RADIO TEST REPORT

Test Report No. : 27DE0139-HO-A

Applicant	:	**OMRON Corporation Okayama Factory**
Type of Equipment	:	**FA Wireless LAN Unit**
Model No.	:	**WE70-AP**
FCC ID	:	**RXEWE70AP**
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: January 19 to March 3, 2007

Tested by:

Kenichi Adachi
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Approved by :

Hironobu Shimoji
Assistant Manager of
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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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SECTION 1: Client information

Company Name	:	OMRON Corporation Okayama Factory
Address	:	2075 Miyoshi Okayama-city, Okayama, 703-8502, Japan
Telephone Number	:	+81-86-276-1797
Facsimile Number	:	+81-86-276-1520
Contact Person	:	Shinji Ueno

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

2.1 Identification of E.U.T.

Type of Equipment	:	FA Wireless LAN Unit
Model No.	:	WE70-AP
Serial No.	:	279651000201 (for Radiated Emission and Conducted Emission tests) 279651000202 (for Antenna Terminal Conducted test)
Rating	:	DC 24V (20.4V to 26.4V)
Country of Manufacture	:	JAPAN
Receipt Date of Sample	:	January 19, 2007
Condition of EUT	:	Production 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 No: WE70-AP is the, FA Wireless LAN Unit (Master).
WE70-AP has a variant model: WE70-CL (Slave). It is identical to WE70-AP in radio specification
The difference between two models is the presence or absence of RSSI button (for receiving status indication) only.
(WE70-AP does not have the button, but WE70-CL does.)

Clock Frequencies are 20MHz(CPU Clock), 25MHz(LAN Clock), 80MHz(Memory Clock) and 40MHz (Wireless LAN).

IEEE802.11b / 11g / 11a WLAN

Equipment Type	Transceiver		
Frequency of Operation	11b/11g	2412MHz - 2462MHz	
	11a	Low	5180MHz - 5240MHz *1)
		Mid	5260MHz - 5320MHz *1) *2)
		Add	5500MHz - 5700MHz *1) *2)
		Upper	5745MHz - 5805MHz *1)
			5825MHz
Type of Modulation	DSSS, DBPSK, DQPSK, CCK (11b) OFDM, BPSK, QPSK, 16QAM, 64QAM, CCK (11g, 11a)		
Bandwidth	20MHz		
Channel spacing	5MHz (11b/11g), 20MHz (11a)		
Power Supply (inner)	DC 3.3V		
Antenna Connector Type	Reverse SMA connector (ANT A and ANT B)		
Antenna Information	Type : Dual Band Diversity Antenna Model name : ANT-S-789 Gain : 2.14dBi (max)		
	Type : Magnetic Pedestal Antenna *3) Model name : WE70-AT001H(OMR04-220100) Gain : 2.4GHz band: 4.5dBi (max) 5GHz band: 7dBi (max)		
	Type : Magnetic Pedestal Antenna with extension cable of 5.0m *4) Model name : WE70-AT001H (OMR04-220100) Gain : 2.4GHz band: 4.5dBi (max) 5GHz band: 7dBi (max)		

*1) Refer to 27DE0139-HO-C FCC Part 15E (FCC 15.407) report.
*2) Refer to 27DE0139-HO-E FCC Part 15E (FCC 15.407 DFS) report.
*3) Magnetic Pedestal Antenna is connected direclty with the cable of 2.0m.
*4) Magnetic Pedestal Antenna can be used with extension cable of 5.0 m (Total length of cable: 7.0m).

[Remarks]
The circuits for 2.4GHz and 5GHz bands are included in one chip of FA Wireless LAN Unit.

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 the 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
This EUT complies with the requirement of 15.203, because a unique coupling (Antenna Connector Type: Reverse SMA) is used for this EUT.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted emission	**FCC:** ANSI C63.4:2003 7. AC powerline conducted emission measurements	**FCC:** Section 15.207	-	N/A	15.3dB, 4.99553MHz, QP, N	Complied
		IC: RSS-Gen 7.2.2	**IC:** RSS-Gen 7.2.2				
2	6dB Bandwidth	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.247(a)(2)	Conducted	N/A	See data.	Complied
		IC: RSS-Gen 4.4.2	**IC:** RSS-210 A8.2(1)				
3	Maximum Peak Output Power	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.247(b)(3)	Conducted	N/A		Complied
		IC: RSS-Gen 4.6	**IC:** RSS-210 A8.4(4)				
4	Restricted Band Edges	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.247 (d)	Conducted/ Radiated	N/A		Complied
		IC: -	**IC:** RSS-210 A8.5				
5	Power Density	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.247 (e)	Conducted	N/A		Complied
		IC: -	**IC:** RSS-210 A8.2(2)				
6	Spurious Emission	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section15.247(d)	Conducted/ Radiated	N/A	**<Tx>** 2.2dB, 88.000MHz, Vertical, QP **<Rx>** 2.7dB, 88.000MHz, Vertical, QP	Complied
		IC: RSS-Gen 4.7 RSS-Gen 4.8	**IC:** RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3				
Note: UL Apex's EMI Work Procedures No.QPM05 and QPM15.							

*These tests were also referred to "Guidance on Measurement of Digital Transmission Systems Operating under 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	N/A	N/A

3.4 Uncertainty

Conducted Emission
The measurement uncertainty (with a 95% confidence level) for this test is ±2.66dB.
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 ±4.59dB(3m).
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ±4.62dB(3m).
The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ±5.27dB.
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 ±3.0dB.

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 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	N/A	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	2.0 x 2.0 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 5.4 m	-
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.

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

4.1 Operating Modes

The mode is used :
The EUT was operating in a manner similar to typical use during the tests.
IEEE 802.11b: CCK (11Mbps(worst), Payload: PN9, High power) * See Remarks.
-Transmitting mode
Low channel : 2412MHz
Middle channel : 2437MHz
High channel : 2462MHz
-Receiving mode
Mid channel : 2437MHz
IEEE 802.11g: OFDM(54Mbps(Worst), Payload: PN9, High power) * See Remarks.
-Transmitting mode
Low channel : 2412MHz
Middle channel : 2437MHz
High channel : 2462MHz
-Receiving mode
Mid channel : 2437MHz
IEEE 802.11a: OFDM(54Mbps(Worst), Payload: PN9, High power) * See Remarks.
-Transmitting mode 5825MHz
-Receiving mode 5825MHz

Remarks
Conditions : 1) Data Rate:IEEE802.11g / 11a : 6M, 9M, 12M, 18M, 24M, 36M, 48M, 54 M bps
IEEE802.11b: 1M, 2M, 5.5M, 11M bps
2) Antenna Connecter: ANT A, ANT B (same connector type)
3) Antenna Type: Dual Band Diversity Antenna
Magnetic Pedestal Antenna
Magnetic Pedestal Antenna with extension cable of 5.0m
4) High / Mid / Low power

As a result of the preliminary test, the final test was performed under the worst conditions of the above. See the below table for the details of the worst conditions.

Worst Conditions:

Test Item	IEEE802.11b	IEEE802.11g / 11a
All tests	1) Rate:11Mbps	1) Rate:54Mbps
	2) Antenna Port: ANT A	
	3) Dual Band Diversity Antenna	
	4) High power	

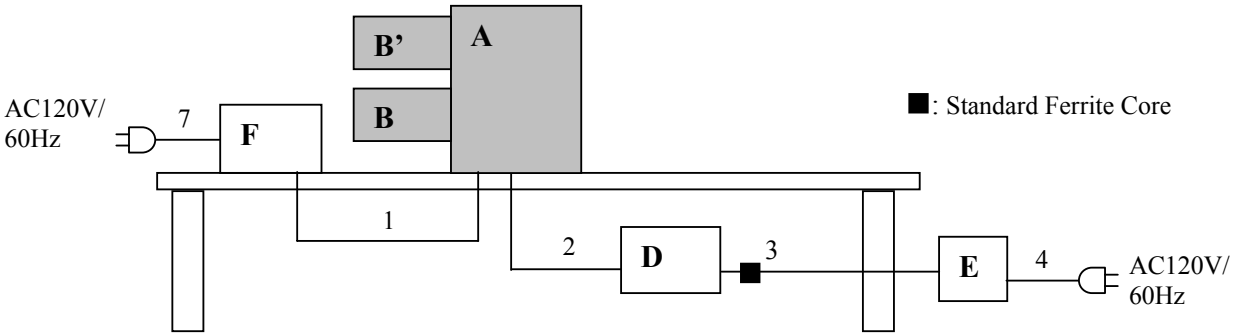
However, some test items were performed with other antennas in addition to the worst one (Dual Band Diversity Antenna). See the below table for the details.

Test Item	Tested Antenna type
Tx (11b / 11g) Middle Ch. Spurious emissions and Tx (11a) 5825MHz Spurious emissions tests.	Dual Band Diversity Antenna Magnetic Pedestal Antenna
Tx (11b / 11g) Low / High ch. BandEdge emissions tests.	Dual Band Diversity Antenna Magnetic Pedestal Antenna Magnetic Pedestal Antenna with extension cable of 5.0m

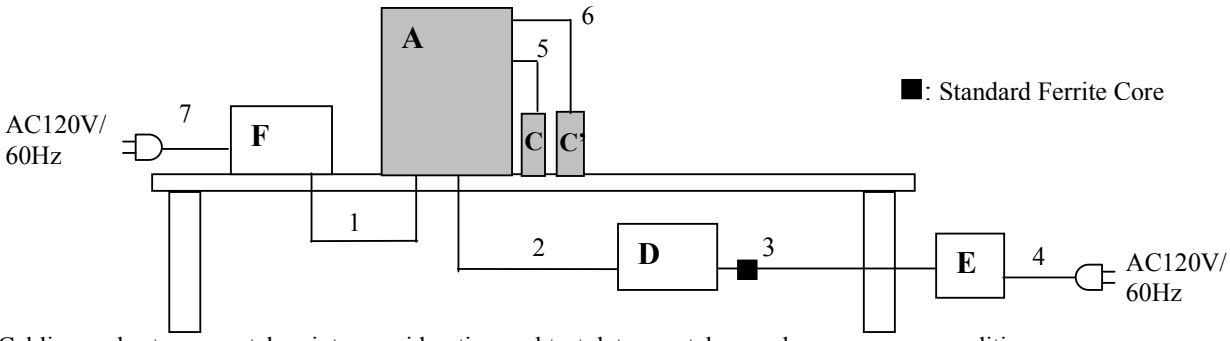
4.2 Configuration and peripherals

4.2.1 Conducted emissions/Antenna Terminal Conducted test

(1) Dual Band Diversity Antenna



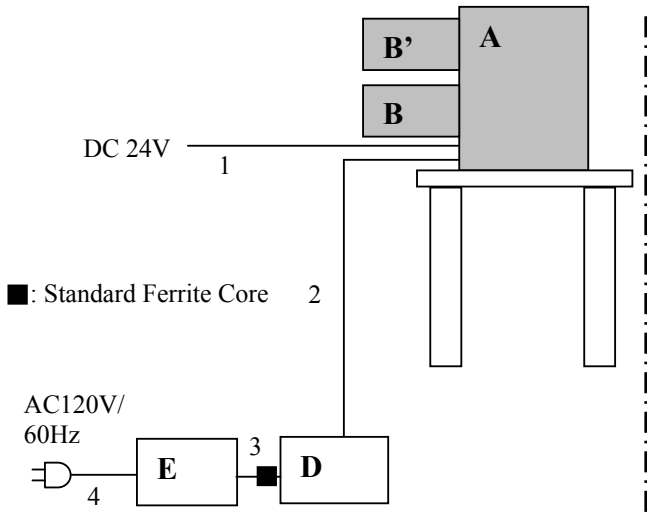
(2) Magnetic Pedestal Antenna



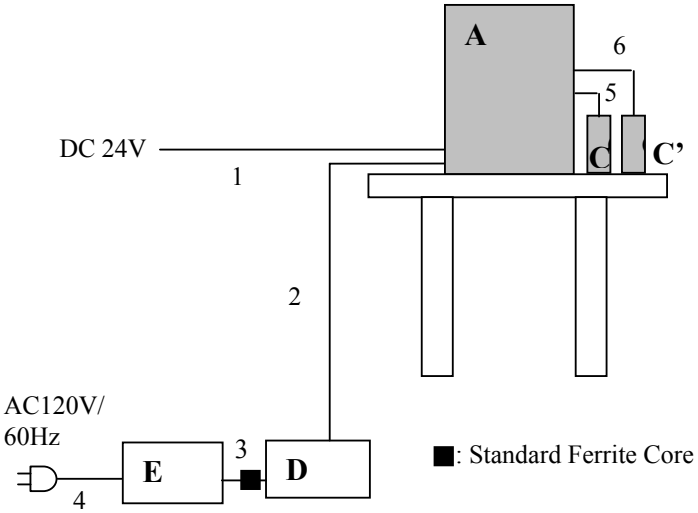
* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

4.2.2 Radiated emissions

(1) Dual Band Diversity Antenna



(2) Magnetic Pedestal Antenna



* 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	FA Wireless LAN Unit	WE70-AP	279651000201 *1) 279651000202 *2)	OMRON	EUT
B,B'	Dual Band Diversity Antenna	-	-	OMRON	EUT
C,C'	Magnetic Pedestal Antenna	-	-	OMRON	EUT
D	Personal Computer	TYPE2366-LJ7	97-99D4L	IBM	-
E	AC Adapter	02K6750	11S02K6750Z1Z2UP29ADTJ	IBM	-
F	DC power supply	6654A	MY40000510	Agilent	-

*1) for Conducted Emission and Radiated Emission tests.
*2) for Antenna Terminal Conducted test

List of cables used

No.	Name	Length (m)	Shield	
			Cable	Connector
1	DC cable	2.5	Unshielded	Unshielded
2	LAN cable	3.0	Shielded	Shielded
3	DC cable	1.8	Unshielded	Unshielded
4	AC cable	1.0	Unshielded	Unshielded
5	Antenna cable	2.0, 7.0 *3)	Shielded	Shielded
6	Antenna cable	2.0, 7.0 *3)	Shielded	Shielded
7	AC cable	2.2	Unshielded	Unshielded

*3) Without extension cable of 5.0m = 2.0m, With extension cable of 5.0m = 7.0m (2.0m + 5.0m.)

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.5m by 1.0m, 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. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

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 2
Test result : Pass

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 2
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.

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 FCC15.205.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver / Spectrum Analyzer	Spectrum Analyzer
Detector IF Bandwidth	QP: BW 120kHz(T/R) 20dBc : RBW: 100kHz VBW: 300kHz (S/A)	PK: RBW:1MHz/VBW: 1MHz 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 and EUT's antenna to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Test data : APPENDIX 2
Test result : Pass

SECTION 7: Bandwidth

Test Procedure

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

Test data : APPENDIX 2
Test result : Pass

SECTION 8: Maximum Peak Output Power

Test Procedure
The Maximum Peak Output Power was measured with a power meter (tested bandwidth: 50MHz) connected to the antenna port.
It was measured based on "Power Output Option 1" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".
Test data : APPENDIX 2
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.
It was measured based on "PSD Option 1" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ".

Test data : APPENDIX 2
Test result : Pass