

EMC TEST REPORT

Project No.	LBE073777	Revision No.	None
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	2007.12.18	
EUT Equipment Under Test	Type of device	Class B personal computers and peripherals	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LML2240	
	Kind of product	Printer	
	Model No.	ML-2240	
		Variant Model No.	ML-2245, ML-2241
Manufacturer	Samsung Electronics (Shandong) Digital Printing Co., Ltd. 264209, Samsung Road, Weihai Hi-Tech. IDZ, Shandong Province, P.R.China		
Applied Standards		FCC Part 15, Subpart B / ANSI C63.4-2003	
Issue date		2007.12.27	
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 : Young Ju, Ryu Y. J. Ryu		Reviewed by : No Cheon, Park N. C. 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

SEC EMC Laboratory

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	FCC Part 15 Subpart B	Complied	Meets Class B Limit Minimum margin is 12.5 dB at 7.896 MHz
☒	Radiated Disturbance		Complied	Meets Class B Limit Minimum margin is 13.6 dB at 385.571 MHz

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
	Radio Research Laboratory	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
	IC(Industry Canada)	Assigned Code: 5871

3. Test Setup configuration

3.1 Test Peripherals

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
Printer	ML-2240	-	Samsung	A3LML2240
Note PC	NP-Q20	KRBA5901278A00C F43M00MH	Samsung	A3LNPQ20
AC Adapter	AD-4212A	CNBA44XXXXXXSE 3831L0241	Dongguan Samsung Electro-Mechanics	-
USB Mouse	M-UAE96	LZK61923409	Logitech	DoC
Earphone	-	-	COSY	-

3.2 EUT operating mode

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

Operating Mode 1	USB Printing
Operating Mode 2	Standby

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 PC to EUT From PC to Mouse
Audio	1.0	No	From earphone to PC

3.5 EUT Description

The following features describe EUT represented by this report:

Item	Specification	Remarks
Processor	Jupiter4e(ARM940T, 150MHz)	-
Standard System memory	8MB SDRAM	-
Resolution	1200x600dpi	-
Copy Quality mode	NA	-
Paper Handling	Paper Tray(standard) 150 Sheets 2nd Tray(optional) : NA Bypass Tray : NA	-
Power Rating	110~127 VAC, 5.0A, 50/60 Hz	-
Power Consumption	Power save mode : 6Watts Printing simplex : 350Watts	-
Printer Language	SPL	-
Interfaces	USB1.1 (Compatible with USB2..0)	-
OS compatibility	Windows 2000 / XP / 2003 / Vista Linux Mac OS 8.6~9.2, 10.1~10.4	-
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	12	Video	14.75
CPU Internal	150	SDRAM	75
USB Device	48		

3.7 Operating mode 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 is supporting the USB printing mode.

- 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	Mains Port	± 2.8 dB
Radiated disturbance	Horizontal	± 5.1 dB
	Vertical	± 5.09 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 mains ports of class A

Frequency range Limits MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	79	66
0,50 to 30	73	60

Note 1: 1 μ V is regarded as 0 dB.
Note 2: If the average limit is met in the measurement with quasi-peak detector, the measurement with average detector at the same frequency is unnecessary.
Note 3: The lower limit shall apply at the transition frequency.

Limits for conducted disturbance at the mains ports of class B

Frequency range Limits MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Note 1: 1 μ V is regarded as 0 dB.
Note 2: The limits shall decreases linearly with the logarithm of the frequency in the range 150 - 500 kHz.
Note 3: If the average limit is met in the measurement with quasi-peak detector, the measurement with average detector is unnecessary.
Note 4: The lower limit shall apply at the transition frequency.

4.1.1 Test instrumentation

Test instrumentation used in the Conducted disturbance test was as follows:

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Test Software	EMC 32	R&S	Ver 5.20.2	N/A	N/A
Measuring receiver	ESCI	R&S	100368	2007-06-01	12
Artificial mains network	ENV216	R&S	100117	2007-09-03	12
Artificial mains network	ESH3-Z5	R&S	100262	2007-09-03	12

4.1.2 Photograph of the test Configuration

(Front)



(Rear)



4.1.3 Test results

Operating condition	USB Printing				
Test date	2007-12-20	Test engineer		Young Ju, Ryu	
Climate condition	Ambient temperature	24.4 ℃	Relative humidity		31 %
	Atmospheric pressure	102.0 kPa			
Test place	Shielded room #1				
Note	* QP : Quasi-peak, AV: Average * Level (QP or AV) = Meter Reading(QP or AV) + Corr.(LISN Insertion loss + Cable loss) * Margin = Limit - Level				

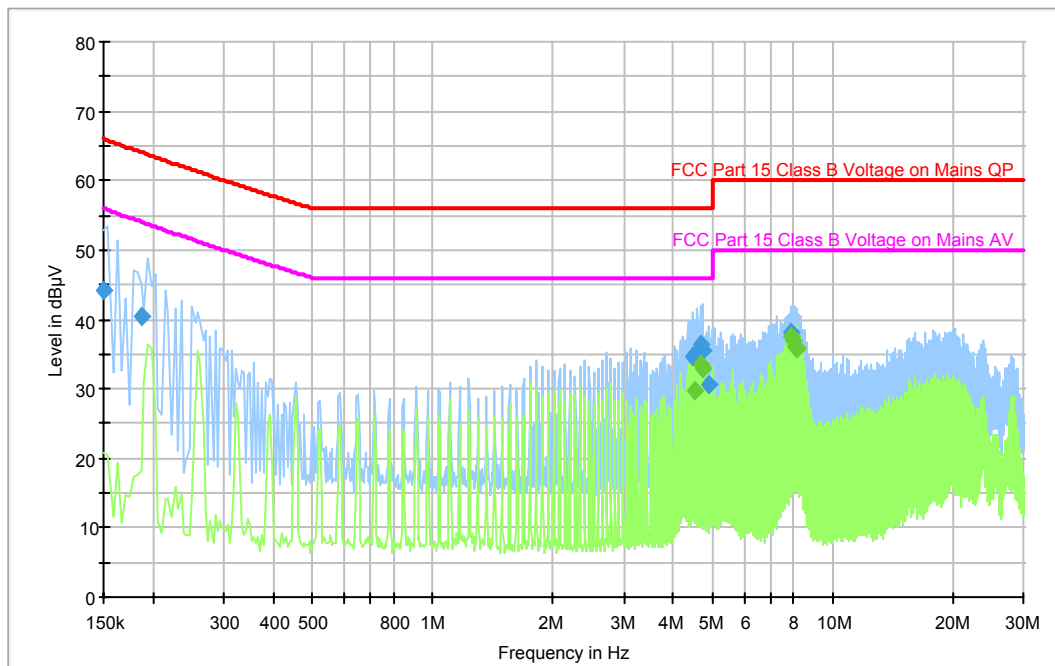
Scan Setup: FCC Part 15 Class_B with ENV 2-Line-LISN fin [EMI conducted]

Hardware Setup:
Level Unit:

Voltage with ENV 2-Line-LISN
dB μ V

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

FCC Part 15 Class_B with ENV 2-Line-LISN



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150 000	44.2	L1	9.6	21.8	66.0
0.186 500	40.5	L1	9.6	23.6	64.1
4.464 500	34.8	N	9.8	21.2	56.0
4.596 500	35.4	N	9.8	20.6	56.0
4.660 500	36.3	N	9.8	19.7	56.0
4.724 500	35.6	N	9.8	20.4	56.0
4.916 500	30.5	N	9.8	25.5	56.0
7.896 500	38.2	N	9.9	21.8	60.0

Final Measurement Detector 2

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
4.532 500	29.7	N	9.8	16.3	46.0
4.660 500	33.4	N	9.8	12.6	46.0
4.724 500	32.8	L1	9.8	13.2	46.0
7.896 500	37.5	N	9.9	12.5	50.0
7.960 500	37.1	N	9.9	12.9	50.0
8.028 500	36.0	N	9.9	14.0	50.0
8.092 500	36.1	N	9.9	13.9	50.0
8.156 500	35.7	L1	9.9	14.3	50.0

Operating condition	Standby			
Test date	2007-12-20	Test engineer		Young Ju, Ryu
Climate condition	Ambient temperature	24.4 ℃	Relative humidity	31 %
	Atmospheric pressure	102.0 kPa		
Test place	Shielded room #1			
Note	* QP : Quasi-peak, AV: Average * Level (QP or AV) = Meter Reading(QP or AV) + Corr.(LISN Insertion loss + Cable loss) * Margin = Limit - Level			

Scan Setup: FCC Part 15 Class_B with ENV 2-Line-LISN fin [EMI conducted]

Hardware Setup:
Level Unit:

Voltage with ENV 2-Line-LISN
dB μ V

Subrange
150kHz - 30MHz

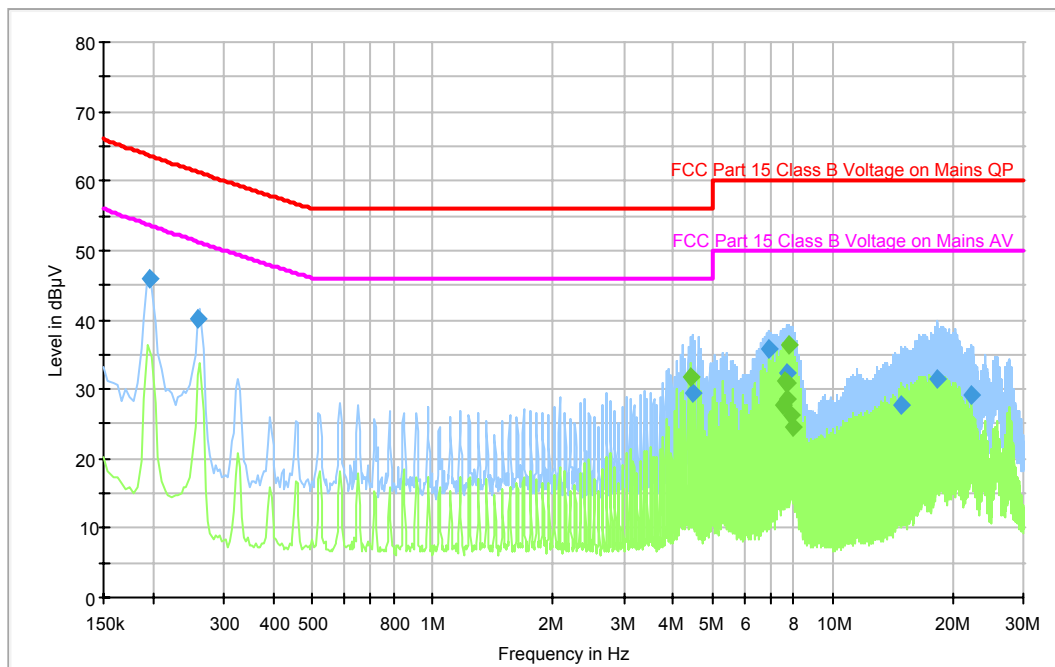
Detectors
QuasiPeak; Average

IF Bandwidth
9kHz

Meas. Time
15s

Receiver
ESCI 3

FCC Part 15 Class_B with ENV 2-Line-LISN



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.194 500	45.9	N	9.6	17.8	63.7
0.258 500	40.1	N	9.6	21.2	61.3
4.476 500	29.5	N	9.8	26.5	56.0
6.943 500	35.9	L1	9.9	24.1	60.0
7.720 500	32.2	N	9.9	27.8	60.0
14.795 500	27.6	N	10.1	32.4	60.0
18.363 500	31.4	N	10.1	28.6	60.0
22.127 500	29.1	N	10.3	30.9	60.0

Final Measurement Detector 2

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
4.412 500	31.8	L1	9.8	14.2	46.0
7.528 500	27.7	N	9.9	22.3	50.0
7.591 500	31.3	L1	9.9	18.7	50.0
7.655 500	31.0	L1	9.9	19.0	50.0
7.723 500	28.7	N	9.9	21.3	50.0
7.787 500	36.5	L1	9.9	13.5	50.0
7.852 500	26.2	N	9.9	23.8	50.0
7.916 500	24.6	N	9.9	25.4	50.0

4.2 Radiated disturbance

Of those disturbances above ($L - 20\text{dB}$), 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($\mu\text{V/m}$)	
	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 $\mu\text{V/m}$ is regarded as 0 dB.

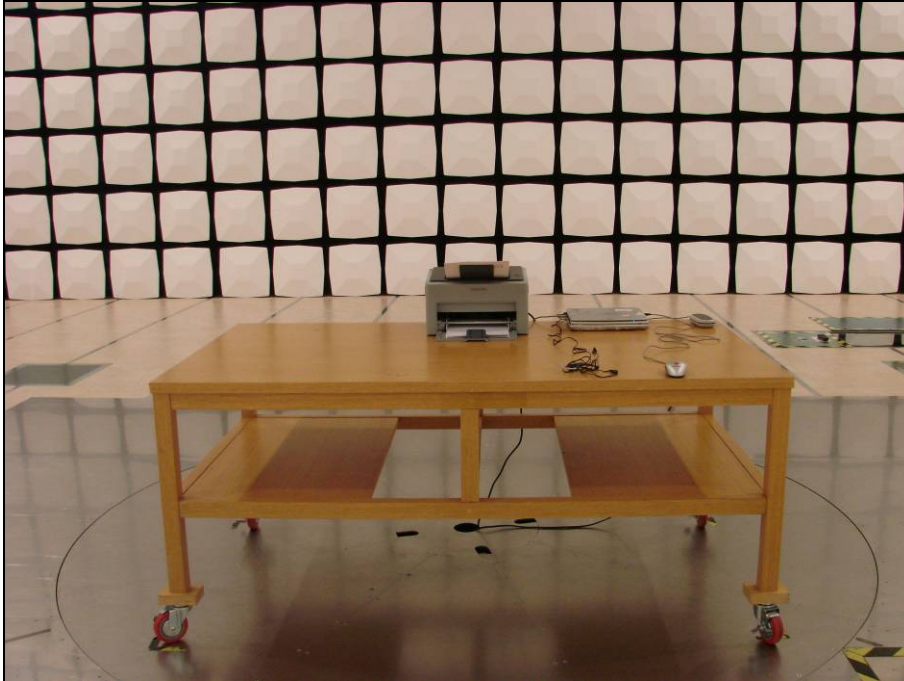
4.2.1 Test instrumentation

Test instrumentation used in the Radiated disturbance was as follows:

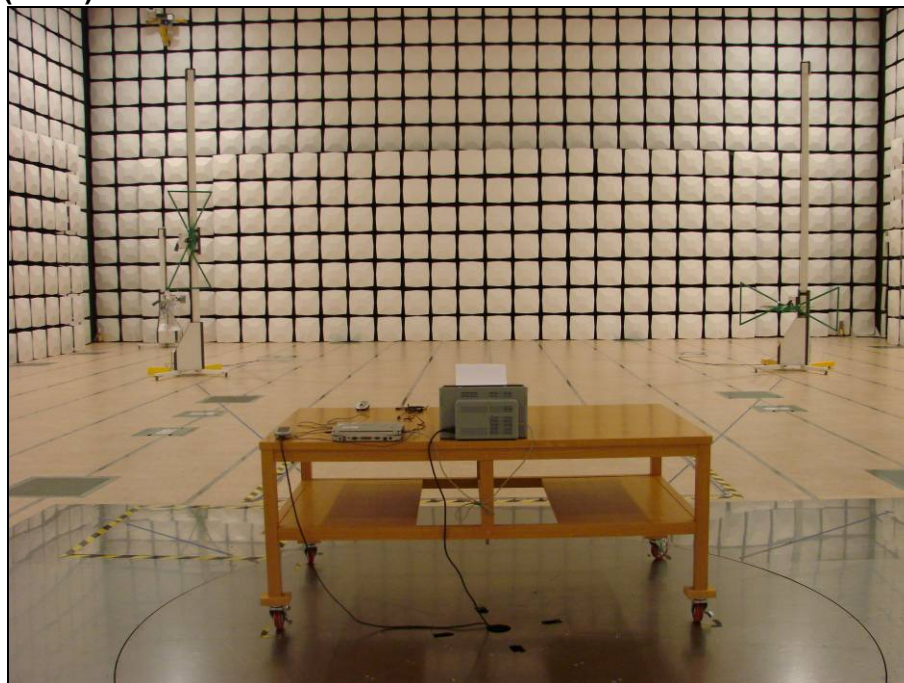
Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Bi-con Antenna	CBL6112D	SCHAFFNER	22602	2006-06-26	24
Bi-con Antenna	CBL6112D	SCHAFFNER	22601	2007-04-02	24
EMI Receiver	ESIB-26	R&S	100289	2007-03-22	12
EMI Receiver	ESIB-26	R&S	100287	2007-04-10	12
AMPLIFIER	310N	SONOMA	186467	2007-03-17	12
AMPLIFIER	310N	SONOMA	251673	2007-03-17	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
Test software	EP5/RE	TOYO	VER 3.1.20	N/A	N/A
RF Selector	NS4900	TOYO	-	N/A	N/A
HORN ANTENNA	BBHA9120B	SCHWARZBECK	335	2007-01-08	24
HORN ANTENNA	BBHA9120C	SCHWARZBECK	352	2007-03-15	24

4.2.2 Photograph of the test Configuration

(Front)

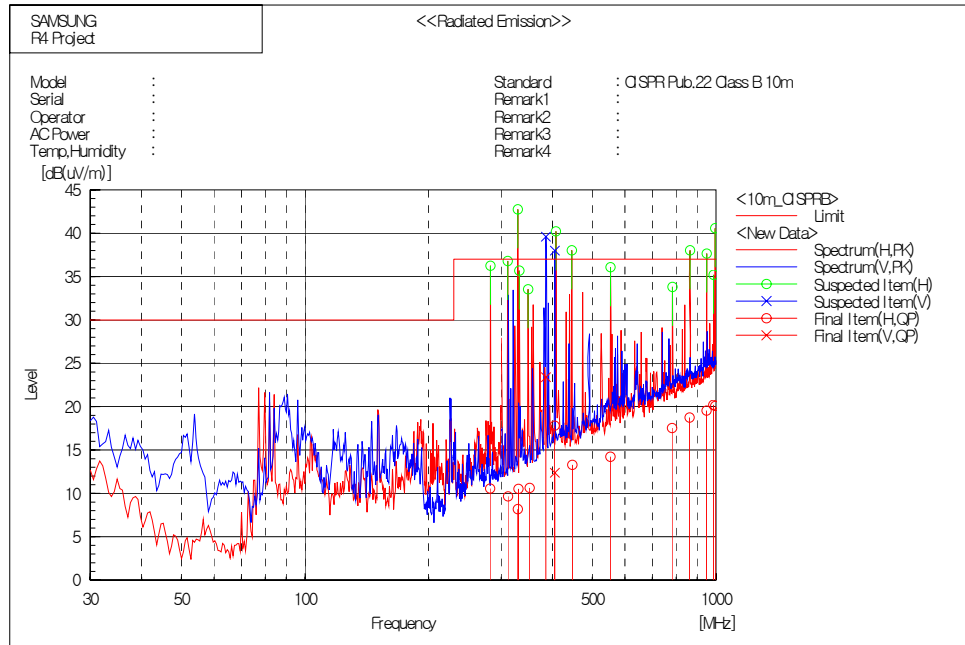


(Rear)



4.2.3 Test results (30 MHz ~ 1 GHz)

Operating condition	USB Printing			
Test date	2007-12-18	Test engineer		Young Ju, Ryu
Climate condition	Ambient temperature	23.5 °C	Relative humidity	28 %
	Atmospheric pressure	102.2 kPa		
Test place	10m Semi-Anechoic Chamber #1			
Note	* Receiving antenna mode : Horizontal, Vertical * Test distance : 10 m (RF Semi Anechoic Chamber) * Result = Reading + c.f (Antenna factor + Cable loss- Amp Gain) * Margin = Limit – Result			



Final Result

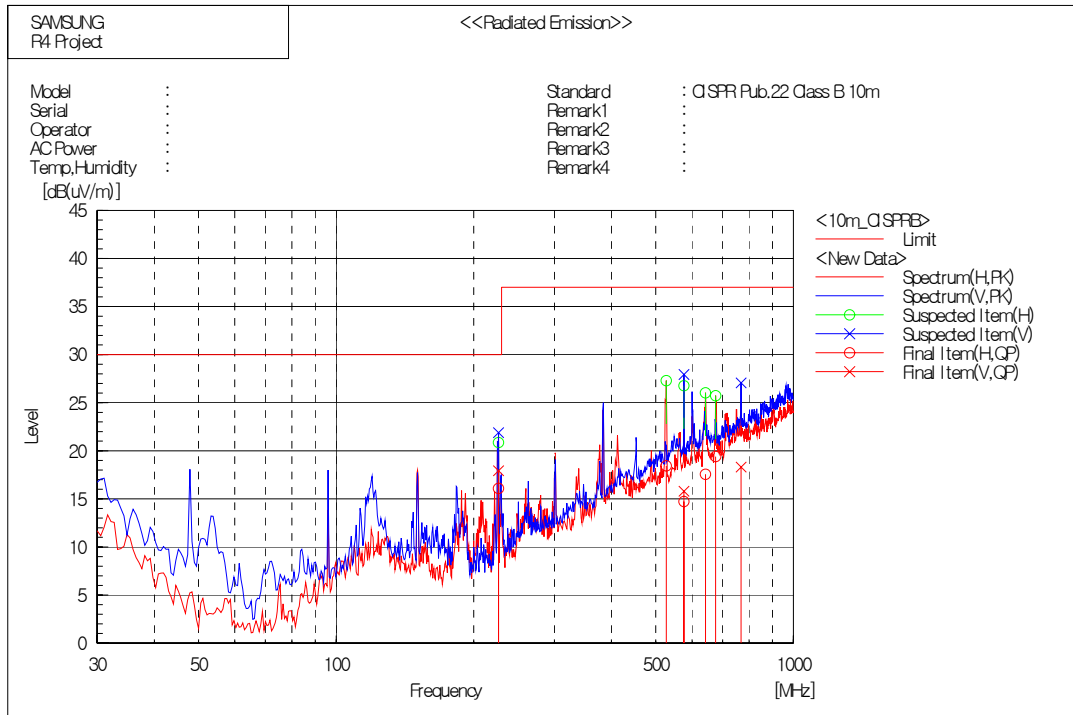
--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Remark
1	282.077	25.7	-15.1	10.6	37.0	26.4	
2	312.015	23.7	-14.0	9.7	37.0	27.3	
3	329.459	21.6	-13.4	8.2	37.0	28.8	
4	330.672	23.9	-13.4	10.5	37.0	26.5	
5	352.163	23.4	-12.8	10.6	37.0	26.4	
6	404.909	28.4	-10.6	17.8	37.0	19.2	
7	447.161	23.3	-10.0	13.3	37.0	23.7	
8	553.522	22.2	-8.0	14.2	37.0	22.8	
9	781.759	22.5	-5.0	17.5	37.0	19.5	
10	862.743	22.6	-3.9	18.7	37.0	18.3	
11	948.244	21.8	-2.3	19.5	37.0	17.5	
12	985.853	21.6	-1.4	20.2	37.0	16.8	
13	995.792	21.3	-1.2	20.1	37.0	16.9	

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Remark
1	385.571	35.4	-12.0	23.4	37.0	13.6	
2	405.210	22.9	-10.5	12.4	37.0	24.6	

Operating condition	Standby			
Test date	2007-12-18	Test engineer		Young Ju, Ryu
Climate condition	Ambient temperature	23.5 ℃	Relative humidity	28 %
	Atmospheric pressure	102.2 kPa		
Test place	10m Semi-Anechoic Chamber #1			
Note	* Receiving antenna mode : Horizontal, Vertical * Test distance : 10 m (RF Semi Anechoic Chamber) * Result = Reading + c.f (Antenna factor + Cable loss- Amp Gain) * Margin = Limit – Result			



Final Result

--- Horizontal Polarization (QP)---

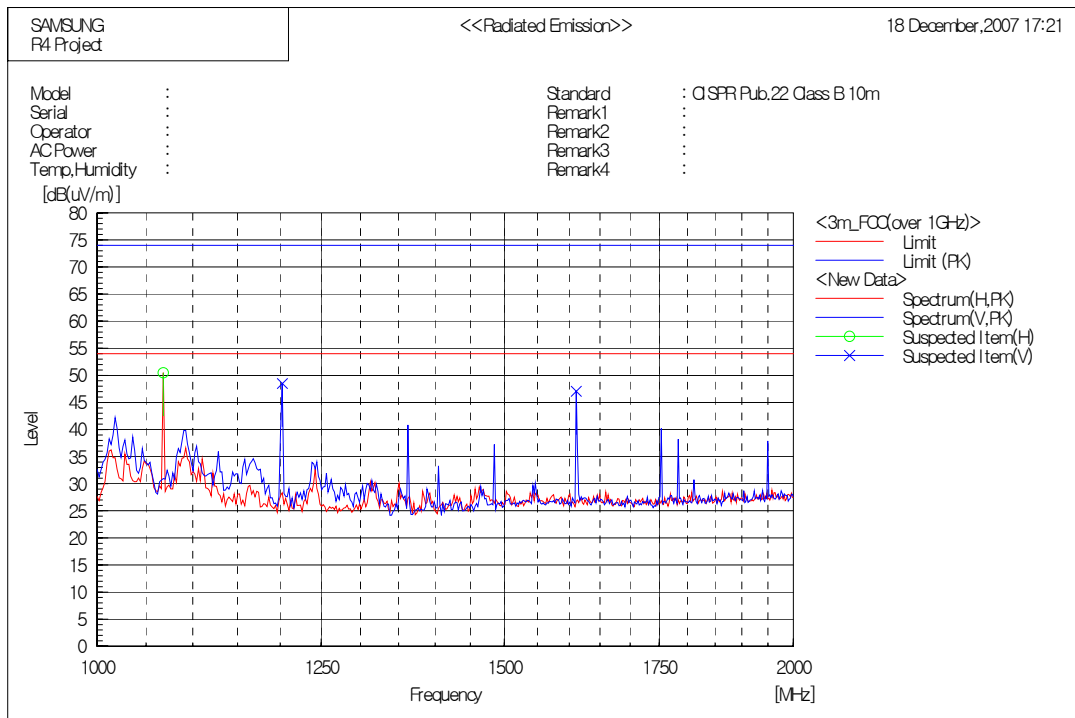
No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Remark
1	226.413	35.2	-19.1	16.1	30.0	13.9	
2	527.255	27.0	-8.6	18.4	37.0	18.6	
3	576.353	22.3	-7.6	14.7	37.0	22.3	
4	642.285	24.7	-7.1	17.6	37.0	19.4	
5	675.952	26.3	-6.9	19.4	37.0	17.6	

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Remark
1	226.413	36.9	-19.0	17.9	30.0	12.1	
2	576.353	23.2	-7.4	15.8	37.0	21.2	
3	768.537	23.2	-4.9	18.3	37.0	18.7	

4.2.4 Test results (1 GHz ~ 2 GHz)

Operating condition	USB Printing			
Test date	2007-12-18	Test engineer		Young Ju, Ryu
Climate condition	Ambient temperature	23.5 °C	Relative humidity	28 %
	Atmospheric pressure	102.2 kPa		
Test place	10m Semi-Anechoic Chamber #1			
Note	* 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			



Spectrum Selection

--- Horizontal Polarization ---

No.	Frequency	Reading	c.f	Result PK	Limit	Margin	Remark
	[MHz]	[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	
1	1068.136	62.7	-12.2	50.5	54.0	3.5	

--- Vertical Polarization ---

No.	Frequency	Reading	c.f	Result PK	Limit	Margin	Remark
	[MHz]	[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	
1	1202.405	60.1	-11.6	48.5	54.0	5.5	
2	1611.223	56.8	-9.7	47.1	54.0	6.9	

Appendix – EUT photography

Front View



Rear View



Label Location



Label

 Samsung Electronics Co., Ltd. Suwon, Korea, 443-742 Place:M264	Model No.:	ML-2240	FCC ID:A3LML2240	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. This Class B digital apparatus complies with Canadian ICES-003 Cet appareil numérique de la classe B est Conforme à la norme NMB-003 du Canada. This product complies with 21 CFR Chapter 1, subchapter J.
	Voltz:	AC 110-127V		
	Hertz:	50/60Hz		
	Amps:	SA		
Manufactured:				
		51Y7 E149091 I.T.E.		
S/N	MADE IN CHINA REV.00			