



CE EMC TEST REPORT

Product : Sonoff Wifi Switch
Trade Name : 
Model Name : Sonoff TH16
Serial Model : Sonoff TH10 , Sonoff Pow , Sonoff Dual.
Report No. : BCTC-FY160902498-2E

Prepared for

ITEAD Intelligent Systems Co., Ltd
RM 401 BLK 4 WANGTANG INDUSTRIAL ZONE, XILI, NANSHAN DIST
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Prepared by

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**TEST RESULT CERTIFICATION**

Applicant's name : ITEAD Intelligent Systems Co., Ltd
Address : RM 401 BLK 4 WANGTANG INDUSTRIAL ZONE, XILI,
NANSHAN DIST SHENZHEN, GUANGDONG, 518000
CHINA (PRC)
Manufacture's Name : ITEAD Intelligent Systems Co., Ltd
Address : RM 401 BLK 4 WANGTANG INDUSTRIAL ZONE, XILI,
NANSHAN DIST SHENZHEN, GUANGDONG, 518000
CHINA (PRC)

Product description

Product name : Sonoff Wifi Switch
Trademark : 
Model and/or type reference : Sonoff TH16
Serial Model : Sonoff TH10 , Sonoff Pow , Sonoff Dual.
Standards : ETSI EN 301 489-1 V1.9.2(2011-09)
ETSI EN301 489-17 V2.2.1 (2012-09)

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive Art.3.1(b) requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test :
Date (s) of performance of tests : Sep. 27 - Oct. 11, 2016
Date of Issue : Oct. 11, 2016
Test Result : **Pass**

Prepared by(Engineer): Eric Yang
Reviewer(Supervisor): Jade Yang
Approved(Manager): Carson Zhang



This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen BCTC Technology Co., Ltd.

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1. TEST SUMMARY

Test Procedures According To The Technical Standards:

ETSI EN 301 489-1 V1.9.2 (2011-09)

ETSI EN301 489-17 V2.2.1 (2012-09)

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
EN 55022:2010	Conducted Emission	Class B	PASS	
	Radiated Emission	Class B	PASS	
EN 61000-3-2:2014	Harmonic Current Emission	Class A or D NOTE (2)	N/A	
EN 61000-3-3:2013	Voltage Fluctuations & Flicker	-----	PASS	
EMC Immunity				
Section EN 55024:2010	Test Item	Performance Criteria	Judgment	Remark
EN 61000-4-2:2009	Electrostatic Discharge	B	PASS	
EN 61000-4-3: 2006+A1:2008+A2:2010	RF electromagnetic field	A	PASS	
EN 61000-4-4:2012	Fast transients	B	PASS	
EN 61000-4-5:2014	Surges	B	PASS	
EN 61000-4-6:2014	Injected Current	A	PASS	
EN 61000-4-8:2010	Power Frequency Magnetic Field	A	N/A	
EN 61000-4-11:2004	Volt. Interruptions Volt. Dips	B / C / C NOTE (3)	PASS	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report

(2) The power consumption of EUT is less than 75W and no Limits apply.

(3) Voltage dip: 100% reduction – Performance Criteria **B**

Voltage dip: 30% reduction – Performance Criteria **C**

Voltage Interruption: 100% Interruption – Performance Criteria **C**

(4) For client's request and manual description, the test will not be executed.



1.1 TEST FACILITY

Shenzhen BCTC Technology Co., Ltd.

Add. : No.101,Yousong Road,Longhua New District, Shenzhen,China

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U , (dB)	NOTE
BCTC01	ANSI	150 KHz ~ 30MHz	3.2	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U , (dB)	NOTE
BCTC01	ANSI	30MHz ~ 1000MHz	4.7	
		1GHz ~6000GHz	5.0	



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

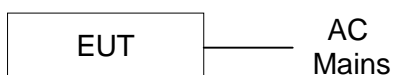
Product Name:	Sonoff Wifi Switch
Model No.:	Sonoff TH16 Sonoff TH10 , Sonoff Pow , Sonoff Dual.
Operation Frequency:	WIFI:2412MHz~2472MHz (802.11b/802.11g/802.11n(H20))
Channel numbers:	WIFI: 13 for 802.11b/802.11g/802.11n(H20) ,
Channel separation:	WIFI : 5MHz
Modulation technology:	WIFI: Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing(OFDM) for 802.11g/n
Data rate:	802.11b: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps 802.11g: 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps,54Mbps 802.11n: Up to 75Mbps
Antenna Type:	PCB Antenna
Antenna gain:	0dBi (declare by Applicant)
Power supply:	90-250VAC~ 50/60Hz

2.1 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX +RX Mode

2.2 DESCRIPTION OF TEST SETUP





2.3 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Sonoff Wifi Switch	N/A	Sonoff TH16	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



2.4 MEASUREMENT INSTRUMENTS LIST

2.4.1 CONDUCTED EMISSION

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101313	Aug. 24, 2017
2	LISN	EMCO	3816/2	00042990	Aug. 24, 2017
3	50Ω Switch	ANRITSU CORP	MP59B	6200983704	Aug. 24, 2017
4	Test Cable	N/A	C01	N/A	Aug. 24, 2017
5	Test Cable	N/A	C02	N/A	Aug. 24, 2017
6	Test Cable	N/A	C03	N/A	Aug. 24, 2017
7	EMI Test Receiver	R&S	ESCI	101160	Aug. 24, 2017
8	Passive Voltage Probe	ESH2-Z3	R&S	100196	Aug. 24, 2017
9	Triple-Loop Antenna	EVERFINE	LIA-2	11020003	Aug. 24, 2017
10	Absorbing Clamp	R&S	MDS-21	100423	Aug. 24, 2017
11	Coupling/Decoupling Network	FRANKONIA	A3011081	BC01-05	Aug. 24, 2017

2.4.2 RADIATED TEST SITE

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Bilog Antenna	TESEQ	CBL6111D	31216	Aug. 24, 2017
2	Test Cable	N/A	R-01	N/A	Aug. 24, 2017
3	Test Cable	N/A	R-02	N/A	Aug. 24, 2017
4	EMI Test Receiver	R&S	ESCI-7	101318	Aug. 24, 2017
5	Antenna Mast	EM	SC100_1	N/A	N/A
6	Turn Table	EM	SC100	060531	N/A
7	50Ω Switch	Anritsu Corp	MP59B	6200983705	Aug. 24, 2017
8	Spectrum Analyzer	Agilent	E4407B	MY45108040	Aug. 24, 2017
9	Horn Antenna	EM	EM-AH-10180	2011071402	Aug. 24, 2017
10	Amplifier	EM	EM-30180	060538	Aug. 24, 2017

2.4.3 HARMONICS AND FILCK

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Harmonic & Flicker	EM TEST	DPA500	0303-04	Aug. 24, 2017
2	AC Power Source	EM TEST	ACS500	0203-01	Aug. 24, 2017

2.4.4 ESD

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	ESD TEST GENERATOR	EVERFINE	EMS61000-2 A-V200	11040001T	Aug. 24, 2017



2.4.5 RS (SMQ)

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Signal Generator	R&S	SMT 06	832080/007	Aug. 24, 2017
2	Log-Bicon Antenna	Schwarzbeck	VULB9161	4022	Aug. 24, 2017
3	Power Amplifier	AR	150W1000M1	320946	Aug. 24, 2017
4	Microwave Horn Antenna	AR	AT4002A	321467	Aug. 24, 2017
5	Power Amplifier	AR	25S1G4A	308598	Aug. 24, 2017

2.4.6 SURGE, EFT/BURST, VOLTAGE INTERRUPTION/DIPS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Surge Generator	EVERFINE	EMS61000-5 A	1101002	Aug. 24, 2017
2	DIPS Generator	EVERFINE	EMS61000-1 1K	1011002	Aug. 24, 2017
	EFT/B Generator	EVERFINE	EMS61000-4 A-V2	1012005	Aug. 24, 2017

2.4.7 INJECTION CURRENT

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Signal Generator	IFR	2023A	202301/368	Aug. 24, 2017
2	Power Amplifier	AR	75A250AM1	0320709	Aug. 24, 2017
3	CDN	FCC	FCC-801-M2	06043	Aug. 24, 2017
4	EM Clamp	FCC	F-203I-23MM	504	Aug. 24, 2017

2.4.8 MF

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Generator	EVERFINE	EMS61000-8 K	1007001	Aug. 24, 2017



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

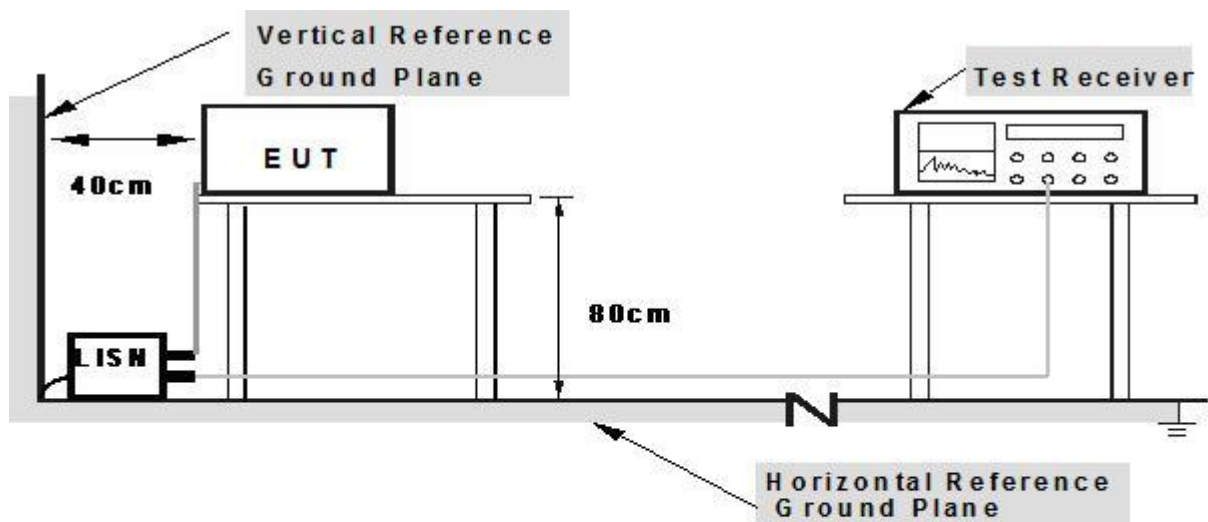
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

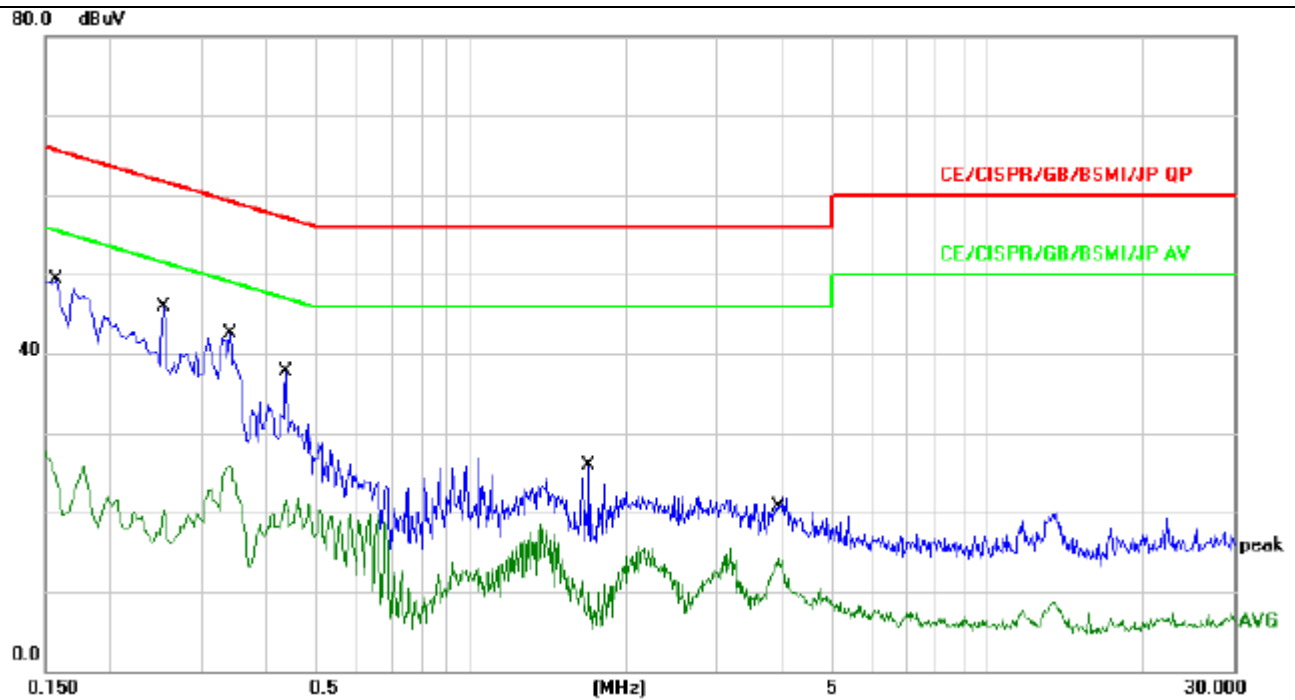
3.1.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.2 Unless otherwise a special operating condition is specified in the follows during the testing.



3.1.5 TEST RESULTS

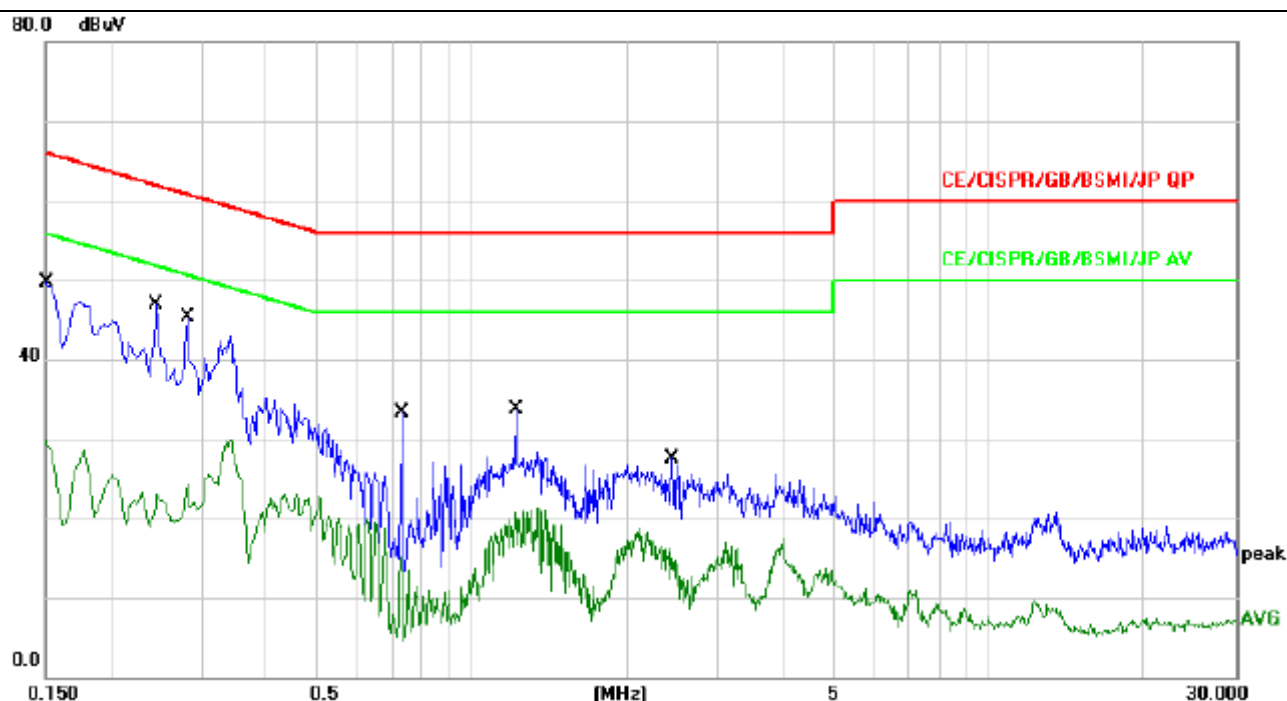
EUT :	Sonoff Wifi Switch	Model Name. :	Sonoff TH16
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	L
Test Voltage :	AC 230V/50Hz	Test Mode :	Mode 1



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1582	38.79	9.67	48.46	65.55	-17.09	QP	
2		0.1582	18.00	9.67	27.67	55.55	-27.88	AVG	
3	*	0.2540	36.19	9.66	45.85	61.62	-15.77	QP	
4		0.2540	10.60	9.66	20.26	51.62	-31.36	AVG	
5		0.3420	32.83	9.66	42.49	59.15	-16.66	QP	
6		0.3420	16.15	9.66	25.81	49.15	-23.34	AVG	
7		0.4380	28.08	9.67	37.75	57.10	-19.35	QP	
8		0.4380	12.10	9.67	21.77	47.10	-25.33	AVG	
9		1.6980	16.23	9.70	25.93	56.00	-30.07	QP	
10		1.6980	6.41	9.70	16.11	46.00	-29.89	AVG	
11		3.9380	12.14	9.73	21.87	56.00	-34.13	QP	
12		3.9380	4.66	9.73	14.39	46.00	-31.61	AVG	



EUT :	Sonoff Wifi Switch	Model Name. :	Sonoff TH16
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	N
Test Voltage :	AC 230V/50Hz	Test Mode :	Mode 1



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	39.93	9.74	49.67	65.99	-16.32	QP	
2		0.1500	20.08	9.74	29.82	55.99	-26.17	AVG	
3	*	0.2460	37.27	9.64	46.91	61.89	-14.98	QP	
4		0.2460	13.57	9.64	23.21	51.89	-28.68	AVG	
5		0.2819	35.61	9.64	45.25	60.76	-15.51	QP	
6		0.2819	15.86	9.64	25.50	50.76	-25.26	AVG	
7		0.7340	23.72	9.67	33.39	56.00	-22.61	QP	
8		0.7340	9.06	9.67	18.73	46.00	-27.27	AVG	
9		1.2220	24.04	9.71	33.75	56.00	-22.25	QP	
10		1.2220	11.54	9.71	21.25	46.00	-24.75	AVG	
11		2.4460	17.70	9.72	27.42	56.00	-28.58	QP	
12		2.4460	8.68	9.72	18.40	46.00	-27.60	AVG	



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)

FREQUENCY (MHz)	Class B (at 3m)
	dBuV/m
30 – 230	40
230 – 1000	47

3.2.2 LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (at 10m) dBuV/m		Class B (at 10m) dBuV/m	
	Peak	Avg	Peak	Avg
1000-3000	76	56	70	50
3000-6000	80	60	74	54

Notes:

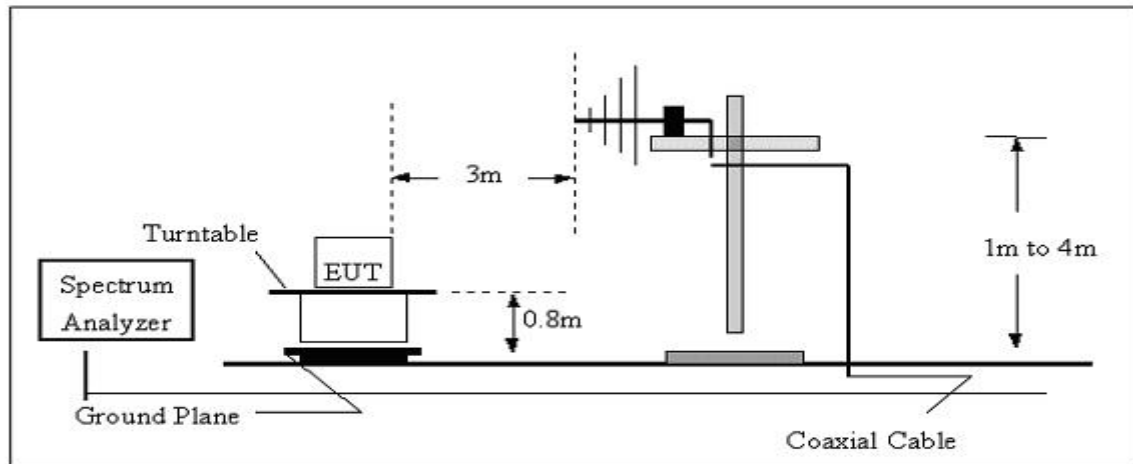
- (1) The limit for radiated test was performed according to as following:
CISPR 22/ FCC PART 15B /ICES-003.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

3.2.3 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.2.4 TEST SETUP

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



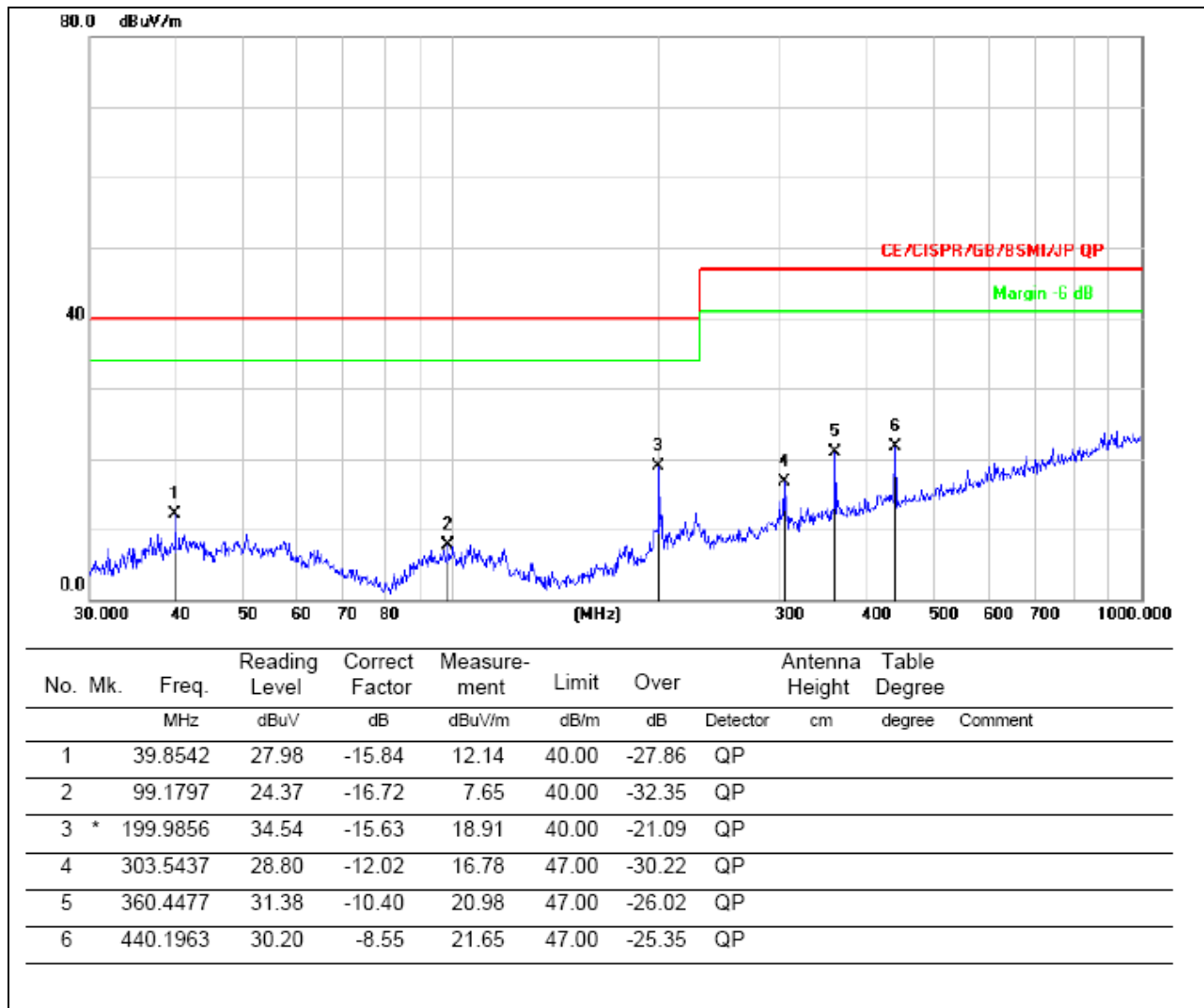
3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.2** Unless otherwise a special operating condition is specified in the follows during the testing.



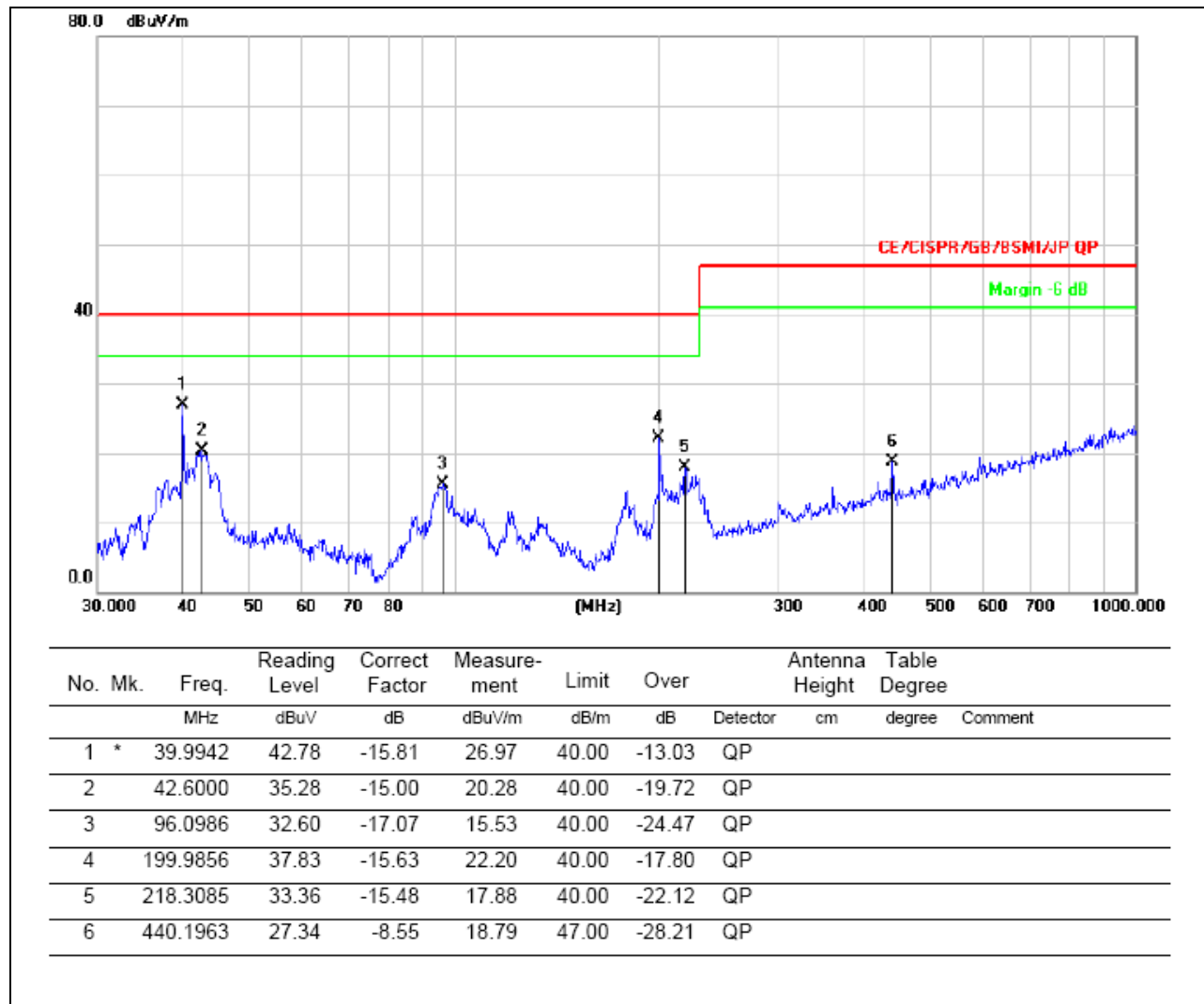
3.2.6 TEST RESULTS (30-1000MHz)

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Horizontal
Test Voltage :	AC 230V/50Hz	Test Mode :	Mode 1





EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical
Test Voltage :	AC 230V/50Hz	Test Mode :	Mode 1





3.2.1 LIMITS OF HARMONICS CURRENT

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)
Non Portable Tools or TV Receivers	Odd Harmonics		TV Receivers	Odd Harmonics	
	3	2.30		3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15≤n≤39	0.15 · 15/n		15≤n≤39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
	4	0.43		4	0.15
	8	0.30			
8≤n≤40	0.23 · 8/n	DC	0.05		

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A) (mA/w)	
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			13≤n≤39	see Table I	3.85/n
			only odd harmonics required		

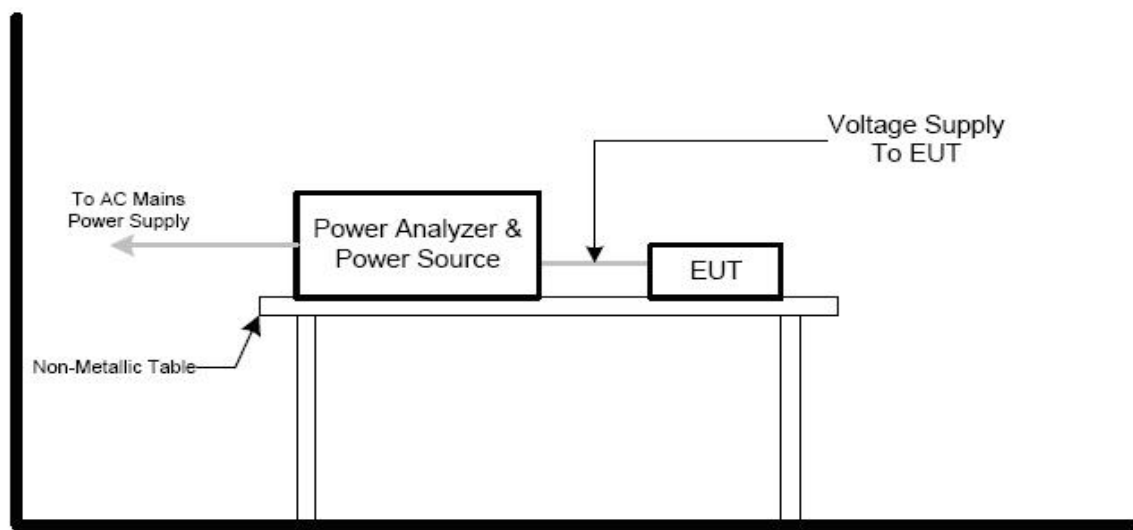
3.2.1.1 TEST PROCEDURE

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.
- b. The classification of EUT is according to section 5 of EN 61000-3-2: 2014. The EUT is classified as follows:
Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
Class B: Portable tools. Portable tools.; Arc welding equipment which is not professional equipment.
Class C: Lighting equipment.
Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.
- c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.
- d. For the actual test configuration, please refer to the related item –EUT Test Photos.

3.2.1.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.2** Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.1.3 TEST SETUP





3.2.2 TEST RESULTS

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	N/A
Test Mode	N/A		

Note: The active input power of the EUT is less than **75W**. No limits apply for equipment with an active input power up to and including 75W

3.2.2.1 VOLTAGE FLUCTUATION AND FLICKERS

3.2.3 LIMITS OF VOLTAGE FLUCTUATION AND FLICKERS

Tests	Limits		Descriptions
	IEC555-3	IEC/EN 61000-3-3	
Pst	≤ 1.0 , Tp= 10 min.	≤ 1.0 , Tp= 10 min.	Short Term Flicker Indicator
Plt	N/A	≤ 0.65 , Tp=2 hr.	Long Term Flicker Indicator
dc	$\leq 3\%$	$\leq 3.3\%$	Relative Steady-State V-Chang
dmax	$\leq 4\%$	$\leq 4\%$	Maximum Relative V-change
d (t)	N/A	$\leq 3.3\%$ for > 500 ms	Relative V-change characteristic

3.2.3.1 TEST PROCEDURE

a. Harmonic Current Test:

Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.

b. Fluctuation and Flickers Test:

Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

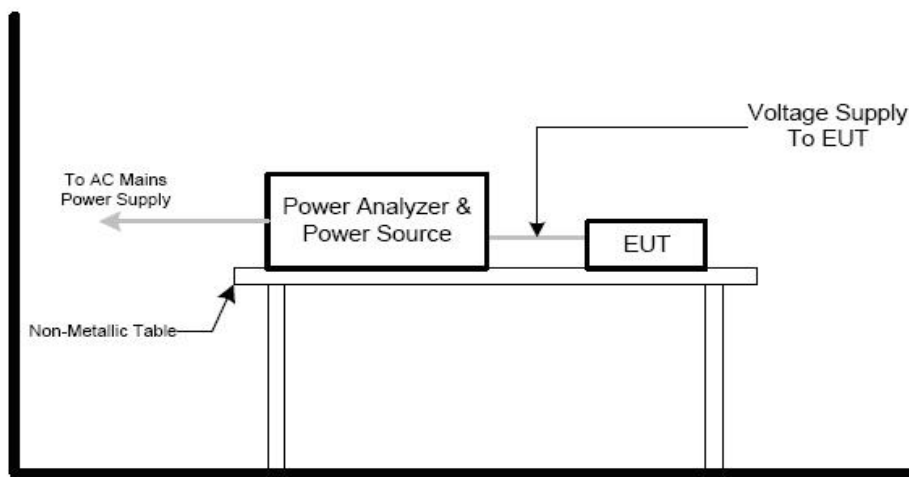
c. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.2.3.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.2** Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.3.3 TEST SETUP





3.2.4 TEST RESULTS

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	AC 230V/50Hz
Test Mode	Mode 1		

Test Parameter	Measurement Value	limit	Remarks
P_{st}	0.064	1.0	Pass
P_{it}	2.770	3.3	Pass
$T_{dt(s)}$	0.000	0.5	Pass
$d_{max}(\%)$	0.03%	4%	Pass
$d_c(\%)$	0.02%	3.3%	Pass



4. EMC IMMUNITY TEST

4.1 GENERAL PERFORMANCE CRITERIA

4.1.1 PERFORMANCE CRITERIA

According To **EN 301489 -17** standard, The General Performance Criteria As Following:

Criteria	During the test	After the test
A	Shall operate as intended May show degradation of performance (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 2) 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 1) No unintentional transmissions	Functions shall be self-recoverable Shall operate as intended after recovering Shall be no degradation of performance (see note 2) 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 2)

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

NOTE 2: no degradation of performance after the test is understood as any 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.



PERFORMANCE FOR TT

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR TR

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR CT

The performance criteria A shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an Acknowledgement (ACK) or Not Acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR CR

The performance criteria A shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

4.2 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.2** Unless otherwise a special operating condition is specified in the follows during the testing.



4.3 ESD TESTING

4.3.1 TEST SPECIFICATION

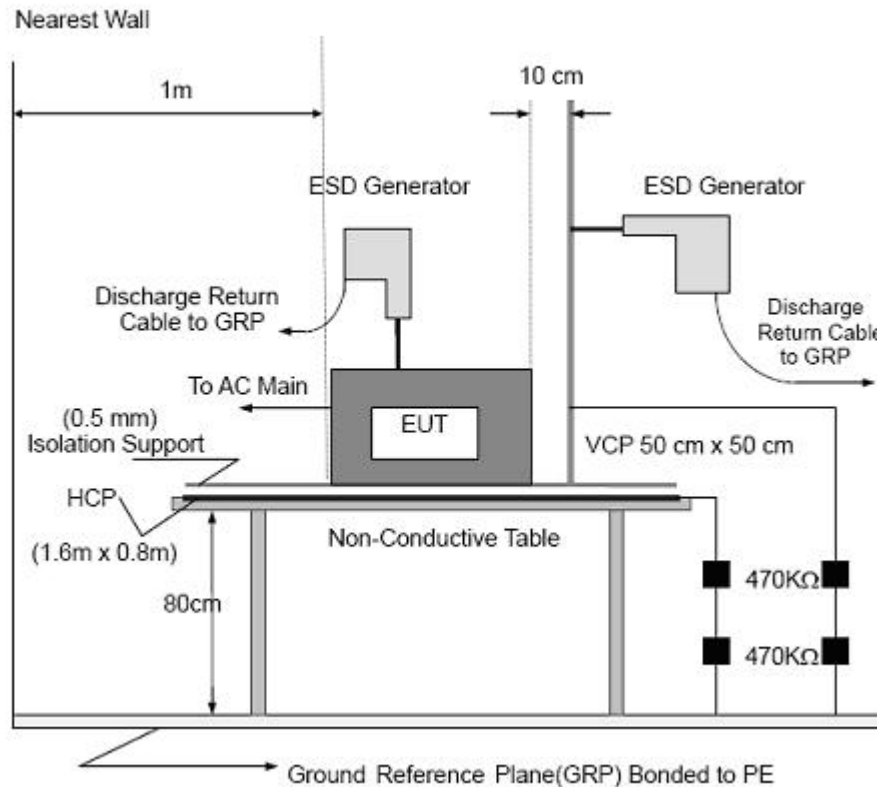
Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Air Discharge : 2kV/4kV/8kV (Direct) Contact Discharge : 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total
Discharge Mode:	AC Discharge
Discharge Period:	1 second minimum

4.3.2 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT.
During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.
If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.
Vertical Coupling Plane (VCP):
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.
Horizontal Coupling Plane (HCP):
The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.
- b. Air discharges at insulation surfaces of the EUT.
It was at least ten single discharges with positive and negative at the same selected point.
- c. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.3.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.



4.3.4 TEST RESULTS

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	AC 230V/50Hz
Test Mode	Mode1		

Mode	Air Discharge								Contact Discharge								Obser vation	Criterion	Result
Test level (kV)	4		8		10		15		2		4		6		8				
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-			
HCP									A	A	A	A					TT,TR	B	PASS
VCP									A	A	A	A							PASS
enclosure									A	A	A	A							PASS
button	A	A	A	A															PASS
Screw									A	A	A	A							PASS
port									A	A	A	A							PASS
slot	A	A	A	A															PASS

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) Test condition:
Direct / Indirect (HCP/VCP) discharges: Minimum 50 times (Positive/Negative) at each point. Air discharges: Minimum 10 times (Positive/Negative) at each point.
- 3) N/A - denotes test is not applicable in this test report
- 4) There was not any unintentional transmission in standby mode



4.4 RS TESTING

4.4.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 1000 MHz ,1400MHz-2700MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds
Test site:	SMQ RS test room

4.4.2 TEST PROCEDURE

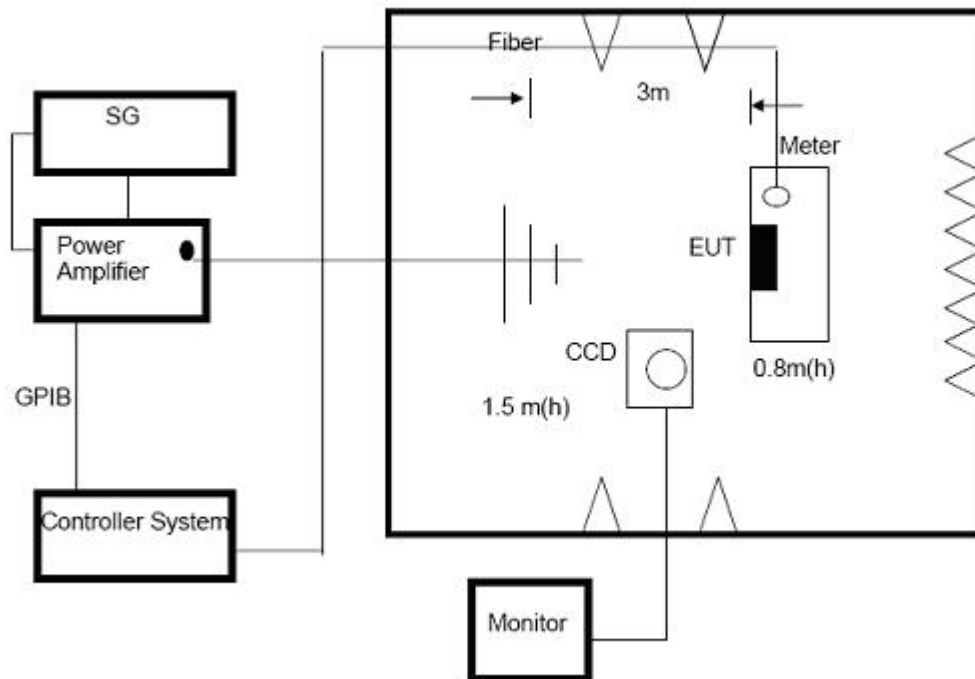
The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

The other condition as following manner:

- The field strength level was 3V/m.
- The frequency range is swept from 80 MHz to 1000 MHz, & 1400MHz - 2700MHz with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5x 10⁻³ decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- Sweep Frequency 900 MHz, with the Duty Cycle:1/8 and Modulation: Pulse 217 Hz(if applicable)
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.4.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.



4.4.4 TEST RESULTS

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	AC 230V/50Hz
Test Mode	Mode1		

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Observation	Perform. Criteria	Results	Judgment
80~1000 1400-2700	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	CT,CR	A	A	PASS
			Rear				
			Left				
			Right				

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable in this test report.
- 3) There was no change operated with initial operating during the test.
- 4) There was not any unintentional transmission in standby mode



4.5 EFT/BURST TESTING

4.5.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-4
Required Performance	B
Test Voltage:	Power Line : 1 kV Signal/Control Line : 0.5 KV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

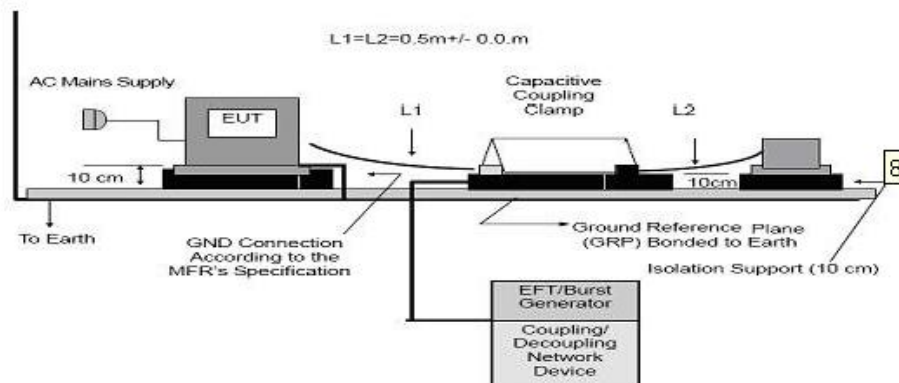
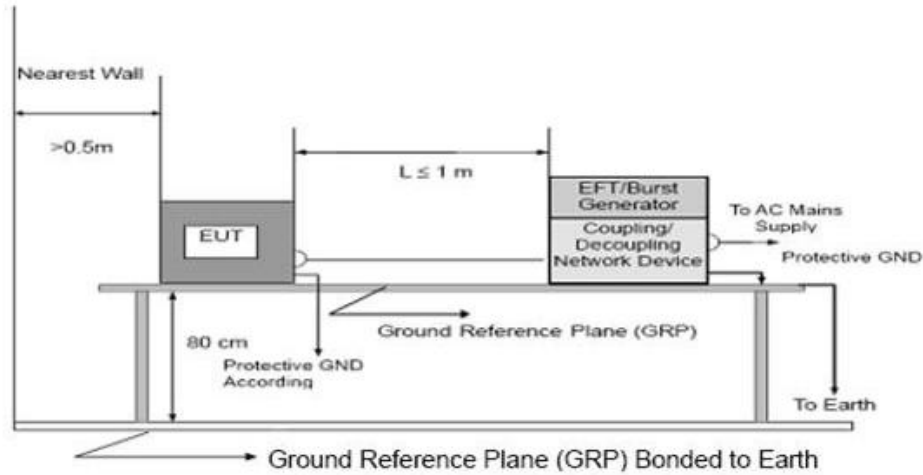
4.5.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- Both positive and negative polarity discharges were applied.
- The duration time of each test sequential was 1 minute
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.5.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.



4.5.4 TEST RESULTS

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	AC 230V/50Hz
Test Mode	Mode1		

Coupling Line		Test level (KV)I								Observation	Criterion	Result
		0.5		1		2		4				
		+	-	+	-	+	-	+	-			
AC Line	L	A	A	A	A					TT,TR	B	PASS
	N	A	A	A	A							PASS
	PE											
	L+N	A	A	A	A							PASS
	L+PE											
	N+PE											
	L+N+PE											
DC Line												
Signal Line												

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable in this test report.
- 3) There was not any unintentional transmission in standby mode



4.6 SURGE TESTING

4.6.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-5
Required Performance	B
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line : 0.5 kV, 1 kV, 2 kV
Surge Input/Output:	L1-L2, L1-PE, L2-PE
Generator Source:	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 /90/180/270
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

4.6.2 TEST PROCEDURE

a. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

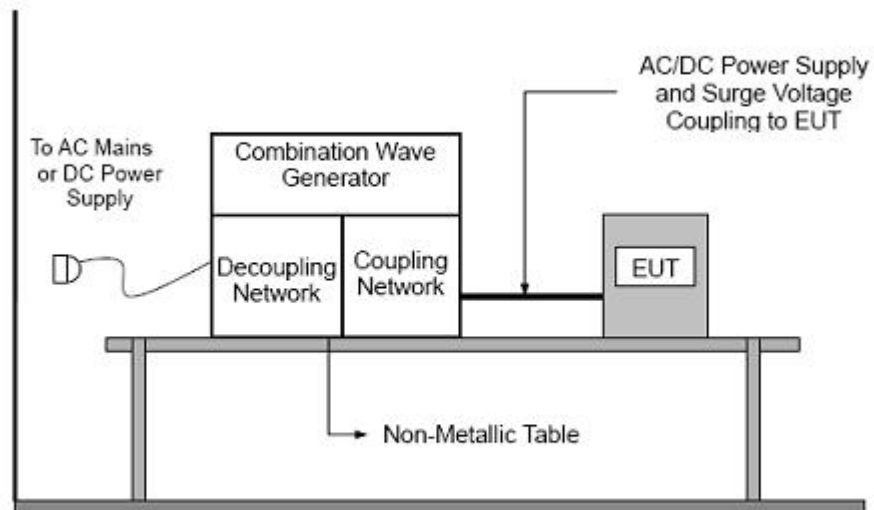
The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.6.3 TEST SETUP





4.6.4 TEST RESULTS

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	AC 230V/50Hz
Test Mode	Mode1		

Coupling Line			Test level (KV)I								Observation	Criterion	Result
			0.5		1		2		4				
			+	-	+	-	+	-	+	-			
AC Line	L-N	0°	A	A	B	B					TT,TR	B	PASS
		90°	A	A	B	B							
		180°	A	A	B	B							
		270°	A	A	B	B							
	L-PE	0°											
		90°											
		180°											
		270°											
	N-PE	0°											
		90°											
		180°											
		270°											
DC Line													
Signal Line													

Note:

- 1) Polarity and Numbers of Impulses: 5 Pst / Ngt at each tested mode
- 2) N/A - denotes test is not applicable in this Test Report
- 3) There was not any unintentional transmission in standby mode



4.7 INJECTION CURRENT TESTING

4.7.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-6
Required Performance	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 Vr.m.s.
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	at least 3 seconds

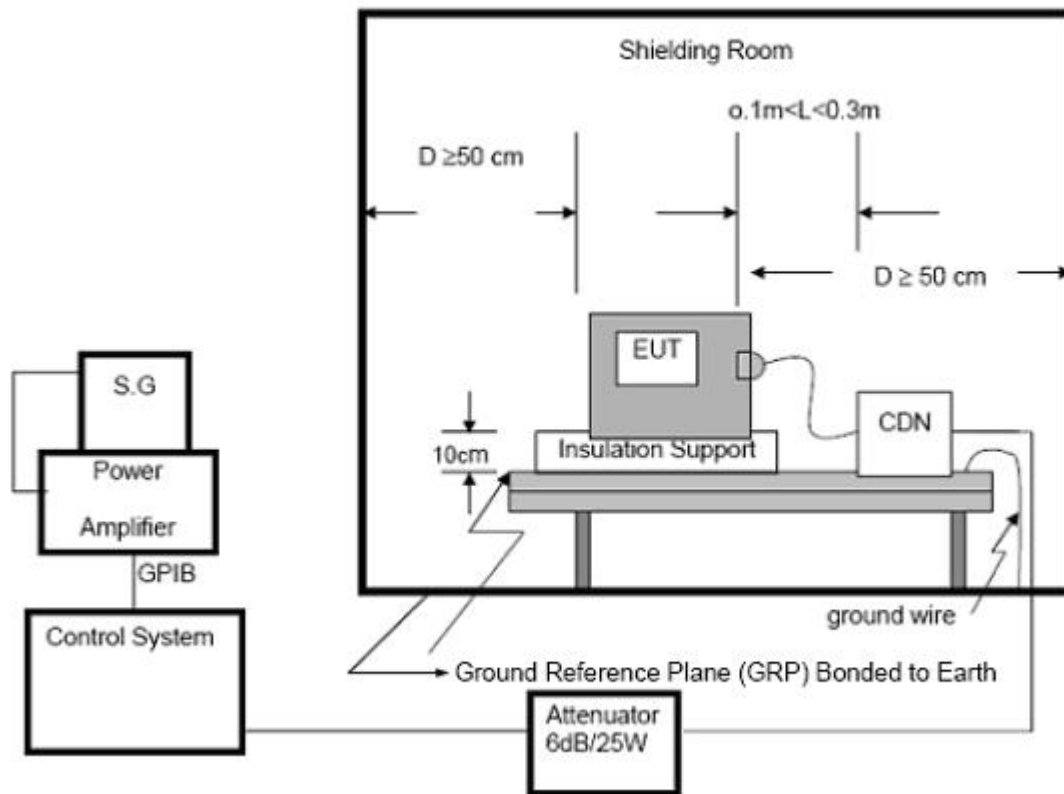
4.7.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- a. The field strength level was 3V.
- b. The frequency range is swept from 150 KHz to 80 MHz, with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.7.3 TEST SETUP



For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.



4.7.4 TEST RESULTS

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	AC 230V/50Hz
Test Mode	Mode1		

Test Ports (Mode)	Freq. Range (MHz)	Field Strength Azimuth	Observation	Perform. Criteria	Results	Judgment
Input/ Output AC. Power Port	0.18-80	3 V/m (rms) AM Modulated 1000Hz, 80%	CT,CR	A	A	PASS
Input/ Output DC. Power Port	0.18-80		N/A	N/A	N/A	N/A
Signal Line	0.18-80		N/A	N/A	N/A	N/A

Note: “A” stand for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

4.8 VOLTAGE INTERRUPTION/DIPS TESTING

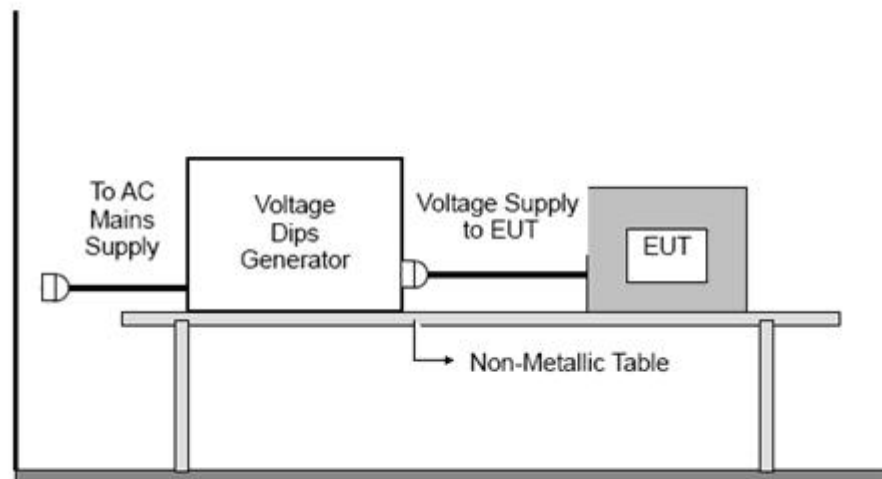
4.8.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-11
Required Performance	100% reduction, 0.5 Cycle 100% reduction, 1.0 Cycle 30% reduction, 25 Cycles
Voltage Interruptions:	100% reduction, 250 Cycles
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

4.8.2 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

4.8.3 TEST SETUP



For the actual test configuration, please refer to the related Item –EUT Test Photos.



4.8.4 TEST RESULTS

EUT :	Sonoff Wifi Switch	Model Name :	Sonoff TH16
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	AC 230V/50Hz
Test Mode	Mode1		

Voltage Reduction	Duration (ms)	Observation	Perform. Criteria	Results	Judgment
Voltage dip 0%	10	TT, TR	B	A	PASS
Voltage dip 0%	20	TT, TR	B	A	PASS
Voltage dip 70%	500	TT, TR	B	A	PASS
Voltage interruptions	5000	TT, TR	C	B	PASS

Note:

- 1) There was not any unintentional transmission in standby mode

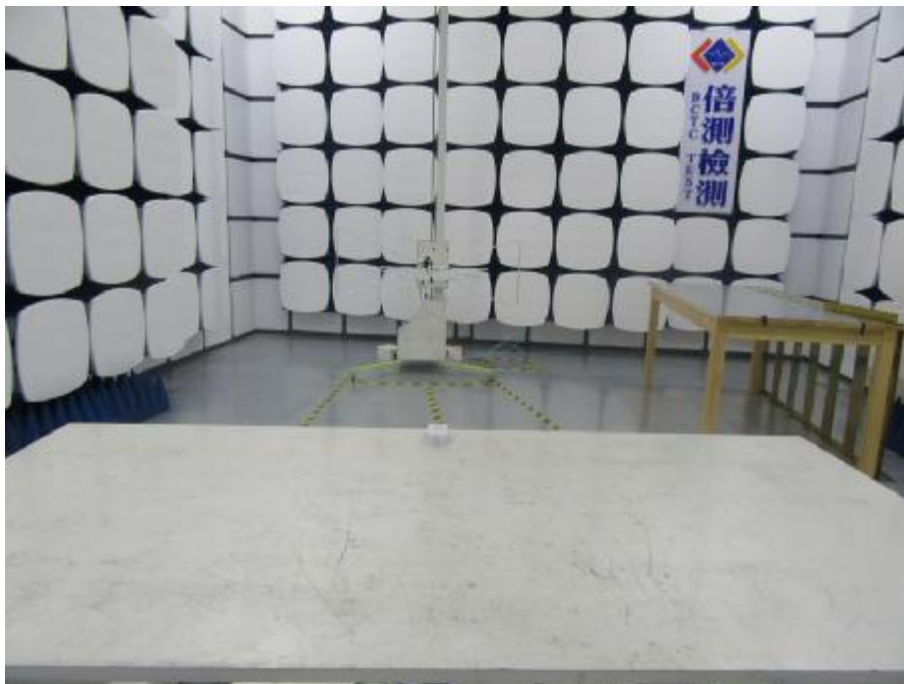


5 PHOTOS OF TEST SETUP

CE



RE





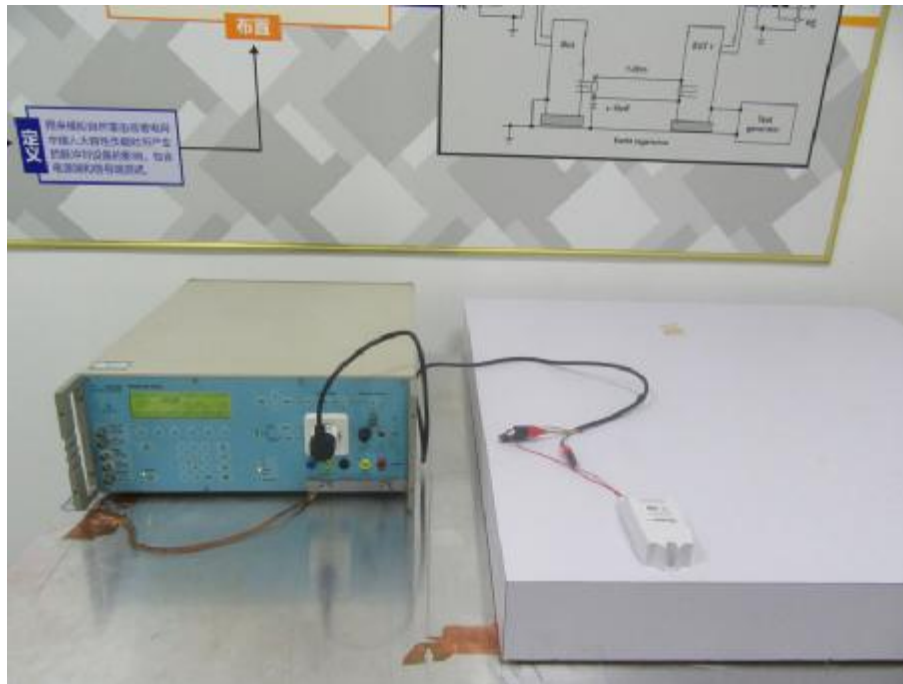
ESD



RS



Surge



6 PHOTOS OF THE EUT

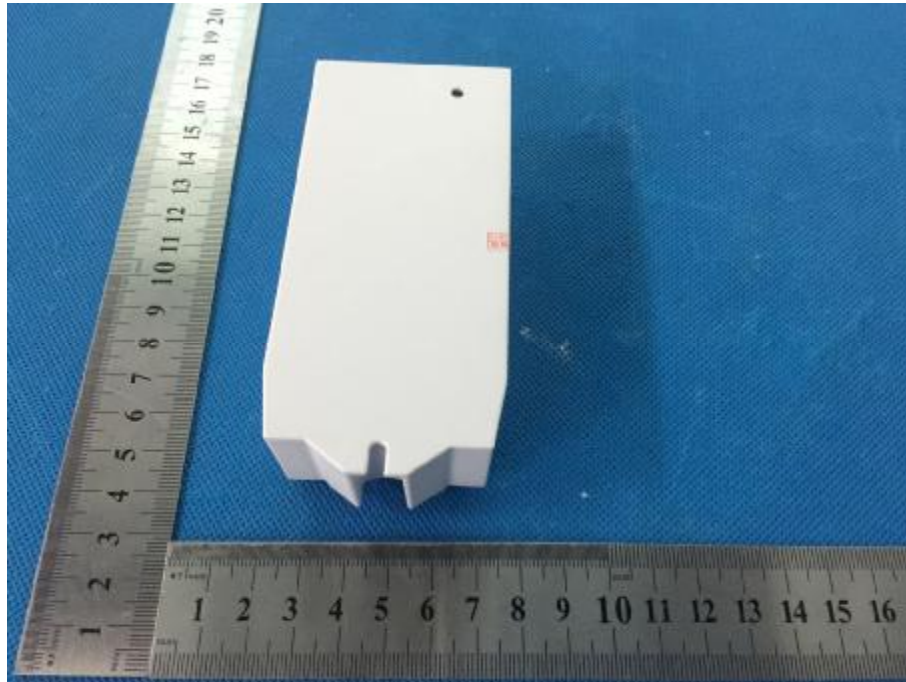
EUT Photo 1



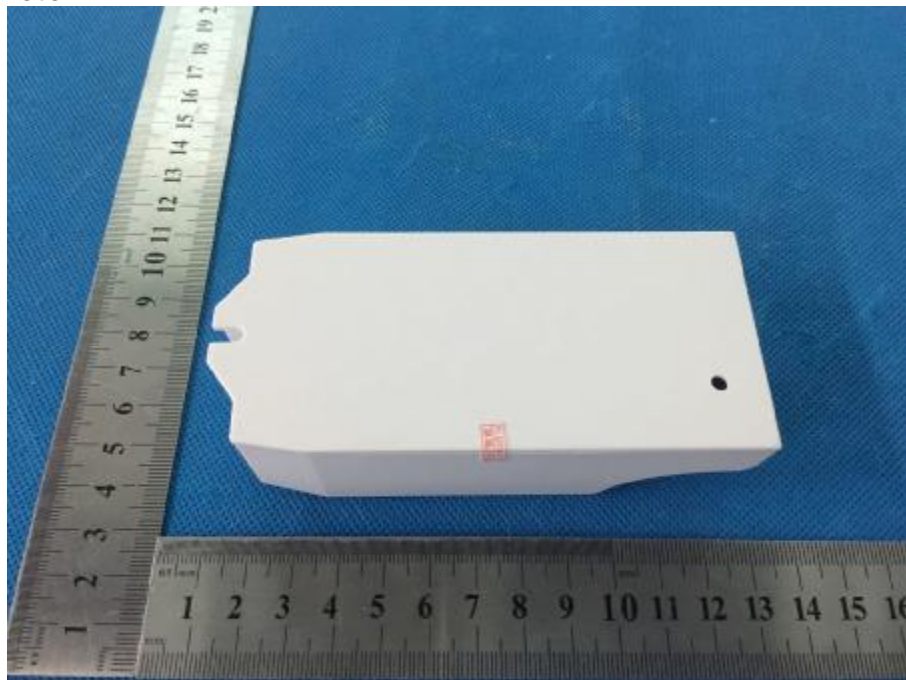
EUT Photo 2



EUT Photo 3



EUT Photo 4



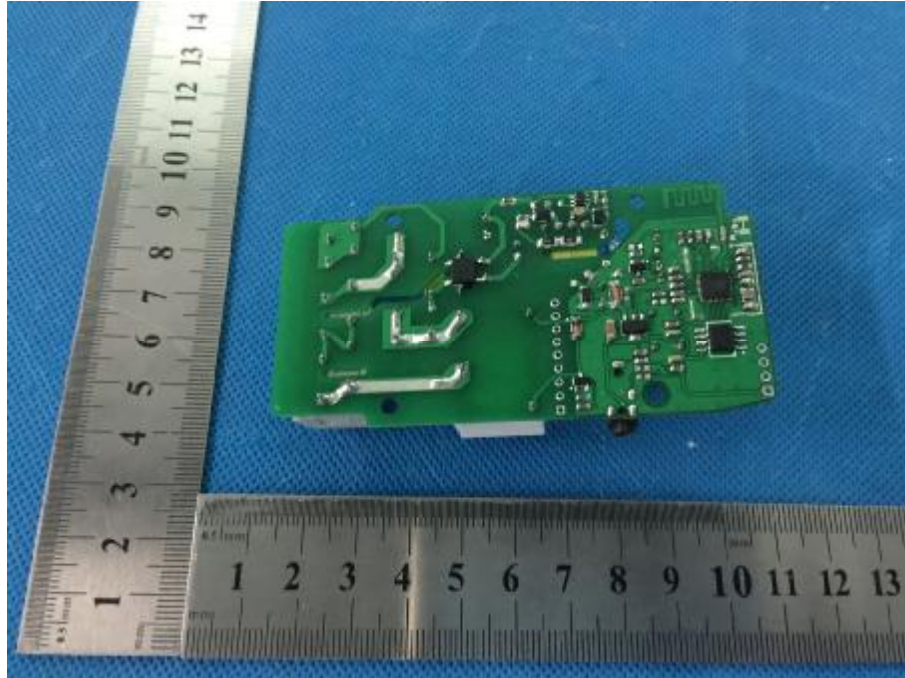
EUT Photo 5



EUT Photo 6



EUT Photo 7



***** END OF REPORT *****