| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.:* | **CN21AFF6 001** | **Auftrags-Nr.:** *Order no.*: | 168326112 | **Seite 1 von 15** *Page 1 of 15* |
| **Kunden-Referenz-Nr.:** *Client reference no.:* | **N/A** | **Auftragsdatum:** *Order date:* | 2021-07-07 | |
| **Auftraggeber:** *Client:* | **Lenovo (Beijing) Limited** 201-H2-6, Floor 2, Building 2, No.6 Shangdi West Road, Haidian District, Beijing 100085, P.R.China | | | |
| **Prüfgegenstand:** *Test item:* | Lenovo Go Wireless Split Keyboard | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type no.:* | KB299W (Trademark: Lenovo) | | | |
| **Auftrags-Inhalt:** *Order content*: | Test Report | | | |
| **Prüfgrundlage:** *Test specification:* | FCC CFR Title 47, Part 15, Subpart C, Section 15.249 | | | |

| | | |
|---|---|---|
| **Wareneingangsdatum:** *Date of sample receipt:* | 2021-07-20 | Please refer to Photo Document |
| **Prüfmuster-Nr.:** *Test sample no:* | A003093381-001~003<br>A003093381-005~006 | |
| **Prüfzeitraum:** *Testing period:* | 2021-07-21 – 2021-08-27 | |
| **Ort der Prüfung:** *Place of testing:* | TÜV Rheinland (Shenzhen) Co., Ltd. | |
| **Prüflaboratorium:** *Testing laboratory:* | TÜV Rheinland (Shenzhen) Co., Ltd. | |
| **Prüfergebnis*:** *Test result*:* | Pass | |

| | | | |
|---|---|---|---|
| **geprüft von:** *tested by:* | Lin Lin | **genehmigt von:** *authorized by:* | Hardy Suo |
| **Datum:** *Date:* 2021-08-30 | | **Ausstellungsdatum:** *Issue date:* 2021-08-30 | |
| **Stellung** / *Position:* | Senior Project Manager | **Stellung** / *Position:* | Reviewer |
| **Sonstiges** / *Other:* | FCC ID: A5MKB299W | | |

| | |
|---|---|
| **Zustand des Prüfgegenstandes bei Anlieferung:** *Condition of the test item at delivery:* | Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged* |

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhaft |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| ** Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specification(s)* | | *F(ail) = failed a.m. test specification(s)* | *N/A = not applicable* | *N/T = not tested* |

# *Test Summary*

**5.1.1 ANTENNA REQUIREMENT**
*RESULT: Pass*

**5.1.2 FIELD STRENGTH OF FUNDAMENTAL AND HARMONICS**
*RESULT: Pass*

**5.1.3 20DB AND 99% BANDWIDTH**
*RESULT: Pass*

**5.1.4 BAND EDGE**
*RESULT: Pass*

# Table of Contents

# 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: Photographs of the Test Set-up

Appendix B: Test Results

# 2 Test Sites

## 2.1 Test Facilities

**TÜV Rheinland (Shenzhen) Co., Ltd.**
362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of 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**

| **Unwanted Emission Testing (TS9975)** | | | | |
|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial No.** | **Cal. until** |
| EMI Test Receiver | R&S | ESR 7 | 102021 | 2022-08-10 |
| Signal Analyzer | R&S | FSV 40 | 101439 | 2022-08-09 |
| System Controller Interface | R&S | SCI-100 | S10010038 | N/A |
| Filterbank | R&S | Wlan | 100759 | 2022-08-09 |
| OSP | R&S | OSP 120 | 102040 | N/A |
| Pre-amplifier | R&S | SCU08F1 | 08320031 | 2022-08-09 |
| Amplifier | R&S | SCU-18F | 180070 | 2022-08-09 |
| Amplifier | R&S | SCU40A | 100475 | 2022-08-09 |
| Trilog Broadband Antenna (30 MHz - 7 GHz) | Schwarzbeck | VULB 9162 | 193 | 2022-08-08 |
| Double-Ridged Antenna (1 -18 GHz) | ETS-LINDGREN | 3117 | 00218717 | 2022-08-08 |
| Wideband Ridged Horn Antenna (18-40 GHz) | Steatite | QMS-00880 | 19067 | 2022-08-08 |
| Active Loop Antenna | Schwarzbeck | FMZB 1513 | 302 | 2022-09-13 |
| Wideband Ridged Horn Antenna (12-18 GHz) | Steatite | QMS-00208 | 18313 | 2021-09-02 |
| Test software | R&S | EMC32 (V10.60.10) | N/A | N/A |
| Control PC | Dell | OptiPlex 7050 | 36NV9P2 | N/A |
| 3m Semi-Anechoic Chamber | Albatross | SAC-3m | APC17151-SAC | 2024-06-24 |

## 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 basics using in house standards or comparisons.

## 2.5 Measurement Uncertainty

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

| Parameter | Uncertainty |
|---|---|
| Radio Frequency | ±1 x 10-7 |
| RF Power (conducted) | ±2.5 dB |
| Radiated Emission of Transmitter, valid up to 26.5 GHz | ±6 dB |
| Radiated Emission of Receiver, valid up to 26.5 GHz | ±6 dB |
| Temperature | ±1 °C |
| Humidity | ±5 % |
| Voltage (DC) | ±1 % |
| Voltage (AC, <10kHz) | ±2 % |

## 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 362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of 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 products is a Lenovo Go Wireless Split Keyboard, which supports 2.4GHz transmitter wireless technology.

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

## 3.2 Ratings and System Details

**Table 2: Technical Specification of EUT**

| **General Information of EUT** | **Value** |
|---|---|
| Kind of Equipment: | Lenovo Go Wireless Split Keyboard |
| Type Designation: | KB299W |
| Trademark: | Lenovo |
| FCC ID: | A5MKB299W |
| Operating Voltage: | Battery operated (2 X AA battery, 3.0Vdc) |
| Operating Temperature Range: | 0 °C ~ 40 °C |
| **Technical Specification of 2.4GHz** | |
| Frequency Range: | 2402 - 2480 MHz |
| Type of Modulation: | GFSK |
| Channel Number: | 40 channels |
| Antenna Type: | Chip Antenna |
| Antenna Gain: | 2.45 dBi |

## 3.3 Independent Operation Modes

The basic operation modes are:

A. 2.4GHz transmitting mode
    1. Low channel
    2. Middle channel
    3. High channel

## 3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

## 3.5 Submitted Documents

- Application Form
- Rating Label

# 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.

Table 3: Test environments

| Environment Parameter | Values During Tests | | |
|---|---|---|---|
| | Temperature | Voltage (Battery operated) | Relative Humidity |
| NTNV | 25°C±2°C | 3.0Vdc | Ambient |

Table 4: Test channel and frequency

| Mode | Test Channels (MHz) | Remark |
|---|---|---|
| Transmitting | L/M/H: 2402MHz, 2440MHz, 2480MHz | -- |

## 4.3 Special Accessories and Auxiliary Equipment

**Table 5: Auxiliary Equipment Used during Test**

| 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)**

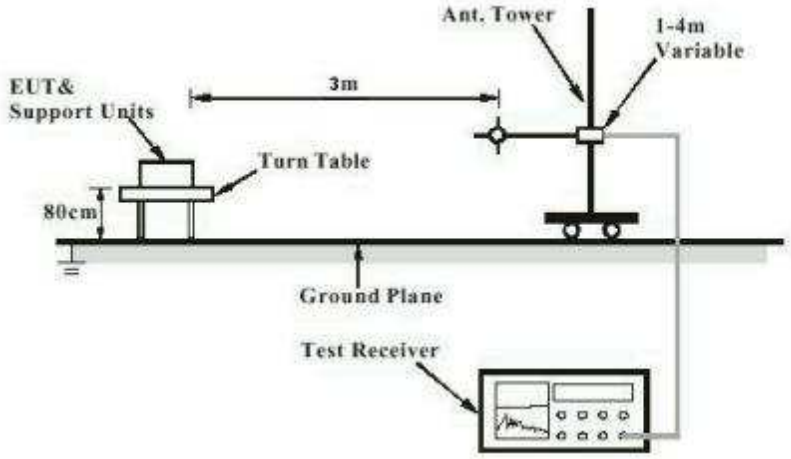



**Diagram of Measurement Configuration for Radiation Test (Above 1GHz)**

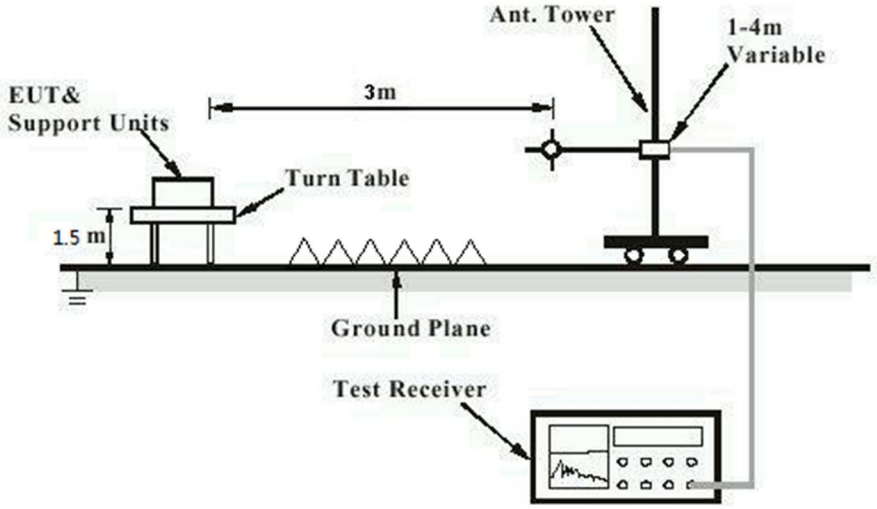
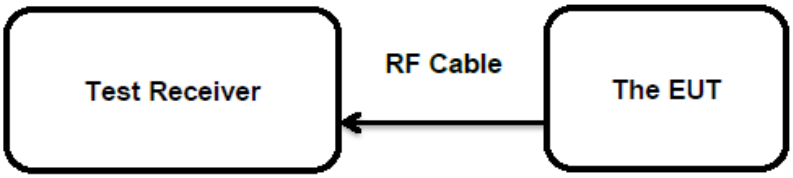



**Diagram of Measurement Configuration for Conducted Transmitter Measurement**



# 5 Test Results

## 5.1 Transmitter Requirement & Test Suites

### 5.1.1 Antenna Requirement

**RESULT:** **Pass**

**Test Specification**
Test standard : FCC Part 15.203

According to the manufacturer declared, the EUT has a Chip antenna, the gain of antenna is 2.45 dBi, which that 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.

## 5.1.2 Field strength of fundamental and harmonics

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.249(a) (d) (e) |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | FCC Part 15.249(a) (d) (e) & 15.209(a) |
| Kind of test site | : | 3m Semi-anechoic Chamber |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2021-07-22 to 2021-08-27 |
| Input voltage | : | Battery operated |
| Operation mode | : | A |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | Refer to test result |
| Relative humidity | : | Refer to test result |
| Atmospheric pressure | : | 101 kPa |

Note: 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 B.

## 5.1.3 20dB and 99% Bandwidth

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.215<br>RSS-Gen Section 6.7 |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | Within assigned band |
| Kind of test site | : | Shielded Room |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2021-08-25 |
| Input voltage | : | Battery operated |
| Operation mode | : | A |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | 22 ℃ |
| Relative humidity | : | 50 % |
| Atmospheric pressure | : | 101 kPa |

For the measurement records, refer to the appendix B.

## 5.1.4 Band Edge

**RESULT:** **Pass**

**Test Specification**

| | | |
|---|---|---|
| Test standard | : | FCC Part 15.249(a) (d) (e) & 15.209 & 15.205 |
| Basic standard | : | ANSI C63.10: 2013 |
| Limits | : | FCC Part 15.249(a) (d) (e) & 15.209 & 15.205 |
| Kind of test site | : | 3m Semi-anechoic Chamber |

**Test Setup**

| | | |
|---|---|---|
| Date of testing | : | 2021-07-22 to 2021-08-27 |
| Input voltage | : | Battery operated |
| Operation mode | : | A |
| Test channel | : | Low / Middle / High |
| Ambient temperature | : | Refer to test result |
| Relative humidity | : | Refer to test result |
| Atmospheric pressure | : | 101 kPa |

For the measurement records, refer to the appendix B.

# 6 Photographs of the Test Set-Up

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

# 7 List of Tables