TEST REPORT

No. I19Z60072-EMC04

HMD Global Oy

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

Model Name: TA-1156

FCC ID: 2AJOTTA-1156

with

Hardware Version: 89626_1_12

Software Version: 00WW_0_130

Issued Date: 2019-02-22

TESTING
NVLAP LAB CODE 600118-0

Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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

Tel:+86(0)10-62304633-2512, Fax:+86(0)10-62304633-2504

Email: cttl_terminals@caict.ac.cn, website: www.caict.ac.cn

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z60072-EMC04	Rev.0	1st edition	2019-02-22

CONTENTS

1. Test Laboratory

1.1. Testing Location

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°C

Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2019-01-21

Testing End Date: 2019-02-22

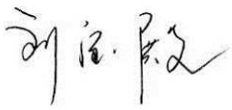
1.4. Signature

Li Yan

(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
Address:	Bertel Jungin aukio 9,02600 Espoo, Finland
City:	/
Postal Code:	/
Country:	/
Contact:	Rosario Casillo
Email:	Rosario.Casillo@hmdglobal.com
Telephone:	/

2.2. Manufacturer Information

Company Name:	HMD Global Oy
Address:	Bertel Jungin aukio 9,02600 Espoo, Finland
City:	/
Postal Code:	/
Country:	/
Contact:	Rosario Casillo
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-1156
FCC ID	2AJOTTA-1156
Extreme vol. Limits	3.6VDC to 4.40VDC (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
EUT2	352907100026541/ 352907100026558	89626_1_12	00WW_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	/	/
AE2	Battery	/	/
AE3	Charger	/	/
AE4	Charger	/	/
AE5	Charger	/	/
AE6	USB Cable	/	/
AE7	USB Cable	/	/
AE8	Headset	/	/

AE1

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

AE2

Model	WT240
Manufacturer	Dongguan DRN New Energy Co.,Ltd
Capacitance	3920mAh
Nominal voltage	3.85V

AE3

Model	CH-21U
Manufacturer	Shenzhen Tianyin Electronics Co.,Ltd
Length of cable	/

AE4	
Model	CH-21E
Manufacturer	Yutong electronics(Huizhou) co.,ltd
Length of cable	/
AE5	
Model	CH-21X
Manufacturer	Yutong electronics(Huizhou) co.,ltd
Length of cable	/
AE6	
Model	CB-35A
Manufacturer	Leagtech Electronics Co.,Ltd
Length of cable	/
AE7	
Model	CB-35A
Manufacturer	Shenzhen BRL Technology Co.,Ltd.
Length of cable	/
AE8	
Model	/
Manufacturer	/
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+ AE6/ AE7+AE8	Charger + FM
Set.2	EUT2+ AE1 + AE6/ AE7	USB mode+MP3+GNSS
Set.3	EUT2+ AE1 + AE4+ AE6/ AE7	Charger
Set.4	EUT2+ AE1 + AE5+ AE6/ AE7	Charger

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	2019-04-16	1 year
3	Universal Radio Communication Tester	CMW500	159408	R&S	2019-03-15	1 year
4	LISN	ESH3-Z5	825562/028	R&S	2019-08-22	1 year
5	EMI Antenna	VULB9163	9163-482	Schwarzbeck	2019-09-21	1 year
6	EMI Antenna	3117	00139065	ETS-Lindgren	2019-11-15	1 year
7	Signal Generator	SMF100A	101295	R&S	2019-11-27	1 year
8	Printer	P1606dn	VNC3L52122	HP	N/A	N/A
9	Keyboard	KU-1601	2048361	Lenovo	N/A	N/A
10	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 the FM application is started up. During the USB mode The EUT is keeping on playing MP3 and the GNSS 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 (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：5.40dB, 1GHz-18GHz：4.32dB, *k*=2.

Measurement results for Set.1:

Charging 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)
16998.000	39.5	-25.6	41.4	23.67	54.0	14.5	H
17103.000	39.3	-25.5	41.3	23.40	54.0	14.7	V
17083.500	39.2	-25.5	41.3	23.40	54.0	14.8	V
17089.500	39.2	-25.5	41.3	23.38	54.0	14.8	V
17013.750	39.2	-25.6	41.4	23.41	54.0	14.8	V
17076.750	39.2	-25.5	41.3	23.39	54.0	14.8	V

Charging 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)
17993.250	51.8	-25.1	40.8	36.08	74.0	22.2	V
17335.500	51.5	-25.7	41.2	36.00	74.0	22.5	H
17078.250	51.4	-25.5	41.3	35.60	74.0	22.6	H
17104.500	51.4	-25.5	41.3	35.51	74.0	22.6	H
17066.250	51.2	-25.5	41.3	35.38	74.0	22.8	H
17108.250	51.1	-25.5	41.3	35.21	74.0	22.9	H

Measurement results for Set.2:

USB 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)
17095.500	39.5	-25.5	41.3	23.64	54.0	14.5	V
17115.000	39.5	-25.5	41.3	23.60	54.0	14.5	V
17094.000	39.4	-25.5	41.3	23.56	54.0	14.6	H
17087.250	39.4	-25.5	41.3	23.54	54.0	14.6	V
17086.500	39.4	-25.5	41.3	23.54	54.0	14.6	V
17102.250	39.4	-25.5	41.3	23.53	54.0	14.6	V

USB 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)
3593.250	57.6	-34.2	33.5	58.26	74.0	16.4	H
3597.750	55.3	-34.1	33.5	55.91	74.0	18.7	H
3590.250	54.1	-34.2	33.5	54.82	74.0	19.9	H
3599.250	53.7	-34.1	33.5	54.34	74.0	20.3	H
3595.500	53.6	-34.2	33.5	54.26	74.0	20.4	H
3597.000	53.1	-34.1	33.5	53.69	74.0	20.9	H

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

Charging Mode + FM, Set.1

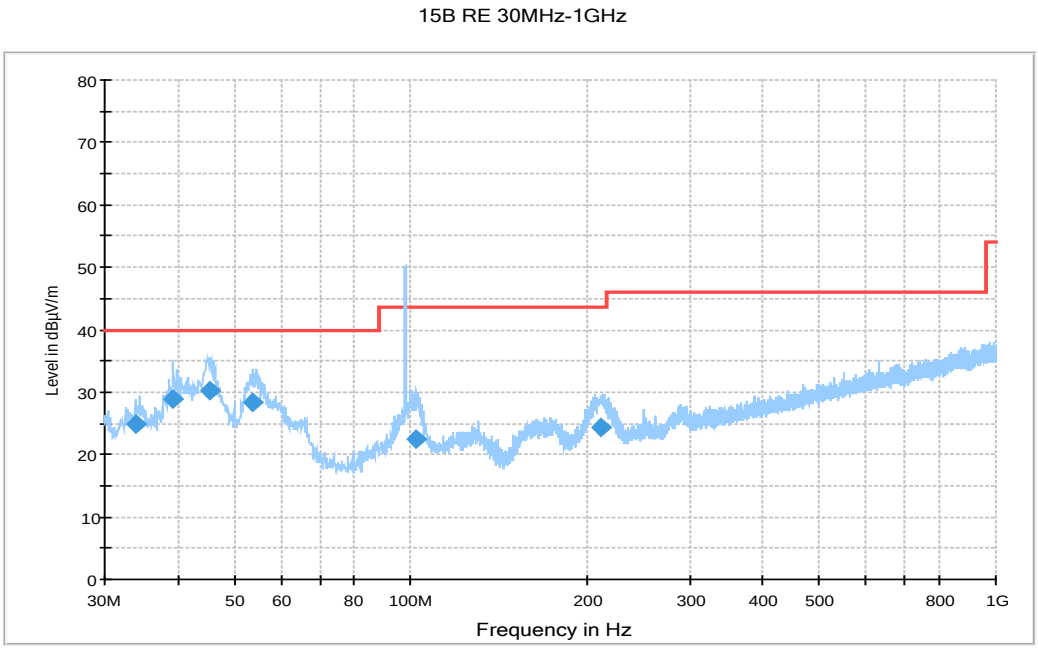


Figure A.1 Radiated Emission from 30MHz to 1GHz

Note: the spike（98MHz）over the limit 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)
33.783000	24.9	100.0	V	135.0	-0.6	15.1	40.0
39.215000	28.9	110.0	V	-24.0	0.7	11.1	40.0
45.423000	30.2	100.0	V	135.0	0.8	9.8	40.0
53.862000	28.5	100.0	V	-24.0	0.4	11.5	40.0
102.45900	22.3	125.0	V	156.0	-1.3	21.2	43.5
211.29300	24.3	100.0	V	-1.0	-1.1	19.2	43.5

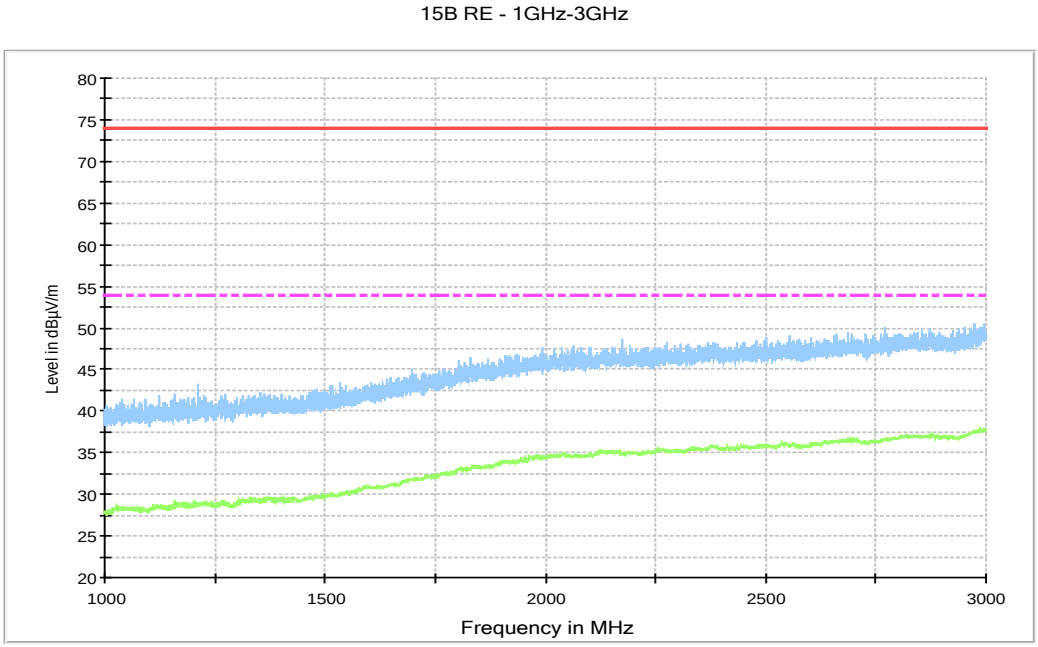


Figure A.2 Radiated Emission from 1GHz to 3GHz

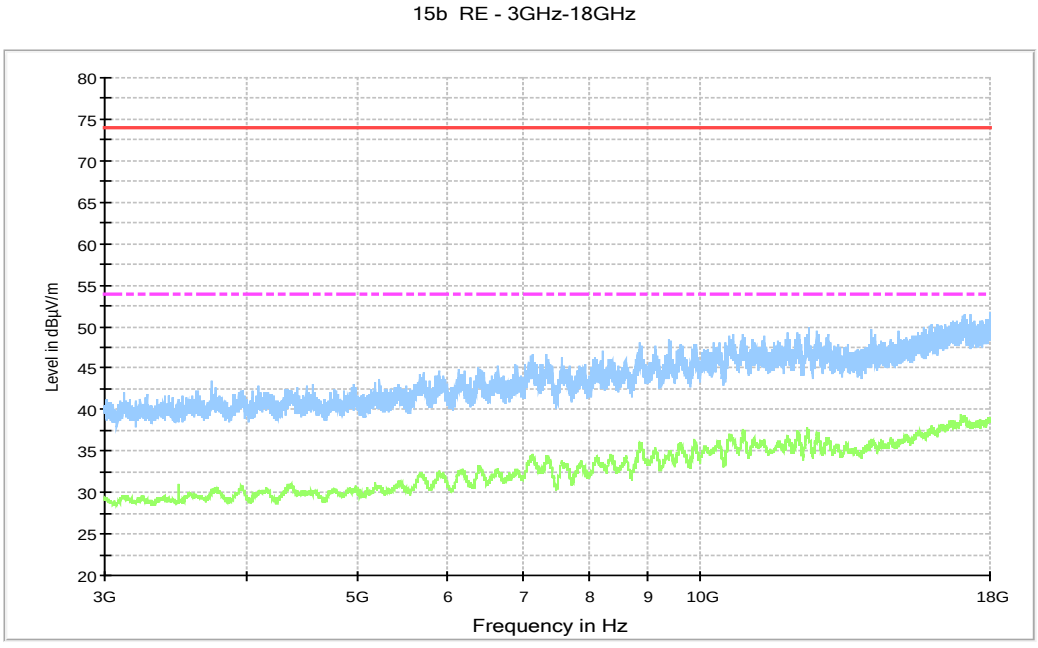


Figure A.3 Radiated Emission from 3GHz to 18GHz

USB Mode +MP3+GNSS, Set.2

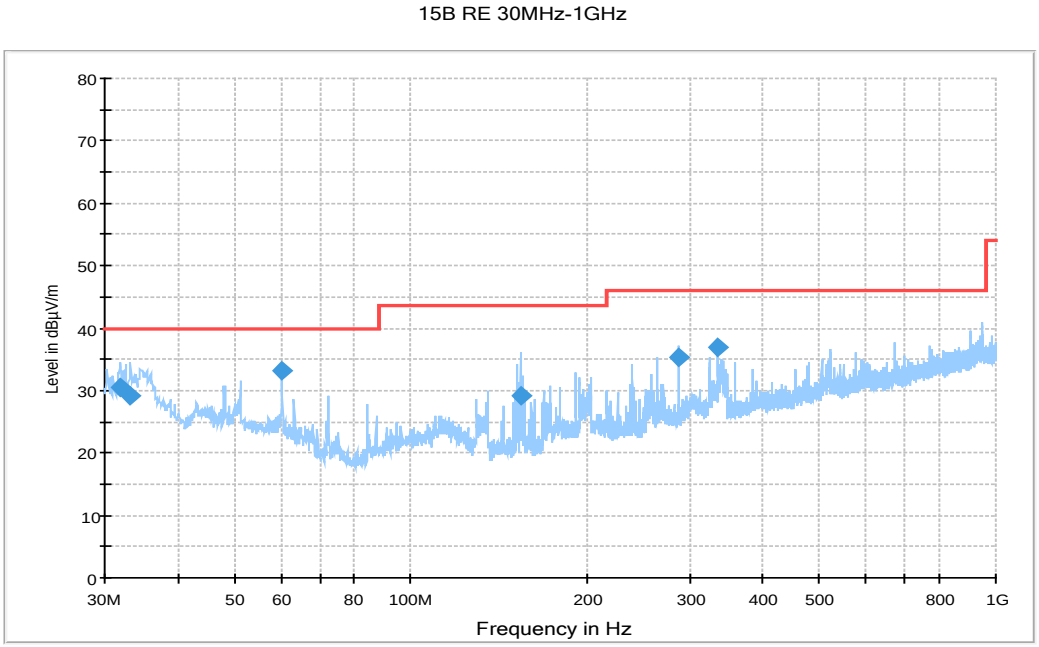


Figure A.4 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
31.940000	30.4	100.0	V	104.0	-1.1	9.6	40.0
33.201000	29.3	100.0	V	96.0	-0.7	10.7	40.0
60.264000	33.1	100.0	V	110.0	-0.2	6.9	40.0
153.86900	29.1	125.0	H	10.0	-4.4	14.4	43.5
287.72900	35.2	100.0	H	279.0	1.1	10.8	46.0
335.64700	36.9	100.0	H	178.0	2.7	9.1	46.0

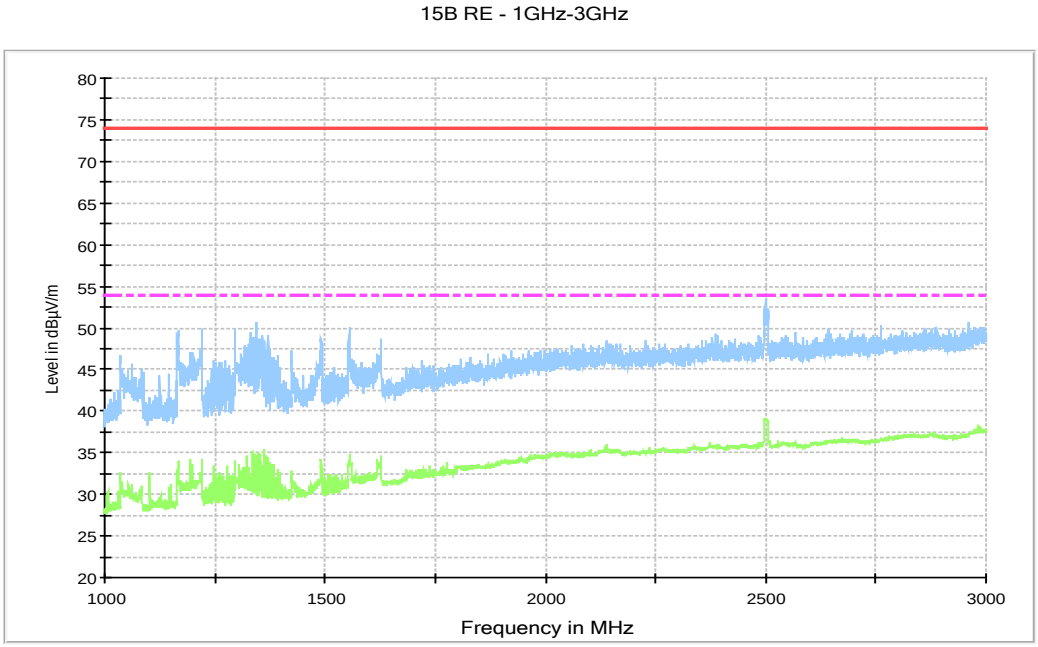


Figure A.5 Radiated Emission from 1GHz to 3GHz

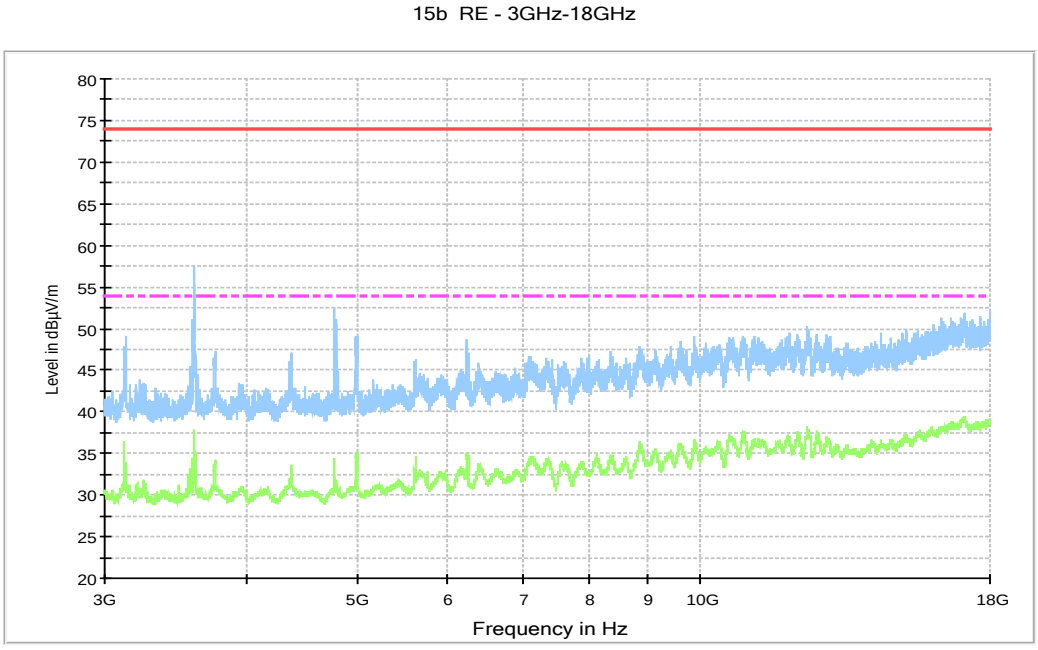


Figure A.6 Radiated Emission from 3GHz to 18GHz

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. During the charging mode the FM application is started up. During the USB mode The EUT is keeping on playing MP3 and the GNSS 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 dB, *k*=2.

Charging Mode +FM, Set.1

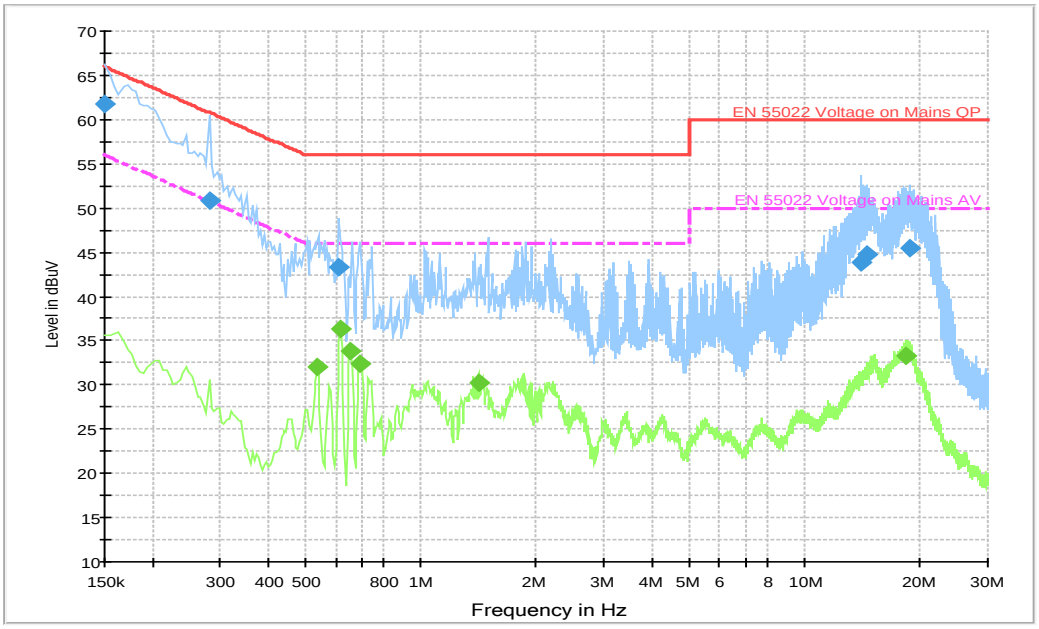


Figure A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	61.8	10000.0	9.000	GND	N	10.3	4.2	66.0
0.280500	50.9	10000.0	9.000	GND	L1	10.3	9.9	60.8
0.613500	43.3	10000.0	9.000	GND	N	10.4	12.7	56.0
14.046000	43.8	10000.0	9.000	GND	N	11.0	16.2	60.0
14.577000	44.8	10000.0	9.000	GND	L1	11.1	15.2	60.0
18.685500	45.5	10000.0	9.000	GND	N	11.2	14.5	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.537000	32.0	10000.0	9.000	GND	L1	10.	14.0	46.0
0.618000	36.3	10000.0	9.000	GND	L1	10.	9.7	46.0
0.654000	33.8	10000.0	9.000	GND	L1	10.	12.2	46.0
0.694500	32.4	10000.0	9.000	GND	L1	10.	13.6	46.0
1.410000	30.3	10000.0	9.000	GND	L1	10.	15.7	46.0
18.267000	33.3	10000.0	9.000	GND	N	11.2	16.7	50.0

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

.**USB Mode +MP3+GNSS, Set.2**

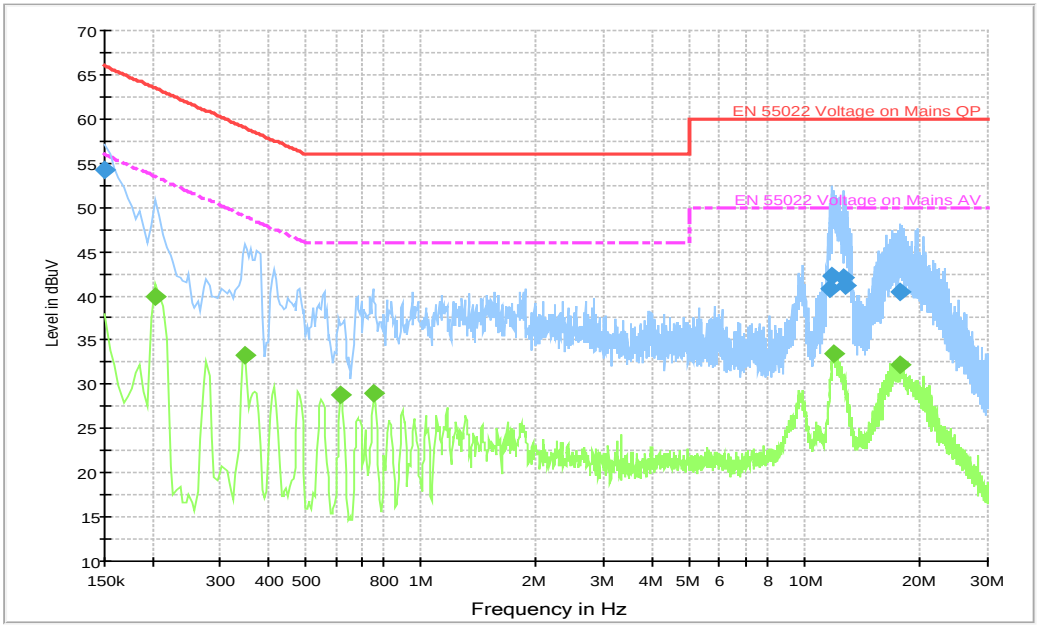


Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	54.2	10000.0	9.000	GND	L1	10.2	11.8	66.0
11.571000	40.7	10000.0	9.000	GND	N	10.8	19.3	60.0
11.755500	42.3	10000.0	9.000	GND	L1	10.9	17.7	60.0
12.583500	42.0	10000.0	9.000	GND	N	10.9	18.0	60.0
12.835500	41.2	10000.0	9.000	GND	N	10.9	18.8	60.0
17.736000	40.5	10000.0	9.000	GND	L1	11.3	19.5	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.204000	39.8	10000.0	9.000	GND	N	10.	13.6	53.4
0.348000	33.3	10000.0	9.000	GND	N	10.	15.7	49.0
0.618000	28.8	10000.0	9.000	GND	N	10.	17.2	46.0
0.757500	28.9	10000.0	9.000	GND	N	10.	17.1	46.0
11.940000	33.4	10000.0	9.000	GND	N	10.	16.6	50.0
17.664000	32.2	10000.0	9.000	GND	L1	11.3	17.8	50.0

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

Charging Mode, Set.3

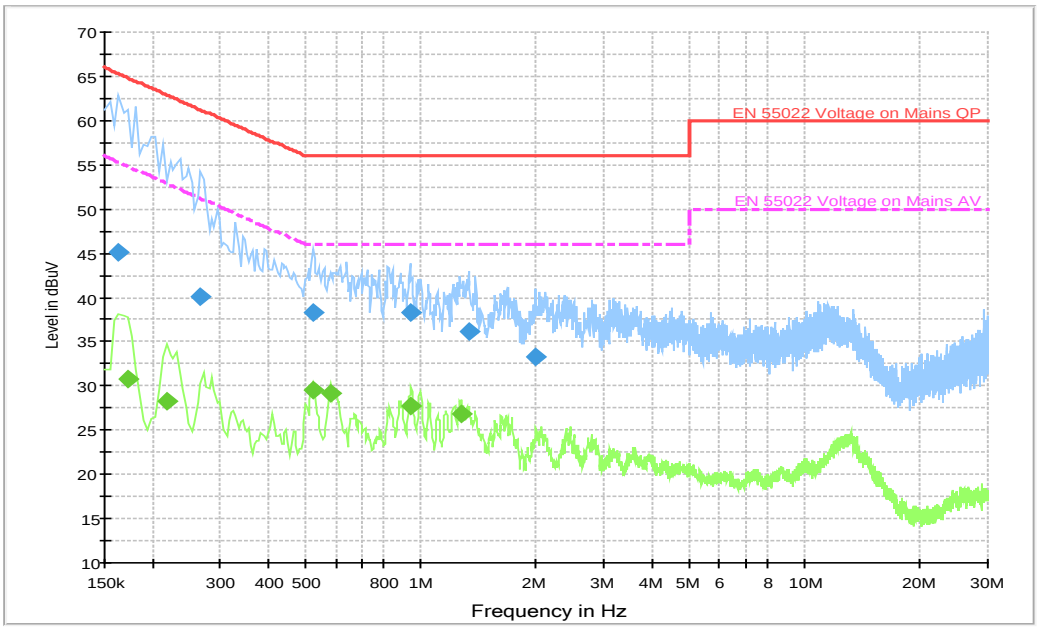


Figure A.9 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	45.2	10000.0	9.000	GND	L1	10.3	20.1	65.3
0.267000	40.0	10000.0	9.000	GND	N	10.3	21.2	61.2
0.523500	38.4	10000.0	9.000	GND	N	10.3	17.6	56.0
0.937500	38.3	10000.0	9.000	GND	L1	10.4	17.7	56.0
1.329000	36.1	10000.0	9.000	GND	L1	10.4	19.9	56.0
1.995000	33.3	10000.0	9.000	GND	N	10.4	22.7	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.172500	30.7	10000.0	9.000	GND	L1	10.	24.2	54.8
0.217500	28.2	10000.0	9.000	GND	L1	10.	24.7	52.9
0.523500	29.4	10000.0	9.000	GND	N	10.	16.6	46.0
0.582000	29.1	10000.0	9.000	GND	N	10.	16.9	46.0
0.942000	27.8	10000.0	9.000	GND	L1	10.	18.2	46.0
1.275000	26.8	10000.0	9.000	GND	L1	10.	19.2	46.0

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

Charging Mode, Set.4

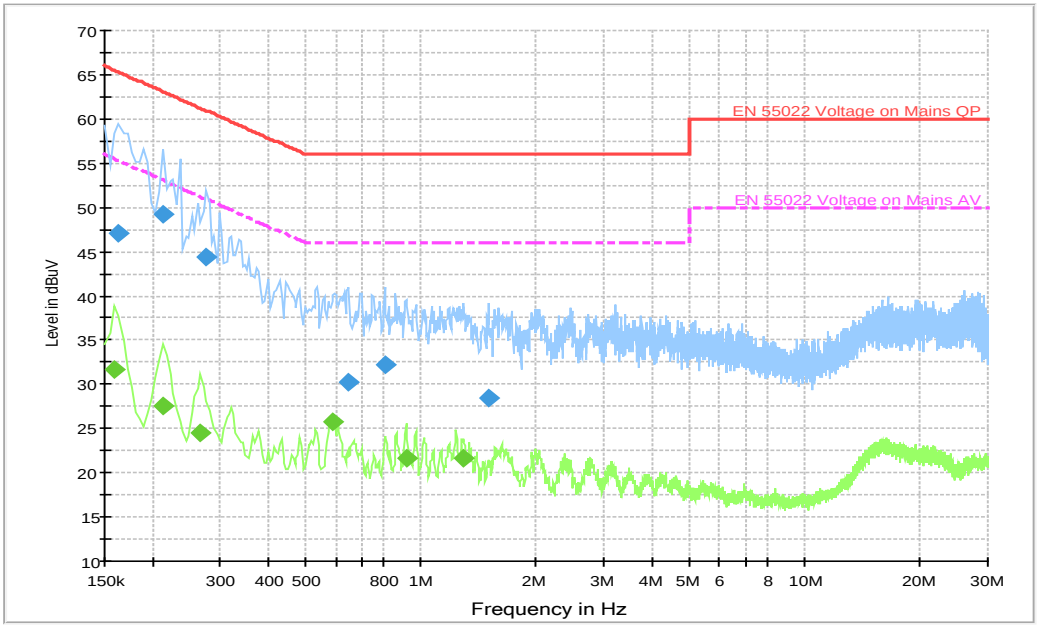


Figure A.10 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	47.1	10000.0	9.000	GND	L1	10.3	18.2	65.3
0.213000	49.3	10000.0	9.000	GND	N	10.3	13.8	63.1
0.276000	44.4	10000.0	9.000	GND	N	10.3	16.5	60.9
0.649500	30.3	10000.0	9.000	GND	N	10.3	25.7	56.0
0.807000	32.2	10000.0	9.000	GND	N	10.4	23.8	56.0
1.500000	28.5	10000.0	9.000	GND	L1	10.4	27.5	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	31.7	10000.0	9.000	GND	L1	10.	23.8	55.5
0.213000	27.6	10000.0	9.000	GND	L1	10.	25.5	53.1
0.267000	24.5	10000.0	9.000	GND	L1	10.	26.7	51.2
0.591000	25.7	10000.0	9.000	GND	N	10.	20.3	46.0
0.915000	21.6	10000.0	9.000	GND	N	10.	24.4	46.0
1.284000	21.6	10000.0	9.000	GND	L1	10.	24.4	46.0

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	Yang Fei
Conducted Emission	Yang Fei

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