EMC TEST REPORT

Project No.	LBE20124768	**Issue No.**	0
Applicant	**Name of organization**	Samsung Electronics Co., Ltd.	
	Address	(Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	Date of application	September 26, 2012	
EUT	**Type of device**	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSWDSC02E	
	Kind of product	Mobile Phone	
	Model No.	SC-02E	
	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	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2003	
Test Period		September 27, 2012 ~ October 2, 2012	
Issue date		October 2, 2012	

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 : Jong-Sup Jeong	**Reviewed by** : Tae-Young Jang

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.

SAMSUNG

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1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	- LBE20124768 (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
☒	Conducted Disturbance (Mains port)	FCC Part 15 Subpart B / ANSI C63.4-2003 (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.

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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	SC-02E	R31C805E65K	SAMSUNG	A3LSWDSC02E
B	Battery	SGH-N025	NAaC822AS/2-B	SAMSUNG	-
C	Headset	EHS64AVFWE	-	SAMSUNG	-
D	Data Cable	ECB-DU4ABE	-	SAMSUNG	-
E	HDTV Adapter	EPL-3FHUBE	-	SAMSUNG	-
F	microSD Card	16GB	-	SANDISK	-
G	Travel Adapter	ETA-U90BBB	SC1C727AS/B-E	SAMSUNG	-
H	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
I	LED TV Monitor	UN22C4000PD	ZOBY31KZ700003F	SAMSUNG	DoC
J	Mouse	N3+Optical	K034729902	HP	DoC
K	Keyboard	SDM8500P	8M000131	SAMSUNG	DoC
L	Gigabit Switch 8	3CGSU08	AB/9XRQAC0024825	3COM	DoC
M	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:

Operating Mode 1	USB Mode (Data Communication)

4.3 Details of Sampling

Customer selected, single unit.

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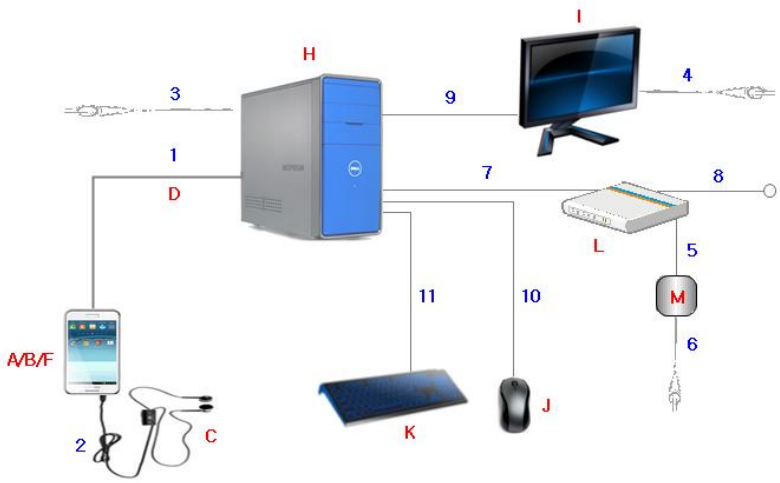
4.4 Used cable description

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 / Travel Adapter	1.0	Yes	From EUT to Desk-Top Computer, From EUT to Travel Adapter, From Travel Adapter to HDTV Adapter
2	Headset	1.3	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LED TV Monitor
5	Power	1.8	No	From Gigabit Switch 8 to Power Supply
6	Power	1.8	No	For Power Supply
7	LAN	1.5	No	From Desk-Top Computer to Gigabit Switch 8
8	LAN	1.5	No	From Gigabit Switch 8 to Local Area Network
9	RGB	1.8	Yes	From Desk-Top Computer to LED 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
12	MHL	0.2	Yes	From EUT to HDMI Cable
13	HDMI	1.5	Yes	From HDTV Adapter to LED TV Monitor

4.5 Test arrangement



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4.6 EUT Description

4.6.1 The following features describe EUT represented by this report:

Item	Specification	
Frequency Range	GSM850	TX : 824.2 ~ 848.8 MHz RX : 869.2 ~ 893.8 MHz
	GSM1900	TX : 1 850.2 ~ 1 909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
	WCDMA FDD5	TX : 824 ~ 849 MHz RX : 869 ~ 894 MHz
Operating Temperature (℃)	-20 ~ +60	
Operating Humidity (%)	0 ~ 95	

4.6.2 The variant models
- None

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]	Kind of Clocks	Frequency [MHz]
CPU	1 600	USB 2.0	24
MHL	74.25		

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

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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	±3.24 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	±4.59 dB
	Vertical	±4.75 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	±4.18 dB
	Vertical	±4.15 dB

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5. Results of individual test

5.1 Conducted disturbance

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)
E4I-093	Test Receiver	ESCI	R&S	100086	2011-11-11	12
E3I-050	LISN	ESH3-Z5	R&S	100263	2011-10-12	12
E3I-259	LISN	ENV216	R&S	101369	2011-10-11	12

5.1.2 Temperature and humidity condition

Test date	2012-09-27	**Test engineer**	Jong-Sup Jeong
Climate condition	Ambient temperature	23.9 ℃	Limit (15.0 to 35.0) ℃
	Relative humidity	37.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.1 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

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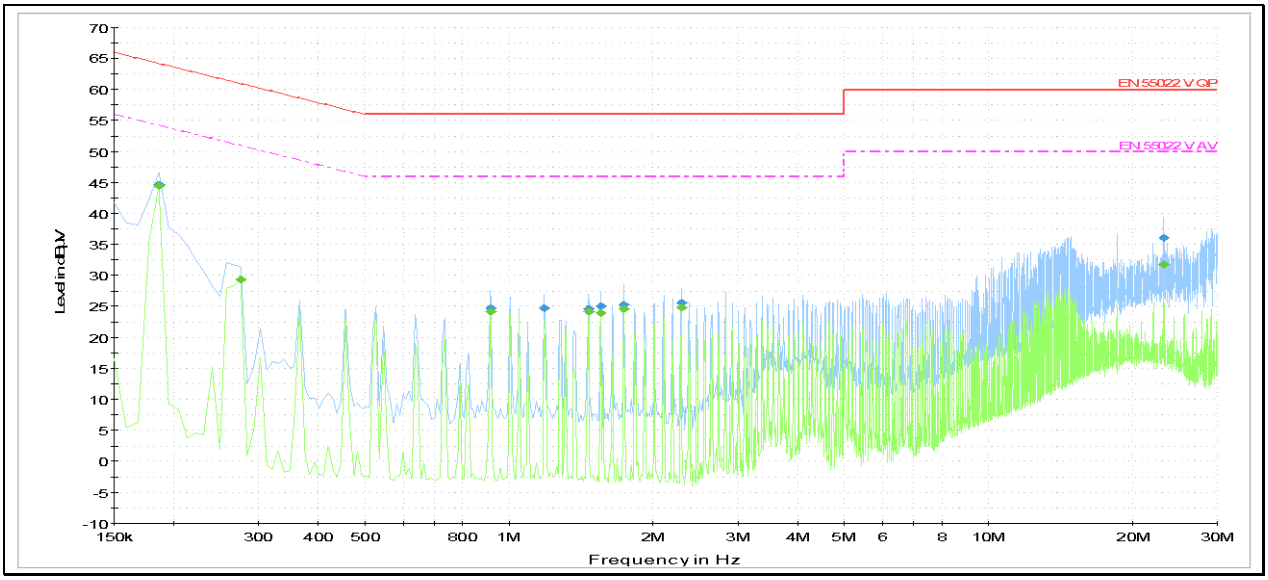
5.1.3 Test results

☐ 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.

Quasi-peak final measurement results table:

Frequency (MHz)	Level (dBµV)	Corr. (dB)	Limit (dBµV)	Margin (dB)	Line
0.186	44.6	10.1	64.2	19.6	L1
0.915	24.7	9.9	56.0	31.3	L1
1.185	24.7	9.8	56.0	31.3	L1
1.464	24.6	9.8	56.0	31.4	L1
1.554	25.0	9.8	56.0	31.0	L1
1.734	25.3	9.8	56.0	30.7	L1
2.283	25.6	9.8	56.0	30.4	L1
23.235	36.1	9.8	60.0	23.9	L1

Average final measurement results table:

Frequency (MHz)	Level (dBµV)	Corr. (dB)	Limit (dBµV)	Margin (dB)	Line
0.186	44.4	10.1	54.2	9.8	L1
0.276	29.4	10.0	50.9	21.5	N
0.915	24.2	9.9	46.0	21.8	L1
1.464	24.1	9.8	46.0	21.9	L1
1.554	24.0	9.8	46.0	22.0	L1
1.734	24.6	9.8	46.0	21.4	L1
2.283	24.8	9.8	46.0	21.2	L1
23.244	31.7	9.8	50.0	18.3	L1

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

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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/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 (PK / AV)	3 (PK) 10 Hz (AV)	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position.
Final measurements were made using peak and 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 [μV/m]	3 m [dB(μV/m)]	10 m [dB(μV/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.

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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	2011-12-06	12
E3I-214	Preamplifier	317	Sonoma	282425	2011-12-06	12
E3I-228	EMI Test Receiver	ESU8	R&S	100084	2011-10-10	12
E3I-231	Horn Antenna	3115	ETS Lindgren	00101620	2012-01-12	24
E3I-233	EMI Test Receiver	ESU26	R&S	100364	2011-10-24	12

5.2.2 Temperature and humidity condition

Test date	2012-10-02	**Test engineer**	Jong-Sup Jeong
Climate condition	Ambient temperature	23.5 ℃	Limit (15.0 to 35.0) ℃
	Relative humidity	36.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.8 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

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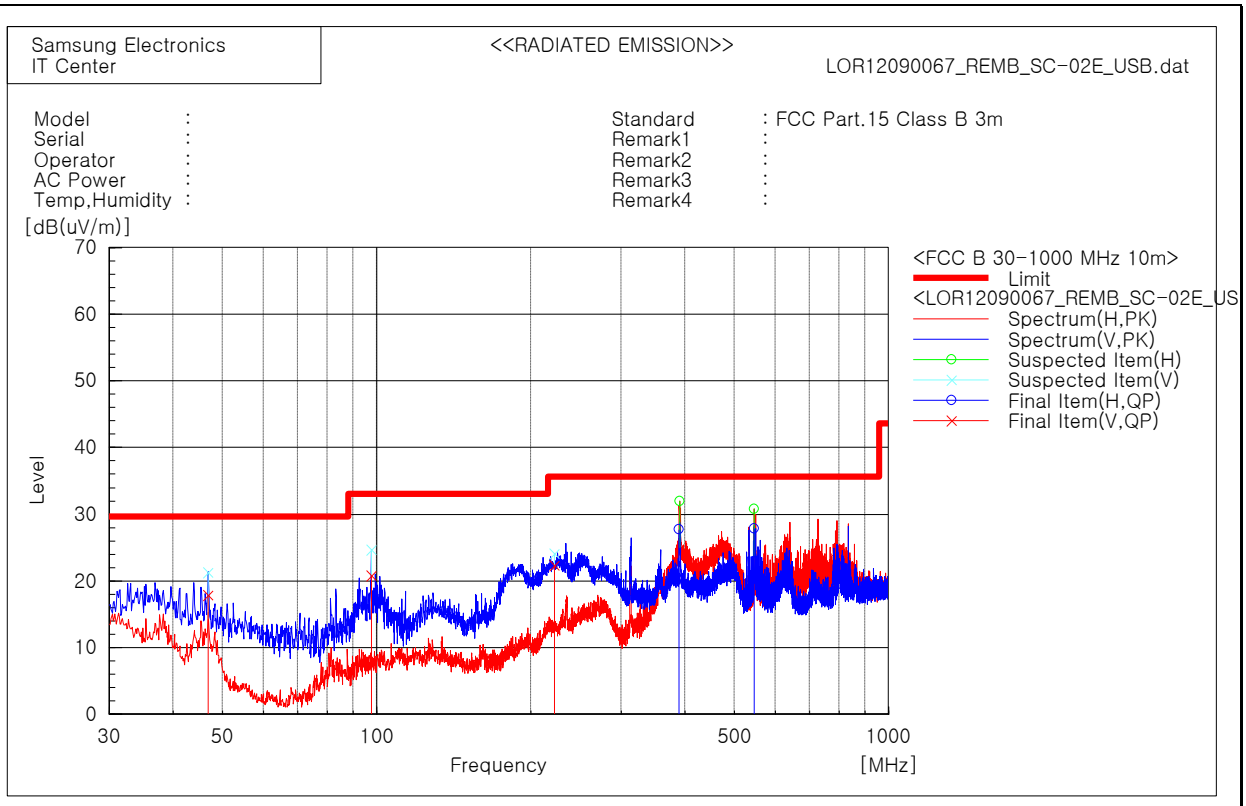
5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz



Final Result

--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]	System
1	389.959	45.3	-17.6	27.7	35.5	7.8	131.0	350.0	1
2	545.970	41.1	-13.3	27.8	35.5	7.7	119.0	1.0	1

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]	System
1	46.854	45.5	-27.7	17.8	29.5	11.7	108.0	49.0	2
2	97.511	46.9	-26.1	20.8	33.0	12.2	127.0	62.0	2
3	222.213	48.3	-26.0	22.3	35.5	13.2	103.0	336.0	2

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

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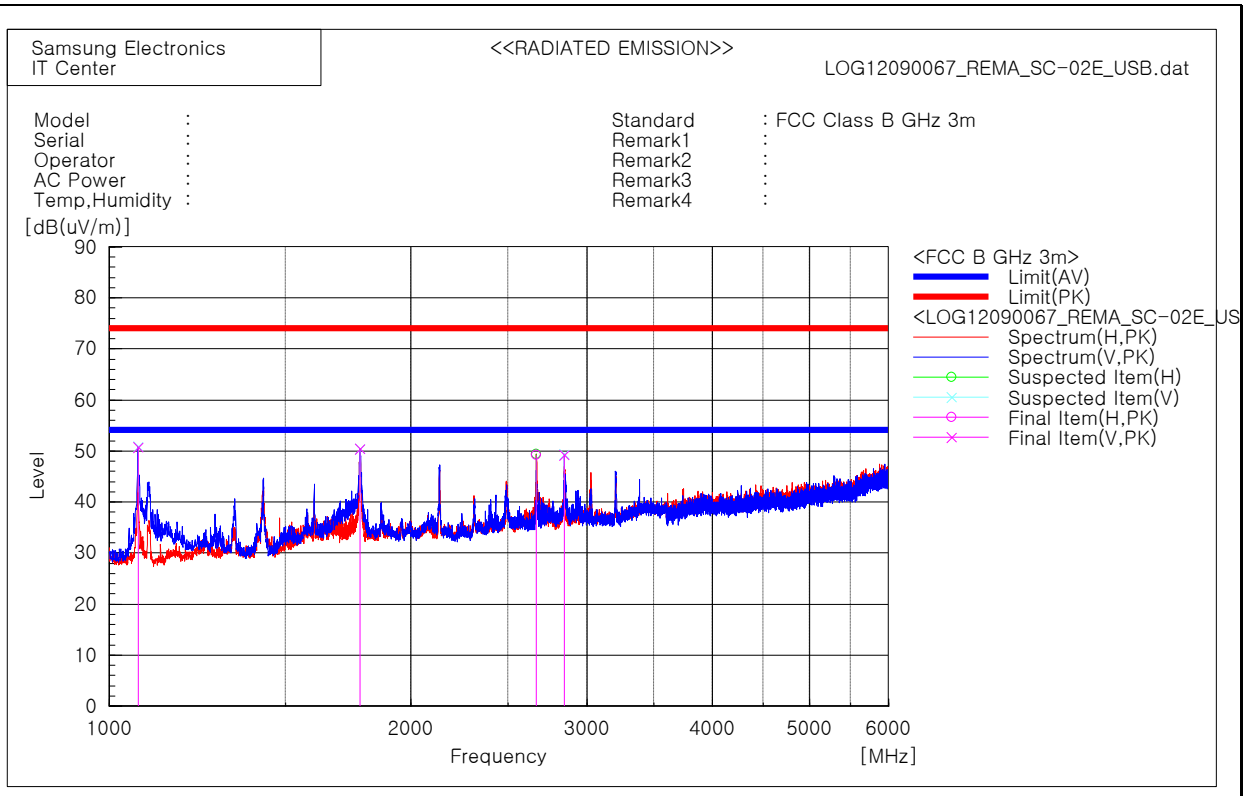
5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 1 000 ~ 8 000 MHz



Final Result

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1	2670.000	53.8	-4.5	49.3	74.0	24.7	100.0	77.0

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1	1068.125	63.4	-12.6	50.8	74.0	23.2	100.0	7.0
2	1779.375	57.9	-7.5	50.4	74.0	23.6	100.0	5.0
3	2847.500	53.1	-3.8	49.3	74.0	24.7	100.0	22.0

Note 1) Representative operating modes were selected by customer and any emissions that do not exceed average limit were not tested with average detector mode. There were no emissions from 6 GHz to 8 GHz.

Note 2) 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

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