

FCC SDoC TEST REPORT

Shenzhen Sonoff Technologies Co., Ltd.
Wi-Fi Smart Switch with Energy Monitoring
Test Model: POWR3

Prepared for : Shenzhen Sonoff Technologies Co., Ltd.
Address : 1001, BLDG8, Lianhua Industrial Park, Shenzhen, GD, China

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample : April 15, 2021
Number of tested samples : 1
Serial number : Prototype
Date of Test : April 15, 2021 ~ April 23, 2021
Date of Report : April 25, 2021



FCC SDoC TEST REPORT

FCC 47 CFR Part 15 Subpart B, Class B(SDoC), ANSI C63.4 -2014

Report Reference No. : **LCS210415072AE**

Date Of Issue : April 25, 2021

Testing Laboratory Name : **Shenzhen LCS Compliance Testing Laboratory Ltd.**

Address : Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing 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 : 1001, BLDG8, Lianhua Industrial Park, Shenzhen, GD, China

Test Specification

Standard : FCC 47 CFR Part 15 Subpart B, Class B(SDoC), ANSI C63.4 -2014

Test Report Form No...... : LCSEMC-1.0

TRF Originator..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF..... : Dated 2011-03

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Test Item Description..... : **Wi-Fi Smart Switch with Energy Monitoring**

Test Model : POWR3

Trade Mark : SONOFF

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

Result : **Positive**

Compiled by:

Linda He

Supervised by:

Jin Wang

Approved by:



Linda He/ File administrators

Jin Wang/ Technique principal

Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS210415072AE

April 25, 2021

Date of issue

Test Model : POWR3

EUT..... : Wi-Fi Smart Switch with Energy Monitoring

Applicant..... : Shenzhen Sonoff Technologies Co., Ltd.Address..... : 1001, BLDG8, Lianhua Industrial Park, Shenzhen, GD,
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Telephone..... : /

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Manufacturer..... : Shenzhen Sonoff Technologies Co., Ltd.Address..... : 1001, BLDG8, Lianhua Industrial Park, Shenzhen, GD,
China

Telephone..... : /

Fax..... : /

Factory..... : /

Address..... : /

Telephone..... : /

Fax..... : /

Test Result according to the standards on page 6: **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

Revision	Issue Date	Revisions	Revised By
000	April 25, 2021	Initial Issue	Gavin Liang

TABLE OF CONTENTS

Test Report Description	Page
1. SUMMARY OF STANDARDS AND RESULTS	6
1.1. Description of Standards and Results	6
2. GENERAL INFORMATION	7
2.1. Description of Device (EUT)	7
2.2. Support Equipment List.....	7
2.3. Description of Test Facility	7
2.4. Statement of the Measurement Uncertainty	8
2.5. Measurement Uncertainty.....	8
3. TEST RESULTS	9
3.1. POWER LINE CONDUCTED EMISSION MEASUREMENT	9
3.2. Radiated emission Measurement	13
4. PHOTOGRAPH	18
5. EXTERNAL AND INTERNAL PHOTOS OF THE EUT	20

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted disturbance at mains terminals	FCC 47 CFR Part 15 Subpart B, Class B(SDoC), ANSI C63.4 -2014	Class B	PASS
Radiated disturbance	FCC 47 CFR Part 15 Subpart B, Class B(SDoC), ANSI C63.4 -2014	Class B	PASS
N/A is an abbreviation for Not Applicable.			

Test mode:

Mode 1	Normal Operation	Record
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2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT : Wi-Fi Smart Switch with Energy Monitoring

Trade Mark : SONOFF

Test Model : POWR3

Power Supply : Input: AC 100-240V, 50/60Hz

Highest internal frequency (Fx) : Fx > 1 GHz

Highest internal frequency (Fx)	Highest measured frequency
Fx ≤ 108 MHz	1 GHz
108 MHz < Fx ≤ 500 MHz	2 GHz
500 MHz < Fx ≤ 1 GHz	5 GHz
Fx > 1 GHz	5 × Fx up to a maximum of 6 GHz

NOTE 1 For FM and TV broadcast receivers, Fx is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.

Where Fx is unknown, the radiated emission measurements shall be performed up to 6 GHz.

2.2. Support Equipment List

Manufacturer	Description	Model	Serial Number	Certificate
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2.3. Description of Test Facility

Site Description

EMC Lab. : NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.

2.4. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

2.5. Measurement Uncertainty

Test	Parameters	Expanded Uncertainty (Ulab)	Expanded Uncertainty (Ucisp)
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	± 2.63 dB ± 2.35 dB	± 3.8 dB ± 3.4 dB
Radiated Emission	Level accuracy (30MHz to 1000MHz)	± 3.48 dB	± 5.3 dB
Radiated Emission	Level accuracy (above 1000MHz)	± 3.90 dB	± 5.2 dB

(1) Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

(2) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

3. TEST RESULTS

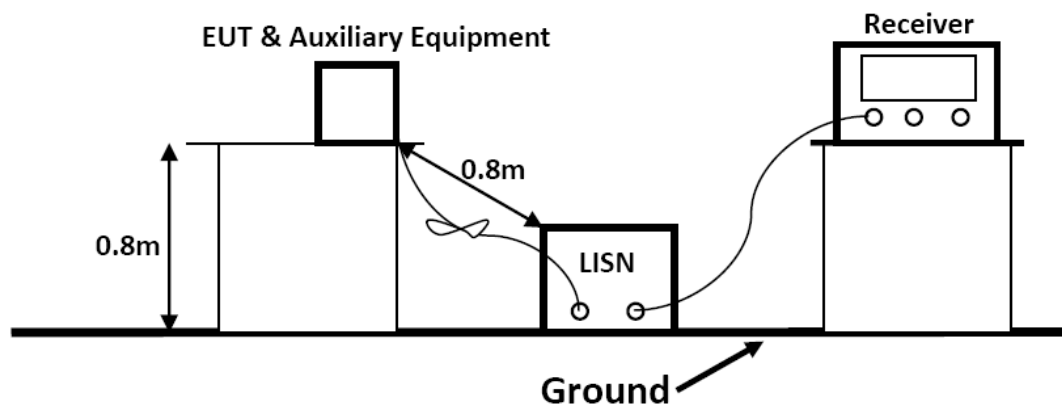
3.1. POWER LINE CONDUCTED EMISSION MEASUREMENT

3.1.1. Test Equipment

The following test equipments are used during the power line conducted measurement:

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	2020-06-22	2021-06-21
3	Artificial Mains	R&S	ENV216	101288	2020-06-22	2021-06-21
4	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2020-06-22	2021-06-21
5	Impedance Stabilization Network	TESEQ	ISN T800	45130	2020-12-02	2121-12-01

3.1.2. Block Diagram of Test Setup



3.1.3. Test Standard

Power Line Conducted Emission Limits (Class B)

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.

3.1.4. EUT Configuration on Test

The following equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

3.1.5. Operating Condition of EUT

3.1.5.1. Setup the EUT as shown on Section 3.1.2

3.1.5.2. Turn on the power of all equipments.

3.1.5.3. Let the EUT work in measuring Mode 1 and measure it.

3.1.6. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC/ANSI C63.4-2014 on Conducted Emission Measurement.

The bandwidth of the test receiver is set at 9kHz.

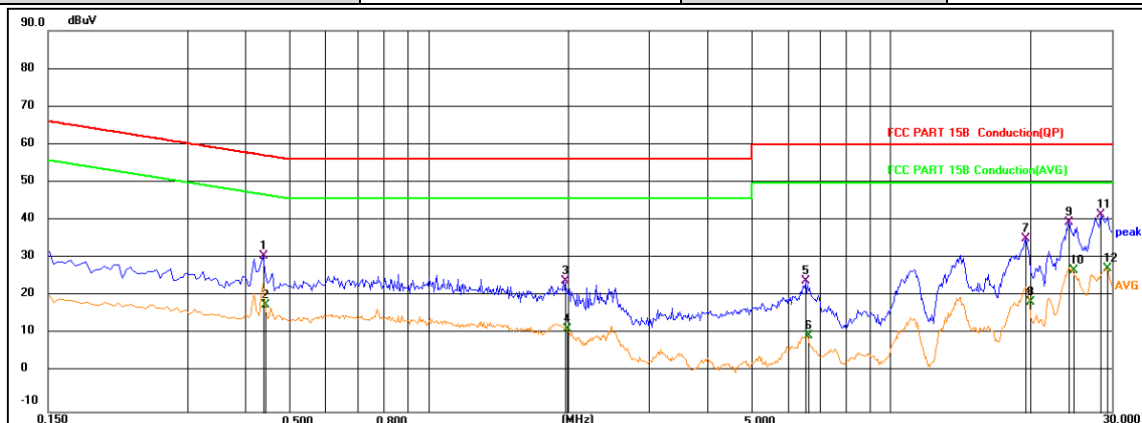
The frequency range from 150kHz to 30MHz is investigated

3.1.7. Test Results

PASS.

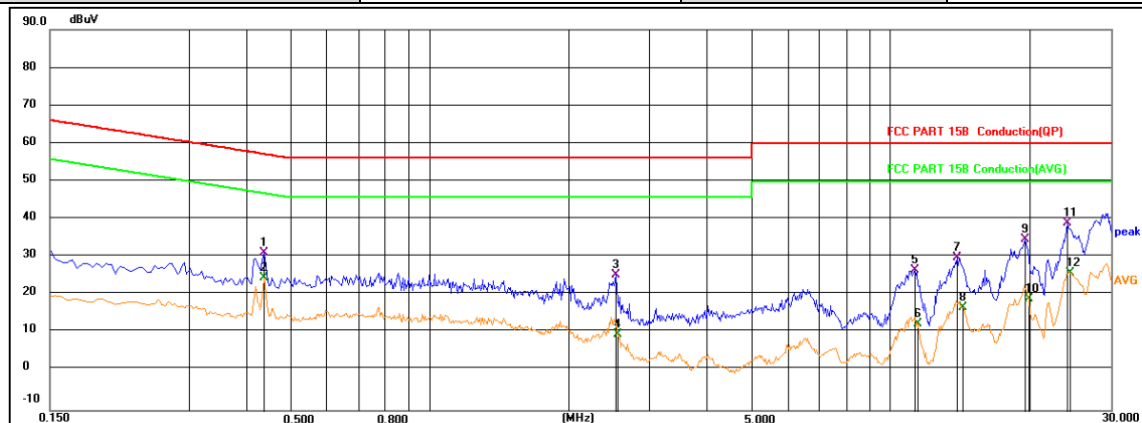
The test result please refer to the next page.

Test Model	POWR3	Test Mode	Mode 1
Environmental Conditions	20.5℃, 51.4% RH	Test Engineer	Carl Fu
Pol	Line	Test Voltage	AC 120V/60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4381	15.13	15.72	30.85	57.10	-26.25	QP
2	0.4426	2.49	15.72	18.21	47.01	-28.80	AVG
3	1.9636	9.13	15.19	24.32	56.00	-31.68	QP
4	1.9906	-3.38	15.19	11.81	46.00	-34.19	AVG
5	6.5400	12.02	12.37	24.39	60.00	-35.61	QP
6	6.6076	-2.44	12.56	10.12	50.00	-39.88	AVG
7	19.6216	25.21	10.16	35.37	60.00	-24.63	QP
8	19.9546	8.65	10.17	18.82	50.00	-31.18	AVG
9	24.2701	31.18	8.53	39.71	60.00	-20.29	QP
10	24.7471	19.04	8.15	27.19	50.00	-22.81	AVG
11	28.5496	34.23	7.42	41.65	60.00	-18.35	QP
12	29.3956	20.13	7.54	27.67	50.00	-22.33	AVG

Test Model	POWR3	Test Mode	Mode 1
Environmental Conditions	20.5℃, 51.4% RH	Test Engineer	Carl Fu
Pol	Neutral	Test Voltage	AC 120V/60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4381	15.68	15.72	31.40	57.10	-25.70	QP
2	0.4381	9.16	15.72	24.88	47.10	-22.22	AVG
3	2.5396	11.48	14.23	25.71	56.00	-30.29	QP
4	2.5576	-4.15	14.20	10.05	46.00	-35.95	AVG
5	11.2966	12.89	13.92	26.81	60.00	-33.19	QP
6	11.4766	-1.30	14.09	12.79	50.00	-37.21	AVG
7	13.9426	18.53	11.67	30.20	60.00	-29.80	QP
8	14.3116	5.35	11.79	17.14	50.00	-32.86	AVG
9	19.5406	24.79	10.16	34.95	60.00	-25.05	QP
10	19.9501	9.05	10.17	19.22	50.00	-30.78	AVG
11	24.2431	30.60	8.56	39.16	60.00	-20.84	QP
12	24.6256	17.87	8.25	26.12	50.00	-23.88	AVG

Note: Pre-Scan all mode, Thus record worse case mode result in this report.

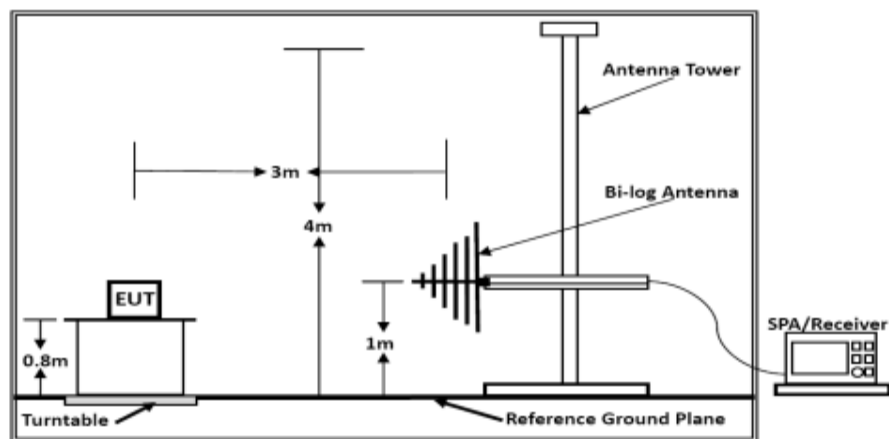
3.2. Radiated emission Measurement

3.2.1. Test Equipment

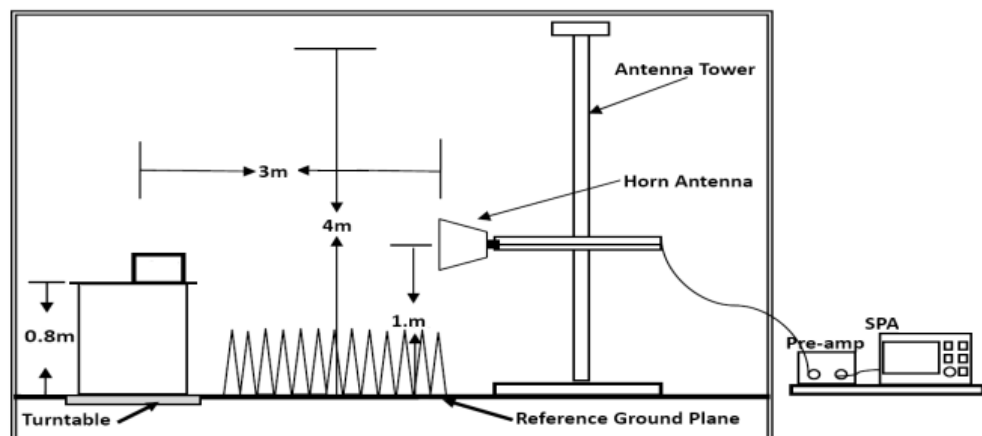
The following test equipments are used during the radiated emission measurement:

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 FRANKONIA	SAC-3M	03CH03-HY	2020-06-22	2021-06-21
3	Positioning Controller	MF	MF7082	MF78020803	2020-06-22	2021-06-21
4	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-07-26	2021-07-25
5	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2018-07-02	2021-07-01
6	EMI Test Receiver	R&S	ESR 7	101181	2020-06-22	2021-06-21
7	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2020-11-17	2021-11-16
8	Broadband Preamplifier	/	BP-01M18G	P190501	2020-06-22	2021-06-21
9	RF Cable-R03m	Jye Bao	RG142	CB021	2020-06-22	2021-06-21
10	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2020-06-22	2021-06-21

3.2.2. Block Diagram of Test Setup



Below 1GHz



Above 1GHz

3.2.3. Radiated Emission Limit (Class B)

Limits for Radiated Disturbance Below 1GHz

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46
960 ~ 1000	3	500	54

Remark: (1) Emission level $(\text{dB})\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$
 (2) The smaller limit shall apply at the cross point between two frequency bands.
 (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

Limits for Radiated Emission Above 1GHz

Frequency (MHz)	Distance (Meters)	Peak Limit ($\text{dB}\mu\text{V/m}$)	Average Limit ($\text{dB}\mu\text{V/m}$)
Above 1000	3	74	54

***Note: The lower limit applies at the transition frequency.

3.2.4. EUT Configuration on Measurement

The following equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

3.2.5. Operating Condition of EUT

3.2.5.1. Setup the EUT as shown in Section 3.2.2.

3.2.5.2. Let the EUT work in test Mode 1 and measure it.

3.2.6. Test Procedure

EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated by-log antenna) is used as receiving antenna. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4-2014 on radiated emission measurement.

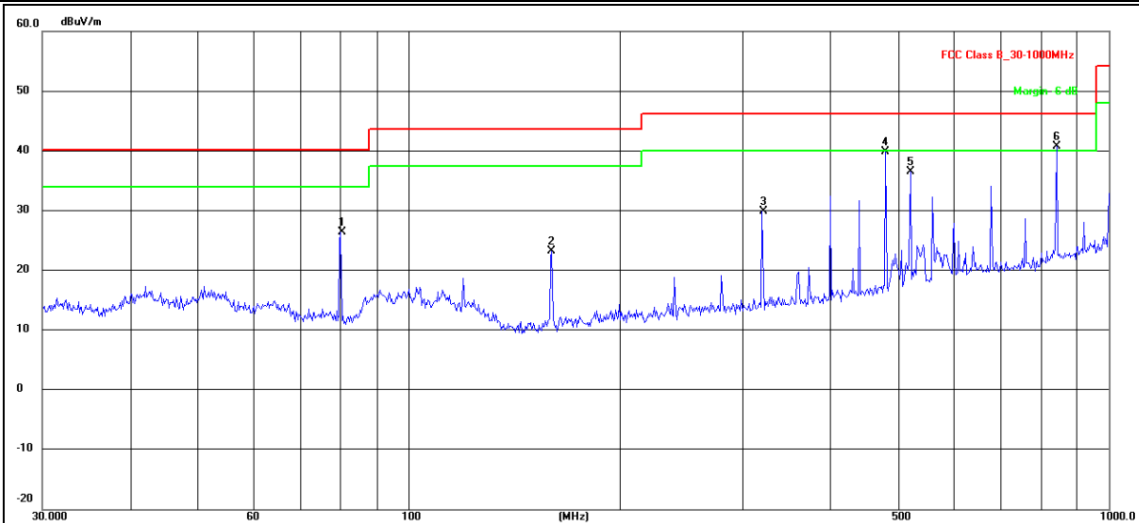
The bandwidth of the EMI test receiver is set at 120kHz, 300kHz.
 The frequency range from 30MHz to 1000MHz is checked.

3.2.7. Radiated Emission Noise Measurement Result

PASS.

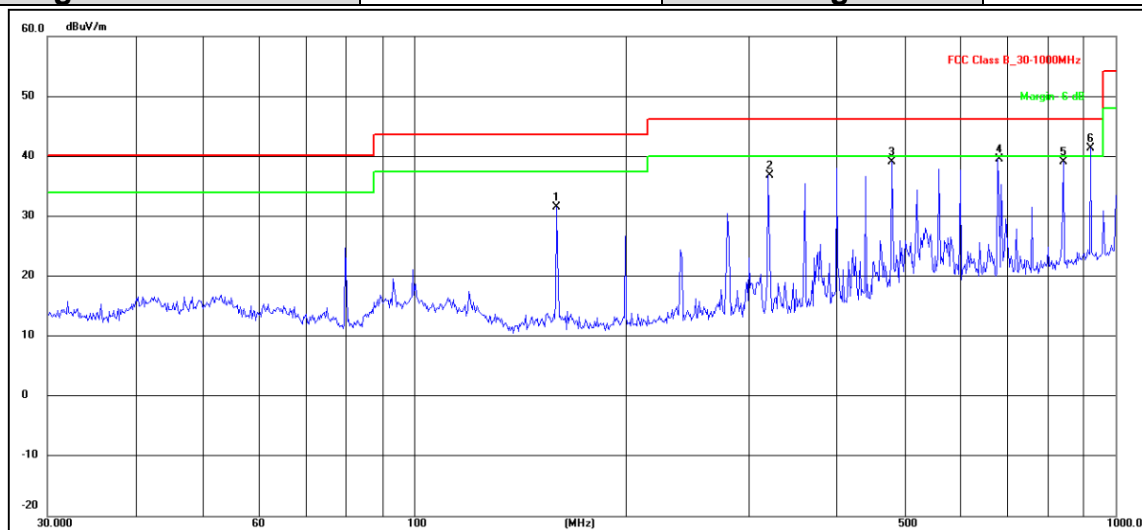
The scanning waveforms please refer to the next page.

Test Model	POWR3	Test Mode	Mode 1
Environmental Conditions	24.6°C, 54.1% RH	Detector Function	Quasi-peak
Pol	Vertical	Distance	3m
Test Engineer	Carl Fu	Test Voltage	AC 120V/60Hz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	80.0806	59.21	-32.73	26.48	40.00	-13.52	QP
2	160.3456	56.07	-32.89	23.18	43.50	-20.32	QP
3	319.9370	57.67	-27.77	29.90	46.00	-16.10	QP
4	480.5276	64.16	-24.36	39.80	46.00	-6.20	QP
5	520.8882	60.08	-23.51	36.57	46.00	-9.43	QP
6 *	842.1296	59.83	-19.01	40.82	46.00	-5.18	QP

Test Model	POWR3	Test Mode	Mode 1
Environmental Conditions	24.6°C, 54.1% RH	Detector Function	Quasi-peak
Pol	Horizontal	Distance	3m
Test Engineer	Carl Fu	Test Voltage	AC 120V/60Hz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	159.7844	64.45	-32.91	31.54	43.50	-11.96	QP
2	319.9370	64.64	-27.77	36.87	46.00	-9.13	QP
3	480.5276	63.43	-24.36	39.07	46.00	-6.93	QP
4	679.9600	60.56	-21.02	39.54	46.00	-6.46	QP
5	842.1296	58.10	-19.01	39.09	46.00	-6.91	QP
6 *	922.5157	59.48	-18.05	41.43	46.00	-4.57	QP

Note: Pre-Scan all mode, Thus record worse case mode result in this report.

Test Mode: Mode 1 (Above 1GHz)	Tested by: Carl Fu
Test Voltage: AC 120V/60Hz	Test Distance: 3m
Detector Function: Peak + AV	Test Results: Passed

Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
1126.02	48.17	1.14	49.31	70.00	-20.69	Peak	Horizontal
1126.02	29.75	1.14	30.89	50.00	-19.11	Average	Horizontal
1693.24	50.17	2.67	52.84	70.00	-17.16	Peak	Horizontal
1693.24	31.31	2.67	33.98	50.00	-16.02	Average	Horizontal
2396.19	51.50	5.75	57.25	70.00	-12.75	Peak	Horizontal
2396.19	29.26	5.75	35.01	50.00	-14.99	Average	Horizontal
3383.18	49.11	1.83	50.94	74.00	-23.06	Peak	Horizontal
3383.18	31.26	1.83	33.09	54.00	-20.91	Average	Horizontal
4189.36	48.07	3.17	51.24	74.00	-22.76	Peak	Horizontal
4189.36	29.56	3.17	32.73	54.00	-21.27	Average	Horizontal
5925.54	48.71	6.13	54.84	74.00	-19.16	Peak	Horizontal
5925.54	31.48	6.13	37.61	54.00	-16.39	Average	Horizontal

Freq. MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
1126.20	51.60	1.14	52.74	70.00	-17.26	Peak	Vertical
1126.20	30.97	1.14	32.11	50.00	-17.89	Average	Vertical
1558.39	49.44	2.67	52.11	70.00	-17.89	Peak	Vertical
1558.39	30.80	2.67	33.47	50.00	-16.53	Average	Vertical
2918.34	51.18	5.75	56.93	70.00	-13.07	Peak	Vertical
2918.34	30.71	5.75	36.46	50.00	-13.54	Average	Vertical
3734.54	48.40	1.83	50.23	74.00	-23.77	Peak	Vertical
3734.54	28.87	1.83	30.70	54.00	-23.30	Average	Vertical
4597.11	51.80	3.17	54.97	74.00	-19.03	Peak	Vertical
4597.11	31.87	3.17	35.04	54.00	-18.96	Average	Vertical
5978.96	50.84	6.13	56.97	74.00	-17.03	Peak	Vertical
5978.96	31.53	6.13	37.66	54.00	-16.34	Average	Vertical

Note:

- 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.
- Measurements above show only up to 6 maximum emissions noted.
- 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.
- Factor = Antenna Factor + Cable Loss + Amplifier Factor
Emission Level = Reading level + Factor
Margin = Emission Level - Limit

4. PHOTOGRAPH



Photo of Power Line Conducted Measurement



Photo of Radiated Measurement

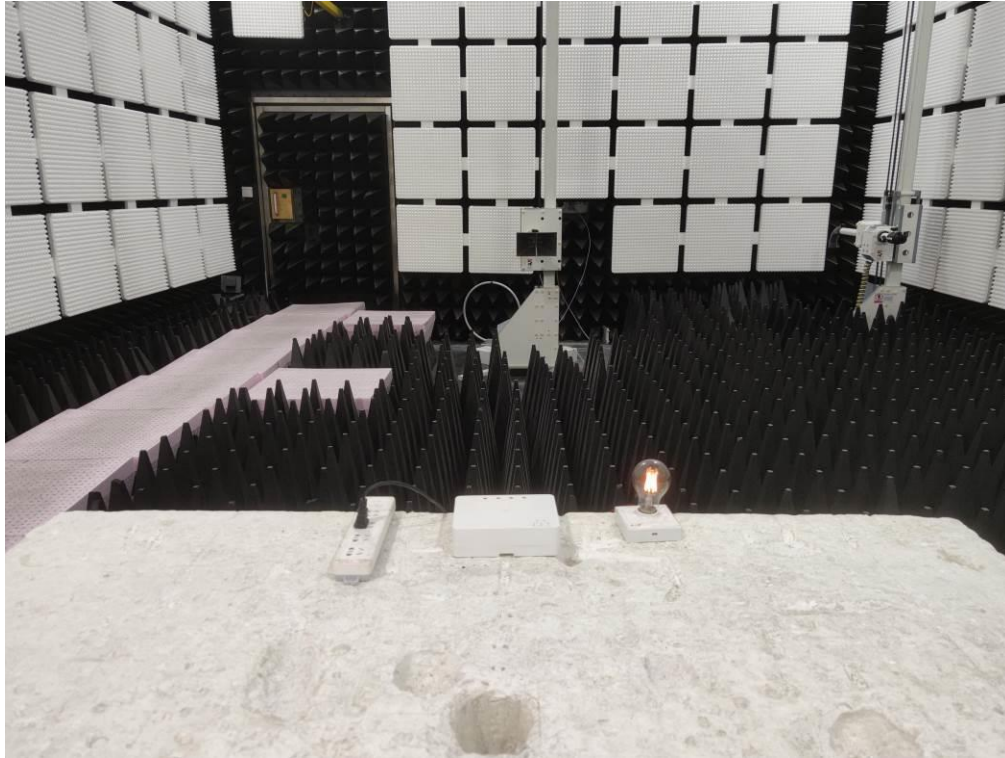


Photo of Radiated Measurement (Above 1GHz)

5. EXTERNAL AND INTERNAL PHOTOS OF THE EUT



Fig.1

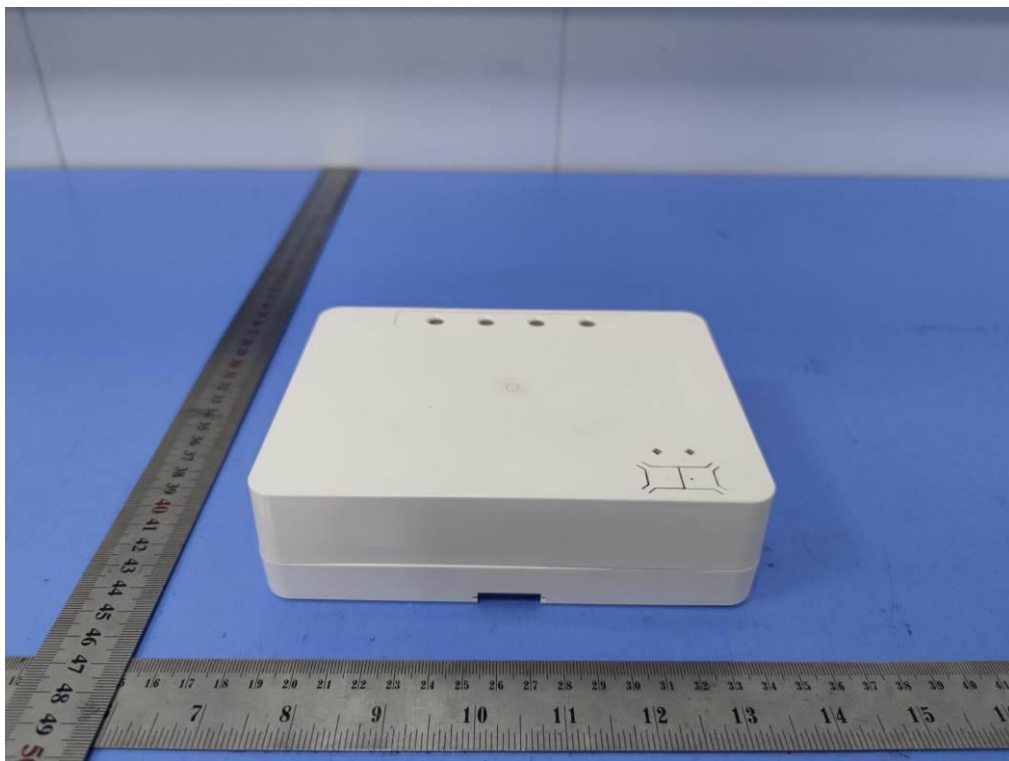


Fig.2



Fig.3

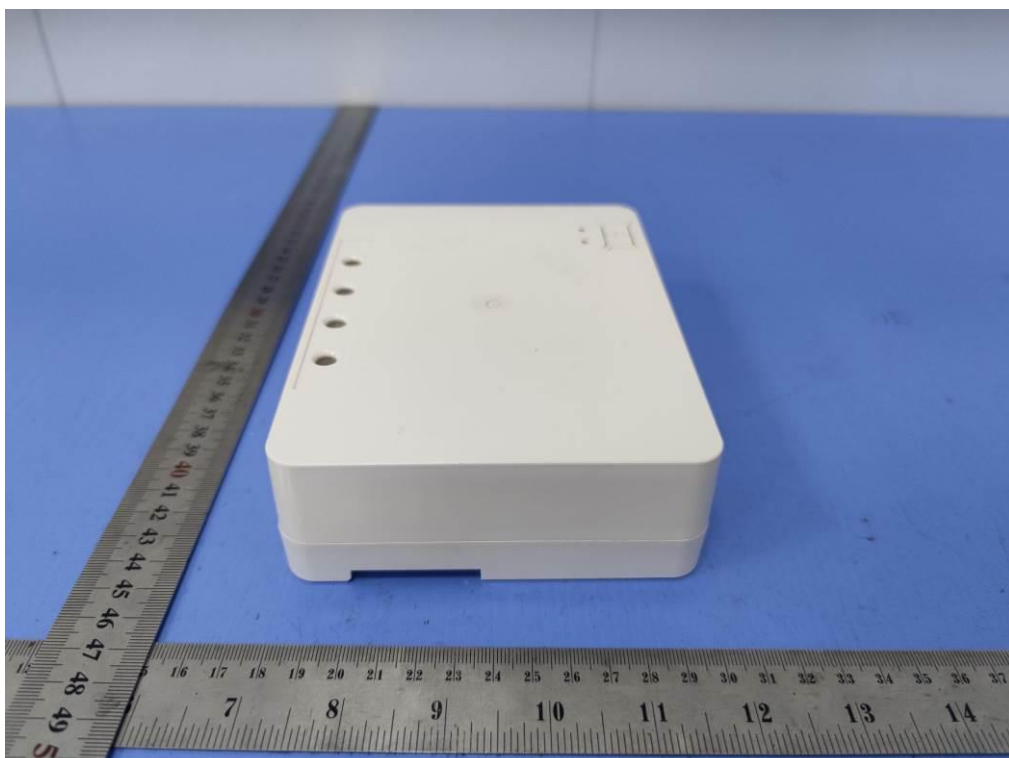


Fig.4



Fig.5



Fig.6

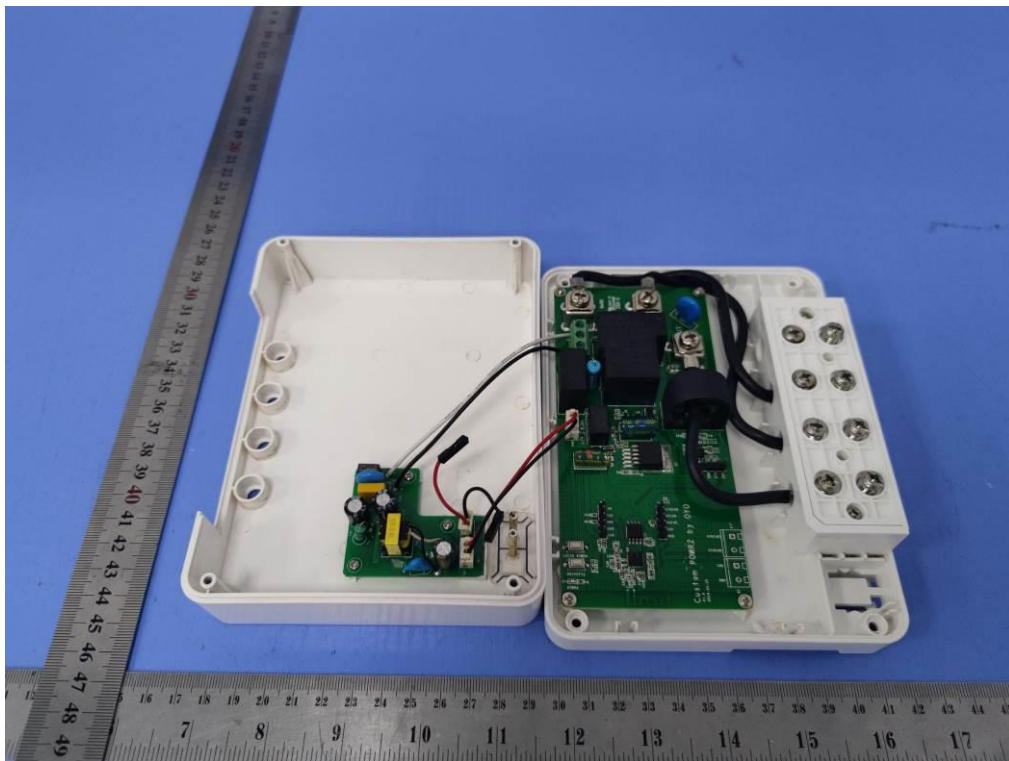


Fig.7

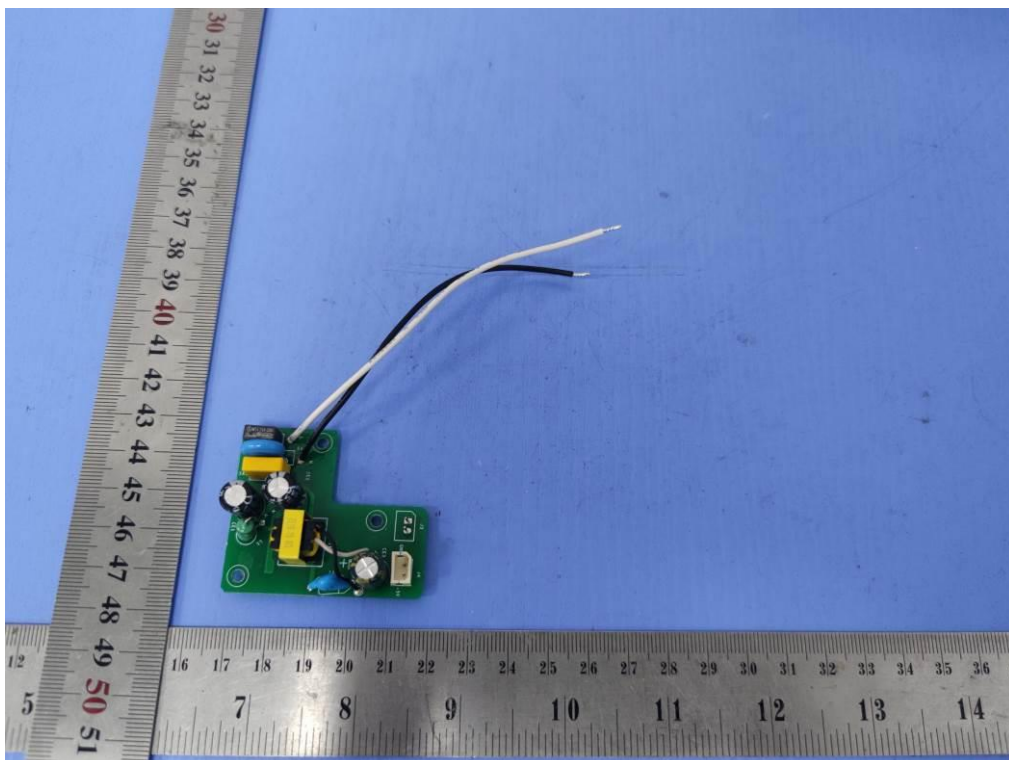


Fig.8

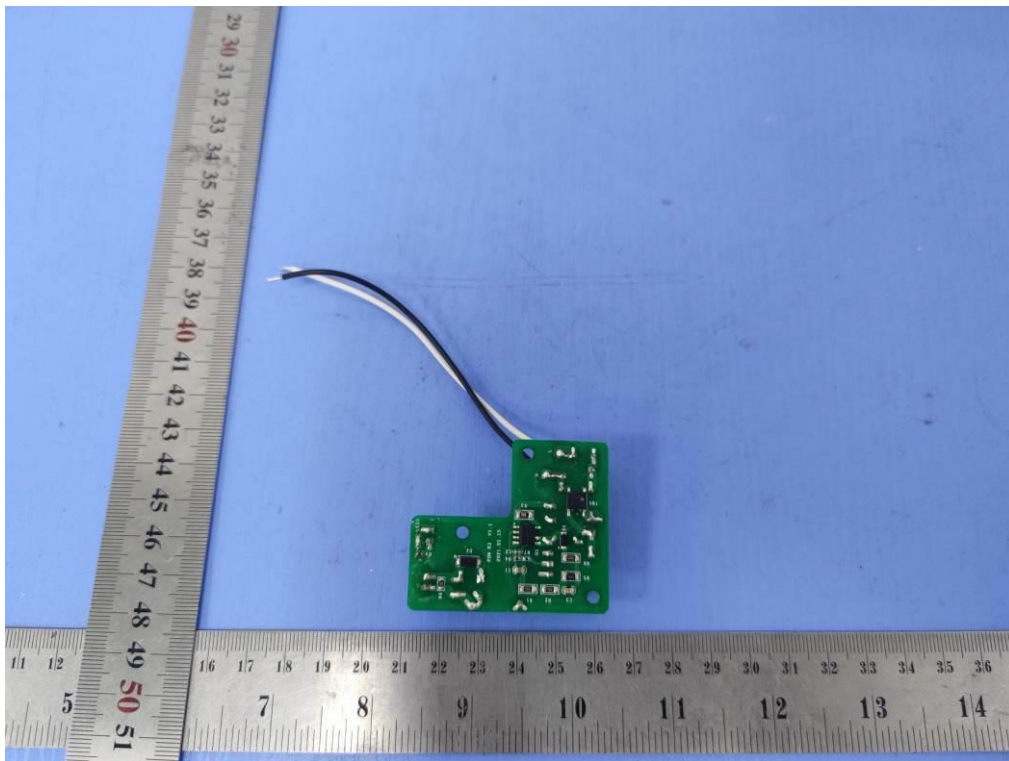


Fig.9

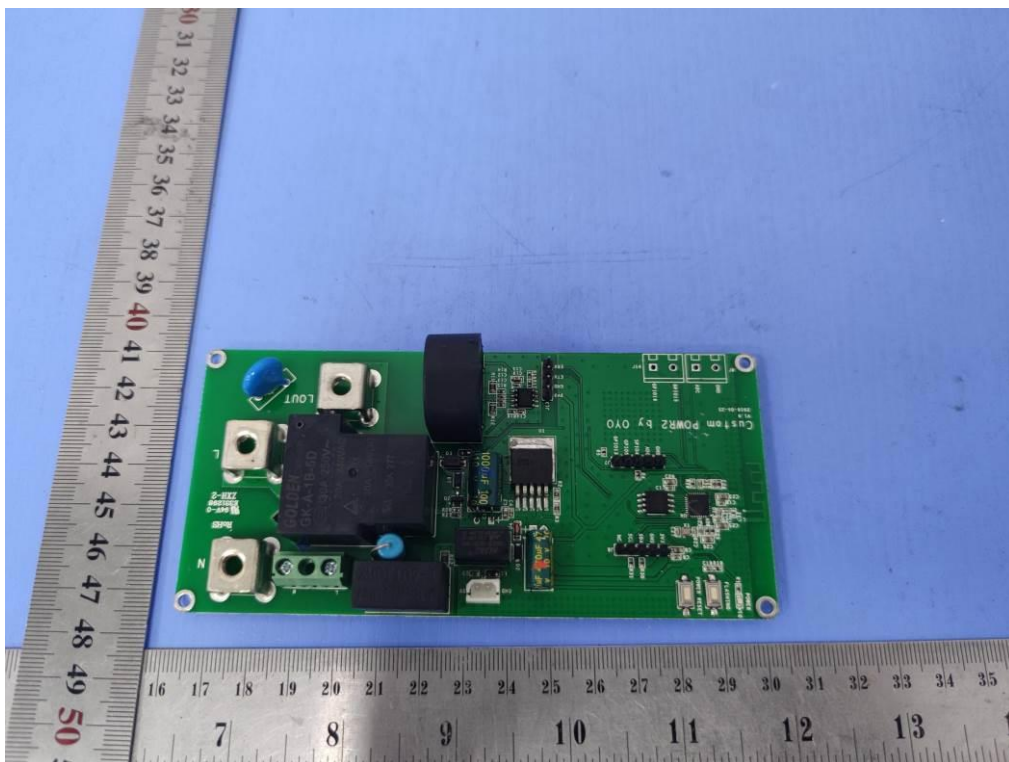


Fig.10

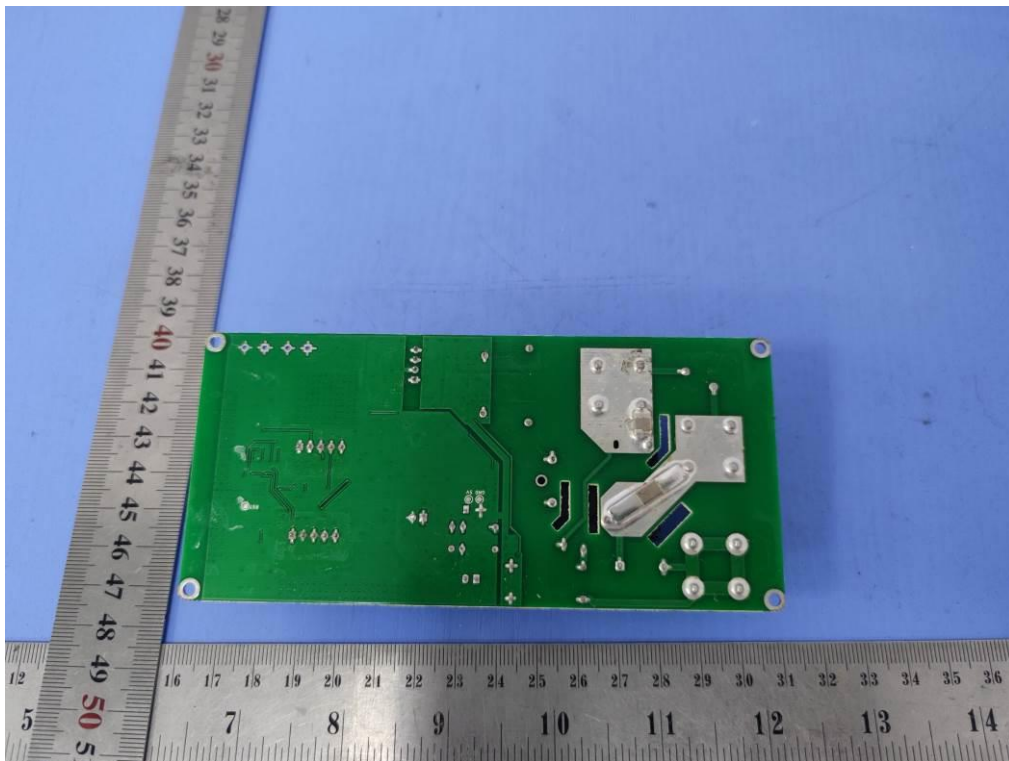


Fig.11

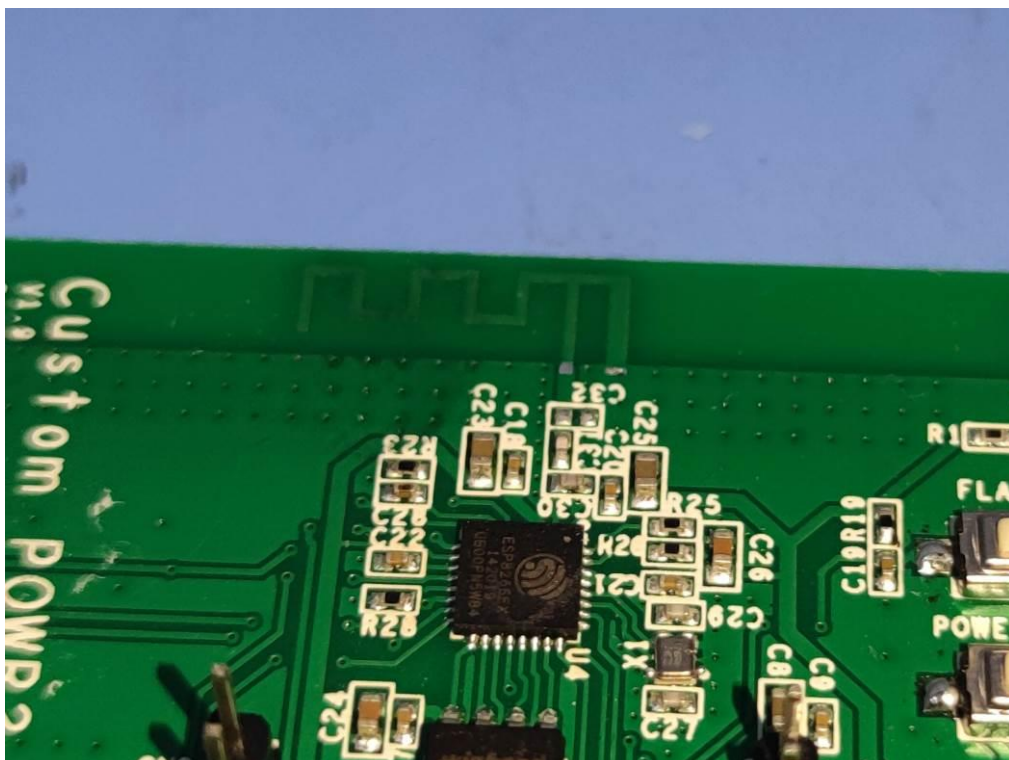


Fig.12

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