



TEST REPORT

No. I19Z61671-EMC01

HMD Global Oy

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

Model Name: TA-1214

FCC ID: 2AJOTTA-1214

with

Hardware Version: 99621_1_11

Software Version: 000T_0_130

Issued Date: 2019-10-18

Note:

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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.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z61671-EMC01	Rev.0	1 st edition	2019-10-18

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1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

CTTL (BDA)

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

1.3. Testing Environment

Normal Temperature: 15-35°C
Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-09-23
Testing End Date: 2019-10-15

1.5. Signature



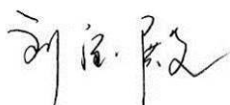
Li Yan

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2. Client Information

2.1. Applicant Information

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Telephone: /

2.2. Manufacturer Information

Company Name: HMD Global Oy
Address: Bertel Jungin aukio 9,02600 Espoo, Finland
City: /
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Country: /
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Email: Rosario.Casillo@hmdglobal.com
Telephone: /

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

3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN
Model Name	TA-1214
FCC ID	2AJOTTA-1214
Extreme vol. Limits	3.6VDC to 4.4VDC (nominal: 3.85VDC)

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	354219100003902	99621_1_11	000T_0_130

*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	/	/
AE6	Charger	/	/
AE7	USB Cable	/	/
AE8	USB Cable	/	/
AE9	Headset	/	/

AE1

Model	WT240
Manufacturer	Jiade Energy Technology (Zhuhai) Co., Ltd
Capacitance	3920mAh
Nominal voltage	3.85v

AE3

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

AE4

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

AE5

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

AE6

Model	CH-35E
Manufacturer	Yutong electronics(Huizhou) co.,ltd
Length of cable	/

AE7

Model	CB-35A
Manufacturer	Leagtech Electronics Co.,Ltd
Length of cable	/

AE8

Model	CB-35A
Manufacturer	Shenzhen BRL Technology Co.,Ltd.
Length of cable	/

AE9

Model	HS-34
Manufacturer	New Leader Industry Co.,Ltd
Length of cable	/

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+ AE3+ AE7/AE8	Charger+MP3+GNSS
Set.2	EUT2+ AE1+ AE4+ AE7/AE8	Charger+CAMERA
Set.3	EUT2+ AE1+ AE5+ AE7/AE8	Charger+CAMERA
Set.4	EUT2+ AE1+ AE6+AE7/AE8	Charger+CAMERA
Set.5	EUT2+ AE1 +AE7/AE8+AE9	USB mode+FM

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×17 meters×10 meters) 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	< 4Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3m/10m 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

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
	BR	Re-use test data from basic model report.

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

7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	Test Receiver	ESU26	100376	R&S	2019-11-27	1 year
2	Test Receiver	ESCI	100766	R&S	2020-03-20	1 year
3	Universal Radio Communication Tester	CMW500	127406	R&S	2020-01-19	1 year
4	Universal Radio Communication Tester	CMW500	159408	R&S	2020-03-03	1 year
5	LISN	ENV216	101459	R&S	2020-04-10	1 year
6	EMI Antenna	VULB9163	9163-514	Schwarzbeck	2020-02-03	1 year
7	EMI Antenna	3117	00167252	ETS-Lindgren	2019-11-15	1 year
8	Signal Generator	SMF100A	101295	R&S	2019-11-27	1 year
9	Printer	P1606dn	VNC3L52122	HP	N/A	N/A
10	Keyboard	KU-1601	2048361	Lenovo	N/A	N/A
11	Mouse	EMS-537A	8021S3MC	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 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 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. During the charging mode (set.1) the EUT is keeping on playing MP3 and the GNSS application is started up. During the charging mode (set.2) the camera is keeping on taking photos. During the USB mode the FM application is started up. The model of the PC is Lenovo M4000e-17, and the serial number of the PC is M706RMW2. 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): 30MHz-1GHz: 5.40dB, 1GHz-18GHz: 4.32dB, $k=2$.

Measurement results for Set.1:

Charging Mode+ MP3+GNSS /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)
17983.000	38.98	-25.8	41.3	23.52	54.0	15.0	V
17988.000	38.96	-25.8	41.3	23.48	54.0	15.0	V
17109.500	38.84	-26.0	41.6	23.25	54.0	15.2	H
17987.000	38.79	-25.8	41.3	23.31	54.0	15.2	H
17104.500	38.79	-26.0	41.6	23.23	54.0	15.2	V
17124.000	38.76	-26.0	41.6	23.21	54.0	15.2	H

Charging Mode+ MP3+GNSS /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)
17220.000	51.9	-26.5	41.5	36.91	74.0	22.1	H
16305.500	51.5	-26.6	41.1	37.06	74.0	22.5	V
17519.000	51.3	-26.4	41.2	36.45	74.0	22.7	V
17010.500	51.2	-26.6	41.7	36.17	74.0	22.8	V
17255.000	51.2	-26.7	41.4	36.44	74.0	22.8	H
17894.500	51.1	-26.2	41.3	36.06	74.0	22.9	V

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

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

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)
17978.500	38.9	-25.9	41.3	23.44	54.0	15.1	V
17982.000	38.8	-25.8	41.3	23.36	54.0	15.2	H
17989.000	38.8	-25.8	41.3	23.32	54.0	15.2	V
17095.000	38.8	-26.1	41.6	23.27	54.0	15.2	V
17983.000	38.8	-25.8	41.3	23.30	54.0	15.2	H
17963.000	38.8	-25.9	41.3	23.38	54.0	15.2	H

Charging Mode+ CAMERA /Peak detector

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)
17052.500	51.9	-26.4	41.6	36.59	74.0	22.1	V
17892.500	51.8	-26.2	41.3	36.70	74.0	22.2	H
17109.000	51.7	-26.0	41.6	36.12	74.0	22.3	V
17971.000	51.6	-25.9	41.3	36.21	74.0	22.4	V
17935.500	51.2	-26.0	41.3	35.98	74.0	22.8	V
17098.500	51.1	-26.1	41.6	35.58	74.0	22.9	H

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

Measurement results for Set.3:

Charging Mode+ CAMERA /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)
17115.000	38.8	-26.0	41.6	23.21	54.0	15.2	V
17111.500	38.8	-26.0	41.6	23.21	54.0	15.2	V
17999.000	38.7	-25.9	41.3	23.32	54.0	15.3	H
17108.000	38.7	-26.0	41.6	23.15	54.0	15.3	V
17988.000	38.7	-25.8	41.3	23.23	54.0	15.3	V
17085.000	38.7	-26.2	41.6	23.25	54.0	15.3	H

Charging Mode+ CAMERA /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)
17555.000	51.6	-26.4	41.2	36.80	74.0	22.4	V
17665.000	51.1	-26.5	41.2	36.33	74.0	22.9	V
17933.000	51.0	-26.0	41.3	35.77	74.0	23.0	V
17997.000	50.9	-25.9	41.3	35.52	74.0	23.1	V
17898.000	50.8	-26.2	41.3	35.75	74.0	23.2	H
17192.500	50.7	-26.4	41.5	35.59	74.0	23.3	H

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

Measurement results for Set.4

Charging Mode+ CAMERA /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)
17112.500	38.9	-26.0	41.6	23.31	54.0	15.1	V
17982.000	38.9	-25.8	41.3	23.39	54.0	15.1	H
17972.500	38.8	-25.9	41.3	23.36	54.0	15.2	V
17106.500	38.8	-26.0	41.6	23.21	54.0	15.2	V
17993.500	38.8	-25.8	41.3	23.33	54.0	15.2	H
17981.500	38.8	-25.8	41.3	23.31	54.0	15.2	V

Charging Mode+ CAMERA /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)
17123.000	51.7	-26.0	41.6	36.10	74.0	22.3	H
17104.500	51.5	-26.0	41.6	35.96	74.0	22.5	H
17937.500	51.0	-26.0	41.3	35.70	74.0	23.0	V
17981.500	50.9	-25.8	41.3	35.44	74.0	23.1	V
16635.500	50.8	-26.6	41.4	36.00	74.0	23.2	V
17036.500	50.8	-26.5	41.7	35.60	74.0	23.2	H

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

Measurement results for Set.5:
USB Mode +FM /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)
17979.500	38.9	-25.8	41.3	23.43	54.0	15.1	V
17982.500	38.8	-25.8	41.3	23.36	54.0	15.2	V
17997.000	38.8	-25.9	41.3	23.39	54.0	15.2	V
17053.000	38.8	-26.4	41.6	23.53	54.0	15.2	H
17987.000	38.8	-25.8	41.3	23.32	54.0	15.2	V
17107.500	38.8	-26.0	41.6	23.22	54.0	15.2	V

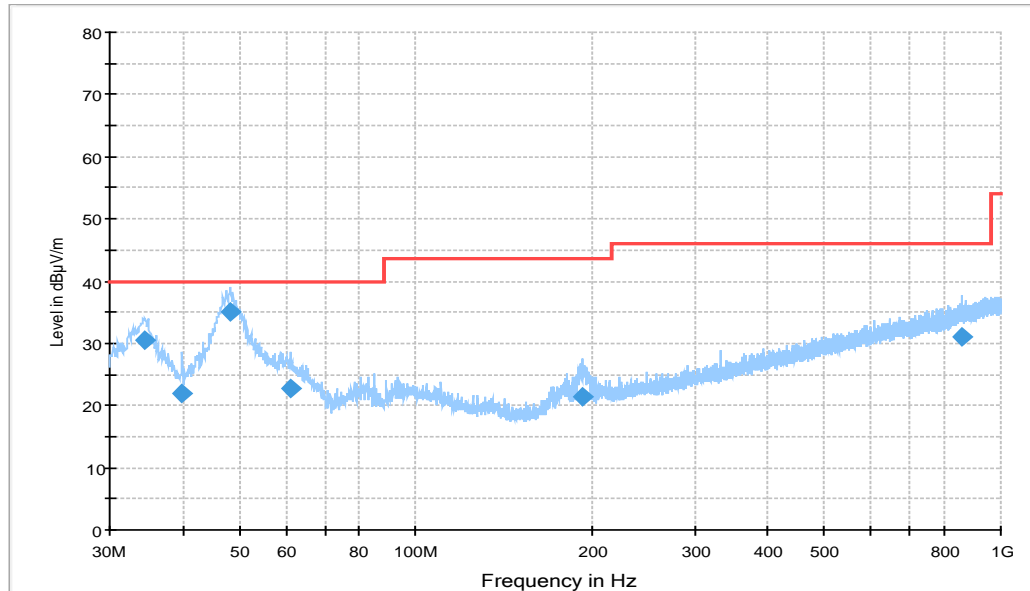
USB Mode +FM /Peak detector

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)
3592.500	54.1	-35.2	33.2	56.16	74.0	19.9	H
17109.000	51.9	-26.0	41.6	36.35	74.0	22.1	V
3588.000	51.6	-35.2	33.2	53.65	74.0	22.4	H
3597.000	51.5	-35.3	33.2	53.64	74.0	22.5	H
17121.500	51.5	-26.0	41.6	35.92	74.0	22.5	V
17934.000	51.5	-26.0	41.3	36.20	74.0	22.5	V

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

Charging Mode + MP3+GNSS, Set.1

15B RE 30MHz-1GHz



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

Figure A.1 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)
34.559000	30.5	100.0	V	55.0	-0.2	9.5	40.0
39.894000	21.8	100.0	V	34.0	0.5	18.2	40.0
48.139000	34.9	100.0	V	62.0	0.8	5.1	40.0
61.234000	22.7	125.0	V	79.0	-0.5	17.3	40.0
192.96000	21.3	100.0	V	8.0	-1.9	22.2	43.5
860.02900	31.0	110.0	V	270.0	12.3	15.0	46.0

15B RE - 1GHz-3GHz

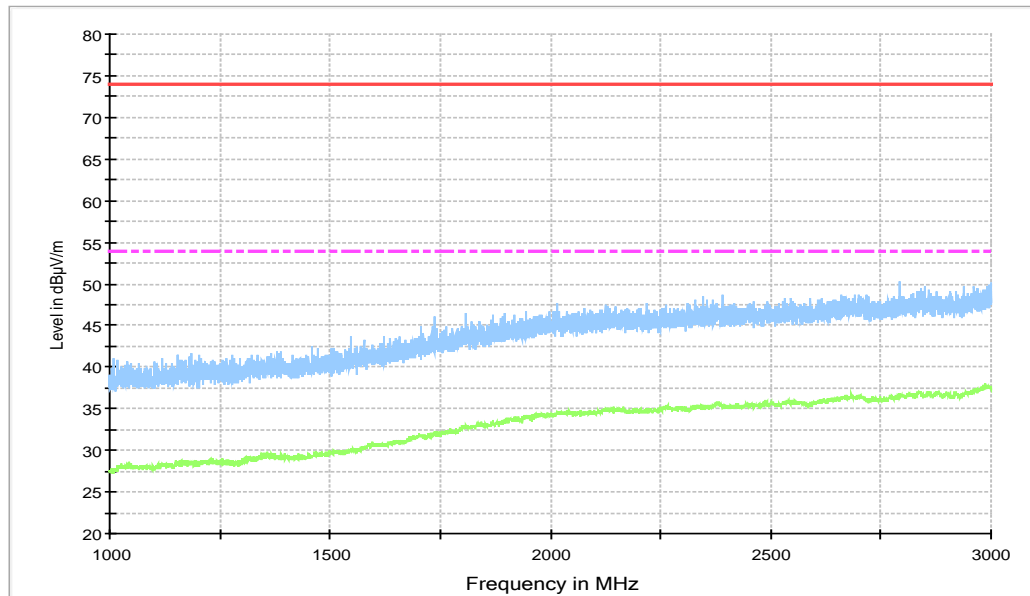


Figure A.2 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

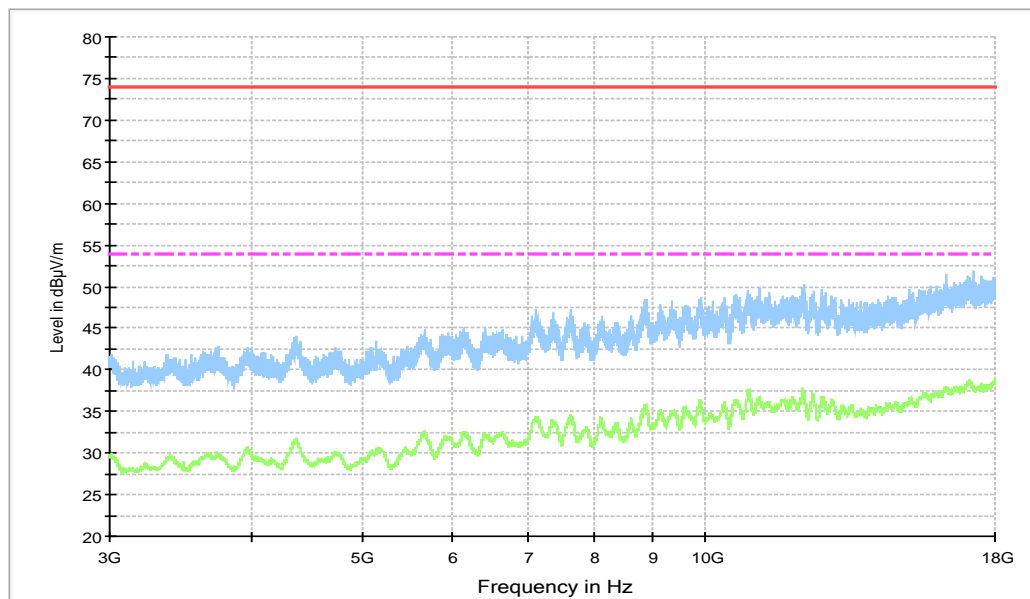


Figure A.3 Radiated Emission from 3GHz to 18GHz

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

Charging Mode+ CAMERA, Set.2

15B RE 30MHz-1GHz

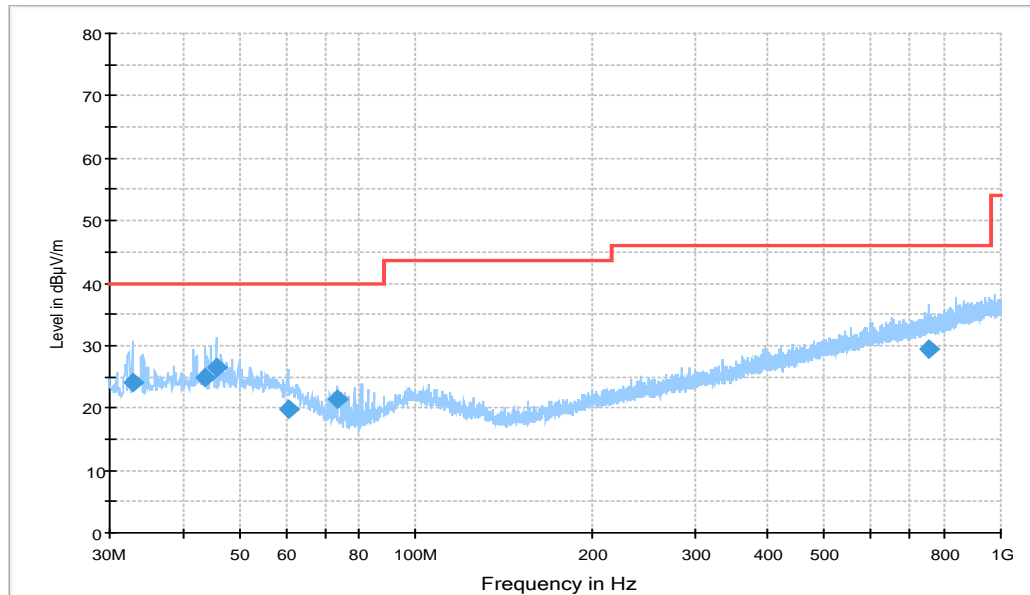


Figure A.4 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
32.813000	24.2	100.0	V	284.0	-0.5	15.8	40.0
43.677000	24.9	100.0	V	45.0	0.7	15.1	40.0
45.617000	26.4	110.0	V	135.0	0.7	13.6	40.0
60.458000	19.9	125.0	V	249.0	-0.1	20.1	40.0
73.553000	21.5	100.0	V	225.0	-4.9	18.5	40.0
754.59000	29.4	100.0	H	197.0	10.8	16.6	46.0

15B RE - 1GHz-3GHz

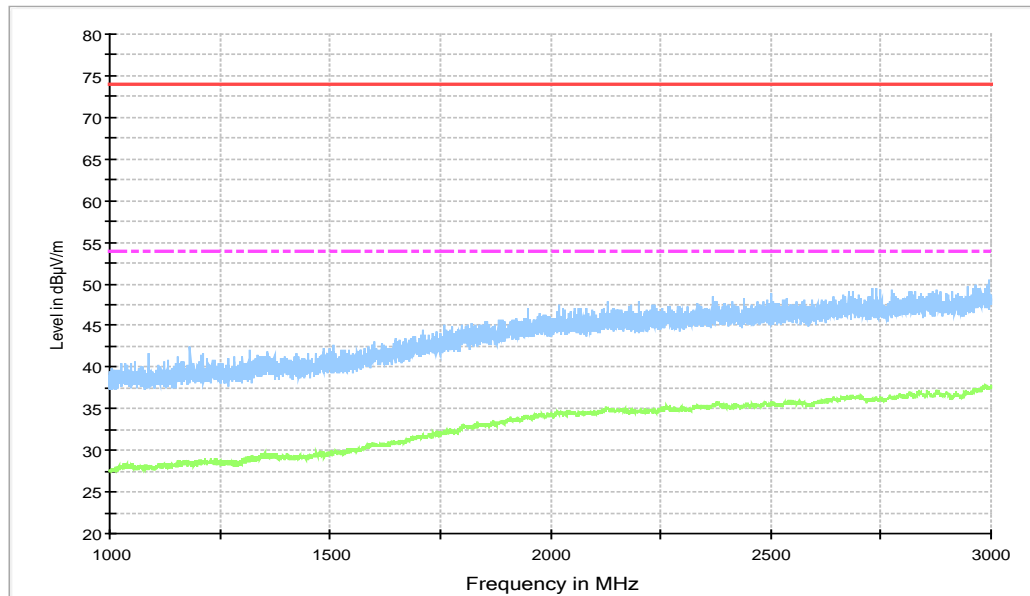


Figure A.5 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

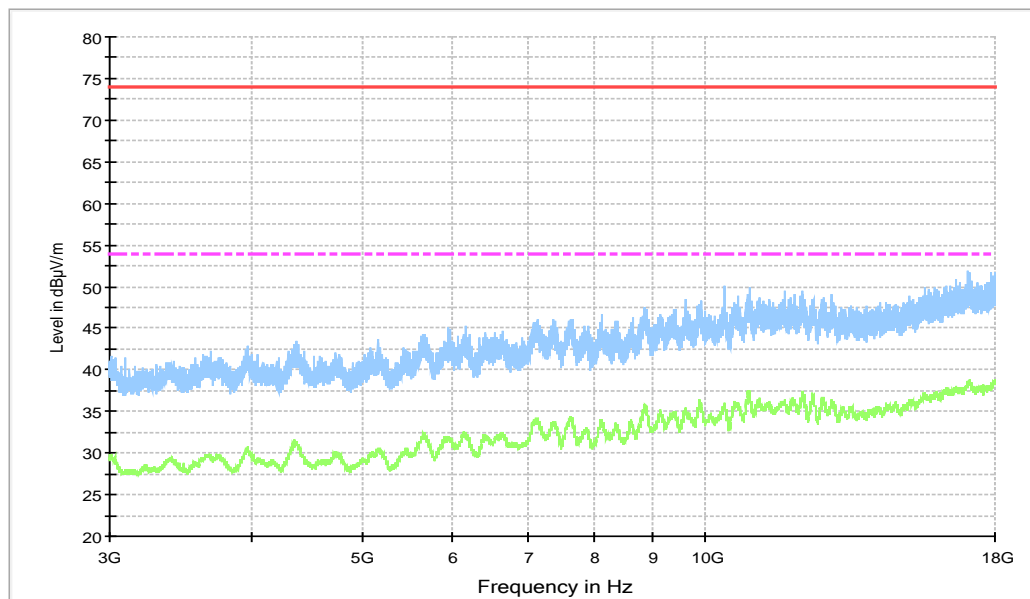


Figure A.6 Radiated Emission from 3GHz to 18GHz

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

Charging Mode+ CAMERA, Set.3

15B RE 30MHz-1GHz

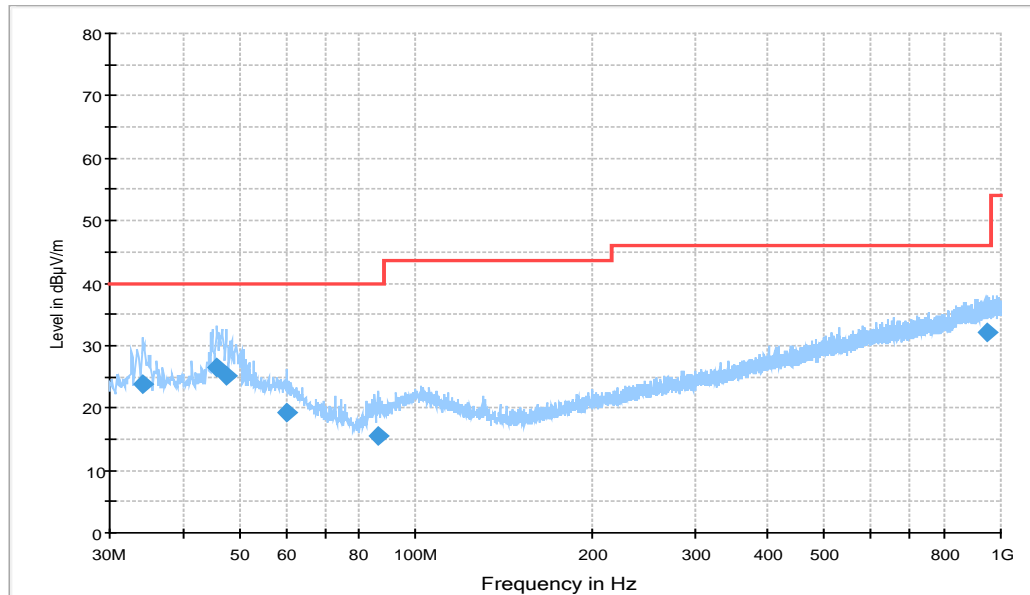


Figure A.7 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
34.171000	23.9	100.0	V	72.0	-0.3	16.1	40.0
45.714000	26.5	100.0	V	124.0	0.7	13.5	40.0
47.557000	25.1	100.0	V	135.0	0.8	14.9	40.0
60.264000	19.3	100.0	H	-28.0	0.0	20.7	40.0
86.163000	15.4	100.0	V	239.0	-4.1	24.6	40.0
947.91100	32.0	100.0	V	-30.0	13.2	14.0	46.0

15B RE - 1GHz-3GHz

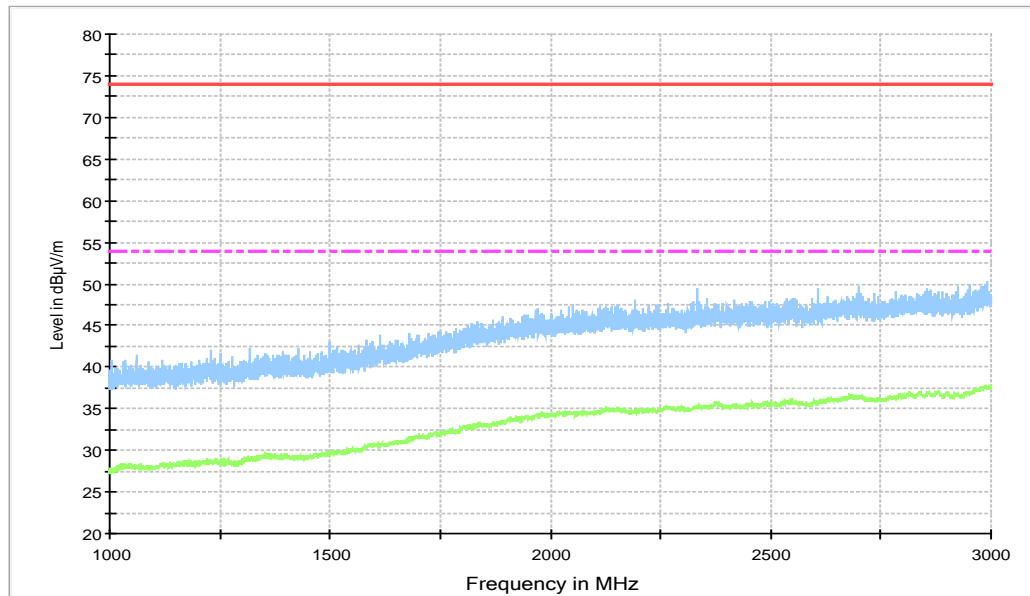


Figure A.8 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

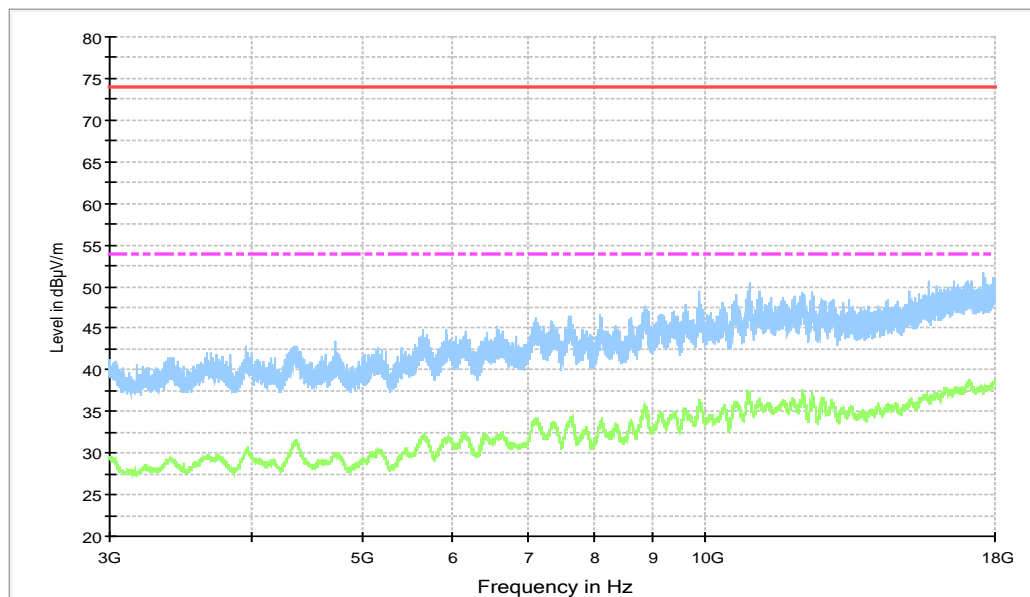


Figure A.9 Radiated Emission from 3GHz to 18GHz

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

Charging Mode+ CAMERA, Set.4

15B RE 30MHz-1GHz

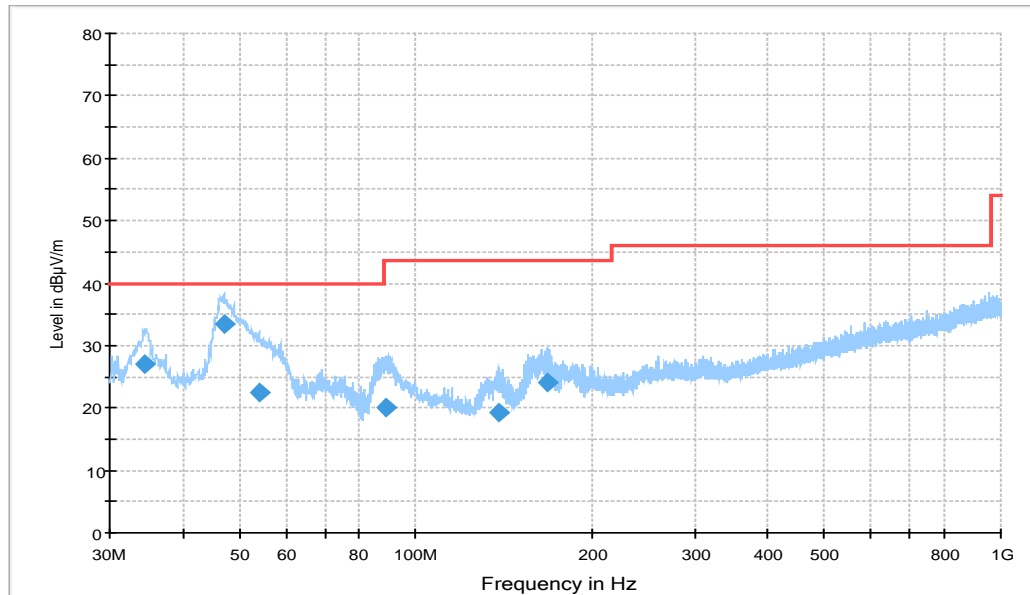


Figure A.10 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
34.559000	26.9	100.0	V	198.0	-0.2	13.1	40.0
46.975000	33.5	100.0	V	96.0	0.8	6.5	40.0
53.959000	22.5	110.0	V	292.0	0.6	17.5	40.0
88.685000	20.1	110.0	V	256.0	-3.4	23.4	43.5
138.64000	19.4	110.0	V	0.0	-4.4	24.2	43.5
167.74000	24.0	100.0	V	-4.0	-3.5	19.5	43.5

15B RE - 1GHz-3GHz

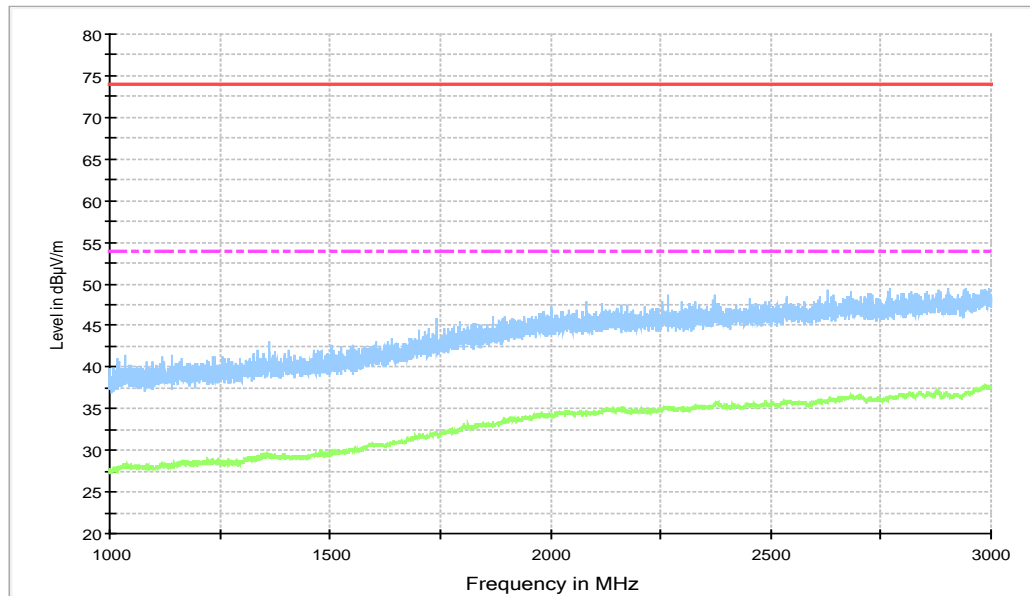


Figure A.11 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

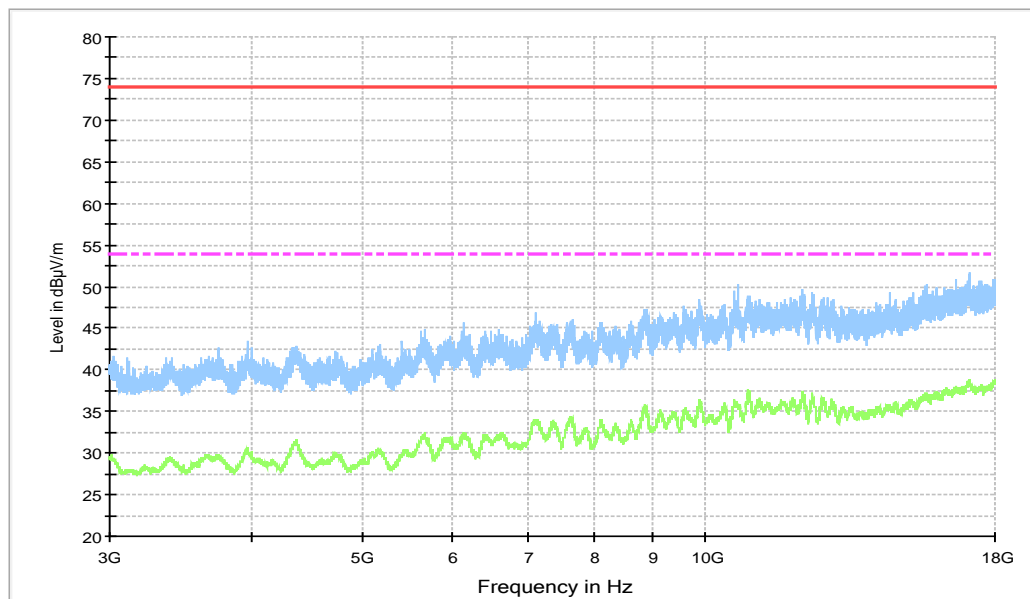


Figure A.12 Radiated Emission from 3GHz to 18GHz

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

USB Mode +FM, Set.5

15B RE 30MHz-1GHz

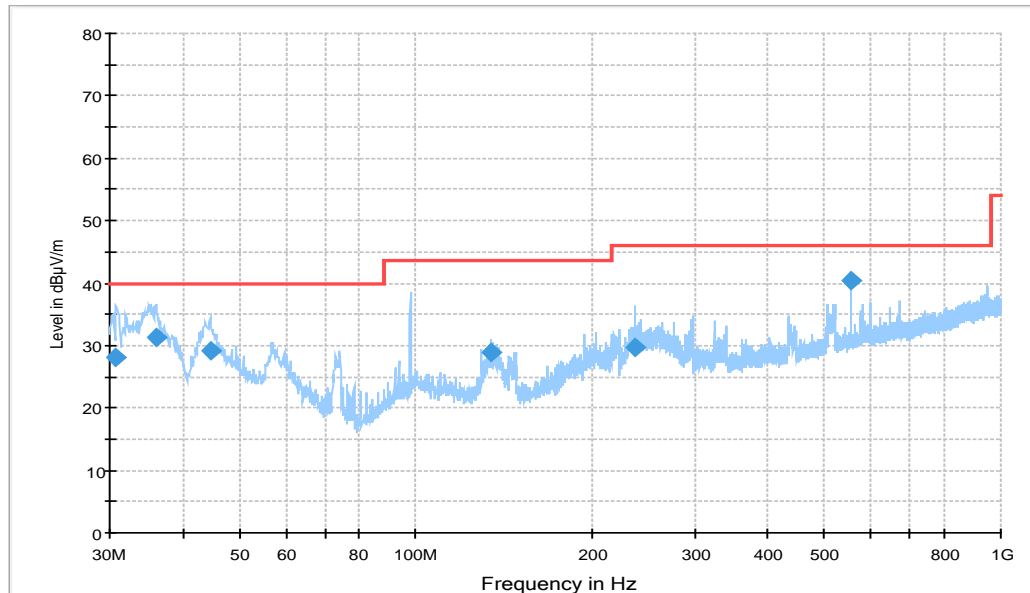


Figure A.13 Radiated Emission from 30MHz to 1GHz

Note: the spike at 98MHz is coming from FM signal source

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.776000	28.1	100.0	V	235.0	-0.9	11.9	40.0
36.014000	31.4	119.0	V	287.0	0.0	8.6	40.0
44.550000	29.2	125.0	V	142.0	0.7	10.8	40.0
134.85700	28.9	125.0	H	40.0	-4.2	14.6	43.5
236.41600	29.8	125.0	H	-11.0	0.1	16.2	46.0
553.99400	40.5	125.0	V	-9.0	8.2	5.5	46.0

15B RE - 1GHz-3GHz

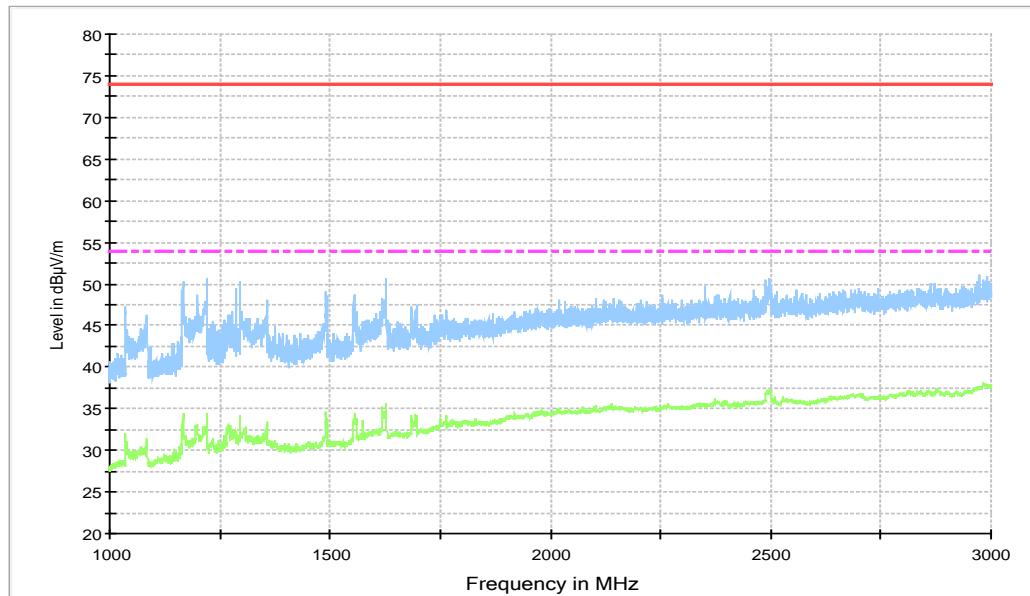


Figure A.14 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

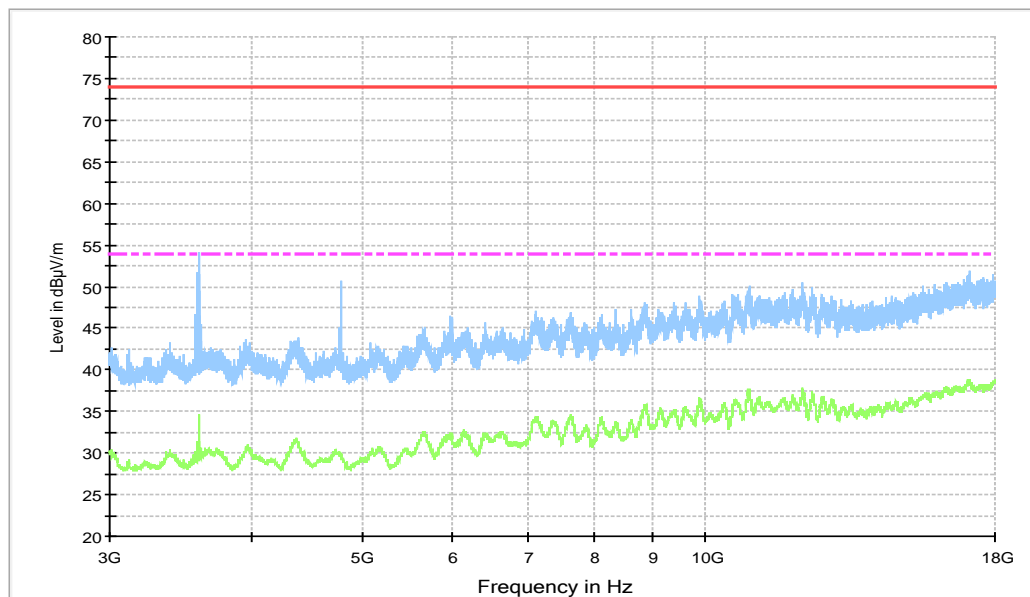


Figure A.15 Radiated Emission from 3GHz to 18GHz

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

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. During the charging mode (set.1) the EUT is keeping on playing MP3 and the GNSS application is started up. During the charging mode (set.2) the camera is keeping on taking photos. During the USB mode the FM application is started up. The model of the PC is Lenovo M4000e-17, and the serial number of the PC is M706RMW2. 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: $U = 3.10 \text{ dB}$, $k=2$.

Charging Mode +MP3+GNSS, Set.1

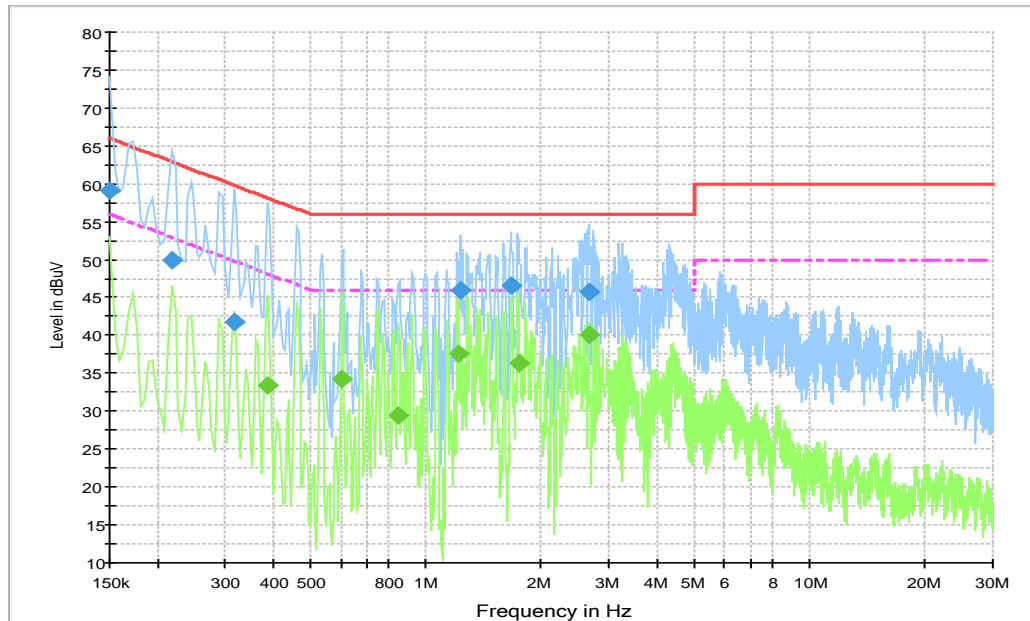


Figure A.16 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	59.1	10000.0	9.000	On	L1	28.9	6.9	66.0
0.217500	49.8	10000.0	9.000	On	L1	20.0	13.1	62.9
0.316500	41.7	10000.0	9.000	On	N	20.0	18.1	59.8
1.230000	45.9	10000.0	9.000	On	N	19.9	10.1	56.0
1.662000	46.5	10000.0	9.000	On	N	19.8	9.5	56.0
2.661000	45.7	10000.0	9.000	On	L1	19.8	10.3	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.388500	33.4	10000.0	9.000	On	N	20.0	14.7	48.1
0.604500	34.3	10000.0	9.000	On	N	20.0	11.7	46.0
0.847500	29.5	10000.0	9.000	On	N	19.9	16.5	46.0
1.212000	37.6	10000.0	9.000	On	N	19.8	8.4	46.0
1.743000	36.4	10000.0	9.000	On	N	19.8	9.6	46.0
2.656500	40.2	10000.0	9.000	On	N	19.8	5.8	46.0

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

. Charging Mode + CAMERA, Set.2

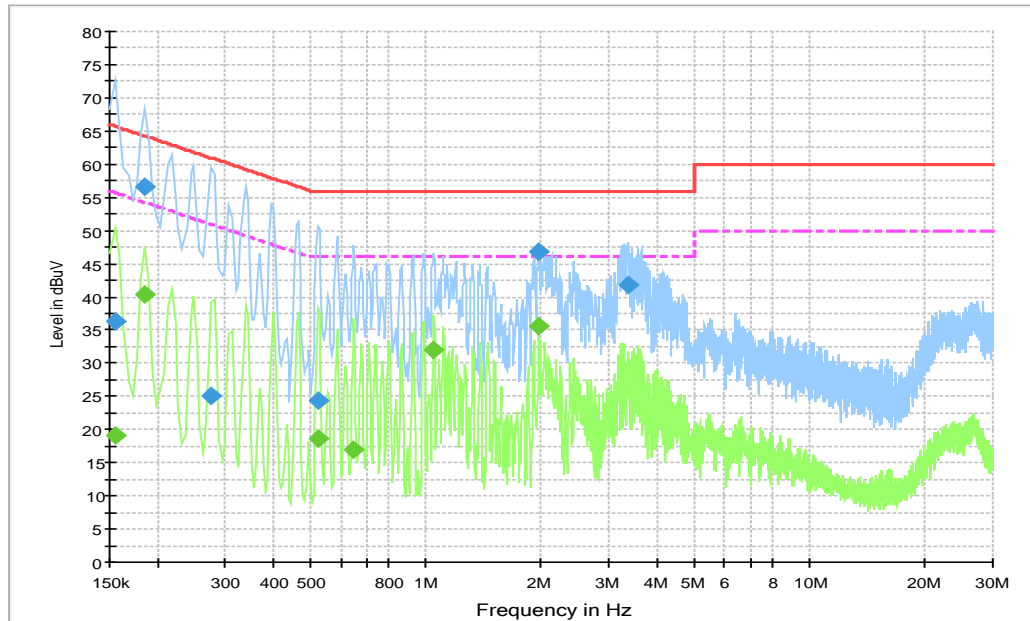


Figure A.17 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.154500	36.3	10000.0	9.000	On	N	28.0	29.5	65.8
0.186000	56.6	10000.0	9.000	On	L1	22.2	7.6	64.2
0.276000	25.0	10000.0	9.000	On	N	20.0	35.9	60.9
0.523500	24.4	10000.0	9.000	On	N	20.0	31.6	56.0
1.972500	46.9	10000.0	9.000	On	L1	19.8	9.1	56.0
3.376500	41.8	10000.0	9.000	On	L1	19.8	14.2	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.154500	19.2	10000.0	9.000	On	N	28.0	36.6	55.8
0.186000	40.4	10000.0	9.000	On	L1	22.2	13.8	54.2
0.523500	18.7	10000.0	9.000	On	L1	20.0	27.3	46.0
0.649500	17.0	10000.0	9.000	On	N	19.9	29.0	46.0
1.050000	32.0	10000.0	9.000	On	L1	19.9	14.0	46.0
1.972500	35.6	10000.0	9.000	On	L1	19.8	10.4	46.0

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

Charging Mode+ CAMERA, Set.3

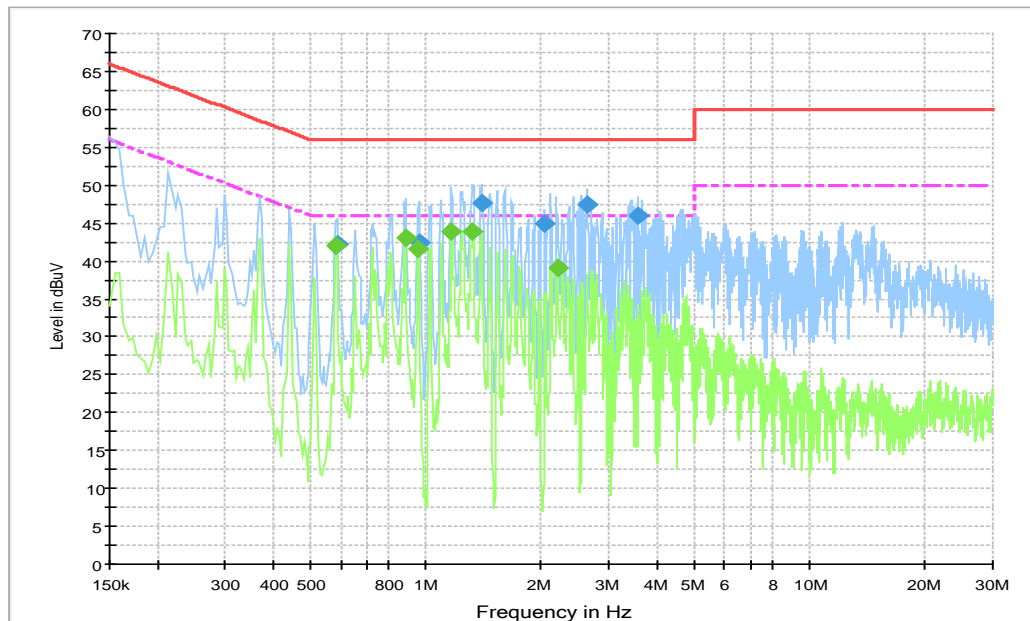


Figure A.18 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.586500	42.2	10000.0	9.000	On	L1	20.0	13.8	56.0
0.960000	42.5	10000.0	9.000	On	N	19.9	13.5	56.0
1.401000	47.7	10000.0	9.000	On	N	19.8	8.3	56.0
2.040000	44.9	10000.0	9.000	On	N	19.8	11.1	56.0
2.620500	47.4	10000.0	9.000	On	N	19.8	8.6	56.0
3.570000	45.9	10000.0	9.000	On	N	19.8	10.1	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.582000	42.0	10000.0	9.000	On	N	20.0	4.0	46.0
0.883500	43.1	10000.0	9.000	On	N	19.9	2.9	46.0
0.955500	41.7	10000.0	9.000	On	N	19.9	4.3	46.0
1.167000	43.9	10000.0	9.000	On	N	19.8	2.1	46.0
1.324500	43.8	10000.0	9.000	On	N	19.8	2.2	46.0
2.197500	39.0	10000.0	9.000	On	N	19.8	7.0	46.0

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

Charging Mode+ CAMERA, Set.4

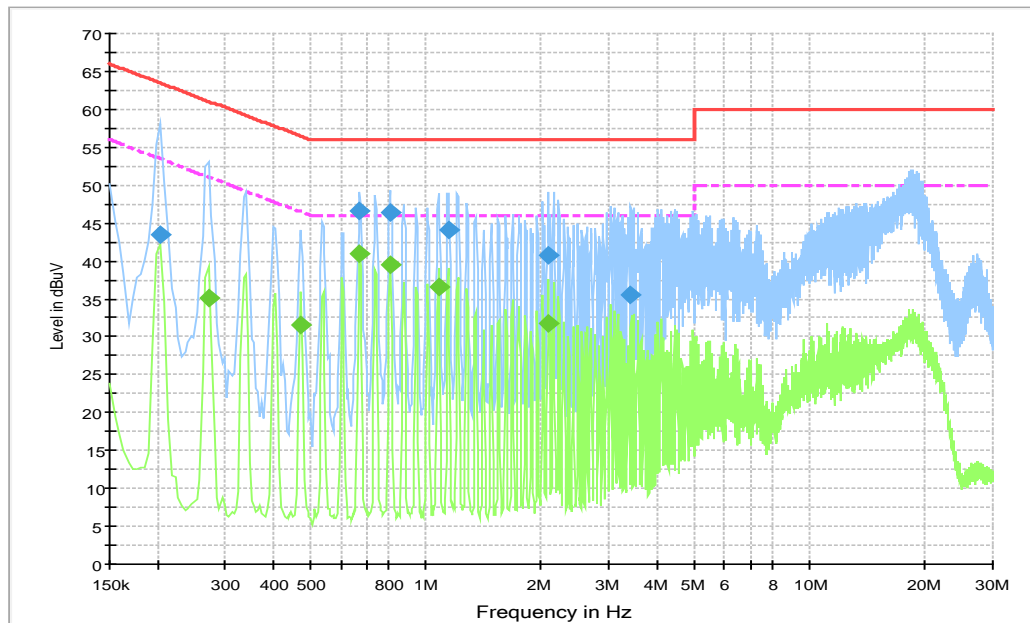


Figure A.19 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.204000	43.4	10000.0	9.000	On	L1	20.0	20.0	63.4
0.672000	46.5	10000.0	9.000	On	L1	19.9	9.5	56.0
0.807000	46.5	10000.0	9.000	On	L1	19.9	9.5	56.0
1.144500	44.1	10000.0	9.000	On	L1	19.8	11.9	56.0
2.085000	40.7	10000.0	9.000	On	L1	19.8	15.3	56.0
3.426000	35.4	10000.0	9.000	On	L1	19.8	20.6	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.271500	35.1	10000.0	9.000	On	N	19.9	16.0	51.1
0.474000	31.6	10000.0	9.000	On	N	20.0	14.8	46.4
0.672000	40.9	10000.0	9.000	On	N	19.9	5.1	46.0
0.807000	39.5	10000.0	9.000	On	L1	19.9	6.5	46.0
1.077000	36.5	10000.0	9.000	On	L1	19.9	9.5	46.0
2.085000	31.8	10000.0	9.000	On	L1	19.8	14.2	46.0

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

USB Mode +FM, Set.5

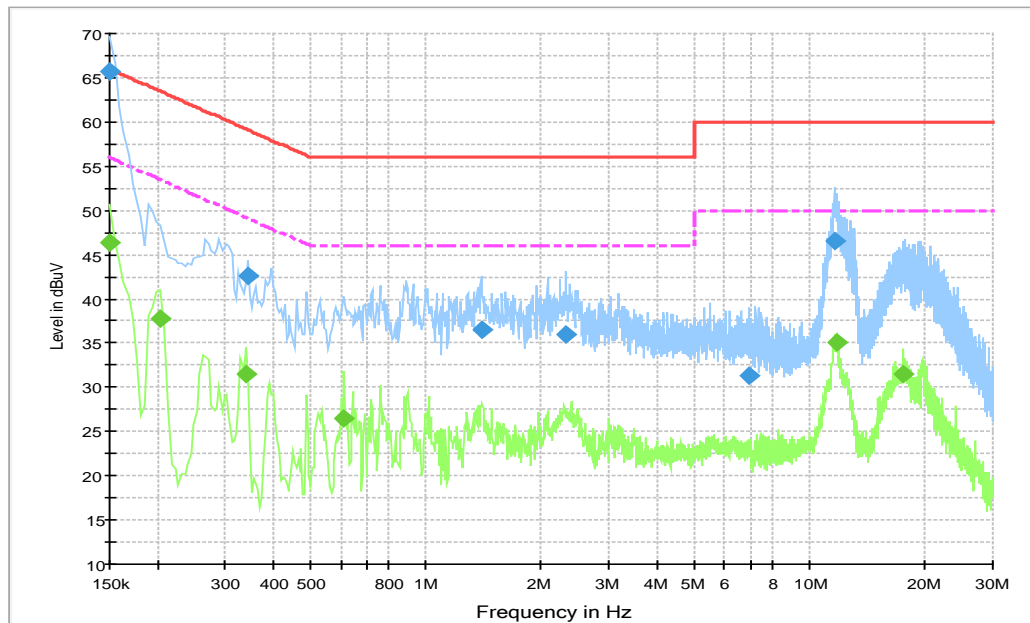


Figure A.20 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	65.7	10000.0	9.000	On	L1	28.9	0.3	66.0
0.343500	42.7	10000.0	9.000	On	L1	20.0	16.5	59.1
1.396500	36.5	10000.0	9.000	On	N	19.8	19.5	56.0
2.323500	36.0	10000.0	9.000	On	N	19.8	20.0	56.0
6.976500	31.4	10000.0	9.000	On	N	19.9	28.6	60.0
11.629500	46.5	10000.0	9.000	On	N	20.0	13.5	60.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	46.4	10000.0	9.000	On	L1	28.9	9.6	56.0
0.204000	37.8	10000.0	9.000	On	N	19.9	15.7	53.4
0.339000	31.6	10000.0	9.000	On	N	20.0	17.7	49.2
0.613500	26.5	10000.0	9.000	On	N	20.0	19.5	46.0
11.701500	35.1	10000.0	9.000	On	N	20.0	14.9	50.0
17.587500	31.5	10000.0	9.000	On	L1	20.0	18.5	50.0

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

ANNEX B: Persons involved in this testing

Test Item	Tester
Radiated Emission	Zhao Wenhui
Conducted Emission	Guo Qian

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