
REPORT ON

Limited FCC CFR 47: Parts 15 B and 22 H Testing in Support of an
Application for Grant of Equipment Authorisation
of a Symbol 4121CDMA Handheld Data Terminal

FCC ID: H9P4121CDMA

Report No OR613597/002 Issue 1

April 2005



Product Service



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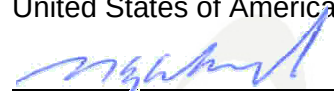
Report No OR613597/002 Issue 1

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26th April 2005

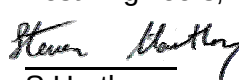
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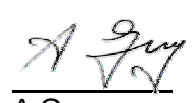
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ENGINEERING STATEMENT

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 limited compliance with FCC CFR 47: Parts 15 and 22. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;


S Hartley


A Guy




G Lawler

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SECTION 1

REPORT SUMMARY

Limited FCC CFR 47: Parts 15 B and 22 H Testing in Support of an
Application for Grant of Equipment Authorisation
of a Symbol 4121CDMA Handheld Data Terminal

1.1 STATUS

EQUIPMENT UNDER TEST	Handheld Data Terminal
OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
NAME AND ADDRESS OF CLIENT	Symbol Technologies Inc One Symbol Plaza Holtsville 11742-1300, New York United States of America
TYPE NUMBER	4121CDMA
PART NUMBER	4121CDMA0
SERIAL NUMBER	4MES0022
HARDWARE VERSION	Rev 5 (To be released as Rev A)
DECLARED VARIANTS	None
TEST SPECIFICATION/ISSUE/DATE	FCC CFR 47: Part 15, Subparts B, October 2003, and FCC CFR 47: Part 22, Subpart H, October 2003
NUMBER OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Commercial In Confidence
INCOMING RELEASE DATE	Declaration of Build Status 24 March 2005
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal Not Applicable Not Applicable
ORDER NUMBER DATE	4500405504 29 November 2004
START OF TEST	14 March 2005
FINISH OF TEST	1 April 2005
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)

1.2 INTRODUCTION

The information contained within this report is intended to show limited verification of compliance of the Symbol Technologies Inc 4121CDMA Handheld Data Terminal to the requirements of FCC Specification Parts 15 and 22.

Testing was carried out in support of an application for Grant of Equipment Authorisation in the name of Symbol Technologies Inc.

Testing of the Symbol Compact Flash 802.11b RLAN radio card and Symbol 21-64831 Symbol Bluetooth module can be found in BABT Test Report Number OR613597/01.

Testing of the Motorola C18 module for 1900MHz can be found in BABT Test Report Number OR613597/03.

The Symbol Compact Flash 802.11b RLAN radio card integrated in this terminal is not designed to operate simultaneously with the Motorola C18 module or 21-64831 Symbol Bluetooth module and therefore these modules are tested independently, but are co-located.

The Symbol 21-64831 Symbol Bluetooth module and Motorola C18 module integrated in this terminal are designed to operate simultaneously and therefore these are tested in Simultaneous transmit mode. This testing can be found in BABT Test Report Numbers OR613597/04 and OR613597/05

In accordance with Part 15.207(c), Conducted Emissions testing has been performed as the EUT is battery powered and is capable of operation whilst connected to the AC Power Lines. For the Symbol Compact Flash 802.11b RLAN radio card the Conducted Emissions were performed and is recorded in BABT Test Report Number OR613597/01. Testing for the Motorola C18 module and 21-64831 Symbol Bluetooth module testing was performed in the worst case Simultaneous Transmit modes. The test results can be found in BABT Test Report Number OR613597/04 and OR613597/05.

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a 4121CDMA Handheld Data Terminal, which offers CDMA 800/1900, 802.11b Wireless LAN and Bluetooth connectivity.

The terminal utilizes the approved Motorola C18 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 21-64831 Symbol Bluetooth module.

1.3.2 Modes of Operation

Modes of operation of the EUT during testing were as follows:

Applicable testing was carried out with the EUT transmitting at maximum power or receiving as detailed in Section 1.3.3.

1.3.3 Test Configuration

CDMA800 Transmit Mode

850MHz Transmitting on the following channels and frequencies;

Channel 1013: 824.70MHz

Channel 384: 836.52MHz

Channel 777: 848.31MHz

The Output Power level (controlled by application software) was set to maximum

CDMA800 Idle Mode

850MHz Idle on the following channels and frequencies;

Channel 384: 836.52MHz

1.3.4 DECLARATION OF BUILD STATUS

MAIN EUT			
MANUFACTURING DESCRIPTION	Handheld Data Terminal		
MANUFACTURER	Symbol Technologies Inc.		
TYPE	4121CDMA		
PART NUMBER	4121CDMA0		
SERIAL NUMBER	4XEQ0155,4XEQ0156, 4MES0022		
HARDWARE VERSION	Rev 5 (to be released as Rev A)		
FCC ID	H9P4121CDMA		
INDUSTRY CANADA ID	1549D-4121CDMA		
TECHNICAL DESCRIPTION	The 4121CDMA is a Handheld Data Terminal, which offers CDMA 800/1900, 802.11b Wireless LAN and Bluetooth connectivity. The terminal utilizes the approved Motorola C18 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 21-64831 Symbol Bluetooth module.		
BATTERY/POWER SUPPLY			
MANUFACTURING DESCRIPTION	Internal Lithium Ion Battery (Li ion)		
PART NUMBER	31-57157-01		
HARDWARE VERSION	Rev B		
VOLTAGE	7.2V		
MODULE			
MANUFACTURING DESCRIPTION	RLAN Module	Bluetooth Module	CDMA Module
MANUFACTURER	Symbol Technologies Inc	Symbol Technologies Inc	Motorola Inc.
TYPE	LA4137	21-64381	C18
ITU DESIGNATION OF EMISSION	11M0F1D	1M00F1D	1M25F9W
TRANSMITTER POWER	100mW	100mW (restricted in this terminal integration to 1 mW)	CDMA800: 0.32W CDMA1900: 0.32W
TRANSMITTER OPERATING BAND	2400-2483.5 MHz	2400-2483.5 MHz	824.7 to 848.31MHz 1851.25 to 1908.75MHz
RECEIVER OPERATING BAND	2400-2483.5 MHz	2400-2483.5 MHz	869.7 to 893.31MHz 1931.25 to 1988.75MHz
DHSS/FHSS/COMBINED OR OTHER	DSSS	FHSS	CDMA (1XRTT)
FCC ID	H9PLA4137	H9P2164381	IHDT56CW1
INDUSTRY CANADA ID	1549104431A	1549D-2164381	109O-CW1
ANCILLARIES			
MANUFACTURING DESCRIPTION	Belt Clip		
PART NUMBER	UPS-BC5000		
HARDWARE VERSION	Rev A		

Signature



Date
D of B S Serial No

24th March 2005
OS613957

The unit used for the internal photographs in this report was not the EUT, but was supplied as an identical unit for photographs only. It is declared as being the same build status as the EUT.

BABT formally certifies that the manufacturer's declaration as reproduced in this report, is a true and accurate record of the original received from the applicant.

1.4 BRIEF SUMMARY OF RESULTS

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

A brief summary of the tests carried out is shown below.

Test	Spec Clause	Test Description	Result	Levels/Comments
2.1	15.109	Radiated Emissions (Unintentional Radiator)	Pass	
2.2	22.913	Effective Radiated Power	Pass	
2.3	22.917	Radiated Emissions	Pass	

1.5 TEST CONDITIONS

The EUT was set-up simulating a typical user installation and was tested in accordance with the applicable specification.

For all tests, the Symbol 4121CDMA Handheld Data Terminal was powered by its own internal battery.

1.6 DEVIATIONS FROM THE STANDARD

Limited tests were applied in accordance with Symbol requirements.

1.7 MODIFICATION RECORD

Not Applicable

1.8 ALTERNATIVE TEST SITE

No alternative test site was utilised.

SECTION 2

TEST DETAILS

Limited FCC CFR 47: Part 22 H Testing in support of an
Application for Grant of Equipment Authorisation
Of a Symbol 4121CDMA Handheld Data Terminal

2.1 SPURIOUS RADIATED EMISSIONS

2.1.1 FCC CFR 47: Part 15 Subpart B, Section 15.109

2.1.2 Equipment Under Test

4121CDMA Handheld Data Terminal

2.1.3 Date of Test

20 March 2005

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified as "Section 2.1" within the Test Equipment Used table shown in Section 3.1.

2.1.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the Anechoic Chamber (3 metres). 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. The list of emissions was then confirmed or updated within the Anechoic Chamber. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

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

2.1 SPURIOUS RADIATED EMISSIONS - continued

2.1.6 Test Results

Equipment Designation: Unintentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15 Subpart B, Section 15.109 for Spurious Radiated Emissions (30MHz – 1GHz).

Measurements were made with the EUT in CDMA800 Idle Mode (see Section 1.3.3 for details).

EUT Rx on Middle Channel

The levels of the six highest emissions measured in accordance with the specification are presented below: -

Emission Frequency	Polarisation	Height	Azimuth	Field Strength		Limit	
MHz	Horizontal/ Vertical	cm	degree	dBµV/m	µV/m	dBµV/m	µV/m
335.4	H	100	254	38.8	87.1	46.0	200.0
383.4	H	100	077	31.6	38.0	46.0	200.0
431.3	V	140	306	31.2	36.3	46.0	200.0
431.3	H	100	251	31.0	35.5	46.0	200.0
527.2	V	100	338	31.0	35.5	46.0	200.0
623.0	V	100	188	31.7	38.5	46.0	200.0

SECTION 2

TEST DETAILS

Limited FCC CFR 47: Part 22 HTesting in Support of an
Application for Grant of Equipment Authorisation
of a Symbol 4121CDMA Handheld Data Terminal

2.2 EFFECTIVE RADIATED POWER

2.2.1 Specification Reference

FCC CFR 47: Part 22 Subpart H, Section 22.913

2.2.2 Equipment Under Test

4121CDMA Handheld Data Terminal

2.2.3 Date of Test

19 March 2005

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified as "Section 2.2" within the Test Equipment Used table shown in Section 3.1.

2.2.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

The EUT did not have an antenna port and therefore the Maximum Peak Output Power was made using the radiated method.

The Spectrum Analyser was tuned to the test frequency. The device Output Power setting was controlled as specified in the Product Information, Section 1.5 of this document. The device was then rotated through 360 degrees until the highest power level was observed in both horizontal and vertical polarisation. The device was then replaced with a substitution antenna, whose input signal the antenna was adjusted until the received level matched that of the previously detected emission.

2.2 EFFECTIVE RADIATED POWER - continued

2.2.6 Test Results

The EUT met the requirements of FCC CFR 47: Part 22 Subpart H, Section 22.913 for Effective Radiated Power.

Measurements were made with the EUT in CDMA800 Transmit Mode (see Section 1.3 for details).

The measurements were performed with the EUT lying down and the measuring antenna in a horizontal position, as this was found to be the worst case position.

Frequency (MHz)	Raw Result (dBm)	Substitution Level (dBm)	Substitution Antenna Gain (dB)	Result ERP (dBm)	Result ERP (mW)	Limit ERP (dBm)	Limit ERP (mW)
824.70	-13.7	14.2	6.4	20.60	115	38.45	7000
836.52	-13.1	14.5	6.4	20.90	123	38.45	7000
848.31	-12.5	15.2	6.4	21.60	145	38.45	7000

2.3 RADIATED EMISSIONS

2.3.1 Specification Reference

FCC CFR 47: Part 22 Subpart H, Section 22.917

2.3.2 Equipment Under Test

4121CDMA Handheld Data Terminal

2.3.3 Date of Test

19 March 2005

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified as "Section 2.3" within the Test Equipment Used table shown in Section 3.1.

2.3.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

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

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the Anechoic Chamber. 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. The list of emissions was then confirmed or updated in the Anechoic Chamber (3 metres). Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a Peak detector.

Emissions identified within the range 1GHz – 9GHz were then formally measured using Peak and Average Detectors, as appropriate.

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

2.3 RADIATED EMISSIONS - continued

2.3.5 Test Procedure

The limits for Spurious Emissions have been calculated, as shown in the table below using the following formula:

Field Strength of Carrier - $(43 + 10\log(P))$

Where:

Field Strength is measured in dB μ V/m

P is Measured Transmitter Power in Watts

Carrier Frequency MHz	Carrier Field Strength dB μ V/m	Measured Power W	Limit for Spurious Emissions dB μ V/m
824.70	121.6	0.115	88.0
836.52	122.6	0.123	88.7
848.31	122.3	0.144	87.7

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

2.3 RADIATED EMISSIONS - continued

2.3.6 Test Results - continued

30MHz – 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 22, Subpart H, 22.917 for Radiated Emissions (30MHz – 1GHz).

Measurements were made with the EUT in CDMA800 Transmit Mode (see Section 1.3 for details).

EUT Tx on Bottom Channel (824.70MHz)

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Limit
MHz	H/V	cm	deg	dBµV/m	dBµV/m
335.43	H	100	254	41.7	88.0
843.84	H	100	307	69.9	88.0
844.92	H	100	307	67.8	88.0

EUT Tx on Middle Channel (836.52MHz)

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Limit
MHz	H/V	cm	deg	dBµV/m	dBµV/m
335.45	H	100	256	41.7	88.7
822.50	H	100	307	59.8	88.7
844.05	H	100	306	63.0	88.7
855.61	H	100	307	60.5	88.7

EUT Tx on Top Channel (848.31MHz)

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Limit
MHz	H/V	cm	deg	dBµV/m	dBµV/m
335.45	H	100	254	41.6	87.7
823.80	H	100	214	56.9	87.7
829.14	H	100	306	68.3	87.7

2.3 RADIATED EMISSIONS - continued

2.3.6 Test Results - continued

1GHz – 9GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 22, Subpart H, 22.917 for Radiated Emissions (30MHz – 1GHz).

Measurements were made with the EUT in CDMA800 Mode (see Section 1.3.3 for details).

EUT Tx on Bottom Channel (824.70MHz)

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
MHz	H/V	cm	deg	dBμV/m	dBμV/m	dBμV/m	dBμV/m
1650	V	208	354	69.6	88.0	N/A	N/A

EUT Tx on Middle Channel (836.52MHz)

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
MHz	H/V	cm	deg	dBμV/m	dBμV/m	dBμV/m	dBμV/m
1673	V	189	343	66.5	88.7	N/A	N/A

EUT Tx on Top Channel (848.31MHz)

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
MHz	H/V	cm	deg	dBμV/m	dBμV/m	dBμV/m	dBμV/m
1697	V	189	345	68.5	87.7	N/A	N/A

Note: The Measurements in the above tables marked N/A are Not Applicable because the frequency does not fall within the Restricted Band (15.205) and hence Average Measurements are not required.

ABBREVIATIONS FOR ABOVE TABLES

H Horizontal Polarisation

V Vertical Polarisation

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No	EMC / INV No	Cal. Due
CDMA Test Set	Agilent	9860 Series 10	Not Applicable	TU
Section 2.1				
Spectrum Analyser	Hewlett Packard	8542E	2286	08/01/2006
Bilog Antenna	Schaffner	CBL6143	2965	12/09/2005
Antenna Mast	Emco	1051-2	2182	TU
Section 2.2				
Drg Horn Antenna	Emco	3115	2297	07/07/2005
Emi Test Receiver	Rohde & Schwarz	ESIB40	2917	07/03/2006
Signal Generator	Hewlett Packard	8672A	411	TU
Peak Power Ana	Hewlett Packard	8990A	1670	24/08/2005
Power Sensor	Hewlett Packard	84812A	1662	24/08/2005
Bilog Antenna	Schaffner	CBL6143	2965	12/09/2005
Section 2.3				
Spectrum Analyser	Hewlett Packard	8542E	2286	08/01/2006
Bilog Antenna	Schaffner	CBL6143	2965	12/09/2005
Antenna Mast	Emco	1051-2	2182	TU
Emi Test Receiver	Rohde & Schwarz	ESIB40	2917	07/03/2006
Low Noise Amplifier	Miteq	AMF-3d-001080-18-13P	2457	TU
Solid State Amplifier	Avantek	AWT-18036	1081	26/06/2005
Signal Amplifier	Avantek	AMT-26177-33	2072	25/06/2005
Drg Horn Antenna	Emco	3115	2297	07/07/2005
Signal Generator	Hewlett Packard	8672A	411	TU
Signal Generator	Marconi	2031	1768	01/09/2005
3GHz High Pass Filter	RLC Electronics	F-100-3000-5-R	4969	TU
Peak Power Analyser	Hewlett Packard	8990A	1670	24/08/2005
Power Sensor	Hewlett Packard	84812A	1662	24/08/2005

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Maximum Output Power	Not Applicable	±0.5dB
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Substitution Antenna, Radiated Field	30MHz to 18GHz Amplitude	2.6dB

Worst case error for both Time and Frequency measurement 12 parts in 10⁶.

* In accordance with CISPR 16-4

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
(Not UKAS Accredited).

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APPENDIX A

TITCHFIELD 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,

A handwritten signature in black ink that reads 'Thomas W. Phillips'.

Thomas W Phillips
Electronics Engineer