

# EMC Test Report

Report No.: AGC01881181101EE02

**PRODUCT DESIGNATION** : Bamboo X speaker  
**BRAND NAME** : N/A  
**MODEL NAME** : P328.00X, M1  
**CLIENT** : Xindao B.V.  
**DATE OF ISSUE** : Nov. 15, 2018  
**STANDARD(S)** : EN 55032:2015/AC:2016-07  
EN 61000-3-2:2014  
EN 61000-3-3:2013  
EN 55035:2017  
**REPORT VERSION** : V1.0

**Attestation of Global Compliance (Shenzhen) Co., Ltd**

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### Report Revise Record

| Report Version | Revise Time | Issued Date   | Valid Version | Notes           |
|----------------|-------------|---------------|---------------|-----------------|
| V1.0           | /           | Nov. 15, 2018 | Valid         | Initial release |

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## 1. VERIFICATION OF CONFORMITY

|                                 |   |
|---------------------------------|---|
| <b>Applicant</b>                | Xindao B.V.                                       |
| <b>Address</b>                  | P.O. Box 3082, 2280 GB, Rijswijk, The Netherlands |
| <b>Manufacturer</b>             | Xindao B.V.                                       |
| <b>Address</b>                  | P.O. Box 3082, 2280 GB, Rijswijk, The Netherlands |
| <b>Factory</b>                  | Xindao B.V.                                       |
| <b>Address</b>                  | P.O. Box 3082, 2280 GB, Rijswijk, The Netherlands |
| <b>Product Designation</b>      | Bamboo X speaker                                  |
| <b>Brand Name</b>               | N/A   |
| <b>Test Model</b>               | P328.00X  |
| <b>Series Model</b>             | M1  |
| <b>Difference Description</b>   | All the same except for the model name.           |
| <b>Date of test</b>             | Nov. 04, 2018 to Nov. 14, 2018                    |
| <b>Deviation</b>                | None  |
| <b>Condition of Test Sample</b> | Normal  |
| <b>Report Template</b>          | AGCRT-EC-IT/AC(2013-03-01)                        |

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. for compliance with the requirements of Technical Standards mentioned above. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment.

The test results of this report relate only to the tested sample identified in this report.

Tested By

Jonhen Wang(Wang Yonghuan)) Nov. 14, 2018

Reviewed By

Cool Cheng(Cheng Mengguo) Nov. 15, 2018

Approved By

Forrest Lei(Lei Yonggang)  
 Authorized Officer Nov. 15, 2018

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## 2. SYSTEM DESCRIPTION

| TEST MODE DESCRIPTION        |                           |       |
|------------------------------|---------------------------|-------|
| NO.                          | EMI TEST MODE DESCRIPTION | WORST |
| 1                            | AUX in with charging      | V     |
| NO.                          | EMS TEST MODE DESCRIPTION |       |
| 1                            | AUX in with charging      |       |
| Note: V means EMI worst mode |                           |       |

## 3. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in measurement" (GUM) published by ISO.

- Uncertainty of Conducted Emission,  $U_c = \pm 3.2 \text{ dB}$
- Uncertainty of Radiated Emission below 1GHz,  $U_c = \pm 3.9 \text{ dB}$
- Uncertainty of Radiated Emission above 1GHz,  $U_c = \pm 4.8 \text{ dB}$

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#### 4. PRODUCT INFORMATION

|                     |                    |
|---------------------|--------------------|
| <b>Housing Type</b> | Plastic and Metal  |
| <b>Power Supply</b> | DC 3.7V by battery |

I/O Port Information (☒ Applicable ☐ Not Applicable)

| I/O Port of EUT |        |                   |             |
|-----------------|--------|-------------------|-------------|
| I/O Port Type   | Number | Cable Description | Tested With |
| USB port        | 1      | 0                 | 1           |
| AUX in port     | 1      | 0                 | 1           |

#### 5. SUPPORT EQUIPMENT

| Device Type  | Manufacturer | Model Name     | Serial No. | Power Cable   |
|--------------|--------------|----------------|------------|---------------|
| PC           | APPLE        | A1465          | N/A        | 0             |
| Mobile phone | Huawei       | V9             | N/A        | 0             |
| Adapter      | KUANTEN      | KT05W050100USU | N/A        | 0             |
| AUX in Cable | N/A          | N/A            | N/A        | 1m unshielded |

Note: The PC and adapter were the charging device for EUT.

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## 6. IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

|                 |  |
|-----------------|--|
| <b>Site</b>     | Attestation of Global Compliance (Shenzhen) Co., Ltd   |
| <b>Location</b> | 1F, B5 Building, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, China |

### TEST EQUIPMENT OF CONDUCTED EMISSION TEST

| Description   | Manufacturer | Model   | S/N    | Calibration Date | Calibration Due. |
|---------------|--------------|---------|--------|------------------|------------------|
| TEST RECEIVER | R&S          | ESPI    | 101206 | Jun.12, 2018     | Jun.11, 2019     |
| LISN          | R&S          | ESH2-Z5 | 100086 | Aug.21, 2018     | Aug.20, 2019     |

### TEST EQUIPMENT OF RADIATED EMISSION TEST

| Equipment           | Manufacturer | Model    | S/N        | Cal. Date     | Cal. Due     |
|---------------------|--------------|----------|------------|---------------|--------------|
| Test Receiver       | R&S          | ESCI     | 10096      | Jun.20, 2018  | Jun.19, 2019 |
| Antenna             | SCHWARZBECK  | VULB9168 | D69250     | Sep.28, 2018  | Sep.27,2019  |
| HORN ANTENNA        | ETS LINDGREN | 3117     | 00034609   | May 26, 2018  | May 25,2019  |
| EXA Signal Analyzer | Aglient      | N9010A   | MY53470504 | Dec. 08, 2017 | Dec.07,2018  |

### TEST EQUIPMENT OF POWER HARMONICS / VOLTAGE FLUCTUATION / FLICKER TEST

| Description              | Manufacturer | Model     | S/N   | Calibration Date | Calibration Due. |
|--------------------------|--------------|-----------|-------|------------------|------------------|
| Signal Conditioning Unit | Schaffner    | CCN1000-1 | 72431 | Aug.21, 2018     | Aug.20, 2019     |
| AC Source                | Schaffner    | NSG1007   | 56825 | Aug.21, 2018     | Aug.20, 2019     |

### TEST EQUIPMENT OF ESD TEST

| Equipment     | Manufacturer | Model   | S/N | Calibration Date | Calibration Due. |
|---------------|--------------|---------|-----|------------------|------------------|
| ESD Simulator | Schaffner    | NSG 438 | 782 | Sep. 20, 2018    | Sep. 19, 2019    |

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**TEST EQUIPMENT OF SURGE/EFT/DIPSTEST**

| Description                | Manufacturer | Model       | S/N   | Calibration Date | Calibration Due. |
|----------------------------|--------------|-------------|-------|------------------|------------------|
| EFT, Surge, Dips Generator | Schaffner    | Modula 6150 | 34437 | Aug.21, 2018     | Aug.20, 2019     |

**TEST EQUIPMENT OF RS IMMUNITY TEST**

| Description       | Manufacturer | Model             | S/N             | Cal. Date    | Cal. Due     |
|-------------------|--------------|-------------------|-----------------|--------------|--------------|
| Signal Generator  | R&S          | E4421B            | MY43351603      | May 31, 2018 | May 30, 2019 |
| Biconilog Antenna | ETS          | 3142C             | 00060447        | Mar.01, 2018 | Feb.28, 2019 |
| Power Sensor      | R&S          | URV5-Z4           | 100124          | May 31, 2018 | May 30, 2019 |
| Power Meter       | R&S          | NRVD              | 832378/027      | Jun.20, 2018 | Jun.19, 2019 |
| Power Amplifier   | KALMUS       | 7100LC            | 04-02/17-06-001 | Jun.20, 2018 | Jun.19, 2019 |
| RF Amplifier      | Milmega      | AS01004-5<br>5_55 | 1004793         | Jun.20, 2018 | Jun.19, 2019 |
| Horn Antenna      | ETS LINDGREN | 3117              | 00034609        | May 26, 2018 | May 25, 2019 |

**TEST EQUIPMENT OF CS IMMUNITY TEST**

| Description                     | Manufacturer | Model            | S/N        | Cal. Date    | Cal. Due     |
|---------------------------------|--------------|------------------|------------|--------------|--------------|
| Power Amplifier                 | AR           | 75A250           | 18464      | Jun.12, 2018 | Jun.11, 2019 |
| CDN                             | Schaffner    | M016             | 21614      | Aug.21, 2018 | Aug.20, 2019 |
| 6dB attenuator                  | JWF          | 50FHC-00<br>6-50 | N/A        | Jun.12, 2018 | Jun.11, 2019 |
| Electromagnetic Injection Clamp | Luthi        | EM101            | 35773      | Aug.21, 2018 | Aug.20, 2019 |
| Power Sensor                    | R&S          | URV5-Z4          | 100124     | May.15, 2018 | May.14, 2019 |
| Power Meter                     | R&S          | NRVD             | 8323781027 | May.15, 2018 | May.14, 2019 |
| SIGNAL GENERATOR                | R&S          | E4421B           | MY43351603 | May.15, 2018 | May.14, 2019 |

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## 7. EN 55032 LINE CONDUCTED EMISSION TEST

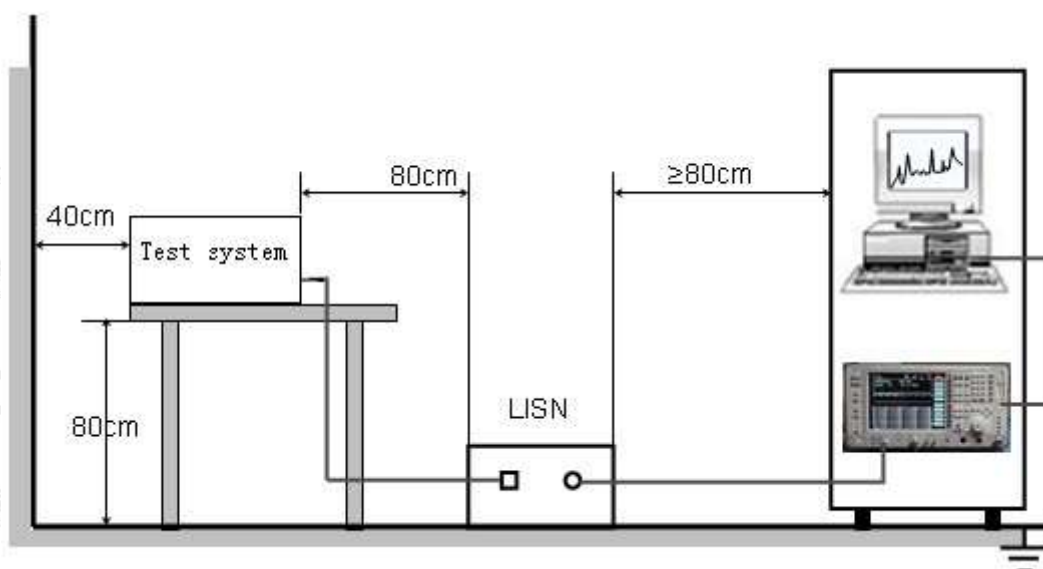
### 7.1. LIMITS OF LINE CONDUCTED EMISSION TEST

| Frequency     | Maximum RF Line Voltage |                |
|---------------|-------------------------|----------------|
|               | Q.P.( dBuV)             | Average( dBuV) |
| 150kHz-500kHz | 66-56                   | 56-46          |
| 500kHz-5MHz   | 56                      | 46             |
| 5MHz-30MHz    | 60                      | 50             |

**Note:**

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50MHz.

### 7.2. BLOCK DIAGRAM OF TEST SETUP



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### 7.3. PROCEDURE OF LINE CONDUCTED EMISSION TEST

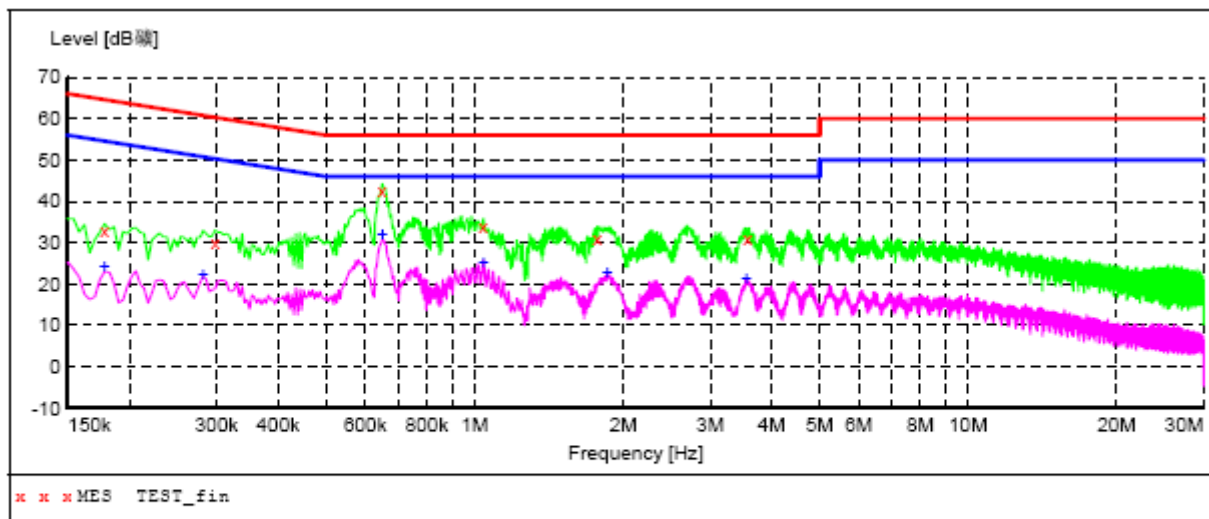
- (1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN55032 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- (2) Support equipment, if needed, was placed as per EN55032.
- (3) All I/O cables were positioned to simulate typical actual usage as per EN55032.
- (4) The EUT received charging voltage by adapter through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- (5) All support equipments received power from a second LISN supplying power of AC 230V/50Hz, if any.
- (6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- (7) Analyzer / Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.
- (8) During the above scans, the emissions were maximized by cable manipulation.
- (9) A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions.
- (10) 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. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.

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## 7.4. TEST RESULT OF LINE CONDUCTED EMISSION TEST

### LINE CONDUCTED EMISSION TEST-L1



#### MEASUREMENT RESULT: "TEST\_fin"

2018/11/13 16:40

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.178000         | 32.80         | 11.4         | 65            | 31.8         | QP       | L1   | FLO |
| 0.298000         | 30.20         | 11.3         | 60            | 30.1         | QP       | L1   | FLO |
| 0.650000         | 42.50         | 11.4         | 56            | 13.5         | QP       | L1   | FLO |
| 1.042000         | 34.00         | 11.3         | 56            | 22.0         | QP       | L1   | FLO |
| 1.774000         | 31.10         | 11.3         | 56            | 24.9         | QP       | L1   | FLO |
| 3.570000         | 31.10         | 11.4         | 56            | 24.9         | QP       | L1   | FLO |

#### MEASUREMENT RESULT: "TEST\_fin2"

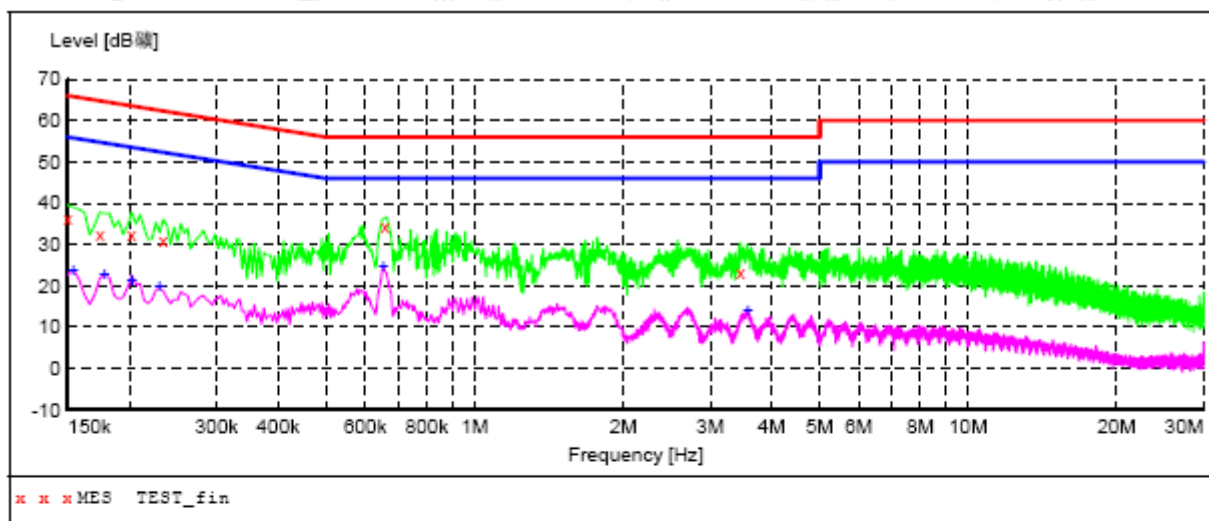
2018/11/13 16:40

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.178000         | 24.40         | 11.4         | 55            | 30.2         | AV       | L1   | FLO |
| 0.282000         | 22.40         | 11.3         | 51            | 28.4         | AV       | L1   | FLO |
| 0.650000         | 31.70         | 11.4         | 46            | 14.3         | AV       | L1   | FLO |
| 1.042000         | 25.40         | 11.3         | 46            | 20.6         | AV       | L1   | FLO |
| 1.858000         | 22.60         | 11.3         | 46            | 23.4         | AV       | L1   | FLO |
| 3.558000         | 21.50         | 11.4         | 46            | 24.5         | AV       | L1   | FLO |

**RESULT: PASS**

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LINE CONDUCTED EMISSION TEST-N



MEASUREMENT RESULT: "TEST\_fin"

2018/11/13 16:32

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.150000         | 36.50         | 11.4         | 66            | 29.5         | QP       | N    | FLO |
| 0.174000         | 32.50         | 11.4         | 65            | 32.3         | QP       | N    | FLO |
| 0.202000         | 32.60         | 11.4         | 64            | 30.9         | QP       | N    | FLO |
| 0.234000         | 30.90         | 11.3         | 62            | 31.4         | QP       | N    | FLO |
| 0.658000         | 34.60         | 11.4         | 56            | 21.4         | QP       | N    | FLO |
| 3.458000         | 23.30         | 11.4         | 56            | 32.7         | QP       | N    | FLO |

MEASUREMENT RESULT: "TEST\_fin2"

2018/11/13 16:32

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.154000         | 23.50         | 11.4         | 56            | 32.3         | AV       | N    | FLO |
| 0.178000         | 22.50         | 11.4         | 55            | 32.1         | AV       | N    | FLO |
| 0.202000         | 21.20         | 11.4         | 54            | 32.3         | AV       | N    | FLO |
| 0.230000         | 20.00         | 11.3         | 52            | 32.4         | AV       | N    | FLO |
| 0.654000         | 24.50         | 11.4         | 46            | 21.5         | AV       | N    | FLO |
| 3.578000         | 14.10         | 11.4         | 46            | 31.9         | AV       | N    | FLO |

RESULT: PASS

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## 8. EN 55032 RADIATED EMISSION TEST

### 8.1. LIMITS OF RADIATED DISTURBANCES

#### AT 3M DISTANCES

For class B equipment

| Frequency (MHz) | Distance (m) | Maximum Field Strength Limit (dBuV/m Q.P.) |
|-----------------|--------------|--|
| 30-230          | 3            | 40   |
| 230-1000        | 3            | 47   |

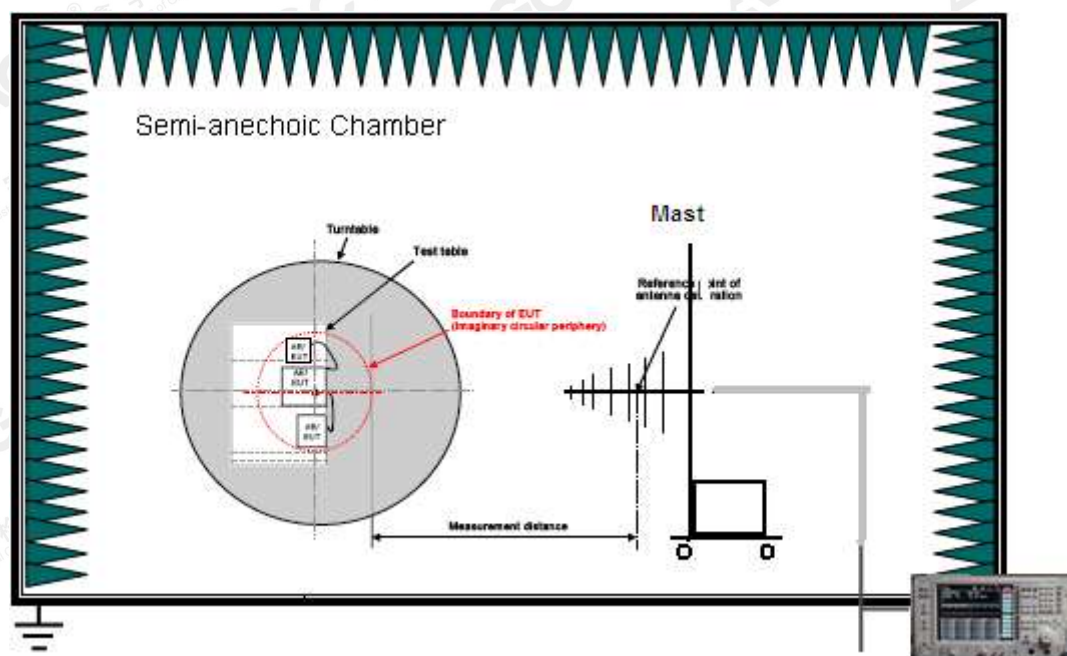
For FM receivers

| Frequency (MHz) | Distance (m) | Maximum Field Strength Limit (dBuV/m Q.P.) |           |
|-----------------|--------------|--|-----------|
|                 |              | Fundamental                                | Harmonics |
| 30-230          | 3            | 60   | 52        |
| 230-300         | 3            |  | 52        |
| 300-1000        | 3            |  | 56        |

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

### 8.2. BLOCK DIAGRAM OF TEST SETUP

System Diagram of Connections between EUT and Simulators



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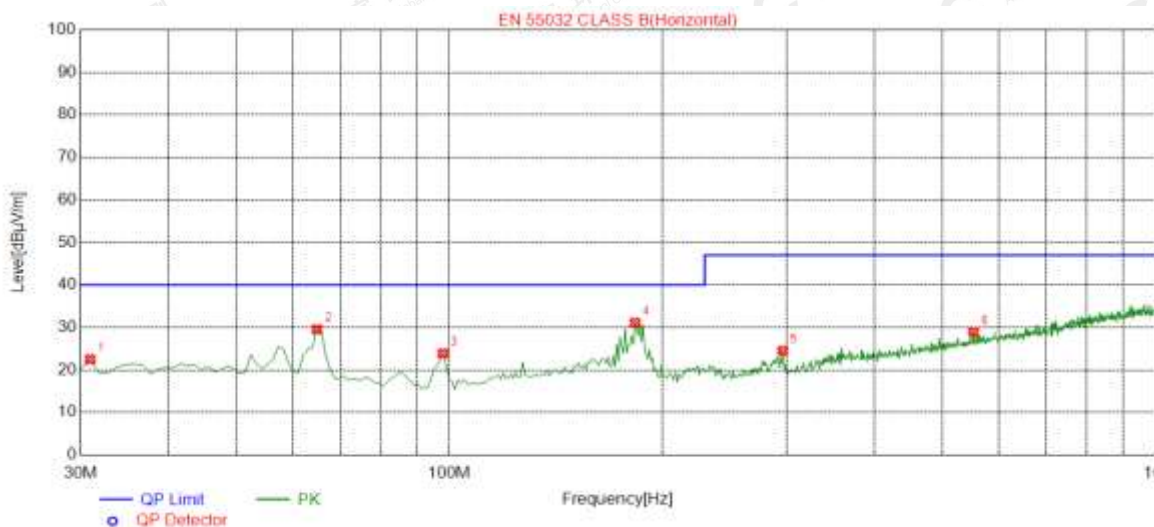
### 8.3. PROCEDURE OF RADIATED EMISSION TEST

- (1) The equipment was set up as per the test configuration to simulate typical actual 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 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 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- (2) Support equipment, if needed, was placed as per EN 55032.
- (3) All I/O cables were positioned to simulate typical actual usage as per EN 55032.
- (4) The EUT received charging voltage by PC which got power through the outlet socket under the turntable. All support equipments received AC230V/50Hz power from socket under the turntable, if any.
- (5) The antenna was placed at 3 meter away from the EUT as stated in EN 55032. The antenna connected to the Analyzer via a cable and at times a pre-amplifier would be used.
- (6) The Analyzer / Receiver quickly scanned from 30MHz to 1000MHz. 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.
- (7) The test mode(s) were scanned during the test:
- (8) Recorded 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./Peak reading is presented.

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#### 8.4. TEST RESULT OF RADIATED EMISSION TEST

##### Radiated Emission Test at 3m Distance-Horizontal



**Suspected Data List**

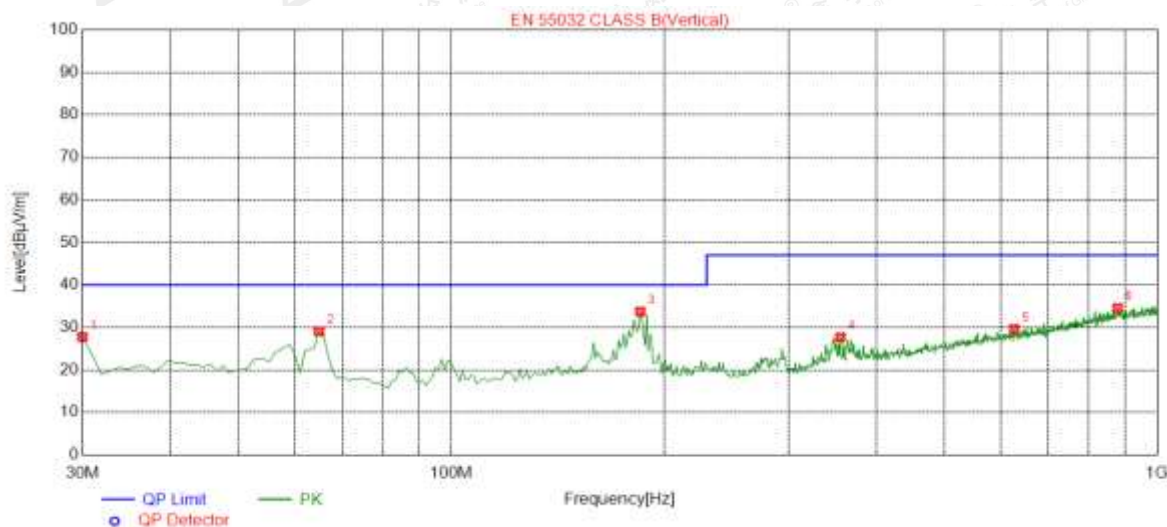
| NO. | Freq. [MHz] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity   |
|-----|-------------|----------------|-------------|----------------|-------------|-------------|-----------|------------|
| 1   | 30.9700     | 22.51          | 12.76       | 40.00          | 17.49       | 100         | 10        | Horizontal |
| 2   | 64.9200     | 29.53          | 12.70       | 40.00          | 10.47       | 100         | 230       | Horizontal |
| 3   | 97.9000     | 23.89          | 10.63       | 40.00          | 16.11       | 100         | 100       | Horizontal |
| 4   | 183.260     | 31.12          | 12.11       | 40.00          | 8.88        | 100         | 100       | Horizontal |
| 5   | 296.750     | 24.53          | 15.02       | 47.00          | 22.47       | 100         | 120       | Horizontal |
| 6   | 552.830     | 28.96          | 21.98       | 47.00          | 18.04       | 100         | 200       | Horizontal |

**RESULT: PASS**

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### Radiated Emission Test at 3m Distance-Vertical



**Suspected Data List**

| NO. | Freq. [MHz] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
|-----|-------------|----------------|-------------|----------------|-------------|-------------|-----------|----------|
| 1   | 30.0000     | 27.75          | 12.59       | 40.00          | 12.25       | 150         | 240       | Vertical |
| 2   | 64.9200     | 29.08          | 12.70       | 40.00          | 10.92       | 200         | 10        | Vertical |
| 3   | 185.200     | 33.71          | 12.01       | 40.00          | 6.29        | 150         | 260       | Vertical |
| 4   | 355.920     | 27.69          | 17.00       | 47.00          | 19.31       | 150         | 110       | Vertical |
| 5   | 627.520     | 29.63          | 23.34       | 47.00          | 17.37       | 200         | 140       | Vertical |
| 6   | 878.750     | 34.57          | 27.96       | 47.00          | 12.43       | 100         | 180       | Vertical |

**RESULT: PASS**

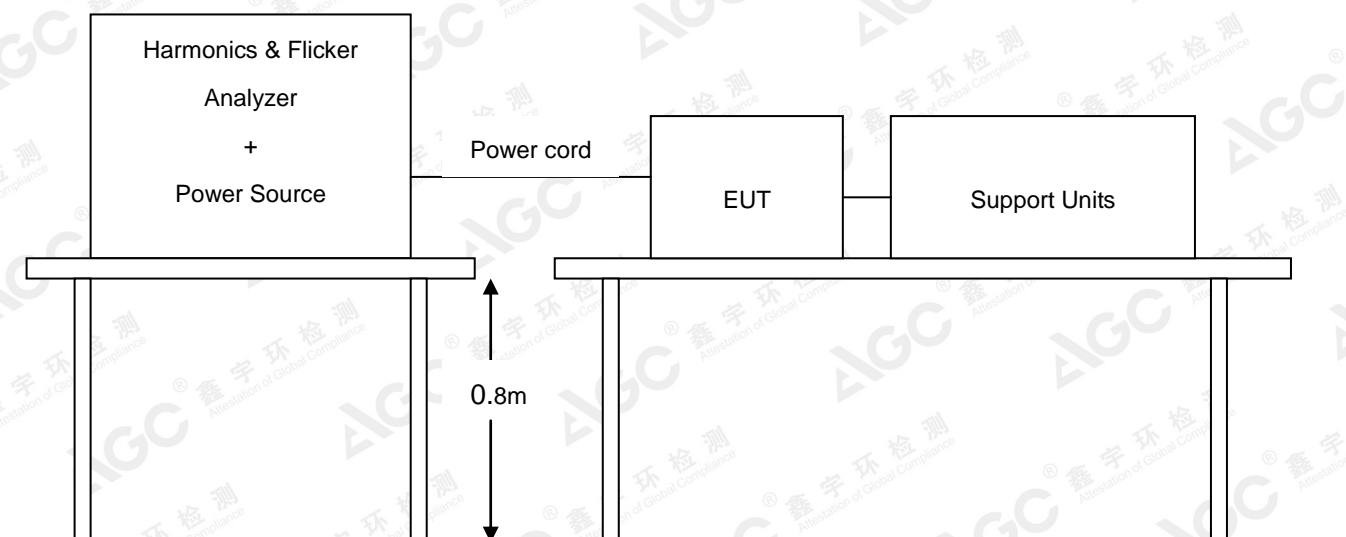
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## 9. POWER HARMONICS TEST

|                |  |
|----------------|--|
| Port           | AC mains   |
| Basic Standard | EN 61000-3-2   |
| Limits         | <input checked="" type="checkbox"/> CLASS A ; <input type="checkbox"/> CLASS B ; <input type="checkbox"/> CLASS C ; <input type="checkbox"/> CLASS D |
| Tester         | Jonhen   |
| Temperature    | 25°C   |
| Humidity       | 55%  |

### 9.1. BLOCK DIAGRAM OF TEST SETUP



### 9.2. RESULT

#### Test Specification

|                 |         |               |         |
|-----------------|---------|---------------|---------|
| Test Frequency: | 50Hz    | Test Voltage: | 230V AC |
| Waveform:       | Sine    | Test Time:    | 2.5min  |
| Classification: | Class A |               |         |

Note:

1. The active input power of the EUT is less than 75W.
2. No limits apply for equipment with an active input power up to and including 75W.

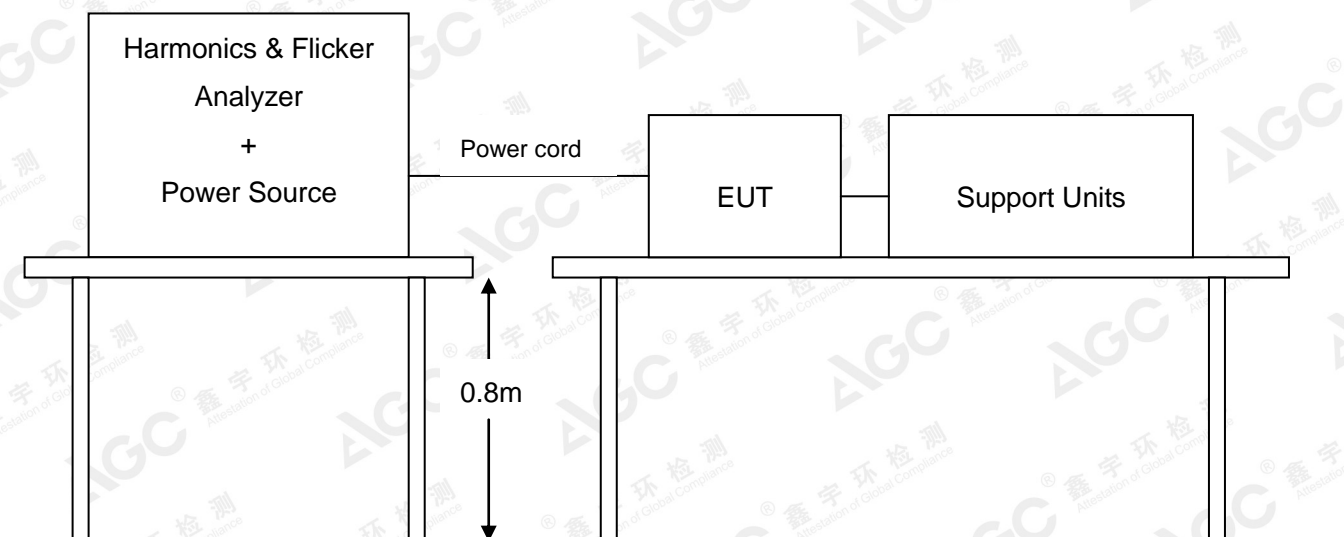
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## 10. VOLTAGE FLUCTUATION / FLICKER TEST

### VOLTAGE FLUCTUATION/FLICKER MEASUREMENT

|                |                    |
|----------------|--------------------|
| Port           | AC mains           |
| Basic Standard | EN 61000-3-3       |
| Limits         | §5 of EN 61000-3-3 |
| Tester         | Jonhen             |
| Temperature    | 25°C               |
| Humidity       | 55%                |

#### 10.1. BLOCK DIAGRAM OF TEST SETUP



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## 10.2. RESULT

### Flicker Test Summary per EN/IEC61000-3-3 (Run time)

EUT: P328.00X

Tested by: Jonhen

Test category: All parameters (European limits)

Test Margin: 100

Test date: Nov. 13, 2018

Start time: 09:31:20

End time: 09:28:52

Test duration (min): 10

Data file name: F-000289.cts\_data

Comment: AUX in with charging

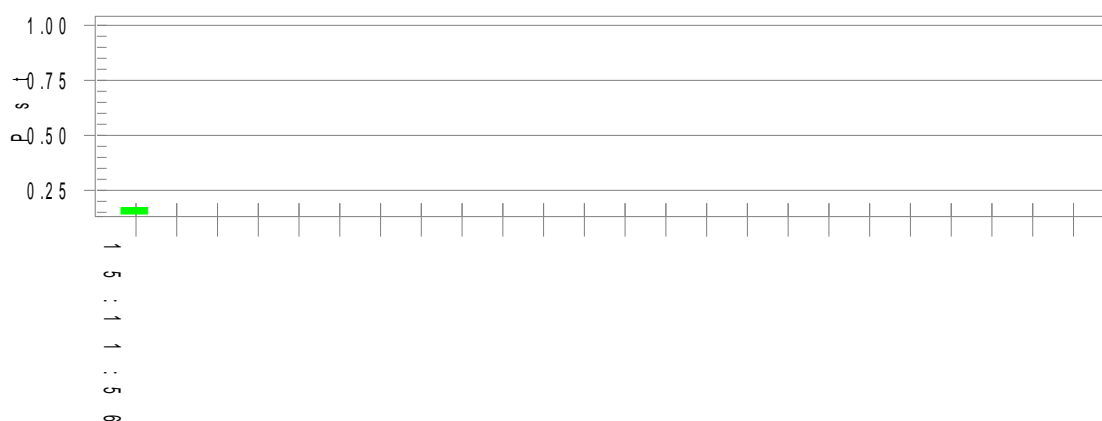
Customer: Xindao B.V.

Test Result: Pass

Status: Test Completed

Pst<sub>i</sub> and limit line

European Limits



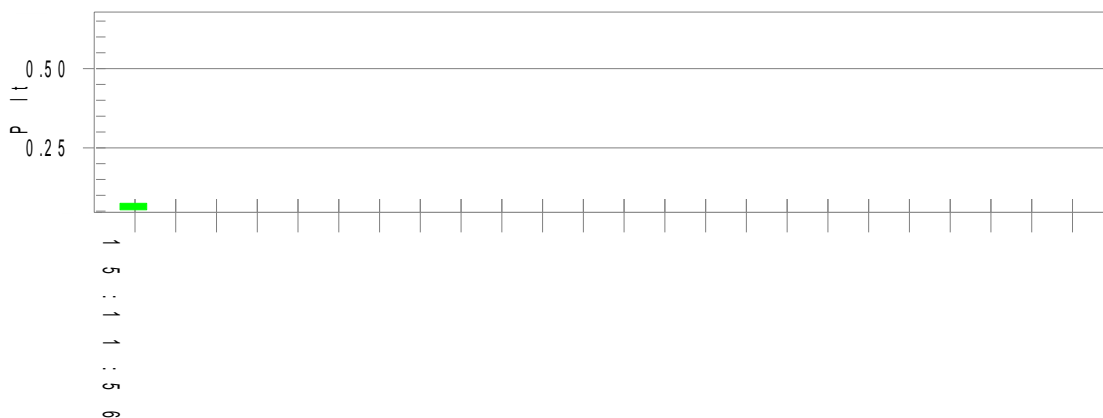
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Add: 2/F, Building 2, No.1-4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Baoan District, Shenzhen, Guangdong China



# Plt and limit line



## Parameter values recorded during the test:

Vrms at the end of test (Volt): 230.83

Highest dt (%): 0.27

Time(mS) > dt: 0.1

Highest dc (%): 0.23

Highest dmax (%): 0.29

Highest Pst (10 min. period): 0.184

Highest Plt (2 hr. period): 0.083

Test limit (%): 3.30 Pass

Test limit (mS): 500.0 Pass

Test limit (%): 3.30 Pass

Test limit (%): 4.00 Pass

Test limit: 1.000 Pass

Test limit: 0.650 Pass

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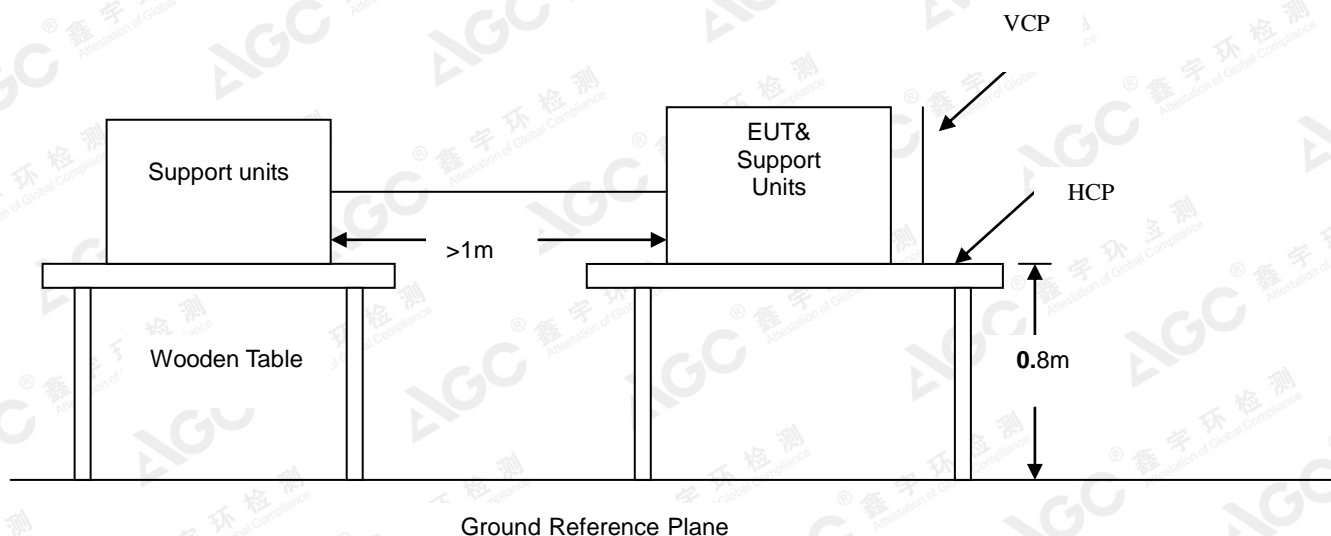
## 11. ESD IMMUNITY TEST

### ELECTROSTATIC DISCHARGE (ESD) IMMUNITY TEST

|                  |   |
|------------------|---|
| Port             | Enclosure   |
| Basic Standard   | EN 61000-4-2  |
| Test Level       | ± 8.0 kV (Air Discharge)<br>± 4.0 kV (Contact Discharge)<br>± 4.0 kV (Indirect Discharge) |
| Standard require | B   |
| Tester           | Jonhen  |
| Temperature      | 20°C  |
| Humidity         | 50%   |

#### 11.1. BLOCK DIAGRAM OF TEST SETUP

(The 470 k ohm resistors are installed per standard requirement)



For the actual test configuration, please refer to Appendix I : Photographs of the Test Configuration.

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## 11.2. TEST PROCEDURE

The EUT was located 0.1 m minimum from all side of the HCP.

The support units were located 1 m minimum away from the EUT.

EUT worked with resistance load, and make sure EUT worked normally.

Activates the communication function if the EUT with such port(s).

As per the requirement of EN 55035: Contact discharge is the preferred test method. 20 discharges (10 with positive and 10 negative polarity) shall be applied on each accessible metal part of the enclosure. In case of a non-conductive enclosure, discharges shall be applied on the horizontal or vertical coupling planes as specified in EN 61000-4-2.

Air discharges shall be used where contact discharges cannot be applied.

The following test condition was followed during the tests.

### Note:

As per the A2 to EN 61000-4-2, a bleed resistor cable is connected between the EUT and HCP during the test.

The electrostatic discharges were applied as follows:

## 11.3. PERFORMANCE & RESULT

| Amount of Discharges | Voltage | Coupling                       | Performance      | Result (Pass/Fail) |
|----------------------|---------|--------------------------------|------------------|--------------------|
| Mini 20 /Point       | ±4kV    | Contact Discharge              | No Function Loss | Pass               |
| Mini 20 /Point       | ±4kV    | Indirect Discharge HCP (Front) | No Function Loss | Pass               |
| Mini 20 /Point       | ±4kV    | Indirect Discharge HCP (Left)  | No Function Loss | Pass               |
| Mini 20 /Point       | ±4kV    | Indirect Discharge HCP (Back)  | No Function Loss | Pass               |
| Mini 20 /Point       | ±4kV    | Indirect Discharge HCP (Right) | No Function Loss | Pass               |
| Mini 20 /Point       | ±4kV    | Indirect Discharge VCP (Front) | No Function Loss | Pass               |
| Mini 20 /Point       | ±4kV    | Indirect Discharge VCP (Left)  | No Function Loss | Pass               |
| Mini 20 /Point       | ±4kV    | Indirect Discharge VCP (Back)  | No Function Loss | Pass               |
| Mini 20 /Point       | ±4kV    | Indirect Discharge VCP (Right) | No Function Loss | Pass               |
| Mini 20 /Point       | ±8kV    | Air Discharge                  | No Function Loss | Pass               |

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Contact Discharge



Air Discharge

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#### 11.4. PERFORMANCE & RESULT PERFORMANCE

|  |  |
|--|--|
| <input checked="" type="checkbox"/> <b>Criteria A:</b> | The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.  |
| <input type="checkbox"/> <b>Criteria B:</b>            | The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. |
| <input type="checkbox"/> <b>Criteria C:</b>            | Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.  |

☒ **PASS**
☐ **FAIL**

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## 12. RADIATED, RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST

### 12.1. TEST SPECIFICATION

|                     |                                      |
|---------------------|--------------------------------------|
| Basic Standard      | EN 61000-4-3                         |
| Frequency Range     | 80-1000, 1800, 2600, 3500, 5000(MHz) |
| Field Strength      | 3V/m                                 |
| Modulation          | 1 kHz sine wave, 80%, AM modulation  |
| Frequency Step      | 1% of fundamental                    |
| Polarity of Antenna | Horizontal and Vertical              |
| Test Distance       | 3m                                   |
| Antenna Height      | 1.5m                                 |
| Dwell Time          | 3 seconds                            |

### 12.2. TEST PROCEDURE

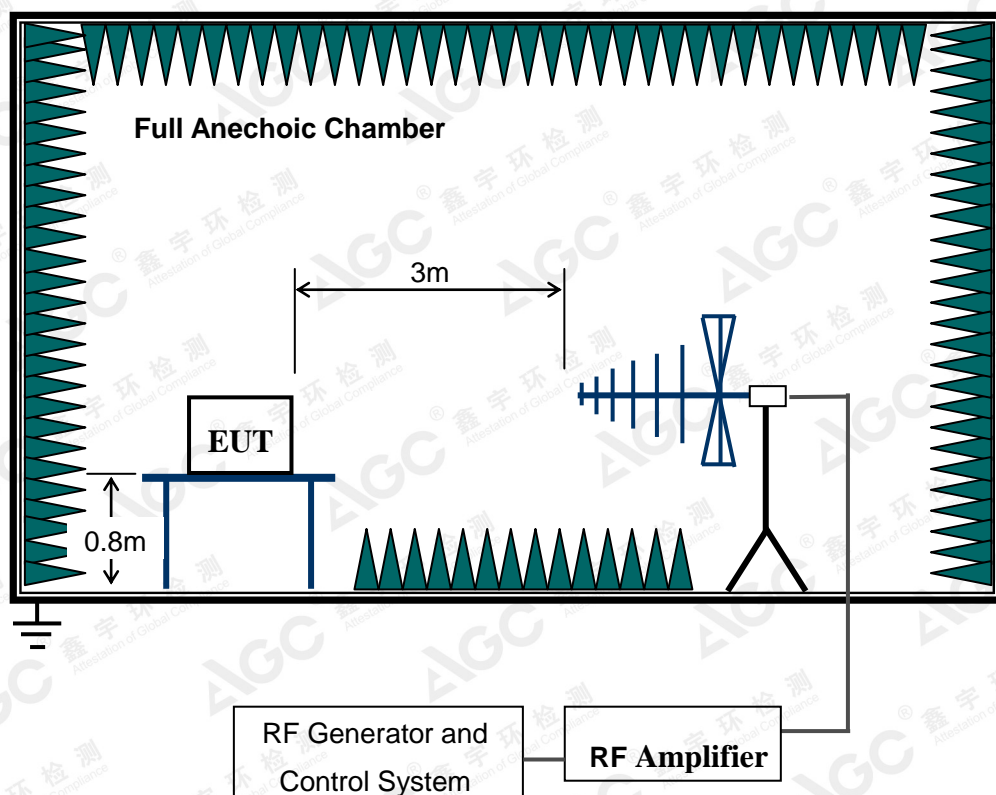
The test procedure was in accordance with EN 61000-4-3.

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- The test signal was 80% amplitude modulated with a 1 kHz sine wave.
- The frequency range was swept at 80-1000, 1800, 2600, 3500, 5000(MHz) with the exception of the exclusion band for transmitters, receivers and duplex transceivers. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The field strength level was 3V/m.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

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### 12.3. TEST SETUP



For the actual test configuration, please refer to Appendix A : Photographs of the Test Configuration.

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#### 12.4. TEST RESULT

| Freq. Range (MHz)           | Field | Modulation | Polarity | Position | Observation      | performance | Result (Pass/Fail) |
|-----------------------------|-------|------------|----------|----------|------------------|-------------|--------------------|
| 80-1000,1800,2600,3500,5000 | 3V/m  | Yes        | H / V    | Front    | No Function Loss | A           | PASS               |
| 80-1000,1800,2600,3500,5000 | 3V/m  | Yes        | H / V    | Back     | No Function Loss | A           | PASS               |
| 80-1000,1800,2600,3500,5000 | 3V/m  | Yes        | H / V    | Left     | No Function Loss | A           | PASS               |
| 80-1000,1800,2600,3500,5000 | 3V/m  | Yes        | H / V    | Right    | No Function Loss | A           | PASS               |
| 80-1000,1800,2600,3500,5000 | 3V/m  | Yes        | H / V    | Top      | No Function Loss | A           | PASS               |
| 80-1000,1800,2600,3500,5000 | 3V/m  | Yes        | H / V    | Bottom   | No Function Loss | A           | PASS               |

**Note:** 1. operating mode include all modes of EMS in page 6

2. The measured acoustic interference ratio and/or the measured electrical interference ratio during the test is -20 dB.

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## 12.5. PERFORMANCE

|  |  |
|--|--|
| <input checked="" type="checkbox"/> <b>Criteria A:</b> | The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.  |
| <input type="checkbox"/> <b>Criteria B:</b>            | The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. |
| <input type="checkbox"/> <b>Criteria C:</b>            | Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.  |

☒ **PASS**
☐ **FAIL**

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### 13. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

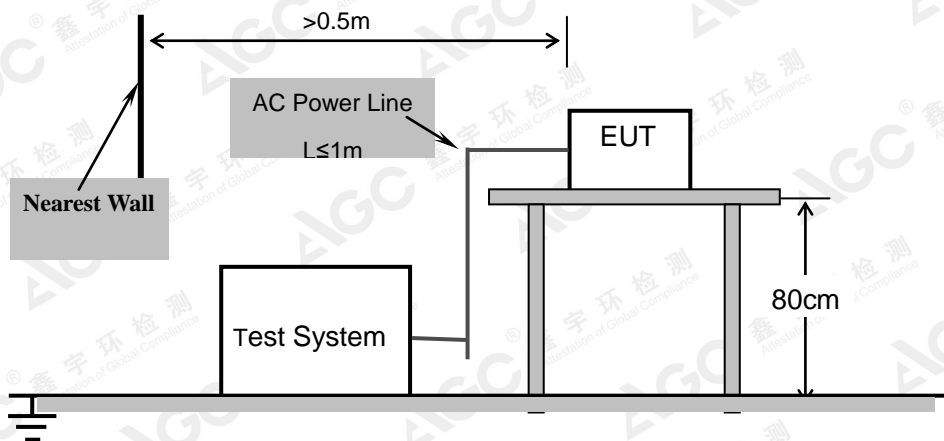
#### 13.1. TEST SPECIFICATION

|                            |                        |
|----------------------------|------------------------|
| <b>Basic Standard:</b>     | EN 61000-4-4           |
| <b>Test Voltage:</b>       | a.c. power port – 1 kV |
| <b>Polarity:</b>           | Positive/Negative      |
| <b>Impulse Frequency:</b>  | 5kHz                   |
| <b>Impulse wave shape:</b> | 5/50ns                 |
| <b>Burst Duration:</b>     | 15ms                   |
| <b>Burst Period:</b>       | 300ms                  |
| <b>Test Duration:</b>      | Not less than 1 min.   |

#### 13.2. TEST PROCEDURE

1. The EUT was tested with 1000 volt discharges to the AC power input leads.
2. Both positive and negative polarity discharges were applied.
3. 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.
4. The duration time of each test sequential was 1 minute.
5. The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

#### 13.3. TEST SETUP



For the actual test configuration, please refer to Appendix I : Photographs of the Test Configuration.

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### 13.4. TEST RESULT

| Test Point     | Polarity | Test Level (kV) | Observation      | performance | Conclusion |
|----------------|----------|-----------------|------------------|-------------|------------|
| a.c. port, L   | +/-      | 1               | No function loss | A           | Pass       |
| a.c. port, N   | +/-      | 1               | No function loss | A           | Pass       |
| a.c. port, L-N | +/-      | 1               | No function loss | A           | Pass       |

**Note:** operating mode include all modes of EMS in page 6

### 13.5. PERFORMANCE

|  |  |
|--|--|
| <input checked="" type="checkbox"/> <b>Criteria A:</b> | The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.  |
| <input type="checkbox"/> <b>Criteria B:</b>            | The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. |
| <input type="checkbox"/> <b>Criteria C:</b>            | Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.  |

☒ **PASS**
☐ **FAIL**

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## 14. SURGE IMMUNITY TEST

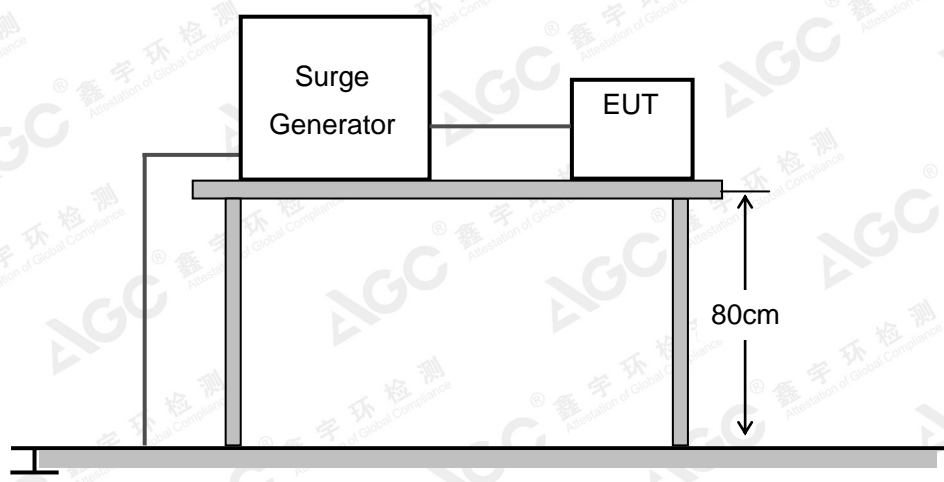
### 14.1. TEST SPECIFICATION

|                         |  |
|-------------------------|--|
| <b>Basic Standard:</b>  | IEC 61000-4-5                                |
| <b>Waveform:</b>        | Voltage 1.2/50 $\mu$ s; Current 8/20 $\mu$ s |
| <b>Test Voltage:</b>    | a.c. power port, line to line 1.0 kV,        |
| <b>Polarity:</b>        | Positive/Negative                            |
| <b>Phase Angle:</b>     | 90°, 270°                                    |
| <b>Repetition Rate:</b> | 60sec  |
| <b>Times:</b>           | 5 time/each condition.                       |

### 14.2. TEST PROCEDURE

- The EUT and the auxiliary equipment were placed on a table of 0.8m heights above a metal ground reference plane. The size of ground plane is greater than 1m $\times$ 1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT was less than 2 meters (provided by the manufacturer).
- The EUT was connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).
- The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.

### 14.3. TEST SETUP



For the actual test configuration, please refer to Appendix I : Photographs of the Test Configuration.



#### 14.4. TEST RESULT

| Coupling Line   | Polarity | Voltage (kV) | Observation      | performance | Conclusion |
|-----------------|----------|--------------|------------------|-------------|------------|
| a.c. power, L-N | +/-      | 1.0          | No function loss | A           | Pass       |

**Note:** operating mode include all modes of EMS in page 6

#### 14.5. PERFORMANCE

|  |  |
|--|--|
| <input checked="" type="checkbox"/> <b>Criteria A:</b> | The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.  |
| <input type="checkbox"/> <b>Criteria B:</b>            | The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. |
| <input type="checkbox"/> <b>Criteria C:</b>            | Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.  |

|   |                                      |
|---|--------------------------------------|
| <input checked="" type="checkbox"/> <b>PASS</b> | <input type="checkbox"/> <b>FAIL</b> |
|---|--------------------------------------|

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## 15. IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS

### 15.1. TEST SPECIFICATION

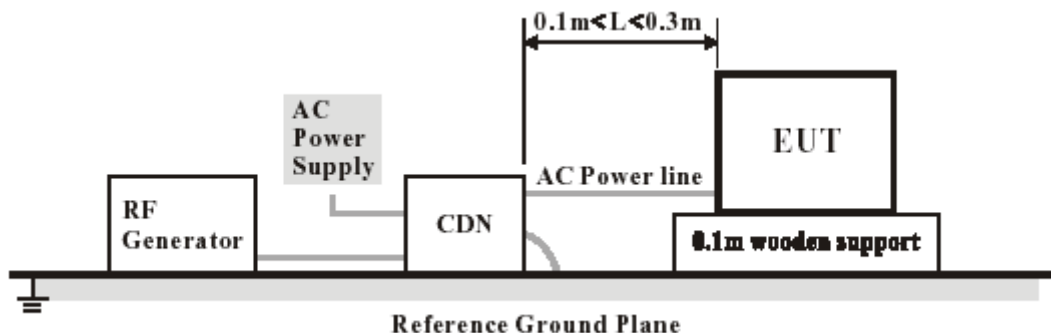
|                         |   |
|-------------------------|---|
| <b>Basic Standard:</b>  | IEC 61000-4-6   |
| <b>Frequency Range:</b> | 0.15 MHz – 80 MHz                                     |
| <b>Field Strength:</b>  | 0.15~10MHz 3Vrms, 10~30MHz 3 to 1Vrms, 30~80MHz 1Vrms |
| <b>Modulation:</b>      | 1 kHz Sine Wave, 80% AM                               |
| <b>Frequency Step:</b>  | 1% of fundamental                                     |
| <b>Coupled Cable:</b>   | a.c. power line                                       |
| <b>Coupling Device:</b> | CDN-M2  |

### 15.2. TEST PROCEDURE

1. The EUT shall be tested within its intended operating and climatic conditions.
2. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.
3. The test signal was 80% amplitude modulated with a 1 kHz sine wave
4. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80% amplitude. The sweep rate shall not exceed  $1.5 \times 10^{-3}$  decades/s. The step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value where the frequency is swept incrementally.
5. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.
6. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.

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### 15.3. TEST SETUP



For the actual test configuration, please refer to Appendix I : Photographs of the Test Configuration.

### 15.4. TEST RESULT

| EUT Working Mode | Test Point | Frequency (MHz) | Field Strength (Vrms) | Observation      | performance | Conclusion |
|------------------|------------|-----------------|-----------------------|------------------|-------------|------------|
| Normal           | a.c. port  | 0.15 – 10       | 3                     | No function loss | A           | Pass       |
| Normal           | a.c. port  | 10 – 30         | 3 to1                 | No function loss | A           | Pass       |
| Normal           | a.c. port  | 30 – 80         | 1                     | No function loss | A           | Pass       |

#### Note:

- operating mode include all modes of EMS in page 6
- The measured acoustic interference ratio and/or the measured electrical interference ratio during the test is -20 dB.

### 15.5. PERFORMANCE

|  |  |
|--|--|
| <input checked="" type="checkbox"/> <b>Criteria A:</b> | The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.  |
| <input type="checkbox"/> <b>Criteria B:</b>            | The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. |
| <input type="checkbox"/> <b>Criteria C:</b>            | Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.  |

☒ **PASS**

☐ **FAIL**

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## 16. VOLTAGE DIPS AND SHORT INTERRUPTIONS IMMUNITY TEST

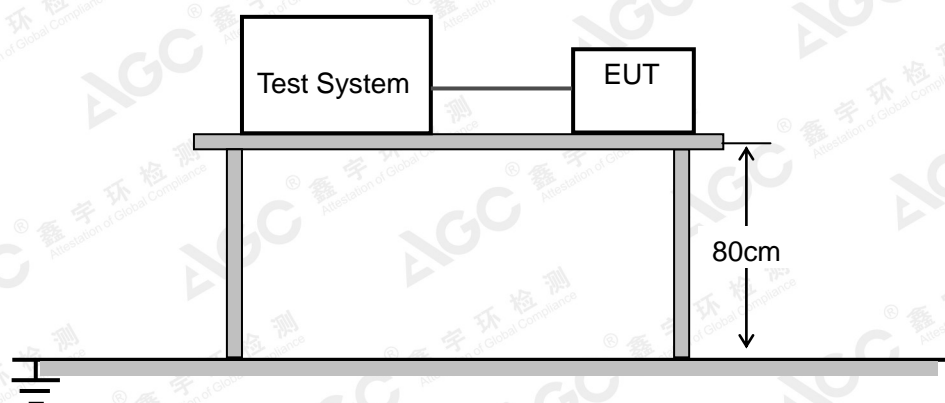
### 16.1. TEST SPECIFICATION

|                               |   |
|-------------------------------|---|
| <b>Basic Standard:</b>        | IEC 61000-4-11  |
| <b>Voltage Dips:</b>          | 100% reduction, 0.5 Cycle<br>30% reduction, 25 Cycles |
| <b>Voltage Interruptions:</b> | 100% reduction, 250 Cycles                            |
| <b>Voltage Phase Angle:</b>   | 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°            |

### 16.2. TEST PROCEDURE

- The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.
- The EUT was tested for (1) 100% voltage dip of supplied voltage with duration of 0.5 cycles, (2) 30% voltage dip of supplied voltage and duration 25 cycles. (3) 100% voltage interruption of supplied voltage with duration of 250 Cycles was followed.
- Voltage reductions occur at 0 degree crossover point of the voltage waveform. The performance of the EUT was checked after the voltage dip or interruption.

### 16.3. TEST SETUP



For the actual test configuration, please refer to Appendix I : Photographs of the Test Configuration.

#### 16.4. TEST RESULT

| Test Mode             | Voltage Reduction | Duration (cycle) | Times | Interval (ms) | Observation      | performance | Conclusion |
|-----------------------|-------------------|------------------|-------|---------------|------------------|-------------|------------|
| Voltage dips          | 100%              | 0.5              | 3     | 10            | No function loss | B           | Pass       |
|                       | 30%               | 25               | 3     | 500           | No function loss | C           | Pass       |
| Voltage interruptions | 100%              | 250              | 3     | 5000          | No function loss | C           | Pass       |

**Note:** operating mode include all modes of EMS in page 6

#### 16.5. PERFORMANCE

|  |  |
|--|--|
| <input type="checkbox"/> <b>Criteria A:</b>            | The apparatus continues to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.  |
| <input checked="" type="checkbox"/> <b>Criteria B:</b> | The apparatus continues to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. |
| <input checked="" type="checkbox"/> <b>Criteria C:</b> | Temporary loss of function is allowed, provided the functions self recoverable or can be restored by the operation of controls.  |

☒ **PASS**
☐ **FAIL**

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## APPENDIX A: PHOTOGRAPHS OF TEST SETUP

### CONDUCTED EMISSION TEST SETUP



RADIATED EMISSION TEST SETUP



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## POWER HARMONICS AND VOLTAGE FLICKER/FLUCTUATION TEST



ESD TEST SETUP



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### RS TEST SETUP



### EFT / SURGE / DIPS IMMUNITY TEST



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### CS IMMUNITY TEST



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## APPENDIX B: PHOTOGRAPHS OF EUT

Refer to Attached file(appendix I)

-----END OF REPORT-----

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