



# RADIO TEST REPORT

Test Report No.: 26GE0204-HO-A

Applicant : FURUNO SYSTEMS CO., LTD.  
Type of Equipment : WLAN module  
Model No. : ATC-BICF  
FCC ID : T87SS22BXXXM  
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:

February 21 to May 10, 2006

Tested by:



Takumi Shimada  
EMC Services



Makoto Kosaka  
EMC Services

Approved by :



Tetsuo Maeno  
Site Manager of  
EMC Services

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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## **SECTION 1: Client information**

Company Name	FURUNO SYSTEMS CO., LTD.
Address	9-52,Ashihara-town, Nishinomiya-city, Hyogo, 662-8580 JAPAN
Telephone Number	+81-798-63-1194
Facsimile Number	+81-798-63-1197
Contact Person	Takeaki Okamoto

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

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

Type of Equipment	WLAN module
Model No.	ATC-BICF
Serial No.	44502809
Country of Manufacture	Japan
Rating	DC 3.3V +/-5%
Receipt Date of Sample	February 21, 2006
Condition of EUT	Production model
Modification of EUT	No modification by the test lab.

### **2.2 Product Description**

#### **2.2.1 General Information**

Feature of EUT	The EUT is IEEE802.11b WLAN module and is installed only in Handy Terminal manufactured by FURUNO SYSTEMS CO., LTD.
Size	About 55 (W)*36 (H)*2.5 (D) mm
Operation Clock	44MHz

#### **2.2.2 Radio specification**

Type of radio	Wireless LAN (IEEE802.11b)
Equipment Type	Transceiver
Frequency band	2400-2483.5MHz
Frequency of Operation	2412-2462MHz
Bandwidth & Channel spacing	20MHz & 5MHz
Type of Modulation	DSSS
Antenna Type	Chip Antenna (DA150S-2450G-FS02)
Antenna Connector Type	U.FL connector (AYU1-1P-02676-120)
Antenna Gain	2dBi (Max)
ITU code	G1D
Power Supply	DC +3.3V +/-5%
Method of Frequency Generation	Synthesizer

**UL Apex Co., Ltd.**

**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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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 EUT does not have its own power supply, but regulated power of 3.3V is supplied from the products of FURUNO SYSTEMS CO., LTD. Therefore, the EUT meets the requirement.

#### **FCC Part 15.203 Antenna requirement**

The modular antenna is connected to the EUT with U.FL connector, and the installation is done by the professionals. Therefore, the equipment complies with the requirement.

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### 3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	Section 15.207	-	N/A	3.3dB 29.87340MHz 29.87191MHz AV, L	Complied
2	6dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247(a)(2)	Conducted	N/A	See data.	Complied
3	Maximum Peak Output Power	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247(b)(3)	Conducted	N/A		Complied
4	Restricted Band Edges	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247 (d)	Conducted/ Radiated	N/A		Complied
5	Power Density	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247 (e)	Conducted	N/A		Complied
6	Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.247(d)	Conducted/ Radiated	N/A		[Tx] 1.0dB 336.052MHz Hori, QP [Rx] 1.2dB 336.052MHz Hori, QP

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 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  $\pm 2.6$ dB.  
The data listed in this report meets the limits unless the uncertainty is taken into consideration.  
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  $\pm 4.58$ dB(3m)/  
 $\pm 4.59$ dB(10m).  
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is  $\pm 4.60$ dB(3m)/  
 $\pm 4.62$ 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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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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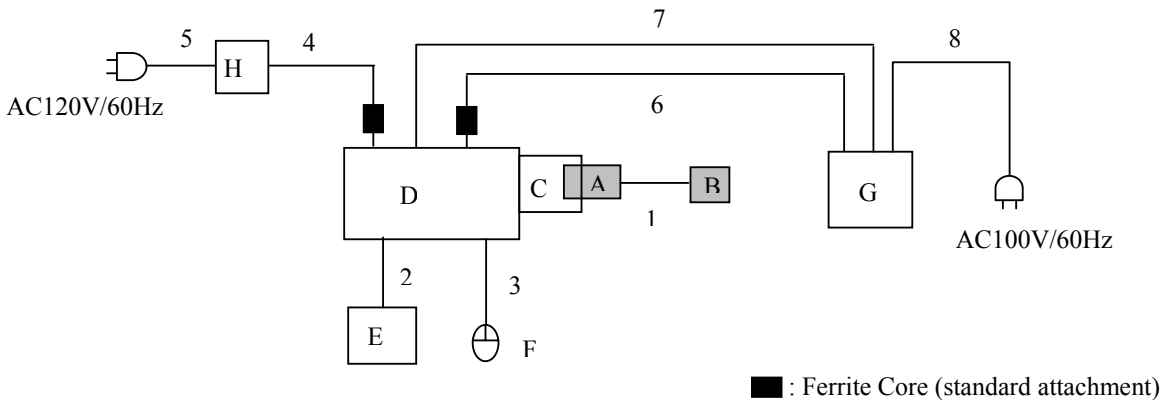
## SECTION 4: Operation of E.U.T. during testing

### 4.1 Operating Modes

The mode used for test : Transmitting mode 11b (CCK 11Mbps (Worst), Packet type: Maximum, Payload: PN9)  
- Low Channel : 2412MHz (Ch 1)  
- Mid Channel : 2437MHz (Ch 6)  
- High Channel : 2462MHz (Ch 11)

Receiving mode  
- Mid Channel : 2437MHz (Ch 6)

### 4.2 Configuration and peripherals



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

#### Description of Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	WLAN Module	ATC-BICF	44502809	Active Inc.	EUT
B	Antenna	DA150S-2450G-FS02	055	NEC / TOKIN	EUT
C	Extender	PCMCIA CF Extender	-	-	-
D	PC	BICF-PC	05	Active Inc.	-
E	Keyboard	RT6674TJP	CMI-6A3T5 A	COMPAQ	-
F	Mouse	M-S35	HCA30412727	Logitech	-
G	LCD	LL-T1501A	1A350015	SHARP	-
H	AC Adaptor	FI9603A	-	ILAN ELEC. LTD	-

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**List of cables used**

No.	Name	Length (m)	Shield	
			Cable	Connector
1	Antenna Cable	0.1	Unshielded	Unshielded
2	Keyboard Cable	1.8	Unshielded	Unshielded
3	Mouse Cable	1.8	Unshielded	Unshielded
4	DC Cable	1.1	Unshielded	Unshielded
5	AC Cable	1.8	Unshielded	Unshielded
6	Serial Cable	1.5	Unshielded	Unshielded
7	USB Cable	1.8	Shielded	Shielded
8	AC Cable	1.8	Unshielded	Unshielded

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## **SECTION 5: Conducted Emission**

### **Test Procedure and conditions**

EUT was placed on a wooden table of nominal size, 1m by 1.5m, 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.

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

Date: May 10, 2006

Test engineer: Takumi Shimada

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**UL Apex Co., Ltd.**

**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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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, 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.

#### **20dBc was applied to the frequency over the limit of FCC 15.209 and outside 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**

Date: April 19, 2006

Test engineer: Takumi Shimada

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**Head Office EMC Lab.**

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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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 power meter connected to the antenna port.

Test data : APPENDIX 3  
Test result : Pass

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

[Conducted]

### **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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