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Test report

289953-3TRFEMC

Date of issue: July 15, 2015

Applicant:

Kontron Canada Inc

Product:

Carrier Grade Rack Mount System (AC option)

Model:

CG2300

Specification:

EN 300 386 V1.6.1 (2012-09)

Electromagnetic compatibility and Radio spectrum Matters (ERM)
Telecommunication network equipment
ElectroMagnetic Compatibility (EMC) requirements

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
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Toll free	+1 800 563 6336		
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Tested by	David Duchesne, Senior EMC/Wireless Specialist , Daniel Hynes, Senior EMC Specialist and Shawn He, Senior EMC Specialist
Reviewed by	Andrey Adelberg, Senior Wireless/EMC Specialist
Review date	July 15, 2015
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

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Section 1 Report summary

1.1 Test specifications

EN 300 386 V1.6.1 (2012-09)	Electromagnetic compatibility and Radio spectrum Matters (ERM) Telecommunication network equipment ElectroMagnetic Compatibility (EMC) requirements

1.2 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.

1.3 Exclusions

None

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 Results

Table 2.1-1: *Emissions results*

Environmental phenomenon	Basic standard	Verdict
Enclosure port, Radiated electromagnetic field emissions	EN 55022	Pass [1]
AC ports – Conducted emissions	EN 55022	Pass [1]
AC ports – Current harmonics	EN 61000-3-2	Pass [2]
AC ports – Voltage fluctuations	EN 61000-3-3	Pass
DC ports, Conducted emissions	EN 55022	Not applicable [3]
Telecommunication ports; Conducted emissions	EN 55022	Pass [6]

Notes: [1] Product classification A
[2] Harmonic classification A
[3] The EUT is AC powered

Table 2.1-2: *Equipment operating in telecommunication centres, enclosure port*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Electrostatic discharge	4 kV (Contact discharge) 4 kV (Air discharge)	B	EN 61000-4-2	Pass
Radio frequency electromagnetic field amplitude modulated	3 V/m (80–800 MHz) 80 % AM (1 kHz)	A	EN 61000-4-3	Pass
	10 V/m (800–960 MHz) 80 % AM (1 kHz)			Pass
	3 V/m (960–1000 MHz) 80 % AM (1 kHz)			Pass
	10 V/m (1400–2000 MHz) 80 % AM (1 kHz)			Pass
	3 V/m (2000–2700 MHz) 80 % AM (1 kHz)			Pass

Notes: None

Table 2.1-3: *Equipment operating in telecommunication centres, ports for outdoor signal lines*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Fast transients	0.5 kV 5/50 Tr/Th ns, 5 kHz	B	EN 61000-4-4	Not applicable
Surges (lines to ground)	1 kV 10/700 (5/320) Tr/Th µs	B	EN 61000-4-5	Not applicable
Radio frequency, conducted continuous	3 V (0.15–80 MHz) 80 % AM (1 kHz)	A	EN 61000-4-6	Not applicable

Notes:
– Outdoor lines carrying DC power with superimposed signals shall be treated as outdoor signal lines.
– For switching equipment which is intended to be installed in locations other than telecommunication centres, the requirements for immunity to surges outdoor signal lines and to continuous conducted disturbances on signal lines are according to the requirements for telecommunication centres. This reduction is based - amongst other things - upon the screening effect of multi-pair cables and specific earthing/bonding techniques in use for switching equipment.

2.1 Results, continued

Table 2.1-4: *Equipment operating in telecommunication centres, ports for indoor signal lines*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Fast transients [1]	0.5 kV 5/50 Tr/Th ns, 5 kHz	B	EN 61000-4-4	Pass
Surges [2] (lines to ground)	0.5 kV 1.2/50 (8/20) Tr/Th µs	B	EN 61000-4-5	Pass
Radio frequency, conducted continuous [1]	3 V (0.15–80 MHz) 80 % AM (1 kHz) Source: 150 Ω	A	EN 61000-4-6	Pass

Notes: Indoor lines carrying DC power with superimposed signals shall be treated as indoor signal lines.

[1] Only applies when the overall cable length between the EUT and another item of active equipment may be greater than 3 m.
[2] Only applies when the overall cable length between the EUT and another item of active equipment may be greater than 10 m.

Table 2.1-5: *Equipment operating in telecommunication centres, AC power ports*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Fast transients	1 kV 5/50 Tr/Th ns, 5 kHz	B	EN 61000-4-4	Pass
Surges	0.5 kV Line to Line 1 kV Line To Earth 1.2/50 (8/20) Tr/Th µs	B	EN 61000-4-5	Pass
Radio frequency, conducted continuous	3 V (0.15–80 MHz) 80 % AM (1 kHz) Source: 150 Ω	A	EN 61000-4-6	Pass

Notes: None

Table 2.1-6: *Equipment operating in telecommunication centres, DC power ports*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Fast transients	0.5 kV 5/50 Tr/Th ns, 5 kHz	B	EN 61000-4-4	Not applicable
Radio frequency, conducted continuous	3 V (0.15–80 MHz) 80 % AM (1 kHz) Source: 150 Ω	A	EN 61000-4-6	Not applicable

Notes: Only applies when the overall cable length between the EUT and another item of active equipment may be greater than 3 m.

2.1 Results, continued

Table 2.1-7: *Equipment operating in locations other than telecommunication centres, enclosure port*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Electrostatic discharge	6 kV (Contact discharge) 8 kV (Air discharge)	B	EN 61000-4-2	Pass
Radio frequency electromagnetic field amplitude modulated	3 V/m (80–800 MHz) 80 % AM (1 kHz)	A	EN 61000-4-3	Pass
	10 V/m (800–960 MHz) 80 % AM (1 kHz)			Pass
	3 V/m (960–1000 MHz) 80 % AM (1 kHz)			Pass
	10 V/m (1400–2000 MHz) 80 % AM (1 kHz)			Pass
	3 V/m (2000–2700 MHz) 80 % AM (1 kHz)			Pass

Notes: None

Table 2.1-8: *Equipment operating in locations other than telecommunication centres, ports for outdoor signal lines*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Fast transients	0.5 kV 5/50 Tr/Th ns, 5 kHz	B	EN 61000-4-4	Not applicable
Surges (lines to ground)	1 kV 10/700 (5/320) Tr/Th µs	B	EN 61000-4-5	Not applicable
Radio frequency, conducted continuous	3 V (0.15–80 MHz) 80 % AM (1 kHz) Source: 150 Ω	A	EN 61000-4-6	Not applicable

Notes:
- Outdoor lines carrying DC power with superimposed signals shall be treated as outdoor signal lines.
- For switching equipment which is intended to be installed in locations other than telecommunication centres, the requirements for immunity to surges on outdoor signal lines and to continuous conducted disturbances on signal lines are according to the requirements for telecommunication centres. This reduction is based - amongst other things - upon the screening effect of multi-pair cables and specific earthing/bonding techniques in use for switching equipment.

Table 2.1-9: *Equipment operating in locations other than telecommunication centres, ports for indoor signal lines*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Fast transients [1]	0.5 kV 5/50 Tr/Th ns, 5 kHz	B	EN 61000-4-4	Pass
Surges [2] (lines to ground)	0.5 kV 1.2/50 (8/20) Tr/Th µs	B	EN 61000-4-5	Pass
Radio frequency, conducted continuous [1]	3 V (0.15–80 MHz) 80 % AM (1 kHz) Source: 150 Ω	A	EN 61000-4-6	Pass

Notes: Indoor lines carrying DC power with superimposed signals shall be treated as indoor signal lines.

[1] Only applies when the overall cable length between the EUT and another item of active equipment may be greater than 3 m.
[2] Only applies when the overall cable length between the EUT and another item of active equipment may be greater than 10 m.

2.1 Results, continued

Table 2.1-10: *Equipment operating in locations other than telecommunication centres, AC power ports*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Fast transients	1 kV 5/50 Tr/Th ns, 5 kHz	B	EN 61000-4-4	Pass
Surges	1 kV Line to Line 2 kV Line To Earth 1.2/50 (8/20) Tr/Th µs	B	EN 61000-4-5	Pass
Radio frequency, conducted continuous	3 V (0.15–80 MHz) 80 % AM (1 kHz)	A	EN 61000-4-6	Pass
Voltage dips and short interruptions	0 % Residual voltage 0.5 Cycles	B	EN 61000-4-11	Pass
	0 % Residual voltage 1 Cycles	B		Pass
	70 % Residual voltage 25 Cycles	B		Pass
	0 % Residual voltage 250 Cycles	C		Pass

Notes: None

Table 2.1-11: *Equipment operating in locations other than telecommunication centres, DC power ports*

Environmental phenomenon	Test specification	Performance criteria	Basic standard	Verdict
Fast transients	1 kV 5/50 Tr/Th ns, 5 kHz	B	EN 61000-4-4	Not applicable
Radio frequency, conducted continuous	3 V (0.15–80 MHz) 80 % AM (1 kHz) Source: 150 Ω	A	EN 61000-4-6	Not applicable

Notes: Only applies when the overall cable length between the EUT and another item of active equipment may be greater than 3 m.

Section 3 Equipment under test (EUT) details

3.1 Applicant and Manufacturer

Company name	Kontron Canada Inc
Address	4555 Ambroise-Lafortune
City	Boisbriand
Province/State	Quebec
Postal/Zip code	J7H 0A4
Country	Canada

3.2 Sample information

Receipt date	March 24, 2015 and July 14, 2015
Nemko sample ID number	133-000142 and 133001316

3.3 EUT information

Product name	Carrier Grade Rack Mount System
Model	CG2300
Serial number	CG23437000
Part number	CG2300A-APP
Power requirements	120/230Vac, 1200W
Description/theory of operation	The Kontron CG2300 is a carrier grade communication rack mount server supporting the Dual Intel® Xeon® E5-2600 v3 16-Core Series (32C, 64T per 2S E5 system). Features include: 16 slot, 8 channel support of DDR4 RDIMM/LRDIMM; Supports 2048GB maximum (with 128GB DIMM) Optimized for PCI-E IO card implementation with PCI-E riser and LP card support; Hot-Swap 2.5” SAS HDDs / SATA SSDs Hot swap, redundant fans Integrated BMC (iBMC) with advanced options Front panel: 1 serial, 1 USB 2.0 Rear panel: 2 USB 2.0, 2x USB 3.0, 1 onboard management NIC port Dual rear GbE NIC ports
Operational frequencies	32.768 kHz, 25 MHz, 33.33 MHz, 48 MHz, 50 MHz, 100 MHz, 125 MHz, 240 MHz, 625 MHz, 1.5 GHz, 1.5625 GHz, 2.5 GHz, 3 GHz, 4 GHz, 4.8 GHz, 5.15625 GHz and 6 GHz.
Software details	Linux Centos

3.4 EUT exercise and monitoring details

Iperf3 generates and monitors traffic, and Burnin exercises and monitors all modules in the system.

3.5 EUT setup details

Table 3.5-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number	Rev.
Network Interface Card 4 port GbE	Intel	I350T4	LAB03383	--
AC-DC Power Supply 1	3Y	YM-2851VA01R	SA000N871504000033	A01
AC-DC Power Supply 2	3Y	YM-2851VA01R	SA000N871504000028	A01

Table 3.5-2: *EUT interface ports*

Description	Qty.
RJ-45 GbE	2
RJ-45 GbE Management	1
DB15 RS-232	1
USB 2.0	2
USB 3.0	2
VGA	1

Table 3.5-3: *Support equipment*

Description	Brand name	Model/Part number	Serial number	Rev.
CG2300	Kontron	CG2300-BPP	CG23449013	--
DC-DC Power supply 1	3Y	YM-2851DA01R	TP020N871519000005	A01
DC-DC Power supply 2	3Y	YM-2851DA01R	TP020N871519000006	A01
Network Interface Card 4 port GbE	Intel	I350T4	3585822246	--
LCD Monitor (for configuration only)	Dell	E173FPI	CN-0D5428-72872-588-9R65	A02
USB Keyboard (for configuration only)	Viewsonic	VSACC27936-1M	GA1053107436	--
USB Mouse (for configuration only)	Logitech	M-BJ58	CA34929092	--

Table 3.5-4: *Inter-connection cables*

Cable description	From	To	Length (m)
CAT5 UTP	Ethernet Port 1 EUT	Ethernet Port 1 Support Equip.	7
CAT5 UTP	Ethernet Port 2 EUT	Ethernet Port 2 Support Equip.	7
CAT5 UTP	Server Adapter Port 1 EUT	Server Adapter Port 1 Support	7
CAT5 UTP	Server Adapter Port 2 EUT	Server Adapter Port 2 Support	7
CAT5 UTP	Server Adapter Port 3 EUT	Server Adapter Port 3 Support	7
CAT5 UTP	Server Adapter Port 4 EUT	Server Adapter Port 4 Support	7
CAT5 UTP	Management Port EUT	Management Port Support	7
VGA Video Cable Shielded with ferrites both ends	VGA Port EUT	Unterminated	2
VGA Video Cable Shielded with ferrites both ends	VGA Port Support Equipment	Unterminated	2
USB Cable Shielded	EUT USB Port 1	Unterminated	2
USB Cable Shielded	EUT USB Port 2	Unterminated	2
USB Cable Shielded	EUT USB Port 3	Unterminated	2
USB Cable Shielded	EUT USB Port 4	Unterminated	2
USB Cable Shielded	Support Equipment USB Port 1	Unterminated	2
USB Cable Shielded	Support Equipment USB Port 2	Unterminated	2
USB Cable Shielded	Support Equipment USB Port 3	Unterminated	2
USB Cable Shielded	Support Equipment USB Port 4	Unterminated	2
AC Power Cable (unshielded)	Power Supply 1	AC Mains	8
AC Power Cable (unshielded)	Power Supply 2	AC Mains	8

3.5 EUT setup details, continued

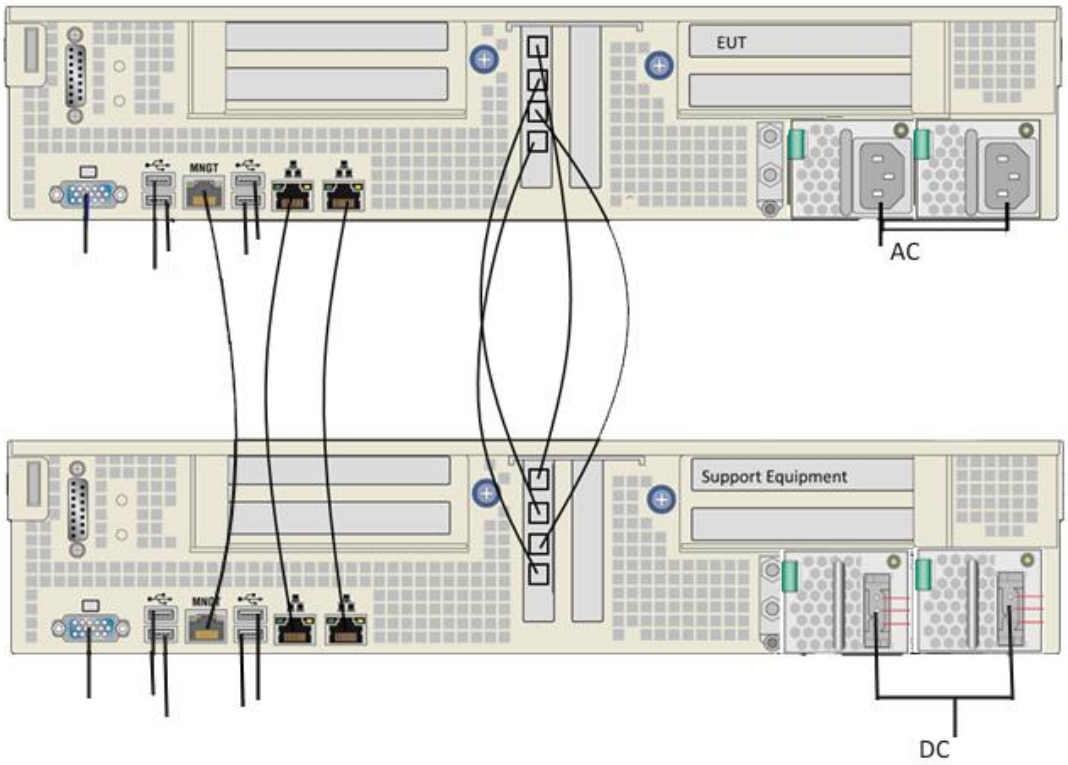


Figure 3.5-1: *Setup diagram*

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 Performance criterion

- See Clause 10.1 “General performance criteria” of EN 300 386 V1.6.1 (2012-09)
- See Clause 11.3 and 12.3 “Specific immunity performance criteria” of EN 300 386 V1.6.1 (2012-09)

7.2 Product classifications definitions

EN 55022

Class B 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.

EN 61000-3-2 (Current harmonics)

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.

EN 61000-3-3 (Voltage fluctuations)

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, *Pst*: The flicker severity evaluated over a short period (in minutes); Pst = 1 is the conventional threshold of irritability.

Long-term flicker indicator, *Plt*: The flicker severity evaluated over a long period (a few hours) using successive Pst values

7.3 General definitions

EN 61000-4-2 (Electrostatic discharge)

Electrostatic discharge; ESD: A transfer of electric charge between bodies of different electrostatic potential in proximity or through direct contact.

Contact discharge method: A method of testing, in which the electrode of the test generator is held in contact with the EUT, and the discharge actuated by the discharge switch within the generator.

Air discharge method: A method of testing, in which the charged electrode of the test generator is brought close to the EUT, and the discharge actuated by a spark to the EUT.

Direct application: Application of the discharge directly to the EUT.

Indirect application: Application of the discharge to a coupling plane in the vicinity of the EUT, and simulation of personnel discharge to objects, which are adjacent to the EUT.

Coupling plane: A metal sheet or plate, to which discharges are applied to simulate electrostatic discharge to objects adjacent to the EUT. HCP: Horizontal Coupling Plane; VCP: Vertical Coupling Plane.

EN 61000-4-3: (Radiated, radio-frequency, electromagnetic field)

Continuous waves (CW): Electromagnetic waves, the successive oscillations of which are identical under steady-state conditions, which can be interrupted or modulated to convey information.

Electromagnetic (EM) wave: Radiant energy produced by the oscillation of an electric charge characterized by oscillation of the electric and magnetic fields.

Field strength The term “field strength” is applied only to measurements made in the far field. The measurement may be of either the electric or the magnetic component of the field and may be expressed as V/m, A/m or W/m2; any one of these may be converted into the others.

Sweep Continuous or incremental traverse over a range of frequencies.

EN 61000-4-4 (Electrical fast transient/burst)

Burst: Sequence of a limited number of distinct pulses or an oscillation of limited duration.

Common mode (coupling): Simultaneous coupling to all lines versus the ground reference plane.

Ground reference plane: Flat conductive surface whose potential is used as a common reference.

Coupling clamp: Device of defined dimensions and characteristics for common mode coupling of the disturbance signal to the circuit under test without any galvanic connection to it.

Transient: Pertaining to or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval which is short compared with the time-scale of interest.

EN 61000-4-5 (Surge)

Surge: Transient wave of electrical current, voltage, or power propagating along a line or a circuit and characterized by a rapid increase followed by a slower decrease.

Ground (reference): Part of the Earth considered as conductive, the electrical potential of which is conventionally taken as zero, being outside the zone of influence of any earthing (grounding) arrangement.

EN 61000-4-6 (Immunity to conducted disturbances, induced by radio-frequency fields)

Clamp injection: Clamp injection is obtained by means of a clamp-on “current” injecting device on the cable.

Coupling/decoupling network CDN: Electrical circuit incorporating the functions of both the coupling and decoupling networks.

Sweep Continuous or incremental traverse over a range of frequencies.

EN 61000-4-11 (Voltage dips, short interruptions and voltage variations)

Voltage dip: A sudden reduction of the voltage at a particular point of an electricity supply system below a specified dip threshold followed by its recovery after a brief interval.

Short interruption: A sudden reduction of the voltage on all phases at a particular point of an electric supply system below a specified interruption threshold followed by its restoration after a brief interval.

Section 8 Testing data

8.1 Enclosure port, Radiated electromagnetic field emissions

8.1.1 References

EN 55022: 2010

8.1.2 Test summary

Verdict	Pass		
Test date	July 8, 2015	Temperature	22.5 °C
Test engineer	David Duchesne	Air pressure	1005.1 mbar
Test location	Ottawa	Relative humidity	52.2 %

8.1.3 Notes

None

8.1.4 Setup details

EUT setup configuration	Floor standing
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: *Enclosure port, Radiated electromagnetic field emissions equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Feb. 25/16
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 07/16
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 12/16
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 01/16
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	May 05/16
50 Ω coax cable	C.C.A.	None	FA002555	1 year	May 05/16
50 Ω coax cable	Huber + Suhner	None	FA002074	1 year	May 05/16

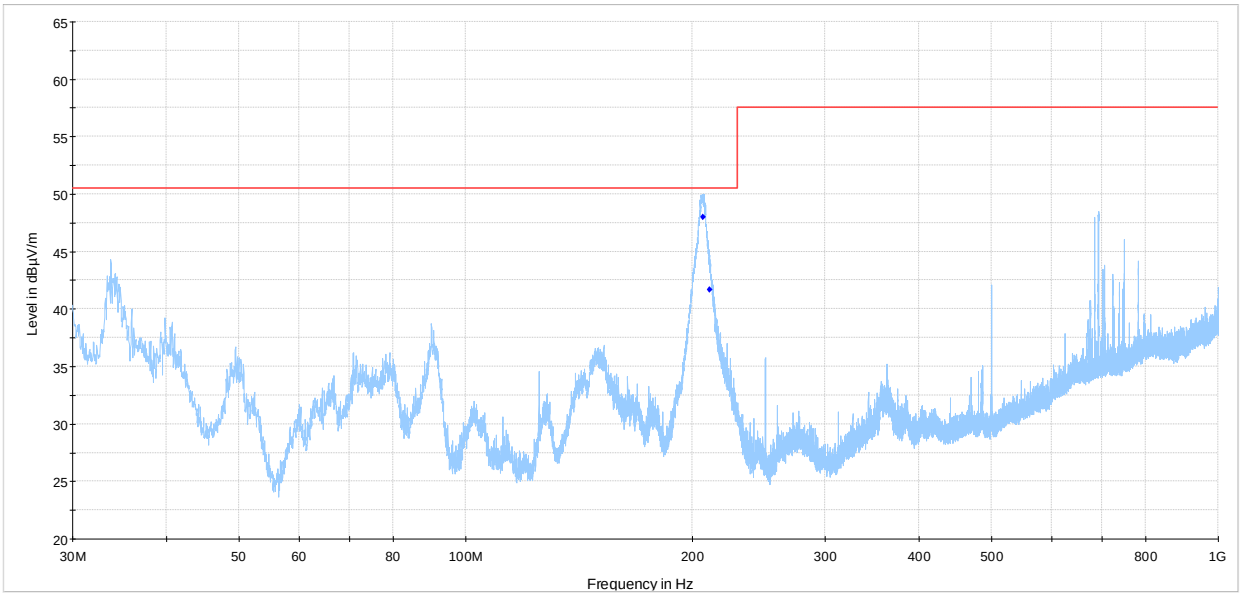
Notes: None

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.

Figure 8.1-1: *Enclosure port, Radiated electromagnetic field emissions plot (30 to 1000 MHz)*

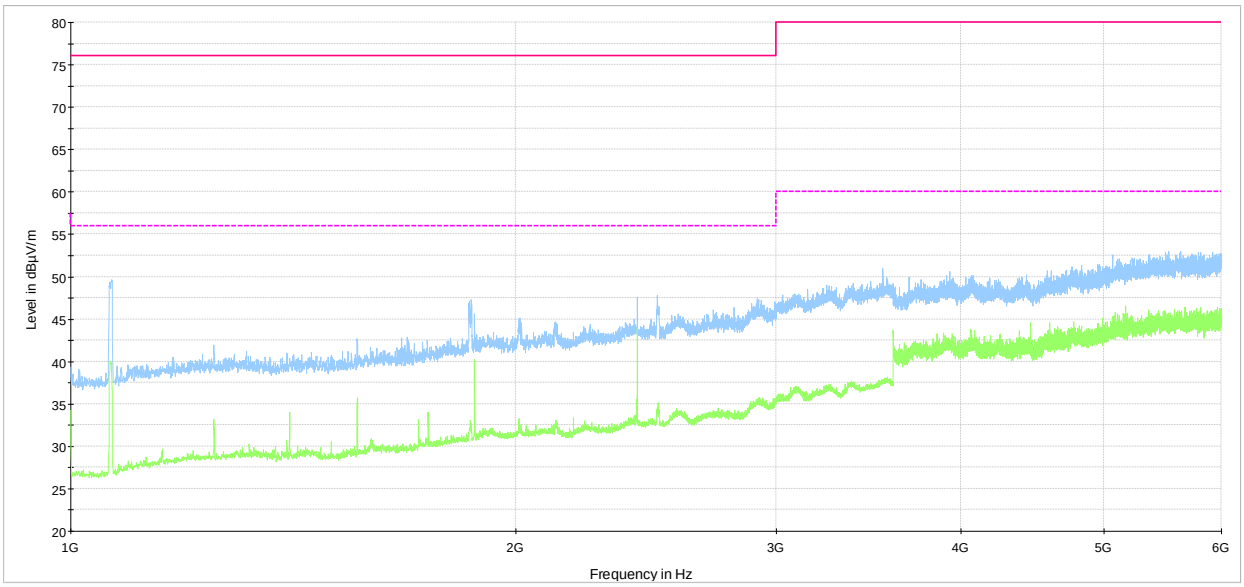
Table 8.1-3: *Enclosure port, Radiated electromagnetic field emissions (Quasi-Peak) results*

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)
206.730	48.0	1000	120	100	H	148	13.6	2.5	50.5
210.660	41.7	1000	120	104	H	141	13.3	8.8	50.5

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: 48.0 dBµV/m (field strength) = 34.4 dBµV (receiver reading) + 13.6 dB (Correction factor)

8.1.5 Test data, continued



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: *Enclosure port, Radiated electromagnetic field emissions plot (1 to 6 GHz)*

8.1.6 Setup photos

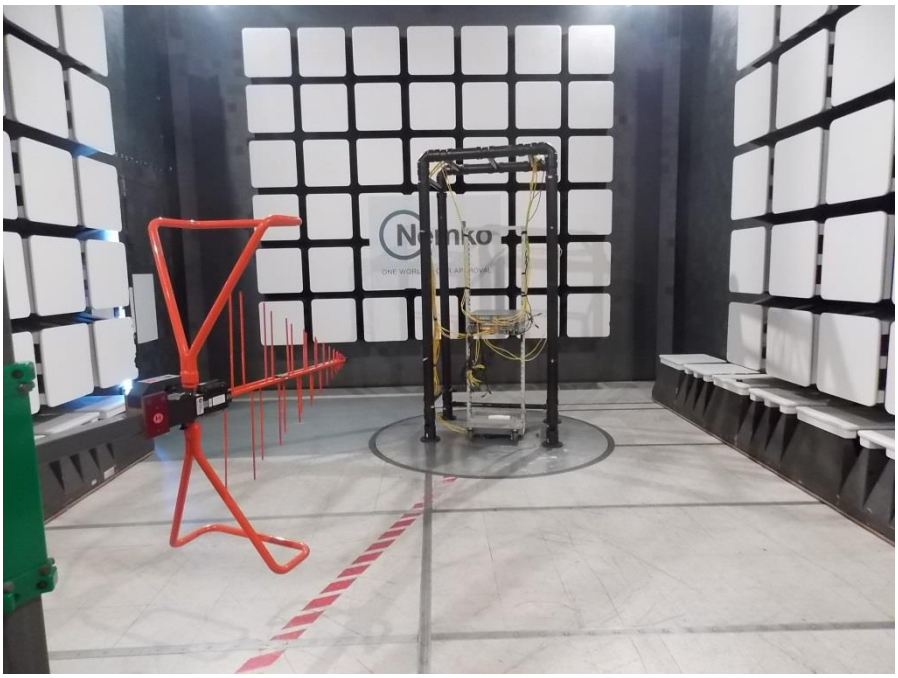


Figure 8.1-3: *Enclosure port, Radiated electromagnetic field emissions setup photo*

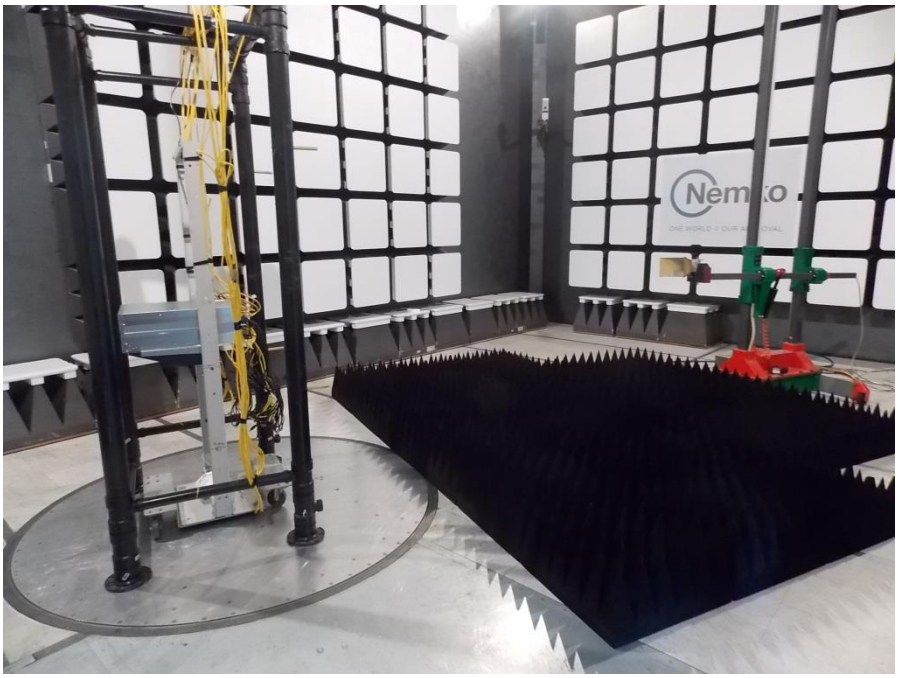


Figure 8.1-4: *Enclosure port, Radiated electromagnetic field emissions setup photo*

8.2 AC ports – Conducted emissions

8.2.1 References

EN 55022: 2010

8.2.2 Test summary

Verdict	Pass		
Test date	May 26, 2015	Temperature	23.6 °C
Test engineer	Daniel Hynes	Air pressure	1010.6 mbar
Test location	Montreal	Relative humidity	57.0 %

8.2.3 Notes

None

8.2.4 Setup details

Port under test	AC mains
EUT setup configuration	Floor standing
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 Average (final measurement)
Trace mode	Max Hold
Measurement time	100 ms (preview measurement); 1000 ms (final measurement)

Table 8.2-1: *AC ports – Conducted emissions 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	FA002515	1 year	July 14/15

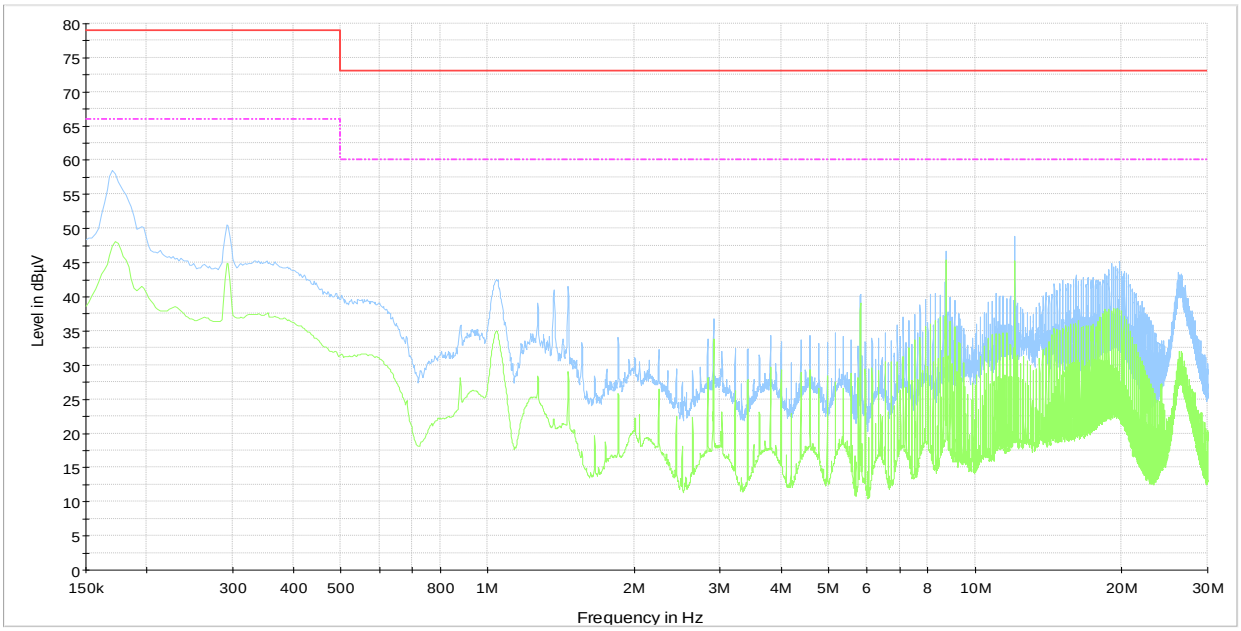
Notes: None

Table 8.2-2: *AC ports – Conducted emissions test software details*

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

Notes: None

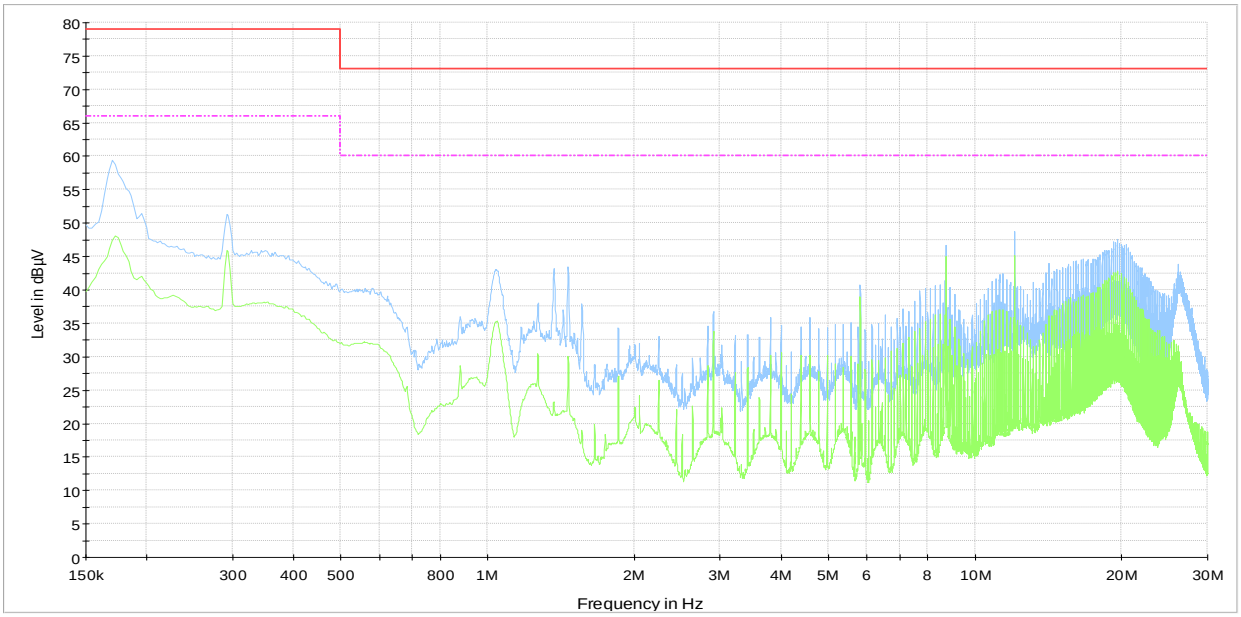
8.2.5 Test data



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

Figure 8.2-1: *AC ports – Conducted emissions plot on phase line*

8.2.5 Test data, continued



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

Figure 8.2-2: *AC ports – Conducted emissions plot on neutral line*

8.2.6 Setup photos

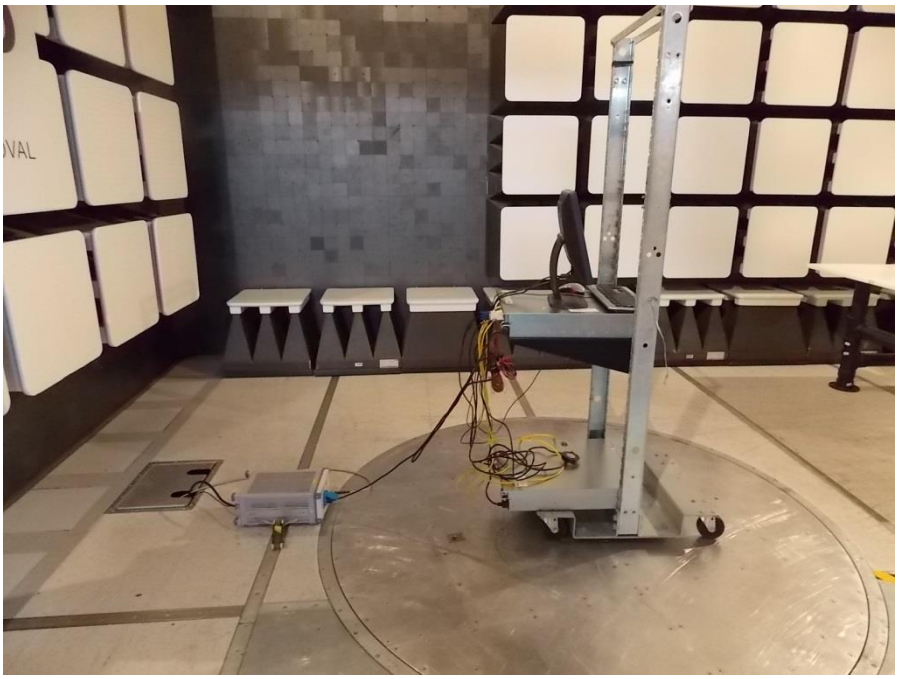


Figure 8.2-3: *AC ports – Conducted emissions setup photo*

8.3 AC ports – Current harmonics

8.3.1 References

EN 61000-3-2: 2006 + A1: 2009 + A2: 2009

8.3.2 Test summary

Verdict	Pass		
Test date	May 25, 2015	Temperature	23.7 °C
Test engineer	Daniel Hynes	Air pressure	1014.7 mbar
Test location	Montreal	Relative humidity	49.8 %

8.3.3 Notes

None

8.3.4 Setup details

Port under test	AC Mains
Measurement time	10 min

Table 8.3-1: *AC ports – Current harmonics equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Three phase power system	TESEQ	ProfLine 2115-400	FA002516	1 year	June 7/15

Notes: None

Table 8.3-2: *AC ports – Current harmonics test software details*

Manufacturer of Software	Details
TESEQ	WIN2100V4, Version 4.3.2

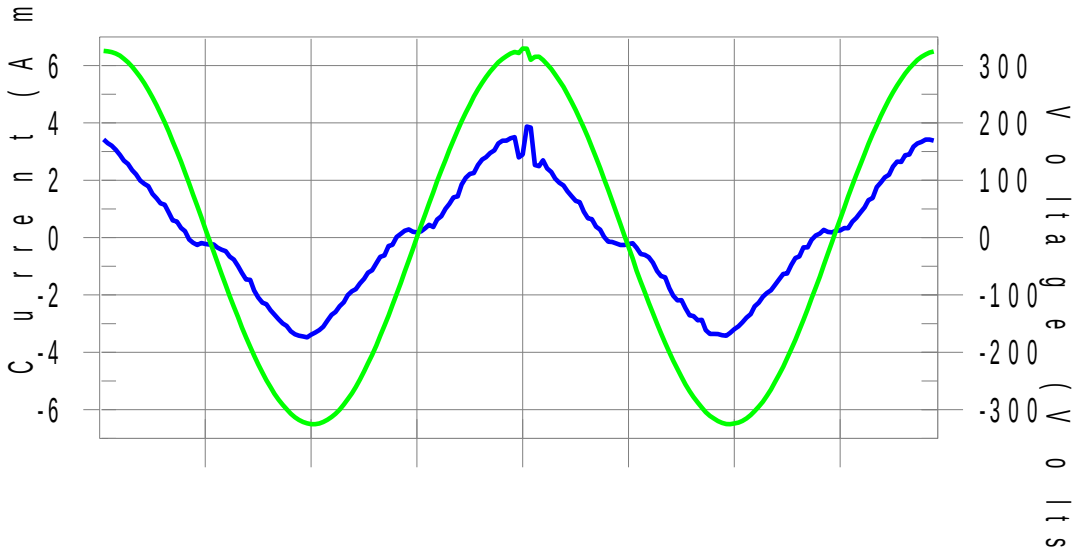
Notes: None

8.3.5 Test data

Measurement data

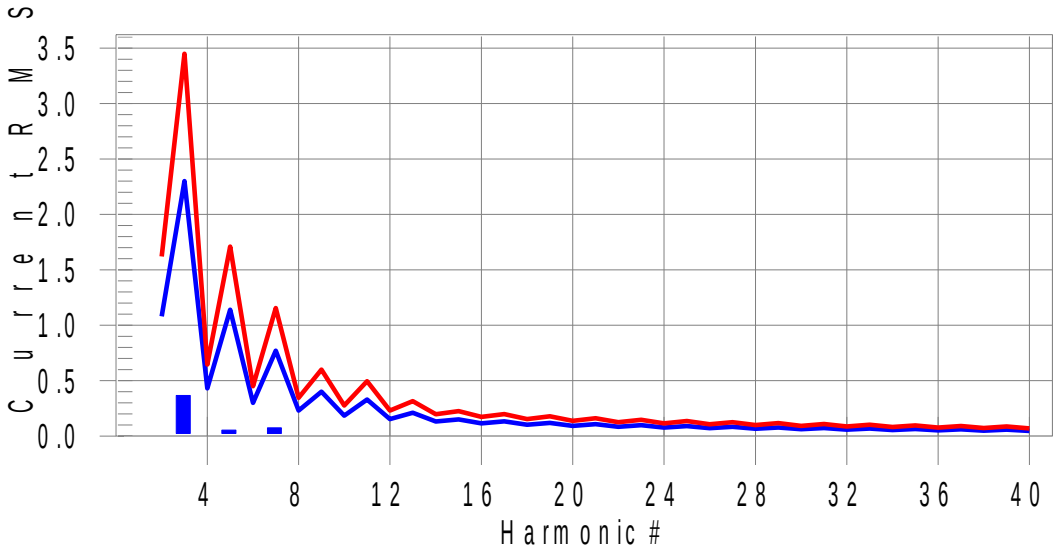
Harmonics – Class-A per Ed. 4.0 (2014)(Run time) incl. inter-harmonics

Current & voltage waveforms



Harmonics and Class A limit line

European Limits



Worst harmonic was #3 with 15.9% of the limit.

8.3.5 Test data, continued

Measurement data, continued

Current Test Result Summary (Run time)

THC (A): 0.378 I-THD (%): 18.9 POHC (A): 0.018 POHC Limit (A): 0.251

Highest parameter values during test:

V_RMS (Volts):	230.08	Frequency(Hz):	50.00
I_Peak (Amps):	4.982	I_RMS (Amps):	2.124
I_Fund (Amps):	2.060	Crest Factor:	2.425
Power (Watts):	469.3	Power Factor:	0.973

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.003	1.080	N/A	0.004	1.620	N/A	Pass
3	0.366	2.300	15.9	0.380	3.450	11.0	Pass
4	0.002	0.430	N/A	0.003	0.645	N/A	Pass
5	0.054	1.140	4.7	0.057	1.710	3.3	Pass
6	0.001	0.300	N/A	0.002	0.450	N/A	Pass
7	0.075	0.770	9.7	0.076	1.155	6.6	Pass
8	0.001	0.230	N/A	0.001	0.345	N/A	Pass
9	0.011	0.400	N/A	0.013	0.600	N/A	Pass
10	0.001	0.184	N/A	0.001	0.276	N/A	Pass
11	0.008	0.330	N/A	0.009	0.495	N/A	Pass
12	0.001	0.153	N/A	0.002	0.230	N/A	Pass
13	0.009	0.210	N/A	0.011	0.315	N/A	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.006	0.150	N/A	0.006	0.225	N/A	Pass
16	0.001	0.115	N/A	0.001	0.173	N/A	Pass
17	0.008	0.132	N/A	0.009	0.198	N/A	Pass
18	0.001	0.102	N/A	0.002	0.153	N/A	Pass
19	0.004	0.118	N/A	0.004	0.178	N/A	Pass
20	0.001	0.092	N/A	0.002	0.138	N/A	Pass
21	0.004	0.107	N/A	0.005	0.161	N/A	Pass
22	0.001	0.084	N/A	0.002	0.125	N/A	Pass
23	0.005	0.098	N/A	0.006	0.147	N/A	Pass
24	0.001	0.077	N/A	0.002	0.115	N/A	Pass
25	0.014	0.090	15.2	0.014	0.135	10.7	Pass
26	0.001	0.071	N/A	0.002	0.107	N/A	Pass
27	0.012	0.083	14.8	0.013	0.125	10.4	Pass
28	0.001	0.066	N/A	0.002	0.099	N/A	Pass
29	0.007	0.078	N/A	0.008	0.116	N/A	Pass
30	0.001	0.061	N/A	0.002	0.092	N/A	Pass
31	0.005	0.073	N/A	0.007	0.109	N/A	Pass
32	0.001	0.058	N/A	0.002	0.086	N/A	Pass
33	0.008	0.068	N/A	0.009	0.102	N/A	Pass
34	0.001	0.054	N/A	0.002	0.081	N/A	Pass
35	0.005	0.064	N/A	0.006	0.096	N/A	Pass
36	0.001	0.051	N/A	0.002	0.077	N/A	Pass
37	0.006	0.061	N/A	0.008	0.091	N/A	Pass
38	0.001	0.048	N/A	0.002	0.073	N/A	Pass
39	0.005	0.058	N/A	0.006	0.087	N/A	Pass
40	0.001	0.046	N/A	0.002	0.069	N/A	Pass

8.3.5 Test data, continued

Measurement data, continued

Voltage Source Verification Data (Run time)

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.016	0.460	3.50	OK
3	0.479	2.071	23.14	OK
4	0.030	0.460	6.61	OK
5	0.034	0.920	3.71	OK
6	0.024	0.460	5.18	OK
7	0.044	0.690	6.42	OK
8	0.018	0.460	3.99	OK
9	0.048	0.460	10.49	OK
10	0.017	0.460	3.62	OK
11	0.017	0.230	7.54	OK
12	0.015	0.230	6.31	OK
13	0.012	0.230	5.05	OK
14	0.007	0.230	2.89	OK
15	0.011	0.230	4.65	OK
16	0.011	0.230	4.64	OK
17	0.010	0.230	4.50	OK
18	0.010	0.230	4.39	OK
19	0.009	0.230	4.08	OK
20	0.012	0.230	5.26	OK
21	0.008	0.230	3.34	OK
22	0.008	0.230	3.43	OK
23	0.008	0.230	3.62	OK
24	0.006	0.230	2.58	OK
25	0.013	0.230	5.79	OK
26	0.007	0.230	2.86	OK
27	0.012	0.230	5.29	OK
28	0.007	0.230	3.01	OK
29	0.008	0.230	3.61	OK
30	0.007	0.230	2.93	OK
31	0.008	0.230	3.60	OK
32	0.005	0.230	2.27	OK
33	0.014	0.230	6.06	OK
34	0.005	0.230	2.13	OK
35	0.008	0.230	3.44	OK
36	0.006	0.230	2.48	OK
37	0.013	0.230	5.77	OK
38	0.005	0.230	2.38	OK
39	0.011	0.230	4.65	OK
40	0.007	0.230	2.87	OK

8.3.6 Setup photos

Figure 8.3-1: *AC ports – Current harmonics setup photo*

8.4 AC ports – Voltage fluctuations

8.4.1 References

EN 61000-3-3: 2008

8.4.2 Test summary

Verdict	Pass		
Test date	May 25, 2015	Temperature	23.7 °C
Test engineer	Daniel Hynes	Air pressure	1014.7 mbar
Test location	Montreal	Relative humidity	49.8 %

8.4.3 Notes

None

8.4.4 Setup details

Port under test	AC Mains
Measurement time	10 min

Table 8.4-1: *AC ports – Voltage fluctuations equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Three phase power system	TESEQ	ProfLine 2115-400	FA002516	1 year	June 7/15

Notes: None

Table 8.4-2: *AC ports – Voltage fluctuations test software details*

Manufacturer of Software	Details
TESEQ	WIN2100V4, Version 4.3.2

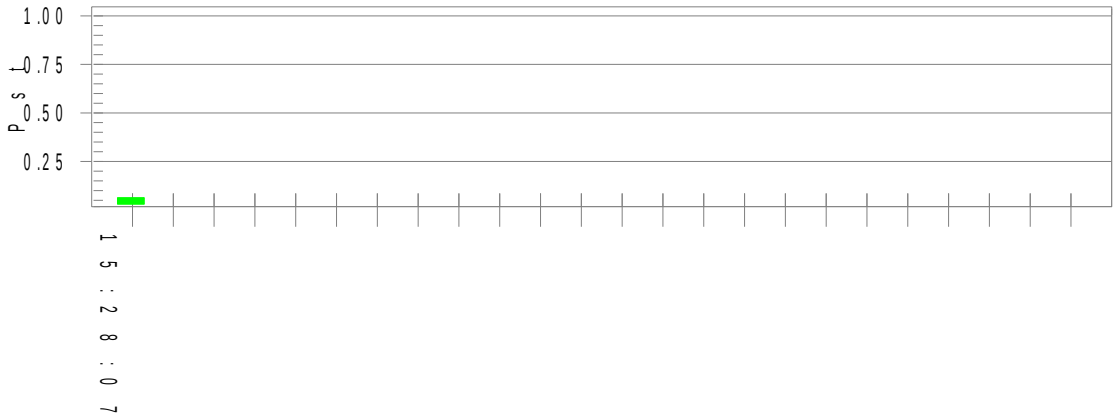
Notes: None

8.4.5 Test data

Measurement data

Flicker Test Summary per EN/IEC61000-3-3 (Run time)

Pst and limit line — European Limits



Plt and limit line

Parameter values recorded during the test:

Vrms at the end of test (Volt):	230.06			
Highest dt (%):	0.00	Test limit (%):	N/A	N/A
T-max (mS):	0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	0.06	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.064	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.028	Test limit:	0.650	Pass

8.4.6 Setup photos

Figure 8.4-1: *AC ports – Voltage fluctuations setup photo*

8.5 Telecommunications ports – Conducted emissions

8.5.1 References

EN 55022: 2010

8.5.2 Test summary

Verdict	Pass		
Test date	July 8, 2015	Temperature	22.5 °C
Test engineer	David Duchesne	Air pressure	1005.1 mbar
Test location	Ottawa	Relative humidity	52.2 %

8.5.3 Notes

None

8.5.4 Setup details

Port under test	GbE_Motherboard, GbE PCIe and MNGT
EUT setup configuration	Floor standing
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 Average (final measurement)
Trace mode	Max Hold
Measurement time	100 ms (preview measurement); 1000 ms (final measurement)

Table 8.5-1: *Telecommunications ports – Conducted emissions equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 07/16
CISPR 22 ISN	FCC	F-120601-1057-1	FA002699	1 year	Mar. 12/16
50 Ω coax cable	C.C.A.	None	FA002556	1 year	May 05/16

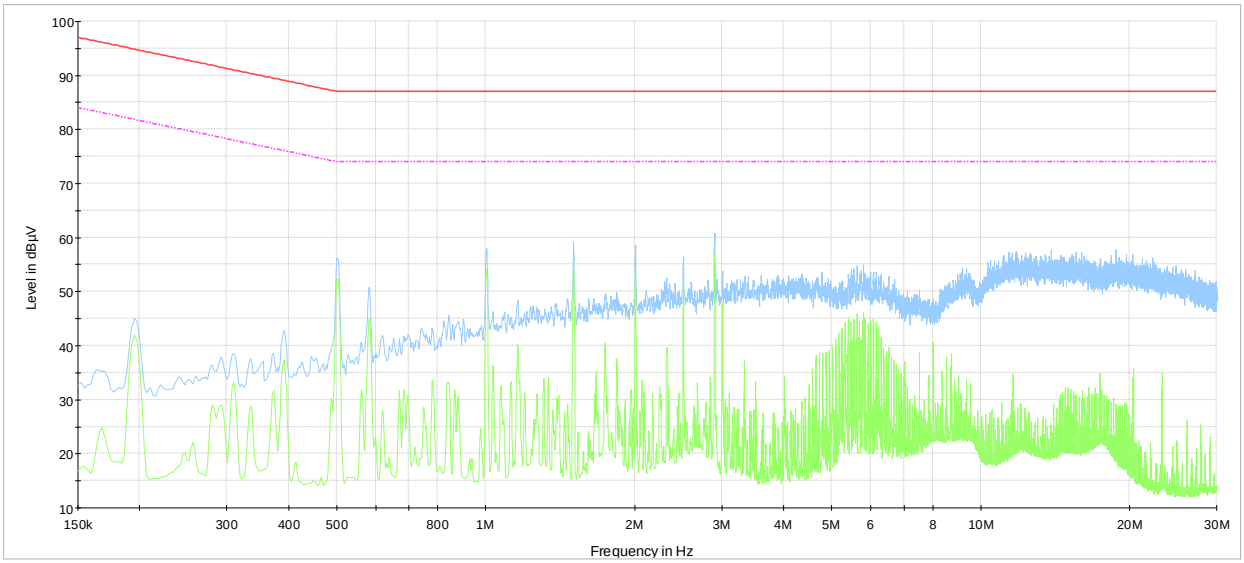
Notes: None

Table 8.5-2: *Telecommunications ports – Conducted emissions test software details*

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

Notes: None

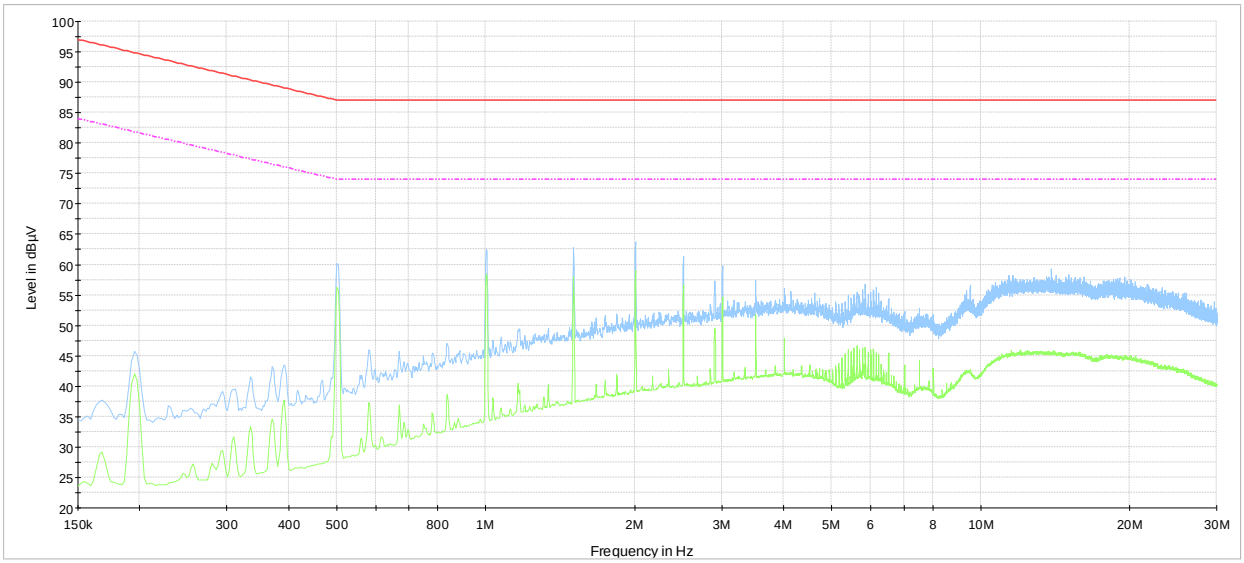
8.5.5 Test data



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

Figure 8.5-1: *Telecommunications ports – Conducted emissions spectral plot on GbE_Motherboard port*

8.5.5 Test data, continued

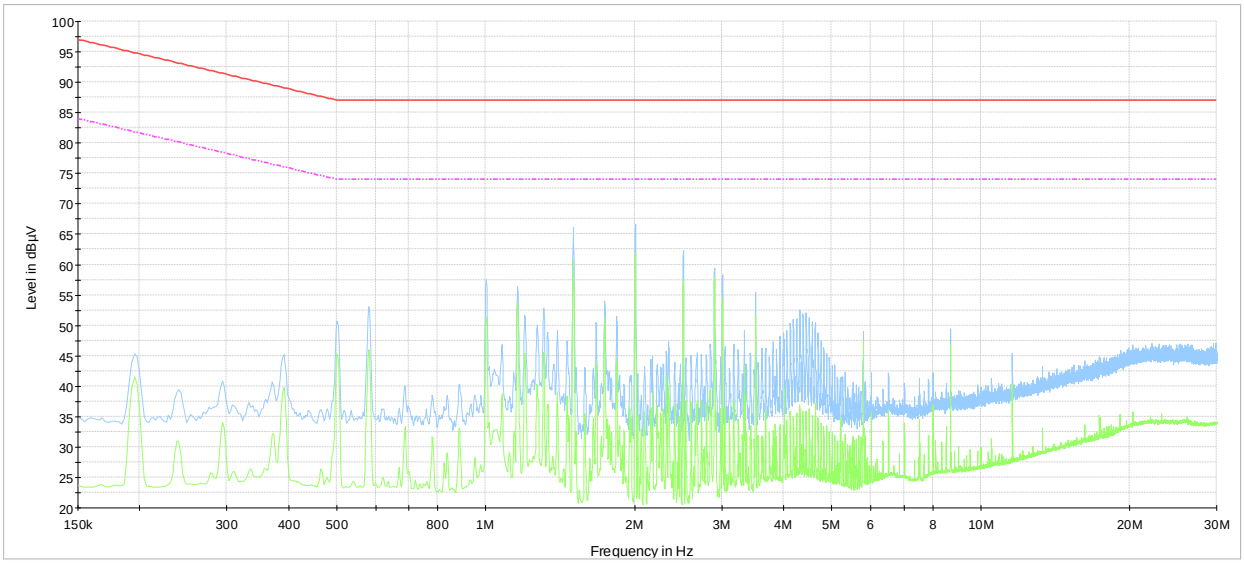


Gbe PCIe
CISPR 22 Telecom QP Class A - Voltage Limit
CISPR 22 Telecom AV Class A - Voltage Limit
Preview Result 1-PK+
Preview Result 2-AVG

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

Figure 8.5-2: *Telecommunications ports – Conducted emissions spectral plot on GbE PCIe Port*

8.5.5 Test data, continued



MNGT
CISPR 22 Telecom QP Class A - Voltage Limit
CISPR 22 Telecom AV Class A - Voltage Limit
Preview Result 1-PK+
Preview Result 2-AVG

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

Figure 8.5-3: *Telecommunications ports – Conducted emissions spectral plot on MNGT port*

8.5.6 Setup photos

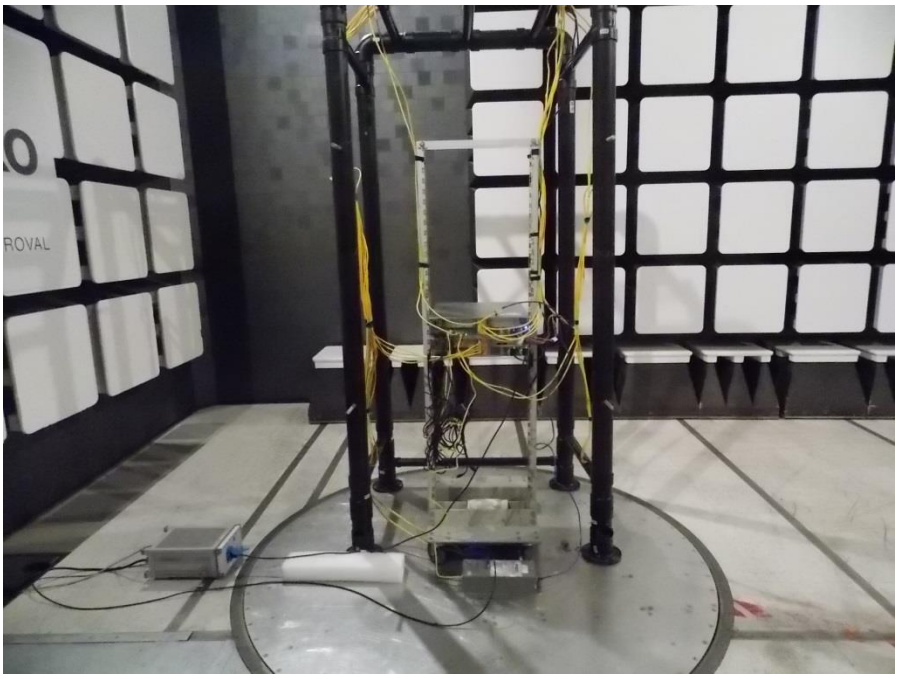


Figure 8.5-4: *Telecommunications ports – Conducted emissions setup photo*

8.6 Radio frequency electromagnetic field amplitude modulated

8.6.1 References

EN 61000-4-3: 2006 + A1: 2008 + A2: 2010

8.6.2 Test summary

Verdict	Pass		
Test date	July 8, 2015	Temperature	22.5 °C
Test engineer	Kevin Rose	Air pressure	1005.1 mbar
Test location	Ottawa	Relative humidity	52.2 %

8.6.3 Notes

None

8.6.4 Setup details

Table 8.6-1: *Radio-frequency electromagnetic field amplitude modulated equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Feb. 25/16
Biconilog antenna (26–3000 MHz)	ETS	3140B	FA002233	—	NCR
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 01/16
E-Field probe (0.003–18 GHz)	AR	FP7018	FA002186	1 year	July 08/15
Directional coupler (80–1000 MHz)	AR	DC6180A	FA002090	1 year	June 09/16
Directional coupler (1–4.2 GHz)	AR	DC7140	FA002389	1 year	June 09/16
Power meter	Rhode & Schwarz	NRP	FA002070	1 year	Jan. 28/16
Power sensor	Rhode & Schwarz	NRP-Z91	FA002107	1 year	Jan. 29/16
Amplifier (80–1000 MHz, 250 W)	AR	250W1000A	FA002038	—	NCR
Amplifier (800–4200 MHz, 120 W)	AR	120S1G4	FA002234	—	NCR
Signal generator	Rhode & Schwarz	SMB100A	FA002174	1 year	April. 21/16
50 Ω coax cable	C.C.A.	None	FA002555	1 year	May 05/16
50 Ω coax cable	Huber + Suhner	None	FA002074	1 year	May 05/16

Notes: NCR - no calibration required

Table 8.6-2: *Radio-frequency electromagnetic field amplitude modulated test software details*

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

Notes: None

8.6.5 Test data

Table 8.6-3: *Radio frequency electromagnetic field amplitude modulated results*

Step size increment:	1 %
Dwell time:	3 s
Antenna polarization:	Vertical and Horizontal
Modulation:	CW signal amplitude modulated (AM) with 80 % depth with a 1 kHz sine wave
EUT setup configuration:	Floor standing
EUT position facing antenna:	Front side, back side, left side and right side

Frequency range, MHz		Test level, V/m	Comments
80	800	3	No degradation
800	960	10	No degradation
960	1000	3	No degradation
1400	2000	10	No degradation
2000	2700	3	No degradation

Notes: EUT operational frequencies within specified test band were also assessed.
As required in 11.2.2 (EN 300 386 V1.6.1 (2012-09), an additional comprehensive functional test was carried out at a limited number of frequencies. The selected frequencies are: 434, 450, 850, 900, 1800, 1950, 2100 and 2400 MHz (±1 %).

8.6.6 Setup photo

Figure 8.6-1: *Radio frequency electromagnetic field amplitude modulated setup photo*

8.7 Radio frequency, conducted continuous

8.7.1 References

EN 61000-4-6: 2009

8.7.2 Test summary

Verdict	Pass		
Test date	July 9, 2015	Temperature	24.1 °C
Test engineer	David Duchesne	Air pressure	1004 mbar
Test location	Ottawa	Relative humidity	46.9 %

8.7.3 Notes

The EUT is equipped with a redundant AC input. Both inputs were tested separately to demonstrate compliance. While each AC input was being tested the second input was disconnected.

8.7.4 Setup details

Table 8.7-1: *Radio frequency, conducted continuous equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Amplifier (0.01–250 MHz, 75 W)	AR	75A250A	FA001943	—	NCR
Signal generator	Rhode & Schwarz	SML-03	FA002046	1 year	Nov. 10/15
6 dB attenuator	Inmet	64671	FA002215	1 year	July 02/16
Directional coupler (0.01–250 MHz)	AR	DC2600A	FA002089	1 year	July 02/16
CDN-T8	FCC	FCC-801-T8-RJ45	FA002111	1 year	April 21/16
CDN-M2	FCC	FCC-801-M2-16	FA000837	1 year	July 17/15
CDN-M2	FCC	FCC-801-M2-16A	FA001811	1 year	July 17/15
CDN-M3	FCC	FCC-801-M3-16A	FA002066	1 year	July 17/15
CDN-M3	FCC	FCC-801-M3-16A	FA002068	1 year	July 14/15
Direct Injection 100 Ω resistor	Nemko	N/A	FA001751	1 year	April 22/16
Power meter	Rhode & Schwarz	NRP	FA002076	1 year	Jan. 09/16
Power sensor	Rhode & Schwarz	NRP-Z91	FA002075	1 year	Jan. 12/16

Notes: NCR - no calibration required

Table 8.7-2: *Radio frequency, conducted continuous test software details*

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

Notes: None

8.7.5 Test data

Table 8.7-3: *Radio frequency, conducted continuous results*

Frequency range:	0.15–80 MHz
Step size increment:	1 %
Dwell time[1]:	3 s
Signal level:	3 V_{RMS}
Modulation:	CW signal amplitude modulated (AM) with 80 % depth with a 1 kHz sine wave

Ports investigated	Coupling method	50 Ω termination point	Comments
AC input (PS1)	CDN – M3	CDN-M3 (AE)	No degradation
AC input (PS2)	CDN – M3	CDN-M3 (AE)	No degradation
GbE_Motherboard	CDN-T8	CDN – M3	No degradation
GbE PCIe	CDN-T8	CDN – M3	No degradation
USB 2.0	Direct injection	CDN – M3	No degradation
USB 3.0	Direct injection	CDN – M3	No degradation
MNGT	CDN-T8	CDN – M3	No degradation

Notes: [1]The dwell time at each frequency was not less than the time necessary for the EUT to be exercised and to be able to respond. The time to exercise the EUT is not interpreted as a total time of a program or a cycle but related to the reaction time in case of failure of the EUT.

8.7.6 Setup photo

Figure 8.7-1: *Radio frequency, conducted continuous setup photo*

8.8 Electrostatic discharge

8.8.1 References

EN 61000-4-2: 2009

8.8.2 Test summary

Verdict	Pass		
Test date	July 8, 2015	Temperature	22.5 °C
Test engineer	Shawn He	Air pressure	1005.1 mbar
Test location	Ottawa	Relative humidity	52.2 %

8.8.3 Notes

None

8.8.4 Setup details

Table 8.8-1: *Electrostatic discharge equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
ESD gun	TESEQ	NSG 435	FA002682	1 year	Feb. 05/16

Notes: None

8.8.5 Test data

Table 8.8-2: *Electrostatic discharge results*

EUT setup configuration:	Floor standing
ESD repetition rate:	1 pulse per second
Discharges:	25 contact discharges and 10 air discharges at each polarity

Contact discharge	**Test voltage (±kV)**	**Comments**
Please refer to "Electrostatic discharge test location points" photos of this section	2, 4, 6, 8	No degradation
Indirect discharge	**Test voltage (±kV)**	**Comments**
VCP (all sides)	2, 4, 6, 8	No degradation
Air discharge	**Test voltage (±kV)**	**Comments**
Please refer to "Electrostatic discharge test location points" photos of this section	2, 4, 8, 15	No degradation

Notes: Contact discharge testing level was increased to 8 kV, and air discharge testing level to 15 kV as requested by the customer.

8.8.5 Test data, continued

Figure 8.8-1: *Electrostatic discharge test location point's photo*

Red points = contact discharge
Green points = air discharge

8.8.5 Test data, continued

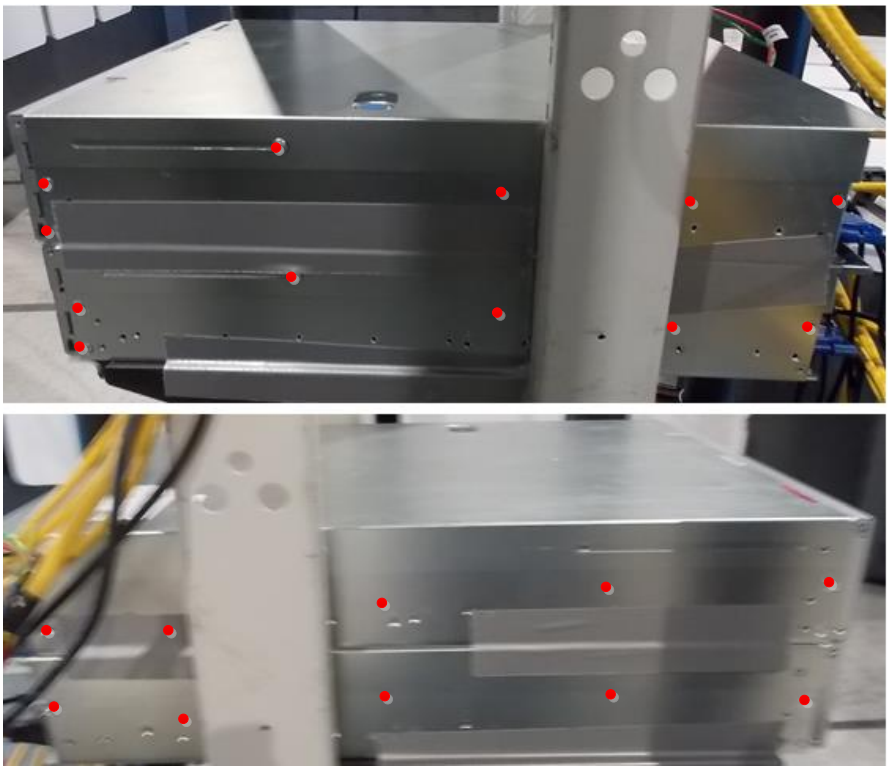


Figure 8.8-2: *Electrostatic discharge test location point's photo*

Red points = contact discharge
Green points = air discharge

8.8.6 Setup photo

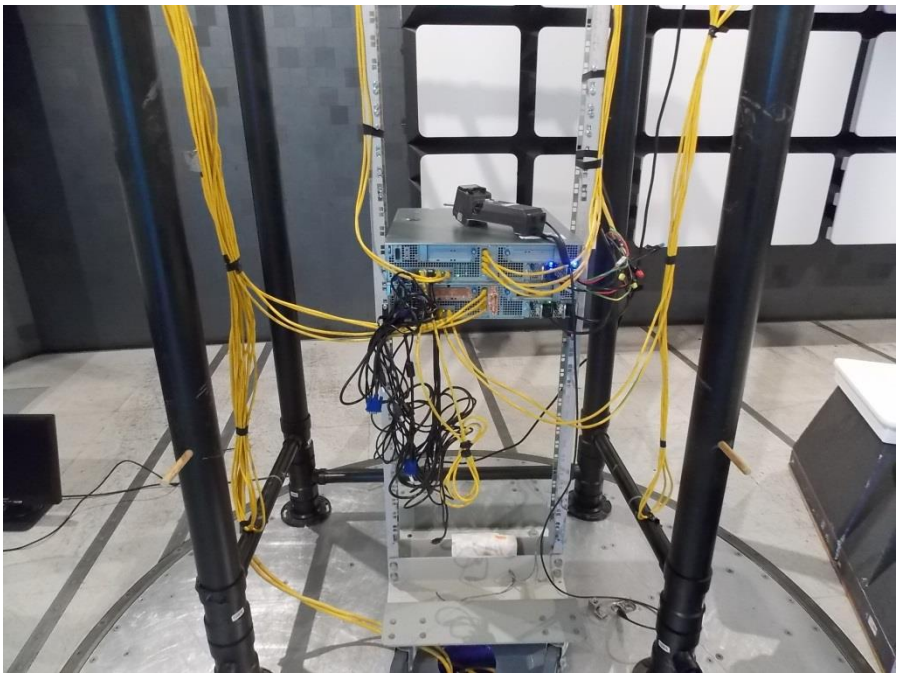


Figure 8.8-3: *Electrostatic discharge setup photo*

8.9 Surge

8.9.1 References

EN 61000-4-5: 2006

8.9.2 Test summary

Verdict	Pass		
Test date	July 9, 2015	Temperature	24.0 °C
Test engineer	Shawn He	Air pressure	1002.6 mbar
Test location	Ottawa	Relative humidity	45.7 %

8.9.3 Notes

The EUT is equipped with a redundant AC input. Both inputs were tested separately to demonstrate compliance. While each AC input was being tested the second input was disconnected.

8.9.4 Setup details

Table 8.9-1: *Surge equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Surge/EFT generator/Ringwave	TESEQ	NSG 3060	FA002177	1 year	July 15/15
Surge/EFT coupler/Decoupler	TESEQ	NSG 3063	FA002177	1 year	July 15/15
I/O Surge CDN	FCC	F-060322-1004-2	FA002373	3 year	July 15/15
Pulse input resistor box – 8 wire	FCC	F-060322-1004-2	FA002373	—	NCR

Notes: NCR - no calibration required

Table 8.9-2: *Surge test software details*

Manufacturer of Software	Details
Teseq	NSG300, Version 1.2.0

Notes: None

8.9.5 Test data

Table 8.9-3: *Surge at AC power ports results*

Open circuit voltage (T_1 / T_2):	1.2/50 µs (T_1 = front time, T_2= time to half value)
Short circuit curent (T_1 / T_2):	8/20 µs (T_1 = front time, T_2= time to half value)
Surge pulse interval:	30 s
Number of pulses:	5 positive and 5 negative

Test port	Coupling	Test voltage (±kV)	Comments
AC input (PS1)	Phase to Neutral	0.5, 1	No degradation
	Phase to ground	0.5, 1, 2	No degradation
	Neutral to ground	0.5, 1, 2	No degradation
AC input (PS2)	Phase to Neutral	0.5, 1	No degradation
	Phase to ground	0.5, 1, 2	No degradation
	Neutral to ground	0.5, 1, 2	No degradation

Notes:
- **Phase to neutral coupling :** Surge applied with generator output impedance set to 2 Ω
- **Phase/neutral to ground coupling :** Surge applied with generator output impedance set to 12 Ω
- Surge applied synchronous (relation to power supply): 0, 90, 180, and 270°

Table 8.9-4: *Surge at intdoor signal ports results*

Open circuit voltage (T_1 / T_2):	1.2/50 µs (T1 = front time, T2= time to half value)
Short circuit curent (T_1 / T_2):	8/20 µs (T1 = front time, T2= time to half value)
Surge pulse interval:	30 s
Number of pulses:	5 positive and 5 negative

Test port	Coupling	Test voltage (±kV)	Comments
GbE_Motherboard	Line to ground	0.5	No degradation
GbE PCIe	Line to ground	0.5	No degradation
MNGT	Line to ground	0.5	No degradation

Notes: Surge applied with generator output impedance set to 42 Ω
Shielded lines: Surge applied with generator output impedance set to 2 Ω

8.9.6 Setup photo

Figure 8.9-1: *Surge setup photo*

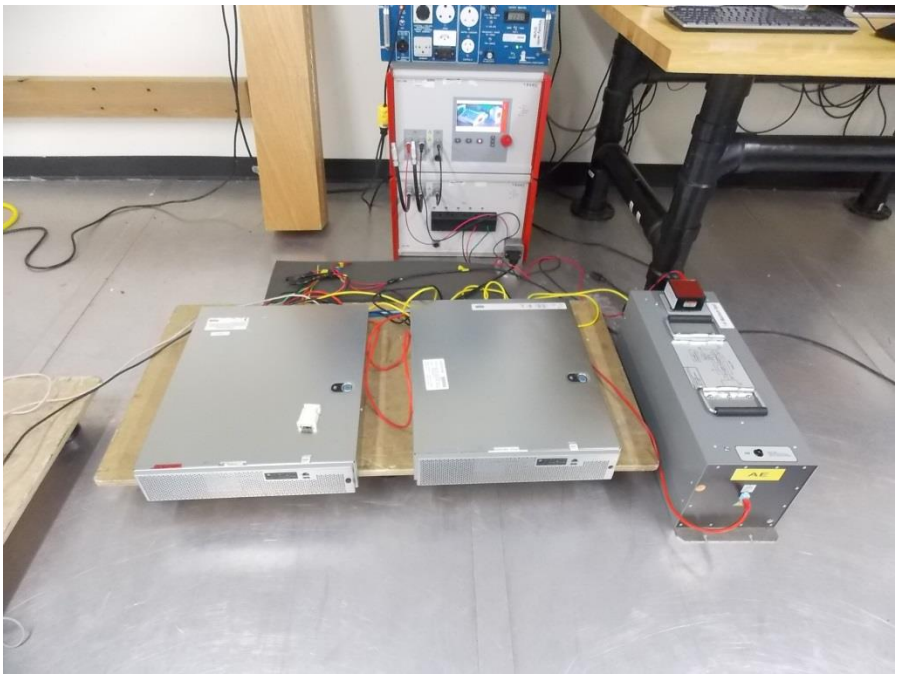


Figure 8.9-2: *Surge setup photo*

8.10 Fast transients

8.10.1 References

EN 61000-4-4: 2004 + A1: 2010

8.10.2 Test summary

Verdict	Pass		
Test date	July 9, 2015	Temperature	24.0 °C
Test engineer	Shawn He	Air pressure	1002.6 mbar
Test location	Ottawa	Relative humidity	45.7 %

8.10.3 Notes

The EUT is equipped with a redundant AC input. Both inputs were tested separately to demonstrate compliance. While each AC input was being tested the second input was disconnected.

8.10.4 Setup details

Table 8.10-1: Fast transients equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Surge/EFT generator/Ringwave	TESEQ	NSG 3060	FA002177	1 year	July 15/15
Surge/EFT coupler/Decoupler	TESEQ	NSG 3063	FA002177	1 year	July 15/15
Capacitive coupling clamp	TESEQ	CDN 8014	FA002176	—	NCR

Notes: None

***Table 8.10-2:** Fast transients test software details*

Manufacturer of Software	Details
Teseq	NSG300, Version 1.2.0

Notes: None

8.10.5 Test data

Table 8.10-3: *Fast transients at AC power ports results*

Wave shape (Tr / Td):	5/50 ns (Tr = rise time, Td= duration time)
Repetition frequency:	5 kHz
Burst duration:	15 ms
Burst period:	300 ms
Test duration:	60 s

Test port	Test voltage (±kV)	Comments
AC input (PS1)	0.5, 1.0	No degradation
AC input (PS2)	0.5, 1.0	No degradation

Notes: Transient applied asynchronous (relation to power supply)

Table 8.10-4: *Fast transients at indoor signal ports results*

Wave shape (Tr / Td):	5/50 ns (Tr = rise time, Td= duration time)
Repetition frequency:	5 kHz
Burst duration:	15 ms
Burst period:	300 ms
Test duration:	60 s

Test port	Test voltage (±kV)	Comments
GbE_Motherboard	0.5	No degradation
GbE_PCIe	0.5	No degradation
USB 2.0	0.5	No degradation
USB 3.0	0.5	No degradation
MNGT	0.5	No degradation

Notes: The test voltage was applied via capacitive coupling clamp

8.10.6 Setup photos

Figure 8.10-1: *Fast transients setup photo*

Figure 8.10-2: *Fast transients setup photo*

8.11 Voltage dips and voltage interruptions

8.11.1 References

EN 61000-4-11: 2004

8.11.2 Test summary

Verdict	Pass		
Test date	July 9, 2015	Temperature	24.0 °C
Test engineer	Shawn He	Air pressure	1002.6 mbar
Test location	Ottawa	Relative humidity	45.7 %

8.11.3 Notes

The EUT is equipped with a redundant AC input. Both inputs were tested separately to demonstrate compliance. While each AC input was being tested the second input was disconnected

8.11.4 Setup details

Table 8.11-1: *Voltage dips and voltage interruptions equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Power source	California Instruments	5001ix	FA001238	1 year	Sept. 18/15
Electronic output switch	California Instruments	EOS-1	FA002253	1 year	Sept. 18/15

Notes: None

Table 8.11-2: *Voltage dips and voltage interruptions test software details*

Manufacturer of Software	Details
TESEQ	WIN2110SII, P/N CIC924, Version 2.2.0.8, July 15, 2010

Notes: None

8.11.5 Test data

Table 8.11-3: *Voltage dips results*

Variation/dip repetition:	Sequence of three dips/interruptions with an interval of 10 seconds between each test		
Test port	**Residual voltage (%)**	**Periods**	**Comments**
AC input (PS1)	0	0.5	No degradation
	0	1	No degradation
	70	25	No degradation
AC input (PS2)	0	0.5	No degradation
	0	1	No degradation
	70	25	No degradation

Notes: Changes occurred at the 0 crossings of the voltage waveform

Table 8.11-4: *Voltage interruptions results*

Variation/dip repetition:	Sequence of three dips/interruptions with an interval of 10 seconds between each test		
Test port	**Residual voltage (%)**	**Periods**	**Comments**
AC input (PS1)	0	250	EUT power cycled
AC input (PS2)	0	250	EUT power cycled

Notes: Changes occurred at the 0 crossings of the voltage waveform

8.11.6 Setup photo

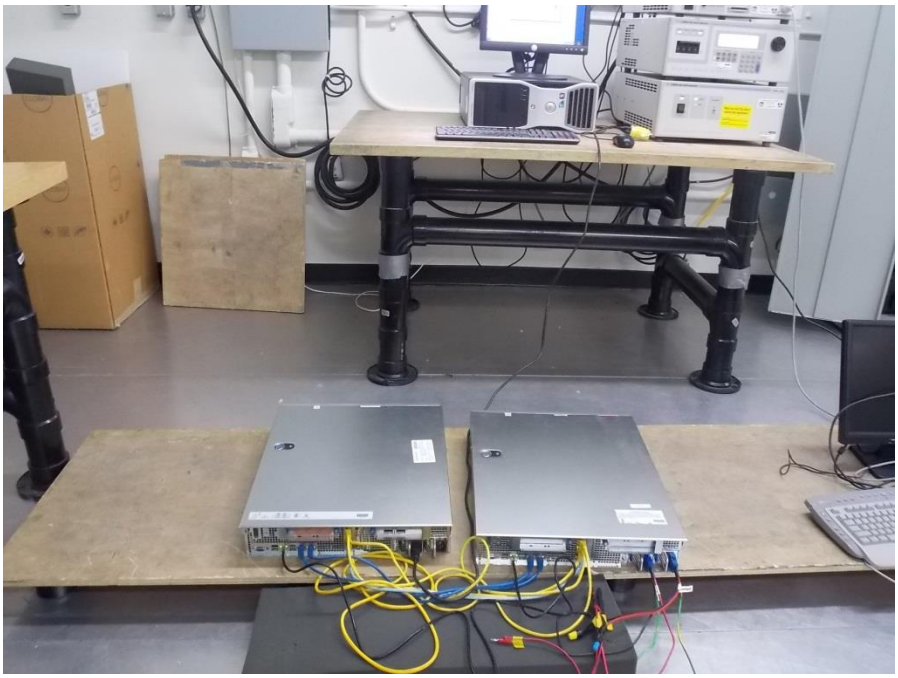


Figure 8.11-1: *Voltage dips and voltage interruptions setup photo*

Section 9 EUT photos

9.1 External photos

Figure 9.1-1: *Front view photo*

Figure 9.1-2: *Rear view photo*

Figure 9.1-3: *Side view photo*

Figure 9.1-4: *Side view photo*