EN 50663: 2017

EN 62479: 2010

ASSESSMENT REPORT

For

SHENZHEN SONOFF TECHNOLOGIES CO.,LTD.

3F & 6F, Bldg A, No. 663, Bulong Rd, Shenzhen, Guangdong, China

Tested Model: R5
Multiple Model: R5W, R5G

Report Type: Original Report	**Product Type:** SONOFF SwitchMan Scene Controller

Report Number:	DG1220118-02730E
Report Date:	2022-03-15
Reviewed By:	Rocky Xiao RF Engineer
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.12, Pulong East 1st Road, Tangxia Town, 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)

Product Name:	SONOFF SwitchMan Scene Controller
EUT Model:	R5
Multiple Models:	R5W,R5G
Model Difference:	Please refer to the DoS
Rated Input Voltage:	6Vdc from battery
Serial Number:	DG1220118-02730E-RF-S1
EUT Received Date:	2022.01.26
EUT Received Status:	Good

Objective

This report is prepared on behalf of ***SHENZHEN SONOFF TECHNOLOGIES CO.,LTD.*** in accordance with EN 50663: 2017 Generic standard for assessment of low power electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (10 MHz - 300 GHz)
And EN 62479: 2010 Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz).

The objective is to determine the compliance of EUT with EN 50663: 2017 and EN 62479: 2010.

Test Methodology

All measurements contained in this report were conducted with EN 50663: 2017 and EN 62479: 2010.

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 "▲". 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.

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.

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RF Exposure Measurement

1. Introduction

These European Standards provides simple conformity assessment methods for low-power electronic and electrical equipment operating at frequencies between 10 MHz and 300 GHz to an electromagnetic field (EMF) exposure limit.

The object of this document is to demonstrate the compliance of such apparatus with the basic restrictions on exposure of the general public to electric, magnetic and electromagnetic fields and contact current.

2. Compliance Criteria

2.1 General considerations

Compliance of electromagnetic emissions from electronic and electrical equipment with the basic restrictions usually is determined by measurements and, in some cases, calculation of the exposure level. If the electrical power used by or radiated by the equipment is sufficiently low, the electromagnetic fields emitted will be incapable of producing exposures that exceed the basic restrictions. This standard provides simple EMF assessment procedures for this low power equipment.

Any relevant compliance assessment procedure which is consistent with the state of the art, reproducible and gives valid results can be used.

For transmitters intended for use with more than one antenna configuration option, the combination of transmitter and antenna(s) which generates the highest available antenna power and/or average total radiated power shall be assessed.

Four routes (Figure 1), as illustrated in Figure 1 and described as follows, can be used to demonstrate compliance with this standard:

A Typical usage, installation and the physical characteristics of equipment make it inherently compliant with the applicable EMF exposure levels such as those listed in the bibliography. This low-power equipment includes unintentional (or non-intentional) radiators, for example incandescent light bulbs and audio/visual (A/V) equipment, information technology equipment (ITE) and multimedia equipment (MME) that does not contain radio transmitters. NOTE Equipment is described as A/V equipment, ITE or MME if its main use is playback/recording of music, voice or images, or processing of digital information.

B The input power level to electrical or electronic components that are capable of radiating electromagnetic energy in the relevant frequency range is so low that the available antenna power and/or the average total radiated power cannot exceed the low-power exclusion level defined in 2.2.

C The available antenna power and/or the average total radiated power are limited by product standards for transmitters to levels below the low-power exclusion level defined in 2.2.

D Measurements or calculations show that the available antenna power and/or the average total radiated power are below the low-power exclusion level defined in 2.2.

If none of these routes can be used, then the equipment is deemed to be out of the scope of this standard and EMF assessment for conformity assessment purposes shall be made according to other standards, such as IEC 62311 or other EMF product standards.

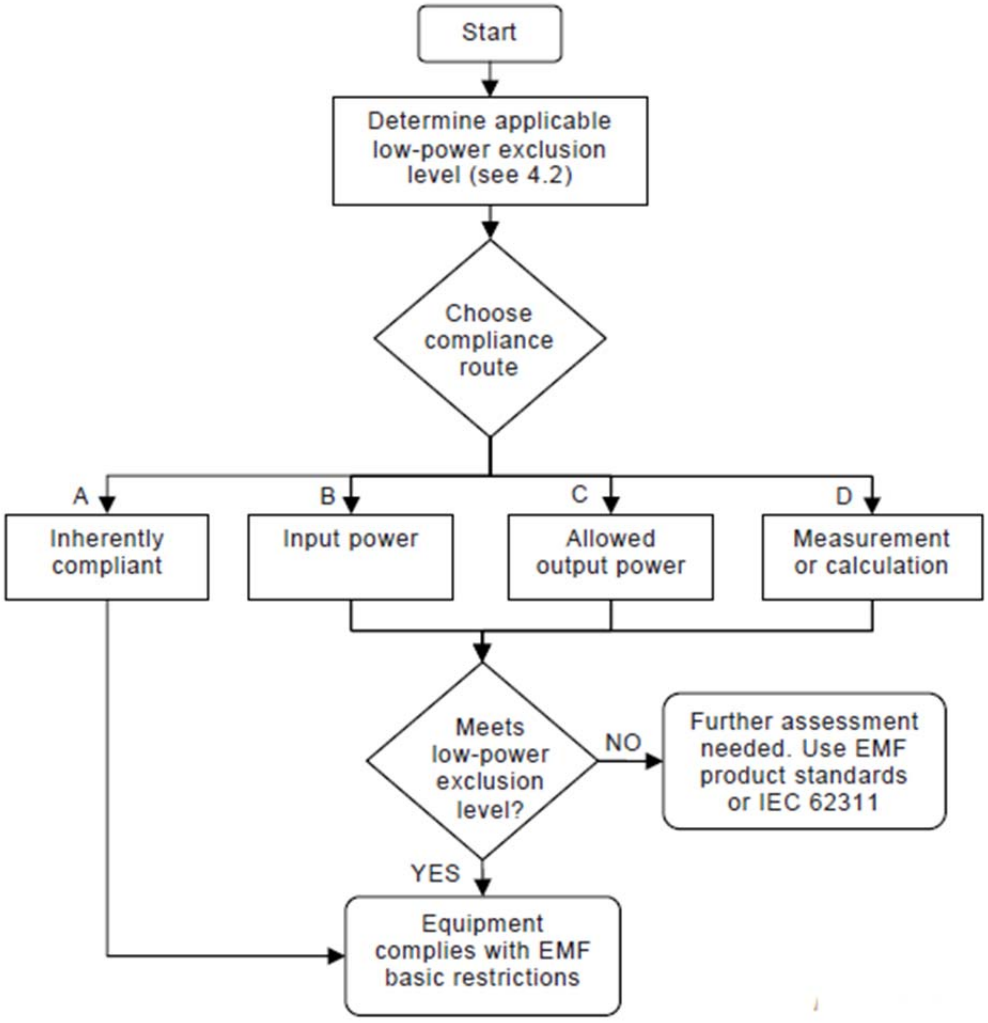

Figure 1 – Routes to show compliance with low-power exclusion level

2.2 Low-power exclusion level (Pmax)

Low-power electronic and electrical equipment is deemed to comply with the provisions of this standard if it can be demonstrated using routes B, C or D that the available antenna power and/or the average total radiated power is less than or equal to the applicable low-power exclusion level Pmax.

Annex A contains example values for Pmax derived from existing exposure limits listed in the bibliography, such as the ICNIRP guidelines [1], IEEE Std C95.1-1999 [2], and IEEE Std C95.1-2005 [3].

For wireless devices operated close to a person's body with available antenna powers and/or average total radiated powers higher than the Pmax values given in Annex A, the alternative Pmax values (called Pmax′), described in Annex B can also be used.

For low power equipment using pulsed signals, other limits may apply in addition to those considered in Annex A and Annex B. Both ICNIRP guidelines [1] and IEEE standards [2], [3] have specific restrictions on exposures to pulsed fields, and the requirements of those standards with respect to exposure to pulses shall be met. Annex C discusses this topic further.

2.3 Exposure to multiple transmitting sources

If equipment under test (EUT) is equipped with multiple intentional radiators, the overall conformity assessment might require more than just the assessment of conformity of each one of the radiators separately. The effect of multiple intentional radiators should be considered in the conformity assessment process.

3. Limit

Low-power electronic and electrical equipment is deemed to comply with the provisions of this standard if it can be demonstrated using routes B, C or D that the available antenna power and/or the average total radiated power is less than or equal to the applicable low-power exclusion level Pmax. Annex A contains example values for Pmax derived from existing exposure limits listed in the bibliography, such as the ICNIRP guidelines [1], IEEE Std C95.1-1999 [2], and IEEE Std C95.1-2005 [3].

For wireless devices operated close to a person's body with available antenna powers and/or average total radiated powers higher than the Pmax values given in Annex A, the alternative Pmax values (called Pmax′), described in Annex B can also be used.

Equipment complying with the requirements for the general public is deemed to comply with the requirements for workers without further testing. The conformity assessment to demonstrate equipment compliance shall be made according to EN 62479:2010, 4.1(Clause 2.1 of this document) and Clause 6.
If routes B, C or D of 4.1 of EN 62479:2010 are followed then the values of Pmax, as described in 4.2 of EN 62479:2010 and given in Annex A of EN 62479:2010, shall be replaced by those in Table 1 below.

Table 1 — Values of *P*max

Exposure tier	Region of body	*P*max (mW)
General public	Head and trunk	20
	Limbs	40
Workers	Head and trunk	100
	Limbs	200

3.1 Annex A

Table A.1 – Example values of SAR-based P_{max} for some cases described by ICNIRP, IEEE Std C95.1-1999 and IEEE Std C95.1-2005

Guideline / Standard	SAR limit, SAR_{max} W/kg	Averaging mass, m g	P_{max} mW	Exposure tier[a]	Region of body[a]
ICNIRP [1]	2	10	20	General public	Head and trunk
	4	10	40	General public	Limbs
	10	10	100	Occupational	Head and trunk
	20	10	200	Occupational	Limbs
IEEE Std C95.1-1999 [2]	1,6	1	1,6	Uncontrolled environment	Head, trunk, arms, legs
	4	10	40	Uncontrolled environment	Hands, wrists, feet and ankles
	8	1	8	Controlled environment	Head, trunk, arms, legs
	20	10	200	Controlled environment	Hands, wrists, feet and ankles
IEEE Std C95.1-2005 [3]	2	10	20	Action level	Body except extremities and pinnae
	4	10	40	Action level	Extremities and pinnae
	10	10	100	Controlled environment	Body except extremities and pinnae
	20	10	200	Controlled environment	Extremities and pinnae

[a] Consult the appropriate standard for more information and definitions of terms.

3.2 Annex B

Based on a systematic study of canonical dipole antennas of different lengths and at different distances from a flat phantom, a simple equation was developed for predicting alternative higher values of the low-power exclusion levels, P_{max}':

$$P_{max}' = \exp\left[As + Bs^2 + C\ln(BW) + D\right] \quad (B.1)$$

Where *s* represents the nearest separation distance between the wireless device and the user's body, *BW* is the free-space antenna bandwidth, and *A*, *B*, *C* and *D* are third-order polynomials of frequency. The bandwidth corresponds to |S11| ≤ -7 dB, which is the reciprocal of the radiation quality factor, defined as the ratio between the stored and the radiated energies of an antenna. In Equation (B.1), s is expressed in mm and *BW* is expressed in percent (e.g. enter 10 in the equation if the bandwidth is 10 %). The frequency dependent parameters A, B, C and D can be found from the following equations, where f is the frequency in GHz. This annex describes formulae to establish Pmax′ values for the 300 MHz to 6 GHz frequency range for devices that are located within 25 mm of the body.

Table B.1 – Some typical frequency bands of portable wireless devices and corresponding low-power exclusion levels P_{max}' predicted using Equations (B.1) through (B.9)

f GHz	BW %	Example air interface	P_{max}' mW			
			s = 5 mm		s = 25 mm	
			m = 1 g	m = 10 g	m = 1 g	m = 10 g
0,393	3,8	TETRA	97	292	265	526
0,420	4,8	TETRA	98	293	274	541
0,461	3,3	GSM	80	244	233	468
0,485	14,4	APCO	117	337	347	660
0,838	7,6	iDEN	48	148	198	399
0,859	8,1	IS-136	47	145	198	398
0,884	16,7	PDC	54	162	233	456
0,896	5,7	TETRA	40	127	176	360
0,918	4,8	iDEN	37	118	165	342
0,925	7,6	GSM	41	129	185	375
1,465	4,9	PDC	17	60	128	281
1,795	9,5	GSM	13	50	139	308
1,920	7,3	GSM	11	44	132	302
2,045	12,2	UMTS	11	44	146	330
2,350	4,3	WiBro	7,9	34	130	323
2,442	3,4	802.11b	7,3	32	130	328
3,550	14,1	WiMAX	6,7	37	244	657
5,250	3,8	WiMAX	6,8	53	258	845
5,788	1,3	WiMAX	6,2	52	164	564

§4.1 & §4.2 - MAXIMUM EMITTED AVERAGE POWER

Test Procedure

Refer to EN 50663:2017 and EN 62479:2010 §4.1&§4.2&§6.

Test Data

Frequency Band(MHz)	Tune-up power		Limit (mW)	Result
	dBm	mW		
2426	9	7.9	20	Pass

Conclusion: Compliant and no SAR test required.

EXHIBIT A – EUT PHOTOGRAPHS

For photos in this section, please refer to report No.: DG1220118-02730E-02 EXHIBIT A.

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