

EMI TEST REPORT

According to FCC Part 15 Subpart B/Class B

Product : Notebook PC
Model No. : SENS Pro 950

FCC ID : A3LS950

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All tests necessary to show compliance to the requirements were and these results met the specifications requirement.

Date of test : June 12, 2001

Issued Date : June 25, 2001

Tested by:

No Cheon, PARK / Test Engineer

Reviewed by:

Seung Kyu, CHA / Manager of EMC Lab

Authorised by:

Taek Jeong, Shin / Chief of EMC Lab

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NVLAP Code: 200447

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Distribution

This test report has been made available as follows:

CS Management Center, EMC Laboratory	1 original
Computer Division	1 copy

1. General Information

Applicant : Samsung Electronics Co., Ltd.
CS Management Center EMC Test Laboratory
Tel.: +81-(0)31-200-2135 Fax.: +81-(0)31-200-2189

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

Kind of Product : **Notebook PC**

FCC ID : **A3LS950**

Project Name : **Matrix II Plus**

Model & Variant Names : **SENS Pro 950** (Brand Name: SAMSUNG)

Test Report Produced by : No Cheon, PARK / Test Eng.

1.1 Product Description

1) Justification

The system was configured for testing in typical fashion use. Cable 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.

Comparing the test results with Docking Station & without Docking Station, the test results without Docking Station was found the worst case emissions. And so the final testing was performed without Docking Station.

Further details of cabling and configuration are shown in the test system configuration.

2) Operating Frequency :

1133MHz(CPU Speed), 133MHz(Host Clock), 133MHz(SDRAM Clock), 8M(Finger print)
33.3MHz(PCI Clock), 14.318MHz(Ref. OSC), 49.512MHz(Audio Clock), 25M(Network)
165MHz(Video Memory Clock), 12.288MHz(Audio Bit Clock), 24.576MHz(Audio C24)
10MHz(Micom Clock), 48MHz(USB Clock), 54MHz(LCD Clock), 66.6(Hub)

3) Description of Testing operating mode

Operating Mode	Operating section of EUT
"H" Pattern display & Read / Write	LCD Screen
	CRT Monitor, TV Monitor
	FDD, Hard disk drive & CD-ROM drive
	LPT1 to Printer
Network	Media Player Playing through Video CD in Network Server
Audio Output	Audio out to Speaker

4) Tested Resolution :

Tested Video mode	Resolutions	Refresh rates	Colors
LCD(15.0")	1400 X 1050	60Hz	32bits
Ext. Monitor	1400 X 1050	85Hz	32bits
TV Monitor	640 X 480	60Hz	32bits

5) Assemble Parts

Item	Specification	Remark
CPU	Intel Tualatin 1133MHz	PSB 133 / 30W Solution uFCPGA2 Cashe 512KB, Core Logic 830M Bus Speed 133MHz
Main Memory (RAM)	SEC, PC133-333-542-A1 128MB, Max 1GB	M464S0924CT2-L75
Video Controller	External & Highest 3D Acceleration 4x AGP with sidebands	16MB, Max:32MB Supports simultaneously LCD/External monitor
Video Display	SEC, LCD 15" TFT, LTN150P1-L03 Upto 1600x1200 Pixels; 16-bit 64k colors	TFT SXGA+(15.0"), 2NB1561102
FDD	Teac, FS05FG-5750A, FQA00210092	3.5", 1.44MB Fixed, 3Mode support
HDD	Fujitsu, MHK2060AT, 01000324	User-removable ; 2.5", 12.7mmH
CD-RW	Matsushita, UJDA330, 0LCHA000016	
AC Adapter	SEC, 60-Watts, AC 100~240V FREE-VOLTAGE	AD-6019
MODEM	SEC, SFM-3100LW, 56KBPS	AC-97 Compliant MODEM Controller
LAN	10/100 Base-T Ethernet support	
Wireless LAN	Agere, MPC13A-20, 01UT15473456, 016681/A	IEEE 802.11b(11MBPS), Mini PCI
Input Devices	Keyboard, 19mm pitch, 2.5mmH travel length Pointing Device, PS/2 Touchpad w/ 2 button Finger Print, ST Microelectronics, TCS1A	Korean, US, UK, Japan German, French
AC Adapter	SEC, 60-Watts, AC 100~240V FREE-VOLTAGE	AD-6019
Battery	Sony, Removable 9-cell Li-Ion Smart, 4HRs	SSB-950KLS, NO0000013
Ports	2 USB, SIO, PIO, PS/2, RJ-11, RJ-45, DC IN, EXT. MONITOR, Mini-Dock Connector, TV-out, MIC-IN, LINE-IN, HEADPHONE-OUT, SPDIF, Card bus slot. Etc	

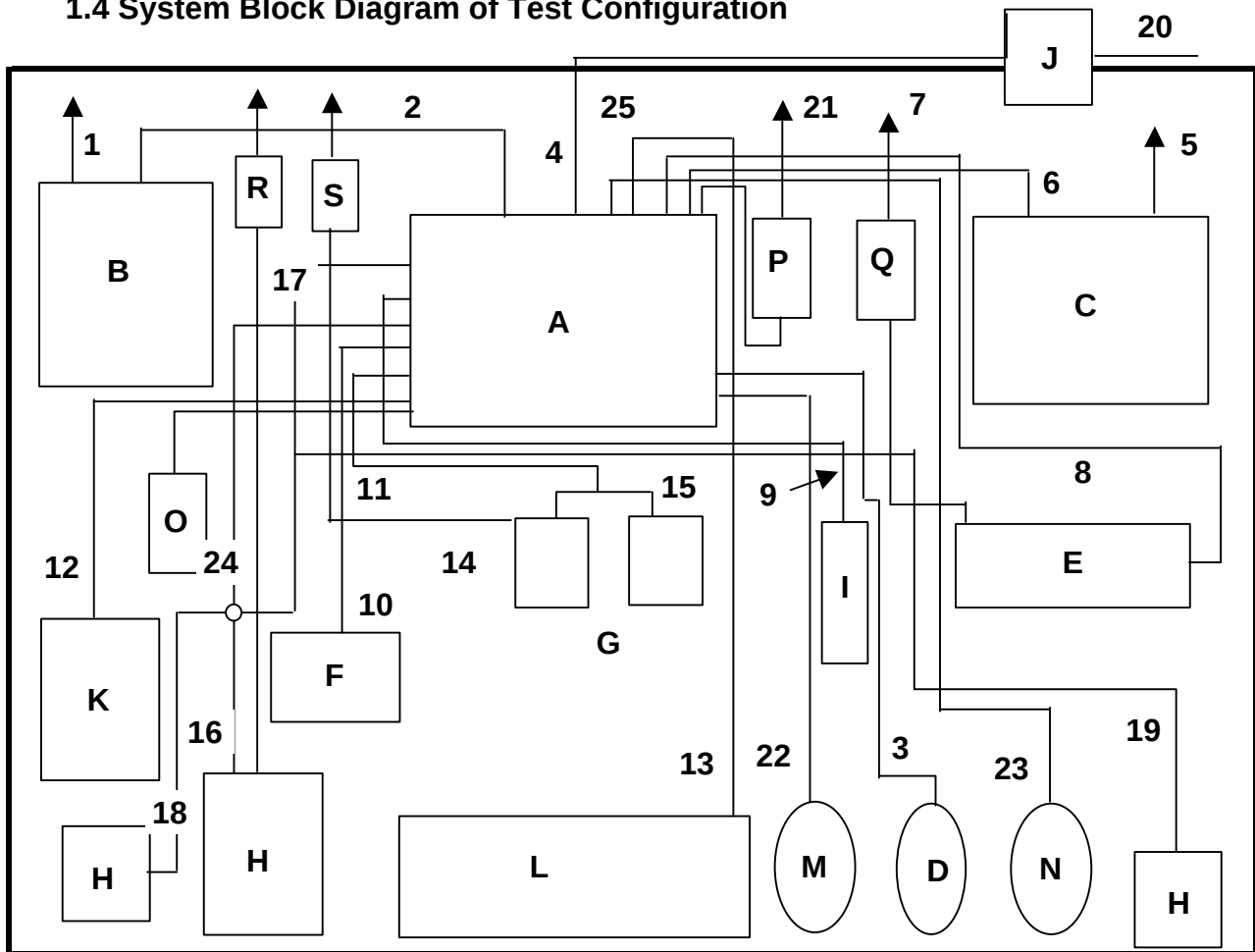
1.2 Configuration of EUT and peripherals

Mark	Item	Model No.	Serial No.	Manufacturer	FCC ID
A	Notebook PC	SENS Pro 950	-	Samsung	A3LS950
B	External Monitor	D828C(T)	R0688EN476020CIAKE	Dell	Doc
C	TV	SMC-100	56KBS0948E	Samsung	-
D	Serial Mouse	X05-51692	7610043-00000	Microsoft	Doc
E	Printer	BJC-50	CLG000800377	Cannon	Doc
F	Audio Device	MY-250	160KB00620	Samsung	-
G	Speaker	SBS36	SW00361292000005	CambridgeS.W.	-
H	Digital Speaker	BA735	0758108	BOSTON	-
I	Microphone	YMC-2511	None	Samsung	-
J	Network Hub	FS-108	FS18A9A013479	BAY NETWORK	Doc
K	Telephone	SSP-2300	902164618	Samsung	-
L	PS/2 Keyboard	SEM-DC8H	85000144	Samsung	Doc
M	USB Mouse	M-U48A	LZE9465004	Logitech	JNZ211360
N	USB Mouse	M-U48A	LZE94654007	Logitech	JNZ211360
O	Digital Camcorder	DCR-PC110	1091827	SONY	-
P	AC Adapter	AD-6019	-	Samsung	-
R	Speaker Adapter1				-
S	Speaker Adapter2			CambridgeS.W.	-

1.3 Used Cable Description

No.	Item	Length[m]	Shielded (Y/N)	Remark
1	Power cable for Monitor	1.82	N	AC Mains
2	Monitor cable	1.85	Y	
3	Notebook PC	1.82	N	
4	Network Cable	30	N	
5	Power cable for TV	1.5	N	
6	TV RCA cable	1.5	Y	
7	Power cable for Printer	1.85	N	
8	Printer Cable	1.6	Y	
9	Microphone Cable	5	Y	
10	Audio Device Cable	1.9	N	
11	LINE IN	1.9	Y	
12	Telephone Cable	1.9	N	
13	PS/2 Keyboard Cable	1.8	N	
14	Speaker Power Cable	2	N	
15	Speaker cable	2	N	
16	Digital Speaker Power Cable	4	N	
17	Digital Speaker cable 1	2.35	N	
18	Digital Speaker cable 2	2	N	
19	Digital Speaker cable 3	2.4	N	
20	Network Power Cable	3.6	N	
21	Adapter for EUT	3.52	N	
22	USB Mouse cable	1.8	N	
23	USB Mouse cable	1.8	N	
24	SPDIF Cable	1.8	N	
25	i-Link cable	1.8	N	

1.4 System Block Diagram of Test Configuration



1.5 Test Facility

All test described in this report were performed by :

SAMSUNG ELECTRONICS CO., LTD.

EMC TESTING LABORATORY

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

Semi Anechoic Chamber #1(Registration Number:98856) and Shielded Room.

This test facility has been filed in FCC under the criteria in ANSI C63.4-1992.

2. System Test Configuration

2.1 Configuration of Radiated and Conducted Interference Measurement

* Cabling was taken into consideration and test data was taken under worse case conditions.

1)Conduction(Front View)



2)Conduction(Rear View)



3) Radiation(Front View)



4) Radiation(Rear View)



2.2 Operation Enviroment

	Conduction	Radiation
Temperature [C] :	23C	23C
Humidity [%] :	63C	63C
Power supply	: AC120V/60Hz	AC120V/60Hz

2.3 Test Procedure

2.3.1 Conducted Emissions

Eut was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting ground plane.

The rear of EUT,including peripherals was aligned and flush with rear of tabletop. 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 current-carrying power lead,except the ground(safety) lead, were individually connected through a LISN to the input power source.

All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

The EUT was switched on and allowed to warm up to its normal operating condition.

A quick scan, from 450kHz to 30MHz, was made on the L1 & L2 line by LISN.

High peaks, relative to the limit line, over the frequency range were then selected.

The EMI TEST RECEIVER was then tuned to the selected frequencies.

CISPR quasi-peak measurements with a receiver bandwidth setting of 10kHz, were taken.

2.3.2 Radiated Emissions

Eut was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.

The rear of EUT, including peripherals was aligned and flush with rear of tabletop.

I/O cables that were connected to the peripherals were bundle in center.

They were folded back and forth forming a bundle 30cm to 40cm long and were hanged 40cm height to the ground plane.

The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found.

The spectrum was scanned from 30 to 2000 MHz using biconiLog antenna.

Also, the EMI TEST RECEIVER was scanned from 1000 to 18000MHz using linearly polarized double ridge horn antennas were used.

Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment; powering the monitor from the floor mounted outlet box and the computer aux AC outlet if applicable, and changing the polarity of the antenna; whichever determined the worst-case emission.

The explanation of measuring instrument setup when respective function is used in any frequency band is as following:

Frequency Band [MHz]	Instrument	Detector fuction	resolution Bandwidth	Video Bandwidth
30 to 1000	Spectrum analyzer	Peak	1MHz	1MHz
	EMI Test receiver	Quasi-Peak	120kHz	-
Above 1000	EMI Test receiver	Average	1MHz	-

3. Conducted Emission Test Data

+ Test Data Sheet

Frequency	Meter Reading [a]	LISN Pol.	Total Loss [b]	Results [a+b]	Limits	Margin (Limit - Result)
[MHz]	[dBuV]	[L,N]	[dB]	[dBuV]	[dBuV]	[dB]
0.5	24.7	L1	0.18	24.88	48	23.12
0.69	21.1	L1	0.17	21.27	48	26.73
0.87	23.6	L2	0.13	23.73	48	24.27
1.06	23.8	L2	0.11	23.91	48	24.09
1.87	24.1	L2	0.29	24.39	48	23.61
2.81	28.3	L1	0.11	28.41	48	19.59
4.36	42	L1	0.12	42.12	48	5.88
7.62	33.5	L1	0.05	33.55	48	14.45
9.37	31.1	L1	0.23	31.33	48	16.67
11.09	26.1	L2	0.52	26.62	48	21.38
16.11	35.5	L1	1.04	36.54	48	11.46
24.16	34.7	L1	1.8	36.5	48	11.5
27.03	29.1	L1	1.63	30.73	48	17.27

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)

* Measurement detector function and bandwidth

Detector function : CISPR quasi-peak

Bandwidth : 10kHz

4. Radiated Emission Test Data

Frequency Range [MHz]	Tested Frequency [MHz]	ANT Pol.	Meter Reading [A] [dBuV/m]	Total Loss [B] [dB]	Antenna Height [Cm]	Turn table Degree [Deg]	Results [A+B] [dBuV/m]	Limits at 3m [dBuV/m]	Margin (Limit-Result) [dB]
30 - 88	40.800	V	11.3	13.0	100	216	24.3	40.0	15.7
	56.368	H	24.3	7.9	308	172	32.2	40.0	7.8
	64.068	H	24.0	6.6	304	148	30.6	40.0	9.4
	72.076	H	27.9	6.4	303	138	34.3	40.0	5.7
	80.090	H	25.1	6.3	189	79	31.4	40.0	8.6
	84.089	H	21.6	6.9	203	87	28.5	40.0	11.5
30 - 216	90.719	H	23.0	7.2	204	37	30.2	43.5	13.3
	106.691	H	17.1	7.8	240	93	24.9	43.5	18.6
	138.248	H	24.3	8.0	116	45	32.3	43.5	11.2
	184.328	H	28.9	10.6	154	8	39.5	43.5	4.0
	214.862	H	20.5	10.9	106	118	31.4	43.5	12.1
216 - 960	253.454	H	17.6	13.7	100	130	31.3	46.0	14.7
	266.925	H	16.4	13.7	100	148	30.1	46.0	15.9
	377.071	H	15.4	17.4	164	176	32.8	46.0	13.2
	399.953	H	11.0	17.9	164	167	28.9	46.0	17.1
	529.376	V	10.1	21.5	110	36	31.6	46.0	14.4
	733.907	H	11.5	25.0	139	30	36.5	46.0	9.5
960 - 8000	1192.8	V	8.6	29.4	223	151	38.0	54.0	16.0
	1464.5	V	17.6	32.2	100	221	49.81	54.0	4.2
	1596.8	V	16.1	34.2	100	193	50.34	54.0	3.7

* "<" Means equal or less then 5dB

* Receiving Antenna Mode : **Horizontal, Vertical**

* Results = Meter Reading + Total Loss(Antenna factor + Cable loss)

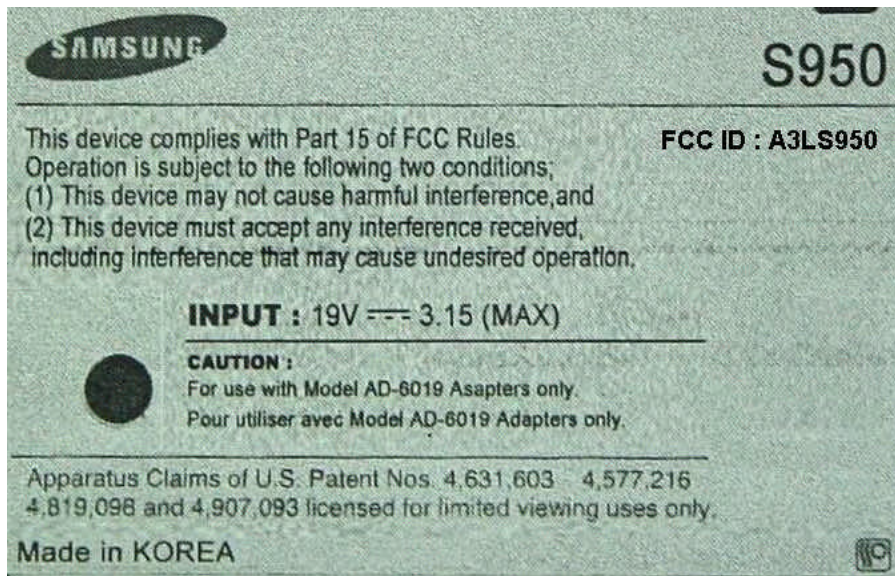
* Measurement detector function and bandwidth

Detector function : CISPR quasi-peak(Above 1000MHz: Average)

Resolution Bandwidth : 120kHz(Above 1000MHz: 1MHz)

5. FCC Label Configuration and Location

5.1 Label Configuration



5.2 Location of Label



6. Test Equipment Used

Equipment	Model No.	Serial No.	Makers	Calibration Last calibration and Interval
Spectrum analyzer	8566B	2611A02672	H.P	00/06/23, 12Months
	Firmware versions : Rev.29.9.86			
Quasi-peak adapter	85650A	2521A00687	H.P	00/10/10, 12Months
RF Preselector	85685A	2602A00224	H.P	00/10/10, 12Months
Field strength meter	ESS	844861/005	R & S	00/06/23, 12Months
	Firmware versions : Main 1.08, OTP 02.01, GRA 02.03			
Field strength meter	ESI 26	832692/002	R & S	01/06/18, 12Months
	Firmware versions : BIOS 3.3, Analyzer 2.09.2			
L.I.S.N	3825-2	9208-1981	EMCO	01/03/23, 12Months
Double Ridged Guide Antenna	3115	9505-4441	EMCO	01/06/03, 12Months
Biconilog Antenna	3142	1237	EMCO	01/ 0/02, 12Months