## Contents



Digitally signed by Mîrzac Marcello
Date: 2025.03.19 10:55:12 EET
Reason: MoldSign Signature
Location: Moldova
MOLDOVA EUROPEANĂ

Český metrologický institut
TESTCOM Praha
Hvožďanská 3
148 00 Praha 4

# Test specification

## Emission : Requirements according to:

**Product standard ETSI EN 301 489-1**
Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

**Product standard ETSI EN 301 489-7**
Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio tele

**Measurement method:**

Radiated emission **EN 55022**
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

Conducted emission **EN 55022**
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

## Immunity : Requirements according to:

**Product standard ETSI EN 301 489-1**

Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

**Product standard ETSI EN 301 489-7**

Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio tele

**Measurement methods:**

| | | |
|---|---|---|
| ESD | **EN 61000-4-2** | Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test |
| Radiated immunity | **EN 61000-4-3** | Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test |
| Burst | **EN 61000-4-4** | Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test |
| Surge | **EN 61000-4-5** | Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test |
| Conducted immunity | **EN 61000-4-6** | Electromagnetic compatibility (EMC) - Part 4 - 6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields |
| Volt. Dips and interruptions | **EN 61000-4-11** | Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests |

# Summary of EMC Tests

**Used standards**

| | Class/Level | Result | Remark |
|---|---|---|---|
| **ETSI EN 301 489-1 V1.9.2: 2011** | | **pass** | |
| **ETSI EN 301 489-7 V1.3.1: 2005** | | **pass** | |
| ČSN EN 55022 ed3: 2011<br>radiated emission<br>conducted emission | <br>B<br>B | <br>pass<br>pass | |
| ČSN EN 61000-4-2 ed.2: 2009 | | pass | |
| ČSN EN 61000-4-3 ed.3: 2006<br>+ A1: 2008<br>+ Z1: 2010<br>+ Změna A2: 2011 | | pass | |
| ČSN EN 61000-4-4 ed. 3: 2013 | | pass | |
| ČSN EN 61000-4-5 ed. 2: 2007 | | pass | |
| ČSN EN 61000-4-6 ed. 3: 2009 | | pass | |

Remark : Standards designated as ČSN EN xxxx are Czech versions of European standards EN xxxx.

# Uncertainties of measurement according to EA - 4/16

| Standard | measurement | Uncertainty [dB] | Remark |
|---|---|---|---|
| ČSN EN 55022 | EM field 30 MHz-300 MHz / bicon. antenna | 3,6 | |
| | EM field 30 MHz-1000 MHz /logper. antenna | 3,9 | |
| | voltage with NNB 11 coupling | 2,3 | |
| | EM field 1GHz - 6 GHz horn antenna 3 m | 3,7 | |
| | current with SMZ 11 coupling | 3,4 | |
| | voltage with ENY 22 coupling | 2,1 | |
| ČSN EN 55014-1 | power 30 MHz - 300 MHz ( MDS 21) | 2,5 | |
| | voltage with NNB 11 coupling | 2,3 | |
| | voltage with TK12 coupling | 3,4 | |
| ČSN EN 55011 | EM field 9 kHz - 30 MHz / loop antenna | 3,4 | 1 |
| | EM field 30 MHz-300 MHz / bicon. antenna | 3,6 | 1 |
| | EM field 30 MHz-1000 MHz /logper. antenna | 3,9 | 1 |
| | voltage with NNB 11 coupling | 2,3 | |
| | voltage with TK12 coupling | 3,4 | |
| | current with SMZ 11 coupling | 3,4 | |
| ČSN EN 55013+A12 | EM field 30 MHz-300 MHz / bicon. antenna | 3,6 | |
| | EM field 30 MHz-1000 MHz /logper. antenna | 3,9 | |
| | voltage with NNB 11 coupling | 2,3 | |
| | power 30 MHz - 300 MHz ( MDS 21) | 2,5 | |
| ČSN EN 55015 | voltage with NNB 11 coupling | 2,3 | |
| | attenuation (fluorescent lamp equivalents) | 3,0 | |
| | voltage with TK12 coupling | 3,4 | |
| | radiated emissions up to 30 MHz | 3,4 | |
| ČSN EN 50121-3 | EM field 9 kHz - 30 MHz / loop antenna | 3,4 | 1 |
| | EM field 30 MHz-300 MHz / bicon. antenna | 3,6 | 1 |
| | EM field 30 MHz-1000 MHz /logper. antenna | 3,9 | 1 |
| ČSN EN 61000-3-2 | harmonic current emissions | 1,8 | |
| ČSN EN 61000-3-3 | voltage variations and flicker | 1,8 | |
| ČSN EN 61000-4-2 | electostatic discharge | 2,7 | |
| ČSN EN 61000-4-3 | EM field immunity test | 2,8 | |
| ČSN EN 61000-4-4 | burst immunity test | 2,2 | |
| ČSN EN 61000-4-5 | surge immunity test | 2,2 | |
| ČSN EN 61000-4-6 | Conducted RF Disturbances Immunity Test | 1,8 | |
| ČSN EN 61000-4-11 | Voltage Dips and Interruptions Immunity Test | 2,2 | |

**Explanation to Remarks**

1 Valid for laboratory measurement - uncertainty of site not involved

Uncertainty is expressed according to EA-4/16 - level of reliability is 95%.

# General EUT information

| **Description of EUT (from viewpoint of the testing)** | |
|---|---|
| [ X ] table top equipment | [ ] floor standing equipment |
| Mains voltage: 230 V AC | Clock frequencies [MHz]: not specified |
| KULON-C is a standalone street light controller designed for remote (over GSM) street lighting system maintainance. | |

**List of cables**

| Input / Output | Length | **S**hielded / **N**onshielded |
|---|---|---|
| power input 230 V AC | > 3 m | N |
| input "sensor 1" | > 3 m | N |
| input "sensor 2" | > 3 m | N |
| GSM antenna port | > 3 m | N |
| output 1 | > 3 m | N |
| input 230 V 1-N | > 3 m | N |
| | | |

**EUT specification and monitoring during immunity tests**

[ ] defined by customer [ ] defined in the standard

LED "BUS" must light. LED "GSM" must flah at 1 Hz normally. After dialing the number of the device (number of the SIM card) from mobile phone the device has to answer the call and the indication of the LED "GSM" will change from flashing to a steady lighting. After releasing the call LED "GSM" starts flashing again.

# Radiated Disturbance
# EN 55022

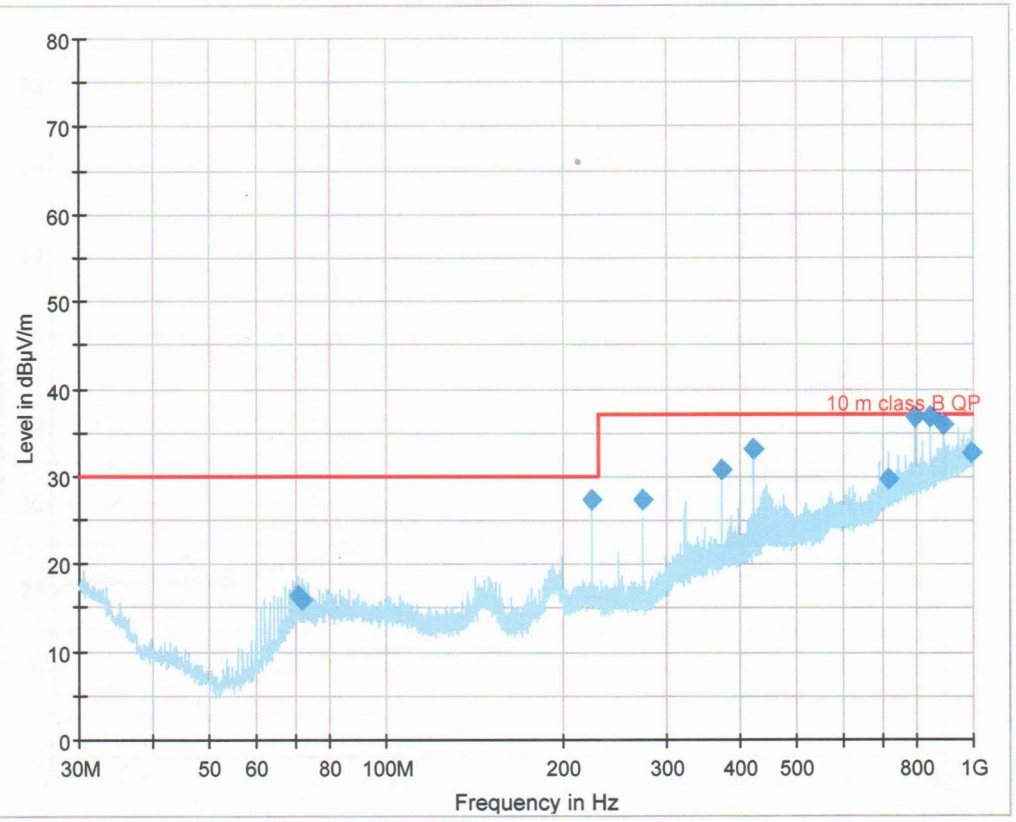
Date of test: 6.3.2014
Ambient temperature: 20 °C ± 3 °C
Relative humidity: 32 % ± 10%
Measured by: M. Svoboda

| Frequency range [MHz] | Measuring distance | Antenna | Class | Result |
|---|---|---|---|---|
| 30 - 1000 | 10m | C102 | B | P |
| 1000 - 6000 | 3 m | C148 | B | P |
| | | | | |
| Legend of column "Result": | | P ...pass acc. to the limits of standard ČSN EN 55022<br>F ... fails acc. to the limits of standard ČSN EN 55022 | | |

**Uncertainties of measurement see Page No. 5**

| Test equipment: | Serial No. | Ident. No. |
|---|---|---|
| EMI test receiver R/S ESIB26 | 100216 | C106 |
| Broadband antenna BTA-M | 0600 | C109 |
| Anechoic chamber 10m in TESTCOM | - | C093 |
| Horn antenna ETS Lindgren 3115 | 91564 | C148 |

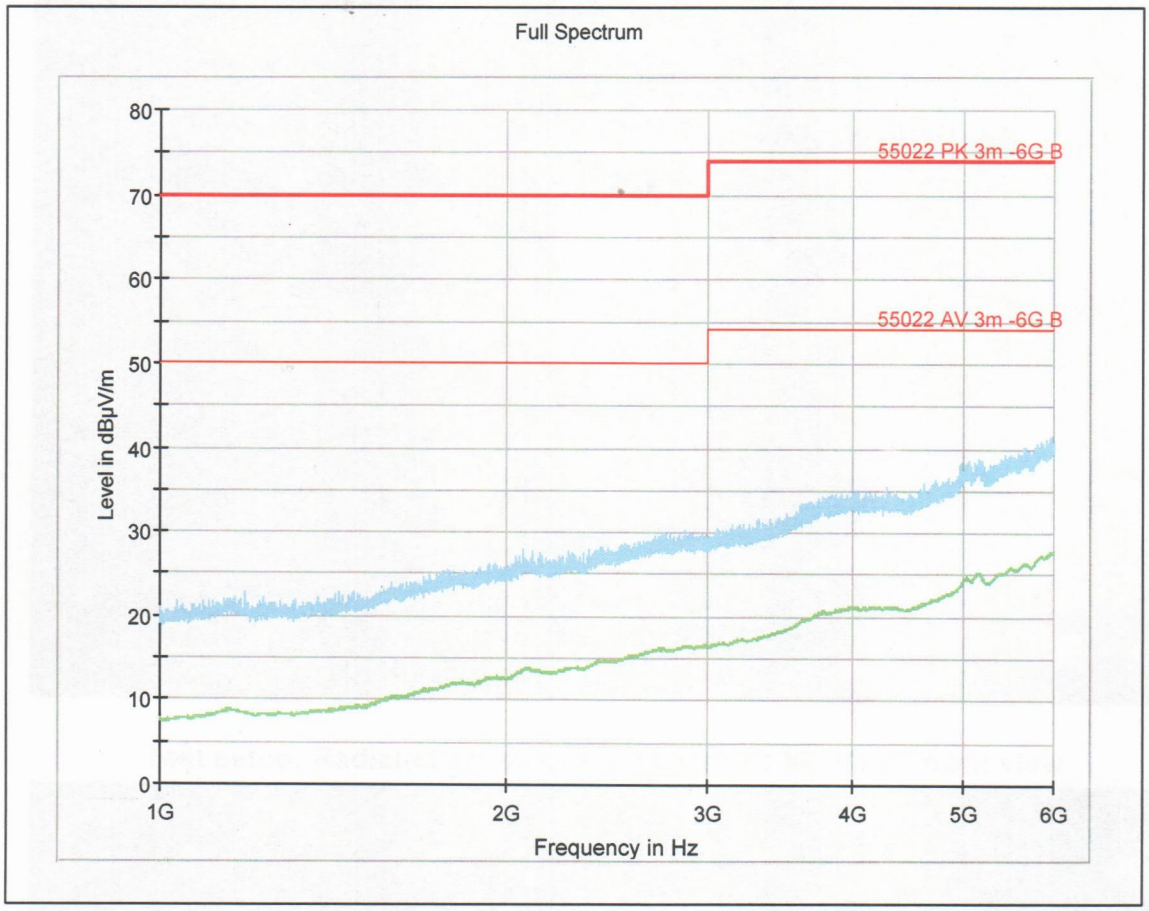
## Measured data - 30 MHz to 1000 MHz



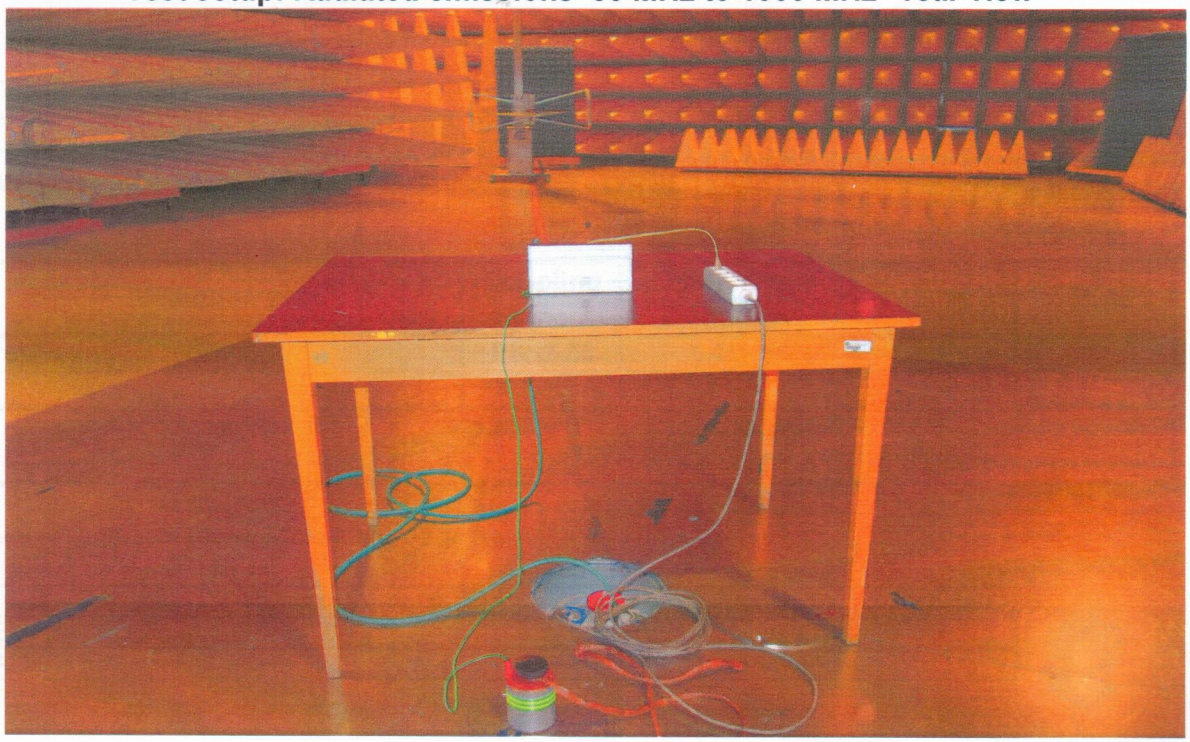

## Final Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) |
|---|---|---|---|---|---|---|---|---|
| 70.380000 | 16.36 | 30.00 | 13.64 | 1000.0 | 120.000 | 315.0 | V | 274.0 |
| 71.460000 | 16.05 | 30.00 | 13.95 | 1000.0 | 120.000 | 155.0 | V | -2.0 |
| 222.960000 | 27.33 | 30.00 | 2.67 | 1000.0 | 120.000 | 126.0 | V | 101.0 |
| 272.520000 | 27.30 | 37.00 | 9.70 | 1000.0 | 120.000 | 362.0 | H | 304.0 |
| 371.580000 | 30.87 | 37.00 | 6.13 | 1000.0 | 120.000 | 300.0 | H | 49.0 |
| 421.140000 | 33.26 | 37.00 | 3.74 | 1000.0 | 120.000 | 262.0 | H | 83.0 |
| 718.380000 | 29.78 | 37.00 | 7.22 | 1000.0 | 120.000 | 123.0 | H | 56.0 |
| 792.720000 | 36.90 | 37.00 | 0.10 | 1000.0 | 120.000 | 105.0 | H | 326.0 |
| 842.220000 | 36.85 | 37.00 | 0.15 | 1000.0 | 120.000 | 245.0 | V | 321.0 |
| 891.840000 | 36.00 | 37.00 | 1.00 | 1000.0 | 120.000 | 300.0 | H | 326.0 |
| 990.840000 | 32.67 | 37.00 | 4.33 | 1000.0 | 120.000 | 274.0 | H | -6.0 |

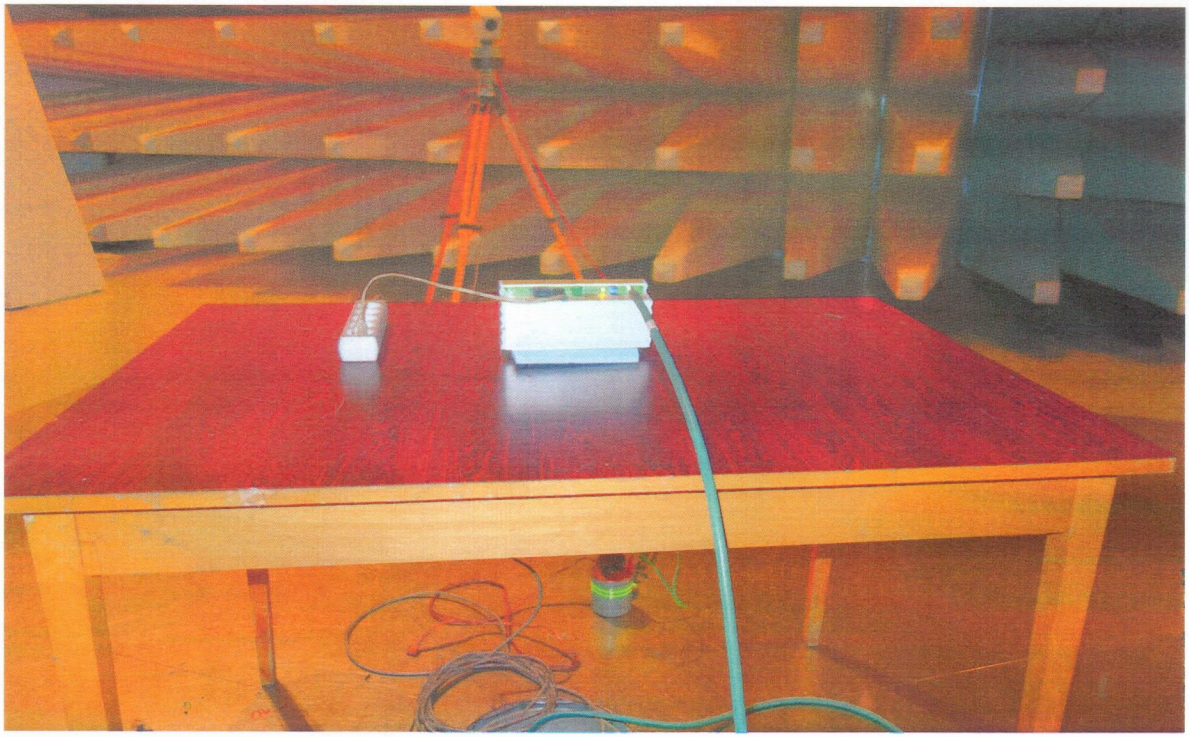
## Measured data - 1 GHz to 6 GHz



**Test setup: Radiated emissions 30 MHz to 1000 MHz - rear view**



**Test setup: Radiated emissions 30 MHz to 1000 MHz - front view**



# Conducted Emissions
# EN 55022

Date of test: 28.1.2014
Ambient temperature: 21 °C ± 3 °C
Relative humidity: 37 % ± 10%
Measured by: P. Nohejl

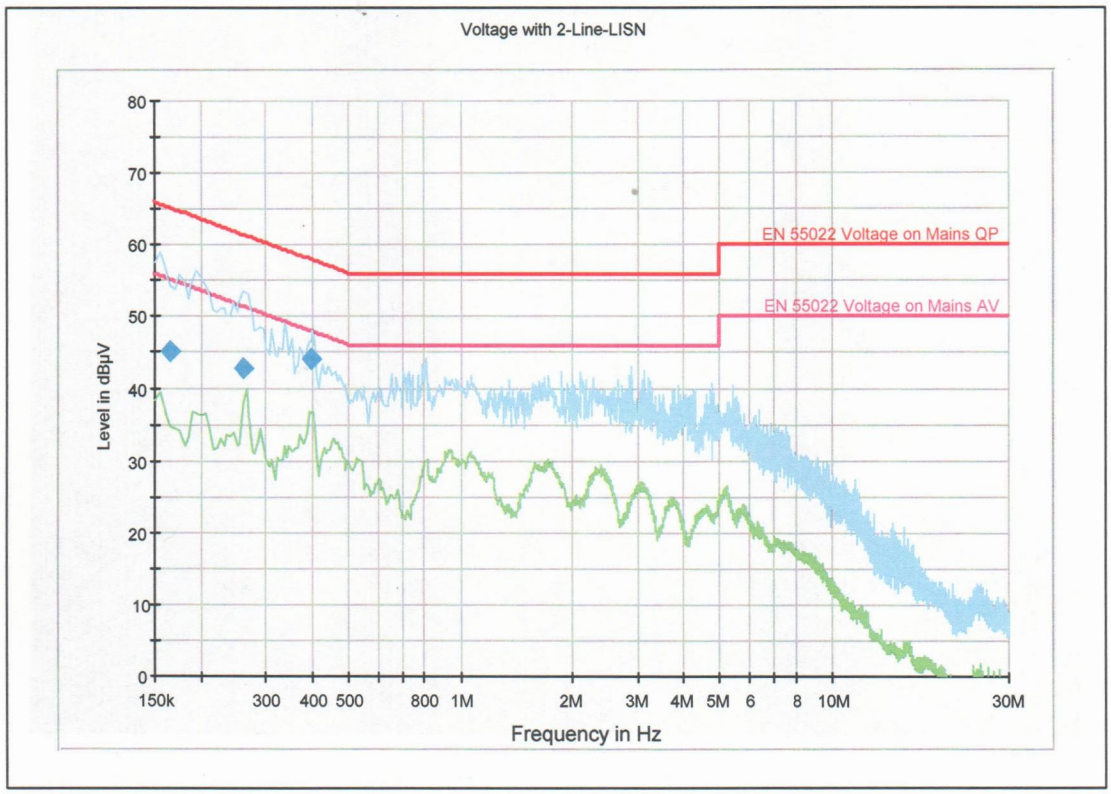
| Measured port | Coupling element | Freq. range [MHz] | Class | Res. |
|---|---|---|---|---|
| napájecí vstup 230 VAC | ESH2-Z5 | 0.15 - 30 | B | P |
| | | | | |

Legend of column "Result": P ...pass acc. to the limits of standard ČSN EN 55022
F ... ails acc. to the limits of standard ČSN EN 55022

**Uncertainties of measurement see Page No. 3**

| Test equipment: | Serial No. | Ident. No. |
|---|---|---|
| EMI test receiver R/S ESHS 30 | 832351/008 | C003 |
| Artifical network R/S ESH2-Z5 | 100220 | C135 |

## Measured data




## Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | Meas. Time (ms) | Bandwidth (kHz) | PE | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 0.165000 | 45.1 | 1000.00 | 10.000 | FL | L1 | 0.0 | 20.1 | 65.2 | |
| 0.260000 | 42.7 | 1000.00 | 10.000 | FL | N | 0.0 | 18.7 | 61.4 | |
| 0.395000 | 44.0 | 1000.00 | 10.000 | FL | N | 0.0 | 14.0 | 58.0 | |