FUJITSU GENERAL EMC LABORATORY LIMITED
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EMI Test report

CATEGORY : FCC Part-15 (2004) ; Class B

MANUFACTURER : FUJITSU LIMITED
4-1-1, Kamikodanaka, Nakahara-ku, Kawasaki 211-8588 JAPAN

PRODUCT TYPE : Personal computer T4210
AC Adapter SEC100P2-19.0
Port Replicator FPCPR61
Bluetooth module EYTF3CS FT
Wireless LAN WM3945ABG AR5BXB6

TEST SITE : FUJITSU GENERAL EMC LABORATORY
1116, Suenaga, Takatsu-ku, Kawasaki 213-8502 JAPAN

DATE TESTED : March 13, 2006 23℃ 30%

TESTED BY : Kiyohiro Ida

Above EUT conforms mentioned all regulations.

APPROVED BY : DATE : March 16, 2006
Hiroyuki Shimanoe, President

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CLIENT : Engineering Dept.1 Mobile Computing Division, FUJITSU LIMITED
4-1-1, Kamikodanaka, Nakahara-ku, Kawasaki 211-8588 JAPAN

※ The description of the EUT and the system configuration in this report are provided by the client.

NVLAP LAB CODE 200373-0

Client Laboratory Recognized By TÜV PRODUCT SERVICE

Accredited by NVLAP.
Authorized by TÜV P.S.
Appointed by TÜV Rheinland Japan
Registered on VCCI.

1. Description of EUT

The EUT: T4210 series personal computer using Yonah (Dual) 2.16 GHz microprocessor has a 12 inch SXGA+ / XGA Display, DVD-super multi drive and a system disk (40 GB×1). The EUT has the interface to extend for RGB, DVI⑬, Mic-in①, Phone-out①, LAN⑥, Modem③, USB×5②⑮⑯⑰⑱, and has Express card slot, PC card slot Bluetooth and wireless LAN.

Internal clock frequency : 4.000 MHz, 14.318 MHz, 25.000 MHz, 33.300 MHz, 48.000 MHz, 96.000 MHz, 100.000 MHz, 166.000 MHz

Input power : AC 120V, 60 Hz, Single-phase 2 wires

The EUT is intended to general use in the residential / domestic area or commercial and light industrial area; category class B.

1.1 Test system configuration

The measurement was performed using T4210 (Yonah 2.16 GHz microprocessor) SXGA+ display and each wireless LAN module(WM3945ABG/ AR5BXB6) with FPCPR61 as a maximum personal computer system with all related equipment shown in figure-1.
The final measurement was performed using SXGA+ display and DVI connection that maximum generate emissions by the primary measurement.

The EUT was selected from the pre-production line.

1.2 Operating condition

The following EUT and dependent devices were tested using "EMC.exe" program for continuous operation and obtaining maximize emission.

① PC-1	LCD-1:	Display "H" character on screen (Maximum contrast / Luminescence/ (Display resolution 1400×1050 / Refresh rate 60Hz)
	LAN:	Continuous transmission and receiving ping command. (1000 M Max)
	Modem:	Connection only
	HDD-1:	Read/write the test data
	DVD:	Play the test disk
	Bluetooth:	Continuous transmission of the RF signal
	Wireless LAN:	Continuous transmission of the RF signal
② PC card:		Non-connection (Radiated emission)
		Read/write the test data (Conducted emission)
③ LCD-2:		Display "H" character on screen (Maximum contrast / Luminescence)
④ Headset:		Connecting only
⑤ USB mouse:		Connecting only
⑥ HDD-2:		Read/write the test data (480 M Max)
⑦ PC-2:		Continuous transmission and receiving ping command. (1000 M Max)

2. EMI test results summary

Applied standard: FCC Part-15(2004)
Limit value: Class B

The test samples met the class B limit of EN55022(1998), +A2 (2003)/ CISPR22(1997) , +A2 (2002) and applied for FCC Part15 (2004) applicable following regulations as shown following highest 6 points of each emission profiles.

The test result is effective in only for the EUT.

2.1 Radiated emission (30 MHz to 1,000 MHz) : Measured at 10 m distance

< WM3945ABG >

Freq. (MHz)	pol.	Noise level (dB μ V/m)	Class B limit (dB μ V/m)	Margin (dB)
143.89	Vert	23.7	30.0	6.3
408.01	Horiz	28.7	37.0	8.3
480.01	Horiz	29.8	37.0	7.2
480.01	Vert	33.2	37.0	3.8
972.00	Horiz	32.6	37.0	4.4
993.69	Vert	30.4	37.0	6.6

< AR5BXB6>

Freq. (MHz)	pol.	Noise level (dB μ V/m)	Class B limit (dB μ V/m)	Margin (dB)
120.00	Horiz	22.9	30.0	7.1
192.01	Horiz	26.3	30.0	3.7
192.01	Vert	24.6	30.0	5.4
432.00	Horiz	30.0	37.0	7.0
432.00	Vert	30.0	37.0	7.0
864.01	Horiz	30.0	37.0	7.0

- Limit value ; CISPR22(1993)and applied for FCC Part15 (2004)
- Measurement uncertainty : ± 3.3 dB (K=2, 95 %)

2.2 Above 1 GHz RF Radiated emission(1 GHz to 10.8 GHz) : Measured at 3 m distance

< WM3945ABG >

Freq. (GHz)	Pol	Noise level (dB μ V/m)	FCC Part-15 Class B limit (dB μ V/m)		Margin (dB to AV)
		Peak	Peak	AV	
1.4000	Vert	46.7	74.0	54.0	7.3
1.5121	Vert	47.2	74.0	54.0	6.8
1.6201	Vert	47.0	74.0	54.0	7.0
2.1600	Vert	47.2	74.0	54.0	6.8
2.7001	Horiz	46.7	74.0	54.0	7.3
2.7001	Vert	48.2	74.0	54.0	5.8

2.3 AC power line conducted emission (150 kHz to 30 MHz)

< WM3945ABG >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB to AV)	
		Q P	A V	Q P	A V	Q P	A V
0.202	# 1	54.4	31.1	63.5	53.5	9.1	22.4
0.230	# 2	52.3	21.7	62.5	52.5	10.2	30.8
0.250	# 1	50.9	22.7	61.8	51.8	10.9	29.1
0.291	# 2	49.9	24.7	60.5	50.5	10.6	25.8
2.713	# 1	42.6	30.7	56.0	46.0	13.4	15.3
2.733	# 2	44.1	33.4	56.0	46.0	11.9	12.6

< AR5BXB6 >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB to AV)	
		Q P	A V	Q P	A V	Q P	A V
0.150	# 1	62.3	32.7	66.0	56.0	3.7	23.3
0.150	# 2	62.3	32.2	66.0	56.0	3.7	23.8
0.264	# 1	50.8	24.0	61.3	51.3	10.5	27.3
0.303	# 2	46.8	27.8	60.2	50.2	13.4	22.4
2.722	# 2	43.8	33.5	56.0	46.0	12.2	12.5
2.732	# 1	43.2	30.4	56.0	46.0	12.8	15.6

- Limit value ; FCC Part-15.
- Measurement uncertainty : ± 2.5 dB (K=2, 95 %)

3. EUT modification under the test

None.

4. Measurement procedure and test equipment

4.1 Radiated emission

4.1.1 Radiated emission (30MHz～1,000MHz)

The EUT was set on the turntable in the 10 m RF semi-anechoic chamber.
The PC-2 and HUB were placed at outside of the chamber to make usual install at the different place. The maximum noise level in the frequency range from 30 MHz to 1,000 MHz were measured by 10 m method with scanning the antenna height from 1 m to 4 m above the ground plane and rotates the EUT through 360 degrees for both horizontal and vertical polarization.
Preliminary measurement using spectrum analyzer peak detection was performed to arrange the minimum margin spectrum. The settings of the interface cables and the mouse were adjusted to obtain maximum level at the minimum margin spectrum. The final measurement was performed using the RFI receiver (CISPR Quasi-peak, 120 kHz band width) and calibrated broadband antennas or dipole antennas about the main spectrums that is obtained by the preliminary measurement.

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
Bi Log antenna	Schwarzbeck	VULB9160	3118	2006.01.04	2007.01.04
Dipole antenna	Schwarzbeck	VHA9103	VHA91031573	2004.12.28	2006.12.28
Dipole antenna	Schwarzbeck	UHA9105	UHA91052119	2004.12.28	2006.12.28
Field strength meter	Rohde & Schwarz	ESCS30	849650/002	2005.04.25	2006.04.25
Spectrum analyzer	HP	85422E	3746A00242	2005.04.24	2006.04.24
RF switch	Rohde & Schwarz	PSU	848290/003	2005.04.25	2006.04.25
RF cable	———	C61	———	2005.04.25	2006.04.25
2nd semi-anechoic chamber	Riken eletech	———	———	2005.01.16	2007.01.16
EMI test program	FGE	Version 1.3			

4.1.2 Radiated emission (1 GHz～10.8 GHz)

The EUT was set on the 80 cm height non-reflective desk on the turntable. The radiated emission measurement from 1 GHz to 10.8 GHz: Operating rate 2.16 GHz was performed using the spectrum analyzer (Peak detection, 1MHz band width) and the horn antenna that was positioned at 3 m from the EUT for class B. The measurement was performed with both horizontal and vertical polarization, rotating the EUT through 360 degrees and fixed the antenna height to the EUT center
The measurement was performed using off mode the RF signal of the wireless LAN and Bluetooth

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
Horn antenna	Schwarzbeck	BBHA9120D	414	2005.02.23	2007.02.23
Spectrum analyzer	Advantest	R3371A	75060396	2005.04.01	2006.04.01
Pre amplifier	HP	8449B	3008A01110	2005.03.24	2006.03.24

4.2 AC power line conducted emission

The conducted emission measurement was performed in the shielded room. The EUT was set on 80 cm height wooden desk with using the 50Ω/50μH artificial mains network: AMN and operate the EUT by AC 120 V/ 60 Hz. Preliminary measurement using spectrum analyzer peak detection was performed in the frequency range from 150 kHz to 30 MHz to arrange the minimum margin spectrum. The setting of the cables was adjusted to obtain maximum level at the minimum margin spectrum. The final measurement was performed using the RFI receiver (CISPR Quasi-peak, 9 kHz band width) and recorded the maximum value in the monitored interval about the main spectrum that is obtained by the preliminary measurement.

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
AMN for EUT	Kyoritsu	KNW-407	8-823-18	2006.01.15	2007.01.15
AMN for AE	Kyoritsu	KNW-242C	8-1387-6	2006.01.15	2007.01.15
Field strength meter	Rohde & Schwarz	ESCS30	849650/003	2005.04.25	2006.04.25
Spectrum analyzer	HP	85422E	3746A00239	2005.04.24	2006.04.24
RF switch	Rohde & Schwarz	PSU	848290/003	2005.04.26	2006.04.26
Band pass filter	Advantest	TR14202	03560027	2005.04.26	2006.04.26
6 dB attenuator	Kyoritsu	CFA-03	———	2005.04.26	2006.04.26
RF cable	———	CF009	———	2005.04.26	2006.04.26
EMI test program	FGE	Version 1.3			

5 Test site and traceability

The FUJITSU GENERAL EMC LABORATORY performs the test for VCCI / EN / CISPR regulation and Fujitsu / Fujitsu General internal regulations. The test procedures and test facilities are comply with international standard. The laboratory is filed on VCCI (Japan), accredited from NVLAP (USA) and authorized from TÜV P. S. (Germany, CE-marking).

VCCI : 1st semi-anechoic chamber(R-753/C-776), Small shielded room(C-777)
Large shielded room(C-778)
2nd semi-anechoic chamber(R-1460/C-1547), 2nd shielded room(C-1548)
3rd shielded room(C-1549)

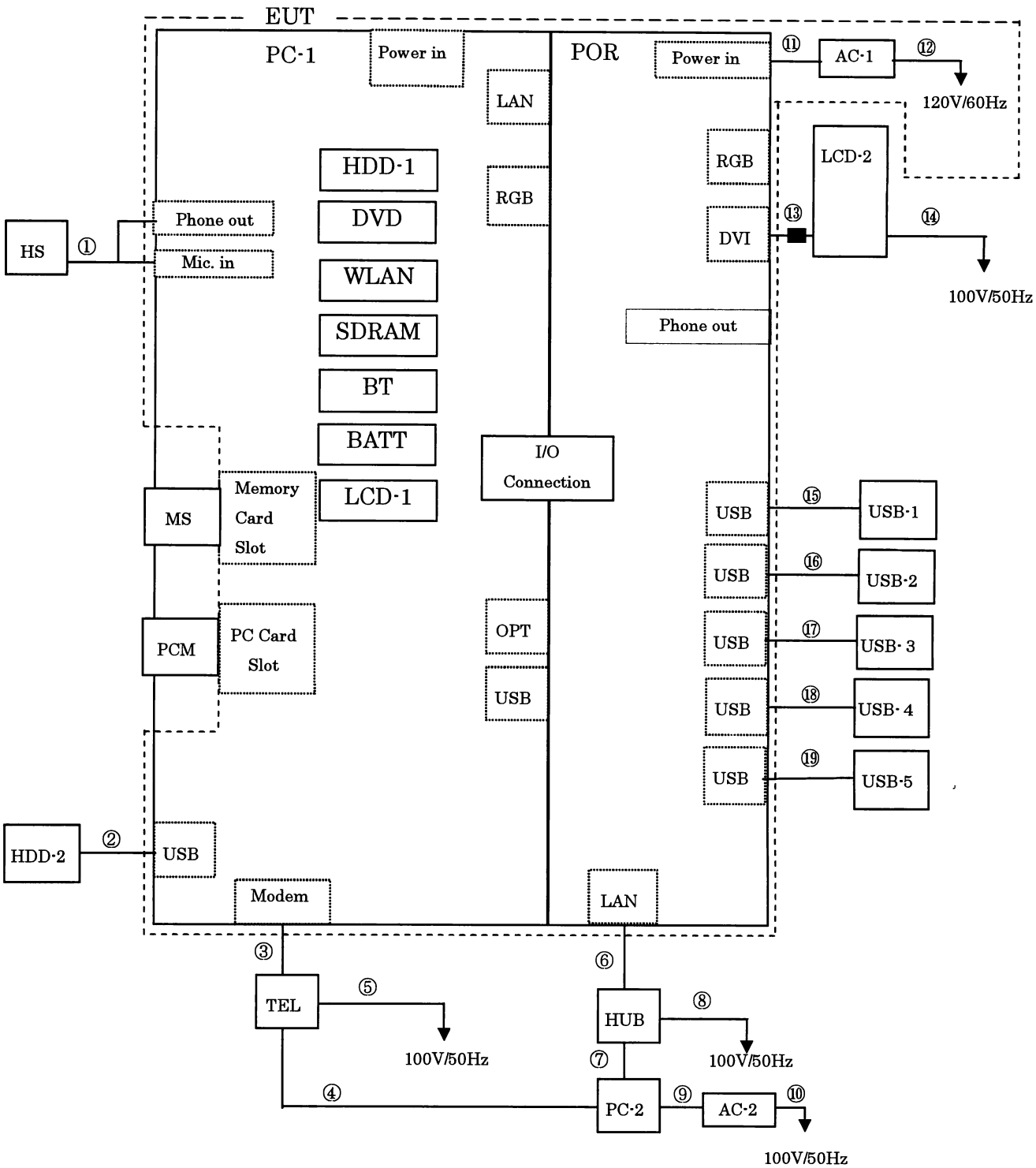
NVLAP : 1998.12.01 Accredited: Lab code 200373-0

TÜV P.S. : 1999.01.29 Authorized

TÜV Rheinland Japan : 2005.08.25 Appointed

The measuring equipment used in the laboratory and test data are traceable to the national or international standard. Each equipment is maintain by periodical calibration and by daily check as a total measurement system to keep those accuracy.

Figure-1 System configuration and cables



■ : Ferrite core

Main EUT

Code	Name	Type	S/N	Product
PC-1	Personal computer	T4210	Pre-production sample	Fujitsu

Related EUT

POR	Port Replicator	FPCPR61	———	Fujitsu
AC-1	AC adapter	SEC100P2-19.0	———	Fujitsu

Included device; PC-1

Code	Name	Type	S/N	Product
HDD-1	60GB HDD	MHV2060BH	NROCT4C25469	Fujitsu
DVD	DVD super multi	DW-224E-C	F5000204	TEAC
WLAN	Wireless LAN	WM3945ABG	———	Intel
		AR5BXB6	———	Atheros
SDRAM	265 MB	MH4HTF3264HY-667B3	———	———
BT	Bluetooth	EYTF3CSFT	———	TAOYO YUDEN
BATT	5200mA/h	CP293420-XX	———	Fujitsu
LCD-1	12"SXGA+	LTD121KM2F	———	ToshibaMatsushita

Assisted equipment

Code	Name	Type	S/N	Product
TEL	Telephone line simulator	TLE-101Ⅲ	407715	AVM
LCD-2	LCD display	P19-1	YEGA217491	FSC
HDD-2	Hard disk drive	YSRU009043	805000501	FSC
HS	Head set	AP-210Pro	———	FSC
PC-2	Personal computer	FMV	———	Fujitsu
HUB	Switching Hub	ETG-SH-8	VD7000010513N	I・O DATA
AC-2	AC adapter	FMV-AC321	052000A	Fujitsu
USB-1	USB Mouse	M-BJ69	HCA50402874	FSC
USB-2	USB Mouse	M-BJ69	HCA50407420	FSC
USB-3	USB Mouse	M-BJ69	HCA50407247	FSC
USB-4	USB Mouse	M-BJ69	HCA50407481	FSC
USB-5	USB Mouse	M-BJ69	HCA50407248	FSC
MS	Memory stick card	32MB	———	Sony
PCM	PC memory card	20MB	———	SunDisk

Cables SLD: Shielded NSLD: Non-shielded CAX: Coaxial
Connector MC: Metal NMC: Non-metal PMC: Point contact metal

No.	I/O Port	Name	Type	Length	Cable type
①	Phone-out/Mic-in	Headset cable	———	2.2m	NSLD,NMC
②	HDD-2	USB cable	———	1.8m	SLD,MC
③	Modem	Modem cable	———	20m	NSLD,NMC
④	———	Modem cable	———	2.0m	NSLD,NMC
⑤	———	AC power cable	———	2.0m	3P-NSLD
⑥	LAN	LAN cable	———	20.0m	SLD, MC
⑦	———	LAN cable	———	1.0m	NSLD, NMC
⑧	———	AC power cable	———	1.5m	2P-NSLD
⑨	———	AC adaptor cable	———	1.8m	NSLD,NMC
⑩	———	AC power cable	———	1.5m	2P-NSLD
⑪	———	AC adaptor cable	———	1.8m	NSLD,NMC
⑫	———	AC power cable	———	2.0m	2P-NSLD
⑬	DVI	DVI cable	———	1.8m	SLD,MC with fixed core
⑭	———	AC power cable	———	1.8m	3P-NSLD
⑮	USB-1	USB mouse cable	———	1.9m	SLD,MC
⑯	USB-2	USB mouse cable	———	1.9m	SLD,MC
⑰	USB-3	USB mouse cable	———	1.9m	SLD,MC
⑱	USB-4	USB mouse cable	———	1.9m	SLD,MC
⑲	USB-5	USB mouse cable	———	1.9m	SLD,MC