



# TEST REPORT

## No. I18Z62335-EMC05

**HMD Global OY**

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

**GSM 850,900,1800,1900 WCDMA : 1, 5, 8**

**LTE :1,3,5,7,8,20,28,38,40,41(120MHz)mobile phone,**

**Bluetooth 4.2,WIFI 802.11 b/g/n**

**Model Name: TA-1150**

**FCC ID: 2AJOTTA-1150**

**with**

**Hardware Version: 89571\_1\_12**

**Software Version: 00XX\_1\_XXX**

**Issued Date: 2019-01-23**



**Note:**

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## **REPORT HISTORY**

Report Number	Revision	Description	Issue Date
I18Z62335-EMC05	Rev.0	1 <sup>st</sup> edition	2019-01-23

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## **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: 2018-12-29

Testing End Date: 2019-01-16

### **1.4. Signature**



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Li Yan

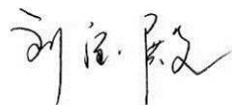
(Prepared this test report)



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Zhang Ying

(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: 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 GSM 850,900, 1800,1900 WCDMA : 1, 5, 8 LTE : 1,3, 5,7,8,20,28,38,40,41(120MHz) mobile phone, Bluetooth 4.2, WIFI 802.11 b/g/n
Model Name	TA-1150
FCC ID	2AJOTTA-1150
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
EUT3	/	89571_1_12	00XX_1_XXX
EUT8	/	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	Charger	/	NO TEST
AE5	USB Cable	/	/
AE6	USB Cable	/	/
AE7	Headset	/	/

##### AE1

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

##### AE2

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

##### AE3

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

##### AE4

Model	CH-35E
Manufacturer	Shenzhen Tianyin Electronics Co.,Ltd



Length of cable	/
AE5	
Model	CB-35A
Manufacturer	Leagtech Electronics Co.,Ltd
Length of cable	/
AE6	
Model	CB-35A
Manufacturer	Shenzhen BRL Technology Co.,Ltd.
Length of cable	/
AE7	
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	EUT3 + AE1 + AE3 + AE5/AE6 + AE7	Charger mode+ FM
Set.2	EUT3 + AE1 + AE3 + AE5/AE6	USB mode+MP3+GPS
Set.3	EUT8 + AE1 + AE3 + AE5/AE6	USB mode

Note1:

TA-1150 is a variant model based on TA-1157, According to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, no test needs to be performed, all results share the TA-1157 results. For detail differences between two models please refer the Declaration of Changes document.

## **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	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
	BR	Re-use test data from basic model report.
	F	Fail

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

## 7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATI ON INTERVAL
1	Test Receiver	ESU26	100376	R&S	2019-11-27	1 year
2	Test Receiver	ESCI	100766	R&S	2019-04-06	1 year
3	Universal Radio Communication Tester	CMW500	127406	R&S	2019-02-19	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 ( $\mu\text{V/m}$ )		
	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): 30MHz-1GHz: 5.16dB, 1GHz-18GHz: 5.44dB,  $k=2$ .

#### 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)
17097.000	39.7	-25.5	41.3	23.88	54.0	14.3	H
17109.000	39.7	-25.5	41.3	23.87	54.0	14.3	V
17108.250	39.7	-25.5	41.3	23.81	54.0	14.3	V
17119.500	39.6	-25.5	41.3	23.81	54.0	14.4	V
17981.250	39.6	-25.3	40.8	24.12	54.0	14.4	V
17095.500	39.6	-25.5	41.3	23.73	54.0	14.4	H

##### 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)
17154.000	52.0	-25.6	41.3	36.34	74.0	22.0	V
17959.500	51.7	-25.0	40.8	35.91	74.0	22.3	V
17962.500	51.6	-25.0	40.8	35.84	74.0	22.4	V
17983.500	51.5	-25.3	40.8	36.00	74.0	22.5	V
17505.750	51.5	-25.4	41.2	35.65	74.0	22.5	V
17145.750	51.5	-25.5	41.3	35.73	74.0	22.5	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)
17101.500	39.9	-25.5	41.3	24.07	54.0	14.1	H
17099.250	39.7	-25.5	41.3	23.85	54.0	14.3	V
17083.500	39.7	-25.5	41.3	23.84	54.0	14.3	V
17095.500	39.6	-25.5	41.3	23.80	54.0	14.4	V
17106.750	39.6	-25.5	41.3	23.77	54.0	14.4	V
17121.750	39.6	-25.5	41.3	23.76	54.0	14.4	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)
3585.750	53.9	-34.2	33.5	54.56	74.0	20.1	H
3593.250	53.0	-34.2	33.5	53.68	74.0	21.0	H
3594.000	52.6	-34.2	33.5	53.29	74.0	21.4	H
17478.750	52.2	-25.3	41.2	36.29	74.0	21.8	V
17964.750	52.2	-25.1	40.8	36.41	74.0	21.8	H
3588.000	52.0	-34.2	33.5	52.74	74.0	22.0	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)
17102.250	39.7	-25.5	41.3	23.85	54.0	14.3	V
17089.500	39.6	-25.5	41.3	23.78	54.0	14.4	H
17094.750	39.6	-25.5	41.3	23.74	54.0	14.4	H
17096.250	39.5	-25.5	41.3	23.65	54.0	14.5	V
17985.000	39.5	-25.3	40.8	24.03	54.0	14.5	H
17117.250	39.5	-25.5	41.3	23.63	54.0	14.5	V

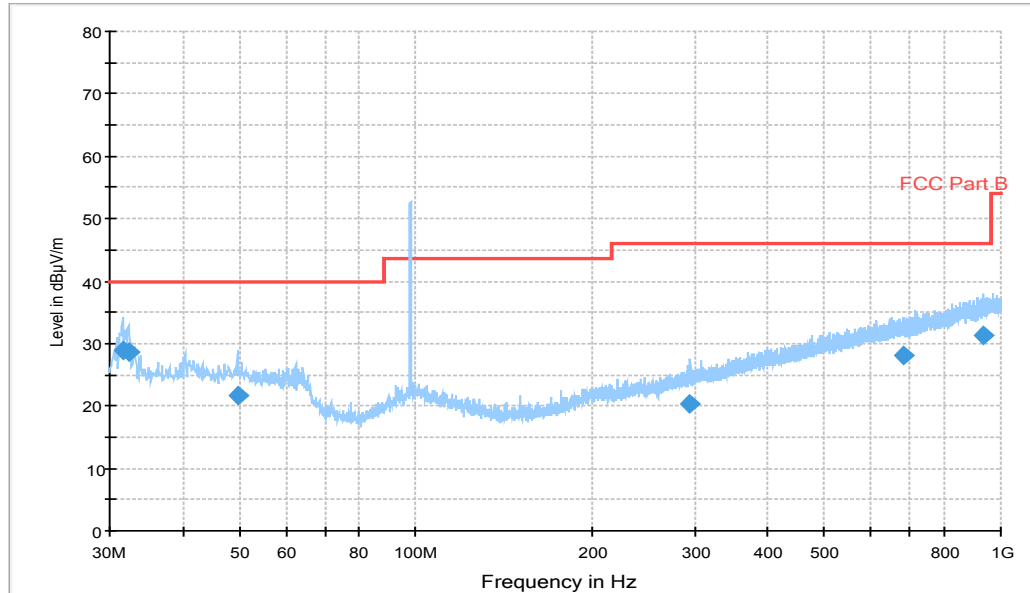
**USB Mode/Peak detector**

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)
3594.000	55.1	-34.2	33.5	55.75	74.0	18.9	H
3596.250	54.7	-34.1	33.5	55.37	74.0	19.3	H
17109.750	52.0	-25.5	41.3	36.16	74.0	22.0	V
3586.500	51.8	-34.2	33.5	52.50	74.0	22.2	H
17079.750	51.8	-25.5	41.3	35.94	74.0	22.2	V
17055.000	51.8	-25.5	41.4	35.92	74.0	22.2	V

Note: The measurement results of Set.1,Set.2 and Set.3 showed here are worst cases of the combinations of different USB cables.

## Charging Mode + FM, Set.1

15B RE 30MHz-1GHz



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

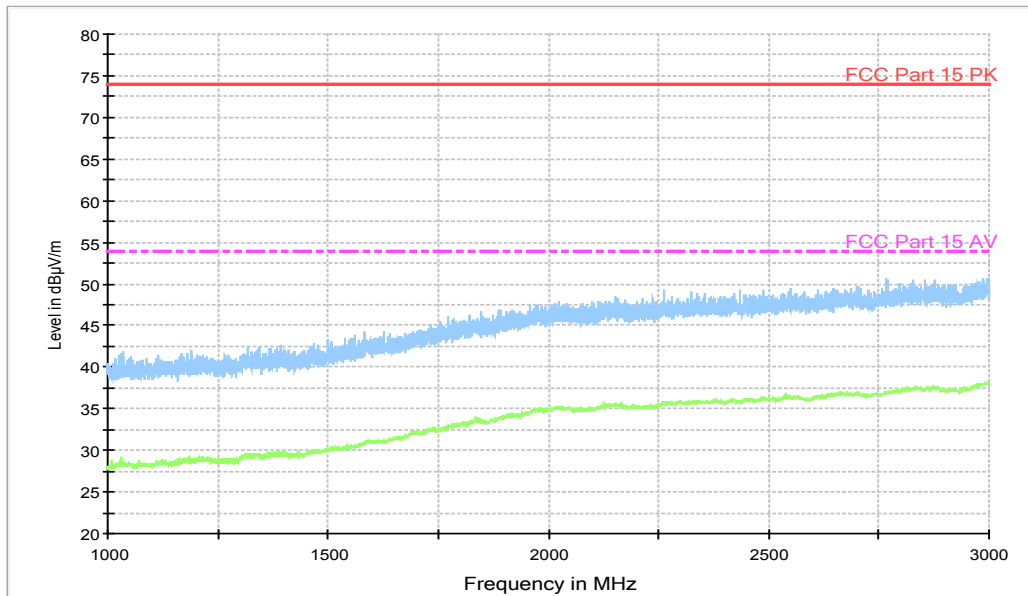
Note: the spike (98MHz) over the limit is coming from FM signal source.

## Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
31.552000	28.8	100.0	V	89.0	-1.2	11.2	40.0
32.328000	28.5	100.0	H	123.0	-1.1	12.5	40.0
49.594000	21.6	194.0	V	123.0	0.8	18.4	40.0
294.81000	20.2	100.0	V	-21.0	1.3	25.8	46.0
683.39200	28.2	225.0	V	-25.0	9.7	17.8	46.0
934.13700	31.4	110.0	V	-18.0	12.5	14.6	46.0

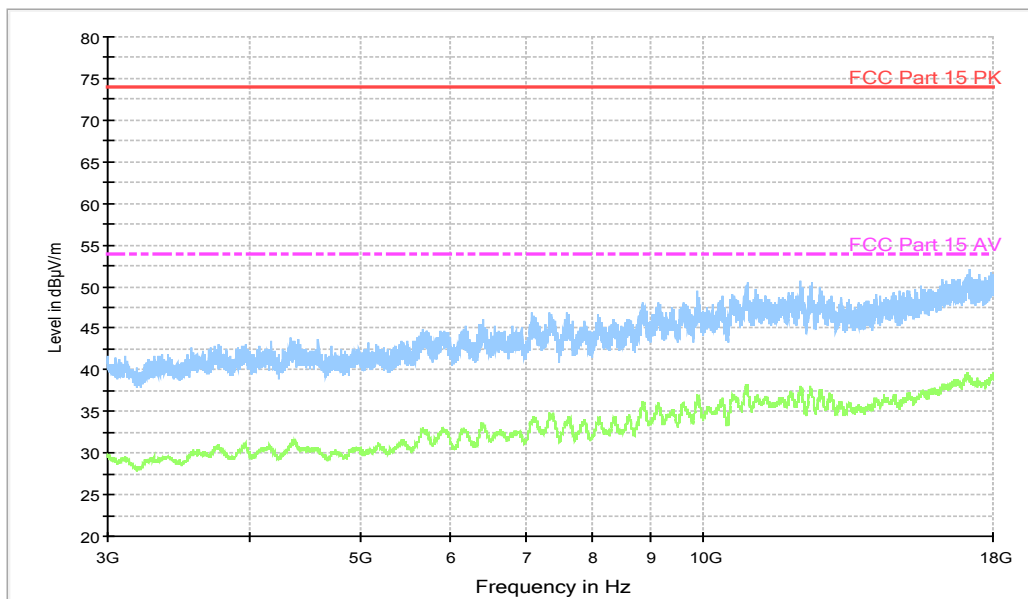


15B RE - 1GHz-3GHz



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

15b RE - 3GHz-18GHz



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

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

15B RE 30MHz-1GHz

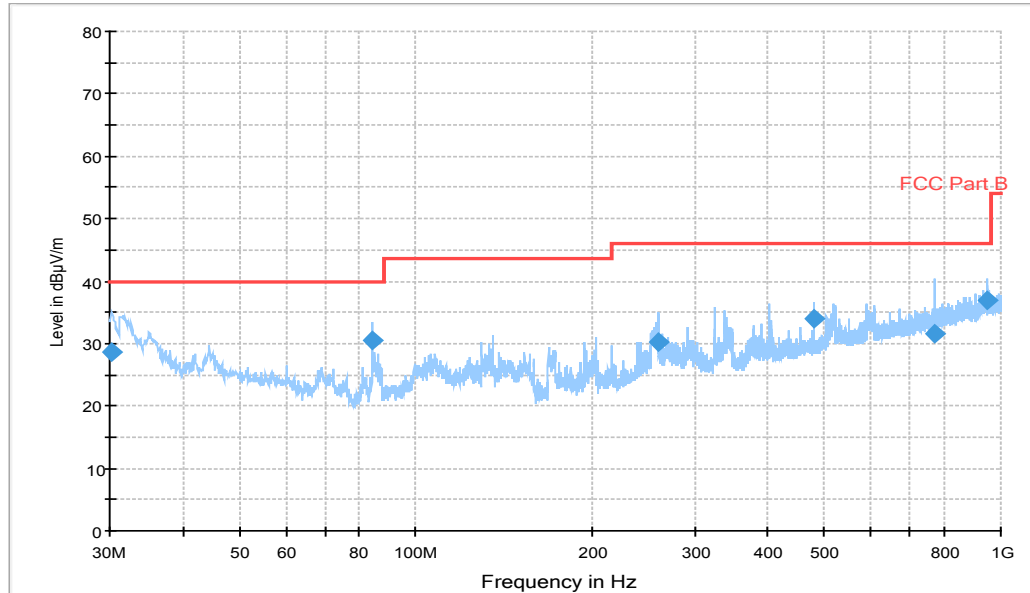
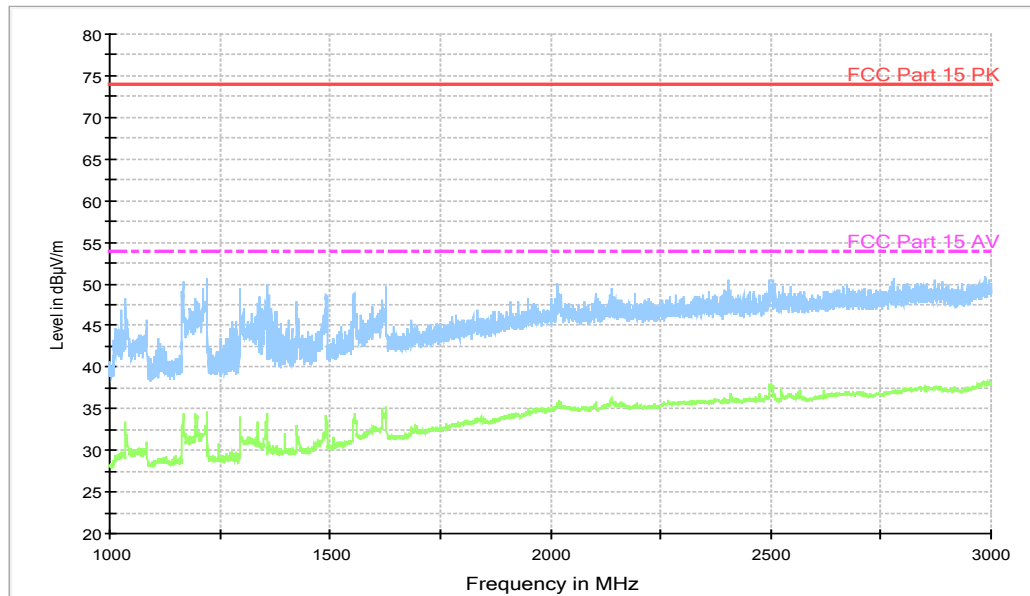


Figure A.4 Radiated Emission from 30MHz to 1GHz

## Final Result 1

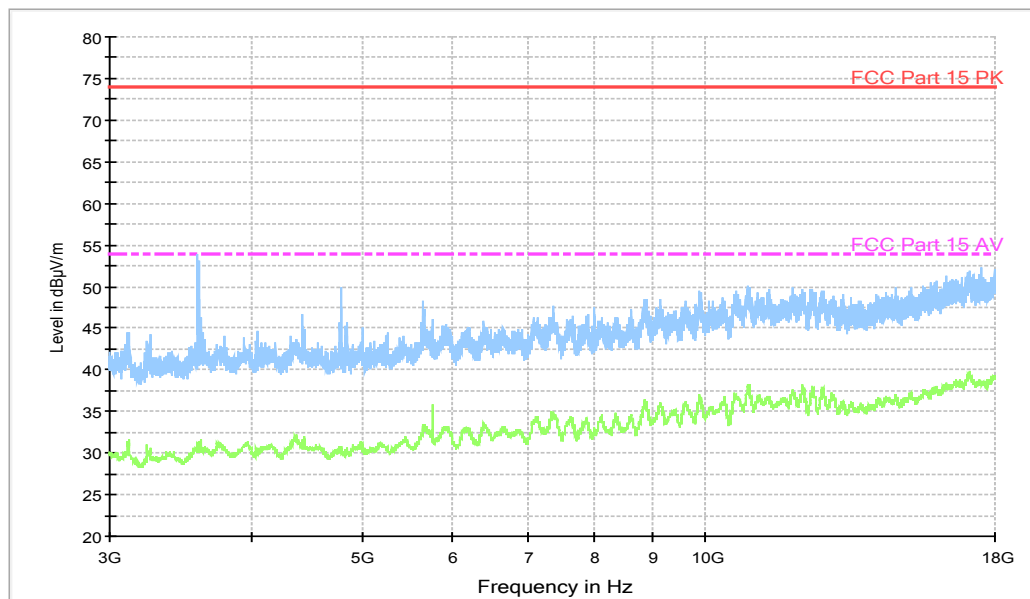
Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.194000	28.6	100.0	V	114.0	-1.6	11.4	40.0
84.320000	30.4	225.0	H	62.0	-4.7	9.6	40.0
259.59900	30.2	175.0	V	3.0	-0.1	15.8	46.0
479.98300	33.9	125.0	H	45.0	6.6	12.1	46.0
768.07300	31.6	100.0	H	10.0	10.7	14.4	46.0
949.07500	37.0	100.0	H	72.0	12.8	9.0	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**

### USB Mode, Set.3

15B RE 30MHz-1GHz

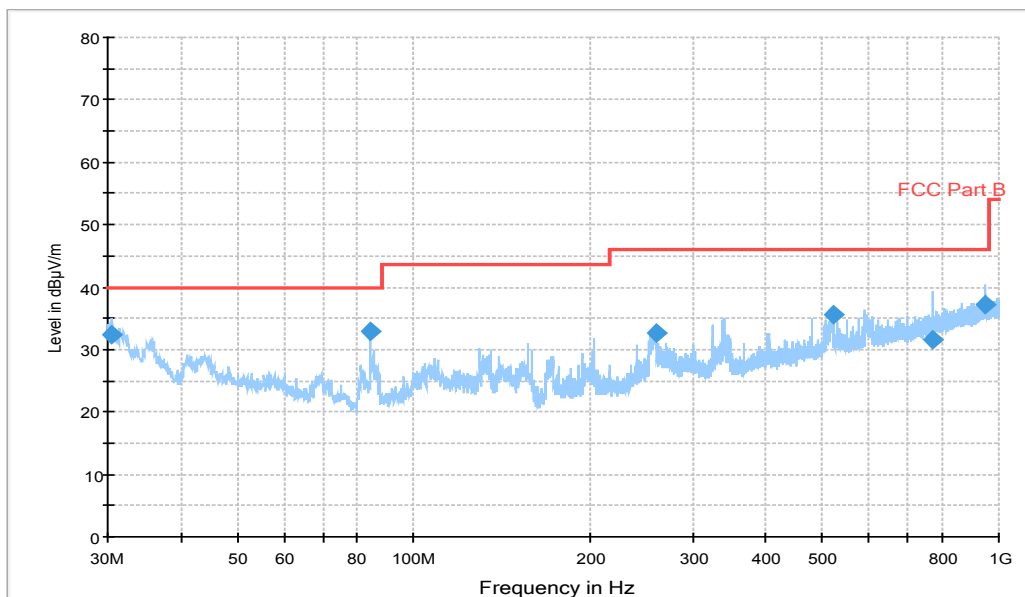
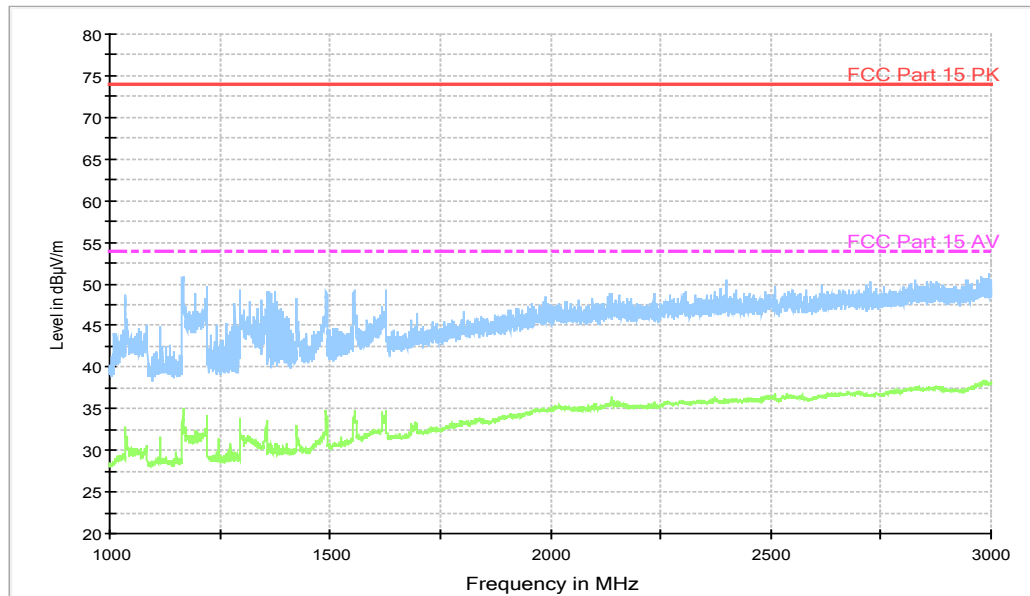


Figure A.4 Radiated Emission from 30MHz to 1GHz

### Final Result 1

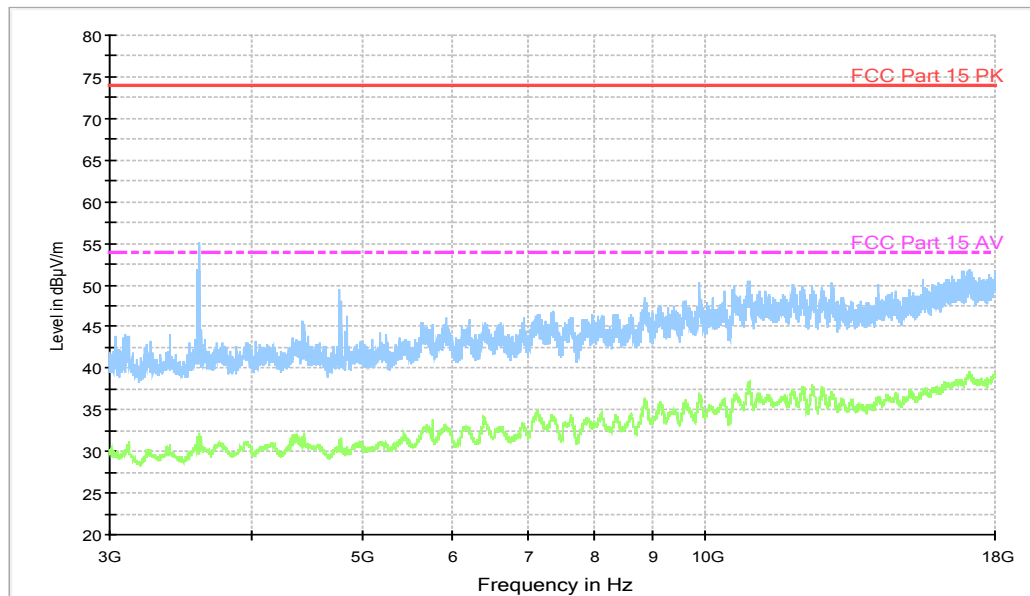
Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.485000	32.3	100.0	V	297.0	-1.5	7.7	40.0
84.320000	33.0	219.0	H	271.0	-4.7	7.0	40.0
260.08400	32.6	125.0	V	-25.0	-0.1	13.4	46.0
519.85000	35.5	119.0	H	-32.0	7.4	10.5	46.0
768.07300	31.6	125.0	H	1.0	10.7	14.4	46.0
949.26900	37.3	100.0	H	59.0	12.8	8.7	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**

## 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:  $U= 3.08 \text{ dB}$ ,  $k=2$ .

Charging Mode +FM, Set.1

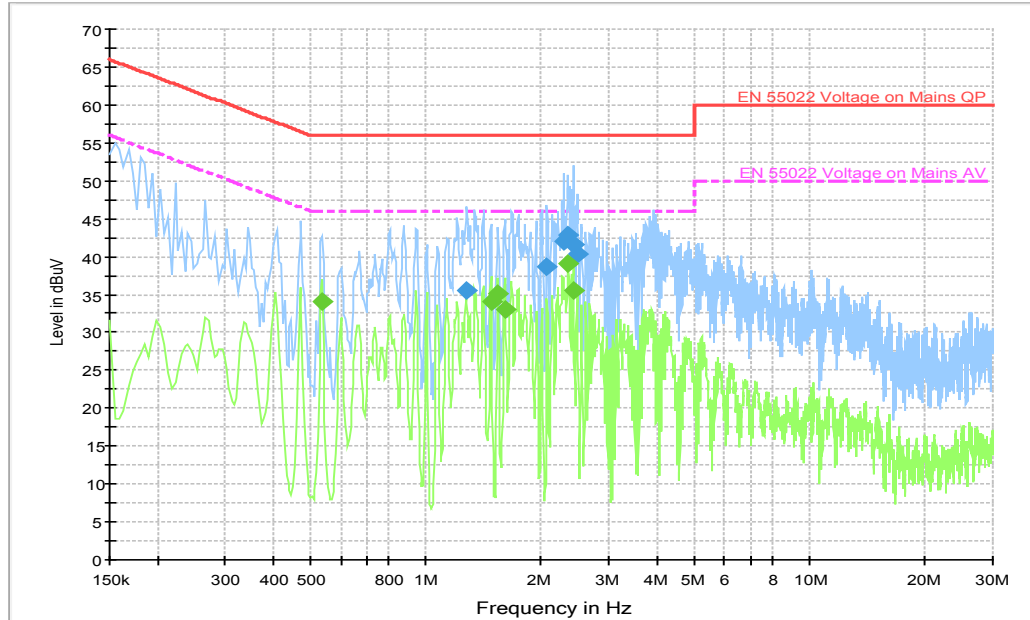


Figure A.7 Conducted Emission

#### Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
1.279500	35.5	2000.0	9.000	GND	N	10.4	20.5	56.0
2.071500	38.7	2000.0	9.000	GND	N	10.4	17.3	56.0
2.283000	42.0	2000.0	9.000	GND	L1	10.4	14.0	56.0
2.346000	42.8	2000.0	9.000	GND	N	10.4	13.2	56.0
2.422500	41.6	2000.0	9.000	GND	N	10.4	14.4	56.0
2.485500	40.4	2000.0	9.000	GND	N	10.4	15.6	56.0

#### Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.537000	34.2	2000.0	9.000	GND	L1	10.3	11.8	46.0
1.477500	34.1	2000.0	9.000	GND	L1	10.4	11.9	46.0
1.540500	35.0	2000.0	9.000	GND	L1	10.4	11.0	46.0
1.608000	32.9	2000.0	9.000	GND	L1	10.4	13.1	46.0
2.346000	39.0	2000.0	9.000	GND	L1	10.4	7.0	46.0
2.418000	35.6	2000.0	9.000	GND	L1	10.4	10.4	46.0

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

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

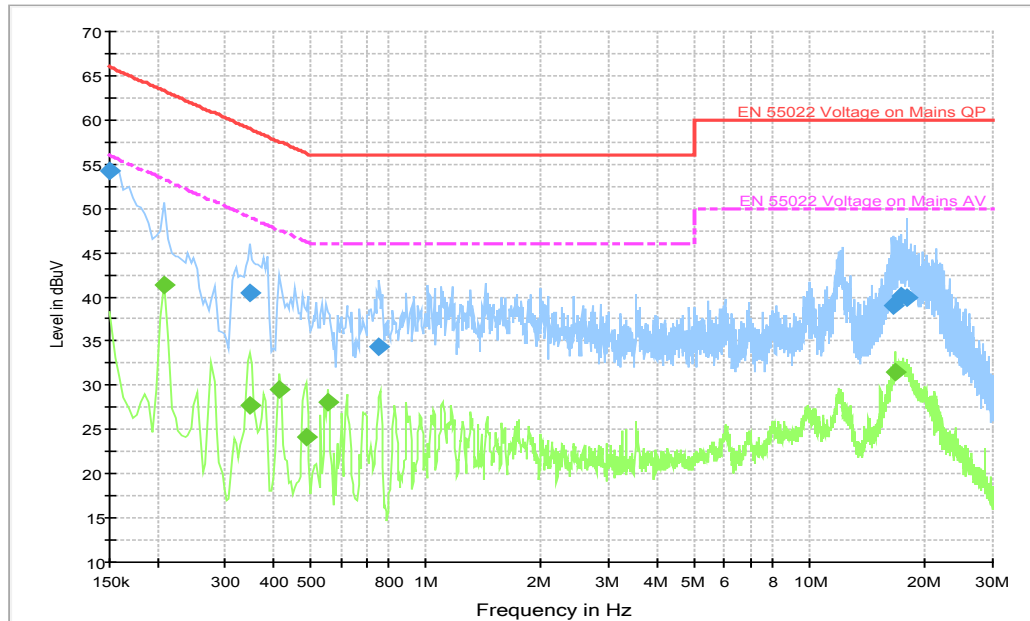


Figure A.8 Conducted Emission

### Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	54.2	2000.0	9.000	GND	L1	10.2	11.8	66.0
0.348000	40.5	2000.0	9.000	GND	L1	10.3	18.5	59.0
0.757500	34.3	2000.0	9.000	GND	N	10.4	21.7	56.0
16.548000	39.1	2000.0	9.000	GND	L1	11.2	20.9	60.0
17.362500	40.1	2000.0	9.000	GND	L1	11.2	19.9	60.0
17.965500	40.0	2000.0	9.000	GND	L1	11.3	20.0	60.0

### Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.208500	41.3	2000.0	9.000	GND	N	10.3	12.0	53.3
0.348000	27.7	2000.0	9.000	GND	N	10.3	21.3	49.0
0.415500	29.5	2000.0	9.000	GND	L1	10.3	18.0	47.5
0.487500	24.2	2000.0	9.000	GND	N	10.3	22.0	46.2
0.555000	28.1	2000.0	9.000	GND	L1	10.3	17.9	46.0
16.638000	31.5	2000.0	9.000	GND	L1	11.2	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	Li Zongliang
Conducted Emission	Li Zongliang

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