



TEST REPORT

No. I18Z62361-EMC02

for

HMD Global Oy

Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN

GSM 850,900, 1800, 1900 WCDMA : 1,2,4, 5, 8

LTE : 1,2, 3,4, 5,7,8,12/17,28,38,66 mobile phone, Bluetooth 4.2, WIFI

802.11 b/g/n

Model Name: TA-1149

FCC ID: 2AJOTTA-1149

Hardware Version: 89571_1_12

Software Version: 00XX_1_XXX

Issued Date: 2019-02-14



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
I18Z62361-EMC02	Rev.0	1 st edition	2019-01-25
I18Z62361-EMC02	Rev.1	Add the headset information on and EUT set-up state the test is performed with FM function Add information of a NO TEST charger CH-35E	2019-02-14



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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. China100191

1.2. Testing Environment

Normal Temperature: 15-35°C

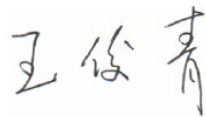
Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2019-01-16

Testing End Date: 2019-01-24

1.4. Signature



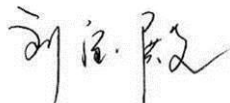
Wang Junqing

(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: HMD Global Oy
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2.2. Manufacturer Information

Company Name: HMD Global Oy
Address /Post: Bertel Jungin aukio 9,02600 ESPOO, FINLAND
City: Espoo
Postal Code: /
Country: FINLAND
Telephone: /

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

3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN GSM 850,900,1800,1900 WCDMA : 1,2,4,5,8 LTE: 1,2,3,4,5,7,8,12/17,28,38,66 mobile phone, Bluetooth 4.2, WIFI 802.11 b/g/n
Model Name	TA-1149
FCC ID	2AJOTTA-1149
Extreme vol. Limits	3.6VDC to 4.4VDC (nominal: 3.9VDC)

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
EUT1	352905100000698	89571_1_12	00XX_1_XXX

*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	USB Cable	/	/
AE5	USB Cable	/	/
AE6	Headset	/	/
AE7	Charger	/	/

AE1

Model	WT330
Manufacturer	Jiade Energy Technology(Zhuhai) Co.,Ltd.
Capacitance	3000 mAh
Nominal voltage	3.85 V

AE2

Model	WT330
Manufacturer	Sunwoda Electronic Co.,Ltd
Capacitance	3000 mAh
Nominal voltage	3.85 V

AE3

Model	CH-35U
Manufacturer	Shenzhen Tianyin Electronics Co.,Ltd
Length of cable	/

AE4

Model	CB-35A
Manufacturer	Manufacturer: Leagtech Electronics Co.,Ltd



Length of cable	/
AE5	
Model	CB-35A
Manufacturer	Manufacturer: Shenzhen BRL Technology Co.,Ltd.
Length of cable	95cm
AE6	
Model	HS-34
Manufacturer	New Leader Industry Co.,Ltd
Length of cable	/
AE7	
Model	CH-35E
Manufacturer	Shenzhen Tianyin Electronics Co.,Ltd
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	EUT1+ AE1/AE2+ AE3+ AE4/AE5 +AE6	Charger with FM function
Set.2	EUT1+ AE1/AE2+ AE4/AE5	USB mode

Note: Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN GSM 850,900, 1800,1900 WCDMA: 1,2,4,5, 8 LTE : 1,2,3,4,5,7,8,12,17,28,38,66 mobile phone, Bluetooth 4.2, WIFI 802.11 b/g/n, TA-1149 manufactured by HMD Global OY for conformance test. According to the declaration of changes, the only difference between TA-1149 and TA-1133 is the SIM card slot has changed from Dual to Single, no test needs to been performed, all results are cited from the TA-1133 model. The report number for TA-1133 model is I18Z62361-EMC01.

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)	B.1	P	CTTL(huayuan North Road)
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	CALIBRATION INTERVAL
1	Test Receiver	ESU26	100235	R&S	2019-03-31	1 year
2	Test Receiver	ESC13	100344	R&S	2019-02-28	1 Year
3	Universal Radio Communication Tester	CMW500	143008	R&S	2019-12-25	1 year
4	LISN	ENV216	101200	R&S	2019-04-15	1 year
5	EMI Antenna	VULB 9163	9163-301	Schwarzbeck	2019-02-03	3 years
6	EMI Antenna	3115	00167250	ETS-Lindgren	2019-06-17	3 years
7	PC	OPTIPLEX 380	2X1YV2X	DELL	N/A	N/A
8	Printer	P1606dn	VNC3L52122	HP	N/A	N/A
9	Keyboard	L100	CN0RH6596589 07ATOI40	DELL	N/A	N/A
10	Mouse	M-UAE119	LZ935220ZRC	Lenovo	N/A	N/A

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): $U = 5.44 \text{ dB}$, $k=2$.

Measurement results for Set.1:

Charging Mode/Average detector

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Antenna Pol. (H/V)
17758.033	31.9	-18.5	45.6	4.800	H
17439.000	31.8	-19.2	41.5	9.500	H
17788.633	31.8	-18.5	45.6	4.700	V
17418.033	31.8	-19.2	41.5	9.500	H
17485.467	31.8	-19.2	41.5	9.500	H
17951.833	31.8	-17.7	45.6	3.900	H

Charging Mode/Peak detector

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Antenna Pol. (H/V)
17589.733	43.2	-18.9	45.6	16.500	H
17807.333	43.2	-18.5	45.6	16.100	H
17488.300	43.1	-19.2	41.5	20.800	V
17471.300	42.9	-19.2	41.5	20.600	H
17855.500	42.9	-18.5	45.6	15.800	H
17475.267	42.9	-19.2	41.5	20.600	H

Measurement results for Set.2:

USB Mode/Average detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17680.967	31.3	-18.9	45.6	4.600	H
17461.100	31.3	-19.2	41.5	9.000	H
17826.033	31.2	-18.5	45.6	4.100	V
17947.300	31.2	-17.7	45.6	3.300	H
17467.333	31.2	-19.2	41.5	8.900	H
17473.567	31.1	-19.2	41.5	8.800	H

USB Mode/ Peak detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17228.200	43.2	-19.5	41.5	21.200	H
17320.567	43.1	-19.5	41.5	21.100	H
17871.933	42.6	-18.5	45.6	15.500	V
17568.200	42.6	-18.9	45.6	15.900	H
17880.433	42.5	-18.5	45.6	15.400	H
17323.967	42.3	-19.5	41.5	20.300	H

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

Charging Mode, Set.1

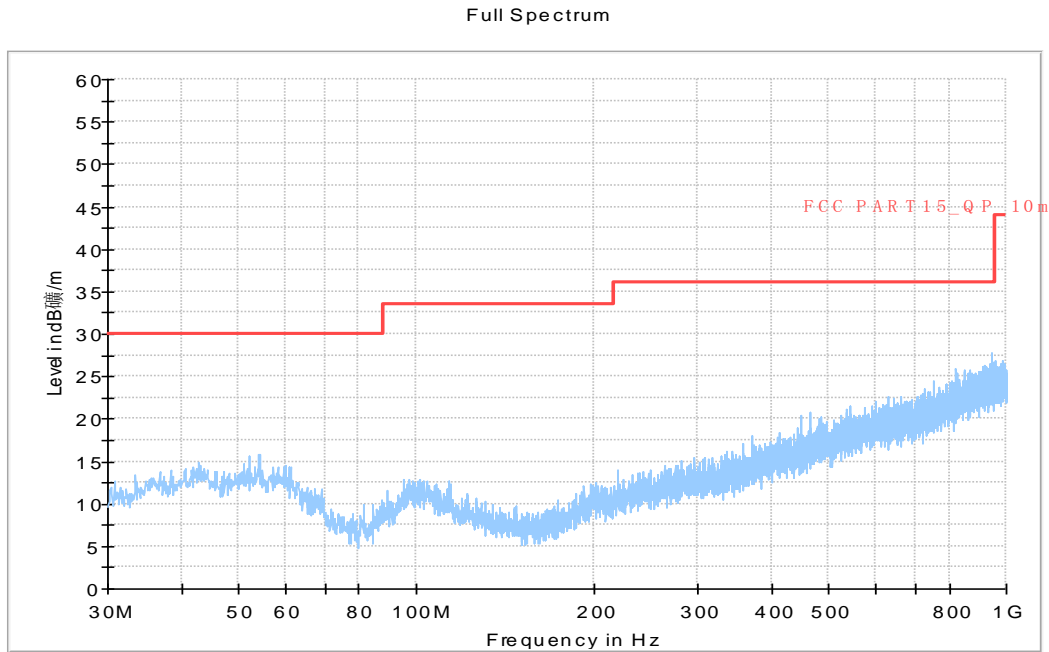


Fig A.1 Radiated Emission from 30MHz to 1GHz

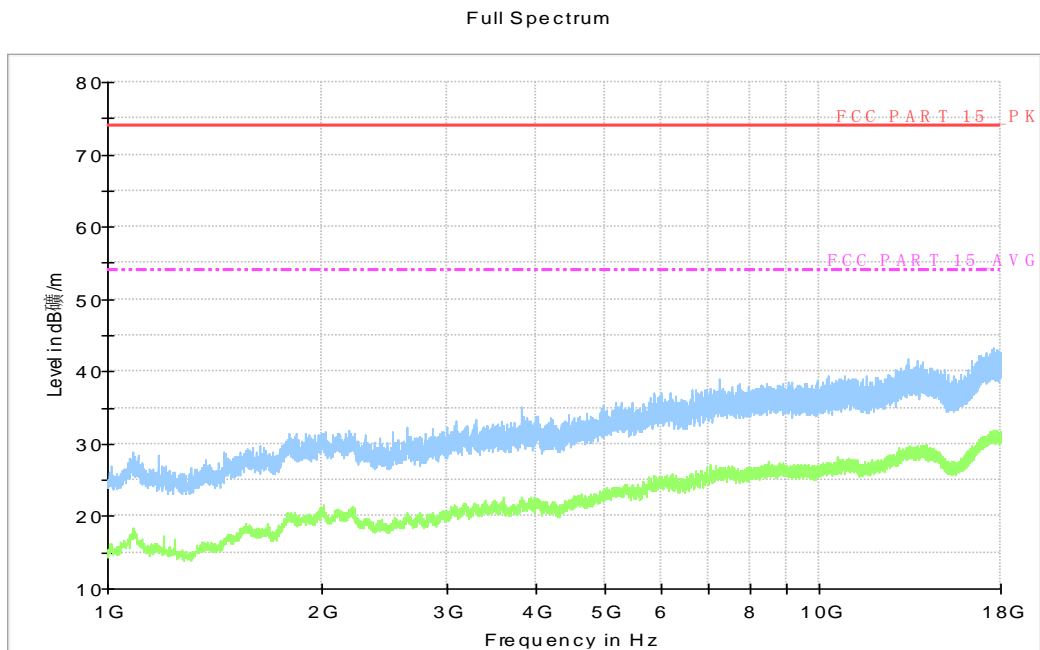


Fig A.2 Radiated Emission from 1GHz to 18GHz

USB Mode, Set.2

Full Spectrum

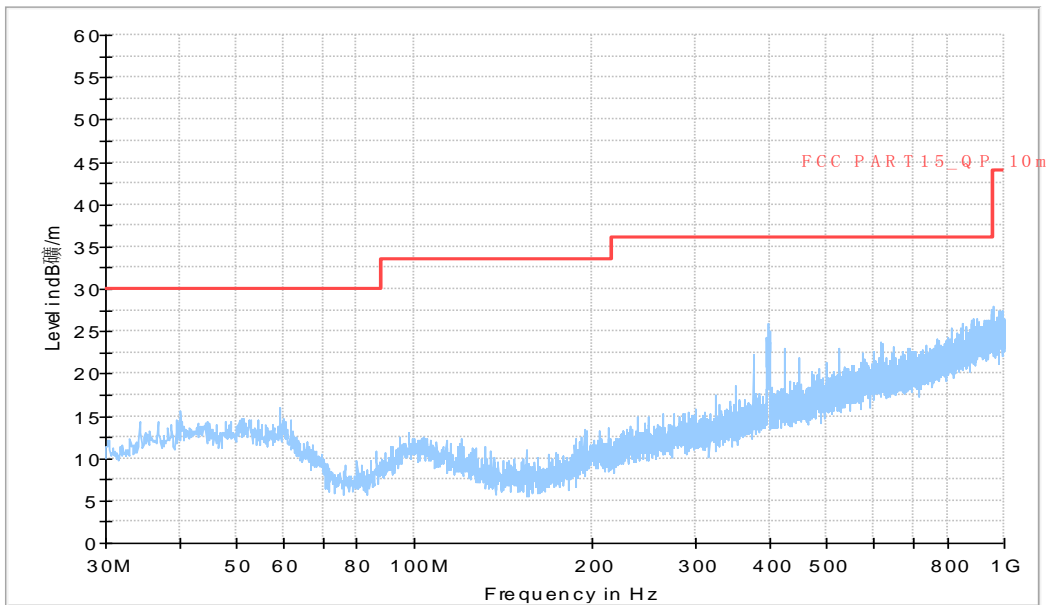


Fig A.3 Radiated Emission from 30MHz to 1GHz

Full Spectrum

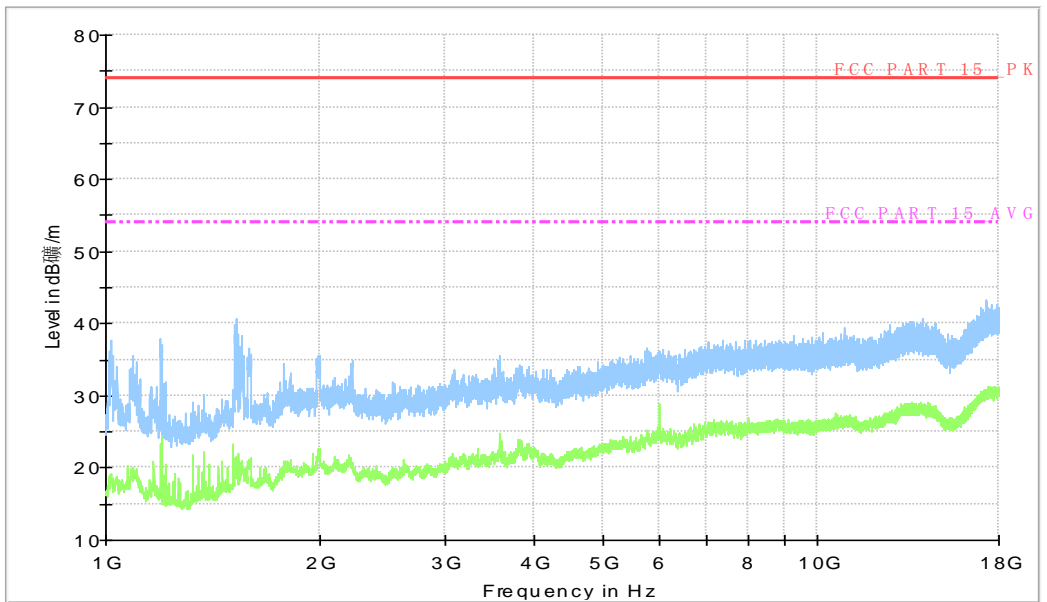


Fig A.4 Radiated Emission from 1GHz to 18GHz

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, Set.1

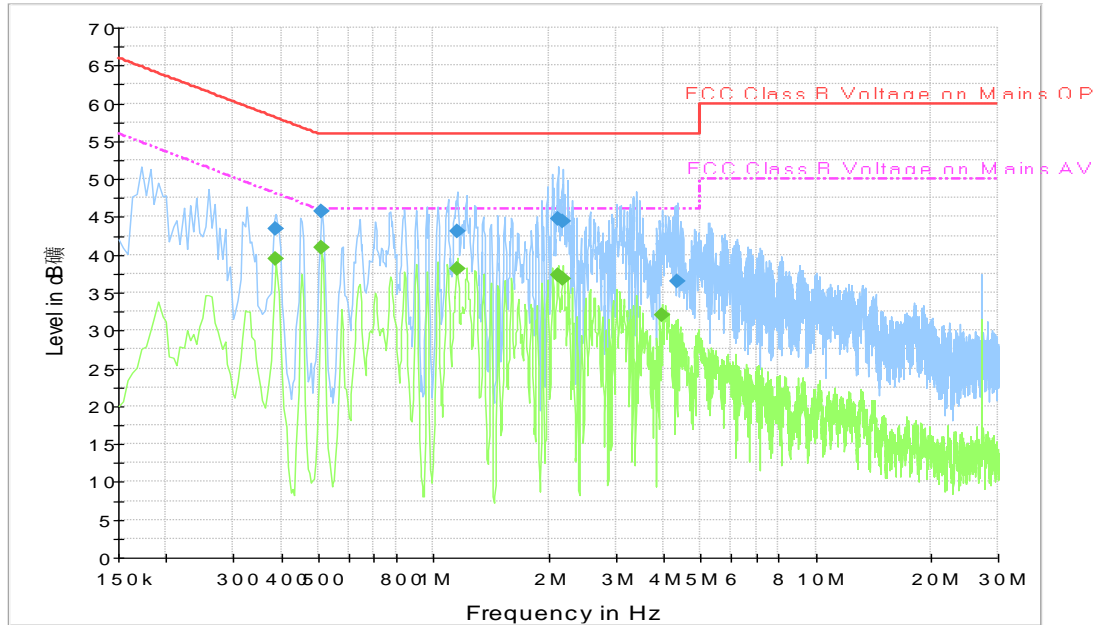


Fig A.5 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.388500	43.5	2000.0	9.000	L1	19.9	14.6	58.1
0.510000	45.7	2000.0	9.000	L1	19.9	10.3	56.0
1.153500	43.1	2000.0	9.000	N	19.6	12.9	56.0
2.116500	44.7	2000.0	9.000	L1	19.7	11.3	56.0
2.184000	44.4	2000.0	9.000	L1	19.7	11.6	56.0
4.353000	36.5	2000.0	9.000	L1	19.6	19.5	56.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.388500	39.5	2000.0	9.000	N	19.9	8.6	48.1
0.510000	40.9	2000.0	9.000	N	19.9	5.1	46.0
1.153500	38.1	2000.0	9.000	N	19.6	7.9	46.0
2.116500	37.3	2000.0	9.000	N	19.6	8.7	46.0
2.184000	36.8	2000.0	9.000	N	19.6	9.2	46.0
3.970500	32.1	2000.0	9.000	N	19.7	13.9	46.0

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

USB Mode, Set.2

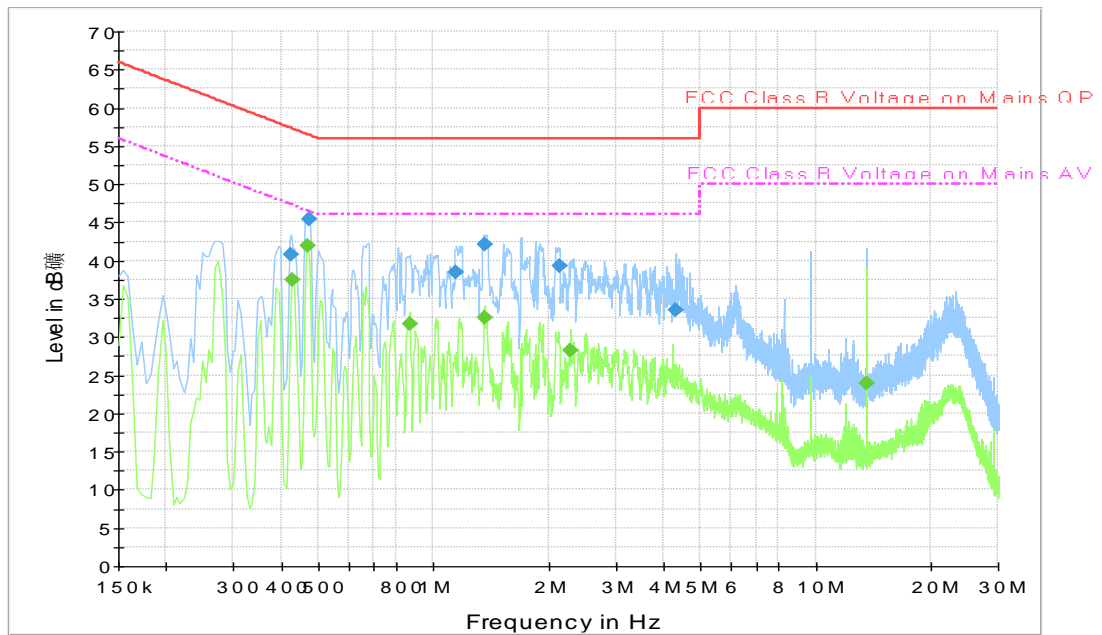


Fig A.6 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.424500	40.8	2000.0	9.000	L1	19.9	16.6	57.4
0.474000	45.4	2000.0	9.000	N	19.9	11.1	56.4
1.149000	38.5	2000.0	9.000	L1	19.6	17.5	56.0
1.360500	42.1	2000.0	9.000	L1	19.6	13.9	56.0
2.134500	39.2	2000.0	9.000	N	19.6	16.8	56.0
4.303500	33.5	2000.0	9.000	N	19.7	22.5	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.429000	37.5	2000.0	9.000	N	19.9	9.8	47.3
0.469500	41.9	2000.0	9.000	L1	19.9	4.6	46.5
0.865500	31.7	2000.0	9.000	N	19.8	14.3	46.0
1.360500	32.5	2000.0	9.000	L1	19.6	13.5	46.0
2.292000	28.2	2000.0	9.000	L1	19.7	17.8	46.0
13.560000	23.9	2000.0	9.000	N	19.8	26.1	50.0

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	Test Software and Version	Software Vendor	Test operator
Conducted Emission	EMC32 V8.5.2	R&S	Wang Huan
Radiated Emission	EMC32 V9.01.00	R&S	Li Jinpeng

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