REPORT ON

Limited FCC CFR 47: Parts 15 and 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 OR611456/04/Issue 1 October 2003

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BABT

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REPORT ON	Limited FCC CFR 47: Parts 15C and 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 OR611456/04/Issue 1 October 2003
PREPARED FOR	Symbol Technologies Inc One Symbol Plaza Holtsville NY 11742-1300 New York United States of America
APPROVED BY	Jensen Adams **J J ADAMS** **EMC Signatory**
DATED	2 October 2003
DISTRIBUTION	Symbol Technologies Inc — Copy 1 (CD) TÜV Product Service — Copy 2 Copy No Total No of Pages 26

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: Parts 15 and 24. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer;

S Hartley

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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
MANUFACTURERS TYPE NUMBER	4111-CDMA
MANUFACTURERS MODEL NUMBER	4111-GPRS0
SERIAL NUMBER	FCC CDMA 2
HARDWARE VERSION	Rev. 3
DECLARED VARIANTS	None
TEST SPECIFICATION NUMBER	FCC CFR 47: Part 15, Subpart C, August 2002 and Part 24, Subpart E, October 2002
REGISTRATION NUMBER	OR611456/01
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	S C 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. FCC Public Notice document (DA 00-705 released 30 March 2000)

TEST RATIONALE

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 15 and Part 24.

The purpose of this Test Report is to show compliance for Simultaneous Radio Operation of CDMA 1900 and Bluetooth.

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: Part15	H9PLA4137	21/03/2000
21-58466	Symbol Bluetooth Module	FCC CFR 47: Part15	H9PSNAPPER	10/11/2002

This report details testing carried out in accordance with:

- FCC CFR 47: Part 15.247(c) and Part 24.238, Radiated Emissions

Location Of Testing

BABT Engineer Steve Hartley 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.

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 600: TX Freq 1880.00MHz, RX Freq 1960.00MHz
Channel 1175: TX Freq 1908.25MHz, RX Freq 1988.75MHz

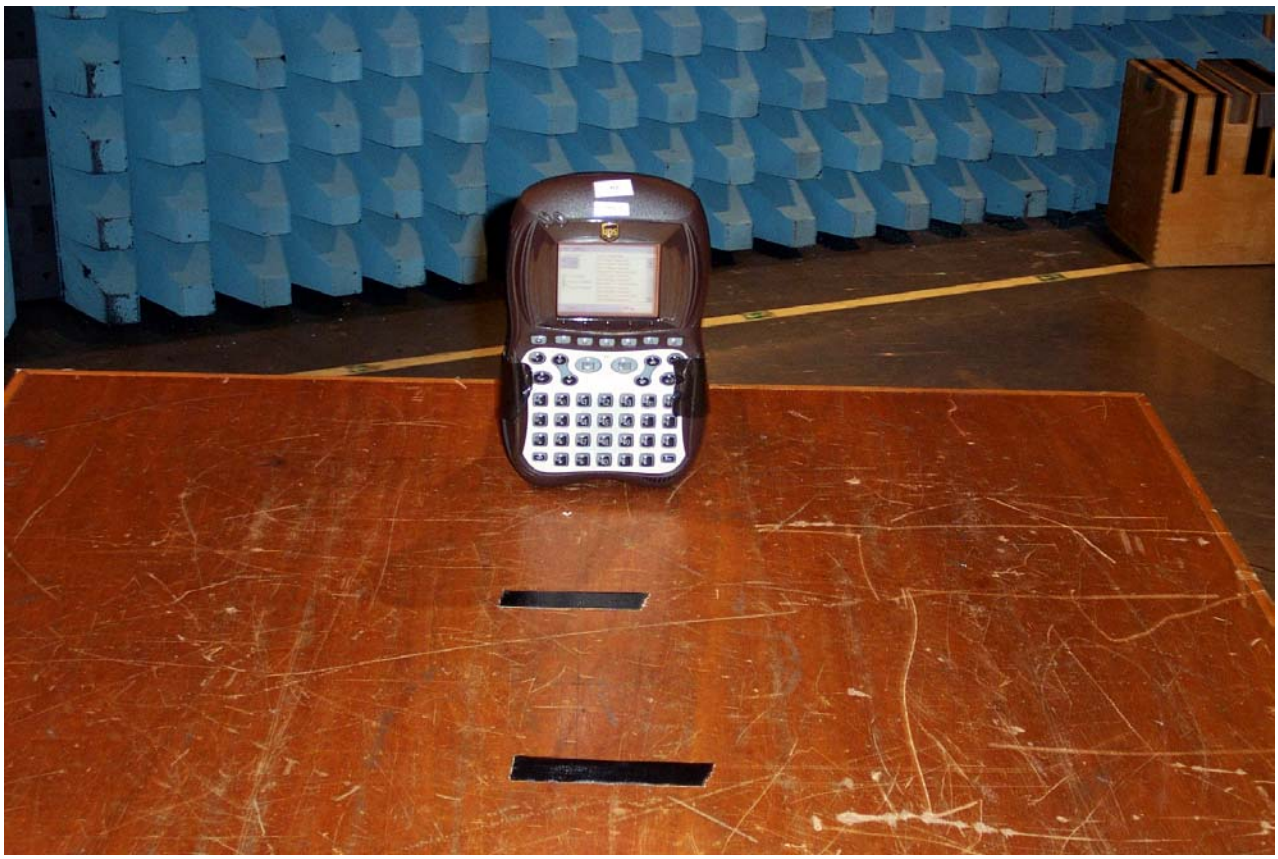
The Output Power level (controlled by application software) was set to “All Up”.

2.4GHz Bluetooth functionality

Channel 2: 2402MHz
Channel 41: 2441MHz
Channel 80: 2480MHz

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

TU - Traceability Unscheduled

Instrumentation Used For Exercising The EUT

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

RADIATED EMISSIONS: EUT in CDMA 1900 and Bluetooth Simultaneous Radio Operation

TEST PROCEDURE

Testing to the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c) and Part 24 Subpart E, Section 24.238 for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed in Annex A.

A preliminary profile of the Radiated 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 30MHz 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.

30MHz – 1GHz emissions levels were then formally measured using a CISPR Quasi-Peak detector.
1GHz – 25GHz emissions levels were then formally measured using Peak and Average detectors.

(Note: Peak measurements performed using a Resolution and Video Bandwidth of 1MHz, Average measurements performed using a Resolution Bandwidth of 1MHz and a Video Bandwidth of 10Hz)

The EUT was operating off its internal battery; the battery was replaced at regular intervals to ensure optimum performance of the EUT.

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

CDMA 1900 functionality

Channel 600: TX Freq 1880.00MHz, RX Freq 1960.00MHz

2.4GHz Bluetooth functionality

Channel 41: 2441MHz

Radiated Emissions from 30MHz to 1GHz were made using a HP 8542E Test Receiver.

Radiated Emissions from 1GHz to 25GHz were made using a Rhode and Schwarz ESIB 40 Test Receiver.

The measurements were performed at a 3m distance unless otherwise stated.

RADIATED EMISSIONS: EUT in CDMA 1900 and Bluetooth Simultaneous Radio Operation - continued

30MHz – 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Parts 15.247(c) and 24.238 for Radiated Emissions (30MHz – 1GHz).

EUT Tx on Middle Channels (CDMA 1900 functionality Channel 600:TX Freq 1880.00MHz RX Freq 1960.00MHz and 2.4GHz Bluetooth functionality Channel 41:2441MHz)

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

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m	Specification Limit	
					dBµV/m	
MHz	H/V	cm	deg	dBµV/m	Part 15.247(c)	Part 24.238
227.38	H	120	359	35.4	74.0	67.2
335.45	H	100	216	40.7	74.0	67.2
431.30	V	113	203	47.7	74.0	67.2
497.68	V	100	174	40.0	74.0	67.2
527.10	V	100	202	44.9	74.0	67.2
623.10	V	100	196	45.3	74.0	67.2

Table of Results for Radiated Emissions

ABBREVIATIONS FOR ABOVE TABLES

H	Horizontal Polarisation	V	Vertical Polarisation
Pol	Polarisation	Hgt	Height
deg	degree	Azm	Azimuth

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

Performed by: S Hartley, EMC Engineer.

RADIATED EMISSIONS: EUT in CDMA 1900 and Bluetooth Simultaneous Radio Operation - continued

1GHz - 25GHz Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Parts 15.247(c) and 24.238 for Radiated Emissions (1GHz – 25GHz).

EUT Tx on Middle Channels (CDMA 1900 functionality Channel 600:TX Freq 1880.00MHz RX Freq 1960.00MHz and 2.4GHz Bluetooth functionality Channel 41:2441MHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Specification Limit dBµV/m	
	Polarisation	Height	Azimuth			
GHz	H/V	cm	Deg	dBµV/m	Part 15.247(c)	Part 24.238
1.860	H	123	184	56.4	74.0	67.2
1.899	H	121	185	55.1	74.0	67.2
3.760	H	100	246	63.8	74.0	67.2
4.287	V	110	243	49.1	74.0	67.2

Table of Results for Radiated Emissions

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

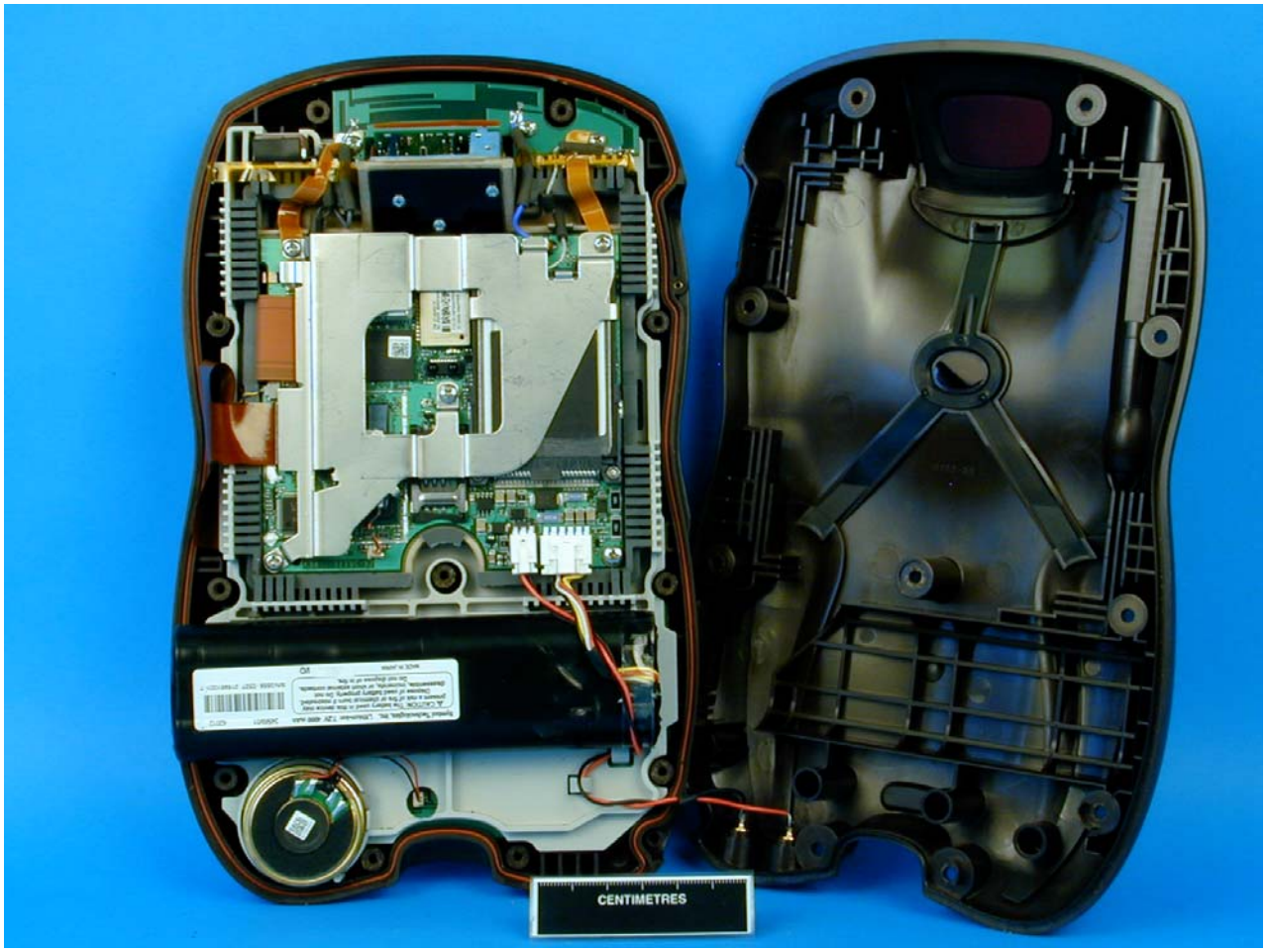
Performed by: S Hartley, EMC Engineer.

PHOTOGRAPHS OF THE 4111-CDMA

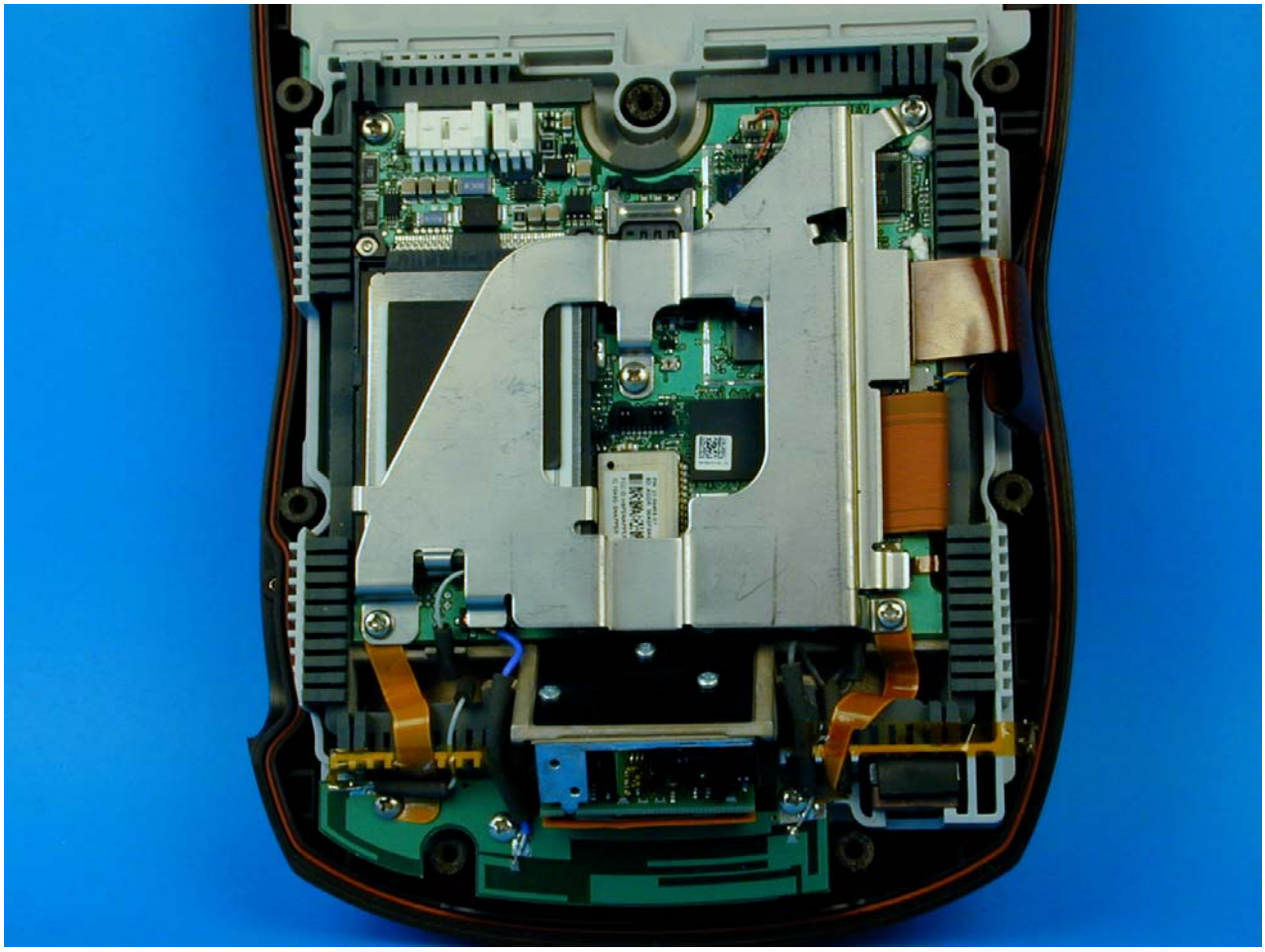
Photograph 2
4111-CDMA Front View

Photograph 3
4111-CDMA Rear View

PHOTOGRAPHS OF EQUIPMENT

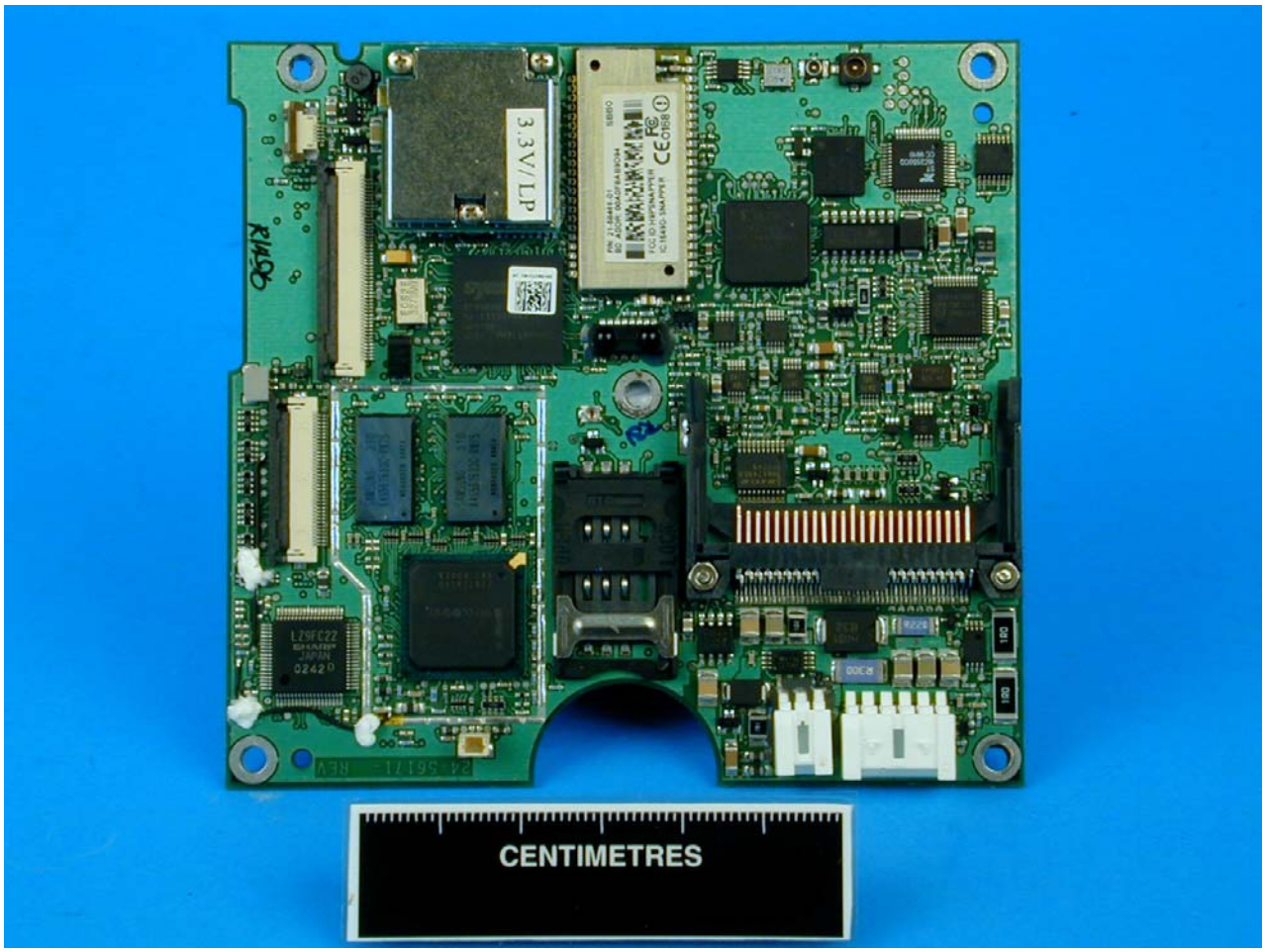


Photograph 4
4111-CDMA Internal View

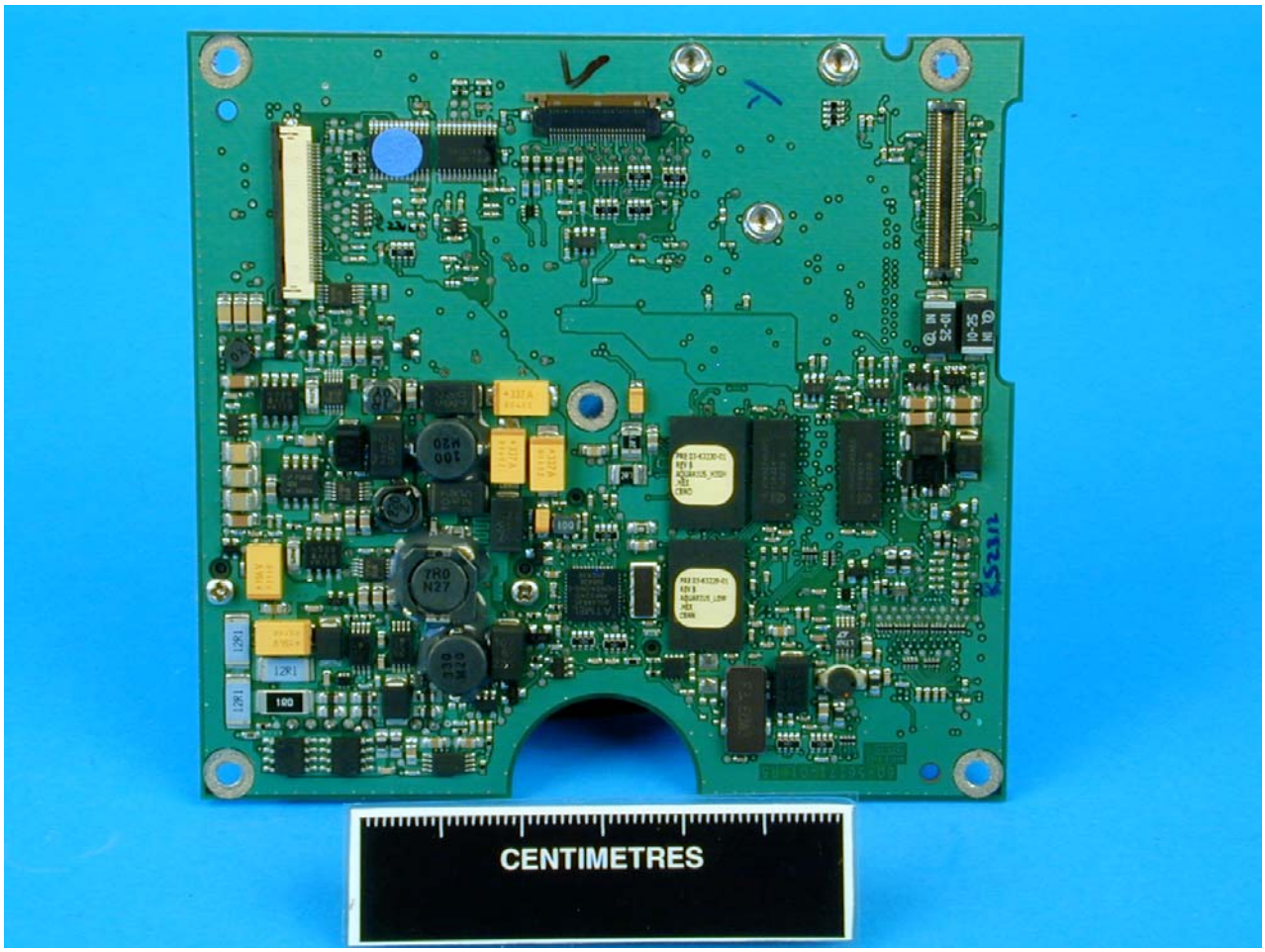


Photograph 5
4111-CDMA Internal View

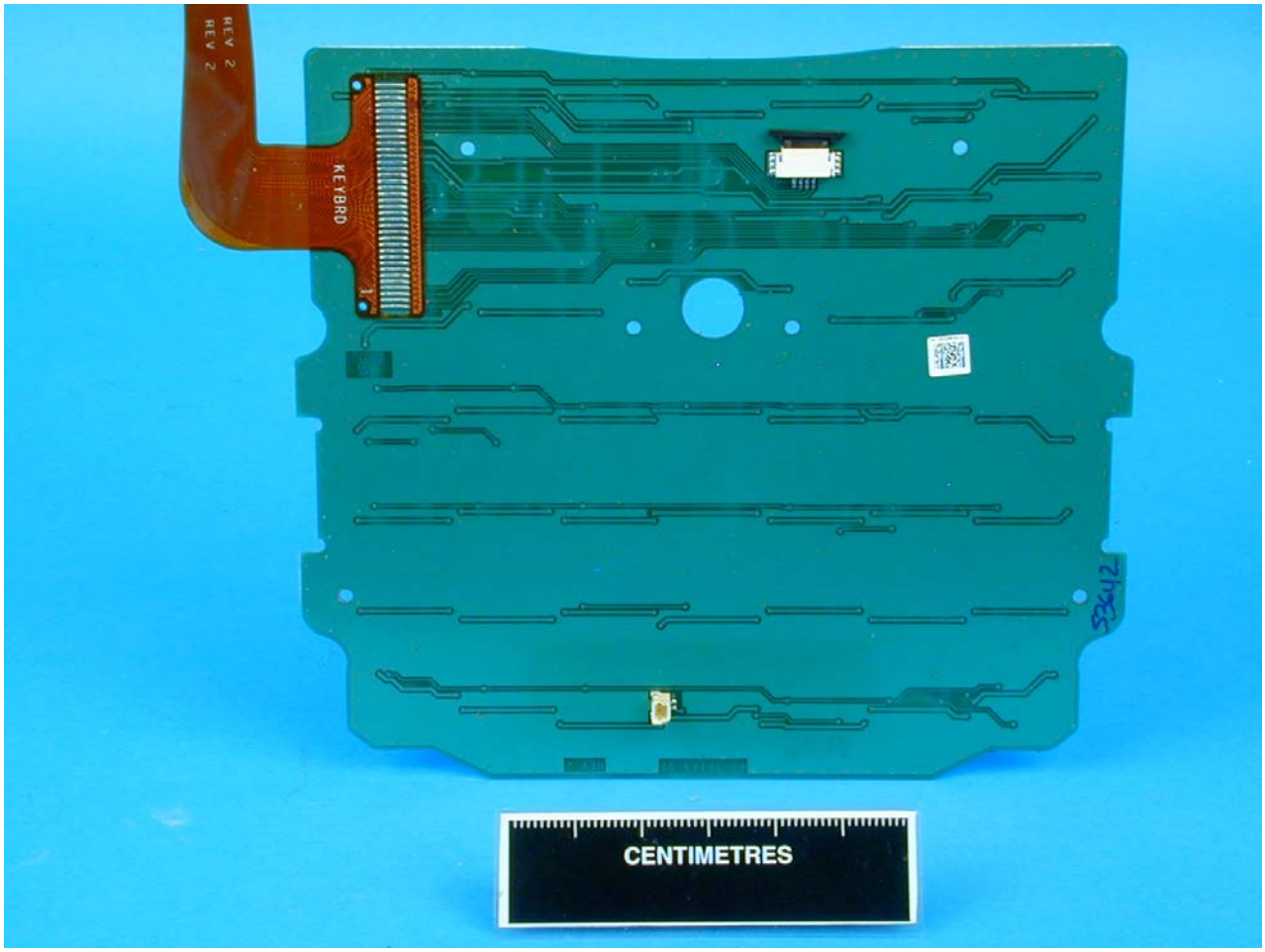
PHOTOGRAPHS OF EQUIPMENT



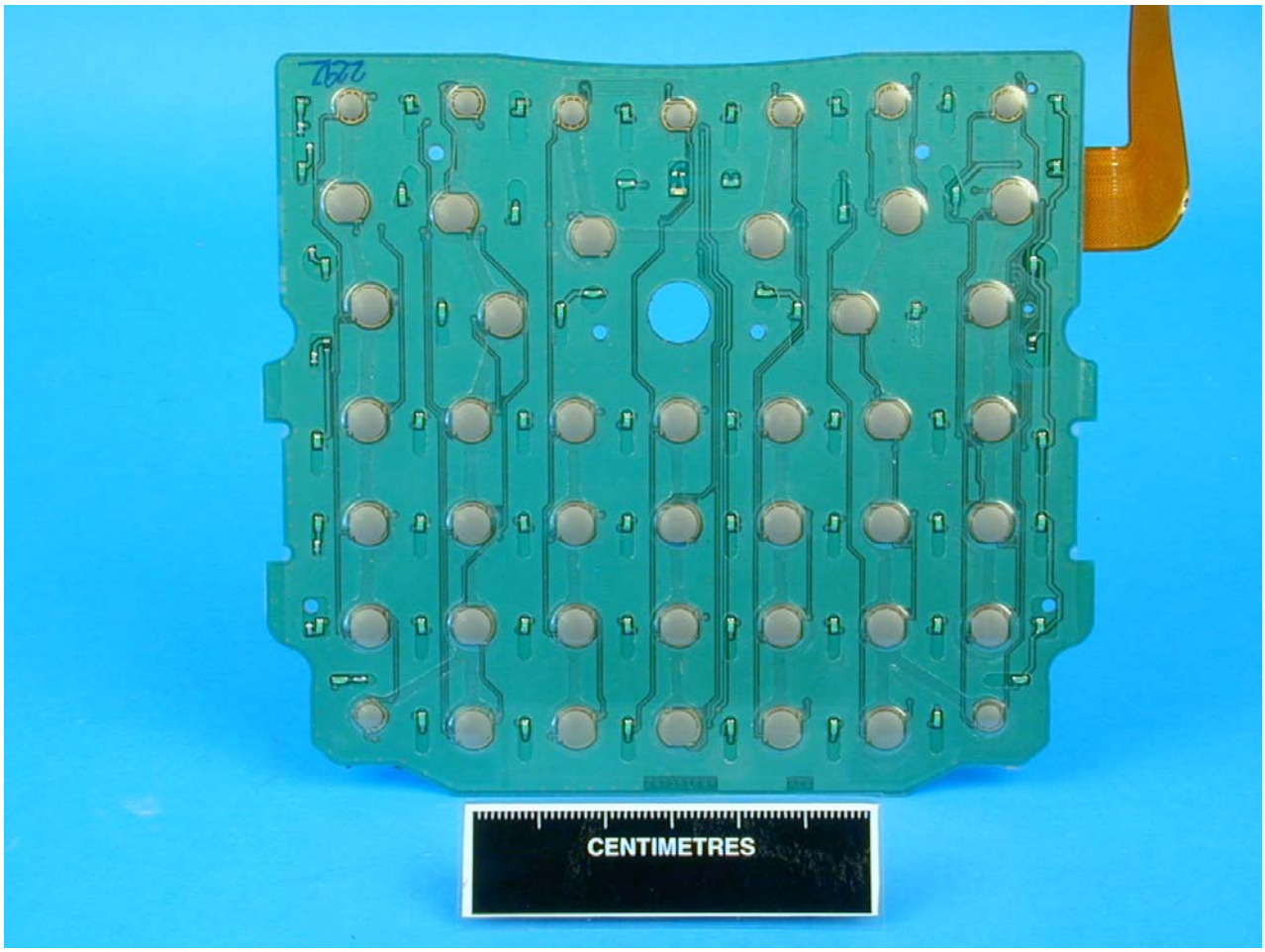
Photograph 6
4111-CDMA Internal View



Photograph 7
4111-CDMA Internal View

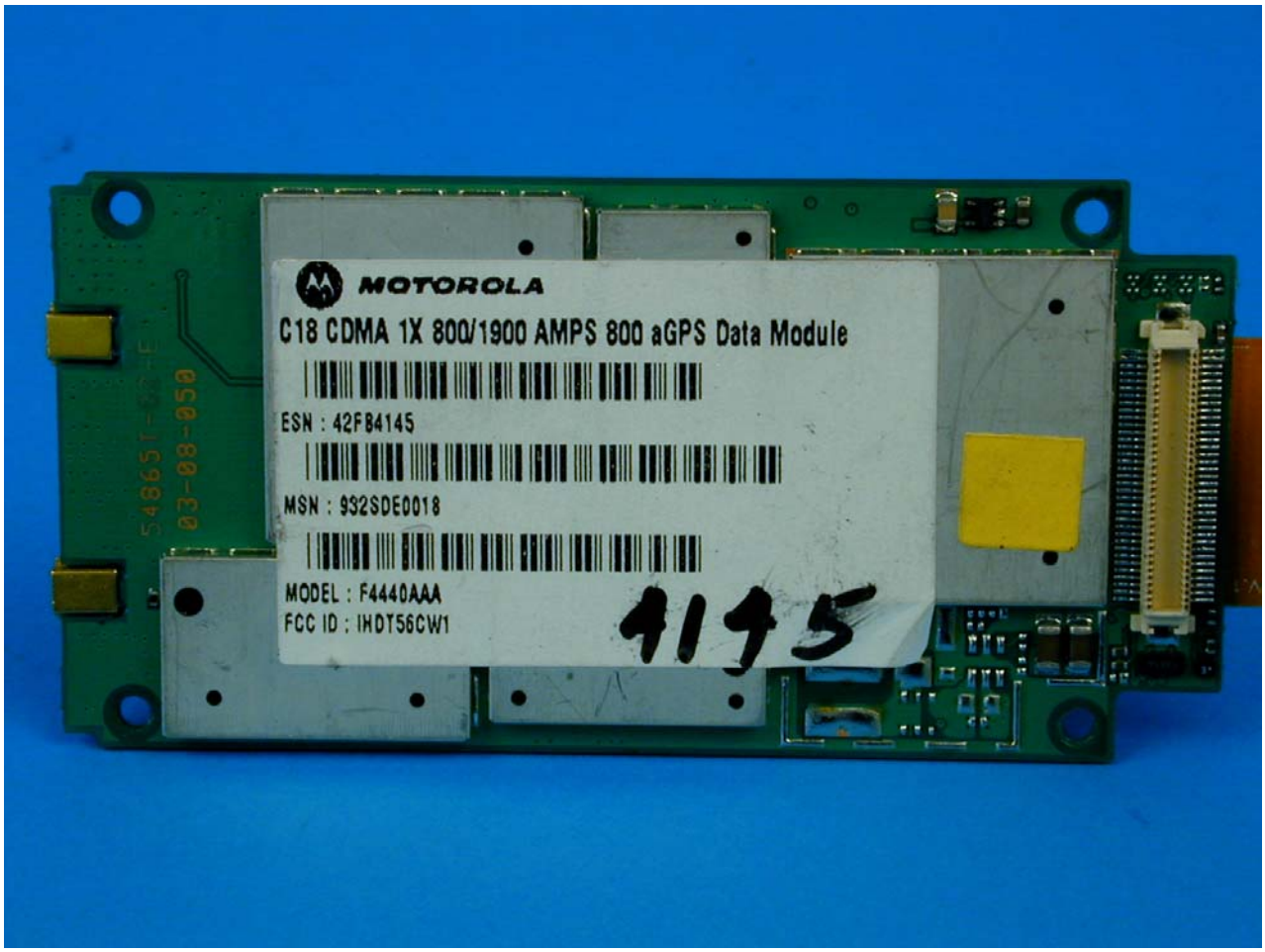


Photograph 8
4111-CDMA Internal View

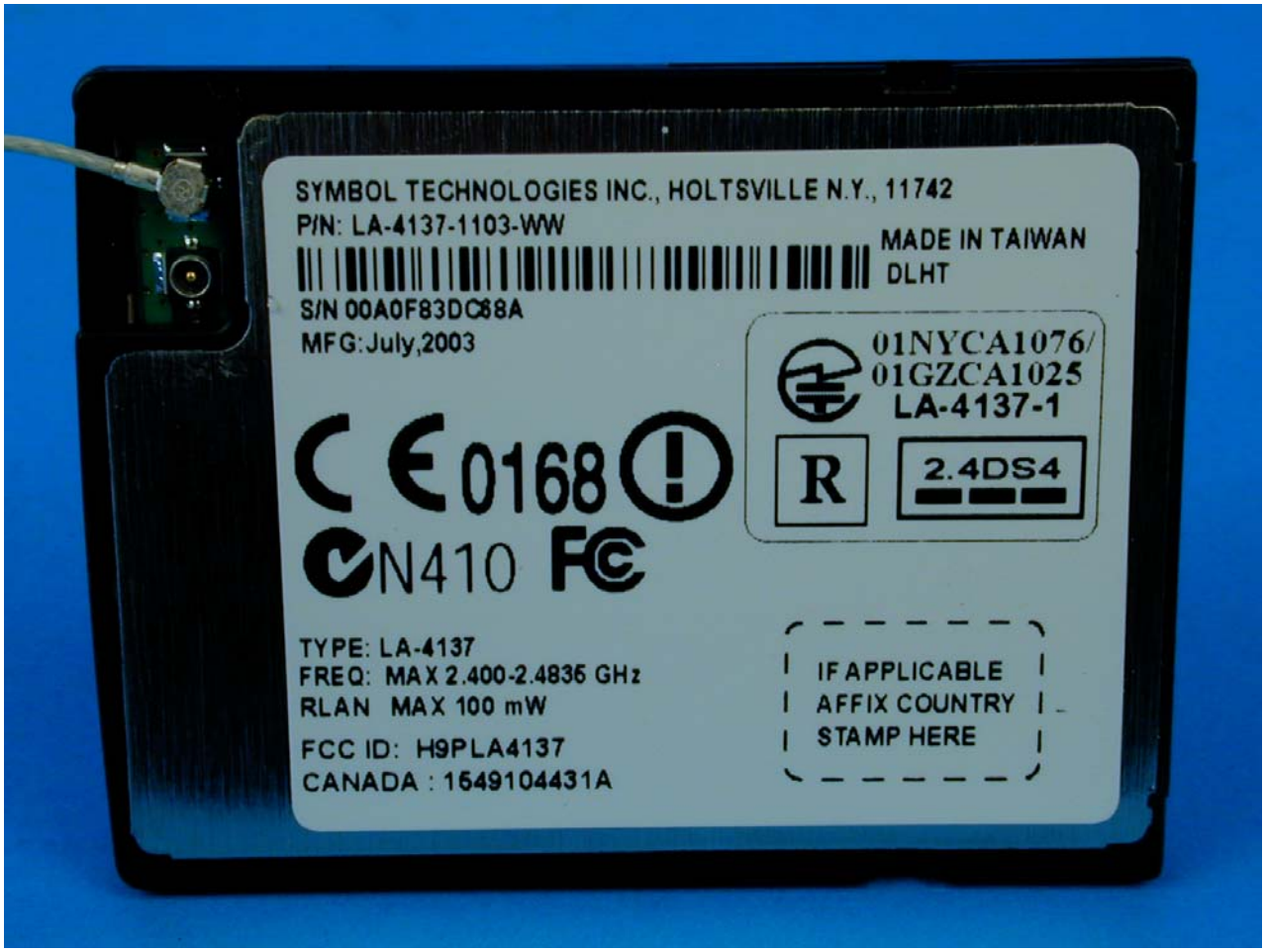


Photograph 9
4111-CDMA Internal View

Photograph 10
4111-CDMA Internal Battery Label View



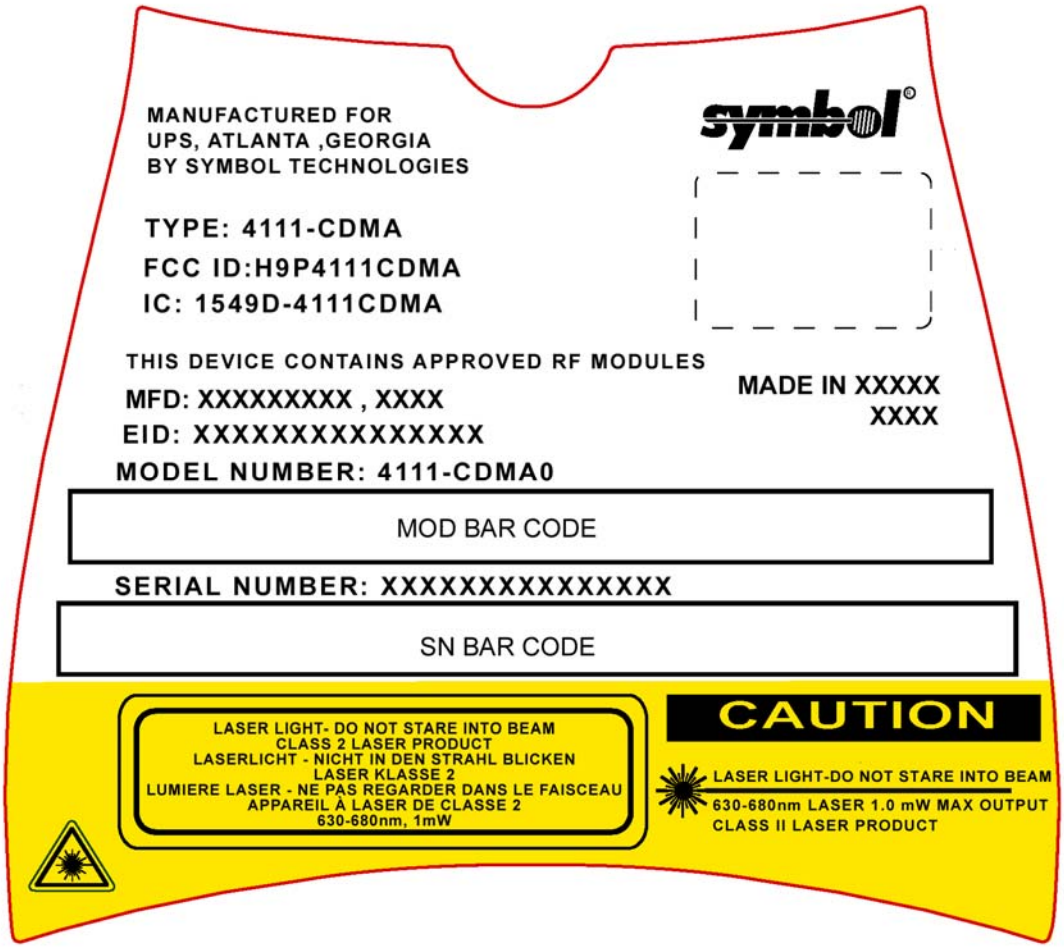
Photograph 11
4111-CDMA Front View of C18 CDMA Module



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

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

0141
Group

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

UKAS Accreditation's 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).

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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
Electronics Engineer