EMC TEST REPORT

Project No.	LBE093147	**Issue No.**	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	October 09, 2009	
EUT	**Type of device**	Class B digital devices, peripherals	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	**A3LML1660**	
	Kind of product	**Mono Laser Printer**	
	Model No.	**ML-1660**	
		Variant Model No.	ML-1665
	Manufacturer	**Samsung Electronics Co., Ltd.** 259, Gongdan-Dong, Gumi-City, Gyeongsangbuk-Do, Korea 730-030 **Samsung Electronics (Shandong) Digital Printing Co., Ltd.** 264209, Samsung Road, Weihai Hi-Tech. IDZ, Shandong Province, P.R.China **Weihai Shin Heung Digital Electronics Co., Ltd.** 98, Samsung Road, Weihai Hi-Tech. IDZ, Shandong Province, P.R.China	
Applied Standards		FCC Part 15, Subpart B / ANSI C63.4-2003	
Test Period		October 10, 2009 ~ October 14, 2009	
Issue date		October 30, 2009	

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 : Sung Jin Sim

Reviewed by : 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.
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 SEC EMC Laboratory.

SAMSUNG

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1. Summary of test results

1.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result	Remarks
☒	Conducted Disturbance (Mains Port)	FCC Part 15 Subpart B	Complied	Meets Class B Limit
☒	Radiated Disturbance		Complied	Meets Class B Limit

2. General Information

2.1 Test facility

The SEC EMC Laboratory is located on Samsung Electronics Co., Ltd. at 416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, South 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 SEC EMC Laboratory is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:2005.

2.2 Accreditation and listing

Laboratory Qualifications		Remarks
	KOLAS(Korea Laboratory Accreditation Scheme)	Accredited : 124
	UKAS(United Kingdom Accreditation Service)	Accredited : 4290
	Korea Communications Commission Radio Research Agency	Accredited : KR0004
	FCC(Federal Communications Commission)	Accredited : KR0004
	National Voluntary Laboratory Accreditation Program	Lab Code: 200623-0
	Norges Elektriske Materiellkontroll	Accredited : ELA 195
	VCCI (Voluntary Control Council for Interference by Information Technology Equipment)	C-2421,R-2224
	China Quality Certification Center	5-053, 5-054
	TUV Rhineland	H9354285
	GOST(GOSTSTANDART)	ROSTEST
	Elektrotechnicky Zkusebni Ustav	Reg. No.: 001
Industry Canada	IC(Industry Canada)	Assigned Code: 5871

3. Test Setup configuration

3.1 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:

Description	Model No.	Serial No.	Manufacturer	FCC ID and/or DoC
Printer	ML-1660	-	SAMSUNG	A3LML1660
PC	PP18L	27182225373	Dell	DoC
AC Adapter	LA65NS1-00	CN-0YD637-71615-83C-0A0A	Dongguang Lite Power	DoC
USB mouse	MOARUO	0827010010	PRIMAX ELECTRONICS	DoC
Headset	MH21	-	ATA	DoC

3.2 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

3.3 Details of Sampling

Customer selected, single unit.

3.4 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;

Connected cable	Length [m]	Shielded [Y/N]	Note
Power	1.8	No	-
USB	1.8	Yes	From EUT to PC

3.5 EUT Description

The following features describe EUT represented by this report:

Item	Specification and Description
Processor	JUPITER4E
Standard System memory	8MB SDRAM
Resolution	Up to 1,200 x 600 dpi effective output
Copy Quality mode	Not Available
Paper Handling	150-sheet Multi Purpose Tray
Power Rating	110~127 VAC, 4A, 50/60 Hz
Power Consumption	Power save mode : Less than 2.8 Watts Average operating mode: Less than 270 Watts Ready mode: Less than 40 Watts Power off mode: Less than 0.45 Watts
Printer Language	SPL
PC Interfaces	Full Speed USB 1.1
OS compatibility	Windows 2000/XP/Vista/Win7/2003 Server/2008 Server Various Linux OS, Mac OS X 10.3~10.6
Modes of Operation	USB Printing
Intended Class for Emissions	Class B

3.6 Clock Frequencies

Kind of Clocks	Frequency[MHz]	Kind of Clocks	Frequency[MHz]
Main source clock	12	Video clock	20.65
CPU internal clock	150	SDRAM clock	75

3.7 Test configuration and condition

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 Voltech Corp.

- Test Voltage : AC 120 V, 60 Hz

3.8 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.)

3.8.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	Main terminal	3.50 dB
Radiated Disturbance	Horizontal	5.04 dB
	Vertical	5.03 dB

4. Results of individual test

4.1 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 A ITE

Frequency range Limits MHz	Resolution Bandwidth	Limits dB(μV)	
		Quasi-peak	Average
0,15 to 0,50	9 kHz	79	66
0,50 to 30	9 kHz	73	60
NOTE The lower limit shall apply at the transition frequency			

Limits for conducted disturbance at the mains ports of class B ITE

Frequency range Limits MHz	Resolution Bandwidth	Limits dB(μV)	
		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.			

4.1.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Measuring receiver	ESCI	R&S	100370	2009-05-07	12
Artificial mains network	ENV216	R&S	100116	2009-10-01	12
Artificial mains network	ESH3-Z5	R&S	100261	2009-04-03	12
Test software	EMC32	R&S	Ver 4.40.	N/A	N/A

4.1.2 Temperature and humidity condition

Test date	October 10, 2009	**Test engineer**	Sung Jin Sim
Test place	Shielded Room #1		

4.1.3 Photograph of Test Setup

Front

Rear

4.1.4 Test results (mains port)

- **Configuration 1 : Standby Mode**

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

Subrange 1

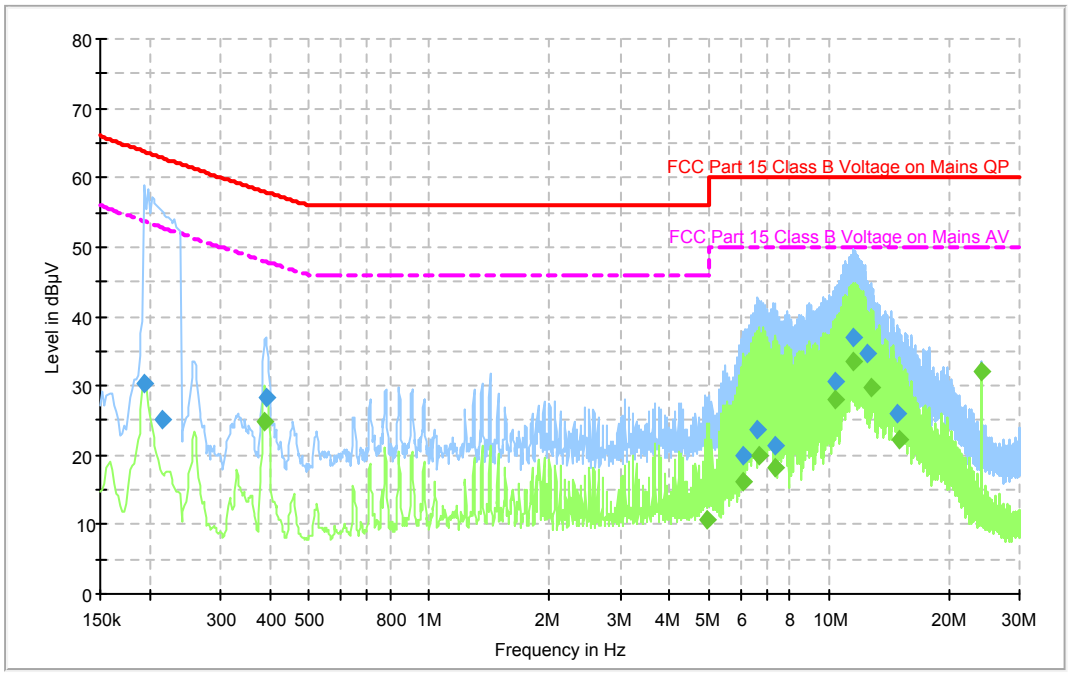
Frequency Range:	150kHz - 30MHz
Receiver:	ESCI 3
Transducer:	ENV216 / Receiver-2-Line-LISN ENV216

Scan Setup: EN55022_B_ENV 2-Line-LISN fin [EMI conducted]

Hardware Setup:	Voltage with ENV 2-Line-LISN
Level Unit:	dB μ V

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
150kHz - 30MHz	Quasi Peak; Average	9kHz	15s	ESCI 3

Test Graph



Note) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Test Results (Quasi-Peak and Average)

Quasi-peak final measurement results table

Frequency (MHz)	Quasi-Peak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.194	30.2	N	9.3	33.5	63.7
0.214	25.1	N	9.4	37.8	62.9
0.390	28.3	L1	9.4	29.7	57.9
6.068	20.1	L1	9.6	39.9	60.0
6.648	23.8	L1	9.6	36.2	60.0
7.360	21.5	L1	9.6	38.5	60.0
10.396	30.5	L1	9.6	29.5	60.0
11.492	37.0	L1	9.6	23.0	60.0
12.524	34.6	L1	9.7	25.4	60.0
14.848	26.0	L1	9.7	34.0	60.0

Average final measurement results table

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.388	24.8	L1	9.4	23.2	47.9
4.972	10.8	L1	9.6	35.2	46.0
6.068	16.1	L1	9.6	33.9	50.0
6.716	19.8	L1	9.6	30.2	50.0
7.360	18.1	L1	9.6	31.9	50.0
10.396	27.9	L1	9.6	22.1	50.0
11.492	33.5	L1	9.6	16.5	50.0
12.720	29.8	L1	9.7	20.2	50.0
14.980	22.1	L1	9.7	27.9	50.0
24.068	32.1	N	9.9	17.9	50.0

Note) Level (Quasi-Peak and/or Average) = Meter Reading (Quasi-Peak and/or Average) + Factor (LISN Insertion Loss + Cable Loss)

Margin = Limit – Level (Quasi-Peak and/or Average)

- **Configuration 1 : USB Printing Mode**

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

Subrange 1

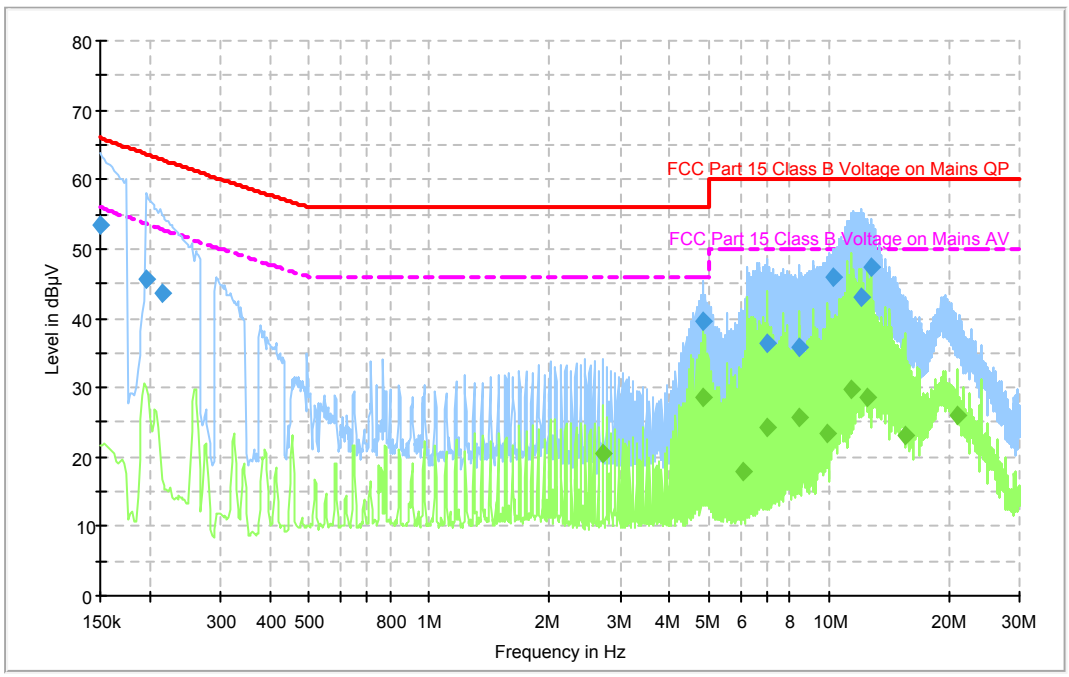
Frequency Range:	150kHz - 30MHz
Receiver:	ESCI 3
Transducer:	ENV216 / Receiver-2-Line-LISN ENV216

Scan Setup: EN55022_B_ENV 2-Line-LISN fin [EMI conducted]

Hardware Setup:	Voltage with ENV 2-Line-LISN
Level Unit:	dB μ V

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
150kHz - 30MHz	Quasi Peak; Average	9kHz	15s	ESCI 3

Test Graph



Note) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Test Results (Quasi-Peak and Average)

Quasi-peak final measurement results table

Frequency (MHz)	Quasi-Peak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150	53.3	N	9.4	12.7	66.0
0.196	45.7	L1	9.3	17.9	63.6
0.214	43.7	L1	9.3	19.2	62.9
4.848	39.5	N	9.6	16.5	56.0
6.984	36.5	N	9.6	23.5	60.0
8.404	35.7	N	9.6	24.3	60.0
10.224	46.1	L1	9.6	13.9	60.0
12.020	43.0	N	9.7	17.0	60.0
12.736	47.5	N	9.7	12.5	60.0

Average final measurement results table

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
2.716	20.4	N	9.6	25.6	46.0
4.848	28.7	N	9.6	17.3	46.0
6.084	17.9	L1	9.6	32.1	50.0
6.984	24.2	N	9.6	25.8	50.0
8.404	25.6	N	9.6	24.4	50.0
9.904	23.4	L1	9.5	26.6	50.0
11.376	29.7	N	9.6	20.3	50.0
12.488	28.5	L1	9.6	21.5	50.0
15.512	23.0	N	9.8	27.0	50.0
21.004	26.0	N	9.6	24.0	50.0

Note) Level (Quasi-Peak and/or Average) = Meter Reading (Quasi-Peak and/or Average) +
Factor (LISN Insertion Loss + Cable Loss)

Margin = Limit – Level (Quasi-Peak and/or Average)

4.2 Radiated disturbance

Of those disturbances above (*L* - 20dB), where *L* is the limit level in logarithmic units, record at least the disturbance levels and the frequencies of the six highest disturbances.
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 meters and elevated between 1 and 4 meters. 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 dB(μV/m)	
		Class A	Class B
30 to 230	120 kHz	40	30
230 to 1000	120 kHz	47	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 1GHz to 40GHz 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	Turntable position (degrees)
100	Horizontal, Vertical	Continuous

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

Class	Limits - dB(μV/m)	
	Peak	Average
A	80	60
B	74	54
Average limit 500 20 log 500 = 53.979 dB ≒ 54 dB		

Antenna height was adjusted to 100 cm to be parallel from EUT to antenna centre.
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.

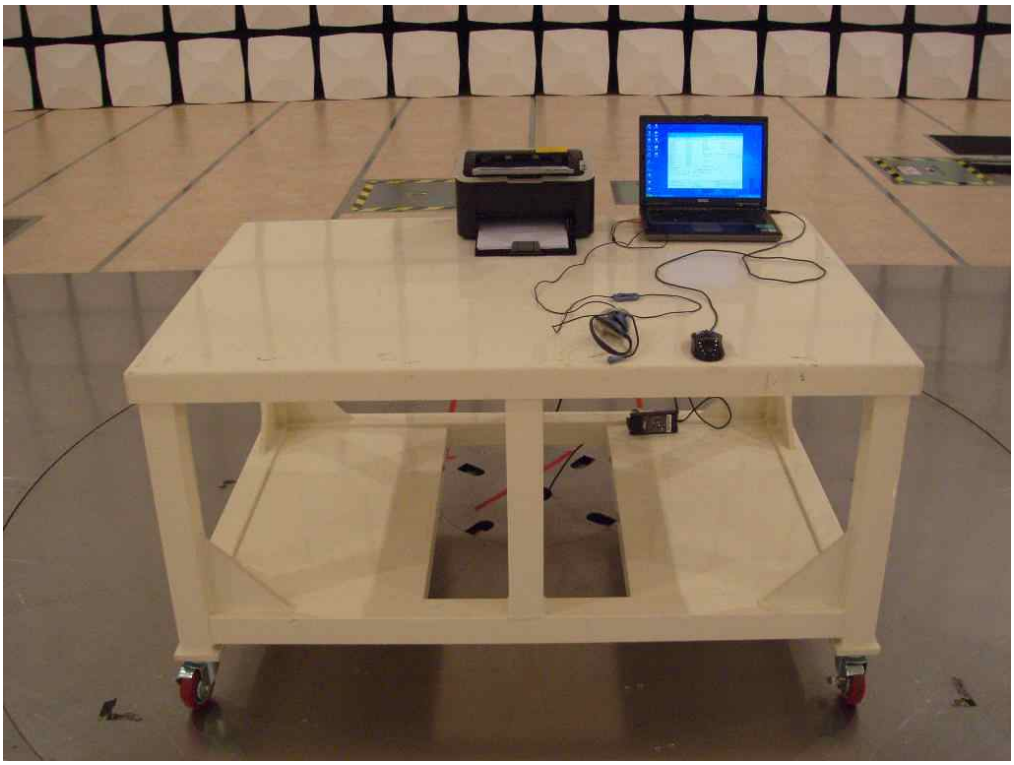
4.2.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Bi-con Antenna	CBL6112D	Schaffner	22602	2008-04-15	24
Bi-con Antenna	CBL6112D	Schaffner	22604	2008-04-15	24
Horn Antenna	HF907	R&S	100016	2009-04-27	24
EMI Receiver	ESIB-26	R&S	100287	2009-08-27	12
EMI Receiver	ESIB-26	R&S	100147	2009-06-30	12
Amplifier	310N	Agilent	185861	2009-01-28	12
Amplifier	310N	Agilent	251676	2009-01-28	12
Amplifier	SCU_F018_G 35_ASF42	R&S	10001	2009-01-19	12
Antenna Mast	MA4000	INN CO	-	N/A	N/A
Antenna Mast	MA4000	INN CO	-	N/A	N/A
Mast Controller	CO2000	INN CO	-	N/A	N/A
Test software	EP5/RE	TOYO	VER 3.1.20	N/A	N/A
RF Selector	NS4900	TOYO	-	N/A	N/A

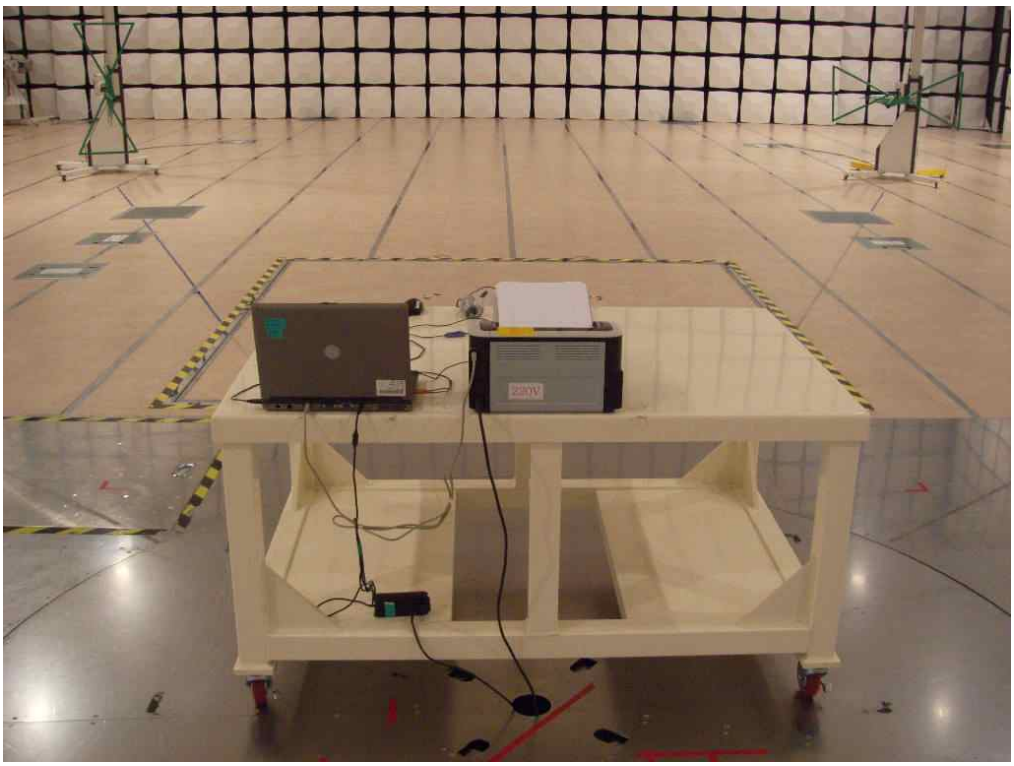
4.2.2 Temperature and humidity condition

Test date	October 12, 2009 ~ October 14, 2009	**Test engineer**	Sung Jin Sim
Test place	10 m Semi-Anechoic Chamber		

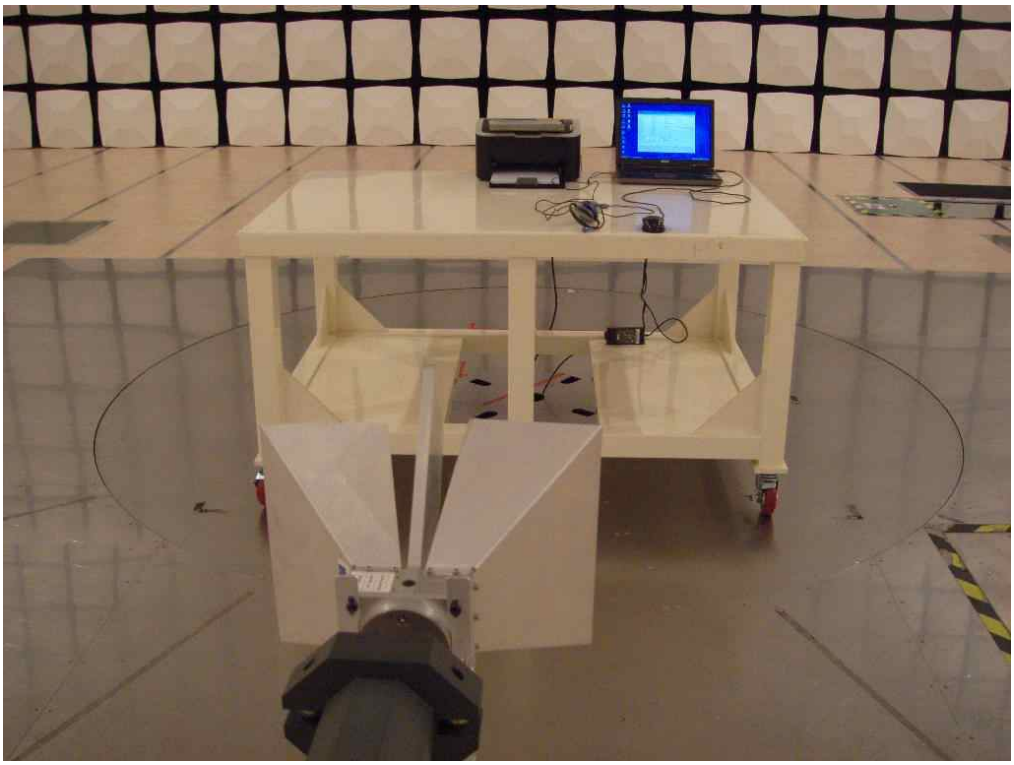
4.2.3 Photograph of Test Setup



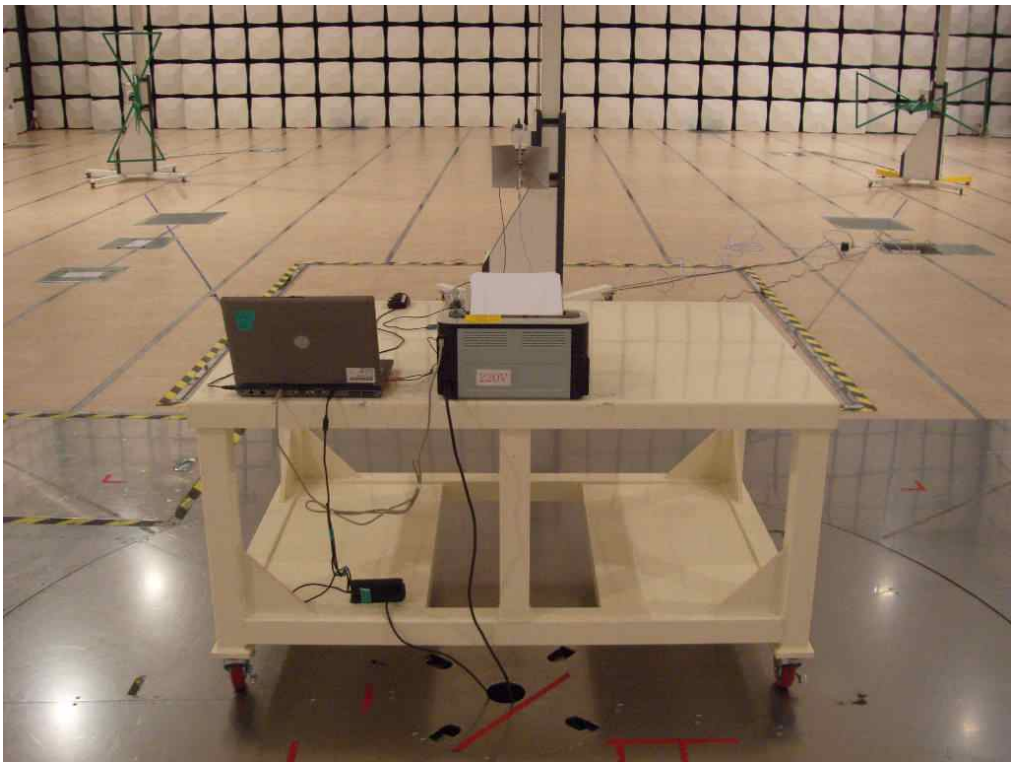
Front



Rear



Front (Above 1GHz)



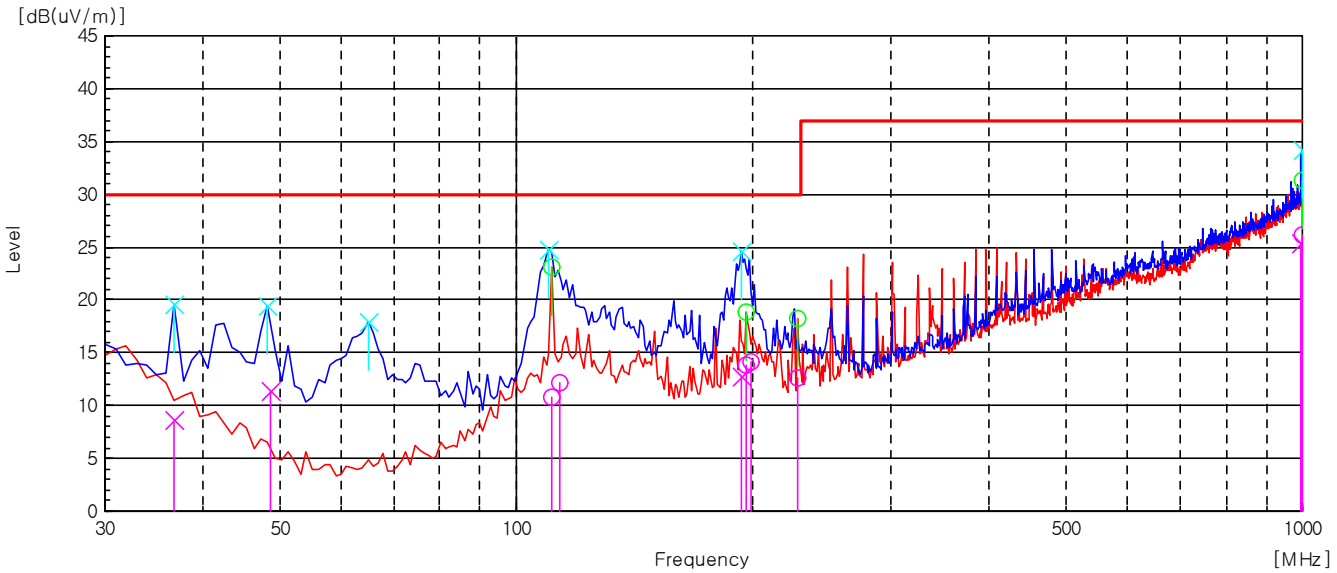
Rear (Above 1GHz)

4.2.4 Test results

4.2.4.1 30 MHz to 1GHz test results

- **Configuration 1 : Stand-by Mode**

Test Graph and Results



Frequency [MHz]	Pol.	Reading QP [dB(μ V)]	Factor [dB(1/m)]	Level QP [dB(μ V /m)]	Limit [dB(μ V /m)]	Margin QP [dB]	Height [cm]	Angle [deg]
36.757	V	25.4	-16.7	8.7	30	21.3	118	3.4
48.812	V	33.9	-22.5	11.4	30	18.6	104	345.6
111.138	H	28.7	-17.9	10.8	30	19.2	350	152.0
113.539	H	30.0	-17.8	12.2	30	17.8	388	345.3
193.242	V	32.6	-19.9	12.7	30	17.3	150	79.0
196.140	H	33.8	-19.9	13.9	30	16.1	350	240.7
198.550	H	34.0	-19.9	14.1	30	15.9	361	308.3
228.016	H	31.4	-18.8	12.6	30	17.4	350	63.2
997.267	V	25.3	0.1	25.4	37	11.6	332	74.7
998.044	H	26.4	-0.3	26.1	37	10.9	152	4.1

Note) Receiving antenna polarization : Horizontal and/or Vertical

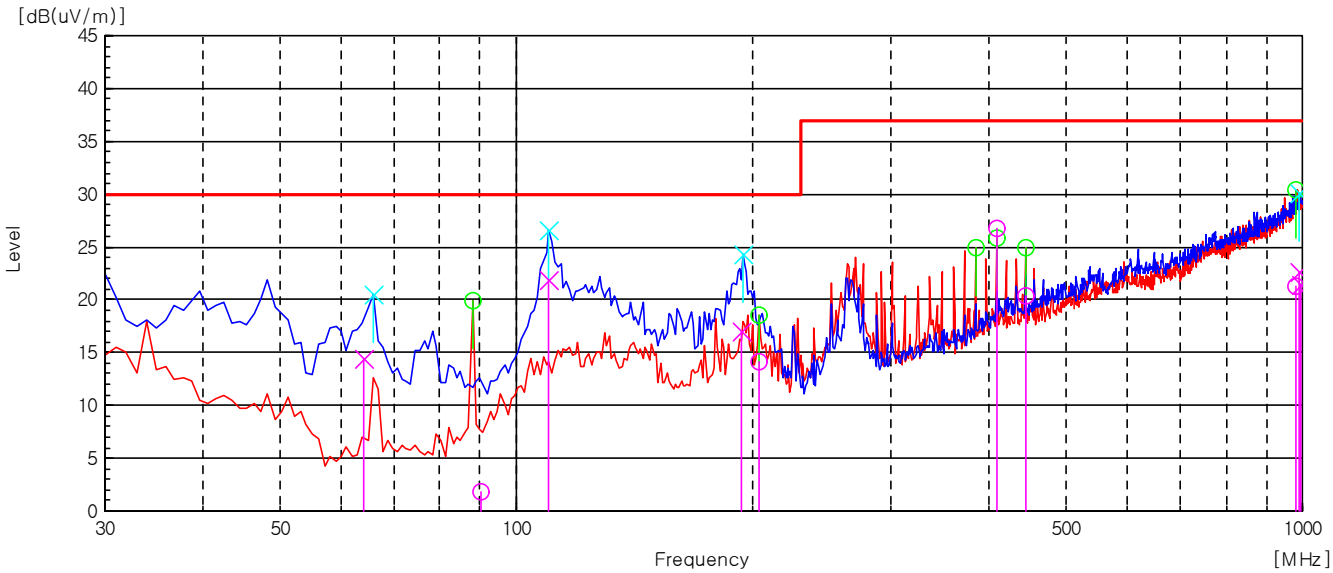
Test Distance : 10m, Antenna Height : 1 to 4 meters

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

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

- **Configuration 1 : USB Printing Mode**

Test Graph and Results



Frequency [MHz]	Pol.	Reading QP [dB(μ V)]	Factor [dB(1/m)]	Level QP [dB(μ V /m)]	Limit [dB(μ V /m)]	Margin QP [dB]	Height [cm]	Angle [deg]
63.957	V	39.2	-24.8	14.4	30	15.6	104	359.5
90.318	H	23.0	-21.2	1.8	30	28.2	290	23.2
110.172	V	39.5	-17.6	21.9	30	8.1	104	359.1
193.866	V	37.0	-19.9	17.1	30	12.9	147	354.6
204.008	H	34.0	-19.9	14.1	30	15.9	290	68.1
408.645	H	37.1	-10.3	26.8	37	10.2	251	185.9
444.385	H	30.2	-9.9	20.3	37	16.7	251	290.5
982.397	H	21.8	-0.5	21.3	37	15.7	290	353.7
992.176	V	22.7	0	22.7	37	14.3	351	0.5
993.091	V	21.4	0	21.4	37	15.6	104	359.1

Note) Receiving antenna polarization : Horizontal and/or Vertical

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

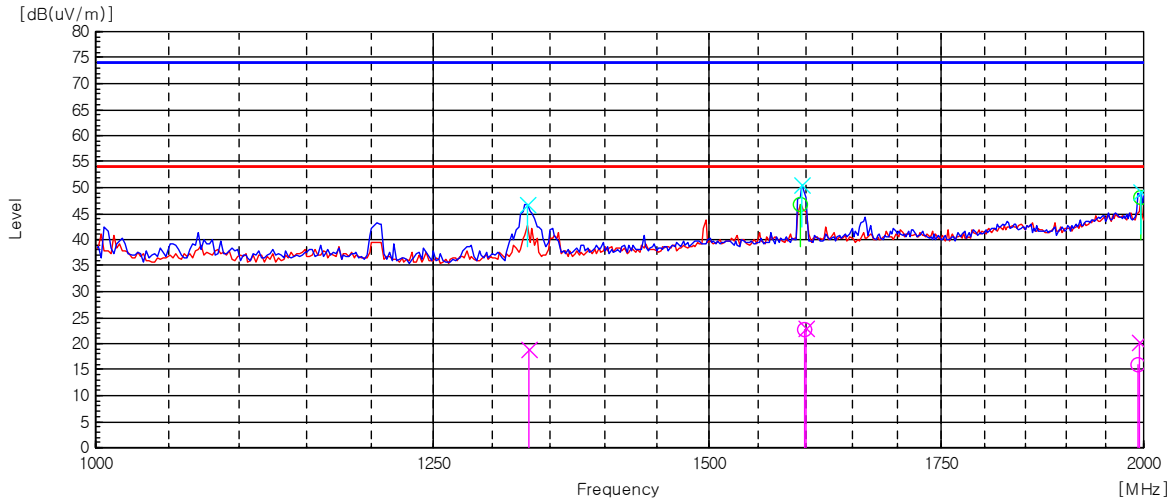
Level QP (Quasi-Peak) = Reading QP + Factor (Antenna Factor + Cable Loss - Amp. Gain)

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

4.2.4.2 1 GHz to 2 GHz test results

- **Configuration 1 : Stand-by Mode**

Test Results



Peak Measurement

Frequency [MHz]	POL	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin PK [dB]	Height [cm]	Angle [deg]
1330.661	V	53.7	-6.9	46.8	74	27.2	100	189.1
1593.186	H	51.1	-4.4	46.7	74	27.3	100	217.3
1595.190	V	55.0	-4.4	50.6	74	23.4	100	141.9
1995.992	V	50.9	-1.7	49.2	74	24.8	100	7.1
1995.992	H	49.7	-1.7	48.0	74	26.0	100	42.7

Average Measurement

Frequency [MHz]	POL	Reading AV [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Limit [dB(uV/m)]	Margin AV [dB]	Height [cm]	Angle [deg]
1331.733	V	25.7	-6.9	18.8	54	35.2	100	352.3
1597.665	H	27.2	-4.4	22.8	54	31.2	100	244.4
1599.429	V	27.3	-4.4	22.9	54	31.1	100	110.9
1992.736	H	17.5	-1.7	15.8	54	38.2	100	76.2
1995.060	V	22.1	-1.7	20.4	54	33.6	100	326.1

Note1) Representative operating modes were selected by customer and any emissions that do NOT exceed Average limit were not tested with average detector mode.

Note2) Receiving antenna polarization : Horizontal and Vertical

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

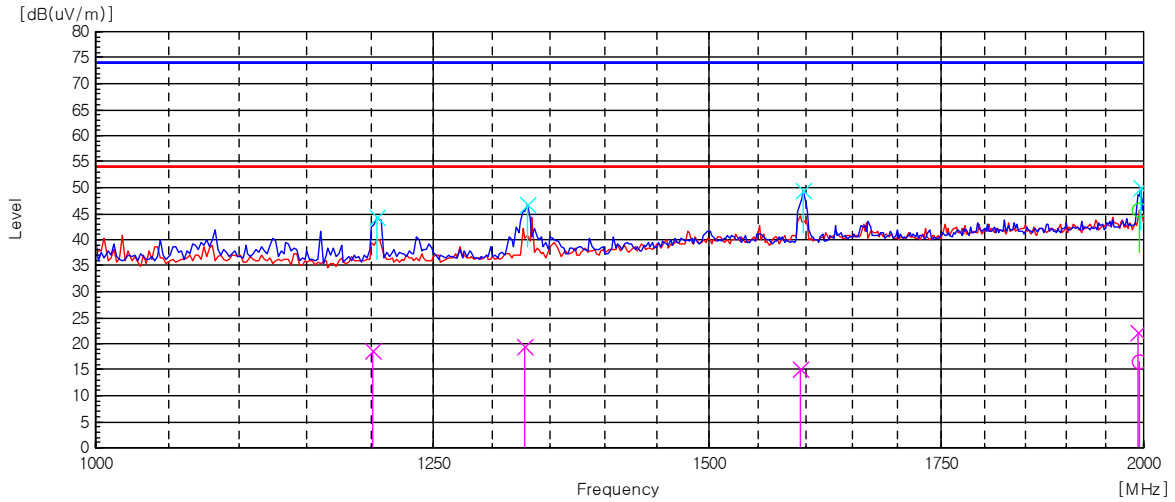
Level AV (Average) = Reading AV (Average) + Factor(Antenna Factor + Cable Loss - Amp. Gain)

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

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

- **Configuration 1 : USB Printing Mode**

Test Results



Peak Measurement

Frequency [MHz]	POL	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin PK [dB]	Height [cm]	Angle [deg]
1204.409	V	52.5	-8.1	44.4	74	29.6	100	38.4
1330.661	V	53.8	-6.9	46.9	74	27.1	100	0.3
1597.194	V	54.0	-4.4	49.6	74	24.4	100	86.8
1993.988	H	47.4	-1.7	45.7	74	28.3	100	98.6
1995.992	V	51.7	-1.7	50.0	74	24.0	100	0.3

Average Measurement

Frequency [MHz]	POL	Reading AV [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Limit [dB(uV/m)]	Margin AV [dB]	Height [cm]	Angle [deg]
1200.712	V	26.7	-8.1	18.6	54	35.4	100	52.0
1327.625	V	26.4	-7.0	19.4	54	34.6	100	3.0
1594.298	V	19.6	-4.4	15.2	54	38.8	100	135.9
1994.740	H	18.2	-1.7	16.5	54	37.5	100	54.3
1993.437	V	23.8	-1.7	22.1	54	31.9	100	327.7

Note1) Representative operating modes were selected by customer and any emissions that do NOT exceed Average limit were not tested with average detector mode.

Note2) Receiving antenna polarization : Horizontal and Vertical

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

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

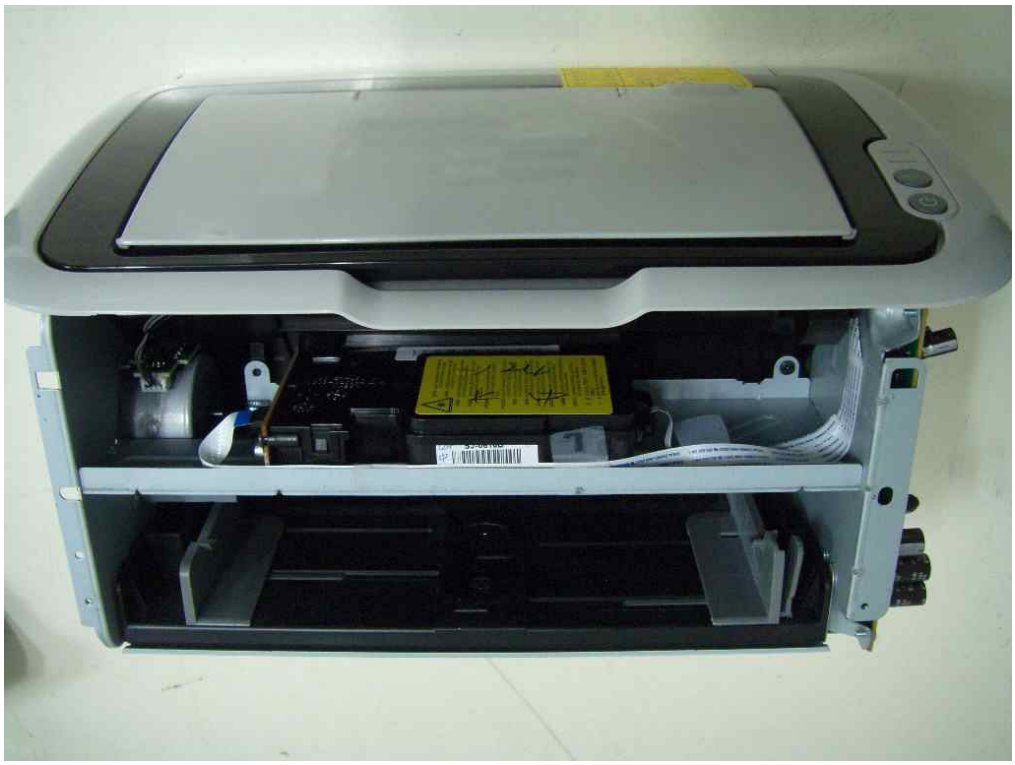
Margin PK (Peak) = Limit – Level PK (Peak)

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

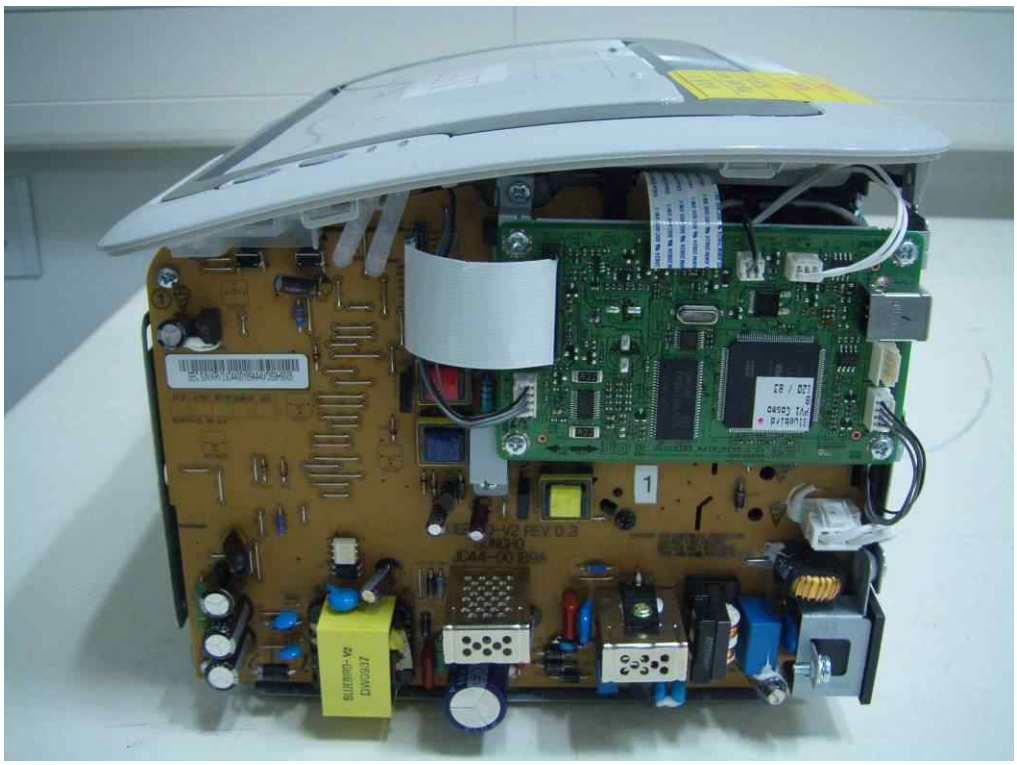
Appendix – EUT photography

Front View

Rear View



Inside View – Front

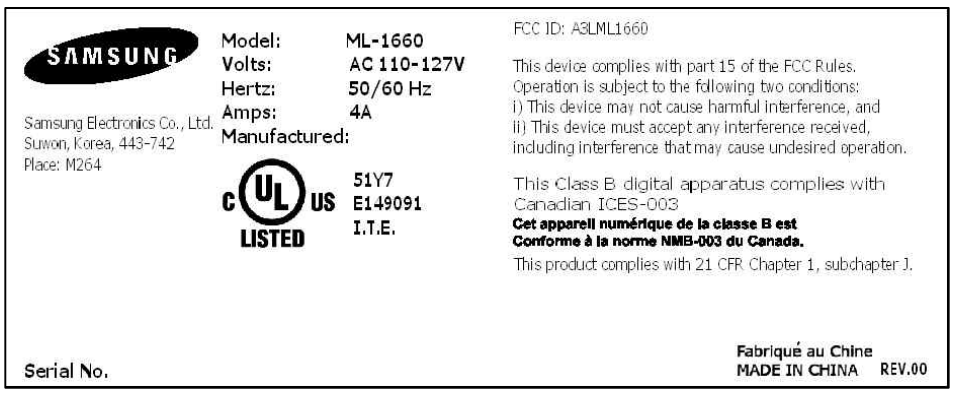


Inside View – Left

Inside View – Rear

Inside View – Right

Label Location



Label