

Prüfbericht-Nr.: <i>Test report no.:</i>	60414293 002	Auftrags-Nr.: <i>Order no.:</i>	168274339	Seite 1 von 18 <i>Page 1 of 18</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2020-07-21	
Auftraggeber: <i>Client:</i>	LENOVO (BEIJING) LIMITED 201-H2-6, Floor 2, Building2, No.6 Shangdi West Road, Haidian District, Beijing 100085, P.R.China			
Prüfgegenstand: <i>Test item:</i>	Wireless Receiver			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	RG51-6108			
Auftrags-Inhalt: <i>Order content:</i>	FCC approval			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.249 CFR47 FCC Part 15: Subpart C Section 15.209 CFR47 FCC Part 15: Subpart C Section 15.207			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020-08-04	Please refer to photo documents		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A002878830-001~003			
Prüfzeitraum: <i>Testing period:</i>	2020-08-05 - 2020-09-08			
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>	2020-09-09	Ausstellungsdatum: <i>Issue date:</i>	2020-09-09	
Stellung / Position	Lin Lin / Senior Project Manager	Stellung / Position	Winnie Hou / Technical Certifier	
Sonstiges / Other: FCC ID: A5MRG51-6108				
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 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 specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable 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 FUNDAMENTAL & HARMONICS RADIATED EMISSION

RESULT: Pass

5.1.3 20dB BANDWIDTH

RESULT: Pass

5.1.4 RADIATED SPURIOUS EMISSION & BAND EDGE

RESULT: Pass

5.1.5 CONDUCTED EMISSION ON AC MAINS

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 of General 2.4GHz.

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 Registration No.: CN1260

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

TÜV Rheinland (Shenzhen) Co., Ltd.

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	2020-09-20
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	2020-09-30
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	2021-07-06

Conducted Emission on AC Mains				
Equipment	Manufacturer	Model No.	Serial No.	Cali. until
EMI Test Receiver	R&S	ESR3	102428	2021-08-16
Artificial Mains Network	R&S	ENV216	102333	2021-08-16
EMC32 test software	R&S	EMC32(Ver.10.50.01)	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)	± 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
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	± 3.70 dB / ± 3.30 dB
Radiated Emission (3m SAC), 30MHz to 1000MHz	± 4.52 dB
Radiated Emission (3m SAC), above 1000MHz	± 4.37 dB
Temperature	± 1 °C
Humidity	± 5 %
Voltage (DC)	± 1 %

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.

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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 EUT is a USB dongle, which supports 2.4GHz 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	Wireless Receiver
Type Designation	RG51-6108
FCC ID	A5MRG51-6108
Operating Voltage	DC 5.0V via USB port
Frequency Range	2405-2475 MHz
Type of Modulation	GFSK (non-FHSS)
Channel Number	16 channels
Channel Separation	2MHz, 3MHz, 4MHz, 5MHz, 6MHz, 7MHz, 8MHz, 10MHz
Antenna Type	Integral Antenna
Antenna Gain	-0.71 dBi

Table 3: RF Channel and Frequency of Transmitter

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2405	2	2407	3	2414	4	2419
5	2422	6	2426	7	2436	8	2439
9	2441	10	2445	11	2453	12	2459
13	2463	14	2466	15	2473	16	2475

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Transmitting mode
- B. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form

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 RG51-6108 in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N	Rating
Wireless mouse	Lenovo	L530-A	N/A	DC 1.5V
Portable Laptop	Lenovo	ThinkPad T480	10Q67059	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)

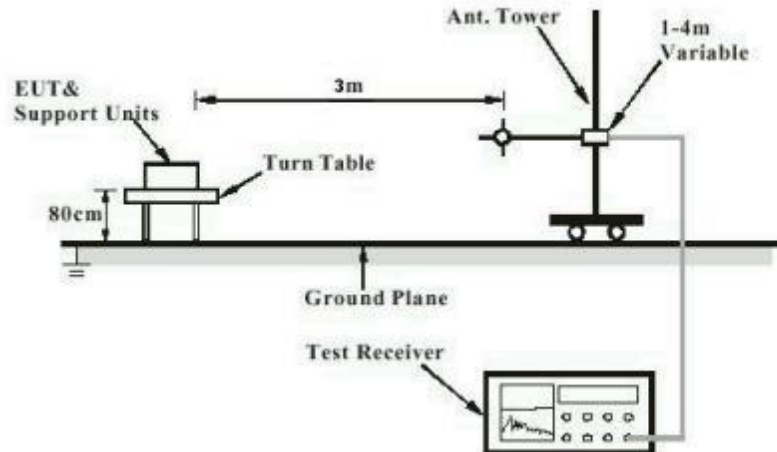


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

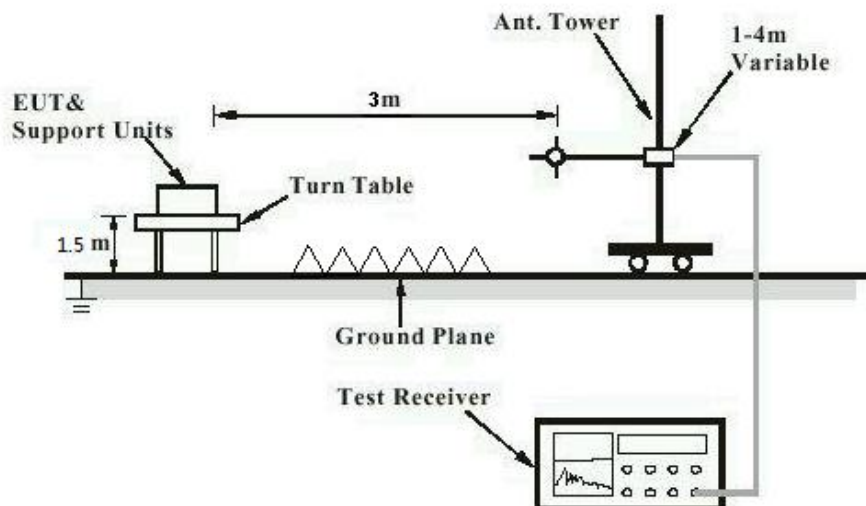


Diagram of Measurement Configuration for Mains Conduction Measurement

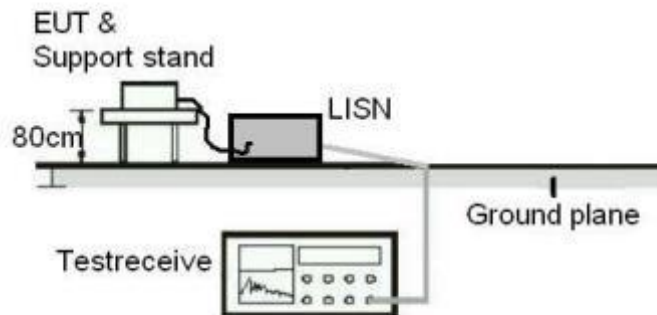
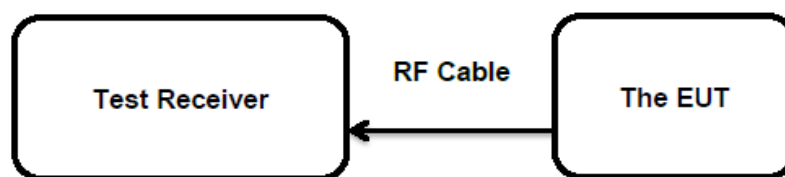


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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 an internal antenna, the directional gain of antenna is -0.71 dBi, and the antenna is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

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

Refer to EUT Photo for further details.

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5.1.2 Fundamental & Harmonics Radiated Emission

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

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

Test Setup

Date of testing	: 2020-08-07~2020-09-02
Input voltage	: DC 5.0V via USB port
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.

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5.1.3 20dB Bandwidth

RESULT:

Pass

Test Specification

Test standard	: FCC Part 15.215
Basic standard	: ANSI C63.10: 2013
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2020-09-03
Input voltage	: DC 5.0V via USB port
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 22 °C
Relative humidity	: 52 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix B.

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5.1.4 Radiated Spurious Emission & Band Edge

RESULT:

Pass

Test Specification

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

Test Setup

Date of testing	: 2020-09-02
Input voltage	: DC 5.0V via USB port
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 22 °C
Relative humidity	: 52 %
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 B.

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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	: 2020-08-21
Input voltage	: DC 1.5V
Operation mode	: A
Ambient temperature	: 22 °C
Relative humidity	: 54 %
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.

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