

EMC TEST REPORT

Project No.	LBE20124516	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 10, 2012	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LGTS5301	
	Kind of product	Mobile Phone	
	Model No.	GT-S5301	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	SAMSUNG ELECTRONICS CO., LTD. 516229 China Guangdong Province Huizhou City Chenjiang Town Samsung Electronics Huizhou Co. Ltd.	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2003	
Test Period		September 10, 2012 ~ September 13, 2012	
Issue date		September 21, 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 : 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	- LBE20124516 (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, 443-742, 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	GT-S5301	R31C70GR35J	Samsung	A3LGTS5301
B	Battery	EB454357VU	TH1B831FS/4-B	ELENTEC	-
C	Earphone	EHS49AS0ME	-	Cresyn	-
D	USB Cable	ECC1DU0BBK	KD1B929TS E	Cresyn	-
E	Desk-Top Computer	DCME	8JBVSBX	DELL	DoC
F	LCD Monitor	GH15LS	N719HVELA11890L	SAMSUNG	DoC
G	Mouse	MOARUO	MS-S5-AR03-01	SAMSUNG	DoC
H	Keyboard	GP-K5000U	15000099	SAMSUNG	DoC
I	Router	3CGSU08	AB/ 9XRQ950036589	3COM	DoC
J	Micro SD Card	1GB	-	SANDISK	-

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

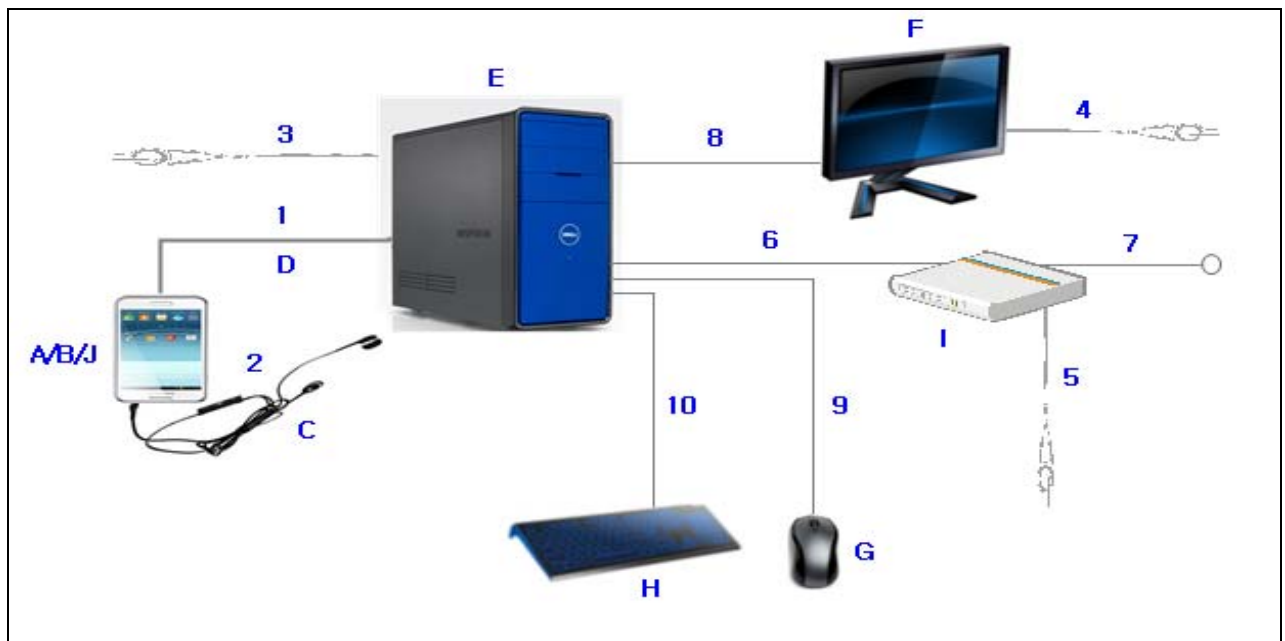
Customer selected, single unit.

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	Data Cable	1.0	Y	From EUT to Desk-Top Computer
2	Headset	1.2	N	For EUT
3	Power	1.8	N	For Desk-Top Computer
4	Power	1.8	N	For LCD Monitor
5	Power	1.8	N	For Power Supply
6	LAN	1.5	N	From Desk-Top Computer to Router
7	LAN	1.5	N	From Router to Local Area Network
8	RGB	1.8	Y	From Desk-Top Computer to LCD Monitor
9	USB	1.8	Y	From Desk-Top Computer to Mouse
10	USB	1.5	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	
Frequency Range	GSM 850	TX : 824.2 ~ 848.8 MHz RX : 869.2 ~ 893.8 MHz
	GSM 1900	TX : 1 850.2 ~ 1 909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
Bluetooth	TX/RX Frequency : 2 402 ~ 2 480 MHz Version : 3.0 + EDR	
Operating Temperature (°C)	-20 ~ +60	
Operating Humidity (%)	0 ~ 95	

4.6.2 The variant models

- None

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]
CPU	800

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	± 4.64 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	± 4.18 dB
	Vertical	± 4.15 dB

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

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

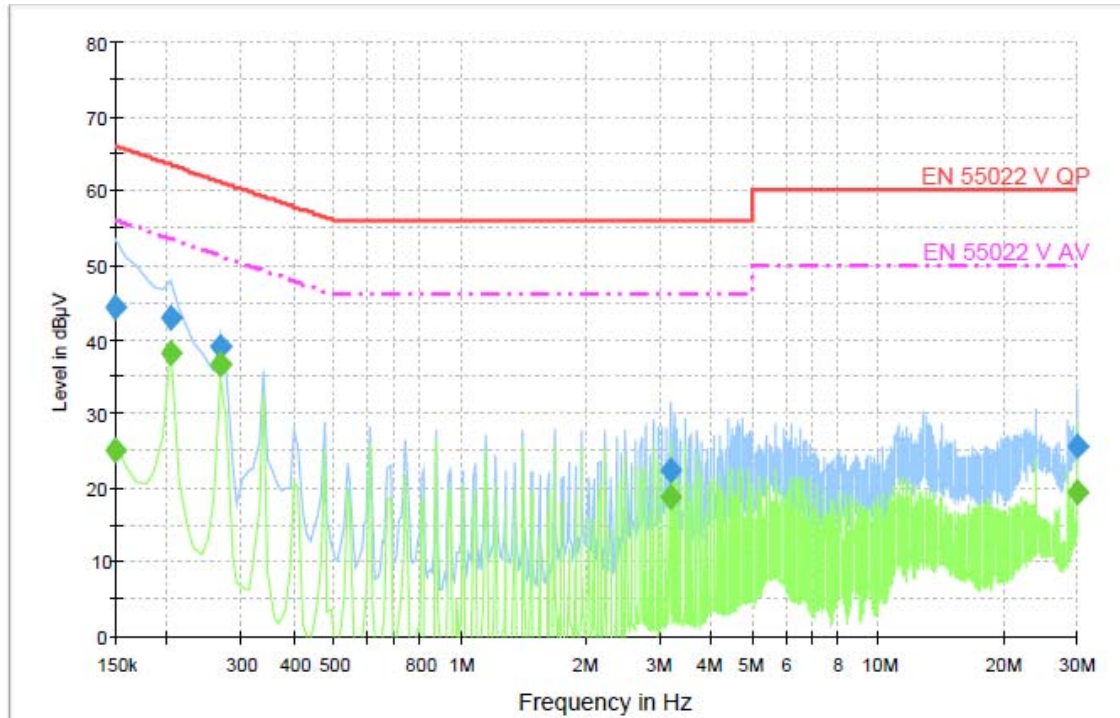
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E4I-093	Test Receiver	ESC13	R&S	100086	2011-11-11	12
E3I-259	LISN	ENV216	R&S	101369	2011-10-11	12
E3I-050	LISN	ESH3-Z5	R&S	100263	2011-10-12	12

5.1.2 Temperature and humidity condition

Test date	2012-09-13	Test engineer	Su-Young Son
Climate condition	Ambient temperature	23.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	38.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.0 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)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	44.3	15000.0	9.000	On	L1	9.9	21.70	66.00
0.204000	42.9	15000.0	9.000	On	L1	10.0	20.50	63.40
0.267000	38.8	15000.0	9.000	On	N	10.0	22.40	61.20
3.174000	22.3	15000.0	9.000	On	N	9.7	33.70	56.00
29.877000	25.5	15000.0	9.000	On	N	10.1	34.50	60.00

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	25.0	15000.0	9.000	On	L1	9.9	31.00	56.00
0.204000	38.0	15000.0	9.000	On	L1	10.0	15.40	53.40
0.267000	36.5	15000.0	9.000	On	N	10.0	14.70	51.20
3.174000	18.6	15000.0	9.000	On	N	9.7	27.40	46.00
29.877000	19.3	15000.0	9.000	On	N	10.1	30.70	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/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 [$\mu\text{V/m}$]	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-190	BILOG Antenna	CBL6112B	Schaffner	2804	2011-06-22	24
E3I-130	BILOG Antenna	CBL6112D	TESEQ	25513	2010-11-12	24
E3I-213	Preamplifier	317	SONOMA	282424	2011-12-06	12
E3I-214	Preamplifier	317	SONOMA	282425	2011-12-06	12
E4I-013	EMI Test Receiver	ESU-08	R&S	100085	2012-03-22	12
E3I-233	EMI Test Receiver	ESU-26	R&S	100364	2011-10-24	12
E3I-231	Horn Antenna	3115	ETS Lindgren	00101620	2012-01-12	24

5.2.2 Temperature and humidity condition

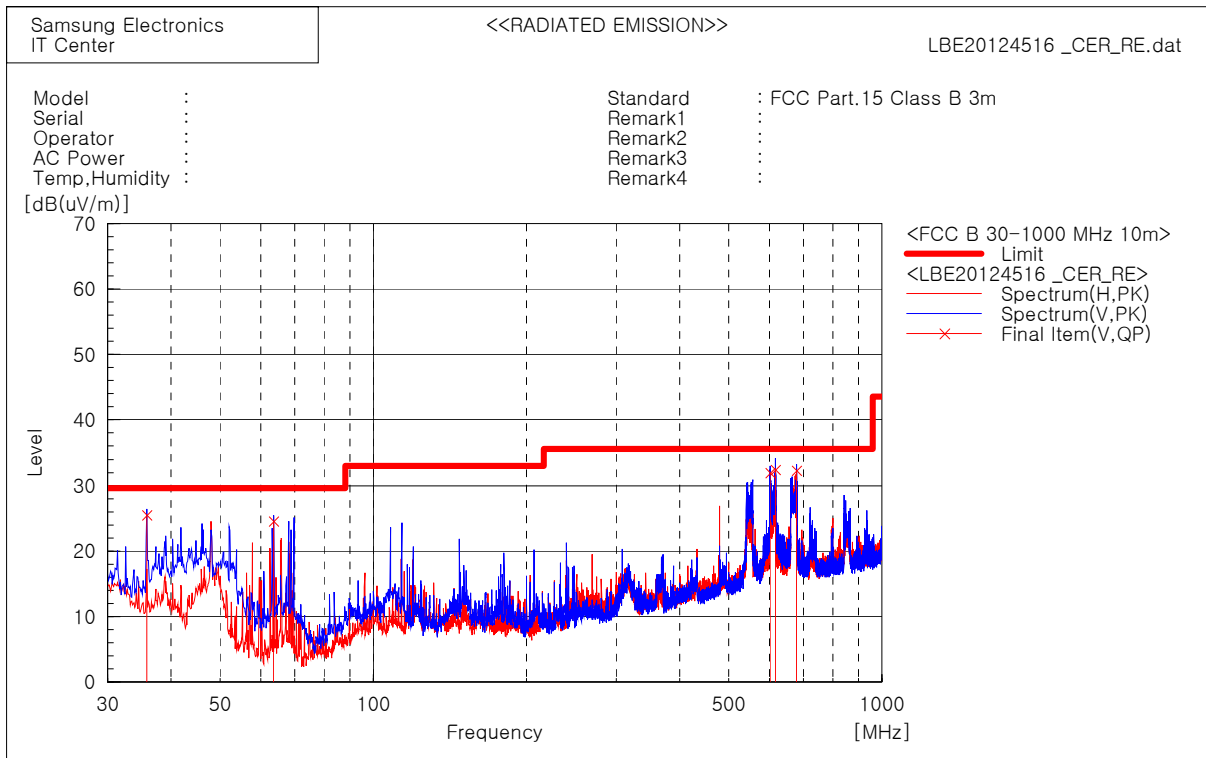
Test date	2012-09-10	Test engineer	Su-Young Son
Climate condition	Ambient temperature	20.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	45.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.0kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz

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Final Result

--- 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	35.820	47.3	-21.8	25.5	29.5	4.0	198.0	269.0	2
2	63.708	55.6	-31.1	24.5	29.5	5.0	198.0	225.0	2
3	602.785	47.1	-15.1	32.0	35.5	3.5	198.0	151.0	2
4	617.214	47.1	-14.7	32.4	35.5	3.1	198.0	151.0	2
5	680.264	47.0	-14.7	32.3	35.5	3.2	198.0	129.0	2

Note) Receiving antenna polarization : Horizontal, Vertical

Test Distance : 10 m, Antenna Height : 1 to 4 meters

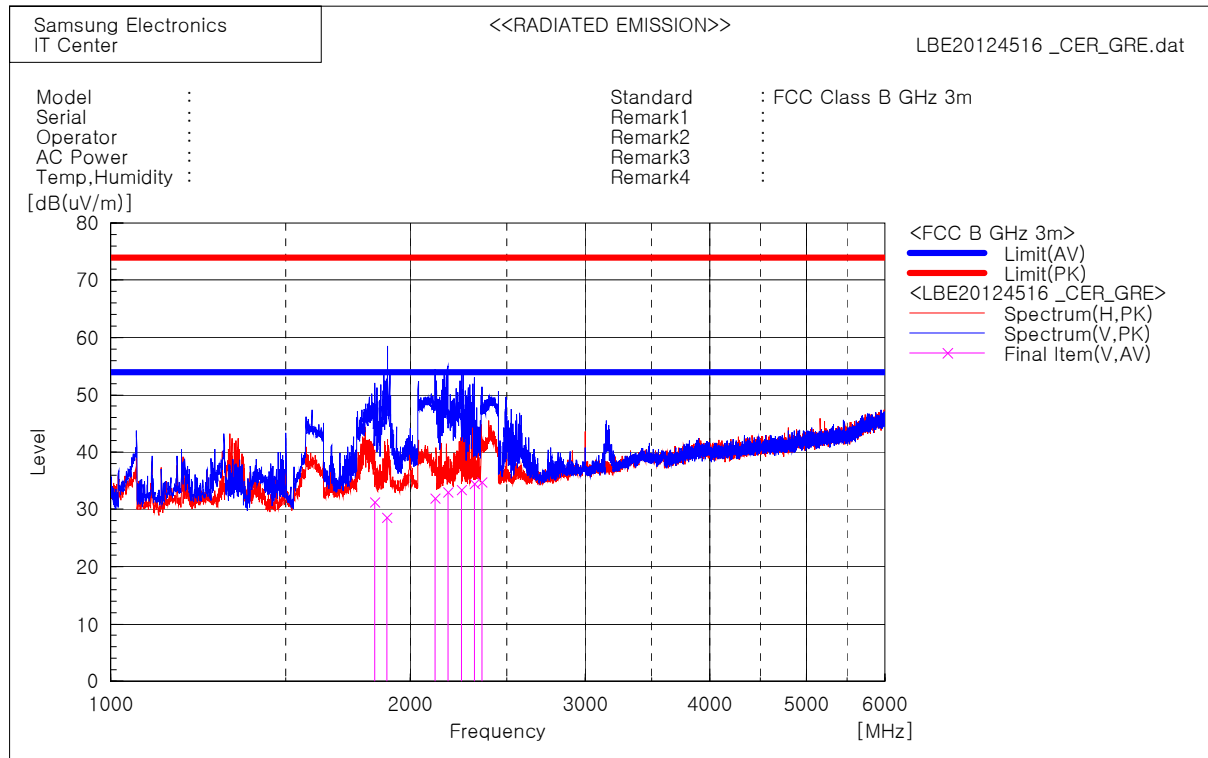
Level (QP) = Reading (QP) + c.f (Antenna Factor + Cable Loss - Amp. Gain)

Margin (QP) = Limit - Level (QP)

QP = Quasi-Peak

- Frequency range: 1 000 ~ 6 000 MHz

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**Final Result**

--- 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]	System
1	1843.750	31.3	0.0	31.3	54.0	22.7	100.0	182.0	1
2	1894.575	34.9	-6.2	28.7	54.0	25.3	100.0	181.0	1
3	2119.375	32.0	0.0	32.0	54.0	22.0	100.0	213.0	1
4	2181.250	33.0	0.0	33.0	54.0	21.0	100.0	213.0	1
5	2252.500	33.4	0.0	33.4	54.0	20.6	100.0	201.0	1
6	2318.750	34.5	0.0	34.5	54.0	19.5	100.0	207.0	1
7	2361.875	34.7	0.0	34.7	54.0	19.3	100.0	195.0	1

Note1) Representative operating modes were selected by customer.

Note2) 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) + c.f (Antenna Factor + Cable Loss - Amp. Gain)

Margin (PK and/or AV) = Limit - Level (PK and/or AV)

PK = Peak, AV = Average