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TEST REPORT

EN 61326-1
Electrical equipment for measurement, control and laboratory use
– EMC requirements – Part 1: General requirements

Report Reference No.: 10238105EEU1

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Applicant's name ..... : Circuitco Electronics, LLC
Address..... : 1380 Presidential Drive Suite 100 Richardson Texas 75081

Model(s) Tested..... : BB-BBLK-000, BeagleBone Black

Test specification:
Standard ..... : EN 61326-1:2006
Test procedure..... : CCA
Non-standard test method ..... : N/A
TRF Revision..... : 30-Apr-12

Revision History

#	Description	Date
0	Original Report Release	8-Feb-13

Notices:

1. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
2. The test results presented in this report relate only to the object tested.
3. The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.
4. "(see Enclosure #)" refers to additional information appended to the report.
5. Throughout this report a point is used as the decimal separator.
6. Dimensions in English units for convenience only, metric units prevail.
7. It is the manufacturer's responsibility to provide special instructions, if needed, to the user regarding the use of special cables (length, shielded/unshielded, type, grounding, etc.), clamp-on ferrite beads, etc for use with their product(s).

Table of Contents

Normative References

The following document(s) have been appropriately considered in the performance of the test results detailed in this report.

CISPR-11:2003
Industrial, scientific and medical (ISM) radiofrequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement.

EN 61000-3-2:2000
Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

EN 61000-3-3:1995 +A1:2001
Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection.

EN 61000-3-11:2000
Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75A and subject to conditional connection

EN 61000-3-12:2005
Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75A and subject to conditional connection

EN 61000-4-2:1995 +A1:1998 +A2:2001
Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test

EN 61000-4-3:2006 +A1:2002
Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test

EN 61000-4-4:2004
Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test

EN 61000-4-5:1995 +A1:2001
Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques – Surge immunity test

IEC 61000-4-6:2003
Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields

EN 61000-4-8:1993 +A1:2001
Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Power frequency magnetic field immunity test

EN 61000-4-11:2004
Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

CISPR 16-1-2:2003 +A1:2004 +A2:2006
Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances

EN 61000-3-2:2006 +A1:2009 +A2:2009
Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

EN 61000-3-3:2008
Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

Equipment Under Test (EUT)

Details:

Test item description:

Model .....: BB-BBLK-000
Serial Number .....: 0113BBBK0090 Rev 4
Dimensions .....: 6 X 1 X 9 cm (width x height x depth)
Production Status .....: ☐ Production ☒ Pre-Production ☐ Prototype
Other Status Info ..... : none
EUT Received Date .....: 5-Feb-13
Ratings .....: 230VAC, 50 Hz ☒ 1ϕ ☐ 3ϕ

General product description:

Development board.

Modifications to the EUT required for compliance:

There have been no modifications to the EUT as a result of this evaluation.

Deviations from Test Methodology:

There have been no deviations, additions to, or exclusions from the specified test standard.

Engineering Judgements:

No engineering judgments based on the results in this test report have been made.

Approved by (+ signature) .....: Click here to enter text.

Table 1 – EUT Internal Operating Frequencies

Frequency (MHz)	Description	Frequency (MHz)	Description
25	Clock		
24	Clock		
48	Clock		
100	Clock		
303	Clock		

Table 2 – EUT Operating Modes

Mode #	Description
1	Standby
2	
3	

EUT Configuration

A minimum representative configuration, as defined by the manufacturer, has been used for the testing performed herein. The selection of hardware (including interface ports), software, and cables were chosen by the manufacturer as being representative of the product's intended use. The interconnection of various articles of equipment and the types of cables used has also been defined by the manufacturer.

The placement of the equipment under test has been, to the extent practical, arranged to maximize emissions.

Cables, of the type and length specified by the manufacturer, were connected to at least one of each type of interface port provided by the EUT and if practical, were terminated by a device typical of actual usage. For multiple ports of the same type, the addition of cables did not significantly affect the emission level (i.e. < 2B variation).

Figure 1 - EUT Configuration Diagram

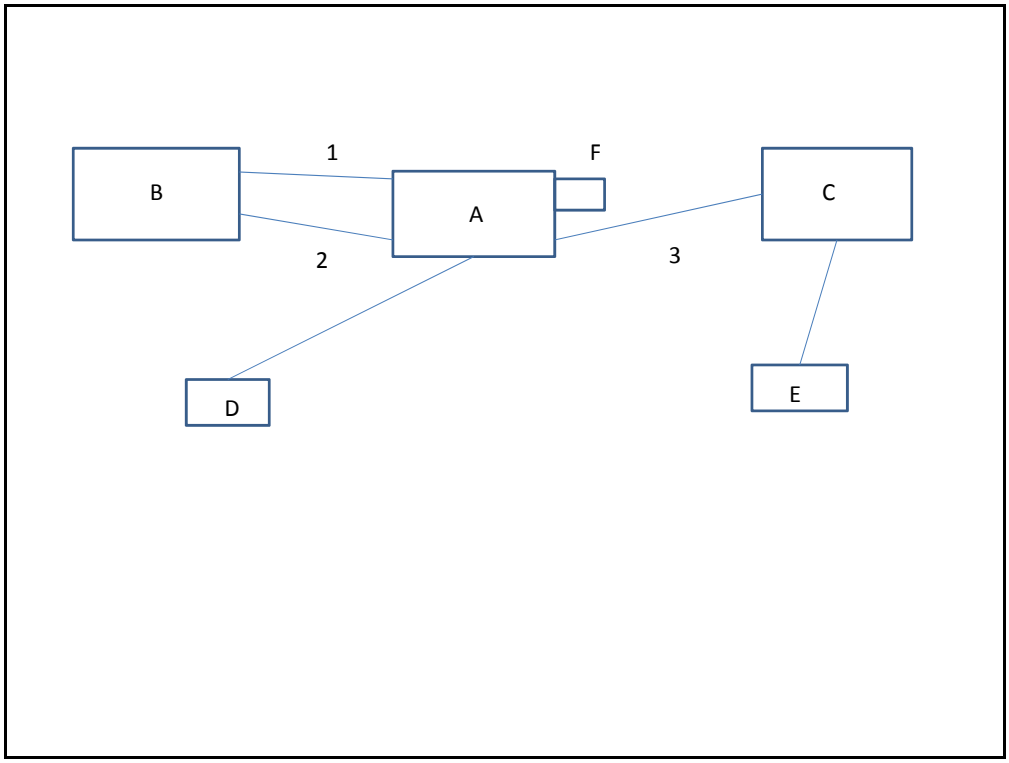


Table 3 – EUT & Auxilliary Equipment List

Item	Use*	Product Type	Manufacturer	Model	Serial No.
A	EUT	Beaglebone	Circuitco	BB-BBLK-000	0113BBBK0090 Rev 4
B	SIM	Netbook	Acer	Aspire one	LUS030B0438481 3A472536
C	SIM	Display	unknown	80NP/C/T-HB 8	869882340013
D	SIM	Power Supply	I.T.E.	PW160	None
E	AE	Power Supply	I.T.E	FJ-SW1280d030	none
F	SIM	Thumbdrive	Micro Cener	4G	none

Note:
* Use = EUT - Equipment Under Test,
AE - Auxiliary/Associated Equipment, or
SIM - Simulator (Not Subjected to Test)

Table 4 - Interconnecting Cables List

Item	Use*	Cable Type
1	SIM	Mini USB Cable
2	SIM	Ethernet Cable
3	SIM	Micro HDMI Cable

General Performance Criteria

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.

Performance Criteria A

During testing, normal performance within the specification limits. The EUT shall operate without any apparent degradation from the manufacturer's specification.

Manufacturer Specific Criteria:
No specific criteria provided by the manufacturer. Laboratory made best effort judgment.

Performance Criteria B

During testing, temporary degradation, or loss of function or performance which is self-recovering.

Example 1: A data transfer is controlled/checked by parity check or by other means. In the case of malfunctioning, such as caused by a lightning strike, the data transfer will be repeated automatically. The reduced data transfer rate at this time is acceptable.

Example 2: During testing, an analogue function value may deviate. After the test, the deviation vanishes.

Example 3: In the case of a monitor used only for man-machine monitoring, it is acceptable that some degradation takes place for a short time, such as flashes during the burst application.

Manufacturer Specific Criteria:
No specific criteria provided by the manufacturer. Laboratory made best effort judgment.

Performance Criteria C

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

Example 1: In the case of an interruption in the mains longer than the specified buffer time, the power supply unit of the equipment is switched off. The switch-on may be automatic or carried out by the operator.

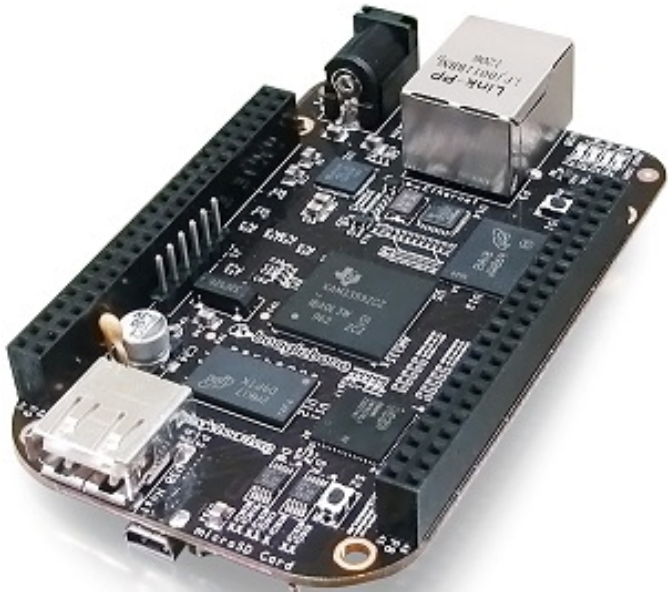
Example 2: After a programme interruption caused by a disturbance, the processor functions of the equipment stops at a defined position and is not left in a "crashed state". The operator's decision prompts may be necessary.

Example 3: The test results in an opening of an over-current protection device that is replaced or reset by the operator.

Manufacturer Specific Criteria:
No specific criteria provided by the manufacturer. Laboratory made best effort judgment.

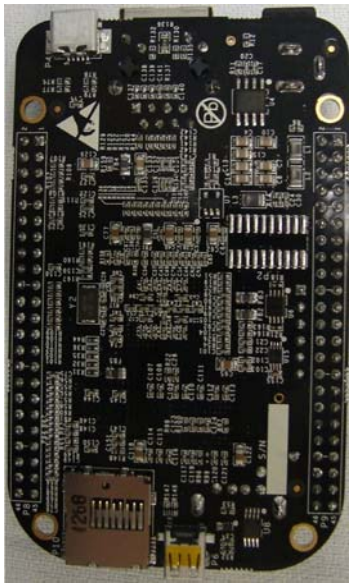
EUT Photo(s)

Photo 1	**EUT Photo – Front/Top View**	



Supplemental Information:

Photo 2	EUT Photo – Rear/Side View	



Supplemental Information:

Photo 3	EUT Photo – External Power Supply	

Supplemental Information:

Summary of Testing

Possible test case verdicts:

- test case does not apply to the test object. : N/A
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement. : F (Fail)
- not tested (not part of this evaluation)..... : NT

Date(s) of performance of tests..... : 5,6,7-Feb-2013

Class/Group ..... : ☐ A ☒ B ☐ 1 ☒ 2

Clause	Test Description	Verdict	Comment
Emissions:			
7.2	Radiated Emissions	P	
7.2	Conducted Emissions	P	
7.2	Harmonics	P	
7.2	Flicker	P	
Immunity: ☒ Clause 6.2, Table 1 – Basic test requirements ☐ Clause 6.2, Table 2 – Test requirements for use in industrial locations ☐ Clause 6.2, Table 3 – Test requirements for equipment used in controlled EM environments ☐ Annex A, Table A.1 – Test requirements for portable test & measurement equipment			
6.2	Electrostatic Discharge (ESD)	P	
6.2	Electrical Fast Tansients (EFT)	P	
6.2	Radiated Disturbances	P	
6.2	Conducted Disturbances	P	
6.2	Power-Frequency Magnetic Fields	N/A	See note 1
6.2	Surges	P	
6.2	Voltage Dips and Interruptions	P	

Notes:

EUT does not have any components susceptible to magnetic field.

General remarks:

Summary of compliance with national requirements:

Compliance with this standard provides one means of conformity with the specified essential requirements of EU Directive 2004/108/EC.

Testing Location	
Testing Laboratory:	Nemko USA, Inc. (Dallas)
Testing location/ address:	802 N. Kealy Ave. Lewisville, TX 75057 USA
Testing procedure: TMP	
Tested by (name + signature):	
Approved by (+ signature):	
Testing location/ address:	
Supplemental Information:	
Testing results contained herein were performed at the location(s) listed above.	

Emissions Requirements

Certain frequencies are designated by the International Telecommunication Union (ITU) for use as fundamental frequencies for ISM equipment. Limits and/or restrictions may apply for particular frequencies, refer to ITU documents for requirements.

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

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

Radiated Emissions

The arrangement of the equipment is typical of a normal installation practice and as was practical, the arrangement was varied and emissions investigated for maximum amplitude. Final measurements were performed in a semi-anechoic chamber or on an open area test site (OATS). The equipment was rotated 360° and the antenna height has been varied between 1m and 4m. Measurements were taken at both horizontal and vertical antenna polarities. The receiver bandwidth was set to 120 kHz for measurements below 1 GHz, and 1 MHz for measurements above 1 GHz. A peak detector is used to detect an emission; a quasi-peak detector may be used to record a final measurement below 1 GHz and an average detector may be used above 1 GHz. An inverse proportionality factor of 20 dB/decade (10 dB) was used, as noted in clause 7.2.3 of CISPR-11, to normalize the measured data to the specified test distance for determining compliance.

Table 5 – Group 1 Radiated Emissions Limits (30 MHz to 1 GHz)

Frequency Range	3m		10m	
	Class A (dBµV/m)	Class B (dBµV/m)	Class A (dBµV/m)	Class B (dBµV/m)
30 MHz – 230 MHz	50	40	40	30
230 MHz – 1 GHz	57	47	47	37
Note: The lower limit applies at the transition frequency.				

Conducted Emissions

The mains cable of the EUT or EUT host unit was connected to the LISN defined in this standard and is bonded to the reference plane. Where applicable, remaining auxiliary equipment was powered through an additional LISN (also bonded to the reference plane), using a multi-socket outlet strip if necessary. The LISNs were at least 0.8m away from the EUT. A vertical ground plane was used while the table-top EUTs were placed on a wooden table 0.4m high. Floor-standing EUTs were insulated from the ground plane and grounded according to the manufacturer's instructions.

Signal cables were positioned for their entire lengths, as far as possible, at a nominal distance of 0.4 m from the ground reference plane. Where the mains cable supplied by the manufacturer was longer than 1 m, the excess was folded at the center into a bundle no longer than 0.4 m, so that its length is shortened to 1 m. If the 1 m cable length cannot be achieved owing to physical limitations of the EUT arrangement, the cable length shall be as near to 1 m as possible.

Table 6 – Group 1 Class A Conducted Emissions Limits - Mains

Frequency	Limits (dBµV)	
	Quasi-peak	Average
150 kHz – 500 kHz	79	66
500 kHz – 30 MHz	73	60
NOTE: The lower limit shall apply at the transition frequency.		

Table 7 – Group 1 Class B Conducted Emissions Limits - Mains

Frequency	Limits (dBµV)	
	Quasi-peak	Average
150 kHz – 500 kHz	66 - 56	56-46
500 kHz – 5 MHz	56	46
5 MHz – 30 MHz	60	50
NOTE 1: The lower limit shall apply at the transition frequency. NOTE 2: The limit decreases linearly with the logarithm of the frequency in the range 150 kHz to 500 kHz.		

Harmonics

Testing was performed to EN 61000-3-2.

This standard deals with the limitation of harmonic currents injected into the public supply system. The equipment classes used to classify equipment for harmonics measurement are not related to the classes used for emissions. Equipment not specified in any of the other classes is considered to be Class A. Portable tools or

arc welding equipment which is not professional equipment, are Class B. Lighting equipment is Class C. Personal computers & monitors, and television receivers are Class D equipment.

Flicker

Testing was performed to EN 61000-3-3.

This standard is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage system. It specifies limits of voltage changes which may be produced. Equipment which does not comply with the limits of this standard, when tested with the reference impedance, Z_{ref}, and which therefore cannot be declared compliant with this part, may be retested or evaluated to show conformity with EN 61000-3-11, which is applicable to equipment with rated input current ≤75 A per phase and subject to conditional connection.

Immunity Requirements

The immunity levels specified by this standard are divided into four categories:

- Table 1 – Basic immunity
- Table 2 – Equipment intended for use in industrial locations
- Table 3 – Equipment used in controlled EM environments
- Annex A – Portable test & measurement equipment

The levels chosen are based on the manufacturer's requirement for intended use.

Electrostatic Discharge (ESD)

Testing was performed according to EN 61000-4-2.

The ground reference plane (GRP) consists of two sheets of galvanized steel that meet the minimum thickness requirements of 0.65 mm (0.0256 inches or 23 gauge) bonded together at the seam and bonded to the protective earth of the building. The overall dimensions of the GRP are 2.4m x 2.4m (8 ft x 8 ft) and the EUT was placed on the GRP with a minimum of 0.1m of the GRP protruding beyond the EUT. The EUT has been placed a minimum of 0.8m (31.6 inches) from the walls of the laboratory or any other metallic surface.

The discharge return cable of the ESD generator was connected to the GRP and was at least 0.2m (7.9 inches) away from other conductive parts of the test setup (except the GRP). The vertical coupling plane (VCP) is a 0,5m square (19.7 inches) metallic plate bonded to the GRP with the same type of cable as the HCP and is always postioned 0.1m (4 inches) from the EUT.

For table-top equipment, the horizontal coupling plane (HCP), made of the same material as the GRP, is 1.6m x 0.8m (63.2 inches x 31.6 inches) ±0.02m (0.8 inches) and is placed on a table that is 0.8m (31.6 inches) above the GRP. For desktop equipment, the EUT and its cables were isolated from the HCP by an insulator of 0.5 mm (0.002 inches) ± 0.05 mm (0.0002 inches) thickness. The EUT was placed on the HCP with a minimum of 0.1m (4 inches) protruding on all sides of the EUT. The HCP is bonded to the GRP through a cable with a 470 kΩ resistor located at each end. For floor-standing equipment, the EUT is isolated from the GRP by an insulator that is 0.05m to 0.15m (2 inches to 6 inches) in thickness as appropriate for the EUT.

Electrostatic discharges were applied only to those points and surfaces of the EUT which are expected to be touched during usual operation, including user access as specified by the manufacturer. Contact Discharges were applied to conductive surfaces, including those on the EUT, Horizontal Coupling Plane (HCP), and Vertical Coupling Plane (VCP). Air discharges were applied to those points where a contact discharge was not possible.

The EUT was exposed to at least 10 discharges in each polarity at the listed test points.

Table 8 – ESD Levels

Clause 6.2 Table	Port	Contact	Air	Minimum Performance Criteria
1	Enclosure	±4 kV	±4 kV	B
2	Enclosure	±4 kV	±8 kV	B
3	Enclosure	±4 kV	±8 kV	B
Annex A Table A.1	Enclosure	±4 kV	±8 kV	B

Electrical Fast Transients (EFT)

Testing was performed according to EN 61000-4-4.

The ground reference plane (GRP) is identical to that described for ESD. Regardless of whether the EUT is table-top, floor-standing, or any other configuration, it is placed on a 0.1m ± 0.01m (4 inches ± 0.4 inches) insulated support over the GRP. All cables associated with the EUT are placed on the same insulating support. If the EUT contains several ports with the same type of interface, only one cable was tested. Decoupling networks were utilized to protect auxiliary equipment, where applicable.

Cables with a length greater than 3m or that can be greater than 3m (e.g. Ethernet, phone) were tested. Multi-conductor signal cables were tested as a single cable. The cable length between coupling device and EUT was as short as possible with the length being no less than 0.5m (19.7 inches) and no more than 3m (118.4 inches). All cables were placed on the 0.1m insulated support.

Table 9 – EFT Levels

Clause 6.2 Table	Port	Level	Minimum Performance Criteria
1	I/O Signal/Control[1]	±0.5 kV	B
	I/O Signal/Control connected directly to Mains	±1 kV	B
	DC Power[1]	±1 kV	B
	AC Input Power	±1 kV	B
2	I/O Signal/Control	±1 kV	B
	I/O Signal/Control connected directly to Mains	±2 kV	B
	DC Power[2]	±2 kV	B
	AC Input Power	±2 kV	B
3	I/O Signal/Control[1]	±0.5 kV	B
	Measurement I/O[1, 3]	±X kV[3]	---
	DC Power[1]	±1 kV	B
	AC Input Power	±1 kV	B
Annex A Table A.1	No requirement	---	---

1. Performed on cables >3m.
2. DC connections between parts of equipment/system which are not connected to a DC distribution network are treated as I/O signal/control ports.
3. The rated disturbance values shall be stated in the product specification by the manufacturer.

Radiated Disturbances

Testing was performed according to EN 61000-4-3.

The testing is performed within an anechoic chamber with anechoic material placed on the floor between the antenna and the EUT. Table-top equipment is placed on a 0.8m (31.6 inches) high table and floor-standing equipment is supported 0.1m (4 inches) above the supporting plane. Cabling specified by the manufacturer to be less than 3m (118.4 inches) are the specified length. Excess length are non-inductively bundled to a 1m (39.5 inches) length. The configuration of the wiring duplicates a typical use setup as specified by the manufacturer.

Prior to testing and placement of the EUT, the intensity of the established field was verified by placing the sensor at a calibration grid point, and the field measured at three frequencies; and confirmed to be within 20% of the calibrated value.

The frequency range of 80 MHz to 1 GHz was tested with a step size of 1%. Testing using continuous swept frequency is not performed, therefore the frequency sweep rate is non-applicable. The applied signal was a 1 kHz sine wave with an 80% modulation depth. The dwell time at each frequency allowed the EUT to be exercised and respond, but was not longer than 5 seconds.

Table 10 – Radiated Disturbance Levels

Clause 6.2 Table	Port	Frequency Range	Level	Minimum Performance Criteria
1	Enclosure	80 MHz – 1 GHz	3 V/m, 1 kHz (80% AM)	A
		1.4 GHz – 2 GHz	3 V/m, 1 kHz (80% AM)	A
		2 GHz – 2.7 GHz	1 V/m, 1 kHz (80% AM)	A
2	Enclosure	80 MHz – 1 GHz	10 V/m, 1 kHz (80% AM)	A
		1.4 GHz – 2 GHz	3 V/m, 1 kHz (80% AM)	A
		2 GHz – 2.7 GHz	1 V/m, 1 kHz (80% AM)	A
3	Enclosure	80 MHz – 1 GHz	1 V/m, 1 kHz (80% AM)	A
		1.4 GHz – 2 GHz	1 V/m, 1 kHz (80% AM)	A
		2 GHz – 2.7 GHz	1 V/m, 1 kHz (80% AM)	A
Annex A Table A.1	Enclosure	80 MHz – 1 GHz	3 V/m, 1 kHz (80% AM)	A
		1.4 GHz – 2 GHz	3 V/m, 1 kHz (80% AM)	A
		2 GHz – 2.7 GHz	1 V/m, 1 kHz (80% AM)	A

Conducted Disturbances

Testing was performed according to EN 61000-4-6.

The ground reference plane (GRP) is identical to that described for ESD. Regardless of whether the EUT is table-top, floor-standing, or any other configuration, it was placed on a 0.1m ± 0.01m (4 inches ± 0.4 inches) insulated support over the GRP. All cables associated with the EUT are placed at least 30 mm (1.2 inches) above the GRP. Where coupling and/or decoupling devices were used, they were located between 0.1 m (4 inches) and 0.3 m (11.8 inches) from the EUT. This distance was measured horizontally from the projection of the EUT on to the GRP to the coupling and/or decoupling device. Auxiliary equipment is placed on an insulating support of 0.1 m (4 inches) above the GRP.

Tests are performed on all cables. For performing the tests, CDNs are used when possible. Otherwise, the EM clamp is used as the injection method for unshielded cables. For instances where the common mode impedance requirements cannot be met at the points closest to the auxiliary equipment (AE), then a 150 Ω resistor is placed from the AE to the GRP. Direct injection is used for shielded cables via the use of a 150 Ω injection probe.

Table 11 – Conducted Disturbance Levels

Clause 6.2 Table	Port	Frequency Range	Level	Minimum Performance Criteria
1 & 2	I/O Signal/Control[1]	150 kHz – 80 MHz	3 V, 1 kHz (80% AM)	A
	I/O Signal/Control connected directly to Mains	150 kHz – 80 MHz	3 V, 1 kHz (80% AM)	A
	DC Power[1]	150 kHz – 80 MHz	3 V, 1 kHz (80% AM)	A
	AC Input	150 kHz – 80 MHz	3 V, 1 kHz (80% AM)	A
3	I/O Signal/Control[1]	150 kHz – 80 MHz	1 V, 1 kHz (80% AM)	A
	Measurement I/O[1]	150 kHz – 80 MHz	X[3] V	---
	DC Power[1]	150 kHz – 80 MHz	1V, 1 kHz (80% AM)	A
	AC Input	150 kHz – 80 MHz	1 V, 1 kHz (80% AM)	A
Annex A Table A.1	All ports	No requirement	--	--

1. Performed on cables greater than 3 m.
2. DC connections between parts of equipment/system which are not connected to a DC distribution network are treated as I/O signal/control ports.
3. The rated disturbance values shall be stated in the product specification by the manufacturer.

Power-Frequency Magnetic Fields

Testing was performed according to EN 61000-4-8.

The ground reference plane (GRP) is identical to that described for ESD. The power-frequency magnetic field is applied to the three orthogonal axis of the EUT for both table-top and floor-standing equipment.

Applicable only to EUT containing devices susceptible to magnetic fields, such as CRT monitors, Hall elements, electro-dynamic microphones, magnetic field sensors, etc.

Table 12 – Power-frequency Magnetic Field Levels

Clause 6.2 Table	Port[1]	Power Frequency	Level	Minimum Performance Criteria
1	Enclosure	No requirement	---	---
2	Enclosure	50 or 60 Hz	30 A/m	A
3	Enclosure	No requirement	---	---
Annex A Table A.1	Enclosure	No requirement	---	---

1. Only to magnetically sensitive equipment. CRT display interference is allowed above 1 A/m.

Surge

Testing was performed according to EN 61000-4-5.

The ground reference plane (GRP), when used, is identical to that described for ESD. The GRP is only necessary when high frequency events are likely (i.e., coupling via gas arrestors) and for tests to shielded lines. The power cord between the EUT and the coupling/decoupling network did not exceed 2 m in length. For purposes of this test, power ports are considered to be only those ports directly connected to the AC Mains or distributed DC power systems (e.g. -48V buss in a telecommunication center).

Table 13 – Surge Levels

Clause 6.2 Table	Port	Waveform (Tr/Th)	Level	Minimum Performance Criteria
1	I/O Signal/Control[1,3]	1.2/50 µsec	±1 kV	B
	I/O Signal/Control connected directly to the Mains	1.2/50 µsec	±0.5 kV L-L ±1 kV	B
	DC Power[1,2]	1.2/50 µsec	±0.5 kV L-L ±1 kV L-PE	B
	AC Input	1.2/50 µsec	±0.5 kV L-L ±1 kV L-PE	B
2	I/O Signal/Control[1,3]	1.2/50 µsec	±1 kV	B
	I/O Signal/Control connected directly to the Mains	1.2/50 µsec	±1 kV L-L ±2 kV L-PE	B
	DC Power[1,2]	1.2/50 µsec	±1 kV L-L ±2 kV L-PE	B
	AC Input	1.2/50 µsec	±1 kV L-L ±2 kV L-PE	B
3	I/O Signal/Control[1,3]	1.2/50 µsec	Not required	---
	Measurement I/O	1.2/50 µsec	Not required	---
	DC Power[1,2]	1.2/50 µsec	Not required	---
	AC Input	1.2/50 µsec	±0.5 kV L-L ±1 kV L-PE	B
Annex A Table A.1	All ports	No requirement	---	---

1. Lines within a building which are longer than 30 m, or which leave the building (including lines of outdoor installations).
2. Cables > 3m.
3. Test applied to all lines simultaneously to earth (ground).

Voltage Dips & Interruptions

Testing was performed according to EN 61000-4-11

The test was performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer, or; the shortest possible length suitable to the application of the EUT. Voltage dips and short interruptions performed at 0° voltage crossover.

Table 14 – Voltage Dips & Interrupts Levels

Clause 6.2 Table	Port	Reduction (%)	Duration	Minimum Performance Criteria
1	AC Input	100	½ cycle	B
		100	1 cycle	B
		30	25 cycles (50 Hz) 30 cycles (60 Hz)	C
		100	250 cycles (50 Hz) 300 cycles (60 Hz)	C
2	AC Input	100	1 cycle	B
		60	10 cycles (50 Hz) 12 cycles (60 Hz)	C
		30	25 cycles (50 Hz) 30 cycles (60 Hz)	C
		100	250 cycles (50 Hz) 300 cycles (60 Hz)	C
3	AC Input	100	½ cycle	B
Annex A Table A.1	Any ports	No requirement	---	---

Measurement Uncertainty

Per the requirement of clause 9 of this standard, the requirements shall not be changed based on an estimate of measurement uncertainties. It is not a requirement of this standard to calculate measurement uncertainties.

List of Test Equipment

The following test equipment was used in the performance of the testing herein.

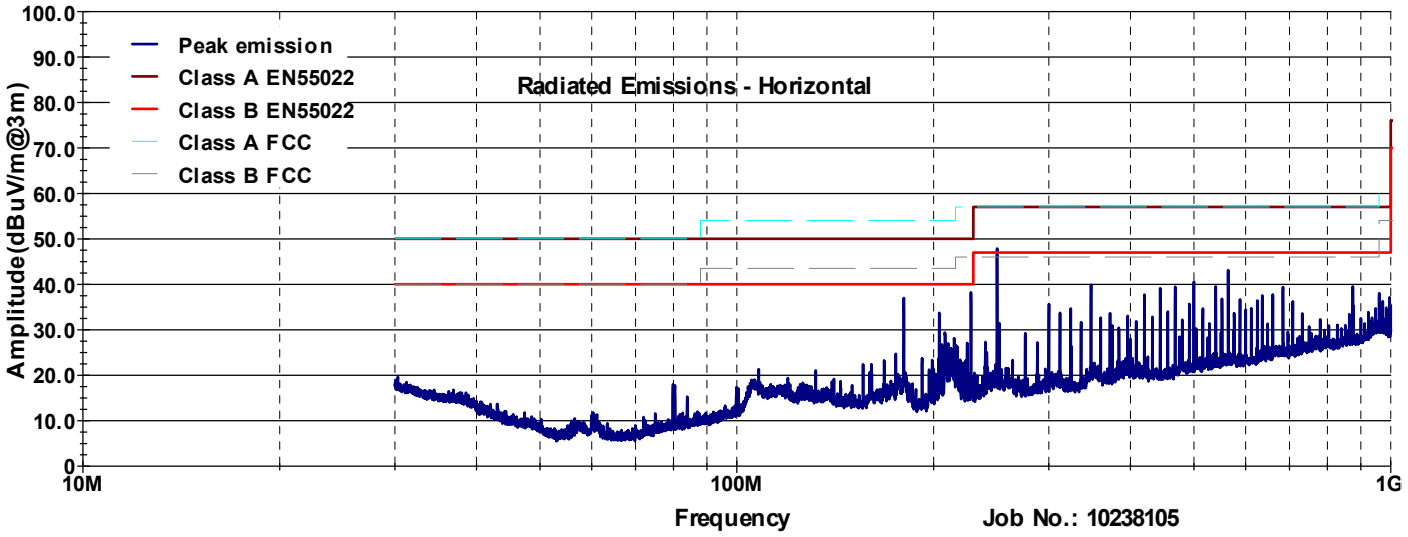
Table 15 – Test Equipment Used

Asset Tag	Description	Manufacturer	Model	Serial Number	Cal. Date	Cal. Due
1942	Weather Station	Omega	wTHBP-LCD	none	25-Apr-2012	25-Apr-2013
1	3m Semi-Anechoic Chamber	Nemko USA, Inc.	Chamber	1	25-Sep-2012	25-Sep-2013
412	Amplifier, RF Power	Amplifier Research	100W1000M1A	21233	N/R	
590	Generator, PEFT (EFT)	Haefely	DGFT junior	589071-03	04-Sep-2012	04-Sep-2013
674	Limiter	Hewlett Packard	11947A	3107A02200	27-Nov-2012	27-Nov-2013
704	Filter, High Pass, 5KHz	Solar Electronics	7930-5.0	933126	18-Jan-2013	18-Jan-2014
793	Analyzer Harmonics	Combinova	300	115	15-May-2012	15-May-2013
1025	Preamplifier, 25dB	Nemko USA, Inc.	LNA25	399	27-Feb-2012	27-Feb-2013
1188	LISN	EMCO	3825/2	1214	17-Oct-2012	17-Oct-2013
1310	Antenna, Horn	Electro Metrics	RGA-60	6174	21-Mar-2011	21-Mar-2013
1663	Spectrum Analyzer	Rohde & Schwartz	FSP3	100073	02-Sep-2011	02-Sep-2013
1738	All-In-One ESD3000 Gun	EMC-PARTNER/ HV Technologies	ESD3000	294	23-Oct-2012	23-Oct-2013
1754	All-In-One Relay Module (Tip)	EMC-PARTNER/ HV Technologies	ESD3000RM32	99	20-Oct-2010	
1763	Antenna, Bilog	Schaffner	CBL 6111D	22926	21-Feb-2012	21-Feb-2013
1767	Receiver, EMI Test 20Hz - 26.5 GHz - 150 - +30 dBm LCD	Rohde & Schwartz	ESIB26	837491/0002	19-Dec-2012	19-Dec-2013
1770	Generator, Signal	Rohde & Schwarz	SMIQ-06L		N/R	
1783	Cable Assy, 3m Chamber	Nemko	Chamber		26-Sep-2012	26-Sep-2013
1793	Field Probe	ETS-Lindgren	HI-6005	00090030	22-Feb-2012	22-Feb-2013
1862	250Watt Amplifier (Freq. 1 to 3GHz)	Amplifier Research	250T1G3	330041	N/R	
1765	Log Antenna	AR	AT1080	0325162	N/R	
585	Generator, Surge	Haefely	P SURGE 4.1	83070-03	31-Aug-2012	31-Aug-2013
715	Injection clamp	Fisher	F-140	83	13-Mar-2012	13-Mar-2013
1182	Generator, Signal	Hewlett Packard	8656B	2549A03601	25-Sep-2012	25-Sep-2013
1448	Amplifier, RF	EIN	3100LA	467	N/R	
1635	CDN	Fischer Custom Communications, Inc.	FCC-801-M5-50 A	01009	13-Mar-2012	13-Mar-2013
1647	1200 Ohm Resister Box	Nemko USA, Inc.			N/R	
1548	0.5m Cable Assy	Nemko USA	RG213		13-Feb-2012	13-Feb-2013

Test Results – Radiated Emissions

Table No. 1	Radiated Emissions	Verdict
		P

Frequency Range ..... : 30 MHz to 1 GHz
Test Location ..... : 3m Chamber
Test Method..... : EN 55011
Test Distance ..... : 3m
EUT Configuration ..... : EUT with cables.
Test Date ..... : 5-Feb-13
Temperature ..... : 21.5°C
Relative Humidity .... : 46 %
Test Equipment Asset Tag List : 1,1025,1763,1767,1783



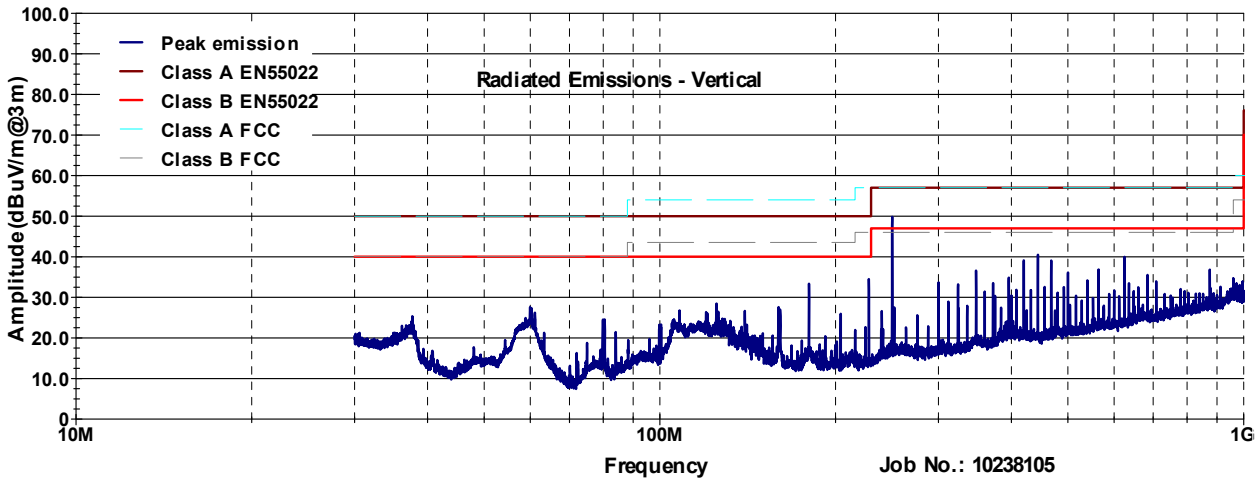
(1) Antenna Polarity (H/V)	(2) Detector	(3) Frequency (MHz)	(6) Receiver Reading (dBµV/m)	(7) Site Correction Factor (dB/m)	(8) Emission Level (dBµV/m)	(9) Limit (dBµV/m)	(10) Margin (dB)	(11) Pass/ Fail
H	QP	228.0040	54.2	-14.8	39.4	40.0	0.6	Pass
H	QP	564.0250	49.0	-5.0	44.0	47.0	3.0	Pass
H	QP	180.0010	52.5	-16.4	36.1	40.0	3.9	Pass
H	QP	420.0480	49.9	-7.8	42.1	47.0	4.9	Pass
H	QP	684.0430	44.2	-2.9	41.3	47.0	5.7	Pass
H	QP	540.0270	46.3	-6.3	40.0	47.0	7.0	Pass
H	QP	444.0320	47.5	-7.9	39.5	47.0	7.5	Pass
H	QP	204.0000	48.1	-15.6	32.4	40.0	7.6	Pass
H	QP	660.0570	42.8	-3.5	39.3	47.0	7.7	Pass
H	QP	348.0210	49.2	-10.0	39.2	47.0	7.8	Pass

Supplemental Information:

Tested by (+ signature) .....: Arturo Ruvalcaba

Table No. 2	Radiated Emissions	Verdict
		P

Frequency Range ..... : 30 MHz to 1 GHz
Test Location ..... : 3m Chamber
Test Method..... : EN 55011
Test Distance ..... : 3m
EUT Configuration ..... : EUT with cables.
Test Date ..... : 5-Feb-13
Temperature ..... : 21.5°C
Relative Humidity .... : 41 %
Test Equipment Asset Tag List : 1,1025,1763,1767,1783



(1) Antenna Polarity (H/V)	(2) Detector	(3) Frequency (MHz)	(6) Receiver Reading (dBµV/m)	(7) Site Correction Factor (dB/m)	(8) Emission Level (dBµV/m)	(9) Limit (dBµV/m)	(10) Margin (dB)	(11) Pass/ Fail
V	QP	228.0040	51.6	-14.8	36.8	40.0	3.2	Pass
V	QP	444.0320	51.5	-7.9	43.6	47.0	3.4	Pass
V	QP	468.0170	48.6	-7.4	41.3	47.0	5.7	Pass
V	QP	420.0480	48.6	-7.8	40.7	47.0	6.3	Pass
V	QP	180.0010	49.2	-16.4	32.8	40.0	7.2	Pass
V	QP	540.0270	45.0	-6.3	38.8	47.0	8.2	Pass
V	QP	564.0250	43.6	-5.0	38.6	47.0	8.4	Pass
V	QP	684.0430	40.1	-2.9	37.2	47.0	9.8	Pass
V	QP	348.0210	46.8	-10.0	36.8	47.0	10.2	Pass
V	QP	624.9590	40.8	-4.3	36.6	47.0	10.4	Pass

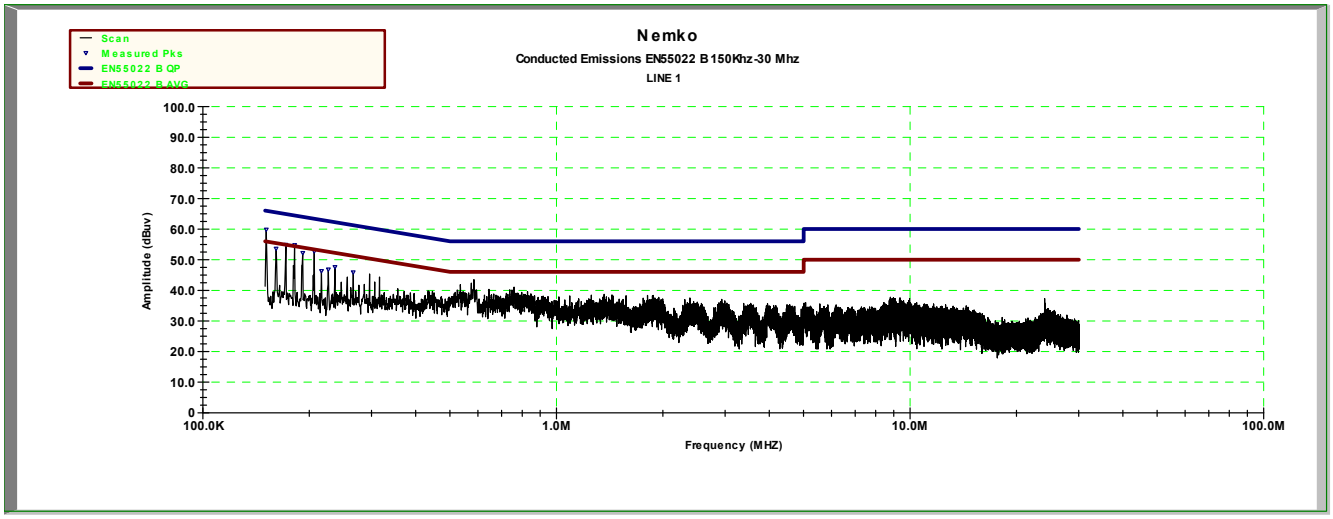
Supplemental Information:

Tested by (+ signature) .....: Arturo Ruvalcaba

Test Results – Conducted Emissions

Table No. 3	Conducted Emissions - Mains	Verdict
		P

Frequency Range .....: 150 kHz to 30 MHz Test Location ..... :Lab 5
Test Method.....: EN 55011
EUT Configuration .....: EUT with cables.
Power Input.....: 230VAC, 50 Hz ☒ 1ϕ ☐ 3ϕ Line Tested . : Neutral
Test Date .....: 5-Feb-13
Temperature .....: 21.5°C Relative Humidity .... :46 %
Test Equipment Asset Tag List : 1923,1924,1188,1663,704,674



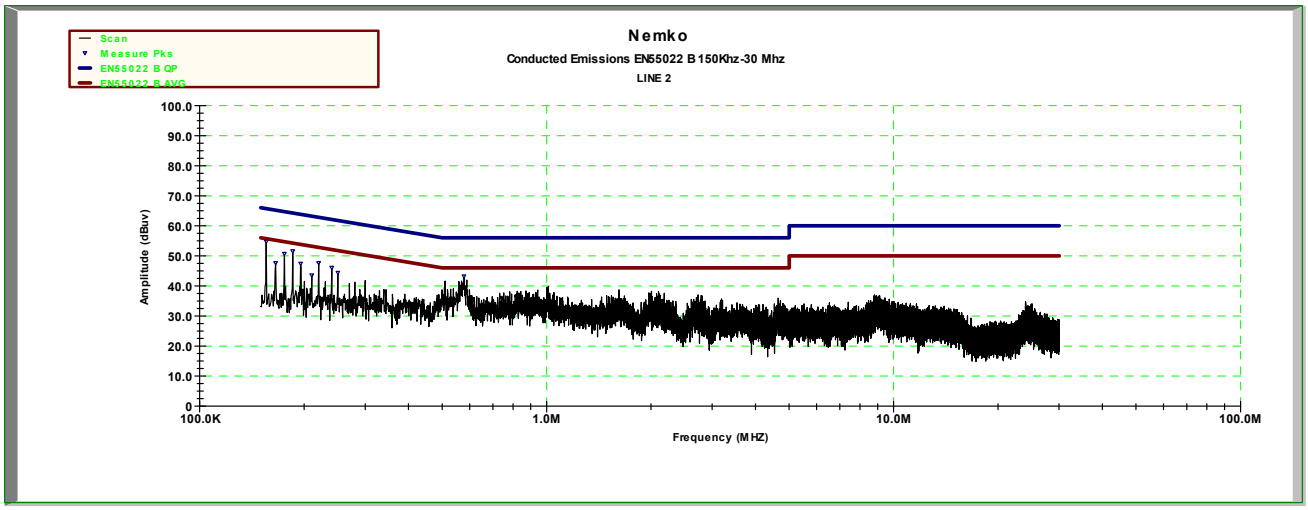
(1)	(4)	(5)	(6)	(7)	(8)	(9)
		Quasi-Peak		Average		
Frequency (MHz)	Emission Level (dBµV)	Limit (dBµV)	Margin (dB)	Limit (dBµV)	Margin (dB)	Pass/ Fail
0.1512	59.8	66.0	6.1	56.0	3.9	Pass
0.1612	53.6	65.7	12.1	55.7	2.1	Pass
0.1718	54.9	65.4	10.5	55.4	0.5	Pass
0.1817	54.8	65.1	10.3	55.1	0.3	Pass
0.1917	52.2	64.8	12.6	54.8	2.6	Pass
0.2066	52.8	64.4	11.6	54.4	1.6	Pass
0.2165	46.3	64.1	17.8	54.1	7.8	Pass
0.2265	46.8	63.8	17.0	53.8	7.0	Pass
0.2364	47.6	63.5	15.9	53.5	5.9	Pass
0.2663	45.9	62.7	16.8	52.7	6.8	Pass

Supplemental Information:
This is data from the optional 5VDC power supply.

Tested by (+ signature) .....: Arturo Ruvalcaba

Table No. 4	Conducted Emissions - Mains	Verdict
		P

Frequency Range .....: 150 kHz to 30 MHz Test Location ..... :Lab 5
Test Method.....: EN 55011
EUT Configuration .....: EUT
Power Input.....: 230VAC, 50 Hz ☒ 1ϕ ☐ 3ϕ Line Tested . : Phase A
Test Date .....: 5-Feb-13
Temperature .....: 21.5°C Relative Humidity .... :46 %
Test Equipment Asset Tag List : 1923,1924,1188,1663,704,674



(1)	(4)	(5)	(6)	(7)	(8)	(9)
		Quasi-Peak		Average		
Frequency (MHz)	Emission Level (dBµV)	Limit (dBµV)	Margin (dB)	Limit (dBµV)	Margin (dB)	Pass/ Fail
0.1556	54.8	65.8	11.1	55.8	1.1	Pass
0.1655	47.6	65.6	17.9	55.6	7.9	Pass
0.1755	50.7	65.3	14.5	55.3	4.5	Pass
0.1854	51.5	65.0	13.4	55.0	3.4	Pass
0.1954	47.4	64.7	17.3	54.7	7.3	Pass
0.2103	43.6	64.3	20.7	54.3	10.7	Pass
0.2203	47.6	64.0	16.4	54.0	6.4	Pass
0.2402	46.1	63.4	17.4	53.4	7.4	Pass
0.2501	44.4	63.1	18.7	53.1	8.7	Pass
0.5779	43.2	56.0	12.8	46.0	2.8	Pass

(4) = (2) + (3) (6) = (5) – (4) (8) = (7) – (4)

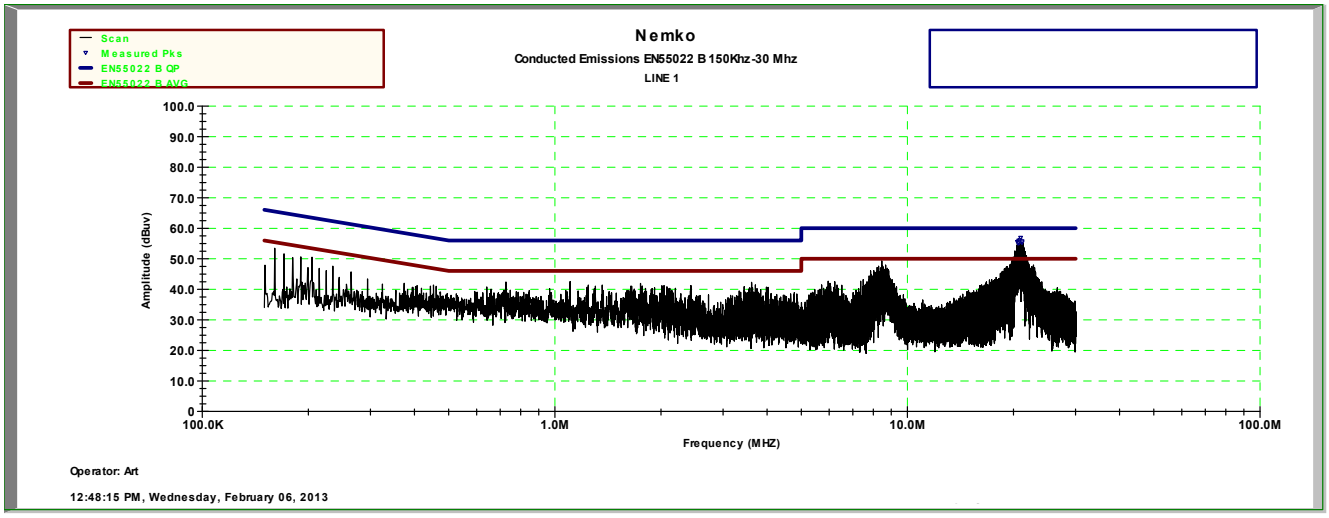
Supplemental Information:

This is data from the optional 5VDC power supply.

Tested by (+ signature) .....: Arturo Ruvalcaba

Table No. 5	Conducted Emissions - Mains	Verdict
		P

Frequency Range .....: 150 kHz to 30 MHz Test Location ..... :Lab 5
Test Method.....: EN 55011
EUT Configuration .....: EUT with cables.
Power Input.....: 230VAC, 50 Hz ☒ 1ϕ ☐ 3ϕ Line Tested . : Neutral
Test Date .....: 5-Feb-13
Temperature .....: 21.5°C Relative Humidity .... :41 %
Test Equipment Asset Tag List : 1923,1924,1188,1663,704,674



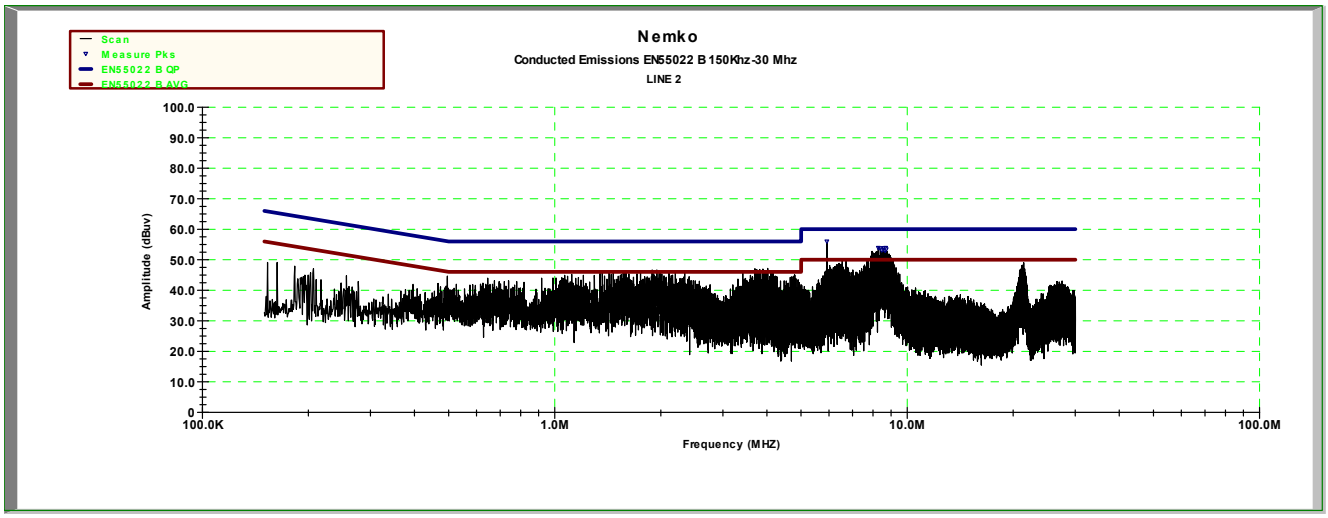
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Quasi-Peak		Average		
Frequency (MHz)	QP Emission Level (dBµV)	AVG Emission Level (dBµV)	Limit (dBµV)	Margin (dB)	Limit (dBµV)	Margin (dB)	Pass/ Fail
20.7028	49.1	41.9	60.0	10.9	50.0	8.1	Pass
20.7249	48.3	42.1	60.0	11.7	50.0	7.9	Pass
20.7362	49.0	41.0	60.0	11.0	50.0	9.0	Pass
20.7710	48.8	41.7	60.0	11.2	50.0	8.3	Pass
20.8321	48.4	40.8	60.0	11.6	50.0	9.2	Pass
20.8393	48.6	42.6	60.0	11.4	50.0	7.4	Pass
20.9270	48.7	42.3	60.0	11.3	50.0	7.7	Pass
21.0976	48.5	42.1	60.0	11.5	50.0	7.9	Pass
21.1360	48.4	41.7	60.0	11.6	50.0	8.3	Pass
21.3456	47.8	42.2	60.0	12.2	50.0	7.8	Pass

Supplemental Information:
This is data from the host lap top.

Tested by (+ signature) .....: Arturo Ruvalcaba

Table No. 6	Conducted Emissions - Mains	Verdict
		P

Frequency Range .....: 150 kHz to 30 MHz Test Location ..... :Lab 5
Test Method.....: EN 55011
EUT Configuration .....: EUT with cables.
Power Input.....: 230VAC, 50 Hz ☒ 1ϕ ☐ 3ϕ Line Tested . : Phase A
Test Date .....: 5-Feb-13
Temperature .....: 21.5°C Relative Humidity .... :41 %
Test Equipment Asset Tag List : 1923,1924,1188,1663,704,674



(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Quasi-Peak		Average		
Frequency (MHz)	QP Emission Level (dBµV)	AVG Emission Level (dBµV)	Limit (dBµV)	Margin (dB)	Limit (dBµV)	Margin (dB)	Pass/ Fail
5.9070	42.0	30.9	60.0	18.0	50.0	19.1	Pass
8.3608	48.8	38.9	60.0	11.2	50.0	11.1	Pass
8.3748	48.5	39.2	60.0	11.5	50.0	10.8	Pass
8.4291	48.7	39.3	60.0	11.3	50.0	10.7	Pass
8.4920	48.9	38.9	60.0	11.1	50.0	11.1	Pass
8.4921	48.9	39.3	60.0	11.1	50.0	10.7	Pass
8.5673	48.3	38.8	60.0	11.7	50.0	11.3	Pass
8.6248	48.3	38.0	60.0	11.7	50.0	12.0	Pass
8.6705	48.2	37.8	60.0	11.8	50.0	12.2	Pass
8.6738	48.2	37.6	60.0	11.8	50.0	12.4	Pass

Supplemental Information:
This is data from the host lap top.

Tested by (+ signature) .....: Arturo Ruvalcaba

Test Results – Harmonics

Table No. 7	**Harmonics** (Steady-State)	Verdict
		P

Power Frequency .....: ☒ 50 Hz ☐ 60 Hz Test Location ..... :Lab 5
Test Method.....: EN 61000-3-2
EUT Configuration .....: EUT with cables
Power Input.....: 230V AC, 50 Hz ☒ 1ϕ ☐ 3ϕ
Test Date .....: 6-Feb-13
Temperature .....: 21.2 °C Relative Humidity .... :49.1 %
Test Equipment Asset Tag List : 793

combinova ANALYZER 300 2013.02.06 13:23:47

Current Harmonics

Setup: 10230507 Gen setting: 1(1) U : 230.19 V fu: 50.003 Hz
Live Analysed periods: 4 I : 30.08 mA P: 2.26 W
Module: M1 Limit: Class A (EN61000_A14) I1: 13.36 mA
Note:
THD=201.68 % (PF=0.326) PASSED

No	A	Lim A	No	A	Lim A	No	A	Lim A
1	0.013		15	0.007	0.150	29	0.003	0.078
2	0.000	1.079	16	0.000	0.115	30	0.000	0.061
3	0.010	2.298	17	0.007	0.132	31	0.002	0.073
4	0.000	0.430	18	0.000	0.102	32	0.000	0.057
5	0.010	1.139	19	0.006	0.118	33	0.002	0.068
6	0.000	0.300	20	0.000	0.092	34	0.000	0.054
7	0.009	0.769	21	0.005	0.107	35	0.001	0.064
8	0.000	0.230	22	0.000	0.084	36	0.000	0.051
9	0.009	0.400	23	0.005	0.098	37	0.001	0.061
10	0.000	0.184	24	0.000	0.077	38	0.000	0.048
11	0.008	0.330	25	0.004	0.090	39	0.001	0.058
12	0.000	0.153	26	0.000	0.071	40	0.000	0.046
13	0.008	0.210	27	0.004	0.083			
14	0.000	0.131	28	0.000	0.066			

Current range: 0.3 Ap

Next measure | Change to bar graph | Relative current | Write to disk

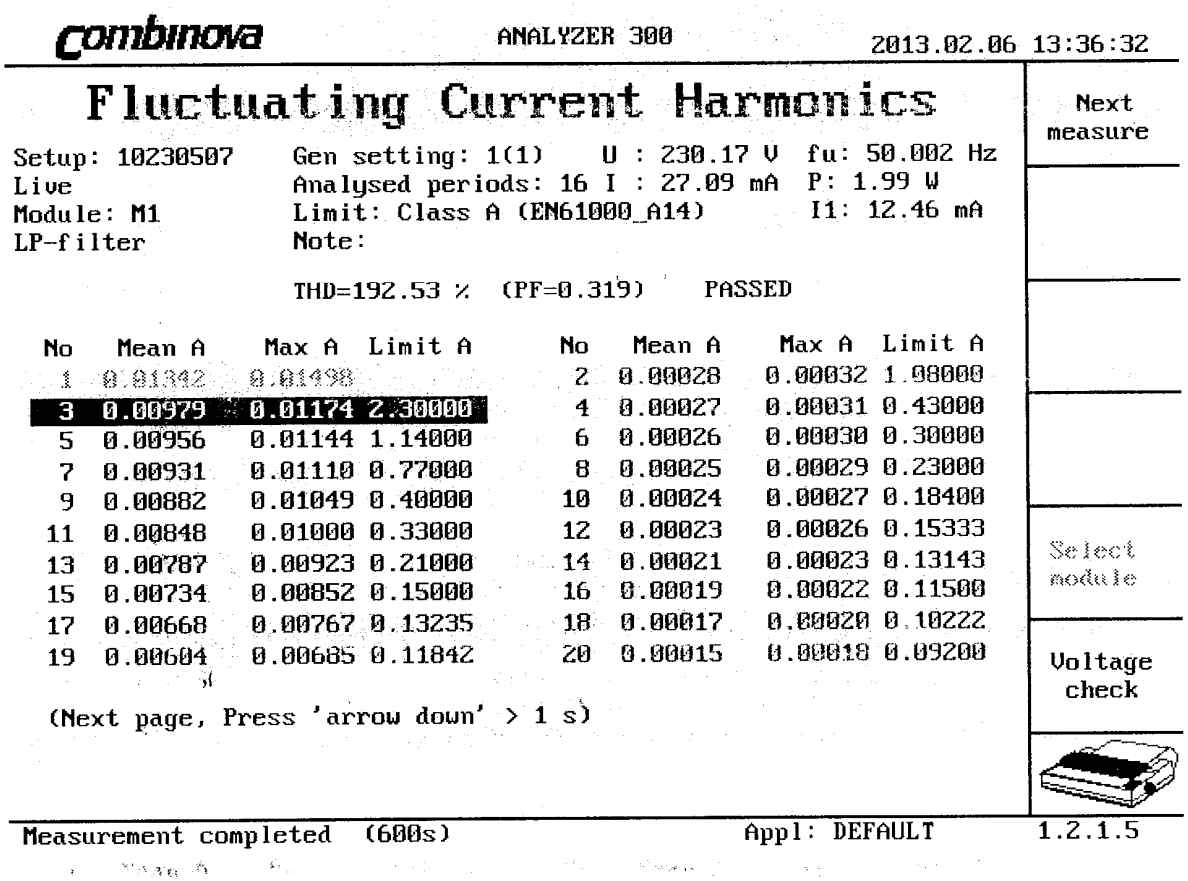
Appl: DEFAULT 1.2.1.2

Supplemental Information:

Tested by (+ signature) ..... : Arturo Ruvalcaba

Table No. 8	**Harmonics** (Fluctuating)	Verdict
		P

Power Frequency .....: ☒ 50 Hz ☐ 60 Hz Test Location ..... :Lab 5
Test Method.....: EN 61000-3-2
EUT Configuration .....: EUT with cables.
Power Input.....: 230V AC, 50 Hz ☒ 1ϕ ☐ 3ϕ
Test Date .....: 6-Feb-13
Temperature .....: 21.2 °C Relative Humidity .... :49.1 %
Test Equipment Asset Tag List : 793



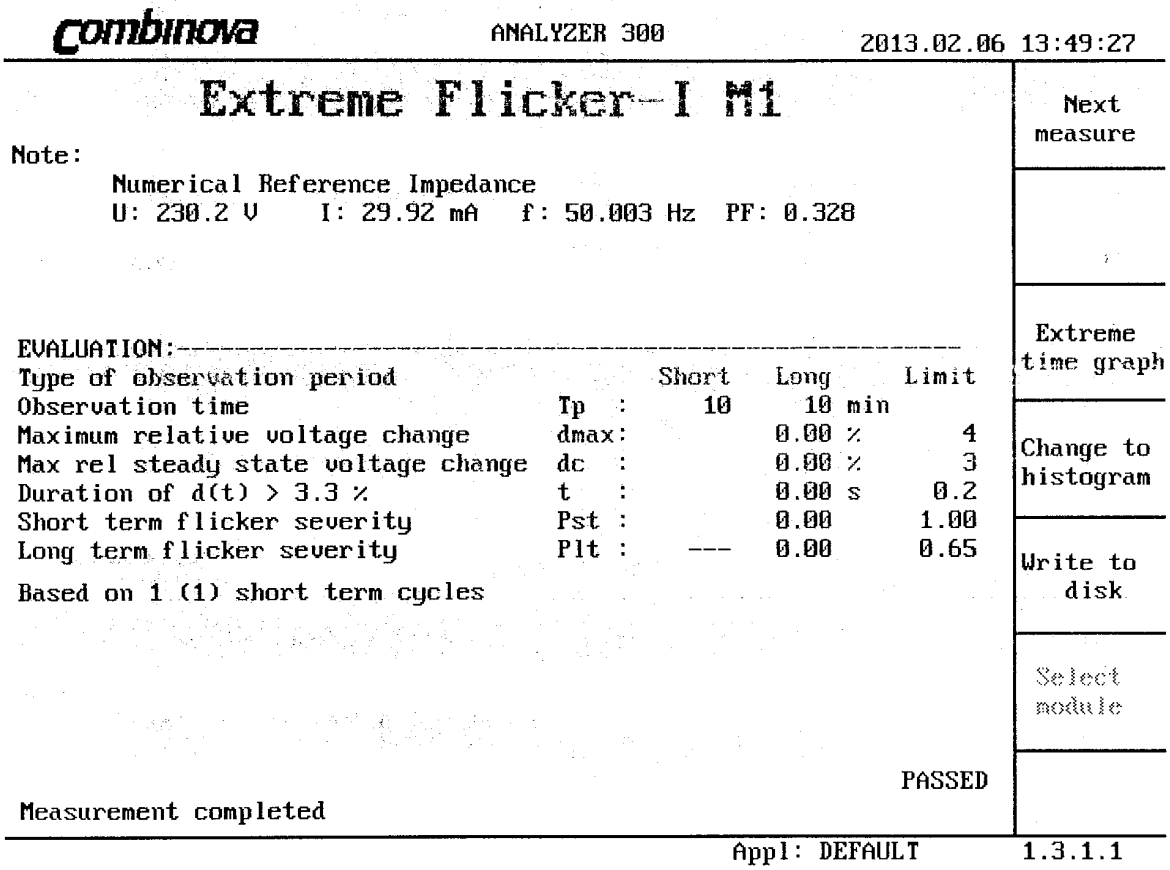
Supplemental Information:

Tested by (+ signature) ..... : Arturo Ruvalcaba

Test Results – Flicker

Table No. 9	Flicker	Verdict
		P

Power Frequency .....: ☒ 50 Hz ☐ 60 Hz Test Location ..... :Lab 5
Test Method.....: EN 61000-3-3
EUT Configuration .....: EUT with cables
Power Input.....: 230V AC, 50 Hz ☒ 1ϕ ☐ 3ϕ
Test Date .....: 6-Feb-13
Temperature .....: 21.2 °C Relative Humidity .... :49.1 %
Test Equipment Asset Tag List : 793



Supplemental Information:

Tested by (+ signature) ..... : Arturo Ruvalcaba

Test Results – Electrostatic Discharge (ESD)

Table No. 10	Electrostatic Discharge (ESD)	Verdict
		P

Test Method..... : EN 61000-4-2 (Levels per EN 61326-1 Clause 6.2 – Table 1)
EUT Configuration ..... : EUT with cables
☒ Table-Top ☐ Floor-Standing
Test Location ..... : Lab 5
Test Date ..... : 8-Feb-13
Bleeder Resistor Verification.... : HCP: 1.023 kΩ VCP: 1.025 kΩ 752 – 1,128 kΩ
Temperature ..... : 21.3°C 15°C - 35°C (59°F - 95°F)
Relative Humidity ..... : 56.4 % 30% - 60%
Atmospheric Pressure..... : 1003 mbars 860 mbars – 1060 mbars
Test Equipment Asset Tag List : 1738,1754

Test Results: (10 discharges per application)

Actual performance criteria recorded in table (Minimum Performance Criteria: B)

	Test Points	Contact		Air						Pass/ Fail
		-4	+4	-8	-4	-2	+2	+4	+8	
A	Horizontal Coupling Plane – Front of EUT	A	A	N/A	N/A	N/A	N/A	N/A	N/A	Pass
B	Vertical Coupling Plane – Right Side of EUT	A	A	N/A	N/A	N/A	N/A	N/A	N/A	Pass
C	Vertical Coupling Plane – Left Side of EUT	A	A	N/A	N/A	N/A	N/A	N/A	N/A	Pass
D	Vertical Coupling Plane – Front of EUT	A	A	N/A	N/A	N/A	N/A	N/A	N/A	Pass
E	Vertical Coupling Plane – Rear of EUT	A	A	N/A	N/A	N/A	N/A	N/A	N/A	Pass
F	Ethernet cable	N/A	N/A	N/A	A	A	A	A	N/A	Pass
G	HDMI cable	N/A	N/A	N/A	A	A	A	A	N/A	Pass
H	Power cable	N/A	N/A	N/A	A	A	A	A	N/A	Pass
I	Micro USB cable	N/A	N/A	N/A	A	A	A	A	N/A	Pass
J				N/A					N/A	NT
K				N/A					N/A	NT
L				N/A					N/A	NT
M				N/A					N/A	NT
N				N/A					N/A	NT

Supplemental Information:

Tested by (+ signature) .....: Arturo Ruvalcaba

Test Results – Electrical Fast Transients (EFT)

Table No. 11	Electrical Fast Transients (EFT)	Verdict
		P

Test Method..... : EN 61000-4-4 (Levels per EN 61326-1 Clause 6.2 – Table 1)
EUT Configuration ..... : EUT with cables
Test Location ..... : Lab 5
Test Date ..... : 7-Feb-13
Temperature ..... : 21.2°C
Relative Humidity ..... : 56.4 %
Test Equipment Asset Tag List : 590,559

Test Results: CC = Capacitive Clamp CN = Coupling Network

	Port	Levels (kV)								Coupling	Verdict
		+2	-2	+1	-1	+0.500	-0.500	+0.250	-0.250		
AC Power Input		---	---	---	---	---	---	---	---	---	---
A	Line to RGP	N/A	N/A	A	A	A	A	A	A	CN	P
B	Neutral to RGP	N/A	N/A	A	A	A	A	A	A	CN	P
C	Protective Earth to RGP	N/A	N/A	A	A	A	A	A	A	CN	P
D	Line to Neutral	N/A	N/A	A	A	A	A	A	A	CN	P
E	Line to Protective Earth	N/A	N/A	A	A	A	A	A	A	CN	P
F	Neutral to Protective Earth	N/A	N/A	A	A	A	A	A	A	CN	P
G	Line, Neutral, & Protective Earth to RGP	N/A	N/A	A	A	A	A	A	A	CN	P
DC Power[1]		---	---	---	---	---	---	---	---	---	---
A	Positive	N/A	N/A							CN	N/A
B	Negative	N/A	N/A							CN	N/A
C	Positive & Negative	N/A	N/A							CN	N/A
I/O Signal/Control[1]		---	---	---	---	---	---	---	---	---	---
A	Ethernet cable	N/A	N/A	N/A	N/A	A	A	A	A	CC	P
B	HDMI cable	N/A	N/A	N/A	N/A	A	A	A	A	CC	P
C		N/A	N/A	N/A	N/A					CC	N/A
D		N/A	N/A	N/A	N/A					CC	N/A

1. Cables > 3m.

Supplemental Information:

EUT is not a DC device.

Tested by (+ signature) .....: Arturo Ruvalcaba

Test Results – Radiated Disturbances

Table No. 12	Radiated Disturbances	Verdict
		P

Test Method..... : EN 61000-4-3
EUT Configuration ..... : EUT with cables.
Test Height ..... : ☒ Table-Top (0.8m) ☐ Floor-Standing (0.1m)
Test Location ..... : Lab 5
Test Date ..... : 7-Feb-13
Temperature ..... : 21.2°C
Relative Humidity ..... : 56.4 %
Test Equipment Asset Tag List : 412,1310,1770,1793,1862,1765

Test Parameters:

Test Level ..... :

per EN 61326-1:	80 MHz to 1 GHz	1.4 GHz – 2 GHz	2 GHz – 2.7 GHz
☒ Clause 6.2 – Table 1	3 V/m	3 V/m	1 V/m
☐ Clause 6.2 – Table 2	10 V/m	3 V/m	1 V/m
☐ Clause 6.2 – Table 3	1 V/m	1 V/m	1 V/m
☐ Annex A – Table A.1	3 V/m	3 V/m	1 V/m

Dwell Time ..... : 3 seconds
Step Size ..... : 1%

Test Results: Minimum Performance Criteria: A

Frequency Range(s)	Polarity (H/V)	Position	Result	Verdict	Comment
80 MHz to 1 GHz	☒ H ☒ V	Front	A	P	
	☒ H ☒ V	Rear	A	P	
	☒ H ☒ V	Left	A	P	
	☒ H ☒ V	Right	A	P	
1.4 GHz – 2 GHz	☒ H ☒ V	Front	A	P	
	☒ H ☒ V	Rear	A	P	
	☒ H ☒ V	Left	A	P	
	☒ H ☒ V	Right	A	P	
2 GHz – 2.7 GHz	☒ H ☒ V	Front	A	P	
	☒ H ☒ V	Rear	A	P	
	☒ H ☒ V	Left	A	P	
	☒ H ☒ V	Right	A	P	

Supplemental Information:

Tested by (+ signature) .....: Arturo Ruvalcaba

Test Results – Conducted Disturbances

Table No. 13	Conducted Disturbances	Verdict
		P

Test Method..... : EN 61000-4-6
EUT Configuration ..... : EUT with cables.
Test Location ..... : Lab 5
Test Date ..... : 6-Feb-13
Temperature ..... : 21.2°C
Relative Humidity ..... : 49.1 %
Test Equipment Asset Tag List : 1182,1448,1635,715,1548

Test Parameters:

Test Level ..... : ☒ 3V (Clause 6.2 – Tables 1 & 2) ☐ 1V (Clause 6.2 – Table 3)
Dwell Time ..... : 3 seconds
Frequency Step Size..... : 1%

Test Results: Minimum Performance Criteria: A

	Cable	Length (m)	Frequency Range	Result	Verdict	Comment
A	AC power cord	1	150 kHz – 80 MHz	A	P	
B	Ethernet cable	1	150 kHz – 80 MHz	A	P	
C	HDMI cable	1	150 kHz – 80 MHz	A	P	
D			150 kHz – 80 MHz		NT	
E			150 kHz – 80 MHz		NT	
F			150 kHz – 80 MHz		NT	
G			150 kHz – 80 MHz		NT	
H			150 kHz – 80 MHz		NT	
I			150 kHz – 80 MHz		NT	
J			150 kHz – 80 MHz		NT	
K			150 kHz – 80 MHz		NT	

Supplemental Information:

Tested by (+ signature) .....: Arturo Ruvalcaba

Test Results – Surges

Table No. 14	Surge	Verdict
		P

Test Method..... : EN 61000-4-5 (Levels per EN 61326-1 Clause 6.2 – Table 1)
EUT Configuration ..... : EUT with cables.
Test Location ..... : Lab 5
Test Date ..... : 6-Feb-13
Temperature ..... : 21.2°C
Relative Humidity ..... : 49.1 %
Test Equipment Asset Tag List : 585

Test Results: DC = Direct Coupling CN = Coupling Network

	Port[1]	+2	-2	Levels[1] (kV) +1	-1	+0.500	-0.500	+0.250	-0.250	Coupling	Verdict
AC Power Input[2]		---	---	---	---	---	---	---	---	---	---
1	Line to RGP	N/A	N/A	A	A	A	A	A	A	CN	P
2	Neutral to RGP	N/A	N/A	A	A	A	A	A	A	CN	P
3	Protective Earth to RGP	N/A	N/A	A	A	A	A	A	A	CN	P
4	Line to Neutral	N/A	N/A	N/A	N/A	A	A	A	A	CN	P
5	Line to Protective Earth	N/A	N/A	A	A	A	A	A	A	CN	P
6	Neutral to Protective Earth	N/A	N/A	A	A	A	A	A	A	CN	P
7	Line, Neutral, & Protective Earth to RGP	N/A	N/A	A	A	A	A	A	A	CN	P
DC Power Input		---	---	---	---	---	---	---	---	---	---
1	Positive to RGP	N/A	N/A							CN	N/A
2	Negative to RGP	N/A	N/A							CN	N/A
3	Positive & Negative to RGP	N/A	N/A	N/A	N/A					CN	N/A
I/O Signal/Control[3]		---	---	---	---	---	---	---	---	---	---
1		N/A	N/A							DC	N/A
2		N/A	N/A							DC	N/A
3		N/A	N/A							DC	N/A
4		N/A	N/A							DC	N/A

1. Five positive and five negative pulses for each test voltage were applied.
2. Pulses applied at phase angles of 0°, 90°, 180°, and 270°.
3. Only applicable to ports directly connected to outdoor cables. Surge applied from all lines simultaneously to the RGP.

Supplemental Information:

EUT is not a DC device.
EUT has no shielded cables.

Tested by (+ signature) .....: Arturo Ruvalcaba

Test Results – Voltage Dips & Interruptions

Table No. 15	Voltage Dips and Interruptions	Verdict
		P

Test Method..... : EN 61000-4-11
EUT Configuration ..... : EUT with cables.
Power Frequency ..... : ☒ 50 Hz ☐ 60 Hz
Test Location ..... : Lab 5
Test Date ..... : 7-Feb-13
Temperature ..... : 21.2°C
Relative Humidity ..... : 56.4 %
Test Equipment Asset Tag List : 1647

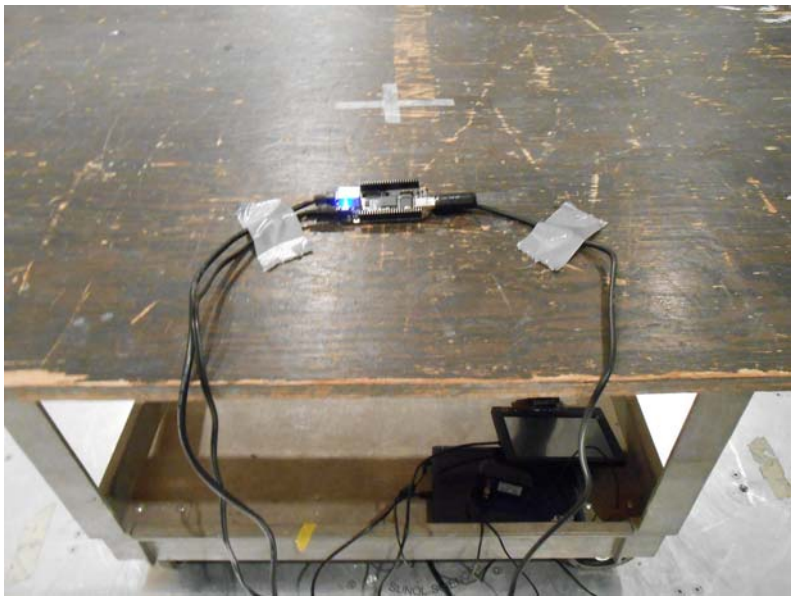
Reduction	Duration	Result	Minimum Performance Criteria	Verdict	Comment
☒ EN 61326-1 Clause 6.2, Table 1					
100%	½ cycle	A	B	P	
100%	1 cycle	A	B	P	
30%	☒ 25 cycles (50 Hz) ☐ 30 cycles (60 Hz)	A	C	P	
100%	☒ 250 cycles (50 Hz) ☐ 300 cycles (60 Hz)	C	C	P	
☐ EN 61326-1 Clause 6.2, Table 2					
100%	1 cycle		B	NT	
60%	☐ 10 cycles (50 Hz) ☐ 12 cycles (60 Hz)		C	NT	
30%	☐ 25 cycles (50 Hz) ☐ 30 cycles (60 Hz)		C	NT	
100%	☐ 250 cycles (50 Hz) ☐ 300 cycles (60 Hz)		C	NT	
☐ EN 61326-1 Clause 6.2, Table 3					
100%	½ cycle		B	NT	

Supplemental Information:

Tested by (+ signature) .....: Arturo Ruvalcaba

Setup Photos

Photo 4	Test Setup – Radiated Emissions	



Supplemental Information:

Photo 5	Test Setup – Conducted Emissions	

Supplemental Information:

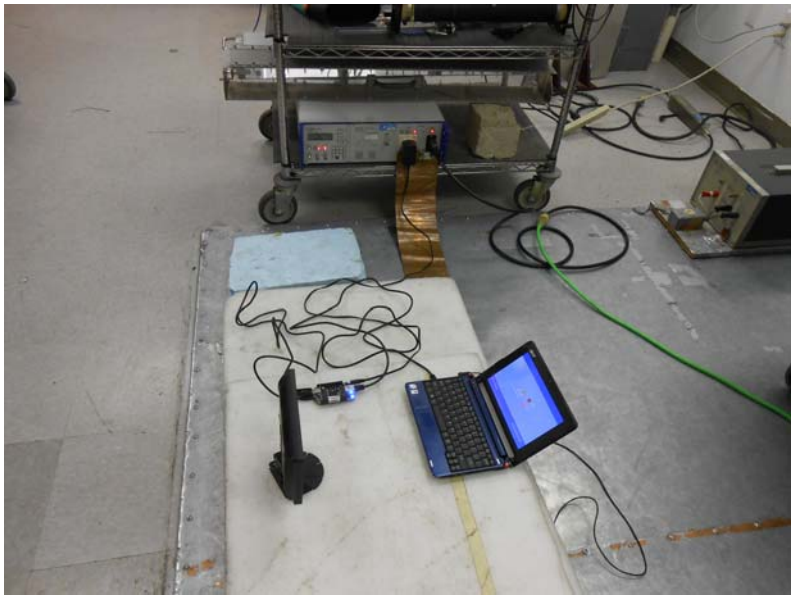
Photo 6	**Test Setup – Harmonics & Flicker**	

Supplemental Information:

Photo 7	**Test Setup – Electrostatic Discharge (ESD)**	

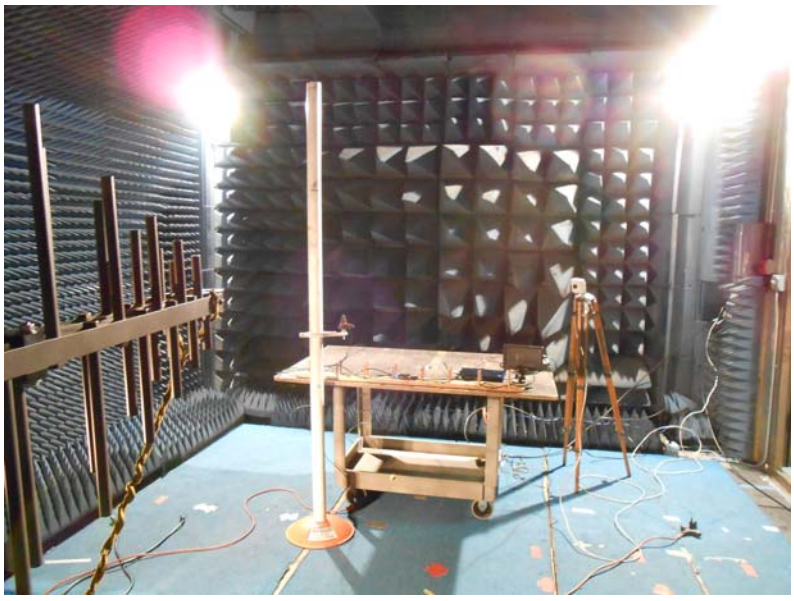
Supplemental Information:

Photo 8	Test Setup – Electrical Fast Transients (EFT)	



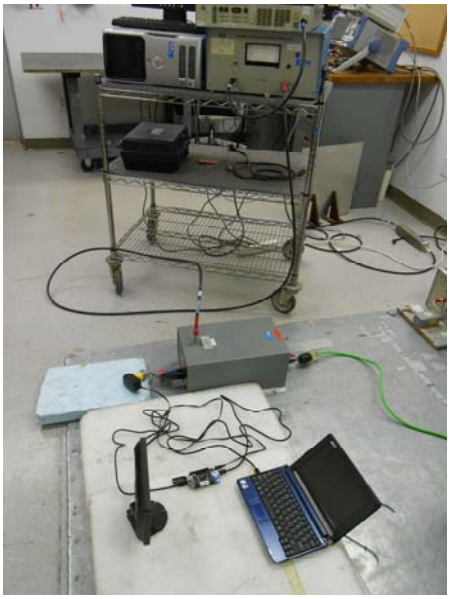
Supplemental Information:

Photo 9	Test Setup – Radiated Disturbances	



Supplemental Information:

Photo 10	Test Setup – Conducted Disturbances	



Supplemental Information:

Photo 11	Test Setup – Surges	

Supplemental Information:

Photo 12	**Test Setup – Voltage Dips and Interruptions**	

Supplemental Information: