

ETSI EN 300 220-1 V3.1.1 (2017-02)

ETSI EN 300 220-2 V3.1.1 (2017-02)

TEST REPORT

For

Shenzhen Sonoff Technologies Co.,Ltd.

Room 1001, 10F, Building 8, Lianhua Industrial Park, Longyuan Road, Longhua District, Shenzhen, GD, China.

Model: RFR2

Report Type: Original Report	Product Type: Wi-Fi Smart Switch with RF Control
Report Number:	RDG190905007-22A
Report Date:	2019-12-05
Reviewed By:	Dean Lau RF Supervisor
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Wi-Fi Smart Switch with RF Control
EUT Model:	RFR2
Rated Input Voltage:	100~240Vac
Serial Number:	RDG190905007-RF-S1
EUT Received Date:	2019.09.05
EUT Received Status:	Good

Objective

This report is prepared on behalf of *Shenzhen Sonoff Technologies Co.,Ltd.* in accordance with ETSI EN 300 220-1 V3.1.1 (2017-02) Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 1: Technical characteristics and methods ; ETSI EN 300 220-2 V3.1.1 (2017-02) Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz;Part 2: Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU for non specific radio equipment..

The objective is to determine the compliance of EUT with:
ETSI EN 300 220-1 V3.1.1 (2017-02)
ETSI EN 300 220-2 V3.1.1 (2017-02).

Test Methodology

All measurements contained in this report were conducted with ETSI EN 300 220-1 V3.1.1 (2017-02) Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 1: Technical characteristics and methods ; ETSI EN 300 220-2 V3.1.1 (2017-02) Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz;Part 2: Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU for non specific radio equipment..

Measurement Uncertainty

According to the requirements of ETSI EN 300 220-1, F_{lab} (the value of the measurement uncertainty according to the requirements of ETSI TR 100 028) shall be, for each measurement, equal to or lower than the figure in the following table:

SN	Parameter	F_{lab}	Maximum allowable uncertainty
1	Radio Frequency	± 0.082 ppm	± 0.5 ppm
2	RF power, conducted	± 0.61 dB	± 3 dB
5	Occupied Bandwidth	± 5 %	± 5 %
6	Conducted Spurious emission of transmitter, valid up to 6 GHz	± 2.47 dB	± 3 dB
7	Conducted emission of receivers	± 2.47 dB	± 3 dB
8	Radiated emission of transmitter, valid up to 6 GHz	± 3.62 dB	± 6 dB
9	Radiated emission of receiver, valid up to 6 GHz	± 3.62 dB	± 6 dB
10	Temperature	± 1 °C	± 2.5 °C
11	Humidity	± 5 %	± 10 %

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “ Δ ”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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SYSTEM TEST CONFIGURATION

Description of Test Configuration

The product was configured for testing in a test mode.

The extreme test conditions which were declared by the manufacturer and the normal conditions are as below:

L.V.: Low Voltage 100VAC; L.T.: Low Temperature -10°C; N.V.: Normal Voltage 230VAC
 N.T.: Normal Temperature +25°C; H.V.: High Voltage 240VAC; H.T.: High Temperature +40°C

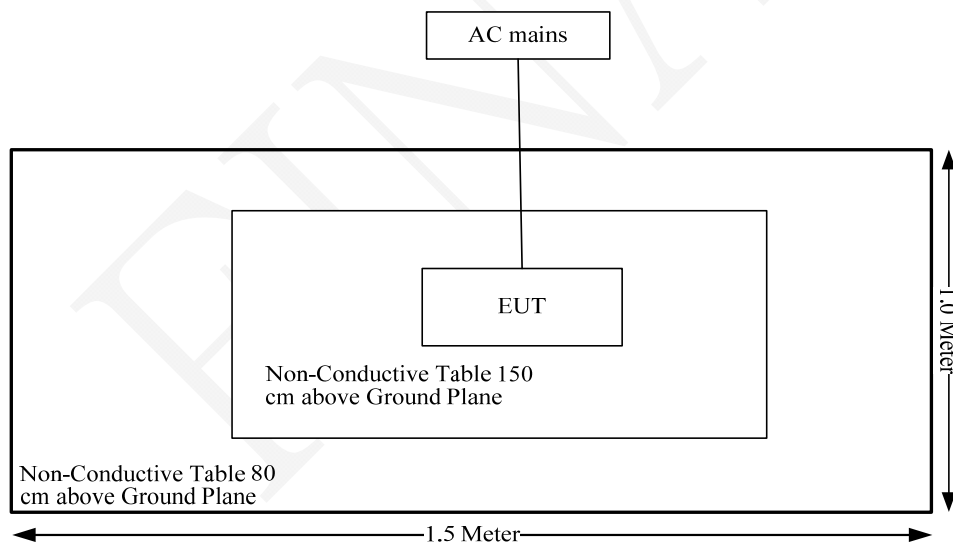
Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

No software was used for testing.

Block Diagram of Test Setup



Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

Support Cable List and Details

Cable Description	Shielding Cable	Ferrite Core	Length (m)	From Port	To
Power Cable	No	No	2	EUT	AC mains

Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100035	2019-08-03	2020-08-03
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
Sonoma	Amplifier	310N	185914	2018-10-13	2019-10-13
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-05-09	2020-05-09
TDK RF	Horn Antenna	HRN-0118	130 084	2018-10-12	2021-10-12
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2019-09-05	2020-09-05
Micro-tronics	High Pass Filter	HPM50111	S/N-G217	2019-06-16	2020-06-16
Agilent	Signal Generator	E8247C	MY43321350	2018-12-10	2019-12-10
ESPEC	Constant temperature and humidity Tester	ESX-4CA	018 463	2019-03-26	2020-03-26
UNI-T	Multimeter	UT39A	M130199938	2019-07-24	2020-07-24
Agilent	MXG Vector Signal Generator	N5182B	MY51350142	2019/11/9	2020/11/9

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Temperature:	26.2°C
Relative Humidity:	53%
ATM Pressure:	101.1kPa
Tester:	Ade Xiao, Tyler Pan
Test Date:	2019.09.24

SUMMARY OF TEST RESULTS

SN	Rule and Clause	Description of Test	Test Result
1	EN 300 220 Clause 4.2.1	Operating frequency	Compliance
2	EN 300 220 Clause 4.2.2	Unwanted emissions in the spurious domain	Compliance
3	EN 300 220 Clause 4.3.1	TX Effective radiated power	Not applicable*
4	EN 300 220 Clause 4.3.2	TX Maximum e.r.p. spectral density	Not applicable*
5	EN 300 220 Clause 4.3.3	TX Duty cycle	Not applicable*
6	EN 300 220 Clause 4.3.4	TX Occupied bandwidth	Not applicable*
7	EN 300 220 Clause 4.3.5	TX out of band emissions	Not applicable*
8	EN 300 220 Clause 4.3.6	TX transient power	Not applicable*
9	EN 300 220 Clause 4.3.7	TX Adjacent channel power	Not applicable*
10	EN 300 220 Clause 4.3.8	TX Behavior under low voltage conditions	Not applicable*
11	EN 300 220 Clause 4.3.9	TX Adaptive power control	Not applicable*
12	EN 300 220 Clause 4.3.10	TX FHSS	Not applicable*
13	EN 300 220 Clause 4.3.11	TX Short term behavior	Not applicable*
14	EN 300 220 Clause 4.4.1	Receiver sensitivity	Not applicable*
15	EN 300 220 Clause 4.5.2	Clear channel assessment threshold	Not applicable*
16	EN 300 220 Clause 4.5.3	Polite spectrum access timing parameters	Not applicable*
17	EN 300 220 Clause 4.4.2	Blocking	Compliance
18	EN 300 220 Clause 4.5.4	Adaptive frequency agility	Not applicable*

Note:

Not applicable*: The EUT just support RX function

1 – OPERATING FREQUENCY

Applicable Standard

According to ETSI EN 300 220-1 V3.1.1 (2017-02) clause 5.1.1.

Limit: The manufacturer may declare either one or more operating frequencies and operating channels. Operating channel(s) shall be entirely within operational frequency bands allowed by annexes B, C or any NRI.

Measurement Procedure

Declared by the manufacturer.

Test Data

The manufacturer declares that operational frequency band is 433.05-434.790MHz, operating frequency is 433.92MHz and operating channel width is 100 kHz.

2 – UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

Limit

Spurious emissions are unwanted emissions in the spurious domain at frequencies other than those of the Operating Channel and its Out Of Band Domain. The relevant spurious domain is shown in Figure 7.

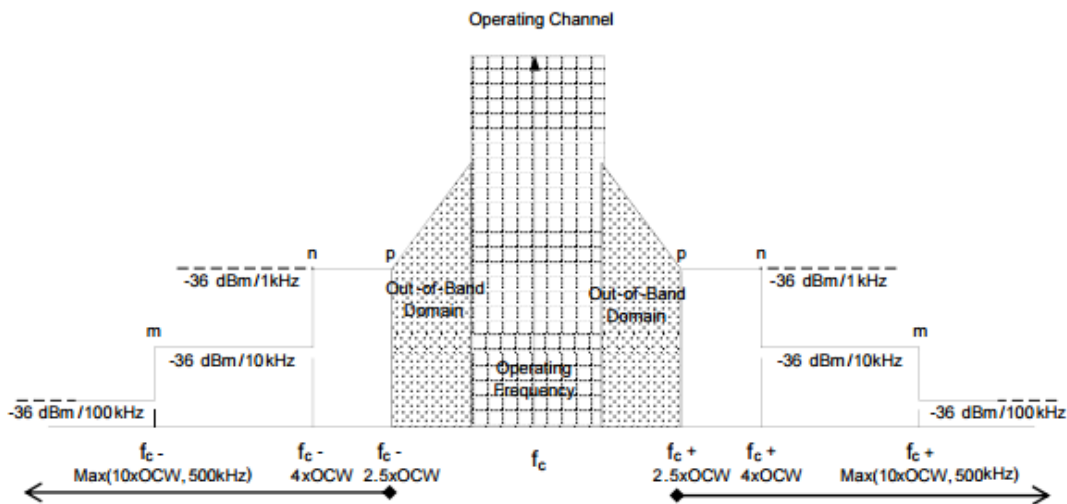


Figure 7: Spectrum Mask for Unwanted Emissions in the Spurious Domain with reference BW

The power of any unwanted emission in the spurious domain shall not exceed the values given in Table 19.

Table 19: Spurious domain emission limits

Frequency	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies below 1 000 MHz	Frequencies above 1 000 MHz
State			
TX mode	-54 dBm	-36 dBm	-30 dBm
RX and all other modes	-57 dBm	-57 dBm	-47 dBm

Test Procedure

According to ETSI EN 300 220-1 V3.1.1 (2017-02) clause 5.9.3.3

Test Data

Please refer to following table:

Receiving			433.92 MHz			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	Polar (H/V)	Receiver Reading (dB μ V)	Substituted Method					
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
378.83	H	39.62	-67.56	0.00	0.37	-67.93	-57.00	10.93
224.51	V	39.13	-68.08	0.00	0.22	-68.30	-57.00	11.30
3255.00	H	47.65	-62.68	13.60	1.58	-50.66	-47.00	3.66
3255.00	V	48.13	-62.22	13.60	1.58	-50.20	-47.00	3.20

Note 1: The unit of antenna gain is dBd for frequency below 1GHz and is dBi for frequency above 1GHz.

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit - Absolute Level

Note 2: Receiving mode is standby mode

17 – BLOCKING

Applicable Standard

Blocking is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at any frequencies other than those of the spurious responses or the adjacent channels or bands.

The blocking levels at the specified frequency offsets shall be equal to or greater than the limits as following tables , except at frequencies where spurious responses are found.

Table 40: Blocking level parameters for RX category 3

Requirement	Limits
	Receiver category 3
Blocking at ±2 MHz from OC edge f_{high} and f_{low}	≥ -80 dBm
Blocking at ±10 MHz from OC edge f_{high} and f_{low}	≥ -60 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -60 dBm

Table 41: Blocking level parameters for RX category 2

Requirement	Limits
	Receiver category 2
Blocking at ±2 MHz from OC edge f_{high} and f_{low}	≥ -69 dBm
Blocking at ±10 MHz from OC edge f_{high} and f_{low}	≥ -44 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -44 dBm

Table 42: Blocking level parameters for RX category 1.5

Requirement	Limits
	Receiver category 1.5
Blocking at ±2 MHz from OC edge f_{high} and f_{low}	≥ -43 dBm
Blocking at ±10 MHz from OC edge f_{high} and f_{low}	≥ -33 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -33 dBm

Table 43: Blocking level parameters for RX category 1

Requirement	Limits
	Receiver category 1
Blocking at ±2 MHz from Centre Frequency	≥ -20 dBm
Blocking at ±10 MHz from Centre Frequency	≥ -20 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -20 dBm

Method of Measurement

According to ETSI EN 300 220-1 V3.1.1 (2017-02) clause 5.18.6

Test Data

Please refer to following table:

Frequency (MHz)	Frequency offset (MHz)	Test result (dBm)	Limit (dBm)	Result
433.92	-2 MHz from OC edge f_{low}	-58	≥ -69	Compliance
	+2 MHz from OC edge f_{high}	-56	≥ -69	Compliance
	-10 MHz from OC edge f_{low}	-41	≥ -44	Compliance
	+10 MHz from OC edge f_{high}	-41	≥ -44	Compliance
	-5 % of Centre Frequency	-36	≥ -44	Compliance
	+5 % of Centre Frequency	-34	≥ -44	Compliance

Note: The equipment provider declared that the receiver category for the EUT is 2

EXHIBIT A – EUT PHOTOGRAPHS

For photos in this section, please refer to report No.: RDG190905007-02 EXHIBIT A.

FINAL

EXHIBIT B – TEST SETUP PHOTOGRAPHS

RE Below 1G View



RE Above 1G View



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