

HEALTH TEST REPORT

For

Shenzhen Sonoff Technologies Co., Ltd.

433MHz RF Bridge

Test Model: RF Bridge

Additional Model No.: /

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

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao' an District, Shenzhen, Guangdong, China

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Date of receipt of test sample : March 13, 2020
Number of tested samples : 1
Serial number : Prototype
Date of Test : March 13, 2020 ~ March 26, 2020
Date of Report : March 26, 2020



HEALTH TEST REPORT
EN 62311: 2008
 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

Report Reference No. : LCS200116005AED

Sample No. : 200116005A

Date of Issue : March 26, 2020

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

Address : Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao' an District, Shenzhen, Guangdong, China
 Full application of Harmonised standards

Testing Location/ Procedure : Partial application of Harmonised standards
 Other standard testing method

Applicant's Name : **Shenzhen Sonoff Technologies Co., Ltd.**

Address : 1001, BLDG8, Lianhua Industrial Park, shenzhen, GD, China

Test Specification

Standard : EN 62311: 2008

Test Report Form No. : LCSEMC-1.0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF : Dated 2011-03

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Test Item Description : 433MHz RF Bridge

Trade Mark : **SONOFF**

Model/ Type reference : RF Bridge

Ratings : Input: 5V=1A

Result : **Positive**

Compiled by:

Vera Deng

Supervised by:

Jin Wang

Approved by:



Vera Deng / File administrators

Jin Wang/ Administrators

Gavin Liang/ Manager

HEALTH --TEST REPORT

Test Report No. : LCS200116005AED	<u>March 26, 2020</u> Date of issue
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Test Model.....	: RF Bridge
EUT.....	: 433MHz RF Bridge
Applicant.....	: Shenzhen Sonoff Technologies Co., Ltd.
Address.....	: 1001, BLDG8, Lianhua Industrial Park, shenzhen, GD, China
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: Shenzhen Sonoff Technologies Co., Ltd.
Address.....	: 1001, BLDG8, Lianhua Industrial Park, shenzhen, GD, China
Telephone.....	: /
Fax.....	: /
Factory.....	: /
Address.....	: /
Telephone.....	: /
Fax.....	: /

Test Result	Positive
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The test report merely corresponds to the test sample.
 It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	March 26, 2020	Initial Issue	Gavin Liang

1. GENERAL INFORMATION

1.1. Product Description for Equipment Under Test (EUT)

EUT	: 433MHz RF Bridge
Test Model	: RF Bridge
List Model No.	: /
Model Declaration	: /
Power Supply	: Input: 5V=1A
Hardware Version	: 433RFBRIGE R2 V1.0
Software Version	: FWRF-BG85-BRIDGE-8285-V2.7.0
WIFI(2.4G Band)	:
Frequency Range	: 2412MHz ~ 2472MHz
Channel Spacing	: 5MHz
Channel Number	: 13 Channel for 20MHz bandwidth(2412~2472MHz)
Modulation Type	: 802.11b: DSSS; 802.11g/n: OFDM
Antenna Description	: PCB Antenna, 1.0dBi(Max.)
SRD	:
Frequency Range	: 433.92MHz
Channel Number	: 1
Modulation Type	: GFSK
Antenna Description	: Internal Antenna, 2.0dBi(Max.)

1.2. Objective

According to its specifications, the EUT must comply with the requirements of the following standards:
EN 62311: 2008 –Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

1.3. Test Methodology

All measurements contained in this report were conducted with EN 62311: 2008.

1.4. Facilities

All measurement facilities used to collect the measurement data are located at Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao' an District, Shenzhen, Guangdong, China.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.5. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
BESTGK	Power Adapter	K-T10B0501000E	---	CE

1.6. External I/O Cable

I/O Port Description	Quantity	Cable
Micro USB Port	1	N/A

1.7. Equipment

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

1.8. Laboratory Accreditations And Listings

Site Description

- EMC Lab. : FCC Registration Number is 254912.
 Industry Canada Registration Number is 9642A.
 EMSD Registration Number is ARCB0108.
 UL Registration Number is 100571-492.
 TUV SUD Registration Number is SCN1081.
 TUV RH Registration Number is UA 50296516-001.
 NVLAP Accreditation Code is 600167-0.
 FCC Designation Number is CN5024.
 CAB identifier is CN0071.
- Name of Firm : Shenzhen LCS Compliance Testing Laboratory Ltd.
- Site Location : Room 101, 201, Building A and Room 301, Building C, Juji Industrial Park, Yabianxueziwei, Shajing Street, Bao' an District, Shenzhen, Guangdong, China

1.9. Measurement Uncertainty

Test Item		Uncertainty
Radio Frequency	:	0.9×10^{-4}
Total RF Power, Conducted	:	1.0 dB
RF Power Density, Conducted	:	1.8 dB
Spurious Emissions, Conducted	:	1.8 dB
All Emissions, Radiated	:	3.1 dB
Temperature	:	0.5 °C
Humidity	:	1 %
DC And Low Frequency Voltages	:	1 %

2. HUMAN EXPOSURE TO THE ELECTROMAGNETIC FIELDS

2.1 Basic Restrictions Reference levels

Council Recommendation 1999/519/EC Annex II

Basic restrictions for electric, magnetic and electromagnetic fields (0Hz to 300GHz)

Frequency range	Magnetic flux density (mT)	Current density (Ma/m ²) (rms)	Whole body average SAR (W/kg)	Localised SAR (head and trunk) (W/kg)	Localised SAR (limbs) (W/kg)	Power density (W/m ²)
0Hz	40	-	-	-	-	-
>0-1Hz	-	8	-	-	-	-
1-4Hz	-	8/f	-	-	-	-
4-1000Hz	-	2	-	-	-	-
1000Hz-100kHz	-	f/500	-	-	-	-
100kHz-10MHz	-	f/500	0.08	2	4	-
10MHz-10GHz	-	-	0.08	2	4	-
10-300GHz	-	-	-	-	-	10

Note:

1. f is the frequency in Hz.
2. The basic restriction on the current density is intended to protect against acute exposure effects on central nervous system tissues in the head and trunk of the body and includes a safety factor. The basic restrictions for ELF fields are based on established adverse effects on the central nervous system. Such acute effects are essentially instantaneous and there is no scientific justification to modify the basic restrictions for exposure of short duration. However, since the basic restriction refers to adverse effects on the central nervous system, this basic restriction may permit higher current densities in body tissues other than the central nervous system under the same exposure conditions.
3. Because of electrical inhomogeneity of the body, current densities should be averaged over a cross section of 1cm² perpendicular to the current direction.
4. For frequencies up to 100 kHz, peak current density values can be obtained by multiplying the rms value by $\sqrt{2}$ (=1.414). For pulses of duration t_p the equivalent frequency to apply in the basic restrictions should be calculated as $f=1/(2t_p)$
5. For frequencies up to 100kHz and for pulsed magnetic fields, the maximum current density associated with the pulses can be calculated from the rise/fall times and the maximum rate of change of magnetic flux density. The induced current density can then be compared with the appropriate basic restriction.
6. All SAR values are to be averaged over any six-minute period.
7. Localised SAR averaging mass is any 10g of contiguous tissue; the maximum SAR so obtained should be the value used for the estimation of exposure. These 10g of tissue are intended to be a mass of contiguous tissue with nearly homogeneous electrical properties. In specifying a contiguous mass of tissue, it is recognised that this concept can be used in computational dosimetry but may present difficulties for direct physical measurements. A simple geometry such as cubic tissue mass can be used provided that the calculated dosimetric quantities have conservation values relative to the exposure guidelines.

8. For pulses of duration t_p the equivalent frequency to apply in the basic restrictions should be calculated as $f=1/(2t_p)$. Additionally, for pulsed exposures, in the frequency range 0,3 to 10GHz and for localised exposure of the head, in order to limit and avoid auditory effects caused by thermoelastic expansion, an additional basic restriction is recommended. This is that SA should not exceed 2mJ kg⁻¹ averaged over 10g of tissue.

2.2 Reference Levels

Council Recommendation 1999/519/EC Annex II

Basic restrictions for electric, magnetic and electromagnetic fields (0Hz to 300GHz)

Frequency range	E-field strength (V/m)	H-field strength (A/m)	B-field (μT)	Equivalent plane wave power density Seq (W/m ²)
0-1Hz	-	$3,2 \times 10^4$	4×10^4	-
1-8Hz	1000	$3,2 \times 10^4/f^2$	$4 \times 10^4/f^2$	-
8-25Hz	1000	4000/f	5000/f	-
0.025Hz-0,8kHz	250/f	4/f	5/f6,25	-
0,8-3kHz	250/f	5	6,25	-
3-150kHz	87	5	6,25	-
0,15-1MHz	87	0,73/f	0,92/f	-
1-10MHz	$87/f^{1/2}$	0,73/f	0,92/f	-
10-400MHz	28	0,073	0,092	2
400-2000MHz	$1,375 f^{1/2}$	$0,0037 f^{1/2}$	$0,0046 f^{1/2}$	f/200
2-300GHz	61	0,16	0,20	10

Note:

- f is the frequency in Hz.
- The basic restriction on the current density is intended to protect against acute exposure effects on central nervous system tissues in the head and trunk of the body and includes a safety factor. The basic restrictions for ELF fields are based on established adverse effects on the central nervous system. Such acute effects are essentially instantaneous and there is no scientific justification to modify the basic restrictions for exposure of short duration. However, since the basic restriction refers to adverse effects on the central nervous system, this basic restriction may permit higher current densities in body tissues other than the central nervous system under the same exposure conditions.
- Because of electrical inhomogeneity of the body, current densities should be averaged over a cross section of 1cm² perpendicular to the current direction.
- For frequencies up to 100 kHz, peak current density values can be obtained by multiplying the rms value by $\sqrt{2}$ (=1.414). For pulses of duration t_p the equivalent frequency to apply in the basic restrictions should be calculated as $f=1/(2t_p)$
- For frequencies up to 100kHz and for pulsed magnetic fields, the maximum current density associated with the pulses can be calculated from the rise/fall times and the maximum rate of change of magnetic flux density. The induced current density can then be compared with the appropriate basic restriction.
- All SAR values are to be averaged over any six-minute period.
- Localised SAR averaging mass is any 10g of contiguous tissue; the maximum SAR so obtained should be the value used for the estimation of exposure. These 10g of tissue are intended to be a mass of contiguous tissue with nearly homogeneous electrical properties. In specifying a contiguous mass of tissue, it is recognised that this concept can be used in computational dosimetry but may present difficulties for direct physical measurements. A simple geometry such as cubic tissue mass can be used

provided that the calculated dosimetric quantities have conservation values relative to the exposure guidelines.

8. For pulses of duration t_p the equivalent frequency to apply in the basic restrictions should be calculated as $f = 1/(2t_p)$. Additionally, for pulsed exposures, in the frequency range 0,3 to 10GHz and for localised exposure of the head, in order to limit and avoid auditory effects caused by thermoelastic expansion, an additional basic restriction is recommended. This is that SA should not exceed 2mJ kg-1 averaged over 10g of tissue.

Classification of the assessment methods

The antenna of the product, under normal use condition is at least 20cm away from the body of the user. Warning statement on the user for keeping 20cm separation distance and the prohibition of operating to a person has been printed on the user manual. So, this product under normal use is located on electromagnetic far field between the human body.

Far Field Calculation Formula

$$E = \frac{\sqrt{30 \times G \times TP}}{D}$$

Where

G : numerical gain of transmitting antenna;

TP : Transmitted power in watt;

D : distance from the transmitting antenna in meter.

2.3. Test Results

2.3.1 According to the radio test report (LCS200116005AEB, LCS200116005AEC):

Mode	Output Power To Antenna (dBm)	Antenna Gain (dBi)	Minimum Distance in Meter (m)	E-field Strength (V/m)	E-field Strength Limit (V/m)	Result
2.4GWIFI	12.02	1.0	0.2	3.88	61.00	Pass
SRD (433MHz)	6.97	2.0	0.2	2.43	61.00	Pass

Note:

1. Only record worst case data.
2. All other emissions are too low to read.

2.3.2 Simultaneous Transmission

Mode	Output Power To Antenna (dBm)	Antenna Gain (dBi)	Minimum Distance in Meter (m)	E-field Strength (V/m)	E-field Strength Limit (V/m)	Result
MIMO (2.4GWIFI+SRD)	11.98	4.54	0.2	6.10	61.00	Pass

This proves that the unit complies with the EN 62311 for RF exposure requirement.

-----THE END OF TEST REPORT-----