**EUROFINS ELECTRICAL TESTING SERVICE (SHENZHEN) CO., LTD.**

# EMC TEST- REPORT

## TEST REPORT NUMBER: EFGX22040293-IE-01-E01

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# 1 General Information

## 1.1 Notes

The results of this test report relate exclusively to the item tested as specified in chapter “Description of test item” and are not transferable to any other test items.

Eurofins Electrical Testing Service (Shenzhen) Co., Ltd. is not responsible for any generalisations and conclusions drawn from this report. Any modification of the test item can lead to invalidity of test results and this test report may therefore be not applicable to the modified test item.

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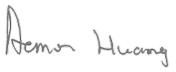
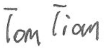
**Operator:**

| | | | |
|---|---|---|---|
| 2022-05-12 | | Aemon Huang / Project Engineer |  |
| Date | Eurofins-Lab. | Name / Title | Signature |

**Technical responsibility for area of testing:**

| | | | |
|---|---|---|---|
| 2022-05-12 | | Tom Tian / EMC Supervisor |  |
| Date | Eurofins | Name / Title | Signature |

## 1.2 Testing laboratory

**Eurofins Electrical Testing Service (Shenzhen) Co., Ltd.**
1st Floor, Building 2, Chungu, Meisheng Huigu Science and Technology Park, No. 83 Dabao Road, Bao'an District, Shenzhen, P. R. China
Telephone : +86-755-82911867
Fax : +86-755-82910749

## 1.3 Details of approval holder

| | | |
|---|---|---|
| Name | : | NINGBO PRINCE TOYS CO., LTD. |
| Address | : | No. 777 East Taoyuan Road, Guanhaiwei Town, Cixi City, Zhejiang, China |
| Telephone | : | ./ . |
| Fax | : | ./ . |

## 1.4 Application details

| | | |
|---|---|---|
| Date of receipt of test item | : | 2022-04-19 |
| Date of receipt of test sample | : | 2022-04-19 |
| Date of test | : | 2022-04-19 to 2022-04-29 |
| Date of issue | : | 2022-05-12 |

## 1.5 EUT information

| | | |
|---|---|---|
| Product name | : | children battery ride on motorcycle |
| Model name | : | H1 |
| Brand name | : | ./ . |
| Sample ID | : | 220419-30-001 |
| Ratings | : | DC 5V 2A powered by Power supply (Model: HK050V-060050<br>Input: AC 120-240V, 50/60Hz, 0.2A;<br>Output: DC 6V 0.5A, 3.0W)<br>Internal rechargeable battery: DC 6V 4A |
| Test voltage | : | AC 120V 50Hz, AC 230V 50Hz for Power supply;<br>DC 6V by battery. |
| Additional information | : | ./ . |

(General disclaimer:
The above sample(s) and sample information was/were submitted and identified on behalf of the applicant. Eurofins assures objectivity and impartiality of the test, and fulfills the obligation of confidentiality for applicant's commercial information and technical documents.)

## 1.6 Test standards

Technical standard :

**EN IEC 55014-1:2021**

**EN IEC 55014-2:2021**

**EN IEC 61000-3-2:2019/A1:2021**

**EN 61000-3-3:2013/A1:2019**

# 2 Technical test

## 2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed. ☒

**or**

The deviations as specified were ascertained in the course of the tests performed. ☐

## 2.2 Test environment

| | | | |
|---|---|---|---|
| Temperature | : 15 | ... | 35°C |
| Relative humidity content | : 30 | ... | 60% |
| Air pressure | : 86 | ... | 106kPa |

## 2.3 Test mode

TM1: Charging (AC 230V 50Hz)
TM2: Charging (AC 120V 50Hz)
TM3: Working (DC 6V)

Only the worst case mode recorded in this report.

## 2.4 Test equipment utilized

| EQUIPMENT ID | EQUIPMENT NAME | MODEL NO. | CAL. DUE DATE |
|---|---|---|---|
| 23-2-13-01 | EMI Test Receiver | ESR7 | 2023-03-21 |
| 23-2-13-02 | Signal Analyzer | N9020B-544 | 2023-03-21 |
| 23-2-12-02 | TRILOG Broadband Antenna | VULB9168 | 2023-04-27 |
| 23-2-10-01 | Preamplifier | BBV9745 | 2023-03-21 |
| 23-2-13-05 | EMI Test Receiver | ESR3 | 2023-03-21 |
| 23-2-13-06 | LISN | NNLK 8127 RC | 2023-03-21 |
| 23-2-10-16 | Attenuator | VTSD 9561-F | 2023-03-21 |
| 23-2-13-16 | Harmonic&Flicker test system | 100C-CTS-230 | 2023-03-21 |
| 23-2-13-17 | Harmonic&Flicker test system | 5001iX-CTS-400 | 2023-03-21 |
| 23-2-13-10 | ESD Generator | NSG437 | 2023-03-25 |
| 23-2-13-11 | Test Generator | compact NX5 bspt-1-300-16 | 2023-03-21 |
| 23-2-13-21 | Switch Unit | variac NX-1-260-16 | 2023-03-21 |
| 23-2-13-09 | Conducted Immunity Test Set | NSG4070C-35 | 2023-03-21 |
| 23-2-10-31 | CDN | CDNM132S | 2023-03-21 |
| 23-2-10-35 | attenuator | DTS60-6dB-1G | 2023-03-21 |
| 23-2-13-07 | Signal Generator | N5171B-506 | 2023-03-21 |
| 23-2-13-08 | Power meter | N1914A | 2023-03-21 |
| 23-2-10-26 | Average power sensor | E9301A | 2023-03-21 |
| 23-2-10-75 | Average power sensor | E9301A | 2023-03-21 |
| 23-2-12-11 | Antenna | STLP9129 | 2023-05-18 |
| 23-2-10-69 | PC | M4000E-16 | N/A |
| 23-2-10-70 | LED Monitor | D18215FD0 | N/A |
| 23-2-10-71 | PC | M4000E-16 | N/A |
| 23-2-10-72 | LED Monitor | V193HQV | N/A |
| 23-2-10-73 | PC | T4099V-00 | N/A |
| 23-2-10-74 | LED Monitor | LS2224 | N/A |
| 23-2-18-001 | Test software | CTS 4 | N/A |
| 23-2-18-002 | Test software | NSG 4070 control program | N/A |
| 23-2-18-003 | Test software | iec.control | N/A |
| 23-2-18-005 | Test software | TS+VER2.1-JS32-CE | N/A |
| 23-2-18-006 | Test software | TS+VER2.1-JS35-RS | N/A |
| 23-2-18-007 | Test software | TS+VER2.1-JS32-RE | N/A |



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## 2.5 System Measurement Uncertainty

| System Measurement Uncertainty | |
|---|---|
| Test Items | Extended Uncertainty |
| Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz | Horizontal: 4.56dB;<br>Vertical: 4.55dB; |
| Uncertainty for Conducted Emission 150kHz-30MHz | 1.96dB |
| Uncertainty for Flicker test | 3.76% |
| Uncertainty for CS test | 28%(CDN),<br>45%(EM Clamp) K=2 |
| Uncertainty for RS test | 25%, K=2 |
| Uncertainty for ESD test | The immunity measurement system uncertainty is within standard requirement and is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. |
| Uncertainty for EFT test | |
| Uncertainty for Surges test | |
| Uncertainty for Voltage Dips, Voltage Variations and Short Interruptions Test | |



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## 2.6 Test results

☒ 1st test ☐ test after modification ☐ production test

| Test item | Sub clause | Required | Test passed | Test failed |
|---|---|---|---|---|
| Conducted Emission | Clause 4.3.2 & 4.3.3 of EN IEC 55014-1 | ☒ | ☒ | ☐ |
| Disturbance power | Clause 4.3.4.4 of EN IEC 55014-1 | ☐ | ☐ | ☐ |
| Radiated disturbance (30MHz to 1000MHz) | Clause 4.3.4 of EN IEC 55014-1 | ☒ | ☒ | ☐ |
| Radiated disturbance (1000MHz to 6000MHz) | Clause 4.3.5 of EN IEC 55014-1 | ☐ | ☐ | ☐ |
| Magnetic field (equipment using IPT) | Clause 4.3.2 of EN IEC 55014-1 | ☐ | ☐ | ☐ |
| Discontinuous disturbance | Clause 4.4.2 of EN IEC 55014-1 | ☐ | ☐ | ☐ |
| Harmonic Current Emissions | EN IEC 61000-3-2 | ☐ | ☐ | ☐ |
| Voltage Changes, Voltage Fluctuations and Flicker | EN 61000-3-3 | ☒ | ☒ | ☐ |
| Electrostatic Discharge | Clause 5.1 of EN IEC 55014-2 & IEC 61000-4-2 | ☒ | ☒ | ☐ |
| Electrical Fast Transients | Clause 5.2 of EN IEC 55014-2 & IEC 61000-4-4 | ☒ | ☒ | ☐ |
| Injected currents (RF continues conducted) | Clause 5.3 & 5.4 of EN IEC 55014-2 & IEC 61000-4-6 | ☒ | ☒ | ☐ |
| Radio frequency electromagnetic fields | Clause 5.5 of EN IEC 55014-2 & IEC 61000-4-3 | ☒ | ☒ | ☐ |
| Surge immunity | Clause 5.6 of EN IEC 55014-2 & IEC 61000-4-5 | ☒ | ☒ | ☐ |
| Voltage dips and Interruption | Clause 5.7 of EN IEC 55014-2 & IEC 61000-4-11 | ☒ | ☒ | ☐ |

Note:
1. The click rate was less than 5, and the click duration was less than 10ms. So it is deemed to comply with Discontinuous disturbance test.
2. The Harmonics current emission test was not required as the rated power of EUT was less than 75W.

# 3 Emission Test

## 3.1 Radiated disturbance

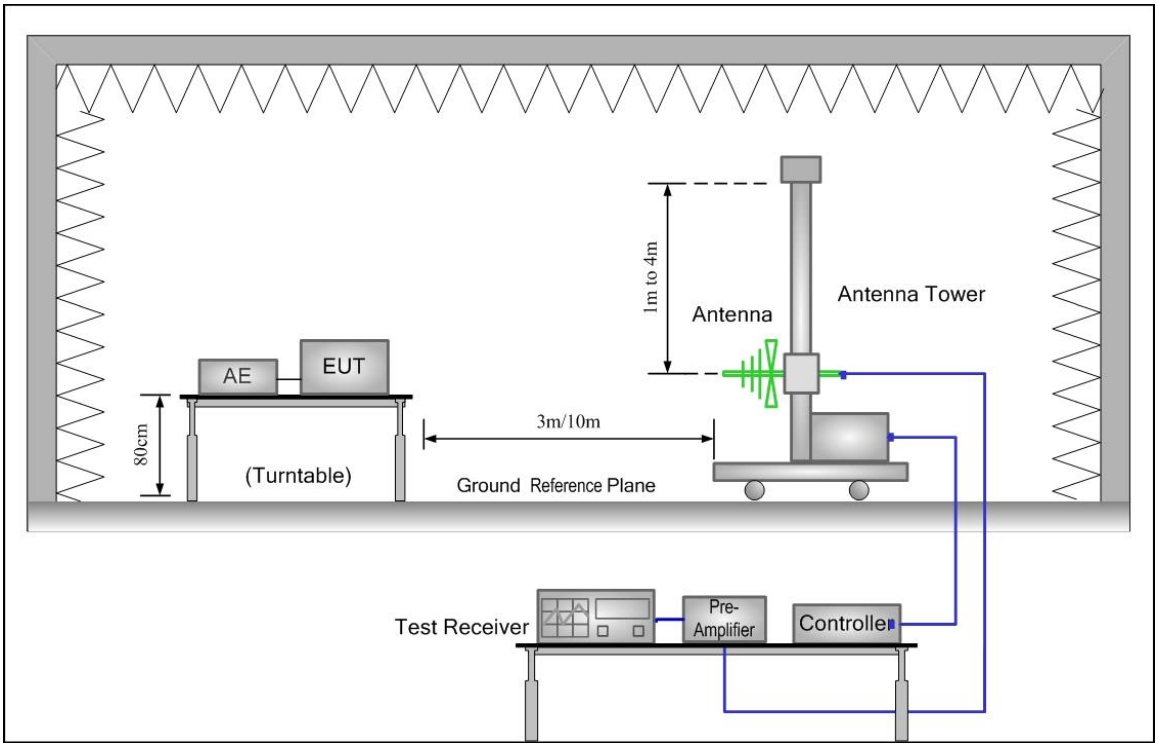
This clause lays down the general requirements for the measurement of Radiated disturbance produced at the space of apparatus.

### 3.1.1 Limits

| Frequency range | Peak limits at 3m | Quasi-peak limits at 3m | Average limits at 3m |
|---|---|---|---|
| MHz | dB (μV/m) | dB (μV/m) | dB (μV/m) |
| 30 to 230 | / | 40 | / |
| 230 to 1000 | / | 47 | / |
| 1000 to 3000 | 70 | / | 50 |
| 3000 to 6000 | 74 | / | 54 |
| At transitional frequencies the lower limit applies. | | | |

Note 1: Result Level= Read Level + Corrector Factor
Note 2: Below 1GHz: Corrector factor = Antenna Factor + Cable Loss - Amplifier Gain.
Note 3: Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain.
Note 4: Radiated disturbance test in the frequency range from 1 GHz to 6 GHz is not required as the highest clock frequency (Fx) of EUT is less than 108MHz.

### 3.1.2 Measurement procedure




1. The radiated emissions test was conducted in a semi-anechoic chamber. The EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was

placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.

2. Before get the final emission results with quasi-peak(QP) detector, a pre-scan was performed with the peak(PK) detector to find out the maximum emission data plots of the EUT.

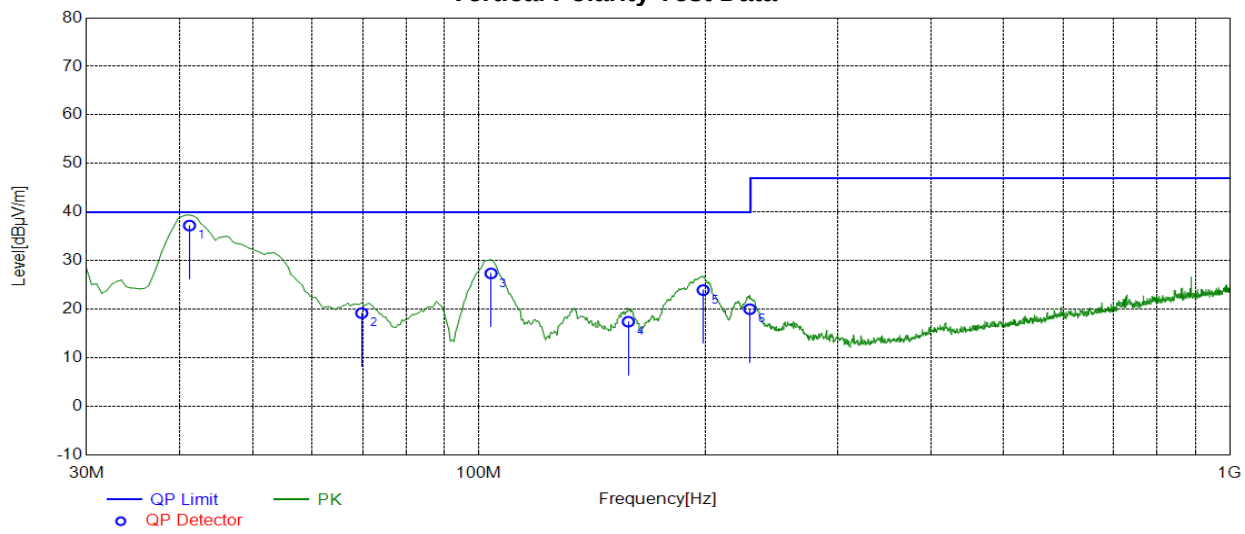
3. The frequencies of maximum emission were determined in the final radiated emissions measurement, the physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization. Test was performed at 3 m distance.

### 3.1.3 Test environment

| | |
|---|---|
| Temperature | : 24.6 °C |
| Relative humidity content | : 57.6 % |
| Air pressure | : 101.5 kPa |

### 3.1.4 Results

**TM1**
**Vertical Polarity Test Data**




| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB/m] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 41.1606 | -15.76 | 37.24 | 40.00 | 2.76 | 100 | 294 | Vertical |
| 2 | 69.7899 | -18.39 | 19.22 | 40.00 | 20.78 | 100 | 347 | Vertical |
| 3 | 103.7569 | -19.95 | 27.38 | 40.00 | 12.62 | 100 | 269 | Vertical |
| 4 | 158.1041 | -15.77 | 17.45 | 40.00 | 22.55 | 100 | 347 | Vertical |
| 5 | 198.8644 | -18.98 | 23.96 | 40.00 | 16.04 | 100 | 347 | Vertical |
| 6 | 229.4347 | -18.45 | 20.03 | 40.00 | 19.97 | 100 | 287 | Vertical |



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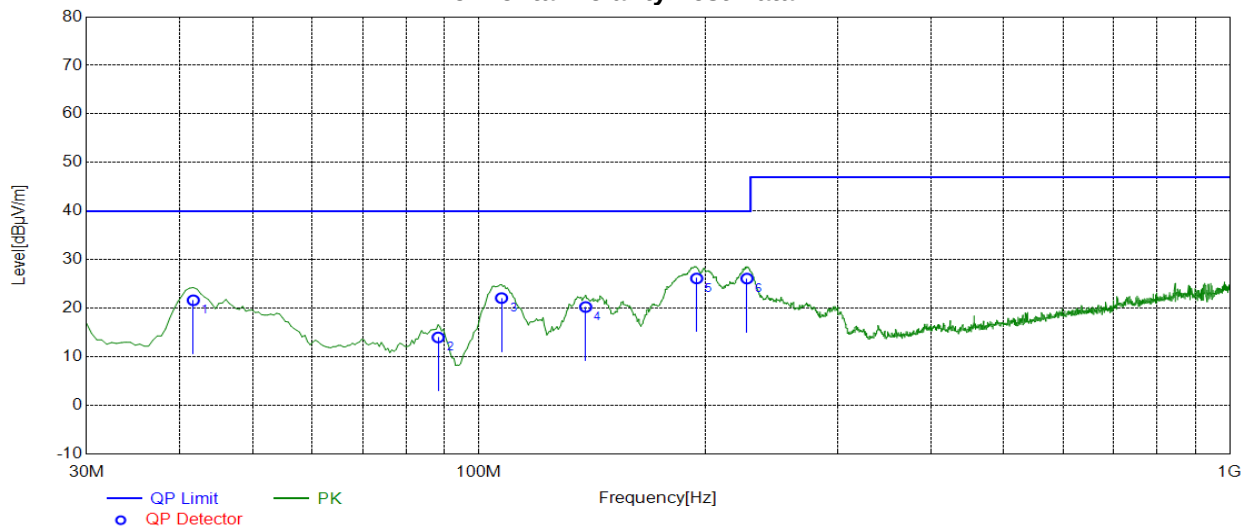
**Horizontal Polarity Test Data**




| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB/m] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 41.6458 | -15.76 | 21.65 | 40.00 | 18.35 | 100 | 359 | Horizontal |
| 2 | 88.2291 | -21.37 | 14.01 | 40.00 | 25.99 | 100 | 112 | Horizontal |
| 3 | 107.1536 | -19.67 | 22.11 | 40.00 | 17.89 | 100 | 192 | Horizontal |
| 4 | 138.6943 | -16.34 | 20.27 | 40.00 | 19.73 | 100 | 112 | Horizontal |
| 5 | 194.9825 | -18.65 | 26.15 | 40.00 | 13.85 | 100 | 360 | Horizontal |
| 6 | 227.4937 | -18.61 | 26.12 | 40.00 | 13.88 | 100 | 360 | Horizontal |



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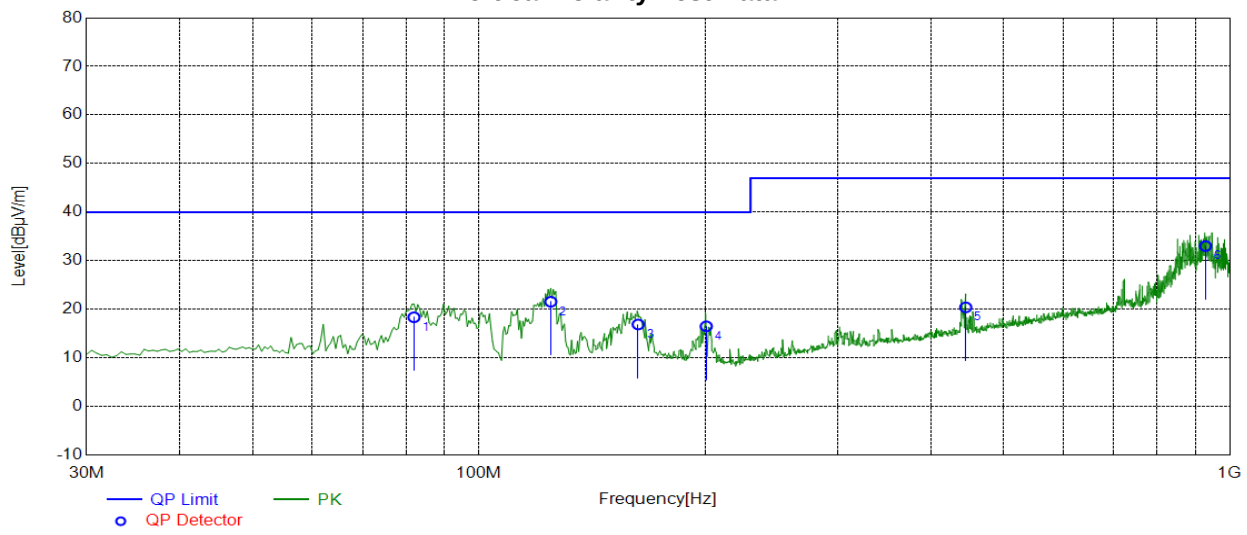
**TM3**
**Vertical Polarity Test Data**




| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB/m] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 81.9210 | -20.89 | 18.36 | 40.00 | 21.64 | 100 | 275 | Vertical |
| 2 | 124.6223 | -18.06 | 21.57 | 40.00 | 18.43 | 100 | 296 | Vertical |
| 3 | 162.9565 | -15.96 | 16.88 | 40.00 | 23.12 | 100 | 258 | Vertical |
| 4 | 200.8054 | -19.08 | 16.50 | 40.00 | 23.50 | 100 | 292 | Vertical |
| 5 | 444.8824 | -12.93 | 20.40 | 47.00 | 26.60 | 100 | 266 | Vertical |
| 6 | 928.1841 | -5.40 | 33.02 | 47.00 | 13.98 | 100 | 334 | Vertical |



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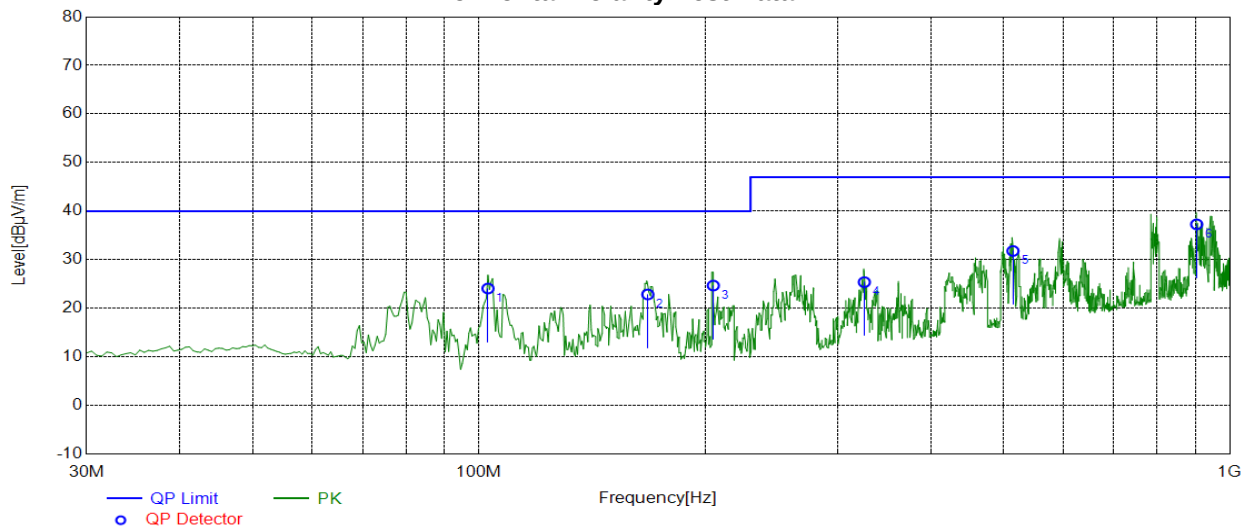
**Horizontal Polarity Test Data**




| Final Data List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB/m] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 102.7864 | -20.03 | 24.08 | 40.00 | 15.92 | 100 | 292 | Horizontal |
| 2 | 167.8089 | -16.34 | 22.86 | 40.00 | 17.14 | 100 | 347 | Horizontal |
| 3 | 205.1726 | -19.12 | 24.68 | 40.00 | 15.32 | 100 | 147 | Horizontal |
| 4 | 325.9980 | -15.19 | 25.39 | 47.00 | 21.61 | 100 | 347 | Horizontal |
| 5 | 514.2721 | -11.46 | 31.80 | 47.00 | 15.20 | 100 | 193 | Horizontal |
| 6 | 903.4367 | -5.84 | 37.28 | 47.00 | 9.72 | 100 | 345 | Horizontal |



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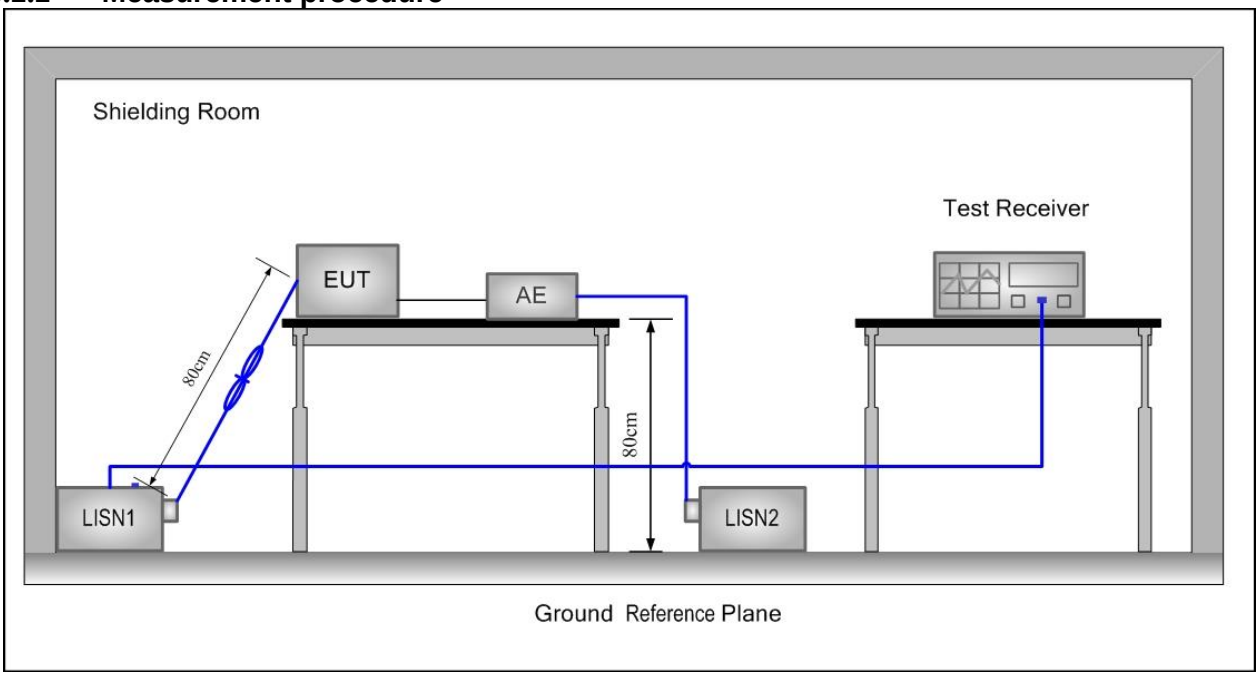
## 3.2 Conducted Emission

This clause lays down the general requirements for the measurement of disturbance voltage produced at the terminals of apparatus.

### 3.2.1 Limits

| Frequency range MHz | At mains terminals dB (μV) | |
|---|---|---|
| | Quasi-peak Limit | Average Limit |
| 0.15 to 0.50 | 66 to 56 | 59 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |
| Note1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 30 MHz.<br>Note2: The lower limit is applicable at the transition frequency. | | |

### 3.2.2 Measurement procedure




1. The mains terminal disturbance voltage was measured with the EUT in a shielded room.
2. The EUT was connected to AC power source through a LISN (Line Impedance Stabilization Network) which provides a (50 μH + 5 Ω) || 50 Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN, which was bonded to the ground reference plane in the same way as the LISN for the unit being measured.
3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.
4. Before get the final emission results with quasi-peak(QP) detector and average(AV) detector, a pre-scan was performed with the peak(PK) and average(AV) detector to find out the maximum emission data plots of the EUT.



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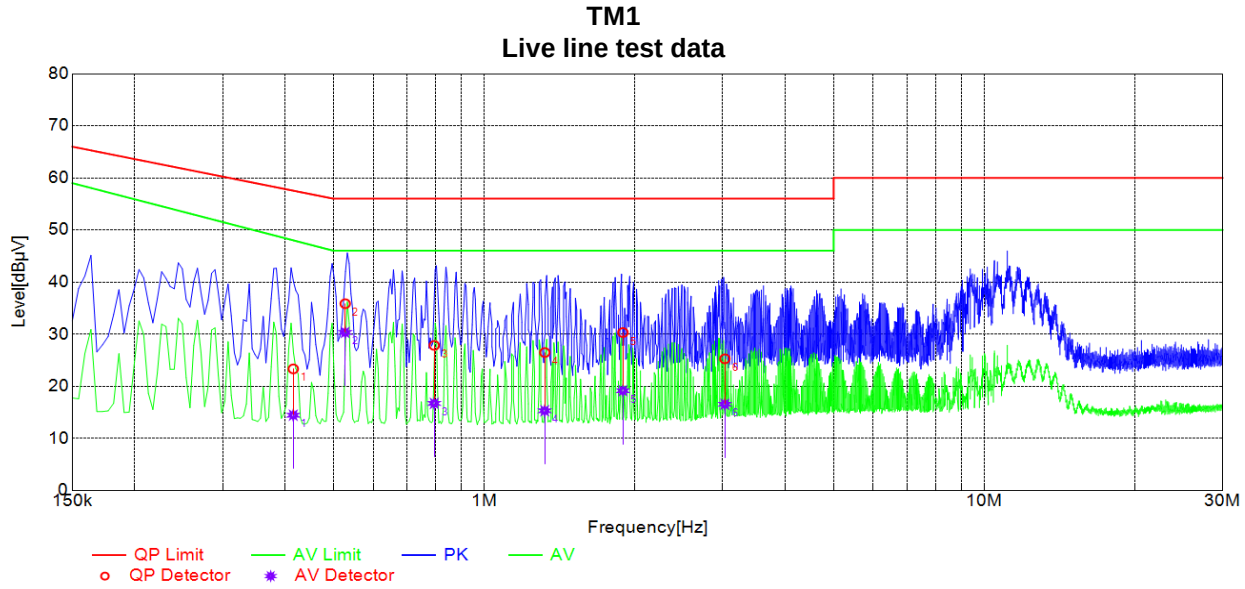
### 3.2.3 Test environment

Temperature : 25.1 °C
Relative humidity content : 57.3 %
Air pressure : 101.5 kPa

### 3.2.4 Results -Measurement Data




| Final Data List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Type | Verdict |
| 1 | 0.4151 | 10.25 | 23.32 | 57.55 | 34.23 | 14.43 | 48.01 | 33.58 | L | PASS |
| 2 | 0.5272 | 10.27 | 35.84 | 56.00 | 20.16 | 30.32 | 46.00 | 15.68 | L | PASS |
| 3 | 0.7945 | 10.28 | 27.83 | 56.00 | 28.17 | 16.69 | 46.00 | 29.31 | L | PASS |
| 4 | 1.3216 | 10.31 | 26.46 | 56.00 | 29.54 | 15.28 | 46.00 | 30.72 | L | PASS |
| 5 | 1.8943 | 10.35 | 30.31 | 56.00 | 25.69 | 19.13 | 46.00 | 26.87 | L | PASS |
| 6 | 3.0291 | 10.37 | 25.26 | 56.00 | 30.74 | 16.53 | 46.00 | 29.47 | L | PASS |



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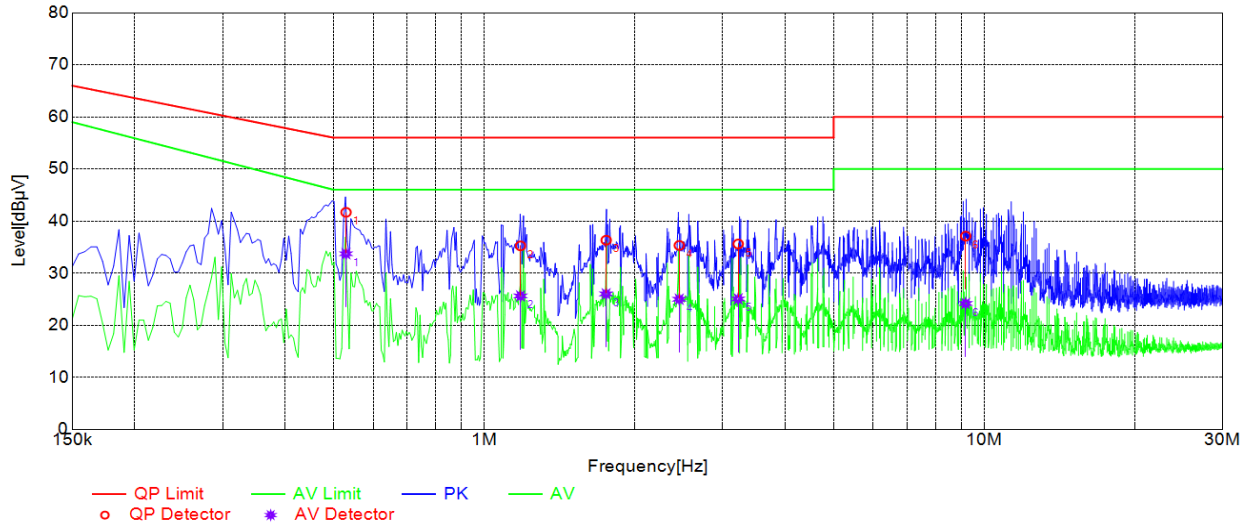
**Neutral line test data**




| Final Data List | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Type | Verdict |
| 1 | 0.5293 | 10.27 | 41.68 | 56.00 | 14.32 | 33.72 | 46.00 | 12.28 | N | PASS |
| 2 | 1.1821 | 10.28 | 35.23 | 56.00 | 20.77 | 25.61 | 46.00 | 20.39 | N | PASS |
| 3 | 1.7533 | 10.30 | 36.32 | 56.00 | 19.68 | 26.01 | 46.00 | 19.99 | N | PASS |
| 4 | 2.4555 | 10.30 | 35.32 | 56.00 | 20.68 | 24.98 | 46.00 | 21.02 | N | PASS |
| 5 | 3.2210 | 10.32 | 35.60 | 56.00 | 20.40 | 25.04 | 46.00 | 20.96 | N | PASS |
| 6 | 9.1822 | 10.45 | 37.10 | 60.00 | 22.90 | 24.16 | 50.00 | 25.84 | N | PASS |

## 3.3 Disturbance power

This clause lays down the general requirements for the measurement of disturbance power produced at the terminals of apparatus.

### 3.3.1 limits

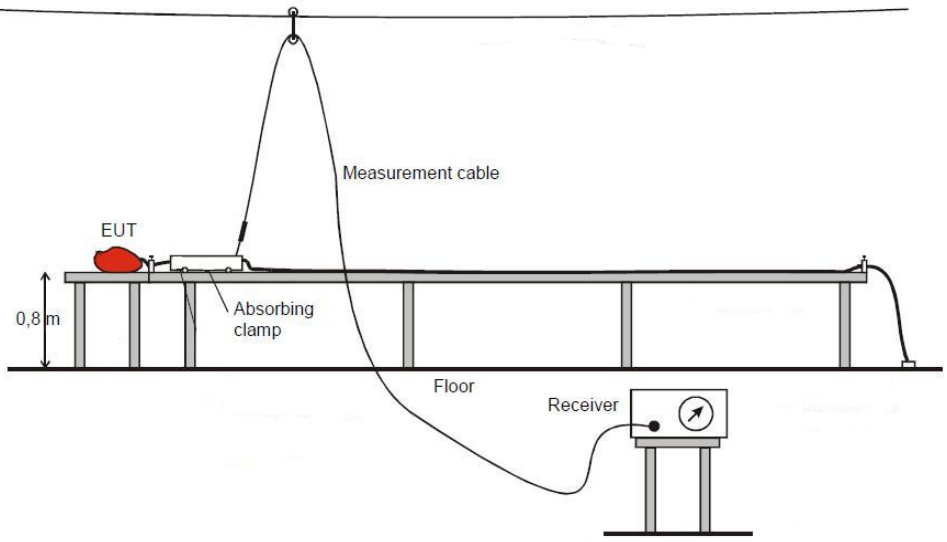
Table 2a-Disturbance power limits for the frequency range 30 MHz to 300 MHz

| **Frequency range** MHz | Limit dB (pW) | |
|---|---|---|
| | Quasi-peak | Average |
| 30 to 300 | 45 to 55 | 35 to 45 |
| Note: Increasing linearly with the frequency from.<br>If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out. | | |

Table 2b-Margin when performing disturbance power measurement in the frequency range 30 MHz to 300 MHz

| | **Household and similar appliances** | | **Tools** | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Frequency range | | | Rated motor power not exceeding 700 W | | Rated motor power above 700 W and not exceeding 1 000 W | | Rated motor power above 1 000 W | |
| (MHz) | dB (pW) Quasi-peak | dB (pW) Average | dB (pW) Quasi-peak | dB (pW) Average | dB (pW) Quasi-peak | dB (pW) Average | dB (pW) Quasi-peak | dB (pW) Average |
| | Increasing linearly with the frequency from: | | | | | | | |
| 200 to 300 | 0 to 10 dB | - | 0 to 10 dB | - | 0 to 10 dB | - | 0 to 10 dB | - |

### 3.3.2 Measurement procedure



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The test configuration corresponds to the standard EN IEC 55014-1. The equipment under test is placed on a non metallic table with 0,8 m high. The lead to be measured is stretched horizontally in a straight line, to permit variation in position of the absorbing clamp along the lead to find the maximum indication. The lead shall be at least length of 6 meter. Before get the final emission results with quasi-peak(QP) detector and average(AV) detector, a pre-scan was performed with the peak(PK) detector to find out the maximum emission data plots of the EUT. The absorbing clamp is placed around the lead.

### 3.3.3 Test environment

| | | |
|---|---|---|
| Temperature | : | °C |
| Relative humidity content | : | % |
| Air pressure | : | kPa |

### 3.3.4 Results

N/A



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## 3.4 Harmonic current emission

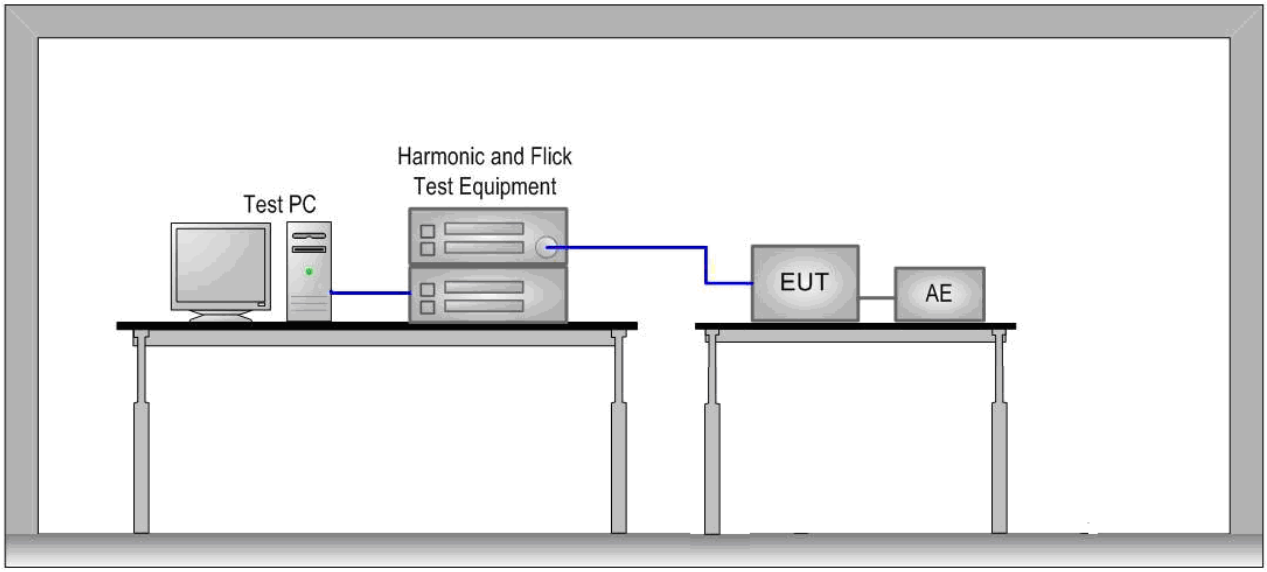
This part deals with the limitation of harmonic currents injected into the public supply system.

### 3.4.1 Limits

Limit for Class A equipment

| Harmonic order<br>n | Maximum permissible harmonic current<br>A |
|---|---|
| **Odd harmonics** | |
| 3 | 2,30 |
| 5 | 1,14 |
| 7 | 0,77 |
| 9 | 0,40 |
| 11 | 0,33 |
| 13 | 0,21 |
| $15 \leq n \leq 39$ | $0,15 \frac{15}{n}$ |
| **Even harmonics** | |
| 2 | 1,08 |
| 4 | 0,43 |
| 6 | 0,30 |
| $8 \leq n \leq 40$ | $0,23 \frac{8}{n}$ |

### 3.4.2 Measurement procedure




The equipment under test is placed on a wooden table with a height of 0,8 m in the EMC lab. For each harmonic order, measure the 1,5 s smoothed r.m.s. harmonic current in each DFT time window and calculate the arithmetic average of the measured values from the DFT time windows, over the entire observation period. Each harmonic order, all 1.5 s smoothed r.m.s. harmonic current values and the average values for the individual harmonic currents, taken over the entire test observation period shall be less than or equal to the applicable limits.

### 3.4.3 Test environment

| | | |
|---|---|---|
| Temperature | : | °C |
| Relative humidity content | : | % |
| Air pressure | : | kPa |

### 3.4.4 Results

N/A



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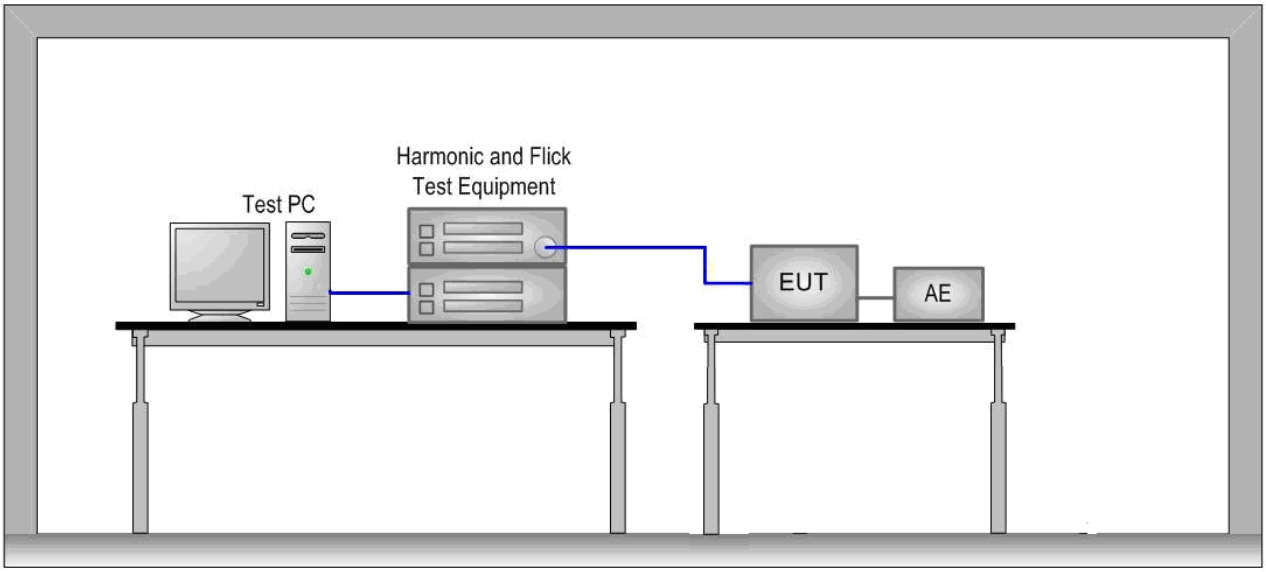
## 3.5 Voltage Changes, Voltage Fluctuations and Flicker

This part is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage system.

### 3.5.1 Limits

| Value | Limit |
|---|---|
| Pst | 1,0 |
| Plt | 0,65 |
| dt | 3,3% |
| dc | 3,3% |
| dmax | 4,0% |

### 3.5.2 Measurementest procedure




The equipment under test is placed on a wooden table with a height of 0,8 m in the EMC lab. The voltage fluctuations and flicker were measured at the supply terminals of the EUT.



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### 3.5.3 Test environment

| | | |
|---|---|---|
| Temperature | : | 24.2 °C |
| Relative humidity content | : | 56.2 % |
| Air pressure | : | 101.5 kPa |

### 3.5.4 Results

**TM1**

**Parameter values recorded during the test:**

| | | | | |
|---|---|---|---|---|
| **Vrms at the end of test (Volt):** | **229.51** | | | |
| **T-max (mS):** | **0** | **Test limit (mS):** | **500.0** | **Pass** |
| **Highest dc (%):** | **0.00** | **Test limit (%):** | **3.30** | **Pass** |
| **Highest dmax (%):** | **0.00** | **Test limit (%):** | **4.00** | **Pass** |
| **Highest Pst (10 min. period):** | **0.200** | **Test limit:** | **1.000** | **Pass** |



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# 4 Immunity Test

## 4.1 Performance Criteria Description in Clause 6 of EN IEC 55014-2

| | |
|---|---|
| **Criterion A:** | The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended. |
| **Criterion B:** | The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and from what the user may reasonably expect from the apparatus if used as intended. |
| **Criterion C:** | Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use. |

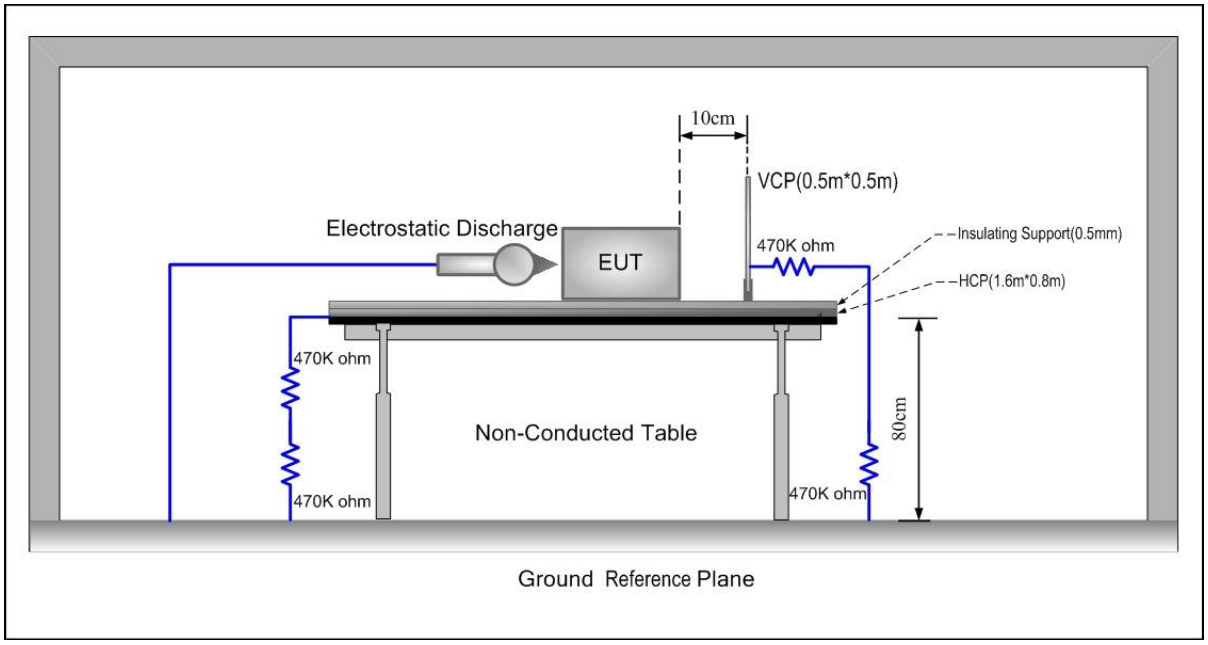
## 4.2 Classification of apparatus

| | |
|---|---|
| **Category I:** | Apparatus containing no electronic control circuitry. |
| **Category II:** | Mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz. |
| **Category III:** | Battery operated equipment not included in Category I. |
| **Category IV:** | Mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 15 MHz but lower than or equal to 200 MHz. |
| **Category V:** | Mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 200 MHz. |

The EUT belongs to Category **III +** Category **II** (while connected to AC mains).

## 4.3 Electrostatic Discharge

### 4.3.1 Test Procedures




1. Contact discharge was applied only to conductive surfaces of the EUT. Air discharge was applied only to non-conducted surfaces of the EUT.
2. The EUT was put on a 0.8m high wooden table for table-top equipment or 0.1m high for floor standing equipment standing on the ground reference plane (GRP).
3. A horizontal coupling plane(HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size while HCP were constructed from the same material type and thickness as that of the GRP, and connected to the GRP via a 470kΩ resistor at each end. The distance between EUT and any of the other metallic surfaces excepted the GRP, HCP and VCP was greater than 1m.
4. During the contact discharges, the tip of the discharge electrode was touching the EUT before the discharge switch is operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the ESD generator was removed from the EUT, the generator is then retriggered for a new single discharge. For ungrounded product, a discharge cable with two resistances was used after each discharge to remove remnant electrostatic voltage. 10 times of each polarity single discharge were applied to HCP and VCP.

### 4.3.2 Test environment

Temperature : 24.1 °C
Relative humidity content : 56.2 %
Air pressure : 101.5 kPa

### 4.3.3 Results

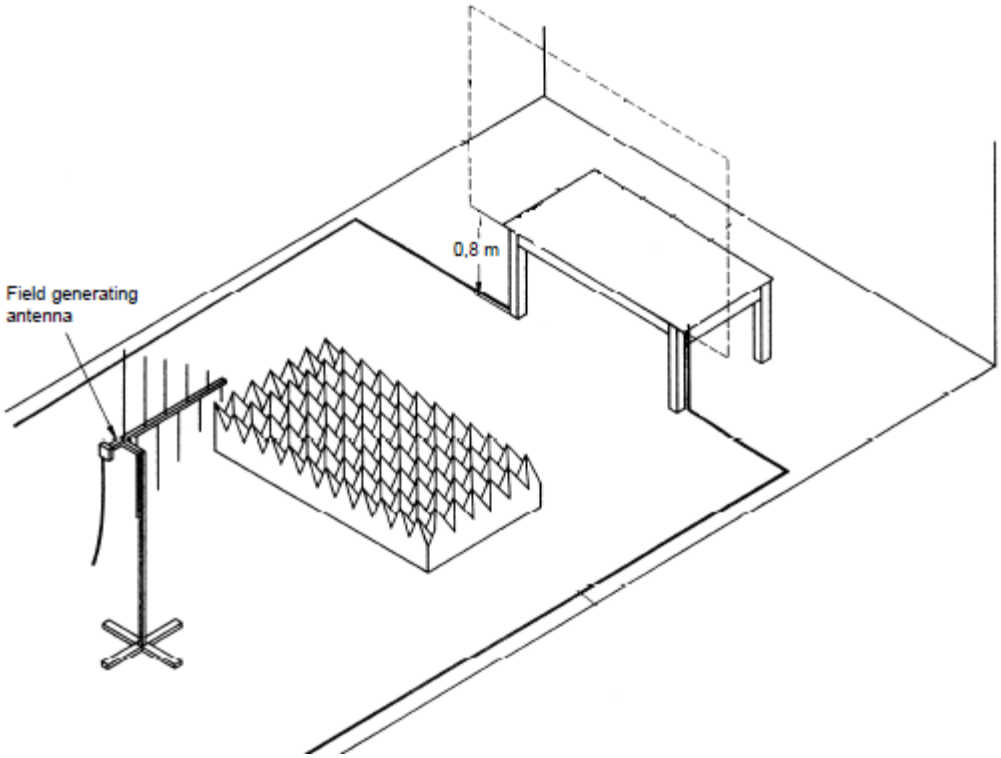
TM1

| Test point | Table (T) Floor (F) | Contact (C) Air (A) | Voltage (Kv) | Number of discharge | Polarity (+ / -) | Opinion |
|---|---|---|---|---|---|---|
| Air discharge | T | A | ±2, ±4, ±8 | Mini 20/point | + / - | A |
| Direct discharge | T | C | ±2, ±4 | Mini 20/point | + / - | A |
| HCP | T | C | ±2, ±4 | Mini 20/point | + / - | A |
| VCP | T | C | ±2, ±4 | Mini 20/point | + / - | A |

A: no loss of function.
N/A: Not Applicable.

## 4.4 Radio frequency electromagnetic fields

### 4.4.1 Measurement procedure




1. The EUT was placed on 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP. The tests normally shall be performed with the generating antenna facing each of four sides of the EUT. When equipment can be used in different orientations (e.g. vertical or horizontal) the test shall be performed on all possible sides of the EUT.
2. The tests are carried out with a field strength by 3 V/m (measured in the unmodulated field) with amplitude modulated signal by a depth of 80 % by a sinusoidal audio signal of 1 kHz. The logarithmic step was 1% and the dwell time was 3s dependent of the EUT cycle time.



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### 4.4.2 Test environment

Temperature : 24.2 °C
Relative humidity content : 56.2 %
Air pressure : 101.5 kPa

### 4.4.3 Results

TM3

| Frequency Range | Field Strength | Modulation | Antenna Polarity | Opinion |
|---|---|---|---|---|
| 80MHz-1GHz | 3V/m | 80% AM 1kHz | Horizontal | A |
| 80MHz-1GHz | 3V/m | 80% AM 1kHz | Vertical | A |

A: no loss of function.



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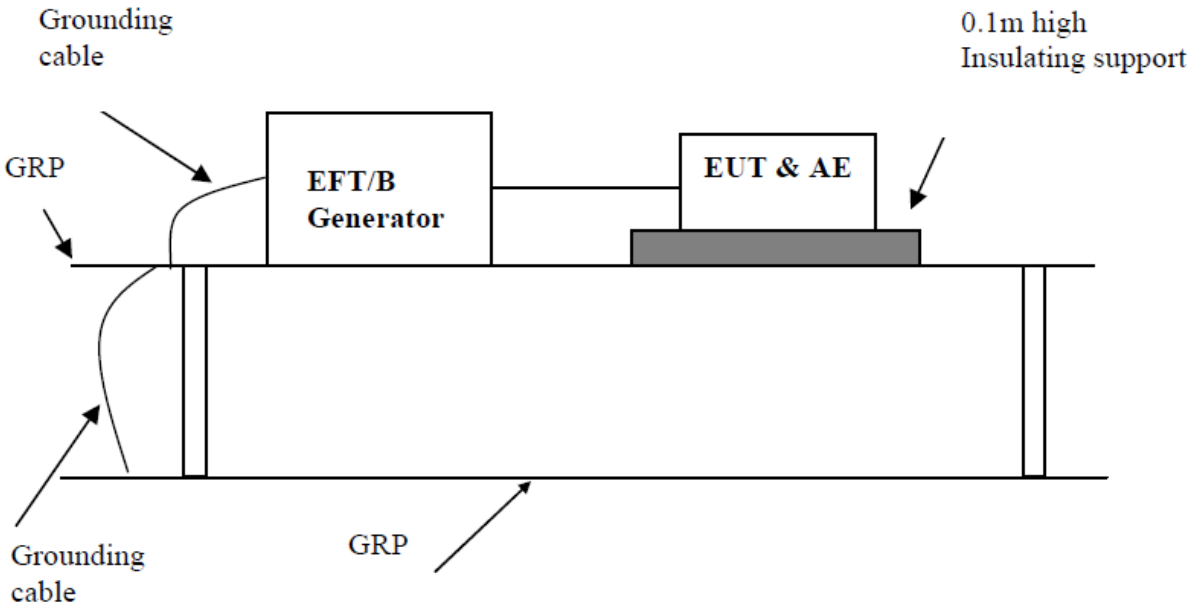
## 4.5 Electrical Fast Transients

### 4.5.1 Measurement procedure




1. The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0,1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2. The GRP shall project beyond the EUT and the clamp by at least 0.1m on all sides. The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m. All cables to the EUT was placed on the insulation support 0.1m above GRP. Cables not subject to EUT was routed as far as possible from cable under test to minimize the coupling between the cables.
3. The length of signal and power cable between the EUT and EFT generator was 0.5m. If the cable is a non-detachable supply cable more than 0.5m, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0.1m above the GRP.

### 4.5.2 Test environment

Temperature : 24.2 °C
Relative humidity content : 56.3 %
Air pressure : 101.5 kPa

### 4.5.3 Results

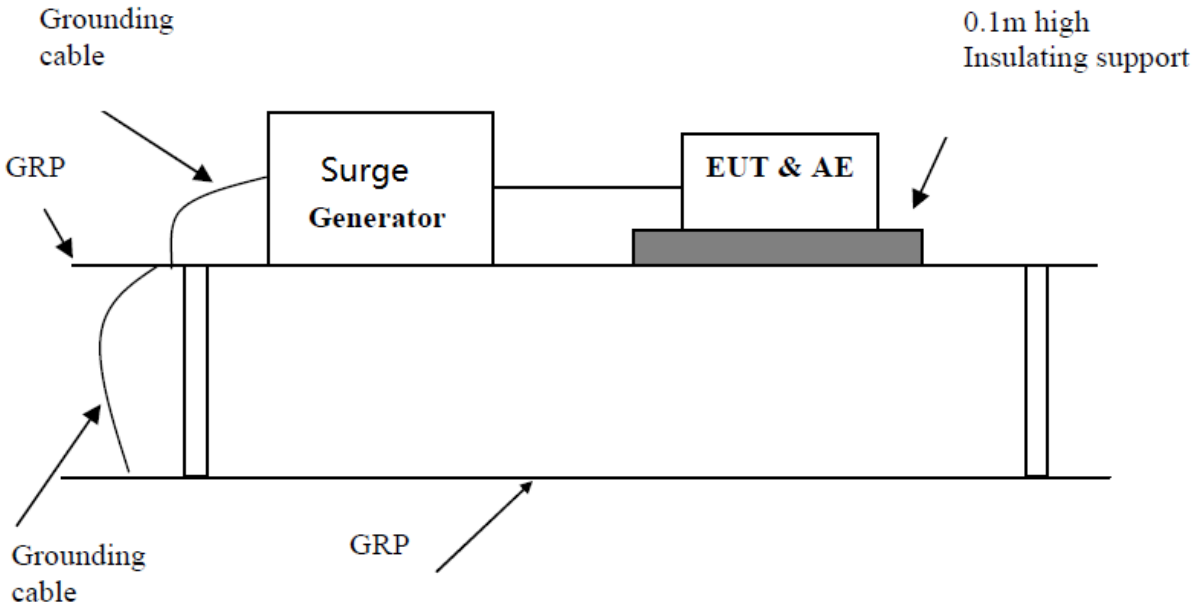
TM1

| Test port | Voltage (kV) | Polarity (+ / -) | Duration (s or min) | Waveform Tr / Th | Repetition Frequency (kHz) | Opinion |
|---|---|---|---|---|---|---|
| a.c. port, L | 1 | +/- | 2 min | 5/50 ns | 5 | A |
| a.c. port, N | 1 | +/- | 2 min | 5/50 ns | 5 | A |
| a.c. port, PE | 1 | +/- | 2 min | 5/50 ns | 5 | N/A |
| a.c. port, L+N | 1 | +/- | 2 min | 5/50 ns | 5 | A |
| a.c. port, L+PE | 1 | +/- | 2 min | 5/50 ns | 5 | N/A |
| a.c. port, N+PE | 1 | +/- | 2 min | 5/50 ns | 5 | N/A |
| a.c. port, L+N+PE | 1 | +/- | 2 min | 5/50 ns | 5 | N/A |

A: no loss of function.
B: the appliance could not work normal during test, but after test it would recover automatically.
N/A: Not Applicable.

## 4.6 Surge Immunity

### 4.6.1 Measurement procedure




1. The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0,1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2. The 1,2/50 μs surge was to be applied to the EUT power supply terminals via the capacitive coupling network .Decoupling networks were required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines and to provide sufficient decoupling impedance to the surge wave so that the specified wave may be applied on the lines under test.
3. The positive pulses are applied 90° relative to the phase angle of the a.c. line voltage to the equipment under test, and the negative pulses are applied 270° relative to the phase angle of the a.c. line voltage to the equipment under test.



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### 4.6.2 Test environment

Temperature : 24.2 °C
Relative humidity content : 56.3 %
Air pressure : 101.5 kPa

### 4.6.3 Results

TM1

| Test port | Polarity (+ / -) | Voltage ( kV ) | Voltage Waveform | Current Waveform | Repetition Rate | Number of pulses | Opinion |
|---|---|---|---|---|---|---|---|
| a.c. port, L-N | +/- | 1.0 | 1.2/50 µs | 8/20 µs | 1 per min | 5 /point | A |
| a.c. port, L-PE | +/- | 2.0 | 1.2/50 µs | 8/20 µs | 1 per min | 5 /point | N/A |
| a.c. port, N-PE | +/- | 2.0 | 1.2/50 µs | 8/20 µs | 1 per min | 5 /point | N/A |

A: no loss of function.
N/A: Not Applicable.



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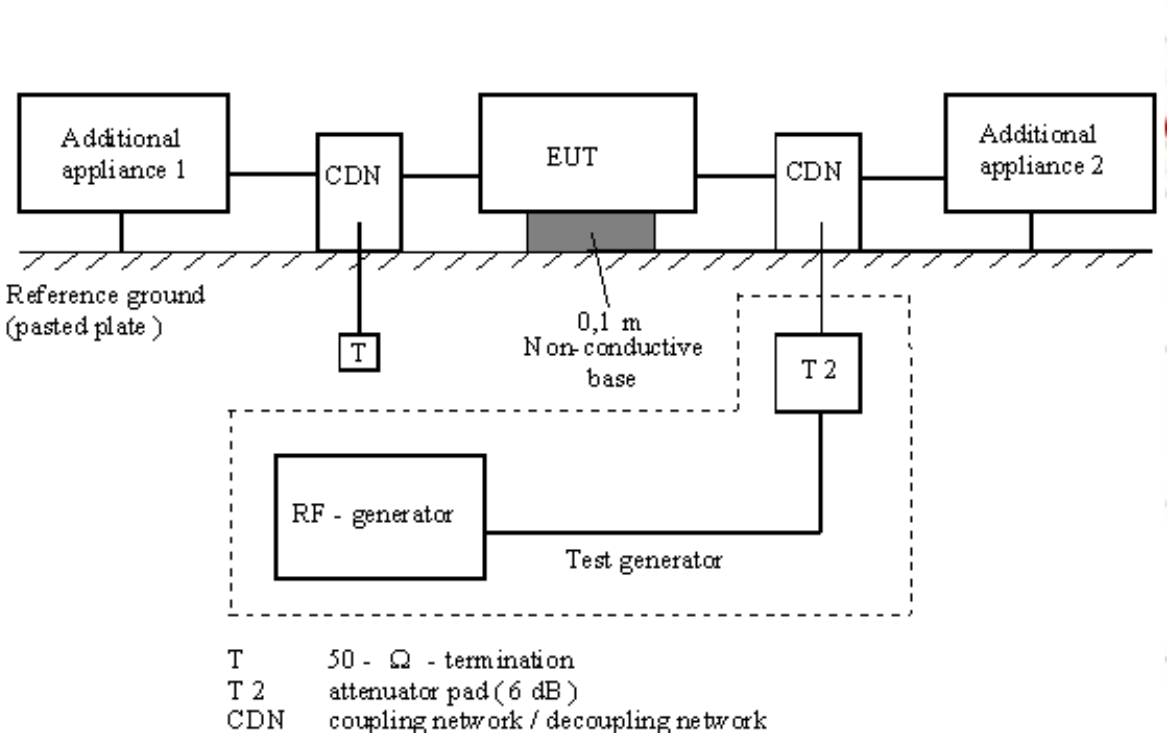
## 4.7 Injected currents(RF continues conducted)

### 4.7.1 Measurement procedure




1. The EUT was placed on an insulating support of 0.1m height above a ground reference Plane, arranged and connected to satisfy its functional requirement. All cables exiting the EUT was supported at a height of at least 30 mm above the ground reference plane.
2. The coupling and decoupling devices were required, they were located between 0,1 m and 0,3 m from the EUT. This distance was to be measured horizontally from the projection of the EUT on to the ground reference plane to the coupling and decoupling device.
3. The frequency range was 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 change coupling devices as necessary. Where the frequency was swept incrementally, the step size do not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency was not less than the time necessary for the EUT to be exercised and to respond, and was not less than 3s.

### 4.7.2 Test environment

Temperature : 24.1 °C
Relative humidity content : 56.2 %
Air pressure : 101.5 kPa

### 4.7.3 Results

TM1

| Test port | Voltage (e.m.f.) | Modulation | Frequency Range | Opinion |
|---|---|---|---|---|
| AC power line | 3V | 80% AM1 kHz | 150 kHz - 80 MHz | A |

A: no loss of function.
N/A: Not Applicable.



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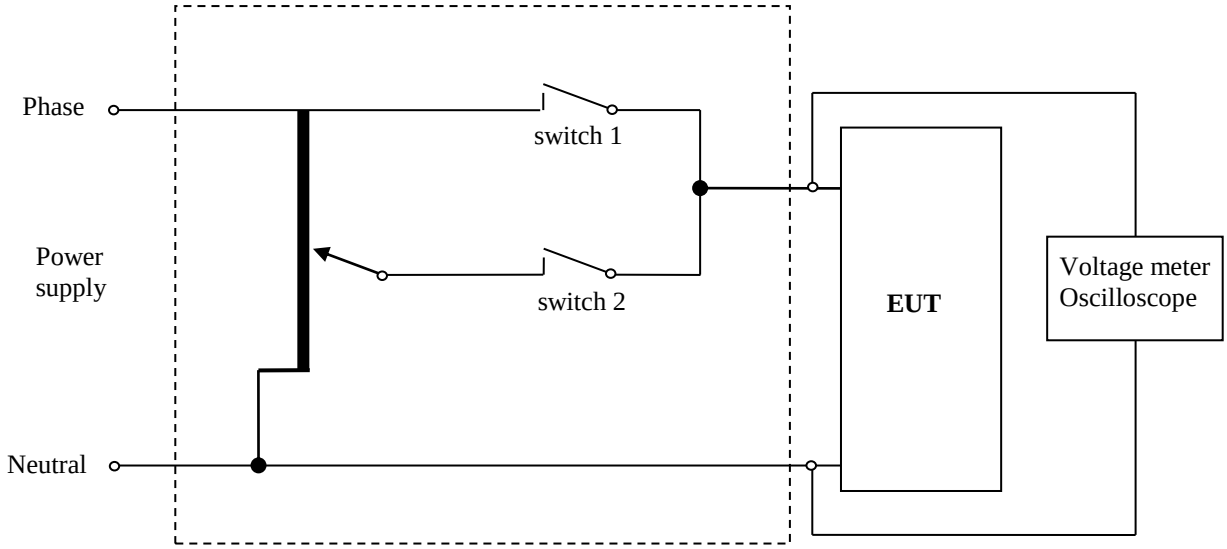
## 4.8 Voltage dips and Interruption

### 4.8.1 Measurement procedure




1. The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0,1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2. The test was performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer. Voltage change shall occur at zero crossing.
3. The EUT was tested for each selected combination of test level and duration with a sequence of three dips /interruptions with intervals of 10 s minimum. Each representative mode of operation was tested.



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### 4.8.2 Test environment

Temperature : 24.1 °C
Relative humidity content : 56.2 %
Air pressure : 101.5 kPa

### 4.8.3 Results

TM1

| Reduction of supply voltage | Test level in % $U_T$ | Duration in parts of period (in ms) | Opinion |
|---|---|---|---|
| 100% | 0 | 0.5 (10 ms) | B |
| 60 % | 40 | 10 (200 ms) | B |
| 30 % | 70 | 25 (500 ms) | B |

A: no loss of function.
B: the appliance could not work normal during test, but after test it would recover automatically.
N/A: Not Applicable.



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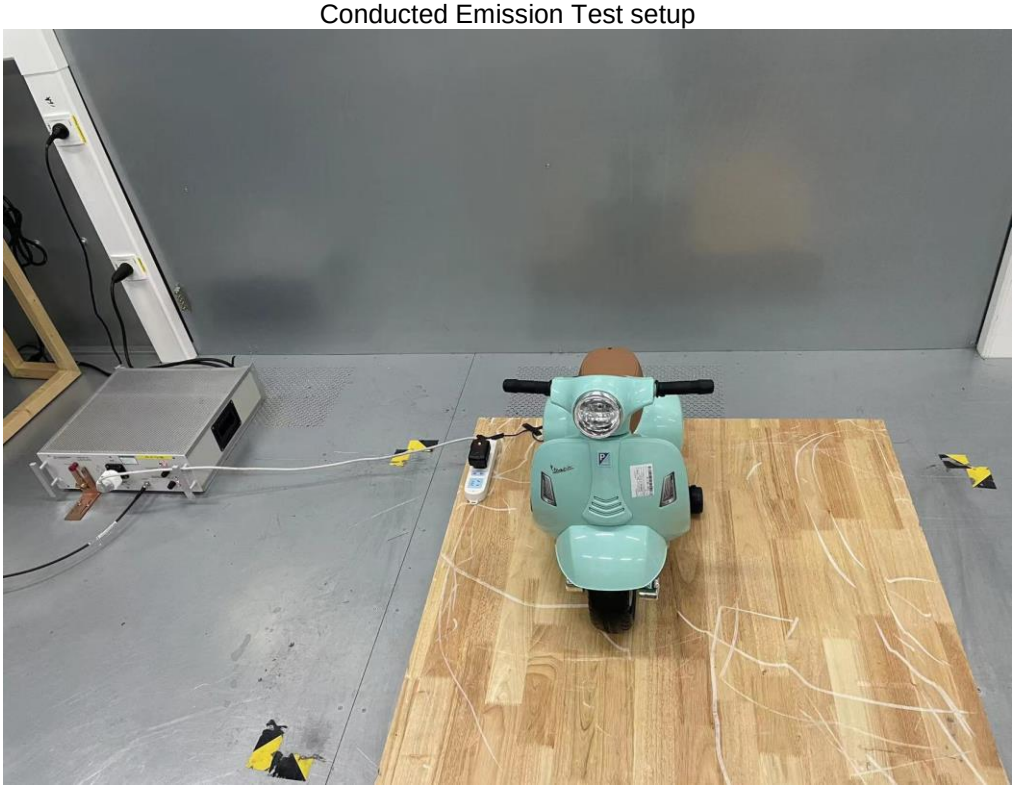
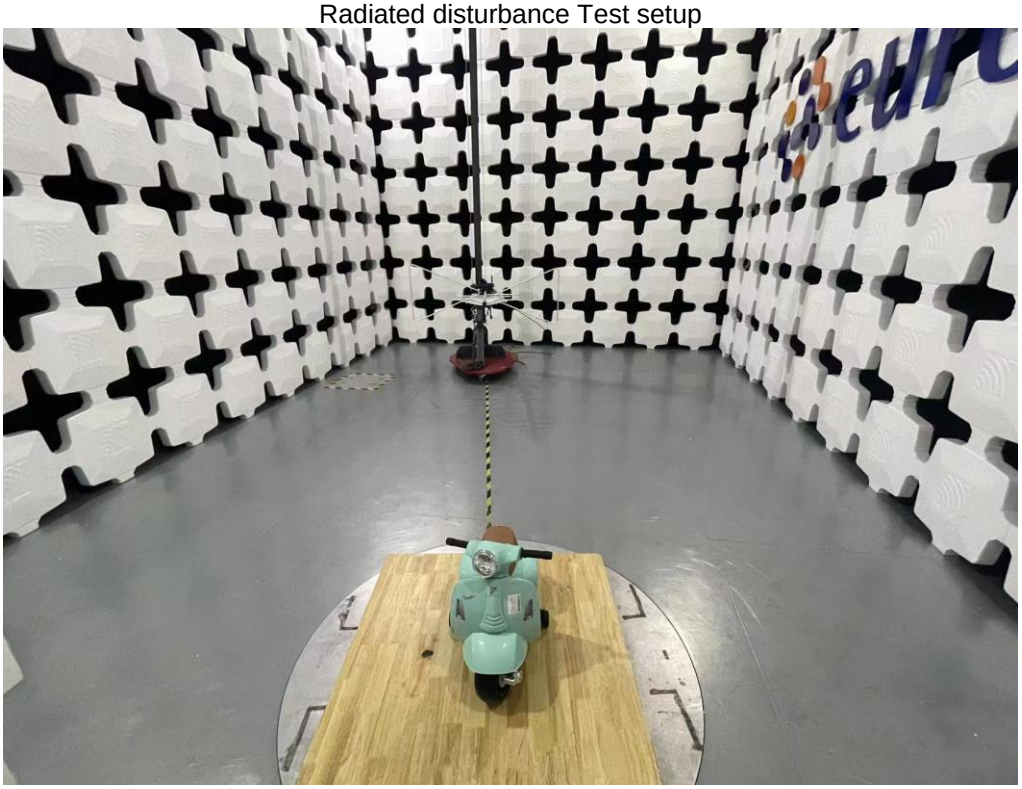
# 5 Test setup Photos

Conducted Emission Test setup

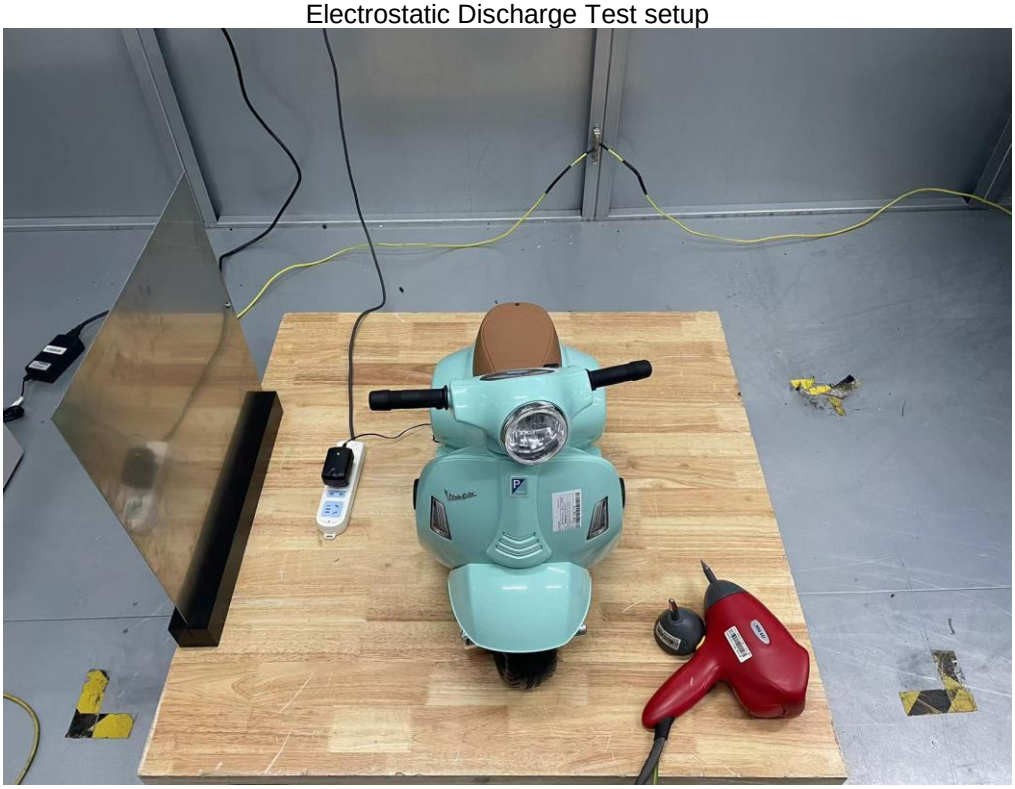


Radiated disturbance Test setup



Voltage Fluctuations and Flicker Test setup

Electrostatic Discharge Test setup





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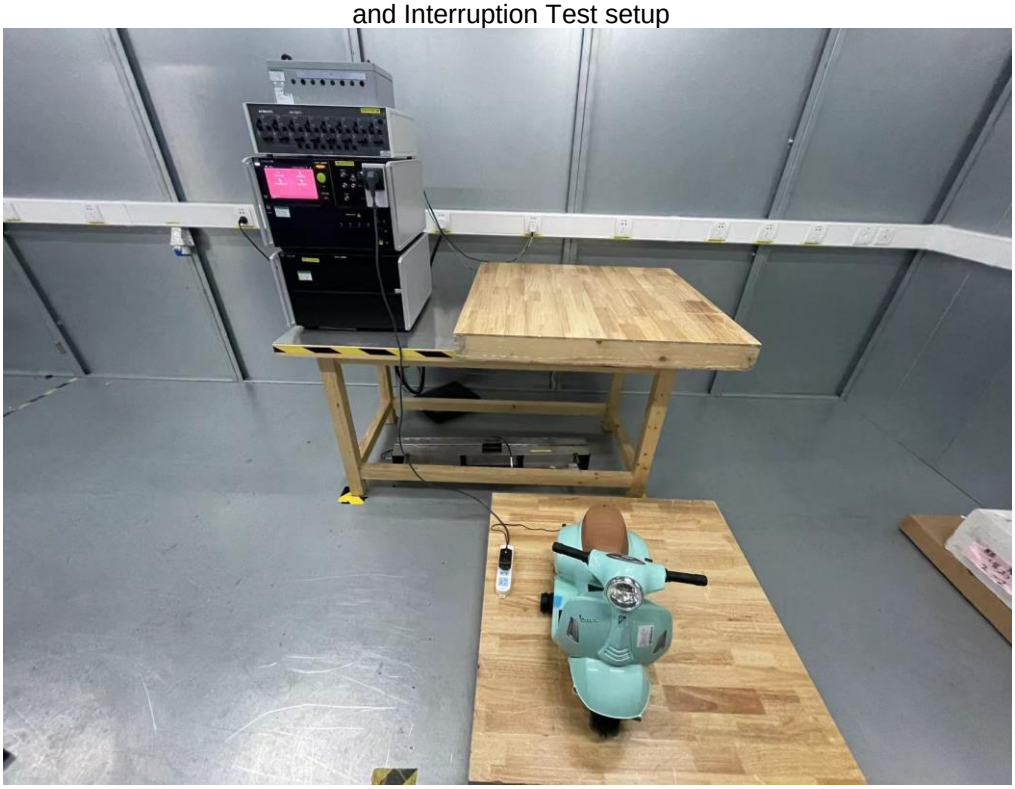
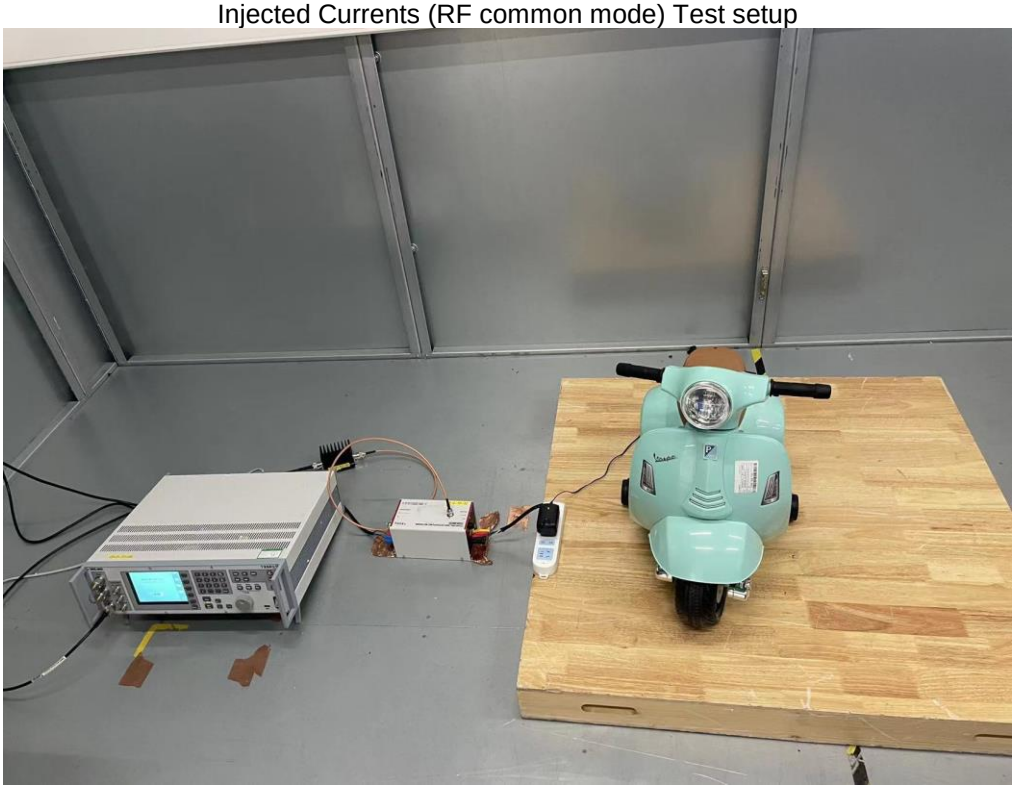
Electrical Fast Transients Immunity/ Surge Immunity/ Voltage DIPS and Interruption Test setup



Injected Currents (RF common mode) Test setup





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# 6 EUT Photos



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---End of Report---