# TEST REPORT

Verified Code: 057346

| | | | |
|---|---|---|---|
| **Report No.:** | E20210414049301-10-G1 | **Application No.:** | E20210414049301 |
| **Client:** | Lumi United Technology Co., Ltd | | |
| **Address:** | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen.China | | |
| **Sample Description:** | Hub E1 | | |
| **Model:** | HE1-G01 | | |
| **Test Specification:** | ETSI EN 301 489-17 V3.2.4 (2020-09)ElectroMagnetic Compatibility (EMC)standard for radio equipment and services;Part 17: Specific conditions forBroadband Data Transmission Systems;Harmonised Standard covering the essential requirementsof article 3.1(b) of Directive 2014/53/EU<br>ETSI EN 301 489-1 V2.2.3(2019-11)ElectroMagnetic Compatibility (EMC)standard for radio equipment and services;Part 1: Common technical requirements;Harmonised Standard for ElectroMagnetic Compatibility<br>EN 55032:2015/A11:2020 Electromagnetic compatibilityof multimedia equipment —Emission Requirements<br>EN 55035:2017Electromagnetic compatibility of multimedia equipment - Immunity requirements<br>EN 61000-3-2:2019 Electromagnetic compatibility(EMC) – Part 3-2: Limits– Limits for harmonic Current emissions (equipment input current ≤16 A per phase )<br>EN 61000-3-3:2013/A1:2019 Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection | | |
| **Receipt Date:** | 2021-04-20 | | |
| **Test Date:** | 2021-07-10 to 2021-07-14 | | |

| | | |
|---|---|---|
| **Issue Date:** | 2021-07-27 | |
| **Test Result:** | Pass | |
| **Prepared By:**<br>Test Engineer<br>Yan Sha | **Reviewed By:**<br>Technical Manager<br>Jiang Tao | **Approved By:**<br>Manager<br>  |
| **Other Aspects:** | | |
| Note:This report instead the report E20210414049301-10, and from the date of issuance of this report, the report which being replaced become invalid. | | |
| **Abbreviations:** *ok / P = passed; fail / F = failed; n.a. / N = not applicable;* | | |
| **The test result in this test report refers exclusively to the presented test sample. This report shall not be reproduced except in full, without the written approval of GRGT.** | | |

# DIRECTIONS OF TEST

1. **This station carries out test task according to the national regulation of verifications which can be traced to National Primary Standards and BIPM.**

2. **The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.**

3. **If there is any objection concerning the test, the client should inform the laboratory within 15 days from the date of receiving the test report.**

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# 1 TEST RESULT SUMMARY

## Emissions

| Test Item | Test mode | Equipment test requirement | Test Method | Class / Severity | Test Result |
|---|---|---|---|---|---|
| **Performance Standard: ETSI EN 301 489-17 V3.2.4 (2020-09))&ETSI EN 301 489-1 V2.2.3 (2019-11) &EN 55032:2015/A11:2020** | | | | | |
| Conducted Emission | Mode 1 | ETSI EN 301 489-17/7.1.1<br>ETSI EN 301 489-1/8.4 | EN 55032:2015/A11:2020 annex A.3 | Meet standard limits | PASS |
| Radiated Emission | Mode 1 | ETSI EN 301 489-17/7.1.1<br>ETSI EN 301 489-1/8.2 | EN 55032:2015/A11:2020 Table A.4 and A.5 | Meet standard limits | PASS |
| Harmonic current | Mode 1 | ETSI EN 301 489-17/7.1.1<br>ETSI EN 301 489-1/8.5 | EN 61000-3-2:2019 | Class A | Note 1) |
| Voltage fluctuations and flicker | Mode 1 | ETSI EN 301 489-17/7.1.1<br>ETSI EN 301 489-1/8.6 | EN 61000-3-3:2013 | / | PASS |

## Immunity

| Test Item | Test mode | Equipment test requirement | Test Method | Class / Severity | Test Result |
|---|---|---|---|---|---|
| **ETSI EN 301 489-17 V3.2.4 (2020-09))&ETSI EN 301 489-1 V2.2.3 (2019-11)&EN 55035:2017** | | | | | |
| Electrostatic discharge (ESD) | Mode 1 | ETSI EN 301 489-17/7.2.1<br>ETSI EN 301 489-1/9.3<br>EN 55035:2017 Table 1 | EN 61000-4-2:2009 | Test specification:<br>±8kV air discharge<br>±4kV Contact discharge<br>Performance : Criteria B | PASS |
| RF electromagnetic field (RS) | Mode 1 | ETSI EN 301 489-17/7.2.1<br>ETSI EN 301 489-1/9.2 | EN61000-4-3:2006+A1: 2008+A2:2010 | Test specification:<br>Test level:<br>For the frequency range 80MHz to 1000MHz, 1000MHz to 2700MHz and 2700MHz to 6000MHz, test level shall be 3 V/m, 80% AM(1000MHz)<br>Performance: Criteria A | PASS |
| RF electromagnetic field (RS) | Mode 1 | EN 55035:2017 Table 1 | EN 61000-4-3:2006+A1: 2008+A2:2010 | Test specification:<br>For the frequency range 80MHz to 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz test level shall be 3 V/m, 80% AM(1000MHz)<br>Performance: Criteria A | PASS |
| Electrical fast transients(EFT) | Mode 1 | ETSI EN 301 489-17/7.2.1<br>ETSI EN 301 489-1/9.4<br>EN 55035:2017 Table 4 | EN 61000-4-4:2012 | Test specification:<br>AC power port: ±1kV, repetition rate: 5 kHz<br>Performance: Criteria B | PASS |
| Surges | Mode 1 | ETSI EN 301 489-17/7.2.1<br>ETSI EN 301 489-1/9.8 | EN 61000-4-5: 2014+ A1:2017 | Test specification:<br>AC power port:<br>1.2/50 us pulse<br>line to line: ±1 kV;<br>Performance : Criteria B | PASS |

| | | | | | |
|---|---|---|---|---|---|
| Surges | Mode 1 | EN 55035:2017 Table 4 | EN 61000-4-5: 2014 | Test specification:<br>AC power port:<br>1.2/50 us pulse<br>line to line: ±1 kV;<br>Performance : Criteria | PASS |
| Radio frequency continuous conducted(CS) | Mode 1 | ETSI EN 301 489-17/7.2.1<br>ETSI EN 301 489-1/9.5 | EN 61000-4-6:2014 | Test specification:<br>AC power port<br>0.15~80 MHz, 3Vrms, 80% AM, 1kHz<br>Performance: Criteria A | PASS |
| Radio frequency continuous conducted(CS) | Mode 1 | EN 55035:2017 Table 4 | EN 61000-4-6:2014 | AC Input Power:<br>0.15MHz-10MHz 3V<br>10MHz-30MHz 3-1V<br>30MHz-80MHz 1V<br>80%AM(1kHz)<br>Performance: Criteria A | PASS |
| Power frequency magnetic field | Mode 1 | EN 55035:2017 | IEC 61000-4-8:2009 | 1A/m<br>50Hz and 60Hz<br>Performance Criterion A | PASS |
| Voltage Dips & Short Interruptions | Mode 1 | ETSI EN 301 489-17/7.2.1<br>ETSI EN 301 489-1/9.7 | EN 61000-4-11:2004 | Test specification:<br>1. Voltage dips:<br>i)0% residual voltage 0.5 cycle.<br>Performance: Criteria B;<br>ii) 0% residual voltage 1 cycle,<br>Performance: Criteria B;<br>iii)70% residual voltage 25 cycle.<br>Performance: Criteria B;<br>2. Voltage interruption:<br>0% residual voltage during 250 cycles.<br>Performance: Criteria C; | PASS |
| Voltage Dips & Short Interruptions | Mode 1 | EN 55035:2017 Table 4 | EN 61000-4-11:2004 | Test specification:<br>1. Voltage dips:<br>i)0% residual voltage 0.5 cycle.<br>Performance: Criteria B<br>ii) 70% residual voltage 25 cycle for 50Hz<br>Performance: Criteria C<br>2. Voltage interruption:<br>0% residual voltage during 250 cycles for 50Hz.<br>Performance: Criteria C; | PASS |

# 2 GENERAL DESCRIPTION OF EUT

## 2.1 APPLICANT

| | |
|---|---|
| Name: | Lumi United Technology Co., Ltd |
| Address: | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen.China |

## 2.2 MANUFACTURER

| | |
|---|---|
| Name: | Lumi United Technology Co., Ltd |
| Address: | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen.China |

## 2.3 FACTORY

| | |
|---|---|
| Name: | Lumi United Technology Co., Ltd |
| Address: | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen.China |

## 2.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

| | |
|---|---|
| Equipment: | Hub E1 |
| Model No.: | HE1-G01 |
| Adding Model: | / |
| Trade Name: | Aqara |
| Power Supply: | Input: 5V ⎓, 0.5A |
| Sample No.: | E20210414049301-0004 |
| Frequency Range: | ZigBee: 2405MHz~2475MHz<br>2.4G WiFi: 2412MHz~2472MHz |
| Sample submitting way : | ■Provided by customer □Sampling |
| Antenna Specification: | ZigBee: Internal antenna with 1dBi gain (Max)<br>2.4G WiFi: Internal antenna with 2.5dBi gain (Max) |
| Temperature Range: | -10 ℃ ~ +40 ℃ |
| Note: | / |

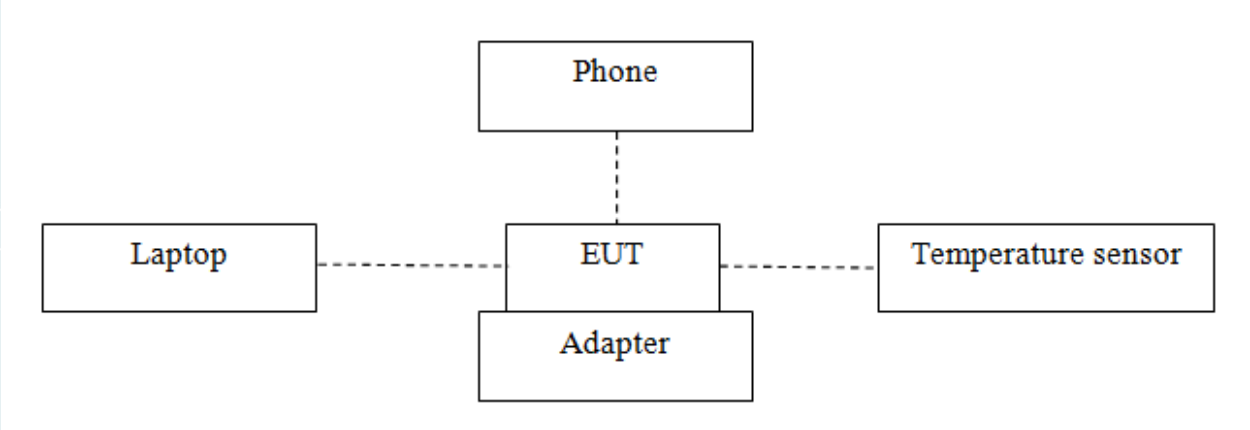
## 2.5 TEST MODE

| Mode No. | Description of the modes |
|---|---|
| 1 | EUT is connected to APP, and temperature and humidity sensor of sub-device is added through APP. Then, the wireless hotspot function is turned on through the APP software, and the ping packet transmission is carried out by using the laptop and EUT.<br>By adding a sub-device temperature and humidity sensor through APP, ZigBee function is realized to transfer temperature, humidity and atmospheric pressure information. |

## 2.6 LOCAL SUPPORTIVE INSTRUMENTS

| Name of Equipment | Manufacturer | Model | Serial Number | Note |
|---|---|---|---|---|
| Laptop | LENOVO | TP00081A | LR-05MFYL | 1.5m |
| Phone | OPPO | R11s Plus | SZDC-2020-052 | / |
| Temperature sensor | LUMI | WSDCGQ11LM | 2016DP6443 | / |
| Adapter | Aohai | A70-050200U-EU1 | / | / |
| Adapter | Apple | A1443 | / | / |
| **Cable** | | | | |
| / | / | / | / | / |

## 2.7 CONFIGURATION OF SYSTEM UNDER TEST



# 3 LABORATORY AND ACCREDITATIONS

## 3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co,. Ltd.


| | |
|---|---|
| Add.: | No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China. |
| P.C.: | 518000 |
| Tel : | 0755-61180008 |
| Fax: | 0755-61180008 |


## 3.2 ACCREDITATIONS

Our laboratoriesare accredited and approved by the following approval agencies according to GB/T 27025(ISO/IEC 17025:2017)

| | |
|---|---|
| **USA** | A2LA(Certificate#:2861.01) |
| **China** | CNAS(L0446) |

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

| | |
|---|---|
| **Canada** | Industry Canada |
| **USA** | FCC |

Copies of granted accreditation certificates are available for downloading from our web site, http://www.grgtest.com

## 3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement | Frequency | Uncertainty |
|---|---|---|
| Conduction Emission | 9 kHz ~ 150 kHz | 2.2 dB |
| | 150 kHz ~ 30 MHz | 2.8 dB |
| Radiated Emission（3m） | 30MHz～200MHz(H) | 4.3 dB |
| | 200MHz～1000MHz(H) | 4.5 dB |
| | 30MHz～200MHz(V) | 4.4 dB |
| | 200MHz～1000MHz(V) | 4.5 dB |
| | 1GHz～6GHz(H) | 4.5 dB |
| | 1GHz～6GHz(V) | 4.5 dB |
| Harmonic Current | / | 1) |
| Voltage Fluctuation and Flicks | / | 1) |
| Electrostatic discharge | / | 1) |
| Radio-Frequency Electromagnetic Field | / | 1) |
| Electrical fast transient/burst | / | 1) |
| Surge | / | 1) |
| Conducted radio frequency disturbances | / | 1) |
| Power frequency magnetic field | / | 1) |
| Voltage Dip & Voltage Interruptions | / | 1) |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of *k*=2.

# 4 LIST OF USED TEST EQUIPMENT AT GRGT

## 4.1 LIST OF USED TEST EQUIPMENT

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| **Conduction Emission** | | | | |
| EZ-EMC | EZ | CCS-3A1-CE | / | / |
| EMI Receiver | ROHDE&SCHWARZ | ESCI | 100783 | 2021/10/08 |
| LISN(EUT) | ROHDE&SCHWARZ | ENV216 | 101543 | 2022/03/21 |
| **Radiated Emission(Below 1GHz)** | | | | |
| Test S/W | EZ | CCS-2ANT | / | / |
| Test Receiver | R&S | ESCI | 100088 | 2021/11/14 |
| Preamplifier | EMEC | EM330 | / | 2022/03/21 |
| Bi-log Antenna | TESEQ | CBL6143A | 32399 | 2021/11/25 |
| **Radiated Emission(Above 1GHz)** | | | | |
| Test S/W | Tonscend | JS32-RE | / | / |
| Preamplifier | Tonscend | TAP037030 | AP20E8060081 | 2022/06/03 |
| Preamplifier | Tonscend | TAP01018048 | AP20E8060075 | 2022/06/07 |
| Bi-log Antenna | Schwarzbeck | BBHA9120D | 286 | 2021/10/08 |
| Spectrum analyzer | Agilent | N9010A | MY52221469 | 2022/04/16 |
| **Harmonic Current** | | | | |
| Test S/W. | / | CTS 4 | / | / |
| Power Source | SCHAFFNER | NSG1007 | 54789 | 2022/03/21 |
| Harmonic & Flicker Tester | SCHAFFNER | CCN1000 | 72045 | 2021/11/15 |
| **Voltage Fluctuation and Flicks** | | | | |
| Test S/W. | / | CTS 4 | / | / |
| Power Source | SCHAFFNER | NSG1007 | 54789 | 2022/03/21 |
| Harmonic & Flicker Tester | SCHAFFNER | CCN1000 | 72045 | 2021/11/15 |
| **Electrostatic discharge** | | | | |
| Dito ESD Simulator | EM Test | dito | V0809103493 | 2021/11/18 |

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| **Radio-Frequency Electromagnetic Field** | | | | |
| Signal generator | R&S | SMA100A | 100434 | 2021/10/08 |
| Switch | TOYO | BS5000 | / | / |
| Amplifier | Schaffner | CBA9433 | 3007 | 2022/03/21 |
| Amplifier | TESEQ | CBA3G-050 | T44161 | 2022/04/16 |
| Amplifier | Milmega | AS1860-50 | 1079232 | 2021/11/15 |
| Dual directional Coupler | AR | DC 6180A | 0328212 | 2021/10/08 |
| Dual directional Coupler | AR | DC 7144A | 327057 | 2021/10/08 |
| Log Periodic Antenna | Schaffner | CBL6143 | 5082 | 2021/10/08 |
| Microwave Log.-Per. Antenna | Schwarzbeck | STLP9149 | 9149-163 | 2021/10/09 |
| Power Meter | Keysight | N1914A | MY57090009 | 2021/10/16 |
| Power Sensor | Keysight | E9301A | MY57060008 | 2021/10/08 |
| Test software | Tonscend | JS35-RS | / | / |
| **Electrical fast transient/burst** | | | | |
| Test S/W. | / | Win3025 Version 4.00 | / | / |
| Fast Transients/Burst Generator | TESEQ | NSG 3025 | 26861 | 2021/10/16 |
| **Surge** | | | | |
| Combined wave lightning surge simulator | 3ctest | CWS 600G | ES0381813 | 2021/11/15 |
| Lightning surge coupling decoupling network | 3ctest | SPN 3618T | ES0941720 | 2021/11/15 |
| **Conducted radio frequency disturbances** | | | | |
| Test S/W | Tonscend | JS35-CS | / | / |
| Signal Generator | TESEQ | NSG4070 | 25807 | 2022/04/16 |
| Attenuator | weinschel corp | 40-6-34 | QQ986 | 2021/10/08 |
| CDN | Luthi | CDN801-M2 | 1897 | 2021/10/08 |

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| **Power frequency magnetic field** | | | | |
| Test S/W | TESEQ | Win2120 Ver6.00 | / | / |
| Power Source | SCHAFFNER | NSG1007 | 54789 | 2022/03/21 |
| Harmonic & Flicker Tester | SCHAFFNER | CCN1000 | 72045 | 2021/11/15 |
| Induction coil Interface | SCHAFFNER | INA2141 | 6003 | 2021/10/16 |
| Induction coil Interface | SCHAFFNER | INA-702 | 711-1115 | 2021/10/16 |
| **Voltage Dip & Voltage Interruptions** | | | | |
| Test S/W | AMETEK | AC Source CIGuiSII-500lix | / | / |
| Power Source | SCHAFFNER | NSG1007 | 54789 | 2022/03/21 |
| Profline 2100 AC Switching Unit | TESEQ | NSG2200-1 | A17820 | 2021/10/16 |
| Harmonic & Flicker Tester | SCHAFFNER | CCN1000 | 72045 | 2021/11/15 |

# 5 EMISSION TEST

## 5.1 RADIATED EMISSION MEASUREMENT (RE)

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4/7.1.1<br>ETSI EN 301 489-1 V2.2.3/8.2<br>EN 55032:2015/A11:2020 /annex A.2 table A.4 and A.5 |
| Test Method: | EN 55032 /annex A.2 |

### 5.1.1 LIMITS

The ancillary equipment shall meet the class B limits given in CENELEC EN 55032 [1], annex A tables A.4 and A.5.

**Table A.4 – Requirements for radiated emissions at frequencies up to 1 GHz for class B equipment**

| Frequency range(MHz) | Distance (m) | bandwidth | Limits dB(uV/m) | | |
|---|---|---|---|---|---|
| | | | Peak (PK) | Quasi-peak (QP) | Average (Avg) |
| 30 to 230 | 3 | 120 kHz | / | 40 | / |
| 230 to 1000 | 3 | 120 kHz | / | 47 | / |

**Table A.5 – Requirements for radiated emissions at frequencies up to 1 GHz for class B equipment**

| Frequency range(MHz) | Distance (m) | bandwidth | Limits dB(uV/m) | | |
|---|---|---|---|---|---|
| | | | Peak (PK) | Quasi-peak (QP) | Average (Avg) |
| 1000~3000 | 3 | 1MHz | 70 | / | 50 |
| 3000~6000 | 3 | 1MHz | 74 | / | 54 |

### 5.1.2 TEST PROCEDURE

**(1) Procedure of Preliminary Test**

Radiated emission tests shall be made with the receive or transmit antenna located at a horizontal distance of 3m plus half of the maximum width of the EUT being tested, measured from the centre of the EUT. The tests shall be performed with the equipment configured as closely as possible to its typical, practical operation. Unless stated otherwise, cables and wiring shall be as specified by the manufacturer and the equipment shall be in its housing (or cabinet) with all covers and access panels in place. Any deviation from normal EUT operating conditions shall be included in the test report.

The EUT (on a non-conductive support structure, where applicable) shall be placed on a remotely operated turntable, to allow the EUT to be rotated. The height of the EUT above the ground plane shall be according to the following requirements.

-- Table-top equipment is placed on a non-conductive set-up table with height 0.8 m ± 0.01 m, CISPR 16-1-4 specifies the method to determine the impact of the non-conductive set-up table on test results.

-- Floor-standing equipment is placed on a non-conductive support, as specified in the applicable product standard. If there are no EUT height placement requirements in the product standard, the EUT shall be placed on a non-conductive support at a height of 5 cm to 15 cm above the ground plane.

Note: This is table-top equipment.

Interface cables, loads, and devices should be connected to at least one of each type of the interface ports of the EUT and, where practical, each cable shall be terminated in a device typical for its actual use. Where there are multiple interface ports of the same type, a typical number of these devices shall be connected to devices or loads. It is sufficient to connect only one of the loads, provided that it can be shown, for example by preliminary testing, that the connection of further ports would not significantly increase the level of disturbance (that is, more than 2 dB) or significantly degrade the immunity level.

The test mode(s) were scanned during the preliminary test. After the preliminary scan, we found the test mode producing the highest emission level. The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

**(2) Procedure of Final Test**

EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test. The Analyzer/ Receiver scanned from 30MHz to 1000MHz and 1000MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level. Record at least 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 for 30MHz~1000MHz only QP reading is presented，for 1000MHz~6000 MHz Peak and AVG reading is presented.

### 5.1.3 TEST SETUP

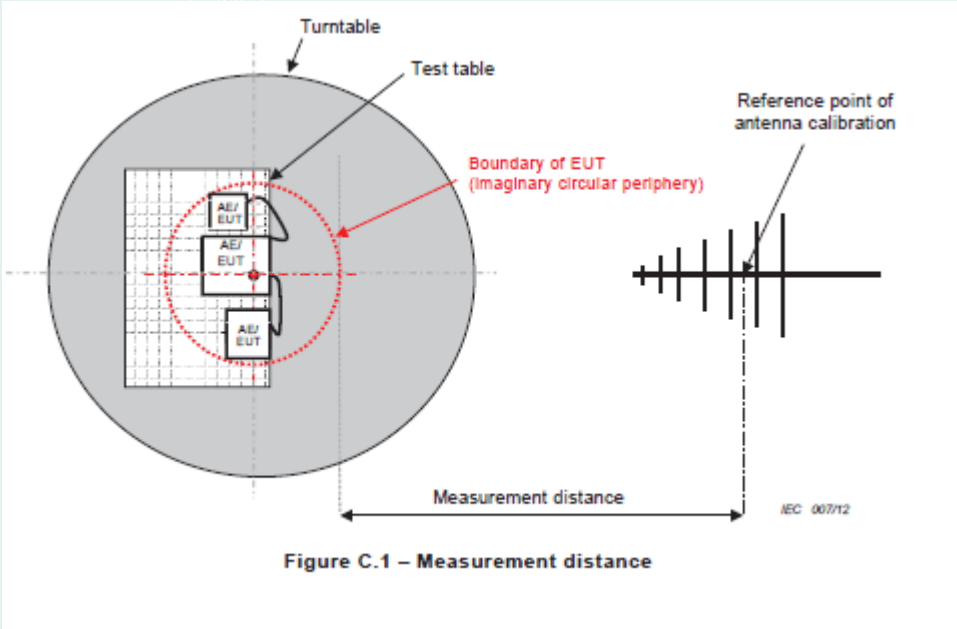



Figure C.1 – Measurement distance

Below the frequency of 1GHz

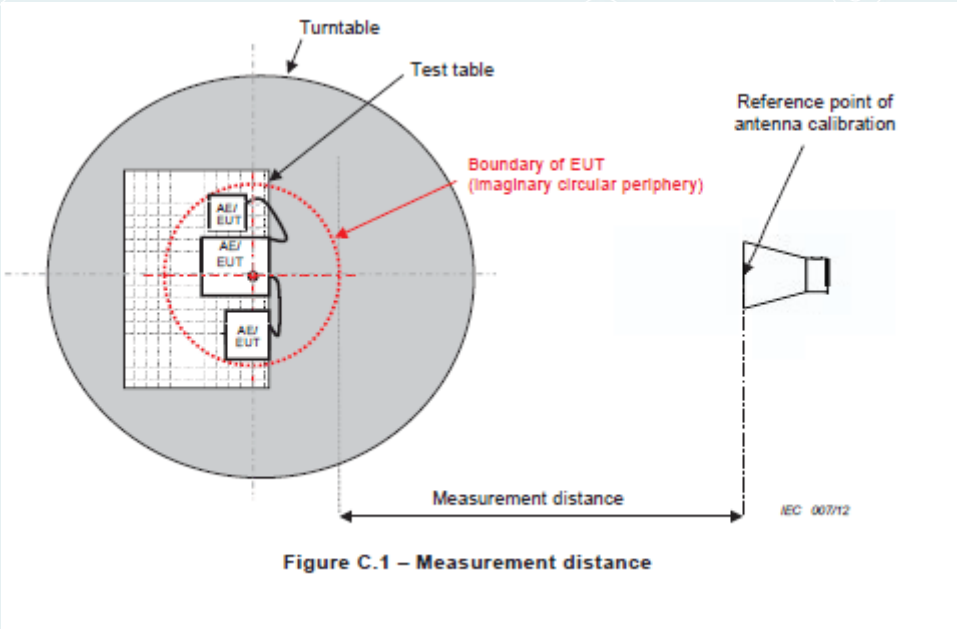



Figure C.1 – Measurement distance

Above the frequency of 1GHz(1GHz-6GHz)

### 5.1.4 DATA SAMPLE

**Below 1GHz**

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| XXX.XXXX | 48.49 | -9.91 | 38.58 | 47.00 | -8.42 | QP |

Frequency (MHz) = Emission frequency in MHz

Reading (dBuV) = Uncorrected Analyzer / Receiver reading

Correct Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)

Limit (dBuV/m) = Limit stated in standard

Margin (dB) = Result (dBuV/m) – Limit(dBuV/m)

QP = Quasi-peak Reading

**Above 1GHz**

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|
| XXXX.XXXX | 57.64 | 1.45 | 59.09 | 74.00 | -14.91 | Peak |
| XXXX.XXXX | 39.57 | 1.45 | 41.02 | 54.00 | -12.98 | AVG |

Frequency (MHz) = Emission frequency in MHz

Reading (dBuV) = Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)

Limit (dBuV/m) = Limit stated in standard

Margin (dB) = Result (dBuV/m) – Limit(dBuV/m)

Peak = Peak Reading

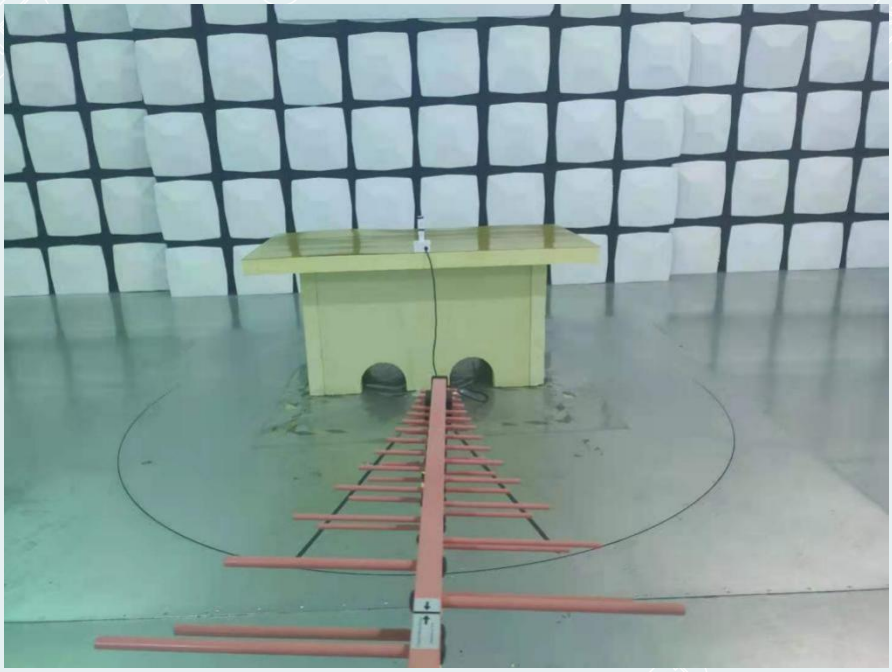
AVG = Average Reading

**Calculation Formula**

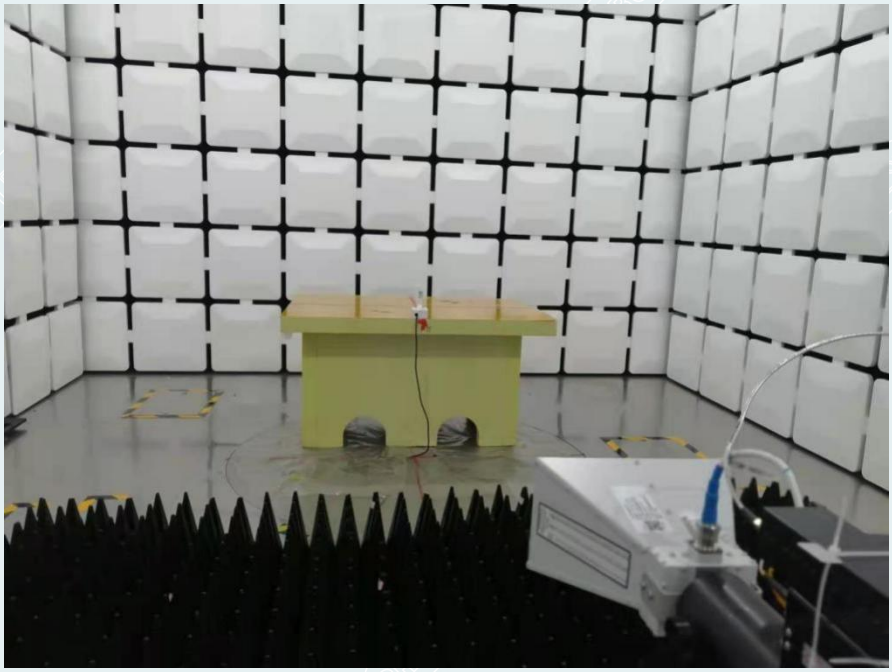
Margin (dB) = Result (dBuV/m) – Limits (dBuV/m)

Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)

### 5.1.5 PHOTOGRAPH OF THE TEST ARRANGEMENT



Below 1GHz



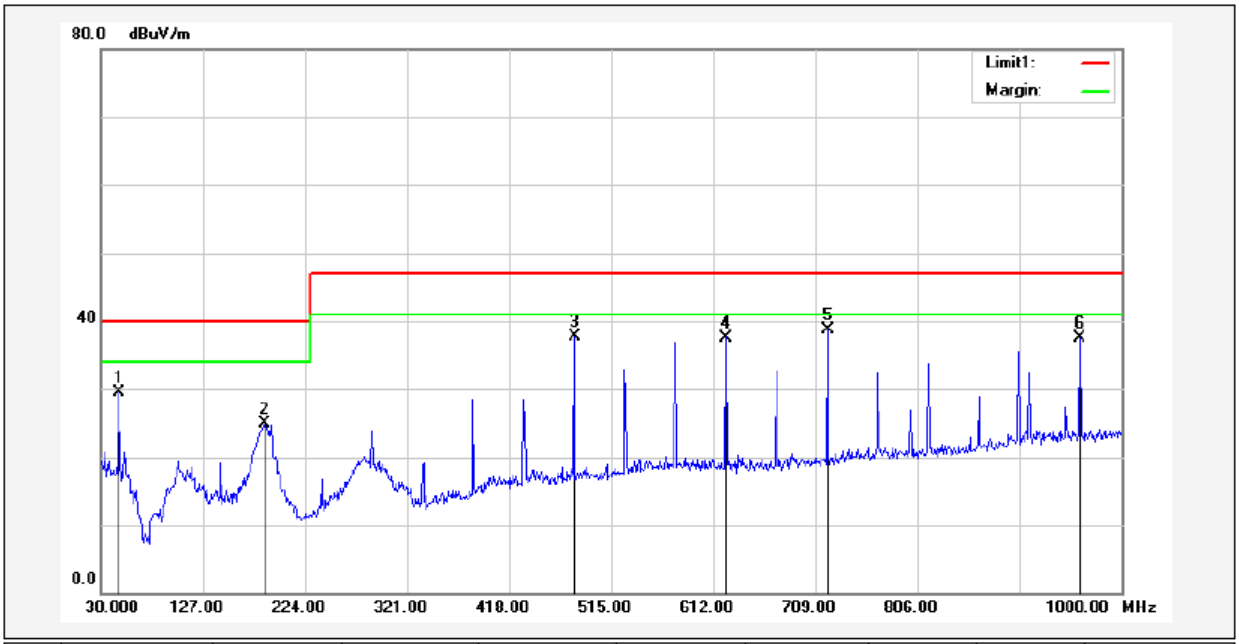
Above 1GHz

### 5.1.6 TEST RESULTS

Below 1G

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 22.7℃/45%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Tang ShengHui |
| Test Date | 2021/07/10 | Sample No. | E20210414049301-0004 |

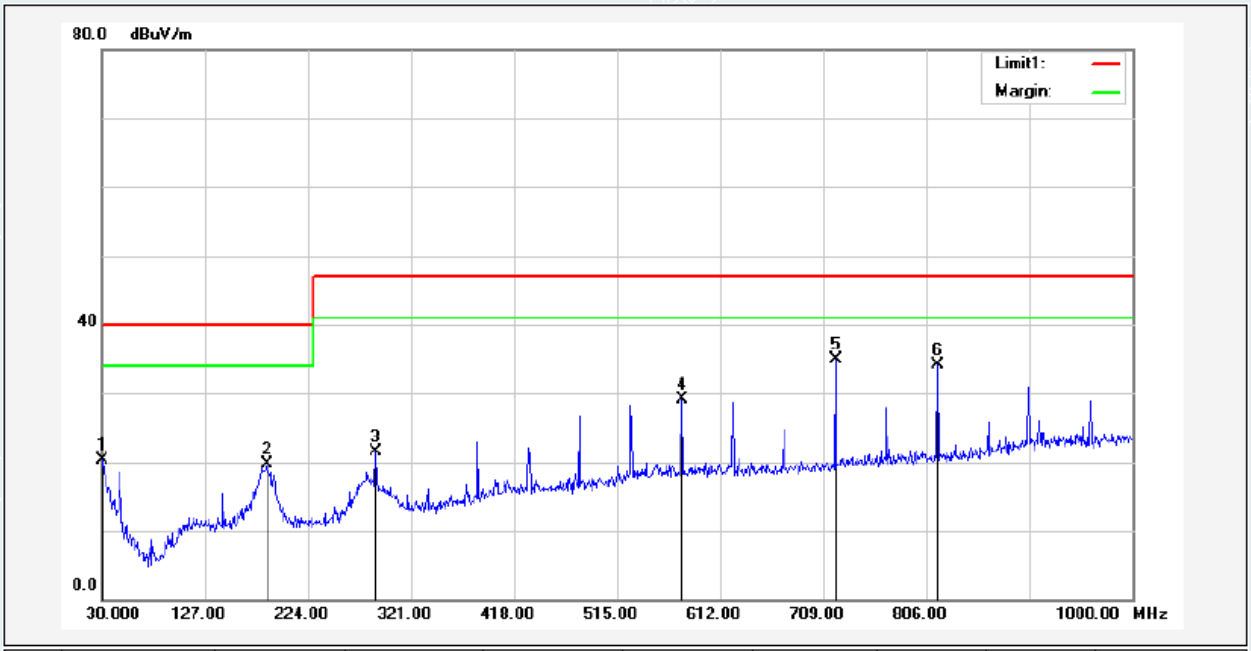
Polarity: Vertical:




| No. | Frequency (MHz) | Reading (dBuV) | Correction factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over (dB) | Degree (deg.) | Height (cm) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 47.4600 | 53.89 | -24.30 | 29.59 | 40.00 | -10.41 | 360 | 113 | QP |
| 2 | 186.1700 | 52.17 | -27.21 | 24.96 | 40.00 | -15.04 | 270 | 100 | QP |
| 3 | 480.0800 | 56.69 | -18.95 | 37.74 | 47.00 | -9.26 | 96 | 100 | QP |
| 4 | 624.6100 | 54.00 | -16.40 | 37.60 | 47.00 | -9.40 | 23 | 100 | QP |
| 5* | 720.6400 | 54.05 | -15.35 | 38.70 | 47.00 | -8.30 | 198 | 100 | QP |
| 6 | 960.2300 | 50.46 | -12.94 | 37.52 | 47.00 | -9.48 | 31 | 100 | QP |

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 22.7℃/45%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Tang ShengHui |
| Test Date | 2021/07/10 | Sample No. | E20210414049301-0004 |

Polarity: Horizontal:

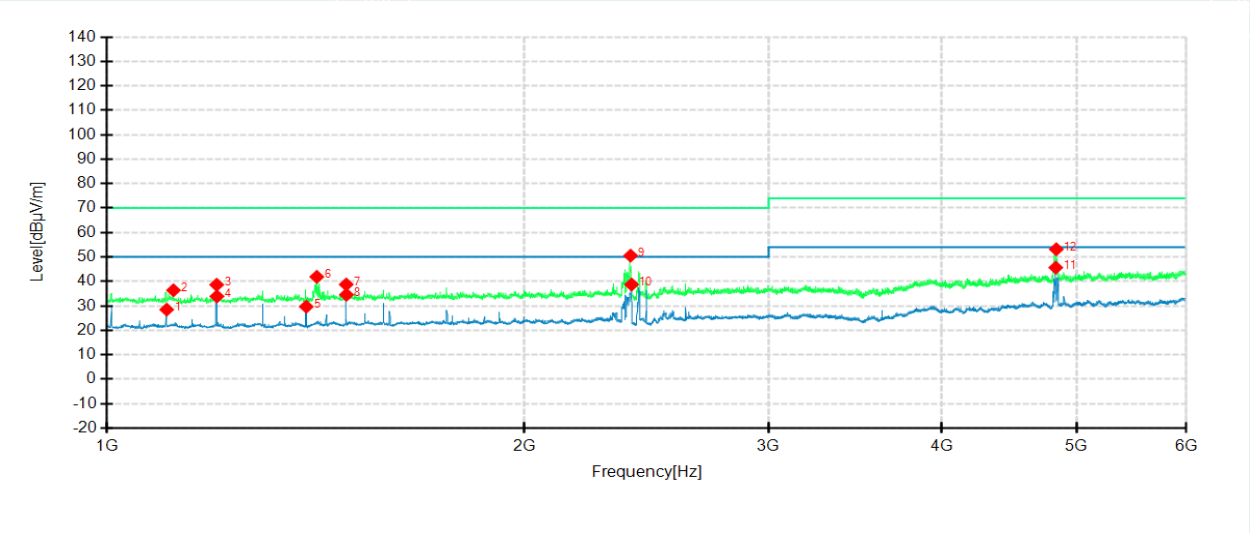



| No. | Frequency (MHz) | Reading (dBuV) | Correction factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over (dB) | Degree (deg.) | Height (cm) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 30.9700 | 36.97 | -16.71 | 20.26 | 40.00 | -19.74 | 177 | 300 | QP |
| 2 | 185.2000 | 46.87 | -27.24 | 19.63 | 40.00 | -20.37 | 138 | 200 | QP |
| 3 | 288.0200 | 45.40 | -23.92 | 21.48 | 47.00 | -25.52 | 119 | 100 | QP |
| 4 | 576.1100 | 45.70 | -16.58 | 29.12 | 47.00 | -17.88 | 65 | 200 | QP |
| 5* | 720.6400 | 50.20 | -15.35 | 34.85 | 47.00 | -12.15 | 60 | 100 | QP |
| 6 | 816.6700 | 48.41 | -14.22 | 34.19 | 47.00 | -12.81 | 85 | 100 | QP |

Above 1G

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 25℃/60%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Chen XiaoCong |
| Test Date | 2021/07/14 | Sample No. | E20210414049301-0004 |

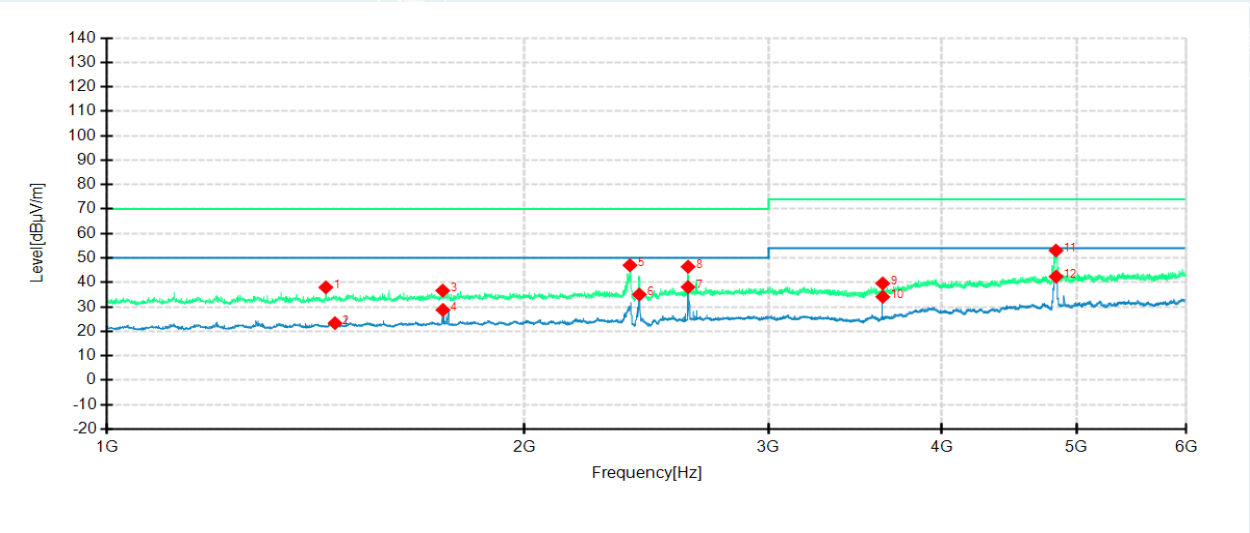
Polarity: Vertical:




| Suspected Data List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Reading [dBµV/m] | Level [dBµV/m] | Factor [dB] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 1104.5000 | 53.36 | 28.46 | -24.90 | 50.00 | 21.54 | 100 | 325 | Vertical |
| 2 | 1117.0000 | 61.20 | 36.37 | -24.83 | 70.00 | 33.63 | 200 | 286 | Vertical |
| 3 | 1200.0000 | 63.23 | 38.62 | -24.61 | 70.00 | 31.38 | 100 | 258 | Vertical |
| 4 | 1200.5000 | 58.49 | 33.88 | -24.61 | 50.00 | 16.12 | 200 | 236 | Vertical |
| 5 | 1392.5000 | 53.33 | 29.65 | -23.68 | 50.00 | 20.35 | 100 | 216 | Vertical |
| 6 | 1417.0000 | 65.41 | 41.87 | -23.54 | 70.00 | 28.13 | 200 | 127 | Vertical |
| 7 | 1488.0000 | 61.89 | 38.74 | -23.15 | 70.00 | 31.26 | 100 | 258 | Vertical |
| 8 | 1488.5000 | 57.70 | 34.55 | -23.15 | 50.00 | 15.45 | 100 | 283 | Vertical |
| 9 | 2385.5000 | 71.23 | 50.53 | -20.70 | 70.00 | 19.47 | 100 | 0 | Vertical |
| 10 | 2389.5000 | 59.38 | 38.72 | -20.66 | 50.00 | 11.28 | 100 | 73 | Vertical |
| 11 | 4832.0000 | 56.03 | 45.64 | -10.39 | 54.00 | 8.36 | 100 | 132 | Vertical |
| 12 | 4836.0000 | 63.48 | 53.13 | -10.35 | 74.00 | 20.87 | 100 | 132 | Vertical |

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 25℃/60%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Chen XiaoCong |
| Test Date | 2021/07/14 | Sample No. | E20210414049301-0004 |

Polarity: Horizontal:




| Suspected Data List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Reading [dBµV/m] | Level [dBµV/m] | Factor [dB] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 1438.5000 | 61.37 | 37.96 | -23.41 | 70.00 | 32.04 | 100 | 141 | Horizontal |
| 2 | 1460.5000 | 46.62 | 23.33 | -23.29 | 50.00 | 26.67 | 200 | 4 | Horizontal |
| 3 | 1746.5000 | 59.19 | 36.65 | -22.54 | 70.00 | 33.35 | 200 | 11 | Horizontal |
| 4 | 1747.0000 | 51.27 | 28.73 | -22.54 | 50.00 | 21.27 | 200 | 4 | Horizontal |
| 5 | 2383.0000 | 67.73 | 47.01 | -20.72 | 70.00 | 22.99 | 100 | 250 | Horizontal |
| 6 | 2420.5000 | 55.52 | 35.05 | -20.47 | 50.00 | 14.95 | 200 | 203 | Horizontal |
| 7 | 2624.5000 | 57.84 | 38.08 | -19.76 | 50.00 | 11.92 | 100 | 141 | Horizontal |
| 8 | 2624.5000 | 66.17 | 46.41 | -19.76 | 70.00 | 23.59 | 100 | 141 | Horizontal |
| 9 | 3625.5000 | 56.05 | 39.58 | -16.47 | 74.00 | 34.42 | 100 | 208 | Horizontal |
| 10 | 3626.0000 | 50.56 | 34.10 | -16.46 | 54.00 | 19.90 | 100 | 216 | Horizontal |
| 11 | 4834.0000 | 63.39 | 53.02 | -10.37 | 74.00 | 20.98 | 100 | 200 | Horizontal |
| 12 | 4834.5000 | 52.75 | 42.38 | -10.37 | 54.00 | 11.62 | 100 | 175 | Horizontal |

## 5.2 CONDUCTED EMISSION MEASUREMENT (CE)

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4/7.1.1<br>ETSI EN 301 489-1 V2.2.3/8.4<br>EN 55032:2015/A11:2020 / table A.10 |
| Test Method: | EN 55032 /annex A.3 |

### 5.2.1 LIMITS

| Frequency (MHz) | Quasi-peak（dBμV） | Average（dBμV） |
|---|---|---|
| 0.15 ~ 0.5 | 66~56 | 56~46 |
| 0.5 ~ 5 | 56 | 46 |
| 5 ~ 30 | 60 | 50 |

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

(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 ～0.5 MHz.

### 5.2.2 TEST PROCEDURES

The test method shall be in accordance with CENELEC EN 55032 [1] annex A.3 and the Artificial Mains Networks (AMNs) shall be connected to the AC mains power source.

The measurement frequency range extends from 150 kHz to 30 MHz. When the EUT is a transmitter operating at frequencies below 30 MHz, then the exclusion band for transmitters applies for measurements in the transmit mode of operation.

**(1) Procedure of Preliminary Test**

For measurement of the disturbance voltage the equipment under test (EUT) is connected to the power supply mains and any other extended network via one or more artificial network(s). A EUT, whether intended to be grounded or not, and which is to be used on a table is configured as follows:

--Either the bottom or the rear of the EUT shall be at a controlled distance of 40 cm from a reference ground plane. This ground plane is normally the wall or floor of a shielded room. It may also be a grounded metal plane of at least 2m by 2m. This is physically accomplished as follows:

1) Place the EUT on a table of non-conducting material which is at least 80 cm high. Place the EUT so that it is 40 cm from the wall of the shielded room, or
2) Place the EUT on a table of non-conducting material which is 40 cm high so that the bottom of the EUT is 40 cm above the ground plane.

-- All other conductive surfaces of the EUT shall be at least 80 cm from the reference ground plane.

-- The AANs are placed on the floor that one side of the AAN housings is 40 cm from the vertical reference ground plane and other metallic parts.

-- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 cm to 40 cm long, hanging approximately in the middle between the ground plane and the table.

-- I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.

The test mode(s) were scanned during the preliminary test. After the preliminary scan, we found the test mode producing the highest emission level. The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

**(2) Procedure of Final Test**

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

### 5.2.3 TEST SETUP

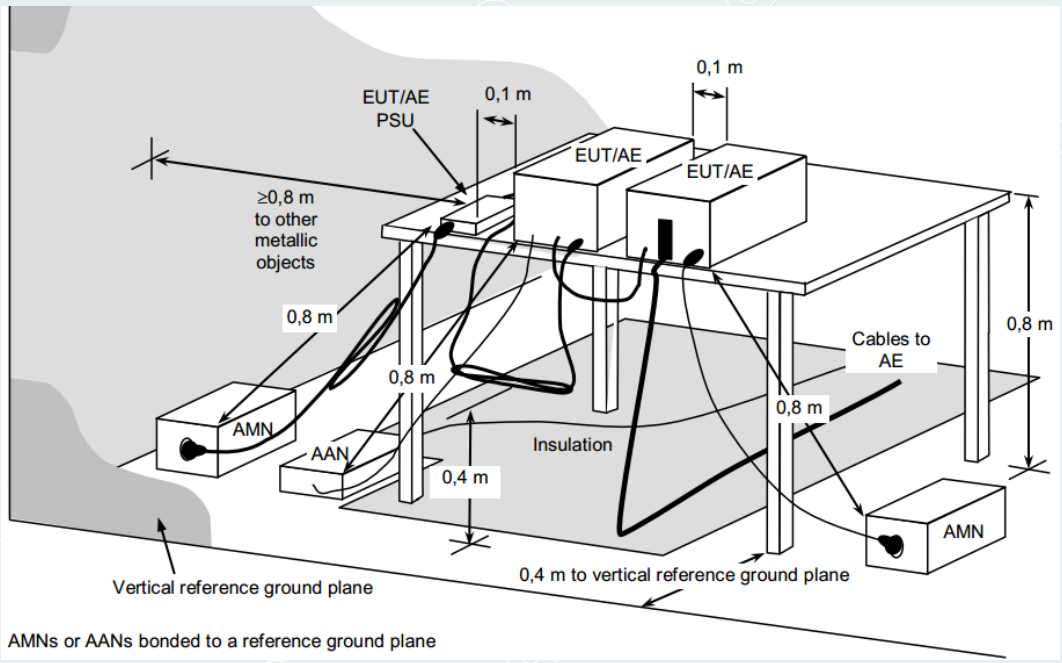


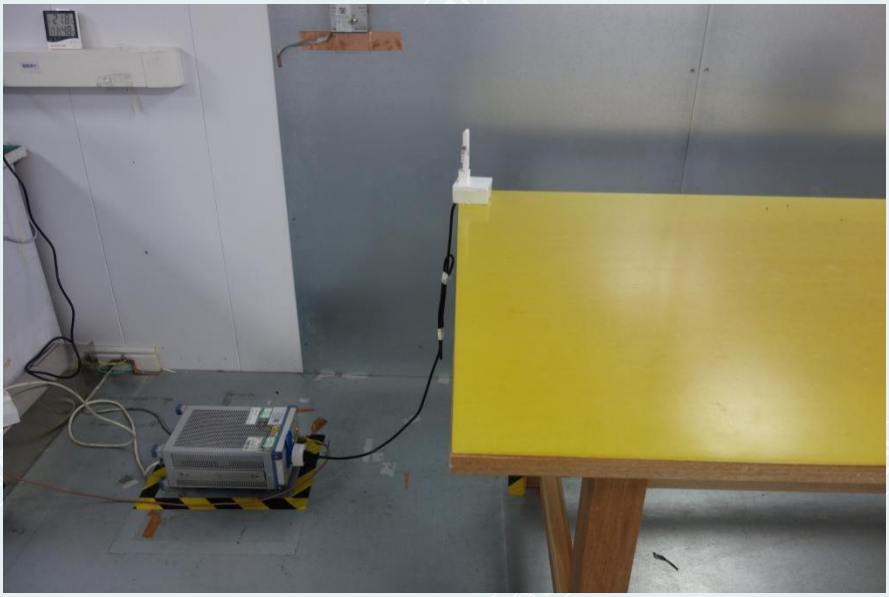

Figure 7.2-1: Test arrangement for Conducted emission measurement

### 5.2.4 DATE SAMPLE

| Frequency (MHz) | QuasiPeak Reading (dBuV) | Average Reading (dBuV) | Correction Factor (dB) | QuasiPeak Result (dBuV) | Average Result (dBuV) | QuasiPeak Limit (dBuV) | Average Limit (dBuV) | QuasiPeak Margin (dB) | Average Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| X.XXXX | 32.69 | 25.65 | 11.52 | 44.21 | 37.17 | 65.78 | 55.79 | -21.57 | -18.62 |

Factor = Insertion loss of LISN + Cable Loss
Result = Quasi-peak Reading/ Average Reading + Factor
Limit = Limit stated in standard
Margin = Result (dBuV) – Limit (dBuV)

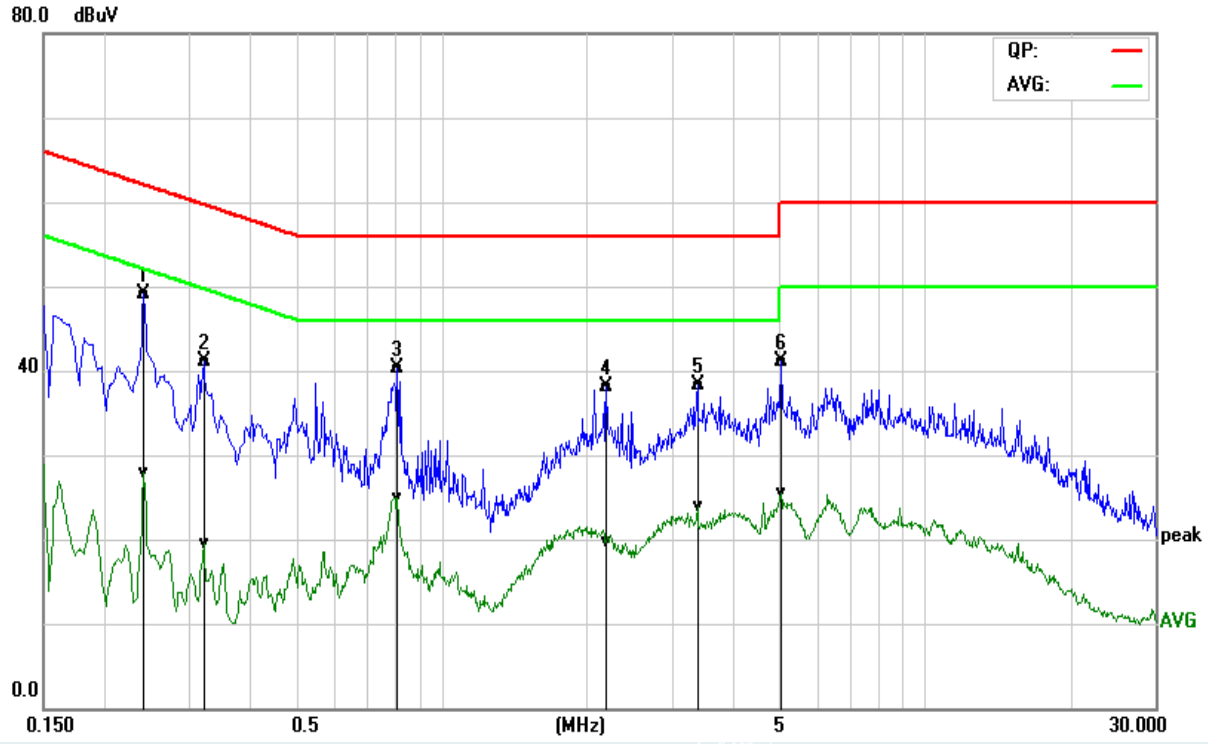
### 5.2.5 PHOTOGRAPH OF THE TEST ARRANGEMENT



### 5.2.6 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/40%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Wang Xinyuan |
| Test Date | 2021/07/13 | Sample No. | E20210414049301-0004 |

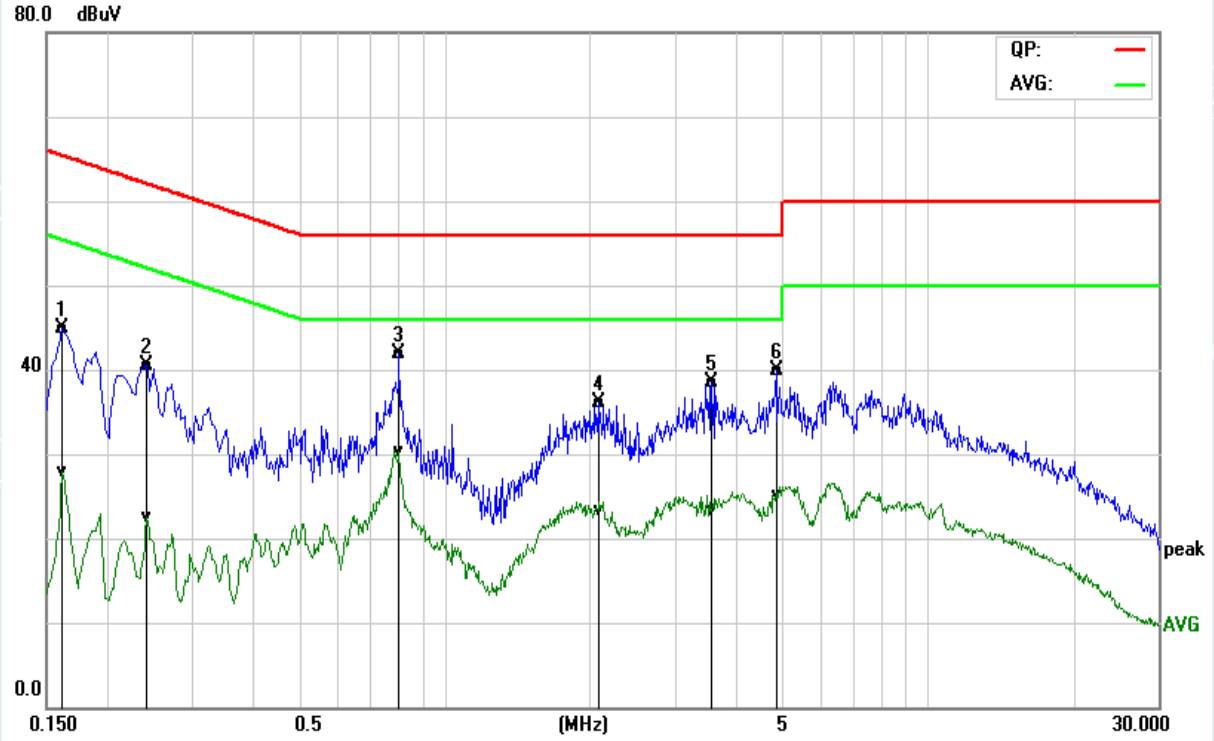
**Line: L1**




| No. | Frequency | QuasiPeak reading | Average reading | Correction factor | QuasiPeak result | Average result | QuasiPeak limit | Average limit | QuasiPeak margin | Average margin | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dBuV) | (dBuV) | (dB) | (dB) | |
| 1* | 0.2420 | 39.55 | 18.25 | 9.63 | 49.18 | 27.88 | 62.02 | 52.03 | -12.84 | -24.15 | Pass |
| 2 | 0.3220 | 31.56 | 9.94 | 9.64 | 41.20 | 19.58 | 59.65 | 49.66 | -18.45 | -30.08 | Pass |
| 3 | 0.8100 | 30.64 | 15.18 | 9.66 | 40.30 | 24.84 | 56.00 | 46.00 | -15.70 | -21.16 | Pass |
| 4 | 2.1940 | 28.37 | 9.97 | 9.66 | 38.03 | 19.63 | 56.00 | 46.00 | -17.97 | -26.37 | Pass |
| 5 | 3.3900 | 28.53 | 14.25 | 9.70 | 38.23 | 23.95 | 56.00 | 46.00 | -17.77 | -22.05 | Pass |
| 6 | 5.0460 | 31.37 | 15.68 | 9.74 | 41.11 | 25.42 | 60.00 | 50.00 | -18.89 | -24.58 | Pass |

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/40%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Wang Xinyuan |
| Test Date | 2021/07/13 | Sample No. | E20210414049301-0004 |

**Line:** **N**




| No. | Frequency | QuasiPeak reading | Average reading | Correction factor | QuasiPeak result | Average result | QuasiPeak limit | Average limit | QuasiPeak margin | Average margin | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV) | (dBuV) | (dB) | (dBuV) | (dBuV) | (dBuV) | (dBuV) | (dB) | (dB) | |
| 1 | 0.1620 | 35.36 | 18.35 | 9.60 | 44.96 | 27.95 | 65.36 | 55.36 | -20.40 | -27.41 | Pass |
| 2 | 0.2420 | 30.93 | 12.81 | 9.63 | 40.56 | 22.44 | 62.02 | 52.03 | -21.46 | -29.59 | Pass |
| 3* | 0.8059 | 32.17 | 20.67 | 9.66 | 41.83 | 30.33 | 56.00 | 46.00 | -14.17 | -15.67 | Pass |
| 4 | 2.0860 | 26.44 | 13.65 | 9.66 | 36.10 | 23.31 | 56.00 | 46.00 | -19.90 | -22.69 | Pass |
| 5 | 3.5740 | 28.90 | 13.68 | 9.69 | 38.59 | 23.37 | 56.00 | 46.00 | -17.41 | -22.63 | Pass |
| 6 | 4.8700 | 30.18 | 15.46 | 9.74 | 39.92 | 25.20 | 56.00 | 46.00 | -16.08 | -20.80 | Pass |

# 5.3 HARMONIC CURRENT

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4/7.1.1<br>ETSI EN 301 489-1 V2.2.3/8.5 |
| Test Method: | EN 61000-3-2:2019 |

## 5.3.1 LIMITS

| Limits for Class A equipment | |
|---|---|
| Harmonics Order n | Max. permissible harmonics current A |
| Odd harmonics | |
| 3 | 2.30 |
| 5 | 1.14 |
| 7 | 0.77 |
| 9 | 0.40 |
| 11 | 0.33 |
| 13 | 0.21 |
| 15<=n<=39 | 0.15x15/n |
| Even harmonics | |
| 2 | 1.08 |
| 4 | 0.43 |
| 6 | 0.30 |
| 8<=n<=40 | 0.23x8/n |

| Limits for Class D equipment | | |
|---|---|---|
| Harmonics Order n | Max. permissible harmonics current per watt mA/W | Max. permissible harmonics current A |
| Odd Harmonics only | | |
| 3 | 3.4 | 2.30 |
| 5 | 1.9 | 1.14 |
| 7 | 1.0 | 0.77 |
| 9 | 0.5 | 0.40 |
| 11 | 0.35 | 0.33 |
| 13 | 0.30 | 0.21 |
| 15<=n<=39 | 3.85/n | 0.15x15/n |
| | | |
| | | |
| | | |
| | | |
| | | |

***Note:***

1. *Class A and Class D are classified according to item 7.4.3.*
2. *According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.*

## 5.3.2 TEST PROCEDURE

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 for each successive harmonic component in turn.

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.

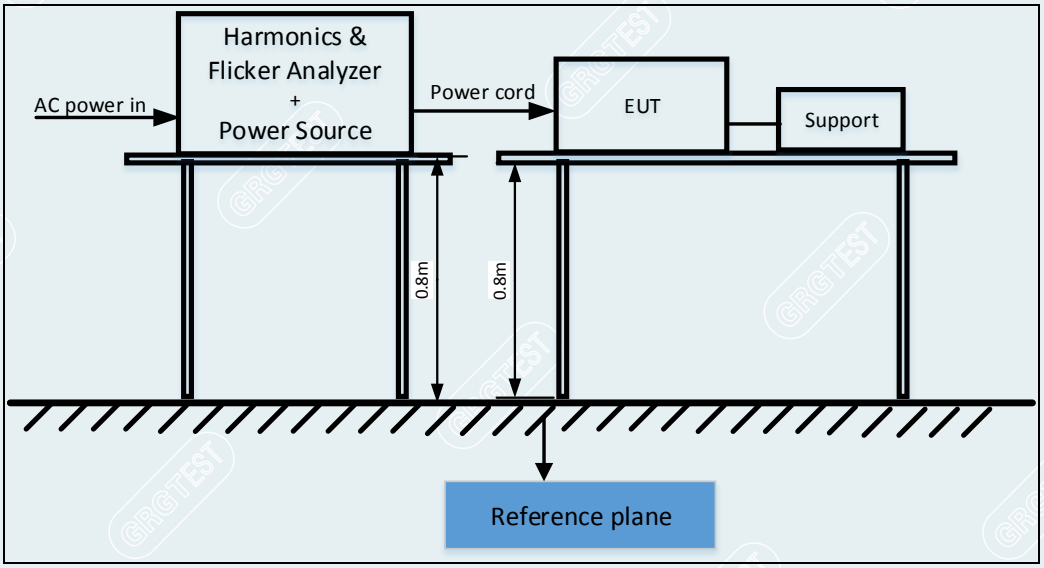
Class B: Portable tools; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

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

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.

### 5.3.3 TEST SETUP




### 5.3.4 PHOTOGRAPH OF THE TEST ARRANGEMENT

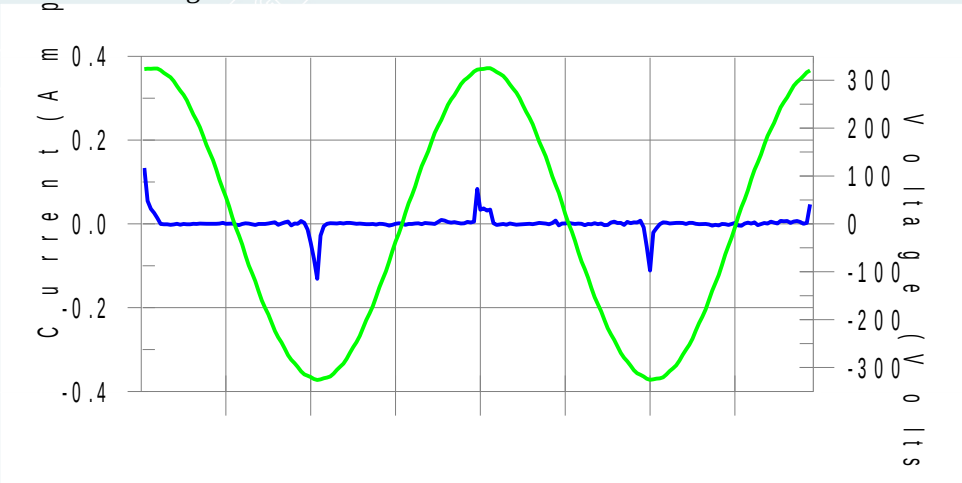
### 5.3.5 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/50%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Wang Xinyuan |
| Test Date | 2021/07/12 | Sample No. | E20210414049301-0004 |
| Test duration (min) | 2.5 | / | / |

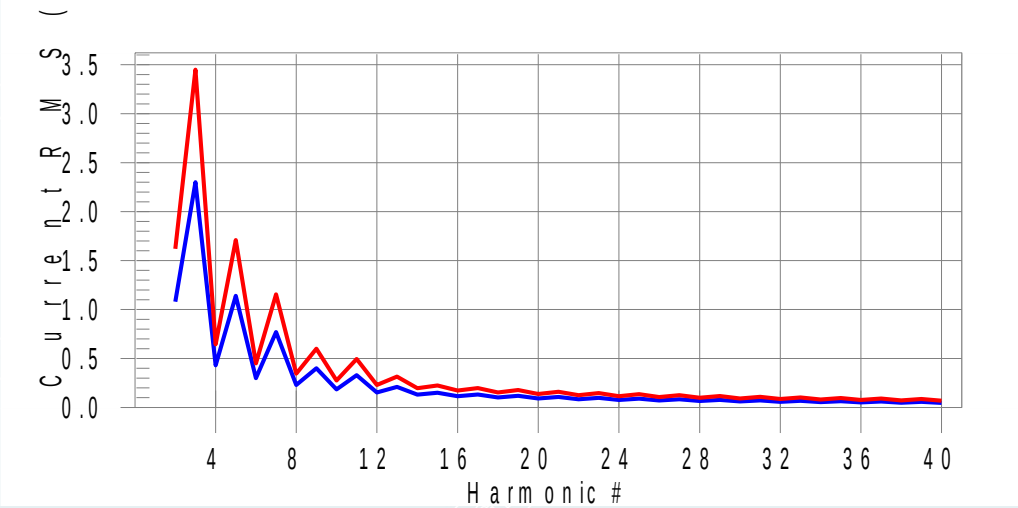
Harmonics – Class-A

EUT: Hub E1 Tested by: Zhong fu ping
Test category: Class-A per Ed. 5.0 (2018) (European limits) Test Margin: 100
Test date: 2021/07/12 Start time: 11:00:28 End time: 11:03:09
Test duration (min): 2.5 Data file name: H-000575.cts_data
Comment: HE1-G01
Test Result: Pass Source qualification: Normal

Current & voltage waveforms




Harmonics and Class A limit lineEuropean Limits




**Test result: Pass Worst harmonics H7-0.4% of 150% limit, H7-.7% of 100% limit**

# Current Test Result Summary

Test category: Class-A per Ed. 5.0 (2018) (European limits) Test Margin: 100
Test date: 2021/07/12 Start time: 11:00:28 End time: 11:03:09
Test duration (min): 2.5 Data file name: H-000575.cts_data

Test Result: Pass Source qualification: Normal
THC(A): 0.013 I-THD(%): 216.2 POHC(A): 0.002 POHC Limit(A): 0.251

Highest parameter values during test:
V_RMS (Volts):230.03 Frequency(Hz): 50.00
I_Peak (Amps):0.159 I_RMS (Amps):0.017
I_Fund (Amps):0.006 Crest Factor:9.607
Power (Watts): 1.4 Power Factor:0.377

| Harm# | Harms(avg) | 100%Limit | %of Limit | Harms(max) | 150%Limit | %of Limit | Status |
|---|---|---|---|---|---|---|---|
| 2 | 0.001 | 1.080 | N/A | 0.001 | 1.620 | N/A | Pass |
| 3 | 0.006 | 2.300 | 0.2 | 0.007 | 3.450 | 0.2 | Pass |
| 4 | 0.001 | 0.430 | N/A | 0.001 | 0.645 | N/A | Pass |
| 5 | 0.005 | 1.140 | 0.5 | 0.006 | 1.710 | 0.3 | Pass |
| 6 | 0.000 | 0.300 | N/A | 0.000 | 0.450 | N/A | Pass |
| 7 | 0.005 | 0.770 | 0.7 | 0.005 | 1.155 | 0.4 | Pass |
| 8 | 0.000 | 0.230 | N/A | 0.000 | 0.345 | N/A | Pass |
| 9 | 0.005 | 0.400 | N/A | 0.005 | 0.600 | N/A | Pass |
| 10 | 0.000 | 0.184 | N/A | 0.000 | 0.276 | N/A | Pass |
| 11 | 0.004 | 0.330 | N/A | 0.004 | 0.495 | N/A | Pass |
| 12 | 0.000 | 0.153 | N/A | 0.000 | 0.230 | N/A | Pass |
| 13 | 0.004 | 0.210 | N/A | 0.004 | 0.315 | N/A | Pass |
| 14 | 0.000 | 0.131 | N/A | 0.000 | 0.197 | N/A | Pass |
| 15 | 0.003 | 0.150 | N/A | 0.003 | 0.225 | N/A | Pass |
| 16 | 0.000 | 0.115 | N/A | 0.000 | 0.173 | N/A | Pass |
| 17 | 0.002 | 0.132 | N/A | 0.003 | 0.198 | N/A | Pass |
| 18 | 0.000 | 0.102 | N/A | 0.000 | 0.153 | N/A | Pass |
| 19 | 0.002 | 0.118 | N/A | 0.002 | 0.178 | N/A | Pass |
| 20 | 0.000 | 0.092 | N/A | 0.000 | 0.138 | N/A | Pass |
| 21 | 0.001 | 0.107 | N/A | 0.002 | 0.161 | N/A | Pass |
| 22 | 0.000 | 0.084 | N/A | 0.000 | 0.125 | N/A | Pass |
| 23 | 0.001 | 0.098 | N/A | 0.001 | 0.147 | N/A | Pass |
| 24 | 0.000 | 0.077 | N/A | 0.000 | 0.115 | N/A | Pass |
| 25 | 0.001 | 0.090 | N/A | 0.001 | 0.135 | N/A | Pass |
| 26 | 0.000 | 0.071 | N/A | 0.000 | 0.107 | N/A | Pass |
| 27 | 0.000 | 0.083 | N/A | 0.001 | 0.125 | N/A | Pass |
| 28 | 0.000 | 0.066 | N/A | 0.000 | 0.099 | N/A | Pass |
| 29 | 0.000 | 0.078 | N/A | 0.000 | 0.116 | N/A | Pass |
| 30 | 0.000 | 0.061 | N/A | 0.000 | 0.092 | N/A | Pass |
| 31 | 0.000 | 0.073 | N/A | 0.000 | 0.109 | N/A | Pass |
| 32 | 0.000 | 0.058 | N/A | 0.000 | 0.086 | N/A | Pass |
| 33 | 0.000 | 0.068 | N/A | 0.000 | 0.102 | N/A | Pass |
| 34 | 0.000 | 0.054 | N/A | 0.000 | 0.081 | N/A | Pass |
| 35 | 0.000 | 0.064 | N/A | 0.000 | 0.096 | N/A | Pass |
| 36 | 0.000 | 0.051 | N/A | 0.000 | 0.077 | N/A | Pass |
| 37 | 0.000 | 0.061 | N/A | 0.000 | 0.091 | N/A | Pass |
| 38 | 0.000 | 0.048 | N/A | 0.000 | 0.073 | N/A | Pass |
| 39 | 0.000 | 0.058 | N/A | 0.000 | 0.087 | N/A | Pass |
| 40 | 0.000 | 0.046 | N/A | 0.000 | 0.069 | N/A | Pass |

# Voltage Source Verification Data (Run time)

Test category: Class-A per Ed. 5.0 (2018) (European limits) Test Margin: 100
Test date: 2021/07/12 Start time: 11:00:28 End time: 11:03:09
Test duration (min): 2.5 Data file name: H-000575.cts_data

Test Result: Pass Source qualification: Normal

Highest parameter values during test:
Voltage (Vrms): 230.03 Frequency(Hz):50.00
I_Peak (Amps):0.159 I_RMS (Amps):0.017
I_Fund (Amps):0.006 Crest Factor:9.607
Power (Watts): 1.4 Power Factor:0.377

| Harm# | Harmonics V-rms | Limit V-rms | % of Limit | Status |
|---|---|---|---|---|
| 2 | 0.161 | 0.460 | 34.90 | OK |
| 3 | 0.466 | 2.070 | 22.53 | OK |
| 4 | 0.071 | 0.460 | 15.41 | OK |
| 5 | 0.050 | 0.920 | 5.47 | OK |
| 6 | 0.035 | 0.460 | 7.59 | OK |
| 7 | 0.021 | 0.690 | 3.02 | OK |
| 8 | 0.023 | 0.460 | 4.94 | OK |
| 9 | 0.015 | 0.460 | 3.21 | OK |
| 10 | 0.025 | 0.460 | 5.38 | OK |
| 11 | 0.014 | 0.230 | 5.97 | OK |
| 12 | 0.020 | 0.230 | 8.66 | OK |
| 13 | 0.015 | 0.230 | 6.69 | OK |
| 14 | 0.011 | 0.230 | 4.76 | OK |
| 15 | 0.008 | 0.230 | 3.29 | OK |
| 16 | 0.012 | 0.230 | 5.34 | OK |
| 17 | 0.016 | 0.230 | 7.12 | OK |
| 18 | 0.017 | 0.230 | 7.36 | OK |
| 19 | 0.008 | 0.230 | 3.50 | OK |
| 20 | 0.012 | 0.230 | 5.17 | OK |
| 21 | 0.009 | 0.230 | 4.06 | OK |
| 22 | 0.009 | 0.230 | 4.11 | OK |
| 23 | 0.008 | 0.230 | 3.51 | OK |
| 24 | 0.007 | 0.230 | 3.05 | OK |
| 25 | 0.007 | 0.230 | 3.21 | OK |
| 26 | 0.011 | 0.230 | 4.69 | OK |
| 27 | 0.007 | 0.230 | 3.25 | OK |
| 28 | 0.009 | 0.230 | 3.74 | OK |
| 29 | 0.006 | 0.230 | 2.51 | OK |
| 30 | 0.007 | 0.230 | 2.97 | OK |
| 31 | 0.005 | 0.230 | 2.17 | OK |
| 32 | 0.007 | 0.230 | 2.87 | OK |
| 33 | 0.006 | 0.230 | 2.41 | OK |
| 34 | 0.004 | 0.230 | 1.53 | OK |
| 35 | 0.003 | 0.230 | 1.14 | OK |
| 36 | 0.004 | 0.230 | 1.59 | OK |
| 37 | 0.004 | 0.230 | 1.92 | OK |
| 38 | 0.003 | 0.230 | 1.39 | OK |
| 39 | 0.004 | 0.230 | 1.68 | OK |
| 40 | 0.006 | 0.230 | 2.41 | OK |

# 5.4 VOLTAGE FLUCTUATIONS AND FLICKER

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4/7.1.1<br>ETSI EN 301 489-1 V2.2.3/8.6 |
| Test Method: | EN 61000-3-3:2013 |

## 5.4.1 LIMITS

| Test Item | Limit | Remark |
|---|---|---|
| $P_{st}$ | 1.0 | $P_{st}$ means short-term flicker indicator. |
| $P_{lt}$ | 0.65 | $P_{lt}$ means long-term flicker indicator. |
| $T_{dt}$ (ms) | 500 | $T_{dt}$ means maximum time that dt exceeds 3 %. |
| $d_{max}$ (%) | 4% | $d_{max}$ means maximum relative voltage change. |
| dc (%) | 3.3% | dc means relative steady-state voltage change |

## 5.4.2 TEST PROCEDURES

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.

During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

### 5.4.3 TEST SETUP

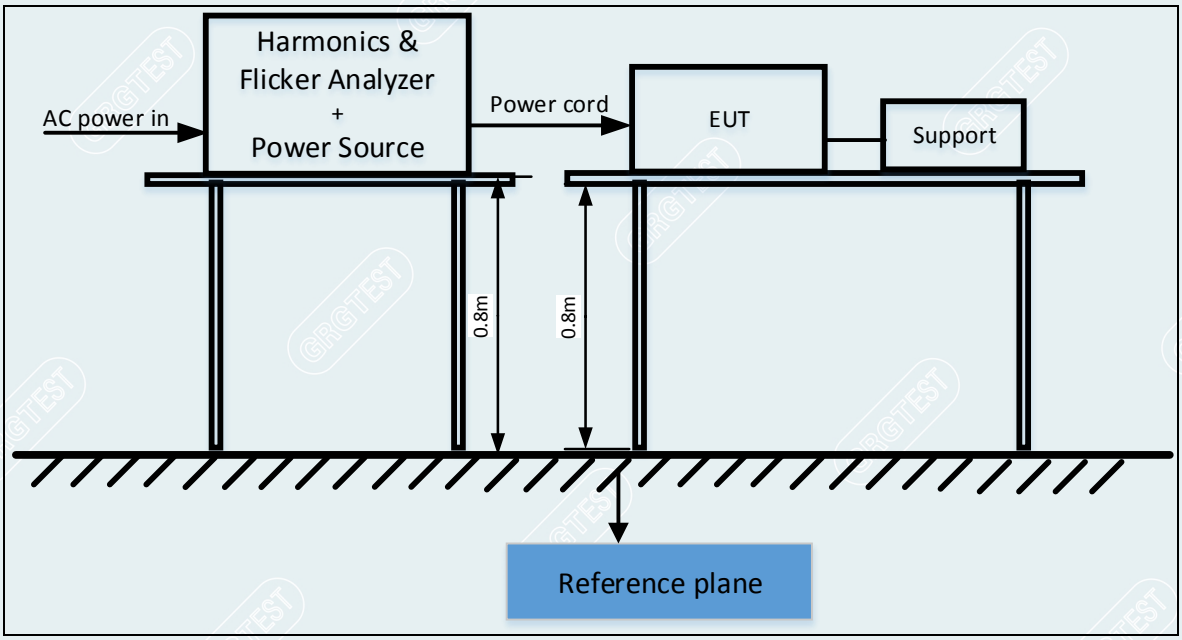



Figure 7.4-1: Test arrangement for Voltage fluctuations and flicker measurement.

### 5.4.4 PHOTOGRAPH OF THE TEST ARRANGEMENT

### 5.4.5 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/50%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50HZ | Tested By | Wang Xinyuan |
| Test Date | 2021/07/12 | Sample No. | E20210414049301-0004 |
| Test duration (min) | 10 | / | / |

Test category: All parameters (European limits) Test Margin: 100
Test duration (min): 10 Data file name: F-000577.cts_data
Test Result: Pass Status: Test Completed
$Pst_i$ and limit line European Limits


Plt and limit line


Parameter values recorded during the test:
Vrms at the end of test (Volt): 229.89
T-max (mS): 0 Test limit (mS): 500.0 Pass
Highest dc (%): 0.00 Test limit (%): 3.30 Pass
Highest dmax (%): 0.00 Test limit (%): 4.00 Pass
Highest Pst (10 min. period): 0.064 Test limit: 1.000 Pass
Highest Plt (2 hr. period): 0.028 Test limit: 0.650 Pass

# 6 IMMUNITY TEST

## 6.1 GENERAL DESCRIPTION

| EMC Immunity | | | | | |
|---|---|---|---|---|---|
| ETSI EN 301 489-17 V3.2.4 &ETSI EN 301 489-1 V2.2.3&EN 55035:2017 | | | | | |
| Item | Application port | Basic Standard | Test method | Performance Criterion | Result |
| Electrostatic discharge (ESD) | Enclosure port | ETSI EN 301 489-17 V3.2.4 /7.2.1<br>ETSI EN 301 489-1 V2.2.3/9.3<br>EN 55035:2017 Table 1 | EN 61000-4-2 | Test specification:<br>±2 kV , ±4 kV, ±8kV air discharge<br>±2 kV , ±4 kV Contact discharge<br>Performance : Criteria B | PASS |
| Radiated radio-frequency electromagnetic (RS) | Enclosure port | ETSI EN 301 489-17 V3.2.4 /7.2<br>ETSI EN 301 489-1 V2.2.3/9.2 | EN 61000-4-3 | Test specification:<br>Test level:<br>For the frequency range 80MHz to 1000MHz , 1000MHzto 2700MHz and 2700MHz to 6000MHz, test level shall be 3 V/m, 80% AM(1000MHz)<br>Performance: Criteria A | PASS |
| Radiated radio-frequency electromagnetic (RS) | Enclosure port | EN 55035:2017 Table 1 | EN 61000-4-3 | Test specification:<br>Test level:<br>For the frequency range 80MHz to 1000MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz test level shall be 3 V/m, 80% AM(1000MHz)<br>Performance: Criteria A | PASS |
| Electrical fast transients(EFT) | AC mains power input port/signal ports | EN 301 489-17 V3.2.2 /7.2.1<br>EN 301 489-1 V2.2.3 /9.4<br>EN 55035:2017 Table 4 | EN 61000-4-4 | Test specification:<br>AC power Port: ±1kV, repetition rate: 5 kHz<br>Performance: Criteria B | PASS |
| Surge | AC mains power input port | EN 301 489-17 V3.2.2 /7.2<br>EN 301 489-1 V2.2.3 /9.8 | EN 61000-4-5 | Test specification:<br>AC Power Port:<br>1.2/50 us pulse<br>line to line: ±1 kV;<br>Performance : Criteria B | PASS |
| Surge | AC mains power input port | EN 55035:2017 Table 4 | EN 61000-4-5 | Test specification:<br>AC Power Port:<br>1.2/50 us pulse<br>line to line: ±1 kV;<br>Performance : Criteria B | PASS |

| | | | | | |
|---|---|---|---|---|---|
| Radio frequency continuous conducted(CS) | AC mains power input port | EN 301 489-17 V3.2.2 /7.2<br>EN 301 489-1 V2.2.3 /9.5 | EN 61000-4-6 | Test specification:<br>AC power port<br>0.15~80 MHz, 3Vrms, 80% AM, 1kHz<br>Performance: Criteria A | PASS |
| Radio frequency continuous conducted(CS) | AC mains power input port | EN 55035:2017 Table 4 | EN 61000-4-6 | Test specification:<br>AC power port<br>0.15~10 MHz, 3Vrms, 80% AM, 1kHz<br>10MHz ~ 30MHz, 3-1Vrms, 80% AM, 1kHz<br>30MHz ~ 80MHz, 1Vrms, 80% AM, 1kHz<br>Performance: Criteria A | PASS |
| Power frequency magnetic field(PFMF) | Enclosure ports | EN 55035:2017 Table 1 | IEC 61000-4-8 | 1A/m<br>50Hz and 60Hz<br>Performance Criterion A | PASS |
| Voltage Dips & Short Interruptions | AC mains power input port | EN 301 489-17 V3.2.2 /7.2<br>EN 301 489-1 V2.2.3 /9.7 | EN 61000-4-11 | Test specification:<br>1. Voltage dips:<br>i)0% residual voltage 0.5 cycle.<br>Performance: Criteria B;<br>ii) 0% residual voltage 1 cycle,<br>Performance: Criteria B;<br>iii)70% residual voltage 25 cycle.<br>Performance: Criteria B;<br>2. Voltage interruption:<br>0% residual voltage during 250 cycles.<br>Performance: Criteria C; | PASS |
| Voltage Dips & Short Interruptions | AC mains power input port | EN 55035:2017 Table 4 | EN 61000-4-11 | Test specification:<br>1. Voltage dips:<br>i)0% residual voltage 0.5 cycle.<br>Performance: Criteria B;<br><br>ii) 70% residual voltage 25 cycle for 50Hz,<br>Performance: Criteria C;<br><br>2. Voltage interruption:<br>0% residual voltage during 250 cycles for 50Hz.<br>Performance: Criteria C; | PASS |

# 6.2 GENERAL PERFORMANCE CRITERIA DESCRIPTION (ETSI EN 301 489-1/17)

## 6.2.1 GENERAL PERFORMANCE CRITERIA

The performance criteria are:

- Performance criteria A for immunity tests with phenomena of a continuous nature;
- Performance criteria B for immunity tests with phenomena of a transient nature;
- Performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

**Performance table**

| Criteria | During Test | After test (i.e. as a result of the application of the test) |
|---|---|---|
| A | Shall operate as intended.<br>(See note).<br>Shall be no loss of function.<br>Shall be no unintentional transmissions. | Shall operate as intended.<br>Shall be no degradation of performance.<br>Shall be no loss of function.<br>Shall be no loss of critical stored data. |
| B | May be loss of function. | Functions shall be self-recoverable.<br>Shall operate as intended after recovering.<br>Shall be no loss of critical stored data. |
| C | May be loss of function. | Functions shall be recoverable by the operator.<br>Shall operate as intended after recovering.<br>Shall be no loss of critical stored data. |
| NOTE:Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2. | | |

**6.2.2.Minimum performance level**

For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to10 %.

For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wirelesstransmission function needed for the intended use of the equipment.

**6.3 Performance criteria for Continuous phenomena**

The performance criteria A shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.

**6.4 Performance criteria for Transient phenomena**

The performance criteria B shall apply, except for voltage dips greater than or equal to 100 ms and voltage interruptionsof 5 000 ms duration, for which performance criteria C shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as a result of the applicationof the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as a result of the applicationof the test.

## 6.3 GENERAL PERFORMANCE CRITERIA DESCRIPTION (EN 55035)

### 6.3.1 GENERAL PERFORMANCE CRITERIA

**Performance criterion A**

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.

**Performance criterion B**

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.

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.

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.

**Performance criterion C**

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.

Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

# 6.4 ELECTROSTATIC DISCHARGE(ESD)

## 6.4.1 TEST SPECIFICATION

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4 /7.2.1<br>ETSI EN 301 489-1 V2.2.3/9.3<br>EN 55035:2017 Table 1 |
| Test Method: | EN 61000-4-2:2009 |
| Discharge Impedance: | 330 ohm / 150 pF |
| Discharge Voltage: | Air Discharge : ±2 kV , ±4 kV, ±8 kV;<br>Contact Discharge: ±2 kV , ±4 kV |
| Polarity: | Positive & Negative |
| Number of Discharge: | Minimum 10 times at each test point |
| Discharge Mode: | Single Discharge<br>1 second minimum |

## 6.4.2 TEST PROCEDURE

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

(1) The EUT was located 0.1 m minimum from all side of the HCP (dimensions 1.6m * 0.8m).

(2) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.

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

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

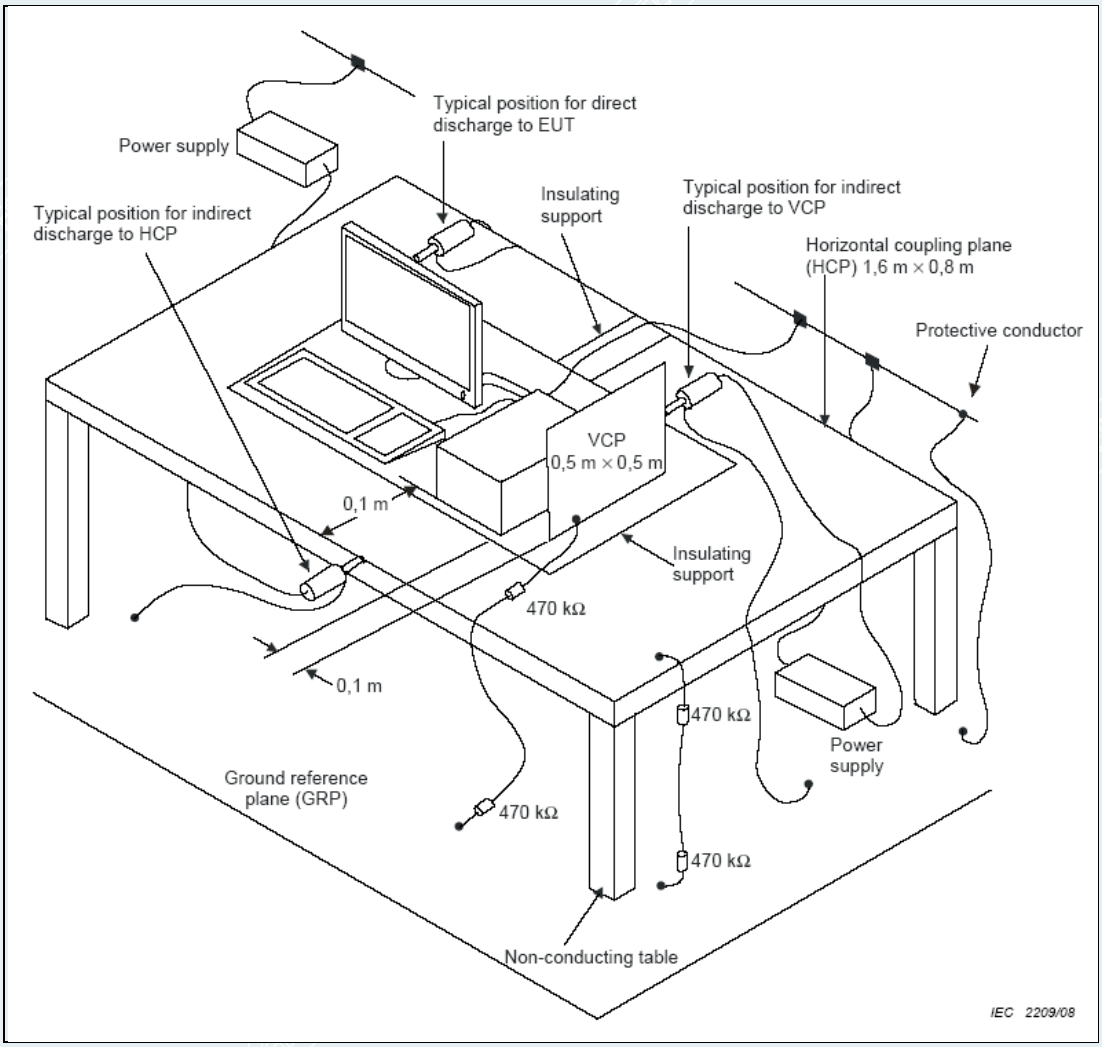
(5) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test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

(6) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each HCP opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the HCP and perpendicular to its front edge during the discharge.

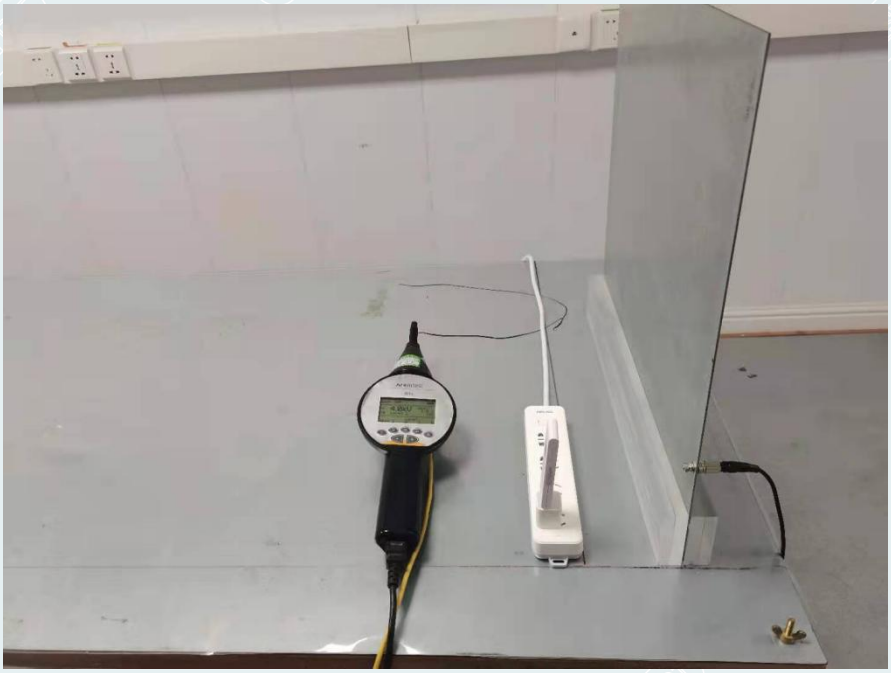
(7) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane (VCP) in sufficiently different positions that the

four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m * 0.5m) was placed vertically to and 0.1 meters from the EUT.

### 6.4.3 TEST SETUP



### 6.4.4 PHOTOGRAPH OF THE TEST ARRANGEMENT



### 6.4.5 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 25℃/48%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Zhong FuPing |
| Test Date | 2021/07/14 | Sample No. | E20210414049301-0004 |

| Discharge point | Discharge voltage | Number of discharges | C- Conduct A-Air | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| Vertical coupling | ±2kV, ±4kV | Each 10 times | C | B | A [1)] | Pass |
| Horizontal coupling | ±2kV, ±4kV | Each 10 times | C | B | A [1)] | Pass |
| Indicator light | ±2kV, ±4kV, ±8kV | Each 10 times | A | B | A [1)] | Pass |
| USB Port | ±2kV, ±4kV, ±8kV | Each 10 times | A | B | A [1)] | Pass |
| Gap | ±2kV, ±4kV, ±8kV | Each 10 times | A | B | A [1)] | Pass |
| **Note:** [1)] The EUT was normal, with normal function and normal wireless connectionbefore, during and after the test. | | | | | | |

# 6.5 RADIATED RADIO-FREQUENCY ELECTROMAGNETIC FIELD (RS)

## 6.5.1 TEST SPECIFICATION

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4 /7.2<br>ETSI EN 301 489-1 V2.2.3/9.2<br>EN 55035:2017 Table 1 |
| Test Method: | EN 61000-4-3:2006+A1:2008+A2:2010 |
| Frequency Range: | EN 55035:2017:<br>80MHz~1000MHz,1800MHz, 2600MHz, 3500MHz, 5000MHz<br>ETSI EN 301 489-17&ETSI EN 301 489-1:<br>80MHz~1000MHz, 1000MHz~2700MHz, 2700MHz~6000MHz |
| Field Strength: | 3 V/m |
| Modulation: | 1kHz Sine Wave, 80%, AM Modulation |
| Polarity of Antenna: | Horizontal and Vertical |
| Test Distance: | 3 m |
| Antenna Height: | 1.55m |

## 6.5.2 TEST PROCEDURE

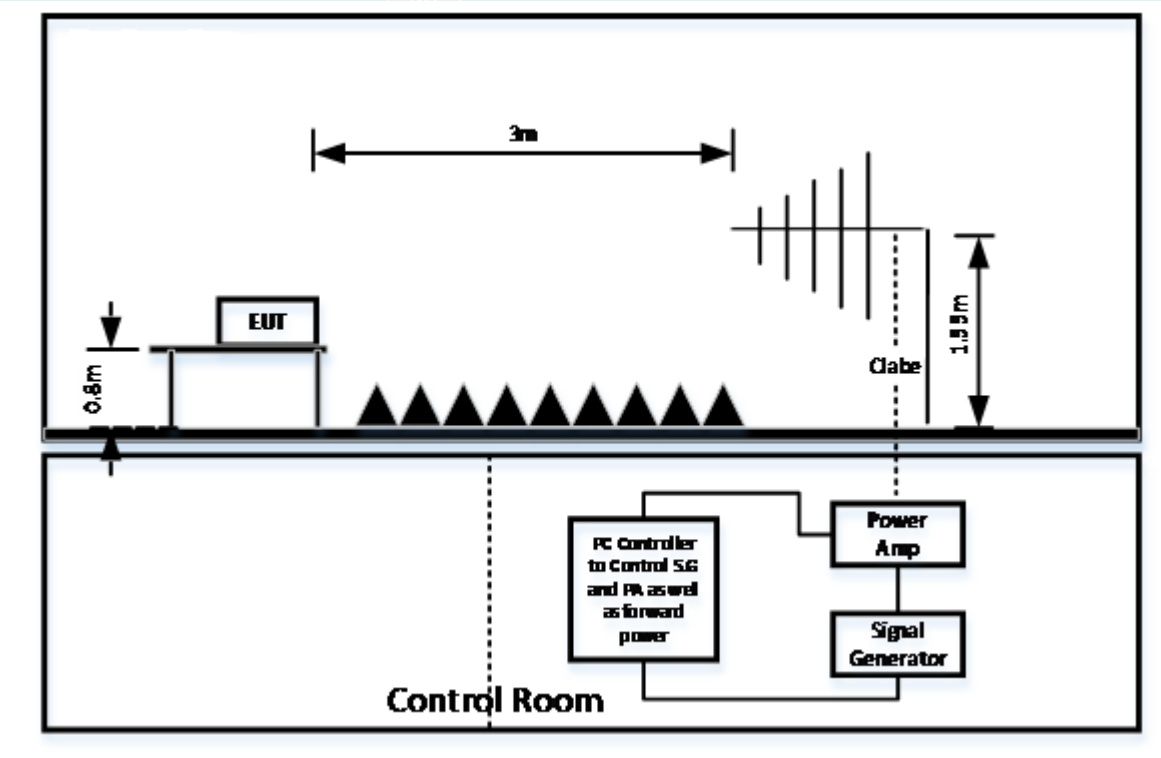
(1) The testing is performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

(2) The frequency range is swept from 80 MHz ~6000 MHz, 1800MHz, 2600MHz, 3500MHz, 5000MHz,with the signal 80% amplitude modulated with a 1 kHz sine-wave. The rate of sweep did not exceed 1.5×10-3 decade/s, where the frequency range is swept incrementally; the step size is 1% of preceding frequency value.

(3) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

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

### 6.5.3 TEST SETUP




**NOTE:**

**(1) Table-top equipment**

The EUT installed in a representative system as described in section 7 of IEC 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.

**(2) Floor-standing equipment**

The EUT installed in a representative system as described in section 7 of IEC 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.

Note: the EUT is a Table-top equipment.

**Note: the EUT is a table-top equipment.**

### 6.5.4 PHOTOGRAPH OF THE TEST ARRANGEMENT

80MHz~1000MHz

1000MHz~6000MHz

### 6.5.5 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 24.7℃/44%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Zhong FuPing |
| Test Date | 2021/07/13 | Sample No. | E20210414049301-0004 |

| Frequency (MHz) | Field strength (V/m) | EUT orientation | Antenna polarization | Required criterion | Actual performance | Result |
|---|---|---|---|---|---|---|
| 80MHz~1000MHz | 3 | Front | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Left | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Right | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Rear | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| 1000MHz MHz~2700MHz | 3 | Front | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Left | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Right | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Rear | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| 2700MHz MHz~6000MHz | 3 | Front | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Left | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Right | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |
| | | Rear | H | Criterion A | Criterion A [1)] | pass |
| | | | V | Criterion A | Criterion A [1)] | pass |

NOTE: [1)]Before test, during the test, and after test, the EUT function is normal, ping link no interrupt,The RF frequency 2280~2603.5MHz is exempted as required by the standards. When the test frequency 2412MHz, the Per is 1.1%.

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 24.7℃/44%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Zhong FuPing |
| Test Date | 2021/07/13 | Sample No. | E20210414049301-0004 |

| Frequency (MHz) | Field Strength (V/m) | Polarity | Azimuth | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| 80 ~1000 MHz | 3V/m | V&H | Front | A | A [1)] | Pass |
| | | V&H | Left | A | A [1)] | Pass |
| | | V&H | Right | A | A [1)] | Pass |
| | | V&H | Rear | A | A [1)] | Pass |
| 1800 MHz | 3V/m | V&H | Front | A | A [1)] | Pass |
| | | V&H | Left | A | A [1)] | Pass |
| | | V&H | Right | A | A [1)] | Pass |
| | | V&H | Rear | A | A [1)] | Pass |
| 2600 MHz | 3V/m | V&H | Front | A | A [1)] | Pass |
| | | V&H | Left | A | A [1)] | Pass |
| | | V&H | Right | A | A [1)] | Pass |
| | | V&H | Rear | A | A [1)] | Pass |
| 3500 MHz | 3V/m | V&H | Front | A | A [1)] | Pass |
| | | V&H | Left | A | A [1)] | Pass |
| | | V&H | Right | A | A [1)] | Pass |
| | | V&H | Rear | A | A [1)] | Pass |
| 5000 MHz | 3V/m | V&H | Front | A | A [1)] | Pass |
| | | V&H | Left | A | A [1)] | Pass |
| | | V&H | Right | A | A [1)] | Pass |
| | | V&H | Rear | A | A [1)] | Pass |

**NOTE:** [1)]Before test, during test and after test, the EUT can work normally, the functions, WIFI with ping is normal, The RF frequency 2280~2603.5MHz is exempted as required by the standards.

# 6.6 ELECTRICAL FAST TRANSIENTS (EFT)

## 6.6.1 TEST SPECIFICATION

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4 /7.2.1<br>ETSI EN 301 489-1 V2.2.3/9.4<br>EN 55035:2017 Table 4 |
| Test Method: | EN 61000-4-4:2012 |
| Test Voltage: | AC power Port: ±1kV |
| Polarity: | Positive and Negative |
| Impulse Frequency: | 5 kHz |
| Impulse Wave-shape: | 5 ns/50ns for voltage |
| Burst Duration: | 15 ms |
| Burst Period: | 300 ms |
| Test Duration: | 1 minute |

## 6.6.2 TEST PROCEDURE

(1) EUTs, whether stationary floor-mounted or table top, and equipment designed to be mounted in other configurations, shall be placed on a ground reference plane and shall be insulated from it by an insulating support 0.1 m ±0.01 m thick. The test generator and the coupling/ decoupling network shall be placed directly on, and bonded to, the ground reference plane.

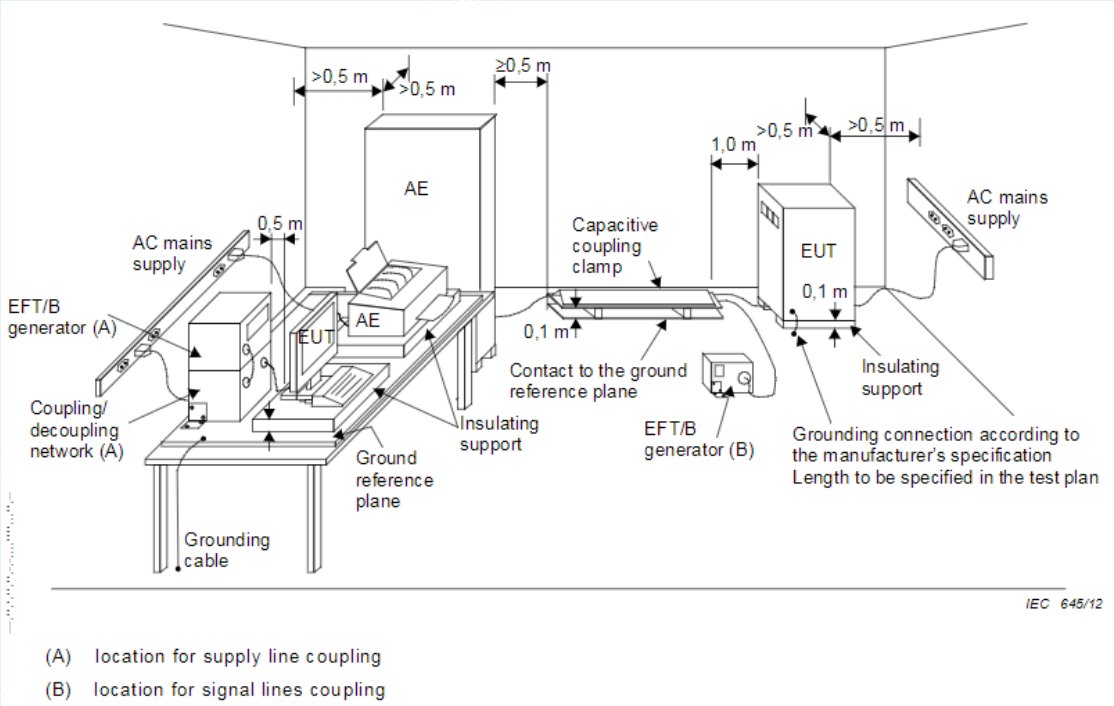
(2) The minimum distance between the EUT and all other conductive structures (e.g. the walls of a shielded room), except the ground reference plane shall be more than 0.5 m. If the manufacturer provides a non-detachable supply cable more than 0.5 m ±0.05 m long with the equipment, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0,1 m above the ground reference plane.

(3) For input and AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test can't less than 1min.

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

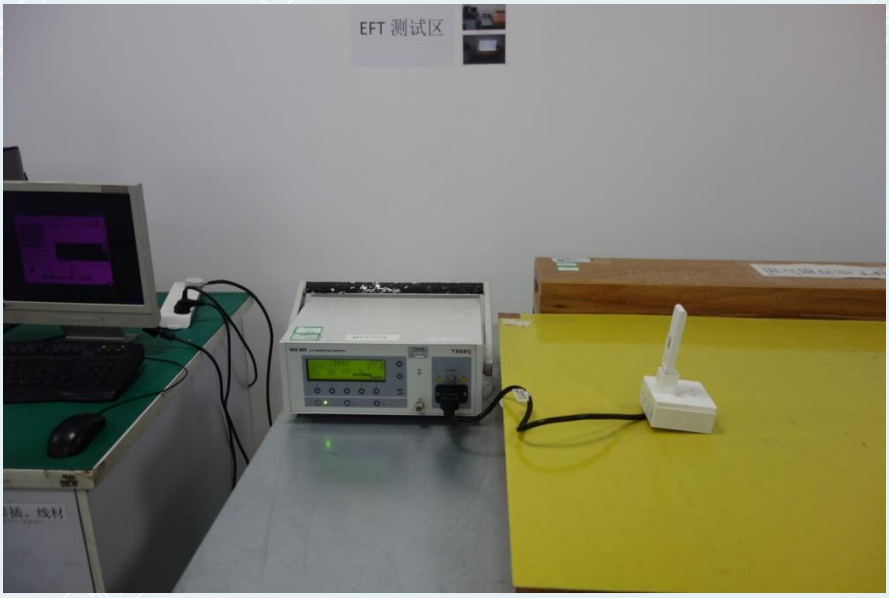
### 6.6.3 TEST SETUP




(A) location for supply line coupling

(B) location for signal lines coupling

### 6.6.4 PHOTOGRAPH OF THE TEST ARRANGEMENT



### 6.6.5 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/50%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Zhong Fuping |
| Test Date | 2021/07/12 | Sample No. | E20210414049301-0004 |

| Test Point | Test Level(kV) | Inject method | Impulse Frequency | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| L | ±1 | Direct | 5kHz | B | A [1)] | PASS |
| N | ±1 | Direct | 5kHz | B | A [1)] | PASS |
| L-N | ±1 | Direct | 5kHz | B | A [1)] | PASS |

**Note:** [1)] Before test, during test and after test, the EUT can work normally, the functions, WIFI with ping is normal.

# 6.7 SURGES

## 6.7.1 TEST SPECIFICATION

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4 /7.2<br>ETSI EN 301 489-1 V2.2.3/9.8<br>EN 55035:2017 Table 4 |
| Test Method: | EN 61000-4-5: 2014+ A1:2017<br>EN 61000-4-5: 2014 |
| Wave-Shape: | AC power supply port: Combination Wave<br>1.2/50 μs Open Circuit Voltage |
| Test Voltage: | AC Port: line to line: ±1 kV<br>Performance Criterion B |
| Generator Source Impedance: | AC power supply port: Line to line 2ohm, Line to PE12ohm |
| Polarity: | Positive and Negative |
| Phase Angle: | ETSI EN 301 489-17/ETSI EN 301 489-1:<br>0 °, 90 °, 180 °, 270 °<br>EN 55035: +90 °, -270 ° |
| Pulse Repetition Rate: | 1 minute |
| Number of tests: | 5 positive and 5 negative at the selected points |

## 6.7.2 TEST PROCEDURE

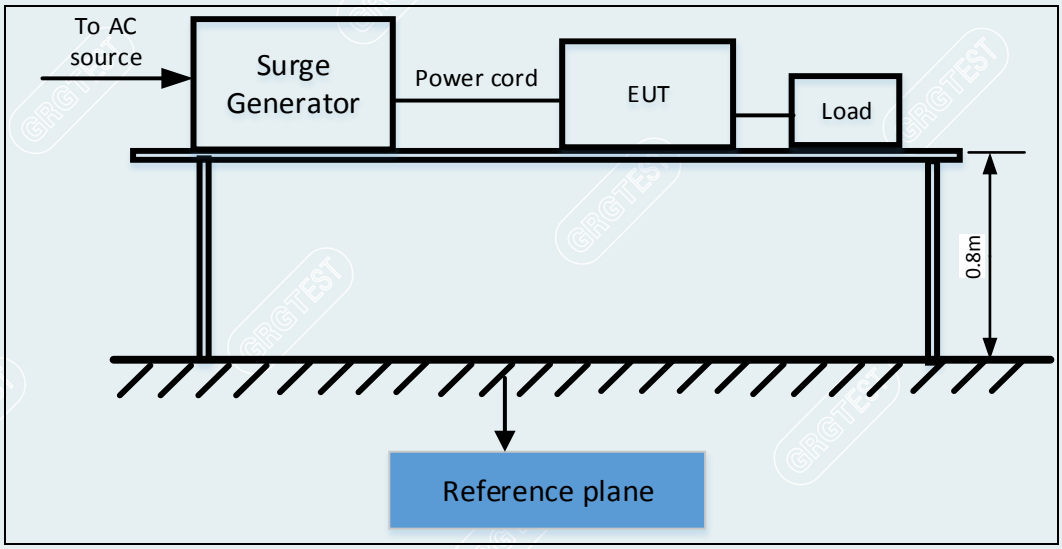
(1) For EUT power supply:

The surge is 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 was shorter than 2 meters in length.

(2) For test applied to unshielded un-symmetrically operated interconnection lines of EUT: The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

(3) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT: The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestors were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

### 6.7.3 TEST SETUP



## 6.7.4 PHOTOGRAPH OF THE TEST ARRANGEMENT

### 6.7.5 TEST RESULTS

| | | | |
|---|---|---|---|
| Environmental Conditions | 25.8℃/51%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Wang Xinyuan |
| Test Date | 2021/07/13 | Sample No. | E20210414049301-0004 |

| Test port | Polarity | Test Level | Phase | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| AC power (L-N) | +/- | 1kV | 0 ° | Criterion B | Criterion A [1)] | PASS |
| | +/- | 1kV | 90 ° | Criterion B | Criterion A [1)] | PASS |
| | +/- | 1kV | 180 ° | Criterion B | Criterion A [1)] | PASS |
| | +/- | 1kV | 270 ° | Criterion B | Criterion A [1)] | PASS |
| NOTE: [1)] Before test, during the test, and after test, the EUT function is normal, ping link no interrupt. | | | | | | |

| | | | |
|---|---|---|---|
| EUT Name | Hub E1 | Model | HE1-G01 |
| Environmental Conditions | 25.8℃/51%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Wang Xinyuan |
| Test Date | 2021/07/13 | Sample No. | E20210414049301-0004 |

| Test Point | Polarity | Phase Angle (°) | Number of Tests | Test Level | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|---|
| AC power (L-N) | + | 90 | Each 5 times | 1kV | B | A[1)] | PASS |
| | - | 270 | Each 5 times | 1kV | B | A[1)] | PASS |
| **Note:**[1)] Before test, during test and after test, the EUT can work normally, the functions, WIFI with ping is normal. | | | | | | | |

# 6.8 RADIO FREQUENCY CONTINUOUS CONDUCTED (CS)

## 6.8.1 TEST SPECIFICATION

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4 /7.2<br>ETSI EN 301 489-1 V2.2.3/9.5<br>EN 55035:2017 Table 4 |
| Test Method: | EN 61000-4-6:2014 |
| Frequency Range: | 0.15 MHz~80 MHz |
| Field Strength: | ETSI EN 301 489-17&ETSI EN 301 489-1:<br>3V (r.m.s), 80%, 1kHz<br>EN 55035:<br>0.15~10 MHz, 3Vrms, 80% AM, 1kHz<br>10MHz ~ 30MHz, 3-1Vrms, 80% AM, 1kHz<br>30MHz ~ 80MHz, 1Vrms, 80% AM, 1kHz |
| Modulation: | 1 kHz, 80% AM |
| Frequency Step: | 1% of the preceding frequency value |
| Dwell Time: | 2s |

## 6.8.2 TEST PROCEDURE

(1) Set up the EUT, CDN and Injection clamp as shown on Section 8.5.3

(2) Let the EUT work in test mode and measure it.

(3) The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).

(4) The disturbance signal described below is injected to EUT through CDN.

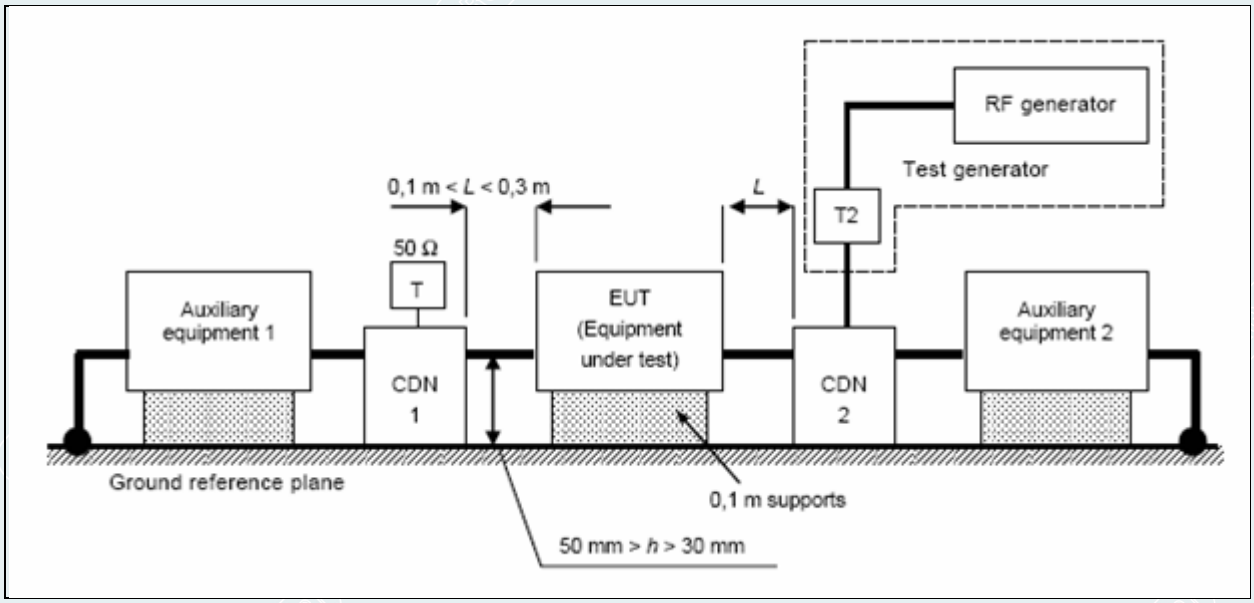
(5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.

(6) The frequency range is swept from 150 kHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave.

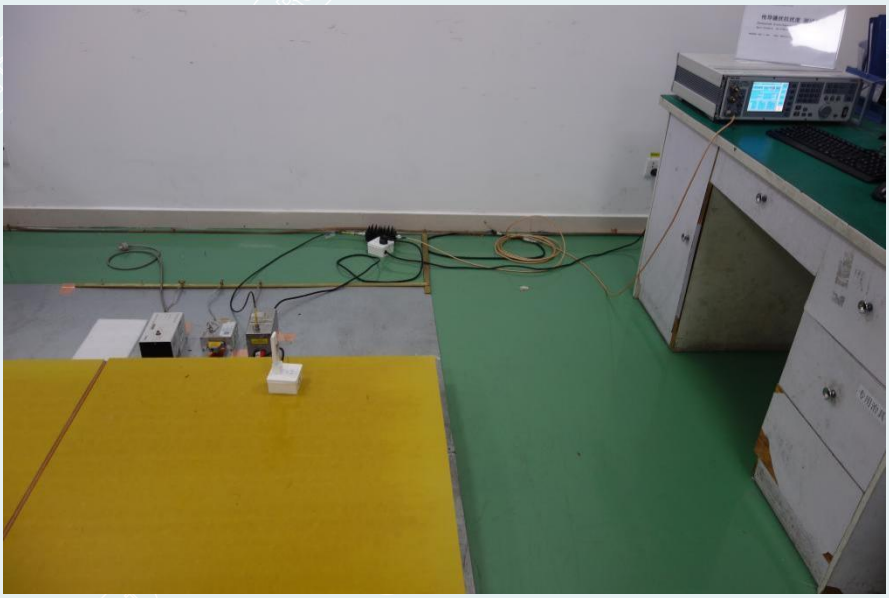
(7) The rate of sweep shall not exceed 1.5×10-3decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.

(8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

### 6.8.3 TEST SETUP



### 6.8.4 PHOTOGRAPH OF THE TEST ARRANGEMENT



### 6.8.5 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 24.7℃/44%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Zhong FuPing |
| Test Date | 2021/07/13 | Sample No. | E20210414049301-0004 |

| Test Point | Frequency Range (MHz) | Injection Method | Field Strength (V.rms) | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| AC Input Port | 0.15 ~ 80 | CDN | 3 | A | A [1)] | PASS |
| **Note:**[1)] Before test, during test and after test, the EUT can work normally, the functions, WIFI with ping is normal. | | | | | | |

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/50%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Zhong Fuping |
| Test Date | 2021/07/12 | Sample No. | E20210414049301-0004 |

| Test Point | Frequency Range (MHz) | Injection Method | Field Strength (V.rms) | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| AC Input Port | 0.15 ~ 10 | CDN | 3 | A | A [1)] | PASS |
| AC Input Port | 10 ~ 30 | CDN | 3 to 1 | A | A [1)] | PASS |
| AC Input Port | 30 ~ 80 | CDN | 1 | A | A [1)] | PASS |
| **Note:**[1)] Before test, during test and after test, the EUT can work normally, the functions, WIFI with ping is normal. | | | | | | |

# 6.9 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

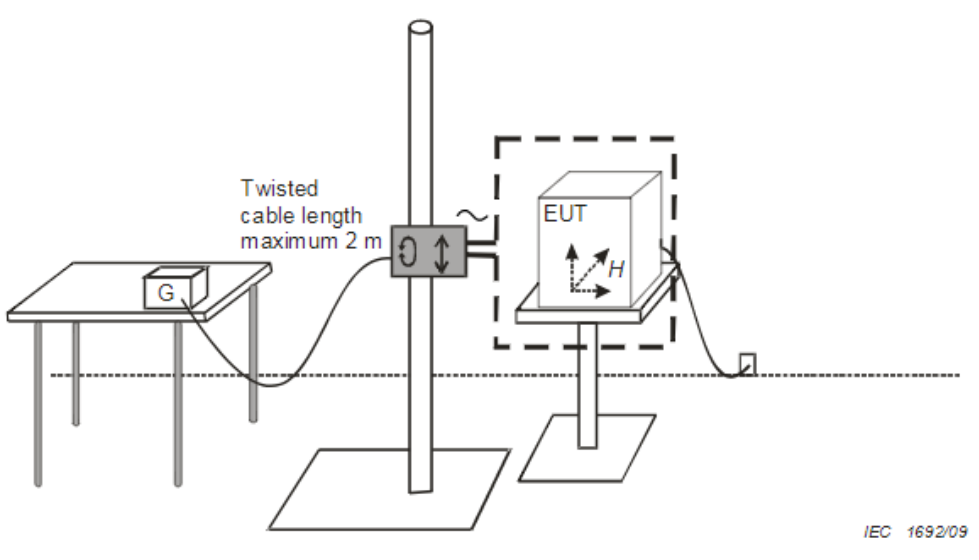
## 6.9.1 TEST SPECIFICATION

| | |
|---|---|
| Test Requirement | EN 55035:2017 |
| Test Method | IEC 61000-4-8:2009 |
| Frequency | 50Hz and 60Hz |
| Field Strength | 1 A/m |
| Observation Time | 5 min |
| Inductance Coil | Rectangular type, 1mx1m |
| Direction | X-axis, Y -axis, Z -axis |

## 6.9.2 TEST PROCEDURE

a) The equipment is configured and connected to satisfy its functional requirements. It shall be placed on the GRP with the interposition of a 0.1m-thick insulating support.
b) The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
c) The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
d) The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

### 6.9.3 TEST SETUP




### 6.9.4 PHOTOGRAPH OF THE TEST ARRANGEMENT

### 6.9.5 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/50%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50HZ | Tested By | Wang Xinyuan |
| Test Date | 2021/07/12 | Sample No. | E20210414049301-0004 |

| Field Strength (A/m) | Frequency (Hz) | Observation Time （min） | Direction | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| 1 | 50 | 5 | X | A | A[1)] | PASS |
| 1 | 50 | 5 | Y | A | A[1)] | PASS |
| 1 | 50 | 5 | Z | A | A[1)] | PASS |
| 1 | 60 | 5 | X | A | A[1)] | PASS |
| 1 | 60 | 5 | Y | A | A[1)] | PASS |
| 1 | 60 | 5 | Z | A | A[1)] | PASS |
| **Note:**[1)]Before test, during the test, and after test, the EUT function is normal, ping link no interrupt. | | | | | | |

# 6.10 VOLTAGE DIPS & SHORT INTERRUPTIONS

## 6.10.1 TEST SPECIFICATION

| | |
|---|---|
| Test Requirement: | ETSI EN 301 489-17 V3.2.4 /7.2<br>ETSI EN 301 489-1 V2.2.3/9.7<br>EN 55035:2017 Table 4 |
| Test Method: | EN 61000-4-11:2004 |
| Test duration time: | ETSI EN 301 489-17&ETSI EN 301 489-1:<br>Test specification:<br>1. Voltage dips:<br>i)0% residual voltage 0.5 cycle.<br>Performance: Criteria B;<br>ii) 0% residual voltage 1 cycle,<br>Performance: Criteria B;<br>iii)70% residual voltage 25 cycle.<br>Performance: Criteria B;<br>2. Voltage interruption:<br>0% residual voltage during 250 cycles.<br>Performance: Criteria C;<br><br>EN 55035:2017<br>Test specification:<br>1. Voltage dips:<br>i) 0% residual voltage 1 cycle,<br>Performance: Criteria B;<br>ii)70% residual voltage 25 cycle.<br>Performance: Criteria C;<br>2. Voltage interruption:<br>0% residual voltage during 250 cycles.<br>Performance: Criteria C; |
| Interval between event: | 10s for each dips at each test angle |
| Phase Angle: | ETSI EN 301 489-17&ETSI EN 301 489-1:<br>0 °, 45 °, 90 °, 135 °, 180 °, 225 °,270 °,315 °<br>EN 55035:2017:<br>0 °,180 ° |
| Test cycle: | 3 |

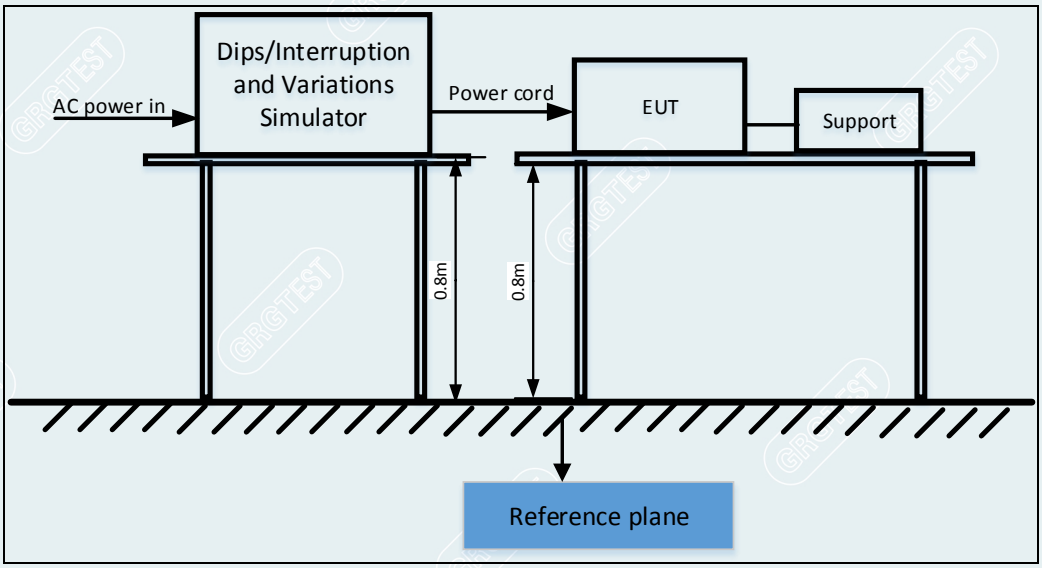
## 6.10.2 TEST PROCEDURE

(1) The EUT and test generator were setup as shown on Section

(2) The interruption is introduced at selected phase angles with specified duration.

(3) Record any degradation of performance.

### 6.10.3 TEST SETUP




### 6.10.4 PHOTOGRAPH OF THE TEST ARRANGEMENT

## 6.10.5 TEST RESULTS

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/50%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Wang Xinyuan |
| Test Date | 2021/07/12 | Sample No. | E20210414049301-0004 |

| Test level % $U_T$ | Voltage Dips & Interruptions % $U_T$ | Duration (Period) | Angle | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| 0 | 100 | 0.5 | 0 °, 45 °, 90 °, 135 °, 180 °, 225 °,270 °,315 ° | B | A [1)] | PASS |
| 0 | 100 | 1.0 | 0 °, 45 °, 90 °, 135 °, 180 °, 225 °,270 °,315 ° | B | A [1)] | PASS |
| 70 | 30 | 25 | 0 °, 45 °, 90 °, 135 °, 180 °, 225 °,270 °,315 ° | B | A [1)] | PASS |
| 0 | 100 | 250 | 0 °, 45 °, 90 °, 135 °, 180 °, 225 °,270 °,315 ° | C | B[2)] | PASS |

**Note:**[1)] Before test, during test and after test, the EUT can work normally, the functions, WIFI with ping is normal.
[2)]Before and after the test, the EUT works as normal. During the test, the EUT is powered down, and it can restore normally by itself.

| EUT Name | Hub E1 | Model | HE1-G01 |
|---|---|---|---|
| Environmental Conditions | 21.1℃/50%RH/101.0kPa | Test Mode | Mode 1 |
| Power supply | AC230V/50Hz | Tested By | Wang Xinyuan |
| Test Date | 2021/07/12 | Sample No. | E20210414049301-0004 |

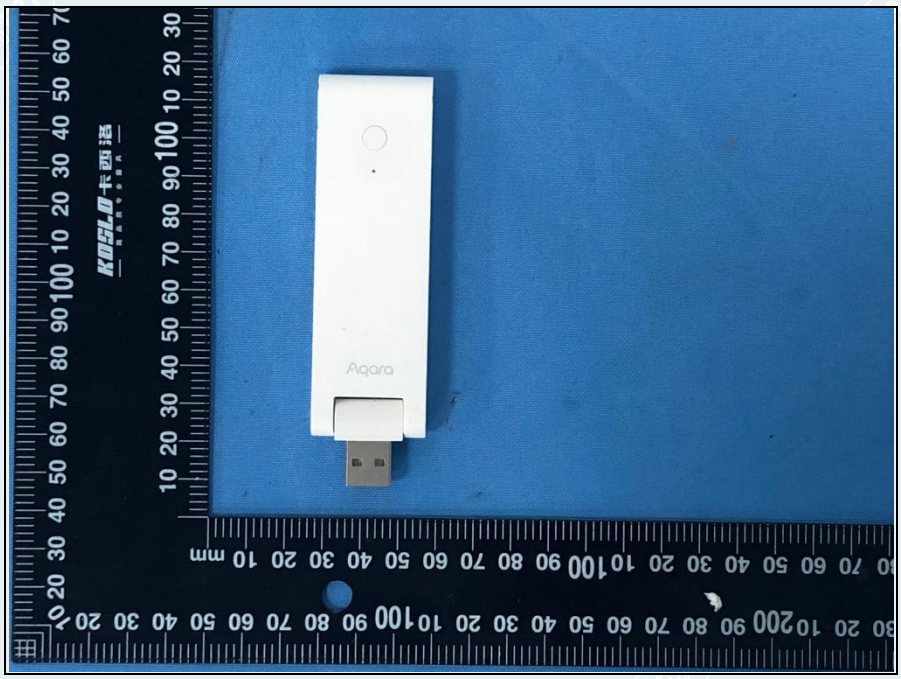
| Test level % $U_T$ | Voltage Dips & Interruptions % $U_T$ | Duration (Period) | Angle | Required Performance | Actual performance | Result |
|---|---|---|---|---|---|---|
| 0 | 100 | 0.5 | 0 ° | B | A [1)] | PASS |
| | | | 180 ° | B | A [1)] | PASS |
| 70 | 30 | 25 | 0 ° | C | A [1)] | PASS |
| | | | 180 ° | C | A [1)] | PASS |
| 0 | 100 | 250 | 0 ° | C | B [2)] | PASS |
| | | | 180 ° | C | B [2)] | PASS |

**Note:** [1)] Before test, during test and after test, the EUT can work normally, the functions, WIFI with ping is normal.

[2)] Before and after the test, the EUT works as normal. During the test, the EUT is powered down, and it can restore normally by itself.

# APPENDIX B: PHOTOGRAPHS OF EUT

## External Photos of EUT

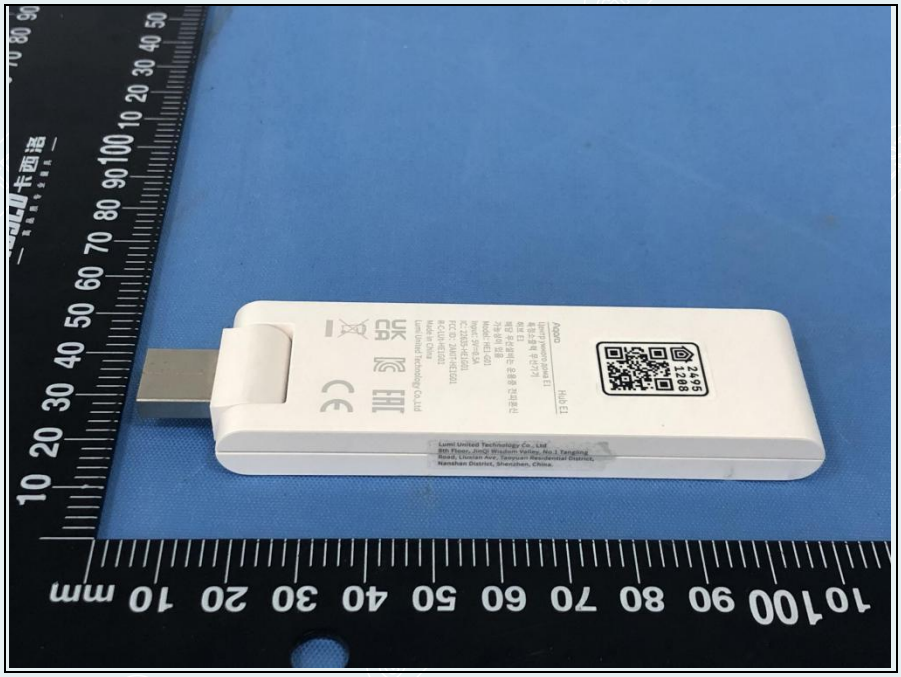



EUT-1

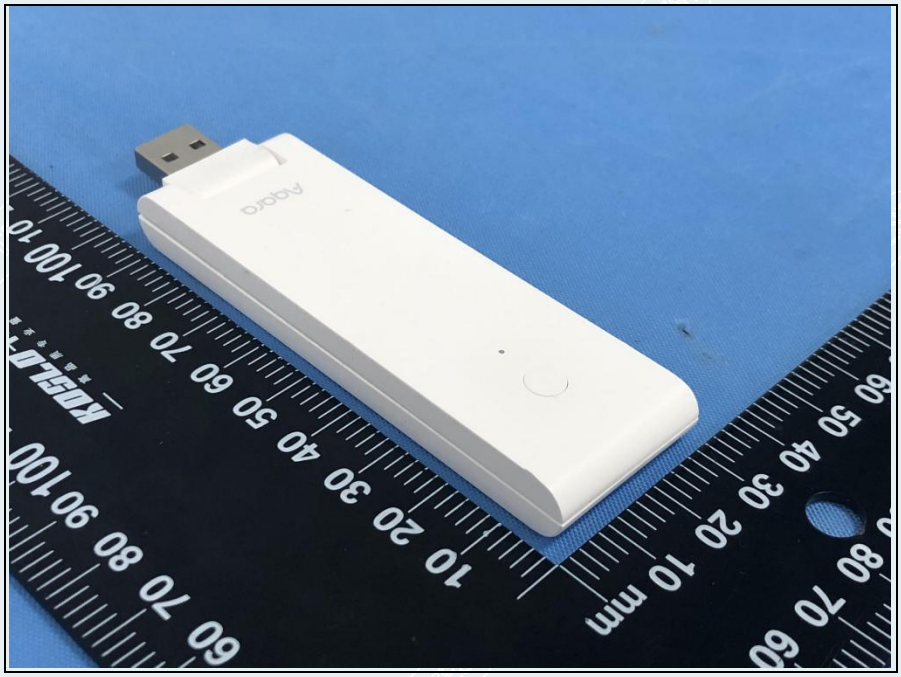
EUT-2


**EUT-3**

**EUT-4**

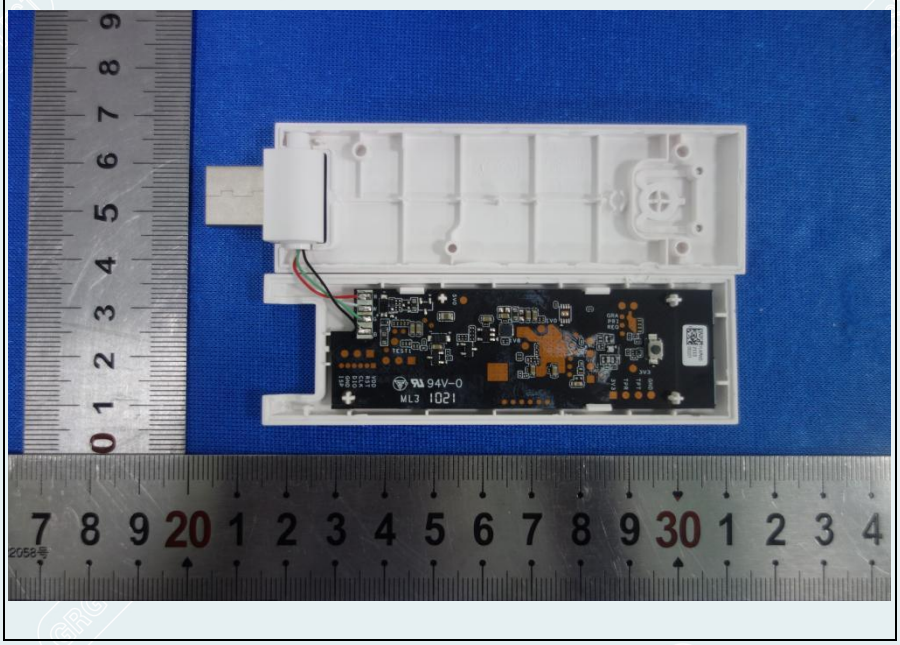


**EUT-5**



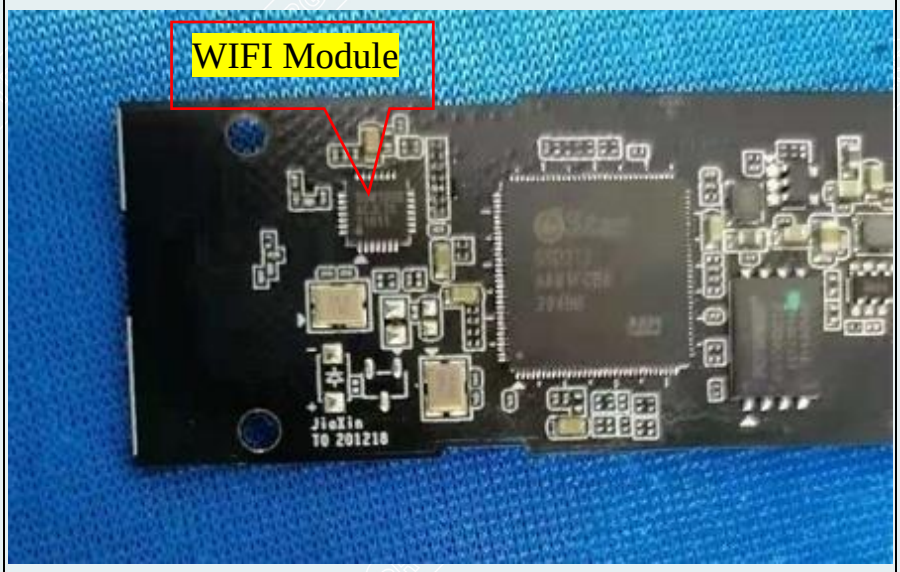
**EUT-6**

# Internal Photos of EUT



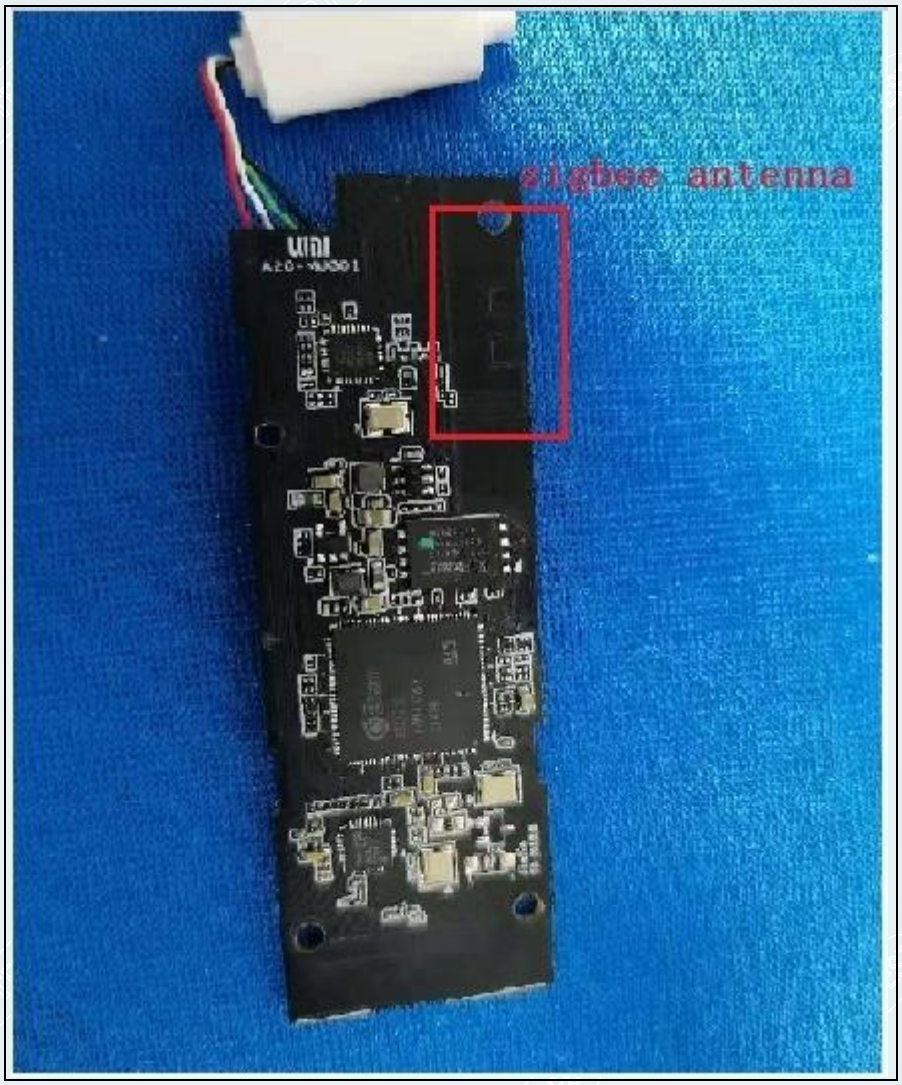
EUT-1

EUT-2

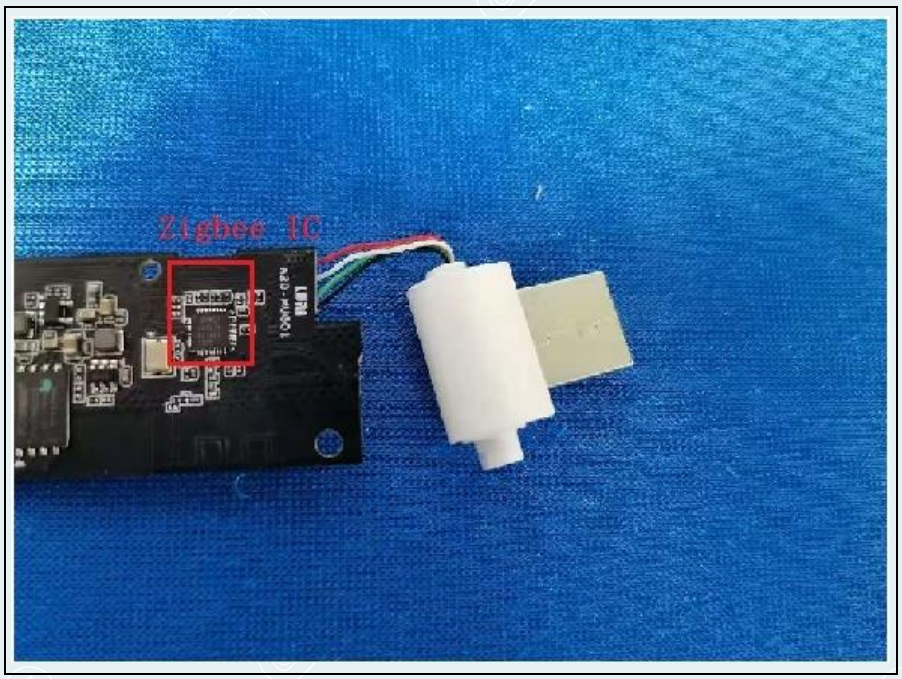



**EUT-3**

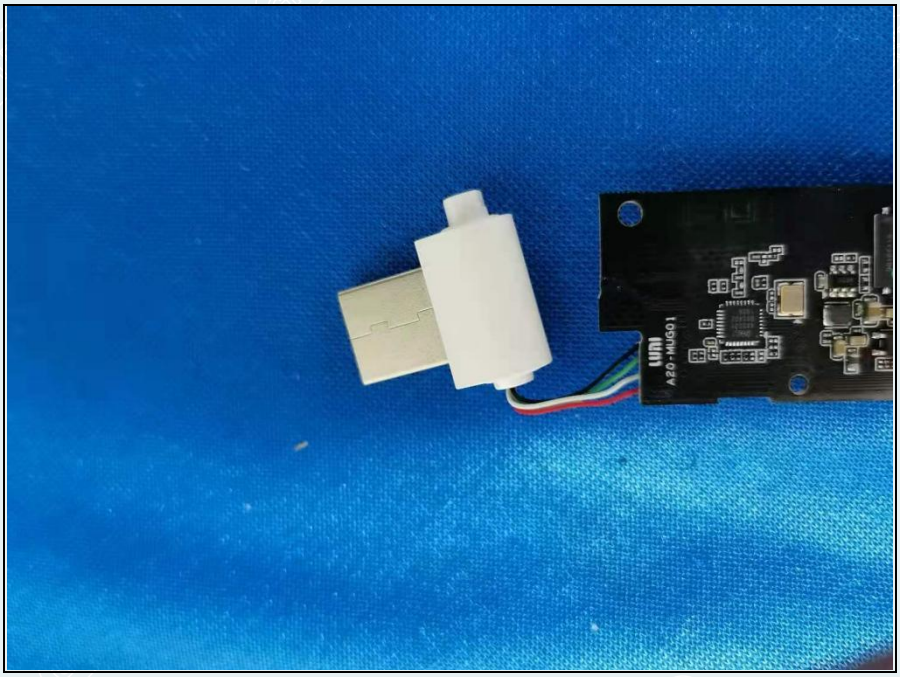

**EUT-4**




**EUT-5**



**EUT-6**



**EUT-7**

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