# TEST REPORT

**Product Name : Uninterruptible Power Systems**
**Model Number : NTCS33150-TY, NTCS33160-TY, NTCS33180-TY, NTCS33200-TY**

| | | |
|---|---|---|
| Prepared for | : | Netcon Enterprise Pvt Ltd |
| Address | : | 430A, Kathirvedu, Puzhal, Chennai- 600066, India |
| Prepared by | : | EMTEK (SHENZHEN) CO., LTD. |
| Address | : | Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China<br>Tel: (0755) 26954280<br>Fax: (0755) 26954282 |

| | | |
|---|---|---|
| Report Number | : | ENS2407290306E00501R |
| Date(s) of Tests | : | September 13, 2022 to October 9, 2022 |
| Date of issue | : | August 02, 2024 |

# TABLE OF CONTENT

# TEST REPORT DESCRIPTION

| | | |
|---|---|---|
| Applicant | : | Netcon Enterprise Pvt Ltd |
| Manufacturer | : | Netcon Enterprise Pvt Ltd |
| Trademark | : | NETCON |
| EUT | : | Uninterruptible Power Systems |
| Model Number | : | NTCS33150-TY, NTCS33160-TY, NTCS33180-TY, NTCS33200-TY |
| Power supply | : | Input: 380-415V, 50/60Hz<br>Output: 380-415V, 50/60Hz |

**Measurement Procedure Used:**

EN IEC 62040-2: 2018, IEC 62040-2: 2016
(IEC 61000-4-2:2008, IEC 61000-4-3:2006+A1:2007+A2:2010, IEC61000-4-4:2012,
IEC 61000-4-5:2014+A1:2017, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004+A1:2017,
IEC 61000-2-2:2002+A1:2017)

The device described above is tested by EMTEK (SHENZHEN) CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (SHENZHEN) CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN IEC 62040-2 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (SHENZHEN) CO., LTD.

| | | |
|---|---|---|
| Date of Test | : | September 13, 2022 to October 9, 2022 |
| Prepared by | : | Kangtao Zhang/Editor |
| Reviewer | : | Jessie Hu/Supervisor |
| Approved & Authorized Signer | : | Lisa Wang/Manager |

# Modified Information

| Version | Report No. | Revision Date | Summary |
|---|---|---|---|
| Ver.1.0 | ENS2407290306E00501R | / | Original Report |

# 1. DESCRIPTION OF STANDARDS AND RESULTS (EUT)

| EMISSION | | | |
|---|---|---|---|
| Description of Test Item | Standard | Limits | Results |
| Conducted Emissions | EN IEC 62040-2: 2018 | C3 | Pass |
| Asymmetric mode conducted emissions Wired network ports | EN IEC 62040-2: 2018 | C3 | N/A |
| Radiated emissions at frequencies up to 1 GHz | EN IEC 62040-2: 2018 | C3 | Pass |
| Harmonic Current Emissions | EN 61000-3-12:2011 | Table 3 | N/A |
| Voltage Fluctuation and Flicker | EN IEC 61000-3-11: 2019 | Section 5 | N/A |
| **IMMUNITY** | | | |
| Description of Test Item | Basic Standard | Performance Criteria | Results |
| Electrostatic Discharge (ESD) | IEC 61000-4-2:2008 | B | Pass |
| RF Field Strength Susceptibility (R/S) | IEC 61000-4-3: 2006+A1:2007+A2:2010 | A | Pass |
| Electro Fast Transient (EFT) | IEC 61000-4-4:2012 | B | Pass |
| Surge | IEC 61000-4-5: 2014+A1:2017 | B | Pass |
| Radio-Frequency, Continuous Conducted Disturbance | IEC 61000-4-6:2013 | A | Pass |
| Power Frequency Magnetic Field | IEC 61000-4-8:2009 | A | Pass |
| Voltage Dips and Interruptions | IEC 61000-4-11: 2004+A1:2017 | - | Pass |
| Low Frequency signals | IEC 61000-2-2: 2002+A1:2017 | A | Pass |
| Power Line Unbalance (Three-Phase Ups Systems Only) | EN IEC 62040-2: 2018 | A | Pass |
| Note: N/A is an abbreviation for Not Applicable.<br>1) AC output cable, as declared by the manufacturer in the user manual, does not exceed 10 m in length. | | | |

# 2. GENERAL INFORMATION

## 2.1. Description of Device (EUT)

| | | |
|---|---|---|
| EUT | : | Uninterruptible Power Systems |
| Model Number | : | NTCS33150-TY, NTCS33160-TY, NTCS33180-TY, NTCS33200-TY (Note: These models are identical in circuitry and electrical, mechanical and physical construction; the only difference is the model number. for trading purpose. We prepare NTCS33200-TY for test.) |
| Test Voltage | : | AC 380V/50Hz |
| Applicant | : | Netcon Enterprise Pvt Ltd |
| Address | : | 430A, Kathirvedu, Puzhal, Chennai- 600066, India |
| Manufacturer | : | Netcon Enterprise Pvt Ltd |
| Address | : | 430A, Kathirvedu, Puzhal, Chennai- 600066, India |
| Date of Received | : | September 13, 2022 |
| Date of Test | : | September 13, 2022 to October 9, 2022 |

Note: This report is based on ENS2209080124E00101R change of applicant, manufacturer, address, trademark and model. This change or addition does not affect test results. The original data and records are referred to ENS2209080124E00101R.

## 2.2. Independent Operation Modes

A. On
1. Line Mode

## 2.3. Test Manner

| Test Items | Test Voltage | Operation Modes | Worst case |
|---|---|---|---|
| Conducted disturbance at mains Terminals | AC 380V/50Hz | Mode A | Mode A.1 |
| Radiated emissions at frequencies up to 1 GHz | AC 380V/50Hz | Mode A | Mode A.1 |
| Harmonic Current Emissions | AC 380V/50Hz | Mode A.1 | / |
| Voltage Fluctuation and Flicker | AC 380V/50Hz | Mode A.1 | / |
| EMS | AC 380V/50Hz | Mode A | / |

## 2.4. Description of Support Device

N/A

## 2.5. Description of Test Facility

Site Description

EMC Lab. : **Accredited by CNAS**
The Certificate Registration Number is L2291.
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01 (identical to ISO/IEC 17025:2017)

**Accredited by FCC**
Designation Number: CN1204
Test Firm Registration Number: 882943

**Accredited by A2LA**
The Certificate Number is 4321.01.

**Accredited by Industry Canada**
The Conformity Assessment Body Identifier is CN0008

Name of Firm : EMTEK (SHENZHEN) CO., LTD.

Site Location : Building 69, Majialong, Industry Zone, Nanshan District, Shenzhen, Guangdong, China

## 2.6. Measurement Uncertaintys

| Test Item | | Uncertainty |
|---|---|---|
| Conducted Emission Uncertainty | : | 2.08dB (9k~150kHz Conduction 1#)<br>2.40dB (150k-30MHz Conduction 1#) |
| Radiated Emission Uncertainty (10m Chamber) | : | 4.58dB (30M~1GHz Polarize: H)<br>4.54dB (30M~1GHz Polarize: V) |
| Uncertainty for Harmonic test | : | 1.8% |
| Uncertainty for C/S Test | : | 1.45(Using CDN Test)<br>2.37(Using EM Clamp Test) |
| Uncertainty for R/S Test | : | 2.10dB(80MHz-200MHz)<br>1.76dB(200MHz-1000MHz) |
| Uncertainty for test site temperature and humidity | : | 0.6℃<br>4% |

# 3. MEASURING DEVICE AND TEST EQUIPMENT

## 3.1. For Conducted Emissions At the Mains Power Ports

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | EMI Test Receiver | Rohde & Schwarz | ESCI | 101384 | May 14, 2022 | 1 Year |
| ☑ | AMN | Rohde & Schwarz | ENV216 | 101161 | May 14, 2022 | 1 Year |
| ☑ | AMN | Kyoritsu | KNW-407 | 8-1492-9 | May 14, 2022 | 1 Year |

## 3.2. For Radiated Emission Measurement

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | Loop Antenna | Schwarzbeck | FMZB1519 | 1519-012 | June 12, 2021 | 2 Year |
| ☑ | Bilog Antenna | Schwarzbeck | VULB9163 | 661 | June 12, 2021 | 2 Year |
| ☑ | Bilog Antenna | Schwarzbeck | VULB9163 | 660 | June 12, 2021 | 2 Year |
| ☑ | EMI Test Receiver | Rohde & Schwarz | ESR3 | 101706 | May 14, 2022 | 1 Year |
| ☑ | Pre-Amplifier | Lunar EM | LNA10M1G-40 | J1011131126001 | May 14, 2022 | 1 Year |
| ☑ | Pre-Amplifier | Lunar EM | LNA10M1G-40 | J1011131126002 | May 14, 2022 | 1 Year |
| ☑ | Loop Antenna | Schwarzbeck | FMZB1519 | 1519-012 | June 12, 2021 | 2 Year |

## 3.3. For Harmonic Current / Flicker Measurement

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | 45KVA AC Power source | Teseq | NSG 1007-45/45KVA | 1305A02873 | May 15, 2022 | 1 Year |
| ☑ | Signal conditioning Unit | Teseq | CCN 1000-3 | 1305A02873 | May 15, 2022 | 1 Year |
| ☑ | Impedance network | Teseq | INA2197/37A | 1305A02873 | May 15, 2022 | 1 Year |
| ☑ | Impedance network | Teseq | INA 2196/75A | 1305A02874 | May 15, 2022 | 1 Year |
| ☑ | Profline 2100 AC Switching Unit | Teseq | NSG 2200-3 | A22714 | May 15, 2022 | 1 Year |

## 3.4. For Electrostatic Discharge Immunity Test

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | ESD Tester | TESEQ AG | NSG 438A | 130 | June 23, 2022 | 1 Year |

## 3.5. For RF Strength Susceptibility Test

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | Power Amplifier | MILMEGA | AS0102-55 | 1018770 | May 14, 2022 | 1 Year |
| ☑ | RF Power Meter. Dual Channel | BOONTON | 4232A | 10539 | May 14, 2022 | 1 Year |
| ☑ | Log.-Per. Antenna | SCHWARZBECK | VULP 9118E | 811 | N/A | N/A |
| ☑ | Signal Generator | Agilent | N5181A | MY50145187 | May 14, 2022 | 1 Year |
| ☑ | 50ohm Diode Power Sensor | BOONTON | 51011EMC | 36164 | May 14, 2022 | 1 Year |
| ☑ | Broad-Band Horn Antenna | SCHWARZBECK | STLP 9149 | 9149-227 | N/A | N/A |
| ☑ | Field Strength Meter | DARE | RSS1006A | 10I00037SNO 22 | May 23, 2022 | 1 Year |
| ☑ | Multi-function interface system | DARE | CTR1009B | 12I00250SNO 72 | N/A | N/A |
| ☑ | Automatic switch group | DARE | RSW1004A | N/A | N/A | N/A |
| ☑ | Power Amplifier | MILMEGA | AS1860-50 | 1059346 | May 14, 2022 | 1 Year |
| ☑ | Power Amplifier | MILMEGA | 80RF1000-17 5 | 1059345 | May 14, 2022 | 1 Year |
| ☑ | Directional Coupler | MILMEGA | DC6180AM1 | 0340463 | May 14, 2022 | 1 Year |
| ☑ | Audio Analyzer | R&S | UPV | 101473 | May 14, 2022 | 1 Year |
| ☑ | Audio Test System | AUDIO PRECISION | ATS-1 | 41100 | May 14, 2022 | 1 Year |

## 3.6. For Electrical Fast Transient / Burst Immunity Test

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | Burst Tester | HAEFELY | PEFT4010 | 080981-16 | May 15, 2022 | 1 Year |
| ☐ | Coupling Clamp | HAEFELY | IP-4A | 147147 | May 15, 2022 | 1 Year |

## 3.7. For Surge Immunity Test

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | Controller | HAEFELY | Psurge 8000 | 174031 | May 15, 2022 | 1 Year |
| ☑ | Impulse Module | HAEFELY | PIM 100 | 174124 | May 15, 2022 | 1 Year |
| ☑ | Coupling Decoupling | HAEFELY | PCD 130 | 172181 | May 15, 2022 | 1 Year |
| ☐ | Coupling Module | HAEFELY | PCD122 | 174354 | May 15, 2022 | 1 Year |
| ☐ | Impulse Module | HAEFELY | PIM 120 | 174435 | May 15, 2022 | 1 Year |
| ☐ | Coupling Module | HAEFELY | PCD 126A | 174387 | May 15, 2022 | 1 Year |
| ☐ | Impulse Module | HAEFELY | PIM 110 | 174391 | May 15, 2022 | 1 Year |
| ☐ | Impulse Module | HAEFELY | PIM 150 | 178707 | May 15, 2022 | 1 Year |
| ☐ | Impulse Module | PMI | PCDN8 | 190422 | May 15, 2022 | 1 Year |

## 3.8. For Injected Current Susceptibility Test

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | Continuous Wave Simulator | EMTEST | CWS500C | 0900-12 | May 15, 2022 | 1 Year |
| ☐ | CDN | EMTEST | CDN-M2 | 510010010010 | May 15, 2022 | 1 Year |
| ☑ | CDN | EMTEST | CDN-M3 | 0900-11 | May 14, 2022 | 1 Year |
| ☑ | EM Injection Clamp | EMTEST | F-2031-23MM | 368 | May 15, 2022 | 1 Year |
| ☑ | Attenuator | EMTEST | 100W 6dB DC-3G | / | May 14, 2022 | 1 Year |
| ☐ | Signal Generator | R&S | SMB100A | 103041 | May 14, 2022 | 1 Year |
| ☑ | CDN | LUTHI | CDN L-801 M2/M3 | 2606 | May 14, 2022 | 1 Year |

## 3.9. For Magnetic Field Immunity Test

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | Magnetic Field Tester | HAEFELY | MAG100 | 250040.1 | May 15, 2022 | 1 Year |

## 3.10. For Voltage Dips and Interruptions Test

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | 45KVA AC Power source | Teseq | NSG 1007-45/45KVA | 1305A02873 | May 15, 2022 | 1 Year |
| ☐ | Signal conditioning Unit | Teseq | CCN 1000-3 | 1305A02873 | May 15, 2022 | 1 Year |
| ☐ | Impedance network | Teseq | INA2197/37A | 1305A02873 | May 15, 2022 | 1 Year |
| ☐ | Impedance network | Teseq | INA 2196/75A | 1305A02874 | May 15, 2022 | 1 Year |
| ☑ | Profline 2100 AC Switching Unit | Teseq | NSG 2200-3 | A22714 | May 15, 2022 | 1 Year |

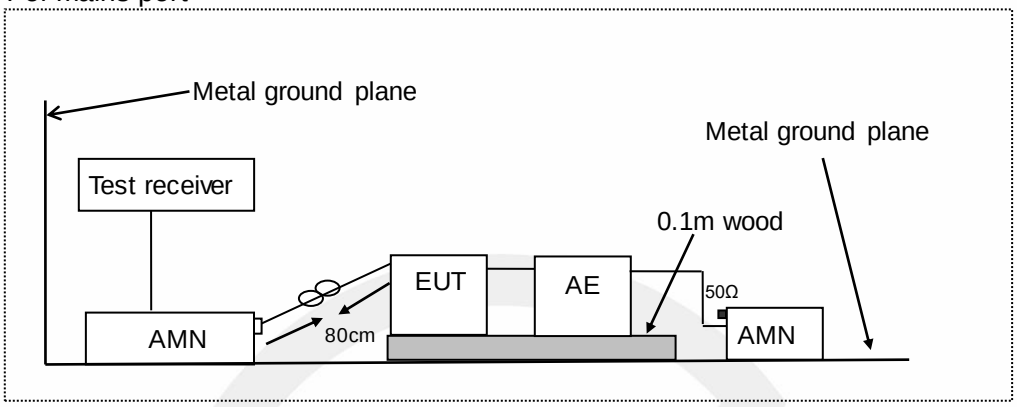
## 3.11. Low Frequency Signals Test

| Used | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| ☑ | Programmable AC Source | CHROMA | 6530 | 5341 | May 15, 2022 | 1 Year |

# 4. CONDUCTED EMISSIONS FROM THE AC MAINS POWER PORTS

## 4.1. Block Diagram of Test Setup

For mains port




AMN: Artificial Mains Network
AE: Associated equipment
EUT: Equipment under test

## 4.2. Limits

**Table 2 – Limits of mains terminal and network port disturbance voltage for category C3 UPS in the frequency range 0,15 MHz to 30 MHz**

| UPS rated output current | Frequency range | Limits dB (μV) | | | |
|---|---|---|---|---|---|
| | | Mains terminal | | Network port | |
| A | MHz | Quasi-peak | Average | Quasi-peak | Average |
| > 16 to 100 | 0,15 to 0,50[b] | 100 | 90 | 110 to 100[a] | 94 to 84[a] |
| | 0,50 to 5,0[b] | 86 | 76 | 100 | 84 |
| | 5,0 to 30,0 | 90 to 73[a] | 80 to 60[a] | | |
| > 100 | 0,15 to 0,50[b] | 130 | 120 | 110 to 100[a] | 94 to 84[a] |
| | 0,50 to 5,0[b] | 125 | 115 | 100 | 84 |
| | 5,0 to 30,0 | 115 | 105 | | |

[a] The limits decrease linearly with the logarithm of the frequency.
[b] The lower limit shall apply at the transition frequency.

## 4.3. Test Procedure

The EUT was placed on a desk 0.1 m height from the metal ground plane and 0.4 m from the conducting wall of the shielding room and it was kept at least 0.8 m from any other grounded conducting surface. The size of the table will nominally be 1.5 m x1.0 m.

The rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.

All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units.

Connect EUT to the power mains through a artificial mains network (AMN). Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

All the support units are connecting to the other AMN.

The AMN provides 50 ohm coupling impedance for the measuring instrument.

The CISPR states that the AMN with 50 ohm and 50 microhenry should be used.

Both sides of AC line were checked for maximum conducted interference.

The frequency range from 150 kHz to 30 MHz was sweep.

Set the test-receiver system to quasi peak detect function and average detect function, and to measure the conducted emissions values.

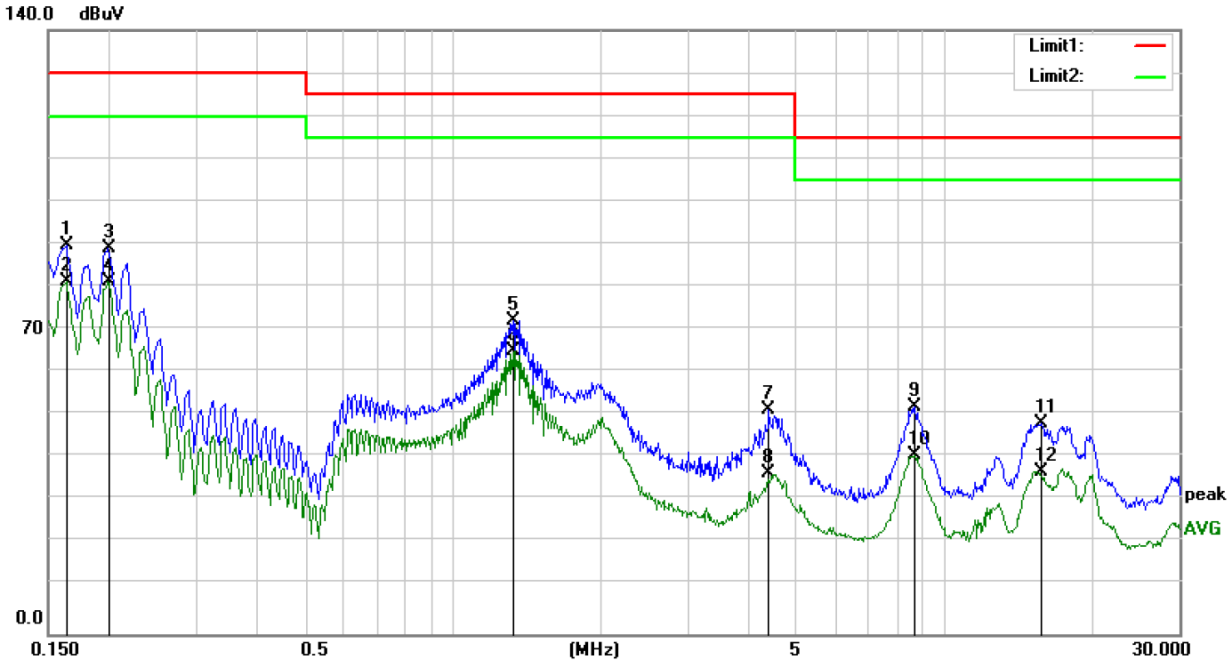
Test results were obtained from the following equation:
Emission Level (dBµV) = AMN Factor (dB) + Cable Loss (dB) + Reading (dBµV)
Margin (dB) = Emission Level (dBµV) - Limit (dBµV)

## 4.4. Measuring Results

**PASS.**

Please refer to the following pages.

INPUT



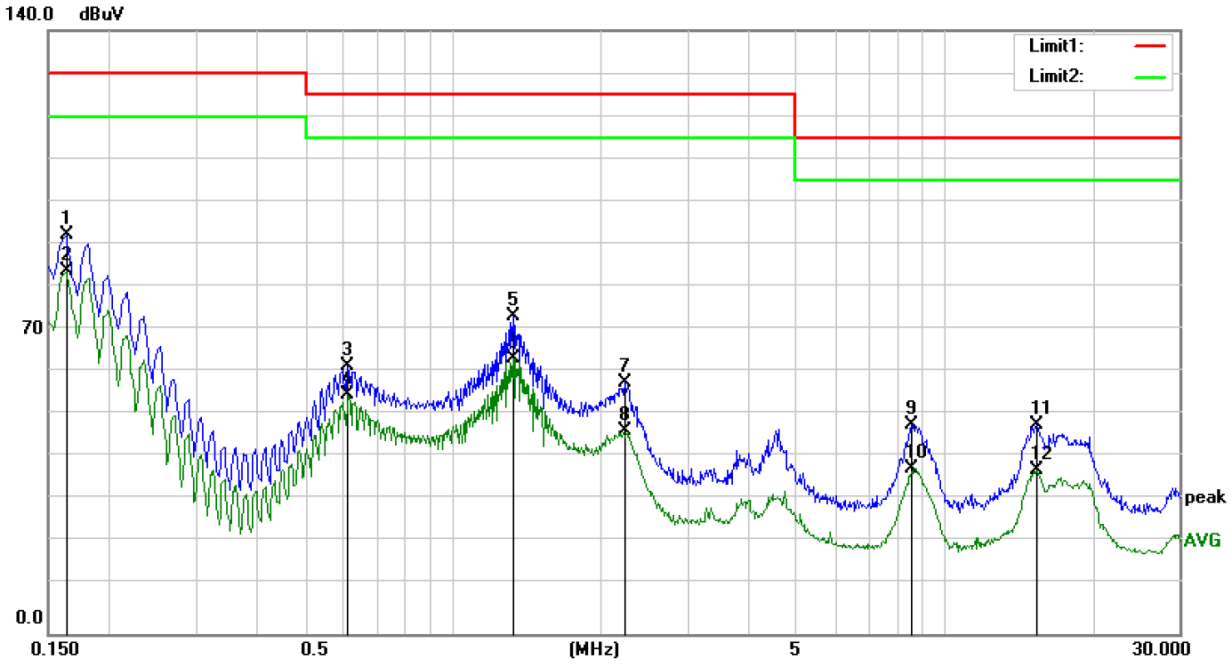

Site Conduction #1 Phase: L1 Temperature: 21.9

Limit: (CE)EN62040-2 C3_QP(>100A) Power: AC 380V/50Hz Humidity: 58 %

Mode: Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1635 | 80.49 | 9.59 | 90.08 | 130.00 | -39.92 | QP | |
| 2 | | 0.1635 | 72.03 | 9.59 | 81.62 | 120.00 | -38.38 | AVG | |
| 3 | | 0.1995 | 79.80 | 9.62 | 89.42 | 130.00 | -40.58 | QP | |
| 4 | * | 0.1995 | 72.02 | 9.62 | 81.64 | 120.00 | -38.36 | AVG | |
| 5 | | 1.3244 | 63.12 | 9.60 | 72.72 | 125.00 | -52.28 | QP | |
| 6 | | 1.3244 | 55.99 | 9.60 | 65.59 | 115.00 | -49.41 | AVG | |
| 7 | | 4.3890 | 42.27 | 9.54 | 51.81 | 125.00 | -73.19 | QP | |
| 8 | | 4.3890 | 27.58 | 9.54 | 37.12 | 115.00 | -77.88 | AVG | |
| 9 | | 8.7000 | 43.02 | 9.55 | 52.57 | 115.00 | -62.43 | QP | |
| 10 | | 8.7000 | 32.00 | 9.55 | 41.55 | 105.00 | -63.45 | AVG | |
| 11 | | 15.7965 | 39.21 | 9.66 | 48.87 | 115.00 | -66.13 | QP | |
| 12 | | 15.7965 | 28.12 | 9.66 | 37.78 | 105.00 | -67.22 | AVG | |



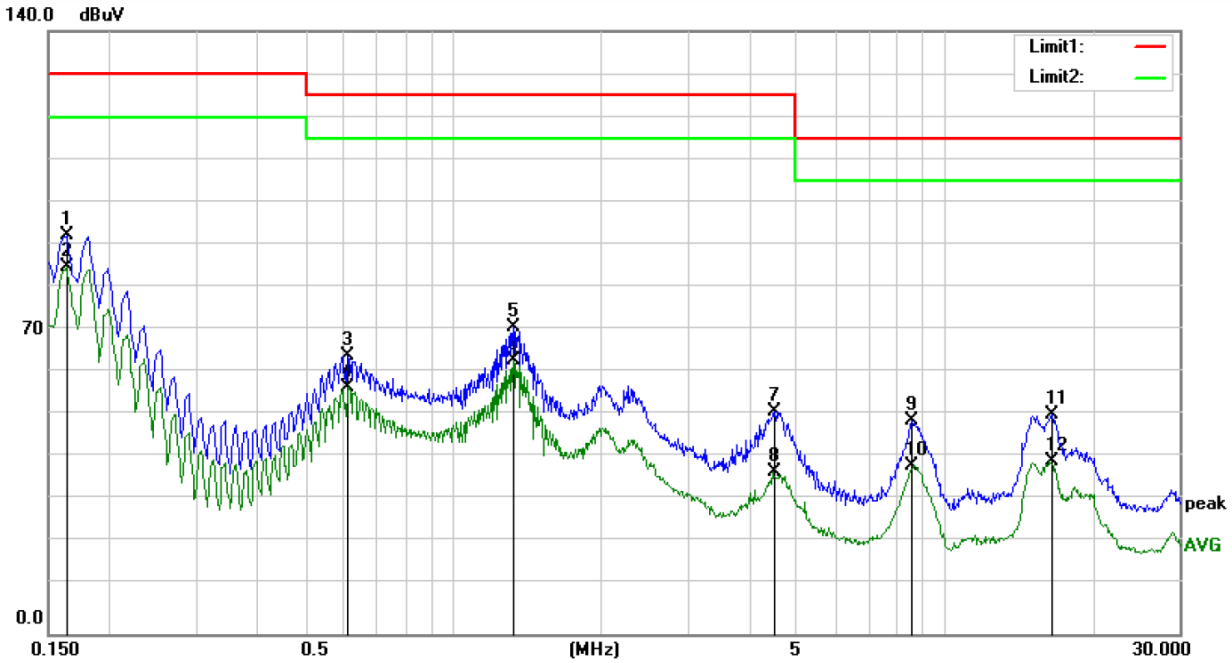

Site Conduction #1 Phase: L2 Temperature: 21.9

Limit: (CE)EN62040-2 C3_QP(>100A) Power: AC 380V/50Hz Humidity: 58 %

Mode: Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1635 | 83.04 | 9.59 | 92.63 | 130.00 | -37.37 | QP | |
| 2 | * | 0.1635 | 74.72 | 9.59 | 84.31 | 120.00 | -35.69 | AVG | |
| 3 | | 0.6134 | 52.68 | 9.61 | 62.29 | 125.00 | -62.71 | QP | |
| 4 | | 0.6134 | 45.73 | 9.61 | 55.34 | 115.00 | -59.66 | AVG | |
| 5 | | 1.3244 | 63.95 | 9.60 | 73.55 | 125.00 | -51.45 | QP | |
| 6 | | 1.3244 | 54.43 | 9.60 | 64.03 | 115.00 | -50.97 | AVG | |
| 7 | | 2.2470 | 48.66 | 9.59 | 58.25 | 125.00 | -66.75 | QP | |
| 8 | | 2.2470 | 37.43 | 9.59 | 47.02 | 115.00 | -67.98 | AVG | |
| 9 | | 8.5875 | 39.08 | 9.54 | 48.62 | 115.00 | -66.38 | QP | |
| 10 | | 8.5875 | 28.96 | 9.54 | 38.50 | 105.00 | -66.50 | AVG | |
| 11 | | 15.4365 | 38.93 | 9.65 | 48.58 | 115.00 | -66.42 | QP | |
| 12 | | 15.4365 | 28.21 | 9.65 | 37.86 | 105.00 | -67.14 | AVG | |



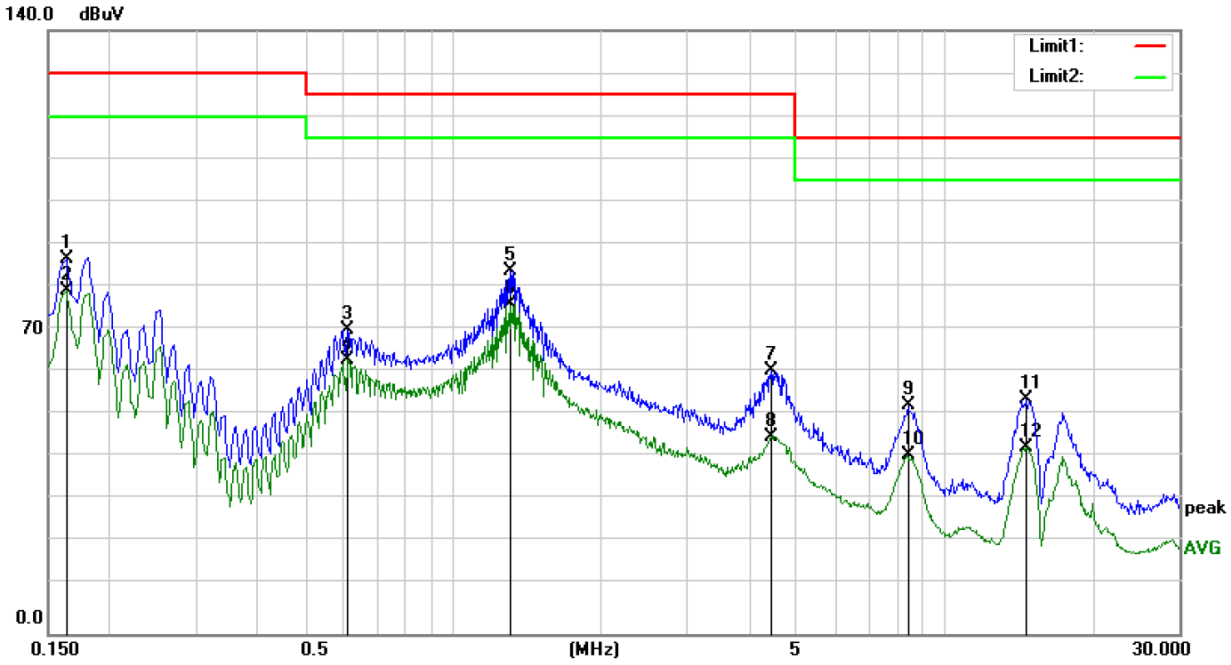

Site Conduction #1 Phase: *L3* Temperature: 21.9

Limit: (CE)EN62040-2 C3_QP(>100A) Power: AC 380V/50Hz Humidity: 58 %

Mode: Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1635 | 83.01 | 9.59 | 92.60 | 130.00 | -37.40 | QP | |
| 2 | * | 0.1635 | 75.51 | 9.59 | 85.10 | 120.00 | -34.90 | AVG | |
| 3 | | 0.6134 | 54.89 | 9.61 | 64.50 | 125.00 | -60.50 | QP | |
| 4 | | 0.6134 | 47.68 | 9.61 | 57.29 | 115.00 | -57.71 | AVG | |
| 5 | | 1.3245 | 61.67 | 9.60 | 71.27 | 125.00 | -53.73 | QP | |
| 6 | | 1.3245 | 53.96 | 9.60 | 63.56 | 115.00 | -51.44 | AVG | |
| 7 | | 4.5195 | 41.97 | 9.53 | 51.50 | 125.00 | -73.50 | QP | |
| 8 | | 4.5195 | 28.15 | 9.53 | 37.68 | 115.00 | -77.32 | AVG | |
| 9 | | 8.5785 | 39.93 | 9.54 | 49.47 | 115.00 | -65.53 | QP | |
| 10 | | 8.5785 | 29.34 | 9.54 | 38.88 | 105.00 | -66.12 | AVG | |
| 11 | | 16.5390 | 41.39 | 9.68 | 51.07 | 115.00 | -63.93 | QP | |
| 12 | | 16.5390 | 30.55 | 9.68 | 40.23 | 105.00 | -64.77 | AVG | |




Site Conduction #1 Phase: N Temperature: 21.9

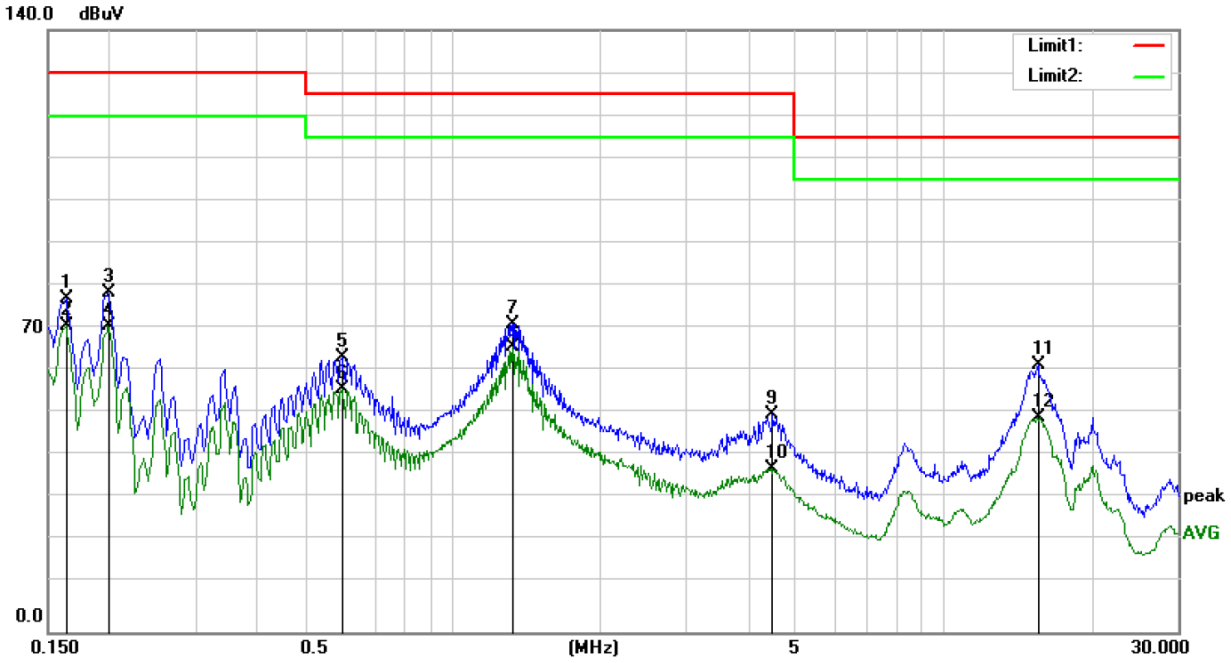
Limit: (CE)EN62040-2 C3_QP(>100A) Power: AC 380V/50Hz Humidity: 58 %

Mode: Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1635 | 77.37 | 9.59 | 86.96 | 130.00 | -43.04 | QP | |
| 2 | | 0.1635 | 70.08 | 9.59 | 79.67 | 120.00 | -40.33 | AVG | |
| 3 | | 0.6134 | 60.96 | 9.61 | 70.57 | 125.00 | -54.43 | QP | |
| 4 | | 0.6134 | 54.05 | 9.61 | 63.66 | 115.00 | -51.34 | AVG | |
| 5 | | 1.3065 | 74.70 | 9.60 | 84.30 | 125.00 | -40.70 | QP | |
| 6 | * | 1.3065 | 66.93 | 9.60 | 76.53 | 115.00 | -38.47 | AVG | |
| 7 | | 4.4520 | 51.53 | 9.54 | 61.07 | 125.00 | -63.93 | QP | |
| 8 | | 4.4520 | 36.31 | 9.54 | 45.85 | 115.00 | -69.15 | AVG | |
| 9 | | 8.4480 | 43.42 | 9.55 | 52.97 | 115.00 | -62.03 | QP | |
| 10 | | 8.4480 | 31.81 | 9.55 | 41.36 | 105.00 | -63.64 | AVG | |
| 11 | | 14.7075 | 44.69 | 9.64 | 54.33 | 115.00 | -60.67 | QP | |
| 12 | | 14.7075 | 33.69 | 9.64 | 43.33 | 105.00 | -61.67 | AVG | |

OUTPUT



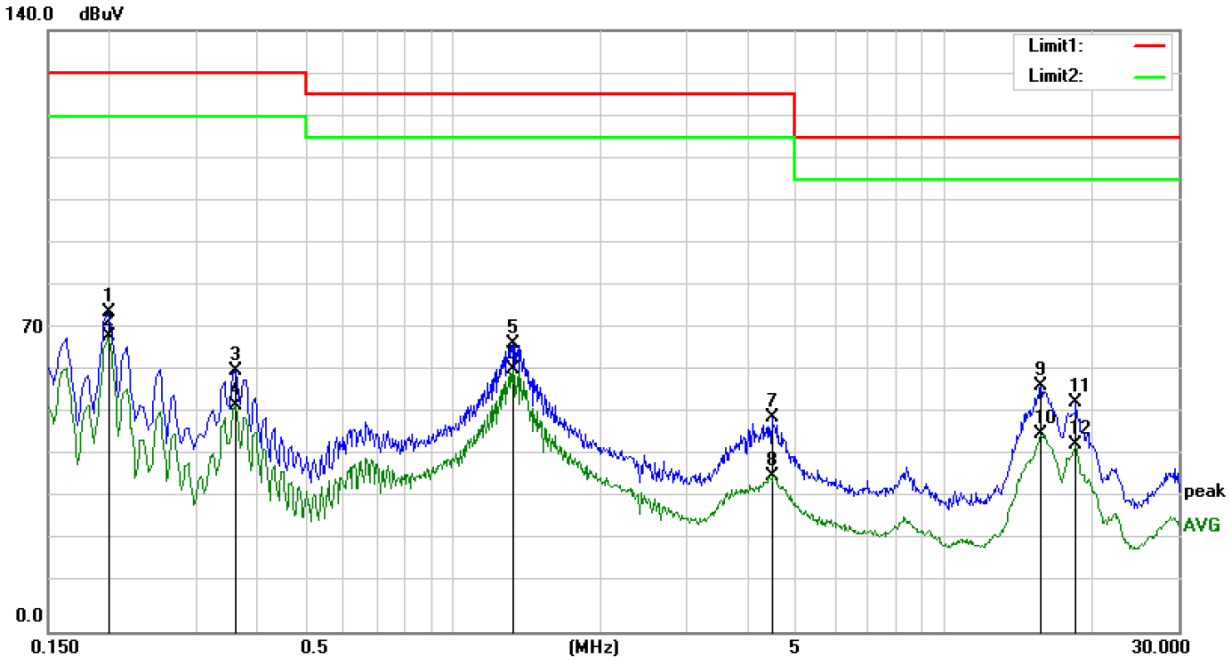

Site Conduction #1 Phase: L1 Temperature: 21.9

Limit: (CE)EN62040-2 C3_QP(>100A) Power: AC 380V/50Hz Humidity: 58 %

Mode: Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1635 | 67.95 | 9.59 | 77.54 | 130.00 | -52.46 | QP | |
| 2 | | 0.1635 | 61.47 | 9.59 | 71.06 | 120.00 | -48.94 | AVG | |
| 3 | | 0.1995 | 69.45 | 9.62 | 79.07 | 130.00 | -50.93 | QP | |
| 4 | | 0.1995 | 61.53 | 9.62 | 71.15 | 120.00 | -48.85 | AVG | |
| 5 | | 0.5954 | 54.24 | 9.61 | 63.85 | 125.00 | -61.15 | QP | |
| 6 | | 0.5954 | 46.81 | 9.61 | 56.42 | 115.00 | -58.58 | AVG | |
| 7 | | 1.3244 | 62.14 | 9.60 | 71.74 | 125.00 | -53.26 | QP | |
| 8 | * | 1.3244 | 56.67 | 9.60 | 66.27 | 115.00 | -48.73 | AVG | |
| 9 | | 4.4835 | 41.04 | 9.54 | 50.58 | 125.00 | -74.42 | QP | |
| 10 | | 4.4835 | 28.36 | 9.54 | 37.90 | 115.00 | -77.10 | AVG | |
| 11 | | 15.5580 | 52.58 | 9.65 | 62.23 | 115.00 | -52.77 | QP | |
| 12 | | 15.5580 | 40.33 | 9.65 | 49.98 | 105.00 | -55.02 | AVG | |



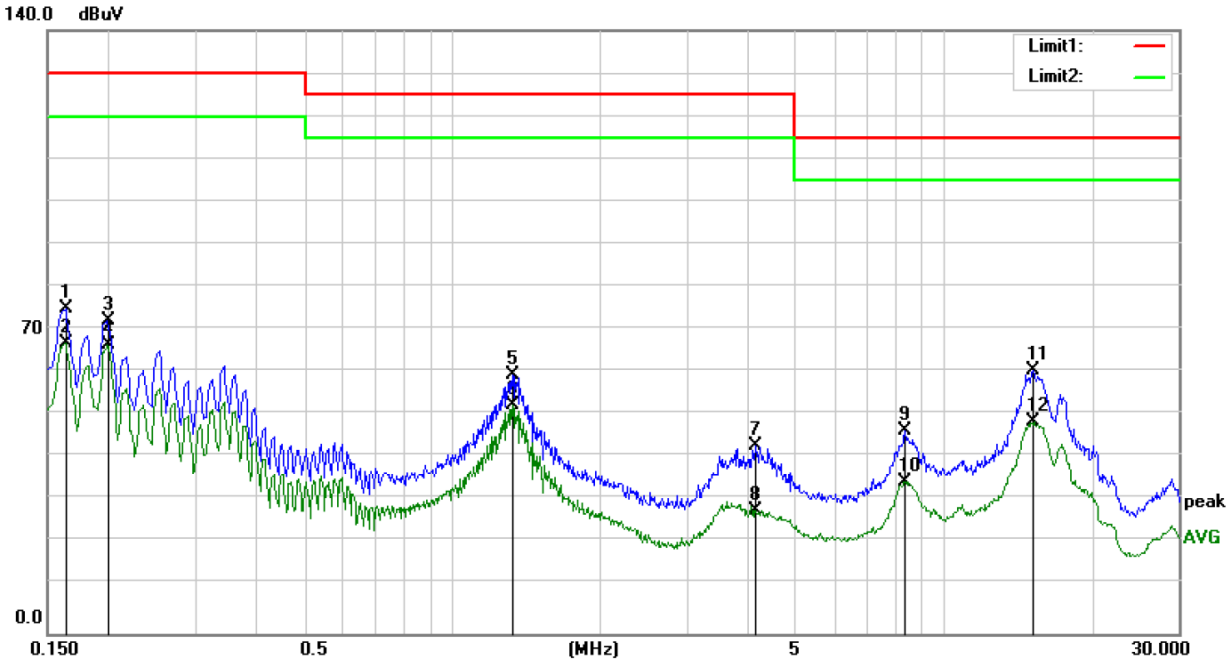

Site Conduction #1 Phase: L2 Temperature: 21.9

Limit: (CE)EN62040-2 C3_QP(>100A) Power: AC 380V/50Hz Humidity: 58 %

Mode: Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1995 | 64.82 | 9.62 | 74.44 | 130.00 | -55.56 | QP | |
| 2 | * | 0.1995 | 59.07 | 9.62 | 68.69 | 120.00 | -51.31 | AVG | |
| 3 | | 0.3614 | 51.10 | 9.68 | 60.78 | 130.00 | -69.22 | QP | |
| 4 | | 0.3614 | 43.06 | 9.68 | 52.74 | 120.00 | -67.26 | AVG | |
| 5 | | 1.3244 | 57.42 | 9.60 | 67.02 | 125.00 | -57.98 | QP | |
| 6 | | 1.3244 | 51.49 | 9.60 | 61.09 | 115.00 | -53.91 | AVG | |
| 7 | | 4.4744 | 40.25 | 9.54 | 49.79 | 125.00 | -75.21 | QP | |
| 8 | | 4.4744 | 26.73 | 9.54 | 36.27 | 115.00 | -78.73 | AVG | |
| 9 | | 15.7650 | 47.61 | 9.66 | 57.27 | 115.00 | -57.73 | QP | |
| 10 | | 15.7650 | 36.35 | 9.66 | 46.01 | 105.00 | -58.99 | AVG | |
| 11 | | 18.5685 | 43.76 | 9.74 | 53.50 | 115.00 | -61.50 | QP | |
| 12 | | 18.5685 | 33.89 | 9.74 | 43.63 | 105.00 | -61.37 | AVG | |



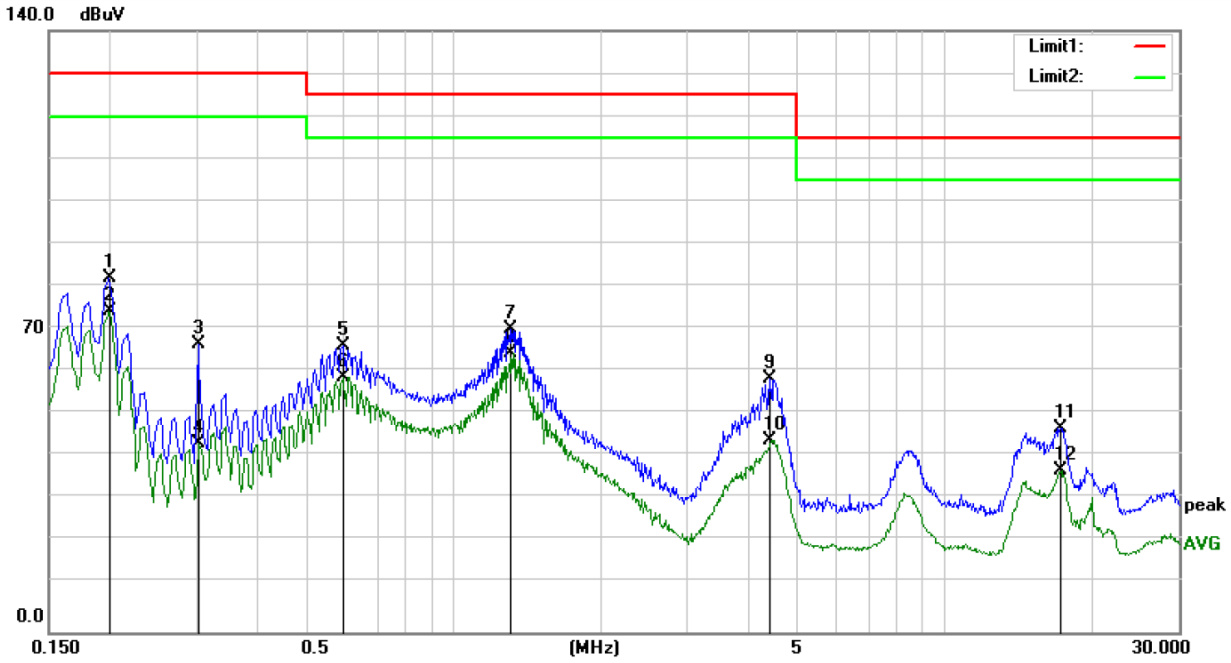

Site Conduction #1 Phase: L3 Temperature: 21.9

Limit: (CE)EN62040-2 C3_QP(>100A) Power: AC 380V/50Hz Humidity: 58 %

Mode: Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1635 | 65.85 | 9.59 | 75.44 | 130.00 | -54.56 | QP | |
| 2 | * | 0.1635 | 57.94 | 9.59 | 67.53 | 120.00 | -52.47 | AVG | |
| 3 | | 0.1995 | 63.14 | 9.62 | 72.76 | 130.00 | -57.24 | QP | |
| 4 | | 0.1995 | 57.52 | 9.62 | 67.14 | 120.00 | -52.86 | AVG | |
| 5 | | 1.3244 | 50.58 | 9.60 | 60.18 | 125.00 | -64.82 | QP | |
| 6 | | 1.3244 | 43.58 | 9.60 | 53.18 | 115.00 | -61.82 | AVG | |
| 7 | | 4.1370 | 33.89 | 9.55 | 43.44 | 125.00 | -81.56 | QP | |
| 8 | | 4.1370 | 19.00 | 9.55 | 28.55 | 115.00 | -86.45 | AVG | |
| 9 | | 8.3535 | 37.40 | 9.55 | 46.95 | 115.00 | -68.05 | QP | |
| 10 | | 8.3535 | 25.75 | 9.55 | 35.30 | 105.00 | -69.70 | AVG | |
| 11 | | 15.1935 | 51.27 | 9.65 | 60.92 | 115.00 | -54.08 | QP | |
| 12 | | 15.1935 | 39.43 | 9.65 | 49.08 | 105.00 | -55.92 | AVG | |




Site Conduction #1 Phase: N Temperature: 21.9

Limit: (CE)EN62040-2 C3_QP(>100A) Power: AC 380V/50Hz Humidity: 58 %

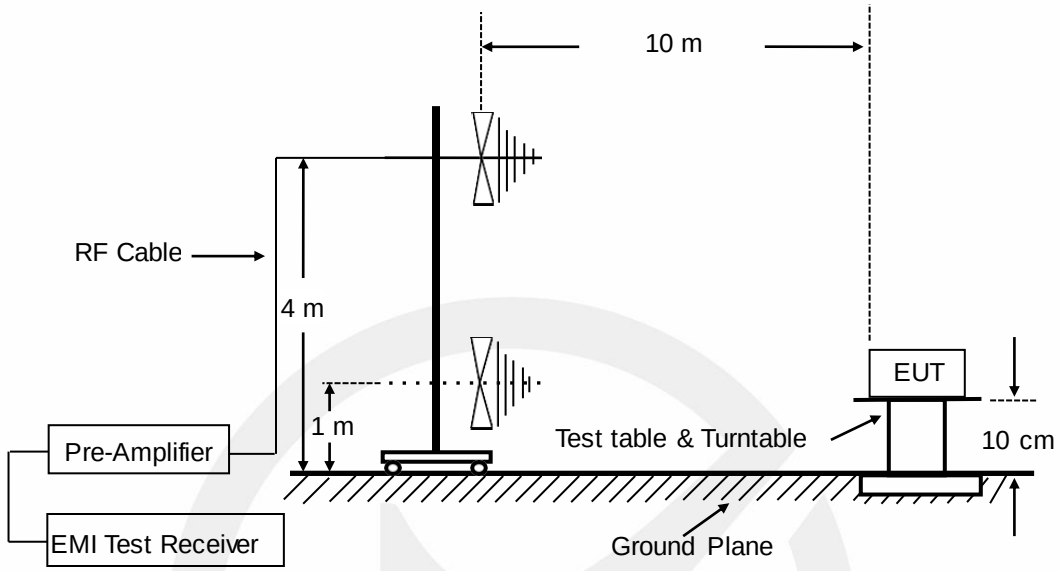
Mode: Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1995 | 72.83 | 9.62 | 82.45 | 130.00 | -47.55 | QP | |
| 2 | * | 0.1995 | 65.20 | 9.62 | 74.82 | 120.00 | -45.18 | AVG | |
| 3 | | 0.3030 | 57.17 | 9.71 | 66.88 | 130.00 | -63.12 | QP | |
| 4 | | 0.3030 | 34.25 | 9.71 | 43.96 | 120.00 | -76.04 | AVG | |
| 5 | | 0.5954 | 57.21 | 9.61 | 66.82 | 125.00 | -58.18 | QP | |
| 6 | | 0.5954 | 49.56 | 9.61 | 59.17 | 115.00 | -55.83 | AVG | |
| 7 | | 1.3064 | 60.93 | 9.60 | 70.53 | 125.00 | -54.47 | QP | |
| 8 | | 1.3064 | 55.22 | 9.60 | 64.82 | 115.00 | -50.18 | AVG | |
| 9 | | 4.4294 | 49.33 | 9.54 | 58.87 | 125.00 | -66.13 | QP | |
| 10 | | 4.4294 | 35.19 | 9.54 | 44.73 | 115.00 | -70.27 | AVG | |
| 11 | | 17.2815 | 37.77 | 9.70 | 47.47 | 115.00 | -67.53 | QP | |
| 12 | | 17.2815 | 27.87 | 9.70 | 37.57 | 105.00 | -67.43 | AVG | |

# 5. RADIATED EMISSION MEASUREMENT (UP TO 1GHz)

## 5.1. Block Diagram of Test Setup




## 5.2. Radiated Limit

**Table 3 – Limits of radiated emission in the frequency range 30 MHz to 1 000 MHz**

| Frequency range | Quasi-peak limits dB (μV/m) | | |
|---|---|---|---|
| MHz | Category C1 UPS | Category C2 UPS | Category C3 UPS |
| 30 to 230[a] | 30 | 40 | 50 |
| 230 to 1 000 | 37 | 47 | 60 |
| [a] The lower limit shall apply at the transition frequency. | | | |

## 5.3. Test Procedure

The EUT was placed on a non-conductive table whose total height equaled 10cm. All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units. Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

The EUT was set 3 meters (or 10 meters) away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.

The turntable can rotate 360 degree to determine the position of the maximum emission level.

The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.

The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

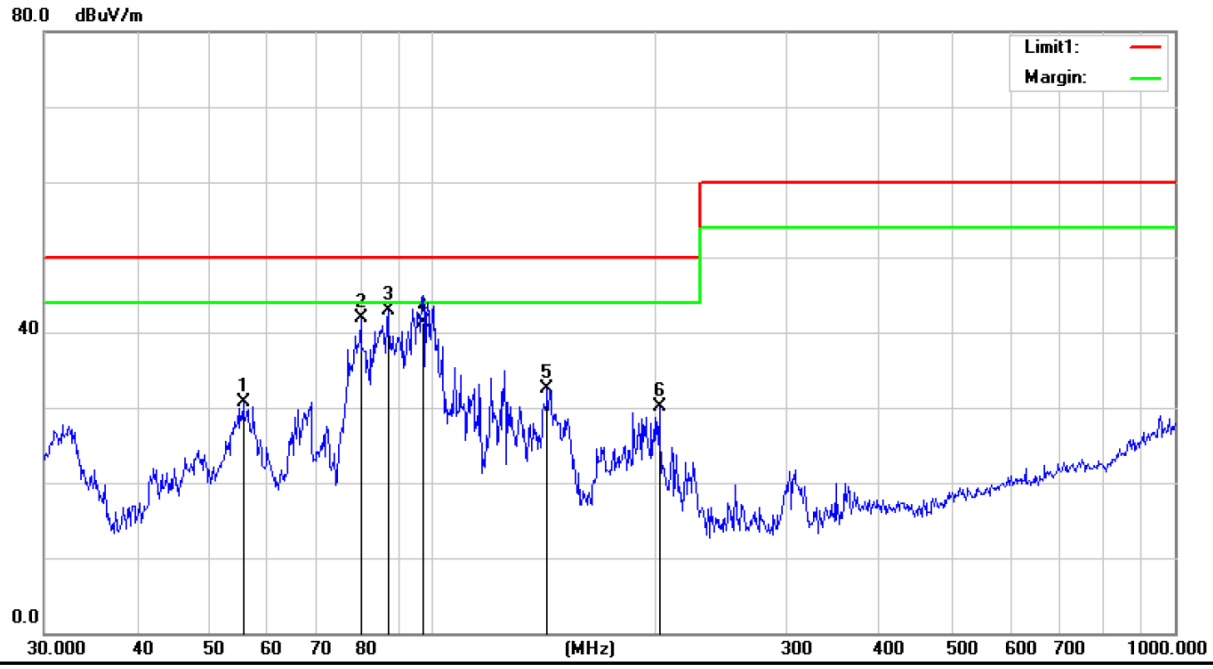
The bandwidth of the Receiver is set at 120 kHz.

Test results were obtained from the following equation:
Emission level (dBμV/m) = Antenna Factor -Amp Factor +Cable Loss + Reading
Margin (dB) = Emission Level (dBμV/m) - Limit (dBμV/m)

## 5.4. Measuring Results

**PASS.**

Please refer to the following pages.



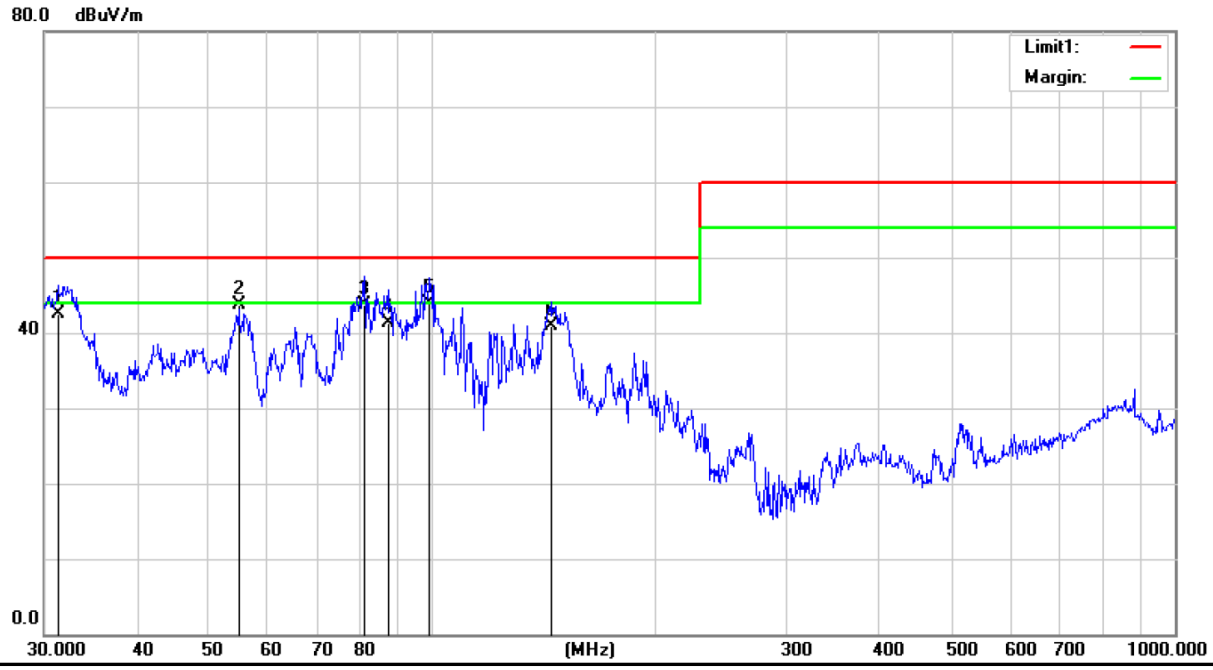

Site 10m Chamber 1# Polarization: *Horizontal* Temperature: 26

Limit: (RE10M)EN62040-2_C3 Power: AC 380V/50Hz Humidity: 60 %

Mode:Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Ant. Factor | Pre Amp Gain | Cable loss | Measure-ment | Limit | Over | | HI | Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | Detector | cm | deg. | Comment |
| 1 | | 55.6094 | 60.79 | 12.2 | 43.52 | 1.23 | 30.70 | 50.00 | -19.30 | QP | 400 | 241 | |
| 2 | | 80.0806 | 76.28 | 7.71 | 43.59 | 1.44 | 41.84 | 50.00 | -8.16 | QP | 400 | 261 | |
| 3 | * | 87.1117 | 76.38 | 8.62 | 43.61 | 1.49 | 42.88 | 50.00 | -7.12 | QP | 300 | 119 | |
| 4 | | 97.1148 | 72.45 | 10.92 | 43.64 | 1.57 | 41.30 | 50.00 | -8.70 | QP | 300 | 263 | |
| 5 | | 142.8243 | 65.29 | 9.04 | 43.8 | 1.95 | 32.48 | 50.00 | -17.52 | QP | 300 | 281 | |
| 6 | | 202.1005 | 60.17 | 11.45 | 43.98 | 2.4 | 30.04 | 50.00 | -19.96 | QP | 400 | 81 | |




Site 10m Chamber 1# Polarization: *Vertical* Temperature: 26

Limit: (RE10M)EN62040-2_C3 Power: AC 380V/50Hz Humidity: 60 %

Mode:Line Mode

Note:

| No. | Mk. | Freq. | Reading Level | Ant. Factor | Pre Amp Gain | Cable loss | Measure-ment | Limit | Over | | HI | Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | Detector | cm | deg. | Comment |
| 1 | | 31.2893 | 74.07 | 10.51 | 43.27 | 1.29 | 42.60 | 50.00 | -7.40 | QP | 200 | 254 | |
| 2 | | 54.8348 | 72.53 | 12.7 | 43.32 | 1.7 | 43.61 | 50.00 | -6.39 | QP | 100 | 15 | |
| 3 | | 80.9274 | 75.78 | 9.29 | 43.39 | 2.02 | 43.70 | 50.00 | -6.30 | QP | 100 | 65 | |
| 4 | | 87.1116 | 73.97 | 8.72 | 43.4 | 2.11 | 41.40 | 50.00 | -8.60 | QP | 200 | 196 | |
| 5 | * | 99.1796 | 75.71 | 9.33 | 43.43 | 2.29 | 43.90 | 50.00 | -6.10 | QP | 100 | 289 | |
| 6 | | 144.3348 | 71.87 | 9.74 | 43.47 | 2.76 | 40.90 | 50.00 | -9.10 | QP | 100 | 320 | |

# 6. IMMUNITY PERFORMANCE CRITERIA DESCRIPTION

## Performance Level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level by its manufacturer or the requestor of the test, or the agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:
1. Based on the used product standard
2. Based on the declaration of the manufacturer, requestor or purchaser

EN IEC 62040-2:

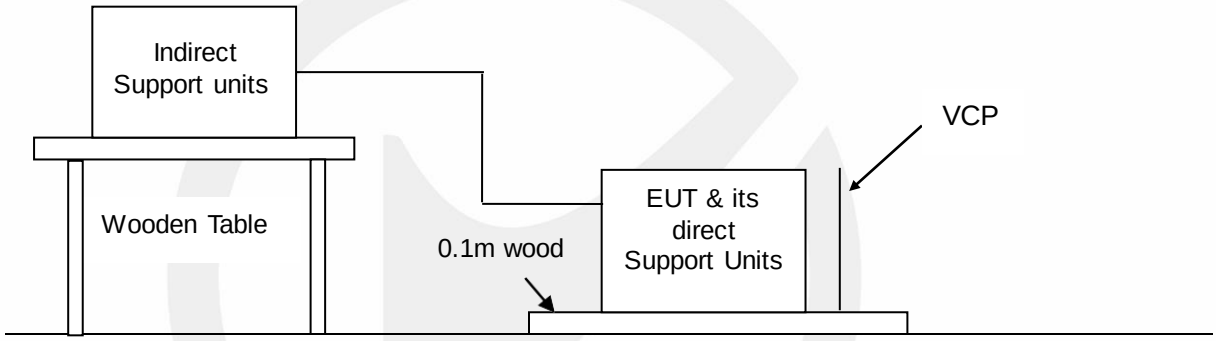
| | **Criterion A** | **Criterion B** |
|---|---|---|
| External and internal indications and metering | Change only during test | Change only during test |
| Control signals to external devices | No change | Change only temporarily in consistency with the actual Uninterruptible Power Systems mode of operation |
| Mode of operation [a] | No change | Change only temporarily |
| a At all times, the Uninterruptible Power Systems shall remain within the performance classification as declared by the Uninterruptible Power Systems manufacturer | | |

# 7. ELECTROSTATIC DISCHARGE

## 7.1. Test Specification

| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Basic Standard | : | IEC 61000-4-2 |
| Performance criterion | : | B |
| Test level | : | ±8.0kV (Air discharge)<br>±4.0kV (Contact discharge) |

## 7.2. Block Diagram of Test Setup




## 7.3. Test Procedure

a. In the case of air discharge testing, the climatic conditions shall be within the following ranges:
- ambient temperature: 15°C to 35°C;
- relative humidity : 30% to 60%;
- atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar)

b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.

c. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

d. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted : - If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate. - Coating declared as insulating by the manufacturer shall only be submitted to the air discharge. - The contact discharge test shall not be applied to such surfaces.

e. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

f. The test voltage shall be increased from the minimum to the selected test severity level, in order to

determine any threshold of failure. The final test level should not exceed the product specification value in order to avoid damage to the equipment.
g. The test shall be performed with both air discharge and contact discharge. According to the CE severity level on pre-selected points, at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge and at least 25 single discharges (in the most sensitive polarity) shall be applied on contact discharge. For the time interval between successive single discharges, an initial value of one second is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.
h. Ensure that the applied charge on the EUT has been dis-charged before next ESD pulse.

## 7.4. Test Results

**PASS**

| | | |
|---|---|---|
| Temperature | : | 25.8°C |
| Humidity | : | 52% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

Air Discharge:

| Amount of discharge | Test Voltage | Location | Actual criterion | Required performance criterion | Result (Pass/Fail) |
|---|---|---|---|---|---|
| Mini 10 /Point | ±2, 4, 8 kV | Slot | A | B | Pass |
| Mini 10 /Point | ±2, 4, 8 kV | Screen | A | B | Pass |

Contact Discharge

| Amount of discharge | Test Voltage | Location | Actual criterion | Required performance criterion | Result (Pass/Fail) |
|---|---|---|---|---|---|
| Mini 25 /Point | ±2, 4kV | Metal | A | B | Pass |
| Mini 25 /Point | ±2, 4kV | USB | A | B | Pass |

Indirect Discharge

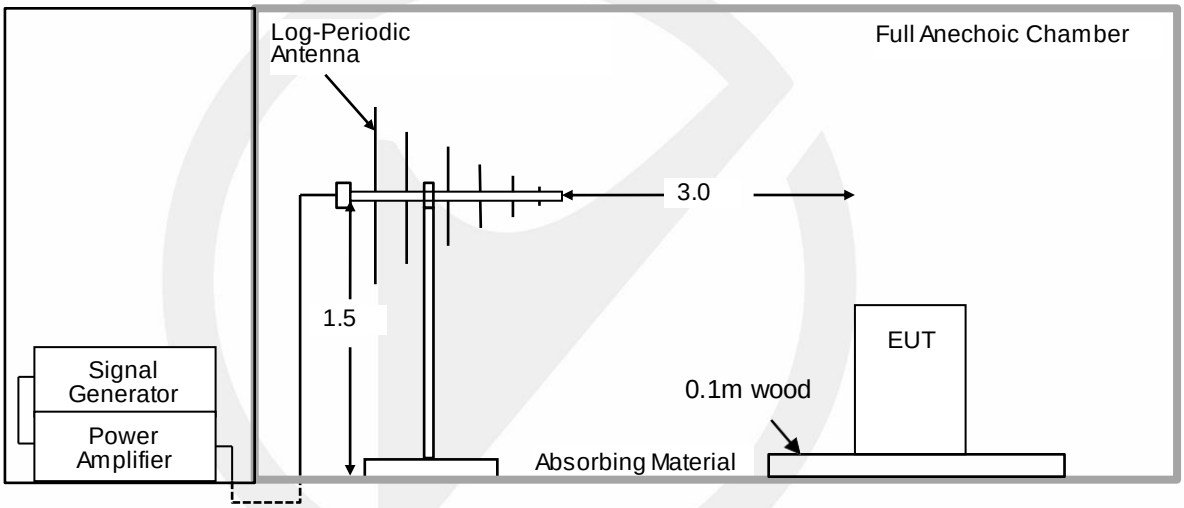
| Amount of discharge | Test Voltage | Location | Actual criterion | Required performance criterion | Result (Pass/Fail) |
|---|---|---|---|---|---|
| Mini 10 /Point | ±2, 4kV | VCP | A | B | Pass |

# 8. RF FIELD STRENGTH SUSCEPTIBILITY TEST

## 8.1. Test Specification

| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Basic Standard | : | IEC 61000-4-3 |
| Performance criterion | : | A |
| Test level | : | 10V/m |
| Frequency Range | | 80M-1000MHz |
| Modulation | | AM 80%, 1kHz sine-wave |

## 8.2. Block Diagram of Test Setup




## 8.3. Test procedure

The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

a. The antenna which is enabling the complete frequency range of 80-1000 MHz is placed 3m away from the equipment. The required field strength is determined by placing the field strength meter(s) on top of or directly alongside the equipment under test and monitoring the field strength meter via a remote field strength indicator outside the enclosure while adjusting the continuous-wave to the antenna.
b. The test is performed with the antenna facing the front and back sides of the EUT with. Both vertical and horizontal polarizations from antenna are tested.

## 8.4. Test results

**PASS**

| | | |
|---|---|---|
| Temperature | : | 24.3°C |
| Humidity | : | 54% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

| Freq. Range (MHz) | Field | Modulation | Polarity | Position (°) | Actual criterion | Required performance criterion | Result |
|---|---|---|---|---|---|---|---|
| 80-1000 | 10V/m | AM | H / V | Front | A | A | Pass |
| 80-1000 | 10V/m | AM | H / V | Right | A | A | Pass |
| 80-1000 | 10V/m | AM | H / V | Back | A | A | Pass |
| 80-1000 | 10V/m | AM | H / V | Left | A | A | Pass |

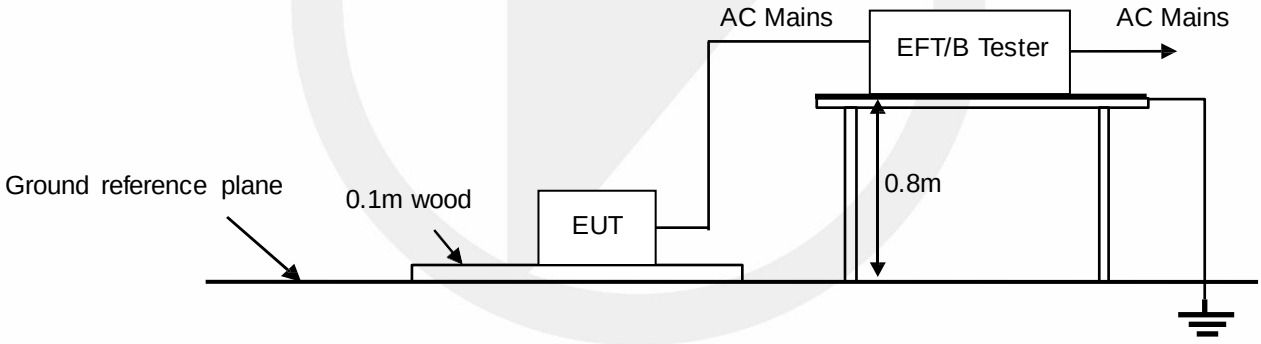
# 9. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

## 9.1. Test Specification

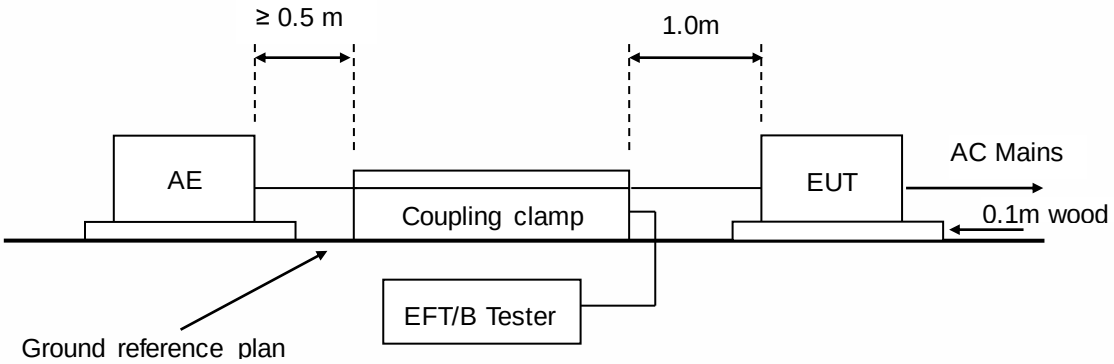
| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Basic Standard | : | IEC 61000-4-4 |
| Performance criterion | : | B |
| Test level | : | ☒2kV, AC input power ports<br>☒2kV, AC output power ports<br>☐2kV, DC port<br>☒2kV, Network port |
| Repetition frequency | : | ☒ 5kHz, ☐100kHz |
| Tr/Th: | : | 5/50ns |
| Burst Period | : | 300ms |
| Test Time : | : | 120s |

## 9.2. Block Diagram of Test Setup

AC Lines:




Signal lines:



## 9.3. Test Procedure

The EUT is put on the wood that is 0.1 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

## 9.4. Test Results

**PASS**

| | | |
|---|---|---|
| Temperature | : | 25.1°C |
| Humidity | : | 47% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

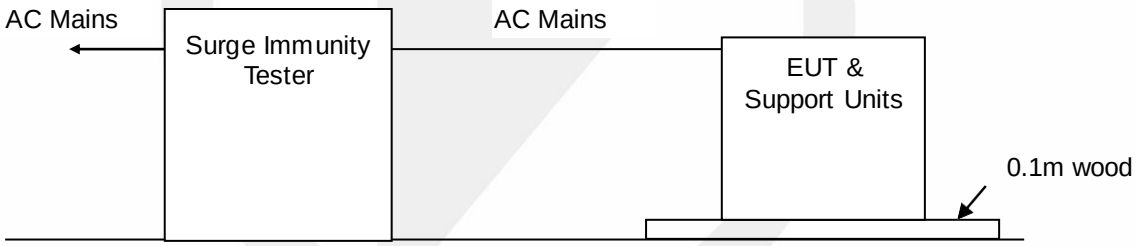
| Injection Line | Voltage (kV) | Injected Method | Actual criterion | Required performance criterion | Result (Pass/Fail) |
|---|---|---|---|---|---|
| ☒ AC input power ports | ± 2 | ☒ CDN<br>☐ Direct injection<br>☐ Capacitive coupling clamp | A | B | Pass |
| ☒ AC output power ports | ± 2 | ☒ CDN<br>☐ Direct injection<br>☐ Capacitive coupling clamp | A | B | Pass |
| ☐ DC port | ± 4 | ☐ CDN<br>☐ Direct injection<br>☐ Capacitive coupling clamp | N/A | N/A | N/A |
| ☒ Network port | ± 2 | ☐ CDN<br>☐ Direct injection<br>☒ Capacitive coupling clamp | A | B | Pass |

# 10.SURGE IMMUNITY TEST

## 10.1.Test Specification

| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Basic Standard | : | IEC 61000-4-5 |
| Test level | : | ☒1.0kV, Line - Line, AC input power ports, Criterion B |
| | | ☒2.0kV, Line - Earth, AC input power ports, Criterion B |
| | | ☒1.0kV, Line - Line, AC output power ports, Criterion B |
| | | ☒2.0kV, Line - Earth, AC output power ports, Criterion B |
| | | ☐1.0kV, Line - Line, DC port, Criterion B |
| | | ☐2.0kV, Line - Earth, DC port, Criterion B |
| | | ☒1.0kV, Network ports, Criterion B |
| Number of surges | : | 5 (for each combination of parameters) |
| Repetition rate | : | 1 minute / time |
| Polarity: | : | Positive / Negative |
| Phase angle: | : | 0º, 90º, 180º, 270º |

## 10.2.Block Diagram of Test Setup




## 10.3.Test Procedure

This test simulates a lightning event by inducing transients onto the AC/DC power supply lines in common mode (Line to Ground) and differential mode (Line to Line). Each device was tested in a total of two surge configurations: Line to Ground (L-G): Combination Wave, Line to Protective Earth with 9uF and 10Ohm and Neutral to Protective Earth with 9uF and 10Ohm, common mode, generator earthed.
Line to Line (L-L): Combination Wave,
Line to Neutral with 18uF, differential mode, generator floated.
2 ohm : the source impedance of the low-voltage power supply network.
12 ohm : the source impedance of the low-voltage power supply network and ground.
a. If not otherwise specified the surges have to be applied synchronized to the voltage phase at the zero-crossing and the peak value of the a.c. voltage wave (positive and negative).
b. The surges have to be applied line to line and line to earth. When testing line to earth, the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.
c. The test procedure shall also consider the non-linear current-voltage characteristics of the equipment under test. Therefore the test voltage has to be increased by steps up to the test level specified in the product standard or test plan. All lower levels including the selected test level shall be satisfied.
d. For testing the secondary protection, the output voltage of the generator shall be increased up to the worst-case voltage breakdown level (let-through level) of the primary protection.
e. Testing shall be performed according to a Test Plan, which shall be included in the test report.

f. To find all critical points of the duty cycle of the equipment, a sufficient number of positive and negative test pulses shall be applied.

## 10.4. Test results

**PASS**

| | | |
|---|---|---|
| Temperature | : | 25.1°C |
| Humidity | : | 47% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

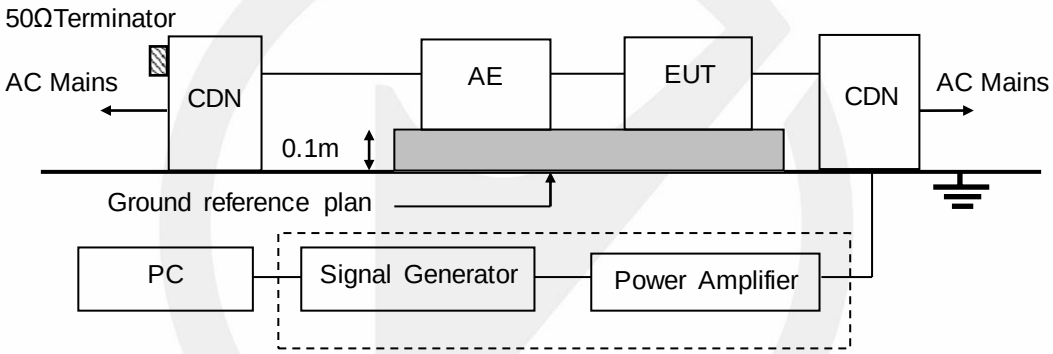
| Coupling Line | Voltage (kV) | Waveform (μs) | Polarity | Actual criterion | Required performance criterion | Result (Pass/Fail) |
|---|---|---|---|---|---|---|
| ☒ AC input power ports (Line to line) | 0.5, 1 | 1.2/50 (8/20) | Pos./ Neg. | A | B | Pass |
| ☒ AC input power ports (Line to earth) | 0.5, 1, 2 | 1.2/50 (8/20) | Pos./ Neg. | A | B | Pass |
| ☒ AC output power ports (Line to line) | 0.5, 1 | 1.2/50 (8/20) | Pos./ Neg. | A | B | Pass |
| ☒ AC output power ports (Line to earth) | 0.5, 1, 2 | 1.2/50 (8/20) | Pos./ Neg. | A | B | Pass |
| ☐ DC port (Line to line) | 0.5, 1 | 1.2/50 (8/20) | Pos./ Neg. | N/A | B | N/A |
| ☐ DC port (Line to earth) | 0.5, 1, 2 | 1.2/50 (8/20) | Pos./ Neg. | N/A | B | N/A |
| ☒ Network Ports | 0.5, 1 | 1.2/50 (8/20) | Pos./ Neg. | A | B | Pass |

# 11. INJECTED CURRENTS SUSCEPTIBILITY TEST

## 11.1. Test Specification

| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Basic Standard | : | IEC 61000-4-6 |
| Performance criterion | : | A |
| Test level | : | 10V |
| Frequency Range | : | 0.15M-80MHz |
| Modulation | : | AM 80%, 1kHz sine-wave |
| Frequency Step | : | 1% of fundamental |

## 11.2. Block Diagram of Test Setup




## 11.3. Test Procedure

a. The EUT shall be operated within its intended climatic conditions. The temperature and relative humidity should be recorded.
b. The EUT is placed on a 0.1m high test table, and a well grounded cable is connected to metallic plane above the test table.
c. All cables/wires must be laid out on test plate (3cm in thickness),and the EUT is set up on test plate (10 cm in thickness) as shown in test setup photo, and the cables/wires must not be in mid-air, they should be touching the surface of test plate. Ensure that the EUT is properly connected to the accessory equipment.
d. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn while the other non-excited RF-input ports of the coupling devices are terminated by a 50 ohm load resistor.
e. The frequency range is swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF-signal level or to switch coupling devices as necessary. The rate of sweep shall no exceed 1.5 x 10-3 decades/s. Where the frequency is swept incrementally, the step size shall no exceed 1% of the start and thereafter 1% of the preceding frequency value.
f. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.
g. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility
h. Testing shall be performed according to a Test Plan, which shall be included in the test report.

## 11.4. Test results

**PASS**

| | | |
|---|---|---|
| Temperature | : | 25.1°C |
| Humidity | : | 47% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

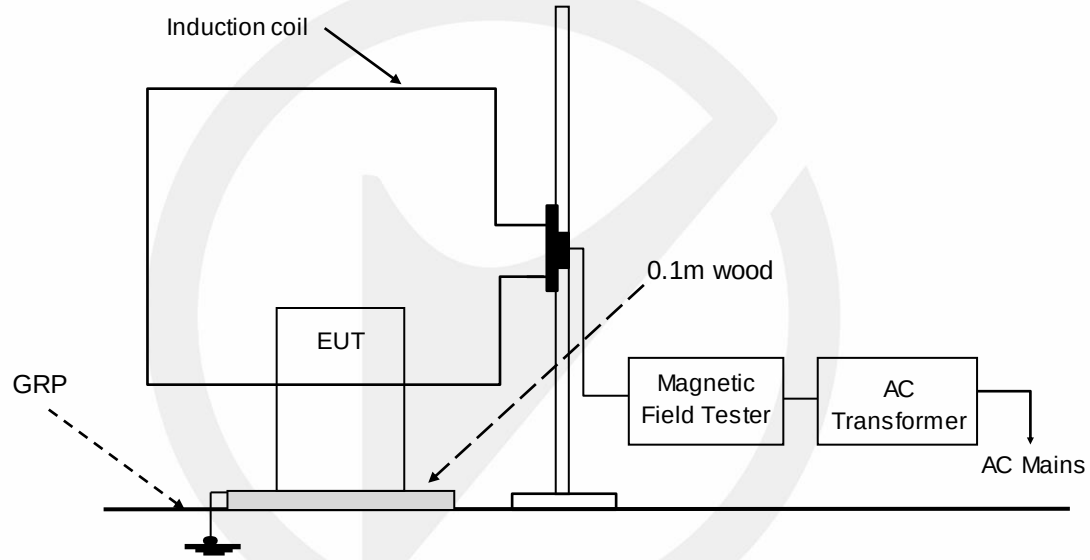
| Range (MHz) | Levers | Injection port | Coupling type | Actual criterion | Required performance criterion | Result (Pass/Fail) |
|---|---|---|---|---|---|---|
| 0.15-80 | 10V | ☒ AC input power ports<br>☒ AC output power ports<br>☐ DC port<br>☐ Network port | ☒ CDN<br>☐ EM Clamp<br>☐ Current Clamp<br>☐ Direct injection | A | A | Pass |
| 0.15-80 | 10V | ☐ AC input power ports<br>☐ AC output power ports<br>☐ DC port<br>☒ Network port | ☐ CDN<br>☒ EM Clamp<br>☐ Current Clamp<br>☐ Direct injection | A | A | Pass |

# 12. MAGNETIC FIELD SUSCEPTIBILITY TEST

## 12.1. Test Specification

| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Basic Standard | : | IEC 61000-4-8 |
| Performance criterion | : | A |
| Test level | : | 30A/m |

## 12.2. Block Diagram of Test Setup




GRP: Ground reference plane
EUT: Equipment under test

## 12.3. Test Procedure

The EUT is placed in the middle of a induction coil (1*1m), under which is a 1*1*0.1m (high) wood, this small table is also placed on a larger table, 0.8 m above the ground. Both horizontal and vertical polarization of the induction coil is set on test, so that each side of the EUT is affected by the magnetic field. Also can reach the same aim by change the position of the EUT.

## 12.4. Test Results

**PASS**

| | | |
|---|---|---|
| Temperature | : | 25.1°C |
| Humidity | : | 47% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

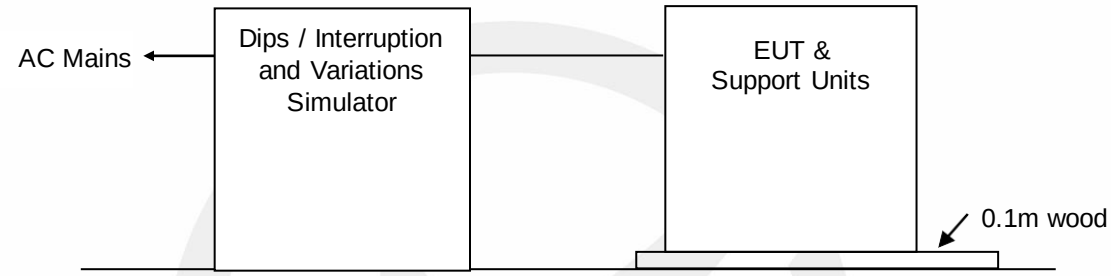
| Test Level (A/m) | Frequency | Testing Duration | Coil Orientation | Actual criterion | Required performance criterion | Result (Pass/Fail) |
|---|---|---|---|---|---|---|
| 30 | ☒ 50Hz<br>☒ 60Hz | 5 mins | ☒ x-axis<br>☒ y-axis<br>☒ z-axis | A | A | Pass |

# 13. VOLTAGE DIPS AND INTERRUPTIONS TEST

## 13.1. Test Specification

| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Basic Standard | : | IEC 61000-4-11 |

## 13.2. Block Diagram of Test Setup




## 13.3. Test Procedure

a. Where the equipment has a rated voltage the following shall apply - If the voltage range does not exceed 20% of the lower voltage specified for the rated voltage range, a single voltage within that range may be specified as a basis for test level specification.
- In all other cases, the test procedure shall be applied for both the lowest and highest voltages declared in the voltage range.
b. Test Conditions
- Select operated voltage and frequency of EUT - Test of interval : 10 sec.
- Level and duration : Sequence of 3 dips/interrupts.
- Voltage rise (and fall) time : 1.5 μs.

## 13.4. Test results

**PASS**

| | | |
|---|---|---|
| Temperature | : | 25.1°C |
| Humidity | : | 47% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

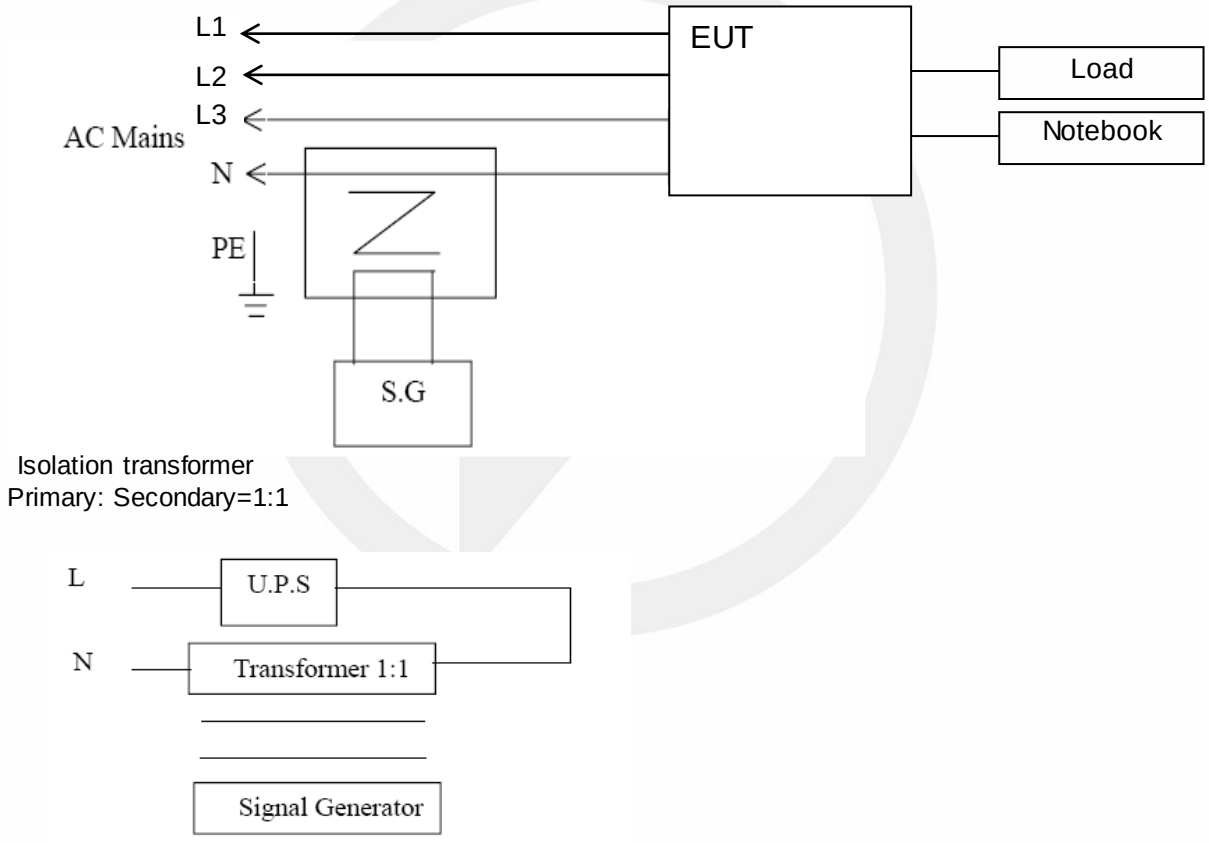
| | Test Level (% UT) | Phase angle (°) | Reduction (%) | Duration (periods) | Actual criterion | Required performance criterion | Result (Pass/Fail) |
|---|---|---|---|---|---|---|---|
| Voltage Dips | 0% | 0º, 180º | 100% | 0.5 | A | B | Pass |
| | 70% | 0º, 180º | 30% | 25 | A | C | Pass |
| Voltage Interruption | 0% | 0º, 180º | 100% | 250 | B | C | Pass |
| Note: When the sample drops to 0% and 250P, the working mode of the sample changes and the test ends, It can automatically recover to normal. | | | | | | | |

# 14.LOW FREQUENCY SIGNALS TEST

## 14.1.Test Specification

| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Basic Standard | : | IEC 61000-2-2 |
| Performance criterion | : | A |
| Test frequency | : | 140-360Hz |
| Test level | : | 10V(rms)Sinusoidal |

## 14.2.Block Diagram of Test Setup




Isolation transformer
Primary: Secondary=1:1




## 14.3.Test Procedure

1) Set up the EUT and test generator as shown on Block diagram.
2) Add the 10V (rms) Sinusoidal interference signal and the interference signal frequency from 140Hz ~ 360Hz to L terminal.
3) Repeat the second step at the N-terminus.

## 14.4. Test Results

**PASS.**

| | | |
|---|---|---|
| Temperature | : | 25.1°C |
| Humidity | : | 47% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

| Frequency Range (Hz) | Step (Hz) | Position | Strength | Result | Note |
|---|---|---|---|---|---|
| 140 | 10 | L,N | 10V(rms) Sinusoidal | Pass | A |
| 160 | | | | Pass | A |
| 200 | | | | Pass | A |
| 240 | | | | Pass | A |
| 280 | | | | Pass | A |
| 320 | | | | Pass | A |
| 360 | | | | Pass | A |

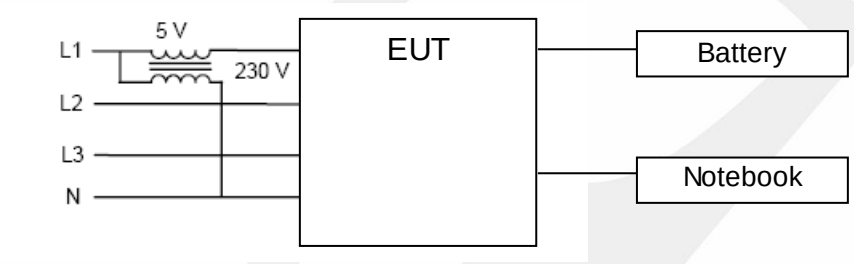
# 15.POWER LINE UNBALANCE (THREE-PHASE UPS SYSTEMS ONLY)

## 15.1.Test Specification

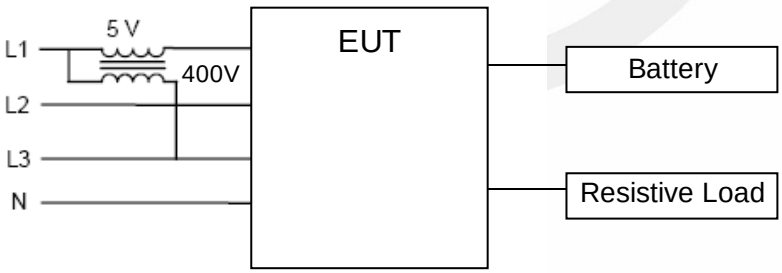
| | | |
|---|---|---|
| Test Standard | : | EN IEC 62040-2 |
| Performance criterion | : | A |
| Test frequency | : | 50Hz |
| Test level | : | 5V(rms)Sinusoidal |

## 15.2.Block Diagram of Test Setup

For Amplitude unbalance:




For Phase unbalance:



## 15.3. Test Results

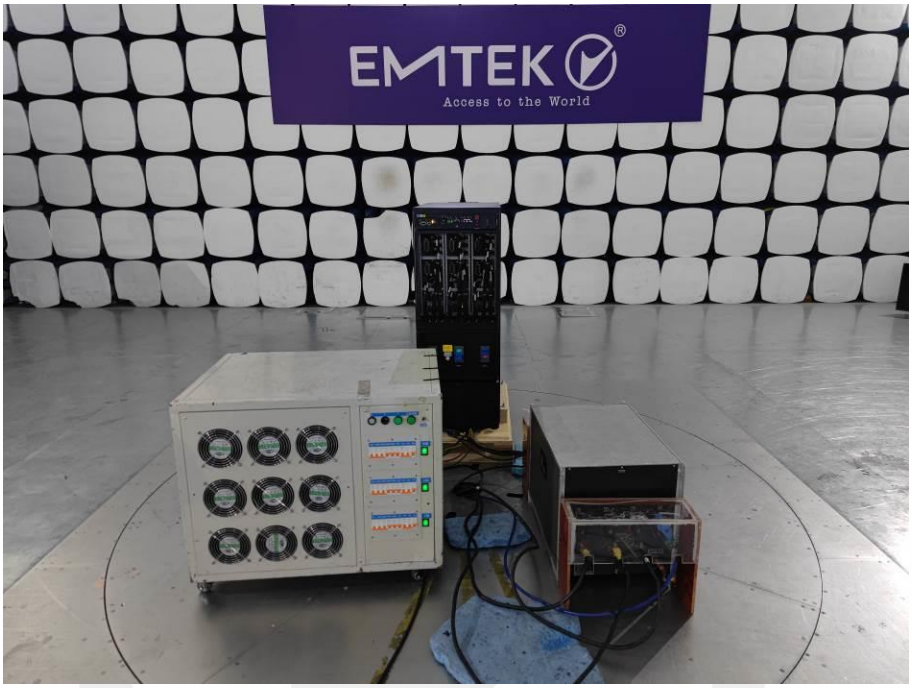
**PASS.**

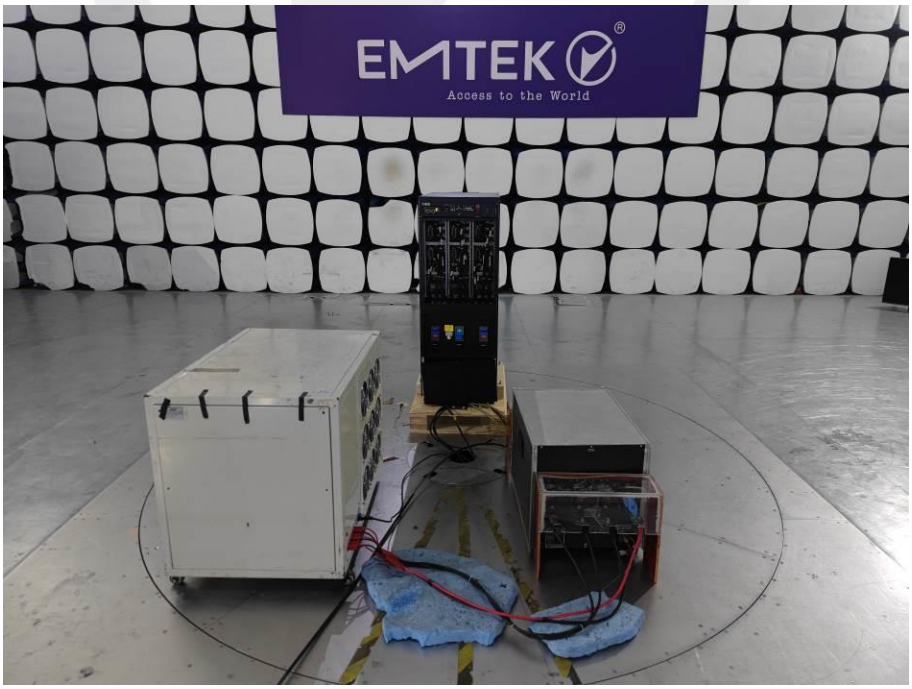
| | | |
|---|---|---|
| Temperature | : | 25.1°C |
| Humidity | : | 47% |
| Atmospheric Pressure | : | 101kpa |
| Test Engineer | : | LHT |
| Test Date | : | 2022-09-27 |

| Frequency Range (Hz) | Position | Strength | Result | Note |
|---|---|---|---|---|
| 50 | L1,L2.L3, N | 5V(rms) Sinusoidal | A | N/A |

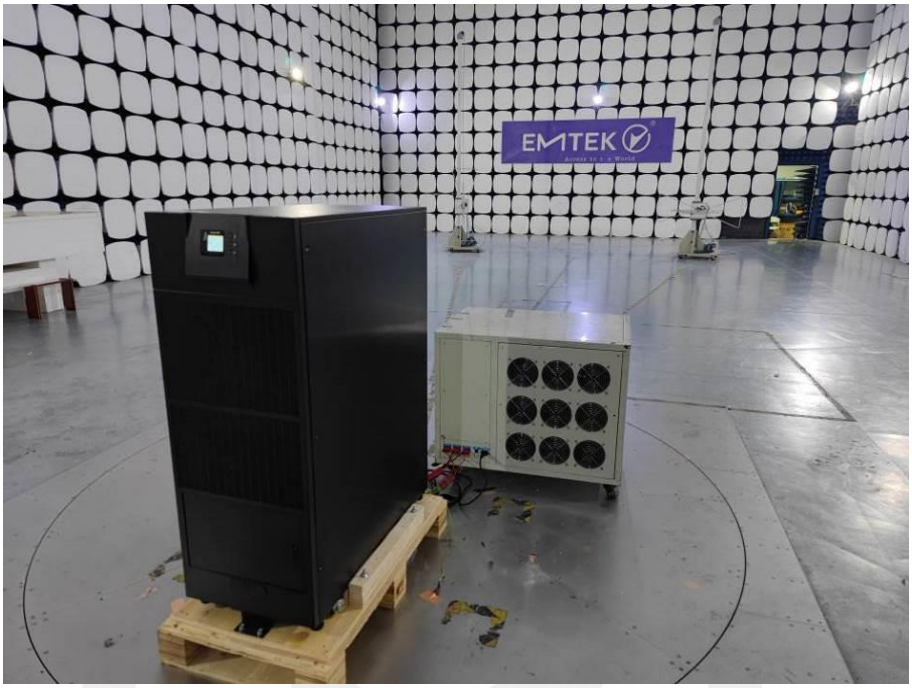
# 16.PHOTOGRAPHS

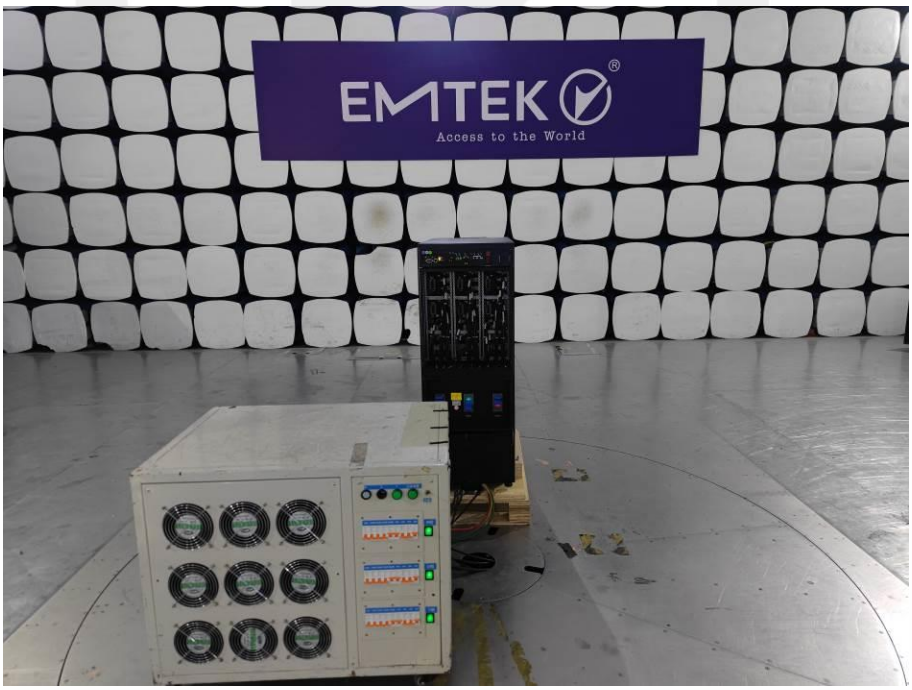
## 16.1.Photos of Conducted Emissions



## 16.2.Photos of Radiation Emission Measurement



## 16.3.Photo of Electrostatic Discharge Test

## 16.4.Photo of RF Field Strength Susceptibility Test

## 16.5.Photos of Electrical Fast Transient / Burst Test

## 16.6.Photos of Surge Test


## 16.7.Photos of Injected Currents Susceptibility Test

## 16.8.Photo of Magnetic Field Susceptibility Test

## 16.9.Photo of Voltage Dips and Interruption Immunity Test

## 16.10. Photo of Low Frequency Signals Test

# APPENDIX
# (Photos of EUT)

***End of Report***

# Statement

1. This report is invalid without the signature of the authorized approver and "special seal for testing".

2. This report shall not be copied partly without authorization.

3. The test results or observations are applicable only to tested sample. Client shall be responsible for representativeness of the sample and authenticity of the material.

4. The observations or tests with special mark fall outside the scope of accreditation, and are only used for purpose of commission, research, training, internal quality control etc.

5. The test results or observations are provided in accordance with measured value, without taking risks caused by uncertainty into account. Without explicit stipulation in special agreements, standards or regulations, EMTEK shall not assume any responsibility.

6. Objections shall be raised within 20 days from the date receiving the report.