

<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	<b>CN24NAPE 001</b>	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	<b>168459887</b>	Seite 1 von 19 Page 1 of 19
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	N/A	<b>Auftragsdatum:</b> <i>Order date:</i>	2024-01-05	
<b>Auftraggeber:</b> <i>Client:</i>	<b>Signify (China) Investment Co., Ltd.</b> Building no.9, Lane 888, Tianlin Road, Minhang District, Shanghai, China			
<b>Prüfgegenstand:</b> <i>Test item:</i>	Zigbee Green Power Device - 4 button Switch			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type no.:</i>	SWS201			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Test Report			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247 RSS-247 Issue 3 August 2023 RSS-Gen Issue 5 February 2021			
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	2024-01-09	Please refer to Photo Document		
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	A003631937-001~006			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	2024-01-19 - 2024-01-22			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>geprüft von:</b> <i>tested by:</i>	 <b>Lin Lin</b>	<b>genehmigt von:</b> <i>authorized by:</i>	 <b>Hardy Suo</b>	
<b>Datum:</b> <i>Date:</i>	2024-02-26	<b>Ausstellungsdatum:</b> <i>Issue date:</i>	2024-02-26	
<b>Stellung / Position:</b>	Sachverständige(r)/Expert	<b>Stellung / Position:</b>	Sachverständige(r)/Expert	
<b>Sonstiges /</b> <i>Other:</i>	FCC ID: 2AGBW-SWS201 IC: 20812-SWS201, HVIN: SWS201			
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

v05

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Test report no.:

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**Anmerkungen**  
Remarks

1	<p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p>
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3	<p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p>
4	<p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information on the resulting risk based of this decision rule please refer to ILAC G8:2019.</i></p>

## Test Summary

**5.1.1 ANTENNA REQUIREMENT**

RESULT: Pass

**5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER**

RESULT: Pass

**5.1.3 CONDUCTED POWER SPECTRAL DENSITY**

RESULT: Pass

**5.1.4 6DB BANDWIDTH**

RESULT: Pass

**5.1.5 99% BANDWIDTH**

RESULT: Pass

**5.1.6 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH**

RESULT: Pass

**5.1.7 RADIATED SPURIOUS EMISSION**

RESULT: Pass

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# 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 Zigbee

Appendix B: Photographs of the Test Set-up

## 2 Test Sites

### 2.1 Test Facilities

**TÜV Rheinland (Shenzhen) Co., Ltd.**

No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China.

FCC Accreditation Designation No.: CN1260

ISED wireless device testing laboratory: 25069

### 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

<b>Radio Spectrum Testing (TS8997)</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Cal. Date</b>	<b>Cal. until</b>
Signal Analyzer	R&S	FSV 40	101441	2023-07-26	2024-07-25
OSP	R&S	OSP 150	101017	2023-11-14	2024-11-13
Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A	N/A
Test Software	R&S	WMS32 (V11.00.00)	N/A	N/A	N/A
Power Meter	R&S	NRP2	107105	2023-11-14	2024-11-13
Wideband Power Sensor	R&S	NRP-Z81	105677	2023-07-26	2024-07-25
Shielding Room 8#	Albatross	SR8	APC17151-SR8	2021-06-22	2024-06-22
<b>Unwanted Emission Testing (TS9975)</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Cal. Date</b>	<b>Cal. until</b>
EMI Test Receiver	R&S	ESR 7	102021	2023-07-26	2024-07-25
Signal Analyzer	R&S	FSV 40	101439	2023-07-26	2024-07-25
System Controller Interface	R&S	SCI-100	S10010038	N/A	N/A
Filterbank	R&S	Wlan	100759	2023-07-26	2024-07-25
OSP	R&S	OSP 120	102040	N/A	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2023-07-26	2024-07-25
Amplifier	R&S	SCU-18F	180070	2023-07-26	2024-07-25
Amplifier	R&S	SCU40A	100475	2023-07-26	2024-07-25
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2022-08-07	2024-08-06
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2022-08-07	2024-08-06
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2022-08-28	2024-08-27
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2022-08-07	2024-08-06
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A	N/A

3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2021-06-22	2024-06-22
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## 2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

**Table 2: Measurement Uncertainty**

Parameter	Uncertainty (k=2)
RF output power, conducted	± 0.99 dB
Occupied Channel Bandwidth	± 2.08 %
RF power density, conducted	± 0.99 dB
Unwanted Emissions, conducted	± 0.89 dB
All emissions, radiated	±4.17 dB

## 2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

## 2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

### 3 General Product Information

#### 3.1 Product Function and Intended Use

The product is a Zigbee Green Power Device - 4 button Switch, which supports Zigbee wireless technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

#### 3.2 Ratings and System Details

**Table 3: Technical Specification of EUT**

General Information of EUT	Value
Kind of Equipment:	Zigbee Green Power Device - 4 button Switch
Type Designation:	SWS201
FCC ID:	2AGBW-SWS201
IC:	20812-SWS201
HVIN:	SWS201
Operating Voltage:	Battery operated (3Vdc)
Operating Temperature Range:	-5 °C ~ +45 °C
Technical Specification of Zigbee	
Operating Frequency:	2405 MHz to 2480 MHz
Type of Modulation:	DSSS(OQPSK)
Channel Number:	16 channels
Channel Separation:	5MHz
Antenna Type:	Integral Antenna
Antenna Gain:	1.87 dBi (Provided by the Client)

**Table 4: RF Channel and Frequency of Zigbee**

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
01	2405.0	05	2425.0	09	2445.0	13	2465.0
02	2410.0	06	2430.0	10	2450.0	14	2470.0
03	2415.0	07	2435.0	11	2455.0	15	2475.0
04	2420.0	<b>08</b>	<b>2440.0</b>	12	2460.0	<b>16</b>	<b>2480.0</b>

Test frequencies are lowest channel: 2405.0 MHz, middle channel: 2440.0 MHz and highest channel: 2480.0MHz for Zigbee



### 3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Zigbee transmitting mode
  - 1) Low Channel
  - 2) Middle Channel
  - 3) High Channel
- B. Off

### 3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

### 3.5 Submitted Documents

- Application Form
- Operation Description
- User Manual
- ID Label and Location Info

## 4 Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

**Radio Spectrum:** The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

**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.

### 4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model SWS201 in this report.

### 4.3 Special Accessories and Auxiliary Equipment

Table 5: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Laptop	Lenovo	T480	PF-16A6N8

### 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.

### 4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

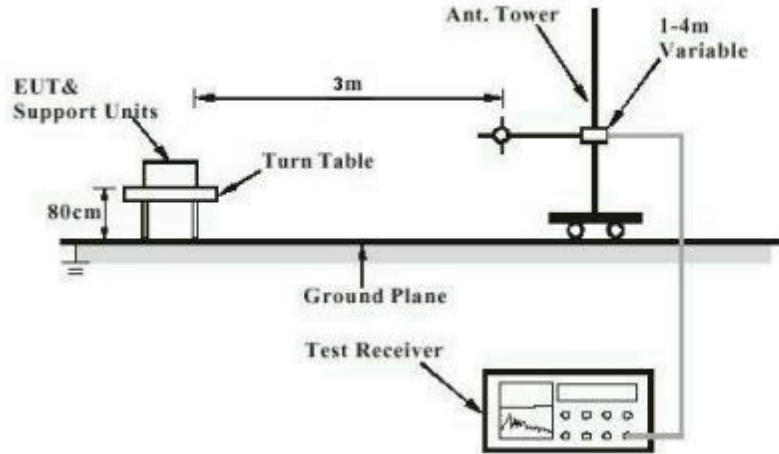


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

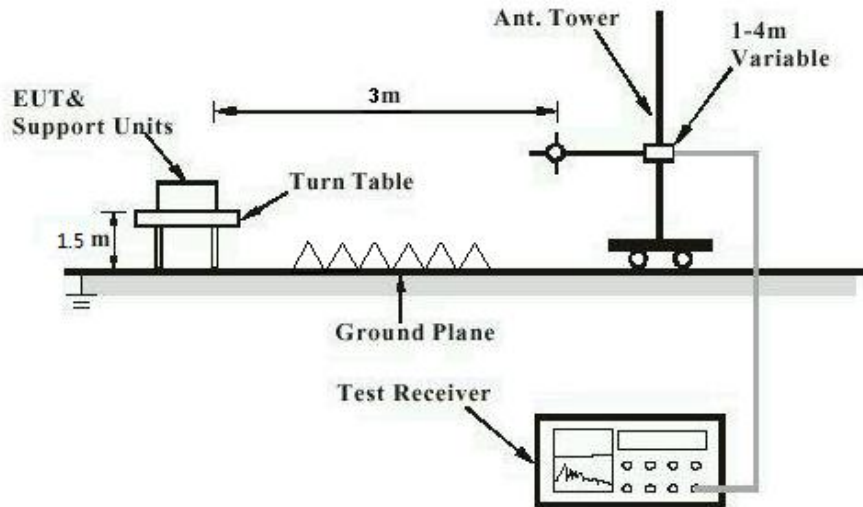
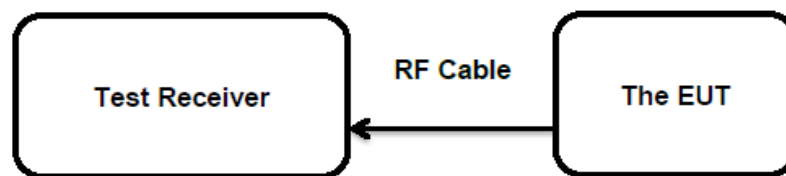


Diagram of Measurement Configuration for Conducted Transmitter Measurement



## 5 Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Antenna Requirement

RESULT:

Pass

**Test Specification**

Test standard : FCC Part 15.247(b)(4) and Part 15.203  
RSS-Gen Clause 6.8

According to the manufacturer declared, the EUT has an Integral antenna, the directional gain of antenna is 1.87 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.



### 5.1.3 Conducted Power Spectral Density

**RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.247(e) RSS-247 Section 5.2(b)
Basic standard	: ANSI C63.10: 2013
Limits	: < 8 dBm / 3kHz
Kind of test site	: Shielded Room

**Test Setup**

Date of testing	: 2024-01-19
Input voltage	: Battery operated (3Vdc)
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 23.1 °C
Relative humidity	: 51 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix A.

### 5.1.4 6dB Bandwidth

**RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.247(a)(2) RSS-247 Section 5.2(a)
Basic standard	: ANSI C63.10: 2013
Limits	: > 500 kHz
Kind of test site	: Shielded Room

**Test Setup**

Date of testing	: 2024-01-19
Input voltage	: Battery operated (3Vdc)
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 23.1 °C
Relative humidity	: 51 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix A.

### 5.1.5 99% Bandwidth

**RESULT:****Pass****Test Specification**

Test standard : FCC Part 15.247(a)  
RSS-Gen Clause 6.7

Basic standard : ANSI C63.10: 2013

Kind of test site : Shielded Room

**Test Setup**

Date of testing : 2024-01-19

Input voltage : Battery operated (3Vdc)

Operation mode : A

Test channel : Low / Middle / High

Ambient temperature : 23.1 °C

Relative humidity : 51 %

Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.



## 5.1.6 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

**RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.247(d) RSS-247 Section 5.5
Basic standard	: ANSI C63.10: 2013
Limits	: 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	: Shielded Room

**Test Setup**

Date of testing	: 2024-01-19
Input voltage	: Battery operated (3Vdc)
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 23.1 °C
Relative humidity	: 51 %
Atmospheric pressure	: 101 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix A.

## 5.1.7 Radiated Spurious Emission

**RESULT:****Pass****Test Specification**

Test standard	: FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Section 3.3
Basic standard	: ANSI C63.10: 2013
Limits	: Refer to 15.209(a) of FCC part 15.247(d) RSS-Gen Section 8.9 & 8.10
Kind of test site	: 3m Semi-anechoic Chamber

**Test Setup**

Date of testing	: 2024-01-21 to 2024-01-22
Input voltage	: Battery operated (3Vdc)
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: Refer to test result
Relative humidity	: Refer to test result
Atmospheric pressure	: 101 kPa

**Remark:**

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix A.

## 6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix B.

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