Veris Industries

Hawkeye Product Group

EN 55011 Test Report

August 17, 2000

Report No. VERI0021a

Report Prepared By:

NORTHWEST EMC

Certificate of Test

Veris Industries
Hawkeye Product Group
Report No: VERI0021a

This product was tested to the following standards at the laboratories of Northwest EMC Inc.:

EN 55011, Class B
Radiated Emissions

Donald Facteau, I.S. Manager

August 17, 2000
Date

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Revision	Date	Description of Revision(s)	Page(s)
VERI0021a	09/07/00	Updated Block Diagram and Cables, Changed report from Class A to Class B, added note that EUT passes both.	2,4,6,7,8,14,16

1.0 General Information

1.1 Scope

This Test Report documents the results of the electromagnetic compatibility (EMC) testing performed by Northwest EMC, Inc. This report is intended to document the results of testing performed on the sample, and only on the sample described in this report. Details and results of testing are contained within.

1.2 Purpose

Testing was performed to evaluate the electromagnetic compatibility (EMC) performance of the EUT (Equipment Under Test). This test report is intended to document compliance to the following standards, specifications, and directives:

- **89/336/EEC: EMC Directive**
- **98/37/EC: Machinery Device Directive**
- **EN 55011:1998**

A package of information and samples detailing the Declaration of Conformity process is available upon request. Contact the Northwest EMC Customer Service Department for more information.

1.3 Summary of Testing

Description	Pass	Fail
EN 55011, Class B, Conducted Emissions	Not Applied	
EN 55011, Class B, Radiated Emissions	●	❍

2.0 Documentation Review/Approval

In order to ensure the quality and accuracy of this document, the contents have been thoroughly reviewed by the following qualified personnel from Northwest EMC, Inc.

In the event of any inconsistencies, inaccuracies or typographical errors, contact the author of this report or any member of the technical report writing staff at 1-888-EMI-CERT.

Prepared By:	**Administrative Review By:**
Liana Potter, Technical Report Writer	Jennifer Fisher, Technical Report Writer
Technical Review By:	**Approved By:**
Dave Tolman, Software/QA Manager	Donald Facteau, I.S. Manager

This Report may only be duplicated in its entirety. The results of this test pertain only to the sample tested.

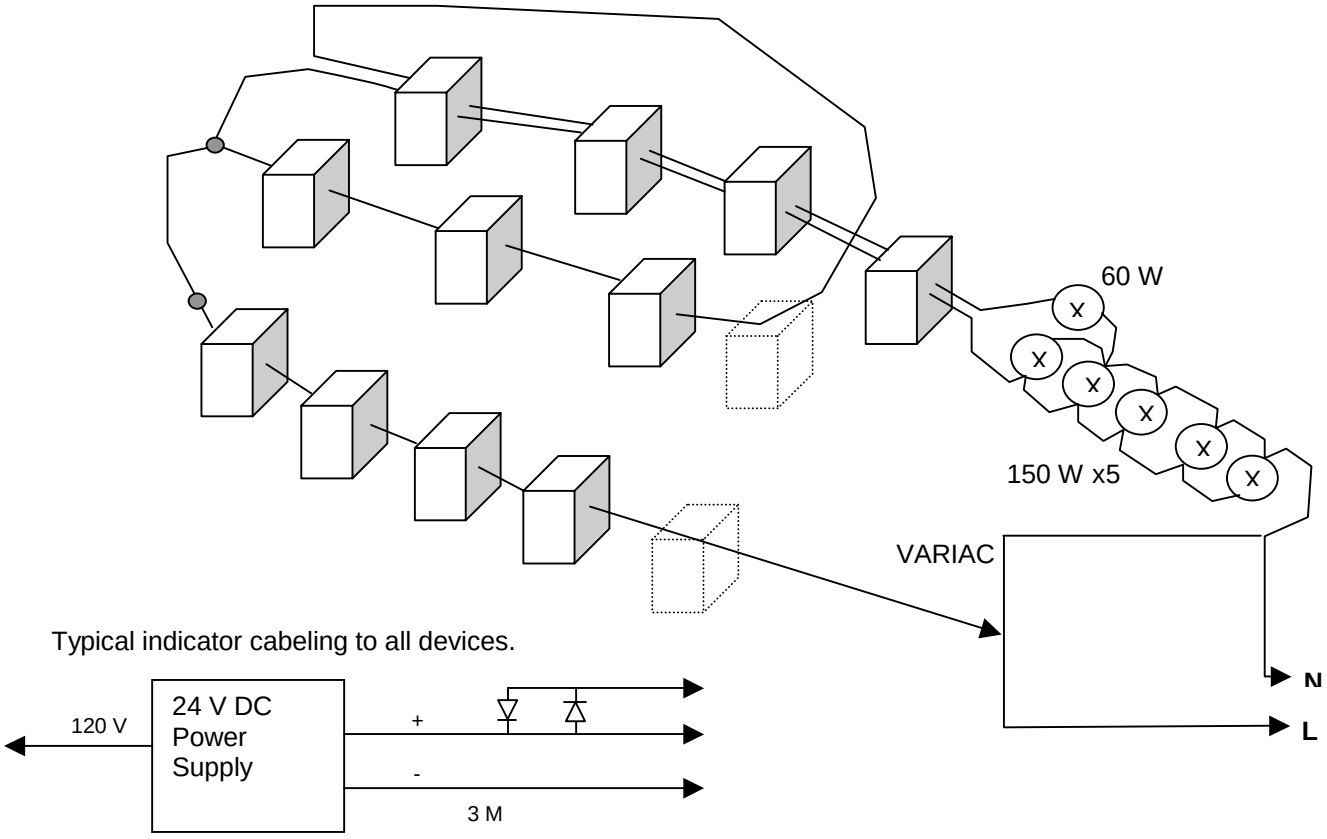
3.0 Product Description

Manufactured By:	Veris Industries
Address:	10831 SW Cascade Blvd., Portland, OR 97223
Test Requested By:	Roger McCoy
Model:	900, 906, 908, 909, 930, 938, 940, 948, 950, 958, 959, 701, 706, 708, 709, 735, 738, 739, 748, 749, 758, 759, 800, 608
Serial Number:	N/A
Date of Test:	August 17, 2000
Receipt Date of Samples:	August 11, 2000
Job Number:	VERI0021

General Description: **Current Sensing Switches (self powered)**

Equipment Type ❍ **Prototype** ❍ **Pre-Production** ● **Production**

Figure 3.1 Configuration of Tested System (Block Diagram)



3.1 EUT and Peripherals

Diagram #	Description	Manufacturer	Model / Part #	Serial Number
A	EUT	Veris industries	900, 906, 908, 909, 930, 938, 940, 948, 950, 958, 959, 701, 706, 708, 709, 735, 738, 739, 748, 749, 758, 759, 800, 608	N/A
B				
C				
D				
E				
F				
G				
H				

3.2 Cables

Ref #	Cable Type	Shield	Length (meters)	Ferrite	Connector	Connection Point 1	Connection Point 2
1	Power	No	3.0	No	N/A	EUT	LED
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

4.0 Test Methodology

4.1 Specifications and Test Method

Description	Test Specification	Class	Test Method
Radiated Emissions	EN 55011:1998	B	EN 55011:1998

4.2 Equipment Classifications

Class A: *Class A equipment is equipment suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes. Class A equipment shall meet Class A limits.*

Note 1 - Operation of equipment which does not meet Class A limits but does not result in unacceptable degradation of radio services may be sanctioned on a case-by-case basis by the competent national authority.

Note 2 - Although Class A limits have been derived for industrial and commercial establishments, administrations may allow, with whatever additional measures are necessary, the installation and use of Class A ISM equipment in a domestic establishment or in an establishment connected directly to domestic electricity power supplies.

Class B: *Class B equipment is equipment suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes. Class B equipment shall meet Class B limits.*

Group 1 ISM equipment: *Group 1 contains all ISM equipment in which there is intentionally generated and/or used conductively coupled radio frequency energy which is necessary for the internal functioning of the equipment itself.*

Group 2 ISM equipment: *Group 2 contains all ISM equipment in which radio frequency energy is intentionally generated and/or used in the form of electromagnetic radiation for the treatment of material, and spark erosion equipment.*

4.3 Field Strength Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured level. The basic equation with a sample calculation is as follows:

Where: Field Strength = Measured Level + Antenna Factor + Cable Attenuation Factor – Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/meter.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/meter

Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

4.4 Measurement Uncertainty

When a measurement is made the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value.

		Uncertainty (dB)					
	Probability Distribution	Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
Test Distance		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86 - 1.88	+ 1.82 - 1.87	+ 2.23 - 1.41	+ 1.29 - 1.26	+ 1.31 - 1.27	+ 1.25 - 1.25
Expanded uncertainty ***U*** (level of confidence ≈ 95%)	normal (k=2)	+ 3.72 - 3.77	+ 3.64 - 3.73	+ 4.46 -2.81	+ 2.59 - 2.52	+ 2.61 - 2.55	+ 2.49 - 2.49

$u_c(y)$ = square root of the sum of squares of the individual standard uncertainties

U = combined standard uncertainty multiplied by the coverage factor: **k**. This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then k=3 (CL of 99.7%) can be used. Please note that with a coverage factor of one, uc(y) yields a confidence level of only 68%.

"ISO Guide to the Expression of Uncertainty in Measurements" and "NIS81: The Treatment of Uncertainty in EMC Measurements" were the basis for determining the uncertainty levels of our measurements. Details of those calculations are available upon request.

4.5 Measurement Bandwidths

Frequency Range (MHz)	Peak Data BW (kHz)	Quasi-Peak Data BW (kHz)	Average Data BW (kHz)
0.01 - 0.15	**1**	**0.2**	**0.2**
0.15 – 30	**10**	**9**	**9**
30 – 1000	**100**	**120**	**120**

5.0 Test Facilities

Trails End Facility:
30475 NE Trails End Lane
Newberg, OR 97132 Fax: (503) 537-0735

Bothell Facility:
19102 North Creek Pkwy., Suite 106
Bothell, WA 98011 Fax: (425) 485-3965

Hillsboro Facility:
5289 NE Elam Young Pkwy., Suite G-800
Hillsboro, OR 97124 Fax: (503) 648-3269

Sultan Facility:
14128 339th Ave. SE
Sultan, WA 98294 Fax: (360) 793-2536

Evergreen Facility:
22975 NW Evergreen Pkwy., Suite 400
Hillsboro, OR 97124 Fax: (503) 844-3826

6.0 Accreditations and Authorizations

NVLAP: Recognized under the United States Department of Commerce, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. NVLAP Lab Code: 200059-0.

FCC: The Open Area Test Sites, and conducted measurement facilities, have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files.

TÜV Product Service: Included by TUV Product Service Group in its Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV's CARAT Program requirements (Certificate No. USA9601C).

TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.

NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

Technology International: Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.

AUSTEL: Accredited by AUSTEL (Australian Telecommunications Authority) as an approved third party test house. This approval is a part of the Technical Approvals Guide No. 3 (TAG3) issue 6.1, Telecommunications Equipment, Standards and Labeling.

VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Evergreen: C-1071 and R-1025, Trails End: C-694 and R-677, Sultan: C-905 and R-871.

BSMI: Accredited by BMSI (Bureau of Standards, Metrology and Inspection) in Taiwan. As an accredited EMC Laboratory, our test data will be accepted for commodity EMC type approval in Taiwan. License No.SL2-IN-E-1017.

Industry Canada: Accredited by Industry Canada for performance of radiated measurements. Our open area test sites comply with RSP 100, Issue 7, section 3.3.

CAB: Designated by NIST as a US Conformity Assessment Body (CAB). Validated to conduct tests as described in the US/EMC Mutual Recognition Agreement.

GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification.

7.0 System Test Configuration

7.1 Justification

The EUT was configured to simulate typical use. Cables were attached to each of the available I/O Ports. Where applicable, peripherals were attached to the I/O Cables. The mode of operation utilized for testing was selected to best simulate typical EUT use.

The Hawkeye Products are basically current sense transformers which are placed around normal electrical power conductors with no galvanic connection. The magnetic field generated by this conductor is sensed and provides the power to operate the Hawkeye device. There are many variations on this basic product to allow for a normally open or normally closed output, adjustable trip levels, high sensitivity (<1.5A trip level), fixed (non. Adj) trip levels, split or solid cores etc. and solid state AC/DC or DC only outputs. Some versions also provide an Aux. Relay that can control AC power loads. All outputs are just a switch closure or opening. No power is output by the Hawkeye product. There are no internal oscillators or clocks at any frequency.

7.1.1 Deviations to the Test Standard

The following deviations were made to the test standard:

- Radiated Emissions was tested at 5 meters to the 10 meter specification limit.

7.2 EUT Exercise Software

Application-specific software was utilized to exercise the EUT for each of the tests.

7.3 Special Accessories

No special accessories are sold with the EUT.

7.4 Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.

8.0 Radiated Emissions Data

8.1 Test Description

Radiated emissions shall be made over the frequency range specified by the procuring authority or regulatory agency or in a specific referenced document, but not outside of the frequency range of 9 kHz to 40 GHz.

Measurements shall be made at the EUT azimuth and antenna height such that the maximum radiated emissions level will be detected. This requires the use of a turntable and an antenna positioner.

The preferred method of a continuous azimuth search is utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna.

In the frequency range of 9 kHz to 30 MHz, magnetic field measurements may be performed. This method is applicable for radiated radio noise from all units, cables, power cords, and interconnect cabling or wiring. A calibrated loop antenna shall be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. For certain applications, the loop antenna may also be positioned horizontally at the specified distance from the EUT. The center of the loop shall be 1 m above the ground.

Electric field measurements may be made in the frequency range of 9 kHz to 30 MHz. This method is applicable for radiated radio noise from all units, cables, powerlines, and interconnecting wiring. A calibrated monopole (rod) antenna shall be positioned at the specified distance from the EUT. The base of the monopole assembly should be placed on the conducting ground plane; and if the antenna is supplied with a counterpoise, the counterpoise shall be bonded to the conducting ground plane through a low-impedance connection.

Electric field measurements may be made in the frequency range of 30 MHz to 1000 MHz. A calibrated, linearly polarized antenna shall be positioned at the specified distance from the periphery of the EUT.

Note: The specified distance is the horizontal separation between the closest periphery of the EUT and the center of the axis of the elements of the receiving antenna. However, if the receiving antenna is a log-periodic array, the specified distance shall be the distance between the closest periphery of the EUT and the front-to-back center of the array of elements.

Tests shall be made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna shall be varied in height above the conducting ground plane to obtain the maximum signal strength. Unless otherwise specified, the measurement distance shall be 3 m, 10 m, or 30 m. At any measurement distance, the antenna height shall be varied from 1 m to 4 m.

These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the antenna clears the ground surface by at least 25 cm.

For any EUT, the frequencies of emission should first be detected. Then the amplitudes of the emissions are measured at the specific measurement distance using the required antenna height, polarization, and detector characteristics. It is preferred that measurements be performed on an open area test site or in an absorber-lined room.

Since the receiving antenna is unlikely to sense simultaneously both a direct signal and a signal reflected from the conducting ground plane, a conducting ground plane is not required, but may be used for measurements over 1 GHz.

In performing these measurements, the sensitivity of the measurement equipment relative to the limit shall be determined before the test. If the overall measurement sensitivity is inadequate, low-noise preamplifiers, closer measurement distances, higher gain antennas, or narrower bandwidths may be used. If closer measurement distances or higher gain antennas are used, the beamwidth versus size of the EUT shall be taken into account. Also, measurement system overload levels shall be determined to be adequate when preamplifiers are used. The effects of using bandwidths different from those specified shall also be determined.

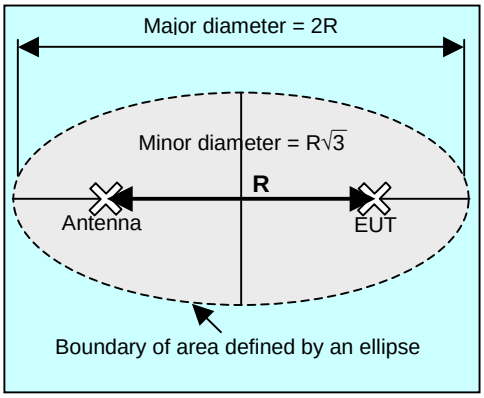
Test Description - continued

Burn-out and saturation protection for the measuring instrumentation is required when low-level emissions are to be measured in the presence of a high-level signal. A combination of bandpass, bandstop, lowpass, and highpass filters may be used. However, the insertion loss of these or any other devices at the frequencies of measurement shall be known and included in any calculations in the report of measurements.

EUT Distance to Antenna:	5 Meters
Test Method :	EN 55011
Specification Limits:	Class B

Note: No signals attributable to EUT were observed during Pre-scans or measured at OATS. The EUT passes both Class A and Class B. The requirements for Class B are more stringent than the requirements for Class A.

Test Location: EV01



Typical Test Site

8.2 Measurement Equipment

Instrument	Manufacturer	Model	Serial No.	Cal Due
Antenna, Biconilog	EMCO	3141	9906-1146	12/2/2000
Spectrum Analyzer	Hewlett-Packard	8566B	2747A05213	1/19/2001
Pre-Amplifier	Amplifier Research	LN1000A	25660	9/2/2000

8.3 Test Procedure

Preliminary radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUT's of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. A shielded room may be used for preliminary testing, but may have anomalies that can lead to errors in amplitude measurements.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often used in this type of testing. The EUT should be set up in its typical configuration and operated in its various modes. For tabletop systems, cables or wires should be manipulated within the range of likely configurations. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit.
Based on the test results in the preliminary tests, the one EUT configuration, cable or wire configuration, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final test. The final test is then performed on a site meeting the normalized site attenuation requirements. If the EUT is relocated from a

Test Procedure - continued

preliminary test site to a final test site, the highest emissions shall be remaximized at the final test location. Antenna height and polarity and EUT azimuth are to be varied, and data shall be collected that satisfies the report requirements.

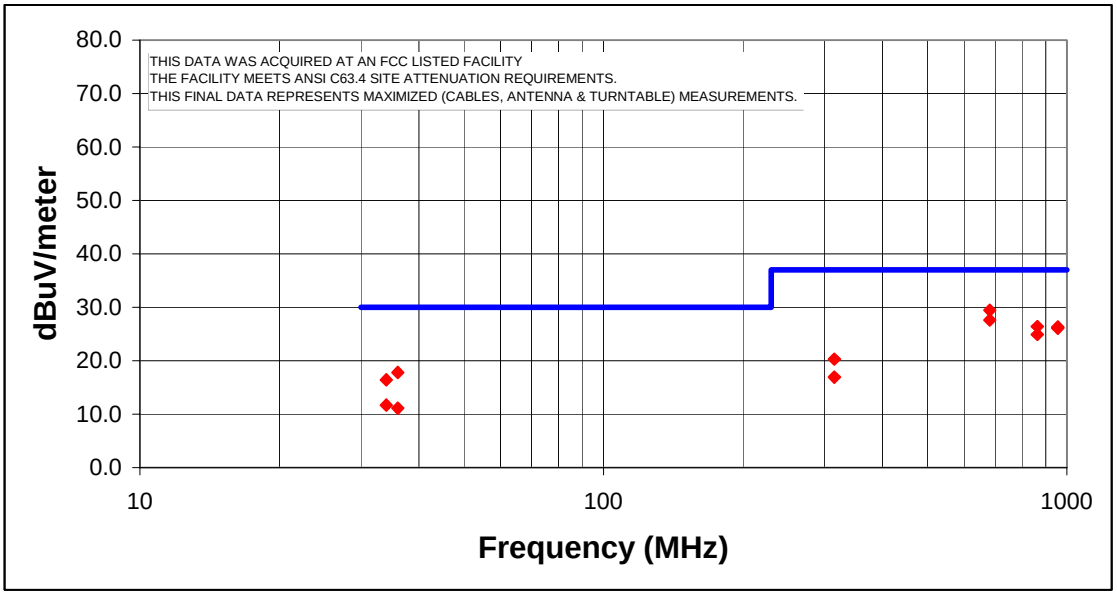
For measurements above 1 GHz, use the EUT configuration and mode of operation determined in the preliminary testing to produce the emission that has the highest amplitude relative to the limit. The antenna should be restricted to a range of heights from 1 m to 4 m above the ground or ground plane.

Notes: (1) Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

8.4 Photographs

Northwest EMC, Inc., Radiated and Conducted Emissions Data Sheets						Rev 3.3 10/09/99
EUT:		Serial Number:		Job Number: **VERI0021**	Date: **08/17/00**	
Manufacturer: **Veris Industries**		Test Engineer: **Rod Peloquin**		Job Site: **EV01**		
Customer Reference Number:		Software:		Power:		
Comments: **AC powered indicator, EUTs on test setup, Variac power source: Increased to about 650W testing level:**						
				Temperature (°C): **19**	% Humidity: **38**	
Test System						
EUT						
Test Equipment						
AAL	APS	AXE				

CISPR 11 Class B (10 meter limit)



Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Polarity	Preamp Gain (dB)	Cable Loss (dB)	Table Azimuth (degrees)	Antenna Height (meters)	Adjusted Level (dBuV/m)	Spec. Limit (dBuV/m)	Margin (dB)	Comment
34.002	32.7	PK	10.4	HBLG	31.8	0.4	43.0	1.0	11.7	30.0	-18.3	Ambient
34.002	37.4	PK	10.4	VBLG	31.8	0.4	111.0	1.5	16.4	30.0	-13.6	Ambient
36.002	39.5	PK	9.6	VBLG	31.7	0.4	216.0	1.5	17.8	30.0	-12.2	Ambient
36.002	32.8	PK	9.6	HBLG	31.7	0.4	152.0	1.0	11.1	30.0	-18.9	Ambient
314.999	36.3	PK	14.4	VBLG	31.3	0.9	43.0	1.3	20.3	37.0	-16.7	Ambient
314.999	32.9	PK	14.4	HBLG	31.3	0.9	191.0	1.5	16.9	37.0	-20.1	Ambient
681.240	37.0	PK	21.4	VBLG	32.3	1.5	302.0	2.7	27.6	37.0	-9.4	Ambient
681.240	38.8	PK	21.4	HBLG	32.3	1.5	182.0	1.3	29.4	37.0	-7.6	Ambient
863.463	34.3	PK	22.7	HBLG	32.3	1.7	45.0	1.0	26.4	37.0	-10.6	Noise floor
863.463	32.8	PK	22.7	VBLG	32.3	1.7	196.0	2.1	24.9	37.0	-12.1	Noise floor
956.054	32.5	PK	23.8	HBLG	31.8	1.8	306.0	1.0	26.3	37.0	-10.7	Noise floor
956.054	32.3	PK	23.8	VBLG	31.8	1.8	45.0	1.3	26.1	37.0	-10.9	Noise floor