
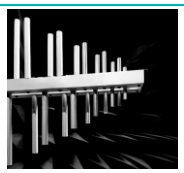
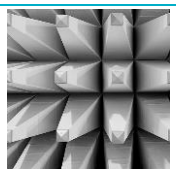

# TEST REPORT

**Test Report No.: 1-6321/23-01-04-A**

## Testing Laboratory


**cetecom advanced GmbH**
Untertürkheimer Straße 6 – 10
66117 Saarbrücken/GERMANY
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: https://cetecomadvanced.com/
e-mail: mail@cetecomadvanced.com


**Accredited Testing Laboratory:**
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with
the registration number: D-PL-12076-01-01

## Applicant


**Schroff SAS**
4 rue du Marais
67660 Betschdorf/FRANCE
Contact: Frédéric Hartmann
e-mail: Frederic.Hartmann@nVent.com


## Manufacturer


**Schroff SAS**
4 rue du Marais
67660 Betschdorf/FRANCE
Contact: Frédéric Hartmann


## Test Standard/s

| | |
|---|---|
| **EN 55032:2015 + AC:2016 + A11:2020 + A1:2020** | Electromagnetic compatibility of multimedia equipment - Emission requirements |

## Test Item

**Kind of test item:** **Rack**
**Model name:** **Varistar CP LHX+ 5/10KW**
detailed information see chapter 6.1 and 6.2 of this test report

This test report is electronically signed and valid without handwritten signature. The public keys can be requested at the test laboratory to verify the electronic signatures.

**Test report authorised:**

cn=Uli Kraus, o=cetecom advanced GmbH, ou=EMC-8459, email=uli.kraus@cetecomadvanced.com, c=DE
2023.07.12 13:30:46 +02'00'

Uli Kraus
Supervisor EMC Services
Radio Communications & EMC

**Test performed:**

cn=Holger Medrow, o=cetecom advanced GmbH, ou=MED-230530, email=Holger.Medrow@cetecomadvanced.com, c=DE
2023.07.13 13:23:56 +02'00'

Holger Medrow
Testing Manager
Radio Communications & EMC

# 1 Table of contents

# 2 General information

## 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. Cetecom advanced GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of cetecom advanced GmbH.
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This test report is electronically signed and valid without handwritten signature. For verification of the electronical signatures, the public keys can be requested at the testing laboratory.

**This test report is a new release and replaces all former versions of this report. Please refer to Annex C "Document history" for further information.**

## 2.2 Application details

| | |
|---|---|
| Date of receipt of order: | 2023-05-30 |
| Date of receipt of test item: | 2023-05-04 |
| Start of test[1)]: | 2023-06-02 |
| End of test[1)]: | 2023-06-05 |

[1)] Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

## 3 Test standard/s:

| | |
|---|---|
| **EN 55032:2015 + AC:2016 + A11:2020 + A1:2020** | Electromagnetic compatibility of multimedia equipment - Emission requirements |

## 4 Test environment

| | |
|---|---|
| Temperature: | 15 °C – 35 °C |
| Relative humidity content: | 30 % – 60 % |
| Air pressure: | 860 hPa – 1060 hPa |
| Power supply of measurement equipment: | 230 V / 50 Hz |

## 5 Test laboratories sub-contracted

---

# 6 Information about test conditions

## 6.1 Test item

| | | |
|---|---|---|
| **Kind of test item :** | **Rack** | |
| **Type identification :** | **Varistar CP LHX+ 5/10KW** | |
| **Equipment classification:** | Equipment for fixed use | |
| **Environment classification:** | Industrial environment | |
| **Supply voltage :** | AC 230 V/ 50 Hz and 400V /50Hz (3x 230V) | |
| **Ports :** | **Description** | **Direction** |
| | AC power port | Input |
| | Telecommunication port: Ethernet 100Mbit/s, shielded | In / output |
| **Mounting position:** | Floor standing | |
| **Additional information:** | | |
| Test set-up / cabling / operating modes of EUT during tests according to customer (see also the file: LHX-EMC test_v02.pptx dated. 2023-06-12).<br><br>Two different set-ups were tested (see 6.4)<br>The device was NOT grounded during the tests<br>The device was modified using an additional EMI-Filter: Schaffner FN261-2-06 into AC line of Power supply/control unit.<br><br>**The following warning shall be included in the instruction of use:**<br>***This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures***<br>The lamp was disconnected during all tests | | |

## 6.2 EUT: Type, S/N etc. and short descriptions used in this test report

| short descrip-tion*) | EUT | Type | S/N serial number | HW hardware status | SW software status |
|---|---|---|---|---|---|
| **EUT A** | Rack | Varistar CP LHX+ 10KW Cabinet | 10630053-0001 | Rev. A | 63998256-52 |

*) EUT short description is used to simplify the identification of the EUT in this test report.

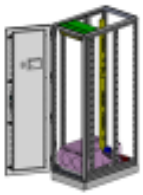
## 6.3 Auxiliary equipment (AE): Type, S/N etc. and short descriptions

| AE descrip-tion*) | Auxiliary equipment | Type | S/N serial number | HW hardware status | SW software status |
|---|---|---|---|---|---|
| **AE A** | notebook | Dell Latitude 5430 | 51B0TT3 | 2022 | WIN 10 64 bit |
| | notebook power supply | Dell LA65NM190LPS | CN-0V2TJ7-LOC00-28J-4W6K-A00 | unknown | - / - |

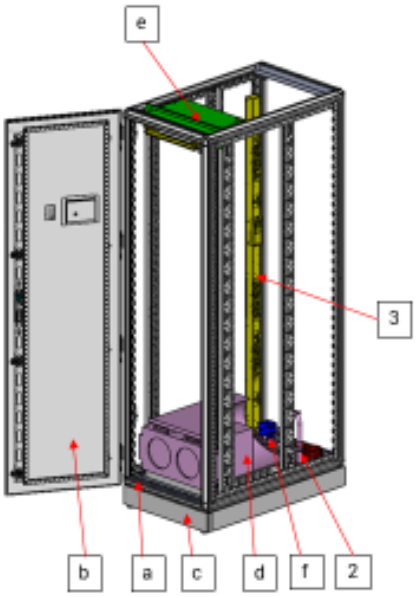
## 6.4 Description of EUT (acc. customer)

### 3rd Test – CUSTOMER SKA configuration completely OPEN

10630-053, with options
23130-663 flow-t° sensor
RP6325 1 phase iPDU



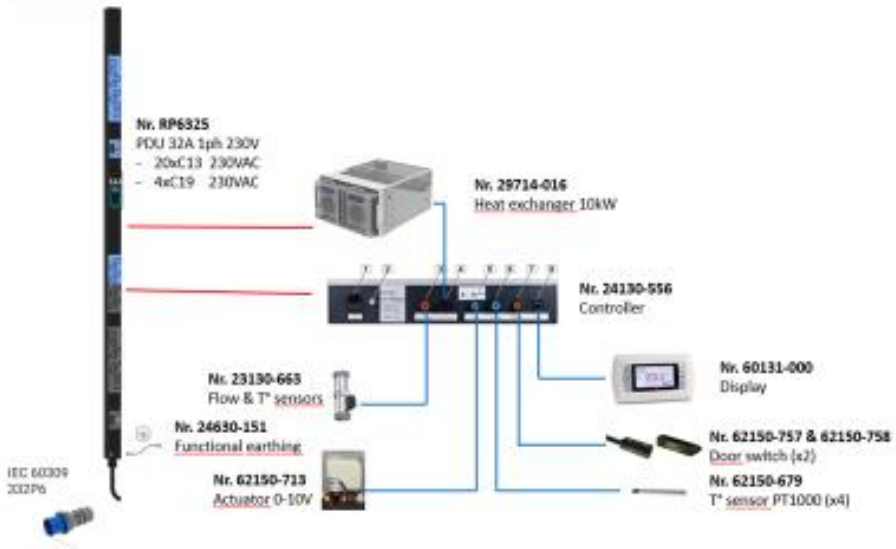
1. **10630-053**
   a) 21630-102 : frame 2000H600W1000D
   b) 21630-529 : door with display 2000H600W
   c) 24630-034 : base plinth 600W1000D
   d) 29714-016 : heat exchange 10Kw
   e) 24130-556 : controller
   f) 62150-713 : actuator
2. **23130-663** : flow-t° sensor
3. **RP6325** : 1 phase iPDU




6 CONFIDENTIAL – FOR INTERNAL USE ONLY nVent

### Cabling 3rd Test

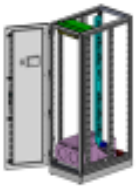
Fourth test



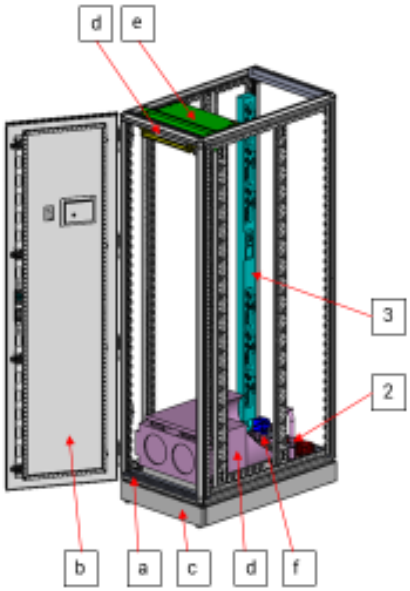

7 CONFIDENTIAL – FOR INTERNAL USE ONLY nVent

## 4th Test – CUSTOMER SKA configuration completely OPEN

10630-053, with options
23130-663 flow-t° sensor
RP6810 3 phases iPDU

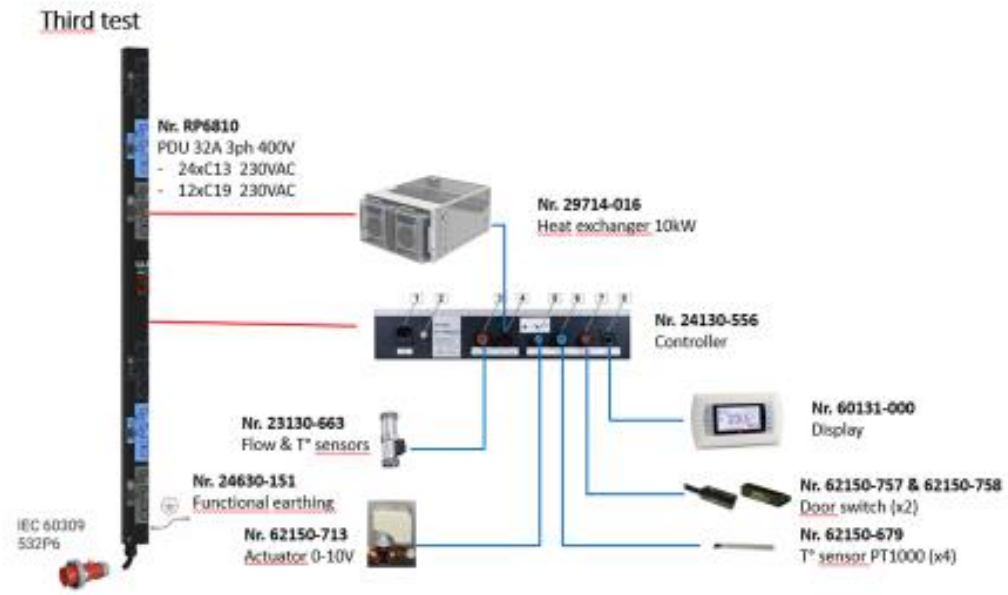


1. **10630-053**
   a) 21630-102 : frame 2000H600W1000D
   b) 21630-529 : door with display 2000H600W
   c) 24630-034 : base plinth 600W1000D
   d) 29714-016 : heat exchange 10Kw
   e) 24130-556 : controller
   f) 62150-713 : actuator
2. **23130-663** : flow-t° sensor
3. **RP6810** : 3 phases iPDU






## Cabling 4th Test



## 6.5 EUT set-up(s)

| EUT set-up no.*) | Combination of EUT and AE | Remarks |
|---|---|---|
| **Set 1** | EUT A + AE A | The rack contains frame connector: PDU 32A 1ph<br><br>The walls of the rack were dismounted, the door was closed |
| **Set 2** | EUT A + AE A | The rack contains frame connector PDU 32A 3ph<br><br>The walls of the rack were dismounted, the door was closed |

## 6.6 EUT operating modes

| EUT operating mode no.*) | Description of operating modes | Additional information |
|---|---|---|
| **op. 1** | Standard mode, test mode | Manual mode, see also LHX-EMC.pptx dated. 2023-06-06. |

# 7 Summary of measurement results

☒ All of the performed measurements are passed
☐ At least one or more of the performed measurements are failed

## 7.1 Emission

### 7.1.1 Enclosure

| EMI phenomenon | Frequency range | Basic standard | Result |
|---|---|---|---|
| Radiated interference field strength | 30 – 1000 MHz | EN 55032 Class A | passed |
| Radiated interference field strength | > 1000 MHz | EN 55032 Class B | passed |

### 7.1.2 AC Mains power Input/Output ports

| EMI Phenomenon | Frequency range | Basic standard | Result |
|---|---|---|---|
| Conducted interference voltage | 0,15 – 30 MHz | EN 55032 Class B | passed |
| Harmonic current emission | 0 – 2 kHz | EN 61000-3-2 | NA 1 |
| Voltage fluctuations and flicker | --- | EN 61000-3-3 | NA 1 |

### 7.1.3 Telecommunication port

| EMI Phenomenon | Frequency range | Basic standard | Result |
|---|---|---|---|
| Conducted interference voltage | 0,15 – 30 MHz | EN 55032 Class B | passed |

### 7.1.4 Antenna port

| EMI Phenomenon | Frequency range | Basic standard | Result |
|---|---|---|---|
| Conducted interference voltage | 0,15 – 30 MHz | EN 55032 Class B | NA 2 |

**Remarks:**

| | |
|---|---|
| NA1 | Not tested because not required by used standard |
| NA2 | Test not applicable because port does not exists |
| NA3 | Test not applicable because port only for services |
| NA4 | Test not applicable because port lengths not longer than 3m |
| NA5 | Not tested because not required by customer |
| NA6 | For equipment with a rated power of ≤75 W, other than lighting equipment, no limits are specified in this edition of the standard. |
| NA7 | No test shall be made on equipment which is unlikely to produce significant voltage fluctuations or flicker. |
| NA8 | Not performed, because highest internal clock frequency < 108 MHz |
| NA9 | EUT doesn't contain devices intrinsically susceptible to magnetic fields |

## 7.2 Measurement and test set-up

Note: Test set-up / cabling / operating modes of EUT during tests according to customer.

## 7.3 Measurement uncertainty

The uncertainty of the measurement equipment fulfils CISPR 16 and the related European and national standards.

The semi anechoic chamber fulfils the requirements of CISPR 16-1 (ANSI C63.4) for a test volume of 4m ∅.

Measurement uncertainty calculations are on file and available from the test laboratory upon request.

The table below shows the measurement uncertainties for each measurement method. The expended uncertainty (k=2 or 95%) was calculated with worst case values.

| | Measurement Method | Frequency area<br>Impulse duration time | Description | Expanded uncertainty (k=2 or 95%) |
|---|---|---|---|---|
| Emission | **Radiated**<br>**EN 55032/11, ANSI C63.4** | < 1 GHz<br>> 1 GHz | Field strength [dBµV/m] | ± 4.64 dB<br>± 4.92 dB |
| | **Conducted**<br>**EN 55032/11, ANSI C63.4** | 9 kHz – 30 MHz | Voltage [dBµV] | ± 3.49 dB |
| | **Power line communication apparatus used in low-voltage installations**<br>**EN 50561-1** | - / - | Voltage [dBµV] | ± 3.49 dB |
| | **Harmonic current**<br>**EN 61000-3-2** | 2...40 x $f_n$<br>$f_n$= 50 Hz | Voltage [V]<br>Current [A] | ± 0.05 %<br>± 0.06 % |
| | **Voltage changes, voltage fluctuations and flicker**<br>**EN 61000-3-3** | $f_n$ = 50 Hz | Voltage [V] | ± 1 % |

# 8 Detailed test results - Emission

## 8.1 Conducted emission

### 8.1.1 Instrumentation for test (see equipment list)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G 1 | G 2 | G 5 | G 2a | | | | | | | | |

### 8.1.2 Test plan

| EUT set-up | Set 1 and set 2 | | | |
|---|---|---|---|---|
| **Operating mode** | **Port / Line** | **LCL factor** | **Limit** | **Result** |
| Op 1 | AC power line | --- | EN 55032 Class B | passed |
| Op 1 | Ethernet (of frame connector) | --- | EN 55032 Class B | passed |

| **Remark :** | --- |
|---|---|

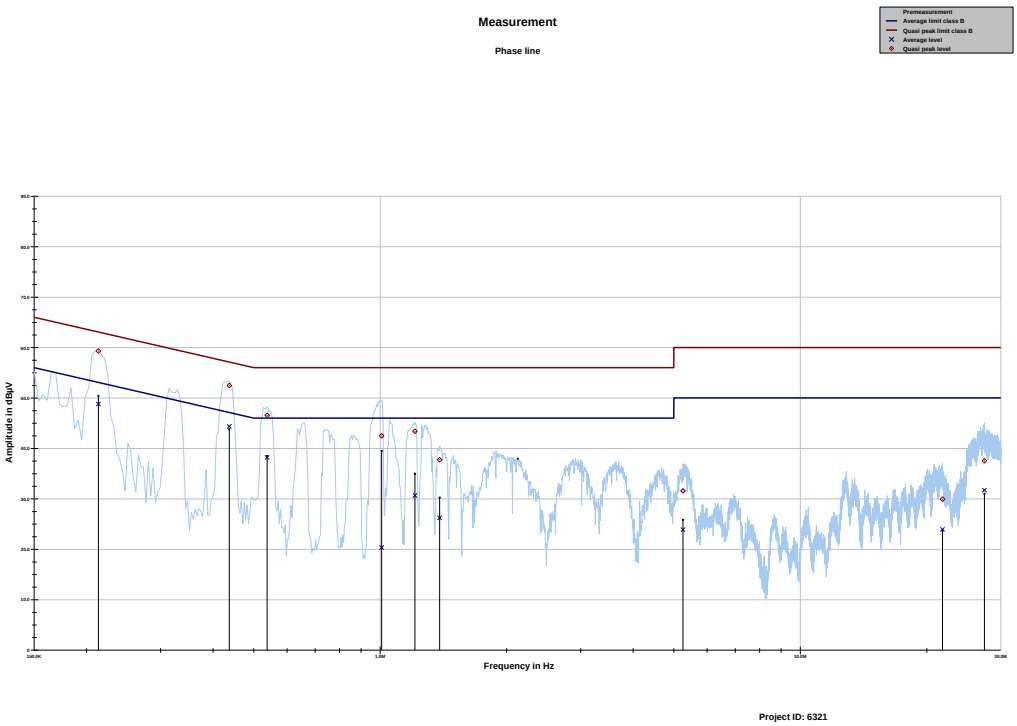
### 8.1.3 Conducted limits (power-line)

| | CISPR 32 / EN 55032 Class B | | CISPR 32 / EN 55032 Class A | |
|---|---|---|---|---|
| **Frequency- range** | **Quasi-Peak (dBµV)** | **Average (dBµV)** | **Quasi-Peak (dBµV)** | **Average (dBµV)** |
| 0,15 MHz – 0,5 MHz | 66-56 | 56-46 | 79 | 66 |
| 0,5 MHz -5 MHz | 56 | 46 | 73 | 60 |
| 5 MHz -30 MHz | 60 | 50 | 73 | 60 |

### 8.1.4 Conducted limits (communication-line)

| | CISPR 32 / EN 55032 Class B | | | | CISPR 32 / EN 55032 Class A | | | |
|---|---|---|---|---|---|---|---|---|
| **Frequency- range** | **Voltage limits (dBµV)** | | **Current limits (dBµA)** | | **Voltage limits (dBµV)** | | **Current limits (dBµA)** | |
| | **Quasi-Peak** | **Average** | **Quasi-Peak** | **Average** | **Quasi-Peak** | **Average** | **Quasi-Peak** | **Average** |
| 0,15 MHz – 0,5 MHz | 84 – 74 | 74 – 64 | 40 – 30 | 30 – 20 | 97 – 87 | 84 – 74 | 53 – 43 | 40 – 30 |
| 0,5 MHz – 30 MHz | 74 | 64 | 30 | 20 | 87 | 74 | 43 | 30 |

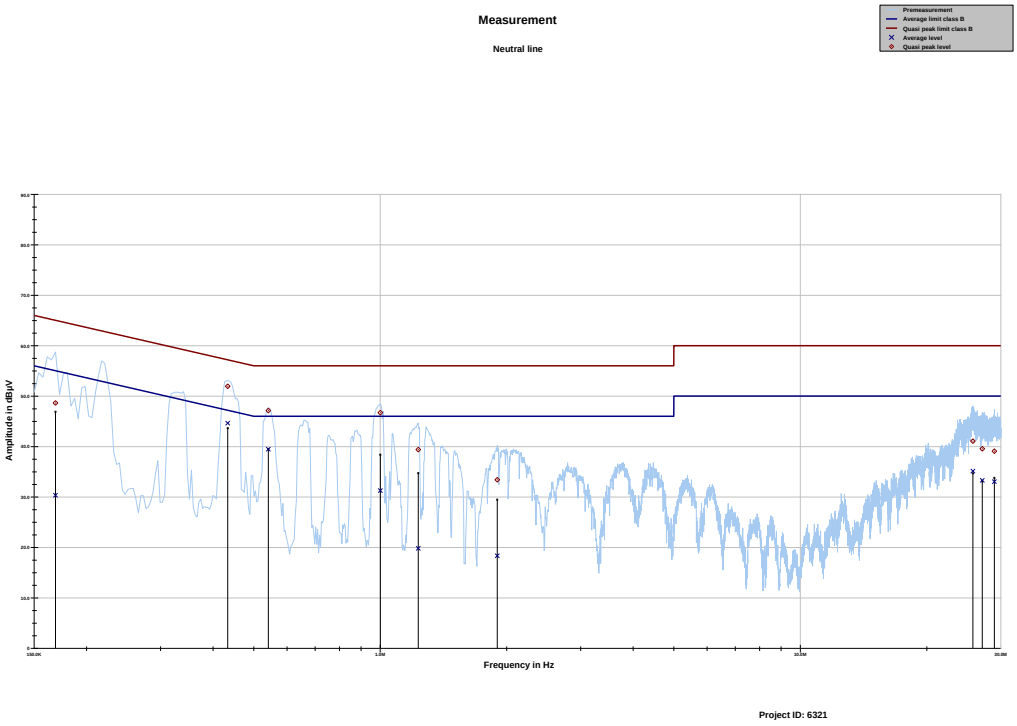
## 8.1.5 Test results of main (Set 1)




Phase line tbl
Project ID: 1-6321/23-01-04

| Frequency | Quasi peak level | Margin quasi peak | Limit QP | Average level | Margin average | Limit AV |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| | | | | | | |
| 0.213431 | 59.30 | 3.77 | 63.071 | 48.79 | 5.40 | 54.188 |
| 0.437306 | 52.47 | 4.64 | 57.113 | 44.36 | 3.43 | 47.791 |
| 0.538050 | 46.55 | 9.45 | 56.000 | 38.21 | 7.79 | 46.000 |
| 1.008188 | 42.49 | 13.51 | 56.000 | 20.34 | 25.66 | 46.000 |
| 1.209675 | 43.39 | 12.61 | 56.000 | 30.66 | 15.34 | 46.000 |
| 1.385044 | 37.75 | 18.25 | 56.000 | 26.23 | 19.77 | 46.000 |
| 5.258081 | 31.57 | 28.43 | 60.000 | 23.89 | 26.11 | 50.000 |
| 21.798713 | 29.94 | 30.06 | 60.000 | 23.92 | 26.08 | 50.000 |
| 27.436631 | 37.53 | 22.47 | 60.000 | 31.71 | 18.29 | 50.000 |

Project ID - 1-6321/23-1-4
EUT - Varistar CP LHX + 10kW Cabinet with PDU 32A 1ph
Serial Number - Sample 01
Operating mode - all doors open, Lamp switched off

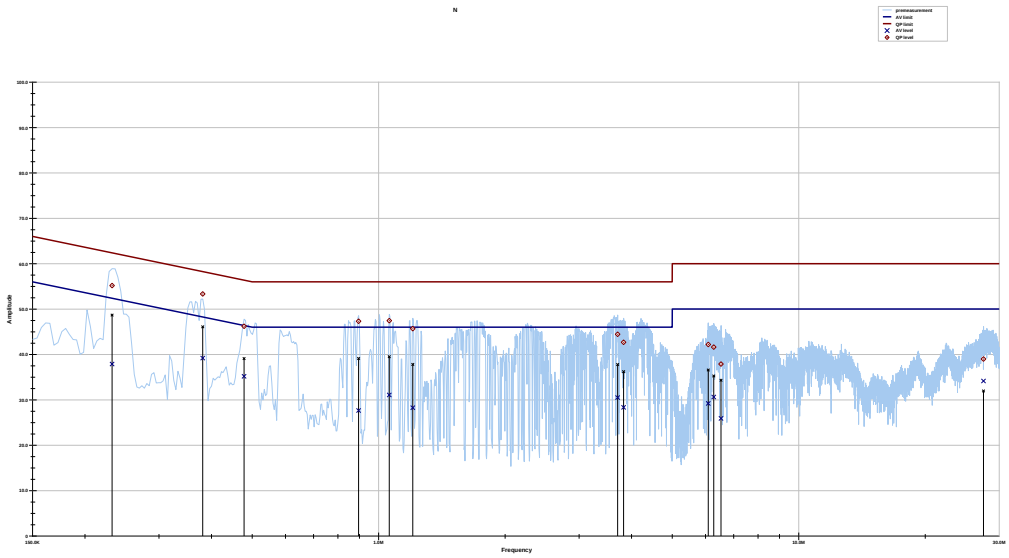



Neutral line tbl
Project ID: 1-6321/23-01-04

| Frequency | Quasi peak level | Margin quasi peak | Limit QP | Average level | Margin Average | Limit AV |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| | | | | | | |
| 0.168656 | 48.64 | 16.39 | 65.026 | 30.35 | 25.12 | 55.467 |
| 0.433575 | 51.93 | 5.25 | 57.184 | 44.63 | 3.27 | 47.898 |
| 0.541781 | 47.13 | 8.87 | 56.000 | 39.47 | 6.53 | 46.000 |
| 1.000725 | 46.71 | 9.29 | 56.000 | 31.26 | 14.74 | 46.000 |
| 1.232063 | 39.40 | 16.60 | 56.000 | 19.82 | 26.18 | 46.000 |
| 1.899956 | 33.40 | 22.60 | 56.000 | 18.35 | 27.65 | 46.000 |
| 25.753837 | 41.06 | 18.94 | 60.000 | 35.12 | 14.88 | 50.000 |
| 27.119475 | 39.56 | 20.44 | 60.000 | 33.30 | 16.70 | 50.000 |
| 28.970175 | 39.08 | 20.92 | 60.000 | 33.03 | 16.97 | 50.000 |

Project ID - 1-6321/23-1-4
EUT - Varistar CP LHX + 10kW Cabinet with PDU 32A 1ph
Serial Number - Sample 01
Operating mode - all doors open, Lamp switched off

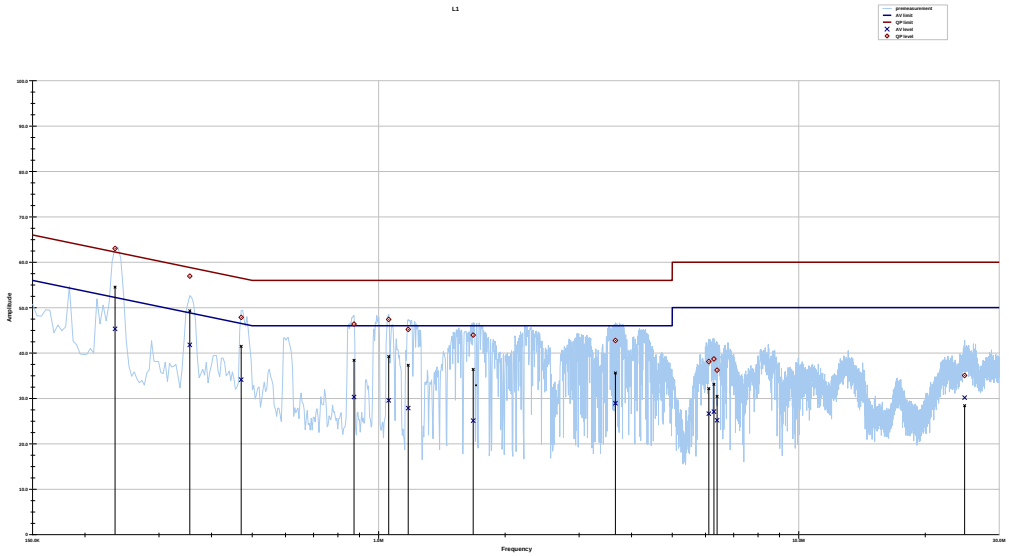
### 8.1.6 Test results of main Set 2



N tbl
Project ID: 1-6321/23-01-04

| Frequency | QP level | Margin QP | Limit QP | AV level | Margin AV | Limit AV |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| | | | | | | |
| 0.232 | 55.166 | 8.488 | 63.655 | 37.883 | 15.772 | 53.655 |
| 0.381 | 53.328 | 6.062 | 59.390 | 39.189 | 10.201 | 49.390 |
| 0.478 | 46.201 | 10.417 | 56.619 | 35.167 | 11.451 | 46.619 |
| 0.896 | 47.312 | 8.688 | 56.000 | 27.647 | 18.353 | 46.000 |
| 1.060 | 47.431 | 8.569 | 56.000 | 31.059 | 14.941 | 46.000 |
| 1.206 | 45.674 | 10.326 | 56.000 | 28.263 | 17.737 | 46.000 |
| 3.706 | 44.443 | 11.557 | 56.000 | 30.495 | 15.505 | 46.000 |
| 3.829 | 42.685 | 13.315 | 56.000 | 28.347 | 17.653 | 46.000 |
| 6.090 | 42.186 | 17.814 | 60.000 | 29.193 | 20.807 | 50.000 |
| 6.277 | 41.615 | 18.385 | 60.000 | 30.619 | 19.381 | 50.000 |
| 6.530 | 37.871 | 22.129 | 60.000 | 25.894 | 24.106 | 50.000 |
| 27.534 | 38.984 | 21.016 | 60.000 | 34.134 | 15.866 | 50.000 |

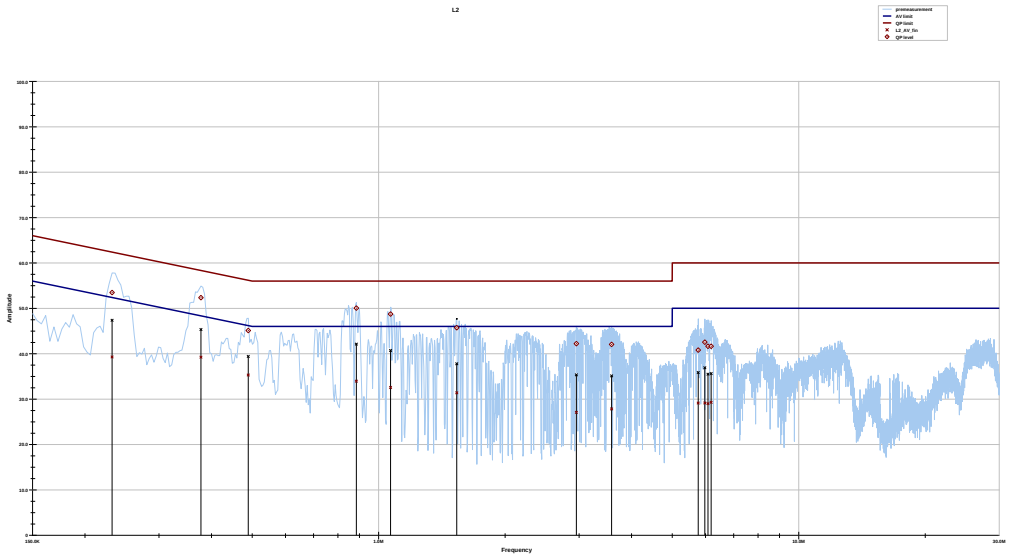
Project ID - 1-6321/23-1-4
EUT - Varistar CP LHX + 10kW Cabinet with PDU 32A 3ph
Serial Number - Sample 01
Operating mode - all doors open, Lamp switched off



L1 tbl
Project ID: 1-6321/23-01-04

| Frequency | QP level | Margin QP | Limit QP | AV level | Margin AV | Limit AV |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| | | | | | | |
| 0.236 | 63.025 | 0.523 | 63.548 | 45.327 | 8.221 | 53.548 |
| 0.355 | 56.933 | 3.204 | 60.137 | 41.793 | 8.343 | 50.137 |
| 0.471 | 47.836 | 8.996 | 56.832 | 34.126 | 12.706 | 46.832 |
| 0.874 | 46.363 | 9.637 | 56.000 | 30.298 | 15.702 | 46.000 |
| 1.057 | 47.404 | 8.596 | 56.000 | 29.579 | 16.421 | 46.000 |
| 1.176 | 45.196 | 10.804 | 56.000 | 27.873 | 18.127 | 46.000 |
| 1.680 | 43.944 | 12.056 | 56.000 | 25.097 | 20.903 | 46.000 |
| 3.661 | 42.761 | 13.239 | 56.000 | 28.929 | 17.071 | 46.000 |
| 6.109 | 38.118 | 21.882 | 60.000 | 26.643 | 23.357 | 50.000 |
| 6.284 | 38.698 | 21.302 | 60.000 | 27.097 | 22.903 | 50.000 |
| 6.392 | 36.221 | 23.779 | 60.000 | 25.177 | 24.823 | 50.000 |
| 24.832 | 35.045 | 24.955 | 60.000 | 30.155 | 19.845 | 50.000 |

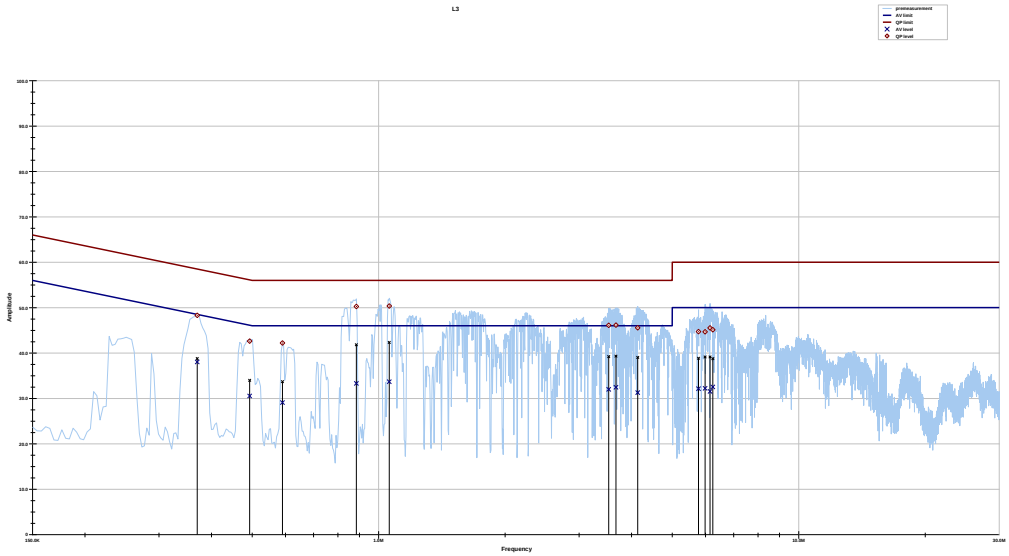
Project ID - 1-6321/23-1-4
EUT - Varistar CP LHX + 10kW Cabinet with PDU 32A 3ph
Serial Number - Sample 01
Operating mode - all doors open, Lamp switched off




L2 tbl
Project ID: 1-6321/23-01-04

| Frequency | QP level | Margin QP | Limit QP | AV level | Margin AV | Limit AV |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| | | | | | | |
| 0.232 | 53.466 | 10.189 | 63.655 | 39.271 | 14.384 | 53.655 |
| 0.378 | 52.347 | 7.150 | 59.497 | 39.227 | 10.270 | 49.497 |
| 0.490 | 45.098 | 11.201 | 56.299 | 35.285 | 11.014 | 46.299 |
| 0.885 | 50.034 | 5.966 | 56.000 | 33.937 | 12.063 | 46.000 |
| 1.068 | 48.731 | 7.269 | 56.000 | 32.547 | 13.453 | 46.000 |
| 1.534 | 45.709 | 10.291 | 56.000 | 31.383 | 14.617 | 46.000 |
| 2.956 | 42.208 | 13.792 | 56.000 | 27.077 | 18.923 | 46.000 |
| 3.586 | 42.032 | 13.968 | 56.000 | 27.828 | 18.172 | 46.000 |
| 5.766 | 40.792 | 19.208 | 60.000 | 29.108 | 20.892 | 50.000 |
| 5.978 | 42.529 | 17.471 | 60.000 | 29.129 | 20.871 | 50.000 |
| 6.083 | 41.631 | 18.369 | 60.000 | 28.989 | 21.011 | 50.000 |
| 6.187 | 41.629 | 18.371 | 60.000 | 29.285 | 20.715 | 50.000 |

Project ID - 1-6321/23-1-4
EUT - Varistar CP LHX + 10kW Cabinet with PDU 32A 3ph
Serial Number - Sample 01
Operating mode - all doors open, Lamp switched off



L3 tbl
Project ID: 1-6321/23-01-04

| Frequency | QP level | Margin QP | Limit QP | AV level | Margin AV | Limit AV |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| | | | | | | |
| 0.370 | 48.300 | 11.410 | 59.710 | 38.017 | 11.693 | 49.710 |
| 0.493 | 42.621 | 13.571 | 56.192 | 30.525 | 15.667 | 46.192 |
| 0.590 | 42.201 | 13.799 | 56.000 | 29.068 | 16.932 | 46.000 |
| 0.885 | 50.243 | 5.757 | 56.000 | 33.305 | 12.695 | 46.000 |
| 1.060 | 50.355 | 5.645 | 56.000 | 33.673 | 12.327 | 46.000 |
| 3.531 | 46.093 | 9.907 | 56.000 | 31.993 | 14.007 | 46.000 |
| 3.672 | 46.148 | 9.852 | 56.000 | 32.446 | 13.554 | 46.000 |
| 4.139 | 45.556 | 10.444 | 56.000 | 31.281 | 14.719 | 46.000 |
| 5.773 | 44.704 | 15.296 | 60.000 | 32.126 | 17.874 | 50.000 |
| 5.986 | 44.670 | 15.330 | 60.000 | 32.217 | 17.783 | 50.000 |
| 6.150 | 45.526 | 14.474 | 60.000 | 31.536 | 18.464 | 50.000 |
| 6.247 | 45.109 | 14.891 | 60.000 | 32.517 | 17.483 | 50.000 |

Project ID - 1-6321/23-1-4
EUT - Varistar CP LHX + 10kW Cabinet with PDU 32A 3ph
Serial Number - Sample 01
Operating mode - all doors open, Lamp switched off

## 8.1.7 Test results (communication line) Set 1

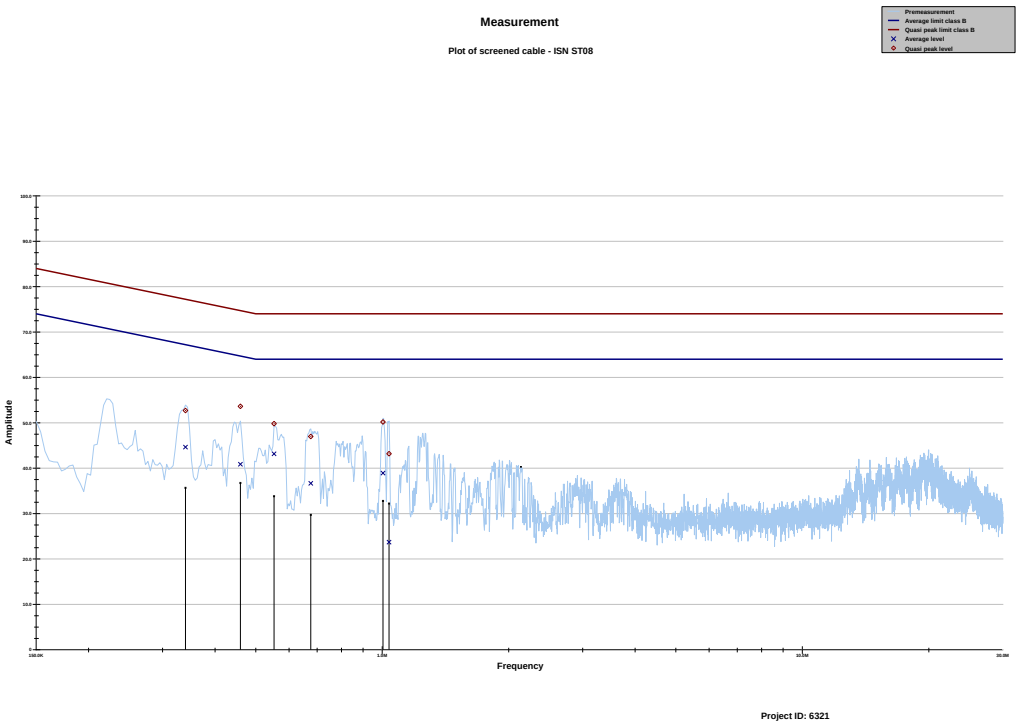



Table of screened cable - ISN ST08
Project ID: 1-6321/23-01-04

| Frequency | Quasi peak level | Margin quasi peak | Limit QP | Average level | Margin average | Limit AV |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| | | | | | | |
| 0.340294 | 52.69 | 24.51 | 77.196 | 44.62 | 23.94 | 68.563 |
| 0.459694 | 53.61 | 21.08 | 74.698 | 40.84 | 24.31 | 65.152 |
| 0.552975 | 49.80 | 24.20 | 74.000 | 43.14 | 20.86 | 64.000 |
| 0.676106 | 46.97 | 27.03 | 74.000 | 36.64 | 27.36 | 64.000 |
| 1.004456 | 50.17 | 23.83 | 74.000 | 38.90 | 25.10 | 64.000 |
| 1.038037 | 43.17 | 30.83 | 74.000 | 23.68 | 40.32 | 64.000 |

Project ID - 1-6321/23-1-4
EUT - Varistar CP LHX + 10kW Cabinet with PDU 32A 1ph
Serial Number - Sample 01
Operating mode - all doors open, Lamp switched off

## 8.1.8 Test results (communication line) Set 2

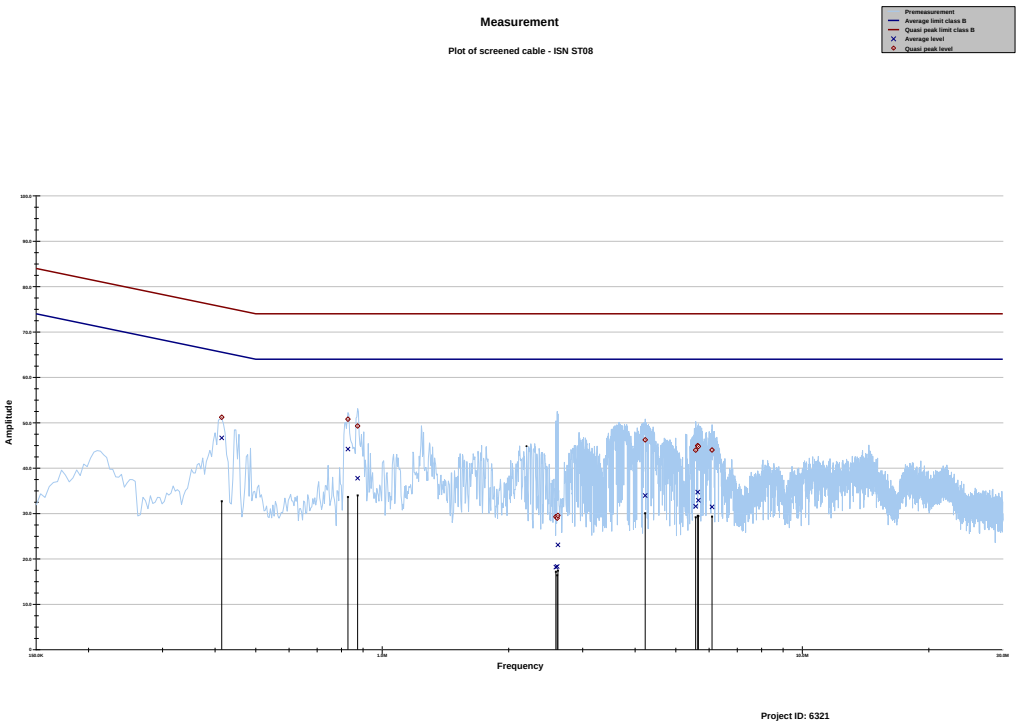



Table of screened cable - ISN ST08
Project ID: 1-6321/23-01-04

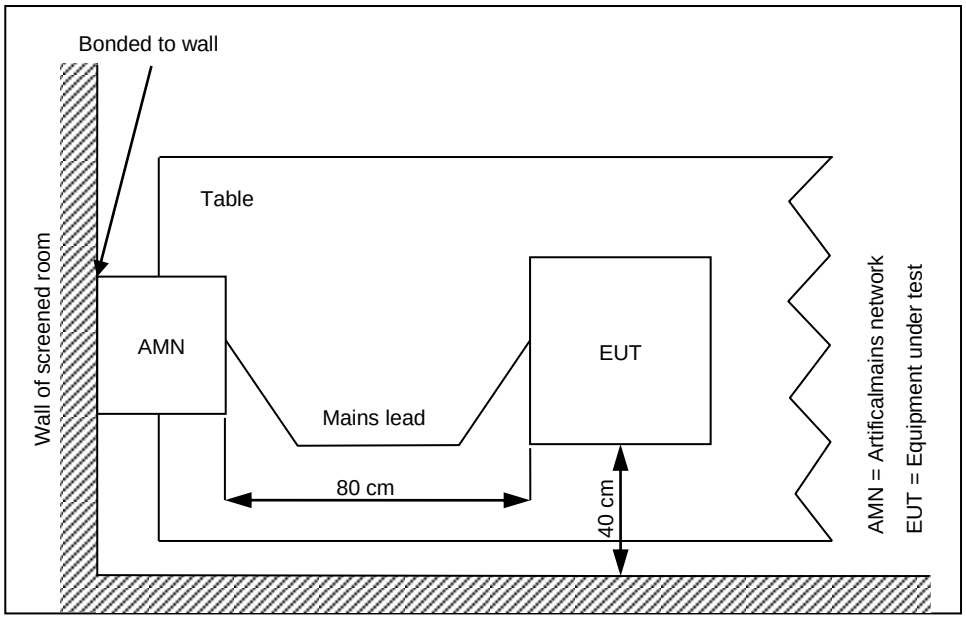
| Frequency | Quasi peak level | Margin quasi peak | Limit QP | Average level | Margin average | Limit AV |
|---|---|---|---|---|---|---|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| | | | | | | |
| 0.414919 | 51.21 | 24.34 | 75.549 | 46.65 | 19.78 | 66.431 |
| 0.829087 | 50.78 | 23.22 | 74.000 | 44.19 | 19.81 | 64.000 |
| 0.873862 | 49.28 | 24.72 | 74.000 | 37.77 | 26.23 | 64.000 |
| 2.590238 | 29.29 | 44.71 | 74.000 | 18.18 | 45.82 | 64.000 |
| 2.608894 | 28.98 | 45.02 | 74.000 | 18.34 | 45.66 | 64.000 |
| 2.620087 | 29.57 | 44.43 | 74.000 | 23.08 | 40.92 | 64.000 |
| 4.228256 | 46.23 | 27.77 | 74.000 | 33.96 | 30.04 | 64.000 |
| 5.575238 | 43.96 | 30.04 | 74.000 | 31.58 | 32.42 | 64.000 |
| 5.638669 | 44.96 | 29.04 | 74.000 | 34.73 | 29.27 | 64.000 |
| 5.657325 | 44.77 | 29.23 | 74.000 | 32.91 | 31.09 | 64.000 |
| 6.097613 | 43.99 | 30.01 | 74.000 | 31.45 | 32.55 | 64.000 |

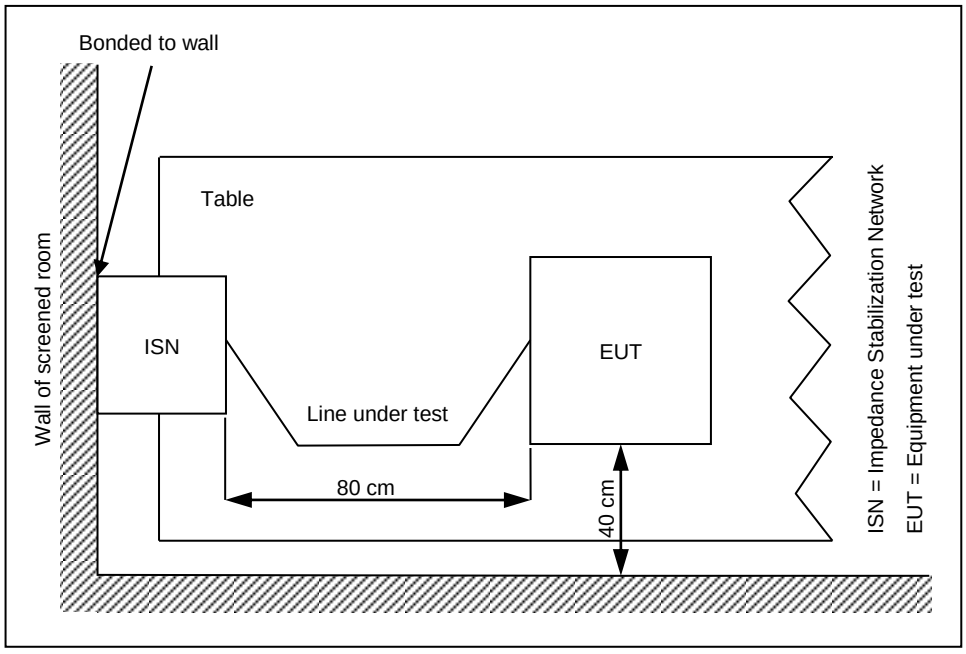
Project ID - 1-6321/23-1-4
EUT - Varistar CP LHX + 10kW Cabinet with PDU 32A 3ph
Serial Number - Sample 01
Operating mode - all doors open, Lamp switched off

## 8.1.9 Test set-up

According to EMC basic standard **EN 55032**

A measurement with spectrum analyzer and peak-detector is performed. If no limit exceeding of specified limits occur, the measurement is concluded at this stage. If the limit exceeding occur, measurement are carried out with the quasi-peak detector at the frequencies at which the exceeding occur.



## 8.2 Electromagnetic radiated emissions (distance 10 m)

### 8.2.1 Instrumentation for test (see equipment list)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F 1 | F 2 | F 4b | F 5 | F 6 | F 7 | F 8 | | | | | |

### 8.2.2 Test Plan

| **EUT set-up** | set 1 and set 2 | | |
|---|---|---|---|
| **Operating mode** | **Application** | **Limit** | **Result** |
| op 1 | Enclosure | EN 55032 Class A | passed |
| op 1 | Enclosure | EN 55032 Class A | passed |

| **Remarks:** | --- |
|---|---|

### 8.2.3 Radiated limits

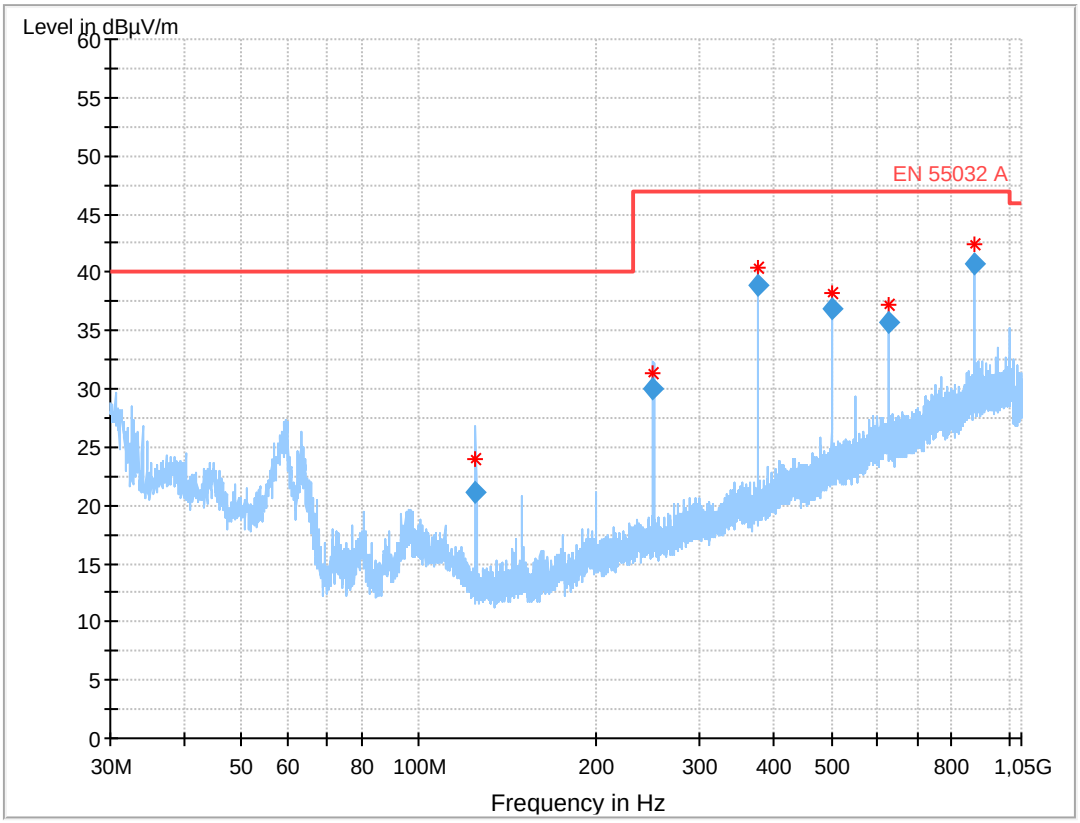
| **Frequency- range** | **CISPR 32 / EN 55032 Class B @ 10 m** | **CISPR 32 / EN 55032 Class A @ 10 m** |
|---|---|---|
| **30 MHz - 230 MHz** | 30 dB(µV/m) | 40 dB(µV/m) |
| **230 MHz - 1000 MHz** | 37 dB(µV/m) | 47 dB(µV/m) |

### 8.2.4 Test results

Set 1

## Common Information

| | |
|---|---|
| EUT: | Varistar CP LHX + 10kW Cabinet |
| Serial number: | Sample 1 |
| Test description: | EN 55032 Class A @ 10m |
| Operating condition: | active, AC EPDU, Lamp disconnected |
| Operator name: | MED |
| Comment: | AC: 230 V / 50 Hz; ETH shielded |



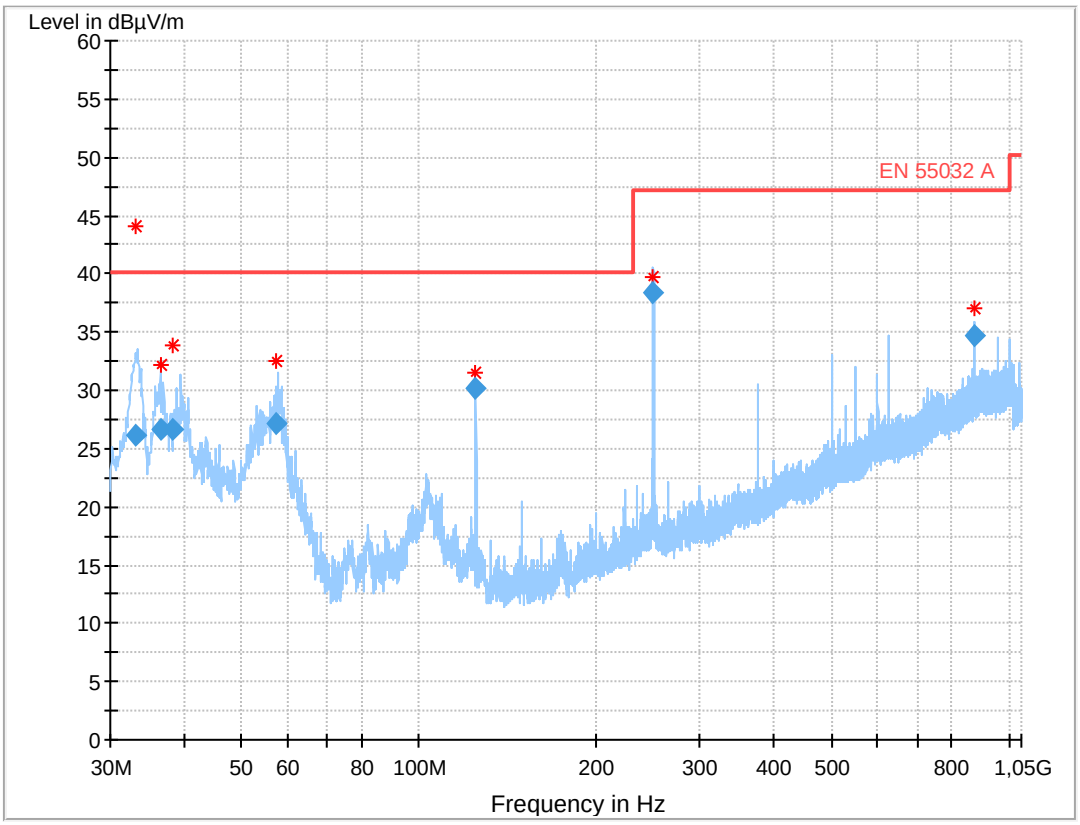

## Final_Result

| Frequency (MHz) | QuasiPeak (dBµV/m | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|
| 124.984 | 21.13 | 40.0 | 18.9 | 1000 | 120.0 | 349.0 | H | 19 | 10 |
| 249.984 | 30.07 | 47.0 | 16.9 | 1000 | 120.0 | 103.0 | V | 196 | 14 |
| 374.977 | 38.87 | 47.0 | 8.1 | 1000 | 120.0 | 103.0 | H | 142 | 17 |
| 499.966 | 36.81 | 47.0 | 10.2 | 1000 | 120.0 | 250.0 | H | 133 | 20 |
| 624.954 | 35.64 | 47.0 | 11.4 | 1000 | 120.0 | 161.0 | H | 182 | 22 |
| 874.947 | 40.70 | 47.0 | 6.3 | 1000 | 120.0 | 300.0 | H | 185 | 25 |

Set 2

## Common Information

| | |
|---|---|
| EUT: | Varistar CP LHX + 10kW Cabinet |
| Serial number: | Sample 1 |
| Test description: | EN 55032 Class A @ 10m |
| Operating condition: | active, AC EPDU, Lamp disconnected |
| Operator name: | MED |
| Comment: | AC: 400V/50 Hz, ETH shielded |




## Final_Result

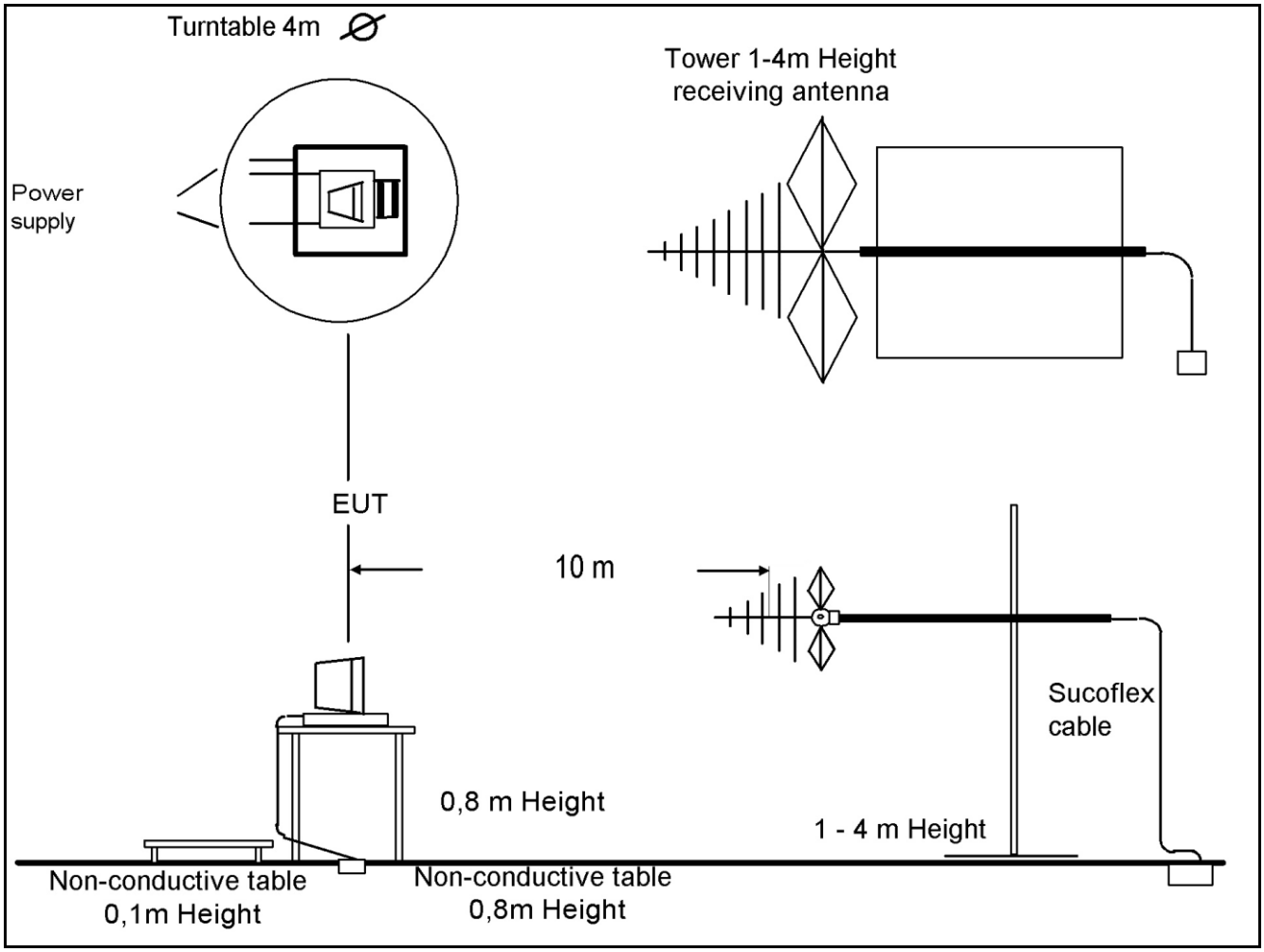
| Frequency (MHz) | QuasiPeak (dBµV/m | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|---|---|
| 33.144 | 26.20 | 40.0 | 13.8 | 1000 | 120.0 | 119.0 | V | 301 | 14 |
| 36.678 | 26.59 | 40.0 | 13.4 | 1000 | 120.0 | 149.0 | V | 345 | 15 |
| 38.338 | 26.70 | 40.0 | 13.3 | 1000 | 120.0 | 200.0 | V | 345 | 15 |
| 57.367 | 27.12 | 40.0 | 12.9 | 1000 | 120.0 | 100.0 | V | 113 | 15 |
| 124.994 | 30.24 | 40.0 | 9.8 | 1000 | 120.0 | 400.0 | H | 210 | 10 |
| 249.982 | 38.34 | 47.0 | 8.7 | 1000 | 120.0 | 400.0 | H | 244 | 14 |
| 874.938 | 34.69 | 47.0 | 12.3 | 1000 | 120.0 | 200.0 | H | 150 | 25 |

## 8.2.5 Hardware set-up

Subrange 1

| | |
|---|---|
| Frequency Range: | 30 MHz - 2 GHz |
| Receiver: | ESR 3 [ESR 3]<br>@ GPIB0 (ADR 20), SN 1316.3003K03/102587, FW 3.66 |
| Signal Path: | without Notch<br>FW 1.0 |
| Antenna: | VULB 9163<br>FW --- |
| Antenna Tower: | Tower [EMCO 2090 Antenna Tower]<br>@ GPIB0 (ADR 8), FW REV 3.12 |
| Turntable: | Turntable [EMCO Turntable]<br>@ GPIB0 (ADR 9), FW REV 3.12 |
| | Software version: EMC32 V10.59.0 |

## 8.2.6 Test set-up



## 8.3 Electromagnetic radiated emissions (distance 5 m)

### 8.3.1 Instrumentation for test (see equipment list)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F 1 | F 4 | F 6 | F 29 | F 30 | F 33 | | | | | | |

### 8.3.2 Test plan

| **EUT set-up** | Set 1 and set 2 | | |
|---|---|---|---|
| **Operating mode** | **Application** | **Limit** | **Result** |
| Op 1 | Enclosure | EN 55032 class B | passed |
| Op 1 | Enclosure | EN 55032 class B | passed |

| **Remarks:** | The measured values are recalculated from 5m to 3m distance |
|---|---|

### 8.3.3 Radiated limits

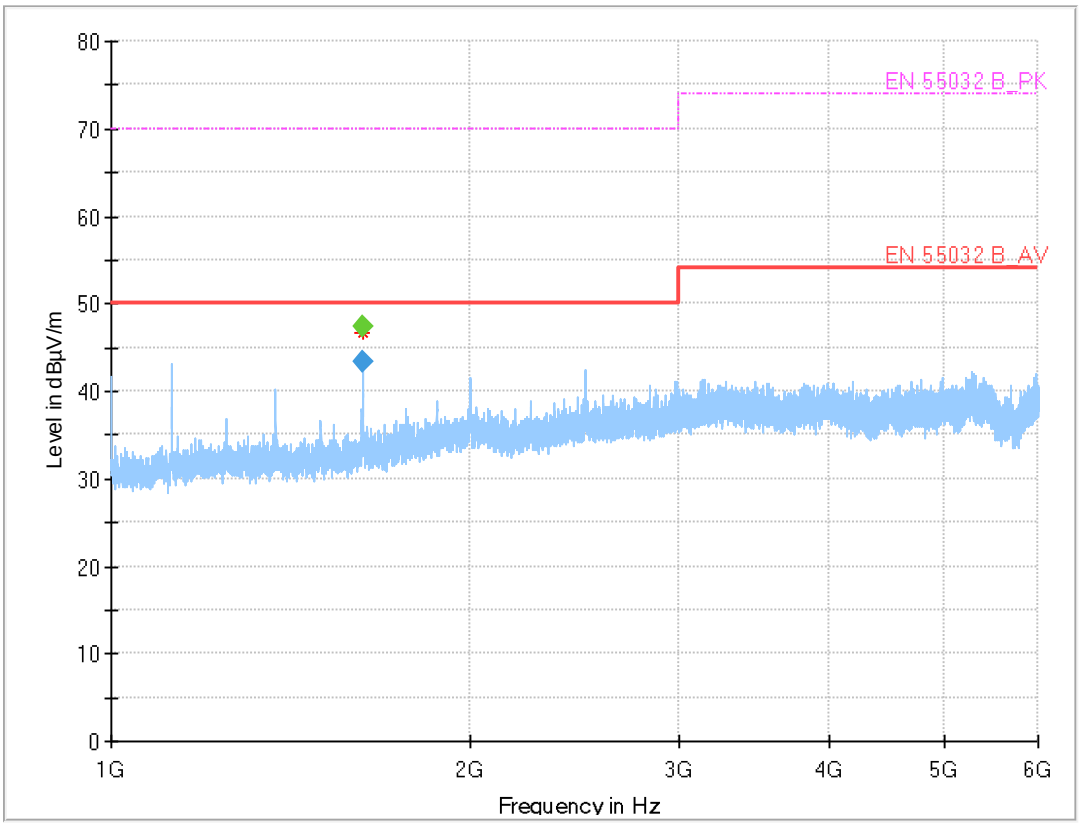
| **Frequency- range** | **CISPR 32 / EN 55032 Class B @ 3 m** | | **CISPR 32 / EN 55032 Class A @ 3 m** | |
|---|---|---|---|---|
| | **peak** | **average** | **peak** | **average** |
| **1 GHz – 3 GHz** | 70dBµV/m | 50 dBµV/m | 76 dBµV/m | 56 dBµV/m |
| **3 GHz – 6 GHz** | 74 dBµV/m | 54 dBµV/m | 80 dBµV/m | 60 dBµV/m |

### 8.3.4 Test results

Set 1:

## Common Information

| | |
|---|---|
| EUT: | Varistar CP LHX + 10kW Cabinet |
| Serial number: | Sample 1 |
| Test description: | EN 55032 Class B |
| Operating condition: | active, AC EPDU 1ph, Lamp disconnected |
| Operator name: | MED |
| Comment: | AC: 230 V / 50 Hz; ETH shielded |



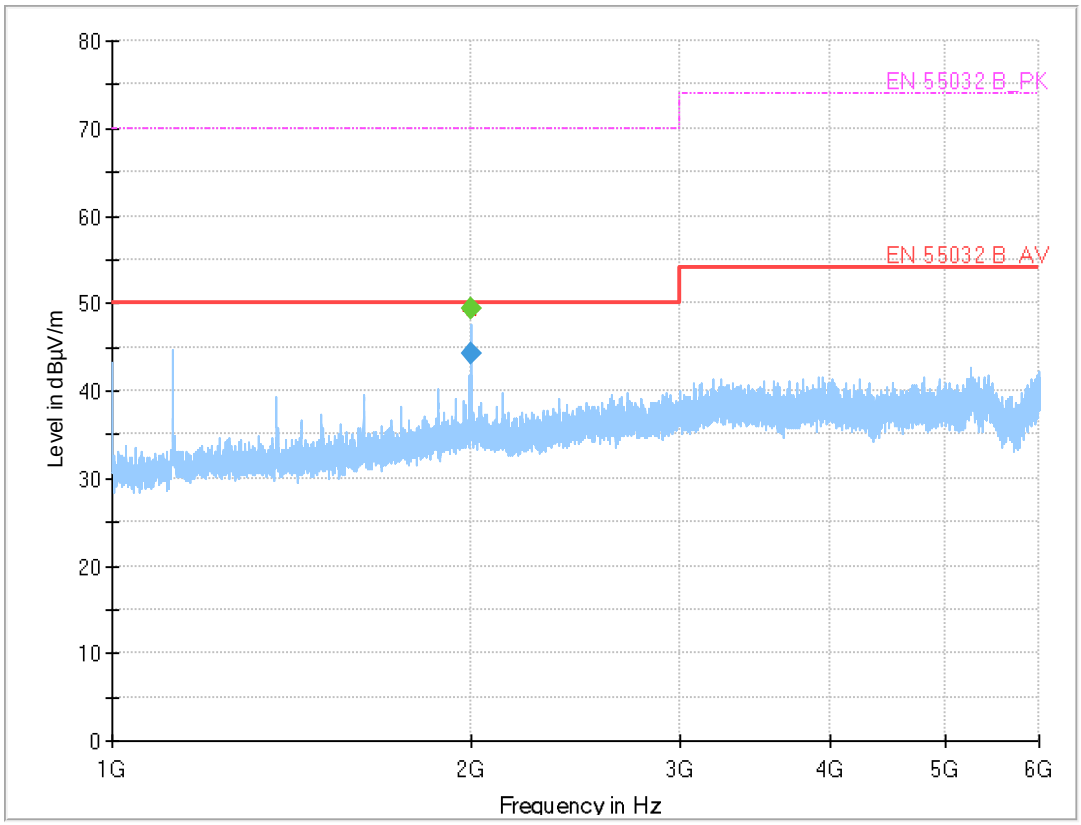

## Final_Result

| Frequency (MHz) | Average (dBµV/m) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1624.824 | --- | 47.28 | 70.0 | 22.7 | 1000 | 1000.0 | H | -1 | -7 | |
| 1624.824 | 43.34 | --- | 50.0 | 6.7 | 1000 | 1000.0 | H | -1 | -7 | |

Set 2:

## Common Information

| | |
|---|---|
| EUT: | Varistar CP LHX + 10kW Cabinet |
| Serial number: | Sample 1 |
| Test description: | EN 55032 Class B |
| Operating condition: | active, AC EPDU 3ph, Lamp disconnected |
| Operator name: | MED |
| Comment: | AC: 400 V / 50 Hz; ETH shielded |




## Final_Result

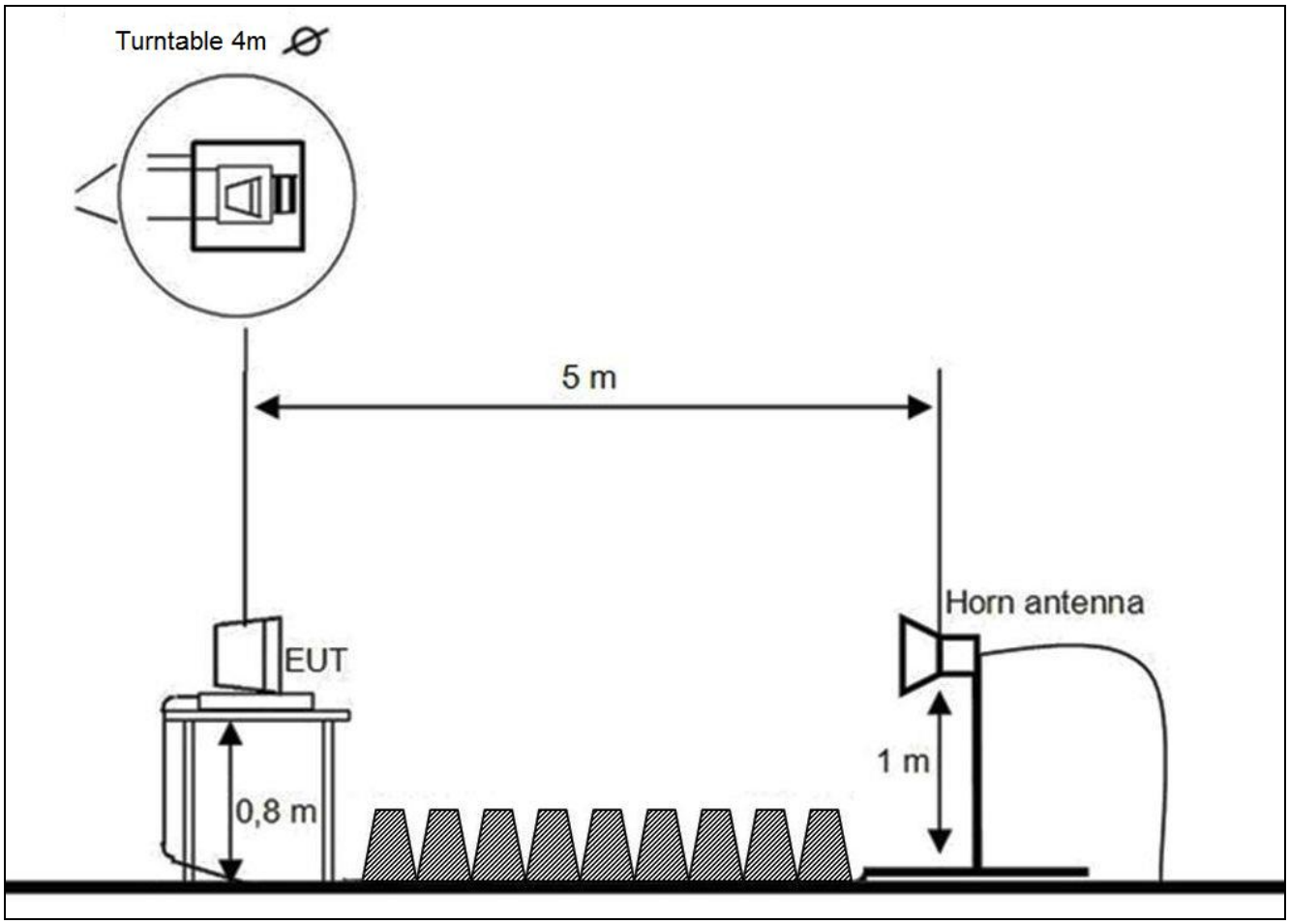
| Frequency (MHz) | Average (dBµV/m) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Pol | Azimuth (deg) | Corr. (dB/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 1999.741 | --- | 49.30 | 70.0 | 20.7 | 1000 | 1000.0 | V | 14 | -5 | |
| 1999.741 | 44.35 | --- | 50.0 | 5.7 | 1000 | 1000.0 | V | 14 | -5 | |

### 8.3.5 Hardware set-up

Subrange 1

| | |
|---|---|
| Frequency Range: | 1 GHz - 18 GHz |
| Receiver: | FSU 26 [FSU 26]<br>@ GPIB0 (ADR 17), SN 200809/026, FW 4.71 |
| Signal Path: | 1_6_EN<br>FW 1.0 |
| Antenna: | Horn Antenna EMCO 3115 |
| Turntable: | Turntable [EMCO Turntable]<br>@ GPIB0 (ADR 9), FW REV 3.12 |
| | Software version: EMC32 V10.59.0 |

### 8.3.6 Test set-up



## 9 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

| No. | Instrument/Ancillary | Manufacturer | Type | Serial-No. | Internal identification |
|---|---|---|---|---|---|
| | **Radiated emission in chamber F** | | | | |
| **F-1** | Control Computer | F+W | | 2934939v001 | 300005258 |
| **F-2** | Trilog-Antenna | Schwarzbeck | VULB 9163 | 9163-1029 | 300005379 |
| **F-4b** | Switch | Netgear | GS108P | 26V12A3H50336 | 300000368 |
| **F-5** | EMI Test receiver | R&S | ESR | 1316.3003K03-102587-ct | 300005771 |
| **F-6** | Turntable Interface-Box | EMCO / ETS-LINDGREN | Model 105637 | 44583 | 300003747 |
| **F-7** | Tower/Turntable Controller | EMCO / ETS-LINDGREN | Model 2090 | 64672 | 300003746 |
| **F-8** | Tower | EMCO / ETS-LINDGREN | Model 2175 | 64762 | 300003745 |
| **F-9** | Ultra Notch-Filter Rejected band Ch. 62 | WRCD | | 9 | |
| | **Radiated immunity in chamber F** | | | | |
| **F-10** | Control Computer | F+W | | 2934939v001 | 300005258 |
| **F-11** | Signal Generator | R&S | SMB 100A | 1406.6000k02-113856 | 300005266 |
| **F-13** | RF-Amplifier | Bonn | BLWA 0860-250/100D | 035491 | 300003210 |
| **F-14** | Stacked Logper Antenna | Schwarzbeck | STLP 9129 | 200 | 300006249 |
| **F-14a** | Bicon-Antenna | EMCO | 3109 | 8906-2309 | 300000575 |
| **F-14b** | Bicon-Antenna | Schwarzbeck | Balun VHBD 9134<br>elements BBFA 9146 | 3011<br>0057 | 300005385 |
| **F-15** | RF-Amplifier | ar | 1000LM20 | 20562 | -/- |
| **F-16** | Directional Coupler | ar | DC7144A | 312786 | 300003411 |
| **F-16a** | Directional coupler | emv | DC 2000 | 9401-1677 | 300000592 |
| **F-18** | Power Meter | R&S | NRP2 | 104973 | 300005114 |
| **F-19** | Power sensor | R&S | NRP-Z91 | 103332 | 300005114-1 |
| **F-20** | Power sensor | R&S | NRP-Z91 | 103333 | 300005114-2 |
| **F-35** | RF- Amplifier | Bonn | BLMA 2060-5 | 097392A | 300003908 |
| **F-36** | Stacked Microwave Log.-Per. Antenna | Schwarzbeck | STLP9149 | 9149-044 | 300003919 |
| | **Harmonics and flicker in front of chamber F** | | | | |
| **F-21** | Flicker and Harmonics Test System | Spitzenberger & Spies | PHE4500/B I<br>PHE4500/B II | B5983<br>B5984 | 300003314 |
| **F-21a** | Power Supply | HBS Electronic | ACS-1600-PS | 2002-001247-0 | 300006074 |
| **F-28** | Power Supply | Hewlett Packard | 6032 A | 2920 A 04466 | 300000580 |
| | **Radiated emission in chamber F > 1GHz** | | | | |
| **F-29** | Horn antenna | Schwarzbeck | BBHA 9120 B | 188 | 300003896 |
| **F-30** | Amplifier | ProNova | 0518C-138 | 005 | F 024 |
| **F-31** | Amplifier | Miteq | 42-00502650-28-5A | 1103782 | 300003379 |
| **F-32** | Horn antenna | EMCO | 3115 | 9709-5289 | 300000213 |
| **F-33** | Spectrum Analyzer | R&S | FSU26 | 200809 | 300003874 |
| **F-34** | Loop antenna | EMCO | 6502 | 8905-2342 | 300000256 |

| No. | Instrument/Ancillary | Manufacturer | Type | Serial-No. | Internal identification |
|---|---|---|---|---|---|
| | **Conducted emission in chamber G** | | | | |
| **G-1** | EMI Receiver | R&S | ESR3 | 102981 | 300006318 |
| **G-2** | V-ISN | Rohde & Schwarz | ESH 3-Z5 | 892475/017 | 300002209 |
| **G-2a** | V-ISN | Rohde & Schwarz | ESH 2-Z5 | 892602/024 | 300000587 |
| **G-3** | 2-Wire ISN | Schaffner | ISN T200 | 19075 | 300003422 |
| **G-4** | 4-Wire ISN | Schaffner | ISN T400 | 22325 | 300003423 |
| **G-5** | Shielded wire ISN | Schaffner | ISN ST08 | 22583 | 300003433 |
| **G-6** | Unshielded 8 wire ISN | Teseq | ISN T800 | 26113 | 300003833 |
| **G-7** | Unshielded 8 wire ISN | Teseq | ISN T8-Cat. 6 | 26374 | 300003851 |
| **G-8** | RF Current probe | Solar | 9134-1 | 100254 | 300004163 |
| **G-9** | V-ISN | Schaffner | ISN PLC-150 | 21579 | 300003318 |
| **G-10** | V-ISN | Schaffner | ISN PLC-25-30 | 21584 | 300003319 |
| **G 10a** | PLC Filter | TESEQ | Filter PLC | 23436 | 300003598 |
| **G 10b** | Coupling unit 75 Ohm | Fiedler | AC | ---- | 300003272.04 |
| | **Conducted immunity in chamber G** | | | | |
| **G-11** | Signal generator | R&S | SMG | 8610647025 | 300000204.01 |
| **G-12** | RF-Amplifier | BONN | BSA 0125-75 | 066502-01 | 300003545 |
| **G-13** | Power Meter | R&S | URV 5 | 837723/025 | 300002844.01 |
| **G-14** | Power Sensor | R&S | URV 5-Z2 | 832874/021 | 300002239 |
| **G-15** | Directional coupler | emv | DC 2000 | 9401-1677 | 300000592 |
| **G-16** | Attenuator 6dB | Alan | 50HP6-100 N | 121048 0348 | 300003148 |
| **G-17** | EM-Injection Clamp | FCC | 203i | 232 | 300000626 |
| **G-18** | CDN | FCC | FCC-801-M3-16 | 237 | 300000627 |
| **G-19** | CDN | FCC | FCC-801-T2 | 78 | 300000629 |
| **G-20** | CDN | FCC | FCC-801-AF 2 | 62 | 300000630 |
| **G-21** | CDN | FCC | FCC-801-AF 4 | 61 | 300000631 |
| **G-22** | CDN | FCC | FCC-801-M1 | 2027 | 300002761 |
| **G-23** | CDN | TESEQ | CDN M016S | 38741 | 300004847 |
| **G-23a** | Clamp | FCC | F-130A-1 | 14 | 300003220 |
| **G-24** | transformer for 50Hz Loop Antenna | EM-Test | MC2630 | 0200-10 | 300002659.01 |
| **G-25** | 50Hz Loop Antenna | EM-Test | MS 100 | none | 300002659 |
| | **Surge, Burst, Dips and Interruptions in chamber G** | | | | |
| **G-26** | Hybrid-Generator | EM-Test | UCS 500N7 | P1506148835 | 300005070 |
| **G-27** | Motor Variac | EM-Test | MV 2616 | 0600-01 | 300002658 |
| **G-28** | Capacitive Coupling Clamp | MWB | KKS 100 | --- | 300000589 |
| **G-29a** | Coupling Decoupling Network | EMC-Partner | CDN-2000-06-32 | 158 | 300004108 |
| **G-29** | Coupling Decoupling Network | EMC-Partner | CDN-UTP8 ED3 | 1503 | 300004752 |
| | **ESD in chamber G** | | | | |
| **G-30** | ESD generator | Schlöder | SESD 30000 | 511333 | 300005097 |
| | **Emission on bench in chamber G** | | | | |
| **G-31** | Absorbing Clamp | R&S | MDS-21 | 832 231/006 | 300000527 |
| | **generic in chamber G** | | | | |
| **G-32** | power supply | Hewlett Packard | 6038A | 2848A06673 | 300001512 |
| **G 45** | Waveform Generator | Keysight | 33500B | MY52500745 | 300005409 |
| | **Conducted interference in chamber G** | | | | |
| **G 33** | Arbitrary Function Generator | 33521B | Keysight | MY52702534 | 300005023 |

## 10 Observations

No observations, exceeding those reported with the single test cases, have been made.

# Annex A Photographs of the test set-up

Photo 1: radiated emission

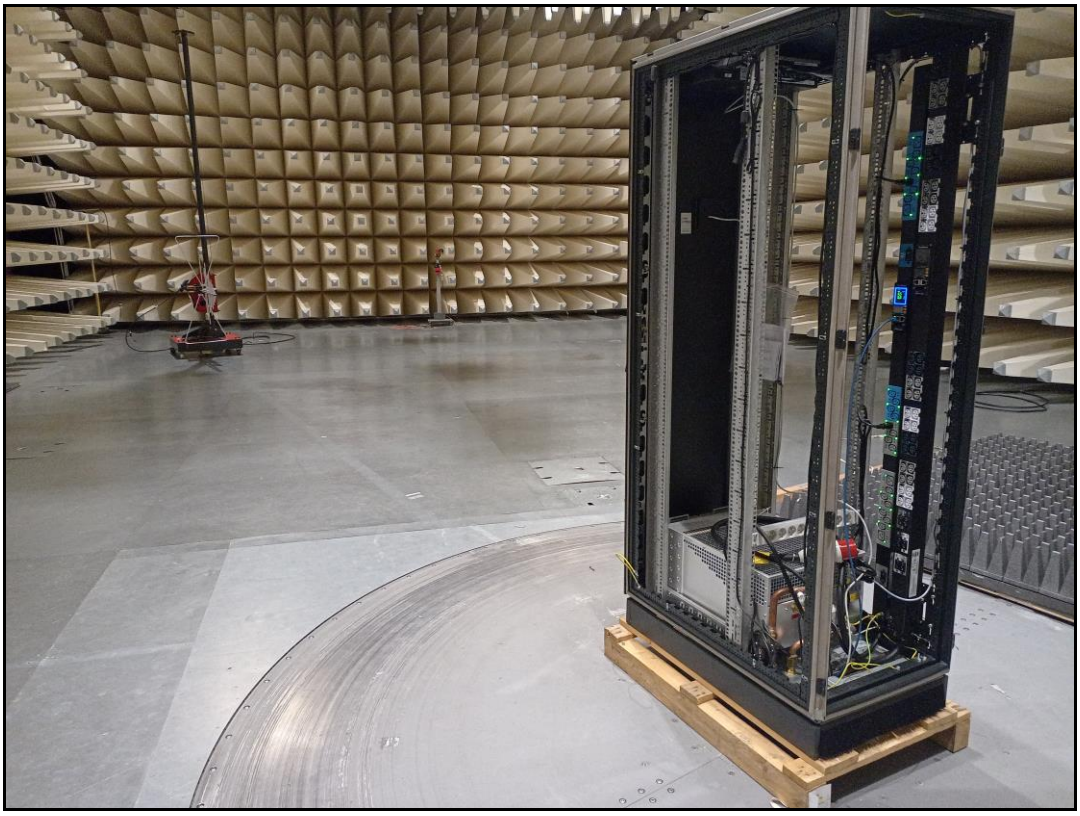


Photo 2: radiated emission

Zirkumposition

Photo 3: radiated emission

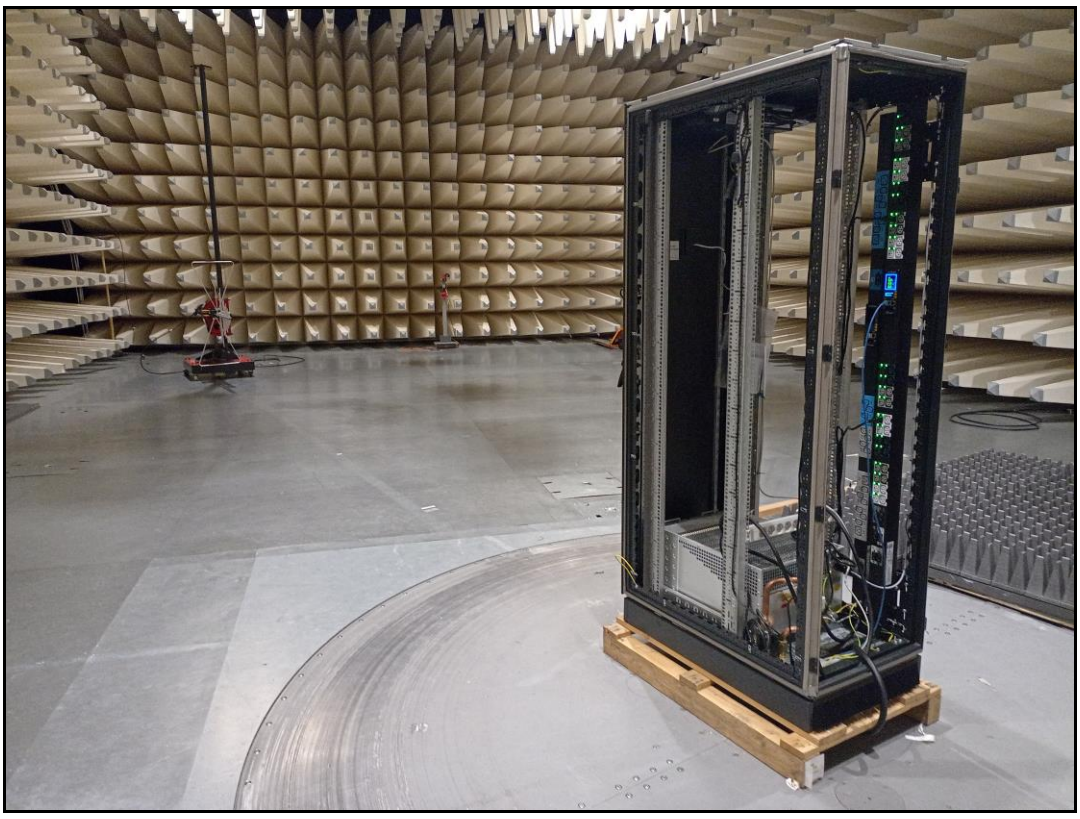


Photo 4: radiated emission

Photo 5: conducted emission

Photo 6: conducted emission

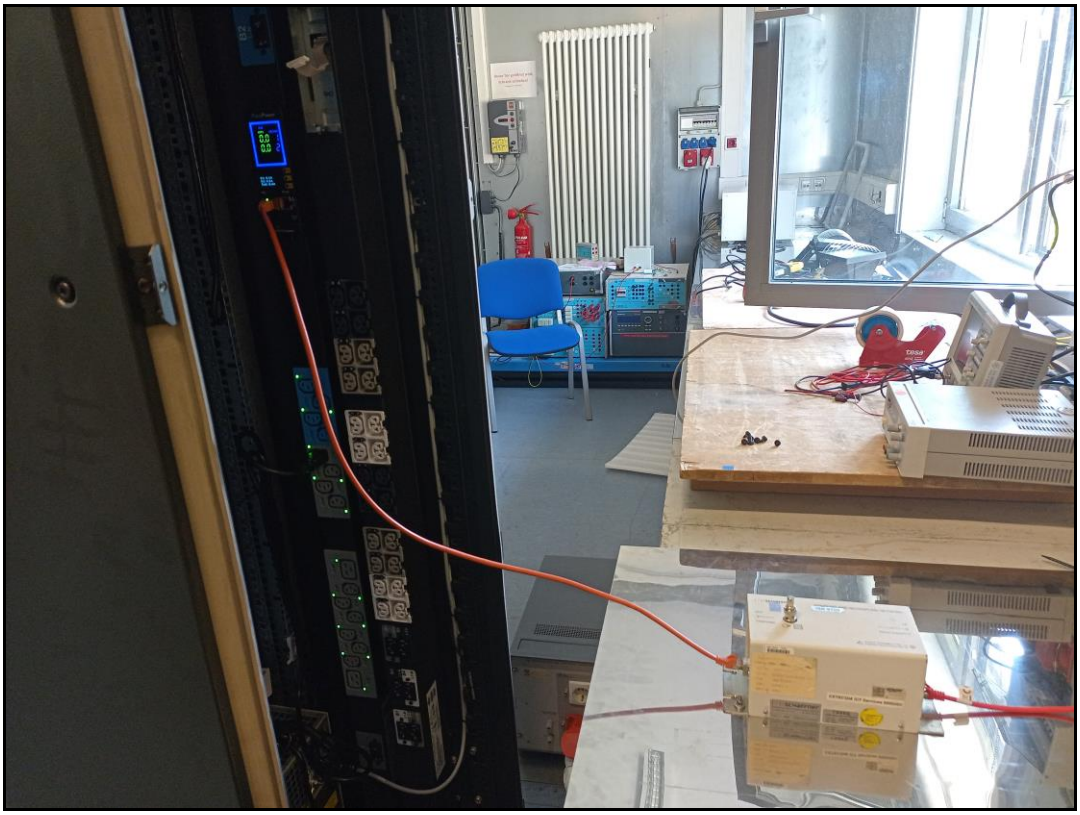


Photo 7: conducted emission

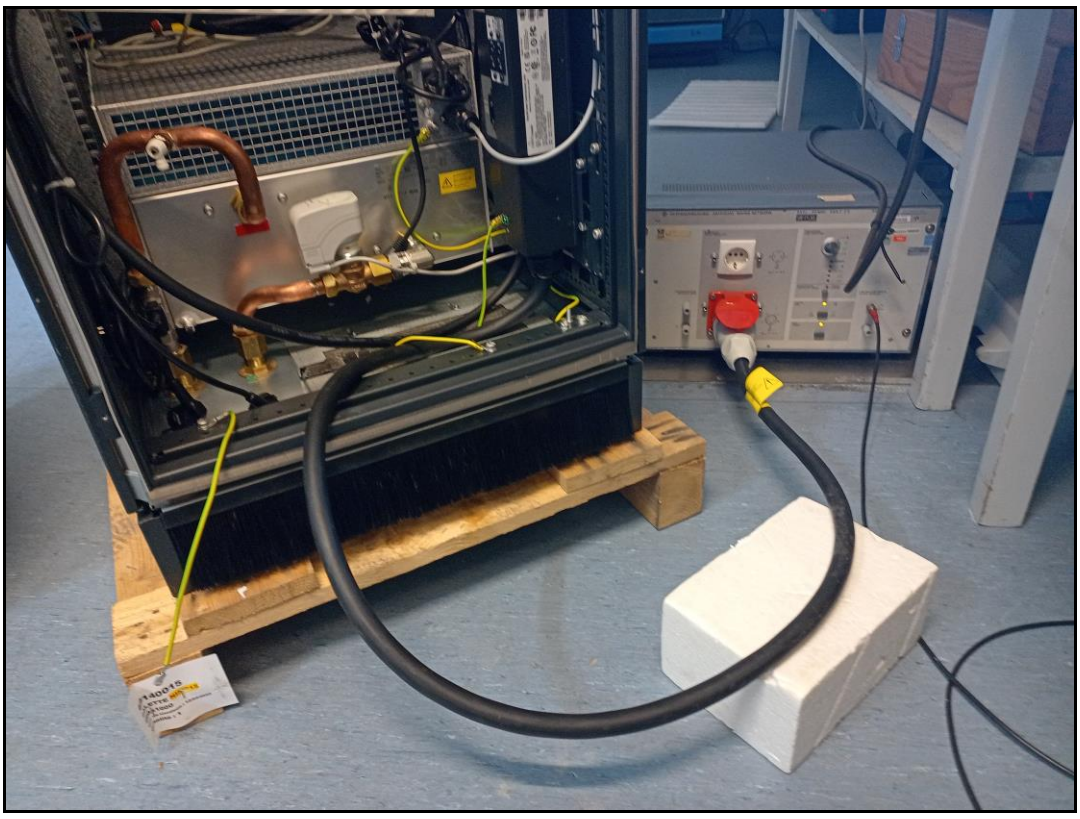
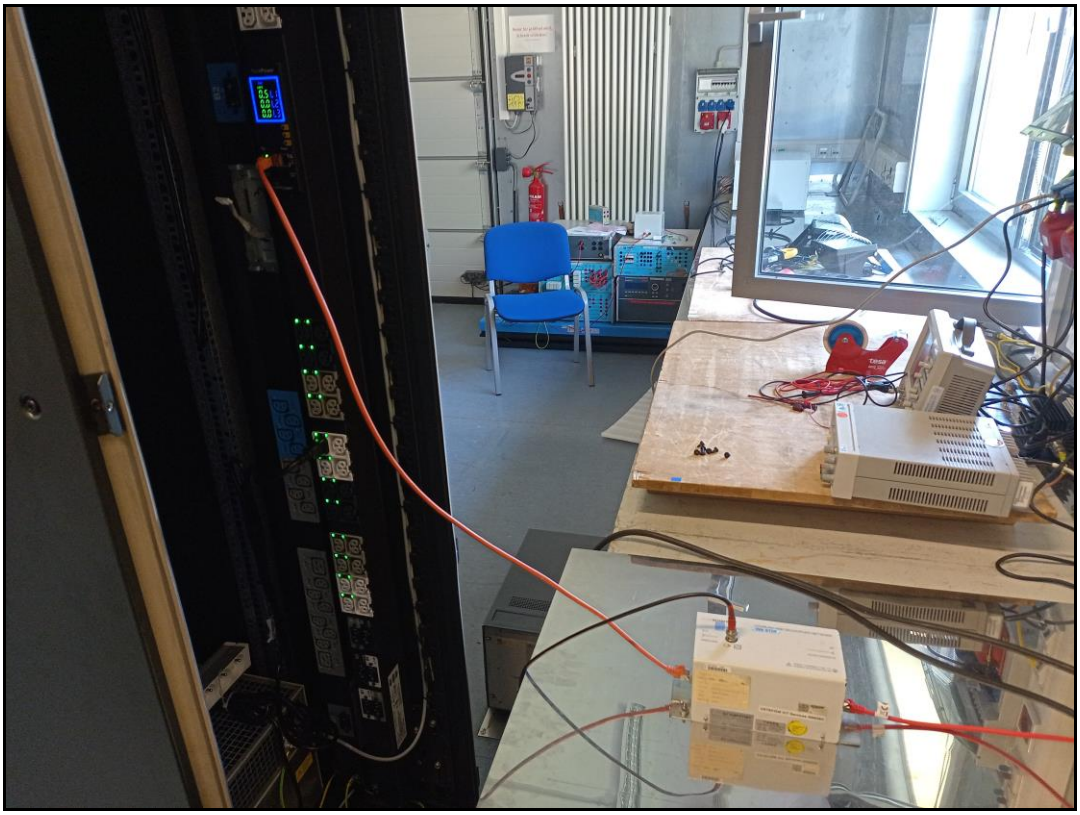


Photo 8: conducted emission



# Annex B Photographs of the EUT

Photo 9: EUT

Photo 10: EUT

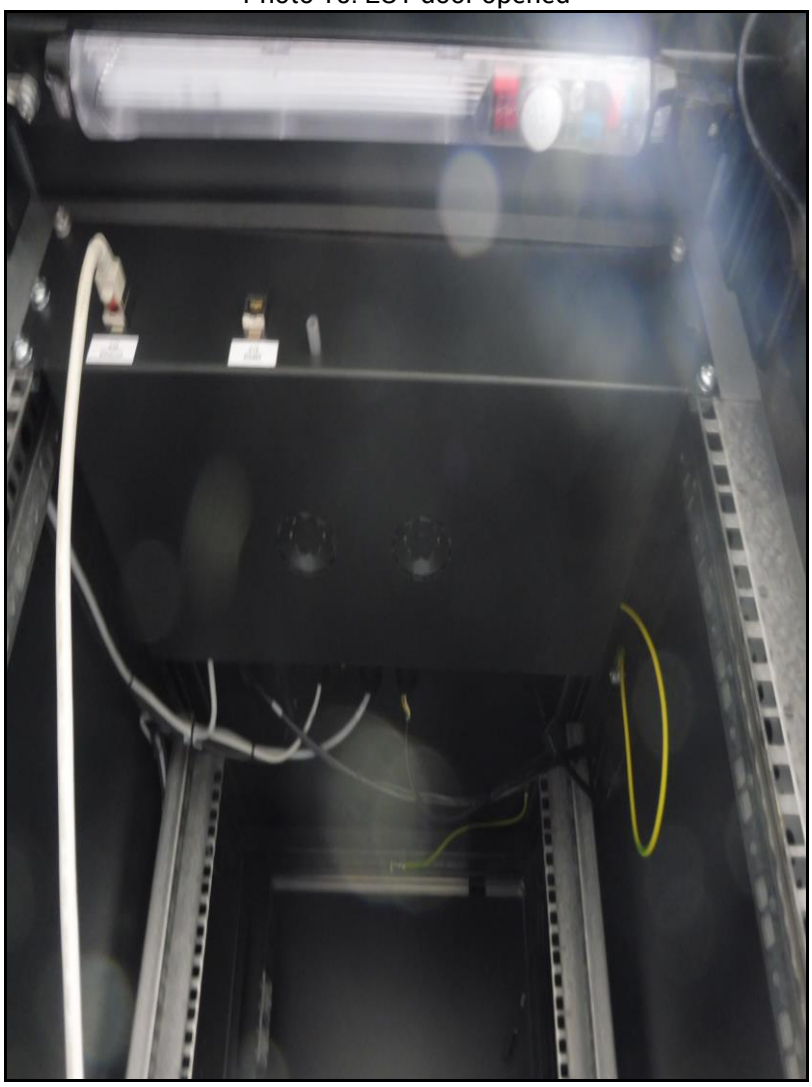
Photo 11: EUT (display)

Photo 12: EUT (display)

Photo 13: EUT door opened

Photo 14: EUT door opened

Photo 15: EUT door opened



## Annex C Document history

| Version | Applied changes | Date of release |
|---|---|---|
| - / - | Initial release | 2023-06-29 |
| -A | Chapter 6.4 added | 2023-07-12 |

**This test report replaces the test report 1-6321/23-01-04 and dated 2023-06-29**

## Annex D Further information

**Glossary**

| | | |
|---|---|---|
| DUT | - | Device under Test |
| EMC | - | Electromagnetic Compatibility |
| EUT | - | Equipment under Test |
| FCC | - | Federal Communication Commission |
| FCC ID | - | Company Identifier at FCC |
| HW | - | Hardware |
| IC | - | Industry Canada |
| Inv. No. | - | Inventory number |
| N/A | - | not applicable |
| S/N | - | Serial Number |
| SW | - | Software |