
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

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support of an Application for Grant of Equipment Authorisation
of a Symbol 4121GPRS Hand Held Data Terminal

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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

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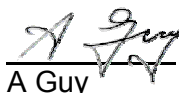
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ENGINEERING STATEMENT

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 24. 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

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 th July 2004 |
| DISPOSAL REFERENCE NUMBER DATE | Held pending disposal Not Applicable Not Applicable |
| ORDER NUMBER | EMEA 14281, dated 27 th May 2004 |
| START OF TEST | 5 th July 2004 |
| FINISH OF TEST | 5 th 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 BTTools.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

| MAIN EUT | | | |
|-----------------------------|--|---|-------------------------|
| MANUFACTURING DESCRIPTION | Hand Held Terminal | | |
| MANUFACTURER | Symbol Technologies Inc | | |
| TYPE | 4121GPRS | | |
| PART NUMBER | 4121GPRS1 | | |
| SERIAL NUMBER | SAMP0000 & SAMP0008 | | |
| HARDWARE VERSION | Rev 1 (to be released as Rev A) | | |
| FCC ID | H9P4121GPRS | | |
| INDUSTRY CANADA ID | 1549D-4121GPRS | | |
| TECHNICAL DESCRIPTION | 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. | | |
| BATTERY/POWER SUPPLY | | | |
| CHEMISTRY | Li Ion | | |
| PART NUMBER | 21-59510-02 | | |
| VOLTAGE | 7.2v | | |
| MODULES | | | |
| MANUFACTURING DESCRIPTION | RLAN Module | Bluetooth Marlin Module | GPRS Module |
| MANUFACTURER | Symbol Technologies Inc | Symbol Technologies Inc | Motorola |
| TYPE | LA4137 | 21-64381 | G18 |
| TRANSMITTER OPERATING BAND | 2400-2483.5 MHz | 2400-2483.5 MHz | GSM 900/1800/1900 |
| RECEIVER OPERATING BAND | 2400-2483.5 MHz | 2400-2483.5 MHz | GSM 900/1800/1900 |
| ITU DESIGNATION OF EMISSION | 11M0F1D | 1M00F1D | 250KG7W |
| POWER | 100mW | 100mW (restricted in this terminal integration to 1 mW) | 900 2W 1800/ 1900 1W |
| DHSS/FHSS/COMBINED OR OTHER | DSSS | FHSS | GMSK/ TDMA |
| FCC ID | H9PLA4137 | H9P2164381 | IHDT6AC1 |

Signature

 Date
 D of B S Serial No

 14th 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
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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

5th 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 $-(43 + 10\log(P))$

Where:

Field Strength is measured in dB μ V/m

P is Measured Transmitter Power in Watts

| Test Mode | Carrier Frequency GHz | Carrier Field Strength dB μ V/m | Measured Power W | Limit for Spurious Emissions dB μ 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 | dBµV/m | dBµV/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 | dBµV/m | dBµV/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 μ V/m | dB μ V/m | dB μ V/m | dB μ 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 μ V/m | dB μ V/m | dB μ V/m | dB μ 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:-

| Test Discipline | Frequency / Parameter | MU |
|--|-------------------------|--------|
| 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
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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

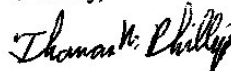
Re: Measurement facility located at Titchfield
Anechoic chamber (3 meters) and 3 & 10 meter OATS
Date of Listing: October 18, 2002

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,



Thomas W Phillips
Electronics Engineer