

EMC TEST REPORT

Project No.	LBE20155616	Issue No.	1
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677 Rep. of Korea	
	Date of application	October 30, 2015	
EUT	Type of device	<input checked="" type="checkbox"/> Class B personal computers and peripherals <input type="checkbox"/> All other devices	
	Equipment authorization	<input type="checkbox"/> Declaration of Conformity <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Verification	
	FCC ID	A3LSMA310M	
	Kind of product	Mobile Phone	
	Model No.	SM-A310M/DS	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	SAMSUNG ELECTRONICS CO., LTD 94-1, Imsu-dong, Gumi-si, Gyengsangbuk-do, 730-722, Republic of Korea SAMSUNG ELECTRONICS CO., LTD 256, 6th Road, zhongkai ChenJiang Town Huizhou GuangDong China 516029	
Applied Standards	FCC Part 15, Subpart B, Class B / ANSI C63.4-2009		
Test Period	November 13, 2015 ~ November 17, 2015		
Issue date	December 3, 2015		

Test result : Complied

The equipment under test has found to be compliant with the applied standards.
 (Refer to thtlife attached test result for more detail.)

Tested by : Young Hun Cheong

J. Y. H

Reviewed by : Tae Young Jang

T. Y. J

The test results in this report only apply to the tested sample. This report must not be reproduced, except in full, without written permission from CS & Environment center.



CS & Environment Center of Samsung Electronics Co., Ltd.

129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677 Rep. of Korea

Table of contents

1. Report Information

1.1 Revision history	3
----------------------------	---

2. Summary of test results

2.1 Emission	3
--------------------	---

3. General Information

3.1 Test facility	3
-------------------------	---

4. Test Configuration

4.1 Test Peripherals	4
4.2 EUT operating mode	4
4.3 Details of Sampling	4
4.4 Used cable description	5
4.5 Test arrangement	5
4.6 EUT Description	6
4.7 Clock Frequencies	6
4.8 Test configuration and condition	6
4.9 Measurement uncertainty	7

5. Result of individual tests

5.1 Conducted disturbance	8
5.2 Radiated disturbance	10

1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	- LBE20155734 (SAMSUNG)
Issue 1	- Added the variant model name by customer's request (SM-A310M).

2. Summary of test results

2.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result
<input checked="" type="checkbox"/>	Conducted Disturbance (Mains port)	FCC Part 15 Subpart B / ANSI C63.4-2009 (Class B)	Complied
<input checked="" type="checkbox"/>	Radiated Disturbance		Complied

3. General Information

3.1 Test facility

The CS & Environment center is located on Samsung Electronics Co., Ltd. at (Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea.

All testing are performed in Semi-anechoic chambers conforming to the site attenuation characteristics defined by ANSI C63.4, CISPR 22, 16-1 and 16-2. and Shielded rooms.

The CS & Environment center is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:2005.

4. Test Setup configuration

4.1 Test Peripherals

The cables used for these peripherals are either permanently attached by the peripheral manufacturer or coupled with an assigned cable as defined below.

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Mark	Description	Model No.	Serial No.	Manufacturer / Trademark	FCC ID / DoC
A	Mobile Phone	SM-A310M/DS	-	SAMSUNG	A3LSMA310M
B	Battery	EB-BA310ABE	-	SAMSUNG	-
C	Headset	EHS64AVFWE	-	SAMSUNG	-
D	Data Cable	EP-DG920UWE	-	SAMSUNG	-
E	Micro SD Card	16 GB	-	SANDISK	-
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD TV Monitor	SP2208WFPt	CN-OPK977-71618-838-106S	Dell	DoC
H	Mouse	M-S48a	LZA00153189	SAMSUNG	DoC
I	Keyboard	SKG-2000PB	CNBA5902830AGP53Z5A3485	SAMSUNG	DoC
J	Gigabit Switch Hub	H3008	10070100009	EFM Networks	DoC
K	Power Supply	HB12B-050200SPA	HBK520201025	Shen Zhen City Hong Ben	DoC

4.2 EUT operating mode

To achieve compliance applied standard specification, the following mode(s) were made during compliance testing:

Operating Mode 1	USB Mode (Data Communication)
-------------------------	-------------------------------

4.3 Details of Sampling

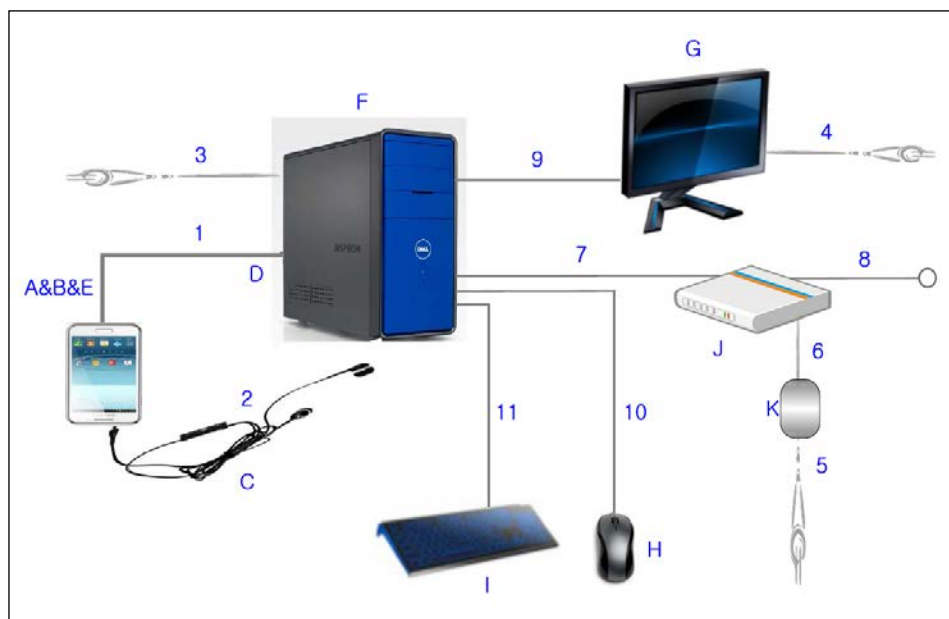
Customer selected, single unit.

4.4 Used cable description

The EUT is configured, installed, arranged and operated in a manner consistent with typical applications. Interface cables/loads/devices are connected to at least one of each type of interface port of the EUT, and where practical, each cable shall be terminated in a device typical of actual usage. The type(s) of interconnecting cables to be used and the interface port (of the EUT) to which these were connected:

No.	Connected cable	Length [m]	Shielded [Y/N]	Note
1	Data Cable	1.0	Yes	From EUT to Desk-Top Computer
2	Headset	1.6	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LCD TV Monitor
5	Power	1.8	No	For Power Supply
6	Power	1.8	No	From Router to Power Supply
7	LAN	1.5	No	From Desk-Top Computer to Router
8	LAN	1.5	No	From Router to Local Area Network
9	RGB	1.8	Yes	From Desk-Top Computer to LCD TV Monitor
10	PS/2	1.8	Yes	From Desk-Top Computer to Mouse
11	PS/2	1.8	Yes	From Desk-Top Computer to Keyboard

4.5 Test arrangement



4.6 EUT Description

The EUT is a bar type Mobile Phone which can operate on GSM850/900/1800/1900, WCDMA FDD1/2/4/5/8, LTE FDD 1/2/3/4/5/7/17/28 bands and incorporates a camera, Bluetooth, Wi-Fi, GPS, ANT+,NFC,FM Radio and MP3/MP4 player.

4.6.1 The variant models

- SM-A310M

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]	Kind of Clocks	Frequency [MHz]
CPU	1 500	-	-

4.8 Test configuration and condition

- The EUT exercise program which is the Samsung standardized emission test program for Windows was used during all EMC measurements were tested. This program was contained on the PC hard disk drive. Once loaded, the program sequentially exercises each system component in turn.
- The EUT was exercised during the testing by data read and write cycles repeated with internal /external storage devices. At the end of the test, the copied back data was compared with original.
- The EUT was connected to the PC by using USB data cable to charge.
- The system was configured for testing in a typical fashion that a customer would normally use, and was tested while in an automated non-attendant mode.

Power source for the EUT operating was supplied by CVCF made by the Pacific Power Source Corp.

- Test Voltage : AC 120 V, 60 Hz

4.9 Measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus: (According to CISPR 16-4 and UKAS Lab 34.)

4.9.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	AC Mains	3.12 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.90 dB
	Vertical	4.65 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	5.45 dB
	Vertical	5.43 dB

5. Results of individual test

5.1 Conducted disturbance

The EUT was connected to the Desk-Top Computer which was powered from one LISN for the measurements. The support equipment power cables were connected to a second LISN.

Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration. The EUT measured in accordance with the methods described in standards.

Limits for conducted disturbance at the mains ports of Class B ITE

Frequency range Limits [MHz]	Resolution Bandwidth [kHz]	Limits [dB(μV)]	
		Quasi-peak	Average
0,15 to 0,50	9	66 to 56	56 to 46
0,50 to 5	9	56	46
5 to 30	9	60	50

NOTE 1 The lower limit shall apply at the transition frequency.
NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

5.1.1 Test instrumentation

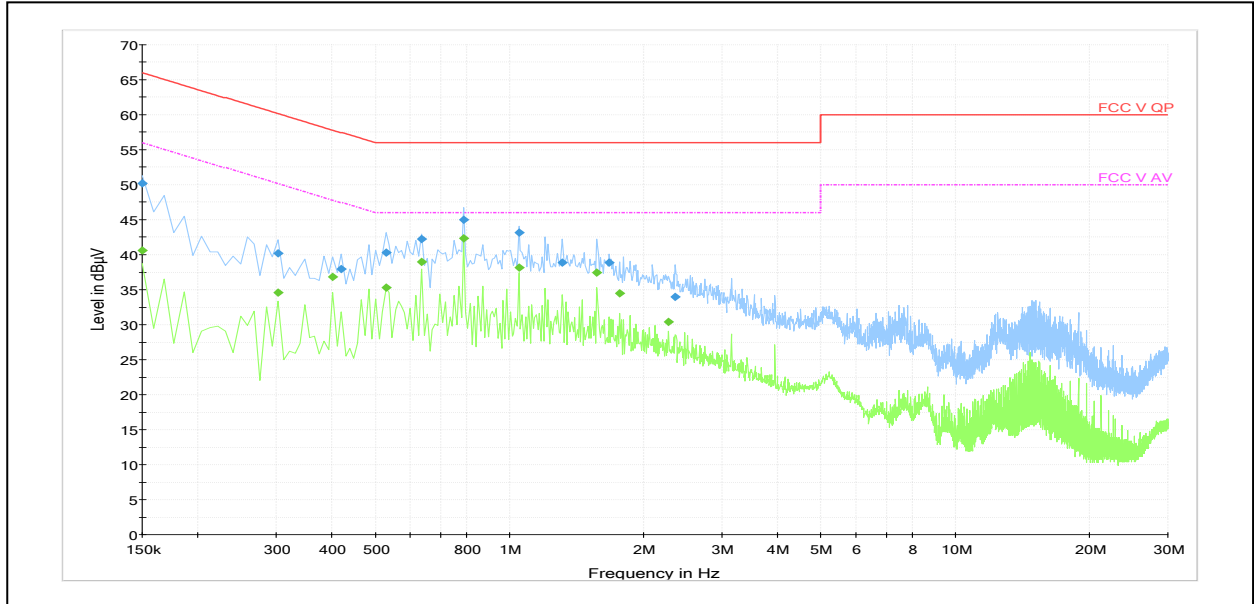
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-132	EMI Test Receiver	ESIB-26	R&S	100291	2014-12-08	12
E3I-260	Two-Line V-Network	ENV216	R&S	101366	2015-08-04	12
E3I-049	Two-Line V-Network	ESH3-Z5	R&S	100260	2015-01-12	12

5.1.2 Temperature and humidity condition

Test date	2015-11-17	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	24.7 °C	Limit (15.0 to 35.0) °C
	Relative humidity	36.6 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.4 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

5.1.3 Test results

Operating Mode 1: AC Mains



Note 1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Test Results (Quasi-Peak and CAV)

Quasi-peak final measurement results table

Frequency [MHz]	Quasi-Peak [dBµV]	Line	Factor [dB]	Margin [dB]	Limit [dBµV]
0.150	50.2	N	10.1	15.8	66.0
0.420	37.9	N	10.2	19.5	57.4
0.528	40.3	N	10.2	15.7	56.0
0.636	42.3	N	10.2	13.7	56.0
0.789	45.0	N	10.2	11.0	56.0
1.050	43.2	L1	9.9	12.8	56.0
1.311	38.9	N	10.1	17.1	56.0
1.671	38.9	N	10.0	17.1	56.0

CAV final measurement results table

Frequency [MHz]	CAV [dBµV]	Line	Factor [dB]	Margin [dB]	Limit [dBµV]
0.402	36.8	L1	10.1	11.0	47.8
0.528	35.3	N	10.2	10.7	46.0
0.636	39.0	N	10.2	7.0	46.0
0.789	42.4	N	10.2	3.6	46.0
1.050	38.2	L1	9.9	7.8	46.0
1.572	37.4	L1	9.9	8.6	46.0
1.770	34.4	L1	9.8	11.6	46.0
2.274	30.4	N	10.0	15.6	46.0

Note 2) Level (QP and/or CAV) = Meter Reading (QP and/or CAV) + Factor (LISN Insertion Loss + Cable Loss)
 Margin (QP and/or CAV) = Limit – Level (QP and/or CAV)
 QP = Quasi-Peak, CAV = CISPR-Average

5.2 Radiated disturbance

The following data lists the significant emission frequencies, measured levels, correction factors (for antenna and cables), orientation of table, polarization and height of antenna, the corrected reading, the limit, and the amount of margin.

Peak measurements were made over the changeable frequency range 30 MHz to 1 GHz at a measurement distance of 10 m for the following antenna and turntable arrangements:

Antenna Height [cm]	Antenna Polarisation	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	120	300	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using quasi-peak detector.

Peak/CISPR-Average measurements were made over the changeable frequency range 1 GHz to 40 GHz or 5th harmonics of the highest frequency in accordance with internal maximum operating frequency at a measurement distance of 3 m for the following antenna and turntable arrangements

Antenna Height [cm]	Antenna Polarisation	Resolution Bandwidth [MHz]	Video Bandwidth [MHz]	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	1	3	0 ~ 345 (Step size: 15 degrees)

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using peak and CISPR-average detectors.

Limits for radiated disturbance of Class B ITE at a measuring distance of 3 m and 10 m

Frequency range Limits [MHz]	Field Strength		
	3 m [$\mu\text{V/m}$]	3 m [dB($\mu\text{V/m}$)]	10 m [dB($\mu\text{V/m}$)]
30 to 88	100	40.0	29.5
88 to 216	150	43.5	33.0
216 to 960	200	46.0	35.5
Above 960	500	54.0	43.5

Results checked manually; and points close to the limit line were re-measured.

5.2.1 Test instrumentation

EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-273	Preamplifier	317	SONOMA	312701	2015-03-25	12
E3I-274	Preamplifier	317	SONOMA	312702	2015-03-25	12
E3I-284	Preamplifier	ESV-Z3	R&S	815111	2015-04-16	12
E3I-130	BILOG Antenna	CBL6112D	TESEQ	25513	2014-10-21	24
E3I-190	BILOG Antenna	CBL6112B	Schaffner	2804	2014-05-14	24
E3I-170	Double-Ridged Waveguide Horn Antenna	HF906	R&S	100028	2014-10-20	24
E5I-015	EMI Test Receiver	ESU-08	R&S	100481	2015-05-13	12
E3I-233	EMI Test Receiver	ESU-26	R&S	100364	2015-03-31	12
E3I-142	EMI Test Receiver	ESI-26	R&S	100019	2015-02-25	12

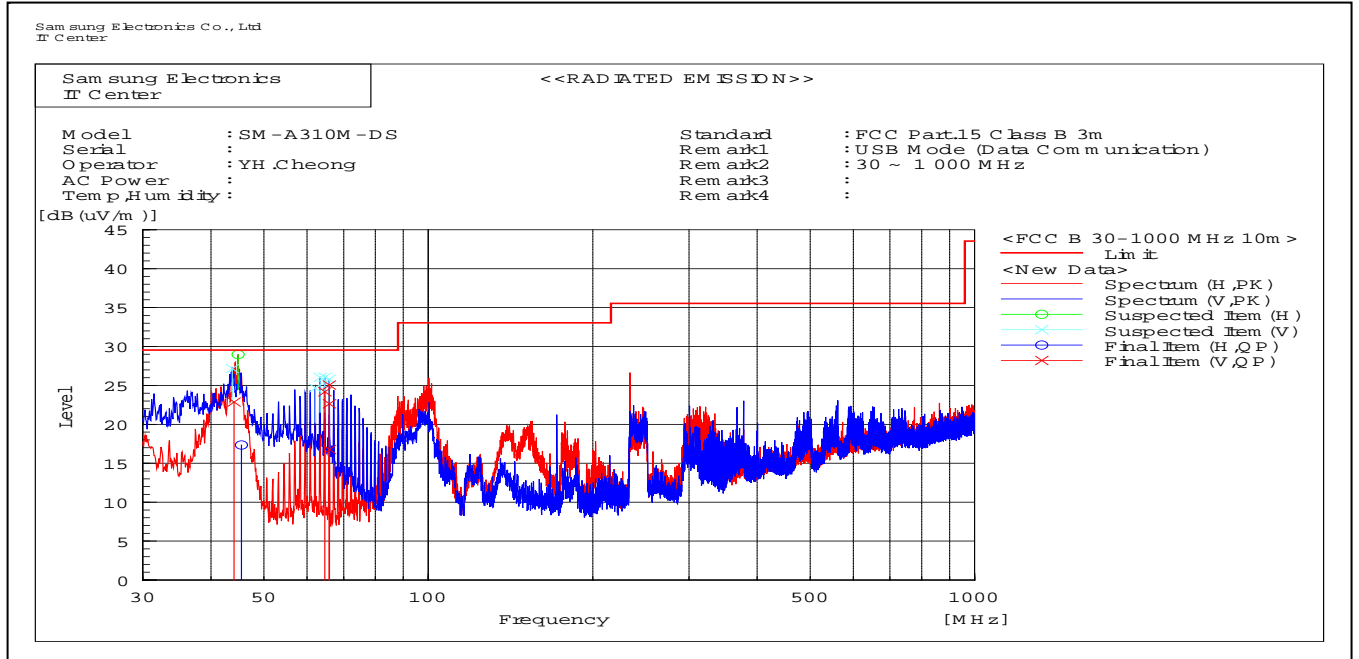
5.2.2 Temperature and humidity condition

Test date	2015-11-13	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	21.9 °C	Limit (15.0 to 35.0) °C
	Relative humidity	52.3 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.5 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

5.2.3 Test results

Operating Mode 1

- Frequencies below 1 GHz



Frequency [MHz]	(P) ¹⁾	Reading QP ²⁾ [dB(μV)]	Factor ³⁾ [dB(1/m)]	Level QP ⁴⁾ [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP ⁵⁾ [dB]	Height [cm]	Angle [deg]
44.075	V	48.5	-25.6	22.9	29.5	6.6	285.0	290.0
45.482	H	43.0	-25.6	17.4	29.5	12.1	276.0	229.0
64.641	V	54.1	-29.9	24.2	29.5	5.3	192.0	326.0
65.887	V	52.5	-29.9	22.6	29.5	6.9	109.0	306.0
65.891	V	55.0	-29.9	25.1	29.5	4.4	185.0	324.0
65.951	V	46.7	-29.9	16.8	29.5	12.7	191.0	2.0

Note1) Receiving antenna polarization : Horizontal, Vertical

Note2) Test Distance : 10 m, Antenna Height : 1 to 4 meters

Note3) (P) : Abbreviation of Antenna Polarity

Note4) Reading QP : Received raw Quasi-peak signal

Note5) Factor = Antenna factor + Cable loss – Amplifier gain

Note6) Level QP = Reading QP + Factor, Real signal Quasi-peak level

Note7) Margin QP = Limit – Level QP

QP : Abbreviation of Quasi-peak

- Frequencies above 1 GHz

