

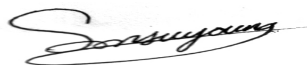
# EMC TEST REPORT

<b>Project No.</b>	LBE20132117	<b>Issue No.</b>	0
<b>Applicant</b>	<b>Name of organization</b>	Samsung Electronics Co., Ltd.	
	<b>Address</b>	(Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	<b>Date of application</b>	April 5, 2013	
<b>EUT</b>	<b>Type of device</b>	<input checked="" type="checkbox"/> Class B personal computers and peripherals <input type="checkbox"/> All other devices	
	<b>Equipment authorization</b>	<input type="checkbox"/> Declaration of Conformity <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Verification	
	<b>FCC ID</b>	A3LSHVE310	
	<b>Kind of product</b>	Mobile Phone	
	<b>Model No.</b>	SHV-E310L	
	<b>Variant Model No.</b>	Refer to clause 4.6	
	<b>Manufacturer</b>	<b>F1</b> : SAMSUNG ELECTRONICS CO., LTD. 94-1, Imsu-dong, Gumi-si, Gyengsangbuk-do, 730-722, Republic of Korea <b>F2</b> : SAMSUNG ELECTRONICS HUIZHOU CO.,LTD. 516229, Chenjiang Town, HuiZhou City, Guangdong Province, China	
<b>Applied Standards</b>		FCC Part 15, Subpart B, Class B / ANSI C63.4-2003	
<b>Test Period</b>		April 5, 2013	
<b>Issue date</b>		April 10, 2013	

**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** : Tae-Young Jang



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# 1. Report Information

## 1.1 Revision history

No.	Revised detailed information
Issue 0	- LBE20132117 (SAMSUNG)

# 2. Summary of test results

## 1.1 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 C63.4-2003 (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	SHV-E310L	-	SAMSUNG	A3LSHVE310
B	Battery	B700BK	AAaD320YS/2-B	SDI	-
C	Headset	EO-HS3303WE	-	Yongbo Engineering	-
D	Data Cable	ECB-DU4EWE	RT1CA20KS E	RF Tech	-
E	Micro SD Card	16GB	-	SANDISK	-
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD Monitor	E173EPb	CN-0C5385-46633-55I-56FU	Dell	DoC
H	Mouse	N3+Optical	K034729902	HP	DoC
I	Keyboard	SDM8500P	8M000131	SAMSUNG	DoC
J	Gigabit Switch 8	3CGSU08	AB/9XRQAC0024825	3COM	DoC
K	Power Supply	PW150	KA1203N03	AULT	DoC

### 4.2 EUT operating mode

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

<b>Operating Mode 1</b>	USB Mode (Data Communication)
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### 4.3 Details of Sampling

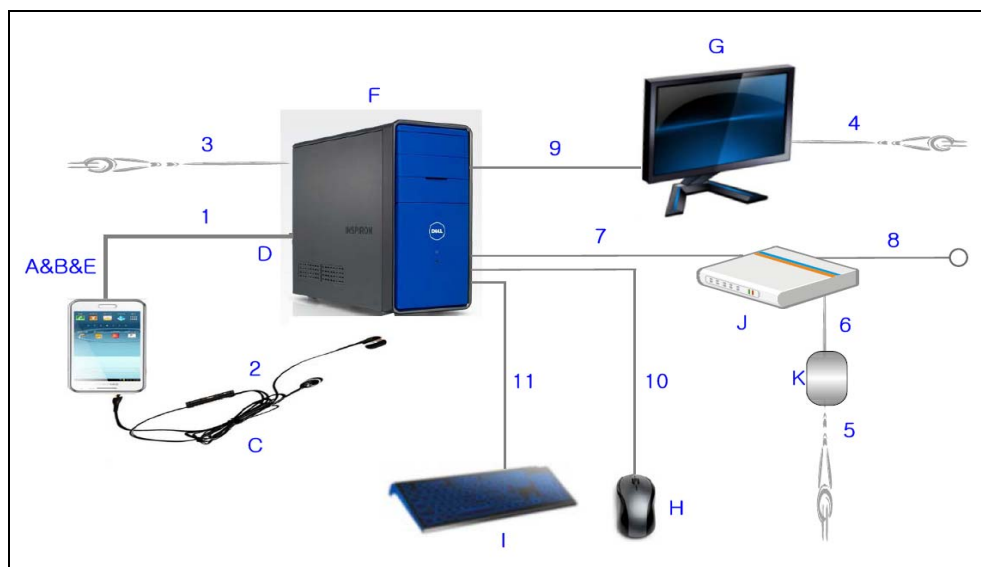
Customer selected, single unit.

#### 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	Data Cable	1.5	Y	From EUT to Desk-Top Computer
2	Headset	1.6	N	For EUT
3	Power	1.8	N	For Desk-Top Computer
4	Power	1.8	N	For LCD TV Monitor
5	Power	1.8	N	From Gigabit Switch 8 to Power Supply
6	Power	1.8	N	For Power Supply
7	LAN	1.5	N	From Desk-Top Computer to Gigabit Switch 8
8	LAN	1.5	N	From Gigabit Switch 8 to Local Area Network
9	RGB	1.8	Y	From Desk-Top Computer to LCD TV Monitor
10	PS/2	1.8	Y	From Desk-Top Computer to Mouse
11	PS/2	1.8	Y	From Desk-Top Computer to Keyboard

#### 4.5 Test arrangement



## 4.6 EUT Description

4.6.1 The following features describe EUT represented by this report:

Item	Specification	
Operating Temperature (°C)	-20 ~ +60	
Operating Humidity (%)	0 ~ 95	
Frequency Range	PCS 1 900	TX : 1 850.2 ~ 1 909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
	WCDMA FDD2	TX : 1 852.4 ~ 1 907.6 MHz RX : 1 932.4 ~ 1 987.6 MHz
	WCDMA FDD5	TX : 826.4 ~ 846.6 MHz RX : 871.4 ~ 891.6 MHz
	LTE FDD5	TX : 824 ~ 848.9 MHz RX : 869 ~ 893.9 MHz

4.6.2 The variant models

- None

## 4.7 Clock Frequencies

Kind of Clocks	Frequency [ MHz ]	Kind of Clocks	Frequency [ MHz ]
CPU	1 700	USB 3.0	480

#### 4.8 Test configuration and condition

- The EUT exercise program which is the Samsung standardized emission test program for Windows was used while 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	$\pm 3.31$ dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	$\pm 4.59$ dB
	Vertical	$\pm 4.75$ dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	$\pm 4.52$ dB
	Vertical	$\pm 4.51$ 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

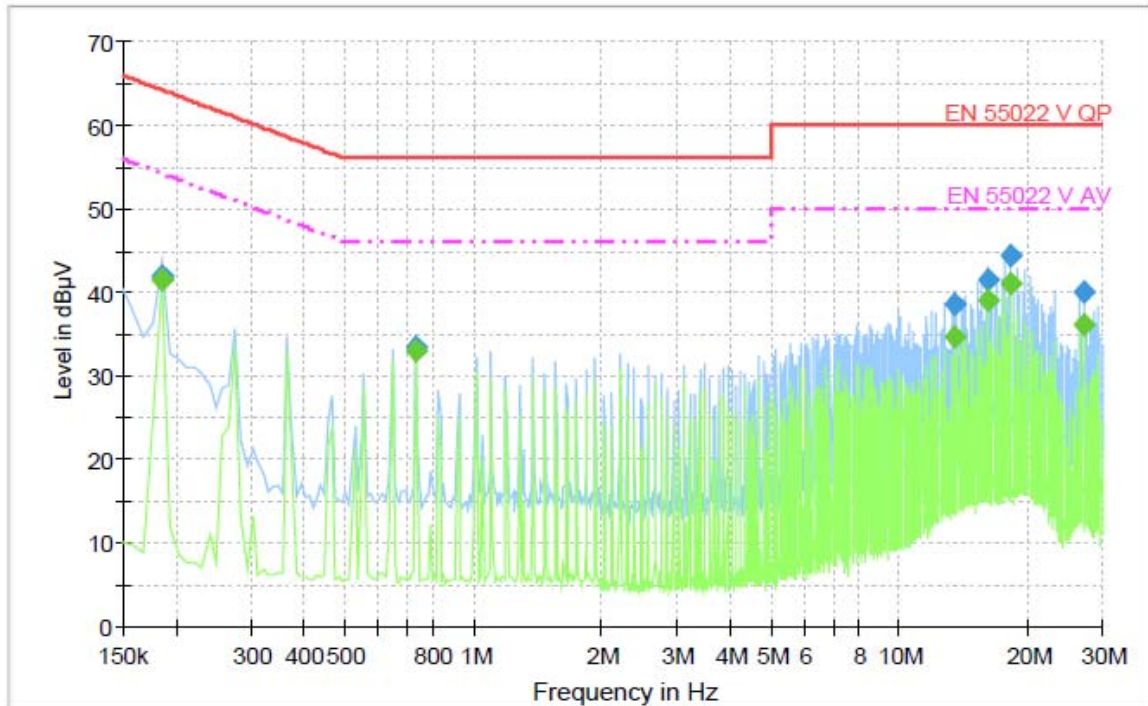
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-266	EMI Test Receiver	ESCI3	R&S	100086	2012-11-27	12
E3I-259	LISN	ENV216	R&S	101369	2012-12-07	12
E3I-260	LISN	ENV216	R&S	101366	2012-09-11	12

#### 5.1.2 Temperature and humidity condition

<b>Test date</b>	2013-04-05	<b>Test engineer</b>	Su-Young Son
<b>Climate condition</b>	Ambient temperature	21.3 °C	Limit (15.0 to 35.0) °C
	Relative humidity	34.6 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.1 kPa	Limit (86.0 to 106.0) kPa
<b>Test place</b>	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)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186000	41.9	15000.0	9.000	On	N	10.1	22.40	64.20
0.735000	33.4	15000.0	9.000	On	L1	9.9	22.60	56.00
13.479000	38.5	15000.0	9.000	On	N	9.9	21.50	60.00
16.170000	41.6	15000.0	9.000	On	N	9.9	18.40	60.00
18.366000	44.3	15000.0	9.000	On	N	10.0	15.70	60.00
27.159000	40.0	15000.0	9.000	On	N	10.1	20.00	60.00

#### Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186000	41.5	15000.0	9.000	On	N	10.1	12.70	54.20
0.735000	33.0	15000.0	9.000	On	L1	9.9	13.00	46.00
13.479000	34.7	15000.0	9.000	On	N	9.9	15.30	50.00
16.170000	38.9	15000.0	9.000	On	N	9.9	11.10	50.00
18.366000	41.0	15000.0	9.000	On	N	10.0	9.00	50.00
27.159000	36.1	15000.0	9.000	On	N	10.1	13.90	50.00

Note 1) 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 Average final measurement results table.

Note 2) Level (QP and/or AV) = Meter Reading (QP and/or AV) + Corr. (LISN Insertion Loss + Cable Loss)

Margin (QP and/or AV) = Limit – Level (QP and/or AV)

QP = Quasi-Peak, AV = 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 detectors.

Peak/RMS-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	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using peak and RMS-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-003	BILOG Antenna	CBL6112B	Schaffner	2805	2012-04-19	24
E3I-190	BILOG Antenna	CBL6112B	Schaffner	2804	2011-06-22	24
E3I-213	Preamplifier	317	SONOMA	282424	2012-11-14	12
E3I-214	Preamplifier	317	SONOMA	282425	2012-11-14	12
E3I-170	Horn Antenna	HF906	R&S	100028	2012-08-13	24
E3I-233	EMI TEST RECEIVER	ESU-26	R&S	100364	2012-10-26	12
E4I-014	EMI TEST RECEIVER	ESU-08	R&S	100084	2012-10-18	12

## 5.2.2 Temperature and humidity condition

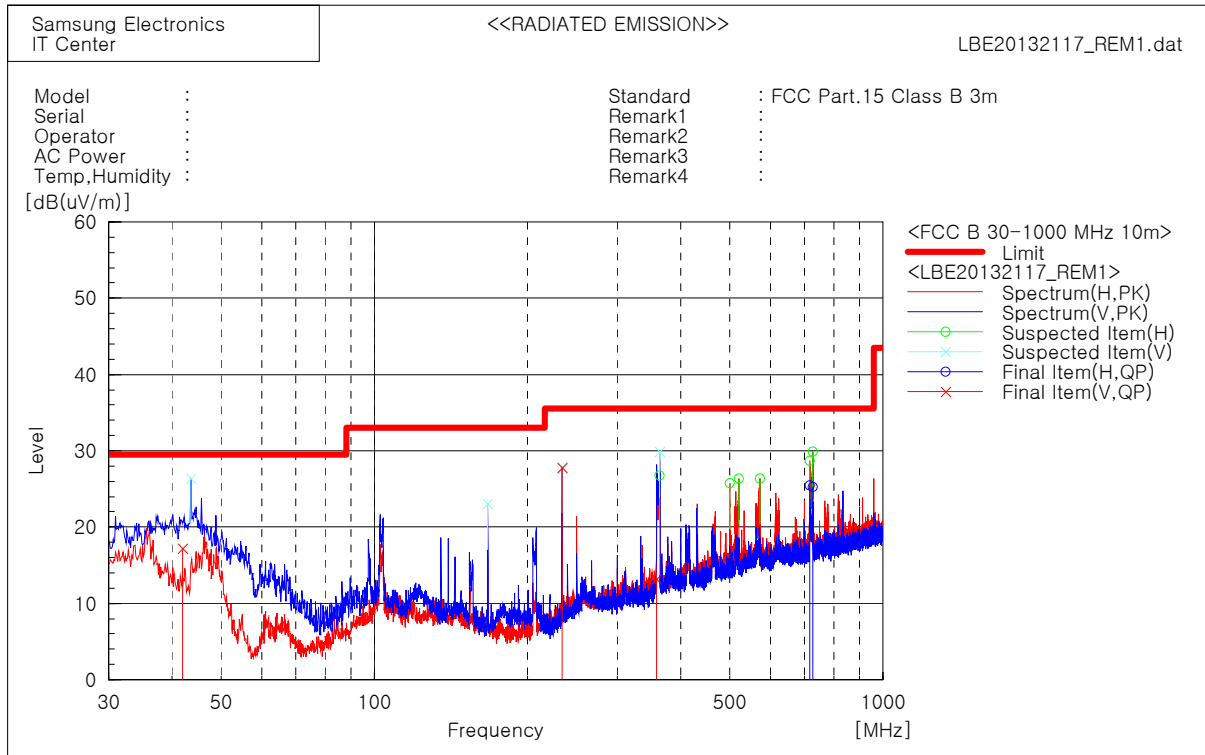
<b>Test date</b>	2013-04-05	<b>Test engineer</b>	Su-Young Son
<b>Climate condition</b>	Ambient temperature	21.5 °C	Limit (15.0 to 35.0) °C
	Relative humidity	38.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.1 kPa	Limit (86.0 to 106.0) kPa
<b>Test place</b>	Semi-Anechoic Chamber (SAC4)		

### 5.2.3 Test results

Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz

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Final Result

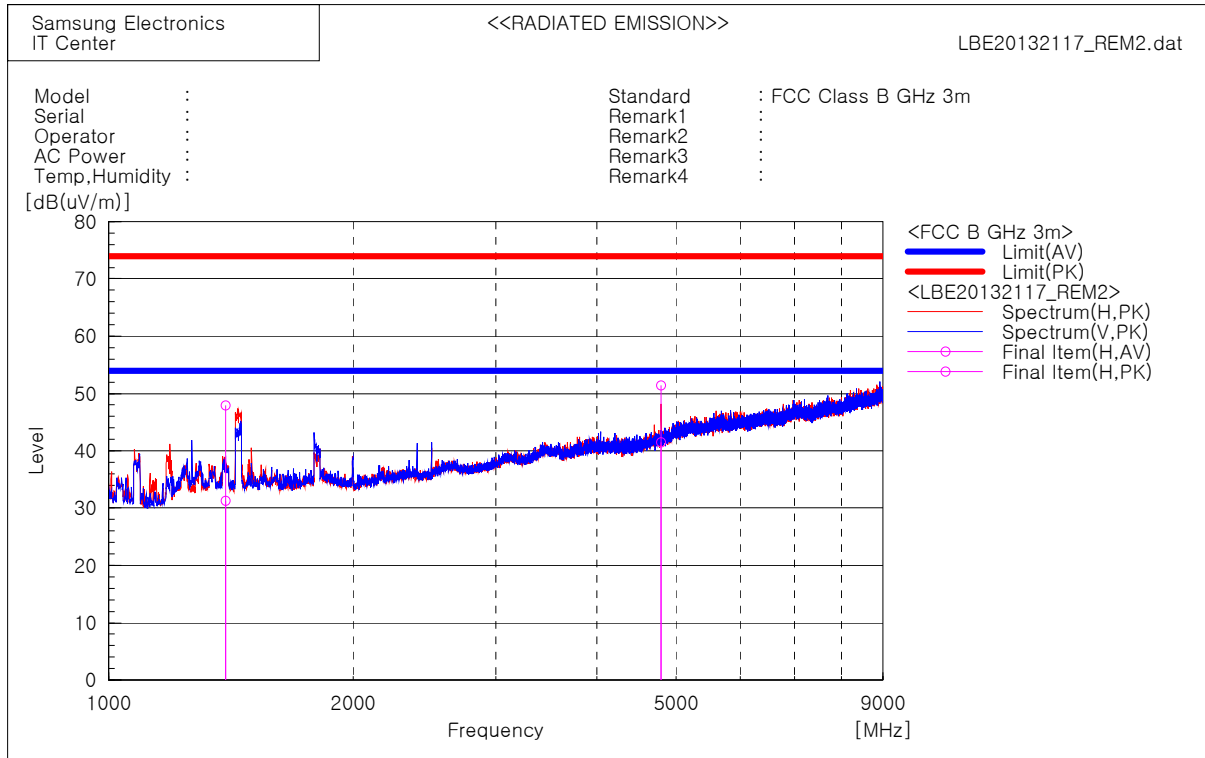
No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	System
1	41.896	V	39.6	-22.4	17.2	29.5	12.3	298.0	274.0	2
2	233.821	V	52.0	-24.2	27.8	35.5	7.7	100.0	307.0	2
3	358.652	V	32.3	-19.1	13.2	35.5	22.3	100.0	136.0	2
4	717.223	H	37.0	-11.5	25.5	35.5	10.0	100.0	289.0	1
5	728.341	H	36.7	-11.4	25.3	35.5	10.2	301.0	281.0	1

Note) Receiving antenna polarization : Horizontal, Vertical  
 Test Distance : 10 m, Antenna Height : 1 to 4 meters  
 Level (QP) = Reading (QP) + c.f (Antenna Factor + Cable Loss - Amp. Gain)  
 Margin (QP) = Limit - Level (QP)  
 QP = Quasi-Peak

Operating Mode 1

- Frequency range: 1 000 ~ 9 000 MHz

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Final Result

--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	1392.221	41.1	-9.8	31.3	54.0	22.7
2	4799.800	38.6	2.8	41.4	54.0	12.6

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	1392.221	57.2	-9.8	47.9	74.0	26.1
2	4799.800	48.6	2.8	51.4	74.0	22.6

Note ) Receiving antenna polarization : Horizontal, Vertical  
 Test Distance : 3 m, Antenna Height : 1 to 4 meters  
 Level (PK and/or AV) = Reading (PK and/or AV) + Corr. (Antenna Factor + Cable Loss - Amp. Gain)  
 Margin (PK and/or AV) = Limit - Level (PK and/or AV)  
 PK = Peak, AV = Average