

EMC TEST REPORT




Project No.	LBE20140696	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 23, 2014	
EUT	Type of device	<input checked="" type="checkbox"/> Class B personal computers and peripherals <input type="checkbox"/> All other devices	
	Equipment authorization	<input type="checkbox"/> Declaration of Conformity <input checked="" type="checkbox"/> Certification <input type="checkbox"/> Verification	
	FCC ID	A3LSMT331	
	Kind of product	Portable Device	
	Model No.	SM-T331	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	Samsung Electronics Vietnam CO., LTD. 730-722 Yenphong 1-I.P, YenTrung Commune, Yenphong Dist. Bacninh Province Vietnam	
Applied Standards	47 CFR Part 15, Subpart B, Class B / ANSI C63.4-2009		
Test Period	January 23, 2014 ~ January 24, 2014		
Issue date	February 3, 2014		
Test result : Complied <p>The equipment under test has found to be compliant with the applied standards. (Refer to the attached test result for more detail.)</p>			
Tested by : Su-Young Son 		Reviewed by : Min-Gon Kim 	
<p>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.</p>			
 <p>(Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-so, 443-742, Republic of Korea Tel: 82 31 279 1750, Fax: 82 31 279 1745</p>			

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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
<input checked="" type="checkbox"/>	Conducted Disturbance (Mains port)	47 CFR Part 15, Subpart B / ANSI C63.4-2009 (Class B)	Complied
<input checked="" type="checkbox"/>	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-T331	-	SAMSUNG	A3LSMT331
B	Battery	SP3379D1H	-	SAMSUNG SDI	DoC
C	Headset	EO-HS3303WE	-	SAMSUNG	-
D	Data Cable	ECB-DU28WE	KD1DC16DS E	SAMSUNG	-
E	microSD Card	16GB	-	SANDISK	DoC
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	DoC
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	-

This tablet 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

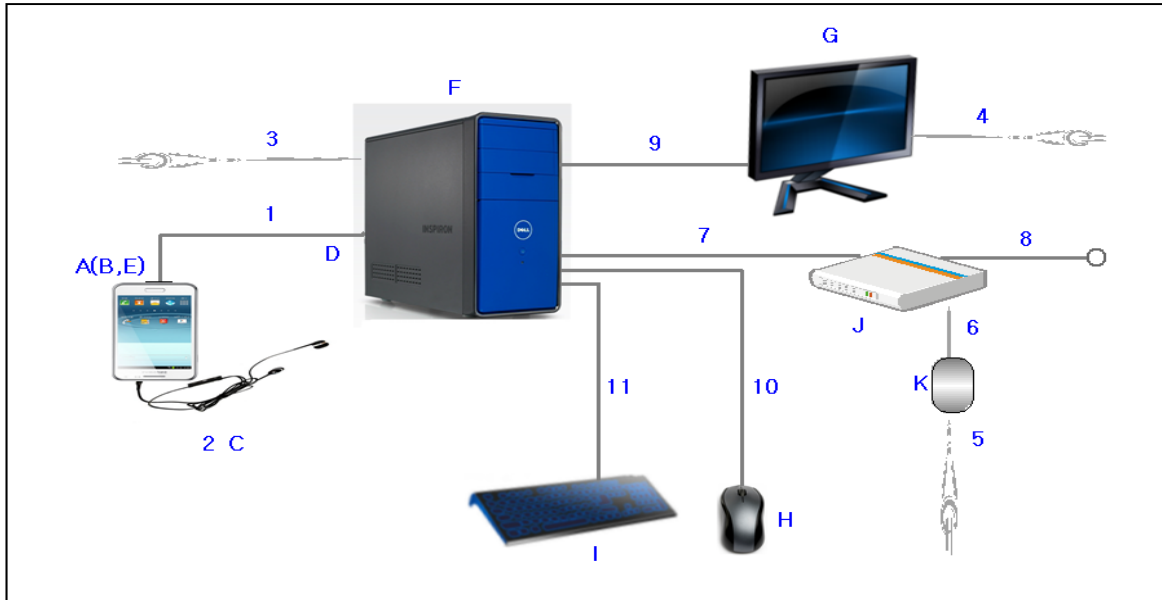
Customer selected, single unit.

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	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 TV Monitor
5	Power	1.8	N	From Gigabit Switch Hub to Power Supply
6	LAN	1.5	N	From Desk-Top Computer to Gigabit Switch Hub
7	LAN	1.5	N	From Gigabit Switch Hub to Local Area Network
8	RGB	1.8	Y	From Desk-Top Computer to LCD TV Monitor
9	PS/2	1.8	Y	From Desk-Top Computer to Mouse
10	PS/2	1.8	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	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
Bluetooth	V4.0 + LE	TX/ RX : 2402 ~ 2480 MHz
WLAN	802.11 b/g/n	TX/ RX : 2412 ~ 2462 MHz
	802.11 a/n	TX/ RX : 5180 ~ 5240 MHz, 5260 ~ 5320 MHz 5500 ~ 5700 MHz, 5745 ~ 5825 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.

- 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

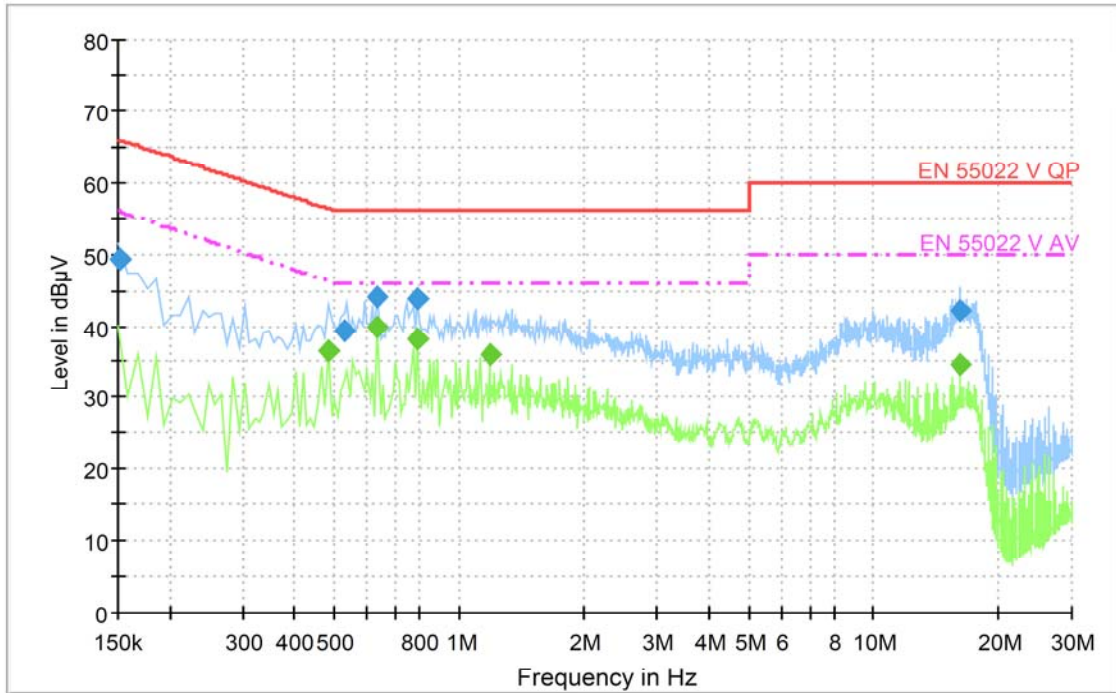
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E5I-016	EMI TEST RECEIVER	ESU	R&S	100482	2013-08-29	12
E3I-259	Two-Line V-Network	ENV216	R&S	101369	2013-11-17	12
E3I-260	Two-Line V-Network	ENV216	R&S	101366	2013-07-28	12

5.1.2 Temperature and humidity condition

Test date	2014-01-23	Test engineer	Su-Young Son
Climate condition	Ambient temperature	22.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	37.0% R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.9 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)
0.151629	49.3	5000.0	9.000	On	L1	9.9	16.60	65.90
0.526992	39.4	5000.0	9.000	On	L1	10.0	16.60	56.00
0.636000	43.9	5000.0	9.000	On	L1	10.0	12.10	56.00
0.789000	43.8	5000.0	9.000	On	N	9.9	12.20	56.00
16.228824	42.0	5000.0	9.000	On	L1	9.8	18.00	60.00

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.483000	36.5	5000.0	9.000	On	N	10.0	9.80	46.30
0.636000	39.7	5000.0	9.000	On	N	10.0	6.30	46.00
0.789000	38.3	5000.0	9.000	On	N	9.9	7.70	46.00
1.185000	36.0	5000.0	9.000	On	N	9.8	10.00	46.00
16.170000	34.5	5000.0	9.000	On	L1	9.8	15.50	50.00

Note1) 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 CISPR-Average final measurement results table.

Note 2) Level (QP and/or CAV) = Meter Reading (QP and/or CAV) + Corr. (LISN Insertion Loss + Cable Loss)
 Margin (QP and/or CAV) = Limit – Level (QP and/or CAV)
 QP = Quasi-Peak, CAV = CISPR-Average, Corr. = Correction Factor

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 3 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/CISPR-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 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)
E3I-005	EMI TEST RECEIVER	ESIB-26	R&S	100355	2013-02-06	12
E3I-263	BILOG Antenna	CBL 6143A	TESEQ	30262	2013-05-16	24
E3I-217	Preamplifier	310N	SONOMA	282363	2013-02-04	12
E3I-170	Double-Ridged Waveguide Horn Antenna	HF906	R&S	100028	2012-08-13	24

5.2.2 Temperature and humidity condition

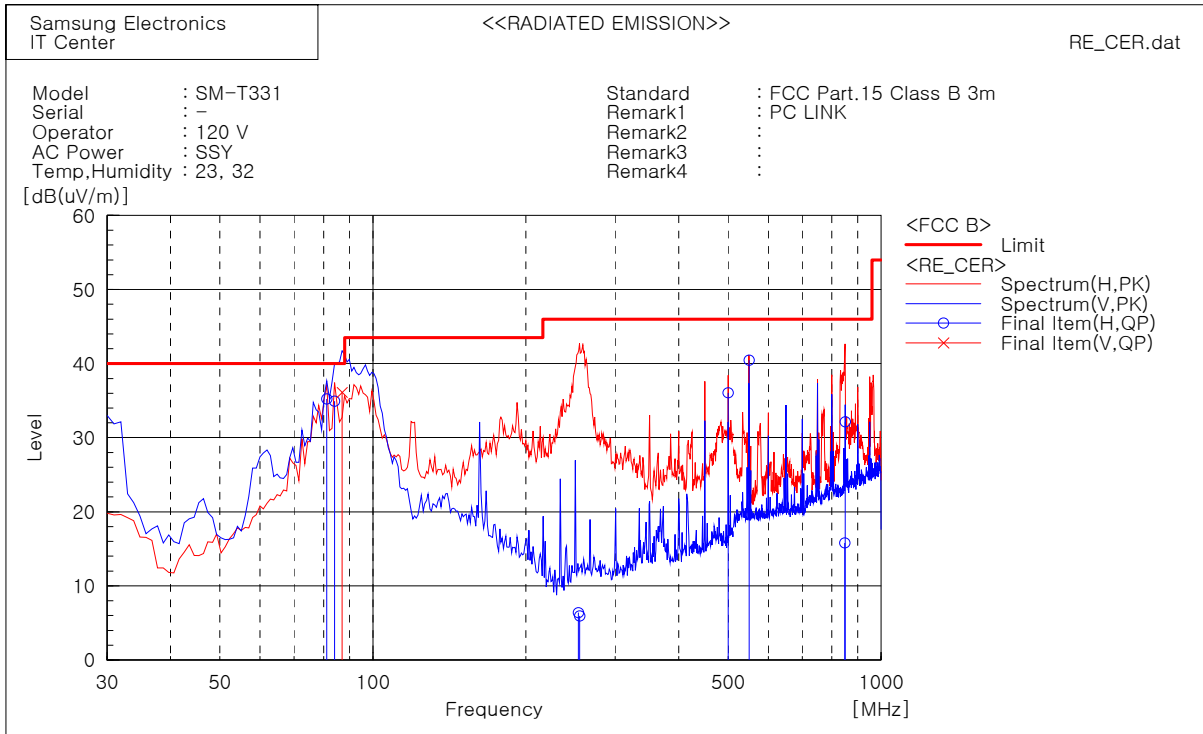
Test date	2014-01-24	Test engineer	Su-Young Son
Climate condition	Ambient temperature	21.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	45.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.0 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC7)		

5.2.3 Test results

Operating Mode 1

- Frequencies below 1 GHz

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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]
1	81.170	H	56.8	-21.6	35.2	40.0	4.8	196.0	288.0
2	84.068	H	56.0	-21.1	34.9	40.0	5.1	196.0	285.0
3	86.985	V	56.8	-20.7	36.1	40.0	3.9	103.0	249.0
4	253.802	H	22.7	-16.3	6.4	46.0	39.6	196.0	65.0
5	255.289	H	22.1	-16.2	5.9	46.0	40.1	196.0	65.0
6	499.998	H	47.3	-11.3	36.0	46.0	10.0	196.0	118.0
7	549.989	H	50.0	-9.5	40.5	46.0	5.5	196.0	151.0
8	848.158	H	22.1	-6.3	15.8	46.0	30.2	102.0	4.0
9	849.996	H	38.4	-6.3	32.1	46.0	13.9	102.0	5.0

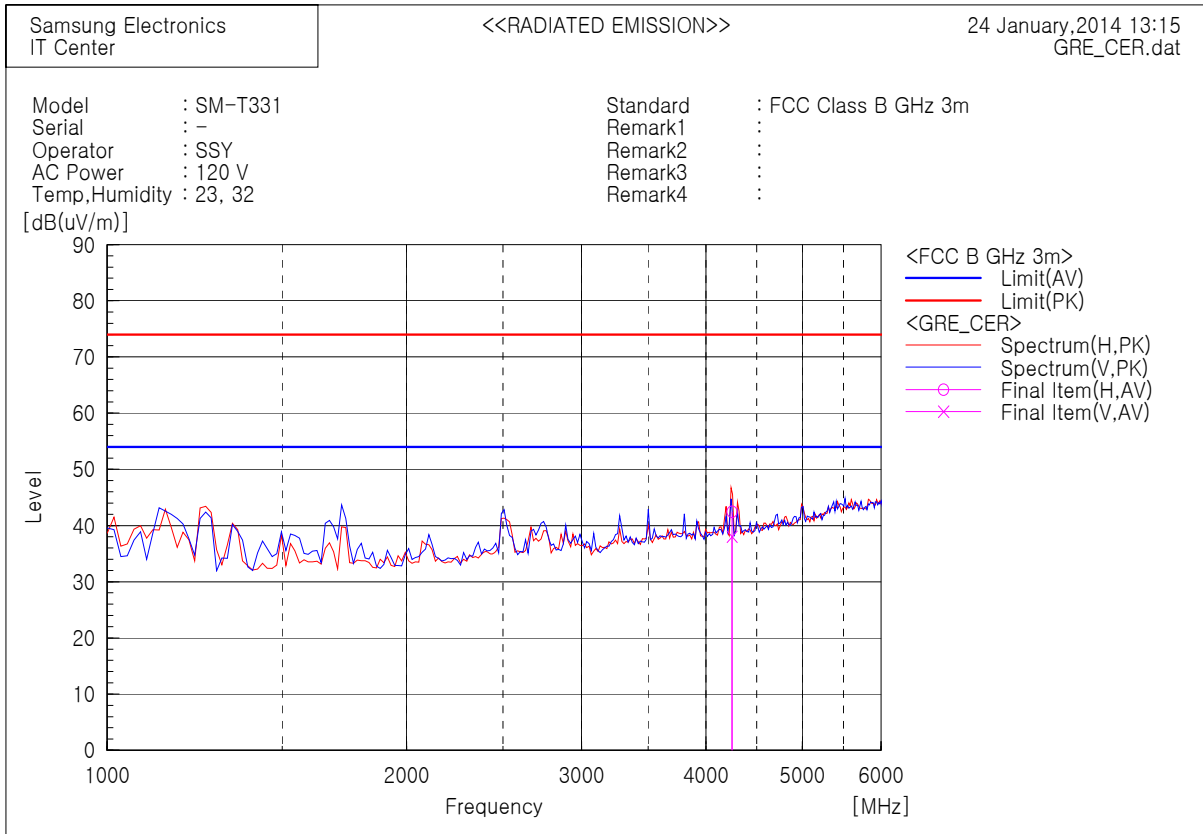
Note) Receiving antenna polarization : Horizontal, Vertical
 Test Distance : 3 m, Antenna Height : 1 to 4 meters
 Level (QP) = Reading (QP) + c.f (Antenna Factor + Cable Loss - Amp. Gain)
 Margin (QP) = Limit - Result (QP)
 QP = Quasi-Peak, c.f = Correction Factor

5.2.3 Test results

Operating Mode 1

- Frequencies above 1 GHz

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Final Result

No.	Frequency (P)	Reading	c.f	Result	Limit	Margin	Height	Angle	
	[MHz]	AV	[dB(1/m)]	AV	AV	AV	[cm]	[deg]	
		[dB(uV)]		[dB(uV/m)]	[dB(uV/m)]	[dB]			
1	4250.742	H	40.7	1.8	42.5	54.0	11.5	102.0	237.0
2	4250.581	V	36.2	1.8	38.0	54.0	16.0	102.0	267.0

Note) Receiving antenna polarization : Horizontal, Vertical

Test Distance : 3 m, Antenna Height : 1 to 4 meters

Level (PK and/or CAV) = Reading (PK and/or CAV) + Corr. (Antenna Factor + Cable Loss - Amp. Gain)

Margin (PK and/or CAV) = Limit – Level (PK and/or CAV)

PK = Peak, CAV = CISPR-Average, Corr. = Correction Factor