EMC TEST REPORT

Project No.	LBE20110869	**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	17 Dec, 2010	
EUT	**Type of device**	Class B digital devices, peripherals	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	**A3LML1670**	
	Kind of product	**Mono Laser Printer**	
	Model No.	**ML-1670**	
		Variant Model No.	ML- 1671, ML-1675, ML-1677
	Manufacturer	**1) Samsung Electronics Co., Ltd.** 259, Gongdan-Dong, Gumi-City, Gyeongsangbuk-Do, Korea 730-030 **2) Samsung Electronics (Shandong) Digital Printing 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 **4) Intops : Intops (Weihai) Electronics Co., Ltd.** Keji Road-268-1, Weihai Hi-Tech,Industries Development Zone , Shandong Province , CHINA	
Applied Standards		FCC Part 15, Subpart B / ANSI C63.4-2009	
Test Period		22 Dec, 2010 ~ 28 Dec, 2010	
Issue date		12 Feb, 2011	

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 : Ho Jin Choi

Reviewed by : No Cheon Park

SAMSUNG

416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 443-742 Korea
Tel: 82 31 277 7752, Fax: 82 31 277 7753

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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 CS & Environment center 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 CS & Environment center is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:2005.

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 / DoC
Mono Laser Printer	ML-1670	-	Samsung	A3L ML1670
Notebook PC	PP18L	27182225373	Dell	DoC
AC Adapter	HP-OQ065B83	CN-0N2765-47890-44I-0240	Dell	DoC
USB Mouse	MOARUO	093308552	Primax Electronics	DoC
Headphone	-	-	Micro soft	DoC

3.2 EUT operating mode

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

Operating Mode 1	Standby
Operating Mode 2	USB Print

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	For EUT
USB	1.8	Yes	From Notebook PC to Mouse
Headphone	1.8	No	From Notebook PC to Headphone

3.5 EUT Description

The following features describe EUT represented by this report:

Item	Specification and Description
Processor	TEMUJIN(300Mhz)
Standard System memory	Embedded SDRAM core of ESMTwith 8MB size
Resolution	True 1200x1200dpi
Copy Quality mode	N.A
Paper Handling	Paper Tray(BIN Type) 150 Sheets
Power Rating	110~127 VAC, 8A, 50/60 Hz
Power Consumption	Power save mode : 0.45 Watts Printing mode: MAX. 270 Watts
Printer Language	GDI
PC Interfaces	USB2.0
OS compatibility	Windows 2000, XP, Vista, Windows7, 2003 Server, 2008 Sever, Various Linux OS, and 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	20.46
CPU Internal Clock	300	USB Device Clock	12

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.

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	3.00 dB
	10/100 Base LAN	2.80 dB
	1000 Base LAN	2.80 dB
	Tel Line	2.80 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.95 dB
	Vertical	4.99 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.			

Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0,15 MHz to 30 MHz for class A equipment

Frequency range Limits MHz	Resolution Bandwidth	Voltage limits dB(μV)		Current limits dB(μA)	
		Quasi-peak	Average	Quasi-peak	Average
0,15 to 0,50	9 kHz	97 to 87	84 to 74	53 to 43	40 to 30
0,50 to 30	9 kHz	87	74	43	30
NOTE 1 The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz. NOTE 2 The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 0.15 kΩ to the telecommunication port under test (conversion factor is 20 log10 150 / I = 44 dB).					

Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0,15 MHz to 30 MHz for class B equipment

Frequency range Limits MHz	Resolution Bandwidth	Voltage limits dB(µV)		Current limits dB(µA)	
		Quasi-peak	Average	Quasi-peak	Average
0,15 to 0,50	9 kHz	84 to 74	74 to 64	40 to 30	30 to 20
0,50 to 30	9 kHz	74	64	30	20

NOTE 1 The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.
NOTE 2 The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 0.15kΩ to the telecommunication port under test (conversion factor is 20 log10 150/l = 44 dB).

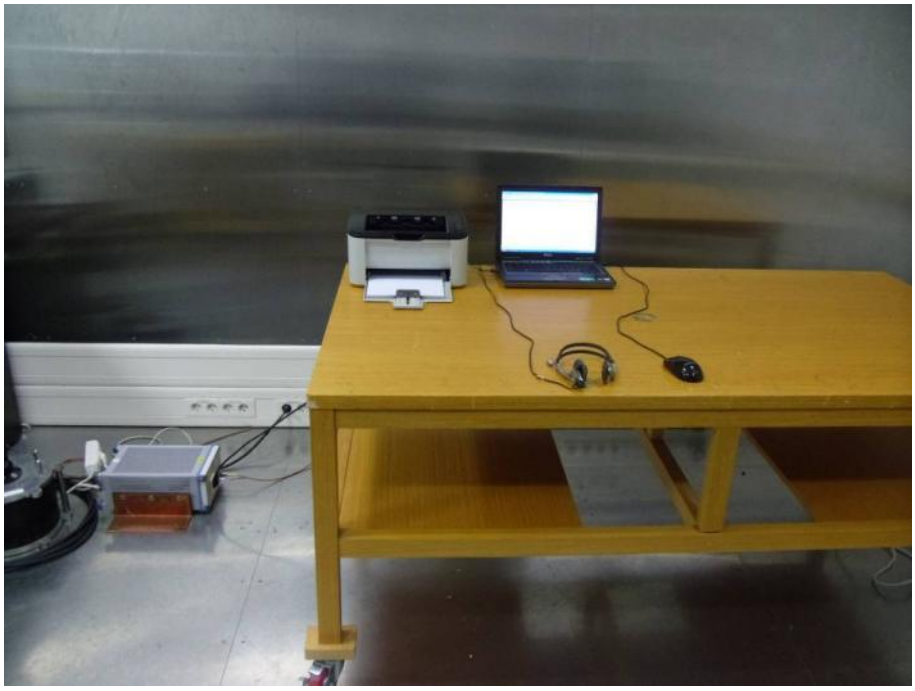
4.1.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Measuring receiver	ESIB 26	R&S	100290	2010-05-19	12
Artificial mains network	ENV216	R&S	100117	2010-11-16	12
Artificial mains network	ESH3-Z5	R&S	831887/004	2010-07-06	12
Test software	EMC32	R&S	Ver 4.40.	N/A	N/A

4.1.2 Temperature and humidity condition

Test date	23 Dec 2010	**Test engineer**	Ho Jin Choi
Test place	Shielded Room #1		

4.1.3 Photograph of Test Setup



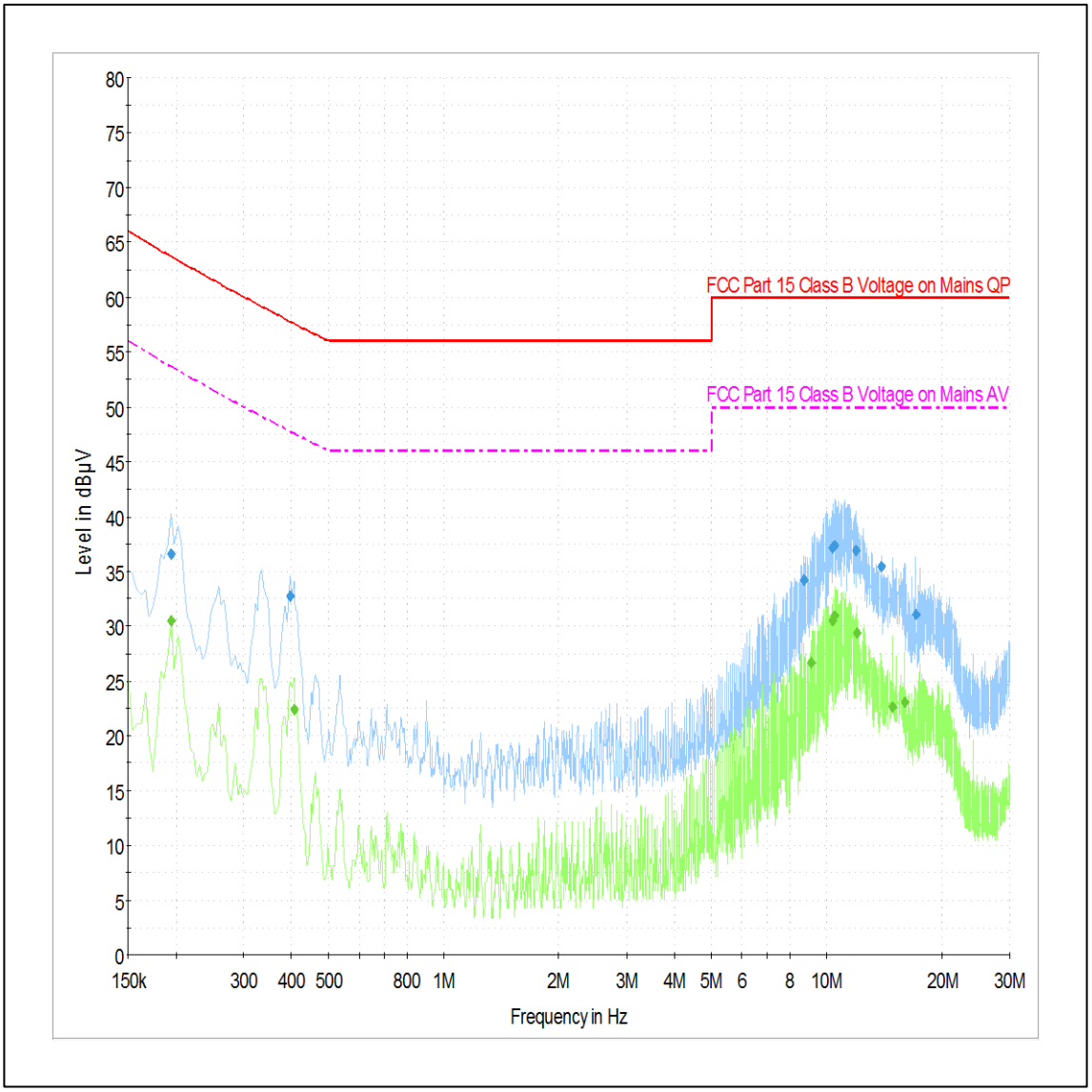
Front

Rear

4.1.4 Test results (mains port)

- **Operating Mode 1 : Standby Mode**

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)

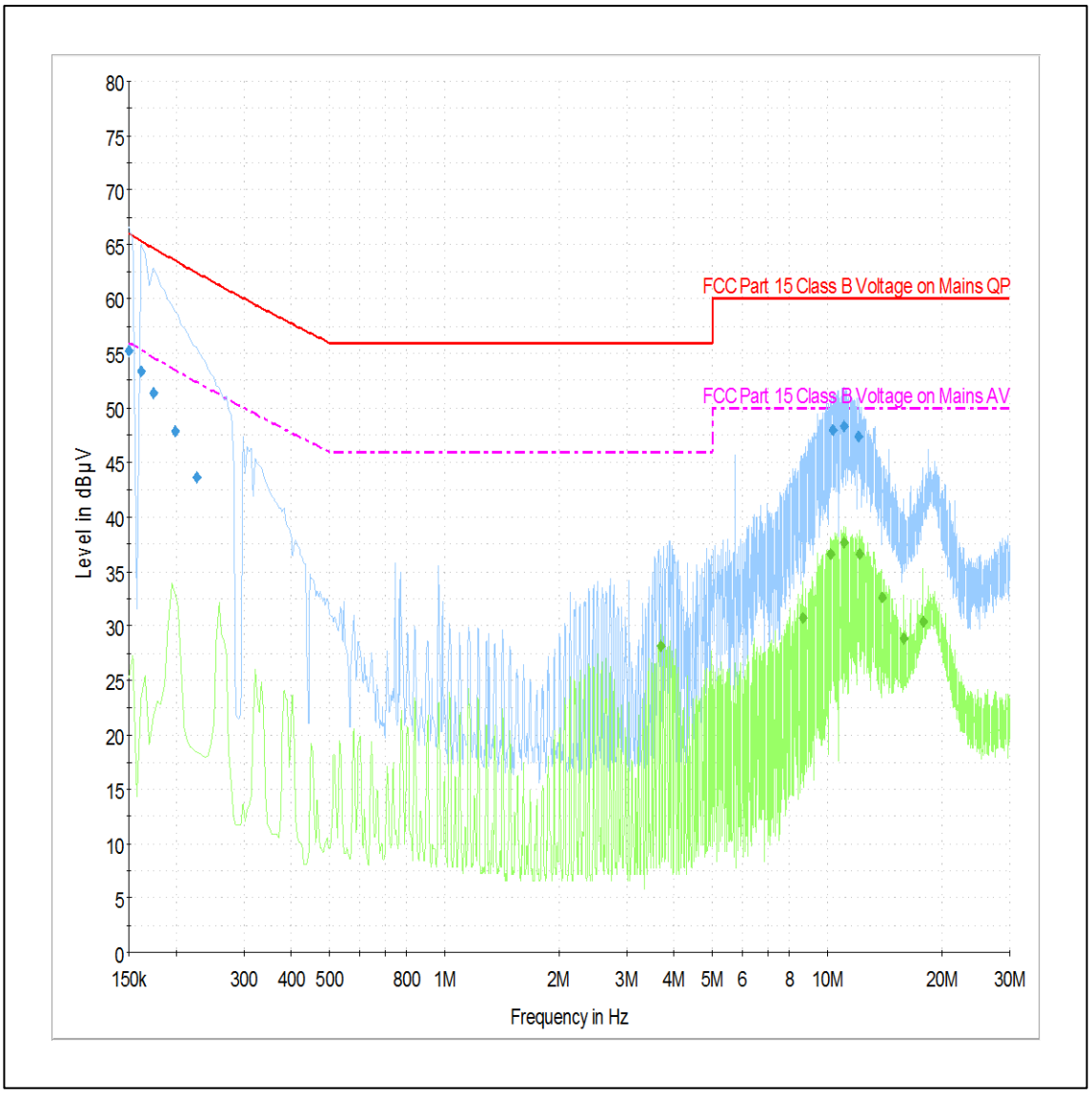
Frequency [MHz]	Quasi-Peak [dBuV]	Bandwidth [kHz]	Line	Factor [dB]	Margin [dB]	Limit [dBuV]
0.194	36.5	9.0	L1	10.1	27.2	63.7
0.398	32.8	9.0	N	10.1	25	57.8
8.696	34.2	9.0	L1	9.8	25.8	60
10.372	37.1	9.0	L1	9.9	22.9	60
10.5	37.3	9.0	L1	9.9	22.7	60
11.92	36.9	9.0	L1	9.9	23.1	60
13.84	35.4	9.0	N	10.1	24.6	60
17.08	31.1	9.0	N	10.1	28.9	60

Frequency [MHz]	Average [dBuV]	Bandwidth [kHz]	Line	Factor [dB]	Margin [dB]	Limit [dBuV]
0.194	30.5	9.0	N	10.1	23.2	53.7
0.406	22.4	9.0	N	10.1	25.2	47.6
9.084	26.7	9.0	L1	9.9	23.3	50
10.372	30.5	9.0	L1	9.9	19.5	50
10.5	30.9	9.0	L1	9.9	19.1	50
11.98	29.4	9.0	L1	9.9	20.6	50
14.832	22.6	9.0	L1	10	27.4	50
15.976	23.1	9.0	N	10.1	26.9	50

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)

- **Operating Mode 2 : USB Print**

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)

Frequency [MHz]	Quasi-Peak [dBuV]	Bandwidth [kHz]	Line	Factor [dB]	Margin [dB]	Limit [dBuV]
0.15	55.2	9.0	N	10.4	10.8	66
0.162	53.3	9.0	L1	10.2	12	65.3
0.174	51.3	9.0	L1	10.3	13.4	64.7
0.198	47.9	9.0	L1	10	15.6	63.5
0.226	43.7	9.0	L1	10	18.7	62.4
10.348	48	9.0	L1	9.9	12	60
11.088	48.3	9.0	N	10	11.7	60
12.088	47.4	9.0	N	10	12.6	60

Frequency [MHz]	Average [dBuV]	Bandwidth [kHz]	Line	Factor [dB]	Margin [dB]	Limit [dBuV]
3.68	28.1	9.0	L1	9.8	17.9	46
8.648	30.7	9.0	L1	9.8	19.3	50
10.248	36.6	9.0	N	9.9	13.4	50
11.084	37.7	9.0	N	10	12.3	50
12.116	36.6	9.0	N	10	13.4	50
13.92	32.6	9.0	N	10.1	17.4	50
15.872	28.8	9.0	L1	10	21.2	50
17.8	30.4	9.0	L1	10.1	19.6	50

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	Quasi-peak Limits dB dB(μV/m)	
	Class A	Class B
30 to 230	40	30
230 to 1000	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. Note 3: 1 μV/m is regarded as 0 dB.		

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 3m for the following antenna and turntable arrangements. Antenna height was adjusted to 100 cm to be parallel from EUT to antenna center and turntable was rotated continuously forward and backward.

Antenna Height (Cm)	Antenna Polarisation	Turntable position (degrees)
100	Horizontal, Vertical	Continuous

Above GHz, peak detector function mode was used with resolution bandwidth of 1 MHz and a video bandwidth of 1 MHz. If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

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		

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

Final measurements were made with a average detector. Results checked manually; and points close to the limit line were re-measured.

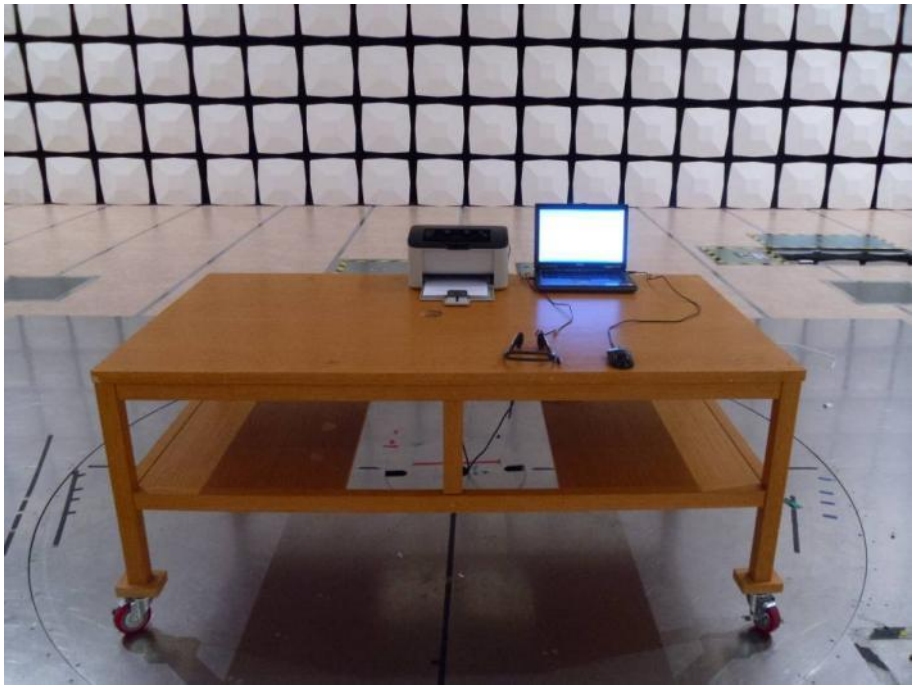
4.2.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Bi-con Antenna	CBL6112D	Schaffner	22602	2010-04-21	24
Bi-con Antenna	CBL6112D	Schaffner	22604	2010-04-21	24
Horn Antenna	R&S	HF907	100016	2009-04-27	24
EMI Receiver	ESIB-26	R&S	100288	2010-06-04	12
EMI Receiver	ESIB-26	R&S	100147	2010-08-17	12
Amplifier	310N	Agilent	185861	2010-12-10	12
Amplifier	310N	Agilent	251676	2010-12-10	12
Preamplifier	R&S	SCU_F018_G35_ ASF42_CNN(F)	10001	2010-04-19	12
Antenna Mast	MA4000	INN CO	-	N/A	N/A
Antenna Mast	MA4000	INN CO	-	N/A	N/A
Antenna Mast	MA2000	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

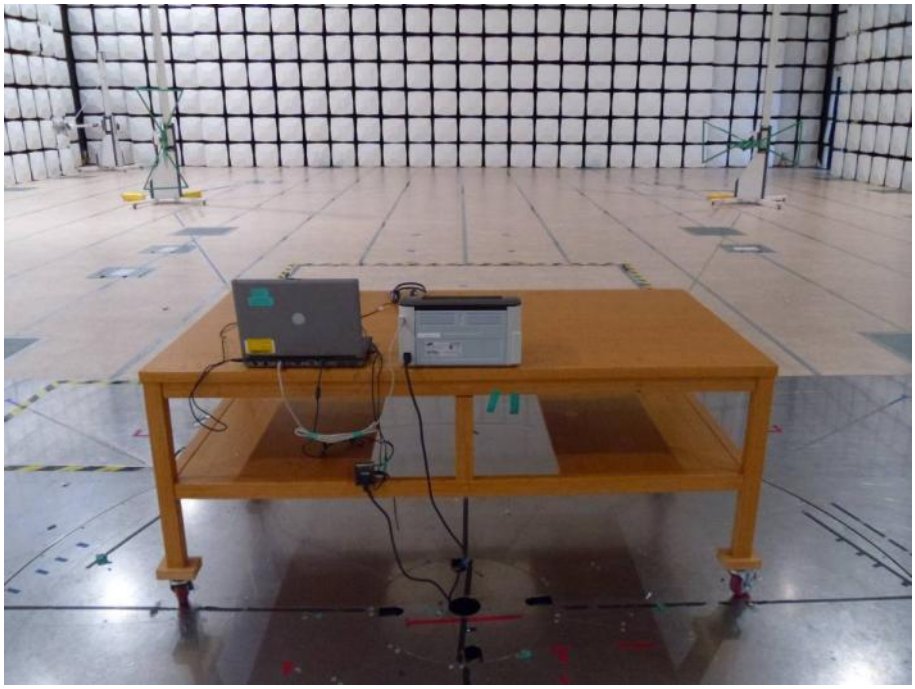
4.2.2 Temperature and humidity condition

Test date	22 Dec 2010 28 Dec 2010	**Test engineer**	Ho Jin Choi
Test place	Semi-Anechoic Chamber		

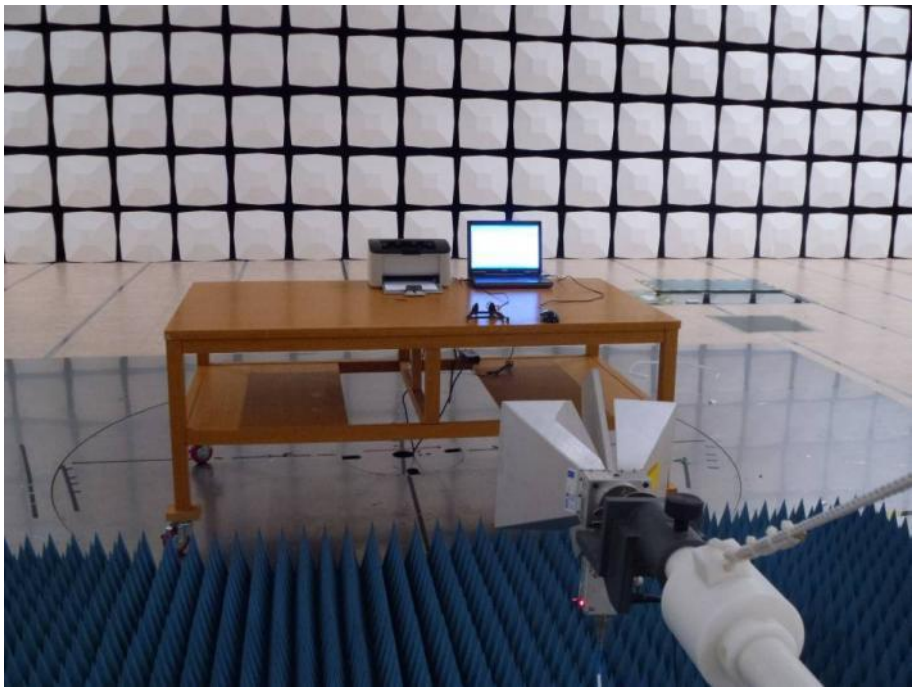
4.2.3 Photograph of Test Setup



Front



Rear



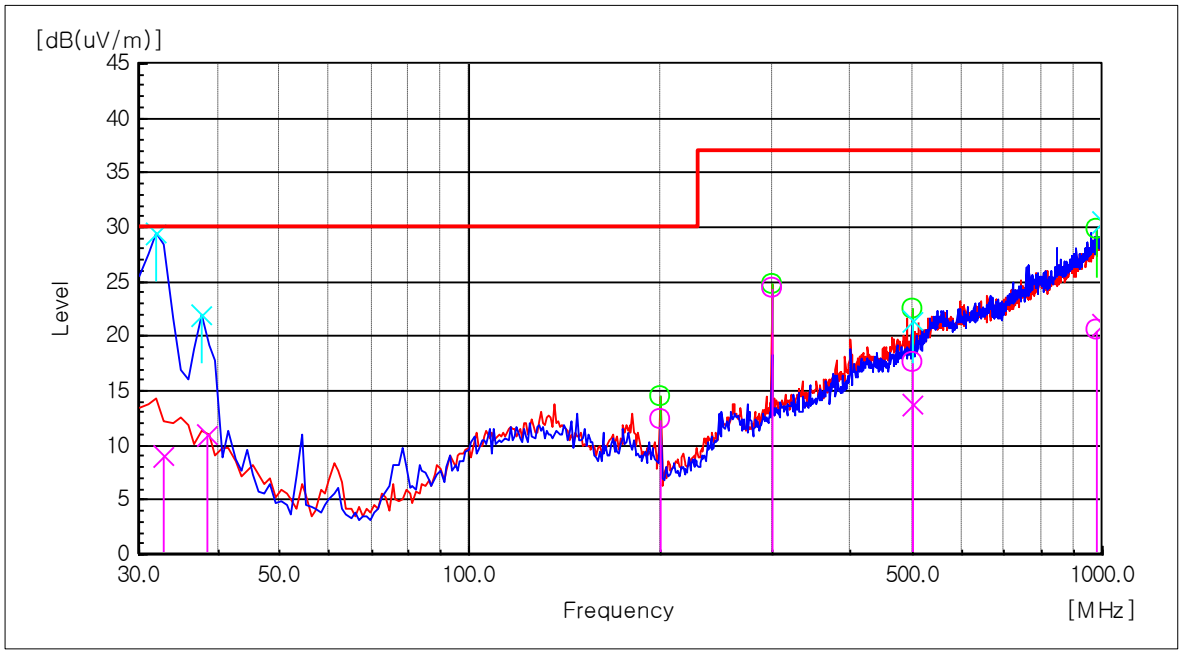
Front (Above 1GHz)

4.2.4 Test results

4.2.4.1 Test results (30MHz ~ 1GHz)

- **Operating Mode 1 : Standby**

Test Graph and Results



Frequency [MHz]	(P)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
32.82	V	23.5	-14.3	9.2	30	20.8	150	194
38.42	V	28.3	-17.4	10.9	30	19.1	150	271
199.99	H	32.5	-20.1	12.4	30	17.6	344	11
299.99	H	38.9	-14.5	24.4	37	12.6	248	38
499.99	H	26.2	-8.6	17.6	37	19.4	151	300.9
502.07	V	21.9	-8.0	13.9	37	23.1	150	301.5
982.80	H	21.2	-0.7	20.5	37	16.5	347	0.3
998.04	V	20.3	0.8	21.1	37	15.9	150	44.7

Note) Receiving antenna polarization : Horizontal and/or Vertical

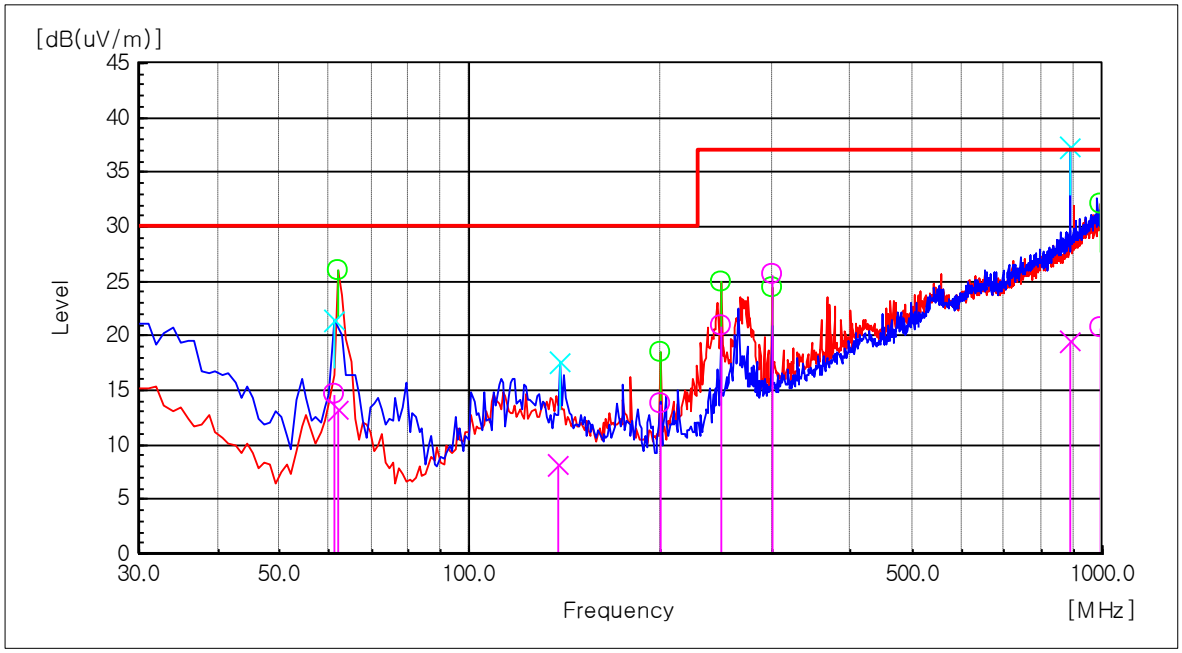
Test Distance : 10m, Antenna Height : 1 to 4 meters

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

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

- **Operating Mode 2 : USB Print**

Test Graph and Results



Frequency [MHz]	(P)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
61.25	H	39.8	-25.1	14.7	30	15.3	252	163
61.79	V	38.0	-24.7	13.3	30	16.7	150	215
137.50	V	25.6	-17.4	8.2	30	21.8	150	276
200.00	H	33.9	-20.1	13.8	30	16.2	347	304.2
249.99	H	37.0	-16.0	21.0	37	16.0	143	3
299.99	H	40.2	-14.5	25.7	37	11.3	254	53.3
889.11	V	21.2	-1.6	19.6	37	17.4	150	136
992.13	H	21.1	-0.4	20.7	37	16.3	251	215.1

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 Test results (1 GHz ~ 2GHz)

- **Operating Mode 1 : Standby**

Peak Measurement

Frequency [MHz]	(P)	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1100.20	V	41.8	-6.1	35.7	70	34.3	100	312
1605.21	H	34.6	-2.4	32.2	70	37.8	100	94
1935.87	H	34.6	0.1	34.7	70	35.3	100	359

- **Operating Mode 2 : USB Printing**

Peak Measurement

Frequency [MHz]	(P)	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1234.47	V	53.1	-5.3	47.8	70	22.2	100	1
1246.49	V	54.5	-5.2	49.3	70	20.7	100	233
1410.82	V	51.9	-3.8	48.1	70	21.9	100	169
1412.83	H	52.6	-3.8	48.8	70	21.2	100	11.9

Note1) 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)

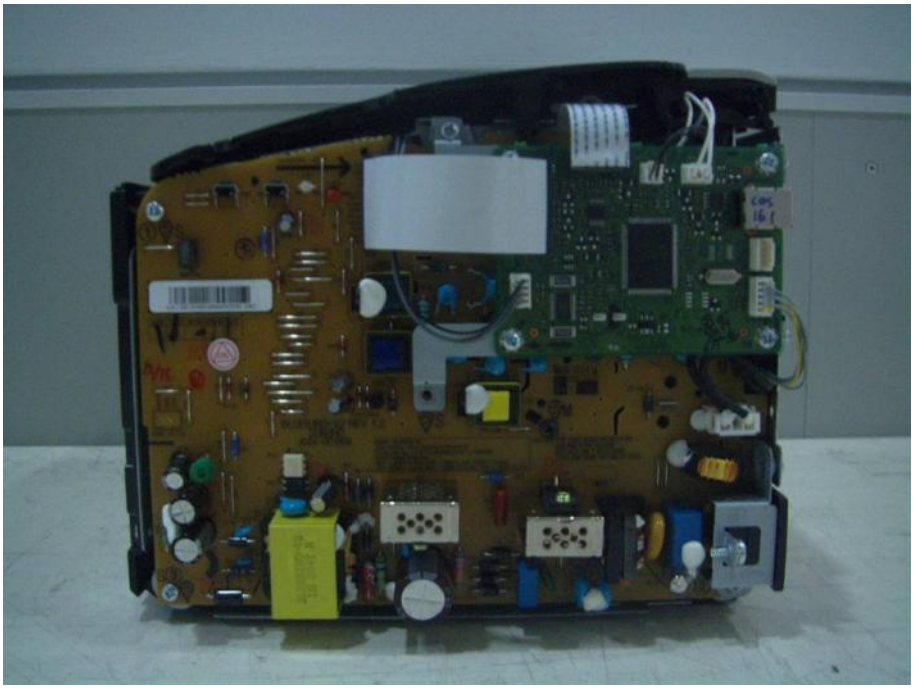
Margin AV (Average) = Limit – Level AV (Average)

Note3) RBW = 1MHz, VBW = 1MHz, Peak detector were used

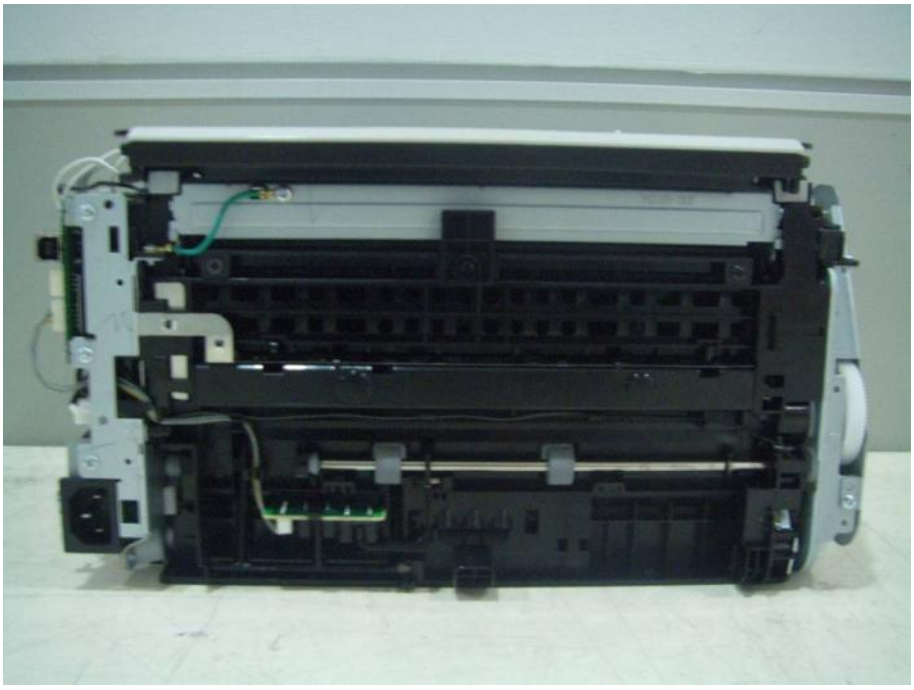
Appendix 1 – EUT photography

Front View

Rear View

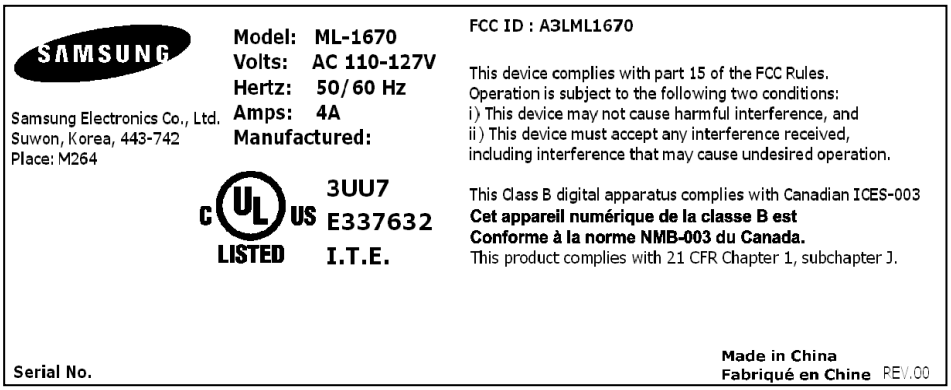


inside View-1



inside View-2

Label location



Label