

EMC TEST REPORT

Project No.	LBE20140183	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	January 7, 2014	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMT531	
	Kind of product	Portable Device	
	Model No.	SM-T531	
	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 SAMSUNG ELECTRONICS HUIZHOU CO.,LTD. 516229, Chenjiang Town, HuiZhou City, Guangdong Province, China	
Applied Standards		47 CFR Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		February 6, 2014 ~ February 12, 2014	
Issue date		February 21, 2014	

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

J. Y. H

Reviewed by : Min Gon Kim

M. G. Kim

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Table of contents

1. Report Information

1.1 Revision history	3
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2. Summary of test results

2.1 Emission	3
--------------------	---

3. General Information

3.1 Test facility	3
-------------------------	---

4. Test Configuration

4.1 Test Peripherals	4
4.2 EUT operating mode	4
4.3 Details of Sampling	5
4.4 Used cable description	5
4.5 Test arrangement	5
4.6 EUT Description	6
4.7 Clock Frequencies	6
4.8 Test configuration and condition	6
4.9 Measurement uncertainty	7

5. Result of individual tests

5.1 Conducted disturbance	8
5.2 Radiated disturbance	10

1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	There are no revisions and this version is basic test report.

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)	47 CFR Part 15, Subpart B, Class 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	Portable Device	SM-T531	-	SAMSUNG	A3LSMT531
B	Battery	EB-BT530FBE	-	SAMSUNG	-
C	Headset	EHS64AVFWE	-	SAMSUNG	-
D	Data Cable	ECB-DU28WE	-	SAMSUNG	-
E	microSD Card	16GB	-	SANDISK	-
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD TV Monitor	UE22C4000PWXZT	B20B3HUB200001A	SAMSUNG	DoC
H	Mouse	M-S48a	LZA00153189	SAMSUNG	JNZ201213
I	Keyboard	SKG-2000PB	CNBA5902830AGP53Z5A3485	SAMSUNG	DoC
J	Gigabit Switch Hub	H3008	10070100009	EFM Networks	DoC
K	Power Supply	HB12B-050200SPA	HBK520201025	Shen Zhen City Hong Ben	DoC

This portable device does not contain the minimum number of ports required for personal computer testing per ANSI C63.4, but the EUT is attached to a computer through its only available port, which represents worst case emissions. All other aspects of C63.4 testing requirements were maintained.

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

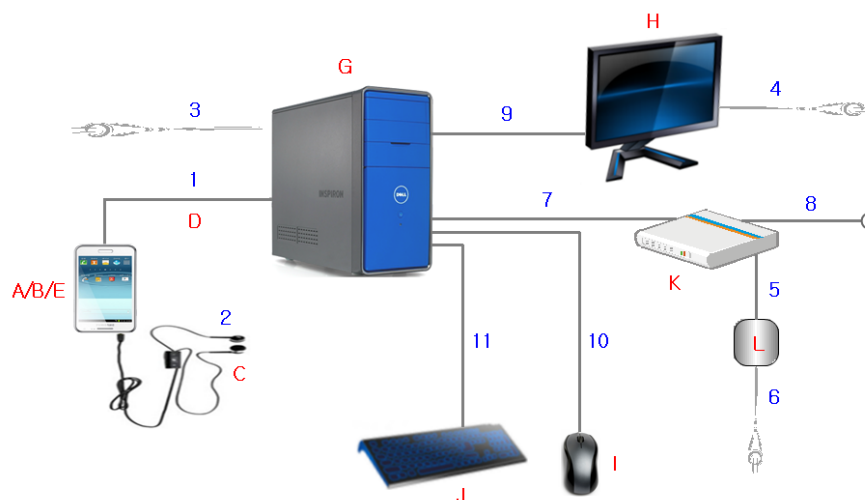
Customer selected, single unit.

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	0.8	Yes	From EUT to Desk-Top Computer
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 ~ 1909.8 MHz RX : 1 930.2 ~ 1989.8 MHz
	WCDMA B2	TX : 1852.4 ~ 1907.6 MHz RX : 1932.4 ~ 1987.6 MHz
	WCDMA B5	TX : 826.4 ~ 846.6 MHz RX : 871.4 ~ 891.6 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]
AP	1 200	USB	75

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 CISPR-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	C/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

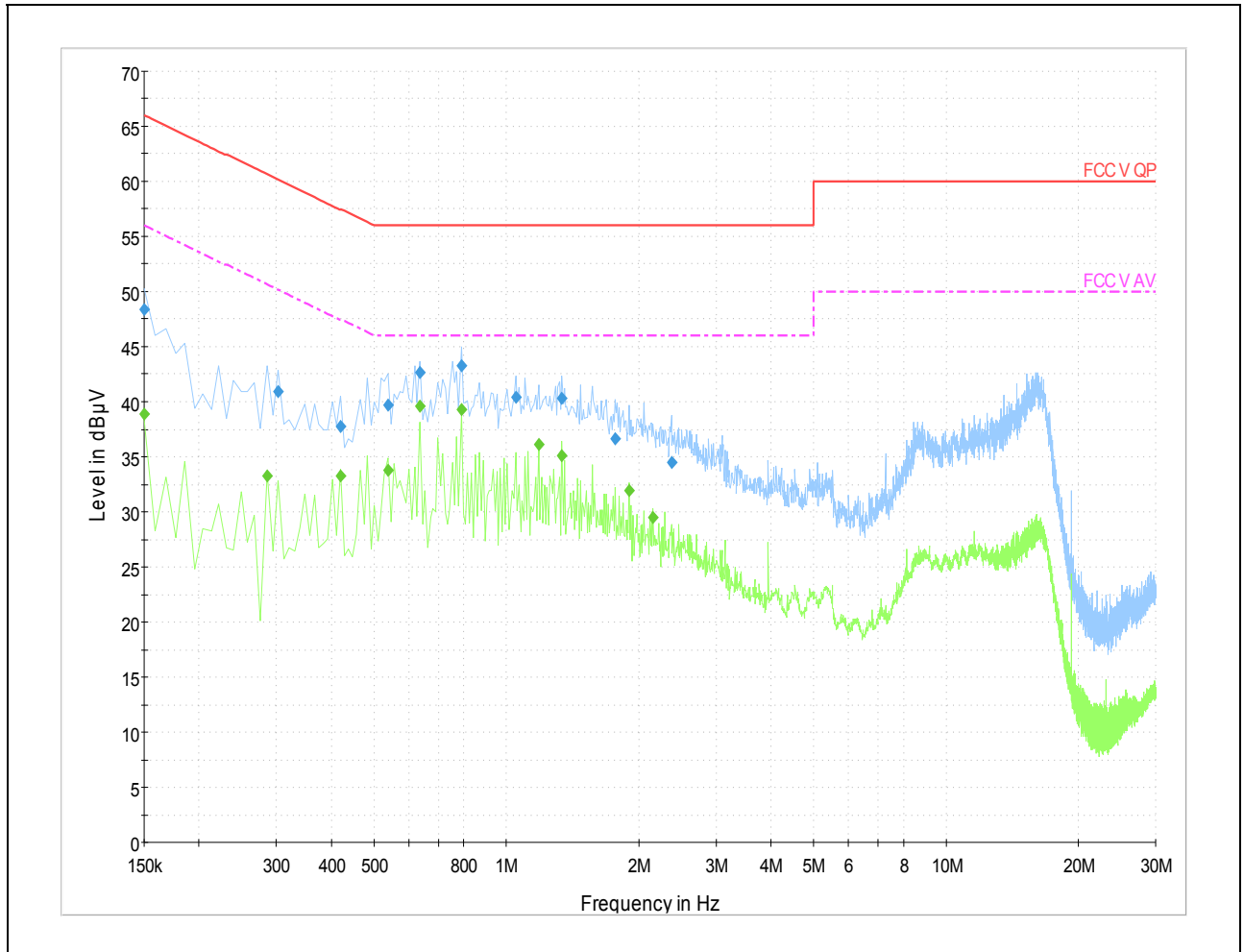
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E51-016	EMI TEST RECEIVER	ESU	R&S	100482	2013-08-29	12
E31-259	Two-Line V-Network	ENV216	R&S	101369	2013-11-17	12
E31-260	Two-Line V-Network	ENV216	R&S	101366	2013-07-28	12
-	Test Software	EMC32	R&S	Ver 8.53.0	-	-

5.1.2 Temperature and humidity condition

Test date	2014-02-12	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	21.2 °C	Limit (15.0 to 35.0) °C
	Relative humidity	35.2 % 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)		

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)
0.150	48.4	L1	9.9	17.6	66.0
0.303	40.9	L1	10.0	19.3	60.2
0.420	37.8	N	10.0	19.6	57.4
0.537	39.7	L1	10.0	16.3	56.0
0.636	42.6	L1	10.0	13.4	56.0
0.789	43.3	N	9.9	12.7	56.0
1.050	40.4	N	9.8	15.6	56.0
1.338	40.3	N	9.8	15.7	56.0
1.770	36.7	N	9.8	19.3	56.0
2.373	34.5	L1	9.7	21.5	56.0

C/Average final measurement results table

Frequency (MHz)	Level ¹⁾ C/Average (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.150	38.9	L1	9.9	17.1	56.0
0.285	33.2	L1	10.0	17.5	50.7
0.420	33.3	N	10.0	14.1	47.4
0.537	33.8	L1	10.0	12.2	46.0
0.636	39.6	N	10.0	6.4	46.0
0.789	39.2	N	9.9	6.8	46.0
1.185	36.1	N	9.8	9.9	46.0
1.338	35.1	L1	9.8	10.9	46.0
1.905	32.0	N	9.7	14.0	46.0
2.157	29.5	N	9.7	16.5	46.0

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 CISPR-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)
E5I-073	Preamplifier	310N	Sonoma	332016	2013-06-10	12
E5I-074	Preamplifier	310N	Sonoma	332017	2013-06-10	12
E5I-072	BiLog Antenna	CBL6112D	Teseq	36009	2013-06-03	24
E5I-071	BiLog Antenna	CBL6112D	Teseq	35384	2013-05-23	24
E3I-174	Horn Antenna	RGA-60	ELECTRO-METRICS	6195	2013-05-13	24
E5I-017	EMI Test Receiver	ESU8	R&S	100483	2013-06-11	12
E5I-021	EMI Test Receiver	ESU40	R&S	100376	2013-06-11	12
E3I-132	EMI TEST RECEIVER	ESIB-26	R&S	100291	2013-11-28	12
-	Test Software	EP5/RE	TOYO	Ver 3.10.20	-	-

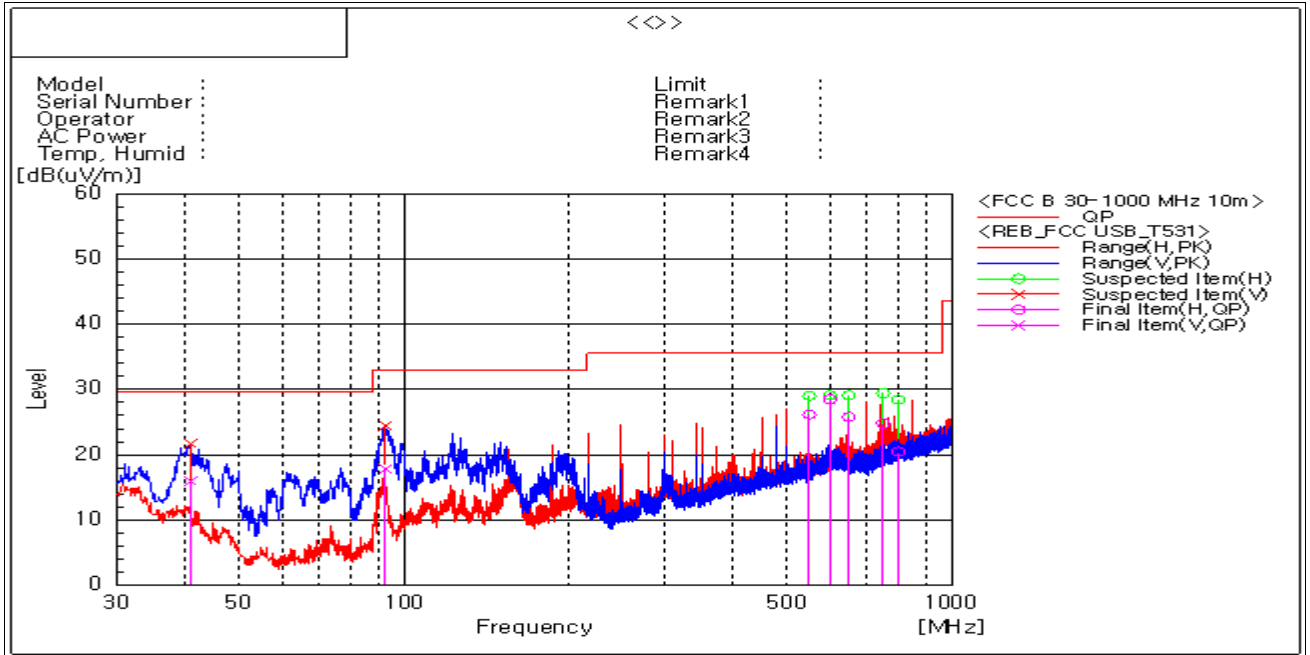
5.2.2 Temperature and humidity condition

Test date	2014-02-06 ~ 2014-02-10	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	22.1 / 23.2 °C	Limit (15.0 to 35.0) °C
	Relative humidity	40.1 / 39.1 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.0 / 101.1 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



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

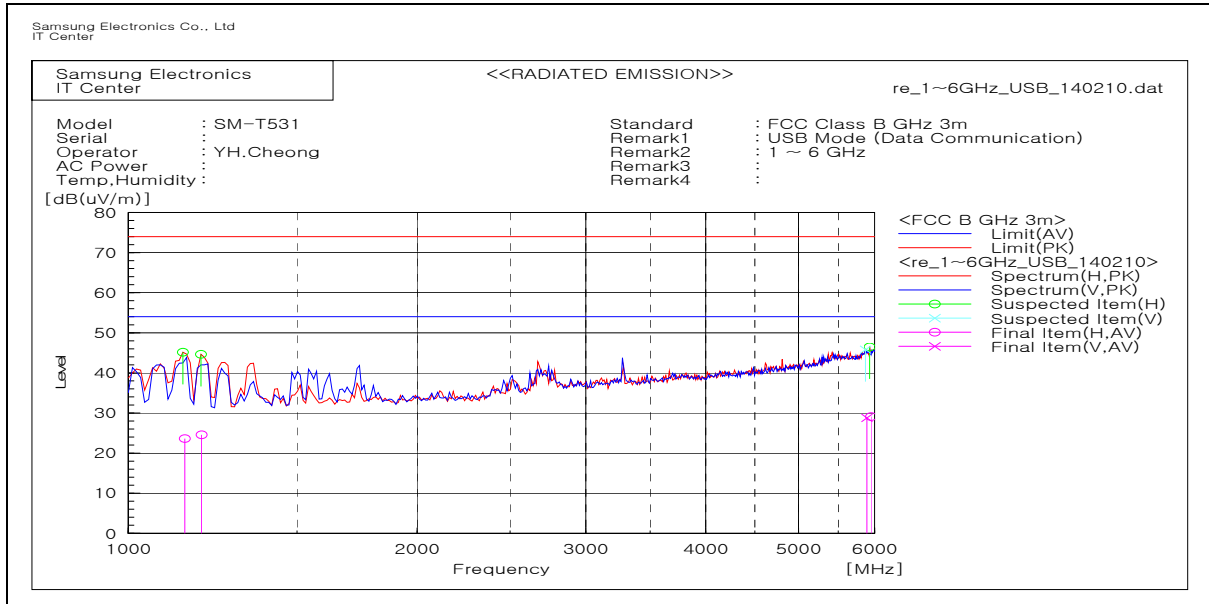
Note5) Margin QP = Limit – Level QP

QP : Abbreviation of Quasi-peak

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 1 000 ~ 6 000 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]
1 140.281	H	53.5	-8.4	45.1	74.0	28.9	101.0	242.0
1 190.381	H	52.9	-8.3	44.6	74.0	29.4	101.0	210.0
5 869.740	V	40.8	5.0	45.8	74.0	28.2	101.0	21.0
5 929.860	H	41.2	5.3	46.5	74.0	27.5	101.0	298.0

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