Engineering and Testing for EMC and Safety Compliance

Certification Application Report
FCC Part 15.247

Test Lab:	Applicant:
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FCC ID:	URZ-WF10020	**Test Report Date:**	July 19, 2007
Platform:	N/A	**RTL Work Order Number:**	2007132
Model Name/Number:	WF10020	**RTL Quote Number:**	QRTL06-458A

American National Standard Institute:	ANSI C63.4-2003: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
FCC Classification:	DTS – Part 15 Digital Transmission System
FCC Rule Part(s):	FCC Rules Part 15.247 (10-01-05): Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System, October 1, 2006
Digital Interface Information	Digital Interface was found to be compliant

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
2412-2462	0.089	N/A	9M90G7D

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, FCC 97-114 and ANSI C63.4.

Signature: _____ Date: July 19, 2007

Typed/Printed Name: Desmond A. Fraser Position: President

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1 General Information

1.1 Scope

Applicable Standards:

- FCC Rules Part 15.247 (August 14, 2006): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

1.2 Description of EUT

Equipment Under Test	802.11b Wi-Fi Module
Model Number	WF10020
Power Supply	3.1 to 3.6 VDC
Modulation Type	DSSS
Frequency Range	2412-2462 MHz
Antenna Connector Type	w.fl
Antenna Types	SMD

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

1.4 Related Submittal(s)/Grant(s)

This is an original certification application for FCC **LIMITED MODULAR APPROVAL** for Model # WF10020, 802.11b Wi-Fi Module, FCC ID: URZ-WF10020, based on the guidelines in FCC Publication DA 00-1407.

The EUT contains a Mitsumi Bluetooth module, FCC ID# POOWML-C29XX. Co-location spurious data, as well as a SAR Evaluation, is presented to show compliance. Based on consultation with ATCB and review of the Mitsumi Bluetooth modular grant (FCC ID# POOWML-C29XX), it was decided that the Bluetooth module could be included in this product with the addition of simultaneous transmission spurious emissions testing (Bluetooth and Wi-Fi) and SAR testing with both transmitters operating. Testing shows that all emissions are compliant when the Bluetooth and Wi-Fi modules are co-located.

It is not the intent to include the Bluetooth module under the Wi-Fi grant; rather, to show that the proposed end product containing both modules (co-located) is compliant, and that the end product would be labeled as containing two modularly approved devices and labeled with the DA 00-1407 “contains” language indicating both FCC ID’s URZ-WF10020 and POOWML-C29XX.

1.5 Modifications

No modifications were required for compliance.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

Table 2-1: Channels Tested

Channel	Frequency
1	2412
6	2436
11	2462

2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested. Although normally battery operated, an off-the-shelf AC adapter was provided for AC conducted emissions testing.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247)

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	Pass
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(a)(2)	6 dB Bandwidth	Pass
FCC 15.247(b)	Maximum Peak Power Output	Pass
FCC 15.247(d)	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(e)	Power Spectral Density	Pass
FCC 15.247(d)	Band Edge Measurement	Pass

2.4 Test System Details

The test sample was received on November 6, 2006. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-3: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
802.11b Module	HandEra, Inc.	WF-10020	093	URZ-WF10020	N/A	17619
802.11b Module	HandEra, Inc.	WF-10020	274	URZ-WF10020	N/A	17618
802.11b Module	HandEra, Inc.	WF-10020	081	URZ-WF10020	N/A	17616
5V AC Adapter	CINCON Electronics, Inc.	TR1505	N/A	N/A	1.8 m unshielded Power	17615
Test Fixture	HandEra, Inc	N/A	N/A	N/A	2 m unshielded I/O	17617
3.7V Battery	HandEra, Inc.	Li-1750-010	N/A	N/A	N/A	17620
Personal Digital Assistant	LevelStar	Icon	FCC #2	URZ-WF10020 & POOWML-C29XX	0.3 m shielded I/O, Power; 0.95 m shielded USB	17652
Personal Digital Assistant	LevelStar	Icon	FCC #1	URZ-WF10020 & POOWML-C29XX	0.3 m shielded I/O, Power; 0.95 m shielded USB	17653
Microphone	Sony	ECM-MS907	N/A	N/A	1.5 m unshielded I/O	17656
5V AC Adapter	Phihong	PSM11R-050	P6070052BA4	N/A	1.8 m unshielded Power	17662
Earphone	LevelStar	N/A	N/A	N/A	1.25 m unshielded I/O	17663
Earphone	LevelStar	N/A	N/A	N/A	1.25 m unshielded I/O	17664
3.7V Battery	LevelStar	Li-1750-010	6EBP19R60398	N/A	N/A	17655

2.5 Configuration of Tested System

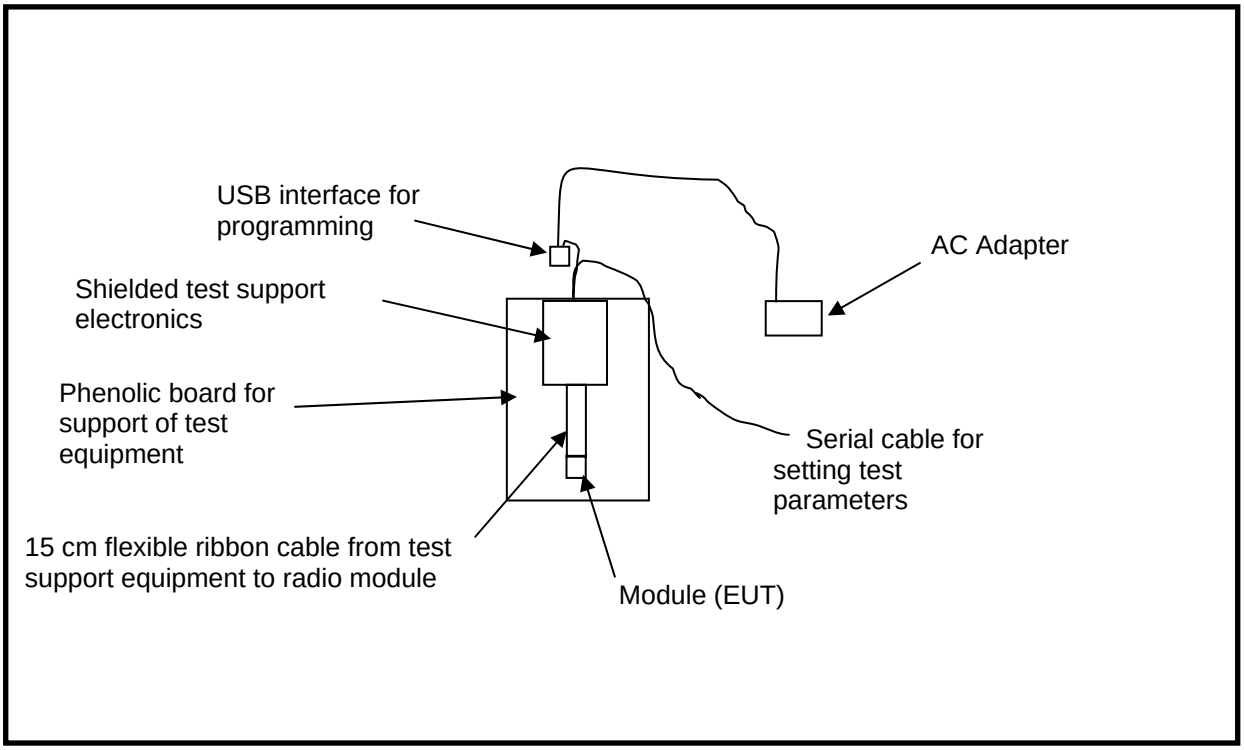


Figure 2-1: Configuration of System under Test – Module Alone

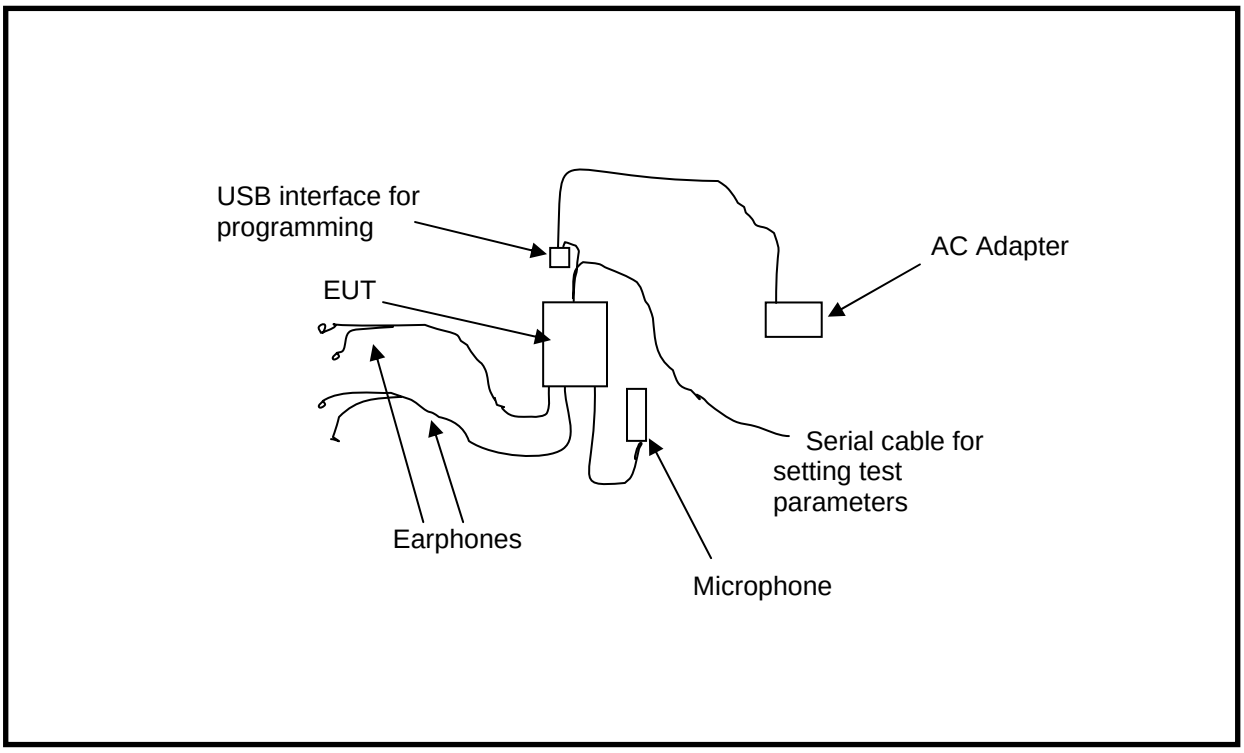


Figure 2-2: Configuration of System under Test – Host

3 Peak Output Power - §15.247(b)(1)

3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor.

Table 3-1: Power Output Test Equipment

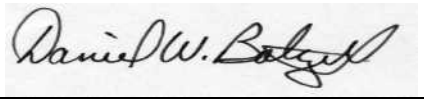
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	9/21/07
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	9/21/07

3.2 Power Output Test Data

Table 3-2: Power Output Test Data

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
1	2412	19.5
6	2436	19.5
11	2462	19.4

Test Personnel:



Daniel W. Baltzell		November 8, 2006
Test Engineer	Signature	Date Of Test

4 Compliance with the Band Edge – FCC §15.247(d)

4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. Peak (1 MHz RBW/VBW) and average (1 MHz RBW/10 Hz VBW) radiated measurements were taken with a suitable span to encompass the peak of the fundamental. A delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the field strength; the result was compared to the limit in the restricted band (54 dBuV/m).

Table 4-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	9/13/07
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	12/12/06
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	5/20/07

4.2 Restricted Band Edge Test Results

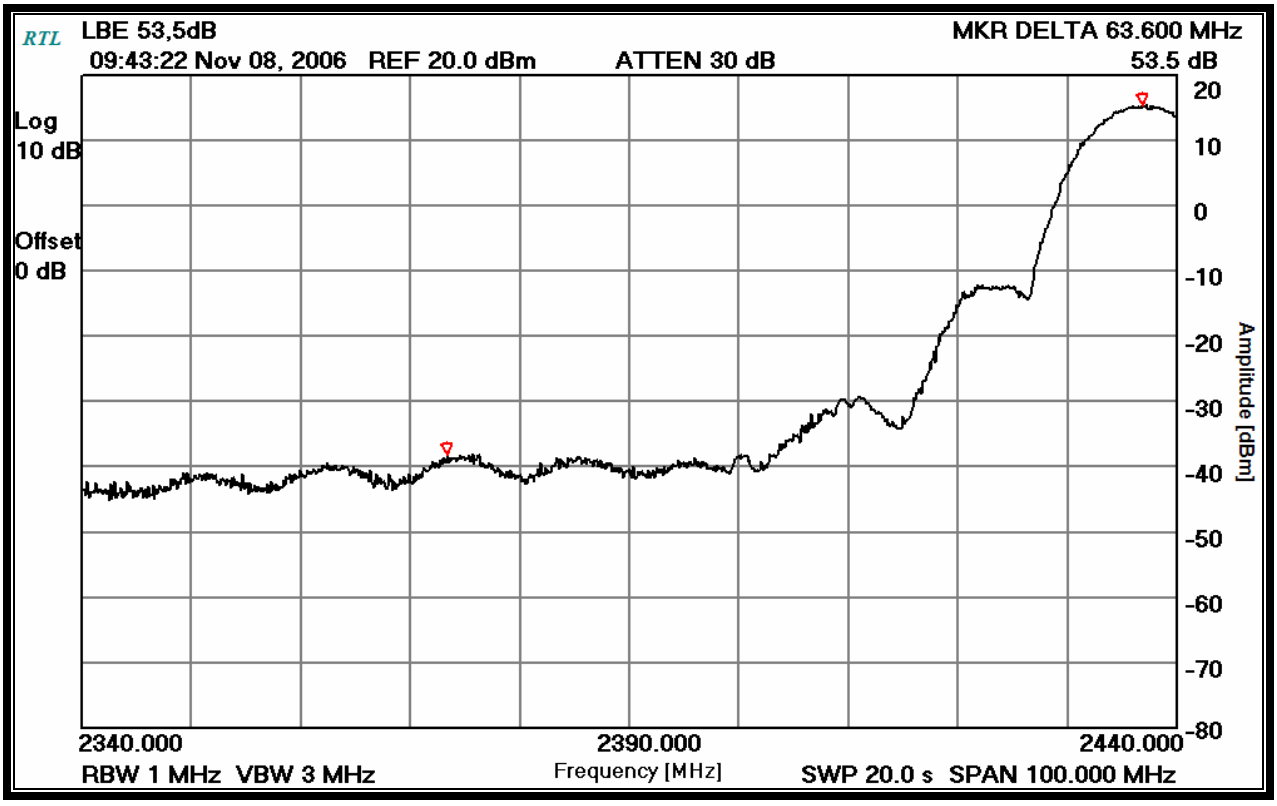
4.2.1 Calculation of Lower Band Edge

96.8 dBuV/m is the field strength measurement, from which the delta measurement of 53.5 dB is subtracted (reference plots), resulting in a level of 43.3 dB. This level has a margin of 10.7 dB below the limit of 54 dBuV/m.

Calculation: 96.8 dBuV/m – 53.5 dB – 54 dBuV/m = -10.7 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 105.8 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 96.8 dBuV/m
Delta measurement = 53.5 dB

Plot 4-1: Lower Band Edge: Average Measurement Channel 1 (TX Frequency: 2412 MHz)



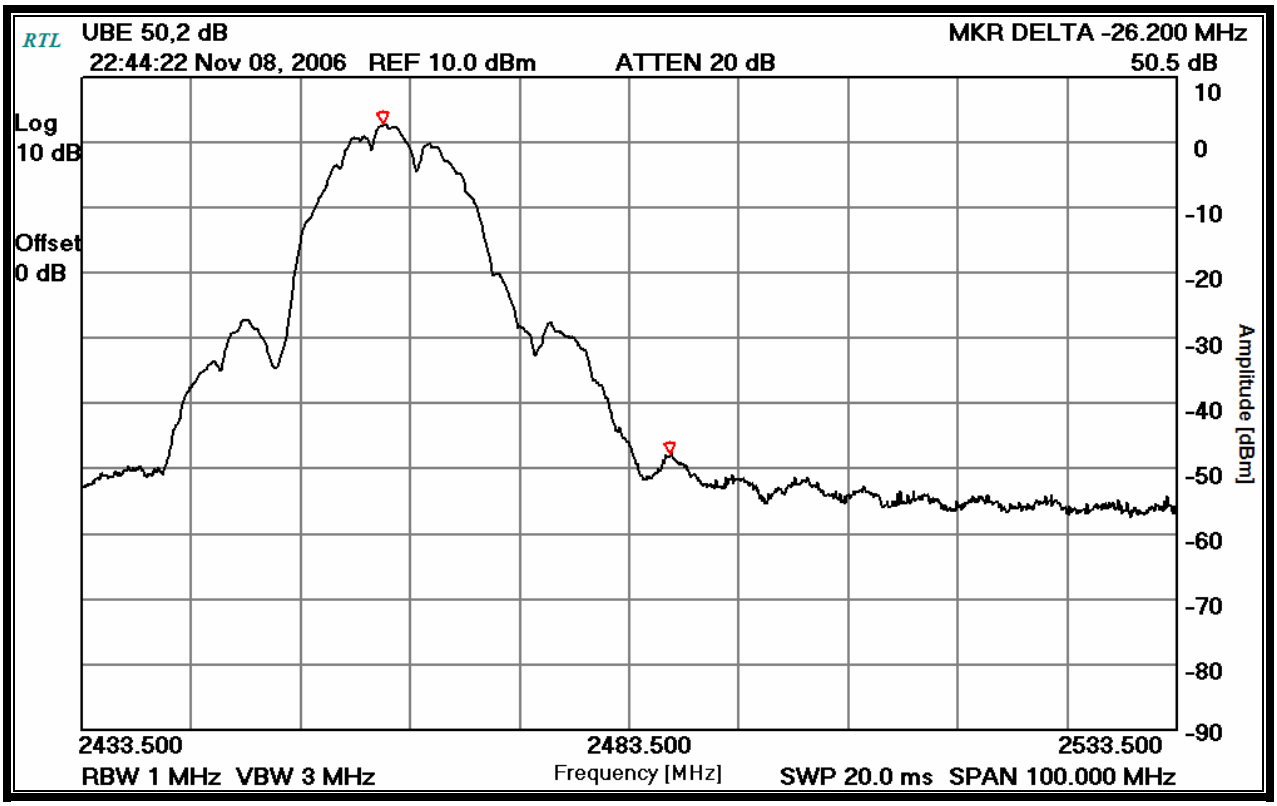
4.2.2 Calculation of Upper Band Edge

97.6 dBuV/m is the field strength measurement, from which the delta measurement of 50.5 dB is subtracted (reference plots), resulting in a level of 47.1 dB. This level has a margin of 6.9 dB below the limit of 54 dBuV/m.

Calculation: 97.6 dBuV/m – 50.5 dB – 54 dBuV/m = -6.9 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 107.4 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 97.6 dBuV/m
Delta measurement = 50.5 dB

Plot 4-2: Upper Band Edge: Average Measurement Channel 11 (TX Frequency: 2462 MHz)



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	November 8, 2006
EMC Test Engineer	Signature	Date Of Test

5 Antenna Conducted Spurious Emissions - §15.247(d)

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(c) were measured from the EUT antenna port using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 1 MHz. The modulated carrier was identified at the following frequencies: 2412 MHz, 2436 MHz and 2462 MHz.

Table 5-1: Antenna Conducted Spurious Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	9/13/07

5.2 Antenna Conducted Spurious Emissions Test Results

Table 5-2: Antenna Conducted Spurious Emissions (2412 MHz)

Frequency (MHz)	Amplitude Measured (dBm)	Limit (20 dBc)	Margin (dB)
2412.0	7.6		Fundamental
4824.0	-46.5	-12.4	-34.1
7236.0	-41.3	-12.4	-28.9
9648.0	-45.0	-12.4	-32.6
12060.0	-60.1	-12.4	-47.7
14472.0	-55.9	-12.4	-43.5
16884.0	-74.4	-12.4	-62.0
19296.0	-73.1	-12.4	-60.7
21708.0	-72.3	-12.4	-59.9
24120.0	-72.5	-12.4	-60.1

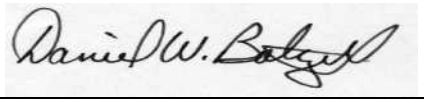
Table 5-3: Antenna Conducted Spurious Emissions (2436 MHz)

Frequency (MHz)	Amplitude Measured (dBm)	Limit (20 dBc)	Margin (dB)
2436.0	6.9		Fundamental
4872.0	-42.5	-13.1	-29.4
7308.0	-41.5	-13.1	-28.4
9744.0	-35.5	-13.1	-22.4
12180.0	-63.1	-13.1	-50.0
14616.0	-55.6	-13.1	-42.5
17052.0	-74.2	-13.1	-61.1
19488.0	-72.9	-13.1	-59.8
21924.0	-73.4	-13.1	-60.3
24360.0	-72.9	-13.1	-59.8

Table 5-4: Antenna Conducted Spurious Emissions (2462 MHz)

Frequency (MHz)	Amplitude Measured (dBm)	Limit (20 dBc)	Margin (dB)
2462.0	6.9		Fundamental
4924.0	-52.2	-13.1	-39.1
7386.0	-41.4	-13.1	-28.3
9848.0	-47.8	-13.1	-34.7
12310.0	-67.4	-13.1	-54.3
14772.0	-58.3	-13.1	-45.2
17234.0	-75.2	-13.1	-62.1
19696.0	-72.3	-13.1	-59.2
22158.0	-72.7	-13.1	-59.6
24620.0	-72.5	-13.1	-59.4

Test Personnel:



Daniel W. Baltzell		November 8, 2006
EMC Test Engineer	Signature	Date Of Test

6 6 dB Bandwidth - §15.247(a)(2)

6.1 6 dB Bandwidth Test Procedure – Minimum 6 dB Bandwidth

The minimum 6 dB bandwidths per FCC 15.247(a)(2) were measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 1 MHz. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 6-1: 6 dB Bandwidth Test Equipment

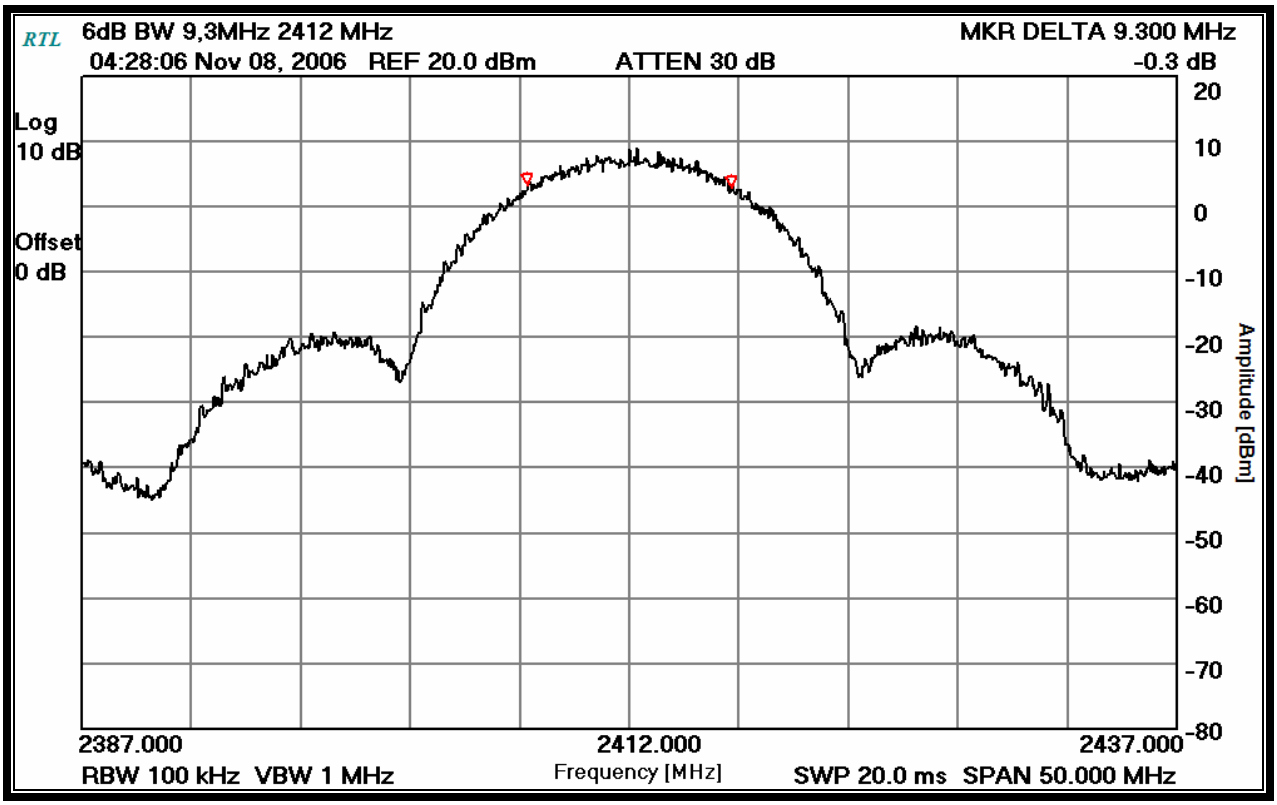
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	9/13/07

6.2 6 db Bandwidth Test Results

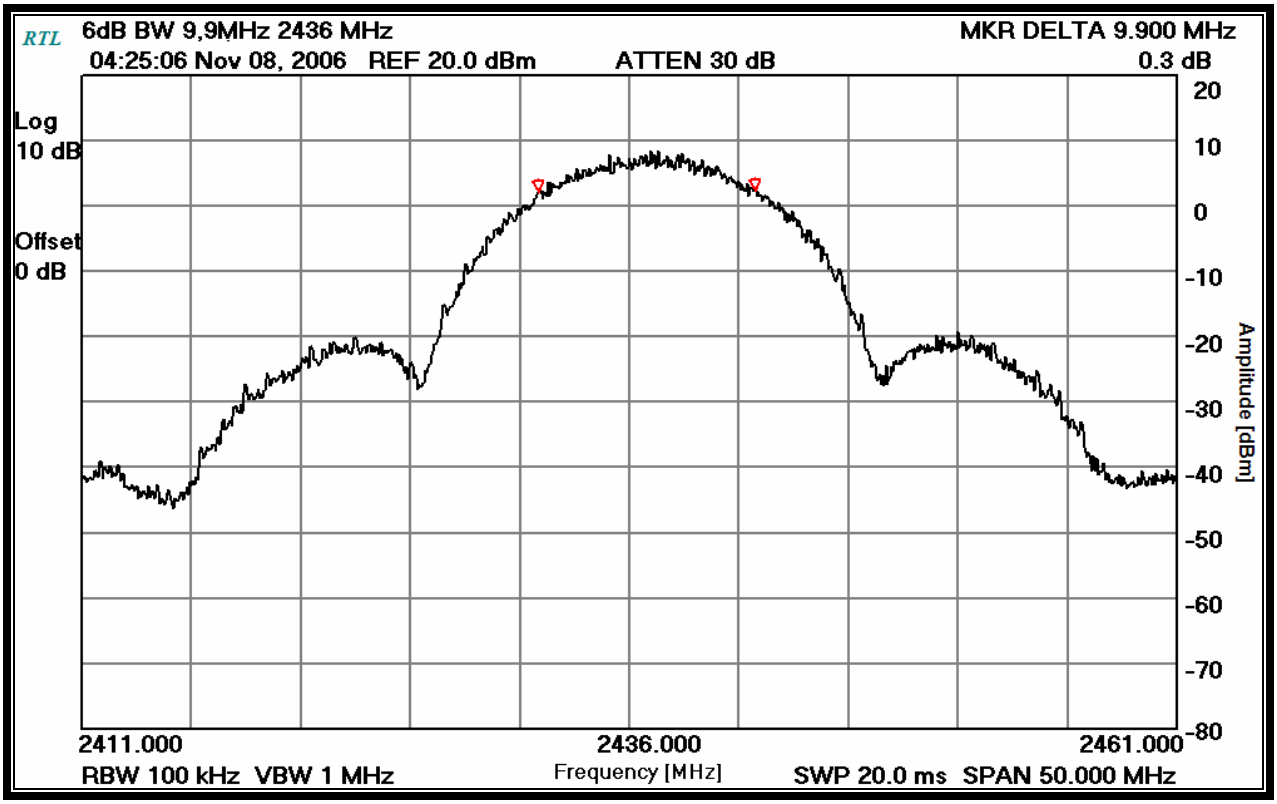
Table 6-2: 6 db Bandwidth Test Data

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
0	2412	9.3	0.5	Pass
7	2436	9.9	0.5	Pass
15	2462	9.8	0.5	Pass

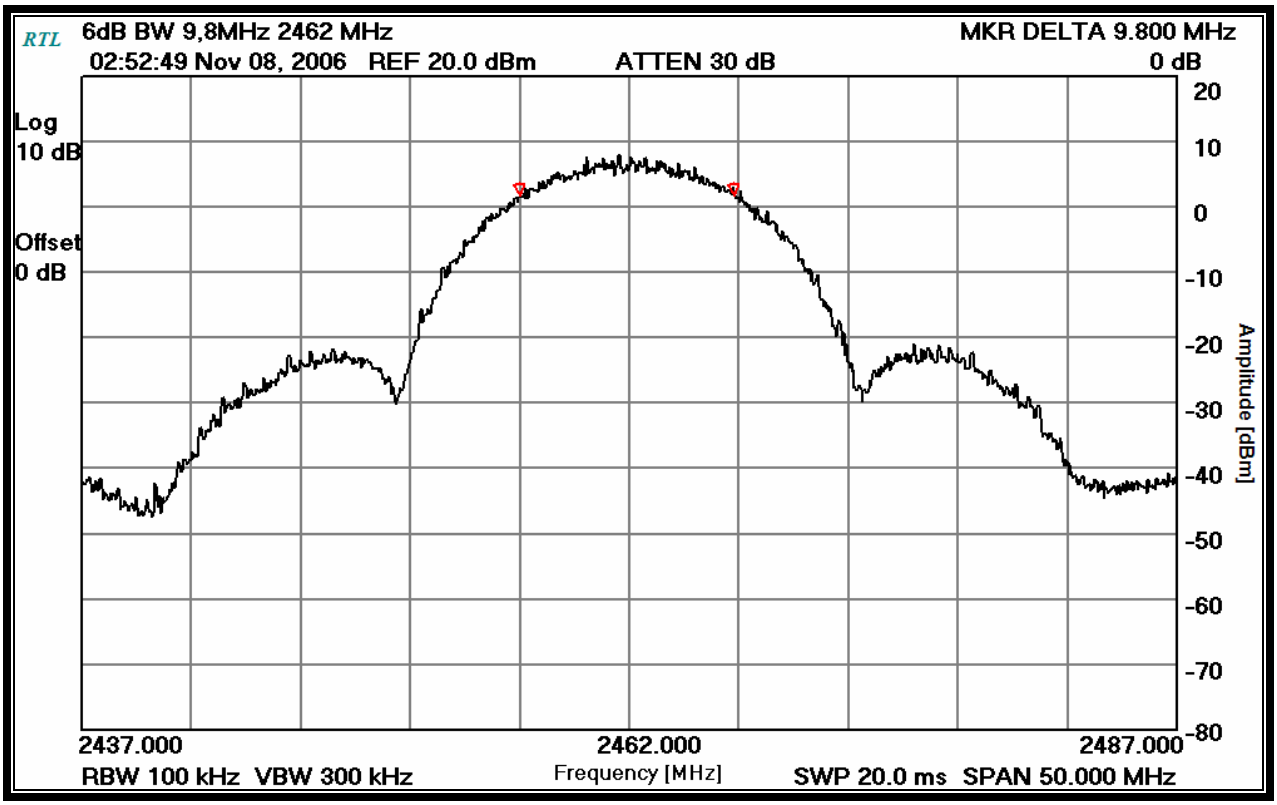
Plot 6-1: 6 dB Bandwidth Channel 1 (TX Frequency: 2412 MHz)



Plot 6-2: 6 dB Bandwidth Channel 6 (TX Frequency: 2436 MHz)



Plot 6-3: 6 dB Bandwidth Channel 11 (TX Frequency: 2462 MHz)



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	November 8, 2006
EMC Test Engineer	Signature	Date Of Test

7 Power Spectral Density - §15.247(e)

7.1 Power Spectral Density Test Procedure

The power spectral density per FCC 15.247(d) was measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 3 kHz, the video bandwidth set at 30 kHz, and the sweep time set at 500 seconds. The spectral lines were resolved for the modulated carriers at 2.412 GHz, 2.436 GHz, and 2.462 GHz respectively. These levels are below the +8 dBm limit. See the power spectral density table and plots.

Table 7-1: Power Spectral Density Test Equipment

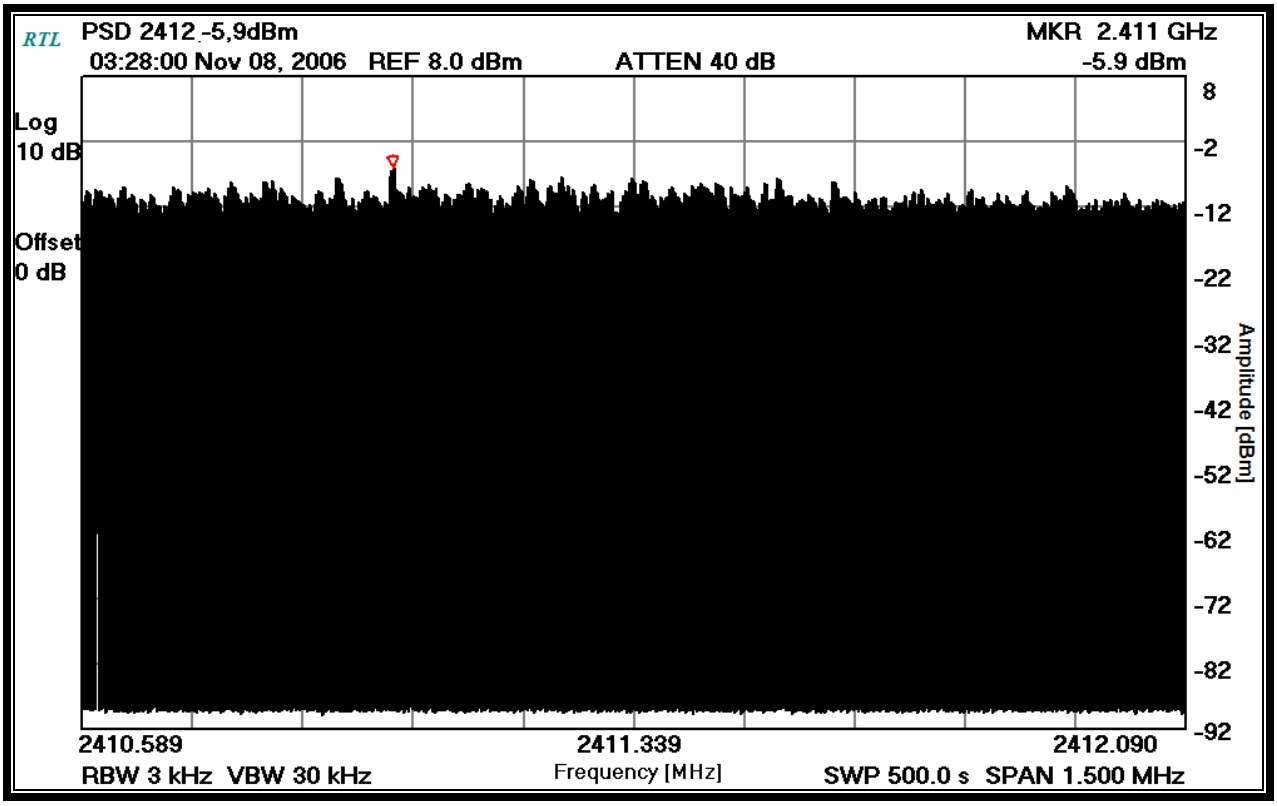
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	9/13/07

7.2 Power Spectral Density Test Data

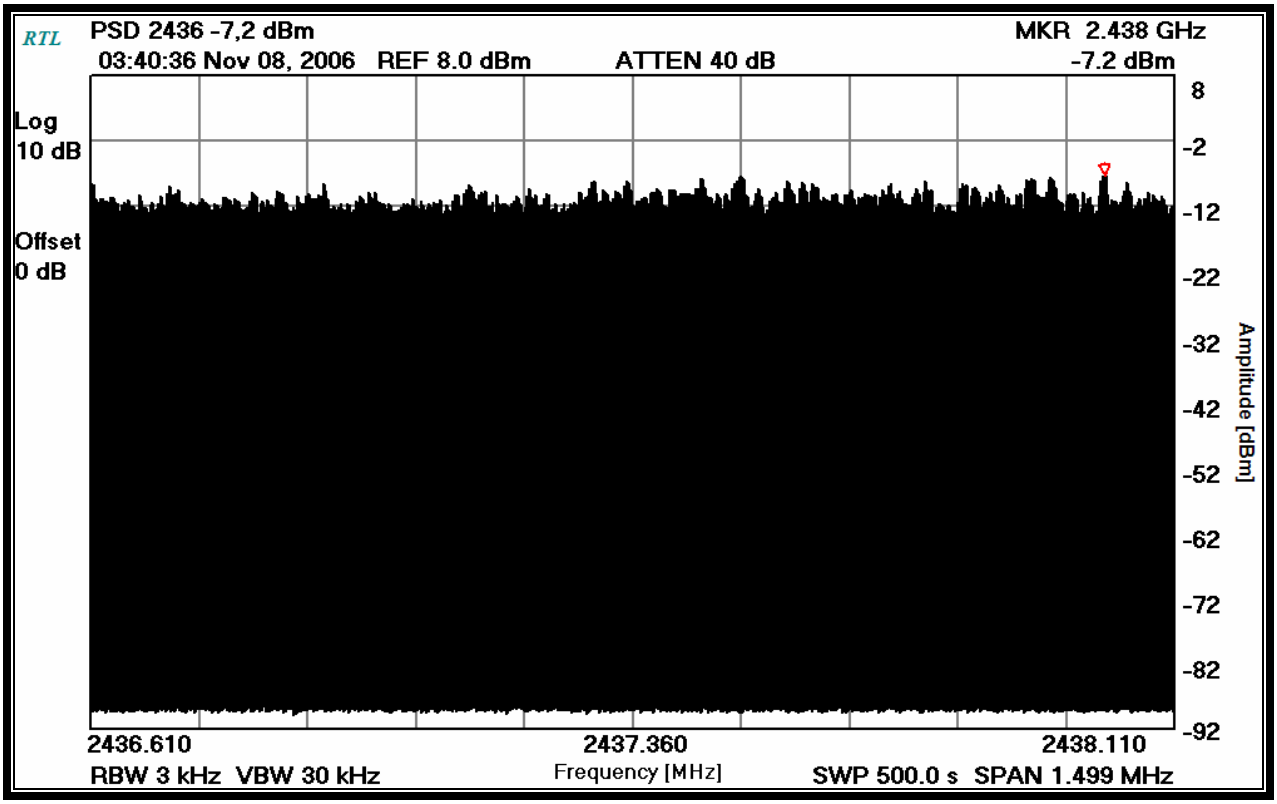
Table 7-2: Power Spectral Density Test Data

Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	-5.9	8	Pass
6	2436	-7.2	8	Pass
11	2462	-6.3	8	Pass

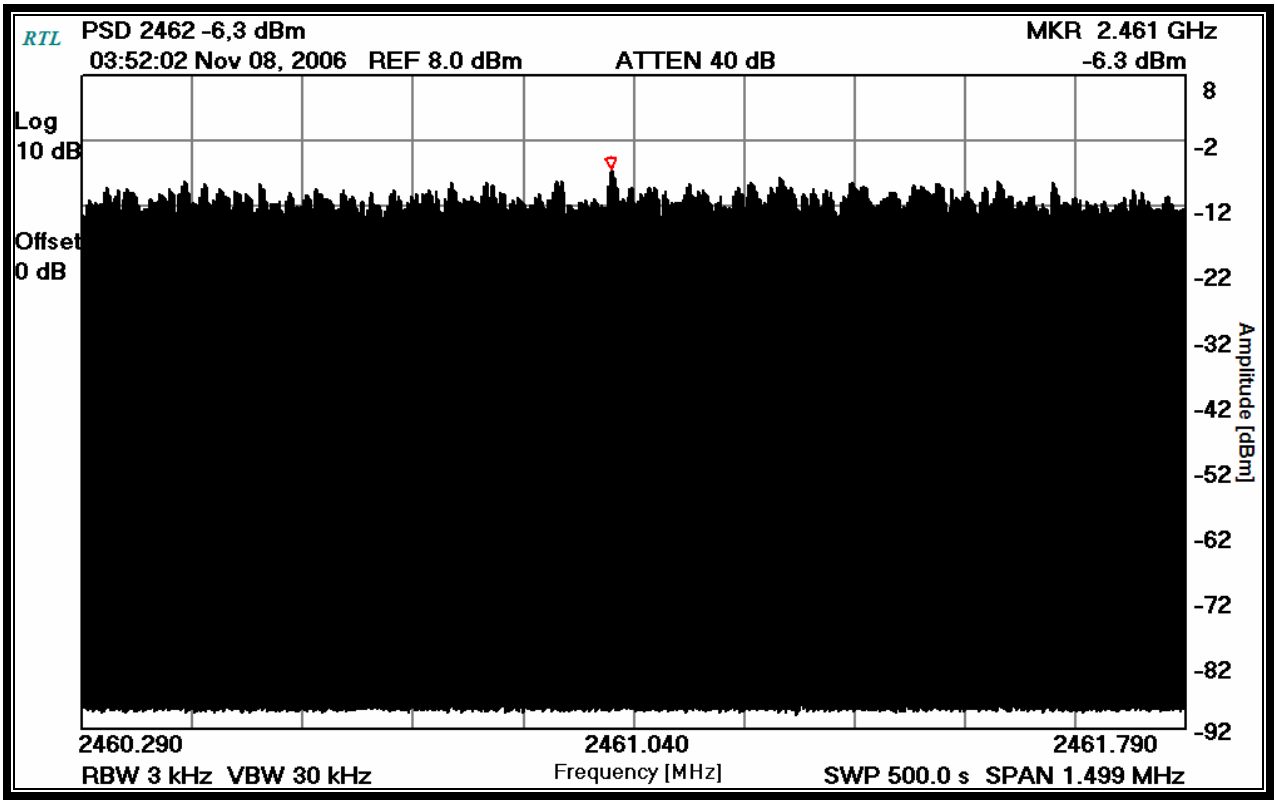
Plot 7-1: Power Spectral Density: Channel 1 (2412 MHz)



Plot 7-2: Power Spectral Density: Channel 6 (2436 MHz)



Plot 7-3: Power Spectral Density: Channel 11 (2462 MHz)



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	November 8, 2006
EMC Test Engineer	Signature	Date Of Test

8 Conducted Limits - §15.207

The conducted test was performed with the EUT exercised in center channel transmit and receive modes, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

8.1 Limits of Conducted Emissions Measurement

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

8.2 Conducted Emissions Measurement Test Procedure

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50-ohm / 50 microhenry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech Quality Manual, Section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

Table 8-1: Conducted Line Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900897	Hewlett Packard	8567A	HP Spectrum Analyzer (10 KHz - 1.5 GHz)	2727A00535	3/3/07
900901	Hewlett Packard	85650A	Quasi-Peak Adapter (30 Hz - 1 GHz)	3145A01599	3/3/07
901084	AFJ International	LS16	16A LISN	16010020082	1/23/07

8.3 Conducted Line Emissions Test Data – Module Alone

Table 8-2: Conducted Emissions (Neutral Side); Transmit Mode

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.165	Av	30.1	0.2	30.3			55.2	-24.9
0.165	Qp	49.6	0.2	49.8	65.2	-15.4		
0.241	Av	24.8	0.2	25.0			52.1	-27.1
0.241	Qp	46.1	0.2	46.3	62.1	-15.8		
0.303	Av	23.3	0.3	23.6			50.2	-26.6
0.303	Qp	42.1	0.3	42.4	60.2	-17.8		
0.356	Av	27.8	0.3	28.1			48.8	-20.7
0.356	Qp	44.8	0.3	45.1	58.8	-13.7		
0.648	Av	26.8	0.2	27.0			46.0	-19.0
0.648	Qp	43.0	0.2	43.2	56.0	-12.8		
1.067	Av	23.2	0.4	23.6			46.0	-22.4
1.067	Qp	38.5	0.4	38.9	56.0	-17.1		
5.094	Av	26.2	1.6	27.8			50.0	-22.2
5.094	Qp	40.9	1.6	42.5	60.0	-17.5		
24.060	Pk	43.9	2.8	46.7			50.0	-3.3

Table 8-3: Conducted Emissions (Phase Side); Transmit Mode

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.194	Av	39.2	0.2	39.4			53.9	-14.5
0.194	Qp	49.9	0.2	50.1	63.9	-13.8		
0.259	Av	38.9	0.2	39.1			51.5	-12.4
0.259	Qp	50.2	0.2	50.4	61.5	-11.1		
0.324	Av	32.9	0.3	33.2			49.6	-16.4
0.324	Qp	44.6	0.3	44.9	59.6	-14.7		
0.668	Av	27.4	0.2	27.6			46.0	-18.4
0.668	Qp	43.7	0.2	43.9	56.0	-12.1		
5.560	Av	31.3	1.5	32.8			50.0	-17.2
5.560	Qp	42.7	1.5	44.2	60.0	-15.8		
23.780	Pk	44.1	2.8	46.9			50.0	-3.1

Table 8-4: Conducted Emissions (Neutral Side); Receive Mode

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.195	Av	39.6	0.2	39.8			53.8	-14.0
0.195	Qp	52.1	0.2	52.3	63.8	-11.5		
0.293	Av	34.2	0.3	34.5			50.4	-15.9
0.293	Qp	48.0	0.3	48.3	60.4	-12.1		
0.391	Av	34.7	0.2	34.9			48.0	-13.1
0.391	Qp	49.2	0.2	49.4	58.0	-8.6		
0.683	Av	34.2	0.2	34.4			46.0	-11.6
0.683	Qp	49.8	0.2	50.0	56.0	-6.0		
5.209	Av	33.7	1.6	35.3			50.0	-14.7
5.209	Qp	49.4	1.6	51.0	60.0	-9.0		
23.250	Pk	44.5	2.9	47.4			50.0	-2.6

Table 8-5: Conducted Emissions (Phase Side); Receive Mode

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.162	Av	29.4	0.2	29.6			55.4	-25.8
0.162	Qp	46.6	0.2	46.8	65.4	-18.6		
0.230	Av	31.3	0.2	31.5			52.4	-20.9
0.230	Qp	45.9	0.2	46.1	62.4	-16.3		
0.390	Av	29.5	0.2	29.7			48.1	-18.4
0.390	Qp	43.4	0.2	43.6	58.1	-14.5		
1.304	Av	28.3	0.6	28.9			46.0	-17.1
1.304	Qp	40.8	0.6	41.4	56.0	-14.6		
5.177	Av	26.4	1.6	28.0			50.0	-22.0
5.177	Qp	41.5	1.6	43.1	60.0	-16.9		
23.500	Pk	44.5	2.8	47.3			50.0	-2.7

Test Personnel:

Daniel W. Baltzell		November 9, 2006
EMC Test Engineer	Signature	Date Of Test

8.4 Conducted Line Emissions Test Data - Host

Table 8-6: Conducted Emissions (Neutral Side); Transmit Mode

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.195	Av	36.9	0.2	37.1	63.8	-26.7	53.8	-16.7
0.195	Qp	44.3	0.2	44.5	63.8	-19.3	53.8	-9.3
0.393	Av	36.9	0.3	37.2	58.0	-20.8	48.0	-10.8
0.393	Qp	39.0	0.3	39.3	58.0	-18.7	48.0	-8.7
0.592	Av	37.6	0.3	37.9	56.0	-18.1	46.0	-8.1
0.592	Qp	39.0	0.3	39.3	56.0	-16.7	46.0	-6.7
1.385	Av	33.4	0.5	33.9	56.0	-22.1	46.0	-12.1
1.385	Qp	38.2	0.5	38.7	56.0	-17.3	46.0	-7.3
1.610	Pk	40.2	0.6	40.8	56.0	-15.2	46.0	-5.2
28.300	Pk	31.8	2.3	34.1	60.0	-25.9	50.0	-15.9

Table 8-7: Conducted Emissions (Phase Side); Transmit Mode

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.198	Pk	46.1	0.2	46.3	63.7	-17.4	53.7	-7.4
0.341	Pk	43.1	0.2	43.3	59.2	-15.9	49.2	-5.9
0.401	Pk	43.2	0.3	43.5	57.8	-14.3	47.8	-4.3
0.598	Pk	41.1	0.3	41.4	56.0	-14.6	46.0	-4.6
0.785	Pk	38.7	0.3	39.0	56.0	-17.0	46.0	-7.0
1.190	Pk	37.4	0.5	37.9	56.0	-18.1	46.0	-8.1
2.420	Pk	38.6	0.8	39.4	56.0	-16.6	46.0	-6.6
28.250	Pk	32.3	2.3	34.6	60.0	-25.4	50.0	-15.4

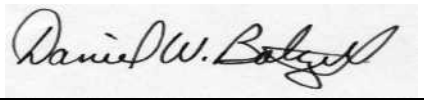
Table 8-8: Conducted Emissions (Neutral Side); Receive Mode

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.153	Pk	54.9	0.2	55.1	65.8	-10.7	55.8	-0.7
0.153	Av	-0.1	0.2	0.1	65.8	-65.7	55.8	-55.7
0.153	Qp	39.4	0.2	39.6	65.8	-26.2	55.8	-16.2
0.175	Pk	52.3	0.2	52.5	64.7	-12.2	54.7	-2.2
0.276	Pk	44.5	0.2	44.7	60.9	-16.2	50.9	-6.2
0.422	Pk	39.9	0.3	40.2	57.4	-17.2	47.4	-7.2
1.460	Pk	38.4	0.5	38.9	56.0	-17.1	46.0	-7.1
26.760	Pk	23.9	2.4	26.3	60.0	-33.7	50.0	-23.7

Table 8-9: Conducted Emissions (Phase Side); Receive Mode

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.173	Pk	52.2	0.2	52.4	64.8	-12.4	54.8	-2.4
0.184	Pk	47.5	0.2	47.7	64.3	-16.6	54.3	-6.6
0.429	Pk	44.0	0.2	44.2	57.3	-13.1	47.3	-3.1
0.500	Pk	42.8	0.2	43.0	56.0	-13.0	46.0	-3.0
1.020	Pk	38.6	0.4	39.0	56.0	-17.0	46.0	-7.0
1.460	Pk	37.9	0.5	38.4	56.0	-17.6	46.0	-7.6
27.710	Pk	27.5	2.3	29.8	60.0	-30.2	50.0	-20.2

Test Personnel:



Daniel W. Baltzell		December 15, 2006
EMC Test Engineer	Signature	Date Of Test

9 Radiated Emissions - §15.209

9.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

9.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10^{th} harmonic of the highest fundamental transmitter frequency (24.8 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 9-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna, (9 kHz - 30 MHz)	827525/019	9/15/09
901365	MITEQ	JS4-00102600-41-5P	Amplifier, 15 V, 0.1-26 GHz, 28 dB gain, power 5 dB	1094152	3/24/07
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	9/13/07
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40 dB (30 MHz – 2 GHz)	1006	3/15/07
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901426	Insulated Wire Inc.	KPS-1503-3600-KPS	RF cable, 30'	NA	12/16/07
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	12/16/07
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	5/20/07
900321	EMCO	3161-03	Horn Antennas (4 - 8,2 GHz)	9508-1020	5/20/07
900323	EMCO	3160-7	Horn Antennas (8,2 - 12,4 GHz)	9605-1054	5/20/07
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	5/20/07
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	5/20/07
901218	EMCO	3301B	Horn Antenna (18 - 26.5 GHz)	960281-003	5/20/07
900392	Hewlett Packard	1197OK	Harmonic Mixer (18 – 26.5 GH)z	3525A00159	11/27/07
900889	Hewlett Packard	85685A	RF Preselector (20 Hz - 2 GHz)	3146A01309	4/12/07

9.3 Radiated Emissions Test Results – Module Alone

9.3.1 Radiated Emissions – Digital Test Data

Table 9-2: Digital Radiated Emissions

Temperature: 68°F Humidity: 48%										
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail
181.000	Qp	H	0	1.0	38.5	-18.6	19.9	43.5	-23.6	Pass
207.000	Qp	H	90	1.0	38.5	-17.3	21.2	43.5	-22.3	Pass
220.000	Qp	H	0	1.0	33.9	-17.3	16.6	46.0	-29.4	Pass
286.000	Qp	V	90	1.5	52.4	-14.1	38.3	46.0	-7.7	Pass
440.000	Qp	V	180	1.0	31.2	-9.4	21.8	46.0	-24.2	Pass
528.000	Qp	V	0	1.0	33.7	-7.4	26.3	46.0	-19.7	Pass

9.3.2 Radiated Emissions Harmonics/Spurious Test Data

Table 9-3: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2412 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4824.0	33.9	28.7	0.5	29.2	54.0	-24.8
7236.0	44.9	37.1	3.3	40.4	76.8	-36.4
9648.0	39.0	29.3	8.4	37.7	76.8	-39.1
12060.0	36.0	24.5	11.3	35.8	54.0	-18.2
14472.0	40.7	27.5	15.3	42.8	54.0	-11.2
16884.0	40.6	26.5	16.3	42.8	76.8	-34.0

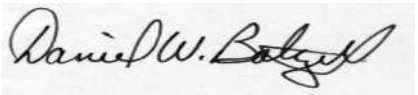
Table 9-4: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2436 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4872.0	33.1	26.5	0.1	26.6	54.0	-27.4
7308.0	43.0	33.6	2.8	36.4	54.0	-17.6
9744.0	39.5	26.7	8.6	35.3	78.1	-42.8
12180.0	37.7	24.6	10.6	35.2	54.0	-18.8
14616.0	41.9	27.8	15.7	43.5	78.1	-34.6
17052.0	41.0	26.9	15.9	42.8	78.1	-35.3

Table 9-5: Radiated Emissions Harmonics/Spurious Channel 11 (TX Frequency: 2462 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4924.0	31.5	22.6	0.4	23.0	54.0	-31.0
7386.0	42.8	32.7	4.0	36.7	54.0	-17.3
9848.0	40.4	27.3	9.3	36.6	77.6	-41.0
12310.0	38.7	24.7	10.2	34.9	54.0	-19.1
14772.0	41.6	27.7	14.7	42.4	77.6	-35.2
17234.0	40.9	27.1	16.2	43.3	77.6	-34.3

Test Personnel:



Daniel W. Baltzell		November 9 and 10, 2006
EMC Test Engineer	Signature	Dates Of Tests

9.4 Radiated Emissions Test Results - Host

9.4.1 Radiated Emissions – Digital Test Data

Table 9-6: Digital Radiated Emissions

Temperature: 58°F Humidity: 59%										
Emission Frequency (MHz)	**Test Detector**	**Antenna Polarity (H/V)**	**Turntable Azimuth (deg)**	**Antenna Height (m)**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB/m)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Pass/ Fail**
73.130	Qp	V	225	1.0	49.4	-23.3	26.1	40.0	-13.9	Pass
84.130	Qp	V	270	1.0	41.6	-21.4	20.2	40.0	-19.8	Pass
253.510	Qp	H	200	1.5	35.1	-14.4	20.7	46.0	-25.3	Pass
255.012	Qp	V	25	1.0	41.4	-14.2	27.2	46.0	-18.8	Pass
285.020	Qp	V	80	1.0	38.1	-13.7	24.4	46.0	-21.6	Pass
345.027	Qp	V	80	1.0	41.9	-11.8	30.1	46.0	-15.9	Pass
525.055	Qp	V	175	1.0	43.1	-7.6	35.5	46.0	-10.5	Pass
525.248	Qp	V	180	1.0	46.9	-7.6	39.3	46.0	-6.7	Pass
555.045	Qp	H	140	1.0	38.1	-6.7	31.4	46.0	-14.6	Pass
585.052	Qp	H	170	1.0	33.0	-6.3	26.7	46.0	-19.3	Pass
615.054	Qp	H	140	1.5	39.0	-5.5	33.5	46.0	-12.5	Pass
630.052	Qp	H	140	1.0	38.0	-5.5	32.5	46.0	-13.5	Pass
645.052	Qp	H	140	1.5	30.8	-5.2	25.6	46.0	-20.4	Pass
720.063	Qp	V	180	1.0	42.3	-4.6	37.7	46.0	-8.3	Pass

9.4.2 Radiated Emissions - Harmonics/Spurious Test Data

Table 9-7: Radiated Emissions - Harmonics/Spurious Channel 1 (TX Frequency: 2412 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2375.4	38.5	30.5	-1.7	28.8	54.0	-25.2
2385.8	56.2	48.2	-1.7	46.5	54.0	-7.5
2412.0	77.7	70.2	28.7	98.9	fundamental	
4803.9	36.8	27.8	6.5	34.3	54.0	-19.7
4824.0	52.0	38.2	6.5	44.7	54.0	-9.3
7236.0	45.0	33.7	8.4	42.1	78.9	-36.8
9648.0	40.6	29.2	14.1	43.3	78.9	-35.6
12060.0	39.1	25.1	14.6	39.7	54.0	-14.3
14472.0	41.5	27.5	19.5	47.0	54.0	-7.0
16884.0	41.1	27.5	20.8	48.3	54.0	-5.7

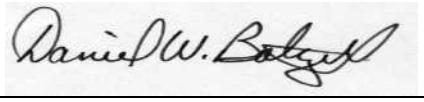
Table 9-8: Radiated Emissions - Harmonics/Spurious Channel 6 (TX Frequency: 2436 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2437.0	75.2	67.7	28.7	96.4	fundamental	
4874.0	50.5	35.7	6.5	42.2	54.0	-11.8
7311.0	48.2	36.7	8.0	44.7	54.0	-9.3
9748.0	39.2	27.3	14.1	41.4	76.4	-35.0
12185.0	35.6	25.3	15.6	40.9	54.0	-13.1
14622.0	39.2	27.7	20.2	47.9	76.4	-28.5
17059.0	40.5	27.6	21.3	48.9	76.4	-27.5

Table 9-9: Radiated Emissions - Harmonics/Spurious Channel 11 (TX Frequency: 2462 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2484.3	45.0	35.1	-1.4	33.7	54.0	-20.3
2462.0	73.7	66.2	28.7	94.9	fundamental	
4889.4	38.4	27.2	6.5	33.7	54.0	-20.3
4924.0	45.1	32.5	6.6	39.1	54.0	-14.9
7386.0	40.7	28.1	8.0	36.1	54.0	-17.9
9848.0	41.5	28.9	14.1	43.0	74.9	-31.9
12310.0	37.7	24.8	15.4	40.2	54.0	-13.8
14772.0	40.5	27.4	19.4	46.8	74.9	-28.1
17234.0	40.2	27.3	20.3	47.6	74.9	-27.3

Test Personnel:



Daniel W. Baltzell		December 21, 2006
EMC Test Engineer	Signature	Dates Of Tests

10 Conclusion

The data in this measurement report shows that the EUT as tested, which includes Model # WF10020, 802.11b Wi-Fi Module, FCC ID: URZ-WF10020, and a Mitsumi Bluetooth module FCC ID# POOWML-C29XX, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations.