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Test report

290739-1TRFEMC

Date of issue: July 15, 2015

Applicant:

Kontron Canada Inc

Product:

Carrier Grade Rack Mount System (DC option)

Model

CG2300

Specifications:

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

Lab and test locations

Company name	Nemko Canada Inc.		
Designation number	CA2040		
Facility Name	Ottawa	Montreal	Almonte
Address	303 River Road	292 Labrosse Ave	1500 Peter Robinson Rd.
City	Ottawa	Pointe-Claire	West Carleton
Province	ON	QC	ON
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Country	Canada	Canada	Canada
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Toll free	+1 800 563 6336		
Website	www.nemko.com		

Tested by	David Duchesne, Senior EMC/Wireless 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

FCC 47 CFR Part 15, Subpart B – Verification	Title 47: Telecommunication; Part 15—Radio Frequency Devices
ICES-003 Issue 5 August 2012	Information Technology Equipment (ITE) – Limits and methods of measurement
EN 55022: 2010 + AC: 2011	Information technology equipment Radio disturbance characteristics Limits and methods of measurement
CISPR 22: Edition 6.0 2008-09	Information technology equipment Radio disturbance characteristics Limits and methods of measurement
AS/NZS CISPR 22: 2009 + A1: 2010	Information technology equipment Radio disturbance characteristics Limits and methods of measurement

1.2 Exclusions

None

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

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

See "Summary of test results" for full details.

1.4 Test report revision history

Table 1.4-1: *Test report revision history*

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

Section 2 Summary of test results

2.1 International test results

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

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

Notes: [1] Product classification A
[2] The EUT is DC powered

2.2 North America test results

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

Test description	Verdict
Radiated disturbance [1]	Pass [1]
Conducted disturbance at mains port [1]	Not applicable [2]

Notes: [1] Product classification A
[2] The EUT is DC powered

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

3.5 EUT setup details, continued

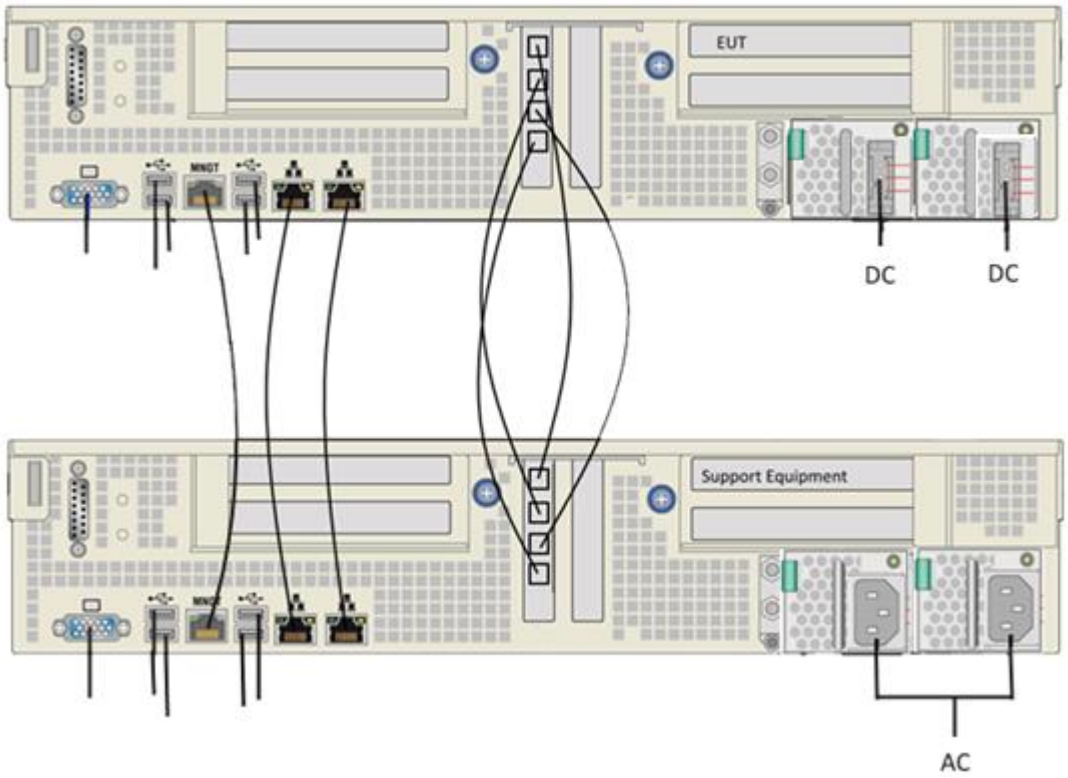


Figure 3.5-1: *Setup diagram*

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 Product classifications definitions

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

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

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

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

7.1.3 ICES-003

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

7.2 General definitions

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

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

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

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

7.2.1 ICES-003

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

Section 8 Testing data

8.1 Radiated disturbance

8.1.1 References

CISPR 22 and ANSI C63.4-2003

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: *Radiated disturbance 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
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
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 12/16
Horn antenna (18–40 GHz)	EMCO	3116	FA001847	1 year	Jan. 09/16
Pre-amplifier (18–26 GHz)	Narda	BBS-1826N612	FA001550	—	VOU
Pre-amplifier (26–40 GHz)	Narda	DBL-2640N610	FA001556	—	VOU

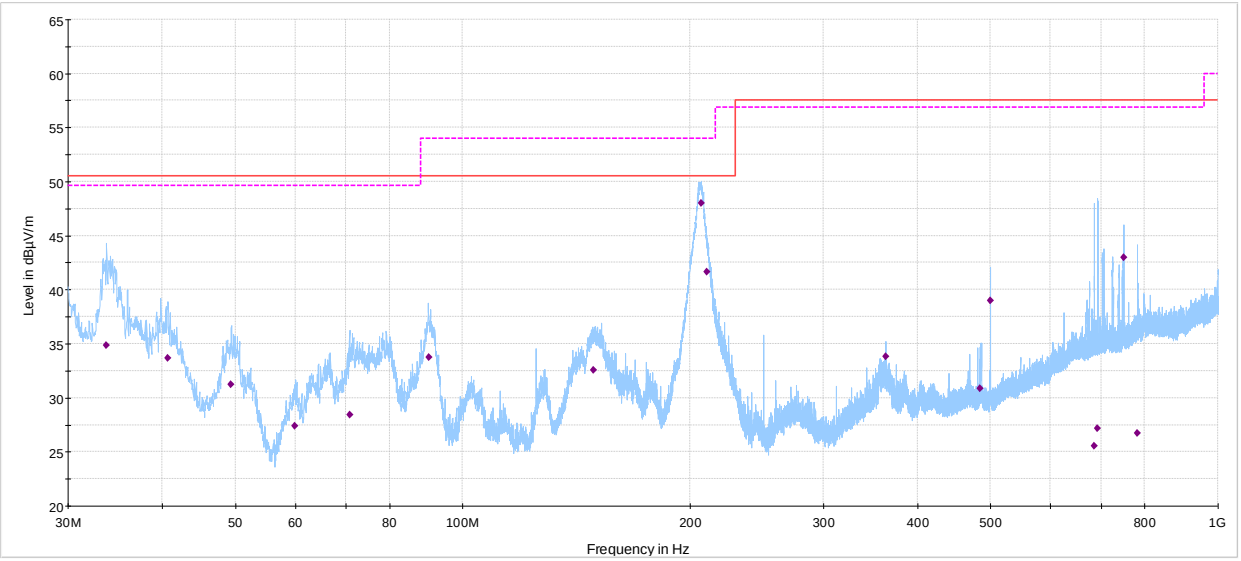
Notes: VOU - verify on use

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: *Radiated disturbance spectral plot (30 to 1000 MHz)*

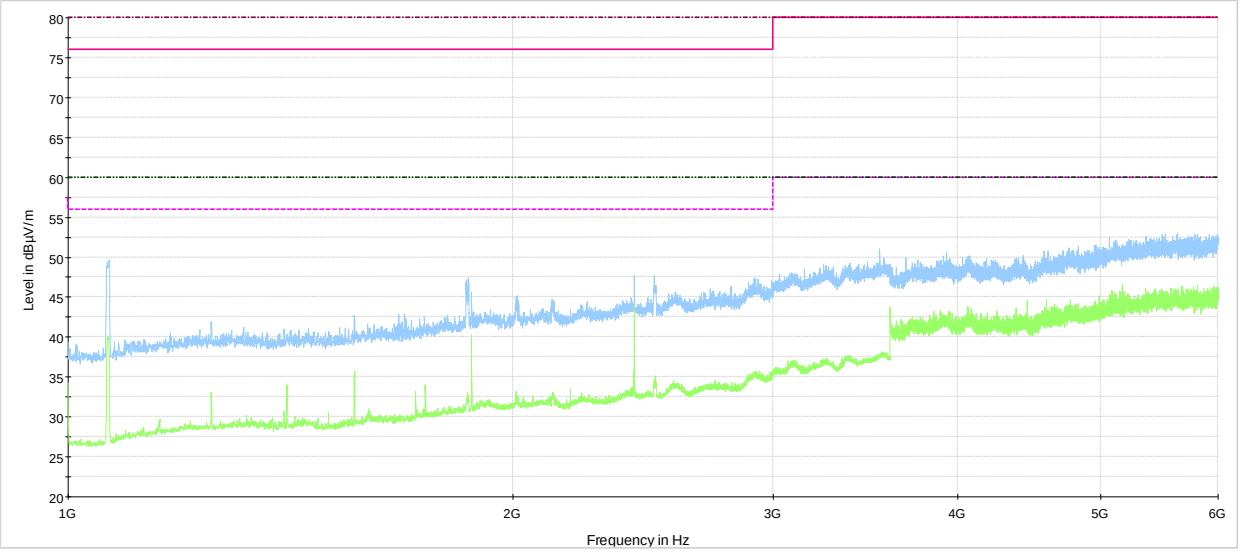
Table 8.1-3: *Radiated disturbance (Quasi-Peak) results*

Frequency (MHz)	Quasi-Peak field strength[1] (dBµV/m)	Measurement time (ms)	Bandwidth (kHz)	Antenna height (cm)	Pol. (V/H)	Turn table position (°)	Correction factor[2] (dB)	Margin (dB)	3 m Quasi-Peak limit (dBµV/m)
CISPR 22, EN 55022 and AS/NZS CISPR 22									
206.73	48.0	1000	120	100.1	H	148.0	13.6	2.5	50.5
210.66	41.7	1000	120	104.0	H	141.0	13.3	8.8	50.5
FCC and ICES-003									
206.73	48.0	1000	120	100.1	H	148.0	13.6	6.0	54.0
210.66	41.7	1000	120	104.0	H	141.0	13.3	12.3	54.0

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)

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

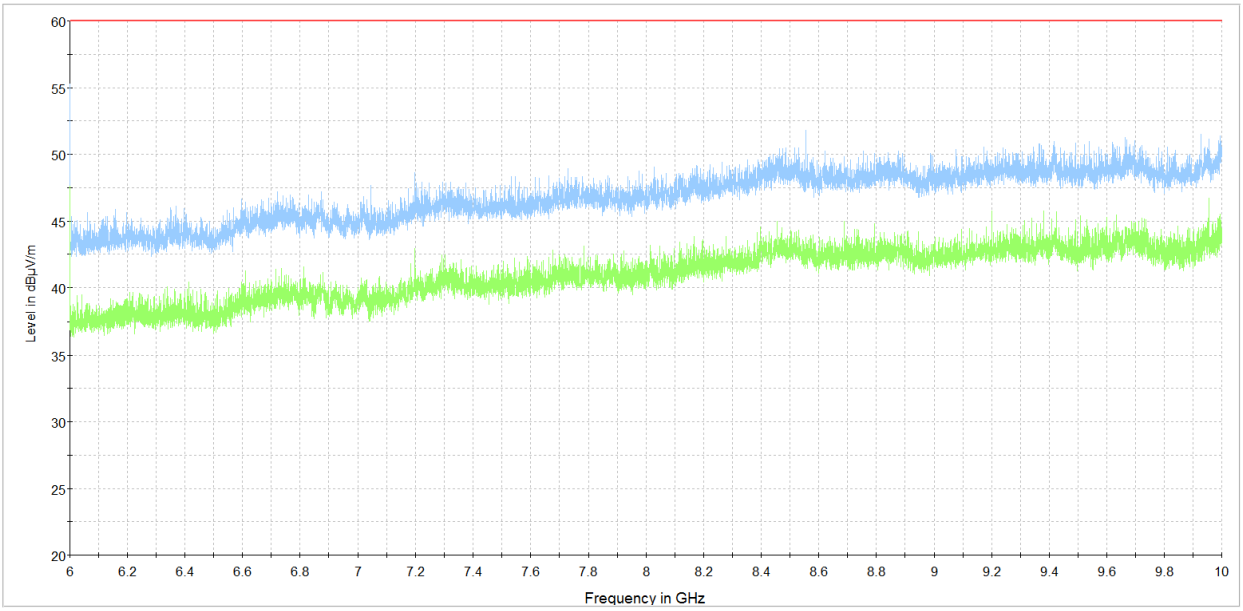
8.1.5 Test data, continued



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: *Radiated disturbance spectral plot (1 to 6 GHz)*

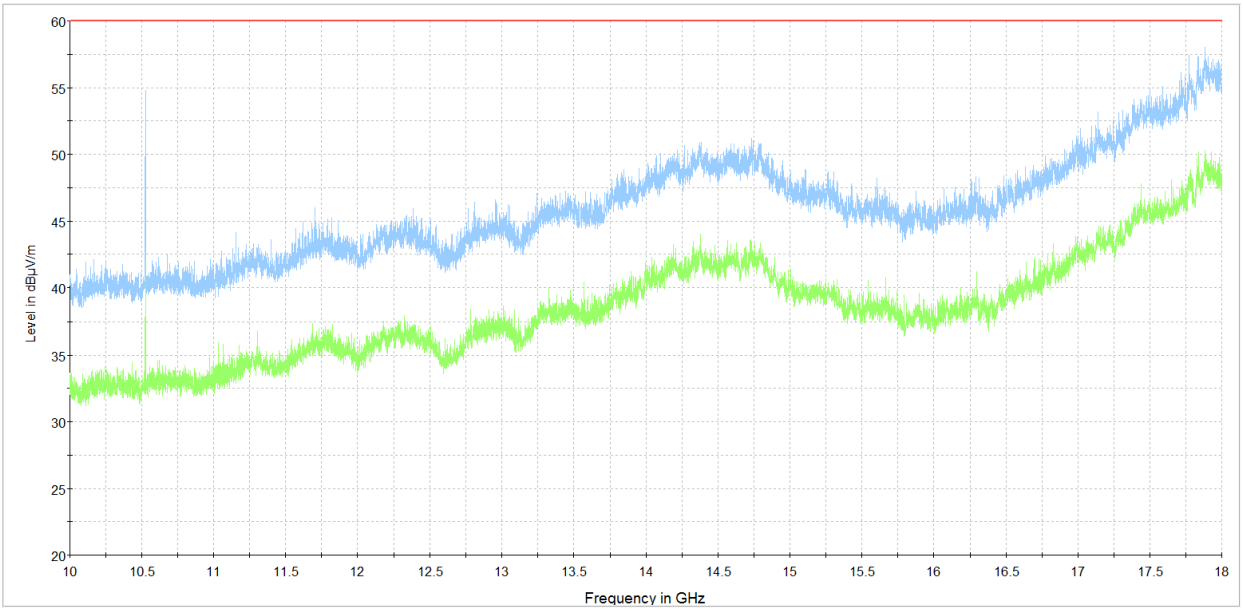
8.1.5 Test data, continued



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 8.1-3: *Radiated disturbance spectral plot (6 to 10 GHz)*

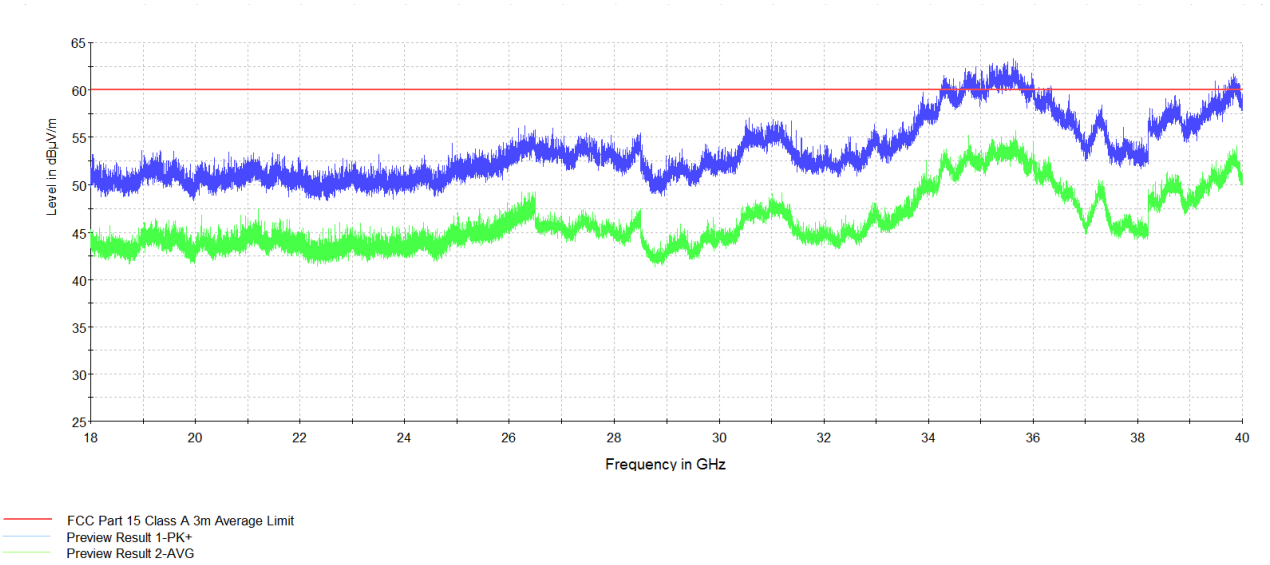
8.1.5 Test data, continued



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 8.1-4: *Radiated disturbance spectral plot (10 to 18 GHz)*

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 8.1-5: *Radiated disturbance spectral plot (18 to 40 GHz)*

8.1.6 Setup photos

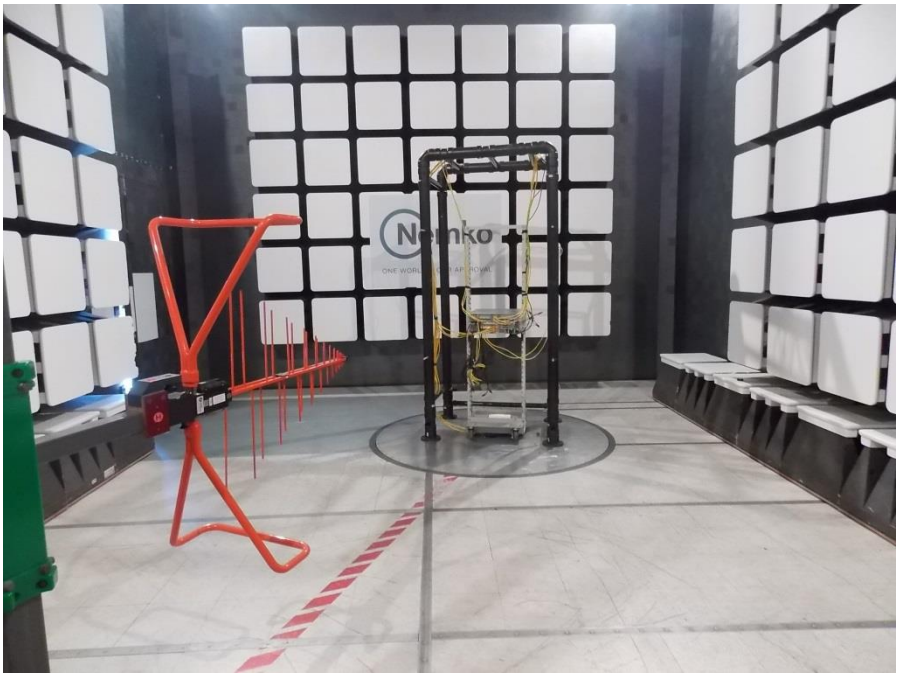


Figure 8.1-3: *Radiated disturbance setup photo from 30 to 1000 MHz*

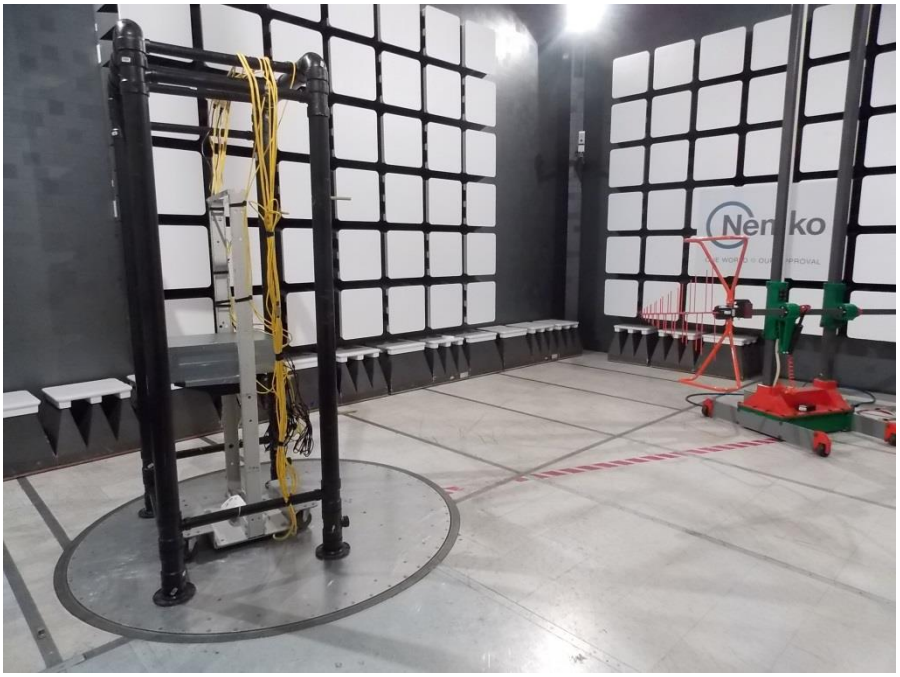


Figure 8.1-4: *Radiated disturbance setup photo 30 to 1000 MHz*

8.1.6 Setup photos, continued

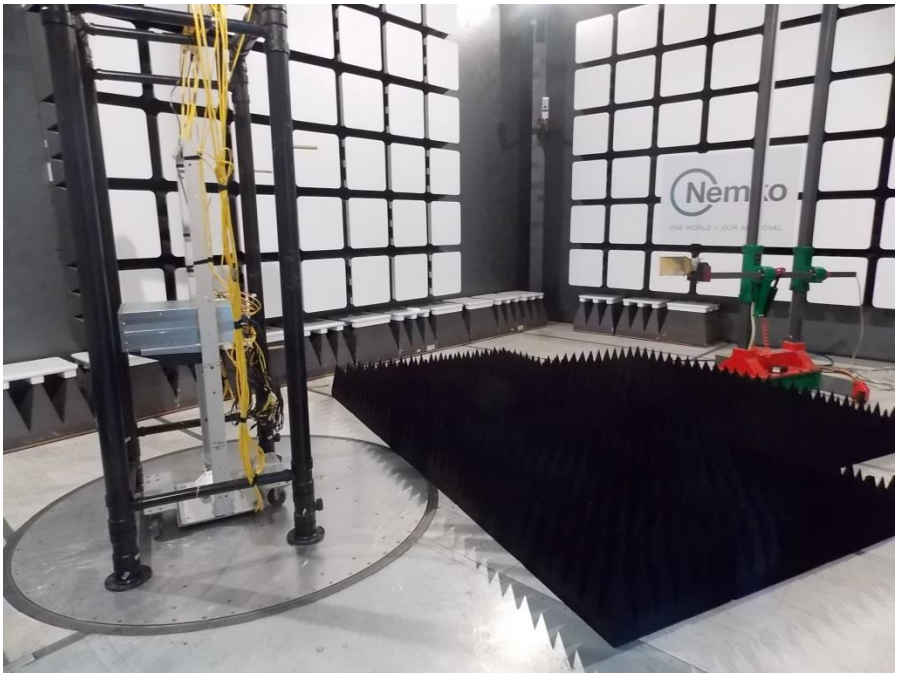


Figure 8.1-5: *Radiated disturbance setup photo above 1 GHz*

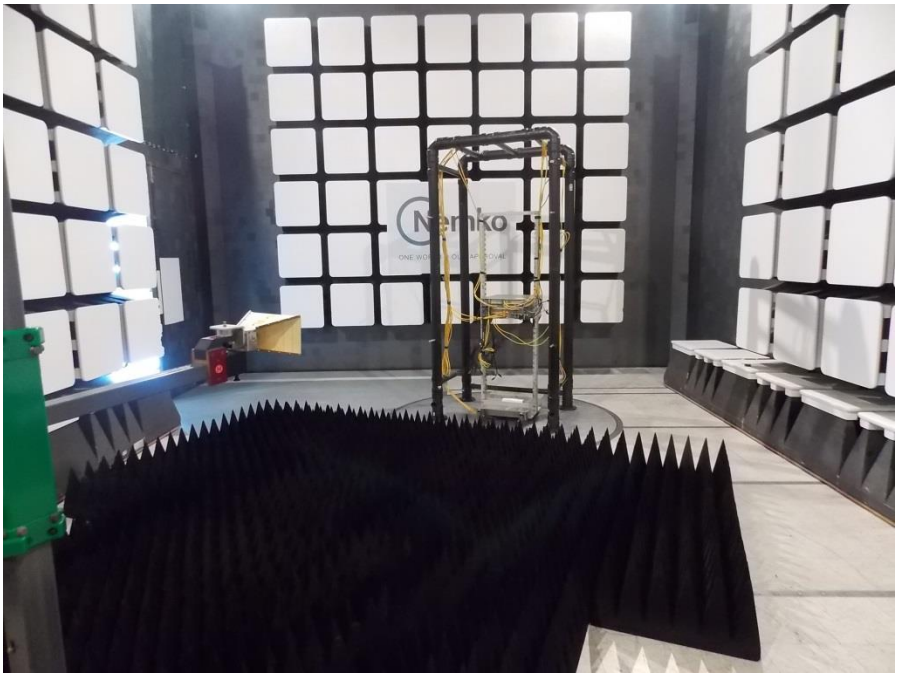


Figure 8.1-6: *Radiated disturbance setup photo above 1 GHz*

8.2 Conducted common mode (asymmetric mode) disturbance at telecommunication port

8.2.1 References

CISPR 22

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	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 8.2-1: *Conducted common mode (asymmetric mode) disturbance at telecommunication port 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

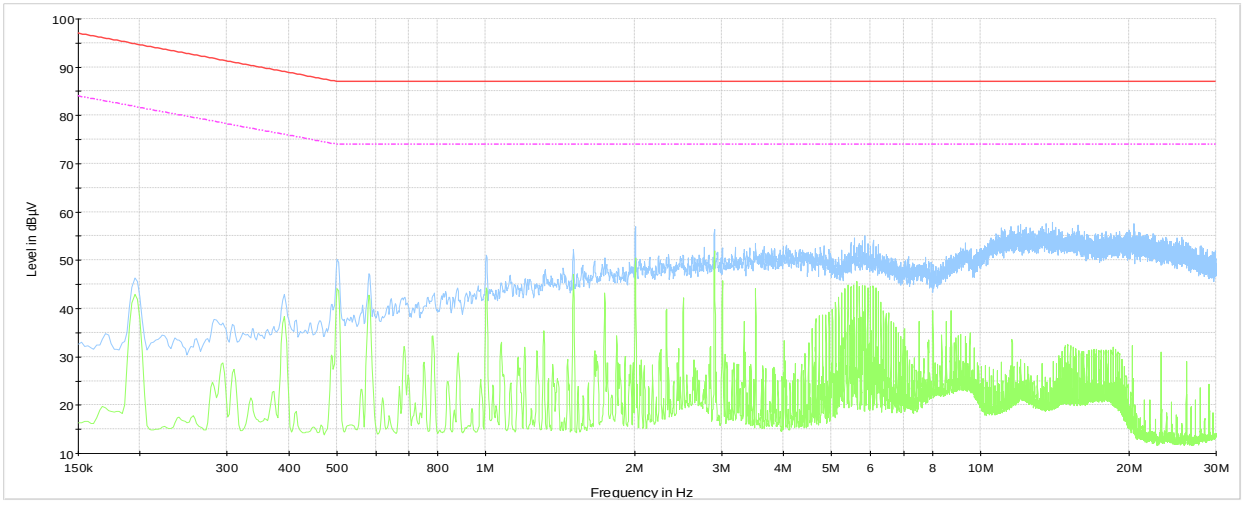
Notes: NCR - no calibration required

Table 8.2-2: *Conducted common mode (asymmetric mode) disturbance at telecommunication port test software details*

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

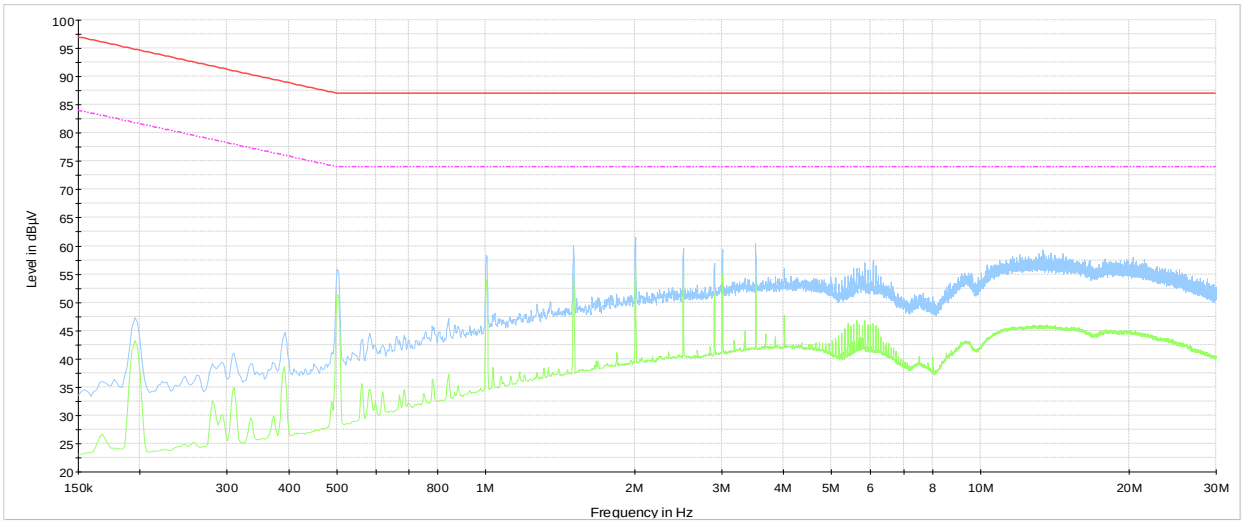
Notes: None

8.2.5 Test data



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

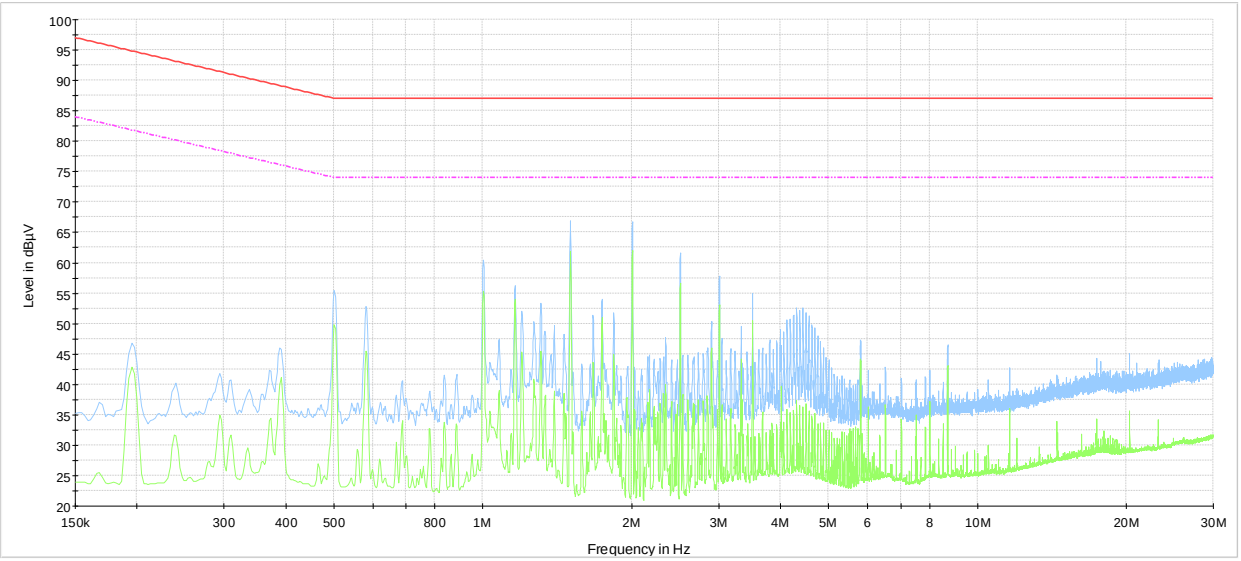
Figure 8.2-1: *Conducted common mode (asymmetric mode) disturbance at telecommunication port spectral plot on GbE_Motherboard port*



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

Figure 8.2-2: *Conducted common mode (asymmetric mode) disturbance at telecommunication port spectral plot on GbE PCIe Port*

8.2.5 Test data, continued



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

Figure 8.2-3: *Conducted common mode (asymmetric mode) disturbance at telecommunication port spectral plot on MNGT port*

8.2.6 Setup photos

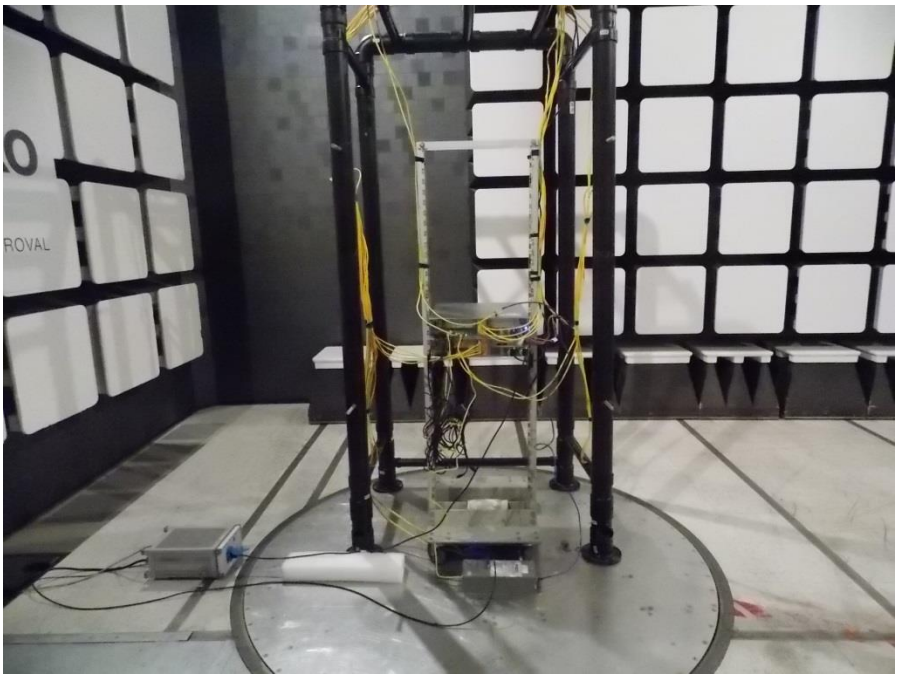


Figure 8.2-4: *Conducted common mode (asymmetric mode) disturbance at telecommunication port setup photo*

Section 9 EUT photos

9.1 External photos

Figure 9.1-1: *Front view photo*

Figure 9.1-2: *Rear view photo*

Figure 9.1-3: *Side view photo*

Figure 9.1-4: *Side view photo*