

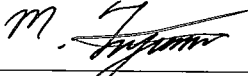
RADIO TEST REPORT

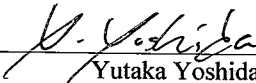
Test Report No.: 26GE0204-HO-B


Applicant : FURUNO SYSTEMS CO.,LTD.
Type of Equipment : Handy Terminal
Model No. : PI-13500-W
FCC ID : T87SS23BTXXT
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.
4. The test results in this report are traceable to the national or international standards.

Date of test: February 21 to 22, 2006

Tested by: 
Mitsuru Fujimura
EMC Services


Yutaka Yoshida
EMC Services

Approved by : 
Tetsuo Maeno
Site Manager 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 : 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 : Handy Terminal
Model No. : PI-13500-W
Serial No. : 7038-6346 for Antenna Terminal Conducted test
7038-6350 for Radiated Spurious Emission test
Country of Manufacture : Japan
Rating : Li-ion Battery: DC3.7V 1800mAh
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

Model No: PI-13500-W is the Handy Terminal.
PI-13500-W has a variant model No. PI-13503-W, and the difference between the two models is the scanning function (PI-13500-W= one-dimensional scanning, PI-13503-W=two-dimensional scanning).
There is no difference in radio specification between these models.

Clock frequency(ies) in the system : Bus:29.4912MHz, CPU_INT(Max):117.9648MHz
Equipment Type : Barcode scanner built in the head of the body reads a wide variety of barcodes. The compact body houses a large LCD panel, laser scanner, Bluetooth and 802.11b transceiver.
Frequency of Operation : 2402-2480MHz
Bandwidth & Channel spacing : 1MHz & 1MHz
Modulation : FHSS
Method of Frequency Generation : Synthesizer
Power Supply (inner) : DC 3.3V
Antenna Type : Pattern Antenna
Antenna Gain : -2 dBi

* The EUT contains FCC Granted WLAN module (Model No.:ATC-BICF, FCC ID: T87SS22BXXXM) inside. The WLAN module and Bluetooth module do not transmit simultaneously.

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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 supplied with the radio part of the EUT. Therefore, the 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	Conducted Emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	Section 15.207	-	N/A *1)	N/A	N/A
2	Carrier Frequency Separation	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.247(a)(1)	Conducted	N/A	See data.	Complied
3	20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.247(a)(1)	Conducted	N/A		Complied
4	Number of Hopping Frequency	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.247(a)(1)(iii)	Conducted	N/A		Complied
5	Dwell time	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.247(a)(1)(iii)	Conducted	N/A		Complied
6	Maximum Peak Output Power	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.247(b)(1)	Conducted	N/A		Complied
7	Band Edge Compliance	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.247(d)	Conducted	N/A		Complied
8	Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.247(d)	Conducted/ Radiated	N/A		3.7dB 2483.5MHz AV, Hor.

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.

*1) The test is not applicable since the EUT is a battery-operated device.

*These tests were also referred to FCC Public Notice DA 00-705 "Guidance on Measurement for Frequency Hopping Spread Spectrum Systems".

*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	IC: RSS-Gen 4.4.1	IC: RSS-Gen 4.4.1	Conducted	N/A	N/A	N/A

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3.4 Uncertainty

Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.58\text{dB}(3\text{m})/\pm 4.59\text{dB}(10\text{m})$.

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

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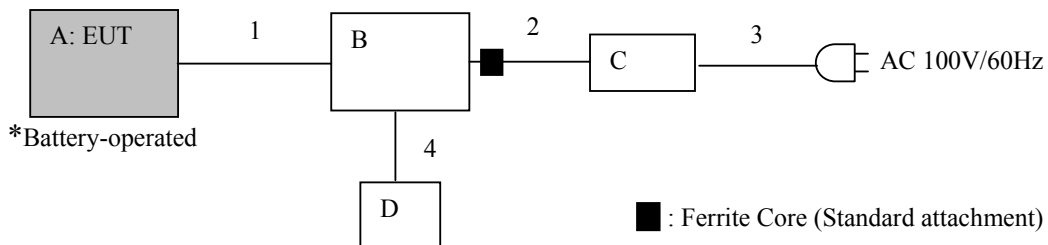
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SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode used for test : Transmitting mode(Packet size DH5, Data packet: PRBS9)
- Low Channel : 2402MHz
- Mid Channel : 2441MHz
- High Channel : 2480MHz
Inquiry mode

4.2 Configuration and peripherals



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

Description of Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Handy Terminal	PI-13500-W	7038-6346 *1) 7038-6350 *2)	SIN RYOCOH Corp.	EUT
B	Note PC	2607-10J	97-0584X	IBM	-
C	AC Adaptor	83H6340	J14HA507072	IBM	-
D	Mouse	TN-DVJKII Mouse	00053861	Tokyo Needs Co., Ltd.	-

*1) Used for Antenna Terminal Conducted test

*2) Used for Radiated Spurious Emission test

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	RS232C Cable	2.1	Unshielded	Unshielded	-
2	DC Cable	1.7	Unshielded	Unshielded	-
3	AC Cable	1.5	Unshielded	Unshielded	-
4	Mouse cable	1.5	Unshielded	Unshielded	-

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SECTION 5: 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: February 21 and 22, 2006

Test engineer: Mitsuru Fujimura

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SECTION 6: Bandwidth

Test Procedure

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

Test data : APPENDIX 3
Test result : Pass

SECTION 7: 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.

Test data : APPENDIX 3
Test result : Pass

SECTION 8: Carrier Frequency Separation

Test Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 3
Test result : Pass

SECTION 9: Number of Hopping Frequency

Test Procedure

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 3
Test result : Pass

SECTION 10: Dwell time

Test Procedure

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

Test data : APPENDIX 3
Test result : Pass

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