**Shenzhen Global Test Service Co., Ltd**
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

# TEST REPORT
## EN 55032
## Electromagnetic compatibility of multimedia equipment - Emission Requirements
## EN 55035
## Information technology equipment – Immunity characteristics – Limits and methods of measurement

| | |
|---|---|
| **Report Reference No**..... : | GTS20250811007-1-02 |
| Date of issue..... : | Nov. 20, 2025 |
| **Testing Laboratory Name**..... : | **Shenzhen Global Test Service Co., Ltd.** |
| Address..... : | No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong |
| Supervised by (Testing Engineer)..... : | Duke Liu |
| Reviewed by (Testing Engineer)..... : | Olive Nie |
| Approved by (Manager)..... : | Jason Hu |
| **Applicant's name**..... : | **Shenzhen Techtion Smart Electronics Co., Ltd.** |
| Address..... : | Room 902, 8th Floor, Unit 1, Building No. 2, Xintianxia Chengyun Factory District, Vanke City Community, Bantian Street, Longgang District, Shenzhen |
| **Manufacturer's name**..... : | **Shenzhen Techtion Smart Electronics Co., Ltd.** |
| Address..... : | Room 902, 8th Floor, Unit 1, Building No. 2, Xintianxia Chengyun Factory District, Vanke City Community, Bantian Street, Longgang District, Shenzhen |
| **Test specification:** | |
| Standard..... : | **EN 55032: 2015+A11:2020+A1: 2020**<br>**EN 55035: 2017+A11: 2020** |
| **Receiver Date**..... : | Aug. 16, 2025 |
| **Test Period**..... : | Aug. 16, 2025 ~Sep. 20, 2025 |
| **Test item description**..... : | Outdoor Reflective and Transflective Display Screen |
| Trade Mark..... : | N/A |
| Model/Type reference..... : | TS-280PHD |
| Listed Models ..... : | N/A |
| Ratings..... : | Input: 110-240V~, 50/60Hz, 62W |
| Result..... : | **PASS** |

# T E S T  R E P O R T

| **Test Report No. :** | GTS20250811007-1-02 | Nov. 20, 2025<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | Outdoor Reflective and Transflective Display Screen |
| Model /Type | : | TS-280PHD |
| Model List | : | N/A |
| Model different | : | N/A |
| Classification of equipment | : | Class A |
| Highest internal frequency | : | Above 108MHz |
| **Applicant** | : | **Shenzhen Techtion Smart Electronics Co., Ltd.** |
| Address | : | Room 902, 8th Floor, Unit 1, Building No. 2, Xintianxia Chengyun Factory District, Vanke City Community, Bantian Street, Longgang District, Shenzhen |
| **Manufacturer** | : | **Shenzhen Techtion Smart Electronics Co., Ltd.** |
| Address | : | Room 902, 8th Floor, Unit 1, Building No. 2, Xintianxia Chengyun Factory District, Vanke City Community, Bantian Street, Longgang District, Shenzhen |

| **Test Result** | **Pass** |
|---|---|

The above equipment has been tested by Shenzhen Global Test Service Co., Ltd., and found compliance with the requirements set forth in the EMC Directive 2014/30/EU technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

# Contents

# 1. TEST SUMMARY

| Emission | | | |
|---|---|---|---|
| Standard | Item | Verdict | Remark |
| EN 55032: 2015+A11:2020+A1: 2020 | Conducted Emission | PASS | Meet Class A limit |
| | Radiated Emission | PASS | Meet Class A limit |

| Immunity (EN 55035: 2017+A11: 2020) | | | |
|---|---|---|---|
| Standard | Item | Result | Remark |
| EN 61000-4-2: 2009 | ESD | PASS | Meets the requirements of Criterion B |
| EN 61000-4-4: 2012 | EFT | PASS | Meets the requirements of Criterion B |
| EN IEC 61000-4-11: 2020 | Voltage Dips & Voltage Variations | PASS | Meets the requirements of<br>Voltage Dips:<br>1) >95% reduction Criterion B<br>2) 30% reduction Criterion C<br>Voltage Interruptions:<br>>95% reduction Criterion C |

The test results of this report was related only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

# 2. EUT INFORMATION

## 2.1. I/O Port Description

| I/O Port Types | Q'TY | Test Description |
|---|---|---|
| 1). / | / | / |

Note: Internal ports are only used during installation so are not considered.

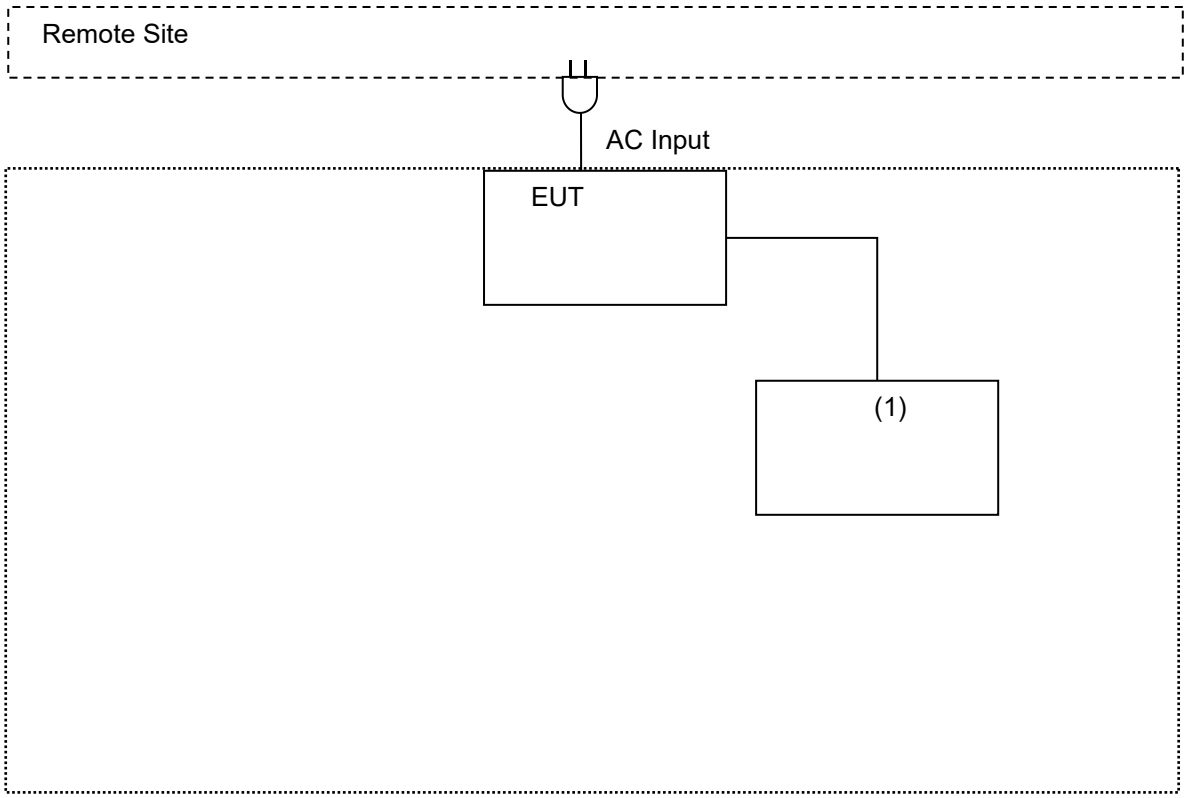
## 2.2. EUT operation mode

| | | | |
|---|---|---|---|
| Pre-Test Mode | Mode 1: Full load operation and displaying colour bar | | |
| Final Test Mode | Conducted Emission | | Mode 1 |
| | Radiates Emission | Below 1GHz | Mode 1 |
| | | Above 1GHz | Mode 1 |
| | ESD | | Mode 1 |
| | EFT | | Mode 1 |
| | Voltage Dips & Voltage Variations | | Mode 1 |

Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.

## 2.3. EUT configuration

**The following peripheral devices and interface cables were connected during the measurement:**




| Auxiliary Equipment | | | | | |
|---|---|---|---|---|---|
| Description | | Manufacturer | Model Number | Otyr | Remarks |
| (1) | Mouse | Lenovo | / | / | Provided by the laboratory |

# 3. TEST ENVIRONMENT

## 3.1. Address of the test laboratory

**Shenzhen Global Test Service Co., Ltd.**
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

## 3.2. Test Facility

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

CNAS (No. CNAS L8169)
Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

## 3.3. Test Software

| Measurement Software | | | |
|---|---|---|---|
| No. | Description | Software | Version |
| 1 | Conducted Emission | JS32-RE | Ver 2.5 |
| 2 | Radiated Emission _ Below 1GHz | JS32-RE | Ver 2.5.1.8 |
| 3 | Radiated Emission _ Above 1GHz | JS32-RE | Ver 2.5.1.8 |
| 4 | RS | EMC-RS | 2.0.1.2 |

## 3.4. Statement of the measurement uncertainty

| Test Item | Test Site | Frequency Range | | Uncertainty (dB) |
|---|---|---|---|---|
| Conducted Emission AC Power Port | Conductive Shielding Room | 9 kHz ~ 150 kHz | | 1.6 |
| | | 150 kHz ~ 30 MHz | | 1.6 |
| Conducted Emission Telecommunication Port | | 150 kHz ~ 30 MHz | | 2.08 |
| Radiated Emission | 966 | 30 MHz ~ 1000 MHz | Horizontal | 3.95 |
| | | | Vertical | 3.95 |
| | | 1000 MHz ~ 6000 MHz | | 4.57 |
| Note: The Vertical and Horizontal measurement uncertainty of 1GHz to 6GHz is evaluated and choose which polarity is worst value. | | | | |

| Test Item | | Uncertainty |
|---|---|---|
| Electrostatic Discharge | Voltage | 0.86 % |
| | Current | 2.5 % |
| | Timing | 6.0 % |
| Electrical Fast Transient/Burst | | 2 % |
| Voltage Dips and Interruption | Voltage | 1.004 % |
| | Timing | 1.004 % |

## 3.5. Test Site Environmental

| Test Item | Required (IEC 60068-1) | | Actual |
|---|---|---|---|
| Conducted Emission | Temperature (°C) | 15-35 | 25.1 |
| | Humidity (%RH) | 25-75 | 52 |
| | Barometric pressure (mbar) | 860-1060 | 100.6 |
| Radiated Emission | Temperature (°C) | 15-35 | 24.8 |
| | Humidity (%RH) | 25-75 | 51 |
| | Barometric pressure (mbar) | 860-1060 | 100.6 |
| ESD | Temperature (°C) | 15-35 | 24.9 |
| | Humidity (%RH) | 30-60 | 50 |
| | Barometric pressure (mbar) | 860-1060 | 100.6 |
| EFT | Temperature (°C) | 15-35 | 24.9 |
| | Humidity (%RH) | 30-60 | 50 |
| | Barometric pressure (mbar) | 860-1060 | 100.6 |
| Voltage Dips & Voltage Variations | Temperature (°C) | 15-35 | 24.9 |
| | Humidity (%RH) | 25-75 | 50 |
| | Barometric pressure (mbar) | 860-1060 | 100.6 |

## 3.6. Test Instruments

| Conducted Emission test site | | | | | |
|---|---|---|---|---|---|
| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Cal. Period |
| Test Receiver | R&S | ESPI 3 | 101841 | 2025/06/26 | 1 year |
| Transient Limiter | CYBERTEK | EM5010A | E1950100106 | 2025/06/27 | 1 year |
| LISN | R&S | ESH2-Z5 | 893606/008 | 2025/06/27 | 1 year |
| LISN | CYBERTEK | EM5040A | E1850400105 | 2025/06/27 | 1 year |
| ISN | SCHWARZBECK | NTFM 8158 | 066 | 2025/06/27 | 1 year |
| ISN | SCHWARZBECK | CAT5 8158 | 121 | 2025/06/27 | 1 year |
| ISN | SCHWARZBECK | CAT3 8158 | 102 | 2025/06/27 | 1 year |
| Test Site | XINJU | Conductive Shielding Room | N/A | N.C.R. | ----- |

| 966 Chamber | | | | | |
|---|---|---|---|---|---|
| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Cal. Period |
| Amplifier | SKET | LAPA 30M01G | SK20240104001 | 2025/01/21 | 1 year |
| Amplifier | EMCI | EMC012645SE | 980340 | 2025/01/21 | 1 year |
| Test Receiver | R&S | ESCI 7 | 101102 | 2025/06/26 | 1 year |
| Spectrum Analyzer | R&S | FSV40-N | 101800 | 2025/06/21 | 1 year |
| Broadband Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB 9163 | 00976 | 2025/07/15 | 1 year |
| Double Ridged Horn Antenna (1~18GHz) | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120D | 01622 | 2024/12/16 | 1 year |
| Test Site | XINJU | 966 | N/A | 2025/06/29 | 3 year |

| Electrostatic Discharge test site | | | | | |
|---|---|---|---|---|---|
| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Cal. Period |
| ESD Simulator | EXPERT IN EMC LIONCEL | ESD-203B | 0200303 | 2025/06/13 | 1 year |
| 0.8m Height Wooden Table | N/A | N/A | N/A | N.C.R. | ----- |
| Test Site | EMS Lab | N/A | N/A | N.C.R. | ----- |

| Electrical Fast Transient/Burst / Voltage Dips and Interruption test site | | | | | |
|---|---|---|---|---|---|
| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Cal. Period |
| EMC Immunity Tester | EMC-PARTNER AG | TRANSIENT 3000 | TRA3000 F5-S-D-V-1527 | 2025/06/21 | 1 year |
| Coupling Clamp | EMC-PARTNER AG | CN-EFT1000 | CN-EFT1000-1574 | 2025/06/21 | 1 year |
| Signal Line Coupling Network | EXPERT IN EMC LIONCEL | CDN-508SUS | 200502 | 2025/06/21 | 1 year |
| Surge Generator | EXPERT IN EMC LIONCEL | LSG-506CT | 220902 | 2025/06/21 | 1 year |
| Test Site | EMS Lab | N/A | N/A | N.C.R. | ----- |

# 4. TEST CONDITIONS AND RESULTS

## 4.1. Conducted Emission

### 4.1.1 Limits

**A.C. Mains Conducted Interference Limit**

| Frequency (MHz) | Class A (dBuV) | | Class B (dBuV) | |
|---|---|---|---|---|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 73 | 60 | 56 | 46 |
| 5.0 - 30.0 | 73 | 60 | 60 | 50 |

Note: (1) The lower limit shall apply at the transition frequencies.

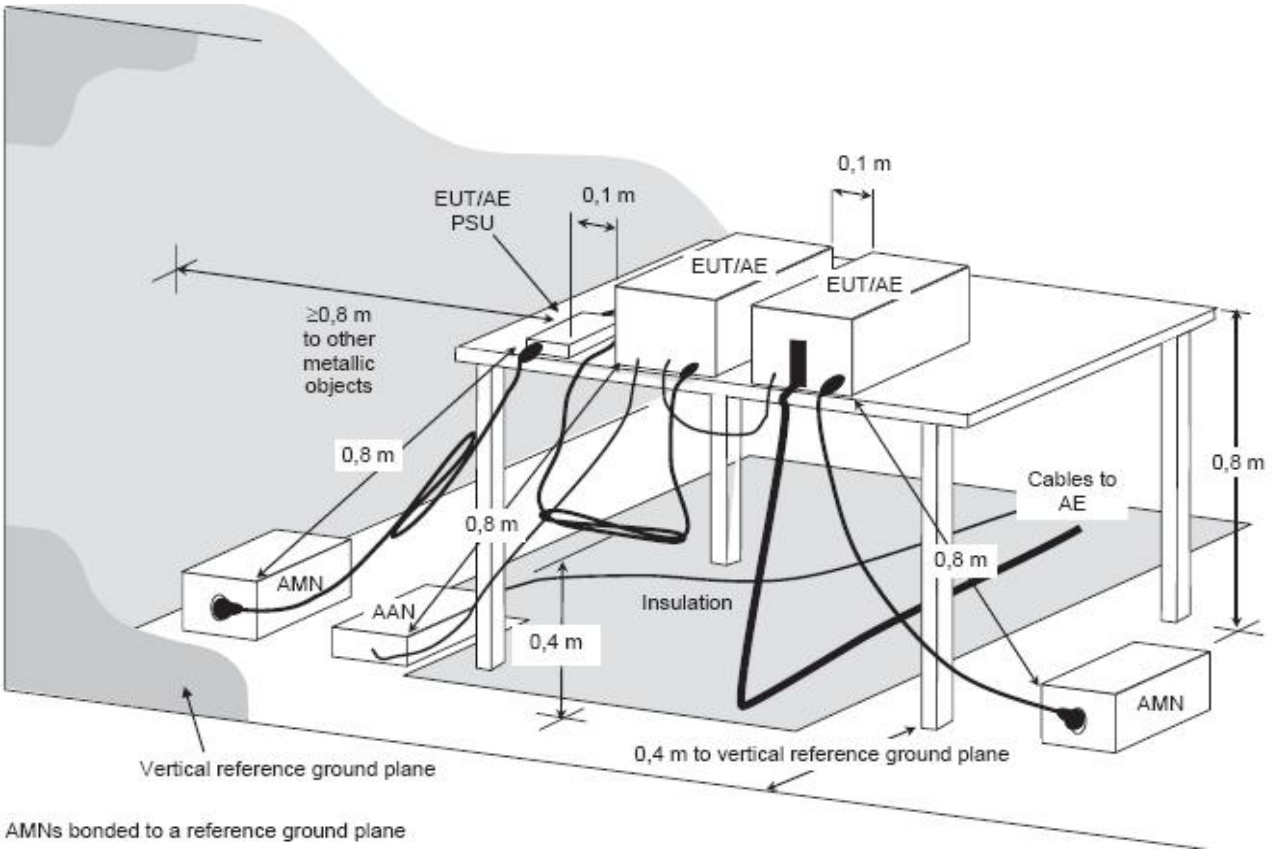
(2) The limit decreases in line with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

(3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

**Telecommunication Port Asymmetric mode Conducted Interference Limit**

| Requirement (MHz) | Class A Equipment | | | | Class B Equipment | | | |
|---|---|---|---|---|---|---|---|---|
| | Voltage Limit (dBμV) | | Current Limit (dBμA) | | Voltage Limit (dBμV) | | Current Limit (dBμA) | |
| | QP | Avg. | QP | Avg. | QP | Avg. | QP | Avg. |
| 0.15 to 0.50 | 97 to 87 | 84 to 74 | 53 to 43 | 40 to 30 | 84 to 74 | 74 to 64 | 40 to 30 | 30 to 20 |
| 0.50 to 30 | 87 | 74 | 43 | 30 | 74 | 64 | 30 | 20 |

### 4.1.2 Test Configuration




AMNs bonded to a reference ground plane

### 4.1.3 Test Procedure

**A.C. Mains Conducted Interference**

Procedure of Preliminary Test

The EUT and support equipment, if needed, were set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55032 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane, which has a less than 15 cm non-conductive covering to insulate the EUT from the ground plane.
All I/O cables were positioned to simulate typical actual usage as per EN 55032.
The EUT installed by AC main power, through a Line Impedance Stabilization Network (LISN), which was supplied power source and was grounded to the ground plane.
All support equipment power by a second LISN.

The test program of the EUT was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.
During the above scans, the emissions were maximized by cable manipulation.
The test mode(s) described in Item 3.1 were scanned during the preliminary test.
After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test.

Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
The test data of the worst-case condition(s) was recorded.
Cables connecting to AE located outside the measurement area shall drop directly to, but be insulated from, the RGP shall be used thickness of the insulation and shall not be more than 150 mm. However, cables which would normally be bonded to ground should be bonded to the RGP in accordance with normal practice or the manufacturer's recommendation

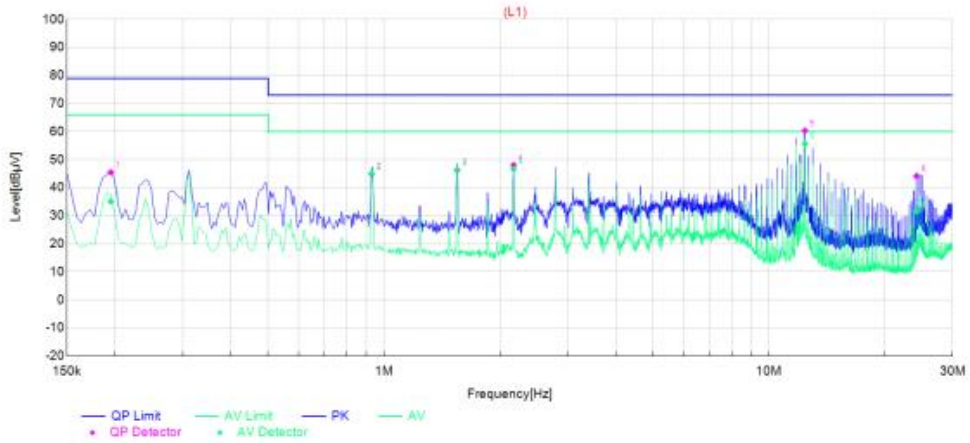
**Telecommunication Port Conducted Interference**

Selecting ISN for unscreened cable and screened cable to make measurement and Current probe for coaxial cable.
The port of the EUT was connected to the remote side support equipment through the ISN/Current Probe and communication in normal condition.
Making a overall range scan by using the test receiver controlled by controller and record at least six highest emissions for showing in the test report.
Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
In case of measuring on the screened cable, the current limit shall be applied; otherwise the voltage limit should be applied.

## 4.1.4 Test Results

| | | | |
|---|---|---|---|
| Test Standard: | EN 55032 | Power Line: | L1 |
| Test Mode: | Mode 1 | Test Power: | AC 230 V/50 Hz |
| Description: | | | |

**Test Graph**




**Final Data List**

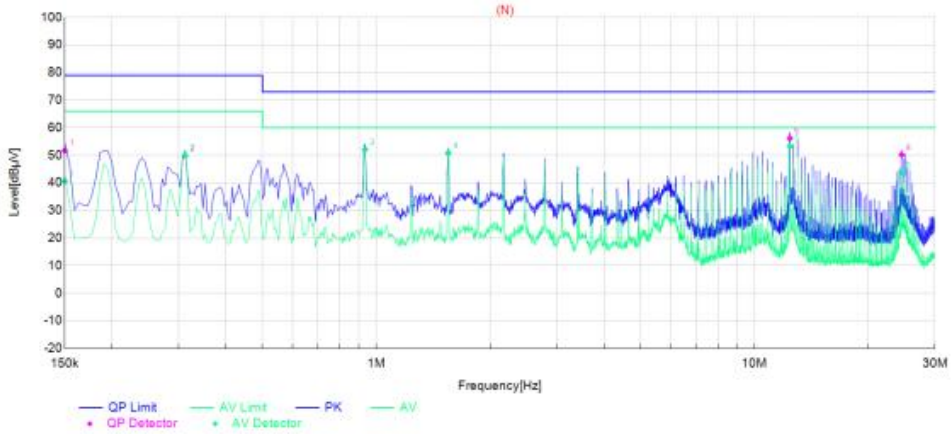
| NO. | Frequency | QP Reading | AVG. Reading | Factor | QP Result | AVG. Result | QP Limit | AVG. Limit | QP Margin | AVG. Margin | Line | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.195 | 35.30 | 24.95 | 10.16 | 45.46 | 35.11 | 79.00 | 66.00 | 33.54 | 30.89 | L1 | PASS |
| 2 | 0.9285 | 34.62 | 34.81 | 10.21 | 44.83 | 45.02 | 73.00 | 60.00 | 28.17 | 14.98 | L1 | PASS |
| 3 | 1.5495 | 36.01 | 36.20 | 10.24 | 46.25 | 46.44 | 73.00 | 60.00 | 26.75 | 13.56 | L1 | PASS |
| 4 | 2.1705 | 37.78 | 36.30 | 10.28 | 48.06 | 46.58 | 73.00 | 60.00 | 24.94 | 13.42 | L1 | PASS |
| 5 | 12.408 | 49.49 | 44.81 | 10.85 | 60.34 | 55.66 | 73.00 | 60.00 | 12.66 | 4.34 | L1 | PASS |
| 6 | 24.189 | 32.57 | 20.04 | 11.57 | 44.14 | 31.61 | 73.00 | 60.00 | 28.86 | 28.39 | L1 | PASS |

Note:1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

| | | | |
|---|---|---|---|
| Test Standard: | EN 55032 | Power Line: | N |
| Test Mode: | Mode 1 | Test Power: | AC 230 V/50 Hz |
| Description: | | | |

**Test Graph**




**Final Data List**

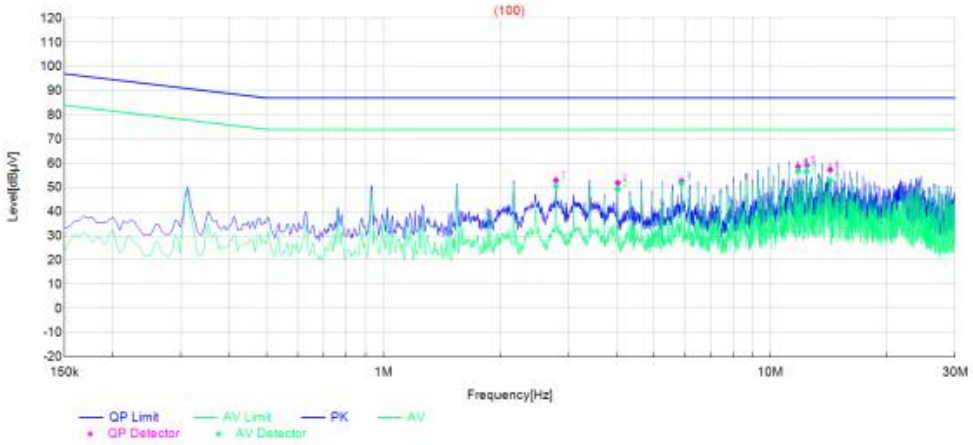
| NO. | Frequency | QP Reading | AVG. Reading | Factor | QP Result | AVG. Result | QP Limit | AVG. Limit | QP Margin | AVG. Margin | Line | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.15 | 41.37 | 30.26 | 10.35 | 51.72 | 40.61 | 79.00 | 66.00 | 27.28 | 25.39 | N | PASS |
| 2 | 0.312 | 39.80 | 39.92 | 10.11 | 49.91 | 50.03 | 79.00 | 66.00 | 29.09 | 15.97 | N | PASS |
| 3 | 0.933 | 41.89 | 41.82 | 10.21 | 52.10 | 52.03 | 73.00 | 60.00 | 20.90 | 7.97 | N | PASS |
| 4 | 1.5495 | 40.59 | 40.58 | 10.24 | 50.83 | 50.82 | 73.00 | 60.00 | 22.17 | 9.18 | N | PASS |
| 5 | 12.408 | 45.32 | 42.40 | 10.85 | 56.17 | 53.25 | 73.00 | 60.00 | 16.83 | 6.75 | N | PASS |
| 6 | 24.5085 | 38.66 | 32.18 | 11.53 | 50.19 | 43.71 | 73.00 | 60.00 | 22.81 | 16.29 | N | PASS |

Note:1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

| | | | |
|---|---|---|---|
| Test Standard: | EN 55032 | Line: | 100M |
| Test Mode: | Mode 1 | Test Power: | AC 230 V/50 Hz |
| Description: | | | |

**Test Graph**




**Final Data List**

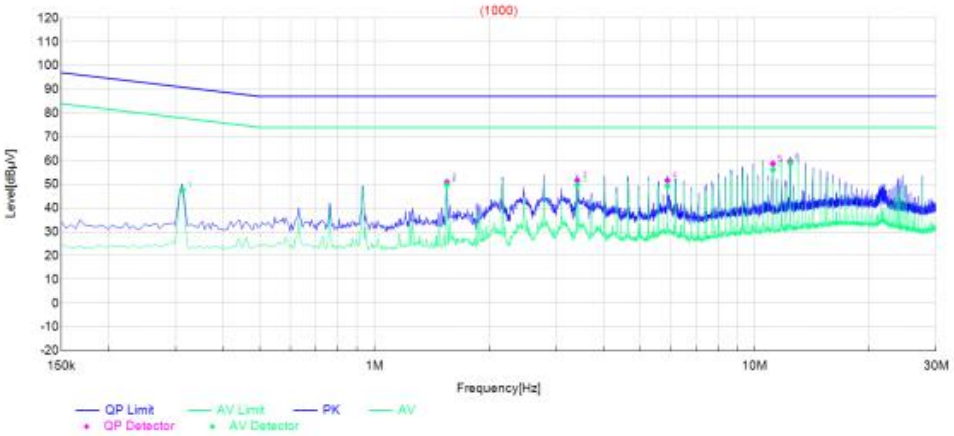
| NO. | Frequency | QP Reading | AVG. Reading | Factor | QP Result | AVG. Result | QP Limit | AVG. Limit | QP Margin | AVG. Margin | Line | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.7915 | 33.47 | 31.08 | 19.46 | 52.93 | 50.54 | 87.00 | 74.00 | 34.07 | 23.46 | 100 | PASS |
| 2 | 4.0335 | 32.49 | 29.89 | 19.40 | 51.89 | 49.29 | 87.00 | 74.00 | 35.11 | 24.71 | 100 | PASS |
| 3 | 5.892 | 33.26 | 32.22 | 19.41 | 52.67 | 51.63 | 87.00 | 74.00 | 34.33 | 22.37 | 100 | PASS |
| 4 | 11.787 | 39.17 | 37.30 | 19.45 | 58.62 | 56.75 | 87.00 | 74.00 | 28.38 | 17.25 | 100 | PASS |
| 5 | 12.408 | 39.77 | 37.21 | 19.46 | 59.23 | 56.67 | 87.00 | 74.00 | 27.77 | 17.33 | 100 | PASS |
| 6 | 14.271 | 37.99 | 33.47 | 19.37 | 57.36 | 52.84 | 87.00 | 74.00 | 29.64 | 21.16 | 100 | PASS |

Note: 1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

| | | | |
|---|---|---|---|
| Test Standard: | EN 55032 | Line: | 1000M |
| Test Mode: | Mode 1 | Test Power: | AC 230 V/50 Hz |
| Description: | | | |

**Test Graph**




**Final Data List**

| NO. | Frequency | QP Reading | AVG. Reading | Factor | QP Result | AVG. Result | QP Limit | AVG. Limit | QP Margin | AVG. Margin | Line | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.312 | 27.99 | 27.84 | 19.70 | 47.69 | 47.54 | 90.92 | 77.92 | 43.23 | 30.38 | 1000 | PASS |
| 2 | 1.5495 | 31.55 | 30.42 | 19.44 | 50.99 | 49.86 | 87.00 | 74.00 | 36.01 | 24.14 | 1000 | PASS |
| 3 | 3.4125 | 32.23 | 30.36 | 19.43 | 51.66 | 49.79 | 87.00 | 74.00 | 35.34 | 24.21 | 1000 | PASS |
| 4 | 5.892 | 32.26 | 29.93 | 19.41 | 51.67 | 49.34 | 87.00 | 74.00 | 35.33 | 24.66 | 1000 | PASS |
| 5 | 11.166 | 39.23 | 36.69 | 19.45 | 58.68 | 56.14 | 87.00 | 74.00 | 28.32 | 17.86 | 1000 | PASS |
| 6 | 12.4035 | 40.17 | 39.34 | 19.46 | 59.63 | 58.80 | 87.00 | 74.00 | 27.37 | 15.20 | 1000 | PASS |

Note: 1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

## 4.2. Radiated Emission

### 4.2.1 Limit

| Frequency (MHz) | dBuV/m (Distance 3 m) | |
|---|---|---|
| | Class A | Class B |
| 30 ~ 230 | 50 | 40 |
| 230 ~ 1000 | 57 | 47 |

Note: The lower limit shall apply at the transition frequencies.

| Frequency (MHz) | dBuV/m (Distance 3 m) | | | |
|---|---|---|---|---|
| | Class A | | Class B | |
| | Average | Peak | Average | Peak |
| 1000 ~ 6000 | 60 | 80 | 54 | 74 |

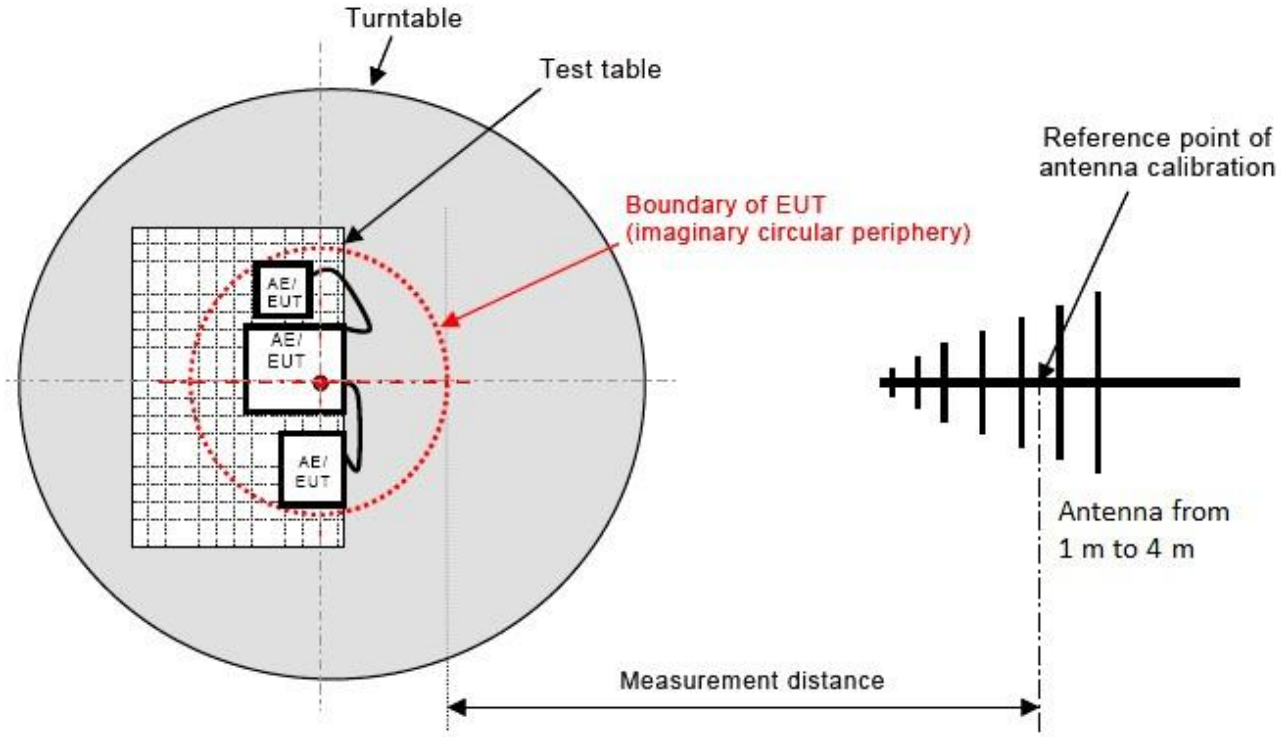
Note: The lower limit shall apply at the transition frequencies.

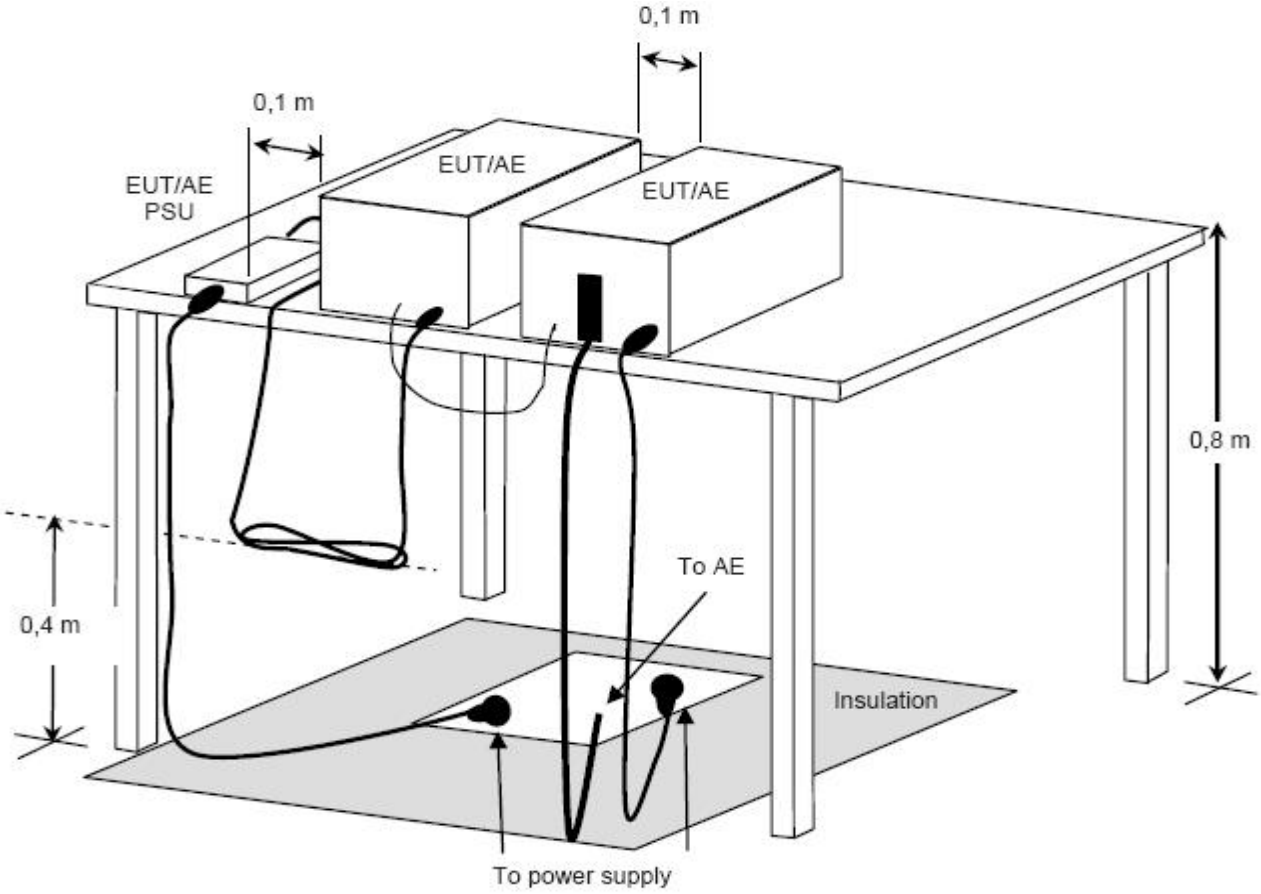
According to EN55032 the measurement frequency range is shown in the following table:

| Highest frequency generated or used within the EUT or on which the EUT operates or tunes (MHz) | Upper frequency of measurement range (MHz) |
|---|---|
| Less than 108 | 1000 |
| 108-500 | 2000 |
| 500-1000 | 5000 |
| Above 1000 | 5 times of the highest frequency or 6GHz, whichever is less |

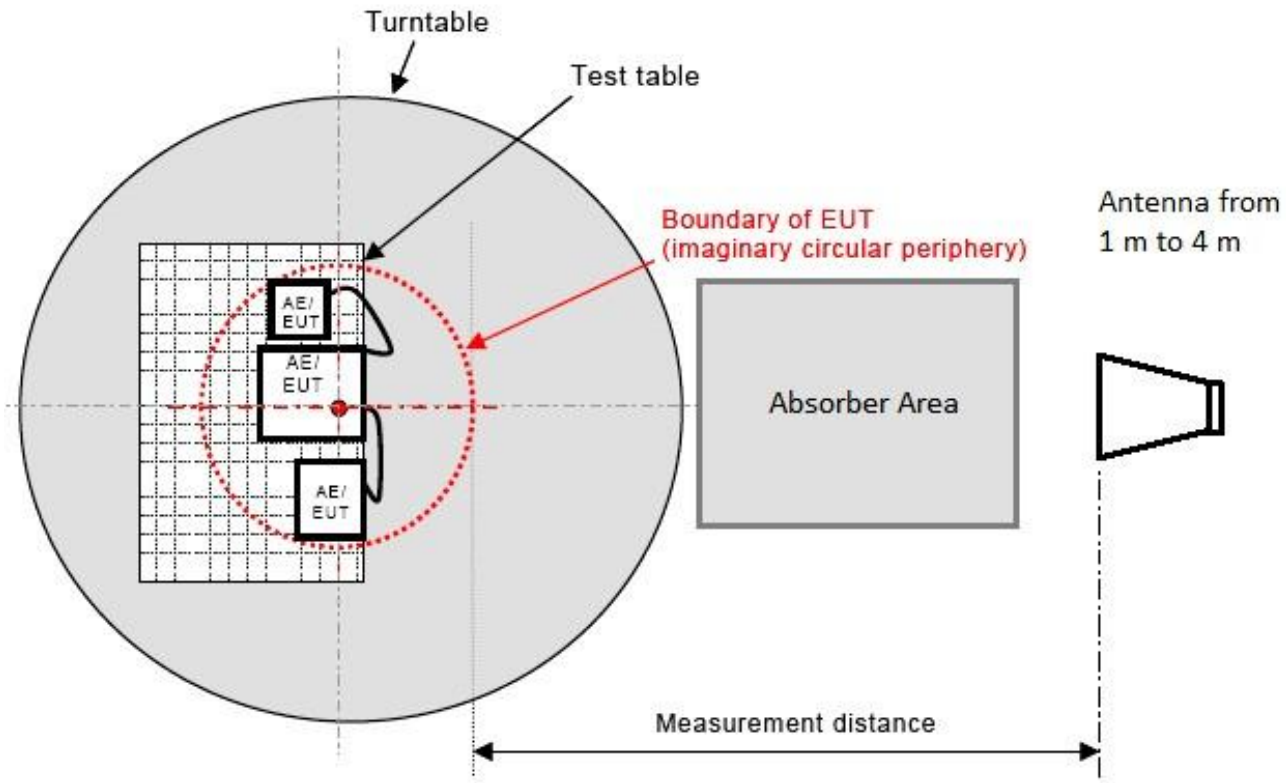
### 4.2.2 Test Configuration

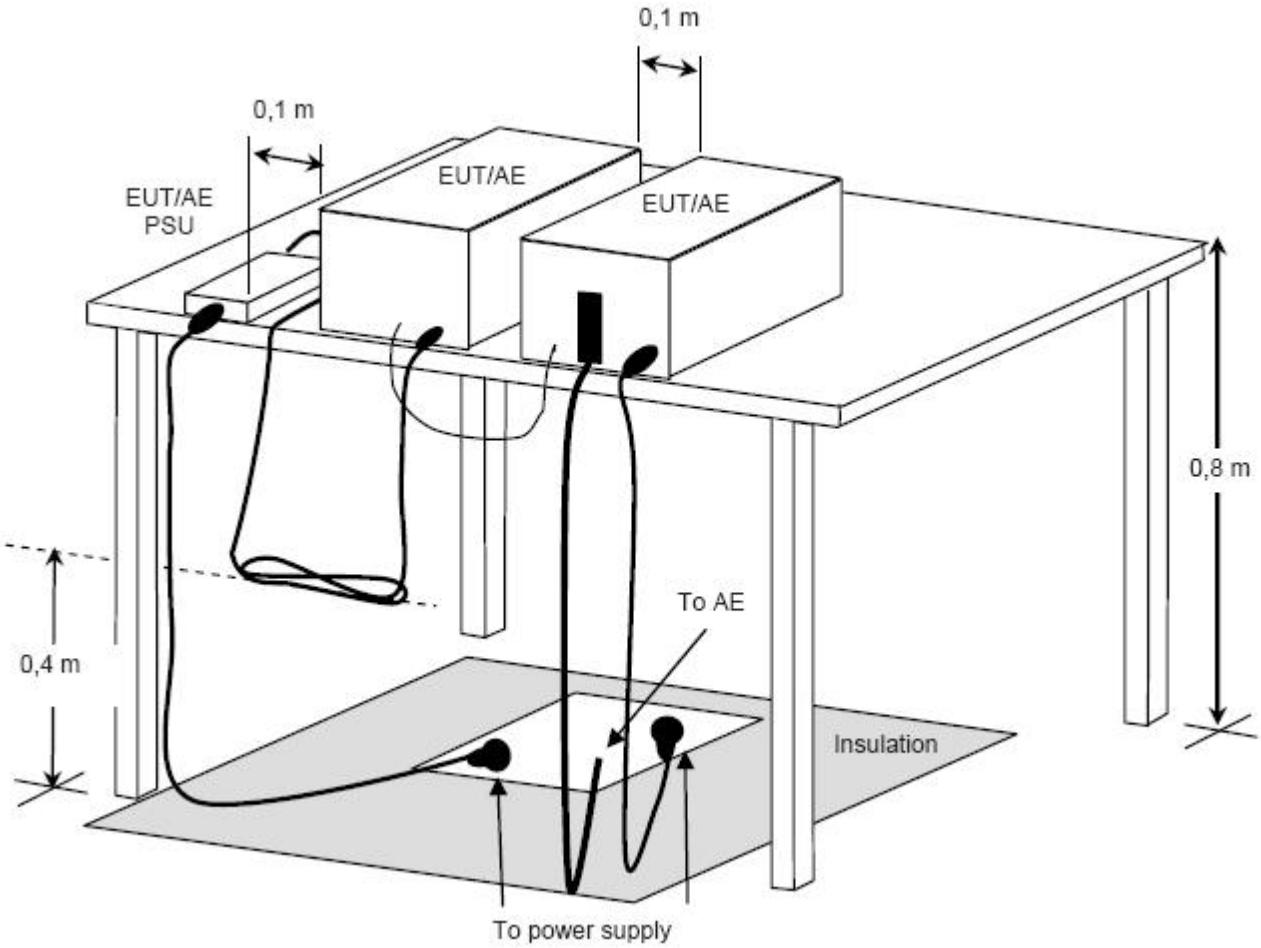
■ **Below 1GHz**



■ **Above 1GHz**


Turntable
Test table
Boundary of EUT
(imaginary circular periphery)
Antenna from
1 m to 4 m
AE/
EUT
AE/
EUT
AE/
EUT
Absorber Area
Measurement distance


0,1 m
0,1 m
EUT/AE
PSU
EUT/AE
EUT/AE
0,8 m
0,4 m
To AE
Insulation
To power supply

### 4.2.3 Test Procedure

■ **Procedure of Preliminary Test.**

The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor ADAPTERing equipment, it is placed on the ground plane which has a less than 150 mm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per EN 55032.

All I/O cables were positioned to simulate typical usage as per EN 55032.

The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.

The antenna was placed at 3 or 10 meter away from the EUT as stated in EN 55032 Annex C.2.2.4 Figure C.1 and Annex D Table D.1. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

The Analyzer / Receiver quickly scanned from 30MHz to 6GHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level (For Below 1GHz) and keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response (For Above 1GHz).

The test mode(s) described in Item 3.1 were scanned during the preliminary test:

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.

The worst configuration of EUT and cable, antenna position, polarization and turntable position of the above highest emission levels were recorded for the final test.

■ **Procedure of Final Test**

EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.

The Analyzer / Receiver scanned from 30MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

Recording at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and Q.P. (For Below 1GHz) or Peak/Average (For Above 1GHz) reading is presented.

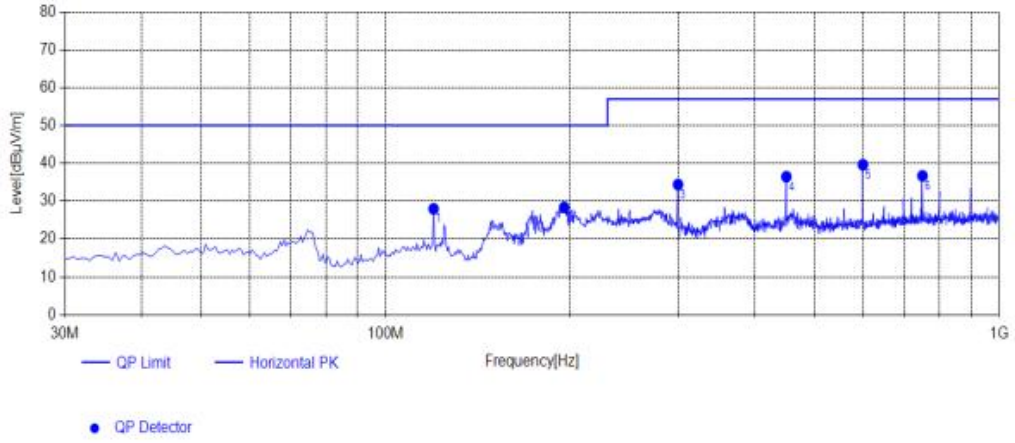
Cables connecting to AE located outside the measurement area shall drop directly to, but be insulated from, the RGP (or turntable where applicable), and then be routed directly to the place where they leave the test site. The thickness of the insulation shall not be more than 150 mm. However, cables which would normally be bonded to ground should be bonded to the RGP in accordance with normal practice or the manufacturer's recommendation

### 4.2.4 Test Results

## Below 1GHz

| | | | |
|---|---|---|---|
| Test Standard: | EN 55032 | Test Distance: | 3 m |
| Test Mode: | Mode 1 | Test Power: | AC 230V /50Hz |
| Measurement Range: | 30 MHz~1 GHz | Ant.Polar.: | Horizontal |
| Description: | | | |

**Test Graph**




**Quasi-peak Final Data List**

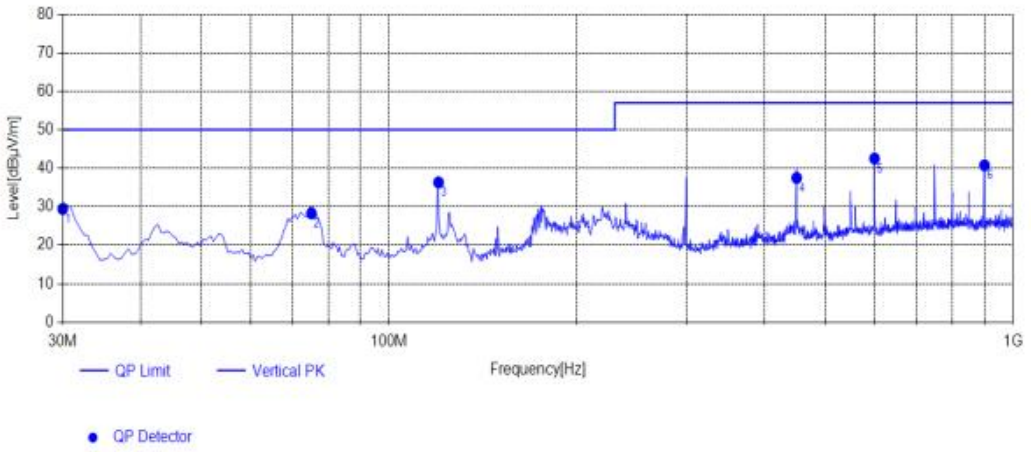
| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 119.725 | 40.63 | -12.64 | 27.99 | 50.00 | 22.01 | 134 | 266 | Horizontal | PASS |
| 2 | 195.385 | 38.99 | -10.61 | 28.38 | 50.00 | 21.62 | 100 | 358 | Horizontal | PASS |
| 3 | 299.66 | 41.89 | -7.47 | 34.42 | 57.00 | 22.58 | 101 | 132 | Horizontal | PASS |
| 4 | 450.01 | 40.31 | -3.82 | 36.49 | 57.00 | 20.51 | 100 | 108 | Horizontal | PASS |
| 5 | 599.875 | 40.19 | -0.54 | 39.65 | 57.00 | 17.35 | 152 | 233 | Horizontal | PASS |
| 6 | 750.225 | 35.43 | 1.28 | 36.71 | 57.00 | 20.29 | 100 | 159 | Horizontal | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

| | | | |
|---|---|---|---|
| Test Standard: | EN 55032 | Test Distance: | 3 m |
| Test Mode: | Mode 1 | Test Power: | AC 230V /50Hz |
| Measurement Range: | 30 MHz~1 GHz | Ant.Polar.: | Vertical |
| Description: | | | |

**Test Graph**




**Quasi-peak Final Data List**

| NO. | Frequency [MHz] | Reading [dBµV/m] | Factor [dB] | Result [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 41.94 | -12.50 | 29.44 | 50.00 | 20.56 | 107 | 61 | Vertical | PASS |
| 2 | 75.105 | 42.46 | -14.18 | 28.28 | 50.00 | 21.72 | 102 | 118 | Vertical | PASS |
| 3 | 120.0363 | 48.97 | -12.64 | 36.33 | 50.00 | 13.67 | 106 | 206 | Vertical | PASS |
| 4 | 450.01 | 41.31 | -3.82 | 37.49 | 57.00 | 19.51 | 100 | 148 | Vertical | PASS |
| 5 | 599.875 | 43.08 | -0.54 | 42.54 | 57.00 | 14.46 | 133 | 226 | Vertical | PASS |
| 6 | 900.09 | 38.62 | 2.16 | 40.78 | 57.00 | 16.22 | 100 | 172 | Vertical | PASS |

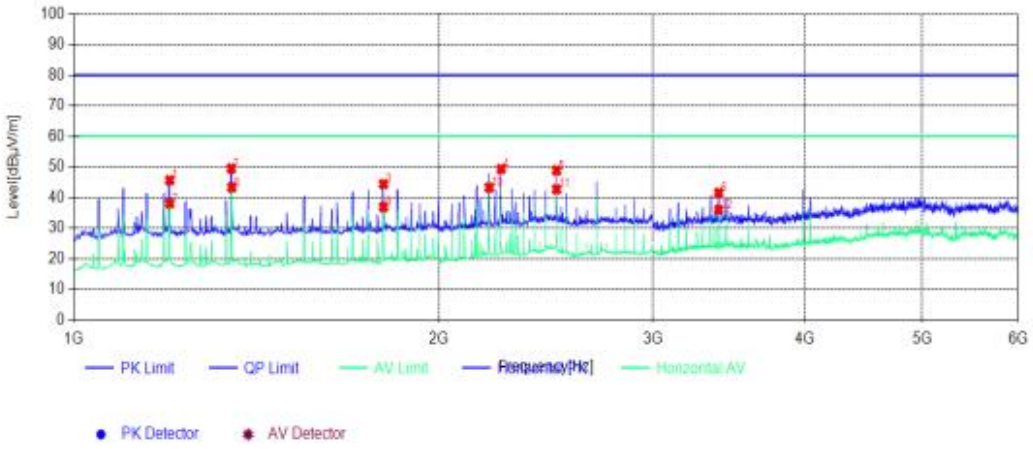
Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

## Above 1GHz

| | | | |
|---|---|---|---|
| Test Standard: | EN 55032 | Test Distance: | 3 m |
| Test Mode: | Mode 1 | Test Power: | AC 230V /50Hz |
| Measurement Range: | 1 GHz~6 GHz | Ant.Polar.: | Horizontal |
| Description: | | | |

**Test Graph**




Suspected List

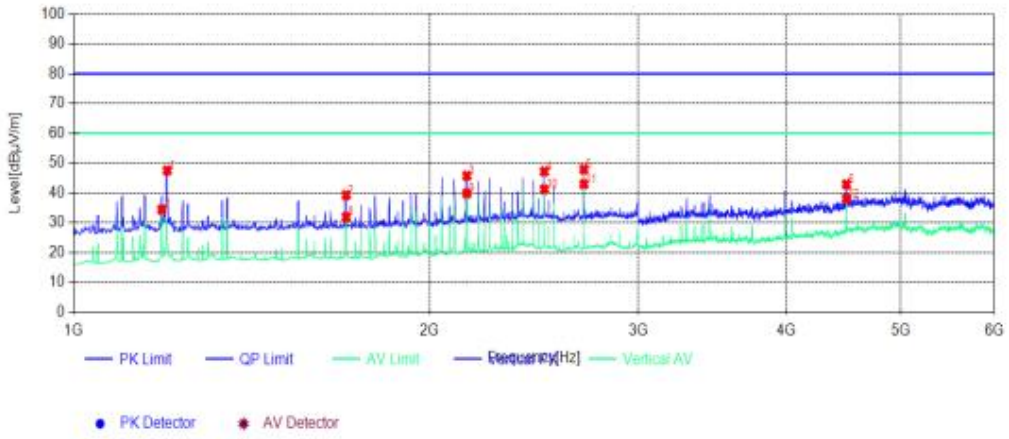
| NO. | Frequency [MHz] | Reading | Factor | Result | Limit | Margin | Height | Angle | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1200 | 63.55 | -17.91 | 45.64 | 80.00 | 34.36 | 100 | 253 | PK | Horizonta | PASS |
| 2 | 1348.75 | 66.50 | -17.00 | 49.50 | 80.00 | 30.50 | 100 | 178 | PK | Horizonta | PASS |
| 3 | 1800 | 59.23 | -14.84 | 44.39 | 80.00 | 35.61 | 100 | 206 | PK | Horizonta | PASS |
| 4 | 2250 | 61.52 | -12.21 | 49.31 | 80.00 | 30.69 | 100 | 206 | PK | Horizonta | PASS |
| 5 | 2500 | 59.59 | -10.77 | 48.82 | 80.00 | 31.18 | 100 | 105 | PK | Horizonta | PASS |
| 6 | 3400 | 48.48 | -6.96 | 41.52 | 80.00 | 38.48 | 100 | 150 | PK | Horizonta | PASS |
| 7 | 1200 | 55.97 | -17.91 | 38.06 | 60.00 | 21.94 | 100 | 224 | AV | Horizonta | PASS |
| 8 | 1350 | 60.29 | -16.99 | 43.30 | 60.00 | 16.70 | 100 | 178 | AV | Horizonta | PASS |
| 9 | 1800 | 51.72 | -14.84 | 36.88 | 60.00 | 23.12 | 100 | 126 | AV | Horizonta | PASS |
| 10 | 2200 | 55.77 | -12.52 | 43.25 | 60.00 | 16.75 | 100 | 166 | AV | Horizonta | PASS |
| 11 | 2500 | 53.46 | -10.77 | 42.69 | 60.00 | 17.31 | 100 | 105 | AV | Horizonta | PASS |
| 12 | 3400 | 42.93 | -6.96 | 35.97 | 60.00 | 24.03 | 100 | 150 | AV | Horizonta | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

| | | | |
|---|---|---|---|
| Test Standard: | EN 55032 | Test Distance: | 3 m |
| Test Mode: | Mode 1 | Test Power: | AC 230V /50Hz |
| Measurement Range: | 1 GHz~6 GHz | Ant.Polar.: | Vertical |
| Description: | | | |

**Test Graph**




Suspected List

| NO. | Frequency [MHz] | Reading | Factor | Result | Limit | Margin | Height | Angle | Detector | Polarity | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1200 | 65.45 | -17.91 | 47.54 | 80.00 | 32.46 | 100 | 324 | PK | Vertical | PASS |
| 2 | 1700 | 54.53 | -15.29 | 39.24 | 80.00 | 40.76 | 100 | 155 | PK | Vertical | PASS |
| 3 | 2150 | 58.55 | -12.82 | 45.73 | 80.00 | 34.27 | 100 | 176 | PK | Vertical | PASS |
| 4 | 2500 | 57.96 | -10.77 | 47.19 | 80.00 | 32.81 | 100 | 176 | PK | Vertical | PASS |
| 5 | 2700 | 57.75 | -9.88 | 47.87 | 80.00 | 32.13 | 100 | 150 | PK | Vertical | PASS |
| 6 | 4500 | 45.24 | -2.39 | 42.85 | 80.00 | 37.15 | 100 | 138 | PK | Vertical | PASS |
| 7 | 1187.5 | 52.38 | -17.99 | 34.39 | 60.00 | 25.61 | 100 | 53 | AV | Vertical | PASS |
| 8 | 1700 | 47.18 | -15.29 | 31.89 | 60.00 | 28.11 | 100 | 155 | AV | Vertical | PASS |
| 9 | 2150 | 52.63 | -12.82 | 39.81 | 60.00 | 20.19 | 100 | 181 | AV | Vertical | PASS |
| 10 | 2500 | 51.96 | -10.77 | 41.19 | 60.00 | 18.81 | 100 | 176 | AV | Vertical | PASS |
| 11 | 2700 | 52.82 | -9.88 | 42.94 | 60.00 | 17.06 | 100 | 150 | AV | Vertical | PASS |
| 12 | 4500 | 40.42 | -2.39 | 38.03 | 60.00 | 21.97 | 100 | 138 | AV | Vertical | PASS |

Note:1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

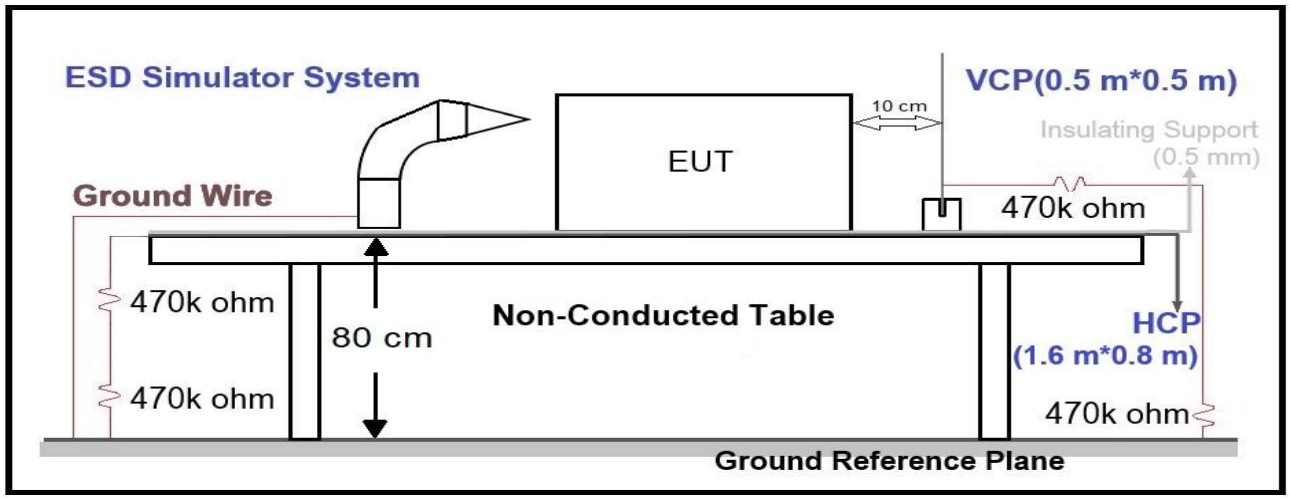
2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

## 4.3. Electrostatic Discharge (ESD)

### 4.3.1Test Specification

| EN 61000-4-2 | | | |
|---|---|---|---|
| Environmental Phenomena | Units | Test Specification | Performance Criterion |
| Enclosure Port | | | |
| Standard requirement Electrostatic Discharge | kV (Charge Voltage) | ±8 Air Discharge<br>±4 Contact Discharge | B |

### 4.3.2Test Configuration




### 4.3.3Test Procedure

**The basic test procedure was in accordance with EN 61000-4-2:**

IEC 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For tabletop equipment, a 1.6 by 0.8-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5-millimeter thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

**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.

**Contact Discharge:**

All the procedure shall be same as Section 8.3.1 of IEC 61000-4-2, except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

**Indirect discharge for horizontal coupling plane**

At least 50 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 0.1 m from the EUT and with the discharge electrode touching the coupling plane.

**Indirect discharge for vertical coupling plane**

At least 50 single discharges 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.

## 4.3.4Test Results

| Test Mode: Mode 1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Air Discharge | | | | | | | | | | | |
| Test Points | Test Levels | | | | | | | | Verdict | | |
| | ± 2 kV | Performance Criterion | ± 4 kV | Performance Criterion | | ± 8 kV | Performance Criterion | | Pass | Fail | Observation |
| Gaps | ☒ | ☒A ☐B | ☒ | ☒A ☐B | | ☒ | ☒A ☐B | | ☒ | ☐ | Note 1 |
| Port | ☒ | ☒A ☐B | ☒ | ☒A ☐B | | ☒ | ☒A ☐B | | ☒ | ☐ | Note 1 |
| Screen | ☒ | ☒A ☐B | ☒ | ☒A ☐B | | ☒ | ☒A ☐B | | ☒ | ☐ | Note 1 |
| Contact Discharge | | | | | | | | | | | |
| Test Points | Test Levels | | | | | | | | Verdict | | |
| | ± 2kV | Performance Criterion | ± 4 kV | Performance Criterion | | ± 6 kV | Performance Criterion | | Pass | Fail | Observation |
| Metal shell | ☒ | ☒A ☐B | ☒ | ☒A ☐B | | ☐ | ☐A ☐B | | ☒ | ☐ | Note 1 |
| Discharge To Horizontal Coupling Plane | | | | | | | | | | | |
| Side of EUT | Test Levels | | | | Verdict | | | | | | |
| | ± 2 kV | ± 4 kV | ± 6 kV | ± 8 kV | Pass | Fail | Performance Criterion | | Observation | | |
| Front | ☒ | ☒ | ☐ | ☐ | ☒ | ☐ | ☒A ☐B | | Note 1 | | |
| Back | ☒ | ☒ | ☐ | ☐ | ☒ | ☐ | ☒A ☐B | | Note 1 | | |
| Left | ☒ | ☒ | ☐ | ☐ | ☒ | ☐ | ☒A ☐B | | Note 1 | | |
| Right | ☒ | ☒ | ☐ | ☐ | ☒ | ☐ | ☒A ☐B | | Note 1 | | |
| Discharge To Vertical Coupling Plane | | | | | | | | | | | |
| Side of EUT | Test Levels | | | | Verdict | | | | | | |
| | ± 2 kV | ± 4 kV | ± 6 kV | ± 8 kV | Pass | Fail | Performance Criterion | | Observation | | |
| Front | ☒ | ☒ | ☐ | ☐ | ☒ | ☐ | ☒A ☐B | | Note 1 | | |
| Back | ☒ | ☒ | ☐ | ☐ | ☒ | ☐ | ☒A ☐B | | Note 1 | | |
| Left | ☒ | ☒ | ☐ | ☐ | ☒ | ☐ | ☒A ☐B | | Note 1 | | |
| Right | ☒ | ☒ | ☐ | ☐ | ☒ | ☐ | ☒A ☐B | | Note 1 | | |

Note1: Criterion A: There was no change compared with initial operation during the test.

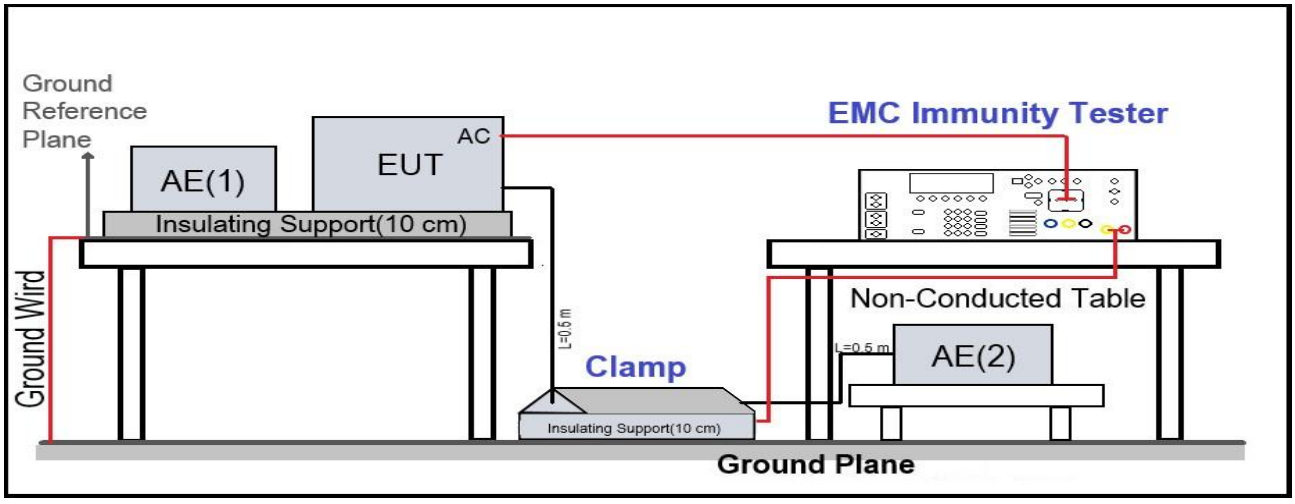
Note2: Criterion B: The performance decreased during the experiment, but it can recover by itself after the experiment.

## 4.4. Electrical Fast Transient/Burst (EFT)

### 4.4.1Test Specification

| EN 61000-4-4 | | | | |
|---|---|---|---|---|
| Item | Environmental Phenomena | Units | Test Specification | Performance Criterion |
| I/O and communication ports | | | | |
| | Fast Transients Common Mode | kV (Peak)<br>Tr/Th ns<br>Rep. Frequency kHz | ±0.5<br>5/50<br>5 | B |
| Input DC Power Ports | | | | |
| | Fast Transients Common Mode | kV (Peak)<br>Tr/Th ns<br>Rep. Frequency kHz | ±0.5<br>5/50<br>5 | B |
| Input AC Power Ports | | | | |
| | Fast Transients Common Mode | kV (Peak)<br>Tr/Th ns<br>Rep. Frequency kHz | ±1<br>5/50<br>5 | B |

### 4.4.2Test Configuration




### 4.4.3Test Procedure

a) Both positive and negative polarity discharges were applied.

b) The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.

c) The duration time of each test sequential was 1 minute.

d) The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

## 4.4.4Test Results

| Test Mode: Mode 1 | | | | | | |
|---|---|---|---|---|---|---|
| Test Point | Polarity | Test Level (kV) | Inject Time (Second) | Inject Method | Performance Criterion | Verdict |
| L | ± | 1 | 60 | Direct | ☒A ☐B | PASS |
| N | ± | 1 | 60 | Direct | ☒A ☐B | PASS |
| PE | ± | 1 | 60 | Direct | ☒A ☐B | PASS |
| L,N | ± | 1 | 60 | Direct | ☒A ☐B | PASS |
| L,PE | ± | 1 | 60 | Direct | ☒A ☐B | PASS |
| N,PE | ± | 1 | 60 | Direct | ☒A ☐B | PASS |
| L,N,PE | ± | 1 | 60 | Direct | ☒A ☐B | PASS |
| Signal Port | ± | 0.5 | 60 | Coupling | ☒A ☐B | PASS |

Note 1: The testing performed is from lowest level up to the highest level as required by Standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

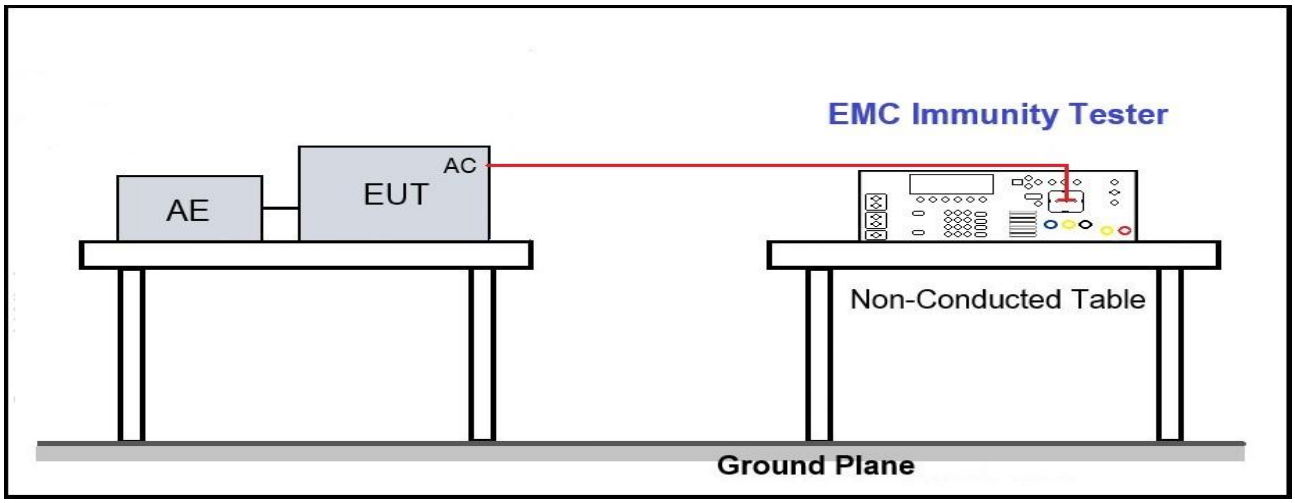
Criterion C: Loss/Error of function

## 4.5. Voltage Dips and Interruptions

### 4.5.1 Test Specification

| EN 61000-4-11 | | | |
|---|---|---|---|
| Environmental Phenomena | Units | Test Specification | Performance Criterion |
| Input AC Power Ports | | | |
| Voltage Dips | >95 | % Reduction | B |
| | 0.5 | Period | |
| | 30 | % Reduction | C |
| | 25 | Period | |
| Voltage Interruptions | >95 | % Reduction | C |
| | 250 | Period | |

### 4.5.2 Test Configuration




### 4.5.3 Test Procedure

The Section of EN 61000-4 defines the immunity test methods and range of preferred test levels for electrical and electronic equipment connected to low-voltage power supply networks for voltage dips. Short interruptions and voltage variations. The Standard applies to electrical and electronic equipment having a rated input current not exceeding 16A per phase. It does not apply to electrical and electronic equipment for connection to D.C networks or 400Hz A.C networks. Test for these networks will be covered by future EN Standard. A performance criterion is classified as A, B, C, the recommendation is criterion A or B.

The test shall be performed with the EUT connected to the test generator with the shortest power supply cable as specified by EUT manufacturer. If no cable length is specified, it shall be the shortest possible length suitable to the application of the EUT.

The test set-up for the two types of phenomena described in this Standard are:

- Voltage dips and short interruptions;
- Voltage variations with gradual transition between the rated voltage and the changed voltage (Option)

Both tests may be implemented with this set-up. Test on the three-phase EUT are accomplished by using three set of equipment mutually synchronized.

The EUT shall be tested for each selected combination of test level and duration with a sequence of three Dip / interruption with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested.

## 4.5.4Test Results

| Test Mode: | Mode 1 | | | |
|---|---|---|---|---|
| Angle: | 0, 45, 90, 135, 180, 225, 270, 315 | | | |
| Test Voltage (Vac) | Voltage Reduction (%) | Test Duration (Periods) | Performance Criterion | Verdict |
| 230 | >95 | 0.5 | ☐A ☒B ☐C | PASS |
| | 30 | 25 | ☐A ☐B ☒C | PASS |
| | >95 | 250 | ☐A ☐B ☒C | PASS |

Note 1: The testing performed is from lowest level up to the highest level as required by Standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

Note 2: The power is temporary off and can be reset by the operator.

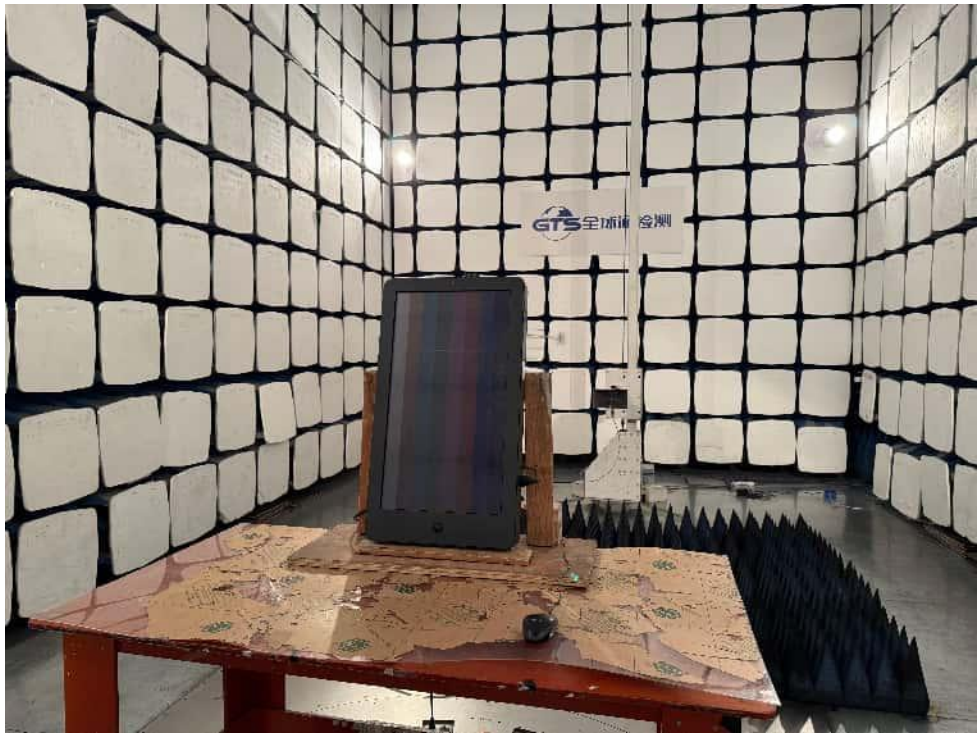
# 5. TEST SETUP PHOTOS OF THE EUT

Conducted Emission ( A.C. Mains)

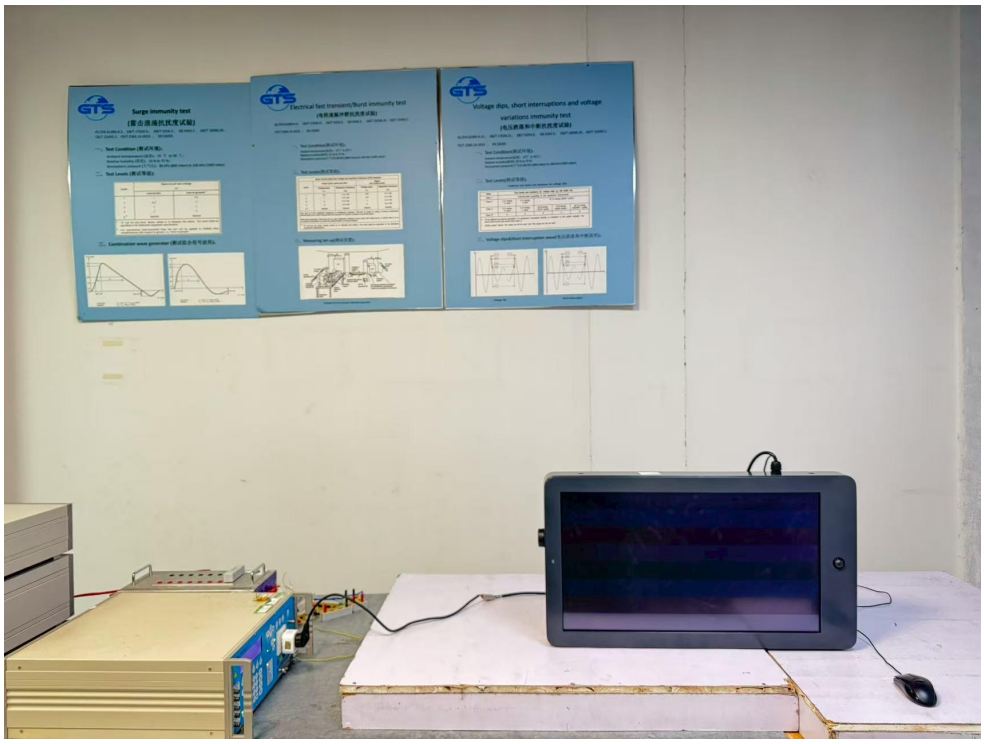
Conducted Emission (Siganl Port)

Radiated Emission Below 1GHz

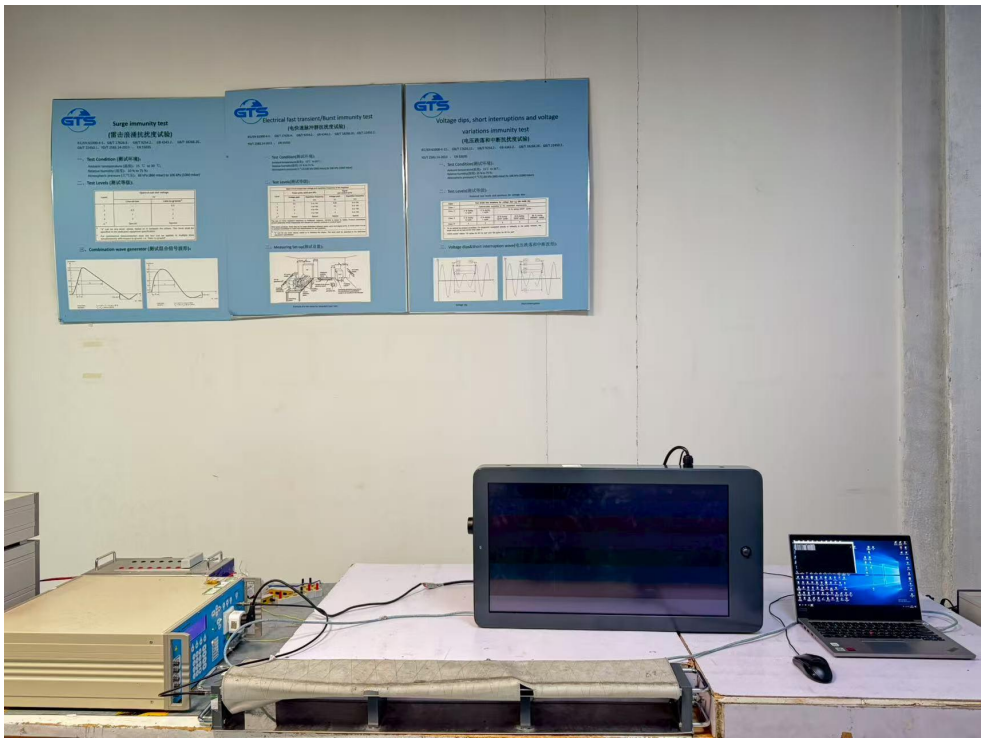
Radiated Emission Above 1GHz



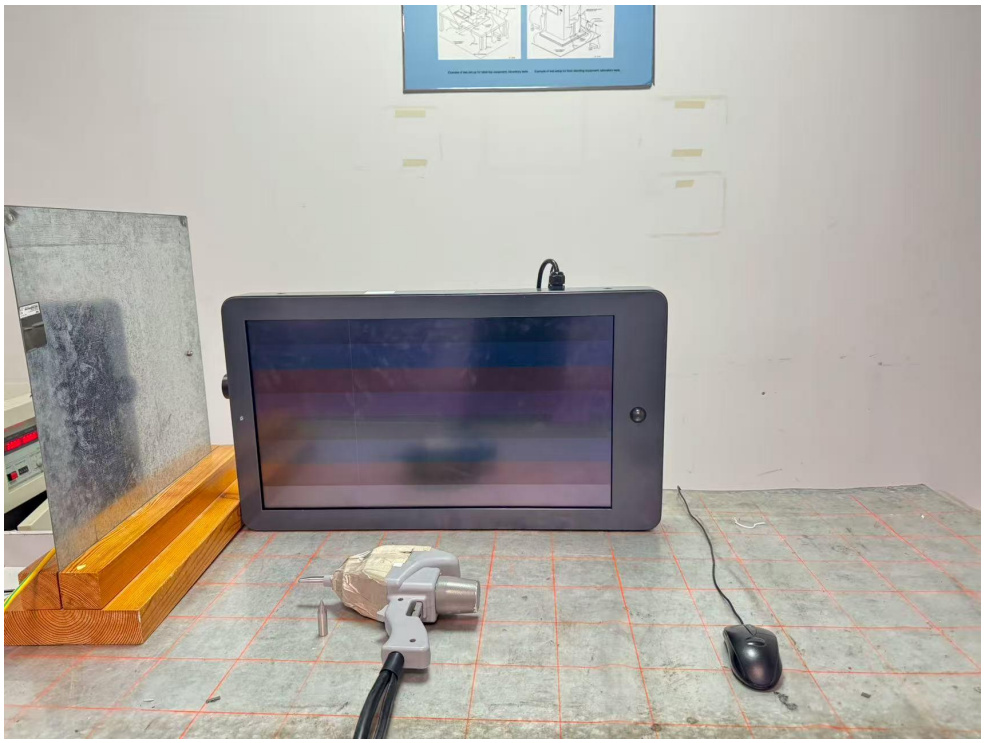
Electrical Fast Transient/Burst /Voltage Dips




Electrical Fast Transient/Burst (Siganl Port)



Electrostatic Discharge



# 6. EXTERNAL PHOTOS OF THE EUT

**.....End of Report.....**