

EMC TEST REPORT

Type of equipment: VIZULO Micro Martin LED Street Luminaire with
Tridonic driver LCA 75W 250-750mA one4all C PRE OTD

Model: MRU 075 740 V04 F032 CBNT DH1

Sub model: N/A

Article no.: 55200005

Applicant: SIA "VIZULO"

Manufacturer: SIA "VIZULO"

Test standards: **LVS EN 55014-1:2017**
*Electromagnetic compatibility - Requirements for household appliances,
electric tools and similar apparatus - Part 1: Emission*
LVS EN 55015:2013+A1:2015
*Limits and methods of measurement of radio disturbance characteristics of
electrical lighting and similar equipment*
LVS EN 61547:2010
*Equipment for general lighting purposes - EMC immunity requirements
(IEC 61547:2009)*
LVS EN 61000-3-2:2015
*Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for
harmonic current emissions (equipment input current ≤ 16 A per phase)
(IEC 61000-3-2:2014)*
LVS EN 61000-3-3:2013
*Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of
voltage changes, voltage fluctuations and flicker in public low-voltage
supply systems, for equipment with rated current 16 A per phase and not
subject to conditional connection (IEC 61000-3-3:2013)*

Test report no.: LEITC-TR-18-134

Identification no.: ID_503

Testing laboratory: LEITC

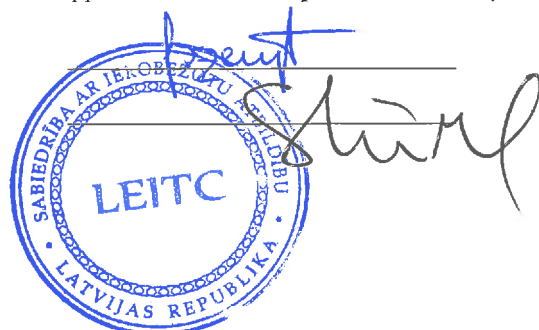
Test result: Pass

The result (pass/fail) applies only to the sample tested, according to the carried tests, which are included in this test report. This report shall not be reproduced except in full, without the written approval of EMC compliance Laboratory.

Test responsible: Andris Dzenis

Laboratory responsible: Uldis Stūre

Date of issue: 30.08.2018



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1. REVISION HISTORY

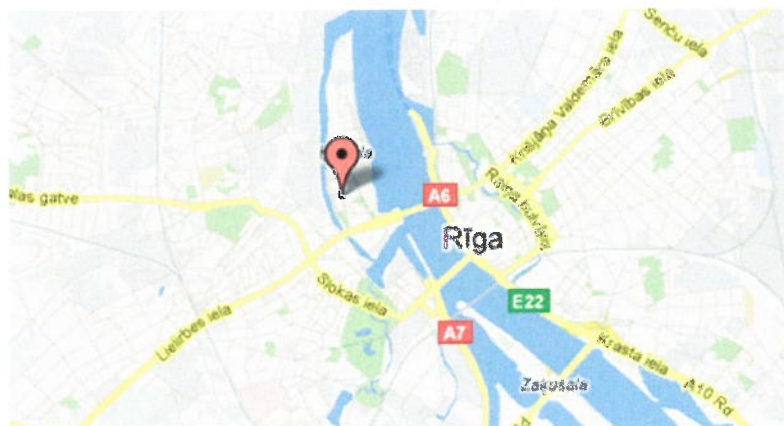
| Revision No. | Description | Date | File name | Pages revised |
|--------------|-------------|------|-----------|---------------|
| 00 | None | - | - | - |
| | | | | |
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| | | | | |

2. LABORATORY INFORMATION



Latvian Electronic Equipment Testing Centre

Address: Azenes 12, Riga, Latvia, LV-1048
Telephone number: +371 22001023
Contact Person: Uldis Stūre
E-mail: uldis.sture@leitic.lv
andris.dzenis@leitic.lv
Web: www.leitic.lv



Accredited by: State agency Latvian National accreditation bureau (LATAK)
Address: Kr.Valdemara str. 157, Riga, LV-1013, Latvia
Web: <http://www.latak.lv>
E-mail: latak@latak.lv
Accreditation No: LATAK-T-397-08-2009

3. CLIENT INFORMATION

Applicant: SIA "VIZULO"
Address: Starta iela 1, Riga, LV-1026
Telephone number: +371 28230842
Contact Person: Sergejs Burtovojš
E-mail: sergey.burtovoy@vizulo.com
Web-page: <http://www.vizulo.com>

Manufacturer: SIA "VIZULO"
Address: Starta iela 1, Riga, LV-1026
Telephone number: +371 28230842
Contact Person: Sergejs Burtovojš
E-mail: sergey.burtovoy@vizulo.com
Web-page: <http://www.vizulo.com>

4. SUMMARY OF TEST RESULTS

| | | | | |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------|--------|
| Standard: | LVS EN 55015:2013+A1:2015 | | | |
| Title: | Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment | | | |
| Reference standard: | LVS EN 55014-1:2017 | | | |
| Title: | Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission | | | |
| Emissions | | | | |
| | Measurement type | Reference standard | Applicability | Result |
| 1. | Radiated emissions (9kHz to 30MHz) | LVS EN 55015:2013+A1:2015 | Y | Pass |
| 2. | Radiated emissions (30MHz to 1GHz) | LVS EN 55015:2013+A1:2015 LVS EN 55014-1:2017 | Y | Pass |
| 3. | Conducted emissions (AC port) | LVS EN 55015:2013+A1:2015 LVS EN 55014-1:2017 | Y | Pass |
| Notes: Y- applied | | | | |
| | | | | |
| Deviations from standard specification | | | | |
| | | | | |

| | | | | |
|-----------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------|----------------------|---------------|
| Standard: | LVS EN 61547:2010 | | | |
| Title: | <i>Equipment for general lighting purposes - EMC immunity requirements (IEC 61547:2009)</i> | | | |
| Immunity | | | | |
| | Measurement type | Reference standard | Applicability | Result |
| 1. | Radio frequency radiated electromagnetic field immunity | LVS EN 61000-4-3:2006+A1:2008+A2:2010 | Y | Pass |
| 2. | Radio frequency common mode immunity | LVS EN 61000-4-6:2014 | Y | Pass |
| 3. | Electric fast transients/Burst | LVS EN 61000-4-4:2013 | Y | Pass |
| 4. | Voltage dips/ interruptions | LVS EN 61000-4-11:2004 | Y | Pass |
| 5. | Surge | LVS EN 61000-4-5:20014 | Y | Pass |
| 6. | Electrostatic discharge | LVS EN 61000-4-2:2009 | Y | Pass |
| 7. | Power frequency magnetic fields | LVS EN 61000-4-8:2010 | N/A | N/A |
| <i>Notes: Y- applied; N/A- not applicable</i> | | | | |
| | | | | |
| Deviations from standard specification | | | | |
| | | | | |

| | | | | |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|--------|
| Standard: | LVS EN 61000-3-2:2015 | | | |
| Title: | Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase) (IEC 61000-3-2:2014) | | | |
| Emissions | | | | |
| | Measurement type | Reference standard | Applicability | Result |
| 1. | Harmonic | LVS EN 61000-3-2:2015 | Y | Pass |
| Notes: Y- applied | | | | |
| Deviations from standard specification | | | | |
| | | | | |

The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

| | | | | |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|--------|
| Standard: | LVS EN 61000-3-3:2013 | | | |
| Title: | Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection (IEC 61000-3-3:2013) | | | |
| Emissions | | | | |
| | Measurement type | Reference standard | Applicability | Result |
| 1. | Flicker | LVS EN 61000-3-3:2013 | Y | Pass |
| Notes: Y- applied | | | | |
| Deviations from standard specification | | | | |
| | | | | |








| | |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Evaluation of immunity test results | |
| The test results are classified in terms of loss of the function or degradation of performance of the EUT: | |
| A | normal performance within limits specified by manufacturer, requestor or purchaser |
| B | temporary loss of function or degradation of performance, which ceases after the disturbance ceases, and from which the EUT recovers its normal performance, without operator intervention |
| C | temporary loss of function or degradation of performance, the correction which requires operator intervention |
| D | temporary loss of function or degradation of performance which is not recoverable, owing damage to hardware or software, or loss of data |

5. DESCRIPTION OF EQUIPMENT UNDER TEST

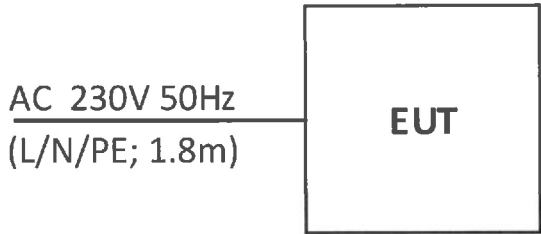
5.1 Description of EUT

VIZULO Micro Martin LED Street Luminaire with Tridonic driver LCA 75W 250-750mA one4all C PRE OTD

| No. | Description | Model | Article No. | Manufacturer |
|-----|---------------|-------------------------------------|-------------|--------------|
| 1. | LED Luminaire | MRU 075 740 V04 F032 CBNT DH1 | 55200005 | SIA "VIZULO" |

| | | | | | | | | |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| | MRU |  |  |  |  |  |  |  |
| Power [W] | 005 ... 075 | | | | | | | |
| Color rendering index | ≥70 - 7 ≥80 - 8 | | | | | | | |
| Color temperature [K] | 2700 ... 6500 | | | | | | | |
| Standard values: | 3000 K - 30 4000 K - 40 | | | | | | | |
| Lens | standard - L01 ... L99 custom configuration - M01 ... Z99 | | | | | | | |
| LED module type | 8 LEDs, type 2x2 lens - A 16 LEDs, type 8 lens - F | | | | | | | |
| LED quantity | 001 ... 032 | | | | | | | |
| Color* | silver (RAL 9006) - CS asphalt (DB 703) - CA *other colors available on request | | | | | | | |
| Console | post top / side-entry, ±15°, 60 mm - N post top / side-entry, ±90°, 60 mm - R post top / side-entry, ±90°, 76 mm - P flood light - F | | | | | | | |
| Opening | four screws - S toolless latch - T | | | | | | | |
| Dimming | non dimmable - N DALI - D 1-10V - A midnight dimming - M wireless - W | | | | | | | |
| Surge protection | 6 kV ... 10 kV integrated in driver - G separate built-in 10 kV/10 kA SPD - H | | | | | | | |
| Insulation | class I - 1 class II - 2 | | | | | | | |

The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

| 5.2 Peripherals and associated equipment | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------|------------|--------------|-------------|-------------|
| No. | Description | Model | Serial No. | Manufacturer | | |
| 1. | N/A | N/A | N/A | N/A | | |
| 5.4 Cables used during the testing | | | | | | |
| No. | Cable type | Shield | Ferrite | Length | Connection1 | Connection2 |
| 1. | AC power cable | no | no | 1.8m | EUT | AC mains |
| 5.5 EUT configuration | | | | | | |
| The equipment under test (EUT) was functioning correctly during all tests, according to user's manual. The EUT was installed within the test site and was configured to simulate a typical user installation. | | | | | | |
| 5.5.1 Operating modes/load | | | | | | |
| 1. | Turned ON in full power. | | | | | |
| 5.5.2 Modification state | | | | | | |
| 1. | No modification. | | | | | |
| Block diagram: | | | | | | |
| <div style="text-align: center;">  </div> | | | | | | |

6. INSTRUMENTATION AND CALIBRATION

Equipment and EUT during the tests are operated in temperature range of 21⁰ to 25⁰C, humidity range of 40% to 60%, if not mentioned more precisely next to measurement data.

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with manufacturer's recommendations or quality manager deliverance and it is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

The following list contains measurement equipment used for testing. The equipment conforms to the requirements of CISPR 16-1 and other standard requirements.

| Radiated emissions | | | | |
|-------------------------------------|--------------|----------------|---------------|---------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| Antenna | R&S | HL562 | 4041.3000.02 | Certificate of calibration No. 201404738.00; 06.01.2015 |
| Antenna | R&S | HF906 | 100448 | Certificate of calibration No. 201404739.00; 18.12.2014 |
| Preamplifier | Bonn | BLMA 0118-1M | 066396D | Test report No. 160701; 01.07.2016 |
| Receiver | R&S | ESIB26 | 1088.7490K26 | Certificate of calibration No.201801814.00; 28.06.2018 |
| Antenna mast | Franconia | FCTAM03 | - | - |
| Turntable | Franconia | FCTAM01 | - | - |
| Test site | Franconia | SAC3 | - | - |
| Software for EMC measurements EMC32 | R&S | Version 8.53.0 | - | - |

| Conducted emissions | | | | |
|-------------------------------------|--------------|----------------|---------------|-----------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| LISN | R&S | ESH2Z5 | 100163 | Certificate of calibration No. 201802157.00; 03.07.2018 |
| AMN | R&S | ENV216 | 100266 | Certificate of calibration No. 201801811.00; 02.07.2018 |
| ISN | R&S | ENY81 | 100066 | Certificate of calibration No. 0001-300458444; 16.03.2018 |
| Receiver | R&S | ESIB26 | 1088.7490K26 | Certificate of calibration No.201801814.00; 28.06.2018 |
| Test site | Franconia | SAC3 | - | - |
| Software for EMC measurements EMC32 | R&S | Version 8.53.0 | - | - |

| Radio frequency radiated electromagnetic field immunity | | | | |
|---------------------------------------------------------|--------------|-----------------|---------------|-------------------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| Generator | R&S | IMS | 1502.0009.02 | Certificate of calibration No. 0378 / D-K-15195-01-00; 26.11.2015 |
| Amplifier | Bonn | BLMA 1040-60/3D | 066396C | Field uniformity calibration No. 160703; 01.07.2016 |
| Amplifier | Bonn | BSA 0125-25I | 066396B | Field uniformity calibration No. 160703; 01.07.2016 |
| Antenna | R&S | HL046E | 4065.5960.02 | Field uniformity calibration No. 160703; 01.07.2016 |
| Power meter | R&S | NRP-Z91 | 1000015 | Certificate of calibration No.201801813.00; 27.06.2018 |
| Field Sensor | ETS-LINDGREN | HI 6005 | 00074579 | Certificate of calibration No. 201801812.00; 26.06.2018 |
| Test site | Franconia | SAC3 | - | - |
| Software for EMC measurements EMC32 | R&S | Version 5.20.2 | - | - |

The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

| Radio frequency common mode immunity | | | | |
|--------------------------------------|--------------|----------------|---------------|---------------------------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| Generator | R&S | IMS | 1502.0009.02 | Certificate of calibration No. 0378 / D-K-15195-01-00; 26.11.2015 |
| Amplifier | Bonn | BSA 0125-150 | 066396A | Test report No. 160704; 01.07.2016 |
| Power meter | R&S | NRP-Z91 | 1000015 | Certificate of calibration No.201801813.00; 27.06.2018 |
| CDN | Liithi | L-801 M2/3 | 2241 | Certificate of calibration No. SCS-2241-BYEMAIL-CDNL-801-M2M3; 29.06.2018 |
| CDN | Liithi | L-801 T8 | 2248 | Certificate of calibration No. SCS-2248-BYEMAIL-CDNL-801-T8; 29.06.2018 |
| CDN | Liithi | L-801 S1 | 2242 | Certificate of calibration No. SCS-2242-BYEMAIL-CDNL-801-S1; 29.06.2018 |
| BCI probe | FCC | F-120-9A | 474 | Certificate of calibration No. 420640-D-K-15012-01-00; 05.05.2017 |
| Test site | Franconia | SAC3 | - | - |
| Software for EMC measurements EMC32 | R&S | Version 5.20.2 | - | - |

| Electric fast transients EFT/Burst | | | | |
|------------------------------------|--------------|--------------|---------------|----------------------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| Burst/Surge generator | EM TEST | UCS500-M | V0629101638 | Certificate of calibration No. SCS-0629101638-UCS500M4; 10.07.2018 |
| Motor variac | EM TEST | MV 2616 | V0629101639 | - |
| Capacitive coupling clamp | EM TEST | HFK | 0906-06 | Certificate of calibration No. CE-D19702-UCS500M4-170410; 10.04.2017 |
| ISMIEC for Windows software | EM TEST | Version 4.08 | - | - |

| Voltage dips/interruptions | | | | |
|-----------------------------|--------------|--------------|---------------|--------------------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| Burst/Surge generator | EM TEST | UCS500-M | V0629101638 | Certificate of calibration No. SCS-0629101638-UCS500M4; 10.07.2018 |
| ISMIEC for Windows software | EM TEST | Version 4.08 | - | - |

| Surge | | | | |
|--------------------------------------------------------------|--------------|------------------------|---------------|---------------------------------------------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| Burst/Surge generator | EM TEST | UCS500-M | V0629101638 | Certificate of calibration No. SCS-0629101638-UCS500M4; 10.07.2018 |
| Motor variac | EM TEST | MV 2616 | V0629101639 | - |
| CDN | EM TEST | CNV 504A | V0629101640 | Certificate of calibration No. CE-D19702-CNV504A-170410; 10.04.2017 |
| Surge Generator | AMETEK CTS | Compact NX5 s-1-300-16 | P1833222427 | Certificate of calibration No. SCS-1833222427-SLO-CH301205-compactNX5s-1-300-16; 15.08.2018 |
| Surge protection network | AMETEK CTS | SPN 508N1 | P1745207951 | Certificate of calibration No. CE-1745207951-SLO-CH100771-SPN508N1; 03.11.2017 |
| High Speed Coupling / Decoupling Network for Burst and Surge | AMETEK CTS | CNI 508N2 | P1745207952 | Certificate of calibration No. CE-1745207952-SLO-CH100771-CNI508N2; 03.11.2017 |
| ISMIEC for Windows software | EM TEST | Version 4.08 | - | - |

| Electrostatic discharge | | | | |
|-------------------------|--------------|-------|---------------|-------------------------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| ESD simulator | EM TEST | DITO | V0629101637 | Certificate of calibration No.SCS-0629101637-by E-Mail-Dito; 06.07.2018 |
| Vertical coupling plane | EM TEST | DITO | - | Certificate of calibration No.SCS-0629101637-by E-Mail-Dito; 06.07.2018 |

The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

| Harmonic current emissions and voltage fluctuation/flicker measurements | | | | |
|--------------------------------------------------------------------------------|---------------------|--------------|----------------------|------------------------------------------------------|
| Device | Manufacturer | Model | Serial number | Notes |
| Harmonic and flicker analyzer | EM TEST | DPA 500 | V0629101635 | Certificate of calibration No. SCS 23263; 31.07.2018 |
| Single phase AC voltage | EM TEST | ACS 500 | V0629101636 | - |
| ISMDPA for Windows software | EM TEST | Version 3.30 | - | - |

7. STATEMENT OF THE MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainties were calculated according to guidelines given in EN 55016-4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4 Uncertainty in EMC Measurements" and LAB 34, and is documented in the SIA "LEITC" quality system according to ISO/IEC 17025. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective manuals.

| Measurement uncertainty | | | |
|----------------------------------------------------------|------------------|----------------------------|---------------------------------------------------|
| Procedure | Designation | Uncertainty | Device |
| Conducted emissions 9kHz to 30MHz | U _{lab} | 2.35dB | LISN: ESH2-Z5 |
| Harmonic current emissions | I | According to EN 61000-3-2 | DPA 500N |
| Flicker | P _{st} | According to EN 61000-3-3 | DPA 500N |
| Radiated emissions 9kHz to 30MHz | U _{lab} | 4.71dB | Antenna: HM020 |
| Radiated emissions 30MHz to 1GHz | U _{lab} | 4.71dB | Antenna: HL562 |
| RF radiated electromagnetic field immunity 80MHz to 3GHz | U _{lab} | 2.01dB | Antenna: HL046E |
| RF common mode immunity 150kHz to 80MHz | U _{lab} | 1.83dB | CDNs: CDN L-801 M2/M3; CDN L-801 T8; CDN L-801 S1 |
| Electrostatic discharge immunity | U _{lab} | According to EN 61000-4-2 | Dito |
| Electric fast transients/Burst immunity | U _{lab} | According to EN 61000-4-4 | UCS 500 M4 |
| Surge immunity | U _{lab} | According to EN 61000-4-5 | UCS 500 M4; Compact NX5 s-1-300-16 |
| Voltage dips/ interruptions immunity | U _{lab} | According to EN 61000-4-11 | UCS 500 M4 |

8. TEST PROCEDURES

Radiated emissions

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is a table top equipment, a wooden turntable with a height of 0,8m is used which is placed on the ground plane. When EUT is floor standing equipment, it is placed on the 0,1m insulation support.

Auxiliary equipment and/or support equipment, if needed was placed as per EN 55015 and EN 55014-1 recommendations.

All input/output cables were positioned to simulate typical usage as per EN 55015 and EN 55014-1.

The EUT was connected to AC mains 230V/50Hz under the turntable shucko type socket, all other equipment was connected to the other shucko type socket under the turntable.

The antenna was placed at 3m away from EUT. Antenna height was changed in range 1-4m and EUT rotation angle in range of -180° to 180° maximize measured emissions.

Conducted emissions

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is a table top equipment, a wooden turntable with a height of 0,8m is used which is placed in a distance of 0,4m from vertical conductive plane. When EUT is floor standing equipment, it is placed on the 0,1m insulation support in a distance of 0,4m from vertical conductive plane.

Auxiliary equipment and/or support equipment, if needed was placed as per EN 55015 and EN 55014-1 recommendations.

All input/output cables were positioned to simulate typical usage as per EN 55015 and EN 55014-1.

EUT mains power port was connected to LISN/AMN which is placed in a distance of 0,8m. Each EUT power lead, except ground (safety), was connected through a LISN/AMN to power source. All lines and neutral of power cord where measured.

All telecommunication and signal cables are connected through ISN which is located in distance of 0,8m. Each cable lead is measured according to used connection type.

Radio frequency radiated electromagnetic field immunity

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is a table top equipment, a wooden table with a height of 0,8m is used. When EUT is floor standing equipment, it is placed on the 0,1m insulation support.

Radio frequency common mode immunity

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is table top equipment, it is placed on table 0,1m above ground reference plane. When EUT is floor standing equipment, it is placed on the 0,1m insulation above the ground reference plane.

Coupling decoupling devices specified in test results.

The frequency range is swept, using the signal levels defined in test data with in disturbance signal 80% amplitude modulation within a 1kHz sine wave, pausing to adjust the RF signal level or to switch coupling devices as necessary. The rate of sweep shall not exceed $1,5e-3$ decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value. The dwell time at each frequency is not less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequencies and harmonics or frequencies of dominant interest shall be analyzed separately.

Electric fast transients EFT/Burst immunity

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is table top equipment, it is placed on table 0,1m above ground reference plane. When EUT is floor standing equipment, it is placed on the 0,1m insulation above the ground reference plane.

On AC mains power ports built-in coupling decoupling network is used to couple EFT/Burst disturbance voltage. For DC/telecommunication/signal ports capacitive clamp is used. Polarity of EFT/Burst disturbance voltage is changed during the test. Duration of test is not less than 1min, however, to avoid synchronization, the test time may be broken down into six 10s burst separated by a 10s pause. It is not intended that the burst is synchronized with EUT signals.

Voltage dips/interruptions immunity

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is table top equipment, it is placed on table 0,1m above ground reference plane. When EUT is floor standing equipment, it is placed on the 0,1m insulation above the ground reference plane.

The EUT for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10s minimum time between each event. Each representative mode of operation is tested. The angle of applied dips/interruptions is defined 0° if not specified in test results. For EUT with more than one power cord, each power cord is tested individually.

Surge immunity

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is table top equipment, it is placed on table 0,1m above ground reference plane. When EUT is floor standing equipment, it is placed on the 0,1m insulation above the ground reference plane.

Surge generator was connected to reference ground plane via low impedance connection. If not mentioned, for DC power ports and interconnection lines and signal/telecommunication lines five positive and five negative surge pulses applied, for AC power line ports five negative and five positive pulses applied each at 0°, 90°, 180°, 270° phase angle. Time between successive pulses was 1min or less if not otherwise specified.

Electrostatic discharge immunity

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is table top equipment, it is placed on table 0,5mm above ground reference plane. When EUT is floor standing equipment, it is placed on the 0,5mm insulation above the ground reference plane.

Electrostatic discharges are applied as contact discharge and air discharge, discharge to vertical and horizontal coupling plane. The discharges are applied only to such points and surfaces of the EUT which are accessible to personnel during normal usage.

Test is performed as single discharges on preselected points at least ten single discharges on both polarities. Between successive discharges a time interval of 1s is used. In case of contact discharge the tip of discharge electrode touch the EUT before the discharge switch is operated. In case of air discharge, the round tip of the discharge electrode is approached as fast as possible (without causing mechanical damage) to touch the EUT discharge switch is operated before the tip is approached.

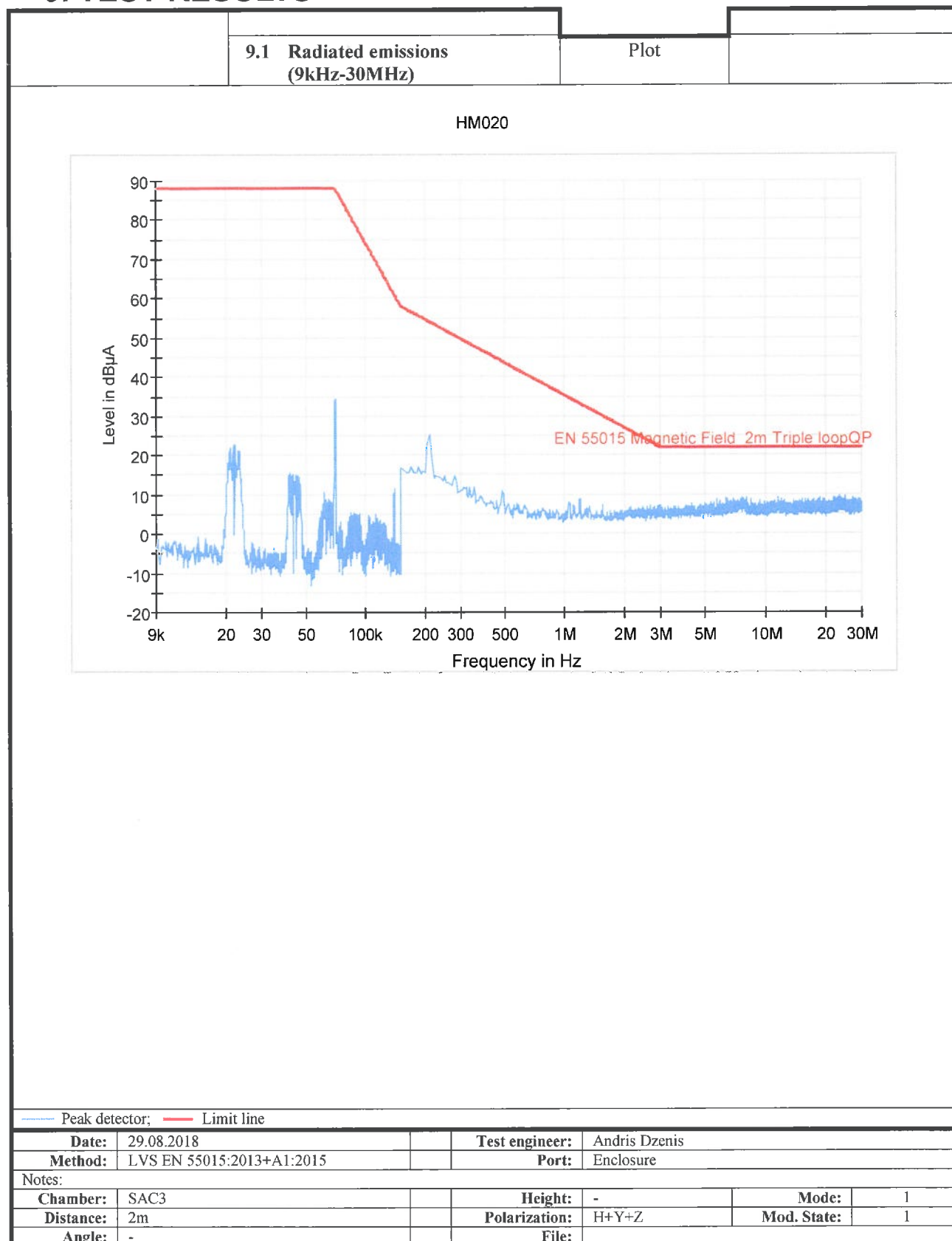
At least ten single contact discharges are applied to horizontal and vertical coupling plate.

Harmonic current emissions and voltage fluctuation/flicker measurements

The equipment was set up as per the test configuration to simulate typical usage per user's manual. When the EUT is table top equipment, it is placed on table 0,1m above ground reference plane. When EUT is floor standing equipment, it is placed on the 0,1m insulation above the ground reference plane.

The equipment is supplied in series with shunts resistance from a source having the same nominal voltage and frequency as the rated supply voltage, and frequency of the equipment.

9. TEST RESULTS

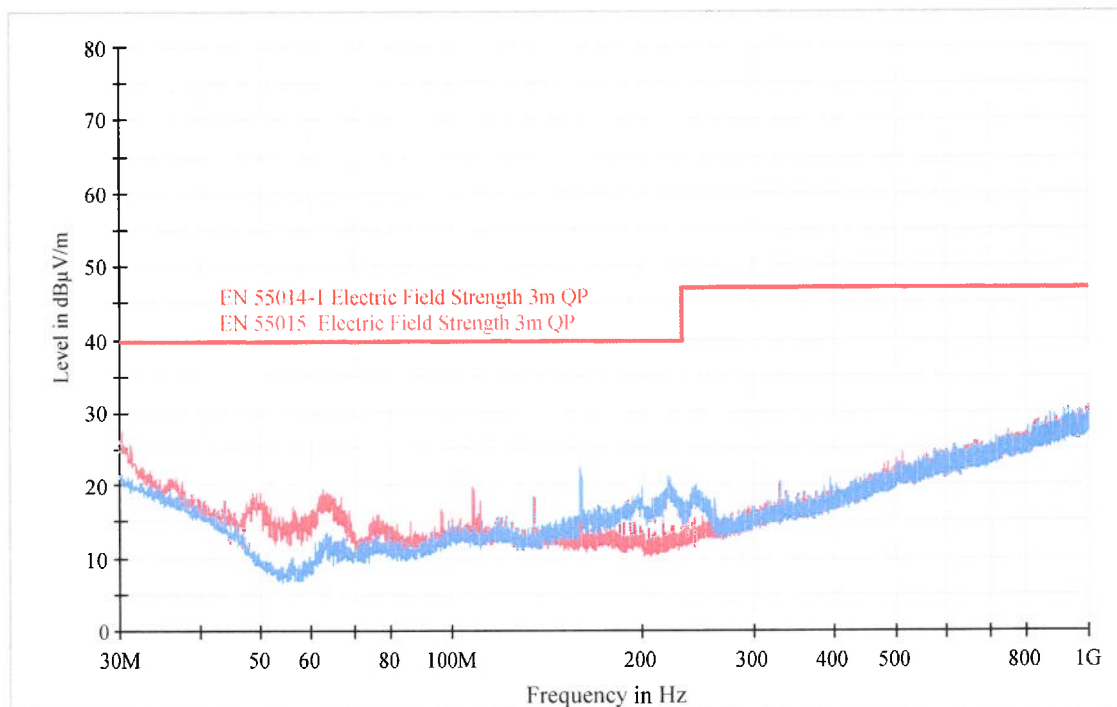


The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

**9.2 Radiated emissions
(30MHz to 1GHz)**

Plot

HL562



— Peak detector (H); ◆ QP detector; — Peak detector (V); — Limit line

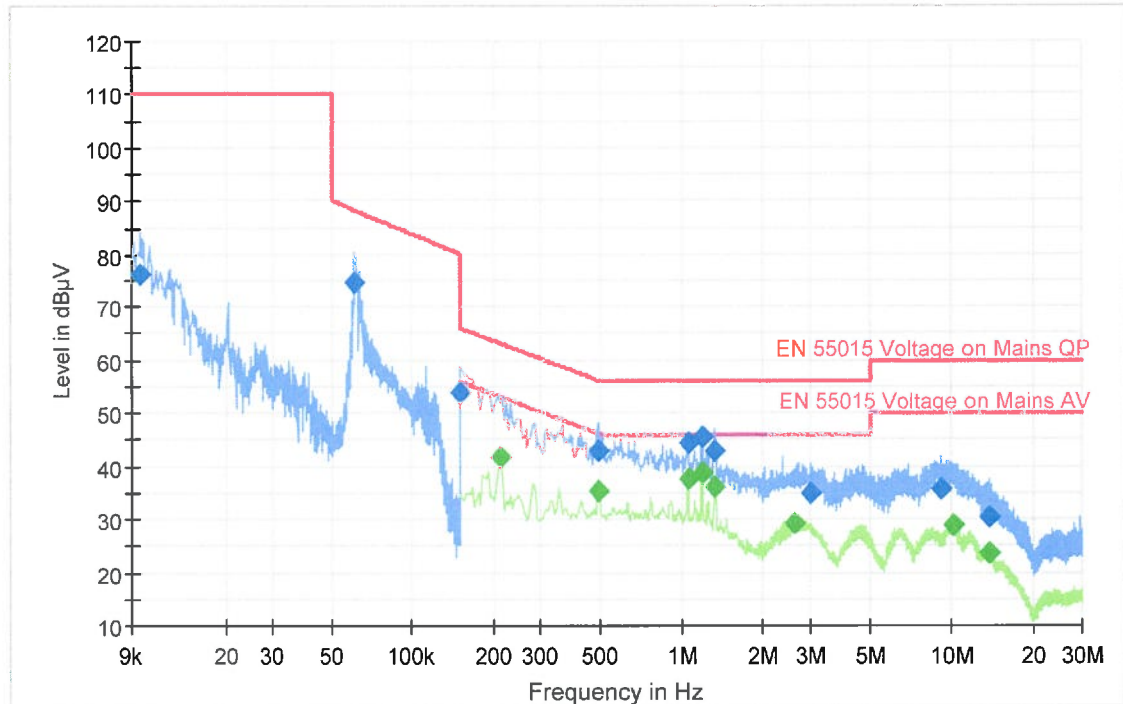
| | | | |
|------------------|--------------------------------------------------|-----------------------|---------------|
| Date: | 29.08.2018 | Test engineer: | Andris Dzenis |
| Method: | LVS EN 55015:2013+A1:2015 LVS EN 55014-1:2017 | Port: | Enclosure |
| Notes: | | | |
| Chamber: | SAC3 | Height: | 1-4m |
| Distance: | 3m | Polarization: | V+H |
| Angle: | -180° to +180° | Mod. State: | 1 |
| | | File: | |

The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

9.3 Conducted emissions

Plot

ESH2-Z5_SAC(2line)



| Frequency (MHz) | QuasiPeak (dB μ V) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dB μ V) | Comment |
|-----------------|------------------------|-----------------|-----------------|-----|------|------------|-------------|--------------------|---------|
| 0.009640 | 76.1 | 5000.0 | 0.200 | GND | L1 | 11.1 | 33.9 | 110.0 | |
| 0.060760 | 74.8 | 5000.0 | 0.200 | GND | L1 | 10.5 | 13.4 | 88.2 | |
| 0.150000 | 54.0 | 10000.0 | 9.000 | GND | N | 10.5 | 12.0 | 66.0 | |
| 0.486000 | 42.7 | 10000.0 | 9.000 | GND | N | 10.5 | 13.5 | 56.2 | |
| 1.054000 | 44.3 | 10000.0 | 9.000 | GND | L1 | 10.5 | 11.7 | 56.0 | |
| 1.194000 | 45.7 | 10000.0 | 9.000 | GND | N | 10.5 | 10.3 | 56.0 | |
| 1.326000 | 43.1 | 10000.0 | 9.000 | GND | N | 10.5 | 12.9 | 56.0 | |
| 2.998000 | 35.0 | 10000.0 | 9.000 | GND | N | 10.6 | 21.0 | 56.0 | |
| 9.190000 | 35.7 | 10000.0 | 9.000 | GND | N | 10.9 | 24.3 | 60.0 | |
| 13.650000 | 30.3 | 10000.0 | 9.000 | GND | N | 11.2 | 29.7 | 60.0 | |

| Frequency (MHz) | Average (dB μ V) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dB μ V) | Comment |
|-----------------|----------------------|-----------------|-----------------|-----|------|------------|-------------|--------------------|---------|
| 0.210000 | 41.7 | 10000.0 | 9.000 | GND | L1 | 10.4 | 11.5 | 53.2 | |
| 0.486000 | 35.4 | 10000.0 | 9.000 | GND | N | 10.5 | 10.9 | 46.2 | |
| 1.050000 | 37.7 | 10000.0 | 9.000 | GND | N | 10.5 | 8.3 | 46.0 | |
| 1.190000 | 38.8 | 10000.0 | 9.000 | GND | N | 10.5 | 7.2 | 46.0 | |
| 1.318000 | 36.0 | 10000.0 | 9.000 | GND | N | 10.5 | 10.0 | 46.0 | |
| 2.638000 | 29.1 | 10000.0 | 9.000 | GND | N | 10.6 | 16.9 | 46.0 | |
| 10.250000 | 28.9 | 10000.0 | 9.000 | GND | N | 11.0 | 21.1 | 50.0 | |
| 13.578000 | 23.7 | 10000.0 | 9.000 | GND | N | 11.2 | 26.3 | 50.0 | |

— Peak detector; ◆ QP detector; — AV detector; ◆ AV detector; — QP Limit line; — AV Limit line; L- Live, N-Neutral; PE- Earth

| | | | |
|----------|--------------------------------------------------|----------------|---------------|
| Date: | 29.08.2018 | Test engineer: | Andris Dzenis |
| Method: | LVS EN 55015:2013+A1:2015 LVS EN 55014-1:2017 | Port: | AC power port |
| Notes: | | | |
| Chamber: | SAC3 | Attenuator: | 0dB |
| LISN: | ESH2-Z5 | Mod. State: | 1 |
| | | File: | |

The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

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|---------------|---------------|----------------------------------------------------------------|---------|---------------------|--------------------|----------------------|--------------|----------------------------|--------------------------|-------|
| | | 9.4 Radio frequency radiated electromagnetic field immunity | | | | | | | | |
| Date: | | 29.08.2018 | | | | | | | | |
| Ports: | | Enclosure | | | | RESULT | | | | |
| Method: | | LVS EN 61000-4-3:2006+ A1:2008+A2:2010 | | | | Recm'd Crit A | | | | |
| Ports: | | | | | | Ach'd Crit A | | | | |
| Method: | | | | | | | | | | |
| Oper. mode | Mod. State | EUT orientation | Antenna | Step size (%) | Frequency (MHz) | Sweep time (s) | Polarization | Field strength (V/m) | Modulation (%AM//kHz) | Notes |
| 1 | 1 | Front | HL046E | 1 | 80-1000 | 5 | V | 3 | 80% 1kHz | #1 |
| 1 | 1 | Front | HL046E | 1 | 80-1000 | 5 | H | 3 | 80% 1kHz | #1 |
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The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

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| | | | | | | | |
|------------|------------|---------------------------------|----------------------|----------------------|----------------------------|--------|--|
| | | 9.10 Harmonic current emissions | | | | | |
| Date: | | 29.08.2018 | | | | | |
| Ports: | | AC power | | | | | |
| Method: | | LVS EN 61000-3-2:2015 | | | | | |
| Power: | | 72.49W | | | | | |
| | | | | | | | |
| | | | | | | | |
| Oper. mode | Mod. State | H _n | I _{rms} (A) | I _{rms} (%) | Limit I _{rms} (A) | Result | |
| 1 | 1 | 1 | 318.036E-3 | 99.865 | | | |
| | | 2 | 499.181E-6 | 0.157 | | PASS | |
| | | 3 | 13.949E-3 | 4.380 | 29.59 | PASS | |
| | | 4 | 1.918E-3 | 0.602 | | PASS | |
| | | 5 | 5.805E-3 | 1.823 | 10.00 | PASS | |
| | | 6 | 723.647E-6 | 0.227 | | PASS | |
| | | 7 | 2.709E-3 | 0.851 | | PASS | |
| | | 8 | 709.586E-6 | 0.223 | | PASS | |
| | | 9 | 3.765E-3 | 1.182 | | PASS | |
| | | 10 | 700.611E-6 | 0.220 | | PASS | |
| | | 11 | 2.850E-3 | 0.895 | | PASS | |
| | | 12 | 774.818E-6 | 0.243 | | PASS | |
| | | 13 | 3.716E-3 | 1.167 | | PASS | |
| | | 14 | 711.377E-6 | 0.223 | | PASS | |
| | | 15 | 3.608E-3 | 1.133 | | PASS | |
| | | 16 | 677.766E-6 | 0.213 | | PASS | |
| | | 17 | 3.442E-3 | 1.081 | | PASS | |
| | | 18 | 992.941E-6 | 0.312 | | PASS | |
| | | 19 | 2.469E-3 | 0.775 | | PASS | |
| | | 20 | 667.960E-6 | 0.210 | | PASS | |
| | | 21 | 3.068E-3 | 0.963 | | PASS | |
| | | 22 | 942.071E-6 | 0.296 | | PASS | |
| | | 23 | 1.783E-3 | 0.560 | | PASS | |
| | | 24 | 724.117E-6 | 0.227 | | PASS | |
| | | 25 | 1.506E-3 | 0.473 | | PASS | |
| | | 26 | 703.467E-6 | 0.221 | | PASS | |
| | | 27 | 1.264E-3 | 0.397 | | PASS | |
| | | 28 | 670.970E-6 | 0.211 | | PASS | |
| | | 29 | 1.061E-3 | 0.333 | | PASS | |
| | | 30 | 715.396E-6 | 0.225 | | PASS | |
| | | 31 | 2.192E-3 | 0.688 | | PASS | |
| | | 32 | 721.820E-6 | 0.227 | | PASS | |
| | | 33 | 1.545E-3 | 0.485 | | PASS | |
| | | 34 | 710.851E-6 | 0.223 | | PASS | |
| | | 35 | 1.704E-3 | 0.535 | | PASS | |
| | | 36 | 832.471E-6 | 0.261 | | PASS | |
| | | 37 | 783.151E-6 | 0.246 | | PASS | |
| | | 38 | 695.676E-6 | 0.218 | | PASS | |
| | | 39 | 1.088E-3 | 0.342 | | PASS | |
| | | 40 | 804.529E-6 | 0.253 | | PASS | |

Note: Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

Note: Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

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|----------------|-----------------------|---------------------|--|--|--|
| | | | | | |
| | | 9.11 Flicker | | | |
| Date: | 29.08.2018 | | | | |
| Ports: | AC power | | | | |
| Method: | LVS EN 61000-3-3:2013 | | | | |
| | | | | | |
| | | | | | |

| Mode 1. | EUT values | Limit | Result |
|----------|------------|-------|--------|
| Pst | 0.028 | 1.00 | PASS |
| Plt | 0.028 | 0.65 | PASS |
| dc [%] | 0.000 | 3.30 | PASS |
| dmax [%] | 0.015 | 4.00 | PASS |
| dt [s] | 0.000 | 0.50 | PASS |

The test results correspond to sample only This test report shall not be reproduced except in full without the written approval.

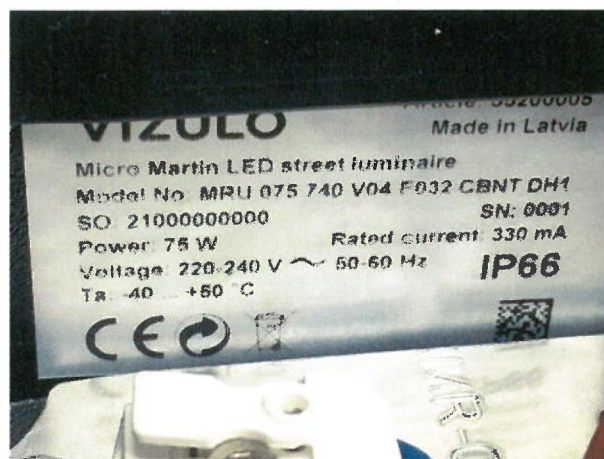
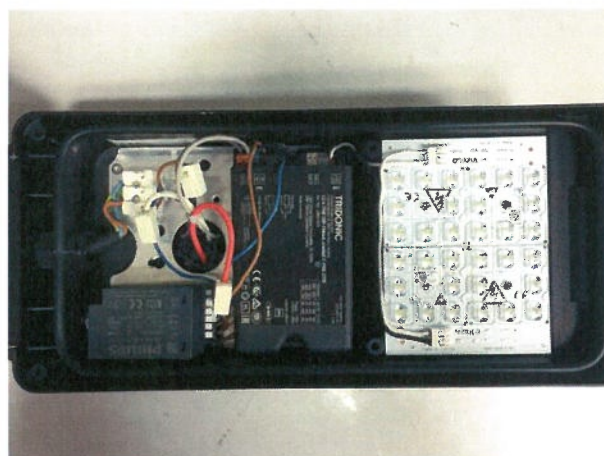
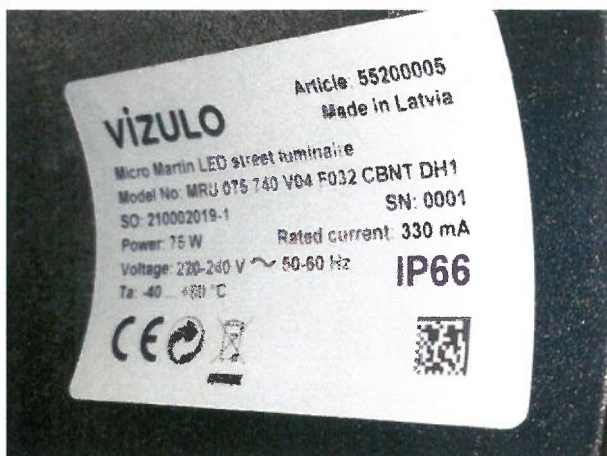
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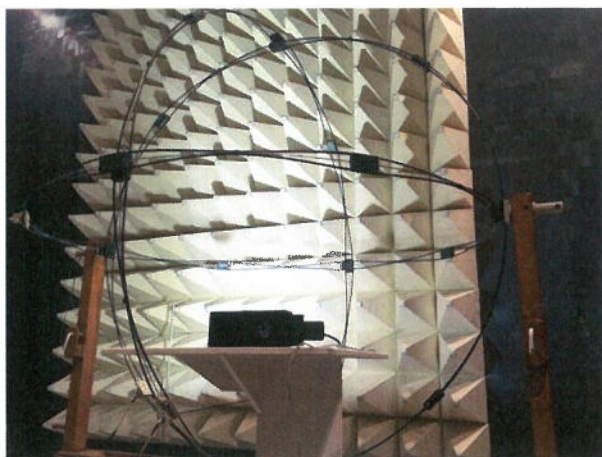
10. TEST PHOTOGRAPHS

EUT-equipment under test:





Radiated emissions (9kHz-30MHz):



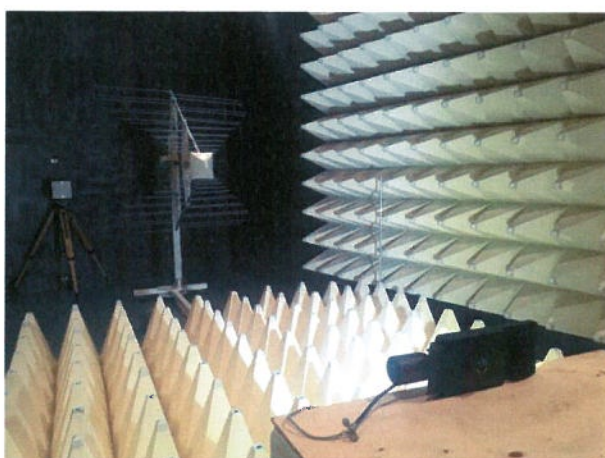
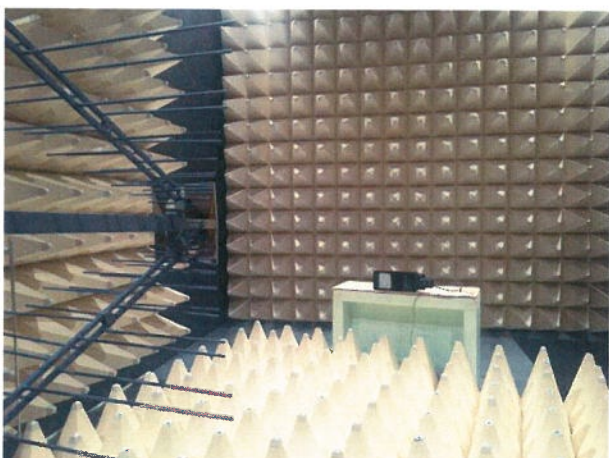
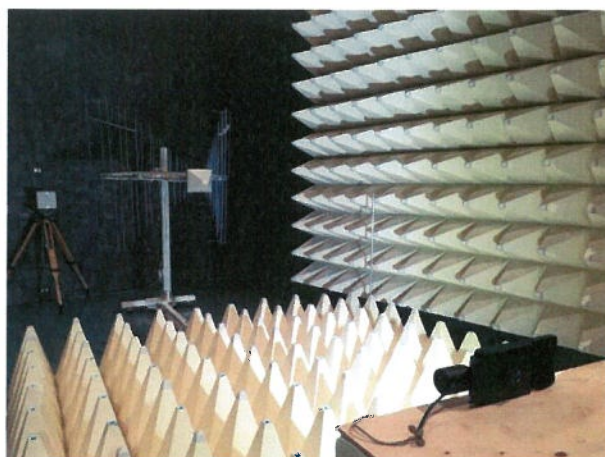
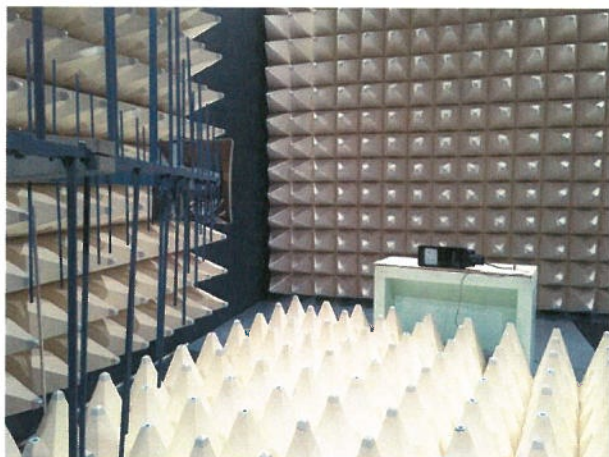
Radiated emissions (30MHz-1GHz):



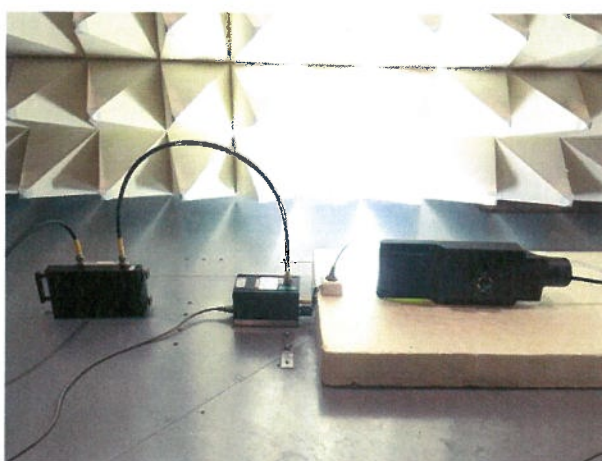
Conducted emissions:



Radio frequency radiated electromagnetic field immunity:



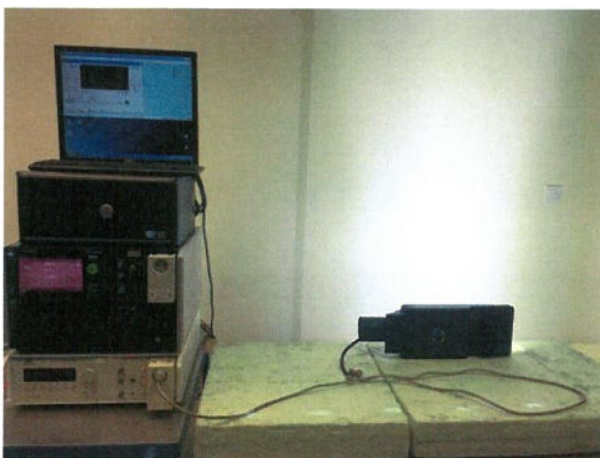
Radio frequency common mode immunity:



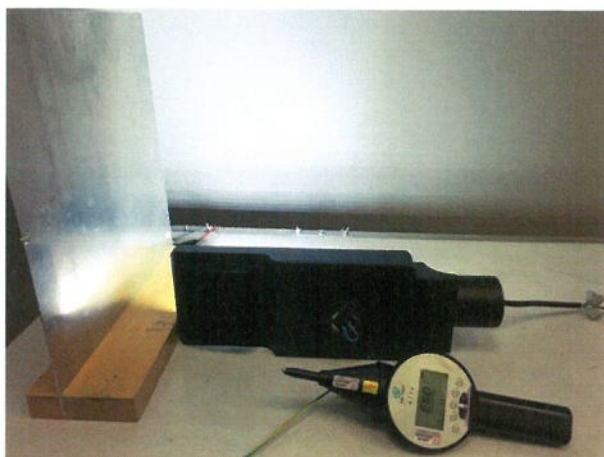
EFT/Burst immunity, voltage dips/interruptions immunity:



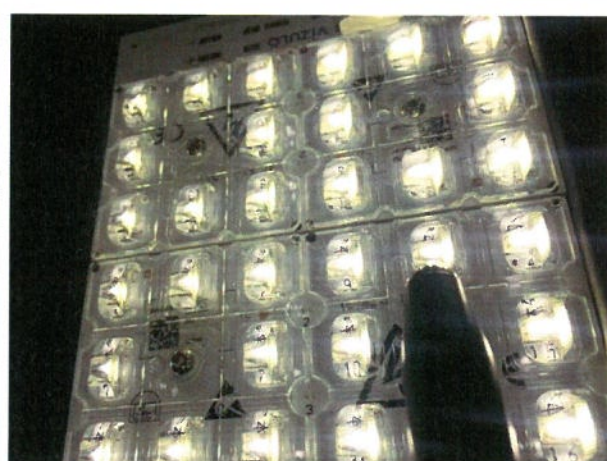
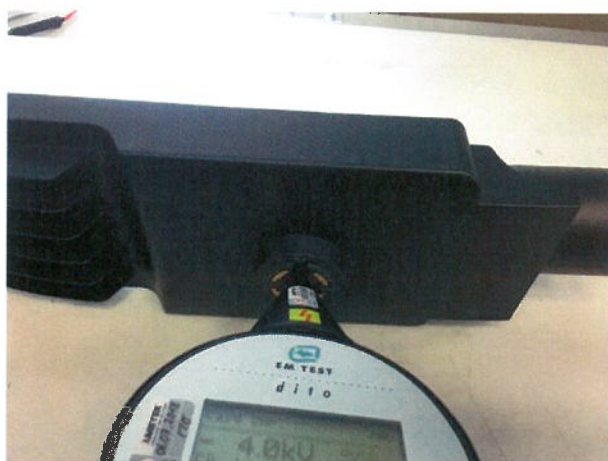
Surge:



ESD:



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Harmonic current emissions/ Flicker:



Power frequency magnetic field immunity:

