2010

Table 38. Test Equipment List

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

V. Certification & User's Manual Information

Certification & User's Manual Information

A. Certification Information

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

§ 2.801 Radio-frequency device defined.

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

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

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

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

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

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

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

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

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

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

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

(i) Compliance testing;

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

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

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

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

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

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

Certification & User's Manual Information

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

§ 2.901 Basis and Purpose

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

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

§ 2.907 Certification.

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

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

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

Certification & User's Manual Information

§ 2.948 Description of measurement facilities.

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

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

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

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

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

Certification & User's Manual Information

Label and User's Manual Information

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

§ 15.19 Labeling requirements.

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

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

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

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

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

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

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

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

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

§ 15.21 Information to user.

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

Verification & User's Manual Information

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

§ 15.105 Information to the user.

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

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

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

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

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

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

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

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 4, February 2004:

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 user's manual.

Labeling Requirements:

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

> This Class [2] digital apparatus complies with Canadian ICES-003.
>
> Cet appareil numérique de la classe [1] est conforme à la norme NMB-003 du Canada.

[2] Insert either A or B but not both as appropriate for the equipment requirements.

End of Report