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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C and Industry Canada RSS 210 Issue 5 on the 2Wire, Inc. Models 100SE, 1800SW, 180SW, 1200SW

FCC ID:	PGR2W1000W
GRANTEE:	2Wire, Inc. 1704 Automation Parkway San Jose, CA 95131
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	April 7, 2003
FINAL TEST DATE:	April 2, 2003
AUTHORIZED SIGNATORY:	Juan Martinez Sr. EMC Engineer

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:

802.11b Chip Boy Models 100SE, 1800SW, 180SW, 1200SW

Manufacturer:

2Wire, Inc.
1704 Automation Parkway
San Jose, CA 95131

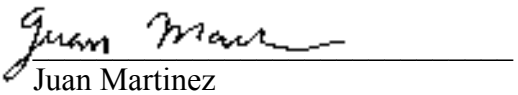
Tested to applicable standards:

RSS-210, Issue 5, November 2001 (Low Power License-Exempt Radiocommunication Devices)
FCC Part 15 Subpart C

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC2845 **SV3** Dated July 30, 2001
Departmental Acknowledgement Number: IC2845 **SV4** Dated July 19, 2001

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of ANSI C63.4 as detailed in section 5.3 of RSS-210, Issue 5); and that the equipment performed in accordance with the data submitted in this report.

Signature	
Name	Juan Martinez
Title	Sr. EMC Engineer
Company	Elliott Laboratories Inc.
Address	684 W. Maude Ave Sunnyvale, CA 94086 USA
Date:	April 7, 2003

Maintenance of compliance with the above standards is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

TABLE OF CONTENTS

SCOPE

An electromagnetic emissions test has been performed on the 2Wire 802.11b Chip Boy Models 100SE, 1800SW, 180SW, 1200SW pursuant to Subpart C of Part 15 of FCC Rules for Direct Sequence Spread Spectrum (DSSS) devices and RSS-210 Issue 5 for low power licence-exempt devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the 2Wire 802.11b Chip Boy Models 100SE, 1800SW, 180SW, 1200SW and therefore apply only to the tested sample. The sample was selected and prepared by Jeremy Muir of 2Wire, Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules and Industry Canada RSS-210 for the radiated and conducted emissions of low power intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units that are subsequently manufactured.

SUMMARY OF RESULTS

FCC Part 15 Section	RSS 210 Section	Description	Measured Value	Comments	Result
15.247(a)			Systems uses Direct Sequence Spread Spectrum techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)		6dB Bandwidth	11.67 MHz	Minimum allowed is 500kHz	Complies
	RSP 100	99% Bandwidth	22.52 MHz	Minimum allowed is 500kHz	Complies
15.247 (b) (3)	6.2.2(o)(b)	Output Power, 2400 - 2483.5 MHz	19.5 dBm (0.089 Watts) EIRP = 0.177 W	Multi-point applications: Maximum permitted is 1Watt, with EIRP limited to 4 Watts.	Complies
15.247(d)	6.2.2(o)(b)	Power Spectral Density	-5.67dBm / MHz	Maximum permitted is 8dBm/3kHz	Complies
15.247(c)	6.2.2(o)(e1)	Spurious Emissions – Antenna Conducted 30MHz – 25GHz	All spurious emissions < -20dBc	All spurious emissions < -20dBc.	Complies
	6.2.2(o)(e1)	Radiated Spurious Emissions 30MHz – 25GHz	All spurious emissions < -20dBc	Emissions in restricted bands must meet the radiated emissions limits detailed in 15.207	Complies
15.247(c) / 15.209		Radiated Spurious Emissions 30MHz – 25GHz	53.5 dBuV/m @ 2462 MHz (-0.5 dB)	Emissions in restricted bands must meet the radiated emissions limits detailed in 15.207. All others must be < -20dBc	Complies
15.207		AC Conducted Emissions	41.2dBuV @ 2.227 MHz (-14.8dB)	Conducted emissions from the AC power port must meet the limits set forth in 15.207	Complies
15.247 (b) (5)		RF Exposure Requirements			
15.203		RF Connector	Unique antenna connection required for user-installed applications. Standard rf connectors permitted for professionally installed systems.	Integral antenna or specialized connector required	Complies
	6.2.2(o)(b)	Processing Gain		Requirement has been removed	

EIRP calculated using antenna gain of dBi (3) for the highest EIRP point-to-multipoint system.

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The 2Wire 802.11b Chip Boy Models 100SE, 1800SW, 180SW, 1200SW are Access points which are designed to provide wireless networking. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz, 2 Amps.

The sample was received on April 2, 2003 and tested on April 2, 2003. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	Proposed FCC ID #
2Wire 1000SW, 1800SW, 180SW, 1200SW Accesspoint	-	TBD

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 2 cm wide by 6 cm deep by 6 cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

The following equipment was used as local support equipment for emissions testing:

Manufacturer/Model/Description	Serial Number	FCC ID Number
Dell PP01L Laptop	9D314A00	DoC

No equipment was used as remote support equipment for the Radio emissions testing:

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length (m)
Ethernet	Laptop	Cat 5	Unshielded	0.5

Note: The Ethernet and DSL ports were not connected, as these were not needed while testing the wireless portion of the device. The Laptop was not connected during the radio test, as the transmitter will continuously transmit, on its own, after being configured.

EUT OPERATION DURING TESTING

Set to continuously transmit on channels 1, 6, and 11 at 19.5 dBm.

ANTENNA REQUIREMENTS

As the device is intended to operate in the 2412 – 2462 GHz band an integral antenna as detailed in 15.203 and RSS-210 6.2.2(q1) (i) is required. The antenna is integral to the PCB board and is permanently attached.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on April 2, 2003 at the Elliott Laboratories Open Area Test Site #4 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Federal Communications Commission. In accordance with Industry Canada rules detailed in RSS 210 Issue 5 and RSS-212, construction, calibration, and equipment data for the test sites have been filed with the Federal Communications Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

POWER METER

A power meter and peak power sensor are used for all direct output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

ANSI C63.4 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

Measurement bandwidths (video and resolution) are set in accordance with FCC procedures for the type of radio being tested.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions from the AC power port are given in units of microvolts, the limits for radiated electric field emissions are given in units of microvolts per meter at a specified test distance and the output power limits are given in temrs of Watts, milliwatts or dBm. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp) the following formula is used to determine the field strength limit in terms of microvolts per meter at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

For reference, converting the voltage and electric field strength specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. Conversion of power specification limits from linear units (in milliwatts) to decibel form (in dBm) is accomplished by taking the base ten logarithm, then multiplying by 10.

SPURIOUS RADIATED EMISSIONS LIMITS

The table below shows the limits for unwanted (spurious) emissions falling in the restricted bands detailed in Part 15.205 and Industry Canada RSS-210 Table 2.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

Note 1: For other than restricted bands, the emissions must be 20 dB below the highest in band emissions level.

AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in Industry Canada RSS-210 section 6.6.

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

AC MAINS CONDUCTED EMISSIONS SPECIFICATION LIMITS, FCC SECTION 15.207

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, if the amplitude measured in the quasi-peak mode is at least 6 dB higher than the amplitude measured in the average mode, the level measured in the quasi-peak mode may be reduced by 13 dB before comparing it to the limit.

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. A distance factor, when used for electric field measurements, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1: Test Equipment Calibration Data

2 Pages

Radiated Emissions, 1000 - 25,000 MHz, 02-Apr-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	Spectrum Analyzer 9kHz - 40 GHz	8564E (84125C)	1393	12	3/12/2003	3/12/2004
Hewlett Packard	EMC Spectrum Analyzer, Opt. 026 9 KHz -26.5GHz	8593EM	1141	12	3/19/2003	3/19/2004

Antenna Conducted Measurements, 02-Apr-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Rohde & Schwarz	Peak Power Sensor 100uW - 2 Watts	NRV-Z32	1423	12	9/6/2002	9/6/2003
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	12	9/6/2002	9/6/2003
Hewlett Packard	Spectrum Analyzer 9kHz - 40 GHz	8564E (84125C)	1393	12	3/12/2003	3/12/2004

Radiated Emissions, 30 - 2000 MHz, 07-Apr-03
Engineer: rwong

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Biconical Antenna, 30-300 MHz	3110B	1320	12	6/3/2002	6/3/2003
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	786	12	2/28/2003	2/28/2004
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	12	10/30/2002	10/30/2003
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12	8/14/2002	8/14/2003

Radiated Emissions, 30 - 2000 MHz, 07-Apr-03
Engineer: rwong

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	Spectrum Analyzer, 9KHz - 26.5GHz	8563E	F1202LB	12	9/27/2002	9/27/2003
Rohde & Schwarz	Test Receiver, 20-1300MHz	ESVP	213	12	7/22/2002	7/22/2003

Conducted Emissions, 07-Apr-03
Engineer: rwong

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Elliott Laboratories	FCC / CISPR LISN	LISN-4, OATS	362	12	4/19/2002	4/19/2003
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	1/24/2003	1/24/2004

Conducted Emissions on I/O Ports, 16-Apr-03
Engineer: jcadigal

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Fischer Custom Communication	ISN, 9 KHz -30 MHz	FCC-TLISN-T4	1263	12	12/13/2001	5/30/2003
Fischer Custom Communication	ISN Connecting Adapter, RJ45-4	ISNT4-AE-RJ45-4	1271	12	12/13/2201	5/30/2003
Fischer Custom Communication	LCL Adapter 60/35 dB, RJ45-4	ISNT4-EUT-RJ45-4-2.5	1270	12	12/13/2001	5/30/2003
Rohde & Schwarz	ISN - T1 (2-wire TISN)	ESH3-Z4, 800.1510.52	267	12	8/31/2002	8/31/2003
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12	12/27/2002	12/27/2003
Solar Electronics	Support Equipment LISN, 0.150-30.0 MHz	8012-50-R-24-BNC	305	12	8/20/2002	8/20/2003
Solar Electronics Co	LISN	8028-50-TS-24-BNC	904	12	6/19/2002	6/19/2003

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T50716 16 Pages
T50374 9 Pages

Elliott

EMC Test Data

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Account Manager:	Dean Eriksen
Contact:	Jeremy Muir		
Emissions Spec:	FCC 15.247 & RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

2Wire

Model

1000SW, 1800SW, 180SW, 1200SW

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Account Mangager:	Dean Eriksen
Contact:	Jeremy Muir		
Emissions Spec:	FCC 15.247 & RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a Accesspoint which is designed to provide wireless networking. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz, 2 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
2wire	1000SW, 1800SW, 180SW, 1200SW	Accesspoint	-	TBD

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 2 cm wide by 6 cm deep by 6 cm high.

Modification History

Mod. #	Test	Date	Modification
1			

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Account Manager:	Dean Eriksen
Contact:	Jeremy Muir		
Emissions Spec:	FCC 15.247 & RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PP01L	Laptop	9D314A00	DoC

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Ethernet	Laptop	Cat 5	Unshielded	0.5

Note: The Ethernet and DSL ports were not connected as these were not needed while testing the wireless portion of the device. The Laptop was not connected during the radio test as the transmitter will continuously transmit, on its own, after being configured.

EUT Operation During Radio Test

Set to continuously transmit on channels 1, 6, and 11 at 19.5 dBm.

Elliott

EMC Test Data

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

15.247 DTS Radiated & Antenna Conducted Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 4/2/2003
Test Engineer: jmartinez
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.
When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 11°C
Rel. Humidity: 98%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a-1c	RE, 30 - 25000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	Refer to individual runs
2	6dB Bandwidth	15.247(a)	Pass	11.67 MHz
3	Peak Output Power	15.247(b)	Pass	19.5 dBm
4	Power Spectral Density (PSD)	15.247(d)	Pass	-5.67dBm
5	Out of Band	15.247(c)	Pass	Refer to individual plots

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30-25,000 MHz. Middle Channel @ 2437 MHz

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	106.85	114.72
Limit for emissions outside of restricted bands:	94.72 dBμV/m	

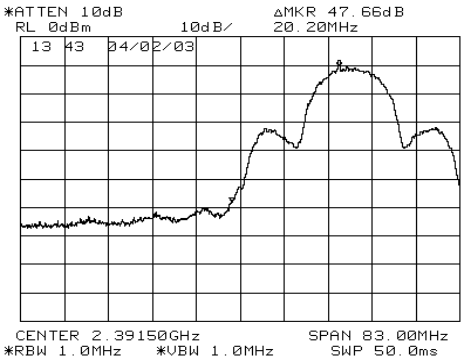
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4873.000	56.2	h	74.0	-17.8	Pk	215	1.0	
4873.000	43.1	h	54.0	-10.9	Avg	215	1.0	
7312.000	56.1	h	74.0	-17.9	Pk	67	1.6	
7312.000	46.4	h	54.0	-7.6	Avg	67	1.6	
12186.00	54.5	h	74.0	-19.5	Pk	361	1.0	
12186.00	41.2	h	54.0	-12.8	Avg	361	1.0	
4873.000	58.7	v	74.0	-15.3	Pk	132	1.0	
4873.000	45.8	v	54.0	-8.2	Avg	132	1.0	
7312.000	56.9	v	74.0	-17.1	Pk	297	1.0	
7312.000	47.6	v	54.0	-6.4	Avg	297	1.0	
12186.00	53.7	v	74.0	-20.3	Pk	63	1.0	
12186.00	42.0	v	54.0	-12.0	Avg	63	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

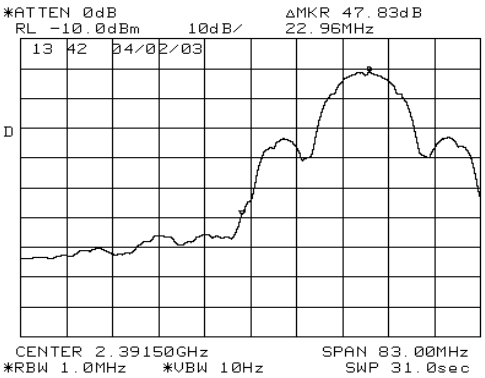
Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30-25,000 MHz. Low Channel @ 2412 MHz

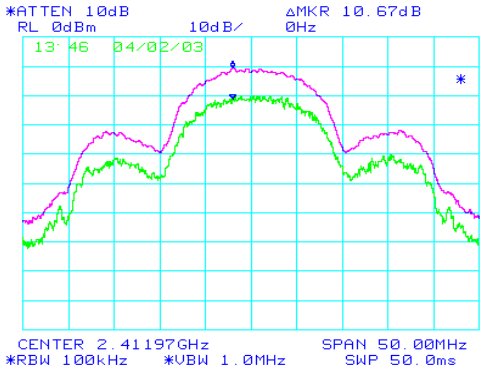
Peak Measurement



Average Measurement



Resolution Correction



Elliott

EMC Test Data

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	109.8	117.8
Limit for emissions outside of restricted bands:	97.8 dBμV/m	

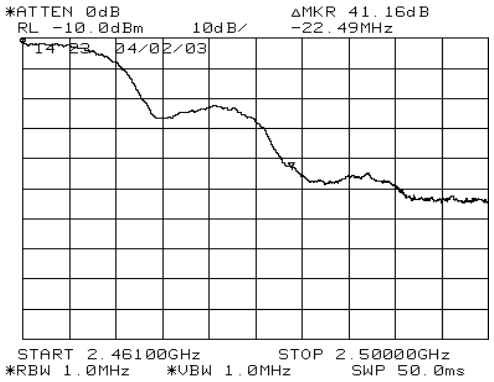
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.000	111.2	h	-	-	Pk	-	-	
2412.000	103.4	h	-	-	Avg	-	-	
2412.000	117.8	v	-	-	Pk	-	-	
2412.000	109.8	v	-	-	Avg	-	-	
2412.000	63.5	h	74.0	-10.5	Pk	-	-	Refer to plots above
2412.000	52.0	h	54.0	-2.0	Avg	-	-	Refer to plots above
2412.000	70.1	v	74.0	-3.9	Pk	-	-	Refer to plots above
2412.000	51.3	v	54.0	-2.7	Avg	-	-	Refer to plots above
4824.00	60.4	h	74.0	-13.6	Pk	235	1.1	
4824.00	46.5	h	54.0	-7.5	Avg	235	1.1	
12060.00	54.8	h	74.0	-19.3	Pk	361	1.0	
12060.00	42.6	h	54.0	-11.4	Avg	361	1.0	
7236.00	59.2	h	74.0	-14.9	Pk	228	1.0	Non-restricted
7236.00	49.8	h	54.0	-4.2	Avg	228	1.0	Non-restricted
4824.00	65.0	v	74.0	-9.1	Pk	296	1.0	
4824.00	52.3	v	54.0	-1.7	Avg	296	1.0	
12060.00	54.5	v	74.0	-19.5	Pk	276	1.2	
12060.00	41.1	v	54.0	-12.9	Avg	276	1.2	
7236.00	56.9	v	74.0	-17.1	Pk	27	1.2	Non-restricted
7236.00	47.6	v	54.0	-6.4	Avg	27	1.2	Non-restricted

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

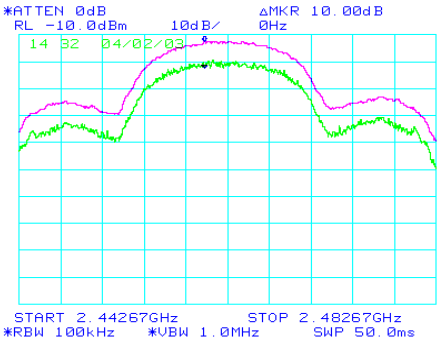
Run #1c: Radiated Spurious Emissions, 30-25,000 MHz. High Channel @ 2462 MHz

Peak Measurement



Average Measurement

Resolution Correction



Elliott

EMC Test Data

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	106.5	115
Limit for emissions outside of restricted bands:	95 dBμV/m	

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2462.000	115.0	v	-	-	Pk	-	-	
2462.000	106.5	v	-	-	Avg	-	-	
2462.000	113.3	h	-	-	Pk	-	-	
2462.000	105.2	h	-	-	Avg	-	-	
2462.000	63.8	v	74.0	-10.2	Pk	-	-	Refer to plots above
2462.000	53.5	v	54.0	-0.5	Avg	-	-	Refer to plots above
2462.000	62.2	h	74.0	-11.8	Pk	-	-	Refer to plots above
2462.000	52.2	h	54.0	-1.8	Avg	-	-	Refer to plots above
4924.00	65.4	h	74.0	-8.6	Pk	298	1.6	
4924.00	37.6	h	54.0	-16.4	Avg	298	1.6	
7386.00	55.0	h	74.0	-19.0	Pk	98	1.6	
7386.00	44.7	h	54.0	-9.4	Avg	98	1.6	
9848.00	57.9	h	74.0	-16.1	Pk	110	1.1	Non-restricted
9848.00	51.1	h	54.0	-2.9	Avg	110	1.1	Non-restricted
12309.00	52.6	h	74.0	-21.4	Pk	311	1.1	
12309.00	40.4	h	54.0	-13.6	Avg	311	1.1	
4924.00	56.8	v	74.0	-17.2	Pk	293	1.8	
4924.00	43.5	v	54.0	-10.5	Avg	293	1.8	
7386.00	55.6	v	74.0	-18.4	Pk	63	1.3	
7386.00	45.6	v	54.0	-8.4	Avg	63	1.3	
9848.00	55.3	v	74.0	-18.7	Pk	335	1.6	Non-restricted
9848.00	46.3	v	54.0	-7.7	Avg	335	1.6	Non-restricted
12309.00	52.7	v	74.0	-21.3	Pk	55	1.1	
12309.00	40.4	v	54.0	-13.6	Avg	55	1.1	

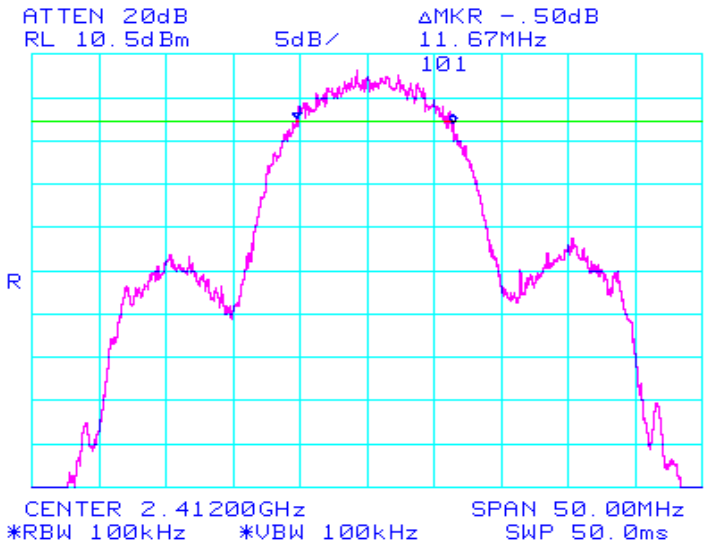
Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

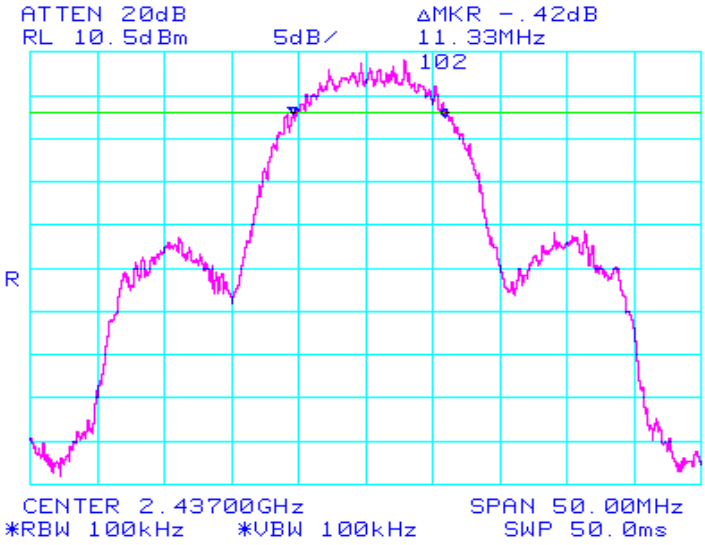
Run #2: Signal Bandwidth

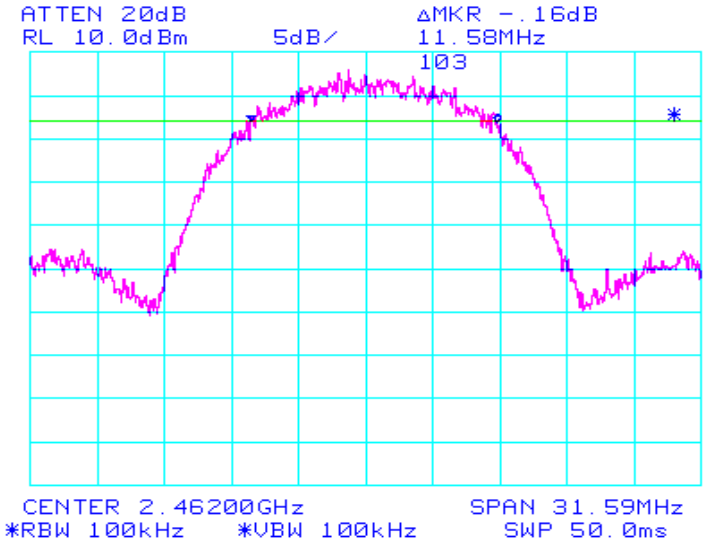
Channel	Frequency (MHz)	Resolution Bandwidth	6dB Signal Bandwidth	Graph reference #
Low	2412	100 kHz	11.67 MHz	101
Mid	2437	100 kHz	11.33 MHz	102
High	2462	100 kHz	11.58 MHz	103

Note 1:	Add note here
Note 2:	



Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A





Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

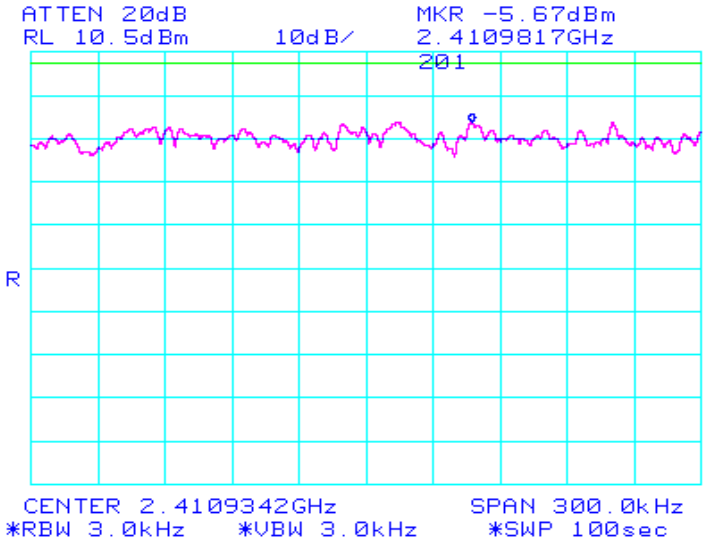
Run #3: Peak Output Power Measurement

Channel	Frequency	Peak Output Power
	(MHz)	(dBm)
Low	2412	19.5
Mid	2437	19.5
High	2462	19.5

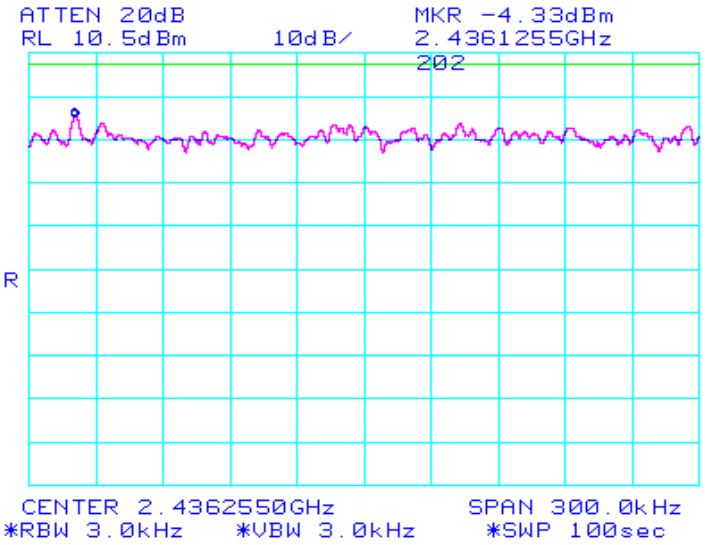
Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

Run #4: Power Spectral Density

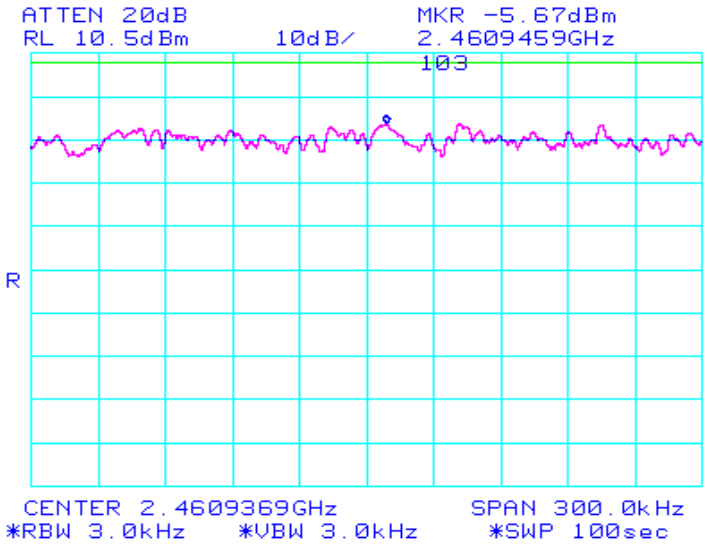
Channel	Frequency (MHz)	Res BW	P.S.D. (averaged over 1 second in a 3kHz bandwidth)	Graph reference #
Low	2412	3kHz	-5.67dBm	201
Mid	2437	3kHz	-4.33dBm	202
High	2462	3kHz	-5.67dBm	203



Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

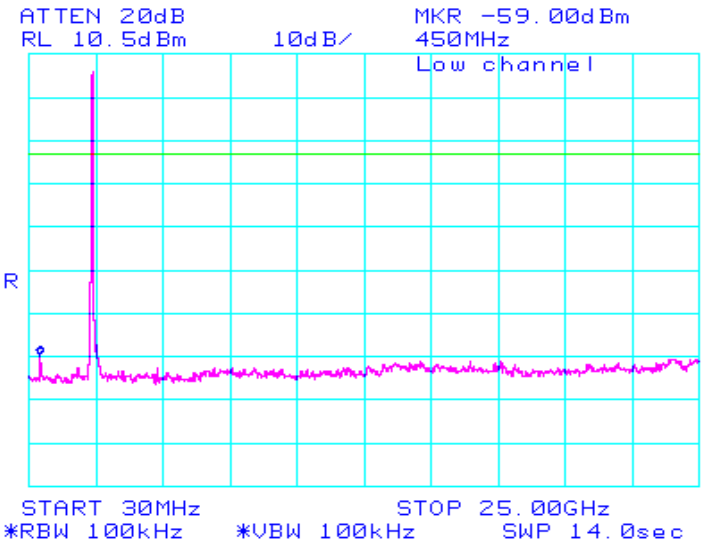


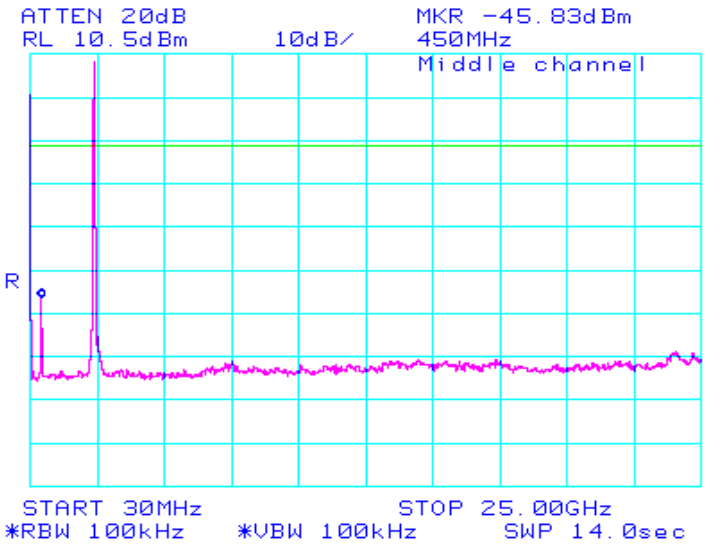
Plot below should be 203



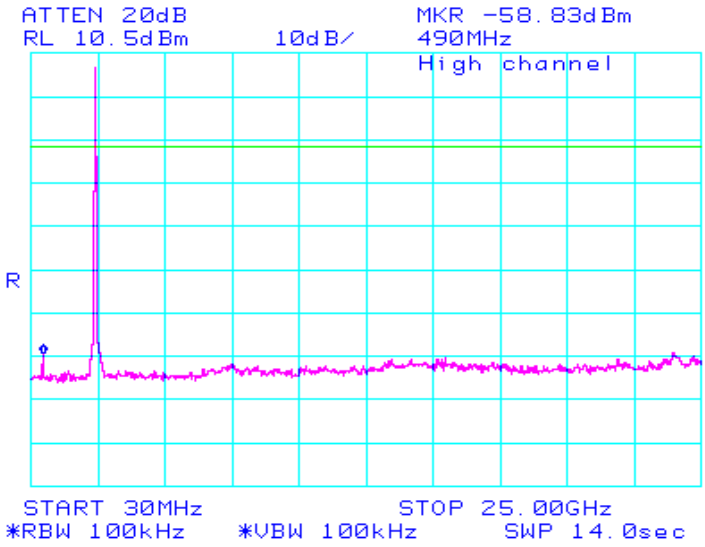
Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A

Run #5: Out-of-band emissions





Client:	2Wire	Job Number:	J50351
Model:	1000SW, 1800SW, 180SW, 1200SW	T-Log Number:	T50716
		Proj Eng:	Dean Eriksen
Contact:	Jeremy Muir		
Spec:	FCC 15.247 & RSS-210	Class:	N/A



Elliott

EMC Test Data

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Proj Eng:	Mark Hill
Contact:	Jeremy Muir		
Emissions Spec:	EN55022	Class:	B
Immunity Spec:	EN55024	Environment:	Other Telco

EMC Test Data

For The

2Wire, Inc.

Model

HomePortal1800SW

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Proj Eng:	Mark Hill
Contact:	Jeremy Muir		
Emissions Spec:	EN55022	Class:	B
Immunity Spec:	EN55024	Environment:	Other Telco

EUT INFORMATION

General Description

The EUT is a DSL router designed to route DSL signals to computers. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 120/240 V, 50/60 Hz, 1.25 Amps.

Equipment Under Test (Emissions)

Manufacturer	Model	Description	Serial Number	FCC ID
2Wire	HomePortal1800SW	Modem	983231000093	-

Other EUT Details

None

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 2 cm wide by 6 cm deep by 6 cm high.

Modification History

Mod. #	Test	Date	Modification
1	-	-	None

Elliott

EMC Test Data

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Proj Eng:	Mark Hill
Contact:	Jeremy Muir		
Emissions Spec:	EN55022	Class:	B
Immunity Spec:	EN55024	Environment:	Other Telco

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PPX	Laptop	255-238-15	-
Hewlett Packard	2225C+	Printer	3028S76892	DS16XU2225

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Ergo	MP-989	Laptop #1	KC05LG9140010	-
Coby	CT-P220	Phone	324001152	-
TLS	TLS3	Call simulator	132916	-
D-Link	TLS3	10/100 Fast Ethernet swtich	B20522B004945	-
D-Link	TLS3	10/100 Fast Ethernet swtich	B20522B004942	-
D-Link	TLS3	10/100 Fast Ethernet swtich	B20522B004920	-

Interface Ports

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length(m)
RJ11	Call simulator	4 wire	Unshielded	10m
Ethernet (x3)	Swtich (x3)	CAT 5	Unshielded	10m
DC input	AC adapter	2 wire	Unshielded	2m
USB	Local laptop	multiwire	Shielded	2m

EUT Operation During Emissions

During emissions testing, the EUT was connected to two remote laptop PCs using the EUT's phone line and Etherent ports. The two laptop PCs pinged to each other through the EUT. In addition, the EUT was connected to a third laptop which functioned as the host PC. This PC was used to ping to and from the EUT.

A batch file was also running on the host laptop to display scrolling "H" characters on the laptop display.

Elliott

EMC Test Data

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Proj Eng:	Mark Hill
Contact:	Jeremy Muir		
Emissions Spec:	EN55022	Class:	B
Immunity Spec:	EN55024	Environment:	Other Telco

EUT Operation During Immunity

During immunity testing, the EUT was connected to two remote laptop PCs using the EUT's phone line and Ethernet ports. The two laptop PCs pinged to each other through the EUT. In addition, the EUT was connected to a third laptop which functioned as the host PC. This PC was used to ping to and from the EUT.

A batch file was also running on the host laptop to display scrolling "H" characters on the laptop display.
System performance was visually monitored by observing the ping status on the three laptop PCs.

Performance Criteria for Immunity

Criterion A:

The EUT shall continued normal operation during and after the test. The percentage of "ping" packets lost shall remained less than 5% as verified on the three laptop PCs.

In addition, or specific dwell frequencies during radiated and conducted immunity testing, it was demonstrated and verified that it was possible to manually stop and restart pinging in a controlled manner.

Criterion B:

Performance criteria B was interpreted as:
Errors or susceptibilities are acceptable, provided that the unit can recover and continue its normal operations without user intervention.

Criterion C:

Performance criteria C was interpreted as:
Loss of function is allowed provided that normal operation can be restored after the test through operation of the controls.

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Account Manager:	Mark Hill
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 4/7/2003
Test Engineer: Rod Wong
Test Location: SVOATS #3

Config. Used: #1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing. Remote support equipment was located approximately 30 meters from the test area with all I/O connections routed overhead.

On the OATS, the measurement antenna was located 3 & 10 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Note, for testing above 1 GHz, the FCC specifies the limit as an average measurement. In addition, the FCC states that the peak reading of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Ambient Conditions:

Temperature: 20 °C
Rel. Humidity: 50 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 -1000 MHz, Preliminary Scan	EN55022 B	Eval	Refer to individual runs
2	RE, 30 - 1000MHz, Maximized Emissions	EN55022 B	Pass	-0.8dB @ 115.106MHz
3	RE, 30 - 1000MHz, Maximized Emissions	FCC B	Pass	-3.8dB @ 115.106MHz
4	RE, 1000 - 2000 MHz, Maximized Emissions	FCC B	Pass	-20.0dB @ 1484.0MHz

Elliott

EMC Test Data

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Account Manager:	Mark Hill
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Run #1: Preliminary Radiated Emissions, 30-1000 MHz
10 Meter Measurements

Frequency	Level	Pol	EN55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
115.106	29.2	V	30.0	-0.8	QP	175	1.0	
142.039	26.6	H	30.0	-3.4	QP	231	2.7	
195.434	26.5	H	30.0	-3.5	QP	84	2.5	
671.235	33.1	V	37.0	-3.9	QP	226	1.0	
111.019	25.3	V	30.0	-4.7	QP	184	1.0	
812.547	31.9	H	37.0	-5.1	QP	270	1.1	
399.008	31.6	H	37.0	-5.4	QP	305	2.0	
172.846	24.3	H	30.0	-5.7	QP	63	2.8	
812.546	31.3	V	37.0	-5.7	QP	219	2.6	
156.770	24.1	H	30.0	-5.9	QP	212	2.6	
325.732	30.4	V	37.0	-6.6	QP	62	1.0	
798.017	30.0	H	37.0	-7.0	QP	64	1.8	
225.005	22.8	H	30.0	-7.2	QP	240	3.8	
373.363	29.3	H	37.0	-7.7	QP	188	2.3	
399.010	28.8	V	37.0	-8.2	QP	223	1.0	
798.017	27.8	V	37.0	-9.2	QP	215	1.6	
373.362	27.1	V	37.0	-9.9	QP	199	1.0	
357.970	26.4	H	37.0	-10.6	QP	189	2.7	
706.562	26.3	H	37.0	-10.7	QP	228	1.5	
325.732	26.1	H	37.0	-10.9	QP	239	2.1	
706.563	25.9	V	37.0	-11.1	QP	213	1.0	
635.905	24.8	H	37.0	-12.2	QP	179	1.7	
275.012	23.4	H	37.0	-13.6	QP	65	1.9	

Elliott

EMC Test Data

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Account Manager:	Mark Hill
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Run #2: Maximized Readings From Run #1
10 Meter Measurements

Frequency	Level	Pol	EN55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
115.106	29.2	V	30.0	-0.8	QP	175	1.0	
195.434	26.7	H	30.0	-3.3	QP	84	2.5	
142.039	26.6	H	30.0	-3.4	QP	231	2.7	
671.235	33.1	V	37.0	-3.9	QP	226	1.0	
111.019	25.3	V	30.0	-4.7	QP	184	1.0	
812.547	31.9	H	37.0	-5.1	QP	270	1.1	

Run #3: Preliminary Radiated Emissions, 30-1000 MHz (Restricted Band Emissions)
3 Meters Measurement

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
115.106	39.7	V	43.5	-3.8	QP	175	1.0	
111.019	35.8	V	43.5	-7.7	QP	184	1.0	
172.846	34.8	H	43.5	-8.7	QP	63	2.8	
156.770	34.6	H	43.5	-8.9	QP	212	2.6	
325.732	40.9	V	46.0	-5.1	QP	62	1.0	
325.732	36.6	H	46.0	-9.4	QP	239	2.1	
275.012	33.9	H	46.0	-12.1	QP	65	1.9	

Run #4: Maximized readings, 1000 - 2000 MHz
Measurements made at 3m per FCC requirements.

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1484.000	34.0	V	54.0	-20.0	Avg	215	1.0	
1413.000	32.3	V	54.0	-21.7	Avg	208	1.1	
1413.000	29.2	H	54.0	-24.8	Avg	162	1.0	
1484.000	28.2	H	54.0	-25.8	Avg	157	1.0	
1330.000	23.7	V	54.0	-30.3	Avg	250	1.0	
1342.000	23.3	H	54.0	-30.7	Avg	155	1.0	
1413.000	39.0	V	74.0	-35.0	Pk	208	1.1	
1413.000	37.4	H	74.0	-36.6	Pk	162	1.0	
1484.000	36.5	H	74.0	-37.5	Pk	157	1.0	
1484.000	34.7	V	74.0	-39.3	Pk	215	1.0	
1342.000	34.4	H	74.0	-39.6	Pk	155	1.0	
1330.000	25.5	V	74.0	-48.5	Pk	250	1.0	

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EMC Test Data

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Account Manager:	Mark Hill
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Conducted Emissions - Power Ports

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test:	4/7/2003	Config. Used:	#1
Test Engineer:	Rod Wong	Config Change:	None
Test Location:	SVOATS #3	EUT Voltage:	120V/60Hz

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment. Remote support equipment was located approximately 30 meters from the test area. All I/O connections routed overhead.

Ambient Conditions:

Temperature:	20 °C
Rel. Humidity:	50 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN55022 B	Pass	-14.8dB @ 2.227MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	2Wire, Inc.	Job Number:	J50351
Model:	HomePortal1800SW	T-Log Number:	T50374
		Account Manager:	Mark Hill
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
2.227	41.2	Neutral	56.0	-14.8	QP	
2.992	40.4	Neutral	56.0	-15.6	QP	
3.206	40.1	Line 1	56.0	-15.9	QP	
0.260	43.4	Line 1	61.4	-18.0	QP	
2.685	37.8	Line 1	56.0	-18.2	QP	
3.401	37.5	Neutral	56.0	-18.5	QP	
2.685	23.1	Line 1	46.0	-22.9	AV	
2.227	16.5	Neutral	46.0	-29.5	AV	
2.992	15.7	Neutral	46.0	-30.3	AV	
3.206	14.8	Line 1	46.0	-31.2	AV	
0.260	18.7	Line 1	51.4	-32.7	AV	
3.401	12.8	Neutral	46.0	-33.2	AV	