Prüfbericht - Produkte
Test Report - Products

TÜVRheinland®

Prüfbericht-Nr.: *Test report no.:*	**NN22S76T 006**	**Auftrags-Nr.:** *Order no.:*	168377937	**Seite 1 von 26** *Page 1 of 26*
Kunden-Referenz-Nr.: *Client reference no.:*	N/A	**Auftragsdatum:** *Order date:*	2022-06-14	
Auftraggeber: *Client:*	**Shenzhen Sonoff Technologies Co.,Ltd.** 3F & 6F, Bldg A, No. 663, Bulong Rd, Shenzhen, Guangdong, China			
Prüfgegenstand: *Test item:*	Smart Power Meter Switch			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	POWR316, POWR320, POWR316D, POWR320D (Trademark: SONOFF)			
Auftrags-Inhalt: *Order content*:	RED approval			
Prüfgrundlage: *Test specification:*	EN 301 489-1 V2.2.3:2019 EN 301 489-17 V3.2.4:2020			

Wareneingangsdatum: *Date of sample receipt:*	2022-06-14
Prüfmuster-Nr.: *Test sample no:*	A003291051-003-008
Prüfzeitraum: *Testing period:*	2022-06-14 to 2022-08-08
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shenzhen) Co., Ltd.
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.
Prüfergebnis*: *Test result*:*	Pass

geprüft von: *tested by:*	X Breeze Jiang Signed by: Breeze Jiang	**genehmigt von:** *authorized by:*	X Lin Lin Signed by: Lin Lin
Datum: *Date:* 2022-10-18		**Ausstellungsdatum:** *Issue date:* 2022-10-18	
Stellung */ Position:*	Assistant Project Manager	**Stellung** */ Position:*	Reviewer
Sonstiges */ Other:*	This report is for Article 3.1b EMC requirements only.		

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

V05

Test Summary

6.1.1 HARMONICS CURRENT EMISSION
RESULT: Not applicable

6.1.2 VOLTAGE FLUCTUATIONS AND FLICKER
RESULT: Not applicable

6.1.3 RADIATED EMISSION
RESULT: Pass

6.1.4 CONDUCTED EMISSION
RESULT: Pass

6.2.1 RADIO FREQUENCY ELECTROMAGNETIC FIELD (RS)
RESULT: Pass

6.2.2 ELECTROSTATIC DISCHARGE (ESD)
RESULT: Pass

6.2.3 ELECTRICAL FAST TRANSIENTS (EFT)
RESULT: Pass

6.2.4 RADIO FREQUENCY COMMON MODE (CS)
RESULT: Pass

6.2.5 SURGES
RESULT: Pass

6.2.6 VOLTAGE DIPS AND INTERRUPTIONS
RESULT: Pass

Contents

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Test Results of Article 3.1b EMC Requirements.

2 Test Sites

2.1 Test Facilities

TUV Rheinland (Shenzhen) Co., Ltd.
No.362, Huanguan Middle Road, Songyuansha Community, Guanhu Subdistrict, Longgang District, Shenzhen 518110, Guangdong, China

CNAS Registration No.: L3080

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

TUV Rheinland (Shenzhen) Co., Ltd.

Harmonics and Flicker				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
5KVA AC Power Source	California Instruments	5001iX-CTS-400-413	1827A00145	2022-08-10
Harmonics/Voltage Fluctuation And Flicker Test System	California Instruments	100-CTS-230	1827A00144	2022-08-10
Harmonics/Voltage Fluctuation And Flicker Test System Test Software	California Instruments	CTS 4 (Ver.4.26.0)	N/A	N/A
Radiated Emission 3m				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
3m SAC	ETS-Lindgren	SAC3	CT001632-Q1362	2024-04-26
EMI Test Receiver	R&S	ESR7	102111	2022-12-01
Active magnetic loop antenna	SCHWARZBECK	FMZB1519B	00080	2023-08-08
Preamplifier (1-18GHz)	FIT	SCU-18F	180077	2023-08-01
Active magnetic loop antenna	SCHWARZBECK	FMZB1519B	00080	2023-08-08
Trilog-Broadband antenna	SCHWARZBECK	VULB9168	0945	2023-08-08
Horn Antenna	R&S	HF907	102706	2023-08-08
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A
Radiated Emission 10m				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
10m SAC	ETS-Lindgren	SAC10	CT001632-Q1399	2024-03-01
EMI Test Receiver 1	R&S	ESR7	102022	2023-07-31
EMI Test Receiver 2	R&S	ESR7	102023	2023-07-31

Bilog Antenna 1	TESEQ	CBL6112D	51321	2023-08-08
Bilog Antenna 2	TESEQ	CBL6112D	51322	2023-07-07
Preamplifier 1 (30-1000MHz)	SCHWARZBECK	BBV9745	115	2023-08-01
Preamplifier 2 (30-1000MHz)	EMCI	EMC9135-P	980629	2023-08-01
Preamplifier 3 (1-18GHz)	FIT	SCU-18F	180076	2023-08-01
Horn Antenna	R&S	HF907	102707	2023-07-03
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A
Conducted Emission				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
EMI Test Receiver	R&S	ESR3	102680	2023-02-27
Artificial Mains Network	R&S	ENV216	101445	2023-02-27
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A
Radio Frequency Electromagnetic Fields (RS)				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
3m FAC	ETS	FAC3	CT001632-Q1360	2024-04-26
Signal Generator	R&S	SMB100A	115183	2022-08-13
Power Amplifier	R&S	BBA150-BC250	103102	2022-08-13
Power Amplifier	R&S	BBA150-D110E100	103117	2022-08-13
NRP6AN Average Power Sensor	R&S	NRP6AN	101161	2022-08-13
NRP6AN Average power sensor	R&S	NRP6AN	101162	2022-08-13
Stacked double Log.-Per. Antenna1825022	SCHWARZBECK	STLP 9128E	0153	2023-01-21
Stacked Log.-Per. Antenna	SCHWARZBECK	STLP 9149	00520	2023-01-21
EMC32 Test Software	R&S	EMC32(Ver.10.30.01)	N/A	N/A
Electrostatic Discharge (ESD)				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
ESD Tester	TESEQ	NSG-437	1282	2022-08-11
Electrical Fast Transients (EFT) & Surges & Voltage Dips and Interruptions				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
EFT/Surge/Voltage Dips & Interruption Main Test Unit	EMTest	compact NX5 bspt-1-300-16	P1807214329	2022-08-11
Variac	EMTest	Variac NX-1-260-16	P1828221789	2022-08-11
EMC 4 IN 1 System Test Software	EMTest	Iec.control(V4.0.0)	N/A	N/A
Radio Frequency Common Mode (CS)				
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Until**
Conducted Immunity Test System	Teseq	NSG 4070	51350	2022-08-11
6 dB Attenuator	Teseq	100W6dB	/	2022-08-11
Coupling And Decoulping Network	Teseq	CDN M016	51056	2022-08-11

2.3 Uncertainty of Measurement

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

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%.

Table 2: Measurement Uncertainty levels

Test	Parameters	Expanded uncertainty (U_{lab})	Expanded uncertainty (U_{cispr})
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	± 3.70 dB ± 3.30 dB	± 3.8 dB ± 3.4 dB
Disturbance Power	Level accuracy (30MHz to 300MHz)	± 4.27 dB	± 4.5 dB
Electromagnetic Radiated Emission (Triple-loop)	Level accuracy (9kHz to 30MHz)	± 2.67 dB	N/A
Radiated Emission (3m SAC)	Level accuracy (30MHz to 1000MHz)	± 4.52 dB	± 6.3 dB
	Level accuracy (above 1000MHz)	± 4.37 dB	N/A
Radiated Emission (10m SAC)	Level accuracy (30MHz to 1000MHz)	± 4.66 dB	± 6.3 dB
	Level accuracy (above 1000MHz)	± 4.35 dB	N/A
Mains Harmonic	Current	± 4.60%	N/A
Voltage Fluctuations & Flicker	Voltage	± 0.64%	N/A

As U_{lab} in all applicable tests listed above are less than U_{cispr} according to CISPR 16-4-2:2011,

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;

non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a Smart Power Meter Switch, which supported 802.11 b/g/n and BLE wireless technologies.

According to the client's declaration, the all models are the same as the original ones in circuit design, layout only different in appearance.

For details refer to the User Manual.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Smart Power Meter Switch
Type Designation	POWR316, POWR320, POWR316D, POWR320D
Trademark	SONOFF
Operating Voltage	AC 100-240V, 50/60Hz
Testing Voltage	AC 230V@50Hz

3.3 Independent Operation Modes

The basic operation modes are:

A. On, Wi-Fi connecting mode
B. On, Normal operation mode
C. Off

3.4 Noise Generating and Noise Suppressing Parts

For details refer to the Circuit Diagram.

3.5 Submitted Documents

- User Manual

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Immunity: The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5 and chapter 6.

According to clause 3.1, all tests were performed on model *POWR320D* in this report.

This testing was carried out on all operation modes, but only the worst case was presented in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
IPad 6	Apple	A1893	DMPYN2HZJF8K	N/A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

5 Immunity Performance Criteria

The "pass/fail" performance criterion to be used during test is detailed below:

5.1 Performance Criteria of EN 301 489-17

In the table below:
Performance criterion A applies for immunity tests with phenomena of a continuous nature;
Performance criterion B applies for immunity tests with phenomena of a transient nature.

Table 5: Performance Criteria of EN 301 489-17

Criterion	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

6 Test Results of EMC Requirement

6.1 Test Results of EMISSION

6.1.1 Harmonics Current Emission

RESULT: **Not applicable**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 61000-3-2: 2014
Measured harmonics	:	2 – 40

Exemption Conditions:
This product is not defined as lighting equipment, and has rated power less than 75W, therefore, no limit apply according to IEC 61000-3-2, the EUT are deemed to comply with this requirement without the further testing.

6.1.2 Voltage Fluctuations and Flicker

RESULT: **Not applicable**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 61000-3-3: 2013
Frequency range	:	0 - 2 KHz

Exemption Conditions:
This apparatus is unlikely to produce significant voltage fluctuations and flicker by examination of the circuit diagram and specification of it. Therefore, it is deemed to fulfill the relevant standard without testing according to clause 6.1 of IEC 61000-3-3.

6.1.3 Radiated Emission

RESULT: **Pass**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 55032: 2015
Test requirement	:	EN 301 489-1 V2.2.3:2019, Clause 8.2
Classification	:	Class B
Frequency range	:	30 MHz – 6 GHz
Kind of test site	:	10m Semi-anechoic Chamber & 3m Full-anechoic Chamber
Limit	:	EN 301 489-1 V2.2.3:2019, Clause 8.2.3

Test Setup

Date of testing	:	2022-08-02
Test voltage	:	AC 230V@50Hz
Operation mode	:	A,B
Test Ports	:	Enclosure
Earthing	:	Not connected
Ambient temperature	:	25 ºC
Relative humidity	:	55%
Atmospheric pressure	:	101.0 kPa

For the measurement records, refer to the appendix A.

6.1.4 Conducted Emission

RESULT: **Pass**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 55032: 2015
Test requirement	:	EN 301 489-1 V2.2.3:2019, Clause 8.4
Classification	:	Class B
Frequency range	:	150 KHz - 30 MHz
Kind of test site	:	Shielded Room
Limit	:	EN 301 489-1 V2.2.3:2019, Clause 8.4.3

Test Setup

Date of testing	:	2022-08-02
Test voltage	:	AC 230V@50Hz
Operation mode	:	A, B
Test ports	:	☒ AC mains ports
		☐ Signal, wired network and control ports
Earthing	:	Not connected
Test configuration	:	Table-top
Ambient temperature	:	20 ℃
Relative humidity	:	54 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix A.

6.2 Test Results of IMMUNITY

6.2.1 Radio Frequency Electromagnetic Field (RS)

RESULT: **Pass**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 61000-4-3:2006+A1+A2
Test requirement	:	EN 301 489-1 V2.2.3:2019, Clause 9.2
Frequency range	:	80 - 6000 MHz
Test level	:	3 V/m, (unmodulated, r.m.s)
Modulation	:	80% AM by a sinusoidal signal of 1KHz
Kind of test site	:	3m Full-anechoic Chamber
Performance criteria	:	Criterion A in section 5.1 of the present report

Test Setup

Date of testing	:	2022-08-02
Test voltage	:	AC 230V@50Hz
Operation mode	:	A, B
Test Ports	:	Enclosure
Earthing	:	Not connected
Ambient temperature	:	20 ℃
Relative humidity	:	50 %
Atmospheric pressure	:	101 kPa

Table 6: Test Result of Radio Frequency Electromagnetic Field (RS)

Mode	Frequency Range	Test port / Test Level	Polarity	Location	Result	Performance criterion
A, B	80 - 1000 MHz	Enclosure 3 V/m	Vertical / Horizontal	Front	Pass	A
				Rear	Pass	A
				Left	Pass	A
				Right	Pass	A
	1000 - 6000 MHz	Enclosure 3 V/m	Vertical / Horizontal	Front	Pass	A
				Rear	Pass	A
				Left	Pass	A
				Right	Pass	A

*Remark: No degradation was observed during and after the tests.

6.2.2 Electrostatic Discharge (ESD)

RESULT: **Pass**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 61000-4-2:2009
Test requirement	:	EN 301 489-1 V2.2.3:2019, Clause 9.3
Discharge impedance	:	330 Ω / 150 pF
Test level	:	Air discharge: ± 2 kV, ± 4 kV, ± 8 kV
		Contact discharge: ± 4 kV
		HCP & VCP: ± 4 kV
Position	:	All exposed surfaces
Performance criteria	:	Criterion B in section 5.1 of the present report

Test Setup

Date of testing	:	2022-08-02
Test voltage	:	AC 230V@50Hz
Operation mode	:	A, B
Test Ports	:	Enclosure
Earthing	:	Not connected
Ambient temperature	:	20 ℃
Relative humidity	:	50 %
Atmospheric pressure	:	101 kPa

Table 7: Test Result of Electrostatic Discharge (ESD)

Test Mode	Test Level	Location	Actual Performance
A, B	± 4 kV / Contact	HCP	A*
		VCP	A*
		Conducted Enclosure	A*
	± 2.0kV, ± 4.0kV, ± 8.0kV / Air	Non-conducted Enclosure	A*
		Button	A*
		Slot	A*

*Remark: No degradation was observed during and after the tests.

6.2.3 Electrical Fast Transients (EFT)

RESULT: **Pass**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 61000-4-4: 2012
Test requirement	:	EN 301 489-1 V2.2.3:2019, Clause 9.4
Test level	:	±1.0kV on AC port
Test duration	:	1 minute per level & polarity
Rise time	:	5/50ns
Repetition frequency	:	5 KHz
Performance criteria	:	Criterion B in section 5.1 of the present report

Test Setup

Date of testing	:	2022-08-02
Test voltage	:	AC 230V@50Hz
Operation mode	:	A, B
Test Ports	:	☒ AC mains ports
		☐ Signal, wired network and control ports
Earthing	:	Not connected
Ambient temperature	:	20 ℃
Relative humidity	:	50 %
Atmospheric pressure	:	101 kPa

Table 8: Test Result of Electrical Fast Transients (EFT), AC mains port

Coupling Method: Direct Injection				
Test Mode	**Coupling Port**	**Test Voltage / Result**		**Remark / Performance Criterion**
A, B	AC mains: L1, N	±1 kV	Passed	EUT operated as intended, no degradation of function. / Performance criterion A

6.2.4 Radio Frequency Common Mode (CS)

RESULT: **Pass**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 61000-4-6: 2009
Test requirement	:	EN 301 489-1 V2.2.3:2019, Clause 9.5
Frequency range	:	0.15 - 80 MHz
Source impedance	:	150 Ω
Test level	:	3V (unmodulated, r.m.s.)
Modulation	:	AM 80%, 1 KHz sine-wave
Sweep mode	:	Automatic
Sweep rate	:	$< 1.5\times10^{-3}$ decade / sec.
Performance criteria	:	Criterion A in section 5.1 of the present report

Test Setup

Date of testing	:	2022-08-02
Test voltage	:	AC 230V@50Hz
Operation mode	:	A, B
Test Ports	:	☒ AC mains ports
		☐ Signal, wired network and control ports
Earthing	:	Not connected
Ambient temperature	:	20 ℃
Relative humidity	:	50 %
Atmospheric pressure	:	101 kPa

Table 9: Test Result of Radio-Frequency Common Mode (CS), AC mains ports

Test Mode	Test port	Test level	Coupling method	Result	Performance Criterion
A, B	AC mains port	3V	Direct injection	Pass	EUT operated as intended, no degradation of function. / Performance criterion A

6.2.5 Surges

RESULT: **Pass**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 61000-4-5: 2006
Test requirement	:	EN 301 489-1 V2.2.3:2019, Clause 9.8
Test level	:	±1.0kV line to line
Number of surges	:	5 (for each combination of parameters)
Repetition rate	:	Max. 1/min
Performance criteria	:	Criterion B in section 5.1 of the present report

Test Setup

Date of testing	:	2022-08-02
Test voltage	:	AC 230V@50Hz
Operation mode	:	A, B
Test Ports	:	☒ AC mains ports
		☐ Signal, wired network and control ports
T_r / T_h	:	1,2 / 50 µs
Earthing	:	Not connected
Ambient temperature	:	20 ℃
Relative humidity	:	50 %
Atmospheric pressure	:	101 kPa

Table 10: Test Result of Surges, AC mains port

Test Mode	Coupling Port	Test Voltage	Coupling Phase	Result	Remark / Performance Criterion
A, B	AC mains:	±1.0 kV / line – line	0, π/2, π, 3π/2	Pass	EUT operated as intended, no degradation of function. / Performance criterion A

6.2.6 Voltage Dips and Interruptions

RESULT: **Pass**

Test Specification

Test standard	:	EN 301 489-17 V3.2.4:2020
Basic standard	:	EN 301 489-1 V2.2.3:2019
		EN 61000-4-11: 2004
Test requirement	:	EN 301 489-1 V2.2.3:2019, Clause 9.7
Performance criteria	:	Criterion B in section 5.1 of the present report

Test Setup

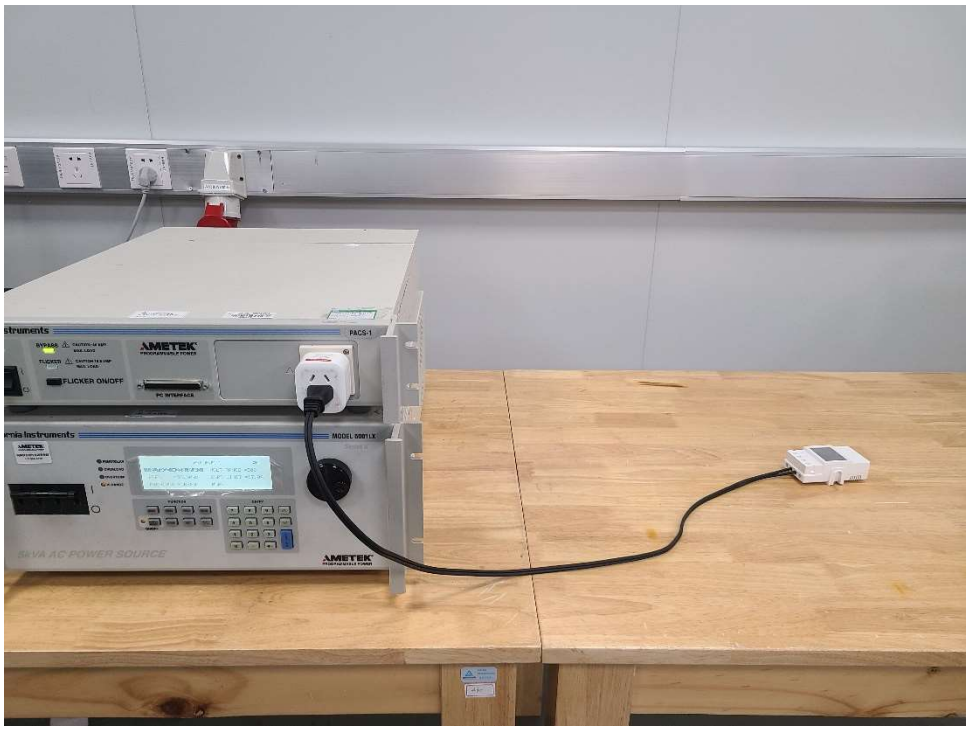
Date of testing	:	2022-08-02
Test voltage	:	AC 230V@50Hz
Operation mode	:	A, B
Test Ports	:	☒ AC mains ports
		☐ Signal, wired network and control ports
Earthing	:	Not connected
Ambient temperature	:	20 ℃
Relative humidity	:	50 %
Atmospheric pressure	:	101 kPa

Table 11: Test Result of Voltage Dips and Interruptions, AC mains ports

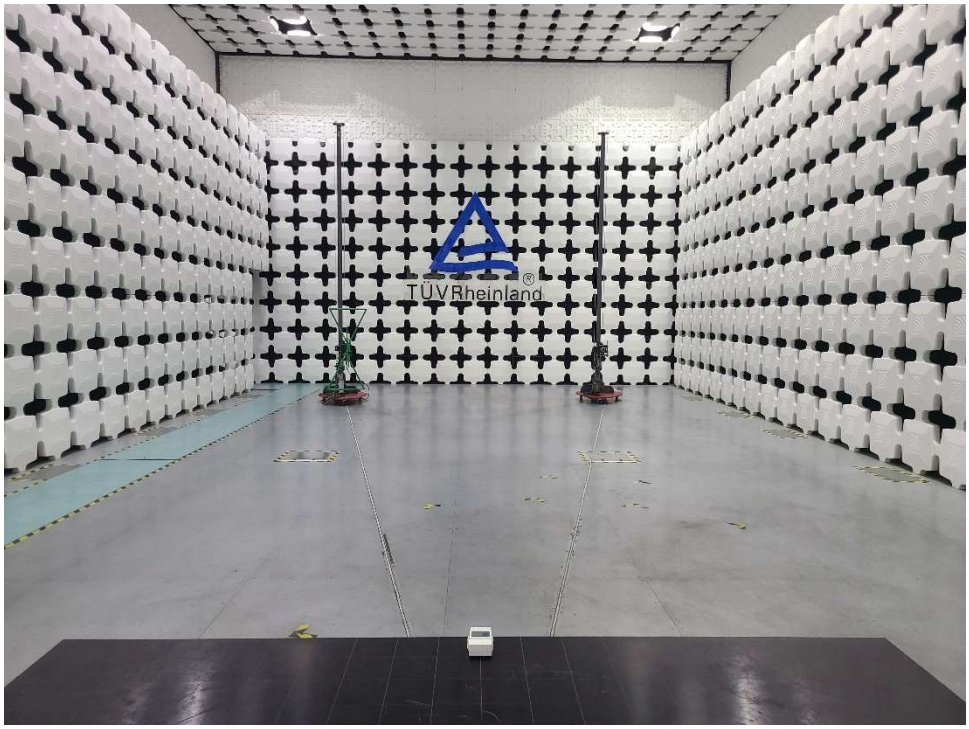
Test Mode	Coupling port	Voltage reduction (%)	Reduction Duration (in Period)	Result	Remark / Performance Criterion
A, B	AC mains ports	0%	0.5	Pass	EUT operated as intended, no degradation of function. / Performance criterion A
		0%	1.0	Pass	EUT operated as intended, no degradation of function. / Performance criterion A
		70%	25	Pass	EUT operated as intended, no degradation of function. / Performance criterion A
		0%	250	Pass	EUT operated as intended, no degradation of function. / Performance criterion A

7 Photographs of the Test Set-Up

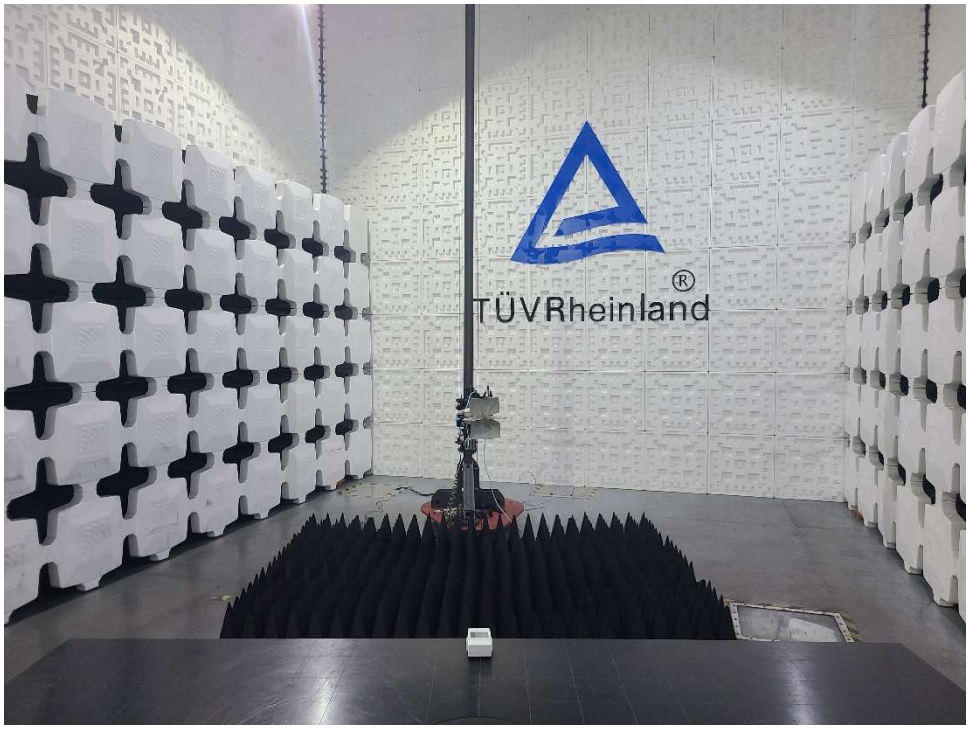
Photograph 1: Set-up for Voltage Fluctuations and Flicker



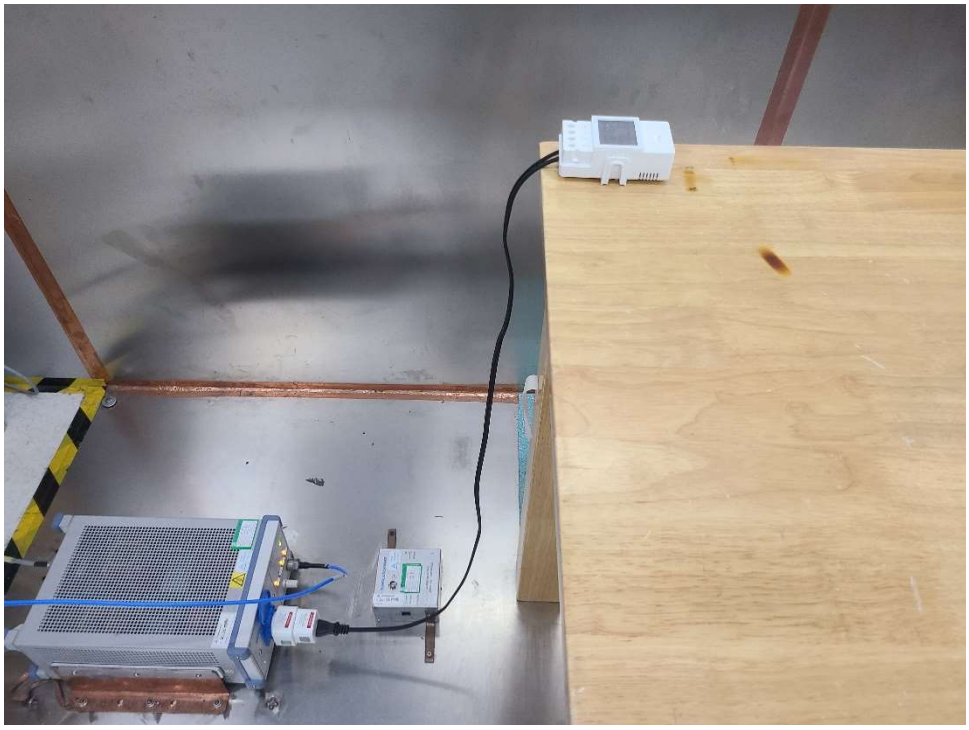
Photograph 2: Set-up for Radiated Emission, Below 1GHz



Photograph 3: Set-up for Radiated Emission, Above 1GHz

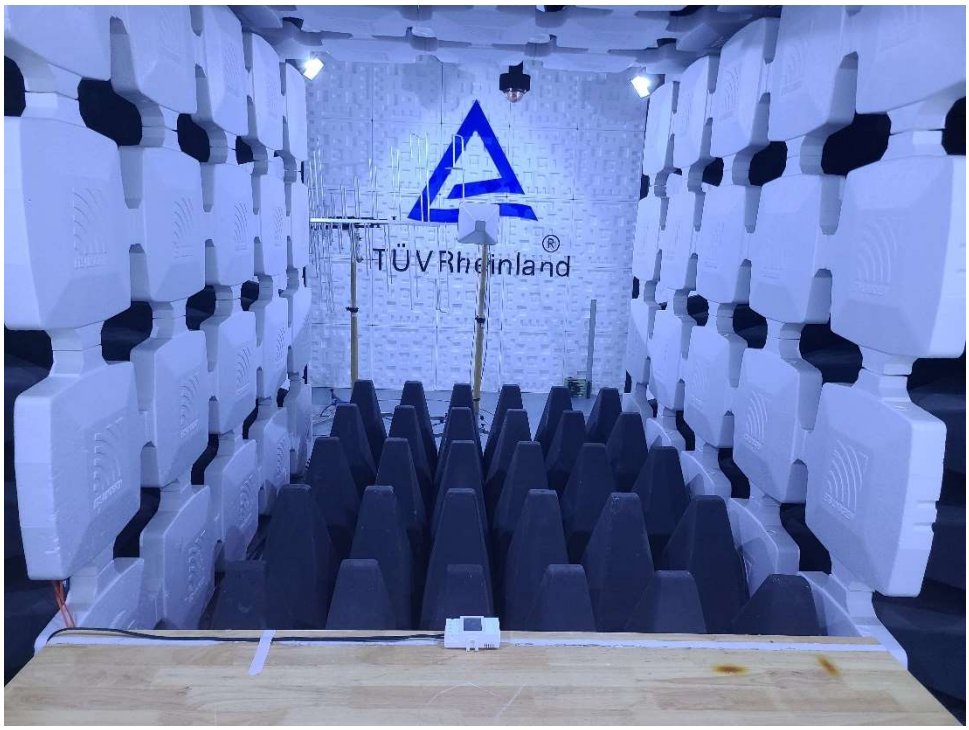


Photograph 4: Set-up for Conducted Emission, AC Mains Port



Photograph 5: Set-up for Radio Frequency Electromagnetic Field (RS), Below 1GHz

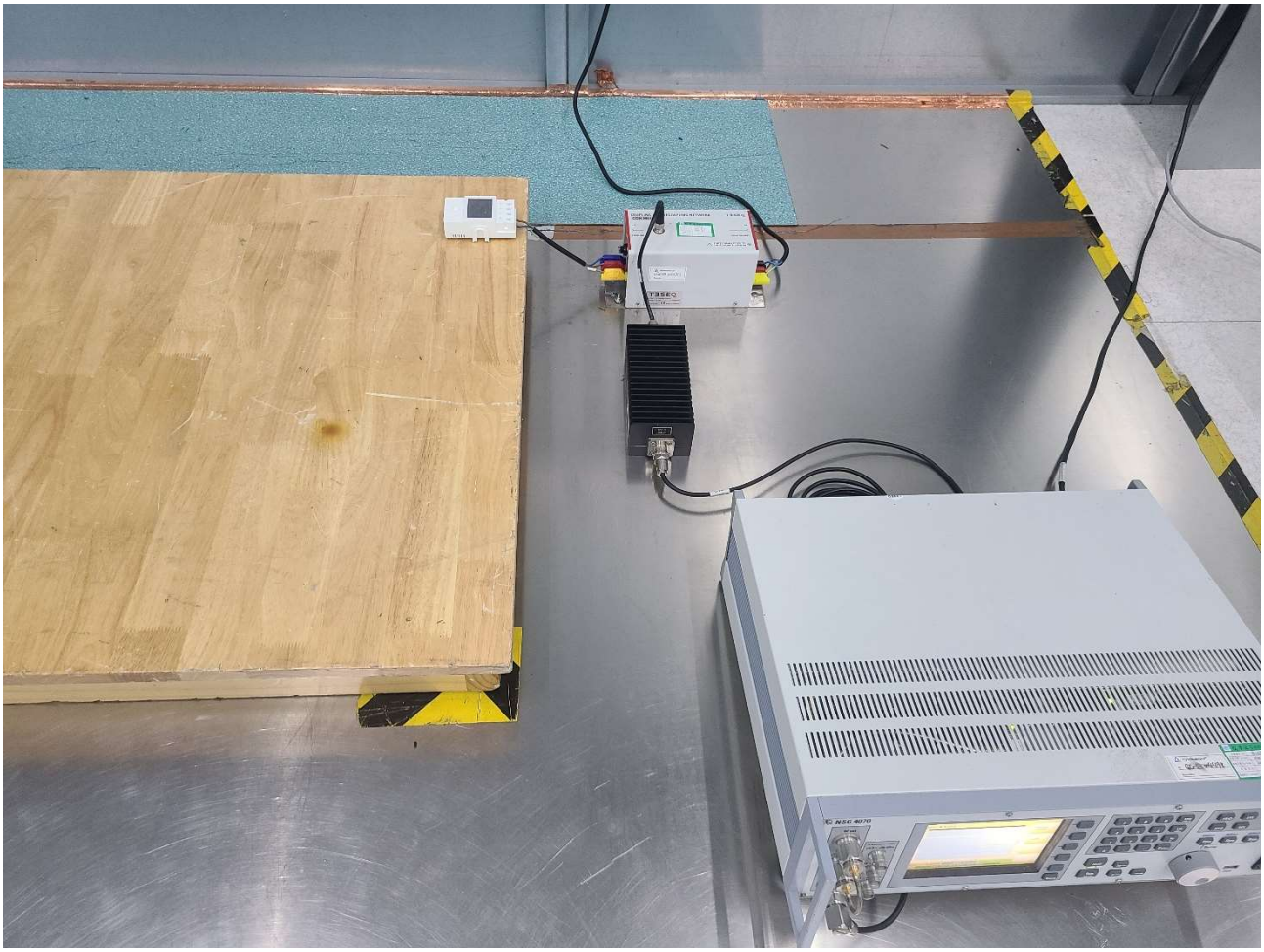
Photograph 6: Set-up for Radio Frequency Electromagnetic Field (RS), Above 1GHz



Photograph 7: Set-up for Electrostatic Discharge (ESD)

Photograph 8: Set-up for Electrical Fast Transients & Surge & Voltage Dips and Interruptions

Photograph 9: Set-up for Radio Frequency Common Mode (CS), AC Mains Port



8 List of Tables

9 List of Photographs

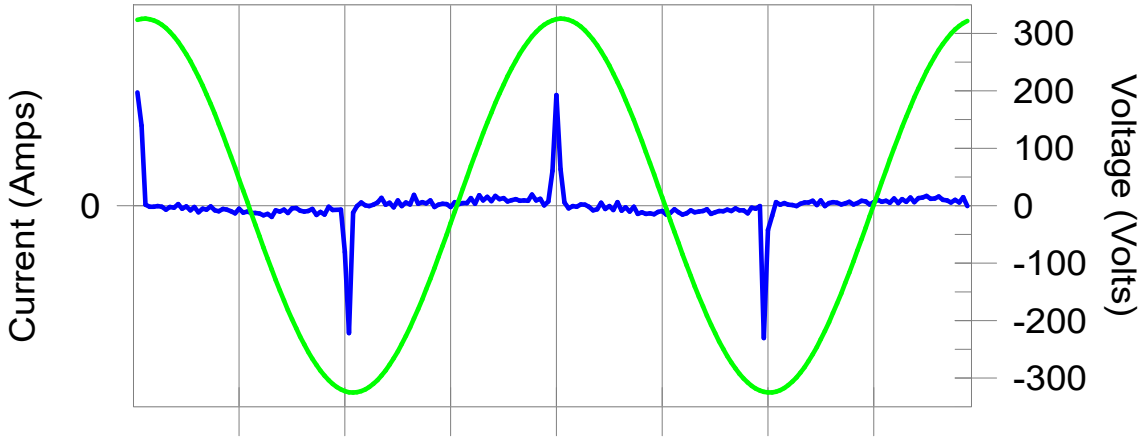
Appendix A: Test Results of Article 3.1b EMC Requirements

Appendix A.1: Test Results of Harmonics Current Emission

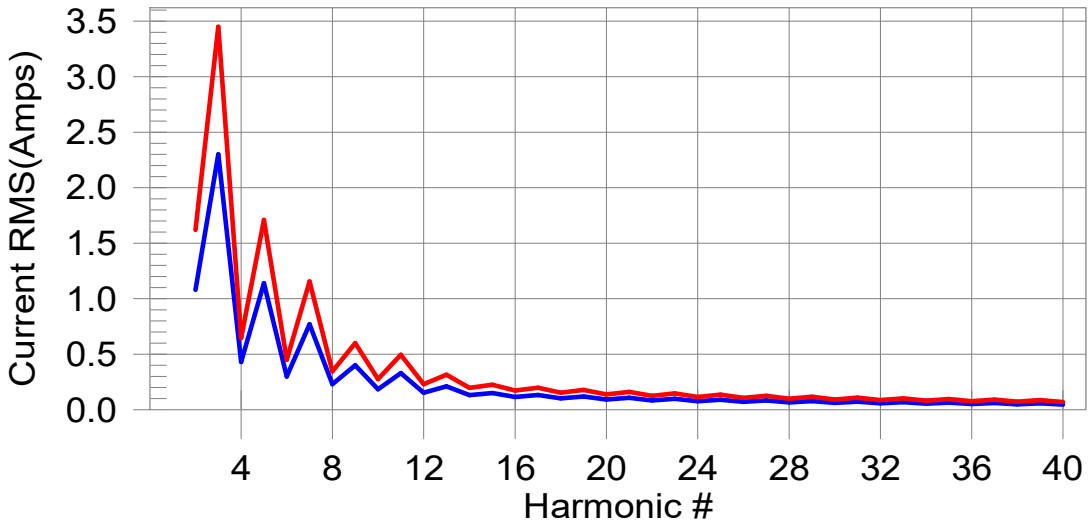
Wi-Fi connecting + normal operation mode
EUT: Smart Power Meter Switch **Tested by: Steve Lan**
Test category: Class-A (European limits) **Test Margin: 100**
Test date: 8/8/2022 **Start time: 3:42:00 PM** **End time: 3:44:41 PM**
Test duration (min): 2.5 **Data file name: H-000724.cts_data**
Comment: Review by:Gary Chen
Customer: Shenzhen Sonoff Technologies Co.,Ltd

Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass **Worst harmonics H0-0.0% of 150% limit, H0-0% of 100% limit**

Current Test Result Summary (Run time)

EUT: Monitoring Switch **Tested by: Steve Lan**
Test category: Class-A (European limits) **Test Margin: 100**
Test date: 8/8/2022 **Start time: 3:42:00 PM** **End time: 3:44:41 PM**
Test duration (min): 2.5 **Data file name: H-000724.cts_data**
Comment: Review by:Gary Chen
Customer: Shenzhen Sonoff Technologies Co.,Ltd

Test Result: Pass **Source qualification: Normal**
THC(A): 0.005 **I-THD(%): 102.8** **POHC(A): 0.003** **POHC Limit(A): 0.251**

Highest parameter values during test:

V_RMS (Volts):	230.33	Frequency(Hz):	50.00
I_Peak (Amps):	0.147	I_RMS (Amps):	0.016
I_Fund (Amps):	0.005	Crest Factor:	14.890
Power (Watts):	0.8	Power Factor:	0.394

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

Voltage Source Verification Data (Run time)

EUT: Monitoring Switch **Tested by: Steve Lan**
Test category: Class-A (European limits) **Test Margin: 100**
Test date: 8/8/2022 **Start time: 3:42:00 PM** **End time: 3:44:41 PM**
Test duration (min): 2.5 **Data file name: H-000724.cts_data**
Comment: Review by:Gary Chen
Customer: Shenzhen Sonoff Technologies Co.,Ltd

Test Result: Pass **Source qualification: Normal**

Highest parameter values during test:

Voltage (Vrms):	230.33	Frequency(Hz):	50.00
I_Peak (Amps):	0.147	I_RMS (Amps):	0.016
I_Fund (Amps):	0.005	Crest Factor:	14.890
Power (Watts):	0.8	Power Factor:	0.394

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.059	0.461	12.81	OK
3	0.381	2.072	18.37	OK
4	0.048	0.461	10.41	OK
5	0.040	0.921	4.30	OK
6	0.021	0.461	4.45	OK
7	0.038	0.691	5.46	OK
8	0.010	0.461	2.18	OK
9	0.019	0.461	4.05	OK
10	0.016	0.461	3.51	OK
11	0.008	0.230	3.55	OK
12	0.014	0.230	6.11	OK
13	0.007	0.230	3.14	OK
14	0.007	0.230	3.20	OK
15	0.011	0.230	4.74	OK
16	0.004	0.230	1.86	OK
17	0.004	0.230	1.75	OK
18	0.006	0.230	2.74	OK
19	0.007	0.230	3.14	OK
20	0.033	0.230	14.43	OK
21	0.007	0.230	3.08	OK
22	0.005	0.230	2.23	OK
23	0.005	0.230	2.18	OK
24	0.003	0.230	1.31	OK
25	0.004	0.230	1.78	OK
26	0.004	0.230	1.87	OK
27	0.006	0.230	2.57	OK
28	0.004	0.230	1.54	OK
29	0.005	0.230	2.27	OK
30	0.003	0.230	1.29	OK
31	0.003	0.230	1.49	OK
32	0.004	0.230	1.78	OK
33	0.005	0.230	2.00	OK
34	0.005	0.230	2.09	OK
35	0.004	0.230	1.91	OK
36	0.004	0.230	1.53	OK
37	0.004	0.230	1.88	OK
38	0.003	0.230	1.14	OK
39	0.006	0.230	2.49	OK
40	0.019	0.230	8.21	OK

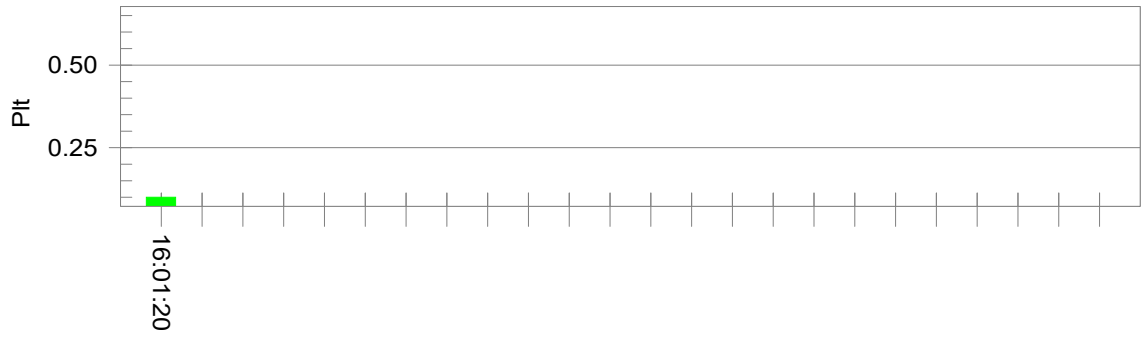
Appendix A.2: Test Results of Voltage Fluctuations and Flicker

Wi-Fi connecting + normal operation mode
EUT: Smart Power Meter Switch **Tested by: Steve Lan**
Test category: All parameters (European limits) **Test Margin: 100**
Test date: 8/8/2022 **Start time: 3:50:59 PM** **End time: 4:01:26 PM**
Test duration (min): 10 **Data file name: F-000726.cts_data**
Comment: Review by:Gary Chen
Customer: Shenzhen Sonoff Technologies Co.,Ltd

Test Result: Pass **Status: Test Completed**

Pst_i and limit line **European Limits**

Plt and limit line



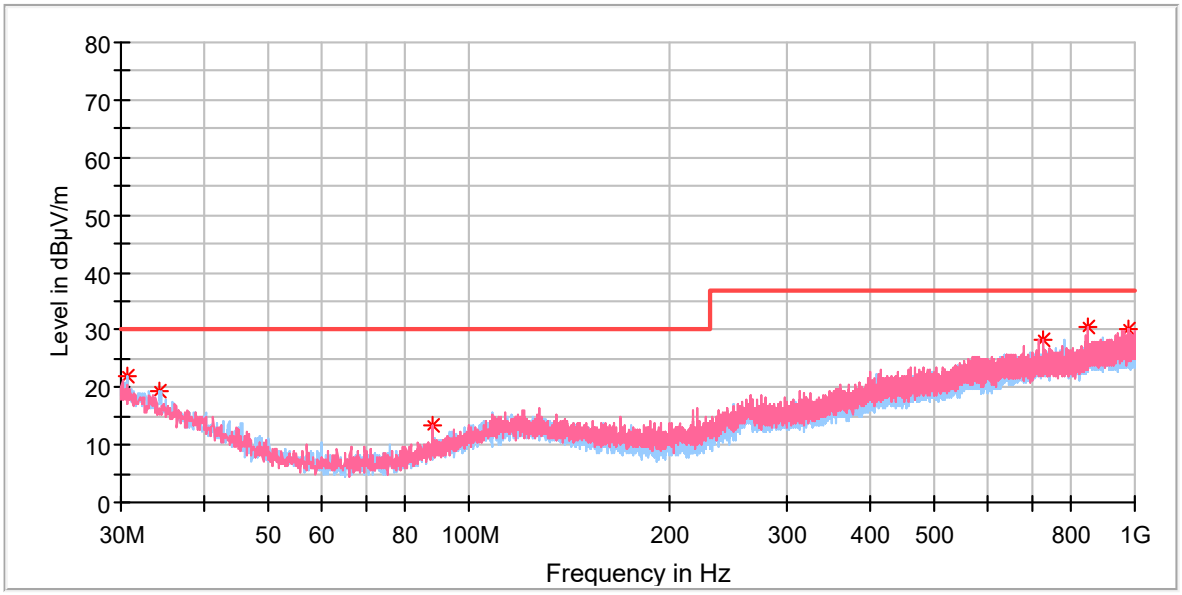
Parameter values recorded during the test:

Vrms at the end of test (Volt):	**228.97**			
Highest dt (%):		**Test limit (%):**		
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.00**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.229**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.100**	**Test limit:**	**0.650**	**Pass**

Appendix A.3: Test Results of Radiated Emission, Below 1GHz

WIFI mode+ normal mode

EUT Name:	Smart Power Meter Switch
Order Number:	168377937
Model:	POWR320D
Test Mode:	WIFI mode+ normal mode
Test Voltage:	AC230V/60Hz
Standard:	EN301489-1
Test By:/Review By:	Steve Lan/Gary Chen
Tem./Hum./Pressure:	24.2°C/49.3%/101kPa
Remark:	10m Chamber



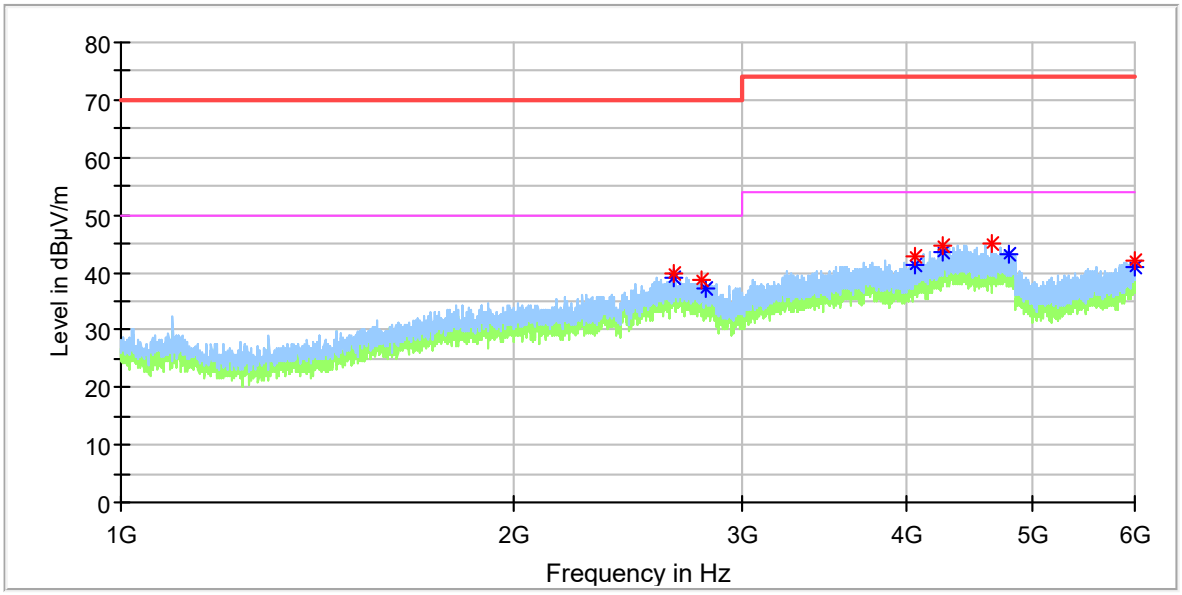
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.646667	21.89	30.00	8.11	100.0	H	219.0	-10.0
34.257222	19.41	30.00	10.59	100.0	H	242.0	-12.2
88.146111	13.27	30.00	16.73	200.0	V	337.0	-13.9
729.046667	28.45	37.00	8.55	200.0	V	164.0	-0.2
851.590000	30.69	37.00	6.31	100.0	V	316.0	1.3
978.013333	30.21	37.00	6.79	100.0	V	127.0	3.3

Appendix A.4: Test Results of Radiated Emission, Above 1GHz

WIFI mode+ normal mode

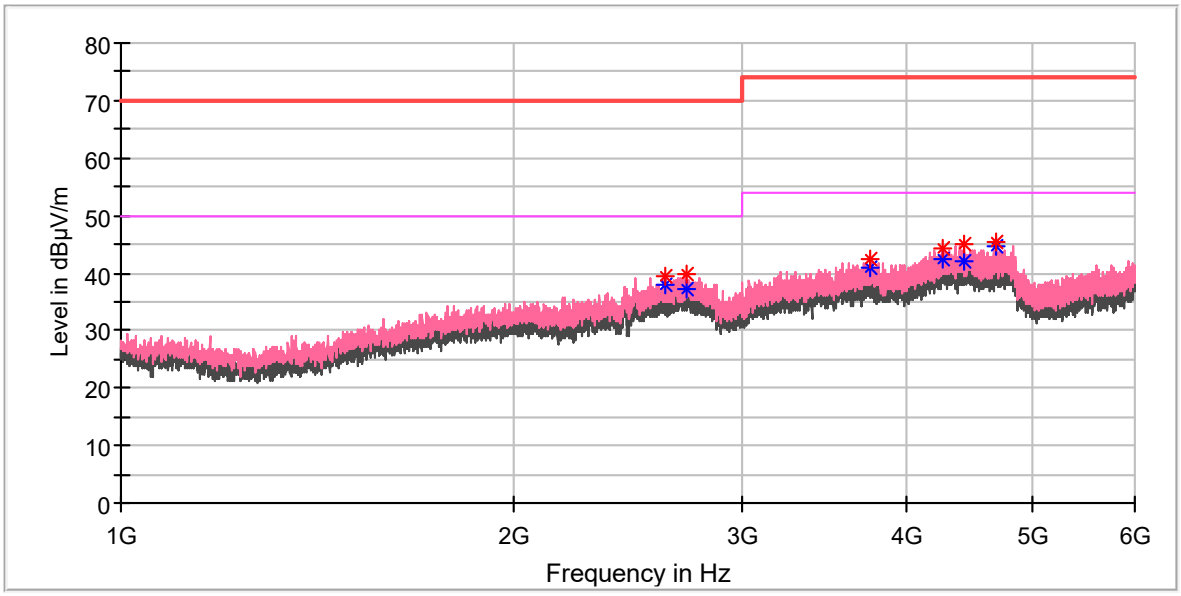
EUT Name:	Smart Power Meter Switch
Order No:	168377937
Model:	POWR320D
Test Mode:	WIFI mode+ normal mode
Test Voltage:	AC 230V/60Hz
Standard:	EN 301489-1
Test By:/Review By:	Steve Lan/Gary Chen
Tem./Hum./Pressure:	25.3°C/54.6%/101kPa
Remark:	3m chamber



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4266.000000	---	43.67	54.00	10.33	100.0	H	22.0	2.0
4266.000000	44.72	---	74.00	29.28	100.0	H	22.0	2.0
4661.500000	44.98	---	74.00	29.02	100.0	H	45.0	2.3
2806.500000	---	37.36	50.00	12.64	100.0	H	96.0	-3.7
4062.000000	---	41.13	54.00	12.87	100.0	H	120.0	0.6
5996.000000	---	40.97	54.00	13.03	100.0	H	150.0	2.4
6000.000000	42.20	---	74.00	31.80	100.0	H	185.0	2.5
4799.000000	---	43.10	54.00	10.90	100.0	H	214.0	2.4
2790.000000	38.64	---	70.00	31.36	100.0	H	286.0	-3.7
4062.500000	42.72	---	74.00	31.28	100.0	H	300.0	0.6
2653.000000	39.85	---	70.00	30.15	100.0	H	337.0	-3.2
2653.000000	---	39.07	50.00	10.93	100.0	H	337.0	-3.2

EUT Name:	Smart Power Meter Switch
Order No:	168377937
Model:	POWR320D
Test Mode:	WIFI mode+ normal mode
Test Voltage:	AC 230V/60Hz
Standard:	EN 301489-1
Test By:/Review By:	Steve Lan/Gary Chen
Tem./Hum./Pressure:	25.3°C/54.6%/101kPa
Remark:	3m chamber



Critical_Freqs

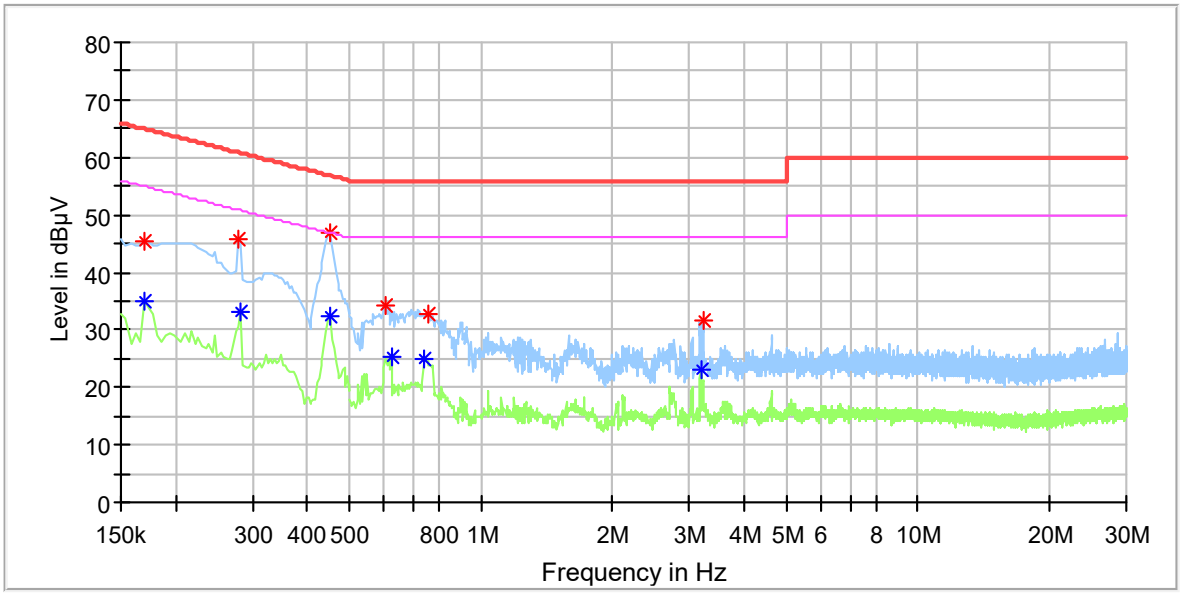
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2616.500000	---	38.09	50.00	11.91	100.0	V	269.0	-3.6
2617.000000	39.44	---	70.00	30.56	100.0	V	276.0	-3.6
2718.000000	39.67	---	70.00	30.33	100.0	V	30.0	-3.2
2718.000000	---	37.20	50.00	12.80	100.0	V	30.0	-3.2
3762.500000	---	41.01	54.00	12.99	100.0	V	0.0	0.1
3763.000000	42.38	---	74.00	31.62	100.0	V	164.0	0.1
4269.500000	---	42.56	54.00	11.44	100.0	V	182.0	2.0
4269.500000	44.24	---	74.00	29.76	100.0	V	182.0	2.0
4434.000000	44.99	---	74.00	29.01	100.0	V	113.0	1.9
4434.500000	---	42.04	54.00	11.96	100.0	V	113.0	1.9
4697.000000	---	44.49	54.00	9.51	100.0	V	187.0	2.6
4697.000000	45.27	---	74.00	28.73	100.0	V	187.0	2.6

Appendix A.5: Test Results of Conducted Emission

Wi-Fi connecting + normal operation mode

EUT Information

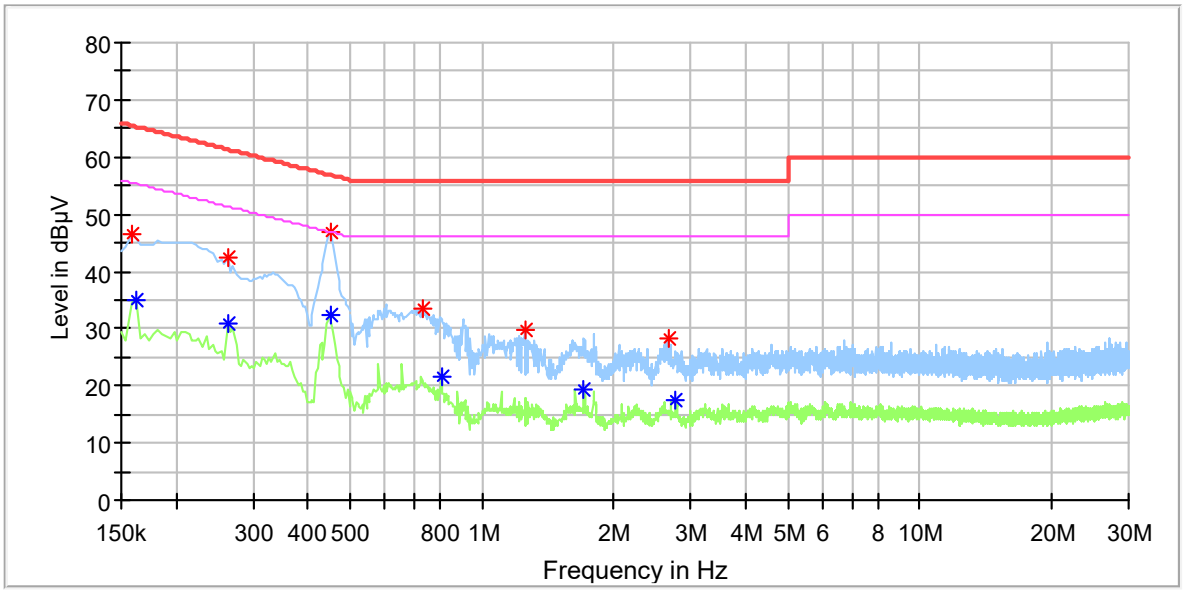
EUT Name:	Smart Power Meter Switch
Order No:	168377937
Model:	POWR320D
Test Mode:	WIFI mode+ normal mode
Test Voltage:	AC 230V/60Hz
Test By/Review By:	Steve Lan/Gary Chen
Test Standard:	EN 301489-1
Tem./Hum./Pressure:	23.9°C/50.7%/101kPa
Remark:	SR1



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.170000	---	34.98	54.96	19.98	L1	9.6
0.170000	45.45	---	64.96	19.51	L1	9.6
0.278000	45.67	---	60.88	15.21	L1	9.6
0.282000	---	32.96	50.76	17.80	L1	9.6
0.450000	47.01	---	56.88	9.86	L1	9.7
0.454000	---	32.51	46.80	14.29	L1	9.7
0.608000	34.26	---	56.00	21.74	L1	9.7
0.624000	---	25.40	46.00	20.60	L1	9.7
0.744000	---	24.96	46.00	21.04	L1	9.7
0.756000	32.91	---	56.00	23.09	L1	9.7
3.184000	---	23.00	46.00	23.00	L1	9.9
3.224000	31.68	---	56.00	24.32	L1	9.9

EUT Name:	Smart Power Meter Switch
Order No:	168377937
Model:	POWR320D
Test Mode:	WIFI mode+ normal mode
Test Voltage:	AC 230V/60Hz
Test By/Review By:	Steve Lan/Gary Chen
Test Standard:	EN 301489-1
Tem./Hum./Pressure:	23.9°C/50.7%/101kPa
Remark:	SR1



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.158000	46.59	---	65.57	18.98	N	9.6
0.162000	---	34.83	55.36	20.53	N	9.6
0.262000	---	30.71	51.37	20.65	N	9.6
0.262000	42.35	---	61.37	19.02	N	9.6
0.450000	---	32.31	46.88	14.57	N	9.7
0.450000	47.00	---	56.88	9.88	N	9.7
0.736000	33.41	---	56.00	22.59	N	9.7
0.808000	---	21.44	46.00	24.56	N	9.7
1.252000	29.74	---	56.00	26.26	N	9.7
1.712000	---	19.51	46.00	26.49	N	9.7
2.660000	28.24	---	56.00	27.76	N	9.9
2.776000	---	17.56	46.00	28.44	N	9.9