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# EMC/EMI Test Report

Tested Product:

# CAM230

Test Report TR-0634371_R1

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A2LA ACCREDITED
CERT #214.48

## REVISION HISTORY

| Revision | Description | Date |
|---|---|---|
| 0 | Initial Release | 2023-04-13 |
| 1 | UKCA marking was added | 2023-04-14 |
| | | |

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# 1 INTRODUCTION

This test report describes EMC tests on the product CAM230:

- 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
PE: Protective Earth
HCP: Horizontal Coupling Plane
VCP: Vertical Coupling Plane
ESD: Electrostatic Discharge
EFT: Electrical Fast Transient
Pst: short-term flicker
Plt: long-term flicker
Un: Nominal Voltage

## 3 PROJECT DATES

| | |
|---|---|
| **RECEPTION DATE(S) (yyyy-mm-dd)** | 2023-04-05 (LABCEM#3464) |
| **TESTS DATE(S) (yyyy-mm-dd)** | From 2023-04-05 to 2023-04-10 (LABCEM#3464) |

# 4 DESCRIPTION OF EQUIPMENT UNDER TEST

## 4.1 EUT

| | |
|---|---|
| **TYPE:** | Camera selector |
| **PRODUCT NAME:** | CAM230 |
| **MANUFACTURER:** | Inogeni |
| **LABCEM NUMBER:** | LABCEM#3464 |
| **PART NUMBER:** | CAM230 |
| **SERIAL NUMBER:** | KUO3090013 |
| **VOLTAGE RATING:** | 12Vdc |
| **EXTERNAL PSU INFO:** | Manufacturer: Phihong<br>Model: ICP20-120-1200D<br>P/N: ICP20-120-1200D<br>S/N: N/A<br>Input Voltage: 100-240V, 50-60Hz<br>Output Voltage: 12Vdc |
| **EUT SIZE:** | Width = 17cm<br>Height = 4cm<br>Depth = 12cm |
| **FIRMWARE:** | Original: 1.23<br>After modification: 1.23C |
| **HIGHEST INTERNAL FREQUENCY:** | 1.5GHz |


**Photo 1: EUT**

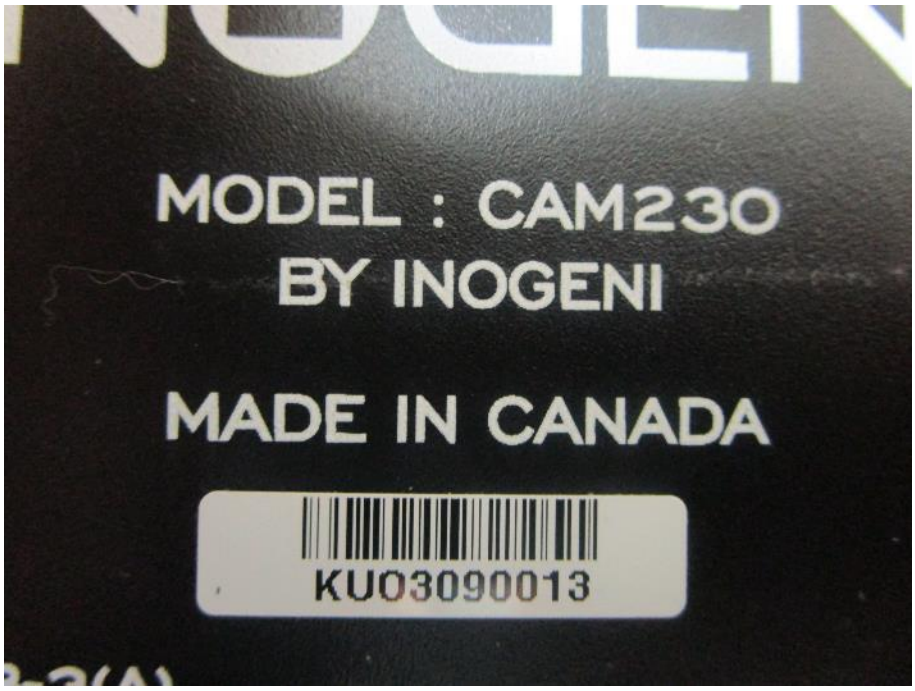



**Photo 2: EUT S/N**

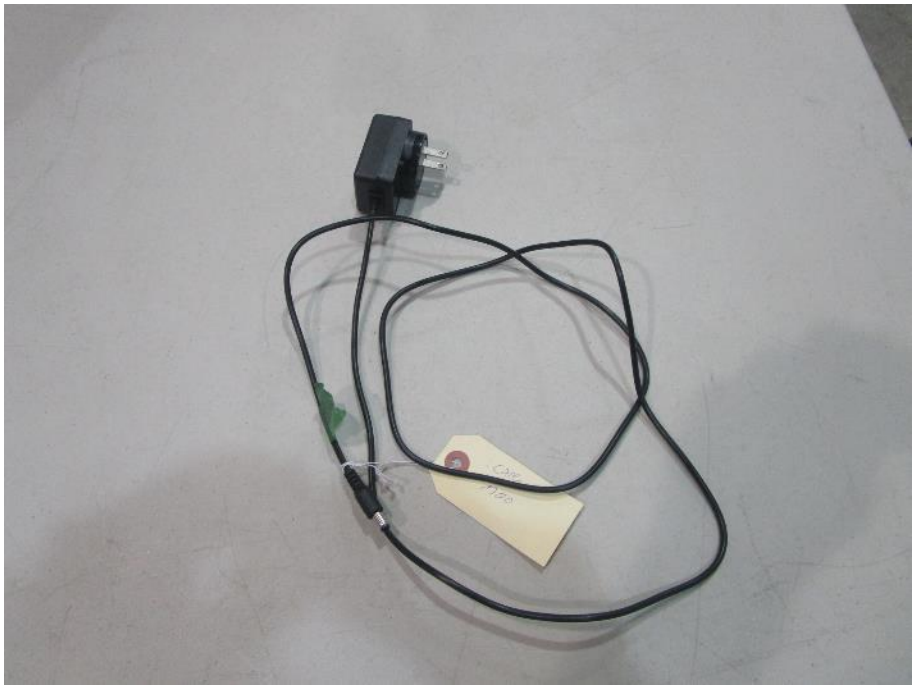


**Photo 3: PSU**


**Photo 4: PSU – S/N**

## 4.2 Support Equipment

EUT was exercised with support equipment supplied by client.

**Photo 5: Support Equipment - Laptop**


**Photo 6: Support Equipment - Monitor**


**Photo 7: Support Equipment – Video pattern generator**

**Photo 8: Support Equipment – Ethernet switch**


**Photo 9: Support Equipment – USB router**


**Photo 10: Support Equipment – USB 3.0 Camera**


**Photo 11: Support Equipment – USB 2.0 Camera**

### 4.3 EUT Setup Diagram

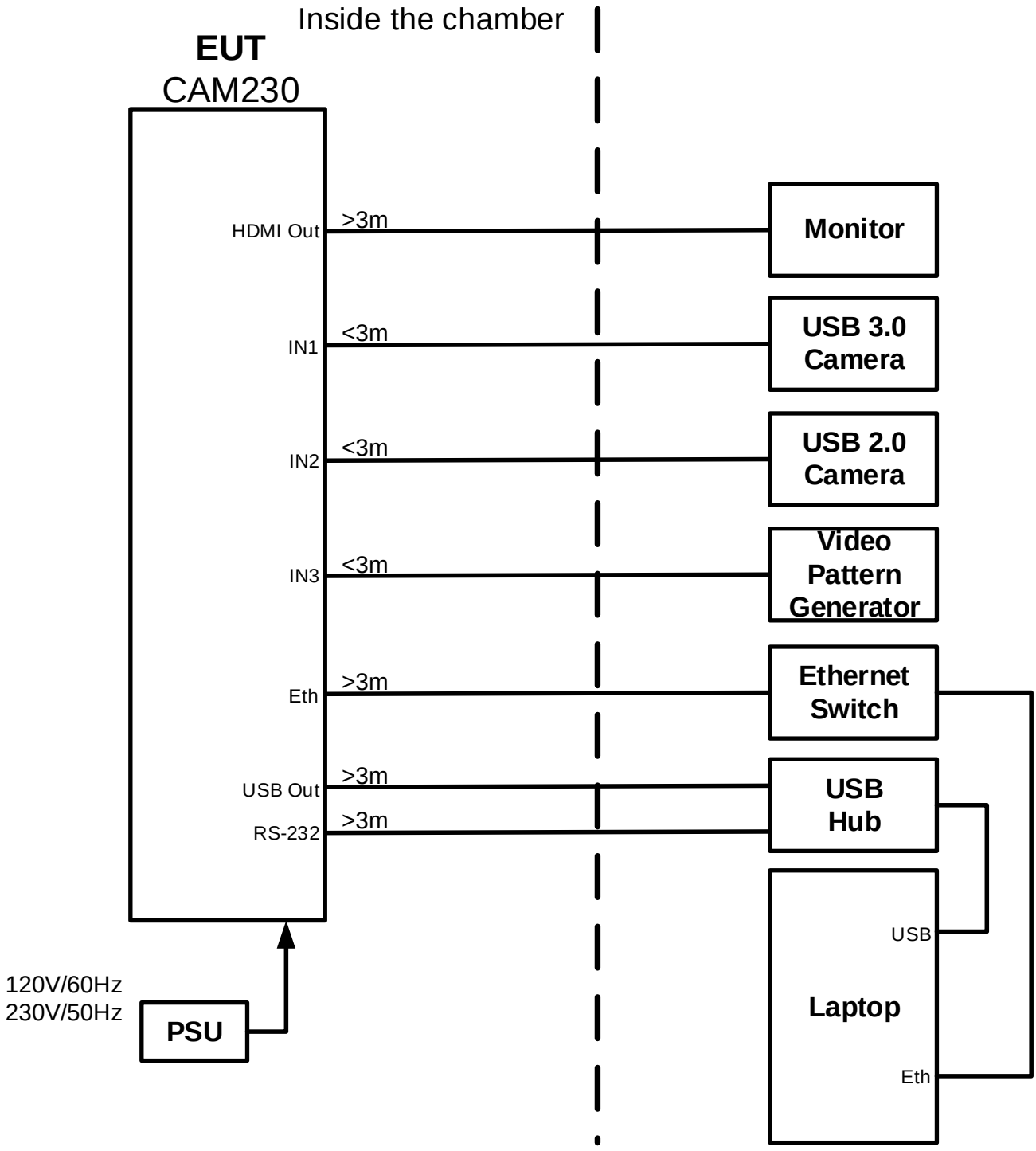
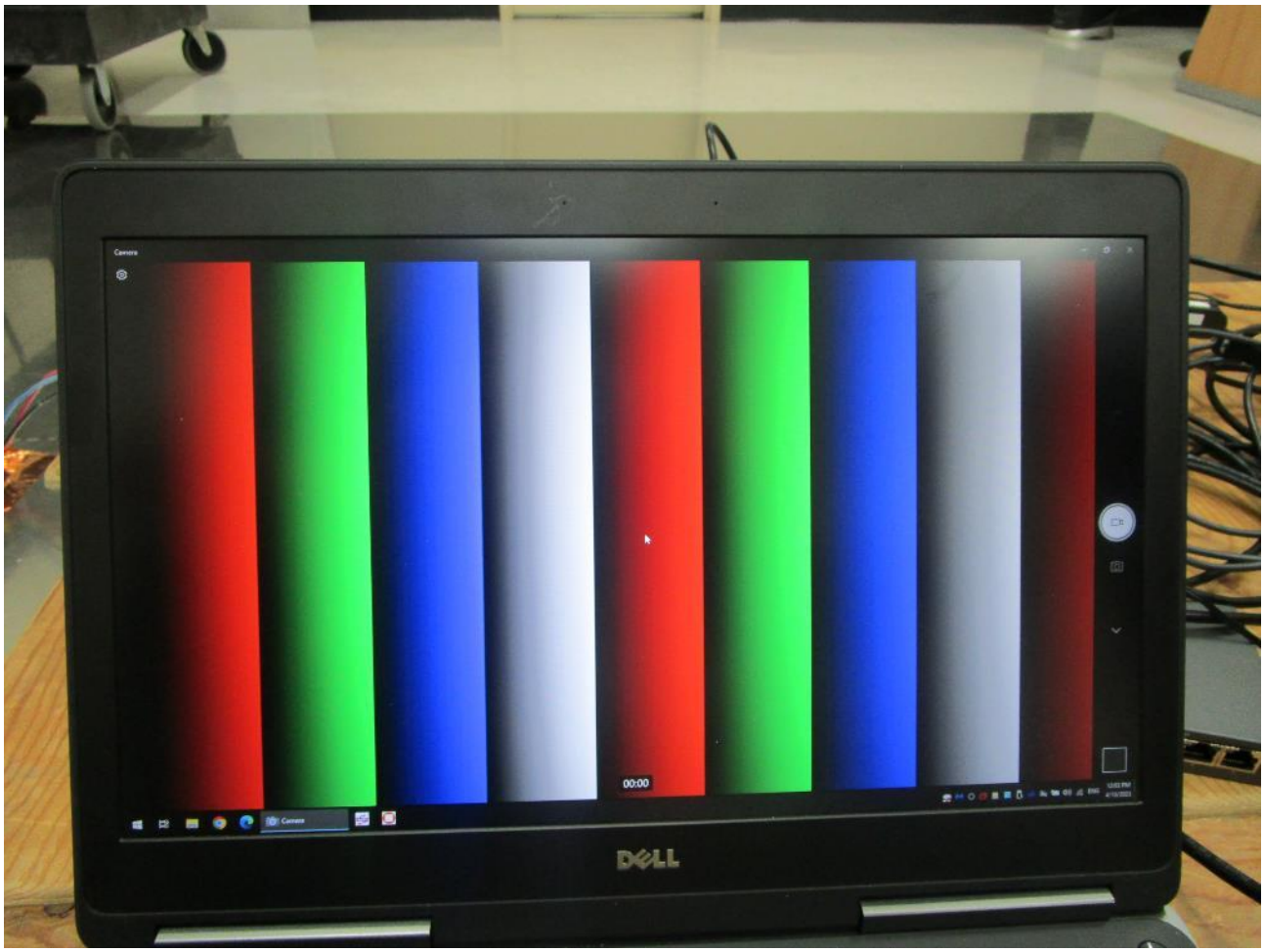



**Figure 1: EUT Setup Diagram**

## 4.4 Mode of Operation

During the tests, the EUT was exercised by powering it to 230V/50Hz or 120V/60Hz. A video signal was applied to IN1, IN2 and IN3. The signal on IN3, from the video pattern generator, was routed to HDMI out which was connected to a monitor, and also to the laptop via USB. The Ethernet port was connected to the laptop Ethernet port via an Ethernet switch. The Ethernet switch was providing power to the CAM230 via Power Over Ethernet. The EUT was priorizing the power from the main power port. If no power was available on the main power port, then the EUT was automatically switching to POE.


**Capture 1: Client Software - Monitor**




**Capture 2: Client Software - Laptop**

## 4.5 Method of Monitoring

During the tests, the EUT was monitored by observing the video pattern 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 National Technical Systems Canada Inc. ($U_{LAB}$) 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) | ± 3.77 dB |
| Conducted Emissions with LISN (150kHz-30MHz) | ± 3.33 dB |
| Radiated Emissions (30MHz-1GHz) | ± 5.87 dB |
| Radiated Emissions (1GHz-18GHz) | ± 5.10 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

2023-04-06 – Modification #1 on EUT (LABCEM#3464)

In order to be compliant with electrostatic discharge test, the firmware has been modified to wait a delay before changing the selected input after losing the video signal from this input. If the signal comes back within that delay, the EUT won't switch to another input. The old firmware version was 1.23. The new was 1.23C.

No other 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 TEST SUMMARY

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

| Test Name<br>Standards | Test Specifications | Minimum Performance Criterion Required | EUT Serial Number | Results |
|---|---|---|---|---|
| Conducted Emissions<br>FCC part 15 subpart B (2022) | Class A<br>150kHz-30MHz | N/A | KUO3090013 | Pass |
| Radiated Emissions<br>FCC part 15 subpart B (2022) | Class A<br>30MHz-1GHz | N/A | KUO3090013 | Pass |
| Conducted Emissions<br>ICES-003 Issue 7 (2020) | Class A<br>150kHz-30MHz | N/A | KUO3090013 | Pass |
| Radiated Emissions<br>ICES-003 Issue 7 (2020) | Class A<br>30MHz-1GHz | N/A | KUO3090013 | Pass |
| Conducted Emissions<br>EN 55032 (2015) A11 (2020) | Class A<br>150kHz-30MHz | N/A | KUO3090013 | Pass |
| Radiated Emissions<br>EN 55032 (2015) A11 (2020) | Class A<br>30MHz-1GHz | N/A | KUO3090013 | Pass |
| Harmonic Current Emission Limits<br>EN IEC 61000-3-2 (2019) A1 (2021) | Class A | N/A | KUO3090013 w/ modification #1 | Pass |
| Voltage Fluctuations and Flicker Limitations<br>EN 61000-3-3 (2013) A1 (2019) A2 (2021) | Observation period for $P_{st}$: 10 min<br>Observation period for $P_{lt}$: 120 min | N/A | KUO3090013 w/ modification #1 | Pass |
| Electrostatic Discharge Immunity<br>IEC 61000-4-2 (2008) | Contact: ±4kV<br>Air: ±2kV, ±4kV, ±8kV | B | KUO3090013 w/ modification #1 | Pass |
| Radiated Electromagnetic Field Immunity<br>IEC 61000-4-3 (2020) | 80MHz-1000MHz: 3V/m<br>1.8GHz, 2.6GHz: 3V/m<br>3.5GHz, 5GHz: 3V/m | A | KUO3090013 w/ modification #1 | Pass |
| Electrical Fast Transient Immunity<br>IEC 61000-4-4 (2012) | Power: ±1kV / 5kHz<br>I/O Ports: ±0.5kV / 5kHz<br>Communication Ports: ±0.5kV / 5kHz | B | KUO3090013 w/ modification #1 | Pass |
| Surge Immunity<br>IEC 61000-4-5 (2014) A1 (2017) | Power: ±2kV L-PE / ±1kV L-L<br>I/O Ports: N/A<br>Communication Ports: N/A | B | KUO3090013 w/ modification #1 | Pass |
| Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields<br>IEC 61000-4-6 (2013) | Power: 3V<br>I/O Ports: 3V<br>Communication Ports: 3V | A | KUO3090013 w/ modification #1 | Pass |
| Power Frequency Magnetic Field Immunity<br>IEC 61000-4-8 (2009) | Continuous Field: 1A/m / 50Hz & 60Hz | A | KUO3090013 w/ modification #1 | Pass |

| Test Name<br>Standards | Test Specifications | Minimum Performance Criterion Required | EUT Serial Number | Results |
|---|---|---|---|---|
| Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC Input<br>IEC 61000-4-11 (2020) | Voltage dips:<br>0%Un during half cycle (at 60Hz)<br>70%Un during 25 cycles (at 50Hz)<br>70%Un during 30 cycles (at 60Hz)<br><br>Short interruptions:<br>0%Un during 250 cycles (at 50Hz)<br>0%Un during 300 cycles (at 60Hz) | <br>B<br><br>C<br><br>C<br><br><br>C<br><br>C | KUO3090013 w/ modification #1 | Pass |

**Table 4: Test Summary**

# 10 EMISSIONS TESTS

## 10.1 Conducted Emissions

### 10.1.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | EN 55032 (2015) A11 (2020)<br>ANSI C63.4 (2014) |

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

| **EUT** | |
|---|---|
| **Identification** | CAM230 |
| **Voltage Input** | 230V/50Hz<br>120V/60Hz |

| **TEST INFO** | |
|---|---|
| **Test Date** (yyyy-mm-dd) | 2023-04-05 |
| **Temperature** °C (For Info Only) | 22.9°C |
| **Relative humidity** % (For Info Only) | 16.7% |
| **Atmospheric pressure** kPa (For Info Only) | 103kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | Louis-Sacha Constantineau (Inogeni) |

### 10.1.2 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 |
| Rohde&Sch | EMI receiver | ESW44 | 101905 | 12 | 2024-01-26 |
| NARDA | LISN | PMM L2-16B | 000WX20801 | 12 | 2023-06-10 |
| TESEQ | ISN, CDN | ST08A | 33995 | 24 | 2024-10-05 |

**Table 5: Conducted Emissions – Test Equipment**

### 10.1.3 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. | | | | |

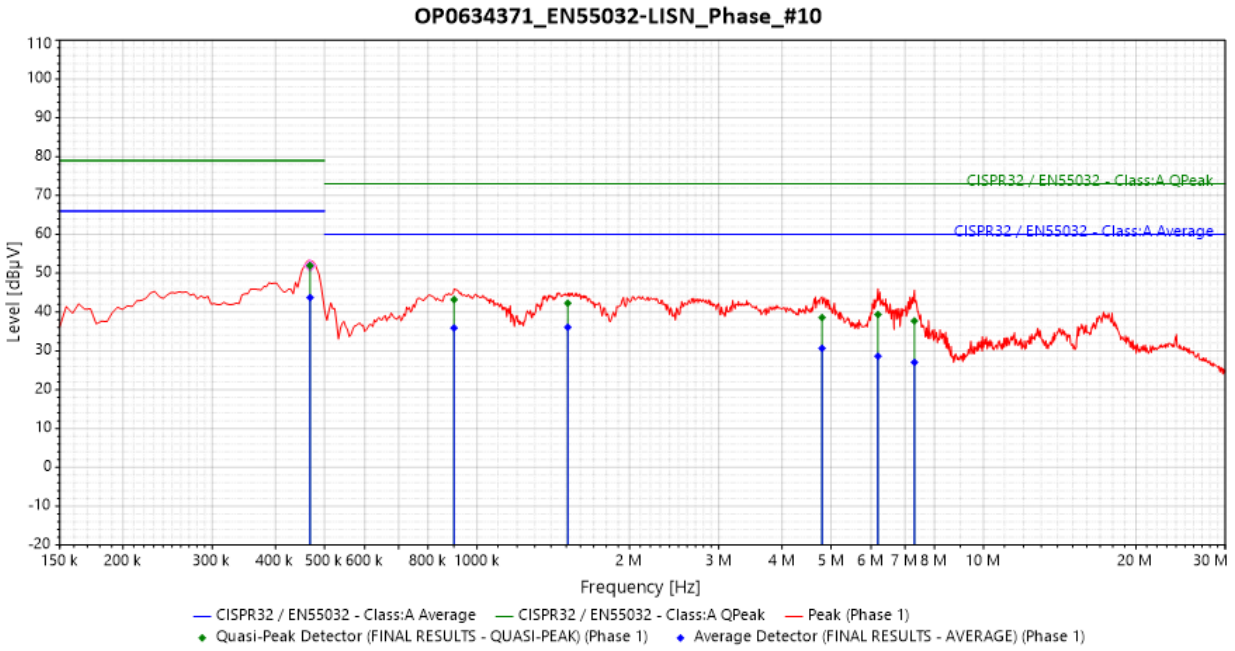
**Table 7: Conducted Emissions – Test Results – FCC Part 15 Subpart B / ICES-003 Class A**

| Tested Line | Frequency (MHz) | Average Limit (dBµV) | Quasi-Peak Limit (dBµV) | Results |
|---|---|---|---|---|
| Ethernet | 0.150 – 0.50 | 84 to 74 | 97 to 87 | Pass |
| | 0.50 – 30 | 74 | 87 | |
| 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. | | | | |

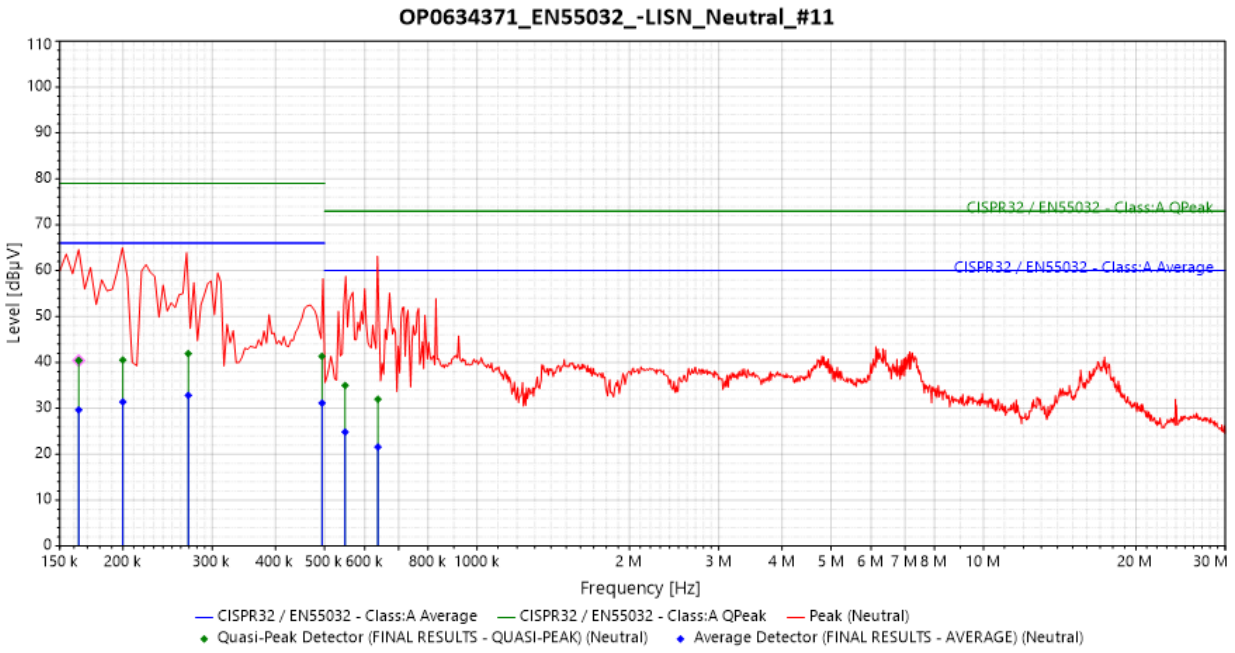
**Table 8: Conducted Emissions – Test Results – EN55032 Class A Telecom Ports**

### 10.1.4 Test Data

See APPENDIX A for data files.



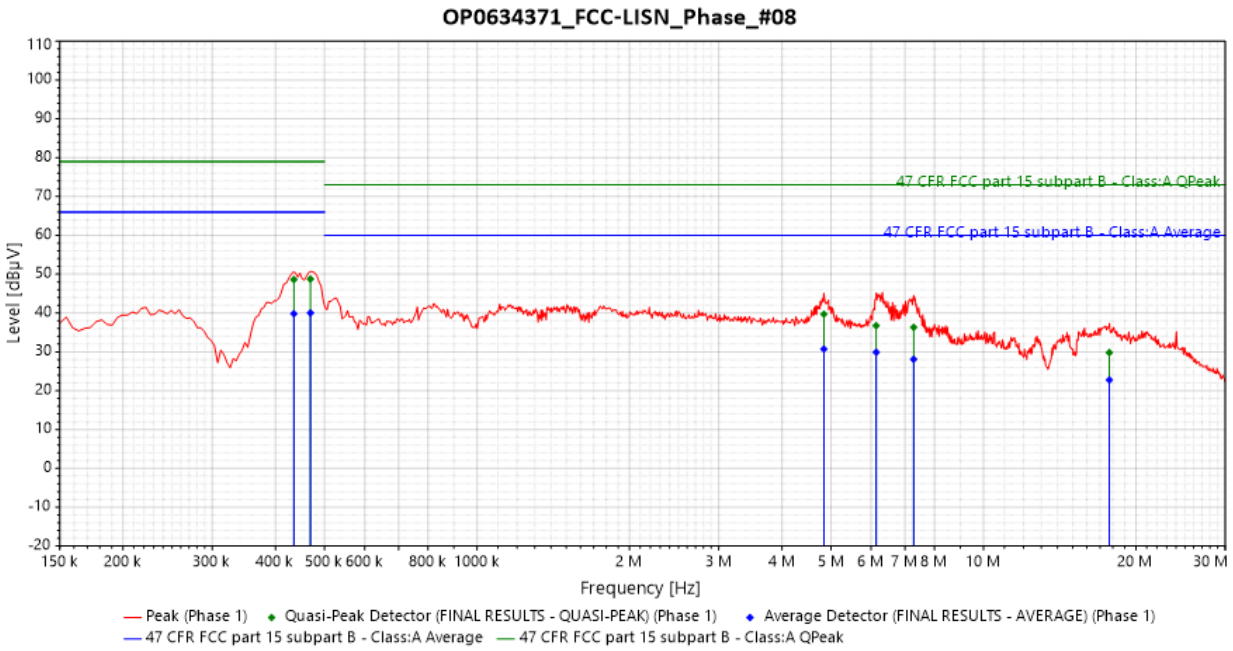

**Graph 1: Conducted Emissions – EN55032 – Power – Phase**



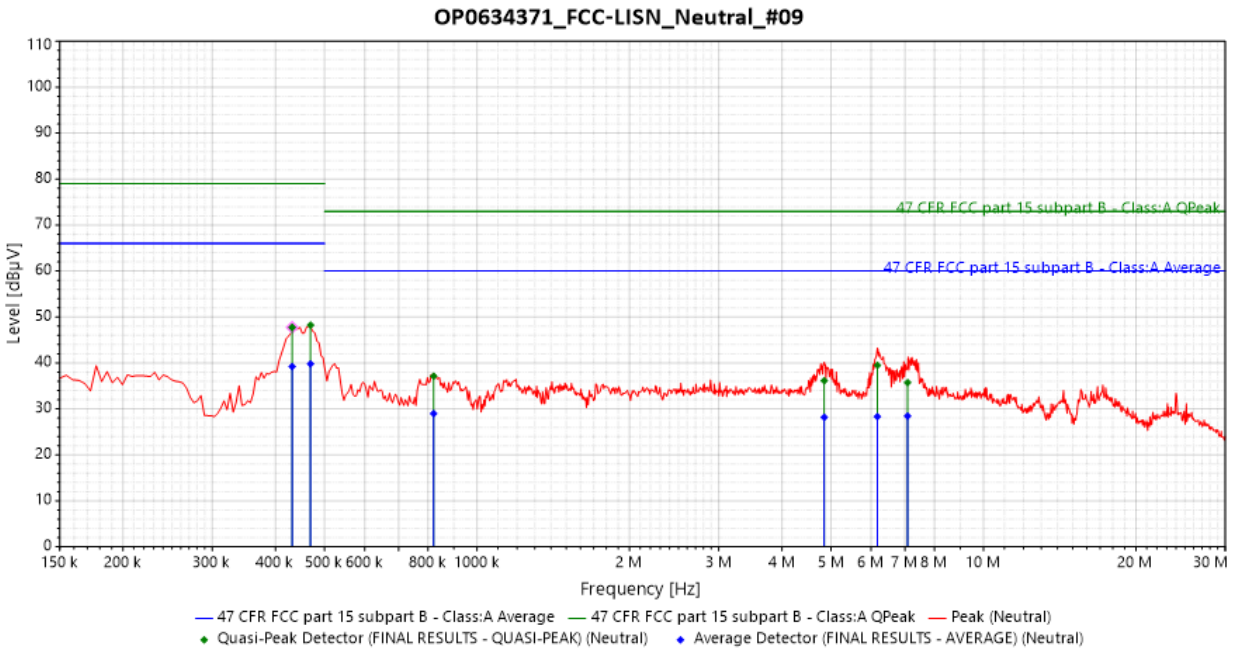

**Graph 2: Conducted Emissions – EN55032 – Power – Neutral**

| Tested Line | Frequency (MHz) | Detector | Level (dBµV) | Limit (dBµV) | Bandwidth (kHz) | Measurement Time (s) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| Power – Phase (230V/50Hz) | 0.4681 | Average | 43.732 | 66.000 | 9 kHz | 15 | 22.268 |
| Power – Neutral (230V/50Hz) | 0.2691 | Average | 32.841 | 66.000 | 9 kHz | 15 | 33.159 |

**Table 9: Conducted Emissions – Lowest Margin according to EN55032.**



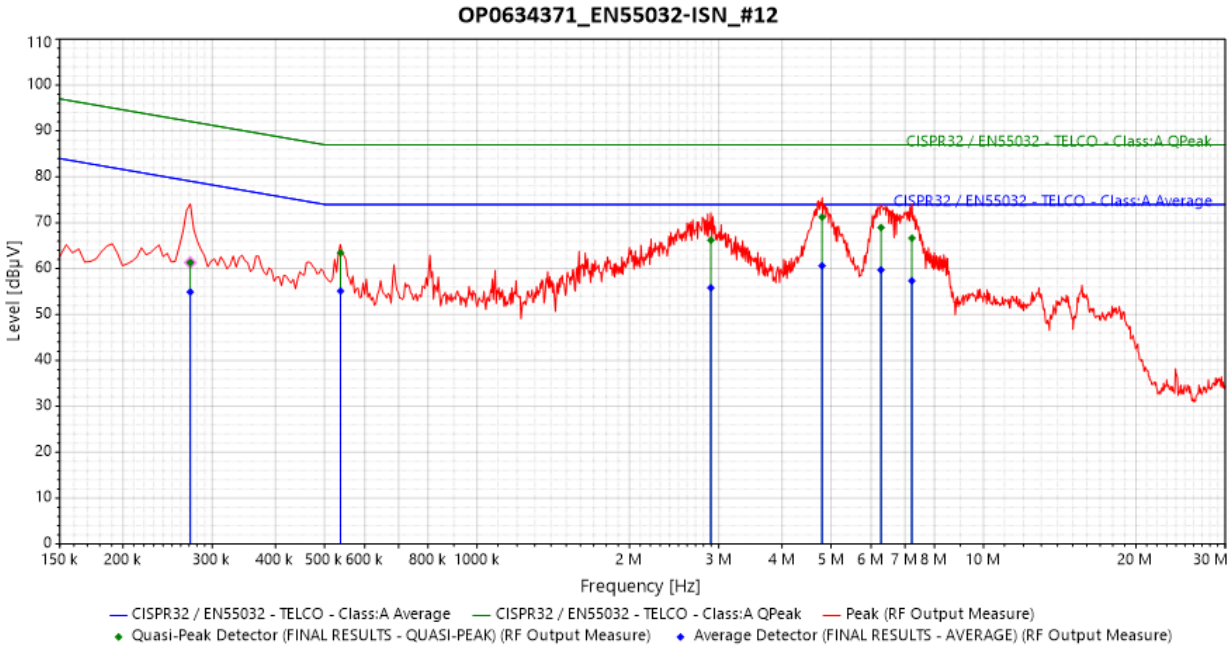

**Graph 3: Conducted Emissions – FCC part 15 Subpart B – Power – Phase**




**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) | 0.4689 | Average | 40.014 | 66.000 | 9 kHz | 15 | 25.986 |
| Power – Neutral (120V/60Hz) | 0.4691 | Average | 39.803 | 66.000 | 9 kHz | 15 | 26.197 |

**Table 10: Conducted Emissions – Lowest Margin according to FCC Part 15 Subpart B / ICES-003**




**Graph 5: Conducted Emissions – EN55032 – Telecom Ports**

| Tested Line | Frequency (MHz) | Detector | Level (dBµV) | Limit (dBµV) | Bandwidth (kHz) | Measurement Time (s) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| Ethernet | 4.8009 | Average | 60.625 | 74.000 | 9 kHz | 15 | 13.375 |

**Table 11: Conducted Emissions – Lowest Margin according to EN55032 – Telecom Ports**

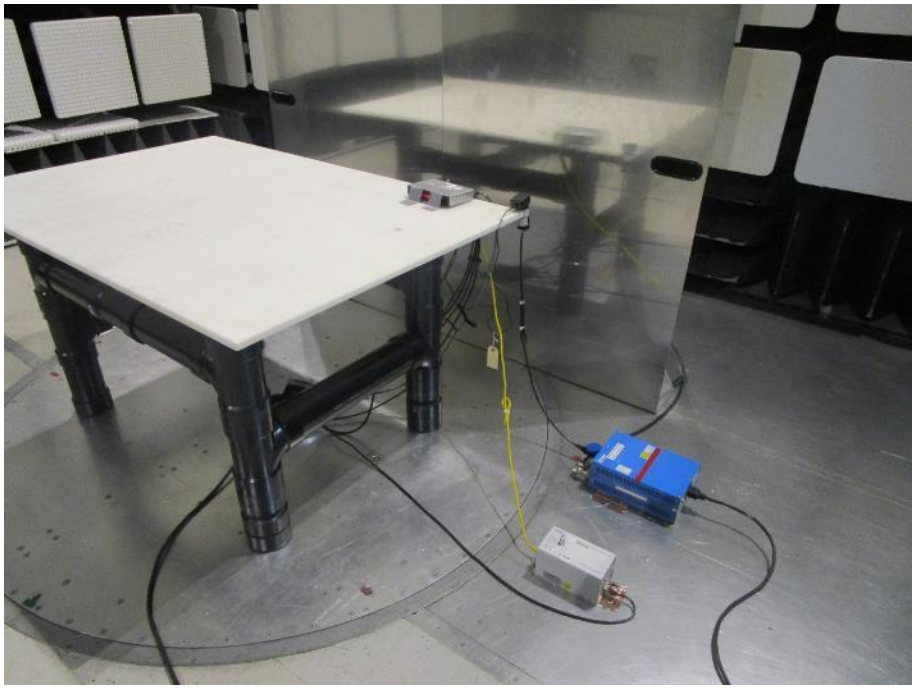


**Photo 12: Conducted Emissions – Test Setup**

**Photo 13: Conducted Emissions – Telecom Ports – Test Setup**

### 10.1.5 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.

## 10.2 Radiated Emissions

### 10.2.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | EN55032 (2015) A11 (2020)<br>ANSI C63.4 (2014) |

| **SPECIFICATIONS** | |
|---|---|
| **Limit** | EN55032 (2015) A11 (2020) class A<br>FCC part 15 subpart B (2022) class A<br>ICES-003 Issue 7 (2020) class A |
| **Frequency Range** | 30MHz – 1GHz<br>1GHz - 9GHz |
| **Measurement Distance** | 3m |
| **Installation** | Table-top equipment |

| **EUT** | |
|---|---|
| **Identification** | CAM230 |
| **Voltage Input** | 230V/50Hz |

| **TEST INFO** | |
|---|---|
| **Test Date** (yyyy-mm-dd) | 2023-04-05 |
| **Temperature** °C (For Info Only) | 22.9°C |
| **Relative humidity** % (For Info Only) | 16.7% |
| **Atmospheric pressure** kPa (For Info Only) | 103kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | Louis-Sacha Constantineau (Inogeni) |

### 10.2.2 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 |
| Rohde&Schwarz | EMI receiver | ESW44 | 101905 | 12 | 2024-01-26 |
| Schaffner | Bilog antenna | CBL6112D | 22617 | 24 | 2023-06-28 |
| TESEQ | Horn antenna | BHA9118 | 33053 | 24 | 2024-09-20 |
| Amplical | Amplifier 1GHz-18GHz | AMP1G18-30-N/PSU | 121212 | 12 | 2024-01-03 |

**Table 12: Radiated Emissions – Test Equipment**

### 10.2.3 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 |
| 3000 – 6000 | - | 60 | 80 | |
| 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. | | | | |

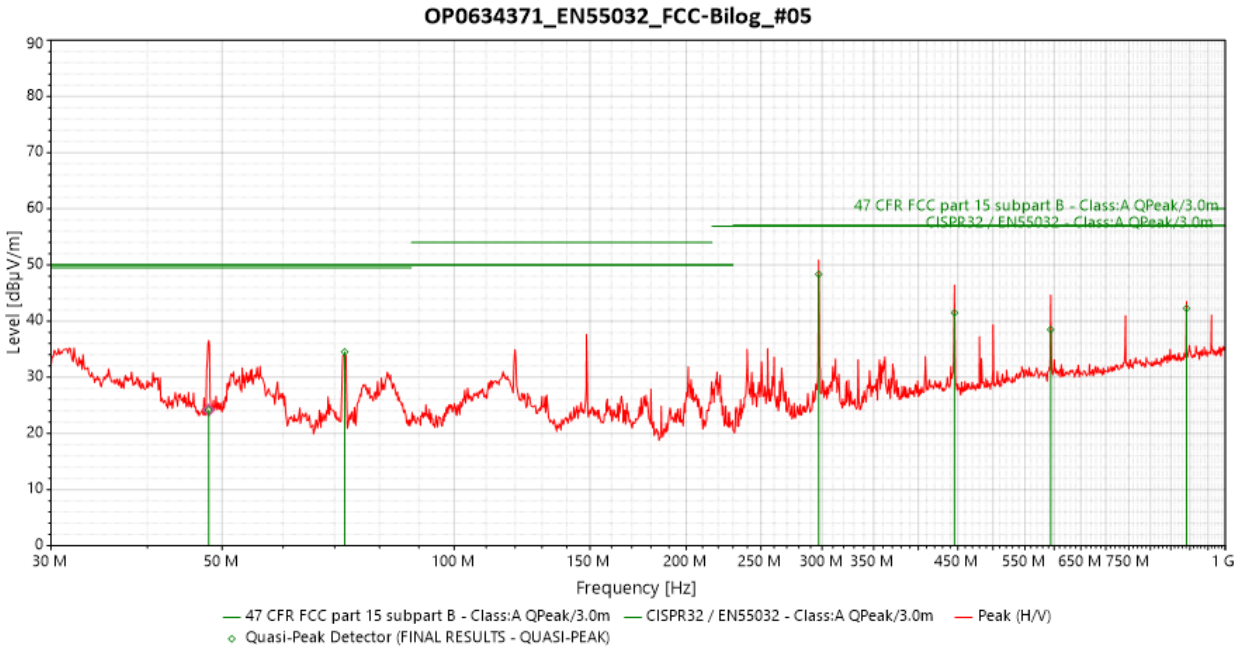
**Table 13: Radiated Emissions – Test Results – EN55032 Class A**

| 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 – 9000 | - | 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. | | | | |

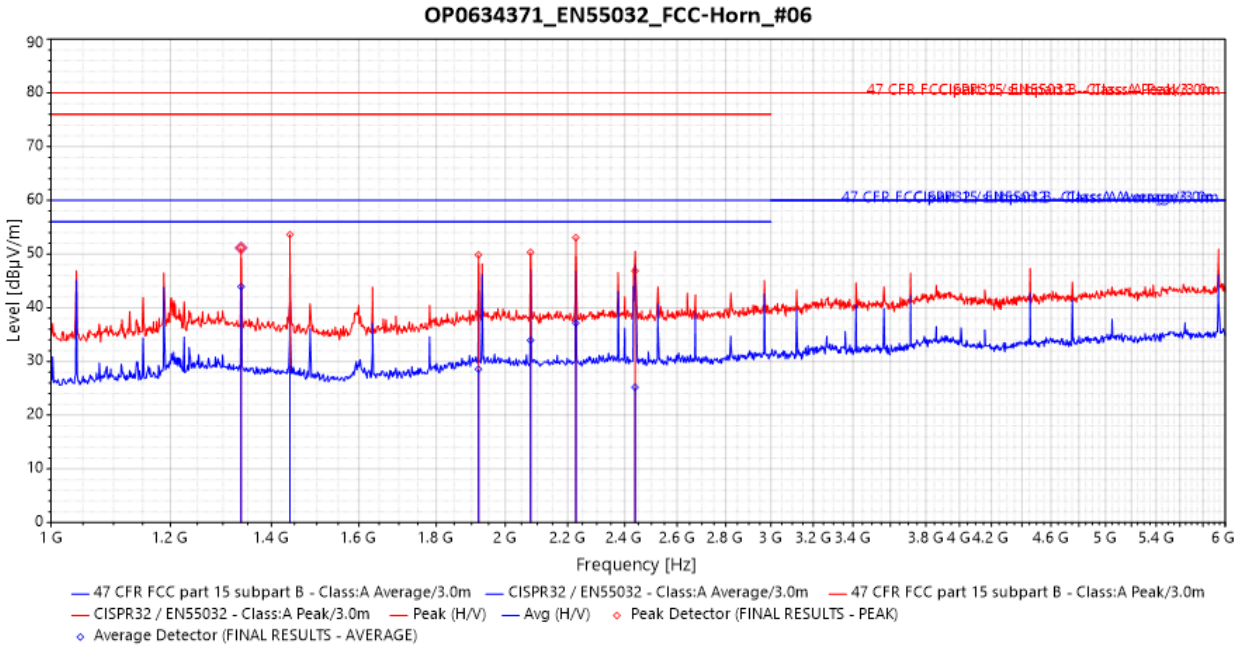
**Table 14: Radiated Emissions – Test Results – FCC Part 15 Subpart B / ICES-003 Class A**

### 10.2.4 Test Data

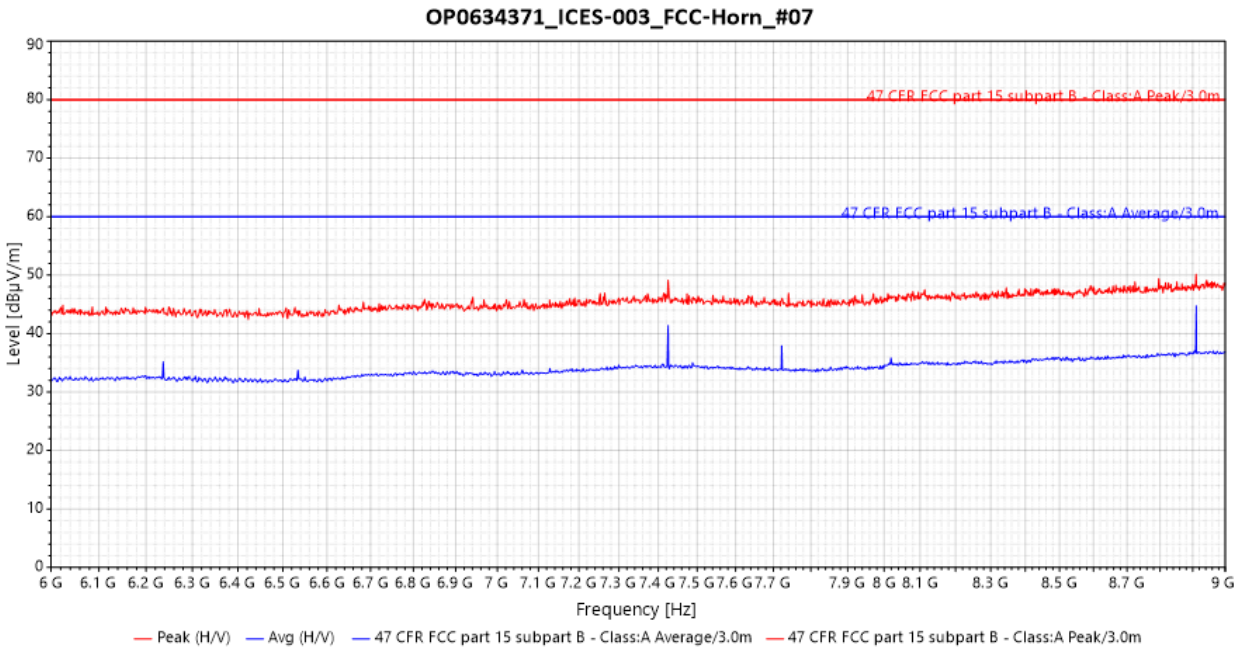
See APPENDIX B for data files.




**Graph 6: Radiated Emissions 30MHz-1GHz**




**Graph 7: Radiated Emissions 1GHz-6GHz**




**Graph 8: Radiated Emissions 6GHz-9GHz**

| Frequency (MHz) | Detector | Level (dBµV/m) | Limit (dBµV/m) | Bandwidth (kHz) | Measurement Time(s) | Margin (dB) |
|---|---|---|---|---|---|---|
| 297.0135 | Quasi-Peak | 48.337 | 57.000 | 120 | 15 | 8.663 |
| 1336.5621 | Average | 43.929 | 56.000 | 1000 | 15 | 12.071 |

**Table 15: Radiated Emissions – Lowest Margin according to EN55032**

| Frequency (MHz) | Detector | Level (dBµV/m) | Limit (dBµV/m) | Bandwidth (kHz) | Measurement Time(s) | Margin (dB) |
|---|---|---|---|---|---|---|
| 297.0135 | Quasi-Peak | 48.337 | 56.900 | 120 | 15 | 8.763 |
| 1336.5621 | Average | 43.929 | 60.000 | 1000 | 15 | 15.171 |

**Table 16: Radiated Emissions – Lowest Margin according to FCC Part 15 Subpart B / ICES-003**

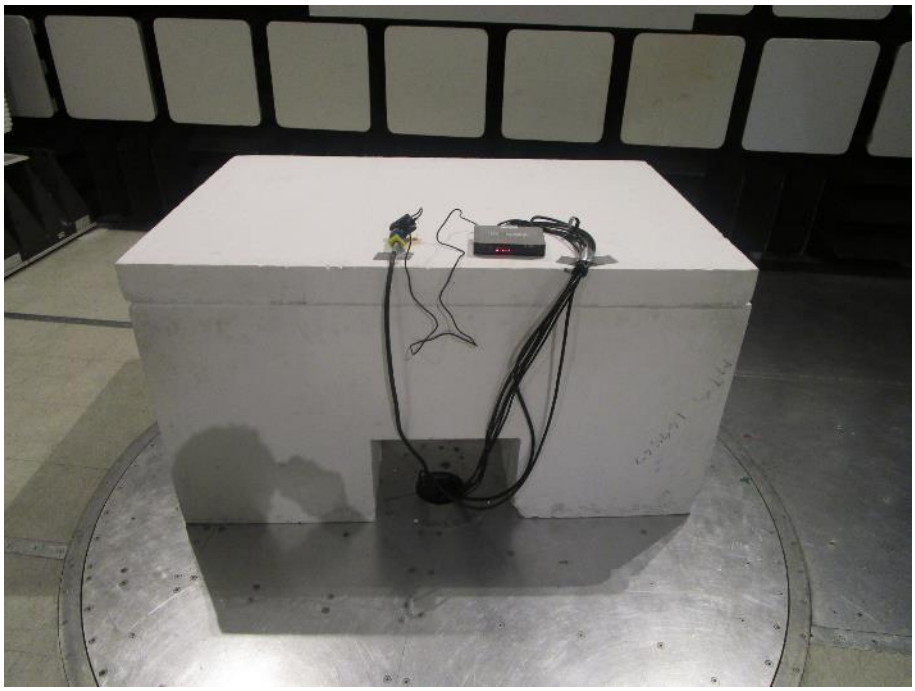


**Photo 14: Radiated Emissions – Test Setup**

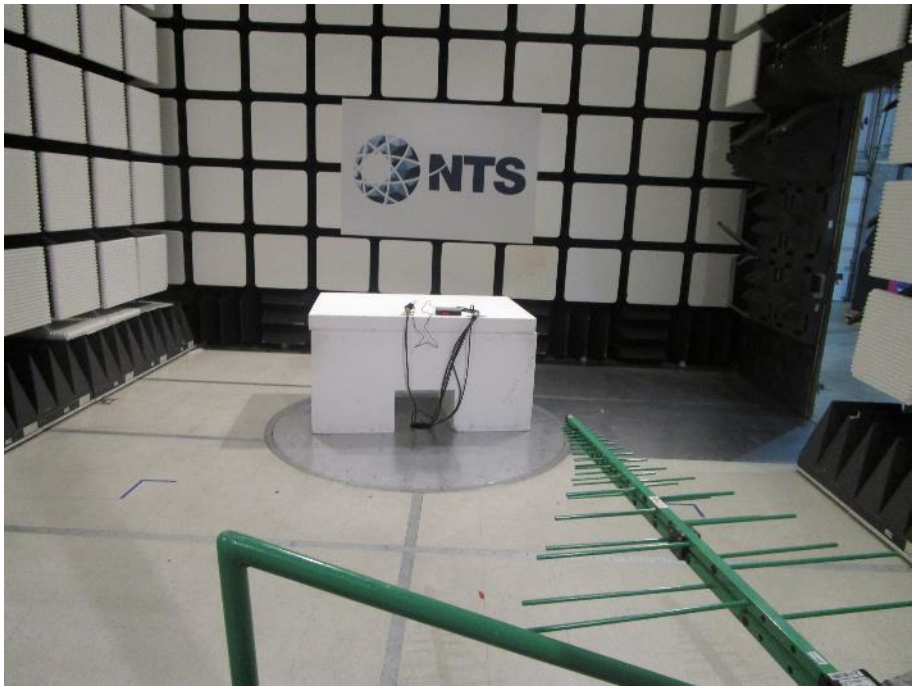



**Photo 15: Radiated Emissions – Test Setup 30MHz-1GHz**

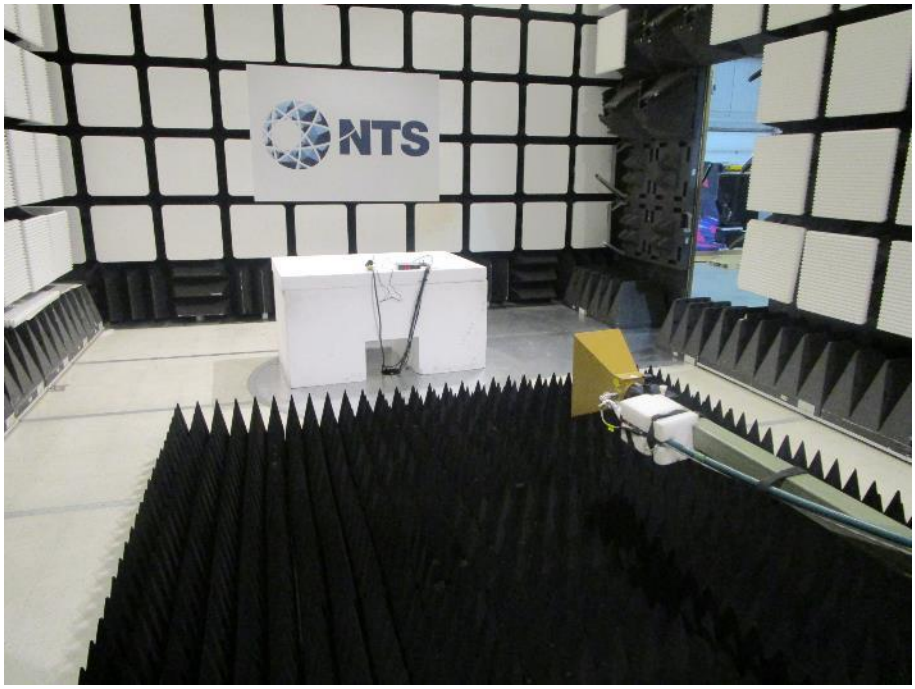



**Photo 16: Radiated Emissions – Test Setup 1GHz-9GHz**

**Photo 17: Radiated Emissions – Support Equipment**

### 10.2.5 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.

## 10.3 Harmonic Current Emissions

### 10.3.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | EN IEC 61000-3-2 (2019) A1 (2021) |
| **SPECIFICATIONS** | |
| **Limit** | Class A |
| **EUT** | |
| **Identification** | CAM230 |
| **Voltage Input** | 230V/50Hz |
| **TEST INFO** | |
| **Test Date** (yyyy-mm-dd) | 2023-04-06 |
| **Temperature** °C (For Info Only) | 23.2°C |
| **Relative humidity** % (For Info Only) | 28.2% |
| **Atmospheric pressure** kPa (For Info Only) | 101.6kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | No witness |

### 10.3.2 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 | 2023-09-14 |

**Table 17: Harmonic Current Emissions – Test Equipment**

### 10.3.3 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 18: 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 19: Harmonic Current Emissions – Test Results**

### 10.3.4 Test Data

See APPENDIX C for data files.

**Photo 18: Harmonic Current Emissions – Test Setup**

### 10.3.5 Test Method

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

## 10.4 Voltage Fluctuations and Flicker Measurements

### 10.4.1 Test Details

| | | |
|---|---|---|
| **REFERENCE STANDARD** | EN 61000-3-3 (2013) A1 (2019) A2 (2021) | |
| **SPECIFICATIONS** | | |
| **$P_{st}$ Observation Period** | 10 min | |
| **$P_{lt}$ Observation Period** | 120 min | |
| **EUT** | | |
| **Identification** | CAM230 | |
| **Voltage Input** | 230V/50Hz | |
| **Manual Switching** | NO | |
| **TEST INFO** | | |
| **Test Date** (yyyy-mm-dd) | 2023-04-06 | 2023-04-10 |
| **Temperature** °C (For Info Only) | 23.2°C | 22.8°C |
| **Relative humidity** % (For Info Only) | 28.2% | 26.6% |
| **Atmospheric pressure** kPa (For Info Only) | 101.6kPa | 102.9kPa |
| **Operator** | Jean Cadotte | Jean Cadotte |
| **Client Witness** | No witness | No witness |

### 10.4.2 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 | 2023-09-14 |
| TESEQ | Lumped impedance | CCN 1000-1 | 1232A04499 (CCN 1000-1) | 24 | 2023-09-14 |

**Table 20: Voltage Fluctuations and Flicker Measurements – Test Equipment**

### 10.4.3 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 21: Voltage Fluctuations and Flicker Measurements – Test Results**

### 10.4.4 Test Data

See APPENDIX D for data files.

Test setup was identical to harmonic current emissions measurements.

### 10.4.5 Test Method

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

# 11 IMMUNITY TESTS

## 11.1 Electrostatic Discharge Immunity

### 11.1.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | IEC 61000-4-2 (2008) |

| **SPECIFICATIONS** | |
|---|---|
| **Test Level** | Contact: ±4kV<br>Air: ±2kV, ±4kV, ±8kV |
| **Installation** | Table-top equipment |
| **Ungrounded Equipment** | YES |

| | |
|---|---|
| **PERFORMANCE CRITERION** | B |

| **EUT** | |
|---|---|
| **Identification** | CAM230 |
| **Voltage Input** | 230V/50Hz |

| **TEST INFO** | |
|---|---|
| **Test Date**<br>(yyyy-mm-dd) | 2023-04-06 |
| **Temperature**<br>Min 15°C – Max 35°C | 24.5°C |
| **Relative Humidity**<br>Min 30% - Max 60% | 38.4% |
| **Atmospheric Pressure**<br>Min 86kPa – Max 106kPa | 101.5kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | Louis-Sacha Constantineau (Inogeni) |

### 11.1.2 Test Equipment

| Manufacturer | Description | Model | Serial No | Calibration Cycle (month) | Next Calibration (y-m-d) |
|---|---|---|---|---|---|
| Vaisala | Thermo-Hygrometer | MI70/HMP77 | H4610004/JO430012 | 24 | 2023-08-13 |
| EMC-Partner | Discharge Generator | ESD3000 | 2076 | 12 | 2023-08-26 |
| EMC-Partner | Relay Module | ESD3000RM32 | 1822 | 12 | 2023-08-26 |
| EMC-Partner | Discharge Network 150pF/330Ohms | ESD3000DN1 | 1777 | 12 | 2023-08-26 |

**Table 22: ESD – Test Equipment**

### 11.1.3 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 | Note 1 | 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. | | | | | | | |
| Note 1: Due to cables, VCP was placed at 17cm from EUT (standard distance is 10cm). | | | | | | | |

**Table 23: ESD – Test Results – Indirect Discharges – CAM230**

| 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 24: ESD – Test Results – Indirect Discharges – PSU**

| ESD Point | ESD Type | Test Level (kV) | Number | Time Interval (s) | Generator Perpendicular | Comments | Results |
|---|---|---|---|---|---|---|---|
| C1 to C8 | Contact | ±4 | 10+ / 10- | 1 | YES | No event | Pass |
| C9 to C14 | Contact | ±4 | 10+ / 10- | 1 | YES | Note 1 | Pass |
| NONE | Air | ±2, ±4, ±8, ±15 | 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.<br><br>Note 2: After discharge points research, no possible air discharge was found on the EUT.<br><br>This test result is considered as a Pass according to performance criteria defined in section 5 | | | | | | | |

**Table 25: ESD – Test Results – Direct Discharges**

### 11.1.4 Test Data

**Photo 19: ESD – Test Setup**

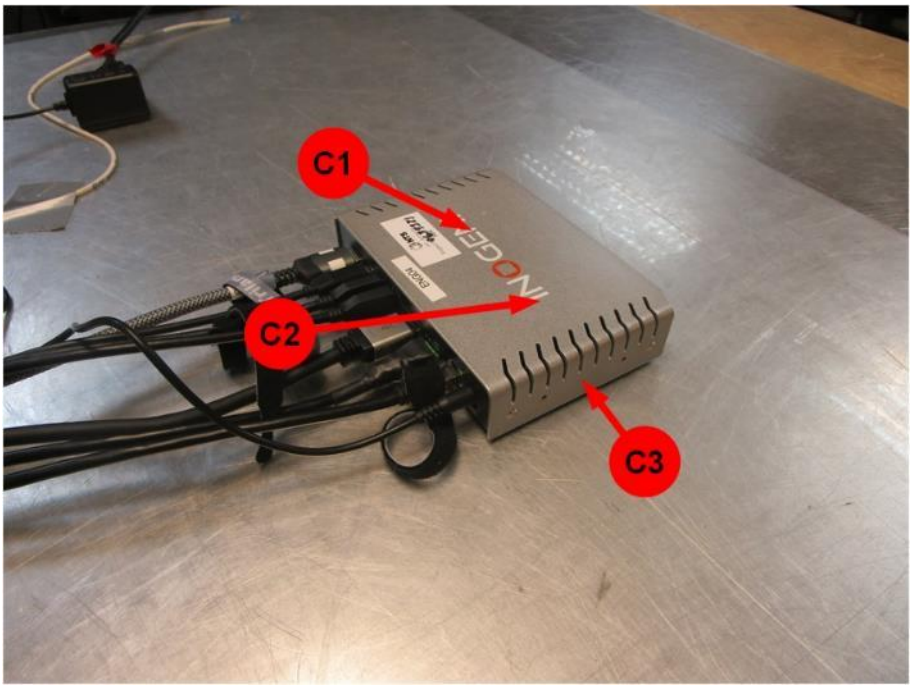



**Photo 20: ESD – Location of Discharge Points #1**

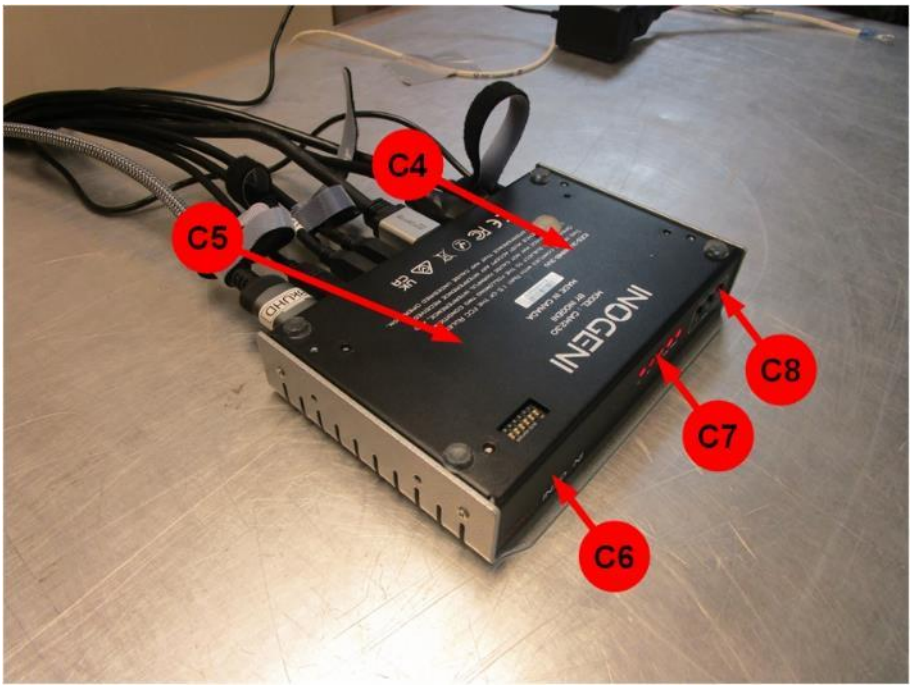



**Photo 21: ESD – Location of Discharge Points #2**

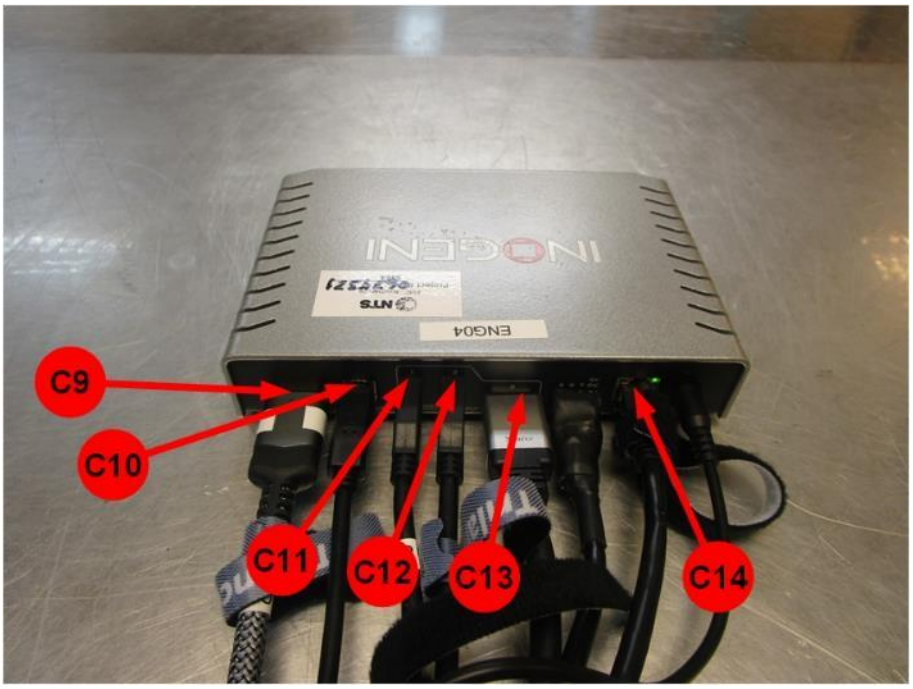



**Photo 22: ESD – Location of Discharge Points #3**

### 11.1.5 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).

## 11.2 Radiated Electromagnetic Field Immunity

### 11.2.1 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 | 20V/m |
| **Test Distance** | 2m | 2m | 2.7m |
| **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** | CAM230 |
| **Voltage Input** | 230V/50Hz |

| **TEST INFO** | |
|---|---|
| **Test Date** (yyyy-mm-dd) | 2023-04-06 |
| **Temperature** °C (For Info Only) | 23.2°C |
| **Relative humidity** % (For Info Only) | 28.2% |
| **Atmospheric pressure** kPa (For Info Only) | 101.6kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | Louis-Sacha Constantineau (Inogeni) |

### 11.2.2 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 | 2023-09-29 |
| Werlatone | Directional coupler (80MHz-1GHz) | C3908-10 | 98552 | 12 | 2023-12-22 |
| Werlatone | Directional coupler (0.8GHz-3GHz) | C6721-10 | 98746 | 12 | 2023-12-22 |
| Agilent | Directional coupler (2GHz-18GHz) | 773D | MY28390533 | 12 | 2023-12-30 |
| TESEQ | Power meter | PM 6006 | 72804 | 12 | 2023-09-29 |
| TESEQ | Power meter | PM 6006 | 72805 | 12 | 2023-09-29 |
| TESEQ | Power meter | PM 6006 | 77352 | 12 | 2023-09-29 |
| TESEQ | Power meter | PM 6006 | 77353 | 12 | 2023-09-29 |
| 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 EP604 | 811ZX20408 | 12 | 2023-10-14 |
| LABCEM | RF Uniformity Field 80MHz-1GHz (36V/m) | N/A | N/A | 12 | 2023-12-27 |
| LABCEM | RF Uniformity Field 1GHz-3GHz (18V/m) | N/A | N/A | 12 | 2023-12-27 |
| LABCEM | RF Uniformity Field 3GHz-6GHz (9V/m) **COM-POWER** | N/A | N/A | 12 | 2023-12-30 |

**Table 26: Radiated EM Field – Test Equipment**

### 11.2.3 Test Results

| Illuminated Face | Frequencies (MHz) | Test Level (V/m) | Modulation | Polarization | Comments | Results |
|---|---|---|---|---|---|---|
| Front | 80 - 1000 | 3 | AM / 1kHz | Horizontal Vertical | No event Note1 | Pass |
| | 1800, 2600 | 3 | AM / 1kHz | Horizontal Vertical | No event Note1 | Pass |
| | 3500, 5000 | 3 | AM / 1kHz | Horizontal Vertical | No event Note1 | Pass |
| Right | 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 |
| 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 27: Radiated EM Field – Test Results**

### 11.2.4 Test Data

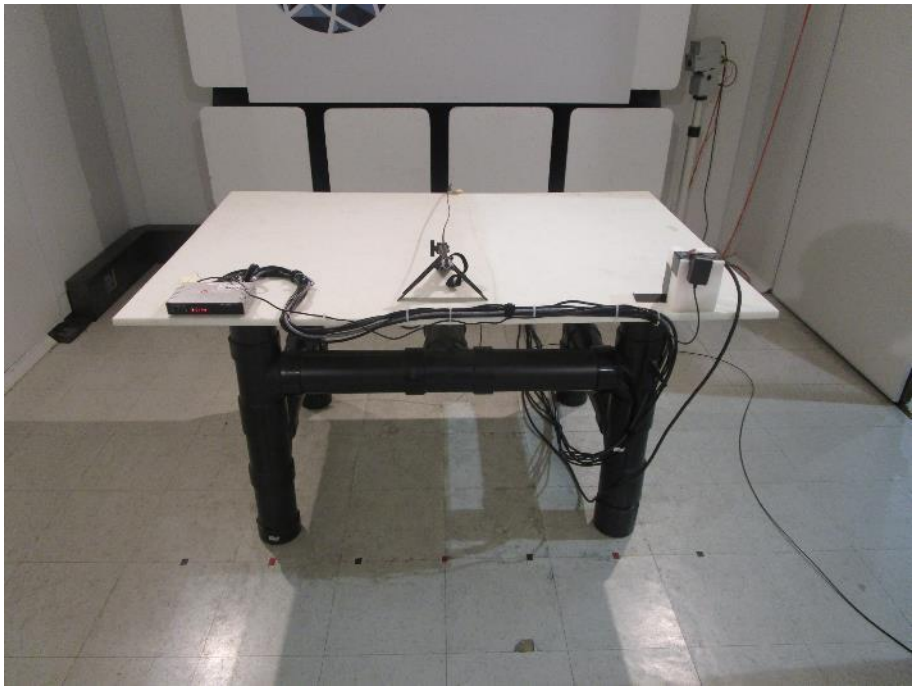


**Photo 23: Radiated EM Field – Test setup – Front**

**Photo 24: Radiated EM Field – Test setup – Right**

**Photo 25: Radiated EM Field – Test setup – Rear**

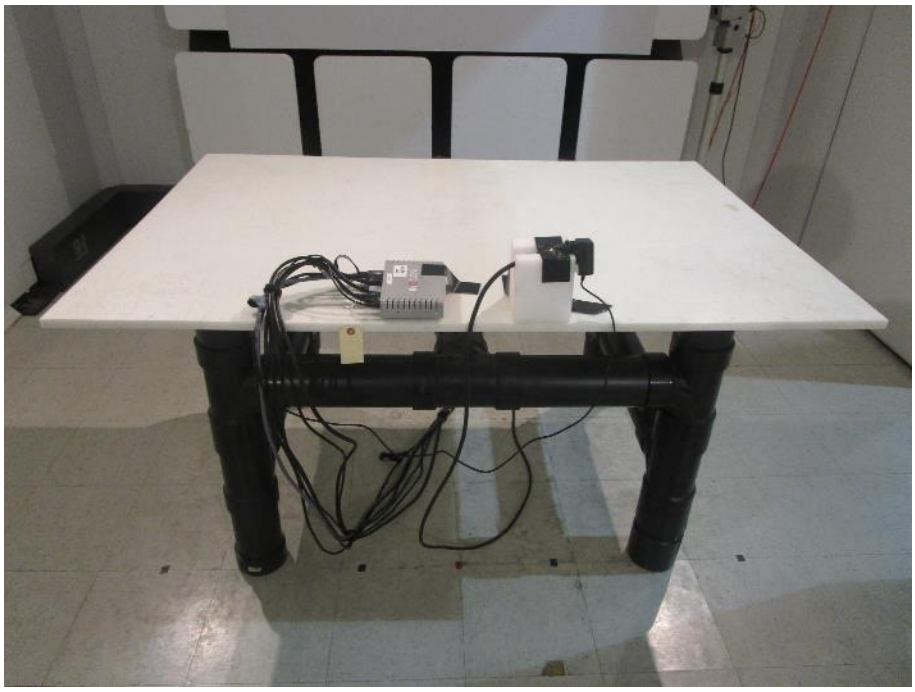


**Photo 26: Radiated EM Field – Test setup – Left**


**Photo 27: Radiated EM Field – Test setup – >3GHz**

### 11.2.5 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.

## 11.3 Electrical Fast Transient Immunity

### 11.3.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | IEC 61000-4-4 (2012) |
| **SPECIFICATIONS** | |
| **Test Level** | Power Ports: ±1kV<br>I/O Ports: ±0.5kV<br>Communication Ports: ±0.5kV |
| **Repetition Frequency** | 5kHz |
| **Installation** | Table-top equipment |
| **PERFORMANCE CRITERION** | B |
| **EUT** | |
| **Identification** | CAM230 |
| **Voltage Input** | 230V/50Hz |
| **TEST INFO** | |
| **Test Date** (yyyy-mm-dd) | 2023-04-06 |
| **Temperature** °C (For Info Only) | 25.6°C |
| **Relative humidity** % (For Info Only) | 34.1% |
| **Atmospheric pressure** kPa (For Info Only) | 101.6kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | Louis-Sacha Constantineau (Inogeni) |

### 11.3.2 Test Equipment

| Manufacturer | Description | Model | Serial No | Calibration Cycle (month) | Next Calibration (y-m-d) |
|---|---|---|---|---|---|
| EMC-Partner | Software | GENECS 3.28 | N/A | N/A | N/A |
| EMC-Partner | Transient Test System | TRA3000 | 1507 | 18 | 2023-08-25 |
| TESEQ | EFT Clamp | CDN 3425 | 1730 | 12 | 2023-11-01 |

**Table 28: EFT – Test Equipment**

### 11.3.3 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 | No event | Pass |
| All cables | ±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. | | | | | | |

**Table 29: EFT – Test Results**

### 11.3.4 Test Data

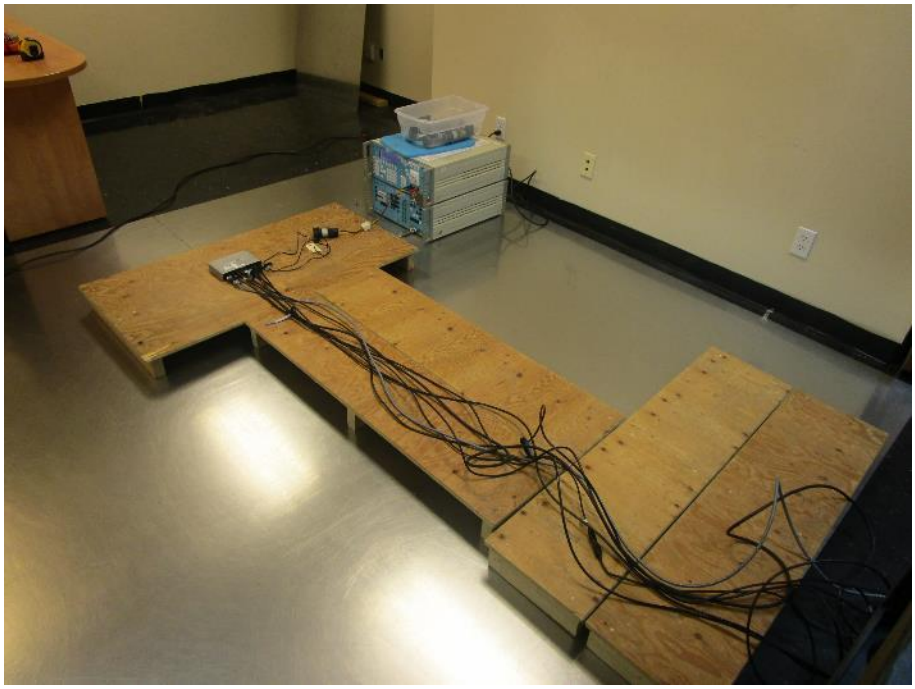


**Photo 28: EFT – Test Setup**

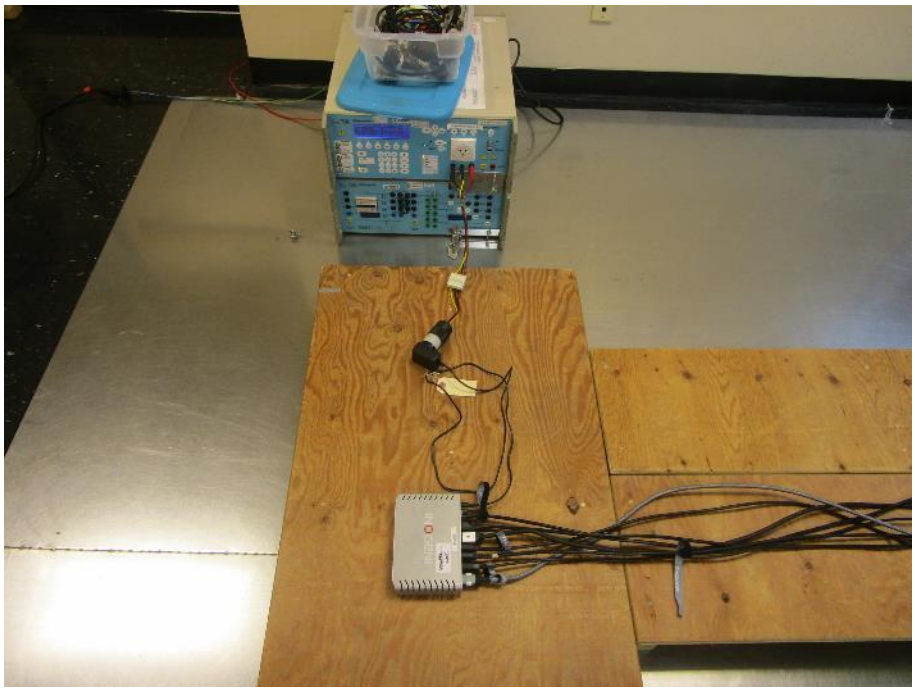


**Photo 29: EFT – Test Setup – CDN – Power**

**Photo 30: EFT – Test Setup – Capacitive Clamp – All cables**

### 11.3.5 Test Method

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

## 11.4 Surge Immunity

### 11.4.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | IEC 61000-4-5 (2014) A1 (2017) |
| **SPECIFICATIONS** | |
| **1.2/50µs Waveform** | Open-Circuit Voltage: 1.2µs/50µs<br>Short-Circuit Current: 8µs/20µs |
| **Test level** | Power: ±2kV L-PE / ±1kV L-L<br>I/O Ports: N/A<br>Communication Ports: N/A |
| **PERFORMANCE CRITERION** | B |
| **EUT** | |
| **Identification** | CAM230 |
| **Voltage Input** | 230V/50Hz |
| **TEST INFO** | |
| **Test Date** (yyyy-mm-dd) | 2023-04-06 |
| **Temperature** °C (For Info Only) | 23.2°C |
| **Relative humidity** % (For Info Only) | 28.2% |
| **Atmospheric pressure** kPa (For Info Only) | 101.6kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | No witness |

### 11.4.2 Test Equipment

| Manufacturer | Description | Model | Serial No | Calibration Cycle (month) | Next Calibration (y-m-d) |
|---|---|---|---|---|---|
| EMC-Partner | Software | GENECS 3.28 | N/A | N/A | N/A |
| EMC-Partner | Transient Test System | TRA3000 | 1507 | 18 | 2023-08-25 |
| EMC-Partner | Coupling/Decoupling Network | CDN2000-6-32 | CDN2000-6-32 0175 | VERIF | VERIF |

**Table 30: Surge – Test Equipment**

### 11.4.3 Test Results

| Application | | Polarity Test Level (kV) | Additional Impedance | Number | Interval (s) | Phase Shifting (°) | Comments | Results |
|---|---|---|---|---|---|---|---|---|
| between | and | | | | | | | |
| L | PE | +0.5<br>+1<br>+2 | 10Ω | 5+ | 30 | 90 | Note 1 | Pass |
| L | PE | -0.5<br>-1<br>-2 | 10Ω | 5- | 30 | 270 | Note 1 | Pass |
| N | PE | -0.5<br>-1<br>-2 | 10Ω | 5- | 30 | 90 | Note 1 | Pass |
| N | PE | +0.5<br>+1<br>+2 | 10Ω | 5+ | 30 | 270 | Note 1 | Pass |
| L | N | +0.5<br>+1 | 0Ω | 5+ | 30 | 90 | No event | Pass |
| L | N | -0.5<br>-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. | | | | | | | | |
| Note 1: EUT without PE, no L vs PE test performed | | | | | | | | |

**Table 31: 1.2/50µs Surge – Test Results – Power Ports**

### 11.4.4 Test Data

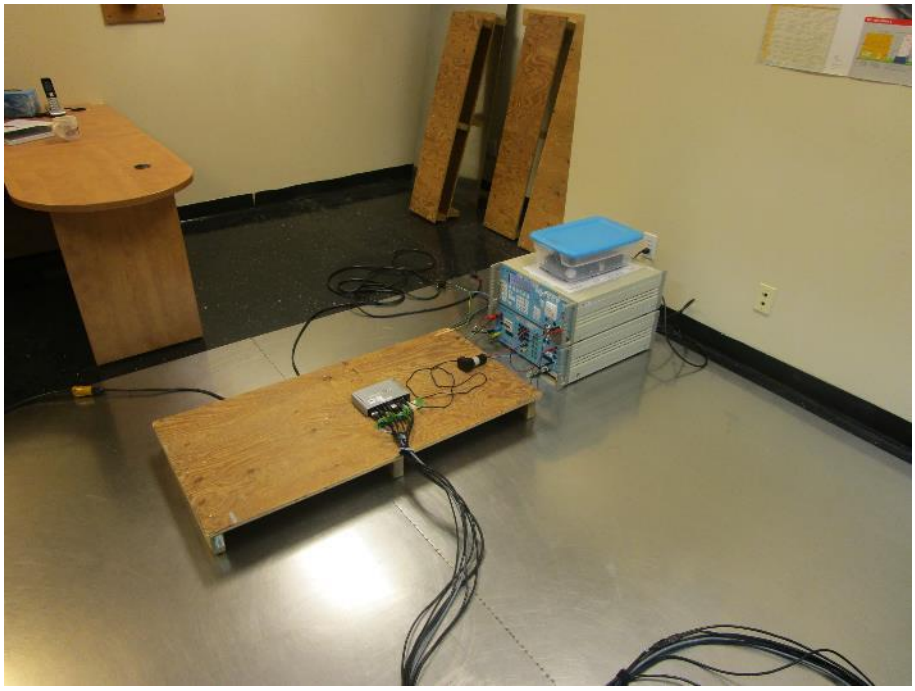


**Photo 31: 1.2/50µs Surge – Test Setup**

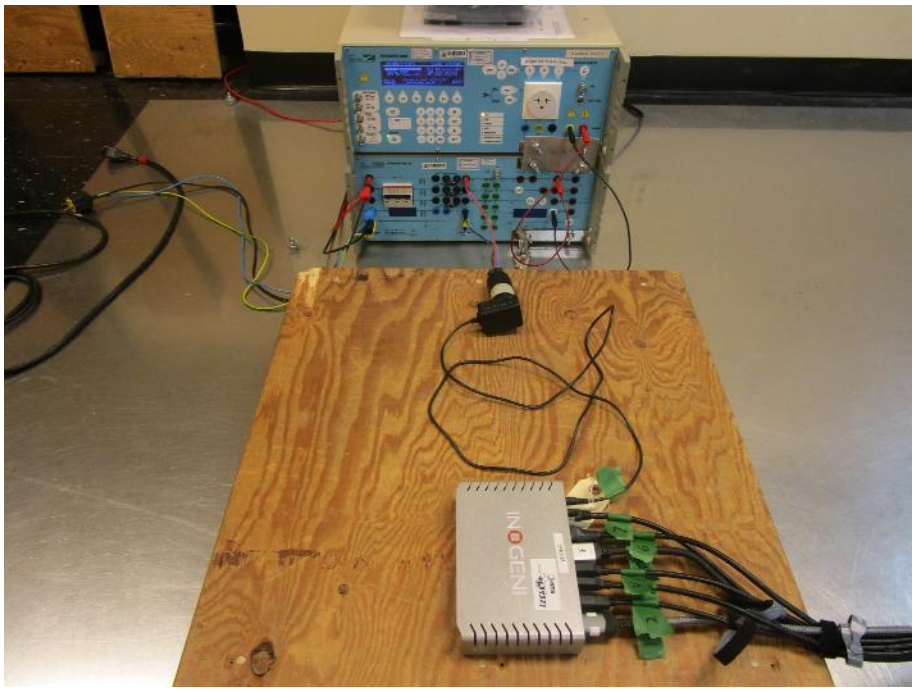



**Photo 32: 1.2/50µs Surge – Test Setup – Power Ports**

### 11.4.5 Test Method

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

## 11.5 Conducted Disturbances Immunity

### 11.5.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | IEC 61000-4-6 (2013) |

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

| | |
|---|---|
| **PERFORMANCE CRITERION** | A |

| **EUT** | |
|---|---|
| **Identification** | CAM230 |
| **Voltage Input** | 230V/50Hz |

| **TEST INFO** | |
|---|---|
| **Test Date** (yyyy-mm-dd) | 2023-04-10 |
| **Temperature** °C (For Info Only) | 22.8°C |
| **Relative humidity** % (For Info Only) | 26.6% |
| **Atmospheric pressure** kPa (For Info Only) | 102.9kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | No witness |

### 11.5.2 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 | 2023-10-13 |
| TESEQ | CDN M2/M3 | CDN M016 | 34597 | 24 | 2024-10-05 |
| TESEQ | CDN M2 | CDN M216 | 32740 | 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 |
| Pasternack | 6dB Fixed Attenuator 150W | PE7AP150-06 | LABCEM #0287 | VERIF | VERIF |
| LABCEM | Laboratory 3 - Conducted Voltage Immunity Calibration CDN-M2 - CI Injection Cable | N/A | N/A | 12 | 2023-10-13 |
| LABCEM | Laboratory 3 - Conducted Voltage Immunity Calibration EM Clamp (sn:33460) - CI Injection Cable + CI Monitoring Cable | N/A | N/A | 12 | 2023-10-13 |

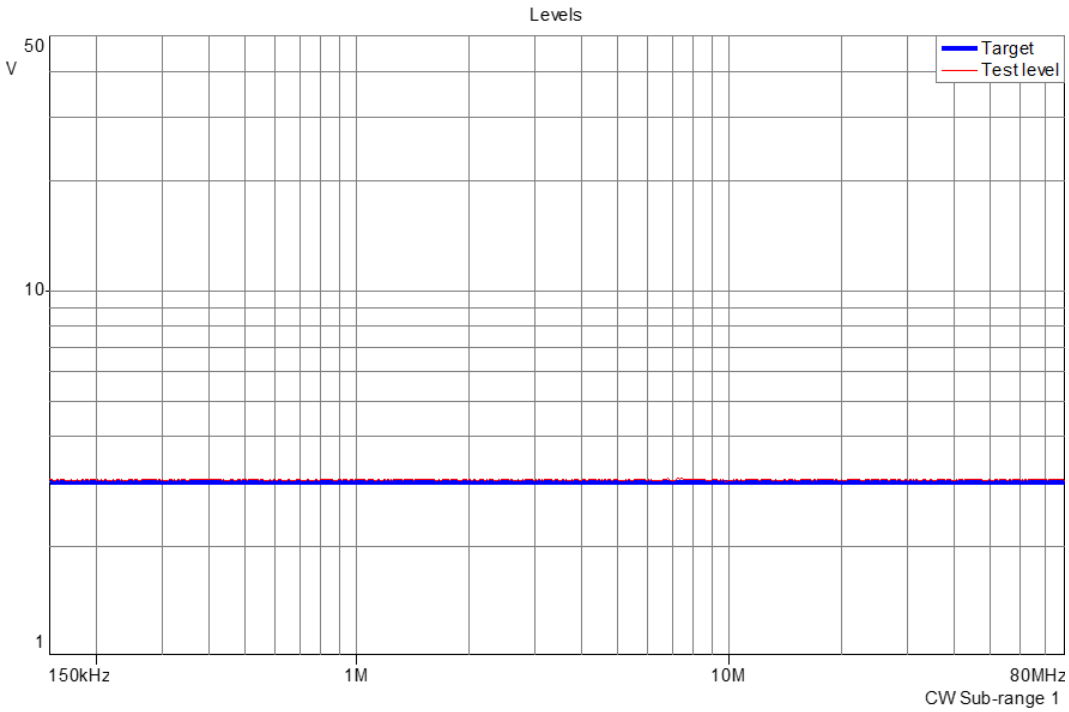
**Table 32: Conducted Disturbances – Test Equipment**

### 11.5.3 Test Results

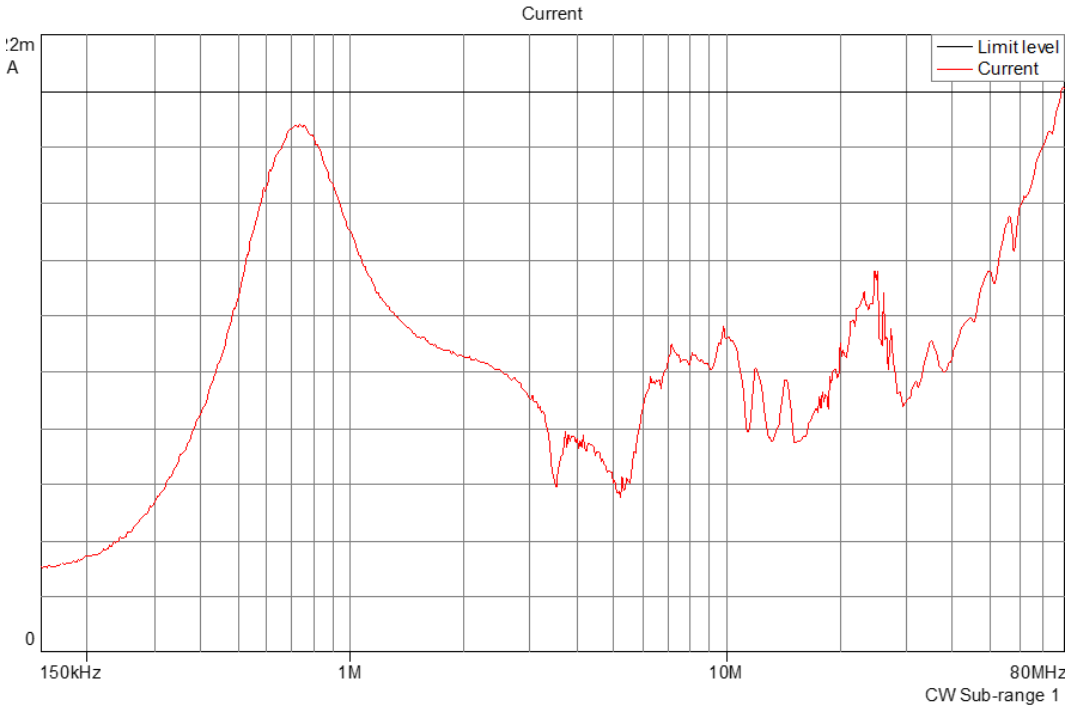
| Tested Line | Coupling Method | Frequency (MHz) | Test Level (V) | Modulation | Comments | Results |
|---|---|---|---|---|---|---|
| Power (230V/50Hz) | CDN-M2 | 0.150 - 80 | 3 | AM / 1kHz | No event | Pass |
| HDMI Out, USB | EM Clamp | 0.150 - 80 | 3 | AM / 1kHz | No event | Pass |
| RS-232, Eth | 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 33: Conducted Disturbances – Test Results**

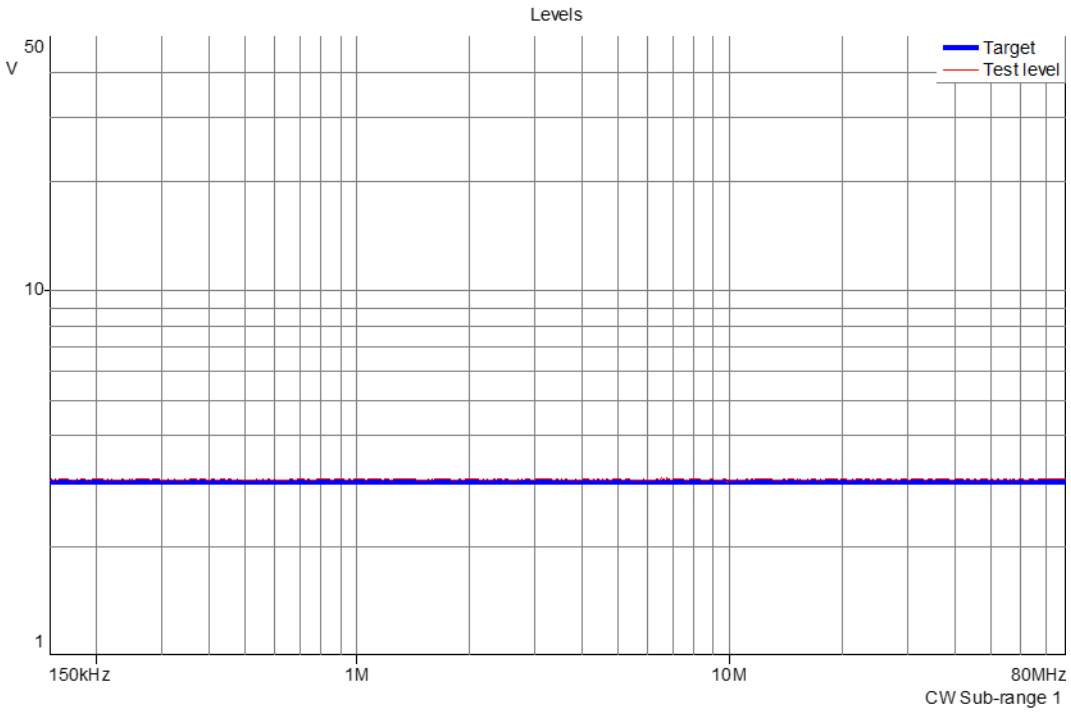
### 11.5.4 Test Data



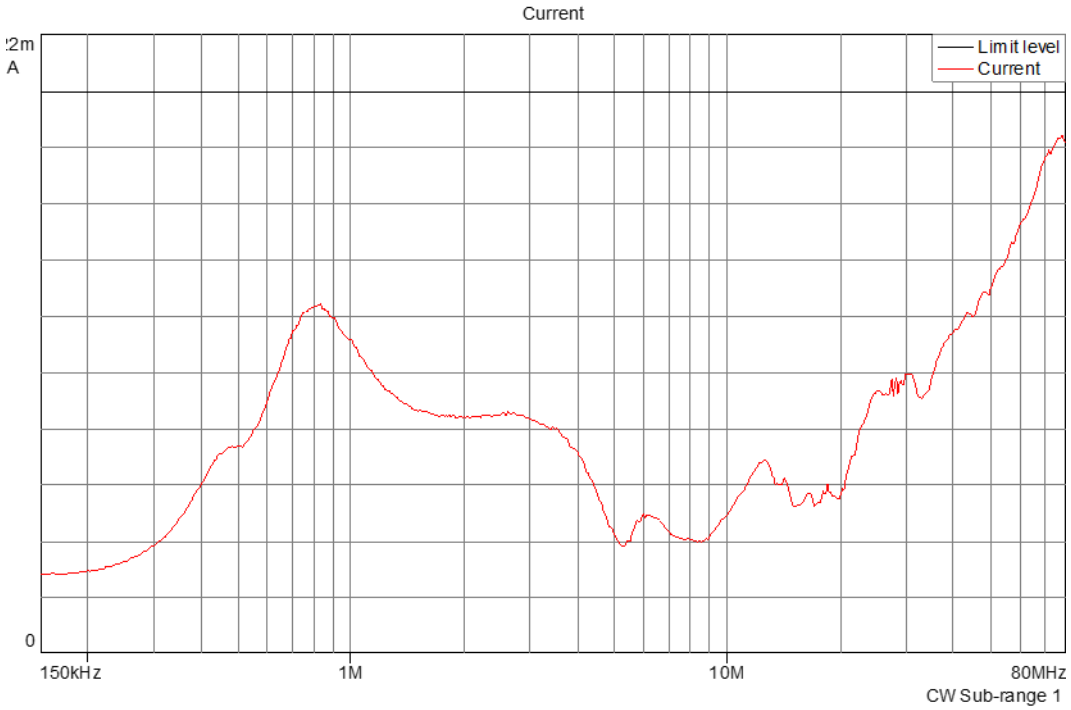

**Graph 9: Conducted Disturbances – Voltage Level – EM Clamp – HDMI Out - USB**




**Graph 10: Conducted Disturbances – Current Measurements – EM Clamp – HDMI Out - USB**




**Graph 11: Conducted Disturbances – Voltage Level – EM Clamp – RS-232 - Eth**




**Graph 12: Conducted Disturbances – Current Measurements – EM Clamp – RS-232 - Eth**

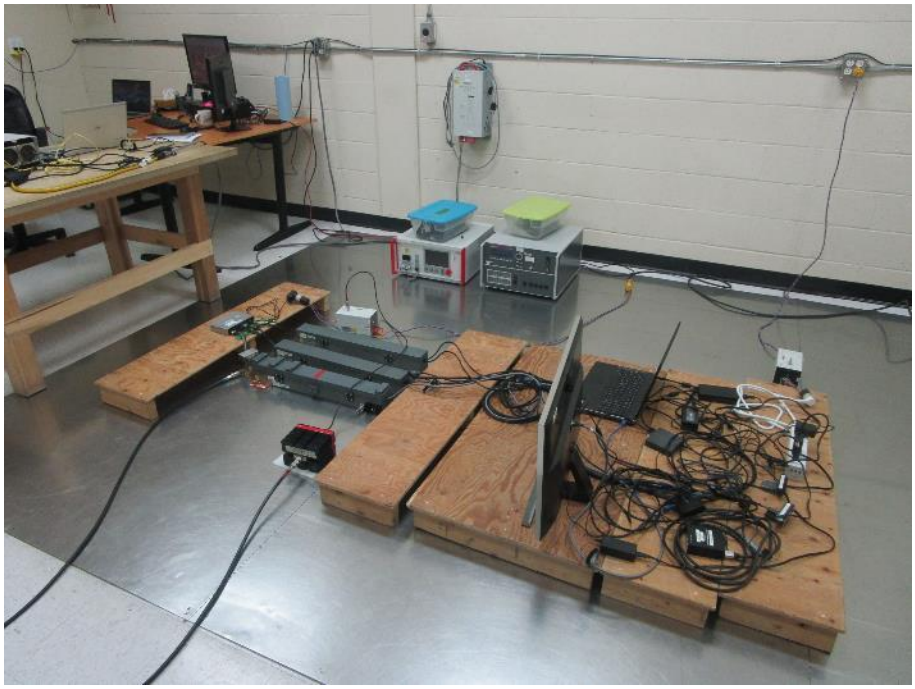


**Photo 33: Conducted Disturbances – Test Setup**

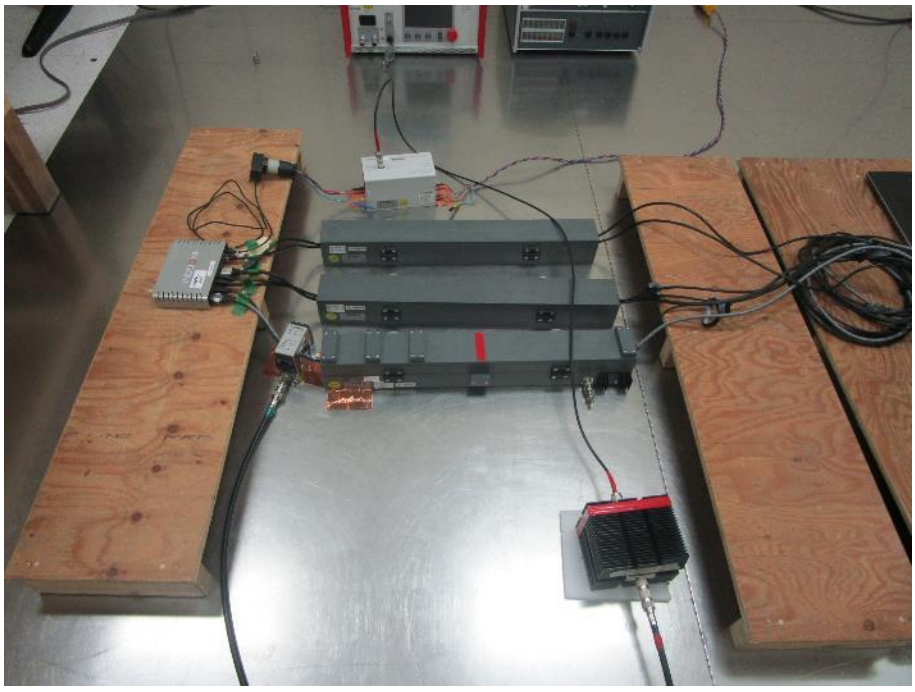


**Photo 34: Conducted Disturbances – Test Setup – CDN – Power**

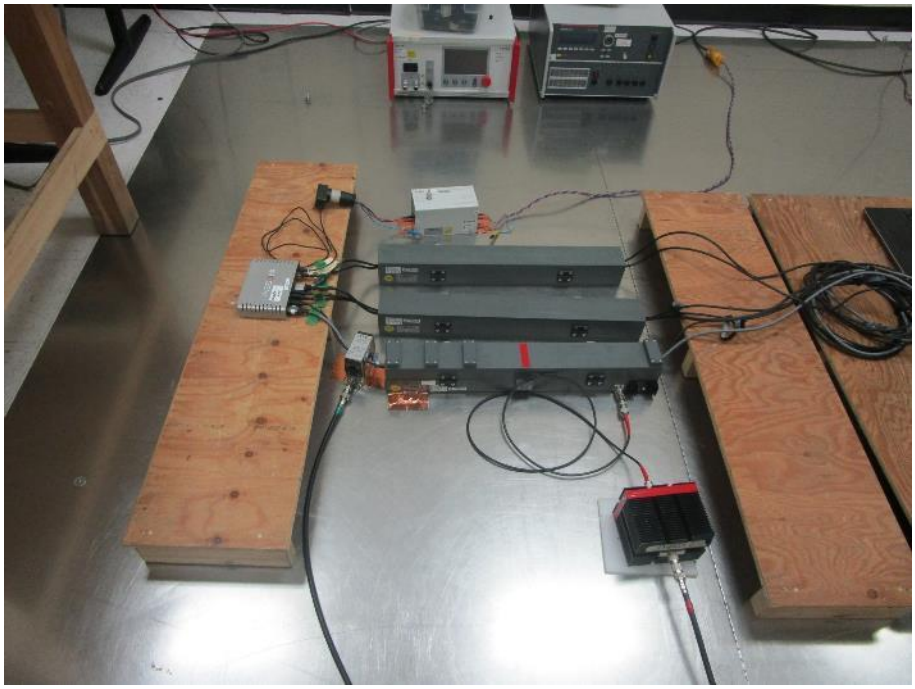


**Photo 35: Conducted Disturbances – Test Setup – EM Clamp – HDMI Out - USB**

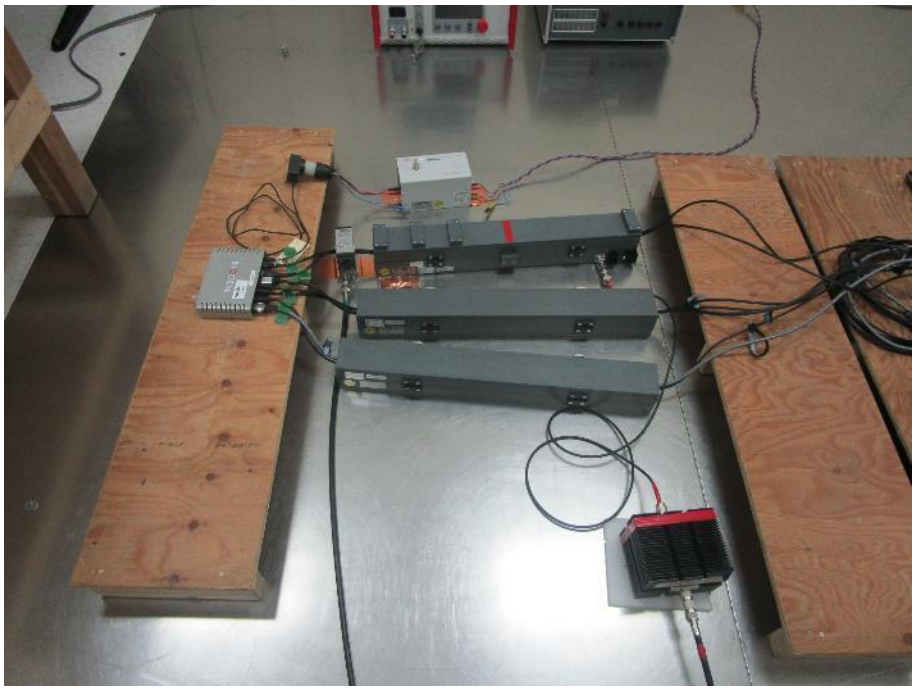


**Photo 36: Conducted Disturbances – Test Setup – EM Clamp – RS-232 - Eth**

### 11.5.5 Test Method

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

## 11.6 Power Frequency Magnetic Field Immunity

### 11.6.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | IEC 61000-4-8 (2009) |

| **SPECIFICATIONS** | |
|---|---|
| **Test Level** | Continuous field: 1A/m (60s) |
| **Frequency** | 50Hz / 60Hz |
| **Induction Coil** | 1m x 1m |

| | |
|---|---|
| **PERFORMANCE CRITERION** | A |

| **EUT** | |
|---|---|
| **Identification** | CAM230 |
| **Voltage Input** | 230V/50Hz<br>120V/60Hz |

| **TEST INFO** | |
|---|---|
| **Test Date** (yyyy-mm-dd) | 2023-04-06 |
| **Temperature** °C (For Info Only) | 23.2°C |
| **Relative humidity** % (For Info Only) | 28.2% |
| **Atmospheric pressure** kPa (For Info Only) | 101.6kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | No witness |

### 11.6.2 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 | 2023-09-14 |
| TESEQ | Magnetic coil interface | INA 2141 | 1417 | NCR | NCR |
| TESEQ | Magnetic coil | INA 703 | 1978 | VERIF | VERIF |
| Fluke | Digital Clamp Meter | 353 | 21950072 | 12 | 2023-07-25 |
| F.W. Bell | ELF Meter | 4190 | 1237005 | 24 | 2024-10-21 |

**Table 34: Magnetic Field – Test Equipment**

### 11.6.3 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 35: 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 36: Magnetic Field – Test Results – 120V/60Hz**

### 11.6.4 Test Data

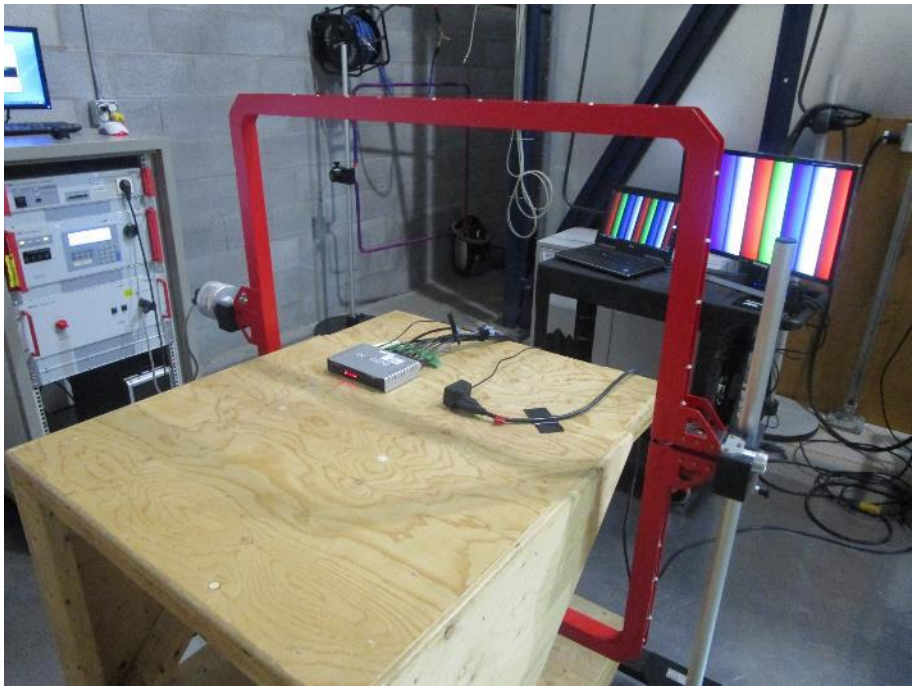


**Photo 37: Magnetic Field – Test Setup – Position #1**

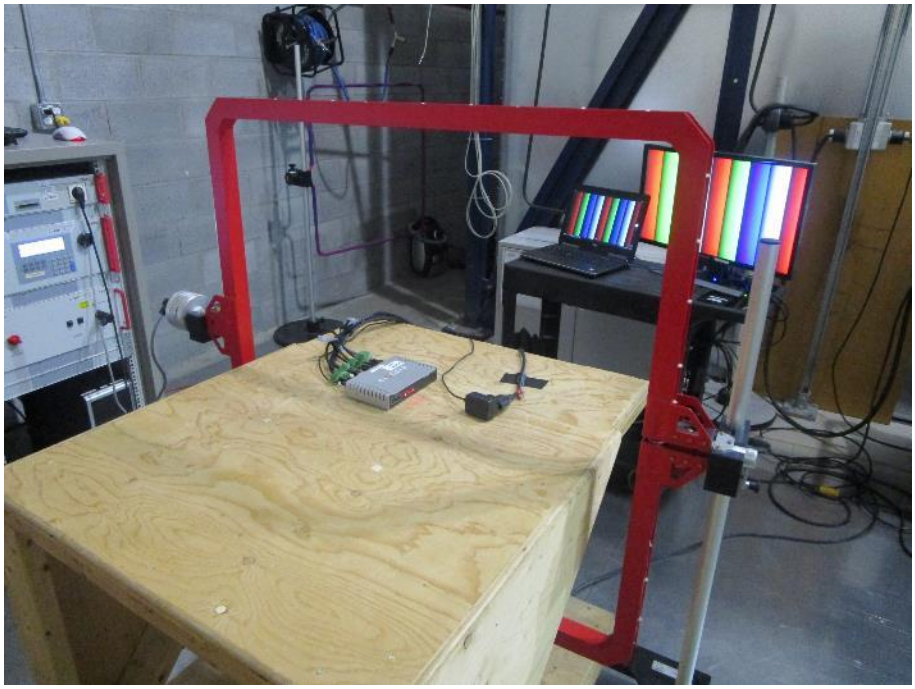


**Photo 38: Magnetic Field – Test Setup – Position #2**

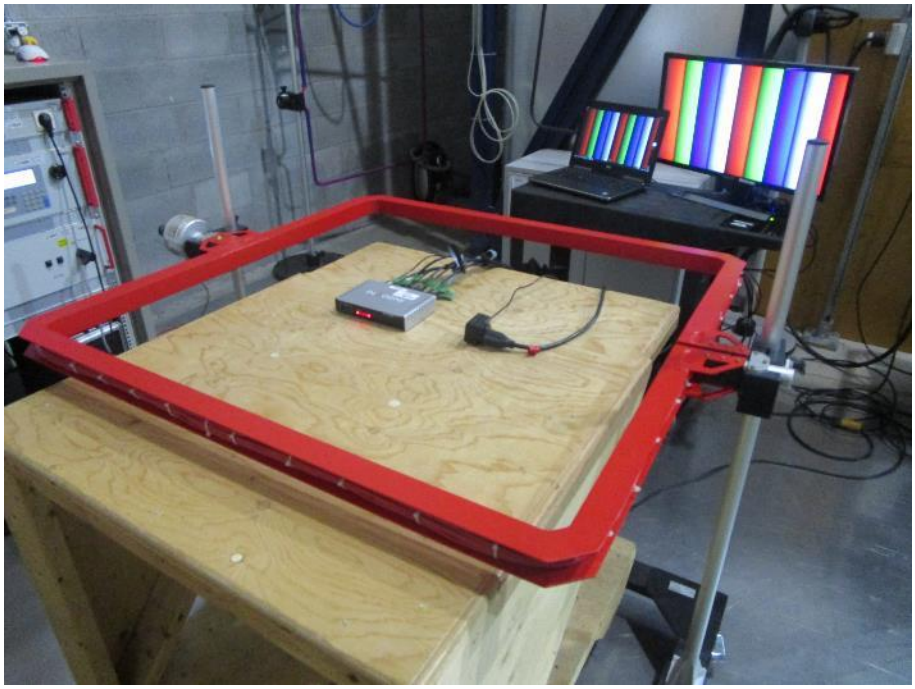


**Photo 39: Magnetic Field – Test Setup – Position #3**

### 11.6.5 Test Method

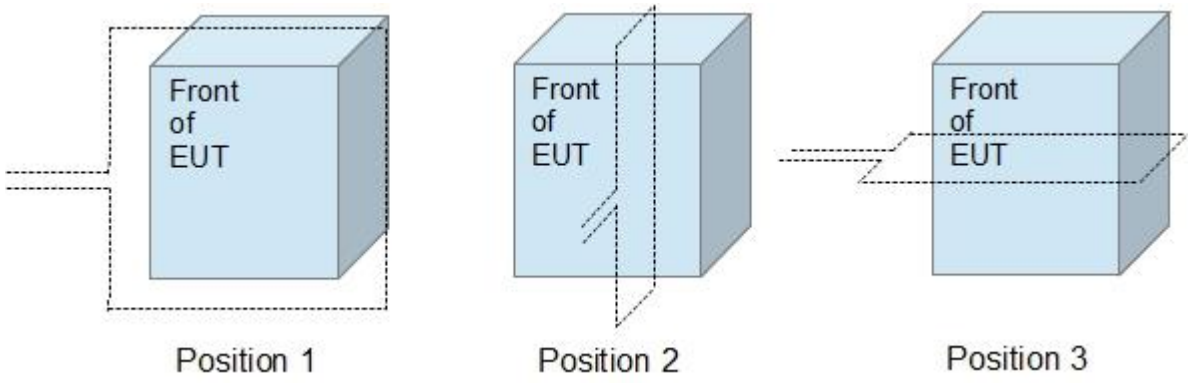



**Figure 2: Magnetic Field – Position of Induction Coil**

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

## 11.7 Voltage Dips, Short Interruptions and Voltage Variation Immunity on AC input

### 11.7.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | IEC 61000-4-11 (2020) |
| **SPECIFICATIONS** | |
| **Voltage Dips** | 0%Un: ½ cycle<br>70%Un: 25 cycles<br>70%Un: 30 cycles |
| **Short Interruptions** | 0%Un: 250 cycles<br>0%Un: 300 cycles |
| **PERFORMANCE CRITERION** | 0%Un / ½ cycle: B<br>70%Un / 25 cycles: C<br>70%Un / 30 cycles: C<br>0%Un / 250 cycles: C<br>0%Un / 300 cycles: C |
| **EUT** | |
| **Identification** | CAM230 |
| **Voltage Input** | 240V/50Hz<br>100V/60Hz |
| **TEST INFO** | |
| **Test Date** (yyyy-mm-dd) | 2023-04-06 |
| **Temperature** °C (For Info Only) | 23.2°C |
| **Relative humidity** % (For Info Only) | 28.2% |
| **Atmospheric pressure** kPa (For Info Only) | 101.6kPa |
| **Operator** | Jean Cadotte |
| **Client Witness** | No witness |

### 11.7.2 Test Equipment

| Manufacturer | Description | Model | Serial No | Calibration Cycle (month) | Next Calibration (y-m-d) |
|---|---|---|---|---|---|
| EMC-Partner | Software | GENECS 3.28 | N/A | N/A | N/A |
| EMC-Partner | Transient Test System | TRA3000 | 1507 | 18 | 2023-08-25 |

**Table 37: Voltage Variations on AC Input – Test Equipment**

### 11.7.3 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 | No event | 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 | 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 38: Voltage Variations on AC Input – Test Results**

### 11.7.4 Test Data

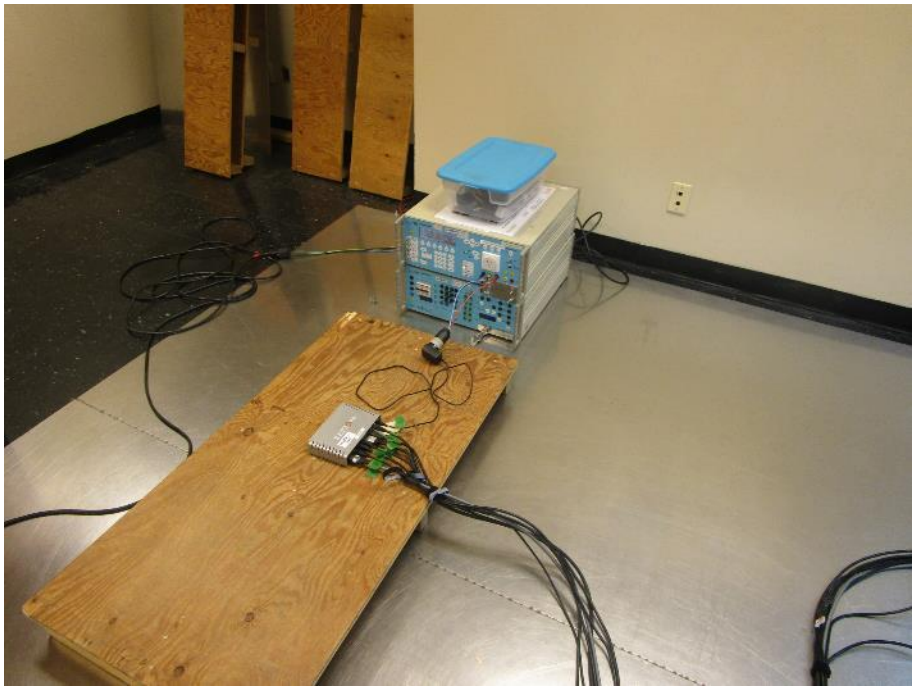


**Photo 40: Voltage Variations on AC Input – Test Setup**

### 11.7.5 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

CONDUCTED EMISSIONS - VOLTAGE
page 1 / 2

***Project:*** *OP0634371* ***Customer:*** *Inogeni*

***DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

**Equipment:** CAM230
**Manufacturer:** Inogeni
**Hardware Version:**
**Software Version:**

***CONDUCTED EMISSIONS MEASUREMENT***: *OP0634371_EN55032-LISN_Phase_#10*

**Test Location:** Anechoic chamber
**Test Date:** 2023-04-05 2:17:25 PM
**Operator(s):** Jean Cadotte
**Test Standard:** EN55032 Class A
**Power:** 230V/50Hz
**Tested Line:** Phase
**Operating Mode:**
**Comments:**

| TEST PARAMETERS | | TEST EQUIPMENT USED |
|---|---|---|
| Frequency Range<br>150 kHz - 30 MHz | Bandwidth<br>9 kHz | LF#1+LF#2<br>LISN : PMM L2-16B#20801-red<br>Rohde & Schwarz : ESW44 |

**FINAL RESULTS - QUASI-PEAK**

| Frequency | SR # | Quasi-Peak Detector (dBµV) | Quasi-Peak Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 468.059 kHz | 1 | 51.936 | 79 | 27.064 | 0.134 |
| 900.779 kHz | 1 | 43.201 | 73 | 29.799 | 0.138 |
| 1.51135 MHz | 1 | 42.272 | 73 | 30.728 | 0.144 |
| 4.798774 MHz | 1 | 38.575 | 73 | 34.425 | 0.214 |
| 6.18994 MHz | 1 | 39.354 | 73 | 33.646 | 0.252 |
| 7.305307 MHz | 1 | 37.719 | 73 | 35.281 | 0.284 |

**FINAL RESULTS - AVERAGE**

| Frequency | SR # | Average Detector (dBµV) | Average Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 468.059 kHz | 1 | 43.732 | 66 | 22.268 | 0.134 |
| 900.779 kHz | 1 | 35.902 | 60 | 24.098 | 0.138 |
| 1.51135 MHz | 1 | 36.069 | 60 | 23.931 | 0.144 |
| 4.798774 MHz | 1 | 30.641 | 60 | 29.359 | 0.214 |
| 6.18994 MHz | 1 | 28.628 | 60 | 31.372 | 0.252 |
| 7.305307 MHz | 1 | 27.03 | 60 | 32.97 | 0.284 |

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**CONDUCTED EMISSIONS - VOLTAGE**
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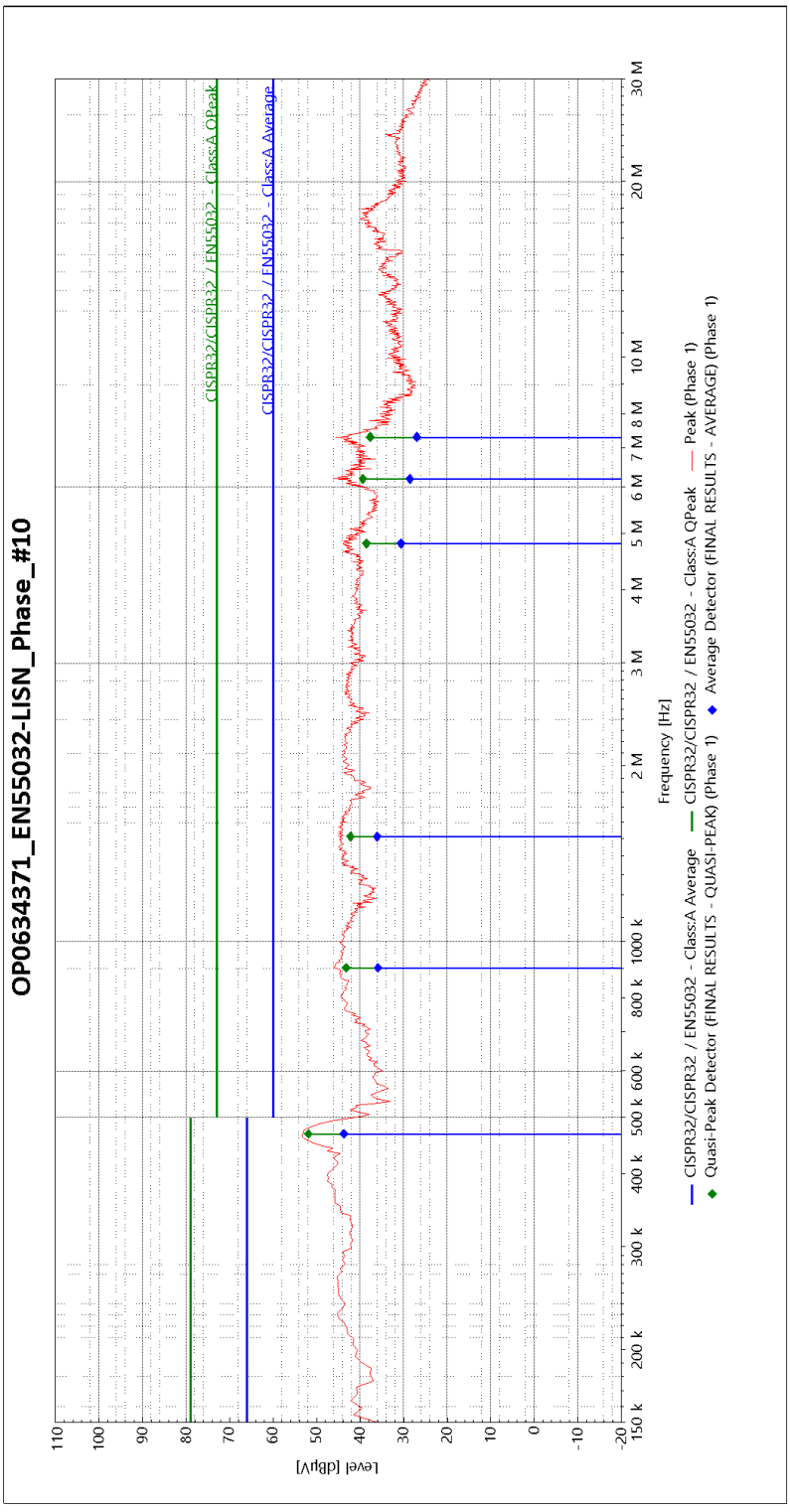


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## CONDUCTED EMISSIONS - VOLTAGE
page 1 / 2

***Project:*** *OP0634371* ***Customer:*** *Inogeni*

***DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

**Equipment:** CAM230
**Manufacturer:** Inogeni
**Hardware Version:**
**Software Version:**

***CONDUCTED EMISSIONS MEASUREMENT***: *OP0634371_EN55032_-LISN_Neutral_#11*

**Test Location:** Anechoic chamber
**Test Date:** 2023-04-05 2:29:47 PM
**Operator(s):** Jean Cadotte
**Test Standard:** EN55032 Class A
**Power:** 230V/50Hz
**Tested Line:** Neutral
**Operating Mode:**
**Comments:**

| TEST PARAMETERS | | TEST EQUIPMENT USED |
|---|---|---|
| Frequency Range<br>150 kHz - 30 MHz | Bandwidth<br>9 kHz | LF#1+LF#2<br>LISN : PMM L2-16B#20801-red<br>Rohde & Schwarz : ESW44 |

**FINAL RESULTS - QUASI-PEAK**

| Frequency | SR # | Quasi-Peak Detector (dBµV) | Quasi-Peak Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 163.565 kHz | 1 | 40.424 | 79 | 38.576 | 0.331 |
| 199.851 kHz | 1 | 40.523 | 79 | 38.477 | 0.331 |
| 269.144 kHz | 1 | 41.92 | 79 | 37.08 | 0.332 |
| 494.289 kHz | 1 | 41.349 | 79 | 37.651 | 0.344 |
| 548.943 kHz | 1 | 34.988 | 73 | 38.012 | 0.344 |
| 637.237 kHz | 1 | 31.991 | 73 | 41.009 | 0.345 |

**FINAL RESULTS - AVERAGE**

| Frequency | SR # | Average Detector (dBµV) | Average Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 163.565 kHz | 1 | 29.66 | 66 | 36.34 | 0.331 |
| 199.851 kHz | 1 | 31.397 | 66 | 34.603 | 0.331 |
| 269.144 kHz | 1 | 32.841 | 66 | 33.159 | 0.332 |
| 494.289 kHz | 1 | 31.146 | 66 | 34.854 | 0.344 |
| 548.943 kHz | 1 | 24.839 | 60 | 35.161 | 0.344 |
| 637.237 kHz | 1 | 21.567 | 60 | 38.433 | 0.345 |

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CONDUCTED EMISSIONS - VOLTAGE
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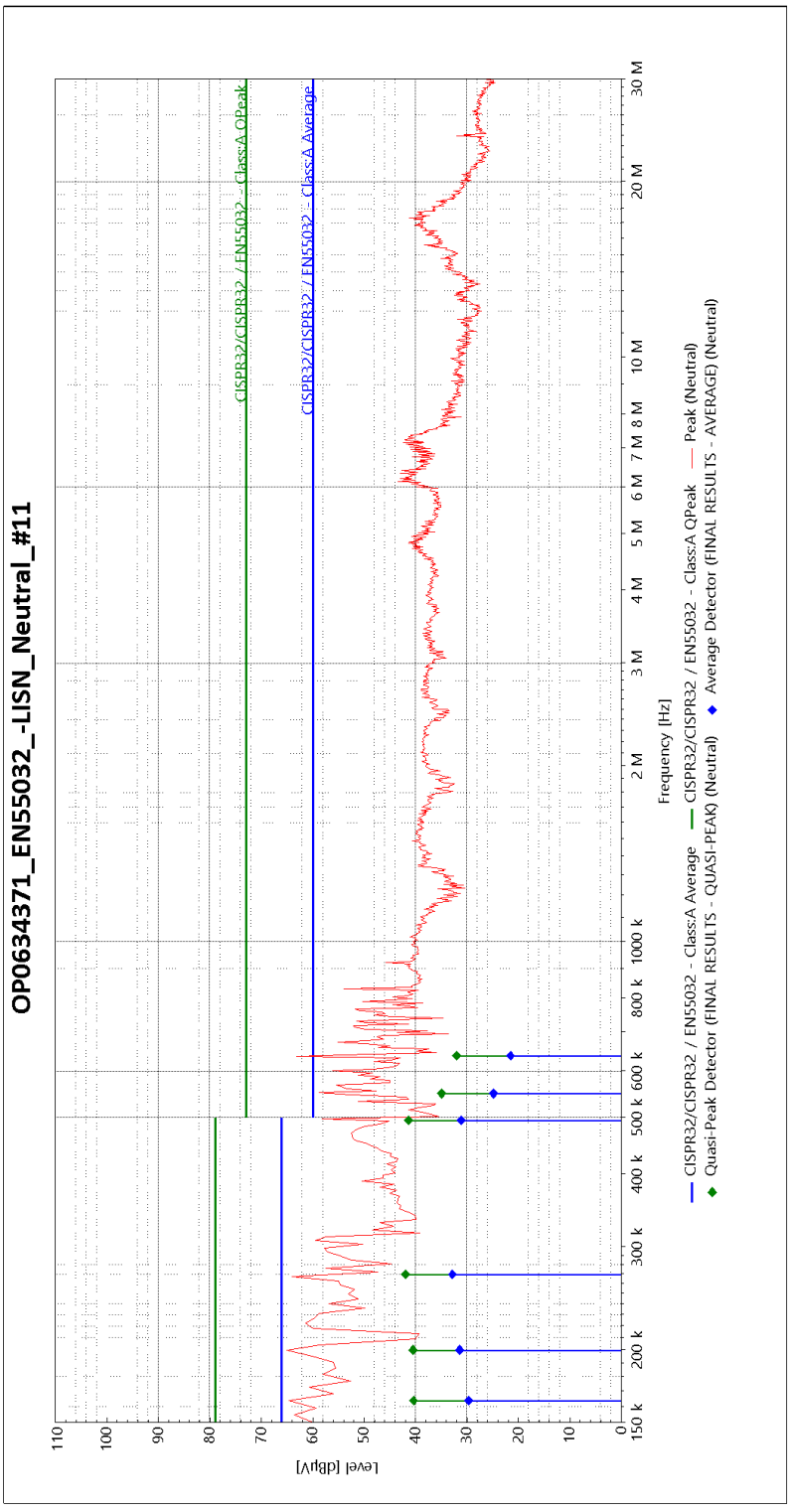


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## CONDUCTED EMISSIONS - VOLTAGE
page 1 / 2

***Project:*** *OP0634371* ***Customer:*** *Inogeni*

***DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

**Equipment:** CAM230
**Manufacturer:** Inogeni
**Hardware Version:**
**Software Version:**

***CONDUCTED EMISSIONS MEASUREMENT***: *OP0634371_FCC-LISN_Phase_#08*

**Test Location:** Anechoic chamber
**Test Date:** 2023-04-05 1:49:44 PM
**Operator(s):** Jean Cadotte
**Test Standard:** FCC part 15 subpart B / Class A
**Power:** 120V/60Hz
**Tested Line:** Phase
**Operating Mode:**
**Comments:**

| TEST PARAMETERS | | TEST EQUIPMENT USED |
|---|---|---|
| Frequency Range<br>150 kHz - 30 MHz | Bandwidth<br>9 kHz | LF#1+LF#2<br>LISN : PMM L2-16B#20801-red<br>Rohde & Schwarz : ESW44 |

**FINAL RESULTS - QUASI-PEAK**

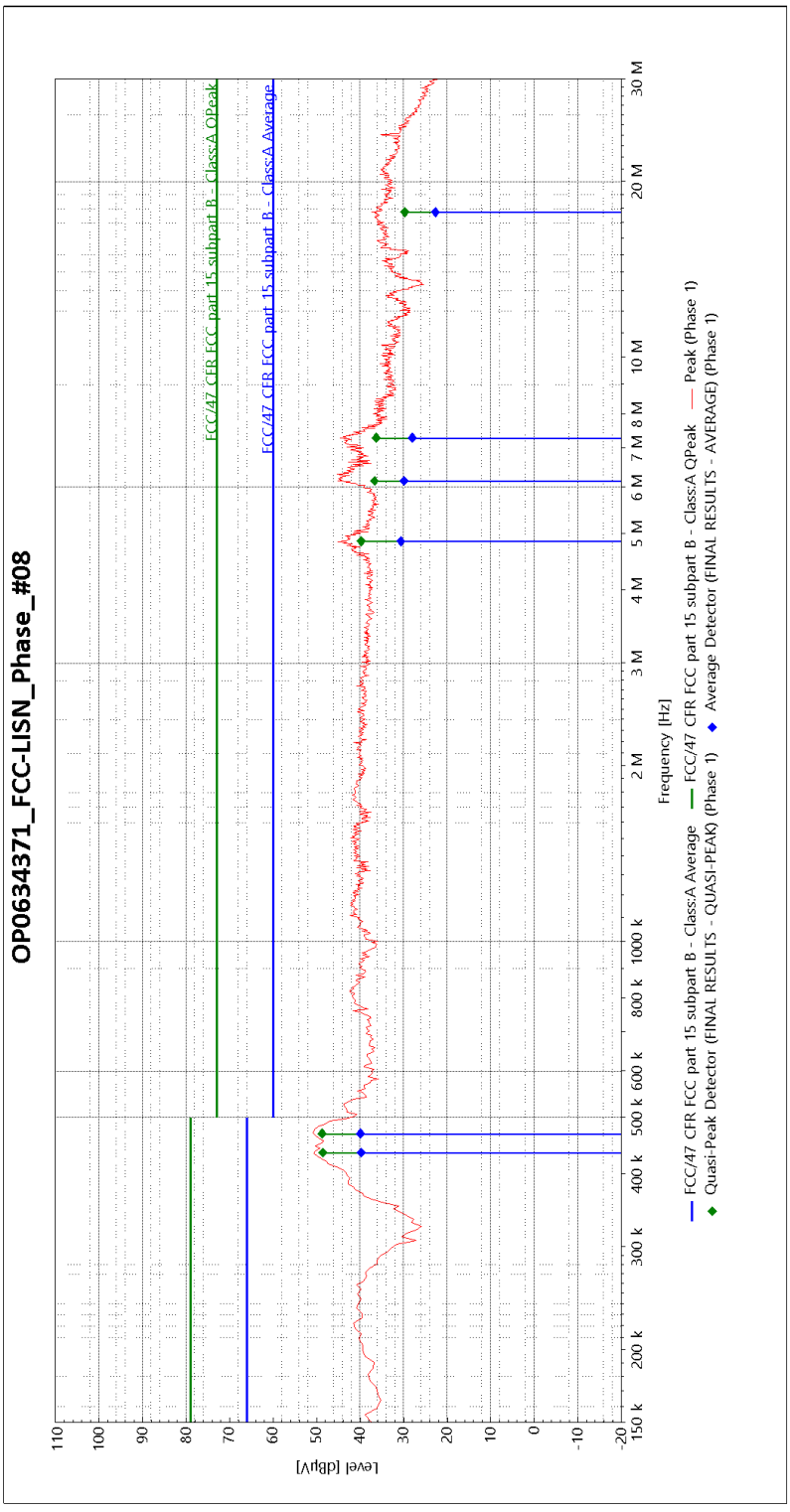
| Frequency | SR # | Quasi-Peak Detector (dBµV) | Quasi-Peak Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 434.907 kHz | 1 | 48.628 | 79 | 30.372 | 0.133 |
| 468.933 kHz | 1 | 48.747 | 79 | 30.253 | 0.134 |
| 4.840952 MHz | 1 | 39.71 | 73 | 33.29 | 0.215 |
| 6.13956 MHz | 1 | 36.751 | 73 | 36.249 | 0.248 |
| 7.282049 MHz | 1 | 36.323 | 73 | 36.677 | 0.284 |
| 17.716113 MHz | 1 | 29.817 | 73 | 43.183 | 0.61 |

**FINAL RESULTS - AVERAGE**

| Frequency | SR # | Average Detector (dBµV) | Average Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 434.907 kHz | 1 | 39.825 | 66 | 26.175 | 0.133 |
| 468.933 kHz | 1 | 40.014 | 66 | 25.986 | 0.134 |
| 4.840952 MHz | 1 | 30.709 | 60 | 29.291 | 0.215 |
| 6.13956 MHz | 1 | 29.907 | 60 | 30.093 | 0.248 |
| 7.282049 MHz | 1 | 28.094 | 60 | 31.906 | 0.284 |
| 17.716113 MHz | 1 | 22.762 | 60 | 37.238 | 0.61 |

PR / OP0634371_FCC-LISN_Phase_#08.docx

CONDUCTED EMISSIONS - VOLTAGE
page 2 / 2




PR / OP0634371_FCC-LISN_Phase_#08.docx

CONDUCTED EMISSIONS - VOLTAGE
page 1 / 2

***Project:*** *OP0634371* ***Customer:*** *Inogeni*

***DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

**Equipment:** CAM230
**Manufacturer:** Inogeni
**Hardware Version:**
**Software Version:**

***CONDUCTED EMISSIONS MEASUREMENT***: *OP0634371_FCC-LISN_Neutral_#09*

**Test Location:** Anechoic chamber
**Test Date:** 2023-04-05 2:02:06 PM
**Operator(s):** Jean Cadotte
**Test Standard:** FCC part 15 subpart B / Class A
**Power:** 120V/60Hz
**Tested Line:** Neutral
**Operating Mode:**
**Comments:**

| TEST PARAMETERS | | TEST EQUIPMENT USED |
|---|---|---|
| Frequency Range<br>150 kHz - 30 MHz | Bandwidth<br>9 kHz | LF#1+LF#2<br>LISN : PMM L2-16B#20801-red<br>Rohde & Schwarz : ESW44 |

**FINAL RESULTS - QUASI-PEAK**

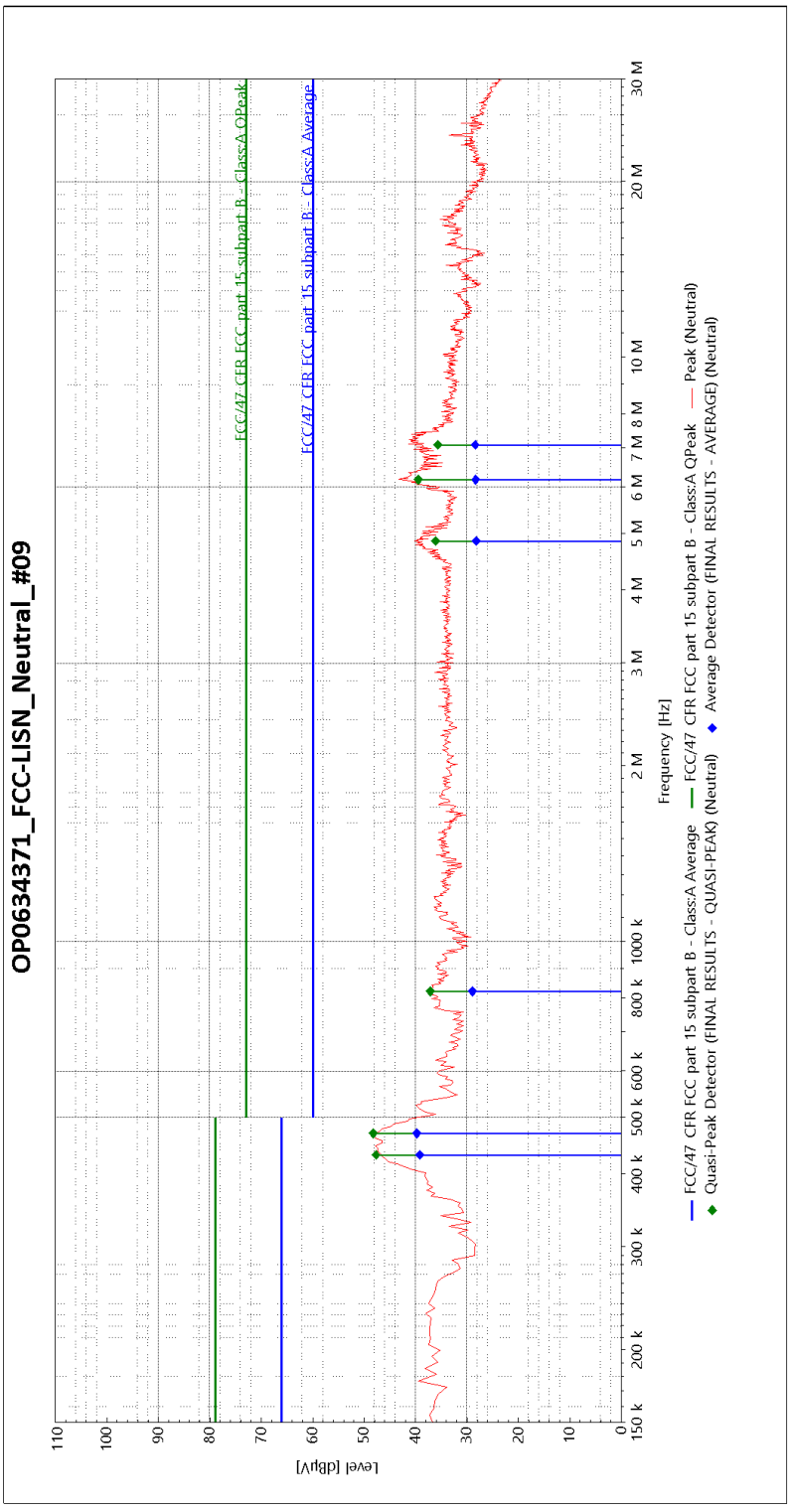
| Frequency | SR # | Quasi-Peak Detector (dBµV) | Quasi-Peak Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 431.476 kHz | 1 | 47.729 | 79 | 31.271 | 0.333 |
| 469.137 kHz | 1 | 48.243 | 79 | 30.757 | 0.344 |
| 821.088 kHz | 1 | 37.128 | 73 | 35.872 | 0.357 |
| 4.846234 MHz | 1 | 36.135 | 73 | 36.865 | 0.465 |
| 6.172935 MHz | 1 | 39.499 | 73 | 33.501 | 0.501 |
| 7.083614 MHz | 1 | 35.733 | 73 | 37.267 | 0.53 |

**FINAL RESULTS - AVERAGE**

| Frequency | SR # | Average Detector (dBµV) | Average Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 431.476 kHz | 1 | 39.227 | 66 | 26.773 | 0.333 |
| 469.137 kHz | 1 | 39.803 | 66 | 26.197 | 0.344 |
| 821.088 kHz | 1 | 28.985 | 60 | 31.015 | 0.357 |
| 4.846234 MHz | 1 | 28.191 | 60 | 31.809 | 0.465 |
| 6.172935 MHz | 1 | 28.314 | 60 | 31.686 | 0.501 |
| 7.083614 MHz | 1 | 28.431 | 60 | 31.569 | 0.53 |

PR / OP0634371_FCC-LISN_Neutral_#09.docx

**CONDUCTED EMISSIONS - VOLTAGE**
**page 2 / 2**




PR / OP0634371_FCC-LISN_Neutral_#09.docx

## CONDUCTED EMISSIONS - VOLTAGE


***Project:*** *OP0634371* ***Customer:*** *Inogeni*

***DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

**Equipment:** CAM230
**Manufacturer:** Inogeni
**Hardware Version:**
**Software Version:**

***CONDUCTED EMISSIONS MEASUREMENT***: *OP0634371_EN55032-ISN_#12*

**Test Location:** Anechoic chamber
**Test Date:** 2023-04-05 2:54:51 PM
**Operator(s):** Xavier Couste
**Test Standard:** EN55032 Class A
**Power:** 230V/50Hz
**Tested Line:** Ethernet
**Operating Mode:** 5%
**Comments:**

| TEST PARAMETERS | | TEST EQUIPMENT USED |
|---|---|---|
| Frequency Range<br>150 kHz - 30 MHz | Bandwidth<br>9 kHz | ISN : ST08A<br>LF#1+LF#2<br>Rohde & Schwarz : ESW44 |

**FINAL RESULTS - QUASI-PEAK**

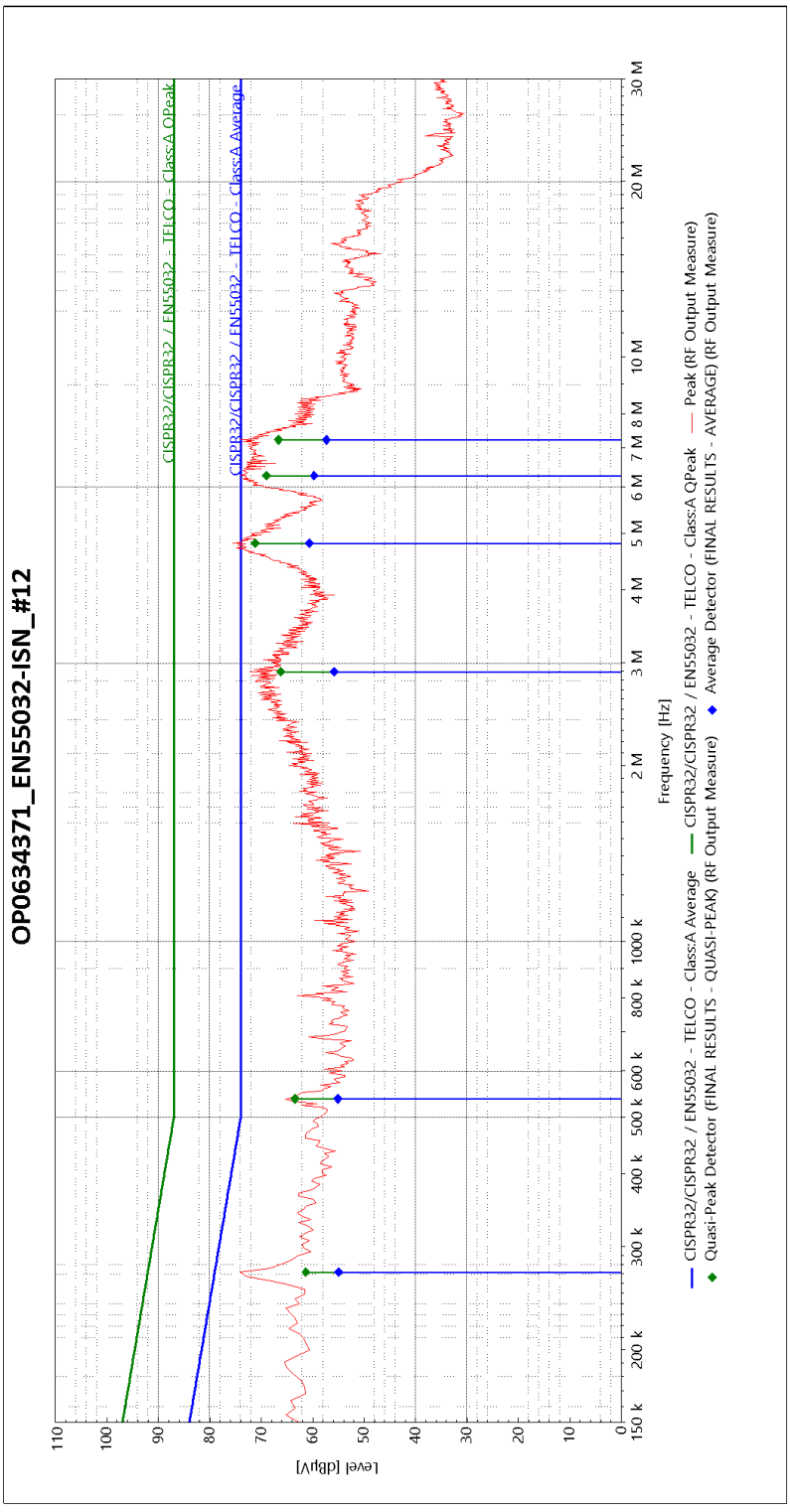
| Frequency | SR # | Quasi-Peak Detector (dBµV) | Quasi-Peak Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 271.5 kHz | 1 | 61.334 | 92.072 | 30.738 | 9.712 |
| 537.676 kHz | 1 | 63.426 | 87 | 23.574 | 9.687 |
| 2.895175 MHz | 1 | 66.231 | 87 | 20.769 | 9.676 |
| 4.800932 MHz | 1 | 71.239 | 87 | 15.761 | 9.73 |
| 6.276056 MHz | 1 | 68.947 | 87 | 18.053 | 9.779 |
| 7.220632 MHz | 1 | 66.648 | 87 | 20.352 | 9.821 |

**FINAL RESULTS - AVERAGE**

| Frequency | SR # | Average Detector (dBµV) | Average Limit (dBµV) | Margin (dB) | Correction (dB) |
|---|---|---|---|---|---|
| 271.5 kHz | 1 | 54.922 | 79.072 | 24.15 | 9.712 |
| 537.676 kHz | 1 | 55.127 | 74 | 18.873 | 9.687 |
| 2.895175 MHz | 1 | 55.842 | 74 | 18.158 | 9.676 |
| 4.800932 MHz | 1 | 60.625 | 74 | 13.375 | 9.73 |
| 6.276056 MHz | 1 | 59.717 | 74 | 14.283 | 9.779 |
| 7.220632 MHz | 1 | 57.359 | 74 | 16.641 | 9.821 |

PR / OP0634371_EN55032-ISN_#12.docx

**CONDUCTED EMISSIONS - VOLTAGE**
**page 2 / 2**




PR / OP0634371_EN55032-ISN_#12.docx

# APPENDIX B
# RADIATED EMISSIONS

## RADIATED EMISSIONS – ELECTRIC FIELD


***Project:*** *OP0634371* ***Customer:*** *Inogeni*

***DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

**Equipment:** CAM230
**Manufacturer:** Inogeni
**Hardware Version:**
**Software Version:**

***RADIATED EMISSIONS MEASUREMENT***: *OP0634371_EN55032_FCC-Bilog_#05*

**Test Location:** Anechoic chamber
**Test Date:** 2023-04-05 10:37:31 AM
**Operator(s):** Jean Cadotte
**Test Standard:** EN55032 / 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

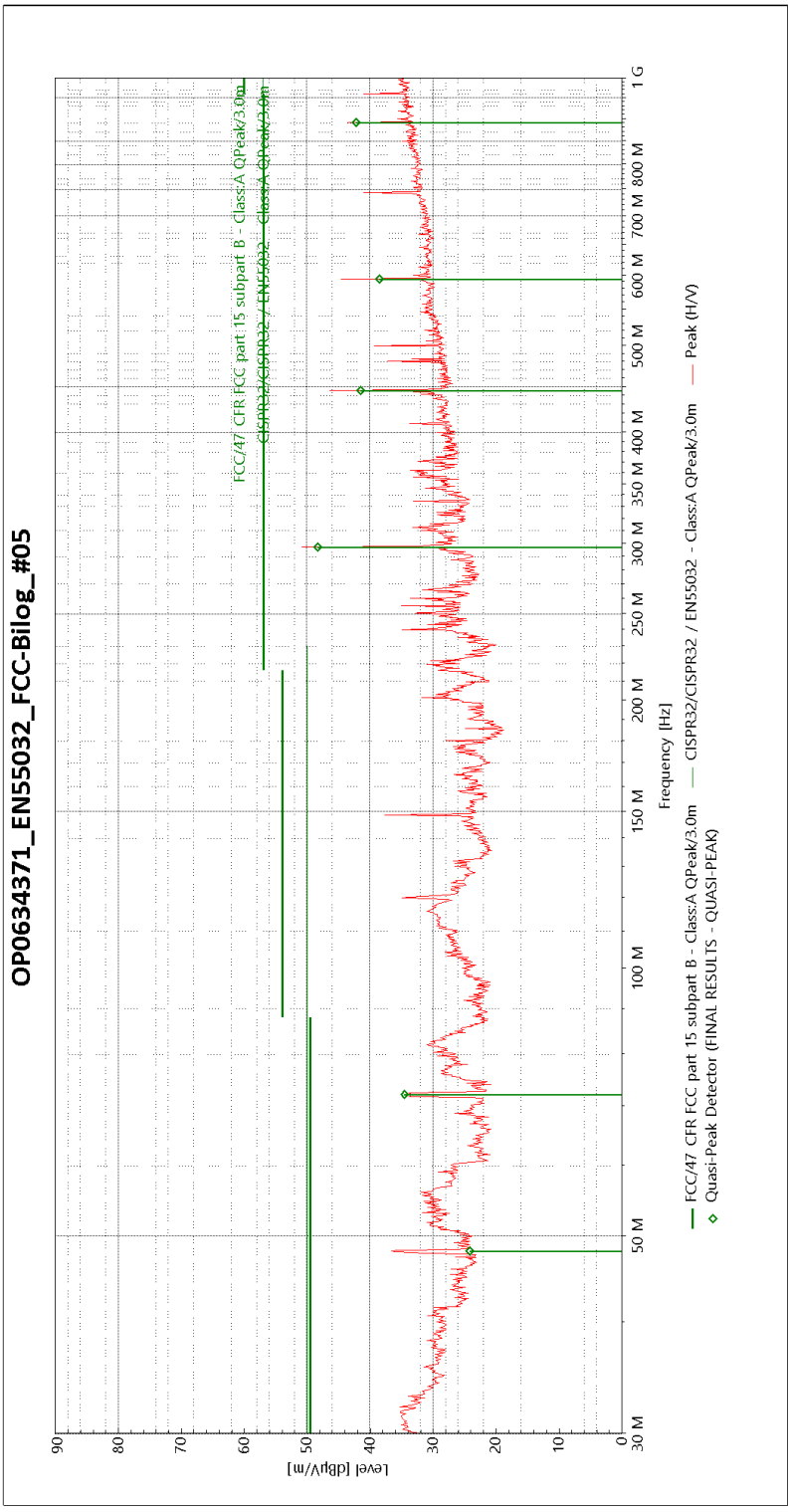
Antenna Mast : SUNOL
Bilog Antenna + 6dB : Schaffner CBL6112D#22617
HF#1 + HF#2
Rohde & Schwarz : ESW44
Turntable : SUNOL

**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) |
|---|---|---|---|---|---|---|---|---|
| 48.042 MHz | 1 | 24.177 | 50 | 25.823 | Vertical | 22.5 | 1.109 | 15.399 |
| 72.103676 MHz | 1 | 34.519 | 50 | 15.481 | Vertical | 360 | 1.226 | 13.2 |
| 297.013534 MHz | 1 | 48.337 | 57 | 8.663 | Horizontal | 143 | 1.109 | 20.77 |
| 445.521297 MHz | 1 | 41.48 | 57 | 15.52 | Horizontal | 304.25 | 1 | 24.635 |
| 594.028297 MHz | 1 | 38.504 | 57 | 18.496 | Vertical | 147.25 | 1 | 27.1 |
| 891.012542 MHz | 1 | 42.262 | 57 | 14.738 | Horizontal | 296.5 | 1 | 29.59 |

PR / OP0634371_EN55032_FCC-Bilog_#05.docx

**RADIATED EMISSIONS – ELECTRIC FIELD**
**page 2 / 2**




PR / OP0634371_EN55032_FCC-Bilog_#05.docx

NTS CEM LABORATOIRE D'ESSAIS

## RADIATED EMISSIONS – ELECTRIC FIELD


***Project:*** *OP0634371* ***Customer:*** *Inogeni*

***DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

**Equipment:** CAM230
**Manufacturer:** Inogeni
**Hardware Version:**
**Software Version:**

***RADIATED EMISSIONS MEASUREMENT***: *OP0634371_EN55032_FCC-Horn_#06*

**Test Location:** Anechoic chamber
**Test Date:** 2023-04-05 12:05:14 PM
**Operator(s):** Xavier Couste
**Test Standard:** EN55032 / FCC part 15 subpart B / Class A
**Power:** 230V/50Hz
**Operating Mode:**
**Comments:**

TEST PARAMETERS

| Frequency Range | Bandwidth | Test Distance |
|---|---|---|
| 1 GHz - 3.6 GHz | 1 MHz | 3 m |
| 3.6 GHz - 6 GHz | 1 MHz | 3 m |

TEST EQUIPMENT USED

Antenna Mast : SUNOL
HF#1+HF#2 + HF-LNA + 3dB
Horn Antenna : TESEQ BHA9118
Rohde & Schwarz : ESW44
Turntable : SUNOL

**FINAL RESULTS - PEAK**

| Frequency | SR # | Peak Detector (dBµV/m) | Peak Limit (dBµV/m) | Margin (dB) | Polarization | Azimuth (degree) | Height (m) | Correction (dB) |
|---|---|---|---|---|---|---|---|---|
| 1.33656207 GHz | 1 | 51.144 | 76 | 24.856 | Vertical | 285.25 | 3.172 | -13.27 |
| 1.440019182 GHz | 1 | 53.626 | 76 | 22.374 | Horizontal | 2.75 | 1.1 | -13.361 |
| 1.920027084 GHz | 1 | 49.854 | 76 | 26.146 | Vertical | 230.25 | 3.943 | -10.651 |
| 2.079100107 GHz | 1 | 50.319 | 76 | 25.681 | Horizontal | 28.5 | 1.022 | -9.865 |
| 2.227607084 GHz | 1 | 53.05 | 76 | 22.95 | Vertical | 282.75 | 3.882 | -9.706 |
| 2.438287031 GHz | 1 | 46.87 | 76 | 29.13 | Horizontal | 197.5 | 1.388 | -8.866 |

**FINAL RESULTS - AVERAGE**

| Frequency | SR # | Average Detector (dBµV/m) | Average Limit (dBµV/m) | Margin (dB) | Polarization | Azimuth (degree) | Height (m) | Correction (dB) |
|---|---|---|---|---|---|---|---|---|
| 1.33656207 GHz | 1 | 43.929 | 56 | 12.071 | Vertical | 285.25 | 3.172 | -13.27 |
| 1.440019182 GHz | 1 | 28.426 | 56 | 27.574 | Horizontal | 2.75 | 1.1 | -13.361 |
| 1.920027084 GHz | 1 | 28.55 | 56 | 27.45 | Vertical | 230.25 | 3.943 | -10.651 |
| 2.079100107 GHz | 1 | 33.935 | 56 | 22.065 | Horizontal | 28.5 | 1.022 | -9.865 |
| 2.227607084 GHz | 1 | 37.158 | 56 | 18.842 | Vertical | 282.75 | 3.882 | -9.706 |
| 2.438287031 GHz | 1 | 25.186 | 56 | 30.814 | Horizontal | 197.5 | 1.388 | -8.866 |

PR / OP0634371_EN55032_FCC-Horn_#06.docx

RADIATED EMISSIONS – ELECTRIC FIELD
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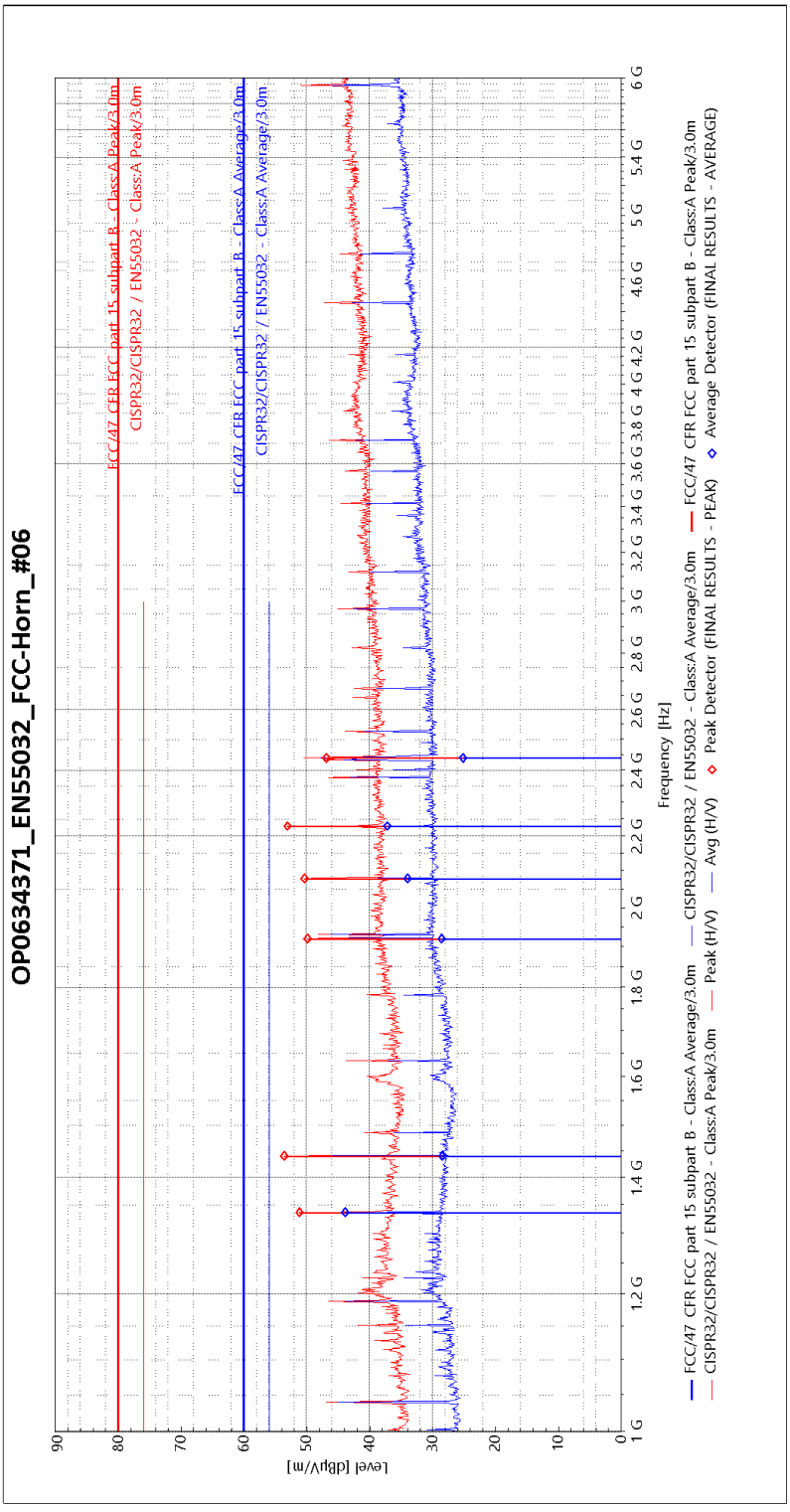



PR / OP0634371_EN55032_FCC-Horn_#06.docx

## RADIATED EMISSIONS – ELECTRIC FIELD


***Project:*** *OP0634371* ***Customer:*** *Inogeni*

***DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)***

**Equipment:** CAM230
**Manufacturer:** Inogeni
**Hardware Version:**
**Software Version:**

***RADIATED EMISSIONS MEASUREMENT***: *OP0634371_ICES-003_FCC-Horn_#07*

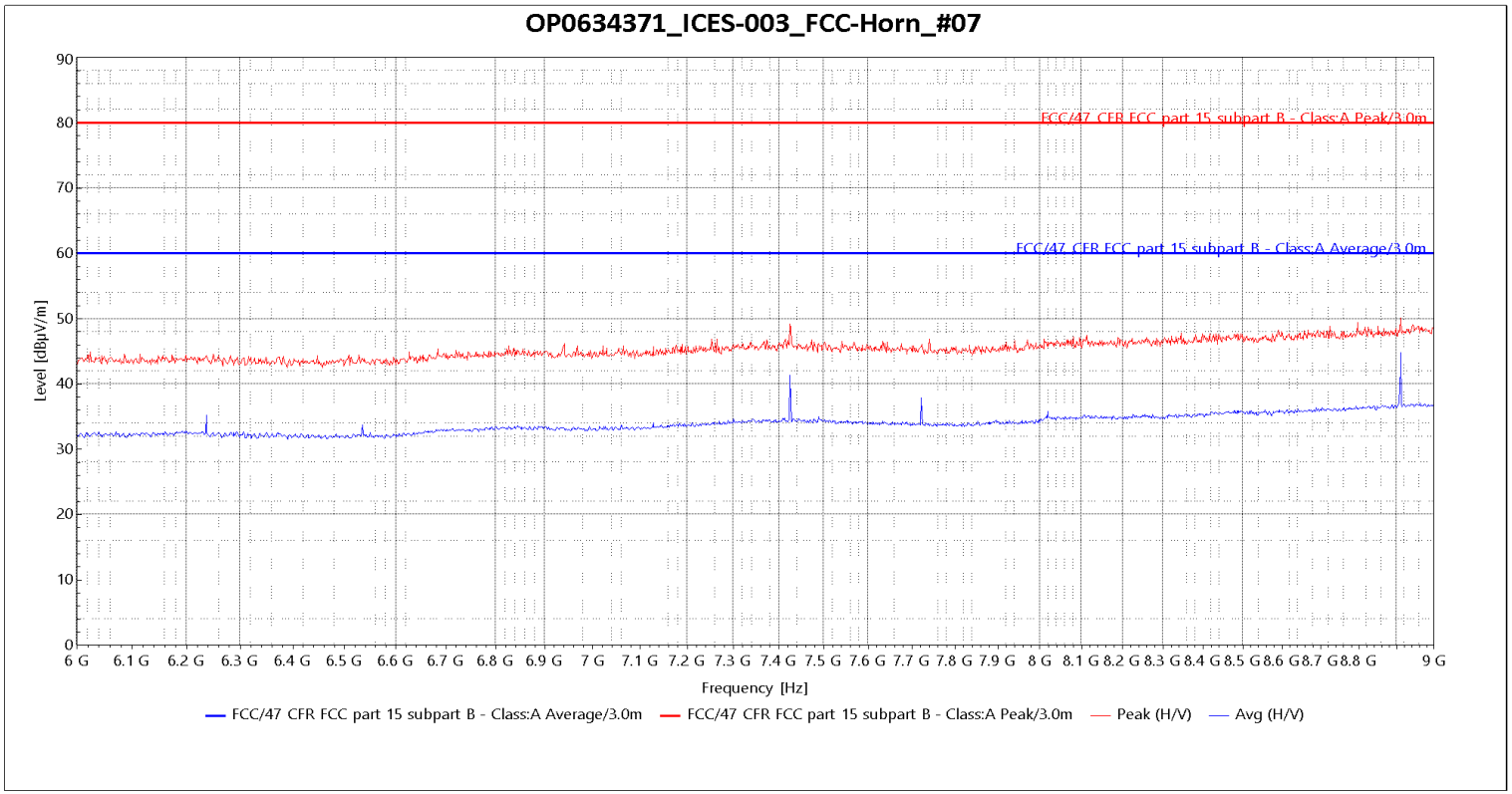
**Test Location:** Anechoic chamber
**Test Date:** 2023-04-05 11:42:50 AM
**Operator(s):** Jean Cadotte
**Test Standard:** FCC part 15 subpart B / Class A
**Power:** 230V/50Hz
**Operating Mode:**
**Comments:**

TEST PARAMETERS

| Frequency Range | Bandwidth | Test Distance |
|---|---|---|
| 6 GHz - 9 GHz | 1 MHz | 3 m |

TEST EQUIPMENT USED

Antenna Mast : SUNOL
HF#1+HF#2 + HF-LNA + 3dB
Horn Antenna : TESEQ BHA9118
Rohde & Schwarz : ESW44
Turntable : SUNOL




PR / OP0634371_ICES-003_FCC-Horn_#07.docx

## APPENDIX C
## HARMONIC CURRENT EMISSIONS LIMITS

Teseq Profline
4542 Luterbach, Switzerland

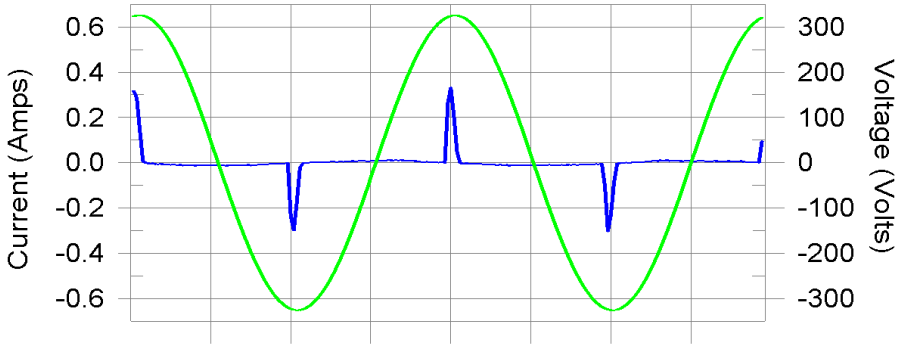
4/11/2023
8:01 AM

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

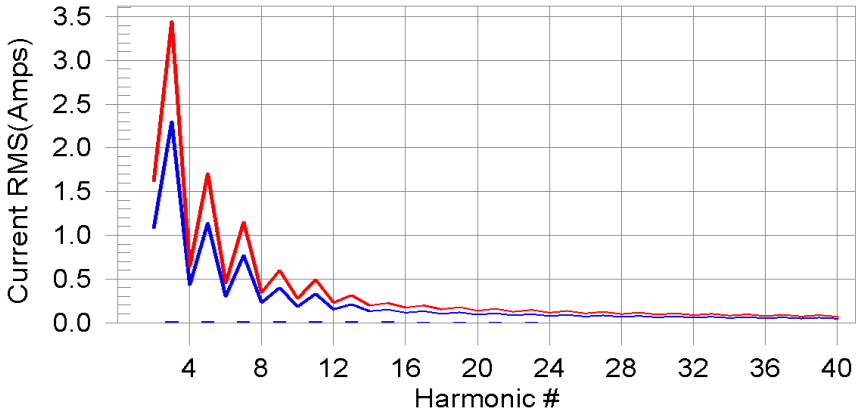
**EUT: CAM230** **Tested by: Jean Cadotte**
**Test category: Class-A per Ed. 4.0 (2014) (European limits)** **Test Margin: 100**
**Test date: 4/6/2023** **Start time: 4:50:25 PM** **End time: 4:52:46 PM**
**Test duration (min): 2** **Data file name: H-000196.cts_data**
**Comment: Harmonics Measurements**
**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 #19 with 6.8% of the limit.**

Teseq Profline 4/11/2023
4542 Luterbach, Switzerland 8:01 AM

## Current Test Result Summary (Run time)

**EUT: CAM230** **Tested by: Jean Cadotte**
**Test category: Class-A per Ed. 4.0 (2014) (European limits)** **Test Margin: 100**
**Test date: 4/6/2023** **Start time: 4:50:25 PM** **End time: 4:52:46 PM**
**Test duration (min): 2** **Data file name: H-000196.cts_data**
**Comment: Harmonics Measurements**
**Customer: Inogeni**

**Test Result: Pass** **Source qualification: Normal**
**THC(A): 0.054** **I-THD(%): 243.5** **POHC(A): 0.018** **POHC Limit(A): 0.251**

**Highest parameter values during test:**

| | | | |
|---|---|---|---|
| V_RMS (Volts): | 230.51 | Frequency(Hz): | 50.00 |
| I_Peak (Amps): | 0.350 | I_RMS (Amps): | 0.061 |
| I_Fund (Amps): | 0.022 | Crest Factor: | 5.922 |
| Power (Watts): | 4.8 | Power Factor: | 0.351 |

| Harm# | Harms(avg) | 100%Limit | %of Limit | Harms(max) | 150%Limit | %of Limit | Status |
|---|---|---|---|---|---|---|---|
| 2 | 0.001 | 1.080 | N/A | 0.001 | 1.620 | N/A | Pass |
| 3 | 0.020 | 2.300 | 0.9 | 0.020 | 3.450 | 0.6 | Pass |
| 4 | 0.001 | 0.430 | N/A | 0.001 | 0.645 | N/A | Pass |
| 5 | 0.020 | 1.140 | 1.7 | 0.020 | 1.710 | 1.2 | Pass |
| 6 | 0.001 | 0.300 | N/A | 0.001 | 0.450 | N/A | Pass |
| 7 | 0.019 | 0.770 | 2.5 | 0.019 | 1.155 | 1.6 | Pass |
| 8 | 0.000 | 0.230 | N/A | 0.001 | 0.345 | N/A | Pass |
| 9 | 0.018 | 0.400 | 4.5 | 0.018 | 0.600 | 3.0 | Pass |
| 10 | 0.000 | 0.184 | N/A | 0.001 | 0.276 | N/A | Pass |
| 11 | 0.017 | 0.330 | 5.2 | 0.017 | 0.495 | 3.5 | Pass |
| 12 | 0.000 | 0.153 | N/A | 0.001 | 0.230 | N/A | Pass |
| 13 | 0.016 | 0.210 | 7.6 | 0.016 | 0.315 | 5.1 | Pass |
| 14 | 0.000 | 0.131 | N/A | 0.001 | 0.197 | N/A | Pass |
| 15 | 0.015 | 0.150 | 9.8 | 0.015 | 0.225 | 6.6 | Pass |
| 16 | 0.000 | 0.115 | N/A | 0.001 | 0.173 | N/A | Pass |
| 17 | 0.013 | 0.132 | 10.2 | 0.014 | 0.198 | 6.8 | Pass |
| 18 | 0.000 | 0.102 | N/A | 0.001 | 0.153 | N/A | Pass |
| 19 | 0.012 | 0.118 | 10.2 | 0.012 | 0.178 | 6.8 | Pass |
| 20 | 0.000 | 0.092 | N/A | 0.001 | 0.138 | N/A | Pass |
| 21 | 0.011 | 0.107 | 10.0 | 0.011 | 0.161 | 6.7 | Pass |
| 22 | 0.000 | 0.084 | N/A | 0.001 | 0.125 | N/A | Pass |
| 23 | 0.009 | 0.098 | 9.6 | 0.009 | 0.147 | 6.4 | Pass |
| 24 | 0.000 | 0.077 | N/A | 0.001 | 0.115 | N/A | Pass |
| 25 | 0.008 | 0.090 | 8.9 | 0.008 | 0.135 | 5.9 | Pass |
| 26 | 0.000 | 0.071 | N/A | 0.001 | 0.107 | N/A | Pass |
| 27 | 0.007 | 0.083 | 8.1 | 0.007 | 0.125 | 5.4 | Pass |
| 28 | 0.000 | 0.066 | N/A | 0.001 | 0.099 | N/A | Pass |
| 29 | 0.006 | 0.078 | 7.1 | 0.006 | 0.116 | 4.8 | Pass |
| 30 | 0.000 | 0.061 | N/A | 0.001 | 0.092 | N/A | Pass |
| 31 | 0.004 | 0.073 | N/A | 0.004 | 0.109 | N/A | Pass |
| 32 | 0.000 | 0.058 | N/A | 0.001 | 0.086 | N/A | Pass |
| 33 | 0.004 | 0.068 | N/A | 0.004 | 0.102 | N/A | Pass |
| 34 | 0.000 | 0.054 | N/A | 0.001 | 0.081 | N/A | Pass |
| 35 | 0.003 | 0.064 | N/A | 0.003 | 0.096 | N/A | Pass |
| 36 | 0.000 | 0.051 | N/A | 0.000 | 0.077 | N/A | Pass |
| 37 | 0.002 | 0.061 | N/A | 0.002 | 0.091 | N/A | Pass |
| 38 | 0.000 | 0.048 | N/A | 0.000 | 0.073 | N/A | Pass |
| 39 | 0.002 | 0.058 | N/A | 0.002 | 0.087 | N/A | Pass |
| 40 | 0.000 | 0.046 | N/A | 0.000 | 0.069 | N/A | Pass |

Teseq Profline 4/11/2023
4542 Luterbach, Switzerland 8:01 AM

## Voltage Source Verification Data (Run time)

**EUT: CAM230** **Tested by: Jean Cadotte**
**Test category: Class-A per Ed. 4.0 (2014) (European limits)** **Test Margin: 100**
**Test date: 4/6/2023** **Start time: 4:50:25 PM** **End time: 4:52:46 PM**
**Test duration (min): 2** **Data file name: H-000196.cts_data**
**Comment: Harmonics Measurements**
**Customer: Inogeni**

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

**Highest parameter values during test:**

| | | | |
|---|---|---|---|
| Voltage (Vrms): | 230.51 | Frequency(Hz): | 50.00 |
| I_Peak (Amps): | 0.350 | I_RMS (Amps): | 0.061 |
| I_Fund (Amps): | 0.022 | Crest Factor: | 5.922 |
| Power (Watts): | 4.8 | Power Factor: | 0.351 |

| Harm# | Harmonics V-rms | Limit V-rms | % of Limit | Status |
|---|---|---|---|---|
| 2 | 0.030 | 0.461 | 6.43 | OK |
| 3 | 0.408 | 2.074 | 19.69 | OK |
| 4 | 0.025 | 0.461 | 5.50 | OK |
| 5 | 0.035 | 0.922 | 3.77 | OK |
| 6 | 0.025 | 0.461 | 5.47 | OK |
| 7 | 0.021 | 0.691 | 3.04 | OK |
| 8 | 0.007 | 0.461 | 1.43 | OK |
| 9 | 0.023 | 0.461 | 5.05 | OK |
| 10 | 0.006 | 0.461 | 1.35 | OK |
| 11 | 0.011 | 0.230 | 4.98 | OK |
| 12 | 0.012 | 0.230 | 5.32 | OK |
| 13 | 0.014 | 0.230 | 5.86 | OK |
| 14 | 0.004 | 0.230 | 1.73 | OK |
| 15 | 0.007 | 0.230 | 2.85 | OK |
| 16 | 0.011 | 0.230 | 4.76 | OK |
| 17 | 0.012 | 0.230 | 5.02 | OK |
| 18 | 0.014 | 0.230 | 6.08 | OK |
| 19 | 0.013 | 0.230 | 5.49 | OK |
| 20 | 0.014 | 0.231 | 6.27 | OK |
| 21 | 0.014 | 0.230 | 5.92 | OK |
| 22 | 0.004 | 0.230 | 1.68 | OK |
| 23 | 0.011 | 0.230 | 4.64 | OK |
| 24 | 0.004 | 0.230 | 1.60 | OK |
| 25 | 0.010 | 0.230 | 4.38 | OK |
| 26 | 0.002 | 0.230 | 0.97 | OK |
| 27 | 0.004 | 0.230 | 1.58 | OK |
| 28 | 0.002 | 0.230 | 0.84 | OK |
| 29 | 0.012 | 0.230 | 5.12 | OK |
| 30 | 0.003 | 0.230 | 1.12 | OK |
| 31 | 0.007 | 0.230 | 3.22 | OK |
| 32 | 0.002 | 0.230 | 0.71 | OK |
| 33 | 0.005 | 0.230 | 2.38 | OK |
| 34 | 0.001 | 0.230 | 0.62 | OK |
| 35 | 0.006 | 0.230 | 2.58 | OK |
| 36 | 0.002 | 0.230 | 0.74 | OK |
| 37 | 0.005 | 0.230 | 2.20 | OK |
| 38 | 0.002 | 0.230 | 0.84 | OK |
| 39 | 0.003 | 0.230 | 1.44 | OK |
| 40 | 0.005 | 0.230 | 2.01 | OK |

Teseq AG Win2100 V4.9.0 Page 3 of 3

Teseq Profline
4542 Luterbach, Switzerland

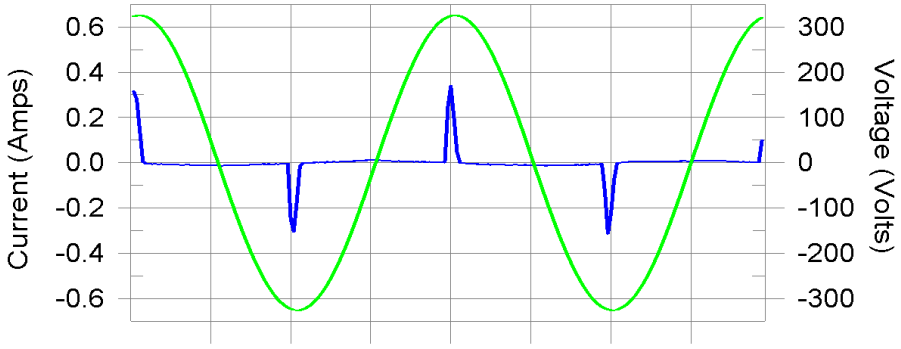
4/11/2023
8:02 AM

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

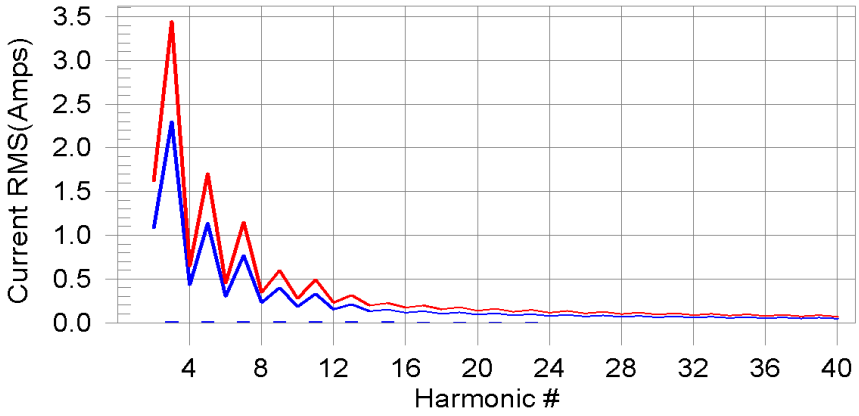
**EUT: CAM230** **Tested by: Jean Cadotte**
**Test category: Class-A per Ed. 4.0 (2014) (European limits)** **Test Margin: 100**
**Test date: 4/6/2023** **Start time: 4:55:22 PM** **End time: 4:57:44 PM**
**Test duration (min): 2** **Data file name: H-000197.cts_data**
**Comment: Harmonics Measurements**
**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 #19 with 6.9% of the limit.**

Teseq Profline 4/11/2023
4542 Luterbach, Switzerland 8:02 AM

## Current Test Result Summary (Run time)

**EUT: CAM230** **Tested by: Jean Cadotte**
**Test category: Class-A per Ed. 4.0 (2014) (European limits)** **Test Margin: 100**
**Test date: 4/6/2023** **Start time: 4:55:22 PM** **End time: 4:57:44 PM**
**Test duration (min): 2** **Data file name: H-000197.cts_data**
**Comment: Harmonics Measurements**
**Customer: Inogeni**

**Test Result: Pass** **Source qualification: Normal**
**THC(A): 0.054** **I-THD(%): 243.9** **POHC(A): 0.019** **POHC Limit(A): 0.251**

**Highest parameter values during test:**

| | | | |
|---|---|---|---|
| V_RMS (Volts): | 230.51 | Frequency(Hz): | 50.00 |
| I_Peak (Amps): | 0.357 | I_RMS (Amps): | 0.061 |
| I_Fund (Amps): | 0.023 | Crest Factor: | 5.965 |
| Power (Watts): | 4.8 | Power Factor: | 0.350 |

| Harm# | Harms(avg) | 100%Limit | %of Limit | Harms(max) | 150%Limit | %of Limit | Status |
|---|---|---|---|---|---|---|---|
| 2 | 0.001 | 1.080 | N/A | 0.001 | 1.620 | N/A | Pass |
| 3 | 0.020 | 2.300 | 0.9 | 0.020 | 3.450 | 0.6 | Pass |
| 4 | 0.001 | 0.430 | N/A | 0.001 | 0.645 | N/A | Pass |
| 5 | 0.020 | 1.140 | 1.7 | 0.020 | 1.710 | 1.2 | Pass |
| 6 | 0.001 | 0.300 | N/A | 0.001 | 0.450 | N/A | Pass |
| 7 | 0.019 | 0.770 | 2.4 | 0.019 | 1.155 | 1.7 | Pass |
| 8 | 0.000 | 0.230 | N/A | 0.001 | 0.345 | N/A | Pass |
| 9 | 0.018 | 0.400 | 4.5 | 0.018 | 0.600 | 3.1 | Pass |
| 10 | 0.000 | 0.184 | N/A | 0.001 | 0.276 | N/A | Pass |
| 11 | 0.017 | 0.330 | 5.2 | 0.017 | 0.495 | 3.5 | Pass |
| 12 | 0.000 | 0.153 | N/A | 0.001 | 0.230 | N/A | Pass |
| 13 | 0.016 | 0.210 | 7.6 | 0.016 | 0.315 | 5.2 | Pass |
| 14 | 0.000 | 0.131 | N/A | 0.001 | 0.197 | N/A | Pass |
| 15 | 0.015 | 0.150 | 9.8 | 0.015 | 0.225 | 6.7 | Pass |
| 16 | 0.000 | 0.115 | N/A | 0.001 | 0.173 | N/A | Pass |
| 17 | 0.013 | 0.132 | 10.2 | 0.014 | 0.198 | 6.9 | Pass |
| 18 | 0.000 | 0.102 | N/A | 0.001 | 0.153 | N/A | Pass |
| 19 | 0.012 | 0.118 | 10.2 | 0.012 | 0.178 | 6.9 | Pass |
| 20 | 0.000 | 0.092 | N/A | 0.001 | 0.138 | N/A | Pass |
| 21 | 0.011 | 0.107 | 10.0 | 0.011 | 0.161 | 6.8 | Pass |
| 22 | 0.000 | 0.084 | N/A | 0.001 | 0.125 | N/A | Pass |
| 23 | 0.009 | 0.098 | 9.6 | 0.009 | 0.147 | 6.4 | Pass |
| 24 | 0.000 | 0.077 | N/A | 0.001 | 0.115 | N/A | Pass |
| 25 | 0.008 | 0.090 | 8.9 | 0.008 | 0.135 | 6.0 | Pass |
| 26 | 0.000 | 0.071 | N/A | 0.001 | 0.107 | N/A | Pass |
| 27 | 0.007 | 0.083 | 8.1 | 0.007 | 0.125 | 5.4 | Pass |
| 28 | 0.000 | 0.066 | N/A | 0.000 | 0.099 | N/A | Pass |
| 29 | 0.006 | 0.078 | 7.2 | 0.006 | 0.116 | 4.8 | Pass |
| 30 | 0.000 | 0.061 | N/A | 0.000 | 0.092 | N/A | Pass |
| 31 | 0.004 | 0.073 | N/A | 0.005 | 0.109 | N/A | Pass |
| 32 | 0.000 | 0.058 | N/A | 0.000 | 0.086 | N/A | Pass |
| 33 | 0.004 | 0.068 | N/A | 0.004 | 0.102 | N/A | Pass |
| 34 | 0.000 | 0.054 | N/A | 0.000 | 0.081 | N/A | Pass |
| 35 | 0.003 | 0.064 | N/A | 0.003 | 0.096 | N/A | Pass |
| 36 | 0.000 | 0.051 | N/A | 0.000 | 0.077 | N/A | Pass |
| 37 | 0.002 | 0.061 | N/A | 0.002 | 0.091 | N/A | Pass |
| 38 | 0.000 | 0.048 | N/A | 0.000 | 0.073 | N/A | Pass |
| 39 | 0.002 | 0.058 | N/A | 0.002 | 0.087 | N/A | Pass |
| 40 | 0.000 | 0.046 | N/A | 0.000 | 0.069 | N/A | Pass |

Teseq Profline 4/11/2023
4542 Luterbach, Switzerland 8:02 AM

## Voltage Source Verification Data (Run time)

**EUT: CAM230** **Tested by: Jean Cadotte**
**Test category: Class-A per Ed. 4.0 (2014) (European limits)** **Test Margin: 100**
**Test date: 4/6/2023** **Start time: 4:55:22 PM** **End time: 4:57:44 PM**
**Test duration (min): 2** **Data file name: H-000197.cts_data**
**Comment: Harmonics Measurements**
**Customer: Inogeni**

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

**Highest parameter values during test:**

| | | | |
|---|---|---|---|
| Voltage (Vrms): | 230.51 | Frequency(Hz): | 50.00 |
| I_Peak (Amps): | 0.357 | I_RMS (Amps): | 0.061 |
| I_Fund (Amps): | 0.023 | Crest Factor: | 5.965 |
| Power (Watts): | 4.8 | Power Factor: | 0.350 |

| Harm# | Harmonics V-rms | Limit V-rms | % of Limit | Status |
|---|---|---|---|---|
| 2 | 0.030 | 0.461 | 6.47 | OK |
| 3 | 0.405 | 2.074 | 19.53 | OK |
| 4 | 0.024 | 0.461 | 5.14 | OK |
| 5 | 0.034 | 0.922 | 3.73 | OK |
| 6 | 0.024 | 0.461 | 5.19 | OK |
| 7 | 0.021 | 0.691 | 3.09 | OK |
| 8 | 0.007 | 0.461 | 1.46 | OK |
| 9 | 0.023 | 0.461 | 4.98 | OK |
| 10 | 0.006 | 0.461 | 1.32 | OK |
| 11 | 0.011 | 0.230 | 4.94 | OK |
| 12 | 0.012 | 0.230 | 5.25 | OK |
| 13 | 0.014 | 0.230 | 5.99 | OK |
| 14 | 0.004 | 0.230 | 1.71 | OK |
| 15 | 0.007 | 0.230 | 2.92 | OK |
| 16 | 0.011 | 0.230 | 4.68 | OK |
| 17 | 0.012 | 0.230 | 5.06 | OK |
| 18 | 0.013 | 0.230 | 5.67 | OK |
| 19 | 0.013 | 0.230 | 5.61 | OK |
| 20 | 0.014 | 0.230 | 6.04 | OK |
| 21 | 0.014 | 0.230 | 5.88 | OK |
| 22 | 0.003 | 0.230 | 1.52 | OK |
| 23 | 0.011 | 0.230 | 4.75 | OK |
| 24 | 0.004 | 0.230 | 1.63 | OK |
| 25 | 0.010 | 0.230 | 4.54 | OK |
| 26 | 0.003 | 0.230 | 1.23 | OK |
| 27 | 0.003 | 0.230 | 1.46 | OK |
| 28 | 0.002 | 0.230 | 0.81 | OK |
| 29 | 0.012 | 0.230 | 5.27 | OK |
| 30 | 0.004 | 0.230 | 1.53 | OK |
| 31 | 0.007 | 0.231 | 3.23 | OK |
| 32 | 0.002 | 0.230 | 0.79 | OK |
| 33 | 0.005 | 0.230 | 2.36 | OK |
| 34 | 0.002 | 0.230 | 0.81 | OK |
| 35 | 0.006 | 0.230 | 2.59 | OK |
| 36 | 0.002 | 0.230 | 0.88 | OK |
| 37 | 0.005 | 0.230 | 2.10 | OK |
| 38 | 0.002 | 0.230 | 0.87 | OK |
| 39 | 0.003 | 0.231 | 1.48 | OK |
| 40 | 0.005 | 0.230 | 2.07 | OK |

## APPENDIX D
## VOLTAGE FLUCTUATIONS AND FLICKER LIMITATIONS

Teseq Profline
4542 Luterbach, Switzerland

4/11/2023
8:03 AM

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

**EUT: CAM230** **Tested by: Jean Cadotte**
**Test category: All parameters (European limits)** **Test Margin: 100**
**Test date: 4/6/2023** **Start time: 5:02:25 PM** **End time: 5:12:56 PM**
**Test duration (min): 10** **Data file name: F-000198.cts_data**
**Comment: Flickers measurements**
**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):** | **230.42** | | | |
| **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):** | **0.218** | **Test limit:** | **1.000** | **Pass** |
| **Highest Plt (2 hr. period):** | **0.095** | **Test limit:** | **0.650** | **Pass** |

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Teseq Profline
4542 Luterbach, Switzerland

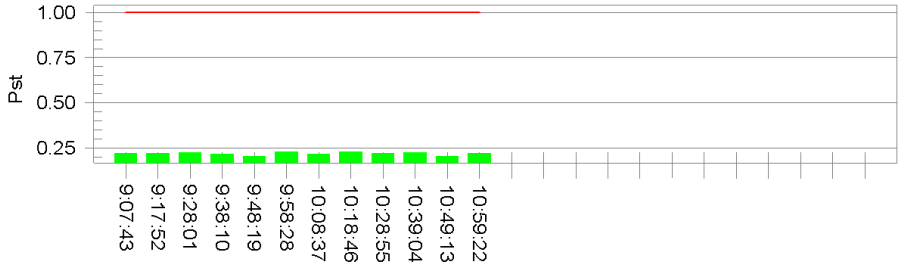
4/11/2023
8:03 AM

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

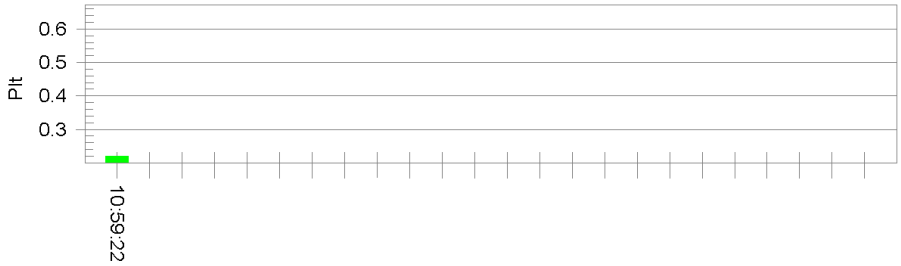
**EUT: CAM230** **Tested by: Jean Cadotte**
**Test category: All parameters (European limits)** **Test Margin: 100**
**Test date: 4/10/2023** **Start time: 8:57:13 AM** **End time: 10:59:24 AM**
**Test duration (min): 120** **Data file name: F-000199.cts_data**
**Comment: Flickers measurements Plt**
**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):** | **230.87** | | | |
| **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 (%):** | **0.08** | **Test limit (%):** | **4.00** | **Pass** |
| **Highest Pst (10 min. period):** | **0.229** | **Test limit:** | **1.000** | **Pass** |
| **Highest Plt (2 hr. period):** | **0.222** | **Test limit:** | **0.650** | **Pass** |

Teseq AG Win2100 V4.9.0 Page 1 of 1

# END OF TEST REPORT