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Test report

PRJ0029749-7TRFEMC

SABS UIN 003803

Date of issue: May 7, 2023

Applicant:

Network Engines, Inc.

Product:

Veritas Server System

Model:

VER5000CYP (Veritas Server), DCS0010 (Western Digital Data Storage Enclosure)

Specifications:

SANS 2332:2017 / CISPR 32:2015

Electromagnetic compatibility of multimedia equipment – Emission requirements

SANS 2335:2018/CISPR 35:2016

Electromagnetic compatibility of multimedia equipment — Immunity requirements

SANS 61000-3-2 2009 (Ed. 3.02)

Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)

SANS 61000-3-3 2009 (Ed. 2.00)

Electromagnetic compatibility (EMC) Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection

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

Lab and test locations

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Tested by	Greg Woelke, EMC Test Engineer
Reviewed by	James Cunningham, EMC/MIL/WL Supervisor
Review date	May 7, 2023
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 USA's ISO/IEC 17025 accreditation.
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Table of Contents

Section 1 Report summary

1.1 Test specifications

SANS 2332:2017 / CISPR 32:2015	Electromagnetic compatibility of multimedia equipment – Emission requirements
SANS 2335:2018/CISPR 35:2016	Electromagnetic compatibility of multimedia equipment — Immunity requirements
SANS 61000-3-2 2009 (Ed. 3.02)	Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)
SANS 61000-3-3 2009 (Ed. 2.00)	Electromagnetic compatibility (EMC) Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection

1.2 Exclusions

None.

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.2 above. 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
PRJ0029749-7TRFEMC	Original report issued

Notes: None

Section 2 Summary of test results

2.1 Radiated emissions

Table 2.1-1: *Requirements for radiated emissions at the frequencies up to 1 GHz for Class A equipment*

Table clause	Frequency range [MHz]	Measurement Distance [m]	Measurement Detector type/ bandwidth	Class A limits dB(µV/m) OATS/SAC (See table A.1[1])	Verdict
A2.1	30 – 230 230 – 1000	10	Quasi Peak/120 kHz	40 47	Pass
A2.2	30 – 230 230 – 1000	3	Quasi Peak/120 kHz	50 57	Not applicable

Notes: SAC – Semi Anechoic Chamber
[1] With reference to SANS 2332:2017 / CISPR 32:2015.

Table 2.1-2: *Requirements for radiated emissions at the frequencies above 1 GHz for Class A equipment*

Table clause	**Frequency range [MHz]**	**Measurement Distance [m]**	**Measurement Detector type/ bandwidth**	**Class A limits dB(µV/m) FSOATS (See table A.1[1])**	**Verdict**
A3.1	1000 – 3000 3000 – 6000	3	CAverage/1 MHz	56 60	Pass
A3.2	1000 – 3000 3000 – 6000	3	Peak/1 MHz	76 80	Pass

Notes: SAC – Semi Anechoic Chamber
[1] With reference to SANS 2332:2017 / CISPR 32:2015.

2.2 Conducted emissions

Table 2.2-1: *Requirements for conducted emissions from the AC mains power ports of Class A equipment*

Table clause	**Frequency range [MHz]**	**Coupling device (See table A.7[1])**	**Detector type/ bandwidth**	**Class A limits dB(µV/m)**	**Verdict**
A8.1	0.15 – 0.5 0.5 – 30	AMN	Quasi Peak/9 kHz	79 73	Pass
A8.2	0.15 – 0.5 0.5 – 30	AMN	CAverage/9 kHz	66 60	Pass

Notes: [1] With reference to SANS 2332:2017 / CISPR 32:2015.

Table 2.2-2: *Requirements for asymmetric mode conducted emissions from class A equipment*

Table clause	Frequency range [MHz]	Coupling device (See table A.7[1])	Detector type/ bandwidth	Class B limits dB(µV/m)		Verdict
A11.1	0.15 – 0.5 0.5 – 30	AAN	Quasi Peak/9 kHz	84 – 74 74	n/a	Pass
	0.15 – 0.5 5 – 30	AAN	CAverage/9 kHz	74 – 64 64	n/a	
A11.2	0.15 – 0.5 0.5 – 30	CVP and current probe	Quasi Peak/9 kHz	84 – 74 74	40 – 30 30	Pass
	0.15 – 0.5 5 – 30	CVP and current probe	CAverage/9 kHz	74 – 64 64	30 – 20 20	
A11.3	0.15 – 0.5 0.5 – 30	Current probe	Quasi Peak/9 kHz	n/a	40 – 30 30	Pass
	0.15 – 0.5 5 – 30	Current probe	CAverage/9 kHz	n/a	30 – 20 20	

Notes:
- The choice of coupling device and measurement procedure is defined in Annex C[1].
- Screened ports including TV broadcast receiver tuner ports are tested with a common-mode impedance of 150 Ω This is typically accomplished with the screen terminated by 150 Ω to earth;
- AC Mains ports that also have the function of a wired network port shall meet the limits given in Table A.9[1]
- The application of the voltage and/or current limits is dependent on the measurement procedure used. Refer to Table C.1[1] for applicability.
- Testing is required at only one EUT supply voltage and frequency.
- Applicable to ports listed above and intended to connect to cables longer than 3 m.
- Class B equipment (See definition in 7.1.1[1]).
- Applicable to: wired network ports, optical fiber ports with metallic shield or tension members, broadcast receiver tuner ports and antenna ports.

[1] With reference to SANS 2332:2017 / CISPR 32:2015.

Table 2.2-3: *SANS 61000-3-2 2009 (Ed. 3.02) results*

Test description	**Verdict**
Harmonic current emissions	Pass

Notes: Harmonic classification A

Table 2.2-4: *SANS 61000-3-3 2009 (Ed. 2.00) results*

Test description	**Verdict**
Voltage fluctuations and flicker	Pass

Notes: None

2.3 Immunity Test Results

Table 2.3-1: *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]	SANS 61000-4-8	Pass
Continuous RF electromagnetic field disturbances, swept test Continuous RF electromagnetic field disturbances, spot test	80–1000 3 80	MHz V/m_{RMS} (unmodulated) % AM (1 kHz)	A	SANS 61000-4-3	Pass
Electrostatic discharge (ESD)	4 (Contact discharge) 8 (Air discharge)	kV (charge voltage) kV (charge voltage)	B	SANS 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.

Table 2.3-2: *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	SANS 61000-4-6	Pass
Surge (line to ground) [2, 4, 5, and 7]	1 or 4 10/700	kV (peak) Tr/Th µs	C	SANS 61000-4-5	Pass
Fast transients [3, 5, and 6]	0.5 5/50 5	kV (peak) Tr/Th ns kHz (repetition rate)	B	SANS 61000-4-4	Pass

Notes:
[1] The frequency range is scanned as specified. However, when specified in Annex A (SANS 2335:2018/CISPR 35:2016), 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 SANS 2335:2018/CISPR 35:2016Annex 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.

2.3 Immunity Test Results, continued

Table 2.3-3: *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	SANS 61000-4-6	Pass
Voltage dip [2]	100 0.5 30 25	% reduction period % reduction periods	B C	SANS 61000-4-11	Pass Pass
Voltage interruptions [2]	100 250	% reduction periods	C	SANS 61000-4-11	Pass
Surge [3]	1.2/50 (8/20) 1 (line to line) 2 (line to ground)	Tr/Th µs kV (peak) kV (peak)	B	SANS 61000-4-5	Pass
Fast transients	1 5/50 5	kV (peak) Tr/Th ns kHz (repetition rate)	B	SANS 61000-4-4	Pass

Notes:
[1] The frequency range is scanned as specified. However, when specified in Annex A (SANS 2335:2018/CISPR 35:2016), 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

Company name	Network Engines, Inc.
Address	25 Dan Road
City	Carton
Province/State	MA.
Postal/Zip code	02021-2817
Country	USA

3.2 Manufacturer

Company name	NEI – Integration Services
Address	Parkmore Business Park
City	Galway
Country	Ireland

3.3 Sample information

Receipt date	March 20, 2023
Nemko sample ID number	Nemko PRJ0029749-7 SABS UIN 003802
Test start date	March 21st, 2023
Test end date	April 13th, 2023

3.4 EUT information

Product name	Veritas Server System
Model	VER5000CYP (Veritas Server), DCS0010 (Western Digital Data Storage Enclosure)
Variant(s)	N/A
Serial number	NNG05225210065, USALP00523QB001
Part number	SYS-CPR-00547, A214-000015-000
Power requirements	100-127 200-240, 10-12a, 50/60Hz
Description/theory of operation	The EUT is a server system that includes a JBOD.
Operational frequencies	Not provided
Software details	Rocky Linux 8.7

3.5 EUT exercise and monitoring details

The EUT was exercised by running BurnIn software with Rocky Linux 8.7 OS. If the EUT were to lose communications or change state this may be considered a failure.

3.6 EUT setup details

Table 3.6-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number	Rev.
Power Supply X2 (VER5000CYP)	Intel	PSSF132202A rev 05A	CNS1322A4LN5H0503	N/A
Disc Drive x 3 (VER5000CYP)	Micron	MTFDKCB1T9TDZ	2214388206D1	N/A
Power Supply (DCS0010)	Shenzhen Gospell Digital Technology Co. LTD	G1358-2000WNEE	1358202NEE221000096	N/A
Disc Drive x24 (DCS0010)	Western Digital	WUS4BA138DSP3X1	A083E047	N/A

Table 3.6-2: *EUT interface ports*

Description	Qty.
100G NIC (QSFP28G) (VER5000CYP)	4
Flex 5365 Broadcom NIC (VER5000CYP)	8
QL2772 HBA1 (VER5000CYP)	2 pair
Ethernet (VER5000CYP)	4
AIC (DCS0010)	4
Ethernet MGMT (DCS0010)	2
USB	5
VGA	1

Table 3.6-3: *Support equipment*

Description	Brand name	Model/Part number	Serial number	Rev.
Keyboard	Logitech	Y-U0009	LZ02333	N/A
Mouse	MicroSoft	COM3000	N/A	N/A
Monitor	Dell	E2013Hc	CN-OXKFTR-64180-346-24VS	N/A
Router/Switch	Netgear	XSM43165	4G3N297AD109	N/A

Table 3.6-4: *Inter-connection cables*

Cable description	From	To	Length (m)
Ethernet	VER5000CYP	Switch	3
Ethernet MGMT	DCS0010	Switch	3
100G NIC (QSFP28G)	VER5000CYP	DCS0010	2.5
Flex 5365 Broadcom NIC	VER5000CYP	VER5000CYP	0.5
QL2772 HBA1	VER5000CYP	VER5000CYP	0.5
USB	VER5000CYP	Keyboard	1.5
USB	VER5000CYP	Mouse	1.5
USB	VER5000CYP	Unterminated	2
VGA	VER5000CYP	Monitor	1.5

Figure 3.6-1: Test 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 USA 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.

Table 6.1-1: *Measurement uncertainty calculations*

Measurement		**U_{cispr} dB**	**U_{lab} dB**
Conducted disturbance at AC mains and other port power using a V-AMN	9 kHz to 150 kHz	3.8	2.9
	150 kHz to 30 MHz	3.4	2.3
Conducted disturbance at telecommunication port using AAN	150 kHz to 30 MHz	5.0	4.3
Conducted disturbance at telecommunication port using CVP	150 kHz to 30 MHz	3.9	2.9
Conducted disturbance at telecommunication port using CP	150 kHz to 30 MHz	2.9	1.4
Conducted disturbance at telecommunication port using CP and CVP	150 kHz to 30 MHz	4.0	3.1
Radiated disturbance (electric field strength in a SAC)	30 MHz to 1 GHz	6.3	5.5
Radiated disturbance (electric field strength in a FAR)	1 GHz to 6 GHz	5.2	4.7
Radiated disturbance (electric field strength in a FAR)	6 GHz to 18 GHz	5.5	5.0

Notes: Compliance assessment:

If U_{lab} is less than or equal to U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit

If U_{lab} is greater than U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level, increased by (U_{lab} - U_{cispr}), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} - U_{cispr}), exceeds the disturbance limit

V-AMN: V type artificial mains network
AAN: Asymmetric artificial network
CP: Current probe
CVP: Capacitive voltage probe
SAC: Semi-anechoic chamber
FAR: Fully anechoic room

Section 7 Terms and definitions

7.1 Equipment classification

Equipment classification	Equipment intended primarily for use in a residential environment shall meet the Class B limits. All other equipment shall comply with the Class A limits. Broadcast receiver equipment is Class B equipment. The user documentation and/or manual shall contain details of any special measures required to be taken by the purchaser or user to ensure EMC compliance of the EUT with the requirements of this publication (SANS 2332). One example would be the need to use shielded or special cables. Class A equipment shall have the following warning in the instructions for use, to inform the user of the risk of operating this equipment in a residential environment: Warning: This equipment is compliant with Class A of SANS 2332:2017 / CISPR 32:2015. In a residential environment this equipment may cause radio interference.

7.2 Performance terms and definitions

General performance criteria, Reference Clause 7.1 of SANS 224: 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 SANS 224: 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 SANS 224: 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 SANS 224: 2010	During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, 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.

7.3 General definitions

7.3.1 Equipment type

Multimedia Equipment (MME)	Equipment that is information technology equipment, audio equipment, video equipment, broadcast receiver equipment, entertainment lighting control equipment or combinations of these.
Information technology equipment [ITE]	Equipment having a primary function of either (or a combination of) entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer. - Examples include data processing equipment, office machines, electronic business equipment and telecommunication equipment.
Audio equipment	Equipment which has a primary function of either (or a combination of) generation, input, storage, play, retrieval, transmission, reception, amplification, processing, switching or control of audio signals
Video equipment	Equipment which has a primary function of either (or a combination of) generation, input, storage, display, play, retrieval, transmission, reception, amplification, processing, switching, or control of video signals.
Broadcast receiver equipment	Equipment containing a tuner that is intended for the reception of broadcast services - These broadcast services are typically television and radio services, including terrestrial broadcast, satellite broadcast and/or cable transmission.
Entertainment lighting control equipment	Equipment generating or processing electrical signals for controlling the intensity, color, nature or direction of the light from a luminaire, where the intention is to create artistic effects in theatrical, televisual or musical productions and visual presentations.

7.3.2 Port type

AC mains power port	Port used to connect to the mains supply network - Equipment with a DC power port which is powered by a dedicated AC/DC power converter is defined as AC mains powered equipment
Antenna port	Port, other than a broadcast receiver tuner port (3.1.8), for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.
Broadcast receiver tuner port	Port intended for the reception of a modulated RF signal carrying terrestrial, satellite and/or cable transmissions of audio and/or video broadcast and similar services - This port may be connected to an antenna, a cable distribution system, a VCR or similar device.
DC network power port	Port, not powered by a dedicated AC/DC power converter and not supporting communication, that connects to a DC supply network. - Equipment with a DC power port which is powered by a dedicated AC/DC power converter is considered to be AC mains powered equipment. - DC power ports supporting communications are considered to be wired networks ports, for example Ethernet ports which include Power Over Ethernet (POE).
Enclosure port	Physical boundary of the EUT through which electromagnetic fields may radiate.
Optical fiber port	Port at which an optical fiber is connected to an equipment.
RF modulator output port	Port intended to be connected to a broadcast receiver tuner port in order to transmit a signal to the broadcast receiver.
Signal/control port	Port intended for the interconnection of components of an equipment under test, or between an equipment under test and local associated equipment and used in accordance with relevant functional specifications (for example for the maximum length of cable connected to it) - Examples include RS-232, Universal Serial Bus (USB), High-Definition Multimedia Interface (HDMI), IEEE Standard 1394 (“Fire Wire”)
Wired network port	Point of connection for voice, data and signaling transfers intended to interconnect widely-dispersed systems by direct connection to a single-user of multi-user communication network (for example CATV, PSTN, ISDN, xDSL, LAN and similar networks) - These ports may support screened or unscreened cables and may also carry AC or DC power where this is an integral part of the telecommunication specification.

7.3 General definitions, continued

7.3.3 SANS 61000-3-2 2009 (Ed. 3.02) (Harmonic emissions)

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

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

7.3.4 SANS 61000-3-3 2009 (Ed. 2.00) (Flicker emissions)

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

7.3.5 SANS 61000-4-2 2009 (Ed. 2.00) (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.

7.3.6 SANS 61000-4-3 2008 (Ed. 3.01): (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.

7.3 General definitions, continued

7.3.7 SANS 61000-4-4 2011 (Ed. 2.01) (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.

Section 8 Emissions Testing data

8.1 Radiated emissions

8.1.1 References

SANS 2332:2017 / CISPR 32:2015

8.1.2 Test summary

Verdict	Pass		
Test date	April 4, 2023	Temperature	19 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1008 mbar
Test location	10m semi anechoic chamber	Relative humidity	37 %

8.1.3 Notes

- The top six emissions within 10 dB of the limit have been recorded for each detector type as required by the standard.
- Where there is a step in the relevant limit, the lower value was applied at the transition frequency.
- The highest operating frequency of the EUT as provided by the client was 12 Gbps.
- The spectrum was scanned up to 6GHz since the EUT highest operating frequency according to ***Table 8.1-1*** was not available from the client.

Table 8.1-1: *Frequency range*

Highest internal frequency [F_X]	Highest measured frequency
$F_X \leq 108$ MHz	1 GHz
108 MHz < $F_X \leq 500$ MHz	2 GHz
500 MHz < $F_X \leq 1$ GHz	5 GHz
$F_X > 1$ GHz	5 × F_X up to a maximum of 6 GHz

Notes: Highest internal frequency [F_X] – highest fundamental frequency generated or used within the EUT or highest frequency at which it operates. This includes frequencies which are solely used within an integrated circuit.
For FM and TV broadcast receivers F_X is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.

8.1.4 Setup details

Port under test	Enclosure Port
EUT setup configuration	Table top
Test facility	10 m Semi anechoic chamber
Measuring distance	3 & 10 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 10 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 (Peak preview measurement) – 5000 ms (Quasi-peak final measurement)

Receiver/spectrum analyzer settings for frequencies above 1 GHz:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak (Preview measurement) Peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak preview measurement) – 5000 ms (Peak and CAverage final measurement)

Table 8.1-2: *Radiated emissions equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMC Test Receiver	Rohde & Schwarz	ESU 26	E1353	1	11/11/2023
Antenna, Bilog	Schaffner-Chase	CBL 6111C	1480	2 Yr	2/21/2024
Antenna, DRG Horn	ETS Lindgren	3117-PA	E1160	1 Yr	2/13/2024
Pre Amp as part of DRG Horn	ETS Lindgren	3117-PA	Part of E1160	1 Yr	2/13/2024
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: NCR - no calibration required

Table 8.1-3: *Radiated emissions test software details*

Manufacturer of Software	Details
Rohde & Schwarz	EMC32 v10.00.00

Notes: None

8.1.5 Test data

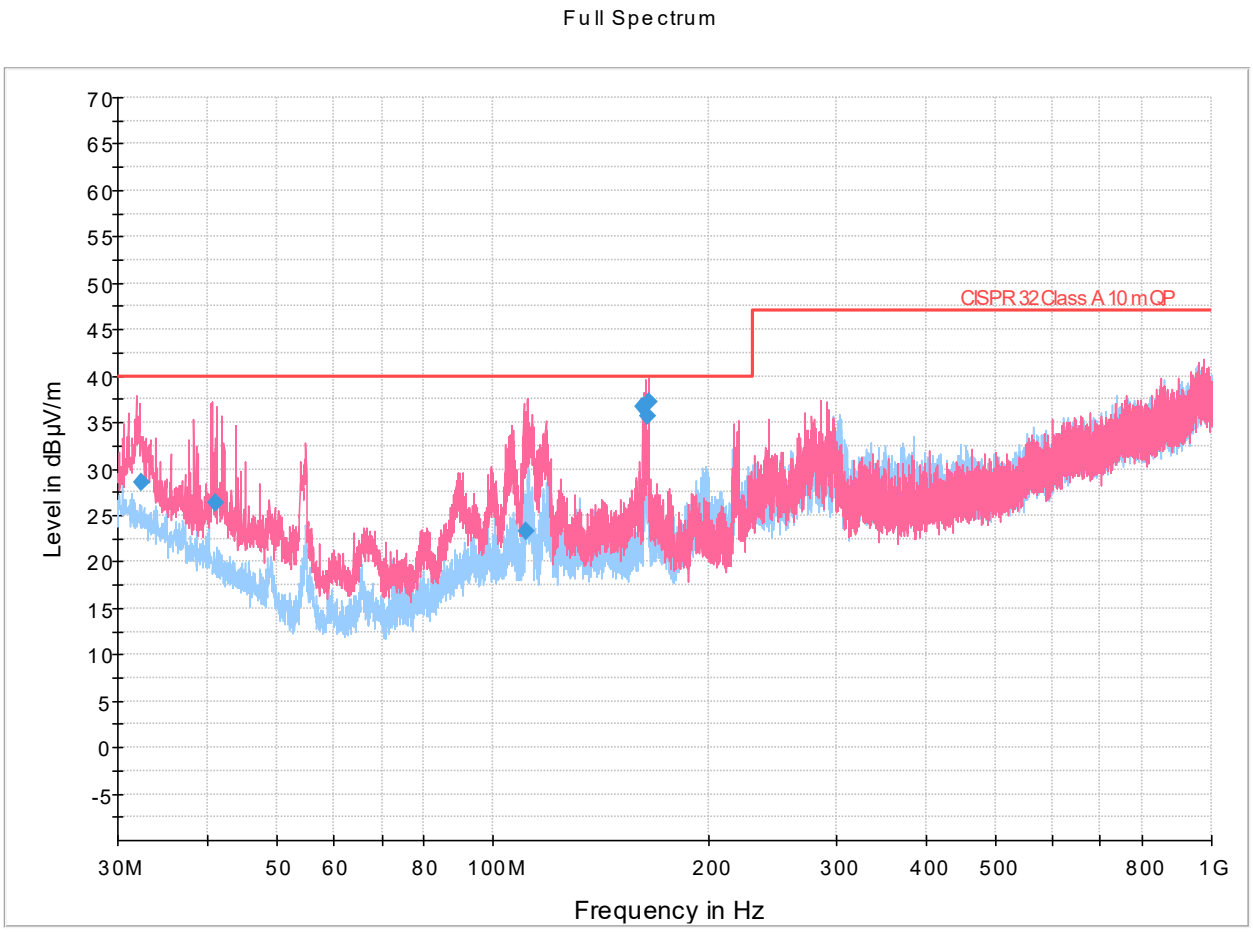


Figure 8.1-1: *Radiated emissions spectral plot (30 MHz - 1 GHz)*

Table 8.1-4*: Radiated emissions results*

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.410667	28.55	40.00	11.45	5000.0	120.000	98.0	V	39.0	24.3
41.133000	26.41	40.00	13.59	5000.0	120.000	274.0	V	134.0	19.7
111.240000	23.24	40.00	16.76	5000.0	120.000	126.0	V	11.0	18.6
161.689333	36.73	40.00	3.27	5000.0	120.000	98.0	V	180.0	18.1
163.651667	35.77	40.00	4.23	5000.0	120.000	98.0	V	182.0	18.1
164.700667	37.18	40.00	2.82	5000.0	120.000	109.0	V	163.0	18.0

Notes: [1] Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

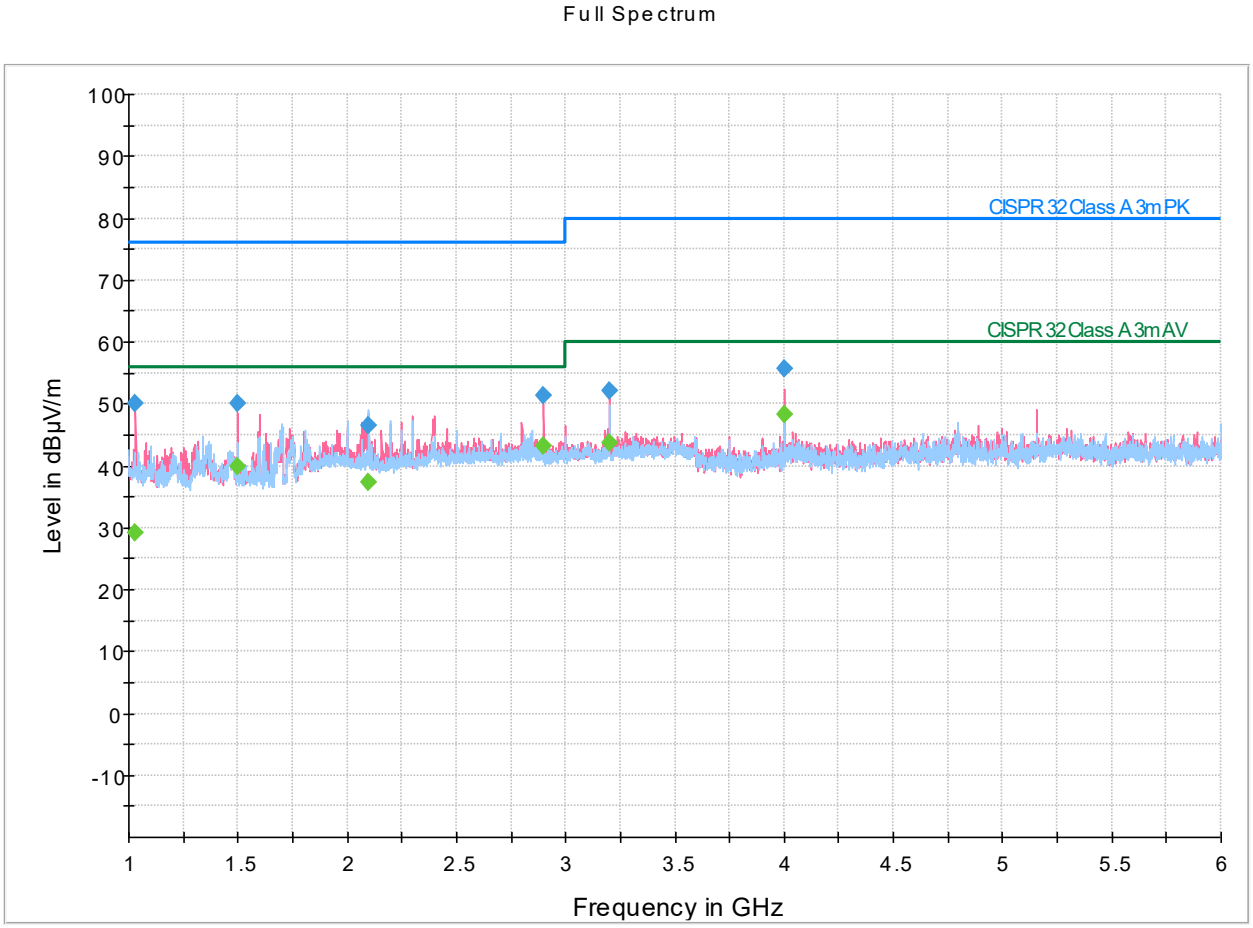


Figure 8.1-2: Radiated emissions spectral plot (1 GHz - 18 GHz)

***Table 8.1-5**: Radiated emissions results*

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1026.500000	50.09	---	76.00	25.91	5000.0	1000.000	139.0	V	174.0	-11.5
1026.500000	---	29.05	56.00	26.95	5000.0	1000.000	139.0	V	174.0	-11.5
1500.000000	50.01	---	76.00	25.99	5000.0	1000.000	132.0	V	186.0	-10.7
1500.000000	---	39.76	56.00	16.24	5000.0	1000.000	132.0	V	186.0	-10.7
2100.100000	46.55	---	76.00	29.45	5000.0	1000.000	347.0	H	21.0	-7.2
2100.100000	---	37.43	56.00	18.57	5000.0	1000.000	347.0	H	21.0	-7.2
2899.950000	51.22	---	76.00	24.78	5000.0	1000.000	98.0	V	0.0	-4.0
2899.950000	---	43.13	56.00	12.87	5000.0	1000.000	98.0	V	0.0	-4.0
3200.000000	52.23	---	80.00	27.77	5000.0	1000.000	124.0	V	112.0	-2.7
3200.000000	---	43.73	60.00	16.27	5000.0	1000.000	124.0	V	112.0	-2.7
4000.250000	55.62	---	80.00	24.38	5000.0	1000.000	98.0	V	175.0	-0.9
4000.250000	---	48.23	60.00	11.77	5000.0	1000.000	98.0	V	175.0	-0.9

Notes: [1] Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

8.1.6 Setup photos

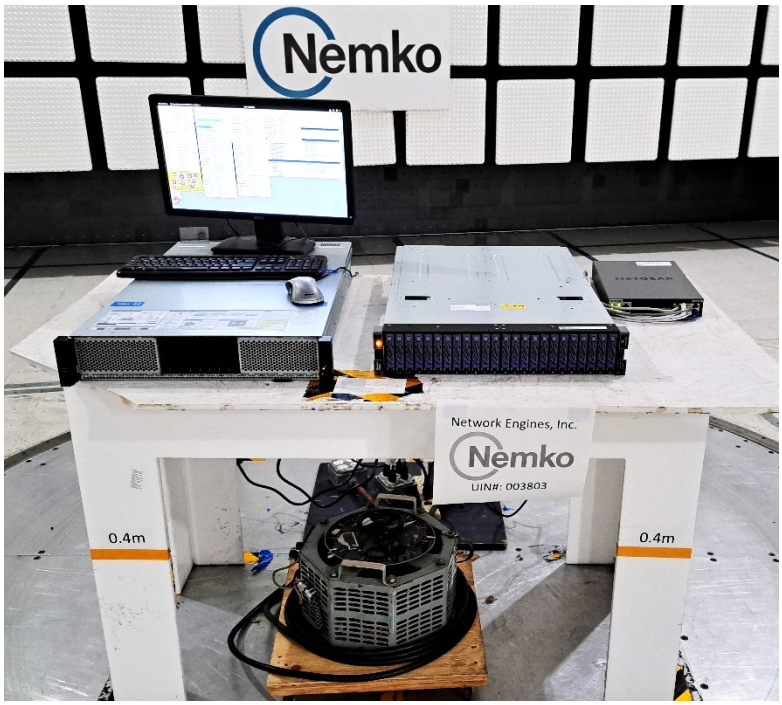


Figure 8.1-3: *Radiated emissions setup photo below 1 GHz*

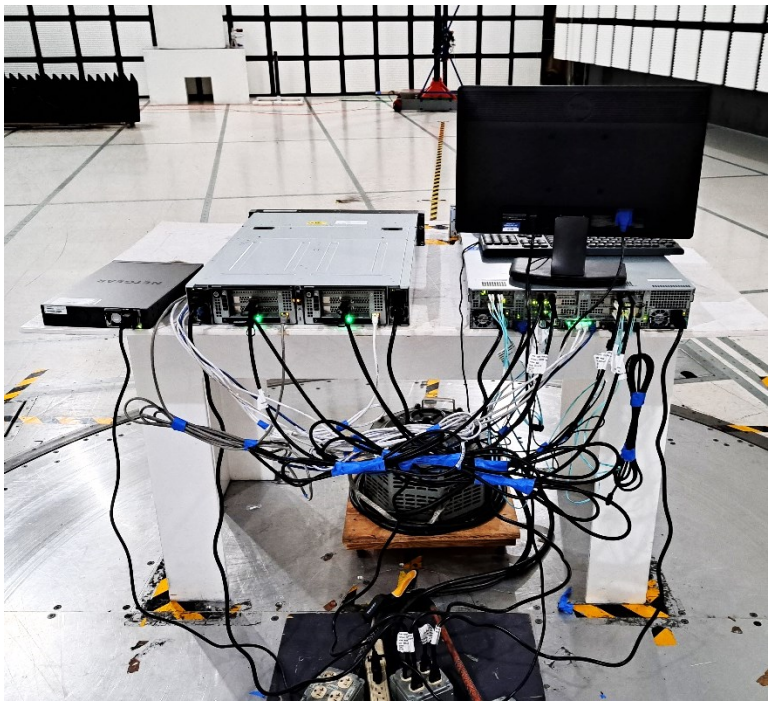


Figure 8.1-4: *Radiated emissions setup photo below 1 GHz*

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

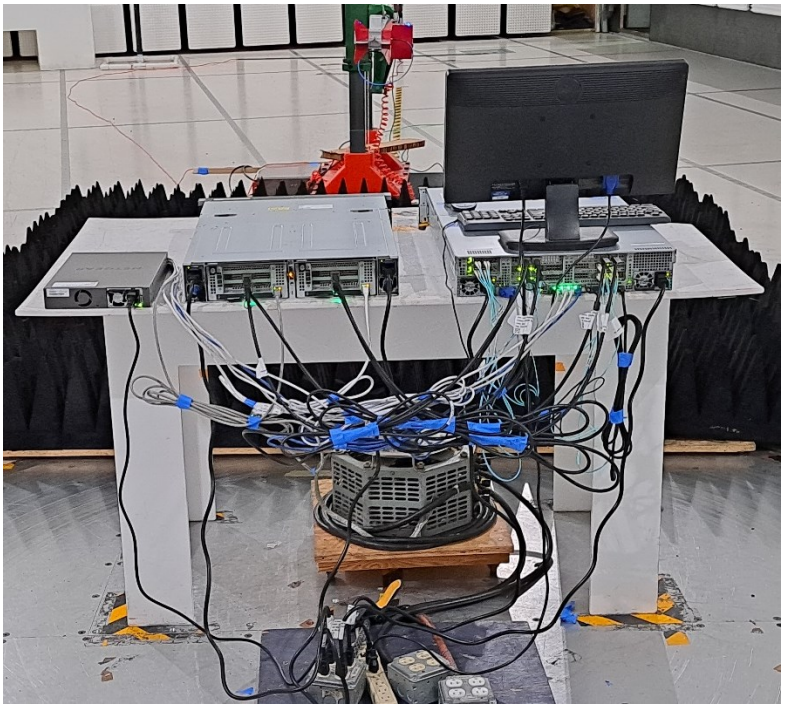


Figure 8.1-6: Radiated emissions setup photo above 1 GHz

8.2 Conducted emissions – from AC mains power ports

8.2.1 References

SANS 2332:2017 / CISPR 32:2015

8.2.2 Test summary

Verdict	Pass		
Test date	April 5, 2023	Temperature	19 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1007 mbar
Test location	Ground Plane	Relative humidity	43 %

8.2.3 Notes

- The top six emissions within 10 dB of the limit have been recorded for each detector type as required by the standard.
- Where there is a step in the relevant limit, the lower value was applied at the transition frequency.
- Equipment with a DC power port powered by a dedicated AC/DC power converter is considered to be AC mains powered equipment and was tested with a power converter. Where the power converter was provided by the manufacturer, the provided converter was used.

8.2.4 Setup details

Port under test – Coupling device	AC Mains PS B and PS B; Two Line V-Network (LISN)
EUT setup configuration	Table top
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 10 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 (Preview measurement) – Quasi-peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak preview measurement) – 5000 ms (Quasi-peak final measurement) – 5000 ms (CAverage final measurement)

Table 8.2-1: *Conducted emissions – from AC mains power ports equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Test Receiver	Rohde & Schwarz	ESCI 7	E1026	2 Yr	3/22/2024
LISN	Rohde & Schwarz	ENV216	E1019	1 Yr	9/30/2023
Transient Limiter (10 dB pad)	Hewlett Packard	11947A	E1159	1 yr	2/28/2024
LISN	Solar	9348-50-R-24-BNC	384	1 Yr	9/14/2023
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: NCR - no calibration required

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

Manufacturer of Software	Details
Rohde & Schwarz	EMC32 v10.20.01

Notes: None

8.2.5 Test data

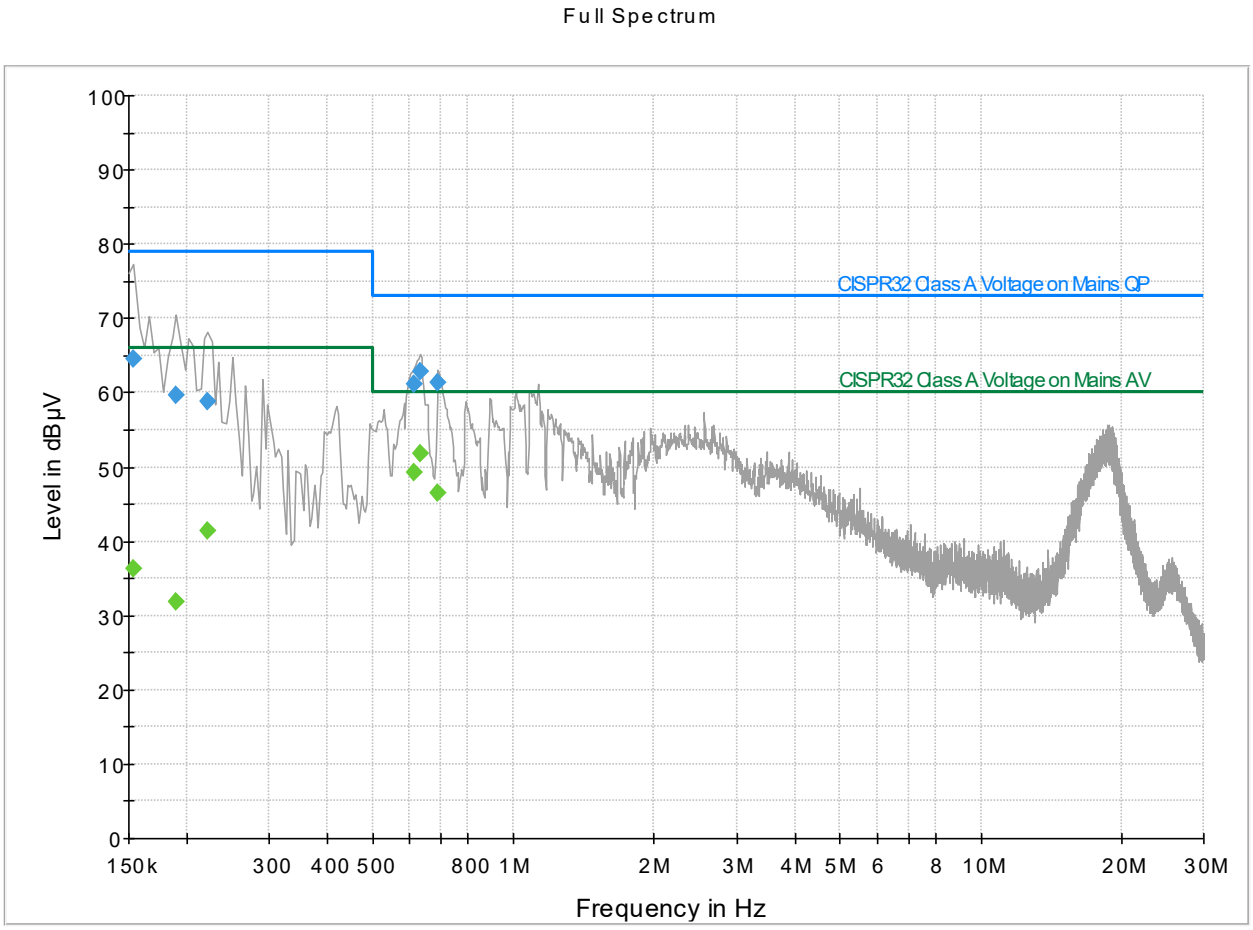


Figure 8.2-1: *Conducted emissions at mains port spectral plot (150 kHz - 30 MHz) for VER5000CYP PS A at 230V 50Hz*

Table 8.2-3*: Conducted emissions at mains port results*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154000	---	36.31	66.00	29.69	5000.0	9.000	L1	ON	19.5
0.154000	64.60	---	79.00	14.40	5000.0	9.000	L1	ON	19.5
0.190000	---	31.80	66.00	34.20	5000.0	9.000	N	ON	19.5
0.190000	59.56	---	79.00	19.44	5000.0	9.000	N	ON	19.5
0.222000	---	41.39	66.00	24.61	5000.0	9.000	N	ON	19.5
0.222000	58.71	---	79.00	20.29	5000.0	9.000	N	ON	19.5
0.614000	---	49.20	60.00	10.80	5000.0	9.000	N	ON	19.4
0.614000	61.24	---	73.00	11.76	5000.0	9.000	N	ON	19.4
0.630000	---	51.81	60.00	8.19	5000.0	9.000	N	ON	19.4
0.630000	62.84	---	73.00	10.16	5000.0	9.000	N	ON	19.4
0.690000	---	46.41	60.00	13.59	5000.0	9.000	N	ON	19.4
0.690000	61.35	---	73.00	11.65	5000.0	9.000	N	ON	19.4

Notes:
[1] Result (dBµV) = receiver analyzer value (dBµV) + correction factor (dB).
[2] Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

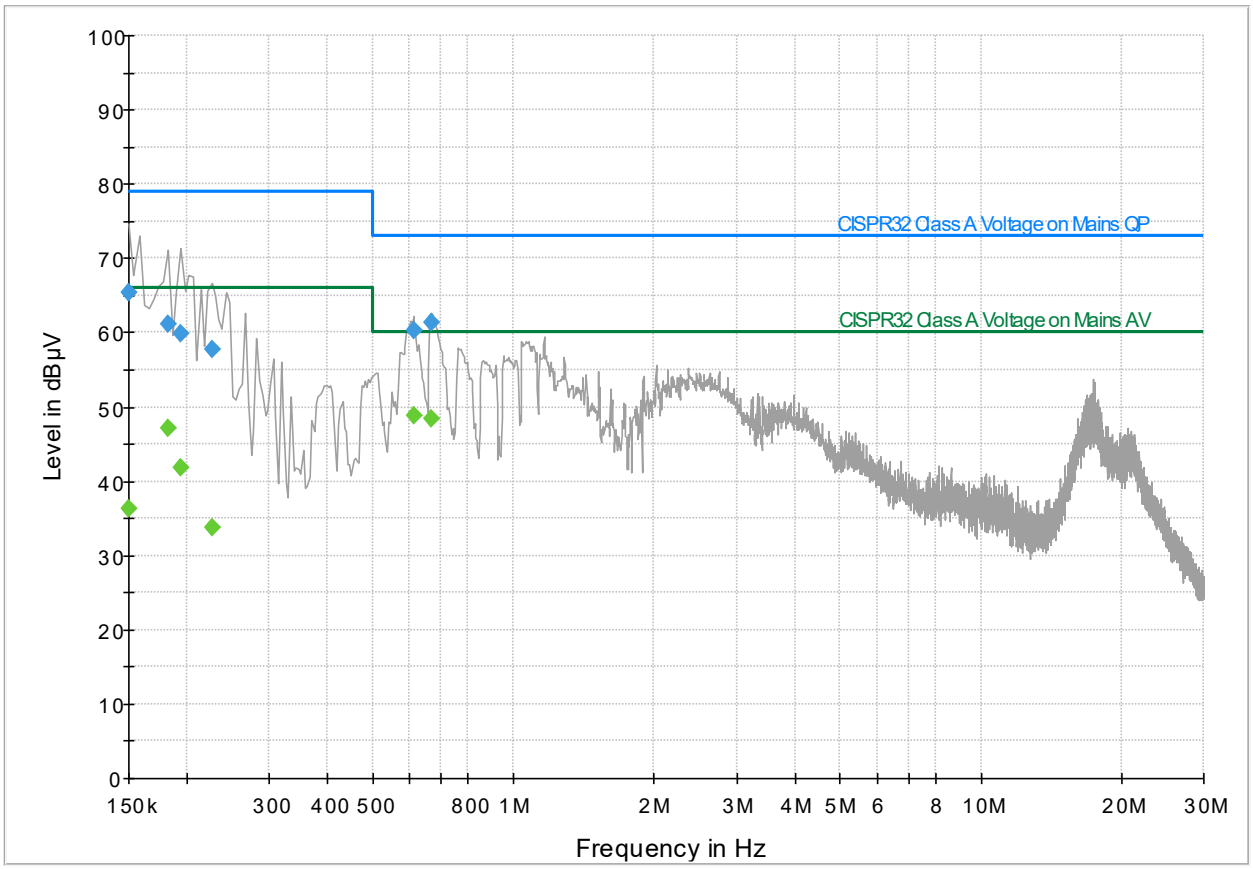


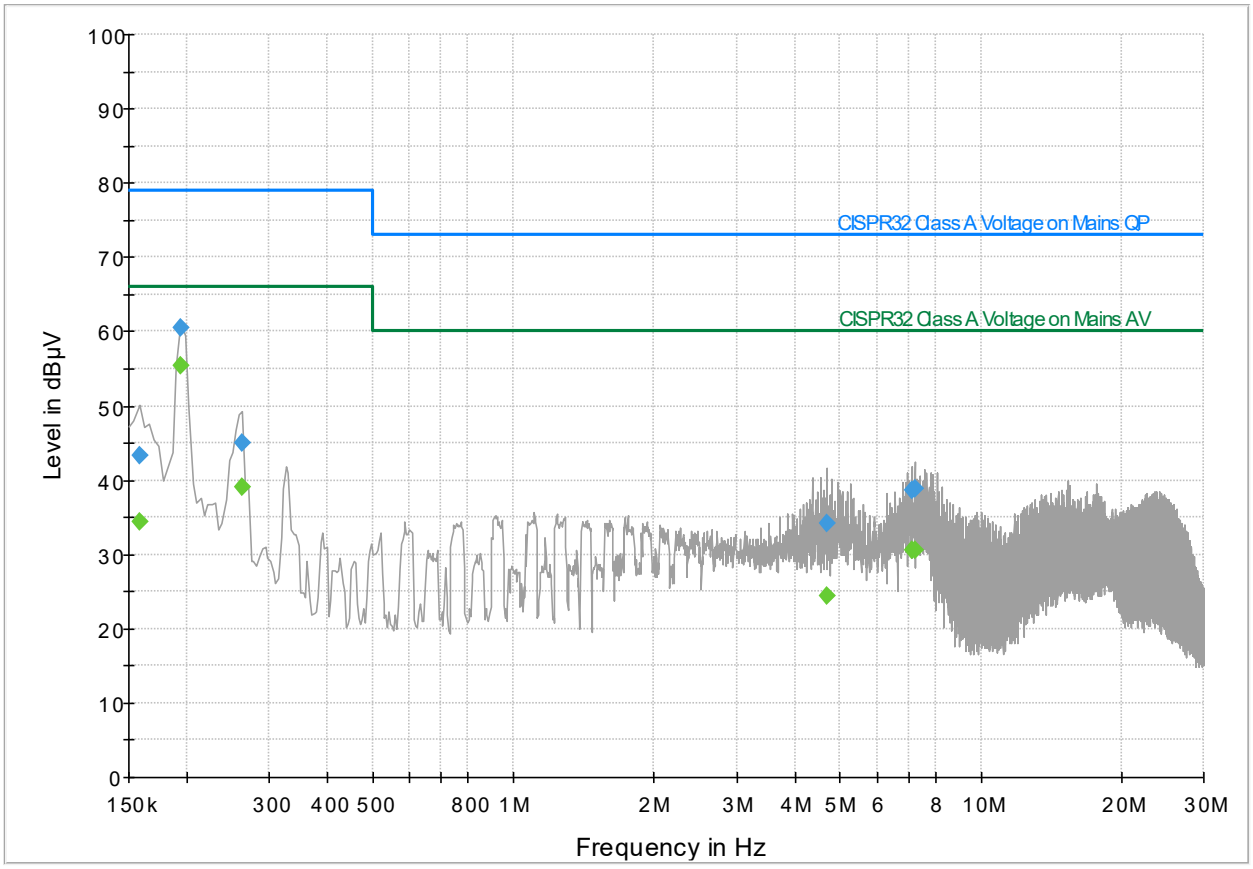
Figure 8.2-2: Conducted emissions at mains port spectral plot (150 kHz - 30 MHz) for VER5000CYP PSU B.

Table 8.2-4*: Conducted emissions at mains port results*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	65.42	---	79.00	13.58	5000.0	9.000	N	ON	19.5
0.150000	---	36.37	66.00	29.63	5000.0	9.000	N	ON	19.5
0.182000	61.09	---	79.00	17.91	5000.0	9.000	L1	ON	19.5
0.182000	---	47.20	66.00	18.80	5000.0	9.000	L1	ON	19.5
0.194000	---	41.76	66.00	24.24	5000.0	9.000	N	ON	19.5
0.194000	59.80	---	79.00	19.20	5000.0	9.000	N	ON	19.5
0.226000	---	33.75	66.00	32.25	5000.0	9.000	N	ON	19.4
0.226000	57.66	---	79.00	21.34	5000.0	9.000	N	ON	19.4
0.610000	60.40	---	73.00	12.60	5000.0	9.000	L1	ON	19.4
0.610000	---	48.90	60.00	11.10	5000.0	9.000	L1	ON	19.4
0.666000	61.36	---	73.00	11.64	5000.0	9.000	L1	ON	19.4
0.666000	---	48.40	60.00	11.60	5000.0	9.000	L1	ON	19.4

Notes: [1] Result (dBµV) = receiver analyzer value (dBµV) + correction factor (dB).
[2] Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum



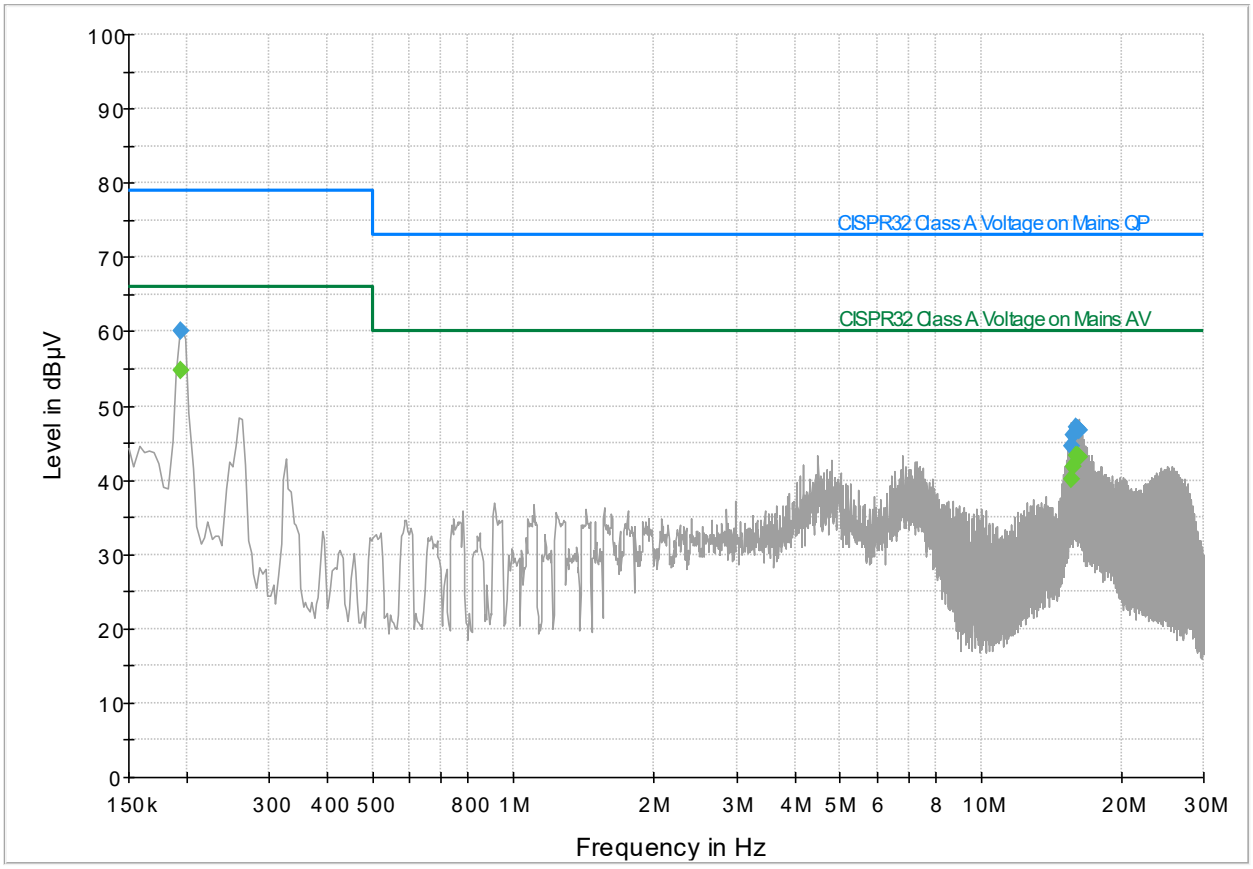
Conducted emissions at mains port spectral plot (150 kHz - 30 MHz) for DCS0010 PSU A.

***Table 8.2-5**: Conducted emissions at mains port results*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.158000	43.36	---	79.00	35.64	5000.0	9.000	N	ON	19.5
0.158000	---	34.41	66.00	31.59	5000.0	9.000	N	ON	19.5
0.194000	60.50	---	79.00	18.50	5000.0	9.000	L1	ON	19.5
0.194000	---	55.39	66.00	10.61	5000.0	9.000	L1	ON	19.5
0.262000	---	39.00	66.00	27.00	5000.0	9.000	L1	ON	19.4
0.262000	44.95	---	79.00	34.05	5000.0	9.000	L1	ON	19.4
4.682000	---	24.46	60.00	35.54	5000.0	9.000	N	ON	19.5
4.682000	34.13	---	73.00	38.87	5000.0	9.000	N	ON	19.5
7.150000	---	30.47	60.00	29.53	5000.0	9.000	L1	ON	19.6
7.150000	38.72	---	73.00	34.28	5000.0	9.000	L1	ON	19.6
7.214000	---	30.54	60.00	29.46	5000.0	9.000	L1	ON	19.6
7.214000	38.91	---	73.00	34.09	5000.0	9.000	L1	ON	19.6

Notes:
[1] Result (dBµV) = receiver analyzer value (dBµV) + correction factor (dB).
[2] Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum



Conducted emissions at mains port spectral plot (150 kHz - 30 MHz) for DCS0010 PSU B.

***Table 8.2-6**: Conducted emissions at mains port results*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.194000	---	54.82	66.00	11.18	5000.0	9.000	L1	ON	19.5
0.194000	60.08	---	79.00	18.92	5000.0	9.000	L1	ON	19.5
15.666000	---	40.19	60.00	19.81	5000.0	9.000	N	ON	19.9
15.666000	44.54	---	73.00	28.46	5000.0	9.000	N	ON	19.9
15.794000	---	41.81	60.00	18.19	5000.0	9.000	N	ON	19.9
15.794000	46.06	---	73.00	26.94	5000.0	9.000	N	ON	19.9
15.990000	---	43.29	60.00	16.71	5000.0	9.000	N	ON	19.9
15.990000	47.03	---	73.00	25.97	5000.0	9.000	N	ON	19.9
16.054000	---	43.31	60.00	16.69	5000.0	9.000	N	ON	19.9
16.054000	47.00	---	73.00	26.00	5000.0	9.000	N	ON	19.9
16.250000	---	43.09	60.00	16.91	5000.0	9.000	N	ON	19.9
16.250000	46.73	---	73.00	26.27	5000.0	9.000	N	ON	19.9

Notes:
[1] Result (dBµV) = receiver analyzer value (dBµV) + correction factor (dB).
[2] Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

8.2.6 Setup photos

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

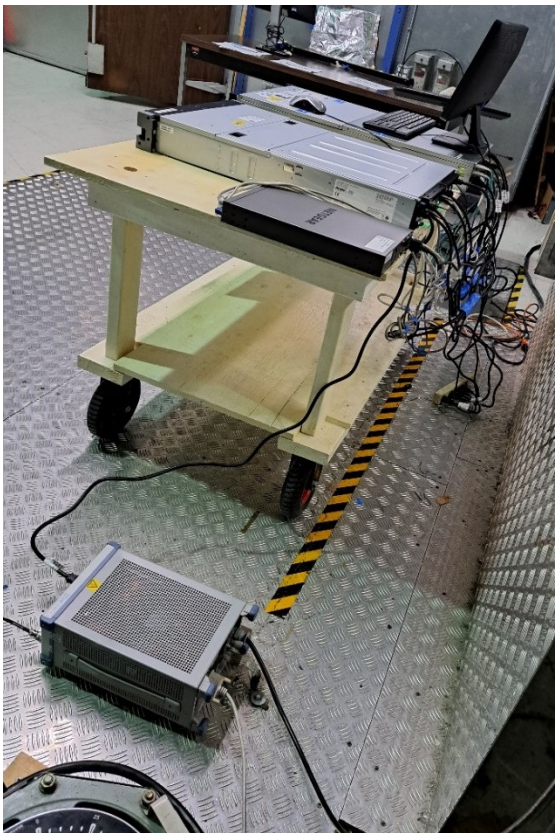


Figure 8.2-4: *Conducted emissions – from AC mains power ports setup photo*

8.3 Conducted emissions – Asymmetric mode

8.3.1 References

SANS 2332:2017 / CISPR 32:2015

8.3.2 Test summary

Verdict	Pass		
Test date	April 6, 2023	Temperature	25 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1004 mbar
Test location	Ground Plane	Relative humidity	60 %

8.3.3 Notes

- The top six emissions within 10 dB of the limit have been recorded for each detector type as required by the standard.
- Where there is a step in the relevant limit, the lower value was applied at the transition frequency.
- Equipment with a DC power port powered by a dedicated AC/DC power converter is considered to be AC mains powered equipment and was tested with a power converter. Where the power converter was provided by the manufacturer, the provided converter was used.

8.3.4 Setup details

Port under test – Coupling device	MGMT Ethernet ; AAN
EUT setup configuration	Table top
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 10 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 (Preview measurement) – Quasi-peak and CAverage (Final measurement)
Trace mode	Max Hold
Measurement time	– 100 ms (Peak preview measurement) – 5000 ms (Quasi-peak final measurement) – 5000 ms (CAverage final measurement)

Table 8.3-1: *Conducted emissions – Asymmetric mode equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Test Receiver	Rohde & Schwarz	ESCI 7	E1026	2 Yr	3/22/2024
LISN	Rohde & Schwarz	ENV216	E1019	1 Yr	9/30/2023
Transient Limiter (10 dB pad)	Hewlett Packard	11947A	E1159	1 yr	2/28/2024
LISN	Solar	9348-50-R-24-BNC	384	1 Yr	9/14/2023
Telecom LISN	FCC	FCC-TLISN-T8-02-09	E1032	1 Yr	10/28/2023
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: NCR - no calibration required

Table 8.3-2: *Conducted emissions – Asymmetric mode test software details*

Manufacturer of Software	Details
Rohde & Schwarz	EMC32 v10.20.01

8.3.5 Test data

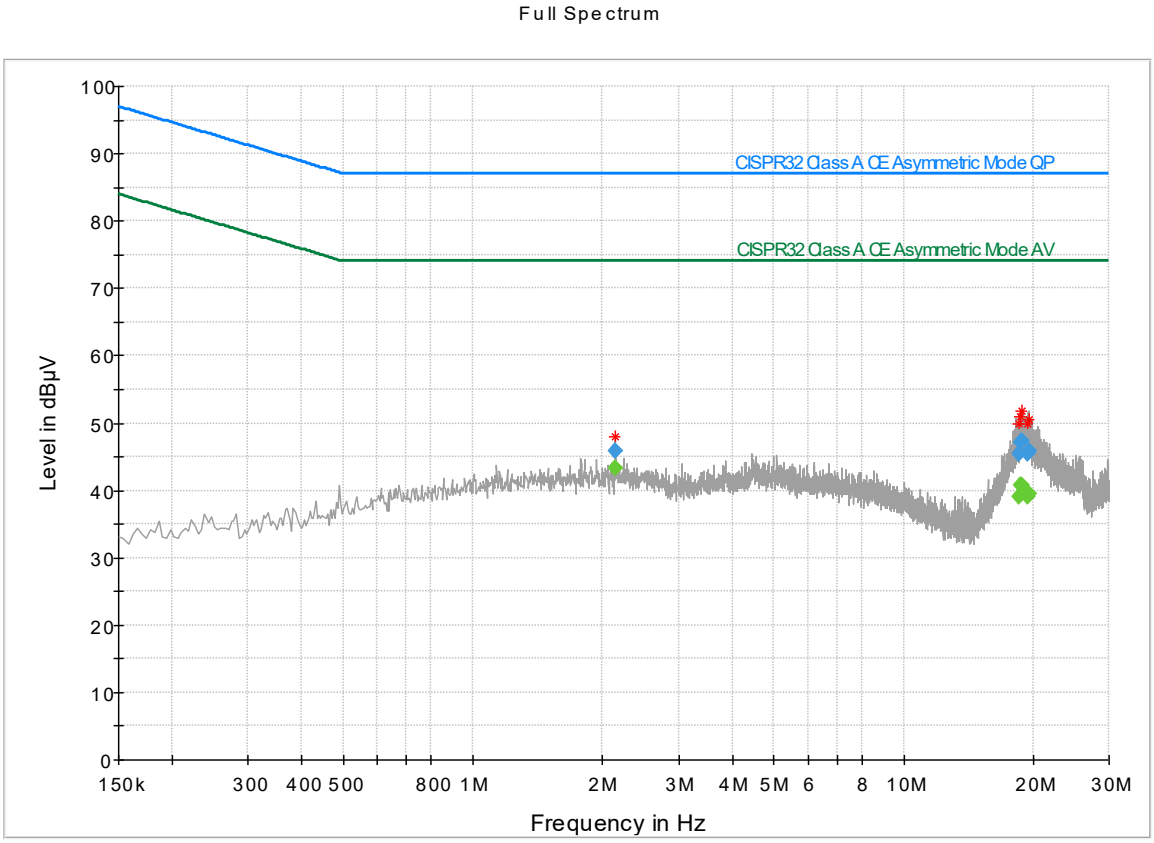


Figure 8.3-1: *Conducted emissions – Asymmetric mode spectral plot (150 kHz - 30 MHz) for VER5000CYP.*

Table 8.3-3*: Conducted emissions – Asymmetric mode port results*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
2.142000	---	43.25	74.00	30.75	5000.0	9.000	Telecom	GND	19.5
2.142000	45.93	---	87.00	41.07	5000.0	9.000	Telecom	GND	19.5
18.490000	---	39.05	74.00	34.95	5000.0	9.000	Telecom	GND	20.2
18.490000	45.36	---	87.00	41.64	5000.0	9.000	Telecom	GND	20.2
18.746000	---	40.68	74.00	33.32	5000.0	9.000	Telecom	GND	20.2
18.746000	47.18	---	87.00	39.82	5000.0	9.000	Telecom	GND	20.2
18.834000	---	40.86	74.00	33.14	5000.0	9.000	Telecom	GND	20.2
18.834000	47.41	---	87.00	39.59	5000.0	9.000	Telecom	GND	20.2
19.482000	---	39.16	74.00	34.84	5000.0	9.000	Telecom	GND	20.2
19.482000	45.37	---	87.00	41.63	5000.0	9.000	Telecom	GND	20.2
19.574000	---	39.52	74.00	34.48	5000.0	9.000	Telecom	GND	20.2
19.574000	45.96	---	87.00	41.04	5000.0	9.000	Telecom	GND	20.2

Notes:
[1] Result (dBµV) = receiver analyzer value (dBµV) + correction factor (dB).
[2] Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

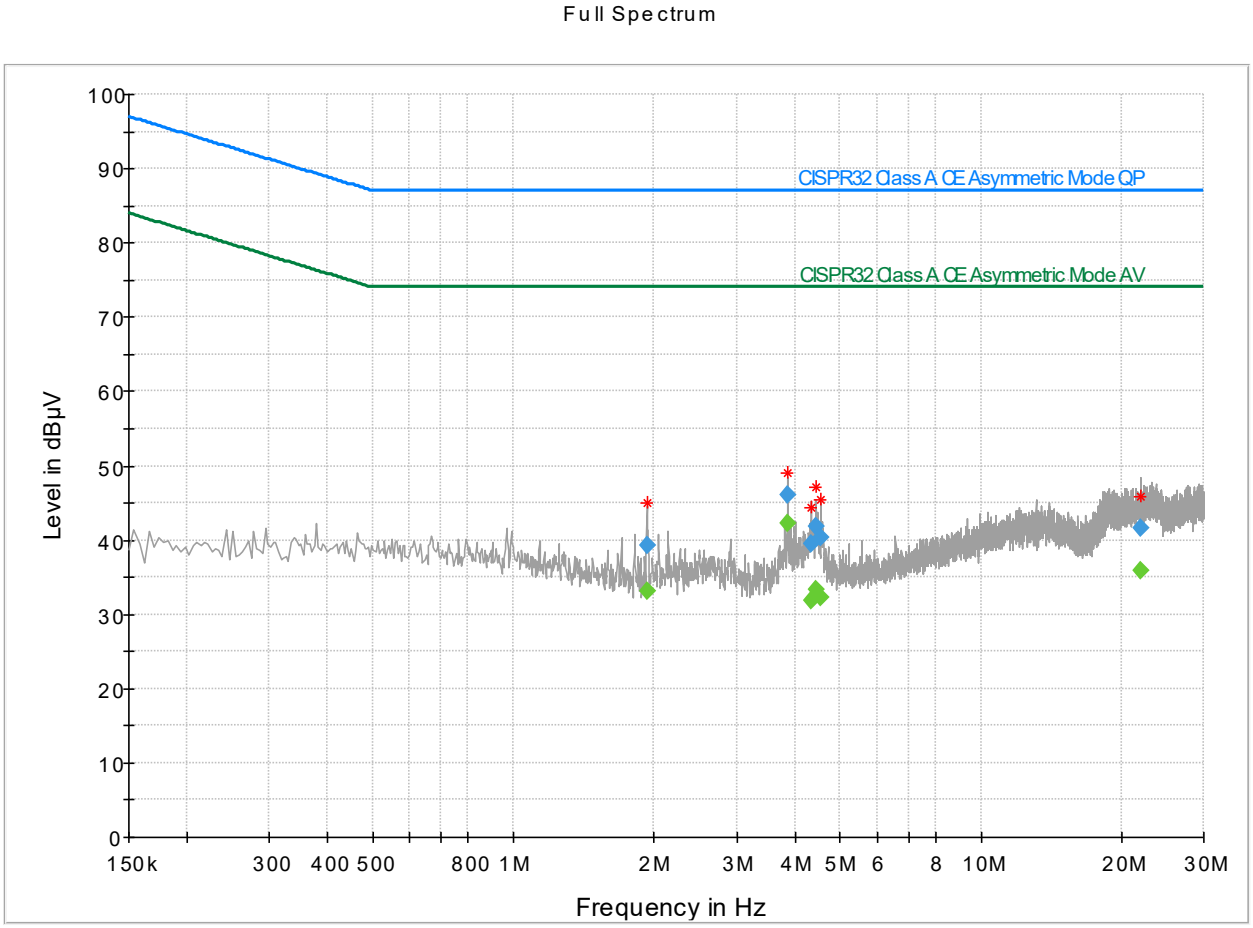


Figure 8.3-2: *Conducted emissions – Asymmetric mode spectral plot (150 kHz - 30 MHz) for DCS0010.*

Table 8.3-4*: Conducted emissions – Asymmetric mode port results*

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
1.926000	---	33.03	74.00	40.97	5000.0	9.000	Telecom	GND	19.6
1.926000	39.23	---	87.00	47.77	5000.0	9.000	Telecom	GND	19.6
3.854000	---	42.21	74.00	31.79	5000.0	9.000	Telecom	GND	19.6
3.854000	46.15	---	87.00	40.85	5000.0	9.000	Telecom	GND	19.6
4.338000	---	31.82	74.00	42.18	5000.0	9.000	Telecom	GND	19.6
4.338000	39.52	---	87.00	47.48	5000.0	9.000	Telecom	GND	19.6
4.446000	---	33.35	74.00	40.65	5000.0	9.000	Telecom	GND	19.6
4.446000	41.82	---	87.00	45.18	5000.0	9.000	Telecom	GND	19.6
4.550000	---	32.22	74.00	41.78	5000.0	9.000	Telecom	GND	19.6
4.550000	40.36	---	87.00	46.64	5000.0	9.000	Telecom	GND	19.6
22.054000	---	35.95	74.00	38.05	5000.0	9.000	Telecom	GND	20.3
22.054000	41.55	---	87.00	45.45	5000.0	9.000	Telecom	GND	20.3

Notes: [1] Result (dBµV) = receiver analyzer value (dBµV) + correction factor (dB).
[2] Correction factors = LISN factor IL (dB) + cable loss (dB) + transient limiter (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

8.3.6 Setup photos

Figure 8.3-3: *Conducted emissions – Asymmetric mode setup photo*

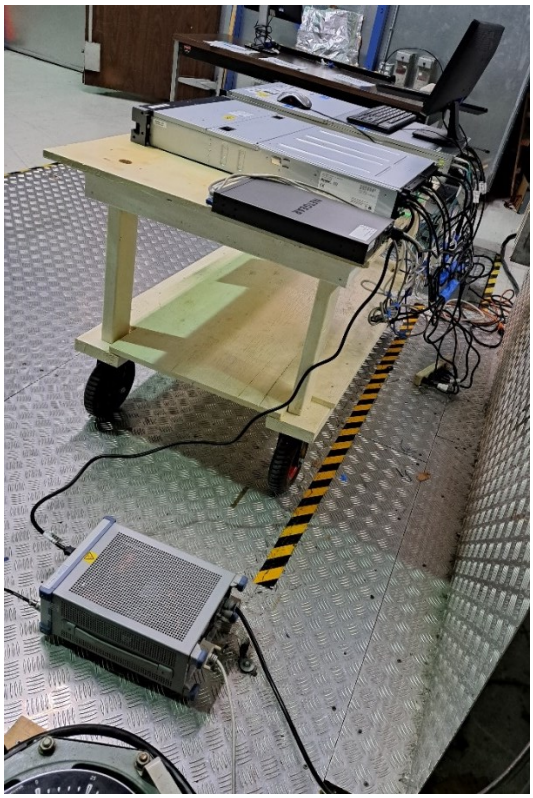


Figure 8.3-4: *Conducted emissions – Asymmetric mode setup photo*

8.4 Harmonic current emissions

8.4.1 References

SANS 61000-3-2 2009 (Ed. 3.02)

8.4.2 Test summary

Verdict	Pass		
Test date	March 31, 2023	Temperature	18 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1010 mbar
Test location	Ground Plane	Relative humidity	49 %

8.4.3 Notes

None

8.4.4 Setup details

Port under test	AC Mains
Measurement time	30 min

Table 8.4-1: *Harmonic current emissions equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
AC & DC Power Source Analyzer	California Instruments/Ametek	90003ix	1851	1 Yr	2/26/2024

Notes: None

Table 8.4-2: *Harmonic current emissions test software details*

Manufacturer of Software	Details
California Instruments	AC Source CIGui SII Version 3.0.0

Notes: None

8.4.5 Test data

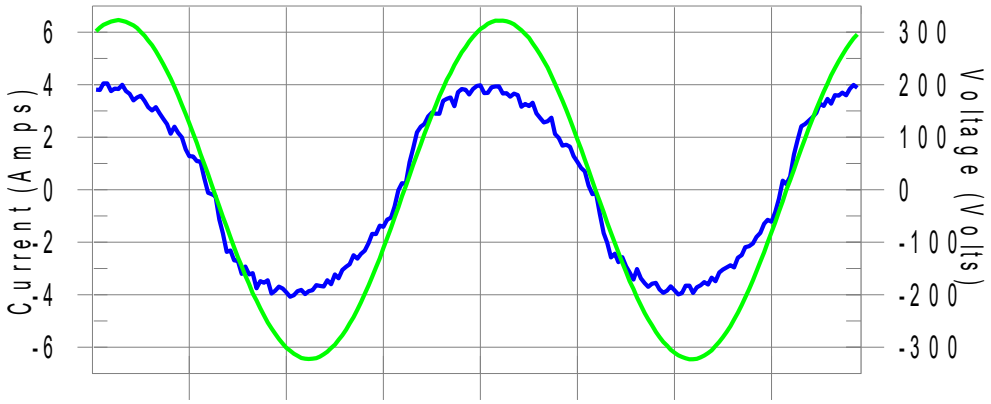
Measurement Data

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

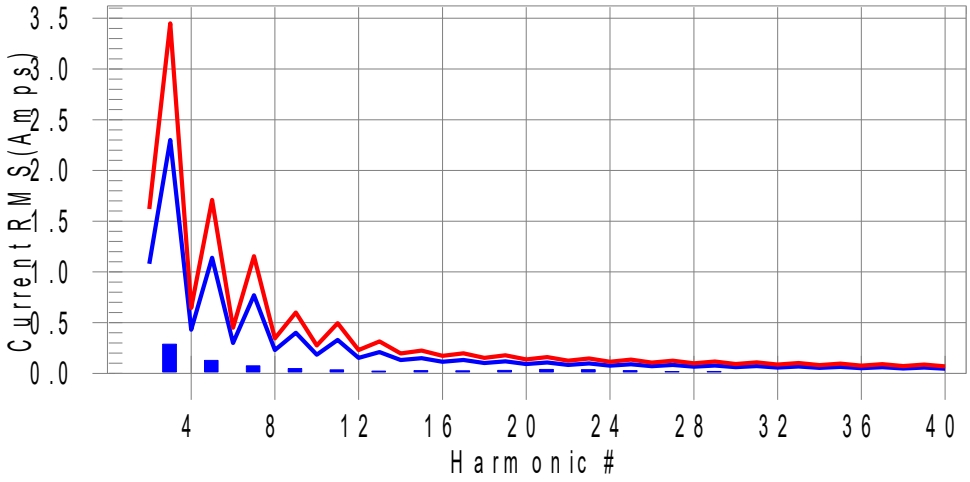
EUT: VER5000CYP **Tested by: Greg Woelke**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 3/31/2023 **Start time: 6:25:25 PM** **End time: 6:55:47 PM**
Test duration (min): 30 **Data file name: H-000198.cts_data**
Comment: 230VAC 50Hz, PRJ0029749
Customer: Network Engines Inc

Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass **Worst harmonic was #23 with 37.3% of the limit.**

Current Test Result Summary (Run time)

EUT: vER5000CYP **Tested by: Greg Woelke**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 3/31/2023 **Start time: 6:25:25 PM** **End time: 6:55:47 PM**
Test duration (min): 30 **Data file name: H-000198.cts_data**
Comment: 230VAC 50Hz, PRJ0029749
Customer: Network Engines Inc

Test Result: Pass **Source qualification: Normal**
THC(A): 0.341 **I-THD(%): 11.9** **POHC(A): 0.065** **POHC Limit(A): 0.251**
Highest parameter values during test:

V_RMS (Volts):	229.10	Frequency(Hz):	50.00
I_Peak (Amps):	4.427	I_RMS (Amps):	2.991
I_Fund (Amps):	2.915	Crest Factor:	1.503
Power (Watts):	660.5	Power Factor:	0.983

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.011	1.080	N/A	0.015	1.620	N/A	Pass
3	0.289	2.300	12.5	0.292	3.450	8.5	Pass
4	0.005	0.430	N/A	0.007	0.645	N/A	Pass
5	0.128	1.140	11.2	0.130	1.710	7.6	Pass
6	0.002	0.300	N/A	0.004	0.450	N/A	Pass
7	0.074	0.770	9.6	0.076	1.155	6.5	Pass
8	0.002	0.230	N/A	0.003	0.345	N/A	Pass
9	0.047	0.400	11.8	0.048	0.600	8.0	Pass
10	0.002	0.184	N/A	0.003	0.276	N/A	Pass
11	0.034	0.330	10.4	0.036	0.495	7.2	Pass
12	0.002	0.153	N/A	0.003	0.230	N/A	Pass
13	0.022	0.210	10.6	0.026	0.315	8.2	Pass
14	0.002	0.131	N/A	0.003	0.197	N/A	Pass
15	0.028	0.150	18.4	0.029	0.225	13.0	Pass
16	0.002	0.115	N/A	0.004	0.173	N/A	Pass
17	0.026	0.132	19.6	0.029	0.198	14.4	Pass
18	0.003	0.102	N/A	0.004	0.153	N/A	Pass
19	0.029	0.118	24.7	0.032	0.178	17.7	Pass
20	0.003	0.092	N/A	0.005	0.138	N/A	Pass
21	0.039	0.107	36.2	0.041	0.161	25.5	Pass
22	0.003	0.084	N/A	0.005	0.125	N/A	Pass
23	0.037	0.098	37.3	0.039	0.147	26.4	Pass
24	0.002	0.077	N/A	0.004	0.115	N/A	Pass
25	0.028	0.090	30.7	0.032	0.135	23.6	Pass
26	0.002	0.071	N/A	0.004	0.107	N/A	Pass
27	0.018	0.083	21.5	0.020	0.125	16.2	Pass
28	0.003	0.066	N/A	0.004	0.099	N/A	Pass
29	0.019	0.078	24.9	0.023	0.116	20.1	Pass
30	0.002	0.061	N/A	0.003	0.092	N/A	Pass
31	0.012	0.073	N/A	0.014	0.109	N/A	Pass
32	0.002	0.058	N/A	0.004	0.086	N/A	Pass
33	0.013	0.068	N/A	0.015	0.102	N/A	Pass
34	0.002	0.054	N/A	0.003	0.081	N/A	Pass
35	0.009	0.064	N/A	0.011	0.096	N/A	Pass
36	0.002	0.051	N/A	0.003	0.077	N/A	Pass
37	0.012	0.061	N/A	0.014	0.091	N/A	Pass
38	0.002	0.048	N/A	0.003	0.073	N/A	Pass
39	0.012	0.058	N/A	0.013	0.087	N/A	Pass
40	0.002	0.046	N/A	0.003	0.069	N/A	Pass

Voltage Source Verification Data (Run time)

EUT: vER5000CYP **Tested by: Greg Woelke**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 3/31/2023 **Start time: 6:25:25 PM** **End time: 6:55:47 PM**
Test duration (min): 30 **Data file name: H-000198.cts_data**
Comment: 230VAC 50Hz, PRJ0029749
Customer: Network Engines Inc

Test Result: Pass **Source qualification: Normal**

Highest parameter values during test:

Voltage (Vrms):	**229.10**	**Frequency(Hz):**	**50.00**
I_Peak (Amps):	**4.427**	**I_RMS (Amps):**	**2.991**
I_Fund (Amps):	**2.915**	**Crest Factor:**	**1.503**
Power (Watts):	**660.5**	**Power Factor:**	**0.983**

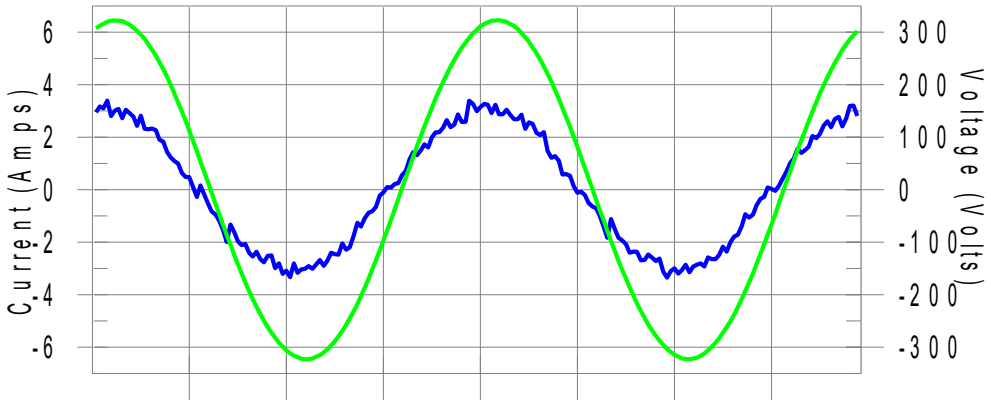
Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.020	0.458	4.39	OK
3	1.132	2.062	54.89	OK
4	0.077	0.458	16.74	OK
5	0.048	0.916	5.19	OK
6	0.068	0.458	14.92	OK
7	0.098	0.687	14.26	OK
8	0.014	0.458	2.95	OK
9	0.023	0.458	5.03	OK
10	0.007	0.458	1.59	OK
11	0.010	0.229	4.17	OK
12	0.017	0.229	7.35	OK
13	0.013	0.229	5.70	OK
14	0.005	0.229	2.31	OK
15	0.018	0.229	7.98	OK
16	0.015	0.229	6.66	OK
17	0.020	0.229	8.92	OK
18	0.022	0.229	9.79	OK
19	0.023	0.229	10.21	OK
20	0.017	0.229	7.62	OK
21	0.055	0.229	24.05	OK
22	0.016	0.229	6.87	OK
23	0.034	0.229	15.02	OK
24	0.009	0.229	3.99	OK
25	0.032	0.229	13.86	OK
26	0.008	0.229	3.43	OK
27	0.022	0.229	9.72	OK
28	0.006	0.229	2.72	OK
29	0.021	0.229	9.06	OK
30	0.008	0.229	3.28	OK
31	0.015	0.229	6.62	OK
32	0.006	0.229	2.78	OK
33	0.017	0.229	7.36	OK
34	0.006	0.229	2.58	OK
35	0.014	0.229	6.04	OK
36	0.007	0.229	2.88	OK
37	0.017	0.229	7.34	OK
38	0.006	0.229	2.52	OK
39	0.018	0.229	8.00	OK
40	0.007	0.229	3.03	OK

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

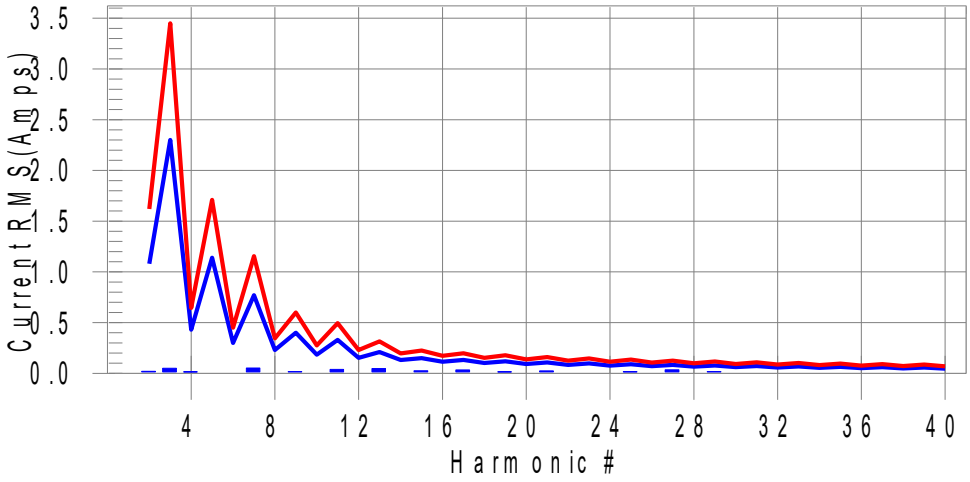
EUT: DCS0010 JBOD **Tested by: Greg Woelke**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 3/31/2023 **Start time: 7:05:19 PM** **End time: 7:35:40 PM**
Test duration (min): 30 **Data file name: H-000199.cts_data**
Comment: 230VAC 50Hz, PRJ0029749
Customer: Network Engines Inc

Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass Worst harmonic was #27 with 41.7% of the limit.

Current Test Result Summary (Run time)

EUT: DCS0010 JBOD **Tested by: Greg Woelke**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 3/31/2023 **Start time: 7:05:19 PM** **End time: 7:35:40 PM**
Test duration (min): 30 **Data file name: H-000199.cts_data**
Comment: 230VAC 50Hz, PRJ0029749
Customer: Network Engines Inc

Test Result: Pass **Source qualification: Normal**
THC(A): 0.124 **I-THD(%): 5.7** **POHC(A): 0.049** **POHC Limit(A): 0.251**
Highest parameter values during test:

V_RMS (Volts):	**229.20**	**Frequency(Hz):**	**50.00**
I_Peak (Amps):	**3.694**	**I_RMS (Amps):**	**2.197**
I_Fund (Amps):	**2.182**	**Crest Factor:**	**1.689**
Power (Watts):	**489.5**	**Power Factor:**	**0.977**

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.021	1.080	1.9	0.022	1.620	1.4	Pass
3	0.050	2.300	2.2	0.051	3.450	1.5	Pass
4	0.015	0.430	3.5	0.017	0.645	2.6	Pass
5	0.009	1.140	N/A	0.010	1.710	N/A	Pass
6	0.002	0.300	N/A	0.003	0.450	N/A	Pass
7	0.053	0.770	6.8	0.054	1.155	4.7	Pass
8	0.006	0.230	N/A	0.007	0.345	N/A	Pass
9	0.017	0.400	4.2	0.018	0.600	3.0	Pass
10	0.006	0.184	N/A	0.007	0.276	N/A	Pass
11	0.038	0.330	11.7	0.039	0.495	8.0	Pass
12	0.006	0.153	N/A	0.007	0.230	N/A	Pass
13	0.047	0.210	22.3	0.048	0.315	15.3	Pass
14	0.006	0.131	N/A	0.007	0.197	N/A	Pass
15	0.025	0.150	16.7	0.026	0.225	11.5	Pass
16	0.007	0.115	N/A	0.008	0.173	N/A	Pass
17	0.034	0.132	25.9	0.035	0.198	17.8	Pass
18	0.007	0.102	N/A	0.008	0.153	N/A	Pass
19	0.015	0.118	12.8	0.016	0.178	9.1	Pass
20	0.006	0.092	N/A	0.008	0.138	N/A	Pass
21	0.025	0.107	23.0	0.026	0.161	16.1	Pass
22	0.004	0.084	N/A	0.005	0.125	N/A	Pass
23	0.005	0.098	N/A	0.006	0.147	N/A	Pass
24	0.004	0.077	N/A	0.005	0.115	N/A	Pass
25	0.016	0.090	17.8	0.017	0.135	12.7	Pass
26	0.010	0.071	N/A	0.012	0.107	N/A	Pass
27	0.035	0.083	41.7	0.036	0.125	28.8	Pass
28	0.006	0.066	N/A	0.008	0.099	N/A	Pass
29	0.017	0.078	22.1	0.019	0.116	15.9	Pass
30	0.002	0.061	N/A	0.003	0.092	N/A	Pass
31	0.004	0.073	N/A	0.005	0.109	N/A	Pass
32	0.003	0.058	N/A	0.004	0.086	N/A	Pass
33	0.007	0.068	N/A	0.008	0.102	N/A	Pass
34	0.004	0.054	N/A	0.005	0.081	N/A	Pass
35	0.006	0.064	N/A	0.008	0.096	N/A	Pass
36	0.005	0.051	N/A	0.006	0.077	N/A	Pass
37	0.007	0.061	N/A	0.009	0.091	N/A	Pass
38	0.007	0.048	N/A	0.008	0.073	N/A	Pass
39	0.010	0.058	N/A	0.011	0.087	N/A	Pass
40	0.008	0.046	N/A	0.009	0.069	N/A	Pass

Voltage Source Verification Data (Run time)

EUT: DCS0010 JBOD **Tested by: Greg Woelke**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 3/31/2023 **Start time: 7:05:19 PM** **End time: 7:35:40 PM**
Test duration (min): 30 **Data file name: H-000199.cts_data**
Comment: 230VAC 50Hz, PRJ0029749
Customer: Network Engines Inc

Test Result: Pass **Source qualification: Normal**

Highest parameter values during test:

Voltage (Vrms):	**229.20**	**Frequency(Hz):**	**50.00**
I_Peak (Amps):	**3.694**	**I_RMS (Amps):**	**2.197**
I_Fund (Amps):	**2.182**	**Crest Factor:**	**1.689**
Power (Watts):	**489.5**	**Power Factor:**	**0.977**

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.022	0.458	4.70	OK
3	1.158	2.063	56.16	OK
4	0.074	0.458	16.19	OK
5	0.060	0.917	6.53	OK
6	0.065	0.458	14.28	OK
7	0.087	0.688	12.65	OK
8	0.011	0.458	2.40	OK
9	0.012	0.458	2.51	OK
10	0.008	0.458	1.81	OK
11	0.014	0.229	6.01	OK
12	0.017	0.229	7.29	OK
13	0.025	0.229	11.08	OK
14	0.006	0.229	2.66	OK
15	0.009	0.229	3.93	OK
16	0.011	0.229	4.67	OK
17	0.022	0.229	9.81	OK
18	0.018	0.229	7.88	OK
19	0.013	0.229	5.78	OK
20	0.016	0.229	7.12	OK
21	0.023	0.229	10.06	OK
22	0.005	0.229	2.07	OK
23	0.007	0.229	3.01	OK
24	0.006	0.229	2.62	OK
25	0.015	0.229	6.66	OK
26	0.011	0.229	5.01	OK
27	0.035	0.229	15.46	OK
28	0.009	0.229	3.86	OK
29	0.017	0.229	7.63	OK
30	0.007	0.229	3.13	OK
31	0.007	0.229	2.98	OK
32	0.007	0.229	3.09	OK
33	0.010	0.229	4.53	OK
34	0.007	0.229	2.89	OK
35	0.009	0.229	4.00	OK
36	0.007	0.229	3.06	OK
37	0.010	0.229	4.28	OK
38	0.010	0.229	4.44	OK
39	0.017	0.229	7.55	OK
40	0.015	0.229	6.35	OK

8.4.6 Setup photos

Figure 8.4-1: *Conducted emissions – Harmonic current emissions setup photo*

8.5 Voltage fluctuations and flicker

8.5.1 References

SANS 61000-3-3 2009 (Ed. 2.00)

8.5.2 Test summary

Verdict	Pass		
Test date	March 31, 2023	Temperature	18 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1010 mbar
Test location	Ground Plane	Relative humidity	49 %

8.5.3 Notes

None

8.5.4 Setup details

Port under test	AC Mains
Measurement time	30 min

Table 8.5-1: *Voltage fluctuations and flicker equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
AC & DC Power Source Analyzer	California Instruments/Ametek	90003ix	1851	1 Yr	2/26/2024

Notes: None

Table 8.5-2: *Voltage fluctuations and flicker test software details*

Manufacturer of Software	Details
California Instruments	AC Source CIGui SII Version 3.0.0

Notes: None

8.5.5 Test data

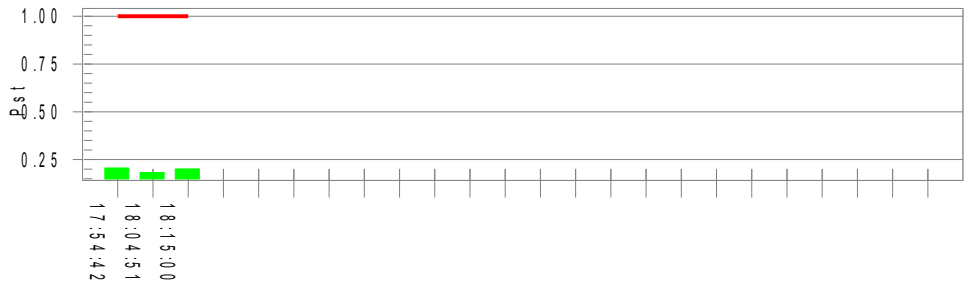
Measurement data

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

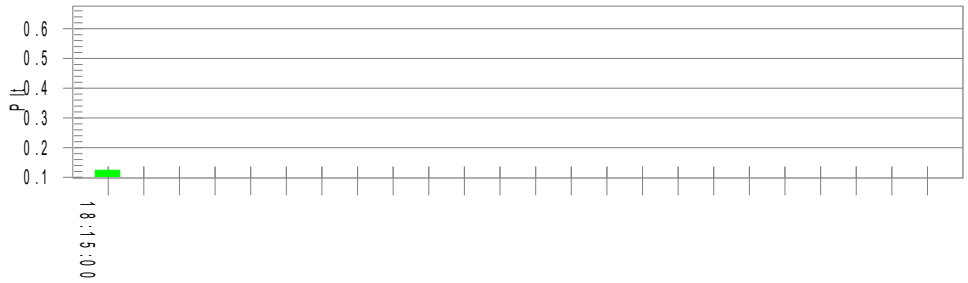
EUT: VER5000CYP Server **Tested by: Greg Woelke**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 3/31/2023 **Start time: 5:44:12 PM** **End time: 6:15:01 PM**
Test duration (min): 30 **Data file name: F-000197.cts_data**
Comment: 230VAC 50Hz, PRJ0029749
Customer: Network Engines, Inc.

Test Result: Pass **Status: Test Completed**

Pst_i and limit line **European Limits**



Plt and limit line



Parameter values recorded during the test:

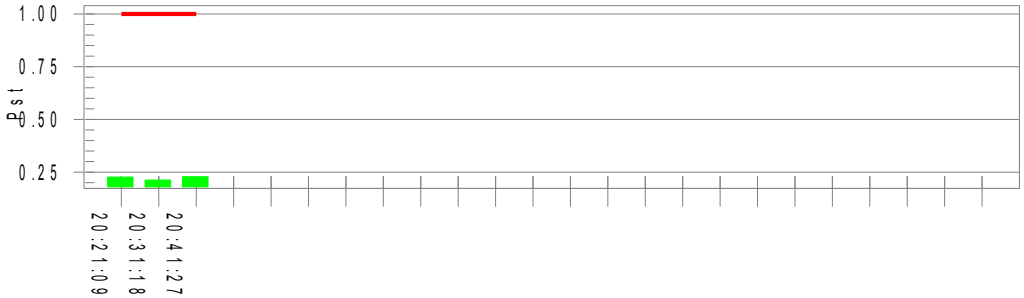
Vrms at the end of test (Volt):	**229.09**			
Highest dt (%):	**0.00**	**Test limit (%):**	**N/A**	**N/A**
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.04**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.206**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	0.124	Test limit:	0.650	Pass

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

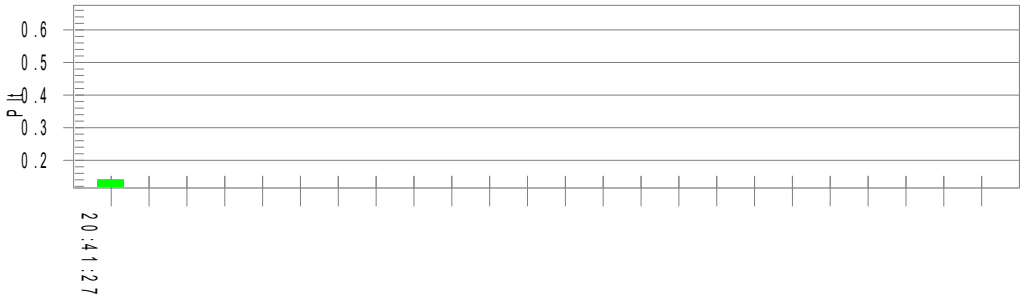
EUT: DCS0010 JBOD **Tested by: Greg Woelke**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 3/31/2023 **Start time: 8:10:39 PM** **End time: 8:41:28 PM**
Test duration (min): 30 **Data file name: F-000200.cts_data**
Comment: 230VAC 50Hz, PRJ0029749
Customer: Network Engines, Inc.

Test Result: Pass **Status: Test Completed**

Pst_i and limit line **European Limits**



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	**229.19**			
Highest dt (%):	**0.00**	**Test limit (%):**	**N/A**	**N/A**
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**-0.04**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.229**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	0.140	Test limit:	0.650	Pass

8.5.6 Setup photos

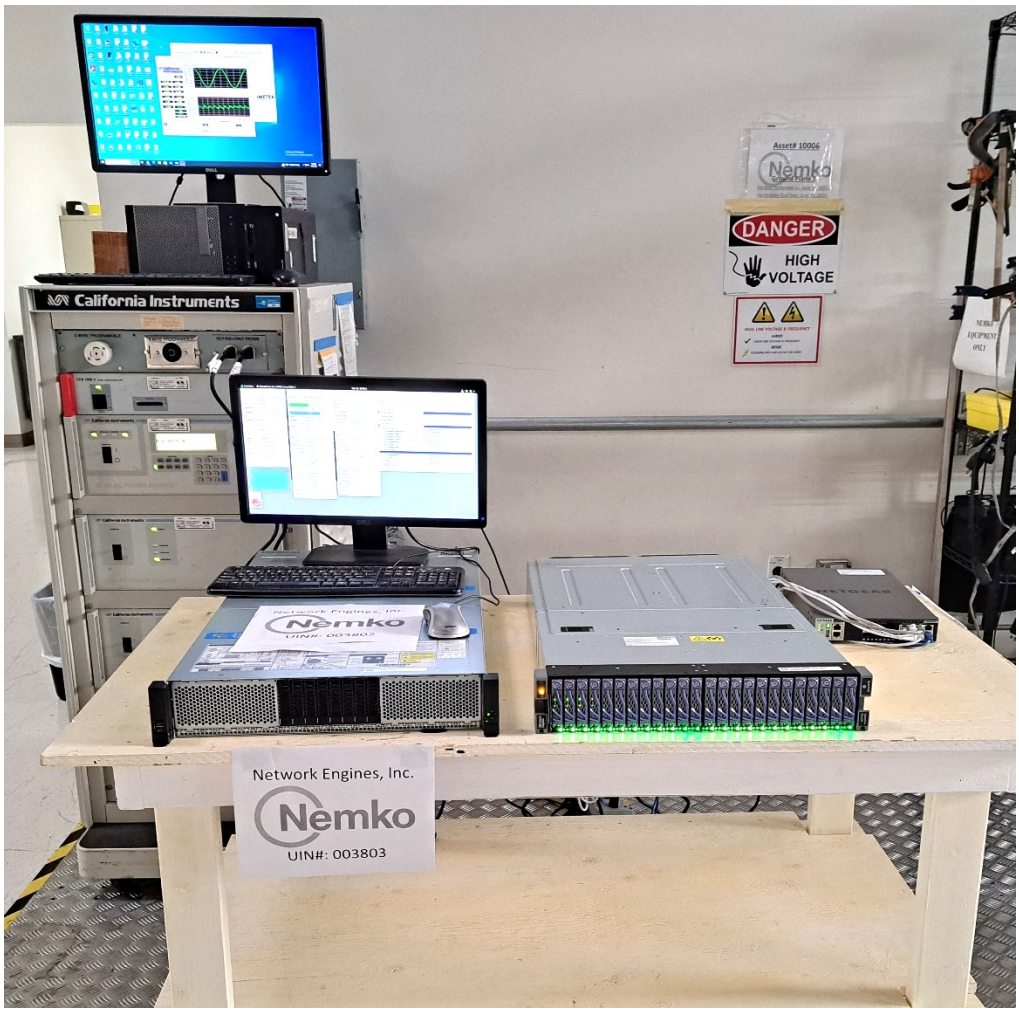


Figure 8.5-1: *Voltage fluctuations and flicker setup photo*

Section 9 Immunity Testing data

9.1 Radio-frequency electromagnetic field amplitude modulated

9.1.1 References

SANS 61000-4-3

9.1.2 Test summary

Verdict	Pass		
Test date	April 11, 2023	Temperature	19 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1003 mbar
Test location	RFI Chamber	Relative humidity	58 %

9.1.3 Notes

None

9.1.4 Setup details

Table 9.1-1: *Radio-frequency electromagnetic field amplitude modulated equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Signal Generator	Rohde & Schwarz	SMC 100A	E1335	2 yr	4/7/2024
RF Amplifier	Amplifier Research	500W1000M5	740	NCR	NCR
RF Amplifier	Amplifier Research	60S1G6	E1176	NCR	NCR
Antenna	Amplifier Research	ATR80M6G	1227	NCR	NCR
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: NCR - no calibration required

Table 9.1-2: *Radio-frequency electromagnetic field amplitude modulated test software details*

Manufacturer of Software	Details
ETS-LINDGREN	TILE! Version 6.0.4.548

Notes: None

9.1.5 Test data

Table 9.1-3: *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	Table top
EUT position facing antenna	Front side, back side, left side and right side

Frequency range, MHz		Test level, V/m	Comments
80	1000	3	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.

Table 9.1-4: *Spot frequency – Continuous RF Electromagnetic Field Disturbances results*

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	Table top
EUT position facing antenna	Front side, back side, left side and right side

Frequency MHz	Test level, V/m	Comments
1800	3	No degradation
2600	3	No degradation
3500	3	No degradation
5000	3	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.

9.1.6 Setup photo

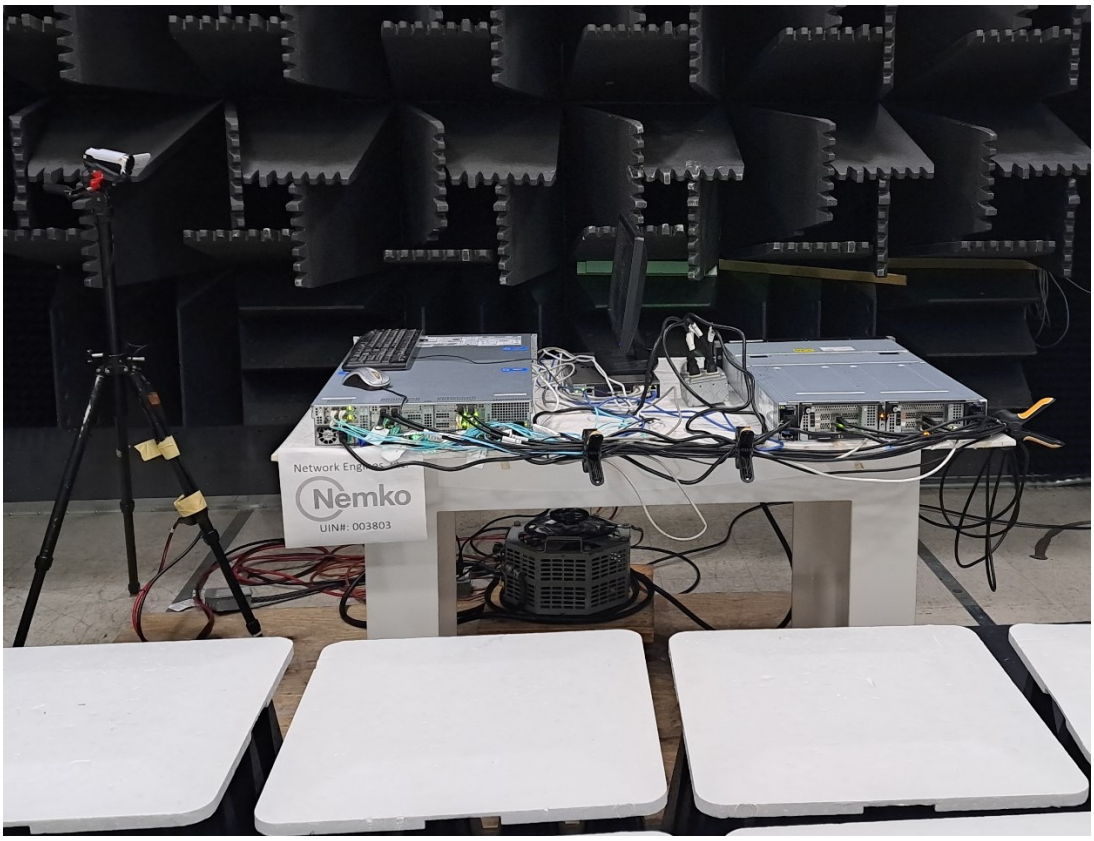


Figure 9.1-1: *Radio-frequency electromagnetic field amplitude modulated setup photo*

9.2 Radio-frequency continuous conducted

9.2.1 References

SANS 61000-4-6

9.2.2 Test summary

Verdict	Pass		
Test date	April 10, 2023	Temperature	19 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1005 mbar
Test location	Ground Plane	Relative humidity	60 %

9.2.3 Notes

None.

9.2.4 Setup details

Table 9.2-1: *Radio-frequency continuous conducted equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Signal Generator	Rohde & Schwarz	SMC 100A	E1306	2Yr	12/5/2023
RF Amplifier	Ophir	GRF5048	E1255	NCR	NCR
CDN	FCC	FCC-801-M3-25	846	1 Yr	3/8/2024
CDN	FCC	FCC-801-M4-25A	628	1 Yr	8/12/2023
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: Choose an item.

Table 9.2-2: *Radio-frequency continuous conducted test software details*

Manufacturer of Software	Details
ETS-LINDGREN	TILE! Version 6.0.4.548

Notes: None

9.2.5 Test data

Table 9.2-3: *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
AC Mains PSA and PSB	CDN	CDN	No degradation
100G NIC (QSFP28G)	Clamp	CDN	No degradation
USB	Clamp	CDN	No degradation
Ethernet	Clamp	CDN	No degradation
Ethernet MGMT	Clamp	CDN	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.

9.2.6 Setup photo

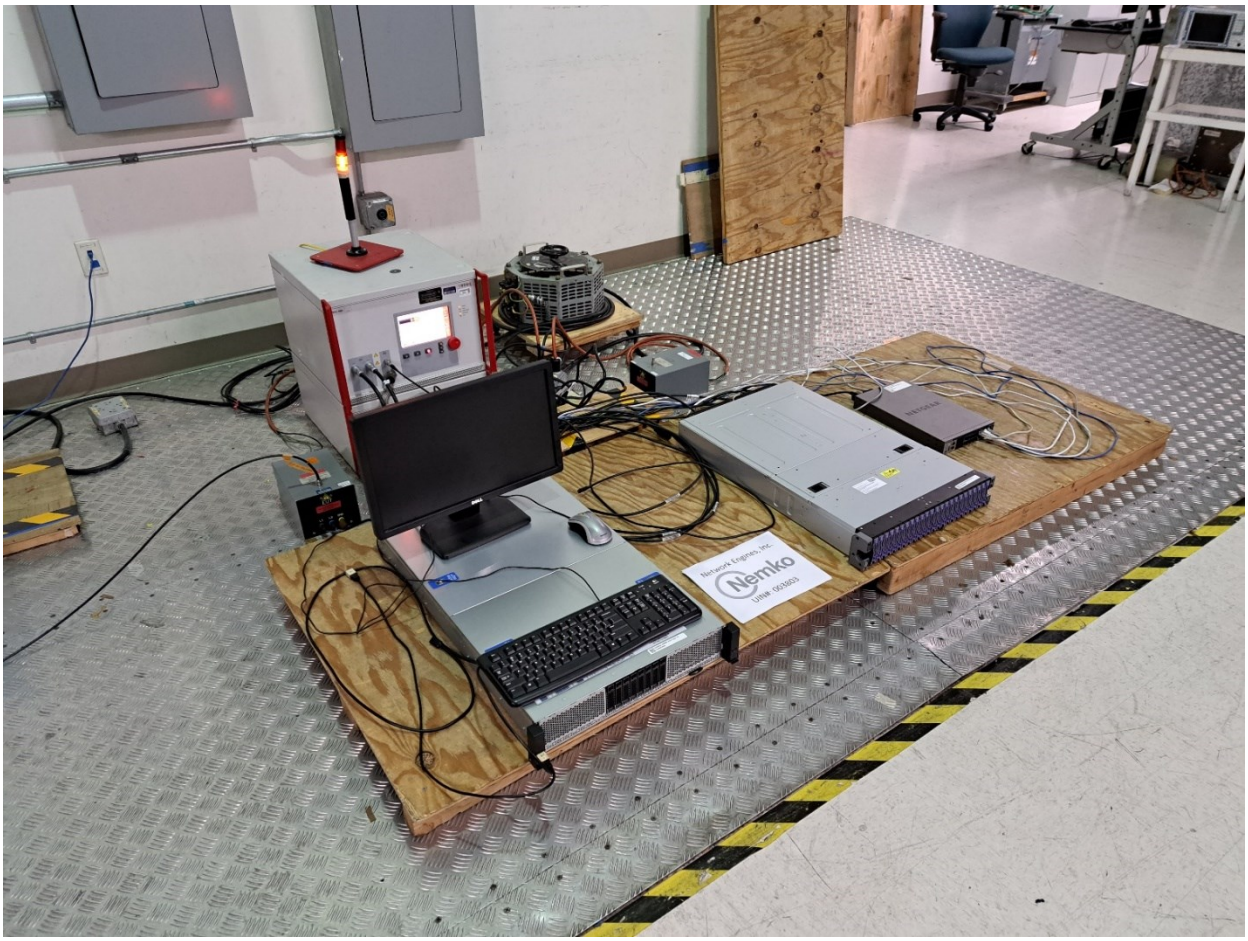


Figure 9.2-1: *Radio-frequency continuous conducted on AC mains setup photo*

Figure 9.2-2: *Radio-frequency continuous conducted on I/O cable setup photo*

9.3 Electrostatic discharge

9.3.1 References

SANS 61000-4-2

9.3.2 Test summary

Verdict	Pass		
Test date	April 12, 2023	Temperature	20 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	998 mbar
Test location	ESD Room	Relative humidity	56 %

9.3.3 Notes

None

9.3.4 Setup details

Table 9.3-1: *Electrostatic discharge equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
ESD Simulator Gun	EMTest	Dito	E1173	1 Yr	4/29/2023
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: None

9.3.5 Test data

Table 9.3-2: *Electrostatic discharge results*

EUT setup configuration:	Table top
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)**	**Comments**
Please refer to "Electrostatic discharge test location points" photos of this section	4	No degradation
Indirect discharge[1 and 2]	**Test voltage (±kV)**	**Comments**
HCP (all sides)	4	No degradation
VCP (all sides)	4	No degradation
Air discharge	**Test voltage (±kV)**	**Comments**
Please refer to "Electrostatic discharge test location points" photos of this section	2, 4, 8	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 center 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.

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.

9.3.5 Test data, continued

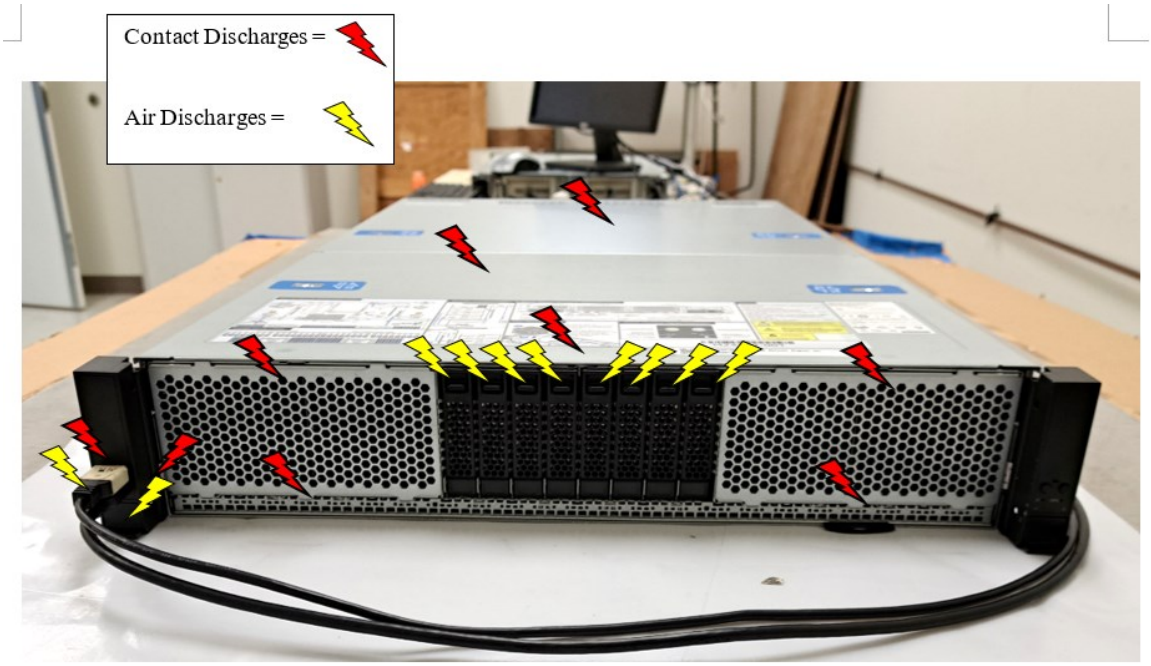


Figure 9.3-1: *Electrostatic discharge test location point's for VER5000CYP*

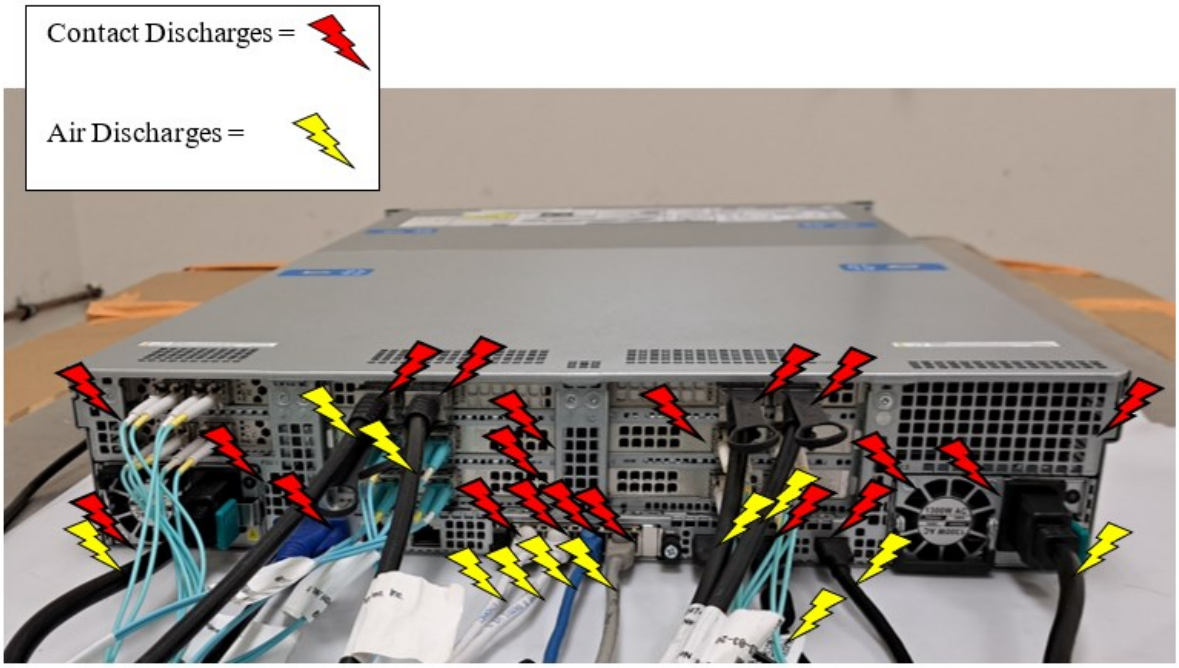


Figure 9.3-2: *Electrostatic discharge test location point's for VER5000CYP*

Figure 9.3-3: *Electrostatic discharge test location point's for DCS0010*

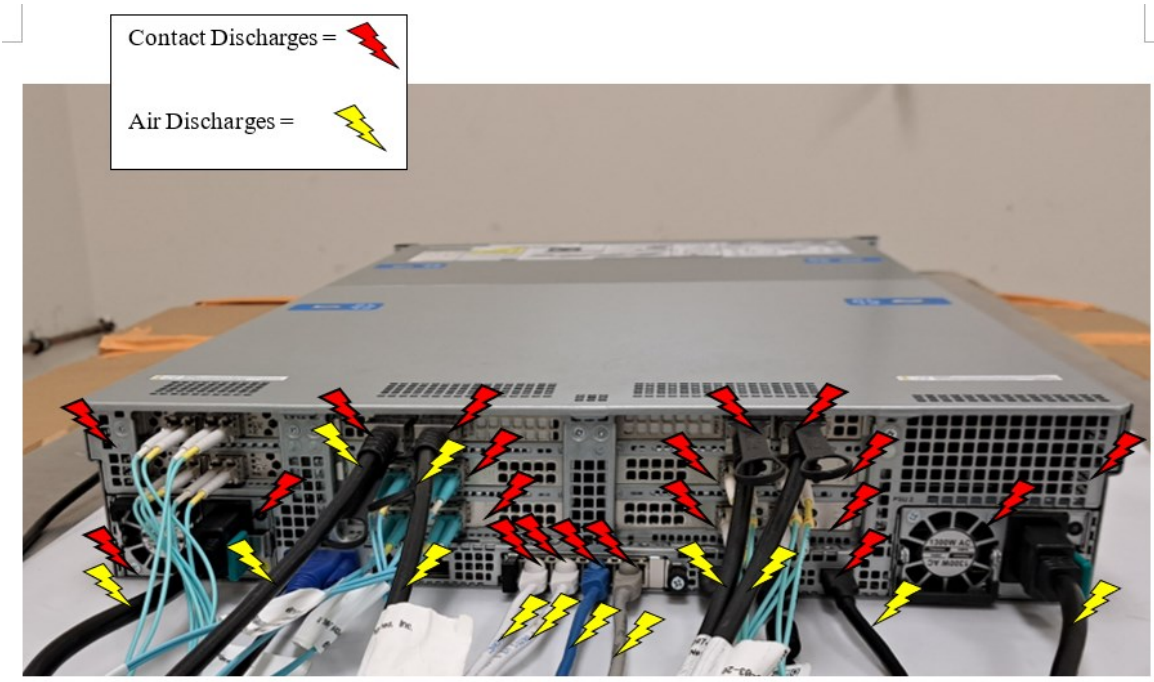


Figure 9.3-4: *Electrostatic discharge test location point's for DCS0010*

9.3.6 Setup photo

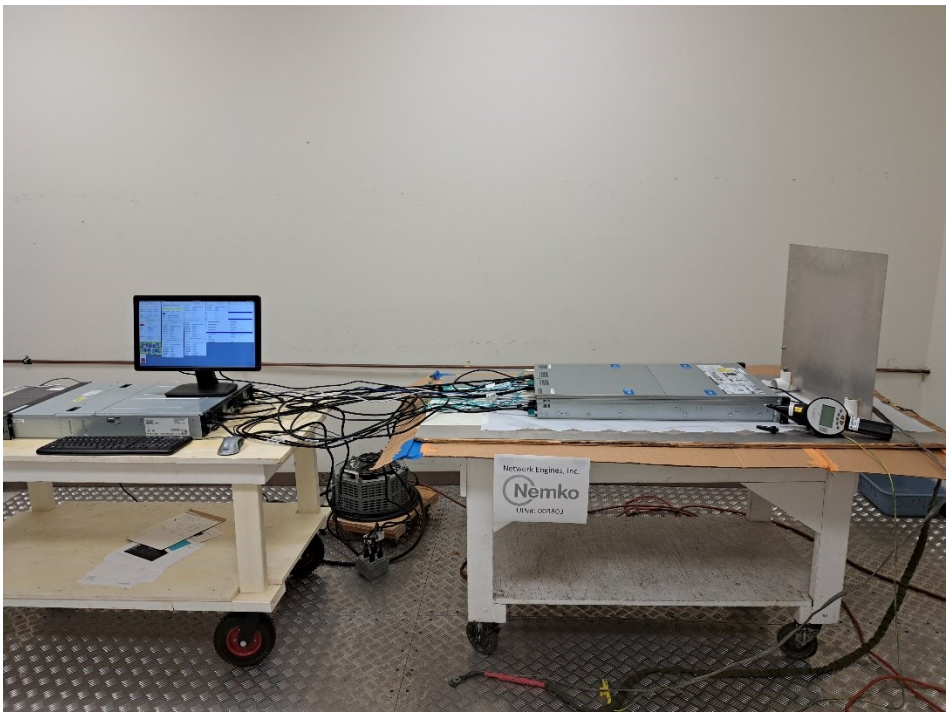


Figure 9.3-5: *Electrostatic discharge setup for VER5000CYP*

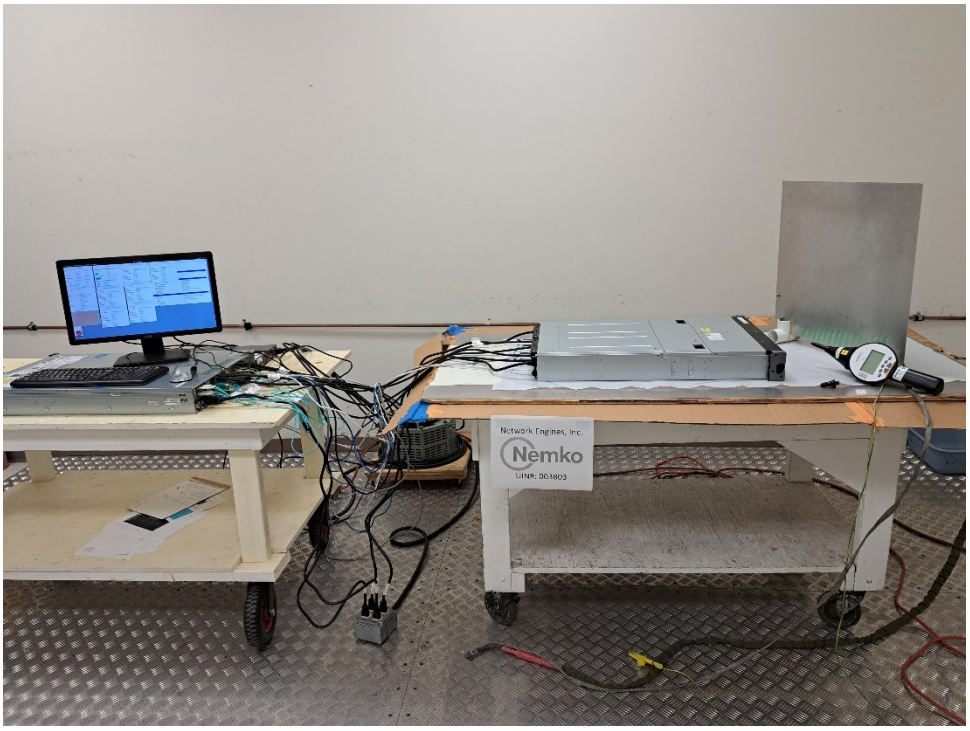


Figure 9.3-6: *Electrostatic discharge setup for DCS0010*

9.4 Surge

9.4.1 References

SANS 61000-4-5

9.4.2 Test summary

Verdict	Pass		
Test date	April 10, 2023	Temperature	19 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1005 mbar
Test location	Ground Plane	Relative humidity	60 %

9.4.3 Notes

None

9.4.4 Setup details

Table 9.4-1: *Surge equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Multitest Generator	TESEQ	NSG 3060	E1341	1 Yr	9/2/2023
Coupling Network	TESEQ	CDN 3061-C16	E1125	1 Yr	9/2/2023
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: None

Table 9.4-2: *Surge test software details*

Manufacturer of Software	Details
TESEQ	Advanced Test Solution for EMC, Version 1.3.2

Notes: None

9.4.5 Test data

Table 9.4-3: *Surge at AC power ports results*

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

Test port	Coupling	Test voltage (±kV)	Comments
AC mains power PS A & PS B	Phase to Neutral	0.5, 1	No degradation
	Phase to ground	0.5, 1, 2	No degradation
	Neutral to ground	0.5, 1, 2	No degradation

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

9.4.6 Setup photo

Figure 9.4-1: *Surge setup photo*

9.5 Fast transients

9.5.1 References

SANS 61000-4-4

9.5.2 Test summary

Verdict	Pass		
Test date	April 13, 2023	Temperature	20 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1000 mbar
Test location	Ground Plane	Relative humidity	47 %

9.5.3 Notes

None

9.5.4 Setup details

Table 9.5-1: *Fast transients equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Multitest Generator	TESEQ	NSG 3060	E1341	1 Yr	9/2/2023
Coupling Network	TESEQ	CDN 3061-C16	E1125	1 Yr	9/2/2023
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: NCR - no calibration required

Table 9.5-2: *Fast transients test software details*

Manufacturer of Software	Details
TESEQ	Advanced Test Solution for EMC, Version 1.3.2

Notes: None

9.5.5 Test data

Table 9.5-3: *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
AC mains power PS A & PS B[1 and 2]	0.5, 1	No degradation
100G NIC (QSFP28G)	0.5	No degradation
USB	0.5	No degradation
Ethernet	0.5	No degradation
Ethernet MGMT	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
[4] For xDSL equipment, the repetition frequency for EFT testing was 100 kHz

- If the EUT contained several ports with the same particular interface, only one was tested
- Multiconductor cables, such as a 50-pair telecommunication cable, were tested as a single cable.

9.5.6 Setup photos

Figure 9.5-1: *Fast transients on AC Mains setup photo*

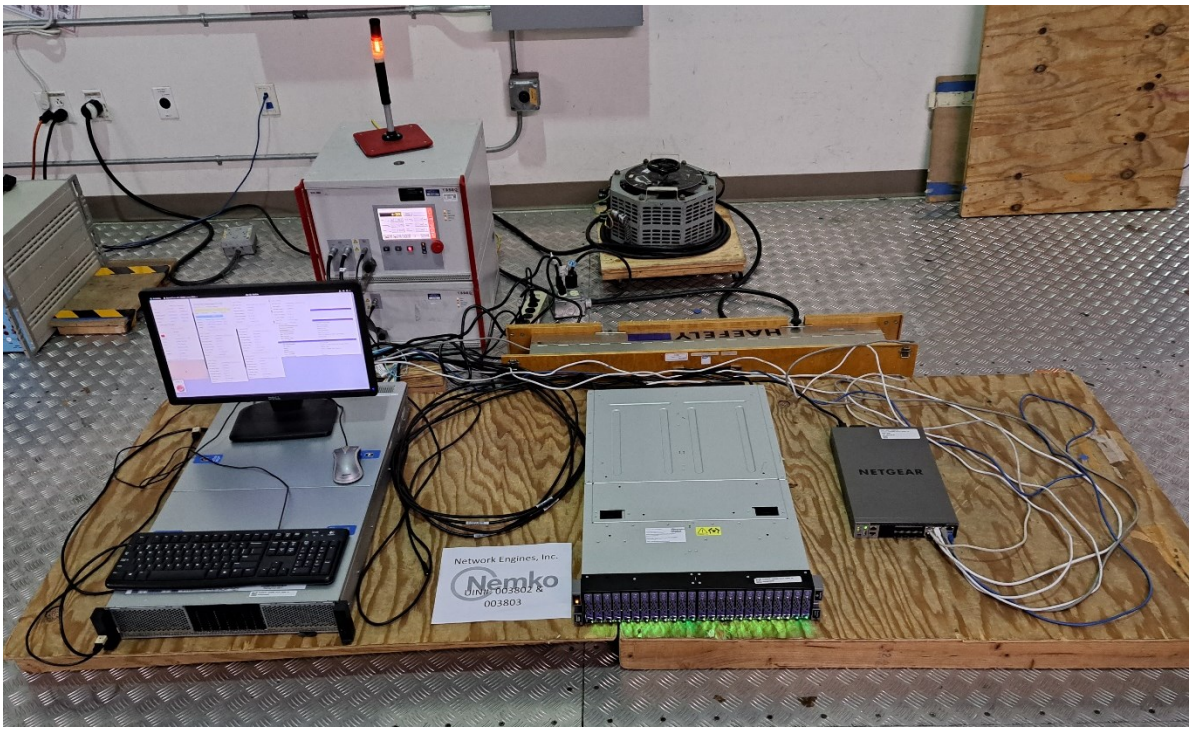


Figure 9.5-2: *Fast transients on AC Mains and analog/digital data port setup photo*

9.6 Voltage dips and voltage interruptions

9.6.1 References

SANS 61000-4-11

9.6.2 Test summary

Verdict	Pass		
Test date	March 31, 2023	Temperature	18 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1009 mbar
Test location	Ground Plane	Relative humidity	51 %

9.6.3 Notes

None

9.6.4 Setup details

Table 9.6-1: *Voltage dips and voltage interruptions equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
AC Power Source	California Instruments	3001 iX	D1851	1 Yr	2/26/2024
Large Magnetic Coil	Nemko	N/A	E1036	NCR	NCR
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: None

Table 9.6-2: *Voltage dips and voltage interruptions test software details*

Manufacturer of Software	Details
California Instruments	AC Source CIGui SII Version 3.0.0

Notes: None

9.6.5 Test data

Table 9.6-3: *Voltage dips results*

Variation/dip repetition:	Sequence of three dips/interruptions with an interval of 10 seconds between each test		
Test port	**Voltage reduction (%)**	**Periods**	**Comments**
AC Mains PS A & PS B	100	0.5	No degradation
	30	25	No degradation

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

Table 9.6-4: *Voltage interruptions results*

Variation/dip repetition:	Sequence of three dips/interruptions with an interval of 10 seconds between each test		
Test port	**Voltage reduction (%)**	**Periods**	**Comments**
AC Mains PS A & PS B	100	250	EUT power cycled

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

9.6.6 Setup photo

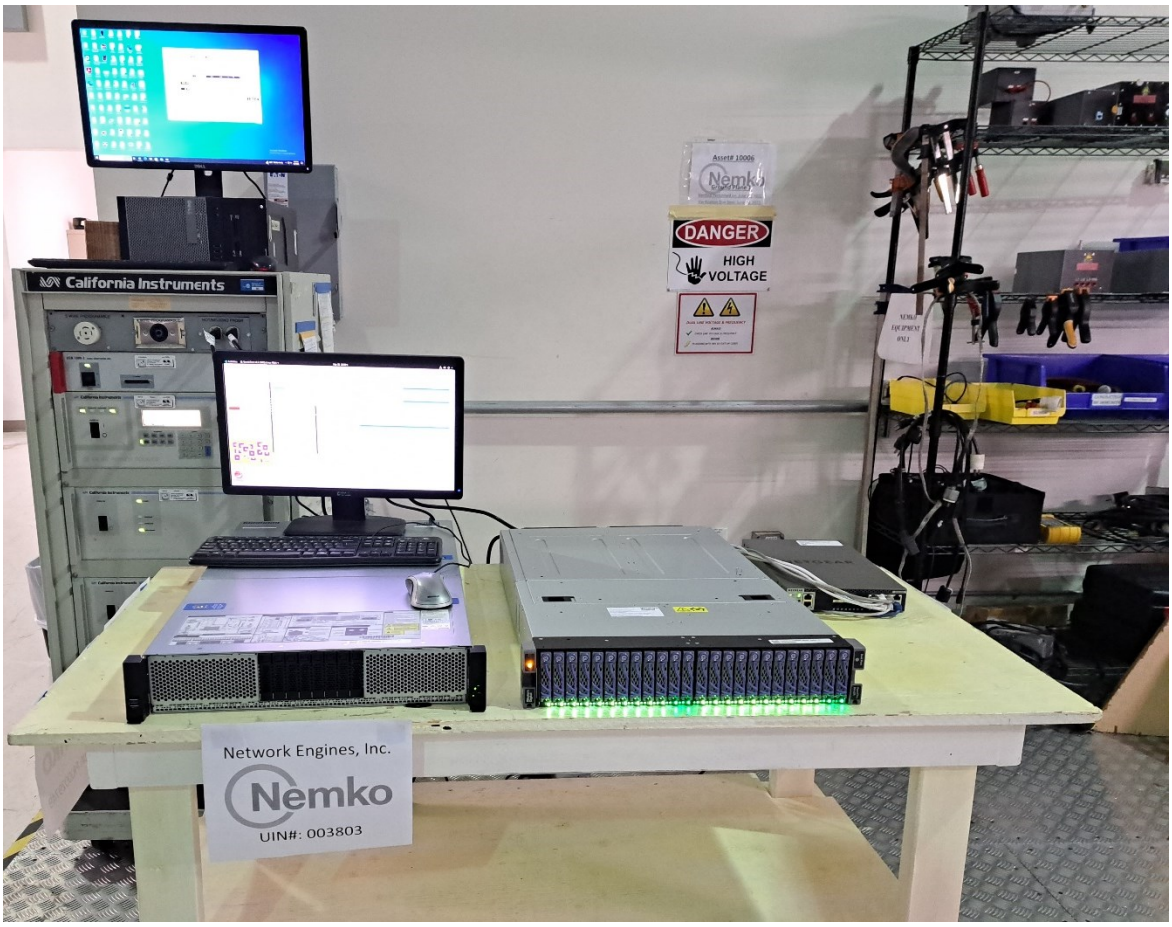


Figure 9.6-1: *Voltage dips and voltage interruptions setup photo*

9.7 Power-frequency magnetic field

9.7.1 References

SANS 61000-4-8

9.7.2 Test summary

Verdict	Pass		
Test date	March 31, 2023	Temperature	18 °C
Test engineer	Greg Woelke, EMC Test Engineer	Air pressure	1009 mbar
Test location	Ground Plane	Relative humidity	51 %

9.7.3 Notes

Applicable only to equipment containing devices susceptible to magnetic fields, such as CRT monitors, Hall elements, electrodynamic microphones, magnetic field sensors, etc.

9.7.4 Setup details

Table 9.7-1: *Power-frequency magnetic field equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
AC Power Source	California Instruments	3001 iX	D1851	1 Yr	2/26/2024
Magnetic Field Level Tester	Narda	ELT-400	851	1 Yr	1/25/2024
Magnetic Field Sensor	Narda	F-0012	852	1 Yr	1/25/2024
Large Magnetic Coil	Nemko	N/A	E1036	NCR	NCR
Variac	Shanghai China	TDGC	S1037	NCR	NCR
Multimeter	Fluke	111	813	1 Yr	9/19/2023

Notes: NCR - no calibration required

9.7.5 Test data

Table 9.7-2: *Power-frequency magnetic field results*

Assessment time:	5 minutes at each loop polarization
Signal frequency:	50 Hz
Magnetic field test level:	1 A/m

Loop polarization	Comments
Vertical (aligned with AC power line)	No degradation
Vertical (perpendicular to AC power line)	No degradation
Horizontal	No degradation

Notes: The EUT was arranged and connected to satisfy its functional requirements, and was placed at the center of the coil system (immersion method). Physically large products that could not be completely submerged in the magnetic field; only the sensitive devices (such as CRT monitors if they are the only sensitive parts were tested.

9.7.6 Setup photo

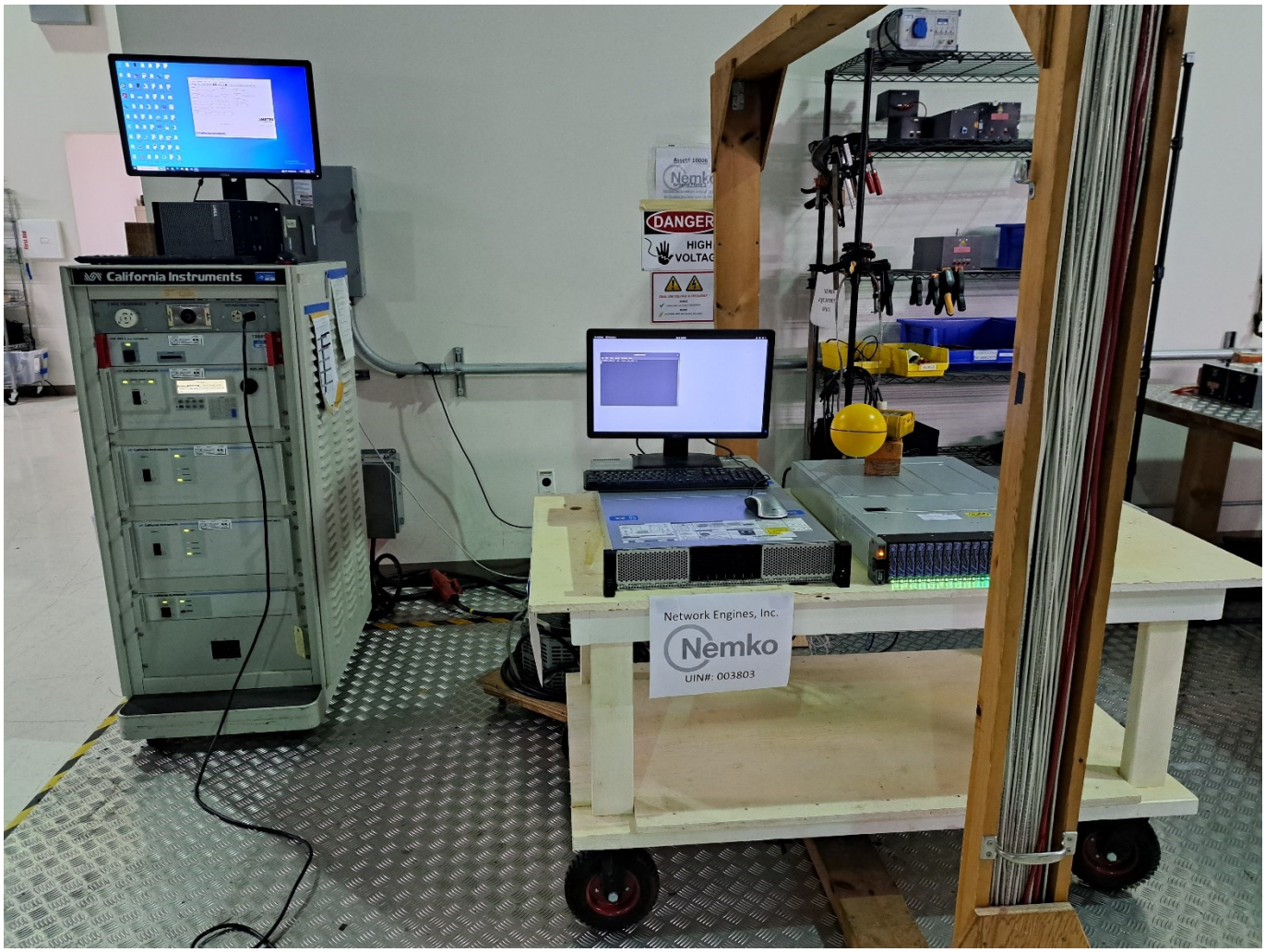


Figure 9.7-1: *Power-frequency magnetic field setup photo*

Section 10 EUT photos

10.1 External photos

Figure 10.1-1: *VER5000CYP Front view photo*

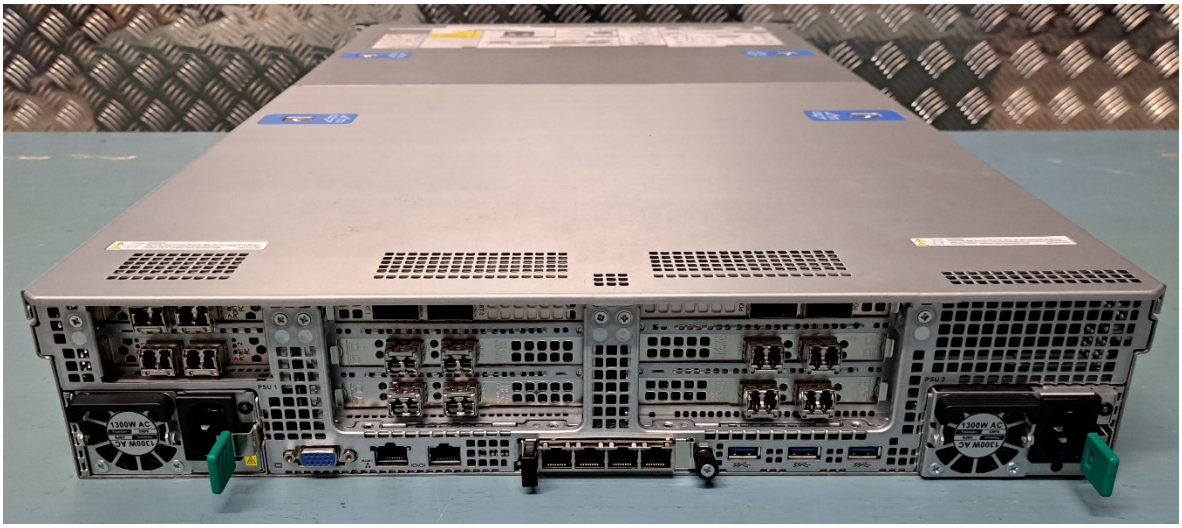


Figure 10.1-2: *VER5000CYP Rear view photo*

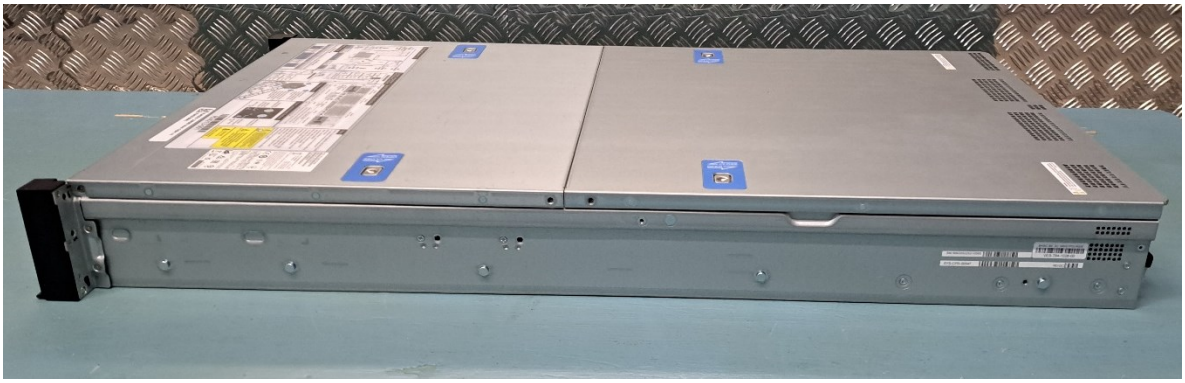


Figure 10.1-3: *VER5000CYP Side view photo*

Figure 10.1-4: *VER5000CYP Side view photo*

Figure 10.1-5: *DCS0010 Front view photo*

Figure 10.1-6: *DCS0010 Rear view photo*

Figure 10.1-7: *DCS0010 Side view photo*

Figure 10.1-8: *DCS0010 Side view photo*