

EMC TEST REPORT

Project No.	LBE20133413	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	June 10, 2013	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMV100T	
	Kind of product	Mobile Hotspot and External Battery Pack	
	Model No.	SM-V100T	
	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 HUIZHOU CO.,LTD. 516229, Chenjiang Town, HuiZhou City, Guangdong Province, China	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2003	
Test Period		June 17, 2013 ~ June 24, 2013	
Issue date		June 26, 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 : Jong-Sup Jeong



Reviewed by : Tae-Young Jang



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1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	- LBE20133413 (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.

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 Hotspot and External Battery Pack	SM-V100T	R31D5260EQK	SAMSUNG	A3LSMV100T
B	Battery	EB595675LA	AA1D310nS/2-B	SAMSUNG	-
C	Data Cable	ECB-DU4EWE	RT1D509ASE	SAMSUNG	-
D	microSD Card	8GB	-	TAIWAN	-
E	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
F	LCD Monitor	CF19MS	CF19H1LS700048Y	SAMSUNG	DoC
G	Mouse	N3+Optical	K034729902	HP	DoC
H	Keyboard	SDM8500P	8M000131	SAMSUNG	DoC
I	Gigabit Switch 8	3CGSU08	AB/9XRQAC0024825	3COM	DoC
J	Power Supply	PW150	KA1203N03	AULT	DoC
K	Mobile Phone	GT-I9128I	-	SAMSUNG	A3LGTI9128I

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) + Mobile Phone Charging
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4.3 Details of Sampling

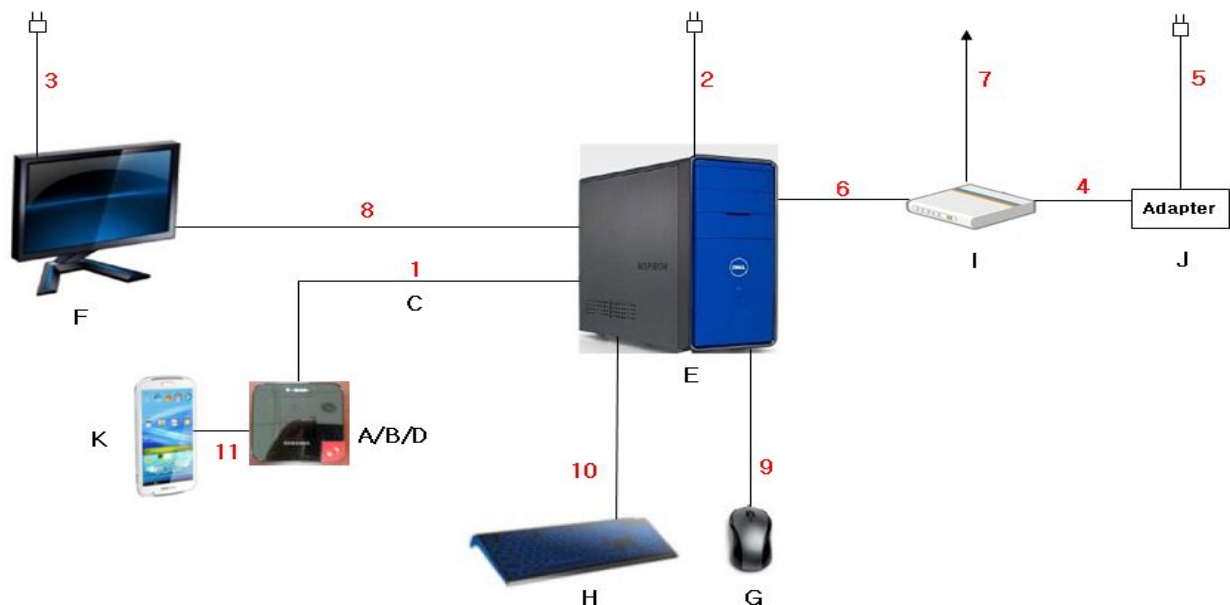
Customer selected, single unit.

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	Yes	From EUT to Desk-Top Computer,
2	Power	1.8	No	For Desk-Top Computer
3	Power	1.8	No	For LCD Monitor
4	Power	1.8	No	From Gigabit Switch 8 to Power Supply
5	Power	1.8	No	For Power Supply
6	LAN	1.5	No	From Desk-Top Computer to Gigabit Switch 8
7	LAN	1.5	No	From Gigabit Switch 8 to Local Area Network
8	RGB	1.8	Yes	From Desk-Top Computer to LCD Monitor
9	PS/2	1.8	Yes	From Desk-Top Computer to Mouse
10	PS/2	1.8	Yes	From Desk-Top Computer to Keyboard
11	Data Cable	0.1	Yes	From EUT to Mobile Phone,

4.5 Test arrangement



4.6 EUT Description

4.6.1 The following features describe EUT represented by this report:

Item	Specification	
Frequency Range	GSM 850	TX : 824.2 ~ 848.8 MHz RX : 869.2 ~ 893.8 MHz
	GSM 1 900	TX : 1 850.2 ~ 1 909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
	LTE FDD4	TX : 1 710 ~ 1 755 MHz RX : 2 110 ~ 2 155 MHz
	LTE FDD17	TX : 704 ~ 716 MHz RX : 734 ~ 746 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]
CPU	1 200

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	± 3.31 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	± 4.69 dB
	Vertical	± 4.83 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	± 4.52 dB
	Vertical	± 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

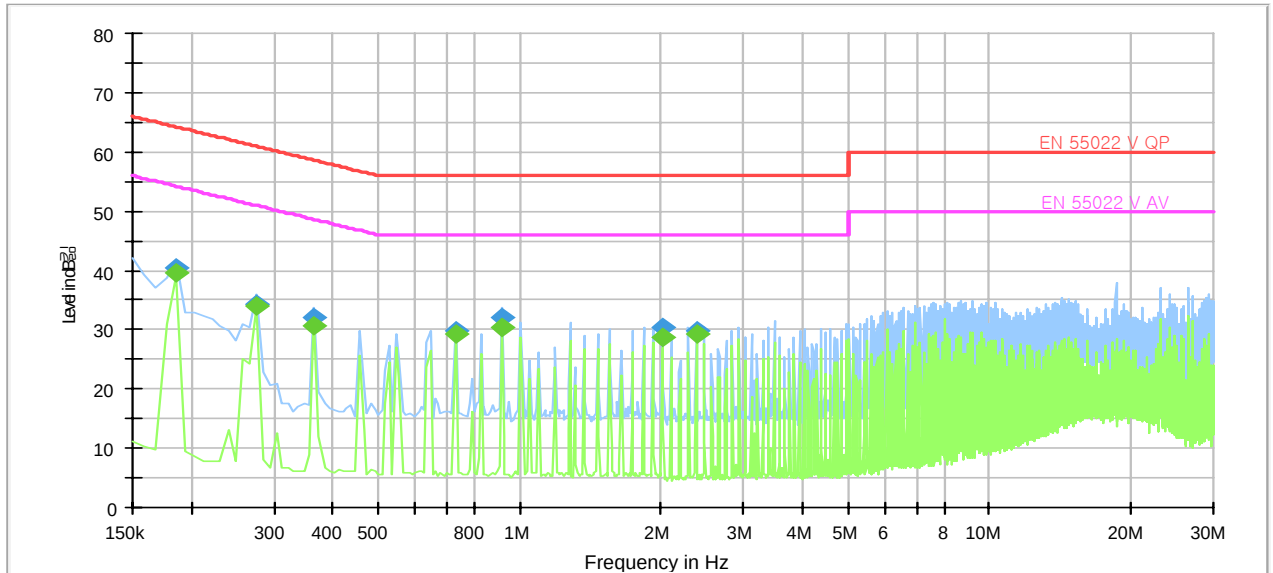
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-260	LISN	ENV216	R&S	101366	2012-09-11	12
E3I-049	LISN	ESH3-Z5	R&S	100260	2013-01-08	12
E3I-132	EMI Test Receiver	ESIB-26	R&S	100291	2012-11-27	12

5.1.2 Temperature and humidity condition

Test date	2013-06-24	Test engineer	Jong-Sup Jeong
Climate condition	Ambient temperature	24.1 °C	Limit (15.0 to 35.0) °C
	Relative humidity	41.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.3 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.

Quasi-peak final measurement results table:

Frequency (MHz)	Level (dBμV)	Corr. (dB)	Limit (dBμV)	Margin (dB)	Line
0.186	40.4	10.1	64.2	23.8	L1
0.276	34.4	10.0	60.9	26.5	L1
0.366	32.0	10.0	58.6	26.6	N
0.735	29.9	9.9	56.0	26.1	N
0.915	32.0	9.9	56.0	24.0	N
2.013	30.5	9.7	56.0	25.5	N
2.382	29.7	9.7	56.0	26.3	N

Average final measurement results table:

Frequency (MHz)	Level (dBμV)	Corr. (dB)	Limit (dBμV)	Margin (dB)	Line
0.186	39.5	10.1	54.2	14.7	L1
0.276	33.9	10.0	50.9	17.0	L1
0.366	30.5	10.0	48.6	18.1	N
0.735	29.4	9.9	46.0	16.6	N
0.915	30.5	9.9	46.0	15.5	N
2.013	28.6	9.7	46.0	17.4	N
2.382	29.4	9.7	46.0	16.6	N

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 detector.

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 [$\text{dB}(\mu\text{V/m})$]	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-130	BILOG Antenna	CBL6112D	TESEQ	25513	2012-11-27	24
E3I-190	BILOG Antenna	CBL6112B	Schaffner	2804	2011-11-03	24
E3I-268	Horn Antenna	HF906	R&S	100291	2012-12-27	24
E3I-233	EMI TEST RECEIVER	ESU-26	R&S	100364	2012-10-26	12
E3I-228	EMI TEST RECEIVER	ESU-08	R&S	100084	2012-10-18	12
E3I-213	Preamplifier	317	SONOMA	282424	2012-11-14	12
E3I-214	Preamplifier	317	SONOMA	282425	2012-11-14	12

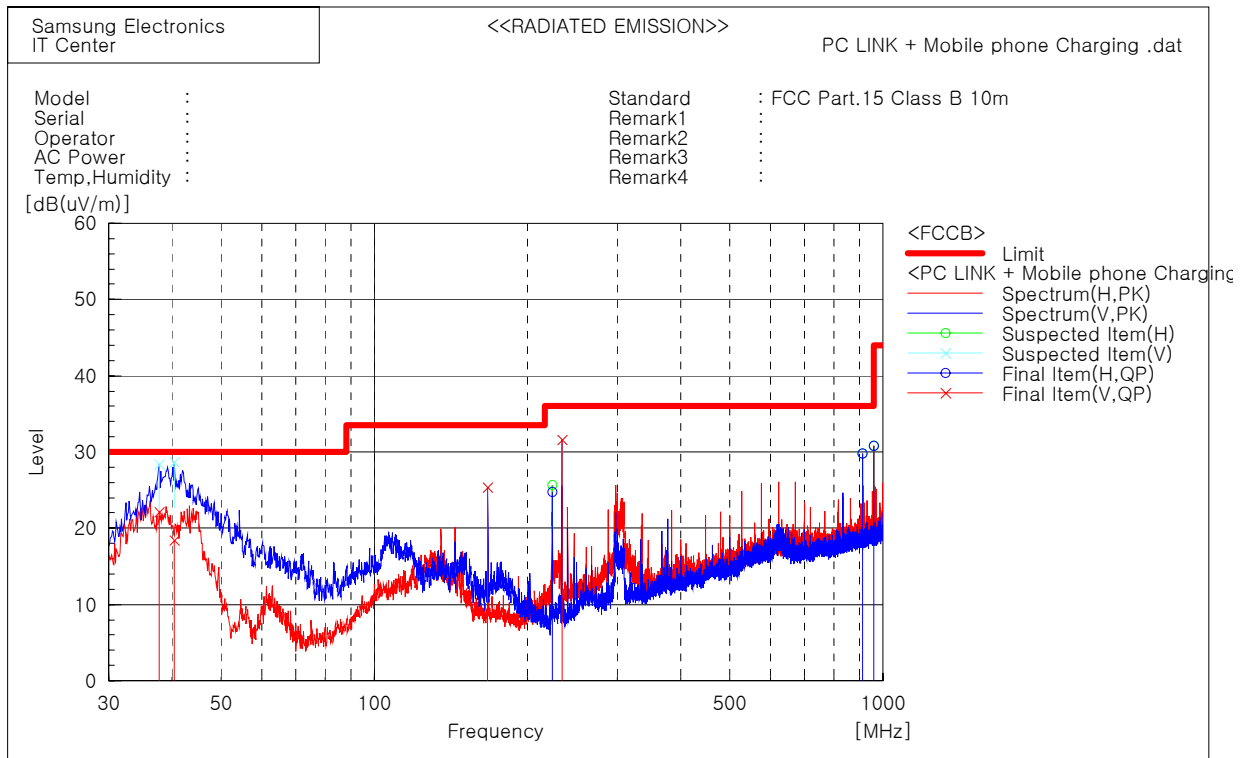
5.2.2 Temperature and humidity condition

Test date	2013-06-17	Test engineer	Jong-Sup Jeong
Climate condition	Ambient temperature	20.2 °C	Limit (15.0 to 35.0) °C
	Relative humidity	52.3 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.5 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz



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	37.760	V	42.6	-20.5	22.1	30.0	7.9	100.0	248.0	2
2	40.428	V	40.1	-21.6	18.5	30.0	11.5	100.0	190.0	2
3	167.013	V	50.9	-25.5	25.4	33.5	8.1	100.0	315.0	2
4	223.758	H	47.8	-23.1	24.7	36.0	11.3	301.0	31.0	1
5	233.821	V	55.8	-24.2	31.6	36.0	4.4	100.0	285.0	2
6	912.094	H	39.1	-9.3	29.8	36.0	6.2	100.0	202.0	1
7	960.109	H	39.6	-8.8	30.8	44.0	13.2	100.0	187.0	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)

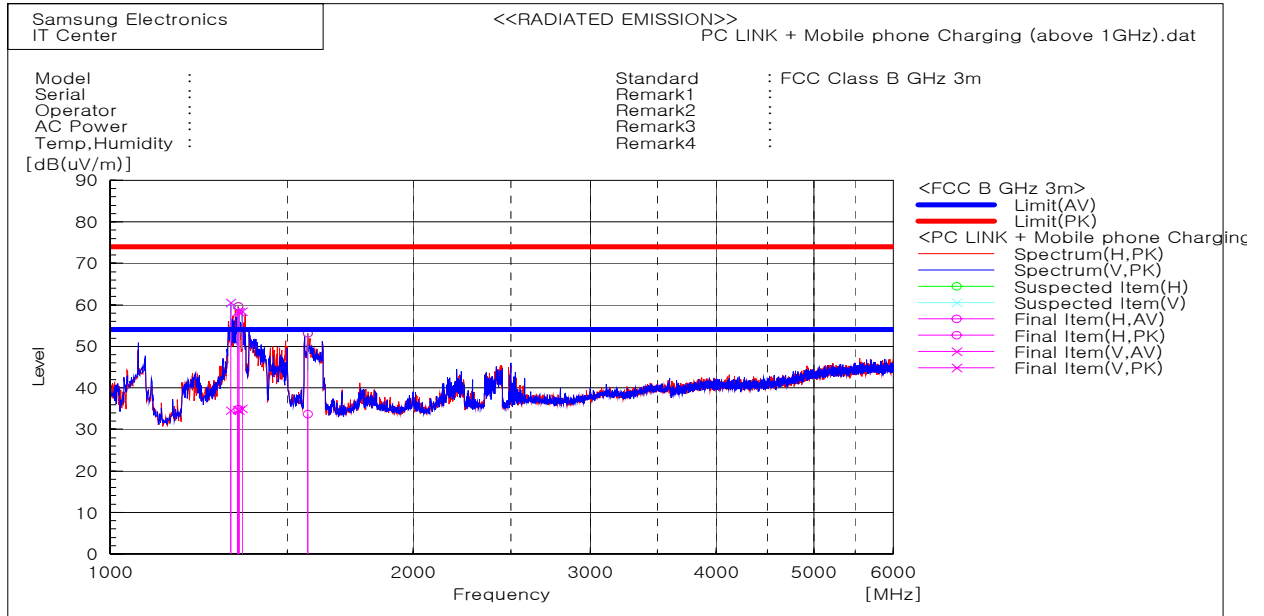
Margin (QP) = Limit - Level (QP)

QP = Quasi-Peak

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 1 000 ~ 6 000 MHz



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]	Height [cm]	Angle [deg]
1	1340.875	45.0	-10.1	34.9	54.0	19.1	100.0	259.0
2	1571.500	42.3	-8.7	33.6	54.0	20.4	100.0	213.0

--- 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	1340.875	69.8	-10.1	59.7	74.0	14.3	100.0	259.0
2	1571.500	61.8	-8.7	53.1	74.0	20.9	100.0	213.0

--- Vertical Polarization (AV)---

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	1317.250	44.9	-10.3	34.6	54.0	19.4	100.0	270.0
2	1337.894	44.8	-10.1	34.7	54.0	19.3	100.0	270.0
3	1343.125	44.7	-10.1	34.6	54.0	19.4	100.0	269.0
4	1353.250	45.1	-10.0	35.1	54.0	18.9	100.0	276.0

--- 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	1317.250	70.8	-10.3	60.5	74.0	13.5	100.0	270.0
2	1337.894	68.5	-10.1	58.4	74.0	15.6	100.0	270.0
3	1343.125	68.4	-10.1	58.3	74.0	15.7	100.0	269.0
4	1353.250	68.5	-10.0	58.5	74.0	15.5	100.0	276.0

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