



# EMC TEST REPORT

Report No: FCS202604147E01

Issued for

|                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicant:                                                                                                                                                                                                                                                                                                                                                       | Mid Ocean Brands B.V.                                                                                                                                                   |
| Address:                                                                                                                                                                                                                                                                                                                                                         | Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.                                                                                    |
| Product Name:                                                                                                                                                                                                                                                                                                                                                    | Wireless Speaker                                                                                                                                                        |
| Brand Name:                                                                                                                                                                                                                                                                                                                                                      | N/A                                                                                                                                                                     |
| Model Name:                                                                                                                                                                                                                                                                                                                                                      | MO9155                                                                                                                                                                  |
| Series Model:                                                                                                                                                                                                                                                                                                                                                    | MO9609                                                                                                                                                                  |
| Test Standard:                                                                                                                                                                                                                                                                                                                                                   | EN 55032:2015/A11:2020<br>EN 55035:2017/A11:2020<br>ETSI EN 301 489-1 V2.2.3 (2019-11)<br>ETSI EN 301 489-17 V3.3.1 (2024-09)<br>EN 61000-3-2:2014<br>EN 61000-3-3:2013 |
| Issued By: Dongguan Funas Testing Technology Co.,Ltd<br>Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan, China<br>Tel: 769-27280901 Fax:769-27280901 <a href="http://www.fcs-lab.com">http://www.fcs-lab.com</a><br>E-mail: <a href="mailto:andy.yue@fcs-lab.com">andy.yue@fcs-lab.com</a> |                                                                                                                                                                         |

**TEST RESULT CERTIFICATION**

Applicant's Name.....: Mid Ocean Brands B.V.

Address.....: Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.

Manufacture's Name.....: Mid Ocean Brands B.V.

Address.....: Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.

**Product Description**

Product Name.....: Wireless Speaker

Brand Name .....: N/A

Model Name.....: MO9155

Series Model.....: Please refer to the first page of the report

Test Standards.....: EN 55032:2015/A11:2020  
EN 55035:2017/A11:2020  
ETSI EN 301 489-1 V2.2.3 (2019-11)  
ETSI EN 301 489-17 V3.3.1 (2024-09)

This device described above has been tested by FCS, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of FCS, this document may be altered or revised by FCS, personal only, and shall be noted in the revision of the document.

**Date of Test.....:**

Date (s) of performance of tests.: Apr.14, 2026~Apr.22, 2026

Date of Issue.....: Apr.22, 2026

Test Result.....: Pass

Tested by :   
\_\_\_\_\_  
(Ling xin.Peng)

Reviewed by :   
\_\_\_\_\_  
(Karl. Huang)

Approved by :   
\_\_\_\_\_  
(Jack Wang)

## TABLE OF CONTENTS

|                                                                               |           |
|-------------------------------------------------------------------------------|-----------|
| <b>1. TEST SUMMARY .....</b>                                                  | <b>5</b>  |
| 1.1 TEST FACTORY .....                                                        | 6         |
| 1.2 MEASUREMENT UNCERTAINTY .....                                             | 6         |
| <b>2. GENERAL INFORMATION .....</b>                                           | <b>7</b>  |
| 2.1 GENERAL DESCRIPTION OF EUT .....                                          | 7         |
| 2.2 DESCRIPTION OF TEST MODES .....                                           | 8         |
| 2.3 DESCRIPTION OF TEST SETUP .....                                           | 8         |
| 2.4 MEASUREMENT INSTRUMENTS LIST .....                                        | 9         |
| <b>3. EMC EMISSION TEST .....</b>                                             | <b>12</b> |
| 3.1 CONDUCTED EMISSION MEASUREMENT .....                                      | 12        |
| 3.2 RADIATED EMISSION MEASUREMENT .....                                       | 16        |
| 3.3 HARMONICS CURRENT .....                                                   | 20        |
| 3.4 VOLTAGE FLUCTUATION AND FLICKERS .....                                    | 23        |
| <b>4. EMC IMMUNITY TEST .....</b>                                             | <b>25</b> |
| 4.1 STANDARD COMPLIANCE/SERVIRITY LEVEL/CRITERIA .....                        | 25        |
| 4.2 GENERAL PERFORMANCE CRITERIA .....                                        | 26        |
| 4.3 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD) .....                         | 27        |
| 4.4 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS) ..... | 30        |
| 4.5 ELECTRICAL FAST TRANSIENT (EFT) .....                                     | 33        |
| 4.6 SURGE TESTING .....                                                       | 37        |
| 4.7 CONDUCTED RADIO FREQUENCY DISTURBANCES (CS) .....                         | 39        |
| 4.8 VOLTAGE INTERRUPTION/DIPS TESTING (DIPS) .....                            | 42        |
| <b>APPENDIX I- TEST SETUP .....</b>                                           | <b>44</b> |

**Revision History**

| Rev.                                    | Issue Date   | Report No.      | Effect Page | Contents      |
|-----------------------------------------|--------------|-----------------|-------------|---------------|
| 00                                      | Apr.22, 2026 | FCS202604147E01 | ALL         | Initial Issue |
| Note: Format version of the report -V00 |              |                 |             |               |

## 1. TEST SUMMARY

Test procedures according to the technical standards:

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-17 V3.3.1 (2024-09)

| EMC Emission                                                                                        |                                                   |                      |          |        |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------|----------|--------|
| Standard                                                                                            | Test Item                                         | Limit                | Judgment | Remark |
| ETSI EN 301 489-1 V2.2.3 (2019-11)<br>ETSI EN 301 489-17 V3.3.1 (2024-09)<br>EN 55032:2015/A11:2020 | Conducted Emissions From The AC Mains Power Ports | Class B              | PASS     |        |
|                                                                                                     | Conducted Emissions From Asymmetric Mode          | Class B              | N/A      |        |
|                                                                                                     | Conducted Differential Voltage Emissions          | Class B              | N/A      |        |
|                                                                                                     | Radiated Emissions                                | Class B              | PASS     |        |
| EN IEC 61000-3-2:2019+A1:2021                                                                       | Harmonic Current Emission                         | Class A              | N/A      |        |
| EN 61000-3-3:2013/A2:2021/AC:2022-01                                                                | Voltage Fluctuations & Flicker                    | -----                | N/A      |        |
| EMC Immunity                                                                                        |                                                   |                      |          |        |
| Section                                                                                             | Test Item                                         | Performance Criteria | Judgment | Remark |
| EN 61000-4-2:2009                                                                                   | Electrostatic Discharge                           | Class B              | PASS     |        |
| EN IEC 61000-4-3:2020                                                                               | RF electromagnetic field                          | Class A              | PASS     | #      |
| EN 61000-4-4:2012                                                                                   | Fast transients                                   | Class B              | N/A      |        |
| EN 61000-4-5:2014/A1:2017                                                                           | Surges                                            | Class B              | N/A      |        |
| EN 61000-4-6:2014/AC:2015                                                                           | Injected Current                                  | Class A              | N/A      |        |
| EN IEC 61000-4-11:2020/AC:2022-10                                                                   | Volt. Interruptions Volt. Dips                    | B / C / C / C        | N/A      |        |

Note: “#” indicates the testing item(s) was(were) fulfilled by subcontracted lab.

## 1.1 TEST FACTORY

|               |                                                                                                                          |
|---------------|--------------------------------------------------------------------------------------------------------------------------|
| Company Name: | Dongguan Funas Testing Technology Co.,Ltd.                                                                               |
| Address:      | Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan, China, |

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately **95 %**.

### A. Conducted Measurement :

| Test Site | Method | Measurement Frequency Range | U, (dB) | NOTE |
|-----------|--------|-----------------------------|---------|------|
| EACC01    | ANSI   | 9KHz-150KHz                 | 4.13    |      |
|           |        | 150 KHz ~ 30MHz             | 4.74    |      |

### B. Radiated Measurement :

| Test Site | Method | Measurement Frequency Range | U, (dB) | NOTE |
|-----------|--------|-----------------------------|---------|------|
| EACC02    | ANSI   | 30MHz ~ 200MHz              | 5.2     |      |
|           |        | 200MHz ~ 1000MHz            | 5.2     |      |
|           |        | 1GHz ~ 6 GHz                | 4.66    |      |

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                         |                                                                                                                                               |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name            | Wireless Speaker                                                                                                                              |
| Brand Name              | N/A                                                                                                                                           |
| Model Name              | MO9155                                                                                                                                        |
| Series Model            | See the first page of the report                                                                                                              |
| Model Difference        | PCB board, structure and internal of these model(s) are the same, only differing in appearance and color. So no additional models were tested |
| Power Supply            | Input: DC 5V 1A                                                                                                                               |
| Battery                 | Charge Limit: 5V<br>Rated Voltage: 3.7V<br>Capacity: 450mAh                                                                                   |
| Hardware version number | V1.0                                                                                                                                          |
| Software version number | V1.0                                                                                                                                          |

## 2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

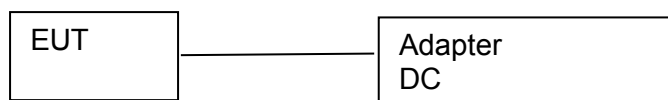
| Pretest Mode | Description |
|--------------|-------------|
| Mode 1       | Working     |

Note: The test modes were carried out for all operation modes(include link and idle).

The worst test mode for the final conducted data of EUT is Mode 2 and the worst test mode for radiation data is Mode 5, test data display.

## 2.3 DESCRIPTION OF TEST SETUP

System Diagram of Connections Between EUT and Simulators



## 2.4 MEASUREMENT INSTRUMENTS LIST

### 2.4.1 CONDUCTED TEST SITE

| Kind of Equipment      | Manufacturer               | Type No. | Serial No. | Last Calibration | Calibrated Until |
|------------------------|----------------------------|----------|------------|------------------|------------------|
| EMI Test Receiver      | R&S                        | ESCI     | 101427     | 2025.08.25       | 2026.08.24       |
| LISN                   | R&S                        | ENV216   | 101242     | 2025.08.25       | 2026.08.24       |
| LISN                   | ETS                        | 3810/2NM | 00023625   | 2025.08.25       | 2026.08.24       |
| Absorbing Clamp        | R&S                        | MDS-21   | 100668     | 2025.08.25       | 2026.08.24       |
| CE Cable               | N/A                        | C01      | N/A        | 2025.08.25       | 2026.08.24       |
| Temperature & Humidity | Mieo                       | HH660    | N/A        | 2025.08.25       | 2026.08.24       |
| Testing Software       | EZ-EMC(Ver.STSLAB-03A1 CE) |          |            |                  |                  |

### 2.4.2 RADIATED TEST SITE

| Kind of Equipment        | Manufacturer               | Type No.       | Serial No.   | Last Calibration | Calibrated Until |
|--------------------------|----------------------------|----------------|--------------|------------------|------------------|
| EMI Test Receiver        | R&S                        | ESCI           | 101427       | 2025.08.25       | 2026.08.24       |
| Bi-log Antenna           | TESEQ                      | CBL6111D       | 34678        | 2025.08.25       | 2026.08.24       |
| Horn Antenna             | SCHWARZBECK                | BBHA 9120D     | 9120D-1343   | 2025.08.25       | 2026.08.24       |
| Pre-amplifier(1G-18G)    | SKET                       | LNPA-01018G-45 | SK2018080901 | 2025.08.25       | 2026.08.24       |
| Pre-amplifier(0.1M-3GHz) | EM                         | EM330          | 060665       | 2025.08.25       | 2026.08.24       |
| Spectrum Analyzer        | Agilent                    | N9020A         | MY49100060   | 2025.08.25       | 2026.08.24       |
| RE Cable (9K-1G)         | N/A                        | R01            | N/A          | 2025.08.25       | 2026.08.24       |
| RE Cable (1G-18G)        | N/A                        | R02            | N/A          | 2025.08.25       | 2026.08.24       |
| Temperature & Humidity   | Mieo                       | HH660          | N/A          | 2025.08.25       | 2026.08.24       |
| Testing Software         | EZ-EMC(Ver.STSLAB-03A1 RE) |                |              |                  |                  |

### 2.4.3 HARMONICS AND FLICKER

| Kind of Equipment                    | Manufacturer            | Type No. | Serial No. | Last calibration | Calibrated until |
|--------------------------------------|-------------------------|----------|------------|------------------|------------------|
| Harmonic Voltage & Flicker           | LAPLACE                 | AC 2000A | 311217     | 2025.08.25       | 2026.08.24       |
| AC Power Source                      | MTONI                   | PHF-5010 | 631169     | 2025.08.25       | 2026.08.24       |
| Universal Radio Communication Tester | R&S                     | CMW500   | 117239     | 2025.08.25       | 2026.08.24       |
| Testing Software                     | HA-PC Link Version 3.03 |          |            |                  |                  |

#### 2.4.4 ESD

| Kind of Equipment                    | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|--------------------------------------|--------------|----------|------------|------------------|------------------|
| Electrostatic Discharge Simulator    | KZKUSUI      | KES4021  | LB003568   | 2025.08.25       | 2026.08.24       |
| Universal Radio Communication Tester | R&S          | CMW500   | 117239     | 2025.08.25       | 2026.08.24       |
| Temperature & Humidity               | N/A          | WS1066   | N/A        | 2025.08.25       | 2026.08.24       |

#### 2.4.5 SURGE, EFT/BURST, VOLTAGE INTERRUPTION/DIPS

| Kind of Equipment                      | Manufacturer | Type No.  | Serial No. | Last calibration | Calibrated until |
|----------------------------------------|--------------|-----------|------------|------------------|------------------|
| Surger Generator                       | HTEC         | HCWG 10   | 152101     | 2025.08.25       | 2026.08.24       |
| Surger Generator                       | HTEC         | TC0MB4    | 152104     | 2025.08.25       | 2026.08.24       |
| VOLTAGE DIPS & INTERRUPTIONS Generator | HTEC         | HPFS 161P | 143803     | 2025.08.25       | 2026.08.24       |
| EFT/B Generator                        | HTEC         | HEFT 51   | 143801     | 2025.08.25       | 2026.08.24       |
| Universal Radio Communication Tester   | R&S          | CMW500    | 117239     | 2025.08.25       | 2026.08.24       |
| Temperature & Humidity                 | Mieo         | HH660     | N/A        | 2025.08.25       | 2026.08.24       |

#### 2.4.6 RS

| Kind of Equipment                    | Manufacturer       | Type No.         | Serial No. | Last calibration | Calibrated until |
|--------------------------------------|--------------------|------------------|------------|------------------|------------------|
| RF Relay matrix tsj                  | TSJ                | RFM-S621         | 04261      | 2025.08.25       | 2026.08.24       |
| Power meter                          | Agilent            | E4419B           | MY45102079 | 2025.08.25       | 2026.08.24       |
| Power Sensor                         | Agilent            | 8481A            | MY41097696 | 2025.08.25       | 2026.08.24       |
| Power Sensor                         | Agilent            | 8481A            | MY41097697 | 2025.08.25       | 2026.08.24       |
| Signal Generator                     | Agilent            | N5182A           | MY46240556 | 2025.08.25       | 2026.08.24       |
| Power Amplifier                      | MICOTOP            | MPA-80-1000-250  | 1711488    | 2025.08.25       | 2026.08.24       |
| Power Amplifier                      | MICOTOP            | MPA-1000-3000-75 | MPA1706275 | 2025.08.25       | 2026.08.24       |
| Logarithmic-periodic Antenna         | Schwarzbeck        | VULP9118E        | 820        | 2025.08.25       | 2026.08.24       |
| Microwave Horn Antenna               | Schwarzbeck        | BBHA 9120LF      | F01008     | 2025.08.25       | 2026.08.24       |
| Universal Radio Communication Tester | R&S                | CMU200           | 111764     | 2025.08.25       | 2026.08.24       |
| Universal Radio Communication Tester | R&S                | CMW500           | 117239     | 2025.08.25       | 2026.08.24       |
| Audio Analyzer                       | R&S                | UPV              | 100419     | 2025.08.25       | 2026.08.24       |
| Power Amplifier                      | MICOTOP            | MPA-3000-6000-50 | 1711489    | 2025.08.25       | 2026.08.24       |
| Testing Software                     | EMC-S<br>V1.2.0.90 |                  |            |                  |                  |

## 2.4.7 INJECTION CURRENT

| Kind of Equipment                    | Manufacturer | Type No.    | Serial No.    | Last calibration | Calibrated until |
|--------------------------------------|--------------|-------------|---------------|------------------|------------------|
| CS                                   | SCHLODER     | CDG-6000-25 | 126A1280/2014 | 2025.08.25       | 2026.08.24       |
| CDN                                  | Frankonia    | CDN-M2+3    | A2210275/2014 | 2025.08.25       | 2026.08.24       |
| EM Clamp                             | SCHLODER     | EMCL-20     | 132A1283      | 2025.08.25       | 2026.08.24       |
| Attenuator                           | Nemtest      | ATT-6DB-100 | A100W224      | 2025.08.25       | 2026.08.24       |
| Audio Power Amplifier                | B&K          | 2716-C-001  | 2610976       | 2025.08.25       | 2026.08.24       |
| Mouth Simulator                      | B&K          | 4227        | 2630621       | 2025.08.25       | 2026.08.24       |
| Sound Calibrator                     | B&K          | 4231        | 2637486       | 2025.08.25       | 2026.08.24       |
| 1/2" Pressure-field Microphone       | B&K          | 4192        | 2641678       | 2025.08.25       | 2026.08.24       |
| Ear Simulator for Telephonometry     | B&K          | 4185        | 2553612       | 2025.08.25       | 2026.08.24       |
| Telephone Test Head                  | B&K          | 4185        | 2631728       | 2025.08.25       | 2026.08.24       |
| Universal Radio Communication Tester | R&S          | CMU200      | 111764        | 2025.08.25       | 2026.08.24       |
| Audio Analyzer                       | R&S          | UPV         | 100419        | 2025.08.25       | 2026.08.24       |
| Universal Radio Communication Tester | R&S          | CMW500      | 117239        | 2025.08.25       | 2026.08.24       |

## 2.4.8 PFMF

| Kind of Equipment                    | Manufacturer | Type No.  | Serial No. | Last calibration | Calibrated until |
|--------------------------------------|--------------|-----------|------------|------------------|------------------|
| MF Generator                         | HTEC         | HMFG-COMB | 143903     | 2025.08.25       | 2026.08.24       |
| Magnetic field coil                  | HTEC         | HCOIL 100 | 143808     | 2025.08.25       | 2026.08.24       |
| Universal Radio Communication Tester | R&S          | CMW500    | 117239     | 2025.08.25       | 2026.08.24       |

### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 REQUIREMENTS FOR CONDUCTED EMISSIONS FROM THE AC MAINS POWER

###### PORTS OF THE CLASS A EQUIPMENT

| FREQUENCY (MHz) | Coupling device | Detector type / bandwidth | Class A limits dB( $\mu$ V) |
|-----------------|-----------------|---------------------------|-----------------------------|
| 0.15 - 0.5      | AMN             | Quasi Peak / 9 kHz        | 79                          |
| 0.50 - 30       |                 |                           | 73                          |
| 0.15 - 0.5      | AMN             | Average / 9 kHz           | 66                          |
| 0.50 - 30       |                 |                           | 60                          |

##### 3.1.2 REQUIREMENTS FOR CONDUCTED EMISSIONS FROM THE AC MAINS POWER

###### PORTS OF THE CLASS B EQUIPMENT

| FREQUENCY (MHz) | Coupling device | Detector type / bandwidth | Class B limits dB( $\mu$ V) |
|-----------------|-----------------|---------------------------|-----------------------------|
| 0.15 - 0.5      | AMN             | Quasi Peak / 9 kHz        | 66 - 56*                    |
| 0.50 - 5        |                 |                           | 56                          |
| 5 - 30          |                 |                           | 60                          |
| 0.15 - 0.5      | AMN             | Average / 9 kHz           | 56 - 46*                    |
| 0.50 - 5        |                 |                           | 46                          |
| 5 - 30          |                 |                           | 50                          |

Note:

- C. The tighter limit applies at the band edges.
- D. The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

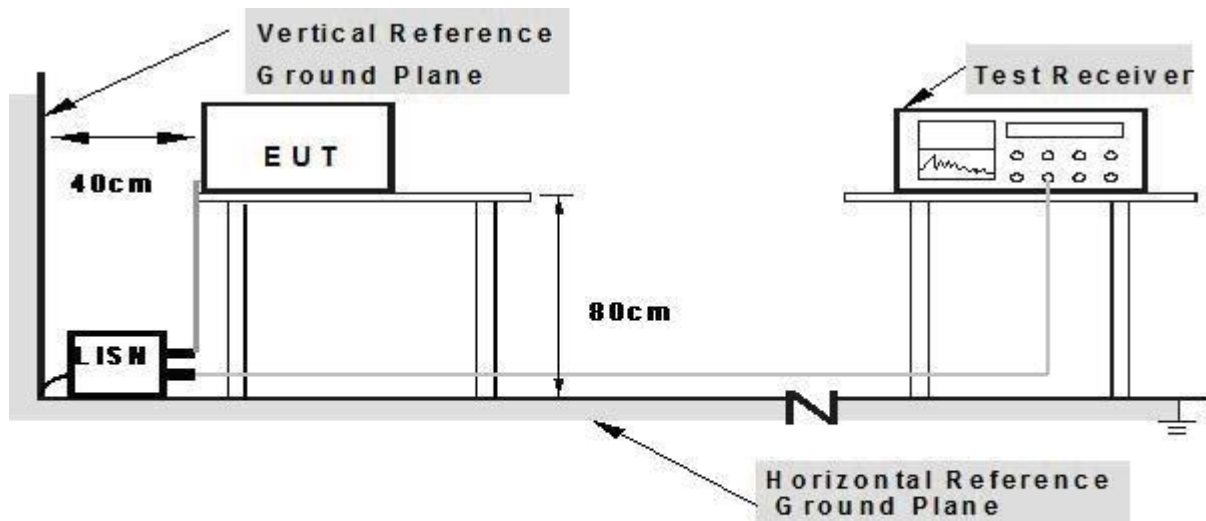
The following table is the setting of the receiver

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

### 3.1.3 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### • TEST SETUP



**Note: 1.Support units were connected to second LISN.**

**2.Both of LISN s (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes**

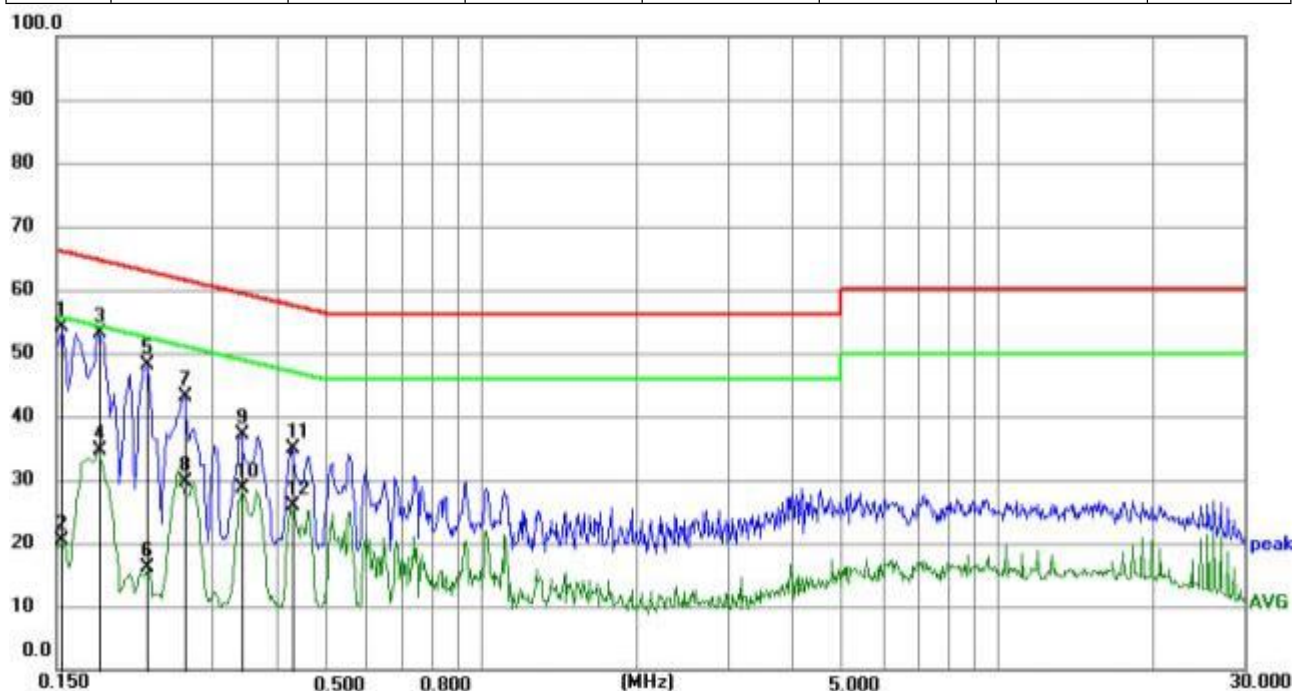
### 3.1.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the following during the testing.

### 3.1.5 TEST RESULTS

|               |        |                    |        |
|---------------|--------|--------------------|--------|
| Temperature:  | 22.5°C | Relative Humidity: | 67%    |
| Phase:        | L      | Test Mode:         | Mode 1 |
| Test Voltage: | DC 5V  |                    |        |

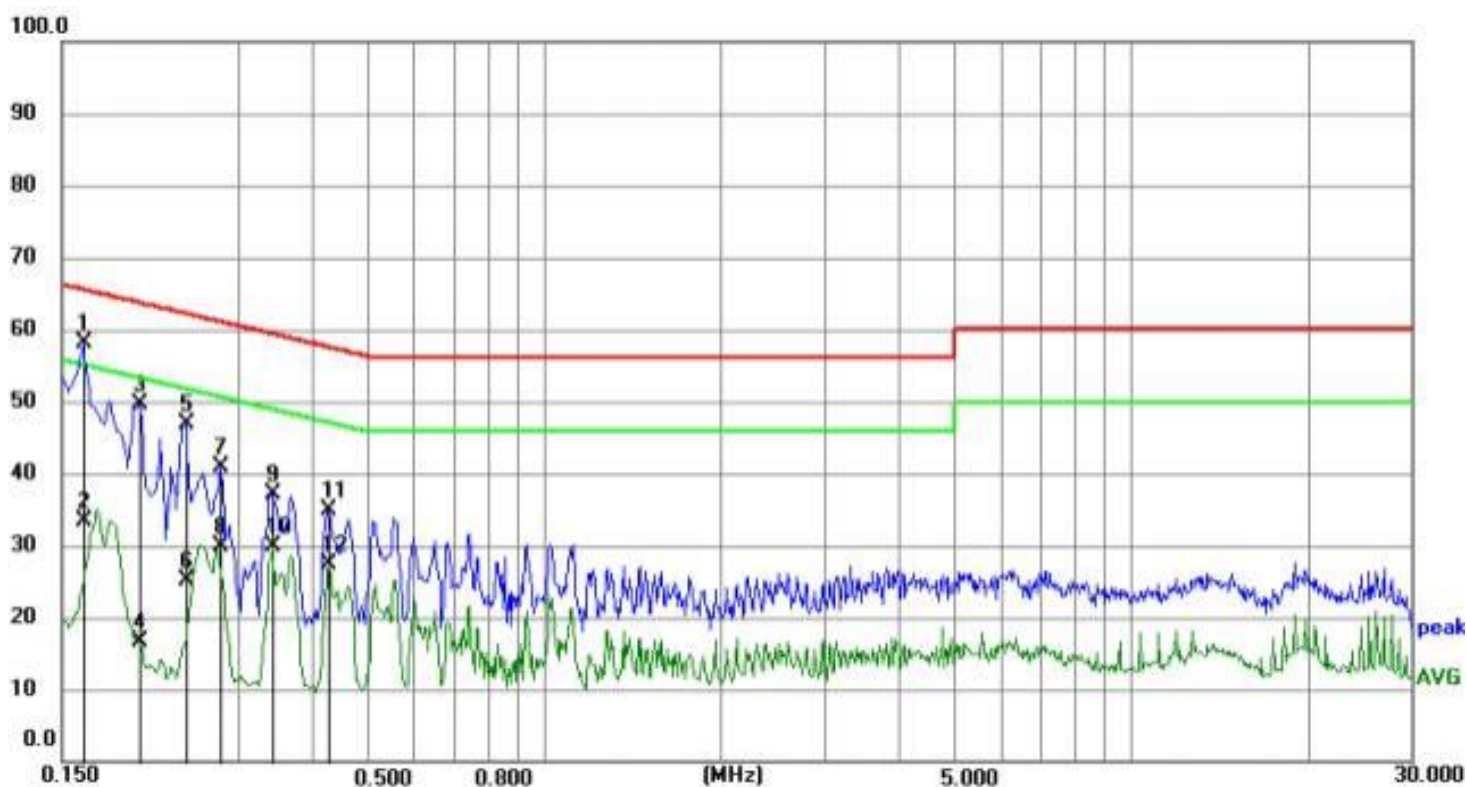
| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 0.1544             | 44.02             | 10.13                 | 54.15            | 65.76           | 11.61          | QP     |
| 2   | 0.1544             | 10.16             | 10.13                 | 20.29            | 55.76           | 35.47          | AVG    |
| 3   | 0.1815             | 42.99             | 10.10                 | 53.09            | 64.42           | 11.33          | QP     |
| 4   | 0.1815             | 24.54             | 10.10                 | 34.64            | 54.42           | 19.78          | AVG    |
| 5   | 0.2265             | 38.18             | 10.06                 | 48.24            | 62.58           | 14.34          | QP     |
| 6   | 0.2265             | 6.07              | 10.06                 | 16.13            | 52.58           | 36.45          | AVG    |
| 7   | 0.2670             | 33.02             | 10.04                 | 43.06            | 61.21           | 18.15          | QP     |
| 8   | 0.2670             | 19.57             | 10.04                 | 29.61            | 51.21           | 21.60          | AVG    |
| 9   | 0.3435             | 27.21             | 10.02                 | 37.23            | 59.12           | 21.89          | QP     |
| 10  | 0.3435             | 18.50             | 10.02                 | 28.52            | 49.12           | 20.60          | AVG    |
| 11  | 0.4290             | 24.93             | 10.02                 | 34.95            | 57.27           | 22.32          | QP     |
| 12  | 0.4290             | 15.81             | 10.02                 | 25.83            | 47.27           | 21.44          | AVG    |



Remark: All readings are Quasi-Peak and Average values.

|               |       |                    |        |
|---------------|-------|--------------------|--------|
| Temperature:  | 22.5℃ | Relative Humidity: | 67%    |
| Phase:        | N     | Test Mode:         | Mode 1 |
| Test Voltage: | DC 5V |                    |        |

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>Factor(dB) | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|-----------------------|------------------|-----------------|----------------|--------|
| 1   | 0.1635             | 47.95             | 10.07                 | 58.02            | 65.28           | 7.26           | QP     |
| 2   | 0.1635             | 23.30             | 10.07                 | 33.37            | 55.28           | 21.91          | AVG    |
| 3   | 0.2040             | 39.70             | 10.05                 | 49.75            | 63.45           | 13.70          | QP     |
| 4   | 0.2040             | 6.61              | 10.05                 | 16.66            | 53.45           | 36.79          | AVG    |
| 5   | 0.2445             | 36.82             | 10.05                 | 46.87            | 61.94           | 15.07          | QP     |
| 6   | 0.2445             | 14.98             | 10.05                 | 25.03            | 51.94           | 26.91          | AVG    |
| 7   | 0.2805             | 30.87             | 10.04                 | 40.91            | 60.80           | 19.89          | QP     |
| 8   | 0.2805             | 19.85             | 10.04                 | 29.89            | 50.80           | 20.91          | AVG    |
| 9   | 0.3435             | 27.23             | 10.02                 | 37.25            | 59.12           | 21.87          | QP     |
| 10  | 0.3435             | 19.74             | 10.02                 | 29.76            | 49.12           | 19.36          | AVG    |
| 11  | 0.4290             | 24.99             | 10.00                 | 34.99            | 57.27           | 22.28          | QP     |
| 12  | 0.4290             | 17.31             | 10.00                 | 27.31            | 47.27           | 19.96          | AVG    |



Remark: All readings are Quasi-Peak and Average values.

### 3.2 RADIATED EMISSION MEASUREMENT

#### 3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)

| FREQUENCY (MHz) | Class A |        | Class B |        |
|-----------------|---------|--------|---------|--------|
|                 | At 10m  | At 3m  | At 10m  | At 3m  |
|                 | dBuV/m  | dBuV/m | dBuV/m  | dBuV/m |
| 30 – 230        | 40      | 50     | 30      | 40     |
| 230 – 1000      | 47      | 57     | 37      | 47     |

#### 3.2.2 LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Class A (at 3m) dBuV/m |     | Class B (at 3m) dBuV/m |     |
|-----------------|------------------------|-----|------------------------|-----|
|                 | Peak                   | AVG | Peak                   | AVG |
| 1000-3000       | 76                     | 56  | 70                     | 50  |
| 3000-6000       | 80                     | 60  | 74                     | 54  |

Notes:

- (1) The limit for radiated test was performed according to CISPR 32.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

#### 3.2.3 TEST PROCEDURE

- e. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- f. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- g. The height of the equipment shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- h. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.
- i. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.
- j. For the actual test configuration, please refer to the related Item –EUT TestPhotos.

### 3.2.4 TEST SETUP

#### (A) Radiated Emission Test Setup Frequency Below 1 GHz

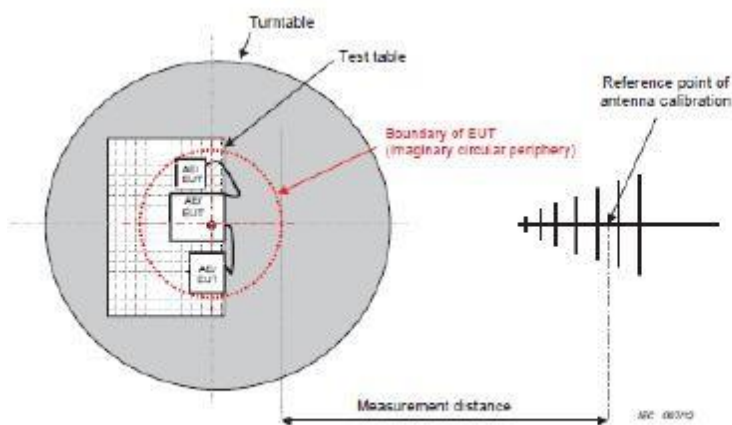


Figure C.1 – Measurement distance

#### (B) Radiated Emission Test Setup Frequency Above 1GHz

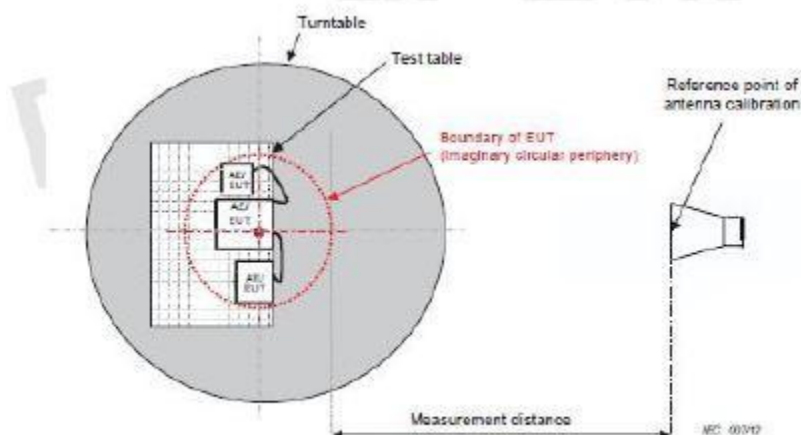


Figure C.1 – Measurement distance

### 3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

### 3.2.6 TEST RESULTS(30 - 1000 MHz)

|               |            |                    |        |
|---------------|------------|--------------------|--------|
| Temperature:  | 24℃        | Relative Humidity: | 56%    |
| Phase:        | Horizontal | Test Mode:         | Mode 1 |
| Test Voltage: | DC 5V      |                    |        |

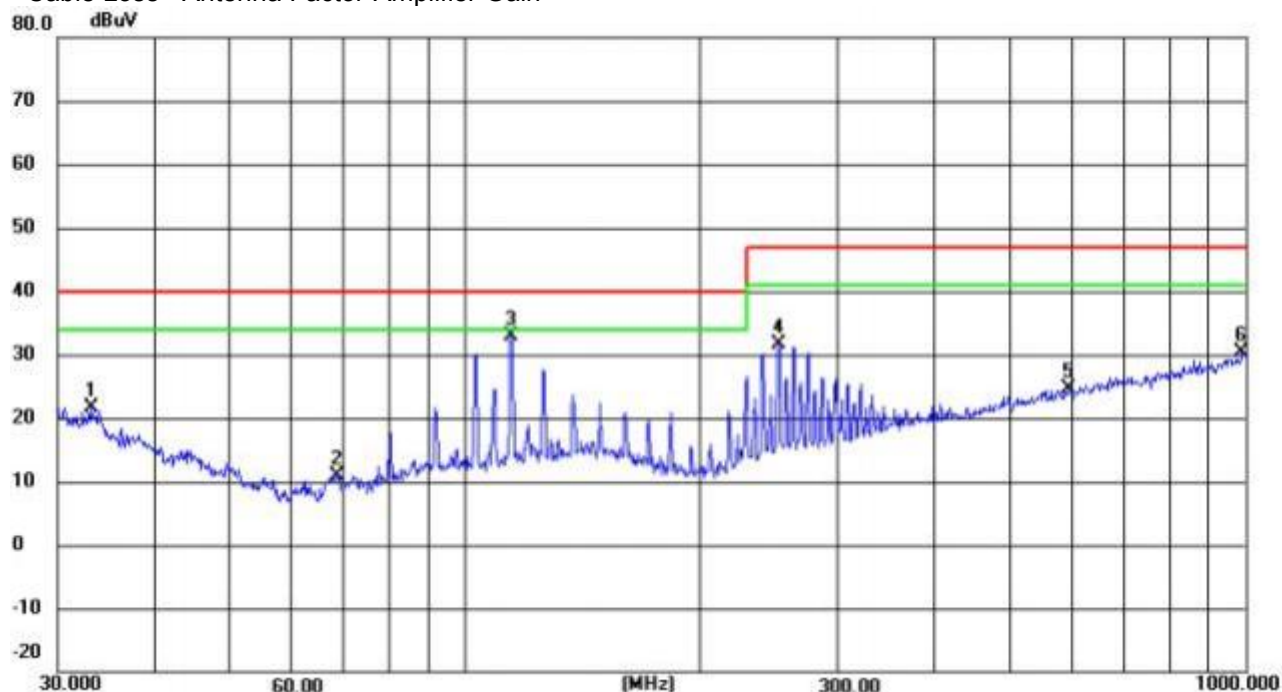
| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB) | Results (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------------|------------------|----------------|-------------|----------|
| 1   | 33.0950         | 30.78          | -9.26               | 21.52            | 40.00          | -18.48      | QP       |
| 2   | 68.3908         | 31.01          | -20.03              | 10.98            | 40.00          | -29.02      | QP       |
| 3   | 114.5146        | 65.00          | -32.18              | 32.82            | 40.00          | -7.18       | QP       |
| 4   | 252.0627        | 63.65          | -31.97              | 31.68            | 47.00          | -15.32      | QP       |
| 5   | 593.0497        | 55.84          | -31.14              | 24.70            | 47.00          | -22.30      | QP       |
| 6   | 989.5355        | 61.01          | -30.61              | 30.40            | 47.00          | -16.60      | QP       |

Remark:

All readings are Quasi-Peak.

Margin = Result (Result =Reading + Factor)–Limit

Factor= Cable Loss +Antenna Factor-Amplifier Gain



|               |          |                    |        |
|---------------|----------|--------------------|--------|
| Temperature:  | 24℃      | Relative Humidity: | 56%    |
| Phase:        | Vertical | Test Mode:         | Mode 1 |
| Test Voltage: | DC 5V    |                    |        |

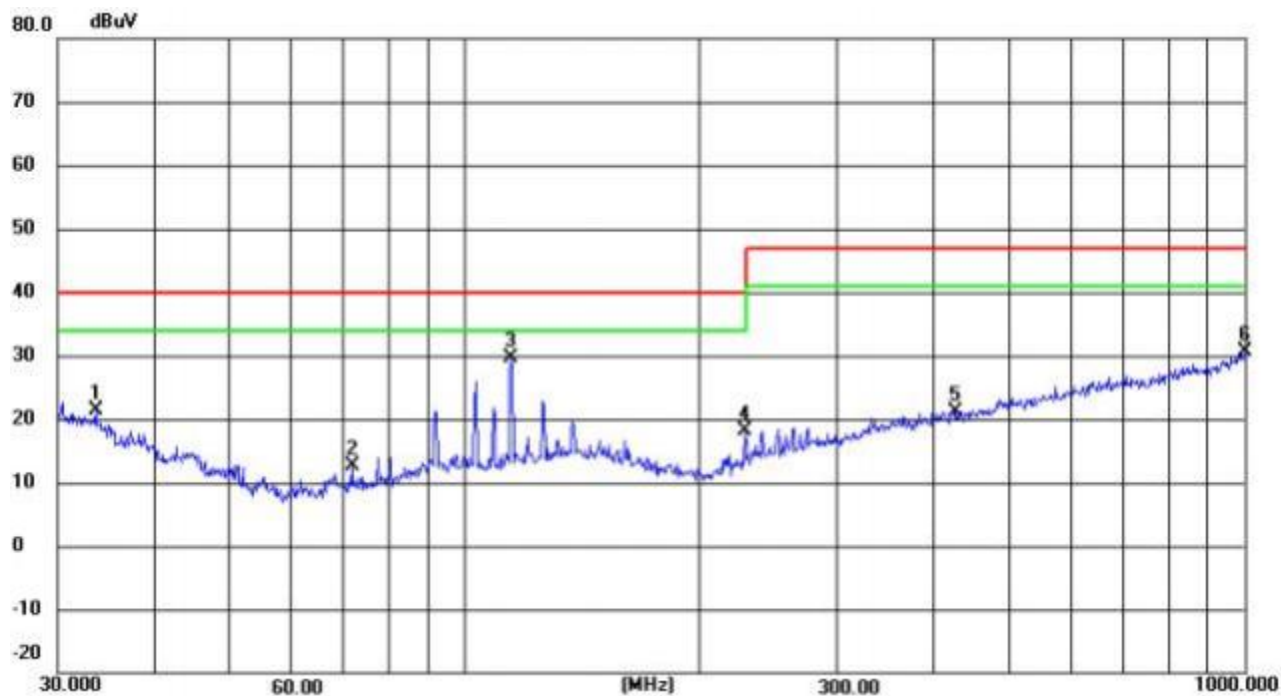
| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB) | Results (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|-----|-----------------|----------------|---------------------|------------------|----------------|-------------|----------|
| 1   | 33.5624         | 30.91          | -9.58               | 21.33            | 40.00          | -18.67      | QP       |
| 2   | 71.5806         | 32.34          | -19.61              | 12.73            | 40.00          | -27.27      | QP       |
| 3   | 114.5146        | 61.92          | -32.18              | 29.74            | 40.00          | -10.26      | QP       |
| 4   | 228.4904        | 50.08          | -32.01              | 18.07            | 40.00          | -21.93      | QP       |
| 5   | 426.5210        | 52.73          | -31.52              | 21.21            | 47.00          | -25.79      | QP       |
| 6   | 1000.0000       | 61.26          | -30.60              | 30.66            | 47.00          | -16.34      | QP       |

Remark:

All readings are Quasi-Peak.

Margin = Result (Result = Reading + Factor) - Limit

Factor = Cable Loss + Antenna Factor - Amplifier Gain



### 3.3 HARMONICS CURRENT

#### 3.3.1 LIMITS OF THE HARMONICS CURRENT

| IEC 555-2                          |                  |                                                |                    |                  |                                                |
|------------------------------------|------------------|------------------------------------------------|--------------------|------------------|------------------------------------------------|
| Table - I                          |                  |                                                | Table - II         |                  |                                                |
| Equipment Category                 | Harmonic Order n | Max. Permissible Harmonic Current (in Amperes) | Equipment Category | Harmonic Order n | Max. Permissible Harmonic Current (in Amperes) |
| Non Portable Tools or TV Receivers | Odd Harmonics    |                                                | TV Receivers       | Odd Harmonics    |                                                |
|                                    | 3                | 2.30                                           |                    | 3                | 0.80                                           |
|                                    | 5                | 1.14                                           |                    | 5                | 0.60                                           |
|                                    | 7                | 0.77                                           |                    | 7                | 0.45                                           |
|                                    | 9                | 0.40                                           |                    | 9                | 0.30                                           |
|                                    | 11               | 0.33                                           |                    | 11               | 0.17                                           |
|                                    | 13               | 0.21                                           |                    | 13               | 0.12                                           |
|                                    | 15≤n≤39          | 0.15 · 15/n                                    |                    | 15≤n≤39          | 0.10 · 15/n                                    |
|                                    | Even Harmonics   |                                                |                    | Even Harmonics   |                                                |
|                                    | 2                | 1.08                                           |                    | 2                | 0.30                                           |
|                                    | 4                | 0.43                                           |                    | 4                | 0.15                                           |
|                                    | 8                | 0.30                                           |                    |                  |                                                |
| 8≤n≤40                             | 0.23 · 8/n       | DC                                             | 0.05               |                  |                                                |

| EN 61000-3-2/IEC 61000-3-2 |                                                                               |                    |                             |                                                 |        |
|----------------------------|-------------------------------------------------------------------------------|--------------------|-----------------------------|-------------------------------------------------|--------|
| Equipment Category         | Max. Permissible Harmonic Current (in Amperes)                                | Equipment Category | Harmonic Order n            | Max. Permissible Harmonic Current (in A) (mA/w) |        |
| Class A                    | Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required | Class D            | 3                           | 2.30                                            | 3.4    |
|                            |                                                                               |                    | 5                           | 1.14                                            | 1.9    |
|                            |                                                                               |                    | 7                           | 0.77                                            | 1.0    |
|                            |                                                                               |                    | 9                           | 0.40                                            | 0.5    |
|                            |                                                                               |                    | 11                          | 0.33                                            | 0.35   |
|                            |                                                                               |                    | 13≤n≤39                     | see Table I                                     | 3.85/n |
|                            |                                                                               |                    | only odd harmonics required |                                                 |        |

### 3.3.2 TEST PROCEDURE

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.

b. The classification of EUT is according to section 5 of EN 61000-3-2. The EUT is classified as follows:

Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

Class B: Portable tools. Portable tools.; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

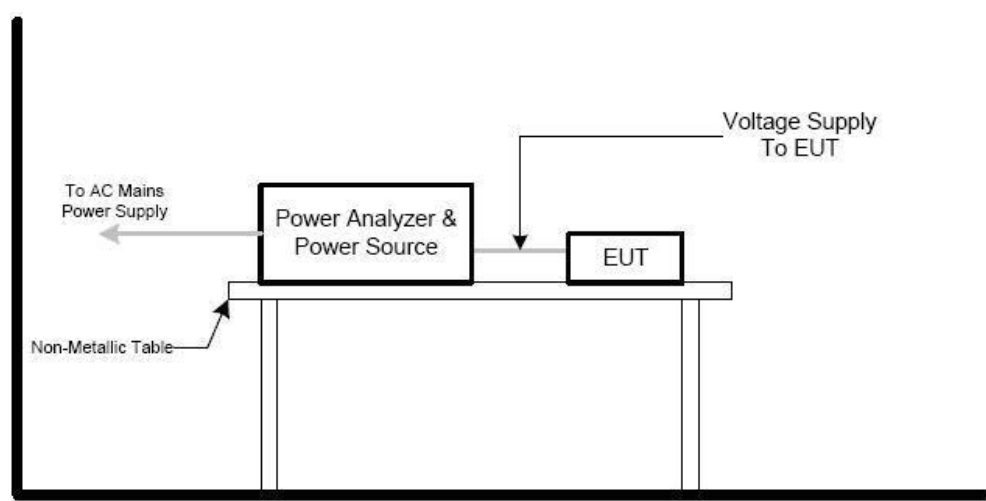
Class D: Equipment having a specified power less than or equal to 600W of the following types: Personal computers and personal computer monitors and television receivers.

c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

### 3.3.3 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the following during the testing.

### 3.3.4 TEST SETUP



### 3.3.5 TEST RESULTS

|               |      |                    |     |
|---------------|------|--------------------|-----|
| Temperature:  | 26°C | Relative Humidity: | 55% |
| Test Voltage: | N/A  |                    |     |

*Note: 1) N/A - denotes test is not applicable in this test report.*

### 3.4 VOLTAGE FLUCTUATION AND FLICKERS

#### 3.4.2 LIMITS OF THE VOLTAGE FLUCTUATION AND FLICKERS

| Tests         | Measurement Value                 | Limit                                    | Descriptions                     |
|---------------|-----------------------------------|------------------------------------------|----------------------------------|
|               | IEC555-3                          | IEC/EN 61000-3-3                         |                                  |
| $P_{st}$      | $\leq 1.0, T_p = 10 \text{ min.}$ | $\leq 1.0, T_p = 10 \text{ min.}$        | Short Term Flicker Indicator     |
| $P_{lt}$      | N/A                               | $\leq 0.65, T_p = 2 \text{ hr.}$         | Long Term Flicker Indicator      |
| $T_{dt(s)}$   | $\leq 3\%$                        | $\leq 3.3\%$                             | Relative Steady-State V-Chang    |
| $d_{max}(\%)$ | $\leq 4\%$                        | $\leq 4\%$                               | Maximum Relative V-Chang         |
| $d_c(\%)$     | N/A                               | $\leq 3.3\% \text{ for } > 500\text{ms}$ | Relative V-change Characteristic |

#### 3.4.3 TEST PROCEDURE

##### a. Fluctuation and Flickers Test:

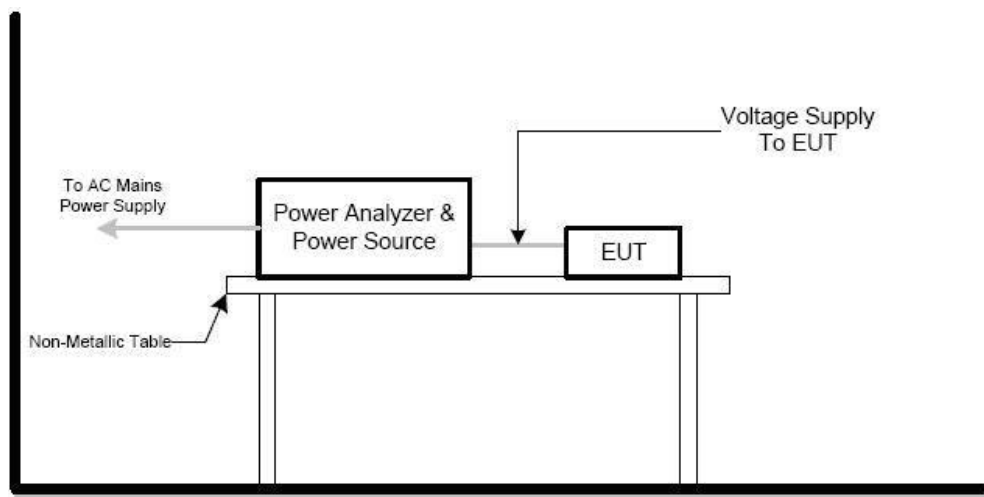
Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

##### b. All types of voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

#### 3.4.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the following during the testing.

#### 3.4.6 TEST SETUP



**3.4.7 TEST RESULTS**

|               |         |                    |     |
|---------------|---------|--------------------|-----|
| Temperature:  | 23.9 °C | Relative Humidity: | 54% |
| Test Voltage: | N/A     |                    |     |

*Note: 1) N/A - denotes test is not applicable in this test report.*

## 4. EMC IMMUNITY TEST

### 4.1 STANDARD COMPLIANCE/SERVIRITY LEVEL/CRITERIA

| Tests<br>Standard No.                                     | TEST SPECIFICATION                                                                         | Test Mode<br>Test Ports         | Perform.<br>Criteria |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------|----------------------|
| 1. ESD<br>IEC/EN 61000-4-2                                | 8KV air discharge<br>4KV contact discharge                                                 | Direct Mode                     | B                    |
|                                                           | 4KV HCP discharge<br>4KV VCP discharge                                                     | Indirect Mode                   | B                    |
| 2. RS<br>IEC/EN 61000-4-3                                 | 80 MHz - 1000<br>MHz, 1800MHz, 2600MHz, 3500MHz, 50<br>00MHz, 1000Hz, 80%,<br>AM modulated | Enclosure                       | A                    |
| 3. EFT/Burst<br>IEC/EN 61000-4-4                          | 5/50ns Tr/Th<br>5KHz Repetition Freq.                                                      | Power Supply<br>Port            | B                    |
|                                                           | 5/50ns Tr/Th<br>5KHz Repetition Freq.                                                      | CTL/Signal<br>Data Line<br>Port | B                    |
| 4. Surges<br>IEC/EN 61000-4-5                             | 1.2/50(8/20) Tr/Th us                                                                      | L-N                             | B                    |
|                                                           | 1.2/50(8/20) Tr/Th us                                                                      | L-PE<br>N-PE                    | B                    |
| 5. Injected Current<br>IEC/EN 61000-4-6                   | 0.15 MHz to 80 MHz, 1000Hz 80% ,<br>AM Modulated<br>150Ω source impedance                  | CTL/Signal Port                 | A                    |
|                                                           | 0.15 MHz to 80 MHz, 1000Hz 80% ,<br>AM Modulated<br>150Ω source impedance                  | AC Power Port                   | A                    |
|                                                           | 0.15 MHz to 80 MHz, 1000Hz 80% ,<br>AM Modulated<br>150Ω source impedance                  | DC Power Port                   | A                    |
| 6. Volt. Interruptions<br>Volt. Dips<br>IEC/EN 61000-4-11 | Voltage dip 100%                                                                           | AC Power Port                   | B                    |
|                                                           | Voltage dip 30%                                                                            |                                 | C                    |
|                                                           | Interruption 100%                                                                          |                                 | C                    |

## 4.2 GENERAL PERFORMANCE CRITERIA

According to ETSI EN 301 489-17 standard, the general performance criteria as following:

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Criterion A</b> | The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.                                                                                                                                                                                                                                 |
| <b>Criterion B</b> | <p>During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.</p> <p>After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.</p> <p>If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p> |
| <b>Criterion C</b> | <p>Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.</p> <p>Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### 4.2.1 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the following during the testing.

### 4.3 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

#### 4.3.1 TEST SPECIFICATION

|                       |                                                                                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------|
| Basic Standard:       | IEC/EN 61000-4-2                                                                                                             |
| Discharge Impedance:  | 330 ohm / 150 pF                                                                                                             |
| Required Performance: | B                                                                                                                            |
| Discharge Voltage:    | Air Discharge: 2KV/4KV/8KV (Direct)<br>Contact Discharge: 2KV/4KV (Direct/Indirect)                                          |
| Polarity:             | Positive & Negative                                                                                                          |
| Number of Discharge:  | Air Discharge: min. 20 times at each test point<br>Contact Discharge: min. 200 times in total<br>20 times at each test point |
| Discharge Mode:       | Single Discharge                                                                                                             |
| Discharge Period:     | 1 second minimum                                                                                                             |

#### 4.3.2 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manners:

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation  
The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

The time interval between two successive single discharges was at least 1 second.

The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.

Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

Vertical Coupling Plane (VCP):

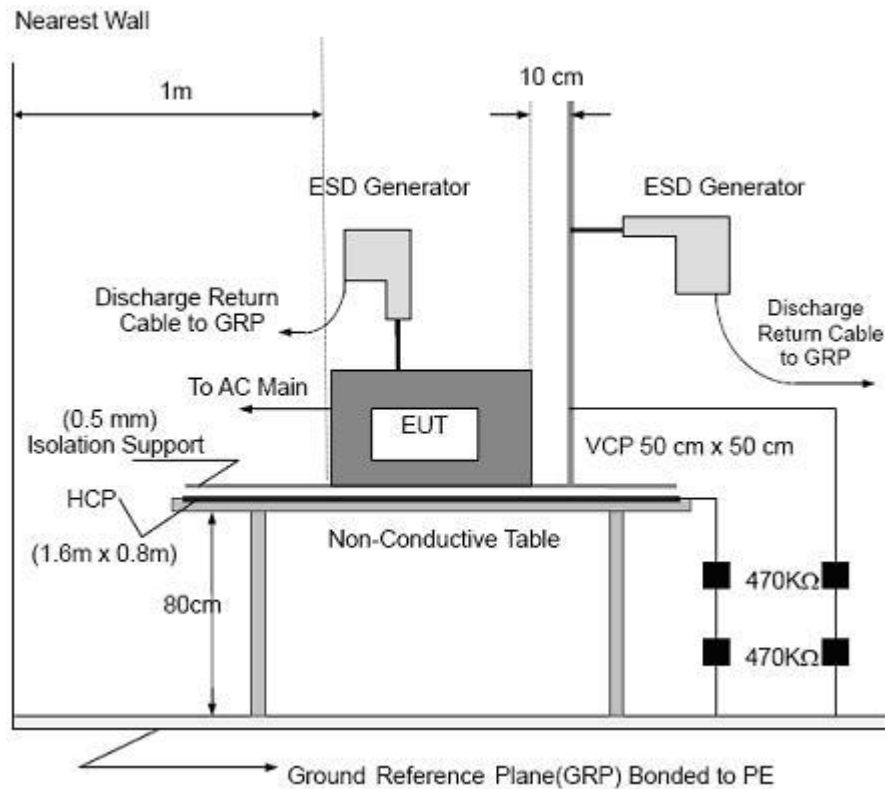
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

- b. Air discharges at insulation surfaces of the EUT.  
It was at least ten single discharges with positive and negative at the same selected point.

### 4.3.3 TEST SETUP



Note:

#### TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 0.8-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

#### FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1 meter thickness. The GRP was consisted of a sheet of aluminum that is at least 0.25mm thick, and extended at least 0.5 meters from the EUT on all sides.

#### 4.3.4 TEST RESULTS

|              |           |                    |       |
|--------------|-----------|--------------------|-------|
| Temperature: | 22.9℃     | Relative Humidity: | 55%   |
| Pressure:    | 1020.1hPa | Test Voltage:      | DC 5V |
| Test Mode:   | Mode 1    |                    |       |

| Discharge Level | Polarity | Test Points | Contact Discharge | Air Discharge | Criterion | Test Result |
|-----------------|----------|-------------|-------------------|---------------|-----------|-------------|
| 4               | +/-      | VCP/HCP     | NOTE              | N/A           | B         | PASS        |
| 2,4             | +/-      | Green Dot   | Note              | N/A           | B         | PASS        |
| 2,4,8           | +/-      | Red Dot     | N/A               | NOTE          | B         | PASS        |

Note: The EUT function was correct during the test.  
 Red Dot —Air Discharged  
 Green Dot —Contact Discharged

## 4.4 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

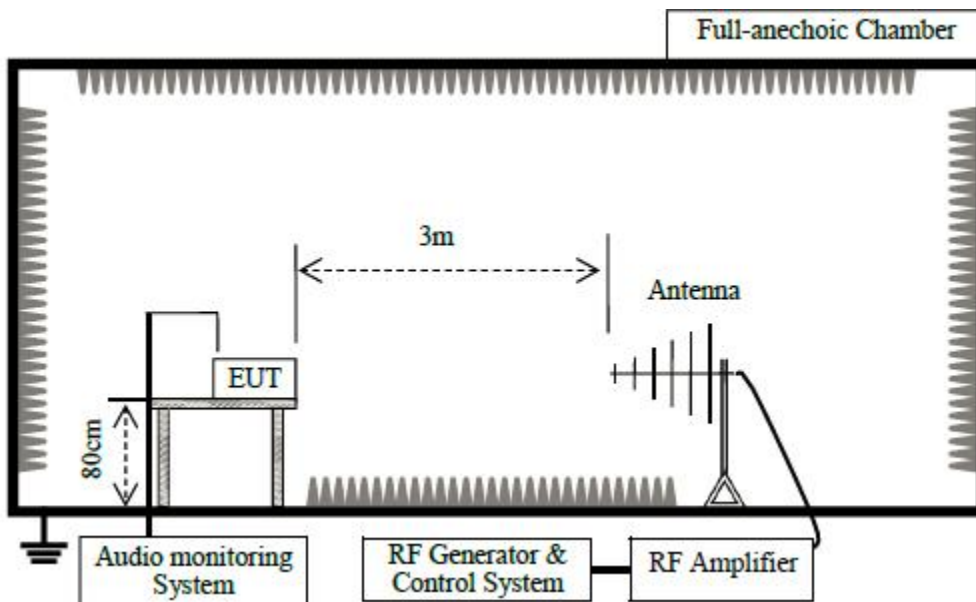
### 4.4.1 TEST SPECIFICATION

|                       |                                    |
|-----------------------|------------------------------------|
| Basic Standard:       | IEC/EN 61000-4-3                   |
| Required Performance: | A                                  |
| Frequency Range:      | 80 MHz - 6000 MHz                  |
| Field Strength:       | 3 V/m                              |
| Modulation:           | 1kHz Sine Wave, 80%, AM Modulation |
| Frequency Step:       | 1 % of fundamental                 |
| Polarity of Antenna:  | Horizontal and Vertical            |
| Test Distance:        | 3 m                                |
| Antenna Height:       | 1.5 m                              |
| Dwell Time:           | $1.5 \times 10^{-3}$ decade/s      |

### 4.4.2 TEST PROCEDURE

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- The frequency range is swept from 80 MHz to 1000 MHz, 1800 MHz, 2600 MHz, 3500 MHz, 5000 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. 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 preceding frequency value.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

#### 4.4.3 TEST SETUP



Note:

##### TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

##### FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

#### 4.4.4TEST RESULTS

|               |       |                    |        |
|---------------|-------|--------------------|--------|
| Temperature:  | 22.9℃ | Relative Humidity: | 55%    |
| Test Voltage: | DC 5V | Test Mode:         | Mode 1 |

| Frequency Range (MHz) | RF Field Position | R.F. Field Strength                        | Azimuth | Observation  | Perform. Criteria | Results  | Judgment    |
|-----------------------|-------------------|--------------------------------------------|---------|--------------|-------------------|----------|-------------|
| 80-6000               | H / V             | 3 V/m (rms)<br>AM Modulated<br>1000Hz, 80% | Front   | <b>CT,CR</b> | <b>A</b>          | <b>A</b> | <b>PASS</b> |
|                       |                   |                                            | Rear    |              |                   |          |             |
|                       |                   |                                            | Left    |              |                   |          |             |
|                       |                   |                                            | Right   |              |                   |          |             |

Note: "A" stand for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

## 4.5 ELECTRICAL FAST TRANSIENT (EFT)

### 4.5.1 TEST SPECIFICATION

|                       |                                                                                |
|-----------------------|--------------------------------------------------------------------------------|
| Basic Standard:       | IEC/EN 61000-4-4                                                               |
| Required Performance: | B                                                                              |
| Test Voltage:         | Power Line: 1 KV<br>Signal/Control Line: 0.5 KV<br>DC network power port:0.5KV |
| Polarity:             | Positive & Negative                                                            |
| Impulse Frequency:    | 5 kHz                                                                          |
| Impulse Wave shape :  | 5/50 ns                                                                        |
| Burst Duration:       | 15ms                                                                           |
| Burst Period:         | 300ms                                                                          |
| Test Duration:        | Not less than 1 min.                                                           |

### 4.5.2 TEST PROCEDURE

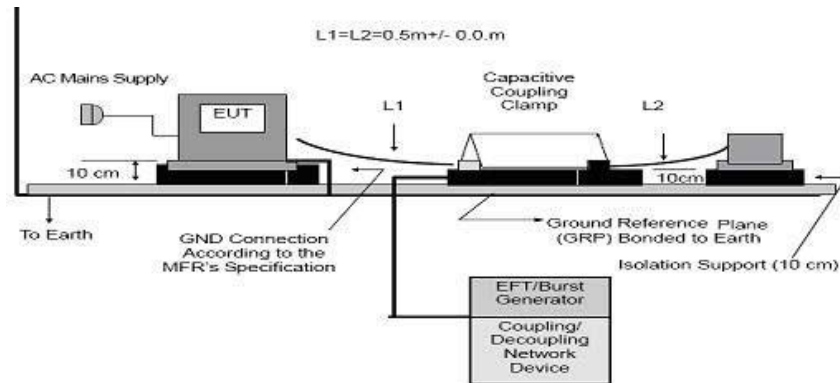
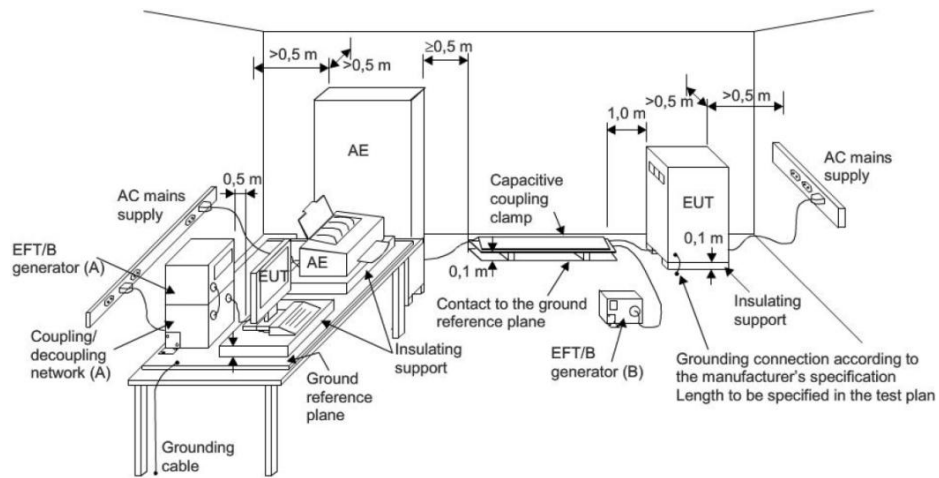
The EUT and support equipment, are placed on a table that is 0.8 meter&0.1 meter above a metal ground plane measured 1m\*1m min .

The ground reference plane shall be a metallic sheet (copper or aluminum) of 0.25 mm minimum thickness; other metallic materials may be used, but they shall have at least 0.65 mm minimum thickness.

The other condition need as following manners:

- c. The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- d. Both positive and negative polarity discharges were applied.
- e. The duration time of each test sequential was 1 minute

### 4.5.3 TEST SETUP



Note:

#### TABLE-TOP EQUIPMENT

Table-top equipment and equipment normally mounted on ceilings or walls as well as built-in equipment shall be tested with the EUT located  $(0.1 \pm 0.01)$  m above the ground reference plane. Testing of large table-top equipment or multiple systems can be performed on the floor; maintaining the same distances as for the test setup of table-top equipment.

The test generator and the coupling/decoupling network shall be bonded to the ground reference plane.

The ground reference plane shall be a metallic sheet (copper or aluminum) of 0.25mm minimum thickness; other metallic materials may be used, but they shall have at least 0.65 mm minimum thickness.

The minimum size of the ground reference plane is 0.8m x 1m. The actual size depends on the dimensions of the EUT.

The ground reference plane shall project beyond the EUT by at least 0.1m on all sides.

The ground reference plane shall be connected to the earth (PE) for safety reasons.

The EUT shall be arranged and connected to satisfy its functional requirements, according to the equipment installation specifications.

The minimum distance between the EUT and all other conductive structures (including the generator, AE and the walls of a shielded room), except the ground reference plane, shall be more than 0.5m.

All cables to the EUT shall be placed on the insulation support 0.1m above the ground reference plane. Cables not subject to electrical fast transients shall be routed as far as possible from the cable under test to minimize the coupling between the cables.

The EUT shall be connected to the earth system in accordance with the manufacturer's installation specifications; no additional earth connections are allowed.

The connection impedance of the coupling/decoupling network earth cables to the ground reference plane and all connectors shall provide a low inductance.

Either a direct coupling network or a capacitive clamp shall be used for the application of the test voltages. The test voltages shall be coupled to all of the EUT ports in turn including those between two units of equipment involved in the test, unless the length of the interconnecting cable makes it impossible to test.

#### FLOOR-STANDING EQUIPMENT

When using the coupling clamp, the minimum distance between the coupling plates and all other conductive surfaces (including the generator), except the ground reference plane beneath the coupling clamp and beneath the EUT, shall be at least 0.5m.

The distance between any coupling devices and the EUT shall be  $(0.5 - 0/+0.1)$  m for tabletop equipment testing, and  $(1.0 \pm 0.1)$  m for floor standing equipment, unless otherwise specified in product standards. When it is not physically possible to apply the distances mentioned above, other distances can be used and shall be recorded in the test report.

The cable between the EUT and the coupling device, if detachable, shall be as short as possible to comply with the requirements of this clause. If the manufacturer provides a cable exceeding the distance between the coupling device and the point of entry of the EUT, the excess length of this cable shall be bundled and situated at a distance of 0.1m above the ground reference plane. When a capacitive clamp is used as a coupling device, the excess cable length shall be bundled at the AE side.

Parts of the EUT with interconnecting cables of a length less than 3m, which are not tested, shall be placed on the insulating support. The parts of the EUT shall have a distance of 0.5m between them. Excess cable length shall be bundled.

#### 4.5.4 TEST RESULTS

|               |       |                    |     |
|---------------|-------|--------------------|-----|
| Temperature:  | 22.9℃ | Relative Humidity: | 55% |
| Test Voltage: | N/A   | Test Mode:         | N/A |

*Note: 1) N/A - denotes test is not applicable in this test report.*

## 4.6 SURGE TESTING

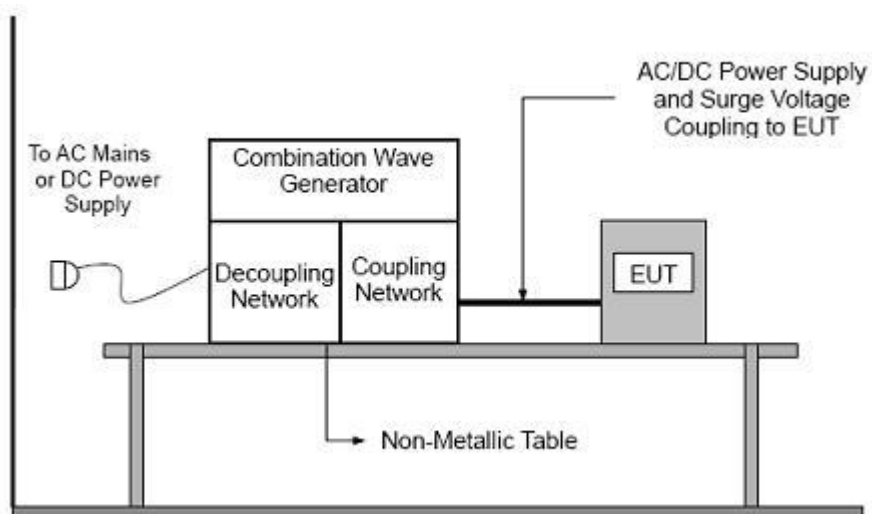
### 4.6.1 TEST SPECIFICATION

|                        |                                                                                                                        |
|------------------------|------------------------------------------------------------------------------------------------------------------------|
| Basic Standard:        | IEC/EN 61000-4-5                                                                                                       |
| Required Performance:  | B                                                                                                                      |
| Wave-Shape:            | Combination Wave<br>1.2/50us Open Circuit Voltage                                                                      |
| Test Voltage:          | Power line ~ line to line: 1 KV<br>line to ground: 2KV<br>Telecommunication line: 0.5KV<br>DC network power port:0.5KV |
| Surge Input/Output:    | L-N, L-PE, N-PE                                                                                                        |
| Generator Source:      | (L-N)2 ohm between networks                                                                                            |
| Impedance:             | (L-PE, N-PE)12 ohm between network and ground                                                                          |
| Polarity:              | Positive/Negative                                                                                                      |
| Phase Angle:           | 0°/90°/180°/270°                                                                                                       |
| Pulse Repetition Rate: | 1 time / min. (maximum)                                                                                                |
| Number of Tests:       | 5 positive and 5 negative at selected points                                                                           |

### 4.6.2 TEST PROCEDURE

- For EUT power supply:
- The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meters in length (or shorter).
- For test applied to unshielded unsymmetrically operated interconnection lines of EUT:
- The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

### 4.6.3 TEST SETUP



### 4.6.4 TEST RESULTS

|               |        |                    |     |
|---------------|--------|--------------------|-----|
| Temperature:  | 22.9°C | Relative Humidity: | 55% |
| Test Voltage: | N/A    | Test Mode:         | N/A |

Note: 1) N/A - denotes test is not applicable in this test report.

## 4.7 CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

### 4.7.1 TEST SPECIFICATION

|                       |                                    |
|-----------------------|------------------------------------|
| Basic Standard:       | IEC/EN 61000-4-6                   |
| Required Performance: | A                                  |
| Frequency Range:      | 0.15 MHz - 80 MHz                  |
| Field Strength:       | 0.15 MHz - 80 MHz, 3V.             |
| Modulation:           | 1kHz Sine Wave, 80%, AM Modulation |
| Frequency Step:       | 1 % of fundamental                 |
| Dwell Time:           | 1.5x 10 <sup>-3</sup> decade/s     |

### 4.7.2 TEST PROCEDURE

The EUT shall be tested within its intended operating and climatic conditions.

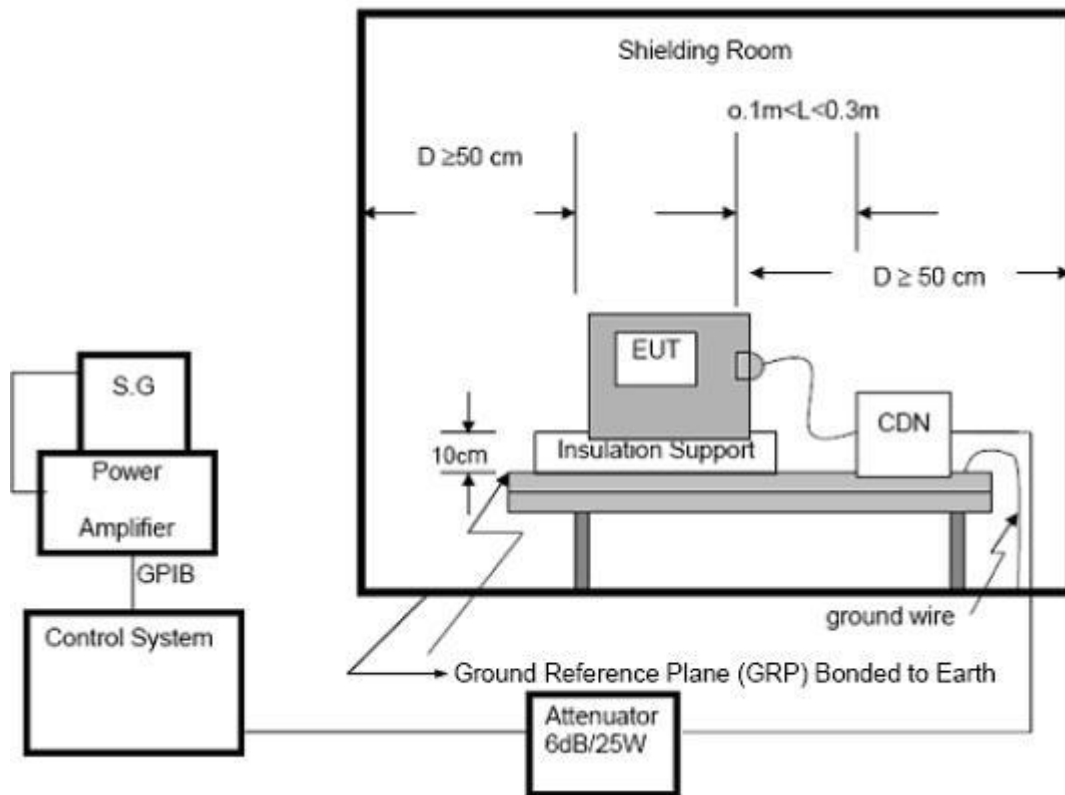
The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was 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 signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5 x 10<sup>-3</sup> decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency (ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts were made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

### 4.7.3 TEST SETUP



#### NOTE:

#### FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

#### 4.7.4 TEST RESULTS

|               |       |                    |     |
|---------------|-------|--------------------|-----|
| Temperature:  | 22.9℃ | Relative Humidity: | 55% |
| Test Voltage: | N/A   | Test Mode:         | N/A |

*Note: 1) N/A - denotes test is not applicable in this test report.*

## 4.8 VOLTAGE INTERRUPTION/DIPS TESTING (DIPS)

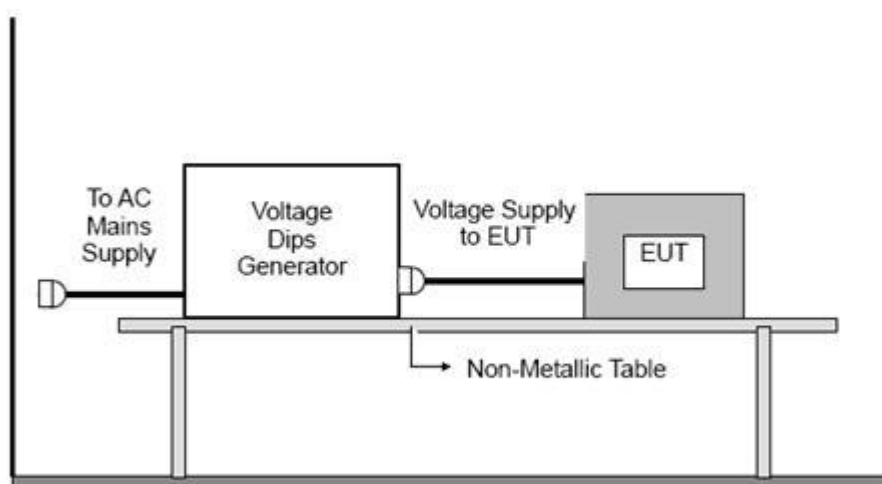
### 4.8.1 TEST SPECIFICATION

|                         |                                                                                                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic Standard:         | IEC/EN 61000-4-11                                                                                                                                                   |
| Required Performance:   | B (For 100% Voltage Dips, 0.5 Cycle)<br>B (For 100% Voltage Dips, 1 Cycle)<br>C (For 30% Voltage Dips, 25 Cycles)<br>C (For 100% Voltage Interruptions, 250 Cycles) |
| Test Duration Time:     | Minimum three test events in sequence                                                                                                                               |
| Interval between Event: | Minimum ten seconds                                                                                                                                                 |
| Phase Angle:            | 0°/45°/90°/135°/180°/225°/270°/315°/360°                                                                                                                            |
| Test Cycle:             | 3 times                                                                                                                                                             |

### 4.8.2 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

### 4.8.3 TEST SETUP



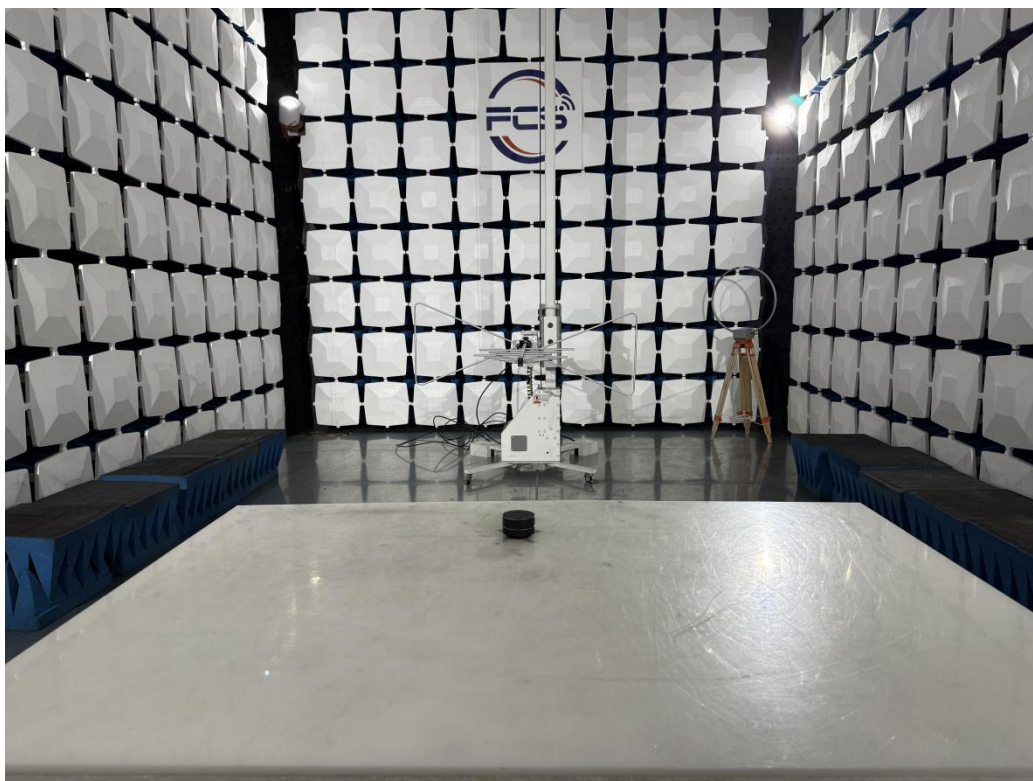
#### 4.8.4 TEST RESULTS

|               |       |                    |     |
|---------------|-------|--------------------|-----|
| Temperature:  | 22.9℃ | Relative Humidity: | 55% |
| Test Voltage: | N/A   | Test Mode:         | N/A |

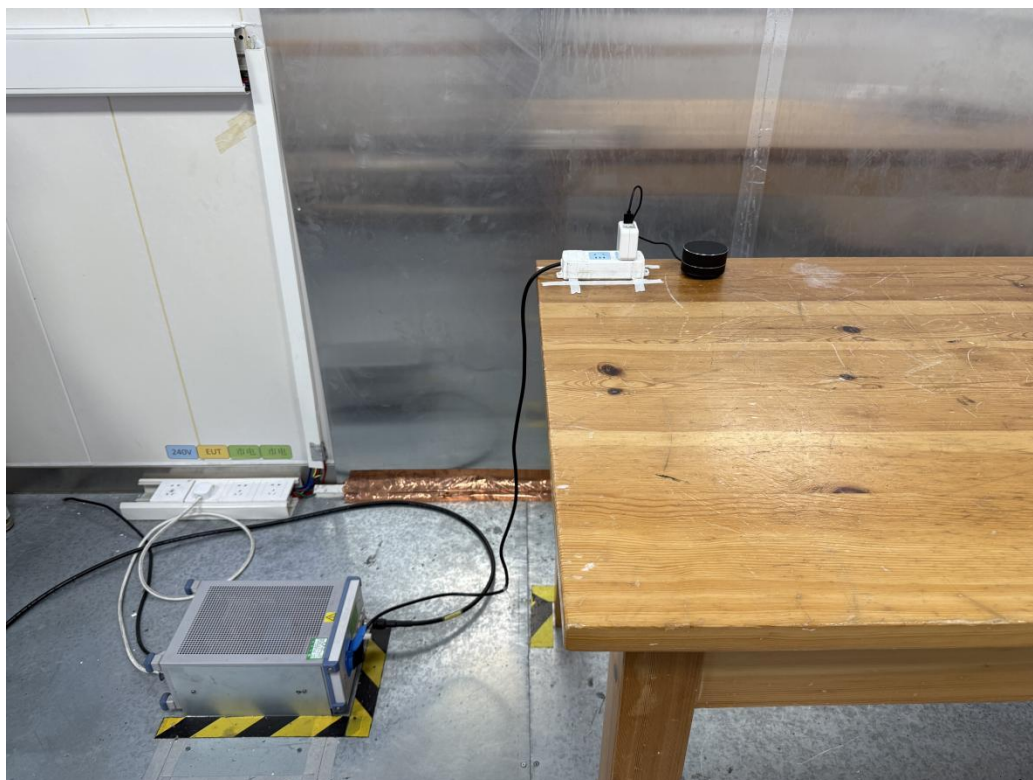
*Note: 1) N/A - denotes test is not applicable in this test report.*

## APPENDIX I- TEST SETUP

### RE



### CE



## ESD



Photo 1



Photo 2

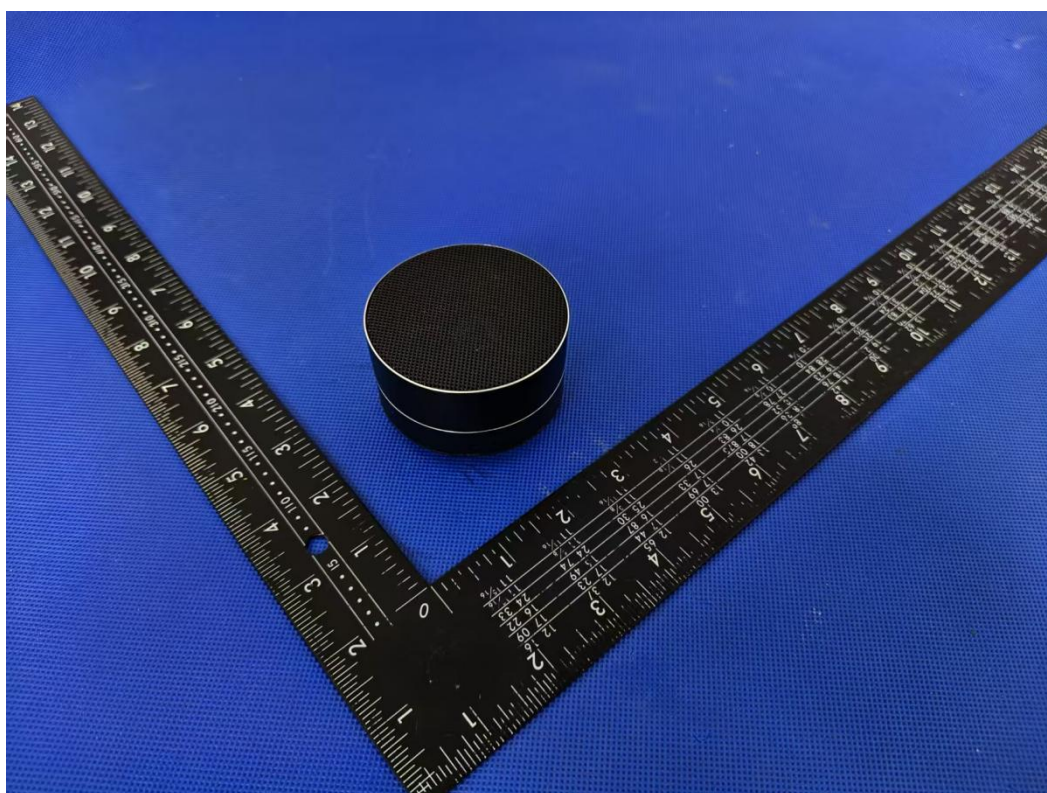


Photo 3



Photo 4

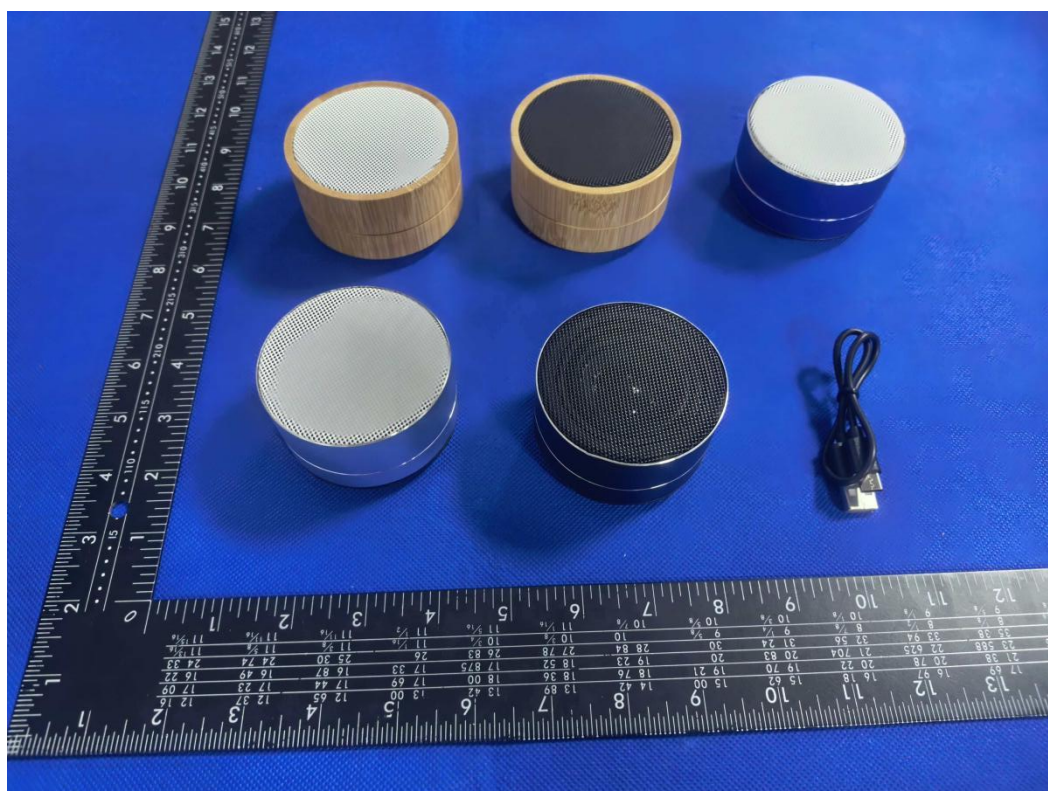


Photo 5



Photo 6

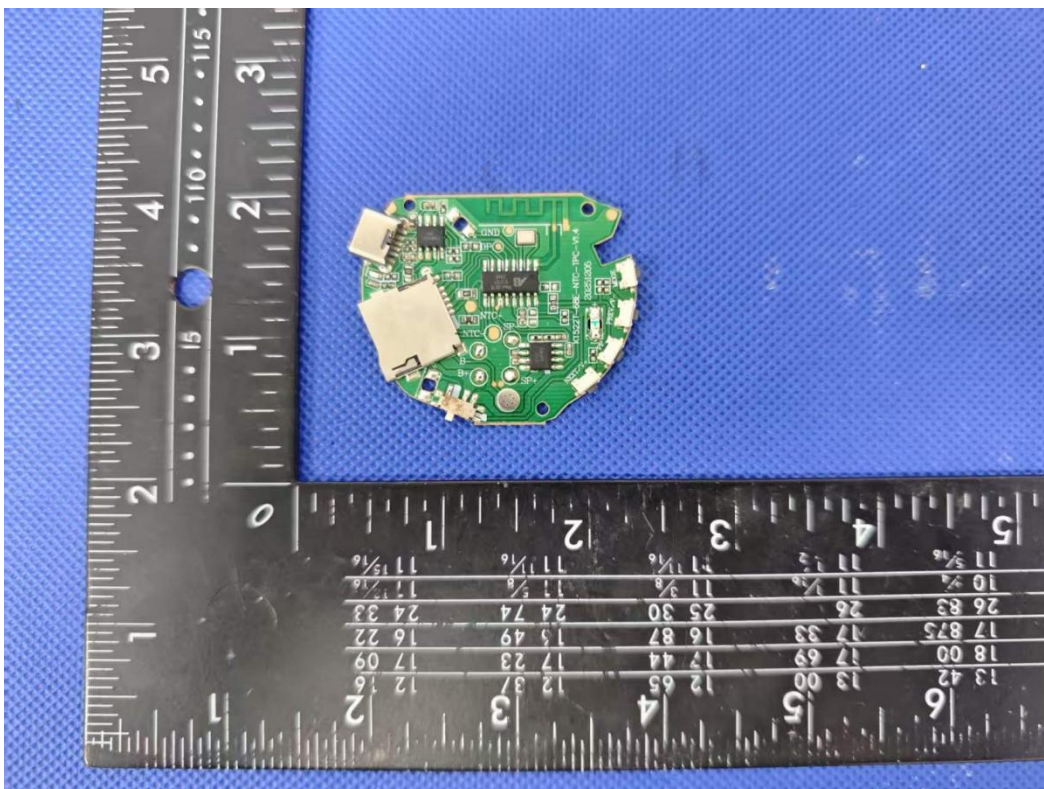


Photo 7

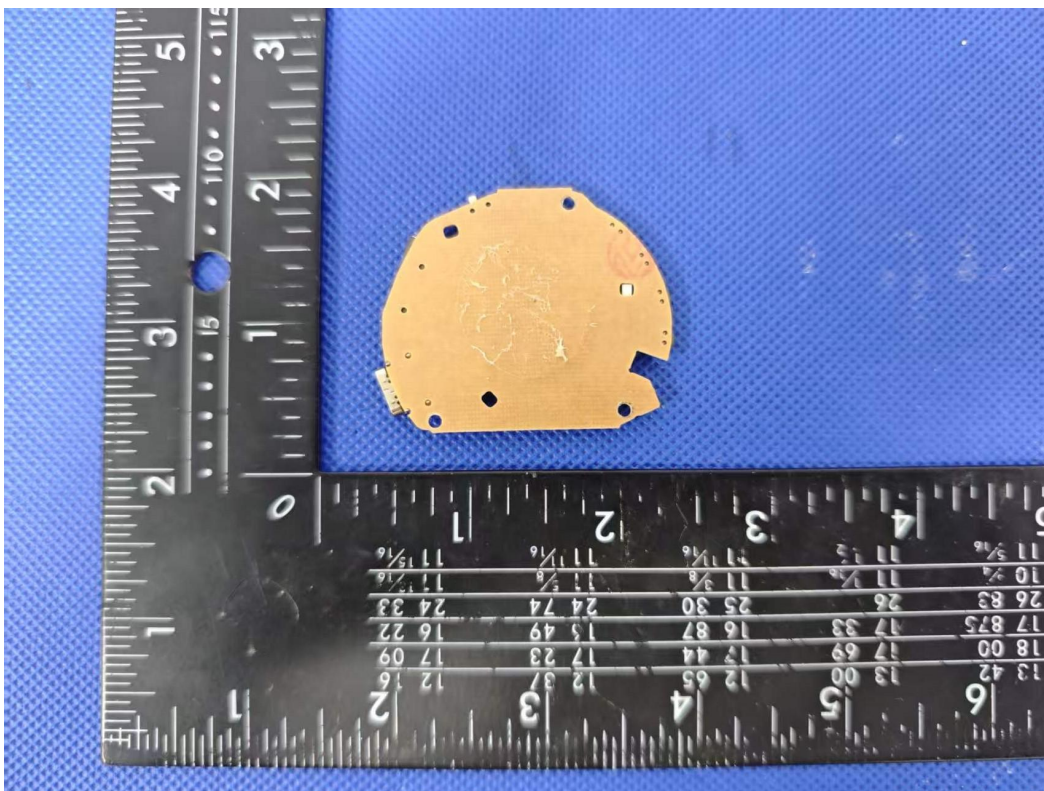
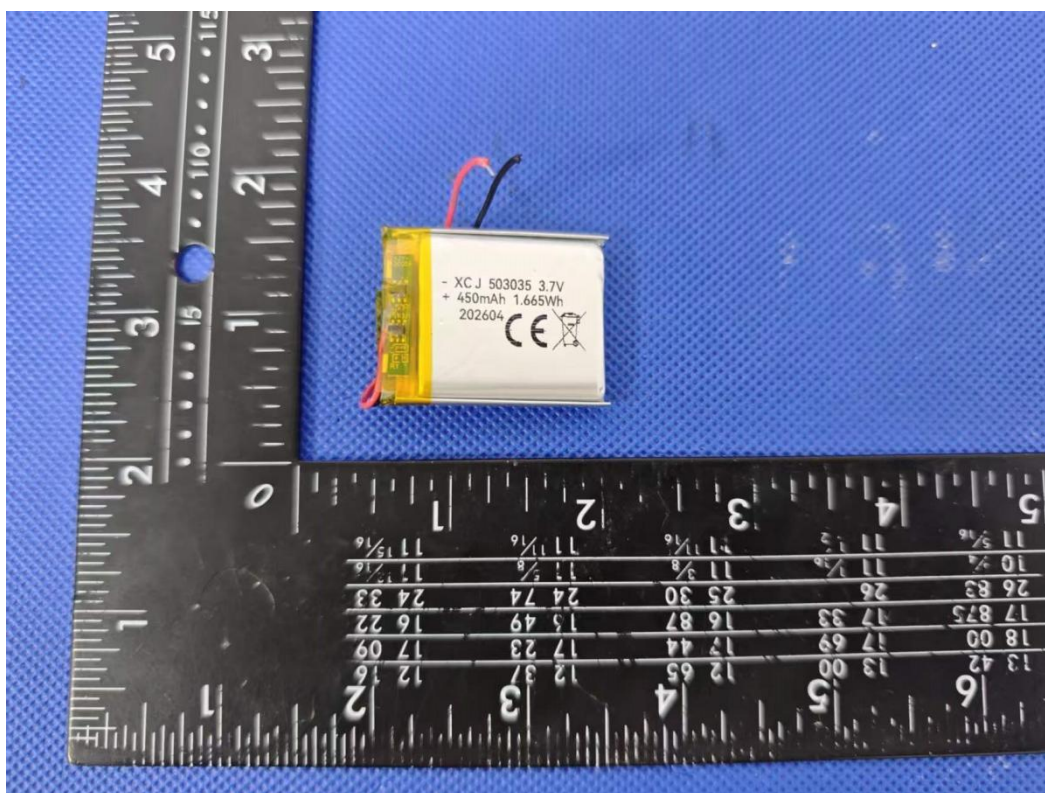


Photo 8



\*\*\*\*\*END OF THE REPORT\*\*\*\*\*