EMC TEST REPORT

Samsung Electronics Co., Ltd.
416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si,Gyeonggi-Do, 443-742 Korea
(Tel: 031 277 7752, Fax: 031 277 7753)
FCC Registration No. : KR0004, NVLAP Code : 200623-0

1. Applicant
   - Name of organization : Samsung Electronics Co., Ltd.
   - Address : 416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 443-742 Korea
   - Date of application : 2006.02.13
2. Manufacturer
   1) Samsung Electronics Co., Ltd.
   259, Gongdan-Dong, Gumi-City, Gyeongsangbuk-Do, Korea 730-030
   2) Shandong Samsung Telecommunications Co., Ltd.
   264209, Samsung Road, Weihai Hi-Tech. IDZ, Shandong Province, P.R.China
   3) Weihai Shin Heung Digital Electronics Co., Ltd.
   98, Samsung Road, Weihai Hi-Tech. IDZ, Shandong Province, P.R.China
3. Purpose for the report : Approval for EMC
4. Description of EUT
   1) Kind of product : Laser Printer
   2) Model name : ML-2510
   3) Brand name : Samsung
   4) FCC ID or DoC/Verification : **A3LML2510**
   5) Variant model : None
5. Date of test : 2006.02.13
6. Applied standard : FCC Part 15, Subpart B, Class B
7. Report No. : LBE060422 Issue 1
8. Test result : The equipment under test has found to be compliant with the applied standards.
   (Refer to the attached test result for more detail.)

Tested by	Reviewed by
Name : Kyeong Dong, Kim	Name : No Cheon, Park

This report is the test result about the sphere accredited by KOLAS which signed the Mutual Recognition Arrangement of International Laboratory Accreditation Cooperation.

2006. 02. 15

Samsung Electornics Co., Ltd.
Chief of CS Management Center

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1. General information

1.1 Basic information related product

Applicant	Samsung Electronics Co., Ltd.
Model name	ML-2510
Applicant address	416 Maetan 3-Dong, Yeongtong-Gu,Suwon-Si,Gyeonggi-Do 443-742 Korea
Contact person	Kyeong Dong, Kim
Kind of product	Laser Printer
Valiant model	None
Manufacturer	1) Samsung Electronics Co., Ltd. 259, Gongdan-Dong, Gumi-City, Gyeongsangbuk-Do, Korea 730-030 2) Shandong Samsung Telecommunications Co., Ltd. 264209, Samsung Road, Weihai Hi-Tech. IDZ, Shandong Province, P.R.China 3) Weihai Shin Heung Digital Electronics Co., Ltd. 98, Samsung Road, Weihai Hi-Tech. IDZ, Shandong Province, P.R.China
Rated power	AC 110-127 V, 50/60 Hz, 5.5 A
New / Alternative / Permissive change information	New

1.2 Detail Information related product

1.2.1 Specification

Item	Specification	Remark
Printing Speed	Up to 24 ppm in A4 (25 ppm in Letter)	-
Printing Resolution	Up to 1 200 x 600 dpi effective output	-
Memory	8 MB (not expandable)	-
Interface	USB 1.1, IEEE 1284 Parallel	-
Power Rating	AC 110-127 V, 50/60 Hz, 5.5 A	
Power Consumption	380 W average during operation / Less than 5 W in power save mode	-
External Dimensions	378 mm(W) X 299 mm(D) X 277 mm(H)	-

- Operating frequencies

Main Clock(12 MHz), Video(22.503 5 MHz), SDRAM clock(75 MHz), Internal PLL(150 MHz)

1.3 Operating mode and condition

The system was configured for testing in typical fashion use. Cable were attached to each of the available I/O port. Where applicable, peripherals were attached to the I/O cables.

The EUT is supporting the Stand-by, USB and Parallel printing mode.
In each test mode, finally we found worst case emission that is above configuration with the worst case components. So, the data of the maximum EUT operation, USB printing(1 200 dpi) was reported.

- Standby mode
- **USB Printing mode (1 200 dpi, toner save on) : worst case emissions**
- Parallel Printing mode

- Test Voltage : 115 V, 60 Hz

1.4 Equipment modifications

No equipment modification

1.5 Test procedure

1.5.1 Conducted emission

The EUT was placed on a platform nominal size, 1 m by 1.5 m, raised 80 cm above the conducting Ground plane. The rear of tabletop was located 40 cm to the vertical conducting ground plane.
The rear of EUT, including peripherals was aligned and flush with rear of tabletop.
All other surfaces of tabletop was at least 80 cm from any other grounded conducting surface.
I/O cables and AC cables that were connected to the peripherals were bundled in center.
They were folded back and forth forming a bindle 30 cm to 40 cm long and were handed at a 40 cm height to the ground plane.
Each EUT current-carrying power lead, except the ground(safety) lead, were individually connected through a LISN to the input power source.
All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

Frequency Band [MHz]	Instrument	Detector	Resolution Bandwidth	Video Bandwidth
0.15 to 30	EMI Receiver	Quasi-Peak	9 kHz	-
		Average	9 kHz	-

1.5.2 Radiated emission

EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The rear of EUT, including peripherals was aligned and flush with rear of tabletop.
The I/O cables that were connected to the peripherals were bundle in center.
They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged 40 cm height to the ground plane.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.
The measurement antenna was varied in height above the conducting ground plane and the trun table azimuth was varied to obtain the maximum signal strength

The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found.
The spectrum was scanned from 30 to 1 000 MHz using biconiLog antenna.

Also, the EMI RECEIVER was scanned from 1 000 to 2 000 MHz using Biconi-Log antenna were used.
The explanation of measuring instrument setup when Respective function is used in any frequency band is as following;

Frequency Band [MHz]	Instrument	Detector	Resolution Bandwidth	Video Bandwidth
30 to 1 000	EMI Receiver	Quasi-Peak	120 kHz	-
Above 1 000	EMI Receiver	Peak, Average	1 MHz	1 MHz

1.6 Test configuration

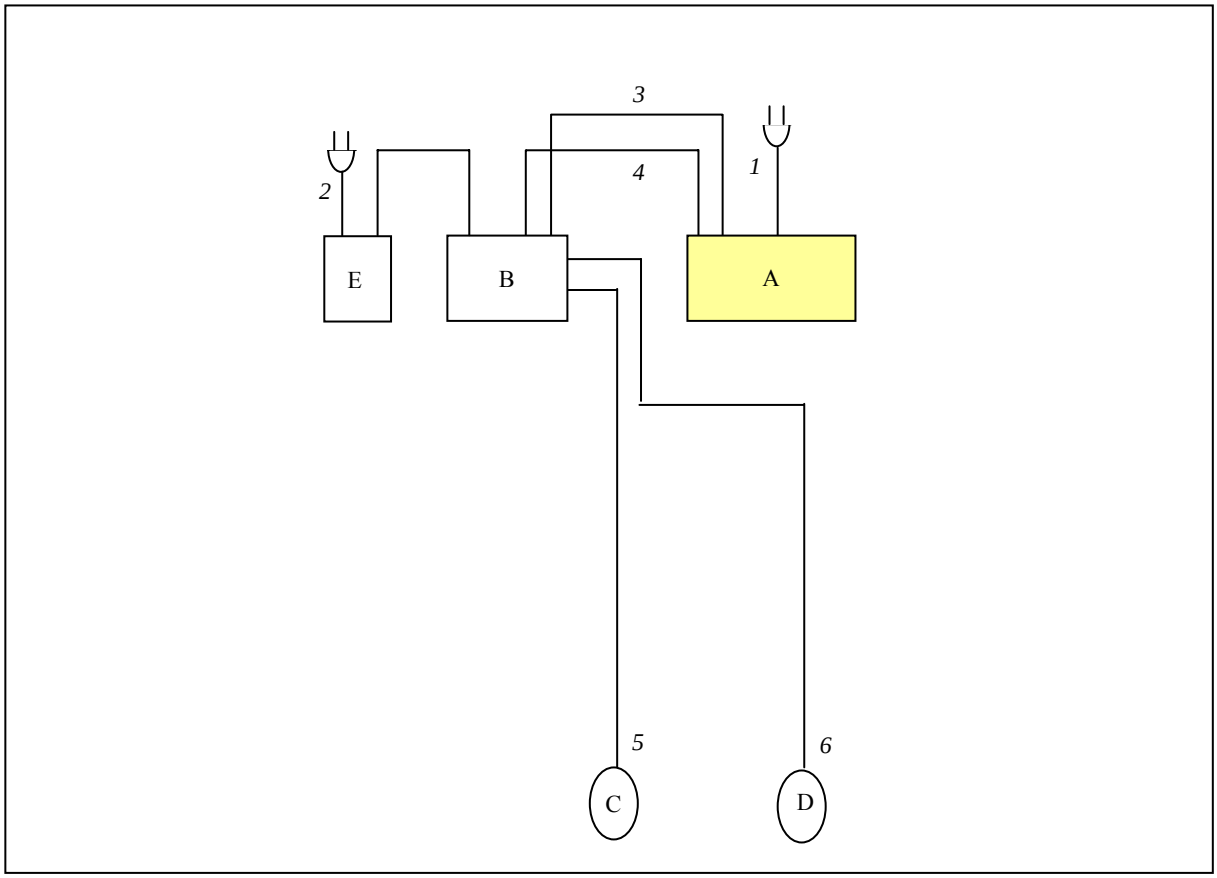
1.6.1 Used EUT and peripherals

Mark	Item	Model No.	Serial No.	Manufacturer	FCC ID/DoC
A	Laser Printer	ML-2510	-	Samsung	A3LML2510
B	Notebook PC	SQ20	I8619CWC00005	Samsung	DoC
C	Serial Mouse	Serial Mouse	1406874	Microsoft	C3KMS1
D	Headset	Axis-202	-	Labtec	-
E	AC Adapter	AD-4214A	CNBA4400148ASE383 AK2463	Dongguan Samsung Electro-Mechanics	For Note PC

1.6.2 Used cable description

Mark	Connected cable	Length [m]	Shielded [Y/N]	Note
1	Power	1.8	No	For EUT
2	Power	1.8	No	For Notebook PC
3	USB Cable	1.8	Yes	From PC to EUT
4	Parallel Cable	1.8	Yes	From PC to EUT
5	Serial Mouse Cable	2.0	Yes	-
6	Headset Cable	2.0	No	-

1.6.3 Block diagram



1.7 Applied Standards

Test standard	Test method
FCC Part 15, Subpart B, Class B	ANSI C 63.4:2003

1.8 Test Facility

1.8.1 General information

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR 22, 16-1, 16-2.This EMC Testing Lab. is accredited by Korea Laboratory Accreditation Scheme(KOLAS) which signed the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the above test item(s) and test method(s).
This Lab. is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:1998.

1.8.2 Accreditation and listing

1.8.3 Measurement uncertainty

(According to CISPR 16-4 and Lab. 34)

Test item	Measurement uncertainty
Conducted emission	± 3.3 dB
Radiated emission Horizontal	± 4.0 dB
Vertical	± 4.4 dB

2. Summary of test results

Result : Complied

The equipment under test(EUT) has been found to comply with the applied standards.

Section of the product standard		Applied standard	Test result
Electromagnetic Emission Test			
3.1	Conducted Emission	FCC Part 15, Subpart B	Complied
3.2	Radiated Emission	FCC Part 15, Subpart B	Complied

3. Description of individual tests

3.1 Conducted emission

3.1.1 Test information

Test engineer	Kyeong Dong, Kim
Test date	Feb 13, 2006
Climate condition	Ambient temperature : 21.0 ℃, Relative humidity : 35 % Atmospheric pressure 101.1 kPa
Test place	Shielded room #1

3.1.2 Test equipment

Equipment	Model name	Manufacturer	Serial no.	Calibration	
				Next date	Interval
Test Software	EMC 32	R&S	None	N/A	N/A
Field strength meter	ESCI	R&S	100136	2006-04-17	12
LISN	ENV216	R&S	100116	2006-09-08	12
LISN	ENV216	R&S	100107	2006-08-18	12

3.1.3 Test result : **Complied**

The measured emission of the EUT has been found to be below the specified limits.

3.1.4 Test data and graph

The initial step in collecting conducted data was to perform a peak and average scan over the measurement range using a receiver.

■ Operating Mode: **H Printing, USB, 1 200 dpi, toner save on**

Test Information

EUT Name:	ML-2510
Serial Number:	N/A
Test Description:	FCC Part 15, Subpart B
Operating Conditions:	H Printing, USB, 1 200 dpi, toner save on
Operator Name:	KKD
Comment:	PASS

Hardware Setup: Voltage with 2-Line-LISN - [EMI conducted]

Subrange 1

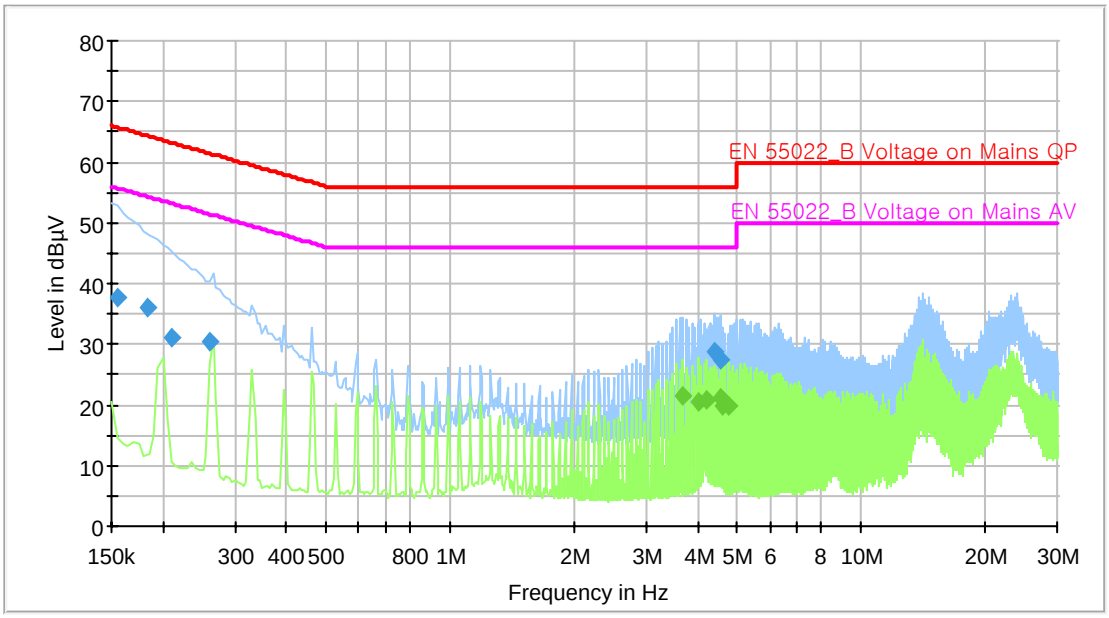
Frequency Range:	150kHz - 30MHz
Receiver:	ESCI 3
Transducer:	ENV216 / Receiver-2-Line-LISN ENV216

Scan Setup: EN55022_B_2-Line-LISN fin [EMI conducted]

Hardware Setup:	Voltage with 2-Line-LISN
Level Unit:	dBµV

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
150kHz - 30MHz	QuasiPeak; Average	9kHz	10s	ESCI 3

EN55022_B with 2-Line-LISN



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line
0.155	37.7	1 000.000	9.000	On	L1
0.185	36.1	1 000.000	9.000	On	N
0.211	31.2	1 000.000	9.000	On	L1
0.261	30.3	1 000.000	9.000	On	N
4.415	28.8	1 000.000	9.000	On	N
4.540	27.5	1 000.000	9.000	On	L1

(continuation of the "Final Measurement Detector 1" table from column 6 ...)

Frequency (MHz)	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.155	9.6	28.1	65.8	
0.185	9.6	28.2	64.3	
0.211	9.6	32.0	63.2	
0.261	9.6	31.1	61.4	
4.415	9.6	27.2	56.0	
4.540	9.6	28.5	56.0	

Final Measurement Detector 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line
3.690	21.5	1 000.000	9.000	On	L1
4.020	20.6	1 000.000	9.000	On	N
4.215	20.9	1 000.000	9.000	On	N
4.545	21.3	1 000.000	9.000	On	L1
4.610	19.9	1 000.000	9.000	On	N
4.740	20.0	1 000.000	9.000	On	N

(continuation of the "Final Measurement Detector 2" table from column 6 ...)

Frequency (MHz)	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
3.690	9.6	24.5	46.0	
4.020	9.6	25.4	46.0	
4.215	9.6	25.1	46.0	
4.545	9.6	24.7	46.0	
4.610	9.6	26.1	46.0	
4.740	9.6	26.0	46.0	

3.2 Radiated emission

3.2.1 Test information

Test engineer	Kyeong Dong, Kim
Test date	Feb 13, 2006
Climate condition	Ambient temperature : 22.5 ℃, Relative humidity : 36 % Atmospheric pressure 101.2 kPa
Test place	10m Semi-anechoic Chamber

3.2.2 Test equipment

Equipment	Model name	Manufacturer	Serial no.	Calibration	
				Next date	Interval
Bi-con Antenna	CBL6141A	SCHAFFNER	4268	2006-05-24	12
Bi-con Antenna	CBL6141A	SCHAFFNER	4266	2006-05-24	12
EMI Receiver	ESI26	R&S	100289	2006-04-11	12
EMI Receiver	ESI26	R&S	100291	2006-04-12	12
Amplifier	310N	SONOMA	251674	2006-03-08	12
Amplifier	310N	SONOMA	251677	2006-03-08	12
Ant Mast	MA4000	Inn-co	-	N/A	N/A
Ant Mast	MA4000	Inn-co	-	N/A	N/A
Mast Controller	CO2000	Inn-co	-	N/A	N/A
RF Selector	NS4900	TOYO	-	N/A	N/A

3.2.3 Test result : **Complied**

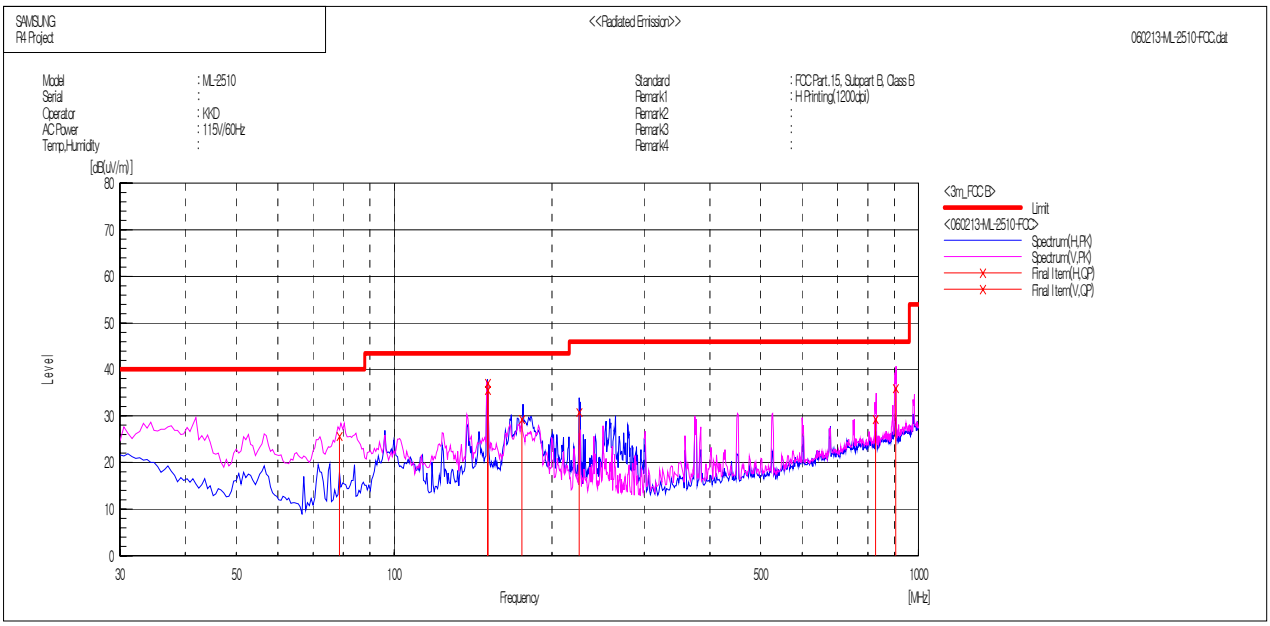
The measured emission of the EUT has been found to be below the specified limits.

3.2.3 Test data and graph

The initial step in collecting radiated data was to perform a peak scan over the measurement range using a receiver. All modes of operation were investigated and the worst-case emissions were reported. All other emissions are non-significant.

3.2.3.1 30 MHz ~ 1 000 MHz

■ Operating Mode: **H Printing, USB, 1 200 dpi, toner save on**



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	78.673	V	47.2	-21.6	25.6	40.0	14.4	101.0	281.8	
2	150.821	H	51.6	-16.0	35.6	43.5	7.9	181.0	222.3	
3	150.848	V	53.0	-16.0	37.0	43.5	6.5	101.0	90.9	
4	175.451	H	47.3	-18.1	29.2	43.5	14.3	132.0	289.8	
5	225.599	H	45.9	-15.2	30.7	46.0	15.3	101.0	290.1	
6	828.135	V	32.3	-3.0	29.3	46.0	16.7	111.0	260.2	
7	904.981	V	37.4	-1.4	36.0	46.0	10.0	100.0	221.0	

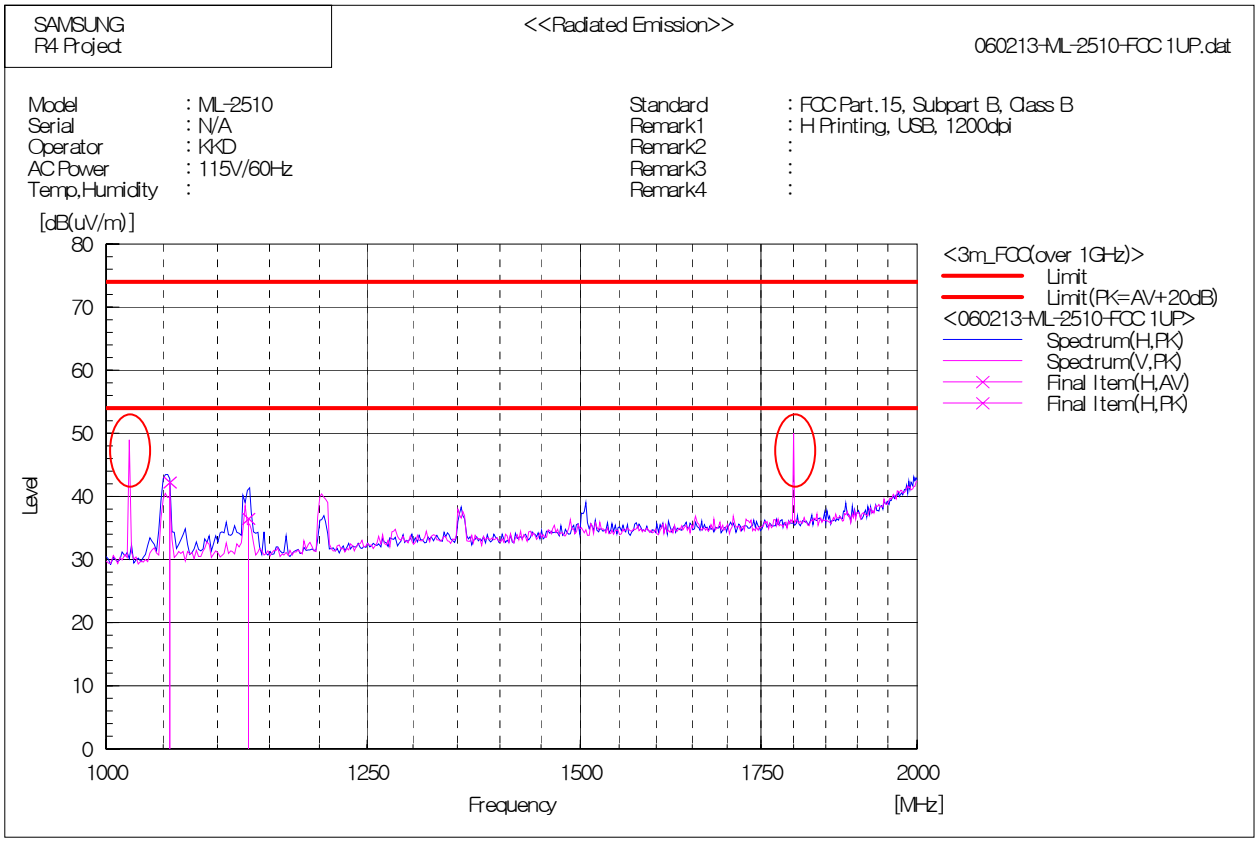
* Receiving antenna mode : Horizontal, Vertical

* Test distance : 3 m (Semi Anechoic Chamber)

* Result = Reading + c.f (Antenna factor + Cable loss- Amp Gain)

* Margin = Limit – Reading

3.2.3.2 Test data and Graph : Above 1 000 MHz



Final Result

No.	Frequency [MHz]	(P)	Reading AV [dB(uV)]	c.f [dB(1/m)]	Result AV [dB(uV/m)]	Limit [dB(uV/m)]	Margin AV [dB]	Height [cm]	Angle [deg]
1	1129.219	H	49.4	-12.9	36.5	54.0	17.5	101.0	230.5
2	1056.112	H	55.8	-13.6	42.2	54.0	11.8	103.0	154.6

* Measurement detector function and bandwidth
  - Detector function : Peak for preview, Average for final measurement
  - Bandwidth : 1 MHz
* Receiving Antenna Mode : Horizontal, Vertical
* Test distance : 3 m (Semi-Anechoic Chamber)
* Result = Meter Reading + Total Loss(Antenna factor + Cable loss - Amp. Gain)
* Margin = Limit – Reading

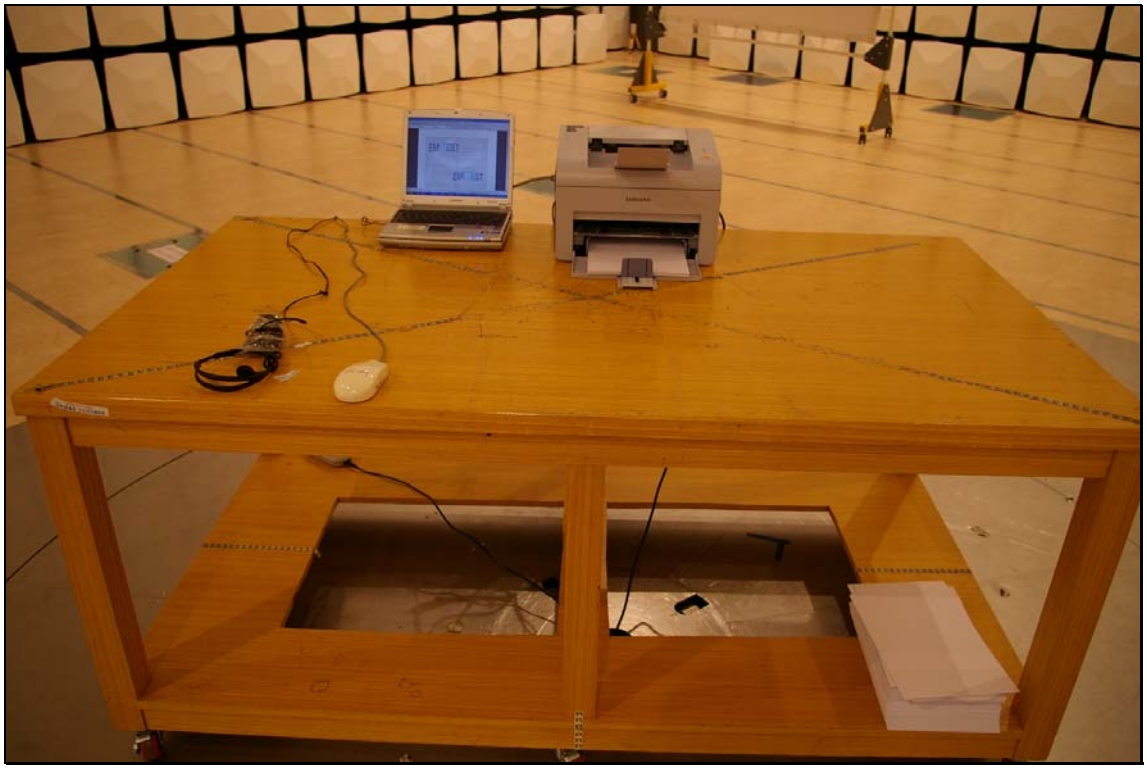
* The red circles is mechanical noises during picking up the paper, found to be same as noise floor.

4. Appendix

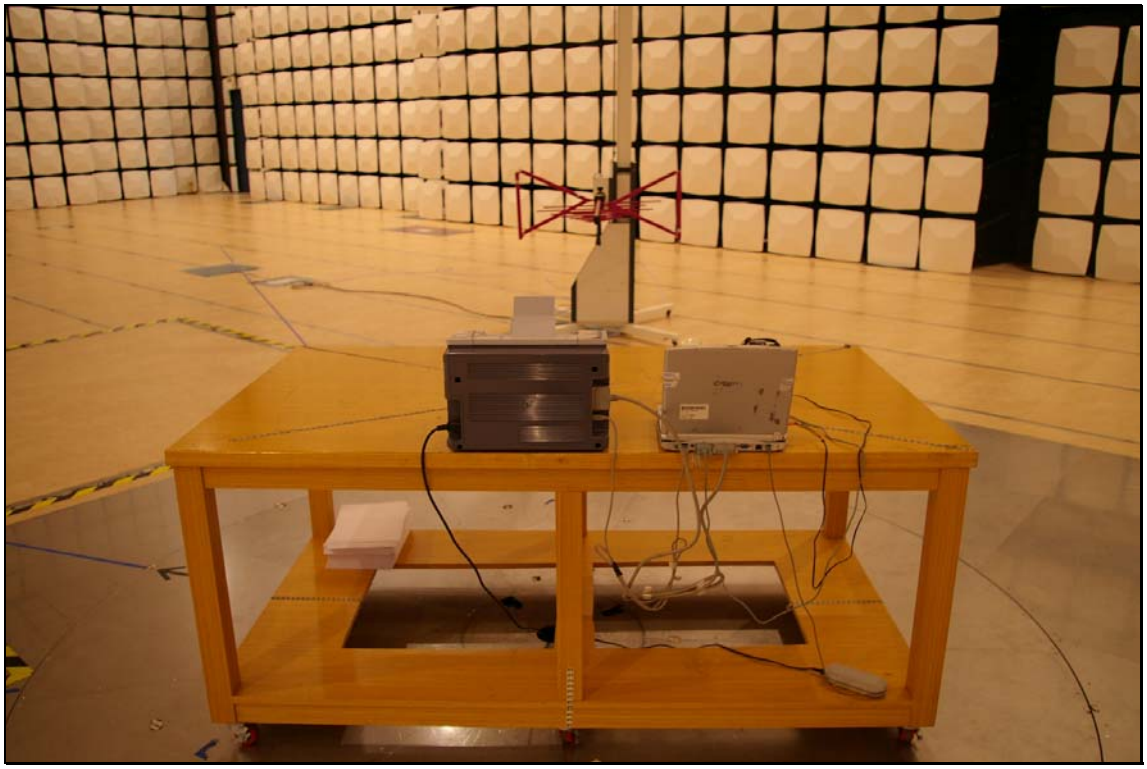
4.1 Test Photographs

Picture 1. Conducted emission (Front)

Picture 2. Conducted emission (Rear)



Picture 3. Radiated emission (Front)



Picture 4. Radiated emission (Rear)

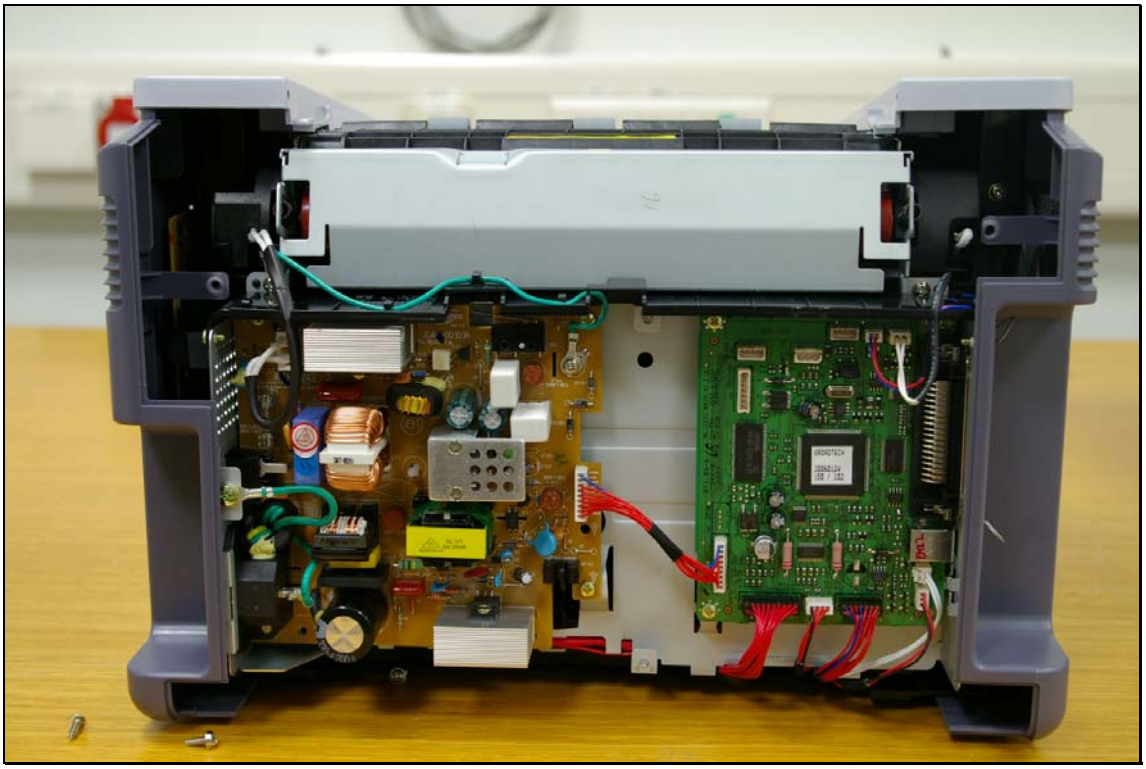
4.2 EUT and Internal Photographs

Picture 5. EUT (front view)

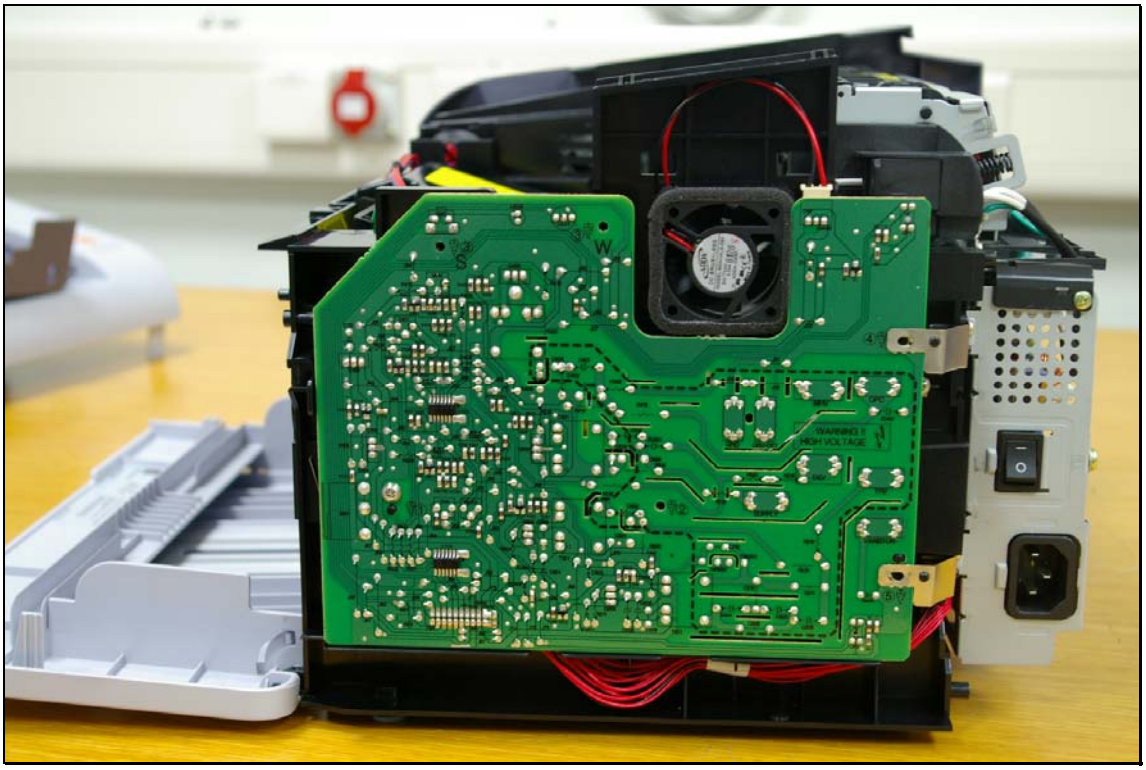
Picture 6. EUT (rear view)

Picture 7. EUT (right view)

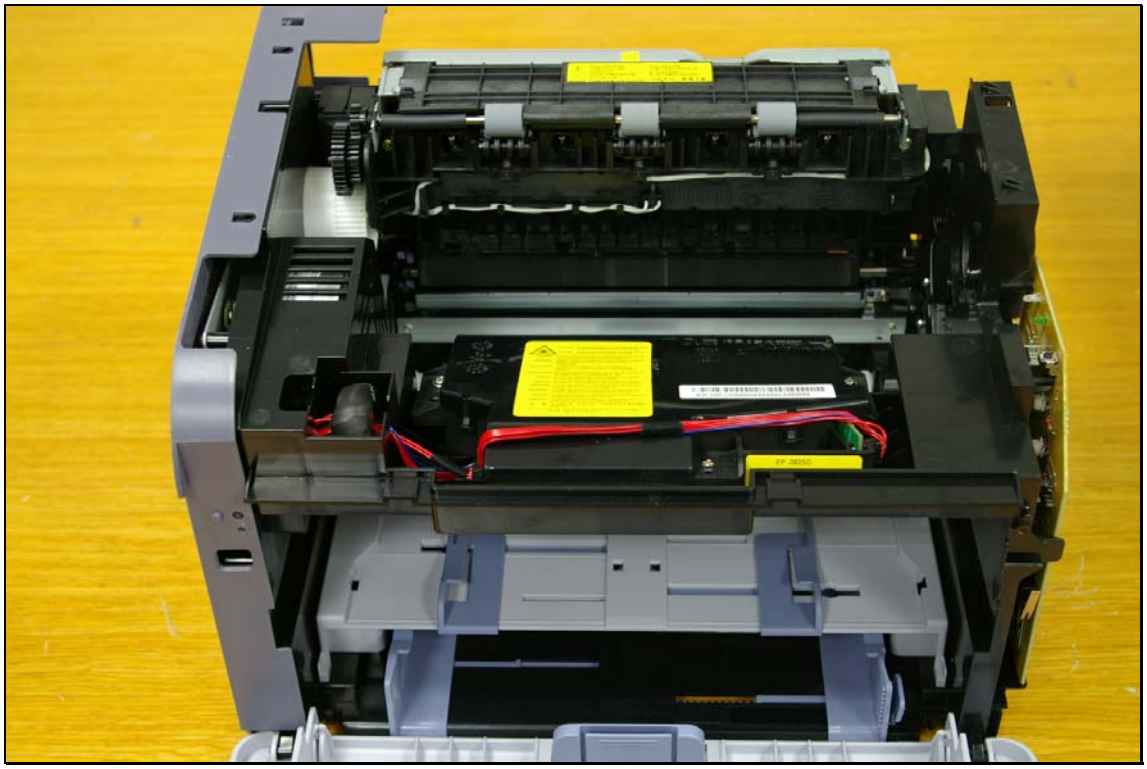
Picture 8. EUT (left view)



Picture 9-1. Internal(1)



Picture 9-2. Internal(2)



Picture 9-3. Internal(3)

4.3 Label and Label Location

SAMSUNG

Samsung Electronics Co., Ltd.
Suwon, Korea, 443-742
Place:M259

Model: ML-2510
Volts: AC 110-127V
Hertz: 50/60Hz
Amps: 5.5A
Manufactured:

FCC ID: A3LML2510

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
i) This device may not cause harmful interference, and
ii) This device must accept any interference received,
including interference that may cause undesired operation.

ENERGY STAR

LISTED
51Y7
E149091
I.T.E.

This product complies with 21 CFR Chapter 1, subchapter J.

This Class B digital apparatus complies with
Canadian ICES-003

Serial No.:

Cet appareil numérique de la classe B est
Conforme à la norme NMB-003 du Canada.

MADE IN KOREA REV.00

- Samsung Electronics Co., Ltd. (Gumi)

SAMSUNG

Samsung Electronics Co., Ltd.
Suwon, Korea, 443-742
Place:M264

Model: ML-2510
Volts: AC 110-127V
Hertz: 50/60Hz
Amps: 5.5A
Manufactured:

FCC ID: A3LML2510

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
i) This device may not cause harmful interference, and
ii) This device must accept any interference received,
including interference that may cause undesired operation.

ENERGY STAR

LISTED
51Y7
E149091
I.T.E.

This product complies with 21 CFR Chapter 1, subchapter J.

This Class B digital apparatus complies with
Canadian ICES-003

Serial No.:

Cet appareil numérique de la classe B est
Conforme à la norme NMB-003 du Canada.

MADE IN CHINA REV.00

- Shandong Samsung Telecommunications Co., Ltd.

SAMSUNG

Samsung Electronics Co., Ltd.
Suwon, Korea, 443-742
Place:M098

Model: ML-2510
Volts: AC 110-127V
Hertz: 50/60Hz
Amps: 5.5A
Manufactured:

FCC ID: A3LML2510

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
i) This device may not cause harmful interference, and
ii) This device must accept any interference received,
including interference that may cause undesired operation.

ENERGY STAR

LISTED
51Y7
E149091
I.T.E.

This product complies with 21 CFR Chapter 1, subchapter J.

This Class B digital apparatus complies with
Canadian ICES-003

Serial No.:

Cet appareil numérique de la classe B est
Conforme à la norme NMB-003 du Canada.

MADE IN CHINA REV.00

- Weihai Shin Heung Digital Electronics Co., Ltd.

Picture 10. Label

Picture 11. Label location