



# RADIO TEST REPORT

**Test Report No. : 26HE0320-HO-A-1**

**Applicant** : Sony Corporation  
**Type of Equipment** : Personal Computer  
**Model No.** : PCG-4H2L  
**FCC ID** : AK8PCG4H2L  
**Test standard** : FCC Part 15 Subpart C  
Section 15.207, Section 15.247: 2006  
**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 the 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 5 to 11, 2006

**Tested by:**

*M. Kosaka*

Makoto Kosaka  
EMC Services

*Y. Yoshida*

Yutaka Yoshida  
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**Approved by :**

*T. Maeno*

Tetsuo Maeno  
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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),  
XTA1-15 (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 Product description**

**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	$\lambda$ /4-Monopole Antenna (Internal)	$\lambda$ /4-Monopole Antenna (Internal)	$\lambda$ /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 C : 2006  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits : 2006  
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz : 2006

#### **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.

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### 3.2 Procedures and results

[Wireless LAN]

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted emission	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements ----- IC: RSS-Gen 7.2.2	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.2	-	N/A	19.6dB 0.19760MHz, QP, L	Complied
2	6dB Bandwidth	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators ----- IC: RSS-Gen 4.4.2	FCC: Section 15.247(a)(2) ----- IC: RSS-210 A8.2(1)	Conducted	N/A	See data.	Complied
3	Maximum Peak Output Power	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators ----- IC: RSS-Gen 4.6	FCC: Section 15.247(b)(3) ----- IC: RSS-210 A8.4(4)	Conducted	N/A		Complied
4	Restricted Band Edges	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators ----- IC: -	FCC: Section 15.247 (d) ----- IC: RSS-210 A8.5	Conducted/ Radiated	N/A		Complied
5	Power Spectral Density	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators ----- IC: -	FCC: Section 15.247 (e) ----- IC: RSS-210 A8.2(2)	Conducted	N/A		Complied
6	Spurious Emission	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators ----- IC: RSS-Gen 4.7 RSS-Gen 4.8	FCC: Section 15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3	Conducted/ Radiated	N/A		[11b:Tx] 7.3dB 24379.0MHz, Hor. PK [11b:Rx] 24.6dB, 1301.2MHz, Ver. AV [11g:Tx] 0.4dB 2390MHz, Hor. PK [11g:Rx] 24.7dB 1591.5MHz, Hor. AV [11a:Tx] 16.7dB 11530.0MHz, Hor. AV [11a:Rx] 26.0dB 1597.7MHz, Hor. AV

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 "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247".

\*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.

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### 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	Section 15.247(d) RSS-210 A8.5	Radiated	N/A *1)	1.4dB 2390.0MHz Hor. PK	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.

### 3.4 Uncertainty

#### Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test is  $\pm 2.6$ 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  $\pm 4.59$ dB(3m)/  
 $\pm 4.58$ dB(10m).

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is  $\pm 4.62$ dB(3m)/  
 $\pm 4.60$ dB(10m).

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is  $\pm 5.27$ 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  $\pm 3.0$ dB.

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### 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**

Test mode :           **[for Conducted emission]**

Transmitting mode (IEEE 802.11b/g)	
+ Bluetooth Hopping (with AUX antenna)	
<i>Low channel</i>	:       2412MHz
<i>Middle channel</i>	:       2437MHz
<i>High channel</i>	:       2462MHz
Receiving mode (IEEE 802.11b/g)	
<i>Middle channel</i>	:       2437MHz
Transmitting (IEEE 802.11a)	
+ Bluetooth Hopping (with Main antenna)	
<i>Low channel</i>	:       5745MHz
<i>Middle channel</i>	:       5765MHz
<i>High channel</i>	:       5825MHz
Receiving mode (IEEE 802.11a)	
<i>Middle channel</i>	:       5765MHz
<b>[for Spurious emission]</b>	
Transmitting mode (IEEE 802.11b/g)	
(with AUX antenna)	
<i>Low channel</i>	:       2412MHz
<i>Middle channel</i>	:       2437MHz
<i>High channel</i>	:       2462MHz
Receiving mode (IEEE 802.11b/g)	
<i>Middle channel</i>	:       2437MHz
Transmitting (IEEE 802.11a)	
(with Main antenna)	
<i>Low channel</i>	:       5745MHz
<i>Middle channel</i>	:       5765MHz
<i>High channel</i>	:       5825MHz
Receiving mode (IEEE 802.11a)	
<i>Middle channel</i>	:       5765MHz
<b>[Simultaneous transmission mode only for Spurious emission]</b>	
Transmitting (IEEE 802.11g) + Bluetooth hopping on	
(with AUX antenna)	
<i>Low channel</i>	:       2412MHz
<i>High channel</i>	:       2462MHz

#### **Remarks:**

\*The test was performed with the AUX Antenna (for 11b and 11g), the data rate of 11b (11Mbps) & 11g (54Mbps) and Main Antenna (for 11a) which have the higher Spurious emission level after all the level of all IEEE 11a/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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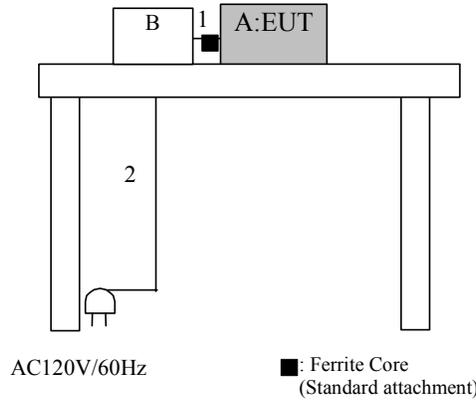
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## 4.2 Configuration and peripherals



\* 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	Remark
A	Notebook Personal Computer	PCG-4H2L	XTA1-17 (Radiated and Conducted Emission), XTA1-15 (For the other tests)	Sony Corp.	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 and conditions**

EUT was placed on a platform of nominal size, 1.0m 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.

**Detector** : CISPR quasi-peak and average detector (IF BW 9 kHz)  
**Measurement range** : 0.15-30MHz  
**Test data** : APPENDIX 3  
**Test result** : Pass

Date: April 11, 2006

Test engineer: Makoto Kosaka

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**SECTION 6: Spurious Emission**

**[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, 0.5m by 1.0m, 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) and 1m(Upper 10GHz).

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 (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

**20dBc was applied to the frequency over the limit of FCC 15.209 and outside the restricted band of 15.205. (FCC)**

**20dBc was applied to the frequency over the limit specified in Table 2 of RSS-210 2.7 and outside the restricted band specified in Table 1 of RSS-210 2.7 (IC)**

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver / Spectrum Analyzer	Spectrum Analyzer
Detector	QP: BW 120kHz(T/R)	PK: RBW:1MHz/VBW: 1MHz
IF Bandwidth	20dBc : RBW: 100kHz VBW: 300kHz (S/A)	AV: RBW:1MHz/VBW:10Hz 20dBc : RBW:100kHz/VBW:300kHz

**Test data** : APPENDIX 3  
**Test result** : Pass

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

**Test data** : APPENDIX 3  
**Test result** : Pass

Date: April 5 to 11, 2006

Test engineer: Makoto Kosaka

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## **SECTION 7: Bandwidth**

### **Test Procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

**Test data** : APPENDIX 3  
**Test result** : Pass

## **SECTION 8: Maximum Peak Output Power**

### **Test Procedure**

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

**Test data** : APPENDIX 3  
**Test result** : Pass

## **SECTION 9: Power Spectral Density**

### **Test Procedure**

The Peak Power Density was measured with a spectrum analyzer connected to the antenna port.  
We followed 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\_FCC15C)*

**Spurious Emission (Radiated)**

*BLANK-ANOTHER EXHIBIT Test Setup Photos (EMC\_FCC15C)*

**Worst Case Position (11b/g: Horizontal: Z-axis/ Vertical:Y-axis)**  
**&(11a: Horizontal: Z axis/ Vertical: Z-axis)**

*BLANK-ANOTHER EXHIBIT Test Setup Photos (EMC\_FCC15C)*