REPORT ON

FCC Part 15 Testing in support of an Application for Grant of Equipment Authorisation
of a Denso LA4137 RLAN Compact Flash Card
FCC ID: PZWLA4137

Report No OR610661/2 March 2003

TÜV PRODUCT SERVICE

BABT

TUV Product Service Ltd, Segensworth Road, Titchfield
Fareham, Hampshire, United Kingdom, PO15 5RH
Tel: +44(0)1329 443459, Fax: +44(0)1329 443331
www.tuvps.co.uk

REPORT ON FCC Part 15C Testing in support of an Application for Grant of Equipment Authorisation of a Denso LA4137 RLAN Compact Flash Card

FCC ID: PZWLA4137

Report No OR610661/2

March 2003

PREPARED FOR

DENSO WAVE INCORPORATED
1-1, Showa-cho
Kariya-shi
Aichi-ken
448-8661
Japan

APPROVED BY

C H GOULD
Chief Engineer

DATED 21 March 2003

DISTRIBUTION

Denso Copy 1

Copy No. 2 (CD)

TÜV Product Service Copy 3

Copy No

Total No of Pages 16

Table of Contents

Page No

STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Radio LAN Module
APPLICANT	DENSO WAVE INCORPORATED 1-1, Showa-cho Kariya-shi Aichi-ken 448-8661 Japan
MANUFACTURERS MODEL NUMBER	LA4137 with antenna 496351-1670
SERIAL NUMBER	00A0F83CE827
TEST SPECIFICATION NUMBER	FCC Part 15 Subpart C
REGISTRATION NUMBER	OR610661
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status OR610661
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal N/A N/A
START OF TEST FINISH OF TEST	25 January 2003 13 March 2003
TEST ENGINEERS	S C Hartley P J Harrison R Henley
RELATED DOCUMENTS	ANSI C63.4 2001. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

TEST RATIONALE

The equipment comprises a WLAN Compact Flash Card, Model LA4137, manufactured by Symbol Technologies, FCC ID: H9PLA4137, and a Denso antenna, part number 496351-1670.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of Denso Wave Incorporated. Test data in this report covers performance characteristics which may have been degraded by the addition of the Denso antenna to the LA-4137 FCC ID: H9PLA4137.

For results of other tests, refer to the original test report.

Section 3 of the report details testing carried out in accordance with:

- FCC: Part 15.247(c), Radiated Electric Field Emissions
- FCC: Part 15.247(b), Maximum Peak Output Power

SYSTEM CONFIGURATION DURING EMC TESTING

The EUT was set-up simulating a typical user installation on the Alternative Open Field Test Site identified on page 23, and tested in accordance with the specification.

The EUT was set to transmit continuously on maximum output power during all testing. The EUT was installed in and powered from a laptop computer.

Testing was carried out with the EUT transmitting on the following channels.

Channel 1: 2412MHz
Channel 6: 2437MHz
Channel 11: 2462MHz

TEST SETUP PHOTOGRAPH

The photograph below shows the EUT configuration during Radiated Emission testing.

Photograph 1

EQUIPMENT INFORMATION

Equipment under Test (EUT):

Equipment:	RLAN Compact Flash Card	Antenna
Manufacturer:	Symbol Technologies	Denso Wave Inc
Type No:	LA4137	496350-3110
Serial No:	00A0F83CE827	Not serialised
Drawing Revsion:	17-21003-01, Rev 3	496350-3110, Rev 0

Instrumentation used for Emission Testing:

Instrument	**Manufacturer**	**Type No**	**EMC No**	**Cal to**
Turntable & Controller	HD GmbH	HD 050	2528	TU
Antenna Mast	Emco	1051	2182	TU
Antenna Mast Controller	Emco	1050	2090	TU
Low Noise Amplifier (1-8GHz)	Miteq	AMF-3D-001080-18-13P	2457	TU
Spectrum Analyser	Hewlett Packard	8562A	1427	10 Jan 04
Horn	EMCO	3115	2397	29 Jun 03
Signal Generator	Rohde & Schwarz	SMR40	2768	23 Feb 03
Low Noise Amplifier (8-18GHz)	Avantek	AWT 18036	1081	TU
Low Noise Amplifier (18-26GHz)	Avantek	AMT-26177-33	2072	TU
Horn	FMI	2024/20	1396	TU
Waveguide to Coax Adaptor	FMI	2093SF40	S/N 595	TU
4GHz High Pass Filter	RLC Electronics	F-100-4000-5-R	INV 04468	TU

Instrumentation used for Maximum Power measurements

Spectrum Analyzer	Rohde and Shwarz	FSEM	4034	16 Dec 03
Signal Generator	Hewlett Packard	ESG 4000A	3709	21 Jan 04
DRG Antenna	EMCO	3115	3549	29 Jun 03
Substitution DRG Antenna	EMCO	3115	3777	20 Jan 04
Cable	Reynolds Industries	269-0088-3000	CS0567	TU
Cable	Rosenberger	FA210B-1-070M	CS0535	TU

TU - Traceability Unscheduled

RADIATED ELECTRIC FIELD EMISSIONS (Tranmitter Portion)

TEST PROCEDURE

Testing to the requirements of FCC Part 15 Subpart C, Section 15.247(c), for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed on page 23.

Measurements were carried out only with respect to the transmitter portion of the EUT as the digital portion of the equipment was not deemed to have been affected by the addition of the Denso antenna, and was already covered by the original test report on the LA-4137, FCC ID H9PLA4137.

A preliminary profile of the Radiated Electric Field Emissions was obtained by operating the Equipment Under Test (EUT) on a remotely controlled turntable within a semi-anechoic chamber; measurements were taken at a 3m distance unless otherwise stated. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 1 GHz to 25GHz. The list of worst case emissions was then confirmed or updated under Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. Emissions levels were then formally measured a peak and average detector.

The test was performed in accordance with ANSI C63.4.

Measurements were made with the EUT transmitting on the following channels.

Channel 1: 2412MHz
Channel 6: 2437MHz
Channel 11: 2462MHz

Radiated Emission from 1GHz to 25GHz were made using a Hewlett Packard 8562A Spectrum Analyser.

RADIATED ELECTRIC FIELD EMISSIONS (cont'd)

TEST RESULTS

Equipment Designation : Intentional Radiator.

The EUT met the requirements of FCC Part 15.247(c) for Radiated Electric Field Emissions.

The emissions were measured at 3m unless otherwise indicated.

EUT Tx on Bottom Channel (2.412GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
2.368	V	100	162	55.4*	74.0	44.7*	54.0
3.670	H	100	120	33.4*	74.0	21.2*	54.0
4.076	V	118	242	54.1	74.0	52.2	54.0
4.824	V	114	215	47.8	74.0	35.3	54.0

EUT Tx on Middle Channel (2.437GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
3.751	H	100	120	36.8*	74.0	24.7*	54.0
4.126	V	100	125	53.4	74.0	52.4	54.0
4.874	V	110	073	57.7	74.0	45.0	54.0
7.311	V	117	216	46.2*	74.0	34.8*	54.0

* Measurements taken a 1m and results extrapolated to 3m

RADIATED ELECTRIC FIELD EMISSIONS

TEST RESULTS(cont'd)

EUT Tx on Top Channel (2.462GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
2.484	V	100	120	56.7*	74.0	45.9*	54.0
3.802	H	100	120	34.5*	74.0	23.5*	54.0
4.176	V	115	245	52.6	74.0	50.8	54.0
4.550	V	110	050	36.1*	74.0	25.8*	54.0
4.924	V	110	070	50.0	74.0	37.0	54.0
7.386	V	110	216	41.4*	74.0	28.7*	54.0

* Measurements taken a 1m and results extrapolated to 3m

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: S C Hartley and P J Harrison, EMC Engineers.

Signatures:

Date: 25 January 2003

MAXIMUM PEAK OUTPUT POWER

TEST PROCEDURE

Testing to the requirements of FCC Part 15 Subpart C, Section 15.247(b)(1), for Maximum Peak Output Power was carried out.

The Spectrum Analyser was tuned to the test frequency. The device Output power setting was controlled via the 'Test Mode' on each handset being set to the conditions specified in the Summary on page 5 of this document. The device was then rotated through 360 degrees until the highest power level was observed in both planes of polarisation. The device was then replaced with a substitution antenna, the signal to the antenna was adjusted to equal the related level detected from the device.

Maximum Peak Output Power measurements were made with the EUT set to continuous transmit at maximum power on the following channels:

Channel 1: 2412MHz
Channel 6: 2347MHz
Channel 11: 2462MHz

TEST RESULTS

The EUT met the requirements of FCC Part 15.247(b)(1) for Maximum Peak Output Power, see Table 1.

MAXIMUM POWER – POWER SETTING SET ON WWC-107C TO B7

Frequency (MHz)	Raw Result (dBm)	Substitution Level (dBm)	Cable Loss (dB)	Substitution Antenna Gain (dB)	Result ERP (dBm)	Result ERP (mW)
2412	-25.10	16.10	-5.33	7.78	18.55	71.61
2437	-23.91	17.30	-5.33	7.92	19.89	97.50
2462	-26.77	14.50	-5.33	8.06	17.23	52.84

Table 1

Calculations: The figures in Watts in the above table were calculated using the formula:

$$\text{EIRP in Watts} = \frac{10^{\left(\frac{dBm}{10}\right)}}{1000}$$

Performed by: R Henley, EMC Engineer.

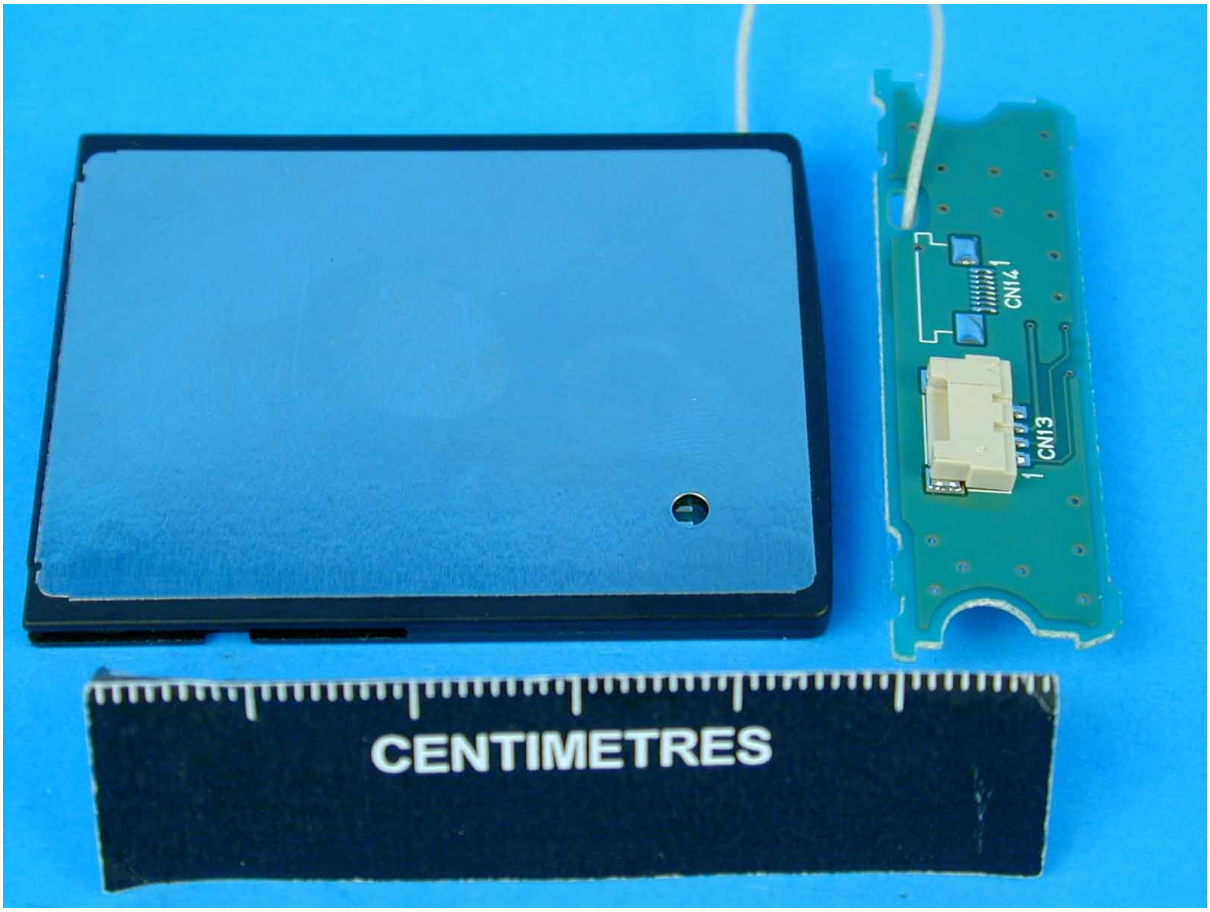
Signature: Ryan Henley.

Date: 13 March 2003

PHOTOGRAPHS OF EQUIPMENT

Photograph 2
View of LA-4137 and antenna 496351-1670

PHOTOGRAPHS OF EQUIPMENT



Photograph 3
Reverse side of LA-4137 and antenna 496351-1670

FCC SITE COMPLIANCE LETTER

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

October 18, 2002

Registration Number: 90987

TUV Product Service Ltd
Segensworth Road
Titchfield
Fareham, Hampshire, PO15 5RH
United Kingdom
Attention: Kevan Adsetts

Re: Measurement facility located at Titchfield
Anechoic chamber (3 meters) and 3 & 10 meter OATS
Date of Listing: October 18, 2002

Gentlemen:

Your request for registration of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC rules. The information has, therefore, been placed on file and the name of your organization added to the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Thomas W Phillips
Electronics Engineer

MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems, are :-

In the frequency range 30MHz to 1000MHz

For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard EMI Receiver:-

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	+4.45dB (30-200MHz; 3m Measurements) -4.42dB (30-200MHz; 3m Measurements) +4.80dB (200-1000MHz; 3m Measurements) -3.81dB (200-1000MHz; 3m Measurements)

In the frequency range 1GHz to 25GHz

For Radiated Emissions measurements:-

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	±3.0dB (1-25GHz; 3m Measurements)

For Effective Radiated Power (ERP) measurements:-

Amplitude	±1.45dBm

0141
Group

This report relates only to the actual item/items tested.

UKAS Accreditations do not cover opinions and interpretations and any expressed herein are outside the scope of any UKAS Accreditation.

Results of tests not yet included in our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

© 2003 TÜV Product Service Limited

This report must not be reproduced without the written permission of TÜV Product Service Limited