

EMC TEST REPORT

Project No.	LBE20134626	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 Korea	
	Date of application	August 30, 2013	
EUT	Type of device	Class B personal computers and peripherals	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSLM2020W	
	Kind of product	Printer	
	Model No.	Xpress M2022W	
	Variant Model No.	Xpress M2020, Xpress M2022, Xpress M2020W	
	Manufacturer	1) Samsung Electronics (Shandong) Digital Printing Co., Ltd. Samsung Road, Weihai Hi-Tech. IDZ, Weihai City, Shandong Province, China 2) Weihai Xinxing Digital Electronics Co., Ltd. 98, Jinzhou Road, Weihai Hi-Tech Industries Development Zone 3) Intops (Weihai) Electronics Company Ltd. No.268-1, Keji Road, Weihai Hi-tech IDZ, Shandong Province, P.R.China 4) Samsung Electronics Suzhou Computer Co., Ltd. 318 Fangzhou Road, Suzhou Industrial Park, Jiangsu Province, China	
Applied Standards		47 CFR Part 15, Subpart B / ANSI C63.4-2009	
		ICES-003 Issue 5	
Test Period	August 30, 2013 ~ September 2, 2013		
Issue date	September 4, 2013		
Test result : Complied The equipment under test has found to be compliant with the applied standards. The result is not applied the uncertainty concept. This mean that the result is applied the original (standard) limit. (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.			
 (Maetan dong) 129, Samsung-ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do 443-742 Korea Tel: 82 31 277 7752, Fax: 82 31 277 7753			

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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.

1.2 Sample calculation

1.2.1 Conducted disturbance (at 10 MHz)

- Class B limit = 60 dB μ V (Quasi-peak limit)
- Level (50 dB μ V) = Meter Reading (40.2 dB μ V) + factor (9.8 dB, AMN factor 9.7 dB + Cable loss 0.1 dB)
- Margin (10 dB) = Limit (60 dB μ V) – Level (50 dB μ V) = 10 dB below limit

1.2.2 Radiated disturbance (at 100 MHz)

- Limit = 30 dB μ V/m at 10 m
- Level (20 dB μ V/m)
 - = Meter Reading (40 dB μ V) + factor (- 20 dB (1/m), antenna factor + cable loss – amplifier gain)
- Margin (10 dB) = Limit (30 dB μ V/m) – Level (20 dB μ V/m) = 10 dB below limit

2. Summary of test results

2.1 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 / ANSI C63.4-2009	Complied
☒	Radiated Disturbance		Complied

- Note : These results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference – Causing Equipment Regulations

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 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 configuration

4.1.1 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.

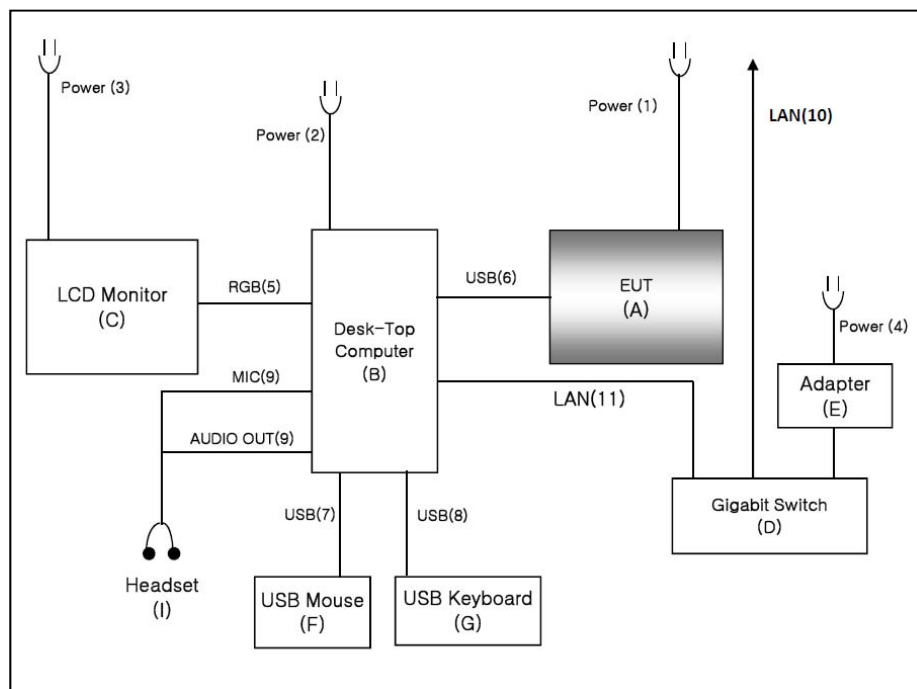
The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Seq	Description	Model No.	Serial No.	Manufacturer	Fcc ID / DoC
A	Printer	Xpress M2022W	-	Samsung	A3LSLM2020W
B	Desktop PC	D10M	753S4W1	DELL	DoC
C	LCD Monitor	U2410f	CN-06550M-72872-213-A5GL	DELL	DoC
D	Gigabit Switch	H3008	1007010008	IPTIME	DoC
E	Adapter	HB12B-050200SPA	-	IPTIME	-
F	USB mouse	AA-SM7PCP	CNBA5903634ADV8J2AI0664	Samsung	DoC
G	USB Keyboard	SKG-3000UB	TAKB601236L	Samsung	DoC
H	Headset	-	-	ACTTO	DoC

4.1.2 Test cables

No.	Connected cable	Length [m]	Shielded [Y/N]	Note
1	Power	1.8	No	For EUT
2	Power	1.8	No	For Desk-Top Computer
3	Power	1.8	No	For LCD Monitor
4	Power	1.8	No	For Gigabit Switch
5	RGB	1.8	Yes	From Desk-Top Computer to Monitor
6	USB	1.8	Yes	From EUT to Desk-Top Computer
7	USB	1.8	Yes	From Desk-Top Computer to Mouse
8	USB	1.8	Yes	From Desk-Top Computer to Keyboard
9	Audio	1.8	No	From Desk-Top Computer to Headset
10	LAN	2.0	No	From Gigabit Switch to Local Area Network
11	LAN	2.0	No	From Desk-Top Computer to Gigabit Switch

4.1.3 Test arrangement



4.2 EUT operating mode

To achieve compliance applied standard specification, the following mode(s) were made during compliance testing:

Operating Mode 1	Stand-By
Operating Mode 2	USB Printing

4.3 Details of Sampling

Customer selected, single unit.

4.4 Clock Frequencies

Kind of Clocks	Frequency[MHz]	Kind of Clocks	Frequency[MHz]
CPU Internal Clock	600	DDR3 Clock	384
Main Source Clock	12		

4.5 EUT Description

The following features describe EUT represented by this report:

Item	Specification and Description
SMPS	SUNGHO, SHANDONG NEW COWITE
Processor	A1500 (600MHZ)
Standard System memory	128MB DDR3 on all configurations (default)
Resolution	Up to 1200 dpi Effective Output (Addressable 1200 x 1200 dpi)
Speed	Up to 20 ppm @ A4 (21ppm in Letter)
Copy Quality mode	NA
Paper Handling	Paper Tray(standard) 150 Sheets Optional Cassette : N.A
Power Rating	110VAC ~ 127VAC, 5A, 50/60 Hz
Power Consumption	Power save mode : 1.7 Watts Stand by mode : 30 Watts Copying mode: 310 Watts
Printer Language	SPL
Interfaces	USB2.0, Wi-Fi 802.11 b/g/n
OS compatibility	Windows8(32/64bit)/2012 2008 Server R2(64bit)/Windows7(32/64bit)/XP(32/64bit)/2003(32/64bit)/Vista(32/64bit)/2008 Server(32/64bit)/2008 Server R2(64bit) Various Linux OS: RedHat Enterprise Linux 5, 6 Fedora 11, 12, 13, 14, 15, 16, 17, 18 OpenSuSE 11.0, 11.1, 11.2, 11.3, 11.4, 12.1, 12.2, 12.3 Ubuntu 10.04, 10.10, 11.04, 11.10, 12.04, 12.10 SuSE Linux Enterprise Desktop 10, 11 Debian 5.0, 6.0 Mint 13, 14 Mac OS 10.5~10.8
Modes of Operation	USB Printing, Wi-Fi Printing
Intended Class for Emissions	Class B

4.6 Test configuration and condition

Item	Model Name	S/N	Manufacturer
MAIN BOARD	SL-M2022W	JC92-02687A	SEC
SMPS / HVPS	BLUEJAY-V1	JC98-02554A	SUNGHO
	BLUEJAY-V1		SHANDONG NEW COWITEL

The system was configured for testing in typical fashion use. Cables were attached to each of the available I/O Ports. Where applicable, peripherals were attached to the I/O cables. The mode of operation utilized for testing was selected to best simulate typical EUT use.

The EUT was measured all testing with toner cartridge.

Power source for the EUT operating was supplied by CVCF made by the Pacific Corp.

- Test Voltage : AC 120 V, 60 Hz

4.7 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.)

4.7.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	Main terminal (ITE)	3.31 dB
Radiated Disturbance (Below 1 GHz)	Horizontal	4.69 dB
	Vertical	4.83 dB
Radiated Disturbance (Above 1 GHz)	Horizontal	5.61 dB
	Vertical	5.60 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 of class B ITE

Frequency range Limits MHz	Resolution Bandwidth	Limits dBμV	
		Quasi-peak	Average
0.15 to 0.50	9 kHz	66 to 56	56 to 46
0.50 to 5	9 kHz	56	46
5 to 30	9 kHz	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

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
EMI TEST RECEIVER	ESIB-26	R&S	100291	2012-11-27	12
Two-Line V-Network	ENV216	R&S	101369	2012-12-07	12
Two-Line V-Network	ESH3-Z5	R&S	100260	2013-01-08	12
Test Software	EMC32	R&S	Ver 8.53.0	-	-

5.1.2 Temperature and humidity condition

Test date	2013-09-02	Test engineer	Young-Jin Kim
Climate condition	Ambient temperature	24.1 °C	Limit (15.0 to 35.0) °C
	Relative humidity	40.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.1 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

5.1.3 Photograph of Test Setup



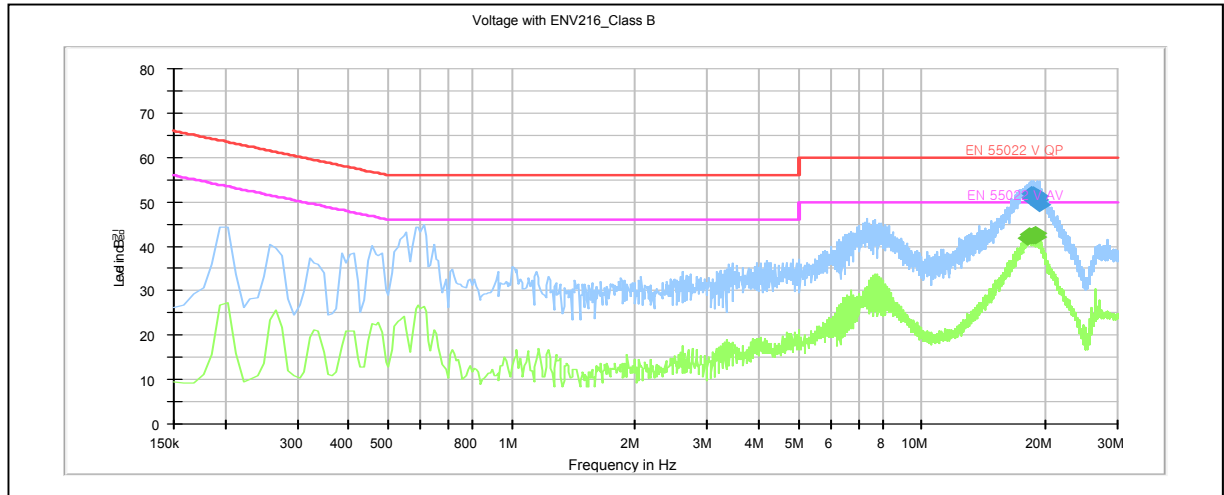
Front



Rear

5.1.4 Test results (mains port)

☐ Operating Mode 1: Stand-By



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)
18.393	50.9	L1	9.9	9.10	60.00
18.501	51.9	L1	9.9	8.10	60.00
18.564	51.7	L1	9.9	8.30	60.00
18.591	51.0	L1	9.9	9.00	60.00
18.744	51.9	L1	9.9	8.10	60.00
18.771	51.6	L1	9.9	8.40	60.00
18.798	50.6	L1	9.9	9.40	60.00
19.023	51.2	L1	9.9	8.80	60.00
19.095	50.6	L1	9.9	9.40	60.00
19.392	49.4	L1	9.9	10.60	60.00

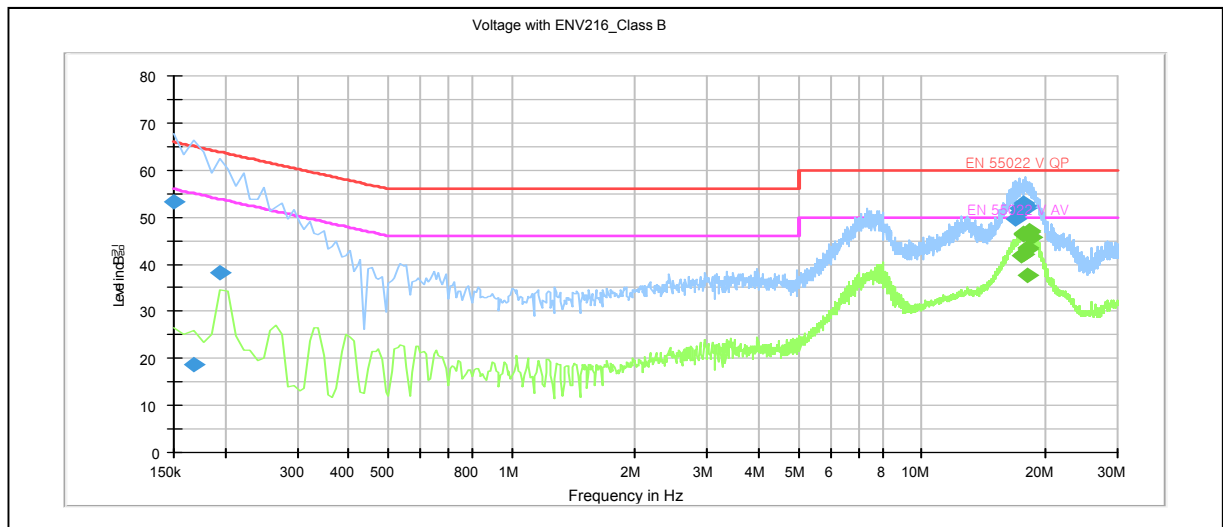
Average final measurement results table:

Frequency (MHz)	Level (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
18.177	41.8	L1	9.9	8.20	50.00
18.204	42.5	L1	9.9	7.50	50.00
18.519	42.0	L1	9.9	8.00	50.00
18.564	42.5	L1	9.9	7.50	50.00
18.654	42.5	L1	9.9	7.50	50.00
18.744	42.5	L1	9.9	7.50	50.00
18.762	42.2	L1	9.9	7.80	50.00
18.789	42.5	L1	9.9	7.50	50.00
18.816	42.0	L1	9.9	8.00	50.00
18.852	43.0	L1	9.9	7.00	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

☐ **Operating Mode 2: USB Printing**


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)
0.150	53.2	N	9.9	12.80	66.00
0.168	18.7	N	10.3	46.40	65.10
0.195	38.1	L1	10.0	25.70	63.80
16.926	49.7	L1	9.9	10.30	60.00
17.268	51.1	L1	9.9	8.90	60.00
17.313	51.8	L1	9.9	8.20	60.00
17.376	51.8	L1	9.9	8.20	60.00
17.754	52.9	L1	9.9	7.10	60.00
17.808	52.5	L1	9.9	7.50	60.00
17.934	51.8	L1	9.9	8.20	60.00

Average final measurement results table:

Frequency (MHz)	Level (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
17.574	41.7	L1	9.9	8.30	50.00
17.637	42.0	L1	9.9	8.00	50.00
17.745	46.2	L1	9.9	3.80	50.00
17.772	46.6	L1	9.9	3.40	50.00
18.060	37.7	N	10.0	12.30	50.00
18.114	43.5	N	10.0	6.50	50.00
18.141	43.1	N	10.0	6.90	50.00
18.249	46.8	L1	9.9	5.20	50.00
18.294	47.2	L1	9.9	5.80	50.00
18.393	45.7	L1	9.9	5.30	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

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. All measurements were taken utilizing quasi-peak detection unless stated otherwise.

Measurements were performed at an antenna to EUT distance of 10 m and elevated between 1 m and 4 m.

Both vertical and horizontal antenna polarizations were measured.

Limits for radiated disturbance of ITE at a measuring distance of 10 m

Frequency range Limits MHz	Resolution Bandwidth	Quasi-peak Limits dB μ V/m
		Class B
30 to 230	120 kHz	30
230 to 1 000	120 kHz	37
NOTE 1 The lower limit shall apply at the transition frequency		
NOTE 2 Additional provisions may be required for cases where interference occurs.		

Peak measurements were made over the changeable frequency range 1 GHz to 40 GHz or 5th 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	1	Continuous

Limits for above 1GHz radiated disturbance of ITE at a measuring distance of 3 m

Class	Limits - dB(μ V/m)	
	Peak	Average
B	74	54
Average limit 500, $20 \log 500 = 53.979 \text{ dB} \approx 54 \text{ dB}$		

Measurements within 20 dB of the limit were then maximized by adjusting turntable position.

Final measurements were made using a average detector.

Results checked manually; and points close to the limit line were re-measured.

5.2.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Antenna Mast	AM 4.0	Maturo	AM4.0/061/2410908	-	-
Antenna Mast	AM 4.0	Maturo	AM4.0/060/2410908	-	-
Controller	MCU	Maturo	MCU/100/2410908	-	-
Preamplifier	317	SONOMA	282424	2012-11-14	12
Preamplifier	317	SONOMA	282425	2012-11-14	12
BI-LOG Antenna	CBL6112B	Schaffner	2805	2012-04-19	24
BI-LOG Antenna	CBL6112D	TESEQ	25513	2013-08-01	24
Horn Antenna	HF906	R&S	100291	2012-12-27	24
EMI TEST RECEIVER	ESU-26	R&S	100364	2013-07-25	12
EMI TEST RECEIVER	ESU-08	R&S	100485	2013-07-25	12
EMI TEST RECEIVER	ESI-26	R&S	100019	2013-01-25	12
Wi-Fi Router	DIR-825	D-Link	F3WR1A3005396	-	-
Desktop	ZCP30	SAMSUNG	Z41698AY9000071V	-	-
Test Software	EP5/RE	TOYO	Ver 3.10.20	-	-

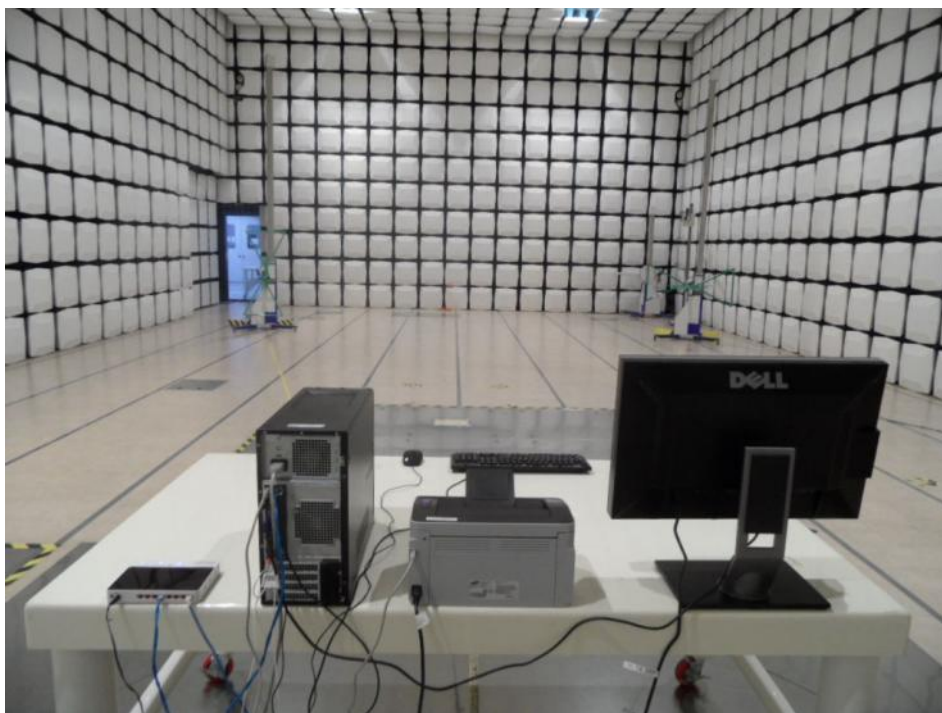
5.2.2 Temperature and humidity condition

Test date	2013-08-30	Test engineer	Young-Jin Kim
Climate condition	Ambient temperature	21.8 °C	Limit (15.0 to 35.0) °C
	Relative humidity	42.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.9 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

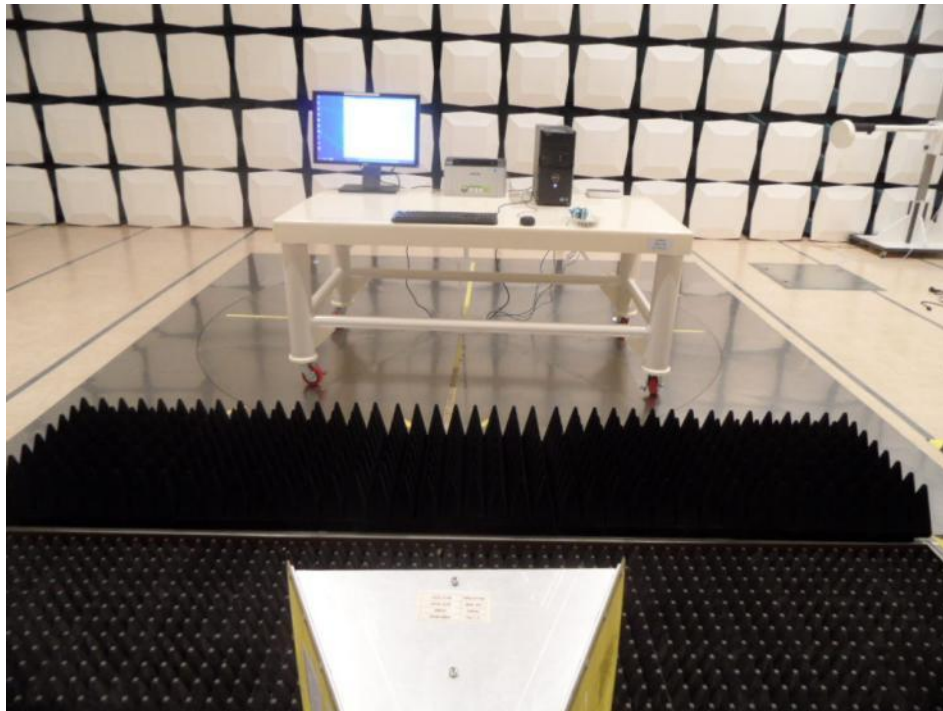
5.2.3 Photograph of Test Setup



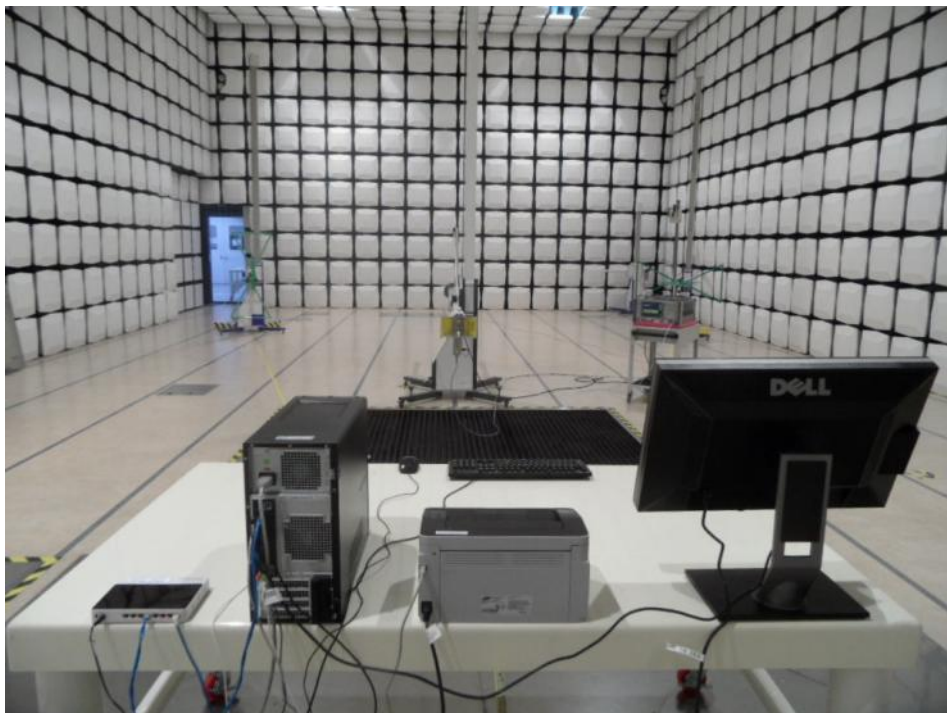
Front (Below 1 GHz)



Rear (Below 1 GHz)



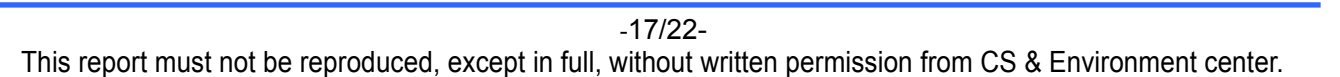
Front (above 1 GHz)



Rear (above 1 GHz)

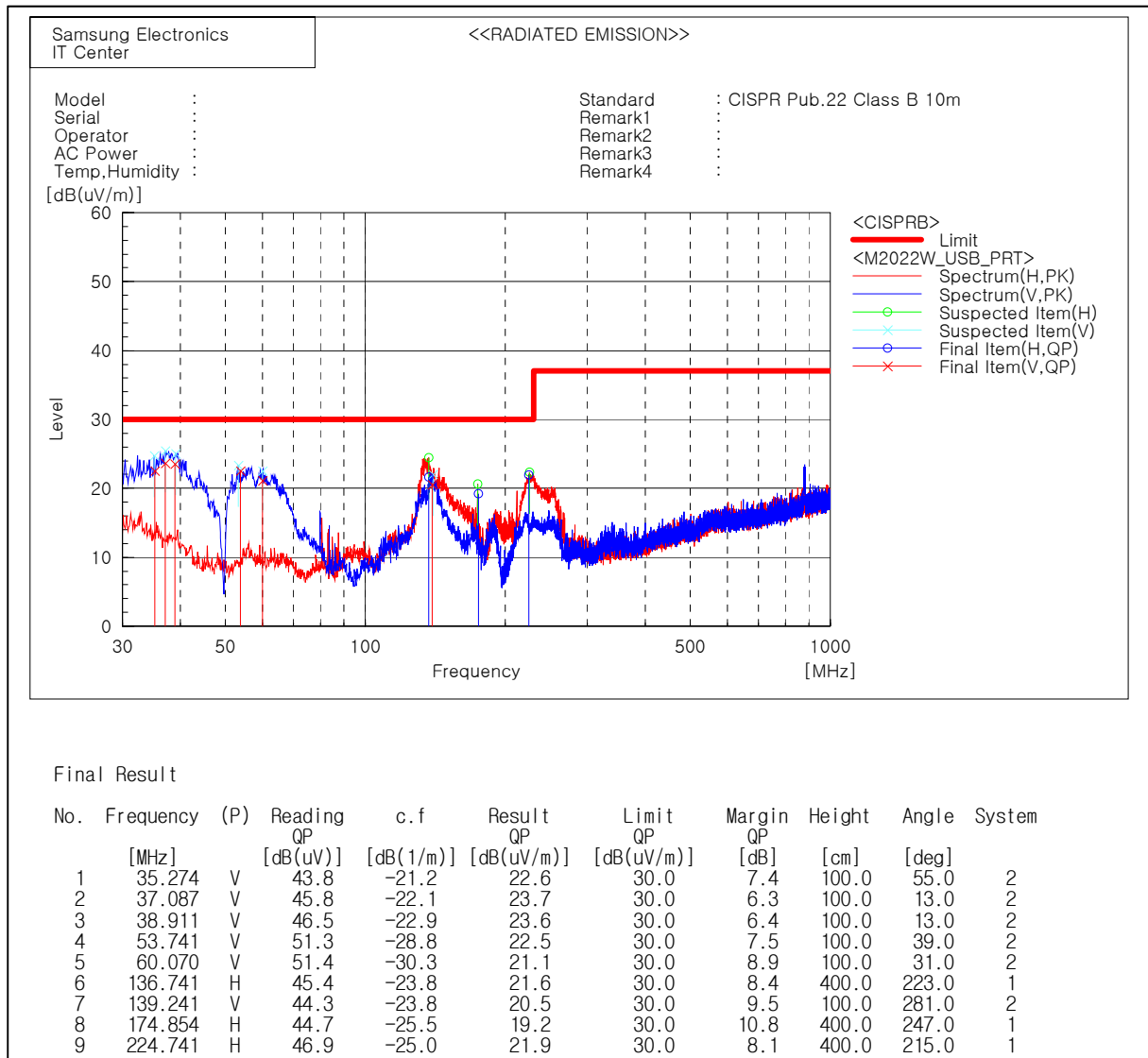
5.2.4.1 30 MHz to 1 GHz test results

- ## Test Graph and Results



- Operating Mode 2 : USB Printing

Test Graph and Results



Note) Receiving antenna polarization : Horizontal and/or Vertical

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

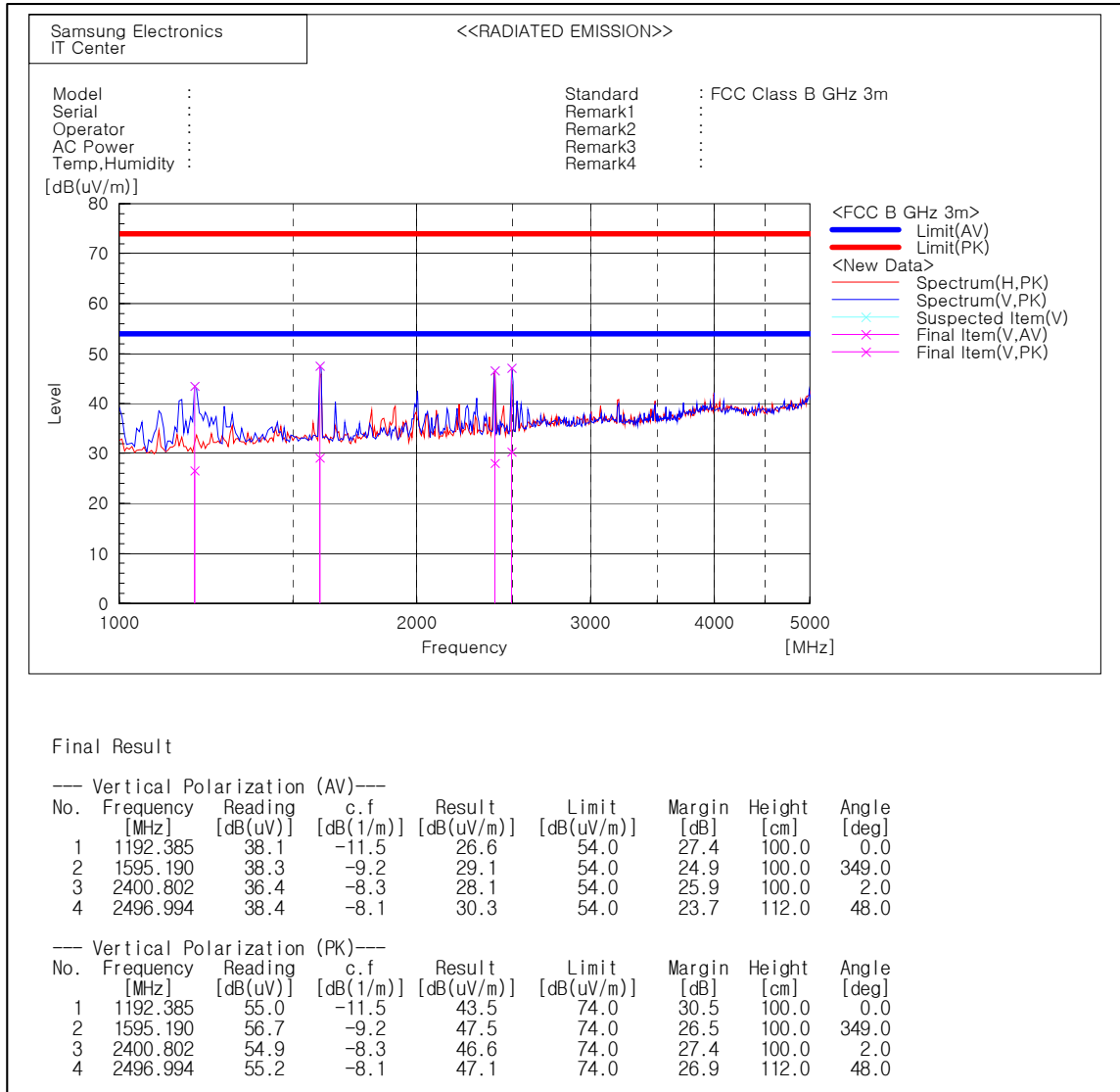
Level QP (Quasi-Peak) = Reading QP + Factor (Antenna Factor + Cable Loss - Amp. Gain)

Margin QP (Quasi-Peak) = Limit - Level QP

5.2.4.2 1 GHz to 5 GHz test results

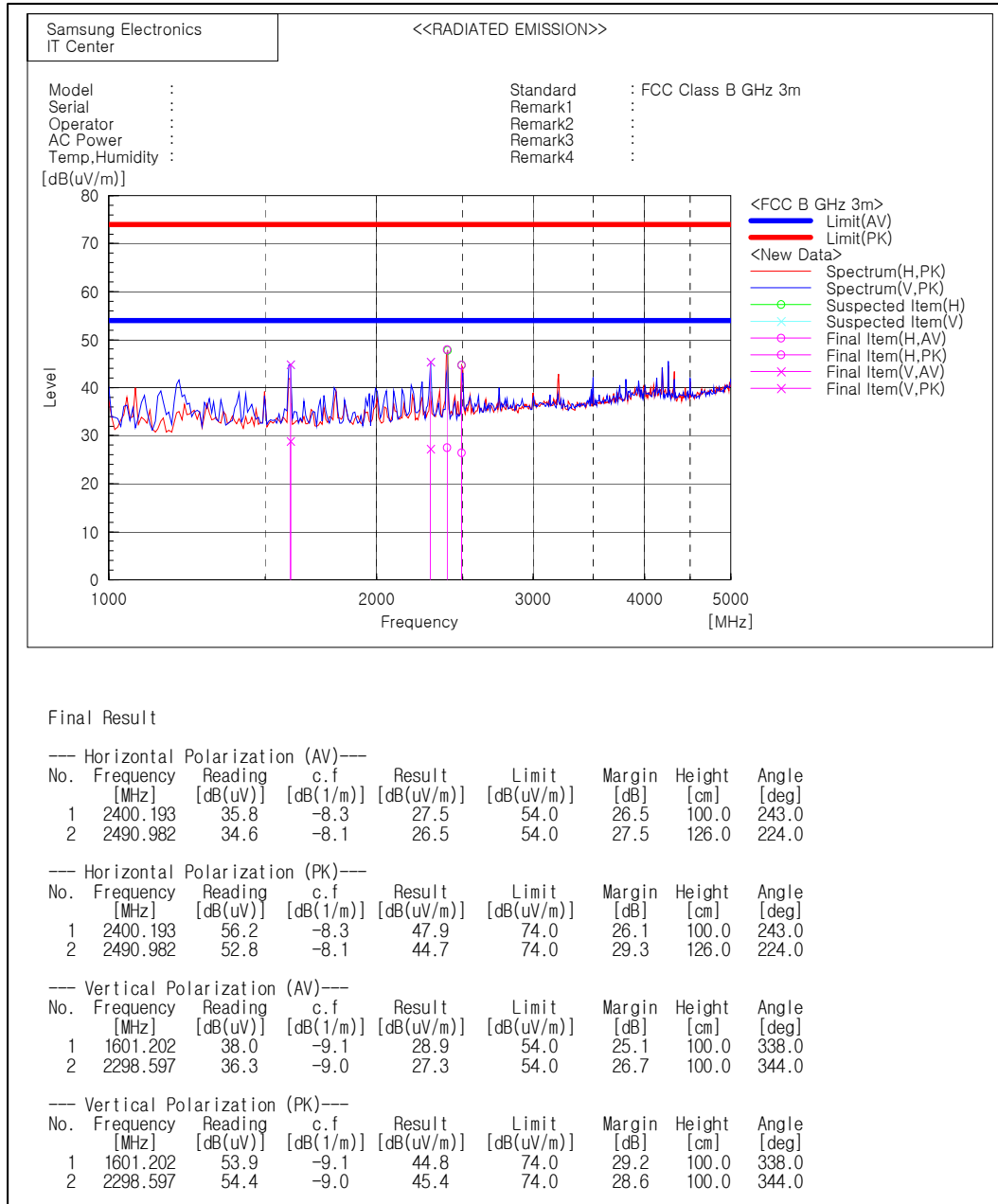
- Operating Mode 1 : Standby

Test Results



- Operating Mode 2 : USB Printing

Test Results



Note1) Receiving antenna polarization : Horizontal and Vertical

Level PK (Peak) = Reading PK (Peak) + Factor (Antenna Factor + Cable Loss - Amp. Gain)

Level AV (Average) = Reading AV (Average) + Factor (Antenna Factor + Cable Loss - Amp. Gain)

Margin PK (Peak) = Limit - Level PK (Peak)

Margin AV (Average) = Limit - Level AV (Average)

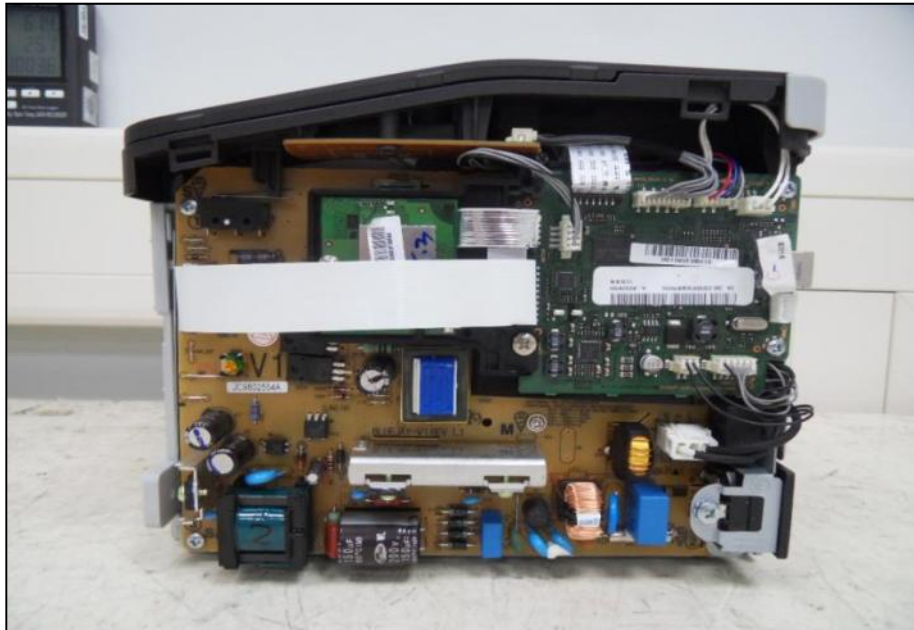
Appendix – EUT photography



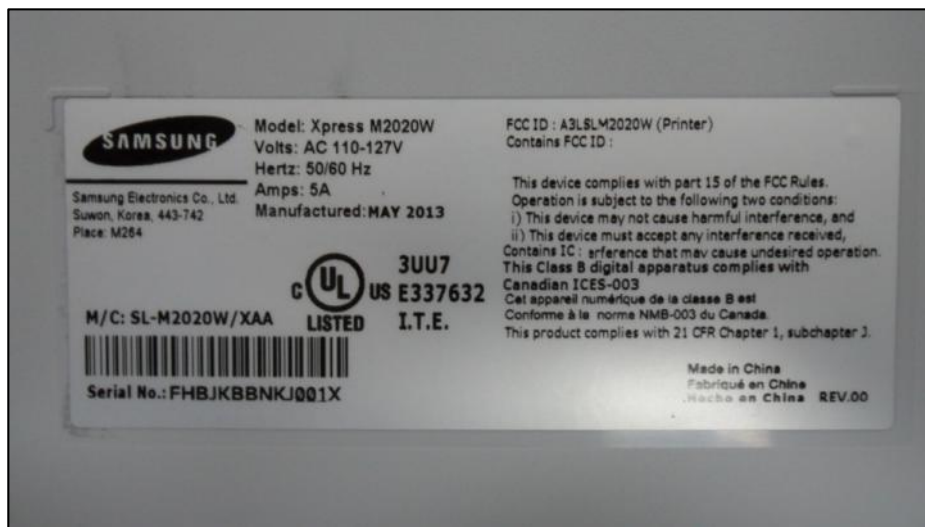
Front View



Rear View



inside View



Label