FCC 15B TEST REPORT

No. I21Z70103-EMC06

for

SAMSUNG Electronics Co., Ltd.

Multi-band GSM/WCDMA/LTE/5GNR Phone

Model Name: SM-A226B/DSN

FCC ID: ZCASMA226BN

with

Hardware Version: REV1.0

Software Version: A226B.001

Issued Date: 2021-05-21

Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z70103-EMC06	Rev.0	1st edition	2021-05-21

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 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 (ISED#: 24849). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Location 1: CTTL(huayuan North Road)

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

Location 2: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℃

Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2021-05-18

Testing End Date: 2021-05-21

1.5. Signature

An Hui

(Prepared this test report)

Zhang Ying

(Reviewed this test report)

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 /Post:	19 Chapin Rd.,Building D Pine Brook, NJ 07058
Contact	Jenni Chun
Email	j1.chun@samsung.com
Telephone:	+1-201-937-4203

2.2. Manufacturer Information

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

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

3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE/5GNR Phone
Model Name	SM-A226B/DSN
FCC ID	ZCASMA226BN

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

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	217010326a	REV1.0	A226B.001

*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	Note
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. General Description

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

3.5. EUT set-ups

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

Note：

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

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	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-2 (10 meters×6.7meters×6.1meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 M
Ground system resistance	< 4
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 6000 MHz

Shielded room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz, >60dB; 1MHz－1000MHz, >90dB.
Electrical insulation	> 2 M
Ground system resistance	< 4

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(huayuan North Road) CTTL (BDA)**

7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	LISN	ENV216	101200	Rohde & Schwarz	2021-05-19	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	100376	R&S	2021-09-04	1 year
5	Test Receiver	ESCI	100766	R&S	2022-03-09	1 year
6	LISN	ENV216	101459	R&S	2022-03-22	1 year
7	BiLog Antenna	VULB9163	9163-482	Schwarzbeck	2021-11-04	1 year
8	EMI Antenna	3117	00139065	ETS-Lindgren	2021-10-11	1 year
9	Universal Radio Communication Tester	CMW500	159408	R&S	2022-03-08	1 year
10	Signal Generator	SMBV100A	260613	Rohde & Schwarz	2022-01-06	1 Year

Note：The LISN which series number is 101200 was before the Cal Due Date when used.

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 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, charging mode, MP4, FM, CAMERA, SD and License RX band 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 the Section 3.4, are investigated. Only the worst case emissions are reported.

The FM radio mode radiated testing was performed with the Low/Mid/High channel. Only the worst cases 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 (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.

Note：

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

Measurement results for Set.1:

Charger1+ Rear Camera +GSM 850MHz idle Mode/QP detector

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
32.813000	26.6	40.0	13.4	100.0	V	141.0
33.492000	25.8	40.0	14.2	100.0	V	198.0
74.426000	31.8	40.0	8.2	225.0	H	180.0
77.239000	30.0	40.0	10.0	225.0	H	180.0
82.380000	29.0	40.0	11.0	202.0	H	195.0
205.279000	21.4	43.5	22.1	100.0	V	267.0

Charger1 + Rear Camera + GSM 850MHz idle Mode/Average detector

Frequency (MHz)	Result (dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol.
17692.500	38.6	-22.2	41.2	19.65	54.0	15.4	V
17691.000	38.4	-22.2	41.2	19.48	54.0	15.6	V
17701.000	38.4	-22.2	41.2	19.50	54.0	15.6	V
17689.000	38.3	-22.2	41.2	19.47	54.0	15.7	H
17690.500	38.3	-22.2	41.2	19.47	54.0	15.6	H
17704.000	38.1	-22.2	41.2	19.47	54.0	15.9	H

Charger1 + Rear Camera + GSM 850MHz idle Mode/Peak detector

Frequency (MHz)	Result (dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol.
17637.000	51.7	-22.0	41.2	32.63	74.0	22.3	V
17053.500	51.5	-23.0	41.6	32.97	74.0	22.5	V
16965.000	51.3	-23.0	41.7	32.70	74.0	22.7	V
17766.000	51.1	-22.3	41.3	32.42	74.0	22.9	V
17222.500	51.1	-22.9	41.5	32.46	74.0	22.9	H
16932.500	50.7	-23.0	41.7	32.24	74.0	23.3	H

Measurement results for Set.7:

USB(SD TO PC)+Headset2+FM Mode/QP detector

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
33.201000	36.7	40.0	3.3	125.0	V	225.0
39.409000	27.8	40.0	12.2	100.0	V	315.0
34.074000	36.0	40.0	4.0	100.0	V	2.0
293.452000	39.1	46.0	6.9	100.0	H	13.0
146.691000	39.5	43.5	4.0	100.0	H	20.0
663.798000	34.8	46.0	11.2	125.0	V	225.0

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

Frequency (MHz)	Result (dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol.
17645.500	38.77	-22.1	41.2	19.59	54.0	15.2	H
17689.500	38.75	-22.2	41.2	19.67	54.0	15.2	H
17687.500	38.71	-22.1	41.2	19.62	54.0	15.3	V
17681.000	38.71	-22.1	41.2	19.61	54.0	15.3	H
17680.000	38.69	-22.1	41.2	19.59	54.0	15.3	V
17639.500	38.68	-22.0	41.2	19.49	54.0	15.3	H

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

Frequency (MHz)	Result (dBμV/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol.
16978.000	51.29	-23.0	41.7	32.62	74.0	22.7	H
17029.000	51.26	-23.0	41.7	32.62	74.0	22.7	H
17677.500	51.15	-22.1	41.2	32.04	74.0	22.8	V
17931.500	51.15	-22.7	41.3	32.55	74.0	22.9	V
17698.500	51.07	-22.2	41.2	32.00	74.0	22.9	V
17479.500	51.05	-23.0	41.2	32.87	74.0	22.9	H

Charger1+ Rear Camera +GSM 850MHz, Set.1

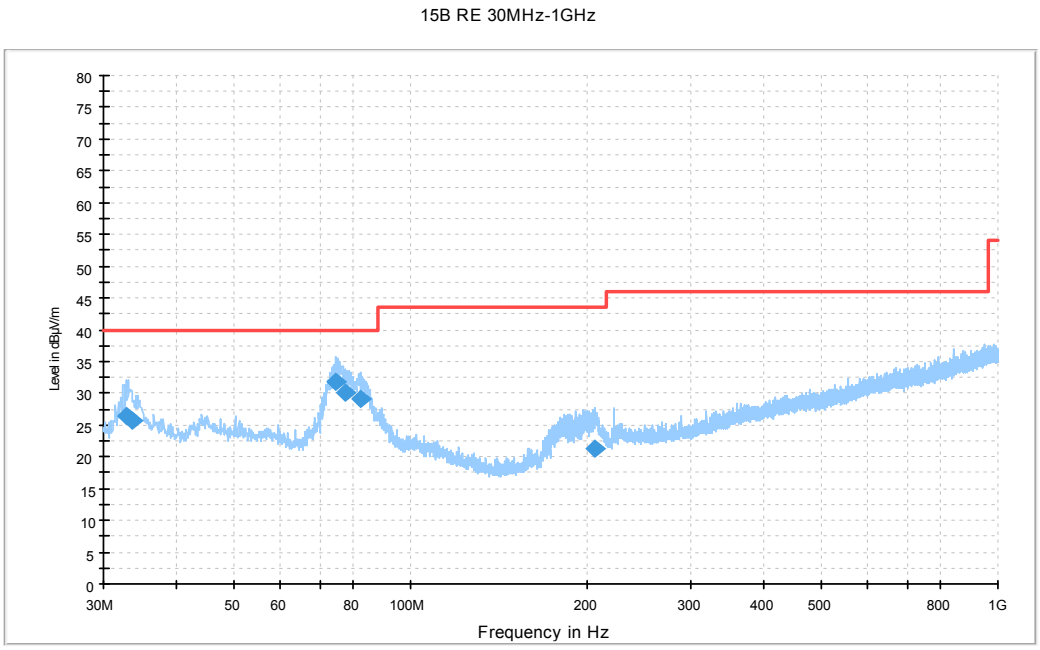

Figure A.1 Radiated Emission from 30MHz to 1GHz

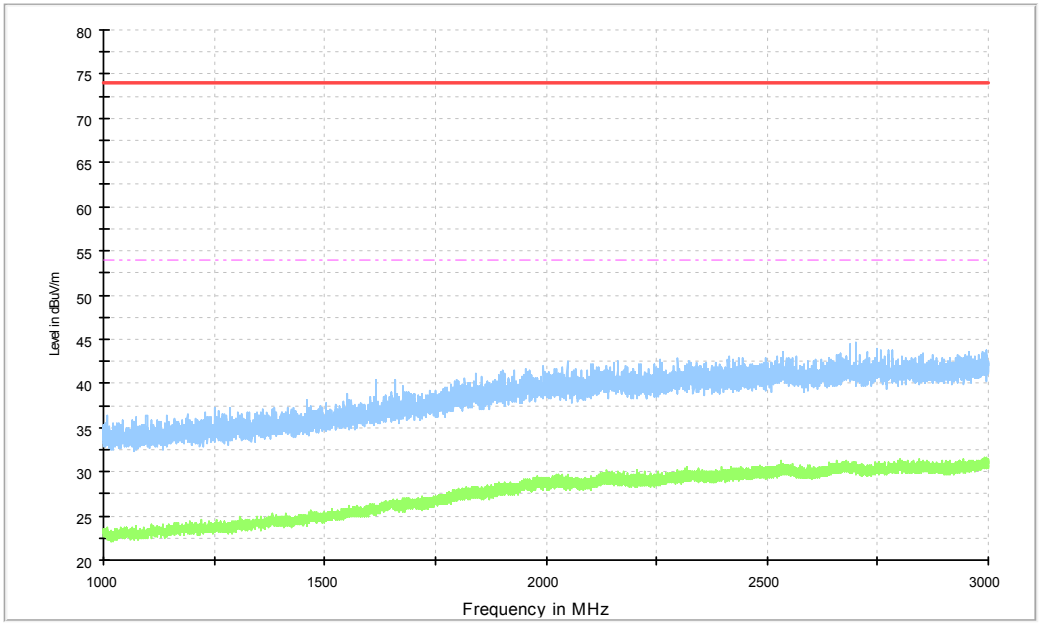

Figure A.2 Radiated Emission from 1GHz to 3GHz

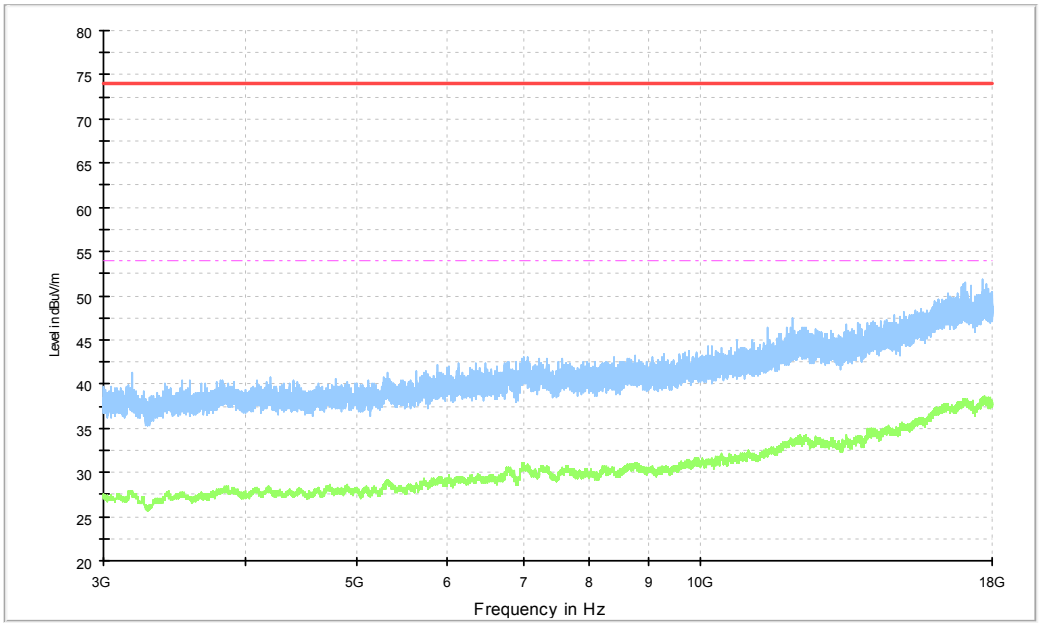

Figure A.3 Radiated Emission from 3GHz to 18GHz

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

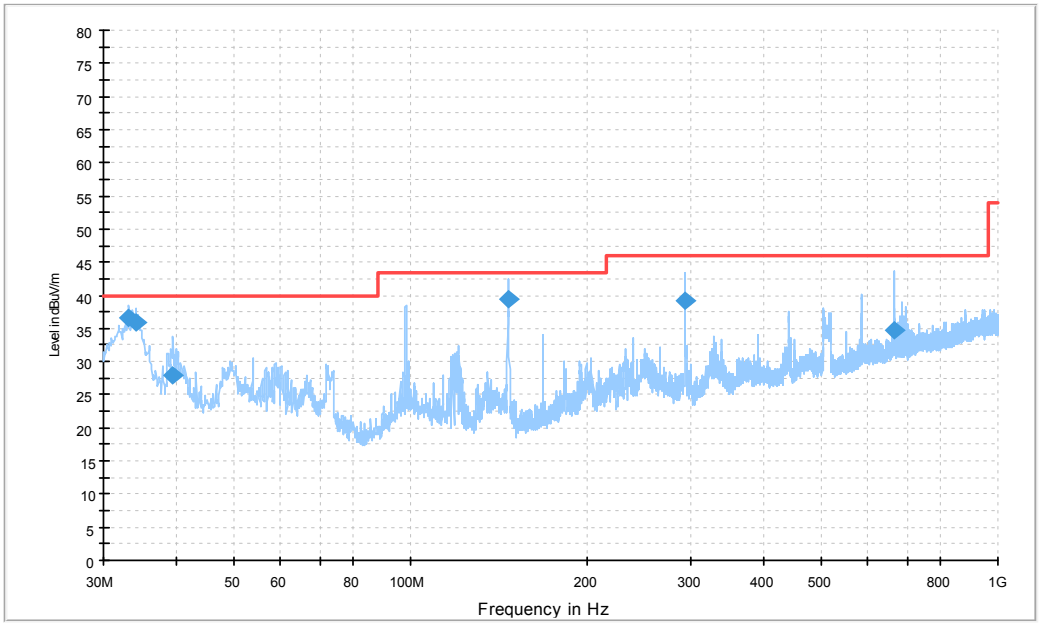

Figure A.4 Radiated Emission from 30MHz to 1GHz

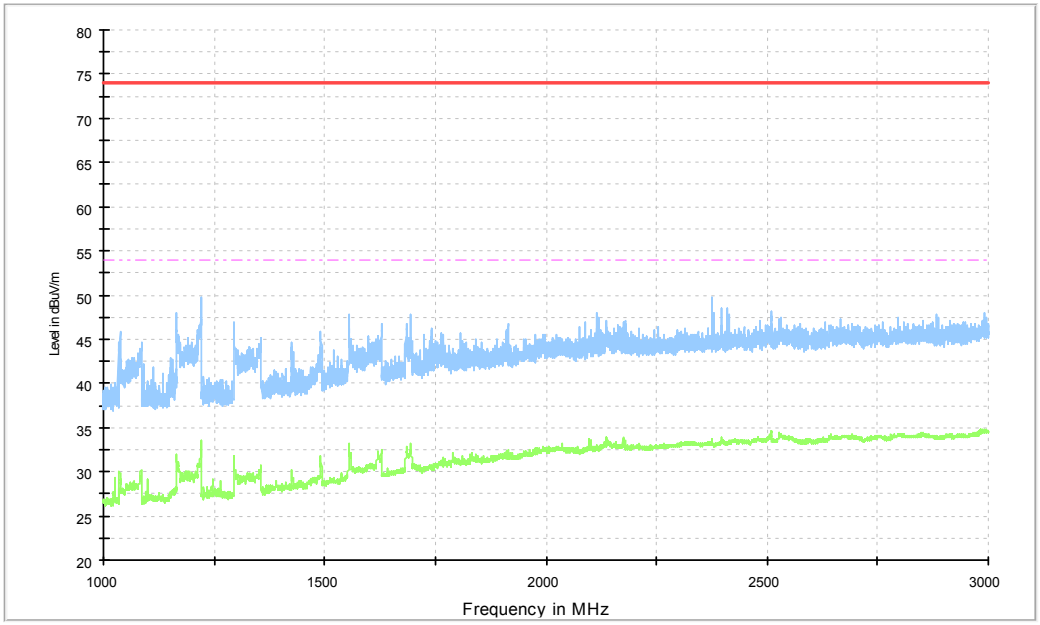

Figure A.5 Radiated Emission from 1GHz to 3GHz

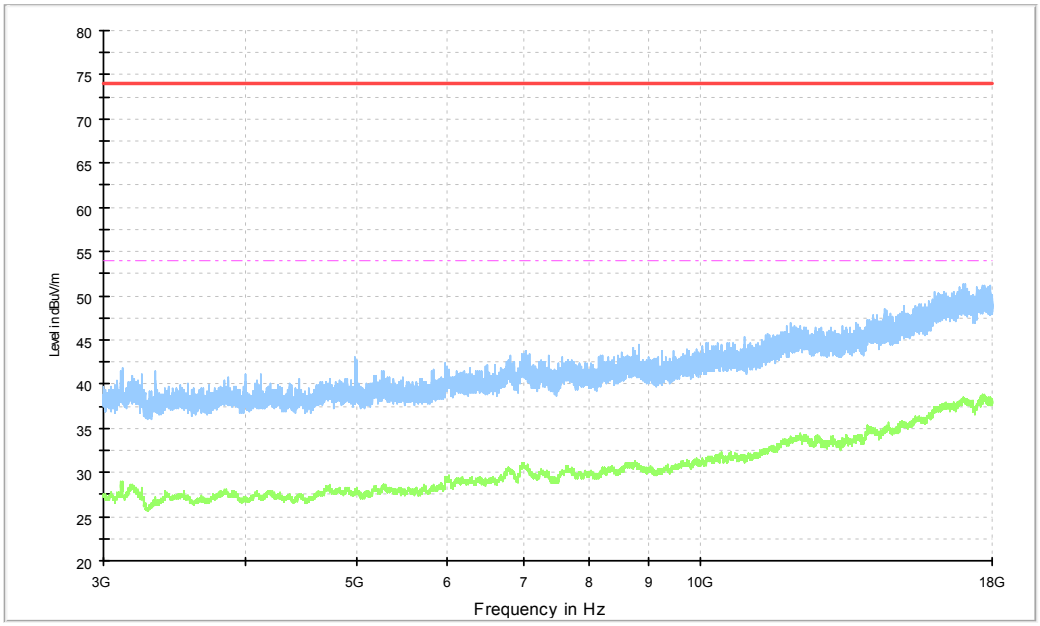

Figure A.6 Radiated Emission from 3GHz to 18GHz

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 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 (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=3.08dB, *k*=2.

U=3.10dB, *k*=2.

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

Charger1+ Rear Camera +GSM 850MHz idle Mode, Set.1

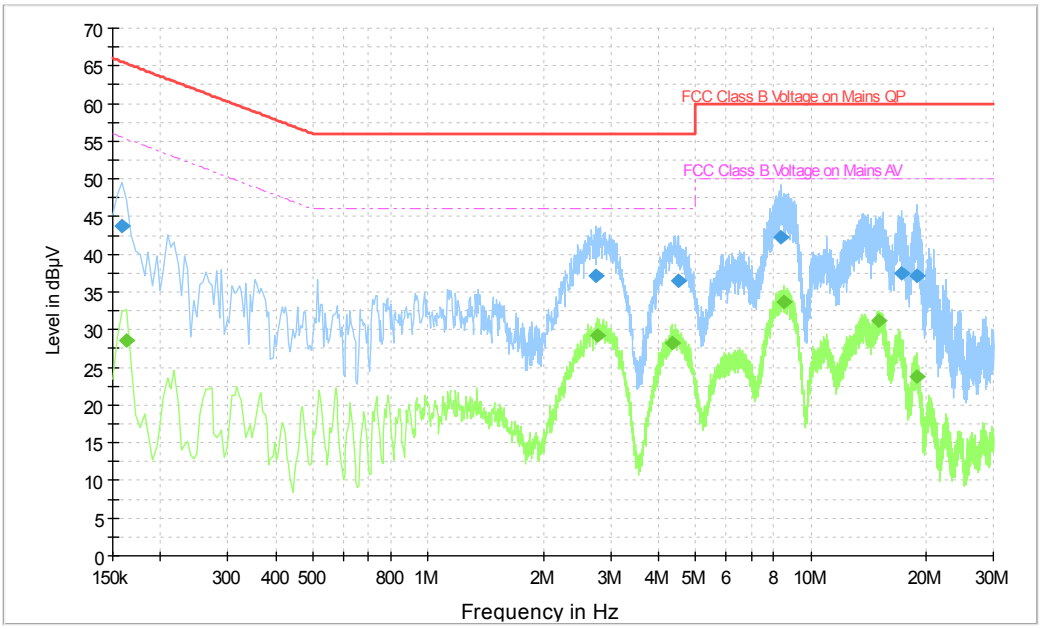

Figure A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	43.7	L1	19.7	21.8	65.5
2.755500	37.2	L1	19.6	18.8	56.0
4.497000	36.5	L1	19.8	19.5	56.0
8.331000	42.3	L1	19.8	17.7	60.0
17.317500	37.4	L1	19.8	22.6	60.0
18.969000	37.1	L1	19.8	22.9	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	28.6	L1	19.7	26.6	55.3
2.773500	29.2	L1	19.6	16.8	46.0
4.339500	28.3	L1	19.8	17.7	46.0
8.515500	33.6	L1	19.8	16.4	50.0
14.986500	31.2	L1	20.0	18.8	50.0
18.933000	23.8	L1	19.8	26.2	50.0

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

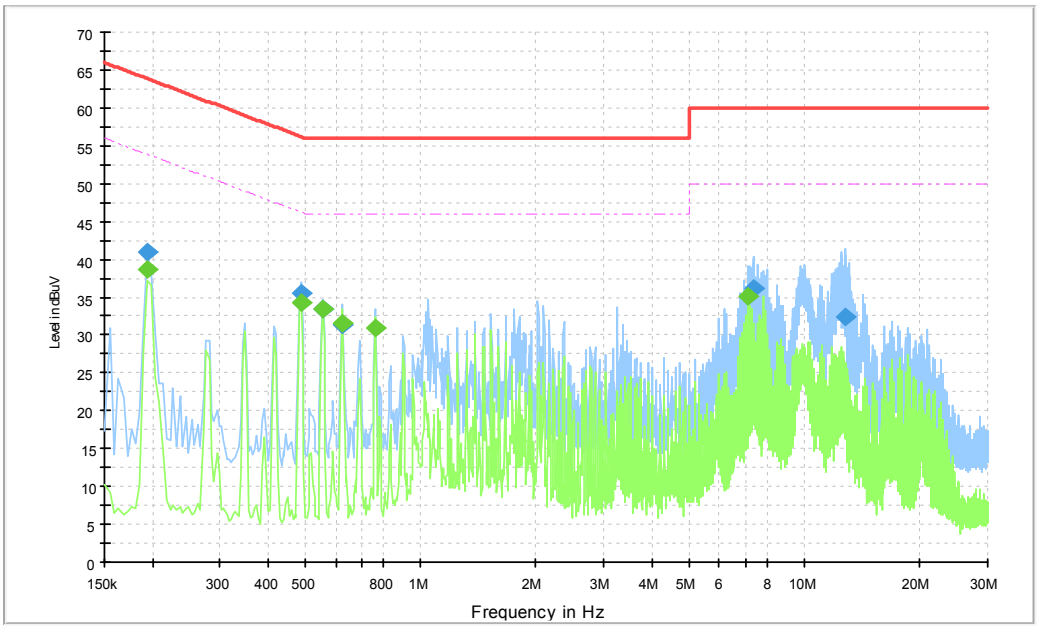

Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.195000	41.0	L1	19.6	22.8	63.8
0.487500	35.5	N	19.8	20.7	56.2
0.555000	33.3	L1	19.8	22.7	56.0
0.622500	31.4	L1	19.7	24.6	56.0
7.408500	36.1	N	19.7	23.9	60.0
12.772500	32.3	L1	19.7	27.7	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.195000	38.6	L1	19.6	15.2	53.8
0.487500	34.3	N	19.8	11.9	46.2
0.555000	33.5	L1	19.8	12.5	46.0
0.622500	31.6	L1	19.7	14.4	46.0
0.762000	30.9	L1	19.7	15.1	46.0
7.107000	35.1	N	19.7	14.9	50.0

ANNEX B: Persons involved in this testing

Test Item	Tester
Conducted Continuous Emission	Yang Mengke,Guo Qian
Radiated Continuous Emission	Li Zongliang

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