# EMC Test Report

| | | |
|---|---|---|
| Client Name | : | Acrel Co., Ltd. |
| Address | : | No.253, Yulv Road, Jiading, Shanghai, China |
| Product Name | : | Feeder Line Protection measuring control device |
| Date | : | Mar. 07, 2022 |

**Shenzhen Anbotek Compliance Laboratory Limited**

# Contents

# TEST REPORT

| | | |
|---|---|---|
| Applicant | : | Acrel Co., Ltd. |
| Manufacturer | : | Jiangsu Acrel Electrical Manufacturing. Co., Ltd. |
| Product Name | : | Feeder Line Protection measuring control device |
| Model No. | : | AM5-F, AM5-T, AM5-M, AM5-U1, AM5-C, AM5-B, AM5-DB, AM5SE-F, AM5SE-T, AM5SE-M, AM5SE-B, AM5SE-C, AM5SE-D2, AM5SE-TB, AM5SE-UB, AM5SE-MD, AM5SE-D3, AM5SE-K, AM4-U1, AM4-I, AM3SE-U, AM3SE-I, AM2SE-V, AM2SE-H |
| Trade Mark | : | Acrel |
| Rating(s) | : | Control power supply: AC/DC 220-240V<br>Rated voltage: 100V<br>Rated current: 5A |
| **Test Standard(s)** | **:** | **EN IEC 61326-1: 2021;<br>EN IEC 61000-3-2: 2019;<br>EN 61000-3-3: 2013+A1: 2019;<br>(IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4;<br>IEC 61000-4-5; IEC 61000-4-6; IEC 61000-4-11)** |

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited 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 Shenzhen Anbotek Compliance Laboratory Limited is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the EN IEC 61326-1, EN IEC 61000-3-2, EN 61000-3-3 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt: Mar. 03, 2022

Date of Test: Mar. 03~07, 2022

Prepared By: Yee Huang
(Yee Huang)

Approved & Authorized Signer: KingKongJin
(KingKong Jin)

# 1. General Information

## 1.1. Client Information

| | | |
|---|---|---|
| Applicant | : | Acrel Co., Ltd. |
| Address | : | No.253, Yulv Road, Jiading, Shanghai, China |
| Manufacturer | : | Jiangsu Acrel Electrical Manufacturing. Co., Ltd. |
| Address | : | No.5, Dongmeng Road, Nanzha, Jiangyin, Jiangsu, China |
| Factory | : | Jiangsu Acrel Electrical Manufacturing. Co., Ltd. |
| Address | : | No.5, Dongmeng Road, Nanzha, Jiangyin, Jiangsu, China |

## 1.2. Description of Device (EUT)

| | | | |
|---|---|---|---|
| Product Name | : | Feeder Line Protection measuring control device | |
| Model No. | : | AM5-F, AM5-T, AM5-M, AM5-U1, AM5-C, AM5-B, AM5-DB, AM5SE-F, AM5SE-T, AM5SE-M, AM5SE-B, AM5SE-C, AM5SE-D2, AM5SE-TB, AM5SE-UB, AM5SE-MD, AM5SE-D3, AM5SE-K, AM4-U1, AM4-I, AM3SE-U, AM3SE-I, AM2SE-V, AM2SE-H<br>(Note: All samples are the same except the model number & appearance, so we prepare “AM5-F” for test only.) | |
| Trade Mark | : | Acrel | |
| Test Power Supply | : | AC 230V, 50Hz | |
| Test Sample No. | : | 1-1-1 | |
| Product Description | : | Adapter: | N/A |
| **Remark:** (1) For a more detailed features description, please refer to the manufacturer’s specifications or the User’s Manual. | | | |

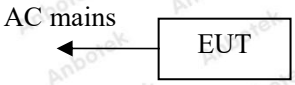
## 1.3. Auxiliary Equipment Used During Test

| | | |
|---|---|---|
| N/A | | |

## 1.4. Description of Test Mode

| Pretest Mode | Description |
|---|---|
| Mode 1 | On |

For Mode 1 Block Diagram of Test Setup




## 1.5. Test Summary

| Test Items | Test Mode | Status |
|---|---|---|
| Power Line Conducted Emission Test (150KHz To 30MHz) | Mode 1 | P |
| Radiated Emission Test (30MHz To 1000MHz) | Mode 1 | P |
| Harmonic Current Test | Mode 1 | P |
| Voltage Fluctuations and Flicker Test | Mode 1 | P |
| Electrostatic Discharge immunity Test | Mode 1 | P |
| RF Field Strength susceptibility Test | Mode 1 | P |
| Electrical Fast Transient/Burst Immunity Test | Mode 1 | P |
| Surge Immunity Test | Mode 1 | P |
| Injected Currents Susceptibility Test | Mode 1 | P |
| Magnetic Field Susceptibility Test | / | N |
| Voltage Dips and Interruptions Test | Mode 1 | P |
| P）Indicates “PASS”.<br>N）Indicates “Not applicable”. | | |

## 1.6. Test Equipment List

Conducted Emission Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | EMI Test Receiver | Rohde & Schwarz | ESCI | 100990 | Sept. 7, 2021 | 1 Year |
| 2. | L.I.S.N. Artificial Mains Network | Schwarzbeck | NSLK 8127 | 8127386 | Sept. 7, 2021 | 1 Year |
| 3. | L.I.S.N. Artificial Mains Network | Schwarzbeck | NSLK 8126 | 8126377 | Sept. 7, 2021 | 1 Year |
| 4. | Software Name | Ferrari Technology | EZ-EMC | EMC-CON 3A1.1 | N/A | N/A |

Radiated Emission Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | EMI Test Receiver | Rohde & Schwarz | ESPI | 101604 | Sept. 7, 2021 | 1 Year |
| 2. | Pre-amplifier | EMtrace | RP01A | 50017 | Sept. 7, 2021 | 1 Year |
| 3. | Pre-amplifier | CD | PAP-0203 | 22008 | Sept. 7, 2021 | 1 Year |
| 4. | TRILOG Broadband Antenna | Schwarzbeck | VULB 9163 | 01417 | Sept. 7, 2021 | 2 Year |
| 5. | Software Name | Ferrari Technology | EZ-EMC | Anbo-3A1 | N/A | N/A |

Harmonic and Flicker Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Programmable AC Power source | IVYTECH | APS-5005A | 632734 | Oct. 22, 2021 | 1 Year |
| 2. | Harmonic and Flicker Analyzer | EMC-PARTNER | HMONICS 1000-1P | 164 | Oct. 22, 2021 | 1 Year |
| 3. | Harmonics-1000 | N/A | Ed.3.0+4.0 | N.A | N/A | N/A |

Electrostatic Discharge Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | ESD Simulators | 3Ctest | EDS-30T | ES0131505 | Sept.15, 2021 | 1 Year |

Electrical Fast Transient/Burst Immunity Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | EFT Burst Simulator | PRIMA | EFT61004B | PR10114282 | Sept. 7, 2021 | 1 Year |
| 2. | EFT-Clamp | PRIMA | EFT-Clamp | / | Oct. 22, 2021 | 1 Year |

R/S Immunity Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Signal Generator | Agilent | N5181A | MY50143107 | Sept. 7, 2021 | 1 Year |
| 2. | Power Meter | Agilent | E4417A | MY45101384 | Sept. 7, 2021 | 1 Year |
| 3. | Amplifier | Micotop | MPA-80-1000-600 | MPA2110318 | Sept. 7, 2021 | 1 Year |
| 4. | Amplifier | Micotop | MPA-1000-6000-100 | MPA2110327 | Sept. 7, 2021 | 1 Year |
| 5. | Log.-Per.-Antenna | Schwarzbeck | VULP 9118E | 01012 | N/A | N/A |
| 6. | Microwave Log.-Per. Antenna | Schwarzbeck | STLP 9149 | 00788 | N/A | N/A |
| 7. | Power Sensor | KEYSIGHT | E9323A | US40410647 | Sept. 7, 2021 | 1 Year |
| 8. | Power Sensor | KEYSIGHT | E9323A | MY53100007 | Sept. 7, 2021 | 1 Year |
| 9. | Electric field Probe | Narda S.T.S /PMM | EP 601 | 811ZX10351 | Sept. 7, 2021 | 1 Year |
| 10. | Software | EMtrace | EM 3 | / | N/A | N/A |

Surge Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Surge Generator | EMPEK | LSG-5060G | / | Sept. 7, 2021 | 1 Year |
| 2. | CDN | EMPEK | CDN-5110G | 06110005N | Sept. 7, 2021 | 1 Year |

Injected Currents Susceptibility Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Signal Generator | Rohde & Schwarz | SML03 | 101772 | Sept. 7, 2021 | 1 Year |
| 2. | Power Meter | Agilent | E4419B | GB43312730 | Sept. 7, 2021 | 1 Year |
| 3. | Amplifier | Micotop | MPA-0.15-230-110 | MPA2110317 | Sept. 7, 2021 | 1 Year |
| 4. | CDN | TESEQ | CDN M016 | 55157 | Sept. 7, 2021 | 1 Year |
| 5. | EM Clamp | TESEQ | KEMZ 801A | 60128 | Sept. 7, 2021 | 1 Year |
| 6. | RF Attenuator | GRENTECH | 150W 6dB DC-3GHz | / | Sept. 7, 2021 | 1 Year |
| 7 | Software | EMtrace | EM 6 | / | N/A | N/A |

Voltage Dips and Interruptions Measurement

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | Voltage DIPS and Up Generator | 3ctest | VDG-1105G | EC0171306 | Sept. 7, 2021 | 1 Year |


Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel:(86) 755-26066440 Fax: (86) 755-26014772 Email: service@anbotek.com
Hotline 400-003-0500
www.anbotek.com

## 1.7. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

**FCC-Registration No.: 184111**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111

**ISED-Registration No.: 8058A**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A

**Test Location**

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518128

## 1.8. EMS Performance Criteria

√ A: Normal performance within the specification limits
√ B: Temporary degradation or loss of function or performance which is self-recoverable
√ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
√ D: Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data

Note: The manufacturer's specification may define effects on the EUT which may be considered insignificant, and therefore acceptable.

This classification may be used as a guide in formulating performance criteria, by committees responsible for generic, product and product-family standards, or as a framework for the agreement on performance criteria between the manufacturer and the purchaser, for example where no suitable generic, product or product-family standard exists.

# 2. Power Line Conducted Emission Test

## 2.1. Test Standard and Limit

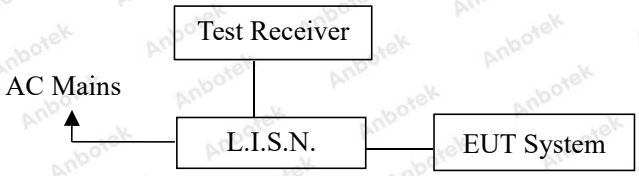
| Test Standard | EN IEC 61326-1 |
|---|---|

Limits for conducted emissions

| Test Limit | Frequency (MHz) | At mains terminals (dBμV) | |
|---|---|---|---|
| | | Quasi-peak Level | Average Level |
| | 0.15 ~ 0.50 | 66.0 ~ 56.0 * | 56.0 ~ 46.0 * |
| | 0.50 ~ 5.00 | 56.0 | 46.0 |
| | 0.50 ~ 30.00 | 60.0 | 50.0 |

**Remark:** (1) At the transition frequency the lower limit applies.
(2) * decreasing linearly with logarithm of the frequency.

## 2.2. Test Setup




## 2.3. EUT Configuration on Measurement

The following equipments are installed on Conducted Emission Measurement to meet EN IEC 61326-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 2.4. Operating Condition of EUT

2.4.1. Setup the EUT as shown in Section 2.2.

2.4.2. Turn on the power of all equipments.

2.4.3. Let the EUT work in test mode and measure it.

## 2.5. Test Procedure

The EUT is put on the table which is 0.8 meter high above the ground and connected to the AC mains through a Line Impedance Stabilization Network (L.I.S.N.). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are checked to find out the maximum conducted emission according to the EN IEC 61326-1 regulations during conducted emission measurement. And the voltage probe had been used for the load terminals measurement according to the EN IEC 61326-1 standard.

The bandwidth of the test receiver (ESCI) is set at 9KHz in 150KHz~30MHz.

The frequency range from 150KHz to 30MHz is investigated for AC mains.

All the test results are listed in Section 2.6.

## 2.6. Test Results

**PASS**

The test curves are shown in the following pages.

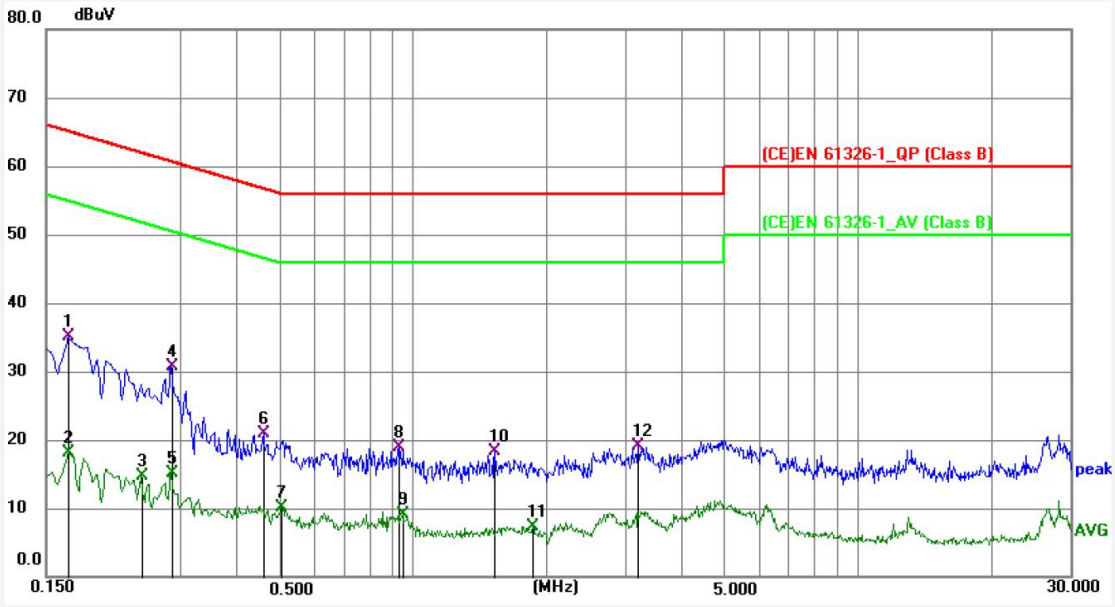
## Conducted Emission Test Data

Test Site: 1# Shielded Room

Test Specification: AC 230V, 50Hz

Comment: Live Line

Temp.: 16.4℃ Hum.: 50%




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1680 | 34.15 | 0.90 | 35.05 | 65.06 | -30.01 | QP | |
| 2 | 0.1680 | 17.22 | 0.90 | 18.12 | 55.06 | -36.94 | AVG | |
| 3 | 0.2445 | 13.88 | 0.89 | 14.77 | 51.94 | -37.17 | AVG | |
| 4 | 0.2850 | 29.74 | 0.91 | 30.65 | 60.67 | -30.02 | QP | |
| 5 | 0.2850 | 14.15 | 0.91 | 15.06 | 50.67 | -35.61 | AVG | |
| 6 | 0.4605 | 20.11 | 0.87 | 20.98 | 56.68 | -35.70 | QP | |
| 7 | 0.5055 | 9.19 | 0.86 | 10.05 | 46.00 | -35.95 | AVG | |
| 8 | 0.9330 | 17.97 | 0.94 | 18.91 | 56.00 | -37.09 | QP | |
| 9 | 0.9510 | 8.09 | 0.94 | 9.03 | 46.00 | -36.97 | AVG | |
| 10 | 1.5315 | 17.46 | 0.93 | 18.39 | 56.00 | -37.61 | QP | |
| 11 | 1.8645 | 6.39 | 0.93 | 7.32 | 46.00 | -38.68 | AVG | |
| 12 | 3.2145 | 18.13 | 0.94 | 19.07 | 56.00 | -36.93 | QP | |

**Note: Result=Reading+Factor Over Limit=Result-Limit**

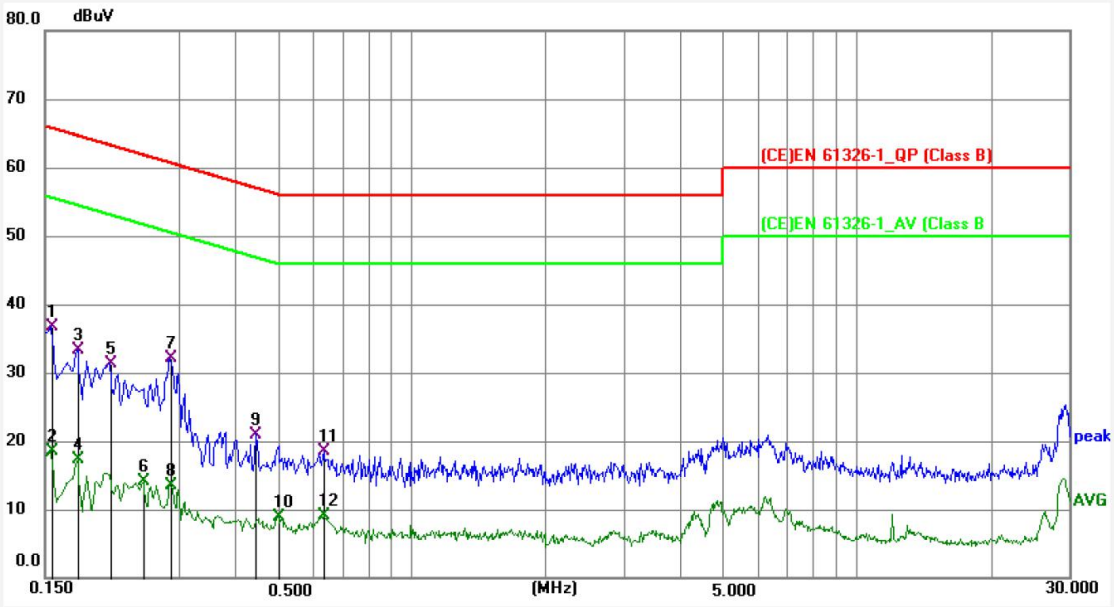
## Conducted Emission Test Data

Test Site: 1# Shielded Room

Test Specification: AC 230V, 50Hz

Comment: Neutral Line

Temp.: 16.4℃ Hum.: 50%




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1545 | 35.87 | 0.80 | 36.67 | 65.75 | -29.08 | QP | |
| 2 | 0.1545 | 17.61 | 0.80 | 18.41 | 55.75 | -37.34 | AVG | |
| 3 | 0.1770 | 32.58 | 0.80 | 33.38 | 64.63 | -31.25 | QP | |
| 4 | 0.1770 | 16.46 | 0.80 | 17.26 | 54.63 | -37.37 | AVG | |
| 5 | 0.2085 | 30.59 | 0.80 | 31.39 | 63.26 | -31.87 | QP | |
| 6 | 0.2490 | 13.25 | 0.82 | 14.07 | 51.79 | -37.72 | AVG | |
| 7 | 0.2850 | 31.27 | 0.83 | 32.10 | 60.67 | -28.57 | QP | |
| 8 | 0.2850 | 12.58 | 0.83 | 13.41 | 50.67 | -37.26 | AVG | |
| 9 | 0.4470 | 20.17 | 0.83 | 21.00 | 56.93 | -35.93 | QP | |
| 10 | 0.5010 | 8.09 | 0.83 | 8.92 | 46.00 | -37.08 | AVG | |
| 11 | 0.6360 | 17.61 | 0.85 | 18.46 | 56.00 | -37.54 | QP | |
| 12 | 0.6360 | 8.20 | 0.85 | 9.05 | 46.00 | -36.95 | AVG | |

**Note: Result=Reading+Factor Over Limit=Result-Limit**

# 3. Radiated Emission Test

## 3.1. Test Standard and Limit

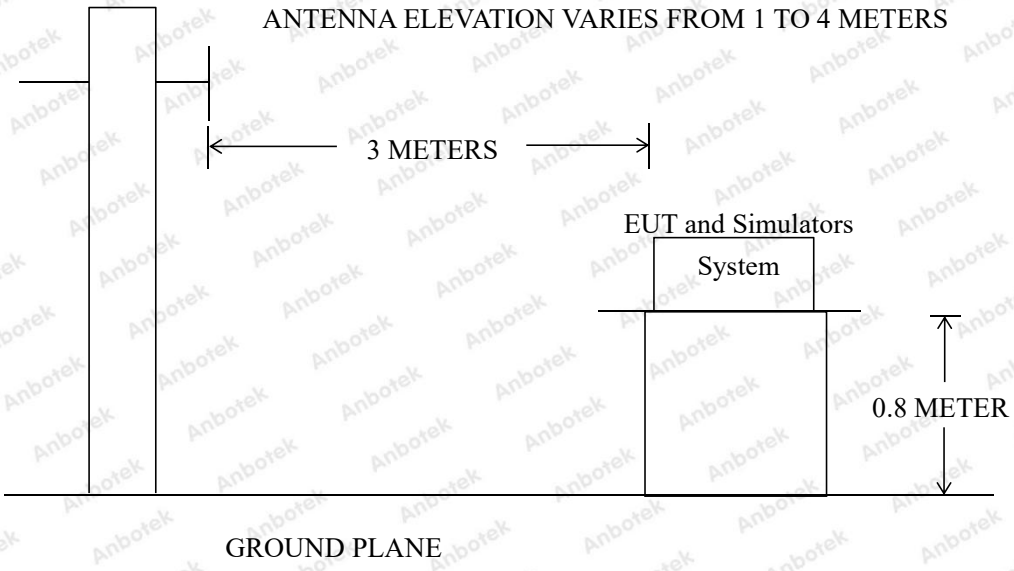
| Test Standard | EN IEC 61326-1 |
|---|---|

Radiated Emission Test Limit

| Test Limit | Frequency (MHz) | DISTANCE (Meters) | FIELD STRENGTHS LIMIT (dBμV/m) |
|---|---|---|---|
| | 30 ~ 230 | 3 | 40 |
| | 230 ~ 1000 | 3 | 47 |

**Remark:** (1) The smaller limit shall apply at the combination point between two frequency bands.
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

## 3.2. Test Setup




## 3.3. EUT Configuration on Measurement

The EN IEC 61326-1 regulations test method must be used to find the maximum emission during radiated emission measurement.

### 3.4. Operating Condition of EUT

3.4.1. Setup the EUT as shown in Section 3.2.

3.4.2. Turn on the power of all equipments.

3.4.3. Let the EUT work in test mode and measure it.

### 3.5. Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

The EUT is tested in Chamber.

The test results are listed in Section 3.6.

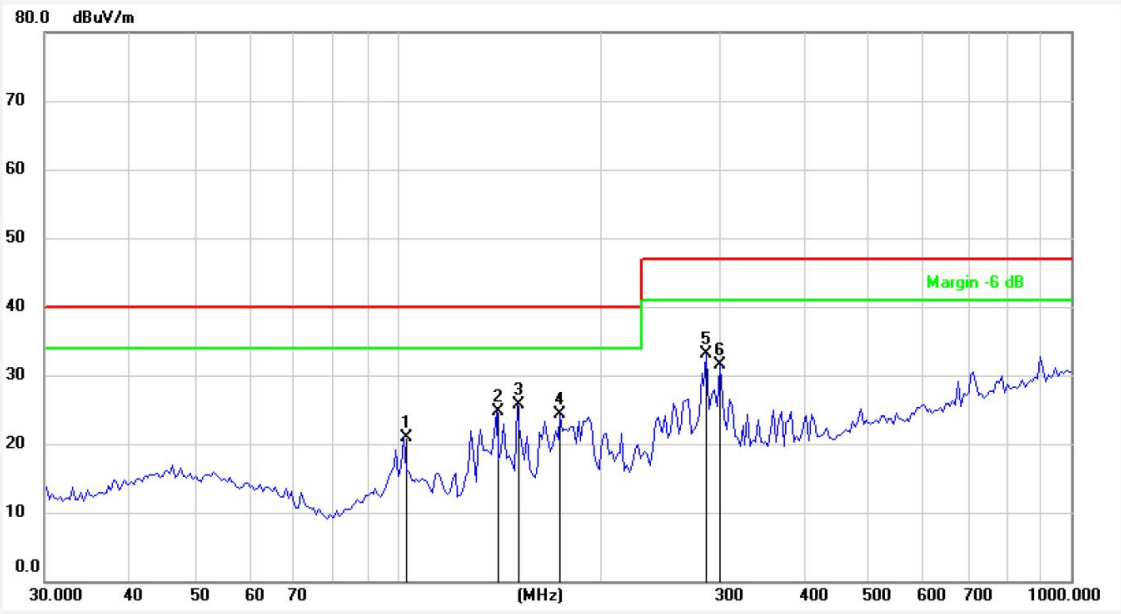
### 3.6. Test Results

**PASS**

The frequency range from 30MHz to 1000MHz is investigated.

The test curves are shown in the following pages.

| | | | |
|---|---|---|---|
| **Test item:** | **Radiation Test** | **Polarization:** | **Horizontal** |
| **Standard:** | **(RE)EN IEC 61326-1** | **Power Source:** | **AC 230V, 50Hz** |
| **Distance:** | **3m** | **Temp.(℃)/Hum.(%RH):** | **16.8(℃)/48%RH** |




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 102.3597 | 38.12 | -17.21 | 20.91 | 40.00 | -19.09 | peak | | | |
| 2 | 140.3421 | 45.61 | -20.88 | 24.73 | 40.00 | -15.27 | peak | | | |
| 3 | 150.5378 | 46.36 | -20.62 | 25.74 | 40.00 | -14.26 | peak | | | |
| 4 | 174.7301 | 43.63 | -19.28 | 24.35 | 40.00 | -15.65 | peak | | | |
| 5 | 287.9904 | 46.81 | -13.62 | 33.19 | 47.00 | -13.81 | peak | | | |
| 6 | 300.8943 | 44.83 | -13.24 | 31.59 | 47.00 | -15.41 | peak | | | |

**Note:** **Result=Reading+Factor** **Over Limit=Result-Limit**

| | | | |
|---|---|---|---|
| **Test item:** | **Radiation Test** | **Polarization:** | **Vertical** |
| **Standard:** | **(RE)EN IEC 61326-1** | **Power Source:** | **AC 230V, 50Hz** |
| **Distance:** | **3m** | **Temp.(℃)/Hum.(%RH):** | **16.8(℃)/48%RH** |


| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 31.0706 | 37.97 | -18.99 | 18.98 | 40.00 | -21.02 | peak | | | |
| 2 | 44.1202 | 35.26 | -15.83 | 19.43 | 40.00 | -20.57 | peak | | | |
| 3 | 101.4663 | 33.47 | -17.27 | 16.20 | 40.00 | -23.80 | peak | | | |
| 4 | 140.3421 | 38.68 | -20.88 | 17.80 | 40.00 | -22.20 | peak | | | |
| 5 | 419.8436 | 41.99 | -9.69 | 32.30 | 47.00 | -14.70 | peak | | | |
| 6 | 900.1474 | 33.97 | 0.55 | 34.52 | 47.00 | -12.48 | peak | | | |

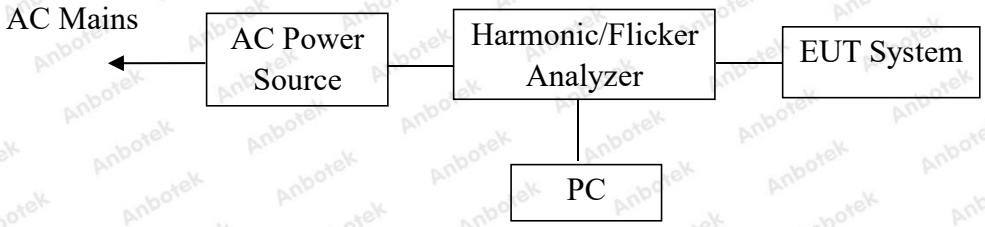
**Note:** **Result=Reading+Factor** **Over Limit=Result-Limit**

# 4. Harmonic Current Emission Test

## 4.1. Test Standard

| Test Standard | EN IEC 61000-3-2 |
|---|---|

## 4.2. Test Setup




## 4.3. Operating Condition of EUT

4.3.1. Setup the EUT as shown on Section 4.2.

4.3.2. Turn on the power of all equipments.

4.3.3. After that, let the EUT work in test mode measure it.

## 4.4. Test Results

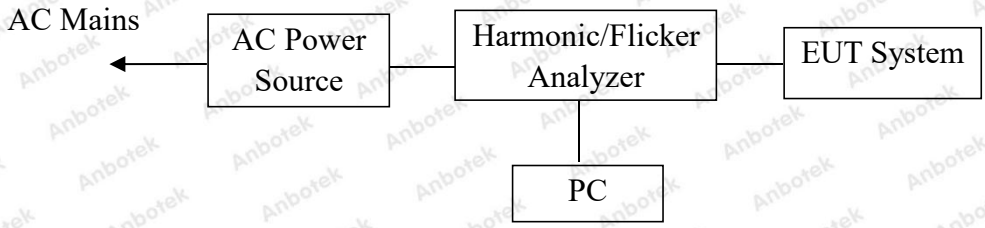
**PASS**

# 5. Voltage Fluctuations & Flicker Test

## 5.1. Test Standard

| Test Standard | EN 61000-3-3 |
|---|---|

## 5.2. Test Setup




## 5.3. Operating Condition of EUT

5.3.1. Setup the EUT as shown on Section 5.2.

5.3.2. Turn on the power of all equipments.

5.3.3. After that, let the EUT work in test mode measure it.

## 5.4. Test Results

**PASS**

# 6. Electrostatic Discharge Immunity Test

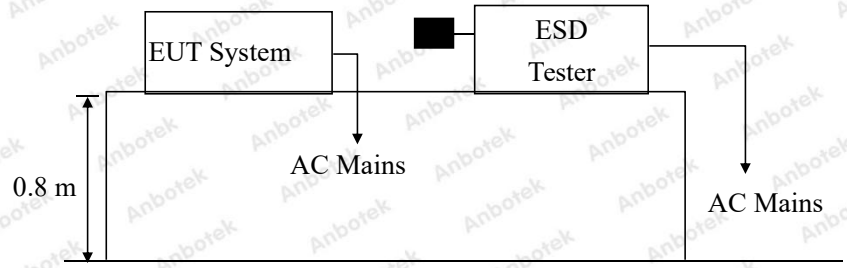
## 6.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN IEC 61326-1 (IEC 61000-4-2) |
| Performance Criterion: | B |
| Severity Level: 3 / Air Discharge: ±8kV, Level: 2 / Contact Discharge: ±4kV | |

Test Level

| Level | Test Voltage Contact Discharge (kV) | Test Voltage Air Discharge (kV) |
|---|---|---|
| 1. | ±2 | ±2 |
| 2. | ±4 | ±4 |
| 3. | ±6 | ±8 |
| 4. | ±8 | ±15 |
| X. | Special | Special |

## 6.2. Test Setup




## 6.3. EUT Configuration on Measurement

The following equipments are installed on Electrostatic Discharge immunity Measurement to meet EN IEC 61326-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 6.4. Operating Condition of EUT

6.4.1. Setup the EUT as shown on Section 6.2.

6.4.2. Turn on the power of all equipments.

6.4.3. After that, let the EUT work in test mode measure it.

## 6.5. Test Procedure

### 6.5.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

### 6.5.2. Contact Discharge:

All the procedure shall be same as Section 6.5.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

### 6.5.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

### 6.5.4. Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m × 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

## 6.6. Test Results

**PASS**

Please refer to the following page.

# Electrostatic Discharge Test Results

| | | | |
|---|---|---|---|
| Air discharge : | ±8.0kV | Temperature : | 17.2℃ |
| Contact discharge : | ±4.0kV | Humidity : | 50% |
| Power Supply : | AC 230V, 50Hz | Expert conclusion: | A |
| Test Result : | ☒ Pass ☐ Fail | | |
| # For each point positive 10 times and negative 10 times discharge | | | |
| | | | |

| **Location** | | **Kind**<br>A-Air Discharge<br>C-Contact Discharge | **Result** |
|---|---|---|---|
| Slot | 4points | A | ☑A ☐B<br>☐C ☐D |
| Screw | 4 points | C | ☑A ☐B<br>☐C ☐D |
| Screen | 4 points | A | ☑A ☐B<br>☐C ☐D |
| Metal | 4 points | C | ☑A ☐B<br>☐C ☐D |
| Button | 4 points | A | ☑A ☐B<br>☐C ☐D |
| COM Port | 4 points | C | ☑A ☐B<br>☐C ☐D |
| HCP | 4 points | C | ☑A ☐B<br>☐C ☐D |
| VCP of the front | 4 points | C | ☑A ☐B<br>☐C ☐D |
| VCP of the rear | 4 points | C | ☑A ☐B<br>☐C ☐D |
| VCP of the left | 4 points | C | ☑A ☐B<br>☐C ☐D |
| VCP of the right | 4 points | C | ☑A ☐B<br>☐C ☐D |

**Remark:** Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

# 7. RF Field Strength Susceptibility Test

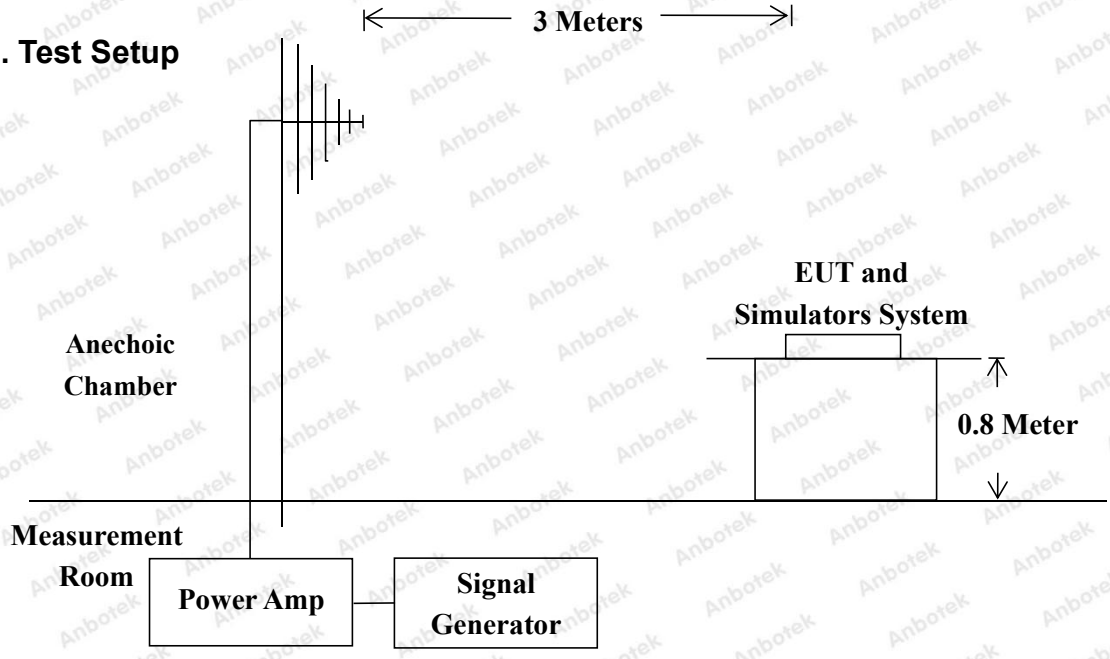
## 7.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN IEC 61326-1 (IEC 61000-4-3) |
| Required Performance: | A |
| Frequency Range: | 80MHz to 1000MHz/ 1.4GHz to 2.0GHz/ 2.0GHz to 2.7GHz |
| Field Strength: | 3V/m, 3V/m, 1V/m |
| Modulation: | 1kHz Sine Wave, 80%, AM Modulation |
| Frequency Step: | 1 % of preceding frequency value |
| Polarity of Antenna: | Horizontal and Vertical |
| Test Distance: | 3 m |
| Antenna Height: | 1.5 m |
| Dwell Time: | at least 0.5s |

Test Level

| Level | Field Strength V/m |
|---|---|
| 1. | 1 |
| 2. | 3 |
| 3. | 10 |
| X. | Special |

## 7.2. Test Setup



### 7.3. EUT Configuration on Measurement

The following equipments are installed on RF Field Strength susceptibility Measurement to meet EN IEC 61326-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 7.4. Operating Condition of EUT

7.4.1. Setup the EUT as shown on Section 7.2.

7.4.2. Turn on the power of all equipments.

7.4.3. After that, let the EUT work in test mode measure it.

### 7.5. Test Procedure

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber. The testing distance from antenna to the EUT was 3 meters.

1) 80 MHz to 1000 MHz the field strength level was 3V/m, 1.4 GHz to 2.0 GHz the field strength level was

   3V/m, 2.0 GHz to 2.7 GHz the field strength level was 1V/m.

2) The frequency range is swept from 80 MHz to 1000 MHz, 1.4 GHz to 2.0 GHz, 2.0 GHz to 2.7 GHz with the signal 80% amplitude modulated with a 1kHz sine wave.

3) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond, but shall in no case be less than 0.5s.

4) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

### 7.6. Measuring Results

**PASS**

Please refer to the following page.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# RF Field Strength Susceptibility Test Results

| | | | |
|---|---|---|---|
| Field Strength : | 3V/m, 3V/m, 1V/m | Temperature : | 19.6℃ |
| Expert conclusion: | A | Humidity : | 49% |
| Power Supply : | AC 230V, 50Hz | Test Result : | ☒ Pass ☐ Fail |
| Dwell Time: | 1s | | |

| Frequency Range | Antenna Polarity | R.F. Field Strength | Azimuth | Result |
|---|---|---|---|---|
| 80MHz~1000MHz | H / V | 3 V/m (rms) | Front | ☑ A ☐ B ☐ C ☐ D |
| | | | Rear | |
| | | | Left | |
| | | | Right | |
| 1.4GHz~2.0GHz | H / V | 3 V/m (rms) | Front | ☑ A ☐ B ☐ C ☐ D |
| | | | Rear | |
| | | | Left | |
| | | | Right | |
| 2.0GHz~2.7GHz | H / V | 1 V/m (rms) | Front | ☑ A ☐ B ☐ C ☐ D |
| | | | Rear | |
| | | | Left | |
| | | | Right | |

# 8. Electrical Fast Transient/Burst Immunity Test

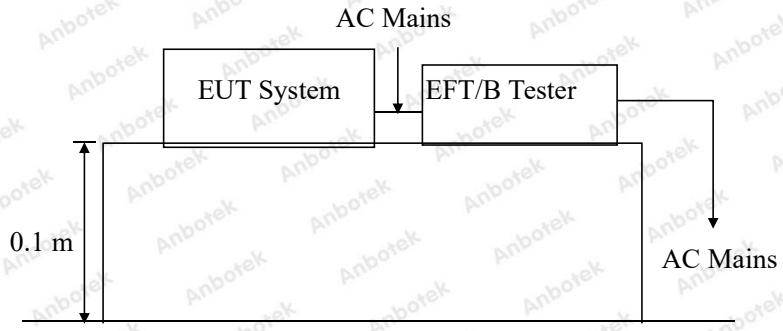
## 8.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN IEC 61326-1 (IEC 61000-4-4) |
| Performance criterion: | B |
| Severity Level 2: 1.00kV | |

Test Level

| Open Circuit Output Test Voltage ± 10% | | |
|---|---|---|
| Level | On Power Supply Lines | On I/O (Input/Output) Signal data and control lines |
| 1. | 0.50 kV | 0.25 kV |
| 2. | 1.00 kV | 0.50 kV |
| 3. | 2.00 kV | 1.00 kV |
| 4. | 4.00 kV | 2.00 kV |
| X. | Special | Special |

## 8.2. Test Setup




## 8.3. EUT Configuration on Measurement

The following equipments are installed on Electrical Fast Transient/Burst Immunity Measurement to meet EN IEC 61326-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 8.4. Operating Condition of EUT

8.4.1. Setup the EUT as shown in Section 8.2.

8.4.2. Turn on the power of all equipments.

8.4.3. Let the EUT work in test mode and measure it.

## 8.5. Test Procedure

The EUT is put on the table which 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.

### 8.5.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

### 8.5.2. For signal lines and control lines ports:

Select tests based on product characteristics.

### 8.5.3. For DC output line ports:

Select tests based on product characteristics.

## 8.6. Test Results

**PASS**

Please refer to the following page.

# Electrical Fast Transient/Burst Test Results

| | | | |
|---|---|---|---|
| Ambient Condition : 17.2℃ / 50% RH | | Expert conclusion: A | |
| Power Supply .: AC 230V, 50Hz | | Test Result : ☒ Pass ☐ Fail | |
| | | | |
| Inject Line : AC Mains | Inject Method: Direct | Inject Time(s): 120 | |
| Line | Polarity | Test Voltage (kV) | Result |
| AC Line | ± | 1.00kV | ☑ A ☐ B ☐ C ☐ D |
| DC Line | | | |
| Signal Line | | | |

# 9. Surge Immunity Test

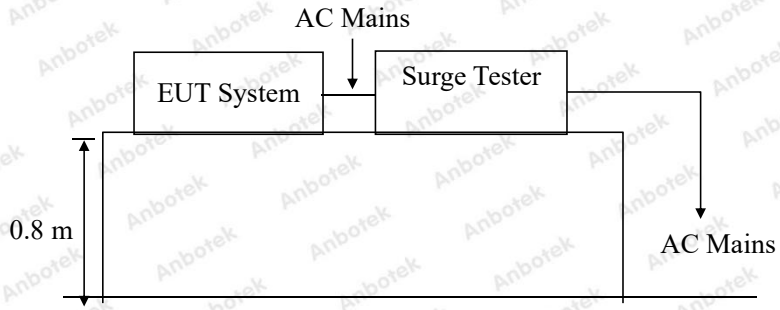
## 9.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN IEC 61326-1 (IEC 61000-4-5) |
| Performance criterion: | B |
| Severity Level: Level 1, Line to Line: 0.5kV; Severity Level: Level 2, Line to Earth: 1.0kV | |

Test Level

| Severity Level | Open-Circuit Test Voltage (kV) |
|---|---|
| 1. | 0.5 |
| 2. | 1.0 |
| 3. | 2.0 |
| 4. | 4.0 |
| X. | Special |

## 9.2. Test Setup




## 9.3. EUT Configuration on Measurement

The following equipments are installed on Surge immunity Measurement to meet EN IEC 61326-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 9.4. Operating Condition of EUT

9.4.1. Setup the EUT as shown in Section 9.2.

9.4.2. Turn on the power of all equipments.

9.4.3. Let the EUT work in test mode and measure it.

## 9.5. Test Procedure

9.5.1. Set up the EUT and test generator as shown on Section 9.2.

9.5.2. For line to line coupling mode, provide a 0.5 kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.

9.5.3. For line to earth coupling mode, provide a 1.0 kV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.

9.5.4. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.

9.5.5. Different phase angles are done individually.

9.5.6. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

## 9.6. Test Results

**PASS**

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# Surge Immunity Test Results

| | | | |
|---|---|---|---|
| Humidity : | 50% | Temperature : | 17.2℃ |
| Power Supply : | AC 230V, 50Hz | Criterion required: | A |
| Test Result : | ☒ Pass ☐ Fail | | |

| Location | Polarity | Phase Angle | Number of Pulse | Pulse Voltage (kV) | Performance Criterion |
|---|---|---|---|---|---|
| L-N | + | ☒ 0° ☒ 90° ☒ 180° ☒ 270° | 5 | 0.5kV | ☑ A ☐ B ☐ C ☐ D |
| L-N | - | ☒ 0° ☒ 90° ☒ 180° ☒ 270° | 5 | 0.5kV | ☑ A ☐ B ☐ C ☐ D |
| L-PE | + | ☒ 0° ☒ 90° ☒ 180° ☒ 270° | 5 | 1.0kV | ☑ A ☐ B ☐ C ☐ D |
| L-PE | - | ☒ 0° ☒ 90° ☒ 180° ☒ 270° | 5 | 1.0kV | ☑ A ☐ B ☐ C ☐ D |
| N-PE | + | ☒ 0° ☒ 90° ☒ 180° ☒ 270° | 5 | 1.0kV | ☑ A ☐ B ☐ C ☐ D |
| N-PE | - | ☒ 0° ☒ 90° ☒ 180° ☒ 270° | 5 | 1.0kV | ☑ A ☐ B ☐ C ☐ D |

# 10. Injected Currents Susceptibility Test

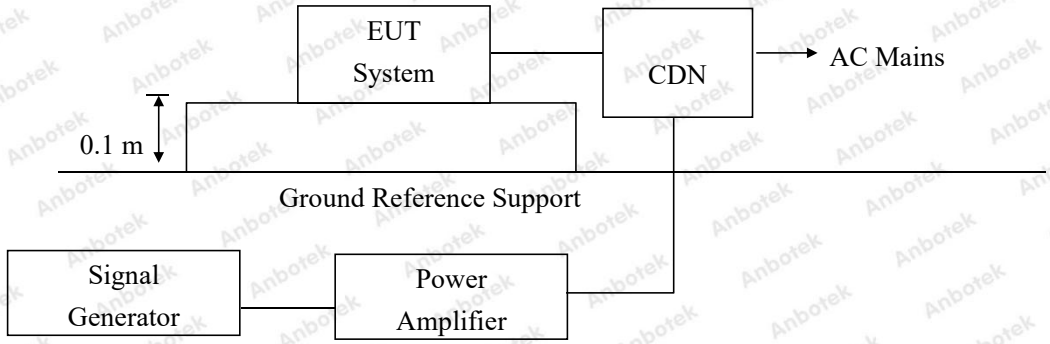
## 10.1. Test Standard and Level

| | |
|---|---|
| Test Standard | EN IEC 61326-1 (IEC 61000-4-6) |
| Performance criterion | A |
| Severity Level 2: 3V (rms), (0.15MHz ~80MHz) | |

Test Level

| Level | Field Strength V |
|---|---|
| 1. | 1 |
| 2. | 3 |
| 3. | 10 |
| X. | Special |

## 10.2. Test Setup




## 10.3. EUT Configuration

The following equipments are installed on currents susceptibility Measurement to meet EN IEC 61326-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 10.4. Operating Condition of EUT

10.4.1. Setup the EUT as shown in Section 10.2.

10.4.2. Turn on the power of all equipments.

10.4.3. Let the EUT work in test mode and measure it.

## 10.5. Test Procedure

1) Set up the EUT, CDN and test generators as shown on Section 10.2.
2) Let the EUT work in test mode and measure it.
3) The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
4) The disturbance signal described below is injected to EUT through CDN.
5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
6) The frequency range is swept from 150KHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.
7) The rate of sweep shall not exceed 1.5*10-3decades/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.
8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

## 10.6. Test Results

**PASS**

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# Injected Currents Susceptibility Test Results

| | | | |
|---|---|---|---|
| Humidity : 50% | | Temperature : 17.2℃ | |
| Power Supply : AC 230V, 50Hz | | Criterion required: A | |
| Test Result : ☒ Pass ☐ Fail | | | |
| | | | |
| Frequency Range (MHz) | Injected Position | Strength (Unmodulated) | Result |
| 0.15 ~ 80 | AC Mains | 3V | ☑ A ☐ B ☐ C ☐ D |
| | | | |

**Remark :** 1. Modulation Signal:1KHz 80% AM


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# 11. Voltage Dips And Interruptions Test

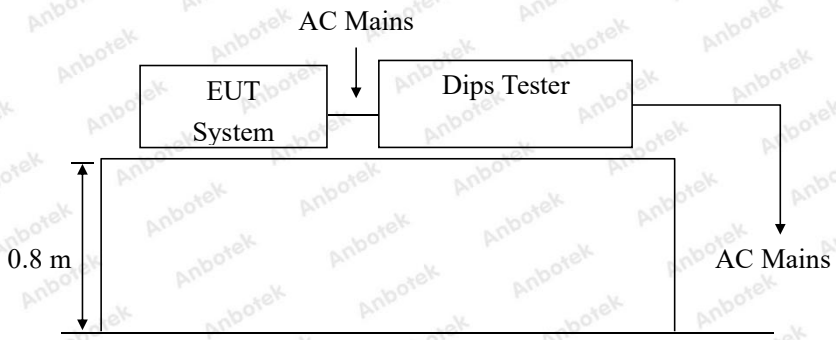
## 11.1. Test Standard and Level

| | |
|---|---|
| Test Standard: | EN IEC 61326-1 (IEC 61000-4-11) |
| Performance Criterion: | B&C |

Test Level

| Test Level %UT | Voltage dip and short interruptions %UT | Duration (in period) |
|---|---|---|
| 0 | 100 | 0.5<br>1<br>5<br>10<br>25<br>50<br>* |
| 0 | 100 | |
| 70 | 30 | |
| 0 | 100 | |

## 11.2. Test Setup




## 11.3. EUT Configuration on Measurement

The following equipments are installed on Voltage dips and interruptions Measurement to meet EN IEC 61326-1 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

## 11.4. Operating Condition of EUT

11.4.1. Setup the EUT as shown in Section 11.2.

11.4.2. Turn on the power of all equipments.

11.4.3. Let the EUT work in test mode and measure it.

### 11.5. Test Procedure

1) Set up the EUT and test generator as shown on Section 11.2.
2) The interruptions is introduced at selected phase angles with specified duration.
3) Record any degradation of performance.

### 11.6. Test Results

**PASS**

Please refer to the following page.

# Voltage Dips and Interruptions Test Results

| | | | |
|---|---|---|---|
| Temperature : 17.2℃ | | Humidity : 50％ | |
| Power Supply : AC 230V, 50Hz | | Expert conclusion: B&C | |
| Test Result : ☒ Pass ☐ Fail | | | |
| | | | |
| Test Level % UT | Voltage Dips & Short Interruptions % UT | Duration (in periods) | Result |
| 0 | 100 | 0.5P | ☐A ☑B ☐C ☐D |
| 0 | 100 | 1.0P | ☐A ☑B ☐C ☐D |
| 70 | 30 | 25P | ☐A ☐B ☑C ☐D |
| | | | |
| | | | |
| Test Level % UT | Voltage Dips & Short Interruptions % UT | Duration (in periods) | Result |
| 0 | 100 | 250P | ☐A ☐B ☑C ☐D |
| | | | |
| | | | |
| | | | |

# APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Power Line Conducted Emission Test

Photo of Radiated Emission Test

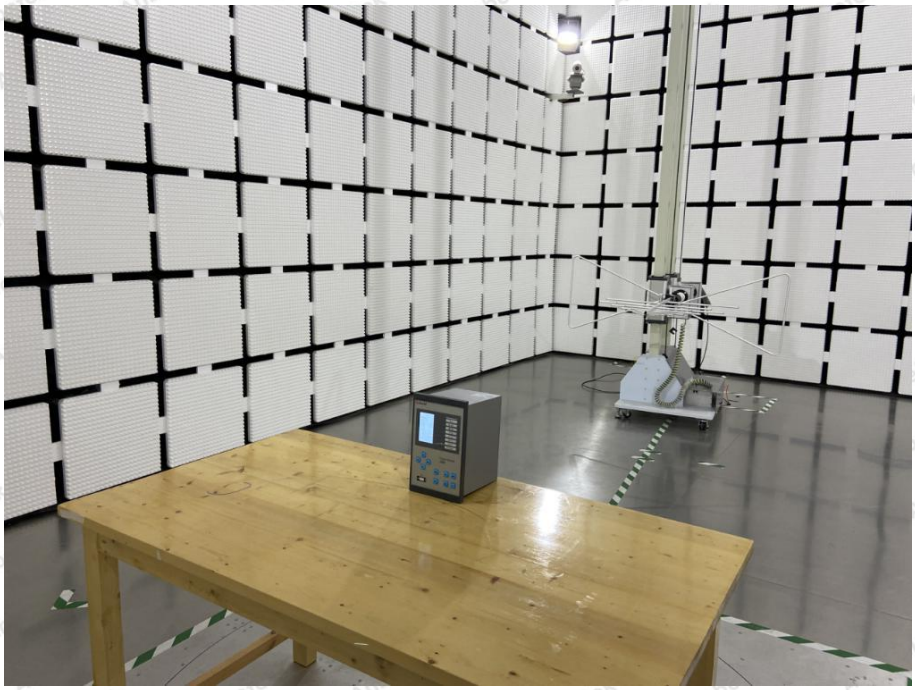


Photo of Electrostatic Discharge Immunity Test

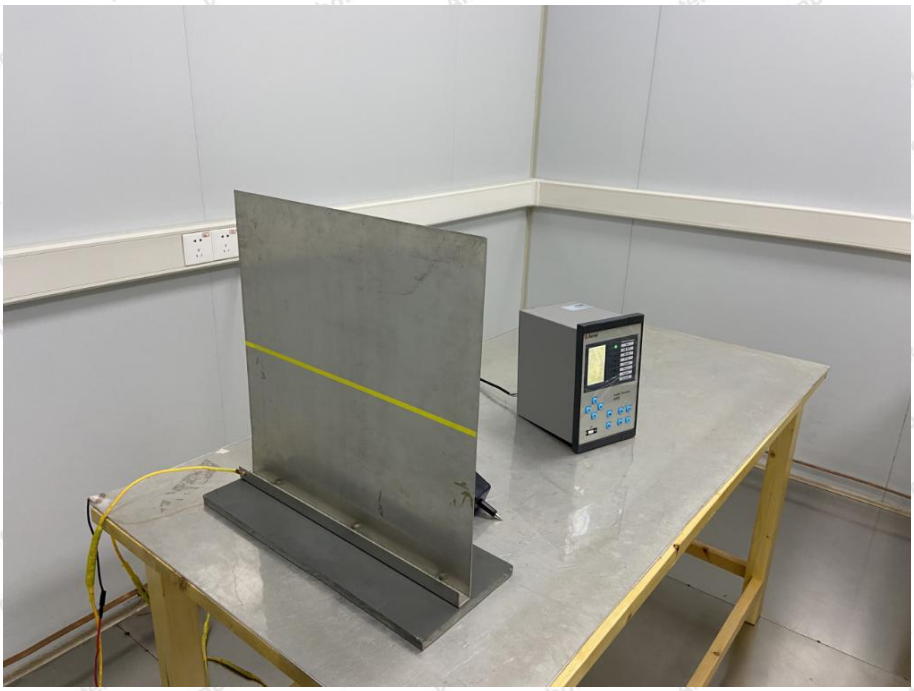


Photo of RF Field Strength susceptibility Test

Photo of Electrical Fast Transient/Burst Immunity Test

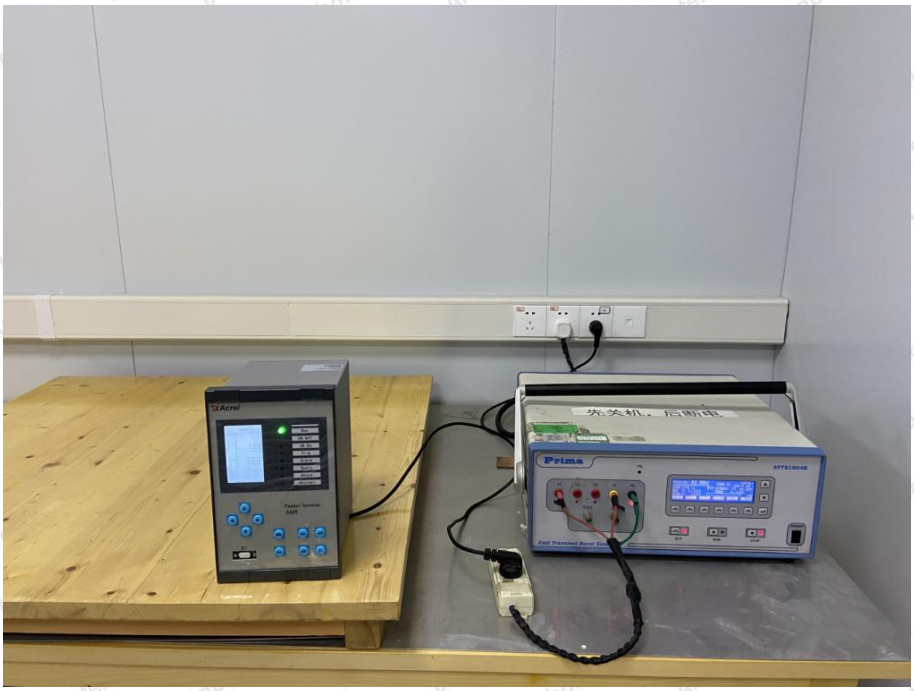



Photo of Surge Immunity Test

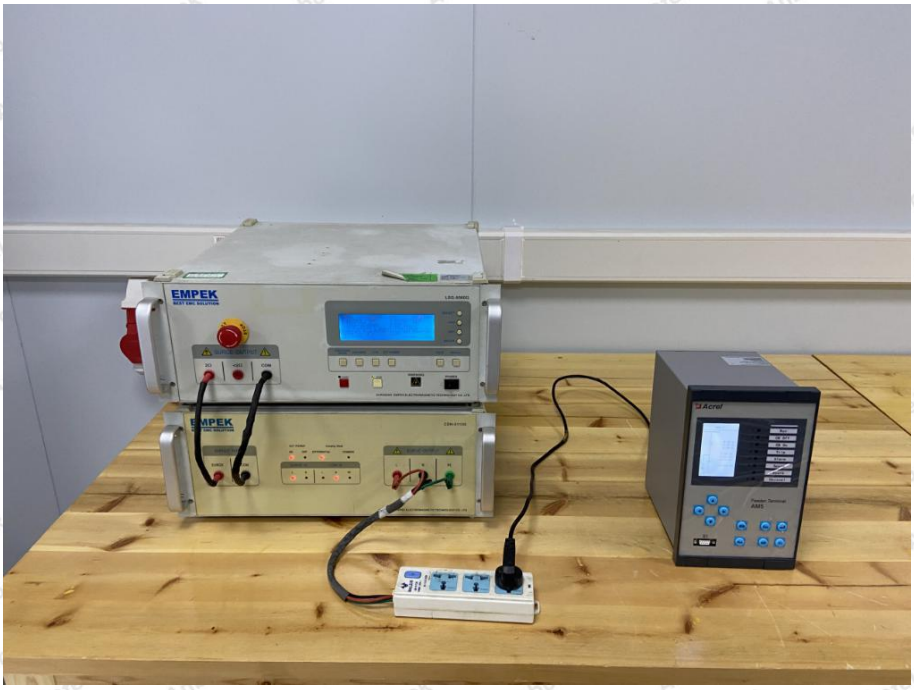


Photo of Injected currents susceptibility Test

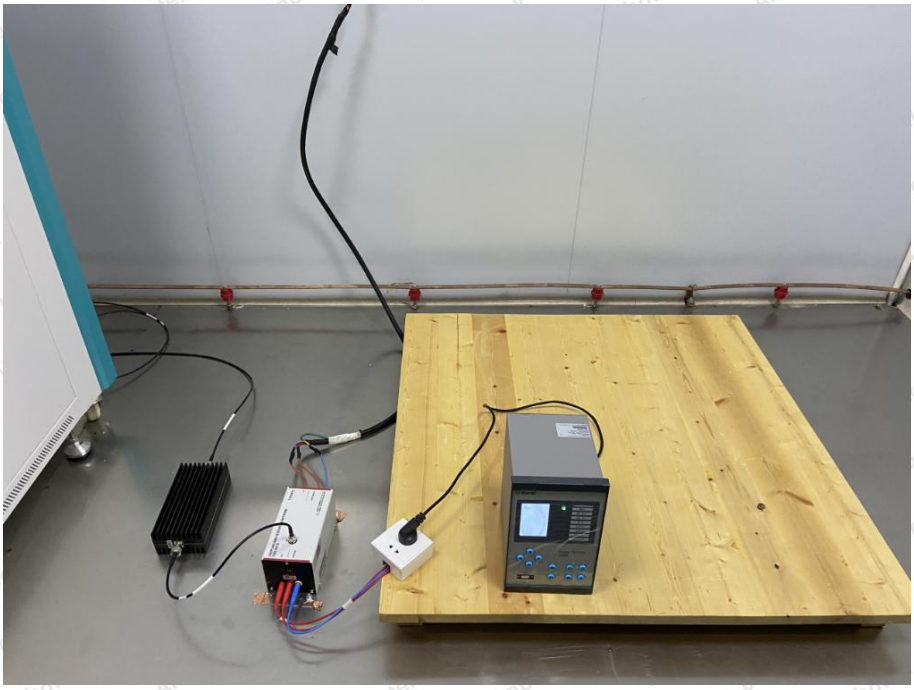
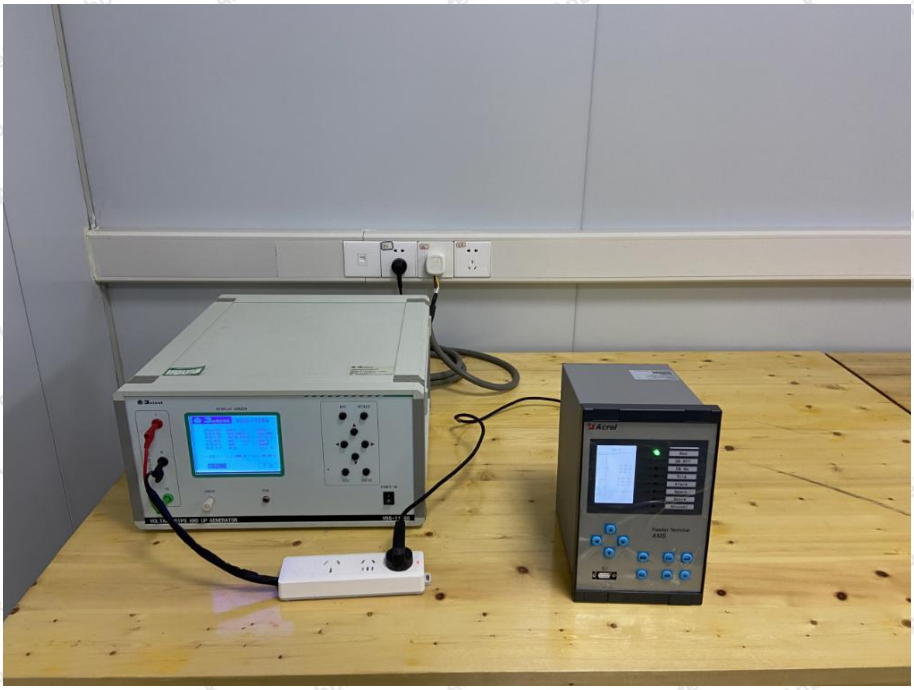
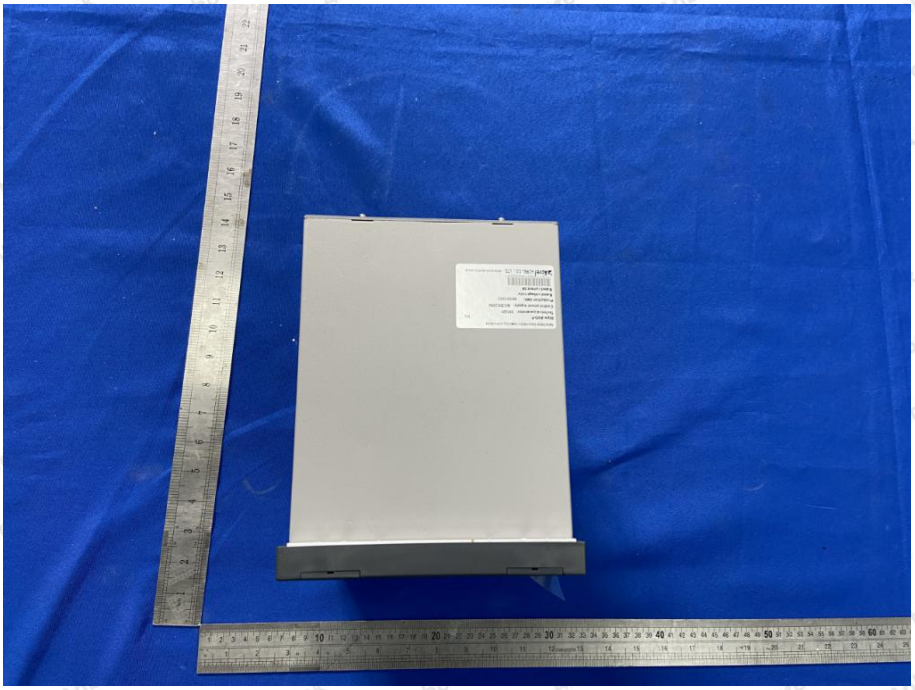


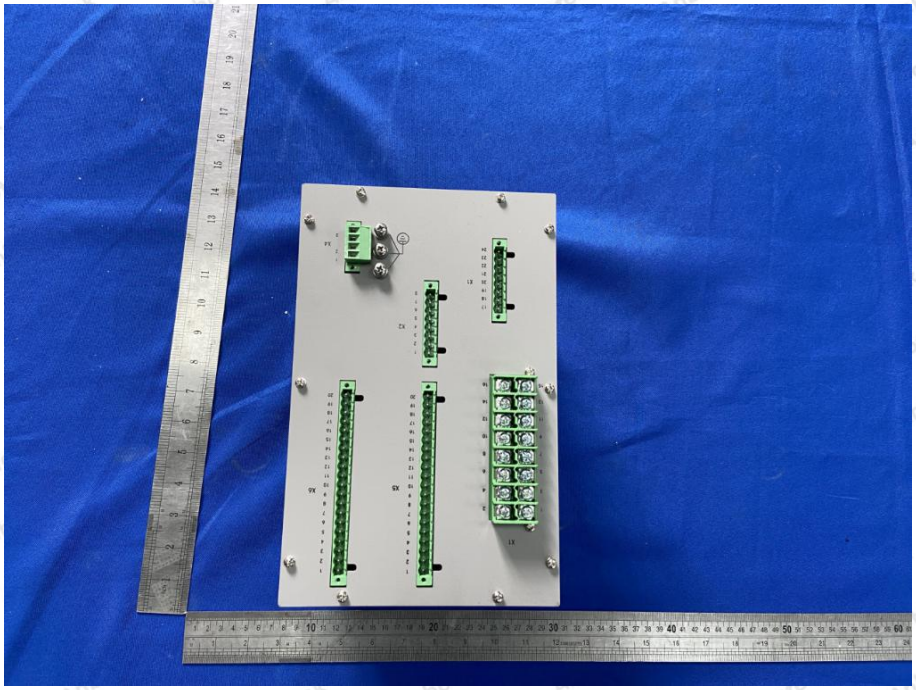
Photo of Voltage Dips and Interruptions Test

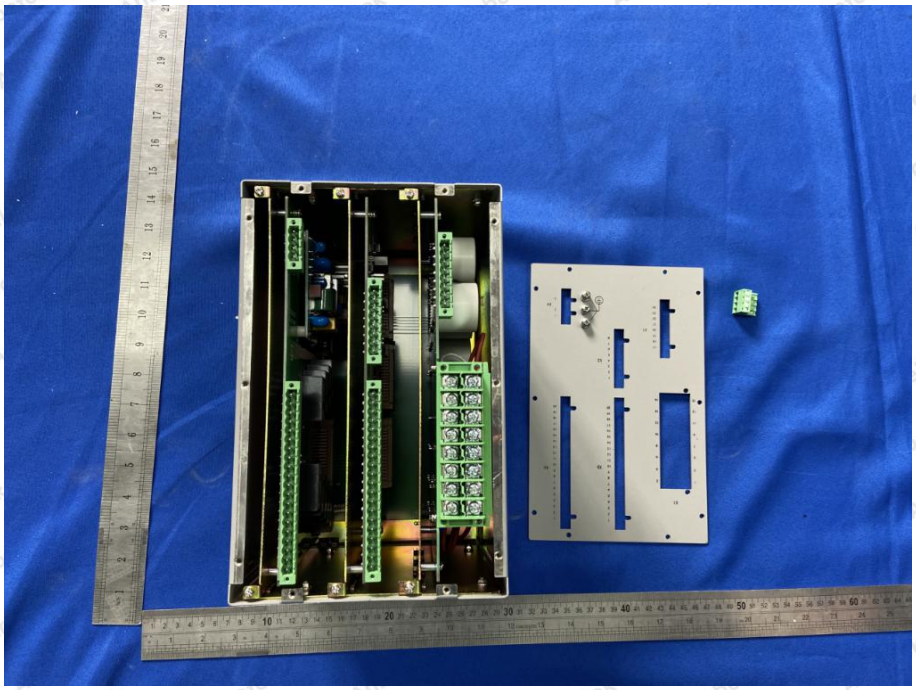


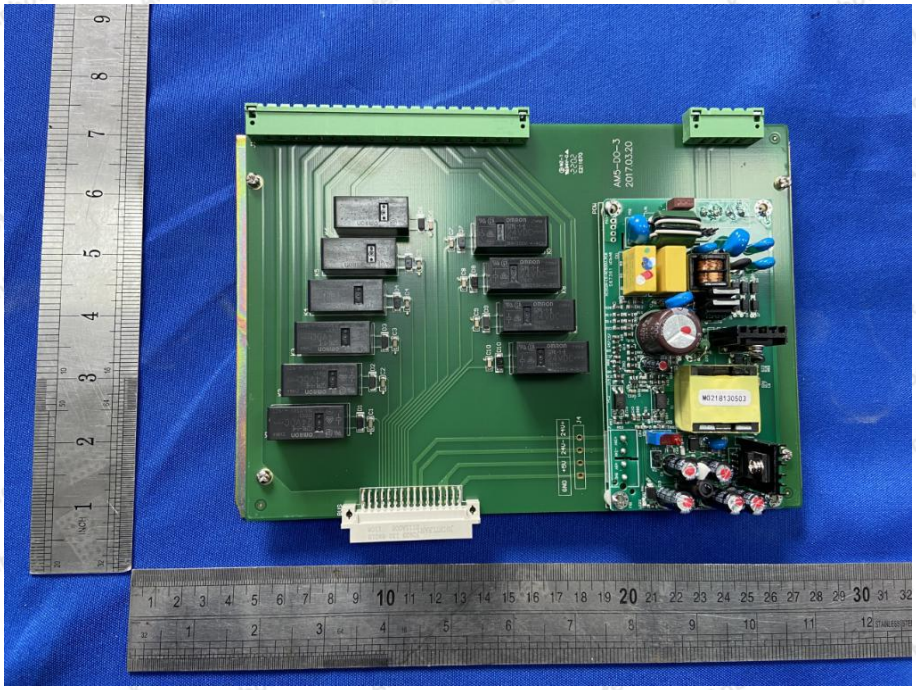
# APPENDIX II -- EXTERNAL PHOTOGRAPH

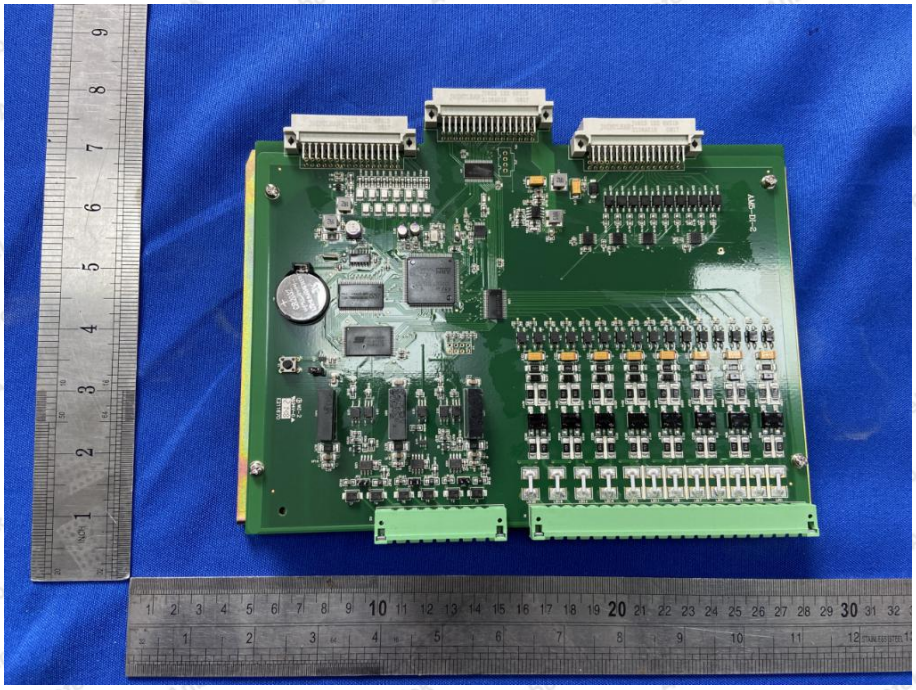


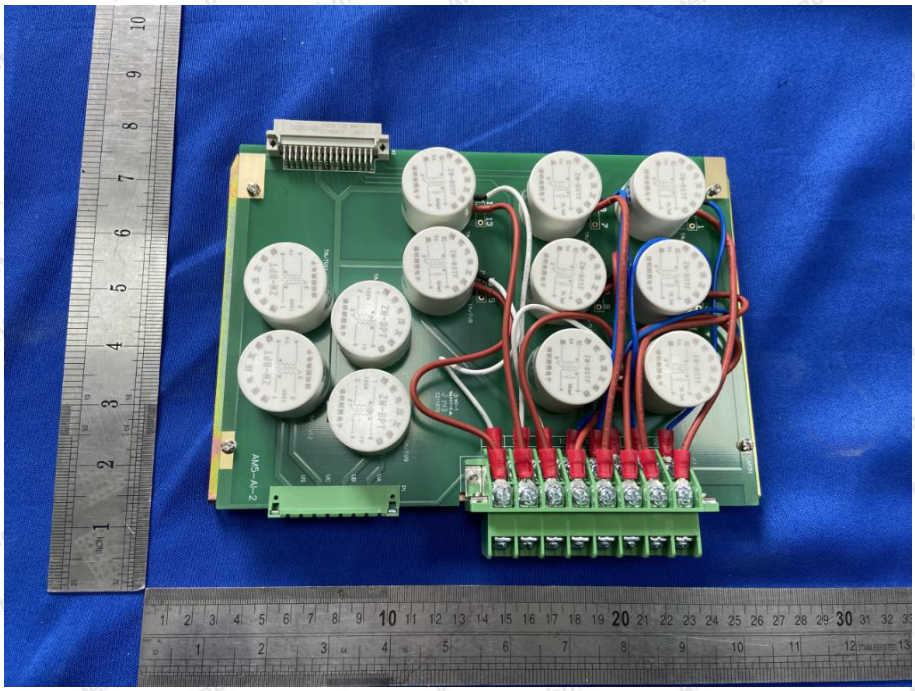
# APPENDIX III -- INTERNAL PHOTOGRAPH

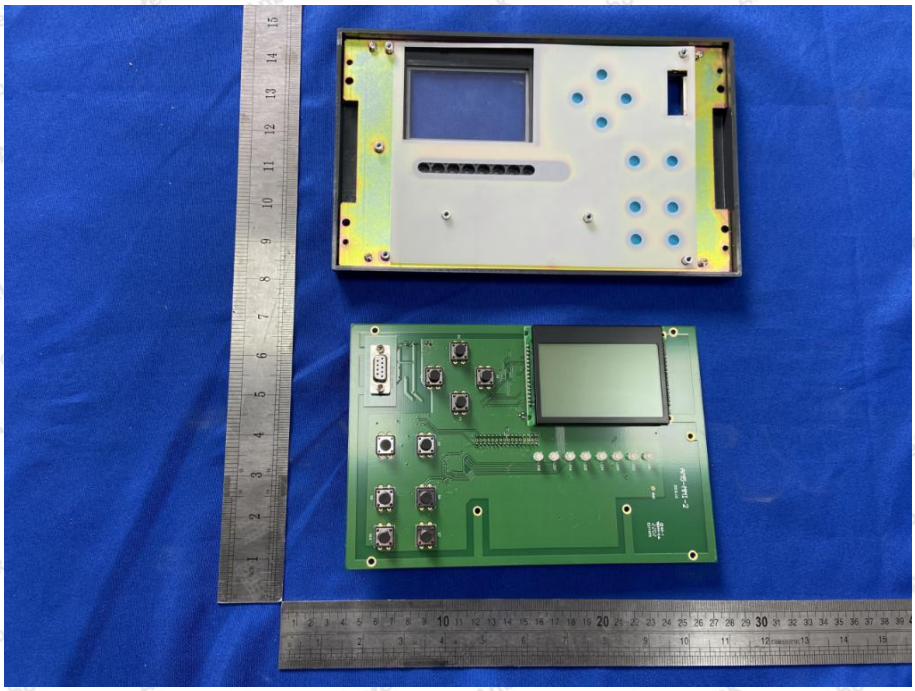


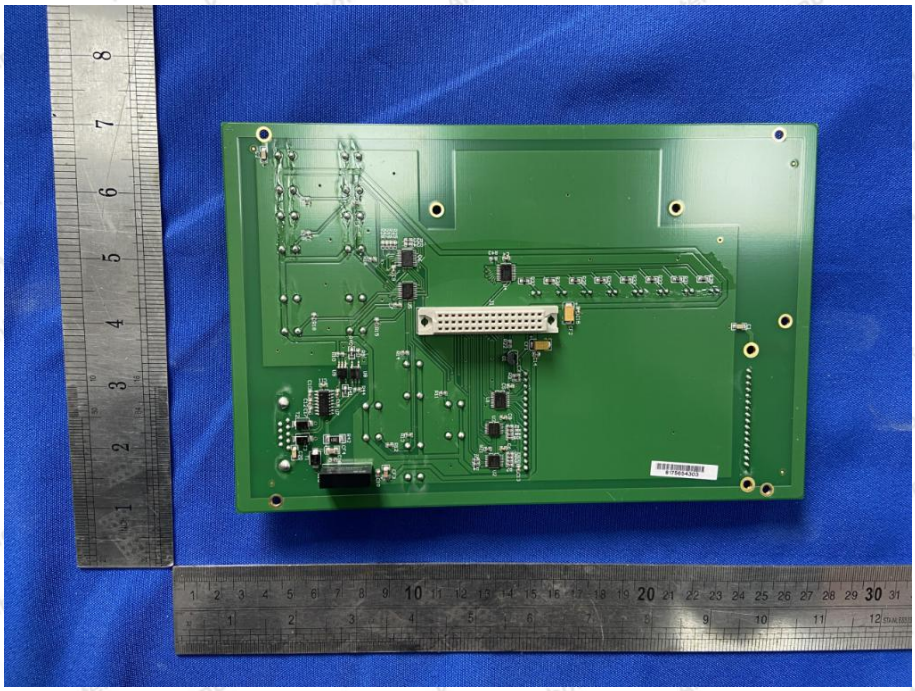


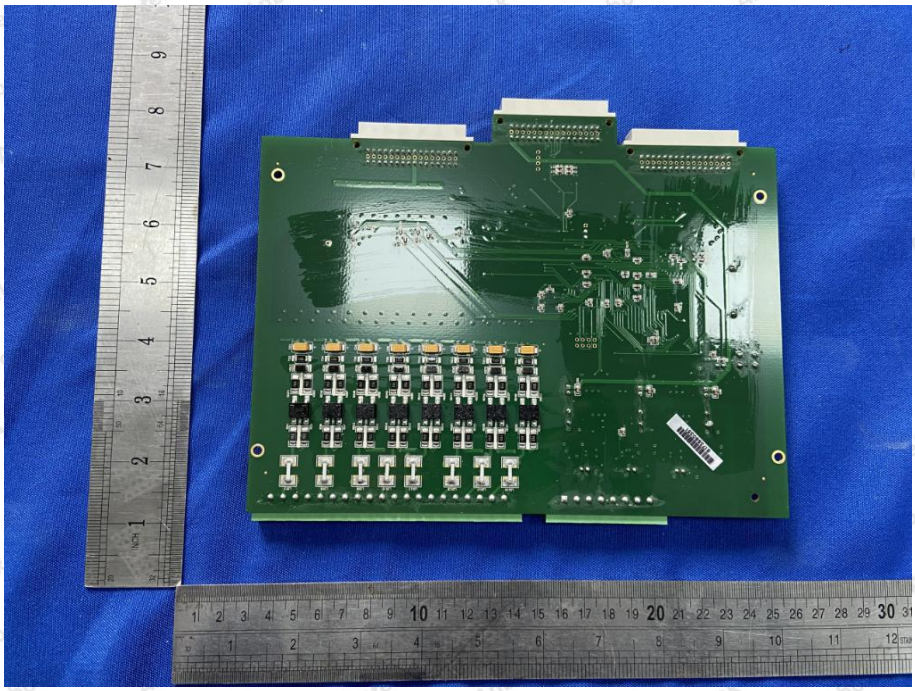


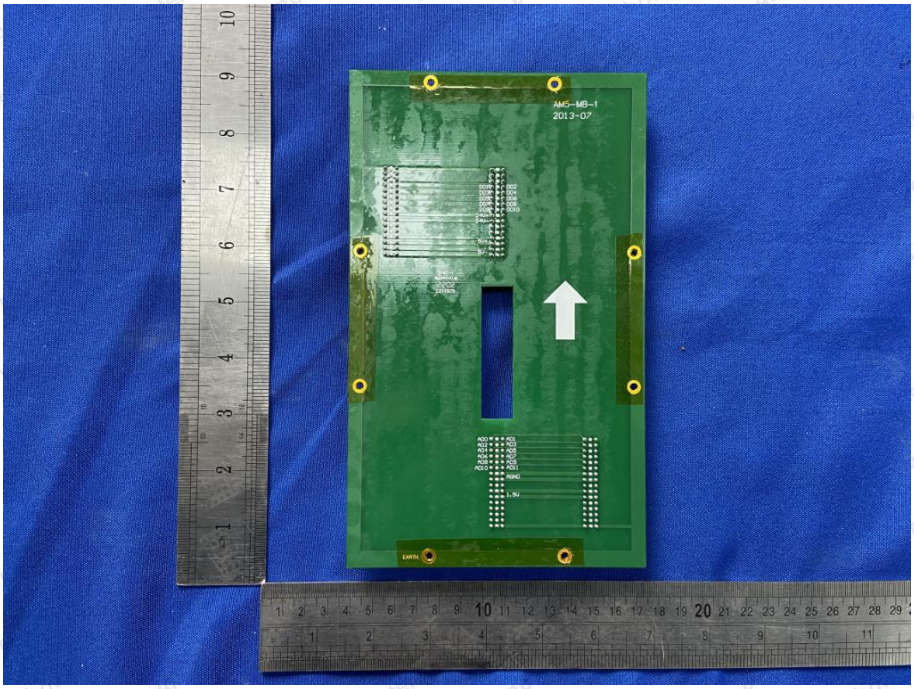











AM5-MB-1
2013-07

# CE Label

1. The CE conformity marking must consist of the initials 'CE' taking the following form:
   If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
2. The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.
3. The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.
4. The CE marking must be affixed visibly, legibly and indelibly.
   It must have the same height as the initials 'CE'.

---------- End of Report ----------