

---

**REPORT ON**

Simultaneous Transmitters: Limited FCC Testing in support of an  
Application for Grant of Equipment Authorisation  
of a Symbol 4121GPRS Hand Held Data Terminal

FCC ID: H9P4121GPRS

Report No OR612329/04 Issue 2

September 2004

---

**REPORT ON**

Simultaneous Transmitters: Limited FCC Testing in support of an Application for Grant of Equipment Authorisation of a Symbol 4121GPRS Hand Held Data Terminal

FCC ID: H9P4121GPRS


Report No OR612329/04 Issue 2

September 2004


**PREPARED FOR**

Symbol Technologies Inc  
One Symbol Plaza  
Holtsville  
NY 11742-1300  
New York  
United States of America

**PREPARED BY**

  
Julie Plummer  
Technical Author

**APPROVED BY**

  
C Gould  
Chief Engineer, EMC Group

**DATED**

07-09-04

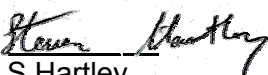
**DISTRIBUTION**


Symbol Technologies Copy 1  
BABT Copy 2  
Copy No

**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 24. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

  
S Hartley

  
A Guy

  
G Lawler





## CONTENTS

<b>Section</b>	<b>Page No</b>
<b>1</b>	<b>REPORT SUMMARY</b>
1.1	Status..... 4
1.2	Introduction or Test and Assessment Schedule..... 5
1.3	Product information ..... 6
1.4	Brief Summary of Results (and Observations)..... 8
1.5	Opinions and Interpretations ..... 9
1.6	Test Conditions (Configuration)..... 9
1.7	Deviations from the Standard ..... 9
1.8	Modification Record..... 9
1.9	Alternative Test Site ..... 9
<b>2</b>	<b>TEST DETAILS</b>
2.1	Spurious Radiated Emissions ..... 11
<b>3</b>	<b>TEST EQUIPMENT USED</b>
3.1	Table of Test Equipment Used..... 17
3.2	Measurement Uncertainty ..... 18
<b>4</b>	<b>EUT PHOTOGRAPH</b>
4.1	EUT Photograph..... 20
<b>5</b>	<b>ACCREDITATION, DISCLAIMERS AND COPYRIGHT</b>
5.1	Accreditation, Disclaimers And Copyright ..... 22
<b>APPENDICES</b>	
A	Titchfield FCC Site Compliance Letter ..... 24



## **SECTION 1**

### **REPORT SUMMARY**

Simultaneous Transmitters: Limited FCC Testing in support of an  
Application for Grant of Equipment Authorisation  
of a Symbol 4121GPRS Hand Held Data Terminal



## 1.1 STATUS

EQUIPMENT UNDER TEST	Hand Held 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	4121GPRS
PART NUMBER	4121GPRS1
SERIAL NUMBER	FCC 2 Samp 0003
HARDWARE VERSION	Rev 1 (To be released as Rev A)
DECLARED VARIANTS	41210000
TEST SPECIFICATION/ISSUE/DATE	FCC CFR 47: Part 24, Subpart D, October 2003 FCC CFR 47: Part 15, Subpart C, October 2003
NUMBER OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Commercial In Confidence
INCOMING RELEASE DATE	Declaration of Build Status 14 <sup>th</sup> July 2004
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal Not Applicable Not Applicable
ORDER NUMBER	EMEA 14281, dated 27 <sup>th</sup> May 2004
START OF TEST	5 <sup>th</sup> July 2004
FINISH OF TEST	5 <sup>th</sup> July 2004
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.



## 1.2 INTRODUCTION

This report is Issue 2 and has been produced to cover several typing errors in the original test report; this report supersedes the previous report OR612329/04 Issue 1.

The information contained within this report is intended to show limited verification of compliance of the Symbol Technologies Inc 4121GPRS Hand Held Data Terminal to the requirements of FCC Specification Parts 15 C and 24, for Simultaneous Transmission of Co-Located Transmitters.

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

The purpose of this Test Report is to show compliance for Simultaneous Radio Operation of GSM/GPRS 1900 with Bluetooth.

Although testing is carried out against both FCC Specification Parts 15 C and 24, it is only a requirement for the EUT to comply with the least stringent limit when both Radios are transmitting. Therefore in this report only the limits for Part 24 have been applied.



### 1.3 PRODUCT INFORMATION

#### 1.3.1 Technical Description

The unit supplied for testing was a 4121GPRS hand held data terminal, which offers Tri Band GSM/GPRS, 2.4GHz 802.11b Wireless LAN and Bluetooth connectivity.

The terminal utilizes the Motorola G18 GSM/GPRS module to offer GSM GPRS data connectivity. Also included in the terminal is the approved LA-4137 Symbol Compact Flash 802.11b RLAN radio card and the 21-64381 Symbol Bluetooth module. FCC ID numbers are detailed in Section 1.3.4 "Declaration of Build Status".

#### 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 "Test Configuration".

The client has declared that the Symbol 21-64436 (RLAN) and the Symbol 21-64381 (Bluetooth) Modules are co-located, but that they are not capable of simultaneously transmitting.

The client has declared that the Symbol 21-64436 (RLAN) and the Motorola GSM GPRS modules are co-located, but that they are not capable of simultaneously transmitting.

The Symbol 21-64381 Bluetooth module is capable of simultaneously transmitting with the Motorola GSM GPRS module. Testing for this mode of operation is covered in this test report.

#### 1.3.3 Test Configuration

##### 1.3.3.1 Simultaneous Transmit Mode

To enable simultaneous transmit mode the individual Bluetooth and GPRS 1900 Modes given below were used to enable transmitting on the following frequencies;

Bluetooth	1900 GSM
2402MHz	1909.8MHz
2480MHz	1850.2MHz

##### Bluetooth Mode

The EUT was running the program Symbol Bluetooth Test Tool BTools.exe, which enabled the test engineer to select transmit or receive on the following channels and frequencies;

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

##### GPRS 1900 Mode

The EUT was running the program Symbol GSM/DCS/PCS Test Tool GSMDEMO.exe, which enabled the test engineer to select transmit or receive on the following channels and frequencies;

Bottom Channel 512:	1850.2MHz
Middle Channel 661:	1880.0MHz
Top Channel 810:	1909.8MHz



## 1.3.4 DECLARATION OF BUILD STATUS

<b>MAIN EUT</b>			
<b>MANUFACTURING DESCRIPTION</b>	Hand Held Terminal		
<b>MANUFACTURER</b>	Symbol Technologies Inc		
<b>TYPE</b>	4121GPRS		
<b>PART NUMBER</b>	4121GPRS1		
<b>SERIAL NUMBER</b>	SAMP0000 & SAMP0008		
<b>HARDWARE VERSION</b>	Rev 1 (to be released as Rev A)		
<b>FCC ID</b>	H9P4121GPRS		
<b>INDUSTRY CANADA ID</b>	1549D-4121GPRS		
<b>TECHNICAL DESCRIPTION</b>	The unit supplied for testing was a 4121GPRS hand held data terminal, which offers GPRS functionality, 2.4GHz 802.11b Wireless LAN and Bluetooth connectivity. The terminal utilizes the approved Motorola g18 module to offer GPRS 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.		
<b>BATTERY/POWER SUPPLY</b>			
<b>CHEMISTRY</b>	Li Ion		
<b>PART NUMBER</b>	21-59510-02		
<b>VOLTAGE</b>	7.2v		
<b>MODULES</b>			
<b>MANUFACTURING DESCRIPTION</b>	RLAN Module	Bluetooth Marlin Module	GPRS Module
<b>MANUFACTURER</b>	Symbol Technologies Inc	Symbol Technologies Inc	Motorola
<b>TYPE</b>	LA4137	21-64381	G18
<b>TRANSMITTER OPERATING BAND</b>	2400-2483.5 MHz	2400-2483.5 MHz	GSM 900/1800/1900
<b>RECEIVER OPERATING BAND</b>	2400-2483.5 MHz	2400-2483.5 MHz	GSM 900/1800/1900
<b>ITU DESIGNATION OF EMISSION</b>	11M0F1D	1M00F1D	250KG7W
<b>POWER</b>	100mW	100mW (restricted in this terminal integration to 1 mW)	900 2W 1800/ 1900 1W
<b>DHSS/FHSS/COMBINED OR OTHER</b>	DSSS	FHSS	GMSK/ TDMA
<b>FCC ID</b>	H9PLA4137	H9P2164381	IHDT6AC1

Signature

Date  
D of B S Serial No14<sup>th</sup> July 2004  
OS612329

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	24.238	Spurious Radiated Emissions	Pass	



**1.5 OPINIONS AND INTERPRETATIONS**

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

**1.6 TEST CONDITIONS**

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

For all tests, the Symbol 4121GPRS Hand Held Data Terminal was powered by its own internal battery.

**1.7 DEVIATIONS FROM THE STANDARD**

Not Applicable

**1.8 MODIFICATION RECORD**

Not Applicable

**1.9 ALTERNATIVE TEST SITE**

No Alternative test site was used



## **SECTION 2**

### **TEST DETAILS**

Simultaneous Transmitters: Limited FCC Testing in support of an  
Application for Grant of Equipment Authorisation  
Of a Symbol 4121GPRS Hand Held Data Terminal



## **2.1 SPURIOUS RADIATED EMISSIONS**

### **2.1.1 Specification Reference**

FCC CFR 47: Part 24 Subpart D, Section 24.238

### **2.1.2 Equipment Under Test**

4121GPRS Hand Held Data Terminal

### **2.1.3 Date of Test**

5<sup>th</sup> July 2004

### **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 a semi-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 under Alternative Open Site conditions. 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.

Emissions identified within the range 1GHz – 25GHz were then formally measured using Peak and Average Detectors, as appropriate.

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



## 2.1 SPURIOUS RADIATED EMISSIONS - continued

### 2.1.5 Test Procedure - continued

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

Field Strength of Carrier  $-(43 + 10\text{Log}(P))$

Where:

Field Strength is measured in dB $\mu$ V/m

P is Measured Transmitter Power in Watts

Test Mode	Carrier Frequency GHz	Carrier Field Strength dB $\mu$ V/m	Measured Power W	Limit for Spurious Emissions dB $\mu$ V/m
Mode 1 (1900)	1850.2	130.2	1.74	84.8
Mode 1 (1900)	1909.8	128.5	1.07	85.2

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



## 2.1 SPURIOUS RADIATED EMISSIONS - continued

### 2.1.6 Test Results

#### **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 Mode 1 (BLUETOOTH: 2402MHz and 1900: 1909.8MHz)**

Measurements were made with the EUT in Mode 1.

Frequency	Antenna		Turntable	Field Strength at 3m	Specification Limit
	Pol	Height	Azimuth		
MHz	H/V	cm	deg	dB $\mu$ V/m	dB $\mu$ V/m
622.8	V	100	330	42.2	85.2

No other emissions were detected.

#### **EUT Tx on Mode 1 (BLUETOOTH: 2480MHz and 1900: 1850.2MHz)**

Measurements were made with the EUT in Mode 1.

Frequency	Antenna		Turntable	Field Strength at 3m	Specification Limit
	Pol	Height	Azimuth		
MHz	H/V	cm	deg	dB $\mu$ V/m	dB $\mu$ V/m
622.8	V	100	330	42.3	84.8

No other emissions were detected.

#### **ABBREVIATIONS FOR ABOVE TABLES**

H Horizontal Polarisation  
Pol Polarisation

V Vertical Polarisation  
deg degree



## 2.1 SPURIOUS RADIATED EMISSIONS - continued

### 2.1.6 Test Results - continued

#### **1GHz - 25GHz Frequency Range**

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c) and 24.238 for Radiated Emissions (1GHz – 25GHz).

#### **EUT Tx on Mode 1 (BLUETOOTH: 2402MHz and 1900: 1909.8MHz)**

Measurements were made with the EUT in Mode 1.

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
GHz	H/V	cm	deg	dB $\mu$ V/m	dB $\mu$ V/m	dB $\mu$ V/m	dB $\mu$ V/m
3.820	H	100	19	56.1	85.2	N/A	N/A
5.730	H	100	246	54.0	85.2	N/A	N/A
7.639	H	138	248	58.2	85.2	N/A	N/A

#### **EUT Tx on Mode 1 (BLUETOOTH: 2480MHz and 1900: 1850.2MHz)**

Measurements were made with the EUT in Mode 1.

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
GHz	H/V	cm	deg	dB $\mu$ V/m	dB $\mu$ V/m	dB $\mu$ V/m	dB $\mu$ V/m
3.7004	V	100	0	51.1	84.8	N/A	N/A
5.5506	H	136	241	62.1	84.8	N/A	N/A
7.4008	H	135	243	58.5	84.8	N/A	N/A
9.2510	V	111	142	60.7	84.8	N/A	N/A
11.1012	H	146	239	63.1	84.8	N/A	N/A



**2.1 SPURIOUS RADIATED EMISSIONS - continued**

**2.1.7 Set Up Photograph**



Spurious Radiated Emissions Set Up Photograph





### **SECTION 3**

#### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

Instrument	Manufacturer	Type No	EMC / INV No	Cal. Due
Section 2.1				
Spectrum Analyser	Hewlett Packard	8542E	2286	18/05/2005
Bilog Antenna	Schaffner	CBL6143	2965	12/09/2004
Digital Barometer	Oregon Scientific	BAA913HG	Room 5	TU
Turntable Controller	HD Gmbh	HD 050	2528	TU
Antenna Mast	Emco	1051-2	2182	TU
Screened Room 5	Siemens	EAC54300	2533	TU
Test Receiver	Rohde & Schwarz	ESIB40	2917	11/02/2005
Low Noise Amplifier	Miteq Corp	AMF-3d-001080-18-13P	2457	TU
Solid State Amplifier	Avantek	AWT-18036	1081	26/06/2005
Antenna	Emco	3115	2397	07/07/2005
Attenuator	Marconi	6534/3	1494	TU
Signal Generator	Hewlett Packard	8672A	411	02/03/2005
Attenuator Fixed	Narda	4768-3	2961	TU
Filter	RLC Electronics	F-1000-300-5-R	4969	10/03/2005
Signal Generator	Marconi	2031	1979	30/10/2004
Antenna	Flann	2024-20	1396	TU



### 3.2 MEASUREMENT UNCERTAINTY

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

<b>Test Discipline</b>	<b>Frequency / Parameter</b>	<b>MU</b>
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*

Worst case error for both Time and Frequency measurement 12 parts in  $10^6$ .

\* In accordance with CISPR 16-4



## **SECTION 4**

### **EUT PHOTOGRAPH**



**EUT PHOTOGRAPH**



Front View



## **SECTION 5**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



## 5.1 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).

This report must not be reproduced, except in its entirety, without the written permission of TÜV Product Service Limited

© 2004 TÜV Product Service Limited

**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

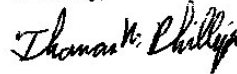
Re: Measurement facility located at Titchfield  
Anechoic chamber (3 meters) and 3 & 10 meter OATS  
Date of Listing: October 18, 2002

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](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,



Thomas W Phillips  
Electronics Engineer