

Test report

290739-5TRFEMC

Date of issue: July 15, 2015

Applicant:

Kontron Canada Inc

Product:

Carrier Grade Rack Mount System (DC 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



Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada. The tests included in this report are within the scope of this accreditation

300 386 v1.6.1.docx; Date: May 17, 2013

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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.

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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
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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	Not applicable ²
AC ports – Current harmonics	EN 61000-3-2	Not applicable ²
AC ports – Voltage fluctuations	EN 61000-3-3	Not applicable ²
DC ports, Conducted emissions	EN 55022	Pass
Telecommunication ports; Conducted emissions	EN 55022	Pass ¹

Notes: ¹Product classification A

²The EUT is DC 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)	B	EN 61000-4-2	Pass
	4 kV (Air discharge)			
	3 V/m (80–800 MHz)	Pass		
	80 % AM (1 kHz)			
Radio frequency electromagnetic field amplitude modulated	10 V/m (800–960 MHz)	A	EN 61000-4-3	Pass
	80 % AM (1 kHz)			
	3 V/m (960–1000 MHz)			Pass
	80 % AM (1 kHz)			
	10 V/m (1400–2000 MHz)			
	80 % AM (1 kHz)			
3 V/m (2000–2700 MHz)	Pass			
80 % AM (1 kHz)				

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	B	EN 61000-4-4	Not applicable
	5/50 Tr/Th ns, 5 kHz			
Surges (lines to ground)	1 kV	B	EN 61000-4-5	Not applicable
	10/700 (5/320) Tr/Th µs			
Radio frequency, conducted continuous	3 V (0.15–80 MHz)	A	EN 61000-4-6	Not applicable
	80 % AM (1 kHz)			

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 μ s	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	Not applicable
Surges	0.5 kV Line to Line 1 kV Line To Earth 1.2/50 (8/20) Tr/Th μ s	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: 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	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: 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)	B	EN 61000-4-2	Pass
	8 kV (Air discharge)			
Radio frequency electromagnetic field amplitude modulated	3 V/m (80–800 MHz)	A	EN 61000-4-3	Pass
	80 % AM (1 kHz)			
	10 V/m (800–960 MHz)			Pass
	80 % AM (1 kHz)			
	3 V/m (960–1000 MHz)			Pass
	80 % AM (1 kHz)			
	10 V/m (1400–2000 MHz)			
	80 % AM (1 kHz)			
	3 V/m (2000–2700 MHz)	Pass		
	80 % AM (1 kHz)			

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 μ s	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 μ s	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	Not applicable
Surges	1 kV Line to Line 2 kV Line To Earth 1.2/50 (8/20) Tr/Th μ s	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
Voltage dips and short interruptions	0 % Residual voltage 0.5 Cycles	B	EN 61000-4-11	Not applicable
	0 % Residual voltage 1 Cycles	B		Not applicable
	70 % Residual voltage 25 Cycles	B		Not applicable
	0 % Residual voltage 250 Cycles	C		Not applicable

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	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: 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	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)
CATS UTP	Ethernet Port 1 EUT	Ethernet Port 1 Support Equip.	7
CATS UTP	Ethernet Port 2 EUT	Ethernet Port 2 Support Equip.	7
CATS UTP	Management Port EUT	Management Port Support Equip.	7
CATS UTP	Server Adapter Port 1 EUT	Server Adapter Port 1 Support	7
CATS UTP	Server Adapter Port 2 EUT	Server Adapter Port 2 Support	7
CATS UTP	Server Adapter Port 3 EUT	Server Adapter Port 3 Support	7
CATS 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	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
DC Power Cable (unshielded)	Power Supply 1	DC Mains	7
DC Power Cable (unshielded)	Power Supply 2	DC Mains	7

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 $\pm 5\%$, 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.

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.

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

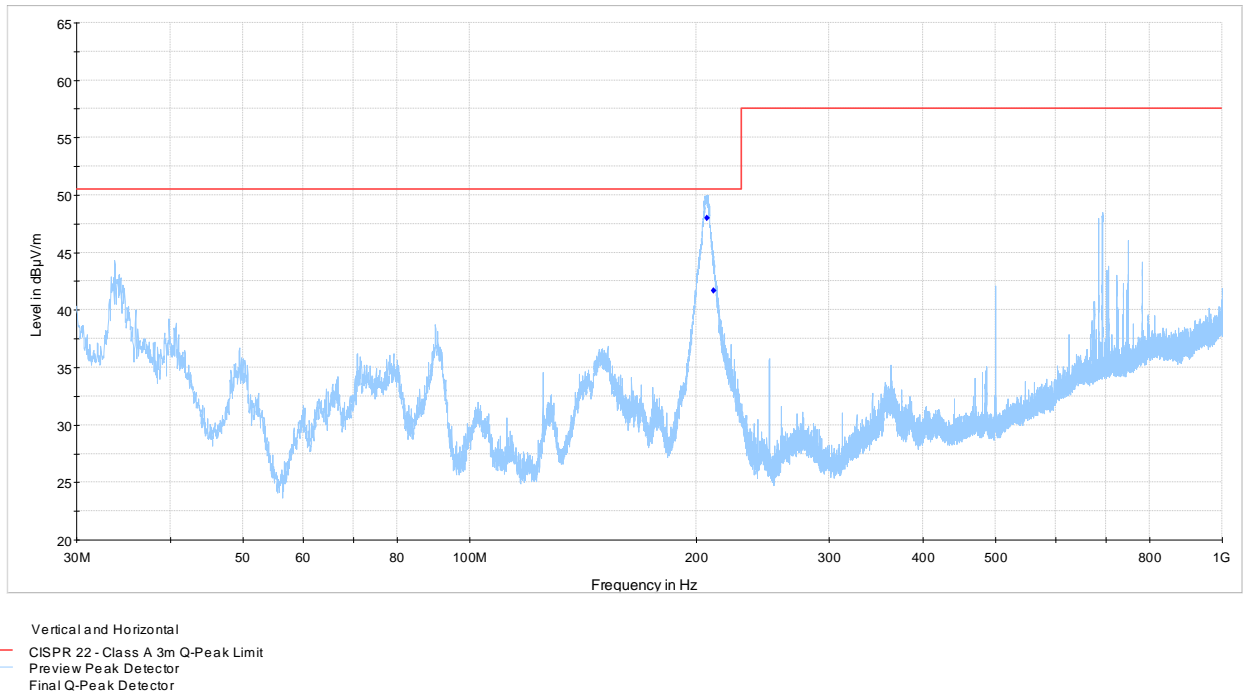
Notes: None

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)

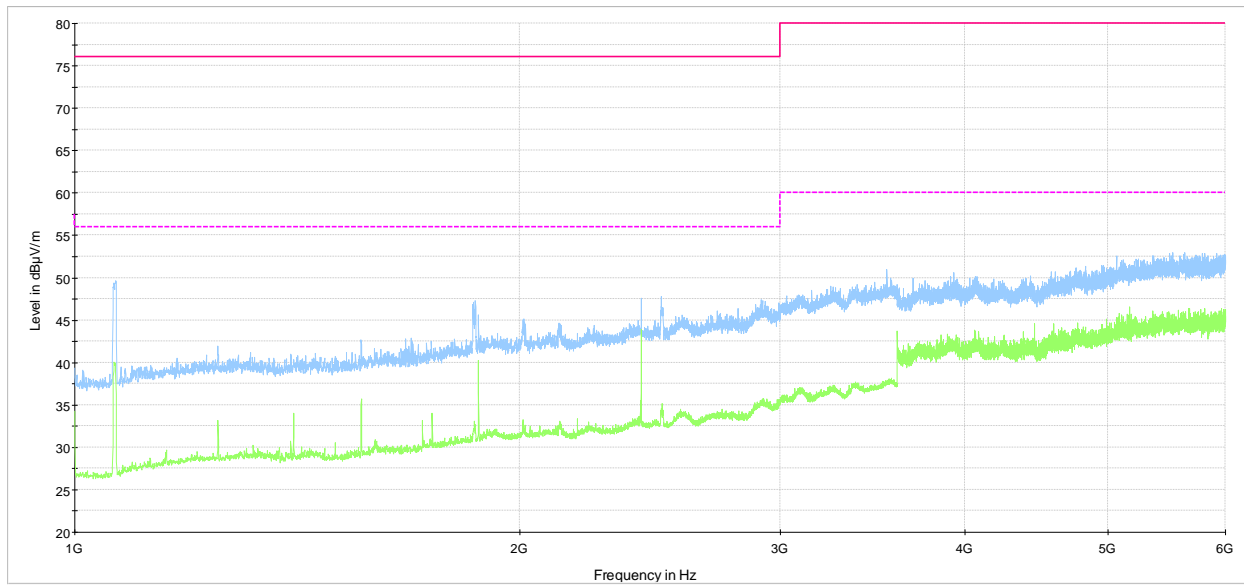
Table 8.1-3: Enclosure port, Radiated electromagnetic field emissions (Quasi-Peak) results

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



— CISPR 22 Class A 3m Peak Limit
- - - CISPR 22 Class A 3m Average Limit
— Preview Result 1-PK+
— Preview Result 2-AVG

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

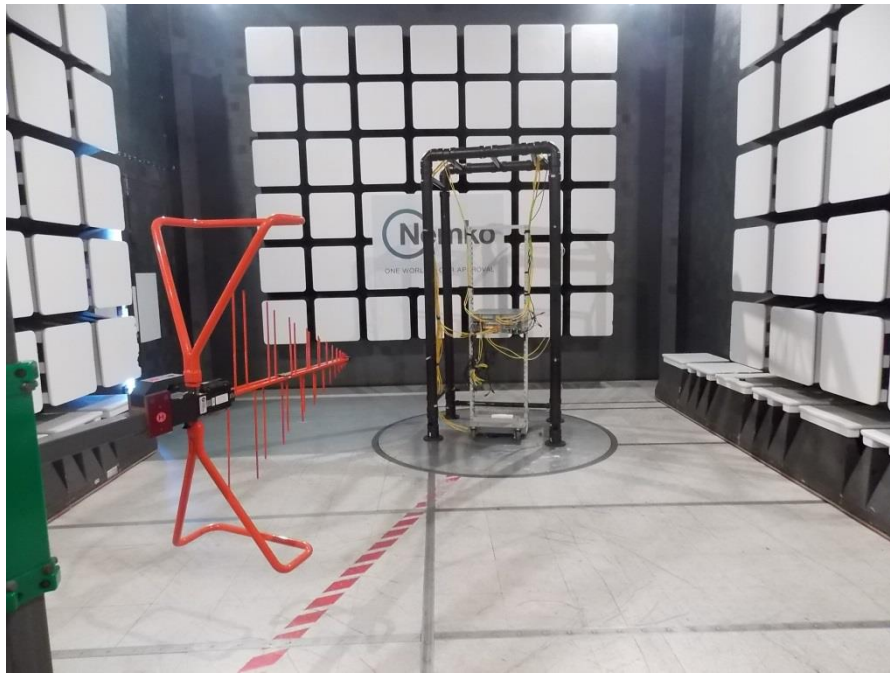


Figure 8.1-3: Enclosure port, Radiated electromagnetic field emissions setup photo

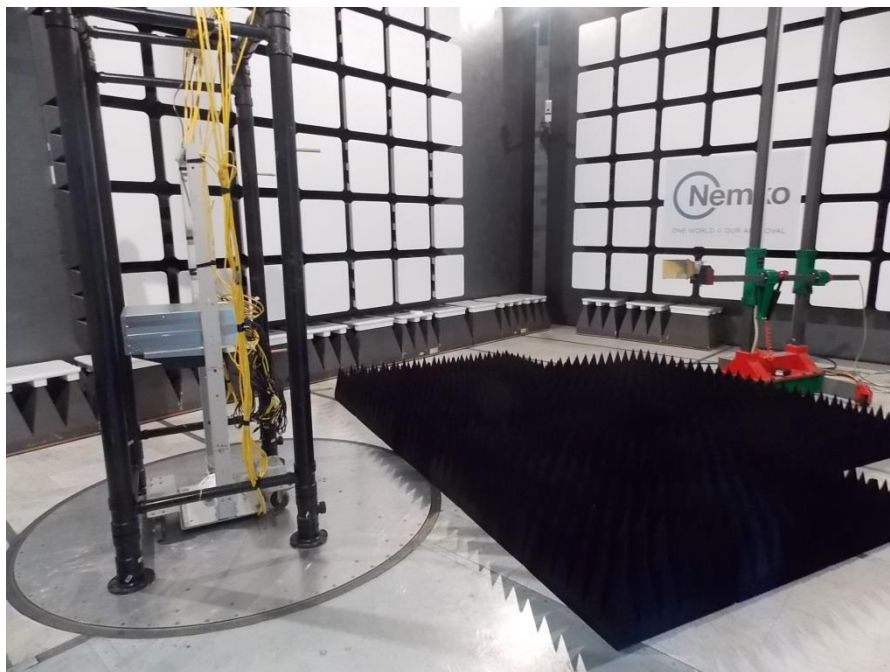


Figure 8.1-4: Enclosure port, Radiated electromagnetic field emissions setup photo

8.2 DC ports – Conducted emissions

8.2.1 References

EN 55022: 2010

8.2.2 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 %

8.2.3 Notes

None

8.2.4 Setup details

Port under test	DC input
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: DC 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
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	Jan. 09/16
50 Ω coax cable	C.C.A.	None	FA002556	1 year	May 05/16

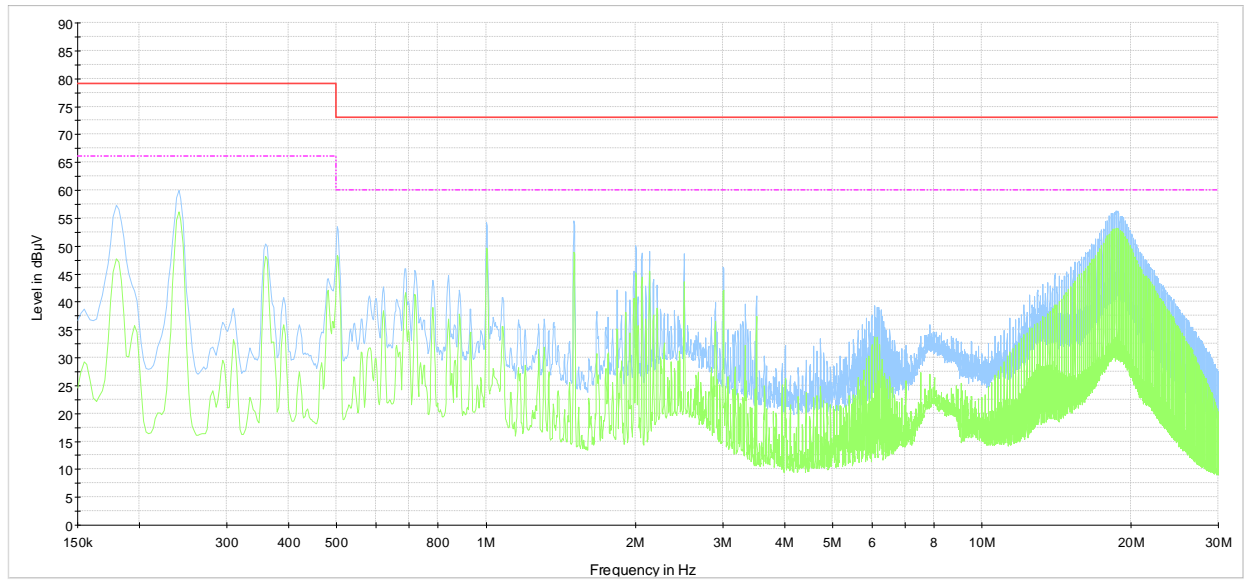
Notes: None

Table 8.2-2: DC 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

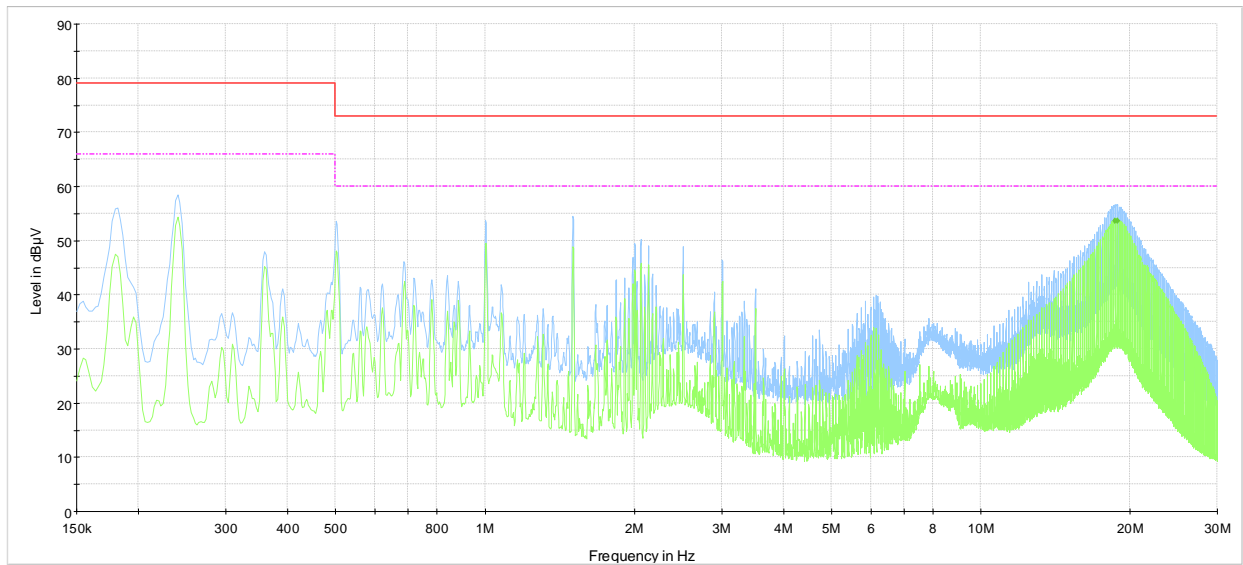


- 48 VDC
- CISPR 22 Mains QP Class A Limit
- - - CISPR 22 Mains AV Class A Limit
- Preview Result 1-PK+
- Preview Result 2-AVG

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

Figure 8.2-1: DC ports – Conducted emissions spectral plot on feed line

8.2.5 Test data, continued



DC return
 — CISPR 22 Mains QP Class A Limit
 - - - CISPR 22 Mains AV Class A Limit
 — Preview Result 1-PK+
 — Preview Result 2-AVG
 * Final Result 2-AVG

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

Figure 8.2-2: DC ports – Conducted emissions spectral plot on return line

Table 8.2-3: DC ports – Conducted emissions (Average) voltage results

Frequency (MHz)	Average result ¹ (dBµV)	Measurement time (ms)	Bandwidth (kHz)	Filter	Conductor	Correction factor ² (dB)	Margin (dB)	Average limit (dBµV)
18.6873	53.6	1000	9	On	N	10.6	6.4	60.0
18.8425	53.6	1000	9	On	N	10.6	6.4	60.0

Notes: ¹Result (dBµV) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

²Correction factor (dB) = LISN factor IL (dB) + cable loss (dB) + attenuator (dB)

Sample calculation: 53.6 dBµV (result) = 43.0 dBµV (receiver reading) + 10.6 dB (Correction factor)

8.2.6 Setup photos



Figure 8.2-3: DC ports – Conducted emissions setup photo

8.3 Telecommunications ports – Conducted emissions

8.3.1 References

EN 55022: 2010

8.3.2 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 %

8.3.3 Notes

None

8.3.4 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 8.3-1: 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

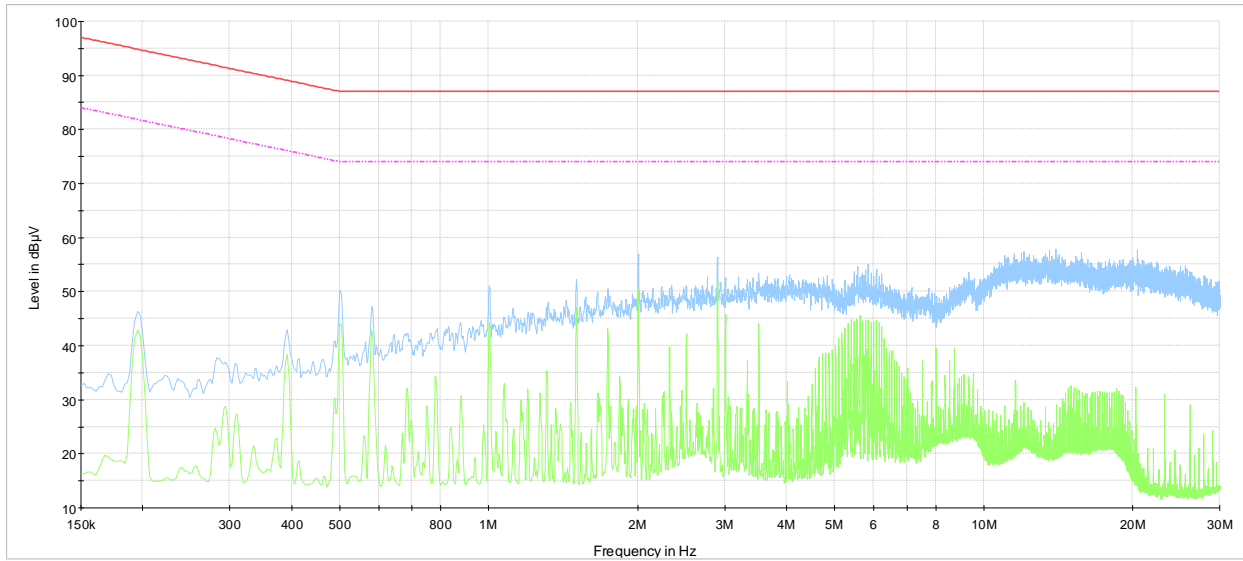
Notes: None

Table 8.3-2: Telecommunications ports – Conducted emissions test software details

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

Notes: None

8.3.5 Test data

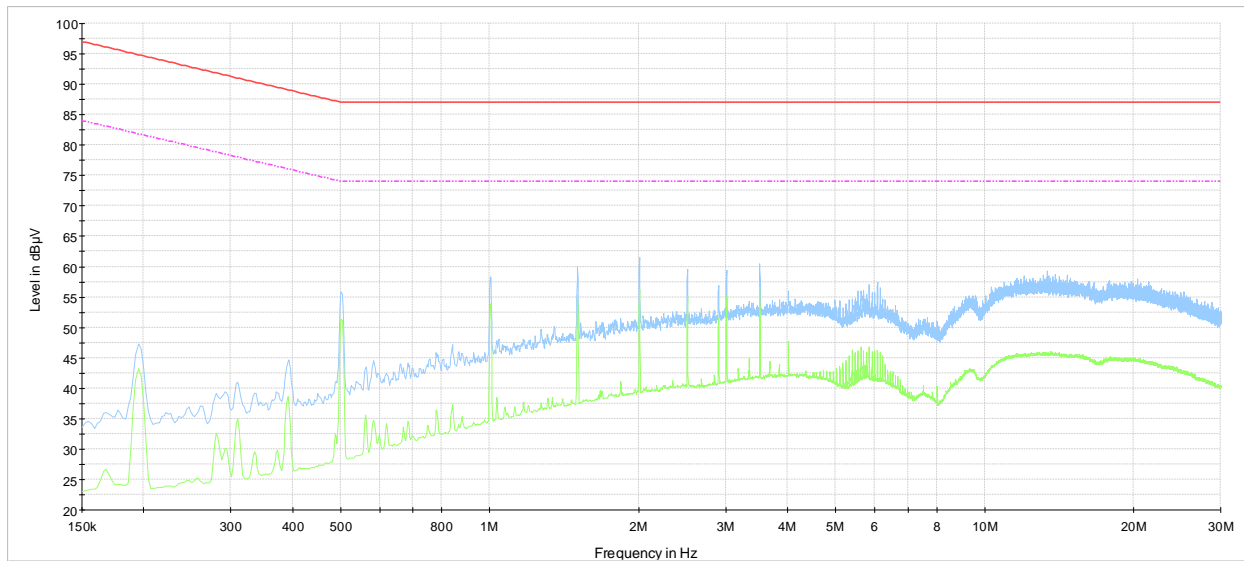


- GbE Motherboard
- CISPR 22 Telecom QP Class A - Voltage Limit
- - - CISPR 22 Telecom AV Class A - Voltage Limit
- Preview Result 1-PK+
- Preview Result 2-AVG

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

Figure 8.3-1: Telecommunications ports – Conducted emissions spectral plot on GbE_Motherboard port

8.3.6 Test data, continued

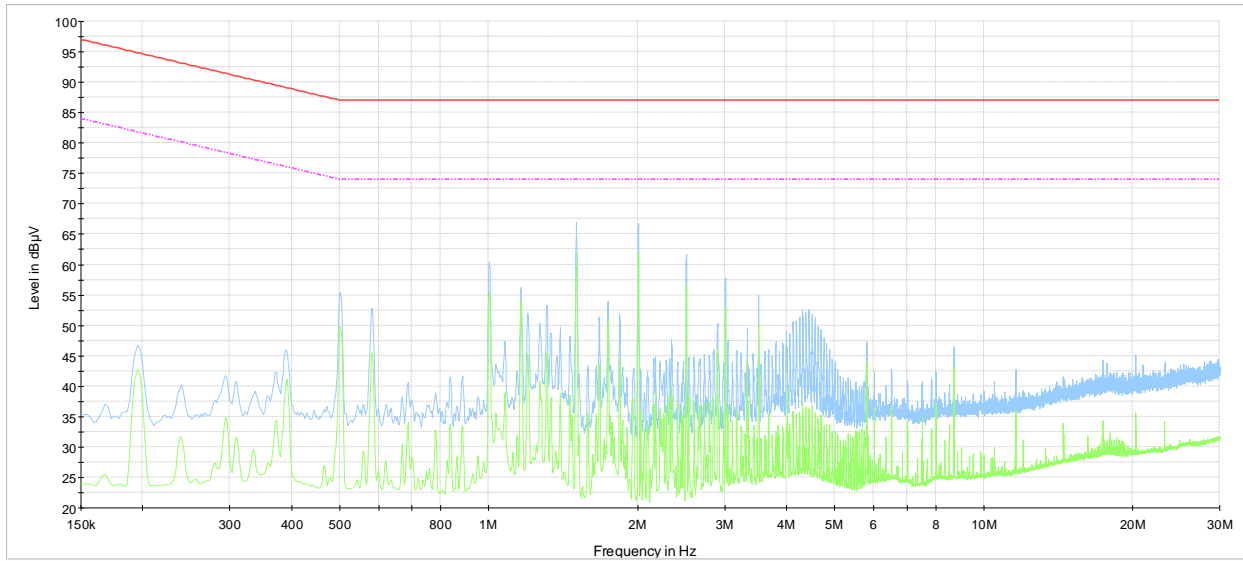


Gbe PCIe
 — CISPR 22 Telecom QP Class A - Voltage Limit
 - - - CISPR 22 Telecom AV Class A - Voltage Limit
 — Preview Result 1-PK+
 — Preview Result 2-AVG

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

Figure 8.3-2: Telecommunications ports – Conducted emissions spectral plot on GbE PCIe Port

8.3.5 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 8.3-3: Telecommunications ports – Conducted emissions spectral plot on MNGT port

8.3.6 Setup photos

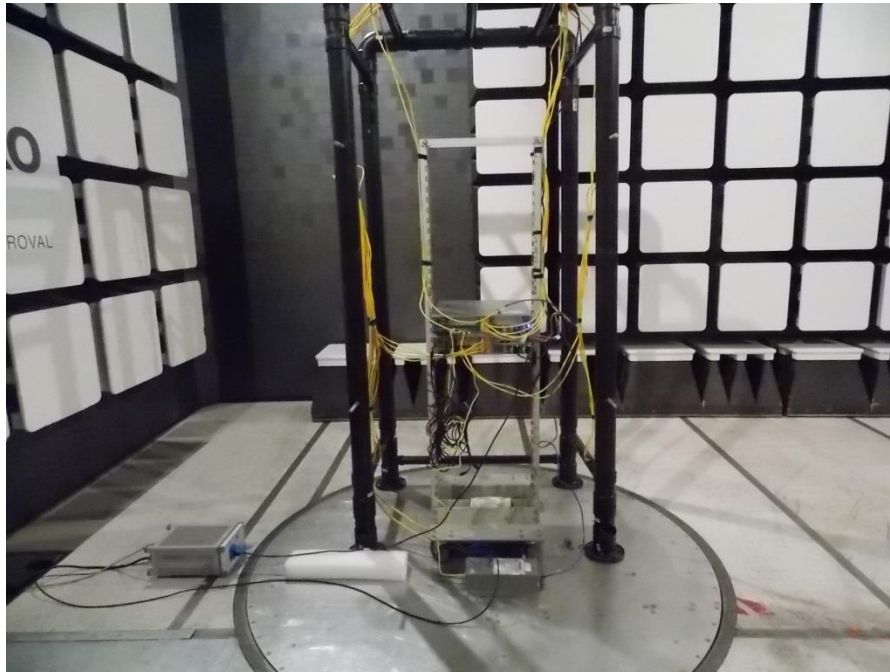


Figure 8.3-4: *Telecommunications ports – Conducted emissions setup photo*

8.4 Radio frequency electromagnetic field amplitude modulated

8.4.1 References

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

8.4.2 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 %

8.4.3 Notes

None

8.4.4 Setup details

Table 8.4-1: *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 8.4-2: *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

8.4.5 Test data

Table 8.4-3: 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 ($\pm 1\%$).

8.4.6 Setup photo



Figure 8.4-1: Radio frequency electromagnetic field amplitude modulated setup photo

8.5 Radio frequency, conducted continuous

8.5.1 References

EN 61000-4-6: 2009

8.5.2 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 %

8.5.3 Notes

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

8.5.4 Setup details

Table 8.5-1: 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 8.5-2: Radio frequency, conducted continuous test software details

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

Notes: None

8.5.5 Test data

Table 8.5-3: Radio frequency, conducted continuous results

Frequency range:	0.15–80 MHz		
Step size increment:	1 %		
Dwell time¹:	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: ¹The 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.

8.5.6 Setup photo



Figure 8.5-1: Radio frequency, conducted continuous setup photo

8.6 Electrostatic discharge

8.6.1 References

EN 61000-4-2: 2009

8.6.2 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 %

8.6.3 Notes

None

8.6.4 Setup details

Table 8.6-1: 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

8.6.5 Test data

Table 8.6-2: 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.

8.6.5 Test data, continued



Figure 8.6-1: Electrostatic discharge test location point's photo

Red points = contact discharge
Green points = air discharge

8.6.5 Test data, continued

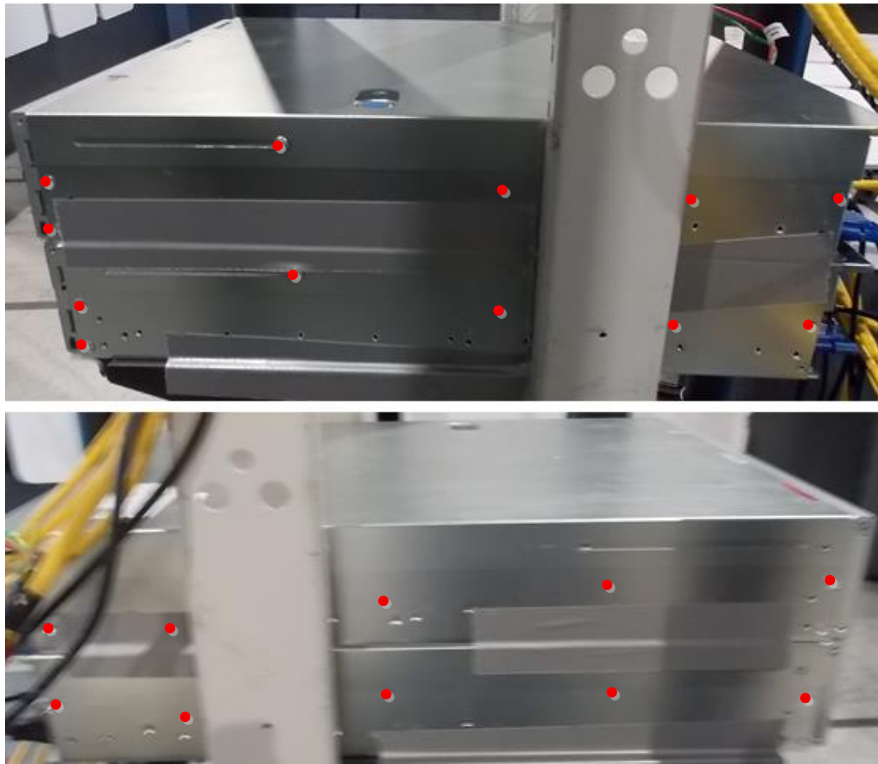


Figure 8.6-2: Electrostatic discharge test location point's photo

Red points = contact discharge
Green points = air discharge

8.6.6 Setup photo

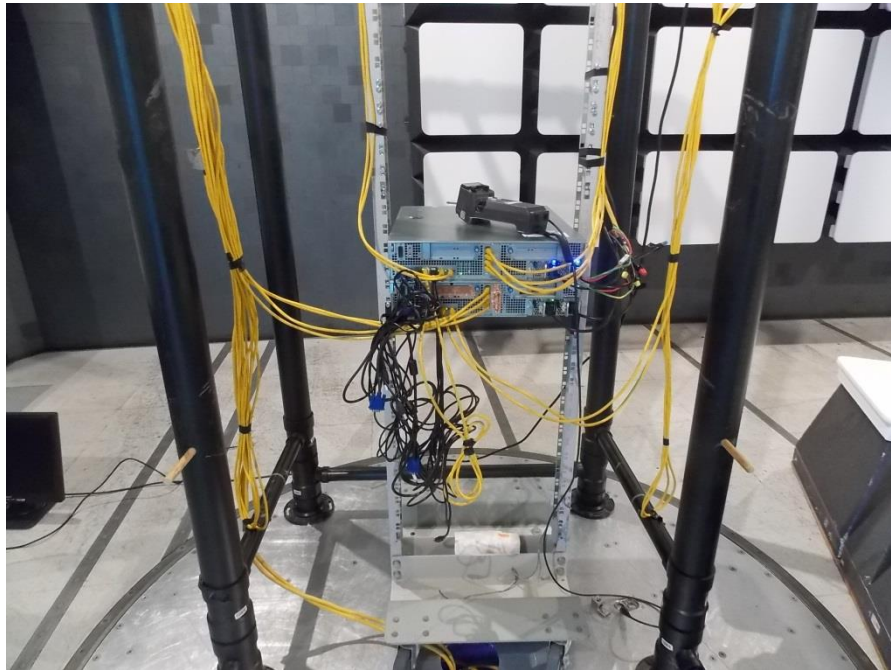


Figure 8.6-3: Electrostatic discharge setup photo

8.7 Surge

8.7.1 References

EN 61000-4-5: 2006

8.7.2 Test summary

Verdict	Pass		
Test date	July 10, 2015	Temperature	24.7 °C
Test engineer	Shawn He	Air pressure	1006.3 mbar
Test location	Ottawa	Relative humidity	48.1 %

8.7.3 Notes

None

8.7.4 Setup details

Table 8.7-1: 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 8.7-2: Surge test software details

Manufacturer of Software	Details
Teseq	NSG300, Version 1.2.0

Notes: None

8.7.5 Test data

Table 8.7-3: Surge at indoor signal ports results

Open circuit voltage (T₁ / T₂):	1.2/50 μs (T ₁ = front time, T ₂ = time to half value)
Short circuit current (T₁ / T₂):	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
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

8.7.6 Setup photo



Figure 8.7-1: Surge setup photo

8.8 Fast transients

8.8.1 References

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

8.8.2 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 %

8.8.3 Notes

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

8.8.4 Setup details

Table 8.8-1: 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 8.8-2: Fast transients test software details

Manufacturer of Software	Details
Teseq	NSG300, Version 1.2.0

Notes: None

8.8.5 Test data

Table 8.8-3: 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_PClc	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

Table 8.8-4: Fast transients at DC 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
DC input (PS1)	0.5, 1	No degradation
DC input (PS2)	0.5, 1	No degradation

Notes: 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

8.8.6 Setup photos



Figure 8.8-1: Fast transients setup photo



Figure 8.8-2: 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