Lenovo (Beijing) Limited

Application
For
Certification
FCC ID: A5MC100

Lenovo new glass C100

Model: C100

Brand name: Lenovo

Computer Peripheral

Report No.: 150701028SZN-002

Prepared and Checked by:

Sign on file

Leo Lai
Project Engineer

Approved by:

Digitally signed by Andy Yan
Location: Intertek Testing Services

Andy Yan
Senior Project Engineer
Date: December 13, 2015

TRF No.: FCC 15C_PC_b

LIST OF EXHIBITS

MEASUREMENT / TECHNICAL REPORT

Lenovo (Beijing) Limited
MODEL: C100

FCC ID: A5MC100

This report concerns (check one:) Original Grant ___X___ Class I Change _____

Equipment Type: JBP-Class B Computing Device Peripheral

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No ___X

If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No ___X

If no, assumed Part 15, Subpart B for unintentional radiator – the new 47 CFR [10-01-14 Edition] provision.

Report prepared by:

Leo Lai
Intertek Testing Services Shenzhen Ltd.
Kejiyuan Branch
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List of attached file

Exhibit Type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated photos	radiated photos.pdf
Test Setup Photo	Conducted photos	conducted photos.pdf
External Photo	External Photos	external photos.pdf
Internal Photo	Internal Photos	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
ID Label / Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidential Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf

EXHIBIT 1

GENERAL DESCRIPTION

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a Lenovo new glass C100. The device can be used to connect PC by USB port. The EUT is powered by 3.7Vdc rechargeable battery and charged by USB 5V/dc Port from AC/DC adapter.

1.2 Related Submittal(s) Grants

This is an application for certification of a computer peripheral. Other digital functions were reported in the verification report: 151023010SZN-001
Bluetooth 4.0 Classic: 150701028SZN-003
Bluetooth 4.0 LE: 150701028SZN-004
WiFi 802.11b/g/n: 150701028SZN-005
.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2014). Radiated emission measurement was performed in Semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

EXHIBIT 2

SYSTEM TEST CONFIGURATION

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2014).

The device was powered by fully charged 3.7Vdc battery and charging with PC which operated by AC 120V/60Hz during the test. The worst case data was reported in this report.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. The step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

The frequency range from 30MHz to 6GHz was searched for spurious emissions from the device. Only those emissions reported were detected. All other emissions were at least 20 dB below the applicable limits.

2.2 EUT Exercising Software

N/A

2.3 Special Accessories

Attached shielded USB Cable was used.

2.4 Equipment Modification

Any modifications installed previous to testing by Lenovo (Beijing) Limited will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch.

2.5 Measurement Uncertainty

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Model No.
Laptop	Lenovo	T420
Hard Disk	Smart.drive	HD-003
USB Cable	Smart.drive	Length 155cm
USB Cable	Lenovo	Shielded, Length 92cm
3.5mm Line in cable	Lenovo	Length 30cm
RJ 45 cable	N/A	Cat 5, Length 500cm

EXHIBIT 3

EMISSION RESULTS

3.0 Emission Results

Data is included worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF – AG

where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB/m
AG = Amplifier Gain in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF – AG

3.1 Field Strength Calculation (cont'd)

Example

Assume a receiver reading of 62.0dBμV is obtained. The antenna factor of 7.4dB/m and cable factor of 1.6dB is added. The amplifier gain of 29dB is subtracted. The net field strength for comparison to the appropriate emission limit is 42dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0dBμV
AF = 7.4dB/m
CF = 1.6dB
AG = 29.0dB

FS = 62 + 7.4 + 1.6 – 29 = 42dBμV/m

Level in μV/m = Common Antilogarithm [(42dBμV/m)/20] = 125.9μV/m

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
At
904.455MHz (Data Transfer Mode)

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 9.0dB margin (Data Transfer Mode)

TEST PERSONNEL:

Sign on file

Leo Lai Project Engineer_____
Typed/Printed Name

August 10, 2015_____
Date

Company: Lenovo (Beijing) Limited
Date of Test: August 10, 2015
Model: C100
Operating Mode: Data Transfer

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	62.010	21.8	20.0	10.6	12.4	40.0	-27.6
Horizontal	240.005	18.5	20.0	25.0	23.5	46.0	-22.5
Horizontal	896.695	28.7	20.0	26.0	34.7	46.0	-11.3
Vertical	61.040	16.6	20.0	25.5	22.1	40.0	-17.9
Vertical	362.225	28.2	20.0	26.3	34.5	46.0	-11.5
Vertical	904.455	29.3	20.0	27.7	37.0	46.0	-9.0

NOTES:

1. Quasi-Peak detector is used for frequency up to 1GHz and Peak detector is used for frequency from 1-6GHz.

2. All measurements were made at 3 meters.

3. Negative value in the margin column shows emission below limit.

4. All emissions up to 1GHz are below the QP limit and all emissions between 1-6GHz are below the AV limit.

Test Engineer: Leo Lai

3.4 Conducted Emission at Mains Terminal

3.5 Conducted Emission Configuration Photograph

Worst Case Conducted Configuration
at
0.178 MHz(Data Transfer Mode)

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

3.6 Conducted Emission Data

Judgement: Passed by 14.3 dB margin(Data Transfer Mode)

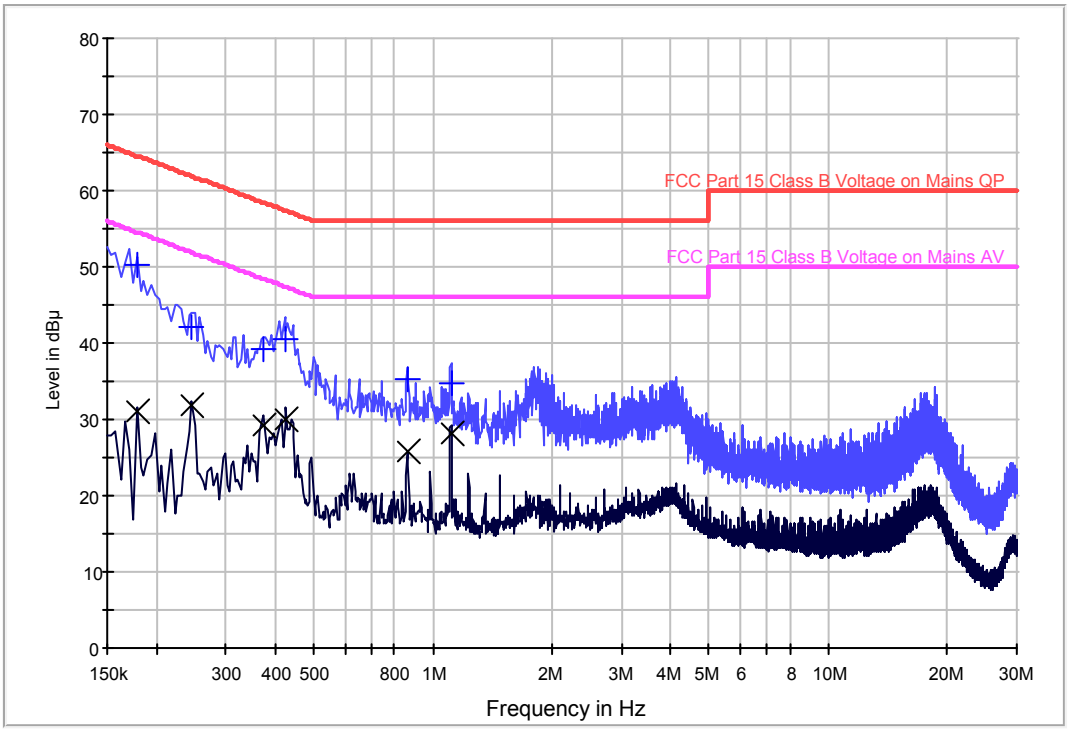
TEST PERSONNEL:

Sign on file

Leo Lai Project Engineer
Typed/Printed Name

August 10, 2015
Date

Company: Lenovo (Beijing) Limited
Date of Test: August 10, 2015
Model: C100
Operating Mode: Data Transfer
Phase: Live
Conducted Emission Test - FCC



Result Table QP

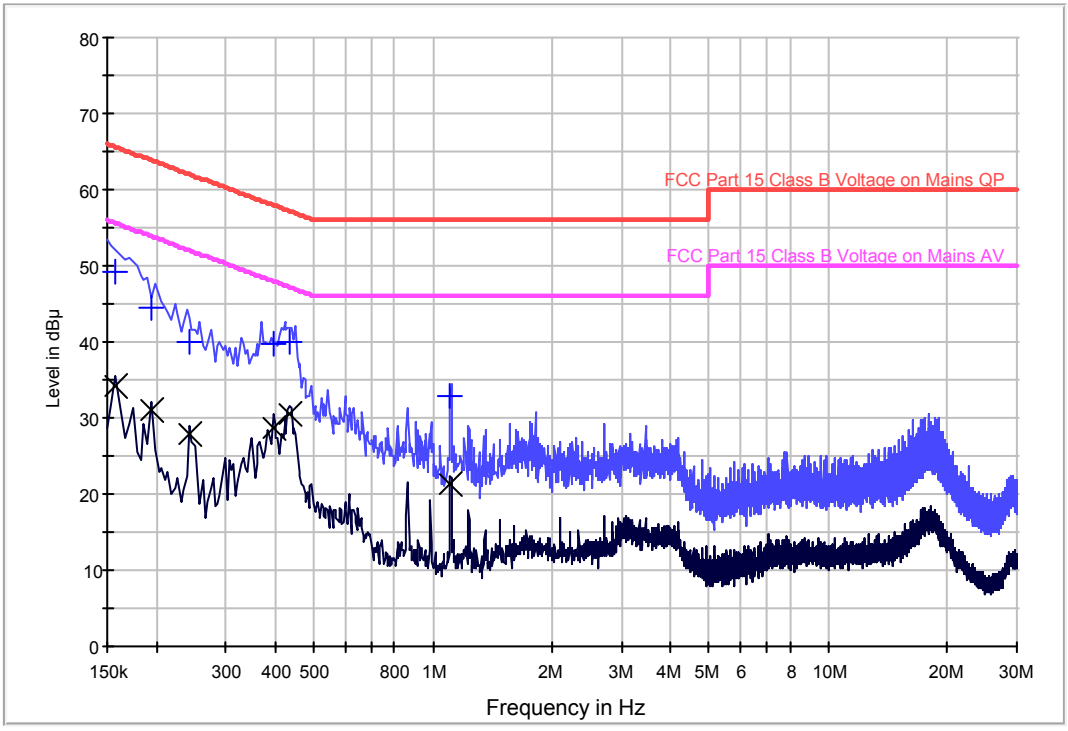
Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.178	50.3	L1	9.8	14.3	64.6
0.246	42.1	L1	9.9	19.8	61.9
0.374	39.2	L1	9.9	19.2	58.4
0.426	40.5	L1	9.9	16.8	57.3
0.862	35.2	L1	10.0	20.8	56.0
1.110	34.6	L1	9.9	21.4	56.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.178	31.0	L1	9.8	23.6	54.6
0.246	31.8	L1	9.9	20.1	51.9
0.374	29.3	L1	9.9	19.1	48.4
0.426	30.0	L1	9.9	17.3	47.3
0.862	25.7	L1	10.0	20.3	46.0
1.110	28.0	L1	9.9	18.0	46.0

Test Engineer: Leo Lai

Company: Lenovo (Beijing) Limited
Date of Test: August 10, 2015
Model: C100
Operating Mode: Data Transfer
Phase: Neutral
Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.158	49.2	N	10.2	16.4	65.6
0.194	44.6	N	10.1	19.3	63.9
0.242	40.0	N	10.2	22.0	62.0
0.394	39.8	N	10.2	18.2	58.0
0.434	40.1	N	10.2	17.1	57.2
1.106	32.8	N	10.3	23.2	56.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.158	34.3	N	10.2	21.3	55.6
0.194	31.1	N	10.1	22.8	53.9
0.242	28.0	N	10.2	24.0	52.0
0.394	28.8	N	10.2	19.2	48.0
0.434	30.5	N	10.2	16.7	47.2
1.106	21.3	N	10.3	24.7	46.0

Test Engineer: Leo Lai

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

4.0 Equipment Photographs

For electronic filing, photographs of the tested EUT are saved with filename: external photos.pdf and internal photos.pdf.

EXHIBIT 5

PRODUCT LABELLING

5.0 Product Labelling

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

EXHIBIT 6

TECHNICAL SPECIFICATIONS

6.0 Technical Specifications

For electronic filing, the block diagram of the tested EUT is saved with filename: block.pdf.

EXHIBIT 7

INSTRUCTION MANUAL

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold / leased in the United States.

EXHIBIT 8

MISCELLANEOUS INFORMATION

8.0 **Miscellaneous Information**

This miscellaneous information includes emission measuring procedure.

8.1 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of computer peripheral operating under Part 15, Subpart B rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 (2014).

The computer peripheral equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The antenna height and polarization are varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions are in QP mode from the frequency band 30MHz to 1GHz with RBW setting 120kHz and in PK & AV mode from frequency band 1GHz to 6GHz with RBW setting 1MHz. Detector function for conducted emissions are in QP & AV mode and IFBW setting is 9kHz from the frequency band 150kHz to 30MHz.

For radiated emission, the frequency range scanned is 30MHz to 6GHz. For line-conducted emissions, the range scanned is 150kHz to 30MHz.

8.1 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

Conducted measurements are made as described in ANSI C63.4 (2014).

EXHIBIT 9

TEST EQUIPMENT LIST

9.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-04	BiConiLog Antenna	ETS	3142C	00066460	19-Oct-2014	19-Oct-2015
SZ185-01	EMI Receiver	R&S	ESCI	100547	07-Feb-2015	07-Feb-2016
SZ061-09	Horn Antenna	ETS	3115	00092346	01-Nov-2014	01-Nov-2015
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	29-Apr-2015	29-Apr-2016
SZ056-06	Spectrum Analyzer	R&S	FSV40	101101	08-Jul-2015	08-Jul-2016
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	07-Feb-2015	07-Feb-2016
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	19-Apr-2014	19-Apr-2016
SZ062-02	RF Cable	RADIALL	RG 213U	--	30-Jun-2015	30-Dec-2015
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	07-Apr-2015	07-Oct-2015
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	07-Apr-2015	07-Oct-2015
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	01-Nov-2014	01-Nov-2015
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	01-Nov-2014	01-Nov-2015
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	24-Jun-2015	24-Jun-2016
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-2014	23-Aug-2016