

Attachment 3

FCC Part 15B Test Report (FG06-085EAL)



Report No. : FG06-085EAL (1/10)

EMI Test report

CATEGORY : EN55022(1998), +A2 / CISPR 22(1997) , +A2 ; Class B
AS/NZS CISPR22 (2002)
FCC Part-15 (2006)
VCCI (2006)
EN301 489-01 V1.4.1

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

PRODUCT TYPE : Personal computer ST5110
AC Adapter SEC80N2-16.0
Docking Station FPCPR67
Bluetooth module EYTF3CS FT
Wireless LAN WM3945ABG AR5BXB6

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

DATE TESTED : August 22, 2006 23°C 65%

TESTED BY : Hiroyuki Aikawa

Above EUT conforms mentioned all regulations.

APPROVED BY : for K. Ich DATE : August 24, 2006
Hiroyuki Shimano, President

FUJITSU GENERAL EMC LABORATORY LIMITED
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※ The description of the EUT and the system configuration in this report are provided by the client.



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1. Description of EUT

The EUT: ST5110 personal computer using Core Dual U2500 1.2 GHz microprocessor has a 12.1/ 10.4 inch XGA LCD display, DVD-Multi drive and a system disk (100 GB). The EUT has the interface to extend for IEEE1394⑨⑩, RGB⑭, Mic-in①, Phone-out①, LAN⑦, USB×5②③⑬⑭⑮⑯, Speaker-out②, TEL④, and has Direct memory 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, 133.000 MHz

Input power : AC 100 V-240 V, 50 / 60 Hz, Single-phase 2 wires

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

1.1 Test system configuration

The measurement was performed using ST5110 (Core Dual U2500 1.2 GHz microprocessor) 12.1 inch XGA display and each wireless LAN module(WM3945ABG/ AR5BXB6) with FPCPR67 as a maximum personal computer system with all related equipment shown in figure-1.

The EUT was selected from the pre-production line.

1.2 Operating condition

The following EUT and dependent devices were tested using “EMC.exe”, “Blue test” and “CRTU” or “ART” program under continuous operating condition to obtain maximize emission.

- | | | |
|-------------------------|---------------|--|
| ① PC-1 | LCD-1: | Display “H” character on screen (Maximum contrast / Luminescence)
(Display resolution 1024×768 / Refresh rate 60Hz) |
| | LAN: | Continuous transmission and receiving ping command. (1000 M Max) |
| | HDD-1: | Read/write the test data |
| | Bluetooth: | Continuous transmission of the RF signal |
| | Wireless LAN: | Continuous transmission of the RF signal |
| ② DCK: | DVD: | Play the test disk |
| ③ PC card: | | Non-connection (Radiated emission)
Read/write the test data (Conducted emission) |
| ④ SD card: | | Non-connection (Radiated emission)
Read/write the test data (Conducted emission) |
| ⑤ LCD-2: | | Display “H” character on screen (Maximum contrast / Luminescence) |
| ⑥ Headset: | | Connecting only |
| ⑦ USB mouse: | | Connecting only |
| ⑧ USB Memory (USB2.0) : | | Read/write the test data (480 M Max) |
| ⑨ 1394 HDD: | | Read/write the test data (480 M Max) |
| ⑩ PC-2: | | Continuous transmission and receiving ping command. (1000 M Max) |

2. EMI test results summary

Applied standard: EN55022 (1998), +A2 (2003)

Limit value: Class B

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

Australia, New Zealand: AS/NZS CISPR22(2002)

U.S.A:FCC Part:15(2006), Canada: CAN/CSA-CEI/IEC CISPR22-02

Japan: VCCI(2006), Taiwan: CSN 13438(1997)

The test result is effective in only the EUT.

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

2.1.1 Wireless LAN module: WM3945ABG

< AC 230 V / 50 Hz single phase >

Freq. (MHz)	pol.	Noise level (QP; dB μ V/m)	Class B limit (QP; dB μ V/m)	Margin (dB)
120.01	Horiz	25.8	30.0	4.2
336.00	Horz	35.4	37.0	1.6
432.00	Horiz	34.4	37.0	2.6
432.00	Vert	34.0	37.0	3.0
528.00	Vert	33.6	37.0	3.4
746.41	Horiz	32.6	37.0	4.4

< AC 120 V / 60 Hz single phase >

Freq. (MHz)	pol.	Noise level (QP; dB μ V/m)	Class B limit (QP; dB μ V/m)	Margin (dB)
120.01	Horiz	26.0	30.0	4.0
336.00	Horz	35.4	37.0	1.7
432.00	Horiz	34.5	37.0	2.5
432.00	Vert	34.2	37.0	2.8
528.00	Vert	33.5	37.0	3.5
746.41	Horiz	32.4	37.0	4.6

2.1.2 Wireless LAN module: AR5BXB6

< AC 230 V / 50 Hz single phase >

Freq. (MHz)	pol.	Noise level (QP; dB μ V/m)	Class B limit (QP; dB μ V/m)	Margin (dB)
192.02	Horiz	27.8	30.0	2.2
198.01	Horiz	25.0	30.0	5.0
432.00	Horiz	31.9	37.0	5.1
528.00	Horiz	32.8	37.0	4.2
528.00	Vert	33.0	37.0	4.0
850.37	Vert	33.4	37.0	3.6

< AC 120 V / 60 Hz single phase >

Freq. (MHz)	pol.	Noise level (QP; dB μ V/m)	Class B limit (QP; dB μ V/m)	Margin (dB)
(MHz)		(QP; dB μ V/m)	(QP; dB μ V/m)	(dB)
192.02	Horiz	27.6	30.0	2.4
198.01	Horiz	25.1	30.0	4.9
432.00	Horiz	31.8	37.0	5.2
528.00	Horiz	32.1	37.0	4.9
528.00	Vert	33.0	37.0	4.0
850.37	Vert	33.5	37.0	3.5

• Limit value ; CISPR22(1997)and applied for FCC Part15 (2006)

• Measurement uncertainty : $\pm$ 3.3 dB (K=2, 95 %)

2.2 Above 1 GHz RF Radiated emission(1 GHz to 6 GHz) : Measured at 3 m distance

<Wireless LAN module: 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	A V	
1.2779	Horiz	40.7	74.0	54.0	13.3
1.5550	Horiz	39.6	74.0	54.0	14.4
1.7272	Horiz	38.0	74.0	54.0	16.0
1.9171	Horiz	40.6	74.0	54.0	13.4
1.9171	Vert	41.4	74.0	54.0	12.6
2.1250	Horiz	39.7	74.0	54.0	14.3

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

2.3.1. Wireless LAN module: WM3945ABG

< AC 230 V / 50 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)	Class B limit (dB μ V)		Margin (dB to AV)
		Q P	Q P	A V	
0.182	# 1	51.1	64.4	54.4	3.3
0.182	# 2	51.0	64.4	54.4	3.4
0.275	# 1	46.6	61.0	51.0	4.4
0.275	# 2	46.8	61.0	51.0	4.2
0.368	# 1	43.5	58.6	48.6	5.1
0.368	# 2	43.8	58.6	48.6	4.8

< AC 120 V / 60 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)	Class B limit (dB μ V)		Margin (dB to AV)
		Q P	Q P	A V	
0.207	# 1	47.4	63.3	53.3	5.9
0.212	# 2	47.1	63.1	53.1	6.0
0.290	# 1	42.1	60.5	50.5	8.4
0.290	# 2	41.2	60.5	50.5	9.3
0.570	# 1	36.0	56.0	46.0	10.0
0.770	# 1	34.6	56.0	46.0	11.4

< AC 100 V / 50 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)	Class B limit (dB μ V)		Margin (dB to AV)
		Q P	Q P	A V	
0.198	# 1	47.7	63.7	53.7	6.0
0.198	# 2	46.4	63.7	53.7	7.3
0.318	# 2	38.8	59.8	49.8	11.0
0.395	# 1	38.9	58.0	48.0	9.1
0.535	# 1	35.7	56.0	46.0	10.3
0.535	# 2	36.5	56.0	46.0	9.5

2.3.2 Wireless LAN module: AR5BXB6

< AC 120 V / 60 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)	Class B limit (dB μ V)		Margin (dB to AV)
		Q P	Q P	A V	
0.197	# 1	48.4	63.7	53.7	5.3
0.217	# 2	48.4	62.9	52.9	4.5
0.294	# 2	40.8	60.4	50.4	9.6
0.326	# 1	40.3	59.6	49.6	9.3
0.547	# 2	37.4	56.0	46.0	8.6
0.557	# 1	36.5	56.0	46.0	9.5

• Limit value ; CISPR22.

• Measurement uncertainty : ± 2.5 dB (K=2, 95 %)

2.4 Telecommunication line conducted emission

< Telecom port >

Freq. (MHz)	Noise level (dB μ V)	Class B limit (dB μ V)		Margin (dB to AV)
	Q P	Q P	A V	
1.524	50.1	74.0	64.0	13.9
1.622	50.2	74.0	64.0	13.8
2.048	51.2	74.0	64.0	12.8
2.145	49.9	74.0	64.0	14.1
2.240	50.9	74.0	64.0	13.1
3.551	51.2	74.0	64.0	12.8

< LAN port >

Freq. (MHz)	Noise level (dB μ A)	Class B limit (dB μ A)		Margin (dB to AV)
	Q P	Q P	A V	
7.116	6.2	30.0	20.0	13.8
7.853	4.1	30.0	20.0	15.9
8.574	5.5	30.0	20.0	14.5
9.307	4.2	30.0	20.0	15.8
9.544	3.0	30.0	20.0	17.0
11.126	9.7	30.0	20.0	10.3

3. EUT modification under the test

None.

4. Measurement procedure and test equipment

4.1 Radiated emission

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 condition 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 rotating 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	849650/003	2006.04.25	2007.04.25
Spectrum analyzer	HP	85422E	3746A00242	2006.04.24	2007.04.24
RF switch	Rohde & Schwarz	PSU	848290/003	2006.05.07	2007.05.07
RF cable	_____	CF013	_____	2006.05.07	2007.05.07
2nd semi-anechoic chamber	Riken eletech	_____	_____	2005.01.17	2007.01.17
EMI test program	FGE	Version 1.3			

4.1.2 Radiated emission (1 GHz~6 GHz)

The EUT was set on the 80 cm height non-reflective desk on the turntable. The radiated emission measurement from 1 GHz to 6 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 with rotating the EUT through 360 degrees and fixing the antenna height to the 1m.

The measurement was performed with off mode of 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	2006.04.01	2007.04.01
Pre amplifier	HP	8449B	3008A01110	2005.03.24	2007.03.24

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 50 Ω /50 μ H artificial mains network: AMN ,and operated by AC230V/50Hz, AC120V/60Hz and AC100V/50Hz. 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 of 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	8-1387-7	2006.01.15	2007.01.15
Field strength meter	Rohde & Schwarz	ESCS30	849650/003	2006.04.25	2007.04.25
Spectrum analyzer	HP	85422E	3746A00242	2006.04.24	2007.04.24
RF switch	Rohde & Schwarz	PSU	848290/003	2006.05.07	2007.05.07
Band pass filter	Advantest	TR14202	03560027	2006.05.07	2007.05.07
10 dB Transient Limiter	HP	11947A	—	2006.05.07	2007.05.07
RF cable	—	CF017	—	2006.05.07	2007.05.07
EMI test program	FGE	Version 1.3			

4.3 Telecommunication line conducted emission

The conducted emission measurement was performed in the shielded room. The EUT was set on the 40 cm height wooden desk with using the impedance stabilization network: ISN and operate by 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
ISN	Rohde & Schwarz	ENY22	830661 048	2005.11.28	2006.11.28
Current probe	Rohde & Schwarz	EZ-17	100007	2006.12.21	2007.12.21
Field strength meter	Rohde & Schwarz	ESCS30	849650/001	2006.04.25	2007.04.25
Spectrum analyzer	HP	85422E	3746A00240	2006.04.24	2007.04.24
RF switch	Rohde & Schwarz	PSU	848290/005	2006.05.07	2007.05.07
Band pass filter	Advantest	TR14202	03560025	2006.05.07	2007.05.07
10 dB Transient Limiter	HP	3107A02582	—	2006.05.07	2007.05.07
RF cable	—	CF009	—	2006.05.07	2007.05.07

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)

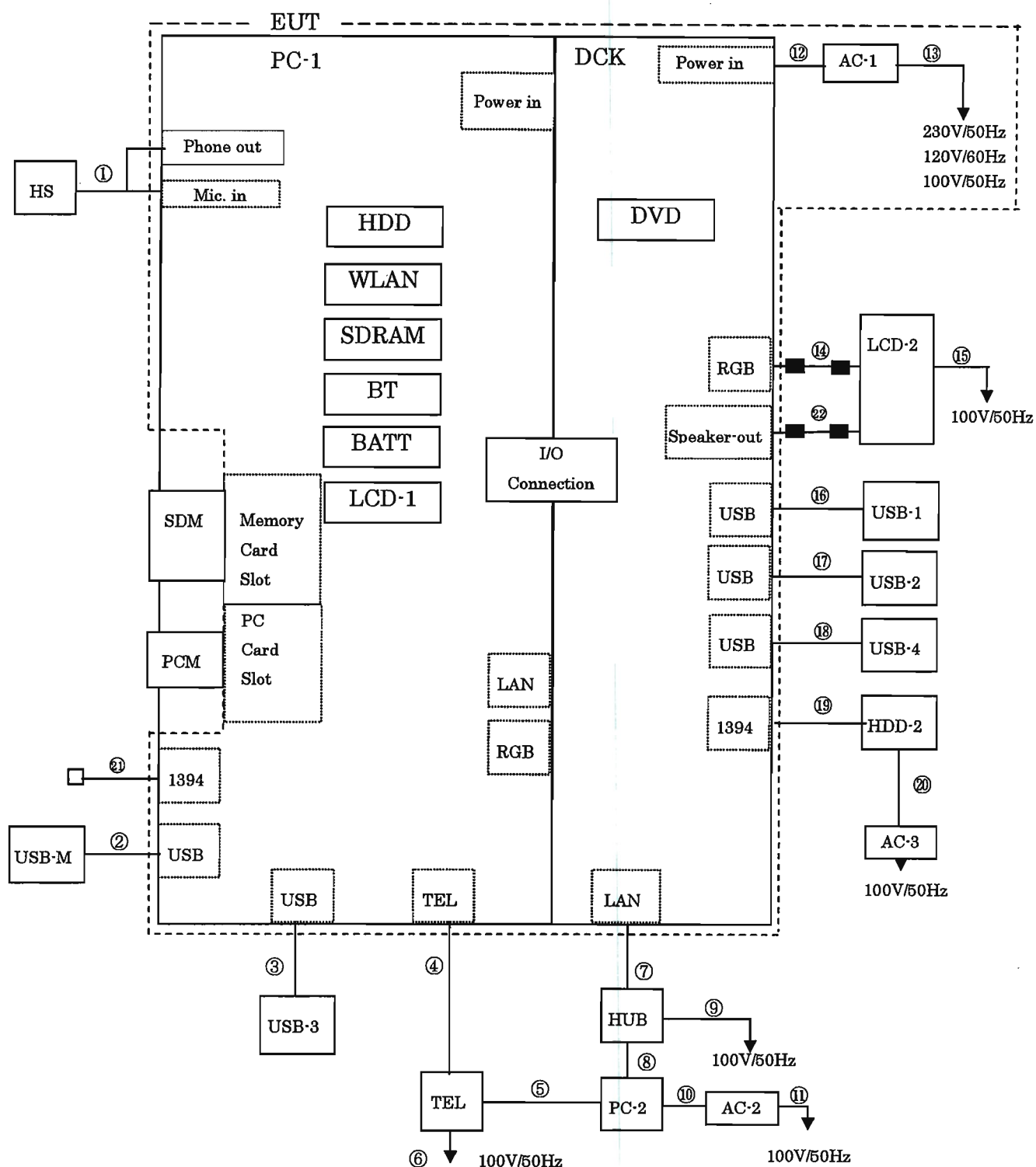
NVLAP : 1998.12.01 Accredited: Lab code 200373-0

TÜV SÜD PS. : 1999.01.29 Authorized

TÜV Rheinland Japan : 2005.08.25 Appointed

The measuring equipments 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	ST5110	Pre-production sample	Fujitsu

Related EUT

DCK	Docking Station	FPCPR67	_____	Fujitsu
AC-1	AC adapter	SEC80N2-16.0	_____	Fujitsu