

<b>Prüfbericht-Nr.:</b> <i>Test report no.:</i>	<b>CN22EOK1 003</b>	<b>Auftrags-Nr.:</b> <i>Order no.:</i>	<b>168363715</b>	<b>Seite 1 von 17</b> <i>Page 1 of 17</i>	
<b>Kunden-Referenz-Nr.:</b> <i>Client reference no.:</i>	<b>N/A</b>	<b>Auftragsdatum:</b> <i>Order date:</i>	<b>2022-03-22</b>		
<b>Auftraggeber:</b> <i>Client:</i>	<b>Lenovo (Beijing) Limited</b> 201-H2-6, Floor 2, Building 2, No. 6 Shangdi West Road, Haidian District, Beijing, China				
<b>Prüfgegenstand:</b> <i>Test item:</i>	Lenovo Wireless Gaming Mouse				
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type no.:</i>	MG880F, MG680F (Trademark: Lenovo)				
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Test Report				
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC CFR Title 47, Part 15, Subpart C, Section 15.249				
<b>Wareneingangsdatum:</b> <i>Date of sample receipt:</i>	2022-03-24	Please refer to Photo Document			
<b>Prüfmuster-Nr.:</b> <i>Test sample no.:</i>	A003252373-001~006 A003223013-001				
<b>Prüfzeitraum:</b> <i>Testing period:</i>	2022-03-31 – 2022-05-20				
<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>	2022-05-25	<b>Ausstellungsdatum:</b> <i>Issue date:</i>	2022-05-25		
<b>Stellung / Position:</b>	Senior Project Manager	<b>Stellung / Position:</b>	Reviewer		
<b>Sonstiges / Other:</b>	FCC ID: A5MMMG880F				
<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>				
<b>* Legende:</b>	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
<b>* Legend:</b>	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	5 = poor 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 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>					

V05

## ***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*

**5.1.5 CONDUCTED EMISSION ON AC MAINS**

*RESULT: Pass*

## Table of Contents

<b>1</b>	<b>GENERAL REMARKS .....</b>	<b>4</b>
<b>1.1</b>	<b>COMPLEMENTARY MATERIALS .....</b>	<b>4</b>
<b>2</b>	<b>TEST SITES .....</b>	<b>5</b>
<b>2.1</b>	<b>TEST FACILITIES .....</b>	<b>5</b>
<b>2.2</b>	<b>LIST OF TEST AND MEASUREMENT INSTRUMENTS.....</b>	<b>5</b>
<b>2.3</b>	<b>TRACEABILITY .....</b>	<b>6</b>
<b>2.4</b>	<b>CALIBRATION .....</b>	<b>6</b>
<b>2.5</b>	<b>MEASUREMENT UNCERTAINTY.....</b>	<b>6</b>
<b>2.6</b>	<b>LOCATION OF ORIGINAL DATA.....</b>	<b>6</b>
<b>2.7</b>	<b>STATUS OF FACILITY USED FOR TESTING.....</b>	<b>6</b>
<b>3</b>	<b>GENERAL PRODUCT INFORMATION .....</b>	<b>7</b>
<b>3.1</b>	<b>PRODUCT FUNCTION AND INTENDED USE.....</b>	<b>7</b>
<b>3.2</b>	<b>RATINGS AND SYSTEM DETAILS .....</b>	<b>7</b>
<b>3.3</b>	<b>INDEPENDENT OPERATION MODES .....</b>	<b>7</b>
<b>3.4</b>	<b>NOISE GENERATING AND NOISE SUPPRESSING PARTS .....</b>	<b>8</b>
<b>3.5</b>	<b>SUBMITTED DOCUMENTS.....</b>	<b>8</b>
<b>4</b>	<b>TEST SET-UP AND OPERATION MODES .....</b>	<b>9</b>
<b>4.1</b>	<b>PRINCIPLE OF CONFIGURATION SELECTION .....</b>	<b>9</b>
<b>4.2</b>	<b>TEST OPERATION AND TEST SOFTWARE.....</b>	<b>9</b>
<b>4.3</b>	<b>SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....</b>	<b>9</b>
<b>4.4</b>	<b>COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE .....</b>	<b>9</b>
<b>4.5</b>	<b>TEST SETUP DIAGRAM .....</b>	<b>10</b>
<b>5</b>	<b>TEST RESULTS .....</b>	<b>12</b>
<b>5.1</b>	<b>TRANSMITTER REQUIREMENT &amp; TEST SUITES .....</b>	<b>12</b>
<i>5.1.1</i>	<i>Antenna Requirement .....</i>	<i>12</i>
<i>5.1.2</i>	<i>Field strength of fundamental and harmonics .....</i>	<i>13</i>
<i>5.1.3</i>	<i>20dB and 99% Bandwidth .....</i>	<i>14</i>
<i>5.1.4</i>	<i>Band Edge.....</i>	<i>15</i>
<i>5.1.5</i>	<i>Conducted Emission on AC Mains.....</i>	<i>16</i>
<b>6</b>	<b>PHOTOGRAPHS OF THE TEST SET-UP .....</b>	<b>17</b>
<b>7</b>	<b>LIST OF TABLES.....</b>	<b>17</b>

## 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**

<b>Unwanted Emission Testing (TS9975)</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Cal. until</b>
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
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	2024-06-22

<b>Conducted Emission</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal. Until</b>
EMI Test Receiver	R&S	ESR3	102428	2022-08-10
Artificial Mains Network	R&S	ENV216	102333	2022-08-10
EMC32 test software	R&S	EMC32(Ver.10.50.0 0)	N/A	N/A

## 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.

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF Power (conducted)	$\pm 2.5$ dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	$\pm 6$ dB
Radiated Emission of Receiver, valid up to 26.5 GHz	$\pm 6$ dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	$\pm 3.70$ dB / $\pm 3.30$ dB
Temperature	$\pm 1$ °C
Humidity	$\pm 5$ %
Voltage (DC)	$\pm 1$ %
Voltage (AC, <10kHz)	$\pm 2$ %

## 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 EUTs is a Lenovo Wireless Gaming Mouse, which supports Bluetooth low energy, 2.4GHz wireless and wireless charging (WPT) technologies.

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 Wireless Gaming Mouse
Type Designation:	MG880F, MG680F
Note1: The models MG880F and MG680F same as appearance, dimensions, PCB mother board and PCB sub board, only difference is MG880F with Qi WPT wireless charging function (Max. Wireless charging rated power is 5W), and MG680F without Qi wireless charging function as based on the model MG880F removed the Qi WPT Rx coil and related Qi peripheral circuitry. Note2: based on above description, selected the model MG880F as master device and additional test (Spurious Emissions and Conducted Emissions) for model MG680F.	
Trademark:	Lenovo
FCC ID:	A5MMG880F
Operating Voltage:	Internal battery operated (3.7Vdc) or Charging by PC USB Port (PC input voltage 120Vac, 60Hz) or Charging by Wireless charger (Qi) (AC/DC Adapter input voltage 120Vac, 60Hz)
Technical Specification of 2.4GHz	
Frequency Range:	2402 MHz to 2480 MHz
Type of Modulation:	GFSK
Channel Number:	79 channels
Channel Separation:	1 MHz
Antenna Type:	Chip Antenna
Antenna Gain:	3.50 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
- B. On, USB C Charging + 2.4G
- C. Off

### 3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

### 3.5 Submitted Documents

- Application Form

- 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.

**Table 3: Test environments**

Environment Parameter	Values During Tests		
	Temperature	Voltage (Battery operated)	Relative Humidity
NTNV	25°C±2°C	3.7Vdc	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
Portable Laptop	Lenovo	ThinkPad T480	10Q67059
USB C cable	Lenovo	Shielded, Length: 60cm	N/A

### 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)

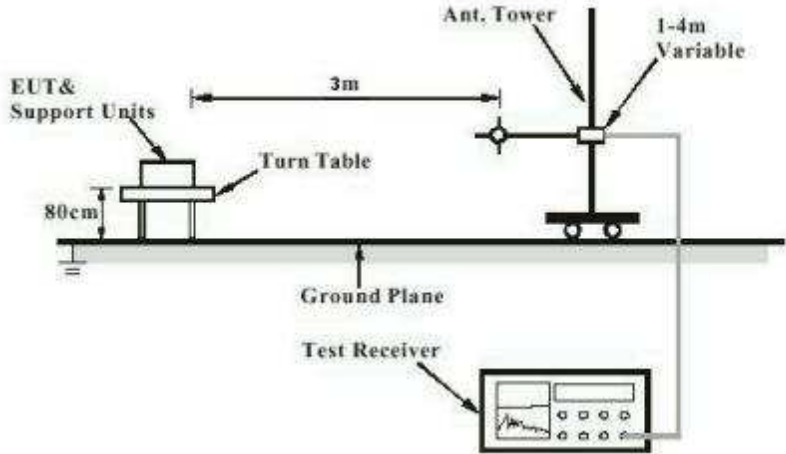


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

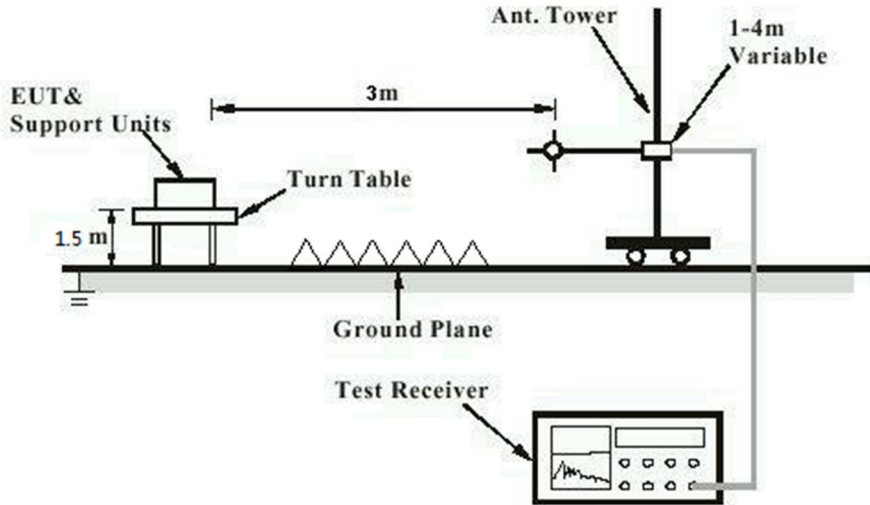


Diagram of Measurement Configuration for Mains Conduction Measurement

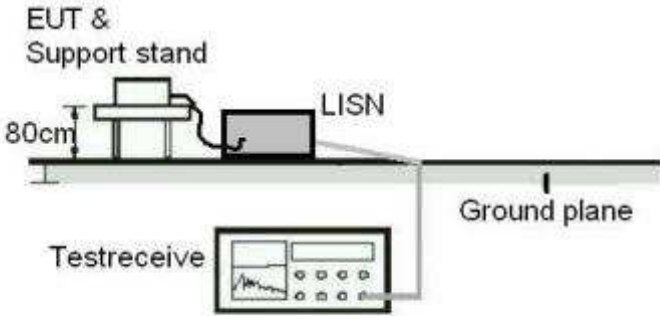
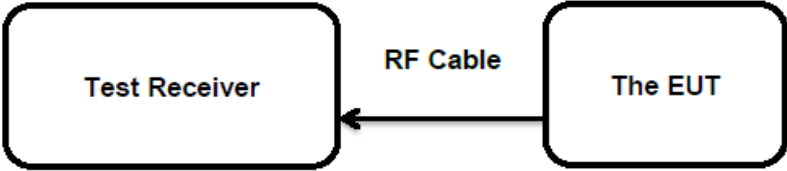


Diagram of Measurement Configuration for Conducted Transmitter Measurement



## 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 3.50 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	:	2022-05-20
Input voltage	:	Internal 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 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	:	2022-04-06
Input voltage	:	Internal battery operated
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25.5 °C
Relative humidity	:	45 %
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	: 2022-05-20
Input voltage	: Internal 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.

**Prüfbericht - Nr.: CN22EOK1 003**  
Test Report No.:Seite 16 von 17  
Page 16 of 17

### 5.1.5 Conducted Emission on AC Mains

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

Test standard : FCC Part 15.207(a)  
Basic standard : ANSI C63.10: 2013  
Frequency range : 0.15 – 30MHz  
Limits : FCC Part 15.207(a)  
Kind of test site : Shielded Room

**Test Setup**

Date of testing : 2022-03-31  
Input voltage : Charging by PC USB Port (PC input voltage 120Vac, 60Hz)  
Operation mode : B  
Earthing : Not connected  
Ambient temperature : 23.9 °C  
Relative humidity : 53 %  
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

Table 1: List of Test and Measurement Equipment.....	5
Table 2: Technical Specification of EUT.....	7
Table 3: Test environments.....	9
Table 4: Test channel and frequency.....	9
Table 5: Auxiliary Equipment Used during Test.....	9