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## TEST REPORT

FCC Part 15  
Radio Frequency Devices  
Subpart B – Unintentional Radiators

ICES-003  
Digital Apparatus

Report Reference No. .... : 10238105EUS1

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

Approved by (+ signature) ..... : Brian Boyea

Date of issue ..... : 8-Feb-13

Report Revision ..... : 0

Total number of pages ..... : 30

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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 ..... : FCC Part 15, Subpart B & ICES-003, Issue 4 (Feb-2004)

Test procedure ..... : CCA

Non-standard test method ..... : N/A

TRF Revision ..... : 30-Jul-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.

## Responsible Party:

In accordance with 47 CFR 2.995(x), record retention under verification authorization procedure, or 47 CFR 2.1075(x), record retention under declaration of conformity authorization procedure, the name and signature of an official of the responsible party, as designated in 47 CFR 2.909 shall appear on the report. The following signature block is provided for this purpose.

Signature:	
Name:	

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## Normative References

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

Code of Federal Regulations – Title 47 – Telecommunications, Part 15 – Radio Frequency Devices

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

ANSI C63.4:2009 [*informative only*]

Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz [KDB No. 704992 dated 10-Mar-2010]

CISPR-22:2003

Information Technology Equipment—Radio Disturbance Characteristics—Limits and Methods of Measurement [47 CFR 15.31(a)(3) excludes clauses 4.1.5.2, 5.7, 9, & 14 and specifies test method as ANSI C63.4] [ICES-003, clause 5, *Limits*, does not include conducted emissions on telecommunications ports]

ICES-003 (Issue 4, Feb-2004)

Digital Apparatus

CAN/CSA-CEI/IEC CISPR 22:02

Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment

## Equipment Under Test (EUT)

### Details:

#### Test item description:

Model ..... : BB-BBLK-000

Serial Number ..... : 0113BBBK0090 Rev 4

Production Status ..... : ☐ Production ☒ Pre-Production ☐ Prototype

Other Status Info ..... : none

EUT Received Date ..... : 5-Feb-13

Ratings ..... : 120VAC, 60 Hz ☒ 1 $\phi$  ☐ 3 $\phi$ 

#### 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

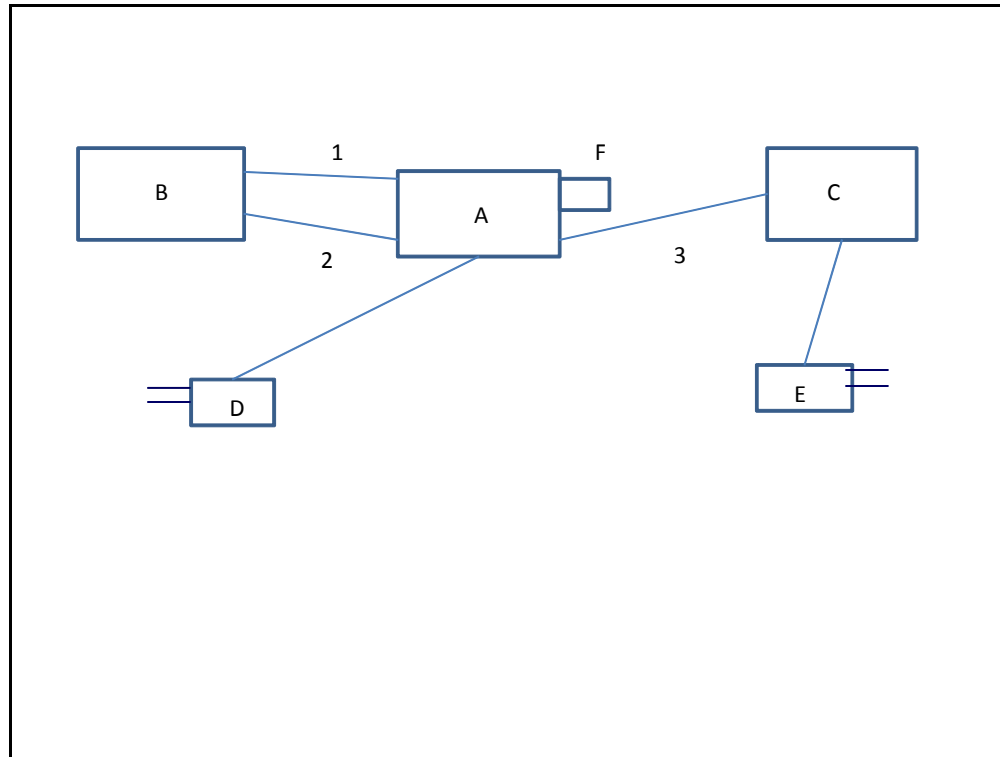
A minimum representative configuration, as defined by the manufacturer, has been used for the testing performed herein. The selection of hardware (including interface ports), software, and cables were chosen by the manufacturer as being representative of the product's intended use. The interconnection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

The arrangement of external power supply units was as follows:

- If the mains input cable of the external power supply unit is greater than 0,8 m, the external power supply unit shall be placed on the tabletop, with a nominal 0,1 m separation from the host unit.
- If the external power supply unit has a mains input cable that is less than 0,8 m, the external power supply unit shall be placed at a height above the ground plane such that its power cable is fully extended in the vertical direction.
- If the external power supply unit is incorporated into the mains power plug, it shall be placed on the tabletop. An extension cable shall be used between the external power supply unit and the source of power. The extension cable should be connected in a manner such that it takes the most direct path between the external power supply unit and the source of power.

*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

**EUT Photo(s)**

Photo 1

**EUT Photo – Front/Top View****Supplemental Information:**

Photo 2

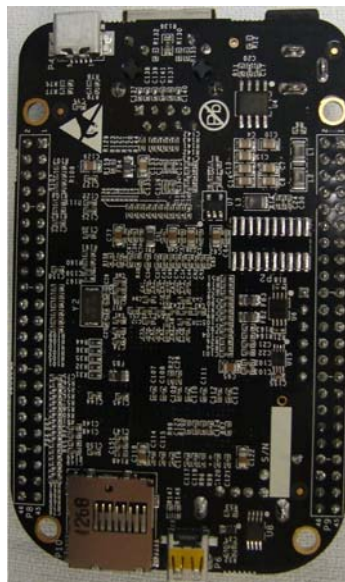
**EUT Photo – Rear/Side View****Supplemental Information:**



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-Feb-2013

Class ..... : ☐ A ☒ B

Clause	Test Description	Verdict	Comment
47 CFR			
15.107	Conducted Emissions - Mains	P	
15.109	Radiated Emissions <input checked="" type="checkbox"/> Using CISPR-22 Limit per 15.109(g) <input type="checkbox"/> Using FCC Limits per 15.109(a) or 15.109(b)	P	
ICES-003			
5.2 or 5.3	Conducted Emissions - Mains	P	
5.4 or 5.5	Radiated Emissions	P	

### Notes:

### General remarks:

### Summary of compliance with national requirements:

Compliance with this standard provides a means of conformity with the United States Federal Communication Commission (FCC) verification, certification, or declaration of conformity authorization procedures and Industry Canada (IC) rules.



### 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.

## Procedural Requirements

The following requirements are taken from the appropriate rules, other rules may apply and the manufacturer should consult the full text of the appropriate laws prior to marketing any device.

### United States

Mandated procedures for digital devices are defined in 47 CFR 15.101, *Equipment authorization of unintentional radiators*. Details of the authorization procedures (verification, declaration of conformity, and certification) can be found in 47 CFR, Part 2, Subpart J, *Equipment Authorization Procedures*.

### Canada

Clause 6 of ICES-003 contains the procedural requirements.

**6.1:** A record of the measurements and results, showing the date that the measurements were completed, shall be retained by the manufacturer or importer for a period of at least five years from the date shown in the record and made available for examination on the request of the Minister.

**6.2:** A written notice indicating compliance must accompany each unit of digital apparatus to the end user. The notice shall be in the form of a label that is affixed to the apparatus. Where because of insufficient space or other constraints it is not feasible to affix a label to the apparatus, the notice may be in the form of a statement included in the user's manual. A suggested text for the notice, in English and in French, is provided in the Annex.

## Information to the User and Labeling Requirements

The following requirements are taken from the appropriate rules, other rules may apply and the manufacturer should consult the full text of the appropriate laws prior to marketing any device.

### **United States**

47 CFR 15.19(a)(1): Receivers associated with the operation of a licensed radio service shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

47 CFR 15.19(a)(2): A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with part 15 of the FCC Rules for use with cable television service.

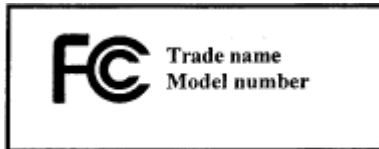
47 CFR 15.19(a)(3): All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

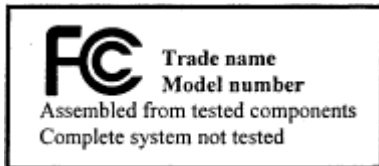
47 CFR 15.19(a)(5): When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

47 CFR 15.19(b): Products subject to authorization under a Declaration of Conformity shall be labeled as follows:

47 CFR 15.19(b)(1): The label shall be located in a conspicuous location on the device and shall contain the unique identification described in 47 CFR 2.1074 (*Devices subject only to a Declaration of Conformity shall be uniquely identified by the responsible party. This identification shall not be of a format which could be confused with the FCC Identifier required on certified, notified, type accepted or type approved equipment. The responsible party shall maintain adequate identification records to facilitate positive identification for each device.*) of this chapter and [one of] the following logo[s]:



(i) If the product is authorized based on testing of the product or system; or



(ii) If a personal computer is authorized based on assembly using separately authorized components, in accordance with §15.101(c)(2) or (c)(3), and the resulting product is not separately tested:

47 CFR 15.19(b)(2) Label text and information should be in a size of type large enough to be readily legible, consistent with the dimensions of the equipment and the label. However, the type size for the text is not required to be larger than eight point.

47 CFR 15.19(b)(3): When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (b)(1) of this section on it, such as for a CPU board or a plug-in circuit board peripheral device, the text associated with the logo may be placed in a prominent location in the instruction manual or pamphlet supplied to the user. However, the unique identification (trade name and model number) and the logo must be displayed on the device.

47 CFR 15.19(b)(4): The label shall not be a stick-on, paper label. The label on these products shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase, as described in §2.925(d) of this chapter. "Permanently affixed" means that the label is etched, engraved, stamped, silkscreened, indelibly printed, or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic, or other material fastened to the equipment by welding, riveting, or a permanent adhesive. The label must be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable.

47 CFR 15.21: The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

47 CFR 15.105(a): For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

47 CFR 15.105(b): For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## Canada

ICES-003 suggests the following text for the notice indicating compliance:

This Class [\*] digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe [\*] est conforme à la norme NMB-003 du Canada.

## Technical Requirements

The testing requirements, as appropriate, were derived from ANSI C63.4; 47 CFR, Subpart A; and CISPR-22.

## 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 15.31(f)(1), to normalize the measured data to the specified test distance for determining compliance.

*Table 5 – Highest Measurement Frequency*

Highest EUT Clock	Highest Measurement
Below 1.705 MHz	30 MHz
1.705 MHz – 108 MHz	1 GHz
108 MHz – 500 MHz	2 GHz
500 MHz – 1 GHz	5 GHz
Above 1 GHz	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

### 30 MHz to 1 GHz

Reading on the measuring receiver showing fluctuations close to the limit, were observed for at least 15 s at each measurement frequency; the highest reading was recorded.

*Table 6 – Radiated Emissions Limits per 47 CFR 15.109(a) & (b) (30 MHz to 1 GHz)*

Frequency Range	3m		10m	
	Class A <sup>2</sup> (dB $\mu$ V/m)	Class B <sup>1</sup> (dB $\mu$ V/m)	Class A <sup>2</sup> (dB $\mu$ V/m)	Class B <sup>1</sup> (dB $\mu$ V/m)
30 MHz – 88 MHz	49.1	40.0	39.1	30.0
88 MHz – 216 MHz	53.5	43.5	43.5	33.5
216 MHz – 960 MHz	56.4	46.0	46.4	56.0
Note: The lower limit applies at the transition frequency. 1 Specified at a test distance of 3m 2 Specified at a test distance of 10m				

*Table 7 – Radiated Emissions Limits per 47 CFR 15.109(g) (30 MHz to 1 GHz)*

Frequency Range	3m		10m	
	Class A (dB $\mu$ V/m)	Class B (dB $\mu$ V/m)	Class A (dB $\mu$ V/m)	Class B (dB $\mu$ V/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.				

### Above 1 GHz

*Table 8 - Radiated Emissions Limits per 47 CFR 15.109(a) & (b) @ 3m (1 GHz – 6 GHz)*

Frequency Range	Class A (dB $\mu$ V/m)		Class B (dB $\mu$ V/m)	
	Average	Peak	Average	Peak
960 MHz – 40 GHz	60	80	54	74



*Table 9 - Radiated Emissions Limits per 47 CFR 15.109(g) @ 3m (1 GHz – 6 GHz)*

Frequency Range	Class A (dB $\mu$ V/m)		Class B (dB $\mu$ V/m)	
	Average	Peak	Average	Peak
1 GHz – 3 GHz	56	76	50	70
3 GHz – 6 GHz	60	80	54	74

## 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 0.8m 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 centre 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.

All telecommunication and signal ports were correctly terminated using either appropriate associated equipment or a representative termination during the measurement of the conducted disturbances at the mains. If an ISN is connected to a telecommunications port during the measurement of conducted disturbances at the mains port, then the ISN receiver port was terminated in 50 $\Omega$ . The ISNs were at least 0.8m away from the EUT.

## Mains

Any power cable(s) from the equipment under test that were directly connected to the AC Mains have been tested. In the event that the equipment under test had no direct connection to the Mains, that is, it was connected to a Host unit (example: USB powered); then conducted emissions was performed on the Mains of the Host unit. Battery powered equipment was not tested for conducted emissions; however, if the equipment makes provisions for connections to a battery charger that is connected to the Mains, then conducted emissions were performed on the battery charger.

*Table 10 – Class A Conducted Emissions Limits - Mains*

Frequency	Limits (dB $\mu$ V)	
	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 11 – Class B Conducted Emissions Limits - Mains*

Frequency	Limits (dB $\mu$ V)	
	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.		

## Measurement Uncertainty

Determining compliance with the limits in these standards was based on the results of the measurement, and does not take into account the measurement instrumentation uncertainty.

Referencing the measurement instrumentation uncertainty considerations contained in CISPR 16-4-2, the expanded measurement uncertainty is  $\pm 4.90$  dB for radiated emissions,  $\pm 3.46$  dB for mains conducted emissions, and  $\pm 4.31$  dB for telecommunication ports conducted emissions.

## List of Test Equipment

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

*Table 12 – 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
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
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	23-Jul-2012	23-Jul-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
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
1783	Cable Assy, 3m Chamber	Nemko	Chamber		26-Sep-2012	26-Sep-2013
1923	.5m Cable	Nemko USA	1923 RG 214	1	14-Feb-2012	14-Feb-2013
1924	3m Cable	Nemko USA	1924 RG 214	1	21-Jan-2013	21-Jan-2014

## **Test Results – Radiated Emissions (below 1 GHz)**

Table No. 1	Radiated Emissions	Verdict
		P

Frequency Range ..... : 30 MHz to 1 GHz      Test Location ..... : 3m Chamber

Test Method..... : 47 CFR 15.109 & ICES-003 clauses 5.4/5.5

Test Distance ..... : 3m

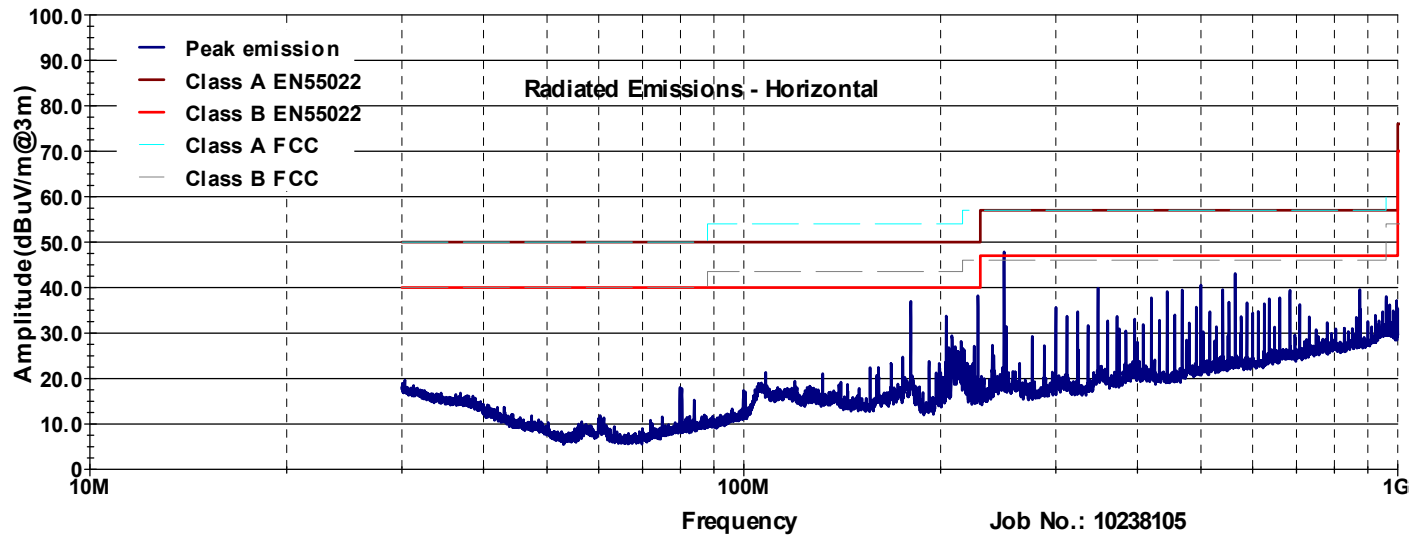
EUT Configuration ..... : EUT with cables.

Test Date ..... : 5-Feb-13

Temperature ..... : 21.5°C

Relative Humidity .... : 46 %

Test Equipment Asset Tag List : 1,1025,1763,1767,1783



(1)	(2)	(3)	(6)	(7)	(8)	(9)	(10)	(11)
Antenna Polarity (H/V)	Detector	Frequency (MHz)	Receiver Reading (dBuV/m)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	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..... : 47 CFR 15.109 & ICES-003 clauses 5.4/5.5

Test Distance ..... : 3m

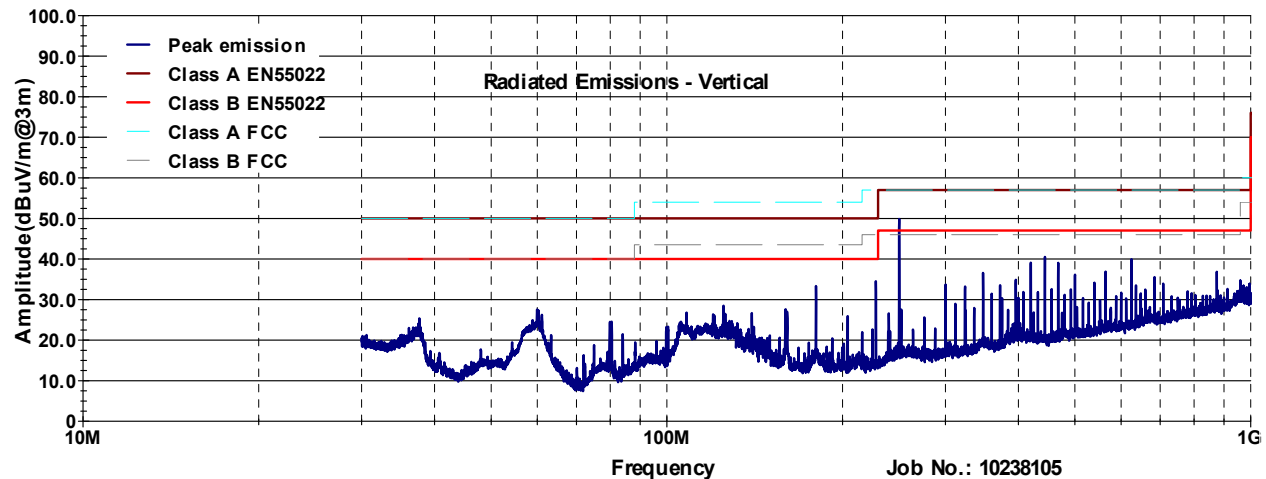
EUT Configuration ..... : EUT with cables.

Test Date ..... : 5-Feb-13

Temperature ..... : 21.5°C

Relative Humidity .... : 41 %

Test Equipment Asset Tag List : 1,1025,1763,1767,1783



(1)	(2)	(3)	(6)	(7)	(8)	(9)	(10)	(11)
Antenna Polarity (H/V)	Detector	Frequency (MHz)	Receiver Reading (dBuV/m)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	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:

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## **Test Results – Radiated Emissions (above 1 GHz)**

Table No. 3	Radiated Emissions	Verdict
		P

Frequency Range ..... : 1 GHz to 6 GHz      Test Location ..... : 3m Chamber

Test Method..... : 47 CFR 15.109 & ICES-003 clauses 5.4/5.5

Test Distance ..... : 3m

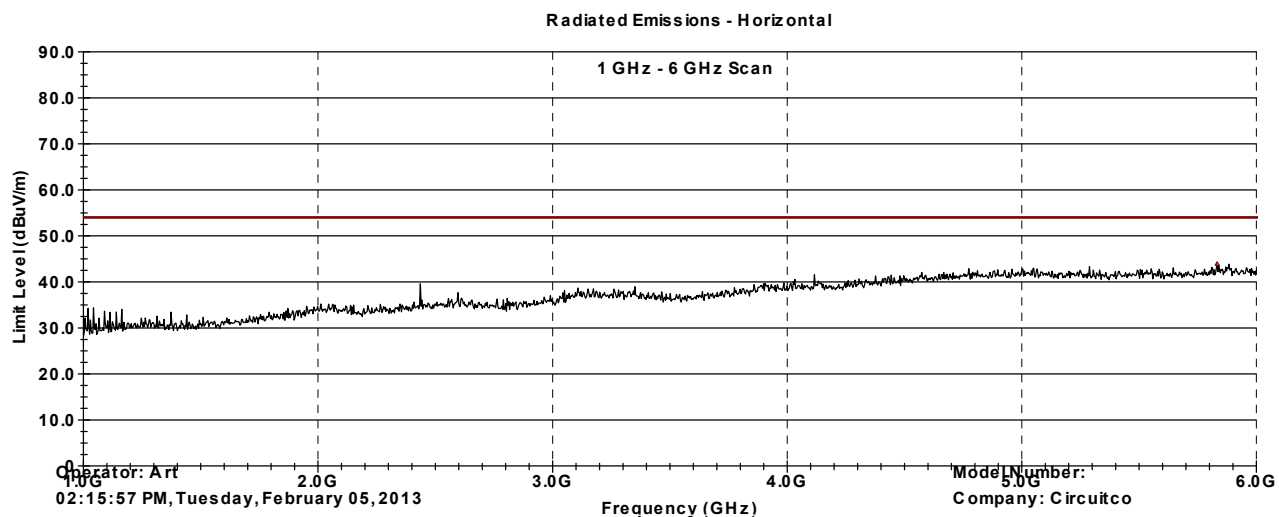
EUT Configuration ..... : EUT with cables.

Test Date ..... : 5-Feb-13

Temperature ..... : 21.5°C

Relative Humidity .... : 46 %

Test Equipment Asset Tag List : 1,1016,1310,1767,1783



(1)	(2)	(3)	(8)	(9)	(10)	(11)
Antenna Polarity (H/V)	Detector	Frequency (GHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pass/Fail
H	Peak	1.0000	30.0	54.0	24.0	Pass
H	Peak	3.0000	36.0	54.0	18.0	Pass
H	Peak	6.0000	42.0	54.0	12.0	Pass

#### Supplemental Information:

No measurable signals were detected. Noise floor readings were taken.

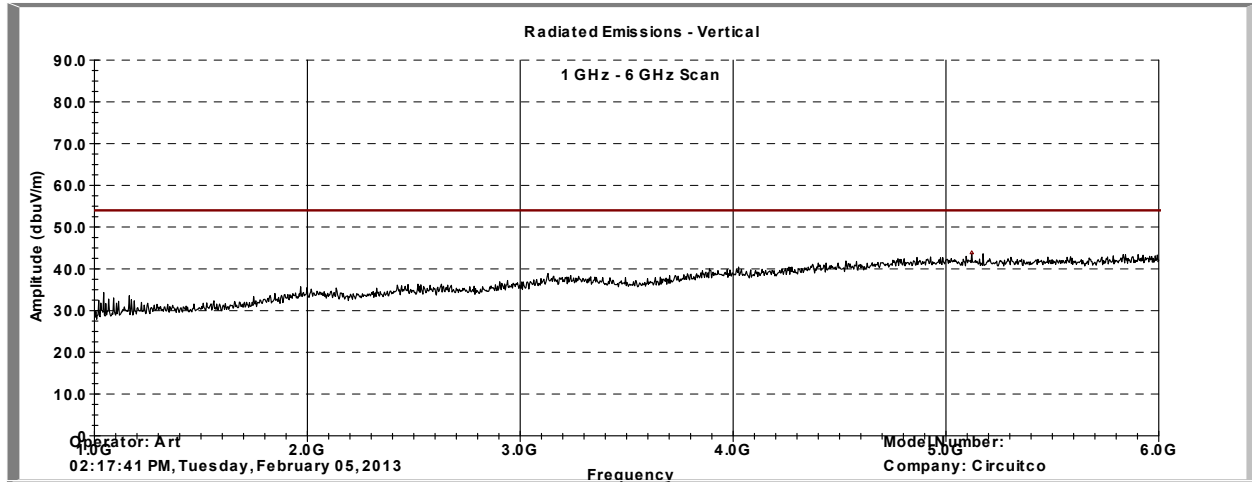
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Table No. 4	Radiated Emissions	Verdict
		P

Frequency Range ..... : 1 GHz to 6 GHz      Test Location ..... : 3m Chamber  
 Test Method..... : 47 CFR 15.109 & ICES-003 clauses 5.4/5.5  
 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 : 1,1016,1310,1767,1783



(1)	(2)	(3)	(8)	(9)	(10)	(11)
Antenna Polarity (H/V)	Detector	Frequency (GHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pass/Fail
V	Peak	1.0000	30.0	54.0	24.0	Pass
V	Peak	3.0000	35.0	54.0	19.0	Pass
V	Peak	6.0000	42.0	54.0	12.0	Pass

#### Supplemental Information:

No measurable signals were detected. Noise floor readings were taken.

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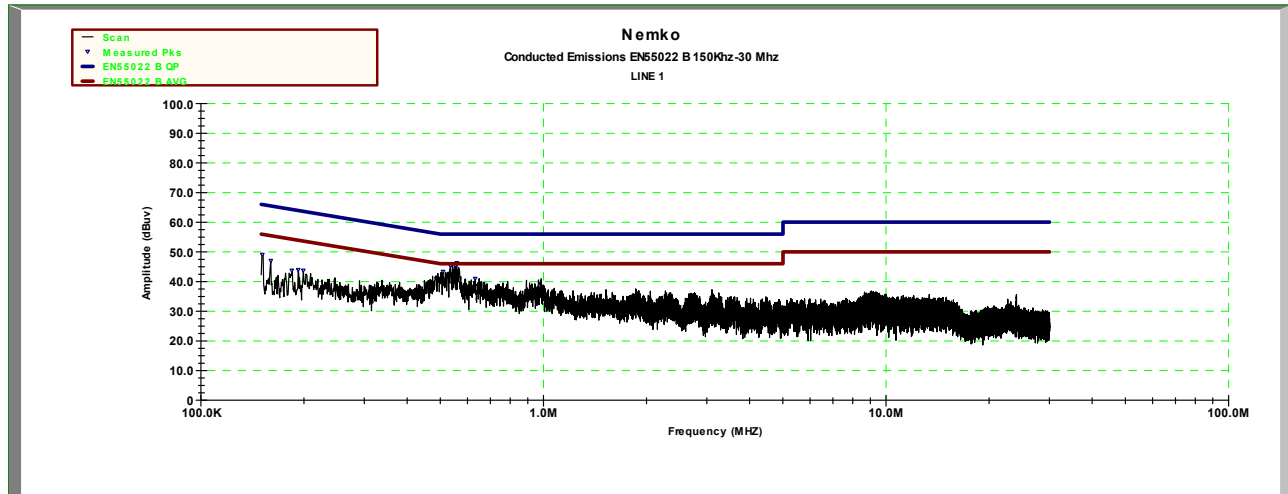


## **Test Results – Conducted Emissions – Mains**



Table No. 5	Conducted Emissions - Mains	Verdict
		P

Frequency Range .....: 150 kHz to 30 MHz Test Location .....: Lab 5  
 Test Method.....: 47 CFR 15.107 & ICES-003 clauses 5.2/5.3  
 EUT Configuration .....: EUT with cables.  
 Power Input.....: 120VAC, 60 Hz ☒ 1 $\phi$  ☐ 3 $\phi$  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)  Frequency (MHz)	(4)	(5)	(6)	(7)	(8)	(9)	(10)  Pass/ Fail
	Quasi-Peak			Average			
	Peak Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	Peak Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	
0.1512	49.1	66.0	16.9	49.1	56.0	6.9	Pass
0.1600	47.0	65.7	18.7	47.0	55.7	8.7	Pass
0.1842	43.7	65.0	21.3	43.7	55.0	11.3	Pass
0.1923	44.0	64.8	20.8	44.0	54.8	10.8	Pass
0.1991	43.7	64.6	20.9	43.7	54.6	10.9	Pass
0.5088	43.4	56.0	12.6	43.4	46.0	2.6	Pass
0.5356	45.2	56.0	10.8	45.2	46.0	0.8	Pass
0.5524	45.4	56.0	10.6	45.4	46.0	0.6	Pass
0.5586	46.3	56.0	9.7	46.3	46.0	0.3	Pass
0.6320	40.9	56.0	15.1	40.9	46.0	5.1	Pass

**Supplemental Information:**

This is data from the optional 5VDC power supply.

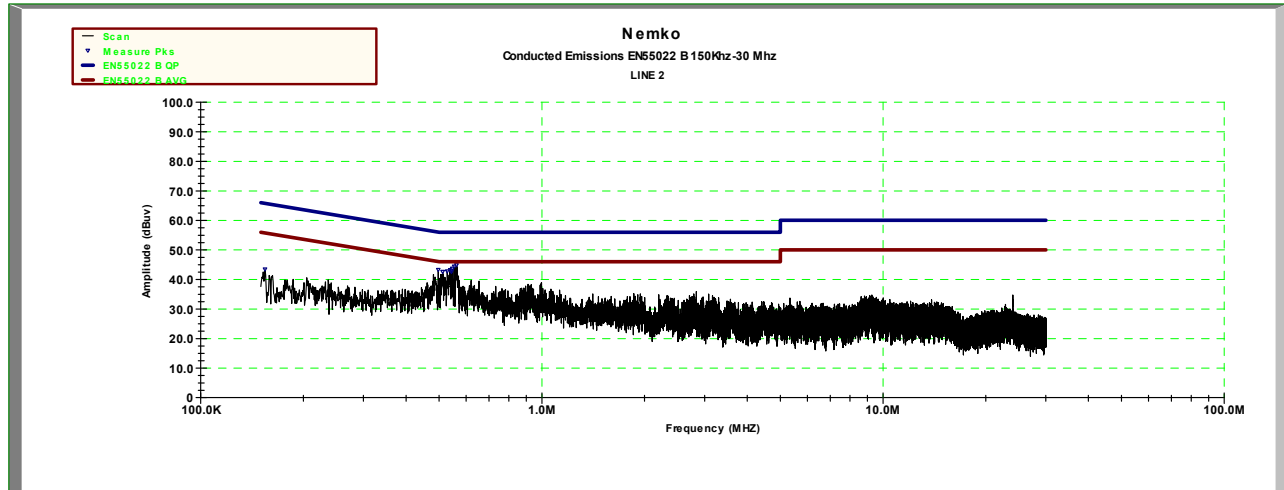
Tested by (+ signature) .....

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Table No. 6	Conducted Emissions - Mains	Verdict
		P

Frequency Range .....: 150 kHz to 30 MHz      Test Location .....: Lab 5  
 Test Method.....: 47 CFR 15.107 & ICES-003 clauses 5.2/5.3  
 EUT Configuration .....: EUT with cables.  
 Power Input.....: 120VAC, 60 Hz    ☒ 1 $\phi$     ☐ 3 $\phi$       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)  Frequency (MHz)	(4)	(5)	(6)	(7)	(8)	(9)	(10)  Pass/ Fail
	Quasi-Peak			Average			
	Peak Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	Peak Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	
0.1544	43.5	65.9	22.4	43.5	55.9	12.4	Pass
0.4970	43.3	56.1	12.8	43.3	46.1	2.8	Pass
0.5119	42.6	56.0	13.4	42.6	46.0	3.4	Pass
0.5281	42.8	56.0	13.2	42.8	46.0	3.2	Pass
0.5387	43.2	56.0	12.8	43.2	46.0	2.8	Pass
0.5430	42.6	56.0	13.4	42.6	46.0	3.4	Pass
0.5449	43.2	56.0	12.8	43.2	46.0	2.8	Pass
0.5461	43.7	56.0	12.3	43.7	46.0	2.3	Pass
0.5530	44.4	56.0	11.6	44.4	46.0	1.6	Pass
0.5617	44.9	56.0	11.1	44.9	46.0	1.1	Pass

**Supplemental Information:**

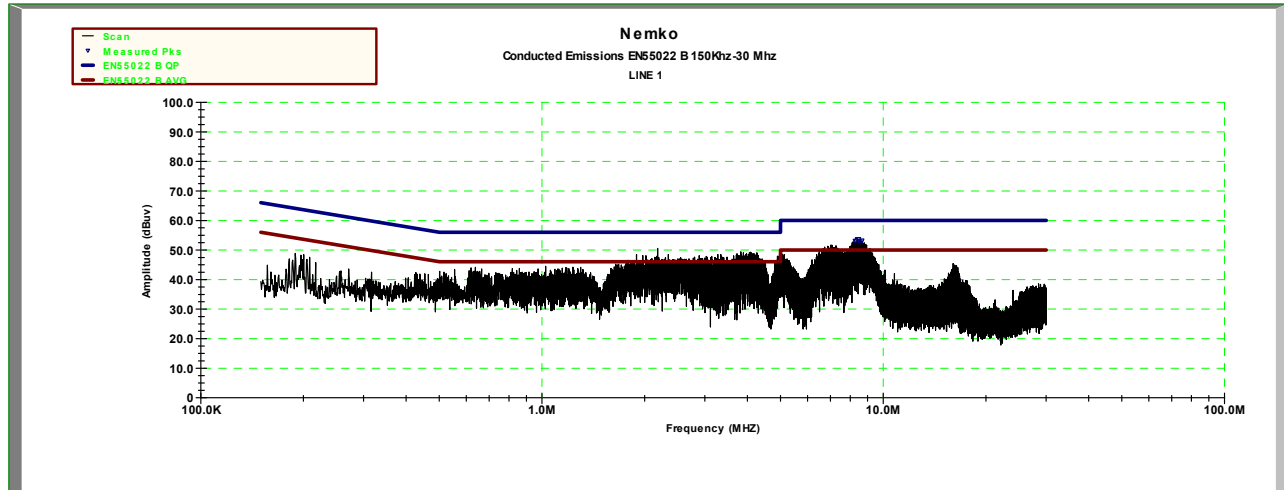
This is data from the optional 5VDC power supply.



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Table No. 7	Conducted Emissions - Mains	Verdict
		P

Frequency Range .....: 150 kHz to 30 MHz      Test Location .....: Lab 5  
 Test Method.....: 47 CFR 15.107 & ICES-003 clauses 5.2/5.3  
 EUT Configuration .....: EUT with cables.  
 Power Input.....: 120VAC, 60 Hz    ☒ 1 $\phi$     ☐ 3 $\phi$       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)  Frequency (MHz)	(4)	(5)	(6)	(7)	(8)	(9)	(10)  Pass/ Fail
	Quasi-Peak			Average			
	Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	
8.1814	47.1	60.0	13.0	35.9	50.0	14.2	Pass
8.3161	47.4	60.0	12.6	37.2	50.0	12.8	Pass
8.3249	47.5	60.0	12.5	37.2	50.0	12.8	Pass
8.3678	47.7	60.0	12.3	37.3	50.0	12.7	Pass
8.3716	47.6	60.0	12.4	37.6	50.0	12.4	Pass
8.5414	47.6	60.0	12.4	36.7	50.0	13.3	Pass
8.5418	47.4	60.0	12.6	37.4	50.0	12.6	Pass
8.5421	47.3	60.0	12.7	37.2	50.0	12.8	Pass
8.6799	46.6	60.0	13.4	35.6	50.0	14.4	Pass
8.7480	46.5	60.0	13.5	35.6	50.0	14.4	Pass

**Supplemental Information:**

This is data from the host lap top.

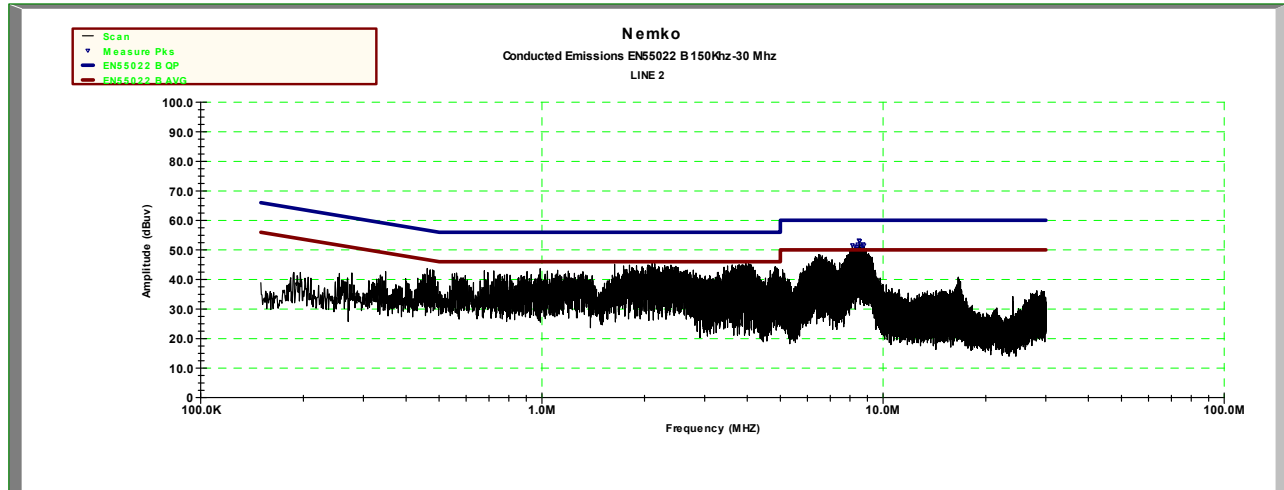


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Table No. 8	Conducted Emissions - Mains	Verdict
		P

Frequency Range .....: 150 kHz to 30 MHz      Test Location .....: Lab 5  
 Test Method.....: 47 CFR 15.107 & ICES-003 clauses 5.2/5.3  
 EUT Configuration .....: EUT with cables.  
 Power Input.....: 120VAC, 60 Hz    ☒ 1 $\phi$     ☐ 3 $\phi$       Line Tested .: Phase A  
 Test Date .....: 6-Feb-13  
 Temperature .....: 21.5°C      Relative Humidity ....: 46 %  
 Test Equipment Asset Tag List : 1923,1924,1188,1663,704,674



(1)  Frequency (MHz)	(4)	(5)	(6)	(7)	(8)	(9)	(10)  Pass/ Fail
	Quasi-Peak			Average			
	Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	Emission Level (dBμV)	Limit (dBμV)	Margin (dB)	
8.1367	45.9	60.0	14.1	35.7	50.0	14.3	Pass
8.3680	46.8	60.0	13.2	37.3	50.0	12.7	Pass
8.3687	47.3	60.0	12.7	37.7	50.0	12.3	Pass
8.5213	47.4	60.0	12.6	37.1	50.0	12.9	Pass
8.5395	47.0	60.0	13.0	37.3	50.0	12.7	Pass
8.5902	47.4	60.0	12.6	37.1	50.0	12.9	Pass
8.6494	47.1	60.0	12.9	37.0	50.0	13.0	Pass
8.6714	47.4	60.0	12.6	37.0	50.0	13.0	Pass
8.6794	47.5	60.0	12.5	37.2	50.0	12.8	Pass
8.7337	46.9	60.0	13.1	37.1	50.0	12.9	Pass

**Supplemental Information:**

This is data from the host Lap top.



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## Setup Photos

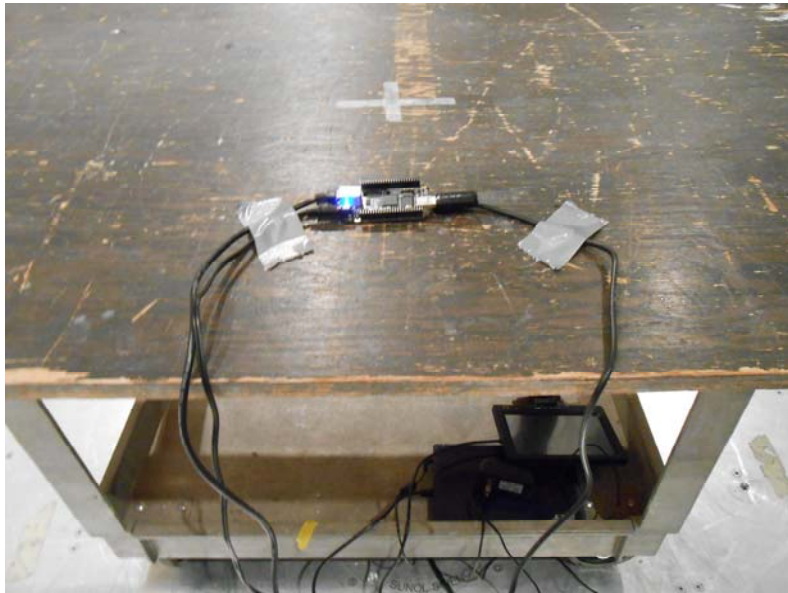

Photo 4	Test Setup – Radiated Emissions	
		
Supplemental Information:		

Photo 5	Test Setup – Conducted Emissions - MAINS	
		
Supplemental Information:		