



TEST REPORT

No. I18Z61508-EMC03

for

Samsung Electronics Co., Ltd.

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

Model Name: SM-G6200

FCC ID: ZCASM6200

with

Hardware Version: REV0.5

Software Version: OPM1.171019.026.G6200ZCU0ARJ4

Issued Date: 2018-10-31



Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I18Z61508-EMC03	Rev.0	1 st edition	2018-10-16
I18Z61508-EMC03	Rev.1	2 nd edition	2018-10-31

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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: 2018-08-22

Testing End Date: 2018-09-20

1.4. Signature



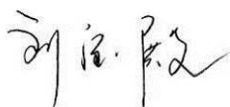
Li Yan

(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: Samsung Electronics Co., Ltd.
Address: (Maetan dong)129,Samsung-ro Yeongtong-gu,Suwon-si, Gyeonggi-do
16677,Korea
City: /
Postal Code: /
Country: /
Telephone: /

2.2. Manufacturer Information

Company Name: Samsung Electronics Co., Ltd.
Address: (Maetan dong)129,Samsung-ro Yeongtong-gu,Suwon-si, Gyeonggi-do
16677,Korea
City: /
Postal Code: /
Country: /
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	SM-G6200
FCC ID	ZCASM6200
Extreme vol. Limits	3.7VDC to 4.40VDC (nominal: 3.85VDC)

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
EUT4	359234090078728	REV0.5	OPM1.171019.026.G6200ZCU0ARJ4

*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	Charger	/	/
AE3	USB cable	/	/

AE1

Model	EB-BG610ABE
Manufacturer	Samsung SDI Co., Ltd.
Capacitance	3300mAh
Nominal voltage	3.85V

AE2

Model	HKC0115021-2D
Manufacturer	SHENZHEN HUNTKEY ELECTRIC CO., LTD
Length of cable	/

AE3

Model	711300000351
Manufacturer	/
Length of cable	/

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

Note: The USB cables are shielded.

3.4. EUT set-ups

EUT set-up No.	Combination of EUT and AE	Remarks
Set.1	EUT4+ AE1 + AE2+ AE3	Charger
Set.2	EUT4+ AE1 + AE3	USB mode

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

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	CALIBRATI ON INTERVAL
1	Test Receiver	ESU26	100376	R&S	2018-12-17	1 year
2	Test Receiver	ESCI	100766	R&S	2019-04-16	1 year
3	Universal Radio Communication Tester	CMW500	159408	R&S	2019-04-12	1 year
4	LISN	ESH3-Z5	825562/028	R&S	2019-01-31	1 year
5	EMI Antenna	VULB9163	9163-514	Schwarzbeck	2020-02-03	3 years
6	EMI Antenna	3117	00139065	ETS-Lindgren	2020-11-15	3 years
7	Printer	P1606dn	VNC3L52122	HP	N/A	N/A
8	Keyboard	KU-1601	2048361	Lenovo	N/A	N/A
9	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. 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_{PL} : Path Loss

P_{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/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)
17623.500	39.1	-25.9	41.1	23.86	54.0	14.8	H
17626.500	39.1	-25.9	41.1	23.86	54.0	14.8	V
17580.000	39.1	-25.7	41.1	23.63	54.0	14.8	V
17565.750	39.1	-25.6	41.1	23.53	54.0	14.8	V
17583.000	39.0	-25.7	41.1	23.60	54.0	14.9	H
17585.250	39.0	-25.7	41.1	23.61	54.0	14.9	H

Charging 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)
16521.000	51.5	-26.0	41.1	36.36	74.0	22.2	V
17865.000	51.2	-23.7	40.9	34.03	74.0	22.2	H
16469.250	51.1	-26.0	41.0	36.03	74.0	22.3	V
17610.750	51.0	-25.8	41.1	35.67	74.0	22.6	V
16509.750	51.0	-26.0	41.1	35.83	74.0	22.7	H
16986.750	50.9	-25.6	41.4	35.11	74.0	22.7	V

Measurement results for Set.2:
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)
17995.500	39.2	-25.0	40.8	23.46	54.0	14.8	V
17972.250	39.2	-25.2	40.8	23.56	54.0	14.8	H
17992.500	39.2	-25.2	40.8	23.54	54.0	14.8	V
17962.500	39.1	-25.0	40.8	23.28	54.0	14.9	H
17989.500	39.1	-25.3	40.8	23.53	54.0	14.9	H
17946.000	39.0	-24.8	40.8	23.03	54.0	15.0	H

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)
16962.000	51.9	-25.6	41.4	36.15	74.0	22.1	H
17382.750	51.6	-25.5	41.2	35.91	74.0	22.4	V
16444.500	51.6	-26.0	41.0	36.59	74.0	22.4	H
17112.750	51.2	-25.5	41.3	35.37	74.0	22.8	H
17454.000	51.1	-25.2	41.2	35.09	74.0	22.9	V
16463.250	51.0	-26.0	41.0	35.99	74.0	23.0	H

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, Set.1

15B RE 30MHz-1GHz

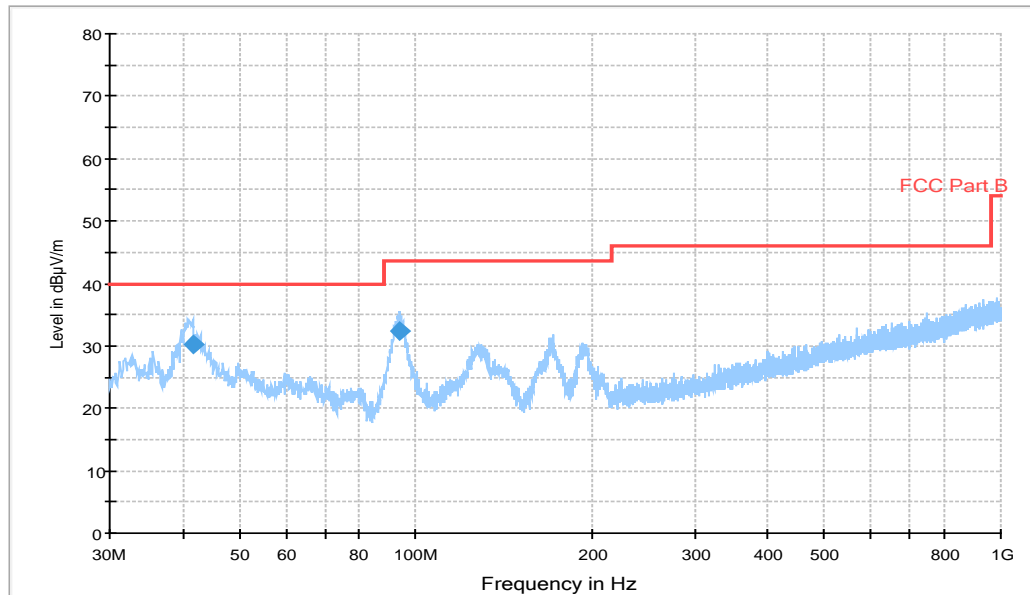


Figure A.1 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
41.543000	30.3	100.0	V	0.0	0.4	9.7	40.0
94.020000	32.4	100.0	V	-20.0	-2.4	11.1	43.5

15B RE - 1GHz-3GHz

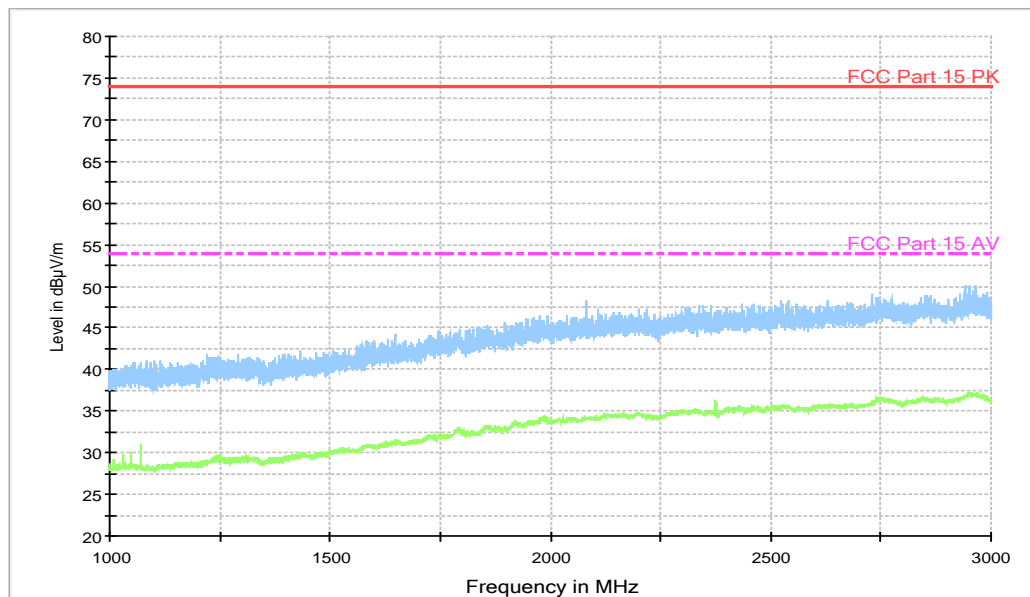
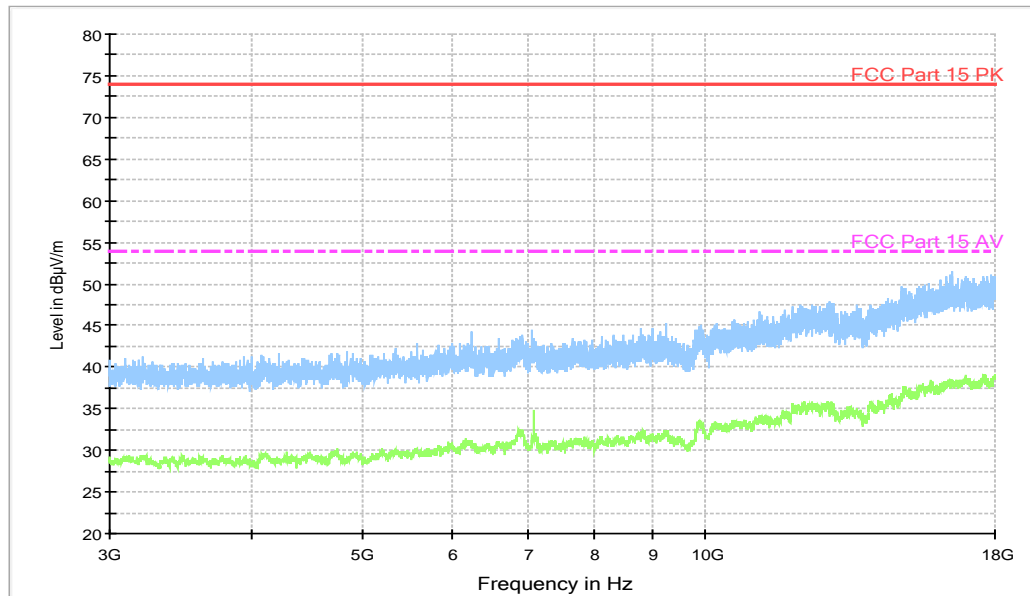


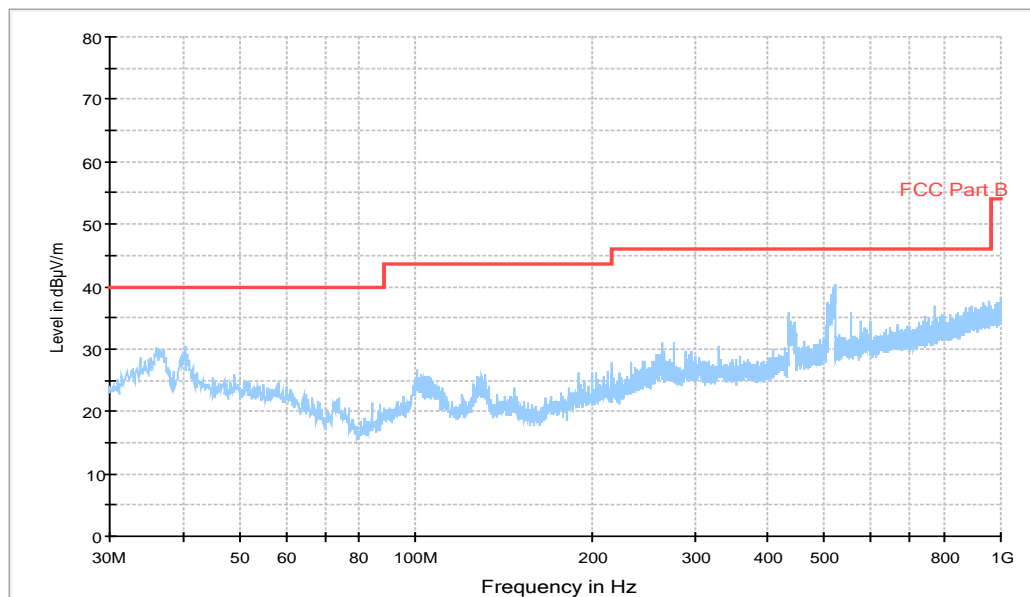
Figure A.2 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz


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

USB Mode, Set.2

15B RE 30MHz-1GHz


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

15B RE - 1GHz-3GHz

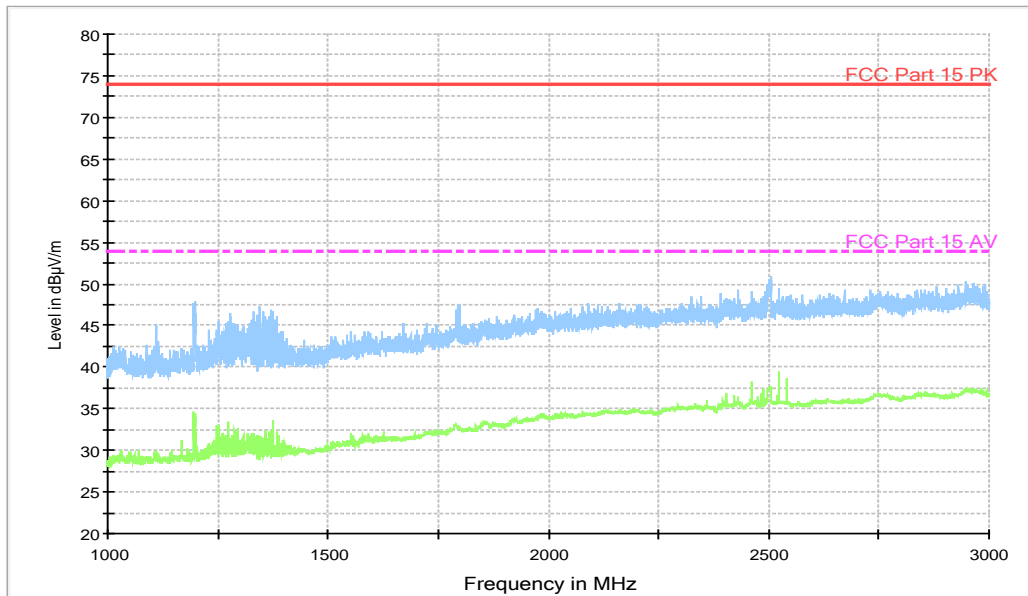


Figure A.5 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

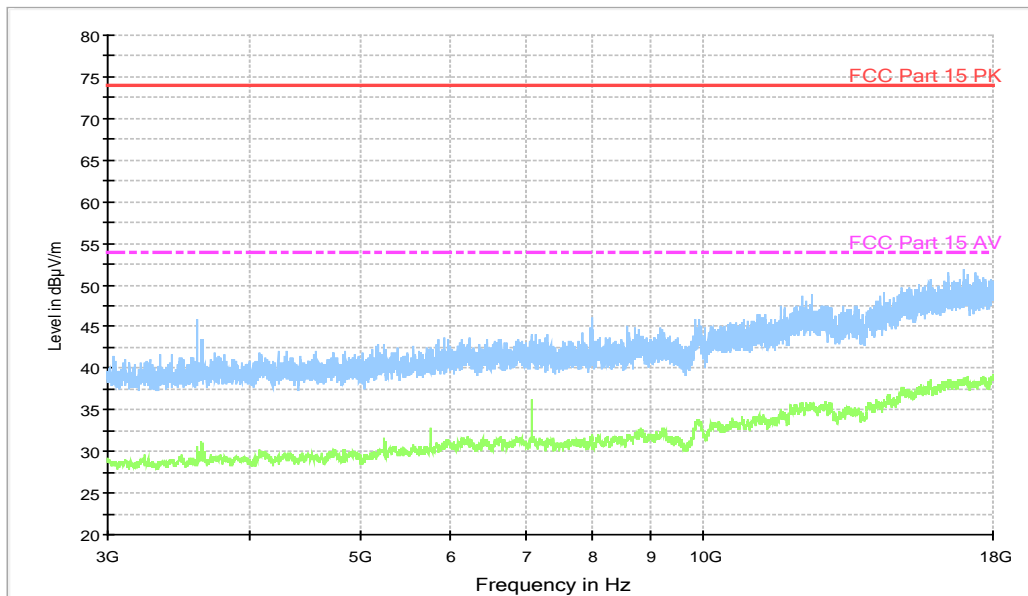


Figure A.6 Radiated Emission from 3GHz to 18GHz

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. The model of the PC is DELL OPTIPLEX 380, and the serial number of the PC is 2X1YV2X. 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, Set.1

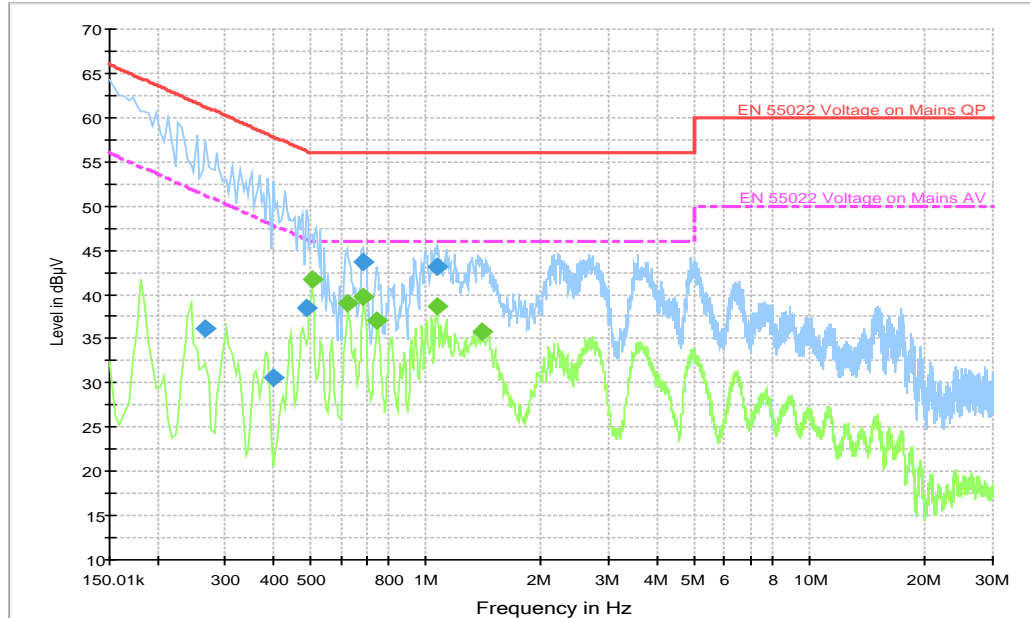


Figure A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	41.5	2000.0	9.000	GND	N	10.4	24.5	66.0
0.267000	36.1	2000.0	9.000	GND	N	10.4	25.1	61.2
0.402000	30.5	2000.0	9.000	GND	N	10.4	27.3	57.8
0.487500	38.4	2000.0	9.000	GND	N	10.4	17.8	56.2
0.685500	43.8	2000.0	9.000	GND	N	10.5	12.2	56.0
1.072500	43.1	2000.0	9.000	GND	N	10.4	12.9	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.505500	41.7	2000.0	9.000	GND	N	10.4	4.3	46.0
0.627000	39.0	2000.0	9.000	GND	N	10.4	7.0	46.0
0.690000	39.8	2000.0	9.000	GND	N	10.5	6.2	46.0
0.748500	37.1	2000.0	9.000	GND	N	10.5	8.9	46.0
1.068000	38.6	2000.0	9.000	GND	N	10.4	7.4	46.0
1.396500	35.8	2000.0	9.000	GND	N	10.5	10.2	46.0

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

USB Mode, Set.2

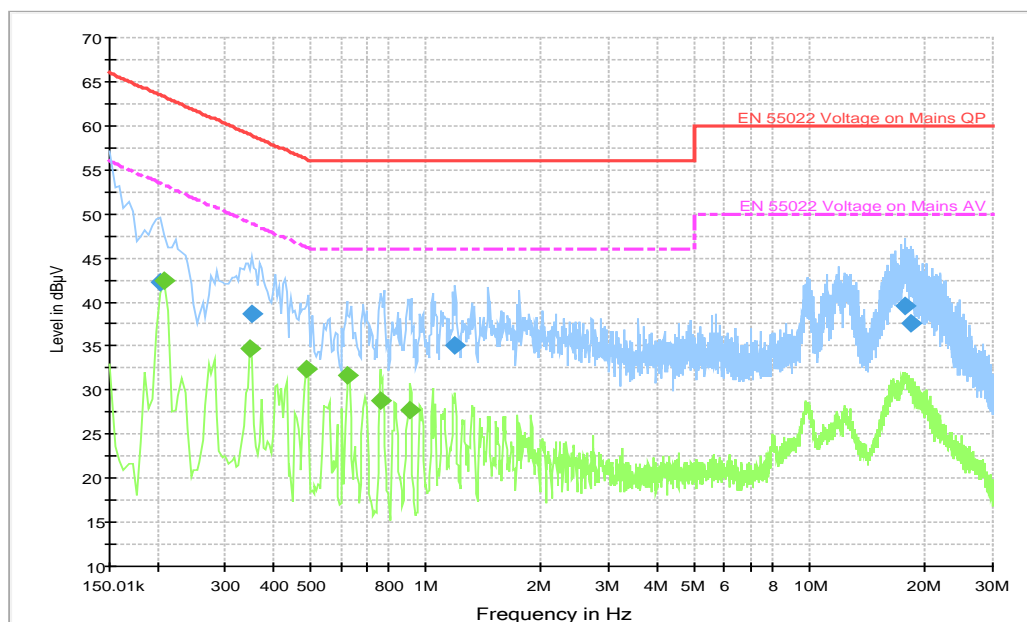


Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	54.3	2000.0	9.000	GND	N	10.4	11.7	66.0
0.204000	42.3	2000.0	9.000	GND	L1	10.4	21.2	63.4
0.352500	38.6	2000.0	9.000	GND	N	10.4	20.3	58.9
1.194000	35.1	2000.0	9.000	GND	L1	10.5	20.9	56.0
17.758500	39.5	2000.0	9.000	GND	N	11.2	20.5	60.0
18.334500	37.5	2000.0	9.000	GND	N	11.2	22.5	60.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.208500	42.4	2000.0	9.000	GND	L1	10.3	10.8	53.3
0.348000	34.7	2000.0	9.000	GND	L1	10.4	14.3	49.0
0.487500	32.4	2000.0	9.000	GND	L1	10.4	13.8	46.2
0.627000	31.7	2000.0	9.000	GND	L1	10.4	14.3	46.0
0.762000	28.8	2000.0	9.000	GND	L1	10.5	17.2	46.0
0.910500	27.8	2000.0	9.000	GND	L1	10.4	18.2	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	Shi Suolan
Conducted Emission	Li Jinpeng

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