

EMC TEST REPORT

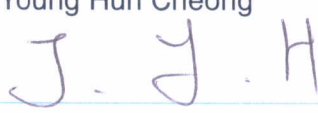
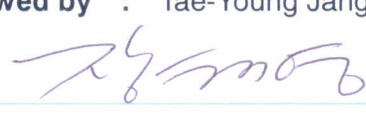
Project No.	LBE20136075	Issue No.	0
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	(Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	Date of application	December 9, 2013	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMG3812B	
	Kind of product	Mobile Phone	
	Model No.	SM-G3812B	
	Variant Model No.	Refer to clause 4.6.2	
	Manufacturer	SAMSUNG ELECTRONICS CO., LTD. 94-1, Imsu-dong, Gumi-si, Gyengsangbuk-do, 730-722, Republic of Korea TIANJIN SAMSUNG TELECOM TECHNOLOGY CO., LTD. 300385, No.9, WeiWu Rd., Micro Electronic Industrial Park, Xiqing Dist, Tianjin, China	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		December 21, 2013 ~ December 23, 2013	
Issue date		December 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 : Young Hun Cheong 		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.			
 (Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea Tel: 82 31 279 1750, Fax: 82 31 279 1745			

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1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	- LBE20136075 (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 C63.4-2009 (☐ Class A, ☒ 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 Phone	SM-G3812B	-	SAMSUNG	A3LSMG3812B
B	Battery	EB585158LC	THaD909AS/2-B	SAMSUNG	-
C	Headset	EHS61ASFWE	-	SAMSUNG	-
D	Data Cable	ECC1DU0BBK	KD1D925DS E	SAMSUNG	-
E	microSD Card	16GB	-	SANDISK	-
F	Travel Adapter	ETA0U42CBC	RT1CA128BS/7-E	SAMSUNG	-
G	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
H	LCD TV Monitor	UE22C4000PWXZT	B20B3HUB200001A	SAMSUNG	DoC
I	Mouse	M-S48a	LZA00153189	SAMSUNG	JNZ201213
J	Keyboard	SKG-2000PB	CNBA5902830AGP53Z5A3485	SAMSUNG	DoC
K	Gigabit Switch Hub	H3008	10070100009	EFM Networks	DoC
L	Power Supply	HB12B-050200SPA	HBK520201025	Shen Zhen City Hong Ben	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)
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4.3 Details of Sampling

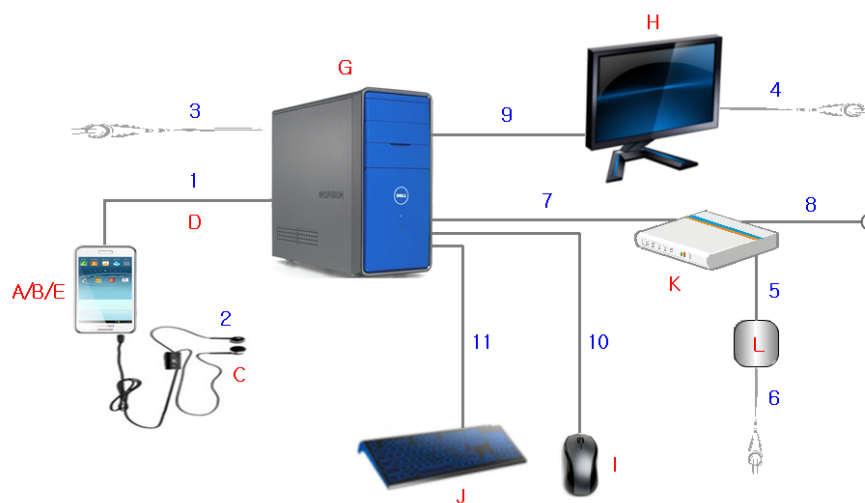
Customer selected, single unit.

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 / Travel Adapter	1.0	Yes	From EUT to Desk-Top Computer / From EUT to Travel Adapter
2	Headset	1.6	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LCD 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 LCD TV Monitor
10	PS/2	1.5	Yes	From Desk-Top Computer to Mouse
11	PS/2	1.5	Yes	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	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
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]	Kind of Clocks	Frequency [MHz]
CPU	1 200	USB 2.0	24

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	2.95 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.69 dB
	Vertical	4.83 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	5.47 dB
	Vertical	5.45 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

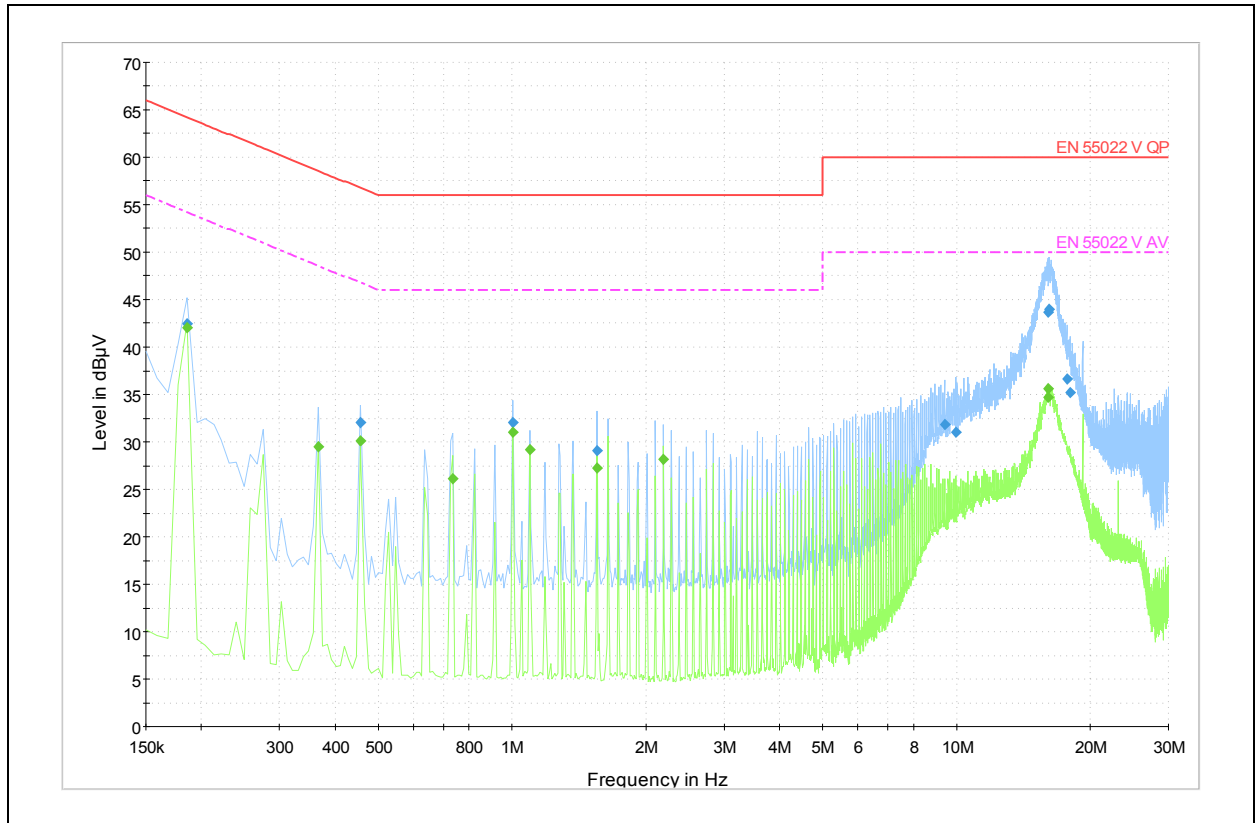
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E5I-010	LISN	ESH3-Z5	R&S	831886/006	2013-01-08	12
E5I-016	EMI Test Receiver	ESU8	R&S	100482	2013-06-11	12
E5I-043	LISN	ENV216	R&S	101630	2013-06-07	12

5.1.2 Temperature and humidity condition

Test date	2013-12-23	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	21.6 °C	Limit (15.0 to 35.0) °C
	Relative humidity	33.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	102.3 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.

Test Results (Quasi-Peak and C/Average)

Quasi-peak final measurement results table

Frequency (MHz)	Level ¹⁾ Quasi-Peak (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.186	42.5	N	10.1	21.7	64.2
0.456	32.0	L1	10.0	24.8	56.8
1.005	32.1	L1	9.8	23.9	56.0
1.554	29.1	L1	9.8	26.9	56.0
9.402	31.8	N	9.8	28.2	60.0
9.951	31.0	L1	9.8	29.0	60.0
16.107	43.7	N	9.9	16.3	60.0
16.188	44.0	N	9.9	16.0	60.0
17.709	36.6	N	10.0	23.4	60.0
18.006	35.2	N	10.0	24.8	60.0

C/Average final measurement results table

Frequency (MHz)	Level ¹⁾ C/Average (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.186	42.0	N	10.1	12.2	54.2
0.366	29.5	L1	10.0	19.1	48.6
0.456	30.1	L1	10.0	16.7	46.8
0.735	26.2	L1	9.9	19.8	46.0
1.005	31.0	L1	9.8	15.0	46.0
1.095	29.2	N	9.8	16.8	46.0
1.554	27.2	N	9.8	18.8	46.0
2.193	28.2	L1	9.7	17.8	46.0
16.053	35.6	N	9.9	14.4	50.0
16.089	34.7	L1	9.8	15.3	50.0

Note1) Level (Quasi-Peak and/or C/Average) = Meter Reading + Factor

Note2) Line = Polarity of input power (Live or Neutral)

N : Abbreviation of Neutral Polarity, L1 : Abbreviation of Live Polarity,

Note3) Factor = LISN Insertion Loss + Cable Loss

Note4) Margin = Limit – Level (Quasi-Peak and/or C/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	0 ~ 345 (Step size: 15 degrees)

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-273	Preamplifier	317	SONOMA	312701	2013-03-30	12
E3I-274	Preamplifier	317	SONOMA	312702	2013-03-30	12
E3I-003	BILOG Antenna	CBL6112B	Schaffner	2805	2012-04-19	24
E3I-130	BILOG Antenna	CBL6112D	TESEQ	25513	2013-08-01	24
E3I-174	Horn Antenna	RGA-60	ELECTRO-METRICS	6195	2013-05-13	24
E3I-233	EMI TEST RECEIVER	ESU-26	R&S	100364	2013-07-25	12
E5I-019	EMI TEST RECEIVER	ESU-08	R&S	100485	2013-07-25	12
E3I-142	EMI TEST RECEIVER	ESI-26	R&S	100019	2013-01-25	12
-	Test Software	EP5/RE	TOYO	Ver 3.10.20	-	-

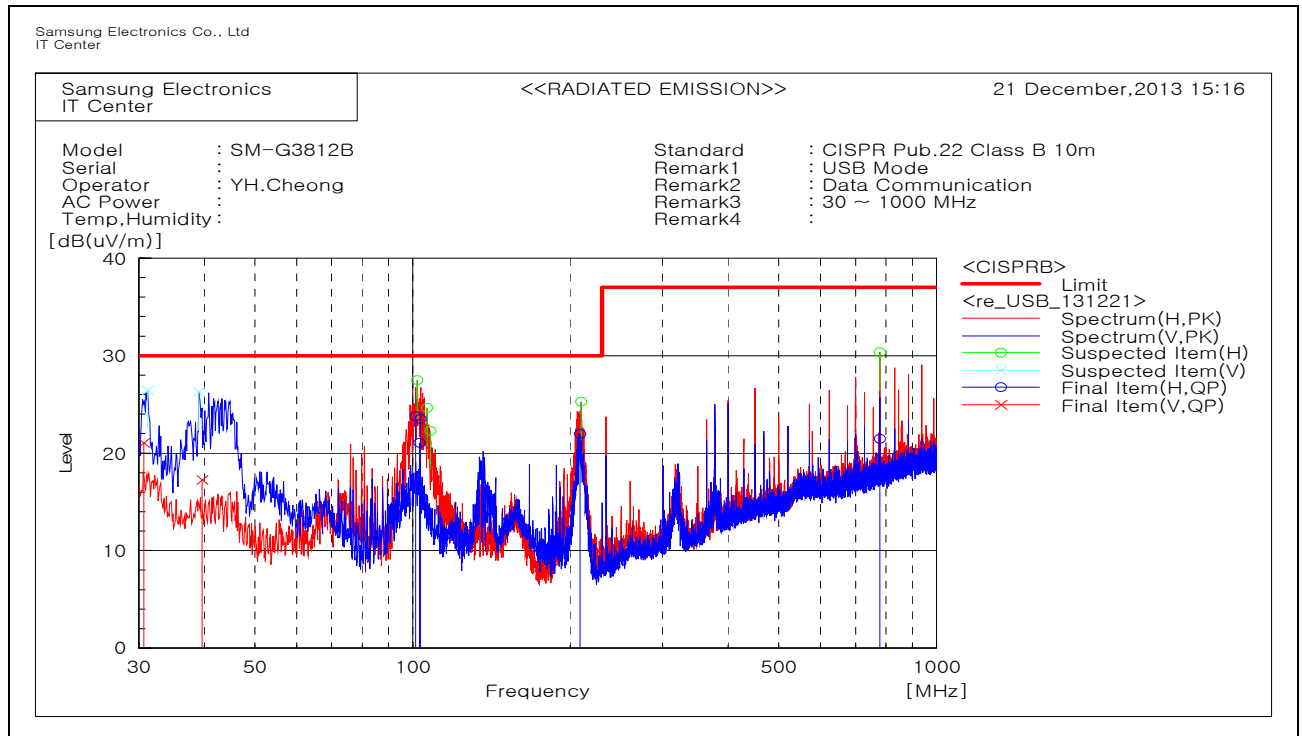
5.2.2 Temperature and humidity condition

Test date	2013-12-21	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	23.7 °C	Limit (15.0 to 35.0) °C
	Relative humidity	38.6 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	102.3 kPa	Limit (86.0 to 106.0) kPa
Test place	10m Semi-Anechoic Chamber		

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz



Frequency [MHz]	(P) ¹⁾	Reading QP ²⁾ [dB(μV)]	Factor ³⁾ [dB(1/m)]	Level QP ⁴⁾ [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP ⁵⁾ [dB]	Height [cm]	Angle [deg]
30.658	V	40.7	-19.6	21.1	30.0	8.9	199.0	356.0
39.620	V	41.4	-24.2	17.2	30.0	12.8	100.0	338.0
101.253	H	48.5	-24.7	23.8	30.0	6.2	297.0	287.0
102.931	H	45.5	-24.4	21.1	30.0	8.9	297.0	279.0
103.358	H	47.9	-24.4	23.5	30.0	6.5	297.0	301.0
208.864	H	47.1	-25.1	22.0	30.0	8.0	400.0	68.0
780.063	H	32.8	-11.3	21.5	37.0	15.5	100.0	88.0

Note1) (P) : Abbreviation of Antenna Polarity

Note2) Reading QP : Received raw Quasi-peak signal

Note3) Factor = Antenna factor + Cable loss – Amplifier gain

Note4) Level QP = Reading QP + Factor, Real signal Quasi-peak level

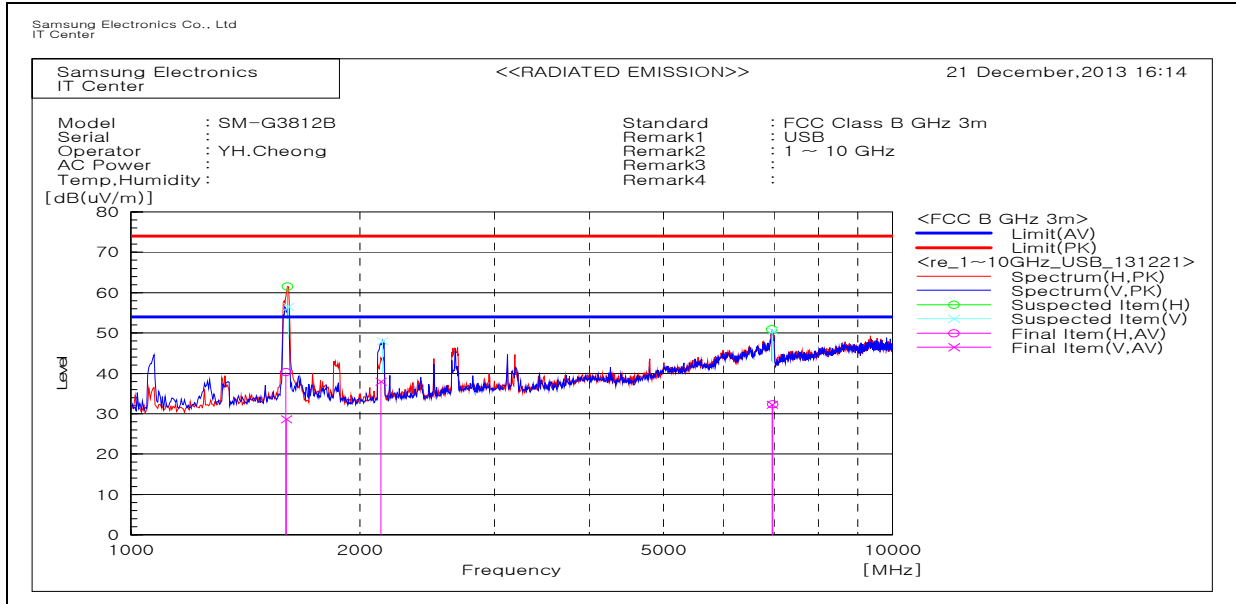
Note5) Margin QP = Limit – Level QP

QP : Abbreviation of Quasi-peak

5.2.3 Test results

□ Operating Mode 1

- Frequency range: 1 000 ~ 10 000 MHz



Peak Measurement

Frequency [MHz]	(P) ¹⁾	Reading PK ²⁾ [dB(uV)]	Factor ³⁾ [dB(1/m)]	Level PK ⁴⁾ [dB(uV/m)]	Limit [dB(uV/m)]	Margin PK ⁵⁾ [dB]	Height [cm]	Angle [deg]
1 605.210	H	70.6	-9.1	61.5	74.0	12.5	100.0	151.0
1 609.219	V	65.6	-9.0	56.6	74.0	17.4	100.0	56.0
2 138.277	V	57.5	-9.5	48.0	74.0	26.0	100.0	27.0
6 943.888	H	48.0	2.9	50.9	74.0	23.1	100.0	4.0
6 961.924	V	47.5	3.0	50.5	74.0	23.5	100.0	3.0

Note1) (P) : Abbreviation of Antenna Polarity

Note2) Reading PK : Received raw Peak signal

Note3) Factor = Antenna factor + Cable loss – Amplifier gain

Note4) Level PK = Reading PK + Factor, Real signal Peak level

Note5) Margin PK = Limit – Level PK

PK : Abbreviation of Peak