Choose Scandinavian trust

EMC TEST REPORT

Report ID
REP003933

Project ID
PRJ0025383

Type of assessment:
Complete Assessment

Applicant:
Nanoptix Inc.

Product:	Model:	Model variant (s):
Thermal Printer	Paycheck NextGen (950050)	Paycheck Desktop 2 [950051] Paycheck NextGen SE [950055]

Specifications:

- EN 55032:2015/A11:2020
- CISPR 32:2015/AMD1:2019
- AS/NZS CISPR 32:2015 AMD 1: 2020
- EN 61000-3-2:2014
- EN 61000-3-3:2013
- FCC 47 CFR Part 15, Subpart B – Verification
- ICES-003 Issue 7 October 2020

Date of issue: January 9, 2023

Predrag Golic, EMC/RF Specialist
Tested by

Signature

David Duchesne, EMC/RF Lab Manager
Reviewed by

Signature

Lab locations

Company name	Nemko Canada Inc.			
Facilities	Ottawa site: 303 River Road Ottawa, Ontario Canada K1V 1H2 Tel: +1 613 737 9680 Fax: +1 613 737 9691	Montréal site: 292 Labrosse Avenue Pointe-Claire, Québec Canada H9R 5L8 Tel: +1 514 694 2684 Fax: +1 514 694 3528	Cambridge site: 1-130 Saltsman Drive Cambridge, Ontario Canada N3E 0B2 Tel: +1 519 650 4811	Almonte site: 1500 Peter Robinson Road West Carleton, Ontario Canada K0A 1L0 Tel: +1 613 256-9117
Test site registration	**Organization**	**Recognition numbers and location**		
	FCC/ISED	FCC: CA2040; IC: 2040A-4 (Ottawa/Almonte); FCC: CA2041; IC: 2040G-5 (Montreal); CA0101 (Cambridge)		
Website	www.nemko.com			

Limits of responsibility

Note that this report's results 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 this report.
This test report has been completed following the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Test specifications

EN 55032:2015/A11:2020	Electromagnetic compatibility of multimedia equipment – Emission requirements
AS/NZS CISPR 32:2015 AMD 1:2020	Electromagnetic compatibility of multimedia equipment – Emission requirements
CISPR 32:2015/AMD1:2019	Electromagnetic compatibility of multimedia equipment – Emission requirements
FCC 47 CFR Part 15, Subpart B – Verification	Title 47: Telecommunication; Part 15—Radio Frequency Devices
ICES-003 Issue 7 October 2020	Information Technology Equipment (including Digital Apparatus)
ICES-Gen Issue 1 July 2018	General Requirements for Compliance of Interference-Causing Equipment
EN 61000-3-2:2014	Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-3:2013	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.

Unless noted in section 1.2, all testing was performed 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 history*

Report ID.	Date of issue	Details of changes made to test report
REP003933	January 9, 2023	Original report issued

Section 2 Engineering considerations

2.1 Modifications incorporated in the EUT for compliance

There were no modifications performed to the EUT during this assessment.

2.2 Technical judgment

None

2.3 Model variant declaration

As declared by the applicant, the EUT model 950050 has been chosen to be representative for all other models in the model family. The model family, and the description of the variations, are as follows:

- 950050 (Full featured printer)
- 950051 (950050 in a plastic enclosure)
- 950055 950055 (same as 950050 except no HDMI, one USB host instead of 3, no Netplex interface)

2.4 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 3 Test conditions

3.1 Atmospheric conditions

Temperature	15 °C – 35 °C
Relative humidity	30 % – 60 %
Air pressure	86 kPa (860 mbar) – 106 kPa (1060 mbar)

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.

3.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the present document, the nominal voltage shall be the declared voltage, or any of the stated voltages ±5 %, for which the equipment was designed.

Section 4 Measurement uncertainty

4.1 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 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC Testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Table 4.1-1: *Measurement uncertainty calculations*

Measurement		U_{cispr} **dB**	U_{lab} **dB**
			Ottawa
Conducted disturbance at AC mains and other port power using a V-AMN	(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
Radiated disturbance (electric field strength at an OATS or in a SAC)	(30 MHz to 1 GHz)	6.3	5.7
Radiated disturbance (electric field strength in a FAR)	(1 GHz to 6 GHz)	5.2	4.8

Notes: Compliance assessment:

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

- compliance is deemed to occur if 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 if 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

Section 5 Information provided by the applicant

5.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results contained within this test report. Nemko accepts no responsibility for the information within this section and its impact on the test plan and resulting measurements.

5.2 Applicant/Manufacturer

Name	Nanoptix Inc.
Address	699 Champlain Street; Dieppe, New Brunswick, E1A 1P6; Canada

5.3 EUT information

Product	Thermal Printer
Model	Paycheck NextGen (950050)
Model variant	Paycheck Desktop 2 [950051] and Paycheck NextGen SE [950055]
Serial number	NG19418
Part number	950050
Power requirements	24 V_{DC} (via external 100–240 V_{AC}, 50/60 Hz power adapter)
Description/theory of operation	The EUT is a 24 V_{DC} thermal printer. This printer is mainly used in casino game terminal to print cash out tickets. It receives print jobs from either USB high speed or RS-232 serial communication.
Operational frequencies	1 GHz internal processor, 400 MHz for memory access.
Software details	PayCheck NextGen firmware NGP-1.24L PC software to send print jobs to the printer for testing is “Nanoptix Printer Status”, revision 5.4.2.6

5.4 EUT setup details

5.4.1 EUT Exercise and monitoring

Methods used to exercise the EUT and all relevant ports:

- A print ticket job was sent every 10 seconds [fastest possible time due to EUT limitation];
- Ethernet was connected to a switch.

Configuration details:

- The EUT was set up in a configuration that was expected to produce the highest amplitude emissions relative to the limit and that satisfy normal operation/installation practice by the end-user.
- The type and construction of cables used in the measurement setup were consistent with normal or typical use.
- The EUT was set up in a manner that was consistent with its typical arrangement and use. The measurement arrangement of the EUT, local AE and associated cabling was representative of normal practice.

5.4.2 EUT test configuration

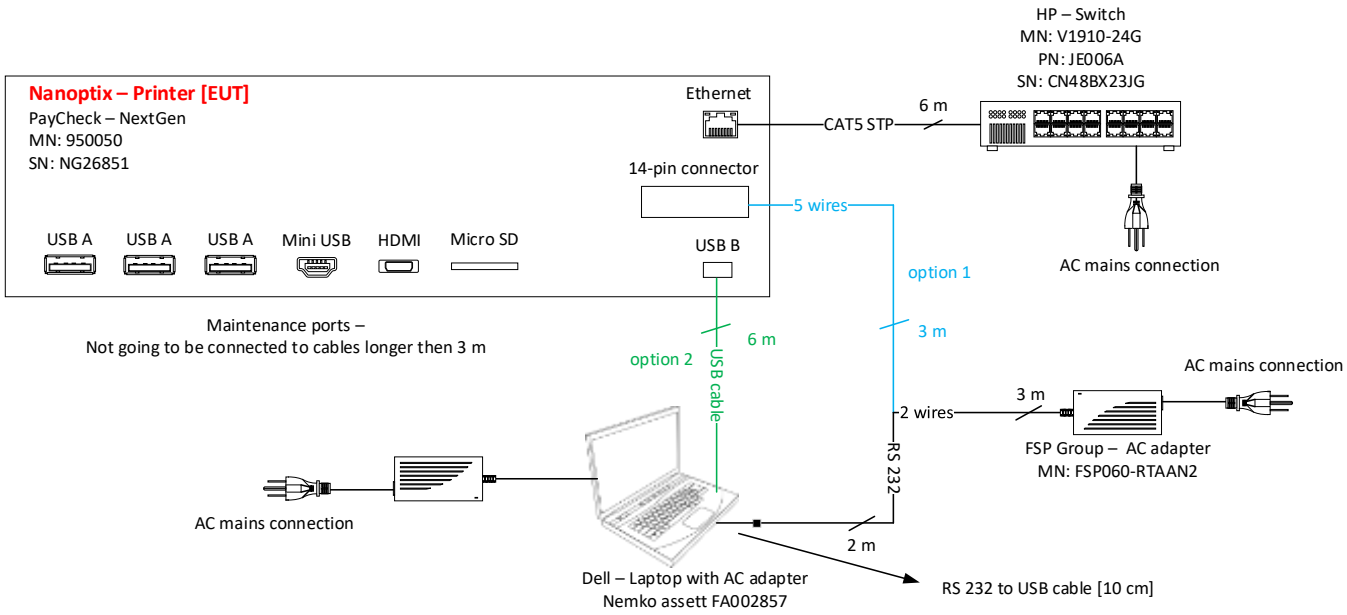

Figure 5.4-1: *Block diagram*

Section 6 Summary of test results

6.1 Testing location

Test location (s)	Ottawa

6.2 Testing period

Test start date	December 14, 2022	Test end date	December 17, 2022

6.3 Sample information

Receipt date	December 7, 2022	Nemko sample ID number	PRJ00253830002

6.4 Test results

Table 6.4-1: *EN 55032:2015/A11:2020, AS/NZS CISPR 32:2015 AMD 1:2020, and CISPR 32:2015/AMD1:2019 result summary for Class B equipment*

Clause	Test description	Verdict
A4.1, A4.2, A4.3, and A4.4	Radiated emissions at frequencies up to 1 GHz measured at 3 or 10 m distance (Facility: OATS / SAC / FAR)	Pass
A5.1 and A5.2	Radiated emissions at frequencies above 1 GHz measured at 3 m distance	Pass
A10.1 and A10.2	Conducted emissions from AC mains power ports	Pass
A12.1, A12.2, and A12.3	Conducted asymmetric mode emissions measured with AAN / CVP and current probe / Current probe	Pass
A13.1, A13.2, A13.3, A13.4, and A13.5	Conducted differential voltage emissions for: 1. Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers. 2. Tuner units (not the LNB) for satellite signal reception 3. Frequency modulation audio receivers and PC tuner cards 4. Frequency modulation car radios 5. EUTs with RF modulator output ports (for example, DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports	Not applicable[1]

Notes: [1]The EUT does not contain any interfaces as defined in clause A13

Test results, continued

Table 6.4-2: *EN 61000-3-2:2014 results*

Test description	Verdict
Harmonic current emissions[1]	Pass

Notes: [1] The EUT utilizes less than 75 W. No limits are specified for equipment with less than 75 W input rating.

Table 6.4-3: *EN 61000-3-3:2013 results*

Test description	Verdict
Voltage fluctuations and flicker	Pass

Notes: None

Table 6.4-4: *FCC 47 CFR Part 15, Subpart B and ICES-003 Issue 7 result summary*

Clause	Test description	Verdict
FCC 47 CFR Part 15, Subpart B		
§15.109	Radiated emissions limits[1]	Pass
§15.107	Conducted emissions limits (AC mains) [1]	Pass
ICES-003 Issue 7		
3.2.1	AC Power Line Conducted Emissions Limits[1]	Pass
3.2.2	Radiated Emissions Limits[1]	Pass

Notes: [1] Product classification B

Section 7 Terms and definitions

7.1 Product classifications and definitions

7.1.1 EN 55032, AS/NZS CISPR 32, and CISPR 32 – 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 (EN 55032). 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 CISPR 32. In a residential environment, this equipment may cause radio interference.

7.1.2 Title 47: Telecommunication – Part 15-Radio Frequency devices, Subpart A – General – Equipment classification

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.

7.1.3 ICES-GEN – Equipment classification

Class A	Equipment that is, by virtue of its characteristics, highly unlikely to be used in a residential environment, including a home business shall be classified as Class A and shall comply with the Class A limits specified in the applicable ICES standard. Characteristics considered in this assessment include price, marketing and advertising methodology, the degree to which the functional design inhibits applications suitable to residential environments, or any combination of features that would effectively preclude the use of such equipment in a residential environment.
Class B	Equipment that cannot be classified as Class A shall comply with the Class B limits specified in the applicable ICES standard.

Product classifications and definitions, continued

7.1.4 EN 61000-3-2 – Equipment classification

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

7.2 General definitions

7.2.1 EN 55032, AS/NZS CISPR 32, and CISPR 32 – 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.

General definitions, continued

7.2.2 EN 55032, AS/NZS CISPR 32, and CISPR 32 – Port type

FAR	Fully Anechoic Room
FSOATS	Free Space Open Area Test Site
OATS	Open Area Test Site
SAC	Semi Anechoic Chamber
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 fibre port	Port at which an optical fibre 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.

7.2.3 Title 47: Telecommunication – Part 15-Radio Frequency devices, Subpart A – General – Digital device definitions

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.

General definitions, continued

7.2.4 EN 55032, AS/NZS CISPR 32, and CISPR 32 – Definitions

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.

7.2.5 ICES-003 – Definitions

ICES	The Interference-Causing Equipment Standard (ICES) sets out limits and methods of measurement of radio frequency emissions, as well as administrative requirements for information technology equipment (ITE), including digital apparatus. This includes devices or systems that generate and/or use timing signals or pulses having a rate of at least 9 kHz and employ digital techniques for purposes such as computation, display, control, data processing and storage.

7.2.6 EN 61000-3-3 – Definitions

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.

Section 8 Testing data

8.1 Radiated emissions

8.1.1 References and limits

- CISPR 32:2015/AMD1:2019: Section A.2
- AS/NZS CISPR 32:2015 AMD 1:2020: Section A.2
- EN 55032:2015/A11:2020: Section A.2
- FCC 47 CFR Part 15, Subpart B: Clause §15.109 (Test method ANSI C63.4:2014)
- ICES-003 Issue 7, October 2020: Section 3.2.2

Table 8.1-1: *Requirements for radiated emissions for Class B*

Facility	Frequency range [MHz]	Measurement		limits
		Distance [m]	Detector type/ bandwidth	[dBµV/m]
EN 55032				
OATS/SAC	30–230	3	Quasi Peak/120 kHz	40.0
	230–1000			47.0
FSOATS	1000–3000	3	CAverage/1 MHz	50.0
	3000–6000			54.0
FSOATS	1000–3000	3	Peak/1 MHz	70.0
	3000–6000			74.0
CISPR 32 / AS/NZS CISPR 32				
OATS/SAC	30–230	3	Quasi Peak/120 kHz	40.0
	230–1000			47.0
FSOATS	1000–6000	3	CAverage/1 MHz	54.0
			Peak/1 MHz	74.0
FCC Part 15 Subpart B				
OATS/SAC	30–88	3	Quasi Peak/120 kHz	40.0
	88–216			43.5
	216–960			46.0
	960–1000			54.0
FSOATS	>1000	3	Linear average/1 MHz	54.0
			Peak/1 MHz	74.0
ICES-003				
OATS/SAC	30–88	3	Quasi Peak/120 kHz	40.0
	88–216			43.5
	216–230			46.0
	230–960			47.0
	960–1000			54.0
FSOATS	>1000	3	Linear average/1 MHz	54.0
			Peak/1 MHz	74.0

Notes:
- OATS – Open Area Test Site, SAC – Semi Anechoic Chamber, FSOATS – Free Space Open Area Test Site
- Where there is a step in the applicable limit, the lower value was applied at the transition frequency.

8.1.2 Test summary

Verdict	Pass		
Tested by	Predrag Golic	Test date	December 13, 14 & 17, 2014

8.1.3 Notes

- The spectral plots within this section are a summation of vertical and horizontal scans. The spectral plots within this section have been corrected with all relevant transducer factors.
- Where tabular data has not been provided, no emissions were observed within 10 dB of the specified limit when measured with the appropriate detector. Additionally, where less than 6 measurements per detector have been provided, fewer than 6 emissions were observed within 10 dB of the specified limit when measured with the appropriate detector.
- EUT was pre-scanned with EUT connected to lowest and highest voltage/frequency. Worst case is formally tested [230 V_{AC}; 50 Hz]
- The spectrum was scanned from 30 MHz up to 6 GHz.
- There are two ways to communicate with the printer. Both are formally assessed.

8.1.4 Setup details

Port under test	Enclosure Port
EUT power input during test	24 V_{DC} (via external 100–240 V_{AC}, 50/60 Hz power adapter)
EUT setup configuration	Table top
Test facility	Semi anechoic chamber
Measuring distance	3 m
Antenna height variation	1–4 m
Turntable position	0–360°
Measurement details	A preview measurement was generated with the receiver in continuous scan or sweep mode while the EUT was rotated and the antenna adjusted to maximize radiated emission. Selected emissions detected were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver/spectrum analyzer settings.

Resolution bandwidth	Measurements below 1 GHz: 120 kHz, Measurements above 1 GHz: 1 MHz
Video bandwidth	Measurements below 1 GHz: 300 kHz, Measurements above 1 GHz: 3 MHz
Detector mode	Measurements below 1 GHz: Peak (Preview), Quasi-peak (Final) Measurements above 1GHz: Peak (Preview), Peak and CAverage (Final)
Trace mode	Max Hold
Measurement time	100 ms

Table 8.1-2: *Radiated emissions equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	January 20, 2023
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
61505 AC source	Chroma	61509	FA003036	—	VOU
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	November 28, 2023
Horn (1–18 GHz)	ETS Lindgren	3117	FA002840	1 year	February 10, 2023
Preamp (1–18 GHz)	ETS Lindgren	124334	FA002873	1 year	August 16, 2023
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	February 14, 2023
RF Cable Assembly	0	2M-750-195A-750	FA002553	1 year	June 18, 2023

Notes: NCR - no calibration required, VOU - verify on use

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

Manufacturer of Software	Details
Rohde & Schwarz	EMC32, Software for EMC Measurements, Version 11.20.00

8.1.5 Test data

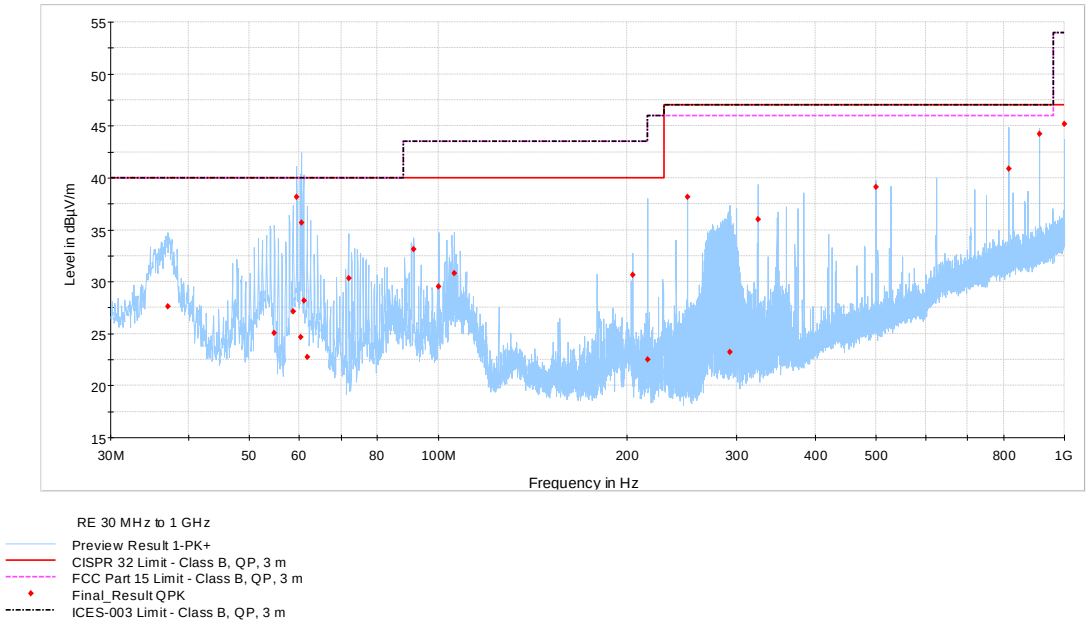

Figure 8.1-1: *Radiated emissions spectral plot (30 to 1000 MHz)* ***[Option 1_RS232]***

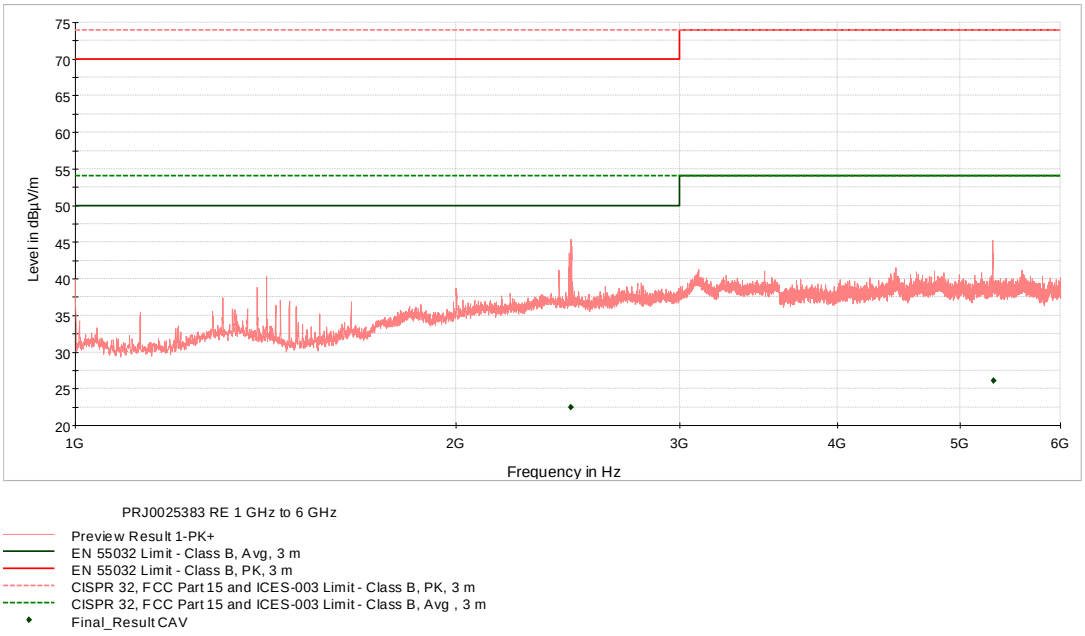

Figure 8.1-2: *Radiated emissions spectral plot (1 to 6 GHz)* ***[Option 1_RS232]***

Test data, continued

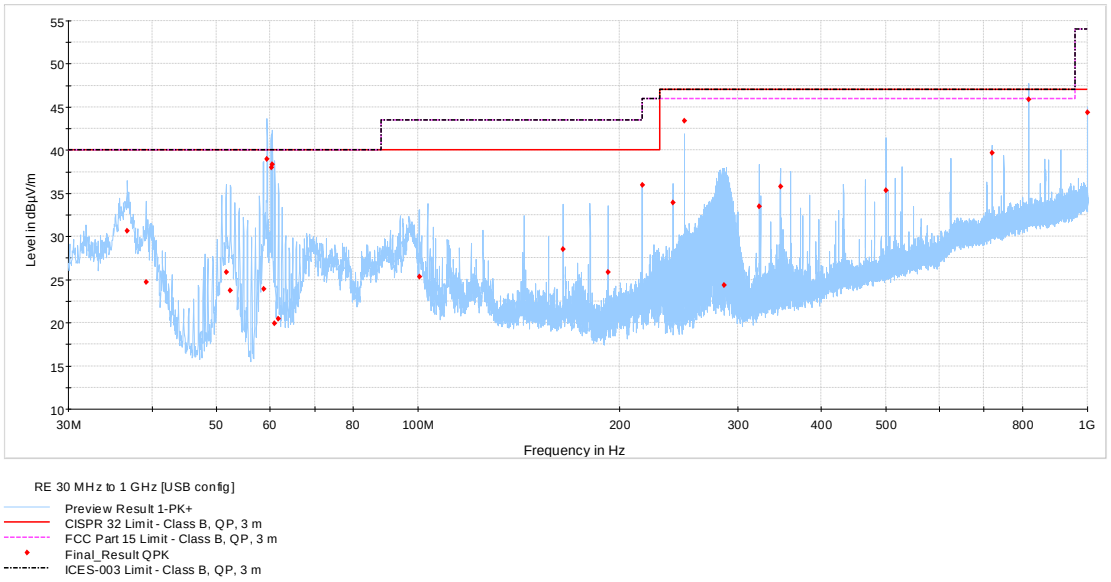

Figure 8.1-3: *Radiated emissions spectral plot (30 to 1000 MHz)* ***[Option 2_USB]***

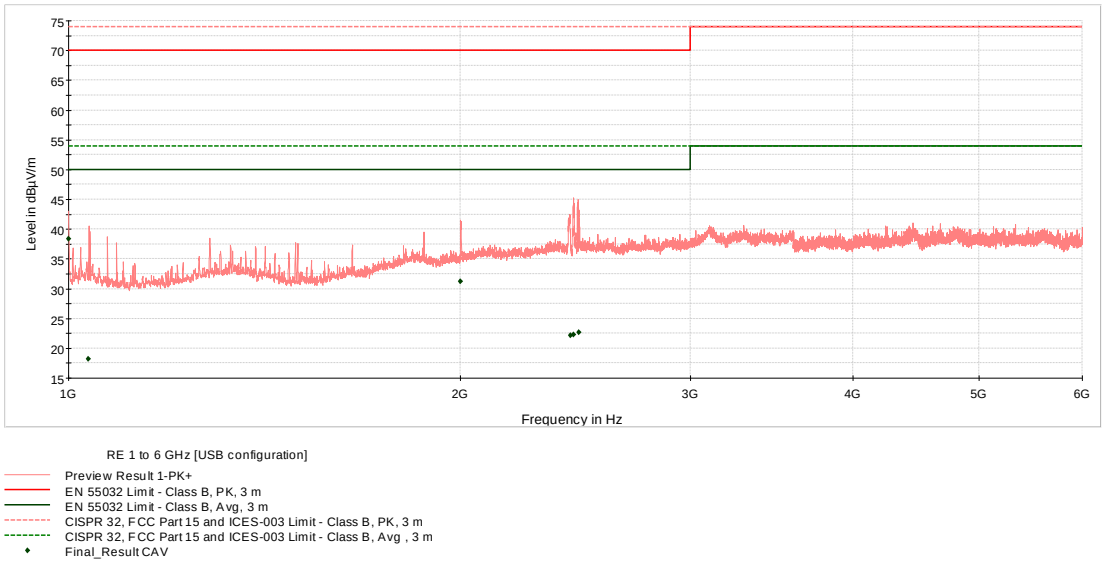

Figure 8.1-4: *Radiated emissions spectral plot (1 to 6 GHz)* ***[Option 2_USB]***

Test data, continued

Table 8.1-4: *Radiated emissions results* ***[Option 1_RS232]***

Frequency (MHz)	Quasi-Peak field strength[1 and 3] (dBµV/m)	Quasi-Peak limit (dBµV/m)	Quasi-Peak margin (dB)	Correction factor[2] (dB)
CISPR 32, EN 55032, and AS/NZS CISPR 32				
999.95	45.2	47.0	1.8	30.6
59.44	38.1	40.0	1.9	12.2
912.02	44.2	47.0	2.8	29.6
60.56	35.7	40.0	4.3	12.4
816.04	40.8	47.0	6.2	28.6
91.50	33.2	40.0	6.8	12.9
500.01	39.1	47.0	7.9	24.0
250.00	38.1	47.0	8.9	17.0
106.10	30.8	40.0	9.2	16.8
204.55	30.6	40.0	9.4	16.8
999.95	45.2	47.0	1.8	30.6
FCC				
912.02	44.2	46.0	1.8	29.6
59.44	38.1	40.0	1.9	12.2
60.56	35.7	40.0	4.3	12.4
816.04	40.8	46.0	5.2	28.6
500.01	39.1	46.0	6.9	24.0
250.00	38.1	46.0	7.9	17.0
999.95	45.2	54.0	8.8	30.6
71.95	30.4	40.0	9.6	13.1
ICES-003				
59.44	38.1	40.0	1.9	12.2
912.02	44.2	47.0	2.8	29.6
60.56	35.7	40.0	4.3	12.4
816.04	40.8	47.0	6.2	28.6
500.01	39.1	47.0	7.9	24.0
999.95	45.2	54.0	8.8	30.6

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

Sample calculation: 37.5 dBµV/m (field strength) = 21.3 dBµV (receiver reading) + 16.2 dB (Correction factor)

Test data, continued

Table 8.1-5: *Radiated emissions results* ***[Option 2_USB]***

Frequency (MHz)	Quasi-Peak field strength[1 and 3] (dBµV/m)	Quasi-Peak limit (dBµV/m)	Quasi-Peak margin (dB)	Correction factor[2] (dB)
CISPR 32, EN 55032, and AS/NZS CISPR 32				
59.39	39.0	40.0	1.0	12.2
816.04	45.9	47.0	1.1	28.6
60.56	38.4	40.0	1.6	12.4
60.26	38.0	40.0	2.0	12.3
1000.00	44.4	47.0	2.6	30.6
250.00	43.4	47.0	3.6	17.0
216.00	35.9	40.0	4.1	16.0
719.96	39.7	47.0	7.3	27.4
36.74	30.6	40.0	9.4	20.8
FCC				
816.04	45.9	46.0	0.1	28.6
59.39	39.0	40.0	1.0	12.2
60.56	38.4	40.0	1.6	12.4
60.26	38.0	40.0	2.0	12.3
250.00	43.4	46.0	2.6	17.0
719.96	39.7	46.0	6.3	27.4
216.00	35.9	43.5	7.6	16.0
36.74	30.6	40.0	9.4	20.8
1000.00	44.4	54.0	9.6	30.6
ICES-003				
59.39	39.0	40.0	1.0	12.2
816.04	45.9	47.0	1.1	28.6
60.56	38.4	40.0	1.6	12.4
60.26	38.0	40.0	2.0	12.3
250.00	43.4	47.0	3.6	17.0
719.96	39.7	47.0	7.3	27.4
216.00	35.9	43.5	7.6	16.0
36.74	30.6	40.0	9.4	20.8
1000.00	44.4	54.0	9.6	30.6

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

Sample calculation: 37.5 dBµV/m (field strength) = 21.3 dBµV (receiver reading) + 16.2 dB (Correction factor)

8.1.6 Setup photos

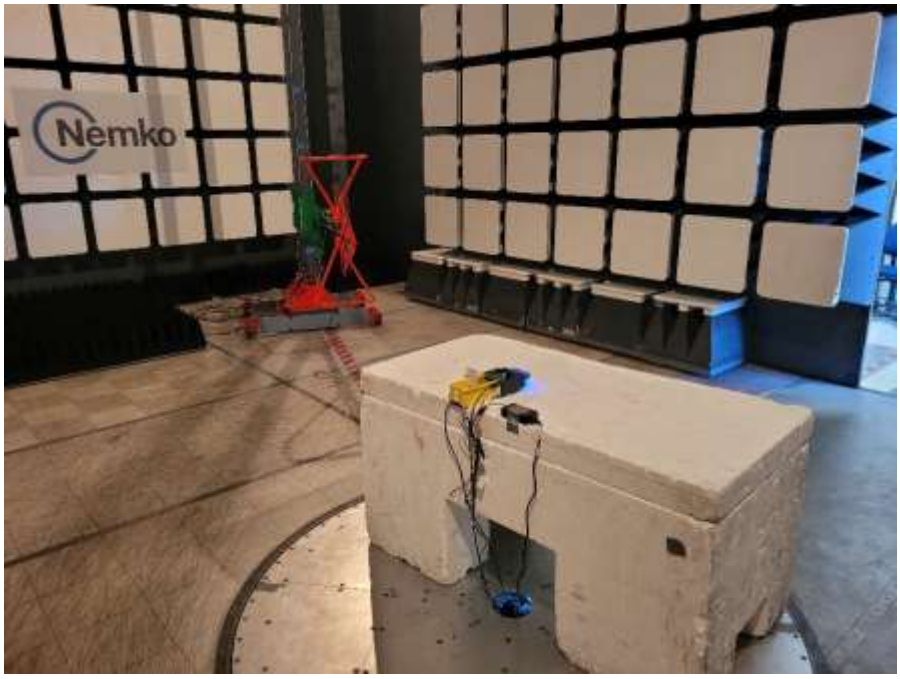

Figure 8.1-5: *Radiated emissions setup photo – below 1 GHz* ***[set up is identical for both options]***

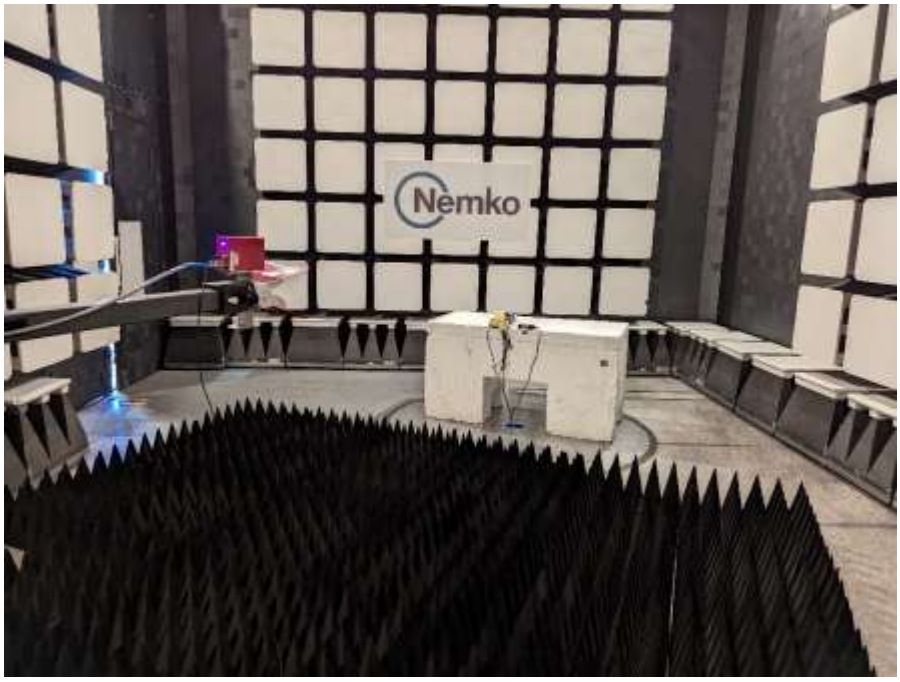

Figure 8.1-6: *Radiated emissions setup photo – above 1 GHz* ***[set up is identical for both options]***

8.2 Conducted emissions – from AC mains power ports

8.2.1 References and limits

- CISPR 32:2015/AMD1:2019: Section A.3
- AS/NZS CISPR 32:2015 AMD 1:2020: Section A.3
- EN 55032:2015/A11:2020: Section A.3
- FCC 47 CFR Part 15, Subpart B: Clause §15.109 (Test method ANSI C63.4:2014)
- ICES-003 Issue 7, October 2020: Section 3.2.2

Table 8.2-1: *Requirements for conducted emissions from the AC mains power ports for Class B*

Frequency range [MHz]	Measurement		Limits
	Coupling device	Detector type/ bandwidth	[dBµV]
0.15–0.5	AMN	Quasi Peak/9 kHz	66.0–56.0
0.5–5			56.0
5–30			60.0
0.15–0.5	AMN	CAverage/9 kHz	56.0–46.0
0.5–5			46.0
5–30			50.0

Notes: The lower limit shall apply at the transition frequency.

8.2.2 Test summary

Verdict	Pass		
Tested by	Predrag Golic	Test date	December 16, 2022

8.2.3 Notes

- The spectral plots within this section have been corrected with all relevant transducer factors.
- Where tabular data has not been provided, no emissions were observed within 10 dB of the specified limit when measured with the appropriate detector. Additionally, where less than 6 measurements per detector have been provided, fewer than 6 emissions were observed within 10 dB of the specified limit when measured with the appropriate detector.
- Equipment with a DC power port powered by a dedicated AC/DC power converter is considered to be AC mains powered equipment and tested with a power converter. Where the manufacturer provided the power converter, the supplied converter was used.
- There are two ways to communicate with the printer. Both are formally assessed.

8.2.4 Setup details

Port under test – Coupling device	AC input of AC adapter – Artificial Mains Network (AMN)
EUT power input during test	24 V_{DC} (via external 100–240 V_{AC}, 50/60 Hz power adapter)
EUT setup configuration	Table top
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Selected emissions detected 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), Quasi-peak and CAverage (Final)
Trace mode	Max Hold
Measurement time	100 ms (Preview), 160 ms (Final)

Table 8.2-2: *Conducted emissions – from AC mains power ports equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	November 28, 2023
61505 AC source	Chroma	61509	FA003036	—	VOU
LISN	Rohde & Schwarz	ENV216	FA002515	1 year	February 4, 2023

Notes: VOU - verify on use

Table 8.2-3: *Conducted emissions – from AC mains power ports test software details*

Manufacturer of Software	Details
Rohde & Schwarz	EMC32, Software for EMC Measurements, Version 11.20.00

8.2.5 Test data

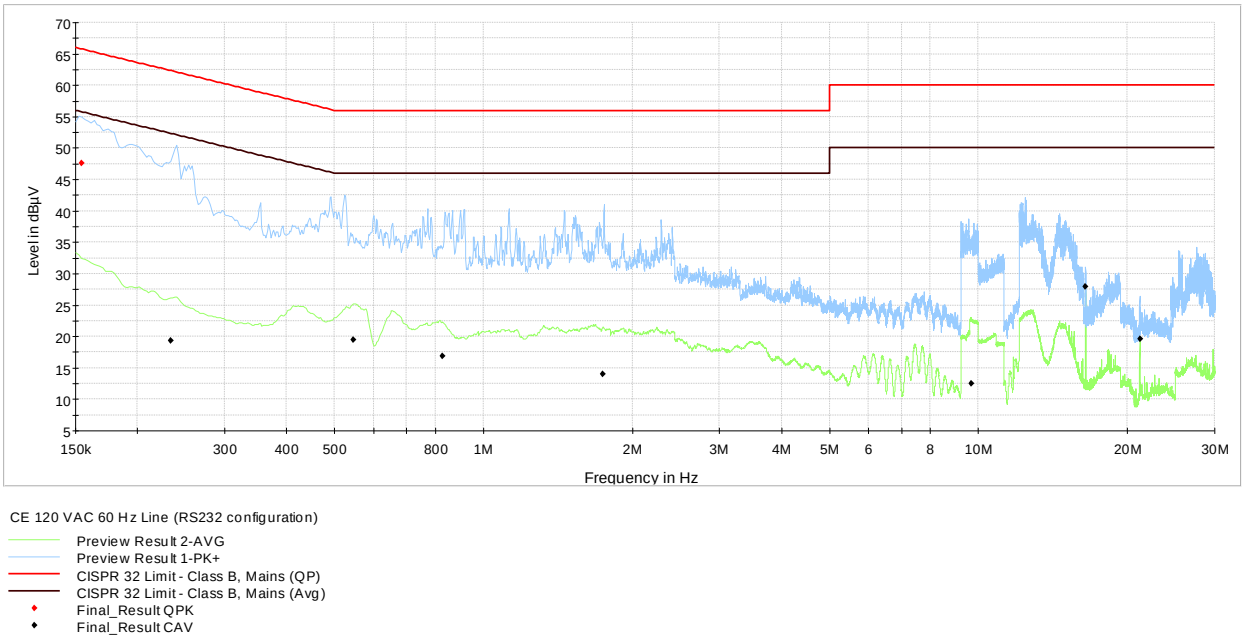

Figure 8.2-1: *Conducted emissions – from AC mains power ports spectral plot on the phase line* ***[Option 1_RS232]***

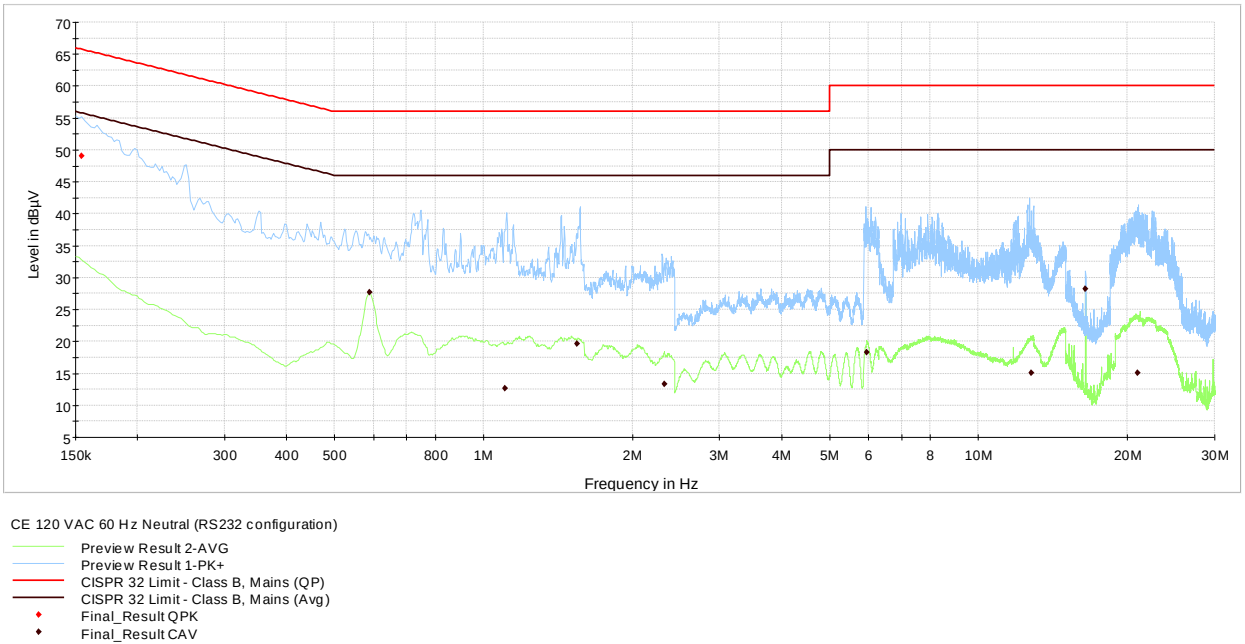

Figure 8.2-2: *Conducted emissions – from AC mains power ports spectral plot on the neutral line* ***[Option 1_RS232]***

Test data continued

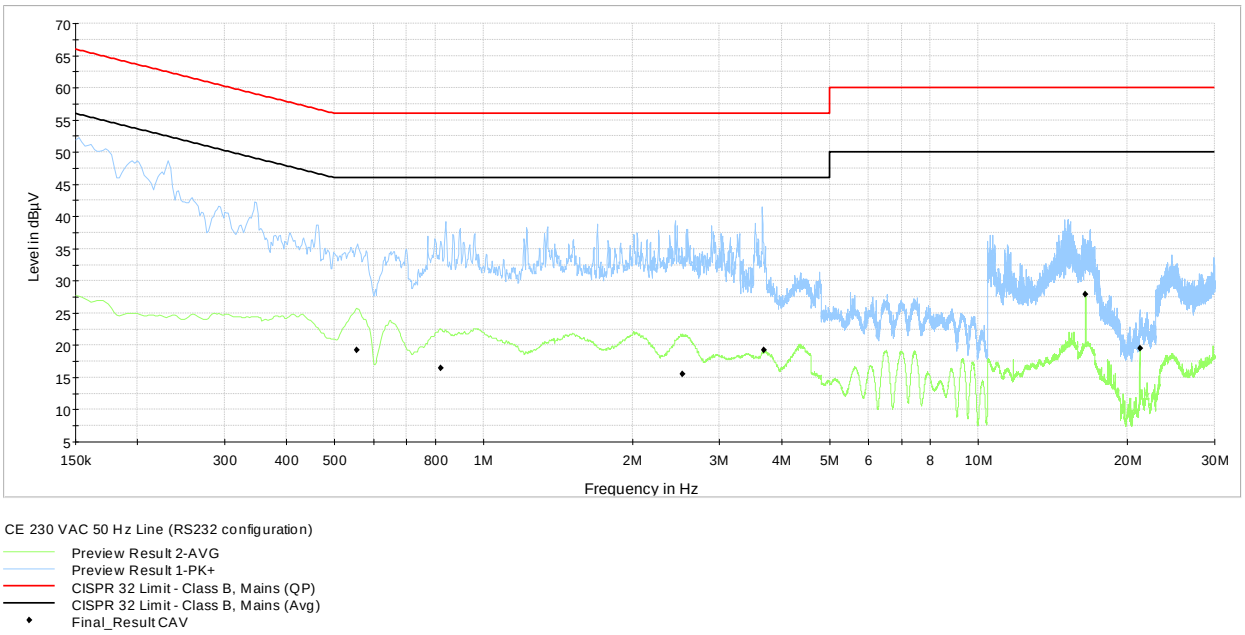

Figure 8.2-3: *Conducted emissions – from AC mains power ports spectral plot on the phase line* ***[Option 1_RS232]***

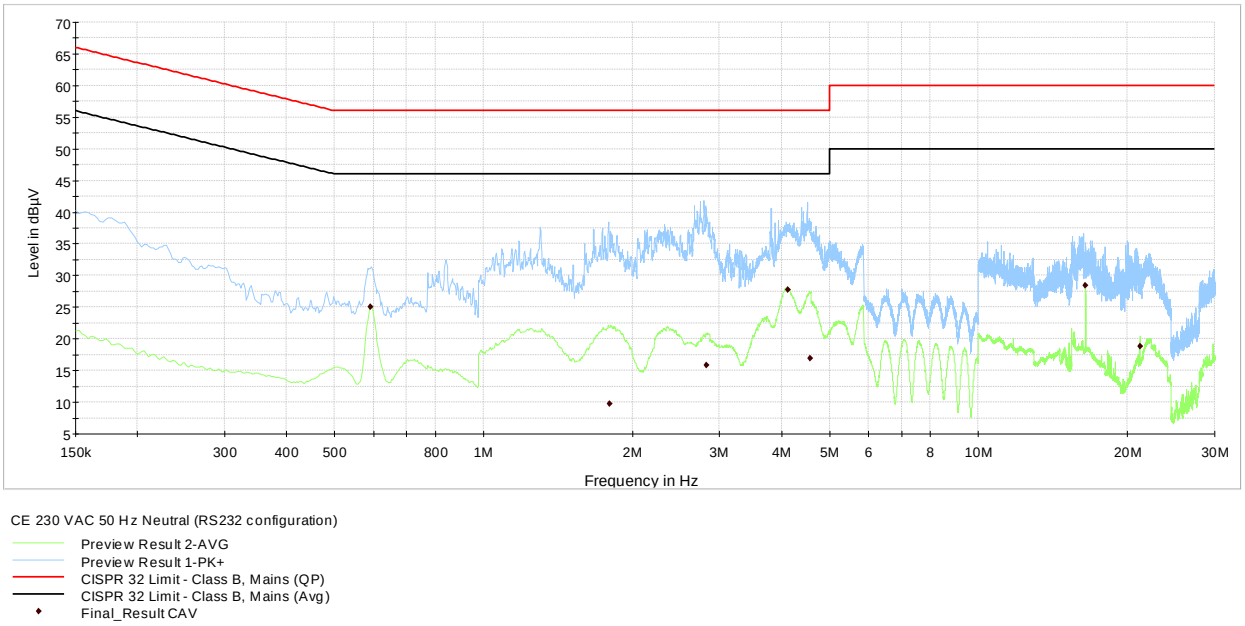

Figure 8.2-4: *Conducted emissions – from AC mains power ports spectral plot on the neutral line* ***[Option 1_RS232]***

Test data continued

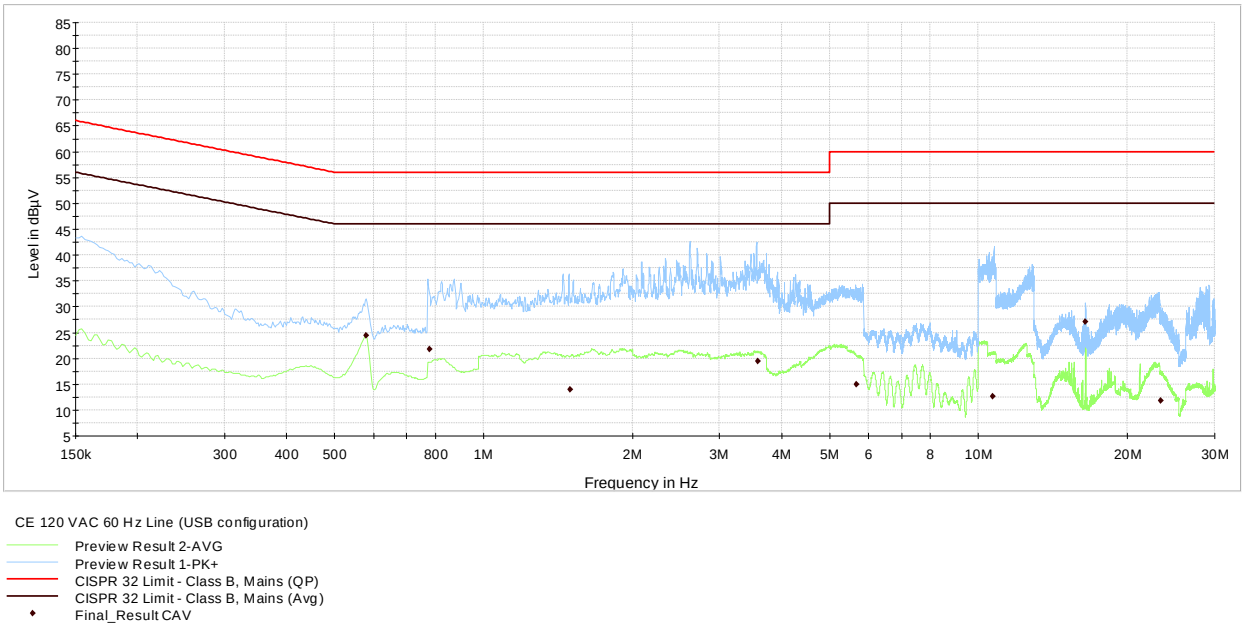

Figure 8.2-5: *Conducted emissions – from AC mains power ports spectral plot on the phase line* ***[Option 2_USB]***

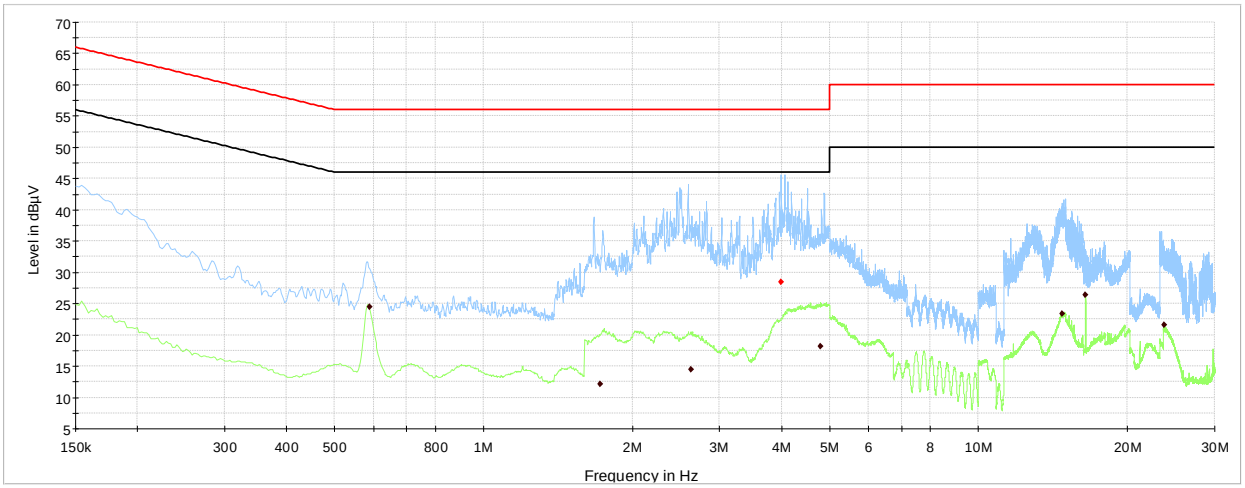

Figure 8.2-6: *Conducted emissions – from AC mains power ports spectral plot on the neutral line* ***[Option 2_USB]***

Test data continued

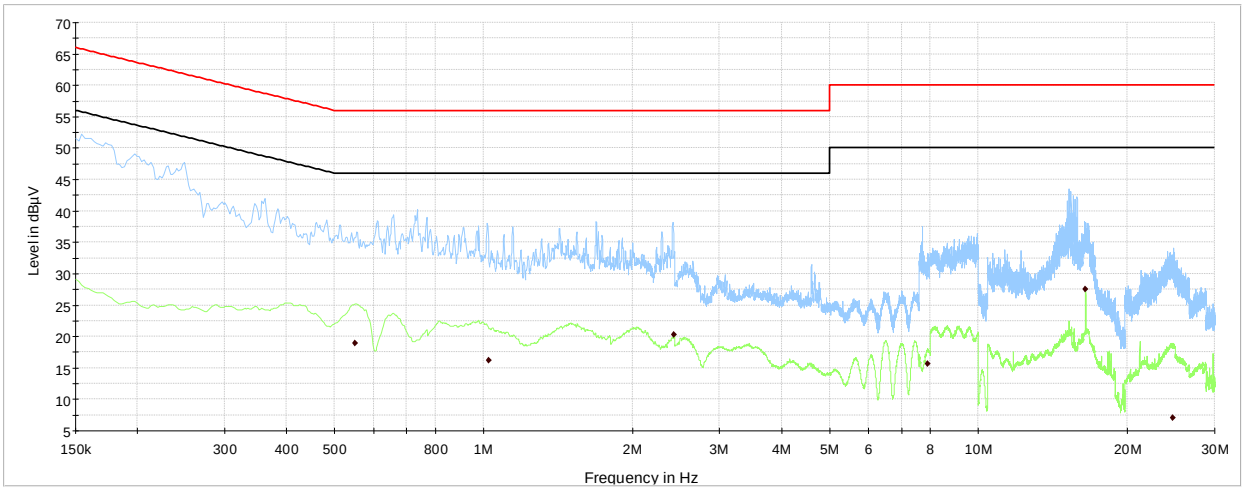

Figure 8.2-7: *Conducted emissions – from AC mains power ports spectral plot on the phase line* ***[Option 2_USB]***

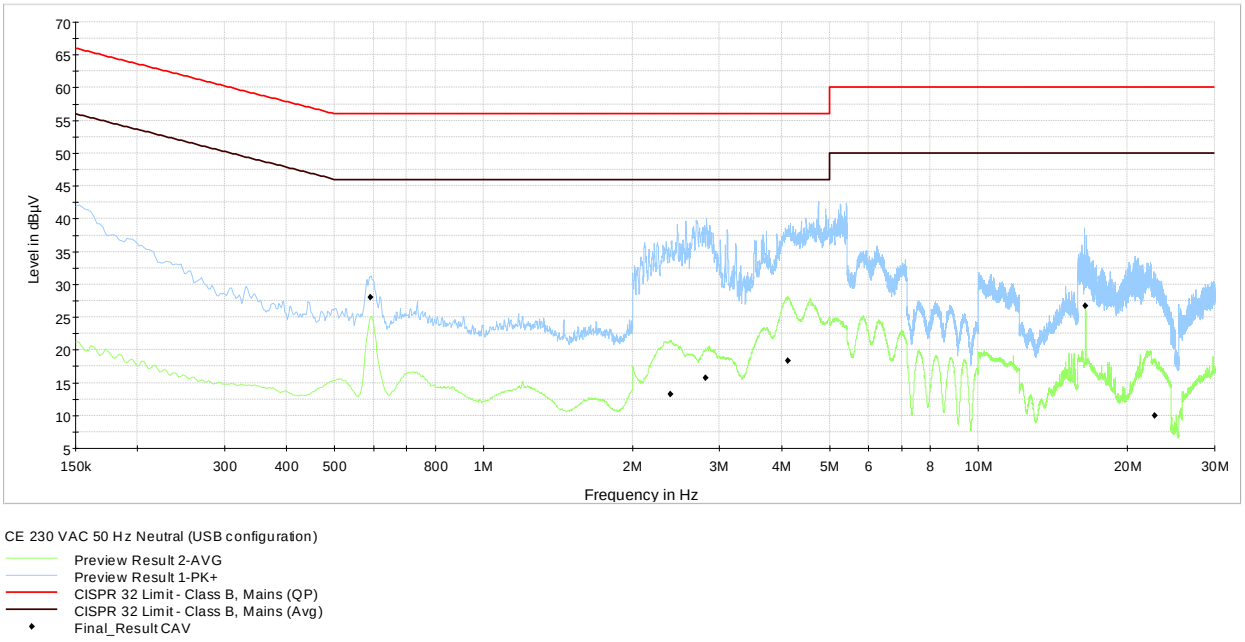

Figure 8.2-8: *Conducted emissions – from AC mains power ports spectral plot on the neutral line* ***[Option 2_USB]***

8.2.6 Setup photos

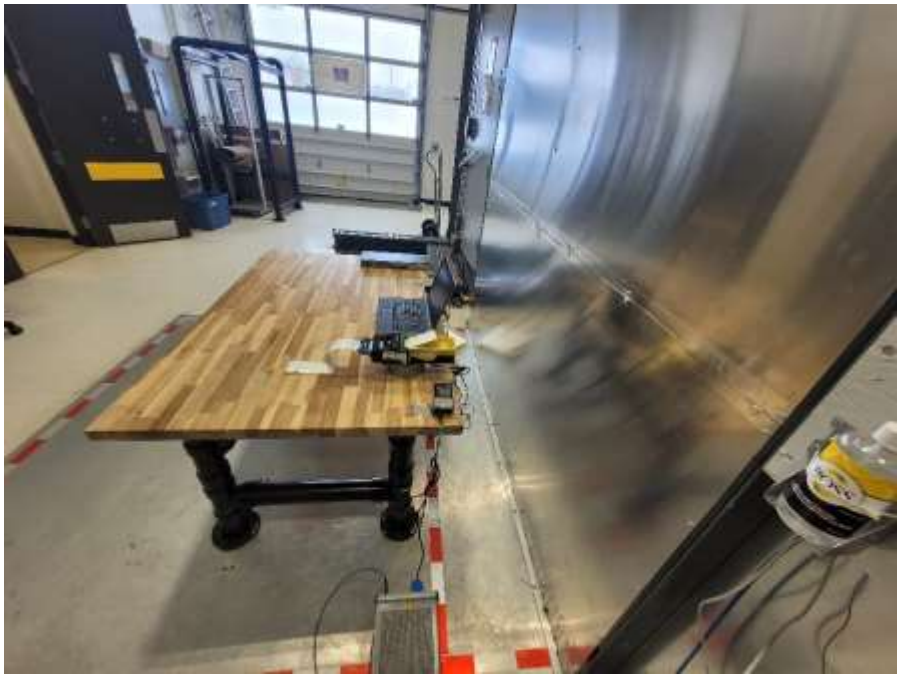

Figure 8.2-9: *Conducted emissions – from AC mains power ports setup photo* ***[set up is identical for both options]***

Figure 8.2-10: *Conducted emissions – from AC mains power ports setup photo* ***[set up is identical for both options]***

8.3 Conducted emissions – Asymmetric mode

8.3.1 References and limits

- CISPR 32:2015/AMD1:2019: Section A.3
- AS/NZS CISPR 32:2015 AMD 1:2020: Section A.3
- EN 55032:2015/A11:2020: Section A.3

Table 8.3-1: *Requirements for asymmetric mode conducted emissions from class B equipment*

Frequency range [MHz]	Measurement		Voltage limits [dBµV]	Current limits [dBµA]
	Coupling device	Detector type/ bandwidth		
0.15–0.5 0.5–30	Current probe	Quasi Peak/9 kHz	N/A	40.0–30.0 30.0
0.15–0.5 0.5–30	Current probe	CAverage/9 kHz	N/A	30.0–20.0 20.0

Notes: None

8.3.2 Test summary

Verdict	Pass		
Tested by	Predrag Golic	Test date	December 16, 2022

8.3.3 Notes

- The spectral plots within this section have been corrected with all relevant transducer factors
- Where tabular data has not been provided, no emissions were observed within 10 dB of the specified limit when measured with the appropriate detector. Additionally, where less than 6 measurements per detector have been provided, fewer than 6 emissions were observed within 10 dB of the specified limit when measured with the appropriate detector
- Where there is a step in the applicable limit, the lower value was applied at the transition frequency
- There are two ways to communicate with the printer. EUT was assessed. in option 1_RS232 as a representative for both

8.3.4 Setup details

Port under test – Coupling device	Ethernet –Current Probe (CP)
EUT power input during test	24 V_{DC} (via external 100–240 V_{AC}, 50/60 Hz power adapter)
EUT setup configuration	Table top
Measurement details	A preview measurement was generated with the receiver in continuous scan mode. Selected emissions detected 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), Quasi-peak and CAverage (Final)
Trace mode	Max Hold
Measurement time	100 ms (Preview), 160 ms (Final)

Table 8.3-2: *Conducted emissions – Asymmetric mode equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	November 28, 2023
61505 AC source	Chroma	61509	FA003036	—	VOU
LISN	Rohde & Schwarz	ENV216	FA002515	1 year	February 4, 2023
Current probe	Solar Electronics	9134-1	FA002050	1 year	February 2, 2023

Notes: VOU - verify on use

Table 8.3-3: *Conducted emissions – Asymmetric mode test software details*

Manufacturer of Software	Details
Rohde & Schwarz	EMC32, Software for EMC Measurements, Version 11.20.00

8.3.5 Test data

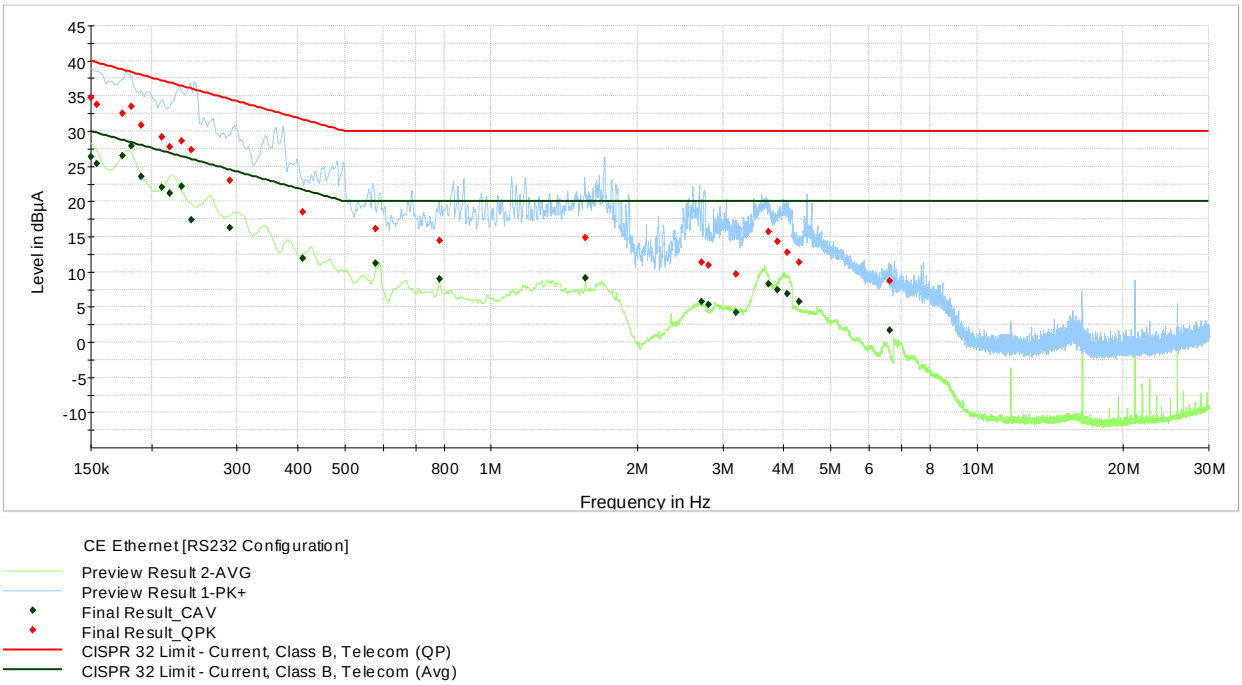

Figure 8.3-1: *Conducted emissions – Asymmetric mode spectral plot on Ethernet port*

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

Frequency (MHz)	Quasi-Peak result[1 and 3] (dBµA)	Quasi-Peak limit (dBµA)	Quasi-Peak margin (dB)	Correction factor[2] (dB)
0.1820	33.5	38.4	4.9	4.3
0.1500	34.8	40.0	5.2	4.5
0.1540	33.8	39.8	6.0	4.5
0.1740	32.5	38.8	6.3	4.4
0.1900	30.8	38.0	7.2	4.3
0.2300	28.6	36.4	7.8	4.2
0.2100	29.2	37.2	8.0	4.2
0.2420	27.3	36.0	8.7	4.2
0.2180	27.8	36.9	9.1	4.2
Frequency (MHz)	**CAverage result[1 and 3] (dBµA)**	**CAverage limit (dBµA)**	**CAverage margin (dB)**	**Correction factor[2] (dB)**
0.1820	27.8	28.4	0.6	4.3
0.1740	26.6	28.8	2.2	4.4
0.1500	26.3	30.0	3.7	4.5
0.2300	22.2	26.4	4.2	4.2
0.1540	25.4	29.8	4.4	4.5
0.1900	23.5	28.0	4.5	4.3
0.2100	21.9	27.2	5.3	4.2
0.2180	21.2	26.9	5.7	4.2
0.2900	16.3	24.5	8.2	4.1

Notes:
[1] Result (dBµA) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor (dB) = cable loss (dB) + attenuator (dB) – Current clamp factor Z (dB Ω)
[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.

Sample calculation: 37.5 dBµA (result) = 24.2 dBµV (receiver reading) + 13.3 dB (Correction factor)

8.3.6 Setup photos

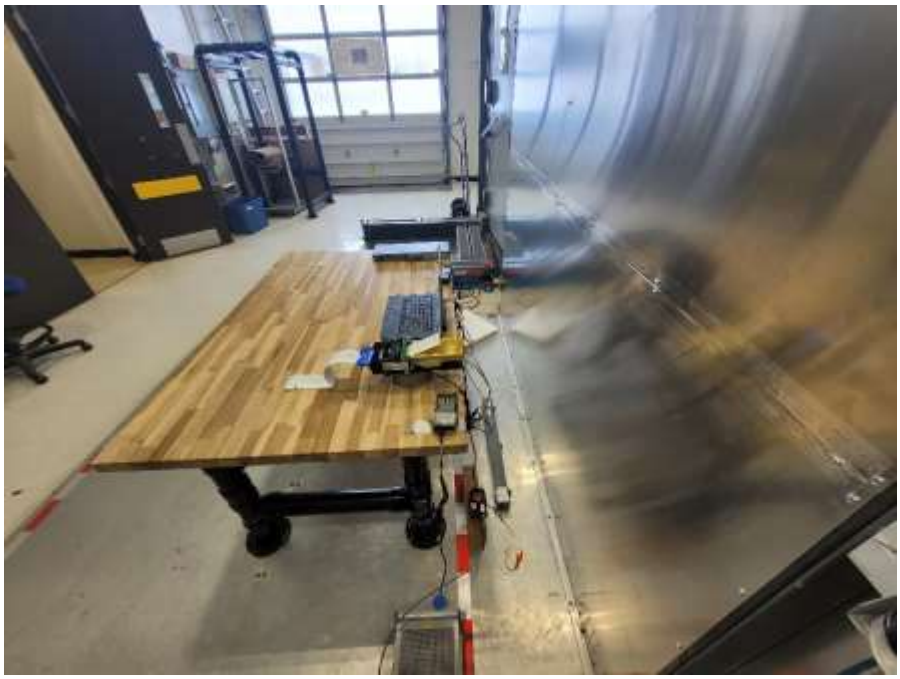

Figure 8.3-2: *Conducted emissions – Asymmetric mode setup photo*

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

Section 9 EUT photos

9.1 External photos

Figure 9.1-1: *Front view photo*

External photos continued

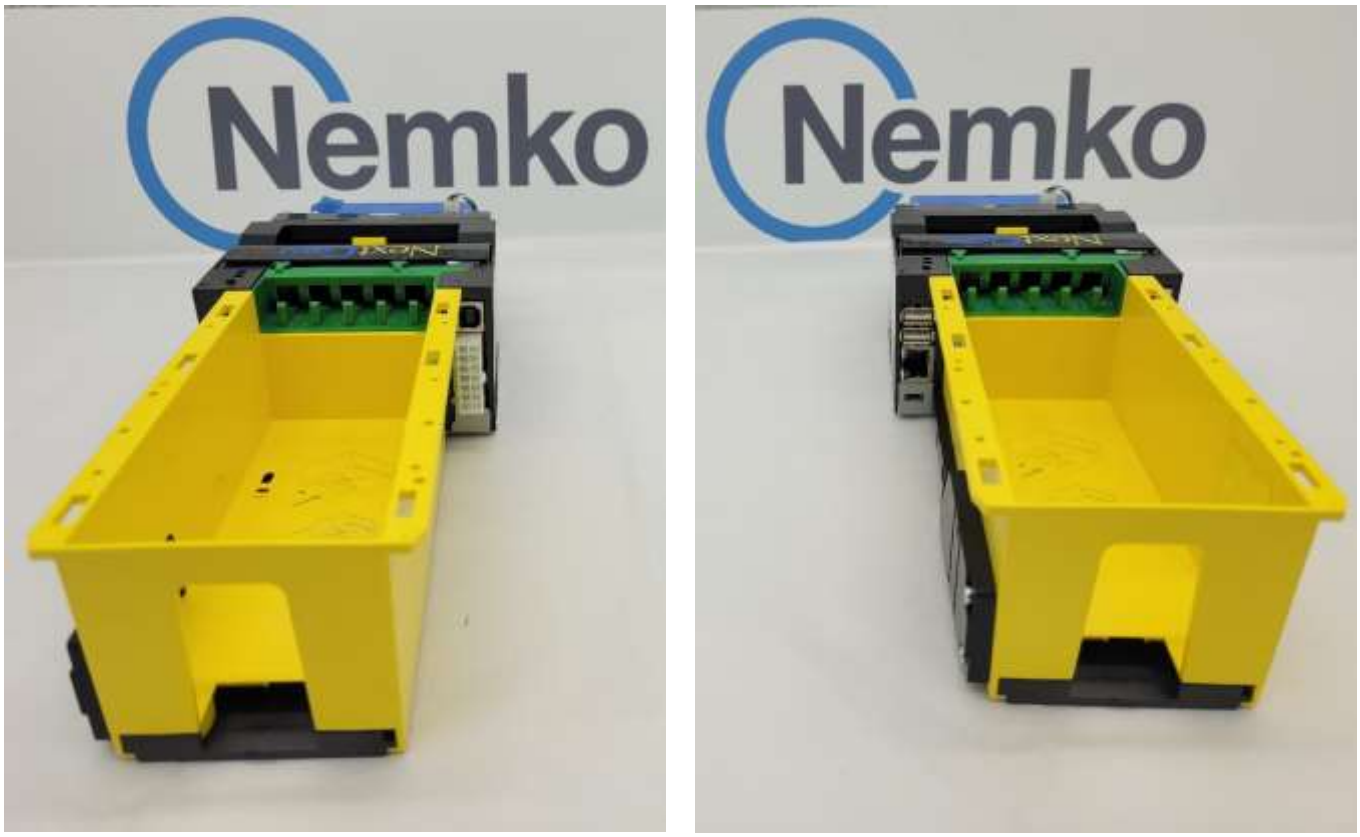

Figure 9.1-2: *Rear view photos*

External photos continued

Figure 9.1-3: *Side view photos*

External photos continued

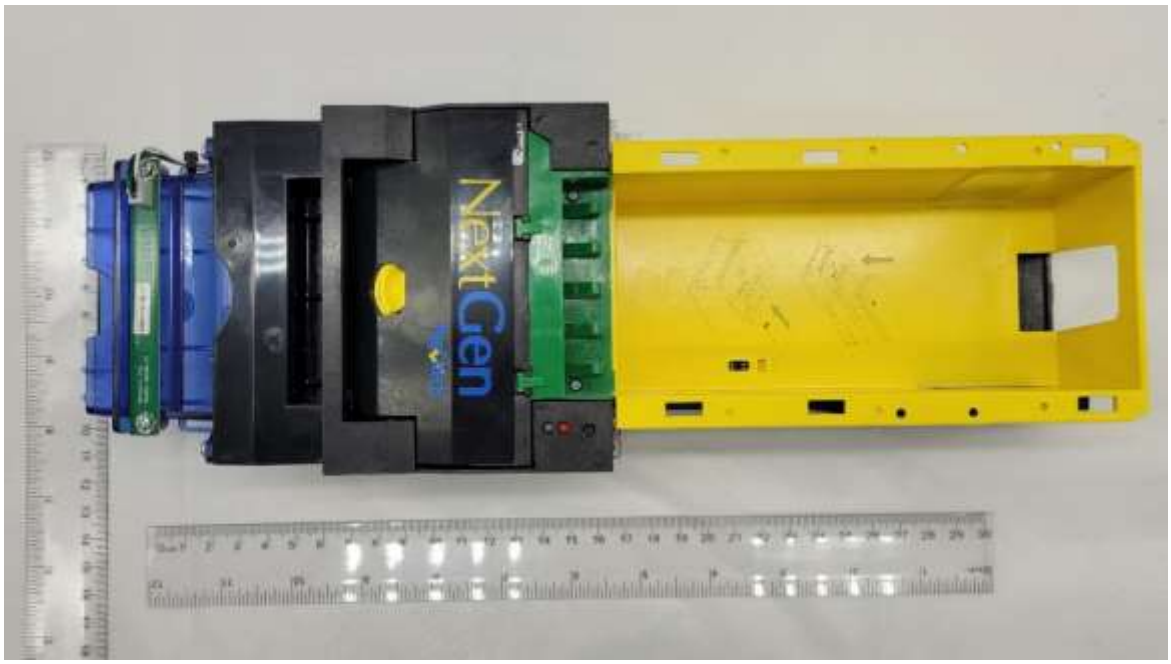

Figure 9.1-4: *Top view photo*

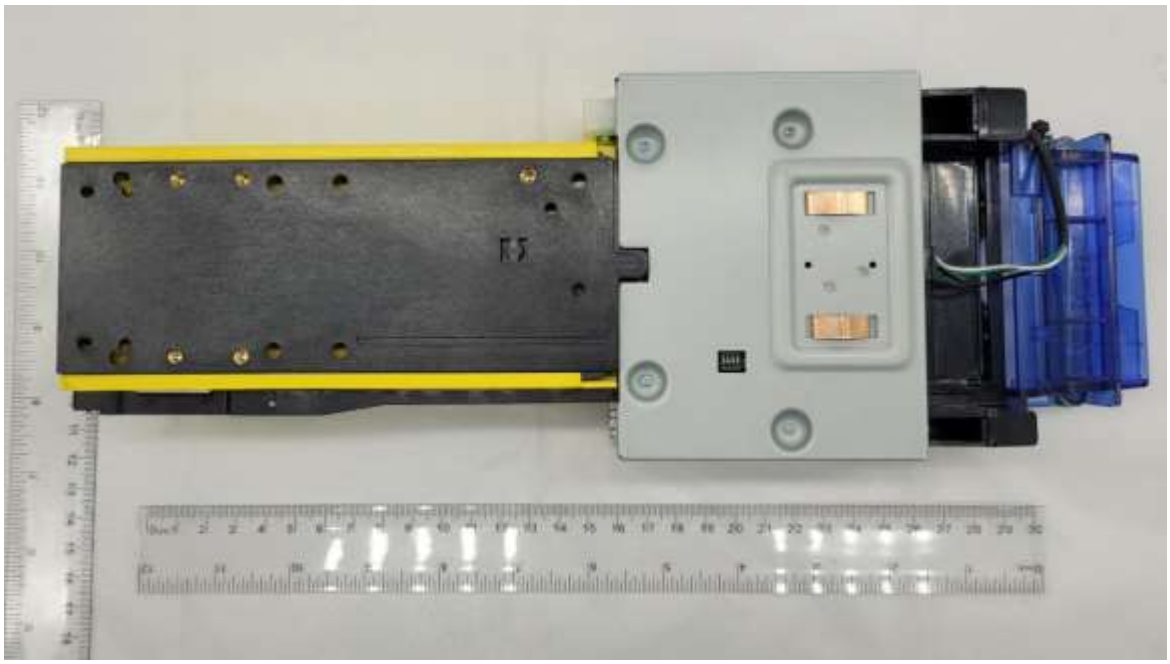

Figure 9.1-5: *Bottom view photo*

End of the test report