TEST REPORT

No. I17Z61084-EMC05

for

Lenovo(Shanghai) Electronics Technology Co., Ltd.

Portable Tablet Computer

Model Name: Lenovo TB-7304I

FCC ID: O57TB7304I

with

Hardware Version: Lenovo Tablet TB-7304I

Software Version: TB-7304I_RF01_170728

Issued Date: 2017-08-08

TESTING
NVLAP LAB CODE 600118-0

Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

Email: cttl_terminals@caict.ac.cn, website: www.caict.ac.cn

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I17Z61083-EMC05	Rev.0	1st edition	2017-08-08

CONTENTS

1. Test Laboratory

1.1. Testing Location

Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191

1.2. Testing Environment

Normal Temperature: 15-35°C

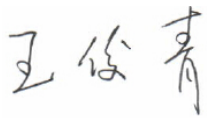
Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2017-07-20

Testing End Date: 2017-08-04

1.4. Signature

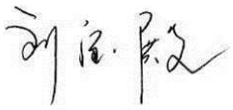


Wang Junqing

(Prepared this test report)

Zhang Ying

(Reviewed this test report)



Liu Baodian

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Lenovo(Shanghai) Electronics Technology Co., Ltd.
Address /Post:	NO.68 BUILDING, 199 FENJU RD, Pilot Free Trade Zone, 200131, China
City:	Shanghai
Postal Code:	200131
Country:	P. R. China
Contact Person:	Spring Zhou
Contact Email	zhoucb1@lenovo.com
Telephone:	+86-21-50504500-8281
Fax:	+86-21-50807240

2.2. Manufacturer Information

Company Name:	Lenovo PC HK Limited
Address /Post:	23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong
City:	Hong Kong
Country:	P. R. China
Contact Person:	Jason Wang
Contact Email	wangjun28@lenovo.com
Telephone:	+86-10-57877542
Fax:	+86-10-58863425

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Portable Tablet Computer
Model Name	Lenovo TB-7304I
FCC ID	O57TB7304I
Marketing Name	Lenovo Tab 7 Essentia
Extreme vol. Limits	3.45VDC to 4.3VDC (nominal: 3.8VDC)

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL,Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	865485030009655	Lenovo Tablet TB-7304I	TB-7304I_RF01_170728

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN	Remarks
AE1	Battery	/	/
AE2	Battery	/	/
AE3	Charger	/	/
AE4	Charger	/	/
AE14	USB Cable	/	/
AE15	USB Cable	/	/

AE1

Model	L13D1P31
Manufacturer	Sunwoda
Capacitance	3450mAh
Nominal voltage	3.8V

AE2

Model	L13D1P31
Manufacturer	SCUD
Capacitance	3450mAh
Nominal voltage	3.8V

AE3

Model	C-P56
Manufacturer	Huntkey
Length of cable	/

AE4

Model	C-P57
Manufacturer	Acbel
Length of cable	/

AE14

Model	L29B-05100070
Manufacturer	LIQI
Length of cable	80cm

AE15

Model	S29B-05100070
Manufacturer	SAIBAO
Length of cable	80cm

*AE ID: is used to identify the test sample in the lab internally.

Note: The USB cables are shielded.

3.4. EUT set-ups

EUT set-up No.	Combination of EUT and AE	Remarks
Set.17	EUT1+ AE3+ AE11/AE12	Charger
Set.23	EUT1+ AE4+ AE11/AE12	Charger
Set.25	EUT1+ AE11	USB

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 15, Subpart B	Radio frequency devices - Unintentional Radiators	2016
ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2014
ICES-003	Information Technology Equipment(ITE)-Limits and methods of measurement	Issue 6

Note: The test methods have no deviation with standards.

5. LABORATORY ENVIRONMENT

Semi-anechoic chamber SAC-1 (23 meters×17meters×10meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 M
Ground system resistance	< 4
Normalised site attenuation (NSA)	< ±4 dB, 10 m distance
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 6GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

Shielded room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz, >60dB; 1MHz－1000MHz, >90dB.
Electrical insulation	> 2 M
Ground system resistance	< 4

6. SUMMARY OF TEST RESULTS

Abbreviations used in this clause:		
Verdict Column	P	Pass
	NA	Not applicable
	F	Fail
Location Column	huayuan North Road	The test is performed in test location huayuan North Road which is described in section 1.1 of this report

Items	Test Name	Clause in FCC rules	Section in this report	Verdict	Test Location
1	Radiated Emission	15.109(a)	B.1	P	1
2	Conducted Emission	15.107(a)	B.2	P	1

7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	Test Receiver	ESU26	100235	R&S	2018-03-01	1 year
2	Test Receiver	ESCI 7	100344	R&S	2018-03-15	1 year
3	Universal Radio Communication Tester	CMW500	143008	R&S	2017-12-01	1 year
4	Universal Radio Communication Tester	CMW500	155415	R&S	2018-02-15	1 year
5	LISN	ENV216	101200	R&S	2018-08-03	1 year
6	EMI Antenna	VULB 9163	9163-301	Schwarzbeck	2017-12-16	3 years
7	EMI Antenna	3115	6914	ETS-Lindgren	2017-12-15	3 years
8	PC	OPTIPLEX 380	2X1YV2X	DELL	N/A	N/A
9	Printer	P1606dn	VNC3L52122	HP	N/A	N/A
10	Keyboard	L100	CN0RH659658907ATOI40	DELL	N/A	N/A
11	Mouse	M-UAE119	LZ935220ZRC	Lenovo	N/A	N/A

Test Item	Test Software and Version	Software Vendor
Radiated Continuous Emission	EMC32 V9.01	R&S
Conducted Emission	EMC32 V8.52.0	R&S

ANNEX A: MEASUREMENT RESULTS

A.1 Radiated Emission

Reference

FCC: CFR Part 15.109(a).

IC: ICES-003 Section 5.

A.1.1 Method of measurement

The field strength of radiated emissions from the unintentional radiator (charging mode of MS) at distances of 3 meters(for 30MHz-1GHz) and 3 meters (for above 1GHz) is tested. Tested in accordance with the procedures of ANSI C63.4 – 2014, section 8.3.

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3/10 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

A.1.2 EUT Operating Mode:

The MS is operating in the charging mode. During the test MS is connected to a charger in the case of charging mode.

Note：I/O information：Printer – USB, Mouse – PS/2, Keyboard – USB.

A.1.3 Measurement Limit

Frequency range (MHz)	Field strength limit (μV/m)		
	Quasi-peak	Average	Peak
30-88	100		
88-216	150		
216-960	200		
960-1000	500		
>1000		500	5000

Note: the above limit is for 3 meters test distance. 10 meters' limit is got by converting.

A.1.4 Test Condition

Frequency range (MHz)	RBW/VBW	Sweep Time (s)	Detector
30-1000	120kHz (IF Bandwidth)	5	Peak/Quasi-peak
Above 1000	1MHz/1MHz	15	Peak, Average

A.1.5 Measurement Results

A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”. It includes the antenna factor of receive antenna and the path loss.

The measurement results are obtained as described below:

Result = P_{Mea} + A_{Rpl} = P_{Mea} + G_A + G_{PL}

Where

G_A: Antenna factor of receive antenna

G_{PL}: Path Loss

P_{Mea}: Measurement result on receiver.

Measurement uncertainty (worst case): 30MHz-1GHz：4.86dB, 1GHz-18GHz：5.26dB, *k*=2.

Measurement results for Set.17:

Charging Mode/Average detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17802.750	41.5	-23.1	41.0	23.68	H
17811.750	41.3	-23.0	41.0	23.43	H
17796.000	41.3	-23.2	41.0	23.59	H
17806.500	41.3	-23.0	41.0	23.42	V
17803.500	41.3	-23.1	41.0	23.46	V
17804.250	41.3	-23.1	41.0	23.45	H

Charging Mode/Peak detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17795.250	54.3	-23.2	41.0	36.60	H
17805.000	53.3	-23.1	41.0	35.36	V
17887.500	52.8	-24.0	40.9	36.10	V
17808.750	52.6	-23.0	41.0	34.69	V
17793.000	52.6	-23.3	41.0	34.86	V
17839.500	52.4	-23.4	40.9	34.88	H

Sample calculation: Peak detector, 17887.500MHz

Result =P_{Mea} (36.1dBμV)+ G_A (40.9dB/m)+ G_{PL}(-24.0 dB) =52.8dBμV/m

Measurement results for Set.23:

Charging Mode/Average detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17807.250	41.6	-23.0	41.0	23.63	H
17808.000	41.6	-23.0	41.0	23.61	H
17811.750	41.5	-23.0	41.0	23.55	H
17811.000	41.4	-23.0	41.0	23.47	H
17806.500	41.4	-23.0	41.0	23.49	H
17801.250	41.3	-23.1	41.0	23.52	H

Charging Mode/Peak detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
16941.000	52.5	-25.7	41.4	36.71	H
17565.750	52.3	-25.6	41.1	36.80	H
17805.750	52.3	-23.1	41.0	34.37	H
17811.000	52.2	-23.0	41.0	34.28	H
17817.750	52.0	-23.1	40.9	34.19	H
16947.000	52.0	-25.7	41.4	36.26	H

Sample calculation: Peak detector, 17565.750MHz
Result =P_{Mea} (36.8dBμV)+ G_A (41.1dB/m)+ G_{PL}(-25.6 dB) =52.3dBμV/m

Measurement results for Set.25:

USB Mode/Average detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17802.750	41.5	-23.1	41.0	23.67	H
17803.500	41.4	-23.1	41.0	23.58	V
17806.500	41.4	-23.0	41.0	23.45	V
17820.000	41.3	-23.1	40.9	23.54	H
17798.250	41.3	-23.2	41.0	23.54	H
17801.250	41.3	-23.1	41.0	23.49	V

USB Mode/Peak detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17802.750	53.4	-23.1	41.0	35.56	V
17811.750	53.2	-23.0	41.0	35.31	V
17817.750	53.1	-23.1	40.9	35.26	H
17830.500	52.9	-23.3	40.9	35.29	V
17814.750	52.8	-23.1	40.9	34.96	H
17800.500	52.7	-23.1	41.0	34.93	V

Sample calculation: Peak detector, 17830.500MHz
Result =P_{Mea} (35.3dBμV)+ G_A (40.9dB/m)+ G_{PL}(-23.3 dB) =52.9dBμV/m

Note: The measurement results of Set.17, Set.23 and Set.25 showed here are worst cases of the combinations of different batteries and USB cables.

Charging Mode, Set.17

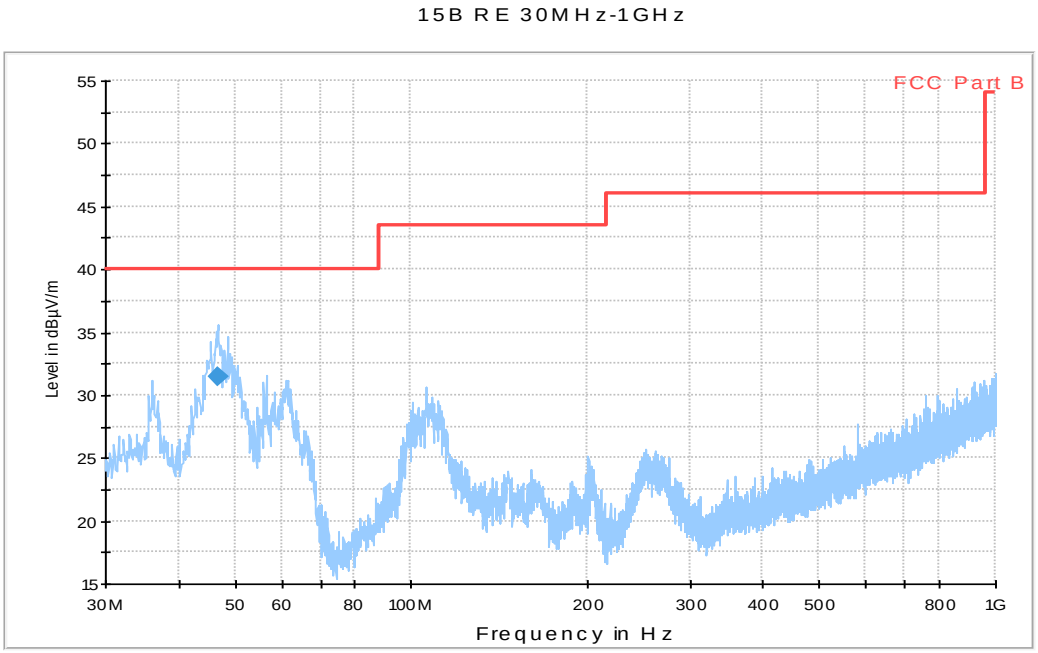


Figure A.1 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency	QuasiPeak	Height	Polarization	Azimuth	Corr.	Margin	Limit	Comment
46.781000	31.4	100.0	V	21.0	-17.8	8.6	40.0	

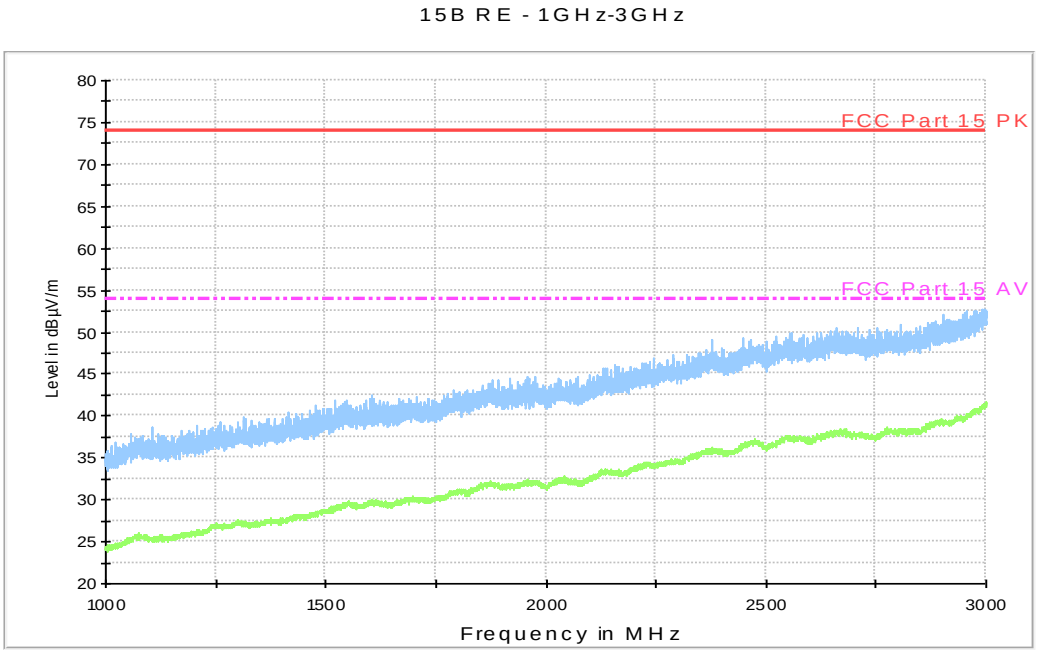


Figure A.2 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

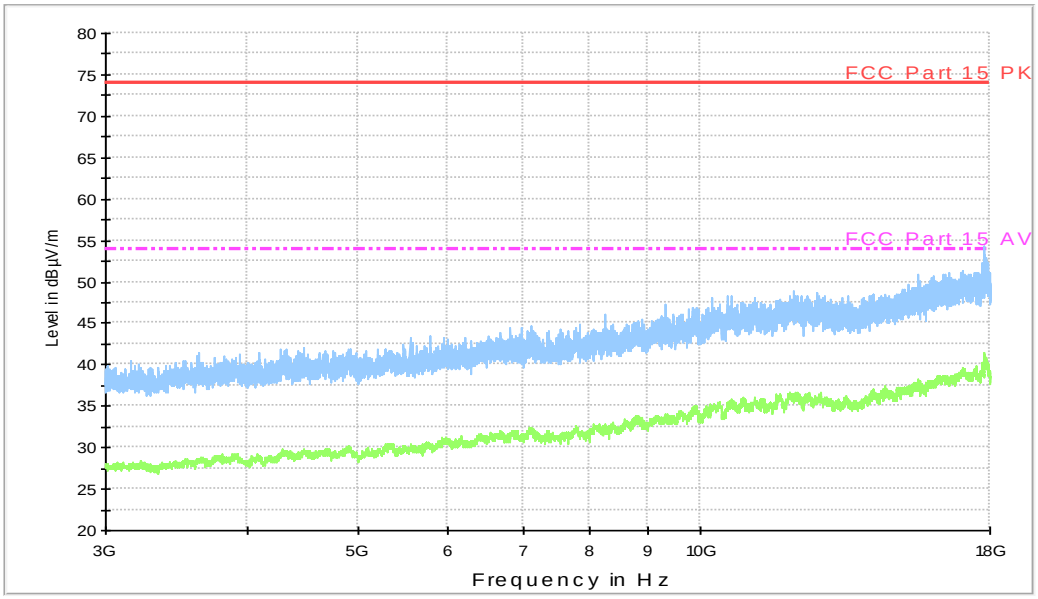


Figure A.3 Radiated Emission from 3GHz to 18GHz

Charging Mode, Set.23

15B RE 30MHz-1GHz

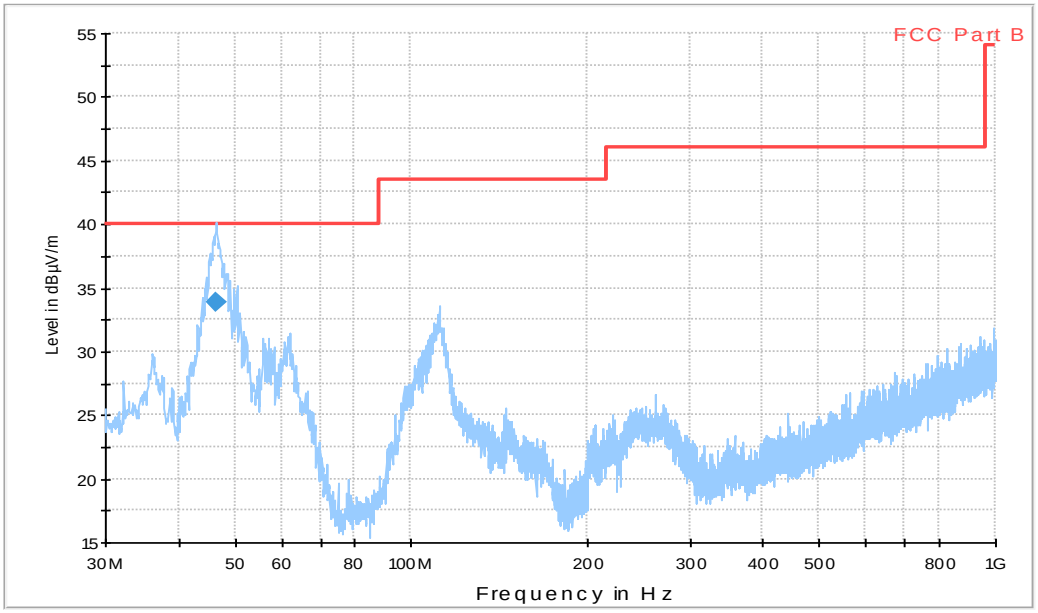


Figure A.4 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency	QuasiPeak	Height	Polarization	Azimuth	Corr.	Margin	Limit	Comment
46.490000	33.9	100.0	V	-3.0	-17.8	6.1	40.0	

15B RE - 1GHz-3GHz

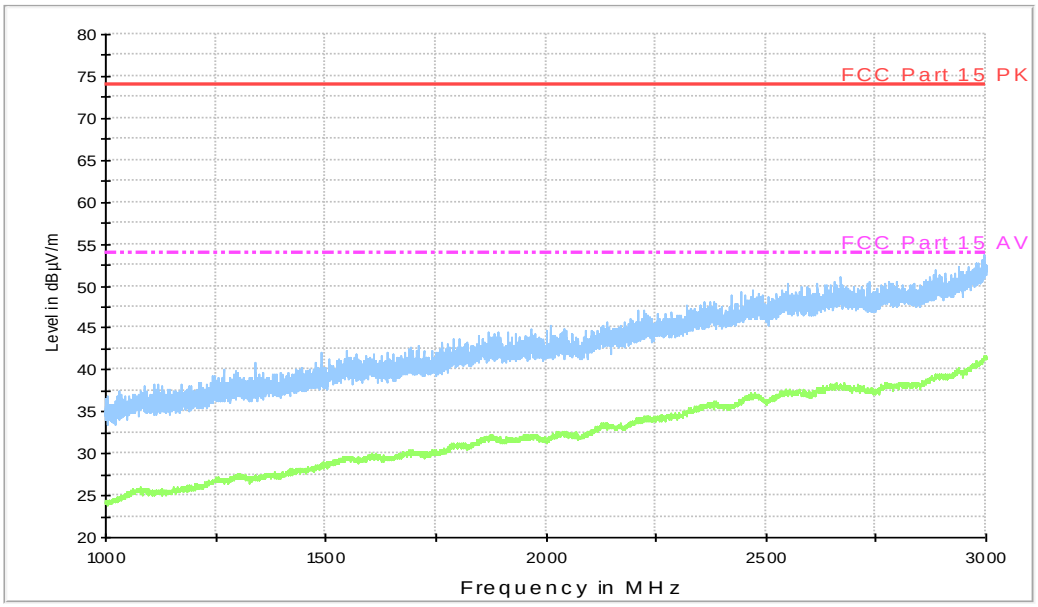


Figure A.5 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

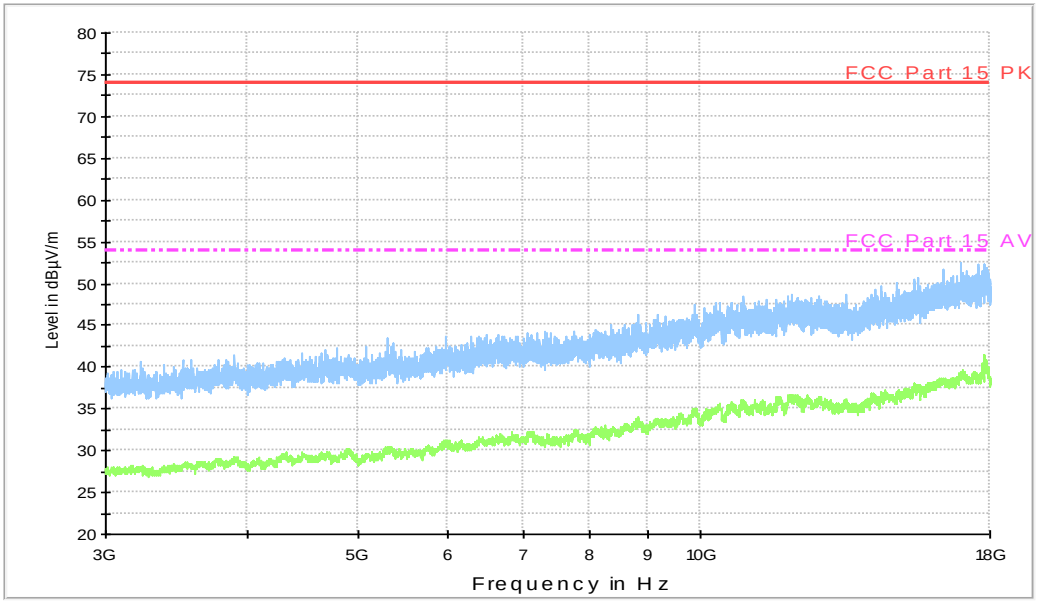


Figure A.6 Radiated Emission from 3GHz to 18GHz

USB Mode, Set.25

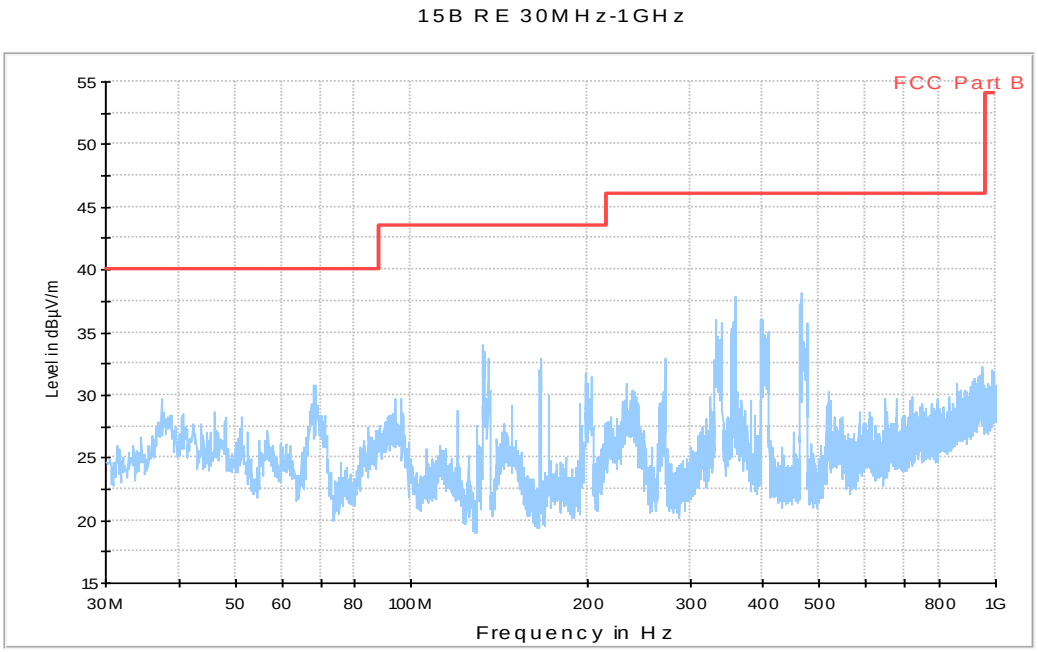


Figure A.7 Radiated Emission from 30MHz to 1GHz

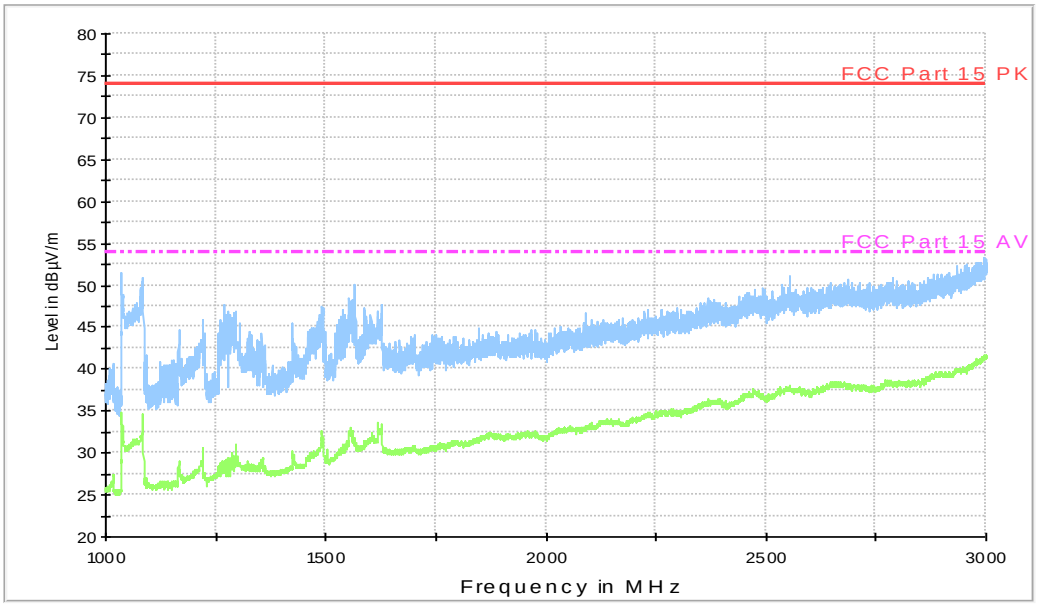


Figure A.8 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

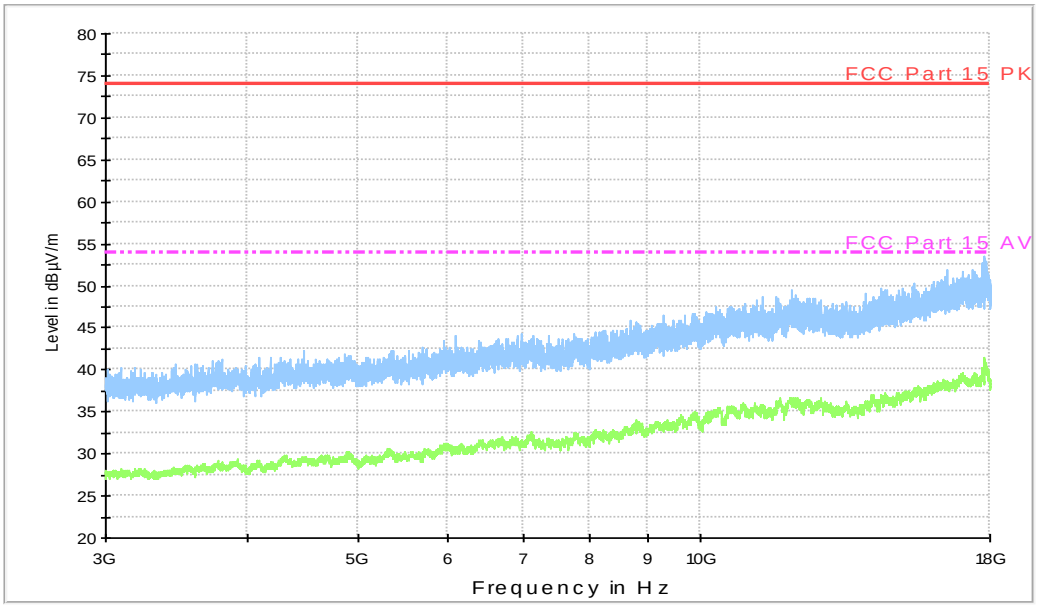


Figure A.9 Radiated Emission from 3GHz to 18GHz

A.2 Conducted Emission

Reference

FCC: CFR Part 15.107(a).

IC: ICES-003 Section 5.

A.2.1 Method of measurement

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits. Tested in accordance with the procedures of ANSI C63.4 – 2014, section 7.3.

A.2.2 EUT Operating Mode

The MS is operating in the charging mode. During the test MS is connected to a charger in the case of charging mode.

A.2.3 Measurement Limit

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency		

A.2.4 Test Condition in charging mode

Voltage（V）	Frequency（Hz）
120	60

RBW/IF bandwidth	Sweep Time(s)
9kHz	1

A.2.5 Measurement Results

Measurement uncertainty: *U*= 3.38dB, *k*=2.

Charging Mode, Set.17

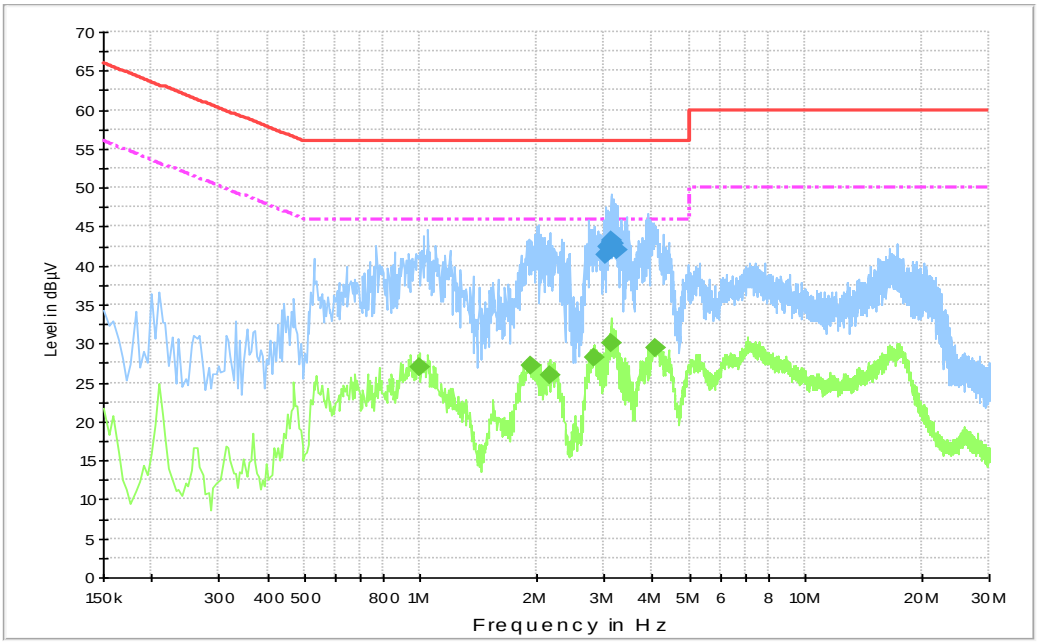


Figure A.10 Conducted Emission

Final Result 1

Frequency	QuasiPeak	PE	Line	Corr.	Margin	Limit
3.034500	41.4	GND	L1	10.3	14.6	56.0
3.066000	42.3	GND	L1	10.3	13.7	56.0
3.115500	43.1	GND	L1	10.3	12.9	56.0
3.142500	43.2	GND	L1	10.3	12.8	56.0
3.174000	42.8	GND	L1	10.3	13.2	56.0
3.232500	41.9	GND	L1	10.3	14.1	56.0

Final Result 2

Frequency	QuasiPeak	PE	Line	Corr.	Margin	Limit
0.996000	27.0	GND	L1	10.2	19.0	46.0
1.932000	27.2	GND	L1	10.3	18.8	46.0
2.175000	25.9	GND	L1	10.2	20.1	46.0
2.823000	28.3	GND	L1	10.3	17.7	46.0
3.115500	30.0	GND	L1	10.3	16.0	46.0
4.056000	29.4	GND	N	10.3	16.6	46.0

Note: The measurement results showed here are worst cases of the combinations of different batteries and USB cables.

Charging Mode, Set.23

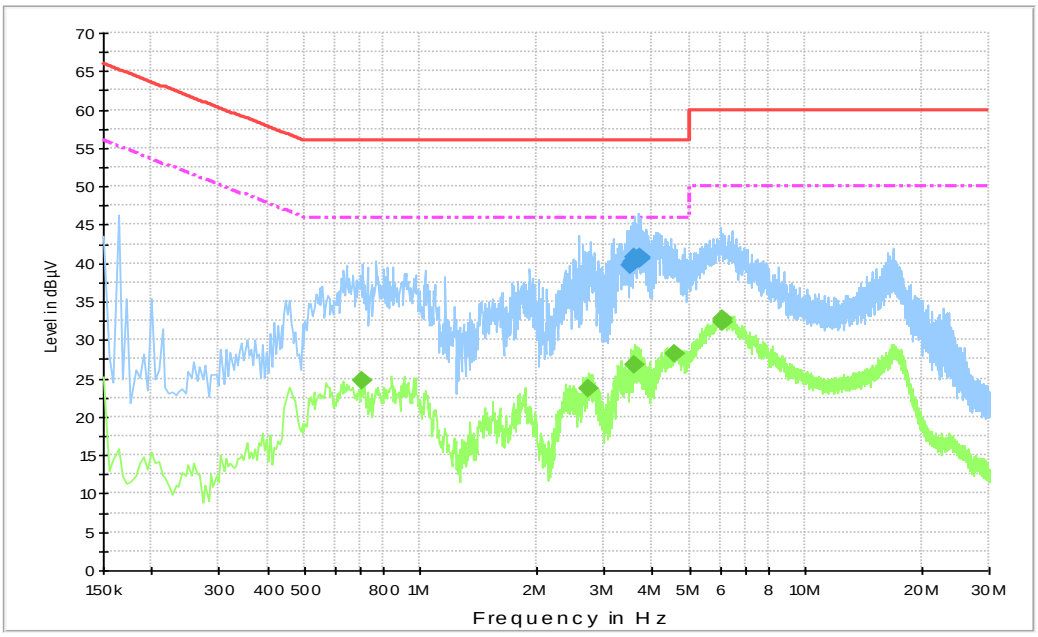


Figure A.11 Conducted Emission

Final Result 1

Frequency	QuasiPeak	PE	Line	Corr.	Margin	Limit
3.525000	39.6	GND	L1	10.3	16.4	56.0
3.561000	40.2	GND	L1	10.3	15.8	56.0
3.592500	40.9	GND	L1	10.3	15.1	56.0
3.673500	40.7	GND	L1	10.3	15.3	56.0
3.700500	40.6	GND	L1	10.3	15.4	56.0
3.714000	40.7	GND	L1	10.3	15.3	56.0

Final Result 2

Frequency	QuasiPeak	PE	Line	Corr.	Margin	Limit
0.708000	24.7	GND	L1	10.2	21.3	46.0
2.724000	23.7	GND	L1	10.3	22.3	46.0
3.592500	26.8	GND	L1	10.3	19.2	46.0
4.560000	28.2	GND	N	10.3	17.8	46.0
6.072000	32.3	GND	N	10.4	17.7	50.0
6.126000	32.6	GND	L1	10.4	17.4	50.0

Note: The measurement results showed here are worst cases of the combinations of different batteries and USB cables.

USB Mode, Set.25

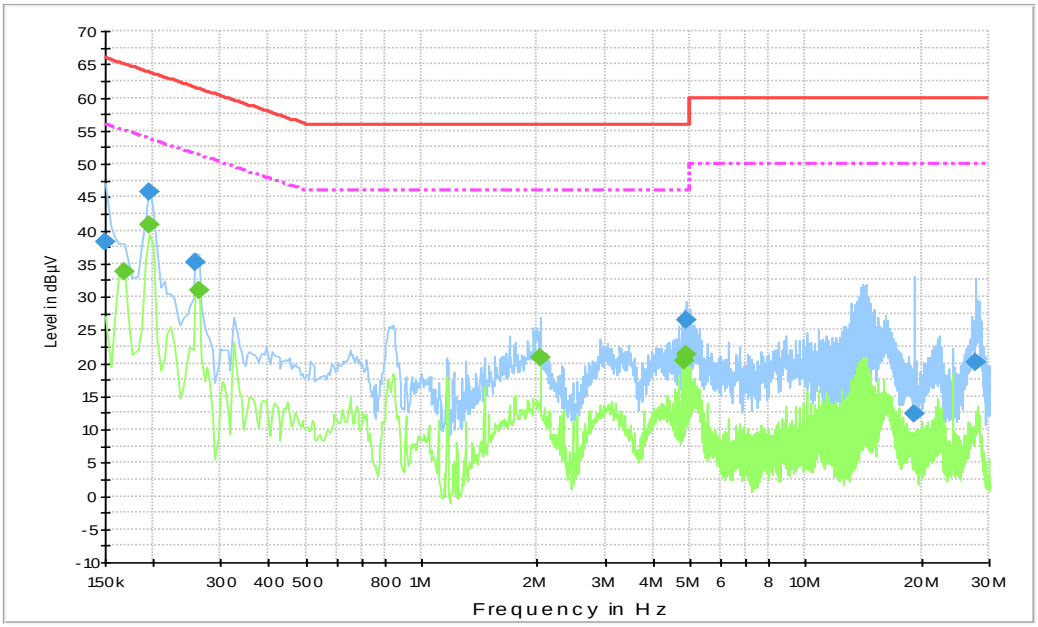


Figure A.12 Conducted Emission

Final Result 1

Frequency	QuasiPeak	PE	Line	Corr.	Margin	Limit
0.150000	38.2	GND	L1	10.2	27.8	66.0
0.195000	45.8	GND	L1	10.2	18.0	63.8
0.258000	35.1	GND	L1	10.2	26.4	61.5
4.875000	26.4	GND	L1	10.3	29.6	56.0
19.117500	12.3	GND	N	11.1	47.7	60.0
27.550500	20.1	GND	L1	11.4	39.9	60.0

Final Result 2

Frequency	QuasiPeak	PE	Line	Corr.	Margin	Limit
0.168000	33.7	GND	L1	10.2	21.4	55.1
0.195000	40.9	GND	L1	10.2	12.9	53.8
0.262500	30.9	GND	L1	10.2	20.4	51.4
2.035500	20.8	GND	N	10.2	25.2	46.0
4.812000	20.3	GND	L1	10.3	25.7	46.0
4.875000	21.3	GND	L1	10.3	24.7	46.0

Note: The measurement results showed here are worst cases of the combinations of different batteries and USB cables.

United States Department of Commerce
National Institute of Standards and Technology

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Telecommunication Technology Labs, CAICT
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China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2016-09-29 through 2017-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

*****END OF REPORT*****