



**MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*  
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January 16, 2009

Motorola, Inc.  
5200 Franklin Drive #100  
Pleasanton CA, 94588

Dear John Marum,

Enclosed is the EMC Wireless test report for compliance testing of the Motorola, Inc., MC-802 Wall Plate 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 Class A 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.

Jennifer Warnell  
Documentation Department

Reference: (\Motorola, Inc.\EMCS81204-FCC247 Rev 4)

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## Electromagnetic Compatibility Criteria Test Report

for the

**Motorola, Inc.**  
**Model MC-802 Wall Plate**

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

**MET Report: EMCS81204-FCC247 Rev 4**

January 16, 2009

**Prepared For:**

**Motorola, Inc.**  
**5200 Franklin Drive #100**  
**Pleasanton CA, 94588**

**Prepared By:**  
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## Electromagnetic Compatibility Criteria Test Report

for the

**Motorola, Inc.**  
**Model MC-802 Wall Plate**

### Tested Under

the FCC Certification Rules  
contained in  
Title 47 of the CFR, Part 15.247, Subpart C  
for Intentional Radiators



Anderson Soungpanya, Project Engineer  
Electromagnetic Compatibility Lab



Jennifer Warnell  
Documentation Department

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of 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
Ø	December 4, 2008	Initial Issue.
1	December 15, 2008	Customer corrections.
2	December 23, 2009	Corrections per engineer.
3	January 7, 2009	Corrections per engineer.
4	January 16, 2009	Incorporated Receiver Spurious Emissions test results into the report.



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## List of Terms and Abbreviations

AC	Alternating Current
ACF	Antenna Correction Factor
Cal	Calibration
<i>d</i>	Measurement Distance
dB	Decibels
dB $\mu$ A	Decibels above one microamp
dB $\mu$ V	Decibels above one microvolt
dB $\mu$ A/m	Decibels above one microamp per meter
dB $\mu$ V/m	Decibels above one microvolt per meter
DC	Direct Current $\mu$
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
GR-1089-CORE	(GR) General Requirement(s) imposed by the NEBS standard, (CORE) Central Office Recovery Express (AT&T), (1089) specifies various parts of the General Requirements under Bellcore Technical Standard, Requirements for Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment
GRP	Ground Reference Plane
H	Magnetic Field
HCP	Horizontal Coupling Plane
Hz	Hertz
IEC	International Electrotechnical Commission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	Line Impedance Stabilization Network
MHz	Megahertz
$\mu$ H	microhenry
$\mu$	microfarad
$\mu$ s	microseconds
NEBS	Network Equipment-Building System
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMS	Root-Mean-Square
TWT	Traveling Wave Tube
V/m	Volts per meter
VCP	Vertical Coupling Plane



# I. Executive Summary





**A. Purpose of Test**

An EMC evaluation was performed to determine compliance of the Motorola, Inc. MC-802 Wall Plate, 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 MC-802 Wall Plate. Motorola, Inc. should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the MC-802 Wall Plate, 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 Motorola, Inc., purchase order number NP4361916. All tests were conducted using measurement procedure ANSI C63.4-2003.

FCC Reference	IC Reference	Description	Compliance
47 CFR Part 15.247:2007	RSS-210 Issue 7: 2007	Applicable Standard	Compliant
Title 47 of the CFR, Part 15 §15.203	N/A	Antenna Requirement	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 §15.207(a)	RSS-210(7.2.2)	Conducted Emission Voltage	Not Applicable
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 and 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)	RSSGen(5.5)	Maximum Permissible Exposure	Compliant
N/A	RSSGen(4.8)	Receiver Spurious Emissions	Compliant

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



## II. Equipment Configuration



## A. Overview

MET Laboratories, Inc. was contracted by Motorola, Inc. to perform testing on the MC-802 Wall Plate, under Motorola, Inc.'s purchase order number NP4361916.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Motorola, Inc., MC-802 Wall Plate.

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

<b>Model(s) Tested:</b>	45010 Wall Plate		
<b>Model(s) Covered:</b>	45010 Wall Plate		
<b>EUT Specifications:</b>	Primary Power: 80 VAC, 20 kHz		
	FCC ID: ACQ45010 and 3231A-45010		
	Type of Modulations:	DSSS (Direct Sequence Spread Spectrum) OFDM (Orthogonal Frequency Division multiplexing)	
	Emission Designators:	16M3G7D	
	Equipment Code:	DTS	
	Peak RF Output Power:	Low	27.16dBm
		Mid	26.74dBm
High		26.37dBm	
EUT Frequency Ranges:	2412 – 2462MHz		
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.		
<b>Environmental Test Conditions:</b>	Temperature: 15-35° C		
	Relative Humidity: 30-60%		
	Barometric Pressure: 860-1060 mbar		
<b>Evaluated by:</b>	Anderson Soungpanya		
<b>Date(s):</b>	December 4, 2008		

**Table 2. Frequency Allocation for 802.11b/g**



## B. References

<b>CFR 47, Part 15, Subpart C</b>	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 15: General Rules and Regulations, Allocation, Assignment, and Use of Radio Frequencies
<b>CFR 47, Part 15, Subpart B</b>	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
<b>ANSI C63.4:2003</b>	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>ANSI/NCSL Z540-1-1994</b>	Calibration Laboratories and Measuring and Test Equipment - General Requirements
<b>ANSI/ISO/IEC 17025:2000</b>	General Requirements for the Competence of Testing and Calibration Laboratories

## C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick Street, Santa Clara, California 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 Motorola, Inc. MC-802 Wall Plate, is a combined 802.11b/g wireless access point and line powered DSL modem. It shares a single twisted wire pair with an ordinary telephone circuit (POTS), multiplexing AC line power and DSL signalling on top of the telephony signalling. The MC-802 provides two 10/100 Ethernet jacks for wired connectivity and an 802.11 b/g radio for wireless access.

The MC-802 connects back to a multiport central concentrator which splits off the POTS signalling from the DSL signalling and provides the remote MC-802 with AC line power.

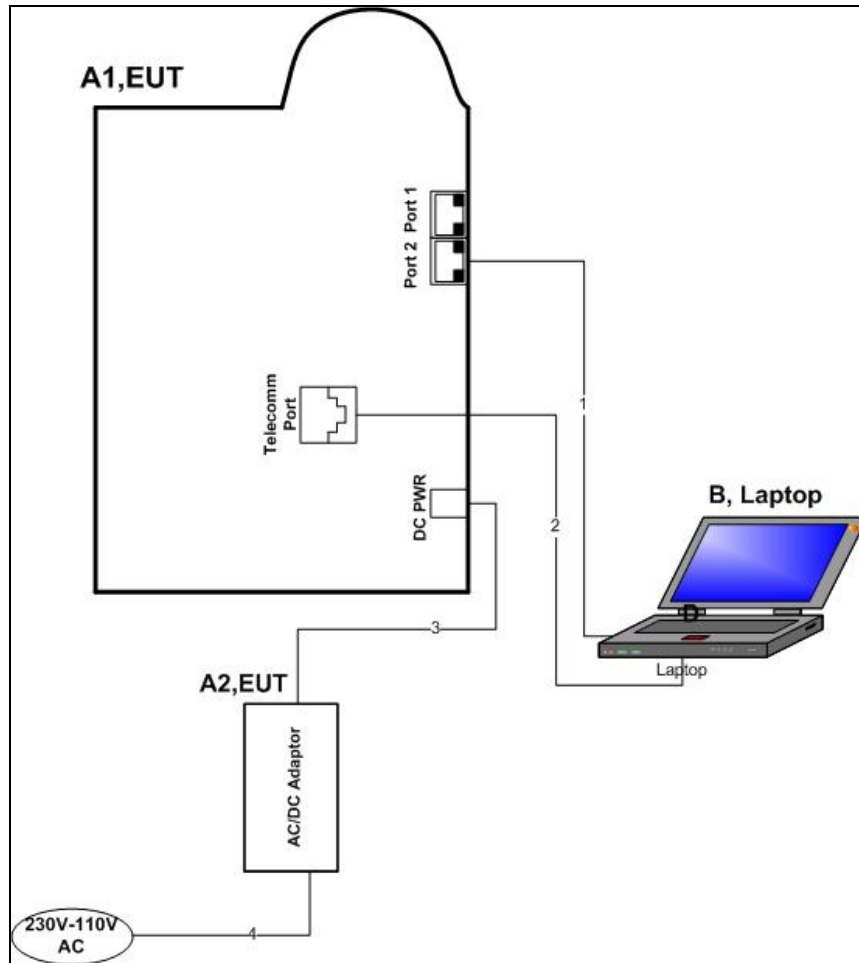


Figure 1. Block Diagram of Test Configuration, Radiated Measurement

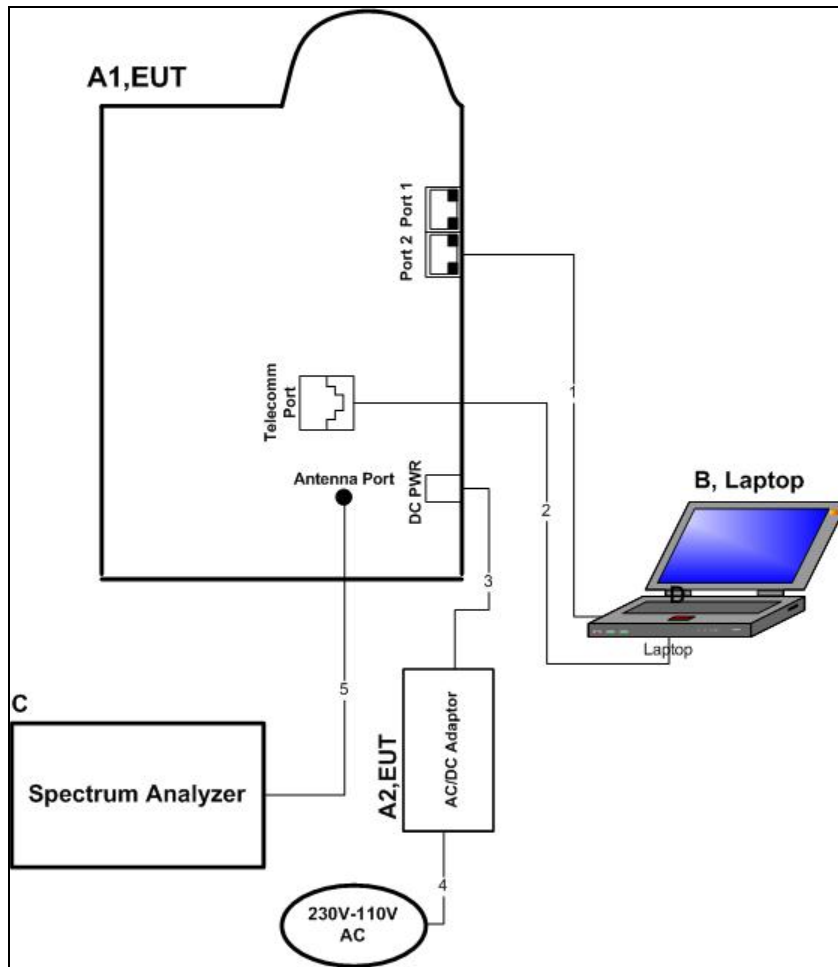


Figure 2. Block Diagram of Test Configuration, Conducted Measurement

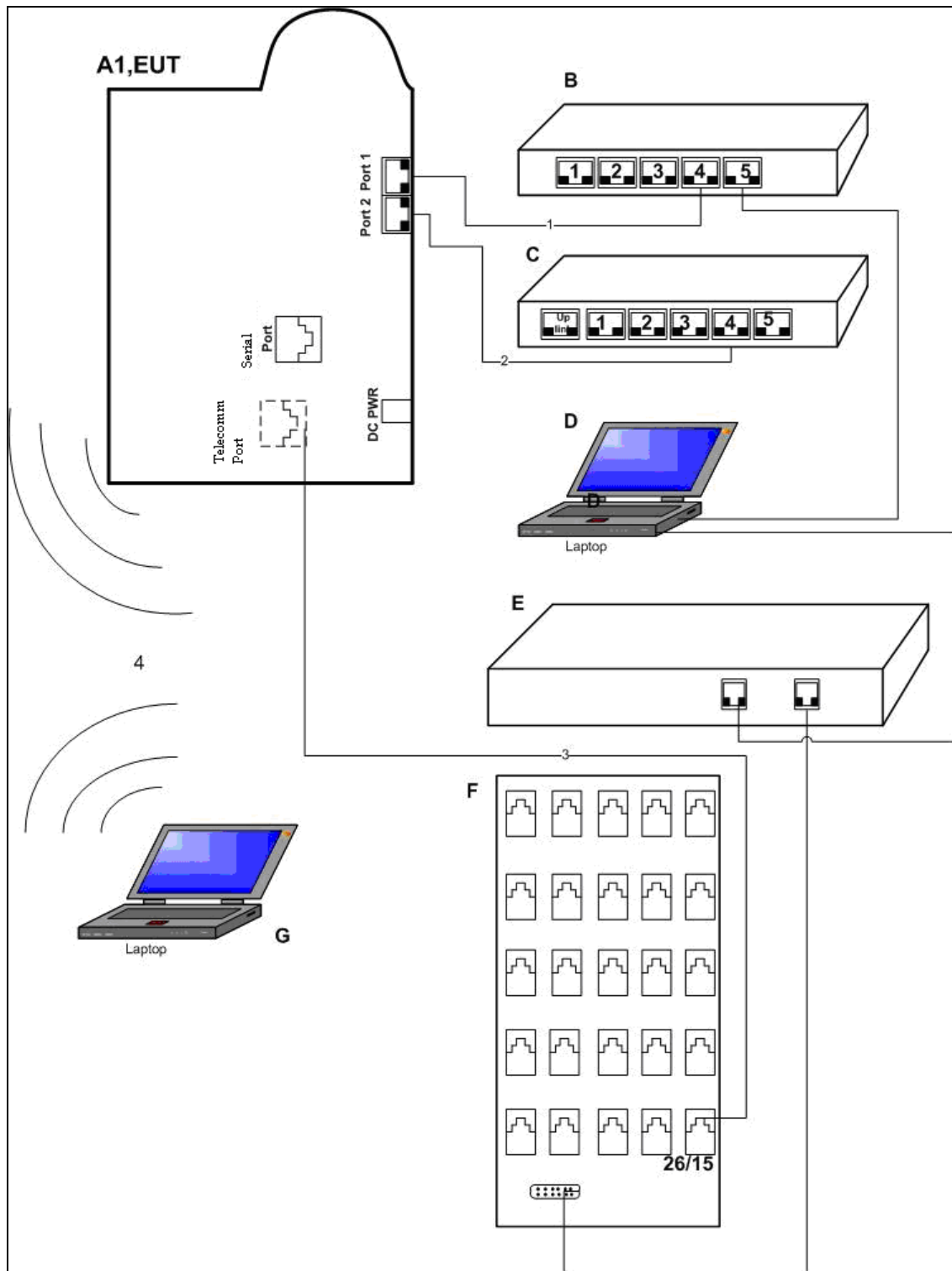


Figure 3. Equipment Configuration, Unintentional



## 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
A1	MC-802 WALL PLATE	45010	557910-001	0830000001

Table 3. Equipment Configuration

## F. Support Equipment

Motorola, Inc. supplied support equipment necessary for the operation and testing of the MC-802 Wall Plate. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number
A2	AC/DC ADAPTOR	NA	WRG10F-120A
B	LAPTOP	DELL	LATITUDE D610
C	SPECTRUM ANALYZER	AGILENT	E4407B
D	ROUTER	LINKSYS	EFAHO5W
E	ROUTER	3COM	SWITCH 5
F	ETHERNET SWITCH	TUT SYSTEMS	MT2A
G	LAPTOP	DELL	PP01L
H	POE HUB	ALLENTEL PRODUCTS	AT125SM

Table 4. Support Equipment





## G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded (Y/N)	Termination Box ID & Port Name
<b>Radiated Measurement</b>						
1	A1, PORT2	CAT 5	1	10	N	B, LAPTOP
2	A1, SERIAL PORT	ETHERNET	1	10	Y	B, LAPTOP
3	A1, DC PWR	POWER CORD	1	1.5	N	A2, AC/DC ADAPTOR
4	A2, AC/DC ADAPTOR	POWER CORD	1	1.5	N	230V-110V AC PWR
<b>Conducted Measurement</b>						
1	A1, PORT2	CAT 5	1	10	Y	B, LAPTOP
2	A1, TELECOMM PORT	ETHERNET TO SERIAL CABLE	1	10	N	B, LAPTOP
3	A1, DC PWR	POWER CORD	1	1.5	N	A2, AC/DC ADAPTOR
4	A2, AC/DC ADAPTOR	POWER CORD	1	1.5	N	230V-110V AC PWR
5	A1, ANTENNA PORT	COAXIAL CABLE	1	2	N	C, SPECTRUM ANALYZER

**Table 5. Ports and Cabling Information**

## H. Mode of Operation

Normal Operation: The 802.11 b/g radio is enabled, receiving and transmits packets when necessary.

TX mode: The 802.11 b/g radio is forced to transmit continuously in spread spectrum operation; DSL and Ethernet functions are disabled.

CW mode: the 802.11 b/g radio is forced to transmit a single carrier (constant wavelength or CW); DSL and Ethernet functions are disabled.

DSL mode: The 802.11 b/g radio is disabled and only the DSL and Ethernet sections of the EUT are active.



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

A Spectrum Analyzer was used to monitor the EUT's transmitter channel and power output.

## **J. Modifications**

### **a) Modifications to EUT**

Client changed capacitor value from 470pF to 1000pF on POE power circuit. This change does not affect any test done with the AC/DC power brick because when AC/DC power brick is used to power up the EUT it shuts down the power circuit used for POE.

AC/DC power brick is only used for Engineering and debugging purposes only. In it's standard Configuration the EUT will use POE to power up.

### **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 Motorola, Inc. upon completion of testing.



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



## Electromagnetic Compatibility Criteria

### § 15.107 Conducted Emissions Limits

**Test Requirement(s):** **15.107 (a)** Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 6. 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 6. 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 6, as measured using a 50  $\mu$ H/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 (dB $\mu$ V)		*Class B Conducted Limits (dB $\mu$ V)	
	Quasi-Peak	Average	Quasi-Peak	Average
* 0.15- 0.45	79	66	66 - 56	56 - 46
0.45 - 0.5	79	66	56	46
0.5 - 30	73	60	60	50

Note 1 — The lower limit shall apply at the transition frequencies.

Note 2 — The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz.

\* -- Limits per Subsection 15.207(a).

**Table 6. 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 not applicable with the Class A requirement(s) of this section. The EUT is POE powered.



## 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 7.

**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 7.

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

**Test Procedures:** The EUT was placed on a 0.8m-high wooden table inside a 3 m chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 3 m from the EUT on an adjustable mast and data was corrected for 10m. 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 found to comply with the Class A requirement(s) of this section. Measured emissions were below applicable limits

**Test Engineer(s):** Anderson Soungpanya

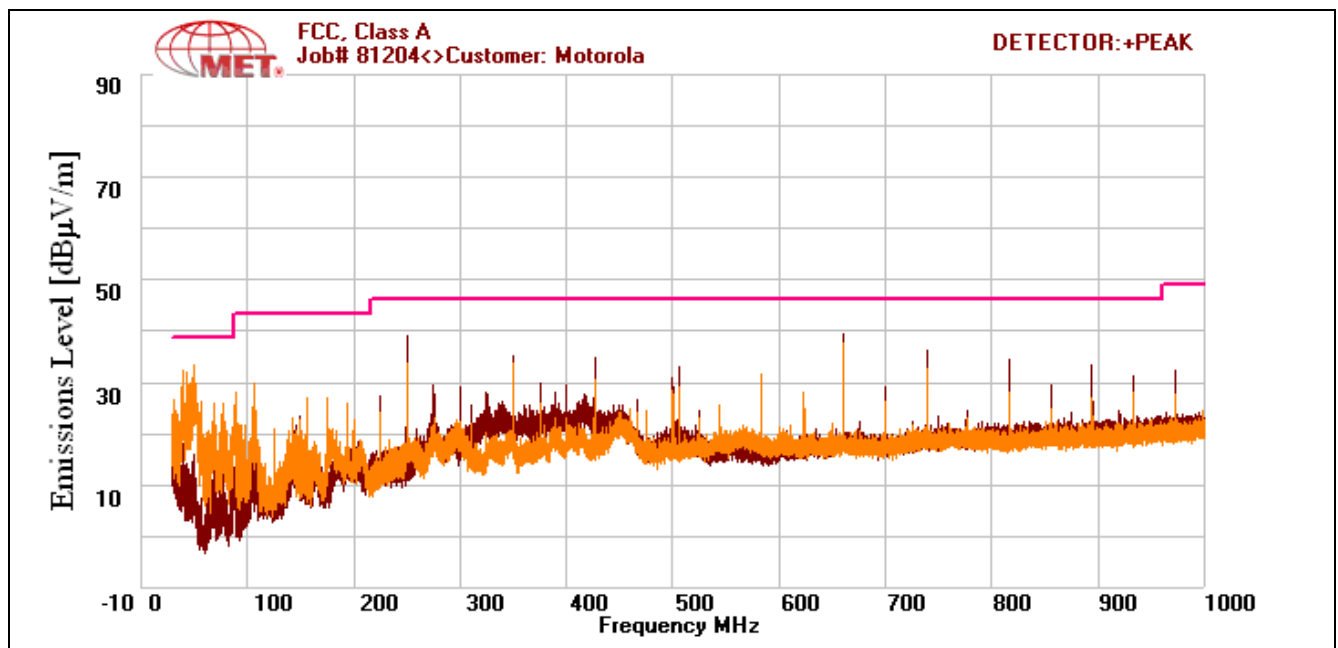
**Test Date(s):** 11/13/08



### Radiated Emissions Limits Test Results, Class A

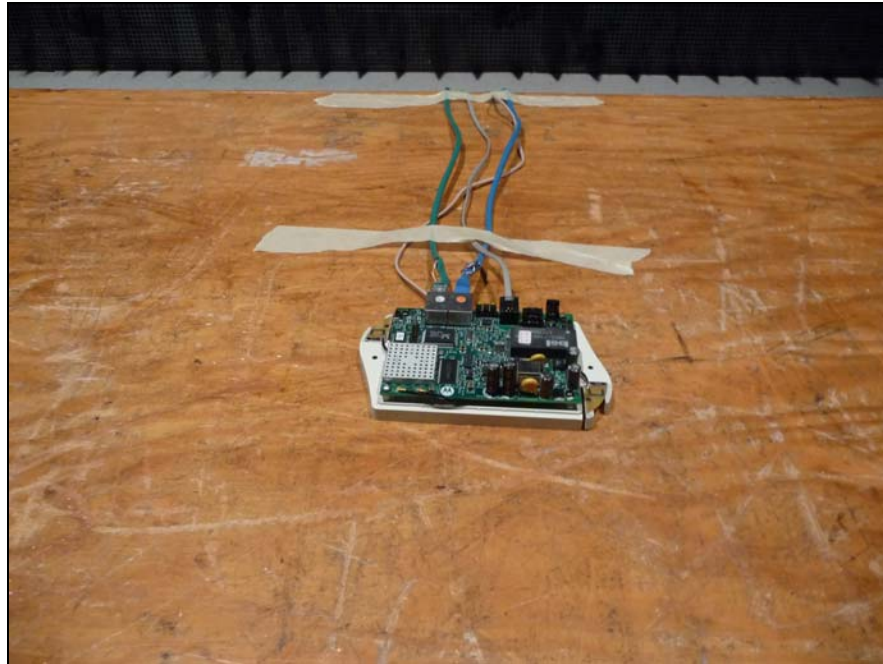
Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
250	H	249	123	33.89	12.9	3.99	-10.46	40.32	46.4	-6.08
660.97	H	143	124	24.95	20.261	6.666	-10.46	41.417	46.4	-4.983
49.97	V	140	100	34.09	7.812	1.739	-10.46	33.181	39	-5.819
660.97	V	56	100	20.12	19.8	6.666	-10.46	36.126	46.4	-10.274
349.94	H	123	100	28.52	15.295	4.809	-10.46	38.164	46.4	-8.236
738.7	H	173	100	18.23	20.648	7.12	-10.46	35.538	46.4	-10.862

Table 8. Radiated Emissions Limits Test Results



Plot 1. Radiated Emissions, Pre-Scan

## Radiated Emission Limits Test Setup

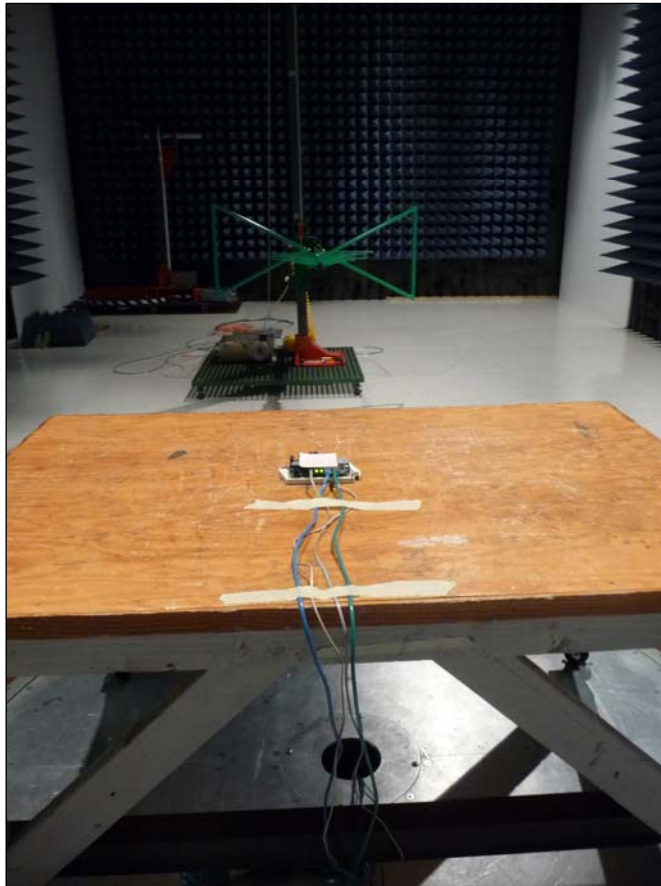


Photograph 1. Radiated Emission Test Setup



**Photograph 2. Radiated Emissions Test Setup, Antenna**





Photograph 3. Radiated Emissions Test Setup, Rear View



## **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 meets the criteria of this rule by virtue of having an antenna permanently attached to the unit. The EUT is therefore compliant with §15.203.

Gain/Model	Manufacturer
4dBi	Motorola

**Test Engineer(s):** Anderson Soungpanya

**Test Date(s):** 11/14/08



## 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  $\mu$ H/50  $\Omega$  line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

**Table 9. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)**

**Test Results:** The EUT was not applicable with this requirement. The EUT is POE powered.

## 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 set to the mid channel at the highest output power and connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using a RBW approximately 1% of the total emission bandwidth, VBW > RBW. The 6 dB Bandwidth was measured and recorded. The measurements were repeated at the low and high channels.

**Test Results** Equipment complies with § 15.247 (a). The 6 dB and 99% Bandwidth was determined from the plots on the following pages.

802.11b mode			
Carrier Channel	Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 6 dB Bandwidth (MHz)
Low	2412	15.5192	9.853
Mid	2437	15.5139	9.898
High	2462	15.4541	9.998

802.11g mode			
Carrier Channel	Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 6 dB Bandwidth (MHz)
Low	2412	16.4825	16.334
Mid	2437	16.4312	16.165
High	2462	16.4813	16.343

**Test Engineer(s):** Jeffrey Hazen

**Test Date(s):** 10/14/08

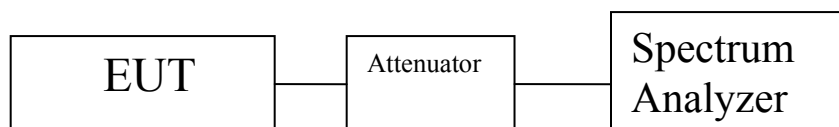
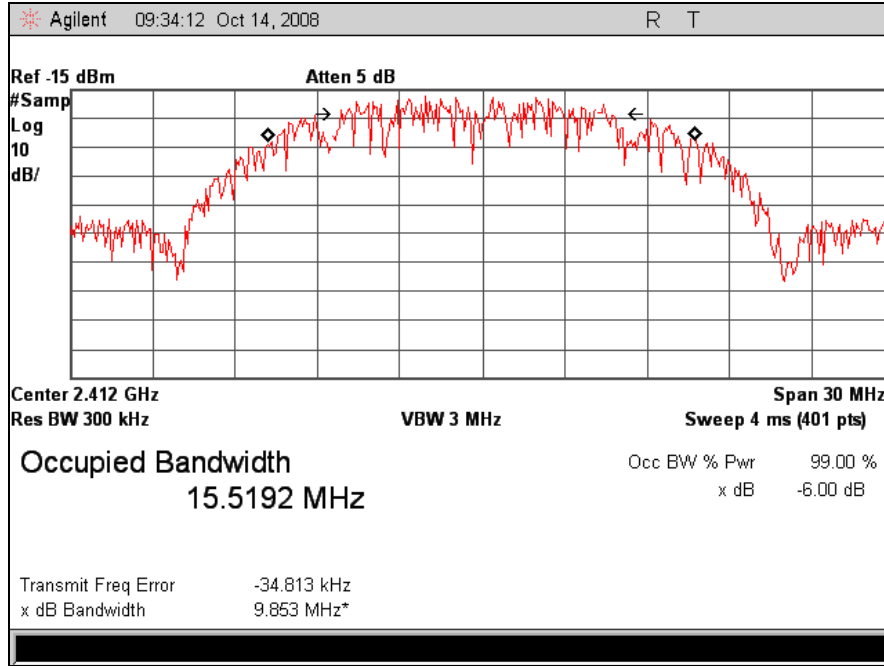


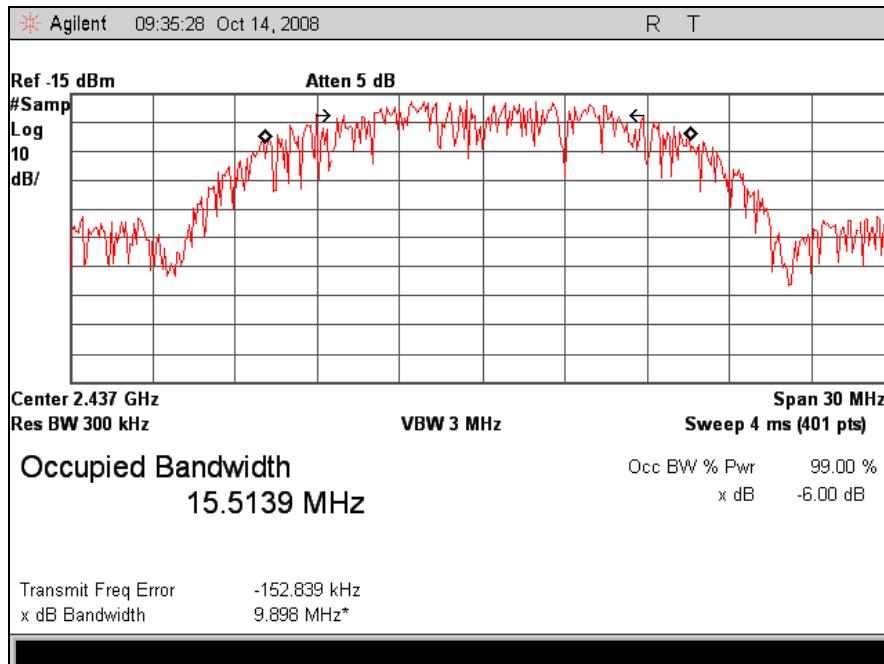
Figure 4. Occupied Bandwidth Block Diagram



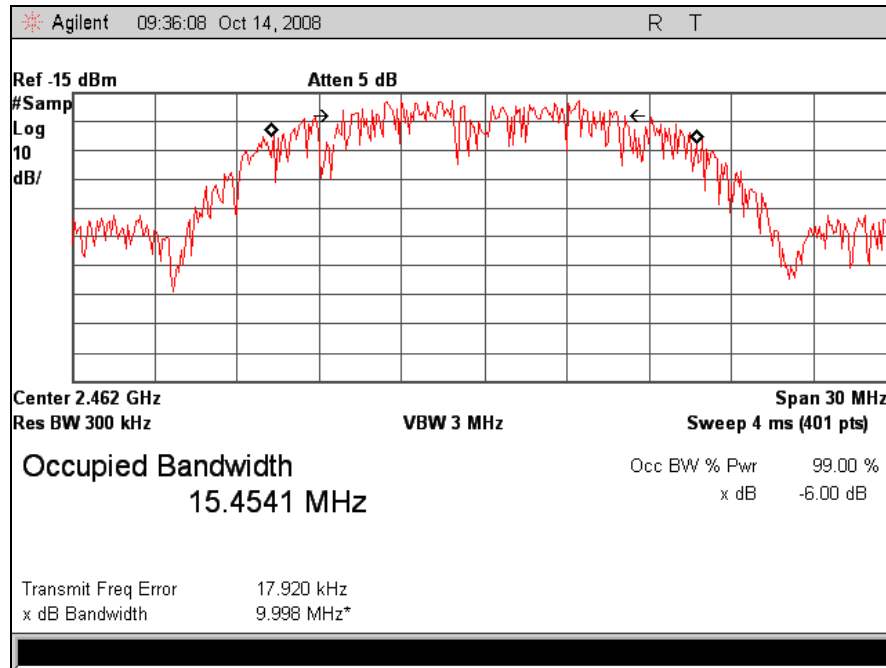
### Electromagnetic Compatibility Criteria for Intentional Radiators



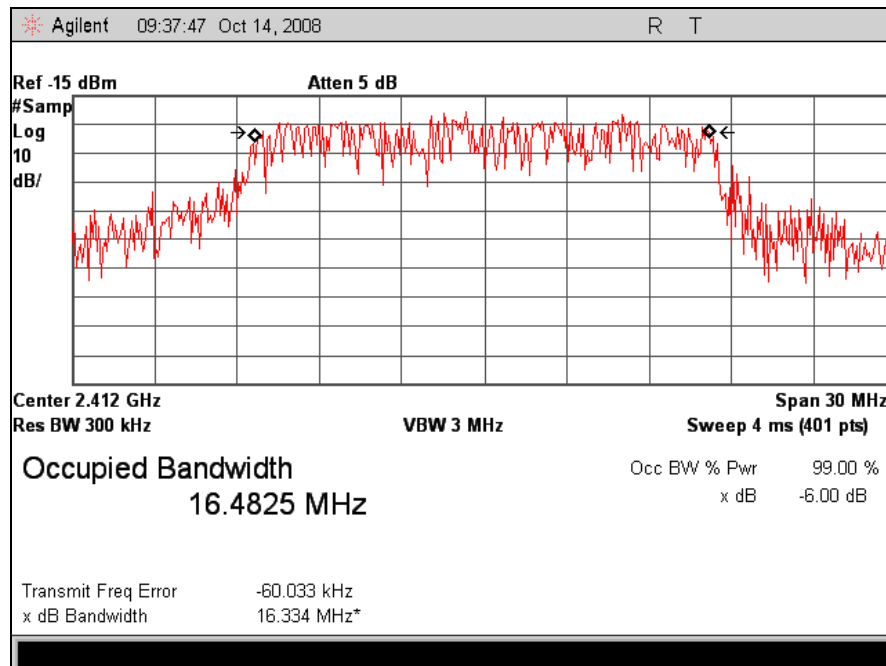
Plot 2. 802.11/b Low Channel, Occupied Band Width



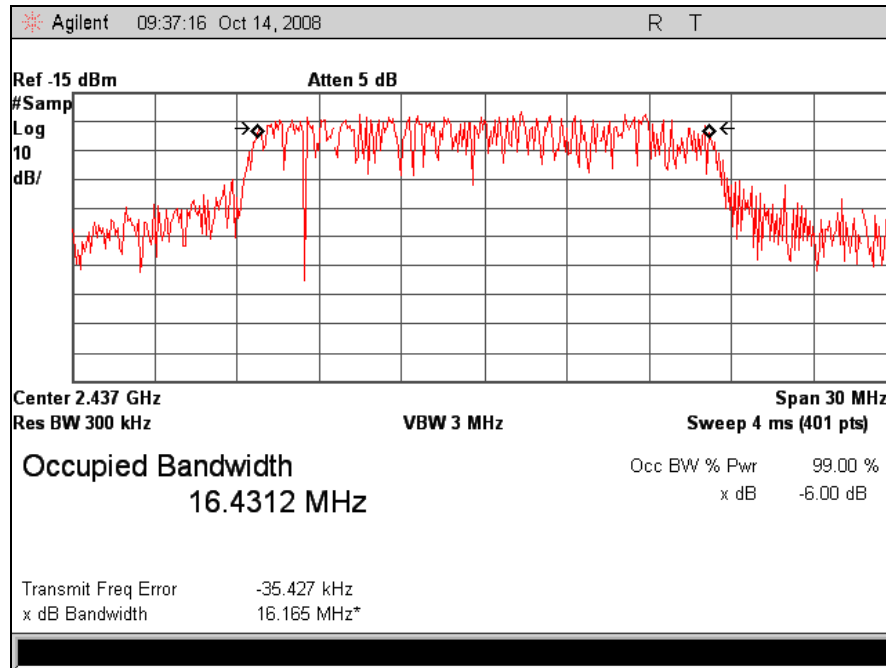
Plot 3. 802.11/b Mid Channel, Occupied Band Width



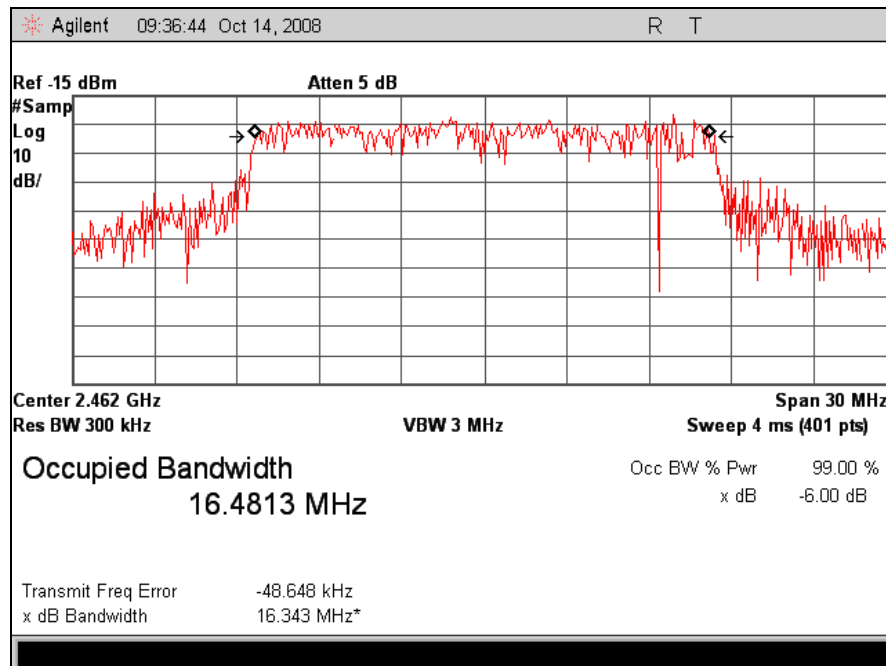
Plot 4. 802.11/b High Channel, Occupied Band Width



Plot 5. 802.11/g Low Channel, Occupied Band Width



Plot 6. 802.11/g Mid Channel, Occupied Band Width



Plot 7. 802.11/g High Channel, Occupied Band Width





## 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 10. 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 10, 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 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, omnidirectional 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 a data rate which gave the maximum power level.

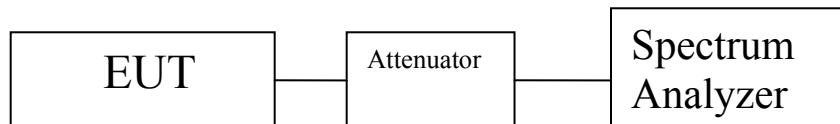
**Test Results:** Equipment complies with the Peak Power Output limits of § 15.247(b).

802.11b		
Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
Low	2412	23.74
Mid	2437	23.46
High	2462	22.45

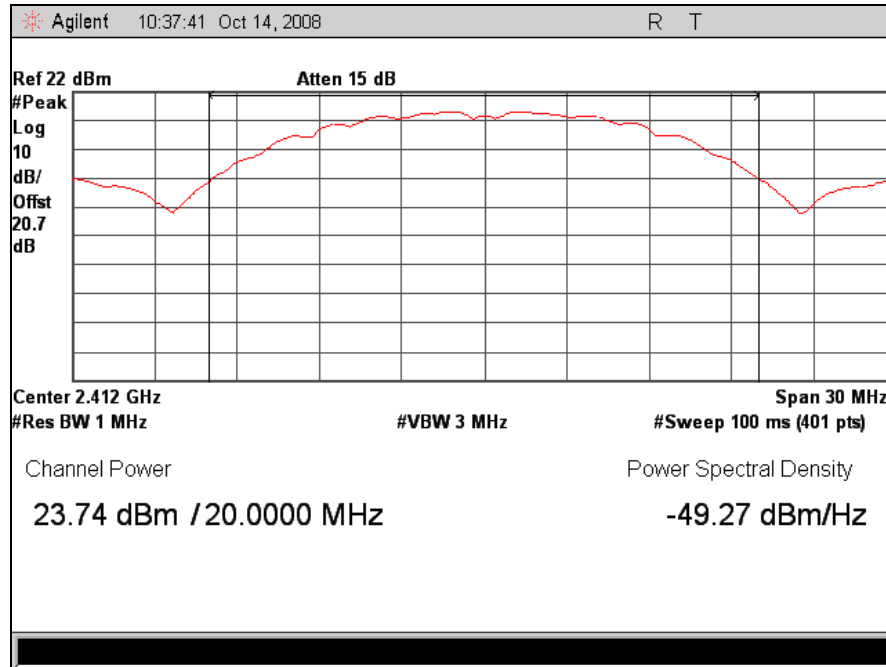
802.11g		
Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
Low	2412	27.16
Mid	2437	26.74
High	2462	26.37

**Test Engineer(s):** Jeffrey Hazen

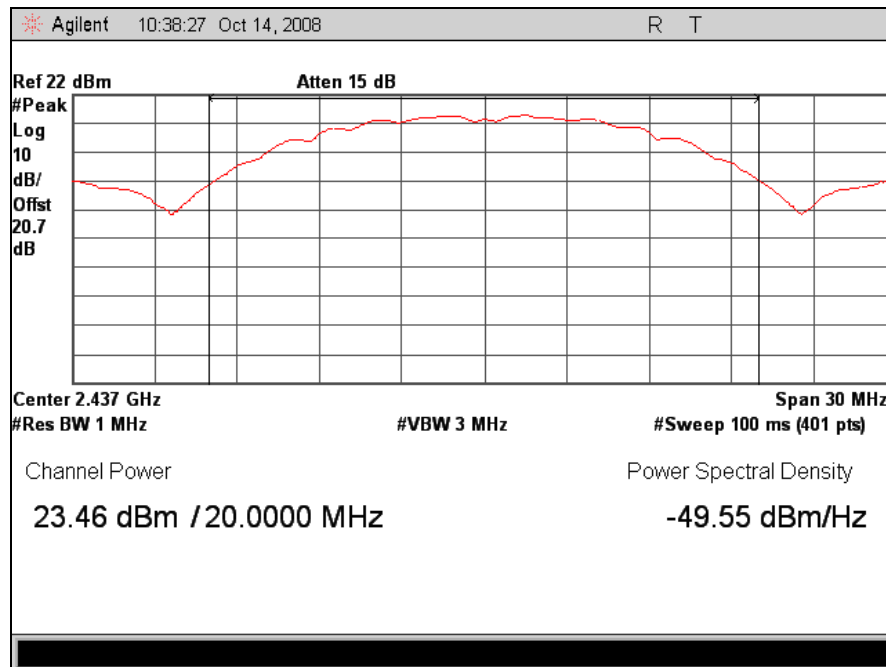
**Test Date(s):** 10/14/08



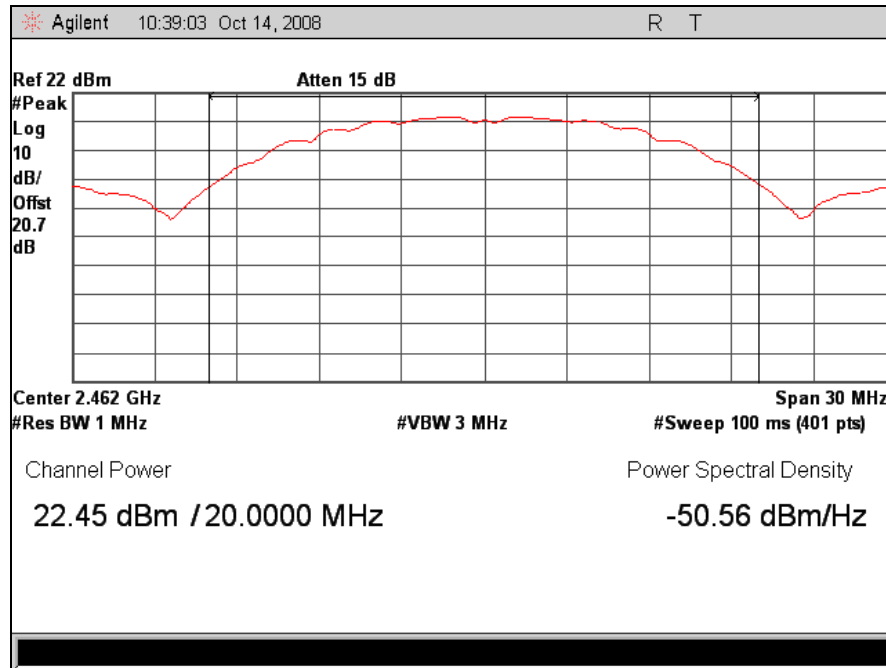
**Figure 5. Peak Power Output Block Diagram**



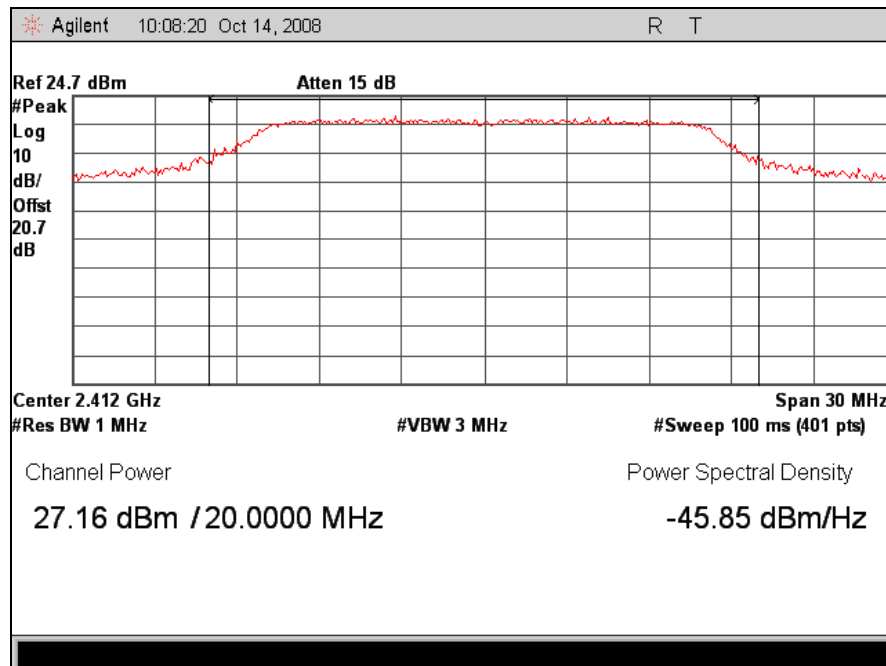
Plot 8. 802.11/b Low Channel, Peak Output Power



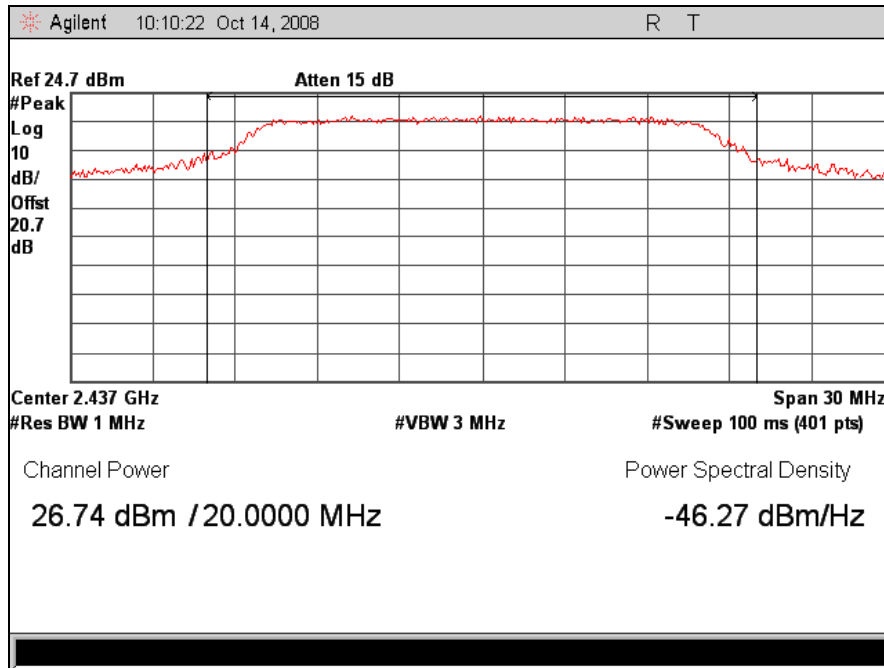
Plot 9. 802.11/b Mid Channel, Peak Output Power



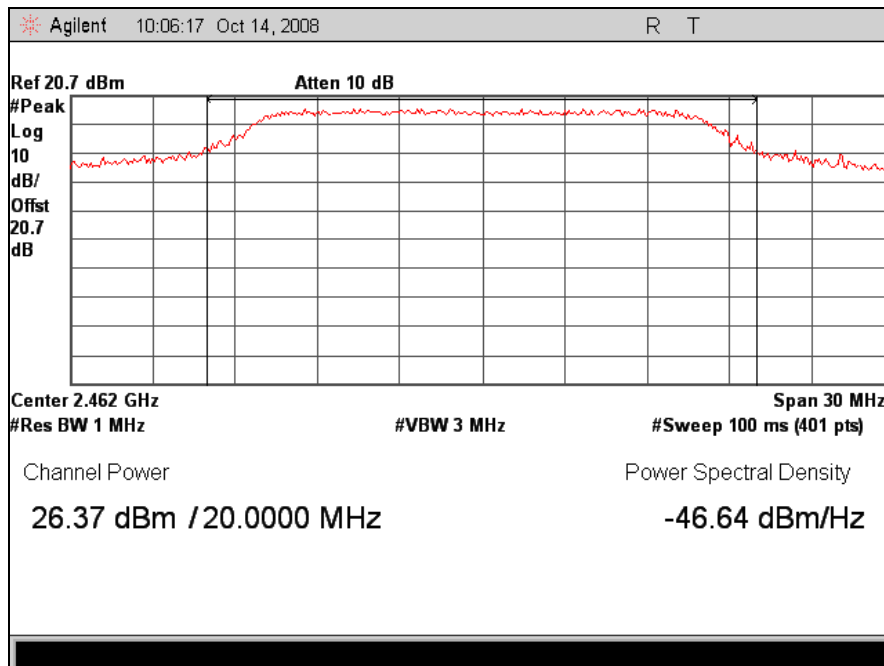
Plot 10. 802.11/b High Channel, Peak Output Power



Plot 11. 802.11/g Low Channel, Peak Output Power



Plot 12. 802.11/g Mid Channel, Peak Output Power



Plot 13. 802.11/g High Channel, Peak Output Power



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(b) Peak Power Output and 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 @ 2400-2483.5 MHz; highest conducted power = 27.16dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm<sup>2</sup> or 10 W/m<sup>2</sup>**

EUT maximum antenna gain = 4dBi.

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<sup>2</sup>)  
P = Power Input to antenna (519.99mW)  
G = Antenna Gain (2.51 numeric)

$$R = (519.99 * 2.51 / 4 * 3.14 * 1.0)^{1/2} = (1306.17 / 12.56)^{1/2} = 10.19 \text{cm}$$
$$S = (519.99 * 2.51 / 4 * 3.14 * 20.0^2) = (1306.17 / 5024) = \mathbf{0.26 \text{ mW/cm}^2 @ 20 \text{cm separation}}$$



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(d) Harmonic Emissions – Radiated

**Test Requirements:** §15.247(d); § 15.209 (a); §15.205: Emissions outside the frequency band.

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

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

MHz	MHz	MHz	GHz
0.090–0.110-----	16.42–16.423	399.9–410	4.5–5.15
<sup>1</sup> 0.495–0.505-----	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905-----	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128-----	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775-----	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775-----	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218-----	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825-----	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225-----	123–138	2200–2300	14.47–14.5
8.291–8.294-----	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366-----	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675-----	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475-----	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293-----	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025-----	240–285	3345.8–3358.36	43–36.5
12.57675–12.57725-----	322–335.4	3600–4400	( <sup>2</sup> )

**Table 11. Restricted Bands of Operation**

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

<sup>2</sup> Above 38.6



**Test Requirement(s):** § 15.209 (a): Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 12.

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

**Test Procedure:** The transmitter was set to the mid channel at the highest output power and placed on a 0.8 m high wooden table inside in a semi-anechoic chamber. Measurements were performed with the EUT rotated 360 degrees and varying the adjustable antenna mast with 1 m to 4 m height to determine worst case orientation for maximum emissions. Measurement were repeated the measurement at the low and highest channels.

For frequencies from 30 MHz to 1 GHz, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

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.

In accordance with §15.35(b) the limit on the radio frequency emissions as measured using instrumentation with a peak detector function shall be 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

EUT Field Strength Final Amplitude = Raw Amplitude – Preamp gain + Antenna Factor + Cable Loss

The DCF was calculated for 30 MHz – 1 GHz. EUT Field Strength Final Amplitude = Raw Amplitude – Preamp gain + Antenna Factor + Cable Loss + DCF.

**Test Results:** The EUT was found compliant with the Radiated Emission limits of §15.209(a) for Intentional Radiators. See following pages for detailed test results.

**Test Engineer(s):** Jeffrey Hazen, Lionel Gabrillo, and Anderson Soungpanya

**Test Date(s):** 10/10/08, 11/07/08, and 1/15/09





**Electromagnetic Compatibility Criteria for Intentional Radiators**

**§ 15.247(d) Harmonic Emissions Requirements – Radiated (802.11b)**

Freq. (GHz)	Antenna Polarity (H/V)	Raw Amp. @ 3 m (Peak) / (Avg)	P.Amp (dB)	Ant. Cor. Factor (dB/m)	Cable Loss (dB)	EUT Field Strength Final Amp. (dBuV/m)	Limit Detector Peak / Avg (Peak) / (Avg)	Limit @ 3 m (dBuV/m)	Delta (dB)
4.824	V	45.94	34.76	33.31	7.78	52.27	Peak	74	-21.73
4.824	V	35.53	34.76	33.31	7.78	41.86	Avg	54	-12.14
7.236	V	46.66	35.01	35.79	10.48	57.92	Peak	74	-16.08
7.236	V	33.55	35.01	35.79	10.48	44.81	Avg	54	-9.19
9.648	V	45.42	35.58	37.78	10.80	58.42	Peak	74	-15.58
9.648	V	34.43	35.58	37.78	10.80	47.43	Avg	54	-6.57
12.06	V	44.33	35.00	39.93	11.80	61.06	Peak	74	-12.94
12.06	V	32.52	35.00	39.93	11.80	49.25	Avg	54	-4.75

**Table 13. Radiated Harmonics, 802.11/b Low Channel Test Results**

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

Freq. (GHz)	Antenna Polarity (H/V)	Raw Amp. @ 3 m (Peak) / (Avg)	P.Amp (dB)	Ant. Cor. Factor (dB/m)	Cable Loss (dB)	EUT Field Strength Final Amp. (dBuV/m)	Limit Detector Peak / Avg (Peak) / (Avg)	Limit @ 3 m (dBuV/m)	Delta (dB)
4.884	V	45.64	34.74	33.46	7.81	52.16	Peak	74	-21.84
4.884	V	35.32	34.74	33.46	7.81	41.84	Avg	54	-12.16
7.326	V	46.53	35.03	36.03	10.69	58.21	Peak	74	-15.79
7.326	V	34.39	35.03	36.03	10.69	46.07	Avg	54	-7.93
9.768	V	44.26	35.55	37.99	10.89	57.59	Peak	74	-16.41
9.768	V	34.42	35.55	37.99	10.89	47.75	Avg	54	-6.25
12.21	V	44.92	34.93	39.58	12.22	61.79	Peak	74	-12.21
12.21	V	32.62	34.93	39.58	12.22	49.49	Avg	54	-4.51

**Table 14. Radiated Harmonics, 802.11/b Mid Channel Test Results**

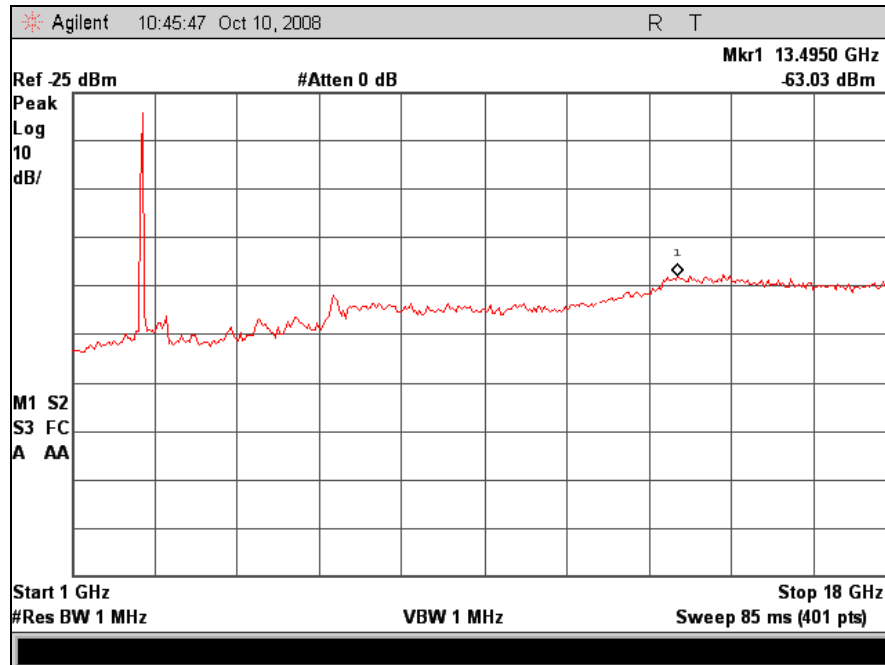
Note: All other emissions were measured at the noise floor of the spectrum analyzer



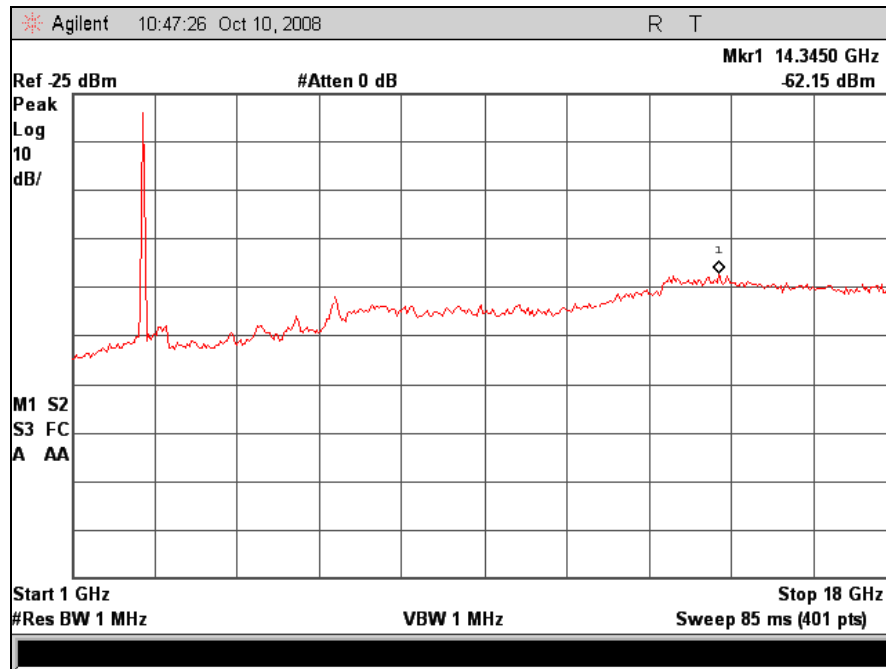
Freq. (GHz)	Antenna Polarity (H/V)	Raw Amp. @ 3 m (Peak) / (Avg)	P.Amp (dB)	Ant. Cor. Factor (dB/m)	Cable Loss (dB)	EUT Field Strength Final Amp. (dBuV/m)	Limit Detector Peak / Avg (Peak) / (Avg)	Limit @ 3 m (dBuV/m)	Delta (dB)
4.924	V	46.2	34.73	33.55	7.83	52.85	Peak	74	-21.15
4.924	V	35.35	34.73	33.55	7.83	42.00	Avg	54	-12.00
7.386	V	46.06	35.05	36.17	10.80	57.98	Peak	74	-16.02
7.386	V	35.39	35.05	36.17	10.80	47.31	Avg	54	-6.69
9.848	V	43.86	35.54	38.12	10.96	57.40	Peak	74	-16.60
9.848	V	32.95	35.54	38.12	10.96	46.49	Avg	54	-7.51
12.31	V	44.8	34.83	39.31	12.61	61.88	Peak	74	-12.12
12.31	V	32.67	34.83	39.31	12.61	49.75	Avg	54	-4.25

Table 15. Radiated Harmonics, 802.11/b High Channel Test Results

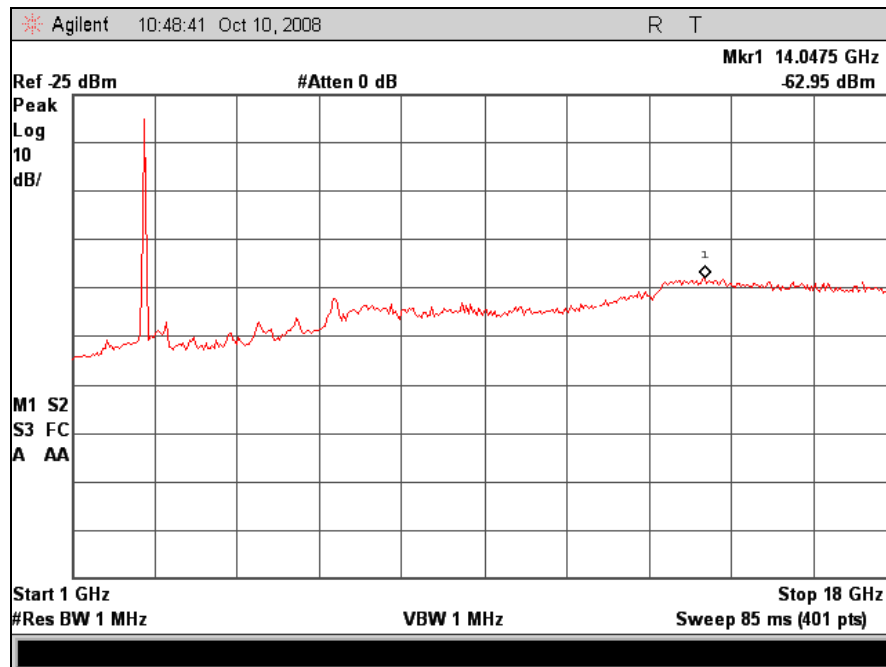
Note: All other emissions were measured at the noise floor of the spectrum analyzer



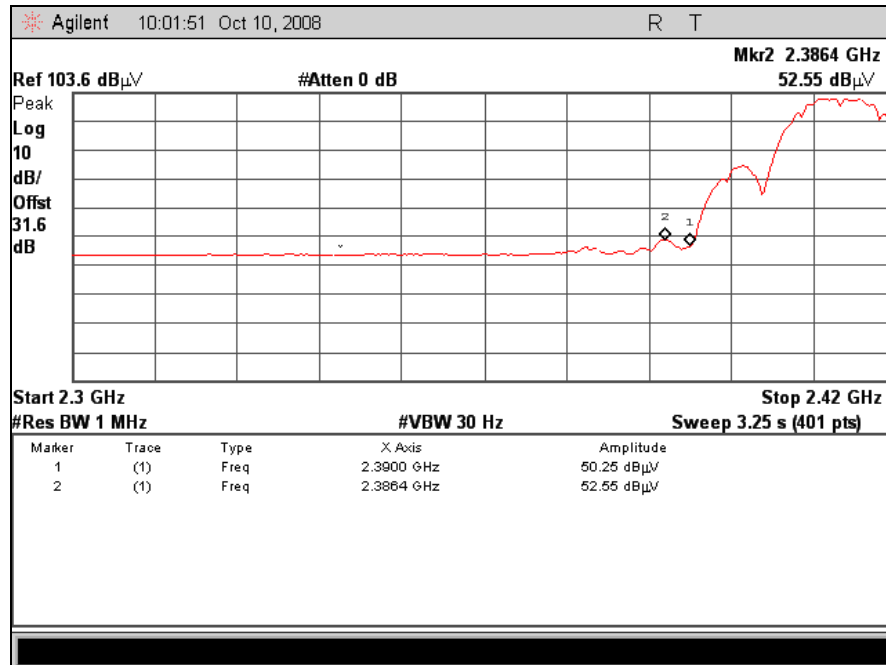
Plot 14. 802.11/b Low Channel, Radiated Spurious



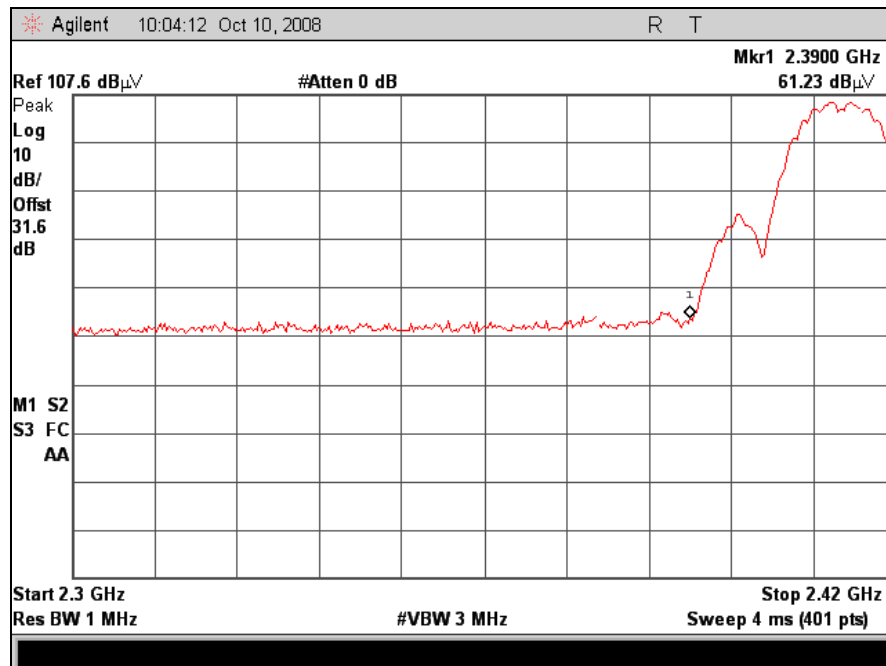
Plot 15. 802.11/b Mid Channel, Radiated Spurious



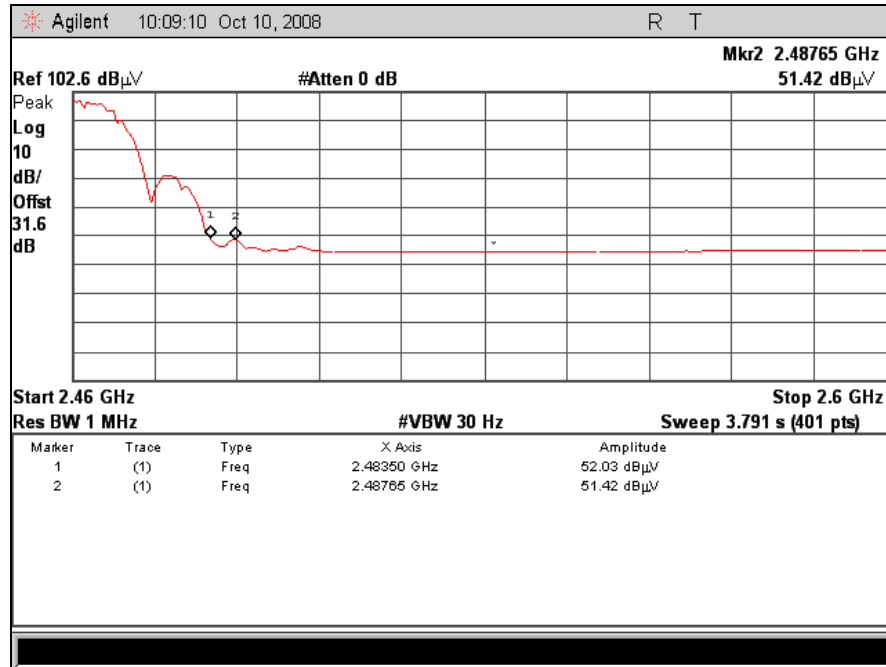
Plot 16. 802.11/b High Channel, Radiated Spurious



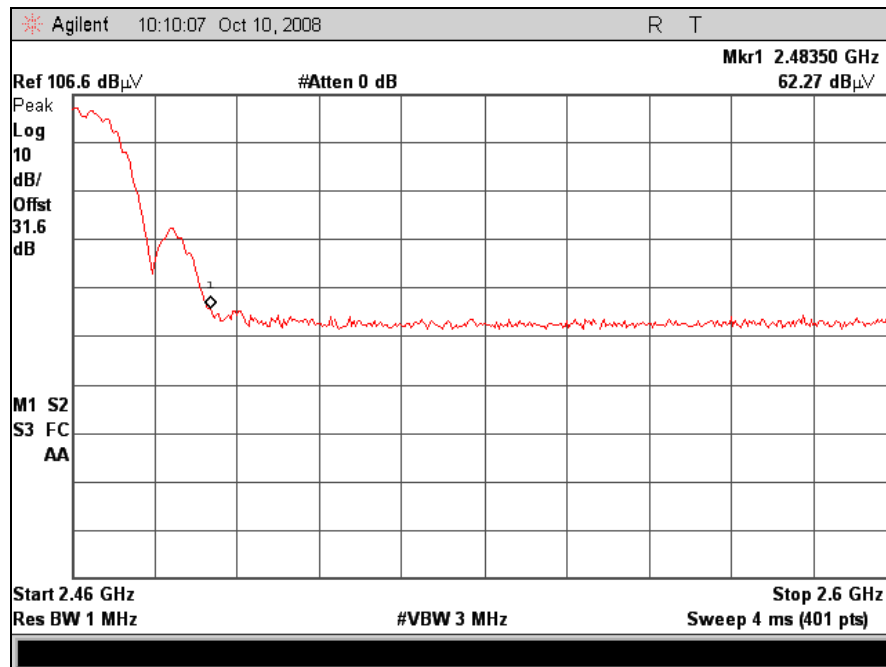
Plot 17. 802.11/b – Lower Band Edge, Average



Plot 18. 802.11/b – Lower Band Edge, Peak



Plot 19. 802.11/b –Upper Band Edge, Average



Plot 20. 802.11/b –Upper Band Edge, Peak



**Electromagnetic Compatibility Criteria for Intentional Radiators**

**§ 15.247(d) Harmonic Emissions Requirements – Radiated (802.11g)**

Freq. (GHz)	Antenna Polarity (H/V)	Raw Amp. @ 3 m (Peak) / (Avg)	P.Amp (dB)	Ant. Cor. Factor (dB/m)	Cable Loss (dB)	EUT Field Strength Final Amp. (dBuV/m)	Limit Detector Peak / Avg (Peak) / (Avg)	Limit @ 3 m (dBuV/m)	Delta (dB)
4.824	V	44.37	34.76	33.31	7.78	50.70	Peak	74	-23.30
4.824	V	31.32	34.76	33.31	7.78	37.65	Avg	54	-16.35
7.236	V	44.14	35.01	35.79	10.48	55.40	Peak	74	-18.60
7.236	V	31.72	35.01	35.79	10.48	42.98	Avg	54	-11.02
9.648	V	44.4	35.58	37.78	10.80	57.40	Peak	74	-16.60
9.648	V	32.14	35.58	37.78	10.80	45.14	Avg	54	-8.86
12.06	V	44.65	35.00	39.93	11.80	61.38	Peak	74	-12.62
12.06	V	32.63	35.00	39.93	11.80	49.36	Avg	54	-4.64

**Table 16. Radiated Harmonics, 802.11/g Low Channel Test Results**

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

Freq. (GHz)	Antenna Polarity (H/V)	Raw Amp. @ 3 m (Peak) / (Avg)	P.Amp (dB)	Ant. Cor. Factor (dB/m)	Cable Loss (dB)	EUT Field Strength Final Amp. (dBuV/m)	Limit Detector Peak / Avg (Peak) / (Avg)	Limit @ 3 m (dBuV/m)	Delta (dB)
4.884	V	44.66	34.74	33.46	7.81	51.18	Peak	74	-22.82
4.884	V	31.54	34.74	33.46	7.81	38.06	Avg	54	-15.94
7.326	V	43.35	35.03	36.03	10.69	55.03	Peak	74	-18.97
7.326	V	31.31	35.03	36.03	10.69	42.99	Avg	54	-11.01
9.768	V	44.57	35.55	37.99	10.89	57.90	Peak	74	-16.10
9.768	V	32.23	35.55	37.99	10.89	45.56	Avg	54	-8.44
12.21	V	44.35	34.93	39.58	12.22	61.22	Peak	74	-12.78
12.21	V	32.47	34.93	39.58	12.22	49.34	Avg	54	-4.66

**Table 17. Radiated Harmonics, 802.11/g Mid Channel Test Results**

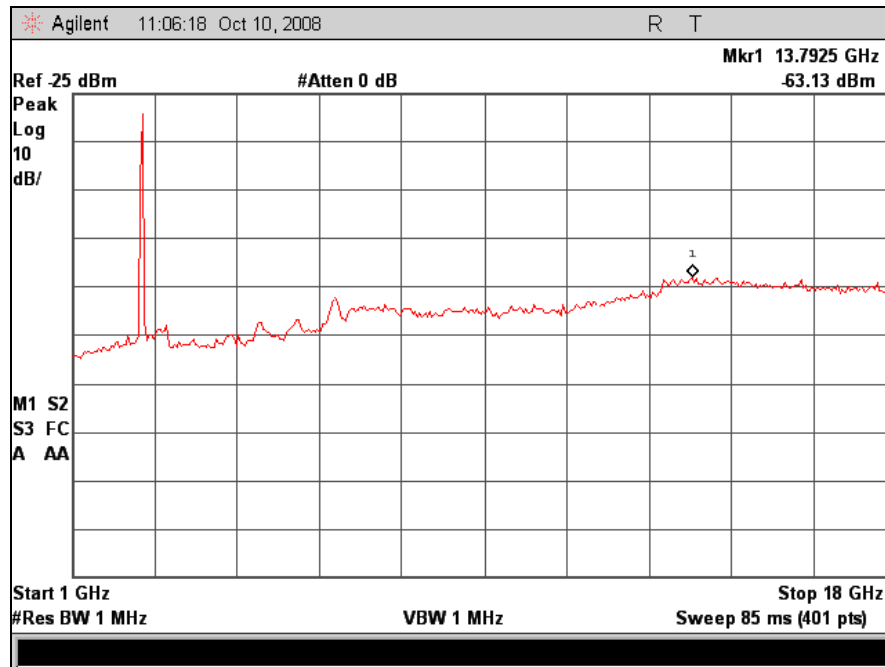
Note: All other emissions were measured at the noise floor of the spectrum analyzer



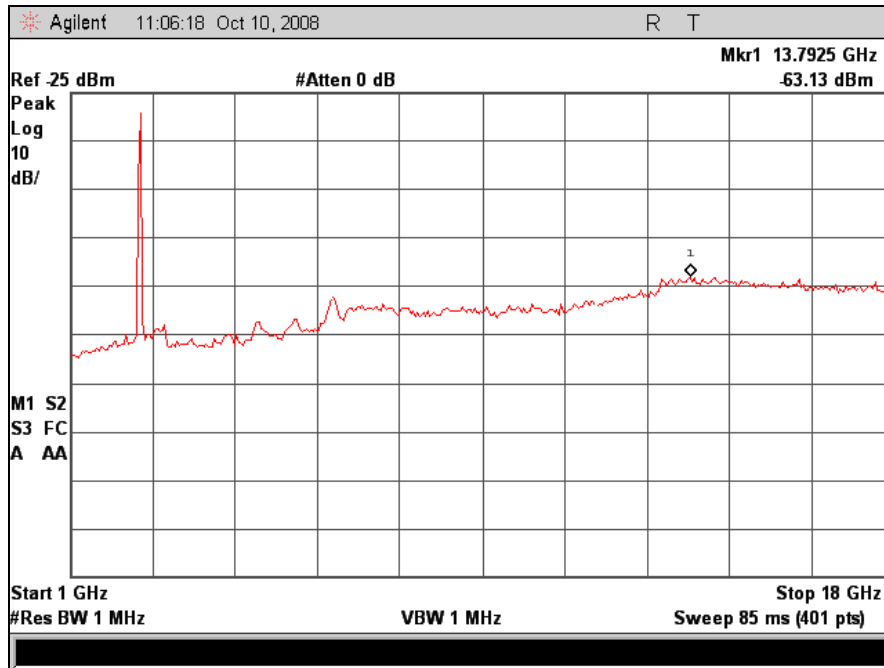
Freq. (GHz)	Antenna Polarity (H/V)	Raw Amp. @ 3 m (Peak) / (Avg)	P.Amp (dB)	Ant. Cor. Factor (dB/m)	Cable Loss (dB)	EUT Field Strength Final Amp. (dBuV/m)	Limit Detector Peak / Avg (Peak) / (Avg)	Limit @ 3 m (dBuV/m)	Delta (dB)
4.924	V	43.45	34.73	33.55	7.83	50.10	Peak	74	-23.90
4.924	V	31.32	34.73	33.55	7.83	37.97	Avg	54	-16.03
7.386	V	44.62	35.05	36.17	10.80	56.54	Peak	74	-17.46
7.386	V	32.03	35.05	36.17	10.80	43.95	Avg	54	-10.05
9.848	V	43.91	35.54	38.12	10.96	57.45	Peak	74	-16.55
9.848	V	31.82	35.54	38.12	10.96	45.36	Avg	54	-8.64
12.31	V	45.35	34.83	39.31	12.61	62.43	Peak	74	-11.57
12.31	V	32.65	34.83	39.31	12.61	49.73	Avg	54	-4.27

**Table 18. Radiated Harmonics, 802.11/g High Channel Test Results**

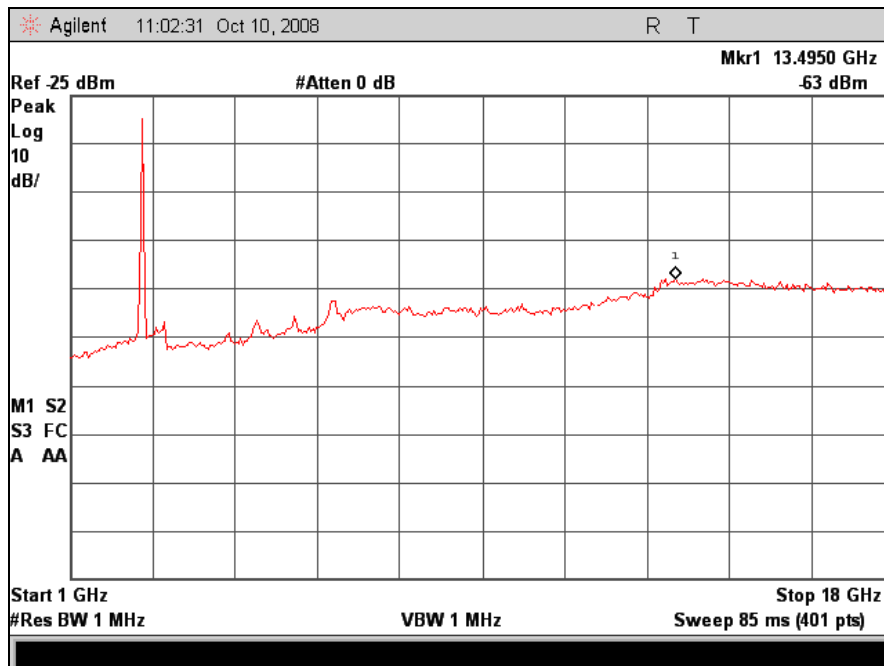
Note: All other emissions were measured at the noise floor of the spectrum analyzer



**Plot 21. 802.11/g Low Channel, Radiated Spurious**



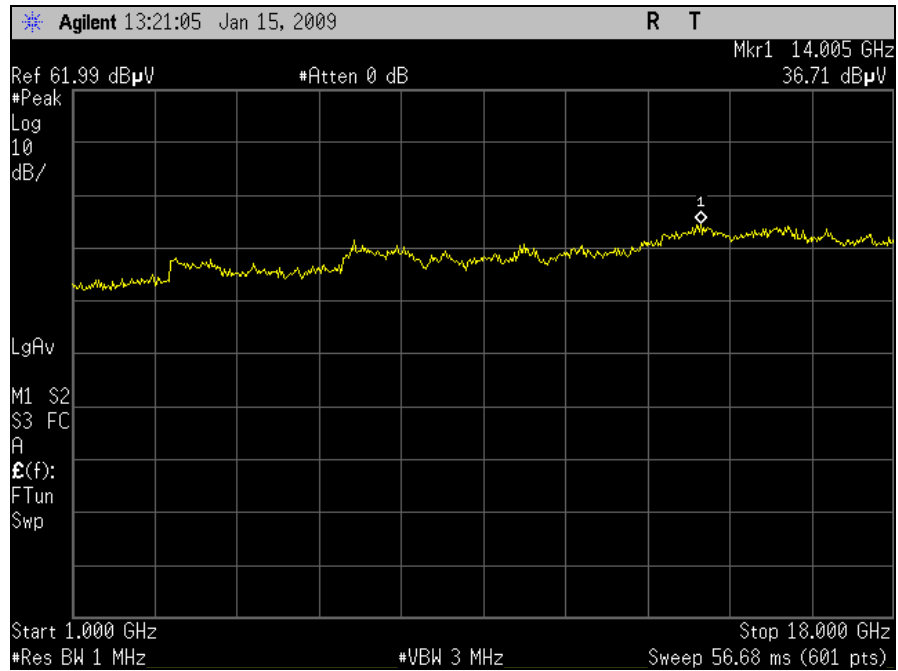
Plot 22. 802.11/g Mid Channel, Radiated Spurious



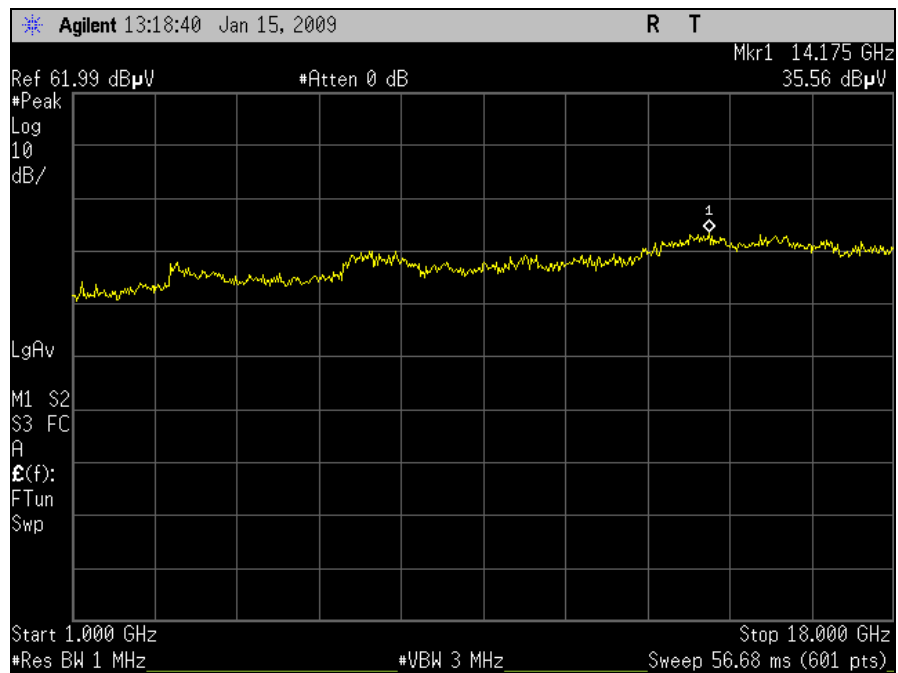
Plot 23. 802.11/g High Channel, Radiated Spurious

The EUT was scanned in Receive mode up to the 10<sup>th</sup> harmonic of the fundamental carrier, no peaks were detected.

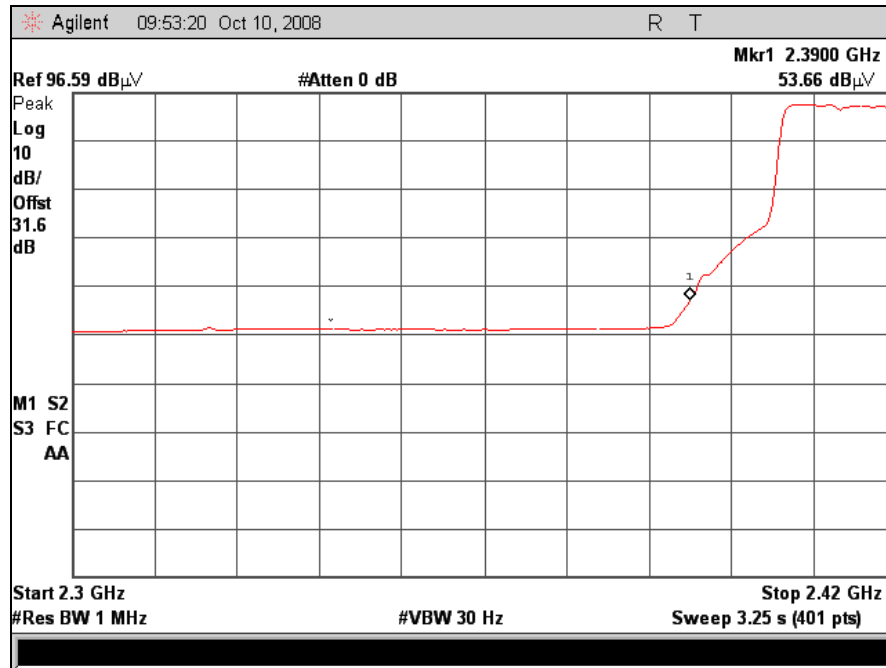




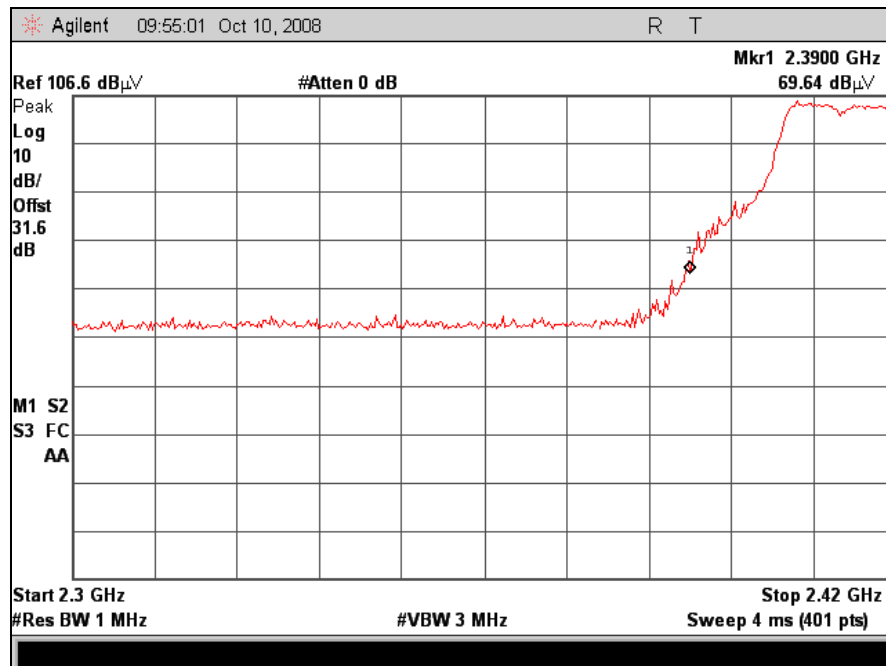
Plot 24. Receiver Spurious Emission, 1 GHz – 18 GHz, Horizontal



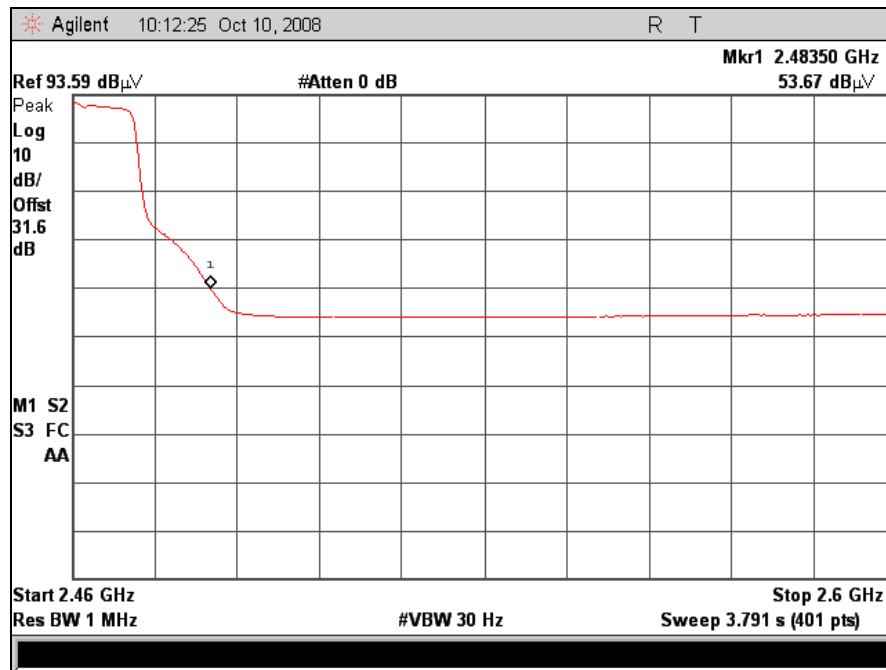
Plot 25. Receiver Spurious Emission, 1 GHz – 18 GHz, Vertical



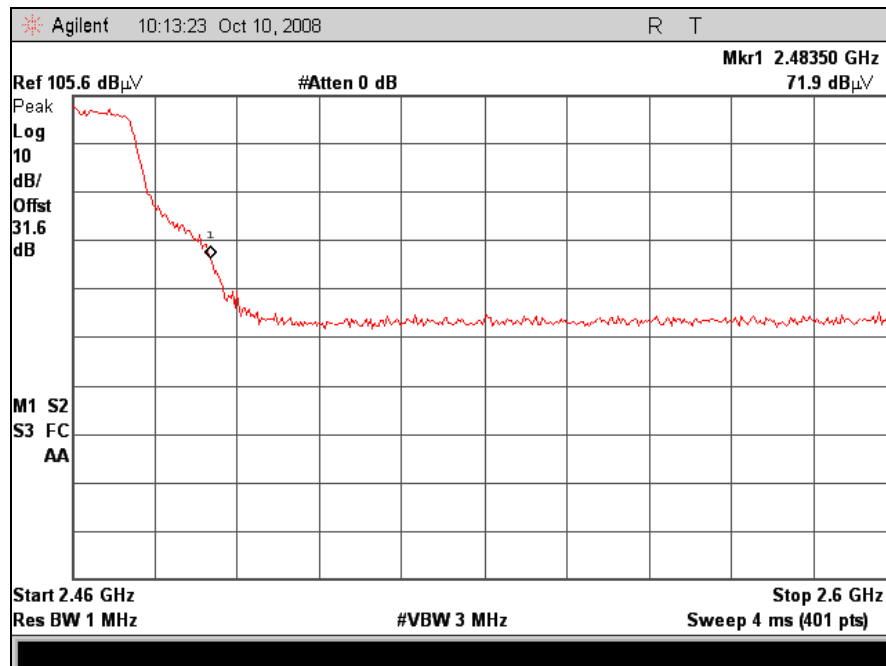
Plot 26. 802.11/g – Lower Band Edge, Average



Plot 27. 802.11/g – Lower Band Edge, Peak



Plot 28. 802.11/g – Upper Band Edge, Average

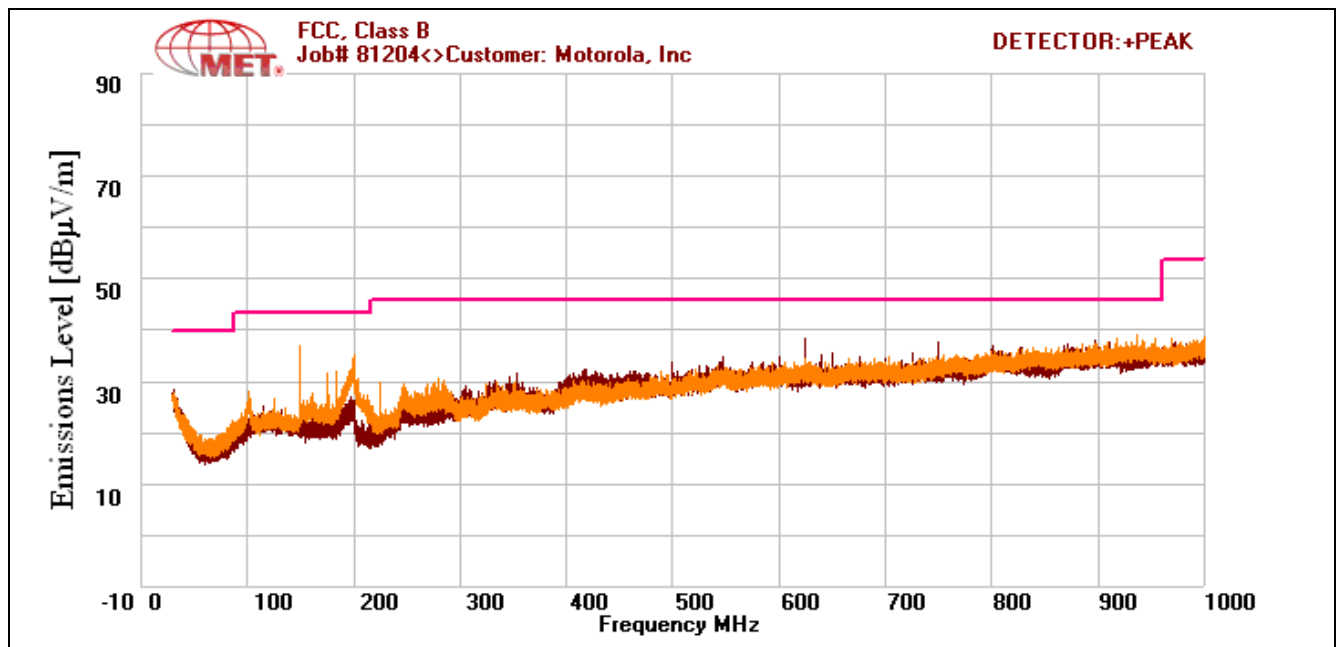


Plot 29. 802.11/g – Upper Band Edge, Peak

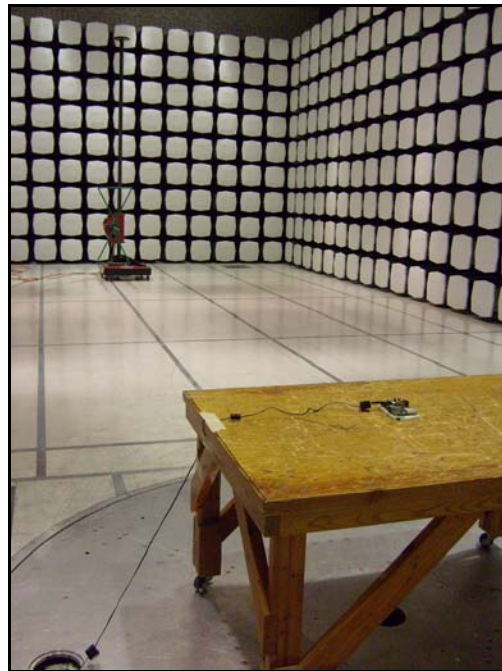


Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
200	V	216.2	120.6	10.14	10.1	0	2.331	10.46	33.031	43.5	-10.469
149.97	V	45.7	112.7	15.01	9.804	0	1.956	10.46	37.23	43.5	-6.27
183.97	V	114.3	100	9.49	9.603	0	2.303	10.46	31.856	43.5	-11.644
711.23	V	341	283.7	1.12	18.851	0	4.439	10.46	34.87	46	-11.13

Table 19. Radiated Harmonics, Test Results, 30 MHz to 1 GHz



Plot 30. 30 MHz to 1 GHz, Radiated Spurious



**Photograph 4. Radiated Emissions Test Setup, 10 m Distance**



**Photograph 5. Test Equipment and Setup for Various Radiated Measurements**

## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(d) Spurious Emissions Requirements –RF Conducted

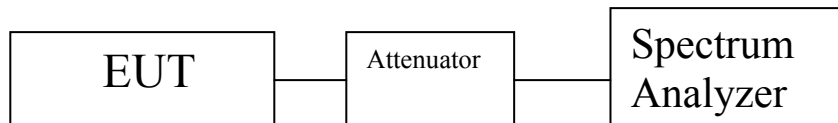
**Test Procedure:** For intentional radiators with a digital device portion which operates below 10 GHz, the spectrum was investigated as per §15.33(a)(1) and §15.33(a)(4); i.e., the lowest RF signal generated or used in the device up to the 10<sup>th</sup> harmonic of the highest fundamental frequency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

For frequencies 1-18GHz, measurements were made at attenuator port.

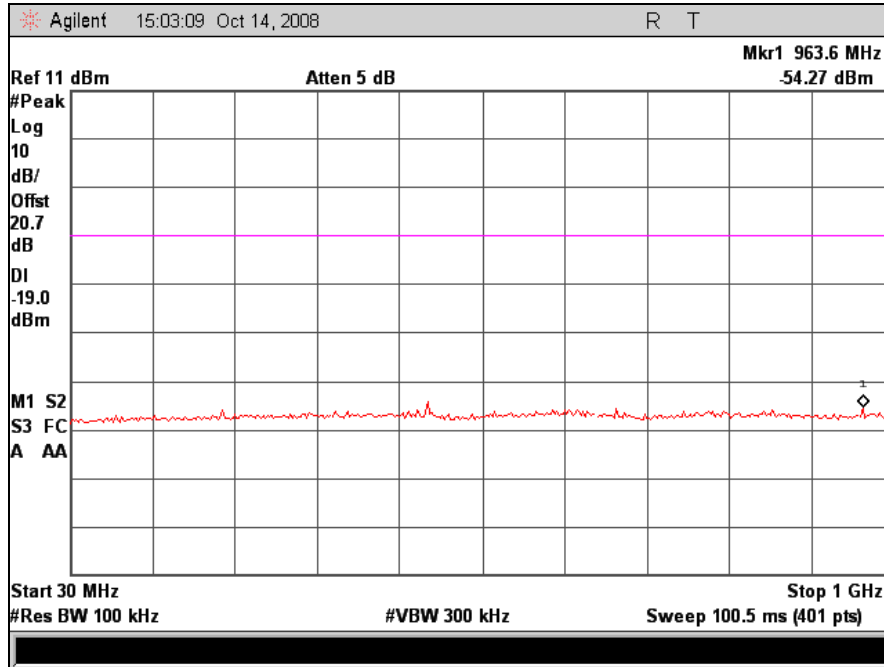
**Test Results:** Equipment complies with the Spurious Emissions Requirements – Radiated and RF Conducted limits of § 15.247 (d). For Radiated Emissions result, refer to section “§15.209: Radiated Emission Limits”. See following pages for detailed test results with RF Conducted Spurious Emissions and §15.205.

**Test Engineer(s):** Anderson Soungpanya and Jeffrey Hazen

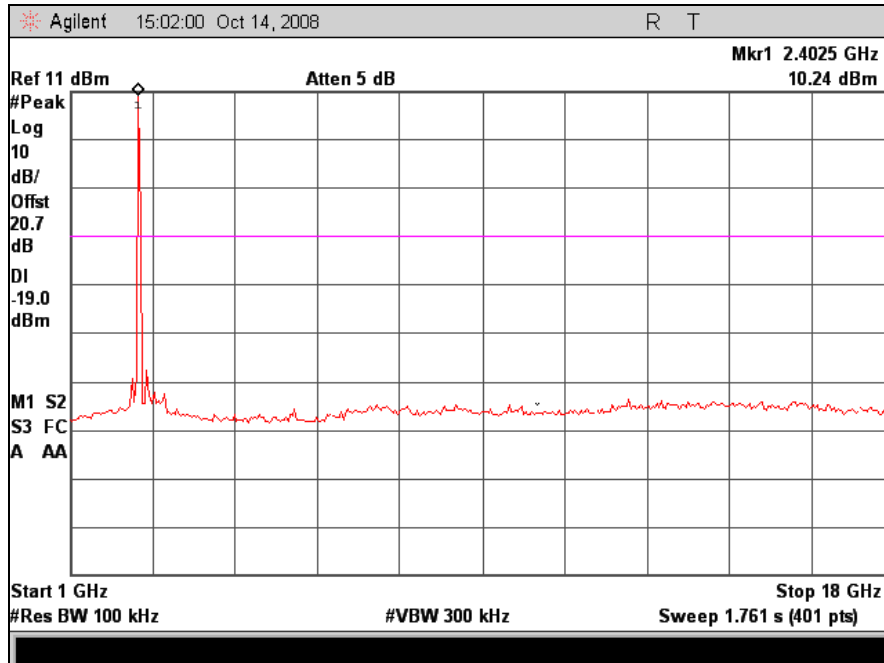
**Test Date(s):** 10/10/08 and 11/17/08



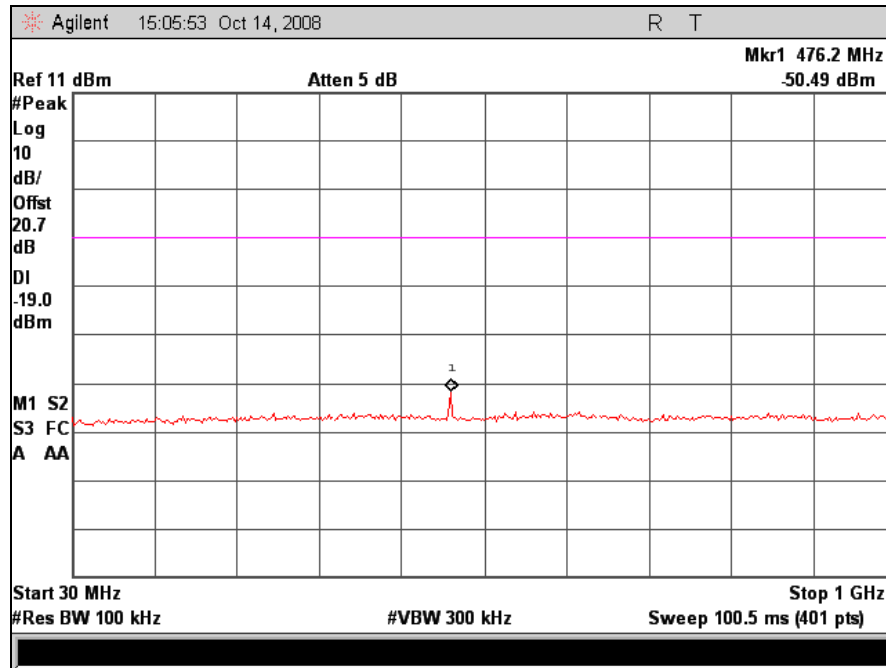
**Figure 6. Spurious Conducted Emissions Block Diagram**



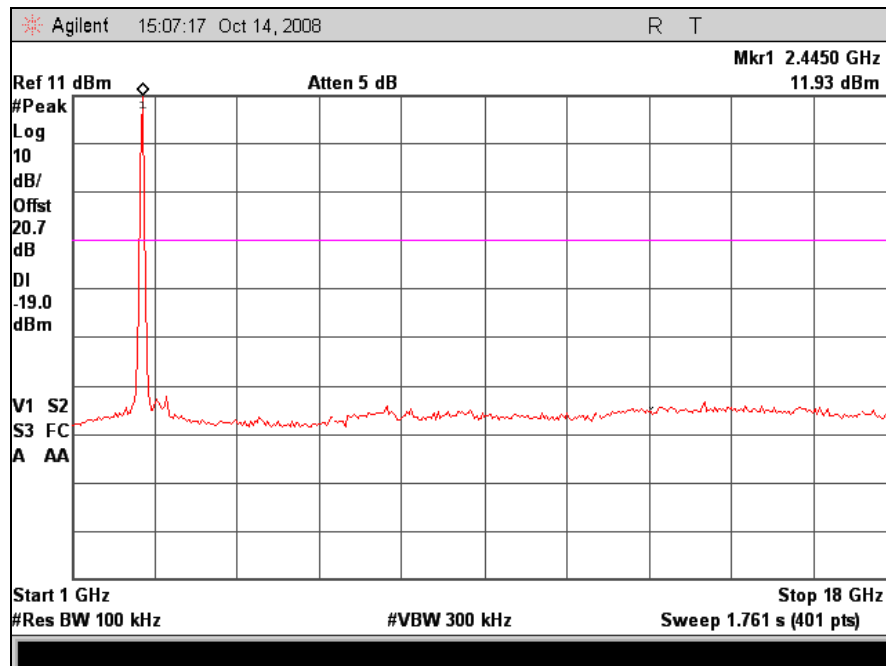
Plot 31. 802.11/b – Low Channel Conducted Emissions 30MHz - 1GHz



Plot 32. 802.11/b – Low Channel Conducted Emissions 1-18GHz

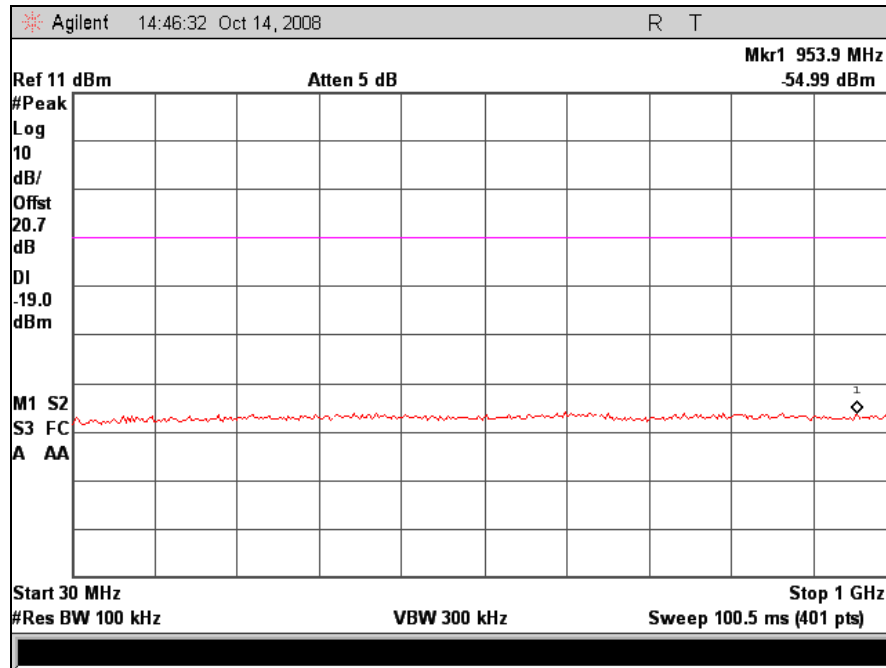


Plot 33. 802.11/b – Mid Channel Conducted Emissions 30MHz – 1GHz

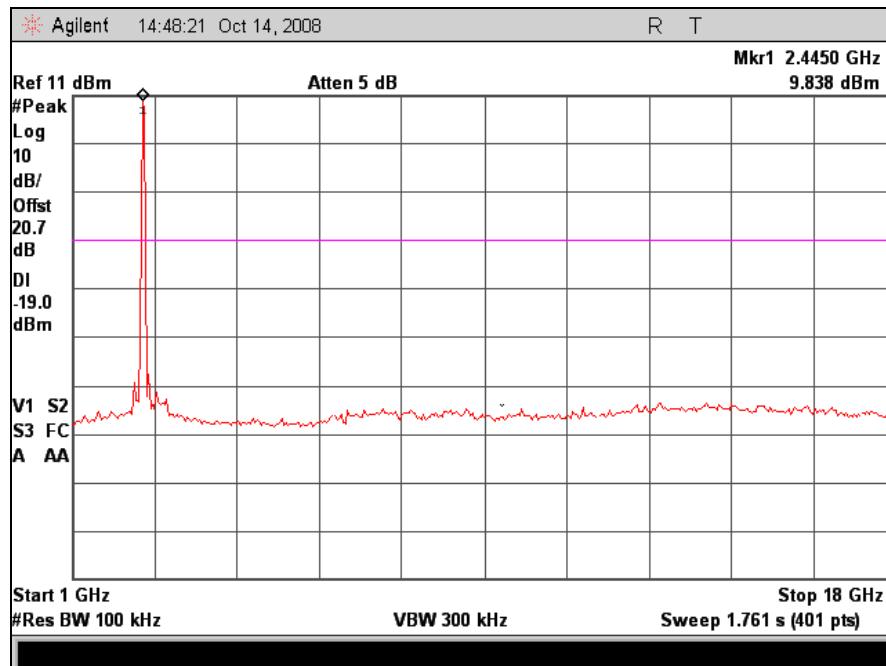


Plot 34. 802.11/b – Mid Channel Conducted Emissions 1 - 18GHz

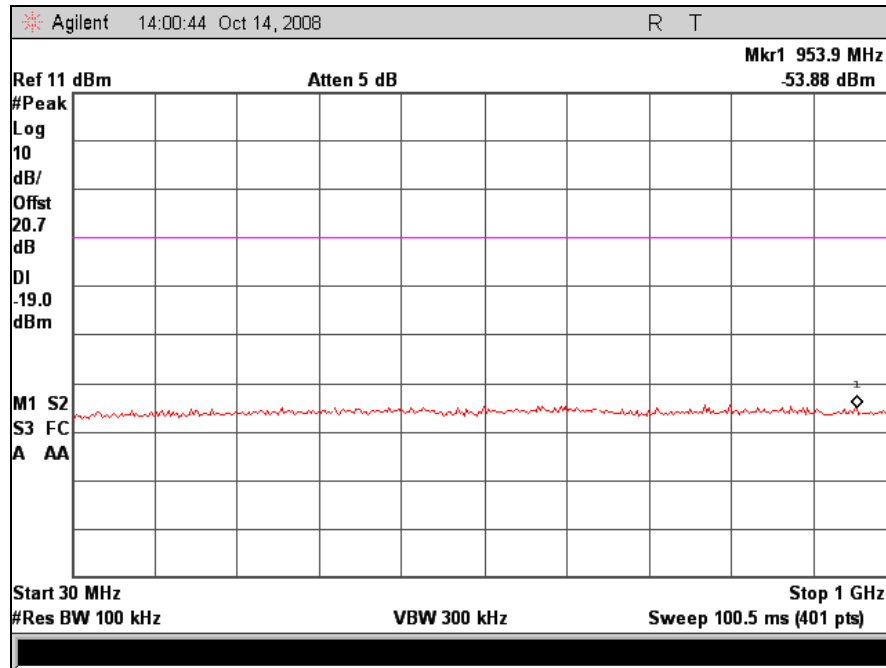




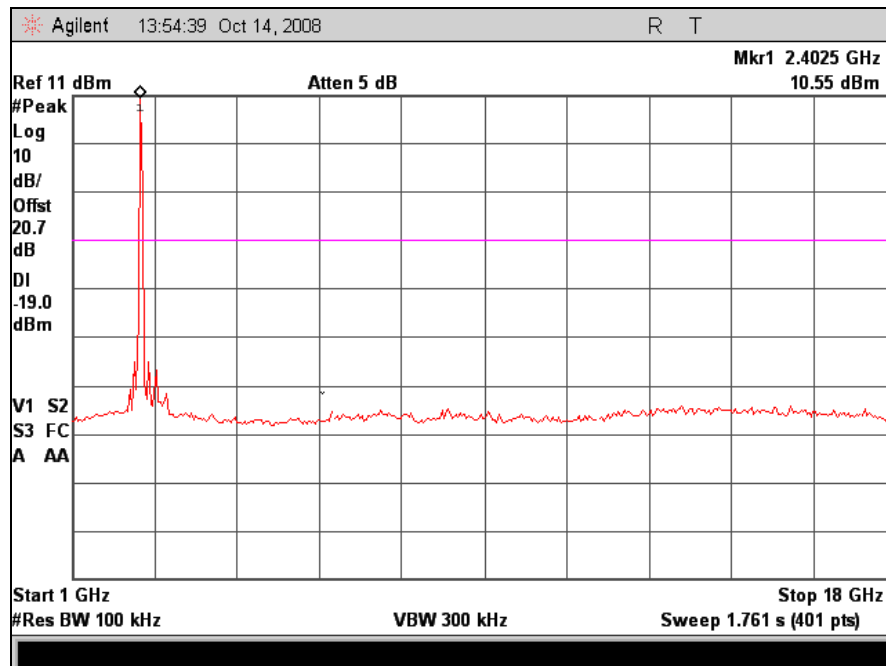
Plot 35. 802.11/b – High Channel Conducted Emissions 30MHz- 1GHz



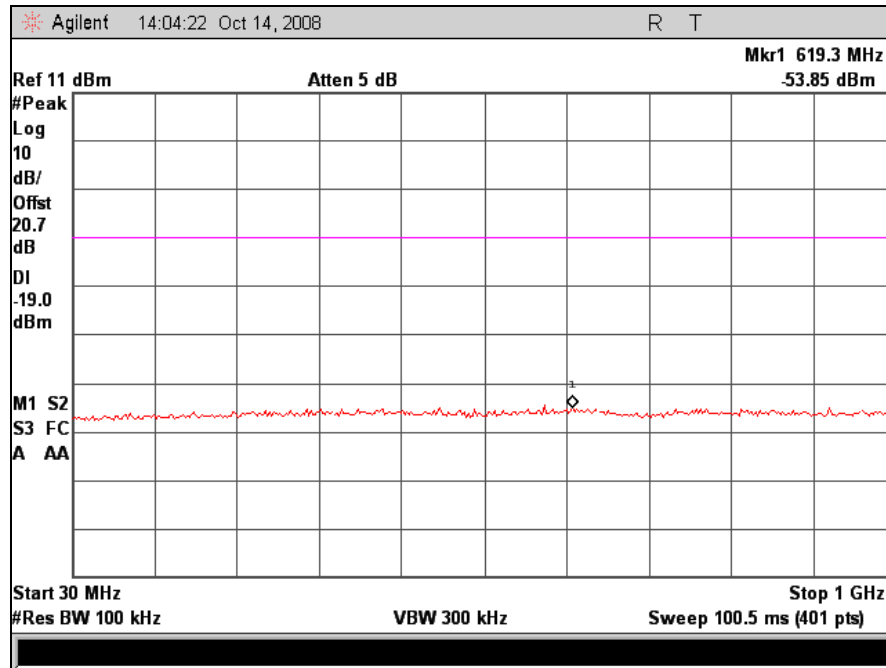
Plot 36. 802.11/b – High Channel Conducted Emissions 1-18GHz



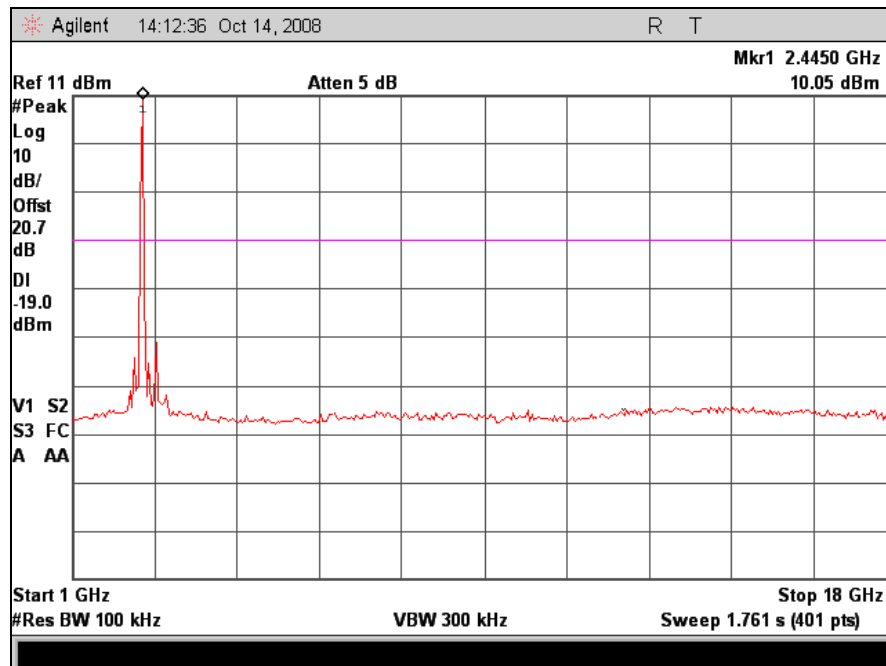
Plot 37. 802.11/g – Low Channel Conducted Emissions 30MHz- 1GHz



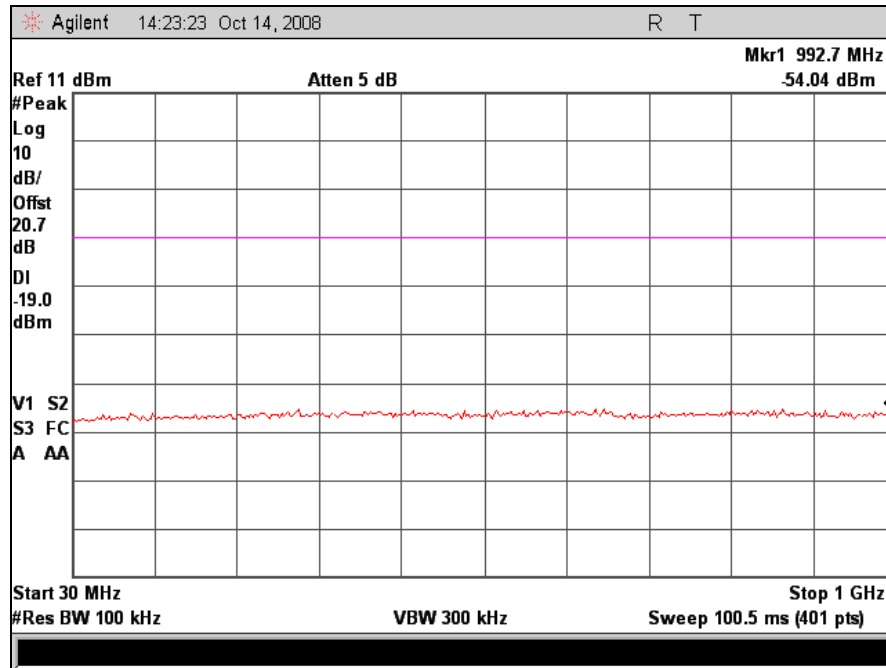
Plot 38. 802.11/g – Low Channel Conducted Emissions 1-18GHz



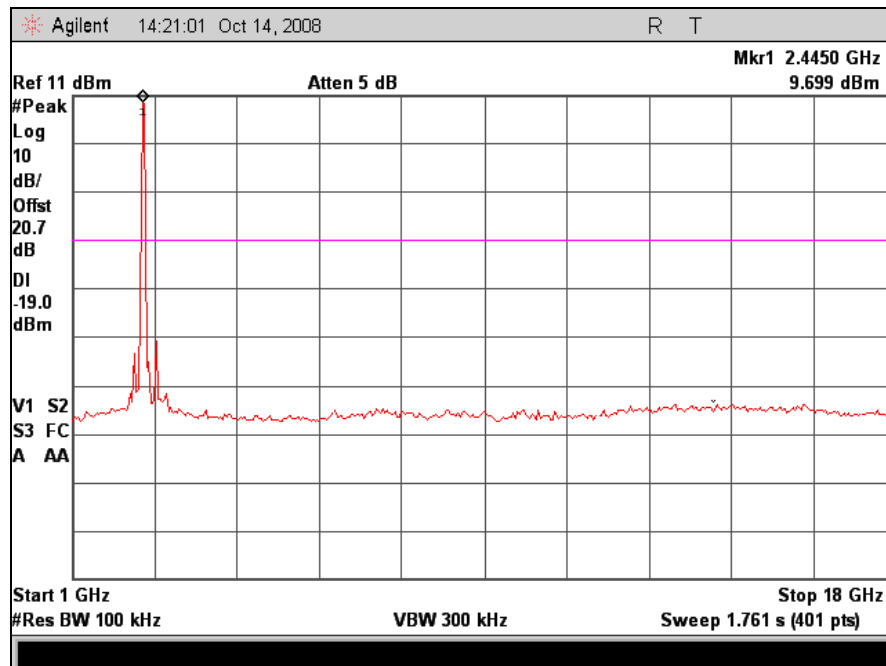
Plot 39. 802.11/g – Mid Channel Conducted Emissions 30MHz – 1GHz



Plot 40. 802.11/g – Mid Channel Conducted Emissions 1-18GHz



Plot 41. 802.11/g – High Channel Conducted Emissions 30MHz – 1GHz



Plot 42. 802.11/g – High Channel Conducted Emissions 1-18GHz



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 15.247(e) Peak Power Spectral Density

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

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

**Test Results:** Equipment complies 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).

802.11b				
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-7.192	8	-15.19
Mid	2437	-4.779	8	-12.78
High	2462	-9.310	8	-17.31

802.11g				
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.088	8	-14.09
Mid	2437	-3.789	8	-11.79
High	2462	-3.202	8	-11.20

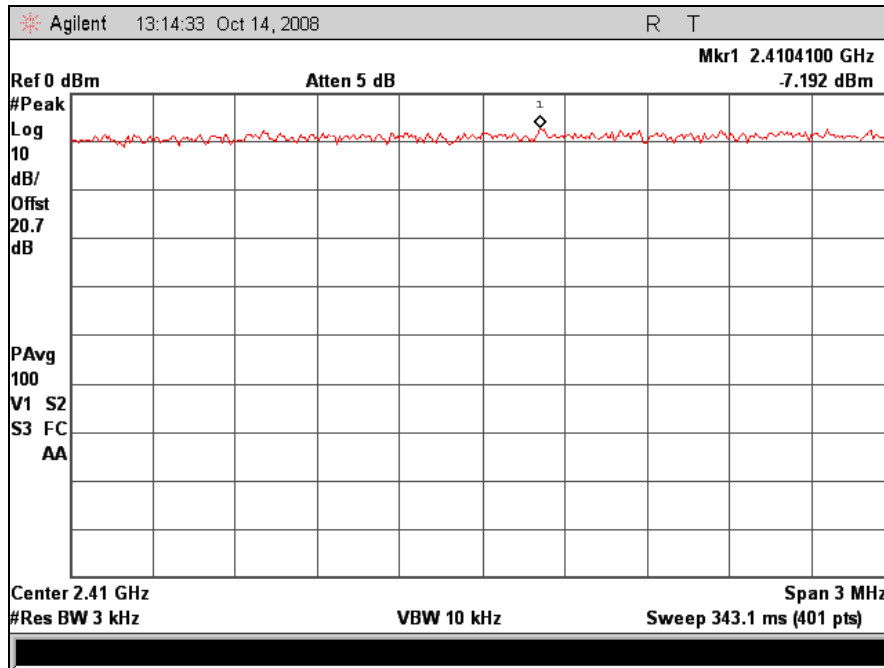
**Test Engineer:** Jeffrey Hazen

**Test Date:** 10/14/08

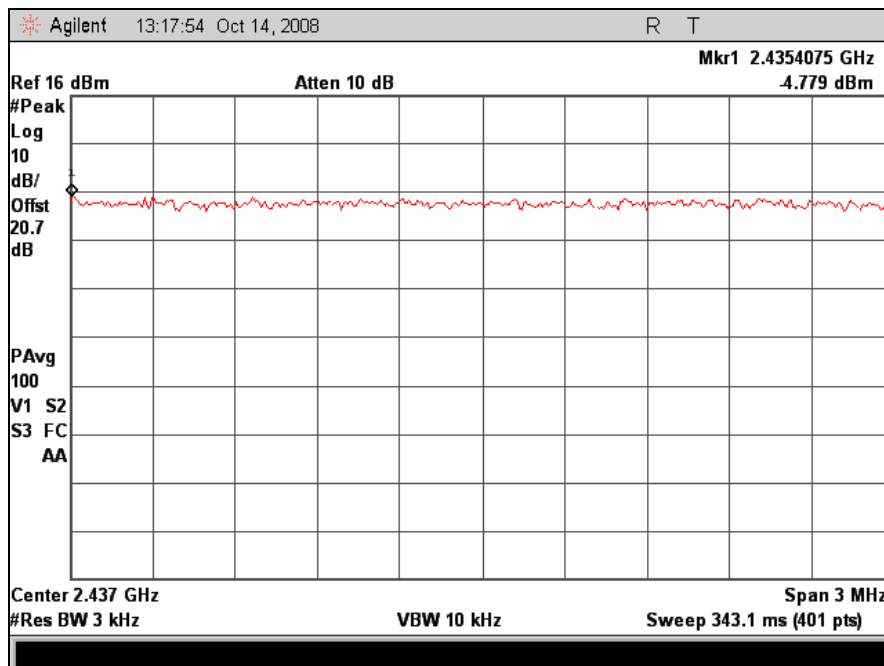


### Electromagnetic Compatibility Criteria for Intentional Radiators

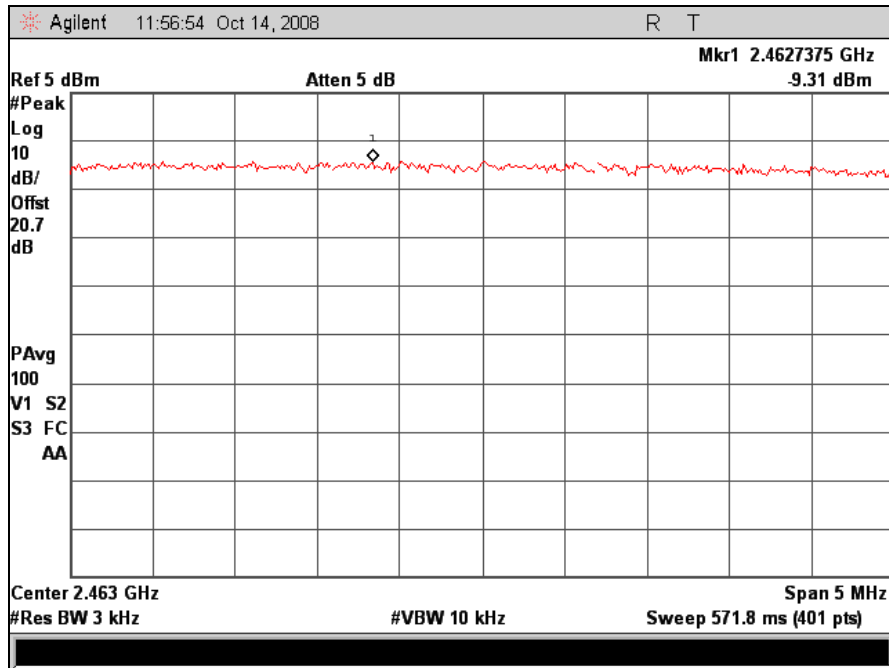
#### § 15.247(e) Peak Power Spectral Density (802.11b/g)



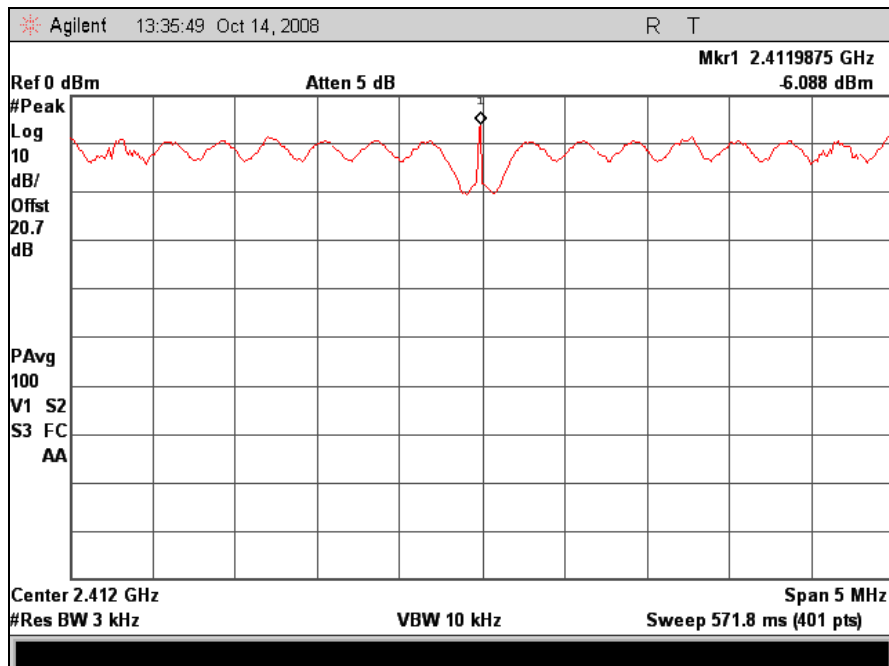
Plot 43. 802.11/b – Low Ch Peak Power Spectral Density



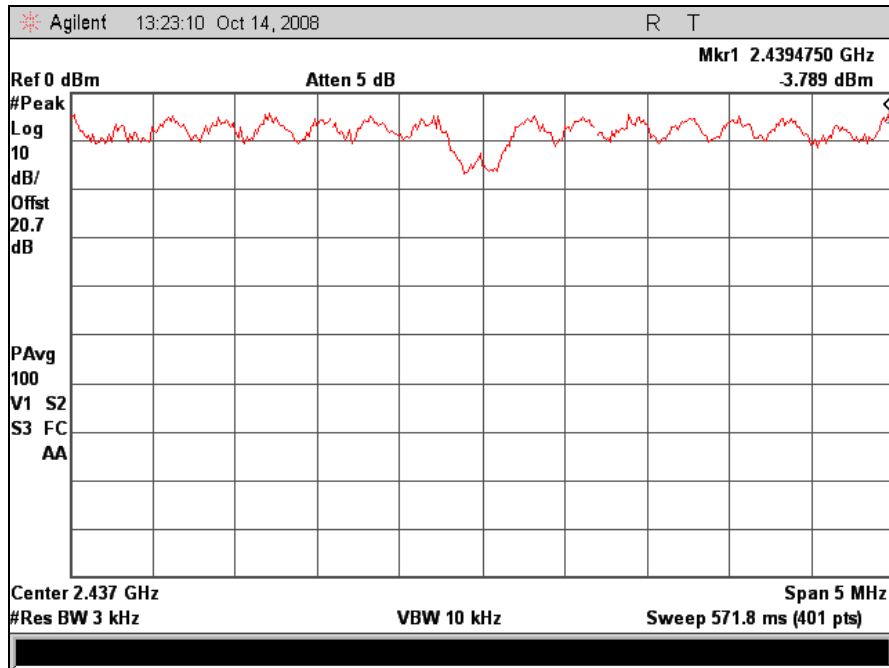
Plot 44. 802.11/b – Mid Ch Peak Power Spectral Density



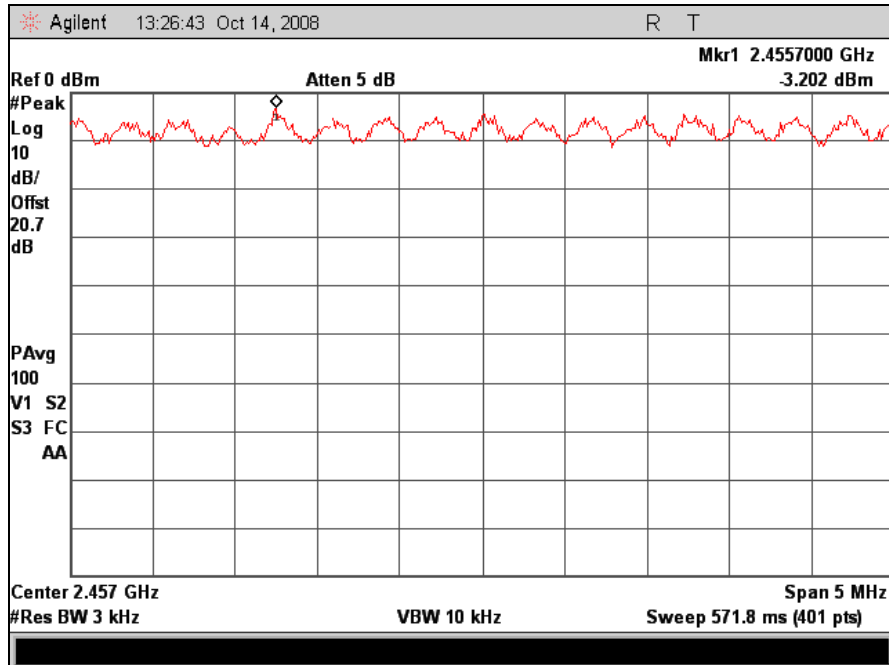
Plot 45. 802.11/b – High Ch Peak Power Spectral Density



Plot 46. 802.11/g – Low Ch Peak Power Spectral Density

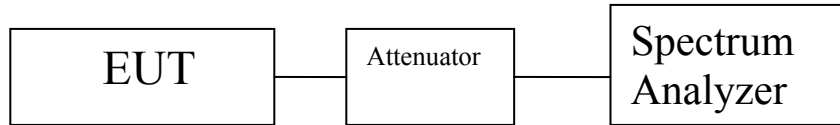


Plot 47. 802.11/g – Mid Ch Peak Power Spectral Density



Plot 48. 802.11/g – High Ch Peak Power Spectral Density





**Figure 7. Peak Power Spectral Density Block Diagram**



## 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
1S2508	AC LISN	SOLAR ELECTRONICS	TYPE 9252-50-R-24-BNC	4/22/08	4/22/09
1S2438	TRANSIENT LIMITER	AGILENT	11947A	SEE NOTE	
1S2460	SPECTRUM ANALYZER	AGILENT	E4407B	3/24/08	3/24/09
1S2198	HORN ANTENNA	EMCO	3115	09/10/08	09/10/09
1S2121	PREAMP	HP	8449B	10/26/08	10/26/09
1S2485	BILOG ANTENNA	TESEQ	CBL-6112D	1/21/08	1/21/09
1S2482	5M SEMI-ANECHOIC CHAMBER	PANASHIELD	N/A	11/18/07	11/18/08
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13146	SEE NOTE	
1S2034	COUPLER, DIRECTIONAL 1-20 GHZ	KRYTAR	101020020	SEE NOTE	
1S2421	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	4/18/2008	4/18/2009
1S2484	BILOG ANTENNA	TESEQ	CBL6112D	1/21/08	1/21/09
1S2481	10M CHAMBER	ETS-LINDGREN	DKE 8X8 DBL	12/26/2007	12/26/2008
1S2499	MULTI DEVICE CONTROLLER	ETS	2090	N/A	N/A
1S2501	EMI RECEIVER	ESU40	ROHDE SCHWARZ	04-08-2008	04-08-2009
1S2488	BILOG ANTENNA	N/A	TESEQ	1/21/08	1/21/09
1S2583	SPECTRUM ANALYZER	AGILENT	E4447A	1/12/09	1/10/10



## **V. Certification & User's Manual Information**



## Certification & User's Manual Information

### A. Certification Information

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

#### § 2.801 Radio-frequency device defined.

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

- (a) The various types of radio communication transmitting devices described throughout this chapter.
- (b) *The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.*
- (c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.
- (d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

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

- (a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:
  - (1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or
  - (2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.
- (d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.



- (e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:
- (i) *Compliance testing;*
  - (ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;
  - (iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;
  - (iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or
  - (v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.
- (e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.
- (f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.



## Certification & User's Manual Information

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

### § 2.901 Basis and Purpose

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

### § 2.907 Certification.

- (a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.
- (b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

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



## Certification & User's Manual Information

### § 2.948 Description of measurement facilities.

- (a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.
  - (1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.
    - (i) *If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.*
    - (ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.
  - (2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.





## Certification & User's Manual Information

### 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 [<sup>2</sup>] digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe [<sup>1</sup>] est conforme à la norme NMB-003 du Canada.

<sup>2</sup> Insert either A or B but not both as appropriate for the equipment requirements.



Motorola, Inc.  
MC-802 Wall Plate

Electromagnetic Compatibility  
End of Report  
CFR Title 47, Part 15, Subpart B and C, RSS-210 & ICES-003

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**End of Report**