TEST REPORT

No. I17Z61226-EMC04

for

TCL Communication Ltd.

UMTS/GSM Smartphone

VFD 310/VFD 311

with

FCC ID: 2ACCJB096

Hardware Version: PIO

Software Version: 010 01

Issued Date: 2017-09-11

TESTING
NVLAP LAB CODE 600118-0

Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I17Z61226-EMC04	Rev.0	1st edition	2017-08-24
I17Z61226-EMC04	Rev.1	Clarify test model VFD 310 on page 6 and page 8.	2017-09-11

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

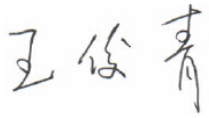
Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2017-08-13

Testing End Date: 2017-08-20

1.4. Signature



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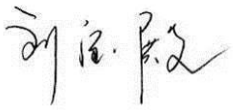

Liu Baodian

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
City:	Shanghai
Postal Code:	201203
Country:	China
Telephone:	0086-21-31363544
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2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China. 201203
City:	Shanghai
Postal Code:	201203
Country:	China
Telephone:	0086-21-31363544
Fax:	0086-21-61460602

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

3.1. About EUT

Description	UMTS/GSM Smartphone
Model Name	VFD 310/VFD 311
FCC ID	2ACCJB096
Extreme vol. Limits	3.4VDC to 4.35VDC (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(VFD 310)	359933080002966	PIO	010 01

*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		/
AE3	Charger		/
AE4	Charger		/
AE5	Charger		/
AE14	USB Cable		/
AE15	USB Cable		/

AE1

Model	CAB1500045C1
Manufacturer	BYD
Capacitance	1500 mAh
Nominal voltage	3.8 V

AE3

Model	CBA3068AA1C4
Manufacturer	AOHAI
Length of cable	/

AE4

Model	CBA0077AA1C1
Manufacturer	BYD
Length of cable	/

AE5

Model	CBA0066AA1C1
Manufacturer	BYD
Length of cable	120cm

AE14

Model	CDA3122005C2
Manufacturer	SHENGHUA
Length of cable	95cm

AE15

Model	CDA3122005C1
Manufacturer	JUWEI
Length of cable	95cm

*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	EUT1+ AE1+AE3+AE14	Charger
Set.3	EUT1+ AE1+AE4+AE14	Charger
Set.5	EUT1+ AE1+AE5+AE14	Charger
Set.25	EUT1+ AE14	USB

Note: The tests are using the model of VFD 310. According to the declaration of changes, for the model of VFD 311, no test needs to been performed, all results are cited from the model VFD 310.

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 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).

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.1:

Charging Mode/Average detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17888.650	43.9	-18.5	45.6	16.800	H
17952.400	43.9	-17.7	45.6	16.000	H
17966.000	43.6	-17.7	45.6	15.700	H
17983.850	43.5	-17.7	45.6	15.600	V
17936.250	43.4	-17.7	45.6	15.500	V
17967.700	43.4	-17.7	45.6	15.500	H

Charging Mode/Peak detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17969.400	54.9	-17.7	45.6	27.000	H
17970.250	54.3	-17.7	45.6	26.400	V
17876.750	53.9	-18.5	45.6	26.800	V
17930.300	53.9	-17.7	45.6	26.000	V
17931.150	53.5	-17.7	45.6	25.600	V
17965.150	53.5	-17.7	45.6	25.600	H

Sample calculation: Peak detector, 17965.150MHz

Result =P_{Mea} (25.6dBμV)+ G_A (45.6dB/m)+ G_{PL}(-17.7 dB) =53.5dBμV/m

Measurement results for Set.3:

Charging Mode/Average detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17968.550	43.7	-17.7	45.6	15.800	H
17982.150	43.7	-17.7	45.6	15.800	H
17886.100	43.7	-18.5	45.6	16.600	H
17921.800	43.6	-17.7	45.6	15.700	H
17980.450	43.5	-17.7	45.6	15.600	H
17895.450	43.5	-18.5	45.6	16.400	H

Charging Mode/Peak detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17966.850	53.9	-17.7	45.6	26.000	H
17988.100	53.9	-17.7	45.6	26.000	H
17905.650	53.9	-18.5	45.6	26.800	H
17859.750	53.8	-18.5	45.6	26.700	H
17926.050	53.6	-17.7	45.6	25.700	H
17929.450	53.6	-17.7	45.6	25.700	H

Sample calculation: Peak detector, 17929.450MHz

Result =P_{Mea} (25.7dBμV)+ G_A (45.6dB/m)+ G_{PL}(-17.7 dB) =53.6dBμV/m

Measurement results for Set.5:

Charging Mode/Average detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17862.300	44.0	-18.5	45.6	16.900	H
17971.950	43.8	-17.7	45.6	15.900	H
17979.600	43.8	-17.7	45.6	15.900	H
17863.150	43.7	-18.5	45.6	16.600	V
17978.750	43.6	-17.7	45.6	15.700	V
17972.800	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
17825.750	53.5	-18.5	45.6	26.400	H
17988.950	53.4	-17.7	45.6	25.500	V
17869.100	53.4	-18.5	45.6	26.300	V
17975.350	53.4	-17.7	45.6	25.500	V
17858.050	53.2	-18.5	45.6	26.100	V
17862.300	53.1	-18.5	45.6	26.000	H

Sample calculation: Peak detector, 17862.300MHz

Result =P_{Mea} (26.0dBμV)+ G_A (45.6dB/m)+ G_{PL}(-18.5dB) =53.1dBμV/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
17963.450	44.2	-17.7	45.6	16.300	H
17896.300	43.7	-18.5	45.6	16.600	V
17996.600	43.5	-17.7	45.6	15.600	V
17972.800	43.5	-17.7	45.6	15.600	H
17871.650	43.4	-18.5	45.6	16.300	H
17970.250	43.4	-17.7	45.6	15.500	V

USB Mode/Peak detector

Frequency(MHz)	Result(dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea}(dBμV)	Polarity
17900.550	54.3	-18.5	45.6	27.200	V
17989.800	54.3	-17.7	45.6	26.400	V
17967.700	53.9	-17.7	45.6	26.000	H
17879.300	53.9	-18.5	45.6	26.800	V
17964.300	53.9	-17.7	45.6	26.000	H
17914.150	53.7	-18.5	45.6	26.600	V

Sample calculation: Peak detector, 17914.150MHz

Result =P_{Mea} (26.6dBμV)+ G_A (45.6dB/m)+ G_{PL}(-18.5dB) =53.7dBμV/m

Note: The measurement results of Set.1, Set.3, Set.5 and Set.25 showed here are worst cases of the combinations of different batteries and USB cables.

Charging Mode, Set.1

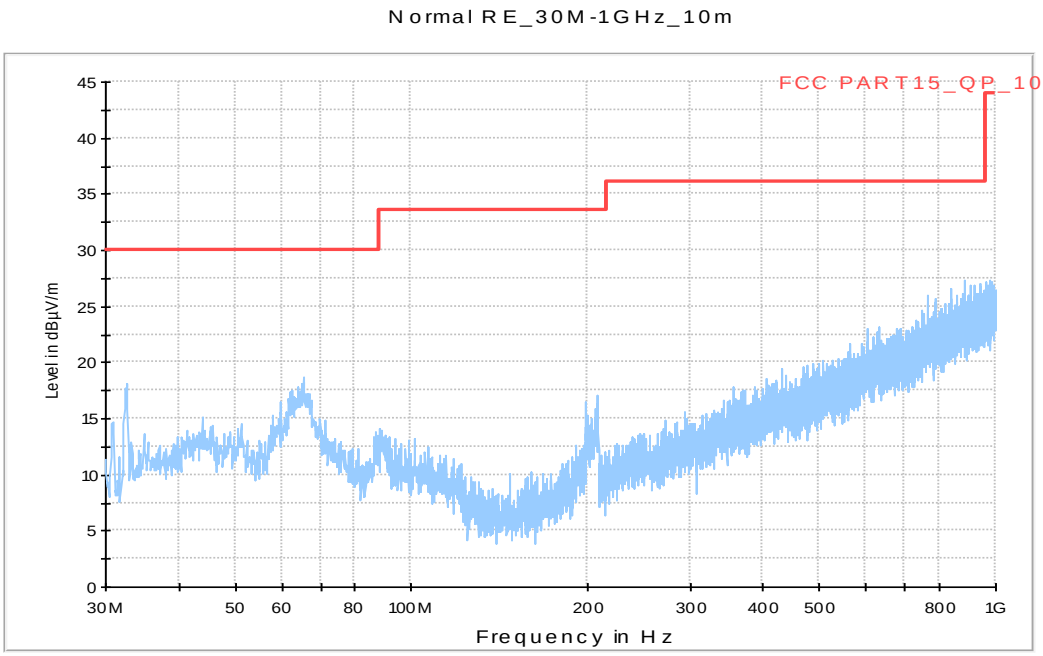

Figure A.1 Radiated Emission from 30MHz to 1GHz

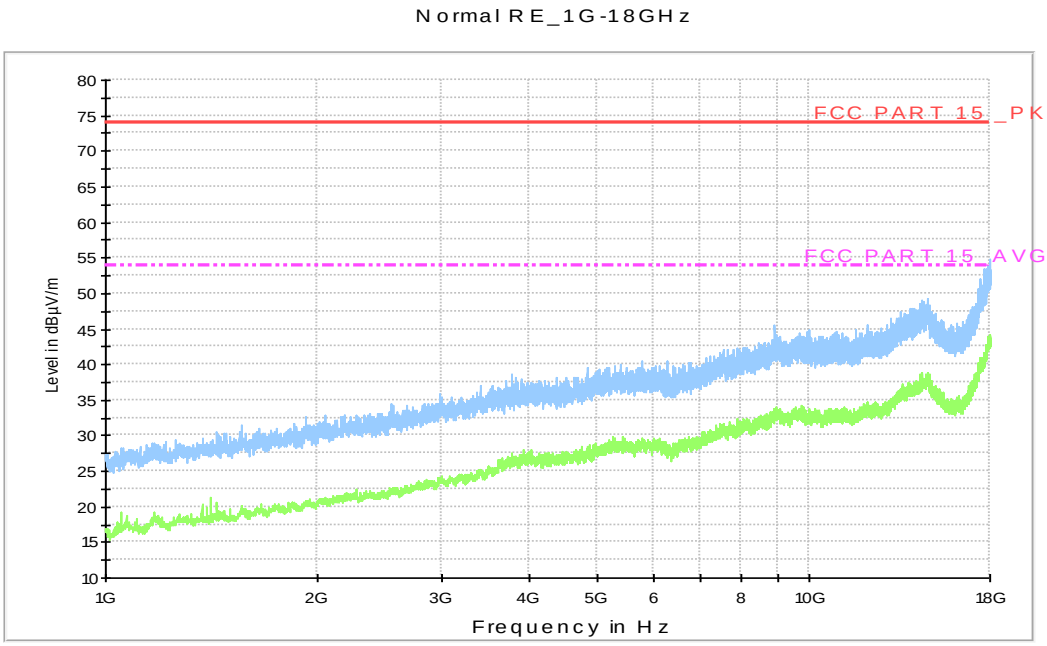

Figure A.2 Radiated Emission from 1GHz to 18GHz

Charging Mode, Set.3

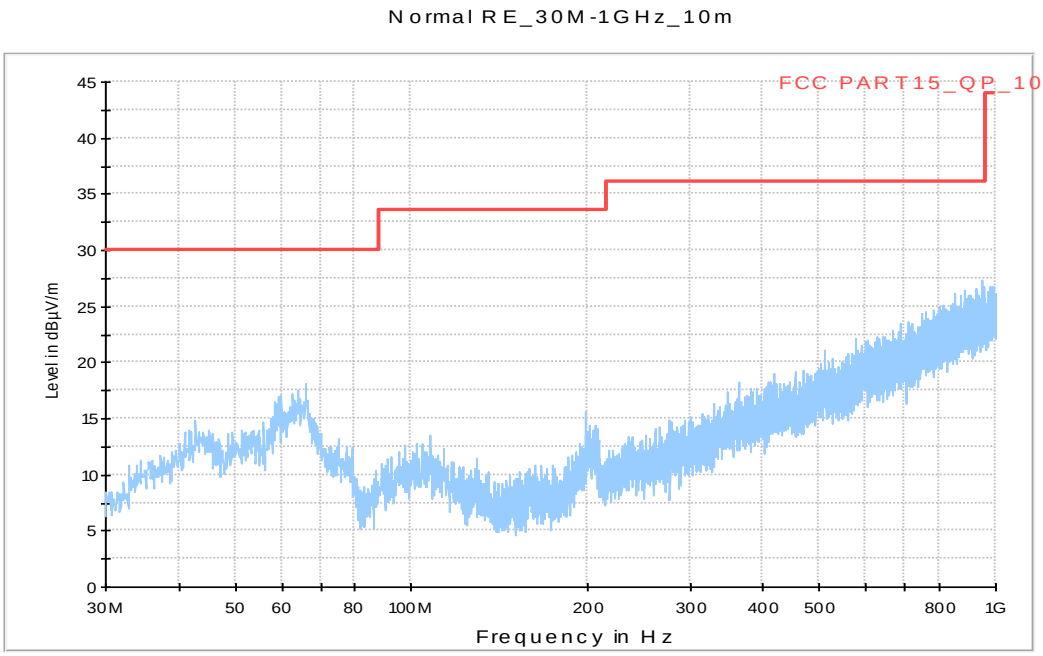

Figure A.3 Radiated Emission from 30MHz to 1GHz

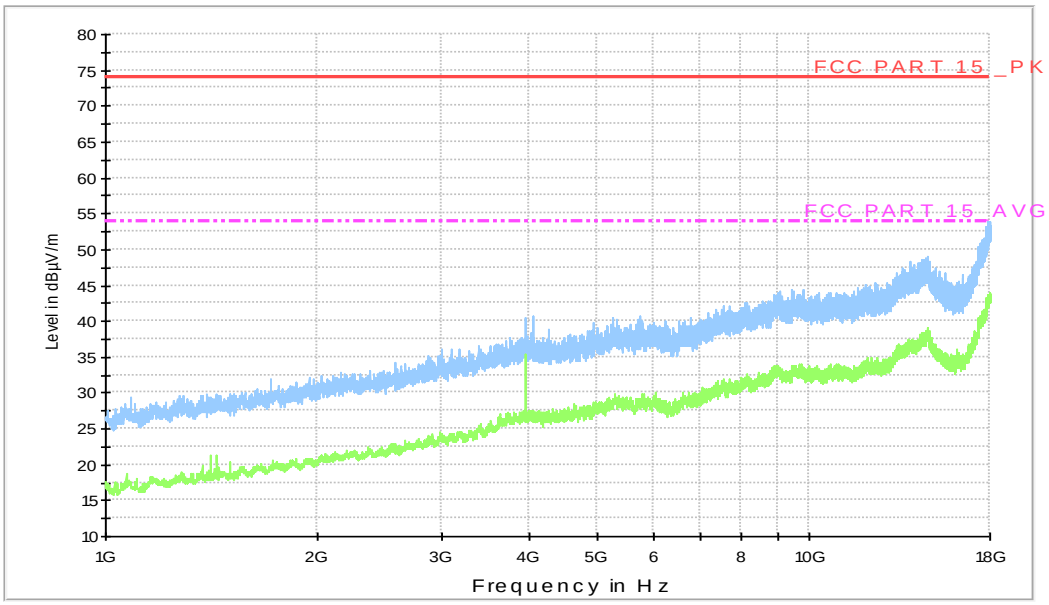

Figure A.4 Radiated Emission from 1GHz to 18GHz

Charging Mode, Set.5

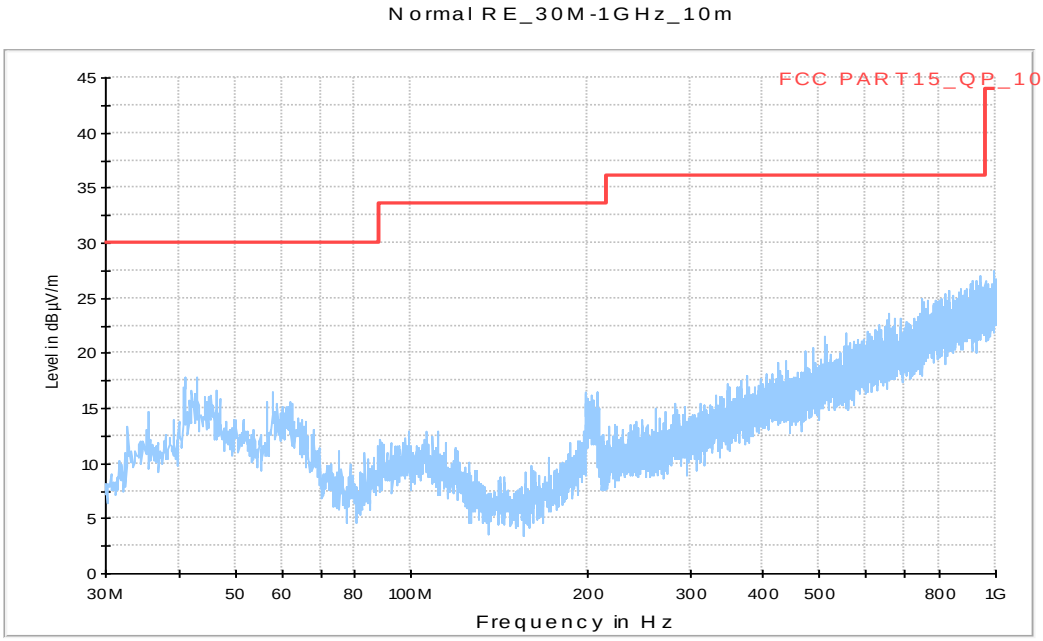

Figure A.3 Radiated Emission from 30MHz to 1GHz

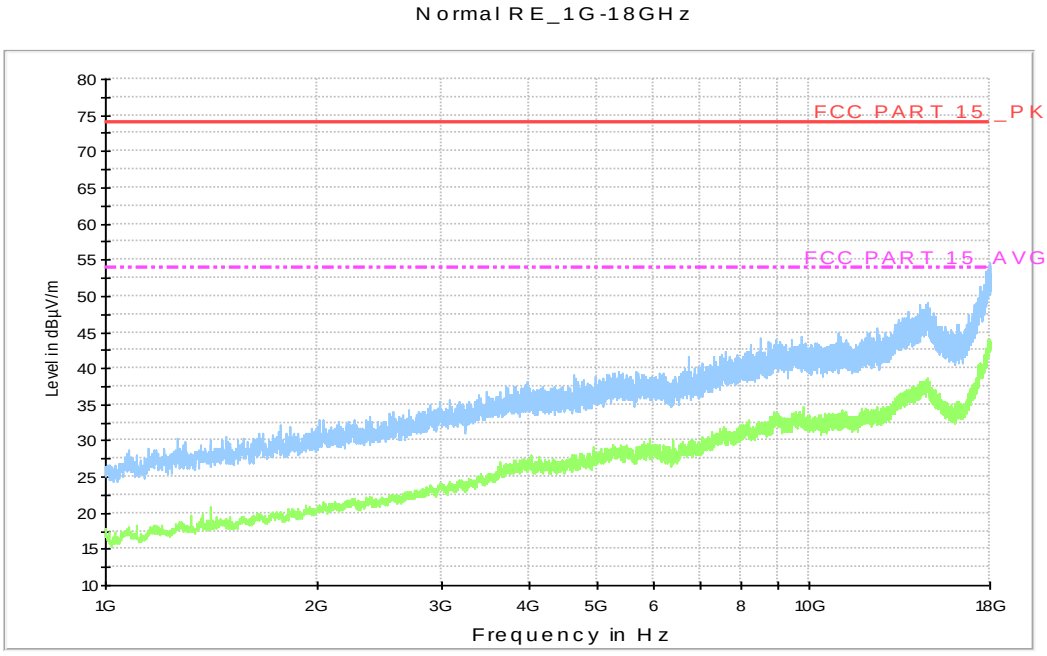

Figure A.4 Radiated Emission from 1GHz to 18GHz

USB Mode, Set.25

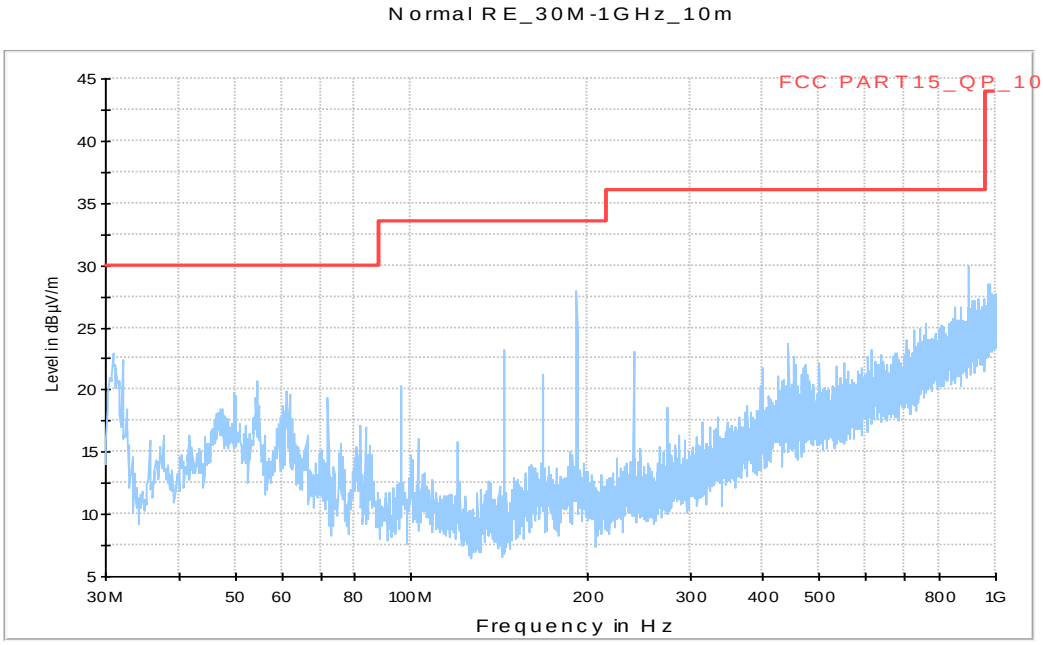

Figure A.5 Radiated Emission from 30MHz to 1GHz

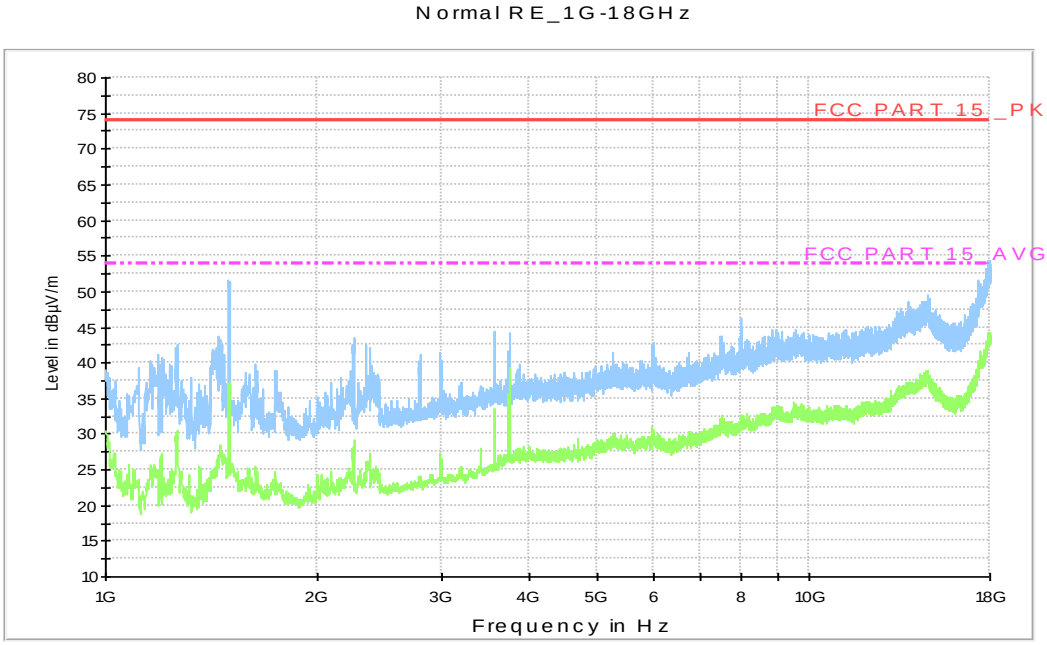

Figure A.6 Radiated Emission from 1GHz to 18GHz

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 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.1

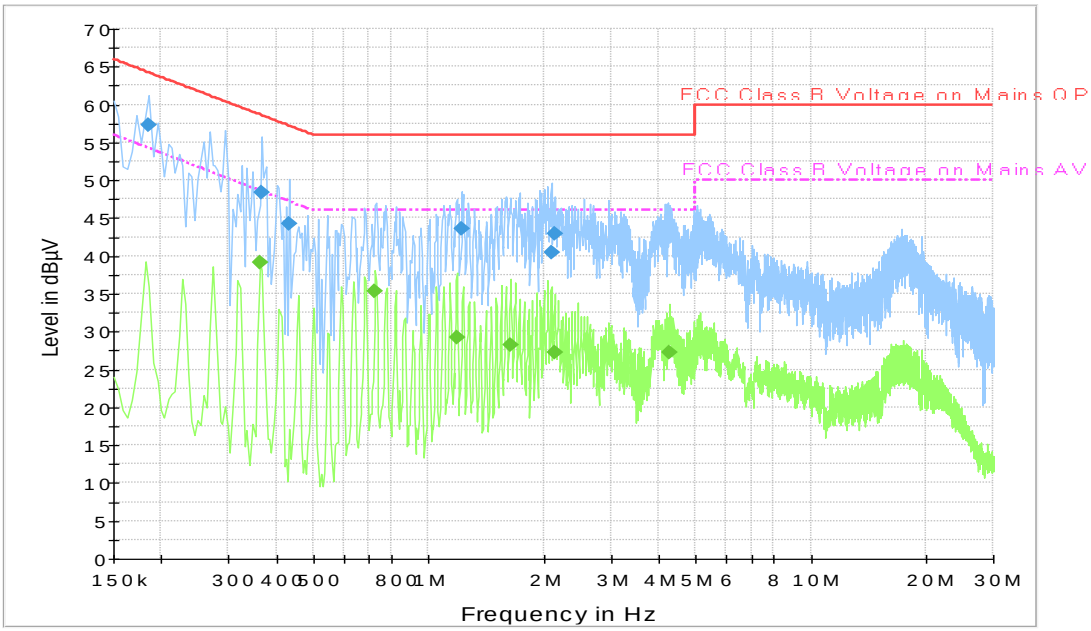

Figure A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186000	57.3	2000.0	9.000	On	L1	19.9	6.9	64.2
0.366000	48.3	2000.0	9.000	On	N	19.9	10.3	58.6
0.433500	44.2	2000.0	9.000	On	N	19.9	13.0	57.2
1.221000	43.6	2000.0	9.000	On	N	19.8	12.4	56.0
2.094000	40.4	2000.0	9.000	On	N	19.7	15.6	56.0
2.134500	42.9	2000.0	9.000	On	L1	19.7	13.1	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.361500	39.1	2000.0	9.000	On	L1	19.9	9.6	48.7
0.726000	35.3	2000.0	9.000	On	L1	19.9	10.7	46.0
1.185000	29.2	2000.0	9.000	On	L1	19.8	16.8	46.0
1.639500	28.3	2000.0	9.000	On	L1	19.7	17.7	46.0
2.143500	27.3	2000.0	9.000	On	L1	19.7	18.7	46.0
4.276500	27.3	2000.0	9.000	On	L1	19.7	18.7	46.0

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

Charging Mode, Set.3

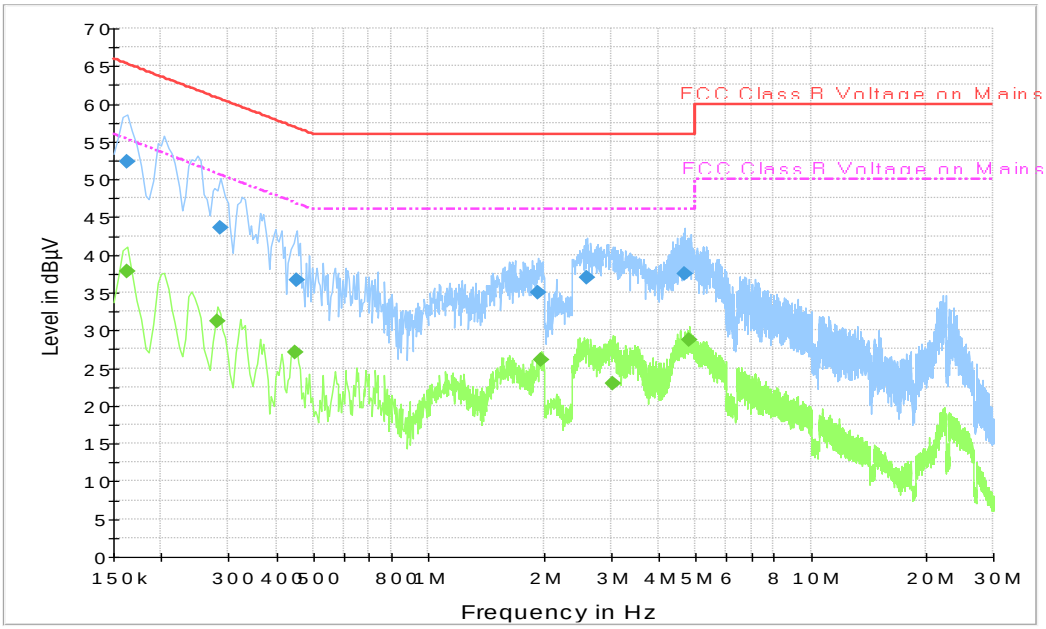

Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	52.4	2000.0	9.000	On	L1	19.9	12.9	65.3
0.285000	43.5	2000.0	9.000	On	L1	19.9	17.1	60.7
0.451500	36.6	2000.0	9.000	On	N	19.9	20.3	56.8
1.927500	34.9	2000.0	9.000	On	L1	19.7	21.1	56.0
2.598000	37.0	2000.0	9.000	On	L1	19.7	19.0	56.0
4.681500	37.5	2000.0	9.000	On	L1	19.7	18.5	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	37.8	2000.0	9.000	On	L1	19.9	17.5	55.3
0.280500	31.2	2000.0	9.000	On	N	19.9	19.6	50.8
0.447000	27.1	2000.0	9.000	On	N	19.9	19.9	46.9
1.977000	26.1	2000.0	9.000	On	L1	19.7	19.9	46.0
3.025500	22.9	2000.0	9.000	On	L1	19.7	23.1	46.0
4.812000	28.7	2000.0	9.000	On	L1	19.7	17.3	46.0

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

Charging Mode, Set.5

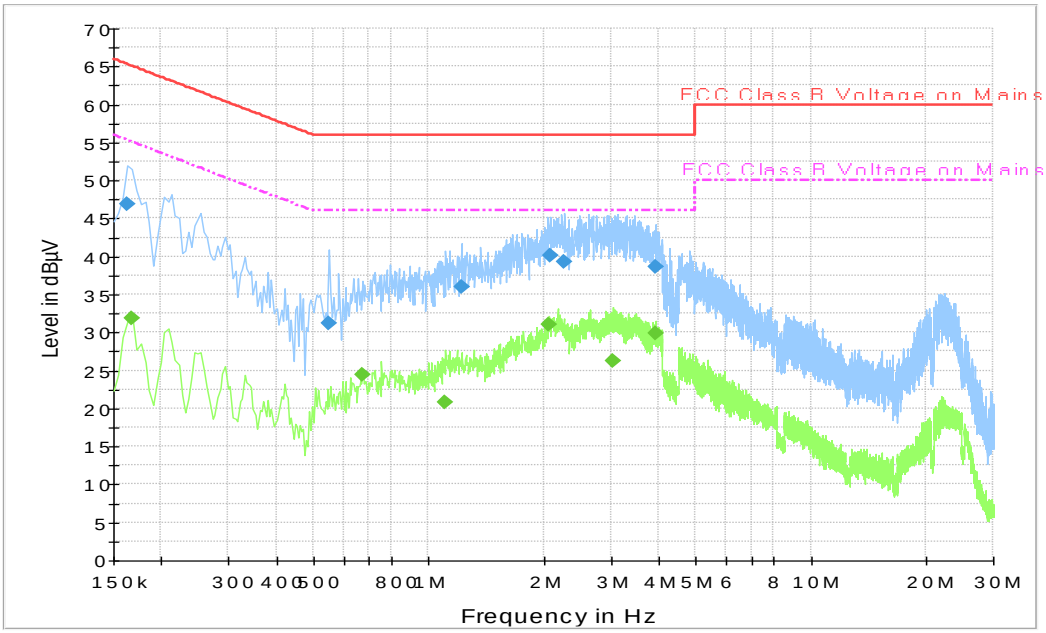

Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	47.0	2000.0	9.000	On	N	19.9	18.3	65.3
0.550500	31.2	2000.0	9.000	On	L1	19.9	24.8	56.0
1.216500	35.9	2000.0	9.000	On	L1	19.8	20.1	56.0
2.076000	40.1	2000.0	9.000	On	L1	19.7	15.9	56.0
2.269500	39.3	2000.0	9.000	On	L1	19.7	16.7	56.0
3.934500	38.7	2000.0	9.000	On	L1	19.7	17.3	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.168000	31.8	2000.0	9.000	On	N	19.9	23.2	55.1
0.672000	24.5	2000.0	9.000	On	L1	19.9	21.5	46.0
1.108500	20.9	2000.0	9.000	On	L1	19.8	25.1	46.0
2.071500	31.1	2000.0	9.000	On	L1	19.7	14.9	46.0
3.043500	26.3	2000.0	9.000	On	L1	19.7	19.7	46.0
3.921000	29.9	2000.0	9.000	On	L1	19.7	16.1	46.0

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

USB Mode, Set.25

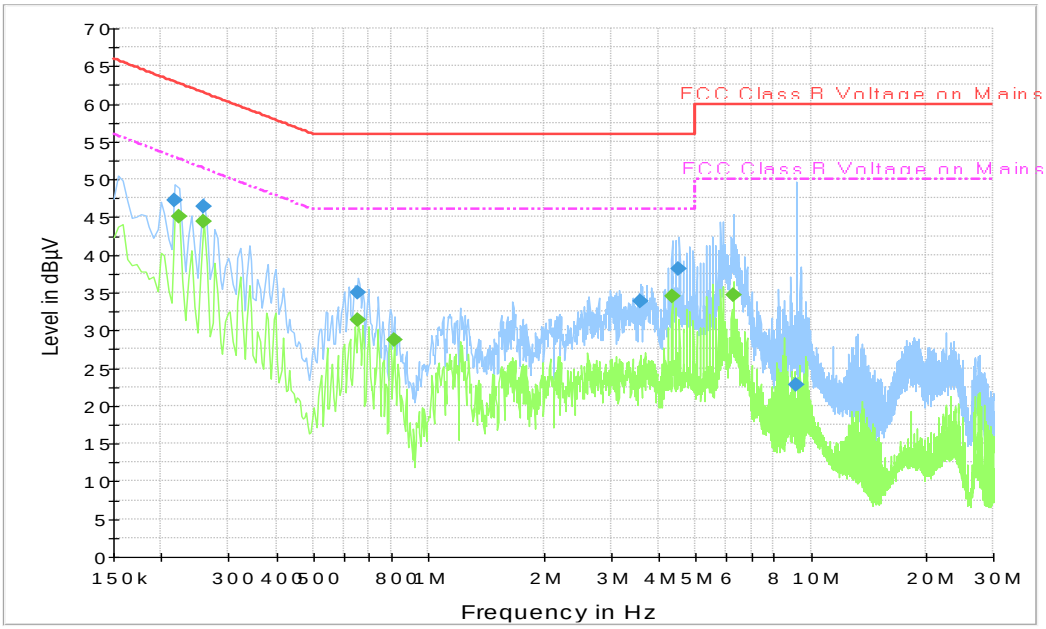

Figure A.9 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.217500	47.3	2000.0	9.000	On	N	19.8	15.6	62.9
0.258000	46.3	2000.0	9.000	On	N	19.8	15.2	61.5
0.654000	35.0	2000.0	9.000	On	N	19.9	21.0	56.0
3.592500	33.8	2000.0	9.000	On	L1	19.7	22.2	56.0
4.528500	38.2	2000.0	9.000	On	N	19.7	17.8	56.0
9.141000	22.8	2000.0	9.000	On	L1	19.9	37.2	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.222000	45.2	2000.0	9.000	On	N	19.8	7.6	52.7
0.258000	44.4	2000.0	9.000	On	N	19.8	7.1	51.5
0.654000	31.4	2000.0	9.000	On	N	19.9	14.6	46.0
0.811500	28.8	2000.0	9.000	On	N	19.8	17.2	46.0
4.330500	34.5	2000.0	9.000	On	L1	19.7	11.5	46.0
6.297000	34.6	2000.0	9.000	On	L1	19.8	15.4	50.0

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

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

For the National Voluntary Laboratory Accreditation Program

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