



# TEST REPORT

## No. I17Z60078-EMC03

for

**TCL Communication Ltd.**

**LTE / UMTS / GSM mobile phone**

**Model Name: VFD 610**

**FCC ID: 2ACCJH071**

with

**Hardware Version: PIO**

**Software Version: v6KC5**

**Issued Date: 2017-02-28**

**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.

**Test Laboratory:**

**FCC 2.948 Listed: No.525429**

CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT

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## **REPORT HISTORY**

Report Number	Revision	Description	Issue Date
I17Z60078-EMC03	Rev.0	1 <sup>st</sup> edition	2017-2-28

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## **1. Test Laboratory**

### **1.1. Testing Location**

#### **CTTL (huayuan North Road)**

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

#### **CTTL (BDA)**

Address: No.18A, Kangding Street, Beijing Economic-Technology Development  
Area, Beijing, P. R. China 100176

### **1.2. Testing Environment**

Normal Temperature: 15-35℃

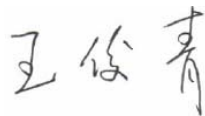
Relative Humidity: 20-75%

### **1.3. Project data**

Testing Start Date: 2017-02-14

Testing End Date: 2017-02-27

### **1.4. Signature**



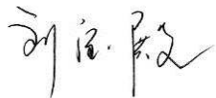
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**Wang Junqing**  
**(Prepared this test report)**



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**Qu Pengfei**  
**(Reviewed this test report)**



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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 /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,  
Pudong Area Shanghai, P.R. China. 201203  
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Contact Email zhizhou.gong@tcl.com  
Telephone: 0086-21-31363544  
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### **2.2. Manufacturer Information**

Company Name: TCL Communication Ltd.  
Address /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,  
Pudong Area Shanghai, P.R. China. 201203  
Contact Person: Gong Zhizhou  
Contact Email zhizhou.gong@tcl.com  
Telephone: 0086-21-31363544  
Fax: 0086-21-61460602

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

#### 3.1. About EUT

Description	LTE / UMTS / GSM mobile phone
Model Name	VFD 610
Marketing Name	/
FCC ID	2ACCJH071
Extreme vol. Limits	3.5VDC to 4.2VDC (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
EUT11	354032080104529	PIO	v6KC5

\*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	/	inbuilt
AE2	Battery	/	inbuilt
AE3	Charger	/	1760078CH006
AE4	Charger	/	1760078CH027
AE5	Charger	/	/
AE6	Charger	/	/
AE7	Charger	/	/
AE8	USB Cable	/	1760078DC011
AE9	USB Cable	/	1760078DC037

##### AE1

Model	CAC2400033CJ
Manufacturer	Costlight
Capacitance	2400 mAh
Nominal voltage	V

##### AE2

Model	CAC2400035C2
Manufacturer	SCUD
Capacitance	2400 mAh
Nominal voltage	V

##### AE3

Model	CBA0057AA1C1
Manufacturer	BYD
Length of cable	/

#### AE4

Model	CBA0057AA1C2
Manufacturer	TEPAO
Length of cable	/

#### AE5

Model	CBA0057AB2C1
Manufacturer	BYD
Length of cable	/

#### AE6

Model	CBA0057AC1C1
Manufacturer	BYD
Length of cable	/

#### AE7

Model	CBA0057ACVC2
Manufacturer	TEPAO
Length of cable	/

#### AE8

Model	CDA6050000C2
Manufacturer	Shenghua
Length of cable	100cm

#### AE9

Model	CDA6050000C8
Manufacturer	PUAN
Length of cable	100cm

\*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	EUT11+ AE1/AE2 +AE3 +AE8/AE9	Charger
Set.2	EUT11+ AE1/AE2 +AE4 +AE8/AE9	Charger
Set.3	EUT11+ AE1/AE2 +AE8/AE9	USB mode

## **4. Reference Documents**

### **4.1. Reference Documents for testing**

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

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 15, Subpart B	Radio frequency devices - Unintentional Radiators	10-1-15 Edition
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)	B.1	P	CTTL(BDA)
2	Conducted Emission	15.107(a)	B.2	P	CTTL(huayuan North Road)

## 7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATI ON INTERVAL
1	Test Receiver	ESU26	100235	R&S	2017-03-02	1 year
2	Test Receiver	ESCI 7	100344	R&S	2017-07-05	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	2017-07-10	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).

#### **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

$G_{\text{PL}}$ : Path Loss

$P_{\text{Mea}}$ : Measurement result on receiver.

Measurement uncertainty (worst case):  $U = 4.3 \text{ dB}$ ,  $k=2$ .

#### Measurement results for Set.1:

##### Charging Mode/Average detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17823.750	40.8	-23.2	40.9	23.089	54.0	13.2	V
17800.500	40.8	-23.1	41.0	22.957	54.0	13.2	V
17799.750	40.8	-23.2	41.0	22.958	54.0	13.2	V
17796.000	40.8	-23.2	41.0	23.015	54.0	13.2	H
17826.750	40.8	-23.2	40.9	23.045	54.0	13.2	H
17782.500	40.7	-23.4	41.0	23.203	54.0	13.3	H

##### Charging Mode/Peak detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17883.000	52.9	-24.0	40.9	35.961	74.0	21.1	H
17792.250	52.8	-23.3	41.0	35.121	74.0	21.2	V
17774.250	52.5	-23.6	41.0	35.085	74.0	21.5	H
17819.250	52.5	-23.1	40.9	34.637	74.0	21.5	V
17853.000	52.4	-23.6	40.9	35.098	74.0	21.6	V
17762.250	52.4	-23.8	41.0	35.177	74.0	21.6	H

**Measurement results for Set.2:**
**Charging Mode/Average detector**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17793.750	40.8	-23.2	41.0	23.123	54.0	13.2	H
17790.000	40.8	-23.3	41.0	23.136	54.0	13.2	V
17792.250	40.8	-23.3	41.0	23.061	54.0	13.2	V
17825.250	40.8	-23.2	40.9	23.020	54.0	13.2	H
17793.000	40.7	-23.3	41.0	23.031	54.0	13.3	V
17799.750	40.7	-23.2	41.0	22.910	54.0	13.3	H

**Charging Mode/Peak detector**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17799.750	53.1	-23.2	41.0	35.255	74.0	20.9	V
17790.750	52.9	-23.3	41.0	35.249	74.0	21.1	H
17826.000	52.6	-23.2	40.9	34.878	74.0	21.4	V
17796.750	52.6	-23.2	41.0	34.805	74.0	21.4	V
17770.500	52.4	-23.6	41.0	35.087	74.0	21.6	H
17793.000	52.4	-23.3	41.0	34.710	74.0	21.6	H

Measurement results for Set.3:

#### USB Mode/Average detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17793.750	40.9	-23.2	41.0	23.206	54.0	13.1	H
17826.000	40.8	-23.2	40.9	23.106	54.0	13.2	H
17790.000	40.8	-23.3	41.0	23.158	54.0	13.2	V
17823.750	40.8	-23.2	40.9	22.999	54.0	13.2	H
17823.000	40.7	-23.2	40.9	22.929	54.0	13.3	H
17793.000	40.7	-23.3	41.0	22.978	54.0	13.3	V

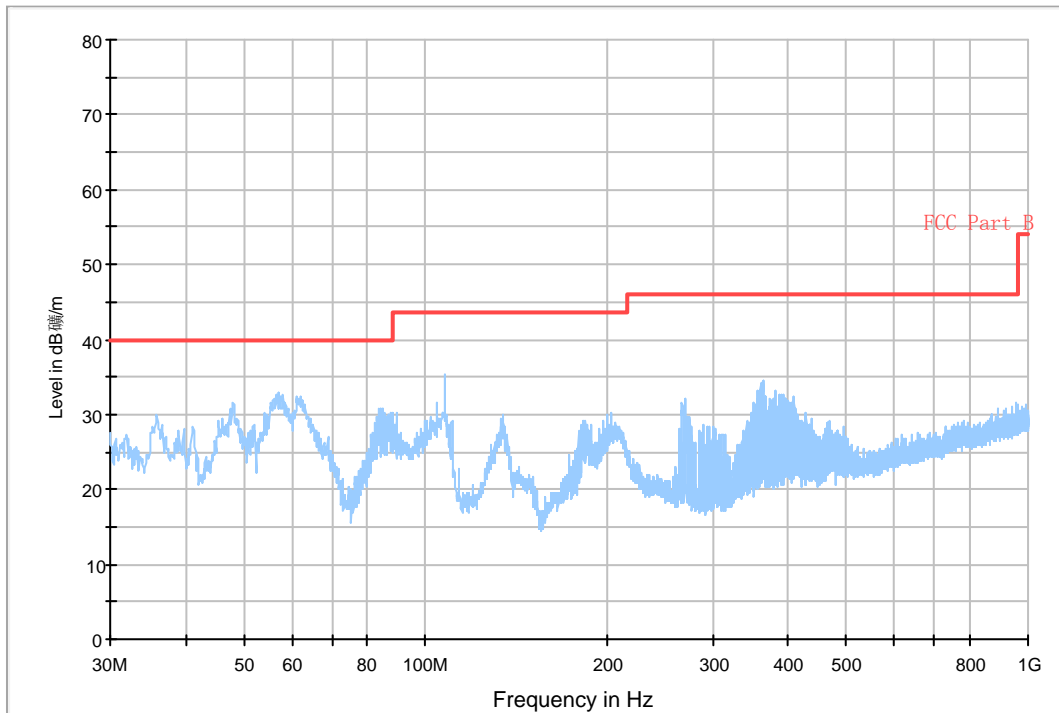
#### USB Mode/ Peak detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17888.250	52.8	-24.1	40.9	35.924	74.0	21.2	H
17793.750	52.7	-23.2	41.0	34.952	74.0	21.3	H
17823.000	52.5	-23.2	40.9	34.777	74.0	21.5	V
17832.750	52.5	-23.3	40.9	34.903	74.0	21.5	H
17827.500	52.3	-23.2	40.9	34.645	74.0	21.7	V
17833.500	52.3	-23.3	40.9	34.726	74.0	21.7	V

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.

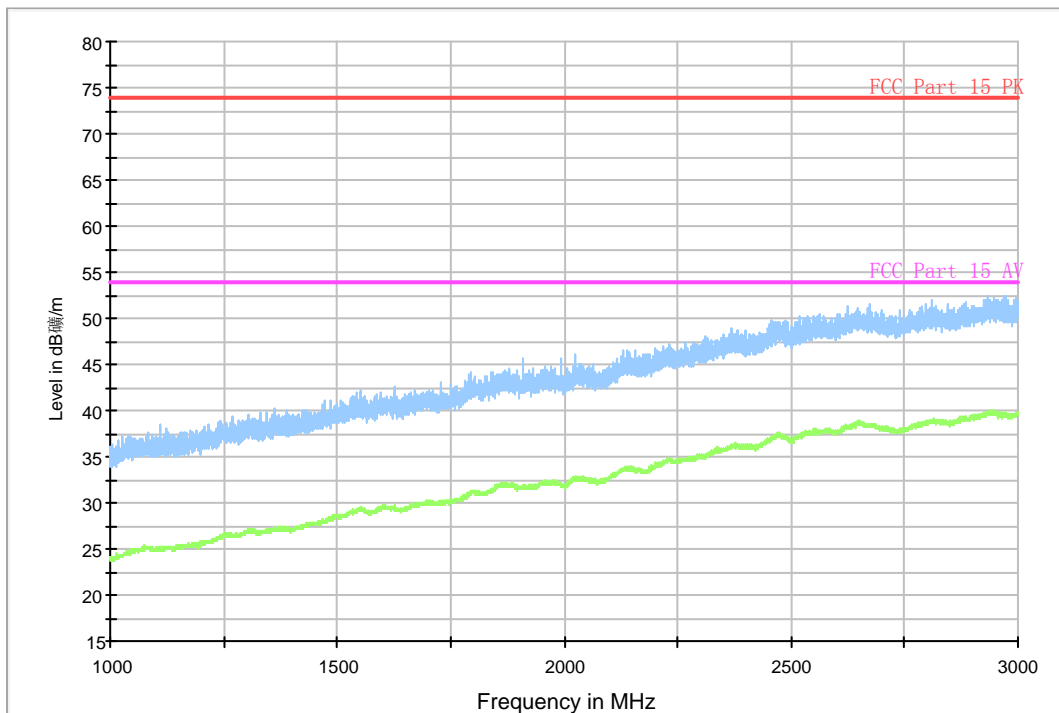
**Charging Mode, Set.1**

15B RE 30MHz-1GHz



**Fig A.1 Radiated Emission from 30MHz to 1GHz**

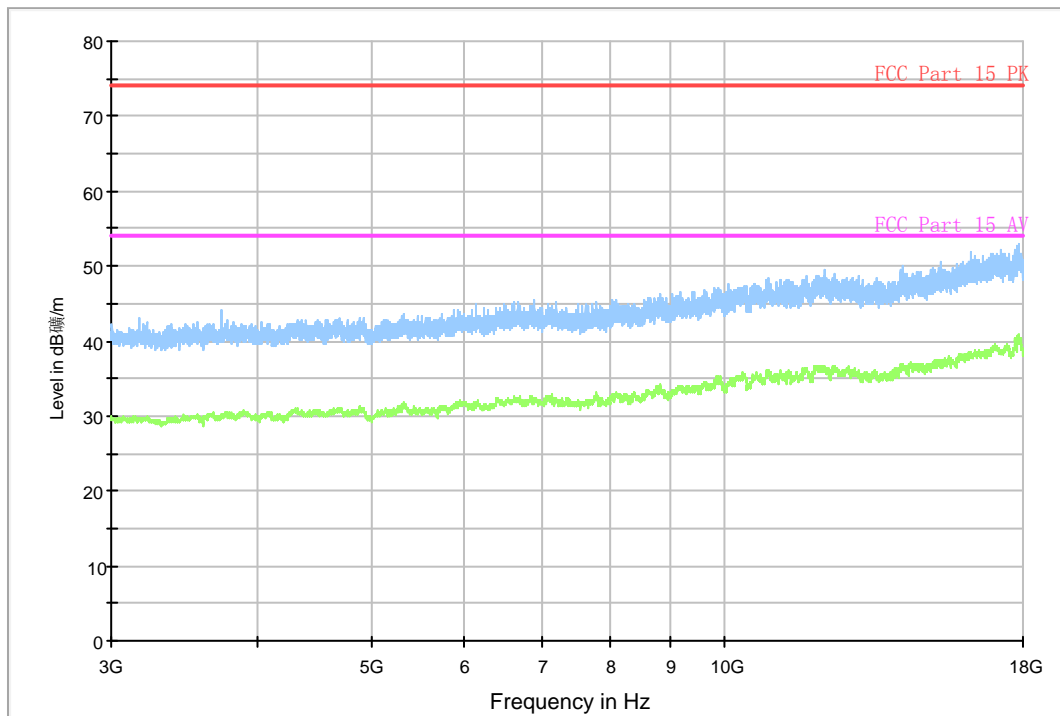
15B RE - 1GHz-3GHz



**Fig A.2 Radiated Emission from 1GHz to 3GHz**



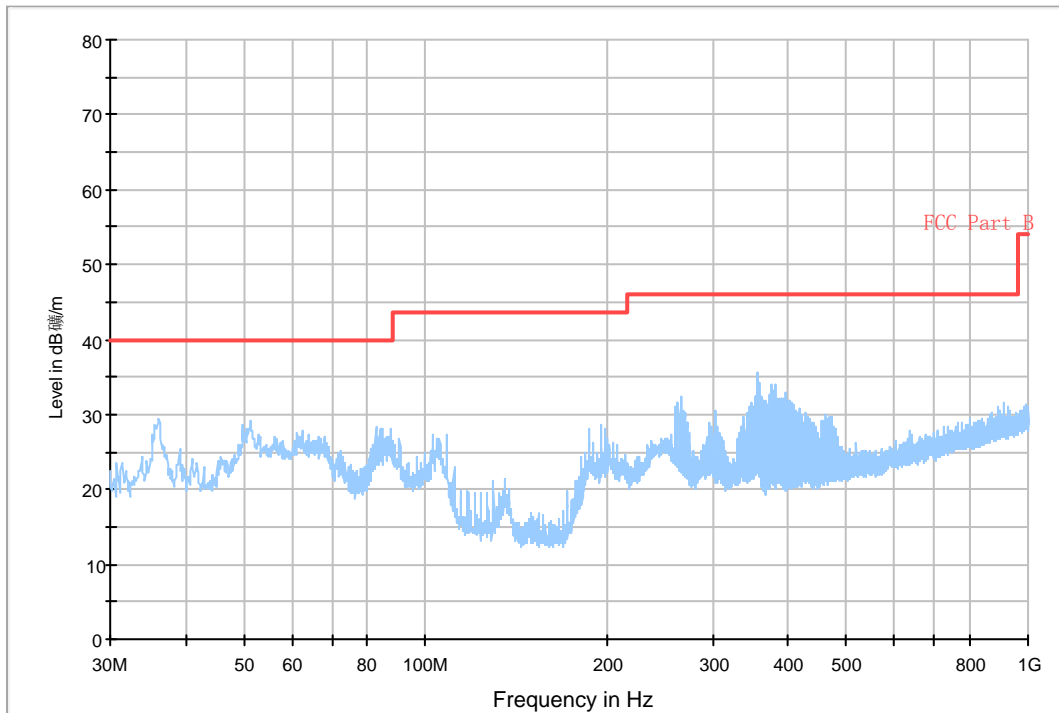
15b RE - 3GHz-18GHz



**Fig A.3 Radiated Emission from 3GHz to 18GHz**

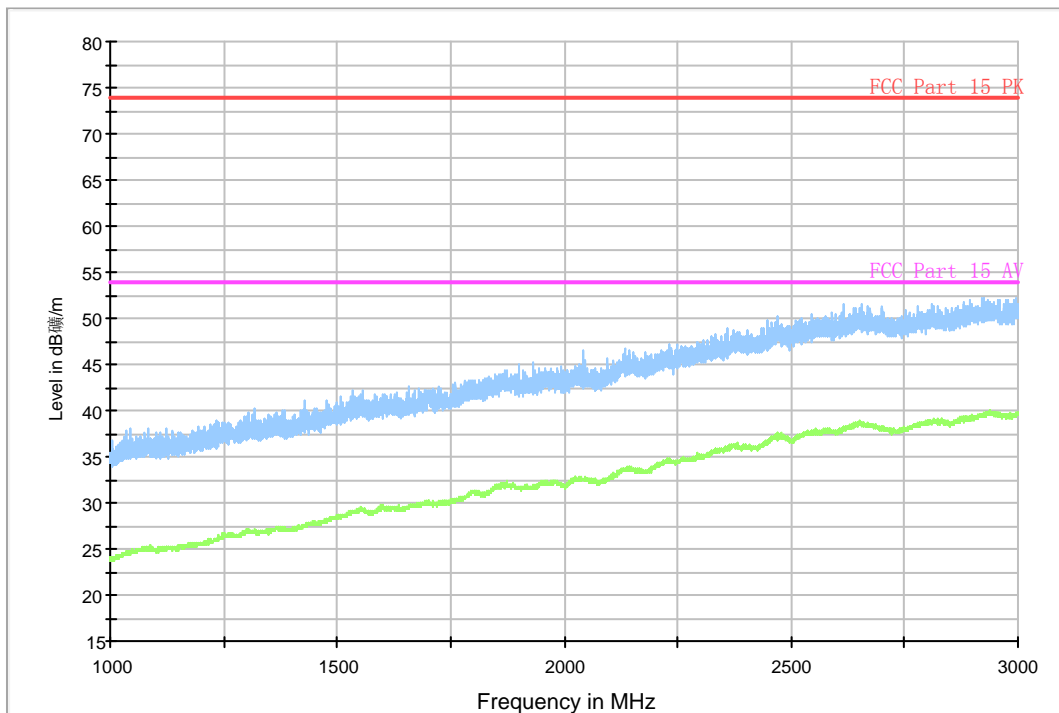
## Charging Mode, Set.2

15B RE 30MHz-1GHz



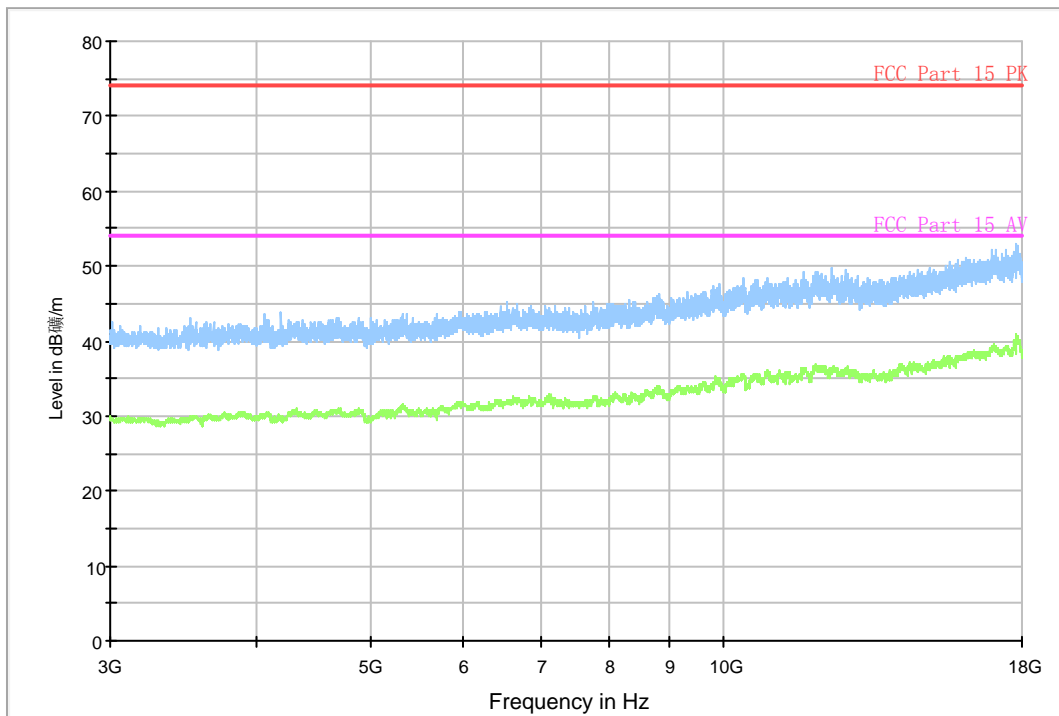
**Fig A.4 Radiated Emission from 30MHz to 1GHz**

15B RE - 1GHz-3GHz



**Fig A.5 Radiated Emission from 1GHz to 3GHz**

15b RE - 3GHz-18GHz



**Fig A.6 Radiated Emission from 3GHz to 18GHz**

USB Mode, Set.3

15B RE 30MHz-1GHz

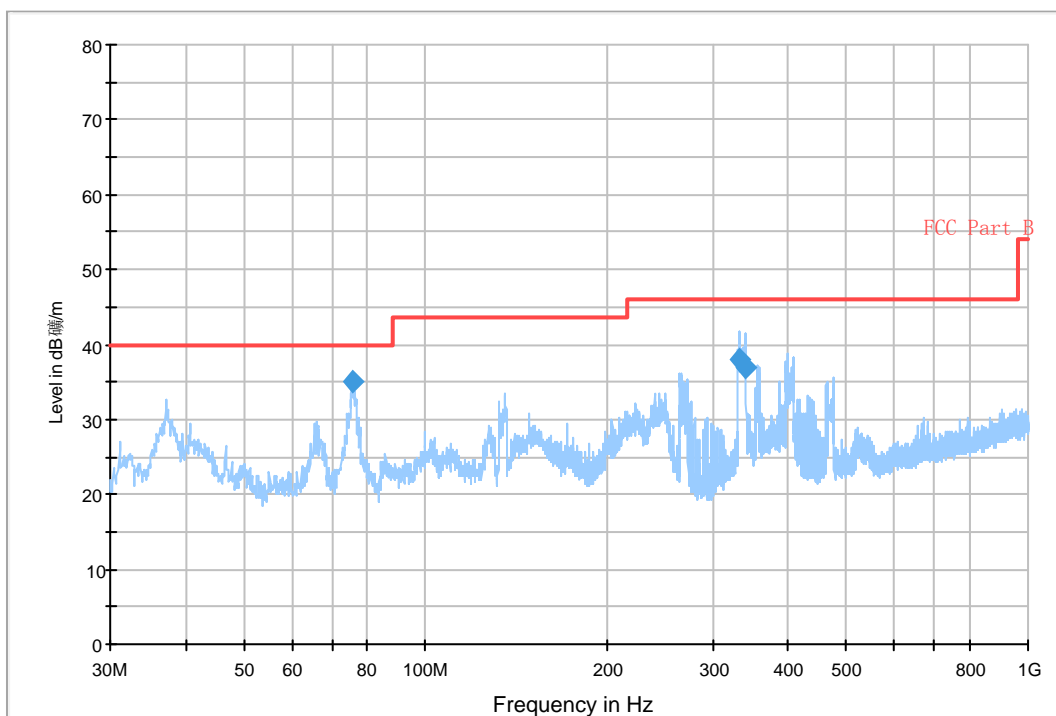
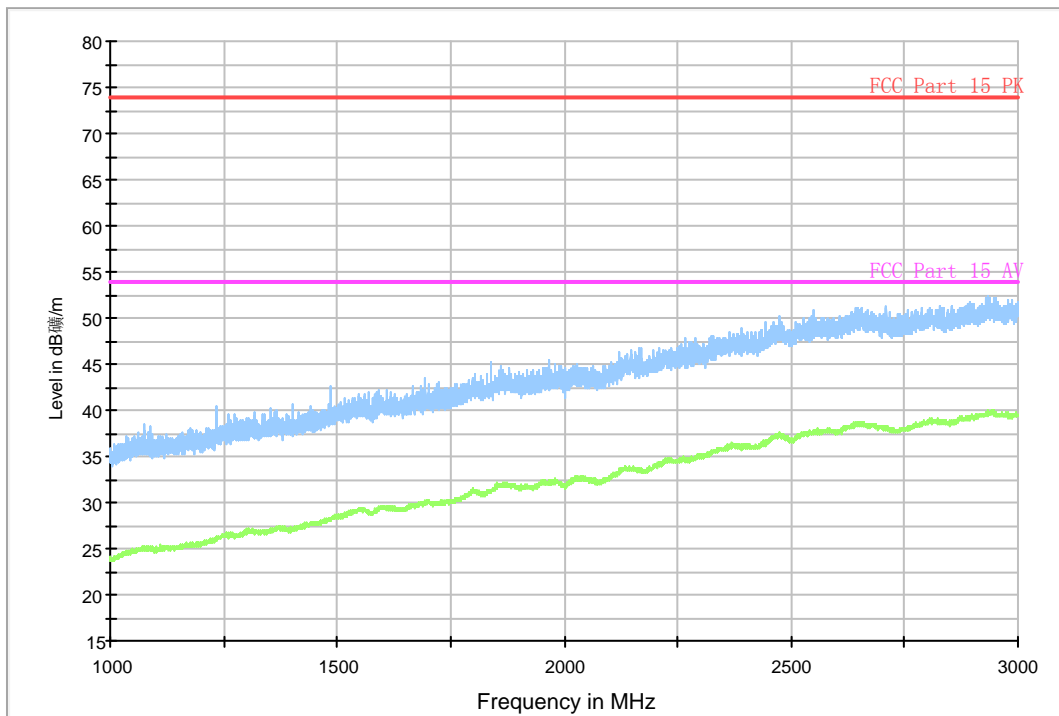


Fig A.7 Radiated Emission from 30MHz to 1GHz

Final Result 1

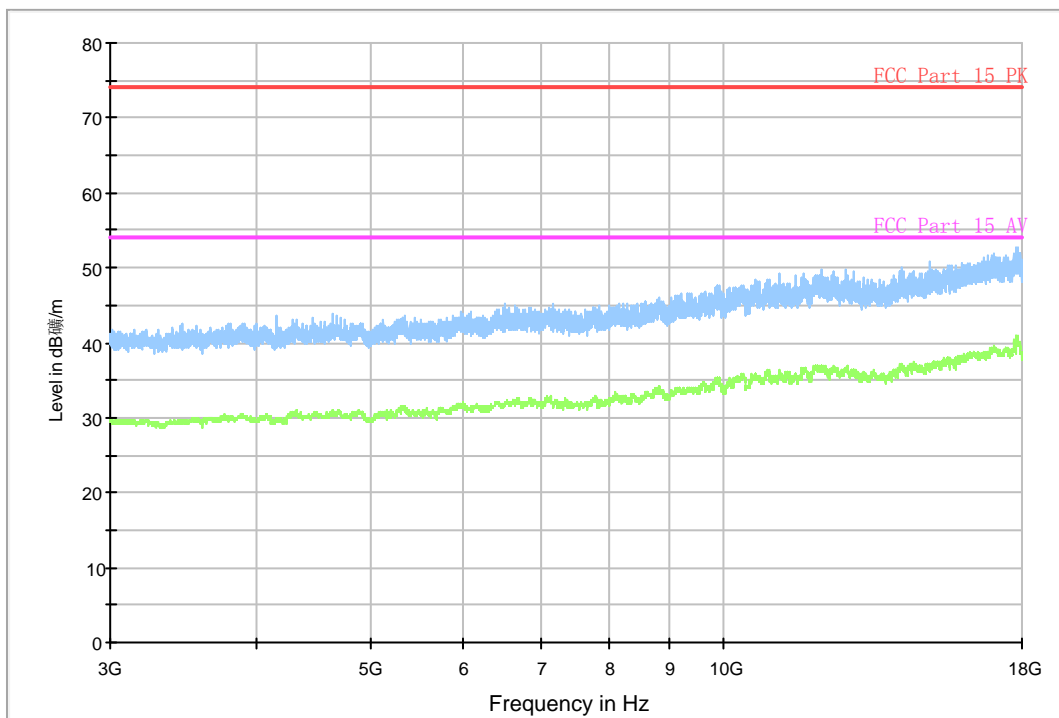
Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
75.590000	35.1	100.0	V	288.0	-24.1	4.9	40.0	
331.088000	37.9	100.0	H	13.0	-14.9	8.1	46.0	
339.333000	36.9	109.0	H	9.0	-14.3	9.1	46.0	

15B RE - 1GHz-3GHz



**Fig A.8 Radiated Emission from 1GHz to 3GHz**

15b RE - 3GHz-18GHz



**Fig A.9 Radiated Emission from 3GHz 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 (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:  $U= 2.9 \text{ dB}$ ,  $k=2$ .

#### Charging Mode, Set.1

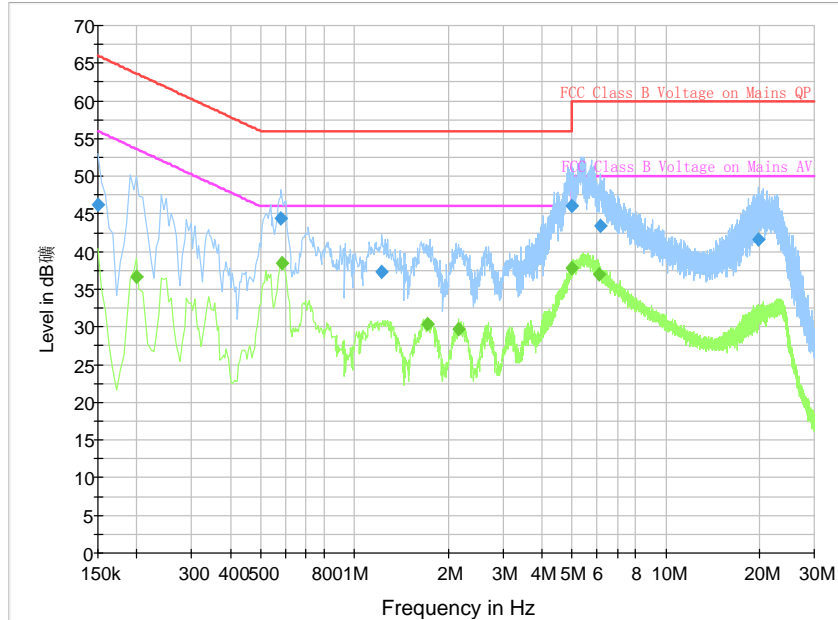


Fig A.10 Conducted Emission

#### Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	46.2	2000.0	9.000	On	L1	20.2	19.8	66.0	
0.582000	44.4	2000.0	9.000	On	L1	19.9	11.6	56.0	
1.225500	37.3	2000.0	9.000	On	L1	19.7	18.7	56.0	
4.978500	46.1	2000.0	9.000	On	N	19.6	9.9	56.0	
6.193500	43.5	2000.0	9.000	On	N	19.6	16.5	60.0	
19.774500	41.6	2000.0	9.000	On	N	19.9	18.4	60.0	

#### Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.199500	36.7	2000.0	9.000	On	L1	19.8	17.0	53.6	
0.586500	38.5	2000.0	9.000	On	N	19.8	7.5	46.0	
1.720500	30.4	2000.0	9.000	On	N	19.7	15.6	46.0	
2.166000	29.8	2000.0	9.000	On	N	19.4	16.2	46.0	
4.987500	37.8	2000.0	9.000	On	N	19.6	8.2	46.0	
6.130500	37.0	2000.0	9.000	On	N	19.6	13.0	50.0	

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

## Charging Mode, Set.2

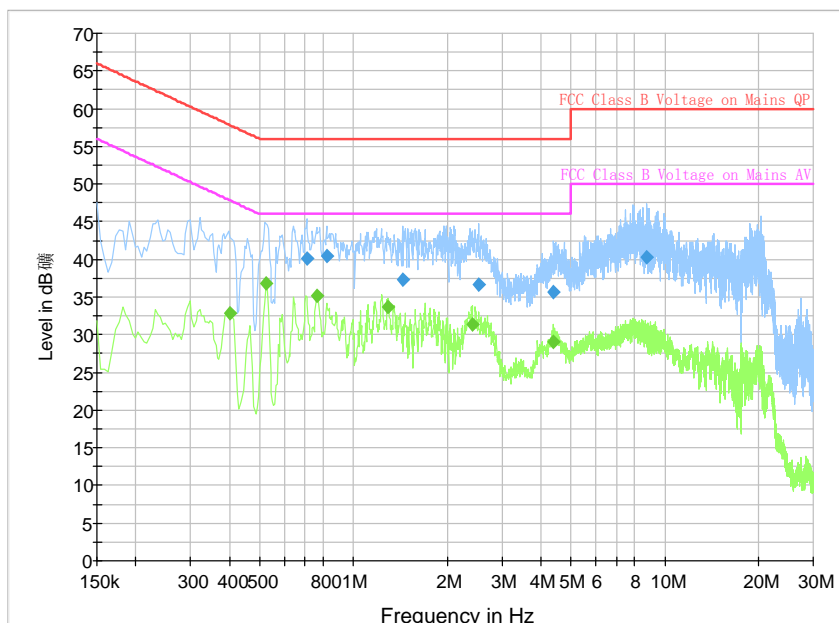


Fig A.11 Conducted Emission

### Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.708000	40.0	2000.0	9.000	On	L1	19.8	16.0	56.0	
0.820500	40.4	2000.0	9.000	On	N	19.8	15.6	56.0	
1.437000	37.3	2000.0	9.000	On	L1	19.7	18.7	56.0	
2.521500	36.6	2000.0	9.000	On	L1	18.9	19.4	56.0	
4.407000	35.6	2000.0	9.000	On	L1	19.6	20.4	56.0	
8.785500	40.2	2000.0	9.000	On	N	19.7	19.8	60.0	

### Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.402000	32.8	2000.0	9.000	On	N	19.9	15.0	47.8	
0.523500	36.8	2000.0	9.000	On	N	19.9	9.2	46.0	
0.762000	35.2	2000.0	9.000	On	N	19.8	10.8	46.0	
1.293000	33.6	2000.0	9.000	On	N	19.7	12.4	46.0	
2.413500	31.4	2000.0	9.000	On	L1	19.2	14.6	46.0	
4.398000	29.0	2000.0	9.000	On	L1	19.6	17.0	46.0	

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



### USB Mode, Set.3

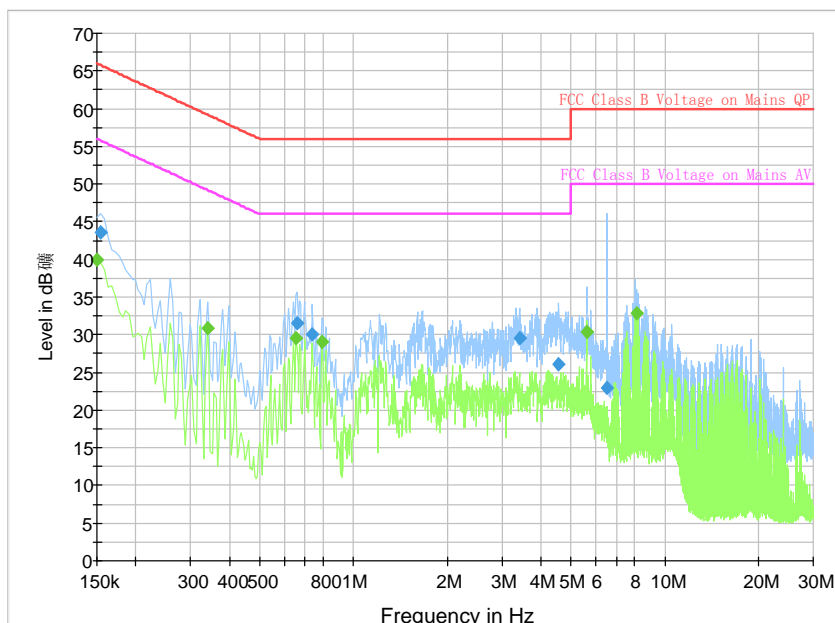


Fig A.12 Conducted Emission

### Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.154500	43.6	2000.0	9.000	On	L1	20.1	22.2	65.8	
0.658500	31.5	2000.0	9.000	On	L1	19.8	24.5	56.0	
0.739500	30.0	2000.0	9.000	On	N	19.8	26.0	56.0	
3.408000	29.5	2000.0	9.000	On	L1	19.4	26.5	56.0	
4.569000	26.1	2000.0	9.000	On	L1	19.6	29.9	56.0	
6.508500	22.9	2000.0	9.000	On	L1	19.6	37.1	60.0	

### Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.150000	40.0	2000.0	9.000	On	L1	20.2	16.0	56.0	
0.339000	30.8	2000.0	9.000	On	L1	19.9	18.4	49.2	
0.654000	29.6	2000.0	9.000	On	L1	19.8	16.4	46.0	
0.793500	29.0	2000.0	9.000	On	L1	19.8	17.0	46.0	
5.604000	30.4	2000.0	9.000	On	L1	19.6	19.6	50.0	
8.119500	32.9	2000.0	9.000	On	N	19.7	17.1	50.0	

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

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