

Prüfbericht-Nr.: <i>Test report no.:</i>	CN211E1I 001	Auftrags-Nr.: <i>Order no.:</i>	168326036	Seite 1 von 15 <i>Page 1 of 15</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2021-07-07	
Auftraggeber: <i>Client:</i>	Lenovo (Beijing) Limited 201-H2-6, Floor 2, Building 2, No.6 Shangdi West Road, Haidian District, Beijing 100085, P.R.China			
Prüfgegenstand: <i>Test item:</i>	Keyboard			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	KB317W (Trademark: Lenovo)			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	FCC CFR Title 47, Part 15, Subpart C, Section 15.249			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2021-07-05	Please refer to Photo Document		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003087125-001~002 A003087340-002~003			
Prüfzeitraum: <i>Testing period:</i>	2021-07-16 – 2021-07-21			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2021-07-30	Ausstellungsdatum: <i>Issue date:</i> 2021-07-30			
Stellung / Position: Senior Project Manager	Stellung / Position: Reviewer			
Sonstiges / Other: FCC ID: A5MKB317W				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
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. <i>This test report only relates to the a. m. 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>				

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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

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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: 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	2021-08-11
Signal Analyzer	R&S	FSV 40	101439	2021-08-10
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	2021-08-10
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2021-08-10
Amplifier	R&S	SCU-18F	180070	2021-08-10
Amplifier	R&S	SCU40A	100475	2021-09-10
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	2022-07-01

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 measurements as below table.

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
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 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:	Keyboard
Type Designation:	KB317W
Trademark:	Lenovo
FCC ID:	A5MKB317W
Operating Voltage:	Battery operated (1 X AA battery, 1.5Vdc)
Operating Temperature Range:	0 °C ~ 40 °C
Technical Specification of 2.4GHz	
Frequency Range:	2403 - 2479 MHz
Type of Modulation:	GFSK
Channel Number:	16 channels
Antenna Type:	PCB antenna
Antenna Gain:	-1.39 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	1.5Vdc	Ambient

Table 4: Test channel and frequency

Mode	Test Channels (MHz)	Remark
Transmitting	L/M/H: 2403MHz, 2439MHz, 2479MHz	--

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)

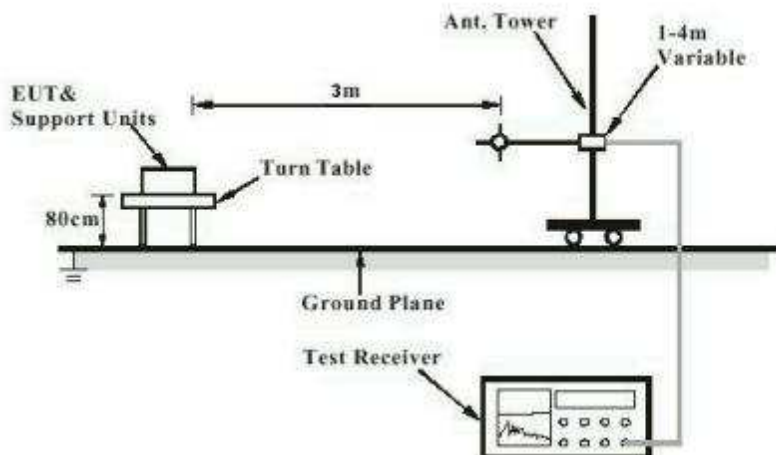


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

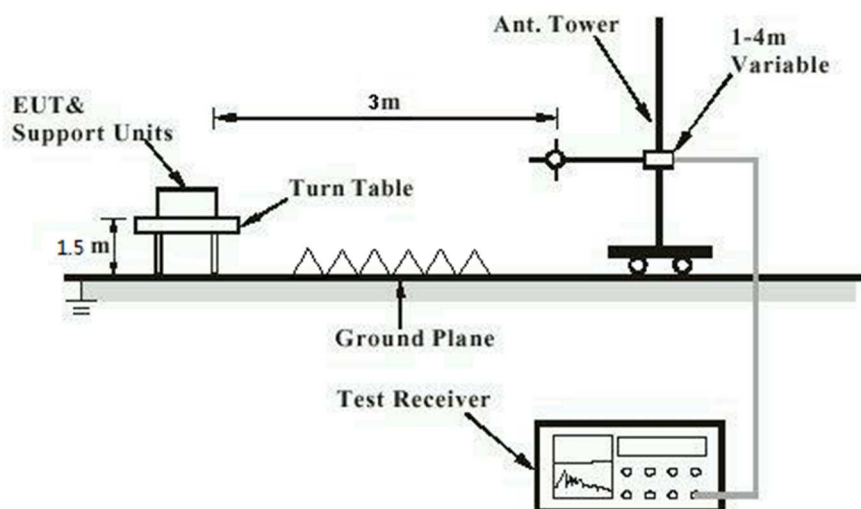
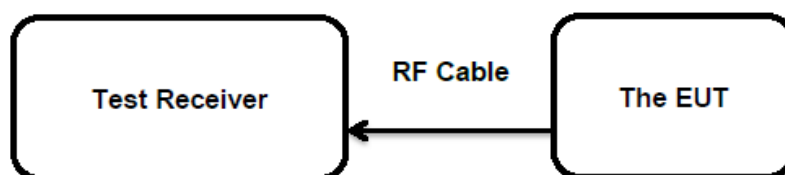


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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 PCB antenna, the gain of antenna is -1.39 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	:	2021-07-21
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.

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5.1.3 20dB and 99% Bandwidth

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

Test standard : FCC Part 15.215
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 : 2021-07-16

Input voltage : Battery operated

Operation mode : A

Test channel : Low / Middle / High

Ambient temperature : 22 °C

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	: 2021-07-21
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

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