

EMC TEST REPORT

Project No.	LBE20155463	Issue No.	1
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	(Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea	
	Date of application	October 23, 2015	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMA5100	
	Kind of product	Mobile Phone	
	Model No.	SM-A5100	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	SAMSUNG ELECTRONICS HUIZHOU CO.,LTD. 516229, Chenjiang Town, HuiZhou City, Guangdong Province, China	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		October 30, 2015	
Issue date		November 20, 2015	

Test result : Complied

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

Tested by : Su Young Son



Reviewed by : Min Gon Kim



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

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1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	There are no revisions and this version is basic test report.
Issue 1	This report corrected the EUT description from Issue0.

2. Summary of test results

1.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result
☒	Conducted Disturbance (Mains port)	FCC Part 15 Subpart B / ANSI C63.4-2009 (Class B)	Complied
☒	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-A5100	-	SAMSUNG	A3LSMA5100
B	Battery (Internal)	EB-BA510ABE	-	SAMSUNG	-
C	Headset	EHS64AVFWE	-	SAMSUNG	-
D	Data Cable	ECB-DU68WE	-	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)
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4.3 Details of Sampling

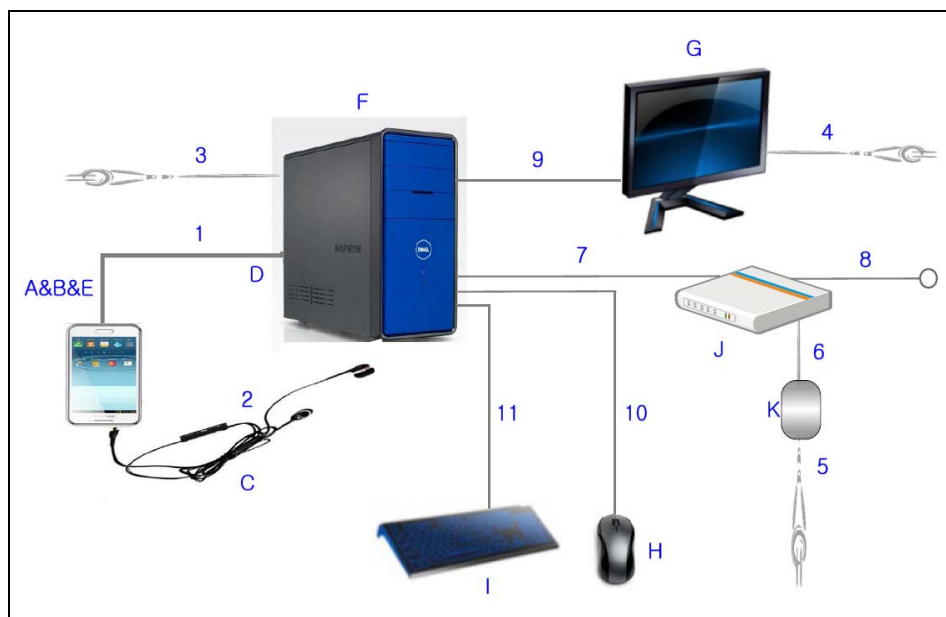
Customer selected, single unit.

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	USB	0.8	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 FDDI/II/V/VIII, LTE FDD1/3/7/8, LTE TDD38/39/40/41 bands and incorporates a camera, Bluetooth, ANT+, Wi-Fi, GPS, NFC, FM, MST, MP3 Player and MP4 Player.

4.6.1 The variant models

- None

4.7 Clock Frequencies

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 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

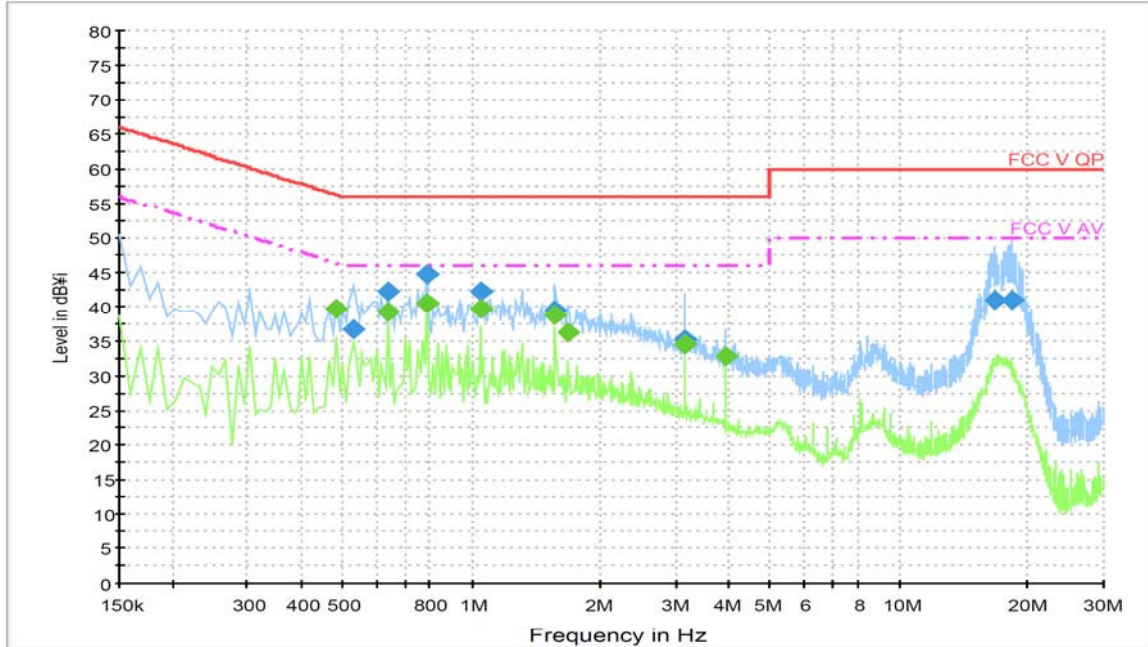
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-132	EMI Test Receiver	ESIB-26	R&S	100291	2014-12-08	12
E3I-259	Two-Line V-Network	ENV216	R&S	101369	2014-11-17	12
E3I-049	Two-Line V-Network	ESH3-Z5	R&S	100260	2015-01-12	12

5.1.2 Temperature and humidity condition

Test date	2015-10-30	Test engineer	Su Young Son
Climate condition	Ambient temperature	(22.2 ~ 23.6) °C	Limit (15.0 to 35.0) °C
	Relative humidity	(35.0 ~ 39.0) % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	(100.8 ~ 100.9) kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

5.1.3 Test results

□ Operating Mode 1: AC Mains



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.528000	36.7	15000.0	9.000	L1	9.9	19.30	56.00
0.636000	42.1	15000.0	9.000	N	9.9	13.90	56.00
0.789000	44.8	15000.0	9.000	N	9.9	11.20	56.00
1.050000	42.4	15000.0	9.000	N	9.8	13.60	56.00
1.572000	39.4	15000.0	9.000	N	9.8	16.60	56.00
3.147000	35.3	15000.0	9.000	L1	9.7	20.70	56.00
16.737000	41.1	15000.0	9.000	N	9.9	18.90	60.00
18.330000	40.9	15000.0	9.000	N	9.9	19.10	60.00

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.483000	39.7	15000.0	9.000	L1	9.9	6.60	46.30
0.636000	39.3	15000.0	9.000	N	9.9	6.70	46.00
0.789000	40.6	15000.0	9.000	N	9.9	5.40	46.00
1.050000	39.8	15000.0	9.000	N	9.8	6.20	46.00
1.572000	38.7	15000.0	9.000	L1	9.8	7.30	46.00
1.689000	36.3	15000.0	9.000	N	9.7	9.70	46.00
3.147000	34.5	15000.0	9.000	L1	9.7	11.50	46.00
3.939000	32.8	15000.0	9.000	N	9.8	13.20	46.00

Note1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

'Final Result 1' is Quasi-peak final measurement results table and 'Final Result 2' is CISPR-Average final measurement results table.

Note2) Level (Quasi-Peak and/or CAverage) = Meter Reading + Factor(Corr.)

Note3) Line = Polarity of input power (Live or Neutral)

N : Abbreviation of Neutral Polarity, L1 : Abbreviation of Live Polarity,

Note4) Factor = LISN Insertion Loss + Cable Loss

Note5) Margin = Limit – Level (Quasi-Peak and/or CAverage)

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 detectors.

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 [$\text{dB}(\mu\text{V/m})$]	10 m [$\text{dB}(\mu\text{V/m})$]
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-213	Preamplifier	317	SONOMA	282424	2014-11-10	12
E3I-214	Preamplifier	317	SONOMA	282425	2014-11-10	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

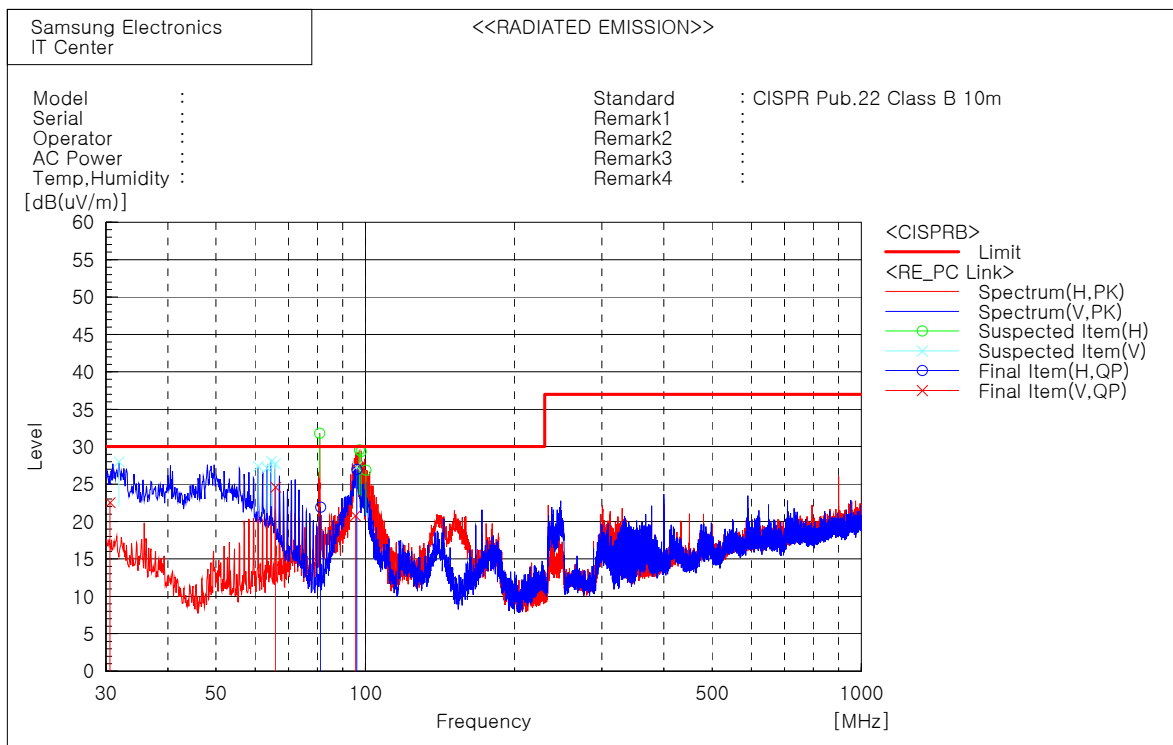
Test date	2015-10-30	Test engineer	Su Young Son
Climate condition	Ambient temperature	(22.0 ~ 23.0) °C	Limit (15.0 to 35.0) °C
	Relative humidity	(38.0 ~ 40.0) % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	(101.0 ~ 101.2) kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

5.2.3 Test results

☐ Operating Mode 1

- Frequencies below 1 GHz

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Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	System
1	81.261	H	50.3	-28.4	21.9	30.0	8.1	400.0	290.0	1
2	65.930	V	54.5	-29.9	24.6	30.0	5.4	189.0	319.0	2
3	96.091	H	52.4	-25.5	26.9	30.0	3.1	323.0	112.0	1
4	30.586	V	40.8	-18.3	22.5	30.0	7.5	100.0	310.0	2
5	95.411	V	46.6	-25.8	20.8	30.0	9.2	304.0	357.0	2

Note1) (P) : Abbreviation of Antenna Polarity

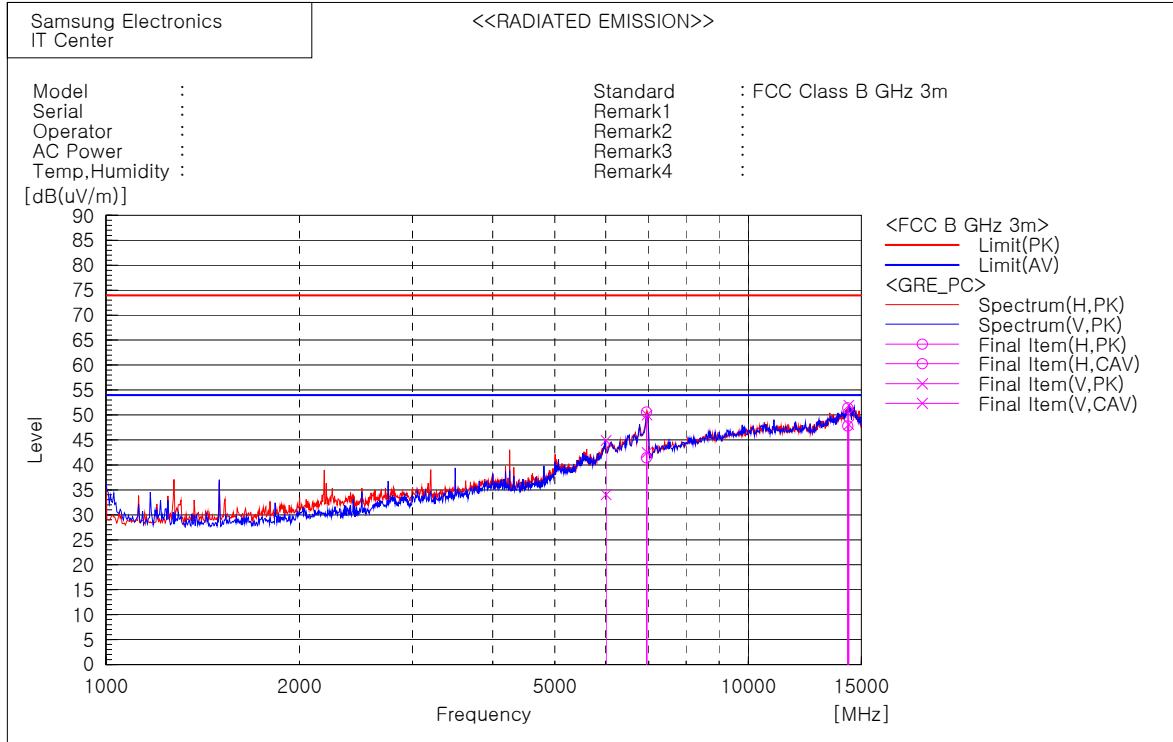
Note2) Reading QP : Received raw Quasi-peak signal

Note3) c.f = Factor = Antenna factor + Cable loss - Amplifier gain

Note4) Result QP = Level QP = Reading QP + Factor, Real signal Quasi-peak level

Note5) Margin QP = Limit - Level QP

QP : Abbreviation of Quasi-peak

- Frequencies above 1 GHzSamsung Electronics Co., Ltd
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Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c.f	Result PK [dB(μV/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	6001.052	V	43.9	33.0	1.0	44.9	34.0	74.0	54.0	29.1	20.0	118.0	91.0
2	6937.876	H	47.2	38.0	3.4	50.6	41.4	74.0	54.0	23.4	12.6	100.0	260.0
3	6955.912	V	46.5	39.0	3.5	50.0	42.5	74.0	54.0	24.0	11.5	100.0	340.0
4	14278.558	H	40.6	37.0	10.8	51.4	47.8	74.0	54.0	22.6	6.2	100.0	51.0
5	14332.666	V	41.1	37.2	10.9	52.0	48.1	74.0	54.0	22.0	5.9	100.0	93.0

Note1) (P) : Abbreviation of Antenna Polarity

Note2) Reading PK : Received raw Peak signal, Reading CAV : Received raw CISPR-Average signal

Note3) c.f = Factor = Antenna factor + Cable loss - Amplifier gain

Note4) Result (PK and/or CAV) = Reading (PK and/or CAV) + Factor, Real signal (PK and/or CAV) level

Note5) Margin (PK and/or CAV) = Limit - Level (PK and/or CAV)

QP : Abbreviation of Peak, CAV : Abbreviation of CISPR-Average