



# EMI TEST REPORT

## Test Report No. : 26GE0351-HO-B

**Applicant** : silex technology, Inc.  
**Type of Equipment** : MiniPCI Wireless LAN Board  
**Model No.** : SX-10WAG  
**Test standard** : FCC Part 15 Subpart E  
Section 15.407: 2006  
**FCC ID** : N6C-SX10WAG  
**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 27 to June 20, 2006

**Tested by :**

Hiroka Umeyama  
EMC Services

Norihisa Hashimoto  
EMC Services

**Approved by :**

Naoki Sakamoto  
Group Leader of EMC Services



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.

\*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://ulapex.jp/emc/nvlap.htm>

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## **SECTION 1: Client information**

Company Name : silex technology, Inc.  
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Facsimile Number : +81-6-6784-3750  
Contact Person : Toshiro Kometani

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

### **2.1 Identification of E.U.T.**

Type of Equipment : MiniPCI Wireless LAN Board  
Model No. : SX-10WAG  
Serial No. : ES0002 / 008923A9A00  
Rating : DC3.3V, 0.54A  
Country of Manufacture : Japan  
Receipt Date of Sample : April 14, 2006  
Condition of EUT : ES0002: Engineering prototype  
008923A9A00: Production prototype  
(Not for Sale: These samples are equivalent to mass-produced items.)  
Modification of EUT : No modification by the test lab.

### **2.2 Product Description**

Model: SX-10WAG is the MiniPCI Wireless LAN Board.

Equipment Type : Transceiver  
Clock frequency : 40MHz  
Method of Frequency Generation : Crystal  
Operating voltage (inner) : DC3.3V +/-10%

	<b>IEEE802.11b</b>	<b>IEEE802.11g</b>	<b>IEEE802.11a</b>
Frequency of operation	2412-2462MHz	2412-2462MHz	5180-5320MHz 5745-5805MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)
Bandwidth & Channel number	22MHz & 5MHz	22MHz & 5MHz	22MHz & 5MHz
ITU Code	G1D	D1D	D1D
Antenna type	Omni-Directional	Omni-Directional	Omni-Directional
Antenna Gain	1.5dBi	1.5dBi	2.1dBi

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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)

The stable voltage (DC3.3V) is provided with the EUT from the host device. Therefore, the EUT complies with the requirement.

#### FCC Part 15.203 Antenna requirement

This EUT complies with the requirement of 15.203, because a unique connector (Reverse SMA) is used for this EUT. Therefore, the EUT complies with the requirement.

### 3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin*0)	Results
1	26dB Emission Bandwidth	ANSI C63.4:2003	Section 15.407(a)(1)(2)(3)	-	N/A	See data	-
2	Peak Transmit Power	ANSI C63.4:2003	Section 15.407(a)(1)(2)(3)	Conducted	N/A		-
3	Peak Power Spectral Density	ANSI C63.4:2003	Section 15.407(a)(1)(2)(3)	Conducted	N/A		-
4	Peak Excursion Ratio	ANSI C63.4:2003	Section 15.407(a)(6)	Conducted	N/A		-
5	Spurious Emission	ANSI C63.4:2003	Section 15.407(b)(1)(2)(3)(4)(5)	Conducted	N/A		-
6	Spurious Emission	ANSI C63.4:2003	(6)(7) 15.205/15.209	Radiated	N/A	0.2dB 115300MHz, Ver AV, Ch153	Complied
7	AC Conducted Emission	ANSI C63.4:2003	Section 15.407(b)(6)/15.207	-	N/A	17.0dB 0.15078MHz Phase N (PK)	Complied
8	Band Edge Compliance	ANSI C63.4:2003	Section 15.407(b)(7)/15.205	Conducted Radiated	N/A	See data	-

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	99% Occupied Band Width	RSS-Gen 4.4.1	RSS-Gen 4.4.1	Conducted	N/A	N/A	N/A

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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 report have enough margin, more than 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 report meets the limits unless the uncertainty is taken into consideration.

#### 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, No.2, No.3 and No.4 semi-anechoic chambers 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**

The EUT was operating in a manner similar to typical use during the tests.

Packet Type : Maximum  
 Payload : PN9  
 Operation : Transmitting mode (IEEE802.11a)  
               - Channel 36: 5180MHz  
               - Channel 48: 5240MHz  
               - Channel 64: 5320MHz  
               - Channel 149: 5745MHz  
               - Channel 153: 5765MHz  
               - Channel 161: 5805MHz

Turbo mode  
               - Channel 40: 5200MHz  
               - Channel 50: 5250MHz  
               - Channel 58: 5290MHz

Receiving mode (IEEE802.11a)  
               - Channel 48: 5240MHz  
               - Channel 153: 5765MHz

Conditions : 1) IEEE802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps  
                             Turbo mode: 12, 18, 24, 36, 48, 72, 96, 108 Mbps  
                             2) Antenna Port A and B (same type)

\*We pre-confirmed the above conditions on EUT and performed the final test with the following conditions;

	IEEE802.11a
Conducted emission test	1) Rate: 54Mbps
	2) Antenna Port A
Radiated emission test	1) Rate: 54Mbps
	2) Antenna Port A
Other tests	1) Rate: 54Mbps
	2) Antenna Port A

<The details>

Conducted emission test : The above conditions did not affect the test result so that the test was made with these conditions in the above table.

Radiated emission test : As for Rate, 54Mbps (Maximum transmission rate of 11a) had worst margins.  
 The result of Antenna Port A had worst margin.

Other tests : As for Rate, 54Mbps (Maximum transmission rate of 11a) had worst margins.  
 The result of Antenna Port A had worst margin.

\* Conducted/Radiated Emission levels at Turbo mode have no difference from the ones at usual operation mode. Therefore, only the test items such as Output Power, Bandwidth, and Bandedges that would be influenced by the Turbo mode were performed.

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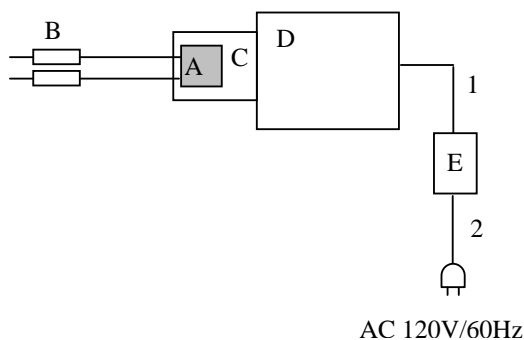
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## 4.2 Configuration and peripherals



\*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	Remarks
A	Mini PCI Wireless LAN Board	SX-10WAG	ES0002 *1) 0080923A9A00 *2)	silex technology	EUT
B	Antenna	SX-10WAG	2, 3	silex technology	EUT
C	Mini PCI Cardbus Adapter	-	-	silex technology	-
D	PC	PP350N009X31・2	Z2026858J	TOSHIBA	-
E	Adapter	PA3241V-1ACA	0210A0010919G	TOSHIBA	-

\*1) Used for 5180-5320MHz band test

\*2) Use for 5745-5805MHz band test

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-

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## **SECTION 5: Conducted Emission**

### **Test Procedure**

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0 m, 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 urethane platform of nominal size, 0.5m by 1.0 m, 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 0.3m( Upper 26.5GHz, Distance Factor :  $20\log(3[m]/0.3[m])$  ).

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 15.205) : Limit -27dBm EIRP

-17dBm EIRP (5.725-5.825GHz Band Edge)

Frequency	Below 1GHz	Above 1GHz (Inside of the restricted bands)	Above 1GHz (Outside of the restricted bands)
Instrument used	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

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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: Peak Transmit 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.

Integral bandwidth of Channel-power measurement function was set at 40MHz/80MHz after it was verified by pre-check that there was no difference between 26dB bandwidth and 40MHz/80MHz bandwidth.

We followed the 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 the method 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 Method 1 specified in DA-02-2138A1.

Test data : APPENDIX 3

Test result : Pass

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