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EMC DIRECTIVE 89/336/EEC

HEAVY INDUSTRY EQUIPMENT
CE EVALUATION

TEST REPORT
(REVISED)

PER EN 61000-6-4, EN 61000-6-2 AND EN 61204-3

For The **AC Power Supply**

MODEL: **LZS-A500-3**

PREPARED FOR

Lambda Electronics
3055 Del Sol Blvd.
San Diego, CA 92154

PREPARED ON **Oct. 4, 2005**

REPORT NUMBER **2005 100857 CE Rev.2**

PROJECT NUMBER: **25-857-LAM**

DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	Oct. 4, 2005	Prepared By: Ferdinand S. Custodio
-	Oct. 4, 2005	Initial Release: F.R. Fleury
1	March 16, 2007	Revision Release: Michael T. Krumweide Reason for Revision: → Additional tests for Voltage dips and short interruptions.
2	March 22, 2007	Revision Release: Michael T. Krumweide Reason for Revision: → Correction to Publications dates on page 6. → Restored Test parameters on page 50.

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to the Subclause 5.10 Requirements of ISO/IEC 17025 "General Criteria For the Competence Of Testing and Calibration Laboratories":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on September 29, 2005 . Testing was performed on the unit described in this report on September 29, 2005 to October 4, 2005 .
- The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- This report does not imply the endorsement of the Federal Communications Commission (FCC), NVLAP or any other government agency.

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CERTIFICATION

The compatibility testing and this report have been prepared by Nemko USA, Inc., an independent electromagnetic compatibility consulting and test laboratory.

As specified by European Union harmonized documents EN 61000-6-4, EN 61000-6-2, and EN 61204-3. The testing and test methods were accomplished in accordance with both the International Electrotechnical Committee (IEC) publications and European Norms EN 55011 specifications for Industrial, Scientific and Medical Equipment (ISM).

I certify the data evaluation and equipment configuration herein to be a true and accurate representation of the sample's immunity and emission characteristics, as of the test date(s), and for the design of the test sample utilized to compile this report.

F.R. Fleury

F.R. Fleury
Manager of EMC Operations

1. ADMINISTRATIVE DATA AND TEST SUMMARY

1.1 Administrative Data

CLIENT: Lambda Electronics
3055 Del Sol Blvd.
San Diego, CA 92154
619 628-2832

CONTACT: Lyn Dinoso

DATE (S) OF TEST: September 29, 2005 to October 4, 2005

EQUIPMENT UNDER TEST (EUT): AC Power Supply

Model LZS-A500-3

Condition Upon Receipt Suitable for Test

TEST SPECIFICATIONS: Radio Frequency Emissions and Electromagnetic Immunity tests in accordance with EN 61000-6-4 and EN 61000-6-2 as follows:

TEST TYPE	TECHNICAL DOCUMENT	DOCUMENT TITLE
Conducted and Radiated Emissions	EN 55011 (1998)	Specification for Limits and Methods of Measurement of Radio Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment
Power Line Harmonics Immunity	EN 61000-3-2 (2000)	Electromagnetic Compatibility, Limits for Harmonic Current Emissions, Equipment Input Current less than or equal to 16A
Power Line Flicker Immunity	EN 61000-3-3 (1995)	Electromagnetic Compatibility, Limitation of Voltage Fluctuations and Flicker In Low-Voltage Supply Systems for Equipment with Rated Current less than or equal to 16A
Electrostatic Discharge Immunity	IEC 61000-4-2 (1995)	Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment Electrostatic Discharge Requirements
Radio Frequency Immunity	IEC 61000-4-3 (2002)	Electromagnetic Compatibility - Testing and Measurement Techniques - Radiated Radio Frequency Electromagnetic Field Immunity Test
Electrical Fast Transient Burst Immunity	IEC 61000-4-4 (1995)	Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment Electrical Fast Transient / Burst Requirements

Test specifications continued:

Power Line Surge Immunity	IEC 61000-4-5 (1995)	Electromagnetic Compatibility, Power Line Surge Immunity
RF Common Mode Immunity	IEC 61000-4-6 (1996)	Electromagnetic Compatibility - Basic Immunity Standard - Conducted Disturbances Induced By Radio-Frequency Fields - Immunity Test
Power Frequency Magnetic Field	IEC-61000-4-8 (1994)	Electromagnetic Compatibility, Testing and Measurement Techniques for Power Frequency Magnetic Field, Immunity Test
Voltage Dips and Short Interruptions Immunity	IEC 61000-4-11: 2004	Electromagnetic Compatibility - Testing and Measurement Techniques - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

1.2 Test Summary

1.2.1 Emissions Test Summary

Specification	*Frequency Range*	*Compliance Status*
EN 55022 (1998) Class "B" Conducted Emissions	0.15 MHz – 30 MHz	**PASS**
EN 55022 (1998) Class "B" Radiated Emissions	30 MHz – 1000 MHz	**PASS**
EN 61000-3-2 (2000) -Power Line Harmonics	up to the 40th Harmonic	**PASS**
EN 61000-3-3 (1995) -Power Line Flicker	less than or equal to 4% Maximum Relative Voltage Change; Value of D(T) less than or equal to 3% for more than 200 Ms	**PASS**

1.2.2 Immunity Test Summary

Specification	*Minimum Criterion Level Required as per IEC 61000-6-2 and IEC 61204-3*	*Criterion Level Tested*	*Compliance Status*
IEC 61000-4-2 (1995) - ESD Immunity	**Criterion B** ±8 kV Air Discharge, ±4 kV Contact Discharge	**Criterion B** ±8 kV Air Discharge, ±6 kV Contact Discharge	**PASS**
IEC 61000-4-3 (2002) -Radio Frequency Immunity	**Criterion A** 10 V/m from 80-1000 MHz (80% AM at 1kHz)	**Criterion A** 10 V/m from 80-2500 MHz (80% AM at 1kHz)	**PASS**
IEC 61000-4-4 (1995) -Electrical Fast Transient Immunity	**Criterion B** Power Line Pulses of +/- 2 kV; up to ±2kV process/control lines; I/O Line Pulses of +/- 1 kV	**Criterion A** Power Line Pulses of +/- 2 kV; up to ±2kV process/control lines;	**PASS**
IEC 61000-4-5 (1995) -Surge Immunity	**Criterion B** +/-0.5kV Common Mode Surges, +/-0.5kV Differential Mode Surges	**Criterion B** +/-2.0kV Common Mode Surges, +/-1.0kV Differential Mode Surges	**PASS**
IEEE C62.41 -Surge Immunity	**Criterion B** 2,4 and 6kV Common Mode and Differential Mode Surges Ring Wave	**Criterion B** 2,4 and 6kV Common Mode and Differential Mode Surges Ring Wave	**PASS**
IEC 61000-4-6 (1996) -RF Common Mode Immunity	**Criterion A** 150 kHz - 80 MHz at $10V_{rms}$ 1kHz 80% amplitude modulated	**Criterion A** 150 kHz - 80 MHz at 10Vrms 1kHz 80% amplitude modulated	**PASS**
IEC-61000-4-8 (1994) Power Frequency Magnetic Field	**Criterion A** Helmholtz coil at 50 Hz, to 30 amps (rms) per meter	**Criterion A** Helmholtz coil at 50 Hz, to 30 amps (rms) per meter	**PASS**
IEC 61000-4-11: 2004 - Voltage Dips and Short Interruptions	**Criterion B and C** Voltage Dips of 30%, 60%; and 100%; Interruptions of >95%.	**Criterion A and B** Voltage Dips of 30%, 60%; and 100%; Interruptions of >95%.	**PASS**

Test Supervisor: F.R. Fleury

F.R. Fleury, Nemko USA, Inc.

2. SYSTEM DESCRIPTION AND CONFIGURATION

2.1 Description and Method of Exercising the EUT

The LZS-A500-3 is a regulated power supply. Its main function is to provide DC power from a single phase power source. The applications for the EUT include industrial power supply for factory automation, process control, NC-machining, automotive, packaging equipment, materials handling, chemical processing, robots and much more. The EUT was exercised by attaching it to a 500W resistive load (24VDC@21A). During Immunity testing, the output of the EUT will be recorded in real time. Any change in the output voltage will be evaluated to the corresponding test criteria (+/-1 volt variation) for that particular test.

2.2 System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT – Regulated Power Supply	Lambda Electronics LZS-A500-3 053920000017	1.8 meters, unshielded, 16AWG x 3, IEC Type
Support Equipment – Load Resistor	Lambda Electronics 1.1Ω total resistance	N/A
Support Equipment – Scopemeter	Fluke 105B Scopemeter Series II 9444 201 05003	Via AC/DC Adapter
Support Equipment – Scopemeter AC/DC Adapter	Fluke PM 8907/803 1697	Direct Wall Plug-In

2.3 Device Interconnection and I/O Cables

CONNECTION	I/O CABLE
EUT to Load	1.7 meters, 10AWG x 2, twisted together

2.4 Design Modifications for Compliance

Device: **AC Power Supply**

Model: **LZS-A500-3**

The following design modifications were made to the EUT during testing.

Model:	**Modifications**:
LZS-A500-3	Added AMOBEADS* to center leads of D400 & D401.

*Lambda PN TCB00012 manufactured by Toshiba (PN AB3x2x3W - Amorphous Material)

Nemko USA, Inc. recommends a safety review be completed in reference to the above listed design modification. The purpose of this review is to ensure that no safety issues are introduced as a result of these design modifications.

3. DESCRIPTION OF TESTING METHODS

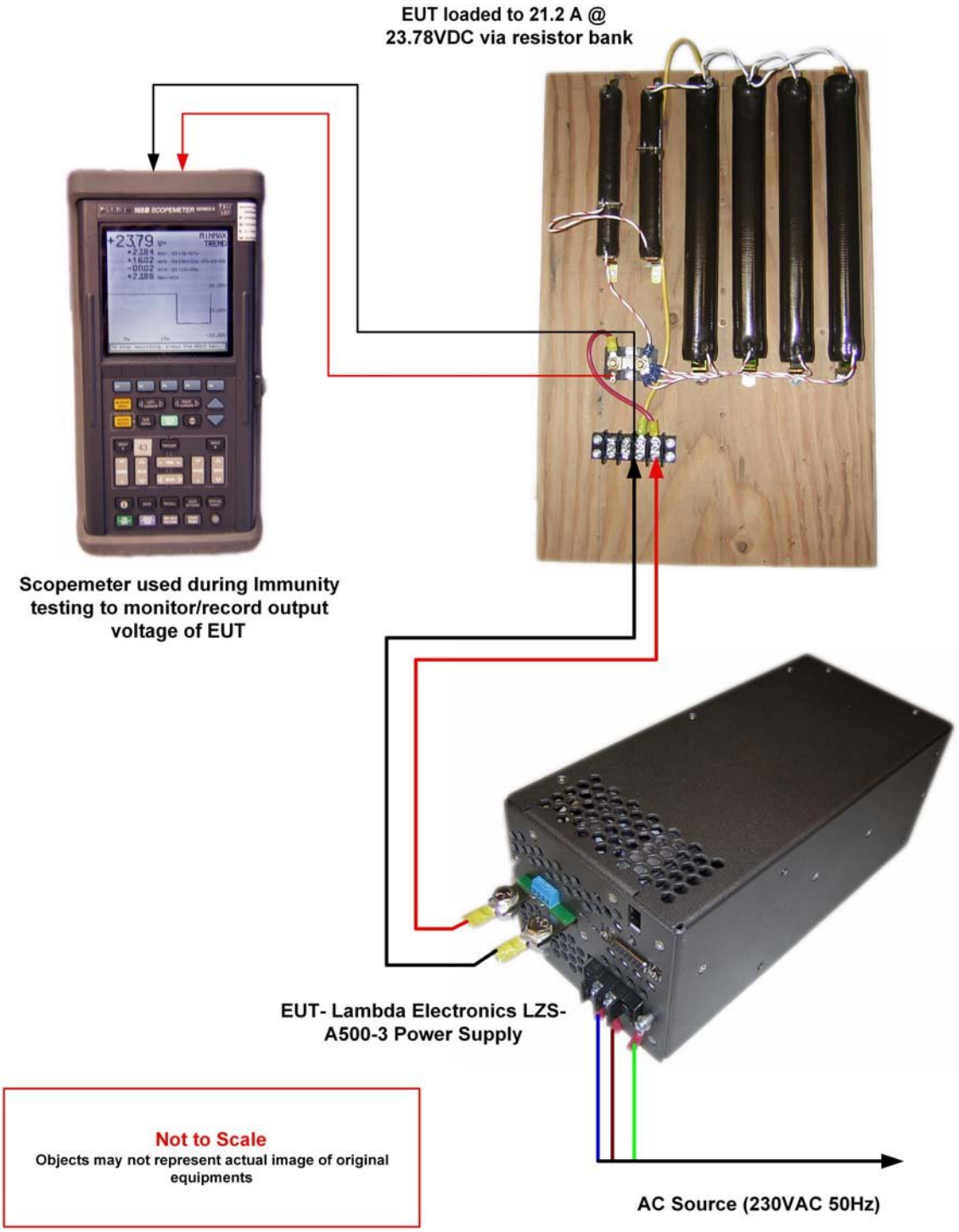
3.1 Introduction

Under the EMC Directive 89/336/EEC (as amended by 92/31/EEC) of the European Union (EU), a device is required to be constructed so that "the electromagnetic disturbance it generates does not exceed a level allowing radio and telecommunications equipment and other apparatus to operated as intended" and that the device "has an adequate level of intrinsic immunity of electromagnetic disturbance to enable it to operate as intended." The Directive requires that all products brought into service within the EU comply with all applicable EMC requirements published as harmonized documents known as European Norms (EN). The harmonized document published for immunity is the EN 61000-6-2:2001, a generic immunity standard for industrial environments. The harmonized document published for radio frequency emissions is the EN 61000-6-4 (dated January 2001) a generic emissions standard.

The methods employed to test the emissions and immunity characteristics of the Equipment Under Test are those mandated by the European Standards EN 61000-6-4: 2001 and EN 61000-6-2: 2001. The applicable tests and the minimum criteria for a pass condition that are listed in the administrative section of this report are taken from these standards.

For General Test Configuration please refer to Photograph 1 on the following page.

Photograph 1. General EUT Test Setup Diagram



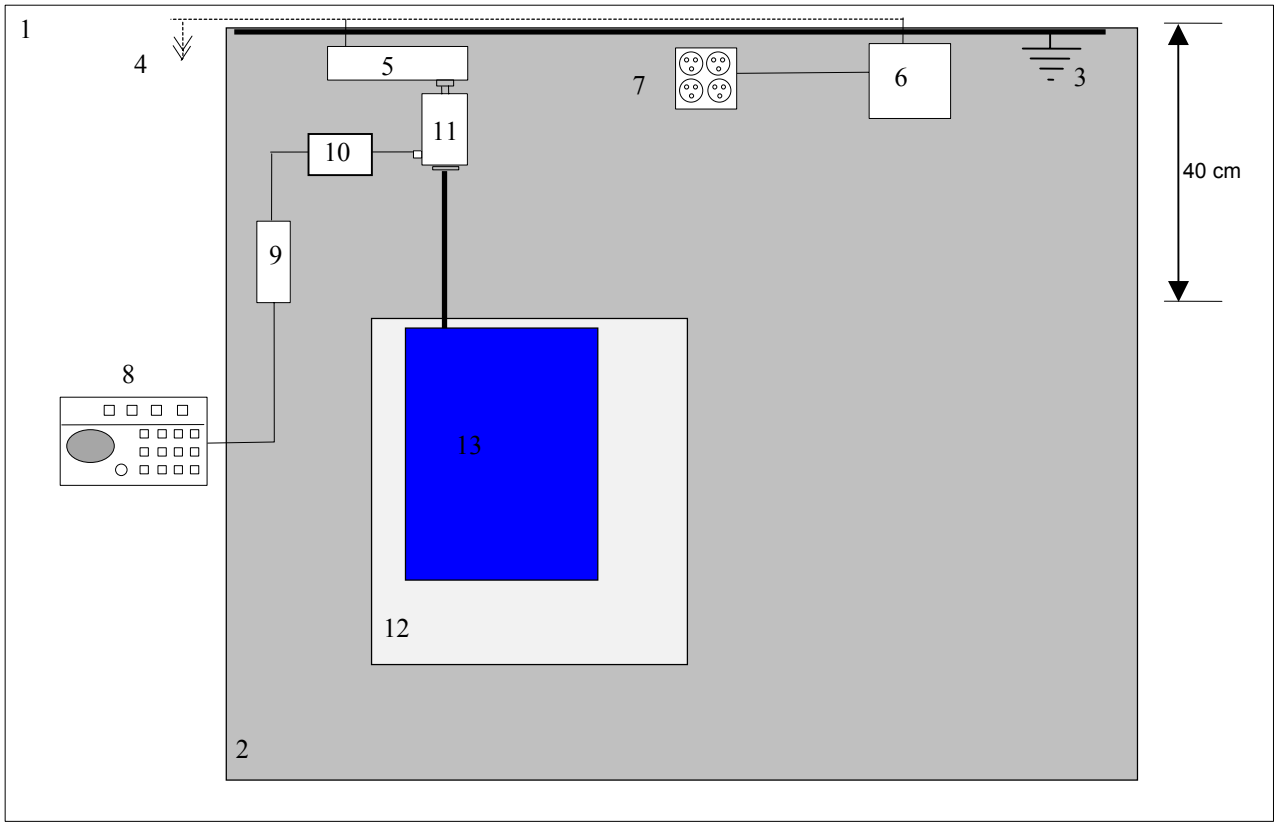
3.2 Configuration and Methods of Measurements for Conducted Emissions

EN 61000-6-4 specifies EN 55011 for the general configuration of the EUT and associated equipment, as well as the test platform for conducted emissions testing. Floor-standing devices are placed 10 centimeters above a ground plane floor and 40 centimeters from a vertical ground plane wall. Both quasi-peak and average detector measurement modes are used. If however, the average limit is met while using a quasi-peak detector, the test unit is deemed to meet both the limits, and measurement with the average detector receiver is unnecessary. The quasi-peak and average emission levels are then recorded and compared to the applicable EN 55011 limits to determine compliance.

EN 61000-6-4 also calls out the requirement for making, *where applicable*, Discontinuous Disturbance (i.e., "Click") measurements per the limits and methods of Clause 4.2 of EN 55014 (2000). Clause 4.2 of EN 55014 (2000) defines a two part procedure for this. First, a determination is made as to whether or not there are "clicks" of sufficient magnitude/duration/frequency of occurrence to be subject to limits. Second, *and only if there are "clicks" of sufficient magnitude/duration/frequency of occurrence to be subject to limits*, the "Clicks" are measured and recorded. Otherwise, no "Click" measurements are to be made. "Click" Disturbances are rarely found to occur in Laboratory Instrumentation; consequently, the requirement is not usually applicable.

For Conducted Emissions Test Configuration please refer to Figure 1 on the next page.

Figure 1. Conducted Emissions Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

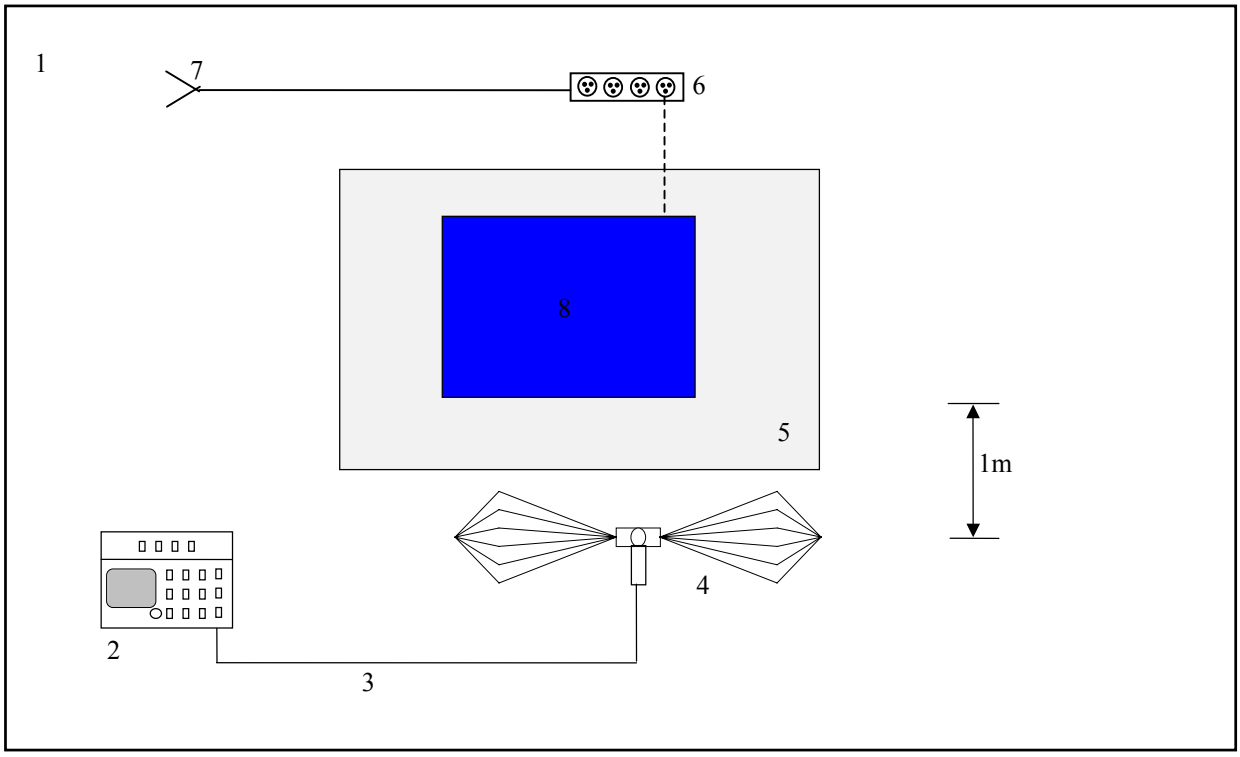
1. Test Laboratory (6 X 6 meters)
2. Ground Plane (15 square meters)
3. Vertical Conducting Wall (Grounded through Ground Plane via 10' ground rod)
4. AC Power for Devices
5. Power Line Filter, Lindgren, 120 dB, 30 amp
6. Artificial Mains Network (AMN) for peripheral devices
7. Power Distribution Box for peripheral devices
8. Spectrum Analyzer with Quasi-Peak Adapter
9. High Pass Filter
10. Coax input from EUT AMN to Spectrum Analyzer
11. AMN for EUT
12. EUT: AC Power Supply and Associated System

3.3 Configuration and Methods of Measurements for Frequency Identification

When performing all testing of equipment, the actual emissions of the EUT are segregated from ambient signals present within the laboratory or the open-field test range. Preliminary testing is performed to ensure that ambient signals are sufficiently low to allow for proper observation of the emissions from the EUT. Ambients within the laboratory are compared to those noted at the nearby open-field site to discriminate between signals produced from the EUT and ambient signals. In the event that a significant emission is produced by the EUT at a frequency that is also demonstrating significant ambient signals, the spectrum analyzer is placed in the peak mode, the bandwidth is narrowed and the EUT's signal is centered on the analyzer. The scan width is expanded to 50 kHz while monitoring the audio to ensure that only the EUT signal is present, the analyzer is switched to quasi-peak mode, and the level of the EUT signal is recorded.

For Frequency ID Test Configuration please refer to Figure 2 on the following page.

Figure 2. Frequency ID of Radiated Emissions Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Antenna to Spectrum Analyzer
4. Receive Antenna (basic relative position)
5. Non-Conducting table 80 cm above ground plane
6. Power strip for EUT and peripherals
7. AC power for devices
8. EUT: AC Power Supply and Associated System

3.4 Configuration and Methods of Measurements for Radiated Emissions

EN 61000-6-4 specifies EN 55011 for radiated emissions testing. Initially, the primary emission frequencies are identified inside a shielded anechoic chamber by positioning a broadband receive antenna one meter from the EUT. Next, the EUT and associated system are placed on a turntable on a ten-meter open area test site (OATS) with known attenuation characteristics and all significant radiated emissions are recorded. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to produce horizontal and vertical polarities, and the turntable is also rotated over 360 Degrees to determine the worst emitting configuration. The numerical results of the test are included herein to demonstrate compliance. The numerical results of the test are included herein to demonstrate compliance.

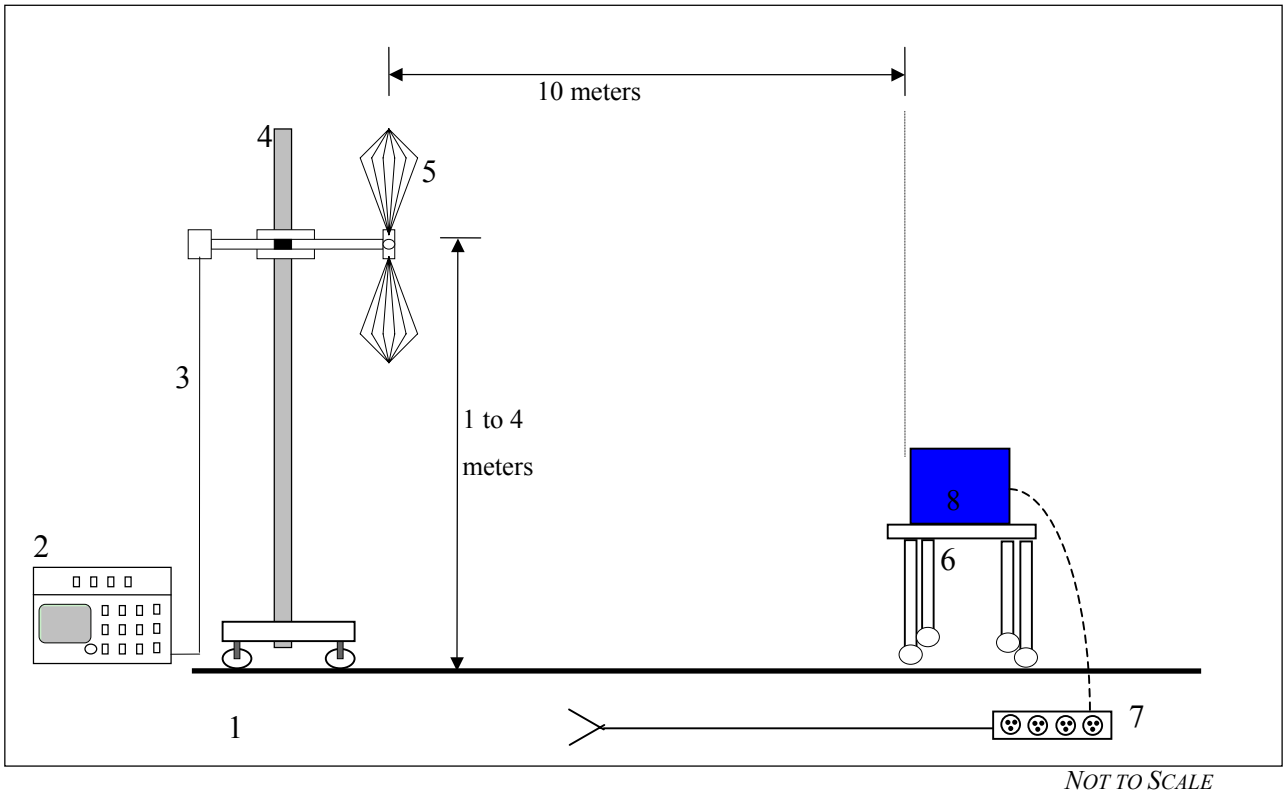
The numerical results that are applied to the emissions limits are arrived at by the following method:
Example: A=RR+CL+AF
A = Amplitude dBuV/M
RR = Receiver Reading dBuV
CL = cable loss dB
AF = antenna factor dBm-1

Example Frequency = 110MHz
18.5 dBuV (spectrum analyzer reading)
+3.0 dB (cable loss @ frequency)
21.5 dBuV
+15.4 dBm-1 (antenna factor @ frequency)
36.9 dBuV/M Final adjusted value

The final adjusted value is then compared to the appropriate emission limit to determine compliance.

For Radiated Emissions Test Configuration please refer to Figure 3 on the following page.

Figure 3. Radiated Emissions Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Ground plane (11 X 17 meters)
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Receive Antenna to Spectrum Analyzer
4. Antenna Mast with motorized mounting assembly
5. Receive Antenna (basic relative position)
6. Non-Conducting table 80 cm above ground plane
7. DC power for devices
8. EUT: AC Power Supply and Associated System

3.5 Power Line Harmonics: EN 61000-3-2 (2000)

This section of the EN 61000-3-2 is applicable to electrical and electronic equipment having an input current up to and including 16 amps per phase, and intended to be connected to public low-voltage distribution systems. The objective of this standard is to set limits for harmonic emissions of equipment onto the AC Power Line.

Basic requirements of the AC source include a +/- 2% voltage regulation and a +/- 0.5% frequency limit. A low distortion sine wave output is required to ensure that the AC source does not adversely contribute distortion to the load, meeting the following limits:

- 0.9% for 3rd order harmonics
- 0.4% for 5th order harmonics
- 0.3% for 7th order harmonics
- 0.2% for 9th order harmonics
- 0.2% for even harmonics of order 2 to 10
- 0.1% for odd harmonic order from 11 to 40

For further information, please refer to the technical sections in the EN 61000-3-2 publication (2000) in addition to the test results section and photographs of the test set-up provided in this report.

For Harmonics Test Configuration please refer to Figure #4 on the next page.

3.6 Power Line Fluctuations/Flicker: EN 61000-3-3 (1995)

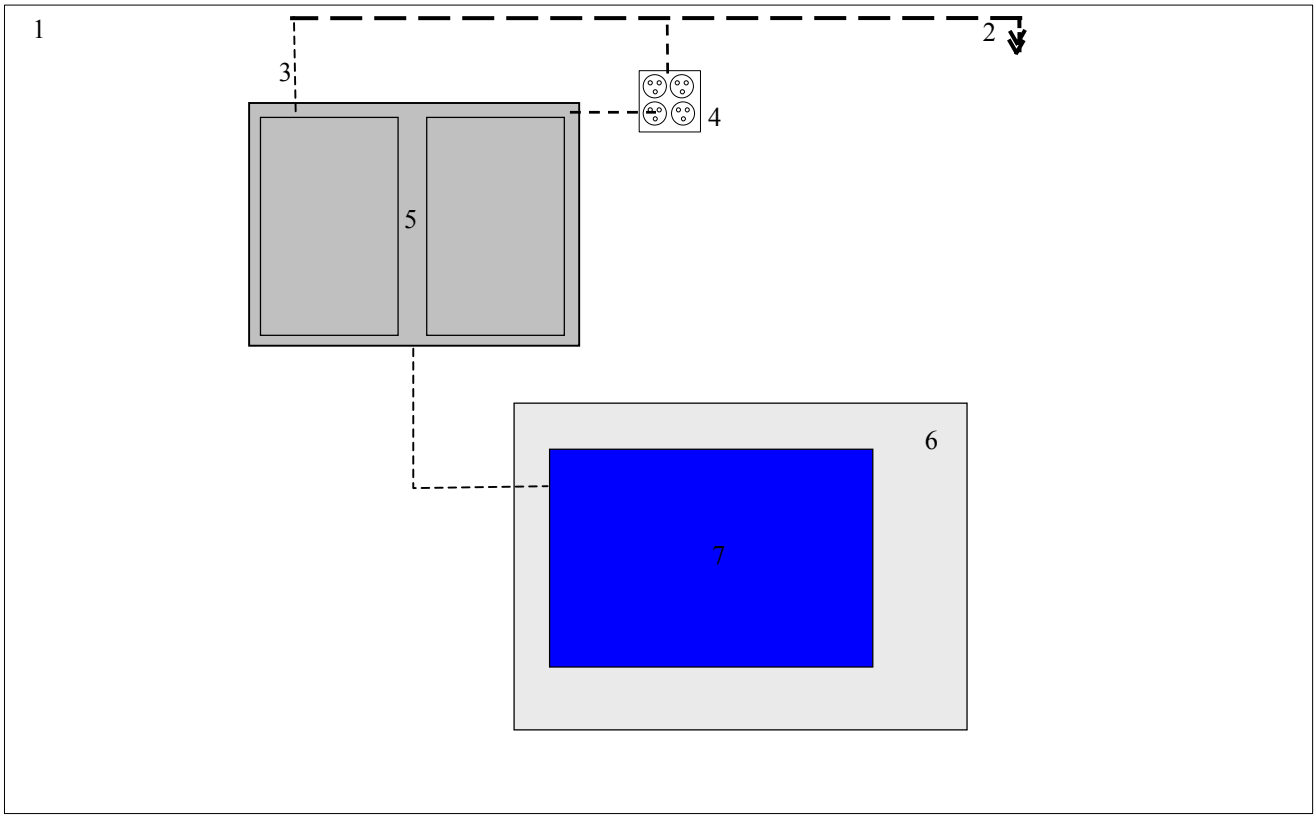
This section of the EN 61000-3-3 is applicable to household appliances and similar electrical and electronic equipment having an input current up to and including 16 amps per phase. The objective of this standard is to set limits for voltage fluctuations of equipment within its scope, and ensures that home appliances and certain other electrical equipment do not adversely affect lighting equipment when connected to the same utility power line. Large current variations combined with high utility line power impedance can cause excessive changes in the AC supply voltage. If these voltage changes are repeated at short intervals, objectionable fluctuations of luminance (flicker) could be generated in illumination sources connected to the same utility line network.

This test requires an AC power source with a standard impedance network and a power analyzer. Measurements of steady state and fluctuating harmonics, along with flicker and voltage deviations, are conducted using a power analyzer, often called a “flickermeter.”

For further information, please refer to the technical sections in the EN 61000-3-3 publication (1995) in addition to the test results section and photographs of the test set-up provided in this report.

For Flicker Test Configuration please refer to Figure #4 on the next page.

Figure 4. Harmonics & Flicker Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory (6 X 6 meters)
2. AC Power for Devices
3. 120/208VAC/60Hz Power for Harmonics/Flicker Test Equipment
4. 115V/60 Hz Power Distribution Box
5. Power Source Rack with Computer Analysis System
6. Non-conducting table
7. EUT: AC Power Supply and Associated System

3.7 Statistical Sampling Required for Continued Compliance

For quality assurance of ongoing productions to comply with RFI interference limits, CISPR 11 Clause 7 stipulates a statistical sampling procedure. In summary, this rule states that the manufacturer should ensure 80% of the units must be in compliance with an 80% confidence level. Refer to CISPR Publication 11, (1991), Clause 7 for a detailed description of the sampling procedure.

3.8 Device Performance Criteria for Immunity Tests

Equipment tested to EN 61000-6-2 must be evaluated to determine whether or not the "operate as intended" requirement is met. Three criteria of acceptable performance are defined by EN 61000-6-2, as follows:

- **Criterion A** - The apparatus shall continue to operate as intended during and after the test. The manufacturer specifies some minimum performance level, which may be specified by the manufacturer as a permissible loss of performance.

- **Criterion B** - The apparatus shall continue to operate as intended after the test. This indicates that the EUT does not need to function at normal performance levels during the test, but must recover from any malfunction. Again, the manufacturer defines some minimal performance. No change in operating state or loss of data is permitted.

- **Criterion C** - Temporary loss of function is allowed. Operation of the EUT may stop, as long as it is either automatically reset or can be manually restored by operation of the controls.

For each test method, EN 61000-6-2 specifies the appropriate criterion to be met.

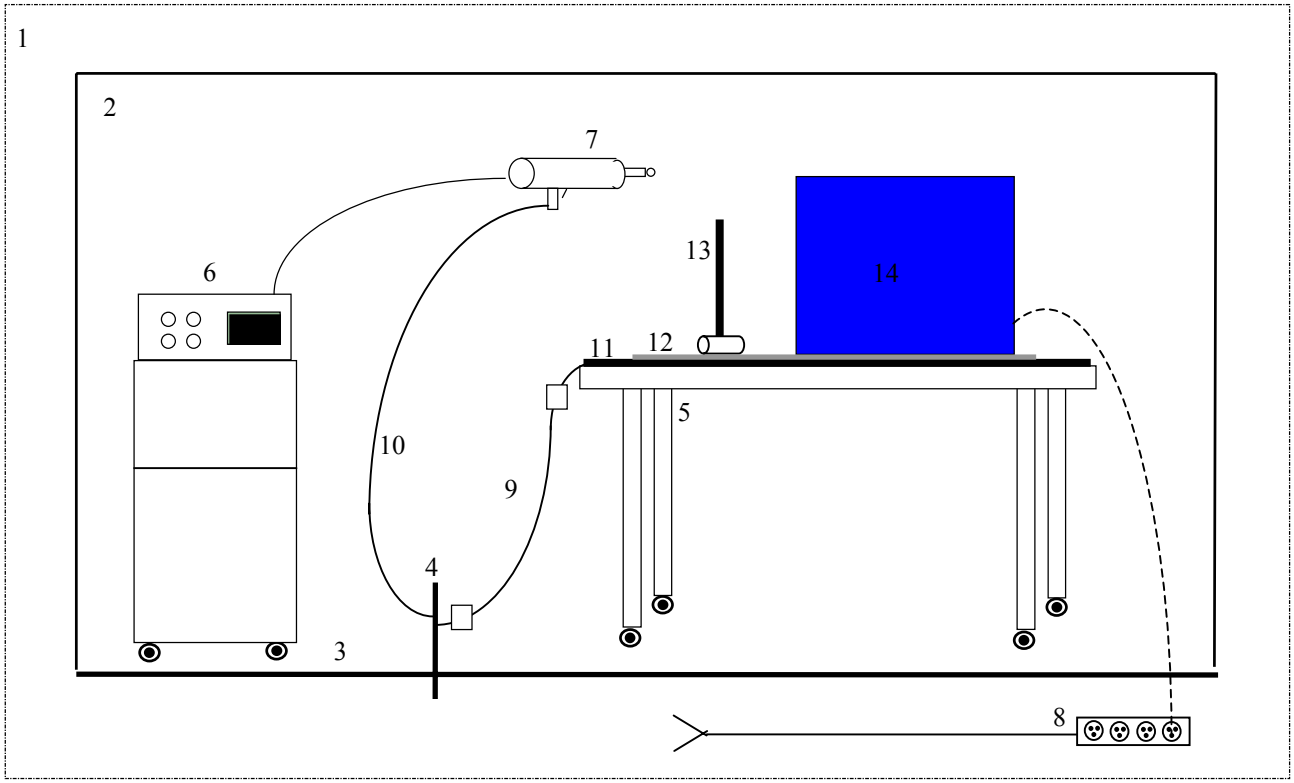
3.9 Electrostatic Discharge Immunity: IEC 61000-4-2 (1995)

EN 61000-6-2 specifies Part 2 of the IEC 61000-4 Standard as the basic procedure for ESD testing. The standard configuration as outlined in IEC 61000-4-2 (1995) is used. Tabletop devices are placed on an insulated mat on a horizontal coupling plane. Air discharges and contact charges are made to the EUT on connectors and conducting surfaces (as illustrated in the Test Results section of this Test Report). For further information, please refer to the technical sections in the IEC 61000-4-2 (1995) publication in addition to the test results section and photographs of the test set-up provided in this report.

For ESD tests, EN 61000-6-2 requires that the EUT meet at least performance Criterion B for discharges of up to ±8 kV air discharge and ±4 kV contact discharge.

For ESD Immunity Test Configuration please refer to Figure 5 on the following page.

Figure 5. ESD Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory (6 x 7 meters)
2. Vertical Conducting Wall (3 x 3 m, grounded)
3. Ground Plane (14 square meters)
4. Ground Rod extending 3 m under ground plane
5. Non-Conducting table for ESD Simulator Control Box
6. ESD Simulator Control Box on cart
7. Electro-Static Discharge (ESD) Gun (hand held, grounded to grounding rod)
8. DC power for devices
9. Ground strap with two 470kOhm resistors
10. Grounding Strap
11. Horizontal Coupling Plane, grounded to Grounding Rod
12. Insulating Mat
13. Vertical Coupling Plane
14. EUT: AC Power Supply and Associated System

3.10 Radio Frequency Immunity: IEC 61000-4-3 (2002)

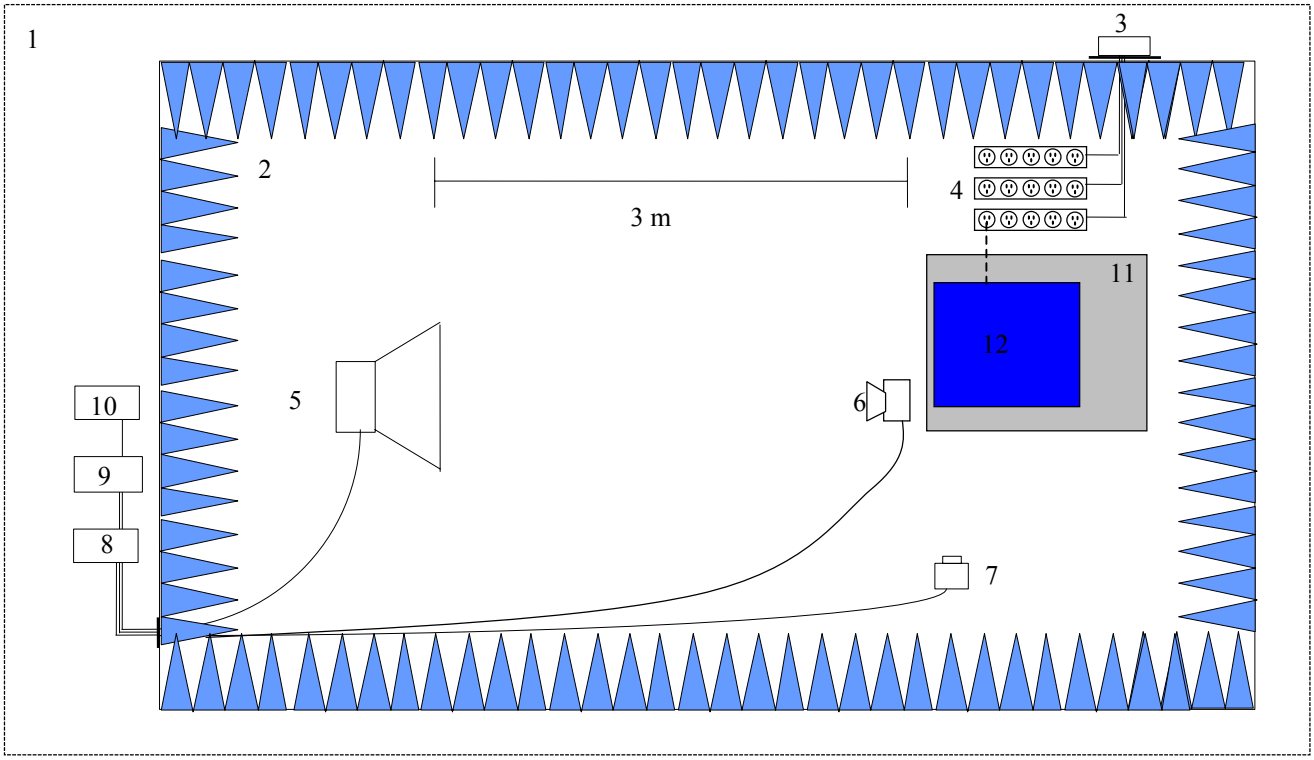
The radio frequency immunity test for a device entails subjecting the device under test to a uniform field of radiated electromagnetic energy of a specified field strength and frequency, and monitoring the functionality of the device as the frequency is swept over a specified frequency range. The IEC 61000-4-3 (2002) were used for radio frequency (RF) immunity requirements and test methods for equipment that are required to withstand electromagnetic (EM) fields.

The IEC 61000-4-3 (2002) specifies a transmit antenna to EUT distance of 3 m and a frequency range of 80 MHz to 1000 MHz (80% amplitude modulated at 1 kHz). The EUT is set up inside a shielded, semi-anechoic chamber with a radiating antenna at a distance of 3 meters from the EUT. For further information, please refer to the technical sections in the IEC 61000-4-3 (2002) publication in addition to the test results section and photographs of the test set-up provided in this report.

For radio frequency immunity tests, EN 61000-6-2 specifies that the EUT meet performance Criterion A for a minimum field strength of 10 V/m.

For RF Immunity Test Configuration please refer to Figure 6 on the following page.

Figure 6. Radio Frequency Immunity Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Test laboratory
2. Shielded anechoic chamber (Anechoic absorber material on walls and ceiling; ferrite tiles on ceiling and floor)
3. Power Line filters and power distribution breaker box
4. Power strip for EUT and peripherals
5. Transmit antennas
6. E-Field sensor
7. Monitoring camera for EUT
8. Broadband power amplifiers
9. E-Field probe monitoring system
10. Signal Generators
11. Non-Conducting table
12. EUT: AC Power Supply and Associated System

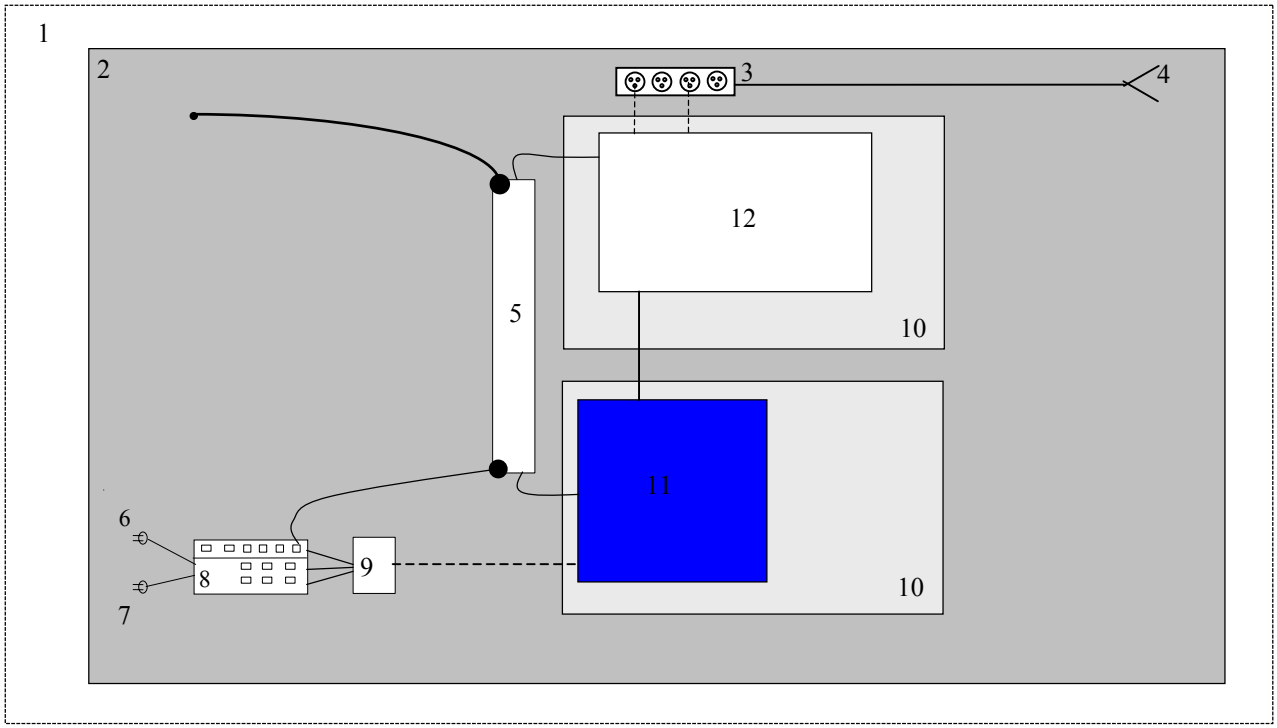
3.11 Electrical Fast Transient Immunity: IEC 61000-4-4 (1995)

EN 61000-6-2 specifies Part 4 of the IEC 61000-4 Standard as the basic procedure for electrical fast transient testing. IEC 61000-4-4 (1995) defines the immunity requirements and test methods for equipment that are required to withstand high-voltage transients coupled on the power mains. The standard configuration for "type tests" outlined in IEC 61000-4-4 (1995) is used. For further information, please refer to the technical sections in the IEC 61000-4-4 (1995) in addition to the test results section and photographs of the test set-up provided in this report.

For electrical fast transient/burst tests, EN 61000-6-2 requires that the EUT meet at least performance Criterion B for +/- 2 kV Power and Process lines and +/- 1 kV signal and data lines transients.

For EFT Immunity Test Configuration please refer to Figure 7 on the following page.

Figure 7. EFT Immunity Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory (6 x 7 meters)
2. Ground Plane
3. Power Strip for Peripherals from power line filter
4. DC Power for Devices
5. Capacitive Coupling Clamp (grounded)
6. Mains Power for EUT
7. AC Power for Fast Transient Noise Generator (120V)
8. Fast Transient Noise Generator
9. Coupling Network
10. 10cm Non-Conducting Platform
11. EUT: AC Power Supply
12. Associated System

3.12 Power Line Surge Immunity: IEC 61000-4-5 (1995)

EN 61000-6-2 specifies Part 5 of the IEC 61000-4 Standard as the basic procedure for power line surge immunity tests. This standard relates to the immunity requirements, test methods, and range of recommended test levels for low voltage equipment to unidirectional surges caused by overvoltages from switching and lightning transients. The standard configuration as outlined in IEC 61000-4-5 (1995), section 7 was used.

Each device was tested in a total of three surge configurations:

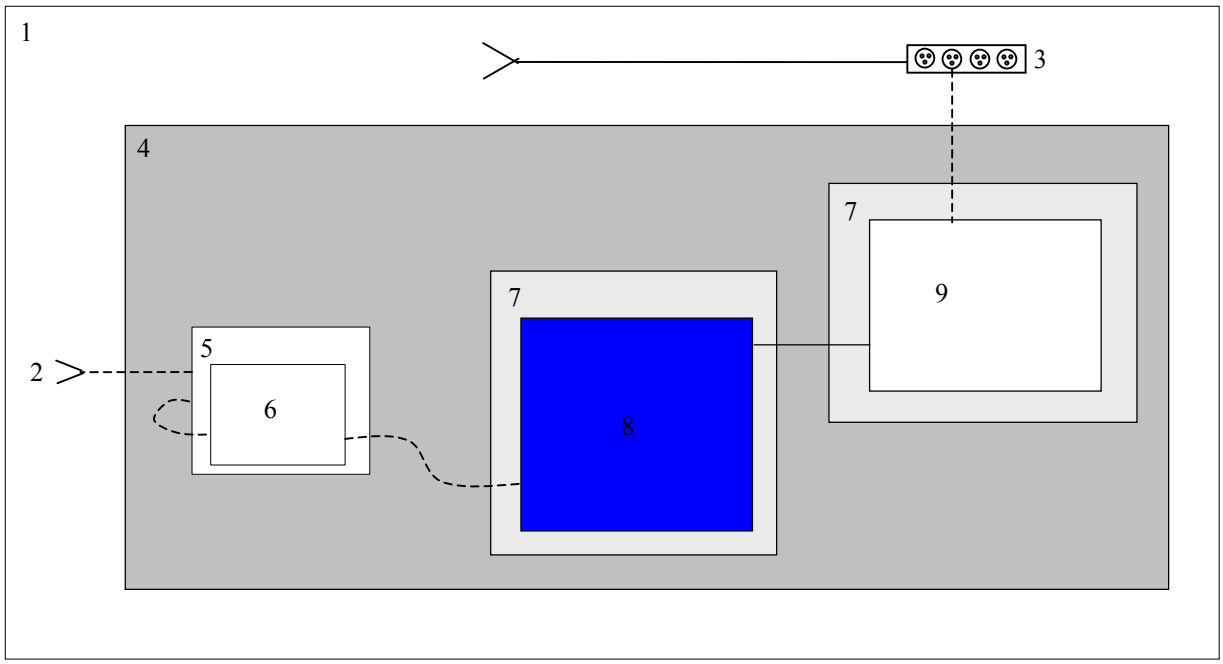
Surge #1: Combination Wave, Line to Protective Earth with 9uF and 10Ohm, common mode, generator earthed.
Surge #2: Combination Wave, Neutral to Protective Earth with 9uF and 10Ohm, common mode, generator earthed.
Surge #3: Combination Wave, Line to Neutral with 18uF, differential mode, generator floated.

For further information, please refer to the technical sections in the IEC 61000-4-5 (1995) in addition to the test results section and photographs of the test set-up provided in this report.

For Power line surge tests, the EUT meet at least performance Criterion B for +/-0.5kV common mode and +/-0.5kV differential mode surges in the DC power supply configuration.

For Surge Immunity Test Configuration please refer to Figure 8 on the following page.

Figure 8. Power Line Surge Immunity Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. AC power for Devices
3. Power strip for associated devices from power line filter
4. Copper Ground Plane
5. Surge Generator
6. Surge Coupling Network
7. Nonconductive tables 80cm above Ground Plane
8. EUT: AC Power Supply
9. Associated System

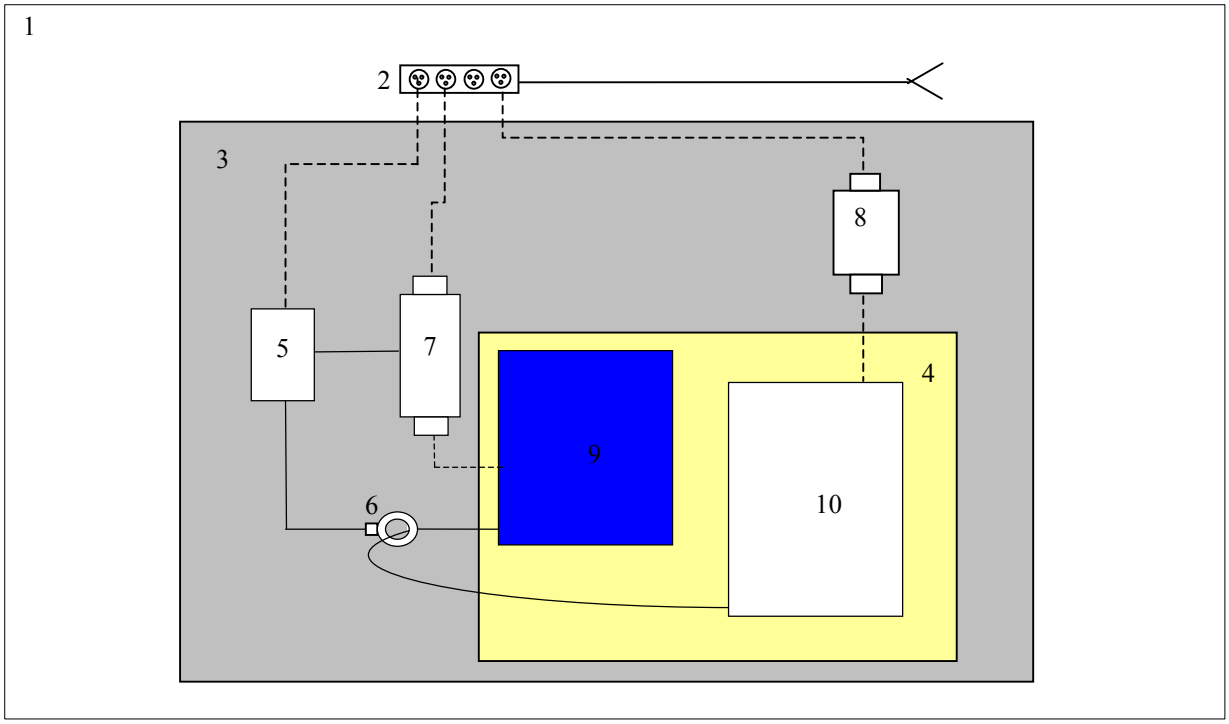
3.13 Radio Frequency Conducted Common Mode Immunity: IEC 61000-4-6 (1996)

EN 61000-6-2 specifies Part 6 of the IEC 61000-4 Standard as the basic standard for radio frequency conducted common mode disturbance testing. This standard relates to the immunity requirements, test methods, and range of recommended test levels for immunity to conducted disturbances induced by radio-frequency fields in the 150 kHz to 80 MHz frequency range. The standard configuration as outlined in the IEC 61000-4-6 (1996) was used. For further information, please refer to the technical sections of the IEC 61000-4-6 (1996) publication in addition to the test results section and photographs of the test set-up provided in this report.

For RF induced conducted common mode disturbances, EN 61000-6-2 specifies that the EUT meet at least performance Criterion B for 10Vrms, 1 kHz, 80% amplitude modulated waveform.

For RF Common Mode Test Configuration please refer to Figure 9 on the following page.

Figure 9. RF Common Mode Immunity Test Setup Diagram



NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. DC power for EUT
3. Ground Plane
4. 10cm wooden Platform
5. Test Generator
6. Current Probe
7. Coupling/Decoupling Network
8. Coupling/Decoupling Network
9. EUT: AC Power Supply
10. Associated System

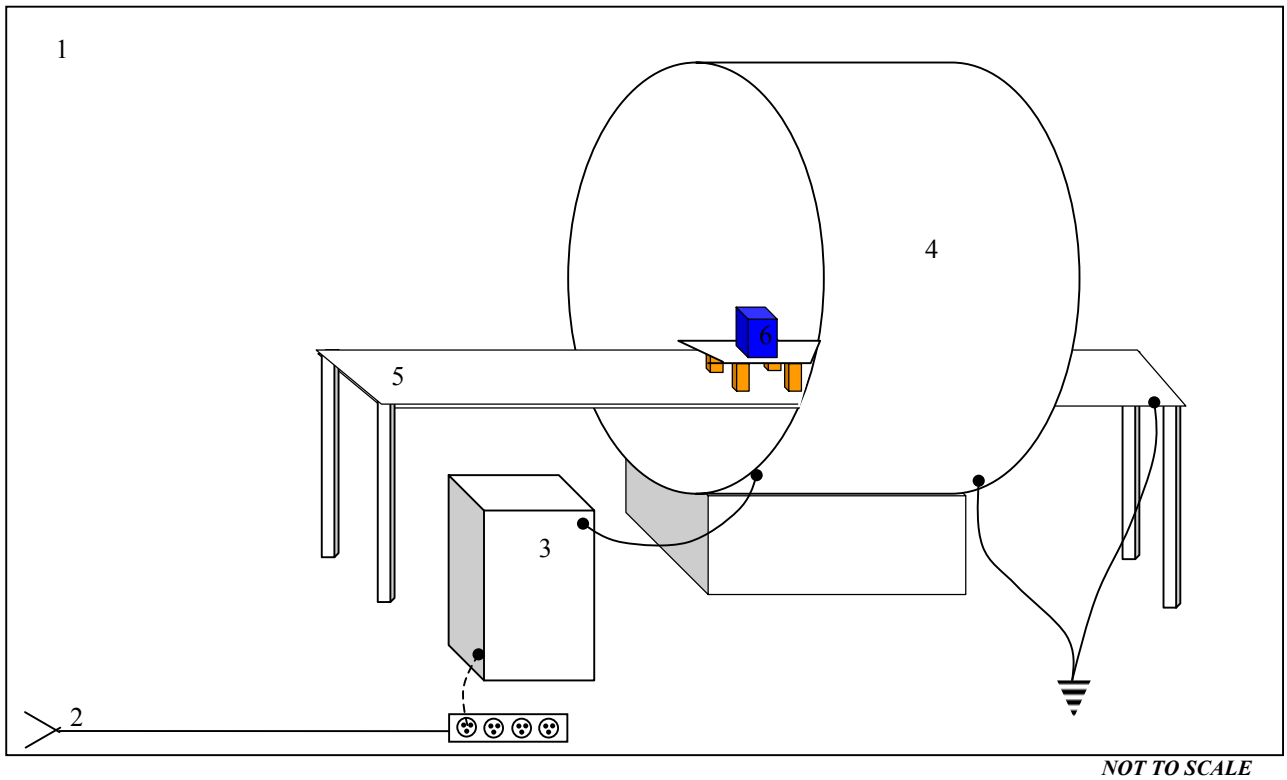
3.14 Power Frequency Magnetic Field Immunity: IEC 61000-4-8 (1994)

EN 61000-6-2 specifies Part 8 of the IEC 61000-4 Standard as the basic procedure for testing apparatus containing devices susceptible to magnetic fields, e.g. Hall Effect sensors, electrodynamic microphones, etc., and to CRT's. The standard configuration as outlined in the EN 61000-4-8 was used. A ground plane was placed inside a Helmholtz coil and at a height of 80cm. The monitors from the EUT were removed and placed on 10cm wood blocks on the ground plane with I/O cables extended to the EUT. For further information, please refer to the technical sections of the EN 61000-4-8 publication (1993) in addition to the test results section and photographs of the test set-up provided in this report.

For power-frequency magnetic field immunity tests, EN 61000-6-2 requires that the EUT meet at least performance Criterion A using a Helmholtz Coil at 50 Hz, to a field strength of 30 amperes (rms) per meter.

For Power-Frequency Magnetic Field Immunity Test Configuration please refer to Figure 10 on the next page.

Figure 10. Power Frequency Magnetic Field Immunity Test Setup



NOT TO SCALE

CONFIGURATION LEGEND

1. Test laboratory
2. AC Power for devices
3. DC Power Supply
4. Helmholtz Coil
5. Ground Plane on Non-Conductive Table
6. EUT: AC Power Supply on 10cm blocks

3.15 Voltage Dips and Short Interruptions: IEC 61000-4-11: 2004

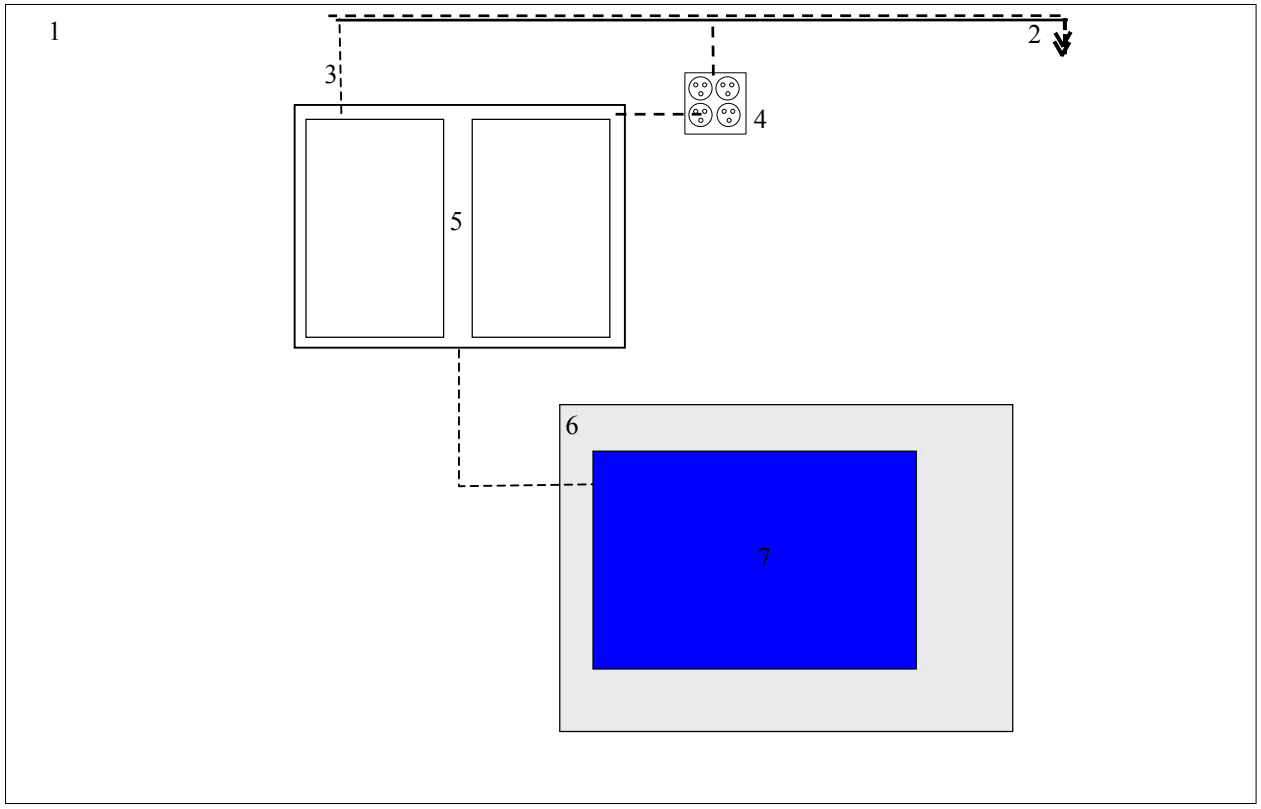
EN 61000-6-2 and EN 61204-3 specifies IEC 61000-4-11 Standard as the basic standard for voltage variations immunity testing. This standard relates to the immunity requirements, test methods, and range of recommended test levels for immunity to variations in AC line voltage. The standard configuration as outlined in the IEC 61000-4-11 was used.

For EN 61000-6-2 and EN 61204-3, the EUT was tested to the levels, as required, for those test standards. The preferred test levels identified in IEC 61000-4-11: 2004 were also applied. Each test level was repeated three times at 230 VAC at 50 Hz and 120 VAC at 60 Hz.

For further information, please refer to the technical sections of the EN 61000-6-2, EN 61204-3, and IEC 61000-4-11: 2004 publications in addition to the test results section and photographs of the test set-up provided in this report.

For Voltage Dips Test Configuration please refer to Figure 11 on the following page.

Figure 11. Voltage Dips and Short Interruptions Test Setup Diagram



NOT TO SCALE

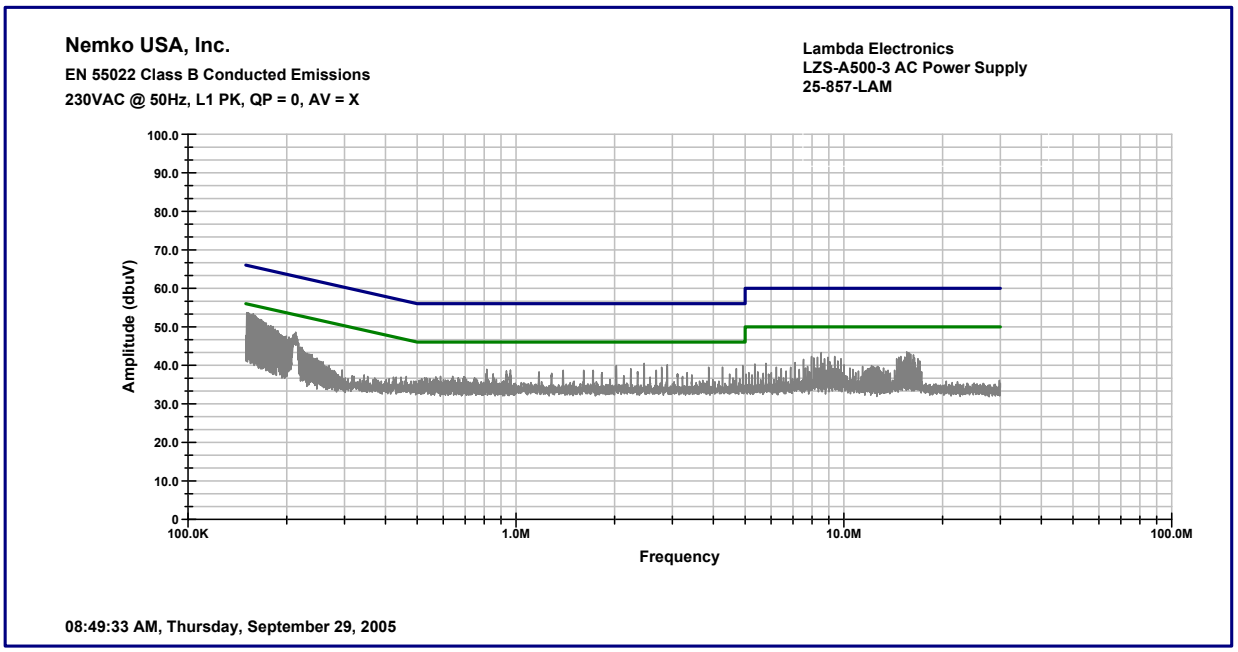
CONFIGURATION LEGEND

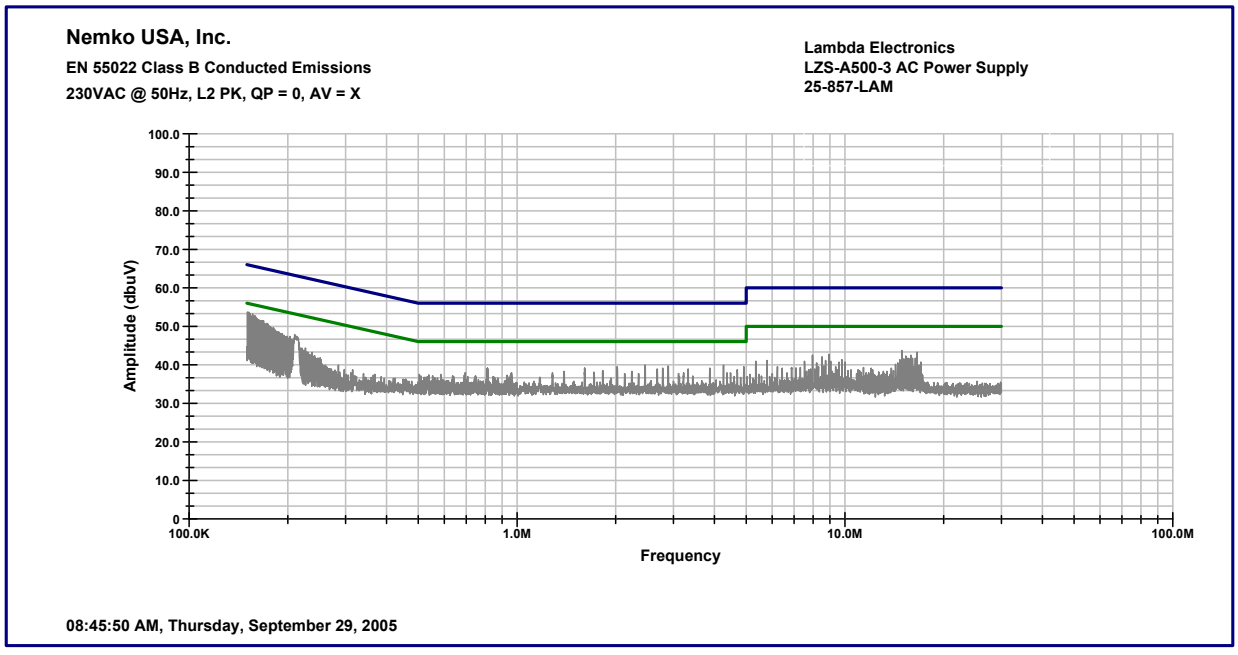
1. Test Laboratory (6 X 6 meters)
2. AC Power for Devices
3. 120/208VAC/60Hz Power for Harmonics/Flicker Test Equipment
4. 115V/60 Hz Power Distribution Box
5. Power Source Rack with Computer Analysis System
6. Non-conducting table
7. EUT: AC Power Supply and Associated System

4. TEST RESULTS

4.1 Conducted Emissions Test Results

Client	Lambda Electronics	Temperature	74	deg F
PAN #	25-857-LAM	Relative Humidity	48	%
EUT Name	AC Power Supply	Barometric Pressure	30.22	Hg
EUT Model	LZS-A500-3	Test Location	Enclosure 2	
Governing Doc	EN 61000-6-4 (2001)	Test Engineer	Ferdinand Custodio	





Conducted Emissions Test Equipment

Client	Lambda Electronics	EUT Name	AC Power Supply
PAN #	25-857-LAM	EUT Model	LZS-A500-3

Device Type	*Model #*	*Asset #*	*Used*	*Cal Done*	*Cal Due*
Filter / Limiter					
High Pass Filter, Solar	8310-1.0	559	X	1/06/05	1/06/06
Transient Limiter, HP	11947A	681	X	5/25/05	5/25/06
Transducer					
V-Network LISN, Solar	9348-50-R-24-BNC	384	X	3/22/04	3/22/05
Spectrum Analyzer / Receiver					
Quasi-Peak Adapter, HP Spectrum Analyzer Display, HP Spectrum Analyzer, HP	85650A 85662A 8566B	533 404 104	X	6/24/05	12/24/05

4.2 Radiated Emissions Test Results

NEMKO USA, Inc.

San Diego Headquarters:
11696 Sorrento Valley Rd.
San Diego, CA 92121
Tel: (858) 755-5525
Fax: (858) 452-1810

Radiated Emissions Data

Complete: X
Preliminary:
Job # : 25-857-LAM
Test # :
Page 1 of 1

Client Name : Lambda Electronics
EUT Name : AC Power supply
EUT Model # : LZS-A500-3 AC
EUT Part # : Rev. P2.2
EUT Serial # : 53920000017
EUT Config. : loaded via resistor bank

Specification : EN55022: 1998, Class B
Reference :

Rod. Ant. #:	NA	Temp. (deg. C) :	22	Date :	9/30/2005
Bicon Ant.#:	115	Humidity (%) :	35	Time :	8:30AM
Log Ant.#:	111	EUT Voltage :	230VAC	Staff :	FSCustodio
DRG Ant. #		EUT Frequency :	50Hz	Photo ID:	
Dipole Ant.#:	NA	Phase:	1	Peak Bandwidth:	120 kHz
Cable#:	NOATS	Location:	NOATS	Video Bandwidth	300 kHz
Preamp#:	826	Distance:	10 meters		
Spec An.#:	898				
QP #:	898				
PreSelect#:	NA				

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
40.71	V		37.1	11.7	1.0	32.6	17.2	30.0	-12.8	Pass	
58.41	V		42.6	12	1.2	32.5	23.3	30.0	-6.7	Pass	Ambient
72.568	V		40.7	8.3	1.5	32.4	18.1	30.0	-11.9	Pass	
86.202	V		38.2	7.9	1.7	32.4	15.4	30.0	-14.6	Pass	
132.1	V		32.4	11.6	2.0	32.6	13.4	30.0	-16.6	Pass	
139.6	V		31.4	11.8	2.0	32.6	12.6	30.0	-17.4	Pass	
158.6	V		30.3	13.9	2.1	32.6	13.7	30.0	-16.3	Pass	
163.3	V		36.3	14.6	2.1	32.7	20.3	30.0	-9.7	Pass	
182.6	V		38.9	16.7	2.2	32.7	25.1	30.0	-4.9	Pass	30KHz BW (see note)
342.4	H		35.1	14.4	3.2	32.9	19.8	37.0	-17.2	Pass	
364	V		42.9	14.4	3.4	32.9	27.8	37.0	-9.2	Pass	
546.3	H		41.6	18.1	4.1	32.6	31.2	37.0	-5.8	Pass	
		Note: Signal is next to a strong ambient noise, BW changed to isolate signal									

Radiated Emissions Test Equipment

Client	Lambda Electronics	EUT Name	AC Power Supply		
PAN #	25-857-LAM	EUT Model	LZS-A500-3		
Device Type	*Model #*	*Asset #*	*Used*	*Cal Done*	*Cal Due*
Pre-Amplifier					
Amplifier, Com-Power	PA-103	826	X	10/22/04	10/22/05
Antenna OATS #1 (North)					
Antenna, Biconical	EMCO	115	X	2/3/04	2/3/05
Antenna, Log Periodic	EMCO	111	X	2/3/04	2/3/05
Spectrum Analyzer / Receiver					
EMI Receiver, HP RF Filter Section, HP	8546A 85460A	898 899	X	5/16/05	5/16/06

4.3 Powerline Harmonics Test results

Xitron Technologies Inc. 2503AH
IEC1000-3-2 TEST REPORT

Nemko USA, Inc.

Test Station: XITRON-Harmonics **Date:** 9/29/05

Test By: Nemko USA **Tel:** (858) 793-9911

UUT Make: Lambda Electronics

UUT Model: LZS-A500-3 AC Power Supply

Test Class: IEC1000-3-2 CLASS A/D, Steady State

Comments: 230VAC 50Hz

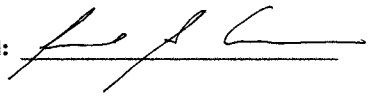
Test Duration: 31.00 min **Test Started:** 10:03:04

Time Elapsed: 31.00 min

Update Rate: 1.00 sec

Test Filename:

Test Result: PASS

Signed: 

XITRON IEC1000-3-2 TEST REPORT

UUT: LZS-A500-3 AC Power Supply

CLASS: IEC1000-3-2 CLASS A/D, Steady State

STATUS: PASS

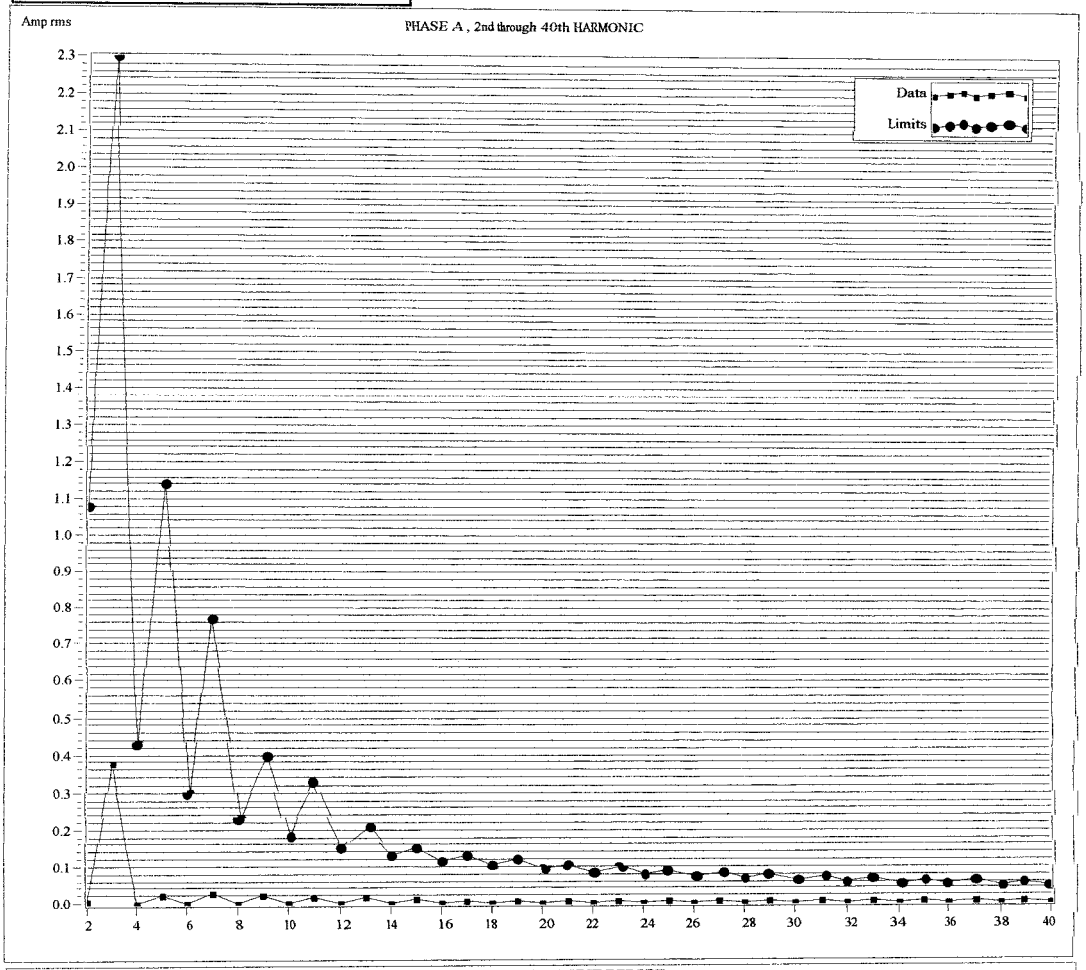
TEST DURATION: 31.00

TEST TIME ELAPSED: 31.00 min

REPORT PRINTED: 9/29/05 10:55 AM

Phase A

Vrms:	230.48	Status:	PASS Class A
Arms:	2.62	PF:	0.942
Watts:	568.04	Fund:	2.59 Arms



XITRON IEC1000-3-2 TEST REPORT

Xitron Technologies Inc. 2503AH
IEC1000-3-2 TEST REPORT

Nemko USA, Inc.

Test Station: XITRON-Harmonics **Date:** 9/29/05

Test By: Nemko USA **Tel:** (858) 793-9911

UUT Make: Lambda Electronics

UUT Model: LZS-A500-3 AC Power Supply

Test Class: IEC1000-3-2 CLASS A/D, Fluctuating

Comments: 230VAC 50Hz

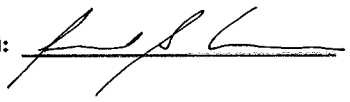
Test Duration: 31.00 min **Test Started:** 10:56:11

Time Elapsed: 31.00 min

Update Rate: 1.00 sec

Test Filename:

Test Result: PASS

Signed: 

XITRON IEC1000-3-2 TEST REPORT

UUT: LZS-A500-3 AC Power Supply

CLASS: IEC1000-3-2 CLASS A/D, Fluctuating

STATUS: PASS

TEST DURATION: 31.00

TEST TIME ELAPSED: 31.00 min

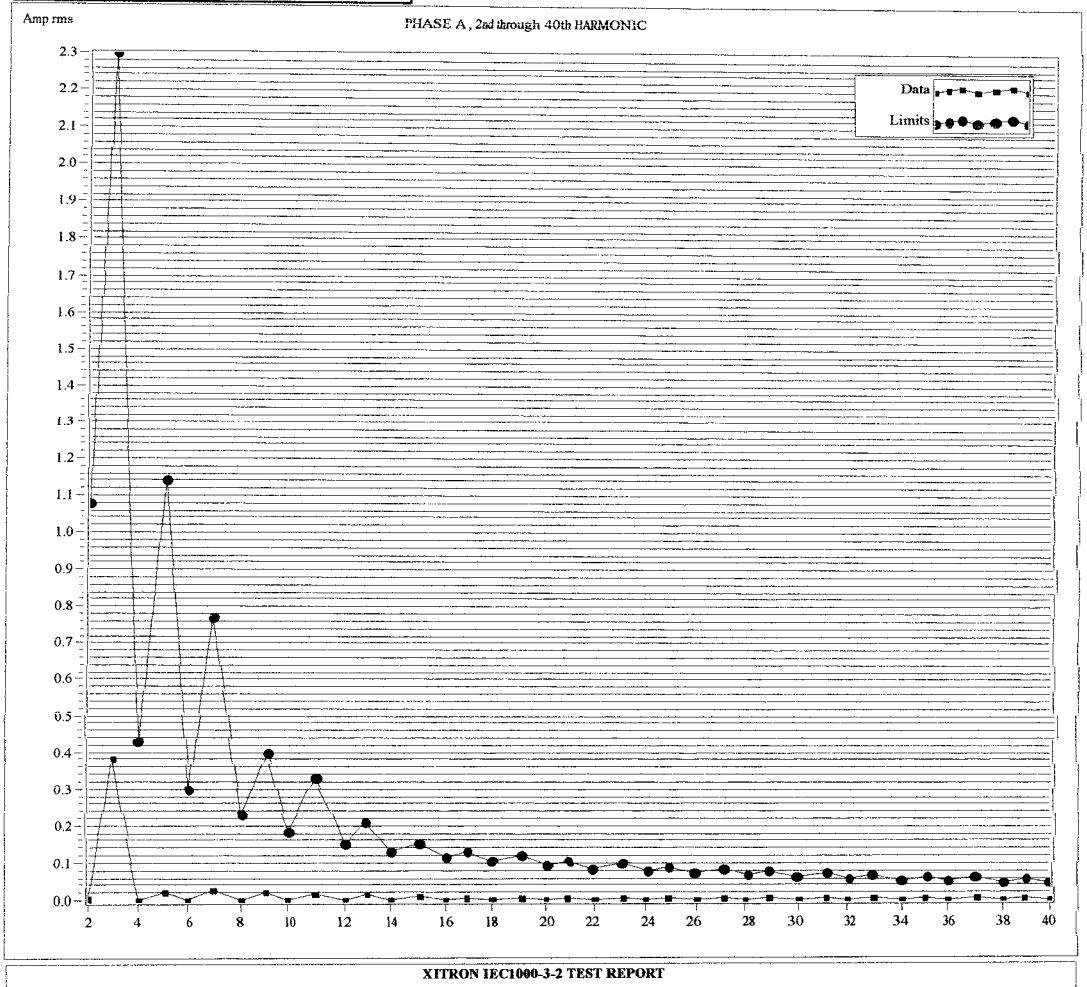
REPORT PRINTED: 9/29/05 11:51 AM

Phase A

Vrms: 230.59 Status: PASS Class A

Arms: 2.62 PF: 0.942

Watts: 568.01 Fund: 2.59 Arms



XITRON IEC1000-3-2 TEST REPORT

4.4 Powerline Flicker Test Results

Xitron Technologies Inc. 2503AH
IEC1000-3-3 (IEC868) TEST REPORT

Nemko USA, Inc.

Test Station: Xitron-Flicker **Date:** 9/29/05

Test By: NEMKO USA **Tel:** (858) 793-9911

UUT Make: Lambda Electronics

UUT Model: LZS-A500-3 AC Power Supply

Comments: 230VAC 50Hz

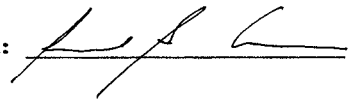
Test Duration: 20.00 min **Test Started:** 9:38:37

Time Elapsed: 20.03 min

Update Rate: 1.00 sec

Test Result: PASSED

Pst/Plt used: YES

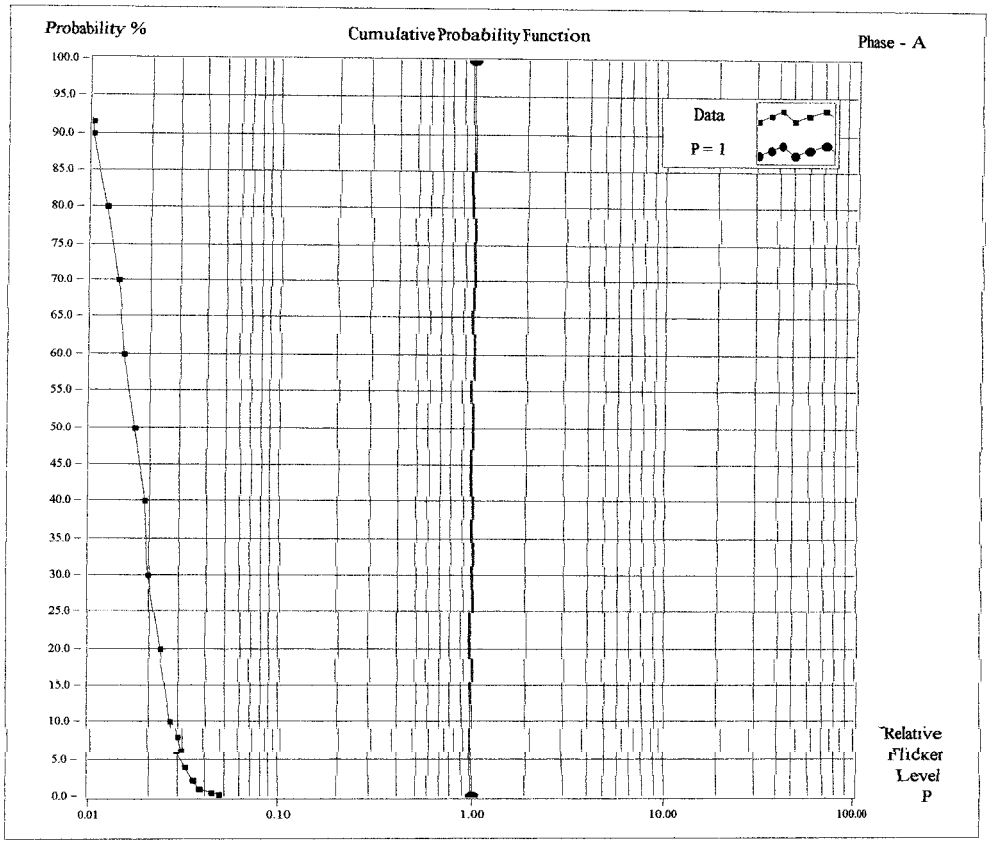
Signed: 

UUT: LZS-A500-3 AC Power
TEST DURATION: 20.00 min

Pst/Plt INCLUDED: YES
TIME ELAPSED: 20.03

STATUS: PASSED
REPORT PRINTED: 9/29/05 10:15 AM

Updated		Phase A	
228.64	UT		
0.06	Plt	Maximum	
0.12	Pst	0.12	
	dt > 3%	0.00	ms
-0.05	dt	-0.14	%
0.00	dmax	0.00	%
0.00	dc	0.00	%
STATUS:		PASS	



XITRON IEC1000-3-3 TEST REPORT

4.5 Electrostatic Discharge Immunity Test Results

Client:	Lambda Electronics	Temperature:	78	degF
PAN #:	25-857-LAM	Relative Humidity:	50	%
EUT Name:	AC Power Supply	Barometric Pressure:	30.02	Hg
EUT Model:	LZS-A500-3	Test Location	West Ground Plane	
Governing Doc:	EN 61000-6-2	Test Engineer	Ferdinand Custodio	
Basic Standard:	IEC 61000-4-2	Date:	September 30, 2005	
Voltage:	230VAC 50Hz			
Discharge Rep. Rate	X ≥ 1 per second			
Number of Discharges	X ≥ 10 per location			

Equipment Used

Device Type	*Model #*	*Asset #*	*Used*	*Cal Done*	*Cal Due*
EMC Partner	Transient 2000	845	X	8/30/05	2/30/06

Location of Discharge

Contact Discharge

Voltage (kV)	Polarity		Numbers	HCP	VCP
	Pos	Neg			
2	X	X	CD# 1	X	X
4	X	X	CD# 1	X	X
6	X	X	CD# 1	X	X

Comments: No susceptibility noted. No disruptions on the recorded output of the EUT.

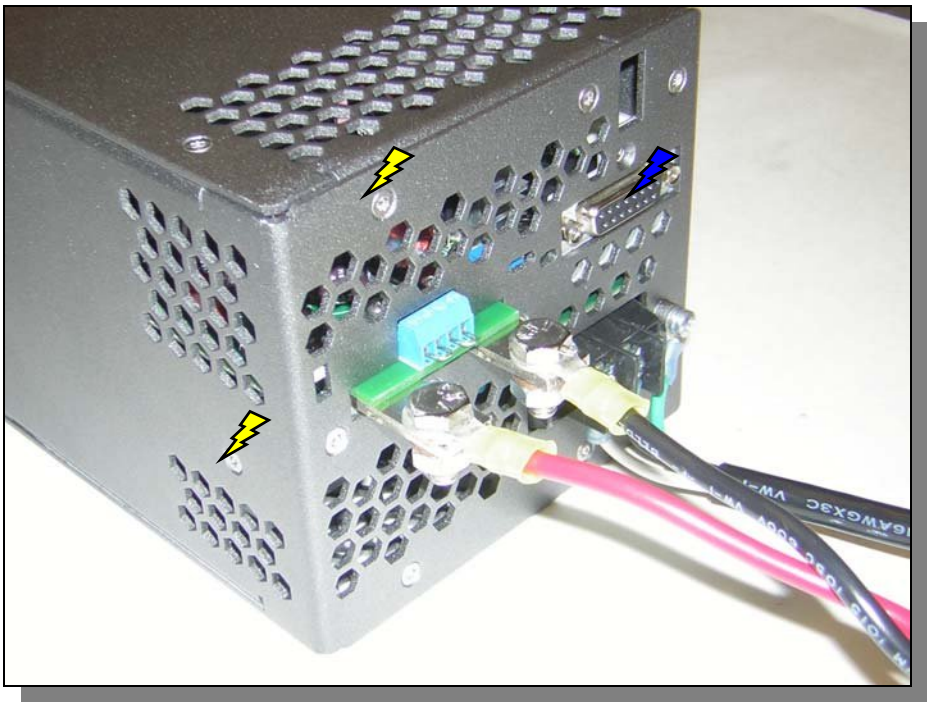
Air Discharge

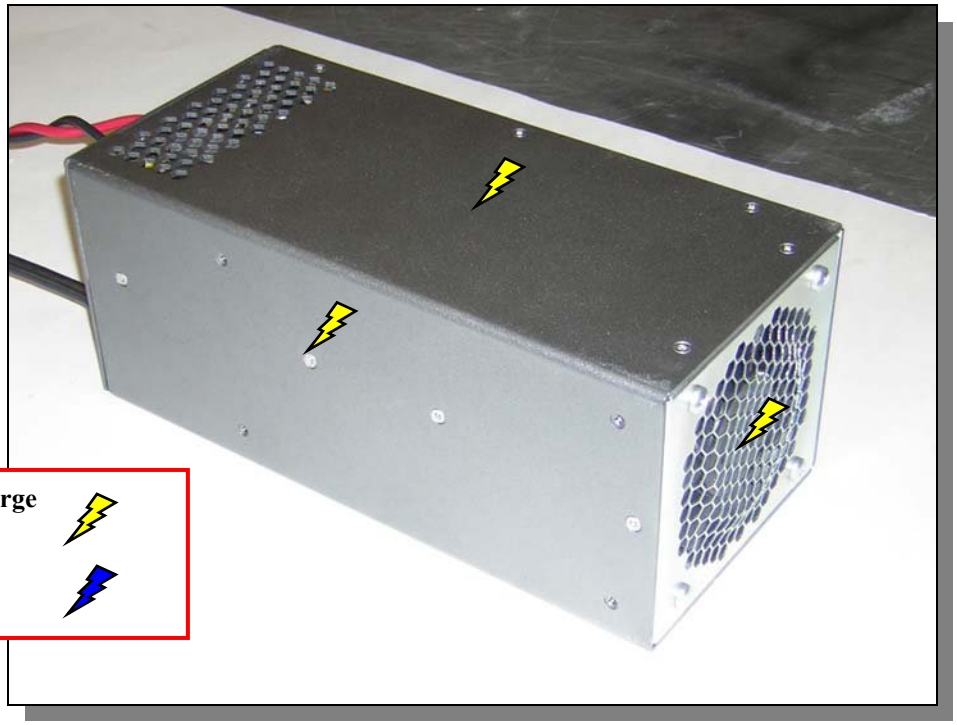
Voltage (kV)	Polarity		Numbers
	Pos	Neg	
2	X	X	AD# 1-5
4	X	X	AD# 1-5
8	X	X	AD# 1-5

Comments: No susceptibility noted. No disruptions on the recorded output of the EUT.

Compliant	X	Non-Compliant			Photo	X

Figure 12. ESD Test Points





4.6 Radio Frequency Immunity Test Results

Radio Frequency Immunity

Client:	Lambda Electronics	Temperature:	74 degF
PAN #:	25-857-LAM	Relative Humidity:	48 %
EUT Name:	AC Power Supply	Barometric Pressure:	30.07 Hg
EUT Model:	LZS-A500-3	Test Location	Anachoic Chamber
Governing Doc:	EN 61000-6-2	Test Engineer	Ferdinand Custodio
Basic Standard:	IEC 61000-4-3	Date:	October 3, 2005
Voltage:	230VAC/ 50Hz		

Threat Levels

Frequency (MHz):		27-500		80-1000		26-1000	X	80-2500
Test Level:		1V/m		3V/m	X	10V/m		200V/m
Modulation:		None (CW)	X	80% AM, 1kHz		50% PM, 200Hz		
Frequency Step:	X	1%		3%				
Dwell Time:	X	1 sec		3 sec		10 sec		
Criteria:	X	A		B		C		

Frequency (MHz)	Antenna Polarization		Compliant		Orientation F: Front R: Rear SL: Side, Left SR: Side, Right	Comments
	H	**V**	**Y**	**N**		
80 to 200	X	X			F	No susceptibility noted
80 to 200	X	X			R	No susceptibility noted
80 to 200	X	X			SL	No susceptibility noted
80 to 200	X	X			SR	No susceptibility noted
200 to 1000	X	X			F	No susceptibility noted
200 to 1000	X	X			R	No susceptibility noted
200 to 1000	X	X			SL	No susceptibility noted
200 to 1000	X	X			SR	No susceptibility noted
1000 to 2500	X	X			F	A swing of +/- 0.64V observed
1000 to 2500	X	X			R	A swing of +/- 0.64V observed
1000 to 2500	X	X			SL	A swing of +/- 0.64V observed
1000 to 2500	X	X			SR	A swing of +/- 0.64V observed

Compliant [X] Not Compliant [ ] Photo [X]

Radio Frequency Immunity Test Equipment

Client	Lambda Electronics	EUT Name	AC Power Supply		
PAN #	25-857-LAM	EUT Model	LZS-A500-3		
Device Type	*Model #*	*Asset #*	*Used*	*Cal Done*	*Cal Due*
Signal Generator					
Gigatronics	1018	440	X	9/22/04	9/22/05
Field Sensors					
AR	FP4080	733	X	3/11/05	3/11/06
Amplifier / Directional Couplers					
AR	500W1000M5	740	X	NCR	NCR
AR	200T1G3M3	743	X	NCR	NCR
Antennas					
Biconical	3109	EA 2466	X	NCR	NCR
Electro-Metrics	RGA-30	350	X	NCR	NCR
AR	AT4002A	728	X	NCR	NCR

4.7 Electrical Fast Transient Burst Immunity Test Results

Client	Lambda Electronics		Temperature	78	deg F
PAN #	25-857-LAM		Relative Humidity	46	%
EUT Name	AC Power Supply		Barometric Pressure	30.07	Hg
EUT Model	LZS-A500-3		Test Location	West Ground Plane	
Governing Doc	EN 61000-6-2		Test Engineer	Ferdinand Custodio	
Basic Standard	IEC 61000-4-4		Date	September 29, 2005	

Test Level:

AC / DC Mains / Control Ports	[ ]	0.5kV	[ ]	1.0kV	[X]	2.0kV	[ ]	4.0kV	[ ] _____
Signal Ports	[ ]	0.25kV	[ ]	0.5kV	[ ]	1.0kV	[ ]	2.0kV	[ ] _____

Test Duration: [X] 61 sec [ ] _____

Test Equipment	Asset #	Used	Calibration Done	Calibration Due
EMC Partner, Transient 2000	845	X	8/30/05	2/30/06

Performance Criteria: [X] **A** [ ] **B** [ ] **C**

Direct Injection Output Path

Test Level	Polarity (+/-)	L1	L2	PE	Comments
2.0 kV	+/-	X			No susceptibility noted
2.0 kV	+/-		X		No susceptibility noted
2.0 kV	+/-			X	No susceptibility noted
2.0 kV	+/-	X	X		No susceptibility noted
2.0 kV	+/-	X		X	No susceptibility noted
2.0 kV	+/-		X	X	No susceptibility noted
2.0 kV	+/-	X	X	X	No susceptibility noted
0.0 kV	+/-				Coupling Clamp:

Cable Description (Clamp Injection)	Polarity
No I/O cable longer than 3 meters	

Compliant [X] Non-Compliant [ ] Photo [X]

4.8 Power Line Surge Immunity Test Results

Client	Lambda Electronics	Temperature	78	deg F
PAN #	25-857-LAM	Relative Humidity	46	%
EUT Name	AC Power Supply	Barometric Pressure	30.07	Hg
EUT Model	LZS-A500-3	Test Location	West Ground Plane	
Governing Doc	EN 61000-6-2	Test Engineer	Ferdinand Custodio	
Basic Standard	IEC 61000-4-5	Date	September 29, 2005	

EUT Power:	**Number of Strikes per Polarity/Voltage:**	**Repetition #**	**Angle**
[X] 230VAC @ 50Hz	[X] Five (5)	1	0º
[ ] 230/400VAC @ 50 Hz	[ ] Twenty (20)	2	90º
[ ] 120VAC @ 60 Hz	[ ]	3	180º
[ ]	[ ]	4	270º
		5	360º

Waveform Generator Type: [ ] Ring Wave [X] Combination

Test Equipment:	**Asset #**	**Used**	**Calibration Done**	**Calibration Due**
EMC Partner, Transient 2000	845	X	8/30/05	2/30/06

Performance Criteria: [ ] A [B] B [ ] **C**

L - G	[X] 0.5kV (Level 1)	[X] 1.0kV (Level 2)	[X] 2.0kV (Level 3)	[ ] 4.0kV (Level 4)	[ ] ??kV (Special)
L - L	[X] 0.25kV (Level 1)	[X] 0.5kV (Level 2)	[X] 1.0kV (Level 3)	[ ] 2.0kV (Level 4)	[ ] ??kV (Special)

	Level 1				**Level 2**				**Level 3**				**Level 4**				**Special**			
	CM		DM		CM		DM		CM		DM		CM		DM		CM		DM	
	0.5kV		0.25kV		1.0kV		0.5kV		2.0kV		1.0kV		4.0kV		2.0kV					
	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
N–Gnd	X	X			X	X			X	X										
L1–Gnd	X	X			X	X			X	X										
N-L1			X	X		X	X			X	X									

Compliant [X] Non-Compliant [ ] Photo [X]

Client	Lambda Electronics	Temperature	72	deg F
PAN #	25-857-LAM	Relative Humidity	53	%
EUT Name	AC Power Supply	Barometric Pressure	30.11	Hg
EUT Model	LZS-A500-3	Test Location	West Ground Plane	
Basic Standard	IEEE C62.41	Test Engineer	Ferdinand Custodio	
		Date	October 4, 2005	

EUT Power:	**Number of Strikes per Polarity/Voltage:**	**Repetition #**	**Angle**
[X] 230VAC @ 50Hz	[X] Five (5)	1	0º
[ ] 230/400VAC @ 50 Hz	[ ] Twenty (20)	2	90º
[ ] 120VAC @ 60 Hz	[ ]	3	180º
[ ]	[ ]	4	270º
		5	360º

Waveform Generator Type: [X] Ring Wave [ ] Combination

Test Equipment:	**Asset #**	**Used**	**Calibration Done**	**Calibration Due**
Haefely PC6-288.1 Surge Tester	413	X	8/4/04	8/4/05
Haefely FP-Surge 16.1 Coupling Filter	412	X	NCR	NCR
Haefely PHV2 Ring Wave Plug-In	411	X	8/4/04	8/4/05

Performance Criteria: [ ] A [B] B [ ] **C**

L - G	[X] 2.0kV (Low)	[X] 4.0kV (Medium)	[X] 6.0kV (High)
L - L	[X] 2.0kV (Low)	[X] 4.0kV (Medium)	[X] 6.0kV (High)

	Low				**Medium**				**High**											
	CM		DM		CM		DM		CM		DM									
	2.0kV		2.0kV		4.0kV		4.0kV		6.0kV		6.0kV									
	+	-	+	-	+	-	+	-	+	-	+	-								
N–Gnd	X	X			X	X			X	X										
L1–Gnd	X	X			X	X			X	X										
N-L1			X	X			X	X			X	X								

Compliant [X] Non-Compliant [ ] Photo [X]

4.9 RF Conducted Common Mode Disturbance Immunity Test Results

Client	Lambda Electronics		Temperature	74	deg C
PAN #	25-857-LAM		Relative Humidity	48	%
EUT Name	AC Power Supply		Barometric Pressure	30.07	Hg
EUT Model	LZS-A500-3		Test Location	West Ground Plane	
Governing Doc	EN 61000-6-2		Test Engineer	Ferdinand Custodio	
Basic Standard	IEC 61000-4-6		Date	October 3, 2005	

Test Level:		3Vrms	X	10Vrms		
Modulation:		None (CW)	X	80%AM @ 1kHz		
Frequency Range:	X	0.15 – 80 MHz		0.15-230MHz		
Step:	X	1%		10%		1.5 x 10^{-3} /decade
Performance Criteria:	X	A		B		

1	Injection Point (Cable)	AC Mains	Injection Method:		Clamp	X CDN
Comments:	No susceptibility noted					
2	Injection Point (Cable)	DC Output	Injection Method:	X	Clamp	CDN
Comments:	No susceptibility noted					
3	Injection Point (Cable)		Injection Method:		Clamp	CDN
Comments:						

Test Equipment Used	Asset #	X if Used	Calibration Done	Calibration Due
Fluke 6060B (Signal Generator)	212	X	6/24/05	12/24/05
FCC-801-M3-25 (CDN)	846		2/24/05	2/24/06
AR 10A250 (Amplifier)	402	X	NCR	NCR
RF Power Labs (Amplifier)	397	X	NCR	NCR
Solar 9144-1N (Clamp)	436	X	6/14/05	6/14/06

Compliant X	Non-Compliant		Photo X

4.10 Power Frequency Magnetic Field Immunity Test results

Client:	Lambda Electronics	Temperature:	74 degF
PAN #:	25-857-LAM	Relative Humidity:	48 %
EUT Name:	AC Power Supply	Barometric Pressure:	30.07 Hg
EUT Model:	LZS-A500-3	Test Location	West Ground Plane
Governing Doc:	EN 61000-6-2	Test Engineer	Ferdinand Custodio
Basic Standard:	IEC 61000-4-8	Date:	October 3, 2005
Voltage:	220VAC/ 50Hz		

Frequency:		DC	X	60Hz	X	50Hz	
Threat Level:		1A/m		3A/m	X	30A/m	
Duration Per Axis:	X	5 Min					
Criteria:	X	A		B		C	

Test Equipment List

Equipment	Asset #	Used	Calibration Done	Calibration Due
Helmholtz Coil	803	X	NCR	NCR
ELGAR Power Supply	220	X	NCR	NCR
Narda B-Field Sensor, 100cm^2	852	X	3/1/05	3/1/06
Narda Exposure Level Tester, ELT-400	851	X	3/1/05	3/1/06

Test Axis	Compliant Y	Compliant N	Comments
X	X		No susceptibility noted (both 50Hz and 60Hz)
Y	X		No susceptibility noted (both 50Hz and 60Hz)
Z	X		No susceptibility noted (both 50Hz and 60Hz)

Photo X

4.11 Voltage Dips and Short Interruptions Test Results

Client	Lambda Electronics	Temperature	73	degF
PAN #	25-857-LAM	Relative Humidity	33	%
EUT Name	AC Power Supply	Barometric Pressure	30.38	Hg
EUT Model	LZS-A500-3	Test Location	West Ground Plane	
Governing Doc	EN 61000-6-2	Test Engineer	Manuel Ugalde	
Basic Standard	IEC 61000-4-11	Date	March 12, 2007	

EUT Voltage: [X] **230VAC @ 50Hz** [X] **120VAC @ 60Hz** [ ]

Equipment Used	Used	Asset #	Cal Done	Cal Due
California Instruments Harmonic Generator/Analyzer	604	X	NCR	NCR

Changes Occur At: [X] **Zero Crossing** [ ]

Voltage Dips

	% Reduction	Duration in Cycles (50Hz / 60Hz)	Criteria A	Criteria B	Criteria C	Compliance Yes	Compliance No
[X]	100%	0.5 / 0.5	X			X	
[X]	100%	1 / 1	X			X	
[X]	30%	0.5 / 0.5	X			X	
[X]	30%	25 / 30	X			X	
[X]	60%	5 / 5	X			X	
[X]	60%	10 / 12	X			X	
[X]	60%	50 / 60	X			X	
[ ]	Not Required						

Voltage Interruptions

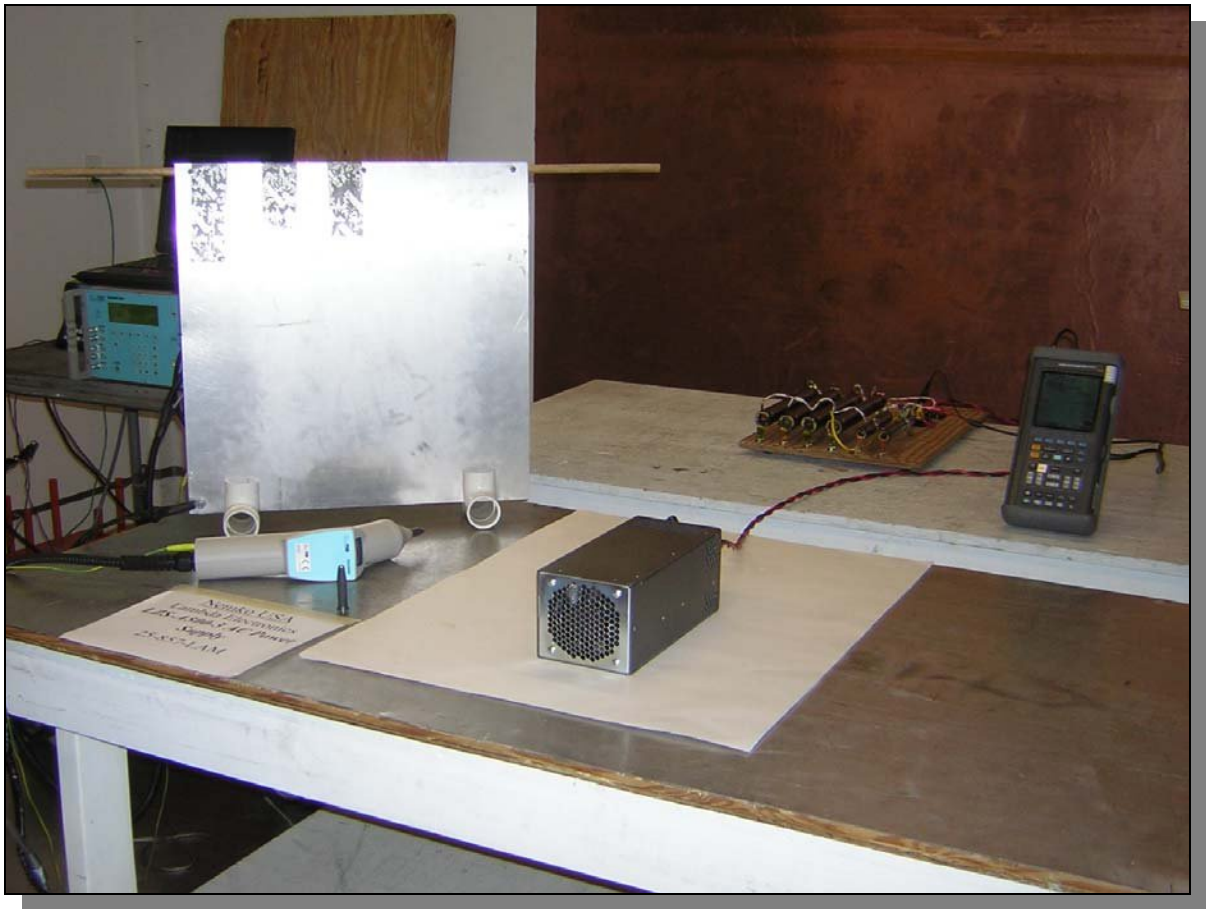
	% Reduction	Duration (cycles)	Criteria A	Criteria B	Criteria C	Compliance Yes	Compliance No
[X]	>95%	250 / 300		X		X	
[X]	100%	1.0 / 1.0		X		X	
[ ]							
[ ]	Not Required						

Photo [X]

Photograph 2. Conducted Emissions Test Configuration

Photograph 3. Radiated Emissions Test Configuration

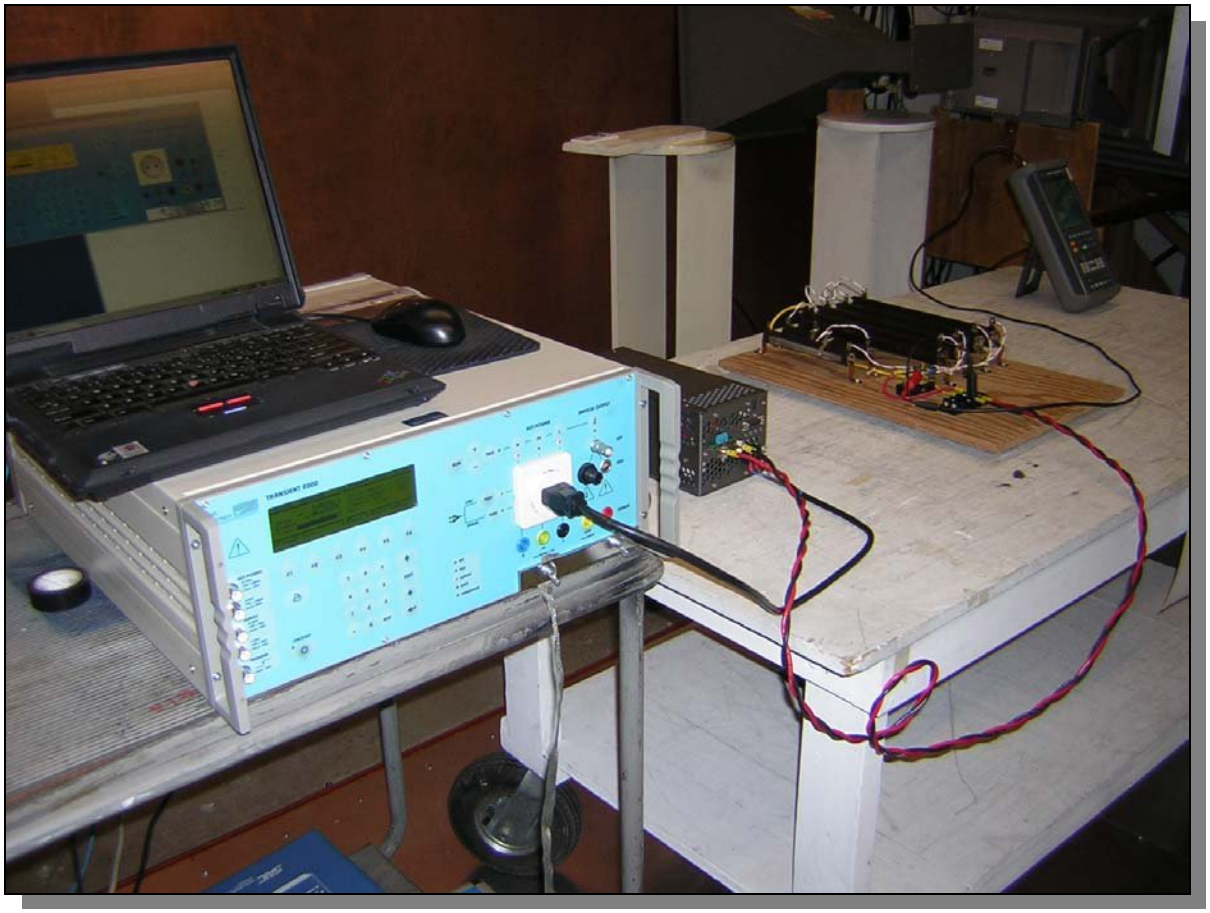
Photograph 4. ESD Immunity Test Configuration



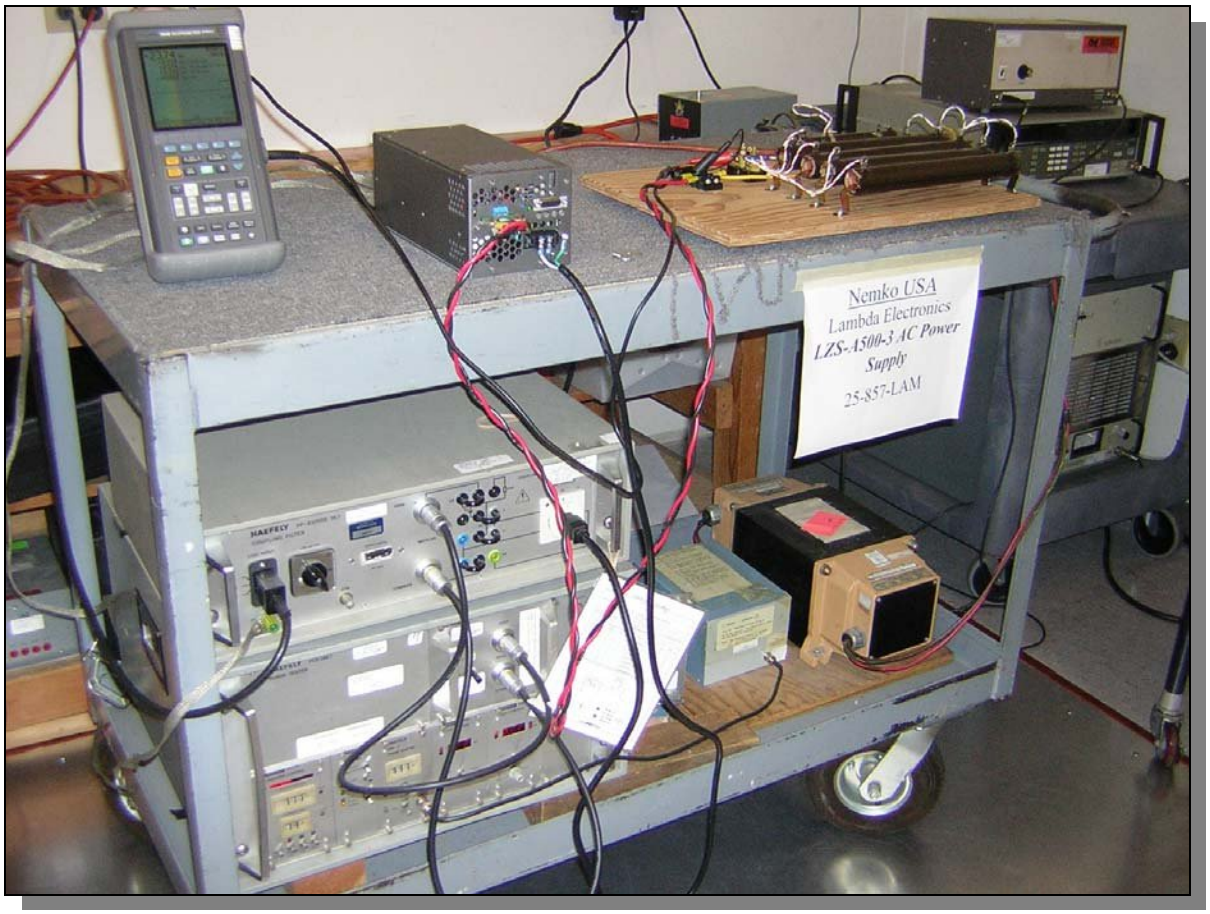
Photograph 5. Radio Frequency Immunity Test Configuration

Photograph 6. EFT Immunity Test Configuration

Photograph 7. Power Line Surge Immunity Test Configuration



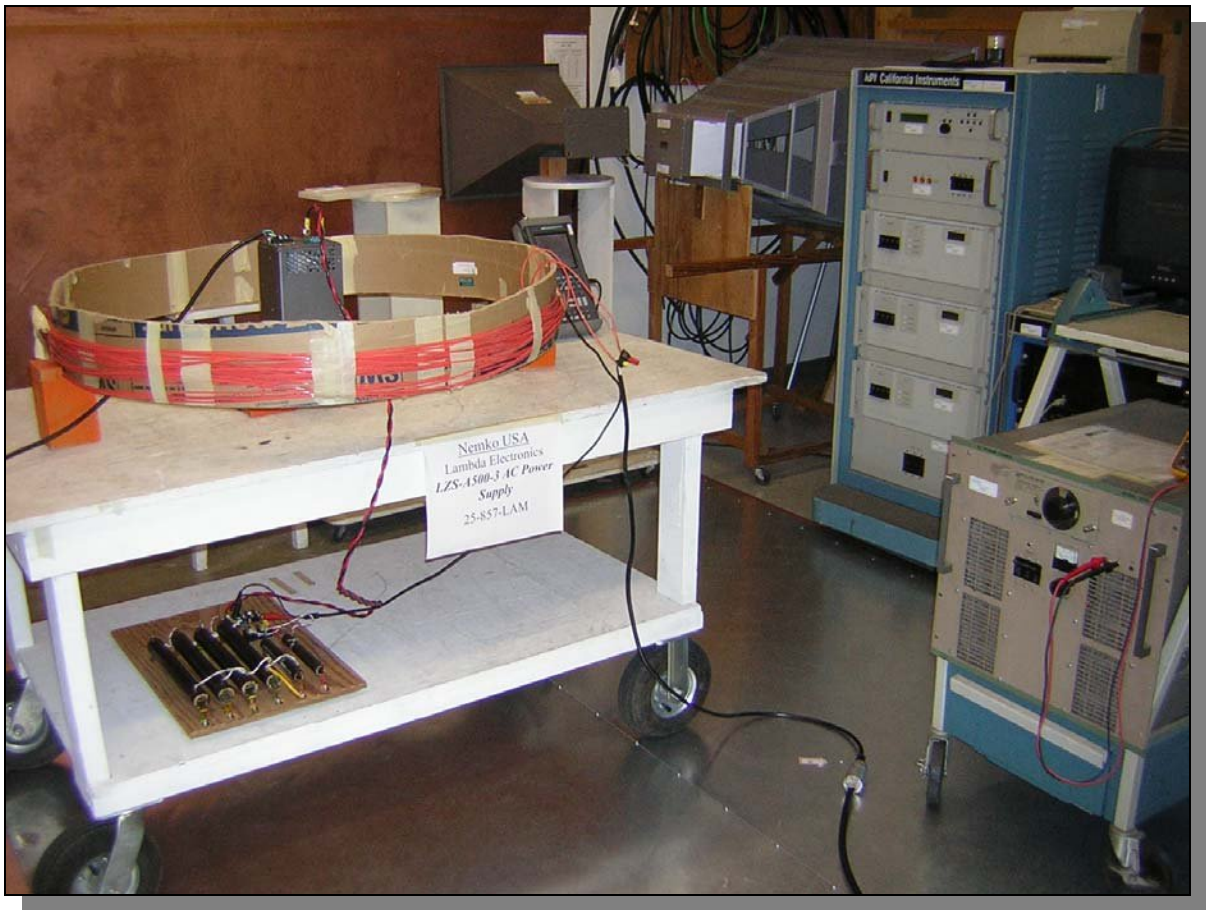
Photograph 8. Power Line Surge (IEEE C62.41) Immunity Test Configuration



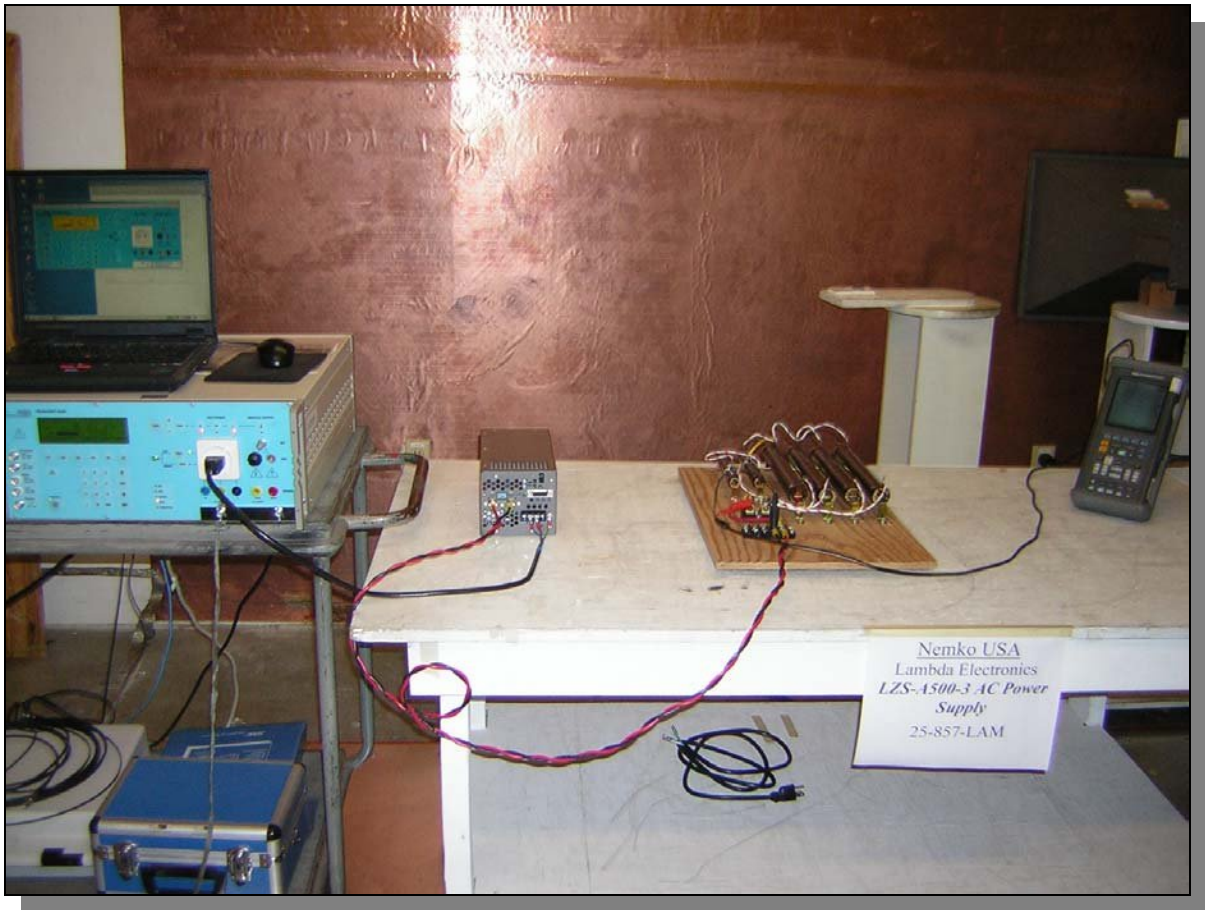
Photograph 9. RF Common Mode Immunity Test Configuration

Photograph 10. I/O RF Common Mode Immunity Test Configuration

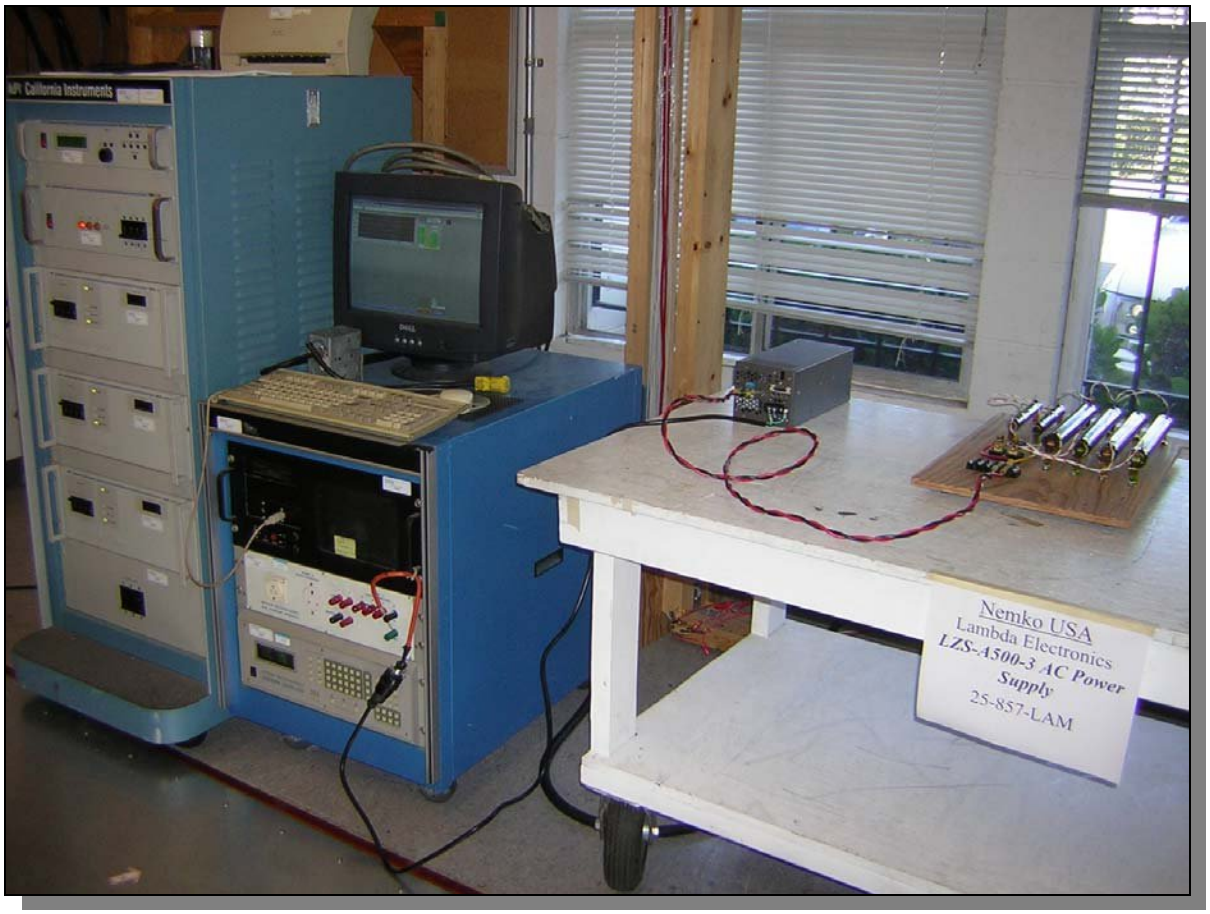
Photograph 11. Magnetic Field Immunity Test Configuration



Photograph 12. Voltage Dips and Short Interruptions Immunity Test Configuration



Photograph 13. Powerline Harmonics and Flicker Test Configuration



APPENDIX A
A. Conducted & Radiated Emissions Measurement Uncertainties

1. Introduction

ISO Standard 17025 and ANSI/NCSL Z540-1 (1994) require that all measurements contained in a test report be "traceable". "Traceability" is defined in the *International Vocabulary of Basic and General Terms in Metrology* (ISO: 1993) as: "the property of the result of a measurement... whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, *all having stated uncertainties*".

The purposes of this Appendix are to "state the *Measurement Uncertainties*" of the conducted emissions and radiated emissions measurements contained in Section 5 of this Test Report, and to provide a practical explanation of the meaning of these measurement uncertainties.

2. Statement of the Worst-Case Measurement Uncertainties for the Conducted and Radiated Emissions Measurements Contained in This Test Report

Table 1: Worst-Case Expanded Uncertainty "U" of Measurement for a k=2 Coverage Factor

Conducted Emissions Measurement Detection Systems	**Applicable Frequency Range**	**"U" for a k=2 Coverage Factor**
HP8568B Spectrum Analyzer with QPA and HP8447F Preamplifier	150 kHz - 30 MHz	+/- 3.0 dB
HP8566B Spectrum Analyzer with QPA and Preselector	9 kHz - 30 MHz	+/- 2.9 dB
Radiated Emissions Measurement Detection Systems	**Applicable Frequency Range**	**"U" for a k=2 Coverage Factor**
HP8568B Spectrum Analyzer with QPA & HP8447F Preamplifier	30 MHz - 200 MHz	+4.0 dB, -4.1 dB
HP8568B Spectrum Analyzer with QPA & HP8447F Preamplifier	200 MHz-1000 MHz	+/- 3.5 dB
HP8566B Spectrum Analyzer with QPA & Preselector	30 MHz - 200 MHz	+3.9 dB, -4.0 dB
HP8566B Spectrum Analyzer with QPA & Preselector	200 MHz-1000 MHz	+/- 3.4 dB
HP8566B Spectrum Analyzer with QPA & HP 8449A Preamplifier	1 GHz - 18 GHz	+2.5 dB, -2.6 dB
HP8566B Spectrum Analyzer with QPA & HP8449A Preamplifier	18 GHz - 40 GHz	+/- 3.4 dB

NOTES:
1. Applies to 3 and 10 meter measurement distances
2. Applies to all valid combinations of Transducers (i.e. LISNs, Line Voltage Probes, and Antennas, as appropriate)
3. Excludes the Repeatability of the EUT

3. Practical Explanation of the Meaning of the Conducted and Radiated Emissions Measurement Uncertainties

In the specific case of EMC Measurements in this test report, the measurement uncertainties of the conducted emissions measurements and the radiated emissions measurements have been calculated in accordance with the method detailed in the following documents:

- *ISO Guide to the Expression of Uncertainty in Measurement* (ISO, 1993)
- NIS 81:1994, *The Treatment of Uncertainty in EMC Measurements* (NAMAS, 1994)
- NIST Technical Note 1297(1994), *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results* (NIST, 1994)

The calculation method used in these documents requires that the stated uncertainty of the measurements be expressed as *an "expanded uncertainty", U, with a k=2 coverage factor*. The practical interpretation of this method of expressing measurement uncertainty is shown in the following example:

EXAMPLE: Assume that at 39.51 MHz, the (measured) radiated emissions level was equal to +26.5 dBuV/m, and that the +/- 2 standard deviations (i.e. 95% confidence level) measurement uncertainty was +/- 3.4 dB.

In the example above, the phrase "k = 2 Coverage Factor" simply means that the measurement uncertainty is stated to cover +/-2 standard deviations (i.e. a 95% confidence interval) about the measurand. The measurand is the radiated emissions measurement of +26.5 dBuV/m at 39.51 MHz, and the 95% bounds for the uncertainty are –3.4 dB to + 3.4 dB. One can thus be 95% confident that the "true" value of the radiated emissions measurement is between +23.1 dBuV/m and +29.5 dBuV/m. *In effect, this means that in the above example there is only a 2.5% chance that the "true" radiated emissions value exceeds +29.5 dBuV/m.*

APPENDIX B
B. Nemko USA, Inc.'s Test Equipment & Facilities Calibration Program

Nemko USA, Inc. operates a comprehensive Periodic Calibration Program in order to ensure the validity of all test data. Nemko USA's Periodic Calibration Program is fully compliant to the requirements of NVLAP Policy Guide PG-1-1988, ANSI/NCSL Z540-1 (1994), ISO 10012-1 (1993-05-01), ISO Standard 17025, ISO-9000 and EN 45001. Nemko USA, Inc.'s calibrations program therefore meets or exceed the US national commercial and military requirements [N.B. ANSI/NCSL Z540-1 (1994) replaces MIL-STD-45662A].

Specifically, all of Nemko USA's *primary reference standard devices* (e.g. vector voltmeters, multimeters, attenuators and terminations, RF power meters and their detector heads, oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, field-strength meters and their detector heads, etc.) and certain *secondary standard devices* (e.g. RF Preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are periodically recalibrated by:

- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratories by NIST; or,
- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratory by another accreditation body (such as A2LA) that is mutually recognized by NIST; or,
- A manufacturer of Measurement and Test Equipment (M&TE), if the manufacturer uses NIST-traceable standards and is ISO Guide 25-accredited as calibration laboratory either by NIST or by another accreditation body (such as A2LA) that is mutually recognized by NIST; or
- A manufacturer of M&TE (or by a Nemko USA-approved independent third party metrology laboratory) that is not ISO Guide 25-accredited. (In these cases, Nemko USA conducts an annual audit of the manufacturer or metrology laboratory for the purposes of proving traceabilty to NIST, ensuring that adequate and repeatable calibration procedures are being applied, and verifying conformity with the other requirements of ISO Guide 25).

In all cases, the entity performing the Calibration is required to furnish Nemko USA with a calibration test report and/or certificate of calibration, and a "calibration sticker" on each item of M&TE that is successfully calibrated.

Calibration intervals are normally one year, except when the manufacture advises a shorter interval (e.g. the HP 8568B Spectrum Analyzer is recalibrated every six months) or if US Government directives or client requirements demand a shorter interval. Items of instrumentation/related equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either in-house [if minor] or by a Nemko USA-approved independent [third party] metrology laboratory, or by the manufacturer of the item of M&TE).

Each antenna used for CISPR 11 and CISPR 22 and FCC Part 15 and Part 18 radiated emissions testing (and for testing to the equivalent European Norms) is calibrated annually by either a NIST (or NVLAP) ISO Standard 17025-Accredited third-party Antenna Calibration Laboratory or by the antenna's OEM if the OEM is NIST or NVLAP ISO Standard 17025-accredited as an antenna calibration laboratory. The antenna calibrations are performed using the methods specified in Annex G.5 of CISPR 16 (2003) or ANSI C63.4 (2001), including the "Three-Antenna Method". Certain other kinds of antennas (e.g. magnetic-shielded loop antennas) are calibrated annually by either a NIST (or NVLAP) ISO Standard 17025-accredited third-party antenna calibration laboratory, or by the antenna's OEM if the OEM is NIST or NVLAP ISO Standard 17025-accredited as an antenna calibration laboratory using the procedures specified in the latest version of SAE ARP-958.

In accordance with FCC and other regulations, Nemko USA recalibrates its suite of antennas used for radiated emissions tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of Nemko USA's Open Area Test Site. Nemko USA, Inc. uses the procedures given in both Subclause 16.6 and Annex G.2 of CISPR 16 (2003), and ANSI C63.4 (2001) when performing the normalized site attenuation measurements.

APPENDIX C
C. NVLAP Accreditation / Nemko Authorization

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation

ISO/IEC 17025:1999
ISO 9002:1994

NEMKO USA, INC. - SAN DIEGO EMC DIVISION
SAN DIEGO, CA

is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

December 31, 2005
Effective through

For the National Institute of Standards and Technology
NVLAP Lab Code: 200116-0

NVLAP-01C (06-01)

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

Nemko USA, Inc. - San Diego EMC Division
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121
Mr. Ricky Hill
Phone: 858-755-5525 x207 Fax: 858-793-9914
E-Mail: rick.hill@nemko.com
URL: http://www.nemko.com

Revised Scope 06/22/2005

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS **NVLAP LAB CODE 200116-0**

NVLAP Code	*Designation / Description*
Emissions Test Methods:	
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and Methods of Measurement of Radio interference Characteristics of Household Electrical Appliances, Portable Tools and Similiar Electrical Apparatus - Part 1: Emissions
12/CIS14a	EN 55014-1 (1993), A1 (1997), A2 (1999):
12/CIS14b	AS/NZS 1044 (1995):
12/CIS14c	CNS 13783-1: Electromagnetic Compatibility Requirements for household appliances, electric tools and similar apparatus - Part 1: Emissions
12/CIS15b	CNS 13439 (2000) + A1 (2001): Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS22	IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000): Limits and methods of measurement of radio disturbance characteristics of information technology equipment
12/CIS22a	IEC/CISPR 22 (1993) and EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)
12/CIS22b	CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment

2005-01-01 through 2005-12-31
Effective dates

For the National Institute of Standards and Technology

NVLAP-01S (REV. 2005-05-19)

NVLAP® National Voluntary Laboratory Accreditation Program

Revised Scope 06/22/2005

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS **NVLAP LAB CODE 200116-0**

NVLAP Code	*Designation / Description*
12/EM02a	IEC 61000-3-2, Edition 2.1 (2001-10), EN 61000-3-2 (2000), and AS/NZS 2279.1 (2000): Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A)
12/EM03b	IEC 61000-3-3, Edition 1.1(2002-03) & EN 61000-3-3, A1(2001): EMC - Part 3-3: Limits - Limitations of voltage changes, voltage flucuations and flicker, in public low-voltage supply-systems, for equipment with rated current <=16 A per phase and not subject to conditional connections
12/F18	FCC OST/MP-5 (1986): FCC Methods of Measurement of Radio Noise Emissions for ISM Equipment (cited in FCC Method 47 CFR Part 18 - Industrial, Scientific, and Medical Equipment)
12/T51	AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

Immunity Test Methods:

12/I01	IEC 61000-4-2, Ed. 1.2 (2001) + A1, A2; EN 61000-4-2: Electrostatic Discharge Immunity Test
12/I02	IEC 61000-4-3, Ed. 2.0 (2002-03); EN 61000-4-3 (2002): Radiated Radio-Frequency Electromagnetic Field Immunity Test
12/I03	IEC 61000-4-4(1995), A1(2000), A2(2001); EN 61000-4-4: Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test
12/I04	IEC 61000-4-5, Ed. 1.1 (2001-04); EN 61000-4-5: Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
12/I05	IEC 61000-4-6, Ed. 2.0 (2003-05); EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/I06	IEC 61000-4-8, Ed. 1.1 (2001); EN 61000-4-8: Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test

2005-01-01 through 2005-12-31

Effective dates

For the National Institute of Standards and Technology

NVLAP® National Voluntary Laboratory Accreditation Program

Revised Scope 06/22/2005

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 200116-0

NVLAP Code	*Designation / Description*
12/I07	IEC 61000-4-11, Ed. 1.1 (2001-03); EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
MIL-STD-462 : Conducted Emissions:	
12/A13	MIL-STD-462 Version D Method CE101
12/A14	MIL-STD-462 Version D Method CE102
12/A15	MIL-STD-462 Version D Method CE106
12/A16	MIL-STD-461 Version E Method CE101
12/A17	MIL-STD-461 Version E Method CE102
12/A18	MIL-STD-461 Version E Method CE106
MIL-STD-462 : Conducted Susceptibility:	
12/B12	MIL-STD-462 Version D Method CS101
12/B13	MIL-STD-462 Version D Method CS103
12/B14	MIL-STD-462 Version D Method CS104
12/B15	MIL-STD-462 Version D Method CS105
12/B16	MIL-STD-462 Version D Method CS109
12/B17	MIL-STD-462 Version D Method CS114
12/B18	MIL-STD-462 Version D Method CS115
12/B19	MIL-STD-462 Version D Method CS116
12/B20	MIL-STD-461 Version E Method CS101
12/B21	MIL-STD-461 Version E Method CS103
12/B22	MIL-STD-461 Version E Method CS104

2005-01-01 through 2005-12-31

Effective dates

For the National Institute of Standards and Technology

NVLAP® National Voluntary Laboratory Accreditation Program

Revised Scope 06/22/2005

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

NVLAP LAB CODE 200116-0

NVLAP Code	*Designation / Description*
12/B23	MIL-STD-461 Version E Method CS105
12/B24	MIL-STD-461 Version E Method CS109
12/B25	MIL-STD-461 Version E Method CS114
12/B26	MIL-STD-461 Version E Method CS115
12/B27	MIL-STD-461 Version E Method CS116
MIL-STD-462 : Radiated Emissions:	
12/D04	MIL-STD-462 Version D Method RE101
12/D05	MIL-STD-462 Version D Method RE102
12/D06	MIL-STD-462 Version D Method RE103
12/D07	MIL-STD-461 Version E Method RE101
12/D08	MIL-STD-461 Version E Method RE102
12/D09	MIL-STD-461 Version E Method RE103
MIL-STD-462 : Radiated Susceptibility:	
12/E08	MIL-STD-462 Version D Method RS101
12/E09	MIL-STD-462 Version D Method RS103
12/E10	MIL-STD-462 Version D Method RS105
12/E11	MIL-STD-461 Version E Method RS101
12/E12	MIL-STD-461 Version E Method RS103
12/E13	MIL-STD-461 Version E Method RS105

2005-01-01 through 2005-12-31

Effective dates

For the National Institute of Standards and Technology

Nemko

Nemko Laboratory Authorisation

Aut. No.: ELA 137-a

EMC Laboratory: **Nemko USA, Inc.**
11696 Sorrento Valley Rd. Suite F
San Diego, CA 92121
USA

Scope of Authorization: **All standards for EMC and radio transmission that are listed on the accompanying page.**

Nemko has assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA -10. During the visit by the Nemko representative it was found that the Laboratory is capable of performing tests within the Scope of the Authorisation.

Accordingly, Nemko will normally accept test results from the laboratory on a partial or complete basis for certification of the products.

In order to maintain the Authorisation, the information given in the pertinent NLA-10 must be carefully followed. Nemko is to be promptly notified about any changes in the situation at the Laboratory, which may affect the basis for this Authorisation. The Authorisation may be withdrawn at any time if the conditions are no longer considered to be fulfilled.

The Authorisation is valid through 31. December 2005.

Oslo, 2003.04.03

For Nemko AS:

Kjell Bergh

Kjell Bergh, Nemko Group EMC Co-ordinator

Nemko AS Gaustadalléen 30 P.O.Box 73 Blindern N-0314 Oslo Norway T +47 22 96 03 30 F +47 22 96 05 50 Enterprise number NO974404532

Nemko

Nemko Laboratory Authorisation

Aut. No.: ELA 137-b

R&TTE Directive

EMC Laboratory: **Nemko EESI, Inc.**
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121
USA

Scope of Authorization: **All standards for EMC and radio transmission that are listed on the accompanying page with reference to the R&TTE Directive.**

Nemko has assessed the quality assurance system , the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA -10. During the visit by the Nemko representative it was found that the Laboratory is capable of performing tests within the Scope of the Authorisation.

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The Authorisation is valid through 31. December 2005.

Oslo, 2003.04.03

For Nemko AS:

Kjell Bergh

Kjell Bergh, Nemko Group EMC Co-ordinator

Nemko AS Gaustadalléen 30 P.O.Box 73 Blindern N-0314 Oslo Norway T +47 22 96 03 30 F +47 22 96 05 50 Enterprise number NO974404532

Nemko

Nemko Laboratory
MDD – EMC Authorisation
Aut. No.: ELA 137-c

EMC Laboratory: **Nemko USA, Inc.**
11696 Sorrento Valley Rd. Suite F
San Diego, CA 92121
USA

Scope of Authorization: **All standards for the Medical Electric Devices Directive, related to EMC that are listed on the accompanying page.**

Nemko has assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA -10. During the visit by the Nemko representative it was found that the Laboratory is capable of performing tests within the Scope of the Authorisation.

Accordingly, Nemko will normally accept test results from the laboratory on a partial or complete basis for certification of the products.

In order to maintain the Authorisation, the information given in the pertinent NLA-10 must be carefully followed. Nemko is to be promptly notified about any changes in the situation at the Laboratory, which may affect the basis for this Authorisation. The Authorisation may be withdrawn at any time if the conditions are no longer considered to be fulfilled.

The Authorisation is valid through 31. December 2005.

Oslo, 2003.04.03

For Nemko AS:

Kjell Bergh

Kjell Bergh, Nemko Group EMC Co-ordinator

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