



TEST REPORT

No. I17Z61084-EMC05

for

Lenovo(Shanghai) Electronics Technology Co., Ltd.

Portable Tablet Computer

Model Name: Lenovo TB-7504X

with

FCC ID: O57TB7504X

Hardware Version: Lenovo Tablet TB-7504X

Software Version: TB-7504X_RF01_170712

Issued Date: 2017-08-03



Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I17Z61084-EMC05	Rev.0	1 st edition	2017-08-03



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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

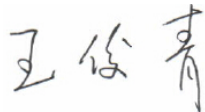
1.2. Testing Environment

Normal Temperature: 15-35°C
Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2017-07-16
Testing End Date: 2017-07-31

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.
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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: Shanghai
Postal Code: 201203
Country: P. R. China
Contact Person: Joanna Yu
Contact Email: yujia8@lenovo.com
Telephone: +86-21-50504500-8281
Fax: +86-21-50807240

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

3.1. About EUT

Description	Portable Tablet Computer
Model Name	Lenovo TB-7504X
FCC ID	O57TB7504X
Marketing Name	Lenovo TAB 7
Extreme vol. Limits	3.5VDC to 4.3VDC (nominal: 3.85VDC)

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	865596030018676/ 865596030018684	Lenovo Tablet TB-7504X	TB-7504X_RF01_170712

*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	SB18C15123
Manufacturer	Sunwoda
Capacitance	3500mAh
Nominal voltage	3.85V

AE2

Model	SB18C15124
Manufacturer	SCUD
Capacitance	3500mAh
Nominal voltage	3.85V

AE3

Model	C-P56
Manufacturer	Huntkey
Length of cable	/

AE4

Model	C-P57
Manufacturer	Acbel
Length of cable	/



AE14

Model	SWT-A064A
Manufacturer	Saibao
Length of cable	80cm

AE15

Model	WT59B1000100
Manufacturer	Fukangyuan
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	CN0RH6596589 07ATOI40	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 ($\mu\text{V}/\text{m}$)		
	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:

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

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(dB μ V/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dB μ V)	Polarity
17938.233	43.7	-17.7	45.6	15.800	H
17911.600	43.6	-18.5	45.6	16.500	H
17934.833	43.5	-17.7	45.6	15.600	H
17957.500	43.5	-17.7	45.6	15.600	V
17964.300	43.4	-17.7	45.6	15.500	V
17947.867	43.4	-17.7	45.6	15.500	H

Charging Mode/Peak detector

Frequency(MHz)	Result(dB μ V/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dB μ V)	Polarity
18000.000	53.2	-45.6	44.5	54.266	H
17999.433	52.9	-17.7	45.6	25.000	V
17998.867	53.6	-17.7	45.6	25.700	V
17998.300	52.6	-17.7	45.6	24.700	V
17997.733	53.9	-17.7	45.6	26.000	V
17997.167	53.4	-17.7	45.6	25.500	H

Sample calculation: Peak detector, 17997.167MHz

$$\text{Result} = P_{\text{Mea}} (25.5\text{dB}\mu\text{V}) + G_A (45.6\text{dB/m}) + G_{\text{PL}}(-17.7 \text{ dB}) = 53.4\text{dB}\mu\text{V/m}$$

Measurement results for Set.23:

Charging Mode/Average detector

Frequency(MHz)	Result(dB μ V/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dB μ V)	Polarity
17959.200	43.8	-17.7	45.6	15.900	H
17969.967	43.7	-17.7	45.6	15.800	H
17930.300	43.7	-17.7	45.6	15.800	H
17911.033	43.6	-18.5	45.6	16.500	H
17905.367	43.6	-18.5	45.6	16.500	H
17928.600	43.6	-17.7	45.6	15.700	H



Charging Mode/Peak detector

Frequency(MHz)	Result(dBμV/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dBμV)	Polarity
17960.333	55.8	-17.7	45.6	27.900	H
17956.933	55.6	-17.7	45.6	27.700	H
17958.067	55.0	-17.7	45.6	27.100	H
17954.100	54.8	-17.7	45.6	26.900	H
17975.633	54.8	-17.7	45.6	26.900	H
17739.333	54.8	-18.5	45.6	27.700	H

Sample calculation: Peak detector, 17739.333MHz

$$\text{Result} = P_{\text{Mea}} (27.7\text{dB}\mu\text{V}) + G_A (45.6\text{dB/m}) + G_{\text{PL}}(-18.5 \text{ dB}) = 54.8\text{dB}\mu\text{V/m}$$

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
17941.067	43.7	-17.7	45.6	15.800	H
17949.000	43.7	-17.7	45.6	15.800	V
17928.600	43.6	-17.7	45.6	15.700	V
17934.833	43.6	-17.7	45.6	15.700	H
17947.867	43.5	-17.7	45.6	15.600	H
17861.167	43.5	-18.5	45.6	16.400	V

USB Mode/Peak detector

Frequency(MHz)	Result(dBμV/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dBμV)	Polarity
17849.833	55.4	-18.5	45.6	28.300	V
17841.333	55.2	-18.5	45.6	28.100	V
17938.233	55.1	-17.7	45.6	27.200	H
17980.167	55.0	-17.7	45.6	27.100	V
17917.267	54.8	-17.7	45.6	26.900	H
17939.933	54.7	-17.7	45.6	26.800	V

Sample calculation: Peak detector, 17939.933MHz

$$\text{Result} = P_{\text{Mea}} (26.8\text{dB}\mu\text{V}) + G_A (45.6\text{dB/m}) + G_{\text{PL}}(-17.7 \text{ dB}) = 54.7\text{dB}\mu\text{V/m}$$

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

Normal RE_30M-1GHz_10m_Class B

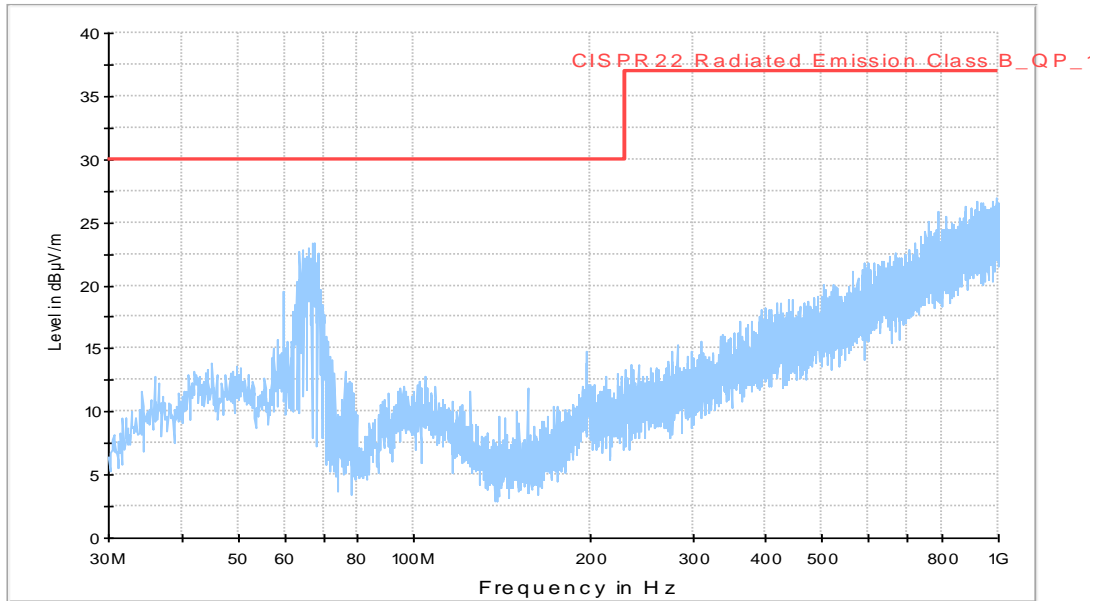


Figure A.1 Radiated Emission from 30MHz to 1GHz

Normal RE_1G-18GHz_directly

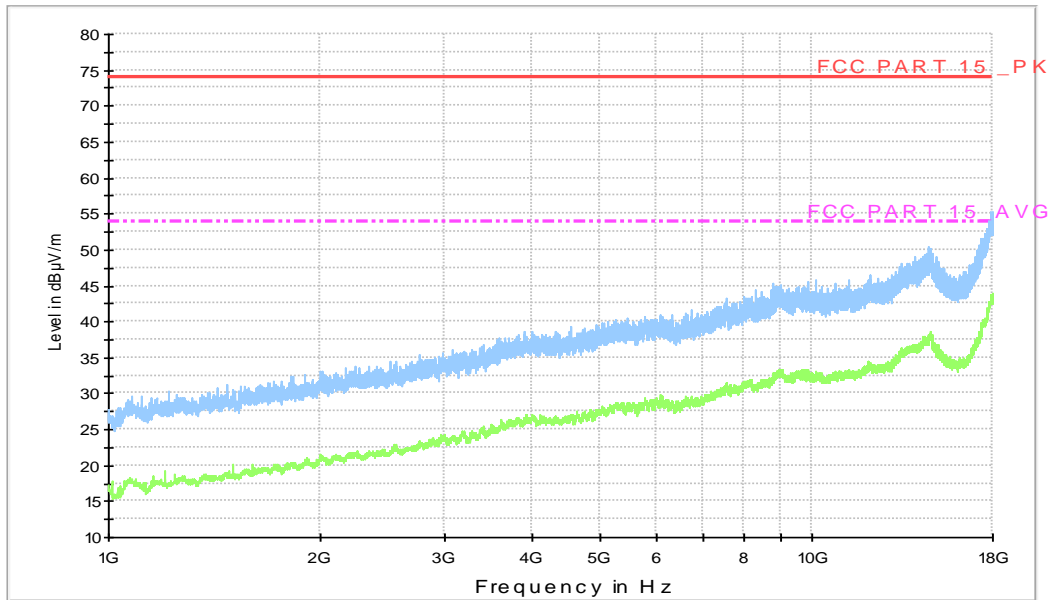


Figure A.2 Radiated Emission from 1GHz to 18GHz

Charging Mode, Set.23

Normal RE_30M-1GHz_10m_Class B

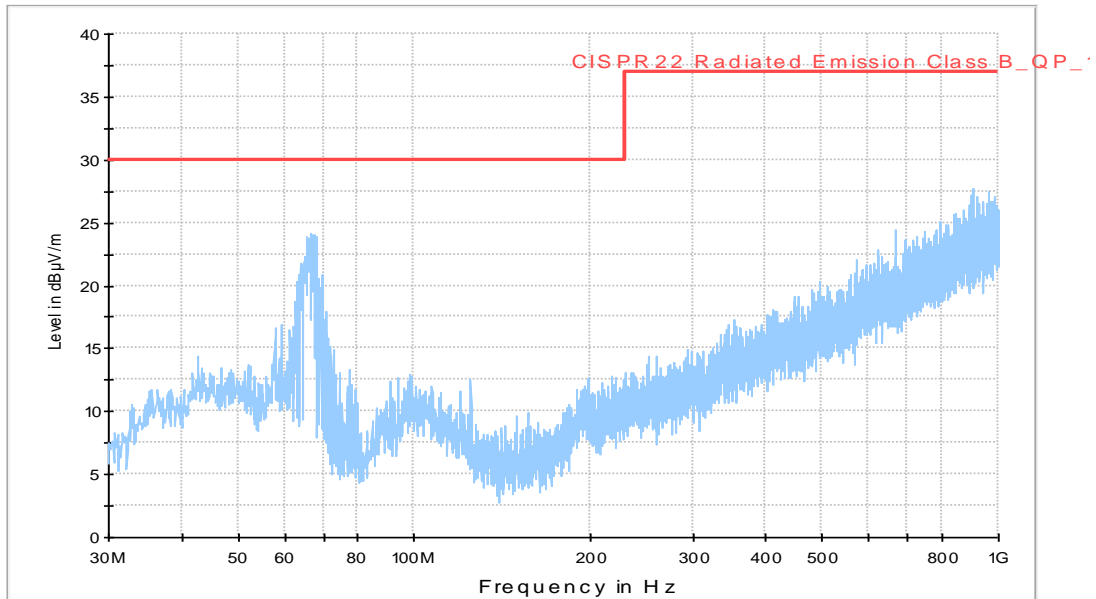


Figure A.3 Radiated Emission from 30MHz to 1GHz

Normal RE_1G-18GHz_directly

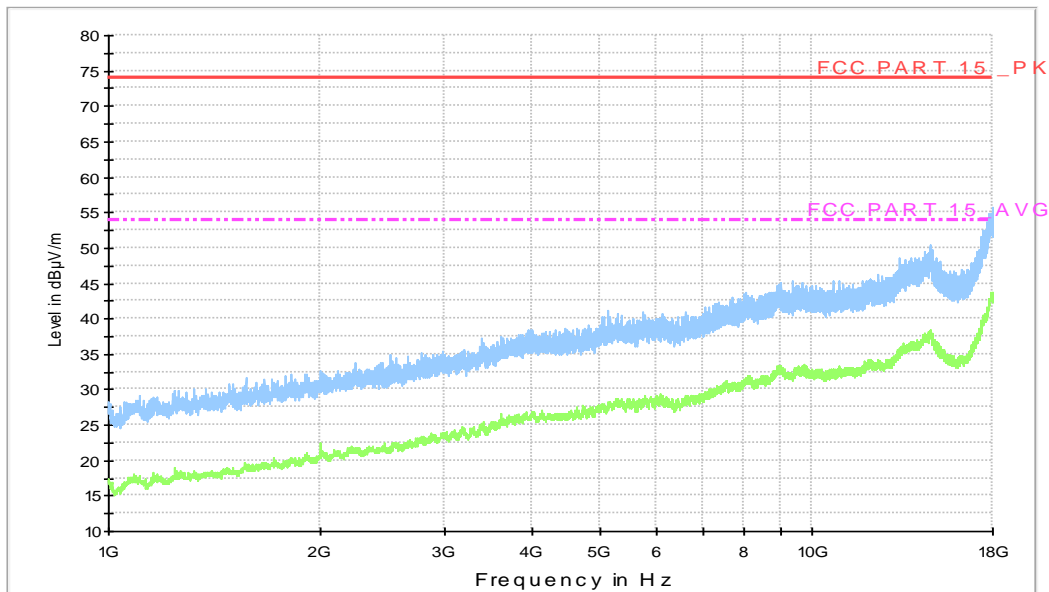


Figure A.4 Radiated Emission from 1GHz to 18GHz

USB Mode, Set.25

Normal RE_30M-1GHz_10m

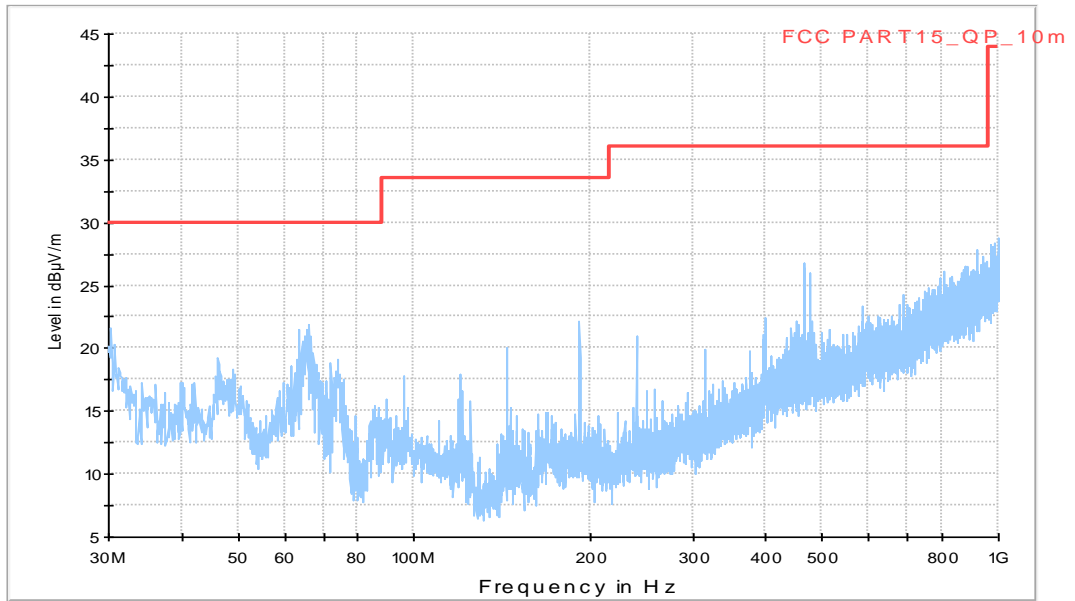


Figure A.5 Radiated Emission from 30MHz to 1GHz

Normal RE_1G-18GHz_directly

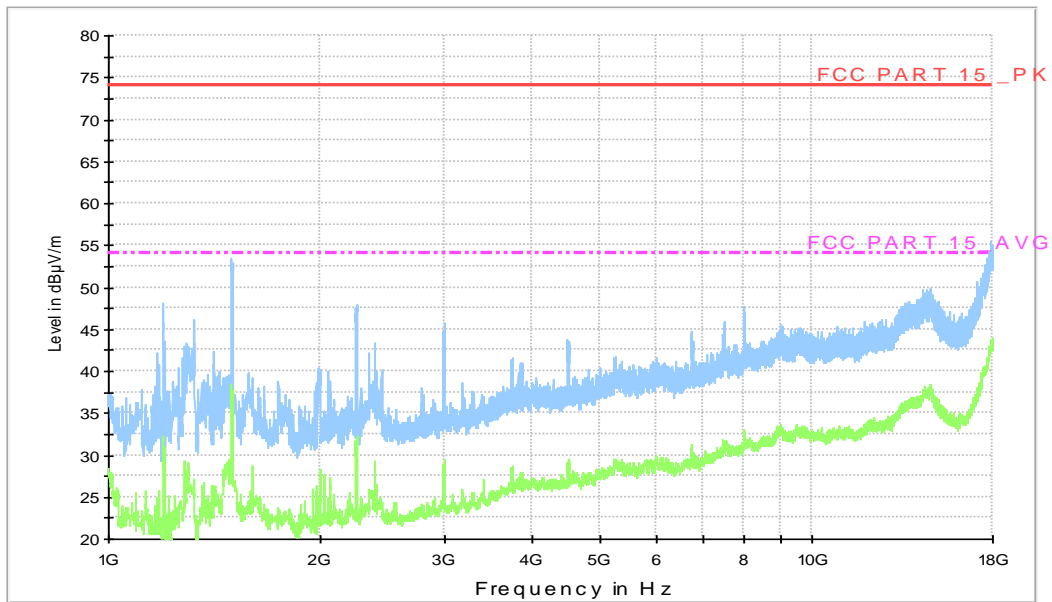


Figure A.6 Radiated Emission from 1GHz to 18GHz

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: $U= 3.38\text{dB}$, $k=2$.

Charging Mode, Set.17

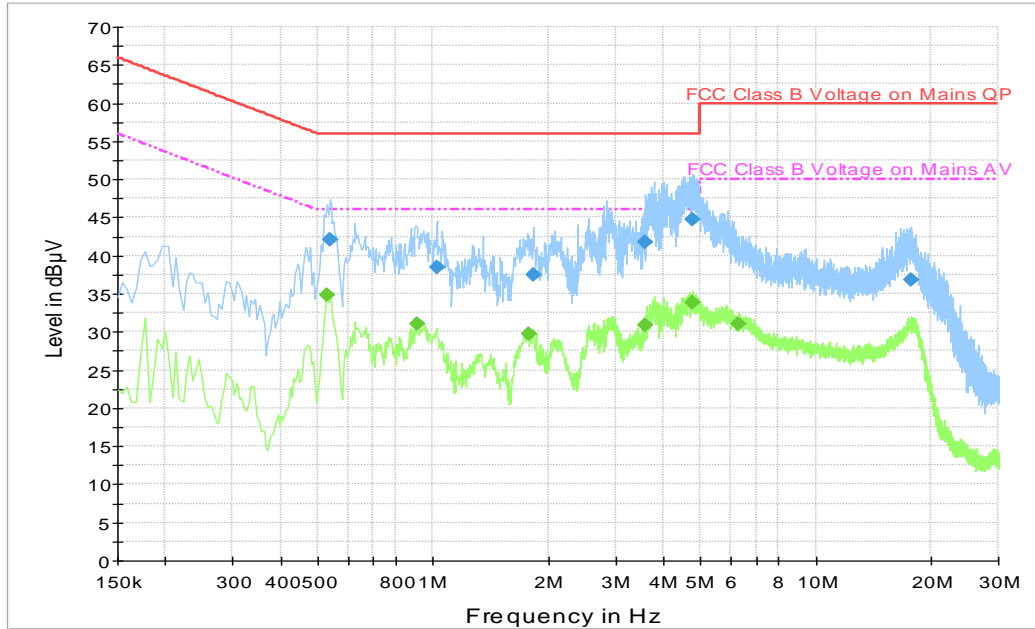


Figure A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.537000	42.1	2000.0	9.000	On	L1	19.9	13.9	56.0
1.023000	38.5	2000.0	9.000	On	L1	19.8	17.5	56.0
1.824000	37.4	2000.0	9.000	On	L1	19.7	18.6	56.0
3.597000	41.8	2000.0	9.000	On	L1	19.7	14.2	56.0
4.776000	44.7	2000.0	9.000	On	L1	19.7	11.3	56.0
17.763000	36.8	2000.0	9.000	On	L1	19.9	23.2	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.528000	34.8	2000.0	9.000	On	L1	19.9	11.2	46.0
0.910500	31.0	2000.0	9.000	On	L1	19.8	15.0	46.0
1.774500	29.8	2000.0	9.000	On	L1	19.7	16.2	46.0
3.588000	30.9	2000.0	9.000	On	L1	19.7	15.1	46.0
4.776000	33.9	2000.0	9.000	On	L1	19.7	12.1	46.0
6.301500	31.1	2000.0	9.000	On	N	19.8	18.9	50.0

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

Charging Mode, Set.23

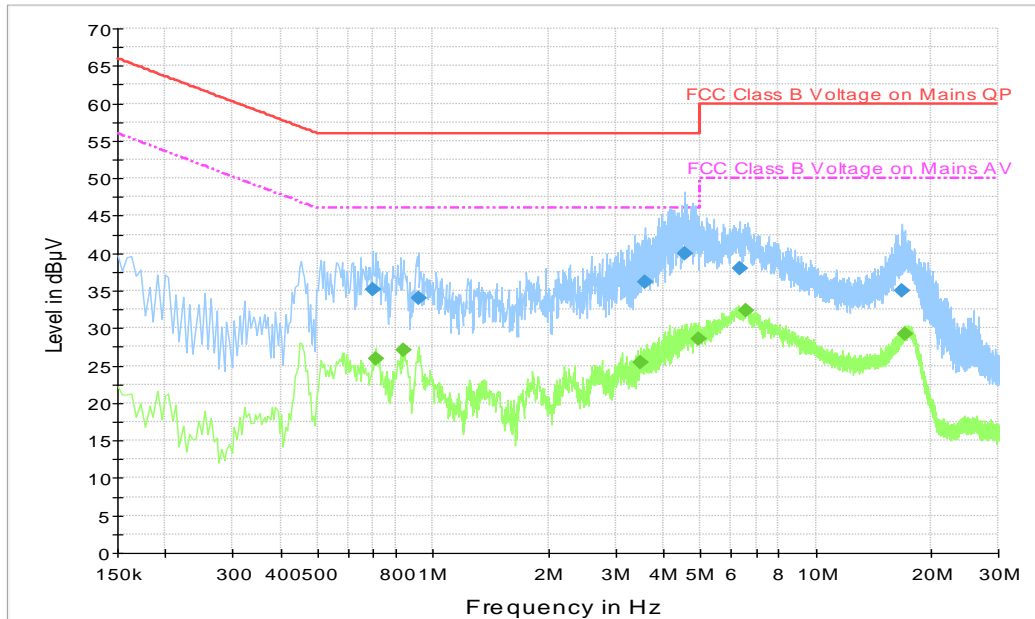


Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.694500	35.2	2000.0	9.000	On	L1	19.9	20.8	56.0
0.915000	34.0	2000.0	9.000	On	L1	19.8	22.0	56.0
3.574500	36.2	2000.0	9.000	On	L1	19.7	19.8	56.0
4.537500	39.9	2000.0	9.000	On	L1	19.7	16.1	56.0
6.328500	37.9	2000.0	9.000	On	L1	19.8	22.1	60.0
16.836000	34.9	2000.0	9.000	On	N	19.9	25.1	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.708000	25.9	2000.0	9.000	On	L1	19.9	20.1	46.0
0.834000	27.0	2000.0	9.000	On	L1	19.8	19.0	46.0
3.493500	25.4	2000.0	9.000	On	L1	19.7	20.6	46.0
4.924500	28.6	2000.0	9.000	On	N	19.7	17.4	46.0
6.589500	32.3	2000.0	9.000	On	L1	19.8	17.7	50.0
17.155500	29.2	2000.0	9.000	On	L1	19.9	20.8	50.0

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

USB Mode, Set.25

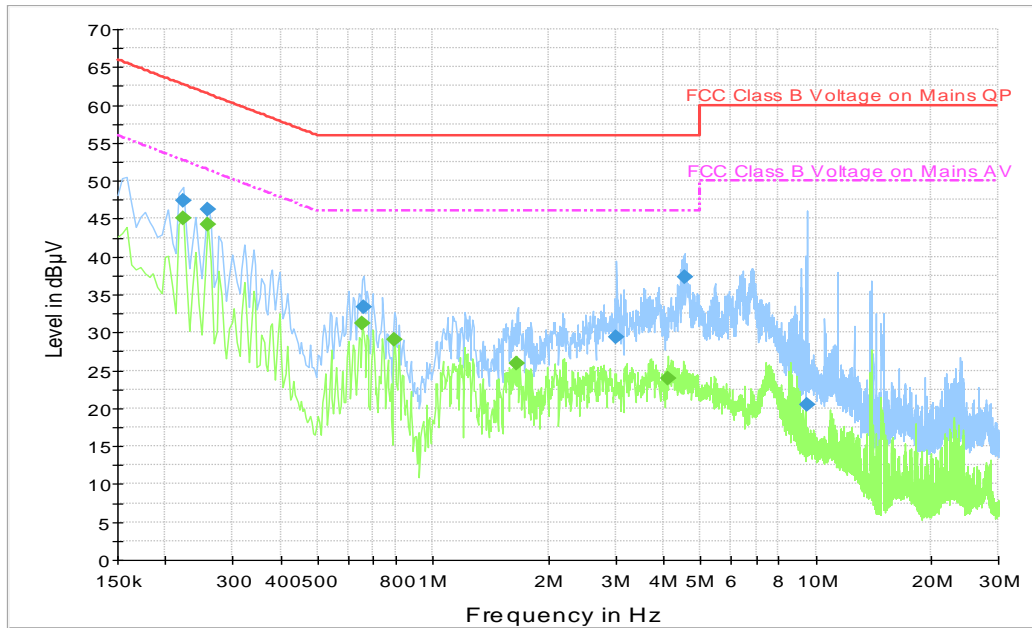


Figure A.9 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.222000	47.4	2000.0	9.000	On	N	19.8	15.3	62.7
0.258000	46.2	2000.0	9.000	On	N	19.8	15.3	61.5
0.658500	33.4	2000.0	9.000	On	N	19.9	22.6	56.0
3.021000	29.5	2000.0	9.000	On	L1	19.7	26.5	56.0
4.533000	37.4	2000.0	9.000	On	L1	19.7	18.6	56.0
9.487500	20.4	2000.0	9.000	On	L1	19.9	39.6	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.222000	45.1	2000.0	9.000	On	N	19.8	7.6	52.7
0.258000	44.3	2000.0	9.000	On	N	19.8	7.2	51.5
0.654000	31.2	2000.0	9.000	On	N	19.9	14.8	46.0
0.793500	29.0	2000.0	9.000	On	N	19.8	17.0	46.0
1.662000	25.9	2000.0	9.000	On	N	19.7	20.1	46.0
4.114500	24.0	2000.0	9.000	On	N	19.7	22.0	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



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

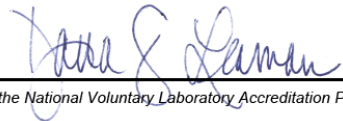
*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

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