



L.S. Compliance, Inc.

W66 N220 Commerce Court
Cedarburg, WI 53012
262-375-4400 Fax: 262-375-4248

COMPLIANCE TESTING OF:

DR 4208D – Digi Reader

PREPARED FOR:

Nexwatch, Inc.
135 W. Forest Hill Avenue
Oak Creek, WI 53154

TEST REPORT NUMBER:

302223 - Rev. 3

TEST DATE:

June 17th, 21st and 26th, 2002

All results of this report relate only to the items that were tested. This report is not to be reproduced, except in full, without written approval of L. S. Compliance, Inc.

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1. L. S. Compliance In Review

L. S. Compliance, Inc. is located in Cedarburg, Wisconsin – United States.

We may be contacted by:

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As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025 : 1999
with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: **1255.01**

U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Conformity Assessment Body operating under the U. S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union EMC Directive 89/336/EEC, Article 10.2.
Date of Validation: **January 16, 2001**

Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948
FCC Registration Number: **90756**

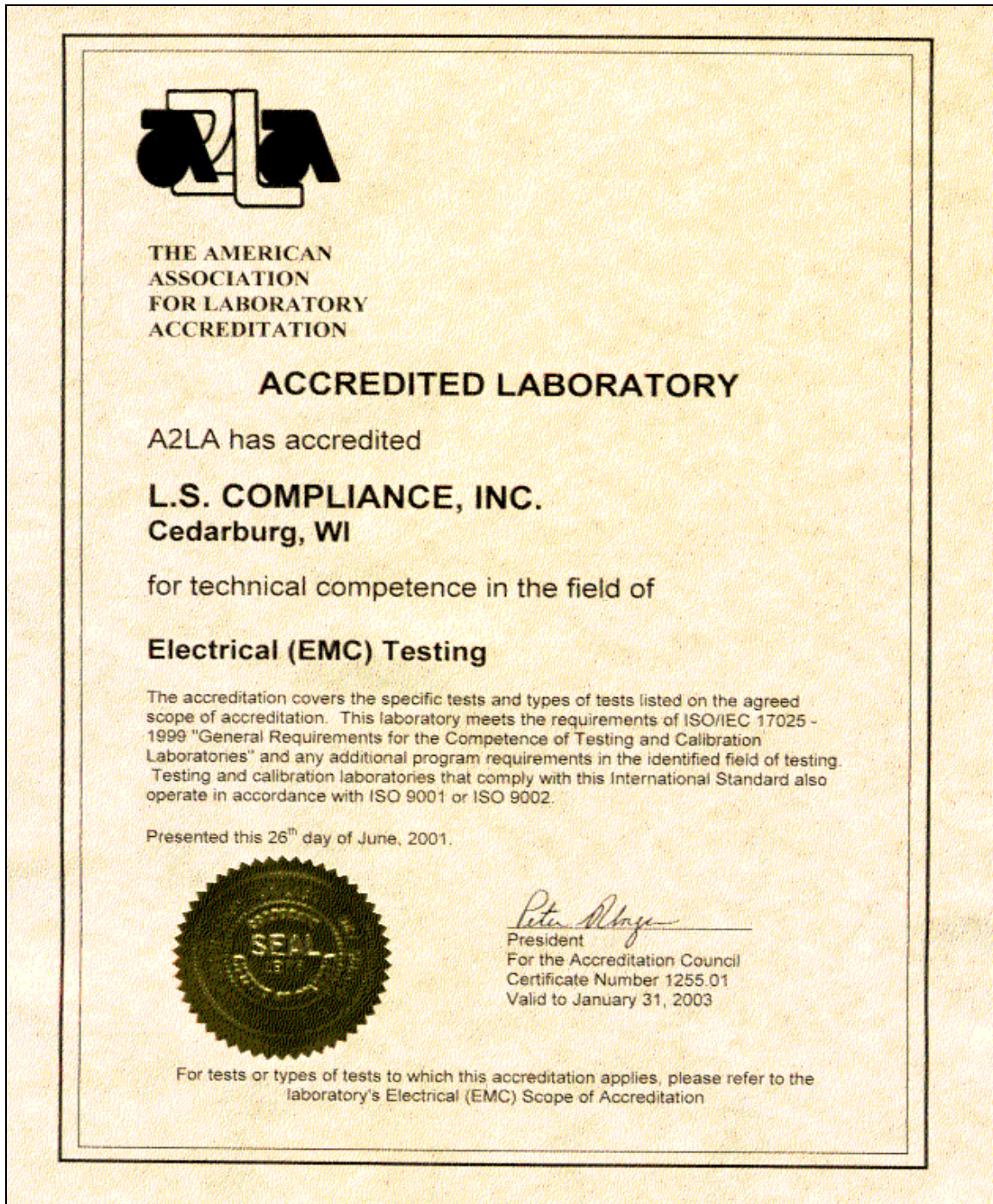
Listing of 3 and 10 meter OATS based on 47CFR 2.948
FCC Registration Number: **90757**

Industry Canada

On-file, 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948
File Number: **IC 3088**

On-file 3 and 10 Meter OATS based on RSS-210
File Number: **IC 3088-A**

2. A2LA Certificate of Accreditation



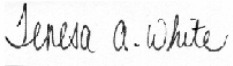
3. A2LA Scope of Accreditation

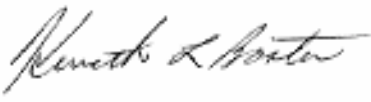
	
American Association for Laboratory Accreditation	
 <u>SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999</u>	
L.S. COMPLIANCE, INC. W66 N220 Commerce Court Cedarburg, WI 53012 James Blaha Phone: 262 375 4400	
ELECTRICAL (EMC)	
Valid to: January 31, 2003	Certificate Number: 1255-01
In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:	
<u>Test</u>	<u>Test Method(s)</u>
Conducted Emissions Continuous/Discontinuous	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11, 22; CNS 13438
Radiated Emissions	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11,22; CNS 13438
Conducted Immunity Fast Transients/Burst	IEC: 1000-4-4, 801-4; EN: 61000-4-4, 50082-1, 50082-2
Surge	IEC: 1000-4-5, 801-5; ENV 50142; EN: 61000-4-5, 50082-1, 50082-2
RF Fields	IEC: 1000-4-6, 801-6; ENV 50141; EN: 61000-4-6, 50082-1, 50082-2
Voltage Dips/Interruptions	IEC 1000-4-11; EN: 61000-4-11, 50082-1, 50082-2
Radiated Immunity RF Fields	IEC: 801-3, 1000-4-3; ENV 50140; EN: 61000-4-3, 50082-1, 50082-2
RF Fields (50 Hz)	IEC 1000-4-8; EN 61000-4-8
RF Fields (Pulse Mode)	EN: 50082-1, 50082-2; ENV 50204
Electrostatic Discharge (ESD)	IEC: 1000-4-2, 801-2; BSEN 60801-2; EN: 61000-4-2, 50082-1, 50082-2
(A2LA Cert. No. 1255.01) 06/26/01 5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644-3248 • Fax: 301-662 2974  Page 1 of 1 	

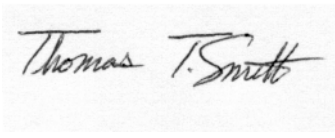
4. Validation Letter – U.S. Competent Body for EMC Directive 89/336/EEC

 1901/2001 NIST CENTENNIAL	 DEPARTMENT OF COMMERCE UNITED STATES OF AMERICA	UNITED STATES DEPARTMENT OF COMMERCE National Institute of Standards and Technology Gaithersburg, Maryland 20899-
January 16, 2001		
Mr. James J. Blaha L.S. Compliance Inc. W66 N220 Commerce Court Cedarburg, WI 53012-2636		
Dear Mr. Blaha:		
I am pleased to inform you that the European Commission has validated your organization's nomination as a U.S. Conformity Assessment Body (CAB) for the following checked (✓) sectoral annex(es) of the U.S.-EU Mutual Recognition Agreement (MRA). (✓) Electromagnetic Compatibility-Council Directive 89/336/EEC, Article 10(2) () Telecommunication Equipment-Council Directive 98/13/EC, Annex III () Telecommunication Equipment-Council Directive 98/13/EC, Annex III and IV - Identification Number: () Telecommunication Equipment-Council Directive 98/13/EC, Annex V - Identification Number:		
This validation is only for the location noted in the address block, unless otherwise indicated below. (✓) Only the facility noted in the address block above has been approved. () Additional EMC facilities: () Additional R&TTE facilities:		
Please note that an organization's validations for various sectors of the MRA are listed on our web site at http://ts.nist.gov/mra. You may now participate in the conformity assessment activities for the operational period of the MRA as described in the relevant sectoral annex or annexes of the U.S.-EU MRA document. NIST will continue to work with you throughout the operational period. All CABs validated for the operational phase of the Agreement must sign and return the enclosed CAB declaration form, which states that each CAB is responsible for notifying NIST of any relevant changes such as accreditation status, liability insurance, and key staff involved with projects under the MRA. Please be sure that you fully understand the terms under which you are obligated to operate as a condition of designation as a CAB. As a designating authority, NIST is responsible for monitoring CAB performance to ensure continued competence under the terms of the MRA.		
		

5. Signature Page

Prepared By:  August 7, 2002
Teresa A. White, Document Coordinator Date

Tested By:  August 7, 2002
Kenneth L. Boston, EMC Engineer Date

Tested By:  August 7, 2002
Thomas T. Smith, EMC Engineer Date

Tested By:  August 7, 2002
Abtin Spantman, EMC Engineer Date

Approved By:  August 7, 2002
Kenneth L. Boston, EMC Lab Manager Date
PE #31926 Licensed Professional Engineer
Registered in the State of Wisconsin, United States

6. Product and General Information

Manufacturer:	Nexwatch, Inc.
Model No.:	DR4208K Digi Reader
Serial No.:	Engineering Unit
Description:	Door Access Card Reader
Frequency Range:	133 kHz

7. Product Description

The DR4208K "Digireader" is the newest addition to the NexWatch line of proximity access control readers. In conjunction with an access control unit (ACU), the DR4208K controls door access by interrogating a specified area around the door for persons possessing a "DigiKey" card, which emits a valid code for entry. The reader is mounted to a permanent fixture (usually an adjacent wall) in the vicinity of the doorway. Because of the frequency of operation, it may be mounted behind a sealed wall for more secure, tamperproof applications. The DR4208D is powered by a 24 volt DC power supply connected to the 117 VAC public mains and has a RS485 interface for communication with the ACU host system. When in operation, a continuous carrier at 133 kHz is transmitted from the door access unit, which is used to energize the "Digi Key" card.

8. Test Requirements

FCC Requirement	Part 15	Test Description
Title 47-CFR	FCC Part 15.209	Radiated Emissions
Title 47-CFR	FCC Part 15.207	Conducted Emissions

9. Summary of Test Report

DECLARATION OF CONFORMITY

The Equipment Under Test (EUT) was found to **MEET** the requirements as described within the specification of Title 47 CFR FCC, Part 15.209, Subpart B; and I.C. RSS-210, Section 7.3 for an unintentional radiator.

10. Introduction

On June 17th, 21st and 26th, 2002 a series of Radiated Emission tests were performed on the EUT. These tests were performed using the procedures outlined in ANSI C63.4-2001 for unintentional radiators, and in accordance with the limits set forth in FCC Part 15.209 (Industry Canada RSS-210) for a low power transmitter. These tests were performed by Kenneth L. Boston, EMC Lab Manager, Thomas T. Smith, EMC Engineer and Abtin Spantman, EMC Engineer of L.S. Compliance, Inc.

11. Purpose

All Radiated and Conducted Emission tests upon the EUT were performed to measure the emissions in the frequency bands described in title 47 CFR, FCC Part 15, including 15.35, 15.207, 15.209 and Industry Canada RSS-210 to determine whether these emissions are below the limits expressed within the standards. These tests were performed in accordance with the procedure described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2001). Another document used as a reference for the EMI Receiver specification was the Comité International Spécial Des Perturbations Radioélectriques (CISPR) Number 16-1, 1993.

12. Radiated Emissions Test

Test Setup

The test setup was assembled in accordance with Title 47, CRF FCC Part 15 and ANSI C63.4-2001. The EUT was placed on an 80cm high non-conductive table centered on a flush mounted 2-meter diameter turntable inside the 3 Meter Semi-Anechoic, FCC listed Chamber located at L. S. Compliance, Inc., Cedarburg, Wisconsin. The EUT was operated in automatic mode, using 24 Volt DC power as provided by the manufacturer. The power supply used was a Nexwatch PS-1, which is normally used as part of the NEXWATCH S-NET ACU System. This supply sources a nominal 27 volt regulated voltage to the transmitter. Fundamental limits were extrapolated for measurement at 10 meters. The limits are further extrapolated by a factor of 20 dB/decade for a pre-scan reading at 3 m, taken in the Semi-Anechoic Chamber (40 dB/decade below 30 MHz). The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a list of the test equipment.

Test Procedure

Preliminary radiation measurements were performed on the EUT in the 3 Meter FCC listed Semi-Anechoic, Chamber, located at L. S. Compliance, Inc. in Cedarburg, Wisconsin. The frequency range from 0.02 MHz to 1000 MHz was pre-scanned, and levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on the non-conductive wooden table in the 3 Meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the test object. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. A Loop Antenna was used for measuring below 30 MHz. The maximum radiated emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities.

The EUT was operated in a continuous running mode during the test. For those frequencies that have significant emissions, measurements were repeated on an FCC listed, 10 meter Open Area Test Site (OATS). The EUT was scanned for emissions at those particular frequencies from 0.02 MHz to 1000 MHz to establish compliance in accordance with Part 15.35 and 15.209 (RSS-210). The Biconical, Log Periodic and Loop Antenna were used as the sensing antennas. The EUT was positioned on an 80 cm high wooden table in the center of a flush-mounted turntable. The EUT was rotated, and the antenna mast was scanned to obtain a maximum signal level. The Loop Antenna was oriented in the position that gave maximum signal level at the fundamental frequency of 133 kHz.

Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a bandwidth of 9 kHz below 30 MHz and 120 kHz for measurements below 1 GHz. Both the Average and Quasi-Peak Detector functions were utilized.

Test Results

The EUT was found to MEET the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.209 for an unintentional radiator (Canada RSS-210). The frequencies with significant signals were recorded and plotted as shown in the Data Charts and Graphs.

Notes:

The A.C. voltage to the PS-1, supplying the transmitter was also varied to 85% of line voltage (98VAC) and 115% of line voltage (132 VAC) with no change in RF output (and no change of D.C. voltage) observed.

The cable from the PS-1 to the transmitter was a 6 conductor, shielded cable containing power, communication and tamper signals. Length was 30 meters.

CALCULATION OF RADIATED EMISSIONS LIMITS

Field strength at transmitter frequency of 133 kHz, according to 15.209

$$\begin{aligned} 0.009 - 0.490 \text{ MHz F.S.} &= 2400/F(\text{kHz}) \text{ at 300 meters} \\ &= 2400/133 = 18.04 \mu\text{V/m} \\ &= 25.13 \text{ dB}\mu\text{V/m at 300 meters} \end{aligned}$$

Per 15.31 (f)(2), measurements are performed at a distance closer than 300 meters.

$$\begin{aligned} \text{at 40dB per decade: limit (133kHz)} &= 25.1 + 60.0 = 85.1 \text{ dB}\mu\text{V/m at 10 meters} \\ \text{limit (133kHz)} &= 25.1 + 80.0 = 105.1 \text{ dB}\mu\text{V/m at 3 meters} \end{aligned}$$

The following table depicts the Class A limits for an unintentional radiator. These limits are obtained from Title 47 CFR, Part 15.109b, for radiated emissions measurements.

Frequency (MHz)	$\mu\text{V/m}$	10 m Limit (dB $\mu\text{V/m}$)
30-88	90	39.1
88-216	150	43.5
216-960	210	46.4
960-10,000	300	49.5

Sample conversion from field strength $\mu\text{V/m}$ to dB $\mu\text{V/m}$:

$$\begin{aligned} \text{dB}\mu\text{V/m} &= 20 \log_{10} (90) \\ &= 39.1 \text{ dB}\mu\text{V/m (from 30-88 MHz)} \end{aligned}$$

Summary of Results and Conclusions

Based on the procedures outlined in this report, and the test results, it can be determined that the EUT does **MEET** the emission requirements of Title 47 CFR, FCC Part 15.209 (Industry Canada RSS-210) for a low power transmitter.

The enclosed test results pertain to the samples of the test item listed, and only for the tests performed per the data sheets. Any subsequent modification or changes to the test items could invalidate the data contained herein, and could therefore invalidate the findings of this report.

Measurement of Electromagnetic Radiated Emissions On the 10 Meter FCC Listed Open Air Test Site (OATS)

Frequency Range Inspected: 0.02 MHz - 1,000 MHz

Manufacturer: NexWatch, Inc.

Date of Test: June 17th, 21st and 26th, 2002

Model No.: DR4208K

Serial No.: Engineering Unit

Test Requirements: 47 CFR 15.209;

Distance: 10 Meters	Frequency Range Inspected: 20 kHz to 1000 MHz
Configuration: Continuous Carrier Transmit	

Test Equipment Used:

EMI Receiver: HP 8546A	Biconical Antenna: EMCO 3110
Amplified Loop Antenna: EMCO 6502	Log Periodic Antenna: EMCO 43146A

Detector(s) Used:		Peak	√	Quasi-Peak	√	Average
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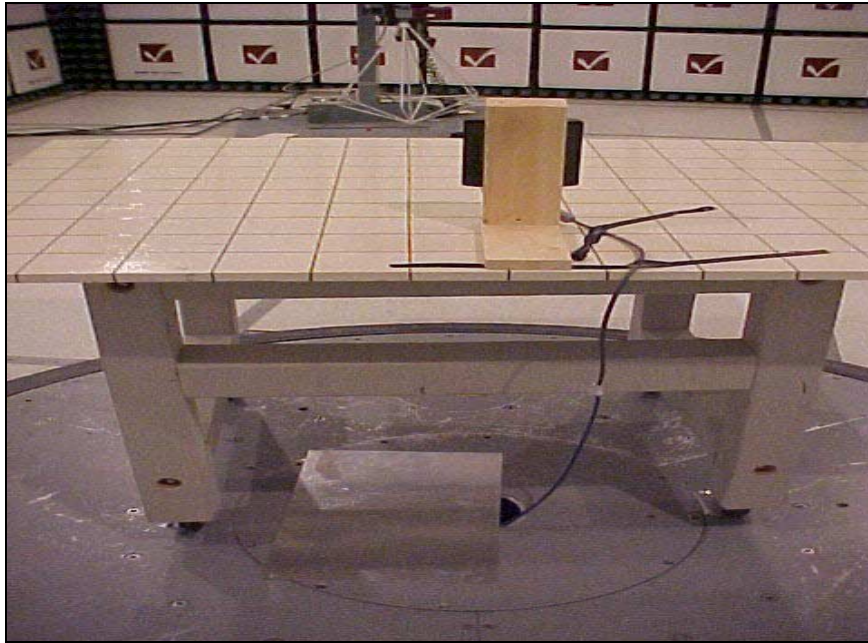
The following table depicts the level of significant emissions found:

Frequency (MHz)	Antenna Polarity	Height (meters)	Azimuth (0° - 360°)	EMI Meter Reading (dBμV/m)	15.209; 15.109 Limit (dBμV/m)	Margin (dB)
.133	*	1.0	0°	67.6 Average	85.1	17.5
35.87	V	1.0	0°	27.7	39.1	11.4
57.61	V	1.0	0°	25.3	39.1	13.8
73.87	V	1.0	0°	35.4	39.1	3.7
123.6	V	4.0	0°	35.3	43.5	8.2

Notes: * Loop Antenna oriented for maximum signal level from the transmitter.

Photos Taken During Radiated Emission Testing

Setup for the Radiated Emissions Test



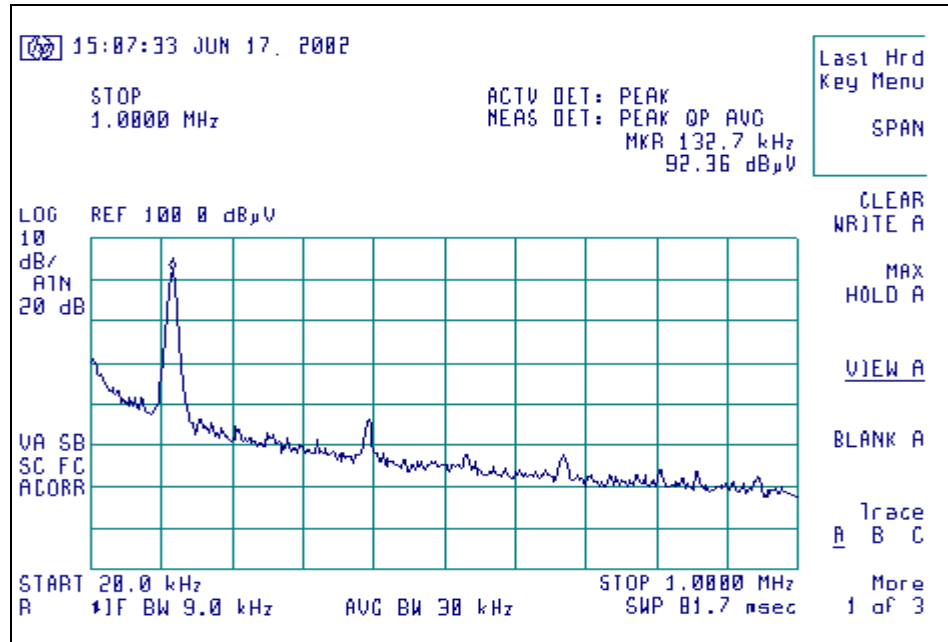
View of the EUT during Radiated Emission Testing in the 3 Meter FCC Listed Chamber



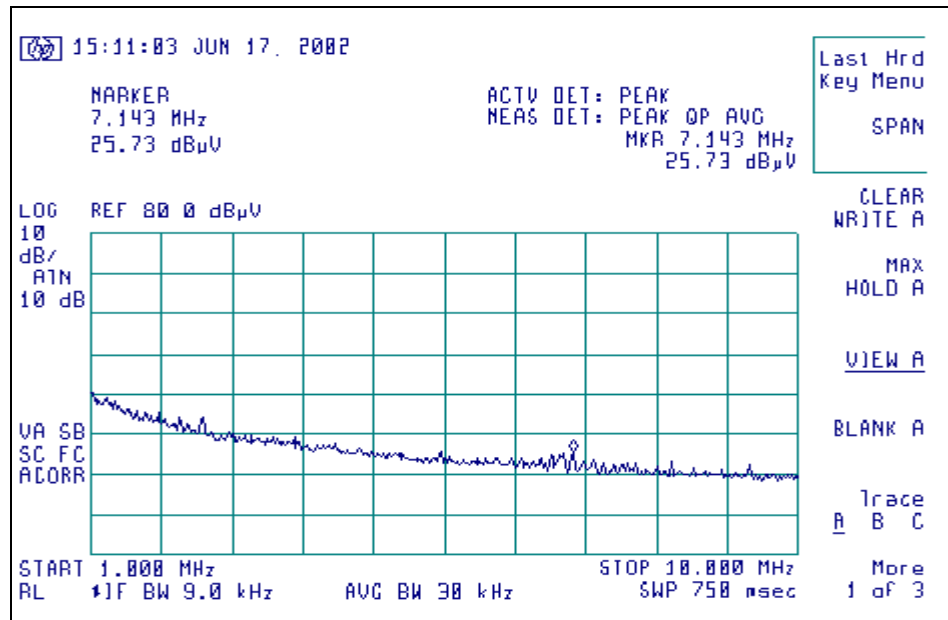
View of the EUT during Radiated Emission Testing on the 10 Meter OATS

Graphs made during Radiated Emission Testing

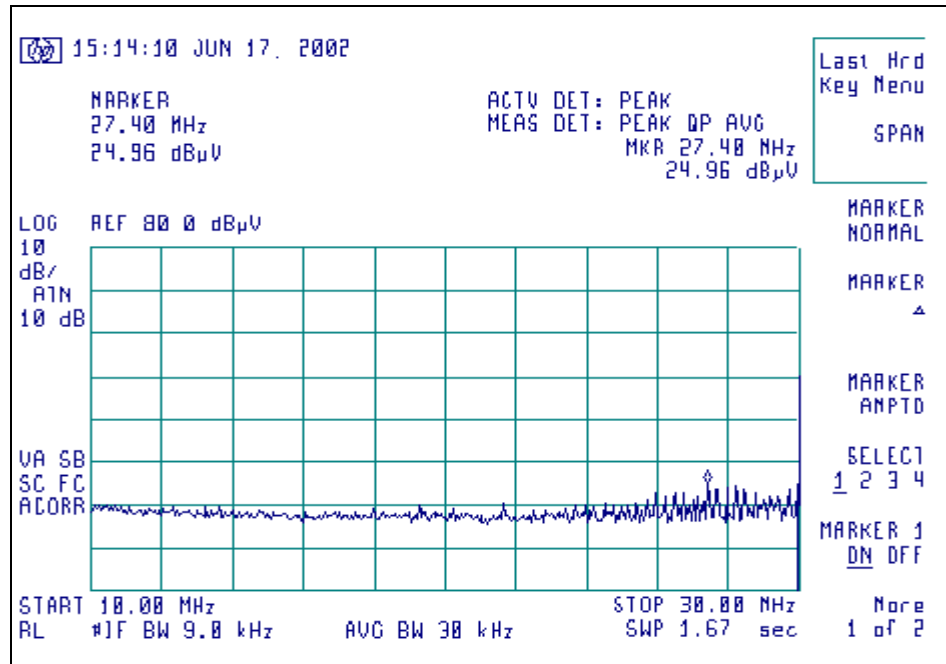
Signature Scan of Radiated Emissions (in the 3 meter Chamber)



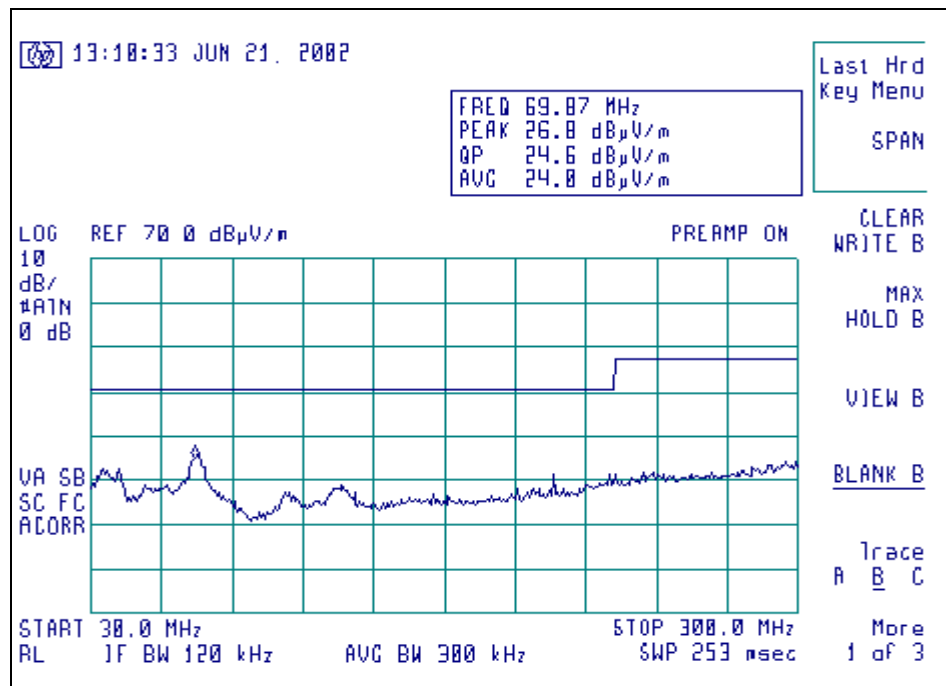
Signature Scan of Radiated Emissions (in the 3 meter Chamber)



Signature Scan of Radiated Emissions (in the 3 meter Chamber)



Signature Scan of Radiated Emissions (in the 3 meter Chamber), Vertical Polarity, 30 MHz – 300 MHz



13. Conducted Emissions Test (AC Line)

Test Setup

The Conducted Emissions test was performed within the FCC Listed Shielded Room, located at L.S. Compliance, Inc. in Cedarburg, Wisconsin. The test area and setup are in accordance with ANSI C63.4-2001 and with Title 47 CFR, FCC Part 15, Subpart B (Industry Canada RSS-210). The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The 24 VDC power supply for the EUT was plugged into a 50 Ω (ohm), 50/250 μ H Line Impedance Stabilization Network (LISN). The AC power supply of 120V was fed into the 3 Meter Semi-Anechoic Chamber via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup in the FCC Listed Shielded Room and connected to the LISN, the RF Sampling Port of the LISN was cabled to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The EMCO LISN used has the ability to terminate the unused port with a 50 Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

Test Procedure

The appropriate frequency range and bandwidths were entered into the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 (1993), Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for malfunction. The emissions are measured on the HP 8546A EMI Receiver, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

Test Results

The EUT was found to MEET the Conducted Emission requirements of FCC Part 15, Conducted Emissions for low power transmitter. See the Data Charts and Graphs for more details of the test results.

Notes:

Data is presented to show compliance with both current FCC (Part 15.207) limits, and limits which will be in force on September 9, 2002 (per Federal Register).

Measurement of Electromagnetic Conducted Emission In the Shielded Room

Frequency Range Inspected: 150 KHz to 30 MHz

Manufacturer: NexWatch, Inc.

Date of Test: June 26th, 2002

Model No.: DR4208K

Serial No.: Engineering Unit

Test Requirements: 47 CFR 15.207; 15.107(b) Class B

Distance: N/A				Frequency Range Inspected: .15 to 30 MHz			
Configuration: Continuous Carrier							
Detector(s) Used:			Peak	√	Quasi-Peak	√	Average

Test Equipment Used:

EMI Receiver: HP 8546A			
LISN: EMCO 3810/2NM		Transient Limiter: HP 11947A	

This table establishes compliance with FCC limits which will be current on 9/9/02.

Frequency (MHz)	Line	Quasi-Peak Reading (dBμV/m)	Quasi-Peak Limit (dBμV/m)	Margin (dB)		Average Reading (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)
0.184	L1	59.0	64.2	5.2		30.2	54.2	24.0
0.265	L1	52.2	61.2	9.0		24.5	51.2	26.7
0.514	L1	39.3	56.0	16.7		12.8	46.0	33.2
0.185	L2	58.5	64.2	5.7		29.6	54.2	24.6
0.263	L2	52.4	61.3	8.9		24.7	51.3	26.6
0.361	L2	43.7	58.7	15.0		17.7	48.7	31.0

- Note:** 1) All other signals were seen to be greater than 20 dB below the limits.
2) Plots show Conducted Emissions as compared to Class B Limits.

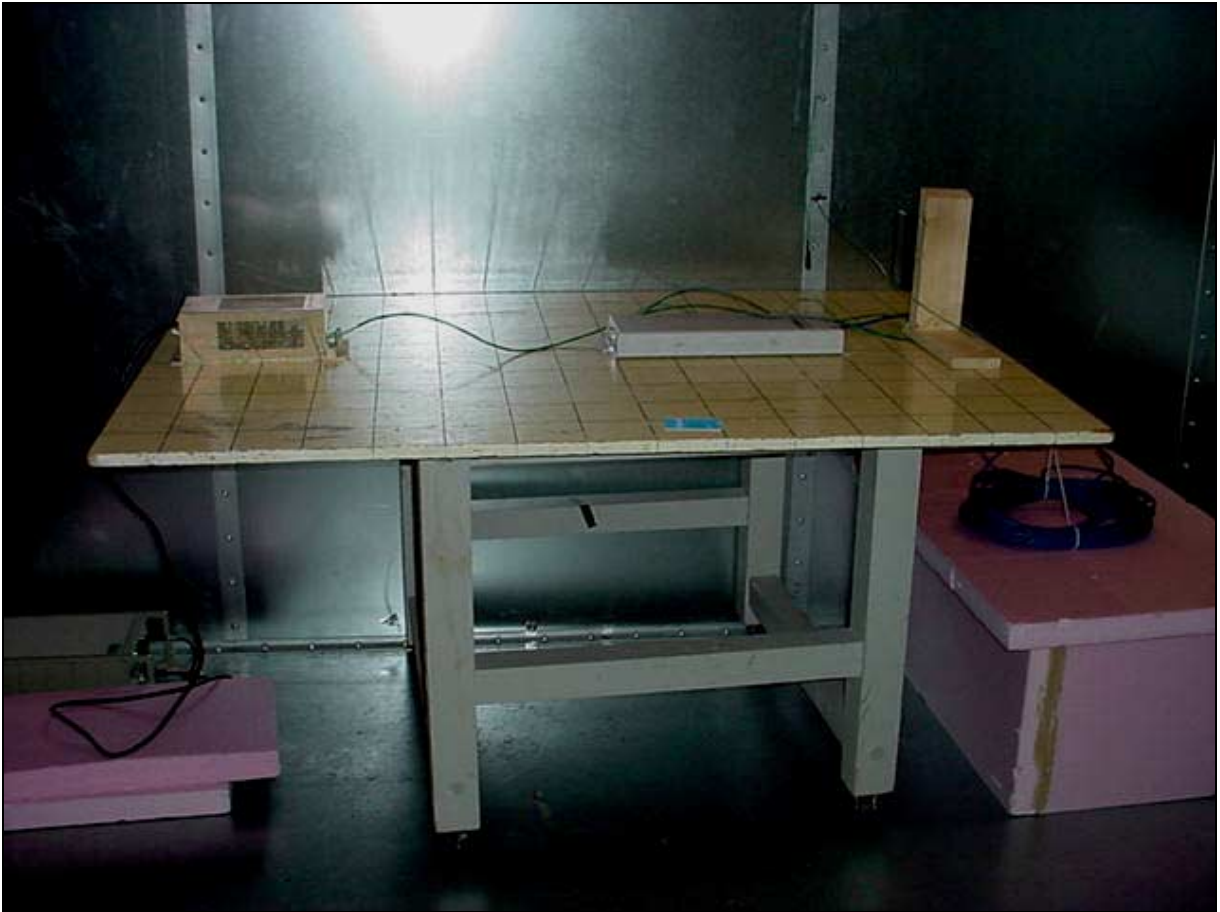
This table establishes compliance with FCC Class B limits, which are current prior to 9/9/02.

Frequency (MHz)	Line	Quasi-Peak Reading (dBμV/m)	Quasi-Peak Limit (dBμV/m)	Margin (dB)
0.514	L1	39.3	48.0	8.7
0.455	L1	46.9*	48.0	1.1
0.461	L2	46.8*	48.0	1.2
0.468	L2	46.5*	48.0	1.5
0.473	L2	46.2*	48.0	1.8
0.499	L2	45.7*	48.0	2.3
0.512	L2	45.9*	48.0	2.1
0.526	L2	45.6*	48.0	2.4

* peak detector readings, extracted from EMI Receiver peak hold (trace A) data table.

Photos Taken During Conducted Emission Testing

Setup for the Conducted Emissions Test

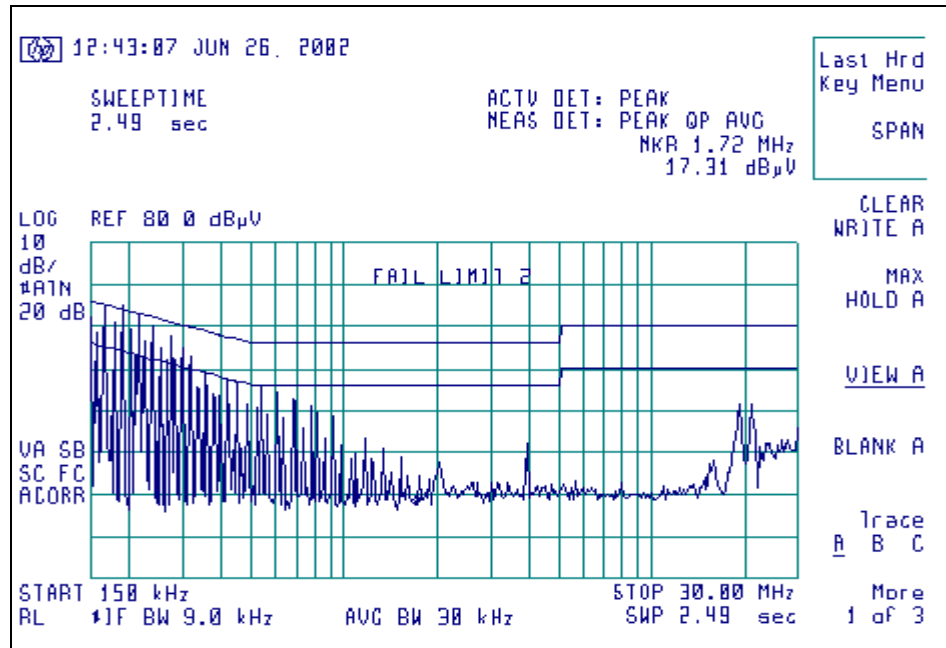


View of the EUT during Conducted Emissions Testing

Graphs made during Conducted Emission Testing

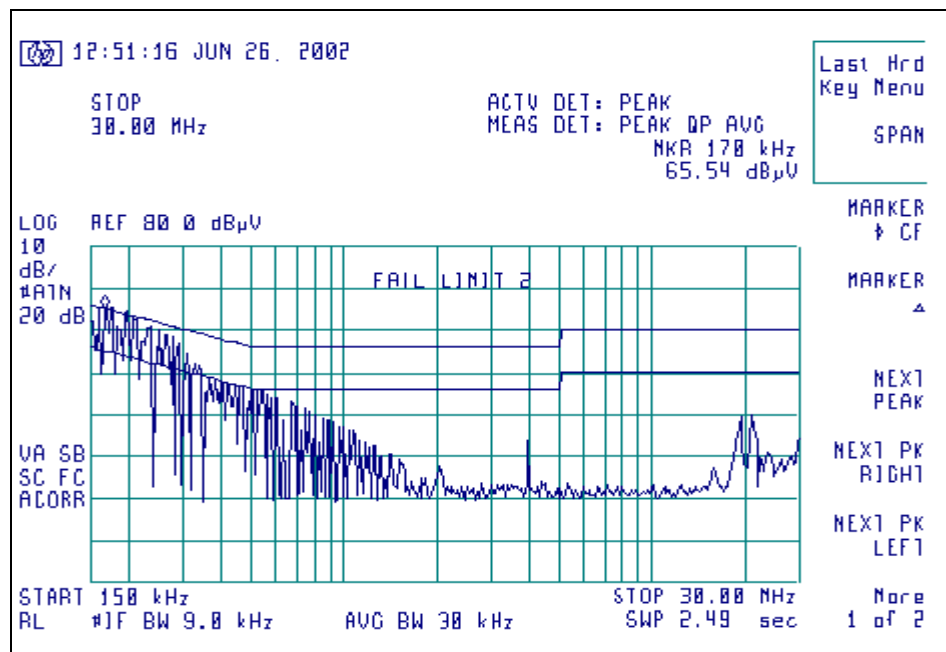
Signature Scan of Conducted Emissions (peak hold shown)

Line 1



Signature Scan of Conducted Emissions (peak hold shown)

Line 2



Appendix A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Calibration Information	
					Date	Due Date
AA960005	EMCO	3110B	9601-2280	Biconical Antenna	09-24-01	09-24-02
AA960006	EMCO	6502	9311-4138	Active Loop Antenna	08-21-00	08-21-02
CC000221	HP	E4407b	Us39160256	26.5 GHz Spectrum Analyzer	11-08-00	11-08-01
EE960004	EMCO	2090	9607-1164	Mast/Table Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	11-02-01	11-02-02
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	11-02-01	11-02-02
FF666006	HP	11947A	3107A02515	Transient Limiter		
FF660012	EMCO	93146	9701-4855	Log-Periodic Antenna	11-29-01	11-29-02
FF660021	EMCO	3810/2NM	9612-1710	10A LISN	09-25-01	09-25-02
N/A	LSC	Cable	0011	3 meter 1/2" Helix Cable	12-07-00	12-07-01
N/A	LSC	Cable	0038	1 meter RG 214 Cable	12-07-00	12-07-01
N/A	LSC	Cable	0050	10 meter RG 214 Cable	12-07-00	12-07-01
N/A	LSC	Attenuator		10 db Attenuator		N/A

Note 1* - Equipment calibrated within a traceable system.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uc Value in Appropriate Units
Radiated Emissions	3 Meter Chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3 Meter Chamber, Log Periodic Antenna	4.80 dB
Radiated Emissions	10 Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10 Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Meter Chamber, 3 Volts/Meter	1.128 Volts/Meter
Conducted Immunity	3 Volt level	1.0 V