

EMI TEST REPORT

Test Report No. : 26HE0320-HO-B-1

Applicant : Sony Corporation
Type of Equipment : Personal Computer
Model No. : PCG-4H2L
Test standard : FCC Part 15 Subpart E
Section 15.407 : 2006
FCC ID : AK8PCG4H2L
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.

Date of test:

April 7 to 11, 2006

Tested by:

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SECTION 1: Client information

Company Name : Sony Corporation
Brand name : SONY
Address : 6-7-35, Kitashinagawa, Shinagawa-ku, Tokyo, 141-0001 Japan
Telephone Number : +81-3-5795-8702
Facsimile Number : +81-3-5795-8981
Contact Person : Katsunori Tsutsui

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Personal Computer
Model No. : PCG-4H2L
Serial No. : XTA1-17 (Radiated and Conducted Emission),
XTB2-5 (For the other tests)
Country of Manufacture : JAPAN
Rating : AC120V
Receipt Date of Sample : April 4, 2006
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)

2.2.1 General Information

Feature of EUT	Sony Corp., Model No: PCG-4H2L is the Notebook computer, which is co-located with Wireless LAN module (IEEE 802.11a, IEEE 802.11b, IEEE 802.11g) and Bluetooth module (FCC ID:CWTUGPZ6). We recognized that this EUT can be co-operated Wireless LAN and Bluetooth. Therefore, we measured EMI when both Wireless LAN and Bluetooth were transmitted at the same time.
Operation Clock	1250MHz, 1200MHz, 533MHz, 500MHz, 400MHz, 270MHz, 160MHz, 133MHz, 77.5MHz, 71.5MHz, 48MHz, 33.3MHz, 24.576MHz, 24MHz, 14.318MHz, 10MHz

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2.2.2 Radio Specification

Sony Corp., Model No: PCG-4H2L is the Notebook computer, which is co-located with Wireless LAN module (IEEE 802.11b, IEEE 802.11g) and Bluetooth module (FCC ID:CWTUGPZ6).

Type of radio	Wireless LAN (IEEE802.11a)	Wireless LAN (IEEE802.11b/g)	Bluetooth
Equipment Type	Transceiver	Transceiver	Transceiver
Frequency of Operation	Low Band : Lower limit =5180 Upper limit =5320 High Band : Lower limit =5745 Upper limit =5825	Lower limit =2412 Upper limit =2462	Lower limit =2402 Upper limit =2480
Bandwidth & Channel spacing	Low Band Bandwidth : 20MHz Ch spacing : 20MHz High Band Bandwidth : 20MHz Ch spacing : 20MHz	Bandwidth : 20MHz Ch spacing : 5MHz	Bandwidth : 1MHz Ch spacing : 1MHz
Type of Modulation	OFDM	11b : DSSS 11g : OFDM	FHSS
Antenna Type	λ /4-Monopole Antenna (Internal)	λ /4-Monopole Antenna (Internal)	λ /4-Monopole Antenna (Internal)
Antenna Connector Type	U.FL Compatible connector	U.FL Compatible connector	U.FL Compatible connector
Antenna Gain	Main antenna : 1.79dBi Aux antenna : 0.90dBi	Main antenna : -2.59dBi Aux antenna : -2.24dBi	1.5dBi (type: HFS05-SO02NN)
Transmit Power Peak power	Low band 14.95 dBm (31.26 mW) High band 16.63 dBm (46.03 mW)	15.94dBm (39.26mW)	0.5 dBm (1.01mW)
Power Supply	DC1.5V & 3.3V	DC1.5V & 3.3V	DC 3.1~3.5V

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part15 Subpart E : 2006
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart E Unlicensed National Information Infrastructure Devices Section 15.407 General technical requirements

FCC 15.31 (e)

This EUT provides stable voltage(DC3.3V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin*0)	Results
1	26dB Emission Bandwidth	ANSI C63.4:2003	FCC 15.407(a)(1)(2) RSS-210 6.2.2(q1)	-	N/A	*See data	N/A
2	Maximum Conducted Output Power	ANSI C63.4:2003	FCC 15.407(a)(1)(2) RSS-210 6.2.2(q1)	Conducted	N/A		Complied
3	Peak Power Spectral Density	ANSI C63.4:2003	FCC 15.407(a)(1)(2) RSS-210 6.2.2(q1)	Conducted	N/A		Complied
4	Peak Excursion Ratio	ANSI C63.4:2003	FCC 15.407(a)(6) RSS-210 N/A	Conducted	N/A		Complied
5	Spurious Emission	ANSI C63.4:2003	FCC 15.407(b)(1)(2)(3) (4)(5)(6)(7)(8)	Conducted	N/A		Complied
6	Spurious Emission	ANSI C63.4:2003	FCC 15.205/15.209 RSS-210 6.2.2(o)(e)(e1), 6.3 and 6.2.2(q1)	Radiated	N/A	[Tx] 8.6 dB, QP 900.891MHz, Ver. [Rx] 9.0dB 900.891MHz, QP Ver.	Complied
7	AC Conducted Emission	ANSI C63.4:2003	FCC 15.407(b)(6)/15.207 RSS-210 6.6	-	N/A	19.5dB 0.19730MHz Phase L (QP)	Complied
8	Band Edge Compliance	ANSI C63.4:2003	FCC15.407(b)(1)(2)(7) /15.205 RSS-210 6.2.2(o)(e)(e1), 6.3 and 6.2.2(q1)	Conducted Radiated	N/A	*See data	Complied

Note: UL Apex's EMI Work Procedures No.QPM05 and QPM15.

*0) The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.

*These tests were also referred to FCC Public Notice DA 02-2138 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands".

*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Co-location & Co-operation (Radiated Spurious Emission at simultaneous transmission)	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.407 RSS-210 A8.5	Radiated	N/A *1)	15.7dB 10360MHz Hor. /Ver., AV	Complied

*1) The data of each modes had quite low noise level so that the tests below 1GHz are considered to have no apparent noise level.

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3.4 Uncertainty

Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test is $\pm 2.66\text{dB}$.
The data listed in this test report has enough margin, more than the site margin.

Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.59\text{dB}(3\text{m}) / \pm 4.58\text{dB}(10\text{m})$.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 4.62\text{dB}(3\text{m}) / \pm 4.60\text{dB}(10\text{m})$.
The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is $\pm 5.27\text{dB}$.
The data listed in this test report has enough margin, more than the site margin.

Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test is $\pm 3.0\text{dB}$.

3.5 Test Location

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	655103	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247A-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	IC4247A-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	-
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 shielded room	-	-	6.0 x 6.0 x 3.9m	N/A	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	N/A	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	N/A	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1 and No.2 semi-anechoic and No.7 shielded room.

3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

[for Conducted emission and Radiated emission]

Transmitting mode (IEEE 802.11a)
+ Bluetooth Hopping (with Main antenna)
Low channel : 5180MHz + Bluetooth Hopping
Middle channel : 5240MHz + Bluetooth Hopping
High channel : 5320MHz + Bluetooth Hopping
Receiving mode (IEEE 802.11a)
Middle channel : 5240MHz

[for Radiated emission]

Transmitting mode (IEEE 802.11a)
+ Bluetooth Hopping (with Main antenna)
Low channel : 5180MHz
Middle channel : 5240MHz
High channel : 5320MHz
Receiving mode (IEEE 802.11a)
Middle channel : 5240MHz

[Simultaneous transmission mode / only for Radiated emission]

Low channel : 5180MHz + Bluetooth Hopping

Remarks:

*The test was performed with the data rate of 11a (54Mbps) and Main Antenna (for 11a) which have the higher Spurious emission level after all the level of all IEEE11a/b/g and Main and Sub antenna and data rates were checked.

*As for the simultaneous transmitting mode, the test had been performed in the above mode + Bluetooth for the simultaneous transmitting mode which had the worst margin.

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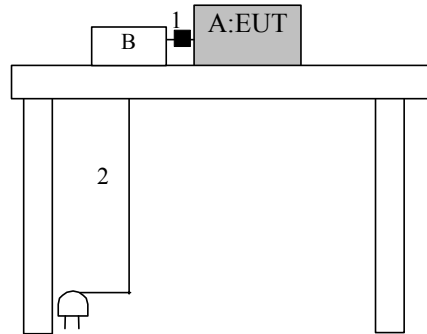
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4.2 Configuration and peripherals



AC120V/60Hz

■:Ferrite Core (Standard attachment)

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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID	Remark
A	Personal Computer	PCG-4H2L	XTA1-17 (Radiated and Conducted Emission), XTB2-5 (For the other tests)	Sony Corp.	AK8PCG4A2L	EUT
B	AC Adaptor	VGP-AC16V8	0001249	Sony Corp.	-	-

List of cables used

No.	Name	Length (m)	Shield
1	DC cable	2.0	N
2	AC cable	0.8	N

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SECTION 5: Conducted Emission

Test Procedure

EUT was placed on a platform of nominal size, 0.5m by 0.5m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center .

For the tests on EUT with other peripherals (as a whole system)

I/O cable 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.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber or a Measurement Room.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The measurements have been performed with a CISPR quasi-peak detector (IF BW 9 kHz).

Measurement range: 0.15-30MHz

Test data	: APPENDIX 3
Test result	: Pass

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SECTION 6: Spurious Emission , Band Edge Compliance

[Conducted]

Test Procedure

The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 3

Test result : Pass

[Radiated]

Test Procedure

EUT was placed on a platform of nominal size, 1.0m by 0.5m, raised 80cm above the conducting ground plane. The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz), 1m(10-26.5GHz, Distance Factor : $20\log(3[m]/1[m])$) and 0.5m(Upper 26.5GHz, Distance Factor : $20\log(3[m]/0.5[m])$).

The height of the measuring varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver or the Spectrum Analyzer.

Below 1GHz

The result also satisfied with the general limits specified in section 15.209(a).

Above 1GHz

Inside of the restricted bands (Section 15.205) : Apply to limit in the Section 15.209(a)

Outside of the restricted bands (Section 15.407) : Limit -27dBm EIRP (5.155-5.25GHz Band Edge)

Frequency	Below 1GHz	Above 1GHz (Inside of the restricted bands)	Above 1GHz (Outside of the restricted bands)
Instrument use	Test Receiver	Spectrum Analyzer	Spectrum Analyzer
Detector	QP: BW 120kHz	PK: RBW:1MHz/VBW: 1MHz	RBW:1MHz/VBW: 1MHz
IF Bandwidth		AV: RBW:1MHz/VBW:10Hz	

Test data : APPENDIX 3

Test result : Pass

*The noise from the EUT was not seen in the above 40GHz. The measurement was made in the residual noise levels.

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SECTION 7: 26dB Emission Bandwidth

Test Procedure

The 26dB Emission Bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data	: APPENDIX 3
Test result	: Pass

SECTION 8: Maximum Conducted Output Power

Test Procedure

The Peak Transmit Power was measured with a spectrum analyzer connected to the antenna port.
The test was made with the spectrum analyzer that has a function of channel-power measurement.
We followed Option 2 / method 1 specified in DA-02-2138A1.

Test data	: APPENDIX 3
Test result	: Pass

SECTION 9: Peak Power Spectral Density

Test Procedure

The Peak Power Spectral Density was measured with a spectrum analyzer connected to the antenna port.
We followed Option 2 specified in DA-02-2138A1.

Test data	:	APPENDIX 3
Test result	:	Pass

SECTION 10: Peak Excursion Ratio

Test Procedure

The Peak Excursion Ratio was measured with a spectrum analyzer connected to the antenna port.
The second Sweep was measured based on Option 2 / method 1 specified in DA-02-2138A1.

Test data	:	APPENDIX 3
Test result	:	Pass

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APPENDIX 1: Photographs of test setup

Conducted Emission

BLANK-ANOTHER EXHIBIT (Test Setup Photos (EMC_FCC15E))

Spurious Emission (Radiated)

BLANK-ANOTHER EXHIBIT (Test Setup Photos (EMC_FCC15E))

Worst Case Position (Z-axis:Horizontal / Y-axis:Vertical)

BLANK-ANOTHER EXHIBIT (Test Setup Photos (EMC_FCC15E))

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