EMC TEST REPORT

Project No.	LBE20131509	**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	March 05, 2013	
EUT	**Type of device**	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSCHR970	
	Kind of product	Mobile Phone	
	Model No.	SCH-R970	
	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		March 06, 2013 ~ March 06, 2013	
Issue date		March 12, 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 : Young-Jin Kim	**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	- LBE20131509 (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	SCH-R970	-	SAMSUNG	A3LSCHR970
B	Battery	B600BU	AAaD131sS/2-B	SAMSUNG	-
C	Headset	EHS64AVFWE	-	SAMSUNG	-
D	USB Cable	ECB-DU4EWE	SW1CA29ASE	SAMSUNG	-
E	microSD Card	16GB	-	SANDISK	-
F	Travel Adapter	ETA-U90EWE	DW3D226DS/B-E	SAMSUNG	-
G	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
H	LCD TV Monitor	CF19MS	CF19H1LS700048Y	SAMSUNG	DoC
I	Mouse	N3+Optical	K034729902	HP	DoC
J	Keyboard	SDM8500P	8M000131	SAMSUNG	DoC
K	Gigabit Switch 8	3CGSU08	AB/9XRQAC0024825	3COM	DoC
L	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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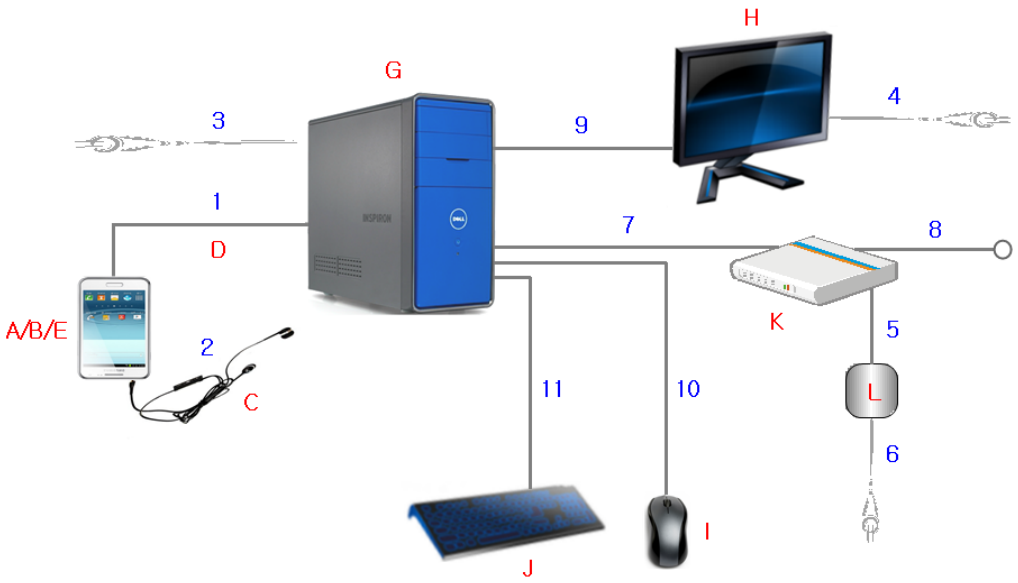
4.4 Used cable description

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	1.5	Yes	From EUT to Desk-Top Computer
2	Headset	1.2	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LCD 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 LCD 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



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4.6 EUT Description

4.6.1 The following features describe EUT represented by this report:

Item	Specification	
Frequency Range	AWS	TX : 1711.25 ~ 1753.75 MHz RX : 2111.25 ~ 2153.75 MHz
	CDMA BC0	TX : 824.64 ~ 848.37 MHz RX : 869.64 ~ 893.37 MHz
	US PCS	TX : 1851.25 ~ 1908.75 MHz RX : 1931.25 ~ 1988.75 MHz
	LTE B2	TX : 1850 ~ 1910 MHz RX : 1930 ~ 1990 MHz
	LTE B4	TX : 1710 ~ 1755 MHz RX : 2110 ~ 2155 MHz
	LTE B5	TX : 824 ~ 849 MHz RX : 869 ~ 894 MHz
	LTE B12	TX : 699 ~ 716 MHz RX : 729 ~ 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	1 800

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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	±3.24 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

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-259	LISN	ENV216	R&S	101369	2012-12-07	12
E3I-266	Test Receiver	ESCI	R&S	100086	2012-11-27	12
E3I-260	LISN	ENV216	R&S	101366	2012-09-11	12

5.1.2 Temperature and humidity condition

Test date	2013-03-07	**Test engineer**	Young-Jin Kim
Climate condition	Ambient temperature	22.8 ℃	Limit (15.0 to 35.0) ℃
	Relative humidity	33.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.2 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

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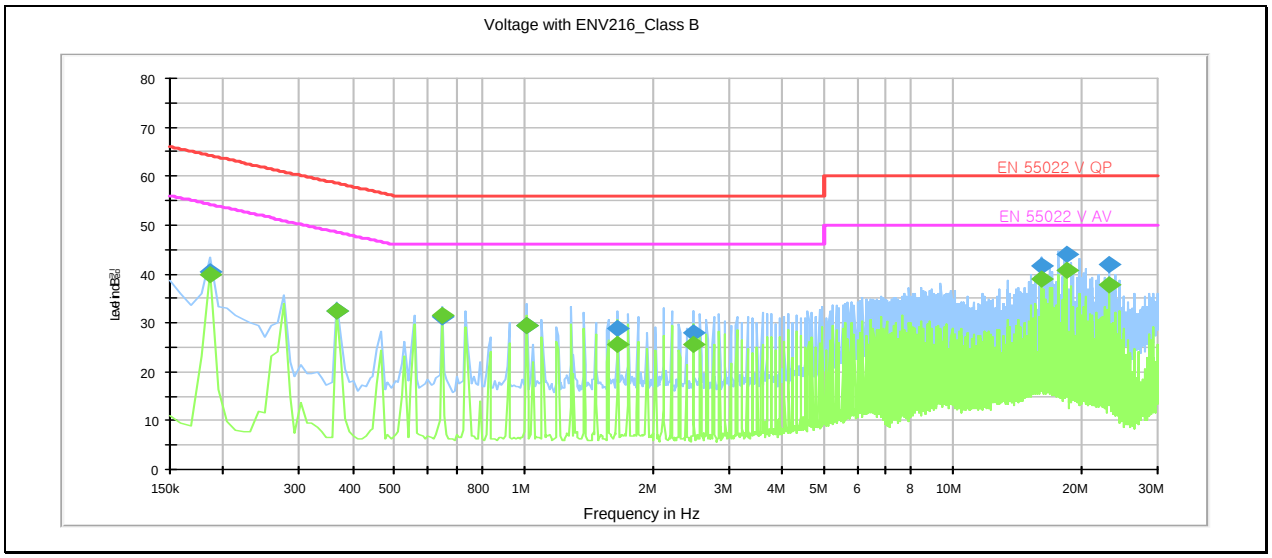
5.1.3 Test results

☐ 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)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186	40.4	N	10.1	23.80	64.20
0.366	32.4	N	10.0	26.20	58.60
0.645	31.3	N	10.0	24.70	56.00
1.014	29.6	L1	9.8	26.40	56.00
1.662	25.8	L1	9.8	30.20	56.00
2.490	28.0	L1	9.7	28.00	56.00
16.170	41.6	N	9.9	18.40	60.00
18.366	43.9	N	10.0	16.10	60.00
23.127	42.1	N	10.1	17.90	60.00

Average final measurement results table:

Frequency (MHz)	Level (dBµV)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186	39.9	N	10.1	14.30	54.20
0.366	32.5	N	10.0	16.10	48.60
0.645	31.6	N	10.0	14.40	46.00
1.014	29.5	L1	9.8	16.50	46.00
1.662	25.4	L1	9.8	20.60	46.00
2.490	25.6	L1	9.7	20.40	46.00
16.170	38.9	N	9.9	11.10	50.00
18.366	40.7	N	10.0	9.30	50.00
23.127	37.7	N	10.1	12.30	50.00

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/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 [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	2012-11-14	12
E3I-214	Preamplifier	317	Sonoma	282425	2012-11-14	12
E3I-233	EMI Test Receiver	ESU-26	R&S	100364	2012-10-26	12
E3I-170	Horn Antenna	HF906	R&S	100028	2012-08-13	24
E3I-228	EMI Test Receiver	ESU-08	R&S	100084	2012-10-18	12

5.2.2 Temperature and humidity condition

Test date	2013-03-06	Test engineer	Young-Jin Kim
Climate condition	Ambient temperature	23.3 ℃	Limit (15.0 to 35.0) ℃
	Relative humidity	32.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.1 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

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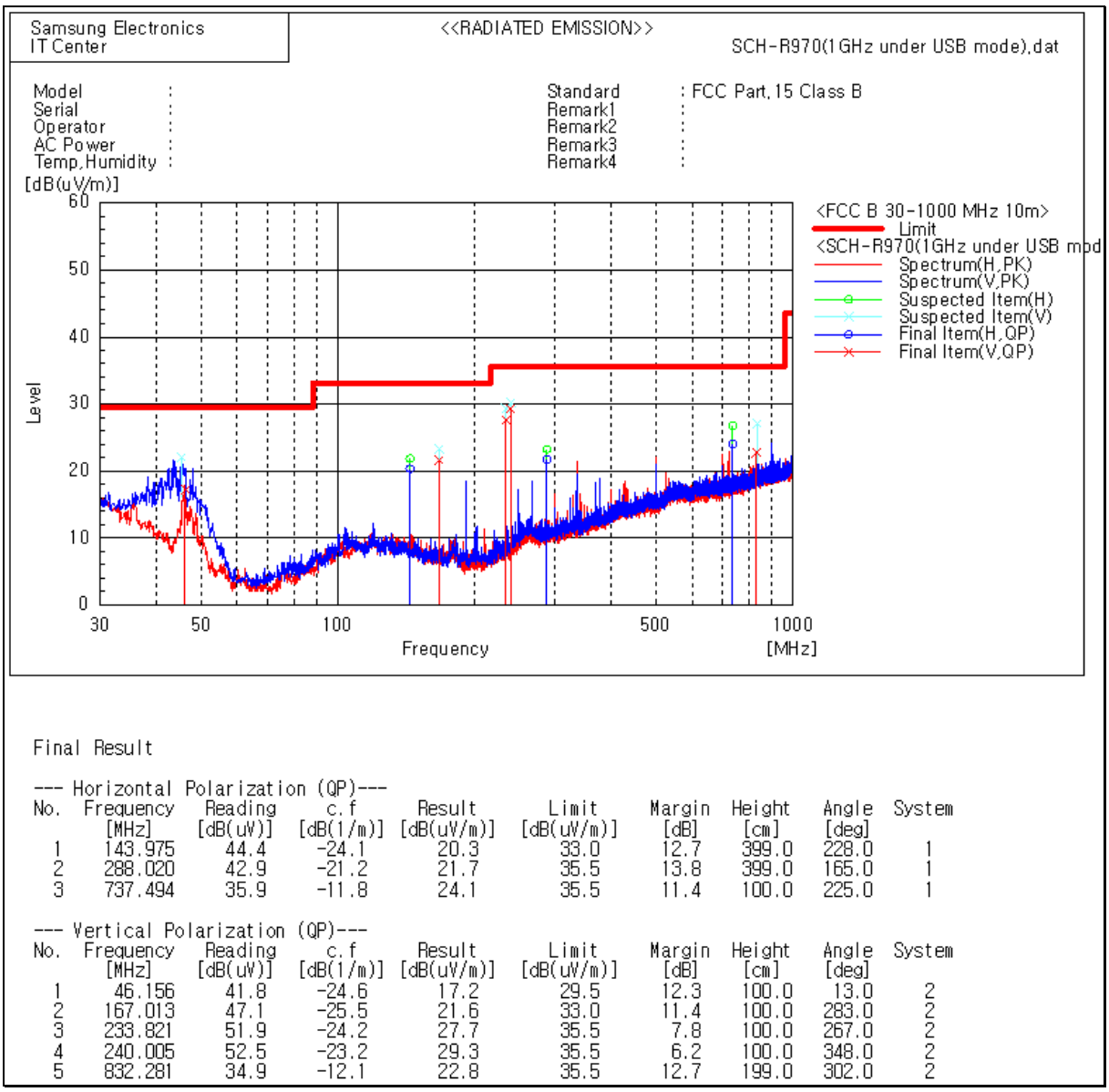
5.2.3 Test results

☐ 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	143.975	44.4	-24.1	20.3	33.0	12.7	399.0	228.0	1
2	288.020	42.9	-21.2	21.7	35.5	13.8	399.0	165.0	1
3	737.494	35.9	-11.8	24.1	35.5	11.4	100.0	225.0	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	46.156	41.8	-24.6	17.2	29.5	12.3	100.0	13.0	2
2	167.013	47.1	-25.5	21.6	33.0	11.4	100.0	283.0	2
3	233.821	51.9	-24.2	27.7	35.5	7.8	100.0	267.0	2
4	240.005	52.5	-23.2	29.3	35.5	6.2	100.0	348.0	2
5	832.281	34.9	-12.1	22.8	35.5	12.7	199.0	302.0	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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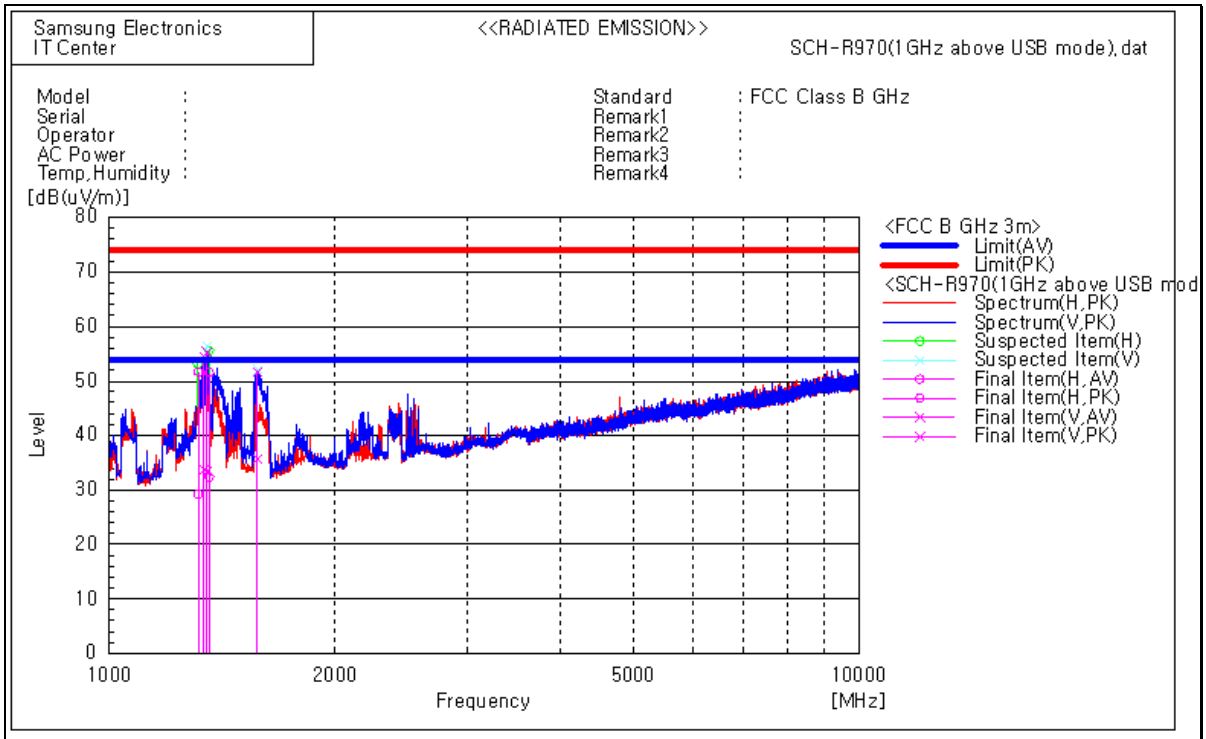
5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 1 000 ~ 10 000 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	1314.424	40.1	-10.8	29.3	54.0	24.7	100.0	177.0
2	1358.993	43.0	-10.6	32.4	54.0	21.6	100.0	176.0

--- 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	1314.424	62.5	-10.8	51.7	74.0	22.3	100.0	177.0
2	1358.993	62.1	-10.6	51.5	74.0	22.5	100.0	176.0

--- 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	1340.095	44.5	-10.7	33.8	54.0	20.2	100.0	246.0
2	1352.043	44.2	-10.6	33.6	54.0	20.4	100.0	246.0
3	1576.216	45.0	-9.3	35.7	54.0	18.3	100.0	258.0

--- 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	1340.095	65.1	-10.7	54.4	74.0	19.6	100.0	246.0
2	1352.043	66.0	-10.6	55.4	74.0	18.6	100.0	246.0
3	1576.216	61.0	-9.3	51.7	74.0	22.3	100.0	258.0

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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