MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE ▯ BALTIMORE, MARYLAND 21230-3432 ▯ PHONE (410) 354-3300 ▯ FAX (410) 354-3313

November 15, 2002

Mobicom Corporation
960 Holmdel Road, Bldg. II
Holmdel, NJ 07733

Reference: GSM/GPRS 900/1900 PCMCIA Card Model M88i
FCC ID: P8D-C6M88I

Dear Mr. Murphy:

Enclosed is the EMC SAR Evaluation Report for the Mobicom Corporation GSM/GPRS 900/1900 PCMCIA Card Model M88i. The GSM/GPRS 900/1900 PCMCIA Card Model M88i was tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C:01-01 and shown to be capable to be in compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE Std. C95.1-1992.

Thank you for using the testing services of MET Laboratories. If you have any questions regarding these results or if MET can be of further assistance to you, please feel free to contact me. We appreciate your business and look forward to working with you again soon.

Kindest Regards,
MET LABORATORIES, INC.

Marianne T. Bosley
EMC Administrator

Enclosures: (\Mobicom Corporation\EMC12218-FCCSAR.rpt)

DOCTEM-23 Jan 02

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Dosimetric Assessment

Test Report

for the

Mobicom Corporation
GSM/GPRS 900/1900 PCMCIA Card Model M88i

Tested and Evaluated
In Accordance With
FCC OET 65 Supplement C:01-01

MET REPORT: EMC12218-SAR

November 18, 2002

PREPARED FOR:

Mobicom Corporation
960 Holmdel Road, Bldg. II
Holmdel, NJ 07733
PREPARED BY:

MET Laboratories, Inc.
914 West Patapsco Avenue
Baltimore, Maryland 21230-3432

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MET REPORT: EMC12218-SAR

DOSIMETRIC ASSESSMENT TEST REPORT

for the

Mobicom Corporation
GSM/GPRS 900/1900 PCMCIA Card, M88i

Tested and Evaluated
In Accordance With
FCC OET Supplement C:01-01

Prepared for

Mobicom Corporation
960 Holmdel Road, Bldg. II
Holmdel, NJ 07733

Report Prepared By

Marianne T. Bosley
EMC ADMINISTRATOR

Report Reviewed By

Asad Bajwa
TEST ENGINEER

Final Review By

CHRISTOPHER R. HARVEY
EMC LAB DIRECTOR

Engineering Statement: The measurements shown in this report were made in accordance with the procedures specified in Supplement C to OET Bulletin 65 of the Federal Communications Commission (FCC) Guidelines [FCC 2001] for uncontrolled exposure. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment evaluated is capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE Std. C95.1-1992.

CHRISTOPHER R. HARVEY
EMC LAB DIRECTOR

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SAR EVALUATION
CERTIFICATE OF COMPLIANCE

FCC ID: P8D-C6M88I
APPLICANT: Mobicom Corporation

APPLICANT NAME AND ADDRESS:
Mobicom Corporation
960 Holmdel Road, Bldg. II
Holmdel, NJ 07733

DATE OF TEST: **November 5, 2002**
TEST LOCATION: MET LABORATORIES INC.
914 West Patapsco Avenue
Baltimore, Maryland 21230

EUT:	GSM/GPRS PCS 1900 PCMCIA Card	
Date of Receipt:	June 14, 2002	
Device Category:	GSM/GPRS PCS 1900 PCMCIA Card	
RF exposure environment:	Uncontrolled	
RF exposure category:	Portable	
Power supply:	Powered by Host Laptop	
Antenna:	Retractable (Not operational in retractable mode)	
Production/prototype:	Identical Prototype	
Measured Standards:	PCS 1900	
Modulation:	GSM	
Crest Factor:	GSM = 8	
TX Range:	GSM PCS 1900 1850.2 MHz - 1909.8 MHz	
RX Range:	GSM PCS 1900 1930.2 MHz - 1989.8 MHz	
Used TX Channels:	Low: ch.512 Center: ch. 610	High: ch. 810
Maximum RF Power Output:	0.9 W EIRP GSM PCS1900 (29.5 dBm)	
Maximum SAR Measurement (Averaged over 1g):	0.852 W/kg PCS GSM Body	

This wireless portable device has been tested in accordance with the measurement procedures specified in FCC/OET Bulletin 65 Supplement C (2001) and IEEE Std. 1528-200X (July 2001), and has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE Std. C95.1 - 1992.

I attest to the accuracy of this data. All reported measurements were performed by me, or were made under my supervision, and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

I also certify that no party to this application has been denied the FCC benefits pursuant to Section 5.301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Chris Harvey
Director, EMC Laboratory

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OBJECTIVE

The GSM/GPRS 900/1900 PCMCIA Card Model M88i is a Global System for Mobile communications/General Packet Radio System from Mobicom Corporation that operates in the TX range 1850.2 – 1909.8 MHz frequency range utilizing a retractable antenna.

The objective of the procedure was to perform a dosimetric assessment one of the PCMCIA cards in the GSM PCS 1900 standard. The measurements have been carried out with the dosimetric assessment system "SARA2", and were made according to the Supplement C to OET Bulletin 65 of the Federal Communications Commission (FCC) Guidelines [FCC 2001] for evaluating compliance of mobile and portable devices with FCC limits for human exposure in the general population to radio frequency emissions.

INTRODUCTION

In the United States, the most recent FCC RF exposure criteria is documented in the publication OET 65 Supplement C Edition 01-01 [FCC 2001], which sets limits for human exposure to radio frequency electromagnetic fields in the frequency range 3kHz to 300GHz.

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. (c) 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring SAR due to the RF radiation exposure from the Equipment Under Test (EUT).

SAR DEFINITION

Specific absorption rate (SAR) is the biological relevant parameter describing the effects of electromagnetic fields in the frequency range of interest. It is a measure of the power absorbed per unit mass and may be spatially averaged over the total mass of an exposed body or its parts.

In mathematical terms Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy absorbed by (dissipated in) an incremental mass contained in a volume element of a given density. It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body as given below**.** The SAR is calculated from the r.m.s. electric field strength E inside the human body, the conductivity σ and the mass density ρ of the biological tissue:

$$SAR = \frac{|E|^2 s}{r}$$

SAR is expressed in units of Watts per Kilogram (W/kg)

σ = Conductivity of the tissue-simulant material (S/m)

ρ= Mass density of the tissue-simulant material (kg/m3)

E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

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SUMMARY FOR SAR TEST REPORT

EUT	GSM/GPRS PCS 1900 PCMCIA Card
FCC ID	P8D-C6M88I
Date of receipt	June 14, 2002
Date of Test	November 5, 2002
RF Exposure Category	Uncontrolled
Measured Standard	PCS 1900
Measurement done by	Asad Bajwa

Maximum Results Found during SAR Evaluation

The equipment is deemed to fulfill the requirements if the measured values are less than or equal to the limit.

Head Configuration

Phantom Configuration	Test Position	Channel	Power (dBm)	Frequency (GHz)	Max. 1g SAR (W/kg)
NA	NA	NA	NA	NA	NA

Table 1: Max SAR Value for Head Testing

Body Worn Configuration

Test Configurations	Power (dBm)	Channel	Frequency (GHz)	Max. 1g SAR (W/kg)
Antenna Horizontal to PCMCIA Card and parallel to Phantom	**29.5**	**610**	**1.8698**	**0.852**

Table 2: the Max SAR value for Body Testing

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DESCRIPTION OF TESTED DEVICE

FCC ID	P8D-C6M88I
Modes of Operation	PCS 1900
Modulation Mode(s)	GSM(GMSK)
Duty Cycle(s) (=1/ Crest Factor)	Crest Factor=8
Transmitter Frequency Range	1850.2-1909.8 MHz

Picture of Phone

Description of the Antenna

Retractable (Not operational in retractable mode)

Battery Options

The Card is powered by the Host laptop.

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EUT PICTURES

EUT Top view

EUT Bottom View

EUT Front view

EUT Back view

EUT with antenna extracted

Handset

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TEST CONDITIONS

Environment

Test Environment	Dedicated test area
Ambient temperature	24°C ± 1 °C
Tissue simulating liquid temperature	24.2°C ± 0.5 °C
Shielded Chamber	Anechoic material strategically positioned to minimize room reflections
Ambient Noise	Very low

Table 3: Summary of Test Environment conditions

Test Signal, Frequencies and Output Power

1. The measurements are first performed at the middle channel of the operating band of the EUT. If the SAR value of the middle channel for each test configuration (Left, Right, Cheek, Tilt, Extended, Retracted) is at least 3 dB below the SAR limit, testing at the high and low channels is optional for such test configurations.
2. The phone was set to maximum power level during all the tests and at the beginning of the each test the battery was fully charged. Power output was measured before and after each test.
3. The phone was equipped with a special firmware, which allowed controlling the transmitter from its keypad.

   ✓ During SAR testing, the EUT (PCMCIA CARD) was operated and controlled by a Rhode & Schwartz CMU 200 Base Station Simulator.

   During SAR testing, the EUT (PCMCIA CARD) was operated and controlled by an Agilent Base station HP 8924 E (with HP 83236B PCS Interface).

   Other

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Host Laptops

Following 3 host Laptops were used to verify the SAR compliance to FCC limits.

1		**Sony** NOTEBOOK COMPUTER MODEL PCG-Z505HS No of PCMCIA Slots=1
2		**Toshiba** TECRA8100 SYSTEM UNIT MODEL NO. 810C-16CF2 NO OF PCMCIA SLOTS=2
3		**Dell** INSPIRON 2600 MODEL NO: PP04L NO OF PCMCIA SLOTS=1

Table 4. Host laptops Description

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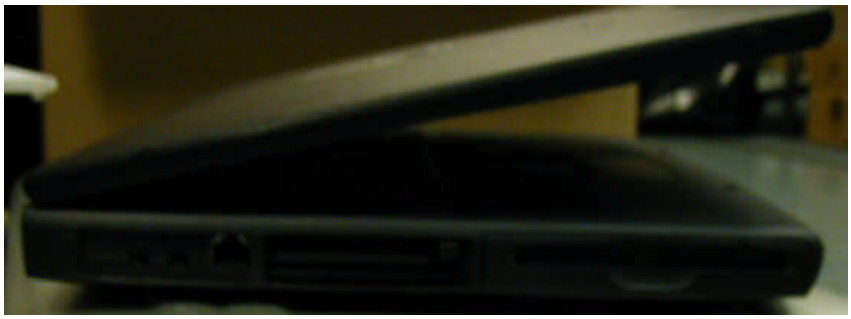
Sony

Toshiba



Dell

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TEST DETAILS

Tissue Recipes

The following recipes are provided in percentage by weight.

1900 MHz, Body: 41% De-Ionized Water
0.2% Salt
58.8% Sugar

Material Parameters

Simulant	Freq [MHz]	Room Temp [C]	Liquid Temp [C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
Body	1900	23.5	23.7	ε_r	54	56.3	1.85	+/- 5%
				σ	1.45	1.43	-1.3	+/- 5%

Table 5: Parameters of the tissue simulating liquid, 1900MHz /Body

NOTES:

1 Parameters were measured before and after testing. These values reflect both measurements.

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System Validation

Following equipment is used for the system validation:

Signal Generator (Agilent E4432B)
RF Amplifier (ALTO Scientific Co.)
Dual Directional Coupler (HP 778D)
The HP 8564E Spectrum Analyzer (used for RF power measurement)
Cables, Attenuate and Adapters

The recommended (IEEE Std 1528) set-up was used:

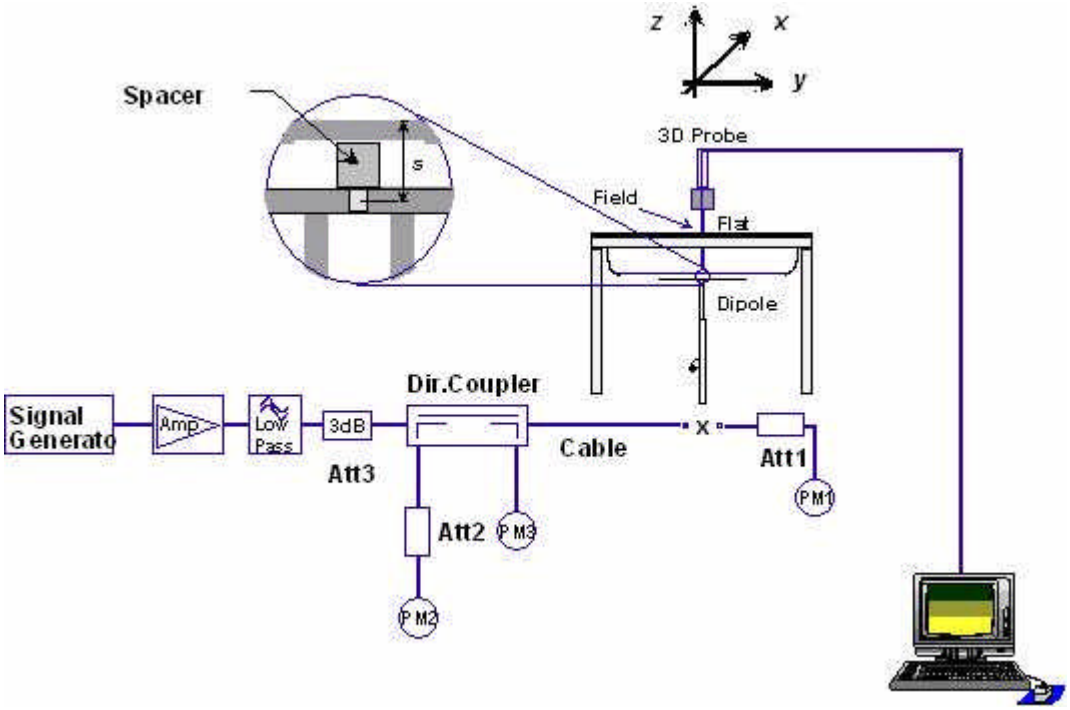

Figure 13. Performance Check Setup Diagram

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Performance Checking

Test Position:	**Flat Phantom**
Test Date:	November 5, 2002
Antenna Position:	Balanced Dipole
Probe:	IXP-050/SN 0082 – SARf(0.51, 0.53, 0.53) Probe Cal Date 03/2002
Med. Parameters:	Body: e_r = 55.1; s = 1.42
Pre Test Room Temp.	23.5 C
Post Test Room Temp.	23.5 C
Pre Test Simulant Liquid Temp.	23.7 C
Post Test Simulant Liquid Temp.	23.7 C
CH	NA
SAR Drift	<2%
SAR (1g):	35.43

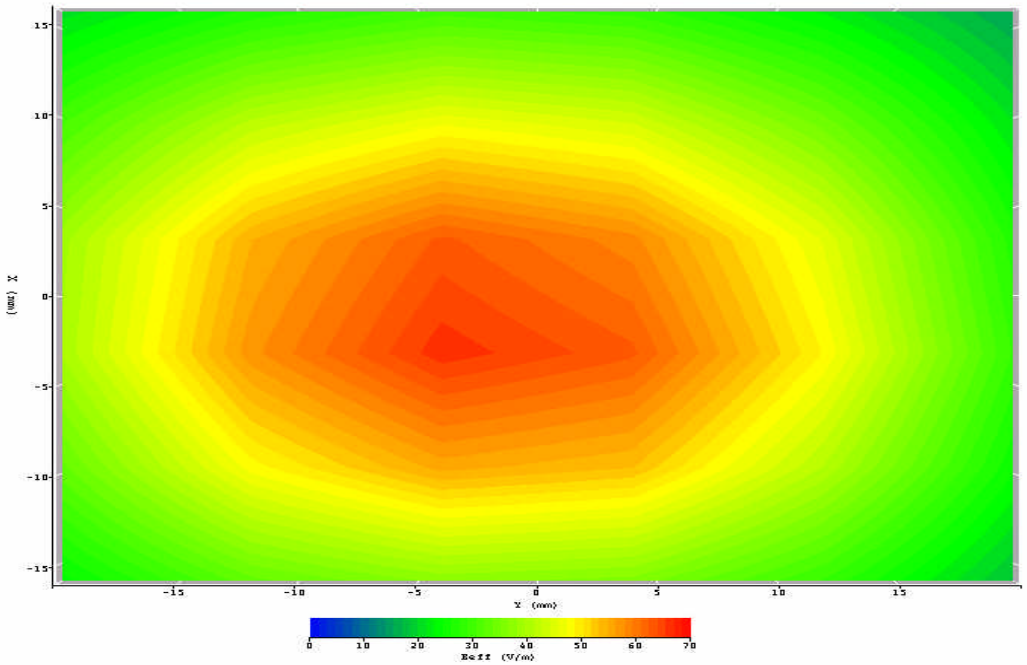

Figure 14. Validation Measurement - 1800 MHz in Body Tissue

Simulant	Freq [MHz]	Room Temp [C]	Liquid Temp [C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
Body	1800	23.5	23.7	ε_r	54	55.1	2.1	+/- 5%
				σ	1.45	1.42	-2.1	+/- 5%
				1g SAR	38.1	35.43	-7.01	+/- 10

Table 6. System Validation Results – (November 5, 2002)

NOTE:
RF Forward power = 0.116 W
Validation was done within 100MHz of test frequency

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Test Position:	**Flat Phantom**
Test Date:	November 6, 2002
Antenna Position:	Balanced Dipole
Probe:	IXP-050/SN 0082 – SARf(0.51, 0.53, 0.53) Probe Cal Date 03/2002
Med. Parameters:	Body: e_r = 56.4; s = 1.43
Pre Test Room Temp.	24.3 C
Post Test Room Temp.	24.3 C
Pre Test Simulant Liquid Temp.	24.7 C
Post Test Simulant Liquid Temp.	24.7 C
CH	NA
SAR Drift	<2%
SAR (1g):	40.73

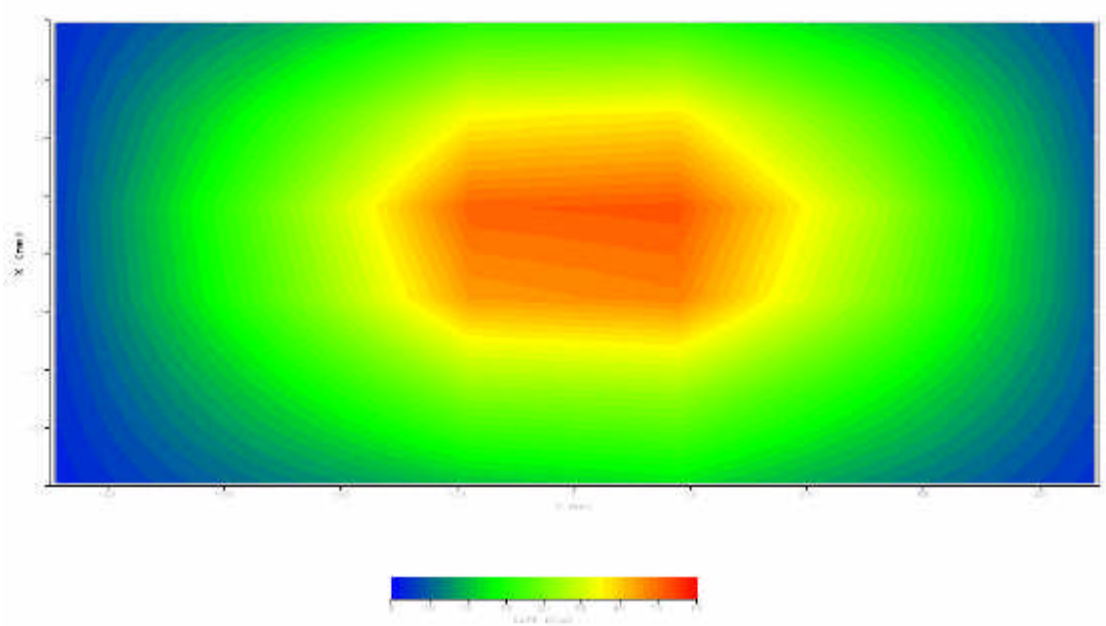

Figure 14. Validation Measurement - 1800 MHz in Body Tissue

Simulant	Freq [MHz]	Room Temp [C]	Liquid Temp [C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
Body	1800	24.3	24.7	ε_r	54	56.4	4.4	+/- 5%
				σ	1.45	1.43	-1.38	+/- 5%
				1g SAR	38.1	40.73	6.9	+/- 10

Table 7. System Validation Results – (November 6, 2002)

NOTE:
RF Forward power = 0.116 W
Validation was done within 100MHz of test frequency

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Test Position:	**Flat Phantom**
Test Date:	November 7, 2002
Antenna Position:	Balanced Dipole
Probe:	IXP-050/SN 0082 – SARf(0.51, 0.53, 0.53) Probe Cal Date 03/2002
Med. Parameters:	Body: e_r = 56.3; s = 1.42
Pre Test Room Temp.	24.5 C
Post Test Room Temp.	24.5 C
Pre Test Simulant Liquid Temp.	24.8 C
Post Test Simulant Liquid Temp.	24.8 C
CH	NA
SAR Drift	<2%
SAR (1g):	40.16

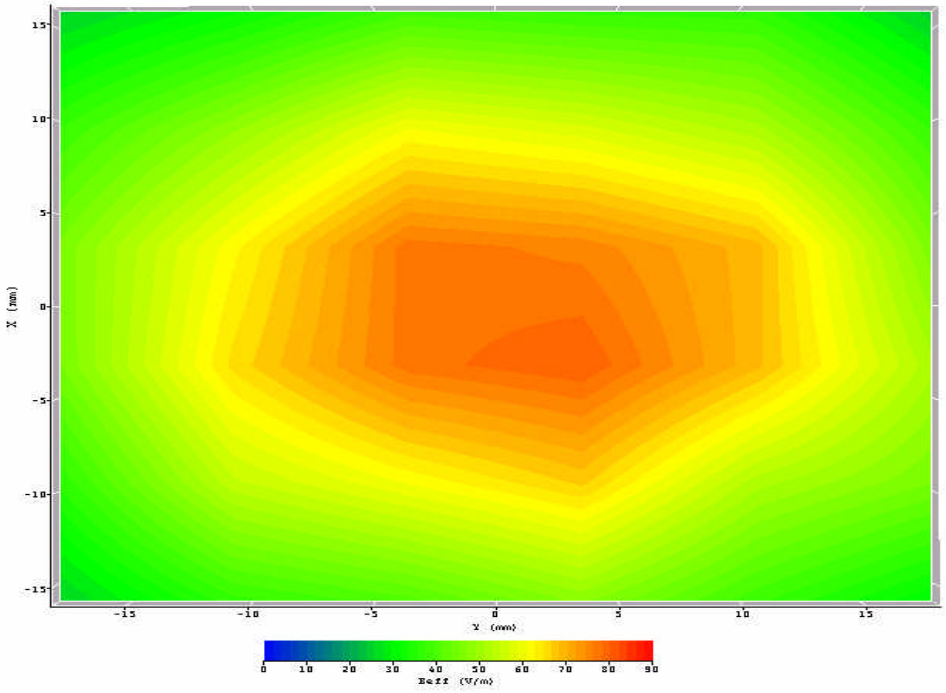

Figure 14. Validation Measurement - 1800 MHz in Body Tissue

Simulant	Freq [MHz]	Room Temp [C]	Liquid Temp [C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
Body	1800	24.5	24.8	ε_r	54	56.3	1.85	+/- 5%
				σ	1.45	1.42	-2.11	+/- 5%
				1g SAR	38.1	40.16	5.4%	+/- 10

Table 8. System Validation Results – (November 7, 2002)

NOTE:
RF Forward power = 0.116W
Validation was done within 100MHz of test frequency

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SAR Results Summary

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MEASUREMENT RESULTS Laptop1

	Description	Power dBm	Channel	Frequency (GHz)	Max. 1g SAR (W/kg)	2nd spot (W/kg)
1	Antenna Vertical to PCMCIA Card and parallel to Phantom	29.5	610	1.8698	0.472	NA
2	Same as above with Handset	29.5	610	1.8698	0.114	NA
3	Antenna Horizontal to PCMCIA Card and parallel to Phantom	29.5	610	1.8698	0.852	NA
4	Same as above with Handset	29.5	610	1.8698	0.669	NA
5	Antenna vertical to PCMCIA Card and Perpendicular to Phantom	29.5	610	1.8698	0.037	NA
6	Same as above with Handset	29.5	610	1.8698	0.042	NA

Table 9. Measured Body SAR results for Sony Laptop

NOTES:

1 The measurements are first performed at the middle channel of the operating band of the EUT. If the SAR value of the middle channel for each test configuration (Left, Right, Cheek, Tilt, Extended, Retracted) is at least 3 dB below the SAR limit, testing at the high and low channels is optional for such test configurations.

2 The test data reported are the worst-case SAR values with the antenna-head position set in a typical configuration.

3 All modes of operation are investigated and worst cases are reported.

4	Multiple Hot Spots	✓None	✓SAR was less than 2 dB of the highest peak	Reported
5	Battery Type	Standard	Extended	Both
6	Power Measured	Conducted	✓EIRP	ERP
7	SAR Measurement System	SARA2		
8	SAR Configuration	Head	✓Body	

9 Before the measurements, the test site ambient conditions were checked performing SAR measurements with the phone powered off.

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MEASUREMENT RESULTS Laptop2

	Description	Power dBm	Channel	Frequency (GHz)	Max. 1g SAR (W/kg)	2nd spot (W/kg)
1	Antenna Vertical to PCMCIA Card and parallel to Phantom	29.5	610	1.8698	0.375	NA
2	Same as above with Handset	29.5	610	1.8698	0.139	NA
3	Antenna Horizontal to PCMCIA Card and parallel to Phantom	29.5	610	1.8698	0.274	NA
4	Same as above with Handset	29.5	610	1.8698	0.27	NA
5	Antenna vertical to PCMCIA Card and perpendicular to Phantom	29.5	610	1.8698	0.019	NA
6	Same as above with Handset	29.5	610	1.8698	0.022	NA

Table 10. Measured Body SAR results for Toshiba Tecra 8100

NOTES:

1 The measurements are first performed at the middle channel of the operating band of the EUT. If the SAR value of the middle channel for each test configuration (Left, Right, Cheek, Tilt, Extended, Retracted) is at least 3 dB below the SAR limit, testing at the high and low channels is optional for such test configurations.

2 The test data reported are the worst-case SAR values with the antenna-head position set in a typical configuration.

3 All modes of operation are investigated and worst cases are reported.

4	Multiple Hot Spots	✓None	✓SAR was less than 2 dB of the highest peak	Reported
5	Battery Type	Standard	Extended	Both
6	Power Measured	Conducted	✓EIRP	ERP
7	SAR Measurement System	SARA2		
8	SAR Configuration	Head	✓Body	

9 Before the measurements, the test site ambient conditions were checked performing SAR measurements with the phone powered off.

10 This laptop had 2 PCMCIA slots, the bottom one gave higher SAR values. The data provided above reflects the SAR values for the bottom slot only.

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MEASUREMENT RESULTS Laptop3

	Description	Power dBm	Channel	Frequency (GHz)	Max. 1g SAR (W/kg)	2nd spot (W/kg)
1	Antenna Vertical to PCMCIA Card and parallel to Phantom	29.5	610	1.8698	0.305	NA
2	Same as above with Handset	29.5	610	1.8698	0.123	NA
3	Antenna Horizontal to PCMCIA Card and parallel to Phantom	29.5	610	1.8698	0.158	NA
4	Same as above with Handset	29.5	610	1.8698	0.179	NA
5	Antenna vertical to PCMCIA Card and Perpendicular to Phantom	29.5	610	1.8698	0.301	NA
6	Same as above with Handset	29.5	610	1.8698	0.102	NA

Table 11. Measured Body SAR results for Dell Laptop

NOTES:

1 The measurements are first performed at the middle channel of the operating band of the EUT. If the SAR value of the middle channel for each test configuration (Left, Right, Cheek, Tilt, Extended, Retracted) is at least 3 dB below the SAR limit, testing at the high and low channels is optional for such test configurations.

2 The test data reported are the worst-case SAR values with the antenna-head position set in a typical configuration.

3 All modes of operation are investigated and worst cases are reported.

4	Multiple Hot Spots	✓None	✓SAR was less than 2 dB of the highest peak	Reported
5	Battery Type	Standard	Extended	Both
6	Power Measured	Conducted	✓EIRP	ERP
7	SAR Measurement System	SARA2		
8	SAR Configuration	Head	✓Body	

9 Before the measurements, the test site ambient conditions were checked performing SAR measurements with the phone powered off.

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