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EMC/EMI Test Report

Tested Product:

Toggle-Rooms

Test Report TR-0649549

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REVISION HISTORY

Revision	Description	Date
0	Initial Release	2024-02-19

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1 INTRODUCTION

This test report describes EMC tests on the product Toggle-Rooms:

- in compliance with electromagnetic compatibility directive 2014/30/EU as part of the requirements leading to the CE marking
- in compliance with the Electromagnetic Compatibility Regulations 2016 No. 1091 as part of the requirements leading to the UKCA marking
- in compliance with FCC part 15 subpart B
- in compliance with ICES-003

The essential requirements of the directive 2014/30/EU and the Electromagnetic Compatibility Regulations 2016 No. 1091 are covered by the following harmonized standards:

- EN 55032 (2015) A11 (2020) – *Electromagnetic compatibility of multimedia equipment - Emission requirements*
- EN 55035 (2017) A11 (2020) – *Electromagnetic compatibility of multimedia equipment – Immunity requirements*

2 ACRONYMS

EMC: ElectroMagnetic Compatibility
EUT: Equipment Under Test
S/N: Serial Number
N/A: Not Applicable / Not Available
NCR: No Calibration Required
VERIF: Internal Verification of Equipment Characteristics
AC: Alternating Current
DC: Direct Current
PSU: Power Supply Unit
LISN: Line Impedance Stabilisation Network
AM: Amplitude Modulation
CDN: Coupling/Decoupling Network
EM Clamp: Electromagnetic Clamp
I/O: Inputs/Outputs
HCP: Horizontal Coupling Plane
VCP: Vertical Coupling Plane
ESD: Electrostatic Discharge
EFT: Electrical Fast Transient
Pst: short-term flicker
Plt: long-term flicker

3 PROJECT DATES

RECEPTION DATE(S) (yyyy-mm-dd)	2024-01-30 (LABCEM#3626) 2024-01-30 (LABCEM#3627)
TESTS DATE(S) (yyyy-mm-dd)	From 2024-01-30 to 2024-01-30 (LABCEM#3626) From 2024-01-30 to 2024-02-01 (LABCEM#3627)

4 DESCRIPTION OF EQUIPMENT UNDER TEST

4.1 EUT

TYPE:	Conference room Multi-media hub.	
PRODUCT NAME:	Toggle-Rooms	
MANUFACTURER:	Inogeni	
LABCEM NUMBER:	LABCEM#3626 (Note 1)	LABCEM#3627
PART NUMBER:	Toggle-Rooms	Toggle-Rooms
SERIAL NUMBER:	TRX4020008	TRX4020015
VOLTAGE RATING:	24V/dc	24V/dc
EXTERNAL PSU INFO:	Manufacturer:Mean Well Model:Ac/DC switching adaptor P/N: GST160A24-R7B S/N:SC281W3861 Input Voltage:100-240Vac Output Voltage:24Vdc	Manufacturer:Mean Well Model:Ac/DC switching adaptor P/N: GST160A24-R7B S/N:SC281W3861 Input Voltage:100-240Vac Output Voltage:24Vdc
EUT SIZE:	Width = 25cm Height = 4cm Depth = 11.5cm	Width = 25cm Height = 4cm Depth = 11.5cm
FIRMWARE:	N/A	N/A
HIGHEST INTERNAL FREQUENCY:	250MHz	250MHz
Note 1 EUT was changed during voltage dip test due to USBC error from bad soldering on board		

Photo 1: EUT

Photo 2: EUT – LABCEM#3626 S/N

Photo 3: EUT – LABCEM#3627 S/N

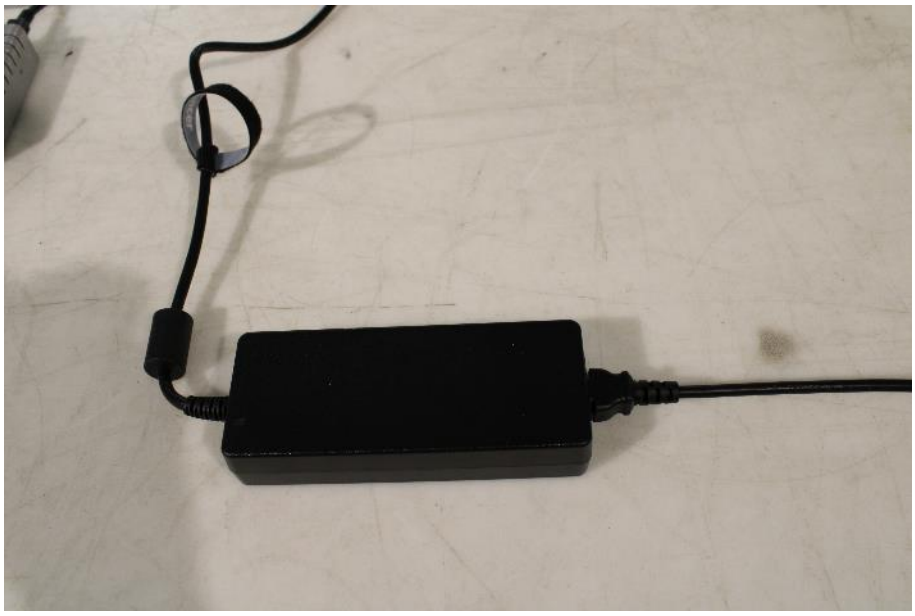


Photo 4: PSU

Photo 5: PSU – S/N

4.2 Support Equipment

EUT was exercised with support equipment supplied by client.

Photo 6: Support Equipment – Monitor

Photo 7: Support Equipment – Monitor

Photo 8: Support Equipment – USB Camera

Photo 9: Support Equipment – Microphone

Photo 10: Support Equipment – Video pattern generator

Photo 11: Support Equipment – Laptop

Photo 12: Support Equipment – Switch

Photo 13: Support Equipment – HDMI splitter

Photo 14: Support Equipment – USB Hub

4.3 EUT Setup Diagram

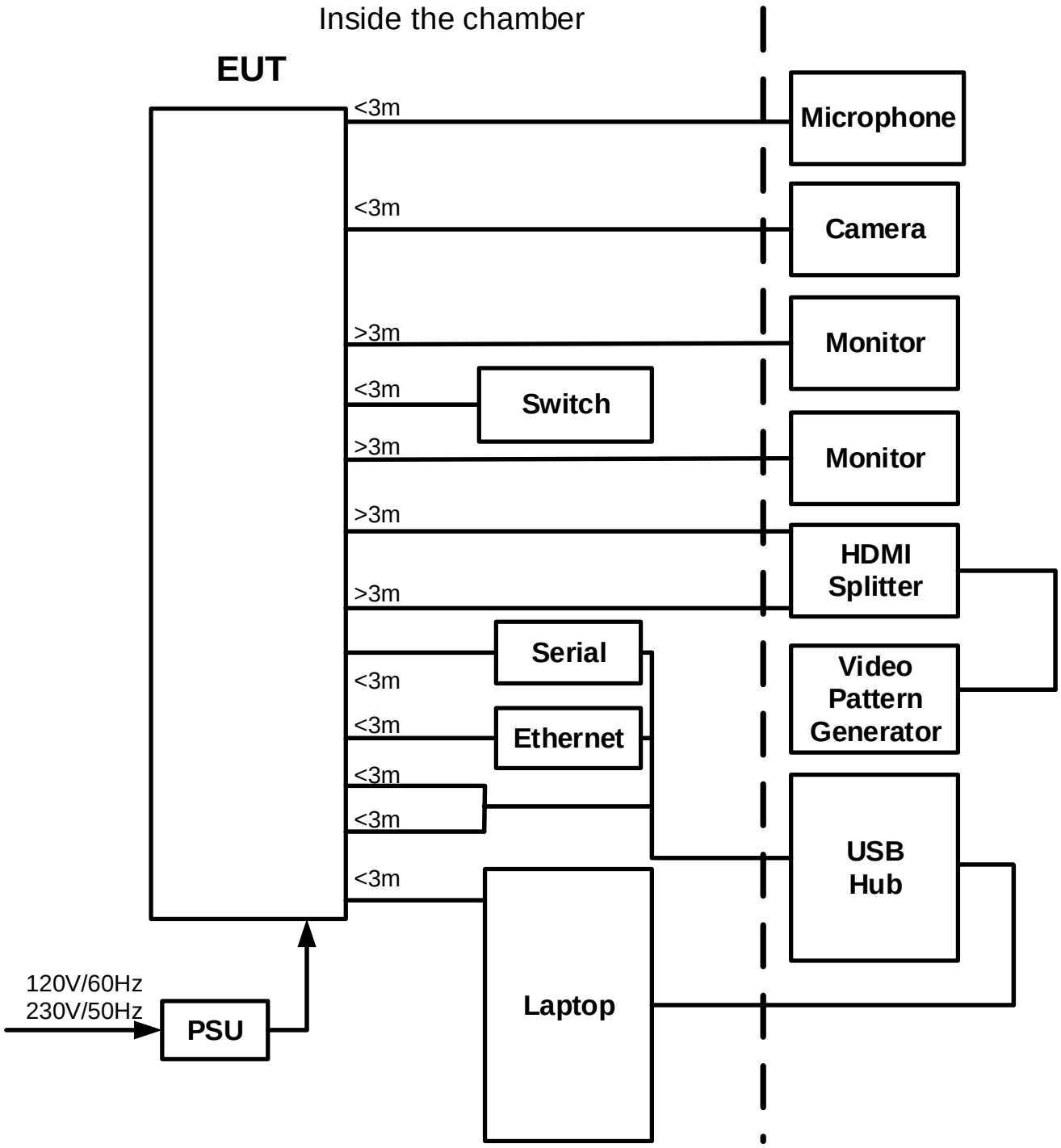
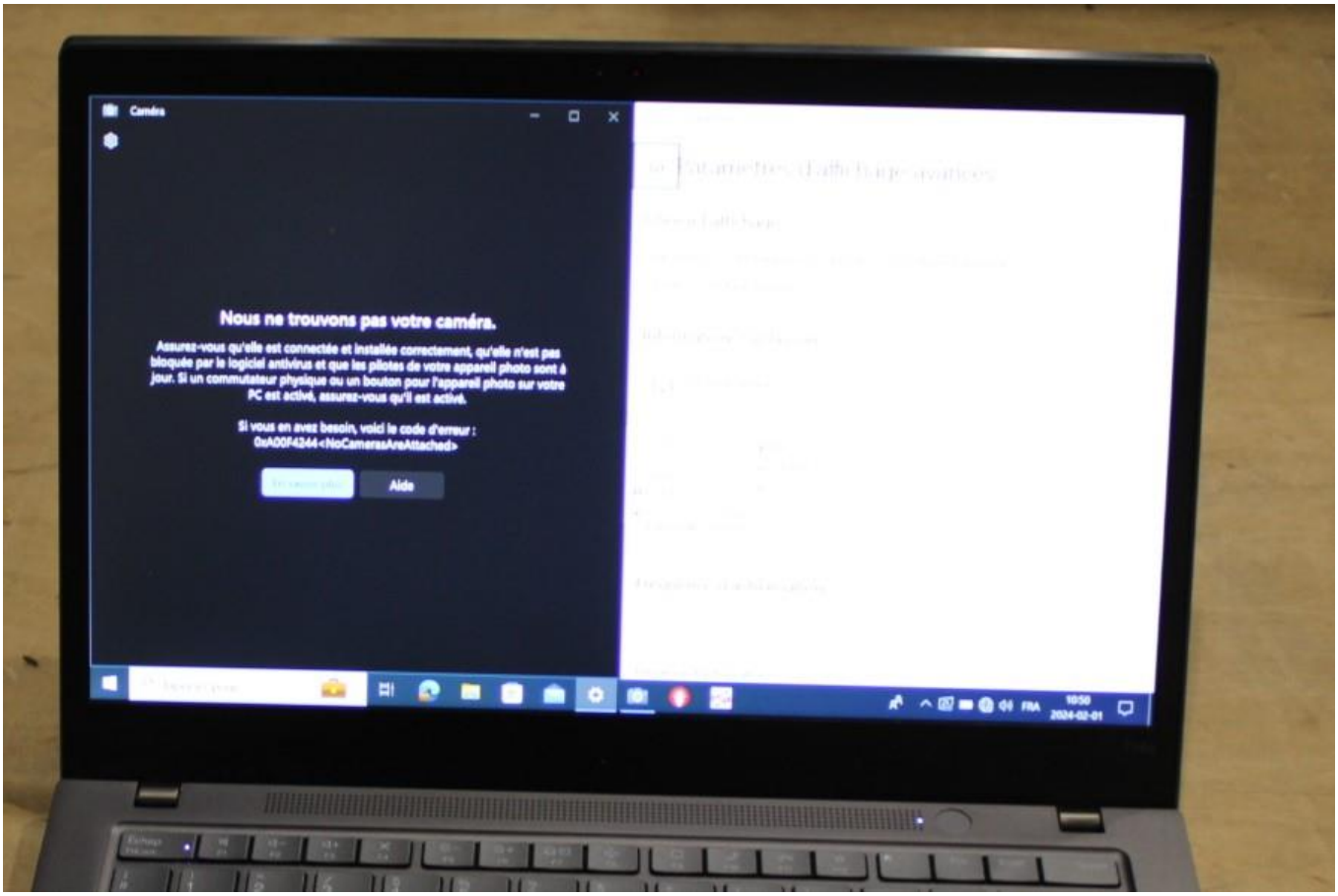


Figure 1: EUT Setup Diagram

4.4 Mode of Operation

During the tests, the EUT was exercised powering it to 230V/50Hz or 120V/60Hz. A video signal was applied from the video pattern generator and camera to the EUT. The EUT was then sending the video signal to the monitors and laptop.

Capture 1: Client Software



Capture 2: Client Software

4.5 Method of Monitoring

During the tests, the EUT was monitored by observing the video on the laptop and on the monitor.

5 PERFORMANCE CRITERIA

During the tests, EUT shall operate normally and the picture on the laptop and the display shall remain stable.

The performance criteria for the evaluation of the immunity test results are defined by EN 55035 standard (Electromagnetic compatibility of multimedia equipment – Immunity requirements).

Performance criterion A: The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment 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 equipment if used as intended.

Performance criterion B: During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.

After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment 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), or recovery time, 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 equipment if used as intended.

Performance criterion C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

6 CALCULATION OF THE COMPLIANCE MARGIN

Conducted Emission Level (dBµV) =	Value Reading at the EMI receiver (dBµV) + Correction Factor (dB)
Correction Factor (dB) =	LISN Attenuation (dB) + Cable Loss (dB) – Amplifier Gain (dB) + Attenuator (dB)
Margin (dB) =	Conducted Emission Level (dBµV) – Limit Value (dBµV)

Table 1: Example of Conducted Emissions Margin Calculation

Radiated Emission Level (dBµV/m) =	Value reading at the EMI receiver (dBµV) + Antenna Factor (dB/m) + Correction Factor (dB)
Correction Factor (dB) =	Cable Loss (dB) – Amplifier Gain (dB) + Attenuator (dB)
Margin (dB) =	Radiated Emission Level (dBµV/m) – Limit Value (dBµV/m)

Table 2: Example of Radiated Emissions Margin Calculation

7 MEASUREMENT UNCERTAINTIES

All measurements under compliance testing, involve certain levels of uncertainties based on test equipment and facilities. The measurement uncertainties of Element Materials Technology Montreal (U_{LAB}) were calculated according to CISPR16-4-2 standard and were lower than the maximum allowed by the standard (U_{CISPR}). Therefore, the measurement uncertainties need not to be considered for compliance.

The following table presents uncertainty calculation for emission measurements as requested by ANSI C63.4 (2014):

Test	Expanded Uncertainty with k=2 Coverage Factor (95% Confidence Level)
Conducted Emissions with LISN (9kHz-150kHz)	± 2.90 dB
Conducted Emissions with LISN (150kHz-30MHz)	± 2.86 dB
Conducted Emissions with ISN	± 4.12 dB
Conducted Emissions with V-Probe	± 2.55 dB
Conducted Emissions with Current Probe	± 2.52 dB
Radiated Emissions (30MHz-1GHz)	± 6.06 dB
Radiated Emissions (1GHz-18GHz)	± 5.15 dB
Radiated Emissions (18GHz-40GHz)	± 5.58 dB

Table 3: Measurement Uncertainties

All other calculations of uncertainties evaluation are available upon request.

8 ENGINEERING COMMENTS

8.1 Modifications incorporated in the EUT

No modification was performed on the EUT during testing.

8.2 Deviations from the standards and/or laboratory tests procedure

No deviation from standards and/or test laboratory procedure was performed during testing.

9 STATEMENT OF COMPLIANCE

The test results recorded herein are based on a single type test of the product and therefore apply only to the tested sample. The sample was selected and prepared by client.

Maintenance of compliance is the responsibility of the client. Any modification of the product that could result in increased emissions or susceptibility should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different enclosure, different line filter or power supply, harnessing and/or interface cable changes, etc.).

10 TEST SUMMARY

The following table lists all tests called by the harmonized standards indicated in the test report introduction.

Test Name Standards	Test Specifications	Minimum Performance Criterion Required	EUT Serial Number	Results
Conducted Emissions FCC part 15 subpart B (2022)	Class B 150kHz-30MHz	N/A	TRX4020015	Pass
Radiated Emissions FCC part 15 subpart B (2022)	Class B 30MHz-1GHz	N/A	TRX4020015	Pass
Conducted Emissions ICES-003 Issue 7 (2020)	Class B 150kHz-30MHz	N/A	TRX4020015	Pass
Radiated Emissions ICES-003 Issue 7 (2020)	Class B 30MHz-1GHz	N/A	TRX4020015	Pass
Conducted Emissions EN 55032 (2015) A11 (2020)	Class B 150kHz-30MHz	N/A	TRX4020015	Pass
Radiated Emissions EN 55032 (2015) A11 (2020)	Class B 30MHz-1GHz	N/A	TRX4020015	Pass
Harmonic Current Emission Limits EN IEC 61000-3-2 (2019) A1 (2021)	Class A	N/A	TRX4020015	Pass
Voltage Fluctuations and Flicker Limitations EN 61000-3-3 (2013) A1 (2019) A2 (2021)	Observation period for P_{st}: 10 min Observation period for P_{lt}: 120 min	N/A	TRX4020015	Pass
Electrostatic Discharge Immunity IEC 61000-4-2 (2008) EN 61000-4-2 (2009)	Contact: ±4kV Air: ±2kV, ±4kV, ±8kV	B	TRX4020015	Pass
Radiated Electromagnetic Field Immunity IEC 61000-4-3 (2020)	80MHz-1000MHz: 3V/m 1.8GHz, 2.6GHz: 3V/m 3.5GHz, 5GHz: 3V/m	A	TRX4020008	Pass
Electrical Fast Transient Immunity IEC 61000-4-4 (2012)	Power: ±1kV / 5kHz I/O Ports: ±0.5kV / 5kHz xDSL Ports: ±0.5kV / 100kHz	B	TRX4020015	Pass
Surge Immunity IEC 61000-4-5 (2014) A1 (2017) EN 61000-4-5 (2014) A1 (2017)	Power: ±0.5kV ±1kV ±2kV L-PE / ±0.5kV ±1kV L-L I/O Ports: N/A Communication Ports: N/A	B	TRX4020015	Pass
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields IEC 61000-4-6 (2013) EN 61000-4-6 (2014)	Power: 3Vrms I/O Ports: 3Vrms Communication Ports: 3Vrms	A	TRX4020008	Pass
Power Frequency Magnetic Field Immunity IEC 61000-4-8 (2009) EN 61000-4-8 (2010)	Continuous Field: 1A/m / 50Hz & 60Hz	A	TRX4020015	Pass

Test Name Standards	Test Specifications	Minimum Performance Criterion Required	EUT Serial Number	Results
Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC Input IEC 61000-4-11 (2020)	Voltage dips: 0%Un during half cycle (at 60Hz) 70%Un during 25 cycles (at 50Hz) 70%Un during 30 cycles (at 60Hz) Short interruptions: 0%Un during 250 cycles (at 50Hz) 0%Un during 300 cycles (at 60Hz)	 B C C C C	TRX4020015	Pass

Table 4: Test Summary

11 EMISSIONS TESTS

11.1 Conducted Emissions

11.1.1 Test Details

REFERENCE STANDARD	EN 55032 (2015) A11 (2020) ANSI C63.4 (2014)

SPECIFICATIONS	
Limit	EN 55032 (2015) A11 (2020) class A FCC part 15 subpart B (2022) class A ICES-003 Issue 7 (2020) class A
Frequency Range	150kHz – 30MHz
Installation	Table-top equipment

EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz 120V/60Hz

TEST INFO	
Test Date (yyyy-mm-dd)	2024-02-01
Temperature °C (For Info Only)	23.8
Relative humidity % (For Info Only)	19.9
Atmospheric pressure kPa (For Info Only)	101.0
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

11.1.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
TDK	Emission Anechoic Chamber	16706-1	5412	24	2024-08-26 (NSA / SVSWR)
NEXIO	Software	BAT-EMC v2022.0.23.0	N/A	N/A	N/A
Agilent	EMI receiver	MXE N9038A	MY52130044	12	2024-11-14
NARDA	LISN	PMM L2-16B	000WX20801	12	2024-06-23
NARDA	LISN	PMM L2-16B	000WX20813	24	2025-09-25

Table 5: Conducted Emissions – Test Equipment

11.1.3 Test Results

Tested Line	Frequency (MHz)	Average Limit (dBµV)	Quasi-Peak Limit (dBµV)	Results
Power – Phase (230V/50Hz)	0.150 – 0.50	66	79	Pass
	0.50 – 30	60	73	
Power – Neutral (230V/50Hz)	0.150 – 0.50	66	79	Pass
	0.50 – 30	60	73	
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client.				

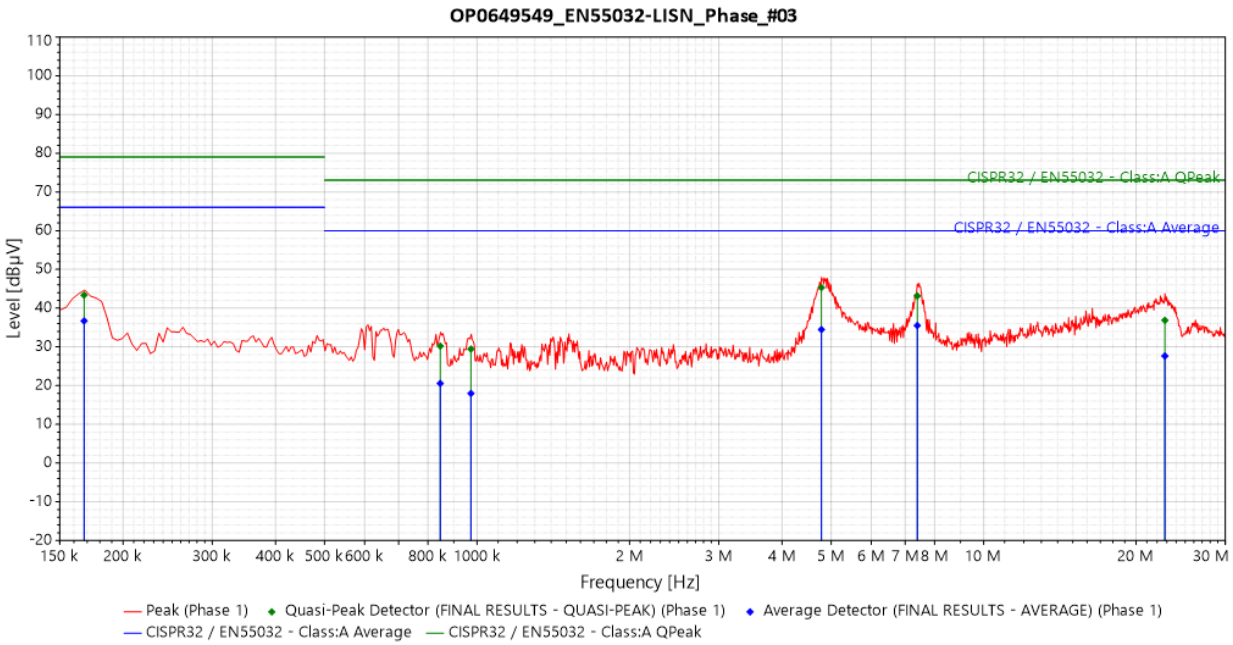
Table 6: Conducted Emissions – Test Results – EN55032 Class A

Tested Line	Frequency (MHz)	Average Limit (dBµV)	Quasi-Peak Limit (dBµV)	Results
Power – Phase (120V/60Hz)	0.150 – 0.50	66	79	Pass
	0.50 – 30	60	73	
Power – Neutral (120V/60Hz)	0.150 – 0.50	66	79	Pass
	0.50 – 30	60	73	
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client.				

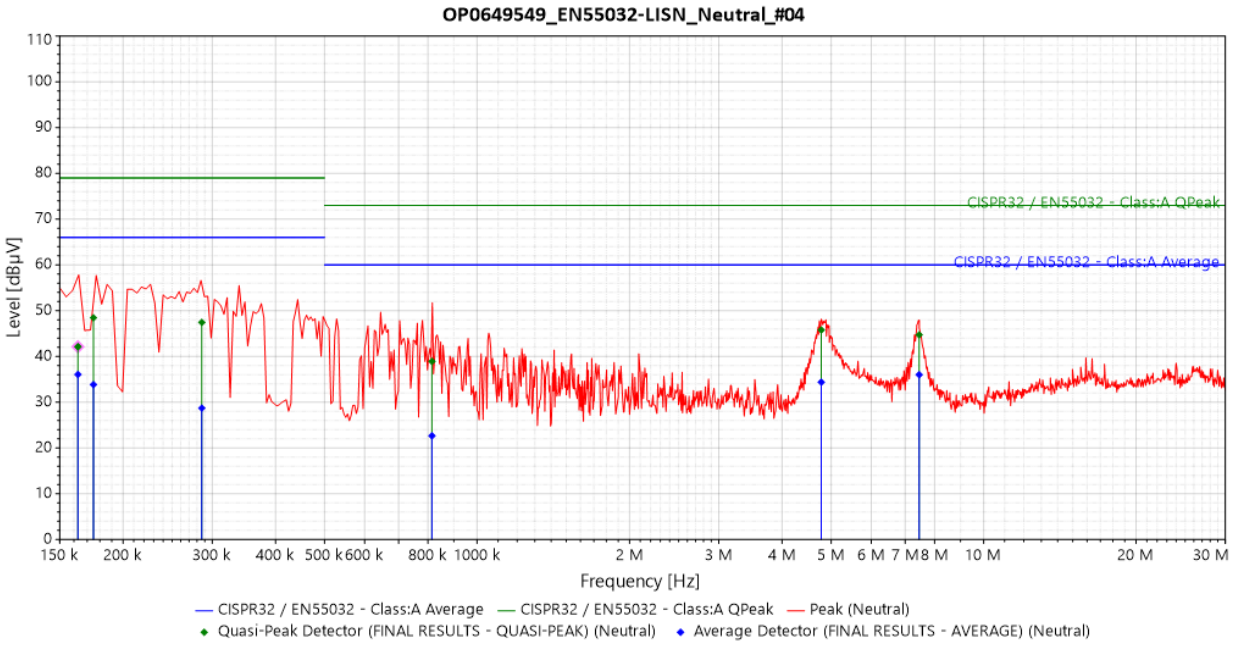
Table 7: Conducted Emissions – Test Results – FCC Part 15 Subpart B / ICES-003 Class A

11.1.4 Test Data

See APPENDIX A for data files.



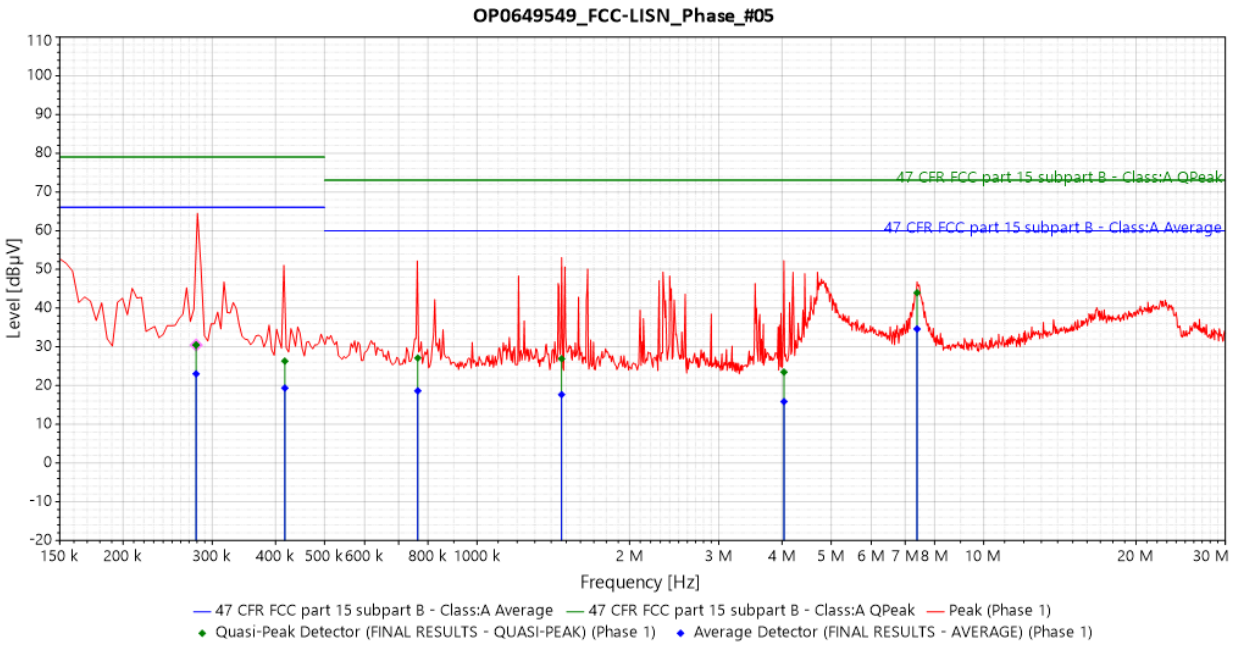
Graph 1: Conducted Emissions – EN55032– Power – Phase



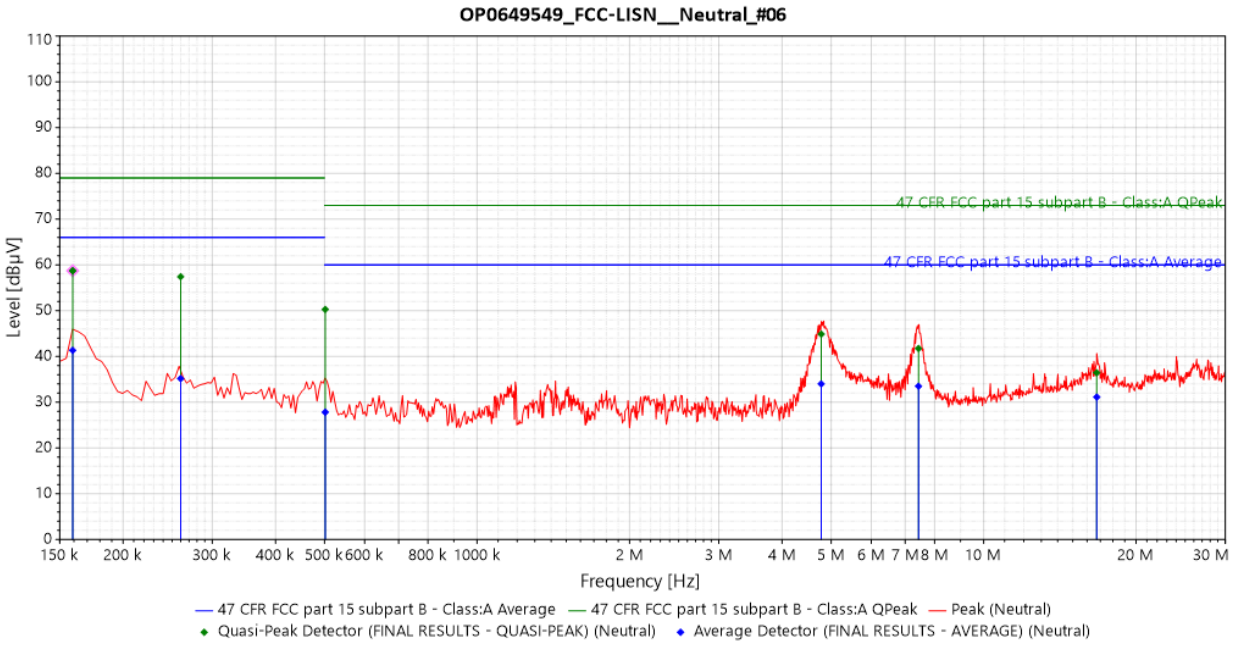
Graph 2: Conducted Emissions – EN55032– Power – Neutral

Tested Line	Frequency (MHz)	Detector	Level (dBµV)	Limit (dBµV)	Bandwidth (kHz)	Measurement Time (s)	Margin (dB)
Power – Phase (230V/50Hz)	7.397	Average	35.503	60	9 kHz	15	24.497
Power – Neutral (230V/50Hz)	7.460	Average	36.014	60	9 kHz	15	23.986

Table 8: Conducted Emissions – Lowest Margin according to EN55032



Graph 3: Conducted Emissions – FCC part 15 Subpart B – Power – Phase



Graph 4: Conducted Emissions – FCC part 15 Subpart B – Power – Neutral

Tested Line	Frequency (MHz)	Detector	Level (dBµV)	Limit (dBµV)	Bandwidth (kHz)	Measurement Time (s)	Margin (dB)
Power – Phase (120V/60Hz)	7.388	Average	34.633	60	9 kHz	15	25.367
Power – Neutral (120V/60Hz)	0.159	Q-Peak	58.72	79	9 kHz	15	20.279

Table 9: Conducted Emissions – Lowest Margin according to FCC Part 15 Subpart B / ICES-003

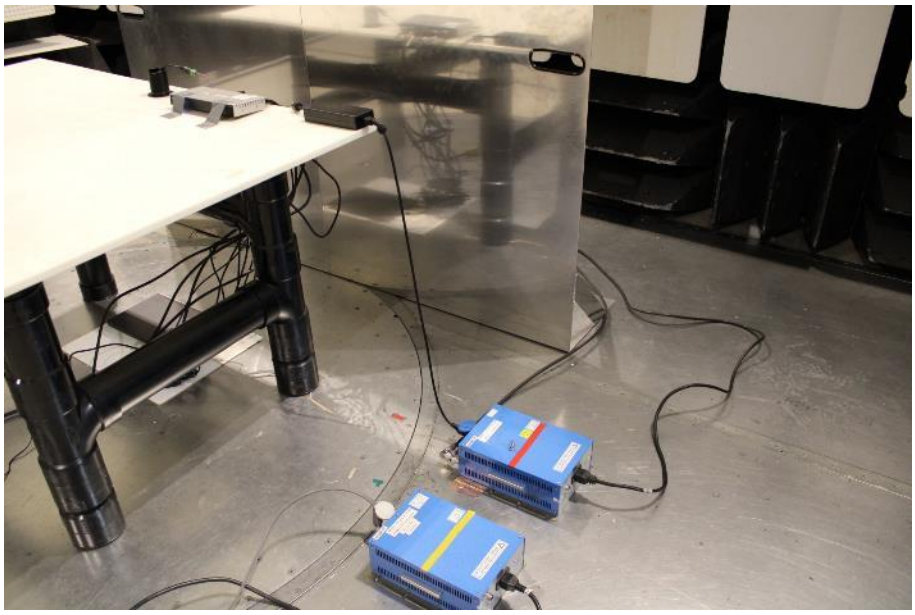


Photo 15: Conducted Emissions – Test Setup

11.1.5 Test Method

Conducted emissions were performed using the procedures of the reference standard.

Once the configuration or mode of operation causing the highest emission level (worst case) was determined, a scan was performed with the Peak detector in the frequency range specified by the reference standard.
Frequencies where level was above the limit or within 20dB of the limit were recorded. The level at these frequencies was measured with the detector specified by the limit.

11.2 Radiated Emissions

11.2.1 Test Details

REFERENCE STANDARD	EN55032 (2015) A11 (2020) ANSI C63.4 (2014)

SPECIFICATIONS	
Limit	EN55032 (2015) A11 (2020) class A FCC part 15 subpart B (2022) class A ICES-003 Issue 7 (2020) class A
Frequency Range	30MHz – 1GHz 1GHz - 2GHz
Measurement Distance	3m
Installation	Table-top equipment

EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz 120V/60Hz

TEST INFO	
Test Date (yyyy-mm-dd)	2024-02-01
Temperature °C (For Info Only)	23.8
Relative humidity % (For Info Only)	19.9
Atmospheric pressure kPa (For Info Only)	101.0
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

11.2.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
TDK	Emission Anechoic Chamber	16706-1	5412	24	2024-08-26 (NSA / SVSWR)
Sunol Sciences Corporation	Antenna Positioning Tower	TLT2	LABCEM #0181	N.C.R.	N.C.R.
Sunol Sciences Corporation	Flush Mount Turntable	FM2011VS/2022VS	LABCEM #0182	N.C.R.	N.C.R.
Sunol Sciences Corporation	System Controller	SC110V	LABCEM #0183	N.C.R.	N.C.R.
NEXIO	Software	BAT-EMC v2022.0.23.0	N/A	N/A	N/A
Agilent	EMI receiver	MXE N9038A	MY52130044	12	2024-11-14
TESEQ	Bilog antenna	CBL6112D	33825	24	2024-07-11
TESEQ	Horn antenna	BHA9118	33053	24	2024-09-20
Amplical	Amplifier 1GHz-18GHz	AMP1G18-30-N/PSU	121212	12	2025-01-05

Table 10: Radiated Emissions – Test Equipment

11.2.3 Test Results

Frequency (MHz)	Quasi-Peak Limit extrapolated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Results
30 – 230	50	-	-	Pass
230 – 1000	57	-	-	
1000 – 3000	-	56	76	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client.				

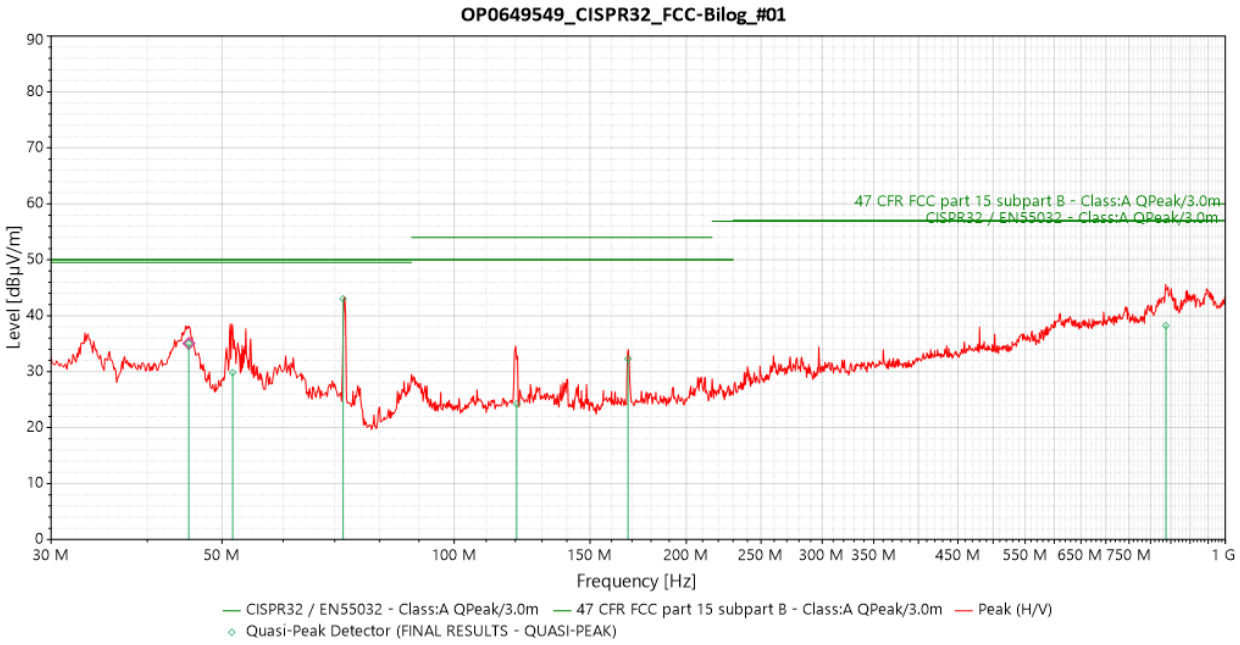
Table 11: Radiated Emissions – Test Results – EN55032 Class A

Frequency (MHz)	Quasi-Peak Limit extrapolated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Results
30 – 88	49.5	-	-	Pass
88 – 216	54.0	-	-	
216 – 960	56.9	-	-	
960 – 1000	60.0	-	-	
1000 – 2000	-	60	80	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client.				

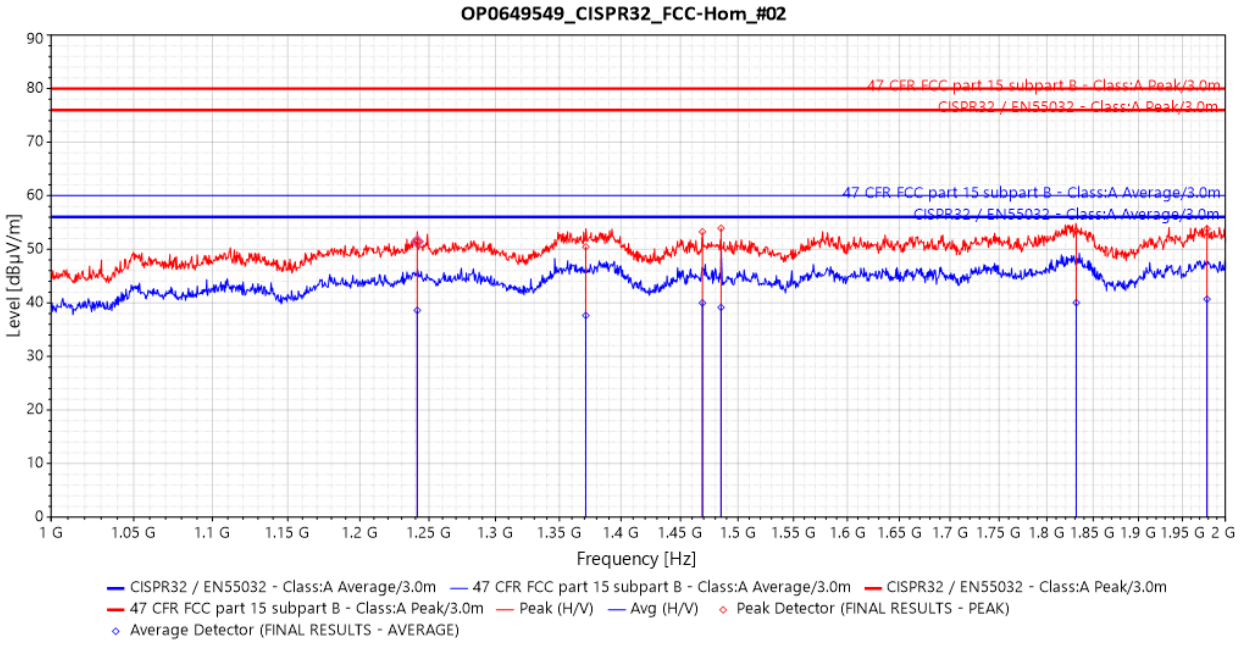
Table 12: Radiated Emissions – Test Results – FCC Part 15 Subpart B / ICES-003 Class A

11.2.4 Test Data

See APPENDIX B for data files.



Graph 5: Radiated Emissions 30MHz-1GHz



Graph 6: Radiated Emissions 1GHz-2GHz

Frequency (MHz)	Detector	Level (dBµV/m)	Limit (dBµV/m)	Bandwidth (kHz)	Measurement Time(s)	Margin (dB)
71.75	Quasi-Peak	43.01	50	120	15	6.984
1978	Average	40.697	56	1000	15	15.303

Table 13: Radiated Emissions – Lowest Margin according to EN55032

Frequency (MHz)	Detector	Level (dBµV/m)	Limit (dBµV/m)	Bandwidth (kHz)	Measurement Time(s)	Margin (dB)
71.75	Quasi-Peak	43.01	49.5	120	15	6.484
1978	Average	40.697	60	1000	15	19.303

Table 14: Radiated Emissions – Lowest Margin according to FCC Part 15 Subpart B / ICES-003

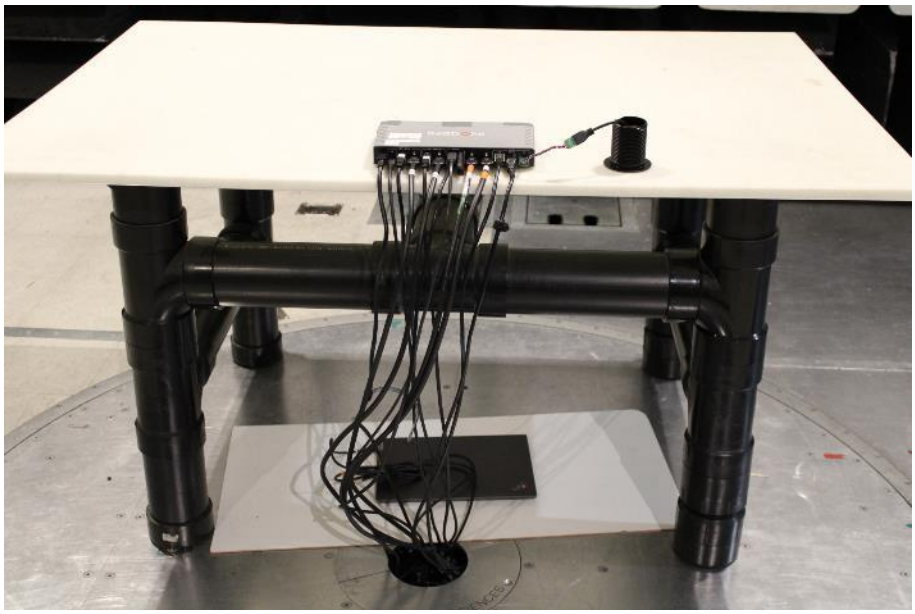


Photo 16: Radiated Emissions – Test Setup

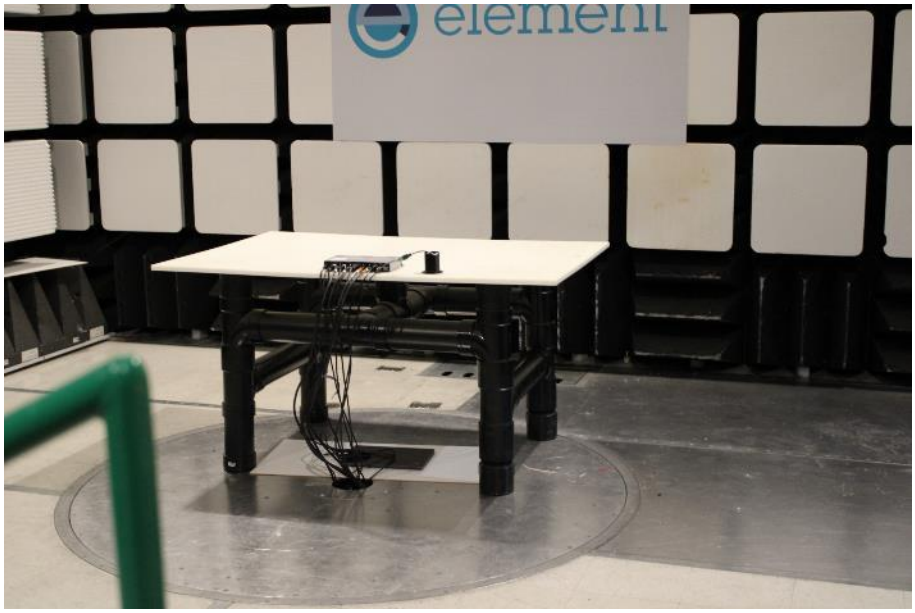


Photo 17: Radiated Emissions – Test Setup 30MHz-1GHz

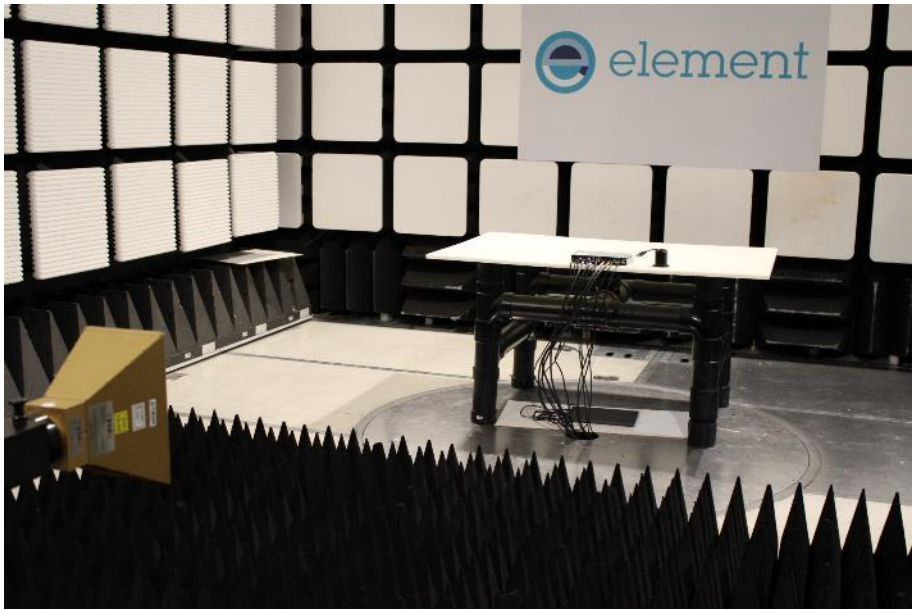


Photo 18: Radiated Emissions – Test Setup 1GHz-2GHz

Photo 19: Radiated Emissions – Support Equipment

11.2.5 Test Method

Radiated emissions were performed using the procedures of the reference standard.

Once the configuration or mode of operation causing the highest emission level (worst case) was determined, spectral previews were performed with the Peak detector in the frequency range specified by the reference standard.
Frequencies where level was above the limit or within 10 dB of the limit were recorded. The level at these frequencies was maximized and measured with the detector specified by the limit.

Note on FCC measurements combined with CISPR measurements for frequency above 1 GHz
Measurement methods of radiated emissions are slightly different between FCC regulation and CISPR standard. The FCC through ANSI C63.4 requires boresighting (tilt) and CISPR16-2-3 does not. For better efficiency, only the boresighting method is carried out, which may increase the level of disturbances during the final evaluation with the CISPR limit.

11.3 Harmonic Current Emissions

11.3.1 Test Details

REFERENCE STANDARD	IEC 61000-3-2 (2018) A1 (2020)
SPECIFICATIONS	
Limit	Class A
EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz
TEST INFO	
Test Date (yyyy-mm-dd)	2024-01-31
Temperature °C (For Info Only)	23.8
Relative humidity % (For Info Only)	17.1
Atmospheric pressure kPa (For Info Only)	101.8
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

11.3.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
TESEQ	Software	Win2100 v4.9	N/A	N/A	N/A
TESEQ	AC-DC Power source	NSG 1007	1232A04499 (NSG 1007)	24	2025-07-18

Table 15: Harmonic Current Emissions – Test Equipment

11.3.3 Test Results

Class A ☒	Class B ☐	Class C ☐	Class D ☐

Class A:
Equipment not specified as belonging to Class B, C or D shall be considered as Class A equipment.

- balanced three-phase equipment;
- household appliances, excluding those specified as belonging to Class B, C or D;
- vacuum cleaners;
- high pressure cleaners;
- tools, excluding portable tools;
- independent phase control dimmers;
- audio equipment;
- professional luminaires for stage lighting and studios.

NOTE 1 Equipment that can be shown to have a significant effect on the supply system may be reclassified in a future of this document, taking into account the following factors:
– number of pieces of equipment in use;
– duration of use;
– simultaneity of use;
– power consumption;
– harmonic spectrum, including phase.

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 6.3.2 less than or equal to 600 W, of the following types:

- personal computers and personal computer monitors;
- television receivers;
- refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

NOTE 2 Class D limits are reserved for equipment that, by virtue of the factors listed in note 1, can be shown to have a pronounced effect on the public electricity supply system.

*Starting and stopping
When a piece of equipment is brought into operation or is taken out of operation, manually or automatically, harmonic currents and power are not taken into account for the first 10 s following the switching event.
The equipment under test shall not be in stand-by mode (see 3.14) for more than 10 % of any observation period.

Table 16: Harmonic Current Emissions – Classification of Equipment

Tested Line	Limit	Observation Time (min)	Harmonics Repeatability Verification ≤5%	Results
Power (230V/50Hz)	Class A	2	YES	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client.				

Table 17: Harmonic Current Emissions – Test Results

11.3.4 Test Data

See APPENDIX C for data files

Photo 20: Harmonic Current Emissions – Test Setup

11.3.5 Test Method

Harmonic current emissions measurements were performed using the procedures of the reference standard.

11.4 Voltage Fluctuations and Flicker Measurements

11.4.1 Test Details

REFERENCE STANDARD	IEC 61000-3-3 (2013) A1 (2017) A2 (2021)

SPECIFICATIONS	
P_{st} Observation Period	10 min
P_{lt} Observation Period	120 min

EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz
Manual Switching	NO

TEST INFO		
Test Date (yyyy-mm-dd)	2024-01-31	2024-02-01
Temperature °C (For Info Only)	23.8	23.8
Relative humidity % (For Info Only)	17.1	19.9
Atmospheric pressure kPa (For Info Only)	101.8	101.0
Operator	Benoit Carle	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)	Mathieu Martin (Inogeni)

11.4.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
TESEQ	Software	Win2100 v4.9	N/A	N/A	N/A
TESEQ	AC-DC Power source	NSG 1007	1232A04499 (NSG 1007)	24	2025-07-18
TESEQ	Lumped impedance	CCN 1000-1	1232A04499 (CCN 1000-1)	24	2025-07-18

Table 18: Voltage Fluctuations and Flicker Measurements – Test Equipment

11.4.3 Test Results

Parameters	Limit	Results
Short-term flicker value: P_{st}	1.0	Pass
Long-term flicker value: P_{lt}	0.65	Pass
Voltage change for more than 500ms: d(t)	3.3%	Pass
Relative steady state voltage change: dc	3.3%	Pass
Maximum relative voltage change: d_{max}	4%	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client.		

Table 19: Voltage Fluctuations and Flicker Measurements – Test Results

11.4.4 Test Data

See APPENDIX D for data files

Test setup was identical to harmonic current emissions measurements.

11.4.5 Test Method

Voltage fluctuations and flicker measurements were performed using the procedures of the reference standard.

12 IMMUNITY TESTS

12.1 Electrostatic Discharge Immunity

12.1.1 Test Details

REFERENCE STANDARD	IEC 61000-4-2 (2008)
SPECIFICATIONS	
Test Level	Contact: ±4kV Air: ±2kV, ±4kV, ±8kV
Installation	Table-top equipment
Ungrounded Equipment	NO
PERFORMANCE CRITERION	B
EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz
TEST INFO	
Test Date (yyyy-mm-dd)	2024-01-31
Temperature Min 15°C – Max 35°C	23.8
Relative Humidity Min 30% - Max 60%	32.5
Atmospheric Pressure Min 86kPa – Max 106kPa	101.8
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

12.1.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
Vaisala	Thermo-Hygrometer	MI70/HMP77	H4610004/JO430012	24	2025-08-16
EMC-Partner	Discharge Generator	ESD3000	2076	12	2024-08-22
EMC-Partner	Relay Module	ESD3000RM32	1822	12	2024-08-22
EMC-Partner	Discharge Network 150pF/330Ohms	ESD3000DN1	1777	12	2024-08-22

Table 20: ESD – Test Equipment

12.1.3 Test Results

Coupling Plane	Position	Polarity Test Level (kV)	Number	Time Interval (s)	Generator Perpendicular	Comments	Results
HCP	Front	±4	10+ / 10-	1	YES	No event	Pass
VCP	Front	±4	10+ / 10-	1	YES	No event	Pass
	Right	±4	10+ / 10-	1	YES	No event	Pass
	Rear	±4	10+ / 10-	1	YES	Note 1	Pass
	Left	±4	10+ / 10-	1	YES	No event	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.							
Note 1: Due to cables, VCP was placed at 21cm from EUT (standard distance is 10cm).							

Table 21: ESD – Test Results – Indirect Discharges – Toggle-Rooms

Coupling Plane	Position	Polarity Test Level (kV)	Number	Time Interval (s)	Generator Perpendicular	Comments	Results
HCP	Front	±4	10+ / 10-	1	YES	No event	Pass
VCP	Front	±4	10+ / 10-	1	YES	No event	Pass
	Right	±4	10+ / 10-	1	YES	No event	Pass
	Rear	±4	10+ / 10-	1	YES	No event	Pass
	Left	±4	10+ / 10-	1	YES	No event	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.							

Table 22: ESD – Test Results – Indirect Discharges – PSU

ESD Point	ESD Type	Test Level (kV)	Number	Time Interval (s)	Generator Perpendicular	Comments	Results
C1-C3 C5-C6 C9-C13 C16-C17	Contact	±4	10+ / 10-	1	YES	No event	Pass
C4,C7, C8, C14, C15	Contact	±4	10+ / 10-	1	YES	Note 1	Pass
NONE	Air	±2, ±4, ±8	10+ / 10-	1	N/A	Note 2	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.							
Note 1: Self-recoverable degradation: : Picture on the laptop flickers during a split of a second. Got back to normal by itself. Note 2: After discharge points research, no possible air discharge was found on the EUT.							

Table 23: ESD – Test Results – Direct Discharges – Toggle-Rooms

12.1.4 Test Data

Photo 21: ESD – Test Setup

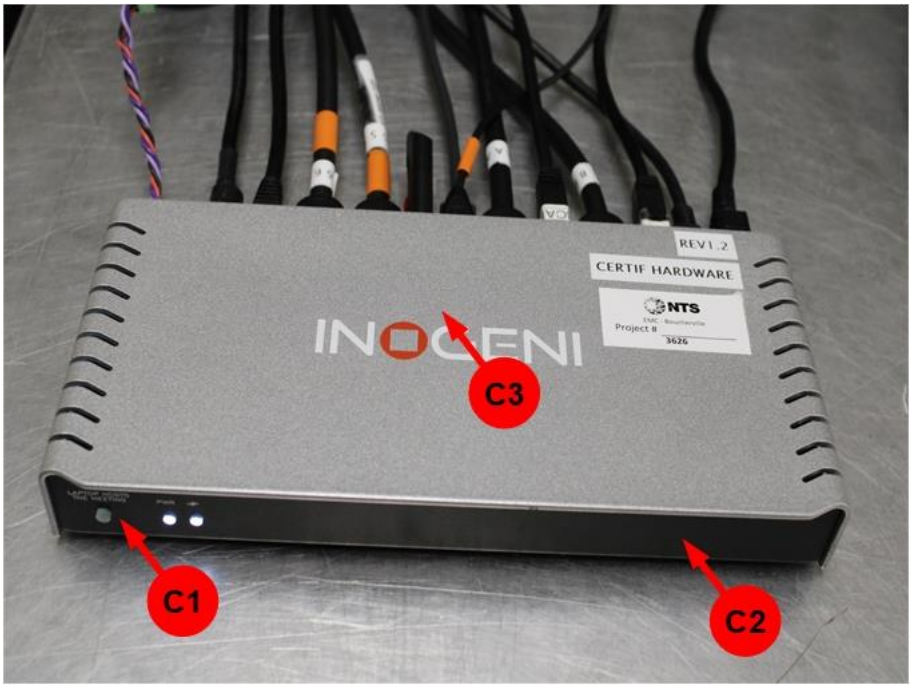


Photo 22: ESD – Location of Discharge Points #1

Photo 23: ESD – Location of Discharge Points #2

Photo 24: ESD – Location of Discharge Points #3

12.1.5 Test Method

Electrostatic discharge immunity tests were performed using the procedures of the reference standard.

Application of direct discharges was applied to points and surfaces of EUT which are accessible to person during normal use. If contact discharge cannot be applied, the air discharge method shall be performed.

Application of indirect discharges was applied to the horizontal coupling plane (0.1m from the front of EUT) and to vertical coupling plane (VCP is positioned at 0.1m from EUT in order to illuminate the four faces of EUT).

12.2 Radiated Electromagnetic Field Immunity

12.2.1 Test Details

REFERENCE STANDARD	IEC 61000-4-3 (2020)

SPECIFICATIONS			
TEST	#1	#2	#3
Frequency Range	80MHz-1000MHz	1.8GHz; 2.6GHz	3.5GHz, 5GHz
Test Level	3V/m	3V/m	3V/m
Test Distance	2m	2m	2m
Uniformity Field Area	Area: 1.5m x 1.5m Lower Edge @ 80cm Antenna Height @ 1.55m	Area: 1.5m x 1.5m Lower Edge @ 80cm Antenna Height @ 1.55m	Area: 1.5m x 1.5m Lower Edge @ 80cm Antenna Height @ 1.55m
Modulation	AM 80% / 1kHz	AM 80% / 1kHz	AM 80% / 1kHz
Frequency Step	1%	N/A	N/A
Dwell Time	0.5s	10s	10s
Illuminated Face	4		
Installation	Table-top equipment		

PERFORMANCE CRITERION	A

EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz

TEST INFO	
Test Date (yyyy-mm-dd)	2024-01-30
Temperature °C (For Info Only)	24.0
Relative humidity % (For Info Only)	16.2
Atmospheric pressure kPa (For Info Only)	102.4
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

12.2.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
TDK	Immunity Anechoic Chamber	16706-2	5712	N/A	N/A
NEXIO	Software	BAT-EMC v2022.0.23.0	N/A	N/A	N/A
TESEQ	Signal generator	ITS 6006	33007	12	2024-08-21
Werlatone	Directional coupler (80MHz-1GHz)	C3908-10	98552	12	2024-12-22
Werlatone	Directional coupler (0.8GHz-3GHz)	C6721-10	98746	12	2024-12-22
Agilent	Directional coupler (2GHz-18GHz)	773D	MY28390533	12	2024-12-22
TESEQ	Power meter	PM 6006	72804	12	2024-08-21
TESEQ	Power meter	PM 6006	72805	12	2024-08-21
TESEQ	Power meter	PM 6006	77352	12	2024-08-21
TESEQ	Power meter	PM 6006	77353	12	2024-08-21
TESEQ	RF amplifier (80MHz-1GHz)	CBA 1G-500	T44193	VERIF	VERIF
TESEQ	RF amplifier (800MHz-3GHz)	CBA 3G-180	T44194	VERIF	VERIF
IFI	RF Amplifier (1GHz-6GHz)	S62-50	Q1539-0113	VERIF	VERIF
Schwarzbeck	Antenna	STLP 9128 D special	9128DS 025	VERIF	VERIF
Com-Power	Horn Antenna	AH-118	071324	24	2024-08-03
Narda	Electric Field Probe	PMM EP601	711WX80868	18	2025-03-12
LABCEM	RF Uniformity Field 80MHz-1GHz (36V/m)	N/A	N/A	12	2024-12-27
LABCEM	RF Uniformity Field 1GHz-3GHz (18V/m)	N/A	N/A	12	2024-12-27
LABCEM	RF Uniformity Field 3GHz-6GHz (9V/m)	N/A	N/A	12	2024-12-28

Table 24: Radiated EM Field – Test Equipment

12.2.3 Test Results

Illuminated Face	Frequencies (MHz)	Test Level (V/m)	Modulation	Polarization	Comments	Results
Front	80 - 1000	3	AM / 1kHz	Horizontal Vertical	No event	Pass
	1800, 2600	3	AM / 1kHz	Horizontal Vertical	No event	Pass
	3500, 5000	3	AM / 1kHz	Horizontal Vertical	No event	Pass
Right	80 - 1000	3	AM / 1kHz	Horizontal Vertical	No event Note1	Pass
	1800, 2600	3	AM / 1kHz	Horizontal Vertical	No event Note1	Pass
	3500, 5000	3	AM / 1kHz	Horizontal Vertical	No event Note1	Pass
Rear	80 - 1000	3	AM / 1kHz	Horizontal Vertical	No event	Pass
	1800, 2600	3	AM / 1kHz	Horizontal Vertical	No event	Pass
	3500, 5000	3	AM / 1kHz	Horizontal Vertical	No event	Pass
Left	80 - 1000	3	AM / 1kHz	Horizontal Vertical	No event	Pass
	1800, 2600	3	AM / 1kHz	Horizontal Vertical	No event	Pass
	3500, 5000	3	AM / 1kHz	Horizontal Vertical	No event	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.						
Note 1: 1m of cable was exposed to the electromagnetic field						

Table 25: Radiated EM Field – Test Results

12.2.4 Test Data

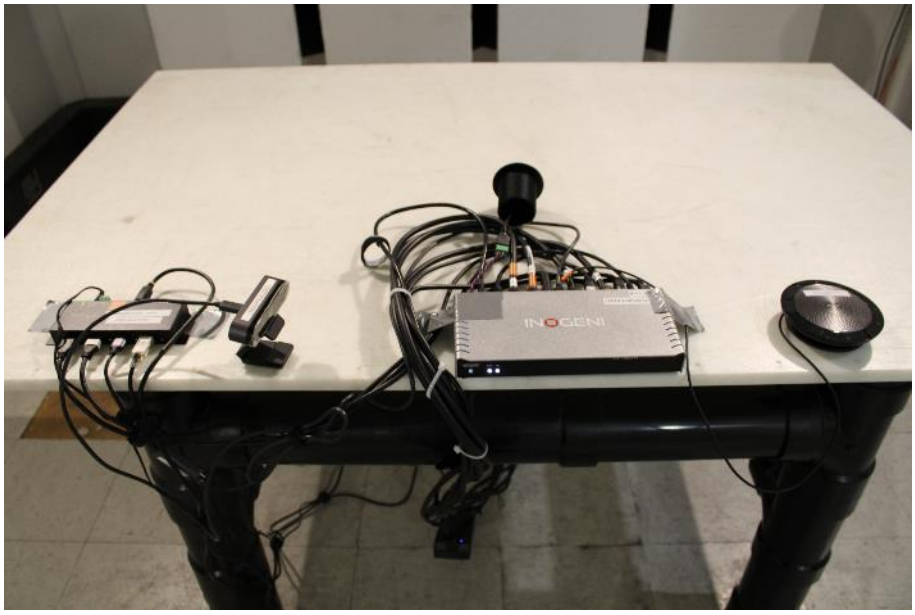


Photo 25: Radiated EM Field – Test setup – Front

Photo 26: Radiated EM Field – Test setup – Right

Photo 27: Radiated EM Field – Test setup – Rear

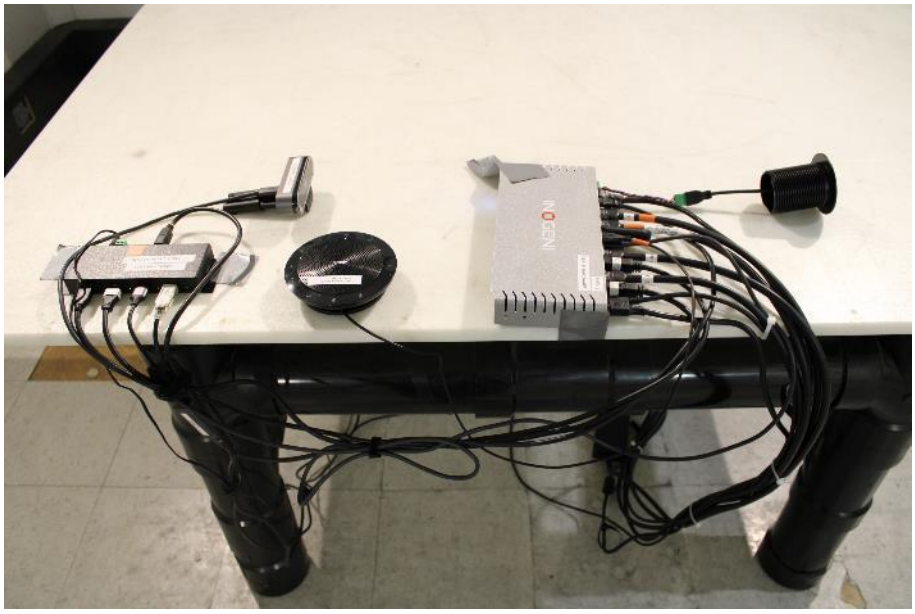


Photo 28: Radiated EM Field – Test setup – Left

Photo 29: Radiated EM Field – Test setup – >3GHz

12.2.5 Test Method

Radiated field immunity tests were performed using the procedures of the reference standard.

During the first illuminated face of EUT, radiated immunity test equipment's were verified by monitoring the EM field.

12.3 Electrical Fast Transient Immunity

12.3.1 Test Details

REFERENCE STANDARD	IEC 61000-4-4 (2012)

SPECIFICATIONS	
Test Level	Power Ports: ±1kV I/O Ports: ±0.5kV Communication Ports: ±0.5kV
Repetition Frequency	5kHz & 100kHz
Installation	Table-top equipment

PERFORMANCE CRITERION	B

EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz

TEST INFO	
Test Date (yyyy-mm-dd)	2024-01-31
Temperature °C (For Info Only)	23.8
Relative humidity % (For Info Only)	14.8
Atmospheric pressure kPa (For Info Only)	101.8
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

12.3.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
EMC-Partner	Software	TEMA3000 v4.10.4	N/A	N/A	N/A
EMC-Partner	Multifunction generator	IMU-MGE	1517	12	2024-08-25
Hilo-Test GmbH	EFT Clamp	EFTC 2012	2204144	12	2024-10-19

Table 26: EFT – Test Equipment

12.3.3 Test Results

Tested Line	Polarity Test level (kV)	Coupling Method	Repetition Frequency (kHz)	Test Duration By Polarity (s)	Comments	Results
L, N, PE	±1	CDN	5	60	Note 1	Pass
HDMI Out	±0.5	Capacitive clamp	5	60	Note 1	Pass
USB, RS232, Ethernet	±0.5	Capacitive clamp	5	60	No event	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.						
Note 1: Self-recoverable degradation: EUT Camera turned OFF but restarted on its own.						

Table 27: EFT – Test Results

12.3.4 Test Data

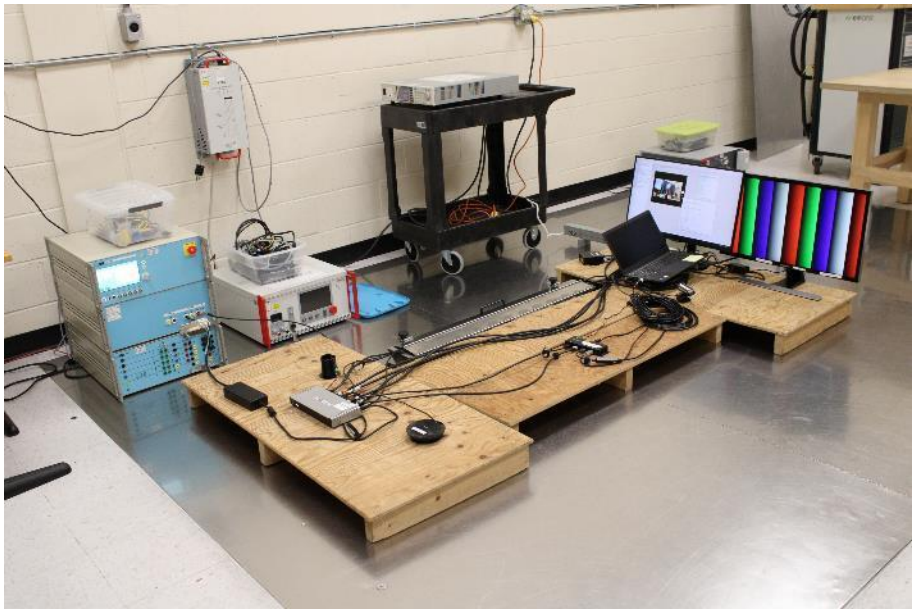


Photo 30: EFT – Test Setup

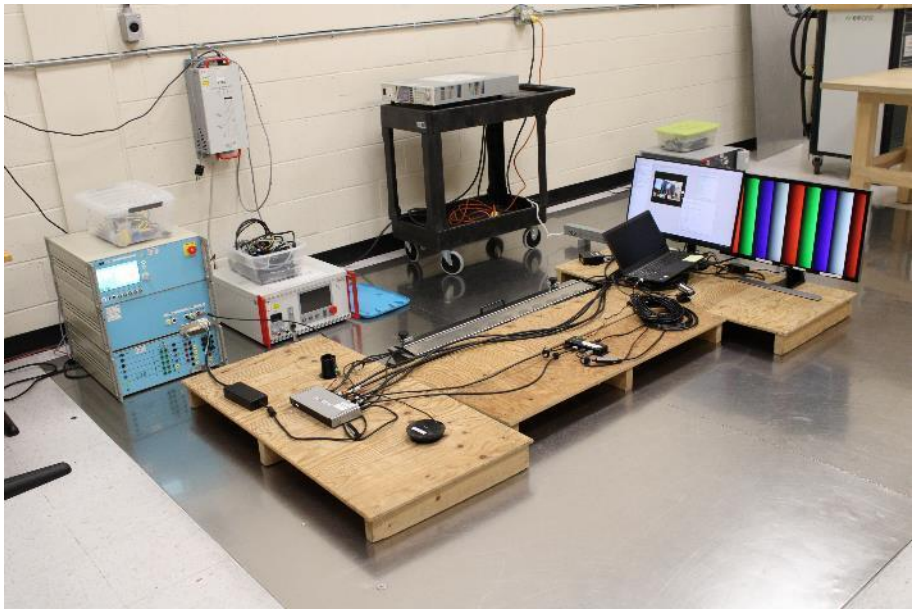


Photo 31: EFT – Test Setup – CDN – Power

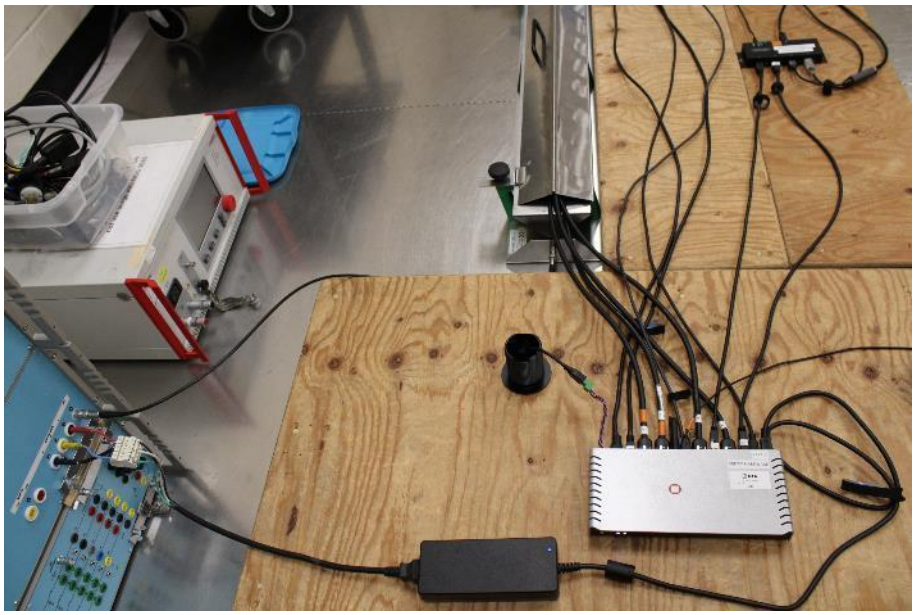


Photo 32: EFT – Test Setup – Capacitive Clamp – HDMI OUT

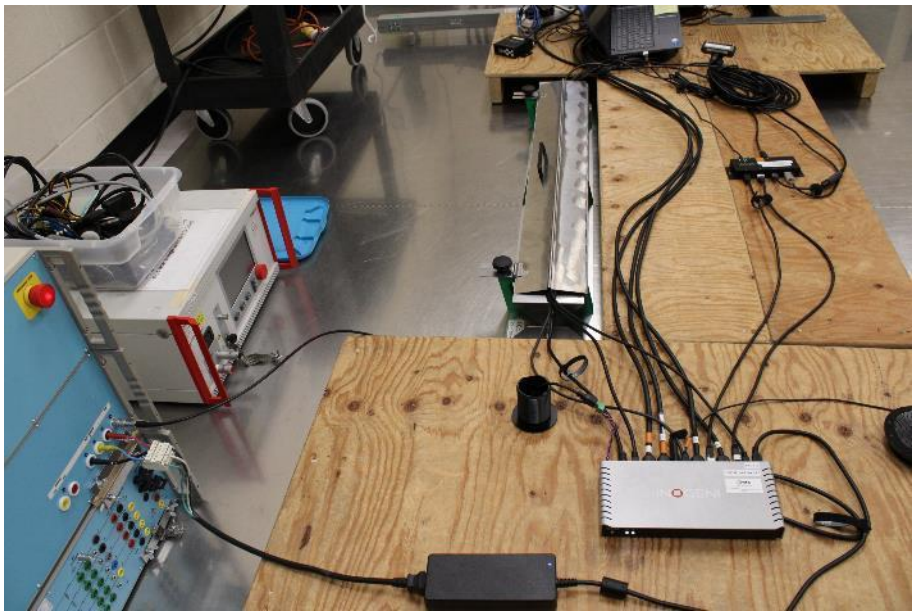


Photo 33: EFT – Test Setup – Capacitive Clamp – USB, RS232, Ethernet

12.3.5 Test Method

Electrical fast transient immunity tests were performed using the procedures of the reference standard.

12.4 Surge Immunity

12.4.1 Test Details

REFERENCE STANDARD	IEC 61000-4-5 (2014) A1 (2017)
SPECIFICATIONS	
1.2/50µs Waveform	Open-Circuit Voltage: 1.2µs/50µs Short-Circuit Current: 8µs/20µs
Test level	Power: ±0.5kV ±1kV ±2kV L-PE / ±0.5kV ±1kV L-L I/O Ports: N/A Communication Ports: N/A
PERFORMANCE CRITERION	B
EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz
TEST INFO	
Test Date (yyyy-mm-dd)	2024-01-31
Temperature °C (For Info Only)	23.8
Relative humidity % (For Info Only)	14.8
Atmospheric pressure kPa (For Info Only)	101.8
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

12.4.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
EMC-Partner	Software	TEMA3000 v4.10.4	N/A	N/A	N/A
EMC-Partner	Multifunction generator	IMU-MGE	1517	12	2024-09-20

Table 28: Surge – Test Equipment

12.4.3 Test Results

Application		Polarity Test Level (kV)	Additional Impedance	Number	Interval (s)	Phase Shifting (°)	Comments	Results
between	and							
L	PE	+0.5 +1 +2	10Ω	5+	30	90	No event	Pass
L	PE	-0.5 -1 -2	10Ω	5-	30	270	No event	Pass
N	PE	-0.5 -1 -2	10Ω	5-	30	90	No event	Pass
N	PE	+0.5 +1 +2	10Ω	5+	30	270	No event	Pass
L	N	+0.5 +1	0Ω	5+	30	90	No event	Pass
L	N	-0.5 -1	0Ω	5-	30	270	No event	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.								

Table 29: 1.2/50µs Surge – Test Results – Power Ports

12.4.4 Test Data

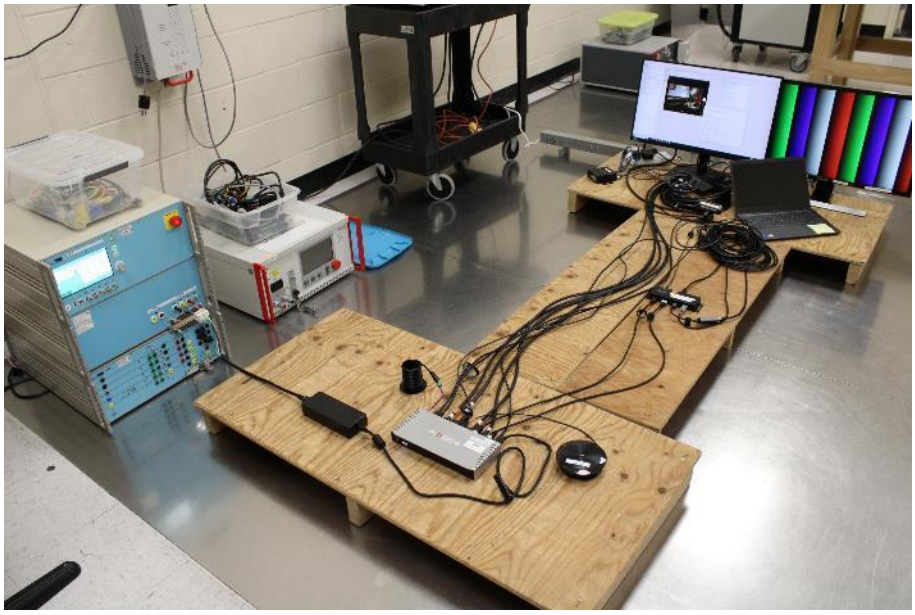


Photo 34: 1.2/50µs Surge – Test Setup

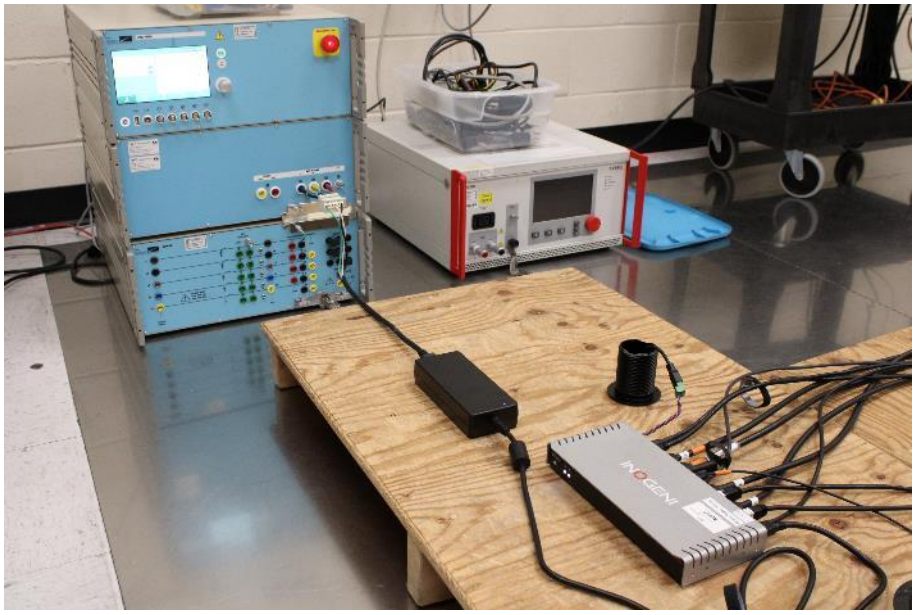


Photo 35: 1.2/50µs Surge – Test Setup – Power Ports

12.4.5 Test Method

Surge immunity tests were performed using the procedures of the reference standard.

12.5 Conducted Disturbances Immunity

12.5.1 Test Details

REFERENCE STANDARD	IEC 61000-4-6 (2013)

SPECIFICATIONS	
Test level	Power: 3Vrms I/O Ports: 3Vrms Communication Ports: 3Vrms
Frequency Range	150kHz-80MHz
Modulation	AM: 80% / 1kHz
Frequency Step	1%
Dwell Time	0.5s

PERFORMANCE CRITERION	A

EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz

TEST INFO	
Test Date (yyyy-mm-dd)	2024-01-30
Temperature °C (For Info Only)	24.0
Relative humidity % (For Info Only)	16.2
Atmospheric pressure kPa (For Info Only)	102.4
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

12.5.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
NEXIO	Software	BAT-EMC v2022.0.23.0	N/A	N/A	N/A
TESEQ	Conducted Immunity Test Generator	NSG 4070B-75	34302	12	2024-10-24
TESEQ	CDN M3	CDN M316	33960	24	2024-10-05
TESEQ	EM Clamp	KEMZ 801A	33460	24	2024-09-22
TESEQ	RF Current Clamp	MD 4070	33320	24	2024-10-17
TESEQ	Attenuation Clamp	KEMA 801A	33174	NCR	NCR
TESEQ	Attenuation Clamp	KEMA 801A	34759	NCR	NCR
Luthi	Attenuation Clamp	FTC 101	5061	NCR	NCR
Luthi	Attenuation Clamp	FTC 101	5062	NCR	NCR
Pasternack	6dB Fixed Attenuator 100W	PE7385-6	LABCEM #0256	VERIF	VERIF
LABCEM	Laboratory 3 - Conducted Voltage Immunity Calibration CDN-M3 - CI Injection Cable	N/A	N/A	12	2024-11-10
LABCEM	Laboratory 3 - Conducted Voltage Immunity Calibration EM Clamp (sn:33460) - CI Injection Cable + CI Monitoring Cable	N/A	N/A	12	2024-11-10

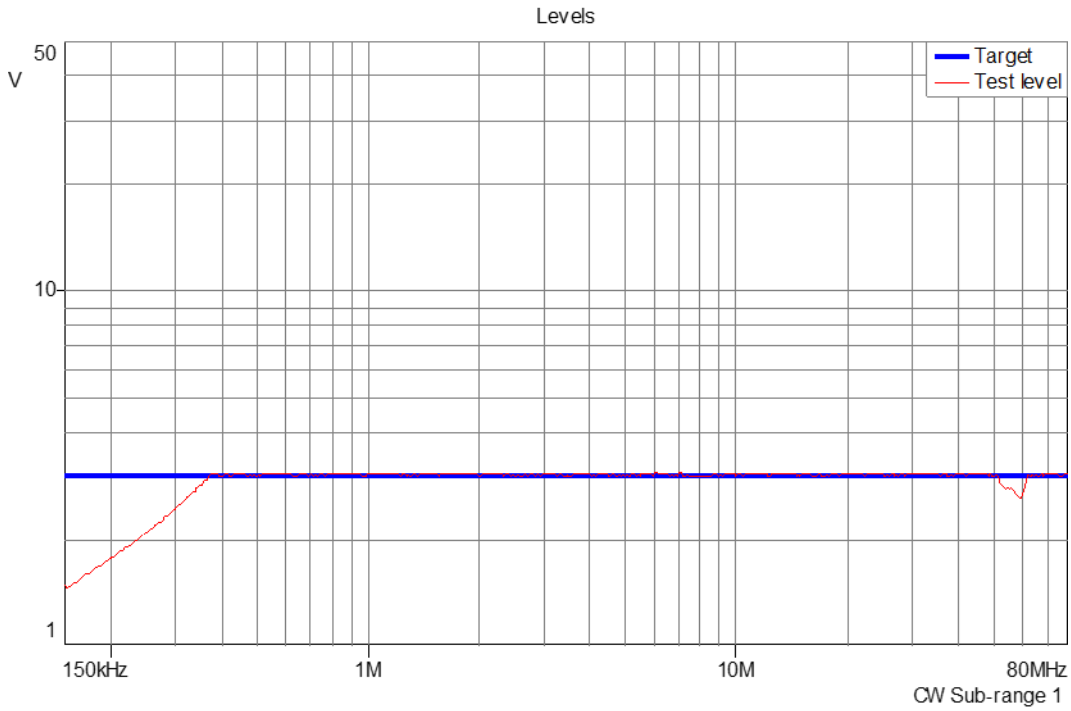
Table 30: Conducted Disturbances – Test Equipment

12.5.3 Test Results

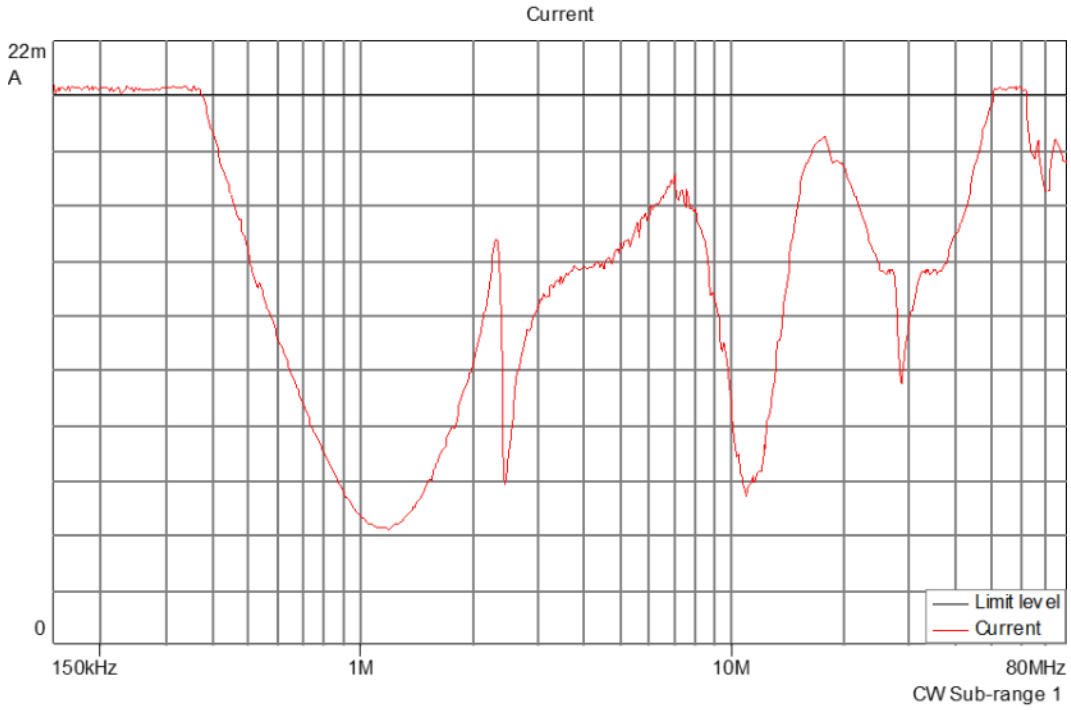
Tested Line	Coupling Method	Frequency (MHz)	Test Level (V)	Modulation	Comments	Results
Power (230V/50Hz)	CDN-M2	0.150 - 80	3	AM / 1kHz	No event	Pass
RS-232, USB, Ethernet	EM Clamp	0.150 - 80	3	AM / 1kHz	No event	Pass
HDMI Host	EM Clamp	0.150 - 80	3	AM / 1kHz	No event	Pass
HDMI Display	EM Clamp	0.150 - 80	3	AM / 1kHz	No event	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.						

Table 31: Conducted Disturbances – Test Results

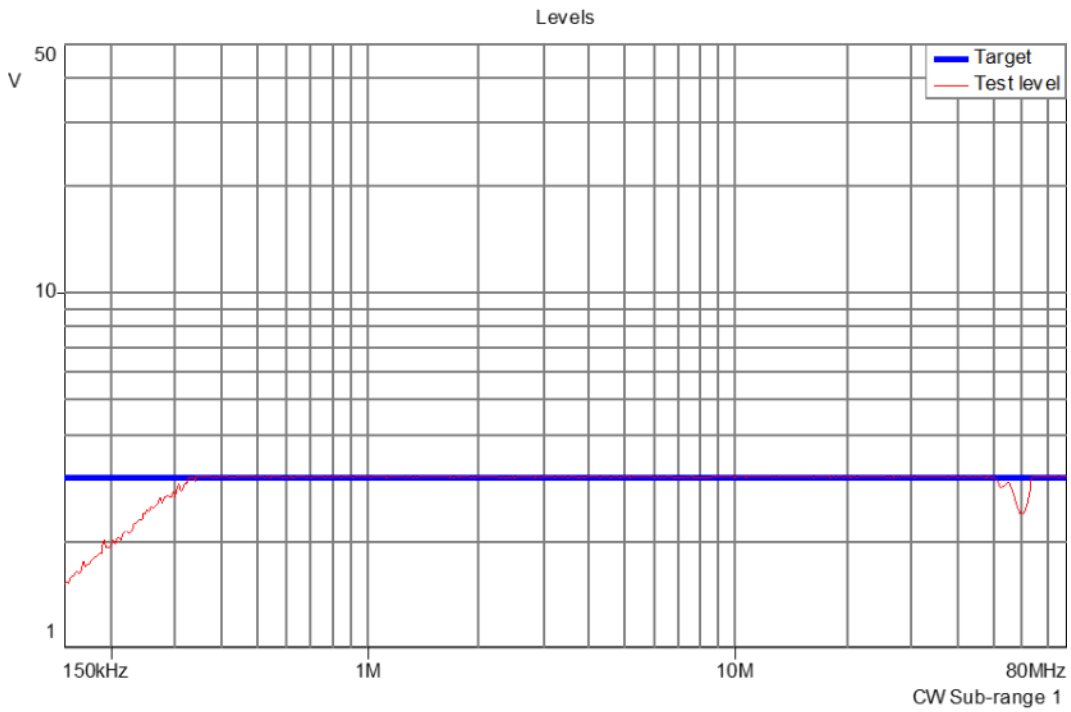
12.5.4 Test Data



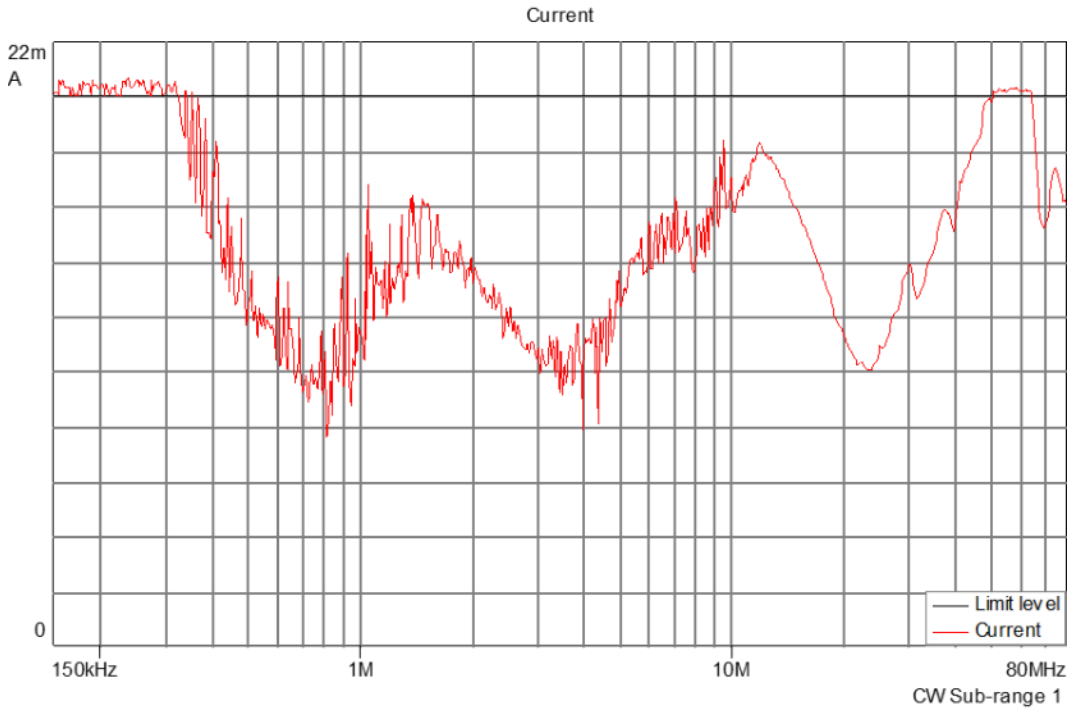
Graph 7: Conducted Disturbances – Voltage Level – EM Clamp – RS-232_USB_Ethernet



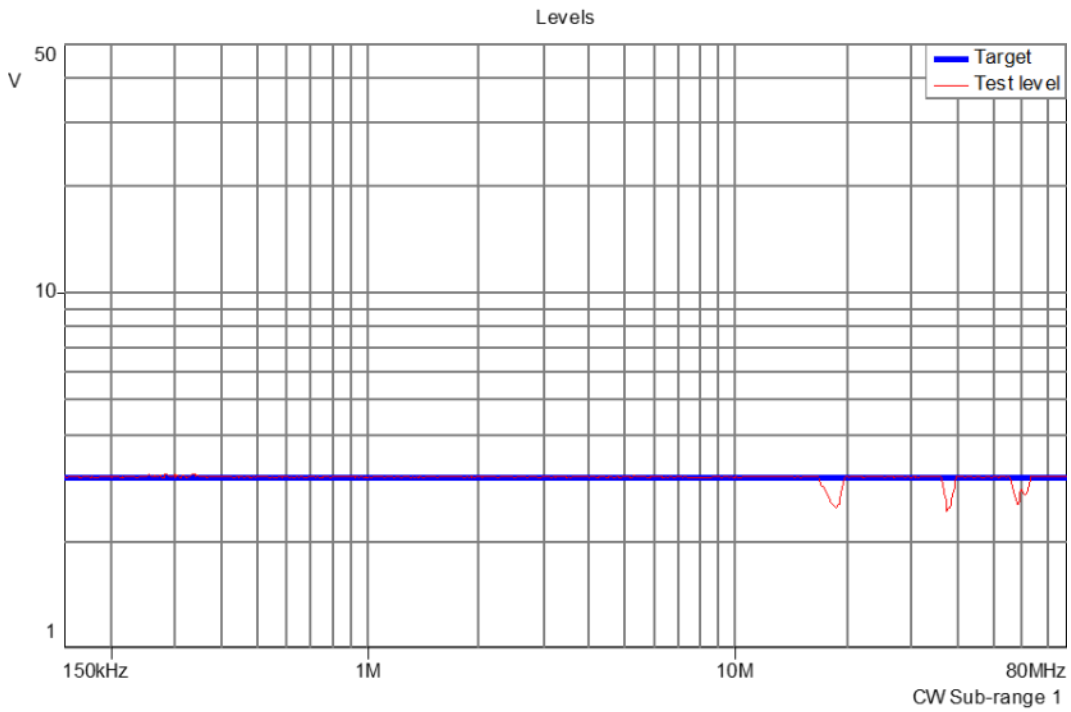
Graph 8: Conducted Disturbances – Current Measurements – EM Clamp – RS-232_USB_Ethernet



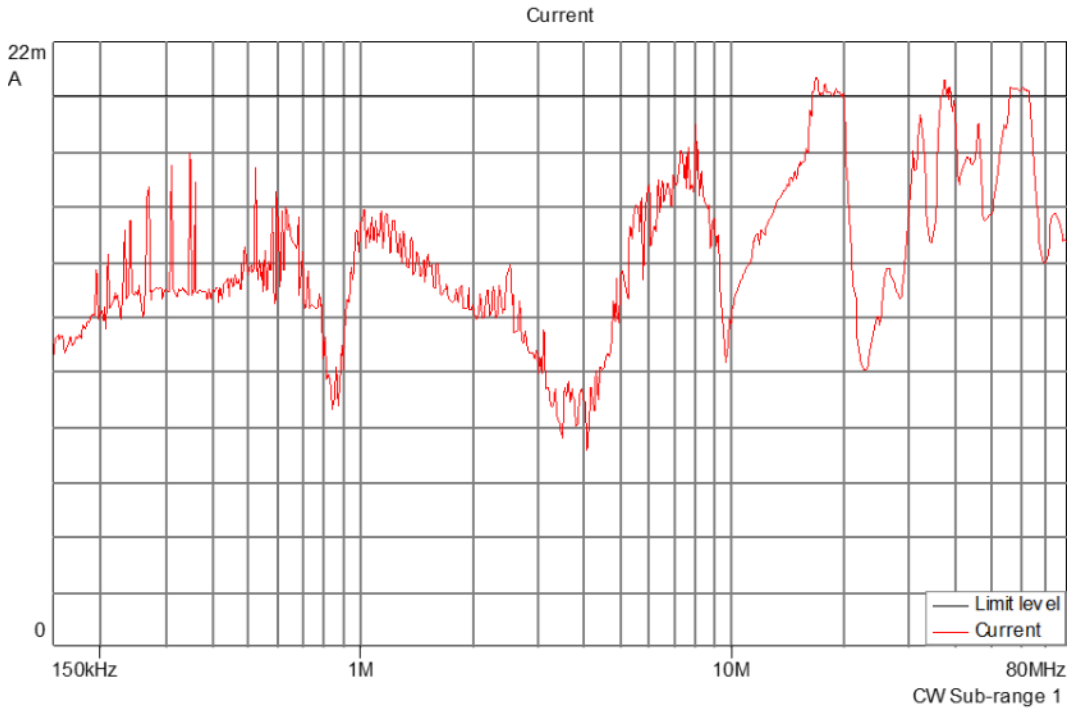
Graph 9: Conducted Disturbances – Voltage Level – EM Clamp – HDMI-Host



Graph 10: Conducted Disturbances – Current Measurements – EM Clamp – HDMI-Host



Graph 11: Conducted Disturbances – Voltage Level – EM Clamp – HDMI Displays



Graph 12: Conducted Disturbances – Current Measurements – EM Clamp – HDMI Displays

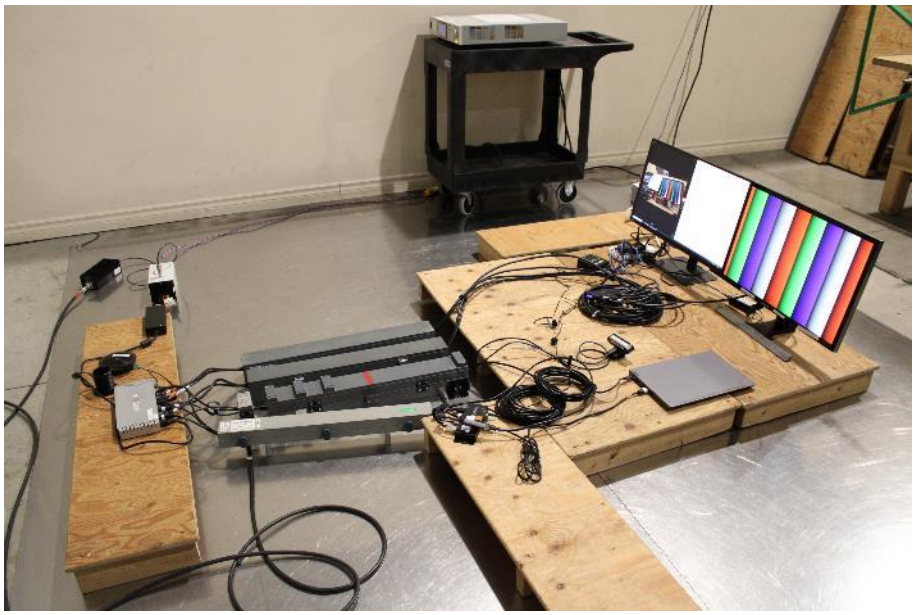


Photo 36: Conducted Disturbances – Test Setup

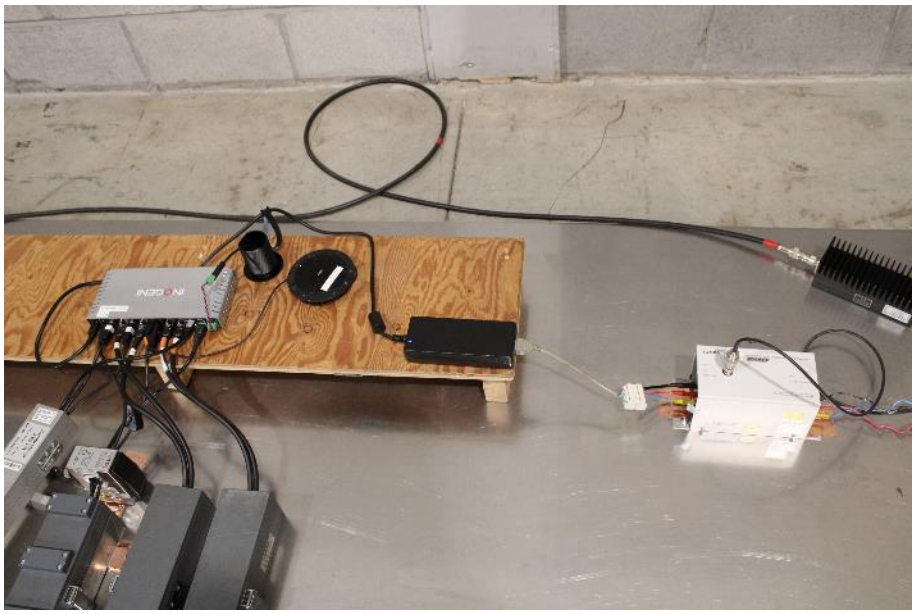


Photo 37: Conducted Disturbances – Test Setup – CDN – Power

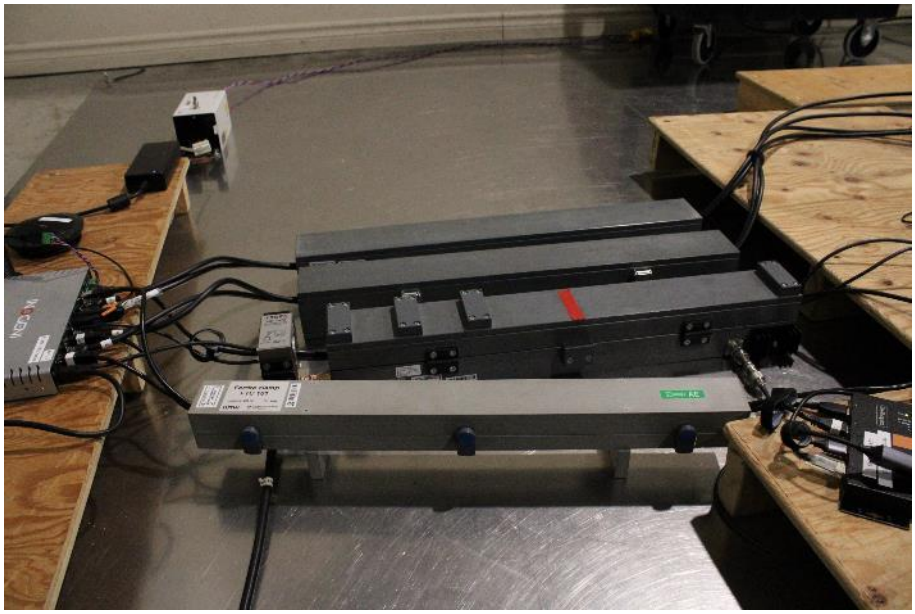


Photo 38: Conducted Disturbances – Test Setup – EM Clamp – RS-232_USB_Ethernet

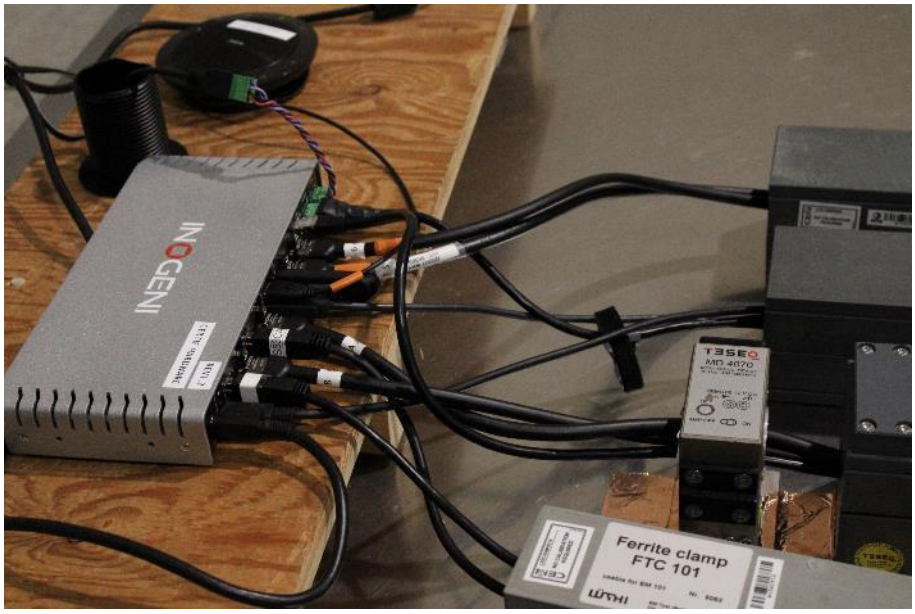


Photo 39: Conducted Disturbances – Test Setup – EM Clamp – HDMI Host

Photo 40: Conducted Disturbances – Test Setup – EM Clamp – HDMI Displays

12.5.5 Test Method

Conducted Disturbances immunity tests were performed using the procedures of the reference standard.

12.6 Power Frequency Magnetic Field Immunity

12.6.1 Test Details

REFERENCE STANDARD	IEC 61000-4-8 (2009)
SPECIFICATIONS	
Test Level	Continuous field: 1A/m (60s)
Frequency	50Hz / 60 Hz
Induction Coil	1m x 1m
PERFORMANCE CRITERION	A
EUT	
Identification	Toggle-Rooms
Voltage Input	230V/50Hz 120V/60Hz
TEST INFO	
Test Date (yyyy-mm-dd)	2024-02-01
Temperature °C (For Info Only)	23.8
Relative humidity % (For Info Only)	19.9
Atmospheric pressure kPa (For Info Only)	101.0
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

12.6.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
TESEQ	Software	Win2120 v6.0 BETA	N/A	N/A	N/A
TESEQ	AC-DC Power source	NSG 1007	1232A04499 (NSG 1007)	24	2025-07-18
TESEQ	Magnetic coil interface	INA 2141	1417	NCR	NCR
TESEQ	Magnetic coil	INA 703	1978	VERIF	VERIF
Fluke	Digital Clamp Meter	353	21950072	12	2024-07-24
F.W. Bell	ELF Meter	4190	1237005	24	2024-10-21

Table 32: Magnetic Field – Test Equipment

12.6.3 Test Results

Position	Frequency (Hz)	Test Level (A/m)	Test Duration (s)	Comments	Results
1	50	1	60	No event	Pass
2	50	1	60	No event	Pass
3	50	1	60	No event	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.					

Table 33: Magnetic Field – Test Results – 230V/50Hz

Position	Frequency (Hz)	Test Level (A/m)	Test Duration (s)	Comments	Results
1	60	1	60	No event	Pass
2	60	1	60	No event	Pass
3	60	1	60	No event	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.					

Table 34: Magnetic Field – Test Results – 120V/60Hz

12.6.4 Test Data

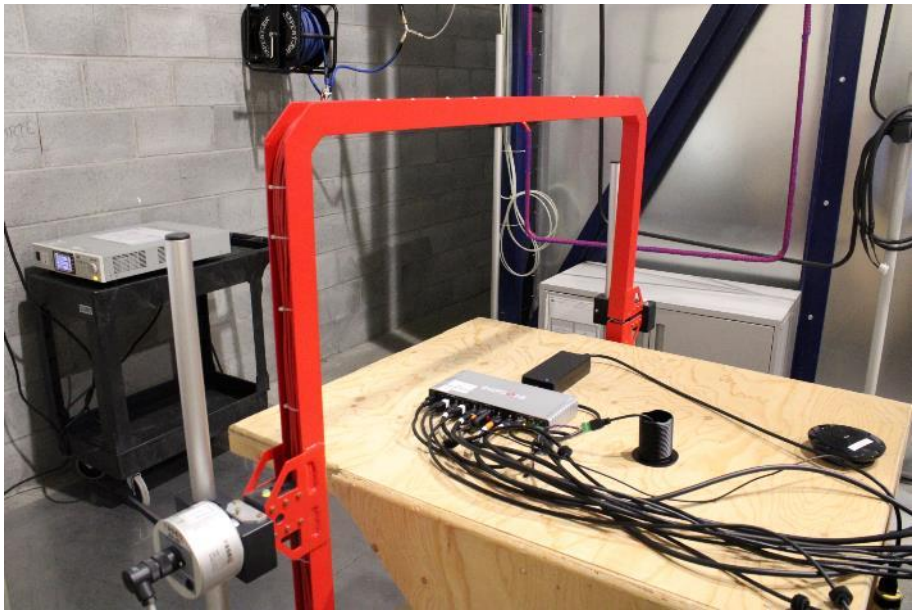


Photo 41: Magnetic Field – Test Setup – Position #1

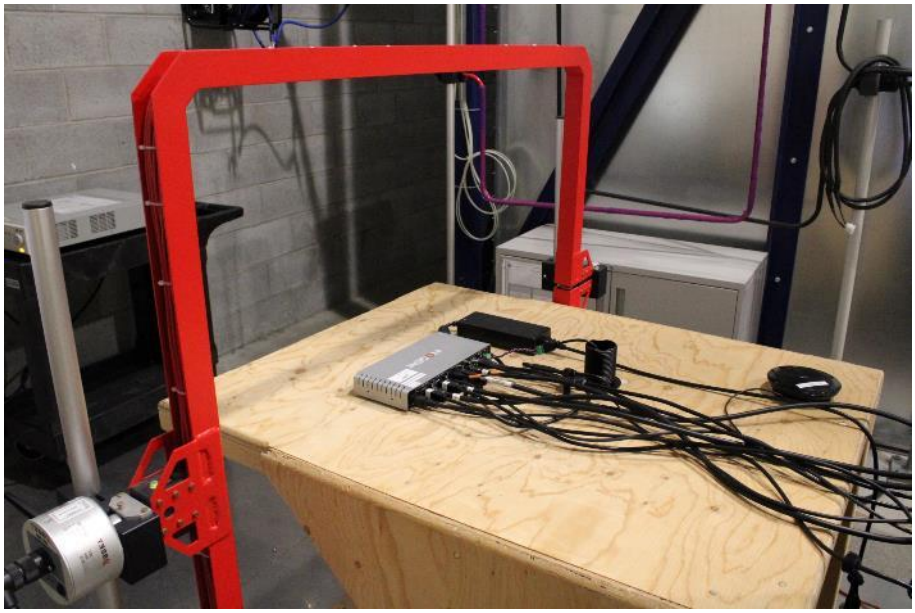


Photo 42: Magnetic Field – Test Setup – Position #2

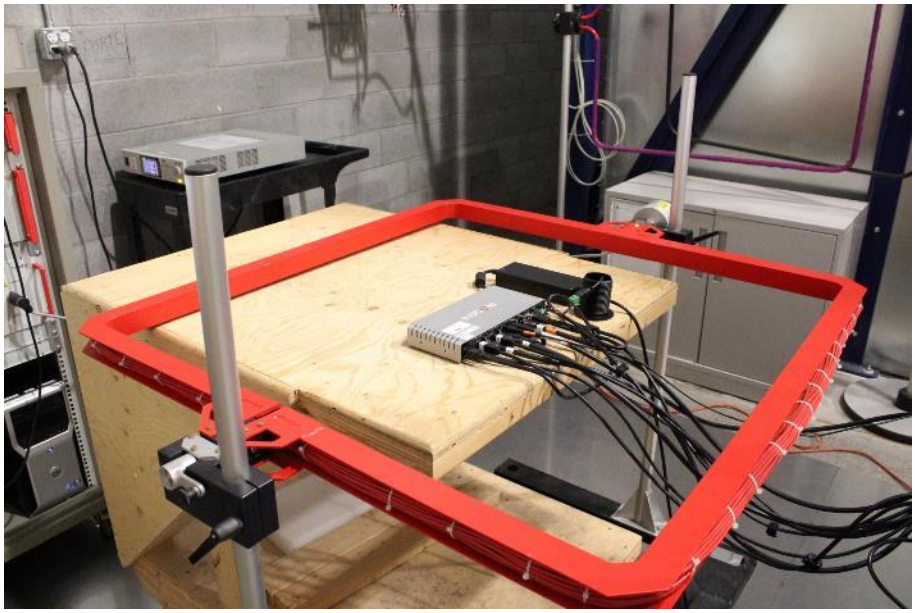


Photo 43: Magnetic Field – Test Setup – Position #3

12.6.5 Test Method

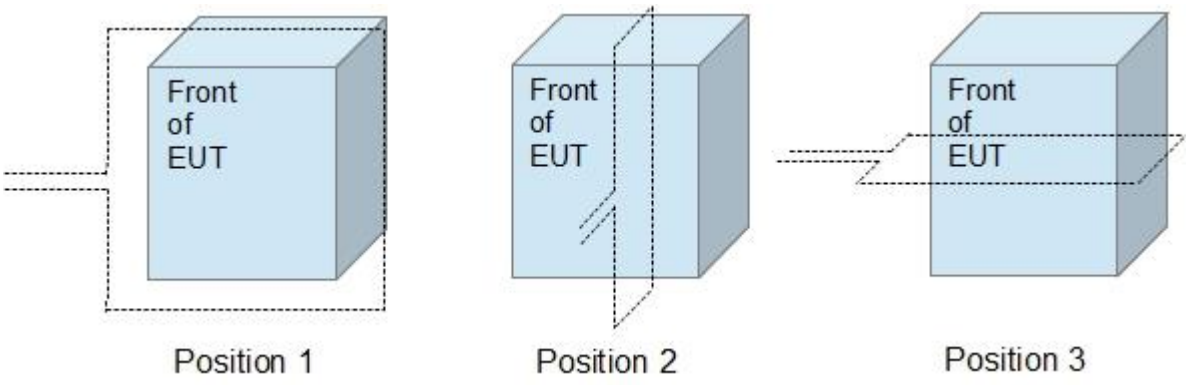


Figure 2: Magnetic Field – Position of Induction Coil

Power frequency field magnetic immunity tests were performed using the procedures of the reference standard.

12.7 Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC input

12.7.1 Test Details

REFERENCE STANDARD	IEC 61000-4-11 (2020)

SPECIFICATIONS	
Voltage Dips	0%Un: ½ cycle 70%Un: 25 cycles 70%Un: 30 cycles
Short Interruptions	0%Un: 250 cycles 0%Un: 300 cycles

PERFORMANCE CRITERION	0%Un / ½ cycle: B 70%Un / 25 cycles: C 70%Un / 30 cycles: C 0%Un / 250 cycles: C 0%Un / 300 cycles: C

EUT	
Identification	Toggle-Rooms
Voltage Input	240V/50Hz 100V/60Hz

TEST INFO	
Test Date (yyyy-mm-dd)	2024-01-31
Temperature °C (For Info Only)	23.8
Relative humidity % (For Info Only)	14.8
Atmospheric pressure kPa (For Info Only)	101.8
Operator	Benoit Carle
Client Witness	Mathieu Martin (Inogeni)

12.7.2 Test Equipment

Manufacturer	Description	Model	Serial No	Calibration Cycle (month)	Next Calibration (y-m-d)
TESEQ	Software	Win3000 v1.3.2	N/A	N/A	N/A
TESEQ	Multifunction generator	NSG 3040	1918	12	2024-10-19

Table 35: Voltage Variations on AC Input – Test Equipment

12.7.3 Test Results

Tested line	Test Level (% Un)	Duration (Cycle)	Number	Interval (s)	Phase Shifting (°)	Comments	Results
Power (240V/50Hz)	0	1/2	3	10	0	No event	Pass
	70	25	3	10	0	No event	Pass
	0	250	3	10	0	Note 1 Note 2	Pass
Power (100V/60Hz)	0	1/2	3	10	0	No event	Pass
	70	30	3	10	0	No event	Pass
	0	300	3	10	0	Note 1	Pass
The decision rule used to determine the test results is based on the limits stated in the test standard and the functional requirement provided by the client. See section 5 for further detail.							
Note 1: Self-recoverable degradation: EUT restarted on its own. Note 2EUT LABCEM#3626 USB3 stopped working due to bad solder on motherboard. EUT switch to LABCEM#3627							

Table 36: Voltage Variations on AC Input – Test Results

12.7.4 Test Data

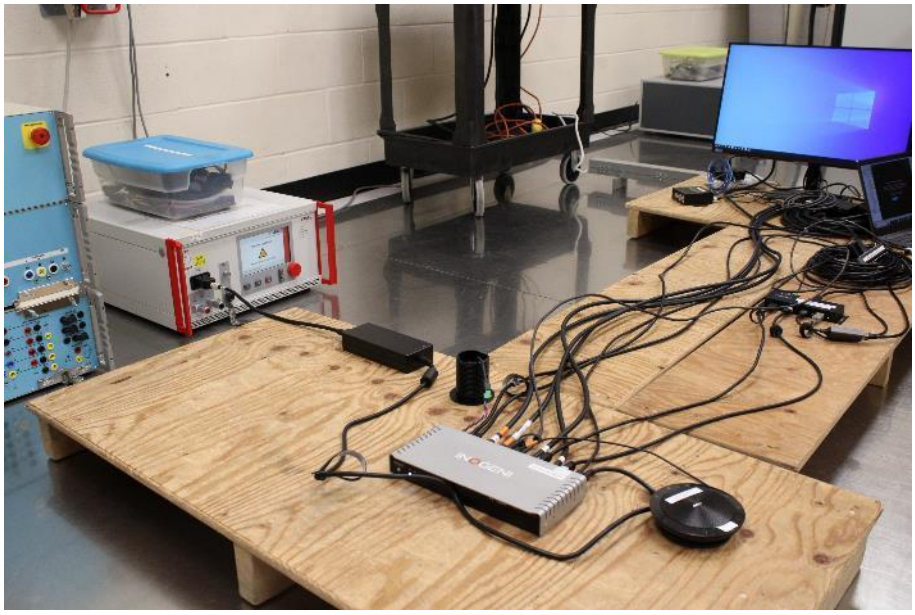


Photo 44: Voltage Variations on AC Input – Test Setup

12.7.5 Test Method

Voltage dips, short interruptions and voltage variation on AC Input immunity tests were performed using the procedures of the reference standard.

APPENDIX A
CONDUCTED EMISSIONS

element

CONDUCTED EMISSIONS - VOLTAGE
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Project: *OP0649549* ***Customer:*** *Inogeni*

DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

Equipment: Toggle-Rooms
Manufacturer:
Hardware Version:
Software Version:

CONDUCTED EMISSIONS MEASUREMENT: *OP0649549_EN55032-LISN_Phase_#03*

Test Location: Anechoic chamber
Test Date: 2024-02-01 7:15:45 PM
Operator(s): Benoit Carle
Test Standard: EN55032 Class A
Power: 230V/50Hz
Tested Line: Phase
Operating Mode:
Comments:

TEST PARAMETERS		TEST EQUIPMENT USED
Frequency Range 150 kHz - 30 MHz	Bandwidth 9 kHz	EMI receiver : MXE N9038A LF#1+LF#2 LISN : PMM L2-16B#20801-red

FINAL RESULTS - QUASI-PEAK

Frequency	SR #	Quasi-Peak Detector (dBµV)	Quasi-Peak Limit (dBµV)	Margin (dB)	Correction (dB)
167.563 kHz	1	43.371	79	35.629	0.691
845.955 kHz	1	30.215	73	42.785	0.705
972.642 kHz	1	29.452	73	43.548	0.712
4.783412 MHz	1	45.327	73	27.673	0.777
7.397396 MHz	1	43.153	73	29.847	0.833
22.796969 MHz	1	36.861	73	36.139	1.031

FINAL RESULTS - AVERAGE

Frequency	SR #	Average Detector (dBµV)	Average Limit (dBµV)	Margin (dB)	Correction (dB)
167.563 kHz	1	36.701	66	29.299	0.691
845.955 kHz	1	20.585	60	39.415	0.705
972.642 kHz	1	17.992	60	42.008	0.712
4.783412 MHz	1	34.467	60	25.533	0.777
7.397396 MHz	1	35.503	60	24.497	0.833
22.796969 MHz	1	27.651	60	32.349	1.031

CONDUCTED EMISSIONS - VOLTAGE
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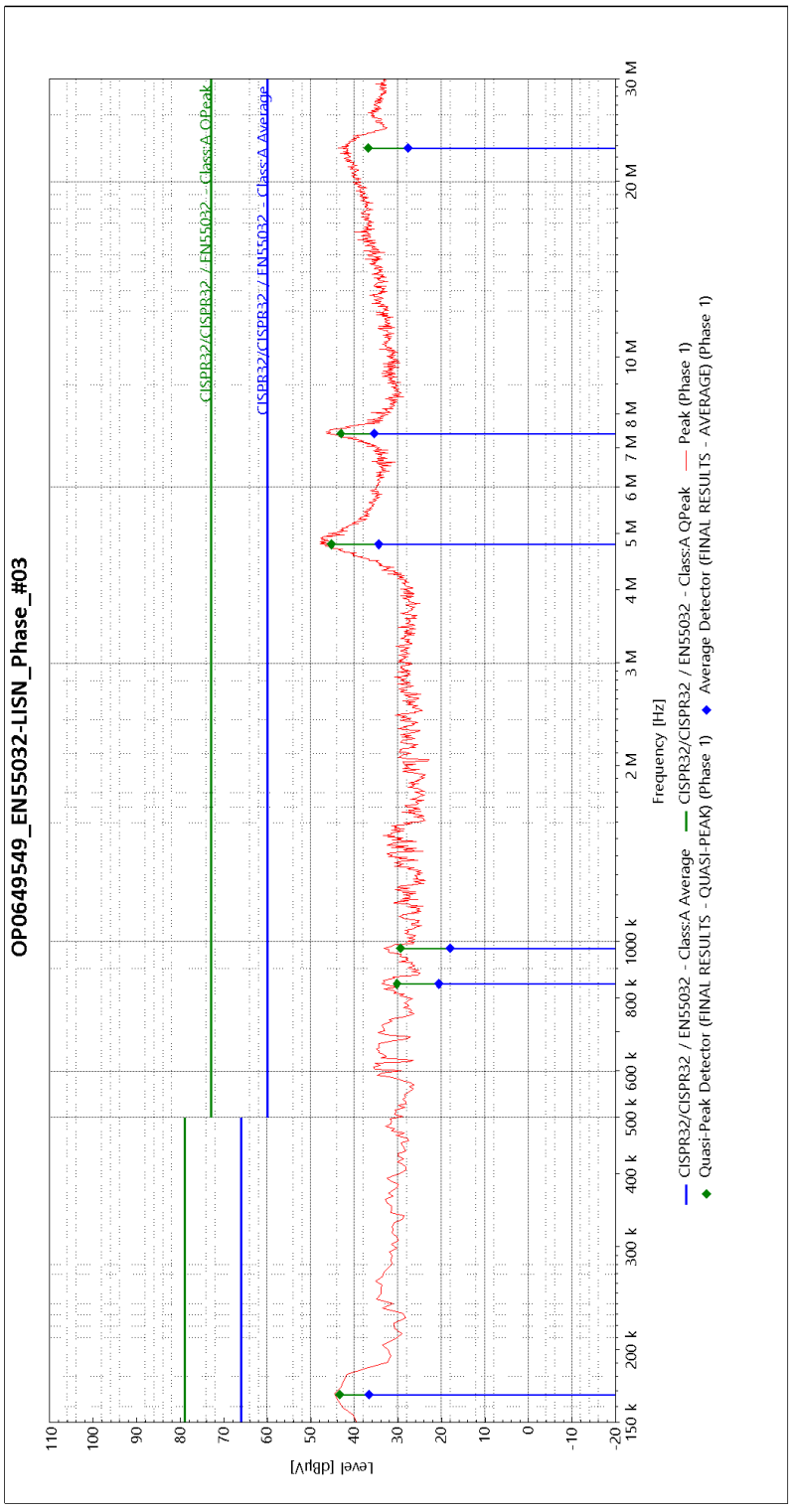

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CONDUCTED EMISSIONS - VOLTAGE

Project: *OP0649549* ***Customer:*** *Inogeni*

DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

Equipment: Toggle-Rooms
Manufacturer:
Hardware Version:
Software Version:

CONDUCTED EMISSIONS MEASUREMENT: *OP0649549_EN55032-LISN_Neutral_#04*

Test Location: Anechoic chamber
Test Date: 2024-02-01 7:31:33 PM
Operator(s): Benoit Carle
Test Standard: EN55032 Class A
Power: 230V/50Hz
Tested Line: Neutral
Operating Mode:
Comments:

TEST PARAMETERS

Frequency Range
150 kHz - 30 MHz

Bandwidth
9 kHz

TEST EQUIPMENT USED

EMI receiver : MXE N9038A
LF#1+LF#2
LISN : PMM L2-16B#20801-red

FINAL RESULTS - QUASI-PEAK

Frequency	SR #	Quasi-Peak Detector (dBµV)	Quasi-Peak Limit (dBµV)	Margin (dB)	Correction (dB)
162.951 kHz	1	42.121	79	36.879	0.731
174.841 kHz	1	48.461	79	30.539	0.731
286.143 kHz	1	47.454	79	31.546	0.744
814.459 kHz	1	38.934	73	34.066	0.754
4.780684 MHz	1	45.787	73	27.213	0.827
7.460293 MHz	1	44.734	73	28.266	0.874

FINAL RESULTS - AVERAGE

Frequency	SR #	Average Detector (dBµV)	Average Limit (dBµV)	Margin (dB)	Correction (dB)
162.951 kHz	1	36.071	66	29.929	0.731
174.841 kHz	1	33.841	66	32.159	0.731
286.143 kHz	1	28.724	66	37.276	0.744
814.459 kHz	1	22.674	60	37.326	0.754
4.780684 MHz	1	34.377	60	25.623	0.827
7.460293 MHz	1	36.014	60	23.986	0.874

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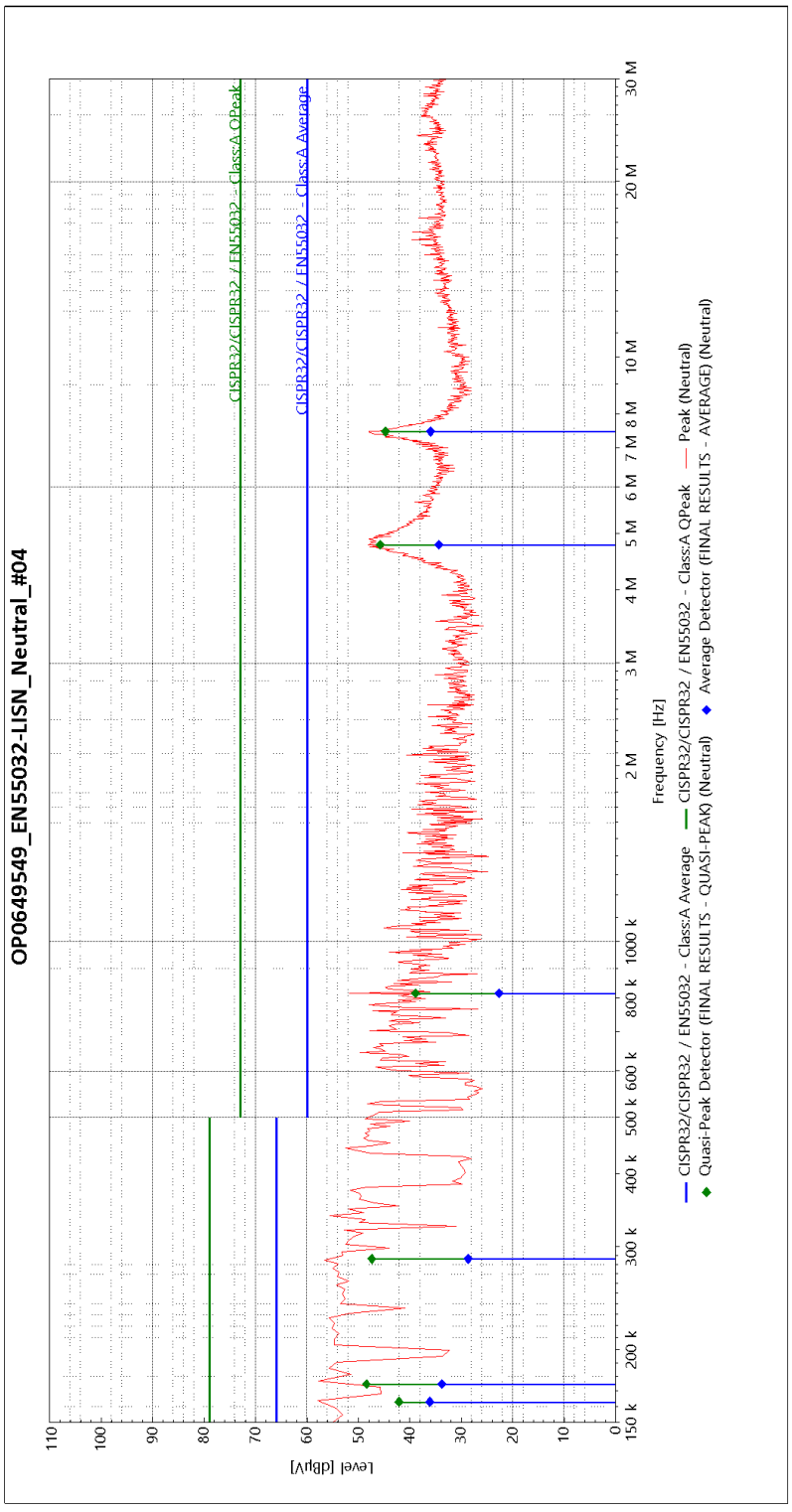

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CONDUCTED EMISSIONS - VOLTAGE
page 1 / 2

Project: *OP0649549* ***Customer:*** *Inogeni*

DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

Equipment: Toggle-Rooms
Manufacturer:
Hardware Version:
Software Version:

CONDUCTED EMISSIONS MEASUREMENT*: OP0649549_FCC-LISN_Phase_#05*

Test Location: Anechoic chamber
Test Date: 2024-02-01 7:49:12 PM
Operator(s): Benoit Carle
Test Standard: FCC part 15 subpart B / Class A
Power: 120V/60Hz
Tested Line: Phase
Operating Mode:
Comments:

TEST PARAMETERS

Frequency Range
150 kHz - 30 MHz

Bandwidth
9 kHz

TEST EQUIPMENT USED

EMI receiver : MXE N9038A
LF#1+LF#2
LISN : PMM L2-16B#20801-red

FINAL RESULTS - QUASI-PEAK

Frequency	SR #	Quasi-Peak Detector (dBµV)	Quasi-Peak Limit (dBµV)	Margin (dB)	Correction (dB)
278.857 kHz	1	30.484	79	48.516	0.694
417.301 kHz	1	26.336	79	52.664	0.696
763.697 kHz	1	27.133	73	45.867	0.703
1.468474 MHz	1	26.944	73	46.056	0.724
4.035378 MHz	1	23.489	73	49.511	0.769
7.388997 MHz	1	43.973	73	29.027	0.833

FINAL RESULTS - AVERAGE

Frequency	SR #	Average Detector (dBµV)	Average Limit (dBµV)	Margin (dB)	Correction (dB)
278.857 kHz	1	23.044	66	42.956	0.694
417.301 kHz	1	19.366	66	46.634	0.696
763.697 kHz	1	18.653	60	41.347	0.703
1.468474 MHz	1	17.684	60	42.316	0.724
4.035378 MHz	1	15.869	60	44.131	0.769
7.388997 MHz	1	34.633	60	25.367	0.833

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CONDUCTED EMISSIONS - VOLTAGE
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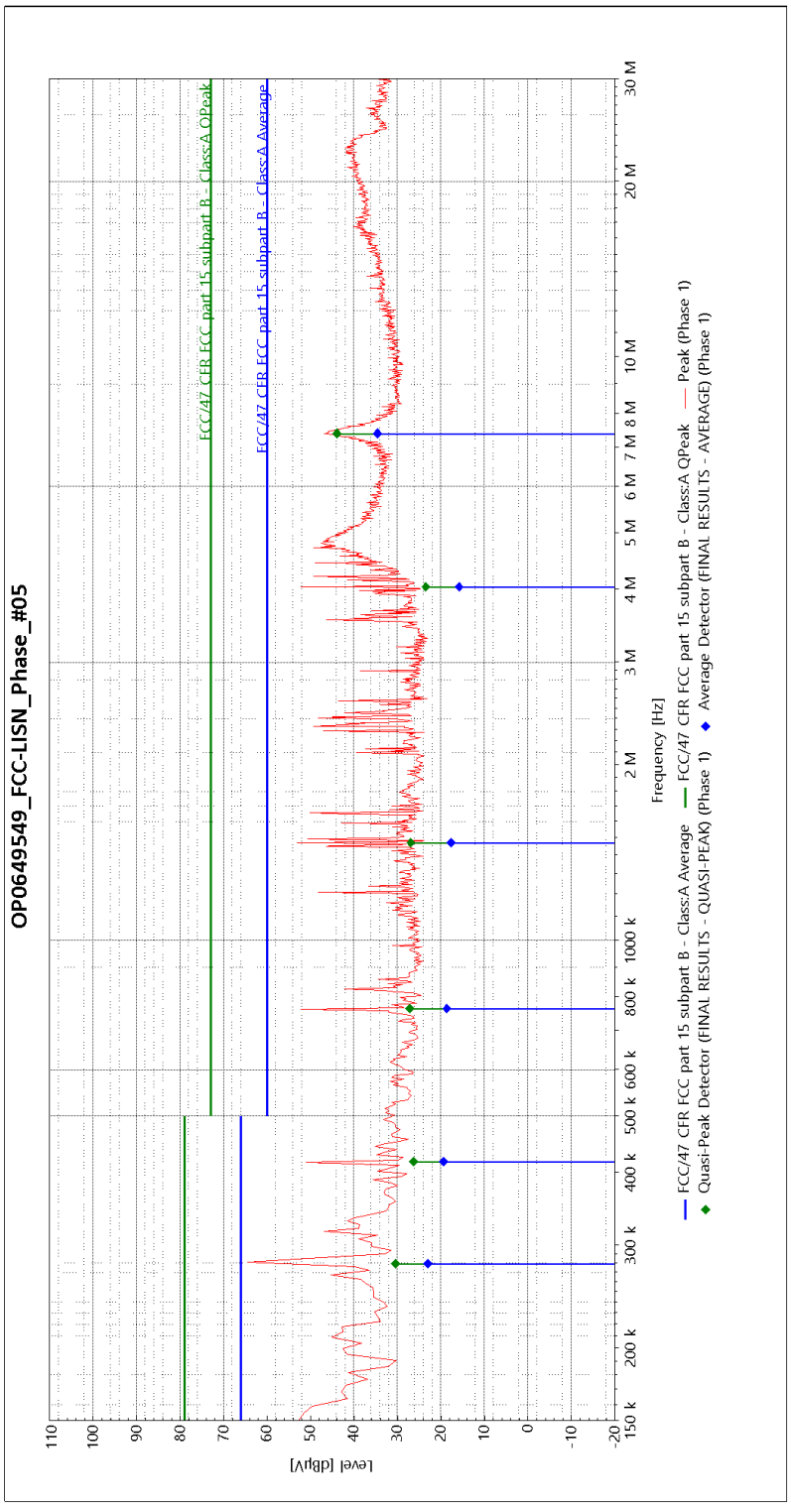

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CONDUCTED EMISSIONS - VOLTAGE
page 1 / 2

Project: *OP0649549* ***Customer:*** *Inogeni*

DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

Equipment: Toggle-Rooms
Manufacturer:
Hardware Version:
Software Version:

CONDUCTED EMISSIONS MEASUREMENT: *OP0649549_FCC-LISN__Neutral_#06*

Test Location: Anechoic chamber
Test Date: 2024-02-01 8:03:31 PM
Operator(s): Benoit Carle
Test Standard: FCC part 15 subpart B / Class A
Power: 120V/60Hz
Tested Line: Neutral
Operating Mode:
Comments:

TEST PARAMETERS

Frequency Range
150 kHz - 30 MHz

Bandwidth
9 kHz

TEST EQUIPMENT USED

EMI receiver : MXE N9038A
LF#1+LF#2
LISN : PMM L2-16B#20801-red

FINAL RESULTS - QUASI-PEAK

Frequency	SR #	Quasi-Peak Detector (dBµV)	Quasi-Peak Limit (dBµV)	Margin (dB)	Correction (dB)
159.089 kHz	1	58.721	79	20.279	0.731
259.875 kHz	1	57.413	79	21.587	0.743
501.413 kHz	1	50.278	73	22.722	0.748
4.779318 MHz	1	44.867	73	28.133	0.827
7.437608 MHz	1	41.753	73	31.247	0.873
16.722151 MHz	1	36.439	73	36.561	1.019

FINAL RESULTS - AVERAGE

Frequency	SR #	Average Detector (dBµV)	Average Limit (dBµV)	Margin (dB)	Correction (dB)
159.089 kHz	1	41.331	66	24.669	0.731
259.875 kHz	1	35.173	66	30.827	0.743
501.413 kHz	1	27.818	60	32.182	0.748
4.779318 MHz	1	33.997	60	26.003	0.827
7.437608 MHz	1	33.503	60	26.497	0.873
16.722151 MHz	1	31.129	60	28.871	1.019

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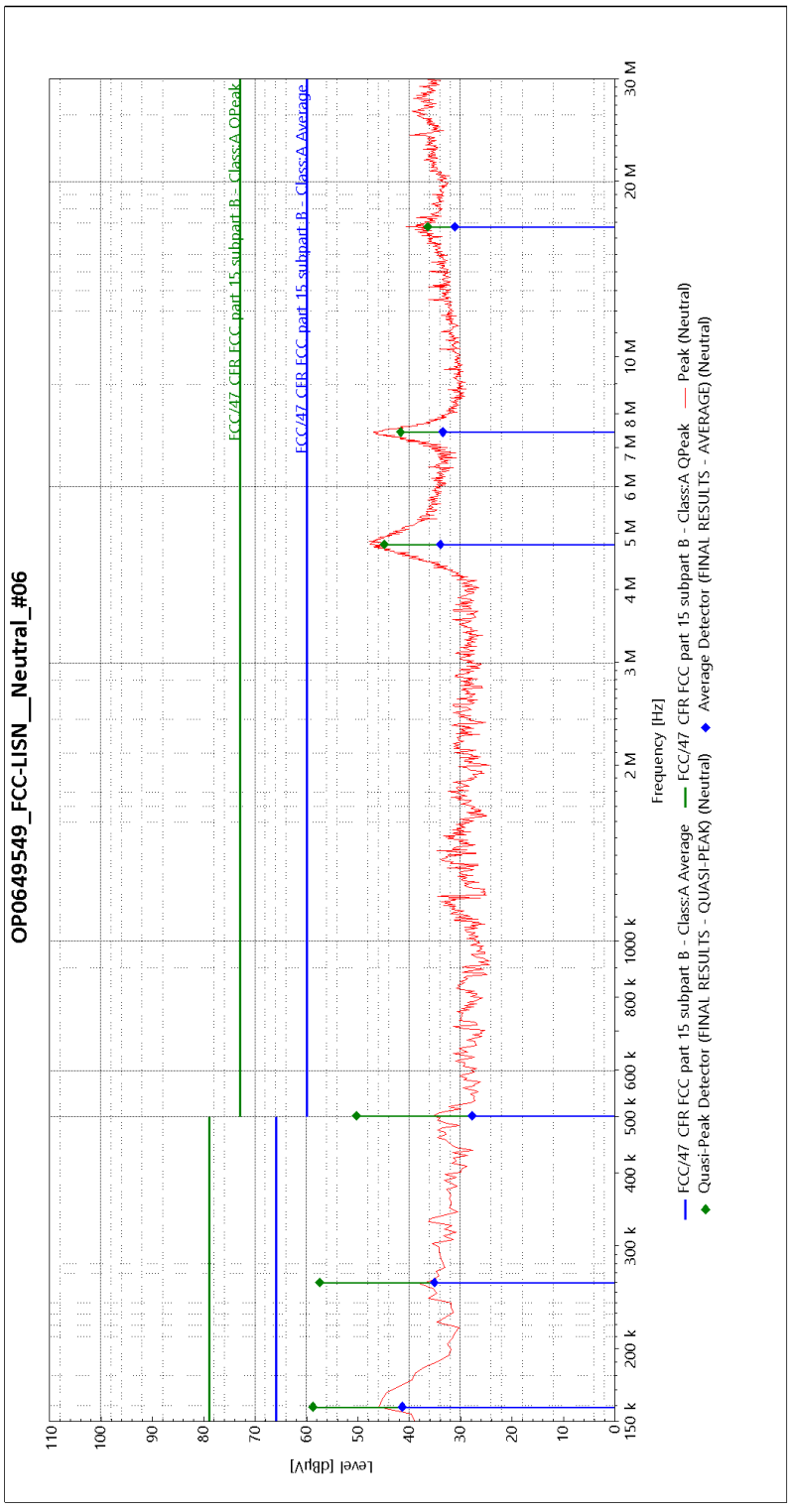

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APPENDIX B
RADIATED EMISSIONS

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RADIATED EMISSIONS – ELECTRIC FIELD

Project: *OP0649549* ***Customer:*** *Inogeni*

DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

Equipment: Toggle-Rooms
Manufacturer:
Hardware Version:
Software Version:

RADIATED EMISSIONS MEASUREMENT: *OP0649549_CISPR32_FCC-Bilog_#01*

Test Location: Anechoic chamber
Test Date: 2024-02-01 5:24:37 PM
Operator(s): Benoit Carle
Test Standard: CISPR32 / FCC part 15 subpart B / Class A
Power: 230V/50Hz
Operating Mode:
Comments:

TEST PARAMETERS

Frequency Range	Bandwidth	Test Distance
30 MHz - 1 GHz	120 kHz	3 m

TEST EQUIPMENT USED

Antenna Mast : SUNOL
Bilog Antenna + 6dB : TESEQ CBL6112D#33825
EMI receiver : MXE N9038A
HF#1 + HF#2
Turntable : SUNOL

FINAL RESULTS - QUASI-PEAK

Frequency	SR #	Quasi-Peak Detector (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Margin (dB)	Polarization	Azimuth (degree)	Height (m)	Correction (dB)
45.2734 MHz	1	35.052	50	14.948	Vertical	300.75	1.028	17.2
51.6115 MHz	1	29.843	50	20.157	Vertical	51.75	1.367	14.363
71.7529 MHz	1	43.016	50	6.984	Vertical	129.5	1.131	13.132
120.5299 MHz	1	24.25	50	25.75	Vertical	54.25	1.145	19.062
168.057 MHz	1	32.302	50	17.698	Vertical	321.75	1.013	16.984
837.3608 MHz	1	38.243	57	18.757	Horizontal	224.25	1.084	29.153

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RADIATED EMISSIONS – ELECTRIC FIELD
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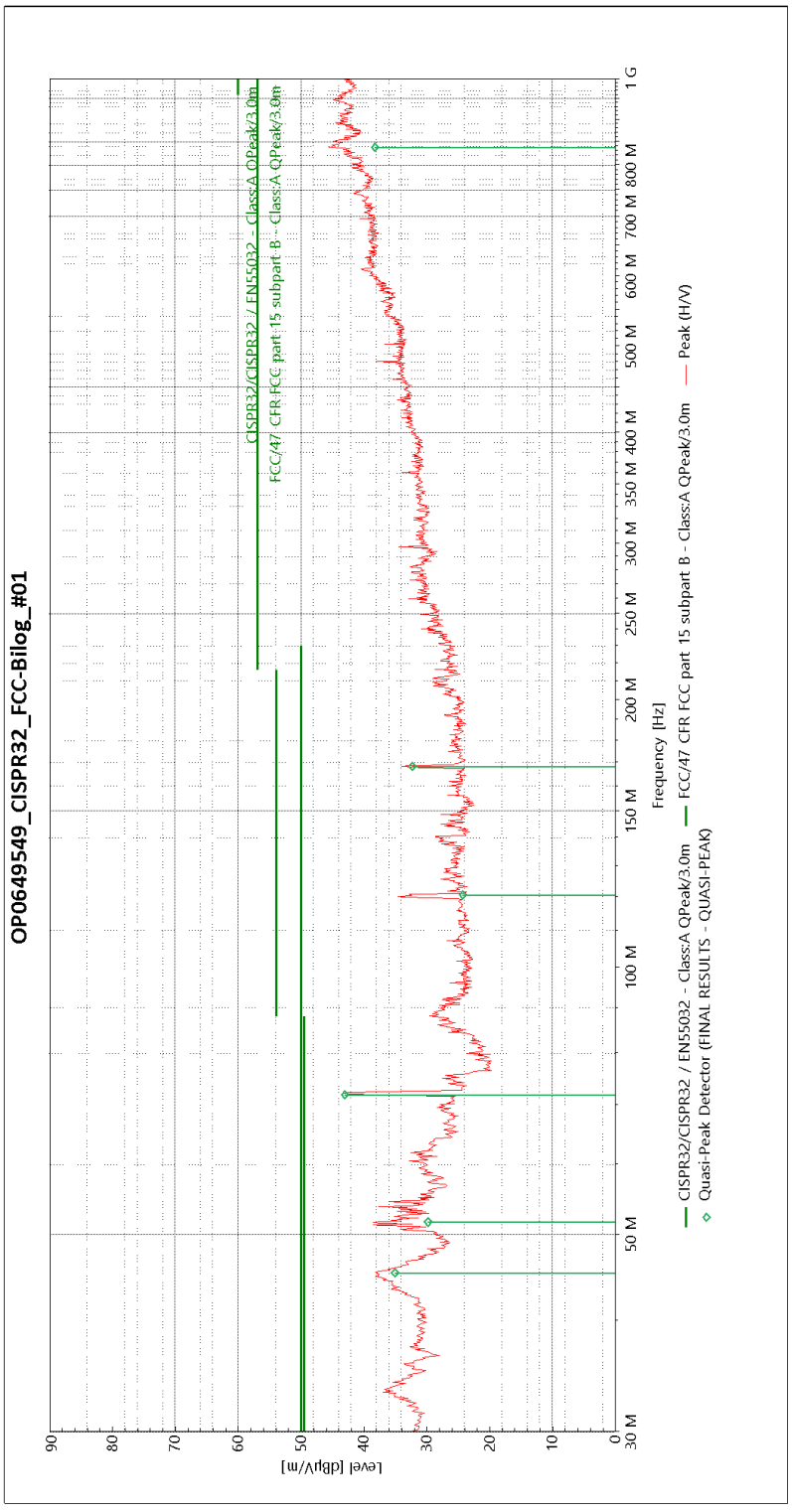

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RADIATED EMISSIONS – ELECTRIC FIELD

Project: *OP0649549* ***Customer:*** *Inogeni*

DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

Equipment: Toggle-Rooms
Manufacturer:
Hardware Version:
Software Version:

RADIATED EMISSIONS MEASUREMENT: *OP0649549_CISPR32_FCC-Horn_#02*

Test Location: Anechoic chamber
Test Date: 2024-02-01 6:23:27 PM
Operator(s): Benoit Carle
Test Standard: CISPR32 / FCC part 15 subpart B / Class A
Power: 230V/50Hz
Operating Mode:
Comments:

TEST PARAMETERS

Frequency Range	Bandwidth	Test Distance
1 GHz - 2 GHz	1 MHz	3 m

TEST EQUIPMENT USED

Antenna Mast : SUNOL
EMI receiver : MXE N9038A
HF#1+HF#2 + HF-LNA + 3dB
Horn Antenna : TESEQ BHA9118
Turntable : SUNOL

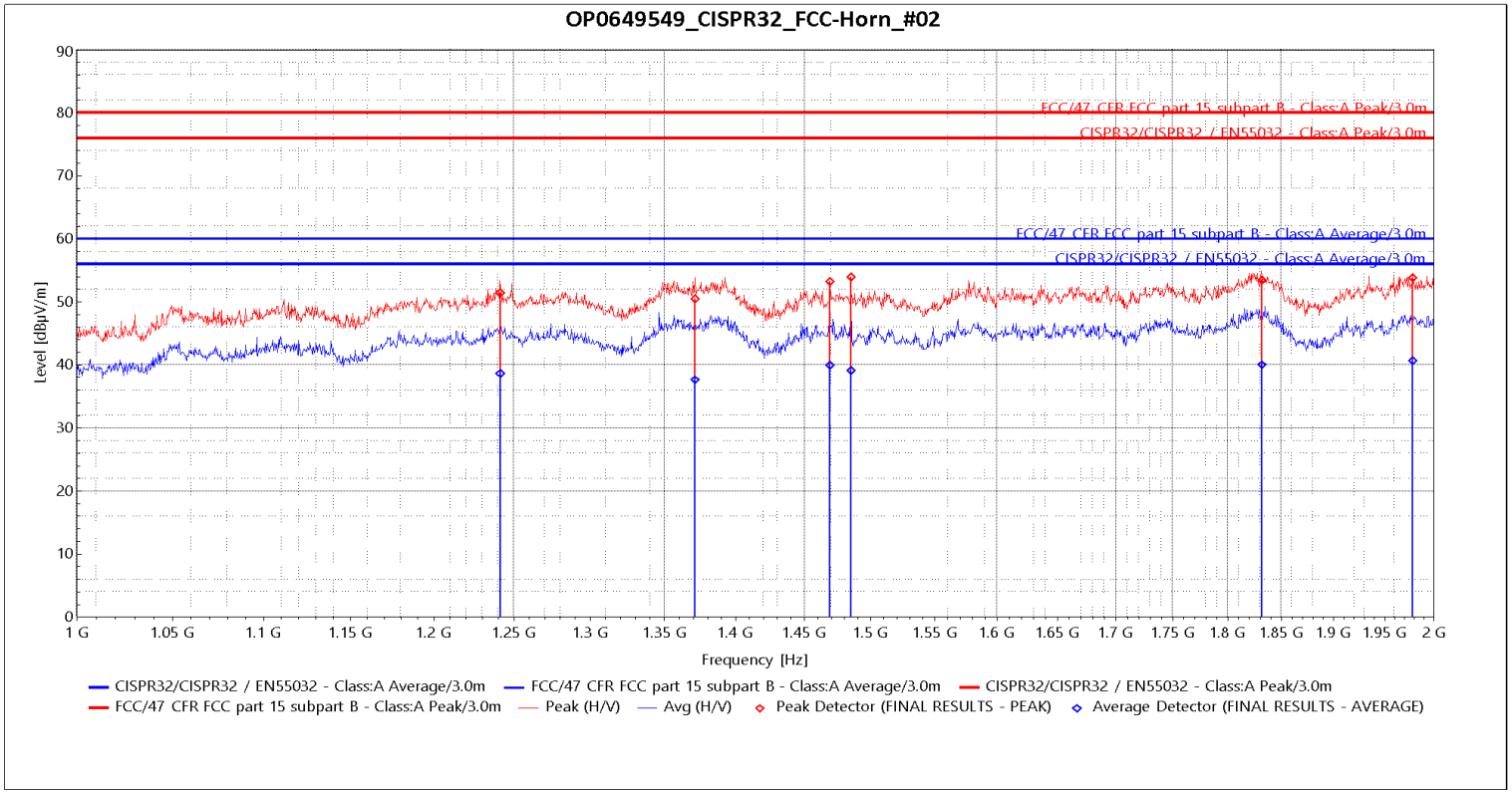
FINAL RESULTS - PEAK

Frequency	SR #	Peak Detector (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Polarization	Azimuth (degree)	Height (m)	Correction (dB)
1.2413503 GHz	1	51.436	76	24.564	Vertical	175.25	2.136	-13.277
1.3711647 GHz	1	50.457	76	25.543	Horizontal	244.25	1.027	-13.393
1.4688527 GHz	1	53.255	76	22.745	Horizontal	214.25	1.118	-13.367
1.4851049 GHz	1	53.925	76	22.075	Horizontal	110.25	1.179	-13.383
1.8316343 GHz	1	53.429	76	22.571	Vertical	26	2.999	-11.279
1.9784716 GHz	1	53.827	76	22.173	Horizontal	63.5	4	-10.063

FINAL RESULTS - AVERAGE

Frequency	SR #	Average Detector (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Polarization	Azimuth (degree)	Height (m)	Correction (dB)
1.2413503 GHz	1	38.614	56	17.386	Vertical	175.25	2.136	-13.277
1.3711647 GHz	1	37.637	56	18.363	Horizontal	244.25	1.027	-13.393
1.4688527 GHz	1	39.975	56	16.025	Horizontal	214.25	1.118	-13.367
1.4851049 GHz	1	39.145	56	16.855	Horizontal	110.25	1.179	-13.383
1.8316343 GHz	1	40.029	56	15.971	Vertical	26	2.999	-11.279
1.9784716 GHz	1	40.697	56	15.303	Horizontal	63.5	4	-10.063

PR / OP0649549_CISPR32_FCC-Horn_#02.docx



PR / OP0649549_CISPR32_FCC-Horn_#02.docx

APPENDIX C
HARMONIC CURRENT EMISSIONS LIMITS

Teseq Profline
4542 Luterbach, Switzerland

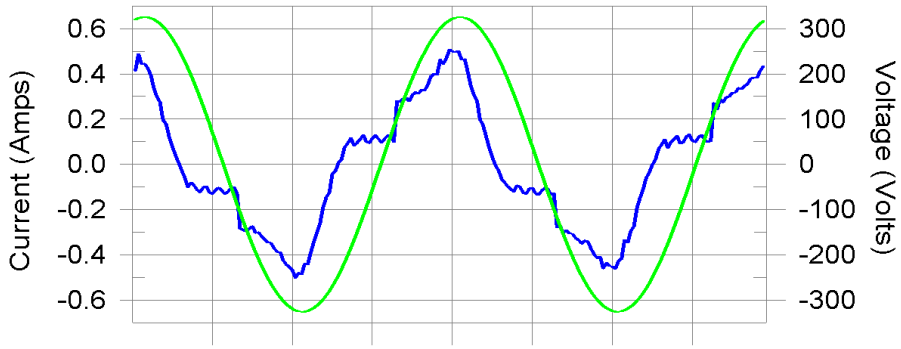
1/31/2024
3:30 PM

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

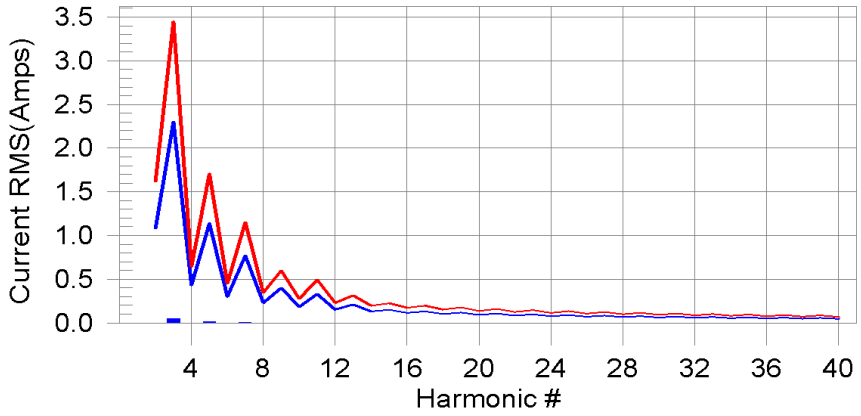
EUT: Toggle-Room **Tested by: Benoit Carle**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 1/31/2024 **Start time: 4:25:29 PM** **End time: 4:27:51 PM**
Test duration (min): 2 **Data file name: H-000463.cts_data**
Comment: Harmonics Fluctuations
Customer: Inogeni

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

Current & voltage waveforms



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



Test result: Pass Worst harmonic was #13 with 1.9% of the limit.

Teseq Profline 1/31/2024
4542 Luterbach, Switzerland 3:30 PM

Current Test Result Summary (Run time)

EUT: Toggle-Room **Tested by: Benoit Carle**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 1/31/2024 **Start time: 4:25:29 PM** **End time: 4:27:51 PM**
Test duration (min): 2 **Data file name: H-000463.cts_data**
Comment: Harmonics Fluctuations
Customer: Inogeni

Test Result: Pass **Source qualification: Normal**
THC(A): 0.061 **I-THD(%): 31.6** **POHC(A): 0.000** **POHC Limit(A): 0.251**

Highest parameter values during test:

V_RMS (Volts):	230.53	Frequency(Hz):	50.00
I_Peak (Amps):	0.529	I_RMS (Amps):	0.239
I_Fund (Amps):	0.215	Crest Factor:	2.370
Power (Watts):	39.6	Power Factor:	0.774

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.002	1.080	N/A	0.005	1.620	N/A	Pass
3	0.055	2.300	2.4	0.061	3.450	1.8	Pass
4	0.002	0.430	N/A	0.004	0.645	N/A	Pass
5	0.017	1.140	1.5	0.022	1.710	1.3	Pass
6	0.001	0.300	N/A	0.002	0.450	N/A	Pass
7	0.012	0.770	1.6	0.013	1.155	1.1	Pass
8	0.001	0.230	N/A	0.002	0.345	N/A	Pass
9	0.007	0.400	1.8	0.008	0.600	1.3	Pass
10	0.001	0.184	N/A	0.001	0.276	N/A	Pass
11	0.006	0.330	1.8	0.007	0.495	1.4	Pass
12	0.001	0.153	N/A	0.001	0.230	N/A	Pass
13	0.005	0.210	2.5	0.006	0.315	1.9	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.004	0.150	N/A	0.005	0.225	N/A	Pass
16	0.001	0.115	N/A	0.001	0.173	N/A	Pass
17	0.004	0.132	N/A	0.004	0.198	N/A	Pass
18	0.001	0.102	N/A	0.001	0.153	N/A	Pass
19	0.003	0.118	N/A	0.004	0.178	N/A	Pass
20	0.000	0.092	N/A	0.001	0.138	N/A	Pass
21	0.003	0.107	N/A	0.003	0.161	N/A	Pass
22	0.000	0.084	N/A	0.001	0.125	N/A	Pass
23	0.002	0.098	N/A	0.003	0.147	N/A	Pass
24	0.000	0.077	N/A	0.001	0.115	N/A	Pass
25	0.004	0.090	N/A	0.005	0.135	N/A	Pass
26	0.000	0.071	N/A	0.001	0.107	N/A	Pass
27	0.002	0.083	N/A	0.003	0.125	N/A	Pass
28	0.001	0.066	N/A	0.001	0.099	N/A	Pass
29	0.002	0.078	N/A	0.003	0.116	N/A	Pass
30	0.000	0.061	N/A	0.001	0.092	N/A	Pass
31	0.002	0.073	N/A	0.003	0.109	N/A	Pass
32	0.001	0.058	N/A	0.001	0.086	N/A	Pass
33	0.002	0.068	N/A	0.002	0.102	N/A	Pass
34	0.000	0.054	N/A	0.001	0.081	N/A	Pass
35	0.001	0.064	N/A	0.002	0.096	N/A	Pass
36	0.000	0.051	N/A	0.001	0.077	N/A	Pass
37	0.001	0.061	N/A	0.002	0.091	N/A	Pass
38	0.000	0.048	N/A	0.001	0.073	N/A	Pass
39	0.001	0.058	N/A	0.002	0.087	N/A	Pass
40	0.000	0.046	N/A	0.001	0.069	N/A	Pass

Teseq Profline 1/31/2024
4542 Luterbach, Switzerland 3:30 PM

Voltage Source Verification Data (Run time)

EUT: Toggle-Room **Tested by: Benoit Carle**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 1/31/2024 **Start time: 4:25:29 PM** **End time: 4:27:51 PM**
Test duration (min): 2 **Data file name: H-000463.cts_data**
Comment: Harmonics Fluctuations
Customer: Inogeni

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

Highest parameter values during test:

Voltage (Vrms):	230.53	Frequency(Hz):	50.00
I_Peak (Amps):	0.529	I_RMS (Amps):	0.239
I_Fund (Amps):	0.215	Crest Factor:	2.370
Power (Watts):	39.6	Power Factor:	0.774

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.029	0.461	6.27	OK
3	0.415	2.075	20.01	OK
4	0.026	0.461	5.60	OK
5	0.040	0.922	4.37	OK
6	0.025	0.461	5.33	OK
7	0.020	0.692	2.92	OK
8	0.007	0.461	1.57	OK
9	0.015	0.461	3.19	OK
10	0.007	0.461	1.49	OK
11	0.008	0.231	3.45	OK
12	0.012	0.231	5.35	OK
13	0.007	0.231	2.89	OK
14	0.004	0.231	1.74	OK
15	0.009	0.231	3.82	OK
16	0.011	0.231	4.65	OK
17	0.005	0.231	2.04	OK
18	0.014	0.231	6.14	OK
19	0.005	0.231	2.19	OK
20	0.014	0.231	6.29	OK
21	0.004	0.231	1.79	OK
22	0.004	0.231	1.86	OK
23	0.004	0.231	1.57	OK
24	0.003	0.231	1.27	OK
25	0.005	0.231	2.32	OK
26	0.002	0.231	1.06	OK
27	0.006	0.231	2.59	OK
28	0.002	0.231	1.03	OK
29	0.006	0.231	2.77	OK
30	0.003	0.231	1.28	OK
31	0.003	0.231	1.12	OK
32	0.002	0.231	0.96	OK
33	0.003	0.231	1.37	OK
34	0.002	0.231	0.95	OK
35	0.003	0.231	1.36	OK
36	0.003	0.231	1.28	OK
37	0.003	0.231	1.22	OK
38	0.002	0.231	1.03	OK
39	0.005	0.231	2.36	OK
40	0.006	0.231	2.41	OK

Teseq Profline
4542 Luterbach, Switzerland

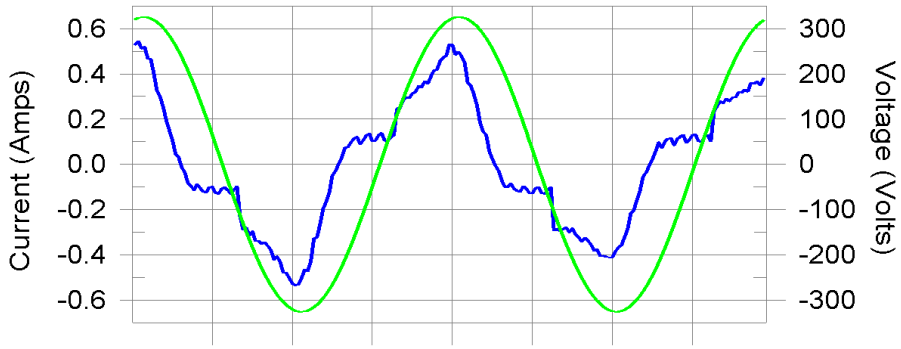
1/31/2024
3:30 PM

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

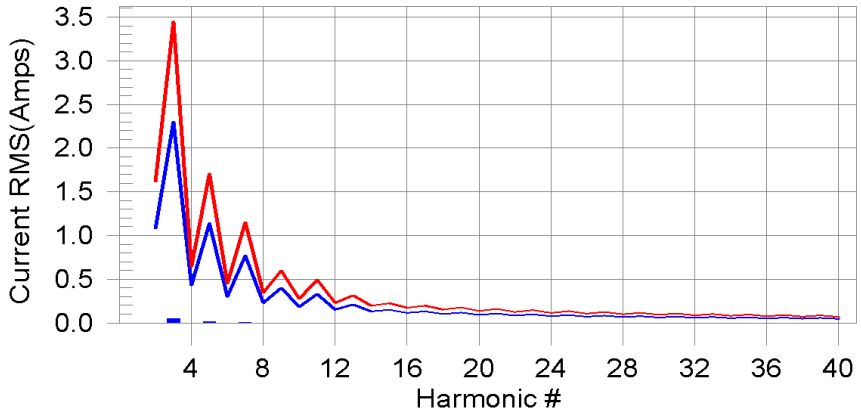
EUT: Toggle-Room **Tested by: Benoit Carle**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 1/31/2024 **Start time: 4:28:38 PM** **End time: 4:31:00 PM**
Test duration (min): 2 **Data file name: H-000464.cts_data**
Comment: Harmonics Fluctuations
Customer: Inogeni

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

Current & voltage waveforms



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



Test result: Pass Worst harmonic was #13 with 1.9% of the limit.

Teseq Profline 1/31/2024
4542 Luterbach, Switzerland 3:30 PM

Current Test Result Summary (Run time)

EUT: Toggle-Room **Tested by: Benoit Carle**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 1/31/2024 **Start time: 4:28:38 PM** **End time: 4:31:00 PM**
Test duration (min): 2 **Data file name: H-000464.cts_data**
Comment: Harmonics Fluctuations
Customer: Inogeni

Test Result: Pass **Source qualification: Normal**
THC(A): 0.063 **I-THD(%): 31.7** **POHC(A): 0.000** **POHC Limit(A): 0.251**

Highest parameter values during test:

V_RMS (Volts):	230.54	Frequency(Hz):	50.00
I_Peak (Amps):	0.563	I_RMS (Amps):	0.271
I_Fund (Amps):	0.216	Crest Factor:	2.494
Power (Watts):	39.7	Power Factor:	0.807

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.002	1.080	N/A	0.003	1.620	N/A	Pass
3	0.057	2.300	2.5	0.062	3.450	1.8	Pass
4	0.002	0.430	N/A	0.003	0.645	N/A	Pass
5	0.018	1.140	1.6	0.021	1.710	1.2	Pass
6	0.001	0.300	N/A	0.002	0.450	N/A	Pass
7	0.012	0.770	1.6	0.013	1.155	1.1	Pass
8	0.001	0.230	N/A	0.002	0.345	N/A	Pass
9	0.007	0.400	1.7	0.008	0.600	1.3	Pass
10	0.001	0.184	N/A	0.001	0.276	N/A	Pass
11	0.006	0.330	1.8	0.007	0.495	1.5	Pass
12	0.001	0.153	N/A	0.001	0.230	N/A	Pass
13	0.005	0.210	2.5	0.006	0.315	1.9	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.004	0.150	N/A	0.005	0.225	N/A	Pass
16	0.001	0.115	N/A	0.001	0.173	N/A	Pass
17	0.004	0.132	N/A	0.004	0.198	N/A	Pass
18	0.001	0.102	N/A	0.001	0.153	N/A	Pass
19	0.003	0.118	N/A	0.004	0.178	N/A	Pass
20	0.000	0.092	N/A	0.001	0.138	N/A	Pass
21	0.003	0.107	N/A	0.003	0.161	N/A	Pass
22	0.000	0.084	N/A	0.001	0.125	N/A	Pass
23	0.002	0.098	N/A	0.003	0.147	N/A	Pass
24	0.001	0.077	N/A	0.001	0.115	N/A	Pass
25	0.004	0.090	N/A	0.005	0.135	N/A	Pass
26	0.000	0.071	N/A	0.001	0.107	N/A	Pass
27	0.002	0.083	N/A	0.003	0.125	N/A	Pass
28	0.001	0.066	N/A	0.001	0.099	N/A	Pass
29	0.002	0.078	N/A	0.002	0.116	N/A	Pass
30	0.001	0.061	N/A	0.001	0.092	N/A	Pass
31	0.002	0.073	N/A	0.003	0.109	N/A	Pass
32	0.001	0.058	N/A	0.001	0.086	N/A	Pass
33	0.002	0.068	N/A	0.002	0.102	N/A	Pass
34	0.000	0.054	N/A	0.001	0.081	N/A	Pass
35	0.002	0.064	N/A	0.002	0.096	N/A	Pass
36	0.000	0.051	N/A	0.001	0.077	N/A	Pass
37	0.001	0.061	N/A	0.002	0.091	N/A	Pass
38	0.000	0.048	N/A	0.001	0.073	N/A	Pass
39	0.001	0.058	N/A	0.002	0.087	N/A	Pass
40	0.000	0.046	N/A	0.001	0.069	N/A	Pass

Teseq Profline
4542 Luterbach, Switzerland

1/31/2024
3:30 PM

Voltage Source Verification Data (Run time)

EUT: Toggle-Room **Tested by: Benoit Carle**
Test category: Class-A per Ed. 4.0 (2014) (European limits) **Test Margin: 100**
Test date: 1/31/2024 **Start time: 4:28:38 PM** **End time: 4:31:00 PM**
Test duration (min): 2 **Data file name: H-000464.cts_data**
Comment: Harmonics Fluctuations
Customer: Inogeni

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

Highest parameter values during test:

Voltage (Vrms):	230.54	Frequency(Hz):	50.00
I_Peak (Amps):	0.563	I_RMS (Amps):	0.271
I_Fund (Amps):	0.216	Crest Factor:	2.494
Power (Watts):	39.7	Power Factor:	0.807

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.014	0.461	3.07	OK
3	0.416	2.074	20.04	OK
4	0.026	0.461	5.56	OK
5	0.040	0.922	4.33	OK
6	0.026	0.461	5.73	OK
7	0.020	0.691	2.89	OK
8	0.007	0.461	1.48	OK
9	0.015	0.461	3.26	OK
10	0.007	0.461	1.48	OK
11	0.008	0.231	3.41	OK
12	0.013	0.231	5.43	OK
13	0.007	0.231	2.85	OK
14	0.004	0.231	1.72	OK
15	0.009	0.231	3.99	OK
16	0.011	0.231	4.69	OK
17	0.005	0.231	2.17	OK
18	0.014	0.231	6.06	OK
19	0.005	0.231	2.05	OK
20	0.015	0.231	6.37	OK
21	0.004	0.231	1.76	OK
22	0.004	0.231	1.87	OK
23	0.003	0.231	1.47	OK
24	0.003	0.231	1.23	OK
25	0.005	0.231	2.01	OK
26	0.002	0.231	0.96	OK
27	0.006	0.231	2.59	OK
28	0.002	0.231	1.05	OK
29	0.007	0.231	2.86	OK
30	0.004	0.231	1.61	OK
31	0.003	0.231	1.11	OK
32	0.002	0.230	0.97	OK
33	0.003	0.231	1.41	OK
34	0.002	0.231	0.93	OK
35	0.004	0.231	1.57	OK
36	0.003	0.231	1.09	OK
37	0.003	0.231	1.27	OK
38	0.002	0.231	1.00	OK
39	0.005	0.231	2.25	OK
40	0.005	0.231	2.34	OK

APPENDIX D
VOLTAGE FLUCTUATIONS AND FLICKER LIMITATIONS

Teseq Profline
4542 Luterbach, Switzerland

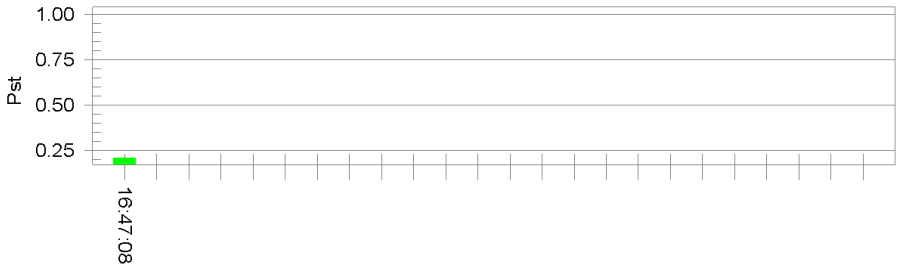
1/31/2024
3:42 PM

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

EUT: Toggle-Room **Tested by: Benoit Carle**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 1/31/2024 **Start time: 4:36:38 PM** **End time: 4:47:09 PM**
Test duration (min): 10 **Data file name: F-000465.cts_data**
Comment: Flicker
Customer: Inogeni

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):	**230.43**			
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 (%):	**0.03**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.212**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.093**	**Test limit:**	**0.650**	**Pass**

Teseq AG Win2100 V4.9.0 Page 1 of 1

Teseq Profline
4542 Luterbach, Switzerland

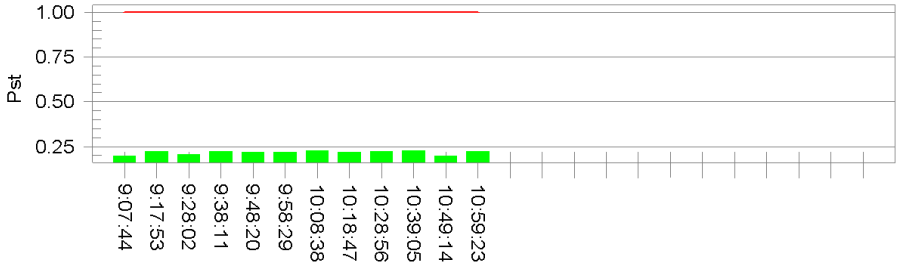
2/1/2024
9:53 AM

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

EUT: Toggle-Room **Tested by: Benoit Carle**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 2/1/2024 **Start time: 8:57:14 AM** **End time: 10:59:24 AM**
Test duration (min): 120 **Data file name: F-000466.cts_data**
Comment: Flicker
Customer: Inogeni

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):	**230.39**			
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 (%):	**0.10**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.229**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.219**	**Test limit:**	**0.650**	**Pass**

Teseq AG Win2100 V4.9.0 Page 1 of 1

END OF TEST REPORT