

## EMC TEST REPORT

For

Allterco Robotics

wifi smart plug

Test Model: Shelly Plug S

Additional Model No.: Please Refer to Page 7

Prepared for : Allterco Robotics  
Address : 103 Cherni Vrah, Sofia, Bulgaria, Post Code: 1407

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.  
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Date of receipt of test sample : September 24, 2019  
Number of tested samples : 1  
Serial number : Prototype  
Date of Test : September 24, 2019 ~ September 30, 2019  
Date of Report : October 15, 2019



**EMC TEST REPORT**  
**ETSI EN 301 489-17 V3.1.1(2017-02)**  
 Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services

**Report Reference No.** ..... : **LCS190920057AEA**  
**Date Of Issue** ..... : October 15, 2019

**Testing Laboratory Name**..... : **Shenzhen LCS Compliance Testing Laboratory Ltd.**  
**Address** ..... : 101, 601, Xingyuan Industrial Park, Gushu Community, Xixiang Street, Bao' an District, Shenzhen, Guangdong, China  
**Testing Location/ Procedure**..... : Full application of Harmonised standards   
 Partial application of Harmonised standards   
 Other standard testing method

**Applicant's Name**..... : **Allterco Robotics**  
**Address** ..... : 103 Cherni Vrah, Sofia, Bulgaria, Post Code: 1407

**Test Specification**  
**Standard**..... : ETSI EN 301 489-1 V2.1.1 (2017-02)  
 ETSI EN 301 489-17 V3.1.1(2017-02)  
**Test Report Form No.** ..... : LCSEMC-1.0  
**TRF Originator** ..... : Shenzhen LCS Compliance Testing Laboratory Ltd.  
**Master TRF**..... : Dated 2017-06

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**Test Item Description.** ..... : **wifi smart plug**  
**Trade Mark** ..... : N/A  
**Test Model**..... : Shelly Plug S  
**Ratings**..... : 110-230V~, 10A, 50/60Hz  
**Result** ..... : **Positive**

**Compiled by:**

*Jayden Zhuo*

Jayden Zhuo / Administrators

**Supervised by:**

*Aking Jin*

Aking Jin / Technique principal

**Approved by:**



Gavin Liang / Manager

# EMC -- TEST REPORT

|  |  |
|--|--|
| <b>Test Report No. : LCS190920057AEA</b> | <u>October 15, 2019</u><br>Date of issue |
|--|--|

|  |
|--|
| Test Model..... : Shelly Plug S  |
| EUT..... : wifi smart plug   |
| <b>Applicant..... : Allterco Robotics</b><br>Address..... : 103 Cherni Vrah, Sofia, Bulgaria, Post Code: 1407<br>Telephone..... : /<br>Fax..... : /    |
| <b>Manufacturer..... : Allterco Robotics</b><br>Address..... : 103 Cherni Vrah, Sofia, Bulgaria, Post Code: 1407<br>Telephone..... : /<br>Fax..... : / |
| <b>Factory..... : Allterco Robotics</b><br>Address..... : 103 Cherni Vrah, Sofia, Bulgaria, Post Code: 1407<br>Telephone..... : /<br>Fax..... : /      |

|                    |                 |
|--------------------|-----------------|
| <b>Test Result</b> | <b>Positive</b> |
|--------------------|-----------------|

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.

### Revision History

| Revision | Issue Date       | Revisions     | Revised By  |
|----------|------------------|---------------|-------------|
| 000      | October 15, 2019 | Initial Issue | Gavin Liang |
|          |                  |               |             |
|          |                  |               |             |

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## 1. GENERAL INFORMATION

### 1.1. Product Description for Equipment Under Test (EUT)

EUT : wifi smart plug  
 Test Model : Shelly Plug S  
 Power Supply : 110-230V~, 10A, 50/60Hz  
 Hardware Version : /  
 Software Version : /

#### 2.4G WLAN

Frequency Range : 2.412-2.472GHz  
 Channel Number : 13 Channels for WIFI 20MHz Bandwidth(802.11b/g/n-HT20)  
 Channel Spacing : 5MHz  
 Modulation Type : IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK)  
 IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)  
 IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK)

Antenna Description : Internal Antenna,1.5dBi (Max.)

### 1.2. Objective

|                    |   |
|--------------------|---|
| ETSI EN 301 489-1  | Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements                 |
| ETSI EN 301 489-17 | Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment Part 17: Specific conditions for Broadband Data Transmission Systems |

The objective is to determine compliance with ETSI EN 301 489-1 V2.1.1 (2017-02), ETSI EN 301 489-17 V3.1.1(2017-02) .

### 1.3. Related Submittal(s)/Grant(s)

No Related Submittals.

### 1.4. Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 489-1 V2.1.1 (2017-02), ETSI EN 301 489-17 V3.1.1(2017-02).

### 1.5. Description of Test Facility

FCC Registration Number is 254912.  
 Industry Canada Registration Number is 9642A-1.  
 EMSD Registration Number is ARCB0108.  
 UL Registration Number is 100571-492.  
 TUV SUD Registration Number is SCN1081.  
 TUV RH Registration Number is UA 50296516-001.  
 NVLAP Accreditation Code is 600167-0.  
 FCC Designation Number is CN5024.  
 CAB identifier: CN0071.

### 1.6. Support equipment List

| Manufacturer | Description | Model | Serial Number | Certificate |
|--------------|-------------|-------|---------------|-------------|
| --           | --          | --    | --            | --          |

### 1.7. External I/O

| I/O Port Description | Quantity | Cable |
|----------------------|----------|-------|
| --                   | --       | --    |

### 1.8. Measurement Uncertainty

| Item   | MU                               | Remark      |
|--|----------------------------------|-------------|
| Uncertainty for Power point Conducted Emissions Test                     | $\pm 2.42\text{dB}$              |             |
| Uncertainty for Radiation Emission test in 3m chamber<br>(30MHz to 1GHz) | $\pm 3.54\text{dB}$              | Polarize: V |
|  | $\pm 4.1\text{dB}$               | Polarize: H |
| Uncertainty for Radiation Emission test in 3m chamber<br>(1GHz to 25GHz) | $\pm 2.08\text{dB}$              | Polarize: H |
|  | $\pm 2.56\text{dB}$              | Polarize: V |
| Uncertainty for radio frequency  | $\pm 3 \times 10^{-7}\text{MHz}$ |             |
| Uncertainty for conducted RF Power                                       | $\pm 0.65\text{dB}$              |             |
| Uncertainty for temperature  | $\pm 0.2^\circ\text{C}$          |             |
| Uncertainty for humidity   | $\pm 1\%$                        |             |
| Uncertainty for DC and low frequency voltages                            | $\pm 0.05\text{V}$               |             |

### 1.9. Description Of Test Modes

There was 2 test Modes. TM1 to TM2 were shown below:

TM1: Operate in WIFI mode.

TM3: Idle mode

\*\*\*Note:

All test modes were tested, but we only recorded the worst case in this report.

## 2. SUMMARY OF TEST RESULTS

| Rule | Description of Test Items  | Result    |
|------|--|-----------|
| §7.1 | Reference to clauses EN 301 489-1<br>§8.4 AC mains power input/output ports  | Compliant |
| §7.1 | Reference to clauses EN 301 489-1 §8.3 DC power input/output ports   | N/A       |
| §7.1 | Reference to clauses EN 301 489-1<br>§8.2 Enclosure of ancillary equipment measured on a stand alone basis                                     | Compliant |
| §7.1 | Reference to clauses EN 301 489-1<br>§8.5 Harmonic current emissions (AC mains input port)   | N/A       |
| §7.1 | Reference to clauses EN 301 489-1<br>§8.6 Voltage fluctuations and flicker (AC mains input port)   | Compliant |
| §7.1 | Reference to clauses EN 301 489-1 §8.7 Telecommunication ports   | Compliant |
| §7.2 | Reference to clauses EN 301 489-1 §9.3 Electrostatic discharge (EN 61000-4-2)  | Compliant |
| §7.2 | Reference to clauses EN 301 489-1<br>§9.2 Radio frequency electromagnetic field (80 MHz to 1 000 MHz and 1 400 MHz to 2 700 MHz)(EN 61000-4-3) | Compliant |
| §7.2 | Reference to clauses EN 301 489-1 §9.4 Fast transients, common mode (EN 61000-4-4)   | Compliant |
| §7.2 | Reference to clauses EN 301 489-1 §9.8 Surges (EN 61000-4-5)   | Compliant |
| §7.2 | Reference to clauses EN 301 489-1 §9.5 Radio frequency, common mode (EN 61000-4-6)   | Compliant |
| §7.2 | Reference to clauses EN 301 489-1<br>§9.6 Transients and surges in the vehicular environment (ISO 7637-2)                                      | N/A       |
| §7.2 | Reference to clauses EN 301 489-1 §9.7 Voltage dips and interruptions (EN 61000-4-11)  | Compliant |

Note: N/A means not applicable.

### 3. LINE CONDUCTED EMISSION

#### 3.1. Conducted Emission Limit

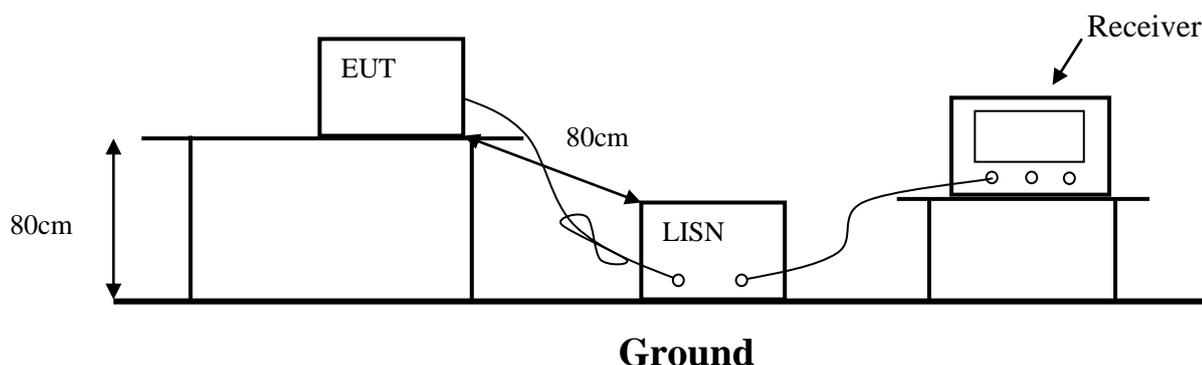
ETSI EN 301 489-1 V2.1.1 (2017-02)/EN 55032

#### Limits for Line Conducted Emission

| Frequency (MHz) | Limit (dBμV)     |               |
|-----------------|------------------|---------------|
|                 | Quasi-peak Level | Average Level |
| 0.15~0.50       | 66.0 ~ 56.0 *    | 56.0 ~ 46.0 * |
| 0.50~5.00       | 56.0             | 46.0          |
| 5.00~30.00      | 60.0             | 50.0          |

NOTE1-The lower limit shall apply at the transition frequencies.  
 NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

#### 3.2. Test Configuration



The setup of EUT is according with per ETSI EN 301 489-1 measurement procedure. The specification used was with the ETSI EN 301 489-1 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

The EUT received DC 5V charging power from the Adapter which received power through a LISN supplying power of AC 230V/50Hz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Receiver Parameter     | Setting       |
|------------------------|---------------|
| Attenuation            | Auto          |
| Start ~ Stop Frequency | 30MHz~1000MHz |
| (IF)RB                 | 9kH           |

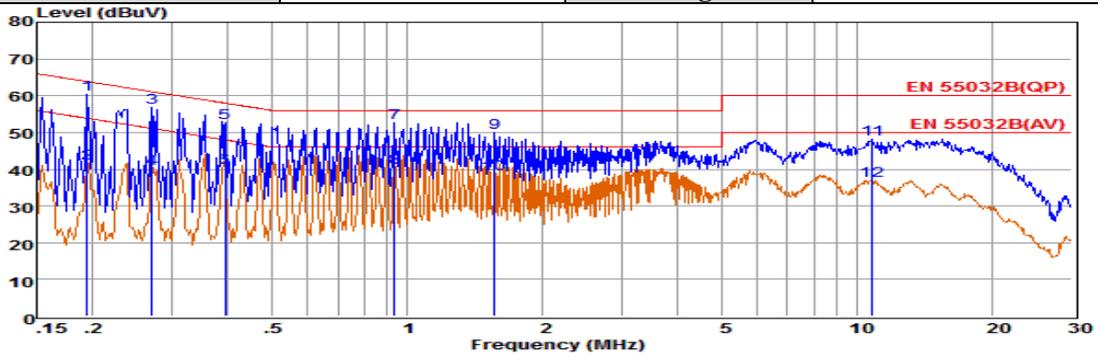
All data was recorded in the Quasi-peak and average detection mode.

Marked on both the 6 highest Quasi-Peak & 6 highest Average emissions points of the EUT.

3.3. Test Data

For pre-scan, the worst test case is TM1, and the test data was show as follow:

|                          |                  |               |              |
|--------------------------|------------------|---------------|--------------|
| Model No.                | Shelly Plug S    | Test Mode     | TM1          |
| Environmental Conditions | 22.4°C, 52.3% RH | Test Engineer | Qu Xin       |
| Pol                      | Line             | Test Voltage  | AC 230V/50Hz |

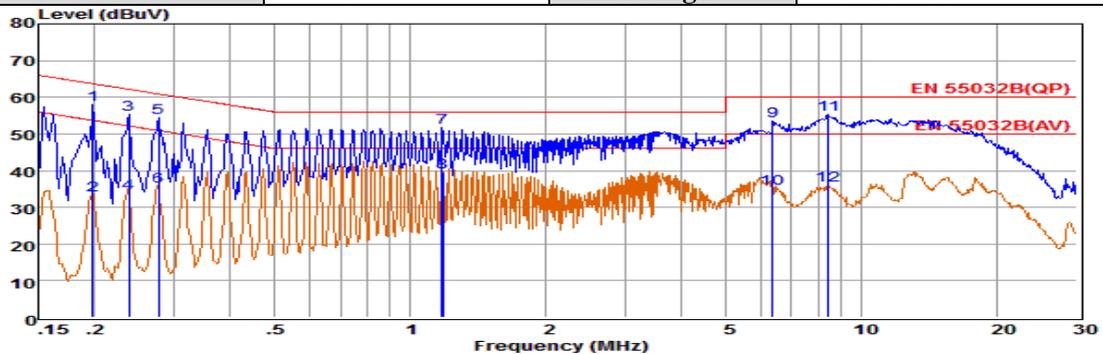


Env. Ins: 22.4\*/52.3%  
 Pol: LINE

|    | Freq  | Reading | LISNFac | CabLos | Aux2Fac | Measured | Limit | Over   | Remark  |
|----|-------|---------|---------|--------|---------|----------|-------|--------|---------|
|    | MHz   | dBuV    | dB      | dB     | dB      | dBuV     | dBuV  | dB     |         |
| 1  | 0.19  | 40.80   | 9.62    | 0.02   | 10.00   | 60.44    | 63.84 | -3.40  | Peak    |
| 2  | 0.19  | 21.85   | 9.62    | 0.02   | 10.00   | 41.49    | 53.84 | -12.35 | Average |
| 3  | 0.27  | 37.28   | 9.63    | 0.03   | 10.00   | 56.94    | 61.12 | -4.18  | Peak    |
| 4  | 0.27  | 20.37   | 9.63    | 0.03   | 10.00   | 40.03    | 51.11 | -11.08 | Average |
| 5  | 0.39  | 33.10   | 9.62    | 0.04   | 10.00   | 52.76    | 57.99 | -5.23  | Peak    |
| 6  | 0.39  | 20.72   | 9.62    | 0.04   | 10.00   | 40.38    | 47.99 | -7.61  | Average |
| 7  | 0.94  | 32.90   | 9.63    | 0.05   | 10.00   | 52.58    | 56.00 | -3.42  | Peak    |
| 8  | 0.94  | 20.77   | 9.63    | 0.05   | 10.00   | 40.45    | 46.00 | -5.55  | Average |
| 9  | 1.56  | 30.23   | 9.64    | 0.05   | 10.00   | 49.92    | 56.00 | -6.08  | Peak    |
| 10 | 1.56  | 18.97   | 9.64    | 0.05   | 10.00   | 38.66    | 46.00 | -7.34  | Average |
| 11 | 10.79 | 28.37   | 9.69    | 0.08   | 10.00   | 48.14    | 60.00 | -11.86 | Peak    |
| 12 | 10.79 | 17.21   | 9.69    | 0.08   | 10.00   | 36.98    | 50.00 | -13.02 | Average |

Remarks: 1. Measured = Reading + LISNFac + Cable Loss + Aux2 Fac.  
 2. The emission levels that are 20dB below the official limit are not reported.

|                          |                  |               |              |
|--------------------------|------------------|---------------|--------------|
| Model No.                | Shelly Plug S    | Test Mode     | TM1          |
| Environmental Conditions | 22.4°C, 52.3% RH | Test Engineer | Qu Xin       |
| Pol                      | Neutral          | Test Voltage  | AC 230V/50Hz |



Env. Ins: 22.4\*/52.3%  
 Pol: NEUTRAL

|    | Freq | Reading | LISNFac | CabLos | Aux2Fac | Measured | Limit | Over   | Remark  |
|----|------|---------|---------|--------|---------|----------|-------|--------|---------|
|    | MHz  | dBuV    | dB      | dB     | dB      | dBuV     | dBuV  | dB     |         |
| 1  | 0.20 | 38.28   | 9.59    | 0.02   | 10.00   | 57.89    | 63.71 | -5.82  | Peak    |
| 2  | 0.20 | 13.72   | 9.59    | 0.02   | 10.00   | 33.33    | 53.71 | -20.38 | Average |
| 3  | 0.24 | 35.60   | 9.60    | 0.03   | 10.00   | 55.23    | 62.17 | -6.94  | Peak    |
| 4  | 0.24 | 14.19   | 9.60    | 0.03   | 10.00   | 33.82    | 52.17 | -18.35 | Average |
| 5  | 0.28 | 34.70   | 9.60    | 0.03   | 10.00   | 54.33    | 60.90 | -6.57  | Peak    |
| 6  | 0.28 | 15.98   | 9.60    | 0.03   | 10.00   | 35.61    | 50.89 | -15.28 | Average |
| 7  | 1.18 | 31.96   | 9.63    | 0.05   | 10.00   | 51.64    | 56.00 | -4.36  | Peak    |
| 8  | 1.18 | 19.78   | 9.63    | 0.05   | 10.00   | 39.46    | 46.00 | -6.54  | Average |
| 9  | 6.35 | 33.65   | 9.68    | 0.07   | 10.00   | 53.40    | 60.00 | -6.60  | Peak    |
| 10 | 6.35 | 15.44   | 9.68    | 0.07   | 10.00   | 35.19    | 50.00 | -14.81 | Average |
| 11 | 8.46 | 35.50   | 9.71    | 0.08   | 10.00   | 55.29    | 60.00 | -4.71  | Peak    |
| 12 | 8.46 | 16.14   | 9.71    | 0.08   | 10.00   | 35.93    | 50.00 | -14.07 | Average |

Remarks: 1. Measured = Reading + LISNFac + Cable Loss + Aux2 Fac.  
 2. The emission levels that are 20dB below the official limit are not reported.

Note: For conducted emission and radiated emission test, a power supply of 230VAC and 120VAC was used for testing respectively, and only recorded the worst case of 230VAC.

## 4. CONDUCTED EMISSION (WIRED NETWORK PORT)

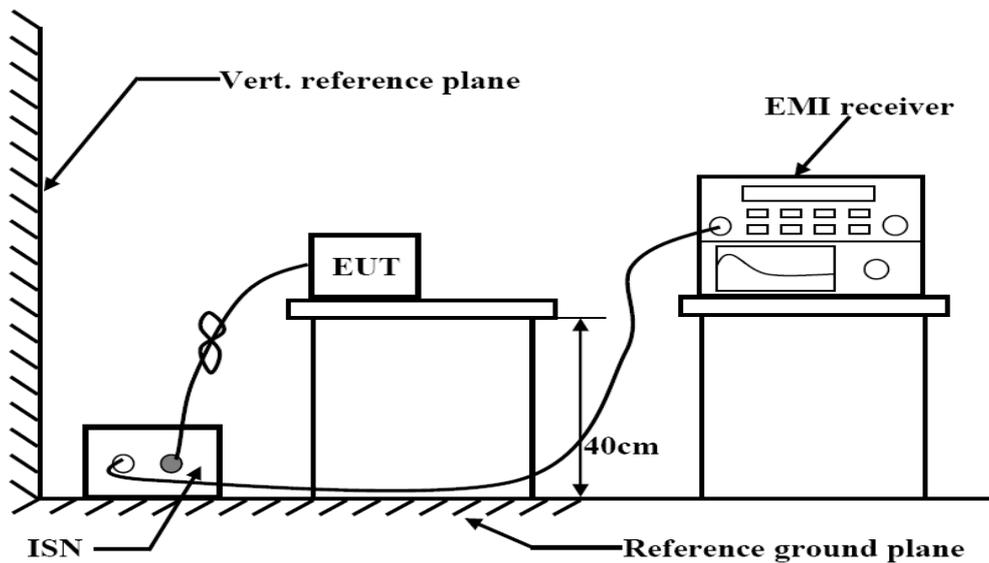
### 4.1. Conducted Emission Limit(Wired Network Port)

| Limits for asymmetric mode conducted emissions |                                     |               |                                     |               |
|--|-------------------------------------|---------------|-------------------------------------|---------------|
| Frequency (MHz)                                | Class B voltage limits (dB $\mu$ V) |               | Class B current limits (dB $\mu$ A) |               |
|  | Quasi-peak Level                    | Average Level | Quasi-peak Level                    | Average Level |
| 0.15 ~ 0.50                                    | 84.0~74.0                           | 74.0~64.0     | 40.0~30.0                           | 30.0~20.0     |
| 0.50 ~ 30.00                                   | 74.0                                | 64.0          | 30.0                                | 20.0          |

NOTE 1-The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.

NOTE 2-The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 $\Omega$  to the telecommunication port under test (conversion factor is  $20 \log_{10} 150 / 1 = 44 \text{ dB}$ ).

### 4.2. Test Configuration



### 4.3. EMI Test Receiver Setup

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Receiver Parameter     | Setting        |
|------------------------|----------------|
| Attenuation            | Auto           |
| Start ~ Stop Frequency | 150KHz ~ 30MHz |
| (IF)RBW                | 9kHz           |

All data was recorded in the Quasi-peak and average detection mode.

### 4.4. Test Procedure

Please refer to ETSI EN 301 489-1 Clause 8.7.2 and EN 55032 Clause 6 for the measurement methods.

### 4.5. Test Data

N/A

## 5. RADIATED DISTURBANCE

### 5.1. Radiated Emission Limit

ETSI EN 301 489-1 V2.1.1 (2017-02)/EN 55032 Class B

#### Limits for radiated disturbance Below 1GHz

| Frequency (MHz) | Distance (Meters) | Field Strengths Limit (dB $\mu$ V/m) |
|-----------------|-------------------|--------------------------------------|
| 30 ~ 230        | 3                 | 40                                   |
| 230 ~ 1000      | 3                 | 47                                   |

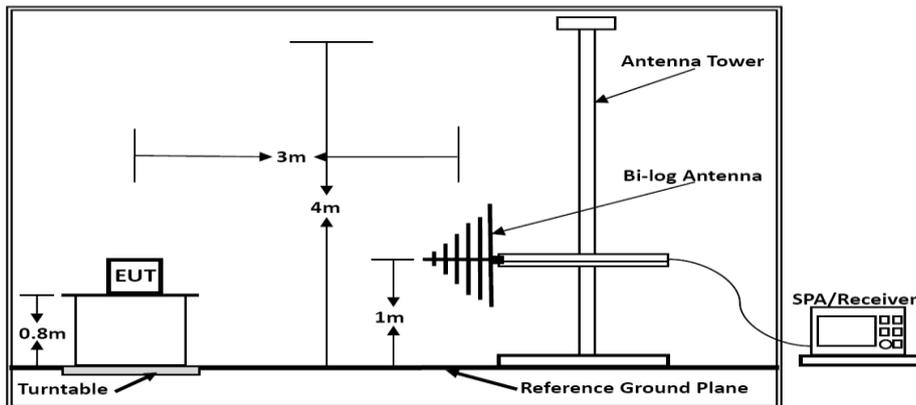
Note: (1) The smaller limit shall apply at the combination point between two frequency bands. (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

#### Limits for radiated disturbance Above 1GHz

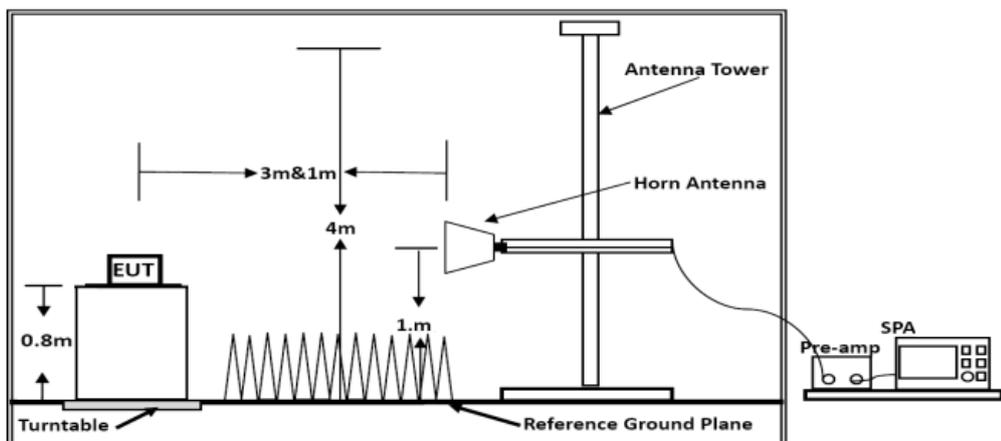
| Frequency (MHz) | Distance (Meters) | Average Limit (dB $\mu$ V/m) | Peak Limit (dB $\mu$ V/m) |
|-----------------|-------------------|------------------------------|---------------------------|
| 1000-3000       | 3                 | 50                           | 70                        |
| 3000-6000       | 3                 | 54                           | 74                        |

Note: The lower limit applies at the transition frequency.

### 5.2. Test Configuration



Below 1GHz



Above 1GHz

### 5.3. Test Procedure

#### 1) Sequence of testing 30 MHz to 1 GHz

##### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

##### Premeasurement:

- The turntable rotates from 0 ° to 315 ° using 45 ° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 4 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

##### Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

## 2) Sequence of testing 1 GHz to 6 GHz

### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

### Premeasurement:

- The turntable rotates from 0 ° to 315 ° using 45 ° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

### Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

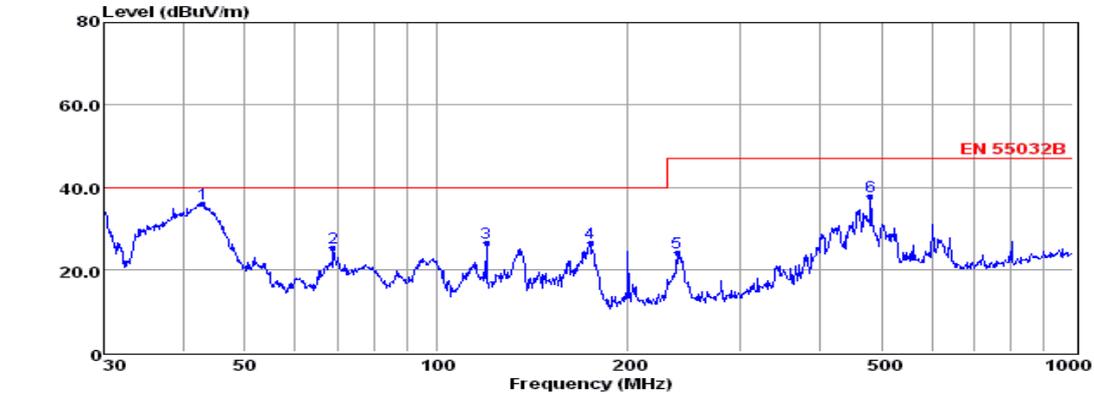
| Receiver Parameter     | Setting                          |
|------------------------|----------------------------------|
| Attenuation            | Auto                             |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 100kHz for QP |

| Spectrum Parameter | Setting  |
|--------------------|--|
| Attenuation        | Auto   |
| Start Frequency    | 1000 MHz                                       |
| Stop Frequency     | 6000 MHz                                       |
| RB / VB            | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |

5.4. Test Data

The worst test mode of the EUT was TM1, and its test data was showed as the follow:

|                                 |                  |                          |              |
|---------------------------------|------------------|--------------------------|--------------|
| <b>Model No.</b>                | Shelly Plug S    | <b>Test Mode</b>         | TM1          |
| <b>Environmental Conditions</b> | 24.2°C, 52.8% RH | <b>Detector Function</b> | Quasi-peak   |
| <b>Pol</b>                      | Vertical         | <b>Distance</b>          | 3m           |
| <b>Test Engineer</b>            | Qu Xin           | <b>Test Voltage</b>      | AC 230V/50Hz |

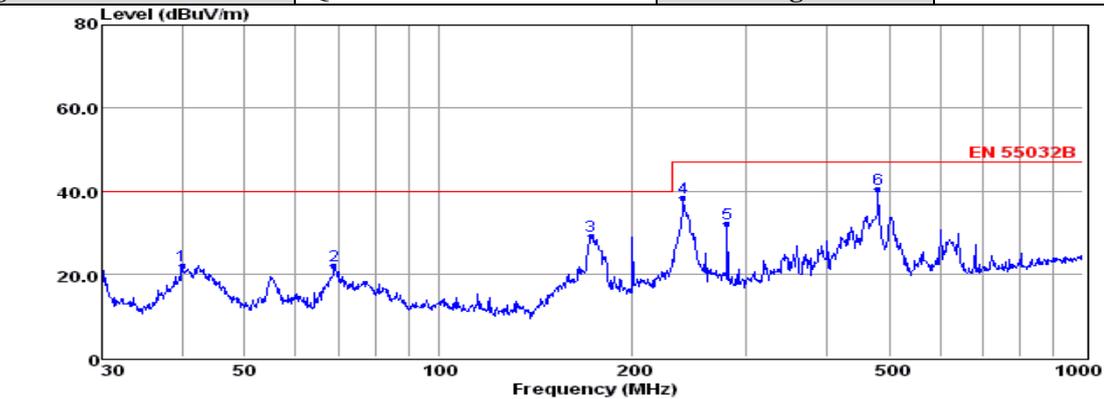


Env./Ins: 24.2°C / 52.8%  
 pol: VERTICAL

|   | Freq<br>MHz | Reading<br>dBuV | CabLos<br>dB | Antfac<br>dB/m | Measured<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Remark |
|---|-------------|-----------------|--------------|----------------|--------------------|-----------------|------------|--------|
| 1 | 42.90       | 21.91           | 0.50         | 13.56          | 35.97              | 40.00           | -4.03      | QP     |
| 2 | 68.87       | 15.61           | 0.51         | 9.11           | 25.23              | 40.00           | -14.77     | QP     |
| 3 | 119.86      | 15.20           | 0.64         | 10.51          | 26.35              | 40.00           | -13.65     | QP     |
| 4 | 174.42      | 16.60           | 0.73         | 9.28           | 26.61              | 40.00           | -13.39     | QP     |
| 5 | 239.15      | 11.09           | 0.96         | 12.05          | 24.10              | 47.00           | -22.90     | QP     |
| 6 | 480.53      | 20.35           | 1.31         | 16.08          | 37.74              | 47.00           | -9.26      | QP     |

Note: 1. All readings are Quasi-peak values.  
 2. Measured= Reading + Antenna Factor + Cable Loss  
 3. The emission that are 20db below the official limit are not reported

|                                 |                  |                          |              |
|---------------------------------|------------------|--------------------------|--------------|
| <b>Model No.</b>                | Shelly Plug S    | <b>Test Mode</b>         | TM1          |
| <b>Environmental Conditions</b> | 24.2°C, 52.8% RH | <b>Detector Function</b> | Quasi-peak   |
| <b>Pol</b>                      | Horizontal       | <b>Distance</b>          | 3m           |
| <b>Test Engineer</b>            | Qu Xin           | <b>Test Voltage</b>      | AC 230V/50Hz |



Env./Ins: 24.2°C / 52.8%  
 pol: HORIZONTAL

|   | Freq<br>MHz | Reading<br>dBuV | CabLos<br>dB | Antfac<br>dB/m | Measured<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Remark |
|---|-------------|-----------------|--------------|----------------|--------------------|-----------------|------------|--------|
| 1 | 39.99       | 8.12            | 0.38         | 13.58          | 22.08              | 40.00           | -17.92     | QP     |
| 2 | 68.87       | 12.35           | 0.51         | 9.11           | 21.97              | 40.00           | -18.03     | QP     |
| 3 | 172.60      | 19.21           | 0.91         | 9.15           | 29.27              | 40.00           | -10.73     | QP     |
| 4 | 239.99      | 25.22           | 1.01         | 12.09          | 38.32              | 47.00           | -8.68      | QP     |
| 5 | 280.02      | 18.29           | 1.01         | 12.67          | 31.97              | 47.00           | -15.03     | QP     |
| 6 | 480.53      | 23.06           | 1.31         | 16.08          | 40.45              | 47.00           | -6.55      | QP     |

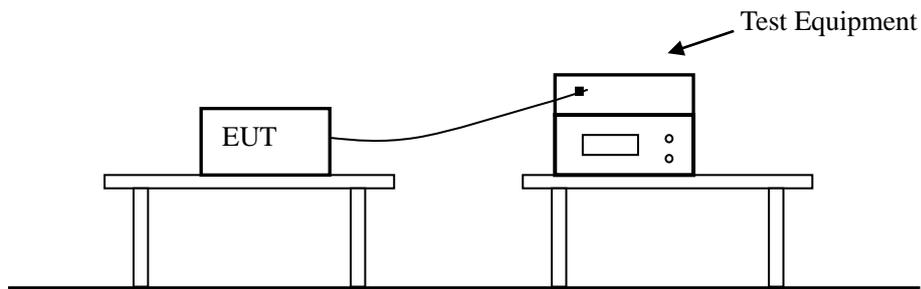
Note: 1. All readings are Quasi-peak values.  
 2. Measured= Reading + Antenna Factor + Cable Loss  
 3. The emission that are 20db below the official limit are not reported

|                                 |                  |                  |     |
|---------------------------------|------------------|------------------|-----|
| <b>Model No.</b>                | Shelly Plug S    | <b>Test Mode</b> | TM1 |
| <b>Environmental Conditions</b> | 24.2°C, 52.8% RH | <b>Distance</b>  | 3m  |
| <b>Test Engineer</b>            | Qu Xin           |                  |     |

| Frequency<br>MHz | Emission Level<br>dB $\mu$ V/m |       | Limits<br>dB $\mu$ V/m |       | Margin<br>dB $\mu$ V/m |        | Polarization |
|------------------|--------------------------------|-------|------------------------|-------|------------------------|--------|--------------|
|                  | Peak                           | AV    | Peak                   | AV    | Peak                   | AV     |              |
| 1341.83          | 57.12                          | 32.73 | 70.00                  | 50.00 | -12.88                 | -17.27 | H            |
| 1809.08          | 58.13                          | 36.64 | 70.00                  | 50.00 | -11.87                 | -13.36 | H            |
| 2248.62          | 51.65                          | 32.69 | 70.00                  | 50.00 | -18.35                 | -17.31 | H            |
| 3259.26          | 49.88                          | 31.42 | 74.00                  | 54.00 | -24.12                 | -22.58 | H            |
| 4349.26          | 55.68                          | 37.04 | 74.00                  | 54.00 | -18.32                 | -16.96 | H            |
| 5803.46          | 54.69                          | 30.57 | 74.00                  | 54.00 | -19.31                 | -23.43 | H            |
| 1347.93          | 56.73                          | 32.98 | 70.00                  | 50.00 | -13.27                 | -17.02 | V            |
| 1810.85          | 56.96                          | 37.42 | 70.00                  | 50.00 | -13.04                 | -12.58 | V            |
| 2250.09          | 52.66                          | 33.53 | 70.00                  | 50.00 | -17.34                 | -16.47 | V            |
| 3258.93          | 48.95                          | 31.15 | 74.00                  | 54.00 | -25.05                 | -22.85 | V            |
| 4347.70          | 54.79                          | 35.98 | 74.00                  | 54.00 | -19.21                 | -18.02 | V            |
| 5809.31          | 55.06                          | 31.61 | 74.00                  | 54.00 | -18.94                 | -22.39 | V            |

## 6. HARMONIC CURRENT EMISSIONS

### 6.1. Test Configuration



### 6.2. Test Standard

According to EN 301 489-1 V2.1.1(2017-02) & EN 61000-3-2: 2014

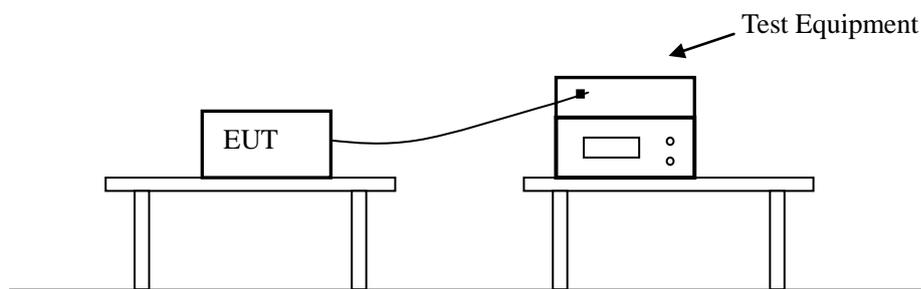
### 6.3. Test Data

N/A

Note: Because power of EUT is less than 75W, according standard EN 61000-3-2, harmonic current is unnecessary to test.

## 7. VOLTAGE FLUCTUATION AND FLICKER

### 7.1. Test Configuration



### 7.2. Test Standard

According to EN 301489-1 V1.9.2 (2011-09) & EN 61000-3-3: 2013

### 7.3. Test Data

|                                |  |
|--------------------------------|--|
| Overall Result:<br><b>PASS</b> | Notes:<br>Measurement method - Voltage |
|--------------------------------|--|

|           | Pst   | dc (%) | dmax (%) | Tmax(> 3.3%)(ms) |
|-----------|-------|--------|----------|------------------|
| Limit     | 1.000 | 3.300  | 4.000    | 500              |
| Reading 1 | 0.090 | 0.006  | 0.217    | 0                |

## **8. GENERAL PERFORMANCE CRITERIA FOR IMMUNITY TEST**

### **8.1. Performance criteria for Continuous phenomena applied to Transmitter (CT)**

For equipment of type II or type III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

### **8.2. Performance criteria for Transient phenomena applied to Transmitter (TT)**

For equipment of type II or type III that requires a communication link that is maintained during the test, this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence. Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

### **8.3. Performance criteria for Continuous phenomena applied to Receiver (CR)**

For equipment of type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence. Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

### **8.4. Performance criteria for Transient phenomena applied to Receiver (TR)**

For equipment of type II or type III that requires a communication link that is maintained during the test, this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence. Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

**Performance criteria for ETSI EN 301 489-17 V3.1.1(2017-02)**

| <b>Criteria</b> | <b>During test</b>  | <b>After test</b>  |
|-----------------|---|--|
| A               | Shall operate as intended.<br>May show degradation of performance(see note 1).<br>Shall be no loss of function.<br>Shall be no unintentional transmissions. | Shall operate as intended.<br>Shall be no degradation of performance (see note 2).<br>Shall be no loss of function.<br>Shall be no loss of stored data or user programmable functions.                         |
| B               | May show loss of function (one or more).<br>May show degradation of performance(see note 1).<br>No unintentional transmissions.                             | Functions shall be self-recoverable.<br>Shall operate as intended after recovering.<br>Shall be no degradation of performance (see note 2).<br>Shall be no loss of stored data or user programmable functions. |
| C               | May be loss of function (one or more).  | Functions shall be recoverable by the operator.<br>Shall operate as intended after recovering.<br>Shall be no degradation of performance (see note 2).   |

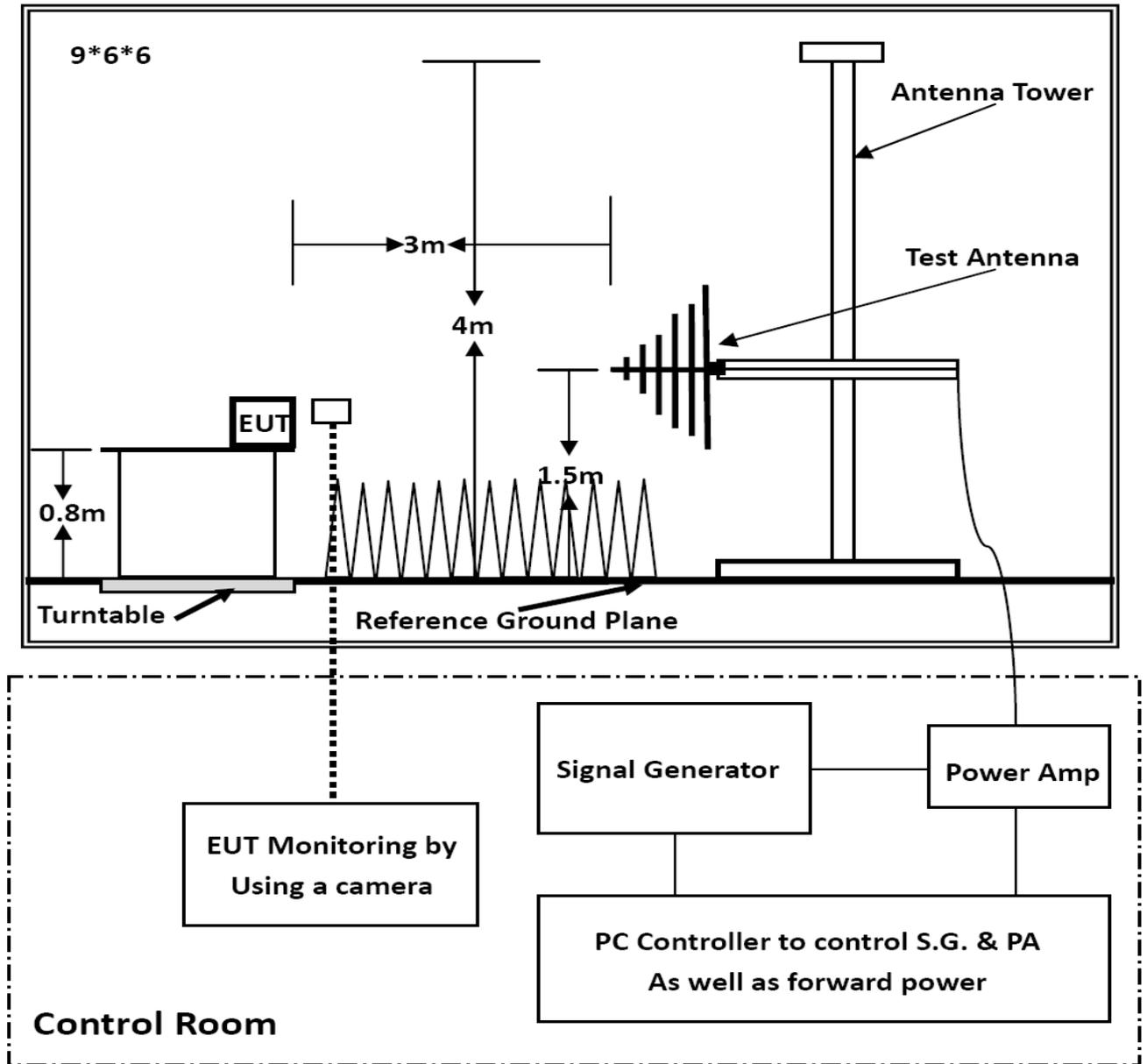
NOTE 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

### 9. RF ELECTROMAGNETIC FIELD (80 MHZ-6000 MHZ)

#### 9.1. Test Configuration



## 9.2. Test Standard

ETSI 301 489-1, EN 301 489-17  
(EN 61000-4-3: 2006+A2: 2010)

Test level 2 at 3V / m.

## 9.3. Severity Level

| Level | Field Strength V/m |
|-------|--------------------|
| 1.    | 1                  |
| 2.    | 3                  |
| 3.    | 10                 |
| X     | Special            |

Performance criterion: A

## 9.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually. In order to judge the EUT performance, a CCD camera is used to monitor EUT screen. All the scanning conditions are as follows:

| Condition of Test         | Remarks                  |
|---------------------------|--------------------------|
| 1. Fielded Strength       | 3 V/m (Severity Level 2) |
| 2. Radiated Signal        | Unmodulated              |
| 3. Scanning Frequency     | 80 – 6000 MHz            |
| 4. Dwell time of radiated | 0.0015 decade/s          |
| 5. Waiting Time           | 3 Sec.                   |

## 9.5. Test Result

| RF ELECTROMAGNETIC FIELD |   |                    |        |
|--------------------------|---|--------------------|--------|
| <b>Standard</b>          | <input type="checkbox"/> IEC 61000-4-3 <input checked="" type="checkbox"/> EN 61000-4-3 |                    |        |
| <b>Applicant</b>         | Allterco Robotics   |                    |        |
| <b>EUT</b>               | wifi smart plug   | <b>Temperature</b> | 24.2°C |
| <b>M/N</b>               | Shelly Plug S   | <b>Humidity</b>    | 52.8%  |
| <b>Test Mode</b>         | TM1-TM2   | <b>Criterion</b>   | B      |
| <b>Test Engineer</b>     | Qu Xin  |                    |        |

## WIFI Test Result:

| EUT Working Mode | Antenna Polarity | Frequency (MHz) | Field Strength (V/m) | Observation | Position                 | Conclusion |
|------------------|------------------|-----------------|----------------------|-------------|--------------------------|------------|
| Operating Mode   | Vertical         | 80--6000        | 3                    | CT,CR       | Front, Right, Left, Back | Pass       |
|                  | Horizontal       | 80--6000        | 3                    | CT,CR       | Front, Right, Left, Back | Pass       |
| Idle             | Vertical         | 80--6000        | 3                    | See Note    | Front, Right, Left, Back | Pass       |
|                  | Horizontal       | 80--6000        | 3                    | See Note    | Front, Right, Left, Back | Pass       |

## TM2Test Result:

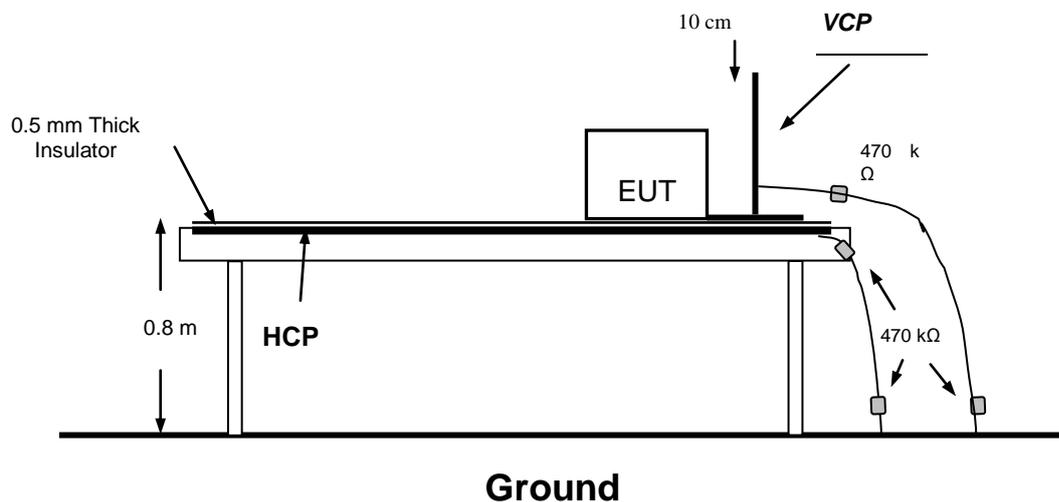
| EUT Working Mode | Antenna Polarity | Frequency (MHz) | Field Strength (V/m) | Observation | Position                 | Conclusion |
|------------------|------------------|-----------------|----------------------|-------------|--------------------------|------------|
| Operating Mode   | Vertical         | 80--6000        | 3                    | See Note    | Front, Right, Left, Back | Pass       |
|                  | Horizontal       | 80--6000        | 3                    | See Note    | Front, Right, Left, Back | Pass       |
| Idle             | Vertical         | 80--6000        | 3                    | See Note    | Front, Right, Left, Back | Pass       |
|                  | Horizontal       | 80--6000        | 3                    | See Note    | Front, Right, Left, Back | Pass       |

\*\*\*Note: Unintentional transmission is not founded from the EUT.

## 10. ELECTROSTATIC DISCHARGE

Please refer to ETSI EN 301 489-1 and EN 61000-4-2.

### 10.1. Test Configuration



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

For tabletop equipment, a 1.5 by 1.0-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5-millimeter thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

## 10.2. Test Procedure

ETSI EN 301 489-1 V2.1.1 (2017-02)/ EN 61000-4-2: 2009

Test level 3 for Air Discharge at  $\pm 8$  kV

Test level 2 for Contact Discharge at  $\pm 4$  kV

### 10.2.1. Air Discharge

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

### 10.2.2. Contact Discharge

All the procedure shall be same as Section 9.2.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

### 10.2.3. Indirect Discharge For Horizontal Coupling Plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

### 10.2.4. Indirect Discharge For Vertical Coupling Plane

At least 10 single discharges (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

## 10.3. Test Data

**PASS.**

## Electrostatic Discharge Test Results

|                      |   |                    |          |
|----------------------|---|--------------------|----------|
| <b>Standard</b>      | <input type="checkbox"/> IEC 61000-4-2 <input checked="" type="checkbox"/> EN 61000-4-2 |                    |          |
| <b>Applicant</b>     | Allterco Robotics   |                    |          |
| <b>EUT</b>           | wifi smart plug   | <b>Temperature</b> | 24.2℃    |
| <b>M/N</b>           | Shelly Plug S   | <b>Humidity</b>    | 52.8%    |
| <b>Criterion</b>     | B   | <b>Pressure</b>    | 1021mbar |
| <b>Test Mode</b>     | TM1-TM2   |                    |          |
| <b>Test Engineer</b> | Qu Xin  |                    |          |

### TEST RESULT OF WIFI

| Test Voltage     | Coupling               | Observation | Result (Pass/Fail) |
|------------------|------------------------|-------------|--------------------|
| ±2KV, ±4kV       | Contact Discharge      | TT, TR      | Pass               |
| ±2KV, ±4kV, ±8kV | Air Discharge          | TT, TR      | Pass               |
| ±2KV, ±4kV       | Indirect Discharge HCP | TT, TR      | Pass               |
| ±2KV, ±4kV       | Indirect Discharge VCP | TT, TR      | Pass               |

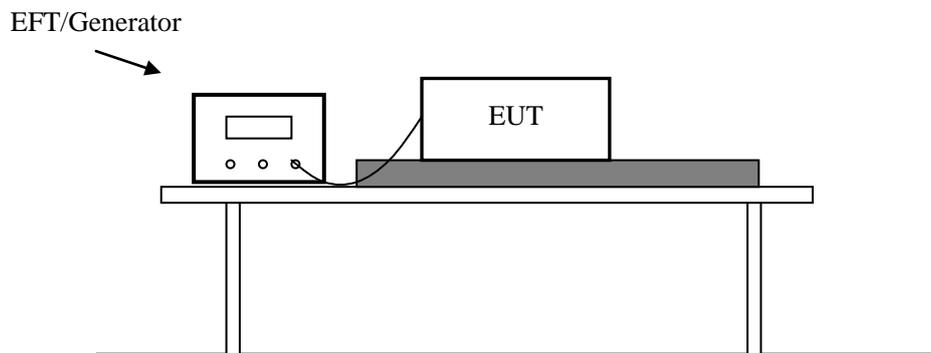
### TEST RESULT OF TM2

| Test Voltage     | Coupling               | Result (Pass/Fail) |
|------------------|------------------------|--------------------|
| ±2KV, ±4kV       | Contact Discharge      | Pass               |
| ±2KV, ±4kV, ±8kV | Air Discharge          | Pass               |
| ±2KV, ±4kV       | Indirect Discharge HCP | Pass               |
| ±2KV, ±4kV       | Indirect Discharge VCP | Pass               |

Note: The EUT performance complied with performance criteria for CT&CR to MS Function and there is no any degradation of performance and function.

# 11. ELECTRICAL FAST TRANSIENT IMMUNITY

## 11.1. Test Configuration



## 11.2. Test Standard

EN 301 489-1 V2.1.1/ EN61000-4-4: 2012  
 Test level 2 at 1 kV

### Test level

| Level | Open Circuit Output Test Voltage $\pm 10\%$ |   |
|-------|---|---|
|       | On Power Supply Lines                       | On I/O (Input/Output) Signal data and control lines |
| 1     | 0.5 kV                                      | 0.25 kV   |
| 2     | 1 kV  | 0.5 kV  |
| 3     | 2 kV  | 1 kV  |
| 4     | 4 kV  | 2 kV  |
| X     | Special                                     | Special   |

Performance criterion: B

### 11.3. Test Procedure

The EUT is put on the table, which is 0.8 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

11.3.1.For input and output 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 is 2 minutes.

11.3.2.For signal lines and control lines ports: No I/O ports. It's unnecessary to test.

11.3.3.For DC output line ports: It's unnecessary to test.

### 11.4. Test Data

**PASS.**

Please refer to the following page.

## Electrical Fast Transient/Burst Test Results

|                      |   |                    |        |
|----------------------|---|--------------------|--------|
| <b>Standard</b>      | <input type="checkbox"/> IEC 61000-4-4 <input checked="" type="checkbox"/> EN 61000-4-4 |                    |        |
| <b>Applicant</b>     | Allterco Robotics   |                    |        |
| <b>EUT</b>           | wifi smart plug   | <b>Temperature</b> | 24.2°C |
| <b>M/N</b>           | Shelly Plug S   | <b>Humidity</b>    | 52.8%  |
| <b>Test Mode</b>     | TM1-TM2   | <b>Criterion</b>   | B      |
| <b>Test Engineer</b> | Qu Xin  |                    |        |

### TEST RESULT OF WIFI

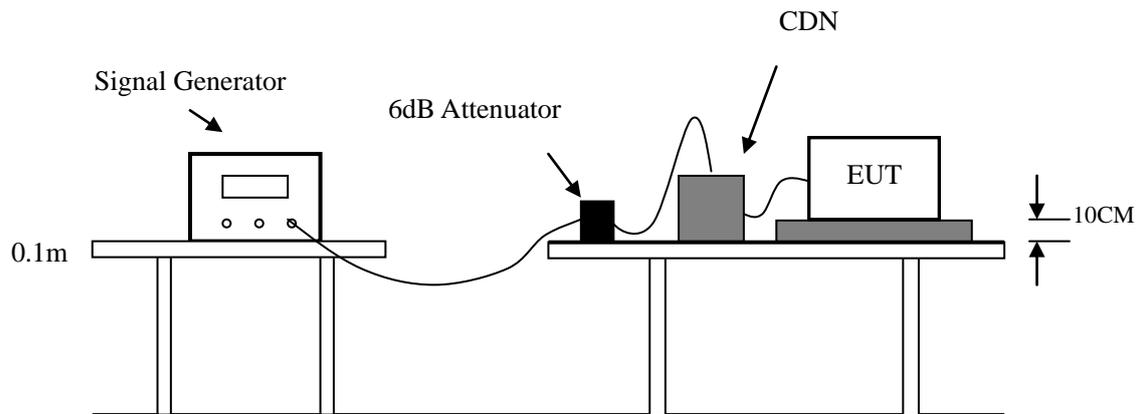
| Line | Test Voltage | Polarity | Observation | Result (Pass/Fail) |
|------|--------------|----------|-------------|--------------------|
| L    | 1KV          | +/-      | TT, TR      | Pass               |
| N    | 1KV          | +/-      | TT, TR      | Pass               |
| L-N  | 1KV          | +/-      | TT, TR      | Pass               |

### TEST RESULT OF TM2

| Line | Test Voltage | Polarity | Result (Pass/Fail) |
|------|--------------|----------|--------------------|
| L    | 1KV          | +/-      | Pass               |
| N    | 1KV          | +/-      | Pass               |
| L-N  | 1KV          | +/-      | Pass               |

## 12. RF COMMON MODE

### 12.1. Test Configuration



### 12.2. Test Standard

EN 301 489-1 V2.1.1/ EN 61000-4-6: 2014  
 Test level 2 at 3 V (r.m.s.), 0.15 MHz ~ 80 MHz,  
 Modulation type: AM  
 Modulation depth: 80%  
 Modulation signal: 1 kHz

#### Test level

| Level | Voltage Level (r.m.s.) (V) |
|-------|----------------------------|
| 1     | 1                          |
| 2     | 3                          |
| 3     | 10                         |
| X     | Special                    |

Performance criterion: A

### 12.3. Test Procedure

12.3.1. Let the EUT work in test mode and test it.

12.3.2. The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3 m 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).

12.3.3. The disturbance signal described below is injected to EUT through CDN.

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

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

12.3.6. The rate of sweep shall not exceed  $1.5 \times 10^{-3}$  decades/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.

12.3.7. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

### 12.4. Test Data

**PASS.**

Please refer to the following page.

| Injected Currents Susceptibility Test Results |   |                    |        |
|---|---|--------------------|--------|
| <b>Standard</b>                               | <input type="checkbox"/> IEC 61000-4-6 <input checked="" type="checkbox"/> EN 61000-4-6 |                    |        |
| <b>Applicant</b>                              | Allterco Robotics   |                    |        |
| <b>EUT</b>                                    | wifi smart plug   | <b>Temperature</b> | 24.2°C |
| <b>M/N</b>                                    | Shelly Plug S   | <b>Humidity</b>    | 52.8%  |
| <b>Test Mode</b>                              | TM1-TM2   | <b>Criterion</b>   | A      |
| <b>Test Engineer</b>                          | Qu Xin  |                    |        |

| TEST RESULT OF WIFI   |                   |                        |             |                    |
|-----------------------|-------------------|------------------------|-------------|--------------------|
| Frequency Range (MHz) | Injected Position | Strength (Unmodulated) | Observation | Result (Pass/Fail) |
| 0.15 ~ 80             | AC Mains          | 3V                     | CT, CR      | Pass               |
|                       |                   |                        |             |                    |
|                       |                   |                        |             |                    |

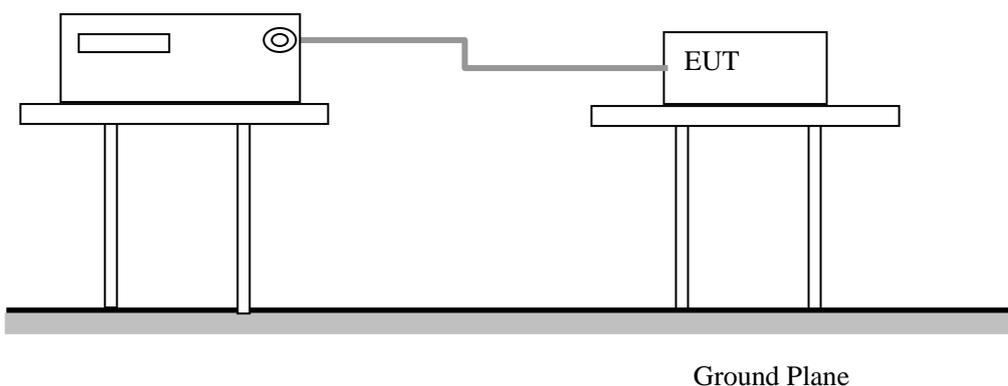
| TEST RESULT OF TM2    |                   |                        |                    |
|-----------------------|-------------------|------------------------|--------------------|
| Frequency Range (MHz) | Injected Position | Strength (Unmodulated) | Result (Pass/Fail) |
| 0.15 ~ 80             | AC Mains          | 3V                     | Pass               |

Remark:

1. Modulation Signal: 1kHz 80% AM
2. Measurement Equipment :  
 Simulator: CIT-10 (FRANKONIA)  
       CDN :  CDN-M2 (FRANKONIA)  
            CDN-M3 (FRANKONIA)

## 13. SURGES, LINE TO LINE AND LINE TO GROUND

### 13.1. Test Configuration



### 13.2. Test Standard

ETSI EN 301 489-1 V2.1.1 / EN 61000-4-5: 2014

L-N: Test level 2 at 1 kV

L-PE, N-PE Test Level 3 at 2kV

#### Test Level

| Open Circuit Output Test Voltage $\pm 10\%$ |                       |  |
|---|-----------------------|--|
| Level                                       | On Power Supply Lines | On I/O (Input/Output)<br>Signal data and control lines |
| 1   | 0.5 kV                | 0.25 kV  |
| 2   | 1 kV                  | 0.5 kV   |
| 3   | 2 kV                  | 1 kV   |
| 4   | 4 kV                  | 2 kV   |
| X   | Special               | Special  |

Performance criterion: B

### 13.3. Test Procedure

- 12.3.1. For line to line coupling mode, provide a 0.5 kV 1.2/50us voltage surge (at open-circuit condition).
- 12.3.2. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 12.3.3. Different phase angles are done individually.
- 12.3.4. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

13.4. Test Data

| Surge Immunity Test Result |   |                    |        |
|----------------------------|---|--------------------|--------|
| <b>Standard</b>            | <input type="checkbox"/> IEC 61000-4-5 <input checked="" type="checkbox"/> EN 61000-4-5 |                    |        |
| <b>Applicant</b>           | Allterco Robotics   |                    |        |
| <b>EUT</b>                 | wifi smart plug   | <b>Temperature</b> | 24.2°C |
| <b>M/N</b>                 | Shelly Plug S   | <b>Humidity</b>    | 52.8%  |
| <b>Test Mode</b>           | TM1-TM2   | <b>Criterion</b>   | A      |
| <b>Test Engineer</b>       | Qu Xin  |                    |        |

| TEST RESULT OF WIFI |  |  |  |  |  |  |
|---------------------|--|--|--|--|--|--|
|---------------------|--|--|--|--|--|--|

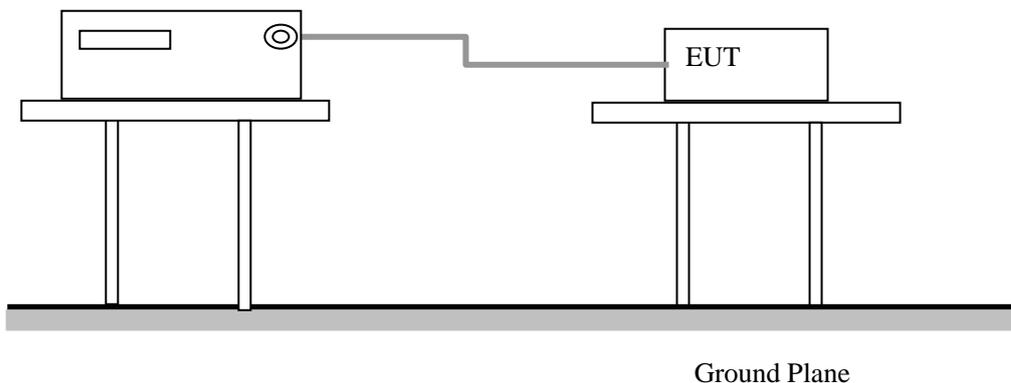
| Location | Polarity | Phase Angle         | Number of Pulse | Pulse Voltage (KV) | Observation | Result (Pass/Fail) |
|----------|----------|---------------------|-----------------|--------------------|-------------|--------------------|
| L-N      | +        | 0°, 90°, 180°, 270° | 5               | 1.0                | TT, TR      | Pass               |
|          | -        | 0°, 90°, 180°, 270° | 5               | 1.0                | TT, TR      | Pass               |
|          |          |                     |                 |                    |             |                    |

| TEST RESULT OF TM2 |  |  |  |  |  |
|--------------------|--|--|--|--|--|
|--------------------|--|--|--|--|--|

| Location | Polarity | Phase Angle         | Number of Pulse | Pulse Voltage (KV) | Result (Pass/Fail) |
|----------|----------|---------------------|-----------------|--------------------|--------------------|
| L-N      | +        | 0°, 90°, 180°, 270° | 5               | 1.0                | Pass               |
|          | -        | 0°, 90°, 180°, 270° | 5               | 1.0                | Pass               |
|          |          |                     |                 |                    |                    |

## 14. VOLTAGE DIPS/INTERRUPTIONS IMMUNITY TEST

### 14.1. Test Configuration



### 14.2. Test Standard

ETSI EN 301 489-1 V2.1.1/ EN 61000-4-11: 2004  
Test levels and Performance Criterion

#### Test Level

| Voltage Reduction<br>%UT | Voltage dips<br>%UT          | Duration<br>(in period) |
|--------------------------|------------------------------|-------------------------|
| 100                      | 0                            | 0.5                     |
| 100                      | 0                            | 1                       |
| 30                       | 70                           | 5                       |
| Voltage Reduction<br>%UT | Voltage Interruptions<br>%UT | Duration<br>(in period) |
| 100                      | 0                            | 250                     |

Performance criterion: B&C

### 14.3. Test Procedure

13.3.1. The interruption is introduced at selected phase angles with specified duration.

13.3.2. Record any degradation of performance.

14.4. Test Data

| Voltage Dips And Interruptions Test Results |   |                    |        |
|---|---|--------------------|--------|
| <b>Standard</b>                             | <input type="checkbox"/> IEC 61000-4-11 <input checked="" type="checkbox"/> EN 61000-4-11 |                    |        |
| <b>Applicant</b>                            | Allterco Robotics   |                    |        |
| <b>EUT</b>                                  | wifi smart plug   | <b>Temperature</b> | 24.2°C |
| <b>M/N</b>                                  | Shelly Plug S   | <b>Humidity</b>    | 52.8%  |
| <b>Test Mode</b>                            | TM1-TM2   | <b>Criterion</b>   | A      |
| <b>Test Engineer</b>                        | Qu Xin  |                    |        |

| TEST RESULT OF WIFI            |  |                          |             |                    |
|--------------------------------|--|--------------------------|-------------|--------------------|
| Test Level<br>% U <sub>T</sub> | Voltage Dips & Short<br>Interruptions % U <sub>T</sub> | Duration<br>(in periods) | Observation | Result (Pass/Fail) |
| 0                              | 100  | 0.5P                     | TT, TR      | Pass               |
| 0                              | 100  | 1P                       | TT, TR      | Pass               |
| 70                             | 30   | 25P                      | TT, TR      | Pass               |
| 0                              | 100  | 250P                     | TT, TR      | Pass               |

| TEST RESULT OF TM2             |  |                          |                    |
|--------------------------------|--|--------------------------|--------------------|
| Test Level<br>% U <sub>T</sub> | Voltage Dips & Short<br>Interruptions % U <sub>T</sub> | Duration<br>(in periods) | Result (Pass/Fail) |
| 0                              | 100  | 0.5P                     | Pass               |
| 0                              | 100  | 1P                       | Pass               |
| 70                             | 30   | 25P                      | Pass               |
| 0                              | 100  | 250P                     | Pass               |

**15. LIST OF MEASURING EQUIPMENT****LINE CONDUCTED EMISSION**

| Item | Equipment         | Manufacturer    | Model No.   | Serial No.      | Cal Date   | Due Date   |
|------|-------------------|-----------------|-------------|-----------------|------------|------------|
| 1    | EMI Test Software | AUDIX           | E3          | /               | N/A        | N/A        |
| 2    | EMI Test Receiver | R&S             | ESPI        | 101840          | 2019-06-11 | 2020-06-10 |
| 3    | Artificial Mains  | R&S             | ENV216      | 101288          | 2019-06-12 | 2020-06-11 |
| 4    | 10dB Attenuator   | SCHWARZBEC<br>K | MTS-IMP-136 | 261115-001-0032 | 2019-06-11 | 2020-06-10 |

**RADIATED DISTURBANCE**

| Item | Equipment                | Manufacturer      | Model No.       | Serial No.  | Cal Date   | Due Date   |
|------|--------------------------|-------------------|-----------------|-------------|------------|------------|
| 1    | EMI Test Software        | AUDIX             | E3              | /           | N/A        | N/A        |
| 2    | 3m Semi Anechoic Chamber | SIDT<br>FRANKONIA | SAC-3M          | 03CH03-HY   | 2019-06-12 | 2020-06-11 |
| 3    | Positioning Controller   | MF                | MF-7082         | /           | 2019-06-12 | 2020-06-11 |
| 4    | By-log Antenna           | SCHWARZBEC<br>K   | VULB9163        | 9163-470    | 2019-07-25 | 2020-07-24 |
| 5    | Horn Antenna             | SCHWARZBEC<br>K   | BBHA 9120D      | 9120D-1925  | 2019-07-01 | 2020-06-30 |
| 6    | EMI Test Receiver        | R&S               | ESR 7           | 101181      | 2019-06-12 | 2020-06-11 |
| 7    | RS SPECTRUM ANALYZER     | R&S               | FSP40           | 100503      | 2018-11-15 | 2019-11-14 |
| 8    | AMPLIFIER                | QuieTek           | QTK             | CHM/0809065 | 2018-11-15 | 2019-11-14 |
| 9    | RF Cable-R03m            | Jye Bao           | RG142           | CB021       | 2019-06-12 | 2020-06-11 |
| 10   | RF Cable-HIGH            | SUHNER            | SUCOFLEX<br>106 | 03CH03-HY   | 2019-06-12 | 2020-06-11 |

**VOLTAGE FLUCTUATION AND FLICKER/HARMONIC CURRENT EMISSIONS**

| Item | Equipment                  | Manufacturer | Model No. | Serial No.   | Cal Date   | Due Date   |
|------|----------------------------|--------------|-----------|--------------|------------|------------|
| 1    | Power Analyzer Test System | Voltech      | PM6000    | 200006700523 | 2019-06-12 | 2020-06-11 |

**RF ELECTROMAGNETIC FIELD**

| Item | Equipment                              | Manufacturer       | Model No. | Serial No. | Cal Date   | Due Date   |
|------|--|--------------------|-----------|------------|------------|------------|
| 1    | RS Test Software                       | Tonscend           | /         | /          | N/A        | N/A        |
| 2    | ESG Vector Signal Generator            | Agilent            | E4438C    | MY42081396 | 2018-11-15 | 2019-11-14 |
| 3    | 3m Semi Anechoic Chamber               | SIDT<br>FRANKONIA  | SAC-3M    | 03CH03-HY  | 2019-06-12 | 2020-06-11 |
| 4    | RF POWER AMPLIFIER                     | OPHIR              | 5225R     | 1052       | NCR        | NCR        |
| 5    | RF POWER AMPLIFIER                     | OPHIR              | 5273F     | 1019       | NCR        | NCR        |
| 6    | Stacked Broadband Log Periodic Antenna | SCHWARZBEC<br>K    | STLP 9128 | 9128ES-145 | NCR        | NCR        |
| 7    | Stacked Mikrowellen Log.-Per Antenna   | SCHWARZBEC<br>K    | STLP 9149 | 9149-484   | NCR        | NCR        |
| 8    | Electric field probe                   | Narda<br>S.TS./PMM | EP601     | 611WX80208 | 2019-03-25 | 2020-03-24 |

**ELECTROSTATIC DISCHARGE**

| Item | Equipment     | Manufacturer | Model No. | Serial No. | Cal Date   | Due Date   |
|------|---------------|--------------|-----------|------------|------------|------------|
| 1    | ESD Simulator | SCHLODER     | SESD 230  | 604035     | 2019-06-13 | 2020-06-12 |

**ELECTRICAL FAST TRANSIENT IMMUNITY**

| Item | Equipment                     | Manufacturer | Model No. | Serial No. | Cal Date   | Due Date   |
|------|-------------------------------|--------------|-----------|------------|------------|------------|
| 1    | Immunity Simulative Generator | EM TEST      | UCS500 M4 | 0101-34    | 2019-06-11 | 2020-06-10 |

**RF COMMON MODE**

| Item | Equipment      | Manufacturer | Model No. | Serial No. | Cal Date   | Due Date   |
|------|----------------|--------------|-----------|------------|------------|------------|
| 1    | Simulator      | FRANKONIA    | CIT-10/75 | A126A1195  | 2019-06-11 | 2020-06-10 |
| 2    | CDN            | FRANKONIA    | CDN-M2+M3 | A2210177   | 2019-06-11 | 2020-06-10 |
| 3    | 6dB Attenuator | FRANKONIA    | DAM25W    | 1172040    | 2019-06-11 | 2020-06-10 |

**SURGES, LINE TO LINE AND LINE TO GROUND**

| Item | Equipment                     | Manufacturer | Model No. | Serial No. | Cal Date   | Due Date   |
|------|-------------------------------|--------------|-----------|------------|------------|------------|
| 1    | Immunity Simulative Generator | EM TEST      | UCS500 M4 | 0101-34    | 2019-06-11 | 2020-06-10 |

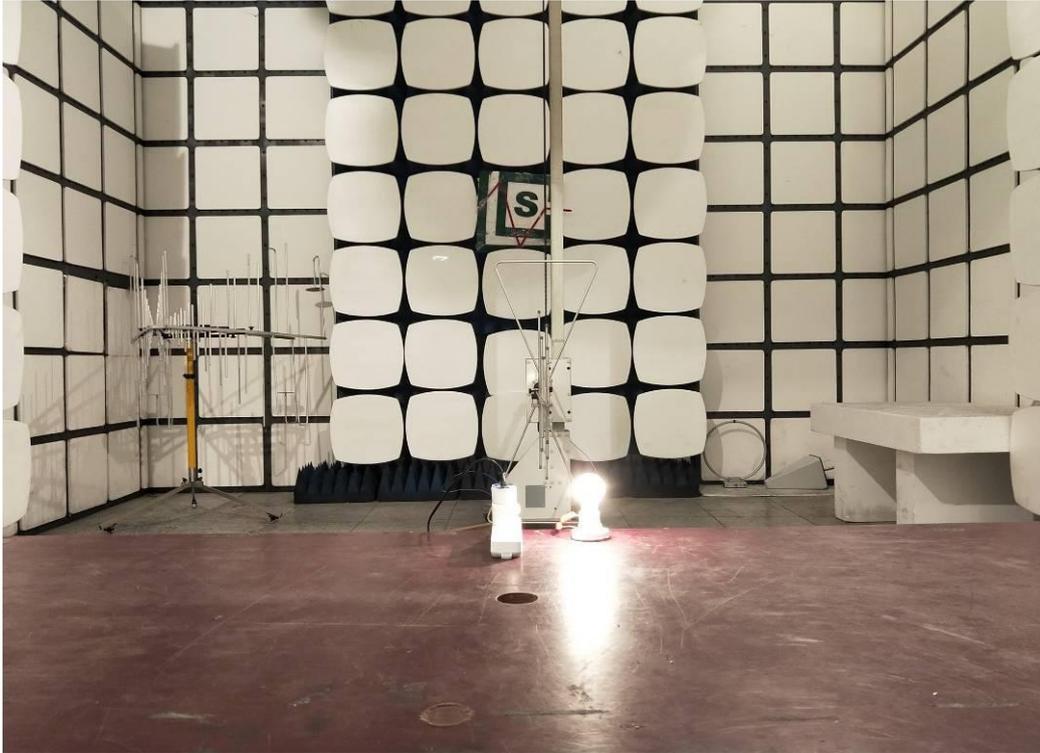
**VOLTAGE DIPS/INTERRUPTIONS IMMUNITY TEST**

| Item | Equipment                     | Manufacturer | Model No. | Serial No. | Cal Date   | Due Date   |
|------|-------------------------------|--------------|-----------|------------|------------|------------|
| 1    | Voltage dips and up generator | 3CTEST       | VDG-1105G | EC0171014  | 2019-06-11 | 2020-06-10 |

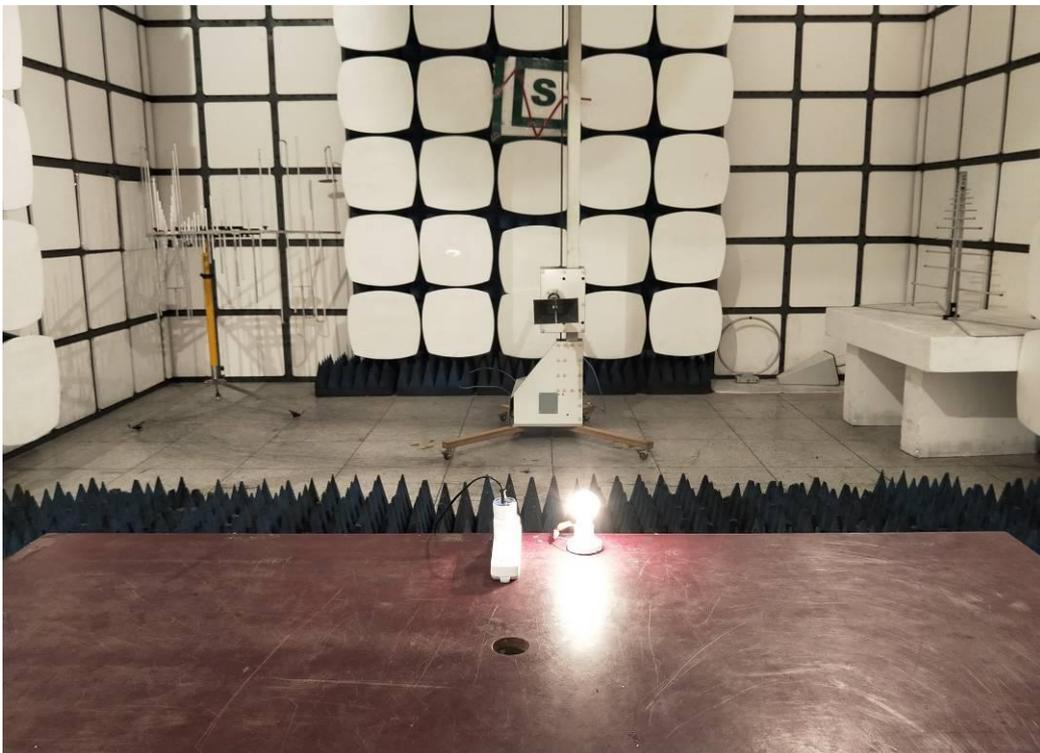
Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO.,LTD.

## 16. TEST SETUP PHOTOGRAPHS

### 16.1. Photo of Radiated Emissions Measurement



Below 1G



Above 1G

### 16.2.Photo of Power Line Conducted Emissions Measurement



### 16.3.Photo of Harmonic & Flicker Measurement



### 16.4.Photo of Electrostatic Discharge Test



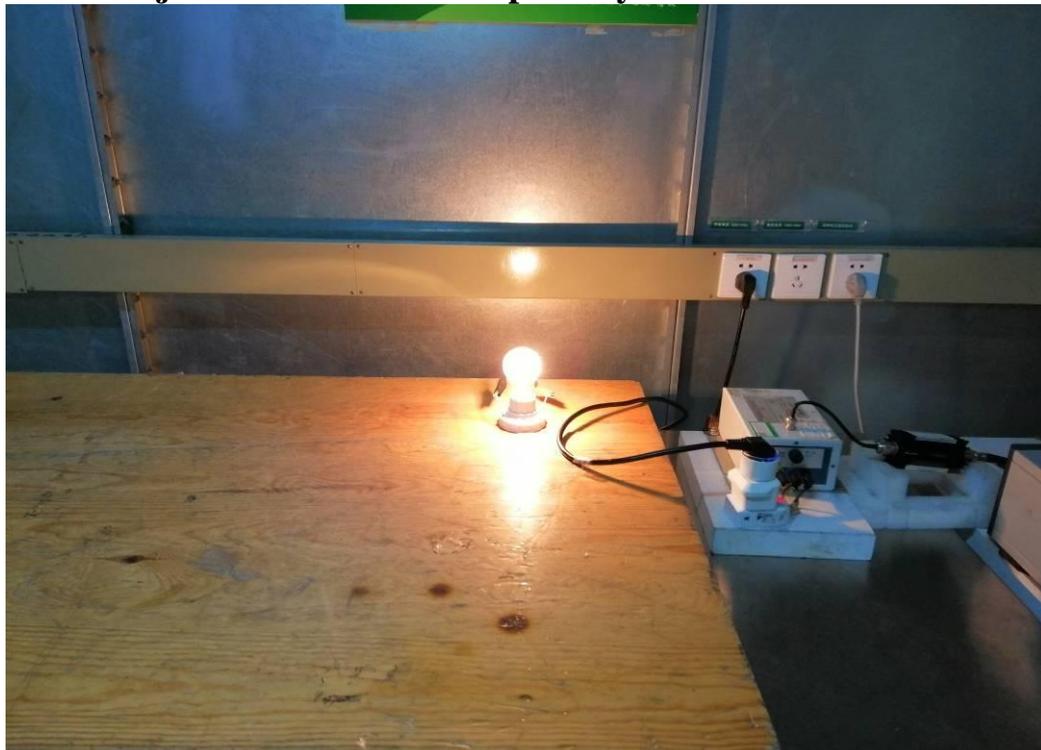
### 16.5.Photo of Radio-frequency, Continuous radiated disturbance



### 16.6.Photo of Electrical Fast Transient/Burst& Surge Immunity Short Interruptions Immunity Test



### 16.7.Photo of Injected Currents Susceptibility Test



### 16.8 Photo of Voltage Dips and Short Interruptions Immunity Test



### 17.EXTERNAL AND INTERNAL PHOTOS OF THE EUT

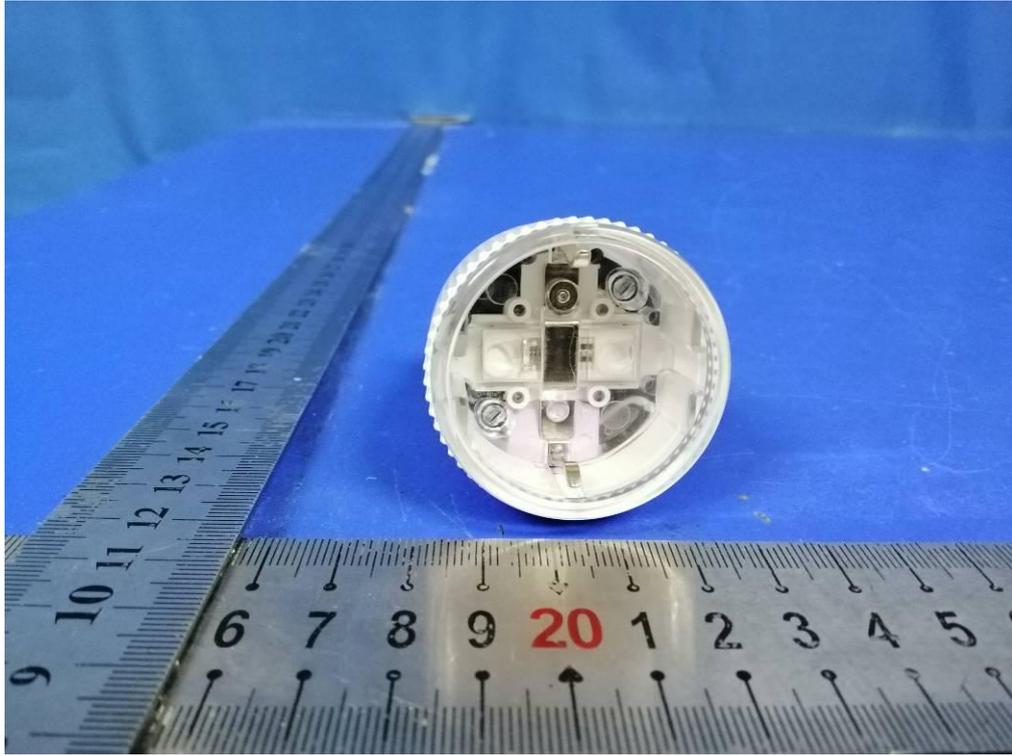


Fig. 1

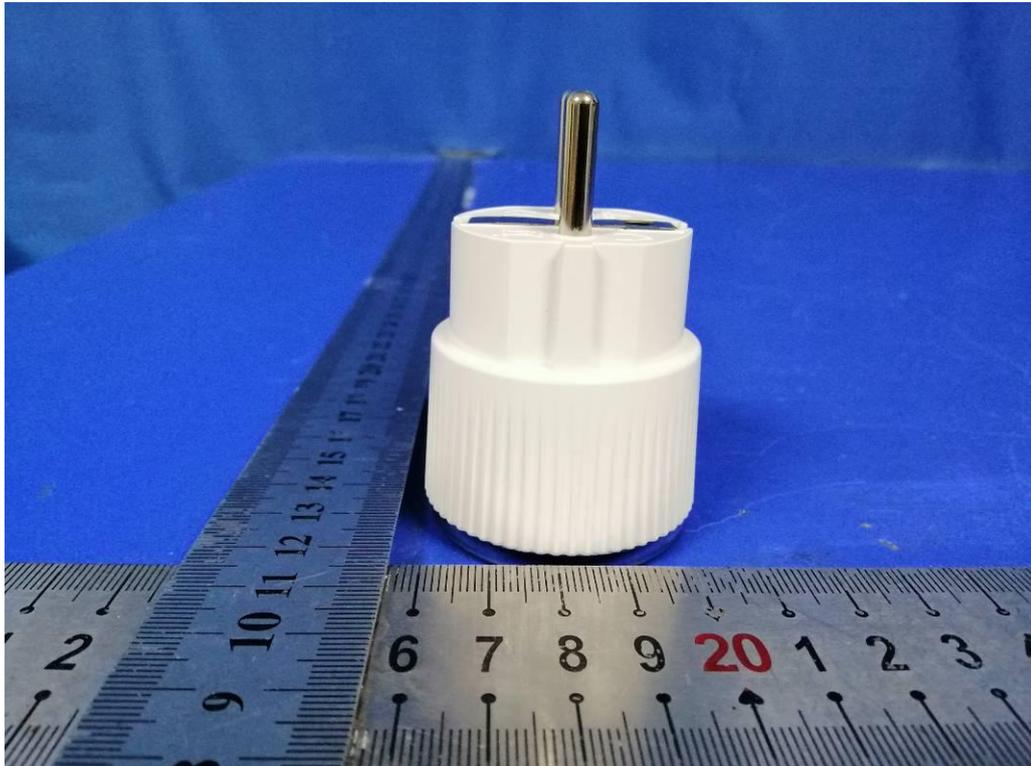


Fig. 2



Fig. 3

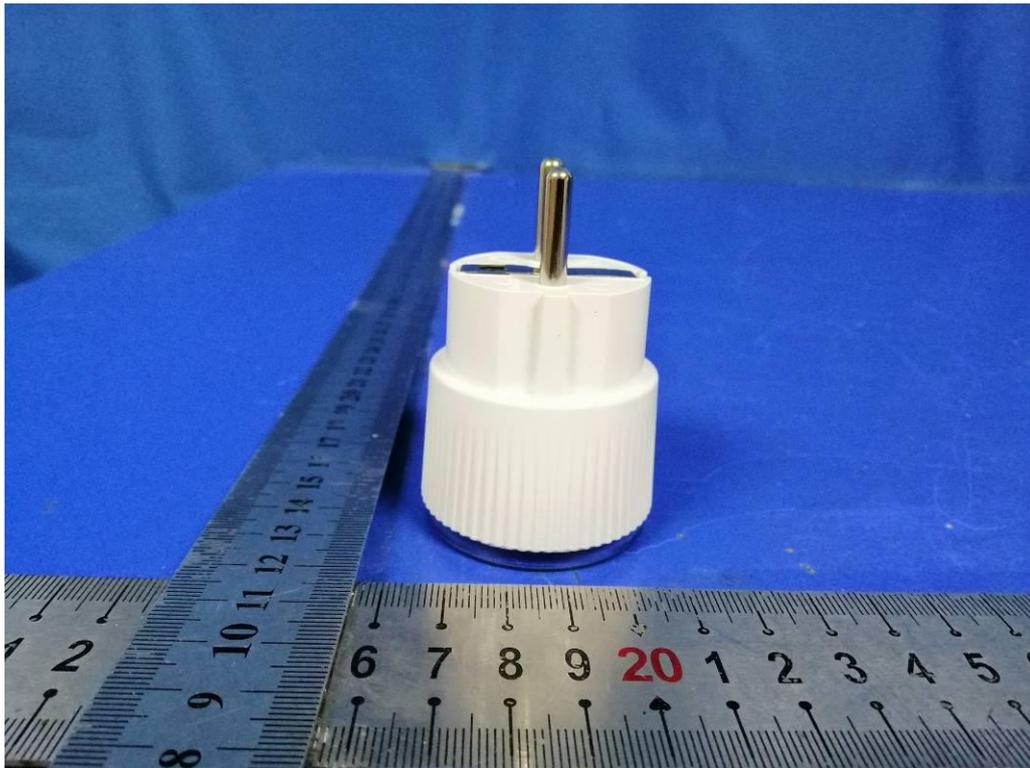


Fig. 4

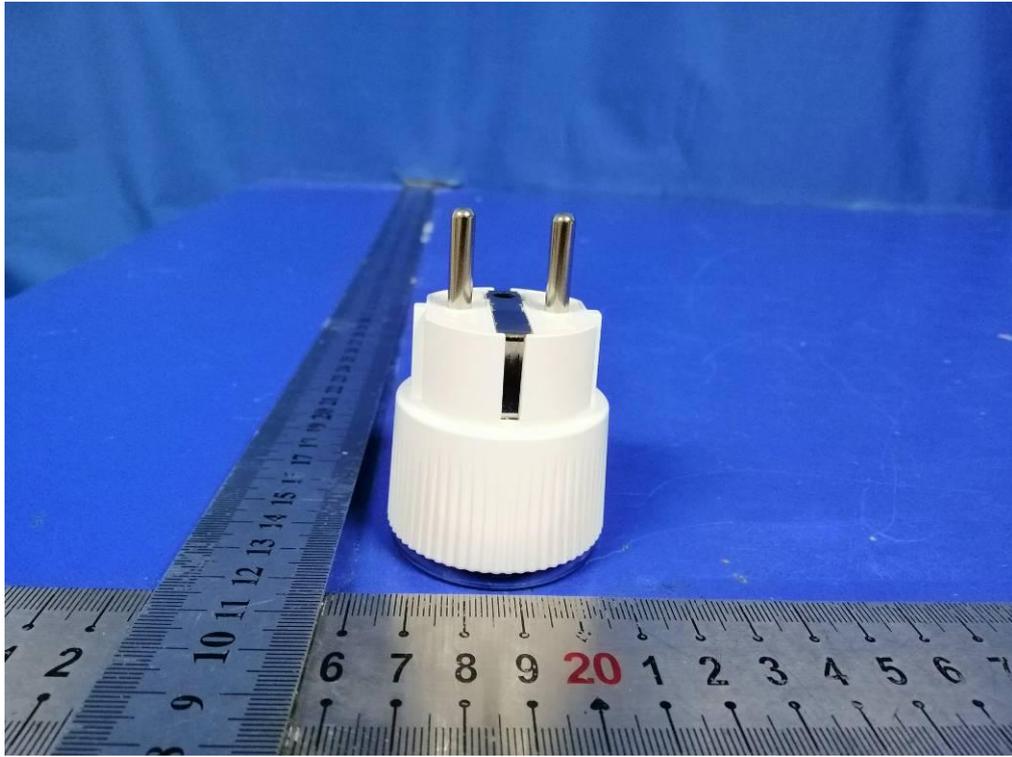


Fig. 5

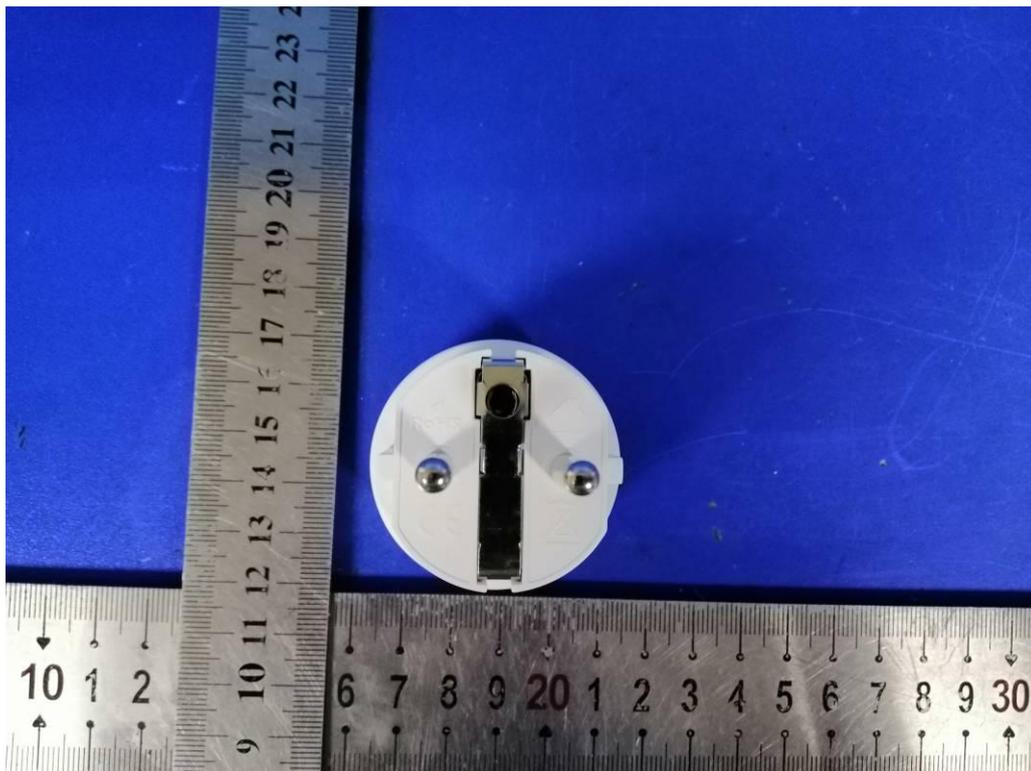


Fig. 6

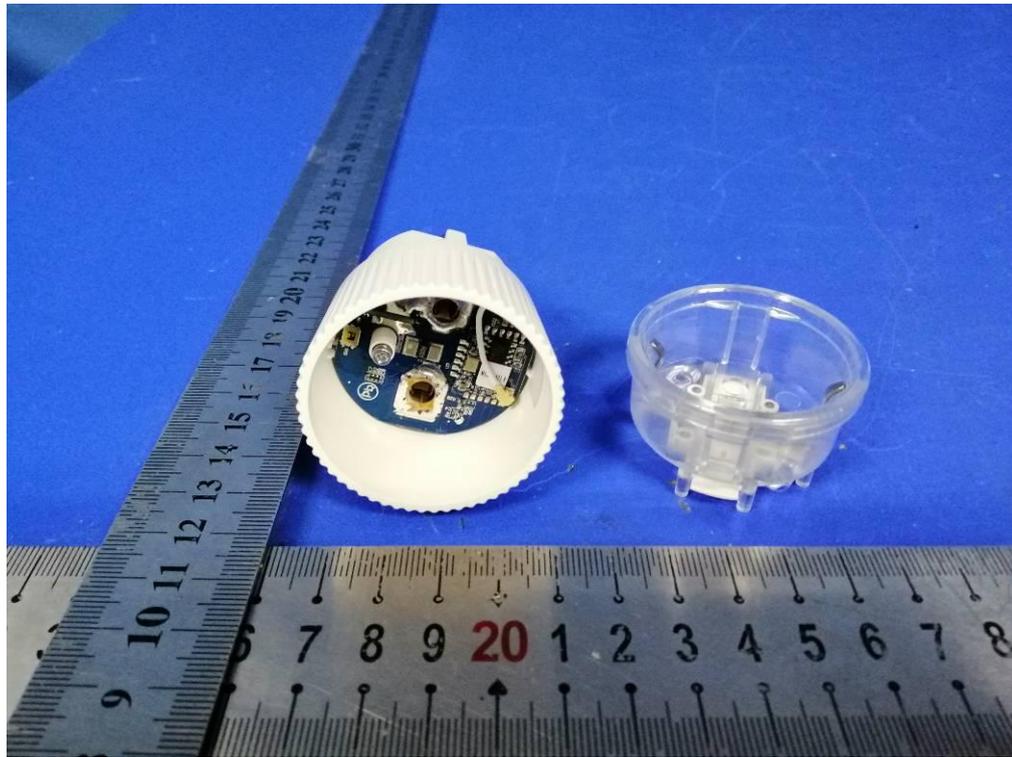


Fig. 7

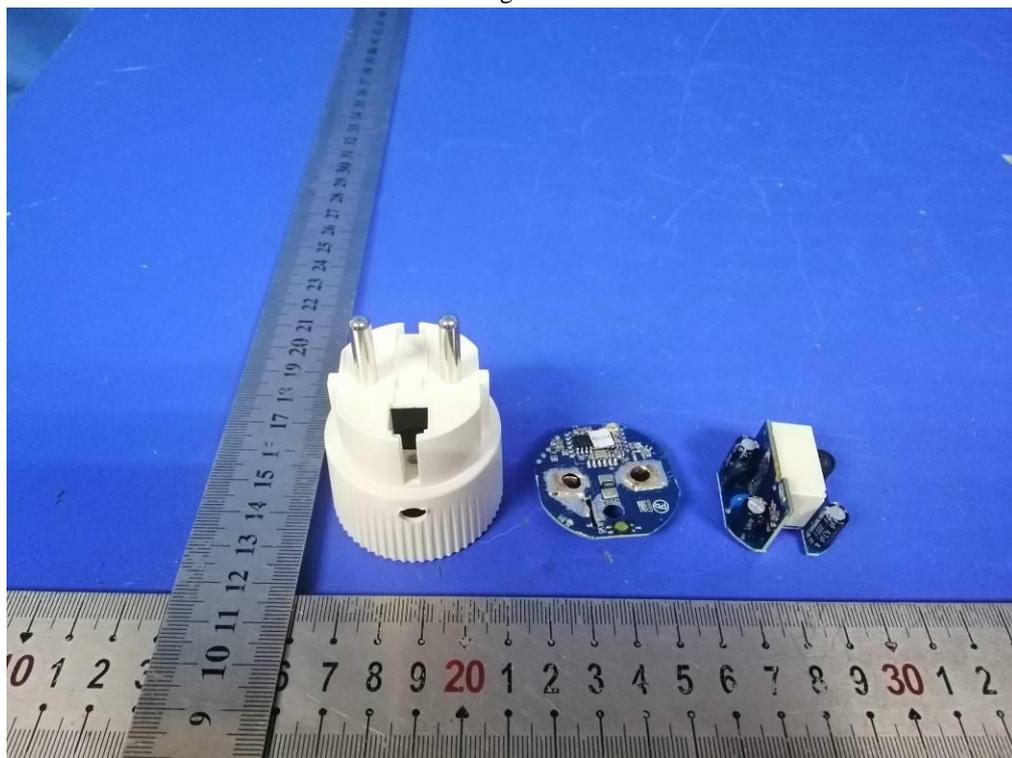


Fig. 8

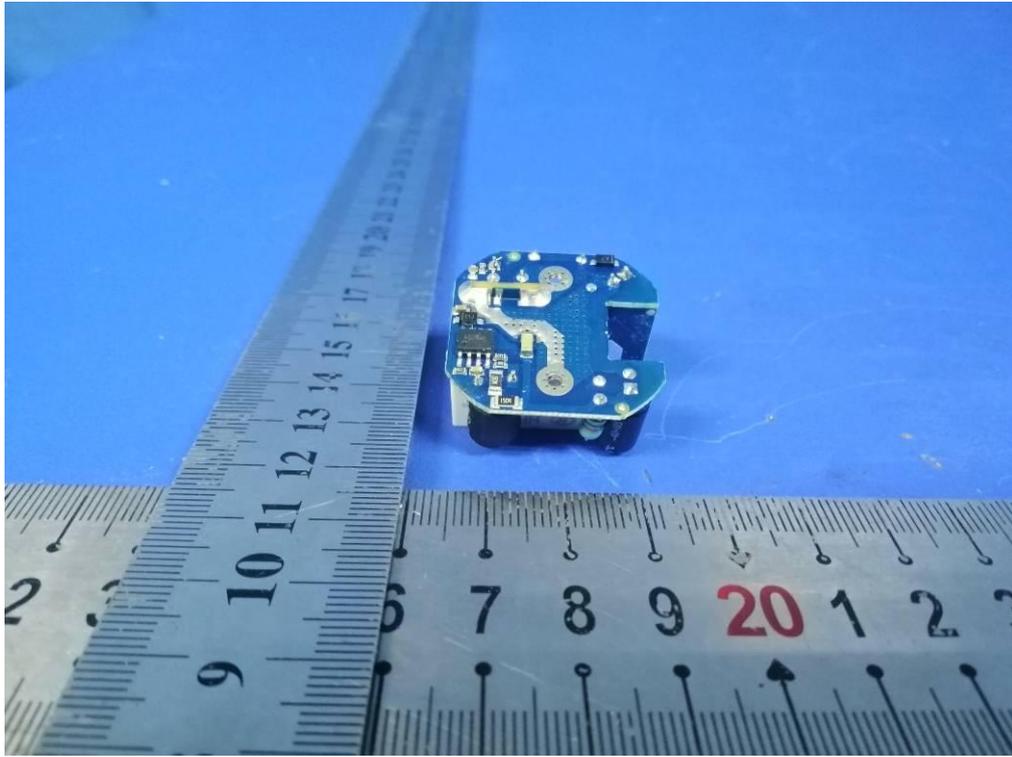


Fig. 9

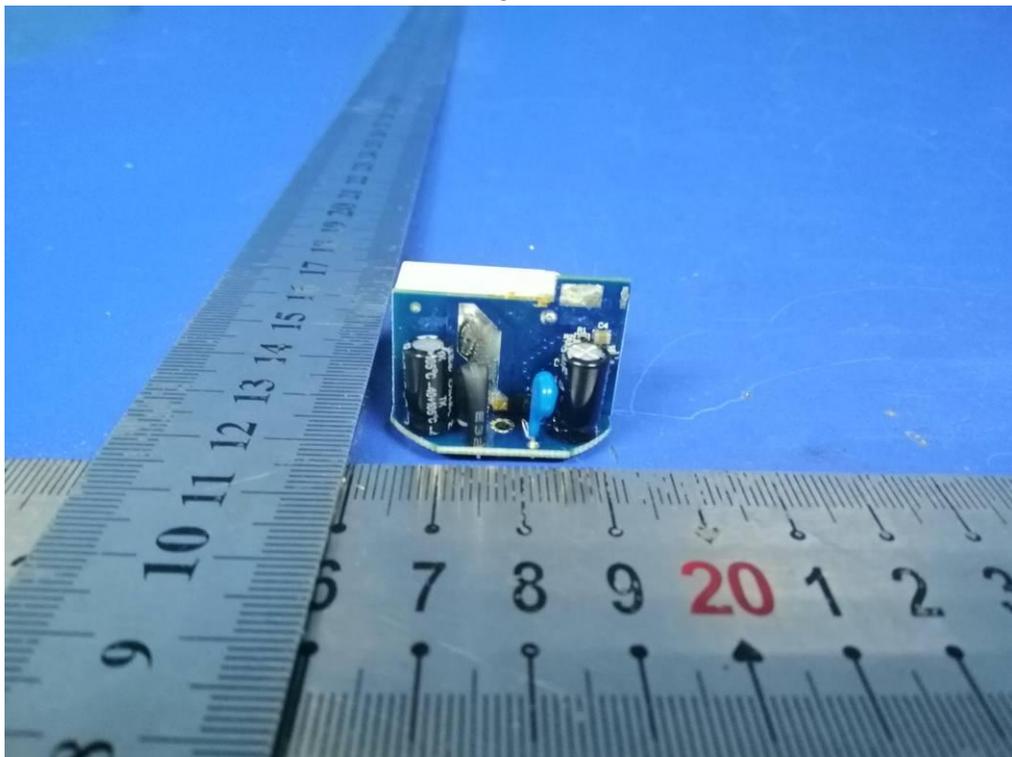


Fig. 10

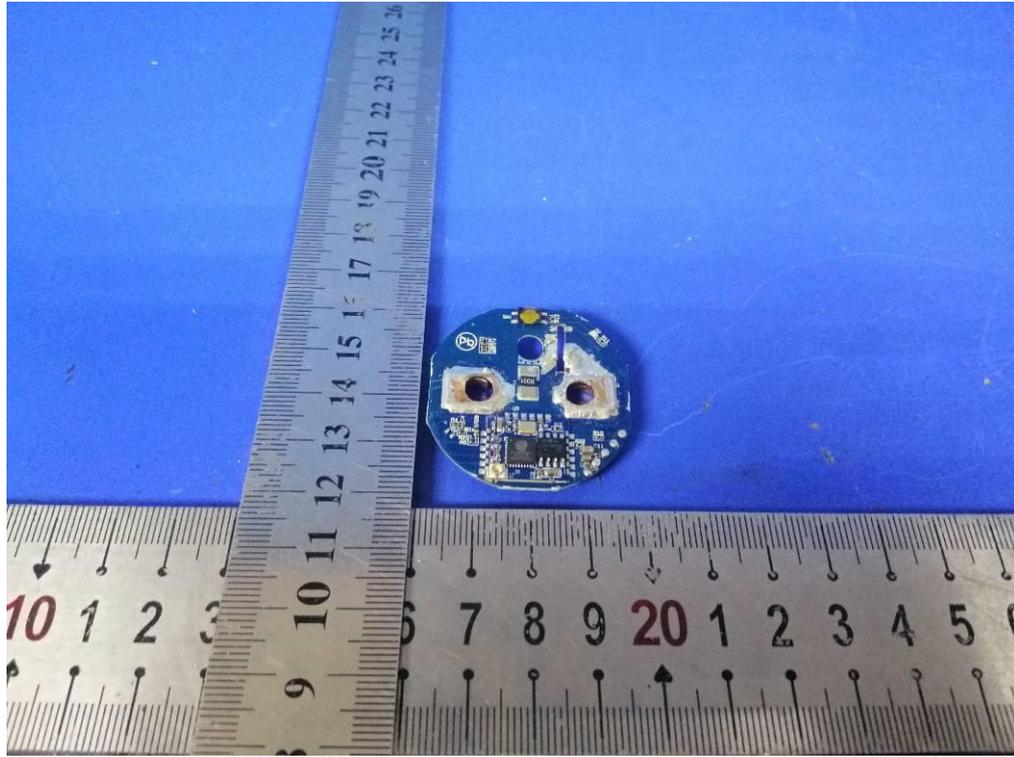


Fig. 11

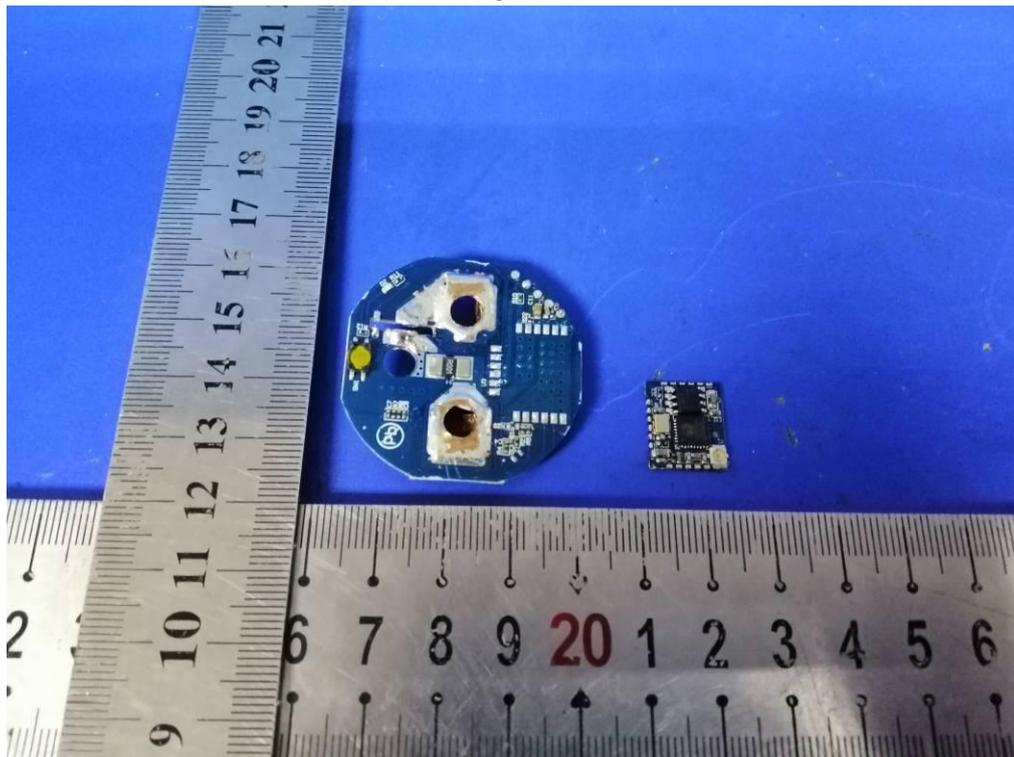


Fig. 12

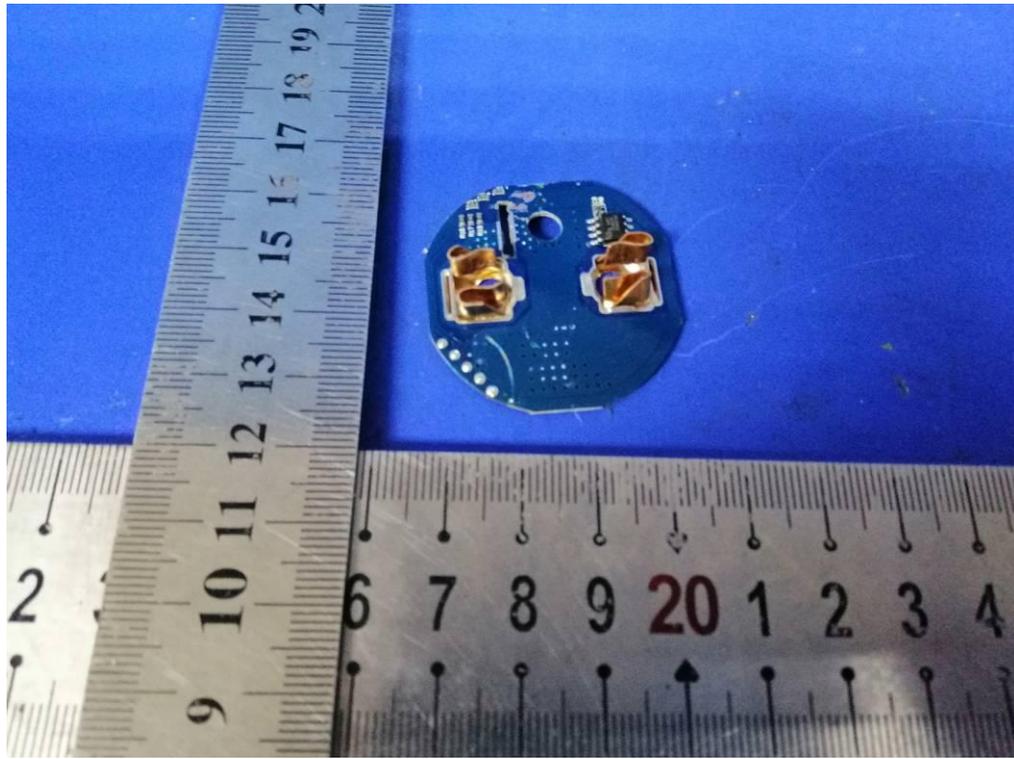


Fig. 13

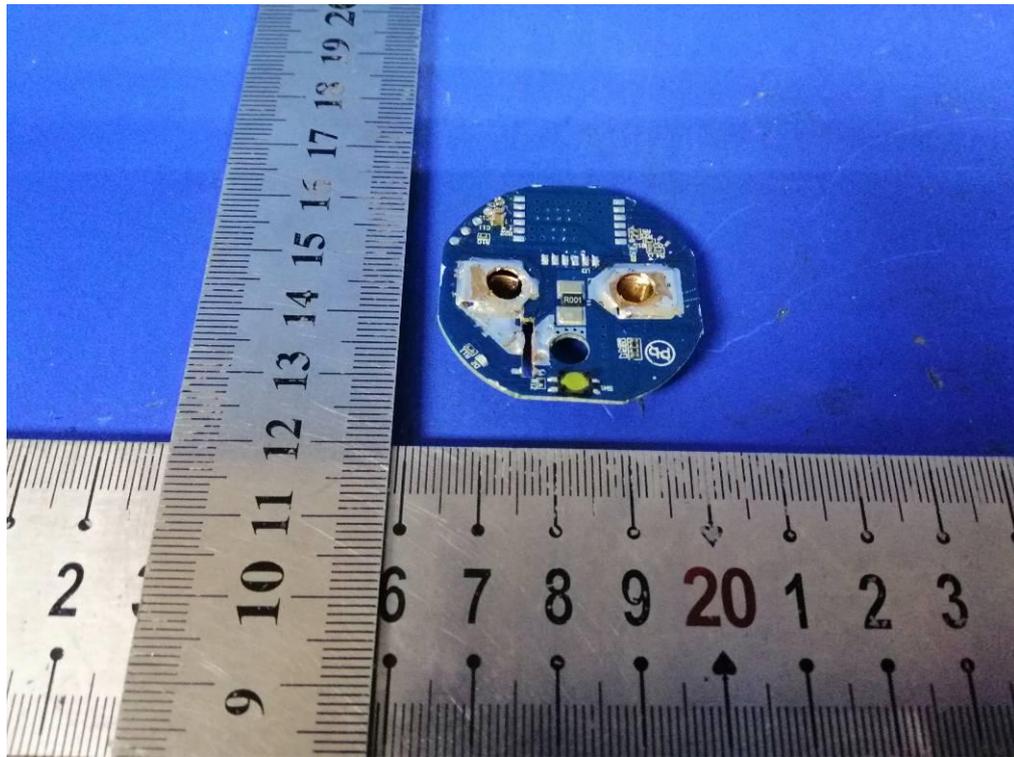


Fig. 14

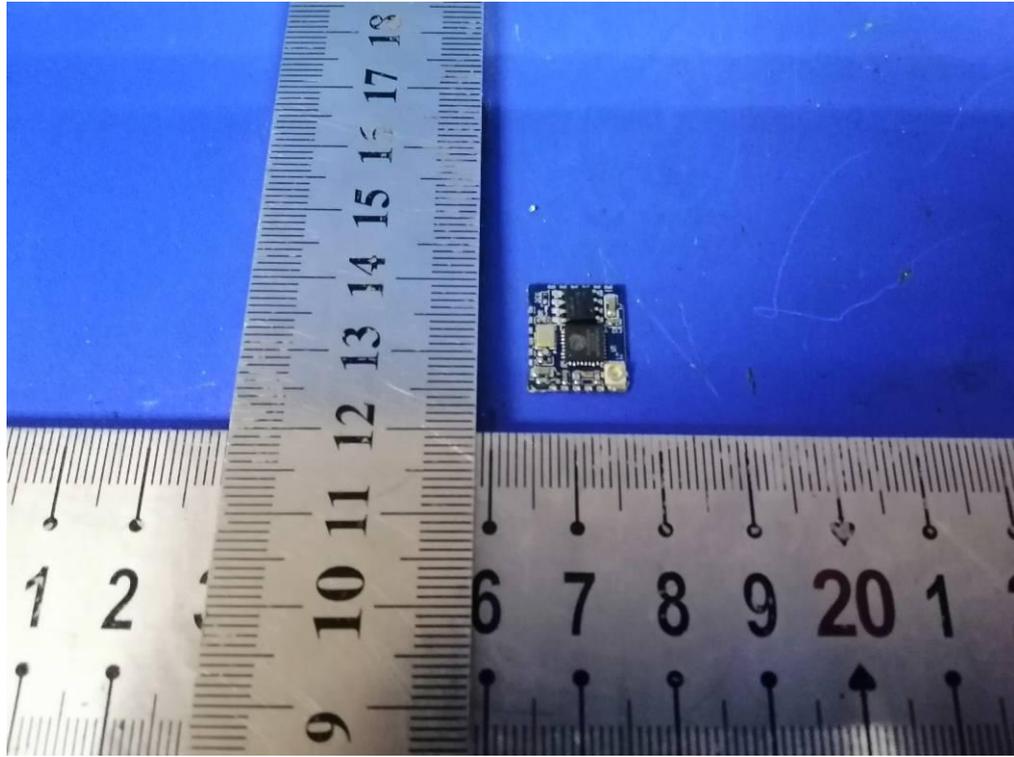


Fig. 15

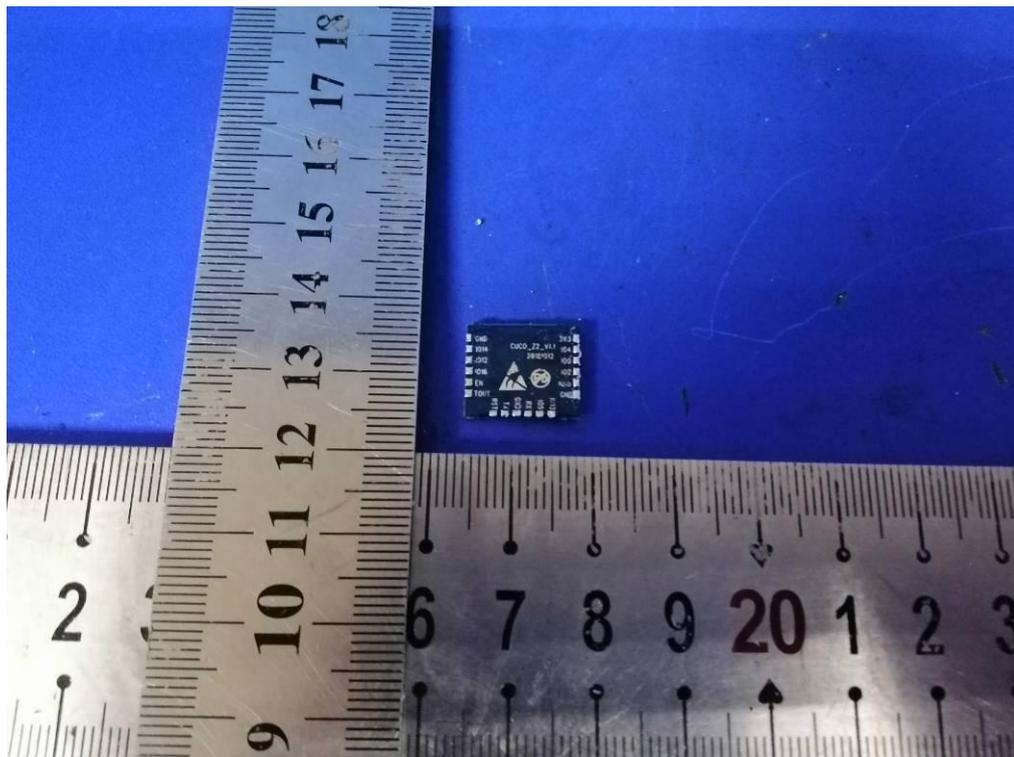


Fig. 16



Fig. 17



Fig. 18

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