



# FCC 15B TEST REPORT

No. I21Z70218-EMC01

for

**SAMSUNG Electronics Co., Ltd.**

**Multi-band GSM/WCDMA/LTE/5G NR Phone with Bluetooth, WLAN**

**Model Name: SM-A226BR/DSN, SM-A226BR/N**

**FCC ID: ZCASMA226BRN**

with

**Hardware Version: REV1.0**

**Software Version: A226BR.001**

**Issued Date: 2021-06-28**

**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**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I21Z70218-EMC01	Rev.0	1 <sup>st</sup> edition	2021-06-28



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## 1. Test Laboratory

### 1.1. Testing Location

#### Location 1: CTTL(huayuan North Road)

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

### 1.2. Testing Environment

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

### 1.3. Project data

Testing Start Date: 2021-05-17  
Testing End Date: 2021-06-25

### 1.4. Signature



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An Hui  
(Prepared this test report)



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Zhang Ying  
(Reviewed this test report)



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Zhang Xia  
Deputy Director of the laboratory  
(Approved this test report)



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: Samsung Electronics Co., Ltd.  
Address 19 Chapin Rd., Building D Pine Brook, NJ 07058  
Contact: Jenni Chun  
Email: j1.chun@samsung.com  
Tel: +1-201-937-4203

### **2.2. Manufacturer Information**

Company Name: Samsung Electronics Co., Ltd.  
Address Samsung R5, Maetan dong 129, Samsung ro  
Youngtong gu, Suwon city 443 742, Korea  
Contact: 조성훈 (Sunghoon Cho)  
Email: ggobi.cho@samsung.com  
Tel: +82-10-2722-4159  
Fax: /

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

#### **3.1. About EUT**

Description	Multi-band GSM/WCDMA/LTE/5G NR Phone with Bluetooth, WLAN
Model Name	SM-A226BR/DSN, SM-A226BR/N
FCC ID	ZCASMA226BRN

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**

<b>EUT ID*</b>	<b>SN or IMEI</b>	<b>HW Version</b>	<b>SW Version</b>
UT01a	217021801a	REV1.0	A226BR.001

\*EUT ID: is used to identify the test sample in the lab internally.

#### **3.3. Internal Identification of AE used during the test**

<b>AE ID*</b>	<b>Description</b>	<b>SN</b>	<b>Note</b>
AE1	Charger1	/	/
AE2	Charger2	/	/
AE3	Charger3	/	/
AE4	USB cable1	/	/
AE5	USB cable1	/	/
AE6	USB cable1	/	/
AE7	USB cable1	/	/
AE8	Headset1	/	/
AE9	Headset2	/	/
AE10	battery	/	/

##### AE1

Model	EP-TA200
Manufacturer	RFTECH
Length of cable	/

##### AE2

Model	EP-TA200
Manufacturer	Dongwon
Length of cable	/

##### AE3

Model	EP-TA200
Manufacturer	SOLUM
Length of cable	/



AE4

Model EP-DR140AWE  
Manufacturer RFTECH Co., Ltd.  
Length of cable /

AE5

Model EP-DR140AWE  
Manufacturer Ningbo Broad Telecommunication Co., Ltd  
Length of cable /

AE6

Model EP-DR140AWE  
Manufacturer DONGGUAN KSD CO.,LTD  
Length of cable /

AE7

Model EP-DR140AWE  
Manufacturer CRESYN HANOI Co.,Ltd  
Length of cable /

AE8

Model EHS61ASFWE  
Manufacturer WATA ELECTRONICS CO., LTD  
Length of cable /

AE9

Model EHS61ASFWE  
Manufacturer Dongguan Yongbao Electronics Co. , Ltd.  
Length of cable /

AE10

Model SCUD-WT-W1  
Manufacturer SCUD(Fujian)Electronic Co.,Ltd.  
Capacitance 4900mAh  
Nominal voltage 3.85V

\*AE ID: is used to identify the test sample in the lab internally.

### 3.4. EUT set-ups

<b>EUT set-up No.</b>	<b>Combination of EUT and AE</b>	<b>Remarks</b>
Set.1	EUT1 + AE1 + AE4+ AE8 + AE10	Charger1+ R Camera+ Headset1+Idle
Set.2	EUT1 + AE1 + AE5 + AE10	Charger1+ R Camera+Idle
Set.3	EUT1 + AE2 + AE6 + AE10	Charger2+F camera+Idle
Set.4	EUT1 + AE3 + AE7 + AE10	Charger3+MP4+Idle
Set.5	EUT1 + AE1 + AE4+ AE8 + AE10	Charger1+FM+Headset1+Idle
Set.6	EUT1 + AE1 + AE4+ AE9 + AE10	Charger1+FM+Headset2+Idle
Set.7	EUT1 + AE4/AE5/AE6/AE7 + AE8 + AE10	USB SD TO PC + Headset2+Idle

**Note1 :**

For the test results, all test configuration and test mode had been tested. But only the worst cases were shown in test report.

**Note2:**

The device contains receivers which tune and operate between 30MHz-960MHz in the following bands: GSM 850MHz,WCDMA Band5, LTE Band 5, LTE Band 12, LTE Band 26, 5G NR NSA B7-n5 and 5G NR NSA B66-n5. The measurement results showed here are worst cases of different bands.



## 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	2019
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

**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(huayuan North Road)
2	Conducted Emission	15.107(a)	A.2	P	CTTL(huayuan North Road)

## 7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	LISN	ESH3-Z5	825562/028	Rohde & Schwarz	2021-10-15	1 Year
2	Test Receiver	ESCI 3	100344	Rohde & Schwarz	2022-02-23	1 Year
3	Universal Radio Communication Tester	CMW500	116588	R&S	2021-12-07	1 Year
4	Test Receiver	ESU26	100235	Rohde & Schwarz	2022-02-23	1 Year
5	BiLog Antenna	VULB9163	9163-483	Schwarzbeck	2021-08-27	1 Year
6	Dual-Ridge Waveguide Horn Antenna	3115	6914	ETS-Lindgren	2022-02-03	1 Year
7	Signal Generator	SMBV100A	260613	Rohde & Schwarz	2022-01-06	1 Year

Test Item	Test Software and Version	Software Vendor
Radiated Continuous Emission	EMC32 V9.01.0	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 (charging mode) 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 charging mode. During the test MS is connected to a charger in the case of charging mode.

The EUT was tested while operating in licensed band Rx mode. All licensed band receivers that tune in the range of 30MHz-960MHz, as listed in Section 3.4, are investigated. Only the worst case emissions are reported.

All equipment is placed on the test table top and arranged in a typical configuration in accordance with ANSI C63.4-2014 and manipulated to obtain worst case emissions.

#### **A.1.3 Measurement Limit**

Frequency range (MHz)	Field strength limit ( $\mu\text{V}/\text{m}$ )		
	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.

$$\text{Limit}(10\text{m}) = \text{Limit}(3\text{m}) + 20[\log(3/10)]$$

#### **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,  $k=2$ .

Note: The measurement results showed here are worst cases of the combinations of different Battery, cables and Headset.

Note: The measurement results showed here are worst cases.

#### Measurement results for Set.3:

##### EUT1 Charger2 +Front Camera + GSM 850MHz idle Mode/QP detector

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
52.213000	18.92	29.50	10.62	102.0	V	300.0
54.832000	20.41	29.50	9.13	345.0	V	256.0
65.696000	12.76	29.50	16.78	235.0	V	-17.0
71.419000	10.96	29.50	18.58	125.0	V	300.0
182.872000	12.42	33.10	20.64	125.0	V	-7.0
218.956000	16.55	35.60	19.01	125.0	V	61.0

##### EUT1 Charger2 +Front Camera + GSM 850MHz idle Mode/Average detector

Frequency (MHz)	Result (dB $\mu$ V/m)	$G_{\text{PL}}$ (dB)	$G_A$ (dB/m)	$P_{\text{Mea}}$ (dB $\mu$ V)	Polarity	Limit (dB $\mu$ V/m)	Margin (dB)
17998.867	47.1	-29.1	46.7	29.498	V	54	6.90
17990.367	47.0	-29.1	46.7	29.398	V	54	7.00
17974.500	47.0	-29.1	46.7	29.401	V	54	7.00
17989.800	46.6	-29.1	46.7	28.998	H	54	7.40
17953.533	46.5	-28.9	46.7	28.783	V	54	7.50
17971.100	46.4	-29.1	46.7	28.801	H	54	7.60

##### EUT1 Charger2 +Front Camera + GSM 850MHz idle Mode/Peak detector

Frequency (MHz)	Result (dB $\mu$ V/m)	$G_{\text{PL}}$ (dB)	$G_A$ (dB/m)	$P_{\text{Mea}}$ (dB $\mu$ V)	Polarity	Limit (dB $\mu$ V/m)	Margin (dB)
17974.500	56.9	-29.1	46.7	39.301	V	74	17.10
17985.267	56.1	-29.1	46.7	38.498	H	74	17.90
17965.433	56.0	-29.1	46.7	38.401	V	74	18.00
17949.000	55.6	-28.9	46.7	37.883	H	74	18.40
17832.833	55.6	-29.7	46.0	39.324	H	74	18.40
17976.200	55.4	-29.1	46.7	37.801	H	74	18.60

**Measurement results for Set.7:**
**EUT1 USB(SD TO PC)+Headset2 Mode/QP detector**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
30.485000	23.59	29.50	5.95	187.0	V	275.0
31.067000	26.49	29.50	3.05	102.0	V	273.0
55.608000	19.88	29.50	9.66	311.0	V	69.0
71.031000	17.42	29.50	12.12	195.0	V	-28.0
98.870000	19.99	33.10	13.07	100.0	V	190.0
495.503000	26.64	35.60	8.92	297.0	V	1.0

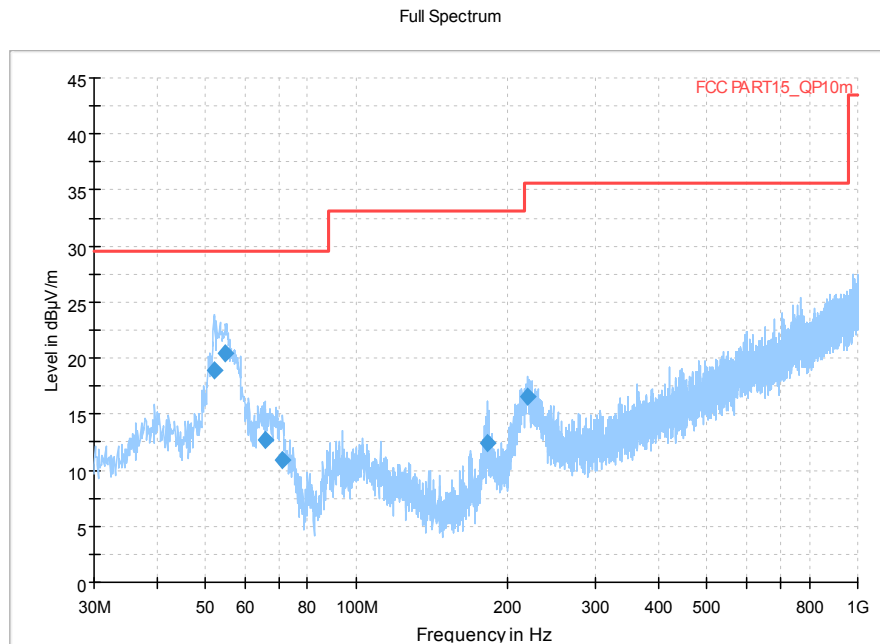
**EUT1 USB(SD TO PC)+Headset2 Mode/Average detector**

Frequency (MHz)	Result (dB $\mu$ V/m)	G <sub>PL</sub> (dB)	G <sub>A</sub> (dB/m)	P <sub>Mea</sub> (dB $\mu$ V)	Polarity	Limit (dB $\mu$ V/m)	Margin (dB)
17984.133	47.7	-29.1	46.7	30.098	V	54	6.30
17997.733	47.1	-29.1	46.7	29.498	V	54	6.90
17909.900	47.0	-29.3	46.0	30.372	H	54	7.00
17981.867	47.0	-29.1	46.7	29.398	V	54	7.00
17976.767	46.9	-29.1	46.7	29.301	V	54	7.10
17966.000	46.8	-29.1	46.7	29.201	V	54	7.20

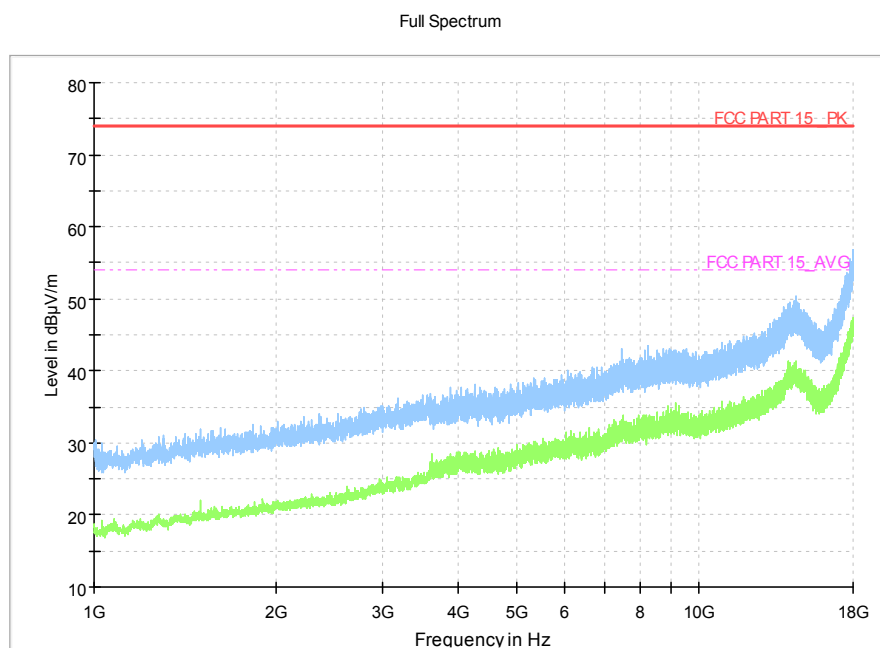
**EUT1 USB(SD TO PC)+Headset2 Mode/Peak detector**

Frequency (MHz)	Result (dB $\mu$ V/m)	G <sub>PL</sub> (dB)	G <sub>A</sub> (dB/m)	P <sub>Mea</sub> (dB $\mu$ V)	Polarity	Limit (dB $\mu$ V/m)	Margin (dB)
17979.600	56.6	-29.1	46.7	39.001	V	74	17.40
17997.733	55.8	-29.1	46.7	38.198	H	74	18.20
17959.767	55.5	-28.9	46.7	37.783	H	74	18.50
17963.733	55.4	-29.1	46.7	37.801	H	74	18.60
17984.133	55.3	-29.1	46.7	37.698	V	74	18.70
17977.333	55.2	-29.1	46.7	37.601	V	74	18.80

**EUT1 Charger2 +Front Camera + GSM 850MHz idle Mode, Set.3**



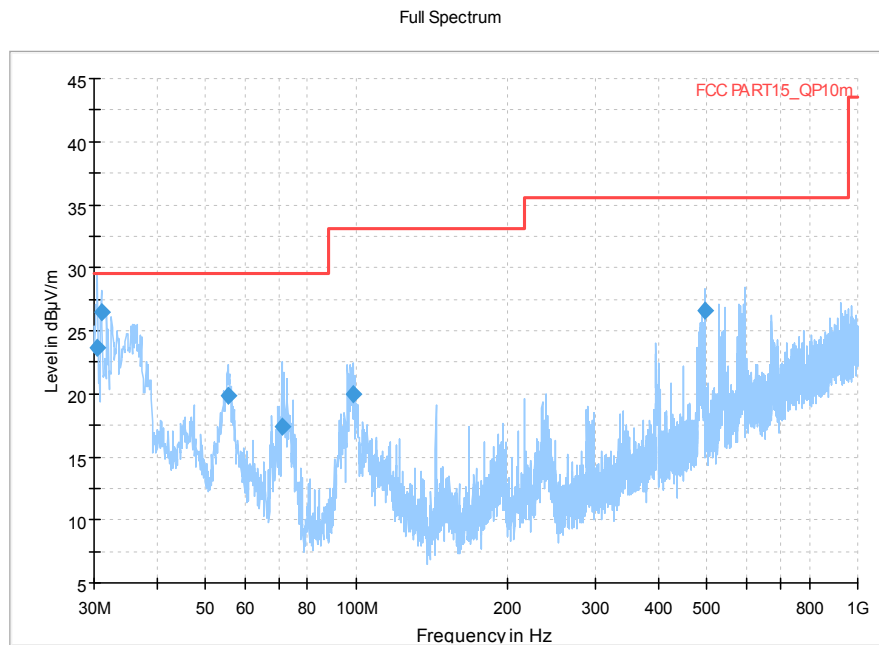
**Figure A.1 Radiated Emission from 30MHz to 1GHz**



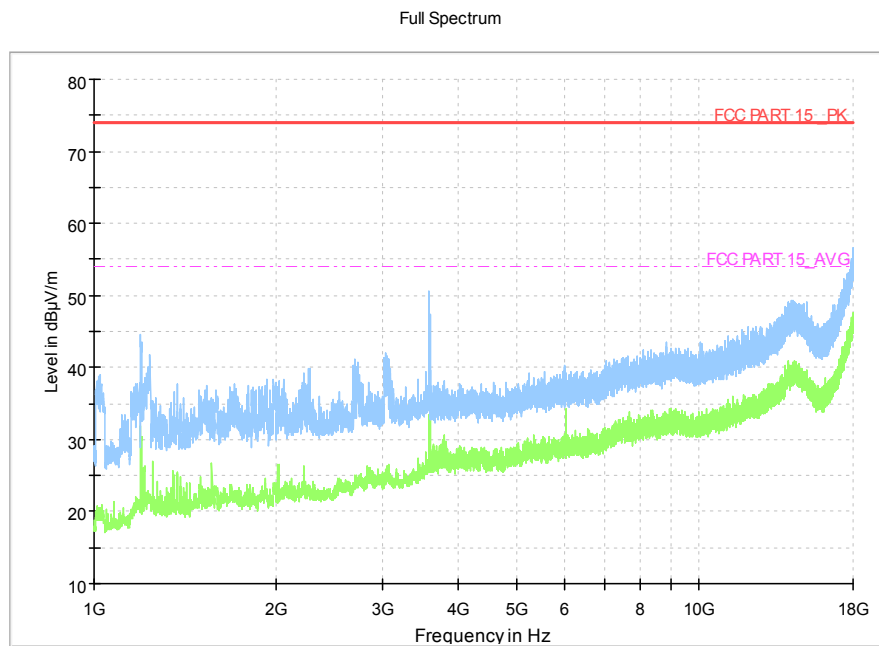
**Figure A.2 Radiated Emission from 1GHz to 18GHz**



**EUT1 USB(SD TO PC)+Headset2 Mode, Set.7**



**Figure A.3 Radiated Emission from 30MHz to 1GHz**



**Figure 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 charging mode. During the test MS is connected to a charger in the case of charging mode.

### A.2.3 Measurement Limit

Frequency of emission (MHz)	Conducted limit (dB $\mu$ 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:  $U=3.08\text{dB}$ ,  $k=2$ .

Note: The measurement results showed here are worst cases.

#### EUT1 Charger2 +Front Camera , Set.3

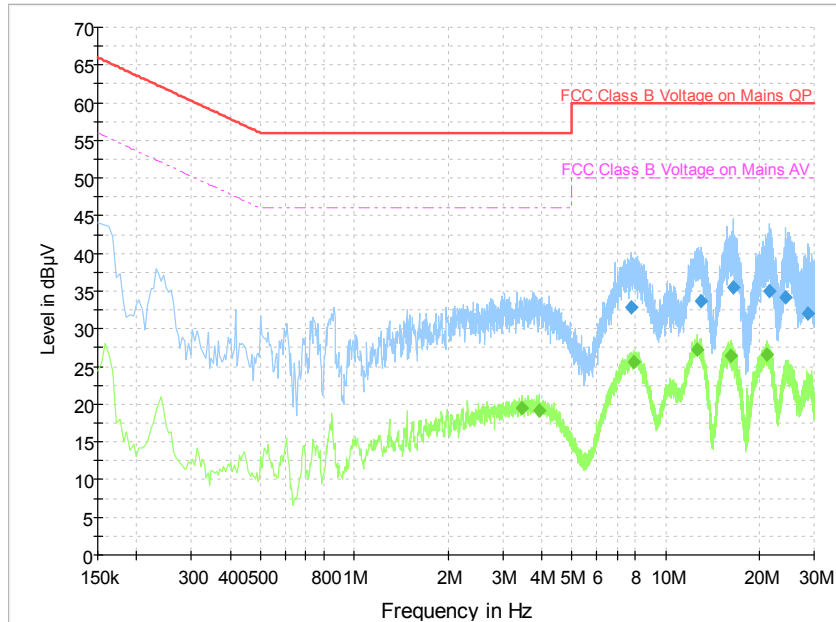


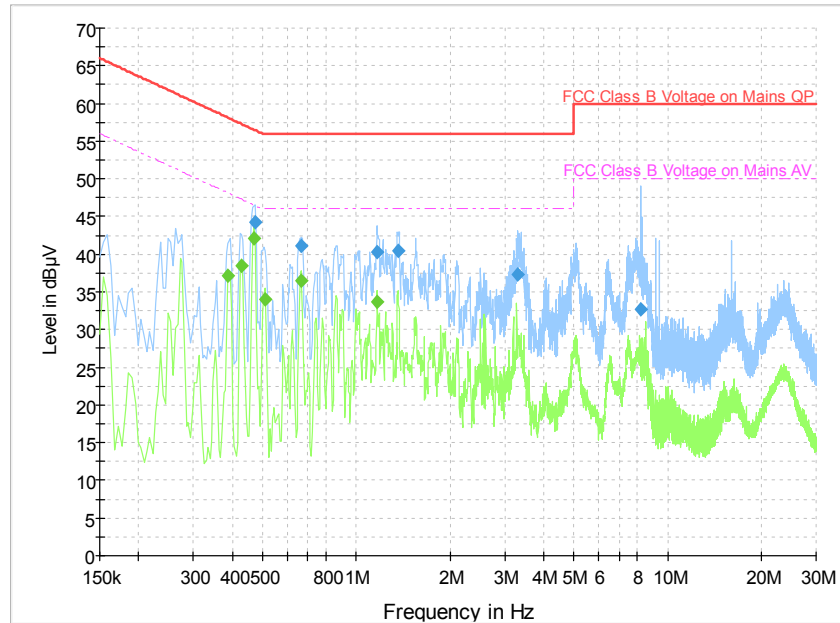
Figure A.5 Conducted Emission

#### Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
7.773000	32.9	N	10.4	27.1	60.0
13.029000	33.6	N	11.1	26.4	60.0
16.444500	35.5	L1	11.6	24.5	60.0
21.484500	34.9	N	12.0	25.1	60.0
24.337500	34.1	L1	12.3	25.9	60.0
28.720500	32.0	L1	12.6	28.0	60.0

#### Final Result 2

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
3.462000	19.5	N	10.1	26.5	46.0
3.939000	19.2	L1	10.1	26.8	46.0
7.926000	25.5	L1	10.5	24.5	50.0
12.606000	27.3	N	11.0	22.7	50.0
16.147500	26.4	L1	11.6	23.6	50.0
21.169500	26.5	N	12.0	23.5	50.0

**EUT1 USB(SD TO PC)+Headset2 Mode, Set.7**

**Figure A.6 Conducted Emission**
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.474000	44.2	N	10.0	12.3	56.4
0.667500	41.2	L1	9.9	14.8	56.0
1.167000	40.3	L1	10.0	15.7	56.0
1.365000	40.5	L1	10.0	15.5	56.0
3.309000	37.3	N	10.1	18.7	56.0
8.223000	32.8	L1	10.5	27.2	60.0

**Final Result 2**

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.388500	37.1	N	10.0	11.0	48.1
0.429000	38.5	N	10.0	8.8	47.3
0.469500	42.0	N	10.0	4.5	46.5
0.510000	34.0	N	10.0	12.0	46.0
0.663000	36.4	N	9.9	9.6	46.0
1.167000	33.7	L1	10.0	12.3	46.0



**ANNEX B: Persons involved in this testing**

Test Item	Tester
Conducted Continuous Emission	Yang Mengke
Radiated Continuous Emission	Zhang Tianli

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