

EMC Test Report

Project No.	LBE041695
Equipment under Test	
Applicant	Samsung Electronics Co. Ltd
Address	416 Maetan3-Dong, Yeongtong-Gu, Suwon-City, Gyeonggi-Do, Korea, 443-742
Product Name	System Keyboard
Model Name	SSC-2000
Manufacturer	SAMSUNG
Brand Name	SAMSUNG
Variant Model	See Page 3
Date of Test	August 26~ September 5, 2004
Issued Date	September 21, 2004

Applied Standards	EN50081-1: 1992, EN50130-4: 1995 + A1:1998
Result	Passed The equipment under test has found to be compliant with the applied standards.

	Name/Position	Signature
Tested by	Sung WooK, Choi Test Engineer	<i>S. W. Choi</i>
Reviewed by	No Cheon, Park Manager of EMC Lab.	<i>N. C. Park</i>
Authorized by	Kyu Baek, Chung Chief of EMC Lab.	<i>K. B. Chung</i>








SAMSUNG ELECTRONICS Co., Ltd. SUWON EMC Test Lab.	      	
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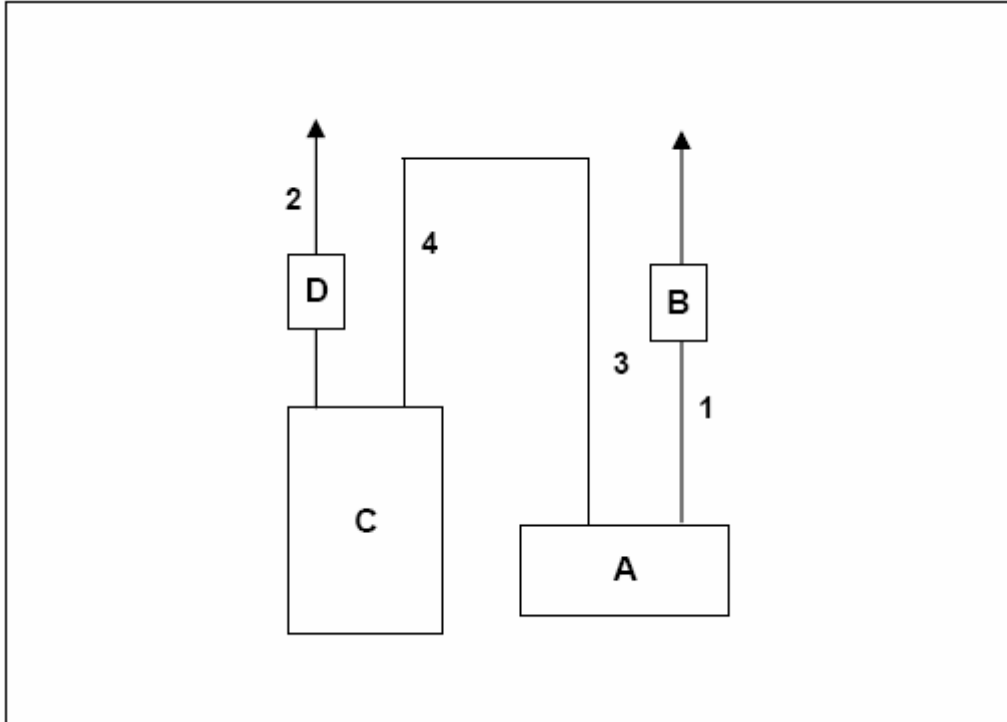
1. General Information

1.1 Basic Information related Product

Applicant	Samsung Electronics Co. Ltd
Model name	SSC-2000
Applicant Address	Samsung Electronics Co. Ltd; 416 Maetan3- Dong, Yeongtong-Gu, Suwon-City, Gyeonggi-Do, Korea, 443-742
Contact Person	Sung Wook, Choi
Kind of Product	System Keyboard
Valiant Model List	None
Manufacturer	Samsung Electronics Co.Ltd

1.2 Test Block Diagram

Block Diagram



Used EUT and Peripherals

Seq	Device	Model Name	Serial #	Maker	Note
A	System Keyboard	SSC-2000	-	Samsung	EUT
B	Adapter	YK-12060K	0401	Samsung	
C	CCTV Camera	SCC-C4203	62ZW300024L	Samsung	
D	Adapter	YK-12060K	0307	Samsung	

1.3 Applied Standards

List

Product or Generic Standards	Basic Standards
EN50081-1: 1992	EN61000-4-2:1995 +A1(1998)+A2:2001
EN50130-4:1995+A1:1998	EN61000-4-3:2002
	EN61000-4-4:1995 +A1:2001 +A2:2001
	EN61000-4-5:1995
	EN61000-4-6:1996 +A1:2001
	EN61000-4-11:1994 +A1:2001

Performance Criteria

- A. normal performance within the specification limits
- B. temporary degradation or loss of function or performance which is self-recoverable
- C. temporary degradation or loss of function or performance which require operator intervention or system reset

1.4 Test Facility

General Information

The EMI/EMS measurement facilities used to collect the tested data are located at 416 Maetan 3 Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, Korea. This sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1 & 16-2.

SAMSUNG Electronics Co.,Ltd 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).

Accreditation and Listing



Uncertainty

(According to NAMAS Pub.NIS81)

Test Item	Expanded Uncertainty
Radiated Disturbance	5.09
Disturbance voltage at the mains terminals	1.64

2. Summary of Test Results

Result : PASS

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

Section of the Product Standard	Applied Standard	Result	
Electromagnetic Emission Test			
3.1	Conducted Emission	EN50081-1: 1992	Complied
3.2	Radiated Emission	EN50081-1: 1992	Complied
Electromagnetic Susceptibility(Immunity) Test			
3.3	ESD	EN61000-4-2:1995 +A1:1998+A2:2001	Complied
3.4	Radiated Immunity	EN61000-4-3:2002	Complied
3.5	EFT	EN61000-4-4:1995 +A1:2001+A2:2001	Complied
3.6	SURGE	EN61000-4-5:1995	Complied
3.7	Conducted Immunity	EN61000-4-6:1996+A1:2001	Complied
3.8	Voltage Dip	EN61000-4-11:1994+A1:2001	Complied

3. Description of Individual Tests

3.1 Conducted Emission

Test Information	
Test Engineer	Sung Wook, Choi
Test Date	August 27, 2004
Climate Condition	Ambient Temperature : 23℃ Relative Humidity : 51%
Test Place	Shield Room #5

Test Equipments

Equipment	Modal Name	Manufacturer	Serial No.	Calibration	
				Next Date	Interval
L.I.S.N	ESH3-Z5	R&S	100262	2005-02-11	12
Test Software	EP5CE	TOYO	None	N/A	N/A
Field strength meter	ESS	R&S	844661/005	2005-01-05	12
RF Relais Matrix	PSU	R&S	861206/024	N/A	N/A
L.I.S.N	ESH3-Z5	R&S	100260	2005-07-06	12
Spectrum Analyzer	ESI	R&S	100067	2005-01-09	12

EUT Test Setup

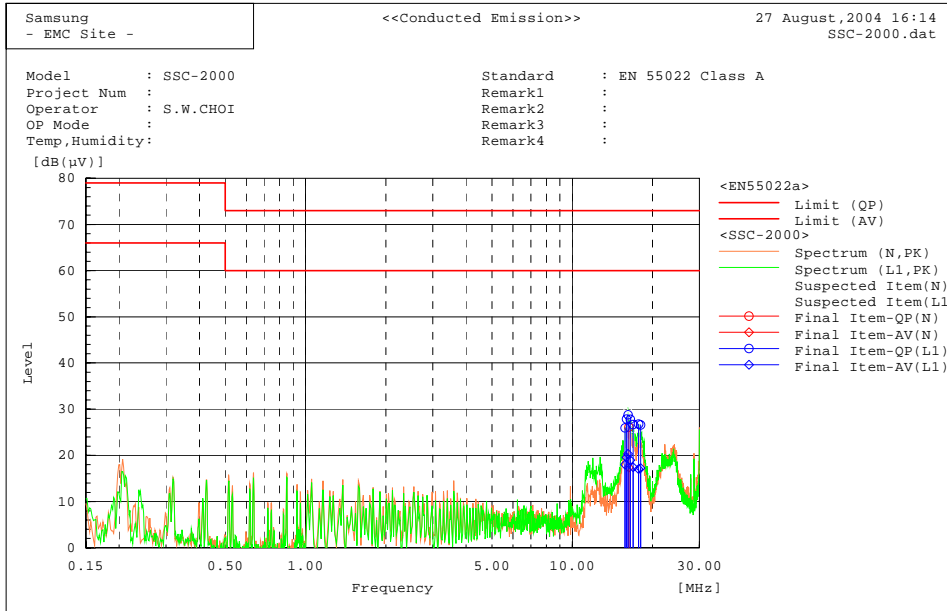
EUT set up in semi-anechoic chamber. EUT positioned at 3m from antenna in center of table.
All ports terminated into characteristic loads.

Test Result

Measurement Results	<p>Pass</p> <p>The measured emissions of the EUT have found to be below the specified limits.</p>
----------------------------	---

Test Data

[Graph and Data]



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(µV)]	Reading AV [dB(µV)]	c.f [dB]	Result QP [dB(µV)]	Result AV [dB(µV)]	Limit QP [dB(µV)]	Limit AV [dB(µV)]	Margin QP [dB]	Margin AV [dB]
1	16.32485	25.1	16.4	1.0	26.1	17.4	73.0	60.0	46.9	42.6

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(µV)]	Reading AV [dB(µV)]	c.f [dB]	Result QP [dB(µV)]	Result AV [dB(µV)]	Limit QP [dB(µV)]	Limit AV [dB(µV)]	Margin QP [dB]	Margin AV [dB]
1	15.78336	24.8	16.9	1.1	25.9	18.0	73.0	60.0	47.1	42.0
2	15.98617	26.8	18.5	1.1	27.9	19.6	73.0	60.0	45.1	40.4
3	16.18537	27.6	19.1	1.2	28.8	20.3	73.0	60.0	44.2	39.7
4	16.52205	26.6	17.7	1.2	27.8	18.9	73.0	60.0	45.2	41.1
5	16.91643	25.5	16.2	1.2	26.7	17.4	73.0	60.0	46.3	42.6
6	17.73567	25.6	15.8	1.2	26.8	17.0	73.0	60.0	46.2	43.0
7	18.03547	25.4	16.1	1.2	26.6	17.3	73.0	60.0	46.4	42.8

3.2 Radiated Emission

Test Information	
Test Engineer	Sung Wook, Choi
Test Date	August 27, 2004
Climate Condition	Ambient Temperature : 23 °C Relative Humidity : 50%
Test Place	10m Semi Anechoic Chamber

Test Equipments

Equipment	Modal Name	Manufacturer	Serial No.	Calibration	
				Next Date	Interval
RF Selector	NS4900	TOYO	0303-015	N/A	N/A
Biconilog Antenna	6112B	SCHAFFNER	2767	2005-05-22	12
Mast Controller	HD2000	HD	HD20000902027	N/A	N/A
Test Software	EP5RET	TOYO	None	N/A	N/A
EMI Receiver	ESI26	R&S	100067	2005-01-09	12
Test Software	EP5RE	TOYO	None	N/A	N/A
Signal Generator	SMG	R&S	860288036	2004-11-06	12
AMPLIFIER	310N	SONOMA	185861	2004-09-20	12
Spectrum Analyzer	E7405A	Agilent	MY42000109	2004-11-27	12
Field strength meter	ESCS30	R&S	839809/002	2005-04-28	12

EUT Test Setup

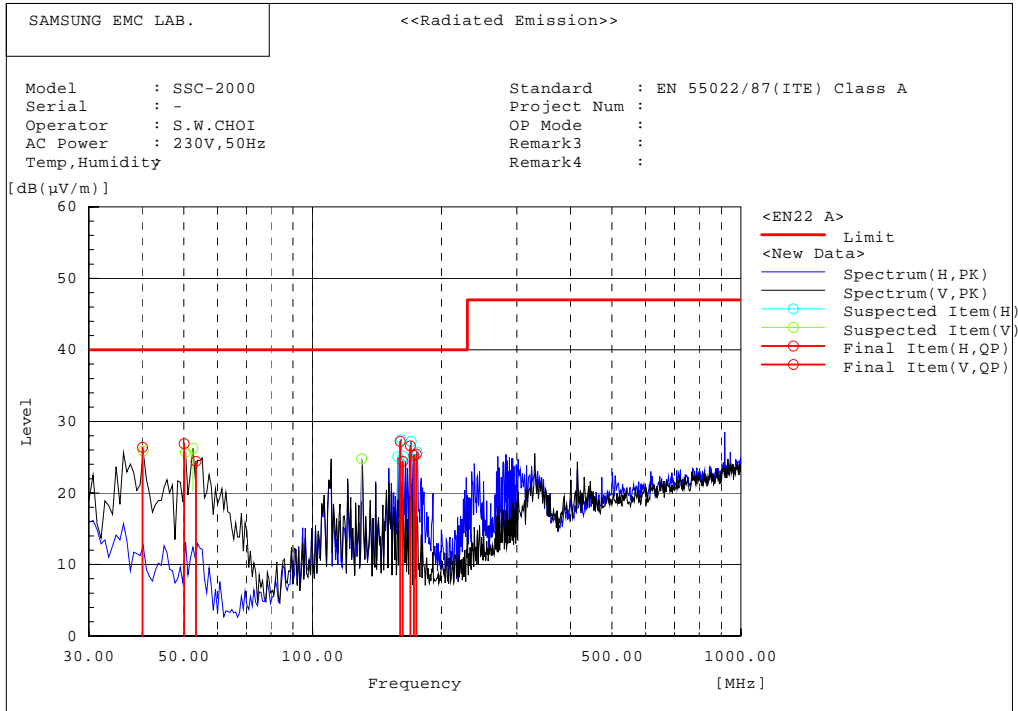
EUT set up in semi-anechoic chamber. EUT positioned at 3m from antenna in center of table.
All ports terminated into characteristic loads.

Test Result

Measurement Results	<p>Pass</p> <p>The measured emissions of the EUT have found to be below the specified limits.</p>
----------------------------	---

Test Data

[Graph and Data]



Final Result

--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Remark
1	160.187	48.5	-21.3	27.2	40.0	12.8	
2	169.091	48.1	-21.5	26.6	40.0	13.4	
3	174.639	46.9	-21.5	25.4	40.0	14.6	
4	172.418	46.8	-21.5	25.3	40.0	14.8	
5	162.408	45.8	-21.4	24.4	40.0	15.6	

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Remark
1	53.389	49.1	-24.7	24.4	40.0	15.6	
2	40.044	45.4	-19.0	26.4	40.0	13.6	
3	50.061	50.5	-23.6	26.9	40.0	13.1	

3.3 ESD

Test Information	
Test Engineer	Sung Wook, Choi
Test Date	September 5, 2004
Climate Condition	Ambient Temperature : 23°C (EN Limit : 15°C~35°C) Relative Humidity : 49% (EN Limit : 30%~60%) Atmospheric Pressure 1013 mbar (EN Limit : 860~1060)
Test Place	Shield Room #2

Test Equipments

Equipment	Modal Name	Manufacturer	Serial No.	Calibration	
				Next Date	Interval
ESD Tester	ESD30	EM Test	0901-23	2005-01-27	12

EUT Test Setup

The EUT was operated on a wooden table 0.8 meter above the reference ground. A HCP is lying on the table. Between the EUT and the HCP 0.5 mm is isolated base.

Test Result

Measurement Results	Pass No Operation errors were detected during or after the applied test.
----------------------------	---

Test Data

	No	Applied Point Name	Discharge Method	Test Level	Tested No	Criteria	Result
Indirect		Horizontal Plane	Contact	$\pm 2\text{kV} / \pm 4\text{kV} / \pm 6\text{kV}$	20	B	A
Indirect		Vertical Plane	Contact	$\pm 2\text{kV} / \pm 4\text{kV} / \pm 6\text{kV}$	20	B	A
Direct	1	LCD Monitor	Air	$\pm 2\text{kV} / \pm 4\text{kV} / \pm 8\text{kV}$	20	B	A
Direct	2	RS-485	Air	$\pm 2\text{kV} / \pm 4\text{kV} / \pm 8\text{kV}$	20	B	A
Direct	3	POWER	Air	$\pm 2\text{kV} / \pm 4\text{kV} / \pm 8\text{kV}$	20	B	A
Direct	4	RS-232	Contact	$\pm 2\text{kV} / \pm 4\text{kV} / \pm 6\text{kV}$	20	B	A
Direct	5	Click Button	Air	$\pm 2\text{kV} / \pm 4\text{kV} / \pm 8\text{kV}$	20	B	A

Test Points

FRONT



REAR



3.4 Radiated Immunity

Test Information	
Test Engineer	Sung Wook, Choi
Test Date	August 30, 2004
Climate Condition	Ambient Temperature : 23.5℃ (EN Limit : 15℃~35℃) Relative Humidity : 50% (EN Limit : 30%~60%) Atmospheric Pressure 1011 mbar (EN Limit : 860~1060)
Test Place	Fully Anechoic Chamber

Test Equipments

Equipment	Modal Name	Manufacturer	Serial No.	Calibration	
				Next Date	Interval
Signal Generator	SML03	R&S	101279	2005-02-10	12
Dual Directional Coupler	DCU	R&S	316976/001	2004-11-07	12
Antenna	AT1080	AR	16511	N/A	N/A
Measurement Software	EMS-K1	R&S	None	N/A	N/A
Power Meter	NRVD	R&S	841501/010	2004-11-13	12
RMS/PEAK Volt Meter	URE3	R&S	839432/032	2004-11-13	12

EUT Test Setup

The EUT was operated on a wooden table 0.8 meter above the reference ground. The test distance was 3 meter.

Test Result

Measurement Results	Pass No Operation errors were detected during or after the applied test.
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Test Data

Test Level	Freq. Range	Modulation	Dwell Time	Test Side	Criteria		Result	
					Ver	Hor	Ver	Hor
10 V/m	80 ~ 1000	PM with 1HZ(0.5s ON: 0.5s OFF)	3 s	Front	C	C	B	B
			3 s	Left	C	C	B	B
			3 s	Back	C	C	B	B
			3 s	Right	C	C	B	B
3 V/m	80 ~ 1000	PM with 1HZ(0.5s ON: 0.5s OFF)	3 s	Front	B	B	B	B
			3 s	Left	B	B	B	B
			3 s	Back	B	B	B	B
			3 s	Right	B	B	B	B
1 V/m	80 ~ 1000	PM with 1HZ(0.5s ON: 0.5s OFF)	3 s	Front	A	A	A	A
			3 s	Left	A	A	A	A
			3 s	Back	A	A	A	A
			3 s	Right	A	A	A	A

Test Level	Freq. Range	Modulation	Dwell Time	Test Side	Criteria		Result	
					Ver	Hor	Ver	Hor
10 V/m	80 ~ 1000	80% AM @1KHz	3 s	Front	C	C	B	B
			3 s	Left	C	C	B	B
			3 s	Back	C	C	B	B
			3 s	Right	C	C	B	B
3 V/m	80 ~ 1000	80% AM @1KHz	3 s	Front	B	B	B	B
			3 s	Left	B	B	B	B
			3 s	Back	B	B	B	B
			3 s	Right	B	B	B	B
1 V/m	80 ~ 1000	80% AM @1KHz	3 s	Front	A	A	A	A
			3 s	Left	A	A	A	A
			3 s	Back	A	A	A	A
			3 s	Right	A	A	A	A

3.5 EFT

Test Information	
Test Engineer	Sung Wook, Choi
Test Date	August 31, 2004
Climate Condition	Ambient Temperature : 23 °C (EN Limit : 15 °C~35 °C) Relative Humidity : 49% (EN Limit : 25%~75%) Atmospheric Pressure 1010mbar (EN Limit : 860~1060)
Test Place	Shield Room #2

Test Equipments

Equipment	Modal Name	Manufacturer	Serial No.	Calibration	
				Next Date	Interval
EFT/Burst Generator	NSG2025	SCHAFFNER	19872	2005-06-01	12
Measurement Software	WIN2025	SCHAFFNER	-	N/A	N/A

EUT Test Setup

The EUT was operated on a wooden table 0.8 meter above the reference ground.

Test Result

Measurement Results	Pass No Operation errors were detected during or after the applied test.
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Test Data

Port	Coupling	Test Level		Phase wave shape (kHz)	Polarity	Criteria	Result
		Voltage (kV)	Frequency (kHz)				
AC Port	Live	1	5	5/50	+/-	B	B
AC Port	Neutral	1	5	5/50	+/-	B	B
AC Port	Live to Neutral	1	5	5/50	+/-	B	B

3.6 Immunity to Surge

Test Information	
Test Engineer	Sung Wook, Choi
Test Date	August 31, 2004
Climate Condition	Ambient Temperature : 23 °C (EN Limit : 15 °C~35 °C) Relative Humidity : 49% (EN Limit : 25%~75%) Atmospheric Pressure 1010 mbar (EN Limit : 860~1060)
Test Place	Shield Room #2

Test Equipments

Equipment	Modal Name	Manufacturer	Serial No.	Calibration	
				Next Date	Interval
Surge Tester	NSG2050	SCHAFFNER	200242-146AR	2005-06-01	12
CDN	131	SCHAFFNER	34307	2005-06-01	12
Measurement Software	WIN2050	SCHAFFNER	-	N/A	12

EUT Test Setup

The EUT was operated on a wooden table 0.8 meter above the reference ground.

Test Result

Measurement Results	Pass No Operation errors were detected during or after the applied test.
----------------------------	---

Test Data

Port	Coupling	Test Level			Phase wave shape (μ s)	Polarity	Criteria	Result
		Voltage (kV)	Repetition Time(sec)	No				
AC Port	Live to Neutral	1	60	40	1.2/50(8/20)	+/-	B	B

3.7 Conducted Immunity

Test Information	
Test Engineer	Sung Wook, Choi
Test Date	August 30, 2004
Climate Condition	Ambient Temperature : 23 °C (EN Limit : 15 °C~35 °C) Relative Humidity : 48% (EN Limit : 30%~60%) Atmospheric Pressure 1011 mbar (EN Limit : 860~1060)
Test Place	Conducted Immunity Room

Test Equipments

Equipment	Modal Name	Manufacturer	Serial No.	Calibration	
				Next Date	Interval
Power Meter	NRVD	R&S	841501/010	2004-11-13	12
RMS/PEAK Volt Meter	URE3	R&S	839432/032	2004-11-13	12
Signal Generator	SML03	R&S	101279	2005-02-10	12
Dual Directional Coupler	DCU	R&S	316976/001	2004-11-07	12
Antenna	AT1080	AR	16511	N/A	N/A
Measurement Software	EMS-K1	R&S	-	N/A	N/A
CDN	M016	SCHAFFNER	20574	2005-05-25	12
CDN	M016	SCHAFFNER	20573	2005-04-21	12
CDN	M016	SCHAFFNER	20571	2005-04-21	12

EUT Test Setup

The EUT was operated on a wooden table 0.8 meter above the reference ground. The test distance was 3 meter.

Test Result

Measurement Results	Pass No Operation errors were detected during or after the applied test.
----------------------------	---

Test Data

Port Coupling	Freq. Range	Level	Dwell Time	Modulation	Coupling	Criteria	Result
AC Mains	0.15~100MHz	10 V	3 s	80% AM @1KHz	CDN	C	B
AC Mains	0.15~100MHz	3 V	3 s	80% AM @1KHz	CDN	B	B
AC Mains	0.15~100MHz	1 V	3 s	80% AM @1KHz	CDN	A	A

Port Coupling	Freq. Range	Level	Dwell Time	Modulation	Coupling	Criteria	Result
AC Mains	0.15~100MHz	10 V	3 s	PM with 1HZ (0.5s ON: 0.5s OFF)	CDN	C	B
AC Mains	0.15~100MHz	3 V	3 s	PM with 1HZ (0.5s ON: 0.5s OFF)	CDN	B	B
AC Mains	0.15~100MHz	1 V	3 s	PM with 1HZ (0.5s ON: 0.5s OFF)	CDN	A	A

3.8 Voltage Dip

Test Information	
Test Engineer	Sung Wook, Choi
Test Date	August 31, 2004
Climate Condition	Ambient Temperature : 23.5 °C (EN Limit : 15 °C ~35 °C) Relative Humidity :50% (EN Limit : 25%~75%) Atmospheric Pressure 1009 mbar (EN Limit : 860~1060)
Test Place	Shield Room #2

Test Equipments

Equipment	Modal Name	Manufacturer	Serial No.	Calibration	
				Next Date	Interval
Voltage Dip & Interruption	NSG1007	SCHAFFNER	55407	2004-07-31	12
Voltage Dip & Interruption	NSG1007	SCHAFFNER	55408	2004-07-31	12
Measurement Software	WIN2120	SCHAFFNER	-	N/A	N/A

EUT Test Setup

The EUT was operated on a wooden table 0.8 meter above the reference ground.

Test Result

Measurement Results	Pass No Operation errors were detected during or after the applied test.
----------------------------	---

Test Data

Voltage Dips/Interference

Voltage reduction 60% * Performance Criterion : B/C

Duration of reduction	Number of applications	Time between application (s)	Result
0.5	3	10	A
1	3	10	A
5	3	10	A
10	3	10	C

Voltage reduction 100% * Performance Criterion : B/C

Duration of reduction	Number of applications	Time between application (s)	Result
0.5	3	10	A
1	3	10	A
5	3	10	A

Mains supply voltage variation * Performance Criterion : A

	Voltage	Result
Supply voltage max(Umax)	10% UP	A
Supply voltage min(Umin)	15% DOWN	A

4. Appendix A

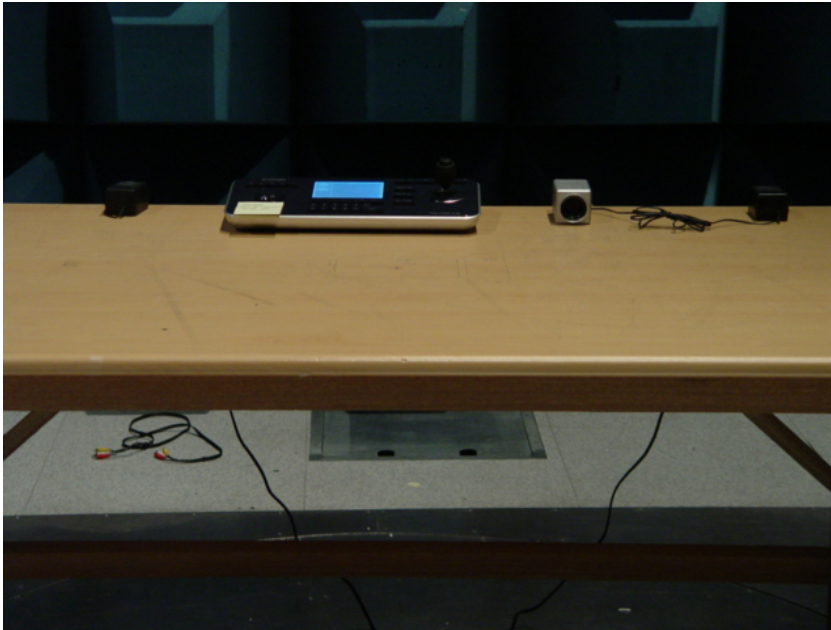
4.1 Test Photography



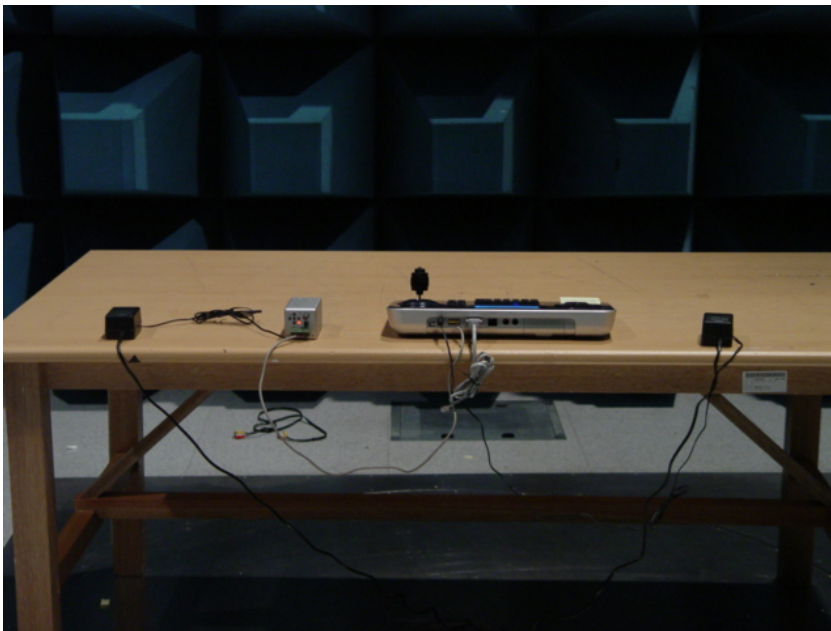
Picture 1. Conducted Emission (Front)



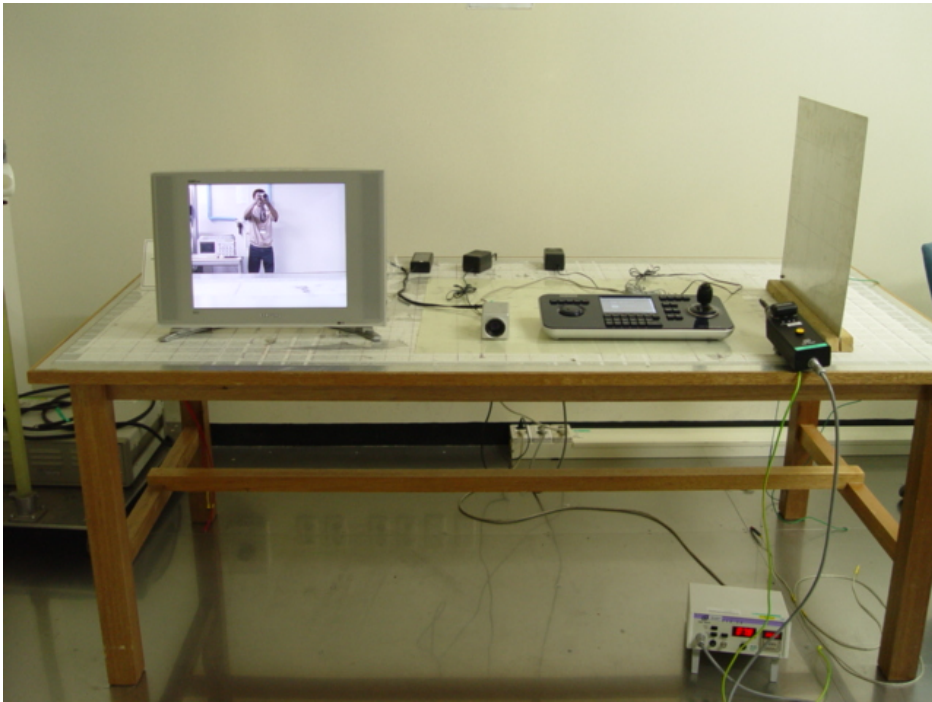
Picture 2. Conducted Emission (Rear)



Picture 3. Radiated Emission (Front)



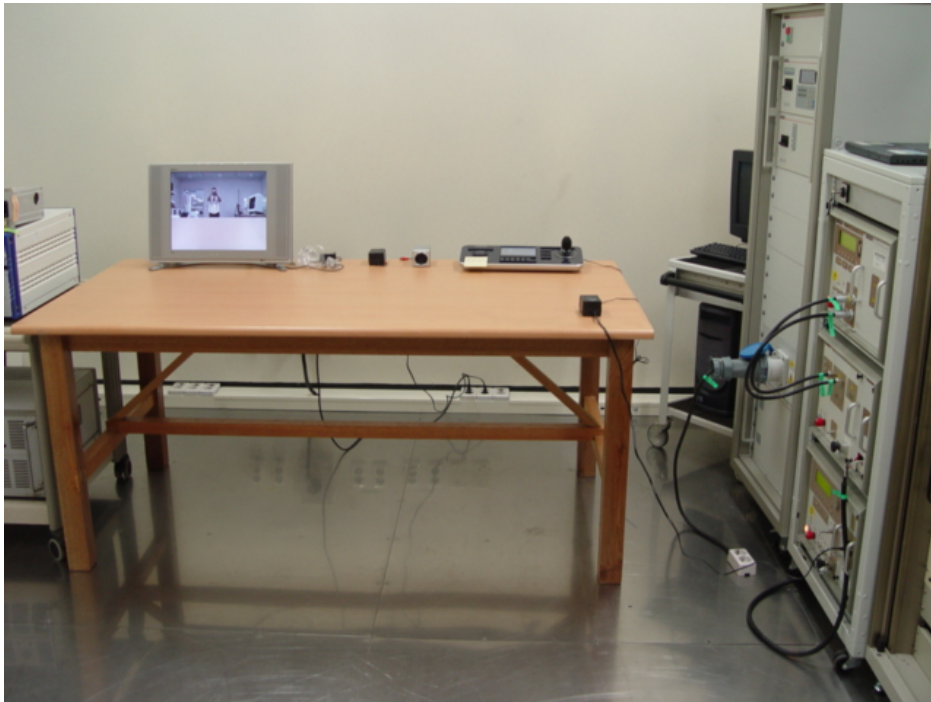
Picture 4. Radiated Emission (Rear)



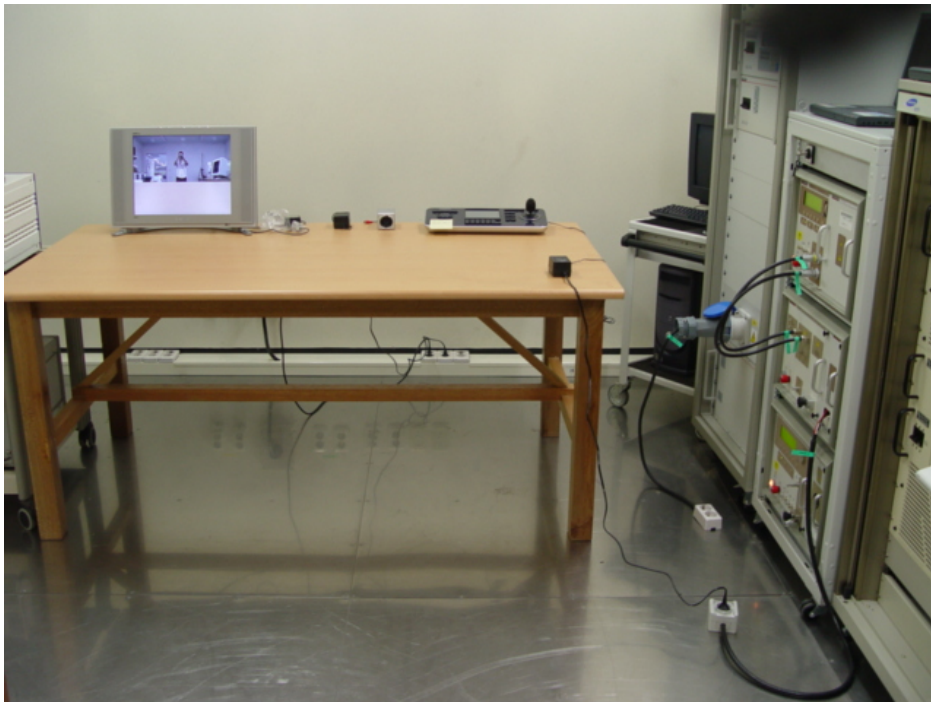
Picture 5. ESD



Picture 6. Radiated Immunity



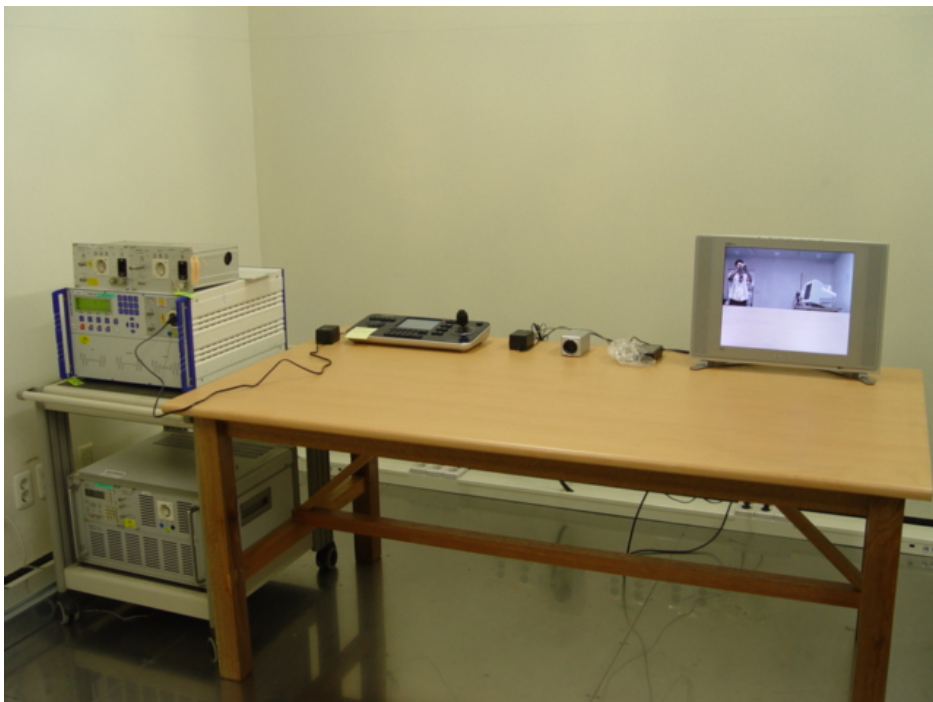
Picture 7. EFT



Picture 8. Surge



Picture 9. Conducted Immunity



Picture 10. Voltage Dip

4.2 EUT Photography



Picture 11. EUT (front)



Picture 12. EUT (rear)