TEST REPORT

FCC CFR 47: Part 24 Testing in support of an Application for Grant of Equipment Authorisation of the Symbol 4111-CDMA Hand Held Data Terminal

FCC ID: H9P4111CDMA

Report Number OR611456/02/Issue 2 October 2003

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REPORT ON FCC CFR 47: Part 24 Testing in support of an Application for Grant of Equipment Authorisation of a Symbol 4111-CDMA Hand Held Data Terminal

FCC ID: H9P4111CDMA

Report No OR611456/02/Issue 2

October 2003

PREPARED FOR

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APPROVED BY

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EMC Signatory

DATED 21 October 2003

DISTRIBUTION

Symbol Technologies Inc (CD)	Copy 1
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Total No of Pages 29

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with FCC CFR 47: Part 24. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

S Hartley A Guy

UKAS TESTING 0141 Group

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FCC SITE COMPLIANCE LETTER ..... ANNEX A

STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Hand Held Data Terminal
APPLICANT	Symbol Technologies Inc One Symbol Plaza Holtsville NY 11742-1300 New York United States of America
TYPE NUMBER	4111-CDMA
MANUFACTURERS MODEL NUMBER	4111-GPRS0
SERIAL NUMBER	FCC CDMA 2
HARDWARE VERSION	Rev. 3
TEST SPECIFICATION NUMBER	FCC CFR 47:Part 24, Subpart E, October 2002
REGISTRATION NUMBER	OR611456/1
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status OR611456 15th August 2003
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal N/A N/A
START OF TEST FINISH OF TEST	18th August 2003 26th August 2003
TEST ENGINEERS	A Guy S Hartley
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. Public Notice DA 00-705, March 2000

TEST RATIONALE

This report has been re-issued as Issue 2 to cover some typographical errors. This report is intended to replace the original report OR611456-02 Issued in October 2003.

The information contained within this report is intended to show verification of compliance of the Symbol Technologies Inc 4111-CDMA Hand Held Data Terminal to the requirements of FCC CFR 47: Part 24.

FCC ID H9P4111CDMA

The unit supplied for testing was a 4111-CDMA hand held data terminal, which offers CDMA functionality, 2.4GHz 802.11b Wireless LAN and Bluetooth connectivity.

The terminal utilizes the Motorola C18 CDMA module to offer CDMA functionality. Also included in the terminal is the approved LA-4137 Symbol Compact Flash 802.11b RLAN radio card and the 21-58466 Symbol Bluetooth module. FCC ID numbers are detailed below:

Type:	Description	Approval	FCC ID	Date
C18	Motorola CDMA module,	FCC CFR 47: Part 24	IHDT56CW1	24/03/2003
LA4137	Symbol Compact Flash RLAN Radio	FCC CFR 47: Part 15	H9PLA4137	21/03/2000
21-58466	Symbol Bluetooth Module	FCC CFR 47: Part 15	H9PSNAPPER	10/11/2002

This report details testing carried out in accordance with:

- FCC CFR 47: Part 24.238, Radiated Emissions
- FCC CFR 47: Part 24.232 (b), Maximum Peak Output Power

Location Of Testing

BABT Engineers, Steve Hartley, and Anthony Guy, conducted all testing at the premises BABT, Segensworth Road, Fareham, Hampshire, PO15 5RH. Spurious Radiated Emissions measurements were performed in a 3 metre Anechoic Chamber. A complete site description is on file with the FCC Laboratory Division, Registration Number: 90987. See Annex A.

SYSTEM CONFIGURATION DURING EMC TESTING

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

In accordance with FCC 47 CFR; Part 24.2389(c), testing has only been performed on upper and lower channels only.

The test software in the EUT enabled the Test Engineer to select full power and continuous transmit on the following channels;

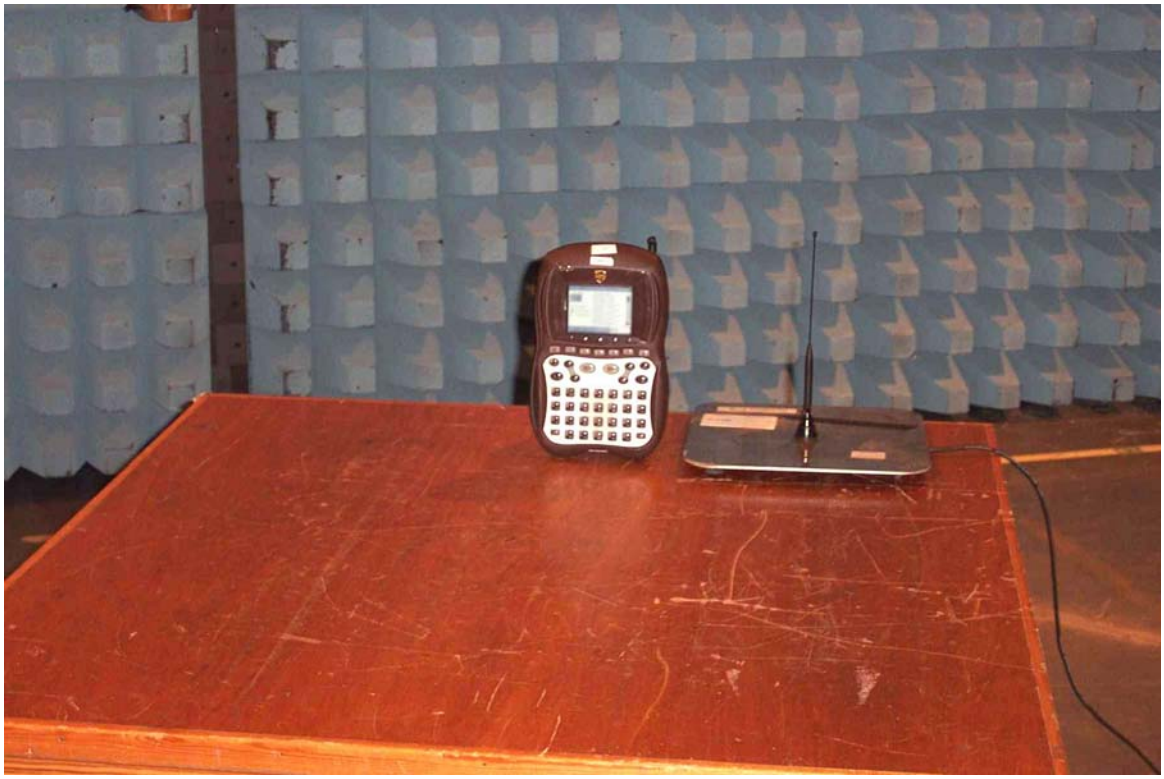
CDMA 1900 functionality

Channel 25: TX Freq 1851.25MHz, RX Freq 1931.25MHz
Channel 1175: TX Freq 1908.25MHz, RX Freq 1988.75MHz

The Output Power level (controlled by application software) was set to “All Up”.

TEST SETUP PHOTOGRAPH

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



Photograph 1

EQUIPMENT INFORMATION

Equipment under Test (EUT):

Equipment:	4111-CDMA Hand Held Data Terminal
Manufacturer:	Symbol Technologies Inc
Type No:	4111-CDMA
Model No.	4111-GPRS0
Serial No:	FCC CDMA 2
Drawing Revision:	Rev. 3

Instrumentation used for Emission Testing:

Instrument	Manufacturer	Type No	EMC No	Cal to
Screened Enclosure	Siemens	EAC 54300	2533	TU
Turntable & Controller	HD GmbH	HD 050	2528	TU
Antenna Mast	Emco	2070	-	TU
Antenna Mast Controller	Emco	2090	-	TU
Test Receiver	Hewlett Packard	8542E	2286	13 Dec 03
Bilog Antenna	Chase	CBL 6143	2860	11 Apr 04
Test Receiver	Rhode and Schwarz	ESIB 40	2917	04 Feb 04
Horn	EMCO	3115	2297	04 July 04
Horn (1 - 18GHz)	EMCO	3115	2397	04 July 04
Horn (18GHz - 40GHz	Advanced Microtek	AM180HA-K-TU2	2945	20 May 04
Signal Generator	Hewlett Packard	8673B	953	05 Jun 04
Low Noise Amplifier (1 - 8GHz)	Miteq	AMF-3D-001080-18-13P	2457	TU
Low Noise Amplifier (8 - 18GHz)	Avantek	AWT 18036	1081	TU
Low Noise Amplifier (18 - 26GHz)	Avantek	AMT-26177-33	2072	TU
3GHz High Pass Filter	RLC Electronics	F-100-3000-5-R	INV 04467	TU
Barometer	diplex	-	1938	TU
Test Receiver	Rohde & Schwarz	ESIB 26	2958	05 Aug 04
Signal Generator	Marconi	2031	1979	21 Nov 03
Hygrometer	Rotronic	A1	INV4066	28 Nov 03

Instrumentation used for Maximum Power measurements

Instrument	Manufacturer	Type No	EMC No	Cal to
Test Receiver	Hewlett Packard	8542E	2286	13 Dec 03
Turntable & Controller	HD GmbH	HD 050	2528	TU
Antenna Mast	Emco	2070	-	TU
Antenna Mast Controller	Emco	2090	-	TU
Screened Enclosure	Siemens	EAC 54300	2533	TU
Horn	EMCO	3115	2297	04 July 04
Horn (1 - 18GHz)	EMCO	3115	2397	04 July 04
Barometer	diplex	-	1938	TU
Hygrometer	Rotronic	A1	INV4066	28 Nov 03
Test Receiver	Rohde & Schwarz	ESIB 26	2958	05 Aug 04
Signal Generator	Marconi	2031	1979	21 Nov 03

TU - Traceability Unscheduled

TEST EQUIPMENT AND ANCILLARIES USED FOR TEST - continued

Instrumentation Used For Exercising The EUT

Instrument	Manufacturer	Type No	Serial No
CDMA Test Set	Rohde and Schwarz	CMU200	DE29213

MAXIMUM PEAK OUTPUT POWER

TEST PROCEDURE

Testing to the requirements of FCC CFR 47: Part 24, Section 24.232 (b), Power and Antenna Height Limits, was carried out on the Measurement Test Facility detailed in Annex A.

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 25: TX Freq 1851.25MHz, RX Freq 1931.25MHz
Channel 1175: TX Freq 1908.25MHz, RX Freq 1988.75MHz

TEST RESULTS

The EUT met the requirements of FCC CFR 47: Part 24, Section 24.232 (b), Power and Antenna Height Limits, see the table below.

Frequency (MHz)	Result EIRP (dBm)	Result EIRP (mW)
1851.25	8.1	6.5
1908.75	7.0	5.0

Limit	<2W or <+33dBm

Table of Results for Maximum Peak Output Power

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

Performed by: S Hartley, EMC Engineer.

RADIATED EMISSIONS

SYSTEM CONFIGURATION DURING EMC TESTING

The Symbol 4111-CDMA with GSM/GPRS Radio Module was powered by its own internal battery.

A communication link was established between the EUT and a CMU200 CDMA Test Set.

TEST PROCEDURE

Testing to the requirements of FCC CFR 47: Part 24, Section 24.238, Emission Limits, was carried out on the Measurement Test Facility detailed in Annex A.

In order to determine the Radiated Emission Limits, measurements of transmitter power (P) were first carried out on the top and bottom channels using a peak detector, and the results are shown in the following table.

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. 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 30MHz to 20GHz. The list of worst-case emissions was then confirmed or updated using the FCC listed semi-anechoic chamber. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. Emissions levels were then formally measured using a peak detector. The details of the worst-case emissions were then recorded and are presented in the following tables.

All measurements made at 3m.

RADIATED EMISSIONS - continued

TEST RESULTS

The measurements of transmitter power, (P), on top and bottom channels are detailed in the table below.

Freq MHz	Res BW MHz	Vid BW MHz	Ant Pol V/H	Ant Hgt cm	EUT Azi deg	Raw PEAK dBµV	Cable loss / Amp gain dB	Antenna Factor dB	Result Peak dBµV/m
Tx Channel 25									
1851.25	1	1	V	140	156	69.5	3.2	28.3	101.0
1851.25	1	1	H	187	188	73.6	3.2	28.3	105.1
Tx Channel 1175									
1908.75	1	1	V	102	150	70.8	3.4	27.1	101.3
1908.75	1	1	H	136	0	72.5	3.4	27.1	103.0

Table of Results for Transmitter Power

The limit for spurious emissions in accordance with FCC CFR 47 24.238 is 43 + 10Log(P) down on the carrier where P is the power in Watts.

As the manufacturer's declared power is 0.32W the spurious limit is 43 +10Log(0.32) = 38dB down on the carrier.

Using the results obtained on the two channels the following limits were calculated:

Bottom channel 25: 105.1dBµV/m – 38dB = 67.1dBµV/m

Top channel 1175: 103.0dBµV/m – 38dB = 65.0dBµV/m

These limits have been used to determine Pass or Fail for the harmonics measured and detailed in the following tables.

RADIATED EMISSIONS - continued

30MHz – 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 24.238 for Radiated Emissions (30MHz – 1GHz).

EUT Tx on Bottom Channel (1851.25MHz)

30MHz – 1GHz Alternative Open Area Test Site Results: The levels of the highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m	Specification Limit
MHz	H/V	cm	deg	dBµV/m	dBµV/m
431.4	V	100	185	40.9	67.1
527.2	V	100	180	44.7	67.1
623.0	V	100	171	46.5	67.1

Table of Results for Radiated Emissions

EUT Tx on Top Channel (1908.75MHz)

30MHz – 1GHz Alternative Open Area Test Site Results: The levels of the highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m	Specification Limit
MHz	H/V	cm	deg	dBµV/m	dBµV/m
432.0	V	100	180	40.7	65.0
527.1	V	100	175	45.0	65.0
623.0	V	100	181	46.0	65.0

Table of Results for Radiated Emissions

ABBREVIATIONS FOR ABOVE TABLE

H Horizontal Polarisation V Vertical Polarisation

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

Performed by: A Guy, EMC Engineer.

RADIATED EMISSIONS - continued

1GHz - 25GHz Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 24.238 for Radiated Emissions (1GHz – 25GHz).

EUT Tx on Bottom Channel (1851.25MHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)
	Polarisation	Height	Azimuth		
GHz	H/V	cm	deg	dBµV/m	dBµV/m
4.229	V	100	0	55.7	67.1

Table of Results for Radiated Emissions

EUT Tx on Top Channel (1908.75MHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)
	Polarisation	Height	Azimuth		
GHz	H/V	cm	deg	dBµV/m	dBµV/m
1.8896	H	120	195	59.9	65.0
3.8175	H	100	250	64.0	65.0
4.3440	H	100	318	47.8	65.0
5.7260	V	100	360	62.1	65.0
7.6350	V	100	190	58.3	65.0

Table of Results for Radiated Emissions

ABBREVIATIONS FOR ABOVE TABLE

H Horizontal Polarisation V Vertical Polarisation

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

Performed by: A Guy, EMC Engineer.

PHOTOGRAPHS OF THE SYMBOL 4111-CDMA

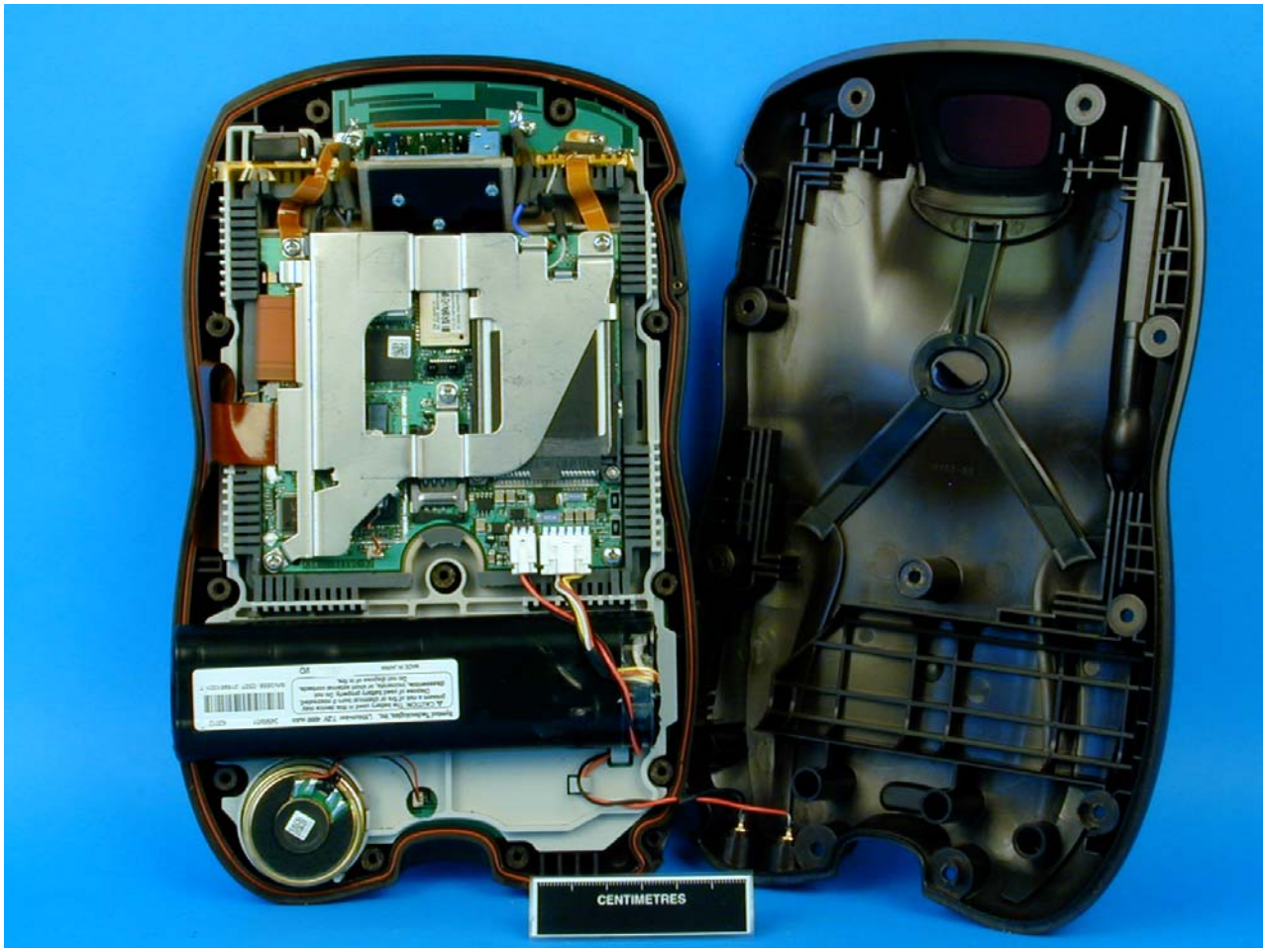
PHOTOGRAPHS OF EQUIPMENT

Photograph 2
4111-CDMA Front View

PHOTOGRAPHS OF EQUIPMENT

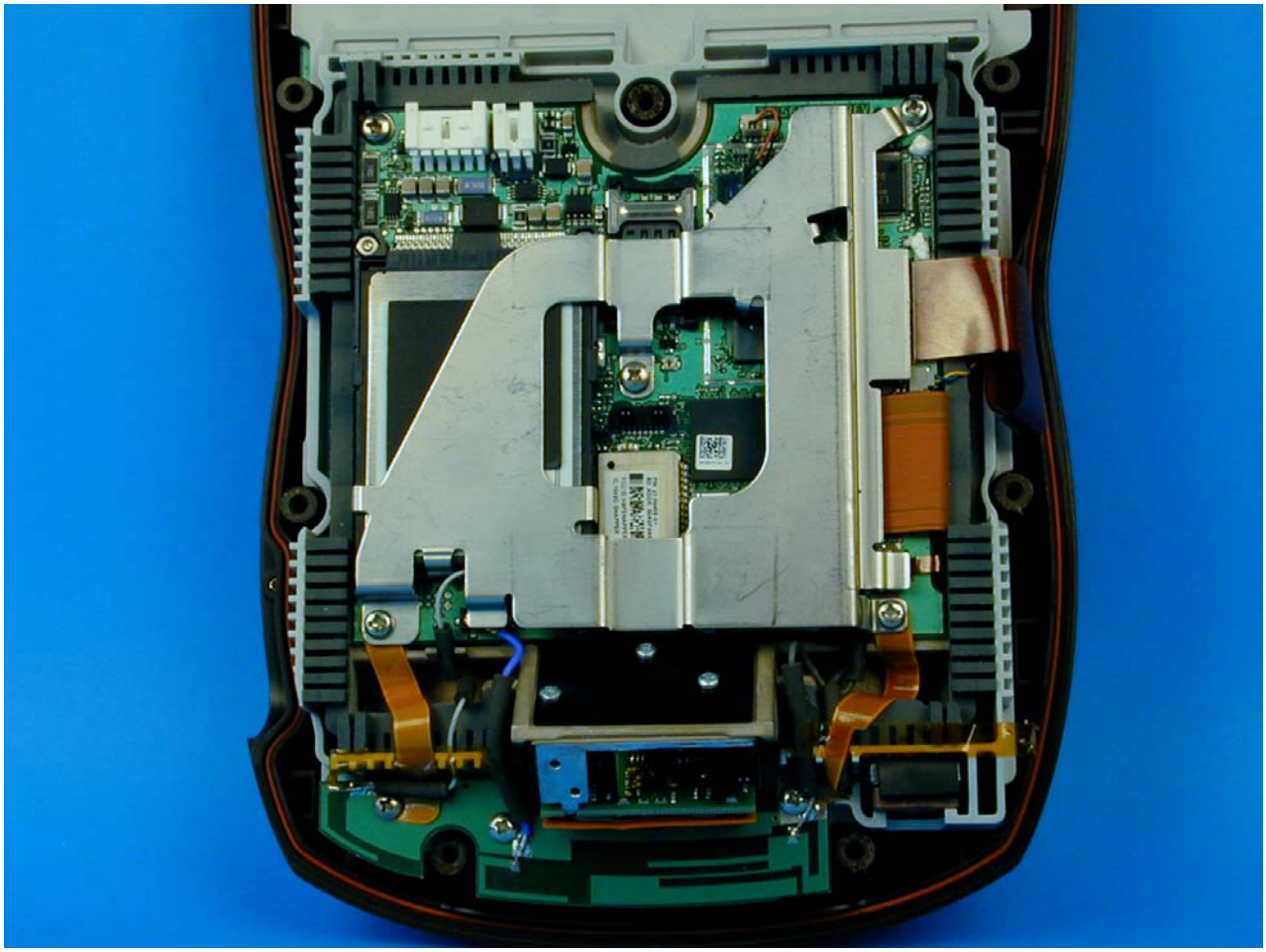
Photograph 3
4111-CDMA Rear View

PHOTOGRAPHS OF EQUIPMENT



Photograph 4
4111-CDMA Internal View

PHOTOGRAPHS OF EQUIPMENT

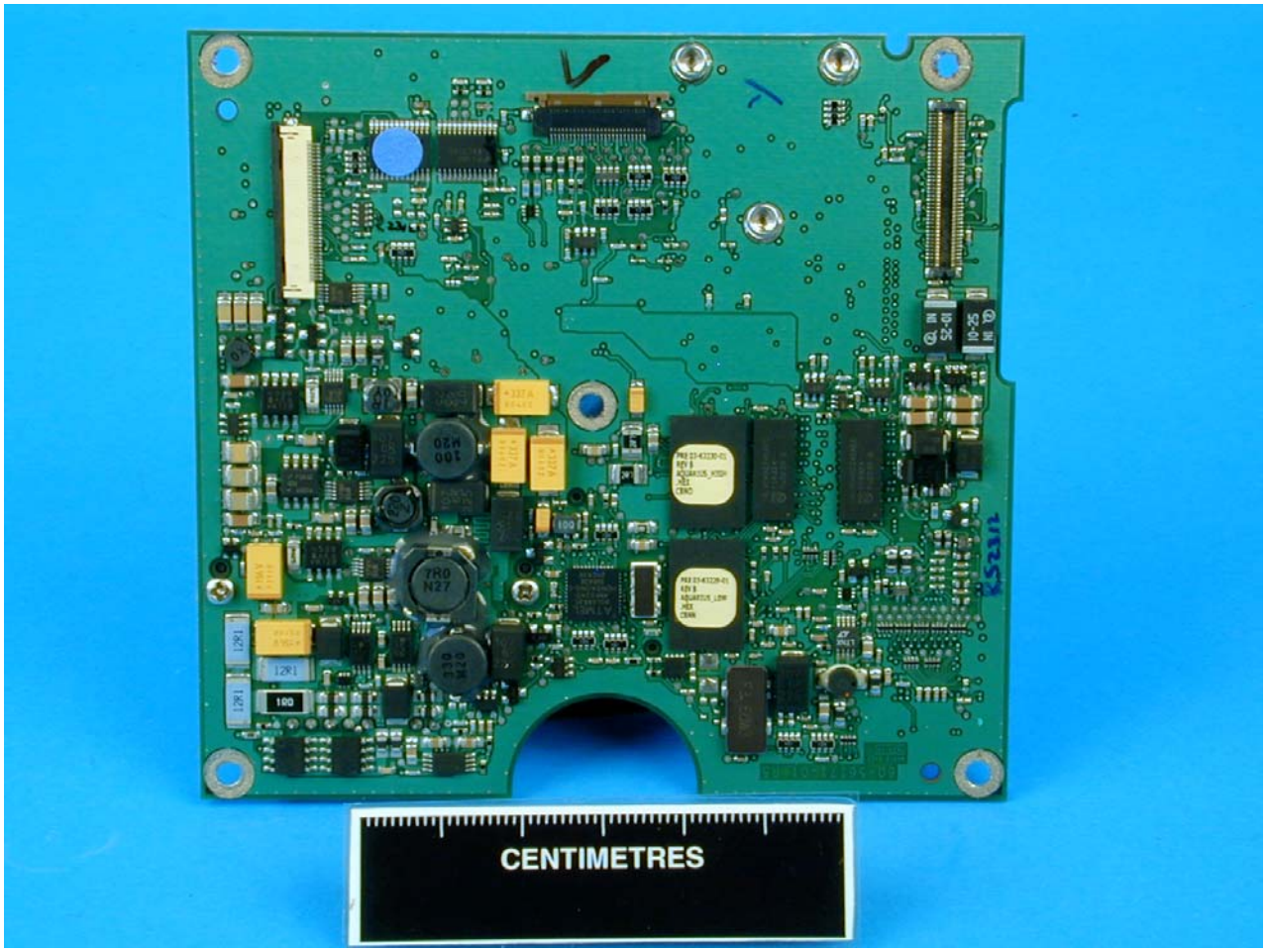


Photograph 5
4111-CDMA Internal View

PHOTOGRAPHS OF EQUIPMENT

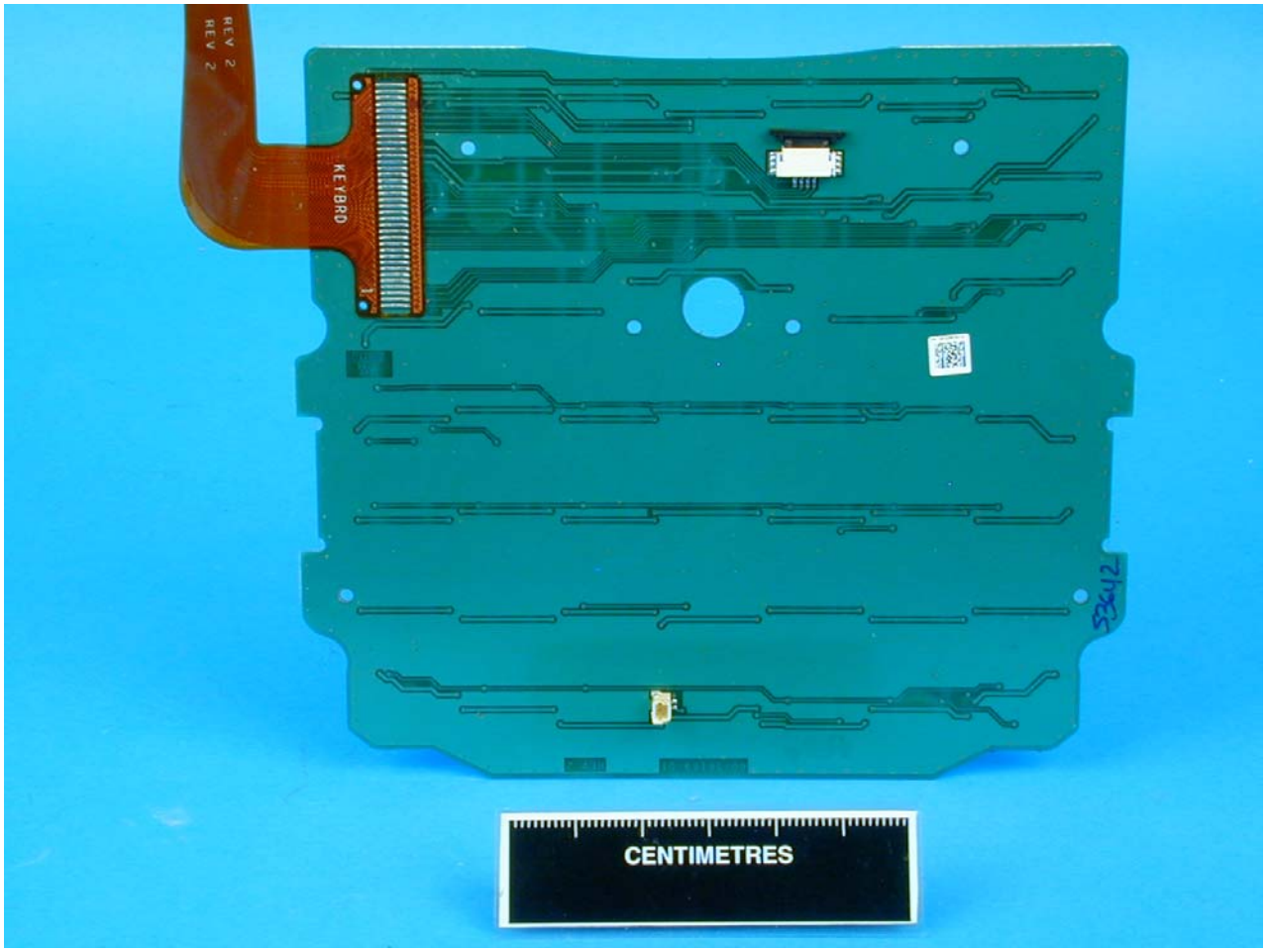
Photograph 6
4111-CDMA Internal View

PHOTOGRAPHS OF EQUIPMENT



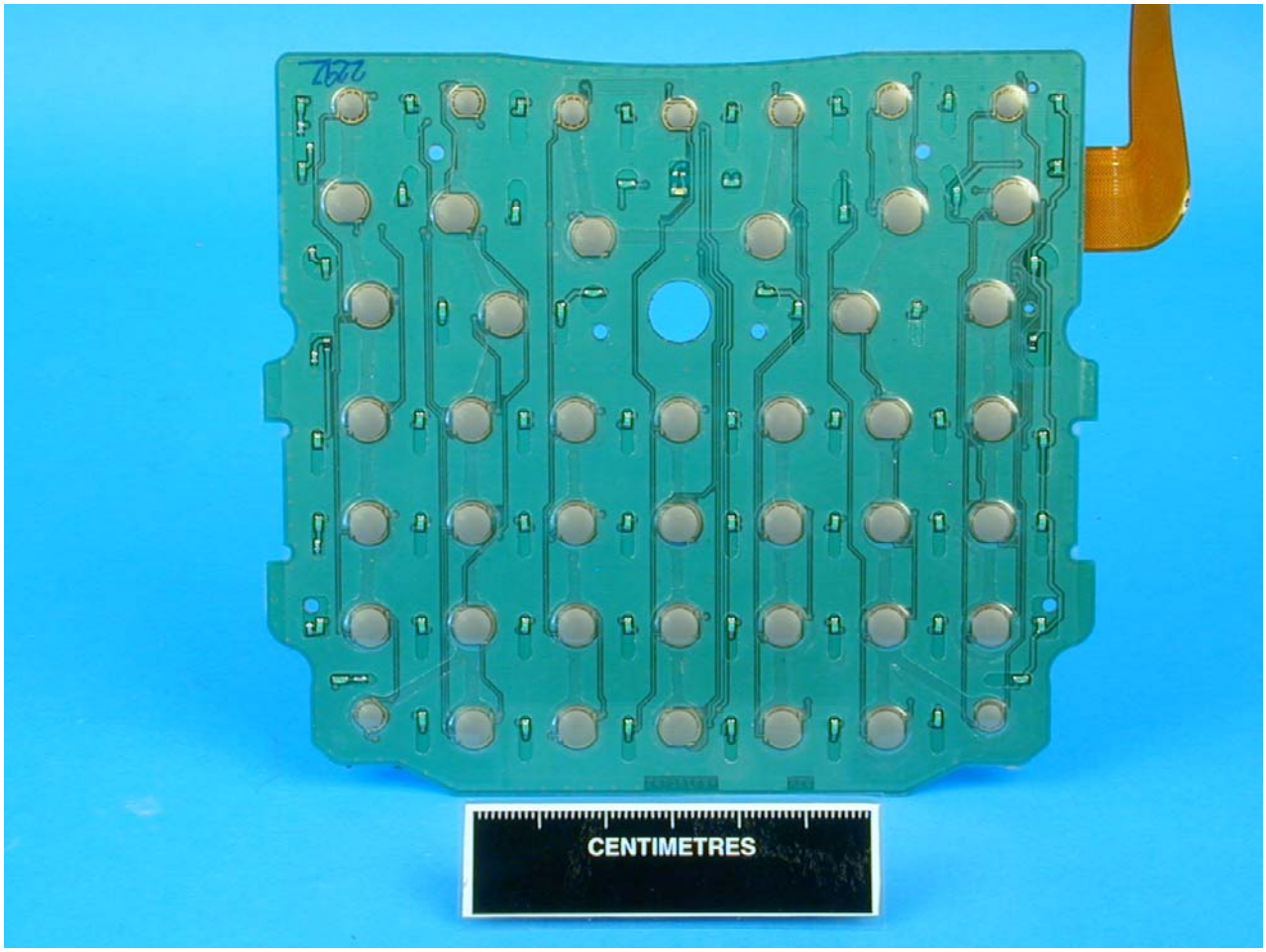
Photograph 7
4111-CDMA Internal View

PHOTOGRAPHS OF EQUIPMENT



Photograph 8
4111-CDMA Internal View

PHOTOGRAPHS OF EQUIPMENT

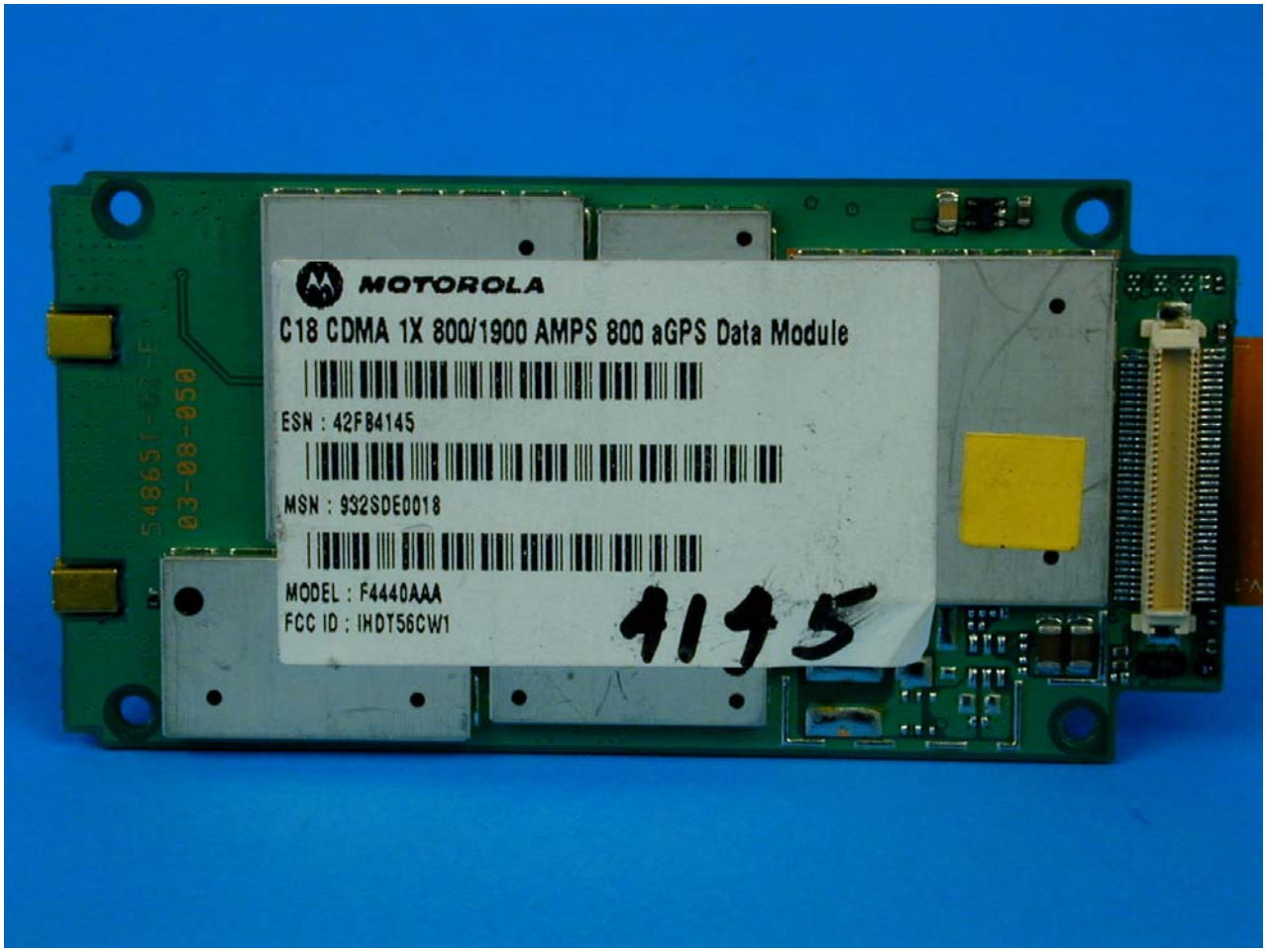


Photograph 9
4111-CDMA Internal View

PHOTOGRAPHS OF EQUIPMENT

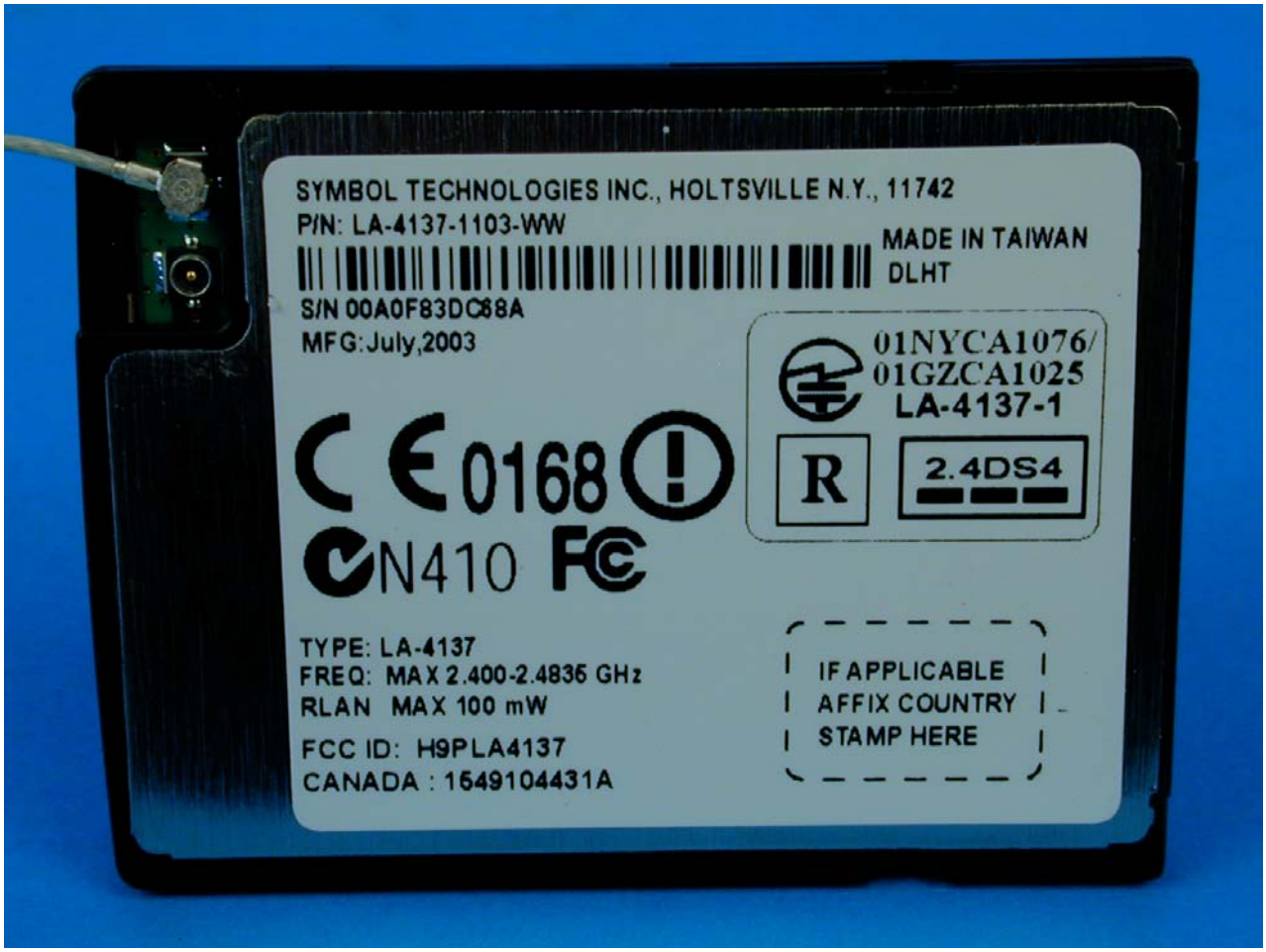
Photograph 10
4111-CDMA Internal Battery Label View

PHOTOGRAPHS OF EQUIPMENT



Photograph 11
4111-CDMA Front view of C18 CDMA Module

PHOTOGRAPHS OF EQUIPMENT

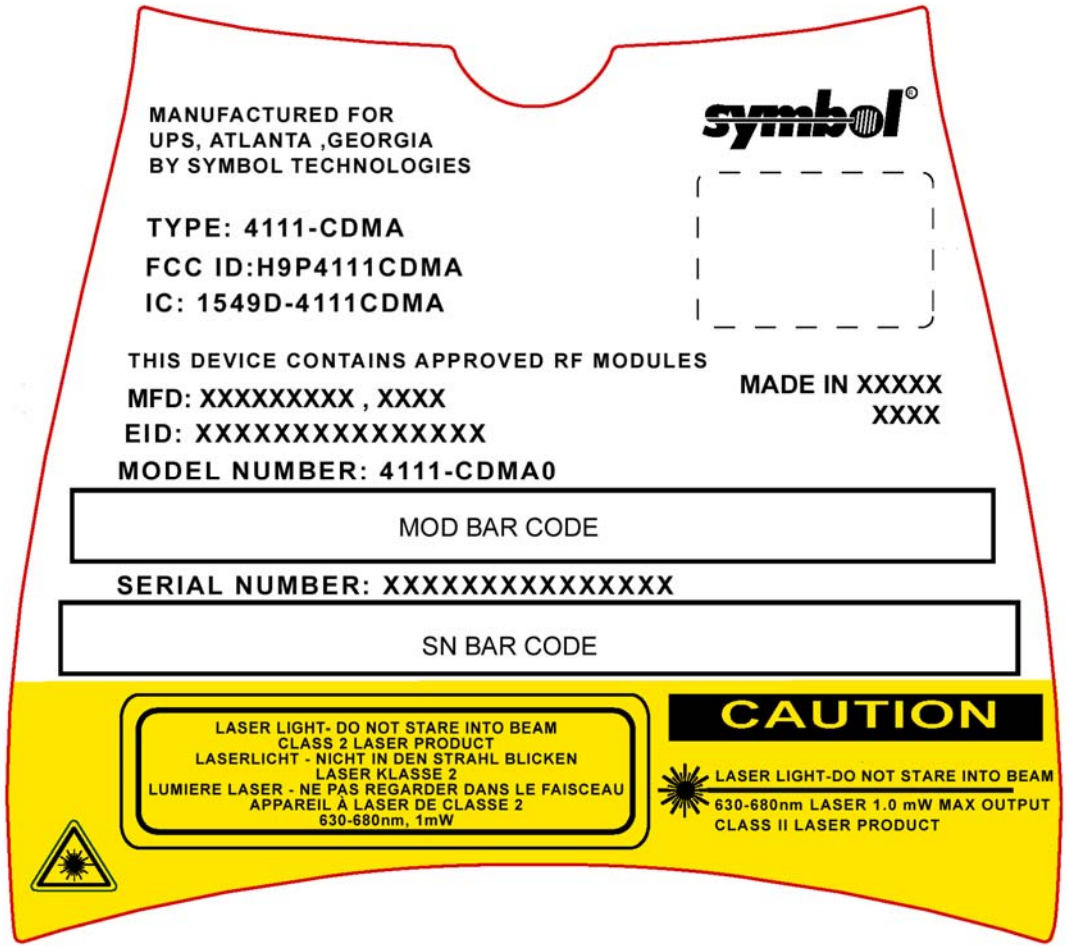


Photograph 12
4111-CDMA View of LA-4137 RLAN Card

PHOTOGRAPHS OF EQUIPMENT

Photograph 13
4111-CDMA Front View Symbol 21-58466 Bluetooth Module

MANUFACTURERS LABEL DIAGRAM



4111-CDMA Label View

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, using the Rohde and Schwarz ESIB 40 Test Receiver: -

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	±3.4dB

For Effective Radiated Power (ERP) measurements: -

Amplitude	±1.45dBm

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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).

Annex A

FCC Measurement Facility Compliance Letter

(Comprising of 1 page)

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

Thomas W Phillips
Electronics Engineer