



TEST REPORT

No. I18Z61763-EMC01

for

TCL Communication Ltd.

LTE/UMTS/GSM mobile phone

Model Name: A501DL

FCC ID: 2ACCJH099

with

Hardware Version: PIO

Software Version: vSV5

Issued Date: 2018-11-02



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
I18Z61763-EMC01	Rev.0	1 st edition	2018-11-02



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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: 2018-10-11
Testing End Date: 2018-11-02

1.4. Signature



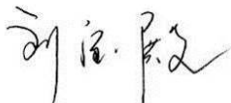
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2. Client Information

2.1. Applicant Information

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2.2. Manufacturer Information

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7/F, Block F4, TCL Communication Technology Building, TCL
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3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	LTE/UMTS/GSM mobile phone
Model Name	A501DL
FCC ID	2ACCJH099
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
EUT3	015293000110274	PIO	vSV5

*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	/	/
AE5	USB cable	/	/
AE6	USB cable	/	/
AE7	USB cable	/	/
AE8	USB cable	/	/
AE9	Headset	/	/

AE1

Model	CAB2110002C1
Manufacturer	BYD
Capacitance	2200mAh
Nominal voltage	/

AE2

Model	CAB2110000C1
Manufacturer	BYD
Capacitance	2200mAh
Nominal voltage	/

AE3

Model	CBA0058AGNC5
Manufacturer	PUAN
Length of cable	/

AE4

Model	CBA0058AGNC7
Manufacturer	CHENYANG



Length of cable	/
AE5	
Model	CDA0000097C8
Manufacturer	PUAN
Length of cable	/
AE6	
Model	CDA0000097C2
Manufacturer	SHENGHUA
Length of cable	/
AE7	
Model	CDA3122002C8
Manufacturer	PUAN
Length of cable	/
AE8	
Model	CDA3122002C2
Manufacturer	SHENGHUA
Length of cable	/
AE9	
Model	/
Manufacturer	/
Length of cable	/

*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	EUT3+AE1+AE3+AE5/AE6+AE9	Charger mode+FM
Set.2	EUT3+AE1+AE4+AE5/AE6	Charger mode+MP3+GPS
Set.3	EUT3+AE1+AE5/AE6	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 (23meters×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 (10meters×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	2019-03-31	1 year
2	Universal Radio Communication Tester	CMW500	143008	R&S	2018-12-26	1 year
3	Test Receiver	ESCI 3	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	2019-04-15	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	Signal Generator	SMT06	831285/005	R&S	2019-04-04	1 years
9	PC	OPTIPLEX 380	2X1YV2X	DELL	N/A	N/A
10	Printer	P1606dn	VNC3L52122	HP	N/A	N/A
11	Keyboard	L100	CN0RH659658 907ATOI40	DELL	N/A	N/A
12	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): 5.44dB, $k=2$.

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
17954.100	39.9	-17.7	45.6	12.000	H
17972.233	39.8	-17.7	45.6	11.900	H
17985.833	39.7	-17.7	45.6	11.800	V
17963.167	39.7	-17.7	45.6	11.800	H
17974.500	39.6	-17.7	45.6	11.700	H
17942.200	39.6	-17.7	45.6	11.700	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
36.693	25.5	-25.4	11.2	39.665	H
36.014	24.8	-25.3	11.2	38.915	H
35.238	24.3	-25.3	11.2	38.415	V
35.335	24.3	-25.3	11.2	38.415	H
36.790	24.3	-25.4	11.2	38.465	H
34.850	24.2	-25.3	11.2	38.315	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
17966.000	39.9	-25.5	43.4	22.002	H
17964.300	39.8	-25.5	43.4	21.902	H
17954.667	39.7	-25.5	43.4	21.802	V
17957.500	39.6	-25.5	43.4	21.702	H
17958.067	39.5	-25.5	43.4	21.602	H
17976.200	39.4	-25.5	43.4	21.502	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
66.763	21.4	-24.8	12.8	33.380	H
62.689	21.3	-24.9	12.8	33.394	H
37.566	21.2	-25.4	11.2	35.365	V
64.144	20.9	-24.9	12.8	32.994	H
64.920	20.9	-24.9	12.8	32.994	H
37.372	20.8	-25.4	11.2	34.965	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
17994.333	40.0	-25.5	43.4	22.102	H
17963.733	39.8	-25.5	43.4	21.902	H
17974.500	39.8	-25.5	43.4	21.902	V
17962.600	39.7	-25.5	43.4	21.802	H
17967.700	39.7	-25.5	43.4	21.802	H
17988.100	39.6	-25.5	43.4	21.702	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
41.349	23.1	-25.4	13.3	35.152	H
41.543	21.8	-25.4	13.3	33.852	H
34.656	21.4	-25.3	11.2	35.518	V
34.268	21.3	-25.3	11.2	35.418	H
34.365	21.3	-25.3	11.2	35.418	H
37.372	20.7	-25.4	11.2	34.865	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 + FM, Set.1

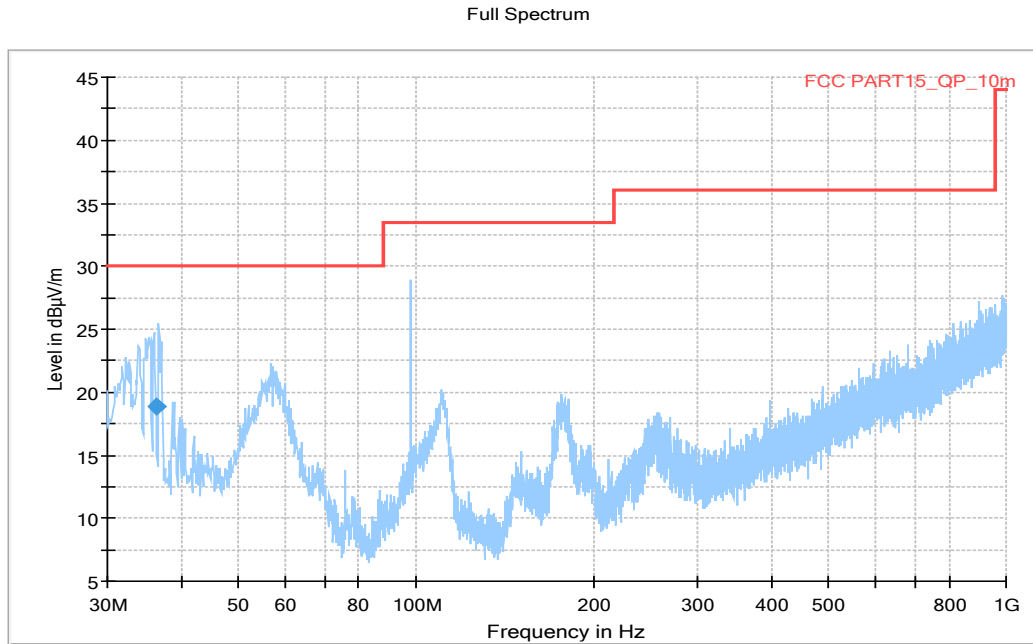


Figure A.1 Radiated Emission from 30MHz to 1GHz

Note: the spike (98MHz) is coming from FM signal source.

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
36.393000	18.84	30.00	11.16	1000.0	120.000	277.0	V	153.0

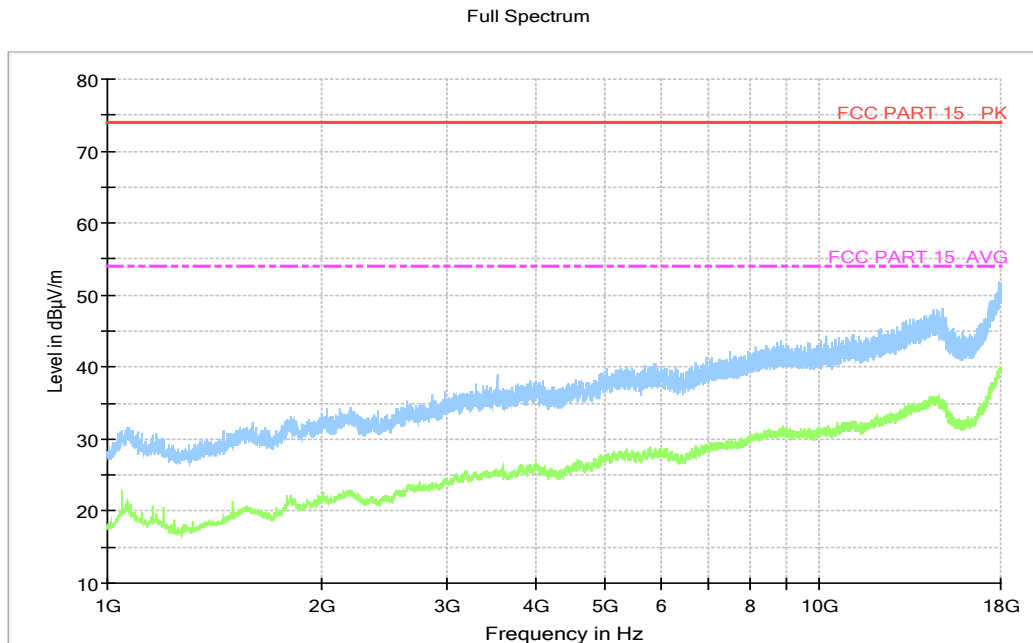


Figure A.2 Radiated Emission from 1GHz to 18GHz

Charging Mode +MP3 +GSP, Set.2

Full Spectrum

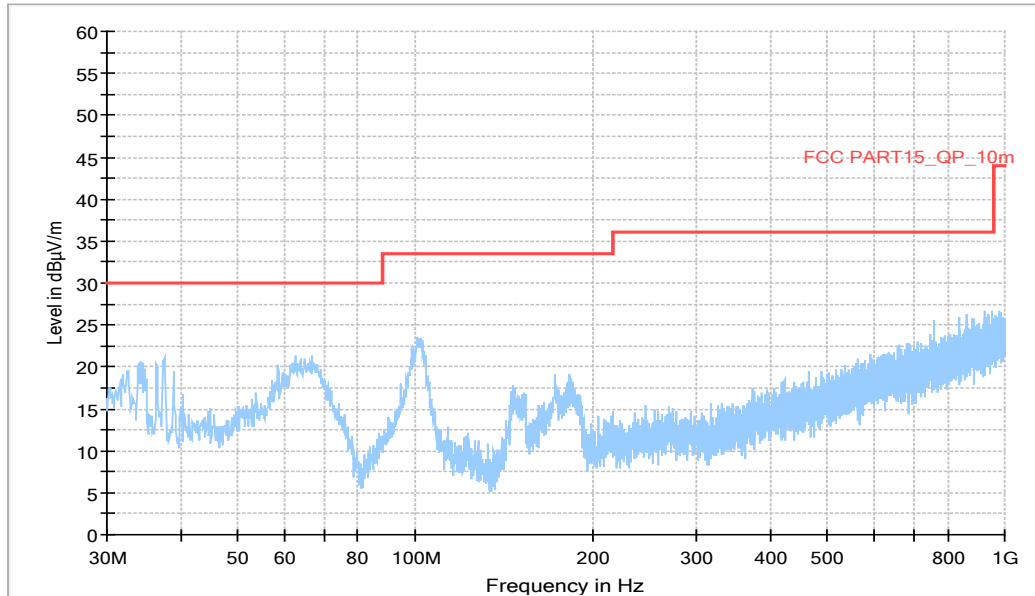


Figure A.3 Radiated Emission from 30MHz to 1GHz

Full Spectrum

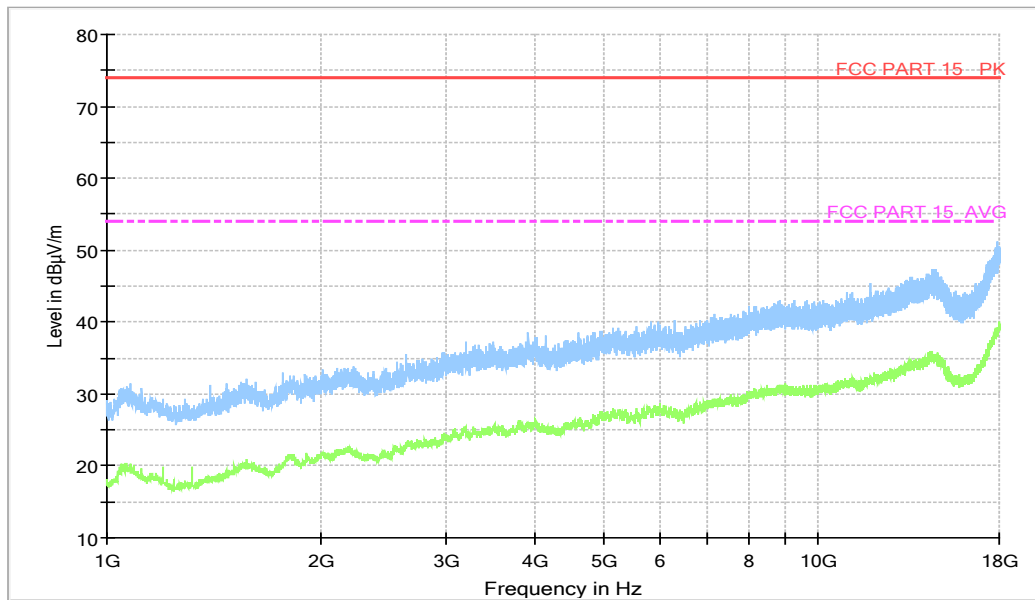


Figure A.4 Radiated Emission from 1GHz to 18GHz

USB Mode, Set.3

Full Spectrum

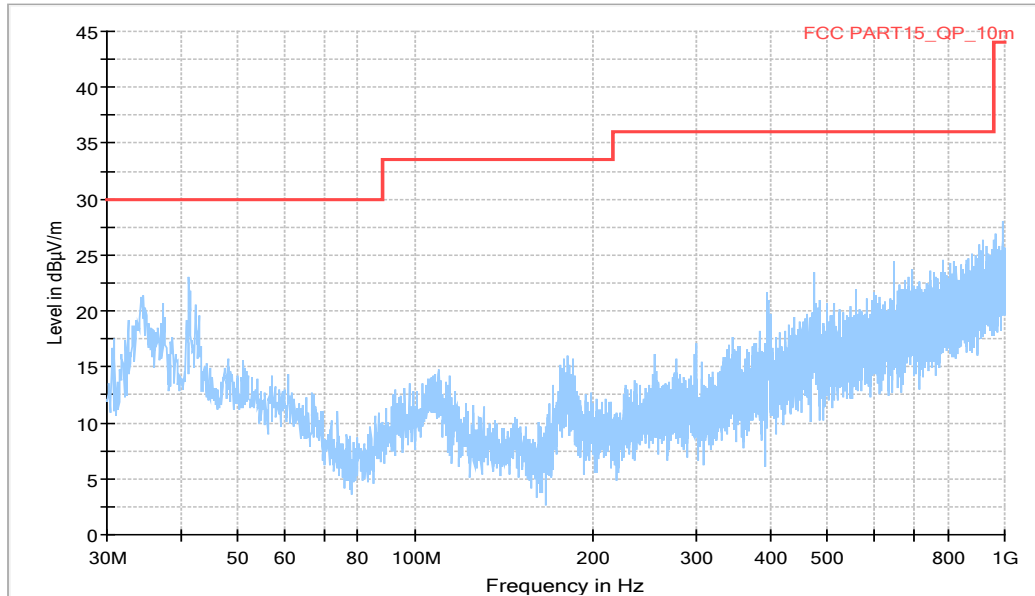


Figure A.5 Radiated Emission from 30MHz to 1GHz

Full Spectrum

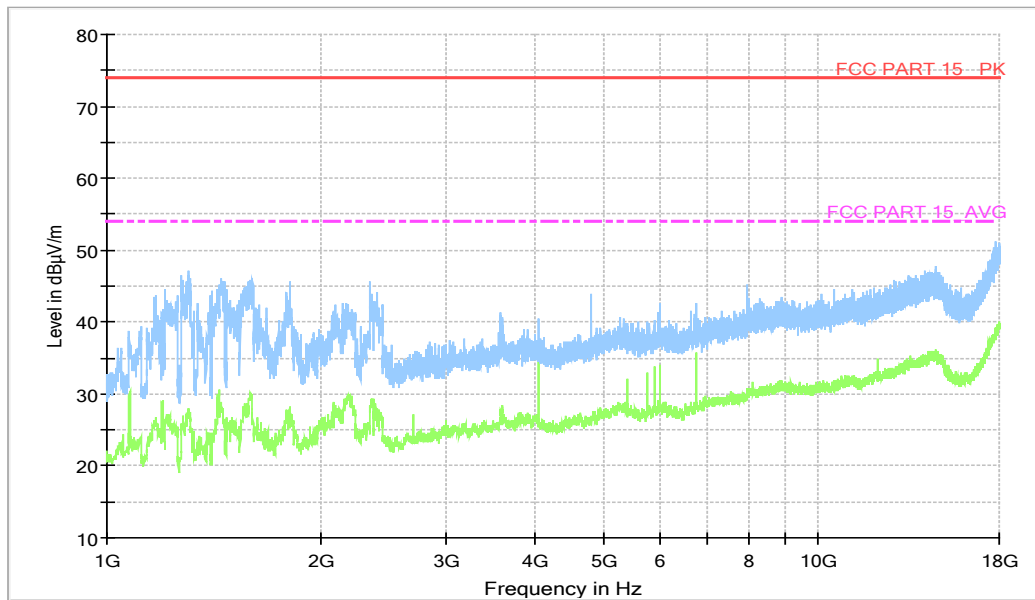


Figure A.6 Radiated Emission from 1GHz to 18GHz

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: $U = 3.08 \text{ dB}$, $k=2$.

Charging Mode +FM, Set.1

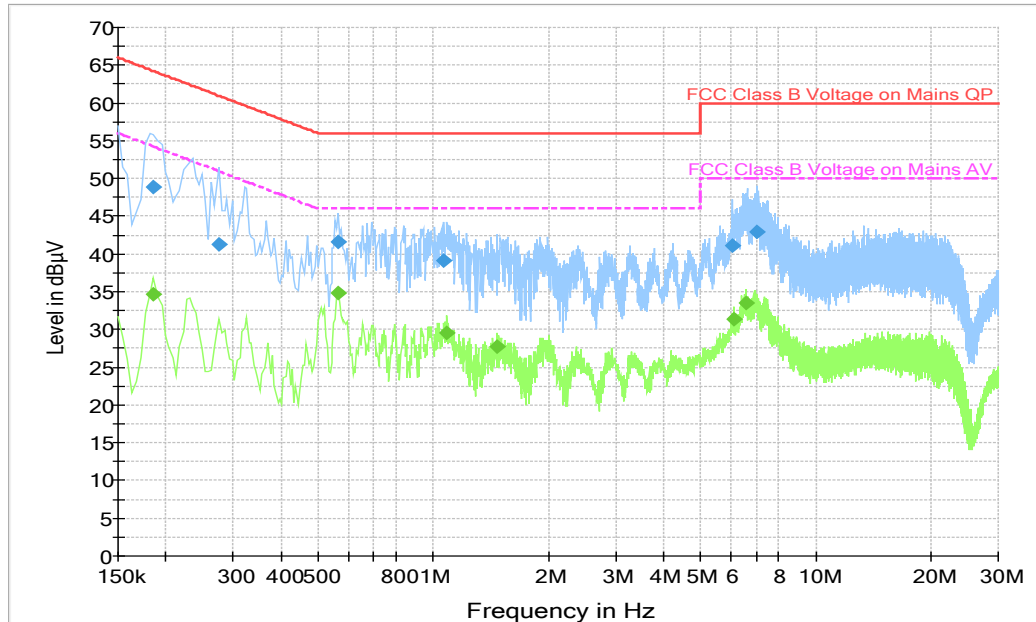


Figure A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186000	48.8	2000.0	9.000	L1	19.8	15.4	64.2
0.276000	41.2	2000.0	9.000	L1	19.8	19.7	60.9
0.564000	41.7	2000.0	9.000	L1	19.9	14.3	56.0
1.068000	39.1	2000.0	9.000	L1	19.6	16.9	56.0
6.076500	41.1	2000.0	9.000	L1	19.7	18.9	60.0
6.994500	43.0	2000.0	9.000	L1	19.8	17.0	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186000	34.7	2000.0	9.000	0.1860	N	19.8	19.5
0.564000	34.8	2000.0	9.000	0.5640	N	19.9	11.2
1.086000	29.5	2000.0	9.000	1.0860	L1	19.6	16.5
1.473000	27.7	2000.0	9.000	1.4730	L1	19.6	18.3
6.108000	31.3	2000.0	9.000	6.1080	L1	19.7	18.7
6.567000	33.6	2000.0	9.000	6.5670	L1	19.8	16.4

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

Charging Mode+MP3+GPS, Set.2

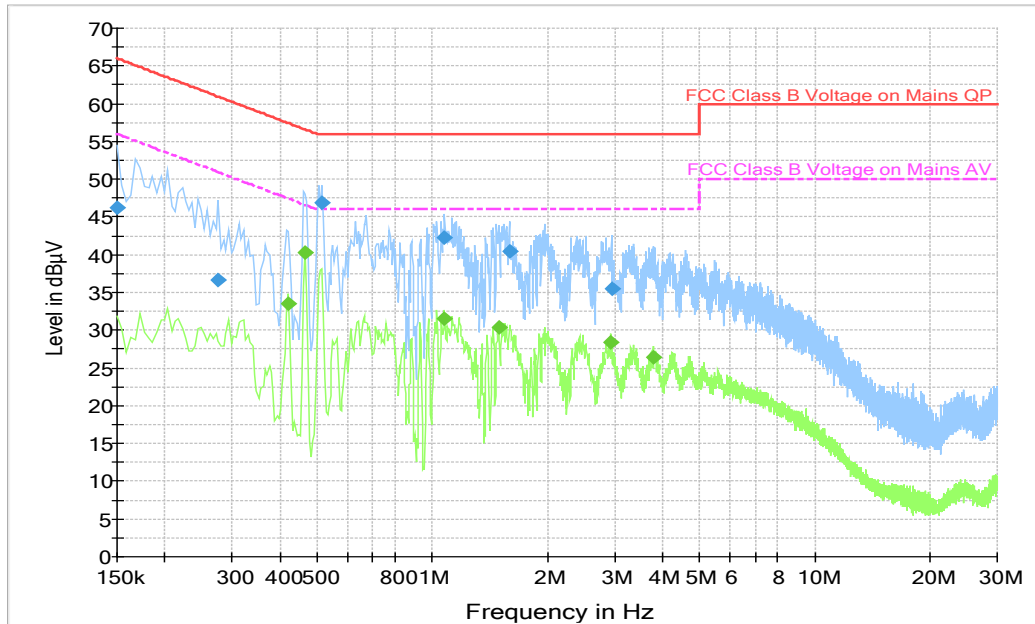


Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	46.3	2000.0	9.000	N	20.2	19.7	66.0
0.276000	36.7	2000.0	9.000	L1	19.8	24.3	60.9
0.514500	46.9	2000.0	9.000	L1	19.9	9.1	56.0
1.077000	42.2	2000.0	9.000	L1	19.6	13.8	56.0
1.590000	40.4	2000.0	9.000	L1	19.7	15.6	56.0
2.944500	35.4	2000.0	9.000	L1	19.7	20.6	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.420000	33.6	2000.0	9.000	L1	19.9	13.9	47.4
0.465000	40.2	2000.0	9.000	L1	19.9	6.4	46.6
1.077000	31.5	2000.0	9.000	L1	19.6	14.5	46.0
1.491000	30.3	2000.0	9.000	L1	19.6	15.7	46.0
2.940000	28.5	2000.0	9.000	N	19.6	17.5	46.0
3.781500	26.4	2000.0	9.000	L1	19.6	19.6	46.0

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

USB Mode, Set.3

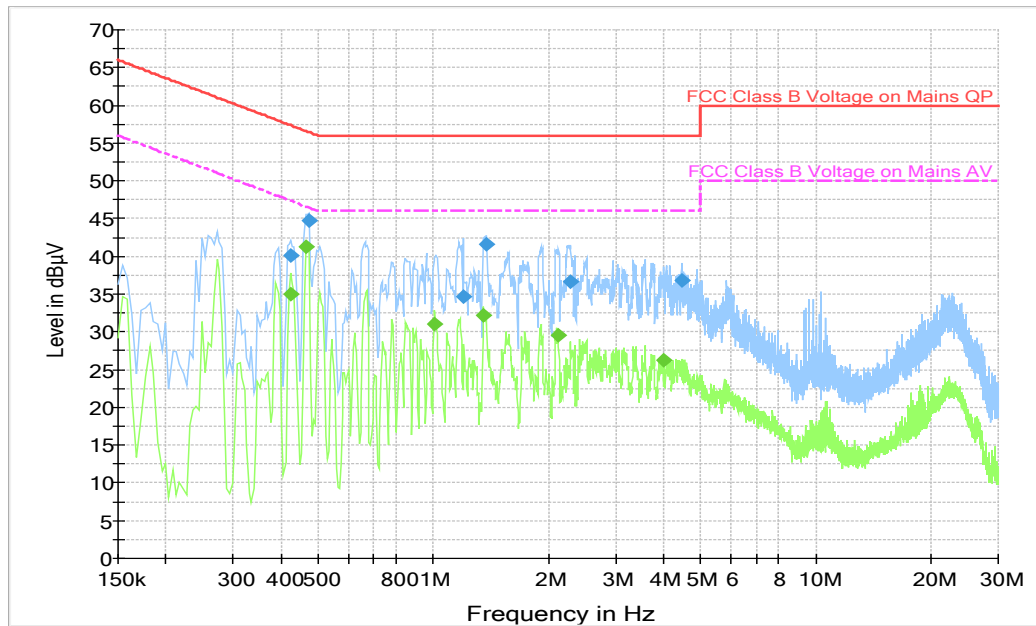


Figure A.9 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.424500	40.1	2000.0	9.000	L1	19.9	17.3	57.4
0.474000	44.7	2000.0	9.000	N	19.9	11.7	56.4
1.198500	34.6	2000.0	9.000	N	19.6	21.4	56.0
1.378500	41.6	2000.0	9.000	L1	19.6	14.4	56.0
2.287500	36.7	2000.0	9.000	L1	19.7	19.3	56.0
4.479000	36.8	2000.0	9.000	N	19.7	19.2	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.424500	35.0	2000.0	9.000	L1	19.9	12.3	47.4
0.465000	41.2	2000.0	9.000	L1	19.9	5.4	46.6
1.009500	31.0	2000.0	9.000	L1	19.6	15.0	46.0
1.356000	32.2	2000.0	9.000	L1	19.6	13.8	46.0
2.125500	29.5	2000.0	9.000	N	19.6	16.5	46.0
4.011000	26.3	2000.0	9.000	N	19.7	19.7	46.0

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



ANNEX B: Persons involved in this testing

Test Item	Tester
Radiated Emission	Shi Suolan
Conducted Emission	Li Jinpeng

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