REPORT ON

Simultaneous Transmitters: Limited FCC Testing in support of an Application for Grant of Equipment Authorisation of a Symbol MC9062 Mobile Computer

FCC ID: H9PMC9062A

Report No OR611524/07 Issue 1 April 2004

TÜV PRODUCT SERVICE

BABT

BABT, Segensworth Road,
Fareham, Hampshire, PO15 5RH, United Kingdom
Tel: +44 (0)1329 443300
Website: www.tuvps.co.uk

REPORT ON

Simultaneous Transmitters: Limited FCC Testing in support of an Application for Grant of Equipment Authorisation of a Symbol MC9062 Mobile Computer

FCC ID: H9PMC9062A

Report No OR611524/07 Issue 1

April 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 14-04-04

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 CF
R 47: Part 15. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

M Larkin A Guy

UKAS TESTING 0141 Group

CONTENTS

Section		Page No
1	**REPORT SUMMARY**	
1.1	Status	4
1.2	Introduction	5
1.3	Brief Summary of Results	7
1.4	Opinions and Interpretations	7
1.5	Product Information	8
1.6	Test Conditions	8
1.7	Deviations from the Standard	8
1.8	Modification Record	8
2	**TEST DETAILS**	
2.1	Spurious Radiated Emissions	11
3	**TEST EQUIPMENT USED**	
3.1	Table of Test Equipment Used	16
3.2	Measurement Uncertainty	17
4	**EUT PHOTOGRAPH**	
4.1	EUT Photograph	19
5	**ACCREDITATION, DISCLAIMERS AND COPYRIGHT**	
5.1	Accreditation, Disclaimers And Copyright	21
APPENDIX		
A	Titchfield FCC Site Compliance Letter	23

SECTION 1

REPORT SUMMARY

Simultaneous Transmitters: Limited FCC Testing in support of an
Application for Grant of Equipment Authorisation
of a Symbol MC9062 Mobile Computer

1.1 STATUS

EQUIPMENT UNDER TEST	MC9062 Mobile Computer
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	MC9062
PART NUMBER	MC9062-SHAH9AEA721
SERIAL NUMBER	ALP75716
HARDWARE VERSION	Rev 8 (To be released as Rev A)
DECLARED VARIANTS	None
TEST SPECIFICATION / ISSUE / DATE	FCC CFR 47: Part 15, Subpart C, August 2002
NUMBER OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Commercial In Confidence
INCOMING RELEASE DATE	Declaration of Build Status 9th February 2004
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal Not Applicable Not Applicable
ORDER NUMBER DATE	EMEA 14085 22nd March 2004
START OF TEST	19th March 2004
FINISH OF TEST	22nd March 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

The information contained within this report is intended to show limited verification of compliance of the Symbol Technologies Inc MC9062 Mobile Computer to the requirements of FCC Specification Parts 15 C for Simultaneous Transmission of Co-Located Transmitters.

Testing was carried out in support of an application for Grant of Equipment Authorisation Type 2 Permissive Change in the name of Symbol Technologies Inc.

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

1.2.1 DECLARATION OF BUILD STATUS

MAIN EUT			
MANUFACTURING DESCRIPTION	Mobile Computer		
MANUFACTURER	Symbol Technologies Inc.		
COUNTRY OF ORIGIN	USA		
TYPE	MC9062		
PART NUMBER	MC9062-SHAH9AEA721		
SERIAL NUMBER	ALP75716		
HARDWARE VERSION	Rev 8 (Manufactured as Rev A)		
FCC ID	H9PMC9062A		
INDUSTRY CANADA ID	1549D-MC9062A		
RADIO MODULES INTEGRATED	RLAN, (21-64436) and Bluetooth, (21-64381), GSM/GPRS 850/1800/1900, (MC46)		
TECHNICAL DESCRIPTION	The unit supplied for testing is a Symbol MC9062 Mobile Computer, which offers Tri-Band GSM/GPRS 850/1800/1900, 2.4GHz 802.11b Wireless LAN and Bluetooth connectivity with the following options: SE824 Scan Engine; Colour (touch) display; 128/32 memory option; 28 Key Keyboard; PPC2003; Audio; Bluetooth		
BATTERY/POWER SUPPLY			
MANUFACTURING DESCRIPTION	Lithium Battery		
MANUFACTURER	Symbol Technologies Inc.		
COUNTRY OF ORIGIN	USA		
TYPE	N/A		
PART NUMBER	21-62960-01		
VOLTAGE	7.2V		
UK AGENT	Symbol Technologies Ltd		
RADIO MODULES			
MANUFACTURING DESCRIPTION	Main Terminal Module with Embedded RLAN Radio	Bluetooth Module	GPRS/GSM Tri-Band Radio Module
MANUFACTURER	Symbol Technologies Inc	Symbol Technologies Inc	Siemens AG
COUNTRY OF ORIGIN	USA	USA	Germany
TYPE	21-64436	21-64381	MC46
POWER	7 - 16V	3.3V	3.2 – 4.5V
TRANSMITTER OPERATING RANGE	2400 – 2483.5MHz	2400 – 2483.5MHz	824-849 / 1710-1785 / 1850-1910
TRANSMITTER POWER	100mW (+20dBm)	100mW (+20dBm)	2W (GSM850) 1W (GSM1800/1900)
RECEIVER OPERATING RANGE	2400 – 2483.5MHz	2400 – 2483.5MHz	869-894 / 1805-1880 / 1930-1990
INTERMEDIATE FREQUENCIES	374MHz	Direct Conversion	Receiver: 0; Transmitter: 80MHz
EMISSION DESIGNATOR	11M0F1D	1M00F1D	*GXW*
DHSS/FHSS/COMBINED	DSSS	FHSS	GSM
FCC ID	H9P2164436	H9P2164381	QIPMC46
INDUSTRY CANADA ID	1549D-2164436	1549D-2164381	267W-MC46
ANCILLARIES			
MANUFACTURING DESCRIPTION	Headset		
MANUFACTURER	VXI Corporation		
TYPE	VXI 61-SYB		
PART NUMBER	50-11300-050		
SERIAL NUMBER	Not Serialised		
HARDWARE VERSION	Rev A		
COUNTRY OF ORIGIN	USA		
UK AGENT	Symbol Technologies Inc		

Signature Marco Belli
Date 9th February 2004
D of B S Serial No OR611524

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.

1.3 BRIEF SUMMARY OF RESULTS

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

Test	Spec Clause	Test Description	Result	Levels/Comments
2.1	15.247(c)	Spurious Radiated Emissions	Pass	

1.4 OPINIONS AND INTERPRETATIONS

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

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The unit supplied for testing is a Symbol MC9062 Mobile Computer, which offers Tri-Band GSM/GPRS 850/1800/1900, 2.4GHz 802.11b Wireless LAN and Bluetooth connectivity with the following options: SE824 Scan Engine; Colour (touch) display; 128/32 memory option; 28 Key Keyboard; PPC2003; Audio; Bluetooth

The terminal utilizes the approved Siemens AG MC46 GSM/GPRS 850/1800/1900 Module, Symbol 21-64436 Main Terminal Module with embedded RLAN Radio and the Symbol 21-64381 Bluetooth Module. FCC ID numbers are detailed in Section 1.2.1 “Declaration of Build Status”.

1.5.2 Modes of Operation

Applicable testing was carried out with the EUT transmitting at maximum power as detailed in Section 1.5.3 “Test Configuration”.

The Client has declared that the Symbol 21-64436 and the Symbol 21-64381 Modules are Co-Located and are capable of Simultaneously Transmitting. The Symbol 21-64436 and the Symbol 21-64381 Modules are both capable of Simultaneously Transmitting with the Tri-Band GSM/GPRS 850/1800/1900 Module individually. Testing for this mode of operation is covered in BABT Test Report Reference Number OR611524/04 Issue 1, dated March 2004.

1.5.3 Test Configuration

Test Mode: RLAN and Bluetooth Transmitting Simultaneously on the following frequencies;

RLAN	Bluetooth
2412MHz	2480MHz
2462MHz	2402MHz

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 MC9062 Mobile Computer was powered by its own internal battery and fitted with a headset.

1.7 DEVIATIONS FROM THE STANDARD

Not Applicable

1.8 MODIFICATION RECORD

Not Applicable

SECTION 2

TEST DETAILS

Simultaneous Transmitters: Limited FCC Testing in support of an
Application for Grant of Equipment Authorisation
Of a Symbol MC9062 Mobile Computer

2.1 SPURIOUS RADIATED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47: Part 15 Subpart C, Section 15.247(c)

2.1.2 Equipment Under Test

MC9062 Mobile Computer

2.1.3 Date of Test

19th March 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 – 26GHz 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 Outside the Restricted Bands have been measured and calculated, as shown in the table below:

Test Mode	Carrier Frequency GHz	Carrier Field Strength dBµV/m	Limit for Spurious Outside Restricted Band (Carrier F S –20dB) dBµV/m
RLAN – Bottom Channel	2412	99.1	79.1
Bluetooth – Top Channel	2480	101.8	81.8*
RLAN – Top Channel	2462	101.2	81.2
Bluetooth – Bottom Channel	2402	106.7	86.7*

*In accordance with FCC guidelines, these are the least stringent results and therefore these are the limits that will be used for any emissions that are found outside the restricted bands.

In accordance with FCC Public Notice DA 00-705, Released 30th March 2000, Section 15.247(c) Spurious Radiated Emissions “If the dwell time per channel of the hopping signal is less than 100ms, then the reading obtained with the 10Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(dwell time/100ms), in an effort to demonstrate compliance with the 15.209 limit the following adjustment has been calculated for use with Average Measurements only;

Dwell Time = 5.81ms this is derived from;

Total slot time per time slot for DH5 packet 625µs x 5 = 3.125ms

Actual transmit time during this time slot is 2.905ms and the reply time slot after each DH5 packet is 625µs.

Total time slot length per channel 3.125 + 0.625 = 3.75ms.

Multiply Total time slot length per channel by 32 channels per hop sequence 32 x 3.75 = 120ms

It is therefore possible to have a maximum of two hop sequences in any given 100ms period, a single channel could occur twice within any 100ms time window. 2 x 2.905 = 5.81ms

Therefore; the Bluetooth Duty Cycle Correction Factor for the EUT is 20 log (5.81/100) = -24.7dB

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 15.247(c) for Radiated Emissions (30MHz – 1GHz).

EUT Tx on RLAN: 2412MHz and BLUETOOTH: 2480MHz

Frequency	Antenna		Turntable	Field Strength at 3m	Specification Limit
	Pol	Height	Azimuth		
MHz	H/V	cm	Deg	dBµV/m	dBµV/m
188.0	V	100	0	28.2	81.8
195.4	V	100	0	31.7	81.8
202.7	V	100	0	34.1	81.8
210.1	V	100	0	33.8	81.8
271.5	V	100	0	31.1	46.0

EUT Tx on RLAN: 2462MHz and BLUETOOTH: 2402MHz

Frequency	Antenna		Turntable	Field Strength at 3m	Specification Limit
	Pol	Height	Azimuth		
MHz	H/V	cm	deg	dBµV/m	dBµV/m
195.4	V	100	0	31.7	86.7
202.7	V	100	0	34.2	86.7
210.1	V	100	0	34.0	86.7
217.5	V	100	0	30.9	86.7
224.9	V	100	0	28.3	86.7

ABBREVIATIONS FOR ABOVE TABLES

H	Horizontal Polarisation	V	Vertical Polarisation
Pol	Polarisation	deg	degree

2.1 SPURIOUS RADIATED EMISSIONS - continued

2.1.6 Test Results - continued

1GHz - 26GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c) for Radiated Emissions (1GHz – 26GHz).

EUT Tx on RLAN: 2412MHz and BLUETOOTH: 2480MHz

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
4.076	V	102	289	54.3	74.0	52.7	54.0
4.824	V	100	297	47.4	74.0	33.3	54.0
4.960	H	100	147	48.0	74.0	41.0	54.0

EUT Tx on RLAN: 2462MHz and BLUETOOTH: 2402MHz

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
GHz	H/V	cm	deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
2.340	V	122	71	59.2	74.0	47.6	54.0
4.176	V	100	299	49.5	74.0	45.5	54.0
4.804	V	100	293	53.7	74.0	46.5	54.0
7.206	V	103	234	74.8	86.7	N/A	N/A

Note: The Measurements in the above table 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
Pol	Polarisation	deg	degree

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

Item	Instrument	Manufacturer	Type No	Serial No	EMC / INV No	Cal. Due
Section 2.1						
1	Spectrum Analyser	HEW	8542E	3617A00165_00154	2286	09/12/2004
2	Bilog Antenna	SCH	CBL6143	-	2860	11/04/2004
3	Turntable Controller	H-D	HD 050	050/396	2528	TU
4	Screened Room 5	SIE	EAC54300	NA	2533	TU
5	Low Noise Amplifier	MIQ	AMF-3d-001080-18-13P	UNK	2457	TU
6	Double Ridge Guide Antenna	EMC	3115	97015079	2397	04/07/2004
7	Signal Generator	HEW	8673B	2147A00423	954	14/06/2004
8	Test Receiver	ROH	ESIB40	100181	2972	08/11/2004
9	Solid State Amplifier	AVA	AWT-18036	F13365 8452	1081	26/06/2004
10	Signal Amplifier	AVA	AMT-26177-33	6669	2072	26/06/2004
11	Horn Antenna	FLA	2024-20	164	1396	TU
12	Antenna Mast	EMCO	2070	-	-	TU
13	Antenna Mast Controller	EMCO	2090	-	-	TU

Key To Manufacturers

AVA Avanteck
EMC Emco
FLA Flann
H-D HD Gmbh
HEW Hewlett Packard
MIQ Miteq Corp
ROH Rohde & Schwarz
SCH Schaffner
SIE Siemens
TU Traceability Unscheduled

3.2 MEASUREMENT UNCERTAINTY

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

IN THE FREQUENCY RANGE 30MHz TO 1000MHz		
TEST	**FREQUENCY**	**AMPLITUDE**
For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard EMI Receiver and Bilog Antenna	$\pm 2 \times 10^{-7}$x Centre Frequency	5.15dB calculated in accordance with CISPR 16-4
IN THE FREQUENCY RANGE 1GHz TO 26GHzz		
TEST	**FREQUENCY**	**AMPLITUDE**
For Spurious Radiated Emissions measurements	$\pm 2 \times 10^{-7}$x Centre Frequency	±3.4dB

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 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 under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Thomas W. Phillips

Thomas W Phillips
Electronics Engineer