

# EMI TEST REPORT

**Test Report No. : 26GE0351-HO-A-1**

**Applicant** : **silex technology, Inc.**  
**Type of Equipment** : **MiniPCI Wireless LAN Board**  
**Model No.** : **SX-10WAG**  
**Test standard** : **FCC Part 15 Subpart C  
Section 15.207, Section 15.247: 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:** May 11 to July 8, 2006

**Tested by:**

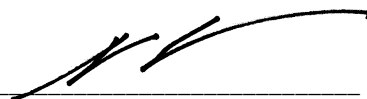


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NVLAP LAB CODE: 200572-0

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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<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Client information</b> .....	<b>3</b>
<b>SECTION 2: Equipment under test (E.U.T.)</b> .....	<b>3</b>
<b>SECTION 3: Test specification, procedures &amp; results</b> .....	<b>4</b>
<b>SECTION 4: Operation of E.U.T. during testing</b> .....	<b>7</b>
<b>SECTION 5: Conducted Emission</b> .....	<b>9</b>
<b>SECTION 6: Spurious Emission</b> .....	<b>10</b>
<b>SECTION 7: Bandwidth</b> .....	<b>11</b>
<b>SECTION 8: Maximum Peak Output Power</b> .....	<b>11</b>
<b>SECTION 9: Peak Power Density</b> .....	<b>11</b>
<b>APPENDIX 1: Photographs of test setup</b> .....	<b>12</b>
<b>Conducted Emission</b> .....	<b>12</b>
<b>Spurious Emission (Radiated)</b> .....	<b>13</b>
<b>Worst Case Position (X-axis:Horizontal / Y-axis:Vertical)</b> .....	<b>14</b>
<b>APPENDIX 2: Test instruments</b> .....	<b>15</b>
<b>APPENDIX 3: Data of EMI test</b> .....	<b>17</b>
<b>Conducted Emission</b> .....	<b>17</b>
<b>6dB Bandwidth</b> .....	<b>28</b>
<b>Maximum Peak Output Power</b> .....	<b>33</b>
<b>Radiated Spurious Emission</b> .....	<b>40</b>
<b>Conducted Spurious Emission</b> .....	<b>58</b>
<b>Conducted emission Band Edge compliance</b> .....	<b>71</b>
<b>Power Density</b> .....	<b>73</b>
<b>99% Occupied Bandwidth</b> .....	<b>78</b>

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**SECTION 1: Client information**

Company Name : silex technology, Inc.  
Address : 15-15 Takaida higashiosaka Osaka Japan  
Telephone Number : +81-6-6784-3758  
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 / 0080923A9A29  
Rating : DC3.3V, 0.54A  
Country of Manufacture : Japan  
Receipt Date of Sample : April 14, 2006  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is 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 5825MHz
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 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)**

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**

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

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### 3.2 Procedures and results

No. Item	Test Procedure	Specification	Remarks	Deviation	Worst margin *0	Results
1	Conducted Emission ANSI C63.4:2003 7. AC powerline conducted emission measurements	Section 15.207	-	N/A	17.6dB 0.22844MHz, Phase N (QP) IEEE802.11g Tx Low Ch.	Complied
2	6dB Bandwidth ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247(a)(2)	Conducted	N/A	-	-
3	Maximum Peak Output Power ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247(b)(3)	Conducted	N/A	-	-
4	Spurious Emission ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247 (d) Section 15.209	Conducted/ Radiated	N/A	[Tx] 0.6dB 7236MHz(11b Low Ch) VER, AV 4824MHz(11g Low Ch) HOR/VER, AV 2483.5MHz(11g High Ch) VER, AV [Rx] 1.1dB 3215.9MHz (11b, 11g) HOR, AV	Complied
5	Restricted Band Edges ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247 (d)	Conducted/ Radiated	N/A	-	-
6	Power Density ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247 (e)	Conducted	N/A	-	-

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 for Digital Transmission Systems Section15.247".

\*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	-	-

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### 3.4 Uncertainty

#### Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test is  $\pm 2.66$ 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  $\pm 4.59$ 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 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  $\pm 3.0$ 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.

- PacketType : Maximum
- Payload : PN9
- Operation : Transmitting mode (IEEE802.11b/11g)
  - Low Channel : 2412MHz(Ch1)
  - Mid Channel : 2437MHz(Ch6)
  - High Channel : 2462MHz(Ch11)

Transmitting mode (IEEE802.11a)  
: 5825MHz(Ch165)

Turbo mode (IEEE802.11g)  
- Channel : 2437MHz(ch6)

Receiving mode (IEEE802.11b/11g)  
- Mid Channel : 2437MHz(Ch6)

- Conditions : 1) Data Rate:IEEE802.11b:1, 2, 5.5, 11  
IEEE802.11g: 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;

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

<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, 11Mbps (Maximum transmission rate of 11b) and 54Mbps (Maximum transmission rate of 11g) had worst margins.  
The result of Antenna Port A had worst margin.

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

\* Conducted/Radiated Emission level at Turbo mode has 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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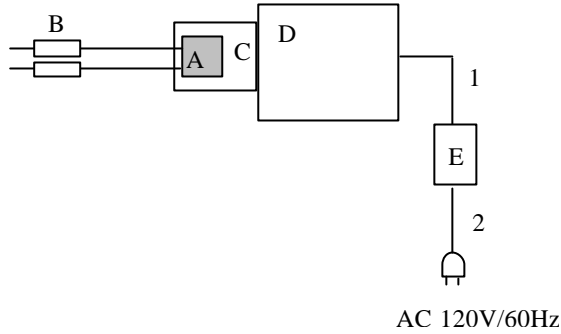
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#### 4.2 Configuration and peripherals



\*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) 0080923A9A29 *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 11b/g test

\*2) Use for 11a 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, 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.

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**

[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, 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) and 1m(Upper 10GHz) and 0.3m(Upper 26.5GHz).

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 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.

When not satisfying the requirement of § 15.209, 20dBc was applied except the restricted band of § 15.205

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

- 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

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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 Maximum Peak Output 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 Guidance on Measurement for Digital Transmission Systems Section 15.247.

Test data : APPENDIX 3  
Test result : Pass

## **SECTION 9: Peak Power Density**

### **Test Procedure**

The Peak Power Density was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 3  
Test result : Pass

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