

EMC TEST REPORT

For

Shenzhen Sonoff Technologies Co., Ltd.

Wi-Fi Smart Lamp Holder

Test Model: SlampherR2

Additional Model No.: /

Prepared for : Shenzhen Sonoff Technologies Co., Ltd.
Address : Building 8, Room 1001, Lianhua industrial park, Longyuan Road, Hualian community, Longhua St, Longhua dist, Shenzhen, Guangdong, China.

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Date of receipt of test sample : March 28, 2019
Number of tested samples : 1
Serial number : Prototype
Date of Test : March 28, 2019~ April 08, 2019
Date of Report : April 12, 2019



EMC TEST REPORT
ETSI EN 301 489-1 V2.1.1 (2017-02)
Final draft ETSI EN 301 489-3 V2.1.1 (2017-03)
ETSI EN 301 489-17 V3.1.1 (2017-02)

Report Reference No. : LCS190326086AEA

Date Of Issue..... : April 12, 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 : Shenzhen Sonoff Technologies Co., Ltd.

Address..... : Building 8, Room 1001, Lianhua industrial park, Longyuan Road, Hualian community, Longhua St, Longhua dist, Shenzhen, Guangdong, China.

Test Specification

Standard..... : ETSI EN 301 489-1 V2.1.1 (2017-02)
Final draft ETSI EN 301 489-3 V2.1.1 (2017-03)
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..... : Wi-Fi Smart Lamp Holder

Trade Mark..... : 

Test Model : SlampherR2

Ratings : Input: AC 100V-240V 50/60Hz;
Output: AC 100V-240V 50/60Hz

Result : Positive

Compiled by:

Ryan Hu

Ryan Hu/ Administrators

Supervised by:

Calvin Weng

Calvin Weng/ Technique principal

Approved by:

Gavin Liang


Gavin Liang/ Manager

EMC -- TEST REPORT**Test Report No. : LCS190326086AEA**April 12, 2019

Date of issue

Test Model..... : Wi-Fi Smart Lamp Holder

EUT..... : SlampherR2

Applicant..... : Shenzhen Sonoff Technologies Co., Ltd.

Address..... : Building 8, Room 1001, Lianhua industrial park, Longyuan Road, Hualian community, Longhua St, Longhua dist, Shenzhen, Guangdong, China.

Telephone..... : /

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Manufacturer..... : Shenzhen Sonoff Technologies Co., Ltd.

Address..... : Building 8, Room 1001, Lianhua industrial park, Longyuan Road, Hualian community, Longhua St, Longhua dist, Shenzhen, Guangdong, China.

Telephone..... : /

Fax..... : /

Factory..... : /

Address..... : /

Telephone..... : /

Fax..... : /

Test Result**Positive**

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

Report Version	Issue Date	Revisions	Revised By
000	April 12, 2019	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1. Product Description for Equipment Under Test (EUT)

EUT	: Wi-Fi Smart Lamp Holder
Model No.	: SlampherR2
Model Declaration	: /
Test Model	: SlampherR2
Power Supply	: Input: AC 100V-240V 50/60Hz; Output: AC 100V-240V 50/60Hz
Hardware Version	: SlampherR2 V2.4
Software Version	: FWSW-0185-SWITCH-8285-DOUT-v2.6.1-20181212.104940.637-FACTORY

WIFI(2.4G Band)

Frequency Range	: 2412-2472MHz
Channel Spacing	: 5MHz
Channel Number	: 13 channels for 20MHz bandwidth(2412~2472MHz)
Modulation Type	: 802.11b: DSSS; 802.11g/n: OFDM
Antenna Description	: Internal antenna, 1dBi (Max.)

433 Receiver

Frequency Range	: 433.92MHz
Channel Number	: 1
Modulation Type	: CCK
Receiver Category	: Category 2
Antenna Description	: Internal Antenna

1.2. Objective

ETSI EN 301 489-1	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
ETSI EN 301 489-17	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
ETSI EN 301 489-3	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

The objective is to determine compliance with ETSI EN 301 489-1 V2.1.1 (2017-02), Final draft ETSI EN 301 489-3 V2.1.1 (2017-03) and 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), Final draft ETSI EN 301 489-3 V2.1.1 (2017-03) and 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.

1.6. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
FSL	tungsten lamp	E27	--	CE

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	2.42dB	
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.54dB	Polarize: V
	4.1dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	2.08dB	Polarize: H
	2.56dB	Polarize: V
Uncertainty for radio frequency	0.01ppm	
Uncertainty for conducted RF Power	0.65dB	
Uncertainty for temperature	0.2℃	
Uncertainty for humidity	1%	
Uncertainty for DC and low frequency voltages	0.06%	

1.9. Description Of Test Modes

There was 4 test Modes. TM1 to TM4 were shown below:

- TM1** : Operate in 2.4G WIFI Link mode;
- TM2** : Operate in 433.92MHz receiver mode;
- TM4** Operate in connecting lamp mode
- TM4** : Idle mode.

***Note:

1. 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 clause 8.4 of ETSI EN 301 489-1 Conducted Emission (AC mains input/output port)	Compliant
§7.1	Reference to clause 8.3 of ETSI EN 301 489-1 Conducted Emission (DC power input/output port)	N/A*
§7.1	Reference to clause 8.7 of ETSI EN 301 489-1 Conducted Emission (Wired network port)	N/A*
§7.1	Reference to clause 8.2 of ETSI EN 301 489-1 Radiated Emission (Enclosure of ancillary equipment)	Compliant
§7.1	Reference to clause 8.5 of ETSI EN 301 489-1 Harmonic current emissions (AC mains input port)	N/A*
§7.1	Reference to clause 8.6 of ETSI EN 301 489-1 Voltage fluctuations and flicker (AC mains input port)	Compliant
§7.2	Reference to clause 9.3 of ETSI EN 301 489-1 Electrostatic discharge (Enclosure port) (EN 61000-4-2)	Compliant
§7.2	Reference to clause 9.2 of ETSI EN 301 489-1 RF electromagnetic field (80MHz to 6000MHz) (Enclosure port) (EN 61000-4-3)	Compliant
§7.2	Reference to clause 9.4 of ETSI EN 301 489-1 Fast transients common mode (signal, wired network and control ports, DC and AC power ports) (EN 61000-4-4)	Compliant
§7.2	Reference to clause 9.8 of ETSI EN 301 489-1 Surges, line to line and line to ground (AC mains power input ports, wired network ports) (EN 61000-4-5)	Compliant
§7.2	Reference to clause 9.5 of ETSI EN 301 489-1 RF common mode 0.15MHz to 80MHz (signal, wired network and control ports, DC and AC power ports) (EN 61000-4-6)	Compliant
§7.2	Reference to clause 9.6 of ETSI EN 301 489-1 Transients and surges in the vehicular environment (ISO 7637-2)	N/A*
§7.2	Reference to clause 9.7 of ETSI EN 301 489-1 Voltage dips and interruptions (AC mains power input ports) (EN 61000-4-11)	Compliant

3. LINE CONDUCTED EMISSION

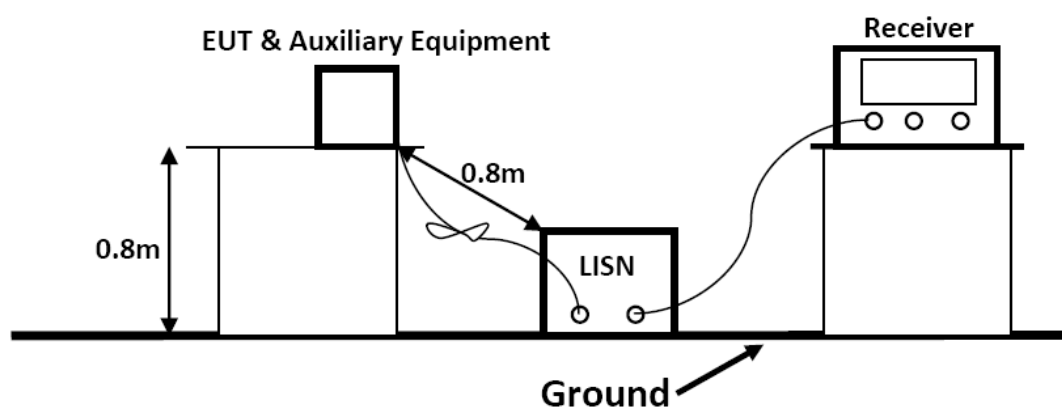
3.1. Conducted Emission Limit

Relevant Standard(s): ETSI EN 301 489-1 V2.1.1 (2017-02) / EN 55032: 2015 Class B

Limits for Line Conducted Emission		
Frequency (MHz)	Limit (dB μ V)	
	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 AC 230V through a LISN supplying power of AC 230V/50Hz.

3.3. 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.

3.4. Test Procedure

Power on the EUT, the EUT begins to work. Make sure the EUT operates normally during the test.

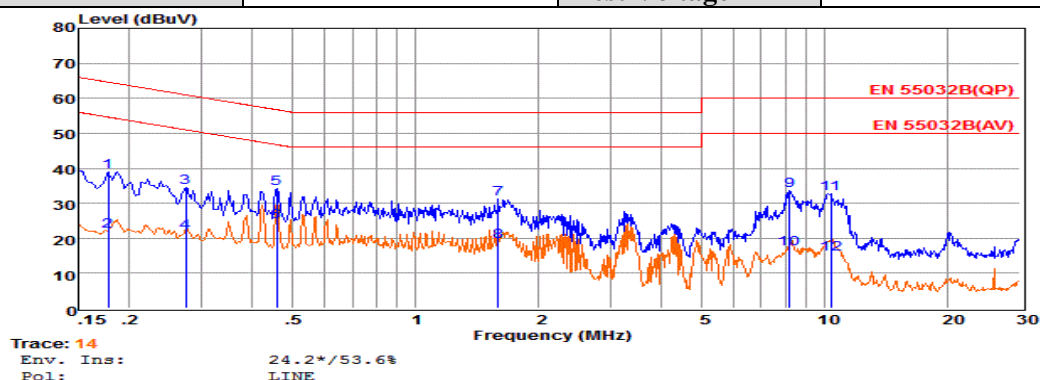
Maximizing procedure was performed on the six (6) highest emissions of the EUT.

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

3.5. Test Data

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

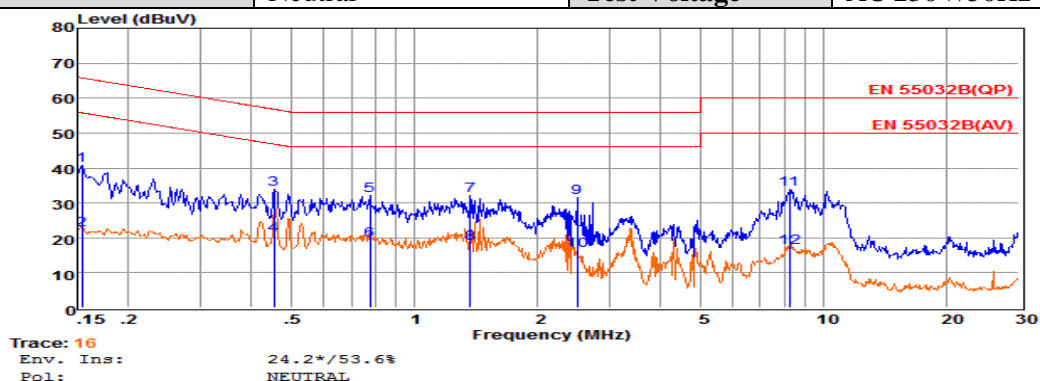
Model No.	SlampherR2	Test Mode	TM1
Environmental Conditions	24.2°C, 53.6% RH	Test Engineer	Mina Xu
Pol.	Line	Test Voltage	AC 230V/50Hz



	Freq MHz	Reading dBuV	LISNFac dB	CabLos dB	Aux2Fac dB	Measured dBuV	Limit dBuV	Over dB	Remark
1	0.18	19.30	9.61	0.02	10.00	38.93	64.59	-25.66	QP
2	0.18	2.50	9.61	0.02	10.00	22.13	54.59	-32.46	Average
3	0.27	14.84	9.63	0.03	10.00	34.50	60.98	-26.48	QP
4	0.27	2.15	9.63	0.03	10.00	21.81	50.98	-29.17	Average
5	0.46	14.66	9.62	0.04	10.00	34.32	56.71	-22.39	QP
6	0.46	4.90	9.62	0.04	10.00	24.56	46.71	-22.15	Average
7	1.59	11.59	9.64	0.05	10.00	31.28	56.00	-24.72	QP
8	1.59	-0.75	9.64	0.05	10.00	18.94	46.00	-27.06	Average
9	8.19	13.91	9.68	0.07	10.00	33.66	60.00	-26.34	QP
10	8.19	-2.83	9.68	0.07	10.00	16.92	50.00	-33.08	Average
11	10.34	12.88	9.69	0.08	10.00	32.65	60.00	-27.35	QP
12	10.34	-4.41	9.69	0.08	10.00	15.36	50.00	-34.64	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.	SlampherR2	Test Mode	TM1
Environmental Conditions	24.2°C, 53.6% RH	Test Engineer	Mina Xu
Pol.	Neutral	Test Voltage	AC 230V/50Hz



	Freq MHz	Reading dBuV	LISNFac dB	CabLos dB	Aux2Fac dB	Measured dBuV	Limit dBuV	Over dB	Remark
1	0.15	21.08	9.69	0.02	10.00	40.79	65.78	-24.99	QP
2	0.15	2.64	9.69	0.02	10.00	22.35	55.77	-33.42	Average
3	0.45	14.31	9.62	0.04	10.00	33.97	56.80	-22.83	QP
4	0.45	1.25	9.62	0.04	10.00	20.91	46.80	-25.89	Average
5	0.78	12.49	9.63	0.04	10.00	32.16	56.00	-23.84	QP
6	0.78	-0.28	9.63	0.04	10.00	19.39	46.00	-26.61	Average
7	1.37	12.37	9.63	0.05	10.00	32.05	56.00	-23.95	QP
8	1.37	-1.13	9.63	0.05	10.00	18.55	46.00	-27.45	Average
9	2.50	11.96	9.64	0.05	10.00	31.65	56.00	-24.35	QP
10	2.50	-3.30	9.64	0.05	10.00	16.39	46.00	-29.61	Average
11	8.24	14.08	9.70	0.07	10.00	33.85	60.00	-26.15	QP
12	8.24	-2.62	9.70	0.07	10.00	17.15	50.00	-32.85	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.

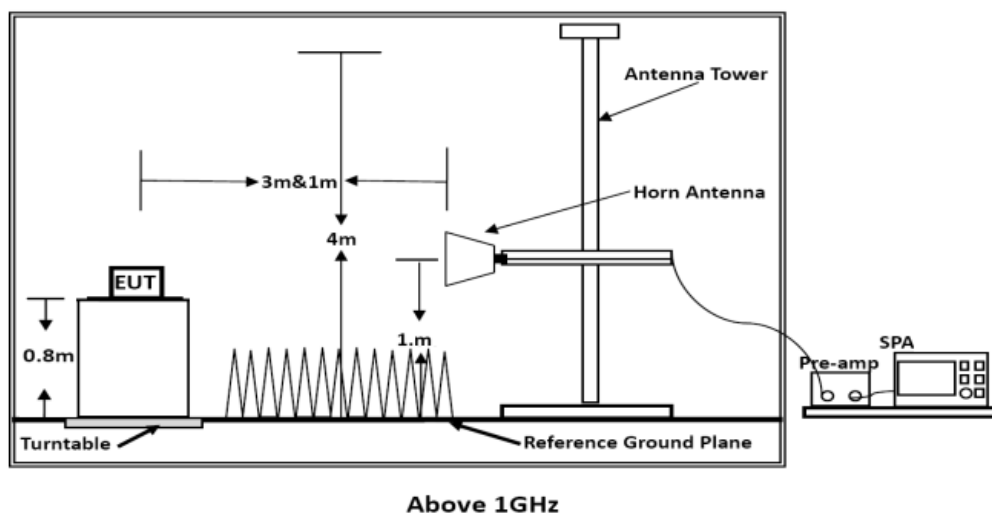
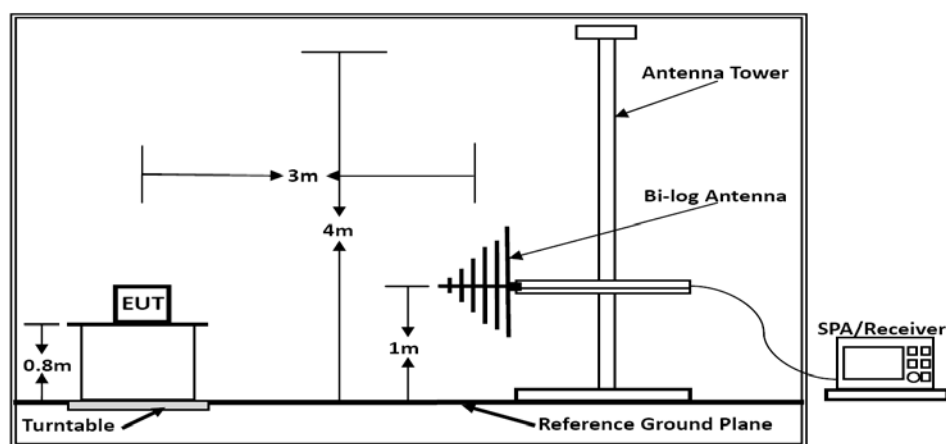
4. RADIATED DISTURBANCE

4.1. Radiated Emission Limit

Relevant Standard(s): ETSI EN 301 489-1 V2.1.1 (2017-02) / EN 55032: 2015 Class B

Limits for Radiated Disturbance Below 1GHz			
Frequency (MHz)	Distance (Meters)	Field Strengths Limit (dBμV/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)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)
1000 ~ 3000	3	70	50
3000 ~ 6000	3	74	54
***Note: The lower limit applies at the transition frequency.			

4.2. Test Configuration



4.3. 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.

Pre-measurement:

- 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 pre-measurement 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.

Pre-measurement:

- 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 pre-measurement 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 pre-measurement with marked maximum final measurements and the limit will be stored.

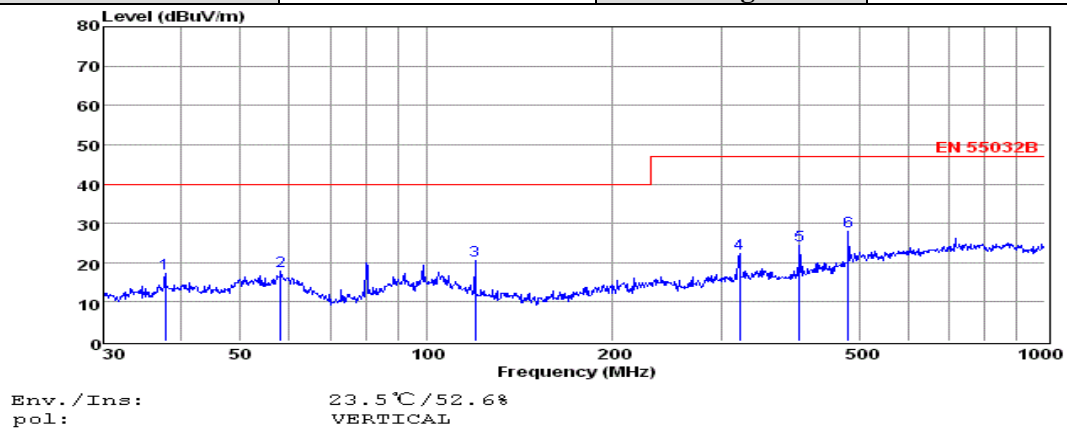
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	30MHz~1000MHz / RBW 100kHz for QP

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	6000 MHz
RBW / VBW	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

4.4. Test Data

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

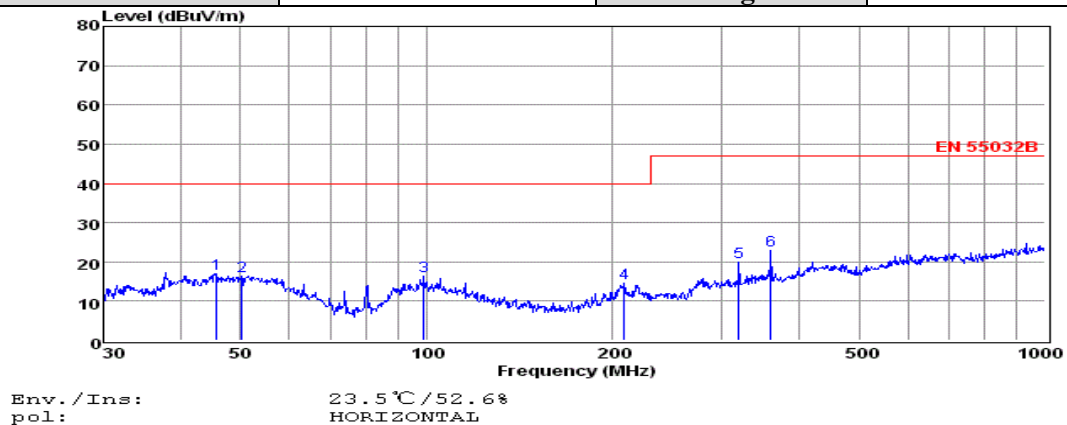
Model No.	SlampherR2	Test Mode	TM1
Environmental Conditions	23.5°C, 52.6% RH	Test Engineer	Mina Xu
Pol.	Vertical	Detector Function	Quasi-peak
Distance	3m	Test Voltage	AC 230V/50Hz



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	37.81	3.88	0.38	13.02	17.28	40.00	-22.72	QP
2	58.00	4.52	0.47	12.82	17.81	40.00	-22.19	QP
3	119.86	9.41	0.64	10.51	20.56	40.00	-19.44	QP
4	321.06	7.86	1.16	13.37	22.39	47.00	-24.61	QP
5	400.43	8.22	1.20	15.07	24.49	47.00	-22.51	QP
6	480.53	10.71	1.31	16.08	28.10	47.00	-18.90	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

Model No.	SlampherR2	Test Mode	TM1
Environmental Conditions	23.5°C, 52.6% RH	Test Engineer	Mina Xu
Pol.	Horizontal	Detector Function	Quasi-peak
Distance	3m	Test Voltage	AC 230V/50Hz



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	45.69	3.18	0.41	13.51	17.10	40.00	-22.90	QP
2	50.23	2.63	0.54	13.24	16.41	40.00	-23.59	QP
3	98.83	2.56	0.61	13.09	16.26	40.00	-23.74	QP
4	208.58	2.95	0.86	10.84	14.65	40.00	-25.35	QP
5	319.94	5.41	1.16	13.33	19.90	47.00	-27.10	QP
6	360.45	7.41	1.18	14.43	23.02	47.00	-23.98	QP

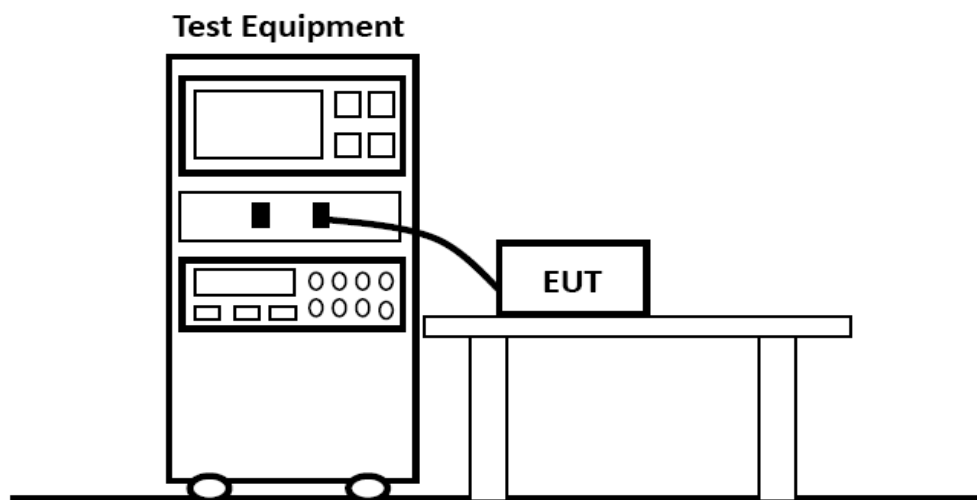
Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that are 20db below the official limit are not reported

Test Mode: TM1(Worst Case for Above 1GHz)				Tested by: Mina Xu			
Test Voltage: AC 230V/50Hz				Test Distance: 3m			
Detector Function: Peak + AV				Test Results: Passed			
Polarization	Frequency (MHz)	Emission Level (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)	
Horizontal	1264.34	57.12	32.89	70.00	50.00	-12.88	-17.11
	1860.84	57.78	36.21	70.00	50.00	-12.22	-13.79
	2152.26	51.67	33.03	70.00	50.00	-18.33	-16.97
	3275.97	49.35	31.99	74.00	54.00	-24.65	-22.01
	4397.63	55.82	37.37	74.00	54.00	-18.18	-16.63
	5730.03	55.25	31.36	74.00	54.00	-18.75	-22.64
Vertical	1262.02	56.78	33.36	70.00	50.00	-13.22	-16.64
	1859.29	58.29	37.13	70.00	50.00	-11.71	-12.87
	2155.23	52.26	33.36	70.00	50.00	-17.74	-16.64
	3275.90	48.89	30.00	74.00	54.00	-25.11	-24.00
	4396.23	55.38	35.97	74.00	54.00	-18.62	-18.03
	5727.95	56.47	31.13	74.00	54.00	-17.53	-22.87

1. Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
2. Measurements above show only up to 6 maximum emissions noted.
3. Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5. HARMONIC CURRENT EMISSIONS

5.1. Test Configuration



5.2. Test Standard

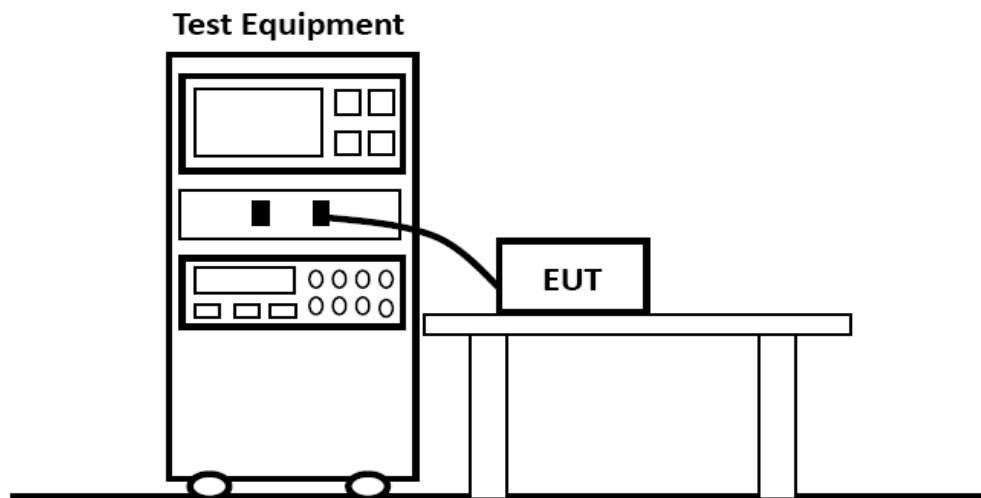
According to ETSI EN 301 489-1 V2.1.1 (2017-02) & EN 61000-3-2: 2014

5.3. Test Data

Because power of EUT less than 75W, According standard EN 61000-3-2, Harmonic current unnecessary to test.

6. VOLTAGE FLUCTUATION AND FLICKER

6.1. Test Configuration



6.2. Test Standard

According to ETSI EN 301 489-1 V2.1.1 (2017-02) & EN 61000-3-3: 2013

6.3. Test Data

Model No.	SlampherR2	Test Mode	TM1
Environmental Conditions	22.9°C, 53.9% RH	Test Engineer	Mina Xu
Test date:	April 02, 2019	Test result	Pass

Voltech IEC61000-3 Windows Software 1.14.06RC1		Test Date: 2019 Apr 2 13:45	
Type of Test:	Flickermeter Test - Table		
Power Analyzer:	Voltech PM6000 SN: 200006700523 Firmware Version: v1.21.07RC2		
Channel(s):	1. SN: 090015502053, 28 Adjusted Date: 22 JUN 2011. 2. SN:None Adjusted Date:None		
	3. SN:None Adjusted Date:None 4. SN:None Adjusted Date:None		
	5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None		
Shunt(s):	1. SN: 091024301916, 4 Adjusted Date: 23 JUN 2011. 2. SN:None Adjusted Date:None		
	3. SN:None Adjusted Date:None 4. SN:None Adjusted Date:None		
	5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None		
AC Source:	Mains / Manual Source		
Overall Result:	Notes:		
PASS	Measurement method - Voltage		

	Pst	dc (%)	dmax (%)	d(t) > 3.3%(ms)
Limit	1.000	3.300	4.000	500
Reading 1	0.090	0.006	0.258	0

Note: All test modes were performed, but only the worst data was recorded.

7. GENERAL PERFORMANCE CRITERIA FOR IMMUNITY TEST

7.1. 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.

7.2. 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.

7.3. 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.

7.4. 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 301 489-3 V2.1.1 (2017-03)

Criteria	During test	After test
A	Operate as intended No loss of function No unintentional responses	Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May show loss of function No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions

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

Criteria	During test	After test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). 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. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

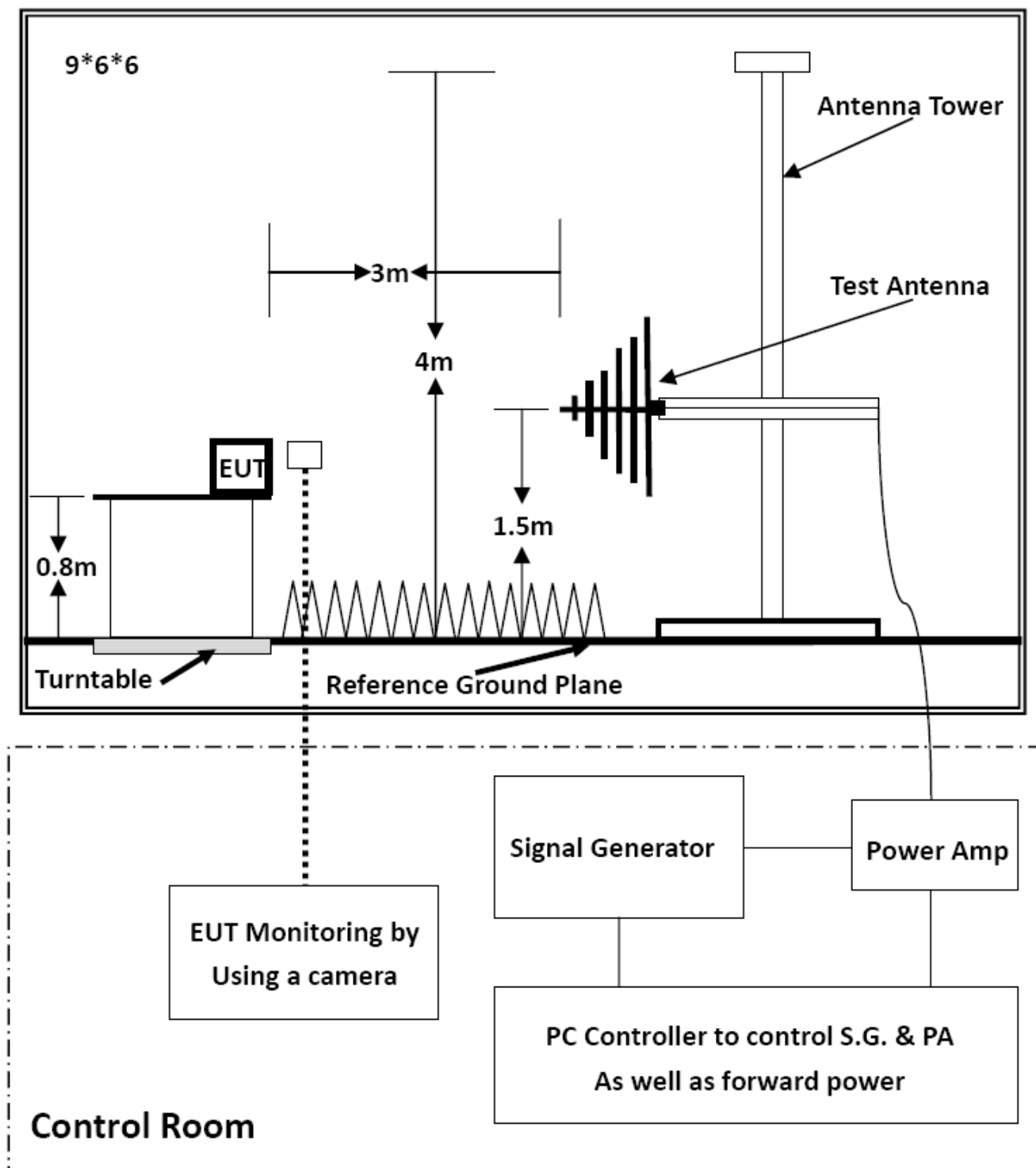
NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If 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: 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 3: 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.

8. RF ELECTROMAGNETIC FIELD (80 MHz - 6000 MHz)

8.1. Test Configuration



8.2. Test Standard

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

Test level 2 at 3V/m.

8.3. Severity Level

Level	Field Strength (V/m)
1	1
2	3
3	10
X	Special
Performance Criterion: A	

8.4. 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	Remark
Fielded Strength	3 V/m (Severity Level 2)
Radiated Signal	Unmodulated
Scanning Frequency	80-6000MHz
Dwell time of radiated	0.0015 decade/s
Waiting Time	3 Sec.

8.5. Test Result

PASS.

Please refer to the following page.

RF ELECTROMAGNETIC FIELD

Standard	<input type="checkbox"/> IEC 61000-4-3 <input checked="" type="checkbox"/> EN 61000-4-3		
Applicant	Shenzhen Sonoff Technologies Co., Ltd.		
EUT	Wi-Fi Smart Lamp Holder	Temperature	23.5℃
M/N	SlampherR2	Humidity	52.6%
Test Mode	TM1-TM4	Criterion	B
Test Engineer	Mina Xu	Test Date	April 02, 2019

2.4G WIFI Test Result:

EUT Working Mode	Antenna Polarity	Frequency (MHz)	Fielded 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

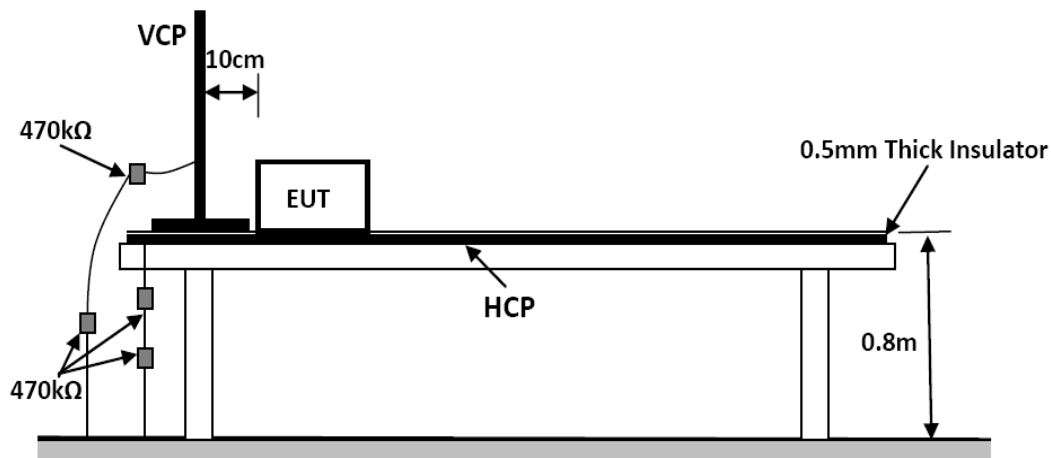
TM2-TM4 Test Result:

EUT Working Mode	Antenna Polarity	Frequency (MHz)	Fielded 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

9. ELECTROSTATIC DISCHARGE

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

9.1. 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.

9.2. Test Procedure

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

Test level 3 for Air Discharge at ± 8 kV

Test level 2 for Contact Discharge at ± 4 kV

9.2.1. 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.

9.2.2. 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.

9.2.3. 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.

9.2.4. 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.

9.3. Test Data

PASS.

Please refer to the following page.

Electrostatic Discharge Test Results

Standard	<input type="checkbox"/> IEC 61000-4-2 <input checked="" type="checkbox"/> EN 61000-4-2		
Applicant	Shenzhen Sonoff Technologies Co., Ltd.		
EUT	Wi-Fi Smart Lamp Holder	Temperature	24.9°C
M/N	SlampherR2	Humidity	53.9%
Criterion	B	Pressure	1021mbar
Test Mode	TM1-TM4	Test Date	April 02, 2019
Test Engineer	Mina Xu		

TEST RESULT OF 2.4G 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

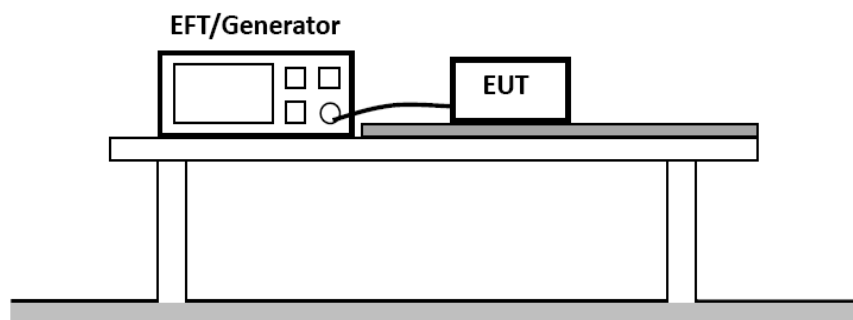
TEST RESULT OF TM2-TM4

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.

10. ELECTRICAL FAST TRANSIENT IMMUNITY

10.1. Test Configuration



10.2. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)/ EN61000-4-4: 2012

Test level 2 at 1 kV

Test Level		
Open Circuit Output Test Voltage $\pm 10\%$		
Level	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		

10.3. 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.

10.3.1. 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.

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

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

10.4. Test Data

PASS.

Please refer to the following page.

Electrical Fast Transient/Burst Test Results

Standard	<input type="checkbox"/> IEC 61000-4-4 <input checked="" type="checkbox"/> EN 61000-4-4		
Applicant	Shenzhen Sonoff Technologies Co., Ltd.		
EUT	Wi-Fi Smart Lamp Holder	Temperature	22.9℃
M/N	SlampherR2	Humidity	53.9%
Test Mode	TM1-TM4	Criterion	B
Test Engineer	Mina Xu	Test Date	April 02, 2019

TEST RESULT OF WIFI

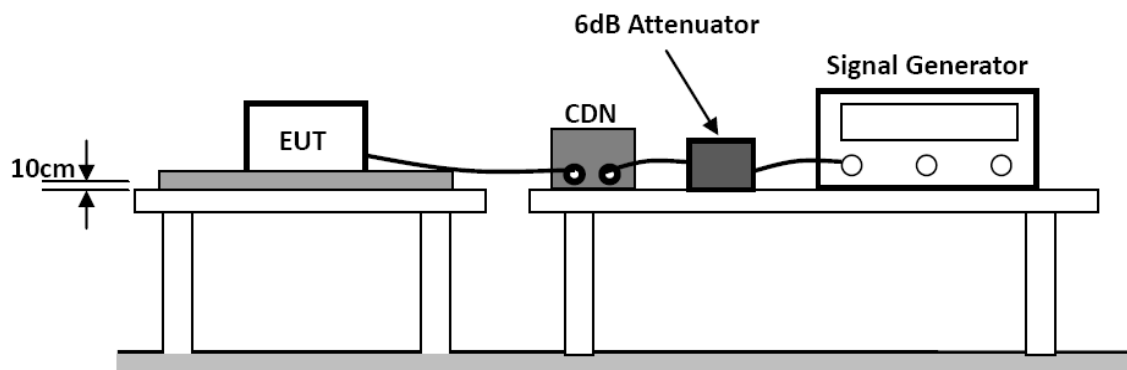
Line	Test Voltage	Polarity	Observation	Result (Pass/Fail)
L	1KV	+/-	TT, TR	Pass
N	1KV	+/-	TT, TR	Pass
L-N	1KV	+/-	TT, TR	Pass

TEST RESULT OF TM2-TM4

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

11. RF COMMON MODE

11.1. Test Configuration



11.2. Test Standard

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

11.3. Test Procedure

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

11.3.2. 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 50mm (where possible).

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

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

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

11.3.6. The rate of sweep shall not exceed 1.5×10^{-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.

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

11.4. Test Data

PASS.

Please refer to the following page.

Injected Currents Susceptibility Test Results

Standard	<input type="checkbox"/> IEC 61000-4-6 <input checked="" type="checkbox"/> EN 61000-4-6		
Applicant	Shenzhen Sonoff Technologies Co., Ltd.		
EUT	Wi-Fi Smart Lamp Holder	Temperature	23.4℃
M/N	SlampherR2	Humidity	53.9%
Test Mode	TM1-TM4	Criterion	A
Test Engineer	Mina Xu	Test Date	April 02, 2019

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-TM4

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 :

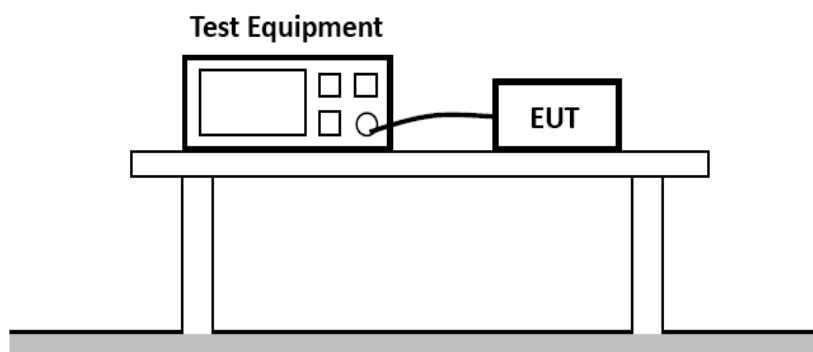
Simulator: CIT-10 (FRANKONIA)

CDN : ☒ CDN-M2 (FRANKONIA)

☐ CDN-M3 (FRANKONIA)

12. SURGES, LINE TO LINE AND LINE TO GROUND

12.1. Test Configuration



12.2. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02) / EN 61000-4-5: 2014+A1: 2017

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) 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		

12.3. 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.

12.4. Test Data

PASS.

Please refer to the following page.

Surge Immunity Test Result

Standard	<input type="checkbox"/> IEC 61000-4-5 <input checked="" type="checkbox"/> EN 61000-4-5		
Applicant	Shenzhen Sonoff Technologies Co., Ltd.		
EUT	Wi-Fi Smart Lamp Holder	Temperature	22.9°C
M/N	SlampherR2	Humidity	53.9%
Test Mode	TM1-TM4	Criterion	A
Test Engineer	Mina Xu	Test Date	April 02, 2019

TEST RESULT OF WIFI

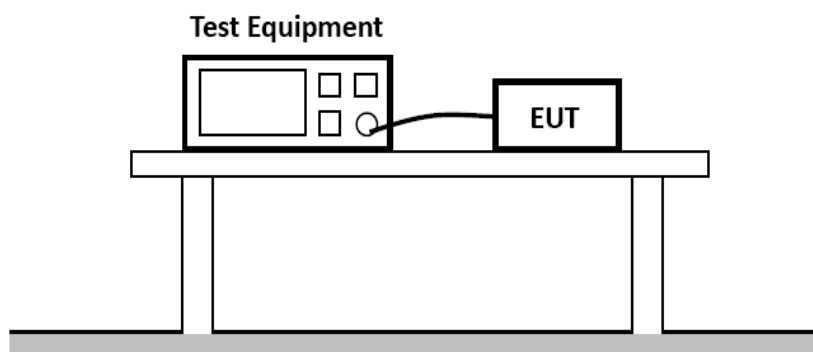
Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (KV)	Observation	Result (Pass/Fail)
L-N	+	0°, 90°, 180°, 270°	5	1.0	TT, TR	Pass
	-	0°, 90°, 180°, 270°	5	1.0	TT, TR	Pass

TEST RESULT OF TM2-TM4

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

13. VOLTAGE DIPS/INTERRUPTIONS IMMUNITY TEST

13.1. Test Configuration



13.2. Test Standard

ETSI EN 301 489-1 V2.1.1 (2017-02)/ EN 61000-4-11: 2004+A1: 2017

Test levels and Performance Criterion

Test Level		
Voltage Reduction % U _T	Voltage Dips % U _T	Duration (in Period)
100	0	0.5
100	0	1
30	70	5
Voltage Reduction % U _T	Voltage Dips % U _T	Duration (in Period)
100	0	250

Performance Criterion: B&C

13.3. Test Procedure

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

13.3.2. Record any degradation of performance.

13.4. Test Data

PASS.

Please refer to the following page.

Voltage Dips And Interruptions Test Results

Standard	<input type="checkbox"/> IEC 61000-4-11 <input checked="" type="checkbox"/> EN 61000-4-11		
Applicant	Shenzhen Sonoff Technologies Co., Ltd.		
EUT	Wi-Fi Smart Lamp Holder	Temperature	22.9℃
M/N	SlampherR2	Humidity	53.9%
Test Mode	TM1-TM4	Criterion	A
Test Engineer	Mina Xu	Test Date	April 02, 2019

TEST RESULT OF WIFI

Test Level % U _T	Voltage Dips & Short Interruptions % U _T	Duration (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-TM4

Test Level % U _T	Voltage Dips & Short Interruptions % U _T	Duration (in periods)	Result (Pass/Fail)
0	100	0.5P	Pass
0	100	1P	Pass
70	30	25P	Pass
0	100	250P	Pass

14. LIST OF MEASURING EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI Test Software	AUDIX	E3	/	2018/6/16	2019/6/15
2	EMI Test Receiver	R&S	ESPI	101840	2018/6/16	2019/6/15
3	Artificial Mains	R&S	ENV216	101288	2018/6/16	2019/6/15
4	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2018/6/16	2019/6/15
5	Positioning Controller	MF	MF-7082	/	2018/6/16	2019/6/15
6	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018/7/26	2019/7/25
7	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2018/7/2	2019/7/1
8	EMI Test Receiver	R&S	ESR 7	101181	2018/6/16	2019/6/15
9	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2018/11/15	2019/11/14
10	AMPLIFIER	QuieTek	QTK	CHM/0809065	2018/11/15	2019/11/14
11	RF Cable-R03m	Jye Bao	RG142	CB021	2018/6/16	2019/6/15
12	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2018/6/16	2019/6/15
13	Power Analyzer Test System	Voltech	PM6000	2.00007E+11	2018/6/16	2019/6/15
14	RS Test Software	Tonscend	/	/	2018/6/16	2019/6/15
15	ESG Vector Signal Generator	Agilent	E4438C	MY42081396	2018/11/15	2019/11/14
16	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2018/6/16	2019/6/15
17	RF POWER AMPLIFIER	OPHIR	5225R	1052	NCR	NCR
18	RF POWER AMPLIFIER	OPHIR	5273F	1019	NCR	NCR
19	Stacked Broadband Log Periodic Antenna	SCHWARZBECK	STLP 9128	9128ES-145	NCR	NCR
20	Stacked Mikrowellen Log.-Per Antenna	SCHWARZBECK	STLP 9149	9149-484	NCR	NCR
21	Electric field probe	Narda S.TS./PMM	EP601	611WX80208	2019/3/25	2020/3/24
22	Sound Level meter	BK Precision	735	7.35009E+15	2018/6/16	2019/6/15
23	Audio Analyzer	R&S	UPV	1146.2003K02-101 721-UW	2018/6/16	2019/6/15
24	Mouse Simulation	Brueel & Kjaer	4227	A0304216	2018/6/16	2019/6/15
25	Ear Simulation and supply	Brueel & Kjaer	2669.4182.5935	A0305284	2018/6/16	2019/6/15
26	Acoustical Calibrators	Brueel & Kjaer	4231	A0304215	2018/6/16	2019/6/15
27	ESD Simulator	SCHLODER	SESD 230	604035	2018/7/2	2019/7/1
28	CaliforniaPACITANCE COUPLING CLAMP	3CTEST	EFTC	EC0441098	2018/6/16	2019/6/15
29	Simulator	FRANKONIA	CIT-10/75	A126A1195	2018/6/16	2019/6/15
30	CDN	FRANKONIA	CDN-M2+M3	A2210177	2018/6/16	2019/6/15
31	6dB Attenuator	FRANKONIA	DAM25W	1172040	2018/6/16	2019/6/15
32	Immunity Simulative Generator	EM TEST	UCS500 M4	0101-34	2018/11/15	2019/11/14
33	Voltage dips and up generator	3CTEST	VDG-1105G	EC0171014	2018/6/16	2019/6/15
34	Power frequency mag-field generator System	EVERFINE	EMS61000-8K	906003	2018/6/16	2019/6/15
35	Impedance Stabilization Network	TESEQ	ISN T800	45130	2018-11-15	2019-11-14

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

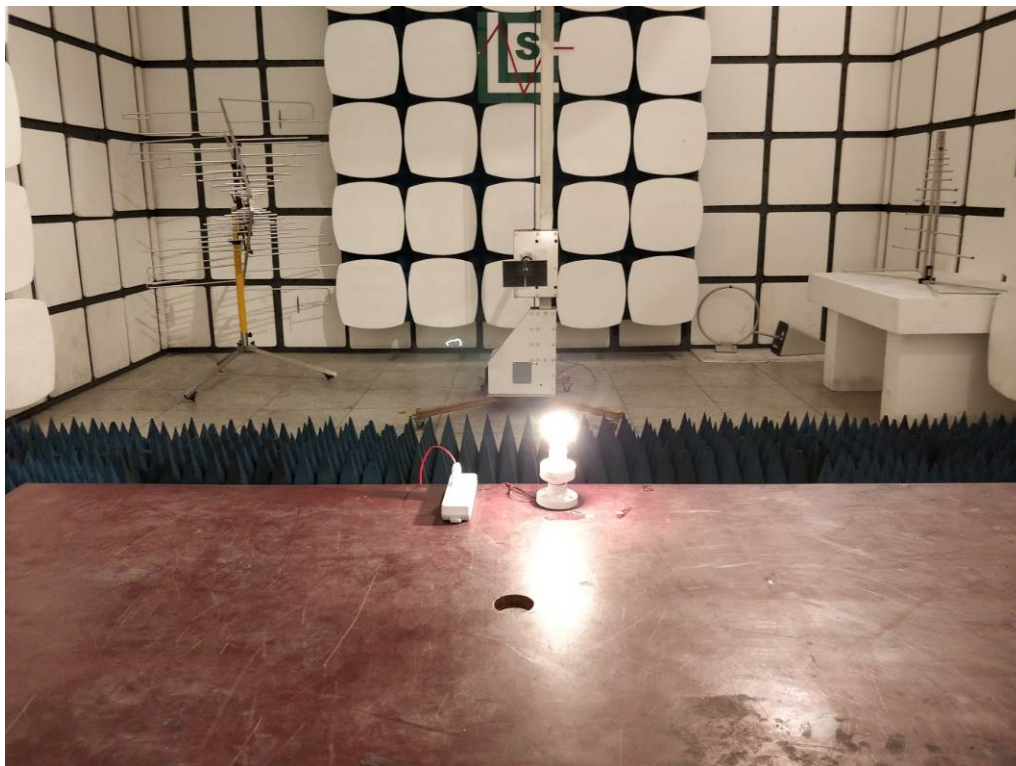
15. PHOTOGRAPHS OF TEST SETUP



Power Line Conducted Emission



Radiated Emission Below 1 GHz



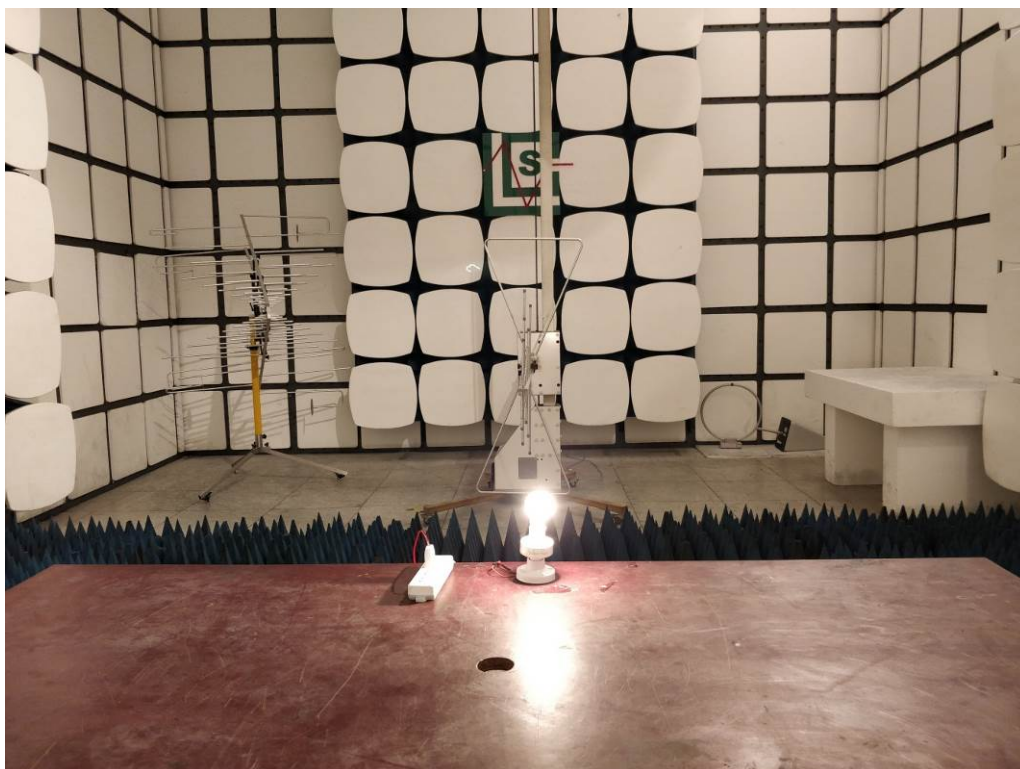
Radiated Emission Above 1 GHz



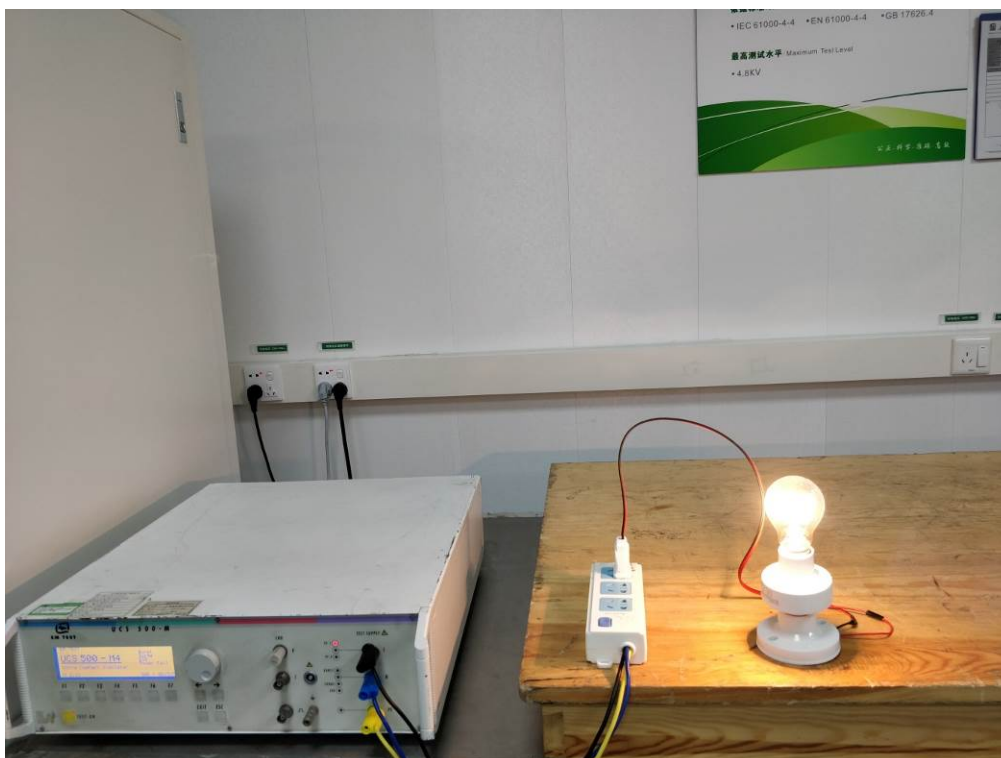
Voltage Fluctuations and Flicker



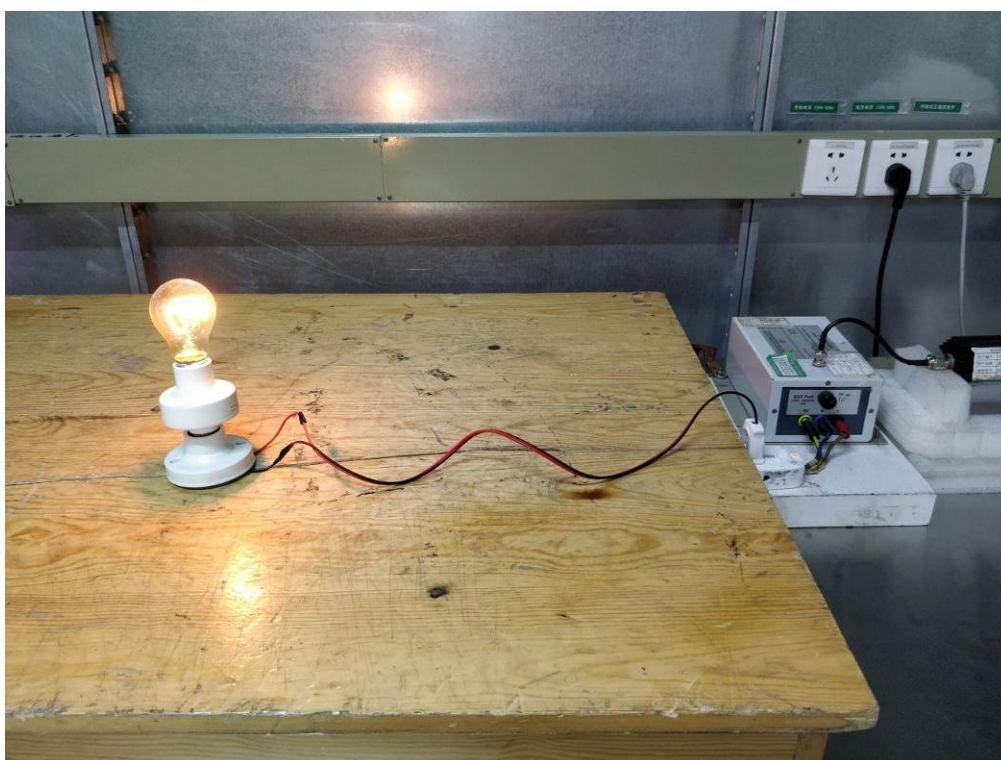
Electrostatic Discharge



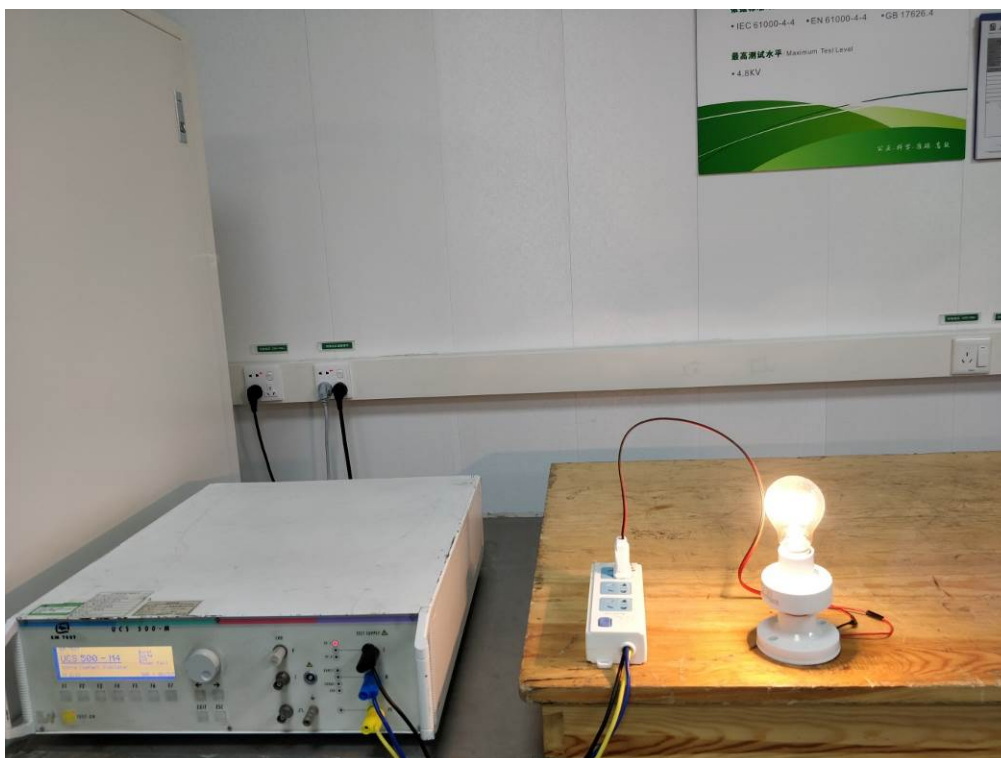
RF Electromagnetic Field (80MHz to 6 000MHz)



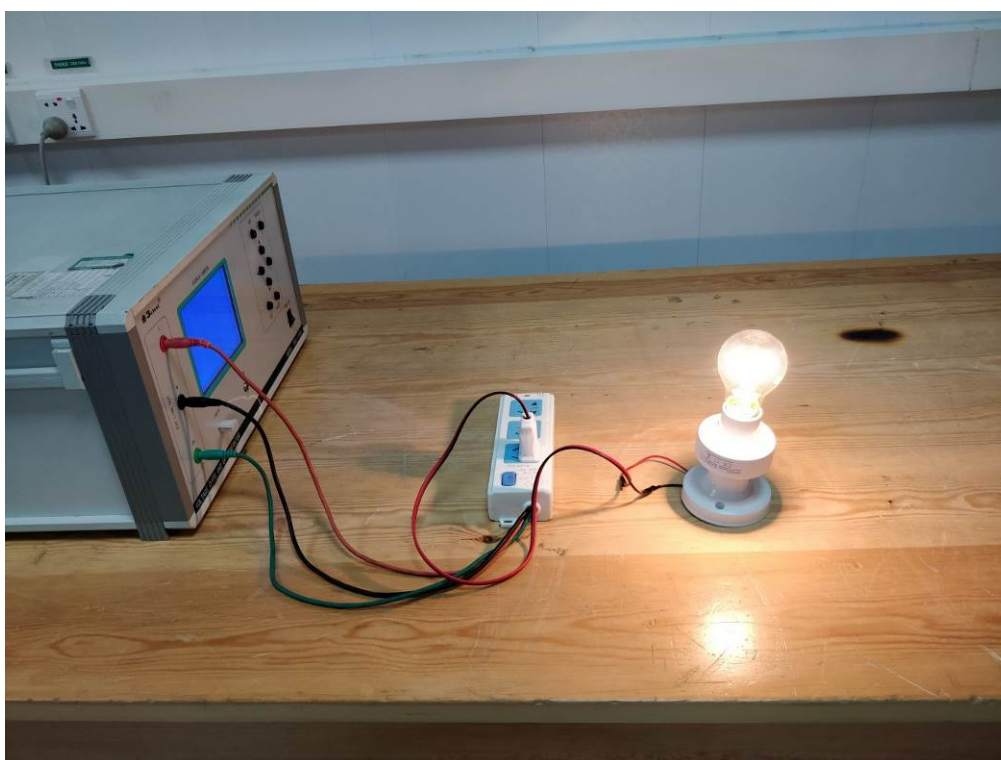
Fast Transients Common Mode



RF Common Mode (0.15 MHz to 80MHz)



Surges



Voltage Dips and Interruptions

16. PHOTOGRAPHS OF THE EUT

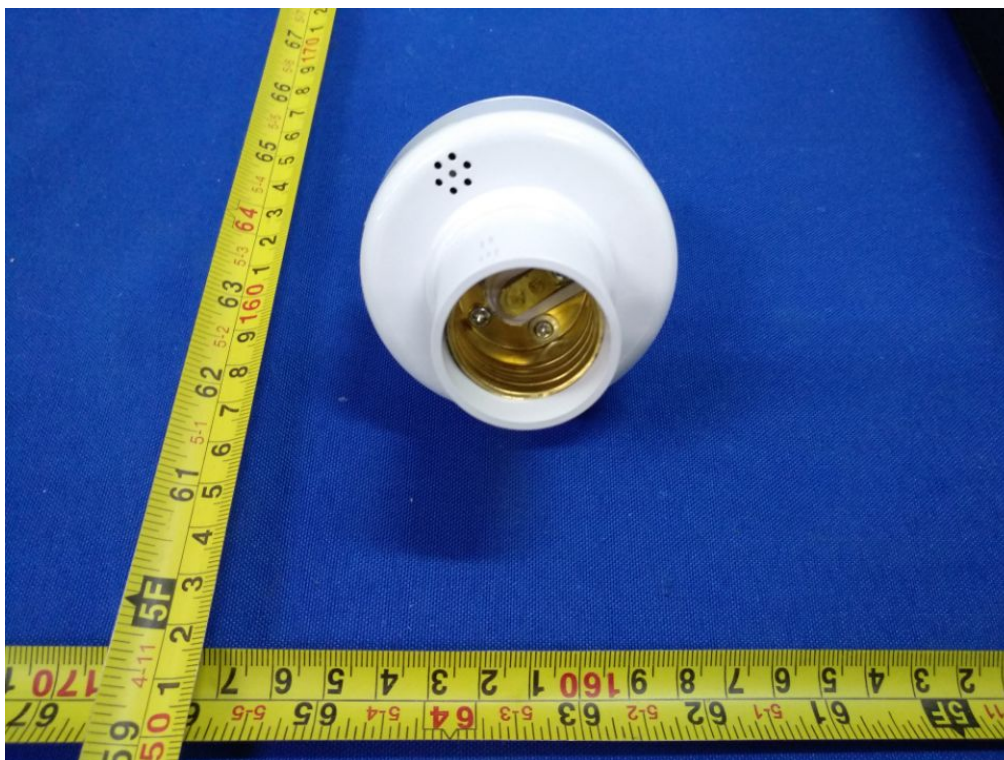


Fig.1



Fig.2



Fig.3



Fig.4



Fig.5



Fig.6

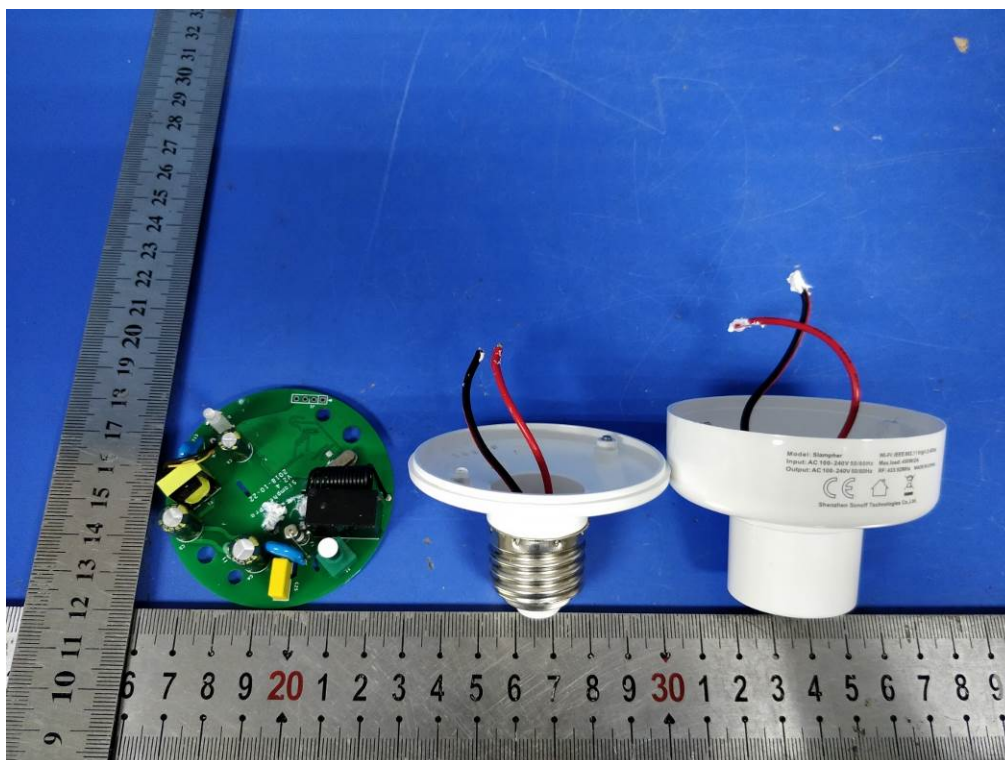


Fig.7

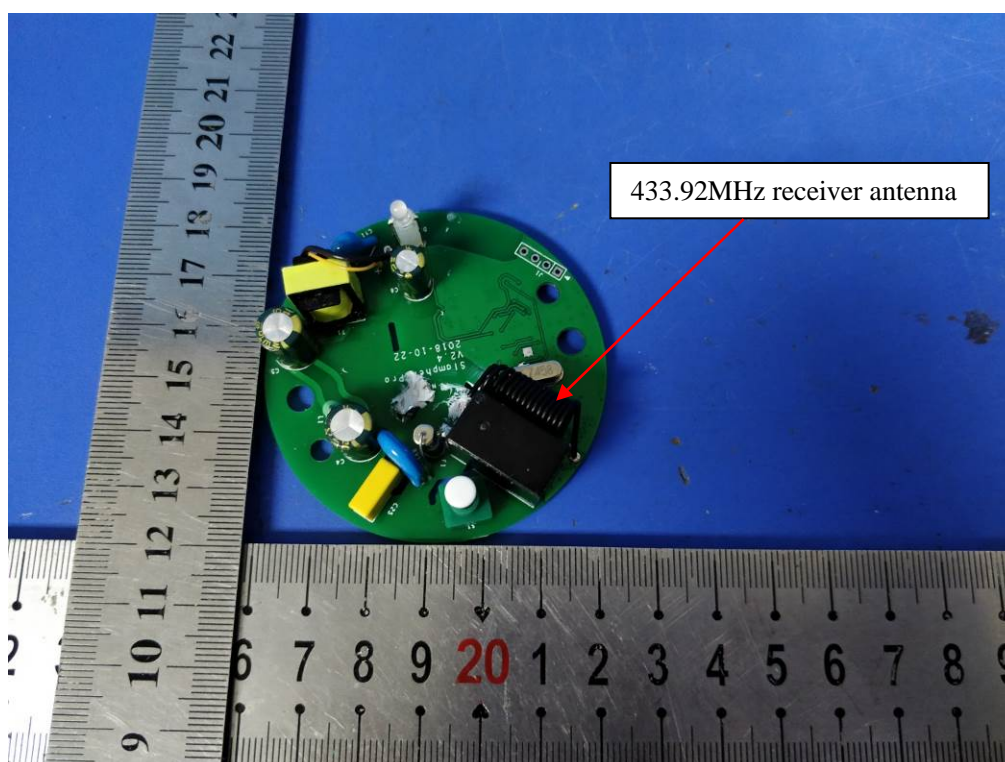


Fig.8

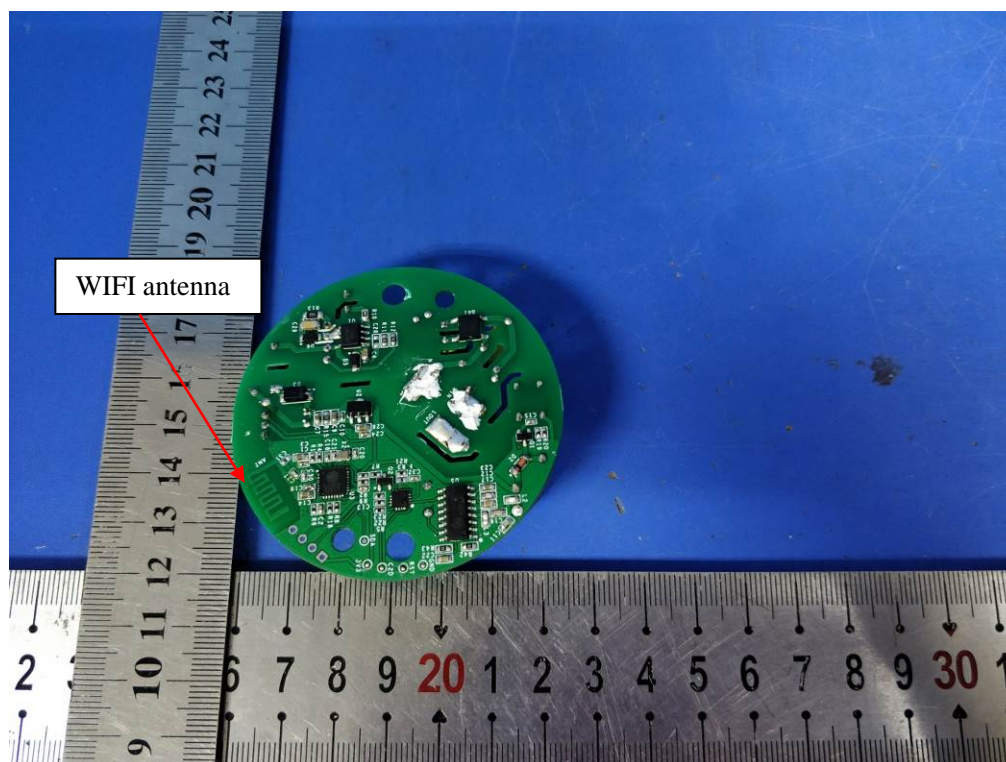


Fig.9

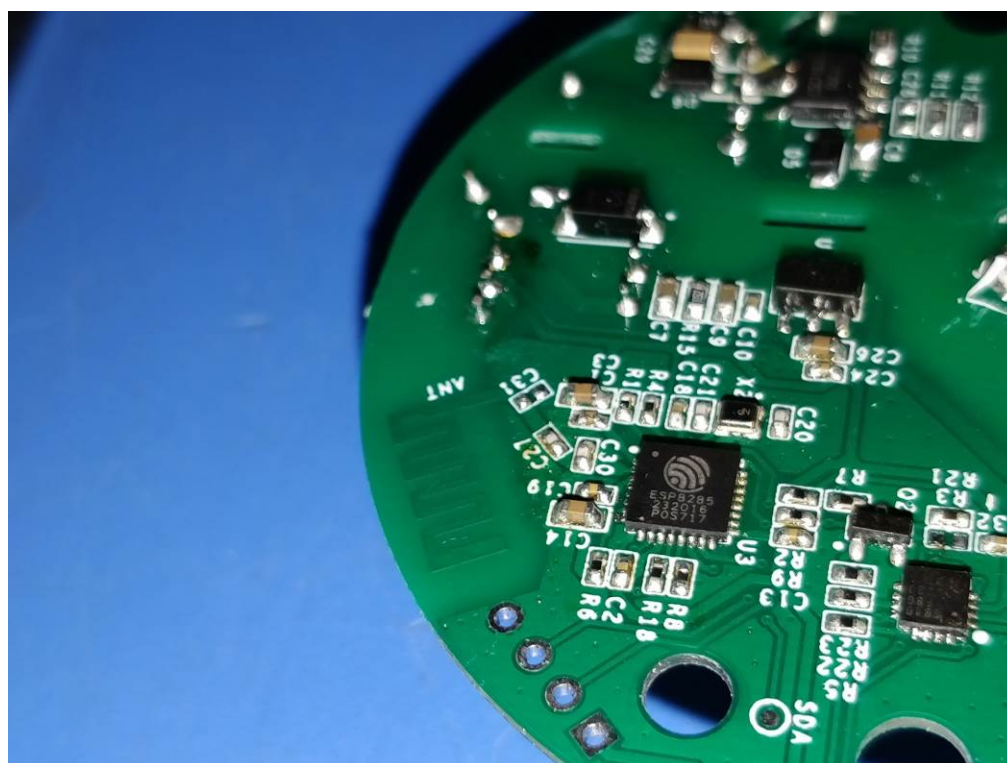


Fig.10

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