



MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587-3201 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

March 8, 2007

Firetide
16795 Lark Ave, Suite 200
Los Gatos, CA 95032

Dear Paul Richards,

Enclosed is the EMC test report for compliance testing of the Firetide, 6100 as tested to the requirements of Title 47 of the CFR, Ch. 1 (10-1-03 ed.), Title 47 of the CFR, Part 15.407 for Intentional Radiators.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

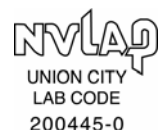
Jennifer Sanchez
Documentation Department

Reference: (\Firetide\EMCS21543A-FCC407)

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33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587-3201 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

Electromagnetic Compatibility Criteria Test Report

for the

**Firetide
Model 6100**

Verified under
the FCC Certification Rules
contained in
Title 47 of the CFR, Part 15.407
for Intentional Radiators

MET Report: EMC21543-FCC407

March 8, 2007

Prepared For:

**Firetide
16795 Lark Ave, Suite 200
Los Gatos, CA 95032**

Prepared By:
MET Laboratories, Inc.
4855 Patrick Henry Dr., Building 6
Santa Clara, CA 95054



Firetide
6100

Electromagnetic Compatibility
Equipment Configuration
CFR Title 47, Part 15, Subpart E

Electromagnetic Compatibility Criteria Test Report

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**Firetide
Model 6100**

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the FCC Certification Rules
contained in
Title 47 of the CFR, Part 15.407
for Intentional Radiators

Shawn McMillen, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Sanchez
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 Part 15.407, of the FCC Rules under normal use and maintenance.

Tony Permsombut, Manager
Electromagnetic Compatibility Lab



Firetide
6100

Electromagnetic Compatibility
Report Status
CFR Title 47, Part 15, Subpart E

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	March 8, 2007	Initial Issue.



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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 μ A	Decibels above one microamp
dB μ V	Decibels above one microvolt
dB μ A/m	Decibels above one microamp per meter
dB μ V/m	Decibels above one microvolt per meter
DC	Direct Current μ
E	Electric Field
DSL	Digital Subscriber Line
ESD	Electrostatic Discharge
EUT	Equipment Under Test
<i>f</i>	Frequency
FCC	Federal Communications Commission
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
μ H	microhenry
μ	microfarad
μ s	microseconds
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 Firetide 6100, with the requirements of Part 15, §15.407. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the 6100. Firetide should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the 6100, has been **permanently** discontinued.

B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, §15.407, in accordance with Firetide, purchase order number 1650. All tests were conducted using measurement procedure ANSI C63.4-2003.

Reference	Description	Results
15.403 (c)	26dB Occupied Bandwidth	Compliant
15.407 (a)(1), (2), (3)	Conducted Transmitter Output Power	Compliant
15.407 (a)(1), (2), (3), (5)	Power Spectral Density	Compliant
15.407 (a)(6)	Peak Excursion	Compliant
15.407 (b)(1), (2), (5), (6)	Undesirable Emissions	Compliant
15.205/15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Compliant
15.207	AC Conducted Emissions 150KHz – 30MHz	Compliant

Table 1 Executive Summary of EMC Part 15.407 Compliance Testing

Reference	Description	Results
15.407 (h)(1)	Transmit Power Control (TCP)	Refer to DFS Report EMCS21543-FCCDFS
15.407 (h)(2)	Radar Detection Function of Dynamic Frequency Selection (DFS)	
15.407 (h)(2)(ii)	Channel Availability Check Time	
15.407 (h)(2)(iii)	Channel Move Time and Channel Closing Time	
15.407 (h)(2)(iv)	Non-Occupancy Period	

Table 2 Executive Summary of EMC Part 15.407 DFS Compliance Testing



II. Equipment Configuration



A. Overview

MET Laboratories, Inc. was contracted by Firetide to perform testing on the 6100, under Firetide's purchase order number 1650.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Firetide 6100.

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

Model(s) Tested:	6100	
Model(s) Covered:	6100	
EUT Specifications:	Primary Power: 100-240V	
	FCC ID: REP-6100-1	
	Type of Modulations:	-Orthogonal Frequency Division Multiplexing (OFDM)
	Emission Designators:	UNII-1: 27M2D7D (26dB) 16M8D7D (99%) UNII-2 Low Band: 25M1D7D (26dB) 16M6D7D (99%) UNII-2 High Band: 29M6D7D (26dB) 17M7D7D (99%)
	Equipment Code:	NII
	Peak RF Output Power:	UNII-1: 16.5dBm UNII-2: 23.9dBm
	EUT Frequency Ranges:	5.15 – 5.25GHz 5.25 – 5.35GHz 5.47 – 5.725GHz
	Analysis:	The results obtained relate only to the item(s) tested.
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Shawn McMillen	
Date(s):	March 8, 2007	



B. References

CFR 47, Part 15, Subpart B	Electromagnetic Compatibility: Criteria for Radio Frequency Devices
CFR 47, Part 15, Subpart E	Unlicensed National Information Infrastructure Devices (UNII)
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

C. Test Site

All testing was performed at MET Laboratories, Inc., 4855 Patrick Henry Drive, Building 6, 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. In accordance with §2.948(d), MET Laboratories has been accredited by A2LA (Certificate Number 591.02).

D. Description of Test Sample

The Firetide 6100 Indoor Unit, is an indoor Wireless Mesh Node equipped with a modularly approved Ubiquiti 802.11 b/g card.



Photograph 1. Firetide 6100

Unintentional Emission
&
Intentional Radiated

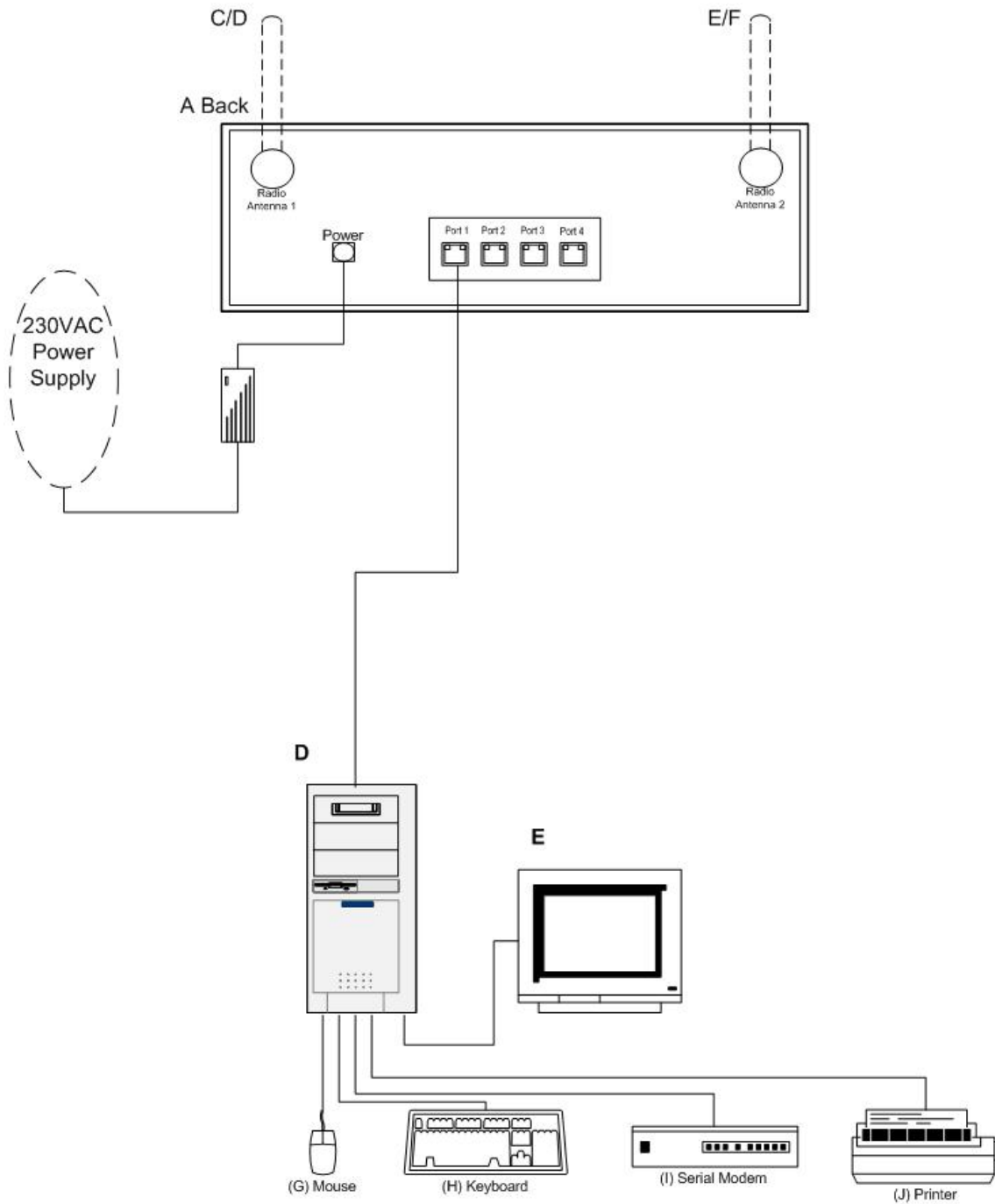


Figure 1. Block Diagram of Test Configuration (Radiated Emissions)

Indoor Conducted Measurement

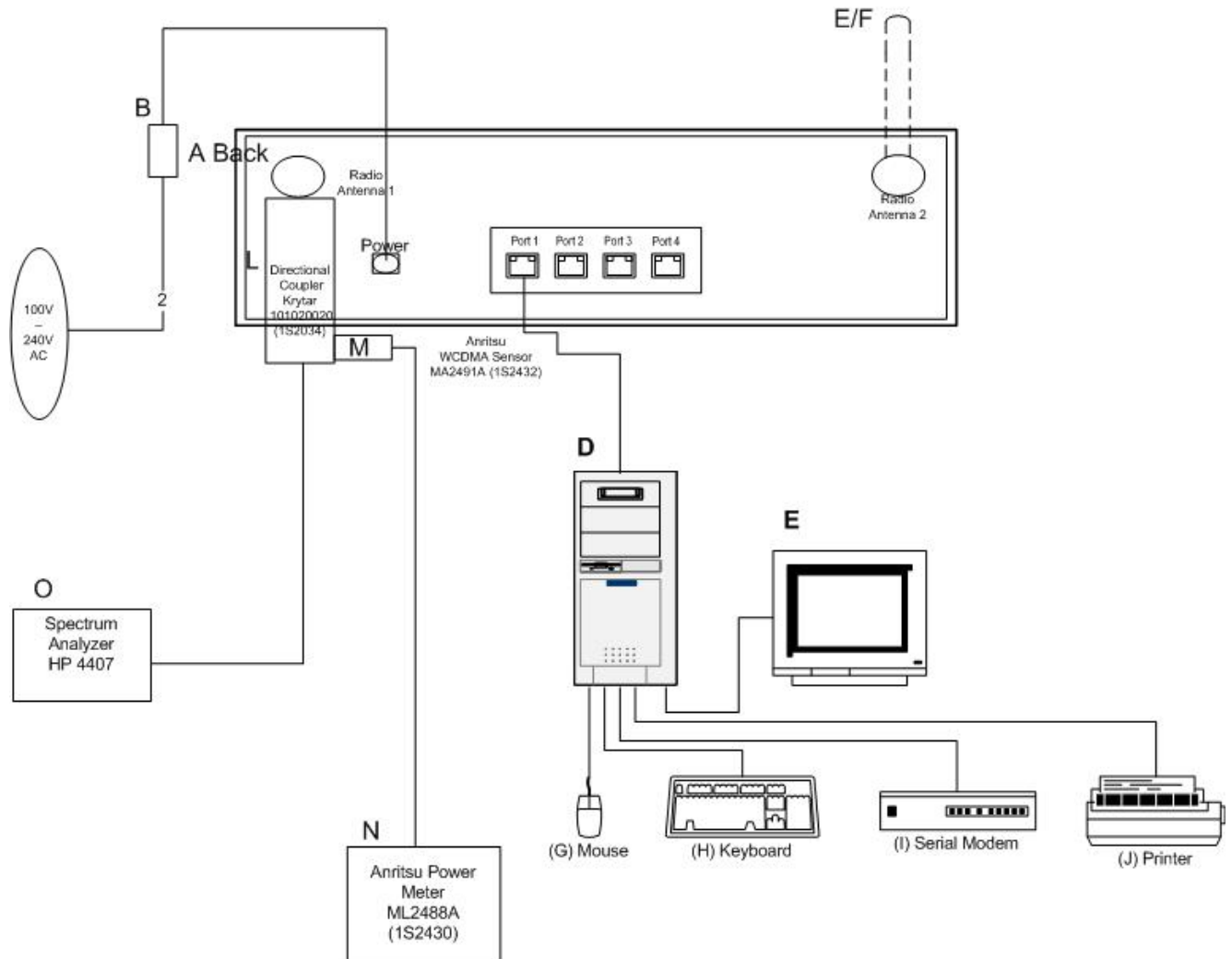


Figure 2. Block Diagram of Test Configuration (Conducted Measurement)



E. Equipment Configuration

The EUT was set up as outlined in Figure 1 and Figure 2, 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	Serial Number
A Indoor	6100 Indoor Unit (FireTide)	6100	N/A
A Indoor, Antenna 3 &4	5dBi OMNI 5.1-5.8 GHz	N/A	2000037-001
B	AC Adapter (Cycon)	TR45A15	45150-0003071

Table 3. Equipment Configuration Unintentional

Ref. ID	Name / Description	Model Number	Serial Number
A Indoor	5Ghz Indoor Antenna (FireTide)	6100	N/A
A Indoor, Antenna 1 &2	5dBi Antenna (FireTide)	N/A	N/A
B	AC Adapter (Cycon)	TR45A15	45150-0003071

Table 4. Equipment Configuration Intentional



F. Support Equipment

6100 supplied support equipment necessary for the operation and testing of the 6100. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
D	Computer	Dell	Optiplex GX 100	N/A
E	Monitor	Dell	E551	N/A
F	Spectrum Analyzer	HP	8591E	N/A
G	Mouse	Microsoft	WheelMouse 3.0	N/A
H	Keyboard	Dell	RT7D5JTW	N/A
I	Serial Modem	Ramp Networks	WebRamp 200FX	N/A
J	Printer	HP	Deskjet 895Cse	N/A

Table 5. Support Equipment (Radiated Emissions)

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
D	Computer	Dell	Optiplex GX 100	N/A
E	Monitor	Dell	E551	N/A
F	Spectrum Analyzer	HP	8591E	N/A
G	Mouse	Microsoft	WheelMouse 3.0	N/A
H	Keyboard	Dell	RT7D5JTW	N/A
I	Serial Modem	Ramp Networks	WebRamp 200FX	N/A
J	Printer	HP	Deskjet 895Cse	N/A
K	Temperature Chamber	Tenny Engineering	T630	N/A
L	Directional Coupler	Krytar	101020020	N/A
M	WCDMA Sensor	Aritsu	MA2491A	N/A
N	Power Meter	Aritsu	ML2488A	N/A
O	Spectrum Analyzer	HP	4407	N/A
P	VariAC	Staco	3PN2210	N/A

Table 6. Support Equipment (Conducted Measurement)

* The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

** The AC/DC Adapter was used to power the EUT for testing purpose only, will not be sold with radio.



G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded (Yes/No)	Termination Box ID & Port ID
Conducted Measurement						
1	A Indoor, Ethernet	CAT5	1	2.5	Yes	D
2	A Indoor, Power Input	AC	1	1	No	B
3	B	AC	1	1	No	110-240VAC Power Supply
4	A Indoor, Antenna 1	Direct Connect	1	N/A	N/A	L
Frequency Satiability						
1	A Indoor, Ethernet	CAT5	1	2.5	Yes	D
2	A Indoor, Power Input	AC	1	1	No	B
3	B	AC	1	1	No	P
4	P	AC	1	1	No	110-240VAC Power Supply
5	A Indoor, Antenna 1	Direct Connect	1	N/A	N/A	L
Radiated Emissions						
1	A Indoor, Ethernet	CAT5	1	2.5	Yes	D
2	A Indoor, Power Input	AC	1	1	No	B
3	B	AC	1	1	No	110-240VAC Power Supply

Table 7. Ports and Cabling Information

H. Mode of Operation

Telnet was use to access the radio in order to change the channel frequency, bit rate and to turn on/off the transmitter.

I. Method of Monitoring EUT Operation

A Spectrum Analyzer and a Power Meter was use to monitor the EUT's transmitter channel and power output.



J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Firetide upon completion of testing.



III. Electromagnetic Compatibility Criteria for Intentional Radiators



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

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

Table 8. 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 semi-anechoic chamber. 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 μ H Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-1992 "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 μ H LISN as the input transducer to an EMC/field intensity meter.

Test Results: The EUT was found to be compliant with the requirement(s) of this section. Measured emissions were below applicable limits

Test Engineer(s): Anderson Soungpanya

Test Date(s): January 24, 2007



Conducted Emissions - Voltage, AC Power, Phase Line (110 VAC, 60 Hz)

Freq. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.206	51.61	79	PASS	-27.39	38.45	66	PASS	-27.55
0.48	44.92	79	PASS	-34.08	44.4	66	PASS	-21.6
9.909	36.63	73	PASS	-36.37	22.8	60	PASS	-37.2
15.17	37.67	73	PASS	-35.33	26.92	60	PASS	-33.08

Table 9. Conducted Emissions - Voltage, AC Power, Phase Line (110 VAC, 60 Hz)

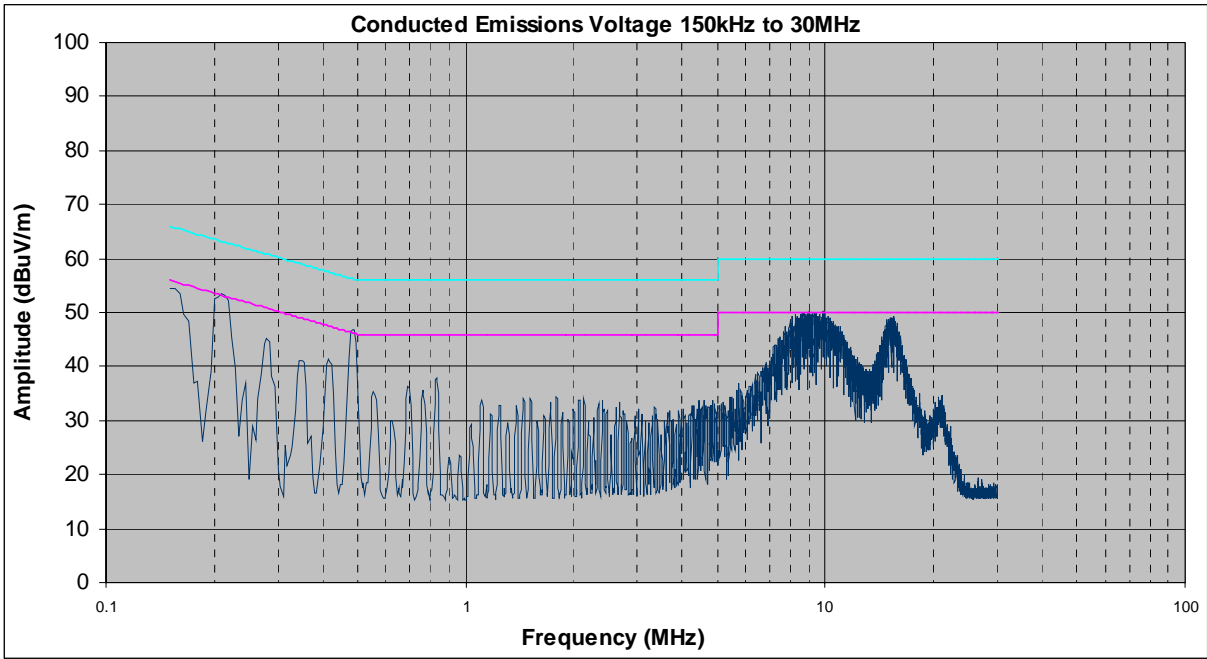
Conducted Emissions - Voltage, AC Power, Neutral Line (110 VAC, 60 Hz)

Freq. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.205	51.34	79	PASS	-27.66	38.19	66	PASS	-27.81
0.479	45.63	79	PASS	-33.37	45.03	66	PASS	-20.97
8.507	45.45	73	PASS	-27.55	30.13	60	PASS	-29.87

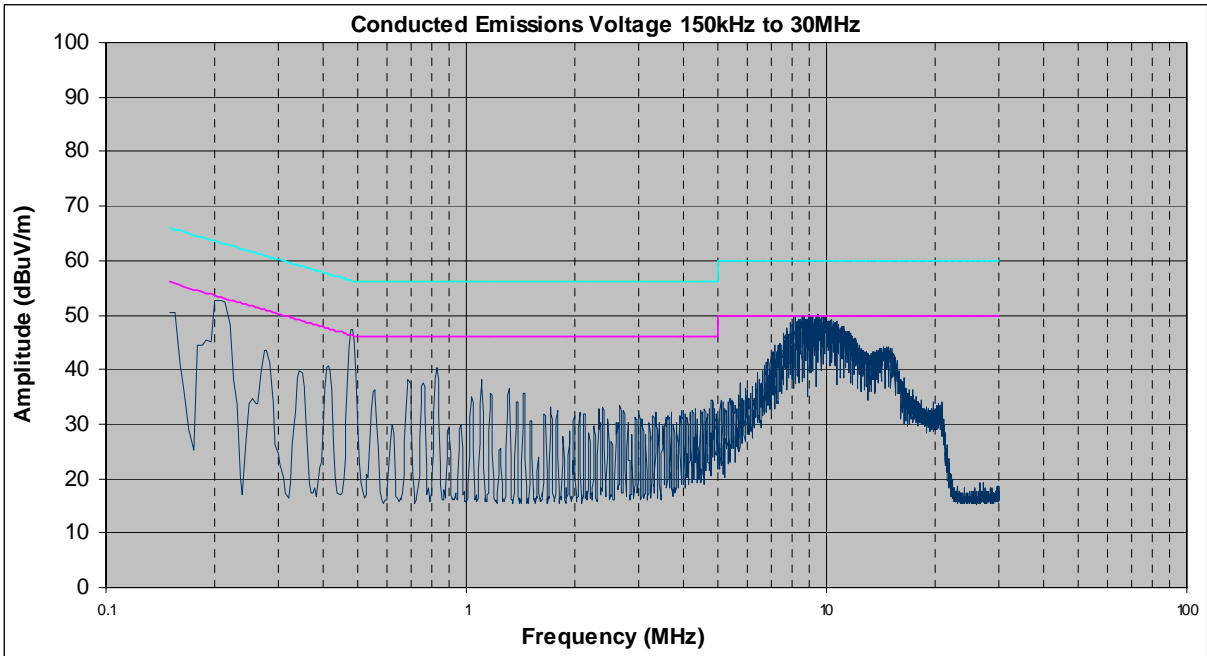
Table 10. Conducted Emissions - Voltage, AC Power, Neutral Line (110 VAC, 60 Hz)



Conducted Emissions - Voltage, Worst Case Emissions, 15.207



Conducted Emission, Phase Line Plots



Conducted Emission, Neutral Line Plots



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15. 403(c) 26dB Bandwidth

Test Requirements: § 15.403 (c): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

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 equal to 1% of the total emission bandwidth, VBW > RBW. The 26 dB Bandwidth was measured and recorded. The measurements were repeated at the low and high channels.

Test Results Equipment complies with § 15.407 (c). The 26 dB Bandwidth was determined from the plots on the following pages.

802.11a mode UNII-1			
Carrier Channel	Frequency (MHz)	Measured 26 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	5180	27.2	16.5
High	5240	24.8	16.8

802.11a mode UNII-2 lower Band			
Carrier Channel	Frequency (MHz)	Measured 26 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	5260	25.1	16.6
High	5320	22.6	16.4

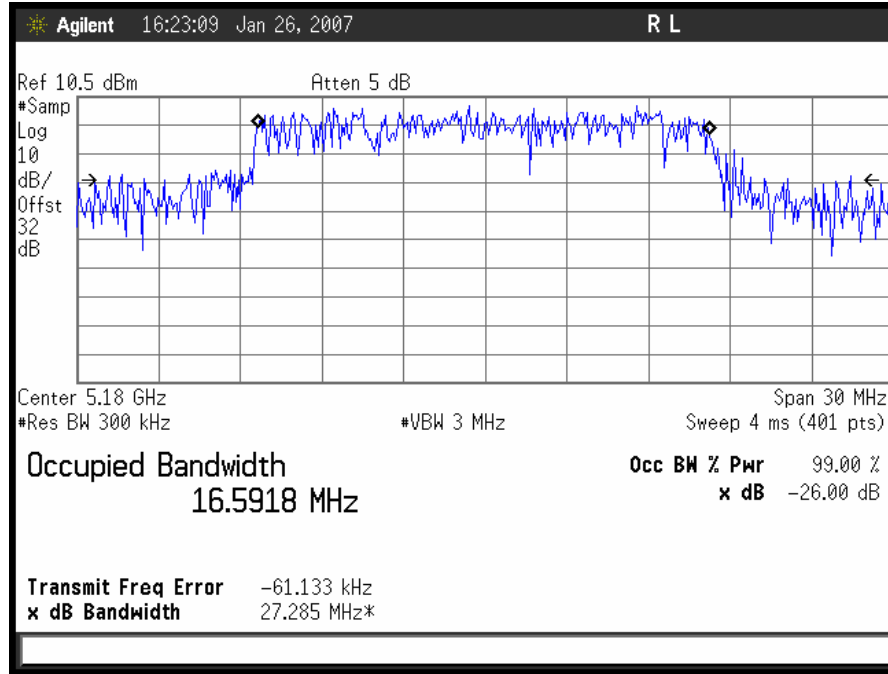
802.11a mode UNII-2 Upper Band			
Carrier Channel	Frequency (MHz)	Measured 26 dB Bandwidth (MHz)	Measured 99% Bandwidth (MHz)
Low	5500	25.4	16.6
Mid	5600	29.6	17.7
High	5700	29.4	17.4

Test Engineer(s): Shawn McMillen

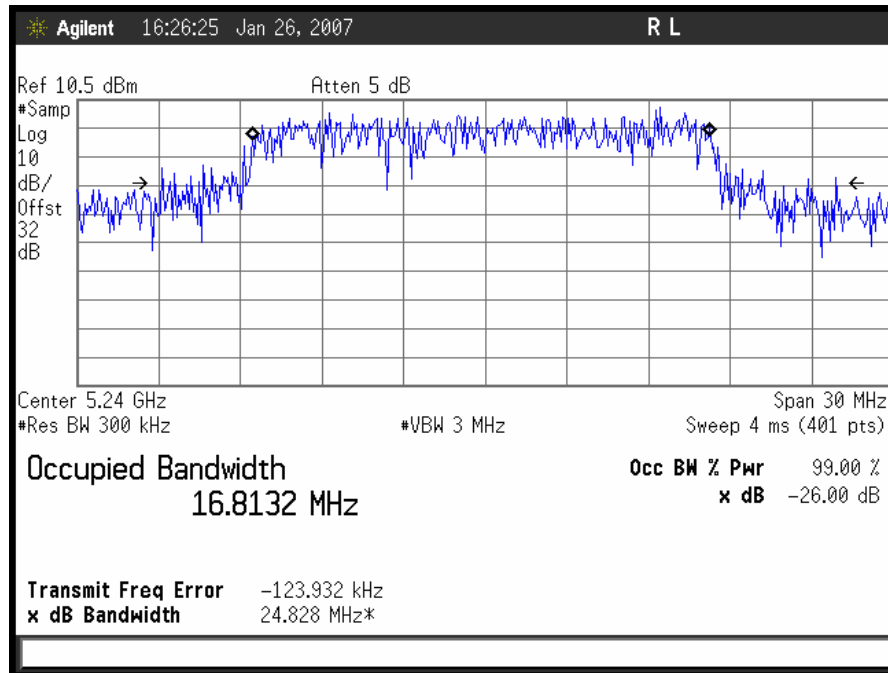
Test Date(s): January 18 & January 26, 2007



Electromagnetic Compatibility Criteria for Intentional Radiators



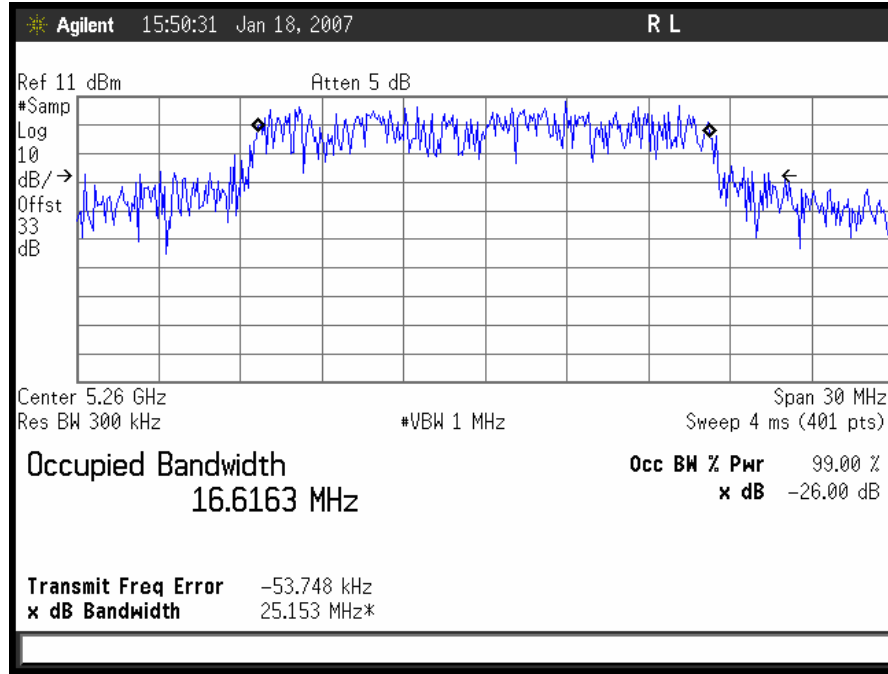
802.11/a UNII-1 Low Ch Occupied Band Width



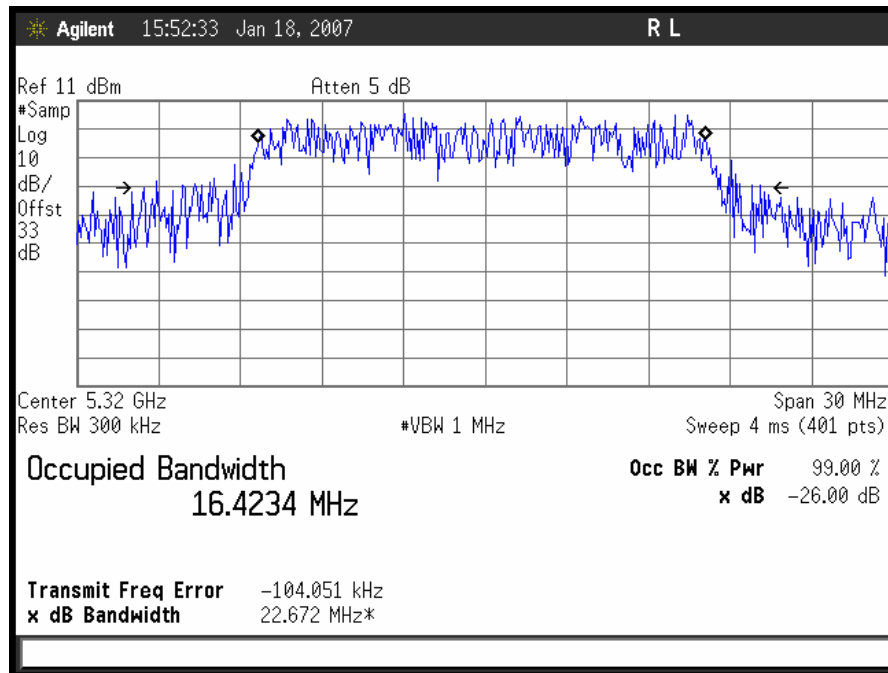
802.11/a UNII-1 High Ch Occupied Band Width



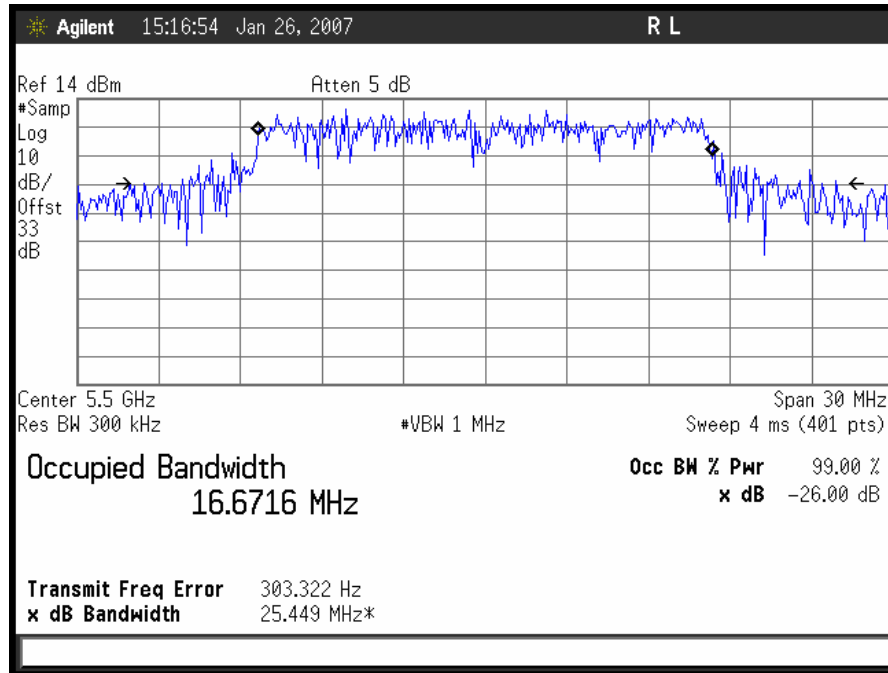
Electromagnetic Compatibility Criteria for Intentional Radiators



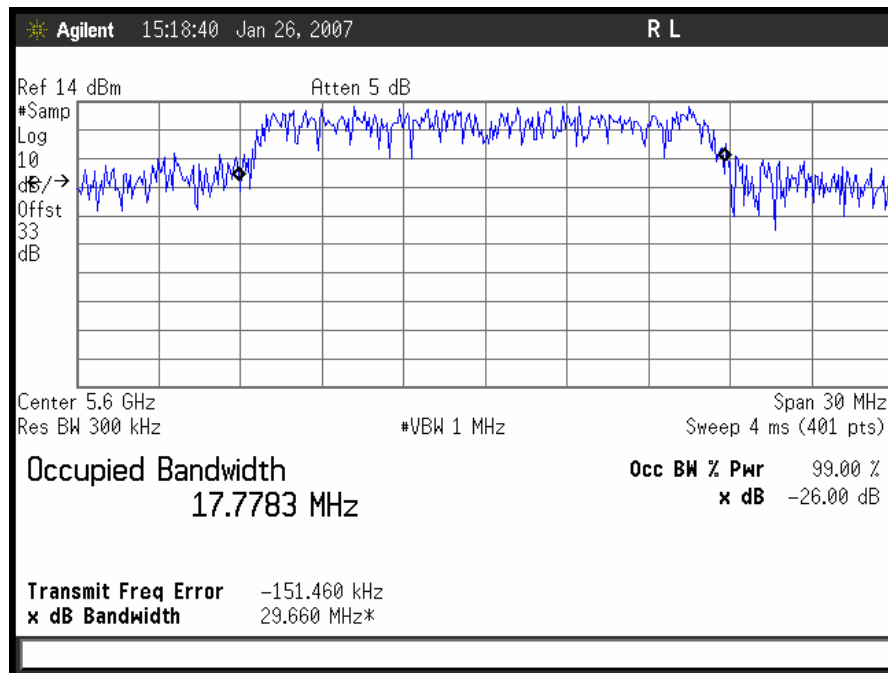
802.11/a UNII-2 Low Band Low Ch Occupied Band Width – 5260MHz



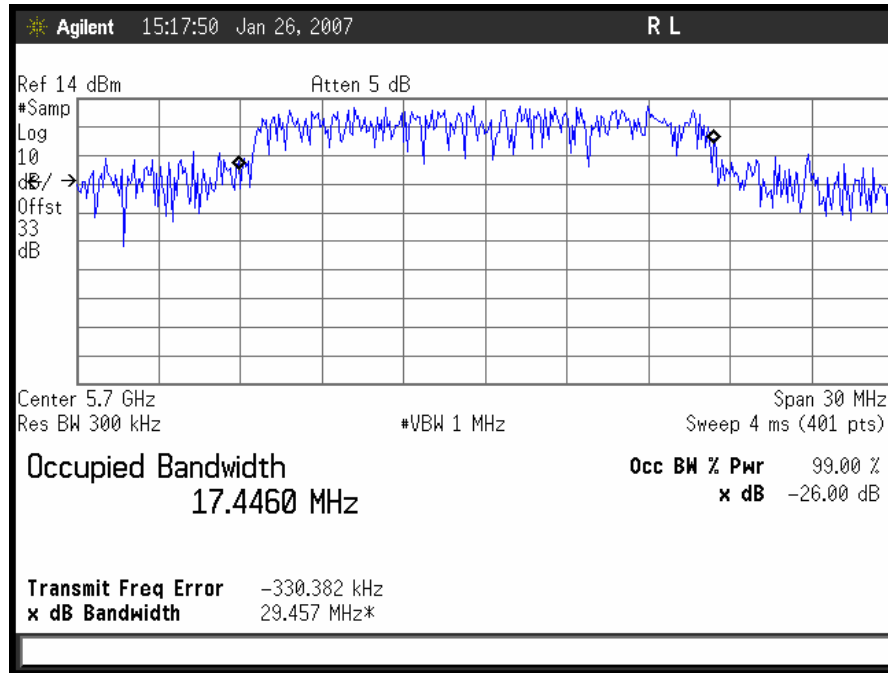
802.11/a UNII-2 Low Band High Ch Occupied Band Width – 5320MHz



802.11/a UNII-2High Band Low Ch Occupied Band Width – 5500MHz



802.11/a UNII-2 High Band Mid Ch Occupied Band Width – 5600MHz



802.11/a UNII-2 High Band High Ch Occupied Band Width – 5700MHz



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a) (1), (2) RF Power Output

Test Requirements: §15.407(a) (1), (2): The maximum output power of the intentional radiator shall not exceed the following:

Digital Transmission Systems (MHz)	Output Limit (mW)
5150-5250	50
5250-5350	250
5470-5725	250

Table 11. Output Power Requirements from §15.407

§15.407(a) (1): For the band 5.15-5.25 GHz the peak transmit power over the frequency band of operation shall not exceed the lesser 50mW or $4\text{dBm} + 10\log B$, where B is the 26-dB emission bandwidth in MHz.

§15.407(a) (2): For the band 5.25-5.35GHz the peak transmit power over the frequency band of operation shall not exceed the lesser of 250mW or $11\text{dBm} + 10\log B$, where B is the 26-dB emission bandwidth in MHz.

Test Procedure: The transmitter was connected to a calibrated Power Meter. The EUT was measured at the low, mid and high channels of each band at all available data rates.

Test Engineer(s): Shawn McMillen

Test Date(s): January 18 & January 26, 2007



Test Results: Equipment complies with the Peak Power Output limits of § 15.401(a) (1)

Carrier Channel	Frequency (MHz)	Measured Peak Output Power dBm
52	5180	16.5
64	5240	16.5



Test Results: Equipment complies with the Peak Power Output limits of § 15.401(a) (2)

UNII-2	
Frequency (MHz)	Measured Peak Output Power dBm
5260	23.9
5320	23.4

UNII-2	
Frequency (MHz)	Measured Peak Output Power dBm
5500	23.9
5600	23.2
5700	23.7



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(1), (a)(2) Peak Power Spectral Density

Test Requirements: § 15.407(a)(1), (a)(2): For digitally modulated systems, the conducted peak power spectral density from the intentional radiator to the antenna shall not be greater than 4dBm/MHz in the frequency band 5.15-5.25 GHz and 11dBm/MHz in the frequency band 5.25-5.35GHz.

Test Procedure: The transmitter was connected directly to a Spectrum Analyzer through a directional coupler. The power was monitored at the coupler port with a Power Meter capable of measuring peak and average RF power. The power level was set to the maximum level on the EUT. The RBW was set to 1MHz and the VBW was set to 3MHz. The method of measurement #2 from the FCC Public Notice CA 02-2138 was used.

Test Results: Equipment complies with the peak power spectral density limits of § 15.407(a)(1), (a)(2). The peak power spectral density was determined from plots on the following page(s).

802.11a UNII-1				
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	3.757	11	7.243
High	5240	3.351	11	7.649

802.11a UNII-2				
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5260	6.036	11	4.964
High	5320	4.946	11	6.054

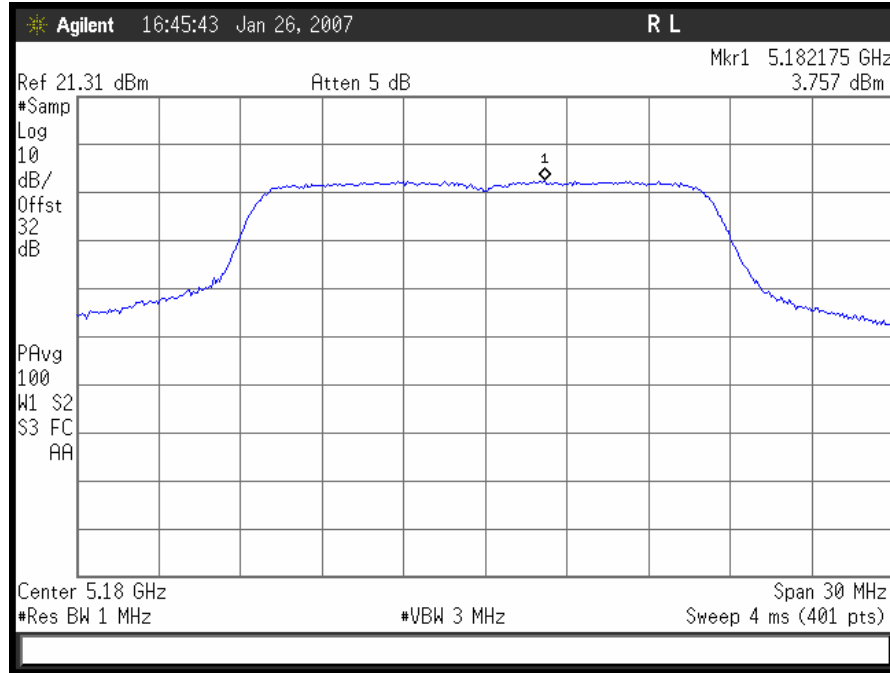
802.11a UNII-2				
Carrier Channel	Frequency (MHz)	Measured PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5500	9.48	11	1.52
Mid	5600	10.56	11	0.44
High	5700	10.54	11	0.46

Test Engineer(s): Shawn McMillen

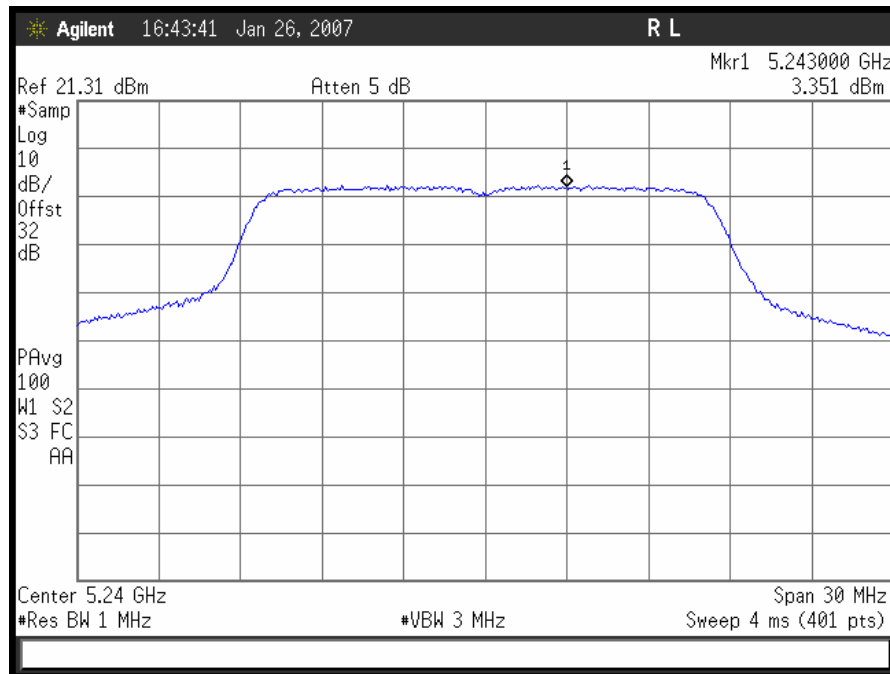
Test Date(s): January 18 & January 26, 2007



Electromagnetic Compatibility Criteria for Intentional Radiators

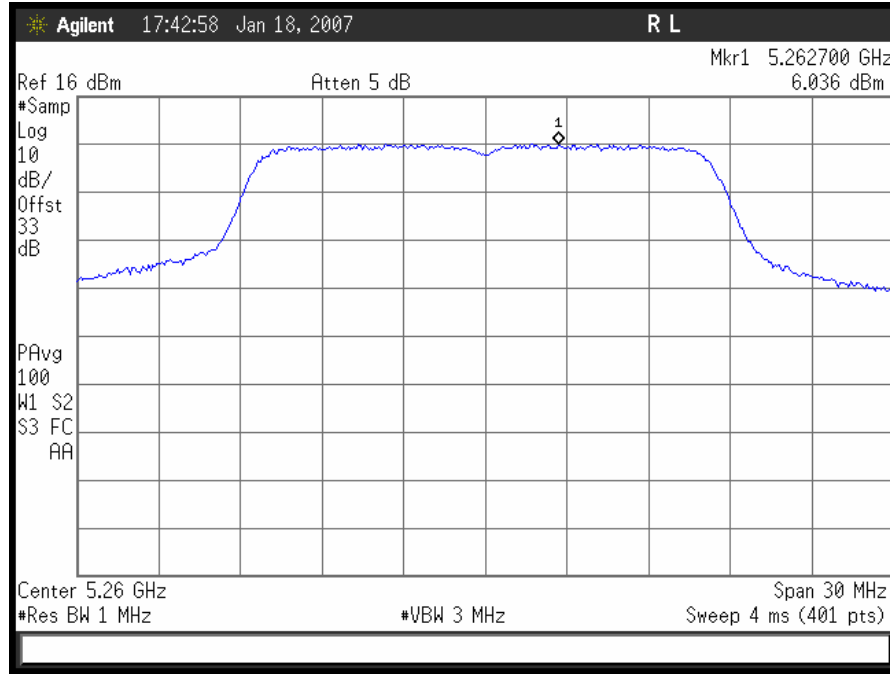


802.11/a – UNII-1 Low Ch Peak Power Spectral Density

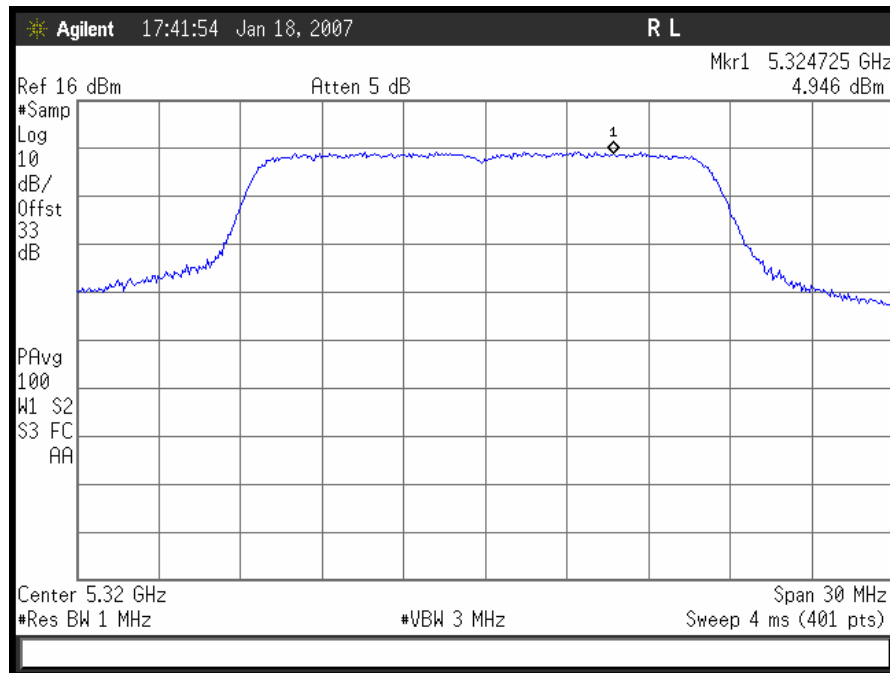


802.11/a – UNII-1 High Ch Peak Power Spectral Density

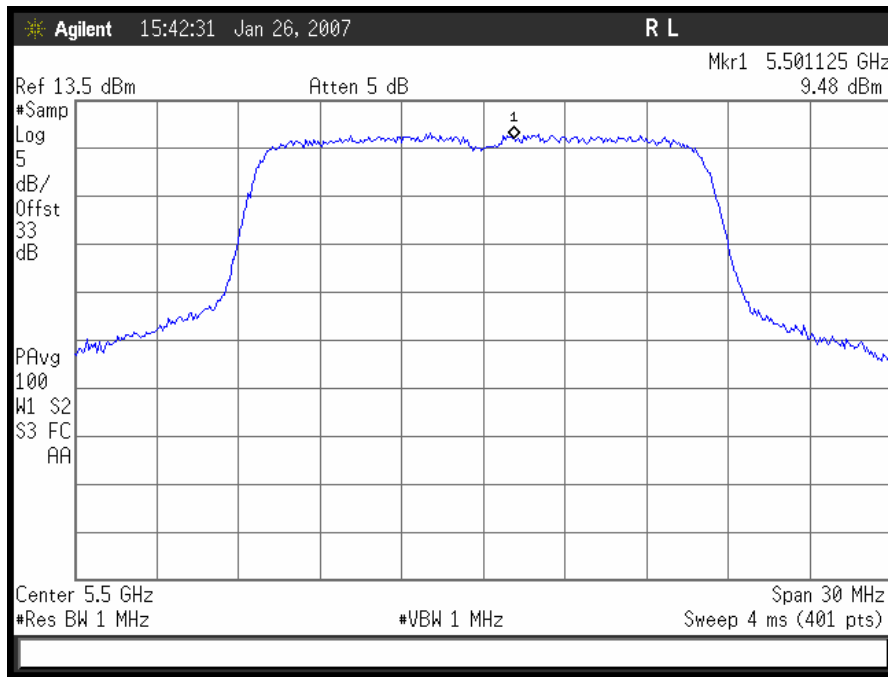
Electromagnetic Compatibility Criteria for Intentional Radiators



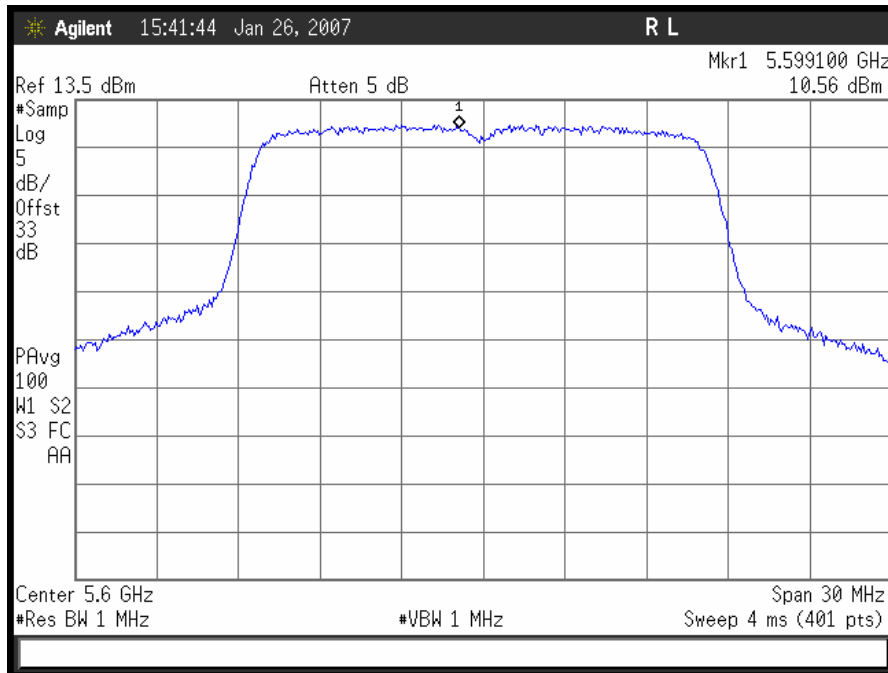
802.11/a- UNII-2 Low Band Low Ch Peak Power Spectral Density



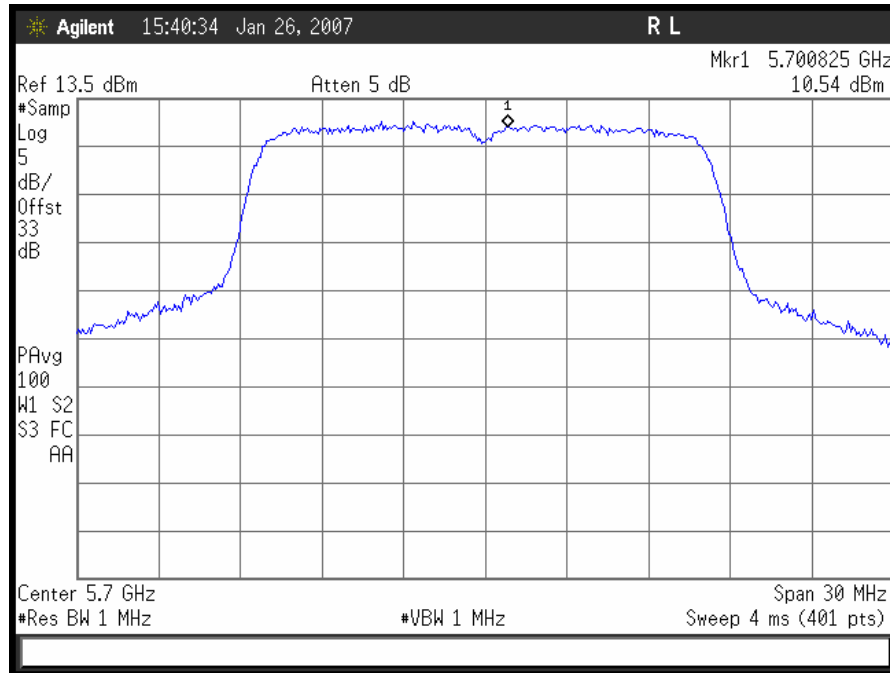
802.11/a - UNII-2 Low Band High Ch Peak Power Spectral Density



802.11/a – UNII-2 High Band Low Ch Peak Power Spectral Density



802.11/a – UNII-2 High Band Mid Ch Peak Power Spectral Density



802.11/a – UNII-2 High Band High Ch Peak Power Spectral Density



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(a)(6) Peak Excursion Ratio

Test Requirements: § 15.407(a)(6): For digitally modulated systems, the peak excursion of the modulation envelope to the peak transmit power shall not exceed 13dB across any 1MHz bandwidth of the emission bandwidth whichever is less.

Test Procedure: The method of measurement #2 from the FCC Public Notice CA 02-2138 was used. The EUT was connected directly to the spectrum analyzer through cabling and attenuation. The 1st trace on the spectrum analyzer was set to RBW=1MHz, VBW=3MHz. The peak detector mode was used and the trace max held. The 2nd trace on the spectrum analyzer was set to a RBW=1MHz, VBW=30 KHz. The detector mode was set to sample detector.

The Peak Excursion Ratio was determined from the difference between the maximum found in each trace.

Test Results: Equipment complies with the peak excursion ratio limits of § 15.407(a)(6). The peak excursion ratio was determined from plots on the following page(s).

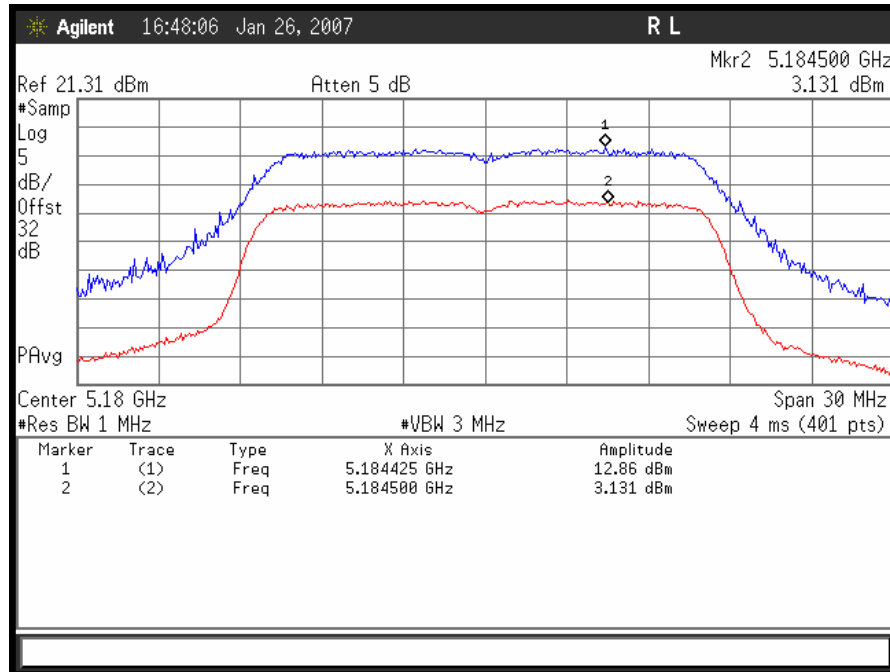
802.11a UNII-1				
Carrier Channel	Frequency (MHz)	Excursion Ratio (dBm)	Limit (dBm)	Margin (dB)
Low	5180	3.131	13	9.869
High	5240	1.497	13	11.503

802.11a UNII-2 Low Band				
Carrier Channel	Frequency (MHz)	Excursion Ratio (dBm)	Limit (dBm)	Margin (dB)
Low	5260	3.31	13	9.69
High	5320	1.923	13	11.07

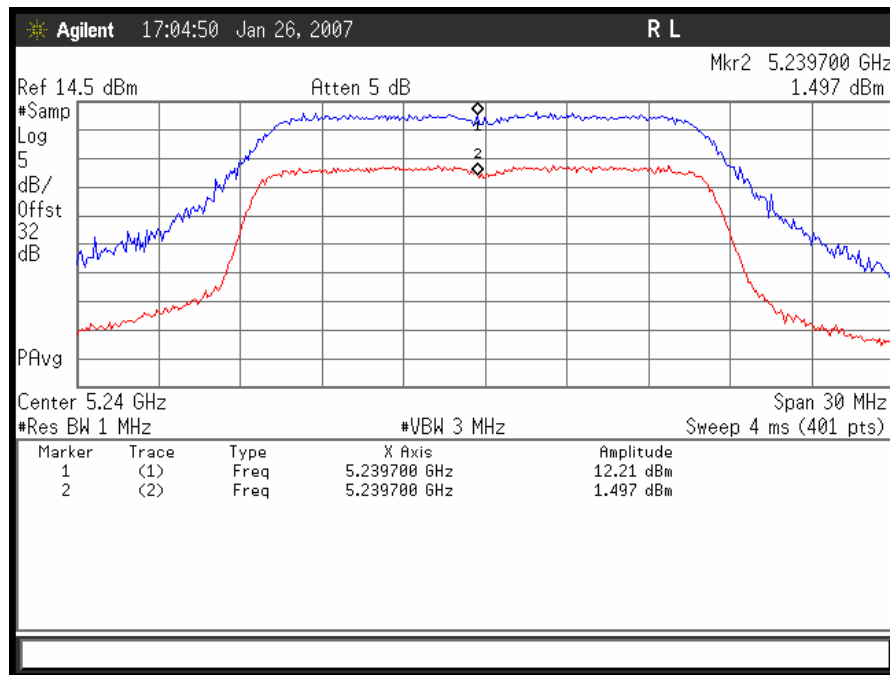
802.11a UNII-2 High Band				
Carrier Channel	Frequency (MHz)	Excursion Ratio (dBm)	Limit (dBm)	Margin (dB)
Low	5500	12.78	13	0.22
Mid	5600	2.828	13	10.17
High	5700	7.033	13	5.96

Test Engineer(s): Shawn McMillen

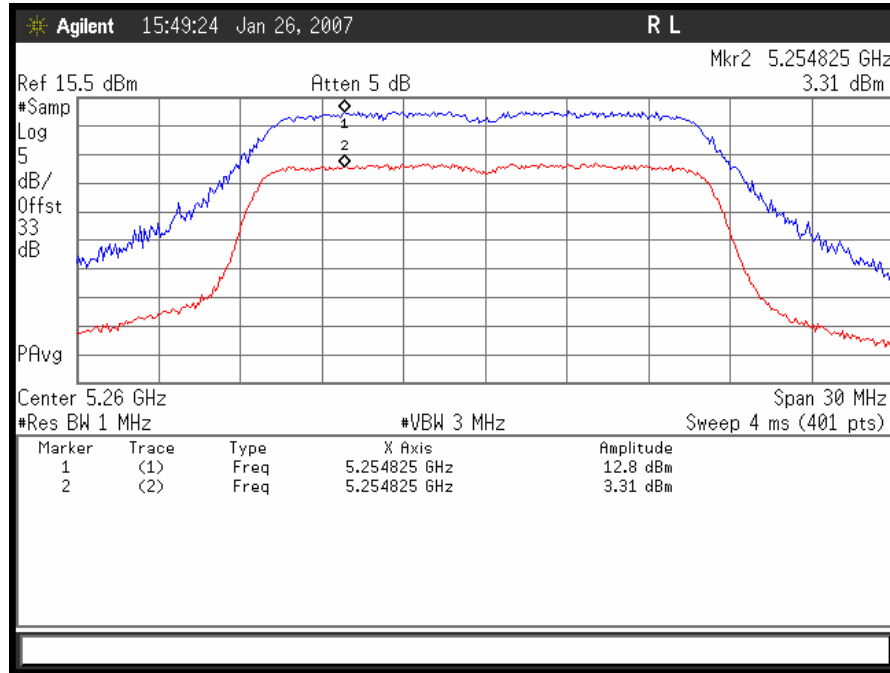
Test Date(s): January 26, 2007



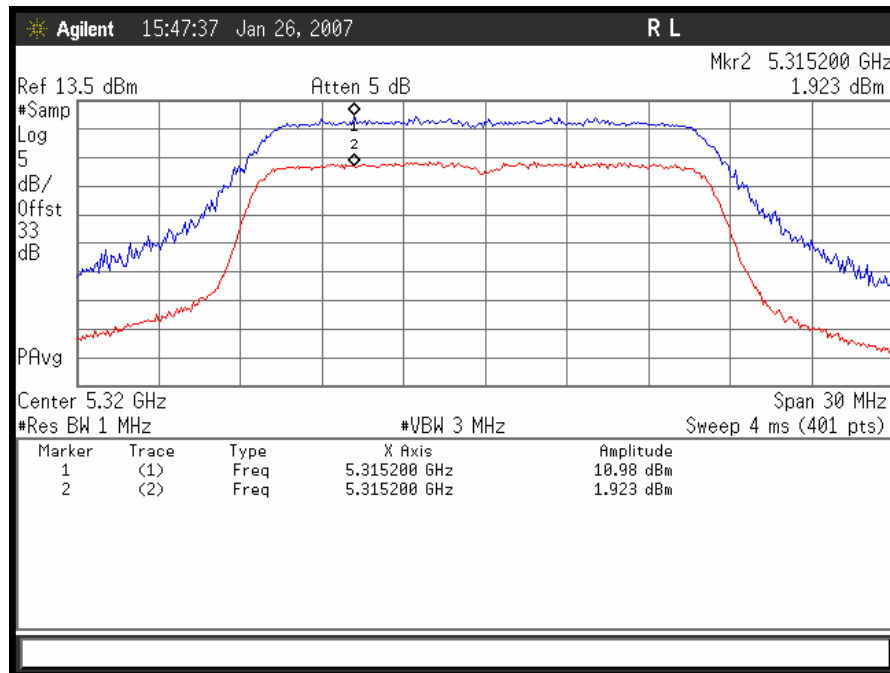
UNII-1 Peak Excursion Ratio for Low Band



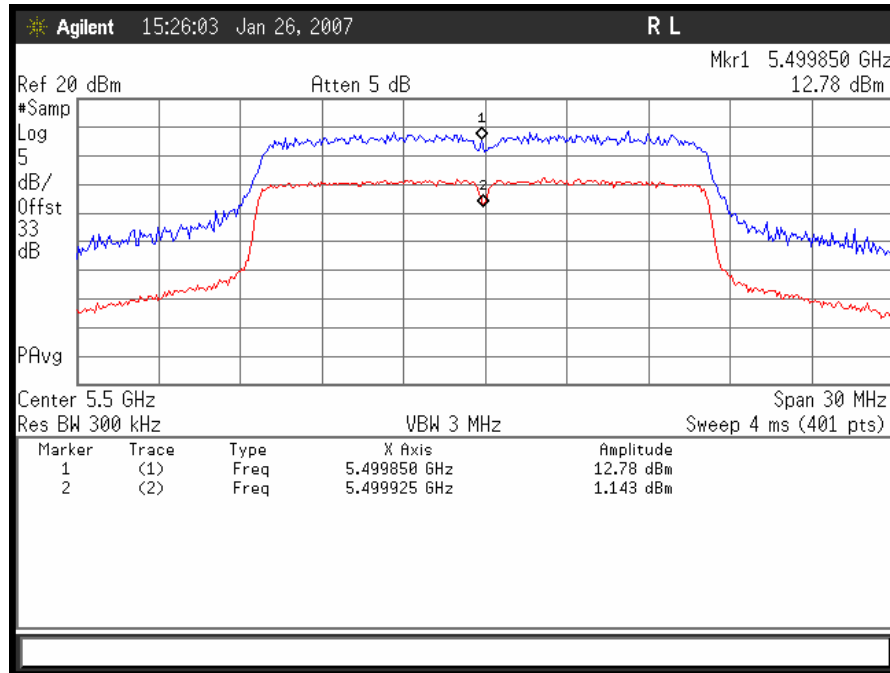
UNII-1 Peak Excursion Ratio for High Band



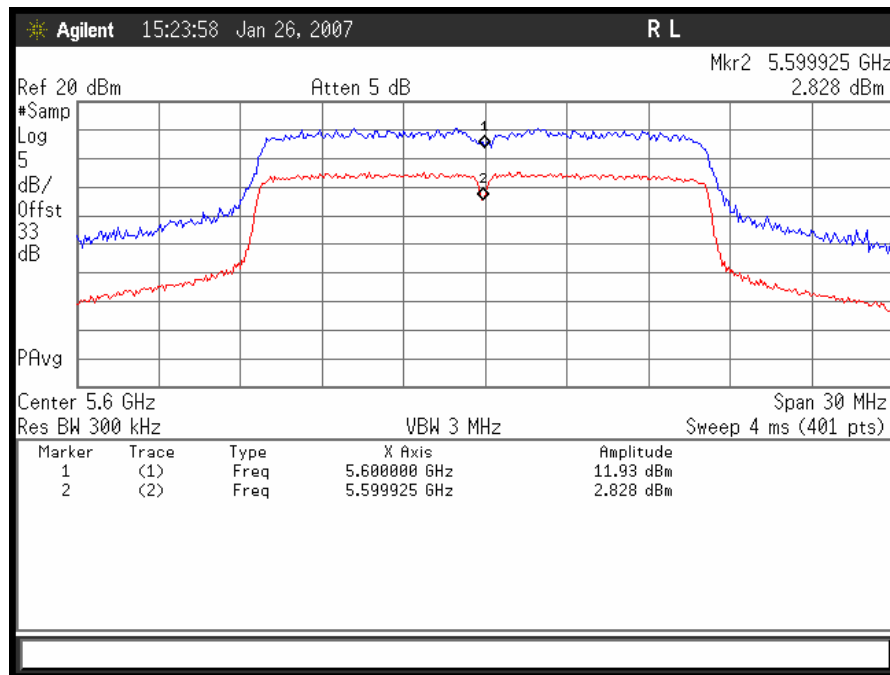
Peak Excursion Ratio for UNII-2 Low Band Low Ch (5260MHz)



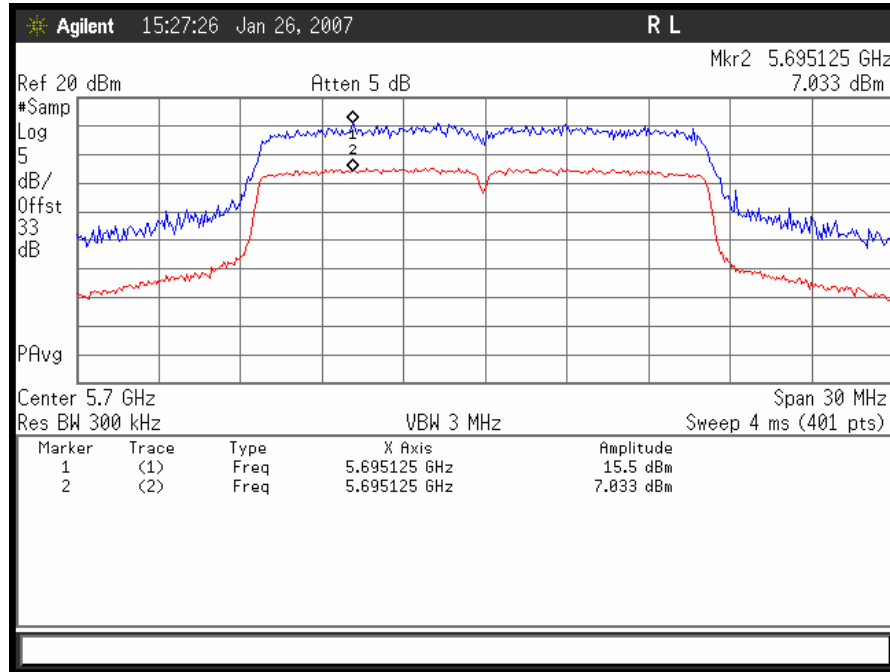
Peak Excursion Ratio for UNII-2 Low Band High Ch (5320MHz)



Peak Excursion Ratio for UNII-2 High Band Low Ch (5500MHz)



Peak Excursion Ratio for UNII-2 High Band Mid Ch (5600MHz)



Peak Excursion Ratio for UNII-2 High Band High Ch (5700MHz)



Electromagnetic Compatibility Criteria for Intentional Radiators

§ 15.407(b)(1),(2), (5), (6) Undesirable Emissions

Test Requirements: § 15.407(b)(1),(2), (5), (6); Error! Reference source not found. §15.205: Emissions outside the frequency band.

§ 15.407(b)(1): In any 1MHz bandwidth outside the frequency band 5.15-5.25GHz in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power shall not exceed -27dBm.

§ 15.407(b)(2): In any 1MHz bandwidth outside the frequency band 5.25-5.35GHz in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power shall not exceed -27dBm.

§ 15.407(b)(6): 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 12. Restricted Bands of Operation

Test Engineer(s): Shawn McMillen



**Firetide
6100**

**Electromagnetic Compatibility
for Intentional Radiators
CFR Title 47, Part 15, Subpart E**

Test Date(s): March 9, 2007



Electromagnetic Compatibility Criteria for Intentional Radiators UNII-1

§ 15.407(b)(1): Harmonic Emissions Requirements – Radiated (802.11a) 5dbi Omni

Frequency (GHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
10360	V	38.8	35.2	38.1	6.7	48.3	74	-25.7	Peak
15540	V	37.6	34.3	38.3	7.8	49.4	74	-24.6	Peak
15540	V	30.8	34.3	38.3	7.8	42.6	54	-11.4	Average
Low Channel 5180MHz									
Frequency (GHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Corrected Field Strength (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
10480	V	38.5	35.2	38.1	6.7	48.1	74	-25.9	Peak
10480	V	30.6	35.2	38.1	6.7	40.2	54	-13.8	Average
15720	V	36.2	34.3	38.3	7.8	48.0	74	-26.0	Peak
15720	V	29.8	34.3	38.3	7.8	41.6	54	-12.4	Average
High Channel 5240MHz									

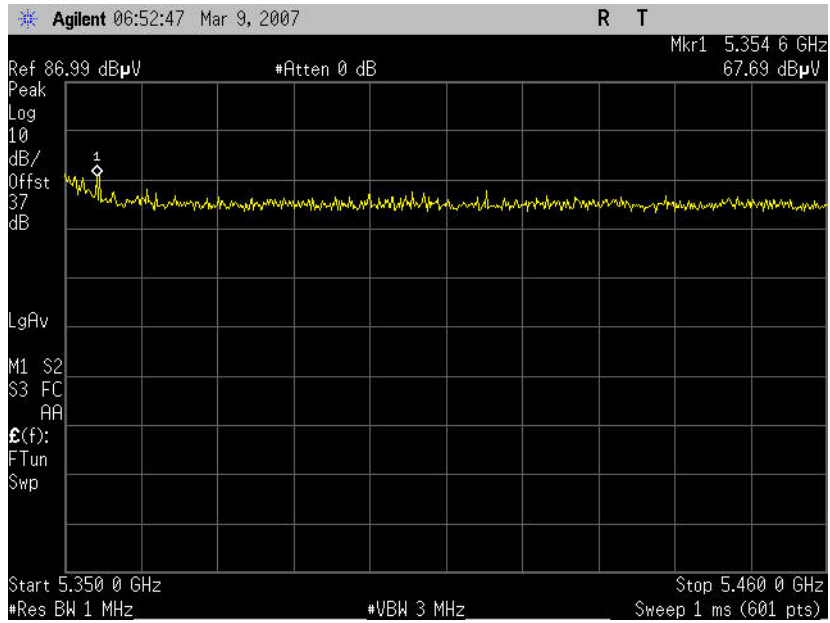


Electromagnetic Compatibility Criteria for Intentional Radiators – UNII-2 Low Band

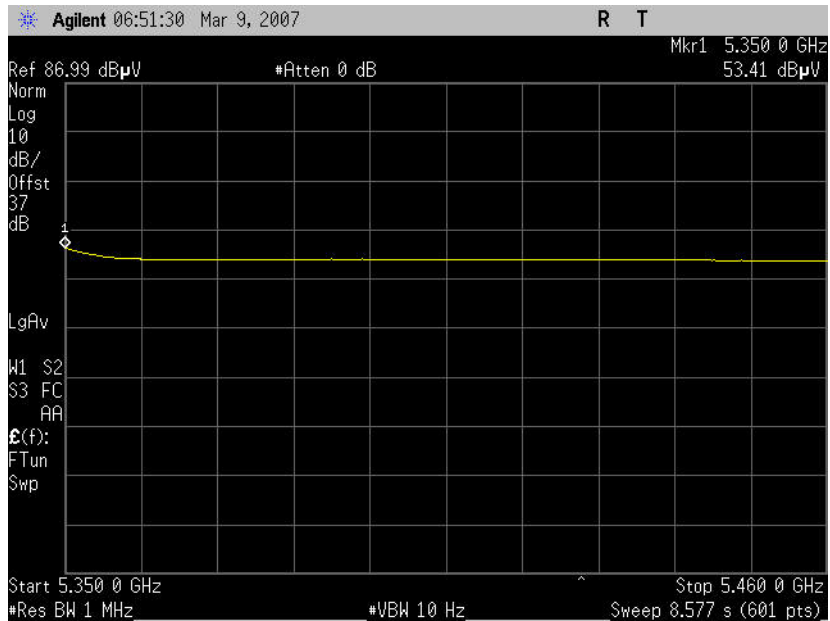
§ 15.407(b)(2): Harmonic Emissions Requirements – Radiated 802.11a (5dBi Omni)

Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
10520	V	42.2	35.2	38.1	6.7	0	51.7	74	-22.3	Peak
15780	V	37.7	34.3	38.3	7.8	0	49.5	74	-24.5	Peak
15780	V	30.6	34.3	38.3	7.8	0	42.4	54	-11.6	Average
Low Channel 5260MHz										
Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBμV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBμV)	Limit @ 3m (dBμV)	Margin (dB)	Measurement Type
10640	V	41.8	35.2	38.1	6.7	0	51.3	74	-22.7	Peak
10640	V	32.7	35.2	38.1	6.7	0	42.3	54	-11.7	Average
15960	V	37.4	34.3	38.3	7.8	0	49.2	74	-24.8	Peak
15960	V	30.2	34.3	38.3	7.8	0	42.0	54	-12.0	Average
High Channel 5320MHz										

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



802.11/a Low Band Restricted band 5320MHz Peak (5dBi Omni)



802.11/a Low Band Restricted band 5320MHz Avg (5dBi Omni)

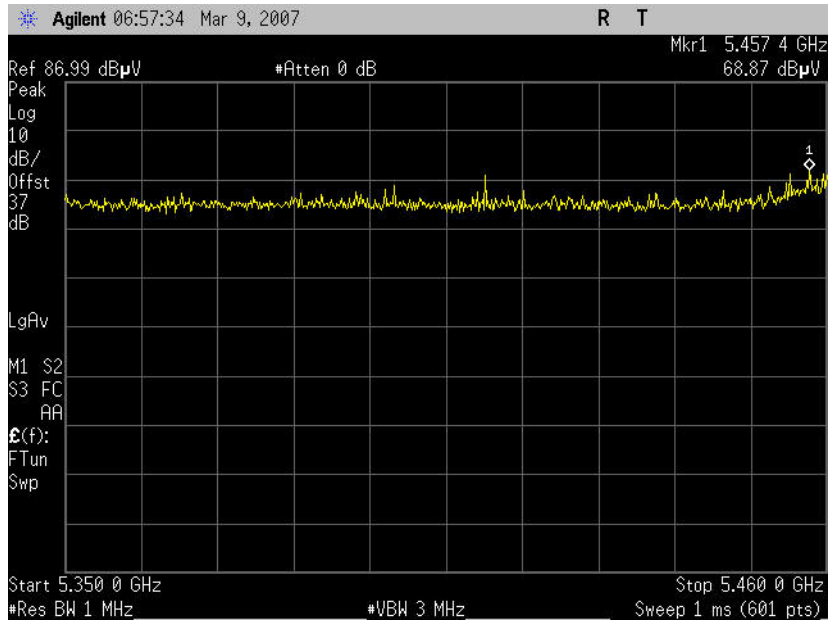


Electromagnetic Compatibility Criteria for Intentional Radiators – UNII-2 High Band

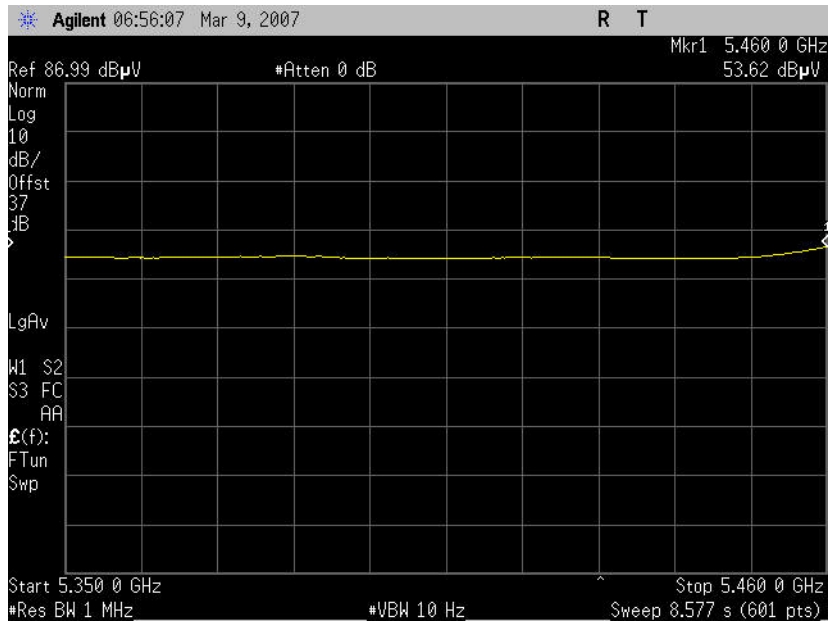
§ 15.407(b)(2): Harmonic Emissions Requirements – Radiated 802.11a (5dBi Omni)

Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBµV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBµV)	Limit @ 3m (dBµV)	Margin (dB)	Measurement Type
11000	V	52.4	35.2	38.1	6.7	0	62.0	74	-12.0	Peak
16500	V	38.2	34.3	38.3	7.8	0	50.0	74	-24.0	Peak
Low Channel 5500MHz										
Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBµV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBµV)	Limit @ 3m (dBµV)	Margin (dB)	Measurement Type
11200	V	47.7	35.2	38.1	6.7	0	57.2	74	-16.8	Peak
11200	V	37.0	35.2	38.1	6.7	0	46.6	54	-7.4	Average
16800	V	40.5	34.3	38.3	7.8	0	52.3	74	-21.7	Peak
Mid Channel 5600MHz										
Frequency (MHz)	Receive Antenna Polarity (H/V)	Uncorrected Field strength (dBµV)@ 3m	Preamp (dB)	Antenna Factor (dB)	Cable Loss (dB)	Distance Correction Factor (dB)	Corrected Field Strength @ 3m (dBµV)	Limit @ 3m (dBµV)	Margin (dB)	Measurement Type
11400	V	45.1	35.2	38.1	6.7	0	54.7	74	-19.3	Peak
17100	V	40.9	34.3	38.3	7.8	0	52.7	74	-21.3	Peak
17100	V	32.4	34.3	38.3	7.8	0	44.2	54	-9.8	Average
High Channel 5700MHz										

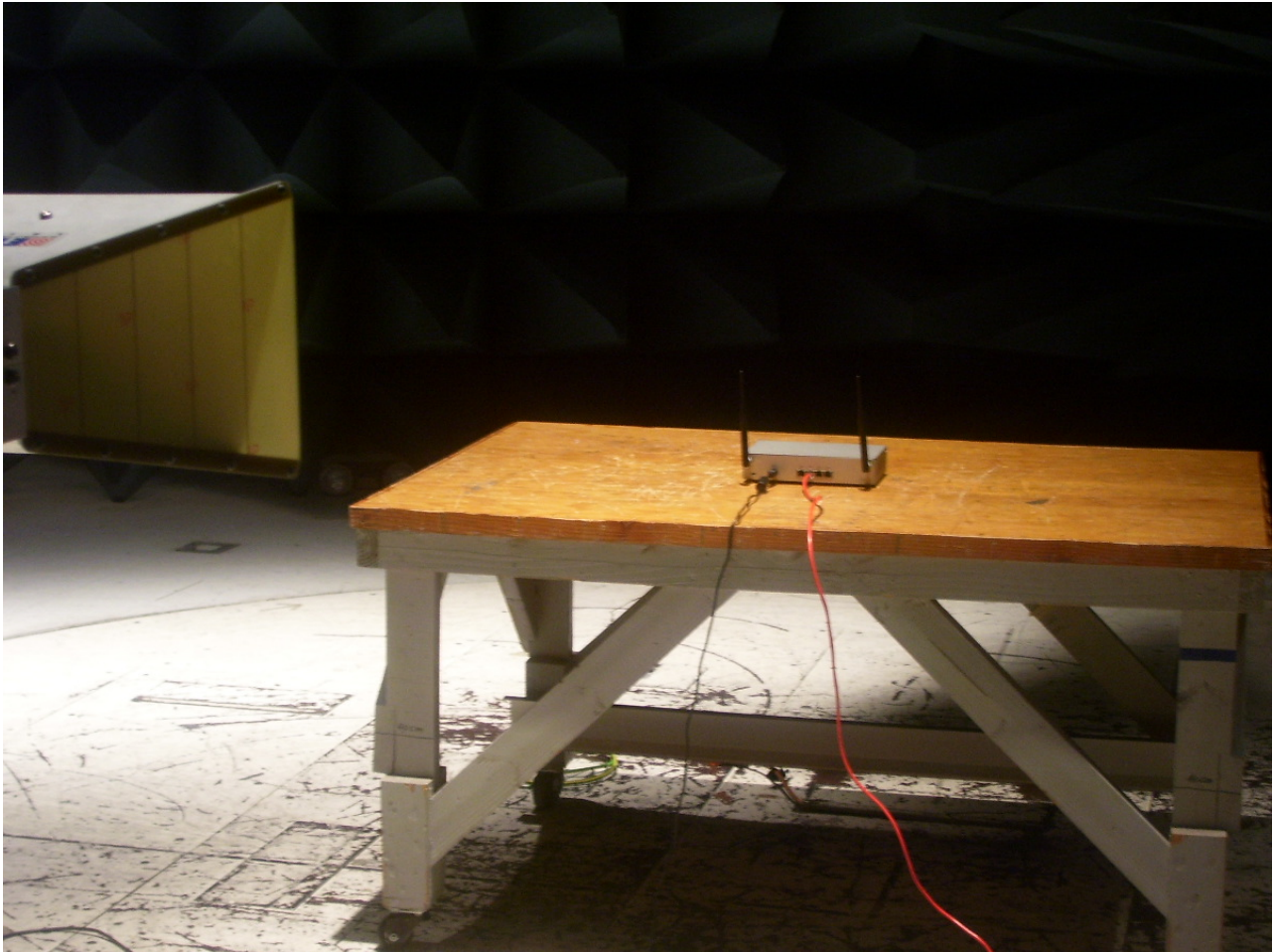
Note: All other emissions were measured at the noise floor of the spectrum analyzer



802.11/a Low Band Restricted band 5500MHz Peak (5dBi Omni)



802.11/a Low Band Restricted band 5500MHz Avg (5dBi Omni)



Photograph 2. Test Equipment and setup for various Radiated Measurements 5dbi Omni Antenna



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
1S2421	EMI RECEIVER	ROHDE&SCHWARZ	ESIB 7	3/22/2006	4/22/2007
1S2184	BILOG ANTENNA	CHASE	CBL6112A	1/3/2007	1/3/2008
1S2121	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	11/28/2006	11/28/2007
1S2198	ANTENNA, HORN	EMCO	3115	8/17/2006	8/17/2007
1S2202	ANTENNA, HORN, 1 METER	EMCO	3116	3/23/2004	3/23/2007
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13146	SEE NOTE	
1S2263	CHAMBER, 10 METER	RANTEC	N2-14	8/15/2006	8/15/2007
1S2430	WIDEBAND POWER METER	ANRITSU COMPANY	ML2488A	1/12/2006	2/12/2007
1S2432	WIDEBAND POWER SENSOR	ANRITSU COMPANY	MA2491A	1/12/2006	2/12/2007
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONAL COAXIAL	NARDA	N/A	SEE NOTE	
1S2460	Analyzer, Spectrum 9 kHz-40GHz	Agilent	E4407B	07/06/2005	07/06/2008
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONAL COAXIAL	NARDA	N/A	SEE NOTE	
1S2128	Harmonic Mixer	Hewlett Packard	11970A	10/26/2006	10/26/2008
1S2129	Harmonic Mixer	Hewlett Packard	11970K	10/26/2006	10/26/2008

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 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.



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