Global EMC Labs

EMI / EMC Test Report

As per

CISPR 22 & FCC Part 15 (Class A)

IEC 61326-1, IEC 61326-2-3

IEC 61000-4-2,3,4,5,6,8,11,12,16,17,29

Sections of IEC 61850-3 & IEC/TS 61000-6-5

on the

Calisto 9

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Testing produced for

MORGAN SCHAFFER
Transformers - The Inside View

See appendix A for full customer & EUT details.

Industry Canada
REGISTRATION #6844A-1

CE

ACCREDITED
Testing Laboratory Certificate #2555.01

VCCI
R-2621
C-2864

FEDERAL COMMUNICATIONS COMMISSION · USA · FC
REG#612361

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Report Scope

This report addresses the EMC verification testing and test results of the RSG2288, herein referred to as EUT (Equipment under test). The EUT was tested for immunity compliance against the following standards:

CISPR 22 & FCC Part 15

IEC 61326-1, IEC 61326-2-3

IEC 61000-4-2,3,4,5,6,8,12,16,17,29

IEC 61850-3

Immunity and emissions testing was evaluated on the EUT. Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

For a more detailed list of the standards and the revision used, see the "Applicable Standards, Specifications and Methods" section of this report.

This report does not imply product endorsement by any accreditation agency, any government, or Global EMC Inc.

Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

Summary

The results contained in this report relate only to the item(s) tested. This report does not imply product endorsement by any government, or Global EMC.

Equipment under test	Calisto 9
EUT Passed all tests performed.	Yes
Tests conducted by	Scott Drysdale

For testing dates see 'Testing Environmental Conditions'.

Test Results Summary

If the product as tested complies with the specification or requirement, the EUT is deemed to comply and is issued a 'PASS' grade. If not 'FAIL' grade will be issued. A pass requiring modifications is denoted with a '*', and the modifications are listed in 'Appendix A – Client Provided Details'.

Note 1: This testing is not currently covered under the laboratories listed scope of accreditation, however calibrated equipment was used and all requirements of ISO 17025 were followed.

Note 2: This test was sub contracted to an ISO 17025 accredited facility where this testing is covered under the scope of the sub-contractors ISO 17025 accreditation. Details of the subcontractor for these test(s) are kept on file at Global EMC.

Test program according to EN/IEC 61000-6-4.

Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emissions standards for industrial environments.

Standard/Method	Description	Criteria	Level	Result
CISPR 22 FCC Part 15	Power line conducted emissions	N/A	A	AC - PASS DC - Not Required (See Justifications)
CISPR 22 FCC Part 15	Radiated emissions	N/A	A	Pass
IEC 61000-3-2	Harmonics Emissions	N/A	A	Pass
IEC 61000-3-3	Flicker Emissions	N/A	N/A	Pass
OVERALL RESULT				PASS

Test program according to IEC/TS 61000-6-5

Electromagnetic Compatibility (EMC) – Part 6-5: Generic Standards – Immunity for power station and substation environments.

Standard/Method	Description	Criteria	Level	Result
IEC 61000-4-2	Electrostatic Discharge Immunity	B	4kV Contact / 8kV Air 8kV Contact 15 kV Air	Pass
IEC 61000-4-3	Radiated Susceptibility Immunity	A	20 V/m (80M-1G) 10 V/m (1G – 2G) 10 V/m (2-2.7G)	Pass
IEC 61000-4-4	Electrical Fast Transients Immunity	B	4 kV mains 4 kV I/O	Pass
IEC 61000-4-5	Surge Immunity	B	2kV DC mains L-G 1 kV DC mains L-L	Pass
IEC 61000-4-5	Surge Immunity	B	4 kV AC mains L-G 2 kV AC mains L-L	Pass
IEC 61000-4-5	Surge Immunity	B	2kV I/O	Pass
IEC 61000-4-6	Conducted Susceptibility Immunity	A	10 Vrms	Pass
IEC 61000-4-8	Magnetic Immunity	A	100 A/m 1000 A/m (3 sec)	Pass
IEC 61000-4-11	Dips & Interrupts	A/B/C	Various	Pass
Overall Result				**PASS**

Client	**Morgan Schaffer**	
Product	**Calisto 9**	
Standard(s)	**CISPR 22 & FCC Part 15, IEC/TS 61000-6-5 & IEC 61000-4-12,16,17,29 IEC 61850-3, IEC 61326-1 & IEC 61326-2-3**	

Customer request specifications

Standard/Method	Description	Criteria	Level	Result
IEC 61000-4-17	AC Ripple on DC power Immunity	A	+/- 15%	Pass
IEC 61000-4-29	DC Voltage Dips & Interrupts	B/C	Various	Pass
Overall Result				**PASS**

Test program according to IEC 61850-3

Communications networks and substations – Part 3: General Requirements

Standard/Method	Description	Criteria	Level	Result
IEC 61000-4-6 IEC 61850-3 Sect 5.7.1.1	Conducted Susceptibility Immunity	A	10 Vrms	Pass
IEC 61000-4-5 IEC 61850-3 Sect 5.7.1.2	Surge Immunity	B	4 kV AC mains L-G 2 kV AC mains L-L	Pass
IEC 61000-4-5 IEC 61850-3 Sect 5.7.1.2	Surge Immunity	B	2 kV I/O mains L-G	Pass
IEC 61000-4-12 IEC 61850-3 5.7.1.3	Oscillatory Surge	B	2.5 kV	Pass[1]
IEC 61000-4-4 IEC 61850-3 Sect 5.7.1.4	Electrical Fast Transients Immunity	B	4 kV mains 4 kV I/O	Pass
IEC 61000-4-3 / IEC 61850-3 Sect 5.7.2	Radiated Susceptibility Immunity	A	20 V/m (80M-1G) 3 V/m (1G – 2G) 1 V/m (2-2.7G)	Pass
IEC 61000-4-16 IEC 61850-3 Sect 5.7.3	Low Frequency Conducted Susceptibility	A	2 & 3	Pass[1]
IEC 61000-4-8 IEC 61850-3 Sect 5.7.3	Magnetic Immunity	A	100 A/m 1000 A/m (5 sec)	Pass
CISPR 22 IEC 61850-3 Sect 5.8	Radiated Emissions	Class A	30 MHz to 1 GHz	Pass
IEC 61000-4-11 IEC 61850-3 Sect 6	Dips & Interrupts	A/B/C	Various	Pass
IEC 61000-4-29 IEC 61850-3 Sect 6	DC Voltage Dips & Interrupts	B/C	Various	Pass[1]

If the product as tested complies with the specification or requirement, the EUT is deemed to comply and is issued a 'PASS' grade. If not 'FAIL' grade will be issued. A pass requiring modifications is denoted with a '*', and the modifications are listed in 'Appendix A – Client Provided Details'.

Note 1: This testing is not currently covered under the laboratories listed scope of accreditation, however calibrated equipment was used and all requirements of ISO 17025 were followed.

Note 2: This test was sub contracted to an ISO 17025 accredited facility where this testing is covered under the scope of the sub-contractors ISO 17025 accreditation. Details of the subcontractor for these test(s) are kept on file at Global Advantage.

Justifications or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

All levels were chosen as per customer request.

Telecom line conducted emissions was not performed as the EUT only contained shielded I/O cables that are not intended for connection to widely dispersed systems (i.e. public switched telecommunications networks (PSTN) integrated services digital networks (ISDN), or x-type digital subscriber lines (xDSL), etc.).

Harmonics emissions testing was not performed as this equipment is Class A equipment, therefore not required as per IEC 61326-1. Additionally, this equipment is professional equipment rated at 5A (in excess of 1 kW).

Flicker emissions testing was not performed as this equipment was deemed unlikely to produce significant voltage fluctuations or flicker

A later revision of the standard may have been substituted in place of the previous dated referenced revision. The year of the specification used are listed under applicable standards. Using the later revision accomplishes the goal of ensuring compliance to the intent of the previous specification, while allowing the laboratory to incorporate the extensions and clarifications made available by a later revision.

Applicable Standards, Specifications and Methods

ANSI C63.4:2003	- Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 11:2004	Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement
CISPR 16-2-3-2003	Methods of measurement of disturbances and immunity – Radiated disturbance measurements
CISPR 22:2006	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
EN55022:1998+A1 +A2	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
FCC Part 15	- Code of Federal Regulations, 47 – Part 15 Telecommunications
IEC 61000-4-2:2001	Testing and measurement techniques –Electrostatic discharge immunity test
IEC 61000-4-3:2002	Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-4:2004	Testing and measurement techniques – Electrical fast transient/burst immunity test
IEC 61000-4-5:2004	Testing and measurement techniques - Surge immunity test
IEC 61000-4-6:2003	Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields
IEC 61000-4-8:2001	Testing and measurement techniques – Power frequency magnetic field immunity test

IEC 61000-4-12:2001 Oscillatory Waves Immunity Test

IEC 61000-4-16:2002 Test for immunity to conducted, common mode disturbances 0 Hz to 150 kHz

IEC 61000-4-17:2002 Ripple on DC power input port immunity Test

IEC 61000-4-29:2000 Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests

IEC 61326-1:2006 Electrical equipment for Measurement, control and Laboratory use - EMC requirements

ISO 17025:2005 - General Requirements for the competence of testing and calibration laboratories

Document Revision Status

Revision 1 - June 8, 2011
- First Revision

Revision 2 - January 11, 2012
- Minor corrections as per email kept on file.

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxiliary Equipment.

Class A device – A device that is marketed for use in a commercial, industrial or business environment. A 'Class A' device should not be marketed for use by the general public . A 'Class A' device should contain the following warning in it's user manual: "**Warning:** This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures."

Class B device – A device that is marketed for use in a residential environment and may also be used in a commercial, business or industrial environments. A 'Class B' device may also be defined as a device to which a broadcast radio or television receivers would be expected within a distance of 10 m of the device concerned.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

Telecommunications port - For transfers intended to interconnect multi-user telecommunications networks (e.g. PSTN, ISDN, xDSL, etc.), local area networks (e.g.
Ethernet, Token Ring, etc.) and similar networks. This excludes one-to-one port types such as RS-485, RS-232 and USB.

ITE – Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency

Test Plan – See 'Appendix A – Client Provided Details'. This should be made available prior to testing.

Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN and using the Vertical Ground plane.

Calibrations and Accreditations

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, 612361), Industry Canada (IC, 6844A-1) and VCCI (R-2621 and C-2864). This chamber was calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at Global EMC. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at Global EMC. Global EMC Inc is accredited to ISO 17025 by A2LA with Testing Certificate #2555.01. The laboratories current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

Testing Environmental Conditions and Dates

Following environmental conditions were recorded in the facility during time of testing –

Date	Test	Init.	Temperature (ºC)	Humidity (RH %)	Pressure (kPa)
April 26, 2011	RE	SD	20-24	35-60	100-102
April 27, 2011	PLCE	SD	20-24	35-60	100-102
April 28, 2011	ESD	SD	20-24	50	100-102
April 26, 2011	RS	SD	20-24	35-60	100-102
April 28, 2011	EFT/B	SD	20-24	35-60	100-102
April 28, 2011	Surge	SD	20-24	35-60	100-102
April 25, 2011	CS	SD	20-24	35-60	100-102
April 28, 2011	MS	SD	20-24	35-60	100-102
April 27, 2011	DIPS	SD	20-24	35-60	100-102
April 29, 2011	OSC	SD	20-24	35-60	100-102
April 29, 2011	LF CS	SD	20-24	35-60	100-102
April 27, 2011	Ripple	SD	20-24	35-60	100-102
April 27, 2011	DC dips	SD	20-24	35-60	100-102

Detailed Test Result Section

Power Line Conducted Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard, as measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio operators, maritime radio, CB radio, and so on, from unwanted interference.

Limits & Method

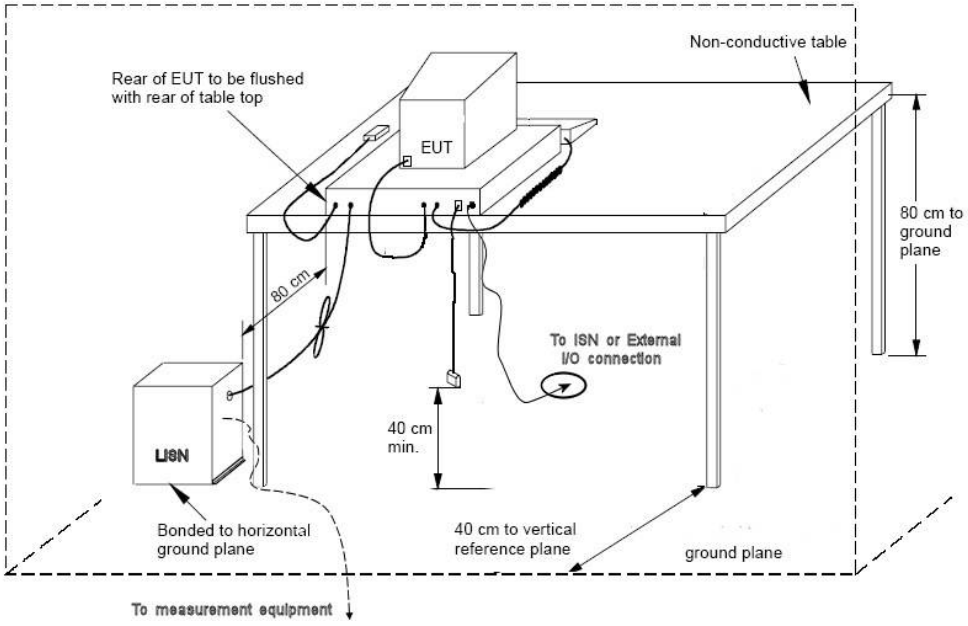
The limits and method are as defined in CISPR 22:2006 and EN55022:2006

Average Limits		QuasiPeak Limits	
150 kHz – 500 kHz	66 dBuV	150 kHz – 500 kHz	79 dBuV
500 kHz – 30 MHz	60 dBuV	500 kHz – 30 MHz	73 dBuV

Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Both limits are applicable, and each is specified as being measured with a 9 kHz measurement bandwidth .

Typical Setup Diagram



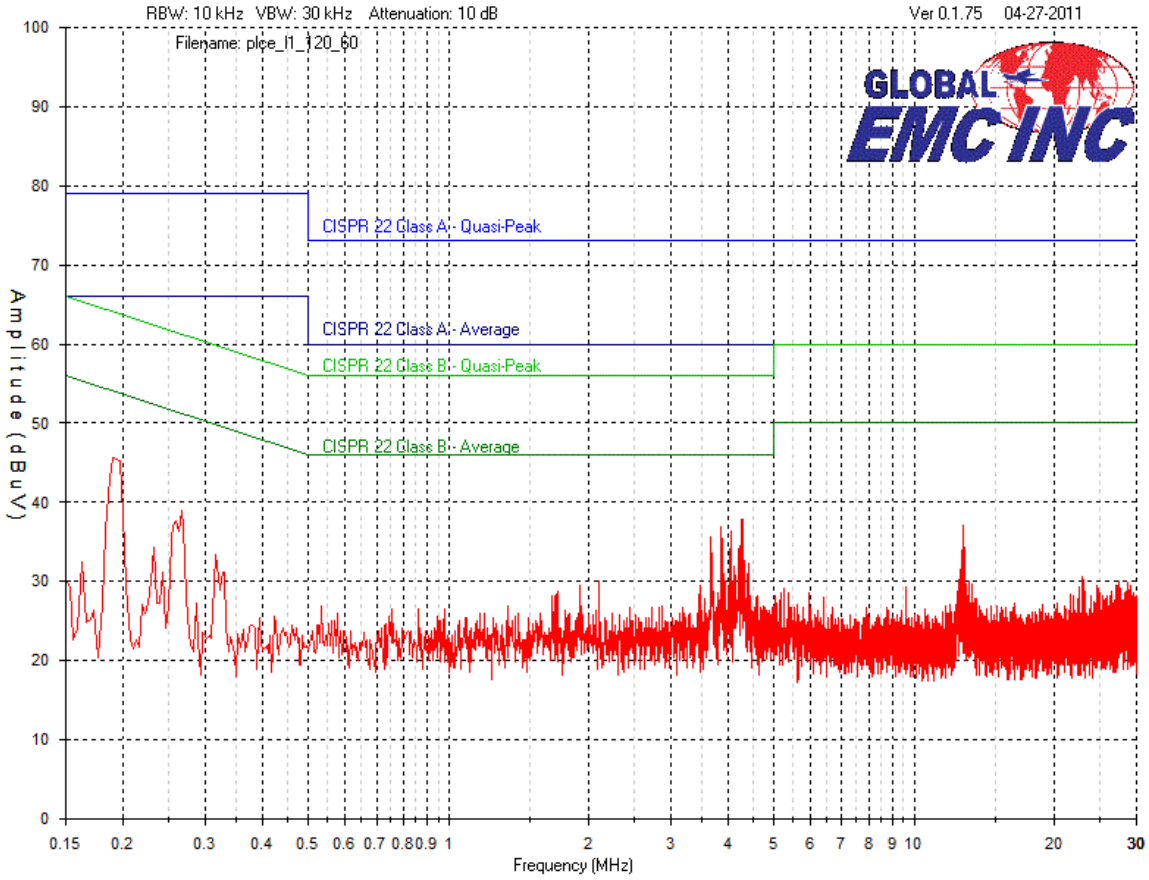
Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-3.6 dB with a 'k=2' coverage factor and a %95 confidence level.

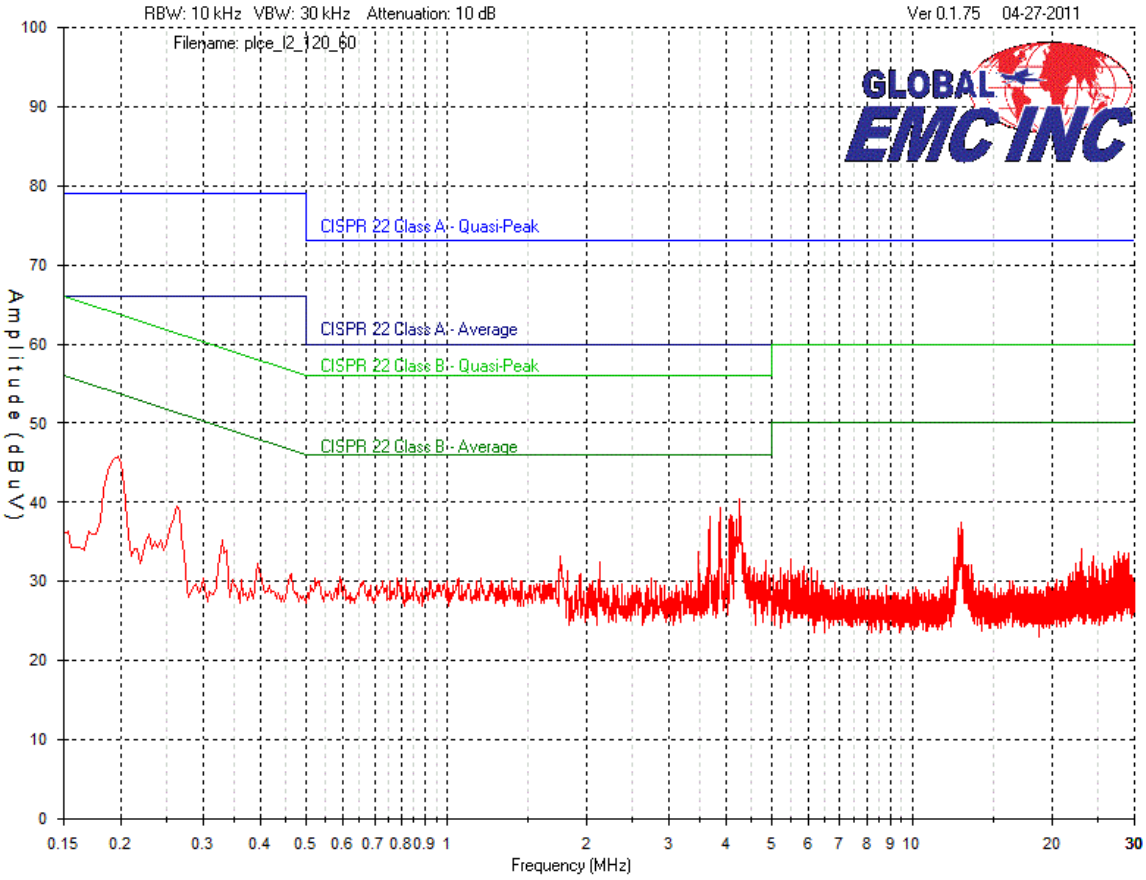
Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector where applicable, please refer to the table. The graph shown below is a peak measurement graph, measured with a resolution bandwidth greater than or equal to the final required detector. This graphs are performed as a worst case measurement to enable the detection of frequencies of concern and for considerable time savings.

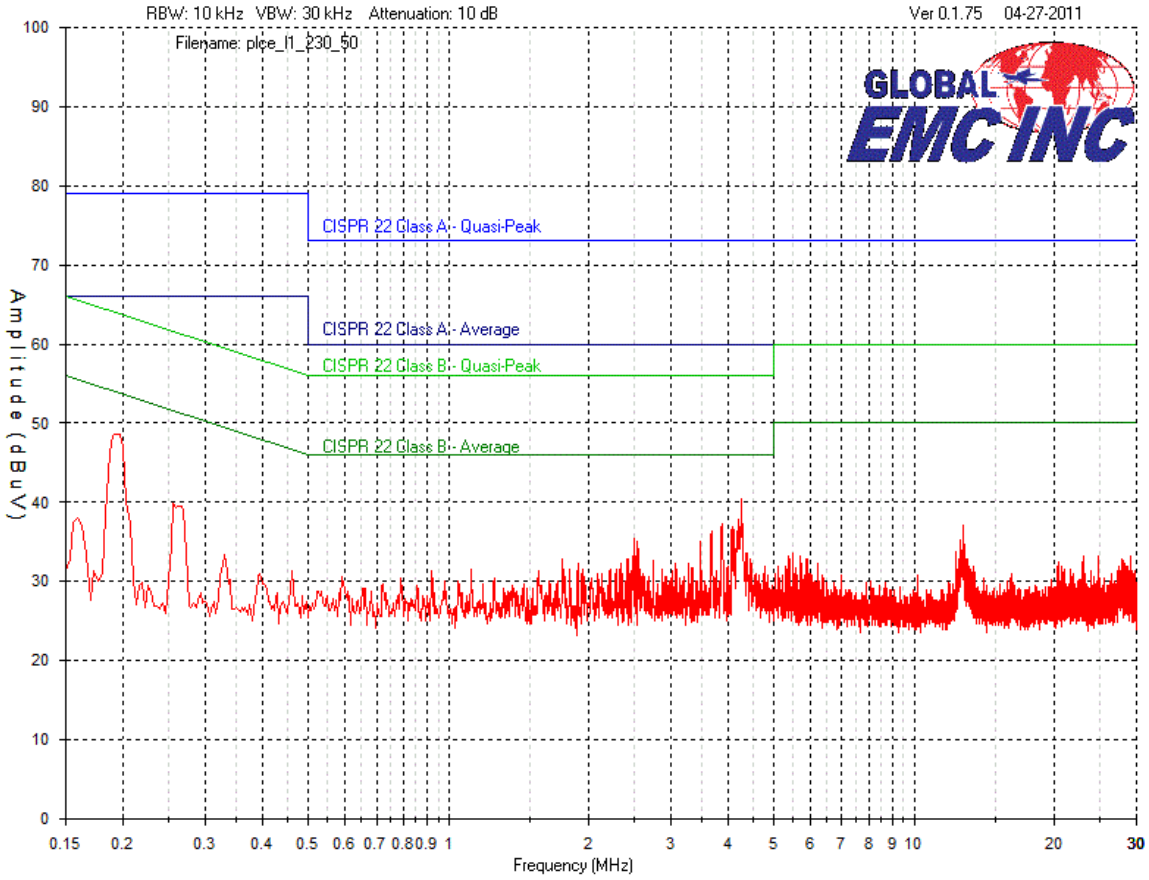
Phase (Black) - 120 Vac, 60 Hz operation



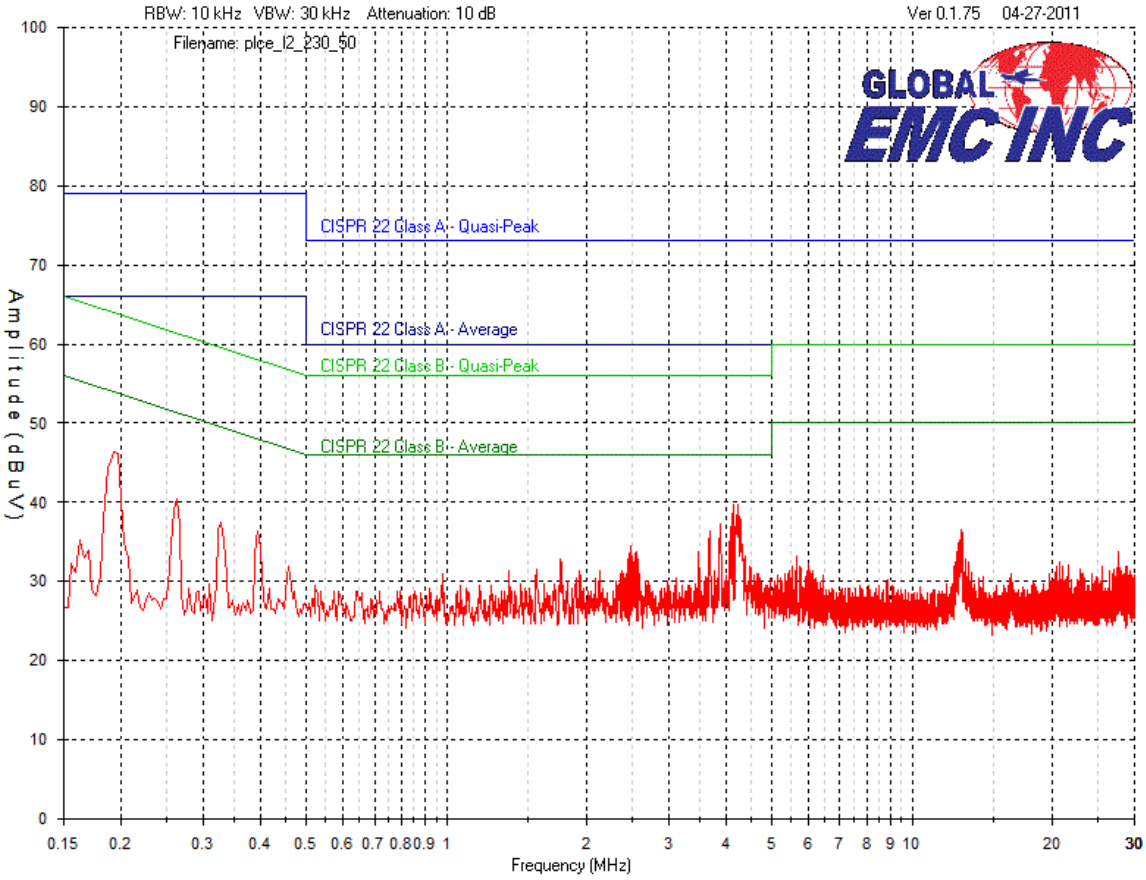
Neutral (White) – 120 Vac, 60 Hz operation



Phase (Brown) – 230 Vac, 50 Hz operation



Neutral (Blue) – 230 Vac, 50 Hz operation



Final Measurements

No peak emissions exceeded the Class A average or quasi-peak limits, so no further measurements were deemed necessary. See above graphs for detail.

Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up for the highest line conducted emission

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	Dec 29, 2009	Dec 29, 2011	GEMC 6350
LISN	FCC-LISN-50/250-16-2-01	FCC			GEMC 65
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42

This report module is based on GEMC template "CISPR22 – Power Line Conducted Emissions Class A_Rev1"

Radiated Emissions

Purpose

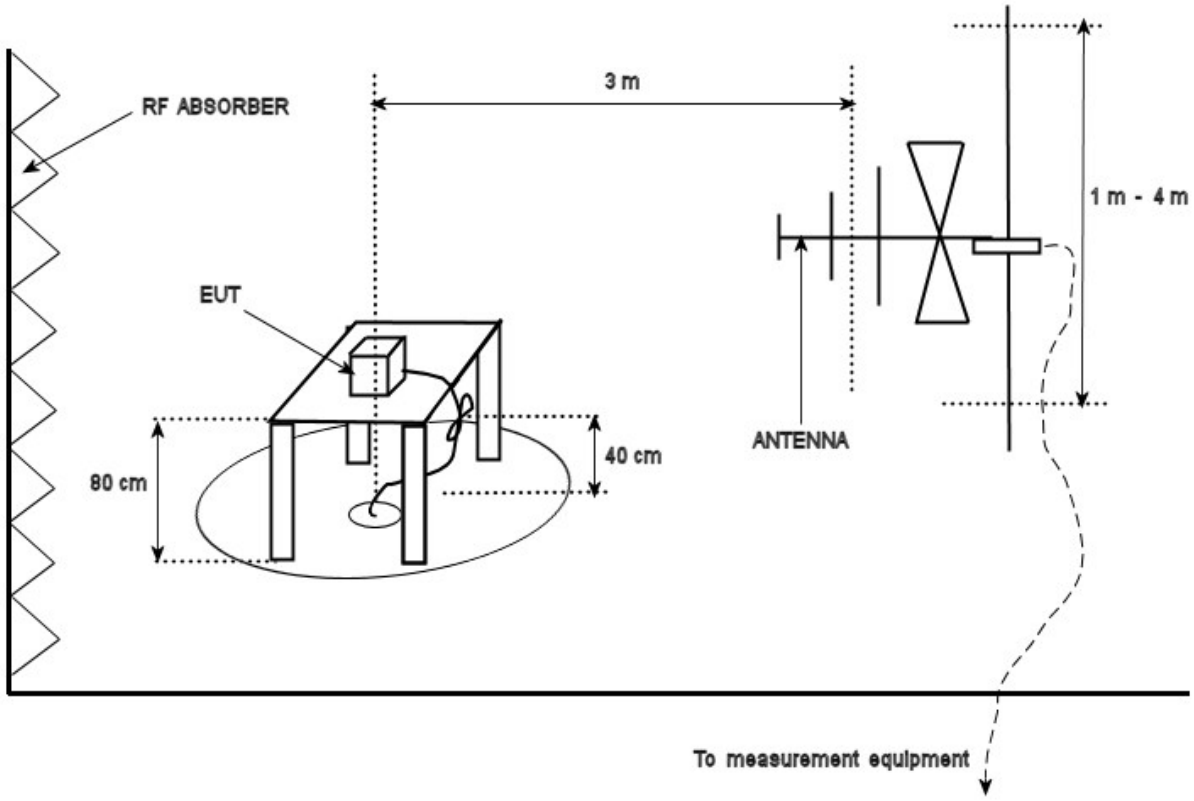
The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s)

The limits are as defined in CISPR 22:2006 and EN55022:2006. Note this also represents the limits specified in FCC Part 15, subpart b, section 15.109(g).
30 MHz – 230 MHz , 40 dBuV/m at 10m, 50.5 dBuV/m at 3m
230 MHz – 1000 MHz, 47 dBuV/m at 10m, 57.5 dBuV/m at 3m

This limit is specified as being measured with a 120 kHz measurement bandwidth and a using a Quasi Peak detector.

Figure 1 – Typical Radiated Emissions Setup



Note: In accordance with CISPR 22 section 10.4.5, testing was performed at a 3 meter test distance. An extrapolation factor of 10.5 dB was applied in accordance with section CISPR 22 section 10.8(a).

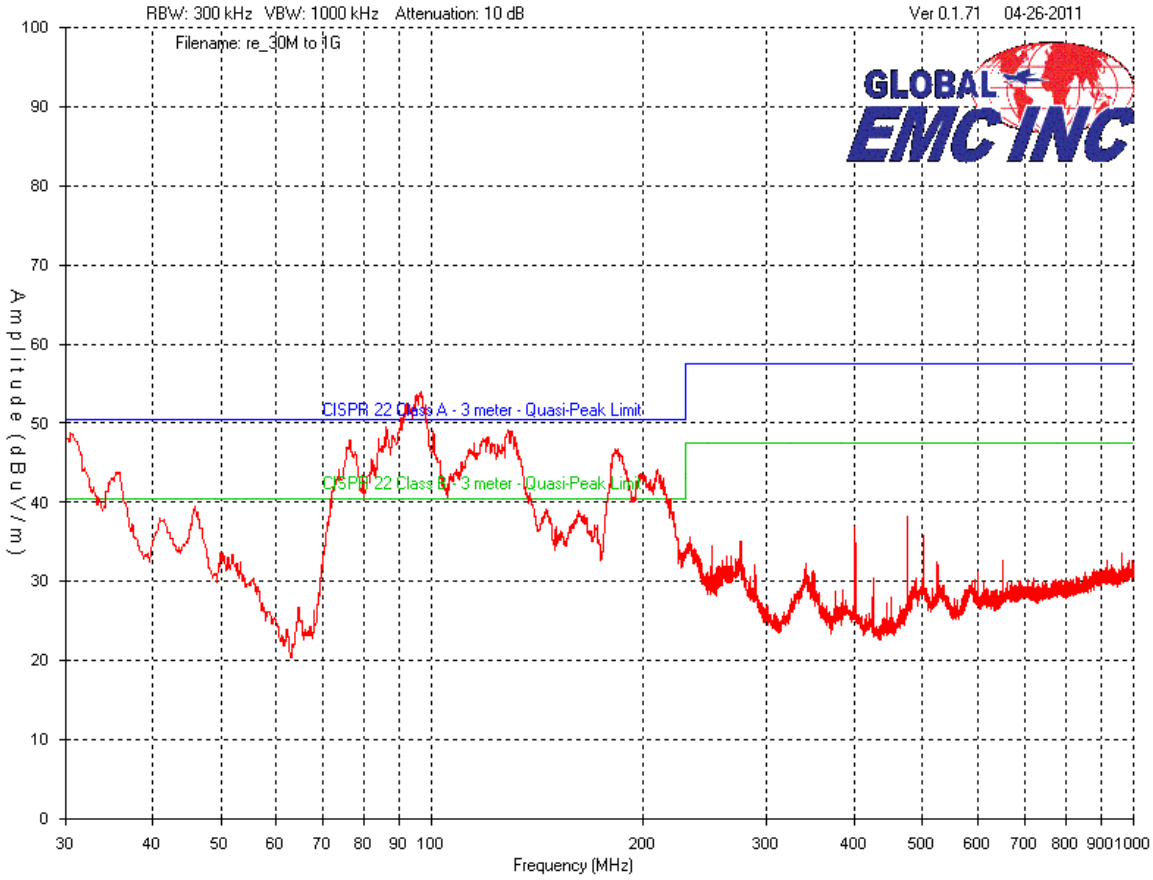
Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a %95 confidence level.

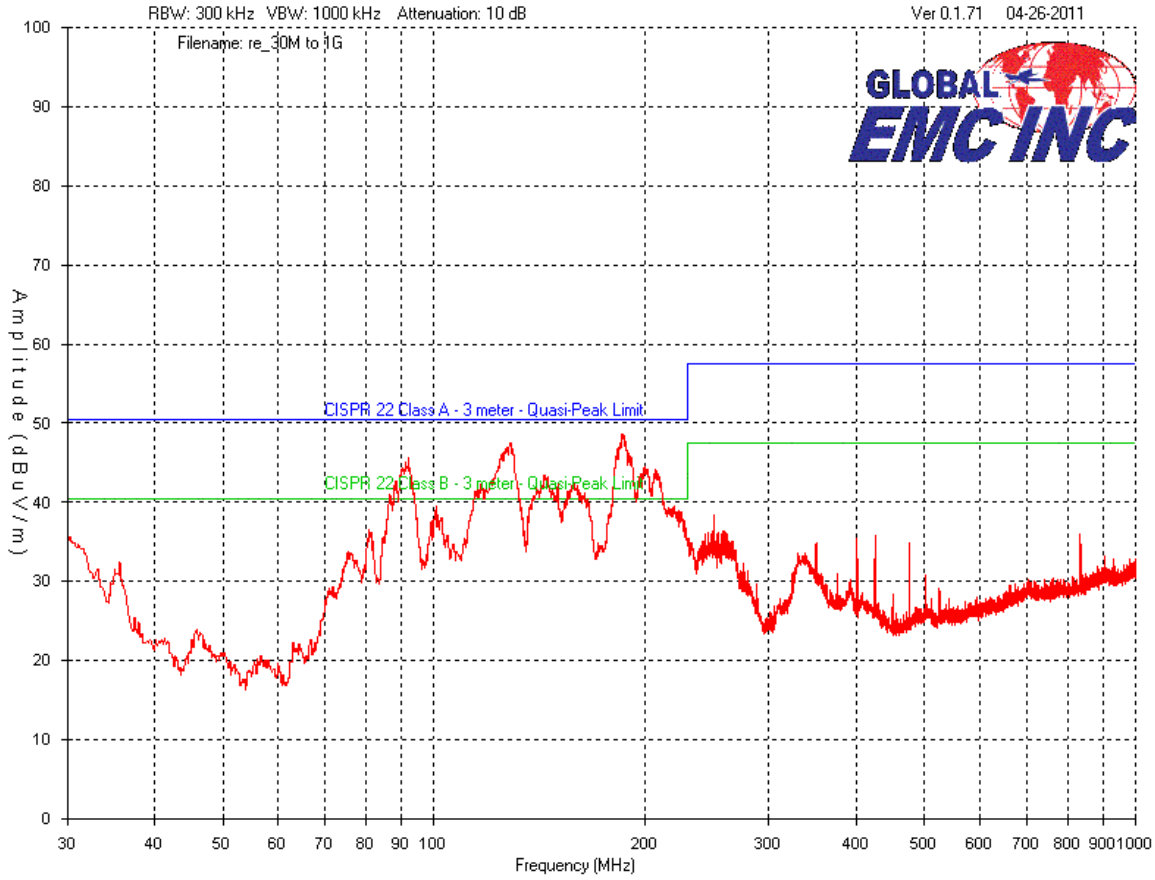
Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater than the final required detector and over a full 0-360 rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.

Vertical – Peak Emissions Graph



Horizontal – Peak Emissions Graph



Final Measurements

The worst case measurement as listed in the table below appeared at a vertical antenna height of 100 cm and a table azimuth of 262 degrees, as pictured in Appendix A.

Quasi Peak Emissions Table

Quasi Peak Emissions Table - Vertical

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dB)	Margin (dB)	Pass/Fail
96.298	64.5	8.9	0.5	-30.2	43.7	50.5	6.8	Pass
125.173	62.8	7.8	0.5	-30.2	40.9	50.5	9.6	Pass
30.582	44.9	18.7	0.3	-30.1	33.8	50.5	16.7	Pass
76.463	56.9	7.4	0.4	-30.2	34.5	50.5	16	Pass
184.133	59.6	9.9	0.5	-30.3	39.7	50.5	10.8	Pass
45.908	59.7	10.5	0.3	-30.1	40.4	50.5	10.1	Pass

Peak (worst case) Emissions Table - Horizontal

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dB)	Margin (dB)	Pass/Fail
185.491	68.5	9.9	0.5	-30.3	48.6	50.5	1.9	Pass
128.164	69.4	7.8	0.5	-30.2	47.5	50.5	3	Pass
91.983	66.6	8.8	0.5	-30.2	45.7	50.5	4.8	Pass
143.975	64.7	8.5	0.5	-30.3	43.4	50.5	7.1	Pass
100.616	60.3	9	0.5	-30.2	39.6	50.5	10.9	Pass
80.925	58.5	7.8	0.4	-30.2	36.5	50.5	14	Pass

Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up for the highest radiated emission

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	Dec 29, 2009	Dec 29, 2011	GEMC 6350
BiLog Antenna	3142-C	ETS	Jan 17, 2011	Jan 17, 2013	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	Aug 25, 2010	Aug 25, 2012	GEMC 6403
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "CISPR22 – Radiated Emissions Class A_Rev1"

Electro-Static Discharge

Purpose

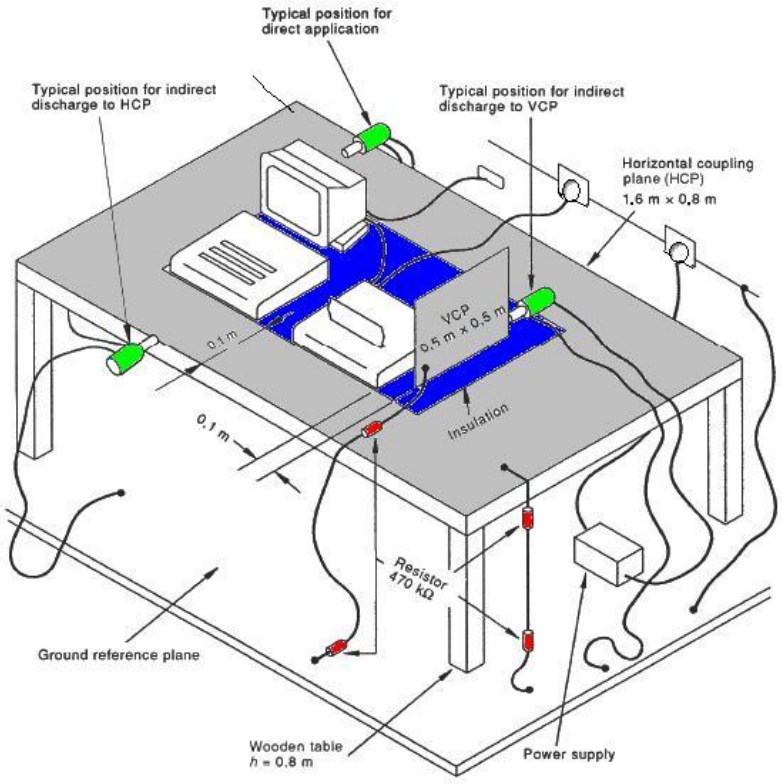
The purpose of this immunity test is to apply a static electricity discharge from the operator to the EUT, or create a nearby discharge field. An example of can be seen in low humidity when a person touches an object and creates is a small spark. This spark may be potentially harmful to the operation of the EUT. Most real life discharges are 'air' as shown in the previous example. The 'contact' method, with related reduced voltages, has been shown to be roughly equivalent 'air' in it is severity. 'Contact' is the preferred method due to its reproducibility. Contact method will be performed unless the discharge point is significantly insulated and the insulation cannot be easily broken through. This test ensures a minimum level of immunity which is likely to occur. This test does not guarantee that the EUT will not experience a higher level which may cause it to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-2:2001. 25 hits in negative and positive polarity will be performed at each defined discharge point on the EUT. These are called direct discharges, irrespective of contact or air being applied. Also, Horizontal Coupling Plane (HCP) and the Vertical Coupling Plane(VCP) discharges will be performed. These are called indirect discharges. For a picture representation of the EUT discharge points, see Appendix B - EUT and Test Setup Photos. For a text description of the EUT discharge points, see Appendix A - Client Provided Details. For a EUT criteria description, see Appendix A - Client Provided Details.

A level of 8kV contact, or 15kV air where applicable, was applied to each defined discharge point. Each level was ramped up by applying the lower levels first. Criteria level 'B' as defined in "Appendix A - Client Provided Details" was applied to this test, however all anomalies are noted.

Typical ESD Setup



Application Level Accuracy

Contact discharge: +/- 15% as measured at tip.

Test Results

The EUT passed the requirements.

Location	Test Voltage	Discharge Type	Pass / Fail
1. Body of EUT Front, Back, Left, Right	+/- 8 kV	Contact	Pass
2. Around cable entry	+/- 15 kV	Air	Pass
3. Display	+/- 15 kV	Air	Pass
4. Green Button	+/- 15 kV	Air	Pass
5. VCP/HCP	+/- 8 kV	Contact	Pass

Test Equipment List

Following equipment was used for ESD immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Minizap ESD Simulator	Minizap	Thermo Electron Corp			GEMC 1
ESD HCP	80CMX160CM	Global EMC	NCR	NCR	GEMC 50
ESD VCP	50CMX50CM1	Global EMC	NCR	NCR	GEMC 51
ESD 470K A	2X470KOHM100CM	Global EMC	NCR	NCR	GEMC 52
ESD 470K B	2X470KOHM100CM	Global EMC	NCR	NCR	GEMC 53

This report module is based on GEMC report template 'IEC61000-4-2_ESD_Rev1'

Radiated Field Immunity

Purpose

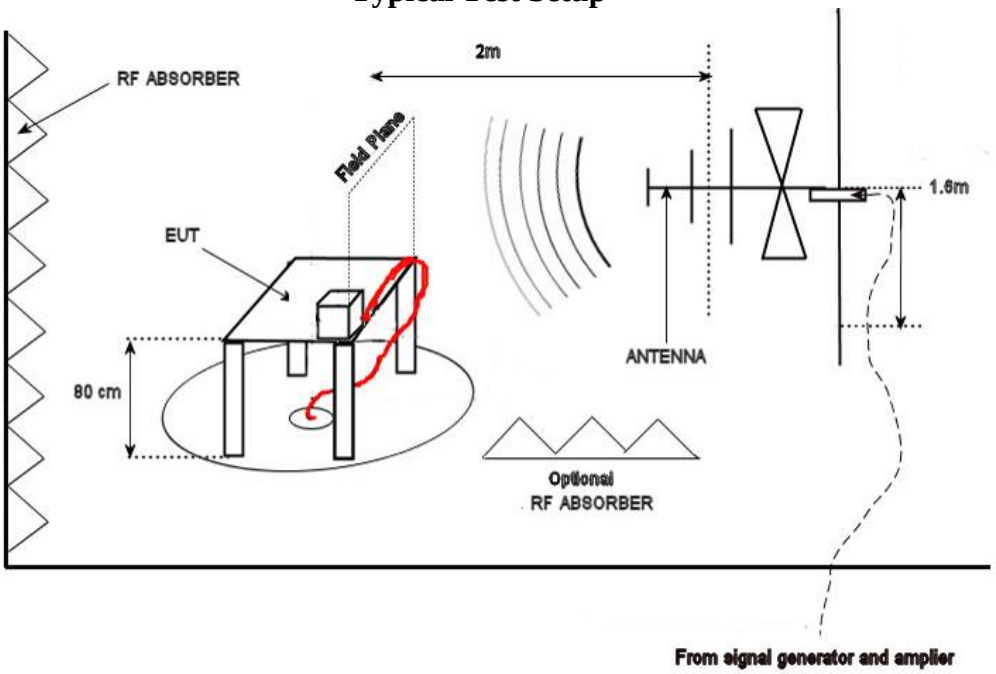
The EUT will likely be exposed to intentional sources of RF energy during the EUTs application. Sources of such radiations can be cellular phones, FM radio, television, remote car alarms, garage door openers, and other broadcast transmissions. These sources of radiations are licensed or certified for broadcast; hence the EUT should be immune to their RF energy. This test gives the test levels that the EUT should be immune to in order to assure the EUTs operation in expected field strengths. This test does not guarantee that the EUT will not experience a higher level field during its' operation, which may cause the EUT to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-3:2002. The immunity test is performed over the frequency range of 80 MHz to 2.7 GHz range. Frequency steps used were calculated at 1% step size of the previous frequency, rounded down to the nearest kHz, as the frequency range is ramped up. Known clock frequencies, local oscillators, etc, shall analyzed separately, these are defined in "Appendix B – Client Provided Details". The level applied to the EUT was calibrated at 10 V/m, and the proper extrapolation was applied . A modulation of 80% AM 1 kHz sinewave was applied during the application of the RF energy at each frequency. Both horizontal and vertical polarization was applied. 4 sides of the EUT were subjeced to RF field. The dwell time used was 3 seconds . Forward power was monitored, and kept on file at Global EMC Inc. An isotropic field probe was placed in near proximity of the EUT to verify the application of the field. Criteria level 'A' as defined in "Appendix A – Client Provided Details" was applied to this test.

Frequency range and signal strength	80 MHz – 1 GHz – 20 V/m (80% AM) 1 GHz – 2 GHz – 10 V/m (80% AM) 2-2.7 GHz - 10 V/m (80% AM) Note: The peak level is extra 5 dB to the level shown above, Example 20 V/m = 35 V/m modulated
Sweep step	1% of fundamental.
Dwell time	3 s
EUT type	Table top

Typical Test Setup



Application Level Accuracy

As per IEC61000-4-3, the RF field is specified as 0 to +6 dB for at least 12 of the 16 calibration points. For a 10 V/m field, this allows for the EUT to be subjected to a field of 10 V/m to 20 V/m with at least 75% coverage at this level.

Test Results

The EUT passed the requirements of 20 V/m (35 V/m peak when modulated) over the frequency range of 80 MHz to 1 GHz. The EUT passed the requirements of 10 V/m from 1G-2GHz and 10 V/m from 2-2.7 GHz. The EUT met Criteria A as defined in "Appendix A – Client Provided Details". No anomalies were observed.

Test Equipment List

Following equipment was used for radiated immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Signal Generator	SMT 03	Rhode and Schwarz	Feb 01, 2011	Feb 01, 2013	GEMC 2
BiLog Antenna	3142-C	ETS	Jan 17, 2011	Jan 17, 2013	GEMC 137
Horn Antenna 1 – 4.2GHz	AT 4510	AR	NCR	NCR	GEMC 26
Power Amplifier	150W1000	AR	NCR	NCR	GEMC 23
Power Amplifier	10S1G4A	AR	NCR	NCR	GEMC 24
Field probe	FL 7006	AR	Aug 19, 2010	Aug 19, 2012	GEMC 25
Field Mon.	FM7004	AR	Aug 19, 2010	Aug 19, 2012	GEMC 13
Power Head	PH 2000	AR	Jan 31, 2011	Jan 31, 2013	GEMC 15
Power meter	PM 2002	AR	Jan 31, 2011	Jan 31, 2013	GEMC 16

This report is based upon GEMC report template 'IEC61000-4-3_RadiatedImmunity_Rev1'

Electrical Fast Transients / Bursts

Purpose

Electronic fast transients / bursts are simulated in this test on the supply and I/O lines of the EUT. In a typical application environment, fast voltage disturbances may be injected into these ports of the EUT . These signals usually arise from nearby switching circuitry such as a light switch, relay bounces, electric motor noise, or other such electrical phenomenon. The EUT should be immune to such disturbances. This test does not guarantee that the EUT will not experience a higher level field during its' operation, which may cause the EUT to fail.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-4:2004. The voltage waveform applied has the following characteristics:

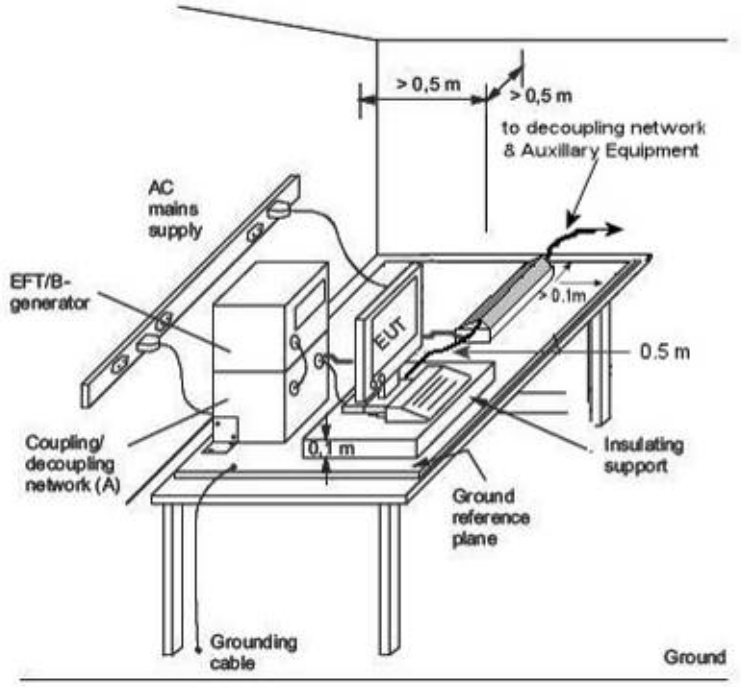
- Pulse rise time 5 ns ± 30%
- Pulse duration (to 50% value) 50ns ± 30%
- Pulse repetition frequency 5kHz (75 pulses per burst train)
- Burst duration should be 15 ms ± 20%
- Burst period should be 300 ms ± 20%

Bursts are applied for 1 minute each at positive and negative and for each I/O line tested.

A test level of 4 kV was applied to I/O lines via a capacitive coupling clamp and 4 kV was applied to the power supply port(s) via a coupling/decoupling network. Lower levels were evaluated by ramping up to the required level. Criteria level 'B' as defined in "Appendix A – Client Provided Details" was applied to this test.

Test Voltage	Repetition rate	Coupling Lines	Result
4 kV	5 kHz	AC	Pass
4 kV	5 kHz and 2.5 kHz	I/O lines	Pass-Criteria B

Typical Test Setup



Application Level Accuracy

As per IEC61000-4-4, the level is specified as being within +/- %20. For an application level of 1kV, this allows for the EUT to be subjected to 980 V to 1.2 kV.

Test Results

The EUT passed the requirements. The EUT met Criteria B as defined in "Appendix A – Client Provided Details". During application to the I/O lines, the Ethernet link was disrupted, and immediately resumed after the application without operator intervention. No further anomalies were observed.

Equipment Used

Following equipment was used for EFT immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Immunity generator	EMC Pro Plus	Keytek Thermo Corp	Feb. 02, 2011	Feb. 02, 2013	GEMC 4
CCL Clamp	EMC Pro Plus	Keytek Thermo Corp	NCR	NCR	GEMC 5

This report module is based on GEMC report template 'IEC61000-4-4_EFTB_Rev1'

Surge on AC & DC Mains and I/O Lines

Purpose

Surges occurs when a high energy disturbance takes place on the power, or less frequently I/O lines. These disturbances can cause significant temporary increases in current and/or voltage. These disturbances can arise during a nearby storm due to lightning, circuit trips, short-circuits on the same power line the equipment is connected to. The sudden rise in voltage over a very short period of time could cause damage to the components of the EUT. Surges are simulated during this test to test equipment immunity to surges. This test differs from EFT / B in that this waveform has more sufficient time to allow for damage to the EUT. This test does not guarantee that the EUT will not experience a higher level field during its' operation, which may cause the EUT to fail. This test does not ensure operation of the EUT in the presence of direct lightning effects.

Application Level Requirement

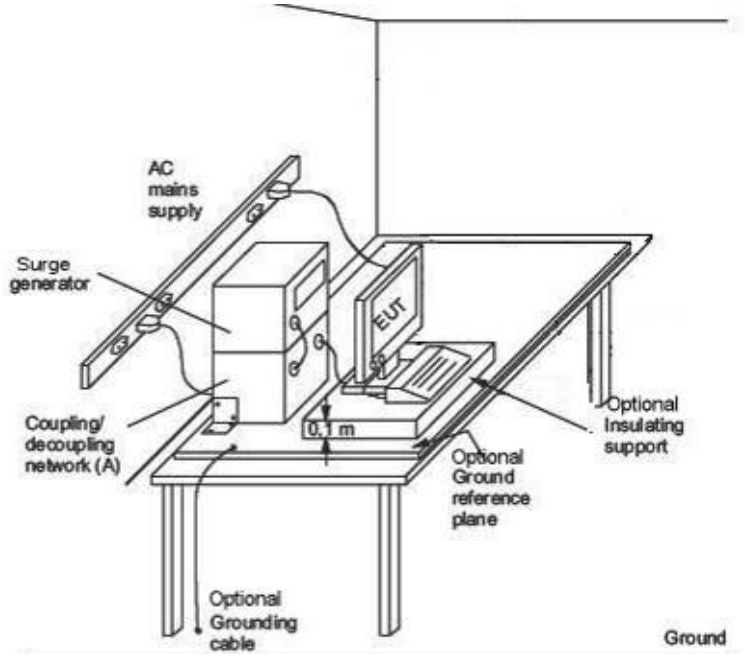
This test was performed in accordance with the methodology defined in IEC61000-4-5. Surges are simulated using a waveform generator. The characteristics of the waveform generated are as follows –

- Rise time of 1.2 µS and wave duration of 50 µS (to %50) into an open circuit
- Rise time of 8 µS and wave duration of 20 µS (to %50) into a short circuit
- Dwell time between each surge was 60s.
- 5 surges in positive and 5 surges in negative are performed

A test level of 2 kV Line – Line and and 4 kV Line – Ground was applied to the AC power supply port(s) via a coupling/decoupling network.

IO Lines was performed at 2kV common mode with respect to ground on the shielded IO cables. All shielded cables were performed using the 20 meter shielded method as described in IEC 61000-4-5. Lower levels were evaluated by ramping up to the required level. Criteria level 'B' as defined in "Appendix A – Client Provided Details" was applied to this test.

Typical Test Setup



Application Level Accuracy

As per IEC61000-4-5 the level is specified as being within +/- %10 for open circuit voltage calibration or +/- %10 short circuit current calibration. The EUTs input impedance or whether Line – PE or Line – Line is being performed, combined with the calibrated generators output impedance will affect the timing and voltage/current of the waveform applied to the EUT.

Test Results

The EUT passed the requirements. The EUT met Criteria A as defined in "Appendix A – Client Provided Details". No anomalies were observed.

Equipment Used

Following equipment was used for surge immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Immunity generator	EMC Pro Plus	Keytek Thermo Corp	Feb. 02, 2011	Feb. 02, 2013	GEMC 4

This report module is based on GEMC report template 'IEC61000-4-5_Surge_Rev1'

Conducted RF Immunity

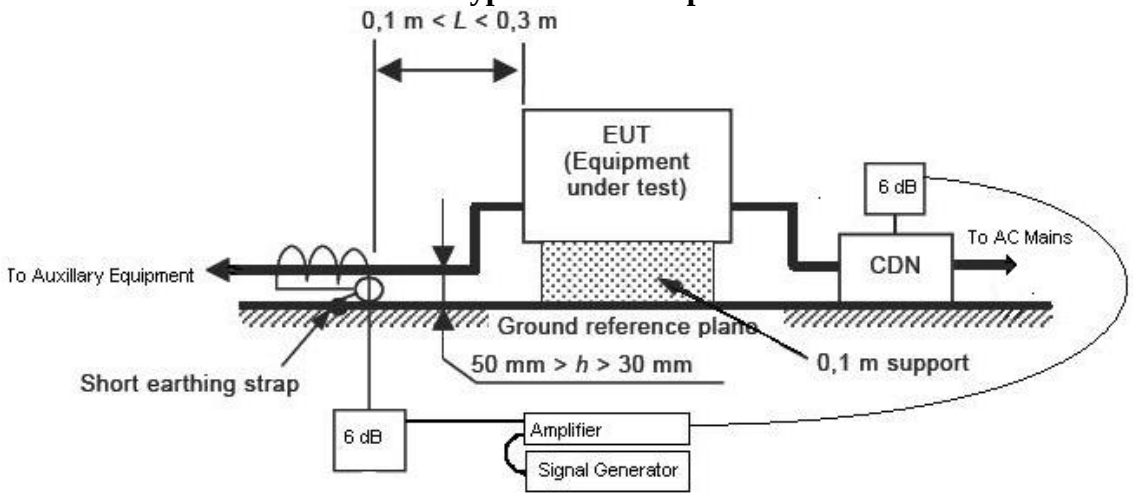
Purpose

The EUT will likely be exposed to low frequency intentional sources of RF energy during the EUTs application. Sources of such radiations can be AM radio, shortwave radio, CB transmissions, and other low frequency broadcast transmissions. These sources of radiations are licensed or certified for broadcast; hence the EUT should be immune to their RF energy. Due to the properties of radio, the power or I/O lines on the EUT would likely be the passive receiving antenna that induces the disturbance to the EUT. Since this is the main method of coupling at this frequency range, the direct application of the RF energy to the line being tested is used. At this frequency range and level, this method is easier to produce and reproduce in a laboratory environment then subjecting the EUT to an equivalent RF field.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-6:2003. I/O cables were performed using a bulk current injection probe, and power lines were tested using a CDN. The immunity test is performed over the frequency range of 150 kHz to 80 MHz. Frequency steps used were calculated at 1% step size of the previous frequency, rounded down to the nearest kHz, as the frequency range is ramped up. Known clock frequencies, local oscillators, etc, shall analyzed separately, these are defined in "Appendix B – Client Provided Details". The level applied to the EUT was calibrated at 10 Vrms. A modulation of 80% AM 1 kHz sinewave was applied during the application of the RF energy at each frequency. The dwell time used was 3 seconds. A current probe was placed between the coupling device and the EUT to verify the application of the RF energy. Criteria level 'A' as defined in "Appendix A – Client Provided Details" was applied to this test.

Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-6, the CDN must meet a common mode impedance $|Z_{CE}| = 150\ \Omega \pm 20\ \Omega$ for 150 kHz to 26 MHz and $|Z_{CE}| = 150\ \Omega + 60\ \Omega$ or $150\ \Omega - 45\ \Omega$ for 26 MHz → 80 MHz. During tests using the bulk current injection probe, the impedance of each cable will affect the current injected, so current was monitored. The calibration performed according to IEC 61000-4-6 allows for +/- 2dB.

Test Results

The EUT passed the requirements. The EUT met Criteria A as defined in "Appendix A – Client Provided Details". No anomalies were observed.

Input Voltage and Frequency	230 Vac / 50 Hz.
Frequency range and signal strength	150 kHz – 80 MHz – 10 Vrms (80% AM)
Sweep step	1% of fundamental.
Dwell time	3 s
EUT type	Table top

Test Equipment List

Following equipment was used for conducted RF immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Power Line CDN	FCC-801-M3-16A	FCC	Jan. 27, 2011	Jan. 27, 2013	GEMC 138
Power Amplifier	75A250A	AR	NCR	NCR	GEMC 14
RF Current probe	F-33-2	FCC	Feb. 02, 2011	Feb. 02, 2013	GEMC 19
Bulk Current Injection Probe	F-120-9A	FCC	Feb. 02, 2011	Feb. 02, 2013	GEMC 20
Signal Generator	SMT 03	Rhode and Schwarz	Feb. 01, 2011	Feb. 01, 2013	GEMC 2
Power Attenuator 6 dB	100-A-FFN-06	Bird	NCR	NCR	GEMC 48

This report module is based on GEMC report template 'IEC61000-4-6_ConductedImmunity_Rev1'

Power Frequency Magnetic Field

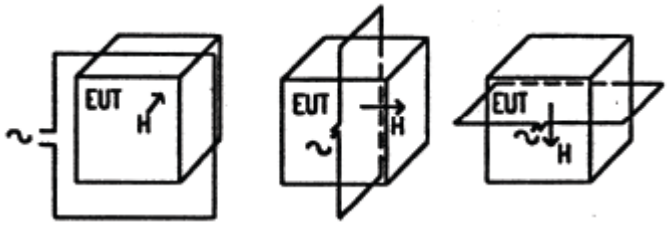
Purpose

A magnetic field with a frequency of the power line is generated around the EUT.
In practice, the EUT will subjected to power frequency magnetic fields from nearby power lines, transformers, or devices such as televisions or monitors. Since the EUT is usually used in conjunction with other electrical equipment, it is subjected to the following fields – Steady State Magnetic Fields – these are magnetic fields that the device is exposed to under constant operating conditions. These fields have a lower field strengths compared to Transient Magnetic fields.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-8:2001. 3 orthogonal axis of the EUT are subjected to the field within the magnetic loop. Transient magnetic field level, if applicable, was tested for 1 minute. Steady state magnetic field level was tested for 15 minutes, or longer. The frequency applied was 50 Hz. As per customer request, a level of 30 A/m was applied to the EUT in each axis. Criteria level 'A' as defined in "Appendix A – Client Provided Details" was applied to this test.

Typical Setup Diagram



Application Level Accuracy

As per IEC61000-4-8, the field over the area the EUT occupies within the loop must be calibrated to be within +/- 3 dB. For a field strength of 3 A/m, this means the empty calibrated field strength will be between and 2.1 A/m and 4.2 A/m over the area the EUT occupies.

Test Results

The EUT passed the requirements of 30 A/m continuous (60 seconds minimum) and 1000 A/m temporary (5 seconds). The EUT met Criteria A as defined in "Appendix A – Client Provided Details". No anomalies were observed.

Test Equipment Used

Following equipment was used for power frequency magnetic field immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Magnetic Loop	F-1000-4-8/9/10-L-1M	FCC	NCR	NCR	GEMC 22
Immunity generator	EMC Pro Plus	Keytek Thermo Corp	Feb. 02, 2011	Feb. 02, 2013	GEMC 4
milligauss meter	4180	F W Bell	NCR	NCR	GEMC 74

This report module is based on GEMC report template 'IEC61000-4-8_MagenticImmunity_Rev1'

Voltage Dips, Interruptions and Variations

Purpose

An AC powered device may be subjected to dips in the power line voltage, short interruptions or other various power line variations. Such conditions arise mainly when a change in network occurs; for example – a large change in load, a brown out or a black out condition occurs. This can also occur with power supplies that are not well regulated, such as emergency diesel AC generators. This test simulates the occurrence of these conditions and subjects the EUT to this phenomenon.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-11:2004. The following dips apply:

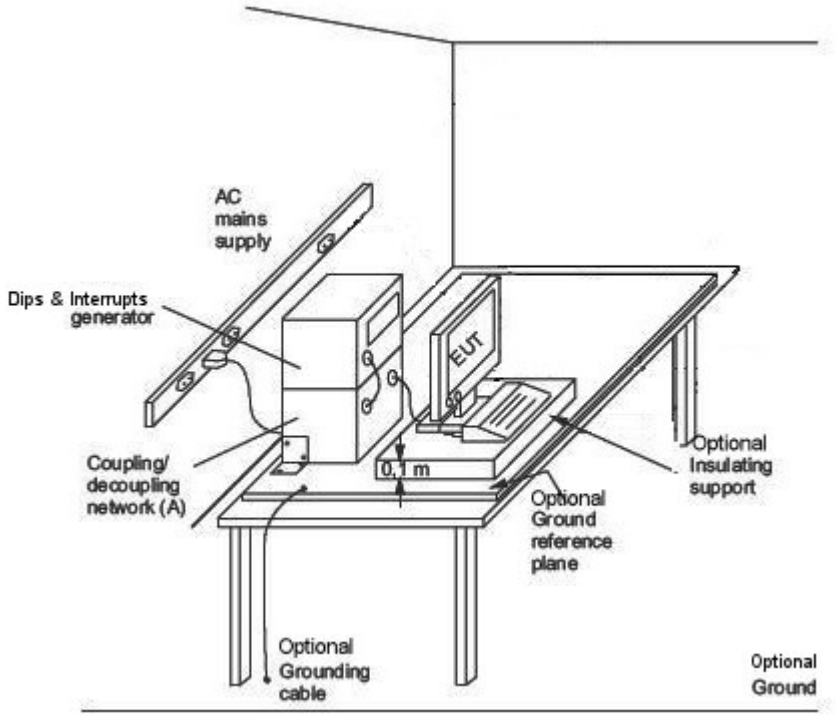
Voltage Dip Applied U_T % (V)	Duration (s)	Duration @ 50 Hz (Cycles)	Criteria Level Applied
100 % (0 Vac)	0.02 s	1 Cycles	B
60 % (92 Vac)	0.2 s	10 Cycles	C
30 % (161 Vac)	0.5 s	25 Cycles	C
100 % (0 Vac)	5 s	250 Cycles	C

The voltage level in brackets presumes a normal operating voltage of 230 Vac. This should be scaled appropriately for other values of operating voltage.

Both 0º and 180º phases of the AC with 5 repetitions is applied at each of the Dips/Interrupts listed in the table above.

Criteria levels ‘A’, ‘B’, and ‘C’ as listed in the table above and defined in “Appendix A – Client Provided Details” was applied to this test.

Typical Test Setup



Application Level Accuracy

As per IEC61000-4-11, the voltage must be +/- 5% of the voltage stated to be applied. The frequency must be kept within +/- 2% of the stated frequency.

Test Results

The EUT passed the requirements. The EUT met the criteria listed above in the application level requirement. During the 5 second dip for 95%, the EUT powered off and reset. The EUT did not require operator intervention to return to normal operating state, however this may be software setting dependant.

Test Equipment List

The following equipment was used for voltage dips and interrupts immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Immunity generator	EMC Pro Plus	Keytek Thermo Corp	Feb. 02, 2011	Feb. 02, 2013	GEMC 4

This report module is based on GEMC report template 'IEC61000-4-11_DipsImmunity_Rev1'

Oscillatory Transient Interference Immunity Test

Purpose

Ring wave surges occurs when a high energy disturbance takes place on the power lines and the energy reverberates at select frequencies until eventually dissipated. These disturbances can cause significant temporary increases in current and/or voltage. These disturbances can arise during a nearby storm due to lightning. The sudden rise in voltage over a very short period of time could cause damage to the components of the EUT. Ring wave surges were simulated during this test to test equipment immunity to this phenomenon. This test differs from a IEC61000-4-5 Surge in that this waveform has a reverberating component during its' decay. This test does not guarantee that the EUT will not experience a higher level field during its' operation, which may cause the EUT to fail. This test does not ensure operation of the EUT in the presence of direct lightning effects.

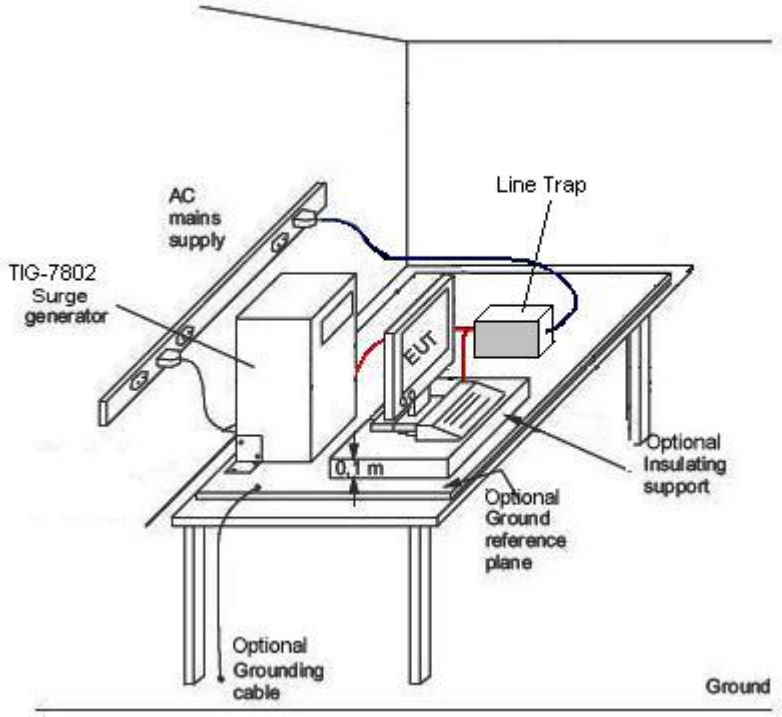
Application Level Requirement

This test was performed in accordance with the methodology defined in IEC 61000-4-12. Surges are performed using the TIG 7802 waveform generator as specified in the aforementioned document. The characteristics / settings of the waveform generated are as follows –

- Reverberating component frequencies of 1 MHz during decay are tested individual
- Dwell time between each surge is less then 60s.
- 5 hits are performed, or more at the discretion of the customer
- Both I/O (common mode), AC Mains, and DC mains are tested to 2.5 kV

Criteria level 'A' as defined in "Appendix A – Client Provided Details" was applied to this test.

Typical Test Setup



Application Level Accuracy

As per the aforementioned standard the level is specified as being within +/- %20. This is covered by calibration the TIG 7802 surge generator, which is as stated below.

Test Results

The EUT passed the requirements. The EUT met Criteria A as defined in "Appendix A – Client Provided Details". No anomalies were observed; see 'Appendix B' for test setup photo(s).

Equipment Used

Following equipment was used for surge immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Ontario Hydro Surge Generator	TIG-7802	Criterion Instruments	Nov 19, 2010	Nov 19, 2011	GEMC 535
Ontario Hydro Line Trap	LT-1	Criterion Instruments	Nov 19, 2010	Nov 19, 2011	GEMC 536

Extremely Low Frequency Conducted Immunity

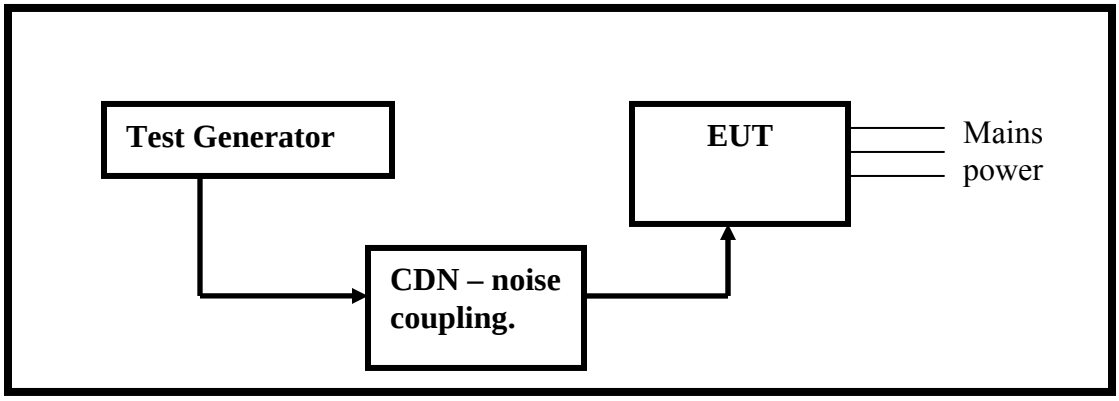
Purpose

The EUT will likely be exposed to low frequency intentional sources of low frequency energy during the EUTs application. These could arise from power supplies or reverse currents from the power grids, or harmonic components from other systems. Because of this the testing is performed at lower frequency spectrum (15 Hz – 150 kHz) and specifically at 50/60 Hz and DC. This test simulates those energies created, and subjects the EUT to the energy.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-16:1998+A1:2001. For the frequency sweep, the dwell time used is 4 seconds, based on maximum sweep rate of 1x10-2 decades/second and a maximum step rate of 10%. Criteria level 'A' as defined in "Appendix A – Client Provided Details" was applied to this test.

Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-16, for telecom direct connection to the shield was used for I/O lines. The calibration performed according to IEC 61000-4-16 allows for +/- 2dB. For mains, a network as described in figure 6 of IEC 61000-4-16 was used for noise coupling.

Test Results

The EUT passed the requirements. The EUT met Criteria A as defined in "Appendix A – Client Provided Details". No anomalies were observed.

Frequency Sweep	15 Hz – 150 kHz at level 3
Result	Pass

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Power Amplifier	75A250A	AR	NCR	NCR	GEMC 14
Signal Generator	SMT 03	Rhode and Schwarz	Feb. 01, 2011	Feb. 01, 2013	GEMC 2
AC Power source	5000 iX	California Instruments	Feb. 01, 2011	Feb. 01, 2013	GEMC 47
AC Power Source	1001SL	Elgar	NCR	NCR	GAI 17
Isolation Transformer	HAMM 1650K	Hammond	NCR	NCR	GEMC 6099
Test generator	5000 iX	California Instruments	Feb. 02, 2011	Feb. 02, 2013	GEMC 47

This report module is based on GEMC report template 'IEC61000-4-16_ConductedImmunity_Rev1'

AC Ripple on DC ports

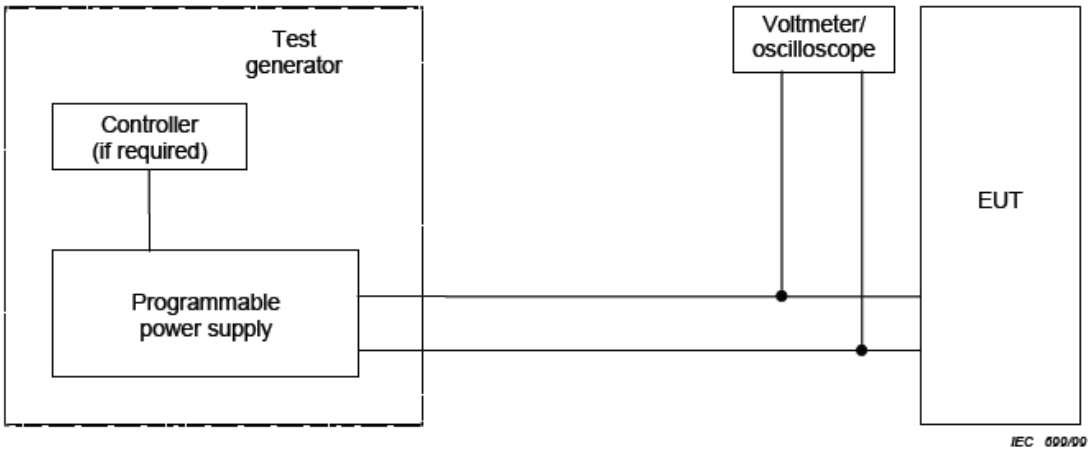
Purpose

The EUT may be exposed to AC ripple components on the DC power ports during the EUTs application. These could arise from DC power supplies with insufficient or faulty capacitance, or reverse currents from the power grids, or harmonic components from other systems.

Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-17:2002. The immunity test was performed at 50/60 Hz ripple waveform as defined in IEC 61000-4-17 at level 4 (15%) . This level was applied to the EUT at both the maximum and minimum input voltage rated for the device under test, 24V and 12V respectively. The dwell time used is 10 minutes under continuous application at both the high and low voltage. Criteria level 'A' as defined in "Appendix A – Client Provided Details" was applied to this test.

Typical Test Setup



Application Level Accuracy

As per IEC 61000-4-17 the test voltage, corresponding to the selected level, shall be applied to the d.c. port of the EUT; the values of the d.c. voltage and the ripple content (peak to peak) shall be measured at the terminals of the EUT and adjusted in order to maintain the selected test level. The measurement uncertainty of the instrumentation shall be better than 2 %.

Test Results

The EUT passed the requirements. The EUT met Criteria A as defined in "Appendix A – Client Provided Details". No anomalies were observed.

Test Equipment List

Following equipment was used for conducted RF immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Test generator	5000 iX	California Instruments	Feb. 01, 2011	Feb. 01, 2013	GEMC 47

This report module is based on GEMC report template 'IEC61000-4-17'

DC Voltage Dips, Interruptions and Variations

Purpose

A DC powered device may be subjected to dips in the power line voltage, short interruptions or other various power line variations. Such conditions arise mainly when a change in network occurs; for example – a large change in load, such as a temporary short, or a brown out or a black out condition occurs. This can also occur with power supplies that are not well regulated, such as emergency DC generators being activated. This test simulates the occurrence of these conditions and subjects the EUT to this phenomenon.

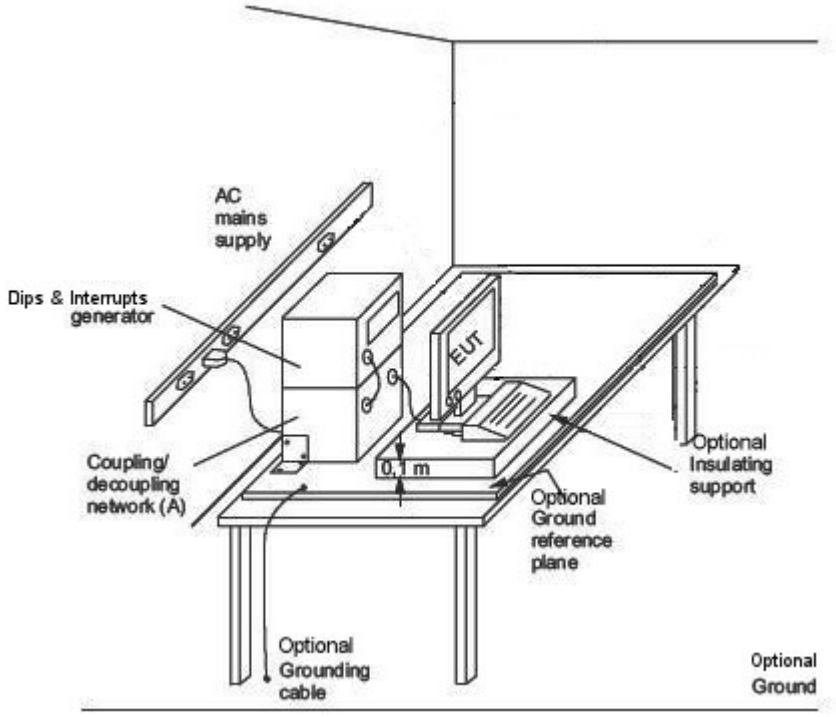
Application Level Requirement

This test is performed in accordance with the methodology defined in IEC 61000-4-29:2000. The following dips apply:

Voltage Dip Applied U_T % (V)	Type	Duration (seconds)	Criteria Level Applied
40	Dip	0.01	A
40	Dip	0.03	A
40	Dip	0.1	A
40	Dip	0.3	A
70	Dip	0.01	A
70	Dip	0.03	A
70	Dip	0.1	A
70	Dip	0.3	A
0V	Interrupt	0.001	C
0V	Interrupt	0.003	C
0V	Interrupt	0.01	C
0V	Interrupt	0.03	C
0V	Interrupt	0.1	C
0V	Interrupt	0.3	C

Criteria levels 'A', 'B', and 'C' as listed in the table above and defined in "Appendix A – Client Provided Details" was applied to this test.

Typical Test Setup



Application Level Accuracy

As per IEC61000-4-29, the voltage must be +/- 2% of the voltage stated to be applied.

Test Results

The EUT passed the requirements. The EUT met the criteria listed above in the application level requirement. During the dips for 100%, the EUT powered off. The EUT did not require operator intervention to return to normal operating state.

Test Equipment List

The following equipment was used for voltage dips and interrupts immunity testing of the device.

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Test generator	5000 iX	California Instruments	Feb 13, 2009	Feb 13,2011	GEMC 47

This report module is based on GEMC report template 'IEC61000-4-11_DipsImmunity_Rev1'

Appendix A – Client Provided Details

General Information

Dear Client:

Please fill out the attached form as much as possible. This information is required for our records, to generate a test plan for EMC compliance testing on your product, and for our report purposes. For every model of the device to be tested please fill in one form; label all the information. For different products please use a new form. Please attach a soft copy of the user manual for the equipment if available, and

Thank you for your interest in Global EMC labs, we appreciate your business.

Global EMC Inc.
180 Brodie Drive – Unit #2
Richmond Hill, ON,
L4B-3K8
Canada

Client Details	
Organization / Address	Morgan Schaffer 8300 Saint Patrick St Suite 150 LaSalle, Quebec, Canada, H8S 2H1
Contact	Boris Iliev
Phone	514 739 1967
Email	Biliev@Morganschaffer.com
EUT (Equipment Under Test) Details	
EUT Name (for report title)	Calisto 9
EUT is powered using	AC / DC
Input voltage range(s) (V)	100-240 VAC / 90-230 VDC
Frequency range(s) (Hz)	50 / 60
Rated input current (A)	3.2A / 110VAC
Nominal power consumption (W)	350W
Number of power supplies in EUT	1
Transmits RF energy? (describe)	No
Basic EUT functionality description	Dissolved Gaz Analysis
Modes of operation	Continous monitoring
Step by step instructions for setup and operation	Client representative will be on site to operate and monitor.
Customer to setup EUT on site?	Yes
EUT response time (ms)	< 3 seconds
Frequency of all clocks present in EUT	32.768Khz, 25Mhz, 96Mhz
I/O cable description Specify length and type	15-50m Shielded
Available connectors on EUT	Ethernet, USB, RS232, RS485, 4-20mA I/O
Peripherals required to exercise EUT Ex. Signal generator	No
Dimensions of product	L 337 mm W 502 mm H 489 mm

Method of monitoring EUT and description of failure for immunity.	Ethernet, RS232, RS485

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT & Test Setup Photographs'.

EUT Functional Description

EUT Configuration

Please see Appendix B for a picture of the unit running in normal conditions.

- Unit was operated in ON mode for all EMC testing.
- Cables and earthing were connected as per manufacturer's specification.

Operational Setup

These devices are required to be attached to the EUT for its normal operation.

- None, the EUT performed a Built-In Self Test exercising all functionality of the EUT during testing.

Modifications for Compliance

The following modifications were made during testing for the sample to achieve compliance with the testing requirements:

- None - the production sample provided met the requirements without need for modification

Criteria Description

Performance criterion A: During testing, normal performance as specified by the manufacturer. “

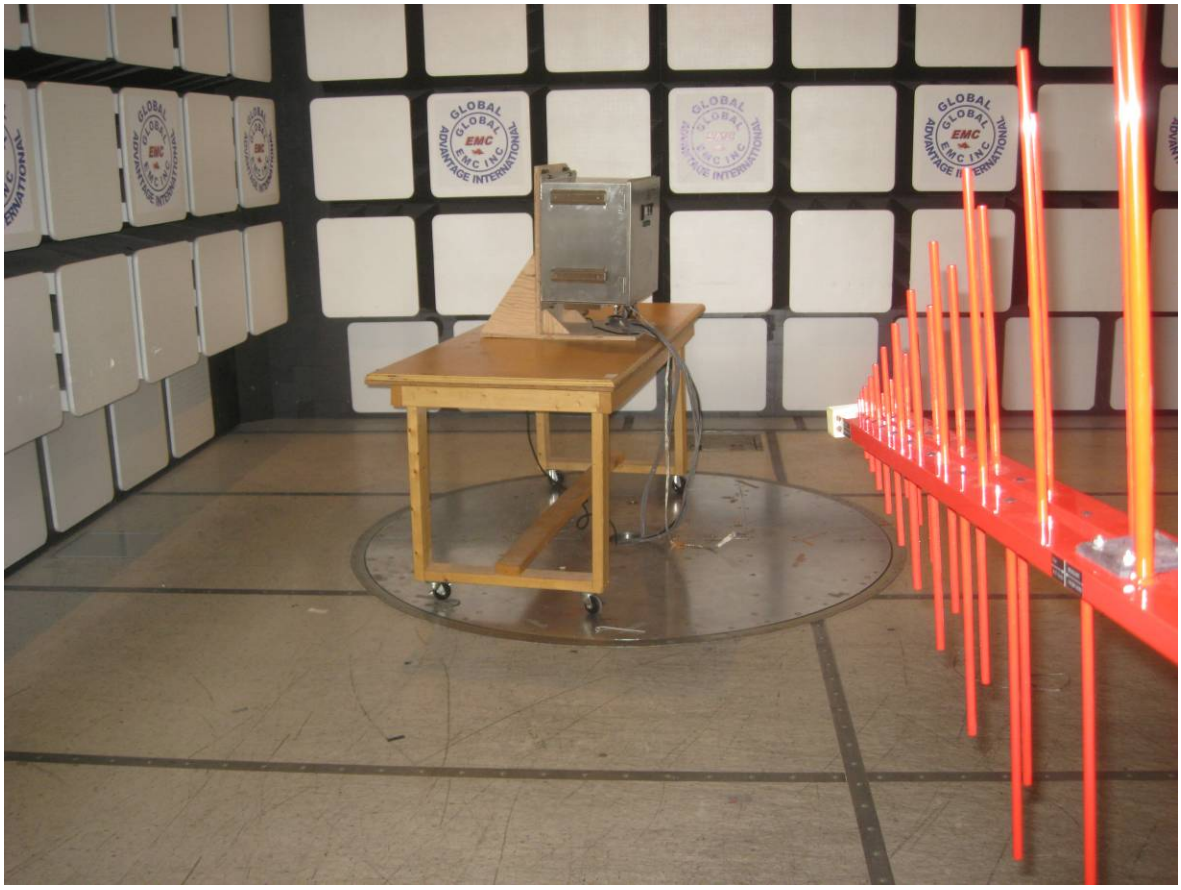
Performance criterion B: During testing, temporary degradation, or loss of function or performance which is self-recovering. Note this is considered equivalent to IEEE 1613 Class 1 operation.

Performance criterion C: During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.

Appendix B – EUT & Test Setup Photos

EUT

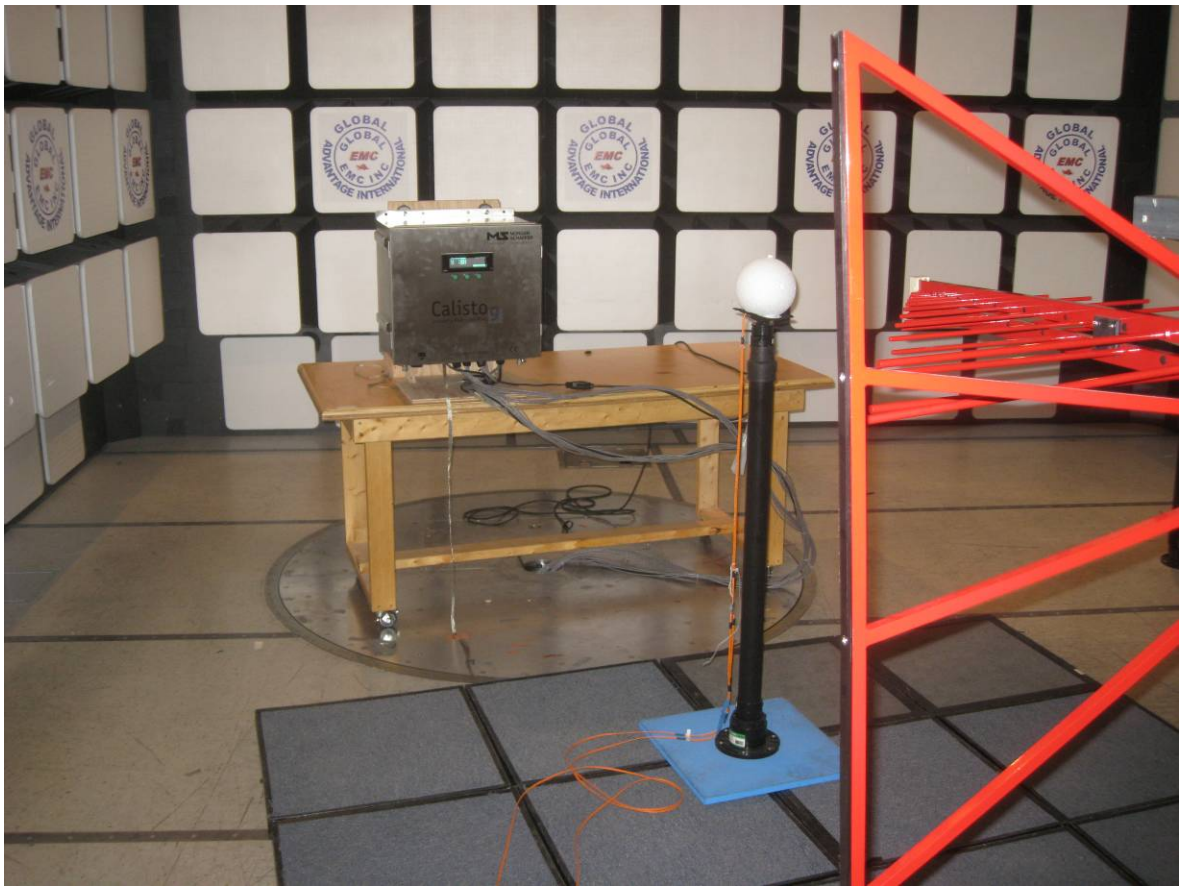
Radiated Emissions Setup Photo



Power Line Conducted Emissions

Electro-Static Discharge Photo

Radiated Susceptibility Photo



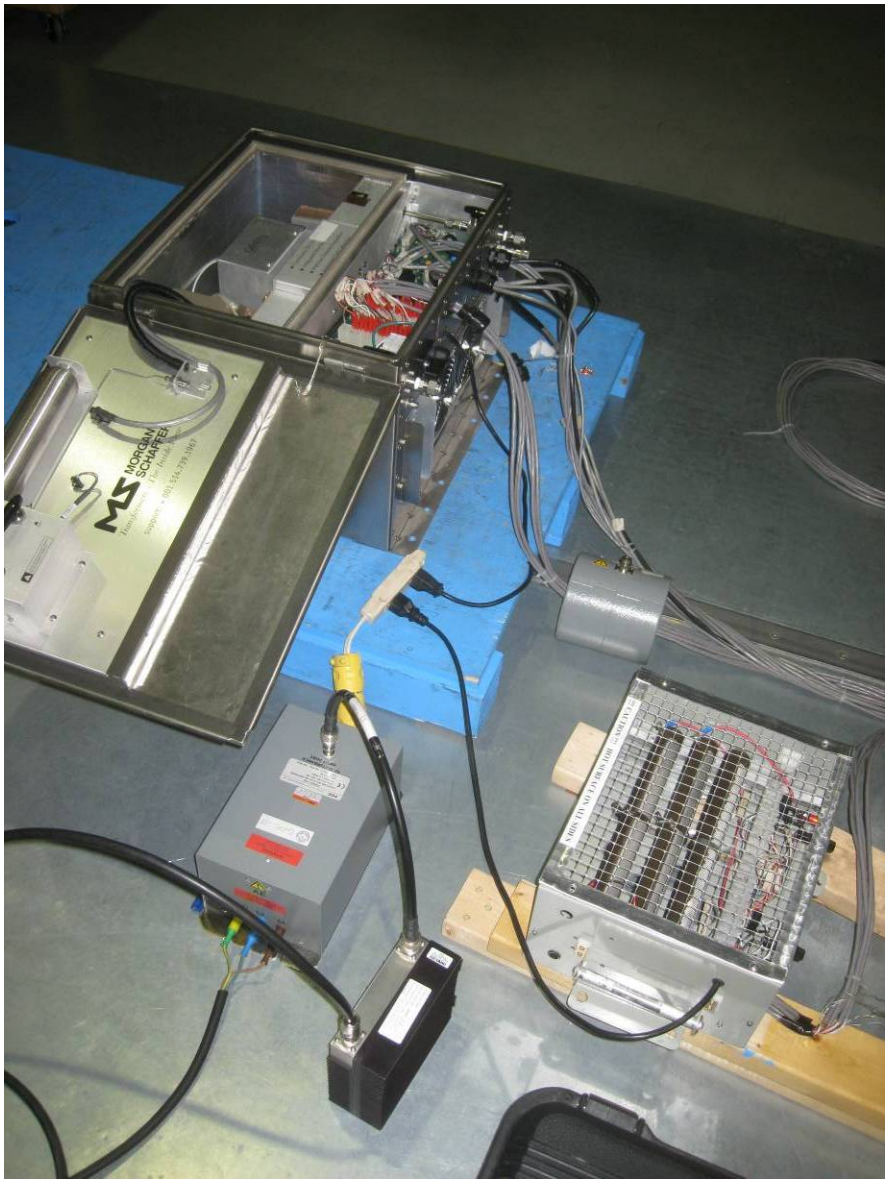
Electrical Fast Transients Mains Photo

Electrical Fast Transients – I/O

Surge Mains Photo

Surge I/O Photo 1

Conducted Susceptibility Mains Photo



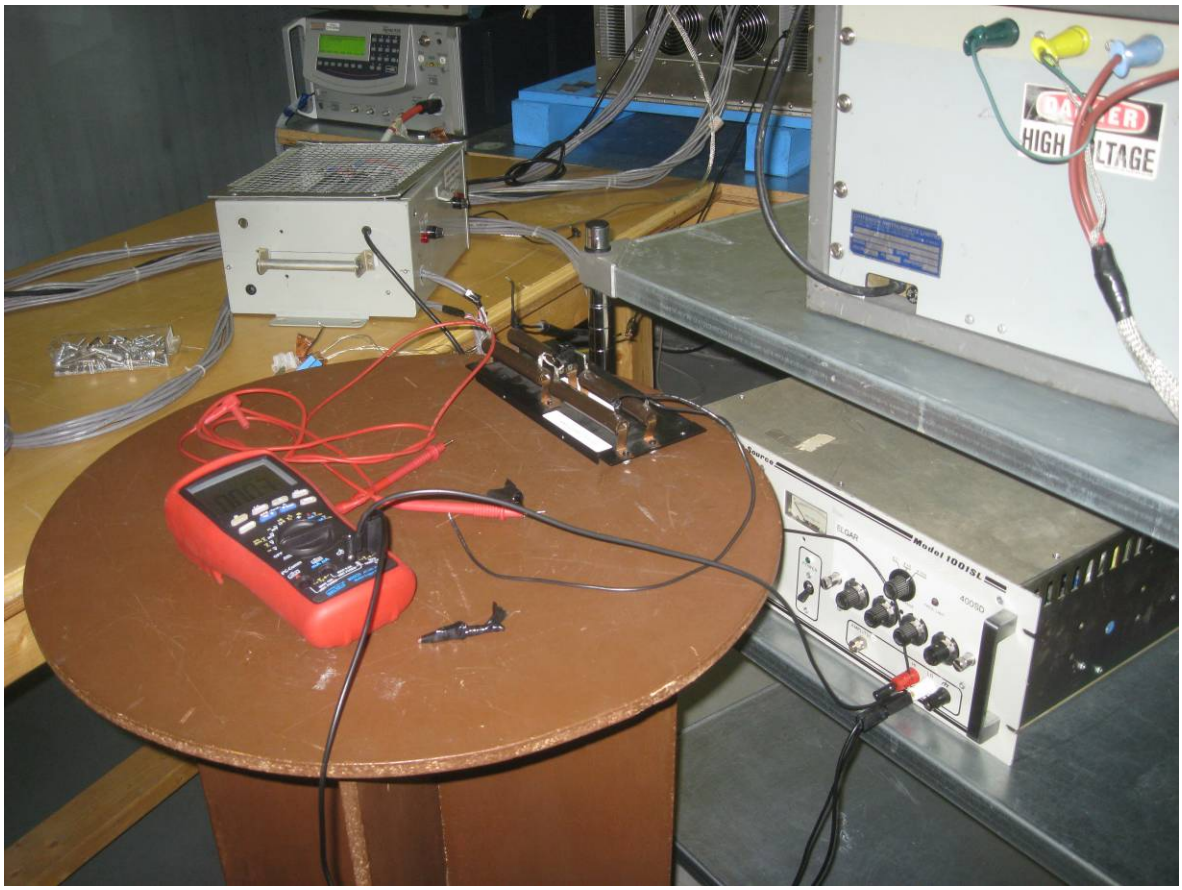
Conducted Susceptibility I/O Photo

Magnetic Fields Susceptibility Photo

Dips and Interrupts Susceptibility Photo

Oscillatory Surge Susceptibility Photo Mains

Low Frequency Common Mode Conducted Susceptibility Photo Mains



AC Ripple on DC systems and DC Voltage Dips Susceptibility Photo