Test of CM-9 802.11 a/b/g Wireless Module

To: FCC 47 CFR Part 15.247/15.407 & IC RSS-210

Test Report Serial No.: HWPD03-A2 Rev A

MiCOM Labs

opening wireless markets

TEST REPORT

FROM

Test of CM-9 802.11 a/b/g Wireless Module
to
To: FCC 47 CFR Part 15.247/15.407 & IC RSS-210

Class II Permissive Change, FCC ID: RTP55010016-5

Additional Antennas

Test Report Serial No.: HWPD03-A2 Rev A

This report supersedes NONE

Applicant: Hewlett Packard
200 Forest Street MR01-2/M18
Marlborough
Massachusetts 01752-3085 , USA

Product Function: 802.11a/b/g Wireless Access Card

Copy No: pdf Issue Date: 20th July 2009

This Test Report is Issued Under the Authority of;

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ACCREDITED
CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

MiCOM Labs, Inc. an accredited laboratory complies with the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

MICOM LABS
Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 26th day of February 2008.

President
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2009

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

LISTINGS

MiCOM Labs test facilities are listed by the following organizations;

North America

United States of America
Federal Communications Commission (FCC) Listing #: 102167

Canada

Industry Canada (IC) Listing #:4143A-2

Japan Registration

VCCI Membership Number: 2959

- Radiation 3 meter site; Registration No. R-2881
- Line Conducted, Registration Nos. C-3181 & T-1470
- Emissions; Registration Nos. C-3180 & T-1469

RECOGNITION

APEC MRA (Asia-Pacific Economic Community Mutual Recognition Agreement)

Conformity Assessment Body (CAB) – MiCOM Labs

Test data generated by MiCOM Labs is accepted in the following countries under the APEC MRA.

Country	Recognition Body	Phase	CAB Identification No.
Australia	Australian Communications and Media Authority (ACMA)	I	
Hong Kong	Office of the Telecommunication Authority (OFTA)	I	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	I	US0159
Singapore	Infocomm Development Authority (IDA)	I	
Taiwan	National Communications Commission (NCC)	I	
	Bureau of Standards, Metrology and Inspection (BSMI)	I	

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	20th July 2009	Initial release.

1. TEST RESULT CERTIFICATE

Applicant:	Hewlett Packard 200 Forest Street MR01-2/M18 Marlborough Massachusetts 01752-3085 , USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	Wireless Access Card	Telephone:	+1 925 462 0304
Model:	CM-9	Fax:	+1 925 462 0306
S/N:	C133736023A4C01		
Test Date(s):	4th May to 5th June '09	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.247/15.407 & IC RSS-210 Limited to radiated Testing for Additional Antennas	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:

ACCREDITED
CERTIFICATE #2381.01

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part Sub-Part C 15.247 Sub-Part E 15.407	2007	Code of Federal Regulations
(ii)	Industry Canada RSS-210	Issue 7 June 2007	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment
(iii)	Industry Canada RSS-Gen	Issue 2 June 2007	General Requirements and Information for the Certification of Radiocommunication Equipment
(iv)	ANSI C63.4	2003	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
(v)	CISPR 22/ EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(vi)	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
(vii)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(viii)	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(ix)	A2LA	14th September 2005	Reference to A2LA Accreditation Status – A2LA Advertising Policy
(x)	FCC Public Notice – DA 02-2138	2002	Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices

2.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the CM-9 802.11 a/b/g Wireless Module in the frequency ranges 2,400 – 2,483.5 MHz, 5150 - 5250MHz, and 5725 – 5,850 MHz to FCC Part(s) 15.247, 15.407 and Industry Canada RSS-210 regulations.
Applicant:	Hewlett Packard 200 Forest Street MR01-2/M18 Marlborough Massachusetts 01752-3085 , USA
Manufacturer:	Winstron NEWEB Corp
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
FCC ID:	RTP55010016-5
IC ID:	4891A-0100165
Test report reference number:	HWPD03-A2 Rev A
Date EUT received:	4th May 2009
Standard(s) applied:	FCC 47 CFR Part 15.247/15.407 & IC RSS-210
Dates of test (from - to):	4th May to 5th June 2009
No of Units Tested:	1
Type of Equipment:	802.11a/b/g Wireless Access Card
Applicants Trade Name:	WLAN a+b+g mini-PCI Module
Model(s):	CM-9
Software Release	5.3
Hardware Release:	-030
Declared Frequency Range(s):	2,400 to 2,483.5 MHz 5,150 to 5,250 MHz 5,725 to 5,850 MHz
Type of Modulation:	Per 802.11 –CCK, BPSK, QPSK, DSSS, OFDM
Declared Nominal Output Power: (Average Power)	802.11a: Legacy +18 dBm 802.11b: Legacy +20 dBm 802.11g: Legacy +20 dBm
EUT Modes of Operation:	Legacy 802.11a/b/g
Transmit/Receive Operation:	Time Division Duplex
Rated Input Voltage and Current:	Power Supply 3.3 Vdc @ 1 A
Operating Temperature Range:	Declared range 0 to +40ºC
Frequency Stability:	±20 ppm max
Equipment Dimensions:	2.5” x 2.5”
Weight:	2oz
Primary function of equipment:	Wireless Access Card for transmitting data and voice

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3.2. Scope of Test Program

RF Testing

The scope of the compliance program was to test additional antennas for the CM-9 802.11 a/b/g wireless module in the frequency ranges 2,400 – 2,483.5 MHz; 5150 – 5250 MHz, and 5725 – 5,850 MHz for compliance against FCC 47 CFR Part 15.247/ 15.407 and Industry Canada RSS-210 specifications.

The antenna tested is detailed in section 3.4 “Antenna Details”.

Although this is for a Limited Modular Approval (LMA) the module was tested in a host device MAP-625.

Only spurious emissions above 1 GHz were performed in order to provide compliance.

Identification

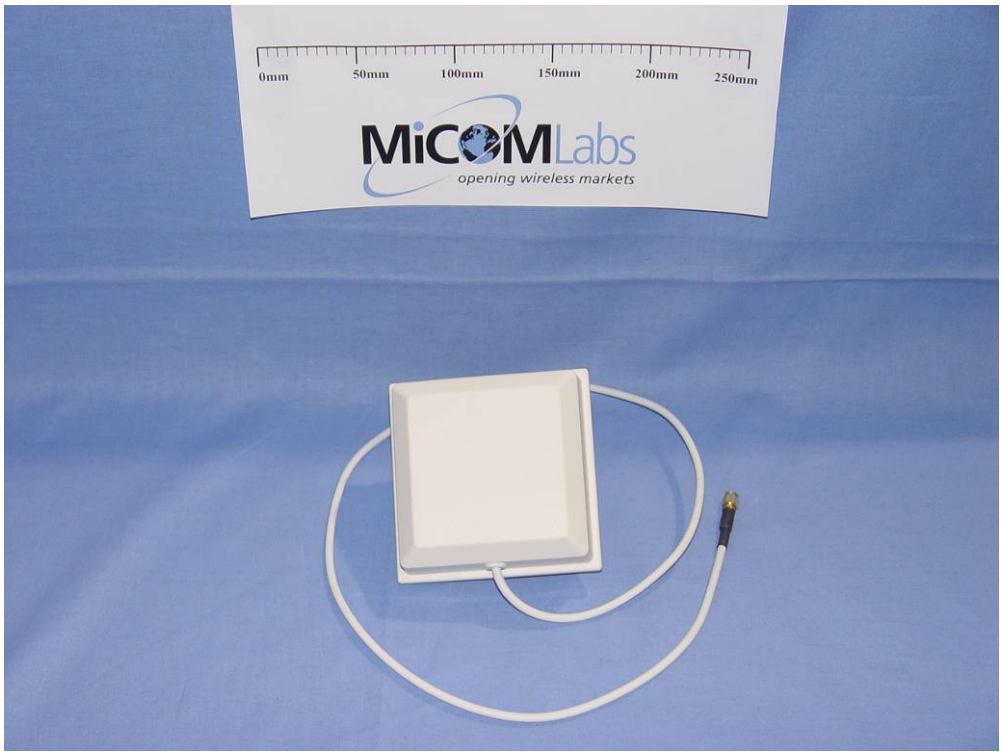
FCC ID: RTP55010016-5
IC ID: 4891A-0100165

J8441A Antenna

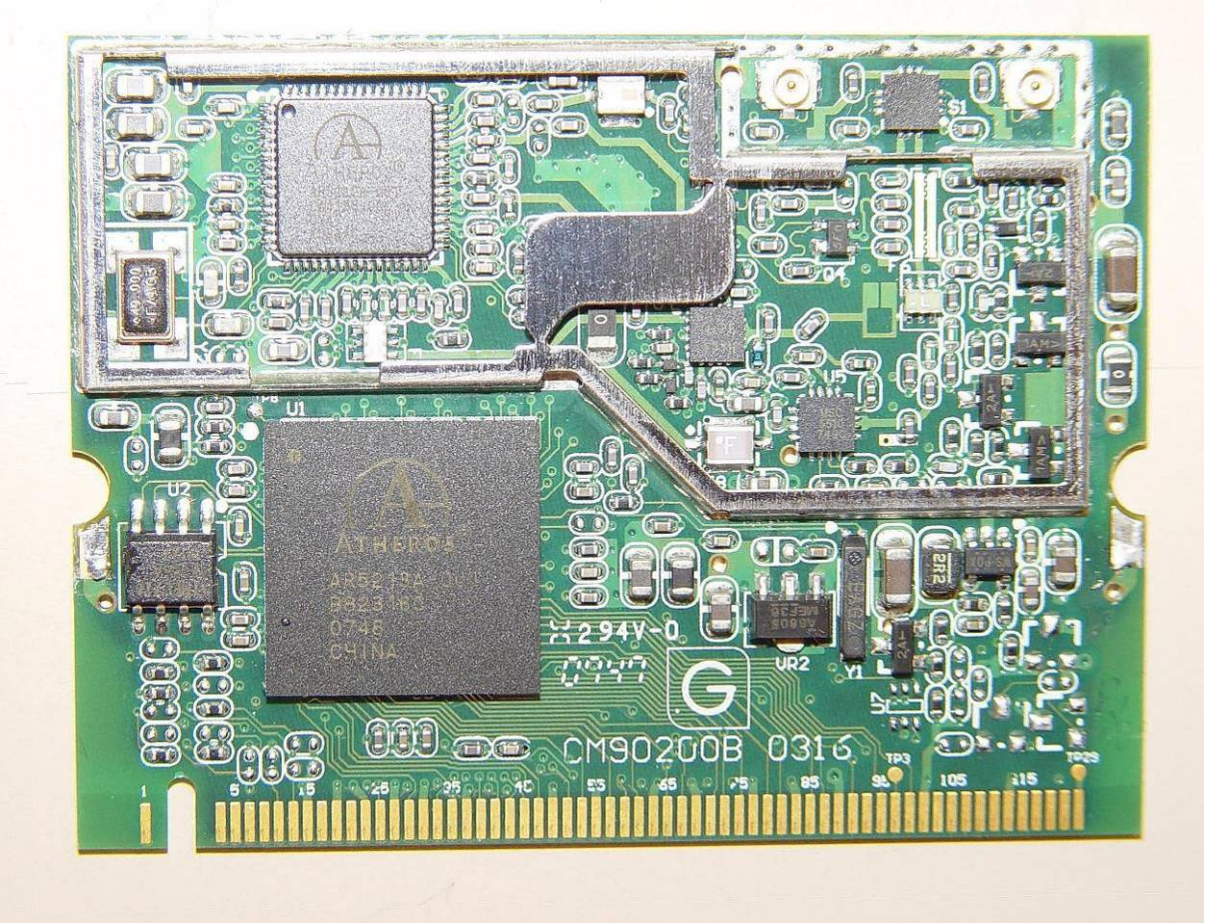
J8444A Antenna

J8997A Antenna

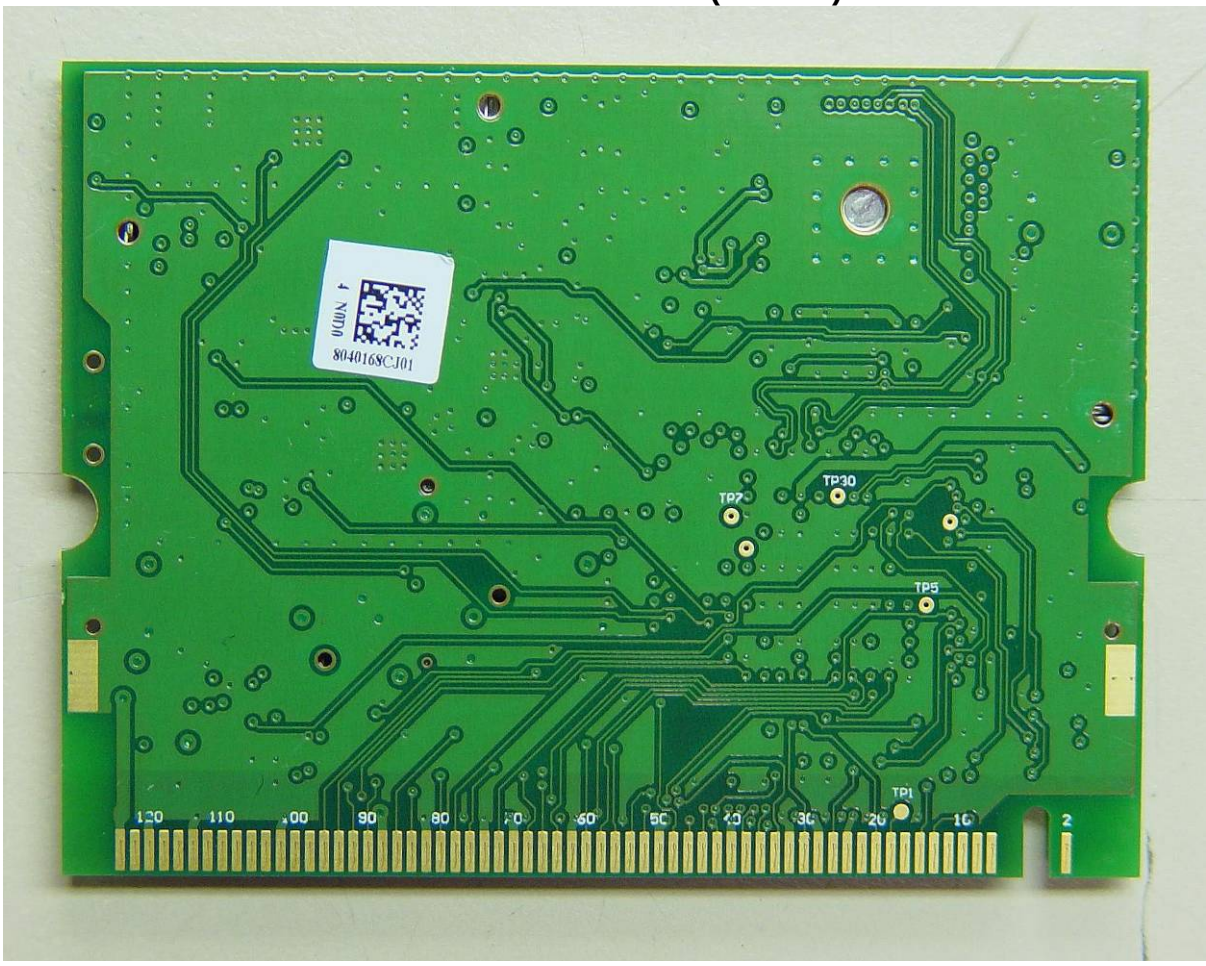
J8999A Antenna



802.11 a/b/g CM-9 wireless card
Wireless Access Card (Top)



802.11 a/b/g CM-9 wireless card
Wireless Access Card (Bottom)



3.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	Access Card		CM-9	--
Support	Wireless Access Point	Colubris Networks	MAP-625	K091-00068
Support	Laptop PC	HP		

3.4. Antenna Details

Antenna	Gain (dBi) 2,400 – 2,483.5 MHz	Gain (dBi) 5,150 – 5,250 MHz	Gain (dBi) 5,725 – 5,850 MHz
J8441A	4.4		
J8444A	7.4		
J8997A	3.0	4.0	4.0
J8999A	6.9	7.7	4.0

3.5. Cabling and I/O Ports

Number and type of I/O ports on supporting wireless access point

1. 1 X RJ-45 , 10/100/1000 BASE-T Ethernet, Auto MDX

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3.6. Test Configurations

Testing was performed to determine the highest power level versus bit rate. The variant with the highest power was used to exercise the product.

Matrix of test configurations

Operational Mode(s) (802.11)	Variant	Data Rates with Highest Power	Frequencies (MHz)
b	Legacy	1 MBit/s	2,412 2,437 2,462
g	Legacy	6 MBit/s	2,412 2,437 2,462
a	Legacy	6 MBit/s	5,745 5,785 5,825
a	Legacy	6 MBit/s	5,180 5,220 5,240

3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

In order to meet the spurious emissions and band edge requirements of the FCC and IC standards the transmitter power was set in accordance with the following tables for each model of antenna.

Antenna J8441A

Operational Mode	Frequency	Test Code Value From Test Plan	Spurious Emissions Value *	Band-Edge Value *	Test Code Power Setting	Max Compliant Power
	[MHz]	[n/a]	[n/a]	[n/a]	[n/a]	[dBm]
b	2412	20		16	16	15.3
	2437	20			20	18.7
	2462	20	18	18	18	16.9
g	2412	20		13	13	10.1
	2437	20			20	19.1
	2462	20		14	14	10.7

Antenna J8444A

Operational Mode	Frequency	Test Code Value From Test Plan	Spurious Emissions Value *	Band-Edge Value *	Test Code Power Setting	Max Compliant Power
	[MHz]	[n/a]	[n/a]	[n/a]	[n/a]	[dBm]
b	2412	20		16	16	15.3
	2437	20			20	18.7
	2462	20	17	19	17	15.9
g	2412	20		13	13	10.1
	2437	20			20	19.1
	2462	20		13	13	9.7

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Antenna J8997A

15.247 2.4 GHz						
Operational Mode	**Frequency**	**Test Code Value From Test Plan**	**Spurious Emissions Value ***	**Band-Edge Value ***	**Test Code Power Setting**	**Max Compliant Power**
	[MHz]	**[n/a]**	**[n/a]**	**[n/a]**	**[n/a]**	**[dBm]**
b	2412	20	19		19	18.3
	2437	20	17		17	15.7
	2462	20	15		15	13.9
g	2412	20			20	17.1
	2437	20			20	19.1
	2462	20		15	15	11.7

15.247 5.8 GHz

Operational Mode	**Frequency**	**Test Code Value From Test Plan**	**Spurious Emissions Value ***	**Band-Edge Value ***	**Test Code Power Setting**	**Max Compliant Power**
	[MHz]	**[n/a]**	**[n/a]**	**[n/a]**	**[n/a]**	**[dBm]**
a	5745	17			17	17.3
	5785	17	15		15	15.9
	5825	17	15		15	16.1

15.407

Operational Mode	**Frequency**	**Test Code Value From Test Plan**	**Spurious Emissions Value ***	**Band-Edge Value ***	**Test Code Power Setting**	**Max Compliant Power**
	[MHz]	**[n/a]**	**[n/a]**	**[n/a]**	**[n/a]**	**[dBm]**
a	5180	17			17	16.8
	5200	16			16	16.1
	5240	17			17	16.7

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Antenna J8999A

15.247 2.4 GHz						
Operational Mode	**Frequency**	**Test Code Value From Test Plan**	**Spurious Emissions Value ***	**Band-Edge Value ***	**Test Code Power Setting**	**Max Compliant Power**
	[MHz]	**[n/a]**	**[n/a]**	**[n/a]**	**[n/a]**	**[dBm]**
b	2412	20	15		15	14.3
	2437	20	18		18	16.7
	2462	20	11		11	9.9
g	2412	20		13	13	10.1
	2437	20			20	19.1
	2462	20		15	15	11.7

15.247 5.8 GHz

Operational Mode	**Frequency**	**Test Code Value From Test Plan**	**Spurious Emissions Value ***	**Band-Edge Value ***	**Test Code Power Setting**	**Max Compliant Power**
	[MHz]	**[n/a]**	**[n/a]**	**[n/a]**	**[n/a]**	**[dBm]**
a	5745	17	16		16	16.3
	5785	17	16		16	16.9
	5825	17	14		14	15.1

15.407

Operational Mode	**Frequency**	**Test Code Value From Test Plan**	**Spurious Emissions Value ***	**Band-Edge Value ***	**Test Code Power Setting**	**Max Compliant Power**
	[MHz]	**[n/a]**	**[n/a]**	**[n/a]**	**[n/a]**	**[dBm]**
a	5180	16			16	16.1
	5200	16			16	16.1
	5240	16			16	15.9

3.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. None

3.9. Subcontracted Testing or Third Party Data

1. NONE

4. TEST SUMMARY

List of Measurements (continued)

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247, Industry Canada RSS-210,** and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(d) **15.205 /** **15.209** **A8.5** **2.2** **2.6** **4.7**	Radiated Emissions	Restricted Bands	Radiated	Complies	5.1.1
	Transmitter Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.1.1*
	Radiated Band Edge	Band-edge results Peak Emissions		Complies	*5.1.1.1*
Industry Canada only **RSS-Gen §4.8, §6**	Receiver Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.1.2*

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.7 'Equipment Modifications' highlights the modifications that were required to bring the product into compliance with the above test matrix*

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.407** and **Industry Canada RSS-210**.and **Industry Canada RSS-Gen**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.407(b)(2) **15.205(a)** **15.209(a)** **2.2** **2.6** **A9.3(2)** **4.7**	Radiated Emissions		Radiated		5.1.2
	Transmitter Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.2.1*
	Radiated Band Edge	Band edge results		Complies	*5.1.2.1*
RSS-GEN **§4.8, §6**	Receiver Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.2.2*

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3:Section 3.7 *Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

5. TEST RESULTS

5.1. Device Characteristics

5.1.1. Radiated Emissions (15.247, RSS-210)

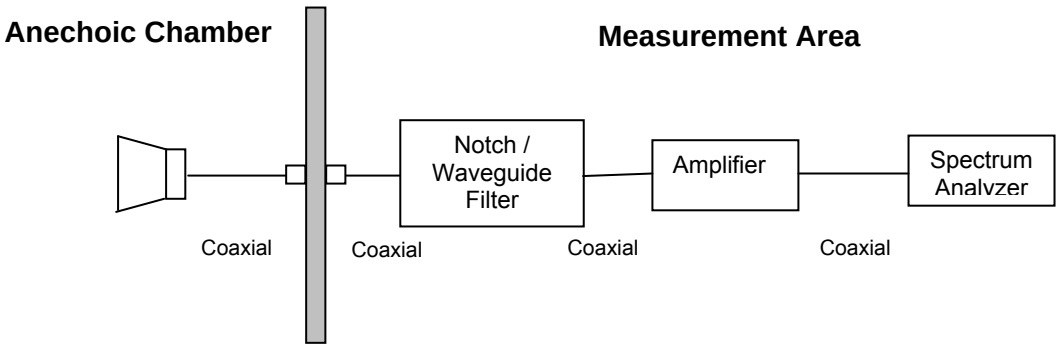
5.1.1.1. Transmitter Radiated Spurious Emissions (above 1 GHz) and Radiated Band Edge Measurements (Restricted Bands)

FCC, Part 15 Subpart C §15.247(d) 15.205; 15.209
Industry Canada RSS-210 §A8.5, §2.2, §2.6
Industry Canada RSS-Gen §4.7

Test Procedure
Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Ambient conditions.
Temperature: 17 to 23°C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

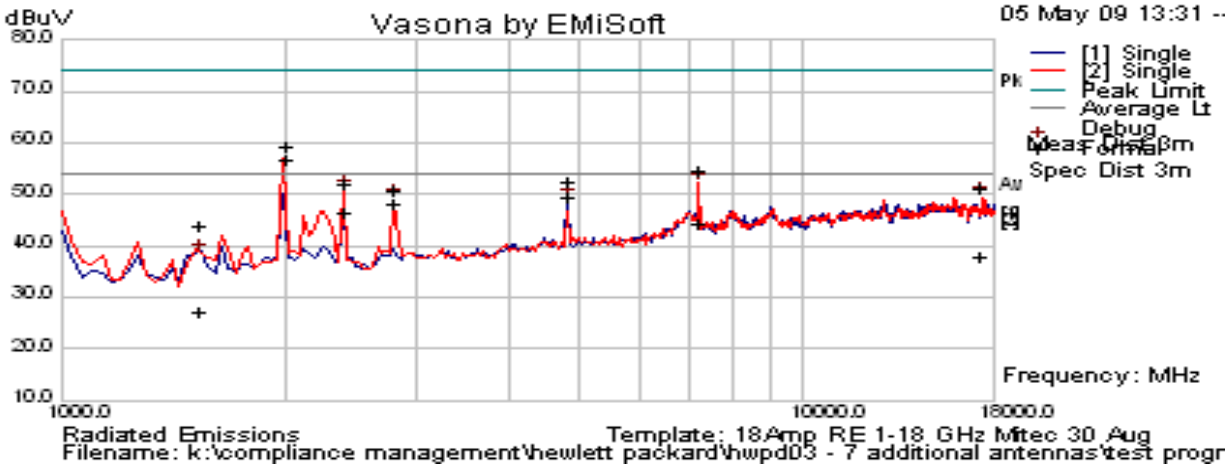
Radio Parameters
Duty Cycle: 100%
Output: Modulated Carrier

ANTENNA J8441A

Radiated Spurious Emissions above 1 GHz

Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2412
Antenna Model	J8441A Antenna / Gain = 4.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH1 MAP625 Radio 2 Platform

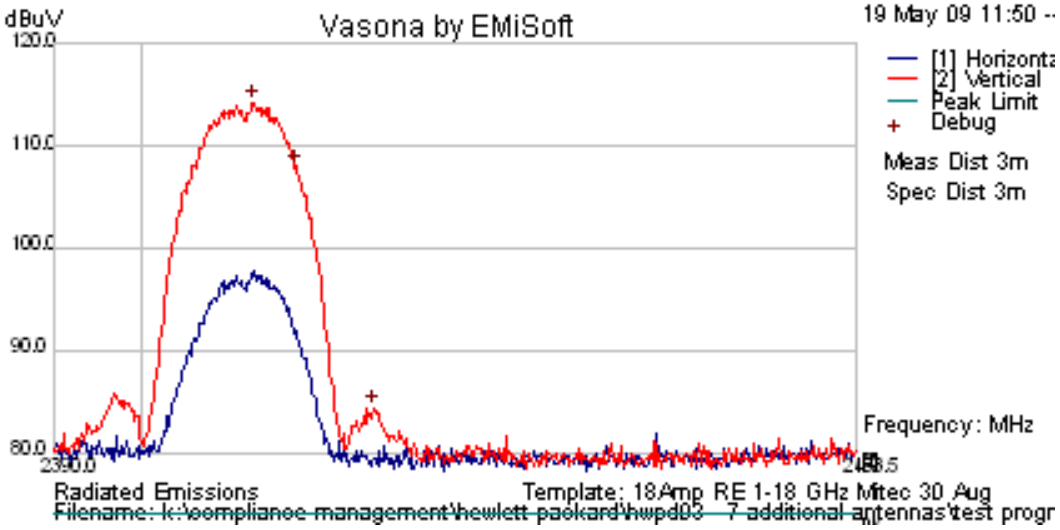
Radiated Emissions



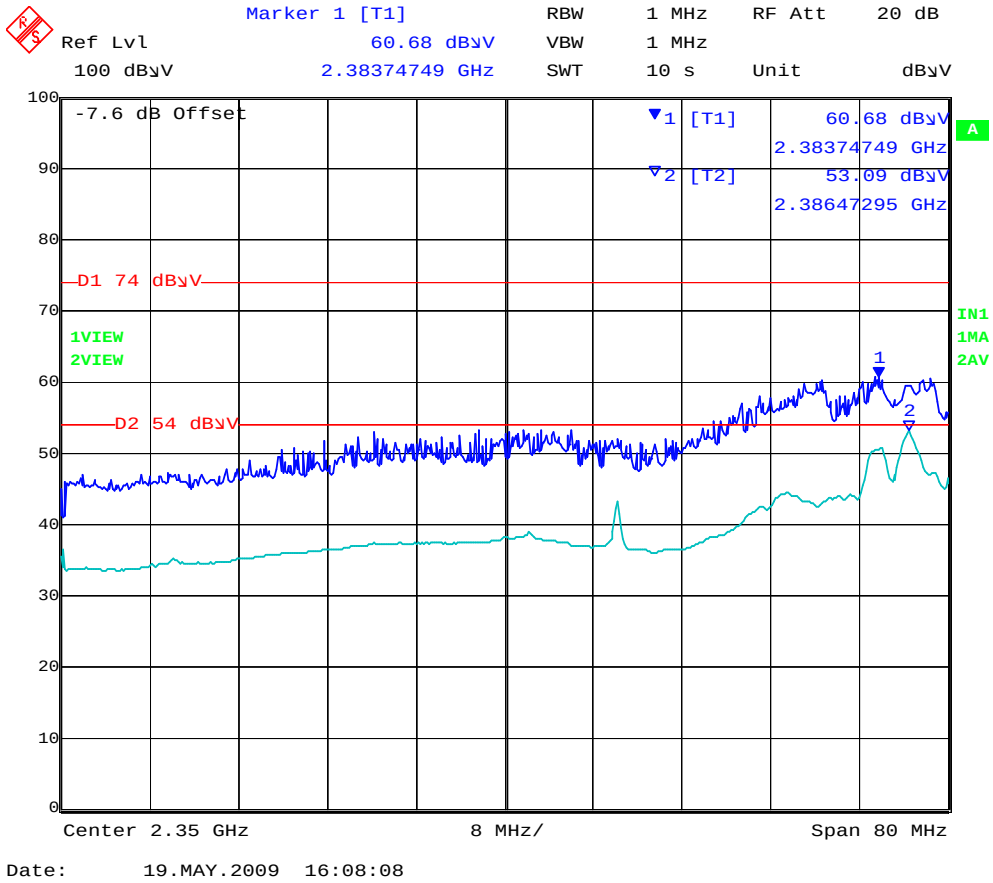
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2413.047	68.91	12.96	32.35	114.2	Peak	V						Fund
2015.957	67.28	2.76	-10.63	59.40	Peak Max	V	98	17	84.2	-34.80	Pass	NRB
2808.037	56.09	3.24	-10.96	48.38	Average Max	V	104	286	54	-5.62	Pass	RB
2808.037	58.63	3.24	-10.96	50.92	Peak Max	V	104	286	74	-23.08	Pass	RB
4824.013	53.74	4.47	-8.75	49.47	Average Max	H	139	35	54	-4.53	Pass	RB
4824.013	56.79	4.47	-8.75	52.51	Peak Max	H	139	35	74	-21.49	Pass	RB
7235.872	41.46	5.43	-2.46	44.43	Average Max	V	98	0	54	-9.57	Pass	RB
7235.872	51.79	5.43	-2.46	54.76	Peak Max	V	98	0	74	-19.24	Pass	RB
2383.74749	Power Setting = 16			60.68	Peak Max	V	--	--	74	-13.32	Pass	Band Edge
2383.74749				53.09	Average Max	V	--	--	54	-0.9	Pass	Band Edge

NRB – Non-restricted bands
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

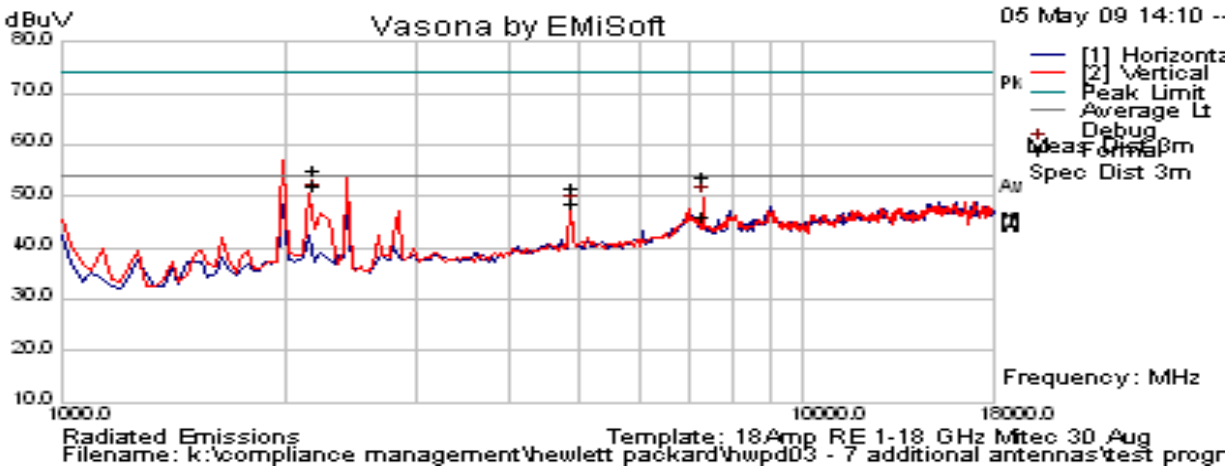


Band Edge Emissions for 802.11b –2,412 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8441A Antenna / Gain = 4.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH6 MAP625 Radio 2 Platform

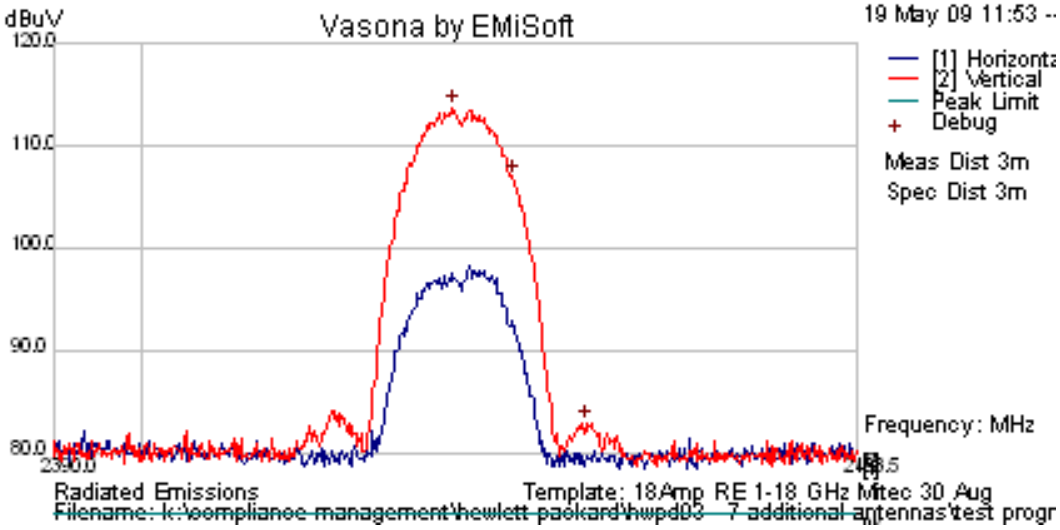
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2436.094	68.4	12.97	32.37	113.7	Peak [Scan]	V					Pass	Fund
2185.993	62.92	2.85	-10.56	55.21	Peak Max	V	104	235	93.7	-38.49	Pass	NRB
4874.001	52.9	4.51	-8.75	48.66	Average Max	V	133	330	54	-5.34	Pass	RB
4874.001	56.04	4.51	-8.75	51.8	Peak Max	V	133	330	74	-22.2	Pass	RB
7307.94	43.37	5.44	-2.82	45.99	Average Max	V	118	358	54	-8.01	Pass	RB
7307.94	51.04	5.44	-2.82	53.66	Peak Max	V	118	358	74	-20.34	Pass	RB
2015.957	67.28	2.76	-10.63	59.4	Peak Max	V	98	17	93.7	-34.3	Pass	NRB

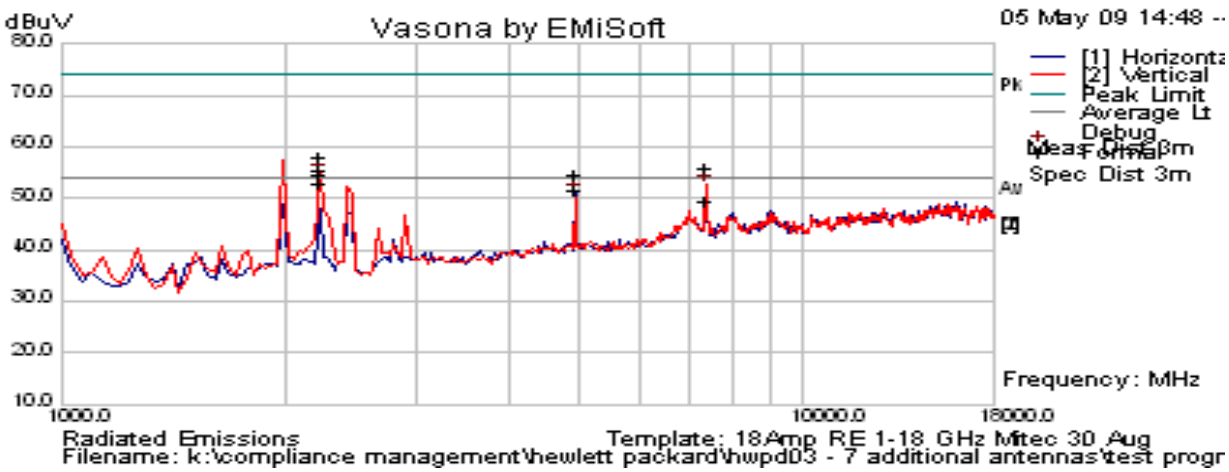
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2462
Antenna Model	J8441A Antenna / Gain = 4.4 dBi
Power setting	18 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH11 MAP625 Radio 2 Platform

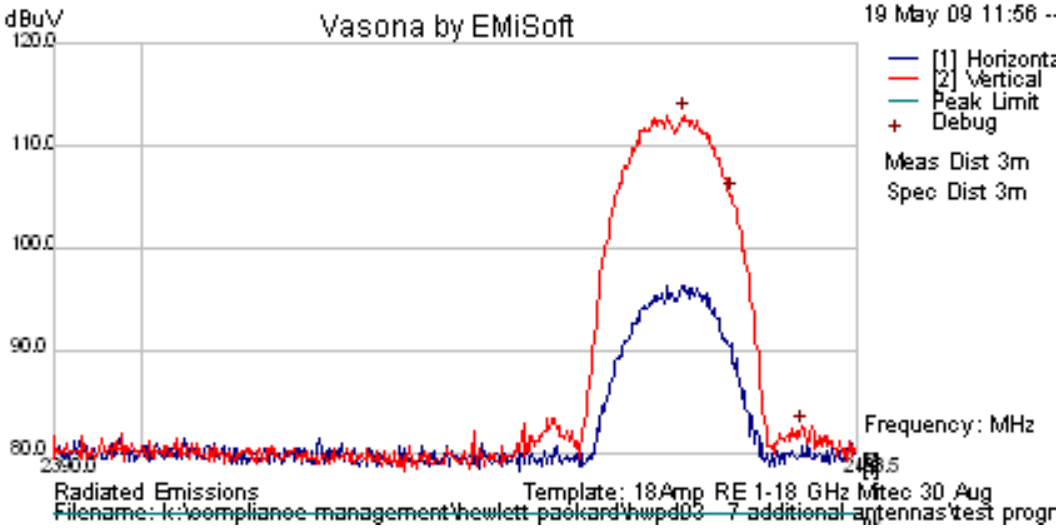
Radiated Emissions



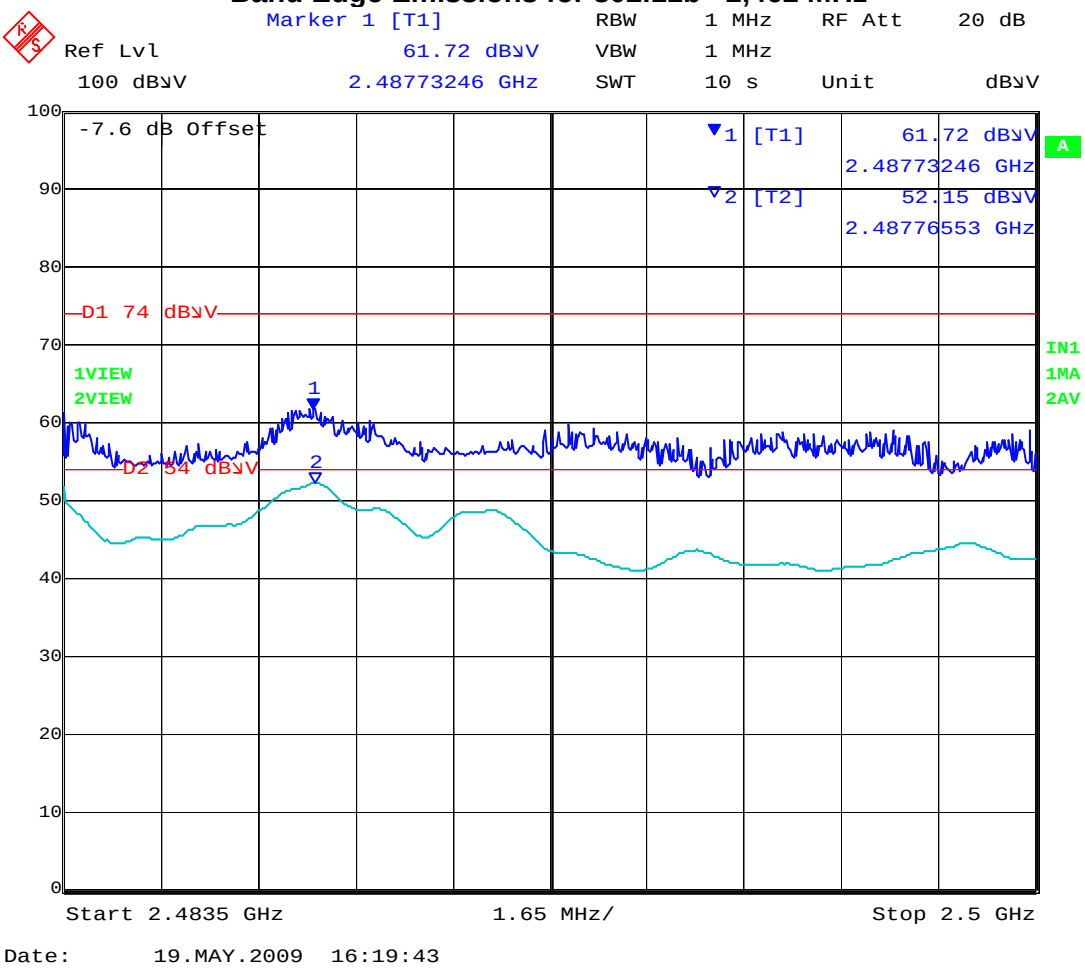
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2463.076	67.67	12.98	32.38	113	Peak [Scan]	V						Fund
2235.99	60.75	2.87	-10.57	53.05	Average	V	126	232	54	-0.95	Pass	RB
2236.05	64.11	2.87	-10.57	56.41	Peak	V	126	232	74	-17.59	Pass	RB
4924.011	55.94	4.55	-8.76	51.74	Average Max	H	129	303	54	-2.26	Pass	RB
4924.011	58.63	4.55	-8.76	54.43	Peak Max	H	129	303	74	-19.57	Pass	RB
7384.048	47.02	5.46	-3.21	49.27	Average Max	V	114	331	54	-4.73	Pass	RB
7384.048	53.63	5.46	-3.21	55.88	Peak Max	V	114	331	74	-18.12	Pass	RB
2015.957	67.28	2.76	-10.63	59.4	Peak Max	V	98	17	83.0	-23.6	Pass	NRB
2487.73246	Power Setting = 18			61.72	Peak Max	V	--	--	74	-12.28	Pass	Band Edge
2487.73246				52.12	Average Max	V	--	--	54	-1.88	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

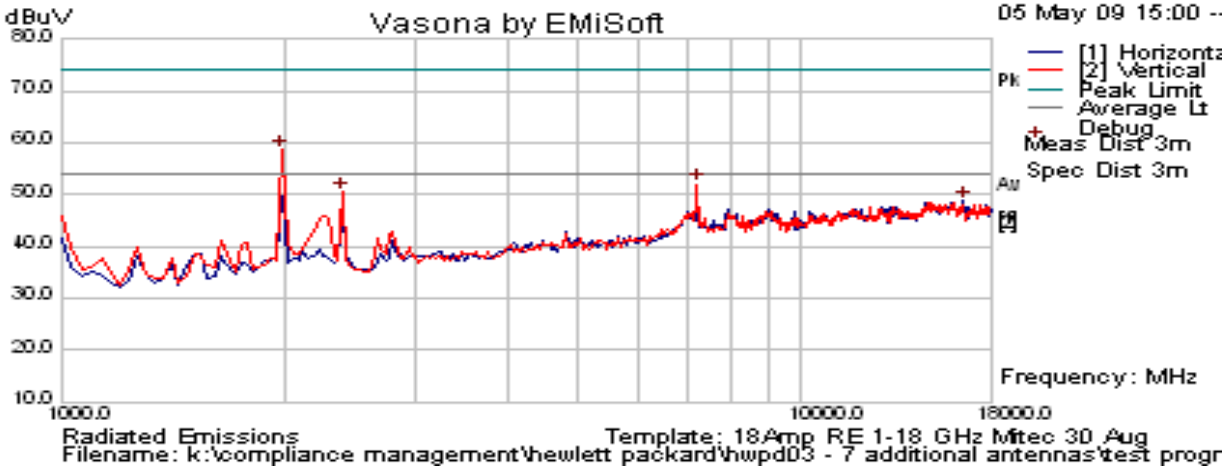


Band Edge Emissions for 802.11b –2,462 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2412
Antenna Model	J8441A Antenna / Gain = 4.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH1 MAP625 Radio 2 Platform

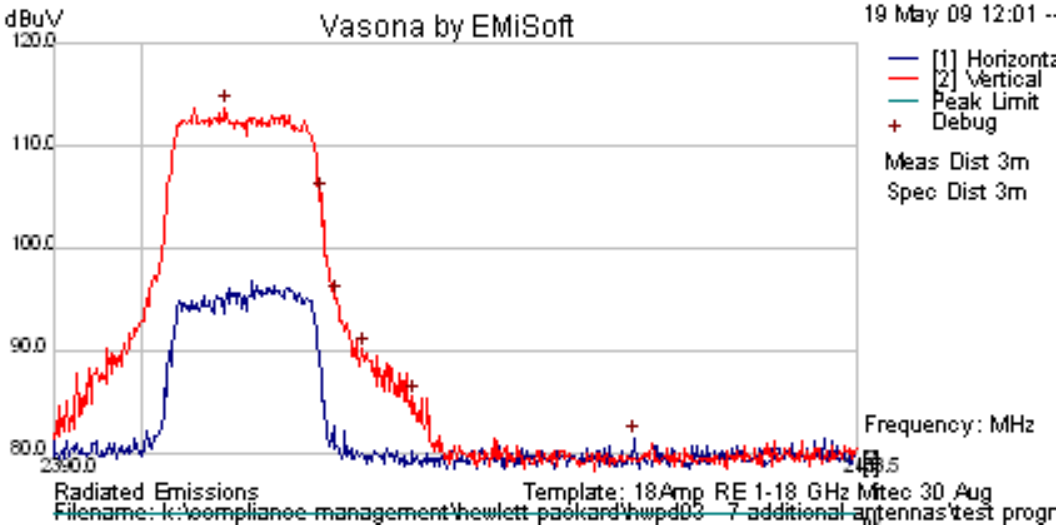
Radiated Emissions



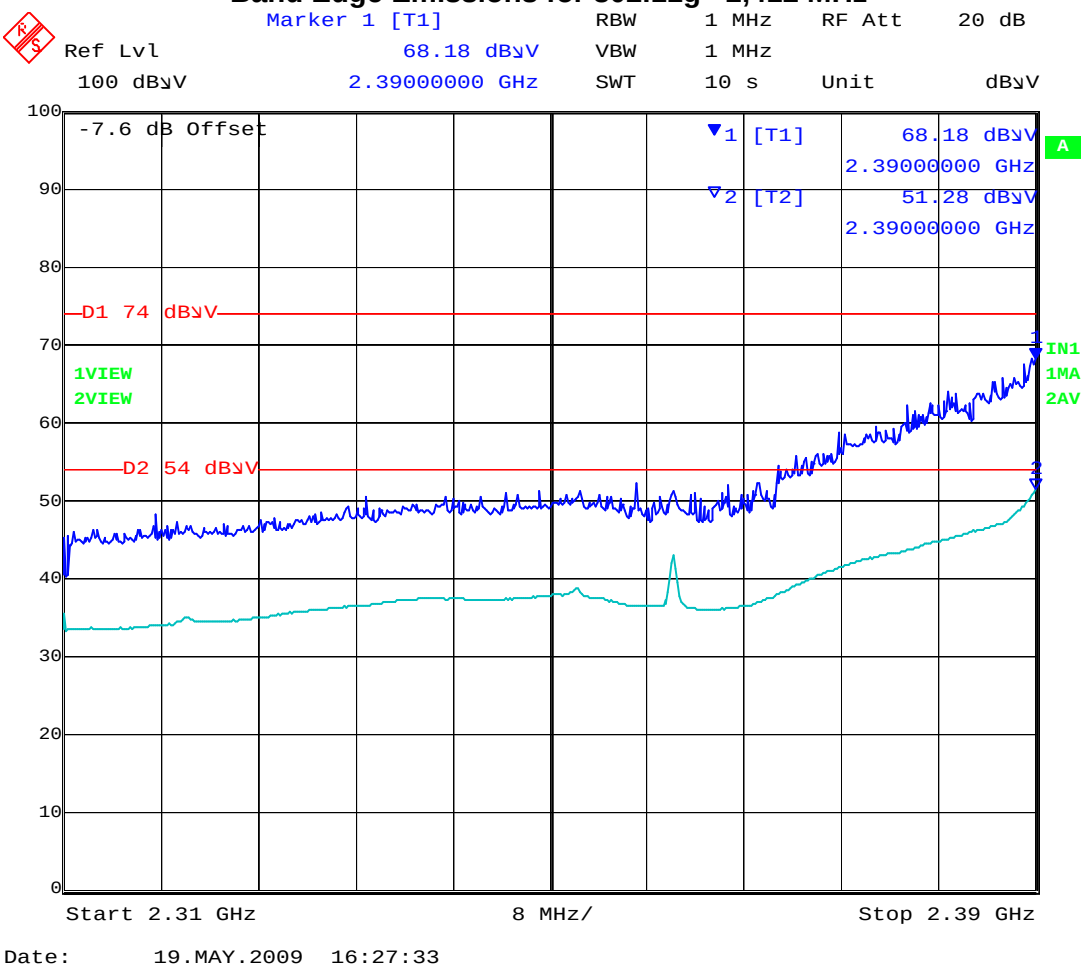
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2409.674	68.49	13	32.35	113.8	Peak [Scan]	V						Fund
1987.976	66.56	2.74	-10.72	58.59	Peak [Scan]	V	100	0	93.8	-35.21	Pass	NRB
7234.469	48.99	5.43	-2.46	51.96	Peak [Scan]	V	100	0	93.8	-41.84	Pass	NRB
16535.07	40.33	8.8	-0.44	48.68	Peak [Scan]	H	100	0	93.8	-45.12	Pass	NRB
2390.000	Power Setting = 13			68.18	Peak Max	V	--	--	74	-5.82	Pass	Band Edge
2390.000				51.28	Average Max	V	--	--	54	-2.72	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

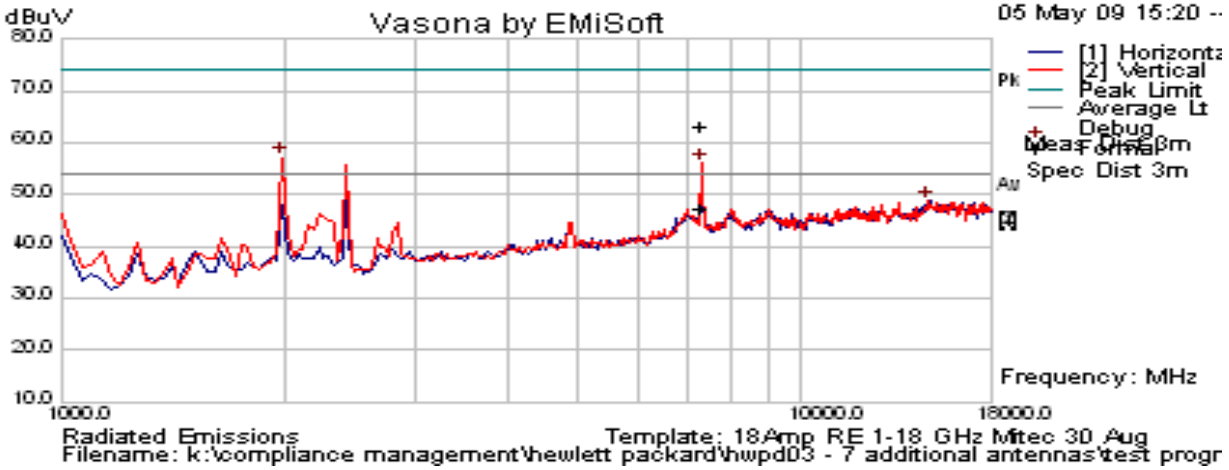


Band Edge Emissions for 802.11g –2,412 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8441A Antenna / Gain = 4.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH6 MAP625 Radio 2 Platform

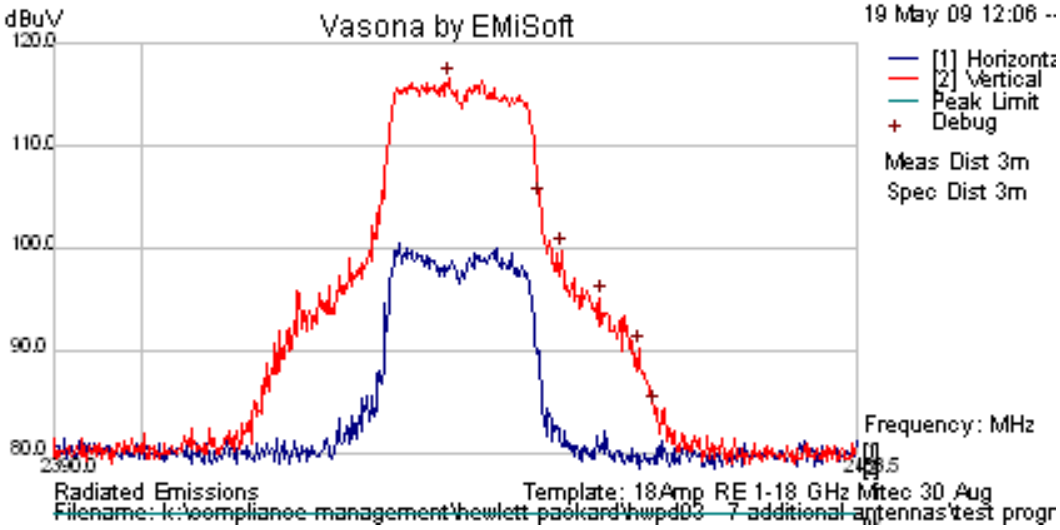
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2435.532	71.31	13	32.36	116.7	Peak [Scan]	V						Fund
7306.06	60.42	5.44	-2.81	63.05	Peak Max	V	115	357	74	-10.95	Pass	RB
7306.06	44.79	5.44	-2.81	47.42	Average Max	V	115	357	54	-6.58	Pass	RB
2015.957	67.28	2.76	-10.63	59.4	Peak Max	V	98	17	96.7	-37.3	Pass	NRB

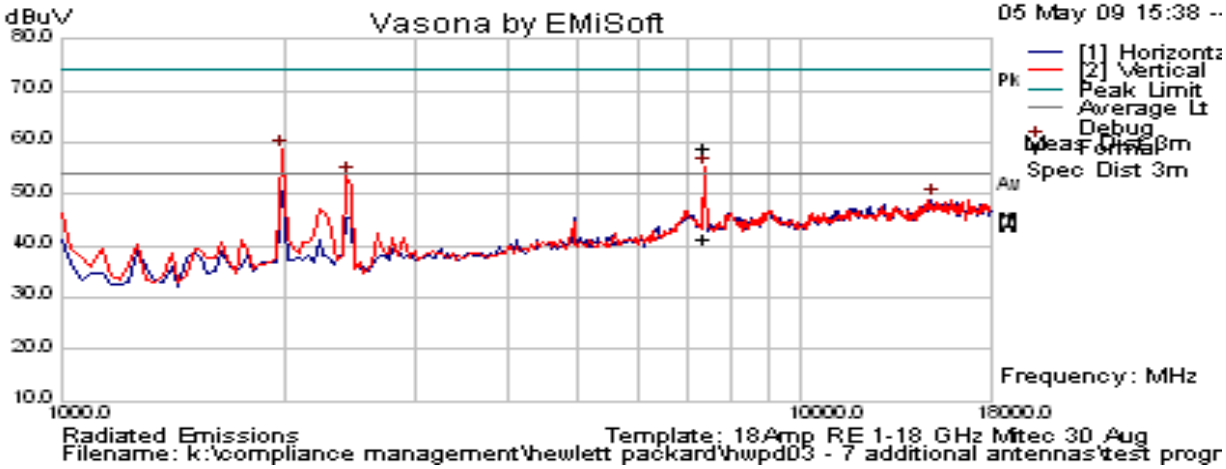
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2462
Antenna Model	J8441A Antenna / Gain = 4.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH11 MAP625 Radio 2 Platform

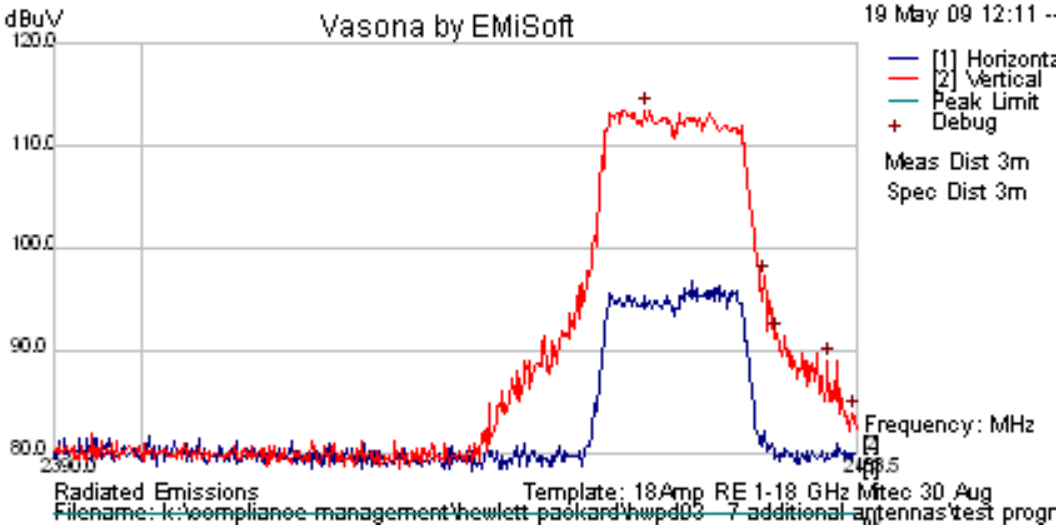
Radiated Emissions



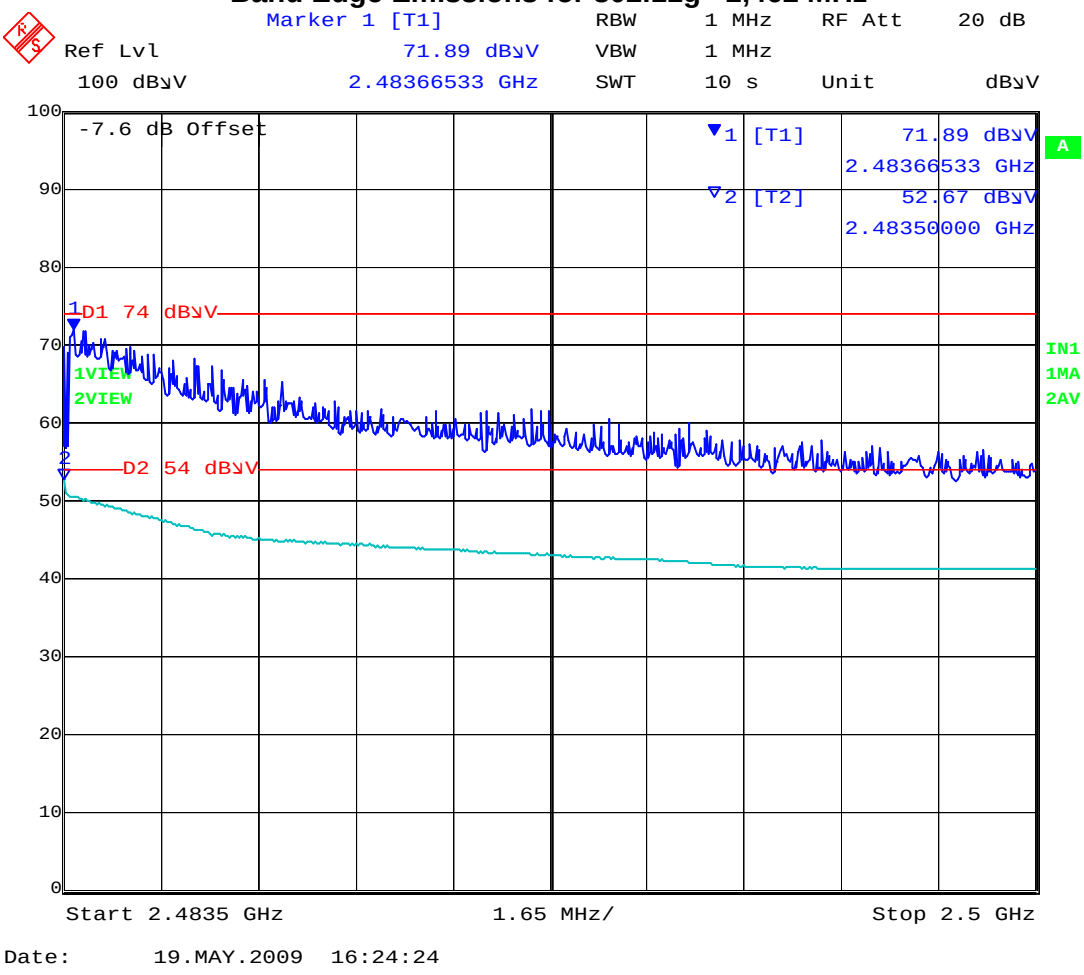
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2458.579	68.19	13	32.38	113.5	Peak [Scan]	V						Fund
7390.485	56.79	5.46	-3.25	59	Peak Max	H	98	352	74	-15.00	Pass	RB
7390.485	39.13	5.46	-3.25	41.34	Average Max	H	98	352	54	-12.66	Pass	RB
2015.957	67.28	2.76	-10.63	59.4	Peak Max	V	98	17	93.5	-34.10	Pass	NRB
2483.665	Power Setting = 14			71.89	Peak Max	V	--	--	74	-2.11	Pass	Band Edge
2483.500				52.67	Average Max	V	--	--	54	-1.33	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



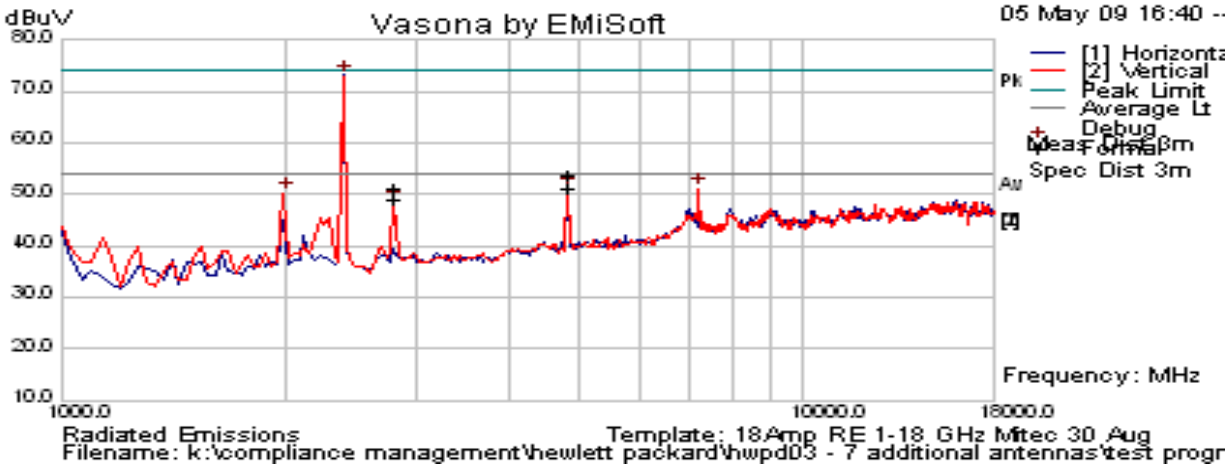
Band Edge Emissions for 802.11g –2,462 MHz



ANTENNA J8444A

Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2412
Antenna Model	J8444A Antenna / Gain = 7.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH1 MAP625 Platform Radio 2

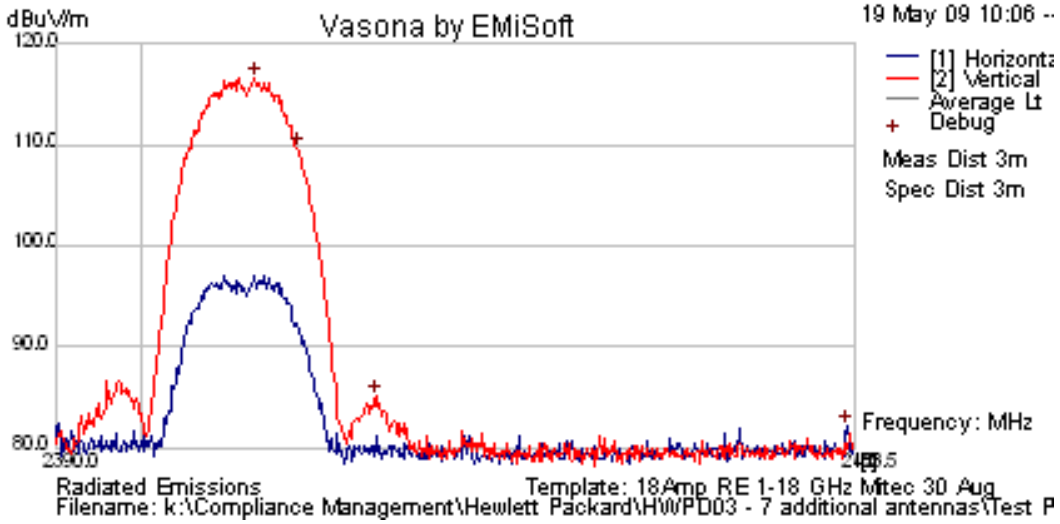
Radiated Emissions



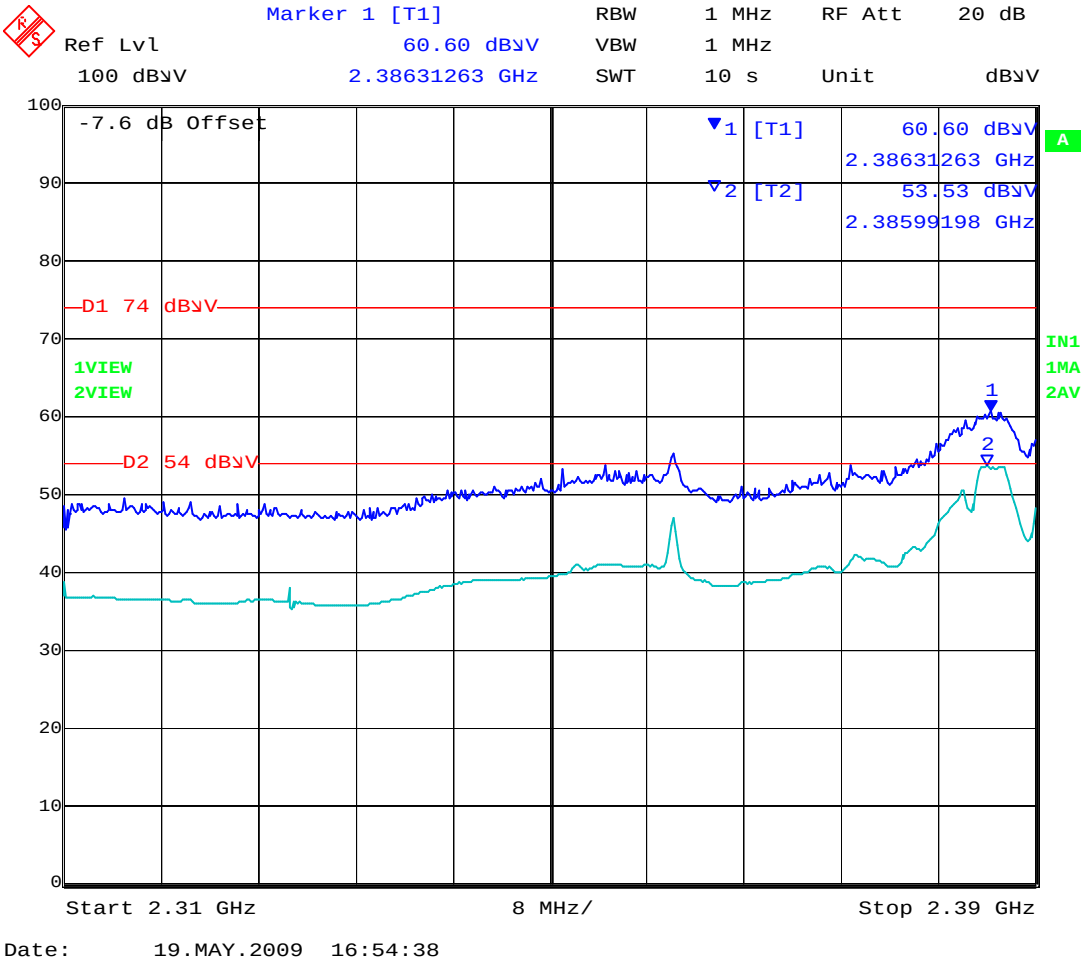
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2413.047	71.26	12.96	32.35	116.6	Peak [Scan]	V						Fund
4824.008	57.84	4.47	-8.75	53.56	Peak Max	H	138	40	74	-20.44	Pass	RB
2807.986	59.03	3.24	-10.96	51.31	Peak Max	V	133	222	74	-22.69	Pass	RB
4824.008	55.59	4.47	-8.75	51.31	Average Max	H	138	40	54	-2.69	Pass	RB
2807.986	56.69	3.24	-10.96	48.98	Average Max	V	133	222	54	-5.02	Pass	RB
2386.31263	Power Setting = 16			60.60	Peak Max	V	--	--	74	-13.4	Pass	Band Edge
2385.99198				53.53	Average Max	V	--	--	54	-0.47	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

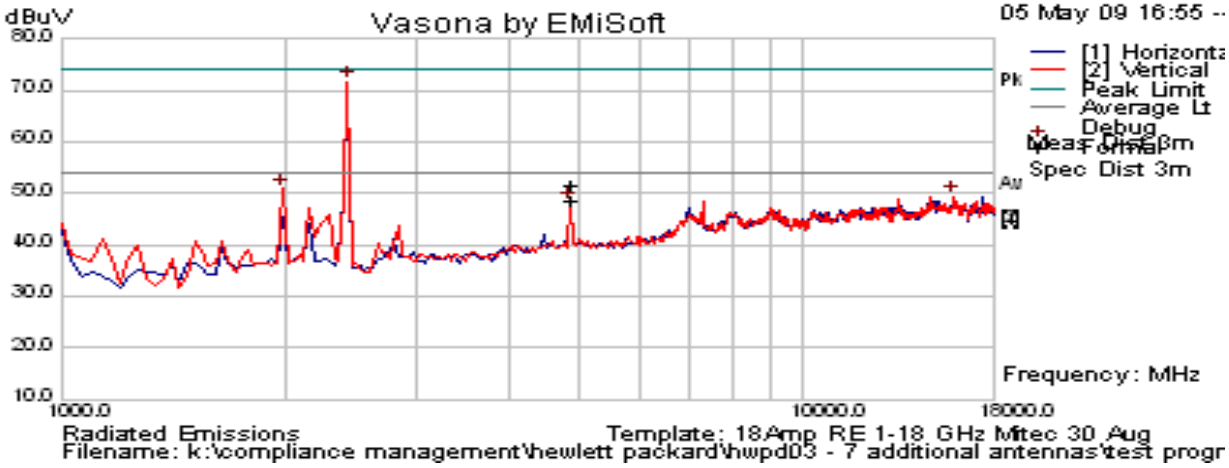


Band Edge Emissions for 802.11b –2,412 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8444A Antenna / Gain = 7.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH6 MAP625 Platform Radio 2

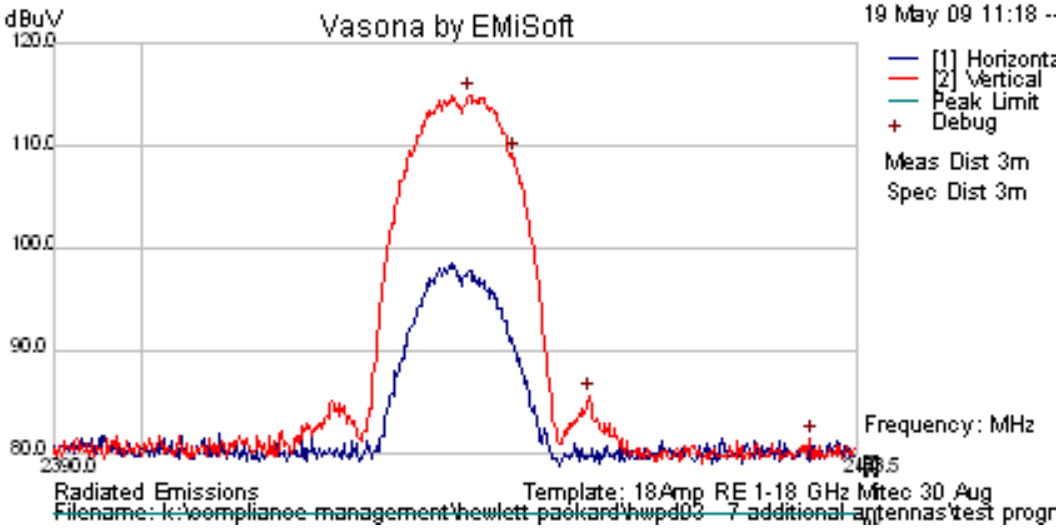
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2437.968	69.67	12.97	32.37	115	Peak [Scan]	V						Fund
4874.032	55.66	4.51	-8.75	51.42	Peak Max	H	124	39	74	-22.58	Pass	RB
4874.032	52.71	4.51	-8.75	48.47	Average Max	H	124	39	54	-5.53	Pass	RB

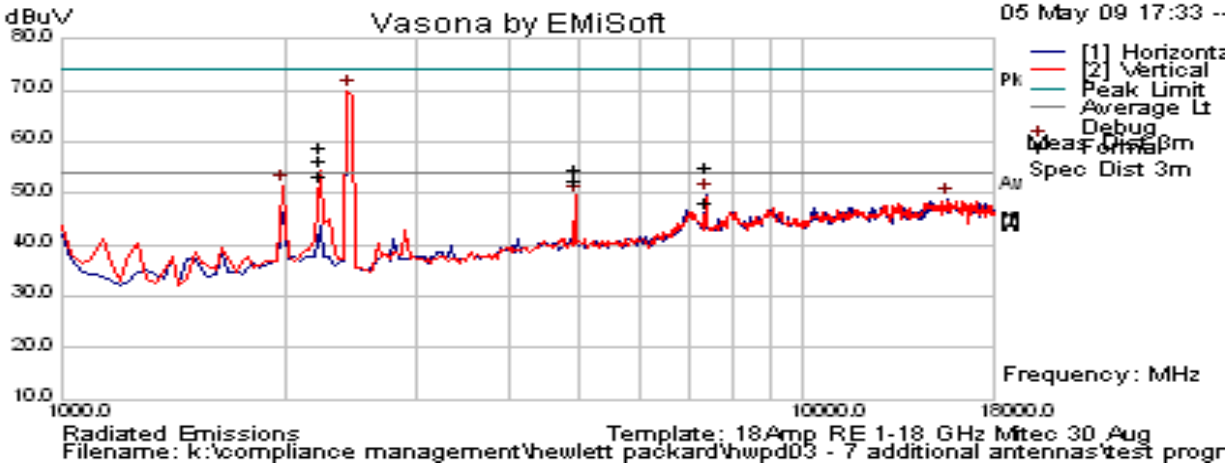
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2462
Antenna Model	J8444A Antenna / Gain = 7.4 dBi
Power setting	17 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH11 MAP625 Platform Radio 2

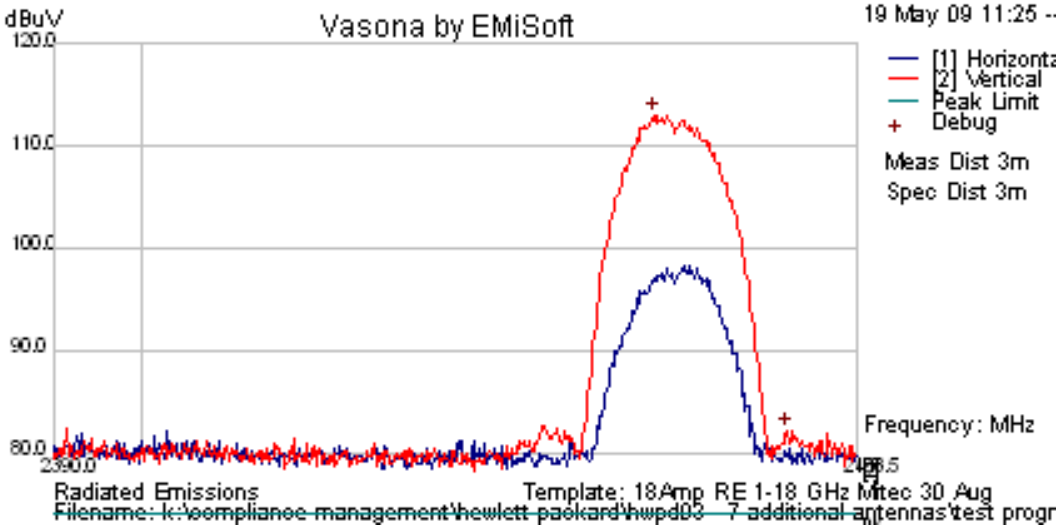
Radiated Emissions



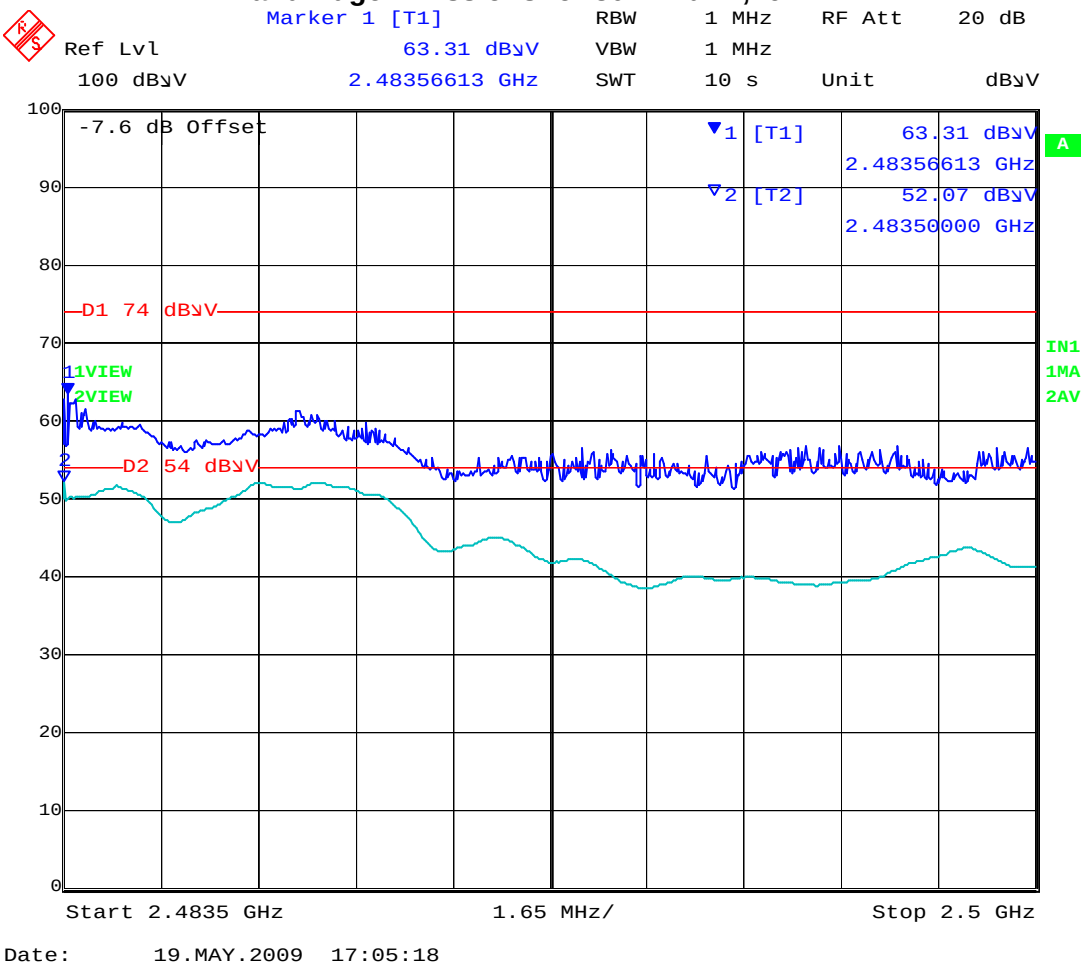
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2459.516	67.73	12.98	32.38	113.1	Peak [Scan]	V						Fund
2235.971	66.53	2.87	-10.57	58.83	Peak Max	V	98	306	74	-15.17	Pass	RB
7385.139	52.85	5.46	-3.22	55.09	Peak Max	V	106	334	74	-18.91	Pass	RB
4923.949	59.03	4.55	-8.76	54.83	Peak Max	V	103	276	74	-19.17	Pass	RB
2235.999	61.11	2.87	-10.57	53.42	Average	V	98	306	54	-0.58	Pass	RB
7385.139	45.82	5.46	-3.22	48.06	Average Max	V	106	334	54	-5.94	Pass	RB
4923.949	56.53	4.55	-8.76	52.33	Average Max	V	103	276	54	-1.67	Pass	RB
2483.56613	Power Setting = 19			63.31	Peak Max	V	--	--	74	-10.69	Pass	Band Edge
2483.5000				52.07	Average Max	V	--	--	54	-1.93	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

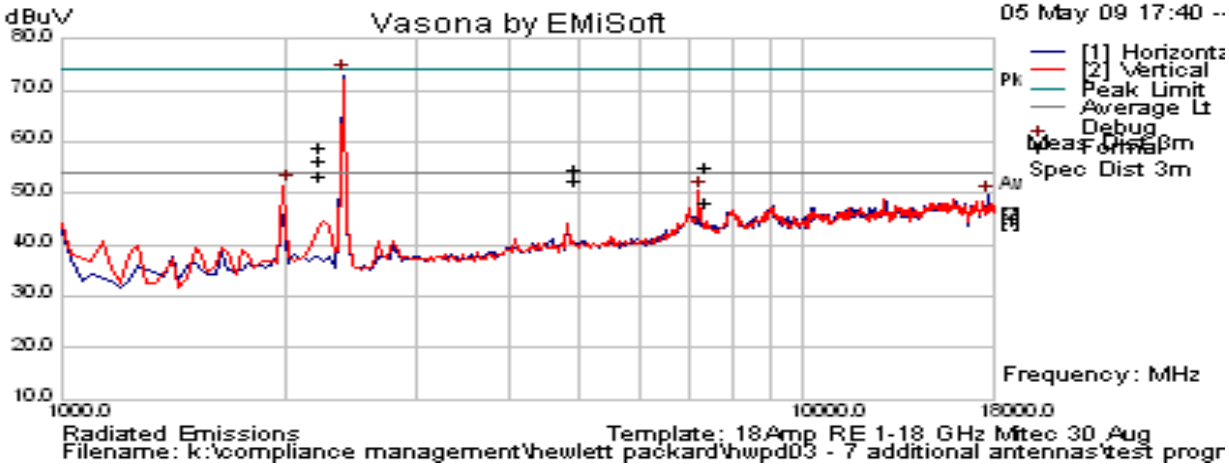


Band Edge Emissions for 802.11b –2,462 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2412
Antenna Model	J8444A Antenna / Gain = 7.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH1 MAP625 Platform Radio 2

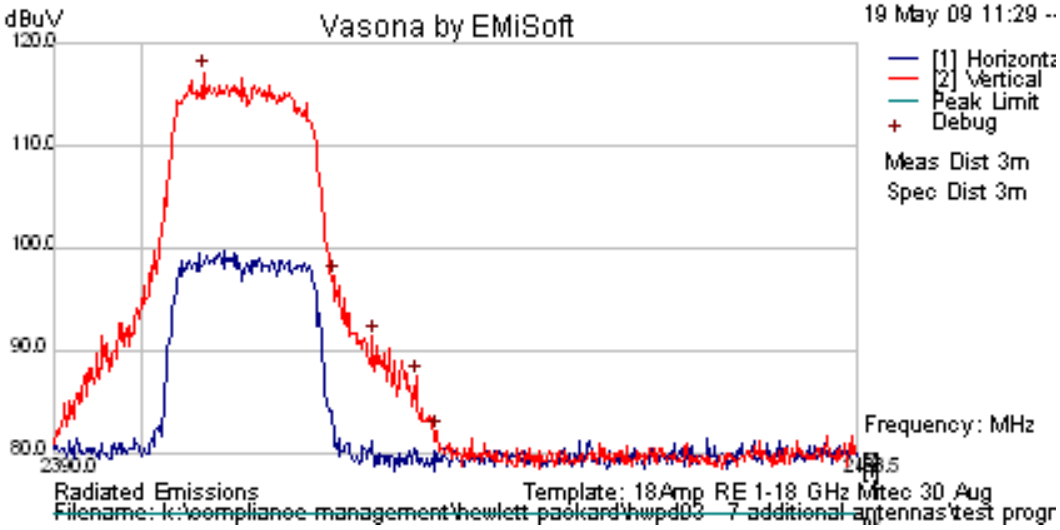
Radiated Emissions



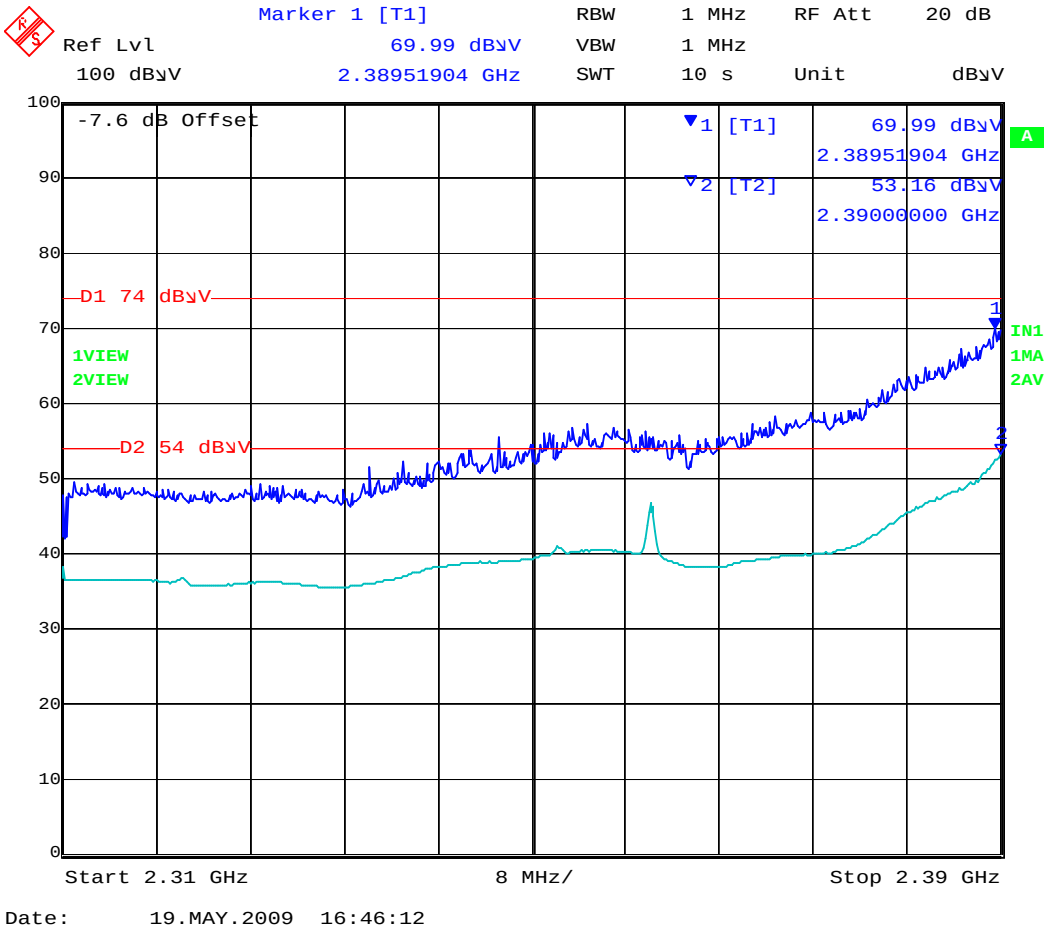
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2407.238	71.87	13	32.35	117.2	Peak [Scan]	V						Fund
2016.032	59.47	2.76	-10.63	51.6	Peak [Scan]	V	100	0	97.2	-45.60	Pass	NRB
7235.551	47.61	5.43	-2.46	50.58	Peak [Scan]	V	100	0	97.2	-46.62	Pass	NRB
2389.51904	Power Setting = 13			69.99	Peak Max	V	--	--	74	-4.01	Pass	Band Edge
2390.00000				53.16	Average Max	V	--	--	54	-0.84	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

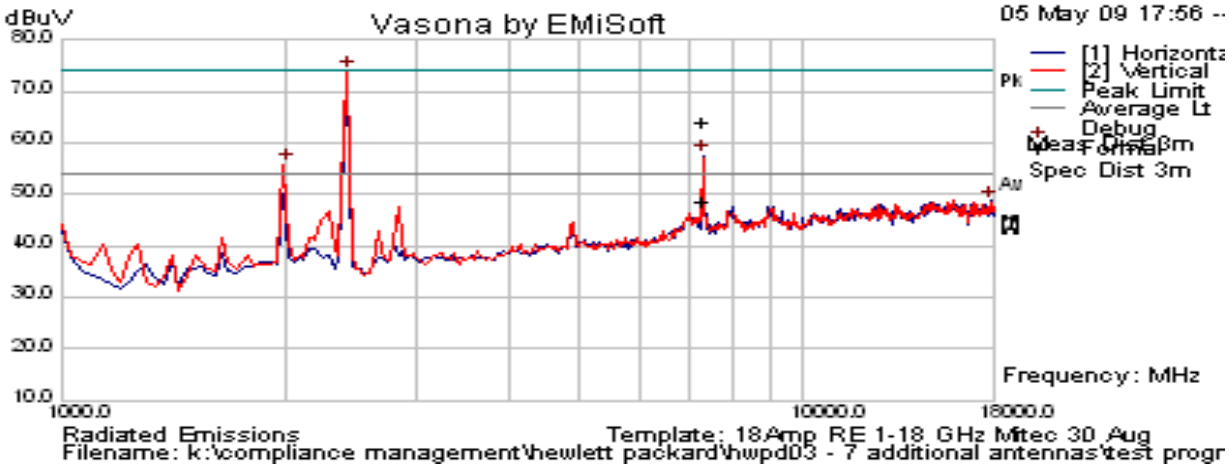


Band Edge Emissions for 802.11g –2,412 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8444A Antenna / Gain = 7.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH6 MAP625 Platform Radio 2

Radiated Emissions

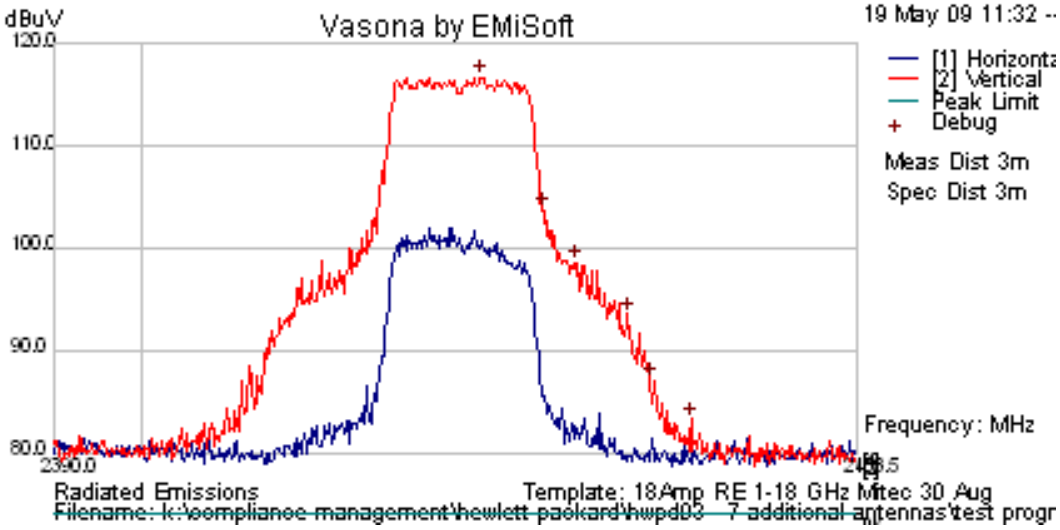


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2439.467	71.41	13	32.37	116.8	Peak [Scan]	V						Fund
7305.836	61.39	5.44	-2.81	64.03	Peak Max	V	141	0	74	-9.97	Pass	RB
7305.836	45.87	5.44	-2.81	48.5	Average Max	V	141	0	54	-5.5	Pass	RB
2016.032	59.47	2.76	-10.63	51.6	Peak [Scan]	V	100	0	96.8	-45.2	Pass	NRB

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

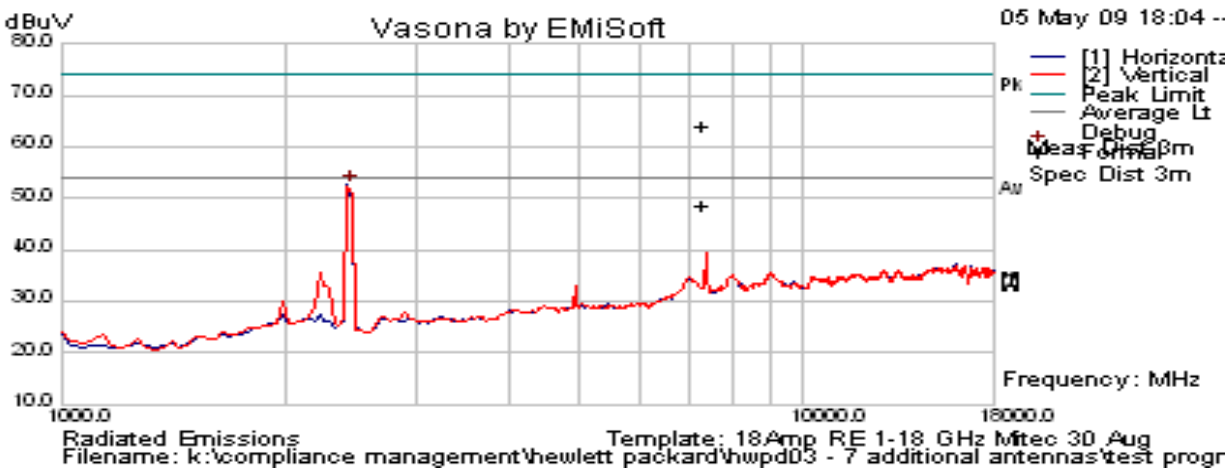
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. Any changes will be noted in the Document History section of the report.

Peak Emission



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2462
Antenna Model	J8444A Antenna / Gain = 7.4 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH11 MAP625 Platform Radio 2

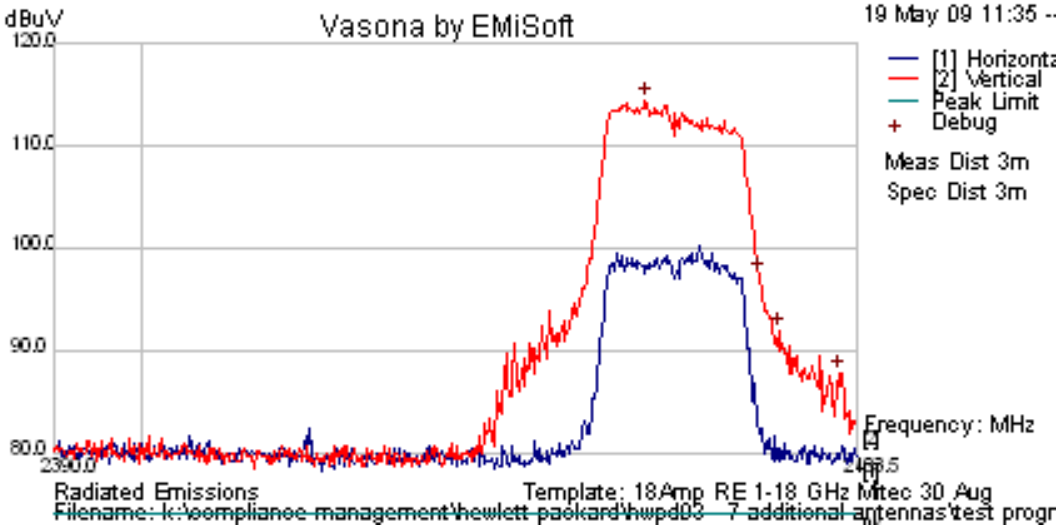
Radiated Emissions



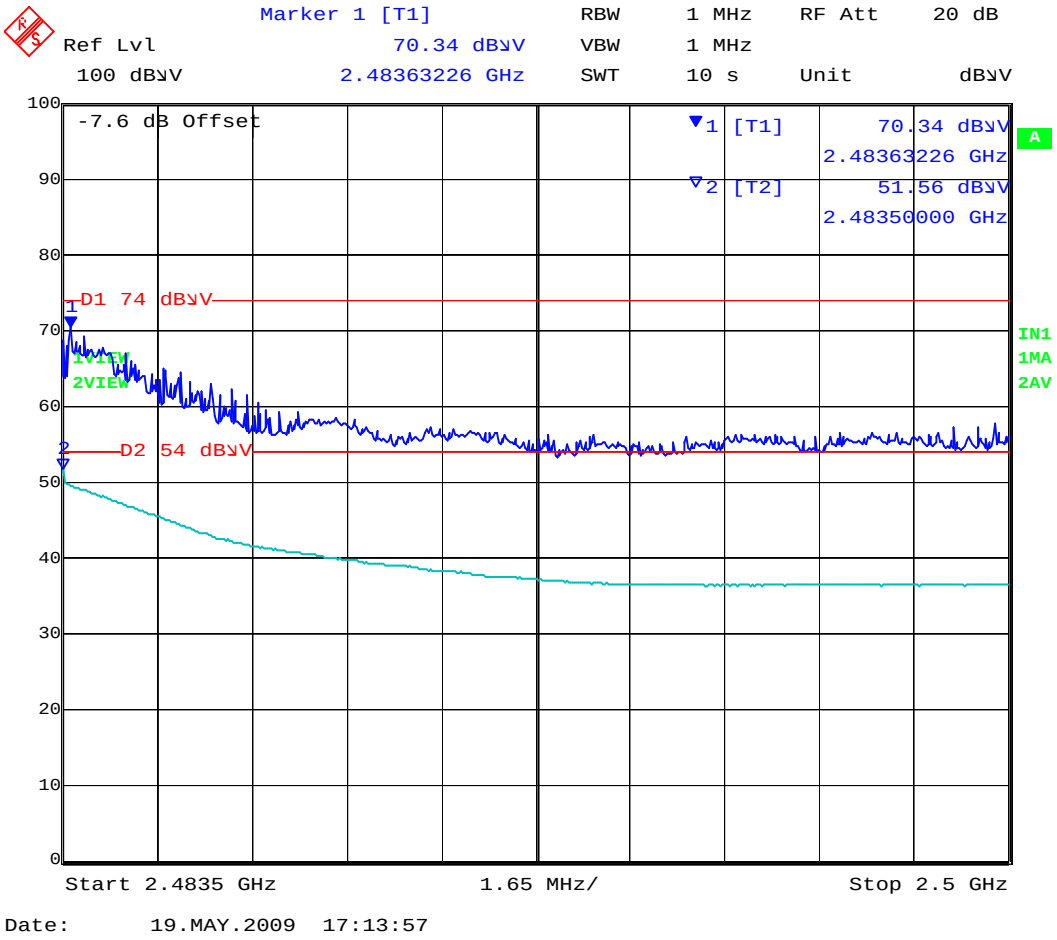
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2458.579	69.12	13	32.38	114.5	Peak [Scan]	V						Fund
2483.63226	Power Setting = 13			70.34	Peak Max	V	--	--	74	-3.66	Pass	Band Edge
2483.500				51.56	Average Max	V	--	--	54	-2.44	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



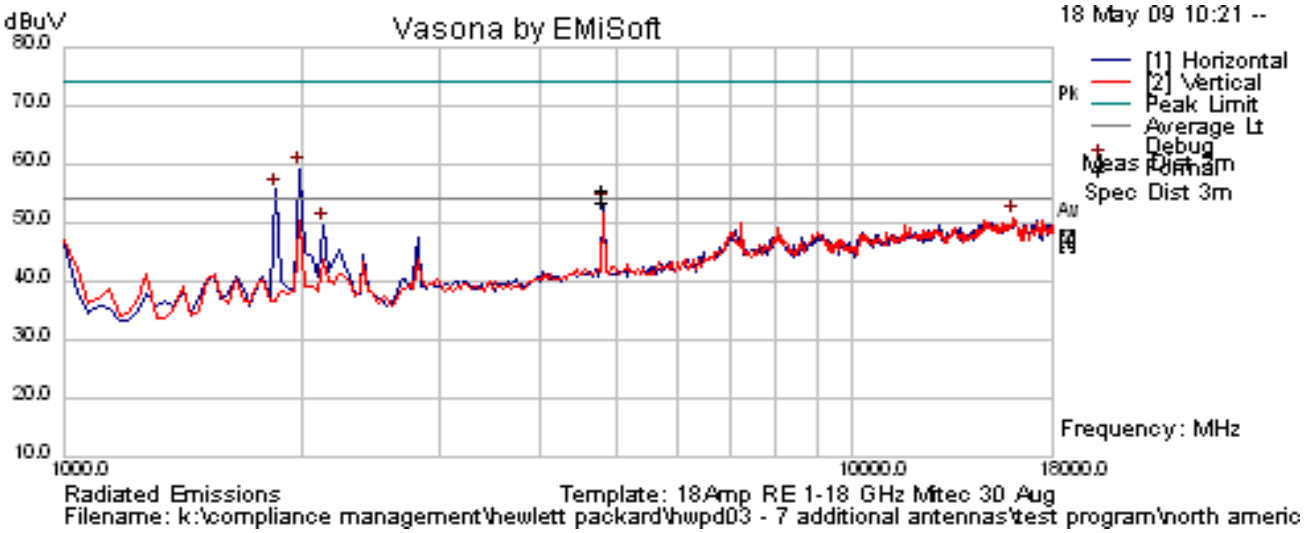
Band Edge Emissions for 802.11b –2,462 MHz



ANTENNA J8997A

Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2412
Antenna Model	J8997A Antenna / Gain = 3 dBi
Power setting	19 - in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH1 MAP625 Platform Radio 2

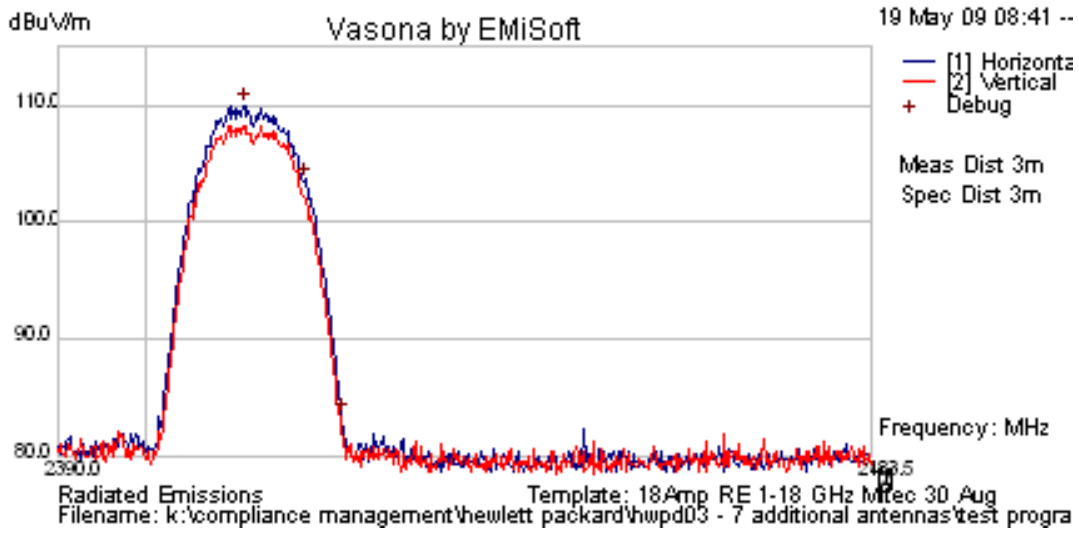
Radiated Emissions



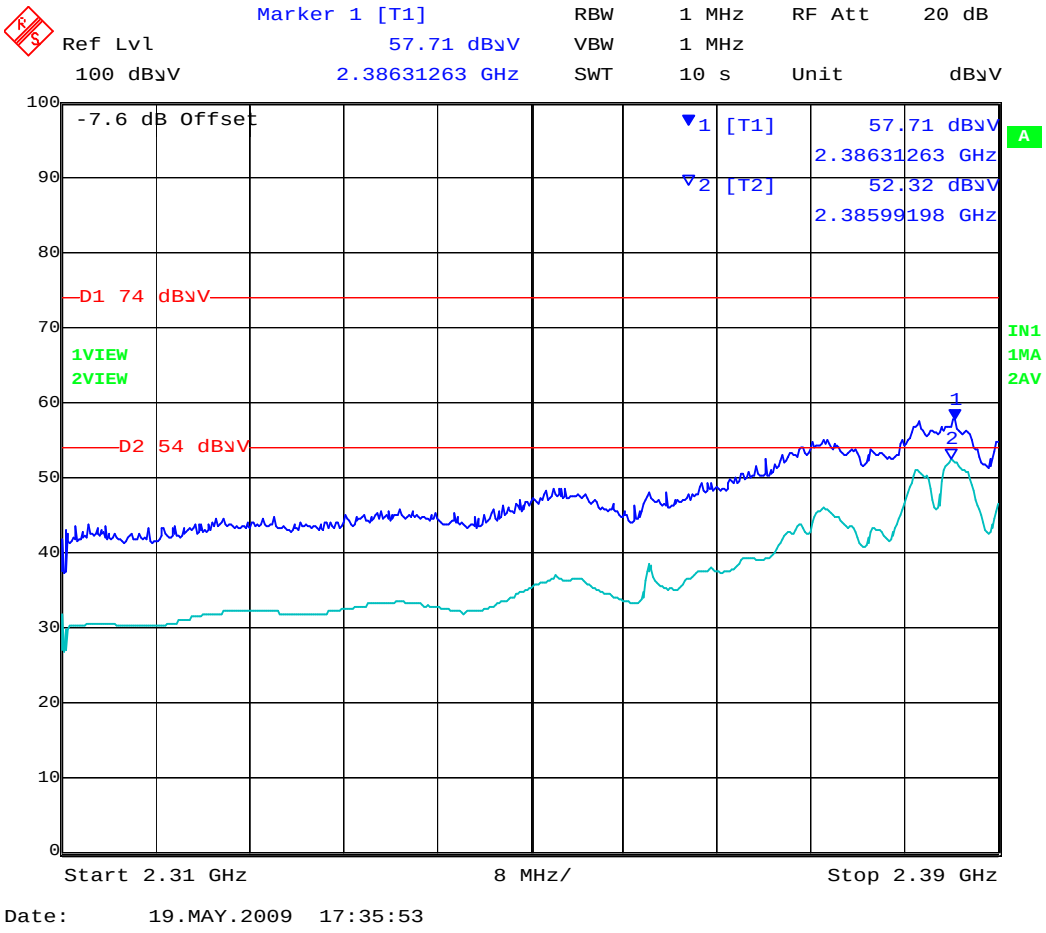
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2411.173	64.65	12.96	32.35	110	Peak [Scan]	H						Fund
4823.999	59.88	4.47	-8.75	55.6	Peak Max	H	151	60	74	-18.4	Pass	RB
4823.999	57.56	4.47	-8.75	53.28	Average Max	H	151	60	54	-0.72	Pass	RB
1987.976	67.18	2.74	-10.72	59.21	Peak [Scan]	H	100	0	90.0	-30.79	Pass	NRB
1851.703	64.8	2.65	-11.82	55.63	Peak [Scan]	H	100	0	90.0	-34.37	Pass	NRB
2386.31263	Power Setting = 20			57.71	Peak Max	V	--	--	74	-16.29	Pass	Band Edge
2385.99198				52.32	Average Max	V	--	--	54	-1.68	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

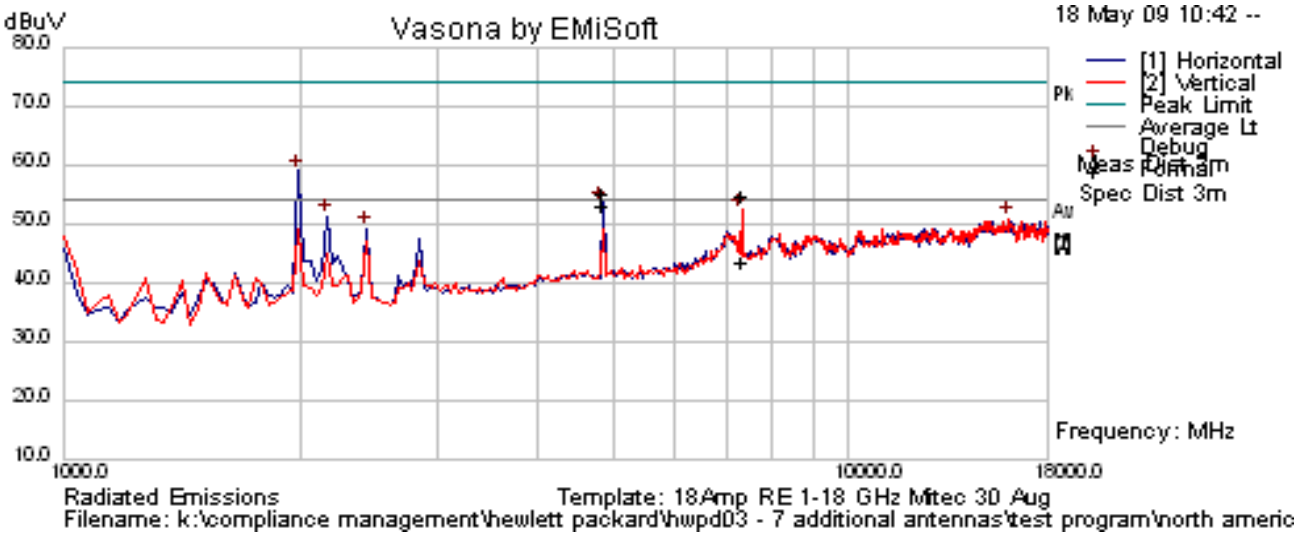


Band Edge Emissions for 802.11b –2,412 MHz



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8997A Antenna / Gain = 3 dBi
Power setting	17 - in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH6 MAP625 Platform Radio 2

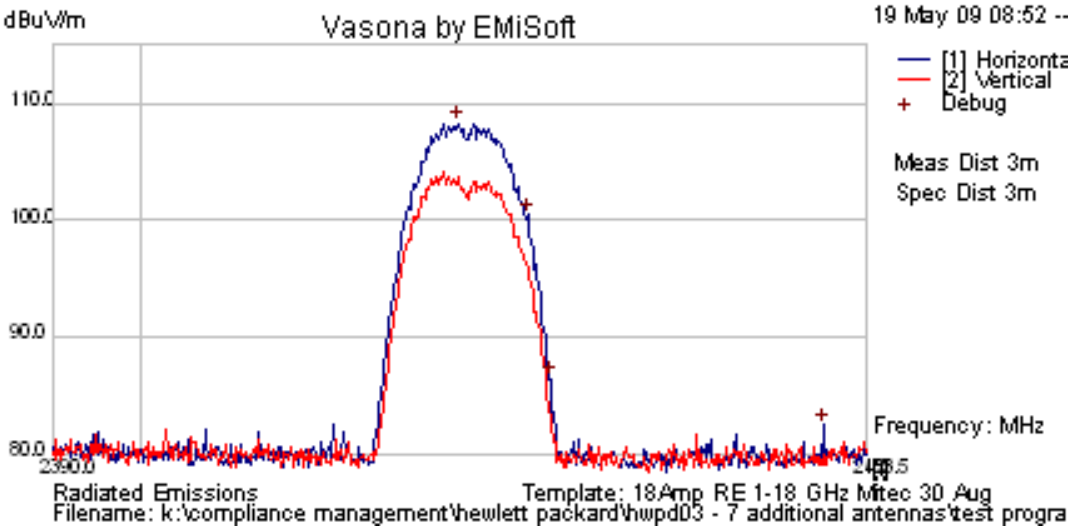
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2436.094	62.97	12.97	32.37	108.3	Peak [Scan]	H						Fund
7310.992	52.18	5.44	-2.83	54.79	Peak Max	V	110	42	74	-19.21	Pass	RB
7310.992	40.93	5.44	-2.83	43.54	Average Max	V	110	42	54	-10.46	Pass	RB
4874.052	59.88	4.51	-8.75	55.64	Peak Max	H	162	73	74	-18.36	Pass	RB
4874.052	57.15	4.51	-8.75	52.91	Average Max	H	162	73	54	-1.09	Pass	RB
1987.976	66.91	2.74	-10.72	58.94	Peak [Scan]	H	100	0	88.3	-29.36	Pass	NRB
2158.317	58.83	2.84	-10.59	51.08	Peak [Scan]	H	100	0	88.3	-37.22	Pass	NRB

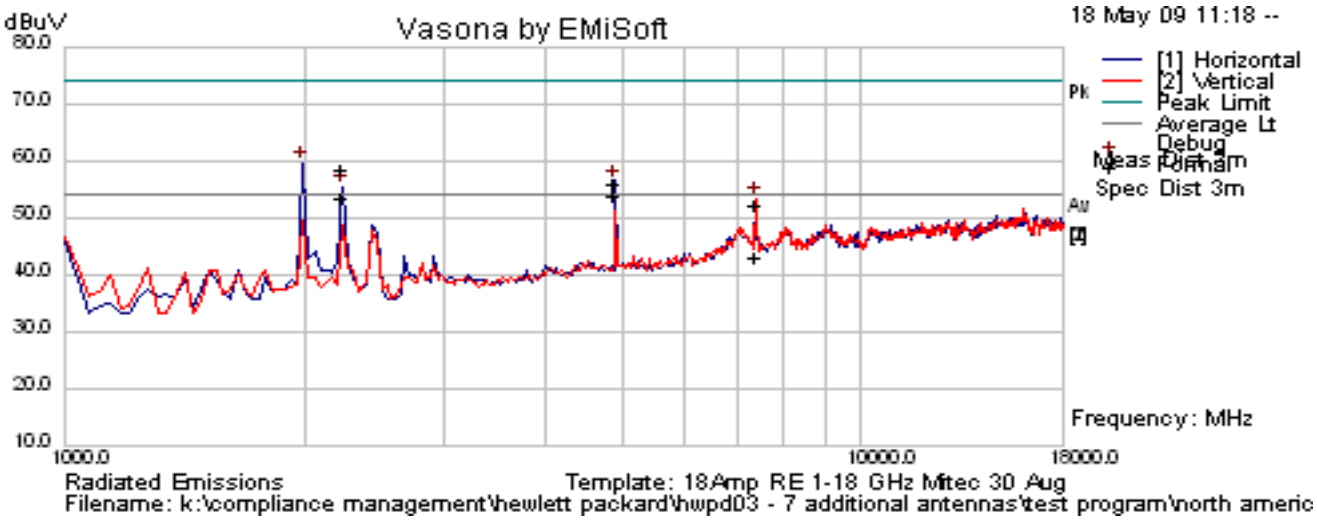
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2462
Antenna Model	J8997A Antenna / Gain = 3 dBi
Power setting	15 - in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH 11 MAP625 Platform Radio 2

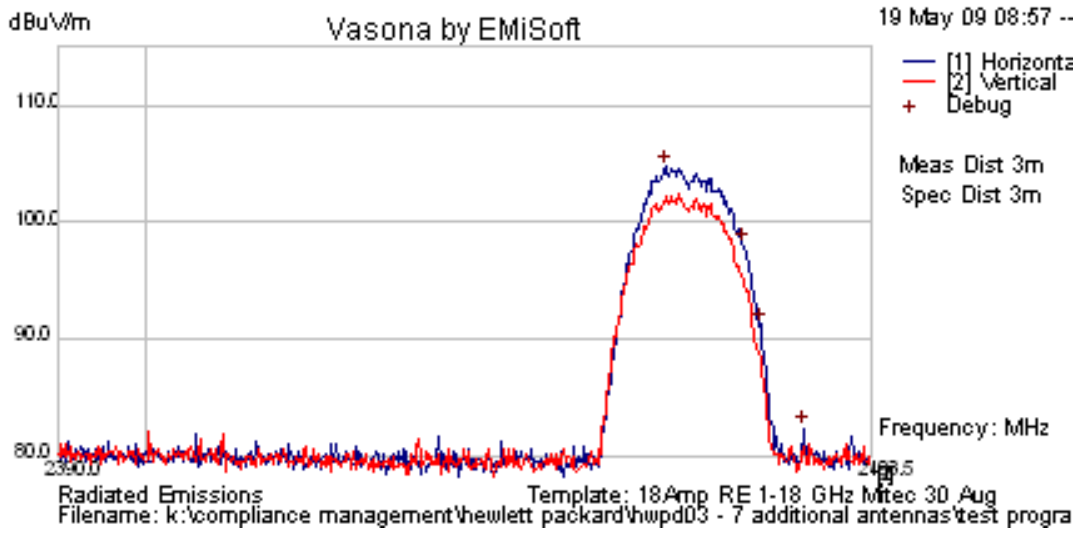
Radiated Emissions



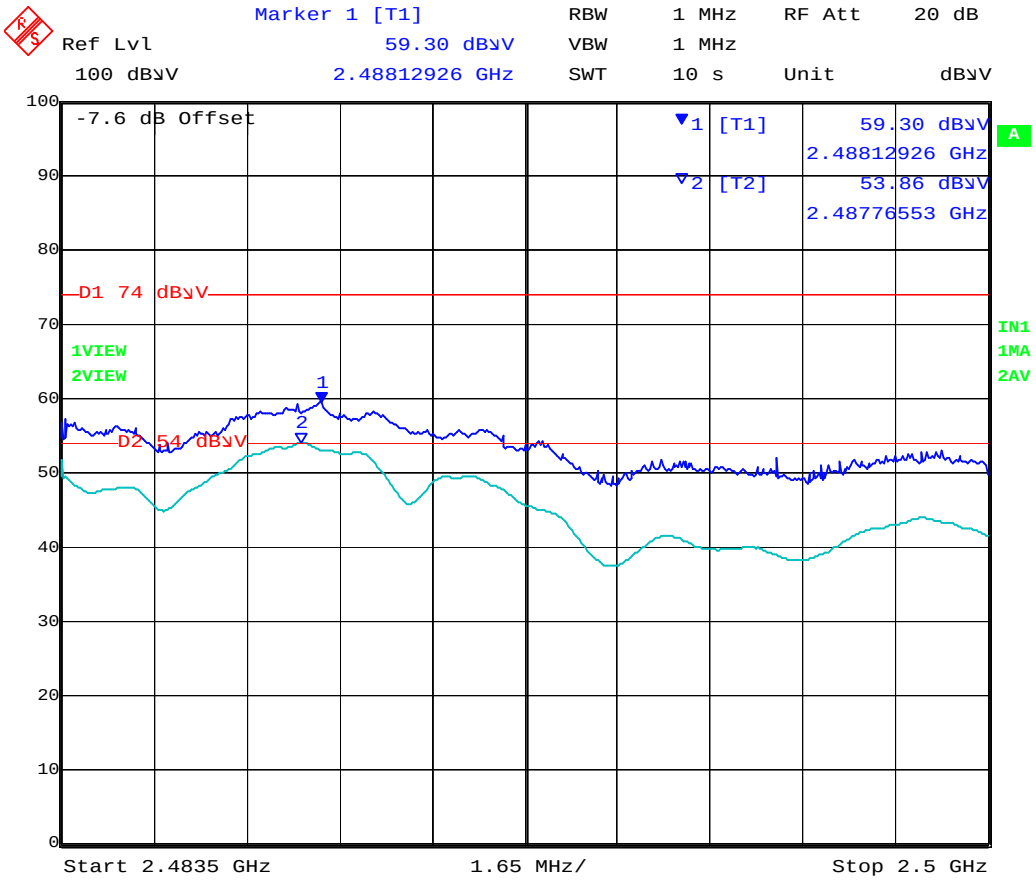
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2459.516	59.41	12.98	32.38	104.8	Peak [Scan]							Fund
4924.09	60.28	4.55	-8.76	56.08	Peak	H	160	65	74	-17.92	Pass	RB
2236.005	66.28	2.87	-10.57	58.58	Peak	H	121	313	74	-15.42	Pass	RB
7383.958	49.83	5.46	-3.21	52.07	Peak	V	130	9	74	-21.93	Pass	RB
4924.09	57.9	4.55	-8.76	53.69	Average	H	160	65	54	-0.31	Pass	RB
2236.005	61.35	2.87	-10.57	53.66	Average	H	121	313	54	-0.34	Pass	RB
7383.958	40.73	5.46	-3.21	42.97	Average	V	130	9	54	-11.03	Pass	RB
1987.976	67.59	2.74	-10.72	59.62	Peak [Scan]	H	100	0	84.8	-25.18	Pass	NRB
2488.12926	Power Setting = 20			59.30	Peak Max	V	--	--	74	-14.70	Pass	Band Edge
2487.76553				53.86	Average Max	V	--	--	54	-0.15	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



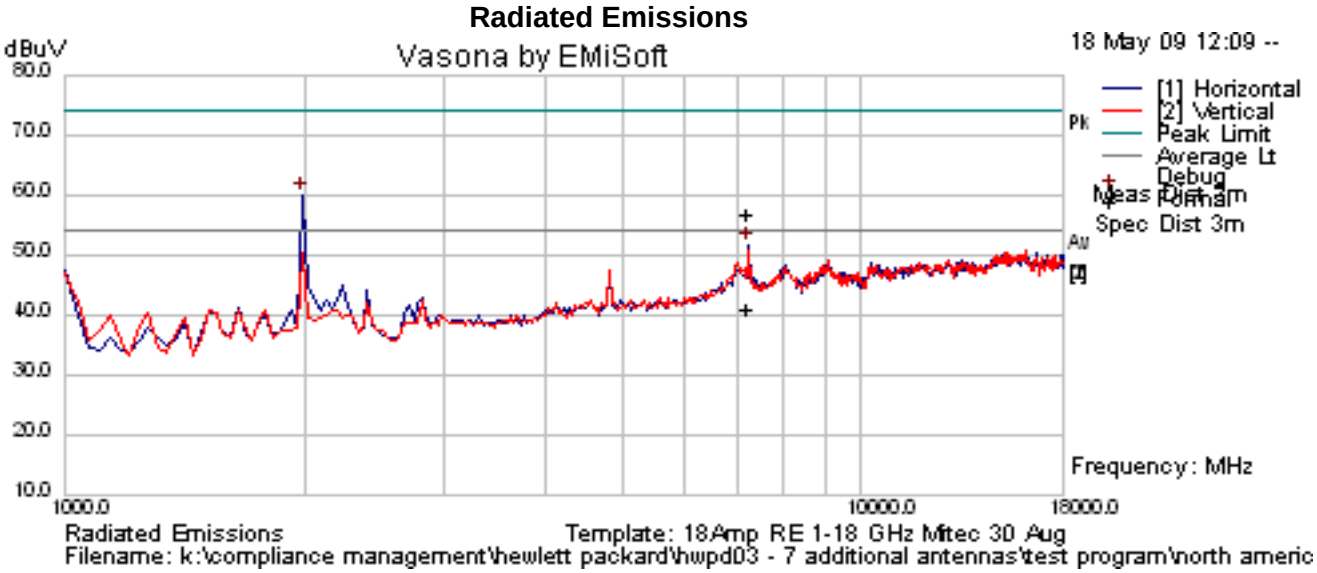
Band Edge Emissions for 802.11b –2,462 MHz



Date: 19.MAY.2009 17:22:12

Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2412
Antenna Model	J8997A Antenna / Gain = 3 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6Mb/s; CH1 MAP625 Platform Radio 2

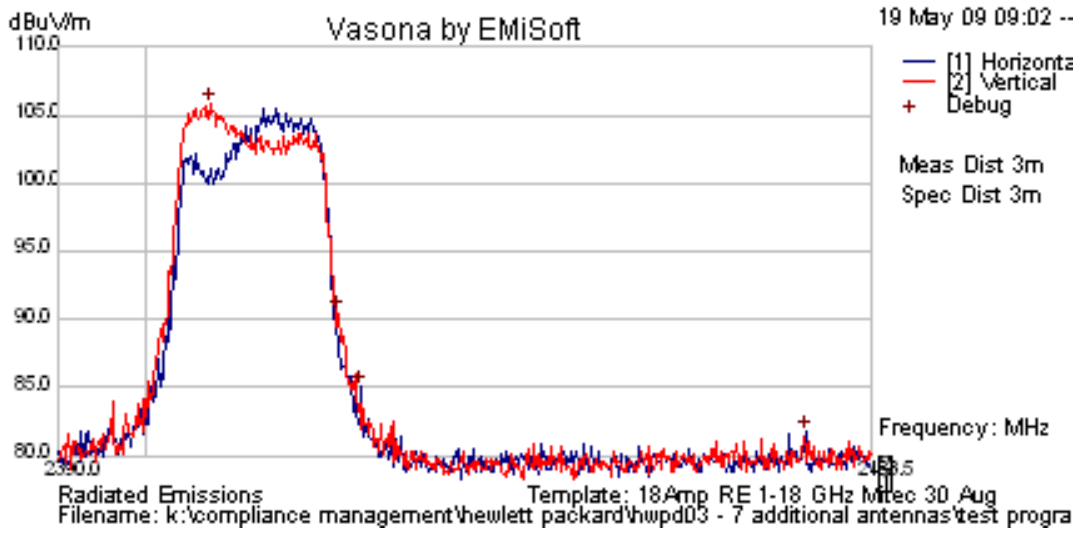
Radiated Emissions



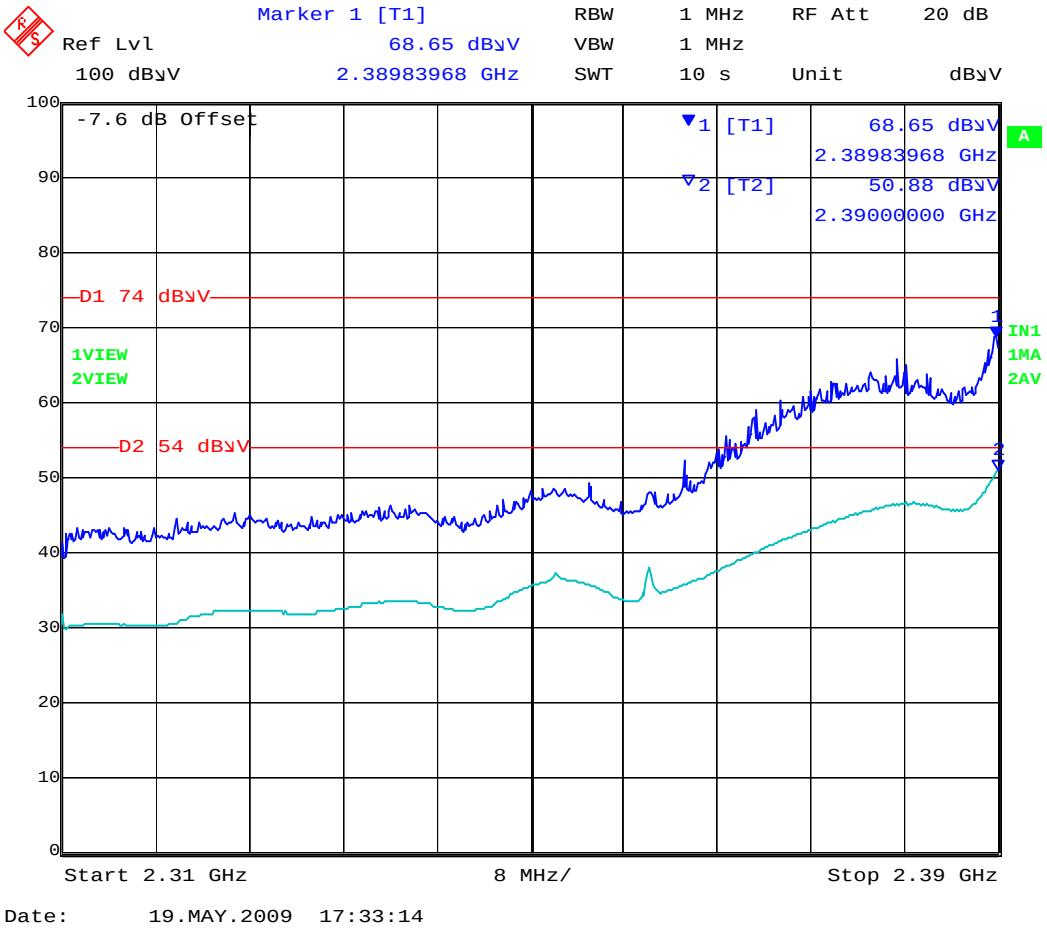
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2407.238	60.5	13	32.35	105.8	Peak [Scan]	V						FUND
7232.229	53.76	5.43	-2.44	56.74	Peak Max	V	122	36	74	-17.26	Pass	RB
7232.228	37.85	5.43	-2.44	40.84	Average	V	122	36	54	-13.16	Pass	RB
1987.976	68	2.74	-10.72	60.03	Peak [Scan]	H	100	0	85.8	-25.77	Pass	NRB
2389.83968	Power Setting = 20			68.65	Peak Max	V	--	--	74	-5.35	Pass	Band Edge
2390.00000				50.88	Average Max	V	--	--	54	-3.12	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

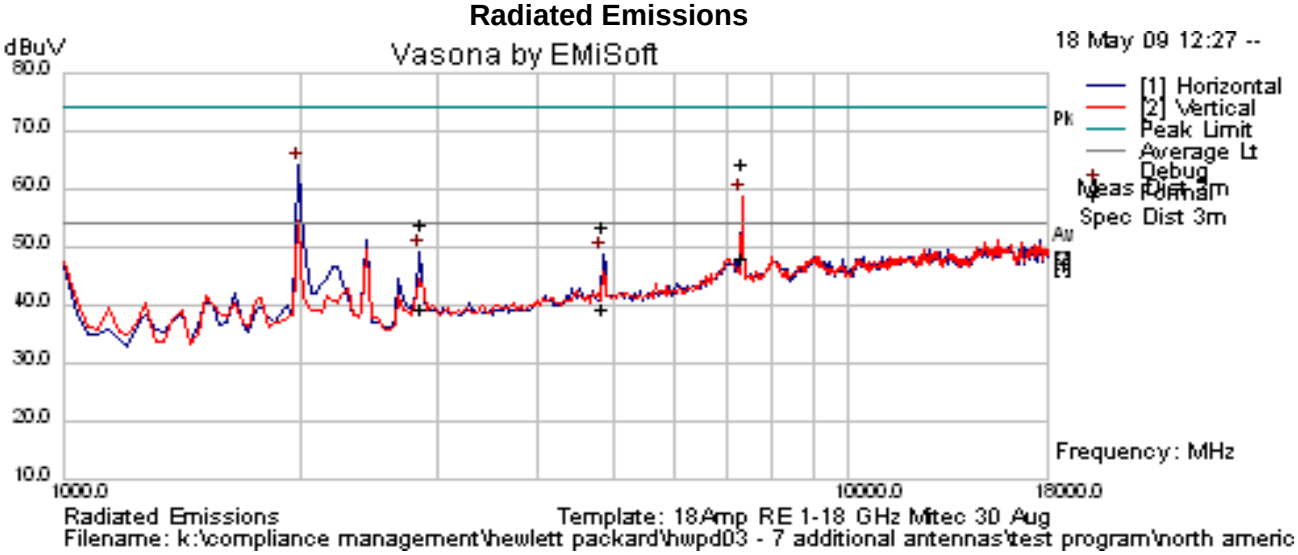


Band Edge Emissions for 802.11g –2,412 MHz



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8997A Antenna / Gain = 3 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH6 MAP625 Platform Radio 2

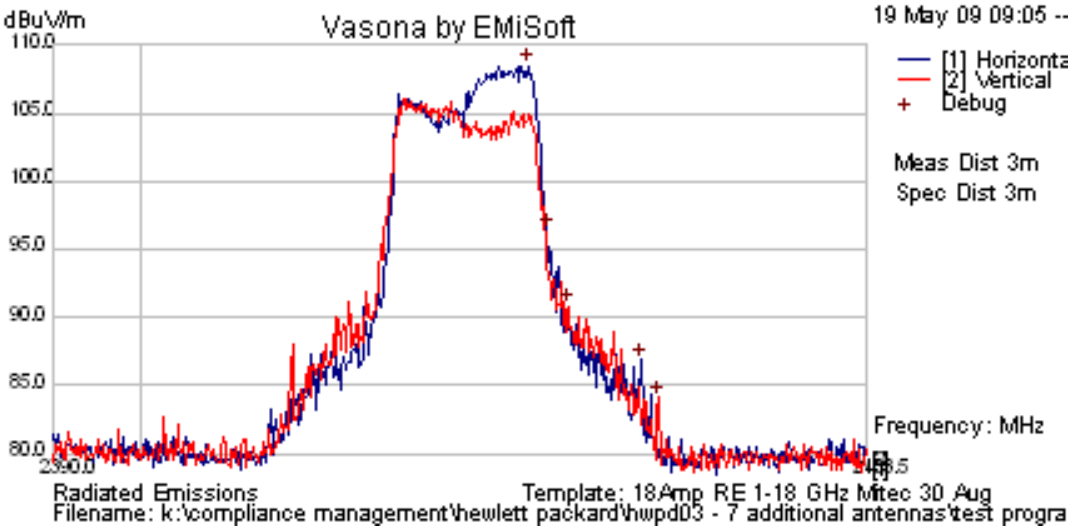
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2444.151	63.1	13	32.37	108.4	Peak [Scan]	H						FUND
7304.429	61.67	5.44	-2.8	64.3	Peak Max	H	106	40	74	-9.7	Pass	RB
2860.561	61.39	3.28	-10.98	53.69	Peak Max	H	98	322	74	-20.31	Pass	RB
4868.657	57.57	4.51	-8.76	53.32	Peak Max	H	156	331	74	-20.68	Pass	RB
7304.429	45.2	5.44	-2.8	47.83	Average Max	H	106	40	54	-6.17	Pass	RB
2860.561	47.12	3.28	-10.98	39.41	Average Max	H	98	322	54	-14.59	Pass	RB
4868.607	43.56	4.51	-8.76	39.3	Average	H	156	331	54	-14.7	Pass	RB
1987.976	72	2.74	-10.72	64.03	Peak [Scan]	H	100	0	88.4	-24.37	Pass	NRB

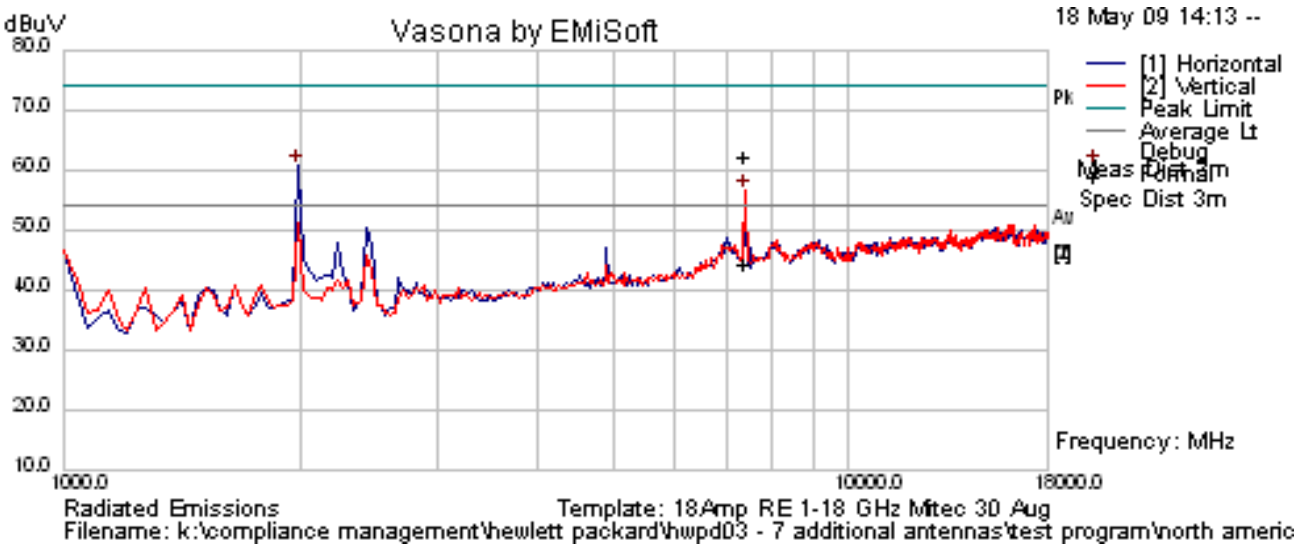
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2462
Antenna Model	J8997A Antenna / Gain = 3 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6Mb/s; CH 11 MAP625 Platform Radio 2

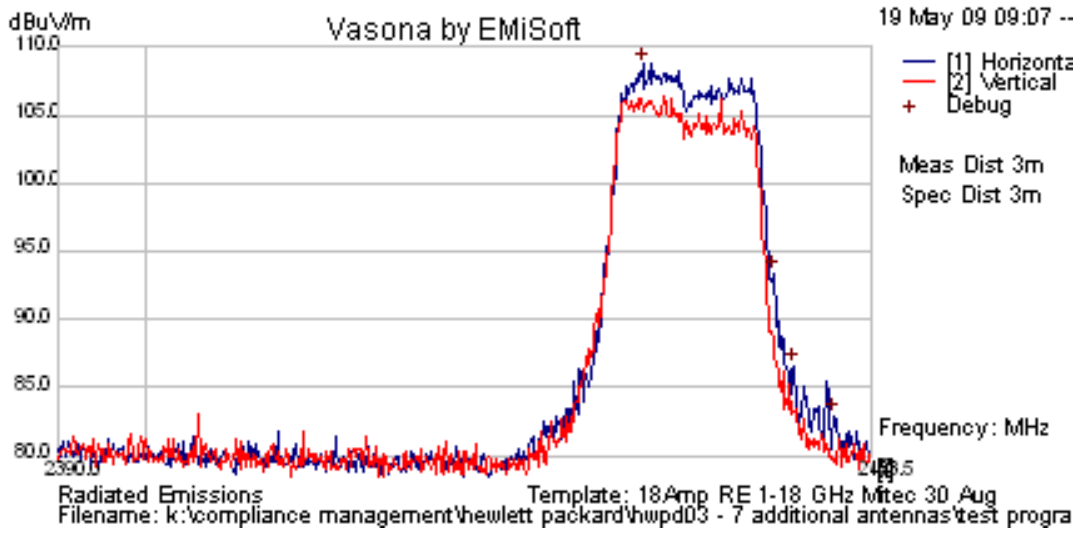
Radiated Emissions



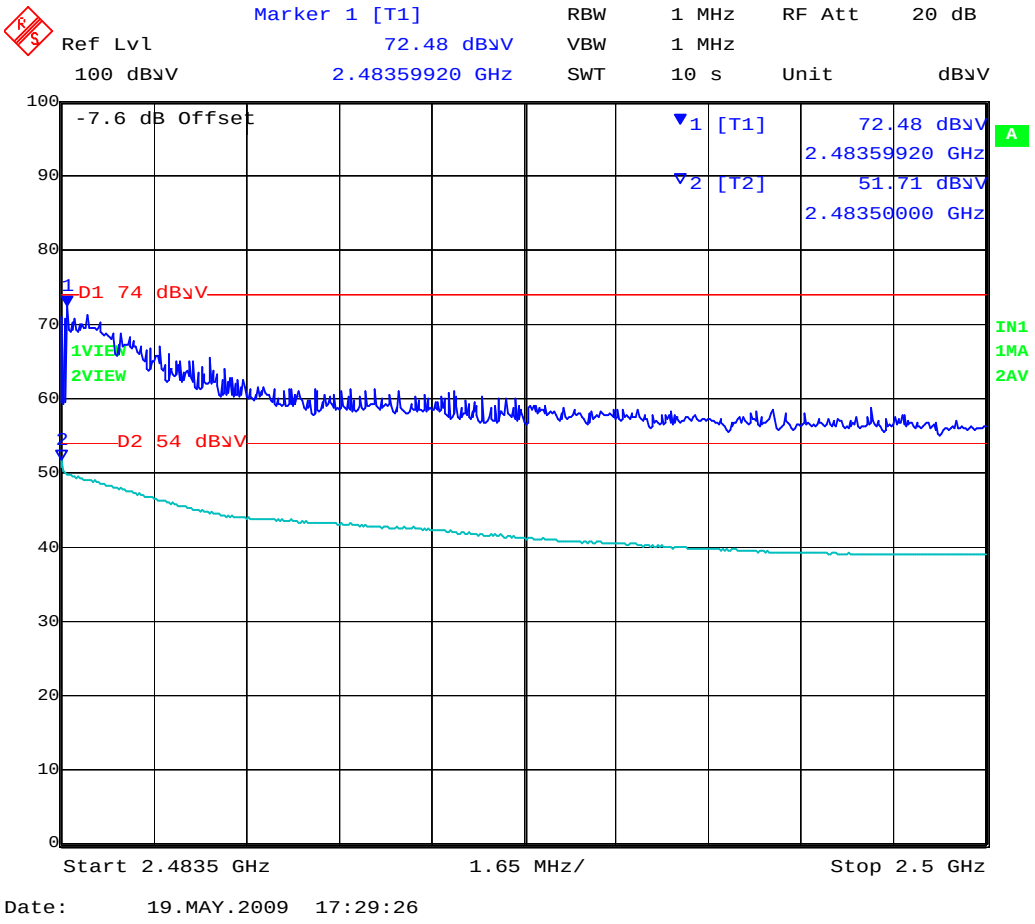
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5747.796	55.1	14.76	35.1	105	Peak [Scan]	H						Fund
7390.727	60.14	5.46	-3.25	62.35	Peak Max	V	115	8	74	-11.65	Pass	RB
7390.727	42.03	5.46	-3.25	44.25	Average Max	V	115	8	54	-9.75	Pass	RB
1987.976	68.57	2.74	-10.72	60.6	Peak [Scan]	H	100	0	85.0	-24.4	Pass	NRB
2483.59920	Power Setting = 15			72.48	Peak Max	V	--	--	74	-1.52	Pass	Band Edge
2483.5000				51.71	Average Max	V	--	--	54	-2.29	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



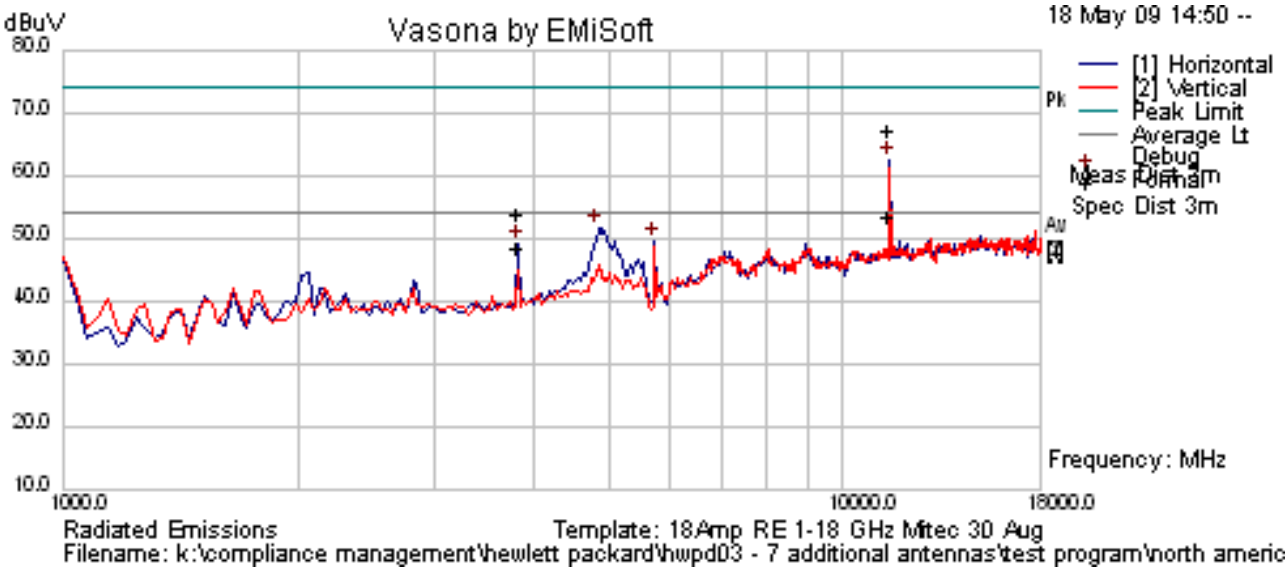
Band Edge Emissions for 802.11g –2,462 MHz



Date: 19.MAY.2009 17:29:26

Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5745
Antenna Model	J8997A Antenna / Gain = 4 dBi
Power setting	17 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6Mb/s; CH149 MAP625 Platform Radio 2

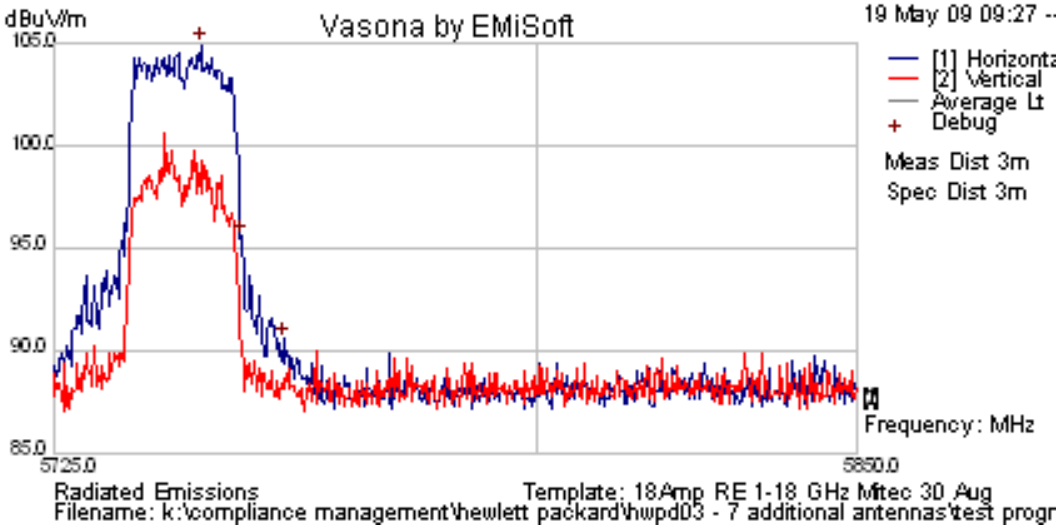
Radiated Emissions



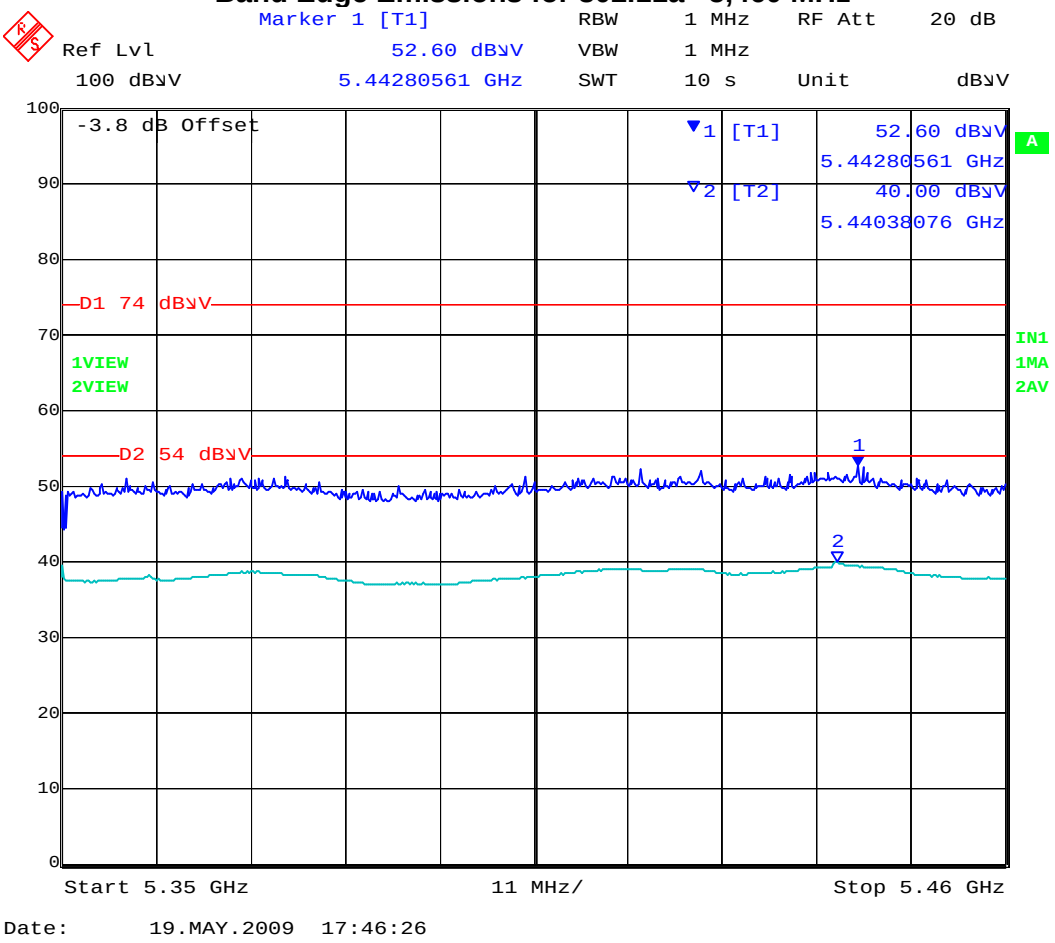
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5747.796	55.1	14.76	35.1	105	Peak [Scan]	H						Fund
11490.26	61.67	6.79	-1.37	67.09	Peak Max	H	132	328	74	-6.91	Pass	RB
3829.999	60.56	3.8	-10.34	54.02	Peak Max	V	149	0	74	-19.98	Pass	RB
11490.26	48.09	6.79	-1.37	53.51	Average Max	H	132	328	54	-0.49	Pass	RB
3829.999	54.96	3.8	-10.34	48.42	Average Max	V	149	0	54	-5.58	Pass	RB
5460.000	Power Setting = 17			52.60	Peak Max	V	--	--	74	-21.40	Pass	BE
5460.000				40.00	Average Max	V	--	--	54	-14.00	Pass	BE

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

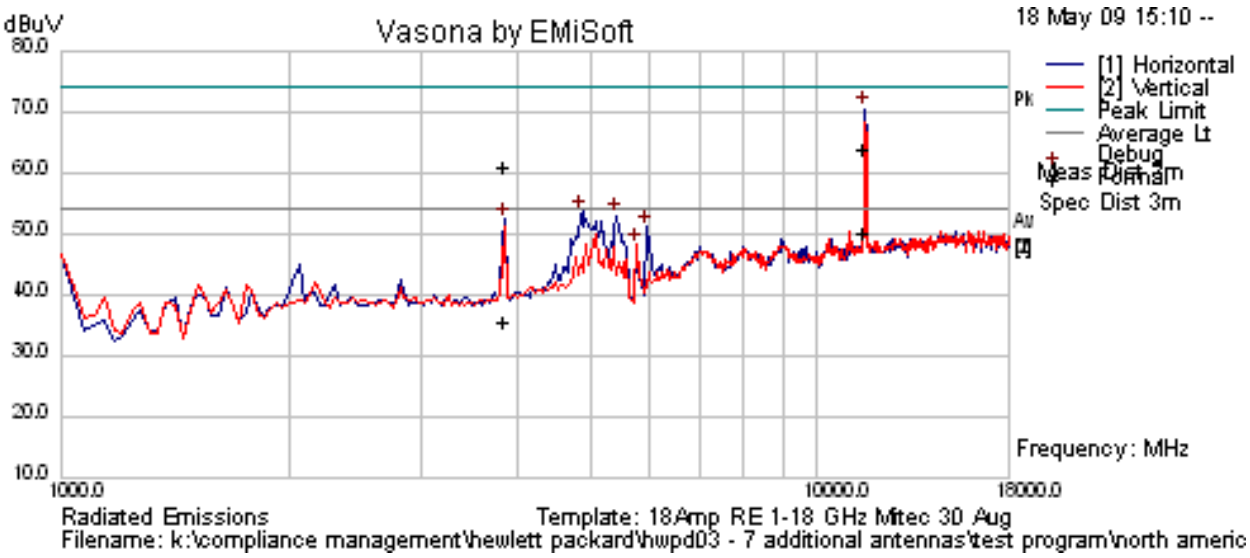


Band Edge Emissions for 802.11a –5,460 MHz



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5785
Antenna Model	J8997A Antenna / Gain = 4 dBi
Power setting	15 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6Mb/s; CH157 MAP625 Platform Radio 2

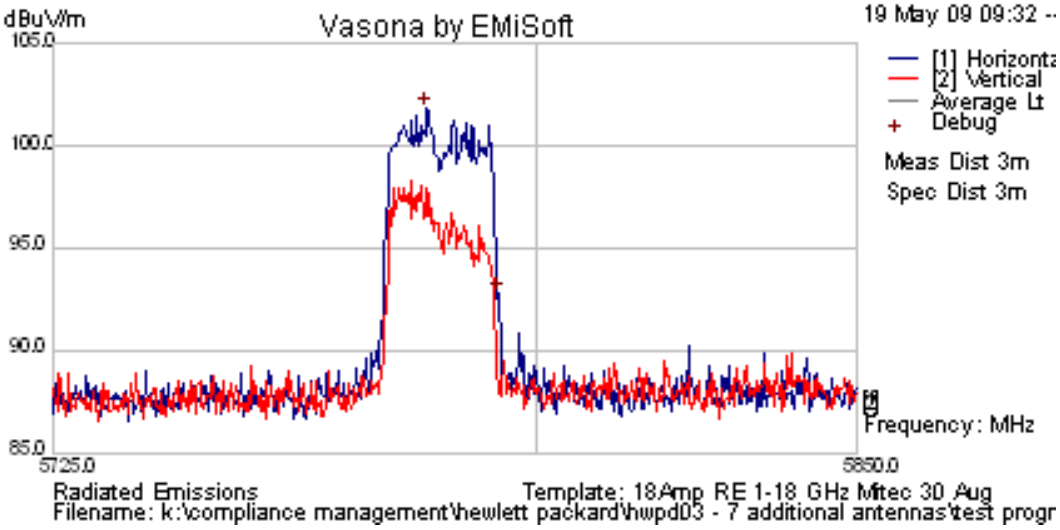
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5782.866	51.9	14.78	35.13	101.8	Peak [Scan]	H						Fund
11567.21	58.23	6.81	-1.11	63.93	Peak	V	116	65	74	-10.07	Pass	RB
3856.661	67.53	3.82	-10.18	61.16	Peak Max	V	201	360	74	-12.84	Pass	RB
11567.21	44.27	6.81	-1.11	49.97	Average	V	116	65	54	-4.03	Pass	RB
3856.661	41.86	3.82	-10.18	35.5	Average Max	H	179	293	54	-18.5	Pass	RB

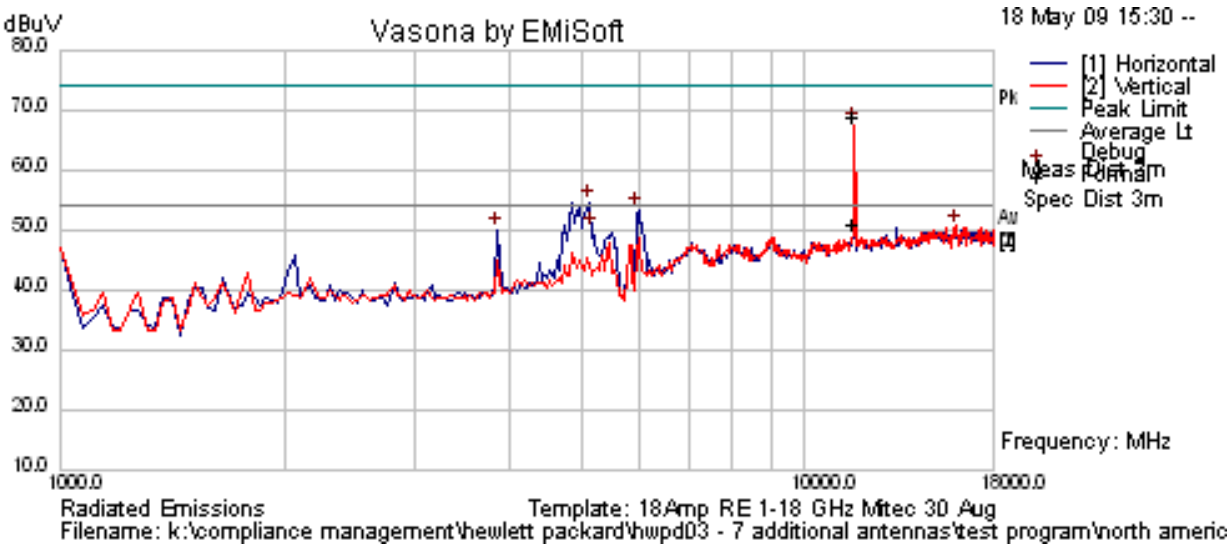
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5825
Antenna Model	J8997A Antenna / Gain = 4 dBi
Power setting	15 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6Mb/s; CH165 MAP625 Platform Radio 2

Radiated Emissions



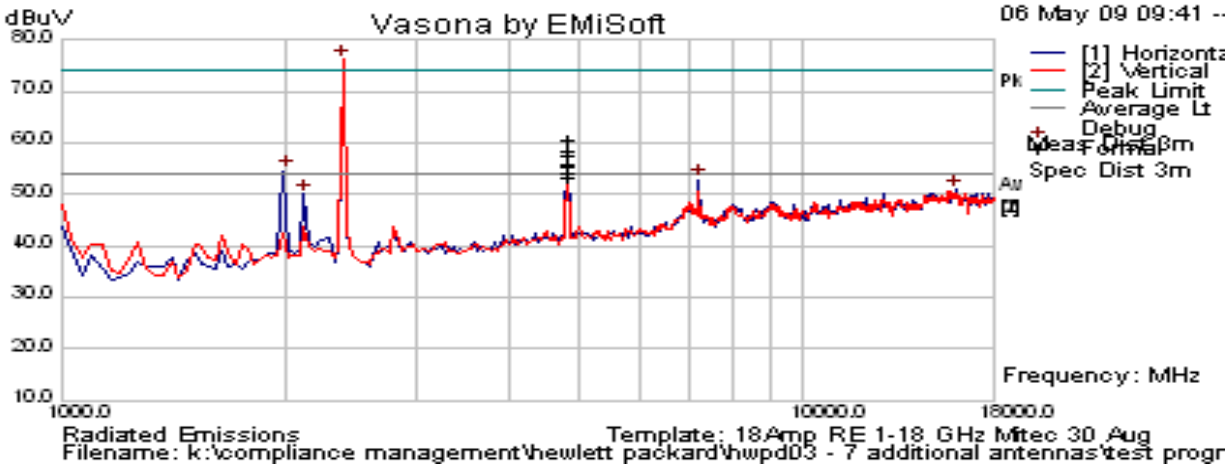
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5747.796	55.1	14.76	35.1	105	Peak [Scan]	H						Fund
11651.27	62.92	6.83	-1.01	68.74	Peak	V	98	320	74	-5.26	Pass	RB
11651.27	45.3	6.83	-1.01	51.12	Average	V	98	320	54	-2.88	Pass	RB

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

ANTENNA J8999A

Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2412
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	15 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH1 MAP625 Platform Radio 2

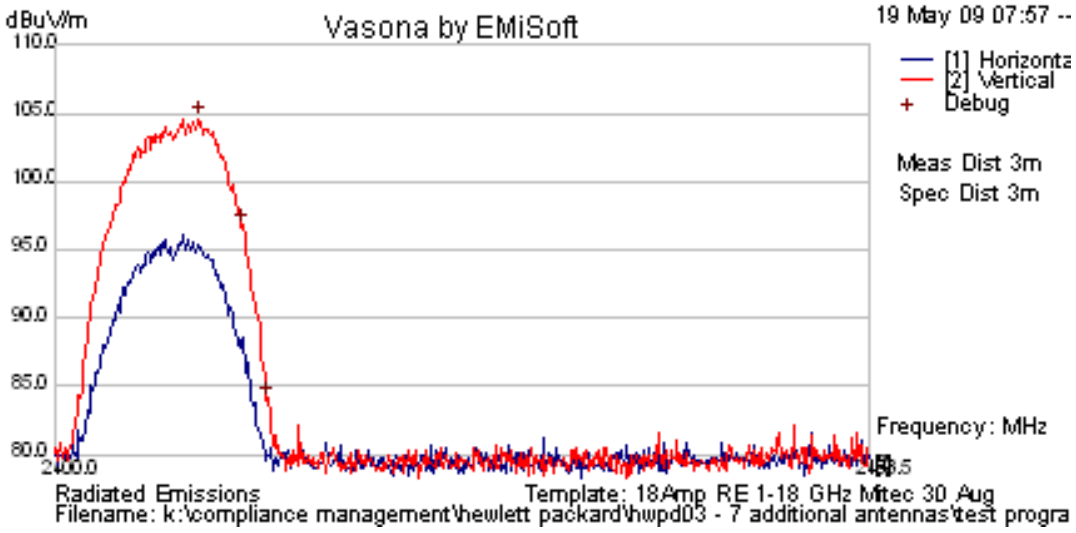
Radiated Emissions



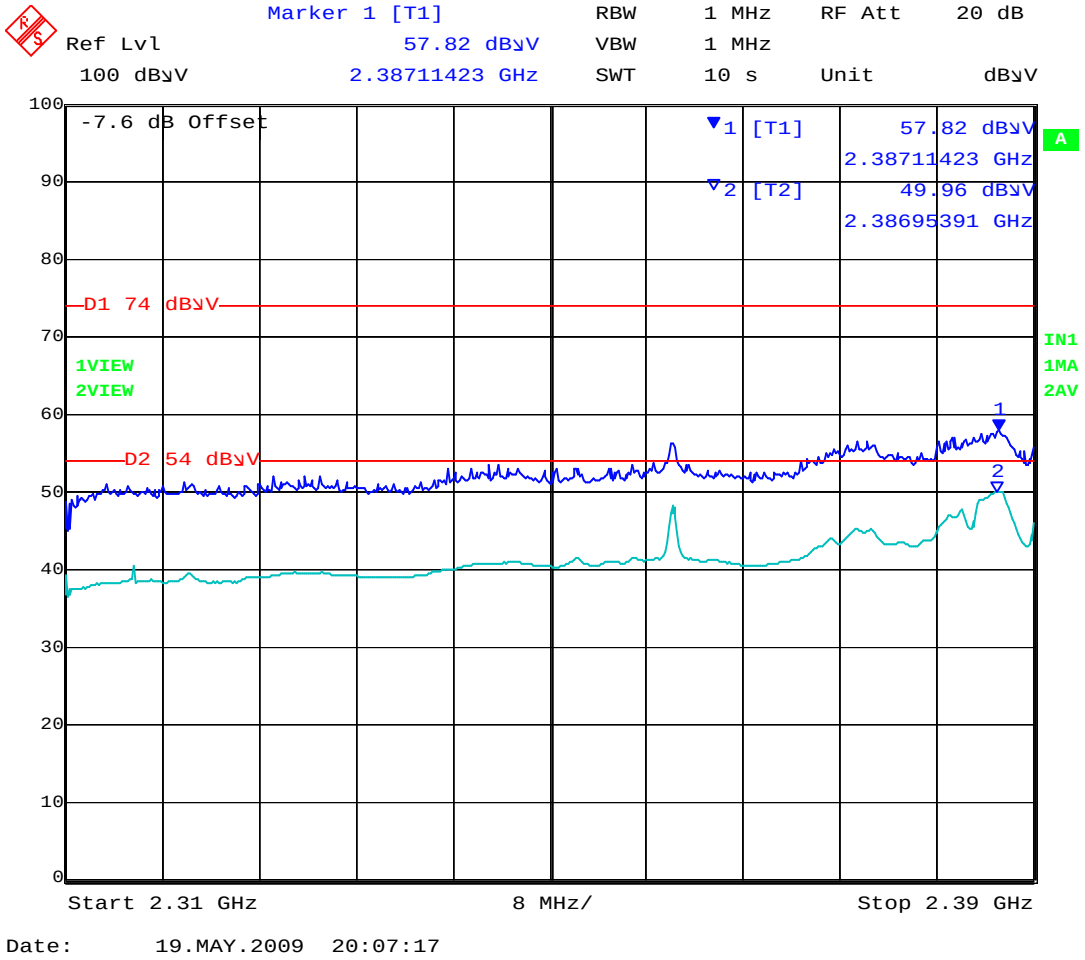
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2414.558	59.27	12.96	32.35	104.6	Peak [Scan]	V						Fund
4824.075	65	4.47	-8.75	60.72	Peak Max	H	98	358	74	-13.28	Pass	RB
4824.046	57.55	4.47	-8.75	53.27	Average	H	98	358	54	-0.73	Pass	RB
2016.03	62.34	2.76	-10.63	54.47	Peak [Scan]	H	100	0	84.6	-30.13	Pass	NRB
7234.469	49.77	5.43	-2.46	52.75	Peak [Scan]	H	100	0	84.6	-31.85	Pass	NRB
2135.993	57.86	2.82	-10.59	50.09	Peak [Scan]	H	100	0	84.6	-34.51	Pass	NRB
2387.11423	Power Setting = 15			57.82	Peak Max	V	--	--	74	-16.18	Pass	Band Edge
2386.95391				49.96	Average Max	V	--	--	54	-4.04	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

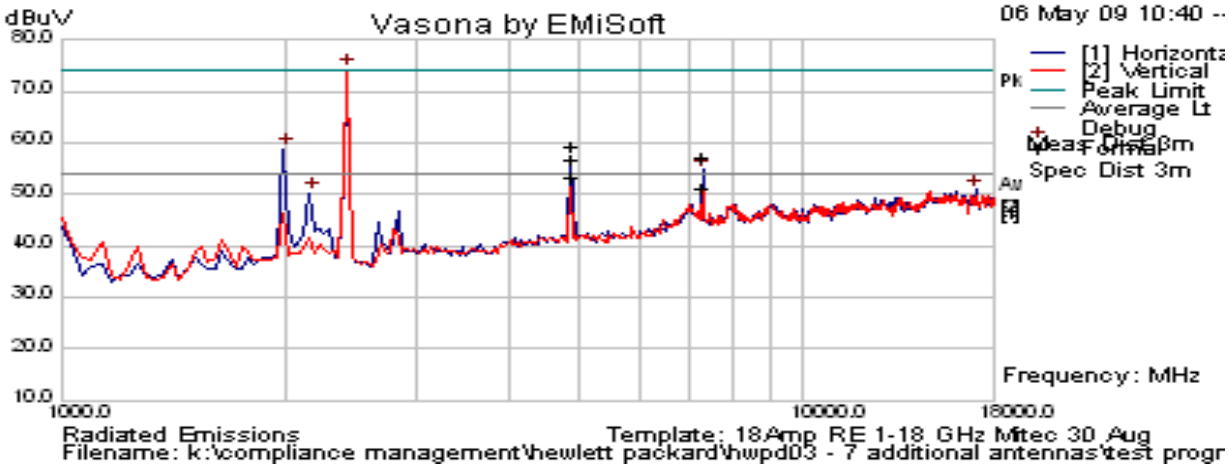


Band Edge Emissions for 802.11b –2,412 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	18 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH6 MAP625 Platform Radio 2

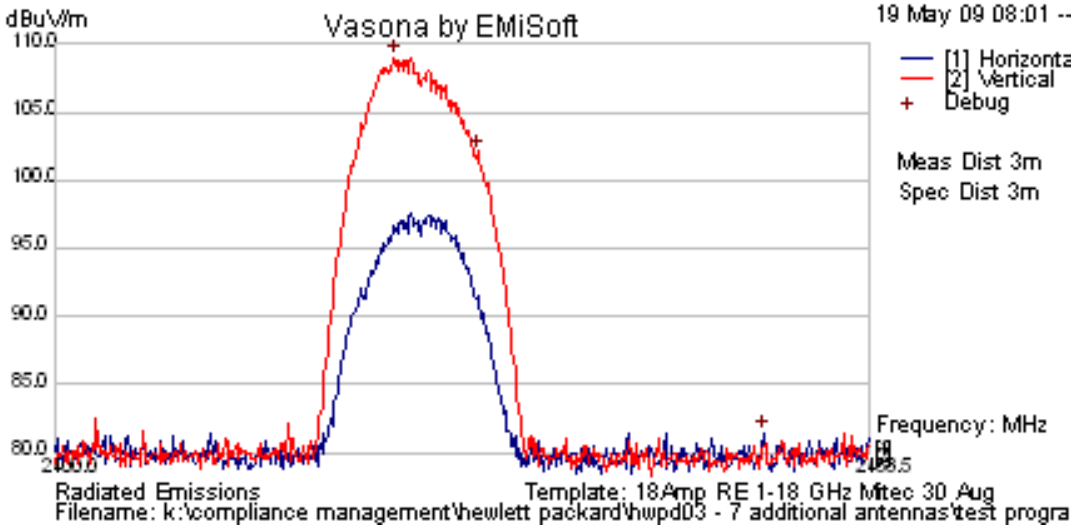
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2434.471	63.65	12.97	32.36	109	Peak [Scan]	V						Fund
7307.548	54.66	5.44	-2.82	57.28	Peak Max	H	98	14	74	-16.72	Pass	RB
4874.052	63.59	4.51	-8.75	59.35	Peak Max	H	106	360	74	-14.65	Pass	RB
7307.548	48.45	5.44	-2.82	51.07	Average Max	H	98	14	54	-2.93	Pass	RB
4874.052	57.78	4.51	-8.75	53.54	Average	H	104	360	54	-0.46	Pass	RB
2015.984	66.74	2.76	-10.63	58.87	Peak [Scan]	H	100	0	89.0	-30.13	Pass	NRB
2185.962	57.96	2.85	-10.56	50.25	Peak [Scan]	H	100	0	89.0	-38.75	Pass	NRB

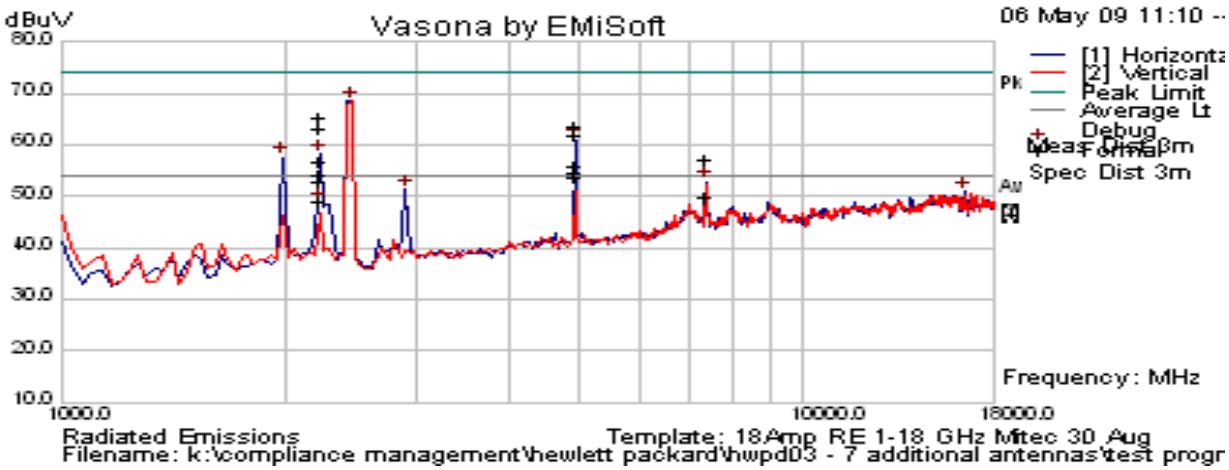
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



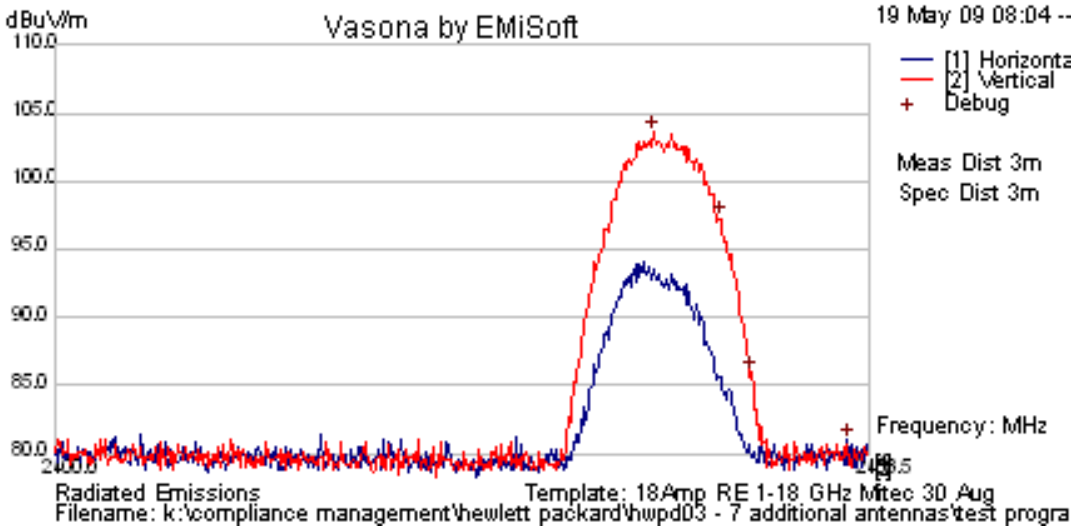
Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2464
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	11 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH11 MAP625 Platform Radio 2

Radiated Emissions

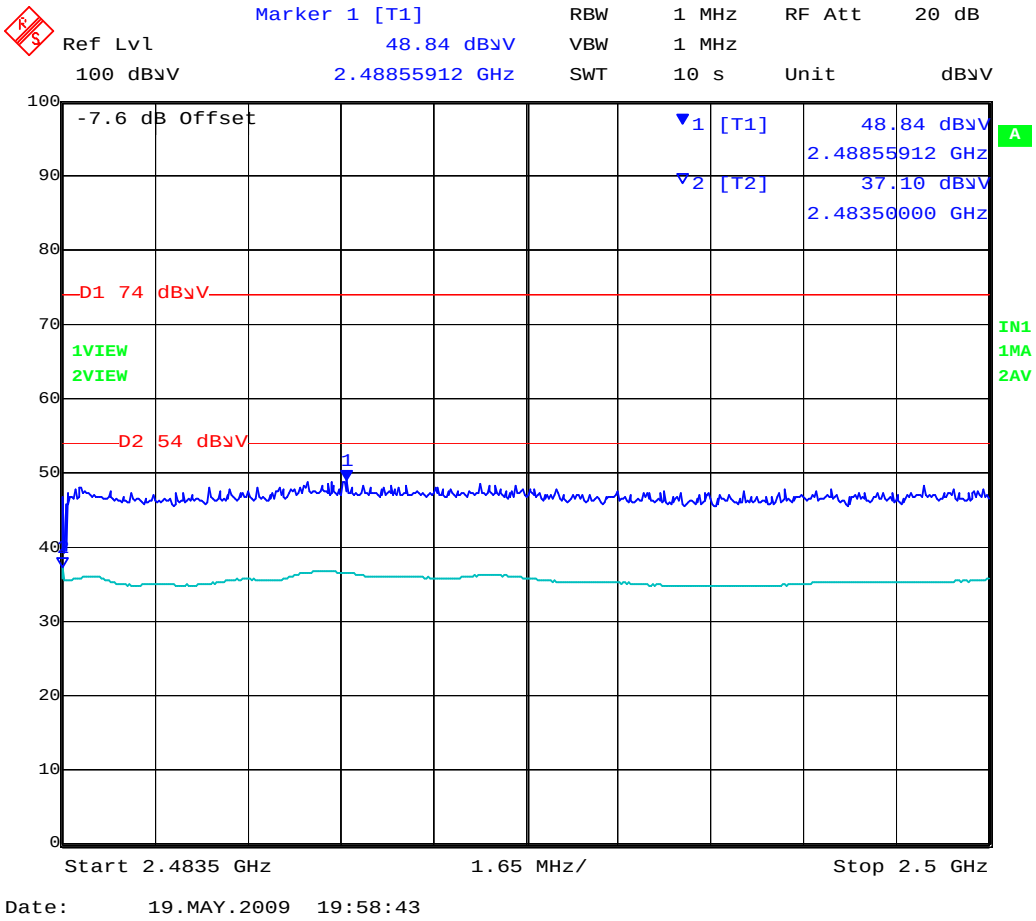


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2461.077	58.2	12.98	32.38	103.6	Peak [Scan]	V						Fund
2236.031	73.14	2.87	-10.57	65.44	Peak Max	H	112	351	74	-8.56	Pass	RB
2236.033	56.65	2.87	-10.57	48.96	Average	H	112	350	54	-5.04	Pass	RB
4924.047	67.9	4.55	-8.76	63.7	Peak Max	H	105	346	74	-10.3	Pass	RB
4924.047	58.09	4.55	-8.76	53.89	Average	H	106	345	54	-0.11	Pass	RB
7382.445	54.78	5.46	-3.2	57.04	Peak Max	H	98	13	74	-16.96	Pass	RB
7382.445	47.83	5.46	-3.2	50.08	Average Max	H	98	13	54	-3.92	Pass	RB
1987.976	65.48	2.74	-10.72	57.51	Peak [Scan]	H	100	0	83.6	-25.99	Pass	NRB
2908.019	59.06	3.32	-10.97	51.4	Peak [Scan]	H	100	0	83.6	-32.2	Pass	NRB
2488.55912	Power Setting = 11			48.84	Peak Max	V	--	--	74	-25.16	Pass	Band Edge
2483.5000				37.10	Average Max	V	--	--	54	-16.90	Pass	Band Edge

Peak Emission

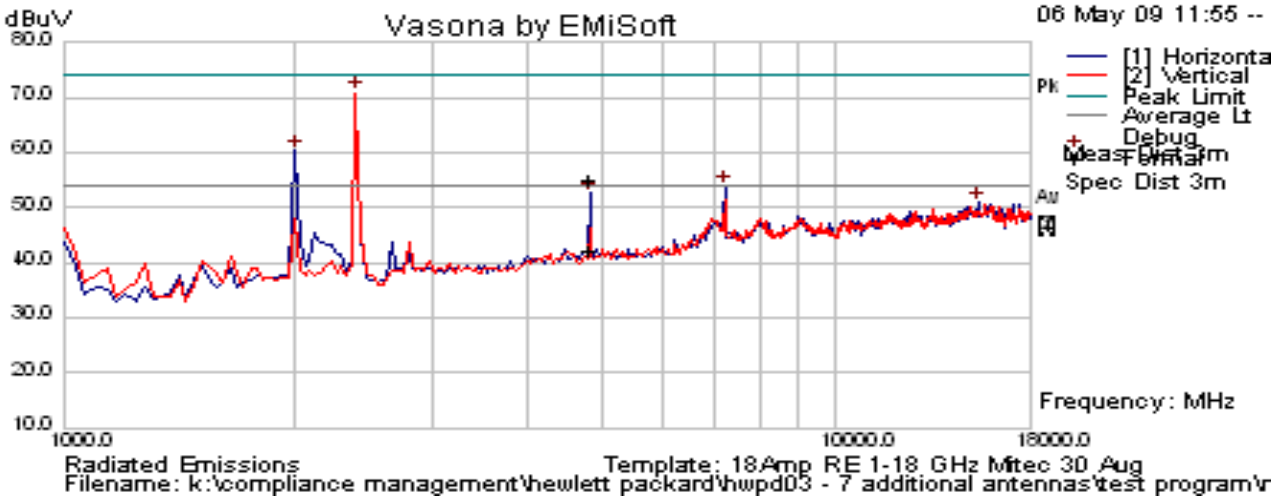


Band Edge Emissions for 802.11b –2,462 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2412
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH1 MAP625 Platform Radio 2

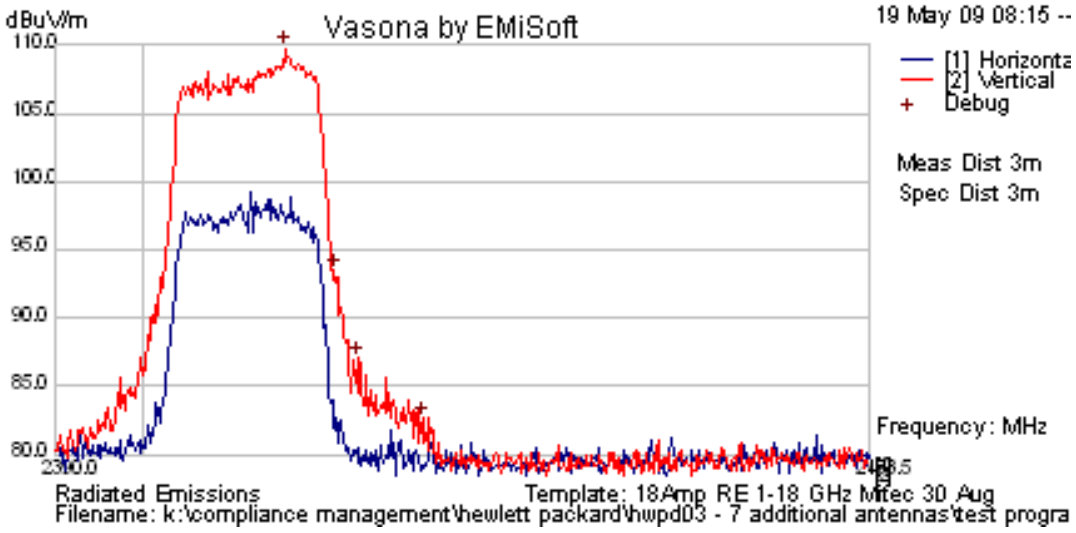
Radiated Emissions



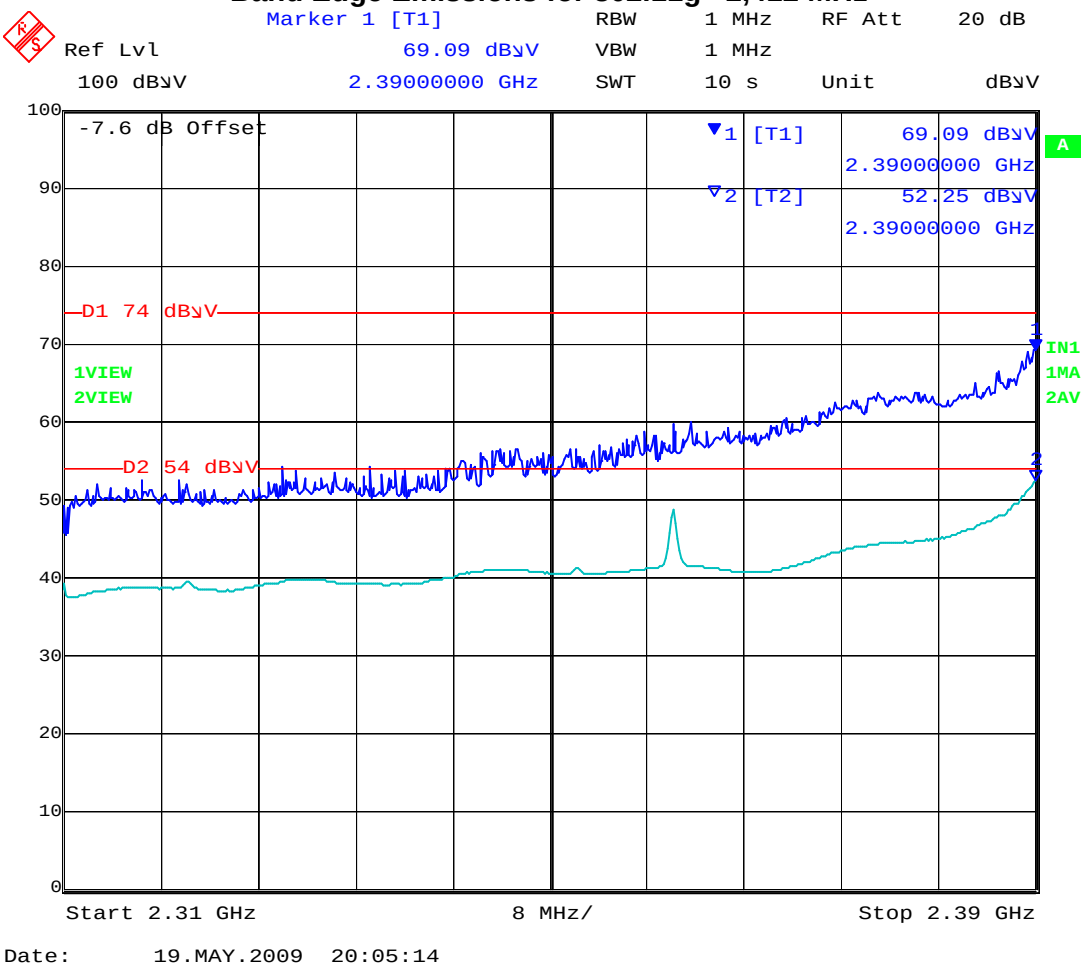
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2416.045	64.42	13	32.35	109.7	Peak [Scan]	V						Fund
4821.151	59.15	4.46	-8.74	54.87	Peak Max	H	98	360	74	-19.13	Pass	RB
4821.151	46.3	4.46	-8.74	42.02	Average Max	H	98	360	54	-11.98	Pass	RB
2016.112	68.17	2.76	-10.63	60.3	Peak [Scan]	H	100	0	89.7	-29.40	Pass	NRB
7234.469	51	5.43	-2.46	53.97	Peak [Scan]	H	100	0	89.7	-35.73	Pass	NRB
2390.0000	Power Setting = 13			69.09	Peak Max	V	--	--	74	-4.91	Pass	Band Edge
2390.0000				52.25	Average Max	V	--	--	54	-1.75	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

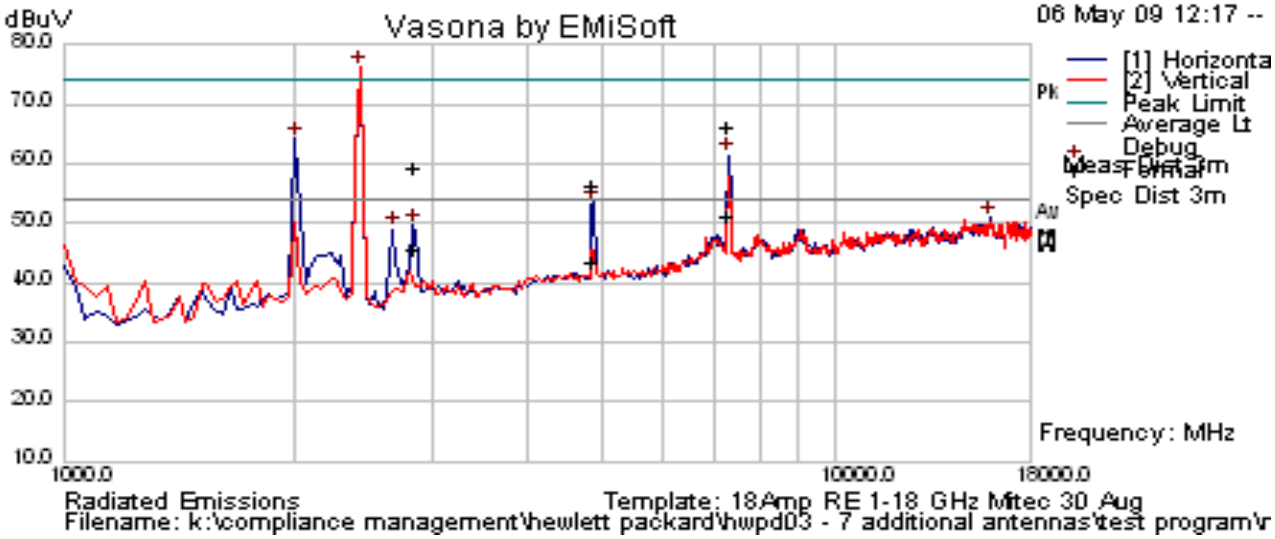


Band Edge Emissions for 802.11g –2,412 MHz



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH6 MAP625 Platform Radio 2

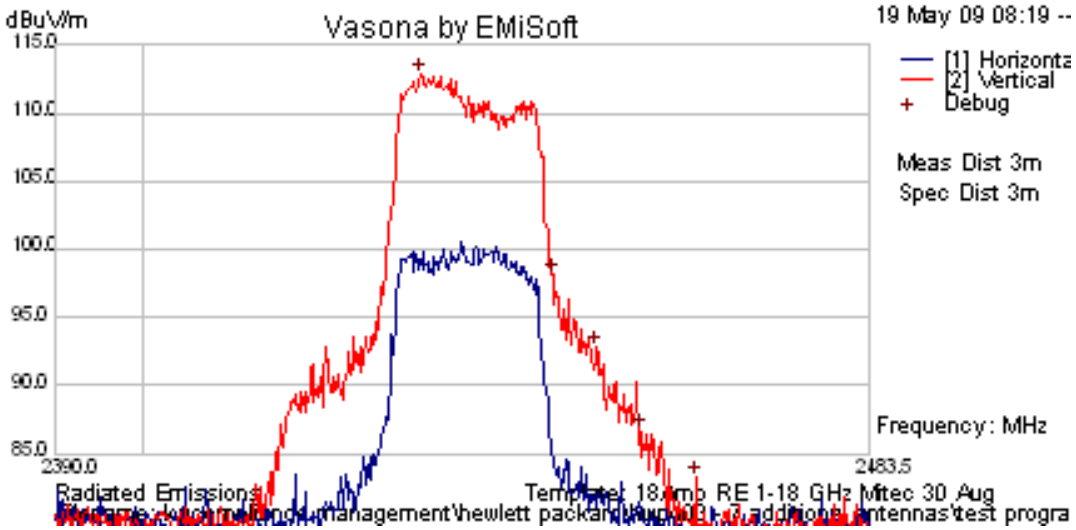
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2431.597	67.53	13	32.36	112.9	Peak [Scan]	V						Fund
7303.086	63.59	5.44	-2.8	66.23	Peak Max	H	100	15	74	-7.77	Pass	RB
4873.747	60.7	4.51	-8.75	56.46	Peak Max	H	99	16	74	-17.54	Pass	RB
2863.086	67.15	3.28	-10.98	59.45	Peak Max	H	131	349	74	-14.55	Pass	RB
7303.086	48.37	5.44	-2.8	51.01	Average Max	H	100	15	54	-2.99	Pass	RB
4873.747	47.91	4.51	-8.75	43.67	Average Max	H	99	16	54	-10.33	Pass	RB
2863.086	53.23	3.28	-10.98	45.53	Average Max	H	131	349	54	-8.47	Pass	RB
2016.353	71.95	2.76	-10.63	64.08	Peak [Scan]	H	100	0	92.9	-28.82	Pass	NRB
2688.029	56.78	3.15	-10.92	49.01	Peak [Scan]	H	100	0	92.9	-43.89	Pass	NRB

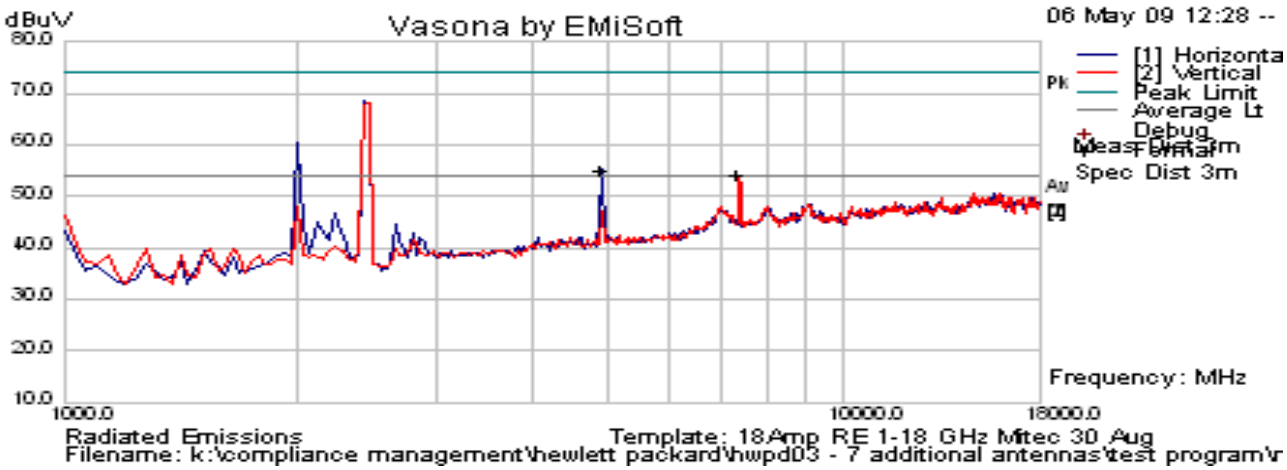
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2462
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	20 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11g 6 Mb/s; CH11 MAP625 Platform Radio 2

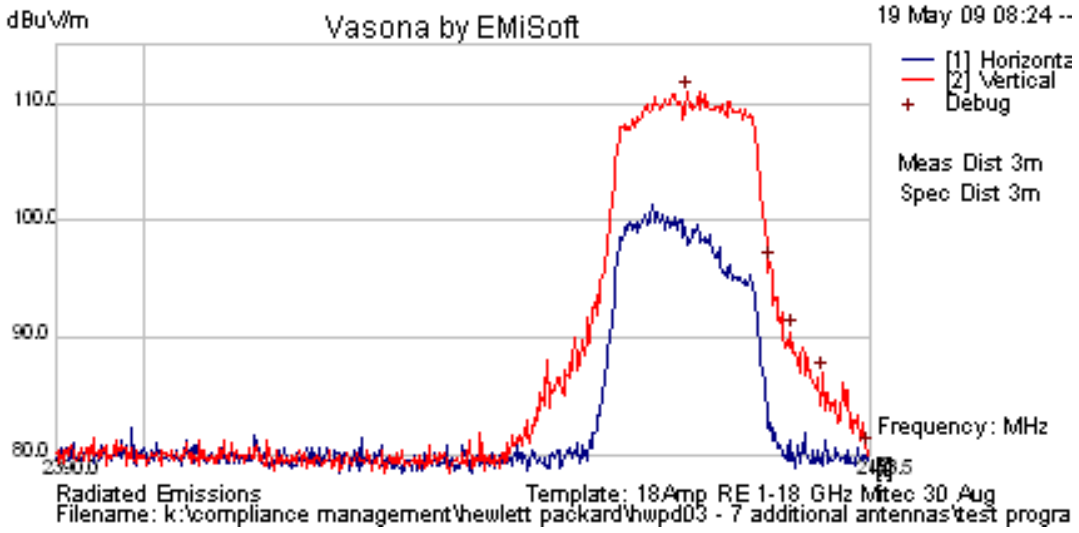
Radiated Emissions



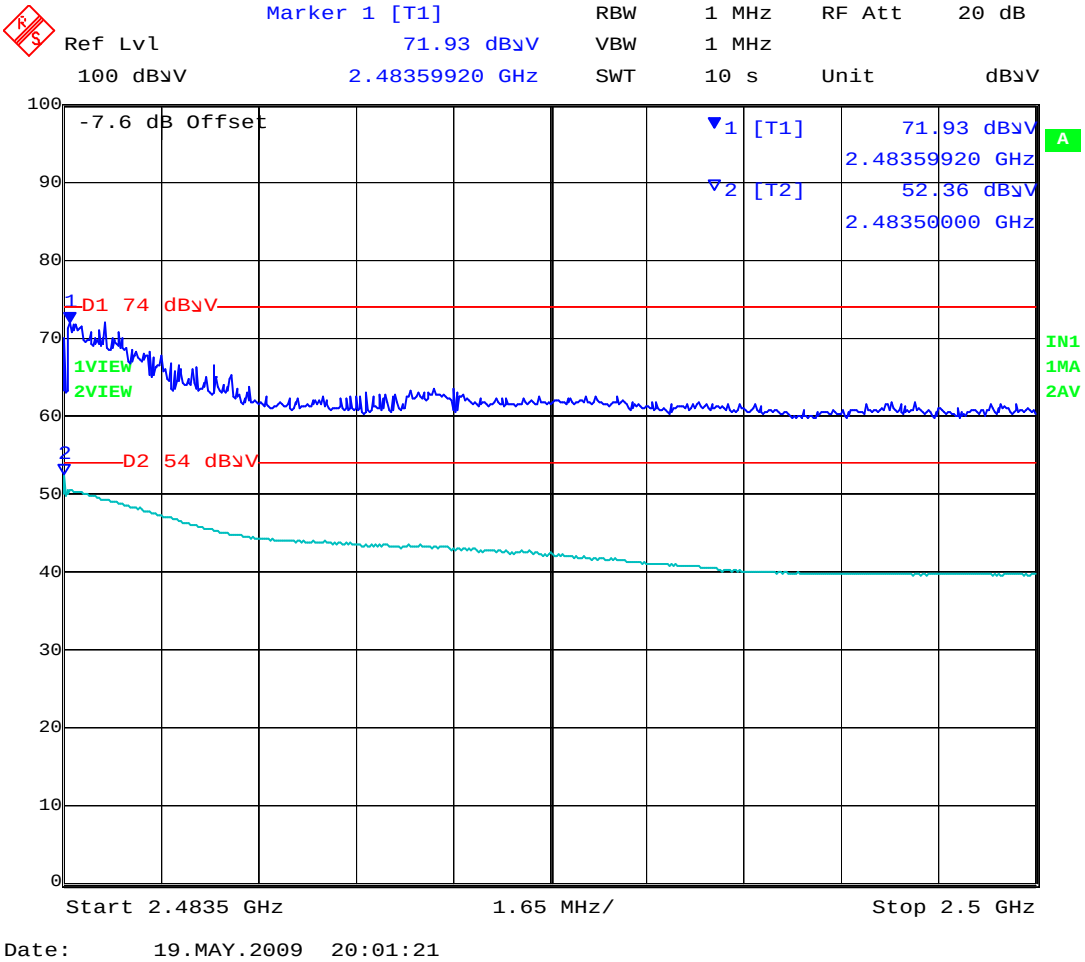
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
2462.139	65.58	13	32.38	111	Peak [Scan]	V						Fund
4923.968	61.53	4.55	-8.76	57.33	Peak Max	H	121	24	74	-16.67	Pass	RB
7386.653	56.41	5.46	-3.23	58.64	Peak Max	V	141	45	74	-15.36	Pass	RB
4923.968	48.7	4.55	-8.76	44.49	Average Max	H	121	24	54	-9.51	Pass	RB
7386.653	39.94	5.46	-3.23	42.17	Average Max	V	141	45	54	-11.83	Pass	RB
2016.035	68.14	2.76	-10.63	60.27	Peak [Scan]	H	100	0	91.0	-30.73	Pass	NRB
2483.5992	Power Setting = 15			71.93	Peak Max	V	--	--	74	-2.07	Pass	Band Edge
2483.5000				52.36	Average Max	V	--	--	54	-1.64	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

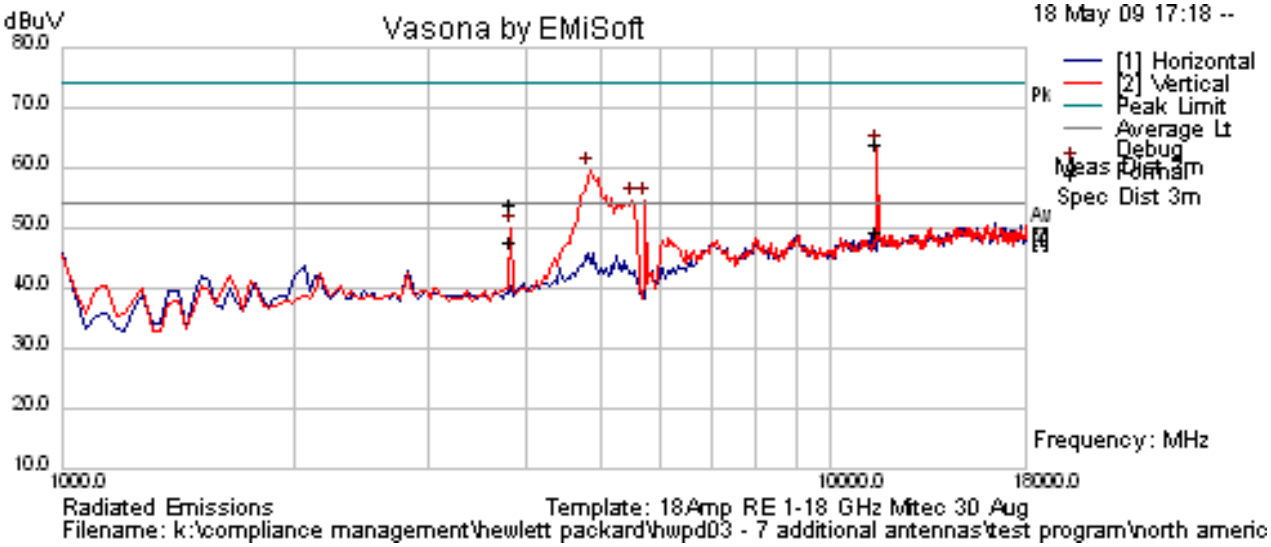


Band Edge Emissions for 802.11g –2,462 MHz



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5745
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	16 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6 Mb/s; MAP625 Platform Radio 2

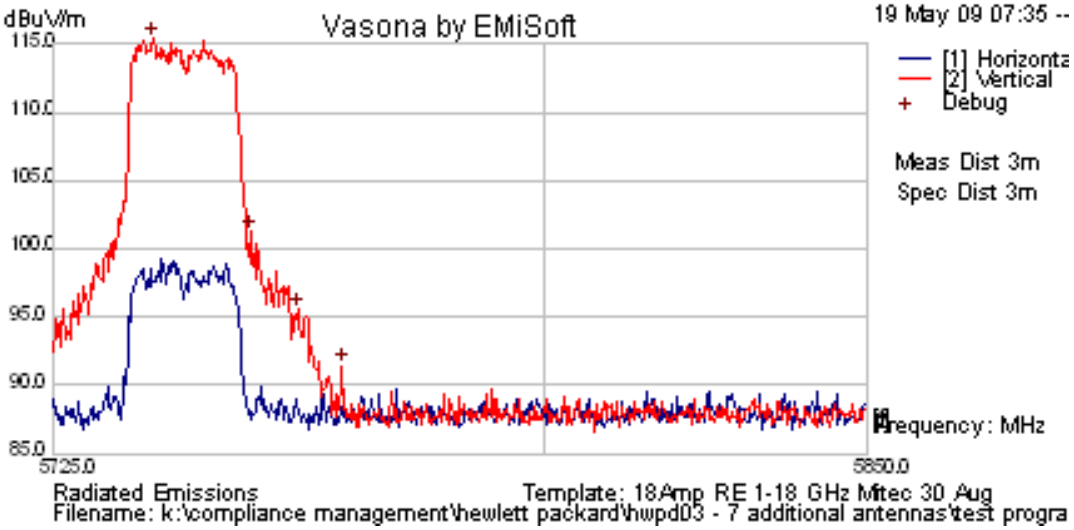
Radiated Emissions



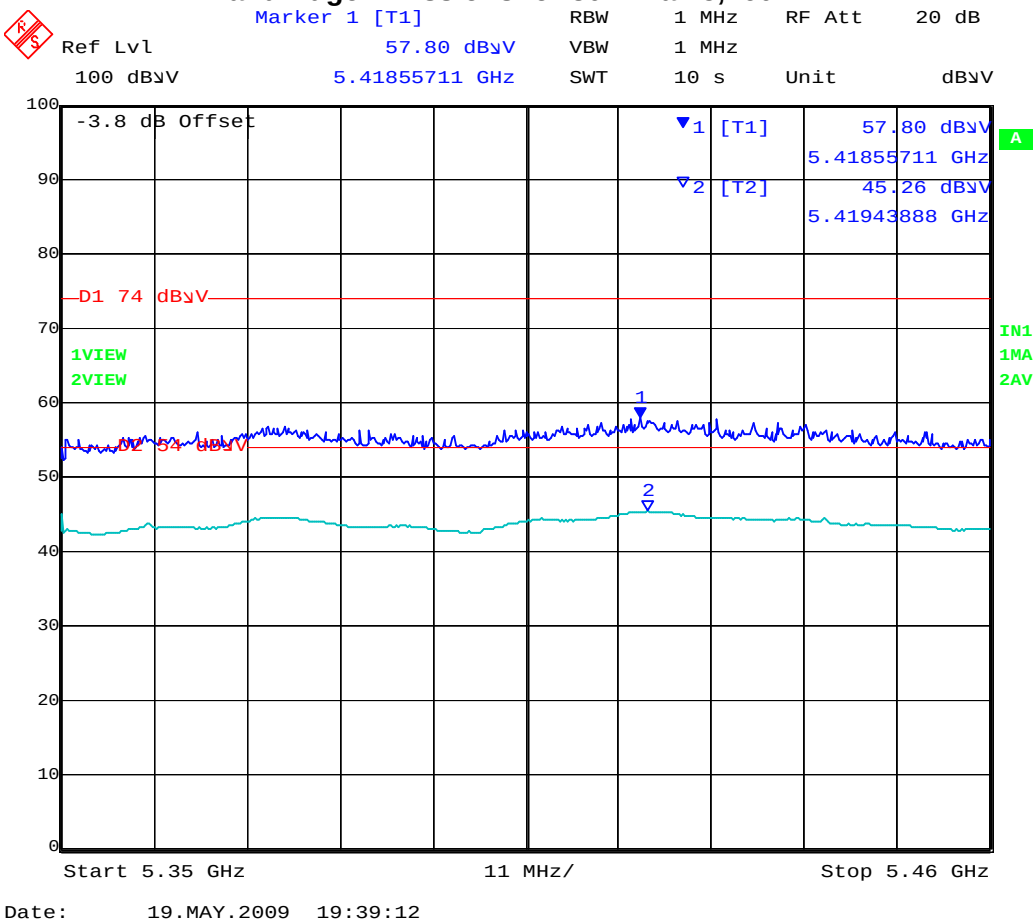
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5740.281	65.5	14.75	35.1	115.4	Peak [Scan]	V						Fund
11489.38	58.63	6.79	-1.37	64.05	Peak	H	153	328	74	-9.95	Pass	RB
3830.001	60.56	3.8	-10.34	54.02	Peak Max	V	98	24	74	-19.98	Pass	RB
11489.38	44.05	6.79	-1.37	49.48	Average	H	153	328	54	-4.52	Pass	RB
3830.001	54.33	3.8	-10.34	47.79	Average Max	V	98	24	54	-6.21	Pass	RB
5460.000	Power Setting = 16			57.80	Peak Max	V	--	--	74	-16.20	Pass	Band Edge
5460.000				45.26	Average Max	V	--	--	54	-8.74	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

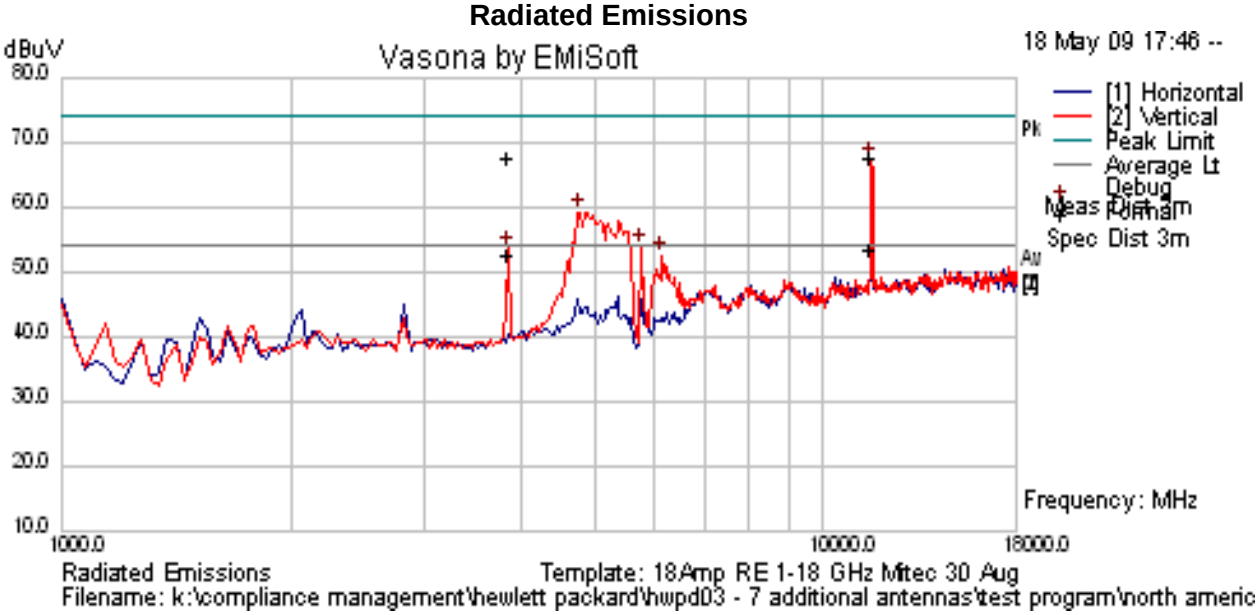


Band Edge Emissions for 802.11a –5,460 MHz



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5785
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	16 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6 Mb/s; MAP625 Platform Radio 2

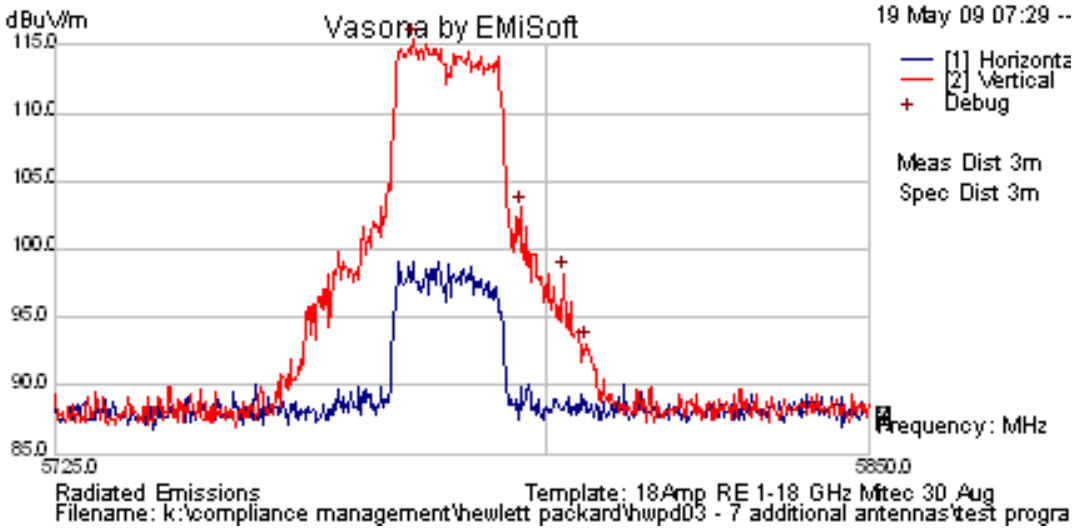
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5779.609	65.49	14.77	35.13	115.4	Peak [Scan]	V						Fund
11568.46	61.8	6.81	-1.11	67.5	Peak	H	104	29	74	-6.5	Pass	RB
3856.667	74.19	3.82	-10.18	67.83	Peak Max	V	114	18	74	-6.17	Pass	RB
11568.46	47.71	6.81	-1.11	53.41	Average	H	104	29	54	-0.59	Pass	RB
3856.667	59.02	3.82	-10.18	52.66	Average Max	V	114	18	54	-1.34	Pass	RB
6144.289	54.49	4.96	-6.96	52.49	Peak [Scan]	V	100	0	95.4	-42.91	Pass	NRB

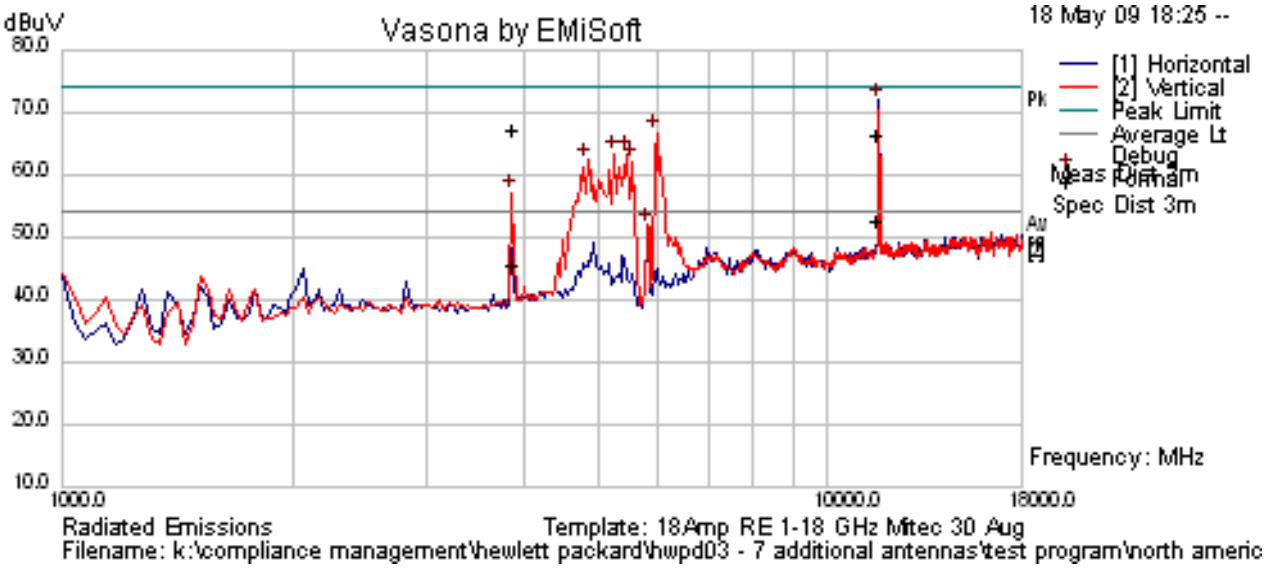
Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5825
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	14 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6 Mb/s; MAP625 Platform Radio 2

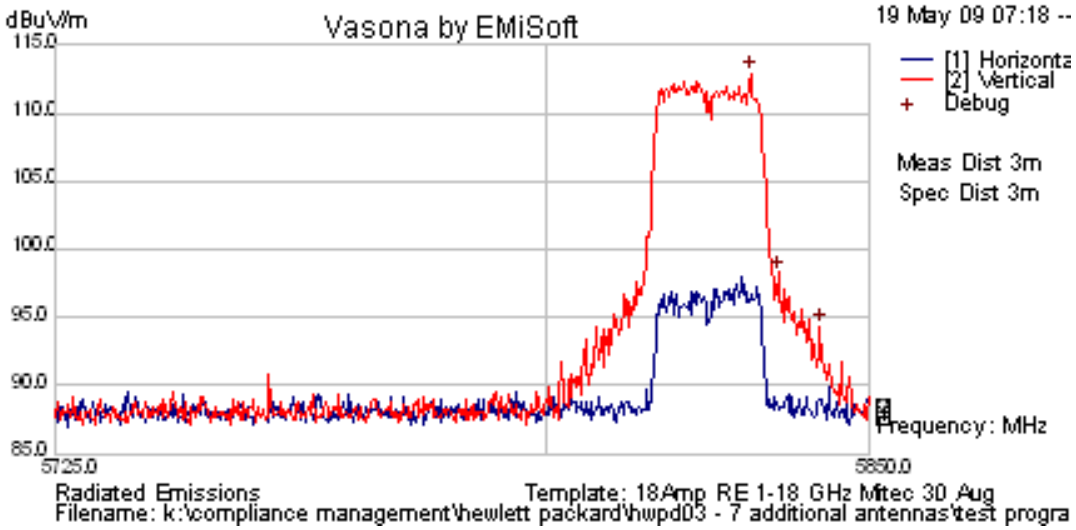
Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5831.713	62.93	14.8	35.17	112.9	Peak [Scan]	V						Fund
11650.25	60.56	6.83	-1.01	66.38	Peak	V	104	255	74	-7.62	Pass	RB
3883.342	73.54	3.83	-10.1	67.27	Peak Max	V	132	57	74	-6.73	Pass	RB
11650.25	46.76	6.83	-1.01	52.58	Average	V	104	255	54	-1.42	Pass	RB
3883.342	51.69	3.83	-10.1	45.43	Average Max	V	132	57	54	-8.57	Pass	RB
5973.948	69.12	4.88	-7.44	66.55	Peak [Scan]	V	100	0	92.9	-26.35	Pass	NRB
5803.607	54.85	4.79	-7.8	51.84	Peak [Scan]	V	100	0	92.9	-41.06	Pass	NRB

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission



Specification Limits

FCC §15.247(d) and RSS-210 §A8.5 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 radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

FCC §15.247(d)
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section §15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(a)).

IC RSS-210 §A8.5 If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

IC RSS-Gen §4.7
The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate of carrier frequency), or from 30 MHz , whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

FCC §15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

FCC §15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC §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 the following table.

§15.209 (a) Limit Matrix

Frequency(MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

5.1.1.2. Receiver Radiated Spurious Emissions (above 1 GHz)

Industry Canada RSS-Gen §4.8, §6

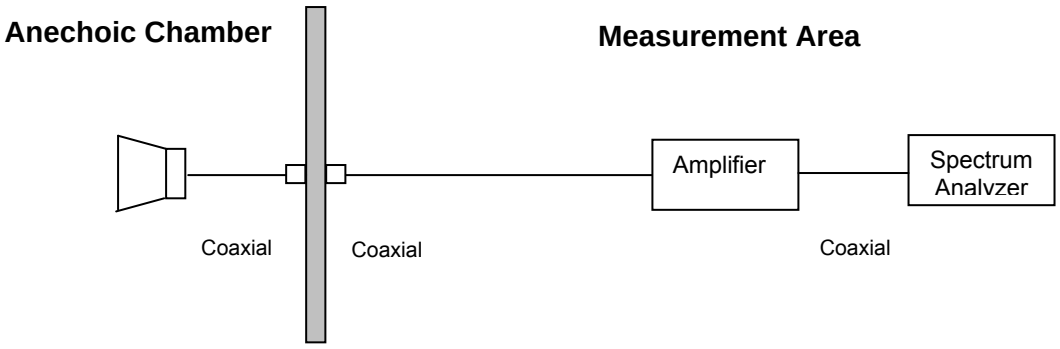
Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

All Sectors of the EUT were tested simulatneously

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

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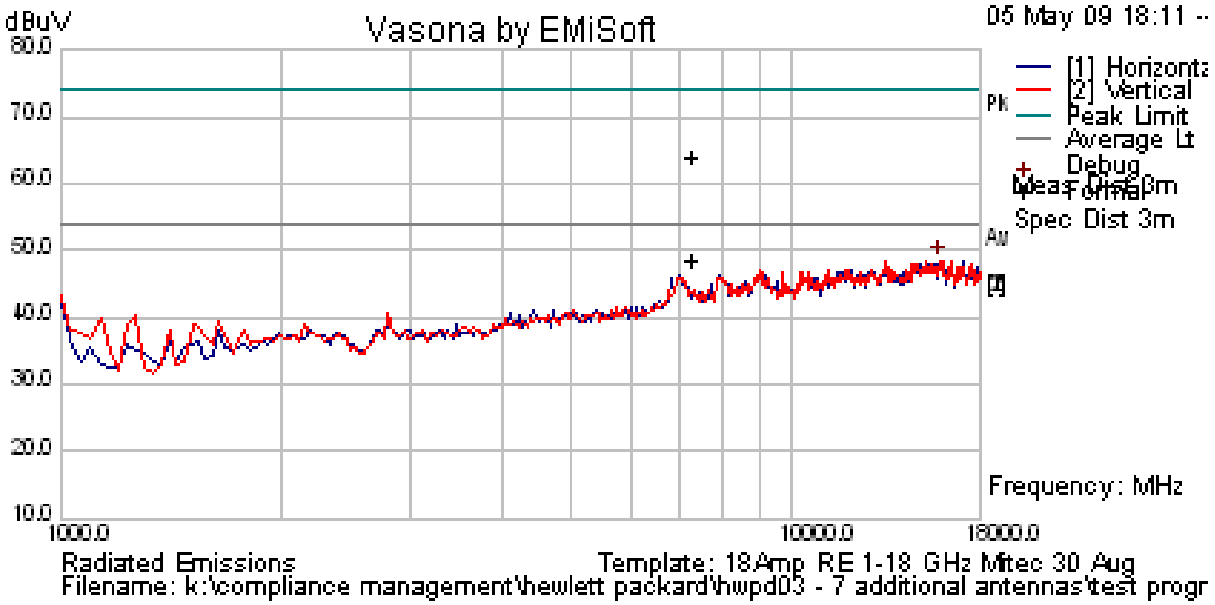
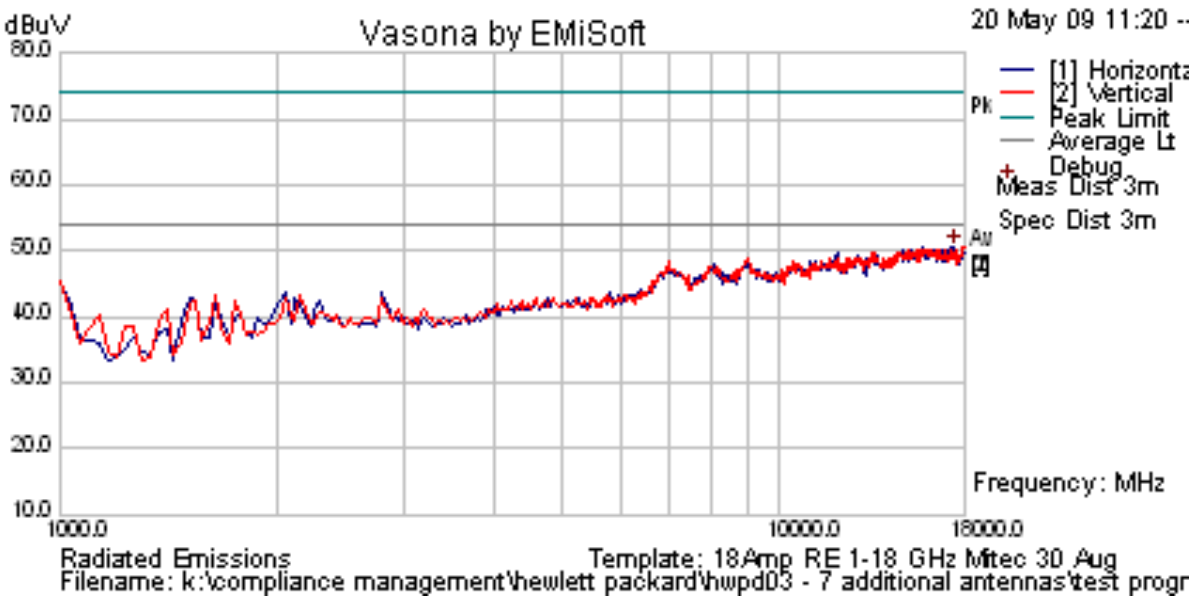
Receiver Radiated Spurious Emissions above 1 GHz

Date	5/5/2009
Engineer	CSB
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	2437
Antenna Model	J8444A Antenna / Gain = 7.4 dBi
Power setting	Receive [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11b 1 Mb/s; CH6 MAP625 Radio 2 Platform



The above plot is peak emissions only

Date	5/20/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5785
Antenna Model	J8999A Antenna / Gain = 7.7 dBi
Power setting	Receive [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a; CH157 MAP625 Platform Radio 2



The above plot is peak emissions only

5.1.2. Radiated Emissions (15.407, RSS-210)

5.1.2.1. Transmitter Radiated Spurious Emissions (above 1 GHz) and Radiated Band Edge Measurements – Restricted Bands

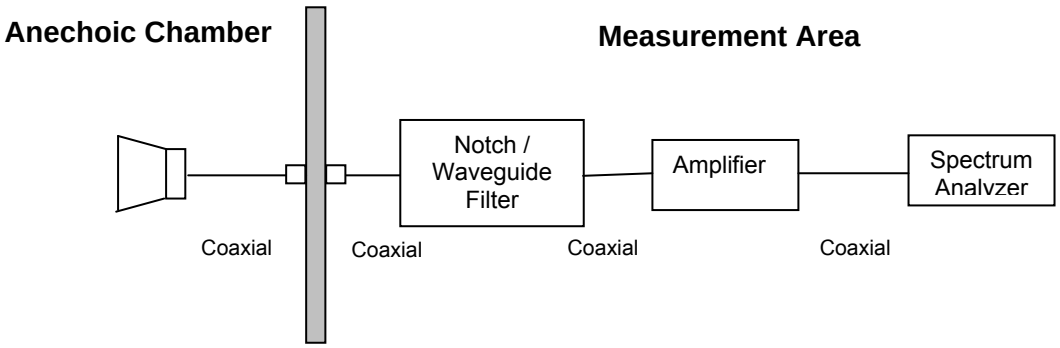
FCC, Part 15 Subpart C §15.407(b)(2), §15.205(a)/15.209(a)
Industry Canada RSS-210 §A9.3(2); §2.2; §2.6; RSS-Gen §4.7

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \ \mu V/m$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Note: The data in this Section identifies that the EUT is in compliance with the -27dBm/MHz EIRP limit (68.23 dBμV/m) for out of band emissions. All peak emissions are less than 68.23 dB μV/m.

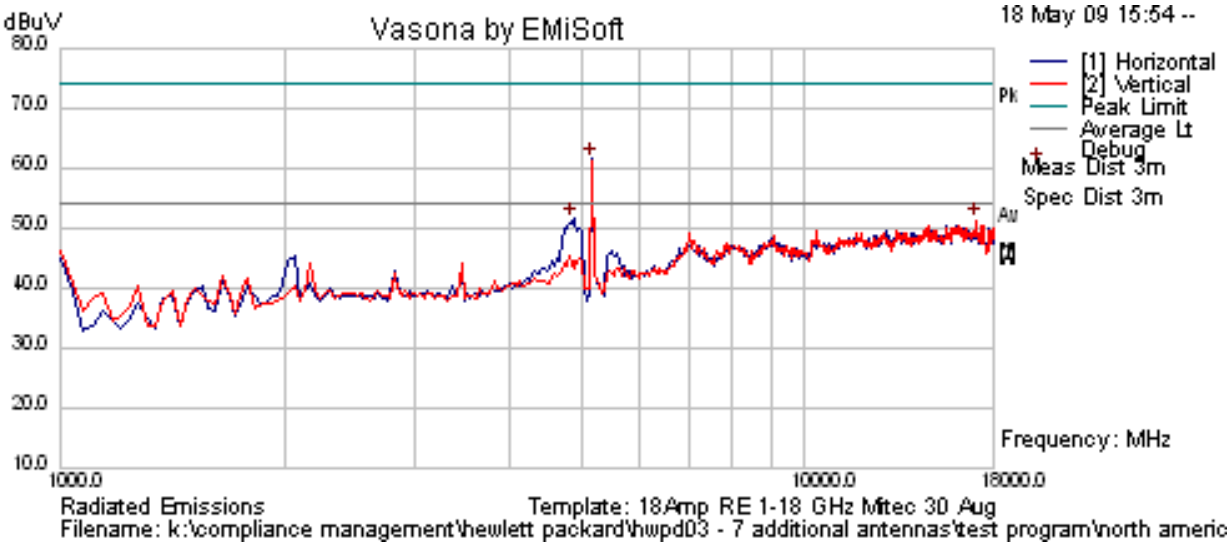
Measurement Results Transmitter Radiated Spurious Emissions above 1 GHz

Ambient conditions.
Temperature: 17 to 23°C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

ANTENNA J8997A

Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5180
Antenna Model	J8997A Antenna / Gain = 4 dBi
Power setting	17 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6Mb/s; CH36 MAP625 Platform Radio 2

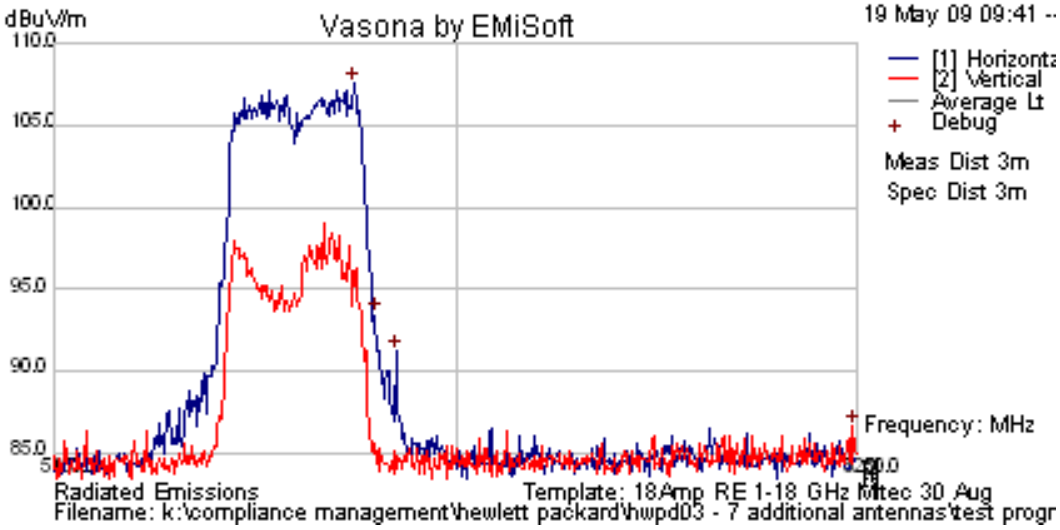
Radiated Emissions



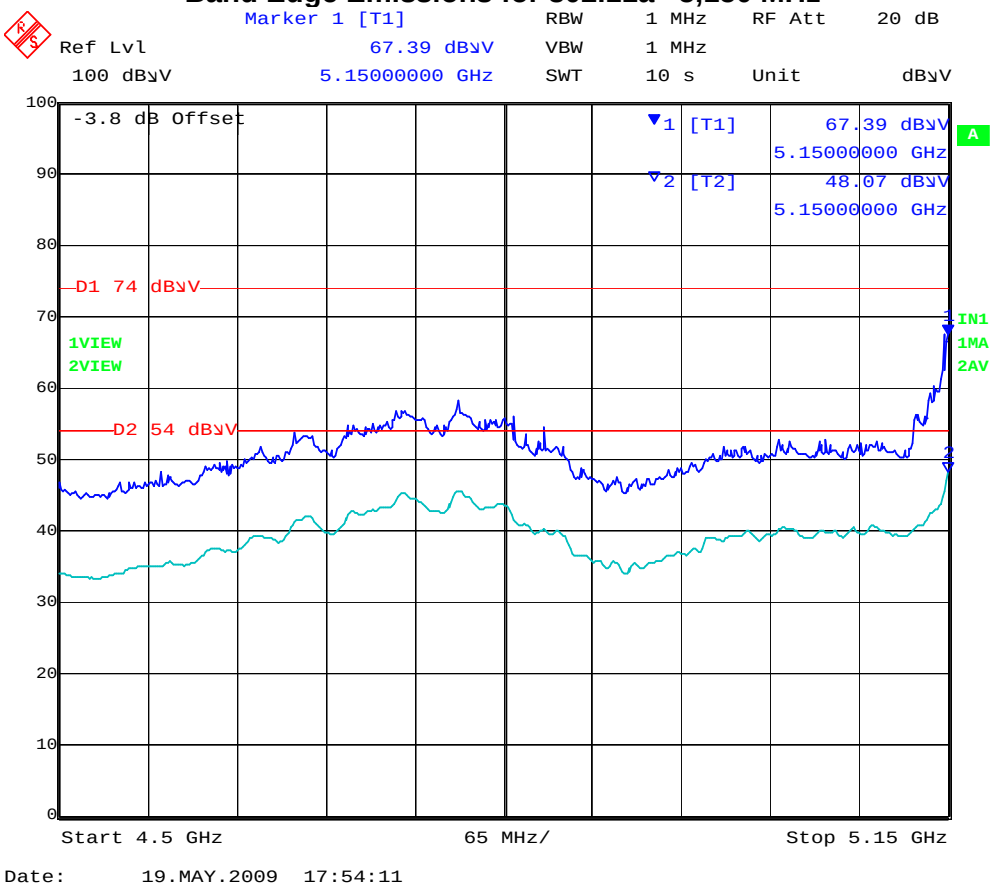
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5187.275	58.25	14.62	34.65	107.5	Peak [Scan]	H						
5150.000	Power Setting = 17			67.39	Peak Max	V	--	--	74	-6.61	Pass	Band Edge
5150.000				48.07	Average Max	V	--	--	54	-5.93	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

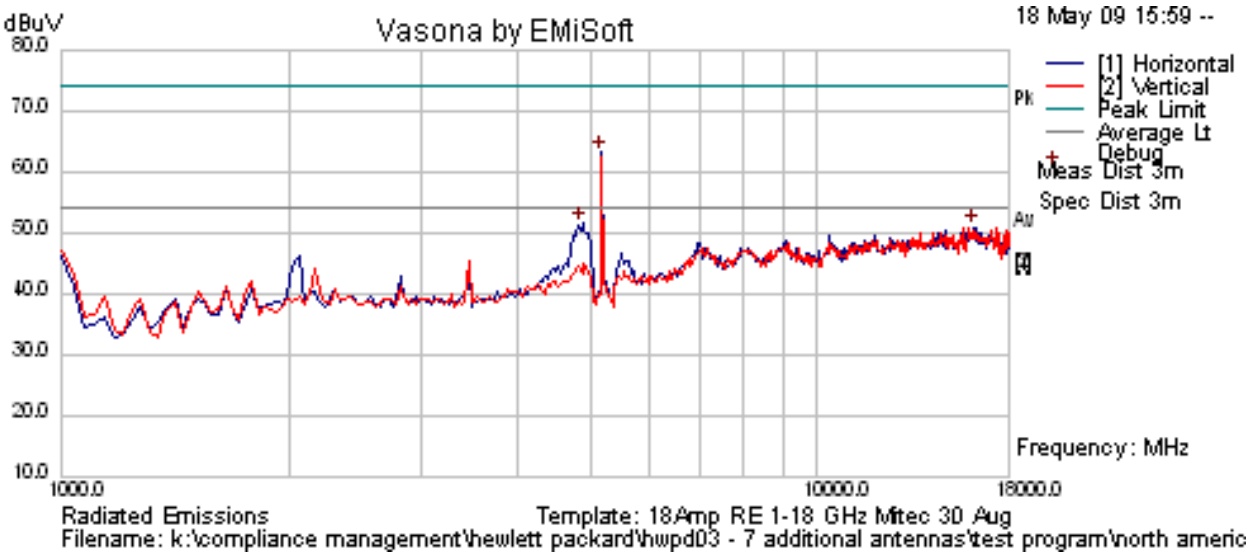
Peak Emission



Band Edge Emissions for 802.11a –5,150 MHz

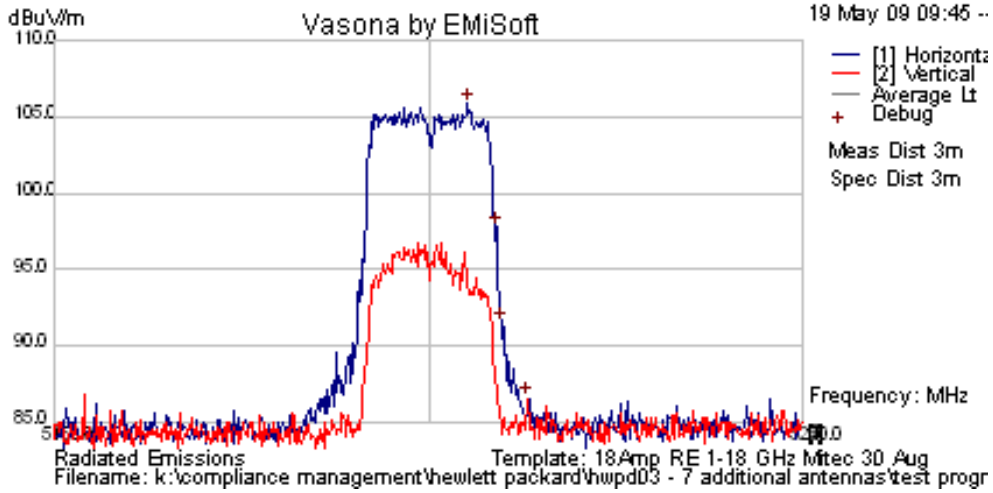


Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5200
Antenna Model	J8997A Antenna / Gain = 4 dBi
Power setting	17 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6Mb/s; CH40 MAP625 Platform Radio 2

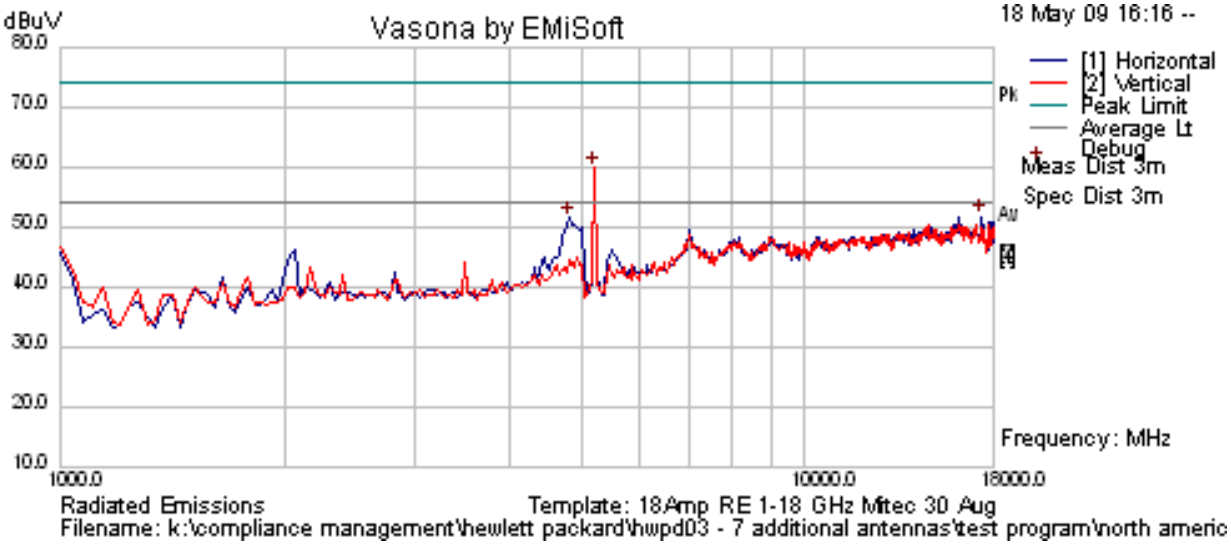


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5205.11	56.56	14.62	34.67	105.9	Peak [Scan]	H						

Peak Emission

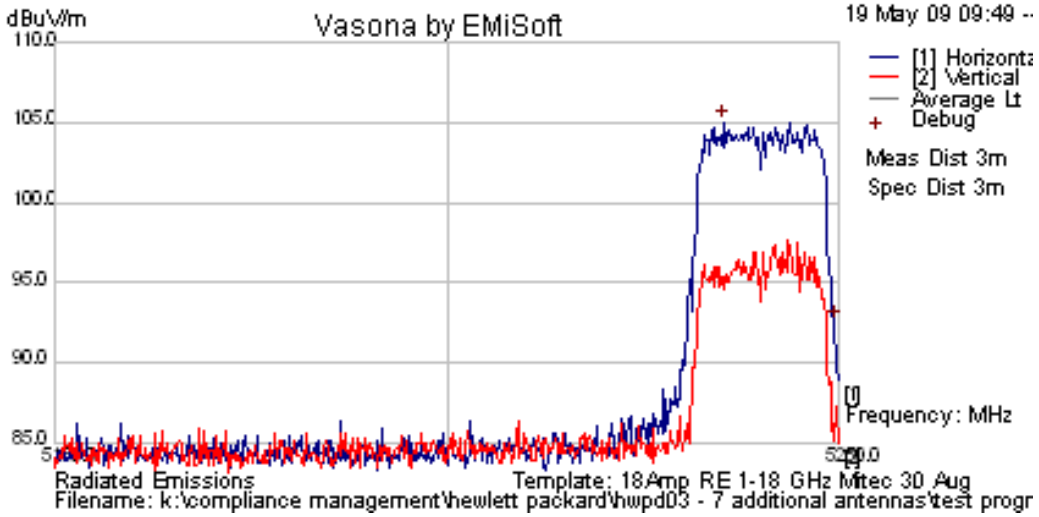


Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5240
Antenna Model	J8997A Antenna / Gain = 4 dBi
Power setting	17 - Max in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6Mb/s; CH48 MAP625 Platform Radio 2



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5235.17	55.76	14.62	34.69	105.1	Peak [Scan]	H						

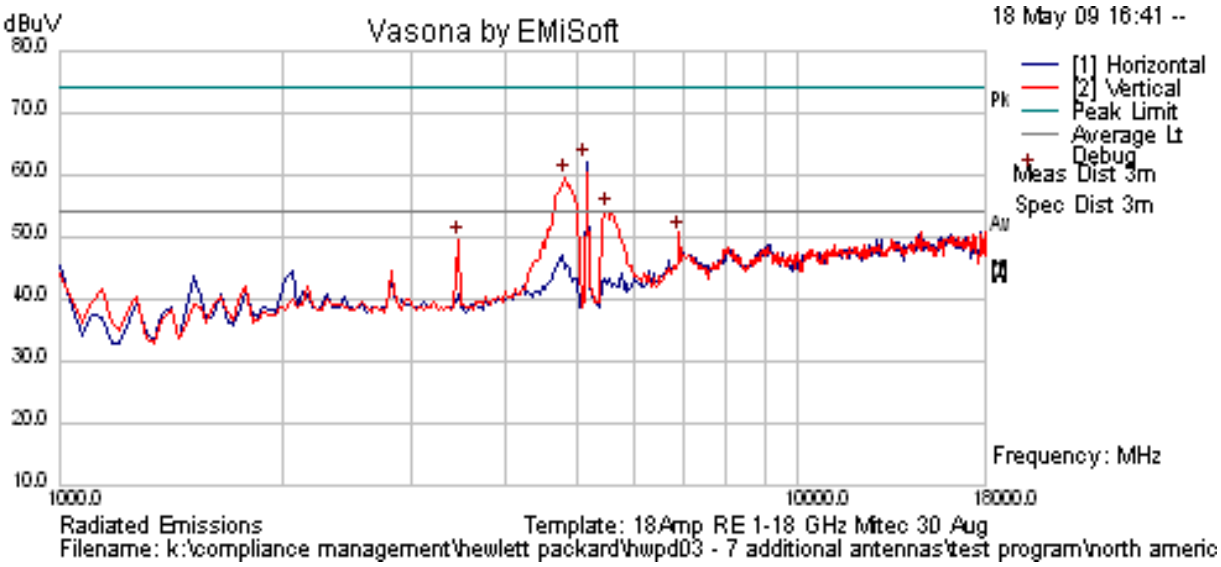
Peak Emission



ANTENNA J8999A

Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5180
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	16 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6 Mb/s; MAP625 Platform Radio 2

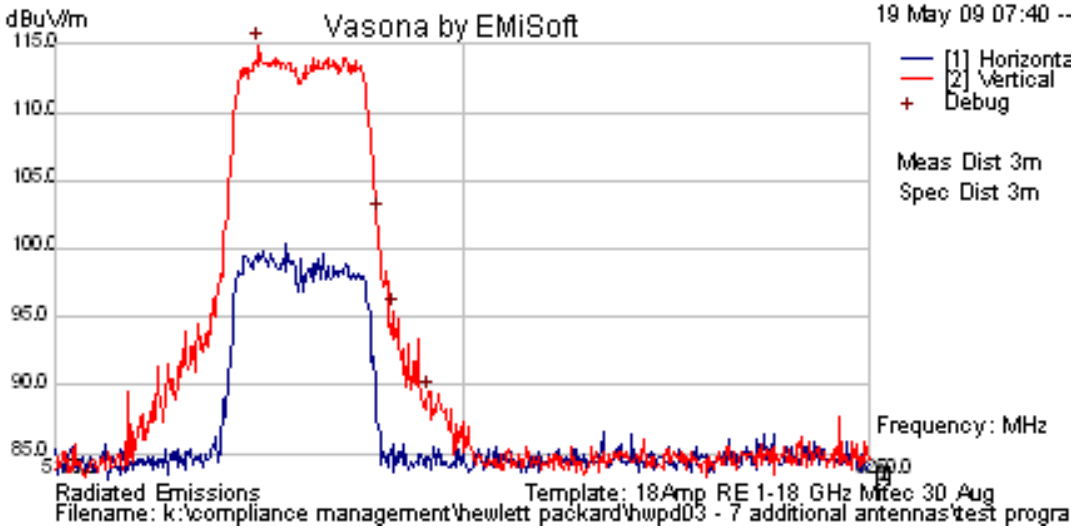
Radiated Emissions



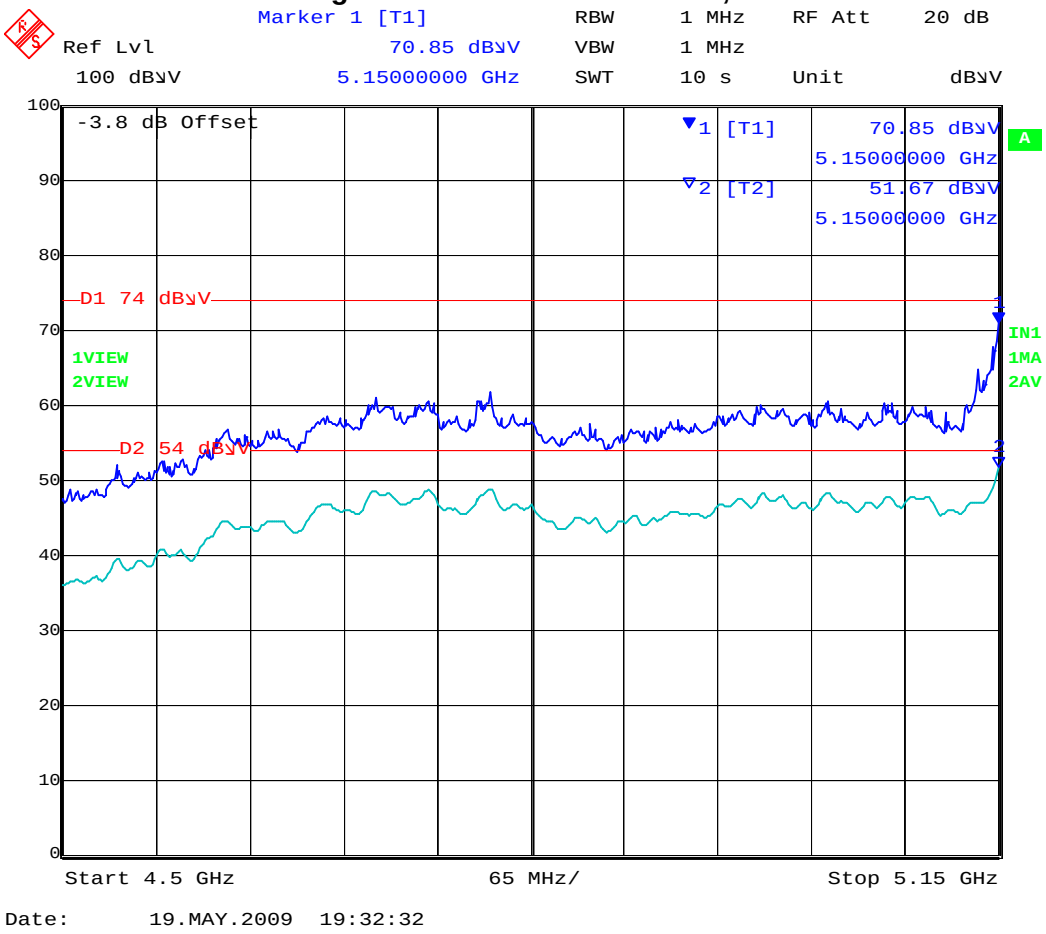
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5174.85	65.65	14.62	34.64	114.9	Peak [Scan]	V						Fund
6893.788	47.83	5.33	-2.56	50.6	Peak [Scan]	V	100	0	68.23	-17.63	Pass	NRB
3452.906	57.16	3.58	-11.29	49.46	Peak [Scan]	V	100	0	68.23	-18.77	Pass	NRB
5150.000	Power Setting = 16			70.85	Peak Max	V	--	--	74	-3.15	Pass	Band Edge
5150.000				51.67	Average Max	V	--	--	54	-2.33	Pass	Band Edge

Band-edge – Restricted Bands
RB – Restricted Band
NRB – Non-Restricted Band

Peak Emission

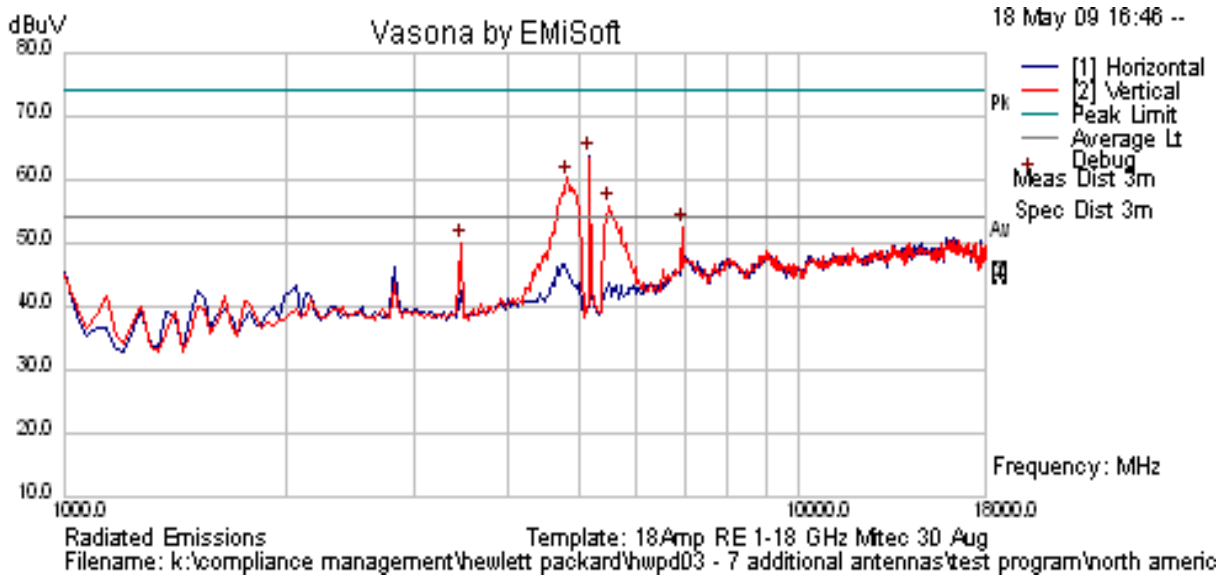


Band Edge Emissions for 802.11a –5,150 MHz



Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5200
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	16 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6 Mb/s; MAP625 Platform Radio 2

Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5203.707	65.32	14.62	34.67	114.6	Peak [Scan]	V						Fund
6927.856	49.3	5.35	-2.21	52.44	Peak [Scan]	V	100	0	68.23	-15.79	Pass	NRB
3452.906	57.51	3.58	-11.29	49.81	Peak [Scan]	V	100	0	68.23	-18.42	Pass	NRB

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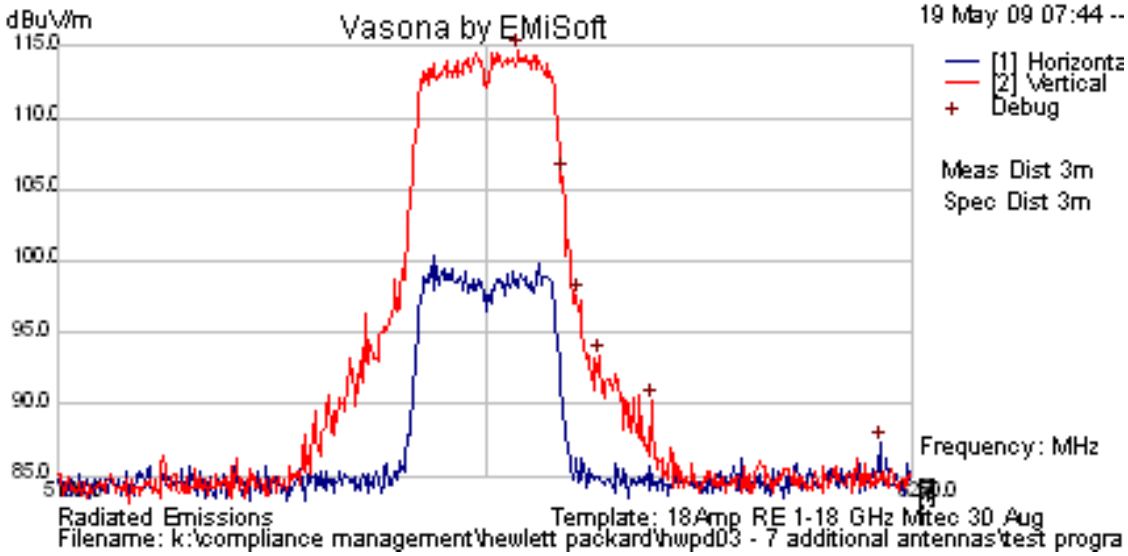
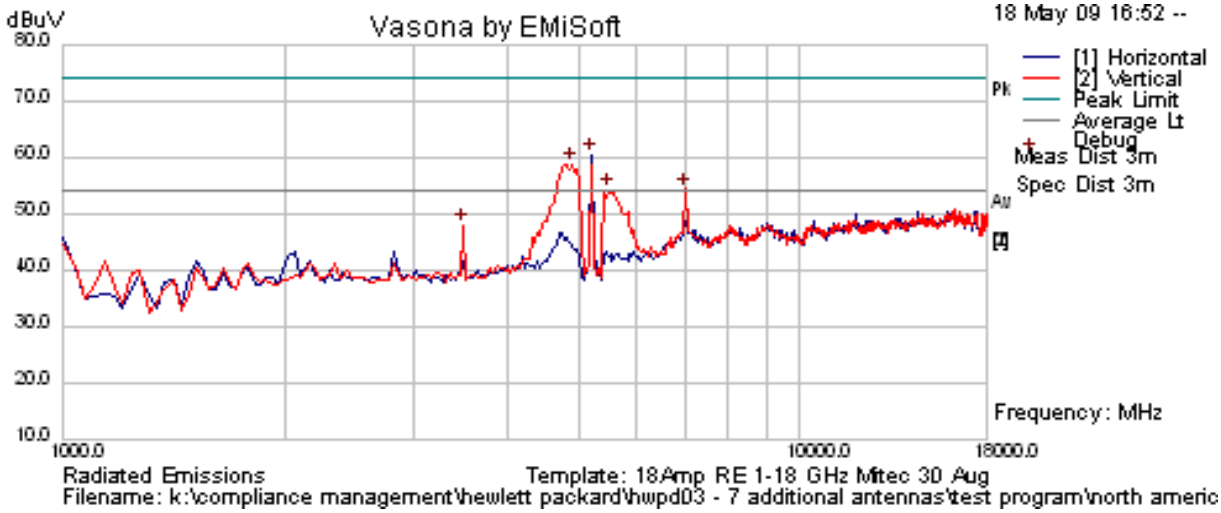
Peak Emission



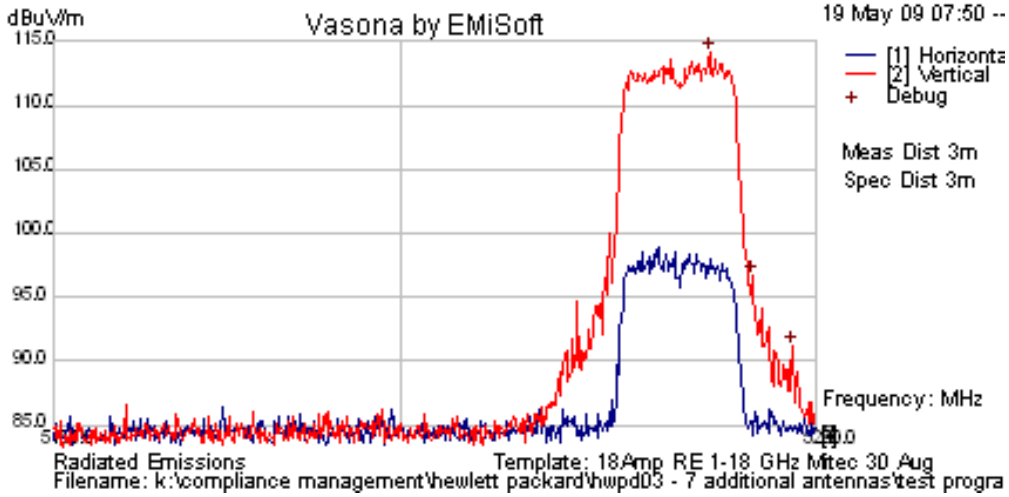
Date	5/18/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5240
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	16 in UI [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a 6 Mb/s; MAP625 Platform Radio 2

Radiated Emissions



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB	Pass /Fail	Comments
5244.569	64.73	14.62	34.7	114.1	Peak [Scan]	V						Fund
6995.992	50.56	5.38	-1.56	52.38	Peak [Scan]	V	100	0	68.23	-15.85	Pass	NRB
3486.974	55.78	3.59	-11.35	48.03	Peak [Scan]	V	100	0	68.23	-20.20	Pass	NRB

Peak Emission



SPECIFICATION

Limits

15.407 (b)(2). All emissions outside of the 5,150-5,350MHz band shall not exceed an EIRP of -27dBm/MHz.

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

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§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 the following table.

RSS-210 §A9.3(2) For transmitters operating in the 5250-5350 MHz band, all emissions outside the 5150-5350 MHz band shall not exceed -27 dBm/MHz e.i.r.p. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band shall not exceed out of band emission limit of 27 dBm/MHz e.i.r.p. in the 5150-5250 MHz band in order to operate indoor/outdoor, or alternatively shall comply with the spectral power density for operation within the 5150-5250 MHz band and shall be labeled "for indoor use only".

RSS-Gen §4.7 The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate of carrier frequency), or from 30 MHz , whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

RSS-Gen §6 Receiver Spurious Emission Standard
If a radiated measurement is made, all spurious emissions shall comply with the limits of the following Table. The resolution bandwidth of the spectrum analyzer shall be 100 kHz for spurious emission measurements below 1.0 GHz and 1.0 MHz for measurements above 1.0 GHz

§15.209 (a) Limit Matrix

Frequency(MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

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5.1.2.2. Receiver Radiated Spurious Emissions (above 1 GHz)

Industry Canada RSS-Gen §4.8, §6

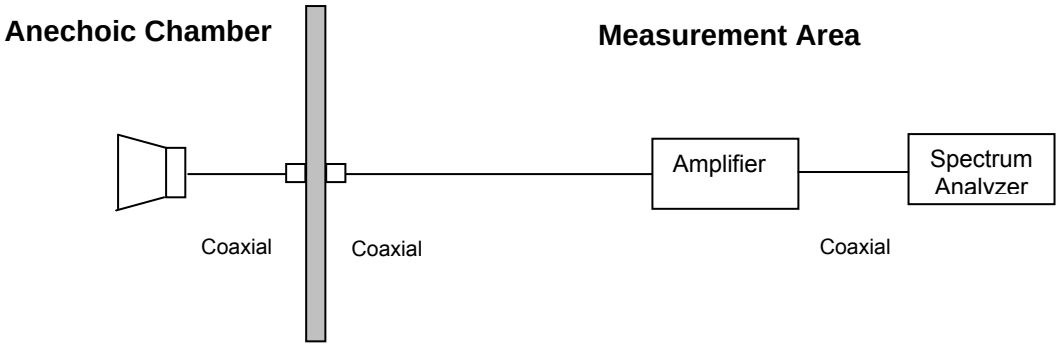
Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

All Sectors of the EUT were tested simultaneously

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

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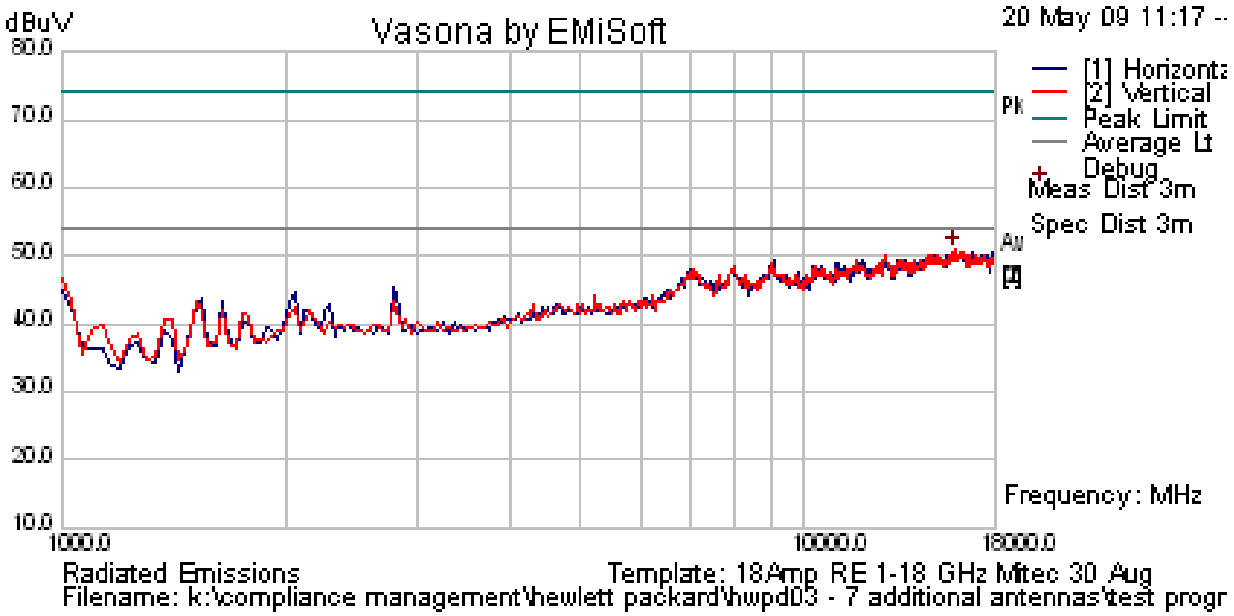
Receiver Radiated Spurious Emissions above 1 GHz

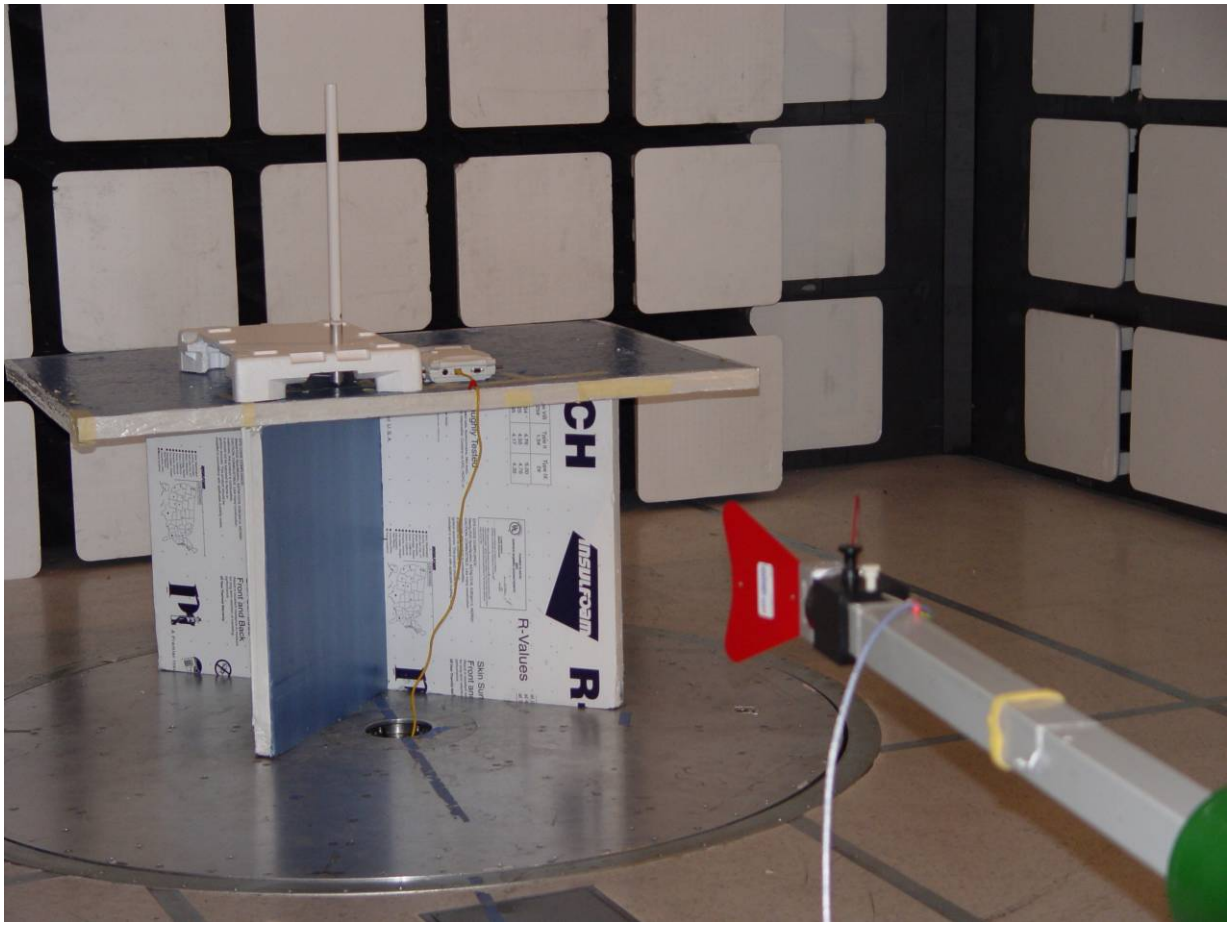
Date	5/20/2009
Engineer	GMH
Test Case	HWPD03 - FCC [Country = United States] Spurious Emissions > 1GHz
Frequency	5200
Antenna Model	J8999A Antenna / Gain = 6.9 dBi
Power setting	Receive [XMIT Test Utility + 5.2.5.0-01-6901]
Test Conditions	CM9 Radio - 802.11a; CH40 MAP625 Platform Radio 2



The above plot is peak emissions only

6. PHOTOGRAPHS

6.1. Radiated Emissions > 1GHz



7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #
0088	Spectrum Analyzer	Hewlett Packard	8564E	3410A00141
0134	Amplifier	Com Power	PA 122	181910
0158	Barometer /Thermometer	Control Co.	4196	E2846
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007
0252	SMA Cable	Megaphase	Sucoflex 104	None
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001
0313	Coupler	Hewlett Packard	86205A	3140A01285
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623
0070	Power Meter	Hewlett Packard	437B	3125U11552
0116	Power Sensor	Hewlett Packard	8485A	3318A19694
0117	Power Sensor	Hewlett Packard	8487D	3318A00371
0184	Pulse Limiter	Rhode & Schwartz	ESH3Z2	357.8810.52
0190	LISN	Rhode & Schwartz	ESH3Z5	836679/006
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001
0301	5.6 GHz Notch Filter	Micro-Tronics	RBC50704	001
0302	5.25 GHz Notch Filter	Micro-Tronics	BRC50703	002
0303	5.8 GHz Notch Filter	Micro-Tronics	BRC50705	003
0304	2.4GHzHz Notch Filter	Micro-Tronics	--	001
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002
0335	1-18GHz Horn Antenna	ETS- Lindgren	3117	00066580
0337	Amplifier	MiCOM Labs	--	--
0338	Antenna	Sunol Sciences	JB-3	A052907

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