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Electromagnetic Emissions Test Report and Request for Class II Permissive Change pursuant to FCC Part 15, Subpart C FHSS Specifications for an Intentional Radiator on the Microwave Data Systems Model: EZNet

FCC ID:	E5MDS-EL806
GRANTEE:	Microwave Data Systems 175 Science Parkway Rochester, NY 14620
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	November 9, 2005
FINAL TEST DATE:	November 2 and November 5, 2005
AUTHORIZED SIGNATORY:	Juan Martinez Senior EMC Engineer

ACCREDITED
2016-01

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SCOPE

An electromagnetic emissions test has been performed on the Microwave Data Systems model EZNet pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4:2003 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 Microwave Data Systems model EZNet and therefore apply only to the tested sample. The sample was selected and prepared by Dennis McCarthy of Microwave Data Systems.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of 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

Note – remove references in the table below that do not apply to the radio tested

FCC Part 15 Section	RSS 210 Section	Description	Measured Value	Comments	Result
	6.2.2(o)(a)	20dB Bandwidth	N/A	The channel spacing shall be greater than the 20dB bandwidth	N/A
	6.2.2(o)(a)	Channel Separation	N/A		N/A
	6.2.2(o)(a)	Number of Channels	N/A	**902- 928 MHz**: 50 hopping frequencies: average time of occupancy <0.4 second within a 20 second period. *More than 25 but less than 50 hopping frequencies: average time of occupancy <0.4 second within a 20 second period*	N/A
	6.2.2(o)(a)	Channel Dwell Time	N/A		N/A
	6.2.2(o)(a)	Channel Utilization	N/A	Refer to Theory of Operations for detailed description of the hopping algorithm	N/A
15.247 (b) (3)	6.2.2(o)(a)	Output Power	26 dBm (.4 Watts) EIRP = 3.2 W	Multi-point applications: **902 – 928 MHz** Maximum permitted is 1Watt, with EIRP limited to 4 Watts for a 50-channel system. *Maximum permitted is 0.25 Watts, with EIRP limited to 1 Watts for a*	Complies

				system that uses less than 50 channels	
15.247(c)	6.2.2(o)(e1)	Spurious Emissions – 30MHz – 25GHz	N/A	All spurious emissions < -20dBc.	N/A
15.247(c) / 15.209		Radiated Spurious Emissions 30MHz – 25GHz	53.3 dBuV/m @ 2782.89 MHz (-0.7 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	N/A		N/A
	6.6	AC Conducted Emissions	N/A		N/A
15.109	7	Radiated Receiver Emissions	42.6 dBuV/m @ 2476.25 MHz (-11.4 dB)		Complies
15.247 (b) (5)		RF Exposure Requirements	FCC /IC limits of power density not exceeded provided antenna is located a minimum of 19.3 cm from persons	Refer to MPE calculation for cm derivation. Refer to User's Guide for installation instructions requiring a 20cm separation	Complies
15.203		RF Connector	Integral antenna .	Integral antenna	Complies

EIRP calculated using antenna gain of dBi (9) 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 UKAS document LAB 34.

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 Microwave Data Systems model EZNet is a wireless networking module which is designed to used in wireless networking applications. The EZnet consists of an OIB and the EL806 module. Since the EUT can be used in a variety of installations, the EUT was treated as tabletop equipment during testing. The electrical rating of the OIB is 48 VDC. The OIB provides 15VDC to the EL806.

The sample was received on November 2, 2005 and tested on November 2 and November 5, 2005. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data Systems	EZNet	Wireless Networking Module	1170713 (EL 806) 1423719 (OIB)	E5MDS-EL806

OTHER EUT DETAILS

The EL806 module is installed on the OIB and the combination is installed inside the Maxrad panel antenna.

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of an antenna or other system.

MODIFICATIONS

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

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
PowerDsine	3001	PoE Adapter	B05246050010787501	DoC

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

Manufacturer	Model	Description	Serial Number	FCC ID
PowerDsine	3001	PoE Adapter	B05246050010787501	DoC
Dell	PP10S	Laptop	J7301 A03	DoC

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)
Etherent	PoE Adapter	Cat 5	Unshielded	30.0
PoE Adapter Ethernet	Laptop	Cat 5	Unshielded	2.0

Note: The serial port on the OIB was not connected during testing. The manufacturer stated that this is for diagnostic purposes and therefore would not normally be connected.

EUT OPERATION DURING TESTING

During digital device emissions testing the EUT was receiving data over the Ethernet from the remote computer.

ANTENNA REQUIREMENTS

The EUT antenna is a MaxRad Z2246 9dBi panel antenna. The module had previously been approved with up to 8.5 dBi Yagi and up to 7.1 dBi Omni antennas.
The EUT is professionally installed and therefore meets the requirements of FCC 15.203.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on November 2 and November 5, 2005at the Elliott Laboratories Open Area Test Site #1 & 2 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 C63.4:2003. 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 C63.4:2003 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 C63.4:2003 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 C63.4:2003 , 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.

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)	Number Of Channels	Output Power
902 – 928	>=50	1 W (30 dBm)
902 – 928	< 50	0.25 W (24 dBm)
2400 – 2483.5	>= 75	1 W (30 dBm)
2400 – 2483.5	>= 75	0.125 W (21 dBm)
5725 – 5850	>=75	1 W (30 dBm)

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 AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in FCC Part 15.207.

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

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 C63.4:2003 , 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

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Radiated Emissions, 30 - 1,000 MHz, 02-Nov-05
Engineer: dbare

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	54	07-Mar-07
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12-Jan-06
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	03-Nov-05

Radiated Emissions, 30 - 10,000 MHz, 02-Nov-05
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	54	07-Mar-07
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	26-Apr-06
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1242	19-Oct-06
Hewlett Packard	EMC Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	28-Mar-06
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12-Jan-06
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	03-Nov-05

Conducted Emissions - AC Power Ports, 02-Nov-05
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	812	11-Feb-06
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1071	28-Sep-06
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12-Jan-06

Radiated Emissions, 1000 - 10,000 MHz, 05-Nov-05
Engineer: Juan Martinez

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	26-Apr-06
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1242	19-Oct-06
Hewlett Packard	EMC Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	28-Mar-06

Receiver Radiated Emissions, 900 - 1000 MHz, 08-Nov-05
Engineer: Juan Martinez

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12-Jan-06
EMCO (ETS-Lindgren)	Log Periodic Antenna, 0.2-2 GHz	3148	1595	14-Jun-06

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T61726 10 Pages

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EMC Test Data

Client:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	Test-Log Number:	T61736
		Project Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	FCC	Class:	A
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Microwave Data Systems

Model

EZNet

Date of Last Test: 11/5/2005

Client:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	Test-Log Number:	T61736
		Project Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	FCC	Class:	A
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a wireless networking module which is designed to used in wireless networking applications. THe EZnet consists of an OIB and the EL806 module. Since the EUT can be used in a variety of installations, the EUT was treated as table-top equipment during testing. The electrical rating of the OIB is 48 VDC. The OIB provides 15VDC to the EL806.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Microwave Data Systems	EZNet	Wireless Networking Module	1170713 (EL 806) 1423719 (OIB)	E5MDS-EL806

Other EUT Details

The following EUT details should be noted: The EL806 module is installed on the OIB and the combination is installed inside the Maxrad panel antenna.

EUT Antenna (Intentional Radiators Only)

The EUT antenna is a MaxRad Z2246 9dBi panel antenna. The module had previously been approved with up to 8.5 dBi Yagi and up to 7.1 dBi Omni antennas.
The EUT is professionally installed and therefore meets the requirements of FCC 15.203.

EUT Enclosure

The EUT does not have an enclosure as it is designed to be installed within the enclosure of an antenna or other system.

Modification History

Mod. #	Test	Date	Modification
1	-	-	None

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

Client:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	T-Log Number:	T61736
		Project Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Emissions Spec:	FCC	Class:	A
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
PowerDsine	3001	PoE Adapter	B05246050010787501	DoC

Note: The PoE adapter was located remotely for radiated emissions tests and locally for the conducted emissions tests.

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
PowerDsine	3001	PoE Adapter	B05246050010787501	DoC
Dell	PP10S	Laptop	J7301 A03	DoC

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Etherent	PoE Adapter	Cat 5	Unshielded	30.0
PoE Adapter Ethernet	Laptop	Cat 5	Unshielded	2.0

Note: The serial port on the OIB was not connected during testing. The manufacturer stated that this is for diagnostic purposes and therefore would not normally be connected.

EUT Operation During Emissions Tests

During digital device emissions testing the EUT was receiving data over the Ethernet from the remote computer.

Client:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	T-Log Number:	T61736
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC	Class:	A

Rx 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: 11/5/2005
Test Engineer: Juan Martinez
Test Location: SVOATS #2
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.

The test distance and extrapolation factor (if used) are detailed under each run description.

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: 17 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1 & 2	RE, 1000 - 5000 MHz, Maximized Emissions	FCC B / RSS-210	Pass	42.6dBuV/m 135.4uV/m) @ 2746.25 MHz (-11.4dB)

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:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	T-Log Number:	T61736
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC	Class:	A

Run #1: Maximized readings, 900 - 5000 MHz

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
902.600	32.4	v	46.0	-13.6	QP	0	1.0	
915.600	28.0	v	46.0	-18.0	QP	0	1.0	
927.600	28.4	v	46.0	-17.6	QP	0	1.0	
902.600	27.3	h	46.0	-18.7	QP	0	1.2	
915.600	28.0	h	46.0	-18.0	QP	0	1.2	
927.600	28.0	h	46.0	-18.0	QP	0	1.2	
902.2 MHz								
1805.770	30.5	V	54.0	-23.5	AVG	0	1.0	
1805.770	40.9	V	74.0	-33.1	PK	0	1.0	
2707.395	33.8	V	54.0	-20.2	AVG	360	1.0	
2707.395	45.2	V	74.0	-28.8	PK	360	1.0	
3611.203	36.9	V	54.0	-17.1	AVG	0	1.0	
3611.203	47.6	V	74.0	-26.4	PK	0	1.0	
4513.495	39.0	V	54.0	-15.0	AVG	0	1.0	
4513.495	49.9	V	74.0	-24.1	PK	0	1.0	
1805.073	31.0	H	54.0	-23.0	AVG	86	1.0	
1805.073	41.5	H	74.0	-32.5	PK	86	1.0	
2708.948	33.9	H	54.0	-20.1	AVG	0	1.0	
2708.948	44.9	H	74.0	-29.1	PK	0	1.0	
3610.145	37.0	H	54.0	-17.0	AVG	0	1.0	
3610.145	47.9	H	74.0	-26.1	PK	0	1.0	
4513.210	39.1	H	54.0	-14.9	AVG	0	1.0	
4513.210	50.1	H	74.0	-23.9	PK	0	1.0	
915.4 MHz								
1830.838	32.9	V	54.0	-21.1	AVG	0	1.0	
1830.838	42.4	V	74.0	-31.6	PK	0	1.0	
2746.187	37.5	V	54.0	-16.5	AVG	360	1.0	
2746.187	48.5	V	74.0	-25.5	PK	360	1.0	
3661.845	37.5	V	54.0	-16.5	AVG	0	1.0	
3661.845	48.7	V	74.0	-25.3	PK	0	1.0	
4577.087	39.7	V	54.0	-14.3	AVG	0	1.0	
4577.087	50.5	V	74.0	-23.5	PK	0	1.0	
2746.187	42.6	H	54.0	-11.4	AVG	86	1.0	
2746.187	49.1	H	74.0	-24.9	PK	86	1.0	
3661.845	37.4	H	54.0	-16.6	AVG	0	1.0	
3661.845	48.1	H	74.0	-26.0	PK	0	1.0	
Continue on next page...								

Client:	Microwave Data Systems						Job Number:	J61511
Model:	EZNet						T-Log Number:	T61736
							Account Manager:	Esther Zhu
Contact:	Dennis McCarthy							
Spec:	FCC						Class:	A

1830.673	36.6	H	54.0	-17.4	AVG	0	1.0	
1830.673	43.9	H	74.0	-30.1	PK	0	1.0	
4577.420	39.5	H	54.0	-14.5	AVG	0	1.0	
4577.420	50.9	H	74.0	-23.2	PK	0	1.0	
927.6 MHz								
1854.983	30.8	H	54.0	-23.2	AVG	0	1.0	
1854.983	42.3	H	74.0	-31.7	PK	0	1.0	
2782.650	39.6	H	54.0	-14.4	AVG	0	1.2	
2782.650	47.2	H	74.0	-26.8	PK	0	1.2	
3709.313	37.8	H	54.0	-16.2	AVG	0	1.0	
3709.313	48.7	H	74.0	-25.3	PK	0	1.0	
4636.733	39.2	H	54.0	-14.8	AVG	0	1.0	
4636.733	50.7	H	74.0	-23.3	PK	0	1.0	
1854.983	31.9	V	54.0	-22.1	AVG	0	1.0	
1854.983	43.1	V	74.0	-30.9	PK	0	1.0	
2782.753	40.4	V	54.0	-13.6	AVG	0	1.0	
2782.753	47.7	V	74.0	-26.3	PK	0	1.0	
3709.733	37.7	V	54.0	-16.3	AVG	0	1.0	
3709.733	49.1	V	74.0	-24.9	PK	0	1.0	
4638.833	39.2	V	54.0	-14.8	AVG	0	1.0	
4638.833	49.9	V	74.0	-24.1	PK	0	1.0	

Client:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	T-Log Number:	T61736
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC	Class:	N/A

Radiated Spurious 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: 11/2/2005 & 11/5/2005 Config. Used: 1

Test Engineer: Mehran Birgani & Jmartinez Config Change: None

Test Location: SVOATS #1 Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT was located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 17 °C

Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	RE, 30 - 10,000 MHz Spurious Emissions	FCC Part 15.209	Pass	49.3dBµV/m (291.7µV/m) @ 2707.8MHz (-4.7dB)
2	RE, 30 - 10,000 MHz Spurious Emissions	FCC Part 15.209	Pass	47.6dBµV/m (239.1µV/m) @ 2746.2MHz (-6.4dB)
3	RE, 30 - 10,000 MHz Spurious Emissions	FCC Part 15.209	Pass	53.3dBuV/m (461 uV/m) @ 2782.89 MHz (-0.7dB)

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:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	T-Log Number:	T61736
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30 - 10000 MHz. Low Channel @ 902.2 MHz

Frequency	Level	Pol	15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2707.824	49.3	V	54.0	-4.7	AVG	326	1.1	3rd Harmonic of 902.2 MHz
2707.824	51.1	V	74.0	-22.9	PK	326	1.1	3rd Harmonic of 902.2 MHz
2707.778	47.1	H	54.0	-6.9	AVG	290	1.5	
2707.778	49.4	H	74.0	-24.6	PK	290	1.5	
3610.423	41.0	H	54.0	-13.0	AVG	254	1.0	
3610.423	46.3	H	74.0	-27.7	PK	254	1.0	
4513.047	41.6	H	54.0	-12.4	AVG	327	1.1	
4513.047	46.7	H	74.0	-27.3	PK	327	1.1	
5415.670	39.0	H	54.0	-15.0	AVG	265	1.0	
5415.670	46.5	H	74.0	-27.5	PK	265	1.0	
6318.185	38.9	H	54.0	-15.1	AVG	247	1.0	
6318.185	46.8	H	74.0	-27.3	PK	247	1.0	
3610.360	42.0	V	54.0	-12.0	AVG	316	1.1	
3610.360	46.6	V	74.0	-27.4	PK	316	1.1	
4512.945	36.0	V	54.0	-18.0	AVG	271	1.0	
4512.945	43.8	V	74.0	-30.3	PK	271	1.0	
5415.665	37.6	V	54.0	-16.4	AVG	295	1.0	
5415.665	46.7	V	74.0	-27.3	PK	295	1.0	
6318.168	30.4	V	54.0	-23.6	AVG	325	1.0	
6318.168	37.1	V	74.0	-37.0	PK	325	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:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	T-Log Number:	T61736
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC	Class:	N/A

Run #2: Radiated Spurious Emissions, 30 - 10000 MHz. Middle Channel @ 915.4 MHz

Frequency	Level	Pol	15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2746.178	47.6	V	54.0	-6.4	AVG	332	1.1	3rd Harmonic of 915.4 MHz
2746.178	50.0	V	74.0	-24.0	PK	332	1.1	3rd Harmonic of 915.4 MHz
3661.550	38.4	V	54.0	-15.6	AVG	270	1.0	
3661.550	43.6	V	74.0	-30.4	PK	270	1.0	
4576.977	36.6	V	54.0	-17.4	AVG	318	1.0	
4576.977	45.0	V	74.0	-29.0	PK	318	1.0	
5492.458	39.5	V	54.0	-14.5	AVG	294	1.0	
5492.458	46.5	V	74.0	-27.5	PK	294	1.0	
6407.715	37.7	V	54.0	-16.4	AVG	282	1.0	
6407.715	45.3	V	74.0	-28.7	PK	282	1.0	
2746.158	46.2	H	54.0	-7.8	AVG	319	1.0	
2746.158	57.8	H	74.0	-16.2	PK	319	1.0	
3661.513	36.6	H	54.0	-17.4	AVG	257	1.1	
3661.513	43.1	H	74.0	-30.9	PK	257	1.1	
4577.037	39.6	H	54.0	-14.4	AVG	327	1.3	
4577.037	46.3	H	74.0	-27.7	PK	327	1.3	
5492.438	39.2	H	54.0	-14.8	AVG	315	1.2	
5492.438	46.6	H	74.0	-27.4	PK	315	1.2	
6407.795	37.3	H	54.0	-16.7	AVG	236	1.1	
6407.795	45.2	H	74.0	-28.8	PK	236	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.

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EMC Test Data

Client:	Microwave Data Systems	Job Number:	J61511
Model:	EZNet	T-Log Number:	T61736
		Account Manager:	Esther Zhu
Contact:	Dennis McCarthy		
Spec:	FCC	Class:	N/A

Run #3: Radiated Spurious Emissions, 30 - 10000 MHz. High Channel @ 927.6 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2782.798	47.8	V	54.0	-6.3	AVG	332	1.1	3rd Harmonic of 927.6 MHz
2782.798	50.0	V	74.0	-24.0	PK	332	1.1	3rd Harmonic of 927.6 MHz
3710.348	51.6	V	54.0	-2.4	AVG	222	1.2	
3710.348	53.0	V	74.0	-21.0	PK	222	1.2	
4638.045	42.0	V	54.0	-12.0	AVG	226	1.0	
4638.045	45.8	V	74.0	-28.2	PK	226	1.0	
5565.555	48.7	V	54.0	-5.3	AVG	136	1.0	
5565.555	50.9	V	74.0	-23.1	PK	136	1.0	
6493.215	43.0	V	54.0	-11.0	AVG	220	1.4	
6493.215	47.2	V	74.0	-26.8	PK	220	1.4	
7420.748	44.4	V	54.0	-9.6	AVG	137	1.0	
7420.748	49.1	V	74.0	-25.0	PK	137	1.0	
8348.386	49.2	V	54.0	-4.8	AVG	174	1.0	
8348.386	52.4	V	74.0	-21.6	PK	174	1.0	
9276.090	36.8	V	54.0	-17.2	AVG	128	1.0	
9276.090	47.2	V	74.0	-26.8	PK	128	1.0	
2782.808	53.3	H	54.0	-0.7	AVG	230	1.2	
2782.808	54.2	H	74.0	-19.8	PK	230	1.2	
3710.385	45.1	H	54.0	-8.9	AVG	248	1.7	
3710.385	47.4	H	74.0	-26.6	PK	248	1.7	
4637.963	43.3	H	54.0	-10.7	AVG	187	1.1	
4637.963	46.8	H	74.0	-27.3	PK	187	1.1	
5565.585	51.0	H	54.0	-3.0	AVG	117	1.0	
5565.585	52.7	H	74.0	-21.4	PK	117	1.0	
7420.726	46.2	H	54.0	-7.8	AVG	239	1.0	
7420.726	50.4	H	74.0	-23.6	PK	239	1.0	
8348.386	48.6	H	54.0	-5.4	AVG	116	1.0	
8348.386	52.3	H	74.0	-21.7	PK	116	1.0	
9275.985	36.8	H	54.0	-17.2	AVG	271	1.0	
9275.985	45.8	H	74.0	-28.2	PK	271	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.