



TEST REPORT

No. I18Z60479-EMC01

for

TCL Communication Ltd.

LTE/UMTS/GSM mobile phone

Model Name: A502DL

FCC ID: 2ACCJH086

with

Hardware Version: PIO

Software Version: vGP1

Issued Date: 2018-05-17



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
I18Z60479-EMC01	Rev.0	1 st edition	2018-05-17



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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: 2018-04-05
Testing End Date: 2018-05-17

1.4. Signature



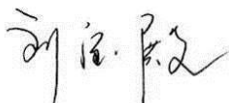
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(Prepared this test report)



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: TCL Communication Ltd.
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2.2. Manufacturer Information

Company Name: TCL Communication Ltd.
7/F, Block F4, TCL Communication Technology Building, TCL
Address /Post: International E City, Zhong Shan Yuan Road, Nanshan District,
Shenzhen, Guangdong, P.R. China 518052
Contact Person: Gong Zhizhou
Contact Email zhizhou.gong@tcl.com
Telephone: 0086-755-36611722
Fax: /

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

3.1. About EUT

Description	LTE/UMTS/GSM mobile phone
Model Name	A502DL
FCC ID	2ACCJH086
Extreme vol. Limits	3.5VDC to 4.4VDC (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, CAICT.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT2	015145000208542	PIO	vGP1
EUT5	010145000208666	PIO	vGP1

*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	Charger	/	/
AE3	Charger	/	/
AE4	USB cable	/	/

AE1

Model	CAC2400038C1
Manufacturer	BYD
Capacitance	2460mAh
Nominal voltage	/

AE2

Model	CBA0058AGAC4
Manufacturer	Aohai
Length of cable	

AE3

Model	CBA0058AGHC5
Manufacturer	Puan
Length of cable	

AE4

Model	CDA0000055C2
Manufacturer	SHENGHUA
Length of cable	98cm

*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.1	EUT2+ AE1+ AE2+ AE4	Charger
Set.2	EUT2+ AE1+ AE3+ AE4	Charger
Set.3	EUT2+ AE1+ AE4	USB mode

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

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 MΩ
Ground system resistance	< 4 Ω
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

Semi-anechoic chamber SAC-2 (10 meters×6.7meters×6.1meters) 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 MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
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 MΩ
Ground system resistance	< 4 Ω



6. SUMMARY OF TEST RESULTS

Abbreviations used in this clause:		
Verdict Column	P	Pass
	NA	Not applicable
	F	Fail

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



7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	Test Receiver	ESU26	100235	R&S	2019-02-28	1 year
2	Universal Radio Communication Tester	CMW500	143008	R&S	2018-12-26	1 year
3	Test Receiver	ESCI 7	100344	R&S	2019-02-28	1 year
4	Universal Radio Communication Tester	CMW500	116588	R&S	2018-11-26	1 year
5	LISN	ENV216	101200	R&S	2018-08-03	1 year
6	EMI Antenna	VULB9163	9163-302	Schwarzbeck	2020-02-27	3 years
7	EMI Antenna	3115	00167250	ETS-Lindgren	2020-05-21	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).

A.1.1 Method of measurement

The field strength of radiated emissions from the unintentional radiator (USB mode of MS and charging mode of MS) at distances of 10 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 USB mode and charging mode. During the test MS is connected to a PC via a USB cable in the case of USB mode and is connected to a charger in the case of charging mode. The model of the PC is DELL OPTIPLEX 380, and the serial number of the PC is 2X1YV2X. The software is used to let the PC keep on copying data to MS, reading and erasing the data after copy action was finished.

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

A.1.3 Measurement Limit

Frequency range (MHz)	Field strength limit ($\mu\text{V/m}$)		
	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): 4.3dB, $k=2$.

Measurement results for Set.1:

Charging Mode/Average detector

Frequency(MHz)	Result(dB μ V/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dB μ V)	Polarity
17455.433	37.6	-19.2	41.5	15.300	H
17901.400	37.6	-18.5	45.6	10.500	H
17886.667	37.5	-18.5	45.6	10.400	V
17435.033	37.5	-19.2	41.5	15.200	H
17380.067	37.5	-19.5	41.5	15.500	H
17420.300	37.4	-19.2	41.5	15.100	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
17499.067	49.8	-19.2	41.5	27.500	H
17359.667	49.4	-19.5	41.5	27.400	H
17594.833	49.3	-18.9	45.6	22.600	V
17393.100	49.0	-19.2	41.5	26.700	H
17841.900	49.0	-18.5	45.6	21.900	H
17924.067	49.0	-17.7	45.6	21.100	H

Measurement results for Set.2:

Charging Mode/Average detector

Frequency(MHz)	Result(dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dB μ V)	Polarity
17877.033	37.8	-18.5	45.6	10.700	H
17919.533	37.5	-17.7	45.6	9.600	H
17377.800	37.5	-19.5	41.5	15.500	V
17396.500	37.5	-19.2	41.5	15.200	H
17445.233	37.5	-19.2	41.5	15.200	H
17865.133	37.4	-18.5	45.6	10.300	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
17799.967	48.7	-18.5	45.6	21.600	H
17716.667	48.6	-18.9	45.6	21.900	H
17864.000	48.4	-18.5	45.6	21.300	V
17827.167	48.4	-18.5	45.6	21.300	H
17874.200	48.3	-18.5	45.6	21.200	H
17876.467	48.2	-18.5	45.6	21.100	H

Measurement results for Set.3:

USB Mode/Average detector

Frequency(MHz)	Result(dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dB μ V)	Polarity
17472.433	37.6	-19.2	41.5	15.300	H
17379.500	37.6	-19.5	41.5	15.600	H
17897.433	37.6	-18.5	45.6	10.500	V
17395.933	37.6	-19.2	41.5	15.300	H
17394.233	37.6	-19.2	41.5	15.300	H
17396.500	37.5	-19.2	41.5	15.200	H

USB Mode/Peak detector

Frequency(MHz)	Result(dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dB μ V)	Polarity
17891.767	49.4	-18.5	45.6	22.300	H
17420.300	49.1	-19.2	41.5	26.800	H
17938.233	49.0	-17.7	45.6	21.100	V
17340.967	48.9	-19.5	41.5	26.900	H
17360.233	48.8	-19.5	41.5	26.800	H
17284.300	48.8	-19.5	41.5	26.800	H

Note: The measurement results of Set.1, Set.2 and Set.3 showed here are worst cases of the combinations of different batteries and USB cables.

Charging Mode, Set.1

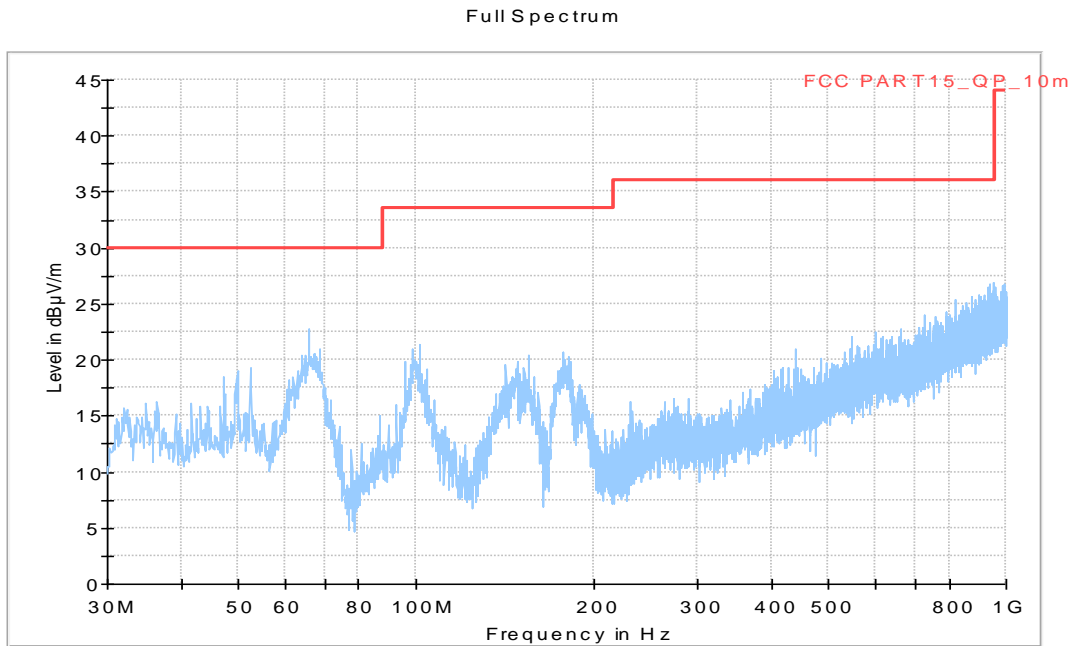


Figure A.1 Radiated Emission from 30MHz to 1GHz

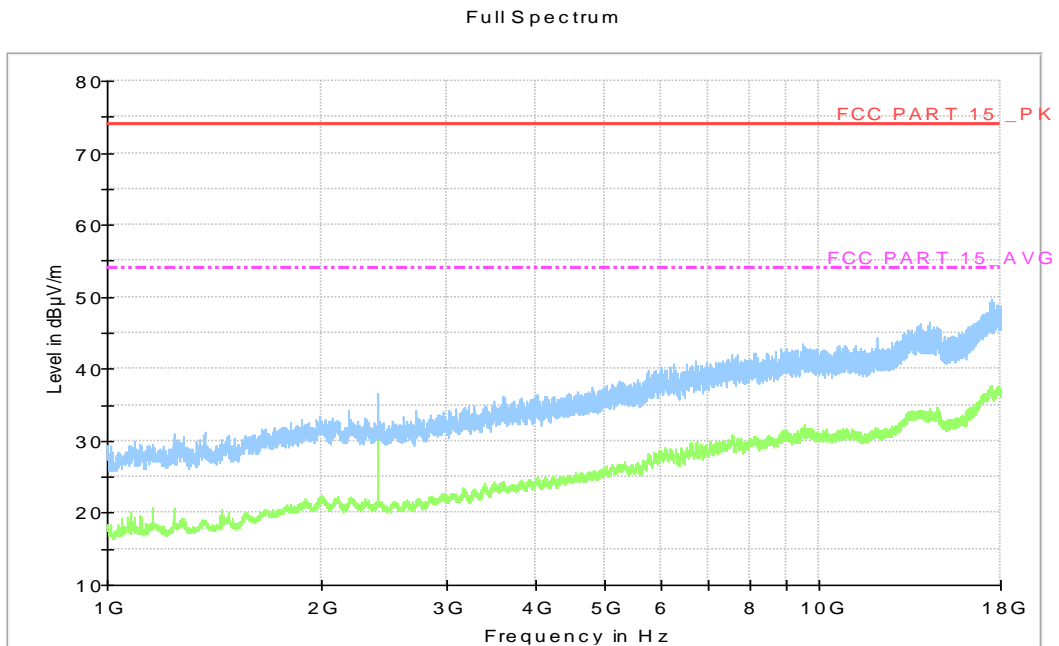


Figure A.2 Radiated Emission from 1GHz to 18GHz

Charging Mode, Set.2

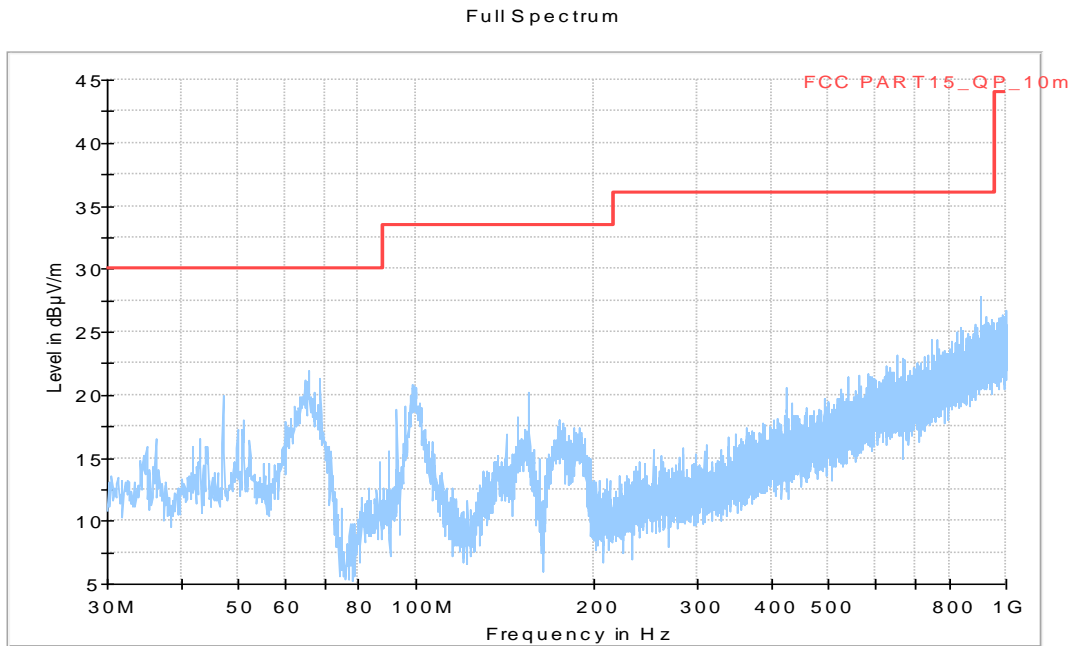


Figure A.3 Radiated Emission from 30MHz to 1GHz

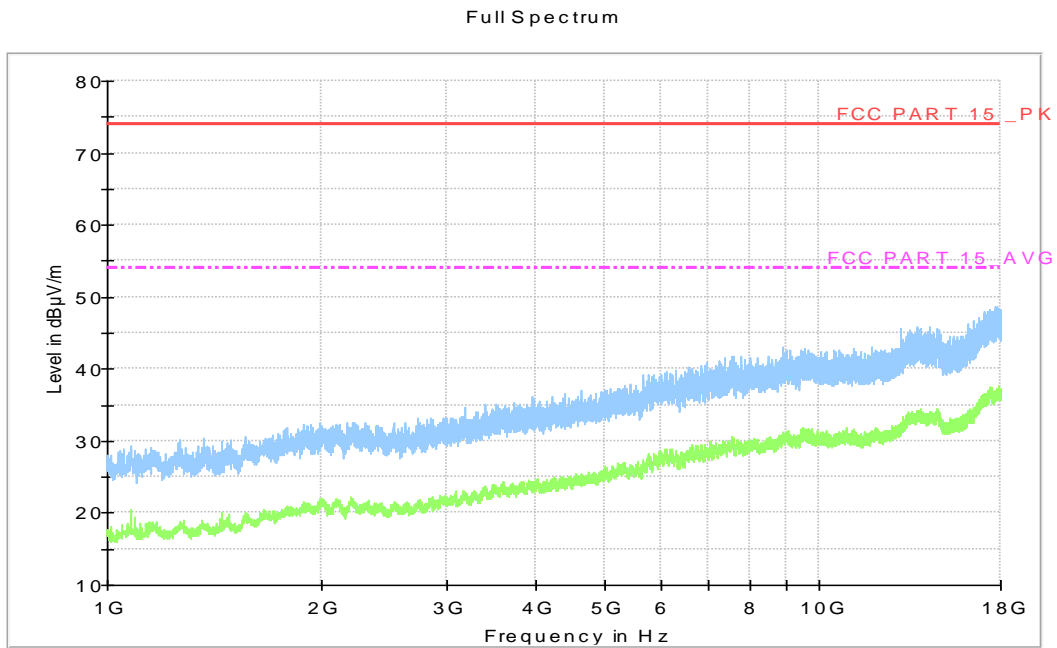


Figure A.4 Radiated Emission from 1GHz to 18GHz

USB Mode, Set.3

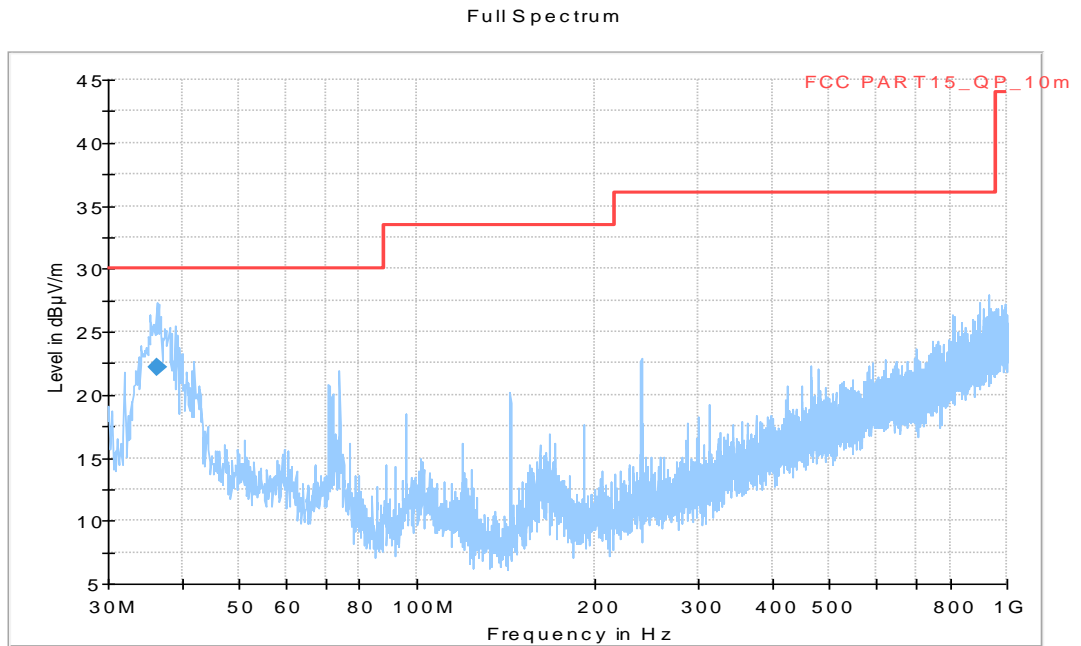


Figure A.5 Radiated Emission from 30MHz to 1GHz

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
36.448000	22.21	30.00	7.79	1000.0	120.000	302.0	V	110.0

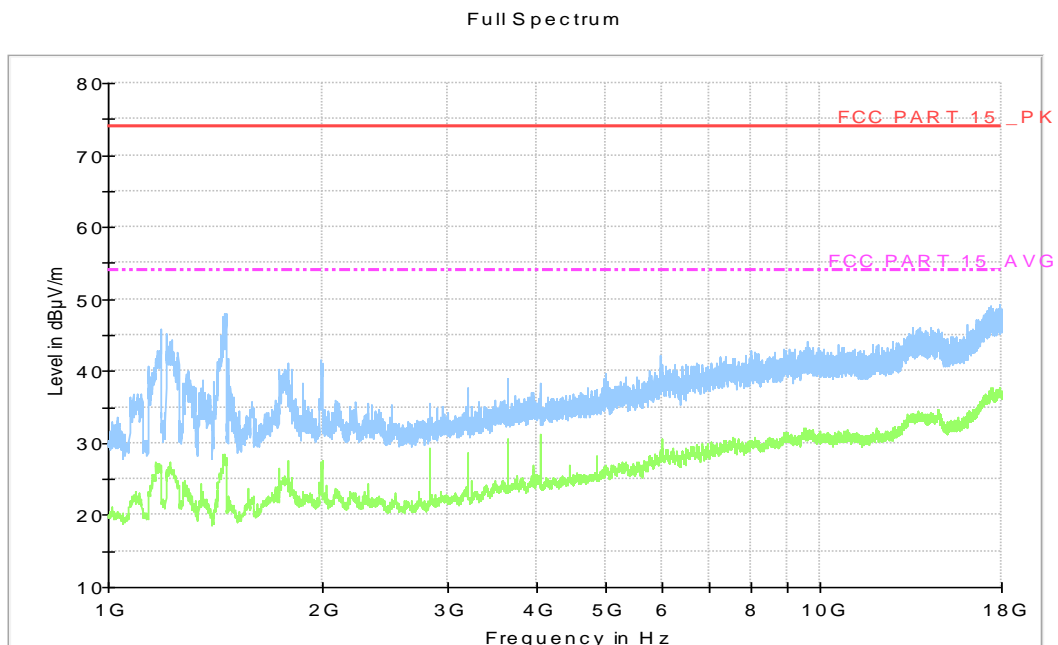


Figure A.6 Radiated Emission from 1GHz to 18GHz

A.2 Conducted Emission

Reference

FCC: CFR Part 15.107(a).

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 USB mode and charging mode. During the test MS is connected to a PC via a USB cable in the case of USB mode and is connected to a charger in the case of charging mode. The model of the PC is DELL OPTIPLEX 380, and the serial number of the PC is 2X1YV2X. The software is used to let the PC keep on copying data to MS, reading and erasing the data after copy action was finished.

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

A.2.3 Measurement Limit

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	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: $U = 2.9 \text{ dB}$, $k=2$.

Charging Mode, Set.1

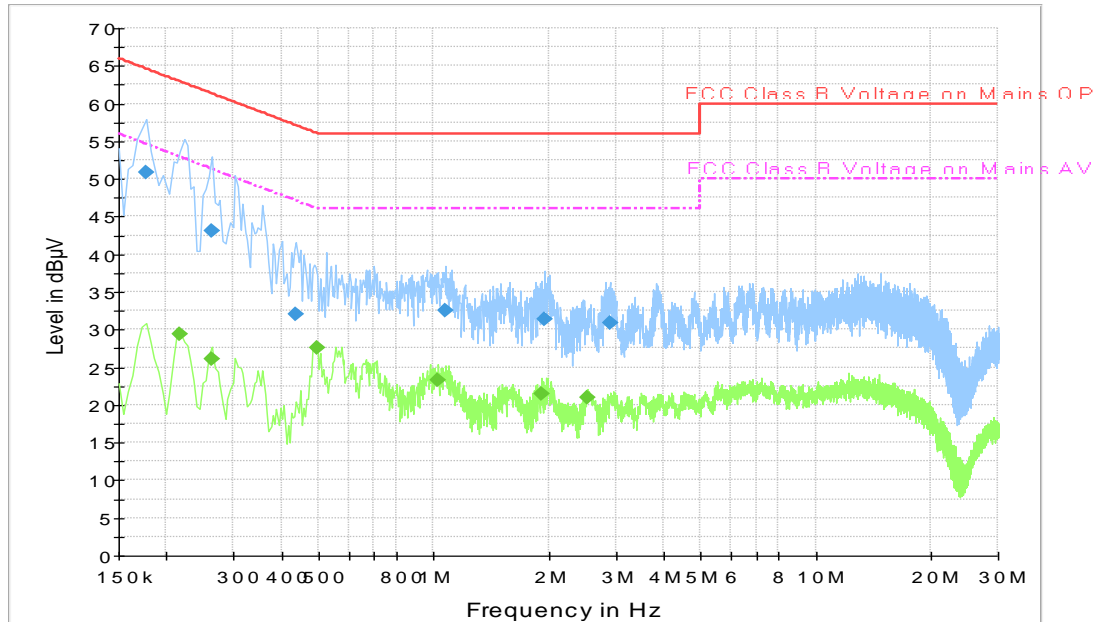


Figure A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.177000	50.8	2000.0	9.000	L1	19.8	13.8	64.6
0.262500	43.0	2000.0	9.000	L1	19.8	18.3	61.4
0.438000	32.0	2000.0	9.000	L1	19.9	25.1	57.1
1.077000	32.6	2000.0	9.000	L1	19.6	23.4	56.0
1.954500	31.4	2000.0	9.000	L1	19.7	24.6	56.0
2.890500	30.8	2000.0	9.000	L1	19.7	25.2	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.217500	29.4	2000.0	9.000	L1	19.8	23.5	52.9
0.262500	26.0	2000.0	9.000	L1	19.8	25.3	51.4
0.496500	27.5	2000.0	9.000	L1	19.9	18.6	46.1
1.027500	23.3	2000.0	9.000	L1	19.6	22.7	46.0
1.923000	21.5	2000.0	9.000	L1	19.7	24.5	46.0
2.530500	21.0	2000.0	9.000	L1	19.7	25.0	46.0

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

Charging Mode, Set.2

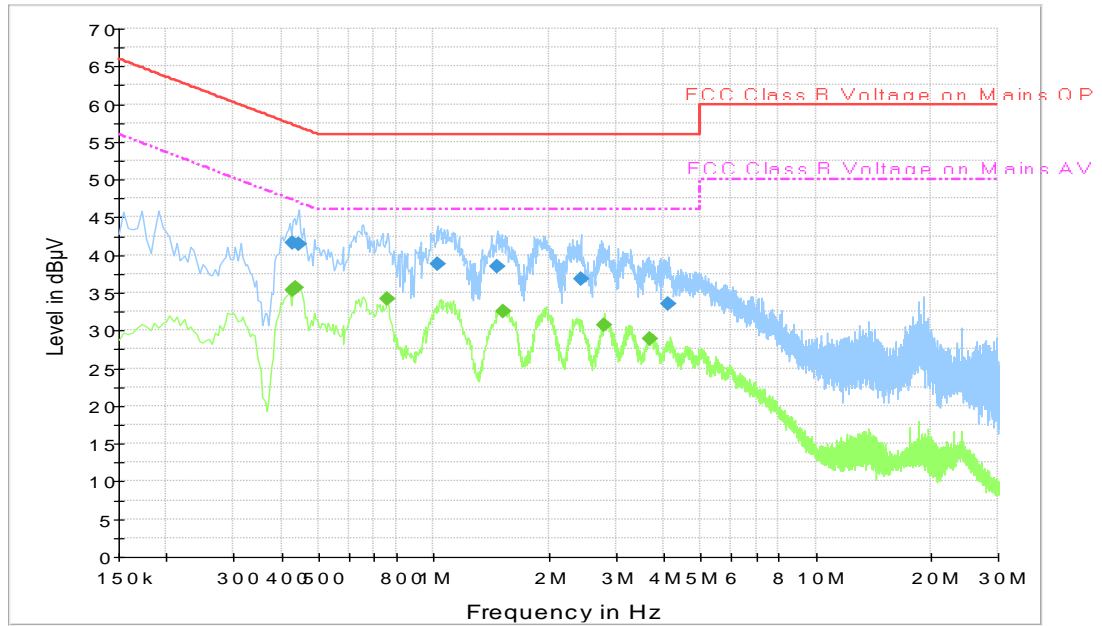


Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.429000	41.6	2000.0	9.000	N	19.9	15.6	57.3
0.442500	41.4	2000.0	9.000	N	19.9	15.6	57.0
1.023000	38.7	2000.0	9.000	L1	19.6	17.3	56.0
1.464000	38.4	2000.0	9.000	N	19.6	17.6	56.0
2.427000	36.7	2000.0	9.000	N	19.6	19.3	56.0
4.110000	33.4	2000.0	9.000	L1	19.6	22.6	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.429000	35.3	2000.0	9.000	N	19.9	12.0	47.3
0.438000	35.7	2000.0	9.000	N	19.9	11.4	47.1
0.757500	34.1	2000.0	9.000	N	19.8	11.9	46.0
1.518000	32.6	2000.0	9.000	N	19.6	13.4	46.0
2.805000	30.7	2000.0	9.000	N	19.6	15.3	46.0
3.673500	28.8	2000.0	9.000	N	19.7	17.2	46.0

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

USB Mode, Set.3

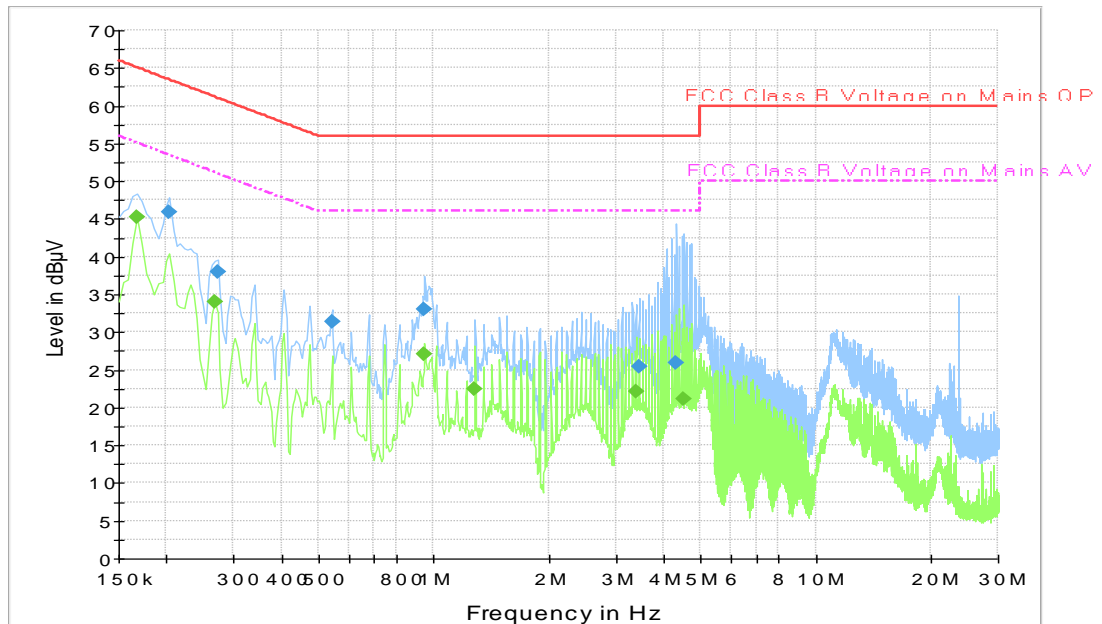


Figure A.9 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.204000	45.9	2000.0	9.000	L1	19.8	17.6	63.4
0.271500	38.0	2000.0	9.000	L1	19.8	23.1	61.1
0.541500	31.4	2000.0	9.000	N	19.9	24.6	56.0
0.946500	33.1	2000.0	9.000	N	19.7	22.9	56.0
3.448500	25.4	2000.0	9.000	N	19.7	30.6	56.0
4.326000	26.0	2000.0	9.000	N	19.7	30.0	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.168000	45.2	2000.0	9.000	N	19.8	9.8	55.1
0.267000	34.0	2000.0	9.000	L1	19.8	17.2	51.2
0.946500	27.1	2000.0	9.000	N	19.7	18.9	46.0
1.284000	22.4	2000.0	9.000	N	19.6	23.6	46.0
3.381000	22.2	2000.0	9.000	N	19.7	23.8	46.0
4.528500	21.1	2000.0	9.000	N	19.7	24.9	46.0

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

ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP[®]

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 Communiqué dated January 2009).*

2017-08-22 through 2018-09-30
Effective Dates




For the National Voluntary Laboratory Accreditation Program

END OF REPORT