



FCC 15B TEST REPORT

No. I21Z70041-EMC01

for

SAMSUNG Electronics Co., Ltd.

Multi-band GSM/WCDMA/LTE/5G NR Phone

Model Name: SM-A226B/DS, SM-A226B

FCC ID: ZCASMA226B

with

Hardware Version: REV1.0

Software Version: A226B.001

Issued Date: 2021-04-12

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

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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CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z70041-EMC01	Rev.0	1 st edition	2021-04-12



CONTENTS

1. TEST LABORATORY.....	4
1.1. TESTING LOCATION.....	4
1.2. TESTING ENVIRONMENT.....	4
1.3. PROJECT DATA.....	4
1.4. SIGNATURE.....	4
2. CLIENT INFORMATION.....	5
2.1. APPLICANT INFORMATION.....	5
2.2. MANUFACTURER INFORMATION.....	5
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE).....	6
3.1. ABOUT EUT.....	6
3.2. INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST.....	6
3.3. INTERNAL IDENTIFICATION OF AE USED DURING THE TEST.....	6
3.4. EUT SET-UPS.....	8
4. REFERENCE DOCUMENTS.....	9
4.1. REFERENCE DOCUMENTS FOR TESTING.....	9
5. LABORATORY ENVIRONMENT.....	10
6. SUMMARY OF TEST RESULTS.....	11
7. TEST EQUIPMENTS UTILIZED.....	12
ANNEX A: MEASUREMENT RESULTS.....	13
ANNEX B: PERSONS INVOLVED IN THIS TESTING.....	21

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: 2021-02-10

Testing End Date: 2021-04-01

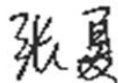
1.4. Signature



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

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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/DS, SM-A226B
FCC ID	ZCASMA226B

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	217004125a	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. EUT set-ups

EUT set-up No.	Combination of EUT and AE	Remarks
Set.1	EUT1 + AE1 + AE4+ AE8 + AE10	Charger1+ R Camera+ Headset1
Set.2	EUT1 + AE1 + AE5 + AE10	Charger1+ R Camera
Set.3	EUT1 + AE2 + AE6 + AE10	Charger2+F camera
Set.4	EUT1 + AE3 + AE7 + AE10	Charger3+MP4
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

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 and 5G NR NSA B7-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.

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-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	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	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	00167250	ETS-Lindgren	2021-05-14	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:

$$\text{Result} = P_{\text{Mea}} + A_{Rpl} = P_{\text{Mea}} + G_A + G_{PL}$$

Where

G_A : Antenna factor of receive antenna

G_{PL} : Path Loss

P_{Mea} : Measurement result on receiver.

Measurement uncertainty (worst case): 30MHz-1GHz: 5.16dB, 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.4:

EUT1 Charger3+MP4+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)
55.608000	22.91	30.00	7.09	325.0	V	6.0
59.197000	24.09	30.00	5.91	197.0	V	-30.0
76.754000	12.83	30.00	17.17	125.0	V	73.0
91.498000	18.63	33.50	14.89	120.0	V	300.0
180.835000	12.65	33.50	20.87	116.0	V	-30.0
214.300000	12.56	33.50	20.96	203.0	V	61.0

EUT1 Charger3+MP4+GSM 850MHz idle Mode/Average detector

Frequency (MHz)	Result (dB μ V/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dB μ V)	Polarity	Limit (dB μ V/m)	Margin (dB)
17981.867	43.7	-29.1	46.7	26.098	H	54	10.3
17960.900	43.6	-29.1	46.7	26.001	H	54	10.4
17998.300	43.6	-29.1	46.7	25.998	H	54	10.4
17970.533	43.5	-29.1	46.7	25.901	H	54	10.5
17929.167	43.3	-29.4	46.7	26.039	V	54	10.7
17914.433	43.3	-29.3	46.7	25.965	H	54	10.7

EUT1 Charger3+MP4+GSM 850MHz idle Mode/Peak detector

Frequency (MHz)	Result (dB μ V/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dB μ V)	Polarity	Limit (dB μ V/m)	Margin (dB)
17813.000	52.4	-29.6	46.0	36.076	V	74	21.6
17746.700	52.3	-29.6	46.0	35.956	H	74	21.7
17935.967	52.1	-29.4	46.7	34.839	H	74	21.9
17985.833	52.1	-29.1	46.7	34.498	V	74	21.9
17971.667	52.0	-29.1	46.7	34.401	V	74	22
17805.633	51.9	-29.6	46.0	35.576	V	74	22.1

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

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
32.425000	20.11	30.00	9.89	125.0	V	200.0
44.550000	13.59	30.00	16.41	300.0	V	-20.0
96.057000	25.03	33.50	8.49	125.0	V	274.0
227.589000	15.37	36.00	20.65	125.0	V	150.0
396.272000	22.69	36.00	13.33	102.0	V	281.0
481.438000	25.31	36.00	10.71	304.0	V	-2.0

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

Frequency (MHz)	Result (dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dB μ V)	Polarity	Limit (dB μ V/m)	Margin (dB)
17964.867	44.1	-29.1	46.7	26.501	H	54	9.9
18000.000	43.7	-29.2	47.0	25.943	V	54	10.3
17959.767	43.5	-28.9	46.7	25.783	H	54	10.5
17959.200	43.3	-28.9	46.7	25.583	H	54	10.7
17917.833	43.2	-29.3	46.7	25.865	V	54	10.8
17981.300	43.1	-29.1	46.7	25.498	V	54	10.9

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

Frequency (MHz)	Result (dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dB μ V)	Polarity	Limit (dB μ V/m)	Margin (dB)
17924.067	52.3	-29.4	46.7	35.039	H	74	21.7
17958.633	52.3	-28.9	46.7	34.583	H	74	21.7
17983.567	52.1	-29.1	46.7	34.498	V	74	21.9
17989.233	51.8	-29.1	46.7	34.198	H	74	22.2
17954.100	51.8	-28.9	46.7	34.083	V	74	22.2
17898.567	51.7	-29.5	46.0	35.280	H	74	22.3

EUT1 Charger3+MP4+GSM 850MHz idle Mode, Set.4

Full Spectrum

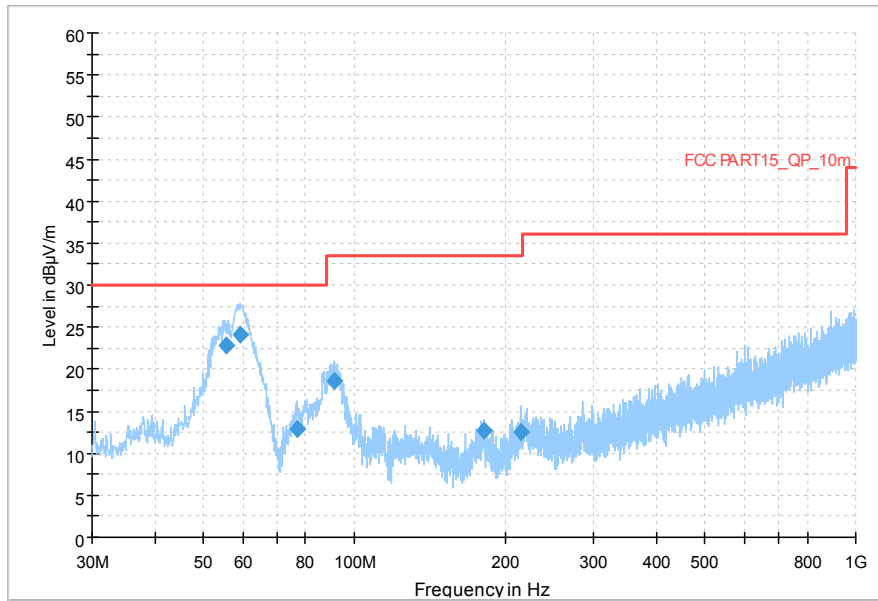


Figure A.1 Radiated Emission from 30MHz to 1GHz

Full Spectrum

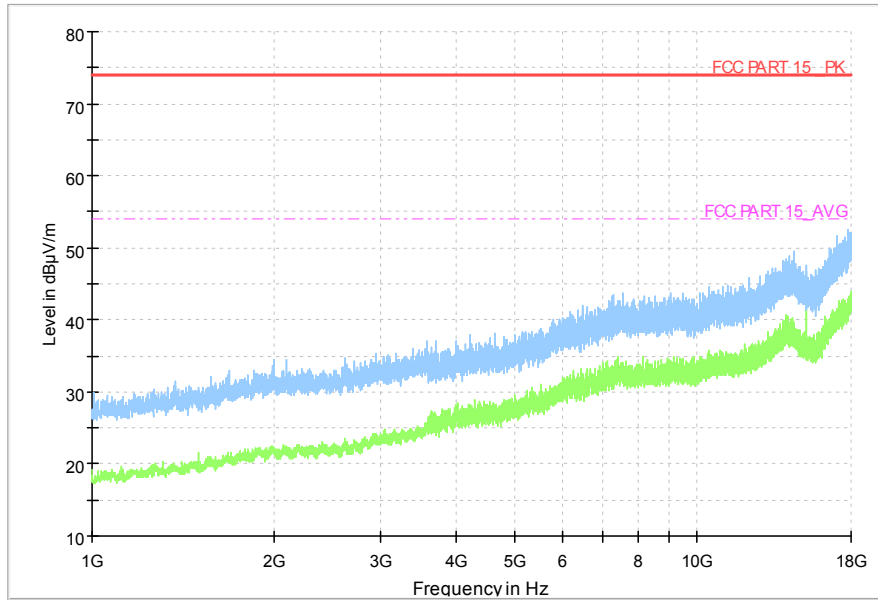


Figure A.2 Radiated Emission from 1GHz to 18GHz

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

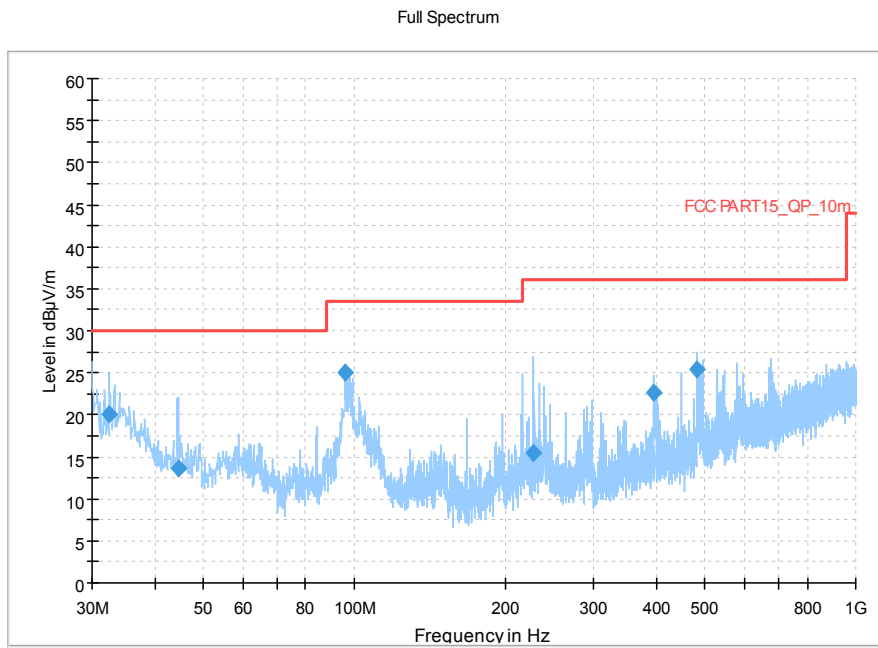


Figure A.3 Radiated Emission from 30MHz to 1GHz

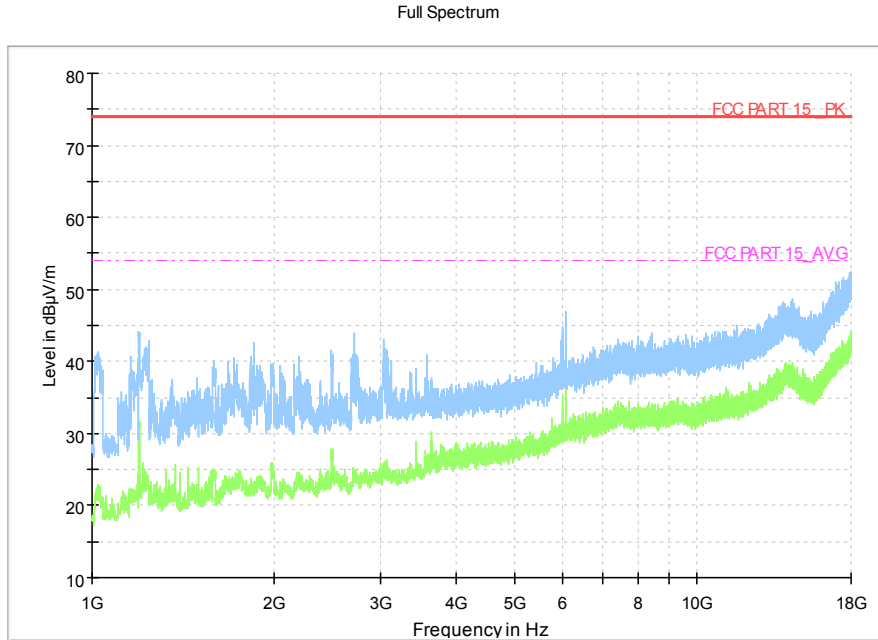


Figure A.4 Radiated Emission from 1GHz to 18GHz

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 μ 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 Charger3+MP4+GSM 850MHz idle Mode, Set.4

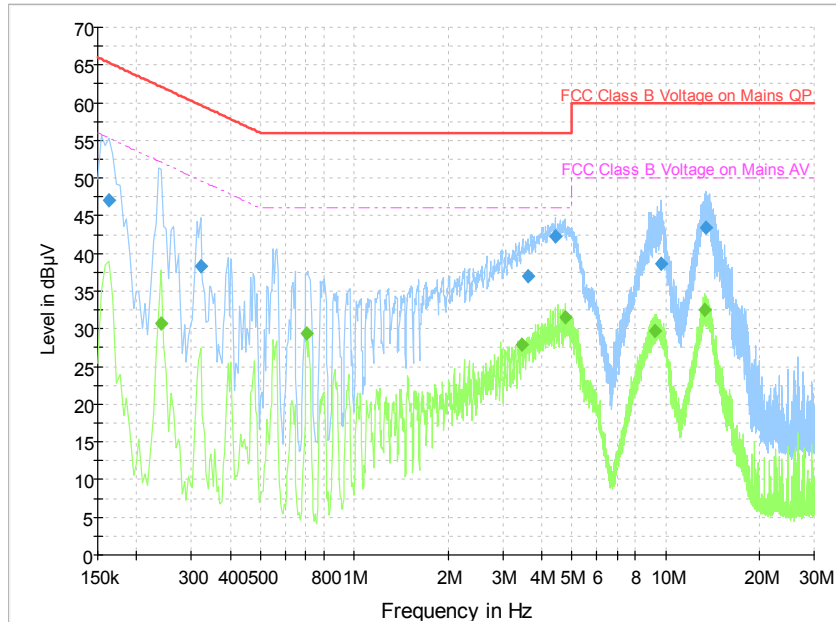


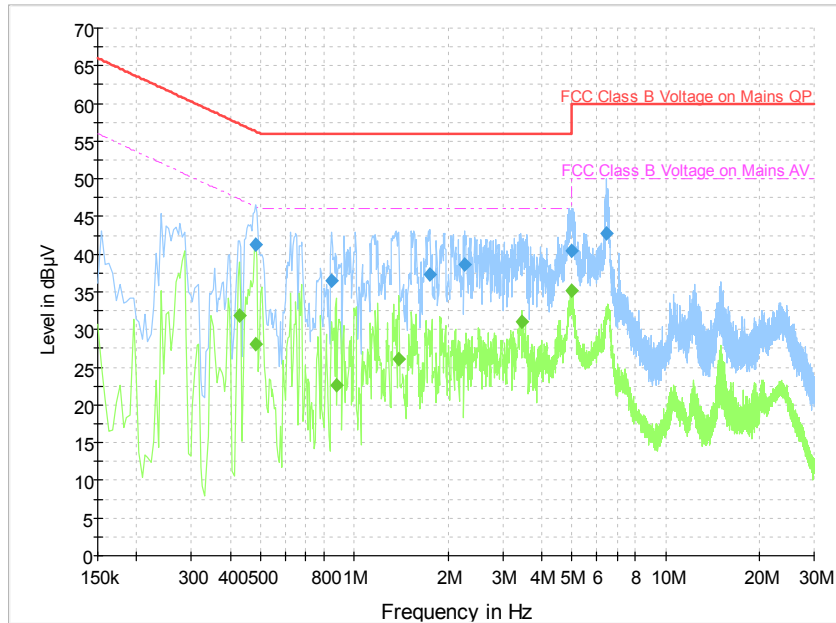
Figure A.5 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.163500	47.1	L1	19.7	18.2	65.3
0.321000	38.3	L1	19.6	21.4	59.7
3.601500	37.0	N	19.6	19.0	56.0
4.429500	42.2	L1	19.8	13.8	56.0
9.640500	38.7	L1	19.9	21.3	60.0
13.474500	43.4	L1	19.9	16.6	60.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.240000	30.7	L1	19.6	21.4	52.1
0.703500	29.4	L1	19.6	16.6	46.0
3.466500	27.9	L1	19.7	18.1	46.0
4.753500	31.5	L1	19.8	14.5	46.0
9.217500	29.8	L1	19.8	20.2	50.0
13.312500	32.6	L1	19.9	17.4	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)
0.483000	41.2	N	19.6	15.1	56.3
0.847500	36.4	L1	19.6	19.6	56.0
1.752000	37.3	L1	19.5	18.7	56.0
2.256000	38.6	N	19.6	17.4	56.0
4.974000	40.5	L1	19.8	15.5	56.0
6.481500	42.7	N	19.6	17.3	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.429000	31.8	L1	19.6	15.5	47.3
0.483000	28.0	L1	19.6	18.2	46.3
0.874500	22.6	N	19.5	23.4	46.0
1.392000	26.1	N	19.6	19.9	46.0
3.457500	31.1	L1	19.7	14.9	46.0
4.969500	35.1	N	19.7	10.9	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*****