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Test report

296685-2TRFEMC

Date of issue: January 6, 2016

Applicant:

Dextera Labs Inc.

Product:

Inogeni SDI-to-USB3.0 converter

Model

SDI2USB3

Specifications:

- FCC 47 CFR Part 15, Subpart B – Verification
- ICES-003 Issue 5 August 2012
- EN 55022: 2010 + AC: 2011
- CISPR 22: Edition 6.0 2008-09
- AS/NZS CISPR 22: 2009 + A1: 2010

Lab and test locations

Company name	Nemko Canada Inc.		
Designation number	CA2040		
Facility Name	Ottawa	Montreal	Almonte
Address	303 River Road	292 Labrosse Ave	1500 Peter Robinson Rd.
City	Ottawa	Pointe-Claire	West Carleton
Province	ON	QC	ON
Postal code	K1V 1H2	H9R 5L8	K0A 1L0
Country	Canada	Canada	Canada
Telephone	+1 613 737 9680	+1 514 694 2684	+1 613 256-9117
Facsimile	+1 613 737 9691	+1 514 694 3528	+1 613 256-8848
Toll free	+1 800 563 6336		
Website	www.nemko.com		

Tested by	Avul Nzenza, EMC Specialist
Reviewed by	Andrey Adelberg, Senior Wireless/EMC Specialist
Review date	January 6, 2016
Reviewer signature	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Test specifications

FCC 47 CFR Part 15, Subpart B – Verification	Title 47: Telecommunication; Part 15—Radio Frequency Devices
ICES-003 Issue 5 August 2012	Information Technology Equipment (ITE) – Limits and methods of measurement
EN 55022: 2010 + AC: 2011	Information technology equipment Radio disturbance characteristics Limits and methods of measurement
CISPR 22: Edition 6.0 2008-09	Information technology equipment Radio disturbance characteristics Limits and methods of measurement
AS/NZS CISPR 22: 2009 + A1: 2010	Information technology equipment Radio disturbance characteristics Limits and methods of measurement
EN 61000-3-2: 2014	Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-3: 2013	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

1.2 Exclusions

None

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.4 Test report revision history

Table 1.4-1: *Test report revision history*

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2 Summary of test results

2.1 International test results

Table 2.1-1: *EN 55022: 2010 + AC: 2011, CISPR 22: Edition 6.0 2008-09, AS/NZS CISPR 22: 2009 + A1: 2010 results*

Test description	Verdict
Radiated disturbance [1]	Pass
Conducted disturbance at mains port [1]	Pass [2]
Conducted common mode (asymmetric mode) disturbance at telecommunication ports [1]	Not applicable

Notes: [1] Product classification A
[2] The unit is USB powered from the computer

2.2 North America test results

Table 2.2-1: *FCC 47 CFR Part 15, Subpart B and ICES-003 Issue 5 results*

Test description	Verdict
Radiated disturbance [1]	Pass
Conducted disturbance at mains port [1]	Pass [2]

Notes: [1] Product classification A
[2] The unit is USB powered from the computer

Section 3 Equipment under test (EUT) details

3.1 Applicant

Company name	Dextera
Address	#104 - 3175 ch. Quatre-Bourgeois
City	Quebec
Province/State	Quebec
Postal/Zip code	G1W 2K7
Country	Canada

3.2 Manufacturer

Company name	Dextera
Address	#104 - 3175 ch. Quatre-Bourgeois
City	Quebec
Province/State	Quebec
Postal/Zip code	G1W 2K7
Country	Canada

3.3 Sample information

Receipt date	October 26, 2015
Nemko sample ID number	133-001118

3.4 EUT information

Product name	Inogeni SDI-to-USB3.0 converter
Model	SDI2USB3
Serial number	SD1520021
Part number	SDI2USB3
Power requirements	5V, 530ma
Description/theory of operation	Video processor that converts a SDI video signal to a USB 3.0 stream.
Operational frequencies	50 MHz, 100 MHz, 148.5 MHz and 312 MHz.
Software details	Internal processor code is pre-programmed by factory.

3.5 EUT exercise and monitoring details

The SDI video signal was provided by a SDI test pattern running at a resolution of 1920x1080 @ 60Hz, i.e. a pixel rate of 148.5 MHz (the highest supported pixel rate). The USB 3.0 bus was connected to a laptop computer that captures and displays the real-time video image of the test pattern, which was monitored during testing. The power to the EUT was provided by the USB connection. A copy of the SDI signal is also sent back through the SDI loop of the unit.

3.6 EUT setup details

Table 3.6-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number	Rev.
Inogeni SDI-to-USB3.0 converter	Inogeni	SDI2USB3	SD1520021	1.0

Table 3.6-2: *EUT interface ports*

Description	Qty.
USB 3.0 port	1
SDI input port	1
SDI loop port	1

Table 3.6-3: *Support equipment*

Description	Brand name	Model/Part number	Serial number	Rev.
Laptop	Apple	MAC BOOK AIR / A1465	C02LK2TDF5N7	--
AC adaptor	Apple	ADP-45GDT / A1436	121354-11	--
SDI generator / analyzer	Phabrix	Phabrix SXe/PHSXE	002946	1.0

Table 3.6-4: *Inter-connection cables*

Cable description	From	To	Length (m)
USB 3.0 type-A to type-B	Mac Book Air	SDI2USB3	5
SDI cable (RG6U)	Phabrix SXe/PHSXE	SDI2USB3	5
SDI cable (RG6U)	SDI2USB3	Phabrix SXe/PHSXE	5

Figure 3.6-1: *Setup diagram*

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6 Measurement uncertainty

6.1 Uncertainty of measurement

Nemko Canada Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC measurements; as well as described in UKAS LAB34: The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Section 7 Terms and definitions

7.1 Product classifications definitions

7.1.1 Title 47: Telecommunication – Part 15-Radio Frequency devices, Subpart A – General

Class A digital device	A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.
Class B digital device	A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public. Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

7.1.2 EN 55022, AS/NZS CISPR 22, and CISPR 22

Class B ITE	ITE (Information technology equipment) is intended primarily for use in the domestic environment and may include: – Equipment with no fixed place of use; for example, portable equipment powered by built-in batteries; – Telecommunication terminal equipment powered by a telecommunication network; – Personal computers and auxiliary connected equipment.
Class A ITE	is a category of all other ITE, which satisfies the class A ITE limits but not the class B ITE limits. Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use: 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.

7.1.3 ICES-003

Class B ITE	limits of radio noise for ITE for residential operation
Class A ITE	limits of radio noise for ITE for non-residential operation
Conditions	Only ITE intended strictly for non-residential use in commercial, industrial or business environments, and whose design or other characteristics strongly preclude the possibility of its use in a residential environment, shall be permitted to comply with the less stringent Class A limits. All ITE that cannot meet the conditions for Class A operation shall comply with the Class B limits. The ITE shall comply with both the power line – conducted and the radiated emissions limits within the same Class, with no intermixing.

7.1 Product classifications definitions, continued

7.1.4 EN 61000-3-2

For the purpose of harmonic current limitation, equipment is classified as follows:

Class A	– Balanced three-phase equipment; – Household appliances excluding equipment identified as Class D; – Tools excluding portable tools; – Dimmers for incandescent lamps; – Audio equipment. Equipment not specified in one of the three other classes shall be considered as Class A equipment.
Class B	– Portable tools; – Arc welding equipment, which is not professional equipment.
Class C	– Lighting equipment.
Class D	Equipment having a specified power according to 6.2.2 less than or equal to 600 W, of the following types: – Personal computers and personal computer monitors; – Television receivers.

7.2 General definitions

7.2.1 Title 47: Telecommunication – Part 15-Radio Frequency devices, Subpart A – General

Digital device (Previously defined as a computing device)	An unintentional radiator (device or system) that generates and uses timing signals or pulses at a rate in excess of 9,000 pulses (cycles) per second and uses digital techniques; inclusive of telephone equipment that uses digital techniques or any device or system that generates and uses radio frequency energy for the purpose of performing data processing functions, such as electronic computations, operations, transformations, recording, filing, sorting, storage, retrieval, or transfer. A radio frequency device that is specifically subject to an emanation requirement in any other FCC Rule part or an intentional radiator subject to subpart C of this part that contains a digital device is not subject to the standards for digital devices, provided the digital device is used only to enable operation of the radio frequency device and the digital device does not control additional functions or capabilities. Note: Computer terminals and peripherals that are intended to be connected to a computer are digital devices.

7.2.2 EN 55022, AS/NZS CISPR 22, and CISPR 22

Information technology equipment (ITE)	Any equipment: a) Which has a primary function of either (or a combination of) entry, storage, display, retrieval, transmission, processing, switching, or control, of data and of telecommunication messages and which may be equipped with one or more terminal ports typically operated for information transfer; b) With a rated supply voltage not exceeding 600 V. It includes, for example, data processing equipment, office machines, electronic business equipment and telecommunication equipment.
Telecommunications/network port	Point of connection for voice, data and signaling transfers intended to interconnect widely dispersed systems via such means as direct connection to multi-user telecommunications networks (e.g. public switched telecommunications networks (PSTN) integrated services digital networks (ISDN), x-type digital subscriber lines (xDSL), etc.), local area networks (e.g. Ethernet, Token Ring, etc.) and similar networks NOTE A port generally intended for interconnection of components of an ITE system under test (e.g. RS-232, IEEE Standard 1284 (parallel printer), Universal Serial Bus (USB), IEEE Standard 1394 (“Fire Wire”), etc.) and used in accordance with its functional specifications (e.g. for the maximum length of cable connected to it), is not considered to be a telecommunications/network port under this definition.

7.2.1 ICES-003

Information technology equipment (ITE)	Information Technology Equipment (ITE) is defined as devices or systems that use digital techniques for purposes such as data processing and computation. ITE is any unintentional radiator (device or system) that generates and/or uses timing signals or pulses having a rate of at least 9 kHz and employs digital techniques for purposes such as computation, display, data processing and storage, and control.

7.2.2 EN 61000-3-3

Voltage fluctuation	Series of changes of r.m.s voltage evaluated as a single value for each successive half-period between zero-crossings of the source voltage.
Flicker	Impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.
Short-term flicker indicator, *P*st	The flicker severity evaluated over a short period (in minutes); *P*st = 1 is the conventional threshold of irritability.
Long-term flicker indicator, *P*lt	The flicker severity evaluated over a long period (a few hours) using successive *P*st values.

Section 8 Testing data

8.1 Radiated disturbance

8.1.1 References

CISPR 22 and ANSI C63.4-2009

8.1.2 Test summary

Verdict	Pass		
Test date	October 26, 2015	Temperature	28 °C
Test engineer	Avul Nzenza	Air pressure	1028 mbar
Test location	Montreal	Relative humidity	33 %

8.1.3 Notes

None

8.1.4 Setup details

EUT setup configuration	Table top
Test facility	3 m Semi anechoic chamber
Measuring distance	3 m
Antenna height variation	1–4 m
Turn table position	0–360°
Measurement details	A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated and antenna adjusted to maximize radiated emission. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver/spectrum analyzer settings for frequencies below 1 GHz:

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Peak (preview measurement); Quasi-peak (final measurement)
Trace mode	Max Hold
Measurement time	100 ms (preview measurement); 1000 ms (final measurement)

Receiver/spectrum analyzer settings for frequencies above 1 GHz:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak (preview); Peak and Average (final)
Trace mode	Max Hold
Measurement time	100 ms (preview); 1000 ms (final)

8.1.4 Setup details, continued

Table 8.1-1: *Radiated disturbance equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002532	1 year	May. 25/16
Flush mount turntable	Sunol	FM2022	FA002550	—	NCR
Controller	Sunol	SC104V	FA002551	—	NCR
Antenna mast	Sunol	TLT2	FA002552	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	April 7/16
Bilog antenna (20–2000 MHz)	Sunol	JB1	FA002517	1 year	Sept. 29/16
Pre-amplifier (0.5–18 GHz)	COM-POWER	PAM-118A	FA002561	1 year	May 6/16
Horn antenna (1–18 GHz)	EMCO	3115	FA001452	1 year	Sept. 29/16

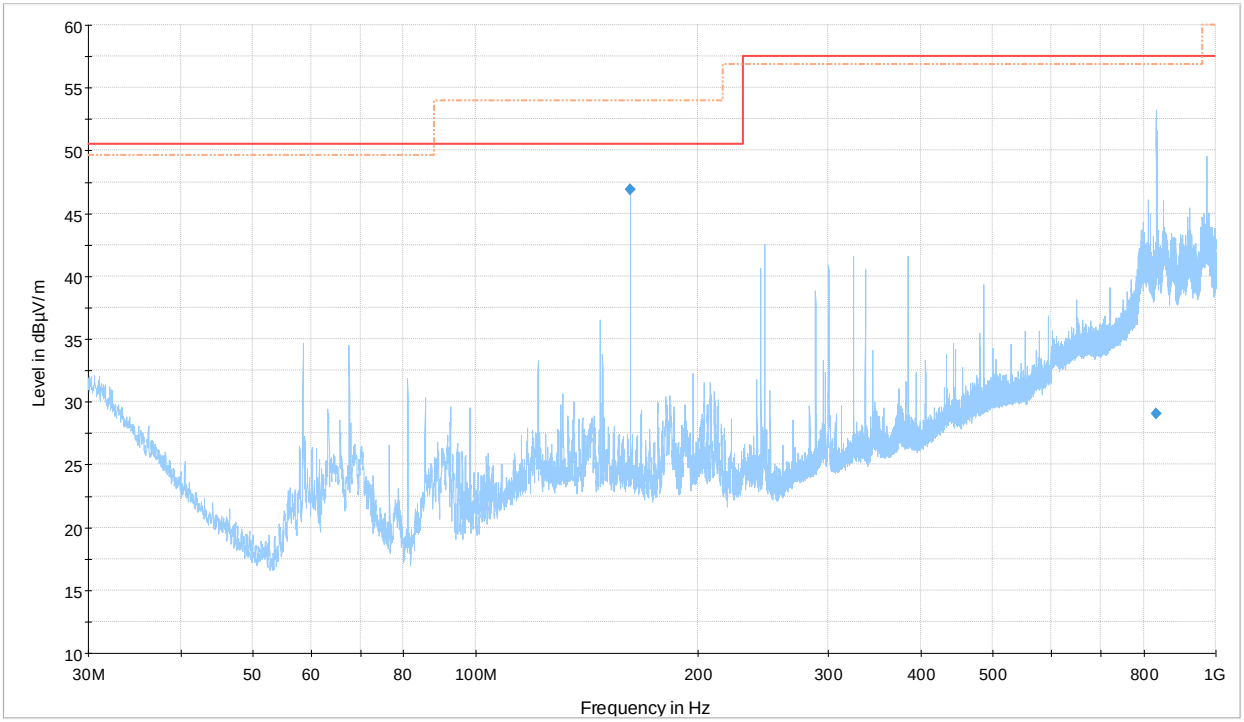
Notes: NCR - no calibration required

Table 8.1-2: *Radiated disturbance test software details*

Manufacturer of Software	Details
Rhode & Schwarz	EMC32, Software for EMC Measurements, Version 8.53.0

Notes: None

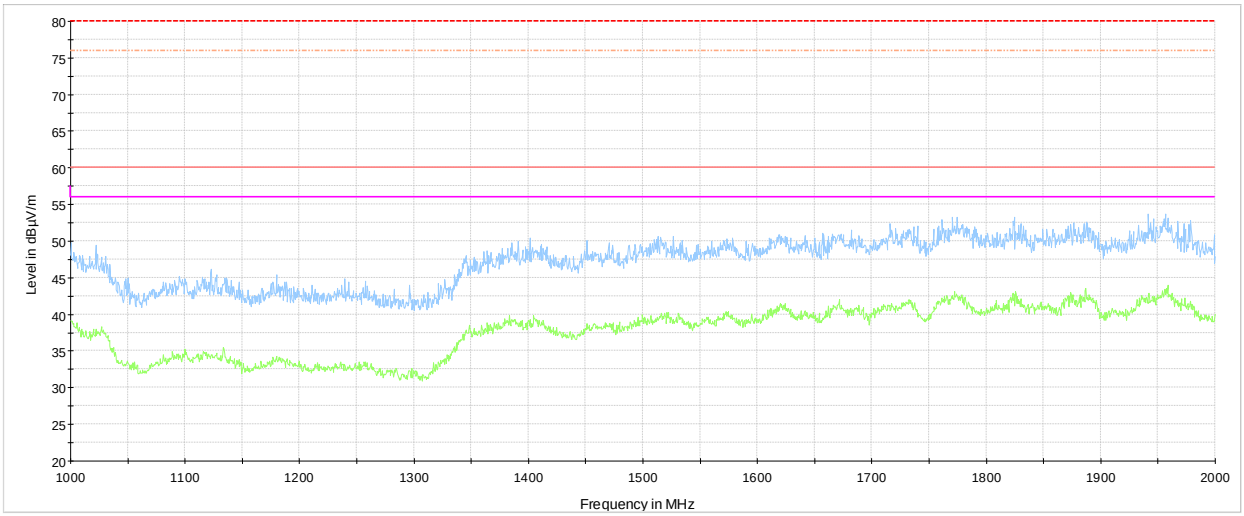
8.1.5 Test data



The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.
An inverse proportionality factor of 20 dB per decade (20 log (10/3) = 10.5 dB) has been used to normalize the specification limit to a measurement distance of 3 meters

Figure 8.1-1: *Radiated disturbance spectral plot (30 to 1000 MHz)*

8.1.5 Test data, continued



Rad Em_296685_VGA2USB3_SDI2USB3_Oct 26, 2015
CISPR 22 - Class A 3m Average
CISPR 22 - Class A 3m Peak
Preview Result 1-PK+
Preview Result 2-AVG
Final Result 1-PK+
Final Result 2-AVG
FCC Part 15 - Class A 3m Peak above 1GHz
FCC Part 15 - Class A 3m QP and Average

The spectral plot is a summation of a vertical and horizontal scan. The spectral scan has been corrected with the associated transducer factors (i.e. antenna factors, cable loss, amplifier gains, and attenuators.

Figure 8.1-2: *Radiated disturbance spectral plot (1 to 2 GHz)*

8.1.5 Test data, continued

Table 8.1-3: *Radiated disturbance (Quasi-Peak) results*

Frequency (MHz)	Quasi-Peak field strength[1] (dBµV/m)	Measurement time (ms)	Bandwidth (kHz)	Antenna height (cm)	Pol. (V/H)	Turn table position (°)	Correction factor[2] (dB)	Margin (dB)	3 m Quasi-Peak limit [3] (dBµV/m)
CISPR 22, EN 55022 and AS/NZS CISPR 22									
162.00	46.9	1000	120	100	V	12	14.3	3.6	50.5
830.97	29.1	1000	120	350	H	194	26.5	28.4	57.5
FCC and ICES-003									
162.00	46.9	1000	120	100	V	12	14.3	7.1	54.0
830.97	29.1	1000	120	350	H	194	26.5	27.8	56.9

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)
[3] An inverse proportionality factor of 20 dB per decade (20 log (10/3) = 10.5 dB) has been used to normalize the specification limit to a measurement distance of 3 meters to determine compliance.

Sample calculation: 46.9 dBµV/m (field strength) = 32.6 dBµV (receiver reading) + 14.3 dB (Correction factor)

8.1.6 Setup photos

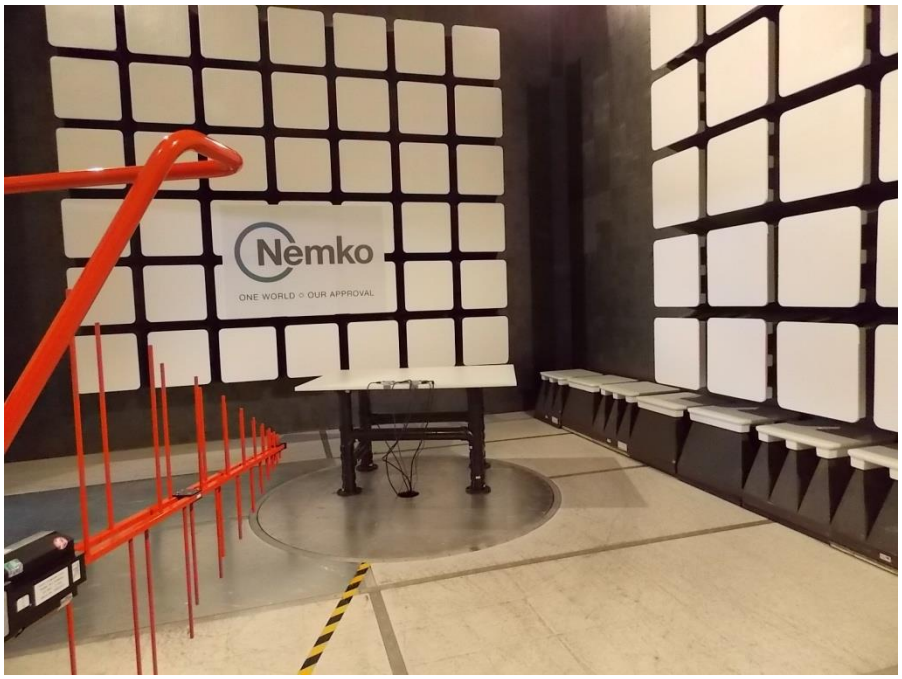


Figure 8.1-3: *Radiated disturbance setup photo*

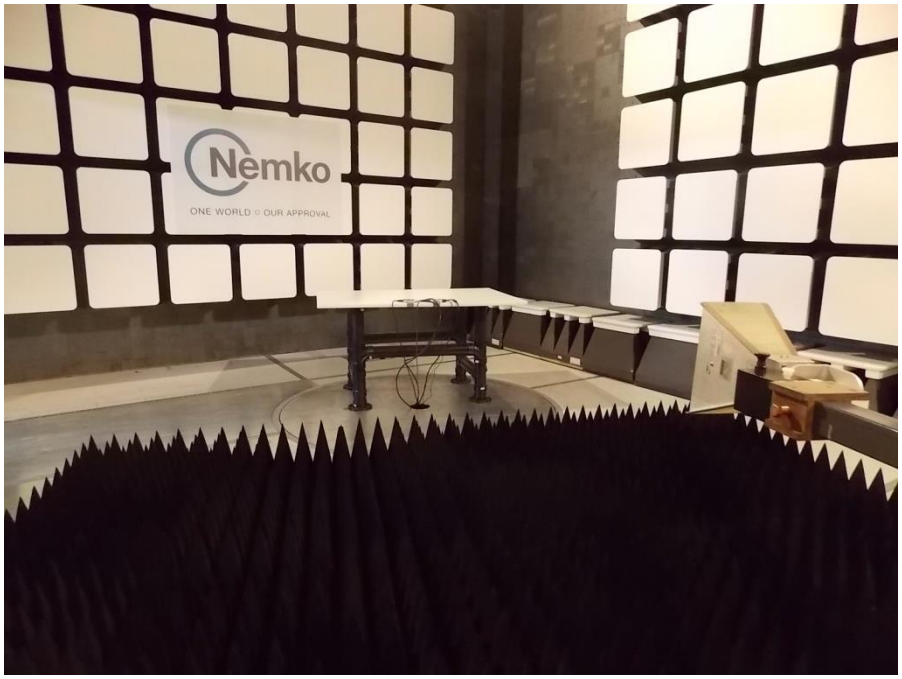


Figure 8.1-4: *Radiated disturbance setup photo*

8.2 Conducted disturbance at mains port

8.2.1 References

CISPR 22 Edition 6.0 2008-09 and ANSI C63.4-2014

8.2.2 Test summary

Verdict	Pass		
Test date	January 5, 2016	Temperature	24 °C
Test engineer	Avul Nzenza	Air pressure	1009 mbar
Test location	Montreal	Relative humidity	34 %

8.2.3 Notes

None

8.2.4 Setup details

Port under test	AC mains
EUT setup configuration	Table top
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver settings:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	– Peak and Average (Preview measurement) – Quasi-peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak and Average preview measurement) – 1000 ms (Quasi-peak final measurement) – 160 ms (CAverage final measurement)

Table 8.1-4: *Conducted disturbance at mains port equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	April 7/16
Power source	California Instruments	5001ix	FA002494	1 year	Jan. 22/16
LISN	Rohde & Schwarz	ENV216	FA002514	1 year	Nov. 20/16

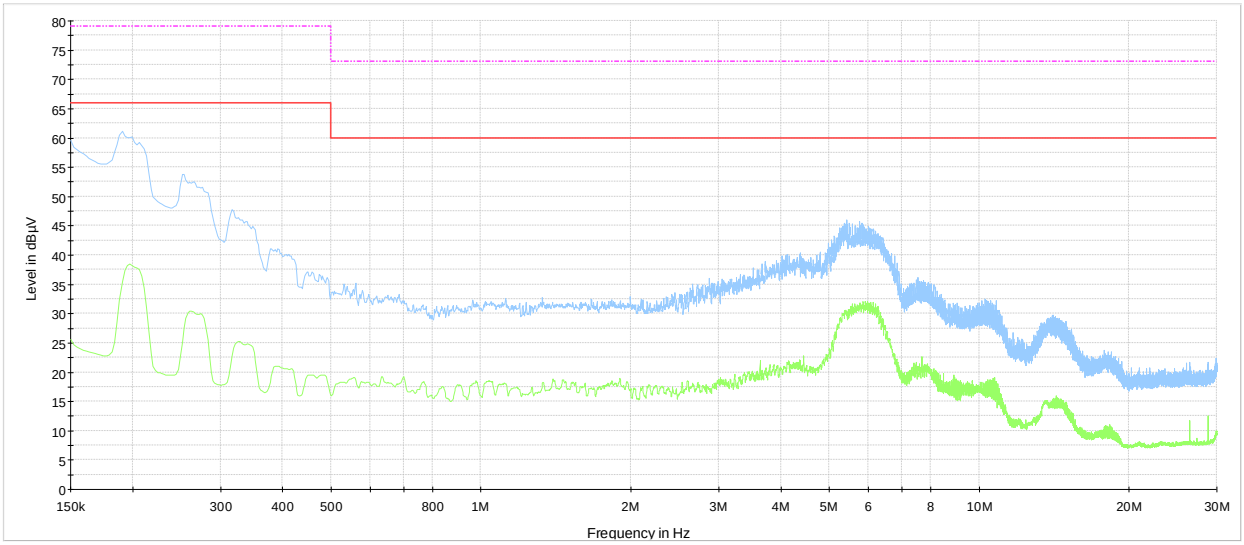
Notes: None

Table 8.1-5: *Conducted disturbance at mains port test software details*

Manufacturer of Software	Details
Rhode & Schwarz	EMC32, Software for EMC Measurements, Version 8.53.0

Notes: None

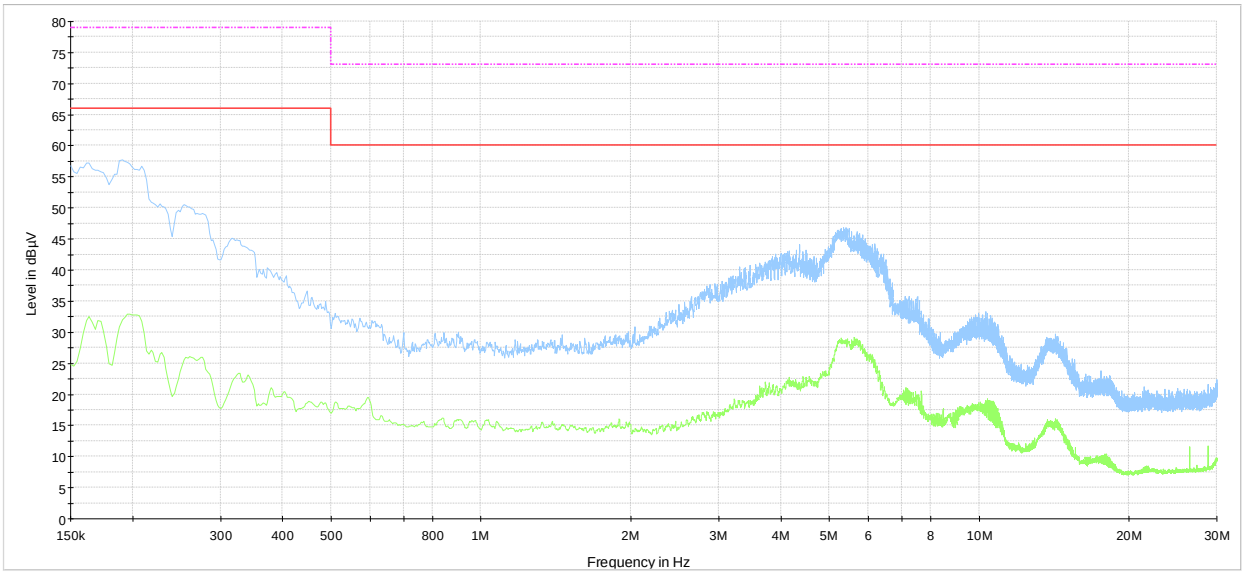
8.2.5 Test data



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Figure 8.1-5: *Conducted disturbance at mains port spectral plot on phase line*

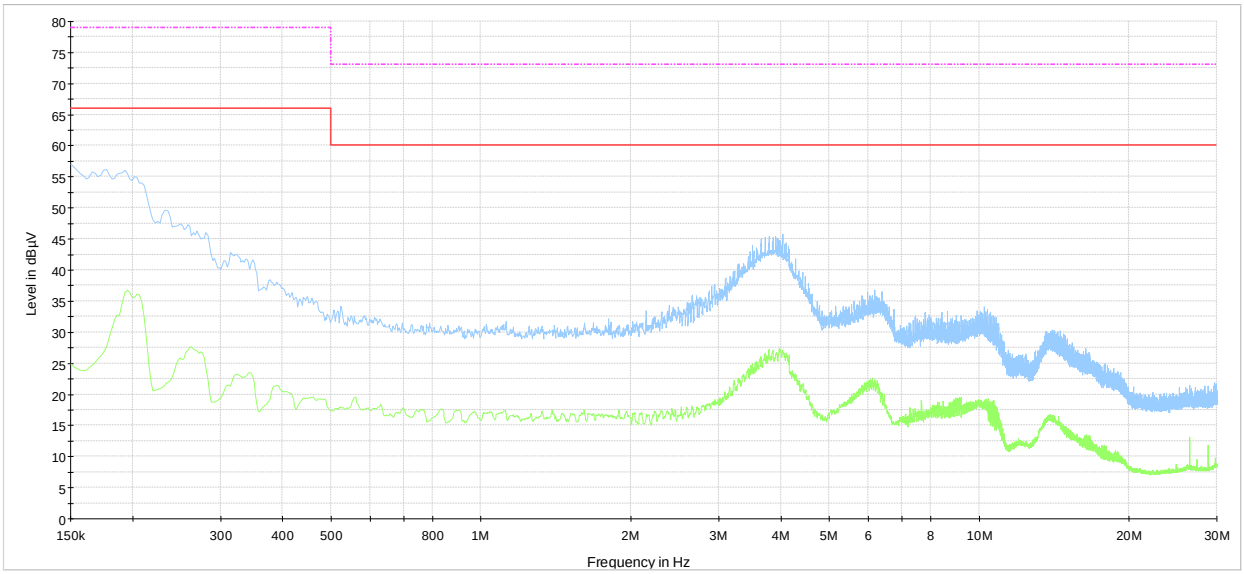
8.2.6 Test data, continued



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Figure 8.1-6: *Conducted disturbance at mains port spectral plot on neutral line*

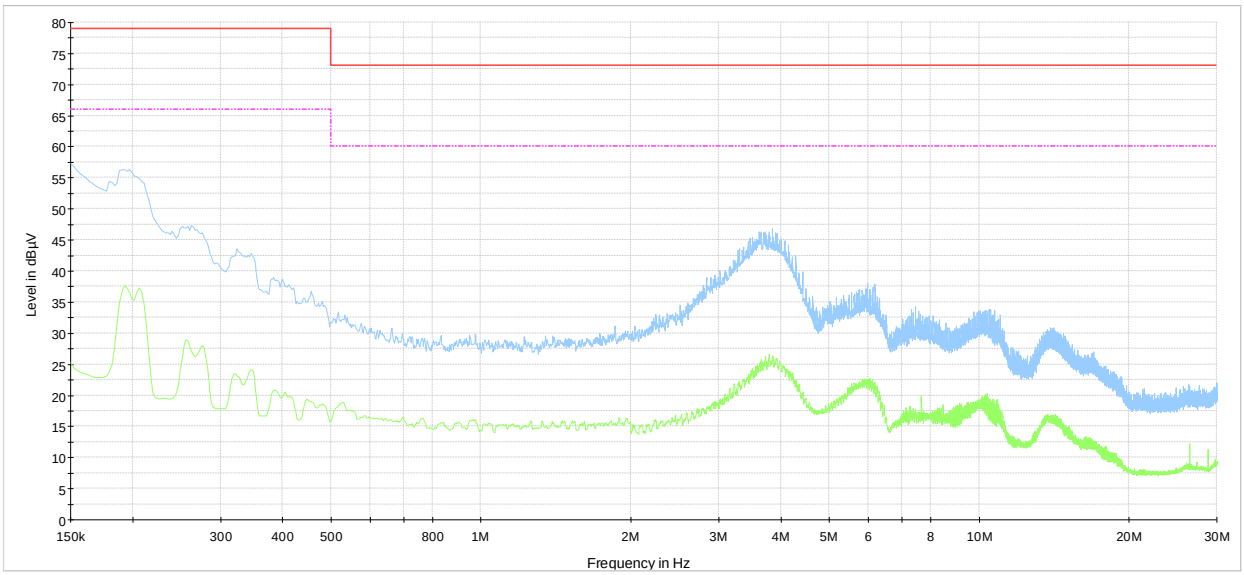
8.2.7 Test data, continued



The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Figure 8.1-7: *Conducted disturbance at mains port spectral plot on phase line*

8.2.8 Test data, continued



296685_SDI2USB3_Jan 5, 2016_Cond Em_Neutral_120Vac
Preview Result 1-PK+
Preview Result 2-AVG
CISPR 22 Mains QP Class A
CISPR 22 Mains AV Class A

The spectral plot has been corrected with transducer factors. (i.e. cable loss, LISN factors, and attenuators)

Figure 8.1-8: *Conducted disturbance at mains port spectral plot on neutral line*

8.2.9 Setup photos

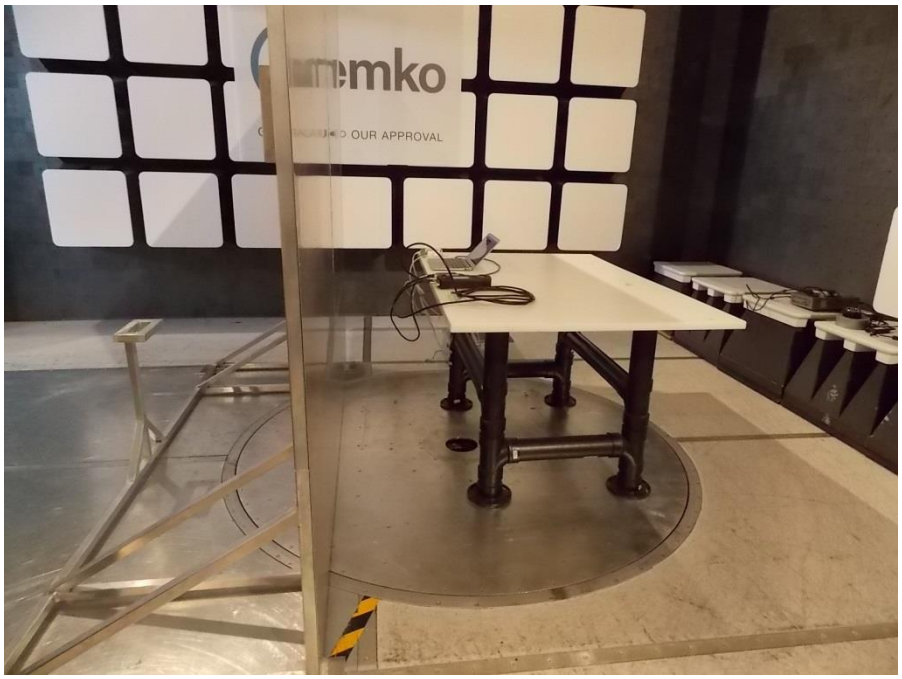


Figure 8.1-9: *Conducted disturbance at mains port setup photo*

Section 9 EUT photos

9.1 External photos

Figure 9.1-1: *Front view photo*

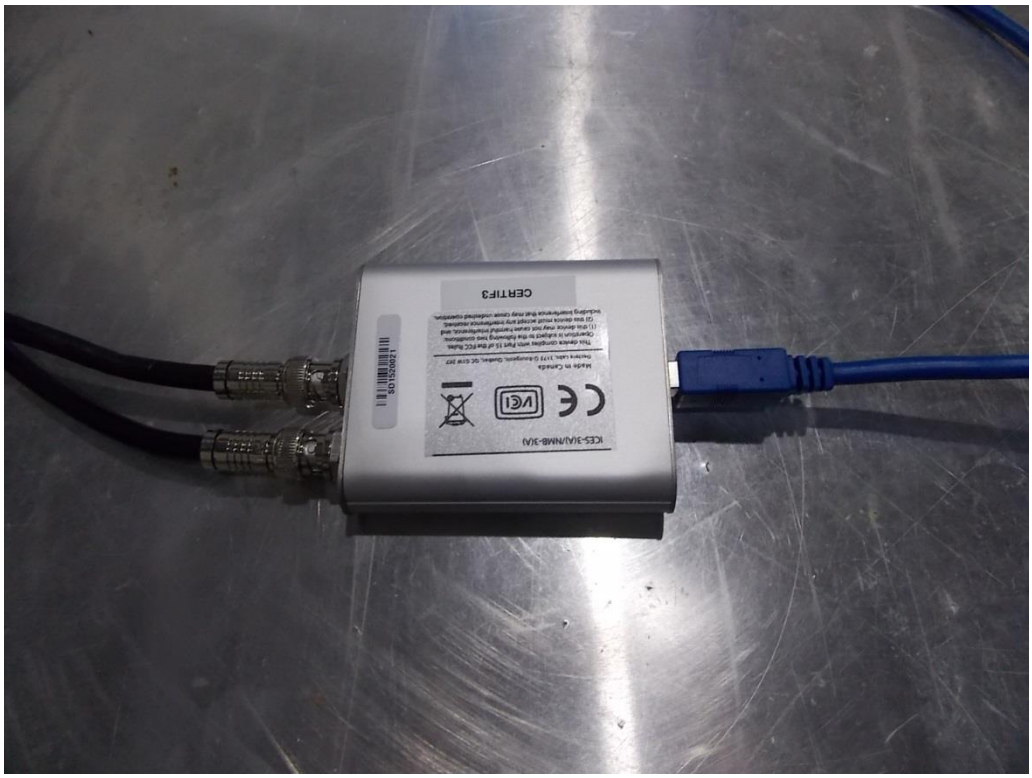


Figure 9.1-2: *Rear view photo*