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Test report

290739-2TRFEMC

Date of issue: July 15, 2015

Applicant:

Kontron Canada Inc

Product:

Carrier Grade Rack Mount System (DC option)

Model:

CG2300

Specification:

EN 55024: 2010

Information technology equipment
Immunity characteristics
Limits and methods of measurement

Lab and test locations

Company name	Nemko Canada Inc.		
Designation number	CA2040		
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Toll free	+1 800 563 6336		
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Tested by	David Duchesne, Senior EMC/Wireless Specialist, Shawn He, Senior EMC Specialist and Kevin Rose, Wireless/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

Table of Contents

Section 1 Report summary

1.1 Test specifications

EN 55024: 2010	Information technology equipment Immunity characteristics Limits and methods of measurement

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 Test results

Table 2.1-1: *Immunity, enclosure results*

Environmental phenomenon	Test specification	Units	Performance criteria	Basic standard	Verdict
Power-frequency magnetic field [1]	50 1	Hz A/m_{RMS}	A[2]	EN 61000-4-8	Not applicable
Radio-frequency electromagnetic field amplitude modulated [3]	80–1000 3 80	MHz V/m_{RMS} (unmodulated) % AM (1 kHz)	A	EN 61000-4-3	Pass
Electrostatic discharge (ESD)	4 (Contact discharge) 8 (Air discharge)	kV (charge voltage) kV (charge voltage)	B	EN 61000-4-2	Pass

Notes:
[1] Applicable only to EUT containing devices susceptible to magnetic fields, such as CRT monitors, Hall elements, electrodynamic microphones, magnetic field sensors, etc.
[2] See Annex B (EN 55024: 2010) as appropriate.
[3] The frequency range is scanned as specified. However, when specified in Annex A (EN 55024: 2010), an additional comprehensive functional test shall be carried out at a limited number of frequencies. The selected frequencies are: 80, 120, 160, 230, 434, 460, 600, 863 and 900 MHz (±1 %).

Table 2.1-2: *Immunity, signal ports and telecommunication ports*

Environmental phenomenon	Test specification	Units	Performance criteria	Basic standard	Verdict
Radio-frequency continuous conducted [1 and 3]	0.15–80 3 80	MHz V_{RMS} (unmodulated) % AM (1 kHz)	A	EN 61000-4-6	Pass
Surge (line to ground) [2, 4, 5, and 7]	1 or 4 10/700	kV (peak) Tr/Th µs	C	EN 61000-4-5	Not applicable
Fast transients [3, 5, and 6]	0.5 5/50 5	kV (peak) Tr/Th ns kHz (repetition rate)	B	EN 61000-4-4	Pass

Notes:
[1] The frequency range is scanned as specified. However, when specified in Annex A (EN 55024: 2010), an additional comprehensive functional test shall be carried out at a limited number of frequencies. The selected frequencies for conducted tests are: 0.2, 1, 7.1, 13.56, 21, 27.12 and 40.68 MHz (±1 %).
[2] Applicable only to ports which according to the manufacturer's specification may connect directly to outdoor cables.
[3] Applicable only to cables which according to the manufacturer's specification supports communication on cable lengths greater than 3 m.
[4] For ports where primary protection is intended, surges are applied at voltages up to 4 kV with the primary protectors fitted. Otherwise the 1 kV test level is applied without primary protection in place.
[5] Test applied to all lines simultaneously to earth (ground).
[6] For xDSL equipment, the repetition frequency for EFT testing shall be 100 kHz (See EN 55024: 2010 Annex H).
[7] Where the coupling network for the 10/700 µs waveform affects the functioning of high speed data ports, the test shall be carried out using a 1,2/50 (8/20) µs waveform and appropriate coupling network.

2.1 Test results, continued

Table 2.1-3: *Immunity, input DC power port (excluding equipment marketed with an a.c/d.c, power converter)*

Environmental phenomenon	Test specification	Units	Performance criteria	Basic standard	Verdict
Radio-frequency continuous conducted [1]	0.15–80 3 80	MHz V_{RMS} (unmodulated) % AM (1 kHz)	A	EN 61000-4-6	Pass
Surge (line to ground) [2]	1.2/50 (8/20) 0.5	Tr/Th µs kV (peak)	B	EN 61000-4-5	Not applicable
Fast transients	0.5 5/50 5	kV (peak) Tr/Th ns kHz (repetition rate)	B	EN 61000-4-4	Pass

Notes: If d.c. power is fed on conductors included in a signal cable, then the requirements of EN 55024: 2010 Table 2 only apply to this cable.
[1] The frequency range is scanned as specified. However, when specified in EN 55024: 2010 Annex A, an additional comprehensive functional test shall be carried out at a limited number of frequencies. The selected frequencies for conducted test are: 0.2, 1, 7.1, 13.56, 21, 27.12 and 40.68 MHz (±1 %).
[2] Applicable only to ports which according to the manufacturer's specification may connect directly to outdoor cables.

Table 2.1-4: *Immunity, input AC power ports (including equipment marketed with a separate a.c./d.c power converter)*

Environmental phenomenon	Test specification	Units	Performance criteria	Basic standard	Verdict
Radio-frequency continuous conducted [1]	0.15–80 3 80	MHz V_{RMS} (unmodulated) % AM (1 kHz)	A	EN 61000-4-6	Not applicable
Voltage dip [2]	100 0.5 30 25	% reduction period % reduction periods	B C	EN 61000-4-11	Not applicable Not applicable
Voltage interruptions [2]	100 250	% reduction periods	C	EN 61000-4-11	Not applicable
Surge [3]	1.2/50 (8/20) 1 (line to line) 2 (line to ground)	Tr/Th µs kV (peak) kV (peak)	B	EN 61000-4-5	Not applicable
Fast transients	1 5/50 5	kV (peak) Tr/Th ns kHz (repetition rate)	B	EN 61000-4-4	Not applicable

Notes: [1] The frequency range is scanned as specified. However, when specified in Annex A (EN 55024: 2010), an additional comprehensive functional test shall be carried out at a limited number of frequencies. The selected frequencies for conducted test are: 0.2, 1, 7.1, 13.56, 21, 27.12 and 40.68 MHz (±1 %).
[2] Changes to occur at 0 degree crossover point of the voltage waveform.
[3] When the manufacturer specifies protection measures and it is impractical to simulate these measures during the tests, then the applied test levels shall be reduced to 0.5 kV (line to line) and 1 kV (line to earth (ground)).

Section 3 Equipment under test (EUT) details

3.1 Applicant/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	July 8, 2015
Nemko sample ID number	133000765

3.3 EUT information

Product name	Carrier Grade Rack Mount System (DC Version)
Model	CG2300
Serial number	CG23437005
Part number	CG2300A-APP
Power requirements	-48 V_{DC}
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	--
DC-DC Power Supply 1	3Y	YM-2851DA01R	TP020N871519000005	A01
DC-DC Power Supply 2	3Y	YM-2851DA01R	TP020N871519000006	A01

Table 3.5-2: *EUT interface ports*

Description	Qty.
RJ-45 GbE	2
RJ-45 GbE Management	1
DB15 RS-232	1
USB2	2
USB3	2
VGA	1

Table 3.5-3: *Support equipment*

Description	Brand name	Model/Part number	Serial number	Rev.
CG2300	Kontron	CG2300-BPP	CG23447000	--
AC-DC Power Supply	3Y	YM-2851VA01R	SA000N871504000033	A01
AC-DC Power Supply	3Y	YM-2851VA01R	SA000N871504000028	A01
Network Interface Card 4 port GbE	Intel	I350T4	3585820549	--
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	Management Port EUT	Management Port 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
VGA Video Cable Shielded with ferrites both ends	VGA Port EUT	Unterminated	2
VGA Video Cable Shielded with ferrites both ends	VGA Port Support Equip.	Unterminated	2
USB Cable Shielded	EUT USB Port 1	Unterminated	2
USB Cable Shielded	EUT USB Port 2	Unterminated	2
USB Cable Shielded	E UT 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
DC Power Cable (unshielded)	Power Supply 1	DC Mains	7
DC Power Cable (unshielded)	Power Supply 2	DC Mains	7

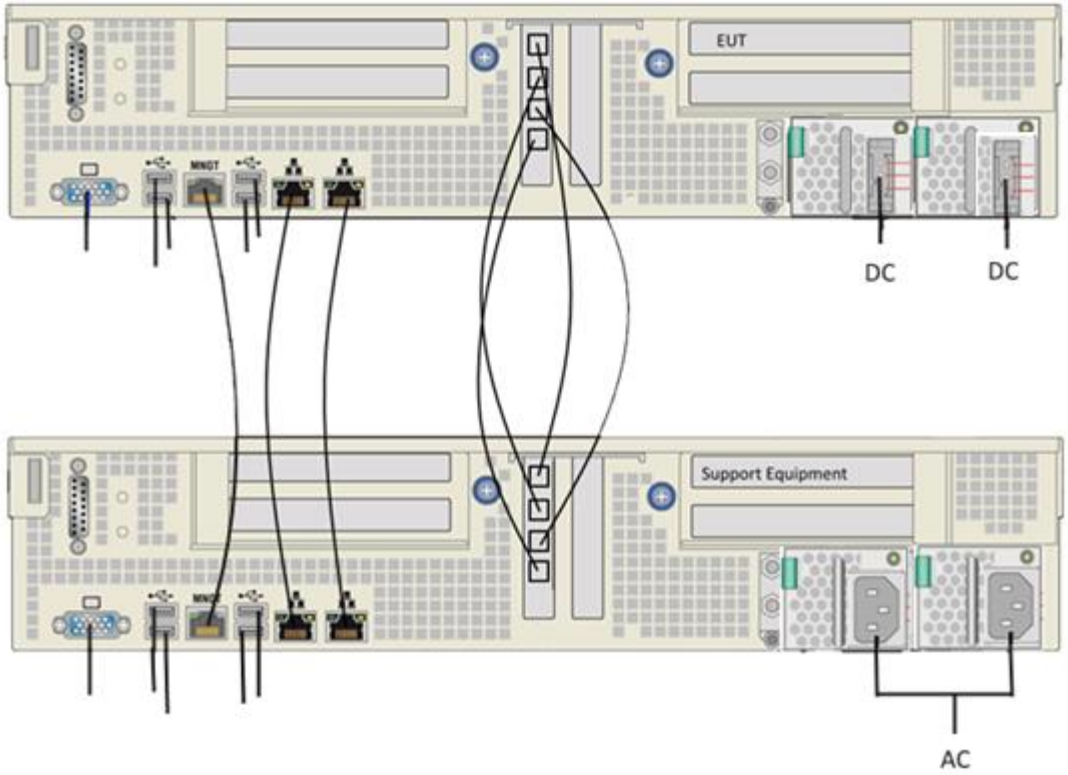

Figure 3.5-1: *Setup diagram*

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 terms and definitions

General performance criteria, Reference Clause 7.1 of EN 55024: 2010	The manufacturer has the obligation to express the performance criteria in terms which relate to the performance of his specific product when used as intended. The following performance criteria are applicable, and shall only be evaluated when the functions referred to are implemented. Examples of functions defined by the manufacturer to be evaluated during testing include, but are not limited to, the following: – Essential operational modes and states; – Tests of all peripheral access (hard disks, floppy disks, printers, keyboard, mouse, etc.); – Quality of software execution; – Quality of data display and transmission; – Quality of speech transmission.
Performance criterion A, Reference Clause 7.2 of EN 55024: 2010	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.
Performance criterion B, Reference Clause 7.3 of EN 55024: 2010	After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.
Performance criterion C, Reference Clause 7.4 of EN 55024: 2010	During and after testing, a temporary loss of function is allowed, provided the function is selfrecoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

7.2 General definitions

7.2.1 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.

7.2.2 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.

7.2.3 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.

7.2 General definitions, continued

7.2.4 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.

7.2.5 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 Radio-frequency electromagnetic field amplitude modulated

8.1.1 References

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

8.1.2 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 %

8.1.3 Notes

None

8.1.4 Setup details

Table 8.1-1: *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
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
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
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 8.1-2: *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

8.1.5 Test data

Table 8.1-3: *Swept frequency – Radio-frequency electromagnetic field amplitude modulated results*

Step size increment	1 %
Dwell time[1]	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 [2], V/m	Comments
80	1000	10	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.

[2] The EUT was tested at 10 V/m as per client request. It was deemed that the EUT would comply at 3 V/m since it was assessed at 10 V/m.

8.1.6 Setup photo

Figure 8.1-1: *Radio-frequency electromagnetic field amplitude modulated setup photo*

Figure 8.1-2: *Radio-frequency electromagnetic field amplitude modulated setup photo*

8.2 Radio-frequency continuous conducted

8.2.1 References

EN 61000-4-6: 2009

8.2.2 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 %

8.2.3 Notes

The EUT is equipped with a redundant DC input. Both inputs were tested separately to demonstrate compliance.

8.2.4 Setup details

Table 8.2-1: *Radio-frequency continuous conducted 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 8.2-2: *Radio-frequency continuous conducted 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

Table 8.2-3: *Swept frequency – Radio-frequency continuous conducted 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
DC input (PS1)	CDN – M2	CDN – M2 (PS2)	No degradation
DC input (PS2)	CDN – M2	CDN – M2 (PS1)	No degradation
GbE_Motherboard	CDN-T8	CDN – M2 (PS1)	No degradation
GbE PCIe	CDN-T8	CDN – M2 (PS1)	No degradation
USB 2.0	Direct injection	CDN – M2 (PS1)	No degradation
USB 3.0	Direct injection	CDN – M2 (PS1)	No degradation
MNGT	CDN-T8	CDN – M2 (PS1)	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.

8.2.6 Setup photo

Figure 8.2-1: *Radio-frequency continuous conducted setup photo*

8.3 Electrostatic discharge

8.3.1 References

EN 61000-4-2: 2009

8.3.2 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 %

8.3.3 Notes

None

8.3.4 Setup details

Table 8.3-1: *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

8.3.5 Test data

Table 8.3-2: *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[1 and 2]	**Test voltage (±kV)**[3]	**Comments**
Please refer to "Electrostatic discharge test location points" photos of this section	4, 6, 8	No degradation
Indirect discharge[1 and 2]	**Test voltage (±kV)**[3]	**Comments**
VCP (all sides)	4, 6, 8	No degradation
Air discharge	**Test voltage (±kV)**[3]	**Comments**
Please refer to "Electrostatic discharge test location points" photos of this section	2, 4, 8, 15	No degradation

Notes:
[1] For contact discharge, the requirement to apply ESD discharges at lower levels, as defined in Clause 5 of IEC 61000-4-2, is not applicable.
[2] The EUT was exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. For table-top equipment one of the test points was the centre front edge of the horizontal coupling plane, which was subjected to at least 50 indirect discharges (25 of each polarity). All other test points received at least 50 direct contact discharges (25 of each polarity). If no direct contact test points were available, then at least 200 indirect discharges were applied in the indirect mode.
[3] Contact discharge testing level was increased to 8 kV, and air discharge testing level to 15 kV as requested by the customer.

Electrostatic discharges were applied only to those points and surfaces of the EUT which are expected to be touched during usual operation, including user access, as specified in the user manual, for example cleaning or adding consumables when the EUT is powered.

8.3.5 Test data, continued

Figure 8.3-1: *Electrostatic discharge test location point's photo*

Red points = contact discharge
Green points = air discharge

8.3.5 Test data, continued

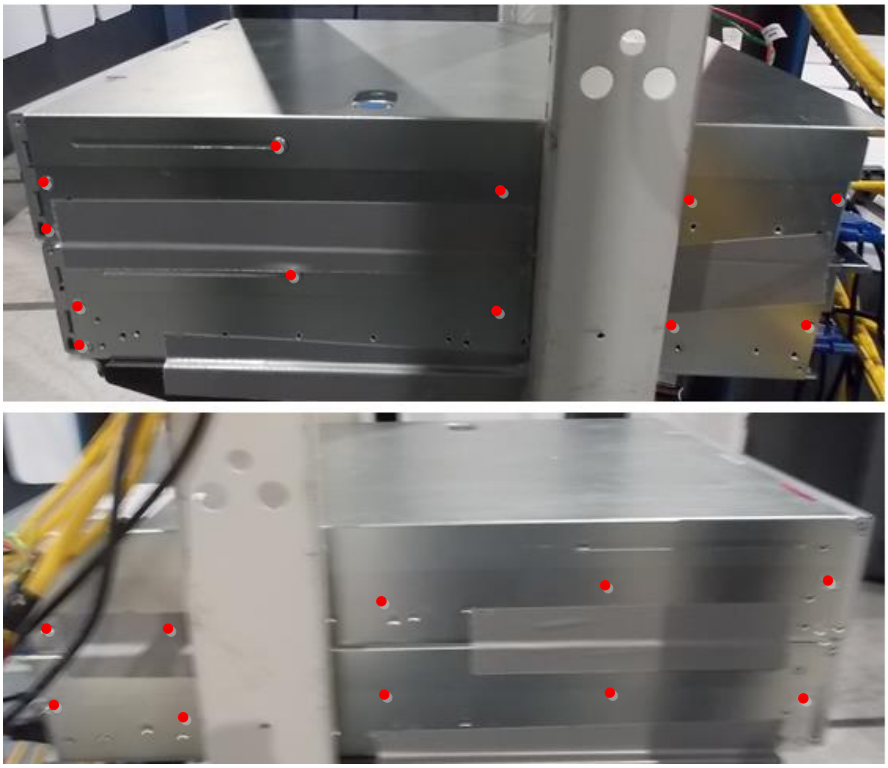

Figure 8.3-2: *Electrostatic discharge test location point's photo*

Red points = contact discharge
Green points = air discharge

8.3.6 Setup photo

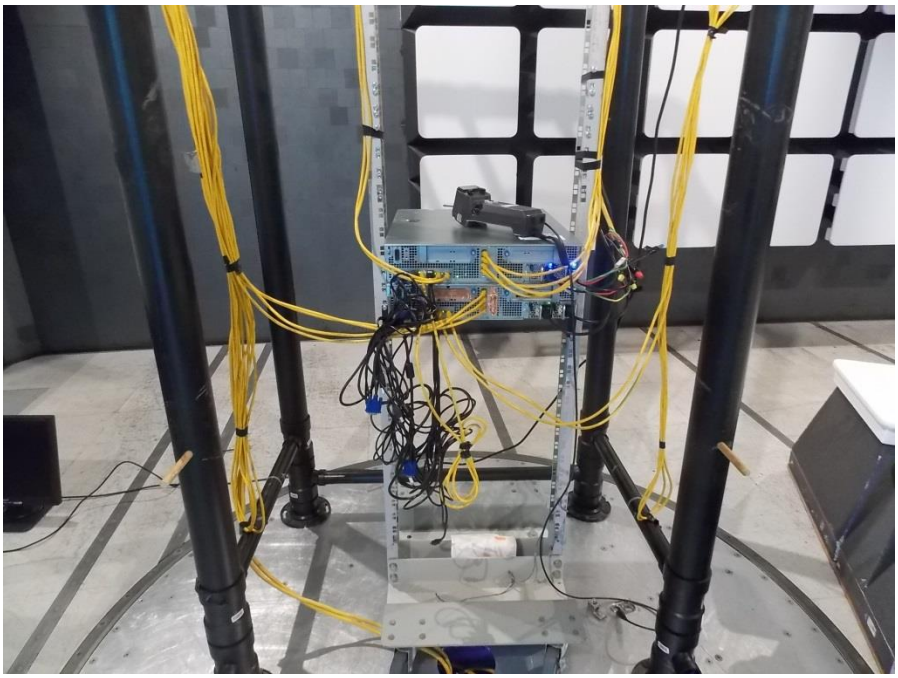

Figure 8.3-3: *Electrostatic discharge setup photo*

8.4 Fast transients

8.4.1 References

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

Special Note: A more relevant publication of EN 61000-4-4 has been applied for this assessment.

8.4.2 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 %

8.4.3 Notes

The EUT is equipped with a redundant DC input. Both inputs were tested separately to demonstrate compliance.

8.4.4 Setup details

Table 8.4-1: *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: NCR - no calibration required

Table 8.4-2: *Fast transients test software details*

Manufacturer of Software	Details
Teseq	NSG300, Version 1.2.0

Notes: None

8.4.5 Test data

Table 8.4-3: *Fast transients results*

Wave shape (Tr / Td):	5/50 ns (Tr = rise time, Td= duration time)
Repetition frequency[4]:	5 kHz
Burst duration:	15 ms
Burst period:	300 ms
Test duration:	60 s

Test port	Test voltage (±kV)	Comments
DC input (PS1)[1 and 2]	0.5, 1	No degradation
DC input (PS2)[1 and 2]	0.5, 1	No degradation
GbE_Motherboard [3]	0.5	No degradation
GbE_PCIe [3]	0.5	No degradation
USB 2.0 [3]	0.5	No degradation
USB 3.0 [3]	0.5	No degradation
MNGT [3]	0.5	No degradation

Notes:
[1]Transient applied asynchronous (relation to power supply)
[2]The test voltage was applied simultaneously between a ground reference plane and all of the power supply terminals and the protective or functional earth port on the EUT cabinet
[3]The test voltage was applied via capacitive coupling clamp

8.4.6 Setup photos

Figure 8.4-1: *Fast transients setup photo*

Figure 8.4-2: *Fast transients 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*