EMC Technologies Pty Ltd
A.C.N. 057 105 549
57 Assembly Drive
Tullamarine Victoria Australia 3043

Ph: + 613 9335 3333
Fax: + 613 9338 9260
email: melb@emctech.com.au

SAR TEST REPORT - FCC
FCC ID: P3A-K78-205R
IC: 4170B-6220511
Report Number: M050436-FCC

Test Sample: Dual Band GSM EFTPOS Terminal
Model Number: K78-205
Tested For: Keycorp Ltd

Date of Issue: 6th May 2005

CONTENTS

SAR EVALUATION
Dual Band GSM EFTPOS Terminal
Model: K78-205
Report Number: M050436-FCC
FCC ID: P3A-K78-205R

1.0 GENERAL INFORMATION

Test Sample:	Dual Band GSM EFTPOS Terminal
Device Category:	Portable Transmitter
Test Device:	Production Unit
Model Name:	K78-205
FCC ID:	P3A-K78-205R
RF exposure Category:	General Population/Uncontrolled
Manufacturer:	Keycorp Ltd
Address:	Level 5, Keycorp Tower, 799 Pacific Highway, Chatswood NSW 2067
Test Standard/s:	**1.** Evaluating Compliance with FCC Guidelines For Human Exposure to Radiofrequency Electromagnetic Fields Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01) **2.** Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields. RSS-102 Issue 1 (Provisional) September 25, 1999
Statement Of Compliance:	The Keycorp GSM EFTPOS Terminal model K78-205 Complied with the FCC General public/uncontrolled RF exposure limits of 1.6mW/g per requirements of 47CFR2.1093(d). It also complied with IC RSS-102 requirements.
Test Dates:	20th to 21st April 2005
Tested for:	Keycorp Ltd
Address:	Level 5, Keycorp Tower, 799 Pacific Highway, Chatswood NSW 2067
Contact:	Ken McAnulty
Phone:	(02) 9415 2900
Fax:	(02) 9415 3562
Email:	KMcAnulty@keycorp.net

Test Officer:

Peter Jakubiec
Assoc Dip Elec Eng

Authorised Signature:

Aaron Sargent B.Eng
EMR Engineer

SAR EVALUATION
Dual Band GSM EFTPOS Terminal
Model: K78-205
Report Number: M050436-FCC
FCC ID: P3A-K78-205R

2.0 DESCRIPTION OF DEVICE

2.1 Description of Test Sample

The device tested was a Dual Band GSM EFTPOS Terminal operating in the GSM and DCS frequency bands. It has one integral, fixed length antenna. The test device was tested in the Hand Held and Belt-clip positions.
It uses an FCC authorised OEM module – Transmitter module for mobile communications (Sony Ericsson Mobile Communications AB), FCC ID: PY76220511, IC: 4170B-6220511.

Table 1: EUT Parameters

Operating Mode during Testing	: See table 2
Operating Mode production sample	: Standard GSM
GPRS Modes:	: Class B Class 8 (1 uplink slot only)
Modulation:	: Standard TDMA
Antenna type	: External
Applicable Head Configurations	: None
Applicable Body Worn-Configurations	: Belt-Clip, keypad and Hand held Position
Battery Options 1.	: Ni-Mh 4.8V, 1450mAh

2.2 Test sample Accessories

2.2.1 Battery Types

One type of battery can be used with Dual Band GSM EFTPOS Terminal.

2.3 Test Signal, Frequency and Output Power

The SAR tests were performed on a Keycorp Dual Band GSM Cellular EFTPOS Terminal for this evaluation. The GSM EFTPOS Terminal was put into operation using a Rohde & Schwarz Radio Communication Tester CMU200. The channels utilised in the measurements were the traffic channels shown in the table below. The power level was set to Class 4 for 850 MHz and Class 1 for 1900 MHz band. Measured conducted power is shown in table 2B. The SAR level of the test sample was measured for both frequency bands of operation. Communication between the tester and the GSM EFTPOS Terminal was maintained by an air link.

Table 2A: Test Frequencies

Band	Frequency Range	Traffic Channels	Band Power Class	Power (dBm)
1	824 – 849 MHz	128, 190 and 251	5	33
2	1850 - 1910 MHz	512, 661 and 810	1	30

2.4 Conducted Power Measurements

Table 2B: Conducted Power Measurements

Band	Freq MHz	Traffic Channel	Measured Power dBm	Band	Freq MHz	Traffic Channel	Measured Power dBm
1	824	128	31.34	2	1850	512	28.6
1	836	190	31.54	2	1880	661	28.7
1	849	251	31.53	2	1910	810	28.2

2.5 Battery Status

The EFTPOS Terminal battery was fully charged prior to commencement of each measurement. Each SAR test was completed within 30 minutes. The battery condition was monitored by measuring the RF power at a defined position inside the phantom before the commencement of each test and again after the completion of the test.

Table 3: Battery Details

Battery #1:	Ni-Mh 4.8V, 1450mAh	**Battery #2:**	Ni-Mh 4.8V, 1450mAh
Part No.:	623-578248-0114	**Part No.:**	623-578248-0114
Serial No.:	N/A	**Serial No.:**	N/A

2.6 Details of Test Laboratory

2.6.1 Location

EMC Technologies Pty Ltd
57 Assembly Drive
Tullamarine, (Melbourne) Victoria
Australia 3043

Telephone:	+61 3 9335 3333
Facsimile:	+61 3 9338 9260
email:	melb@emctech.com.au
website:	www.emctech.com.au

2.6.2 Accreditations

EMC Technologies Pty. Ltd. is accredited by the National Association of Testing Authorities, Australia (NATA).
NATA Accredited Laboratory Number: 5292

EMC Technologies Pty Ltd is NATA accredited for the following standards:

ARPANSA Standard AS/NZS 2772.2:	RF and microwave radiation hazard measurement
ACA:	Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2003
FCC:	Guidelines for Human Exposure to RF Electromagnetic Field OET65C 01/01
CENELEC:	ES59005: 1998
EN 50360: 2001	Product standard to demonstrate the compliance of Mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)
EN 50361: 2001	Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from Mobile phones (300MHz – 3GHz)
IEEE 1528: 2003	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.

Refer to NATA website www.nata.asn.au for the full scope of accreditation.

2.6.3 Environmental Factors

The measurements were performed in a shielded room with no background RF signals. The temperature in the laboratory was controlled to within 21± 1 °C, the humidity was in the range 45% to 46%. See section 3.5.1 for measured temperature and humidity. The liquid parameters were measured daily prior to the commencement of each test. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY4 SAR measurement system using the SN1377 probe is less than 5μV in both air and liquid mediums.

3.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

3.1 Probe Positioning System

The measurements were performed with the state of the art automated near-field scanning system **DASY4 Version V4.4 Build 3** from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision 6-axis robot (working range greater that 1.1m), which positions the SAR measurement probes with a positional repeatability of better than ±0.02 mm. The DASY4 fully complies with the OET65 C (01-01), IEEE 1528 and EN50361 SAR measurement requirements.

3.2 E-Field Probe Type and Performance

The SAR measurements were conducted with the dosimetric probe ET3DV6 Serial: 1377 (manufactured by SPEAG) designed in the classical triangular configuration and optimised for dosimetric evaluation. The probe has been calibrated and found to be accurate to better than ±0.25 dB. The probe is suitable for measurements close to material discontinuity at the surface of the phantom. The sensors of the probe are directly loaded with Schottky diodes and connected via highly resistive lines (length = 300 mm) to the data acquisition unit.

3.3 Data Acquisition Electronics

The data acquisition electronics (DAE3) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. The input impedance of the DAE3 box is 200 MΩ; the inputs are symmetrical and floating. Common mode rejection is above 80dB.Transmission to the PC-card is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The mechanical probe-mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

3.4 Calibration and Validation Procedures and Data

Prior to the SAR assessment, the system validation kit was used to verify that the DASY4 was operating within its specifications. The validation was performed at both 900 MHz and 1800 MHz with the SPEAG calibrated dipoles.

The validation dipoles are highly symmetric and matched at the centre frequency for the specified liquid and distance to the phantom. The accurate distance between the liquid surface and the dipole centre is achieved with a distance holder that snaps onto the dipole.

System validation is performed by feeding a known power level into a reference dipole, set at a know distance from the phantom. The measured SAR is compared to the theoretically derived level.

3.4.1 Validation Results (900 MHz and 1800 MHz)

The following table lists the dielectric properties of the tissue simulating liquid measured prior to each SAR validation. The results of the validation for each day are listed in columns 5 and 6. The forward power into the reference dipole for each SAR validation was adjusted to 250 mW.

Table 4: Validation Results (SPEAG calibrated dipoles)

1 Validation Date	2 Frequency (MHz)	3 ∈r (measured)	4 σ (mho/m) (measured)	5 Measured SAR 1g	6 Measured SAR 10g
20th April 2005	900	41.2	0.97	2.71	1.73
21st April 2005	1800	38.6	1.43	9.25	4.91

3.4.2 Deviation from reference validation values

The reference SAR values are derived using a reference dipole and flat phantom suitable for centre frequencies of 900 MHz and 1800 MHz. These reference SAR values are obtained from the IEEE Std 1528-2003 and are normalized to 1W.

The SPEAG calibration reference SAR value is the SAR validation result obtained in a specific dielectric liquid using the validation dipole during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table 5 below.

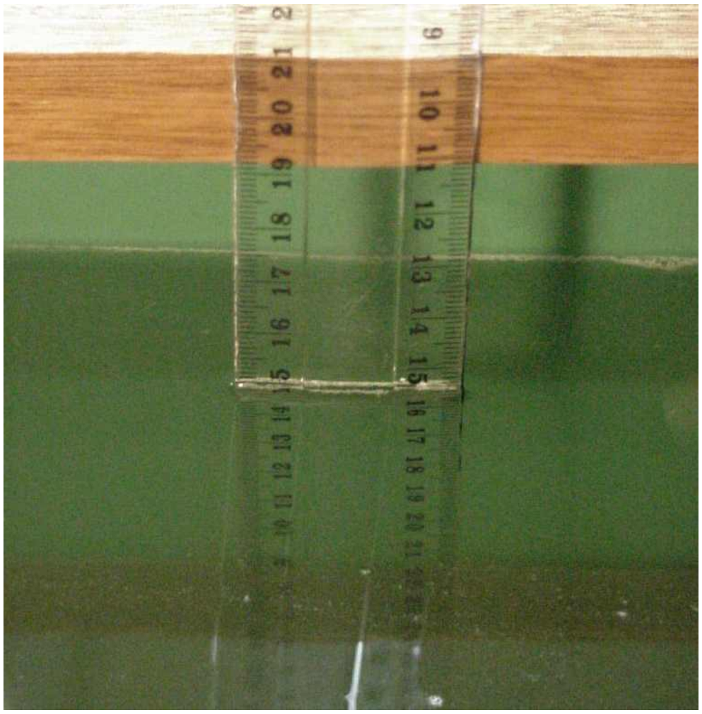
Table 5: Deviation from reference validation values

Validation Frequency & Date	Measured SAR 1g (input power = 250mW)	Measured SAR 1g (Normalized to 1W)	SPEAG Calibration reference SAR Value 1g (mW/g)	Deviation From SPEAG 1g (%)	IEEE Std 1528 reference SAR value 1g (mW/g)	Deviation From IEEE 1g (%)
900MHz 20th April 2005	2.71	10.8	11.1	-2.34	10.8	0.37
1800MHz 21st April 2005	9.25	37.0	38.2	-3.14	38.1	-2.89

NOTE: All reference validation values are referenced to 1W input power.

3.4.3 Liquid Depth 15cm

During the SAR measurement process the liquid level was maintained to a level of a least 15cm with a tolerance of ± 0.5cm.



3.5 Phantom Properties (Size, Shape, Shell Thickness, Tissue Material Properties)

The phantom used during the SAR validation was the "SAM" phantom from. The phantom shape is based on the size and dimensions of the 90 percentile large adult male reported in a 1989 anthropomorphic study. The phantom thickness is 2.0mm+/-0.2 mm and the phantom was filled with the required tissue simulating liquid. The flat phantom support structures were all non-metallic and spaced more than one device width away in transverse directions.

For SAR testing in the body worn positions the FLAT PHANTOM 10.1 was used. The thickness of the FLAT PHANTOM 10.1 is 2.0mm±0.2mm and the phantom was filled with the required tissue simulating liquid.

The dielectric parameters of the Muscle simulating liquid were measured prior to SAR assessment using the HP85070A dielectric probe kit and HP8714B Network Analyser. The actual dielectric parameters are shown in the following table.

Table 6: Measured Muscle Simulating Liquid Dielectric Values at 850MHz

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
824 MHz Muscle	53.3	55 ±5% (52.4 to 58)	0.97	0.97 ±5% (0.92 to 1.02)	1000
836 MHz Muscle	53.2	55 ±5% (52.4 to 58)	0.98	0.97 ±5% (0.92 to 1.02)	1000
849 MHz Muscle	53.0	55 ±5% (52.4 to 58)	1.00	0.97 ±5% (0.92 to 1.02)	1000

Table 7: Measured Muscle Simulating Liquid Dielectric Values at 1900MHz

Frequency Band	∈r (measured range)	∈r (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
1850 MHz Muscle	53.1	53.3 ±5% (50.6 to 56.0)	1.56	1.52 ±5% (1.44 to 1.60)	1000
1880 MHz Muscle	52.9	53.3 ±5% (50.6 to 56.0)	1.58	1.52 ±5% (1.44 to 1.60)	1000
1910 MHz Muscle	52.8	53.3 ±5% (50.6 to 56.0)	1.60	1.52 ±5% (1.44 to 1.60)	1000

NOTE: The Muscle liquid parameters were within the required tolerances of ±5%.

3.5.1 Temperature and Humidity

The humidity and dielectric/ambient temperatures are recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and the temperature during tests was less than |2|°C.

Table 8: Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
20th April 2005	21.5	20.8	46
21st April 2005	20.7	20.0	45

3.6 Simulated Tissue Composition Used for SAR Test

The tissue simulating liquids are created prior to the SAR evaluation and often require slight modification each day to obtain the correct dielectric parameters. Head liquid was used for the SAR validations.

Table 9: Tissue Type: Muscle @ 850MHz
Volume of Liquid: 30 Litres

Approximate Composition	% By Weight
Distilled Water	41.05
Salt	1.35
Sugar	56.5
HEC	1.0
Bactericide	0.1

*Refer "OET Bulletin 65 97/01 P38"

Table 10: Tissue Type: Muscle @ 1900MHz
Volume of Liquid: 30 Litres

Approximate Composition	% By Weight
Distilled Water	61.17
Salt	0.31
Bactericide	0.29
Triton X-100	38.23

3.7 Device Holder for DASY4

The DASY4 device holder supplied by SPEAG is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The rotation centres for both scales is the ear opening. Thus the device needs no repositioning when changing the angles.

The DASY4 device holder is made of low-loss material having the following dielectric parameters: relative permittivity $\varepsilon=3$ and loss tangent $\delta=0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, to reduce the influence on the clamp on the test results.

Refer to Appendix A2-A3 for photograph of device positioning.

4.0 SAR MEASUREMENT PROCEDURE USING DASY4

The SAR evaluation was performed with the SPEAG DASY4 System (DASY4 Version V4.4 Build 3). A summary of the procedure follows:

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the EUT. The SAR at this point is measured at the start of the test and then again at the end of the test.

b) The SAR distribution at the exposed side of the head or the flat section of the flat phantom is measured at a distance of 3.9 mm from the inner surface of the shell. The area covers the entire dimension of the head and the horizontal grid spacing is 15 mm x 15 mm. The actual Area Scan has dimensions of 181 mm x 71 mm surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.

c) Around this point, a volume of 30 mm x 30 mm x 30 mm is assessed by measuring 7 x 7 x 7 points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

   (i) The data at the surface are extrapolated, since the centre of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

   (ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”- condition (in x, y and z-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

   (iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

   (iv) The SAR value at the same location as in Step (a) is again measured