Attachment 3: TEST REPORT

FG05_051EAL (PART 1)

FUJITSU GENERAL EMC LABORATORY LIMITED
1116, SUENAGA, TAKATSU-KU, KAWASAKI 213-8502 JAPAN TEL:044-861-7897 FAX:044-861-9890

EMI Test report

CATEGORY : EN55022(1994),+A1,+A2/ CISPR 22(1993)+A1,+A2 ; Class B
AS/NZS CISPR22 (2002)
FCC Part-15 (2004)
VCCI (2005)

MANUFACTURER : FUJITSU LIMITED
1405, Ohmaru, Inagi-shi, Tokyo 206-8503 JAPAN

PRODUCT TYPE : Personal computer T4020
AC Adapter SEC80N2-19.0 / PTW1931N
Port Replicator FPCPR49 / FMV-NPR7
Grouping model: T4020D

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

DATE TESTED : May 21 , 2005 23℃ 40%

TESTED BY : Hiroyuki Aikawa

Above EUT conforms mentioned regulations.

APPROVED BY : for K. Shimanoe DATE : May 25, 2005
Hiroyuki Shimanoe, President

FUJITSU GENERAL EMC LABORATORY LIMITED
1116, Suenaga, Takatsu-ku, Kawasaki-shi, 213-8502 JAPAN
TEL: (044)861-7897 FAX: (044)861-9890

CLIENT : Engineering Dept.1 Mobile Computing Division, FUJITSU LIMITED
1045, Ohmaru, Inagi-shi, Tokyo 206-8503 JAPAN

※ The discription 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.
Registered on VCCI.

1. Description of EUT

The EUT: T4020 series personal computer using Pentium-M 2.26 GHz microprocessor has a system disk (40 GB). The EUT has the interface to extend for, RGB⑱, MIC IN②, Headphone①, LAN⑨, USB×6-⑤⑭ ⑮⑯⑰ and has SD card slot, PC card slot, Bluetooth and wireless LAN.

The following type code are given according to a Centrino (Pentium-M CPU, Intel915 Chipset and Calexico2 wireless LAN).

Type	CPU, Chipset and wireless LAN
T4020	Centrino
T4020D	Non- Centrino

Internal clock frequency : 4.000 MHz, 8.000 MHz, 14.318 MHz, 24.000 MHz, 25.000 MHz, 33.300 MHz, 48.000 MHz, 66.000 MHz, 96.000 MHz, 100.000MHz

Input power : AC 100 - 230V, 50 / 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 T4020 with FPCPR49 as a maximum personal computer system with all related equipment shown in figure-1.

The EUT was selected from the pre-product line.

1.2 Operating condition

The following EUT and dependent devices were tested using "EMC.exe" and "SPBEST" program for continuously operating and to obtain maximize emission.

① PC-1	LCD:	Display "H" character on screen (Maximum contrast / Luminescence)
	LAN:	Continuous transmission and reception of the "H" character (1000 Mbps)
	TEL:	Continuous transmission of the test data (56 kbps)
	DISK:	Play test disk
② PC card:		Connecting only
③ SD card:		Connecting only
④ USB2.0 Memory:		Read/write the test data (480 Mbps)
⑤ LCD:		Display "H" character on screen (Maximum contrast / Luminescence)
⑥ Headset:		Connecting only
⑦ USB mouse:		Connecting only
⑧ PC-2:		Read/write "H" character and receiving serial data.

2. EMI test results summary

Applied standard: EN55022(1994), +A1(1995), +A2(1997)
Limit value: Class B

The test samples met the class B limit of EN55022(1994), +A1(1995), +A2(1997) / CISPR22(1993), +A1(1995), +A2(1996) and applicable following regulations as shown following highest 6 points of each emission profiles.

Australia, New Zealand: AS/NZS CISPR22(2002)
FCC Part-15(2004), Canada: CAN/CSA-CEI/IEC CISPR22-02
Japan: VCCI(2005), Taiwan: CSN 13438(1997)

This test was done without deviation from the standard.
The test result effective only for the EUT.

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

Freq. (MHz)	pol.	Noise level (dB μ V/m)	Class B limit (dB μ V/m)	Margin (dB)
61.44	Vert	26.1	30.0	3.9
86.02	Vert	26.2	30.0	3.8
216.00	Vert	24.4	30.0	5.6
540.00	Vert	32.4	37.0	4.6
745.03	Horz	31.3	37.0	5.7
852..30	Horz	32.3	37.0	4.7

- Limit value ; EN55022(1994) / CISPR 22(1993) and applied for FCC Part-15.
- Measurement uncertainty : ± 3.3 dB (K=2, 95 %)

2.2 Above 1 GHz RF Radiated emission(1 GHz to 12 GHz) : Measured at 3 m distance

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	
1.6200	Vert	48.3	74.0	54.0	5.7
1.8300	Vert	49.1	74.0	54.0	4.9
1.9400	Vert	48.9	74.0	54.0	5.1
2.5890	Horz	48.0	74.0	54.0	6.0
2.5890	Vert	50.0	74.0	54.0	4.0
2.6940	Vert	50.7	74.0	54.0	3.3

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

< AC 100 V / 50 Hz single phase : SEC80N2-19.0 >

Freq. (MHz)	Line #	Noise level (dB μ V)	Class B limit (dB μ V)		Margin (dB to AV)
		Q P	Q P	A V	
0.200	# 1	50.2	63.6	53.6	3.4
0.200	# 2	48.5	63.6	53.6	5.1
0.410	# 1	39.0	57.7	47.7	8.6
2.800	# 1	37.8	56.0	46.0	8.2
17.000	# 1	41.8	60.0	50.0	8.2
17.000	# 2	41.6	60.0	50.0	8.4

< AC 100 V / 50 Hz single phase : PTW1391N>

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
0.400	# 1	43.3	40.2	57.9	47.9	14.6	7.7
0.400	# 2	43.1	39.9	57.9	47.9	14.8	8.0
0.536	# 1	41.6	39.0	56.0	46.0	14.4	7.0
0.536	# 2	41.6	38.3	56.0	46.0	11.9	7.7
0.670	# 1	43.2	36.8	56.0	46.0	12.8	7.6
0.670	# 2	42.5	36.8	56.0	46.0	13.5	9.2

< AC 120 V / 60 Hz single phase : SEC80N2-19.0 >

Freq. (MHz)	Line #	Noise level (dB μ V)	Class B limit (dB μ V)		Margin (dB to AV)
		QP	QP	AV	
0.200	# 1	49.6	63.6	53.6	4.0
0.200	# 2	47.9	63.6	53.6	5.7
0.300	# 1	42.4	60.2	50.2	7.8
0.500	# 1	37.6	56.0	46.0	8.4
2.770	# 2	37.9	56.0	46.0	8.1
17.000	# 1	42.2	60.0	50.0	8.0

< AC 120 V / 60 Hz single phase : PTW1391N >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
0.534	# 1	42.4	39.3	56.0	46.0	13.6	6.7
0.534	# 2	44.2	38.2	56.0	46.0	11.8	7.8
0.670	# 1	43.4	40.6	56.0	46.0	12.6	5.4
0.670	# 2	43.3	39.2	56.0	46.0	12.7	6.8
0.735	# 1	42.4	38.2	56.0	46.0	13.6	7.8
0.735	# 1	42.4	38.2	56.0	46.0	13.6	7.8

< AC 230 V / 50 Hz single phase : SEC80N2-19.0 >

Freq. (MHz)	Line #	Noise level (dB μ V)	Class B limit (dB μ V)		Margin (dB to AV)
		QP	QP	AV	
0.200	# 1	50.4	63.6	53.6	3.2
0.200	# 2	49.9	63.6	53.6	3.7
0.300	# 1	47.1	60.2	50.2	3.1
0.300	# 2	45.5	60.2	50.2	4.7
0.380	# 1	42.1	58.3	48.3	6.2
0.500	# 1	37.4	56.0	46.0	8.6

< AC 230 V / 50 Hz single phase : PTW1391N >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
0.534	# 1	43.4	40.9	56.0	46.0	12.6	5.1
0.670	# 1	43.4	40.6	56.0	46.0	12.6	5.4
0.735	# 1	43.4	40.2	56.0	46.0	12.6	5.8
0.800	# 1	44.1	41.5	56.0	46.0	11.9	4.5
0.800	# 2	45.1	41.1	56.0	46.0	10.9	4.9
0.870	# 2	43.1	39.3	56.0	46.0	12.9	6.7

- Limit value ; EN55022(1994) / CISPR 22(1993).
- 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 installation 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	2004.12.29	2005.12.29
Dipole antenna	Schwarzbeck	VHA9103	VHA91031573	2004.12.29	2005.12.29
Dipole antenna	Schwarzbeck	UHA9105	UHA91052119	2004.12.29	2005.12.29
Field strength meter	Rohde & Schwarz	ESCS30	849650/002	2005.04.25	2006.04.25
Spectrum analyzer	HP	85422E	3746A00242	2005.04.25	2006.04.25
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

4.1.2 Radiated emission (1 GHz～12 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 GHz: Operating rate 1.2 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, rotate the EUT through 360 degrees and fixed the antenna height to the EUT center

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
Horn antenna	Schwarzbeck	BBHA9120D	136	2005.03.04	2007.03.04
Spectrum analyzer	Advantest	R3371A	75060396	2005.04.01	2006.04.01
Pre amplifier	HP	8449B	3008A01110	2005.03.24	2007.03.2

4.2 AC power line conducted emission

The conducted emission measurement was performed in the shielded room. The EUT was set on the 80 cm height wooden desk with using the 50Ω/50μH artificial mains network: AMN and operate the EUT by AC 100 V/ 50 Hz, AC 120 V/ 60 Hz and AC 230 V/ 50 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	2005.01.14	2006.01.14
AMN for AE	Kyoritsu	KNW-242C	8-1387-7	2005.01.14	2006.01.14
Field strength meter	Rohde & Schwarz	ESCS30	849650/002	2005.04.25	2006.04.25
Spectrum analyzer	HP	85422E	3746A00242	2005.04.25	2006.04.25
RF switch	Rohde & Schwarz	PSU	848290/003	2005.04.25	2006.04.25
Band pass filter	Advantest	TR14202	120200240	2005.04.25	2006.04.25
6 dB attenuator	Kyoritsu	CFA-03	———	2005.04.25	2006.04.25
RF cable	———	C63	———	2005.04.25	2006.04.25

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).

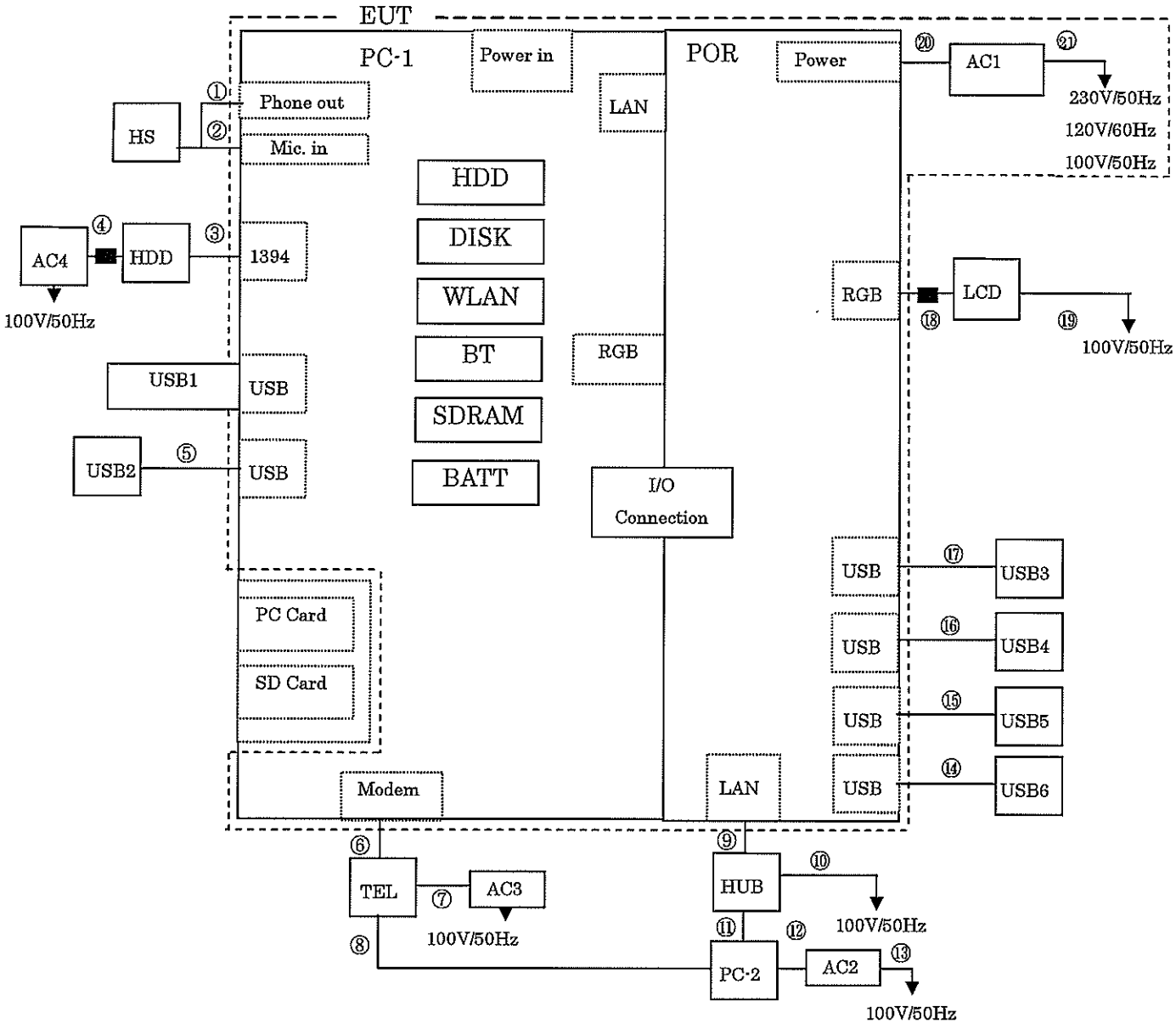
VCCI : 1st semi-anechoic chamber(R-753/C-776), Small shielded room(C-777)
Large shielded room(C-778)
2nd semi-anechoic chamber(R-1460/C-1547), 2nd shielded room(C-1548)
3rd shielded room(C-1549)

NVLAP : 1998.12.01 Accredited: Lab code 200373-0

TÜV P.S. : 1999.01.29 Authorized

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	T4020	Pre-production sample	Fujitsu

Related EUT

POR	Port Replicator	FPCPR49 / FMV-NPR7	———	Fujitsu
AC1a	AC adapter	SEC80N2-19.0	———	Fujitsu
AC1b	AC adapter	PTW1931N	———	Fujitsu

Included device; PC-1

Code	Name	Type	S/N	Product
HDD	40GB	MHT2040BH	———	———
DISK	DVD-Multi	19771386-F2	A071471	Teac
WLAN	Wireless LAN	WM3B2915AGB	———	Intel
BT	Bluetooth	UGXZ5-102A	———	ALPS
SDRAM	256MB	MT8HTF3264HDY-53EB3	———	———
BATT	48000mA/h	FPCBP95	———	Fujitsu

Assisted equipment

Code	Name	Type	S/N	Product
TEL	Telephone line simulator	TLE-101	———	ASCII Corp.
LCD	LCD display	P19-1	YEGA217491	FSC
HDD	Herd disk drive	KC4020-N	0007293	FSC
HS	Head set	FMH-40acom	———	Fujitsu
PC-2	Personal computer	FMV LIFEBOOK	———	Fujitsu
HUB	Switching Hub	GSW-8	0055690030400803	Corega
AC2	AC adapter	FMV-AC312	———	Fujitsu
AC3	AC adapter	TLE-101	———	LSI JAPAN
AC4	AC adapter	ACT-21	———	Sunfone
USB1	Memory Drive	256MB	———	I-O DATA
USB2	USB Mouse	CP154021-01	HCA50506730	Fujitsu
USB3	USB Mouse	CP154021-01	HCA50506780	Fujitsu
USB4	USB Mouse	M-UV96	HCA44800081	Logitec
USB5	USB Mouse	M-UV96	HCA44800205	Logitec
USB6	USB Mouse	M-UV96	HCA44801356	Logitec
PC card	PC card	HPC-ADP01	M91220D	Hagiwara sys-com
SD card	SD card 256MB	AR0403RK	———	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	Headset cable	———	2.2m	NSLD, MC
②	Mic-in	Headset cable	———	2.2m	NSLD, MC
③	1394	IEEE 1394 cable	———	2.5m	SLD, MC
④	———	DC cable	———	1.6m	NSLD, NMC with core＊1
⑤	USB2	USB mouse cable	———	1.0m	SLD, MC
⑥	Modem	Modem cable	———	20m	NSLD, NMC
⑦	———	DC cable	———	2.0m	NSLD, NMC
⑧	———	Modem cable	———	3.0m	NSLD, NMC
⑨	LAN	LAN cable	———	20.0m	SLD, MC
⑩	———	Power cable	———	2.0m	NSLD, NMC
⑪	———	LAN cable	———	1.0m	SLD, MC
⑫	———	DC cable	———	1.6m	NSLD, NMC
⑬	———	AC cable	———	1.8m	NSLD, NMC
⑭	USB3	USB mouse cable	———	1.0m	SLD, MC
⑮	USB4	USB mouse cable	———	2.5m	SLD, MC
⑯	USB5	USB mouse cable	———	2.5m	SLD, MC
⑰	USB6	USB mouse cable	———	2.5m	SLD, MC
⑱	RGB	RGB cable	———	1.5m	SLD, MC with fixed core
⑲	———	Power cable	———	2.0m	SLD, NMC
⑳	Power	DC cable	———	1.6m	NSLD, NMC
㉑	———	Power cable	———	1.8m	NSLD, NMC

＊1: KITAGAWA industry Co.,Ltd; RFC6

Appendix data (#05-051E: Total 25 pages)

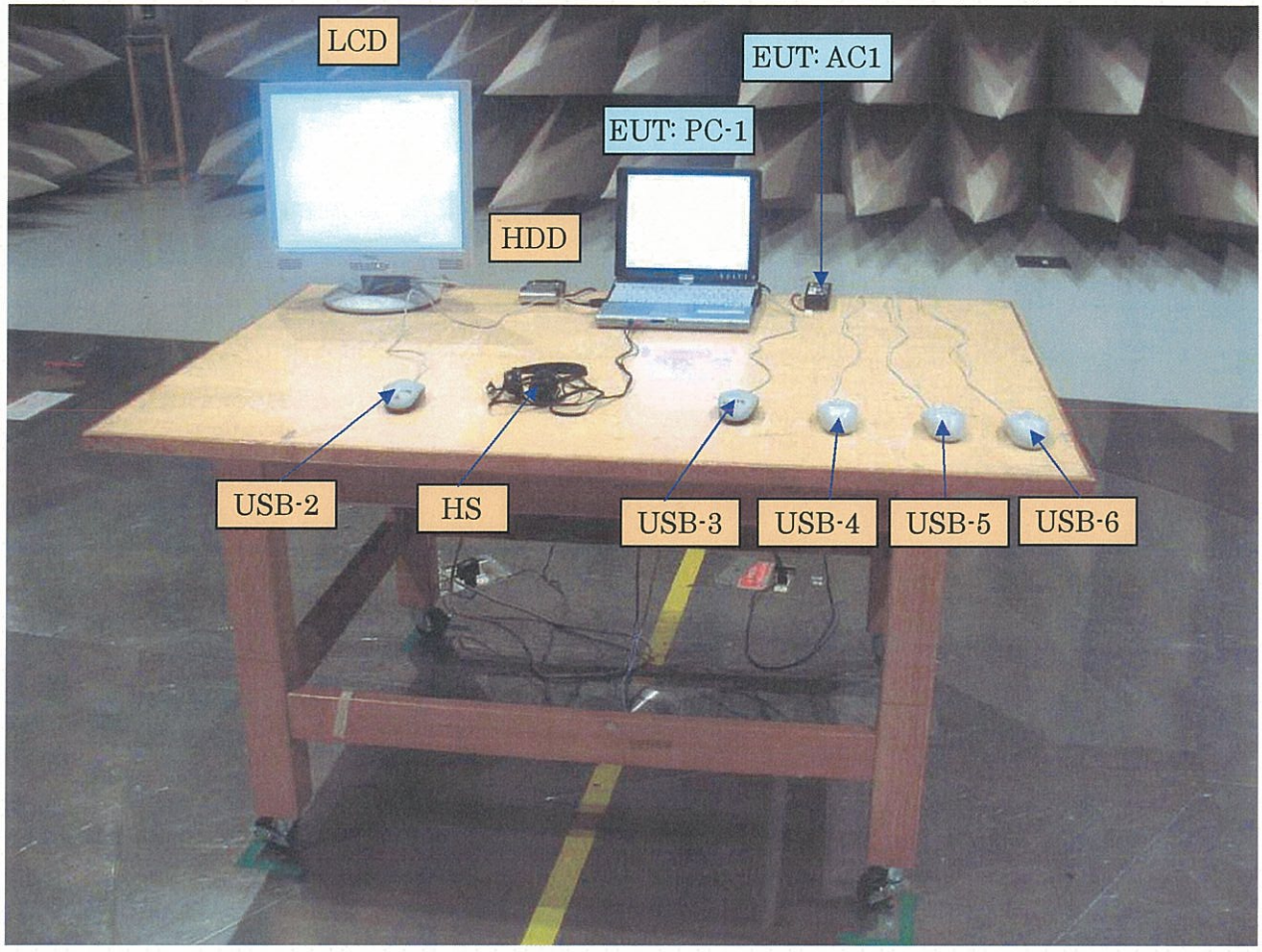
1. Photograph #05-051E (3 pages)

· Radiated emission measurement	30-1000 MHz(Front)	: Photo-1.1
·	30-1000 MHz (Back)	: Photo-1.2
·	1-12GHz (Front)	: Photo-1.3
· Conducted emission measurement		: Photo-2
· Label		: Photo-3

2. Test data (22pages)

· Radiated emission	30-1000 MHz	: #05-051E-RE	(2 pages)
·	1-10 GHz	: #05-051E-GH	(2 pages)
· Conducted emission	AC 100 V / 50 Hz (SEC80N2-19.0)	: #05-051E-CE1	(2 pages)
·	(PTW1931N QP mode)	: #05-051E-CE2	(2 pages)
·	(PTW1931N AV mode)	: #05-051E-CE3	(2 pages)
·	AC 120 V / 60 Hz (SEC80N2-19.0)	: #05-051E-CE4	(2 pages)
·	(PTW1931N QP mode)	: #05-051E-CE5	(2 pages)
·	(PTW1931N AV mode)	: #05-051E-CE6	(2 pages)
·	AC 230 V / 50 Hz (SEC80N2-19.0)	: #05-051E-CE7	(2 pages)
·	(AC1b QP mode)	: #05-051E-CE8	(2 pages)
·	(AC1b AV mode)	: #05-051E-CE9	(2 pages)

Photo-1.1 Radiated emission measurement; 30-1000 MHz (Front)



・PC-2 and HUB were set at outside of the chamber.

Photo-1.2 Radiated emission measurement; 30-1000 MHz (Back)

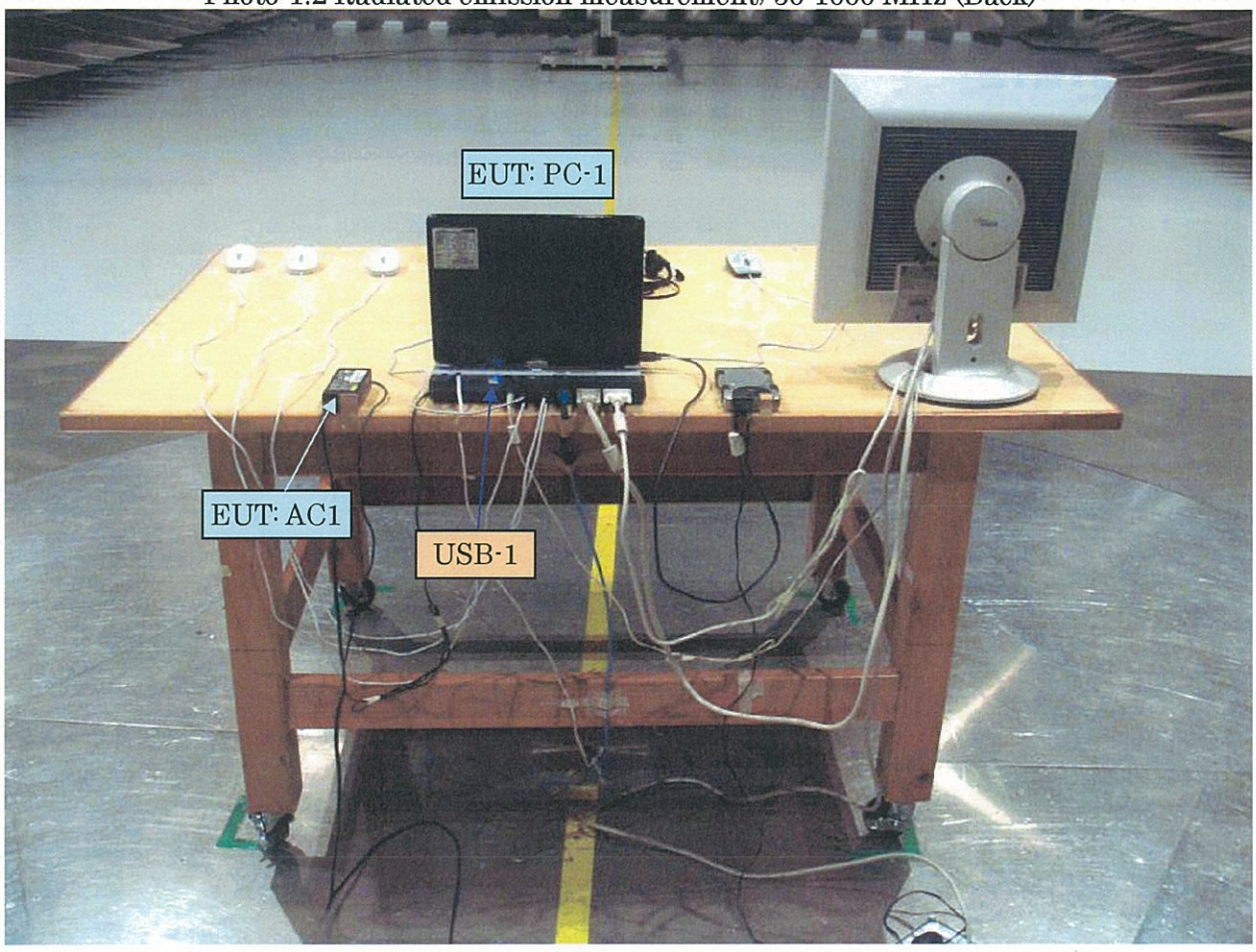


Photo-1.3 Radiated emission measurement; 1-12 GHz (Front)

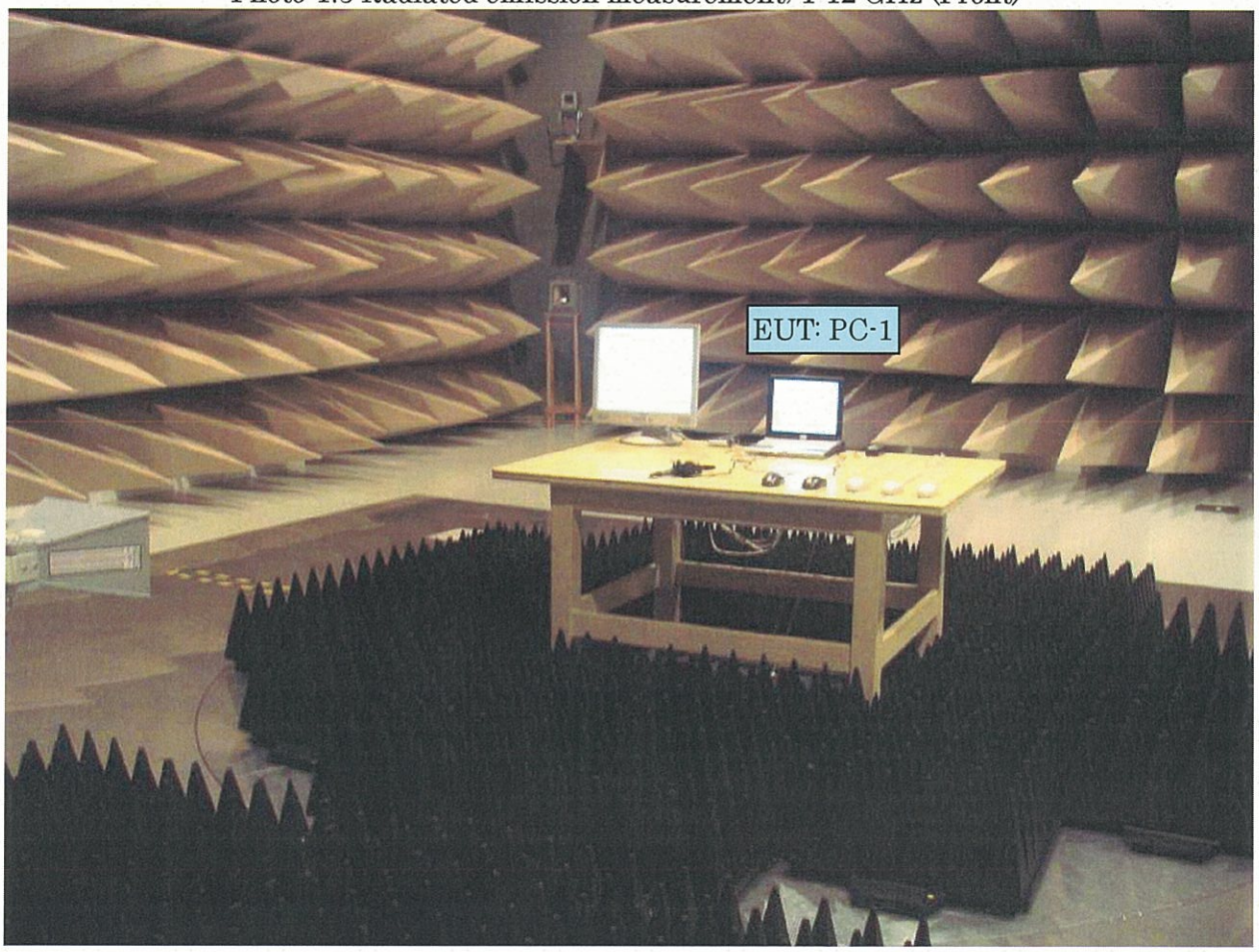


Photo-2 Conducted emission measurement

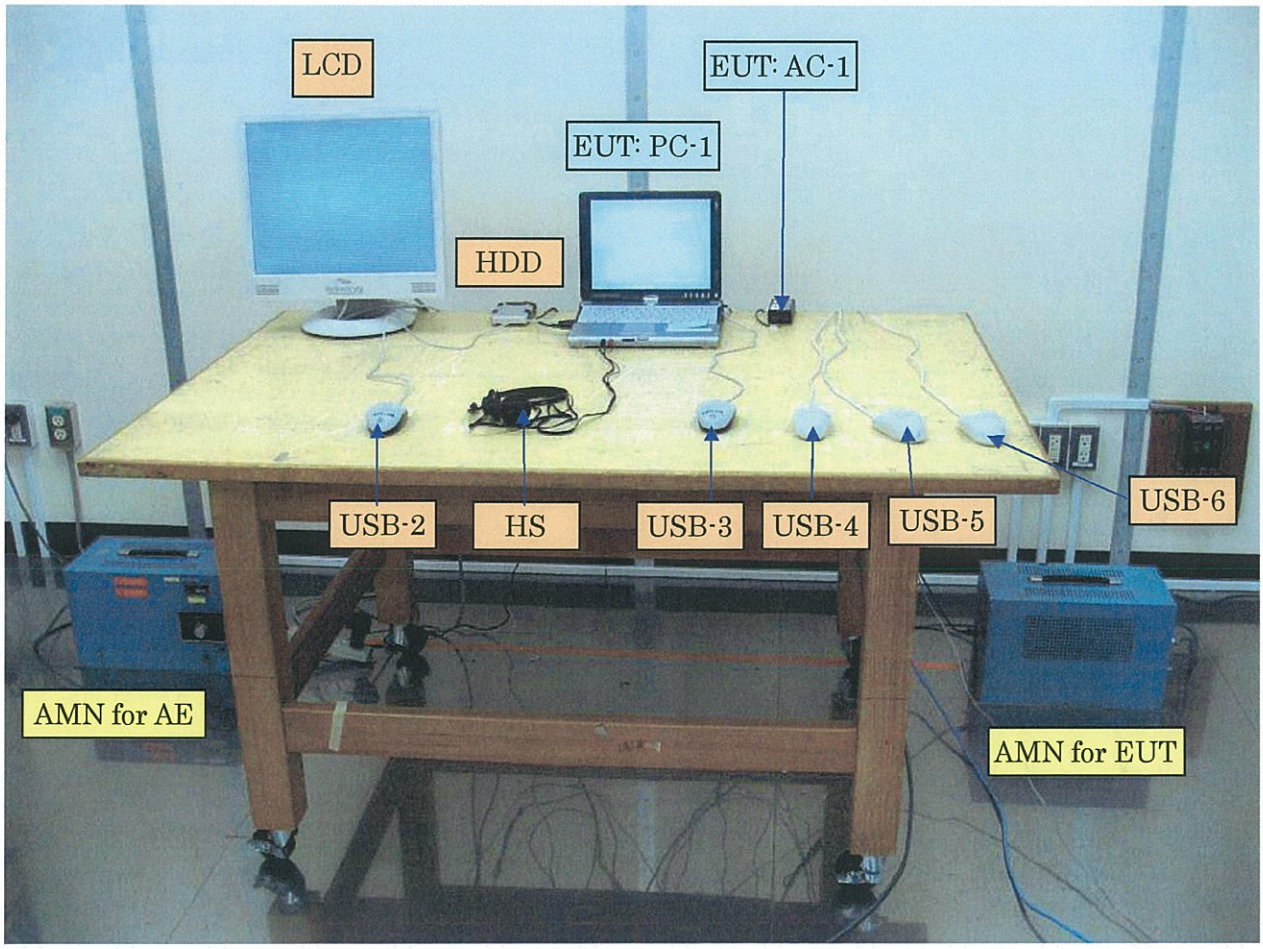


Photo-3 Label