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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 2Wire, Inc. Model: HomePortal 1800HG, HomePortal1000HG, HomePortal180HG, BT Wireless Newtwork 1250 and BT intelligent Gateway 1800HG

FCC ID:	PGR2WHPLHG
GRANTEE:	2Wire, Inc. 1704 Automation Parkway San Jose, CA. 95131
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	May 13, 2004
FINAL TEST DATE:	April 20, April 27 and May 3, 2004
AUTHORIZED SIGNATORY:	Juan Martinez Senior EMC Engineer

ACCREDITED

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DECLARATIONS OF COMPLIANCE

Equipment Name and Model:

HomePortal 1800HG, HomePortal1000HG, HomePortal180HG, BT Wireless Newtwork 1250 and BT intelligent Gateway 1800HG

Manufacturer:

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

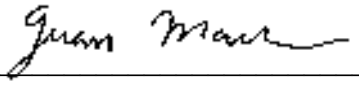
Tested to applicable standards:

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 **SV1** 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:	May 13, 2004

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.).

SCOPE

An electromagnetic emissions test has been performed on the 2Wire, Inc. model HomePortal 1800HG pursuant to Subpart C of Part 15 of FCC Rules for Digital Transmission System (DTS) 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, Inc. model HomePortal 1800HG and therefore apply only to the tested sample. The sample was selected and prepared by Jeremy Muir of 2Wire, Inc.

Model HomePortal 1800 HG was considered representative of the following models:
HomePortal1000HG - Same as 1800HG but with single Ethernet port
HomePortal180HG - has the DSL section removed.
BT Wireless Network 1250 - Exactly the same as the 1800HG
BT intelligent Gateway 1800HG - Exactly the same as the 1800HG

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, which are subsequently manufactured.

SUMMARY OF RESULTS

FCC Part 15 Section	RSS 210 Section	Description	Measured Value	Comments	Result
15.247(a)	6.2.2(o)(b)	Digital Modulation	Systems uses OFDM & DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	6.2.2(o)(b)	6dB Bandwidth	13.10 MHz	Minimum allowed is 500kHz	Complies
	RSP 100	99% Bandwidth	15.63 MHz	For information only	Complies
15.247 (b) (3)	6.2.2(o)(b)	Output Power, 2400 - 2483.5 MHz	26.2 dBm (.416 Watts) EIRP = .832 W (Note: For results of power refer to data 9 of 21 and 19 of 21)	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	-1.8 dBm / MHz	Maximum permitted is 8dBm/3kHz	Complies
15.247(c)	6.2.2(o)(e1)	Antenna Port Spurious Emissions – 30MHz – 26 GHz	All spurious emissions < -20dBc	All spurious emissions < -20dBc.	Complies
15.247(c) / 15.209		Radiated Spurious Emissions – 30MHz – 26 GHz	52.4 dBuV/m @ 4873.965 MHz (-1.6 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	42.9 dBuV @ 3.296 MHz (-3.1 dB)		Complies
	6.6	AC Conducted Emissions	45 dBuV @ 3.296 MHz (-3.0 dB)		Complies
15.247 (b) (5)		RF Exposure Requirements	MPE Calculation		
15.203		RF Connector	Antenna is part of the PCB board and is permanent	Unique antenna connection required for user-installed applications. Standard rf connectors permitted for professionally installed systems	Complies

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, Inc. model HomePortal 1800HG is a DSL router designed to route DSL signals to computers. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as tabletop 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.

The sample was received on April 20, 2004 and tested on April 20, April 27 and May 3, 2004. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number
2Wire	HomePortal 1800SW	Modem	-
2Wire	SAL115A-0525-6G	AC Adpater	-
Sino-American	SAL115A-0525V-6	AC Adpater	-
Goodpower	GPUSW062000WDOS	AC Adpater	-

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 require modifications during testing in order to comply with the emission specifications.

R793 changed to 124k? as referenced on page 10 of schematic 3100-000384-002

SUPPORT EQUIPMENT

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

Manufacturer/Model/Description	Serial Number	FCC ID Number
Dell	109	DoC

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

Manufacturer/Model/Description	Serial Number	FCC ID Number
Ergo/MP989/Laptop	KC50LG8140010	DoC
Dell/PPX/Laptop	99125	DoC
2wire/PCP-1/PC port	00D09E3C3E1D	-

EUT INTERFACE PORTS

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

Port	Connected to	Cable(s)		
		Description	Shielded or Unshielded	Length (m)
AC power	Converter	P/S Brick	Unshielded	1
Ethernet	Remote Laptop	CAT5	Unshielded	>2
Phone	PC port	RJ45	Unshielded	>2
USB	Local Laptop	Multiwire	Shielded	>2

EUT OPERATION DURING TESTING

EUT was continuously transmitting at full power on low, middle, and high channels.

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 20, April 27 and May 3, 2004at the Elliott Laboratories Open Area Test Site #1 & 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 and 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.

CONDUCTED POWER MEASUREMENTS FROM ANTENNA PORT

The following procedure is taken from DA-02-2138 (UNII procedure, Method# 3). This method was used on the 802.11G, since the analyzer does not have a wide enough RBW to capture the entire power envelope of the signal. We also do not have a peak power meter that has a fast response time, which will yield lower peak readings. The FCC and ATCB have accepted the DA-02-2138 power method to be used on 802.11G radios.

Set span to encompass the entire emission bandwidth (EBW) of the signal.
Set sweep trigger to "free run".
Set RBW = 1 MHz. Set VBW = 3 MHz
Use linear display mode.
Use sample detector mode if bin width (i.e., span/number of points in spectrum) < 0.5 RBW. Otherwise use peak detector mode.
Set max hold.
Allow max hold to run for 60 seconds.
Compute power by integrating the spectrum across the 26 dB EBW
The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

For 802.11B radio a peak power meter was used.

For power measurements results refer to data 9 of 21 and 19 of 21.

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:

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

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.

FCC 15.407 (a)and RSS 210 (o) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
902 – 928	1 Watts (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watts (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watts (30 dBm)	8 dBm/3kHz

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

RSS 210 (o) AND FCC 15.247 SPURIOUS RADIATED EMISSIONS LIMITS

T limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands detailed in Part 15.205 and for all spurious emissions from the receiver are:

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

All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level.

FCC 15.205 AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in FCC Part 15.205.

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

RSS-210 SECTION 6.6 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

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, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

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 Page

Radio Antenna Port (Power and Spurious Emissions), 03-May-04
Engineer: Chris Byleckie

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	786	29-Oct-04
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz), Sunnyvale	84125C	1149	02-Jun-04
Hewlett Packard	EMC Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	20-Nov-04
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	11-Sep-04
Rohde & Schwarz	Peak Power Sensor 100uW - 2 Watts	NRV-Z32	1423	18-Mar-05

Radiated Emissions, 30 - 26,500 MHz, 18-May-04
Engineer: Juan Martinez

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Horn antenna, D. Ridge 1-18GHz (SA40 system antenna)	3115	1142	27-May-04
Hewlett Packard	EMC Spectrum Analyzer 30Hz - 40 GHz, Sunnyvale	8564E (84125C)	1148	02-Jun-04
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz), Sunnyvale	84125C	1149	02-Jun-04
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	11-Sep-04
Rohde & Schwarz	Peak Power Sensor 100uW - 2 Watts	NRV-Z32	1423	18-Mar-05

Radiated Emissions, 30 - 1,000 MHz, 21-Apr-04
Engineer: Yu Chien Ho

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	13-May-04
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	05-Jan-05
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	28-Oct-04

Conducted Emissions - AC Power Ports, 21-Apr-04
Engineer: Yu Chien Ho

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	FCC / CISPR LISN	LISN-3, OATS	304	01-Jul-04
Solar Electronics Co	LISN	8028-50-TS-24-BNC support	904	07-Aug-04
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	05-Jan-05
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1398	12-Jan-05

Conducted Emissions - Telecommunications Ports, 03-May-04
Engineer: Chris Byleckie

Manufacturer	Description	Model #	Asset #	Cal Due
Fischer Custom Communication	ISN Connecting Adapter, RJ45-3, sunnyvale	ISNT4-AE-RJ45-3	1267	11-Mar-05
Fischer Custom Communication	LCL Adapter 60/35 dB, RJ45-4, sunnyvale	ISNT4-EUT-RJ45-4-2.5	1270	11-Mar-05
Fischer Custom Communication	ISN Connecting Adapter, RJ45-4, sunnyvale	ISNT4-AE-RJ45-4	1271	11-Mar-05
Fischer Custom Communication	LCL Adapter 80/55 dB, RJ11, sunnyvale	ISNT4-EUT-RJ11-6-1 Mod T2	1272	11-Mar-05
Fischer Custom Communication	ISN Connecting Adapter, RJ11, sunnyvale	ISNT4-AE-RJ11-6-1 Mod T2	1275	11-Mar-05
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	1316	15-Dec-04

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T55324_Radio	21 Pages
T55310_Digital	11 Pages
AC Conducted Plots	2 Pages

Elliott

EMC Test Data

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	EN301 489-17	Environment:	HIPERLAN

EMC Test Data

For The

2-Wire, Inc

Model

HomePortal 1800HG

Date of Last Test: 5/17/2004

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	EN301 489-17	Environment:	HIPERLAN

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

Manufacturer	Model	Description	Serial Number	FCC ID
2Wire	HomePortal 1800HG	Modem	55	-
Sino-American	SAL115A-0525V-6	AC Adpater	-	-
2Wire	SAL115A-0525-6G	AC Adpater	-	-
Goodpower	GPUSW062000WDOS	AC Adpater	-	-

Other EUT Details

The 2Wire adapter and Goodpower adapter are for domestic use and the Sino-American adapter is for European use. Only the Sino-American adapter was tested.

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 2 cm wide by 25 cm deep by 22 cm high.

Modification History

Mod. #	Test	Date	Modification
1	-	-	None
2			
3			

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

Elliott

EMC Test Data

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	EN301 489-17	Environment:	HIPERLAN

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PPX	Laptop	109	DoC

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Ergo	MP989	Laptop	KC50LG8140010	CE
Dell	PPX	Laptop	99125	CE
2Wire	PCP-1	PC port	00D09E3C3E1D	-

Interface Cabling and Ports

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length(m)
AC Power	Converter	P/S Brick	Unshielded	1m
Ethernet	Remote Laptop	CAT5	Unshielded	>2m
Phone	PC port	RJ45	Unshielded	>2m
USB (not being tested)	Laptop (Local)	Multi-wire	Shielded	>2m

Note: The USB port was not tested as the manufacturer stated that the USB Port was connected to a cable less than 3m.

EUT Operation During Emissions

During emissions testing, the EUT was connected to a remote laptop PC using the EUT's phone line and Etherent ports. 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.

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

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: 4/20/2004
Test Engineer: Juan Martinez
Test Location: SVOATS #4

Config. Used: -
Config Change: -
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: 16 °C
Rel. Humidity: 54 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a-1c	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	-1.6dB @ 4874 MHz
2	6dB Bandwidth	15.247(a)	Pass	16.8 MHz
3	Output Power	15.247(b)	Pass	26.2 dBm
4	Power Spectral Density (PSD)	15.247(d)	Pass	-6.33 dBm
5	Out of Band Emissions	15.247(c)	Pass	> 20dBc

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

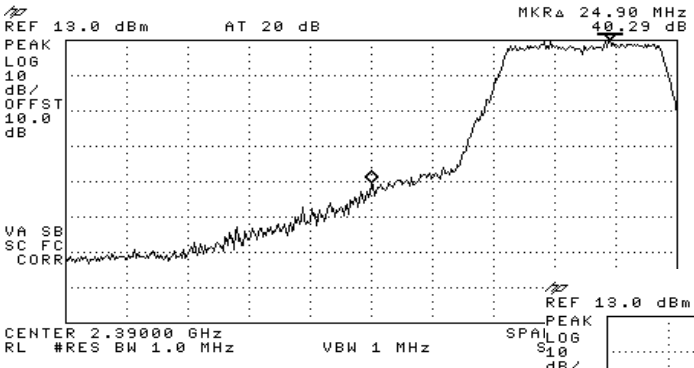
No deviations were made from the requirements of the standard.

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

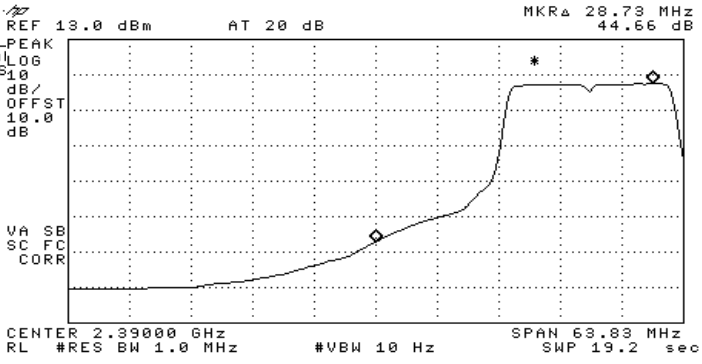
Run #1a: Radiated Spurious Emissions, 30 - 26,000 MHz. Low Channel @ 2412 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	109.5	116.2	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	101.2	105	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	51.2 dB		
Delta Marker - Average	55.5 dB		
Calculated Band-Edge Measurement:	65 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	49.5 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

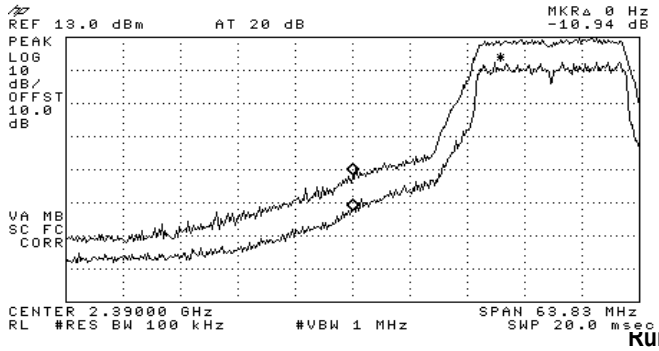
Peak Detla



Average Delta



BW Correction



Run #1a continued on next page

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1a continued

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.585	105.0	V	-	-	AVG	60	1.0	#1 Fundamental
2412.585	116.2	V	-	-	PK	60	1.0	#1 Fundamental
2412.595	101.2	H	-	-	AVG	220	1.0	#1 Fundamental
2412.595	109.5	H	-	-	PK	220	1.0	#1 Fundamental
4823.950	51.2	H	54.0	-2.8	AVG	30	1.3	2x #1 Fundamental-Restricted
4823.950	66.8	H	74.0	-7.2	PK	30	1.3	2x #1 Fundamental-Restricted
7235.400	61.4	H	96.2	-34.8	PK	249	1.2	3x #1 Fundamental, Non-Res.
9647.960	66.4	H	96.2	-29.8	PK	247	1.1	4x #1 Fundamental, Non-Res.
4823.935	43.2	V	54.0	-10.8	AVG	352	1.5	2x #1 Fundamental-Restricted
4823.935	54.0	V	74.0	-20.0	PK	352	1.5	2x #1 Fundamental-Restricted
7235.360	66.5	V	96.2	-29.7	PK	347	1.2	3x #1 Fundamental, Non-Res.
9647.900	68.1	V	96.2	-28.1	PK	356	1.5	4x #1 Fundamental, Non-Res.

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20 dB below the level of the fundamental.
Note 2:	

Run #1b: Radiated Spurious Emissions, 30 - 26,000 MHz. Center Channel @ 2437 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4873.965	51.2	V	54.0	-2.8	AVG	333	1.1	2x #6 Fundamental-Restricted
4873.965	66.5	V	74.0	-7.5	PK	333	1.1	2x #6 Fundamental-Restricted
7310.415	52.1	V	54.0	-1.9	AVG	358	1.3	3x #6 Fundamental-Restricted
7310.415	64.2	V	74.0	-9.8	PK	358	1.3	3x #6 Fundamental-Restricted
9747.915	66.5	V	94.2	-27.7	PK	317	1.1	4x #6 Fundamental, Non-Res
4874.005	52.4	H	54.0	-1.6	AVG	41	1.4	2x #6 Fundamental-Restricted
4874.005	67.2	H	74.0	-6.8	PK	41	1.4	2x #6 Fundamental-Restricted
7310.380	50.2	H	54.0	-3.8	AVG	232	1.3	3x #6 Fundamental-Restricted
7310.380	63.2	H	74.0	-10.8	PK	232	1.3	3x #6 Fundamental-Restricted
9747.970	63.2	H	94.2	-31.0	PK	75	1.2	4x #6 Fundamental, Non-Res

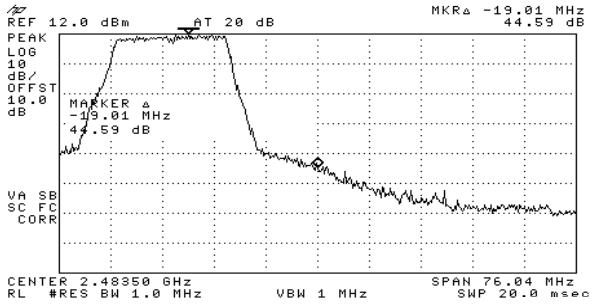
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20 dB below the level of the fundamental.
Note 2:	

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

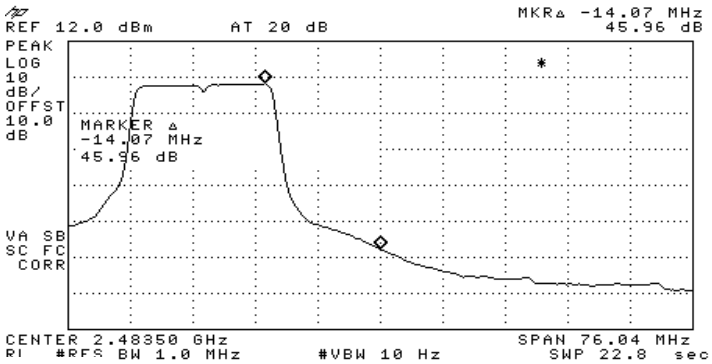
Run #1c: Radiated Spurious Emissions, 30 - 26,000 MHz. High Channel @ 2462 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	110.9	115.2	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	102.5	104.9	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	52.8 dB		
Delta Marker - Average	54.17 dB		
Calculated Band-Edge Measurement:	62.4 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	50.73 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

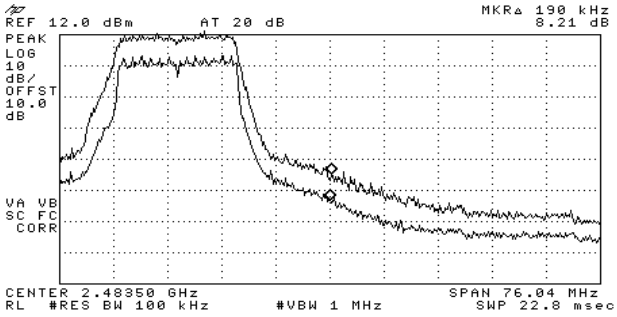
Peak Delta



Average Delta



BW Corrections



Run #1c continued on next page

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1c continued

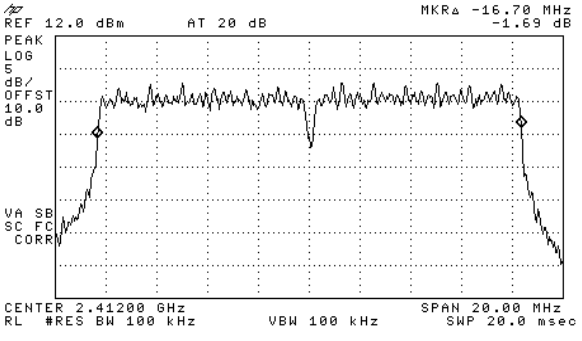
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2460.995	104.9	V	-	-	AVG	16	1.0	#11 Fundamental
2460.995	115.2	V	-	-	PK	16	1.0	#11 Fundamental
2460.935	102.5	H	-	-	AVG	227	1.0	#11 Fundamental
2460.935	110.9	H	-	-	PK	227	1.0	#11 Fundamental
4924.000	52.1	H	54.0	-1.9	AVG	121	1.0	2x #11 Fundamental-Restricted
4924.000	66.5	H	74.0	-7.5	PK	121	1.0	2x #11 Fundamental-Restricted
7385.420	51.2	H	54.0	-2.8	AVG	226	1.2	3x #11 Fundamental-Restricted
7385.405	65.5	H	74.0	-8.5	PK	226	1.2	3x #11 Fundamental-Restricted
9847.995	64.7	H	95.2	-30.5	PK	67	1.0	4x #11 Fundamental, Non-Res
4923.935	47.7	V	54.0	-6.3	AVG	17	1.6	2x #11 Fundamental-Restricted
4923.935	58.3	V	74.0	-15.7	PK	17	1.6	2x #11 Fundamental-Restricted
7385.390	47.9	V	54.0	-6.2	AVG	306	1.4	3x #11 Fundamental-Restricted
7385.390	59.6	V	74.0	-14.5	PK	306	1.4	3x #11 Fundamental-Restricted
9847.965	66.5	V	95.2	-28.7	PK	329	1.0	4x #11 Fundamental, Non-Res

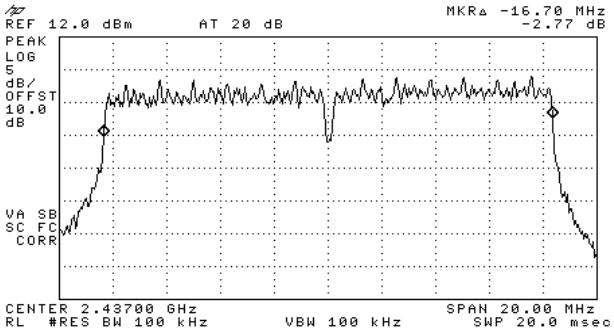
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20 dB below the level of the fundamental.
Note 2:	

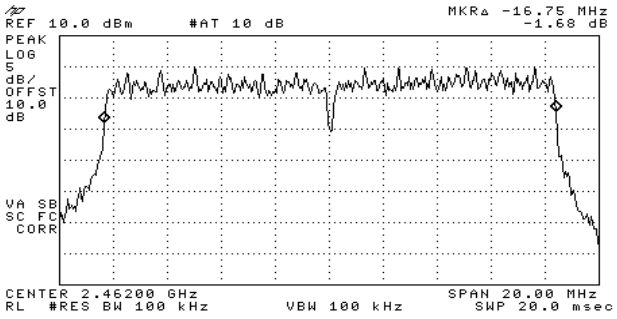
Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #2: Signal Bandwidth

Channel	Frequency (MHz)	Resolution Bandwidth	6dB Signal Bandwidth	Graph reference #	99% Bandwidth
Low	2412	100kHz	16.7 MHz		16.6 MHz
Mid	2437	100kHz	16.7 MHz		16.6 MHz
High	2462	100kHz	16.8 MHz		16.6 MHz







Run #3: Output Power

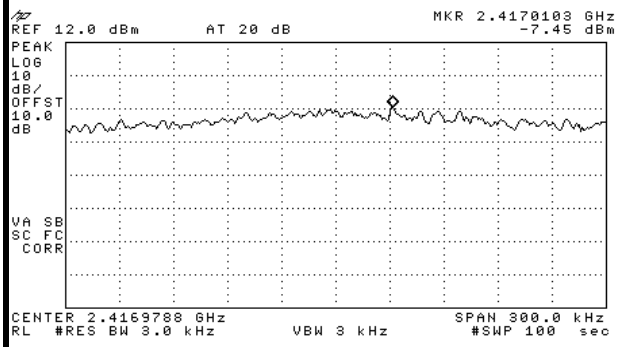
Channel	Frequency (MHz)	Res BW	Output Power Note 2
Low	2412	1MHz	25.9
Mid	2437	1MHz	26.2
High	2462	1MHz	26.1

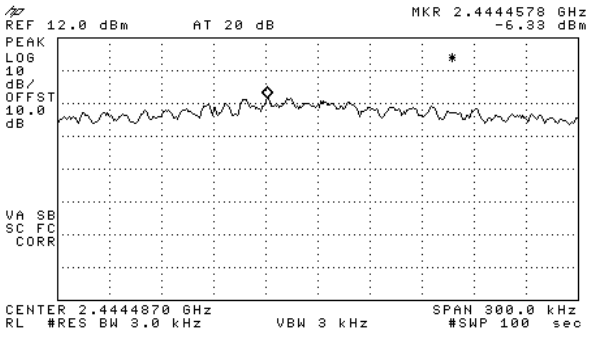
Note 1:	Measured with using the Channel Power function on the spectrum analyzer. Test Procedure is in report under "CONDUCTED POWER MEASUREMENTS FROM ANTENNA PORT".

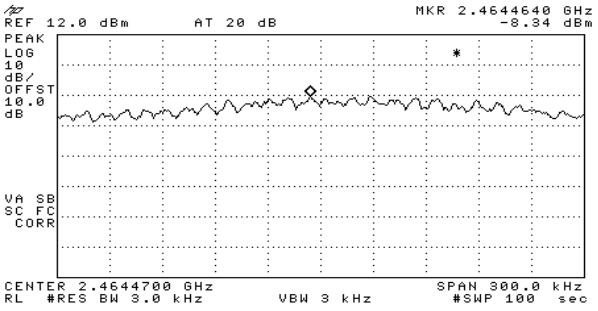
Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

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	3.0kHz	-7.45 dBm	
Mid	2437	3.0kHz	-6.33 dBm	
High	2462	3.0kHz	-8.34 dBm	



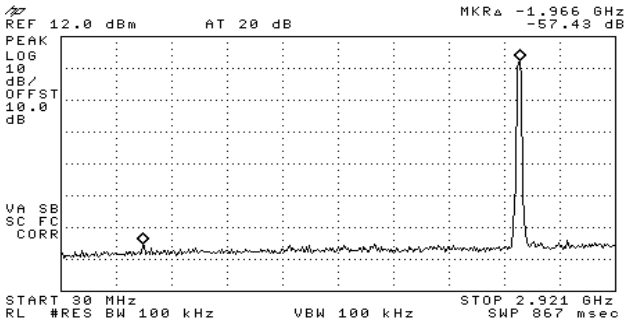




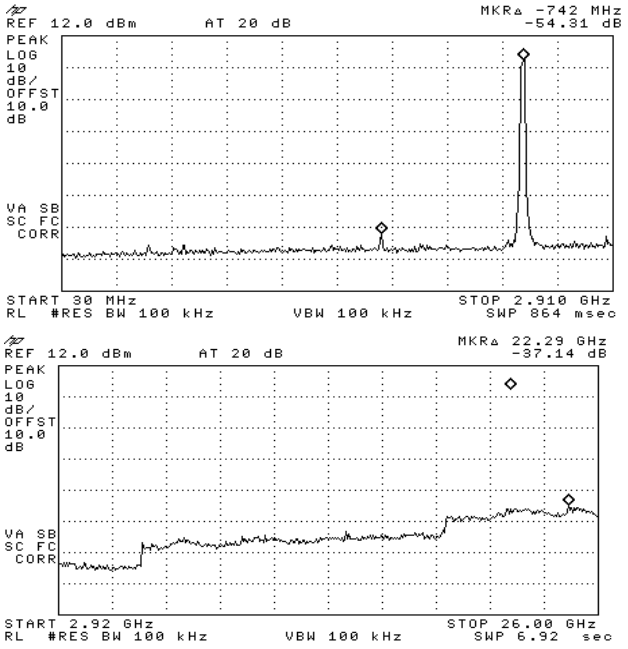
Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #5: Out of Band Emissions

Channel 1 - 2412 MHz

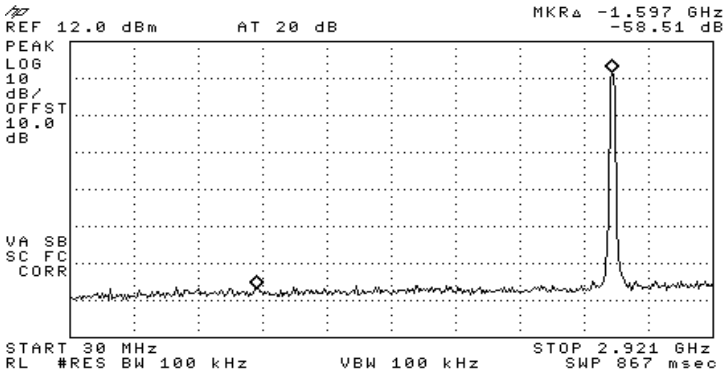


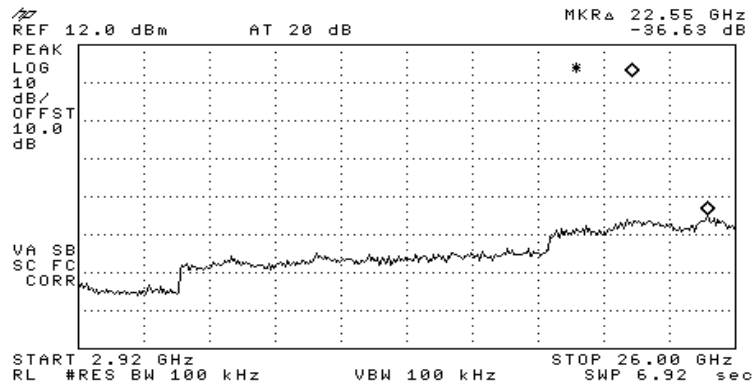
Channel 6 - 2437 MHz



Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Channel 11 - 2462 MHz





Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

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: 5/3/2004
Test Engineer: Chris Byleckie
Test Location: SVOATS #1

Config. Used: -
Config Change: -
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: 24 °C
Rel. Humidity: 50 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a-1c	RE, 30 - 26,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	-4.6dB @ 7310.MHz
2	6dB Bandwidth	15.247(a)	Pass	13.10 MHz
3	Output Power	15.247(b)	Pass	26dBm
4	Power Spectral Density (PSD)	15.247(d)	Pass	-1.8 dBm
5	Out of Band Emissions	15.247(c)	Pass	> 20dBc

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

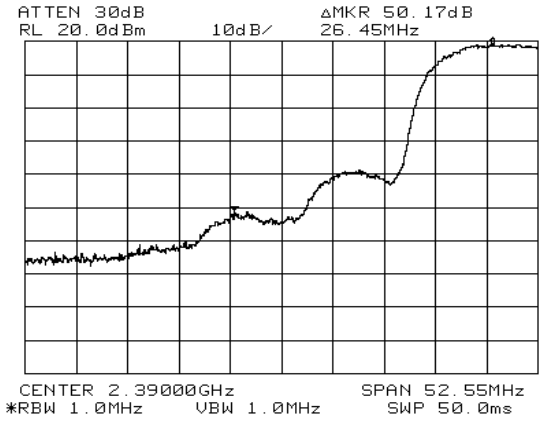
No deviations were made from the requirements of the standard.

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 26,000 MHz. Low Channel @ 2412 MHz

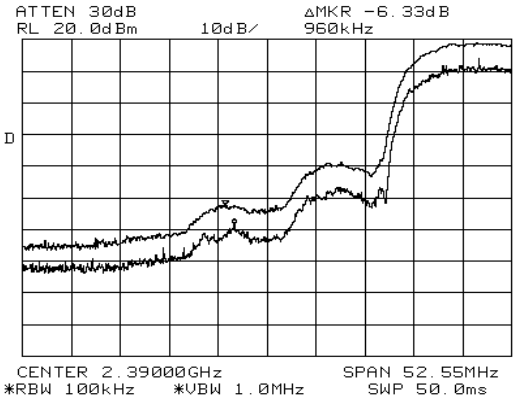
	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	114.5	114.2	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	106.8	106.4	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	56.5 dB		
Delta Marker - Average	59.8 dB		
Calculated Band-Edge Measurement:	58 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	47 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

Peak delta



Average Delta

BW Correction



Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.585	114.2	V	-	-	AVG	26	1.3	#1 Fundamental
2412.585	106.4	V	-	-	PK	26	1.3	#1 Fundamental
2412.595	114.5	H	-	-	AVG	217	1.3	#1 Fundamental
2412.595	106.8	H	-	-	PK	217	1.3	#1 Fundamental
4823.950	34.9	H	54.0	-19.1	AVG	30	1.3	2x #1 Fundamental-Restricted
4823.950	45.8	H	74.0	-28.2	PK	30	1.3	2x #1 Fundamental-Restricted
7235.400	61.4	H	101.0	-39.6	PK	249	1.2	3x #1 Fundamental, Non-Res.
9647.960	62.2	H	101.0	-38.8	PK	247	1.1	4x #1 Fundamental, Non-Res.
4823.935	46.6	V	54.0	-7.4	AVG	352	1.5	2x #1 Fundamental-Restricted
4823.935	57.3	V	74.0	-16.7	PK	352	1.5	2x #1 Fundamental-Restricted
7235.360	60.8	V	101.0	-40.2	PK	347	1.2	3x #1 Fundamental, Non-Res.
9647.900	63.8	V	101.0	-37.3	PK	356	1.5	4x #1 Fundamental, Non-Res.

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20 dB below
Note 2:	

Run #1b: Radiated Spurious Emissions, 30 - 26,000 MHz. Center Channel @ 2437 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4873.965	48.2	V	54.0	-5.8	AVG	333	1.1	2x #6 Fundamental-Restricted
4873.965	58.8	V	74.0	-15.2	PK	333	1.1	2x #6 Fundamental-Restricted
7310.415	47.3	V	54.0	-6.7	AVG	358	1.3	3x #6 Fundamental-Restricted
7310.415	59.0	V	74.0	-15.0	PK	358	1.3	3x #6 Fundamental-Restricted
9747.915	60.2	V	101.2	-41.0	PK	317	1.1	4x #6 Fundamental, Non-Res
4874.005	34.2	H	54.0	-19.8	AVG	41	1.4	2x #6 Fundamental-Restricted
4874.005	45.1	H	74.0	-28.9	PK	41	1.4	2x #6 Fundamental-Restricted
7310.380	49.5	H	54.0	-4.6	AVG	232	1.3	3x #6 Fundamental-Restricted
7310.380	61.4	H	74.0	-12.6	PK	232	1.3	3x #6 Fundamental-Restricted
9747.970	58.1	H	101.2	-43.1	PK	75	1.2	4x #6 Fundamental, Non-Res

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below
Note 2:	

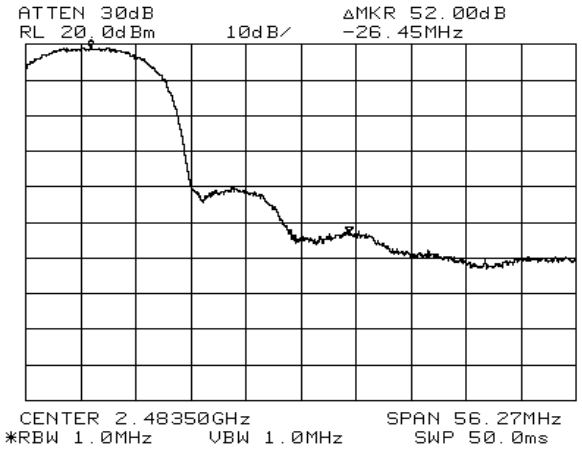
EMC Test Data

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

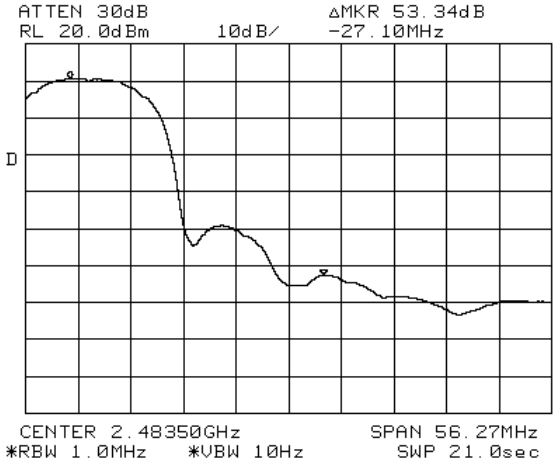
Run #1c: Radiated Spurious Emissions, 30 - 26,000 MHz. High Channel @ 2462 MHz

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	114.1	112	Peak Measurement (RBW=VBW = 1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	105.6	104	Average Measurement (RBW=VBW = 10Hz)
Delta Marker - Peak	61.2 dB		
Delta Marker - Average	62.5 dB		
Calculated Band-Edge Measurement:	52.9 dBuV/m		Peak Measurement (RBW=VBW = 1MHz)
Calculated Band-Edge Measurement:	43.1 dBuV/m		Average Measurement (RBW=VBW = 10Hz)

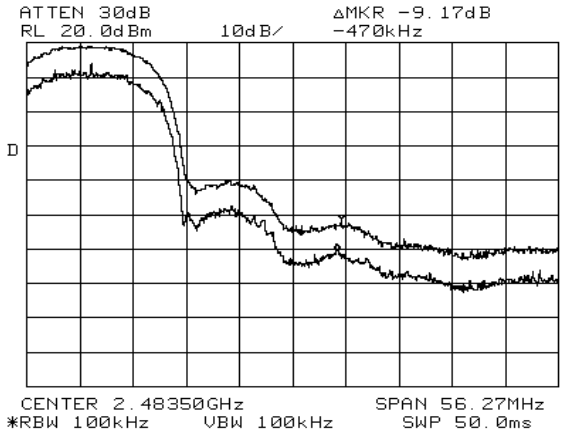
Peak Delta



Average Delta



BW Correction



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EMC Test Data

Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

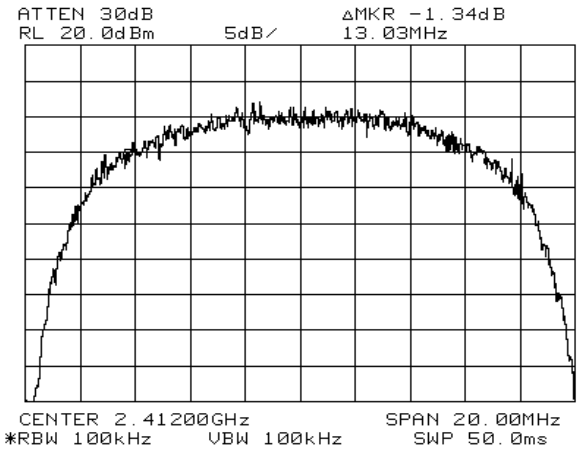
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2462.505		V	-	-	AVG	35	1.0	Ch# 11 fundamental
2462.505		V	-	-	PK	35	1.0	Ch# 11 fundamental
2462.495	114.1	H	-	-	AVG	228	1.5	Ch# 11 fundamental
2462.495	105.6	H	-	-	PK	228	1.5	Ch# 11 fundamental
4924.000	40.8	H	54.0	-13.2	AVG	121	1.0	2x #11 Fundamental-Restricted
4924.000	51.7	H	74.0	-22.3	PK	121	1.0	2x #11 Fundamental-Restricted
7385.420	49.4	H	54.0	-4.6	AVG	226	1.2	3x #11 Fundamental-Restricted
7385.405	66.4	H	74.0	-7.6	PK	226	1.2	3x #11 Fundamental-Restricted
9847.995	57.0	H	102.3	-45.4	PK	67	1.0	4x #11 Fundamental, Non-Res
4923.935	47.7	V	54.0	-6.3	AVG	17	1.6	2x #11 Fundamental-Restricted
4923.935	58.3	V	74.0	-15.7	PK	17	1.6	2x #11 Fundamental-Restricted
7385.390	47.9	V	54.0	-6.2	AVG	306	1.4	3x #11 Fundamental-Restricted
7385.390	59.6	V	74.0	-14.5	PK	306	1.4	3x #11 Fundamental-Restricted
9847.965	54.1	V	102.3	-48.2	PK	329	1.0	4x #11 Fundamental, Non-Res

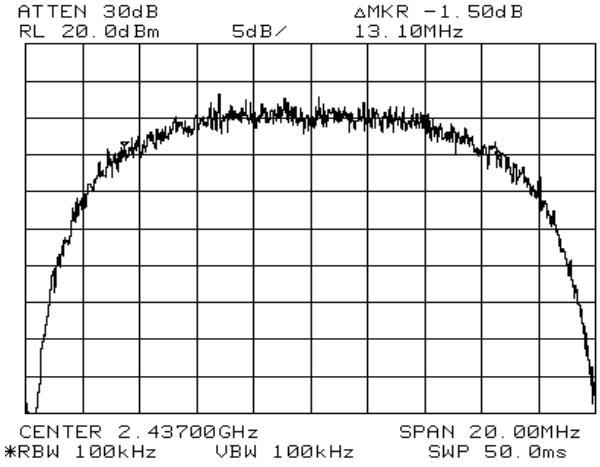
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below
Note 2:	

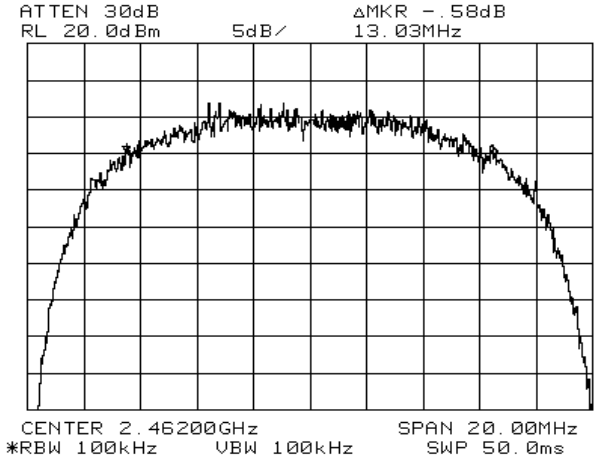
Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Run #2: Signal Bandwidth

Channel	Frequency (MHz)	Resolution Bandwidth	6dB Signal Bandwidth	Graph reference #	99% Bandwidth
Low	2412	100 kHz	13.03 MHz		15.63 MHz
Mid	2437	100 kHz	13.10 MHz		15.60 MHz
High	2462	100 kHz	13.03 MHz		15.57 MHz







Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

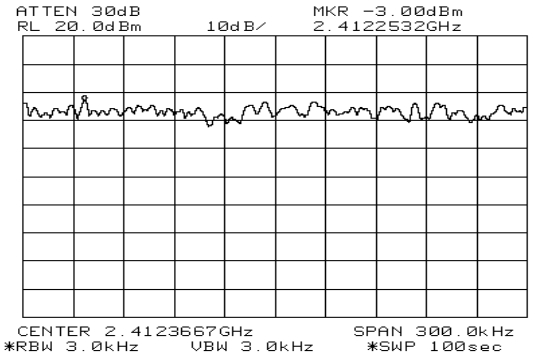
Run #2: Output Power

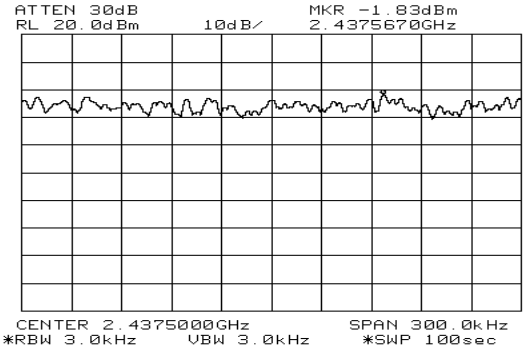
Channel	Frequency (MHz)	Output Power Note 1
Low	2412	26.0
Mid	2437	26.0
High	2462	26.0

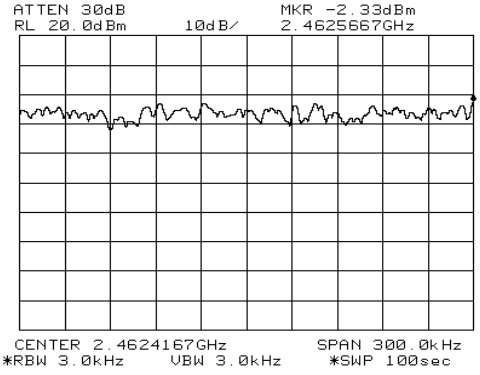
Note 1:	Measured with a peak power meter. Test Procedure is in report under "CONDUCTED POWER MEASUREMENTS FROM ANTENNA PORT".

Run #3: Power Spectral Density

Channel	Frequency (MHz)	Res BW	P.S.D. (averaged over 1 second in a 3kHz bandwidth)	Graph reference #
Low	2412	3.0 kHz	-3.0 dBm	
Mid	2437	3.0 kHz	-1.8 dBm	
High	2462	3.0 kHz	-2.3 dBm	

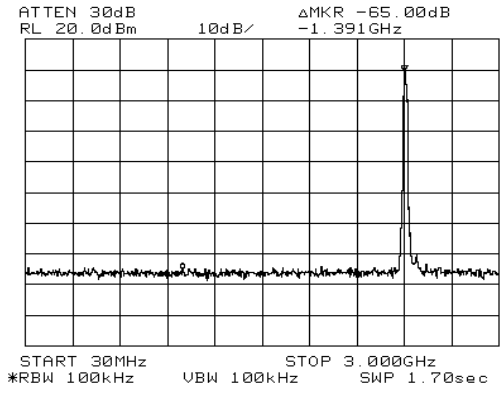


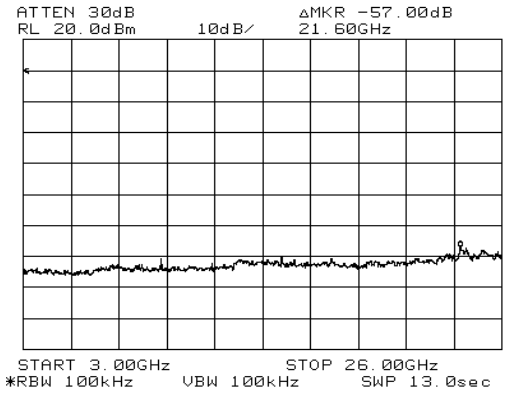




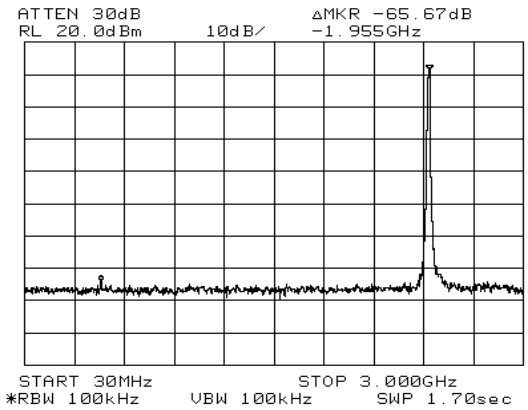
Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

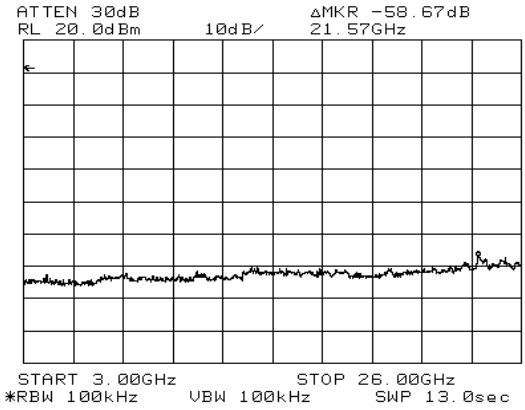
Run #5: Out of Band Emissions
Channel 1 - 2412 MHz





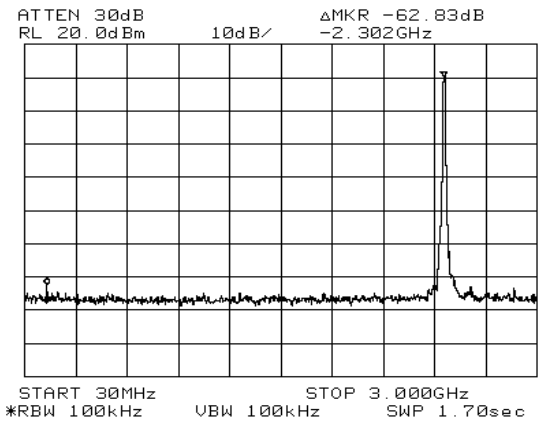
Channel 6 - 2437 MHz

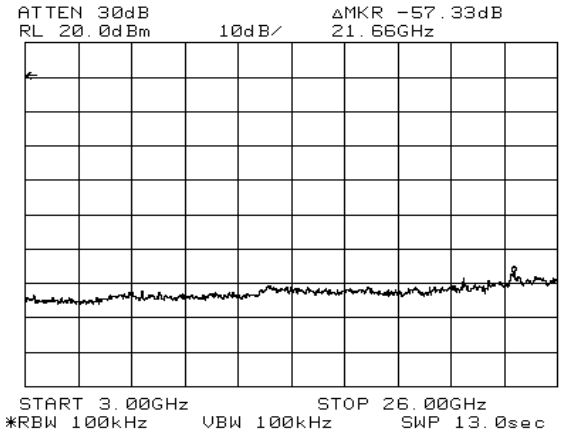




Client:	2-Wire, Inc	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55324
		Account Manager:	Rob Holt
Contact:	Jeremy Muir		
Spec:	FCC 15.247, RSS-210	Class:	N/A

Channel 11 - 2462 MHz





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EMC Test Data

Client:	2Wire	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
Contact:	Jeremy Muir		
Emissions Spec:	EN55022	Class:	B
Immunity Spec:	EN301 489-17	Environment:	-

EMC Test Data

For The

2Wire

Model

HomePortal 1800HG

Date of Last Test: 5/3/2004

Client:	2Wire	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
Contact:	Jeremy Muir		
Emissions Spec:	EN55022	Class:	B
Immunity Spec:	EN301 489-17	Environment:	-

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

Manufacturer	Model	Description	Serial Number	FCC ID
2Wire	HomePortal 1800SW	Modem	-	-
Sino-American	SAL115A-0525-6G	AC Adpater	-	-
Sino-American	SAL115A-0525V-6	AC Adpater	-	-

Other EUT Details

The 2Wire adapter is for domestic use and the Sino-American adapter is for European use.

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
2			
3			

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

Elliott

EMC Test Data

Client:	2Wire	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
Contact:	Jeremy Muir		
Emissions Spec:	EN55022	Class:	B
Immunity Spec:	EN301 489-17	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PPX	Laptop	255-238-15	-
HP	3820	Printer	CN2451B1YS	-
USRobotics	pilot5000	PDA	-	MQ90001

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	Latitude	Laptop	-	-
TLS	TLS3	Call simulator	132916	-

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Phone Line	Call simulator	RJ-11	unshielded	10m
Ethernet	Latitude	CAT 5	unshielded	10m
USB	Local laptop	multiwire	Shielded	2m
DC input	AC adapter	2 wire	Unshielded	10m

EUT Operation During Emissions

During emissions testing, the EUT was connected to a remote laptop PC using the EUT's phone line and Etherent ports. 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	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
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: 4/21/2004
Test Engineer: Yu Chien Ho
Test Location: SVOATS #1

Config. Used: #1
Config Change: None
EUT Voltage: Refer to individual run

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 10 meters from the test area with all I/O connections running on top of the groundplane routed overhead.

Unless otherwise specified, the measurement antenna was located 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: 16 °C
Rel. Humidity: 72 %

Client:	2Wire	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 -1000 MHz, Preliminary Scan	EN 55022 B	Eval	-0.6dB @ 69.712MHz
2	RE, 30 - 1000MHz, Maximized Emissions	EN 55022 B	Pass	-0.6dB @ 69.712MHz
3	RE, 30 -1000 MHz, Preliminary Scan	EN 55022 B	Eval	-4.0dB @ 69.712MHz
4	RE, 30 - 1000MHz, Maximized Emissions	EN 55022 B	Pass	-4.0dB @ 69.712MHz
3	RE, 30 -1000 MHz, Preliminary Scan	EN 55022 B	Eval	-1.8dB @ 69.712MHz
4	RE, 30 - 1000MHz, Maximized Emissions	EN 55022 B	Pass	-1.8dB @ 69.712MHz

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:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Run #1: Preliminary Radiated Emissions, 30-1000 MHz
2Wire PSU: 120V / 60Hz
Model #: SAL115A-0525-6G

Frequency	Level	Pol	EN 55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
69.712	29.4	v	30.0	-0.6	QP	253	1.0	BB
123.025	27.9	v	30.0	-2.1	QP	140	1.0	BB
57.915	27.5	v	30.0	-2.5	QP	0	1.7	BB
83.025	27.2	v	30.0	-2.8	QP	112	1.0	BB
63.150	26.0	v	30.0	-4.0	QP	326	1.0	BB
87.250	25.7	v	30.0	-4.3	QP	117	1.0	BB
85.450	25.4	v	30.0	-4.6	QP	266	1.0	BB
398.225	32.0	h	37.0	-5.0	QP	187	1.7	BB
146.100	22.4	v	30.0	-7.6	QP	172	1.0	BB
398.225	29.0	v	37.0	-8.0	QP	308	1.0	BB
123.025	21.5	h	30.0	-8.5	QP	126	2.4	BB
69.712	21.2	h	30.0	-8.8	QP	180	4.0	BB
146.100	20.5	h	30.0	-9.5	QP	157	4.0	BB
85.450	19.6	h	30.0	-10.4	QP	136	4.0	BB

Run #2: Maximized Readings From Run #1
2Wire PSU: 120V / 60Hz
Model #: SAL115A-0525-6G

Frequency	Level	Pol	EN 55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
69.712	29.4	v	30.0	-0.6	QP	253	1.0	BB
123.025	27.9	v	30.0	-2.1	QP	140	1.0	BB
57.915	27.5	v	30.0	-2.5	QP	0	1.7	BB
83.025	27.2	v	30.0	-2.8	QP	112	1.0	BB
63.150	26.0	v	30.0	-4.0	QP	326	1.0	BB
87.250	25.7	v	30.0	-4.3	QP	117	1.0	BB

Elliott

EMC Test Data

Client:	2Wire	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Run #3: Preliminary Radiated Emissions, 30-1000 MHz
Goodpower PSU: 120V / 60Hz
Model #: GPUSW062000WDOS

Frequency	Level	Pol	EN 55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
69.712	26.0	v	30.0	-4.0	QP	28	1.0	BB
192.000	25.6	v	30.0	-4.4	QP	190	1.0	BB
112.350	25.3	v	30.0	-4.7	QP	41	1.0	BB
144.075	24.6	v	30.0	-5.4	QP	157	1.0	BB
87.250	23.7	v	30.0	-6.3	QP	248	1.0	BB
83.025	22.7	v	30.0	-7.3	QP	285	1.0	BB
123.025	22.4	v	30.0	-7.6	QP	188	1.0	BB
57.915	22.4	v	30.0	-7.6	QP	189	1.0	BB
63.150	21.5	v	30.0	-8.5	QP	0	1.0	BB

Run #4: Maximized Readings From Run #1
Goodpower PSU: 120V / 60Hz
Model #: GPUSW062000WDOS

Frequency	Level	Pol	EN 55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
69.712	26.0	v	30.0	-4.0	QP	28	1.0	BB
192.000	25.6	v	30.0	-4.4	QP	190	1.0	BB
112.350	25.3	v	30.0	-4.7	QP	41	1.0	BB
144.075	24.6	v	30.0	-5.4	QP	157	1.0	BB
87.250	23.7	v	30.0	-6.3	QP	248	1.0	BB
83.025	22.7	v	30.0	-7.3	QP	285	1.0	BB

Run #5: Preliminary Radiated Emissions, 30-1000 MHz
Sino-American PSU: 230V / 50Hz
Model: SAL115A-0525V-6

Frequency	Level	Pol	EN 55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
69.712	28.2	v	30.0	-1.8	QP	201	1.0	BB
40.170	28.2	v	30.0	-1.8	QP	189	1.0	BB
54.160	27.1	v	30.0	-2.9	QP	207	1.0	BB
80.950	26.0	v	30.0	-4.0	QP	206	1.0	BB
117.790	24.6	v	30.0	-5.4	QP	157	1.0	BB
240.000	29.8	v	37.0	-7.2	QP	49	1.0	BB
145.000	21.7	v	30.0	-8.3	QP	172	1.0	BB

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EMC Test Data

Client:	2Wire	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Run #6: Maximized Readings From Run #1
Sino-American PSU: 230V / 50Hz
Model: SAL115A-0525V-6

Frequency	Level	Pol	EN 55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
69.712	28.2	v	30.0	-1.8	QP	201	1.0	BB
40.170	28.2	v	30.0	-1.8	QP	189	1.0	BB
54.160	27.1	v	30.0	-2.9	QP	207	1.0	BB
80.950	26.0	v	30.0	-4.0	QP	206	1.0	BB
117.790	24.6	v	30.0	-5.4	QP	157	1.0	BB
240.000	29.8	v	37.0	-7.2	QP	49	1.0	BB

Client:	2Wire	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
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: 4/21/2004
Test Engineer: Yu-Chien Ho
Test Location: SVOATS #1
Config. Used: #1
Config Change: None
EUT Voltage: Refer to individual run

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 10 meters away from the test area.

Ambient Conditions:

Temperature: 16 °C
Rel. Humidity: 72 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN 55022 B	Pass	-3.1dB @ 3.296MHz
2	CE, AC Power, 230V/50Hz	EN 55022 B	Pass	-6.9dB @ 0.384MHz

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.

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EMC Test Data

Client:	2Wire	Job Number:	J55253
Model:	HomePortal 1800HG	T-Log Number:	T55310
		Account Manager:	Robert Holt
Contact:	Jeremy Muir		
Spec:	EN55022	Class:	B

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz
2Wire PSU: 120V / 60Hz
Model #: SAL115A-0525-6G

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
3.296	42.9	Line	46.0	-3.1	Average	
3.618	42.8	Neutral	46.0	-3.2	Average	
0.517	38.3	Line	46.0	-7.7	Average	
0.388	40.2	Neutral	48.1	-7.9	Average	
3.296	45.0	Line	56.0	-11.0	QP	
3.618	44.7	Neutral	56.0	-11.3	QP	
0.193	42.0	Line	53.9	-11.9	Average	
0.193	51.7	Line	63.9	-12.2	QP	
0.194	51.5	Neutral	63.9	-12.4	QP	
0.194	41.0	Neutral	53.9	-12.9	Average	
0.517	40.2	Line	56.0	-15.8	QP	
0.388	40.4	Neutral	58.1	-17.7	QP	

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz
Sino-American PSU: 230V / 50Hz
Model: SAL115A-0525V-6

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.384	41.3	Neutral	48.2	-6.9	Average	
0.384	39.4	Line	48.2	-8.8	Average	
0.255	41.2	Neutral	51.6	-10.4	Average	
1.086	35.1	Line	46.0	-10.9	Average	
0.191	51.4	Neutral	64.0	-12.6	QP	
0.191	40.6	Neutral	54.0	-13.4	Average	
0.255	47.6	Neutral	61.6	-14.0	QP	
0.384	43.2	Neutral	58.2	-15.0	QP	
0.384	40.9	Line	58.2	-17.3	QP	
1.086	36.6	Line	56.0	-19.4	QP	
22.432	30.3	Line	50.0	-19.7	Average	
22.432	37.4	Line	60.0	-22.6	QP	

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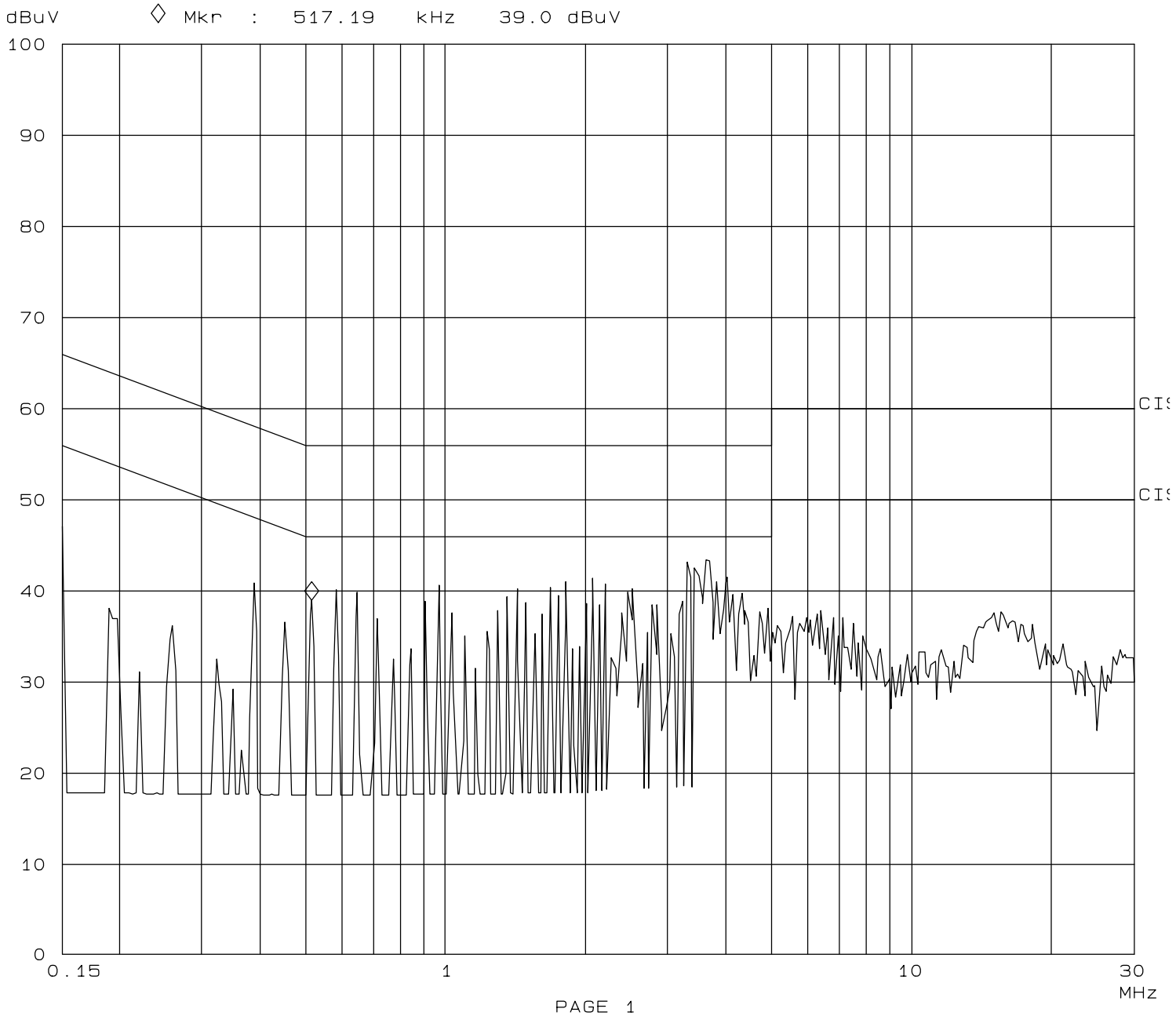
21. Apr 04 16:01

AC Conducted Emissions

EUT:	Home Portal 1800HG
Manuf:	2Wire
Op Cond:	120V / 60Hz
Operator:	Yu-Chien Ho
Test Spec:	EN 55022 B
Comment:	J55253/T55310
	Run No. 1 120V Neutral (2wire PSU)



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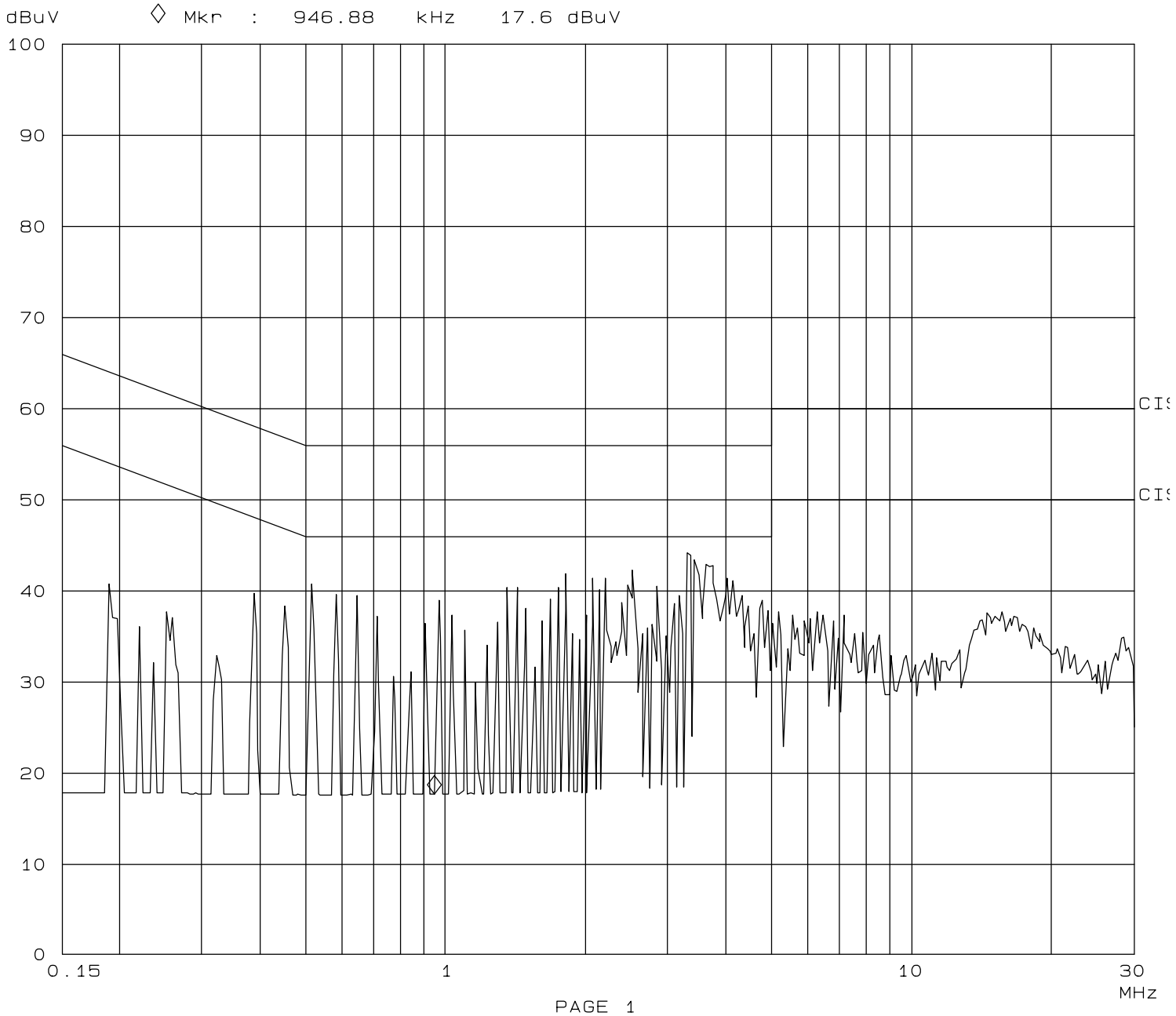
21. Apr 04 15:50

AC Conducted Emissions

EUT:	Home Portal 1800HG
Manuf:	2Wire
Op Cond:	120V / 60Hz
Operator:	Yu-Chien Ho
Test Spec:	EN 55022 B
Comment:	J55253/T55310
	Run No. 1 120V Line (2Wire PSU)