EMI TEST REPORT

Test report no. : ERI-FCC-0089

Type of equipment : CD-ReWritable

Basic Model no. : SW-232

Variant Model no. : MP7320A (OEM : RICOH)
RW7320A (OEM : -)

FCC ID : A3LSW232

Applicant. : SAMSUNG ELECTRONICS Co., Ltd.

Test standards : FCC Part15 Subpart B (Class B)

Test result : Complied

This equipment has been tested for FCC Part 15 standard.
The results in this report apply only to the sample tested.
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Date of test: 2002. 1. 2 **Issued date: 2002. 1. 5**

Tested by : YOUNG-SIK, KIM

approved by: MIN-SEOK, CHUNG

This laboratory is registered by KOLAS, KOREA.

This test report have been performed in accordance with Its terms of registration.

80, JEIL-RI, YANGJI-MYUN, YOUNGIN-CITY, KYUNGGI-DO, KOREA
TEL: 82 31 336 1186 FAX : 82 31 336 1184 homepage : www.esak.or.kr

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Conducted Emission test
Radiated Emission Test

1. Client information

Applicant : SAMSUNG ELECTRONICS Co., Ltd.

Address : 416 Maetan 3 Dong, Paldal-Ku, Suwon City,
Kyungki Do, Korea, 442-742

Telephone Number : 82-31-200-4252
Facsimile Number : 82-31-200-7890

Manufacturer : SAMSUNG ELECTRONICS Co., Ltd.

Address : 416 Maetan 3 Dong, Paldal-Ku, Suwon City,
Kyungki Do, Korea, 442-742

Telephone Number : 82-31-200-4252
Facsimile Number : 82-31-200-7890

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2. Laboratory information

Address

The open area test site and EMC facilities are used for these testing.
This facility was accredited by KOLAS, EK of Korea, MIC, FCC.

EMC RESEARCH INSTITUTE .
80, JEIL-RI, YANGJI-MYUN, YOUNGIN-CITY, KYUNGGI-DO, KOREA

Telephone Number : 82-31-336-1186
Facsimile Number : 82-31-336-1184

KOLAS No. : 111
EK : J
MIC : KR0030
FCC Filing No. : 96753

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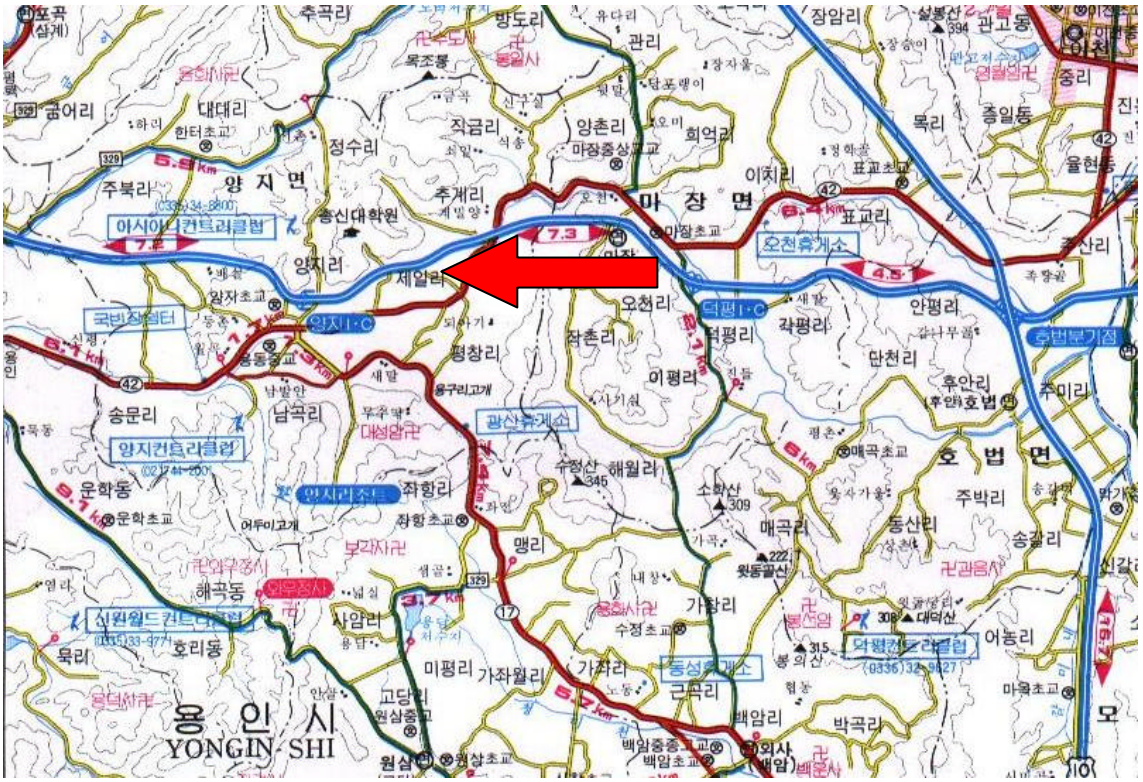
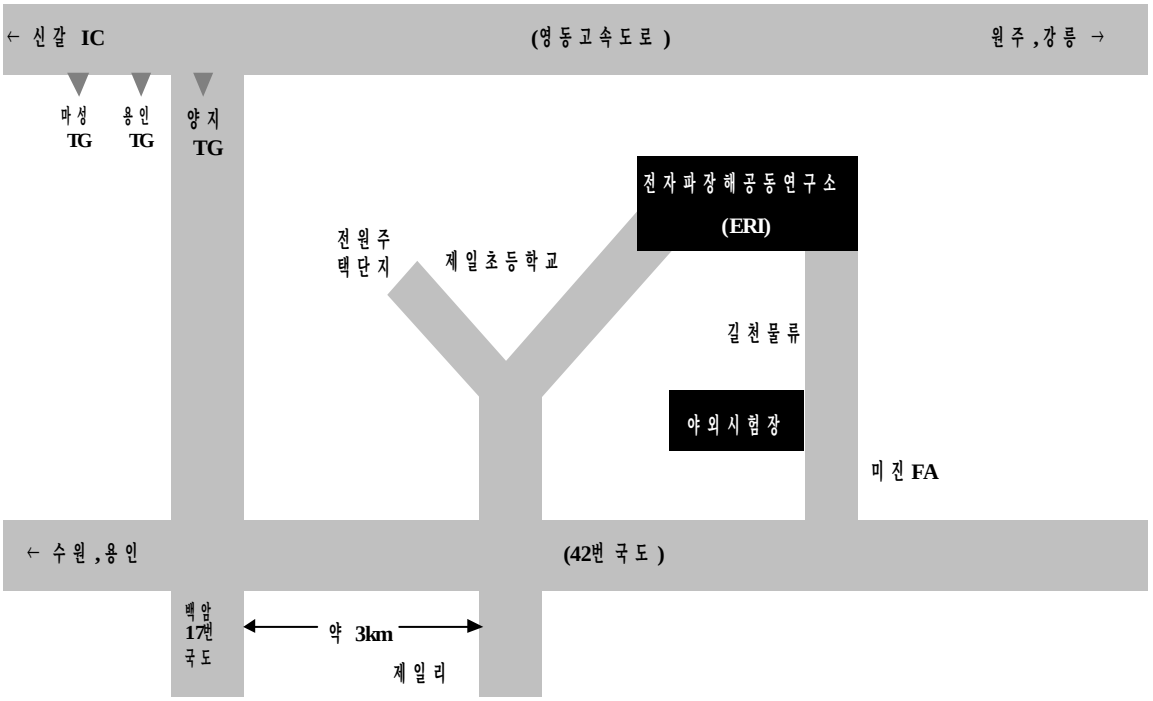
MAP





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3. TEST SYSTEM CONFIGURATION

3.1 Operation Environment

	Temperature	Humidity	pressure
3m OATS (Radiated Emission) :	2 ° C	25 %	1003hPa
Shielded room (Conducted Emission) :	23 ° C	45 %	1003hPa

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, specially in field of EMC.
The factors contributing to uncertainties are test receiver, Cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna Frequency interpolation, measurement distance variation, site imperfection, mismatching, and system repeatability.

Based on NIS 80,81, The measurement uncertainty level with a 95% confidence level were applied.

3.3 sample calculation

radiated emission

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.
The sample calculation is as follows :

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FS = MR + AF + CL + AT-AG

MR = Meter Reading
AF = Antenna Factor
CL = Cable Loss
AP = Antenna Pad
AG=Amplifier Gain

If MR is 30dB, AF 12dB, CL 5dB, AP 10dB, AG 35dB
The result (MR) is

30 + 12 + 5 + 10 –35 = 22dBuV/m

Conducted emission

The field strength is calculated by adding the LISN factor, cable loss from the measured reading.
The sample calculation is as follows :

FS = MR + LF + CL
MR = Meter Reading
LF = LISN Factor
CL = Cable Loss

If MR is 30dB, LISN insertion loss Factor 1dB, CL 1dB
The result (MR) is

30 + 1 + 1 = 32dBuV

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4. Description of e.u.t.

4.1 Product Description

Manufactured By	SAMSUNG ELECTRONICS Co., Ltd.
Address	416 Maetan 3 Dong, Paldal-Ku, Suwon City, Kyungki Do, Korea, 442-742
Test Requested By	SAMSUNG ELECTRONICS Co., Ltd.
Model	SW-232
Serial Number:	N/A
Power Supply	DC 5V/12V
Electric Current	1.5A
Colck Frequency	MICOM : 18MHz, EN/DEC : 33.86MHz
General Description	This EUT(Equipment Under Test) is CD-ReWritable
Speed	CD : 40X, CD-R : 32X, CD/RW : 10X
Buffer	2MB (Option 8MB)
Interface	Enhanced IDE (ATAPI)
Loading Type	Motorized Tray
Size	149(W) ×42.5(H) ×180(D) mm

4.2 peripherals

Description	Manufacturer	Model / Part #	Serial Number	Remark
CD-ReWritable	SAMSUNG	SW-232	-	EUT
Monitor	SAMSUNG	SAMTRON 55E	-	
PC	Trigem	DreamSys EZ/AC	50041 354 00304	
Speaker	FENGSHIN ELECTRONICS	CAMAC.G7	-	
GAME PAD	DEXXA	G-YD1	CCC93508076	
Mouse	COMPAQ	M-S34	-	
Keyboard	B.C.T. Korea	5900	K98102824	
Mouse	SEJIN LECTRON INC.	SMB-400	7CFF079075	
Head Phone	Trigem	DW-400M	-	
Printer	HEWLETT PACKARD	895CXI	SG8BN1W11G	
Adapter	-	AT3018A-0101	7500M2090	
Mic	-	-	-	

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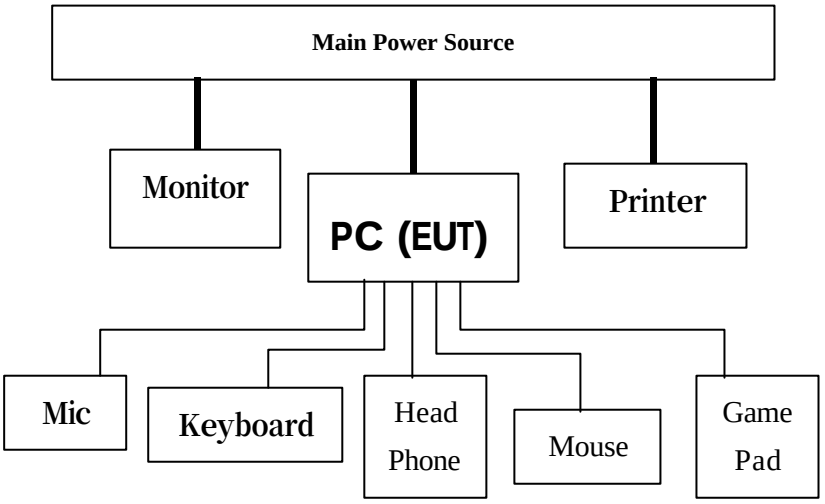
4.3 used cables

EUT Port	Length (meters)	type	pin	Shield (Y/N)	Connected To
IDE	0.35	IDE	39	N	Main Board
POWER	0.2	Line	4	N	Power Board
AUDIO	0.2	Line	4	N	Main Board
Head Phone	1.0	P-Jack	3	N	Head Phone

4.4 E.U.T Test Configuration



4.4 Operating conditions

Operating : - The system was configured in typical fashion (as a customer would normally use it) for testing.
- The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

- Read, write, rewrite Mode

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5. TEST RESULTS

5.1 Conducted emission

5.1.1 Measurement procedure

Mains

The measurements were performed in a shielded room.
EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.
The rear of tabletop was located 40Cm to the vertical conducted plane.
All other surfaces of tabletop was at least 80cm 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 bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.
Each EUT power lead, except ground (safety) lead, were individually connected through a LISN to input power source.
Both lines of power cord, hot and neutral, were measured.

5.1.2 Used equipment

Equipment	Model	Serial No.	Makers	Cal.Date	Used
Test receiver	ESS	848588/006	R&S	01. 6. 08	x
	ESHS30	831332/002	R&S	01. 1. 29	
L.I.S.N.	ESH3-Z5	827246/008	R&S	01. 2. 27	x
	ESH3-Z5	100029	R&S	01.5. 21	

5.1.3 measurement uncertainty

Conducted Emission measurement : ± 2.4 (K=2)

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5.1.4 test data

< Test Mode : Read >

Frequency Range [MHz]	Tested Freq. [MHz]	LISN Pol.	Meter Reading[A] [dBuV]	Total Loss [B] [dB]	Results QP [A] + [B] [dBuV]	Margin [C] -[A+B] [dBuV]	Limits [C] [dBuV]
0.45~30	0.459	N	30.80	0.18	30.98	17.02	48
	0.723	N	32.10	0.18	32.28	15.72	48
	0.789	N	32.70	0.18	32.88	15.12	48
	0.918	N	31.70	0.19	31.89	16.11	48
	0.984	N	34.70	0.19	34.89	13.11	48
	1.182	N	33.30	0.19	33.49	14.51	48
	1.245	N	31.70	0.19	31.89	16.11	48
	1.446	N	30.30	0.20	30.50	17.50	48
	1.509	N	31.60	0.20	31.80	16.20	48
	1.773	N	32.80	0.21	33.01	14.99	48
	2.364	N	30.90	0.23	31.13	16.87	48

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)
* Margin = Limits Result
* IF Bandwidth = 9kHz
* Detecting Mode : Quasi-Peak
* Used receiver : ESS (Rohde & Schwarz)

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< Test Mode : Write >

Frequency Range [MHz]	Tested Freq. [MHz]	LISN Pol.	Meter Reading[A] [dBuV]	Total Loss [B] [dB]	Results QP [A] + [B] [dBuV]	Margin [C] -[A+B] [dBuV]	Limits [C] [dBuV]
0.45~30	0.459	N	30.70	0.18	30.88	17.12	48
	0.723	N	31.80	0.18	31.98	16.02	48
	0.789	N	32.30	0.18	32.48	15.52	48
	0.918	N	30.90	0.19	31.09	16.91	48
	0.984	N	34.50	0.19	34.69	13.31	48
	1.182	N	32.50	0.19	32.69	15.31	48
	1.248	N	32.10	0.19	32.29	15.71	48
	1.575	N	32.00	0.20	32.20	15.80	48
	1.773	N	32.60	0.21	32.81	15.19	48
	2.364	N	30.90	0.23	31.13	16.87	48
	8.270	N	30.50	0.57	31.07	16.93	48
	10.780	N	32.80	0.77	33.57	14.43	48
	11.750	N	31.90	0.81	32.71	15.29	48

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)
* Margin = Limits Result
* IF Bandwidth = 9kHz
* Detecting Mode : Quasi-Peak
* Used receiver : ESCS30 (Rohde & Schwarz)

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<Test Mode : Rewrite>

Frequency Range [MHz]	Tested Freq. [MHz]	LISN Pol.	Meter Reading[A] [dBuV]	Total Loss [B] [dB]	Results QP [A] + [B] [dBuV]	Margin [C]-[A+B] [dBuV]	Limits [C] [dBuV]
0.45~30	0.459	N	30.70	0.18	30.88	17.12	48
	0.723	N	31.70	0.18	31.88	16.12	48
	0.790	N	32.50	0.18	32.68	15.32	48
	0.984	N	34.50	0.19	34.69	13.31	48
	1.182	N	31.80	0.19	31.99	16.01	48
	1.248	N	31.70	0.19	31.89	16.11	48
	1.575	N	32.20	0.20	32.40	15.60	48
	1.773	N	32.00	0.21	32.21	15.79	48
	2.364	N	30.50	0.23	30.73	17.27	48
	2.757	N	30.80	0.24	31.04	16.96	48

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)
* Margin = Limits Result
* IF Bandwidth = 9kHz
* Detecting Mode : Quasi-Peak
* Used receiver : ESCS30 (Rohde & Schwarz)

5.1.5 Result

Complied

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5.2 Radiated Emission

5.2.1 Measurement procedure

A pretest was performed at 3m distance in an semi-anechoic chamber for searching correct frequency.
The final test was done at a 3m open area test site with a quasi-peak detector.
EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.
Cables connected to EUT were fixed to cause maximum emission.
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 to obtain the maximum signal strength.

5.2.2 Used equipment

Equipment	Model No.	Serial No.	Makers	Cal. Date
Test receiver	ESMI	826210/007	R&S	01. 6. 8
	ESCS30	830986/015	R&S	01.1.29
	ESS	848588/006	R&S	01.6. 4
Biconnical antenna	HK116	825177/013	R&S	01. 6. 4
Log-Periodic antenna	HL223	825032/017	R&S	01. 6. 4
Antenna Mast	EMAT2014	N/A	EM	-
Turn Table	EMRT2015	N/A	EM	-
Test site	OATS (10m)	Test site	EM	-
	chamber(3m)		EM	-

5.2.3 measurement uncertainty

Radiated Emission measurement :

30-300MHz +3.96dB / -4.04dB
300-1000MHz +3.04dB / -3.00dB

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5.2.4 test data

<Test Mode : Read>

Frequency Range [MHz]	Tested Frequency [MHz]	ANT Pol.	Meter Reading [A] [dBuV/m]	Total Loss [B]	Results [A+B] [dBuV/m]	Margin [c]-[A+B] [dBuV/m]	Limits [c] [dBuV/m]
30 - 88							40
88-216	149.94	V	4.20	15.50	19.70	23.80	43.5
	162.38	V	4.10	16.03	20.13	23.38	
	181.25	H	9.20	17.00	26.20	17.30	
	192.02	H	4.80	17.70	22.50	21.00	
	205.26	H	10.90	18.50	29.40	14.10	
216-960	360.04	H	3.20	20.21	23.41	23.09	46.0
	400.88	V	13.50	21.80	35.30	11.20	
	406.99	V	9.60	21.87	31.47	15.03	
	498.28	V	5.70	24.16	29.86	16.64	
	555.25	V	11.40	25.42	36.82	9.68	
	875.79	V	10.40	31.90	42.30	4.20	
960-							54.0

* Receiving Antenna Mode : *Horizontal, Vertical*
* Test Distance :3m
* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)
* IF Bandwidth = 120kHz
* Detecting Mode : Quasi-Peak
* Used receiver : ESCS30 (Rohde & Schwarz)

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<Test Mode : Write>

Frequency Range [MHz]	Tested Frequency [MHz]	ANT Pol.	Meter Reading [A] [dBuV/m]	Total Loss [B]	Results [A+B] [dBuV/m]	Margin [c]-[A+B] [dBuV/m]	Limits [c] [dBuV/m]
30 - 88	44.60	V	2.50	12.89	15.39	23.61	40
88-216	134.30	H	3.20	14.70	17.90	25.60	43.5
216-960	204.60	V	11.20	18.50	29.70	16.80	46.0
	360.04	H	3.00	20.21	23.21	23.29	
	408.30	V	4.30	21.90	26.20	20.30	
	667.80	H	5.40	28.18	33.58	12.92	
	830.47	H	2.70	30.65	33.35	13.15	
960-							54.0

* Receiving Antenna Mode : *Horizontal, Vertical*
* Test Distance :3m
* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)
* IF Bandwidth = 120kHz
* Detecting Mode : Quasi-Peak
* Used receiver : ESCS30 (Rohde & Schwarz)

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<Test Mode : Rewrite>

Frequency Range [MHz]	Tested Frequency [MHz]	ANT Pol.	Meter Reading [A] [dBuV/m]	Total Loss [B]	Results [A+B] [dBuV/m]	Margin [c]-[A+B] [dBuV/m]	Limits [c] [dBuV/m]
30 - 88	71.20	V	4.80	10.80	15.60	23.40	40
88-216	134.30	H	3.20	14.70	17.90	25.60	43.5
216-960	364.70	H	4.20	20.29	24.49	22.01	46.0
	498.00	V	11.40	24.16	35.56	10.94	
	662.90	H	5.30	27.95	33.25	13.25	
	667.80	H	7.80	28.18	35.98	10.52	
	934.50	H	8.20	32.10	40.30	6.20	
960-							54.0

* Receiving Antenna Mode : *Horizontal, Vertical*
* Test Distance :3m
* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)
* IF Bandwidth = 120kHz
* Detecting Mode : Quasi-Peak
* Used receiver : ESCS30 (Rohde & Schwarz)

5.2.5 Result

Complied

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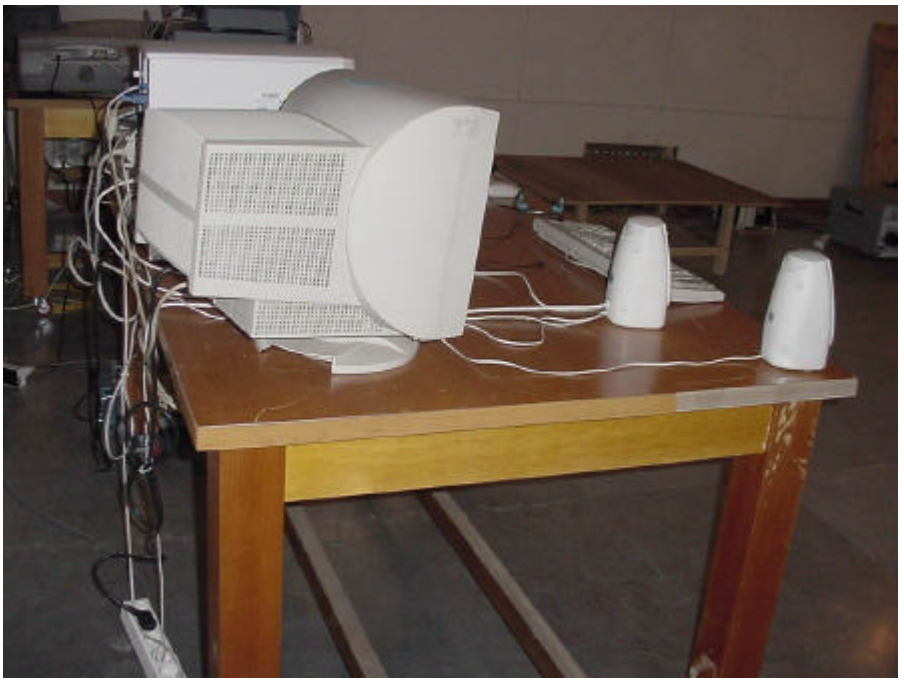
6. TEST PHOTOGRAPHS

Conducted Emission

<Test Mode : Read>



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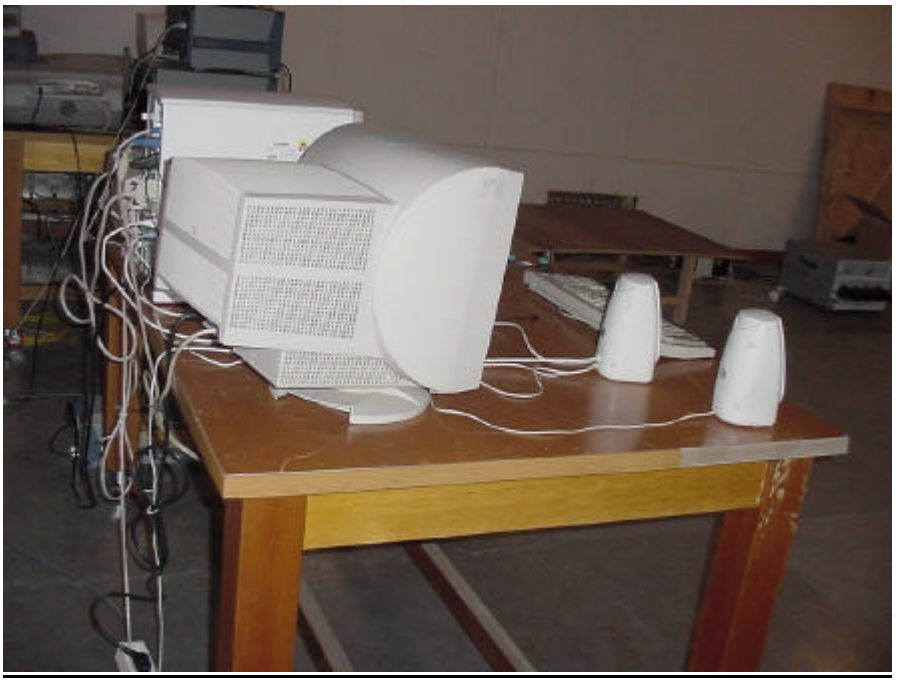

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Radiated Emission

<Test Mode : Read>

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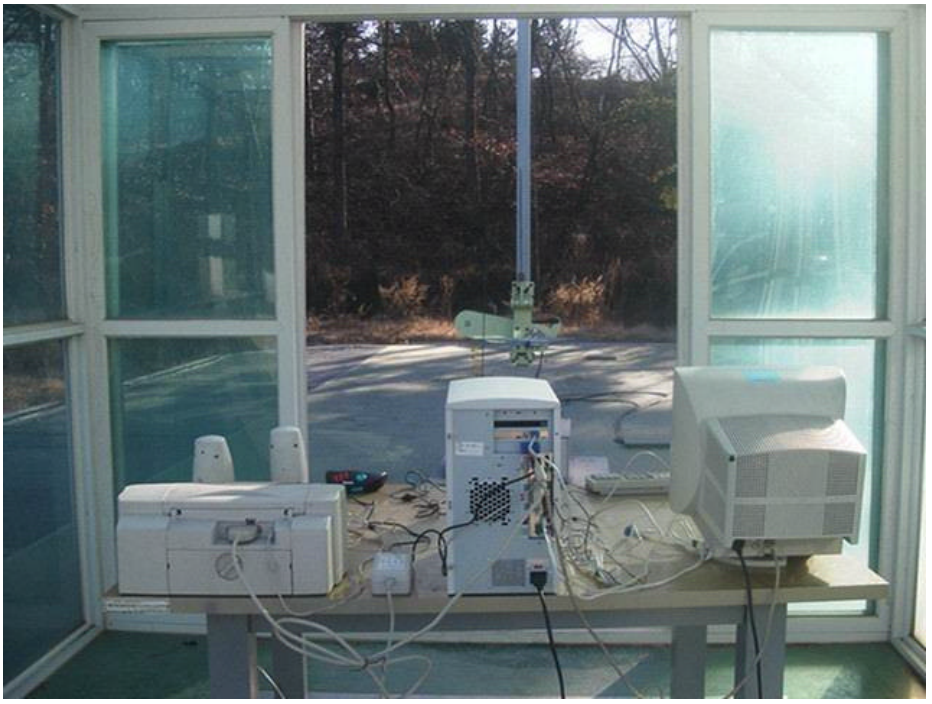

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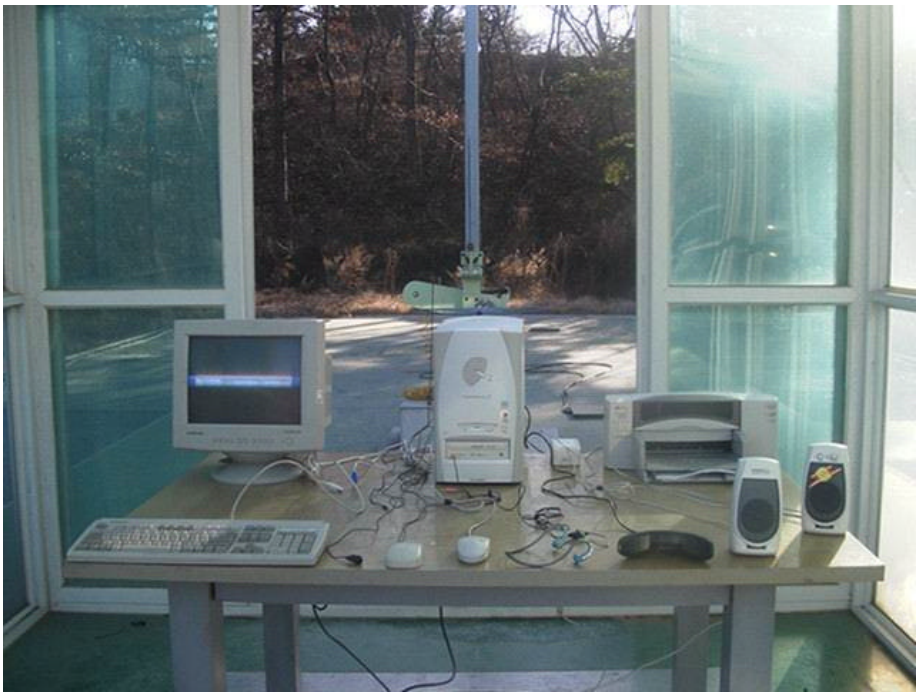

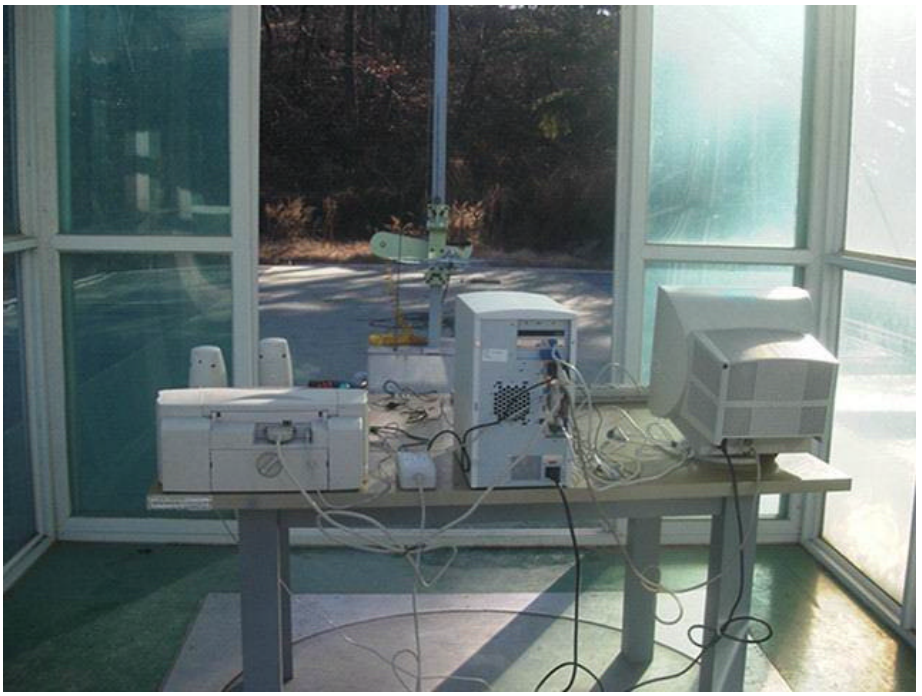

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