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LD/SEMC/BGUG/NM Hamid Kami Shirazi

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GUG/N 04:134

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LD/SEMC/BGUG/NMC Mats Hansson

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SAR Test Report: PY7A1021044

Date of test: April. 03 to 15, 2004

Laboratory: Electromagnetic Near Field and Radio Frequency Dosimetry
Lab
Sonyericsson Mobile Communications AB
Nya Valentorget
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Statement of Compliance

Sony Ericsson Mobile Communications AB declares under its sole responsibility that the product

Sony Ericsson Type AAB-1021044BV ; FCC ID: PY7A1021044

to which this declaration relates, is in conformity with the appropriate RF exposure standards recommendations and guidelines. It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(None)

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This test report shall not be reproduced except in full, without written approval of the laboratory.

The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report.

Sony Ericsson encourages all feedback, both positive and negative, on this report.



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Date

040624

Rev

A

Reference

File

1 Table of contents

2 INTRODUCTION 3

3 DEVICE UNDER TEST 3

3.1 ANTENNA DESCRIPTION 3

3.2 DEVICE DESCRIPTION 3

4 TEST EQUIPMENT..... 4

4.1 DOSIMETRIC SYSTEM 4

4.2 ADDITIONAL EQUIPMENT 4

5 ELECTRICAL PARAMETERS ON THE TISSUE SIMULATING LIQUID 4

6 SYSTEM ACCURACY VERIFICATION 5

7 SAR MEASUREMENT UNCERTAINTY 5

8 TEST RESULTS 7

9 REFERENCES 7

10 APPENDIX..... 8

10.1 SAR DISTRIBUTION COMPARISON FOR SYSTEM ACCURACY VERIFICATION 8

10.2 SAR DISTRIBUTION PLOT 16

10.3 PHOTOGRAPHS OF THE DEVICE UNDER TEST..... 17

10.4 DEVICE POSITION ON SAM TWINS PHANTOM..... 21

10.5 PROBE CALIBRATION PARAMETERS..... 24

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2 Introduction

In this report, compliance of the Sony Ericsson PY7A1021044 portable telephone with RF safety guidelines is demonstrated. The applicable RF safety guidelines and the SAR measurement specifications used for the test are described in the *SAR Measurement Specifications of Wireless Handsets* [1].

3 Device Under Test

3.1 Antenna Description

Type	Internal antenna	
Location	Inside back, near the top	
Dimensions	Max length	38mm
	Max width	14mm
Configuration	PIFA	

3.2 Device description

Device model	PY7A1021044
Serial number	CB500TH82L
Mode	GSM 1900
Multiple Access Scheme	TDMA
Maximum Output Power Setting	30
Factory Tolerance in Power Setting	± 0.5dB
Maximum Peak Output Power	30.5dBm
Crest Factor	8
Transmitting Frequency Range	1850.2 – 1909.8 MHz
Prototype or Production Unit	Preproduction
Device Category	Portable
RF exposure environment	General population / uncontrolled

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4 Test equipment

4.1 Dosimetric system

SAR measurements were made using the DASY3 professional system (software version 3.1c) with SAM twin phantom, manufactured by Schmid & Partner Engineering AG (SPEAG). The list of calibrated equipment is given below.

<i>Description</i>	<i>Serial Number</i>	<i>Due Date</i>
DASY3 DAE V1	419	4/2005
E-field probe ETDV6	1585	4/2005
Dipole Validation Kit, D1900 V2	5d002	2/2006

4.2 Additional equipment

<i>Description</i>	<i>Inventory Number</i>	<i>Due Date</i>
Signal generator ESG-D4000A	INV 462935	9/2004
Directional coupler HP778D	INV 2903	1/2005
Power meter R&S NRVD	INV 483920	1/2005
Power sensor R&S NRV-Z5	INV 2333	1/2005
Power sensor R&S NRV-Z5	INV 2334	1/2005
Termination 65N50-0-11	INV 2903	1/2005
Network analyzer HP8753C	INV421671	8/2004
S-parameter test set HP85047A	INV 421670	9/2004
Dielectric probe kit HP8507D	INV 20000053	2/2005
Radio Communication Tester	INV 74410	4/2005

5 Electrical parameters on the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ϵ_r , and the conductivity, σ , of the tissue simulating liquids were measured with the dielectric probe kit. These values are shown in the table below. The mass density, ρ , entered into the DASY3 software is also given. Recommended limits for permittivity ϵ_r , conductivity σ and mass density ρ are also shown.

Application Note: The head and body tissue dielectric parameter recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table is prepared according to the following receipts. **For 1900MHz Head: Water 54.9%, Salt 0.18% and DGBE 44.92%, and For 1900MHz Body: Water 56.1%, DGBE 33.4%, Salt 0.5%,**

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ϵ_r	σ (S/m)	ρ (g/cm ³)
1900	Head	Measured, 11/06/04	39.1	1.47	1.0
		Recommended	40.0	1.40	1.0
	Muscle	Measured, 14/06/04	50.0	1.52	1.0
		Recommended	53.3	1.52	1.0

6 System accuracy verification

A system accuracy verification of the DASY3 was performed using the dipole validation kit listed in section 3.1. The system verification test has done as the same day as the measurement of the DUT. The measurement made in ambient temperature 25°C and humidity 30%. The obtained results are displayed in the table below.

RF noise had been measured in liquid when all RF equipment in lab was set off. Measured value was 0.0011W/g in 1g mass.

f (MHz)	Tissue type	Measured / Reference	SAR (W/kg) 1g mass	Dielectric Parameters			t (°C)
				ϵ_r	σ (S/m)	ρ (g/cm ³)	
1900	Head	Measured, 11/06/04	41.5	39.1	1.47	1.0	22
		Reference	41.6	38.8	1.44	1.0	-
	Muscle	Measured, 14/06/04	44.1	50.0	1.52	1.0	22
		Measured, 15/06/04	44.0	50.0	1.52	1.0	22
		Reference	43.2	51.2	1.59	1.0	-

7 SAR measurement uncertainty

Error description	Uncertainty (%)	Distribution	Divisor	c_i 1g	Standard Uncertainty Head	Standard Uncertainty Body
Measurement system						
Probe calibration	±4.4	Normal	1	1	±4.4	±4.4
Axial isotropy	±4.7	Rectangular	$\sqrt{3}$	$(1-c_p)^{1/2}$	±1.9	±1.9
Spherical isotropy	±9.6	Rectangular	$\sqrt{3}$	$(c_p)^{1/2}$	±3.9	±3.9
Spatial resolution	±0.0	Rectangular	$\sqrt{3}$	1	±0.0	±0.0
Boundary effects	±5.5	Rectangular	$\sqrt{3}$	1	±3.2	±3.2
Probe linearity	±4.7	Rectangular	$\sqrt{3}$	1	±2.7	±2.7
Detection limit	±1.0	Rectangular	$\sqrt{3}$	1	±0.6	±0.6
Readout electronics	±1.0	Normal	1	1	±1.0	±1.0
Response time	±0.8	Rectangular	$\sqrt{3}$	1	±0.5	±0.5
Integration time	±1.4	Rectangular	$\sqrt{3}$	1	±0.8	±0.8
RF ambient conditions	±3.0	Rectangular	$\sqrt{3}$	1	±1.7	±1.7
Mech. Constraints of robot	±0.4	Rectangular	$\sqrt{3}$	1	±0.2	±0.2
Probe positioning	±2.9	Rectangular	$\sqrt{3}$	1	±1.7	±1.7
Extrap. and integration	±3.9	Rectangular	$\sqrt{3}$	1	±2.3	±2.3
Measurement System Uncertainty					±8.3	±8.3
Test sample related						
Device positioning	±6.0	Normal	0.89	1	±6.7	±6.7
Device holder	±5.0	Normal	0.84	1	±5.9	±5.9
Power drift	-3.8/-2.5	Rectangular	$\sqrt{3}$	1	±2.2	±1.4
Test Sample Related Uncertainty					±9.2	±9.0
Phantom and setup						
Phantom uncertainty	±4.0	Rectangular	$\sqrt{3}$	1	±2.3	±2.3
Liquid conductivity (target)	±5.0	Rectangular	$\sqrt{3}$	0.6	±1.7	±1.7
Liquid conductivity (meas)	+5/0.0	Rectangular	$\sqrt{3}$	0.6	+1.7	0
Liquid permittivity (target)	±5.0	Rectangular	$\sqrt{3}$	0.6	±1.7	±1.7
Liquid permittivity (meas)	-2.3/-6	Rectangular	$\sqrt{3}$	0.6	-1.3	-2.1
Phantom and Tissue parameter Uncertainty					±3.9	±3.9
Combined standard uncertainty					±12.9	±12.8
Extended standard uncertainty(k=2)					±25.8	±25.7



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8 Test results

The measured 1-gram averaged SAR values of the device against the head and the body are provided in Tables 1 and 2 respectively. The humidity and ambient temperature of test facility were 30.4% - 36.8% and 24.8 °C – 25.1 °C respectively. The depth of the head tissue simulating liquid was 15 cm and of the muscle tissue simulating liquid was 15.2cm. A base station simulator was used to control the device during the SAR measurement. The phone was supplied with full-charged battery for each measurement.

For head measurement, the device was tested on the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom in two phone position, cheek (touch) and tilt (cheek + 15deg). For GSM 1900 modes, the Phone was tested when it was open and also when it was close and at the lowest, middle and highest frequencies in the transmit band.

Mode	Channel	Peak Output Power (dBm)	Phone Position	Liquid temp(°C)	SAR (W/kg) in 1g mass	
					Right-hand	Left-hand
1900 GSM	512	30,5	Cheek	22/22.1	0.43	0.36
			Tilt	22.1/22.3	0.39	0.35
	661	30,5	Cheek	22/22.1	0.43	0.35
			Tilt	22.1/22.3	0.43	0.35
	810	30,5	Cheek	22/22.1	0.49	0.37
			Tilt	22.1/22.3	0.43	0.37

Table1: SAR measurement result for Sony Ericsson PY7A1021044 telephone. Measured against the head.

For body-worn measurements, the device was tested against flat phantom representing the user body. Under measurement the phone was put under flat section of phantom with 15mm space and the measurement provides for both front and back part of the phone to the phantom.

The GPRS measurements have done only for back part of the phone to find the max SAR value. This has done in flat section of the phantom while the devise has 15mm space to phantom. Data communication was sent in two time slots by using a base station.

Mode	Chanel	Peak Output Power(dBm)	Phone Position	Liquid temp(°C)	SAR(W/kg) in 1g mass
1900 GSM	512	30,5	Front to Phantom 15mm space	22	0.09
			Back to Phantom 15mm space	22	0.89
			Back to Phantom 15mm space Data communication mode	22	0.89
	661	30,5	Front to Phantom 15mm space	22.2	0.09
			Back to Phantom 15mm space	22.2	1.14
			Back to Phantom 15mm space Data communication mode	22.2	0.87
	810	30,5	Front to Phantom 15mm space	22.2	0.10
			Back to Phantom 15mm space	22.2	1.22
			Back to Phantom 15mm space Data communication mode	22.2	1.53

Table 2: SAR measurement result for Sony Ericsson PY7A1021044 telephone. Measured against the body.



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040624

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9 References

[1] R.Plicanic, "SAR Measurement Specification of Wireless Handsets", Sony Ericsson internal document LD/SEMC/GUG/N 03:141

[2] FCC, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radio Frequency Emissions," Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97- 01).

[3] IEEE, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques," Std 1528-200x .

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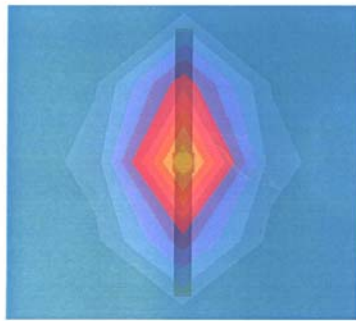
10 Appendix

10.1 SAR distribution comparison for system accuracy verification

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Dipole 1900 MHz

SAM 4 Phantom: Flat Section; Position: (90° 90°); Frequency: 1900 MHz
Probe: ET3DV6 - SNI555; Conn(F):26.5,26.5,26); Crest factor: 1.0; Head (1900MHz: $\sigma = 1.47 \text{ mho/m}$, $\epsilon = 39$) $\rho = 1.00 \text{ g/cm}^3$
Cubes (2): SAR (1g): 4.15 mW/g $\pm 0.05 \text{ dB}$, SAR (10g): 2.13 mW/g $\pm 0.01 \text{ dB}$, (Worst-case extrapolation)
Course: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdirt: -0.05 dB
 $P = 100 \text{ mW}$, $d = 10 \text{ mm}$, 1900MHz dipol D1900V2 s/n 54002
Target values: 1g mass 41.6 mW/g, 10g mass 21.5 mW/g
Measured values: 1g mass 41.5mW/g(-0.3%), 10g mass 21.3 mW/g(-0.9%)
LIQUIDS Temperature 22.8 C, Ambient Temperature 24.5 C, humidity 32.5%



Validation Dipole, measured with head simulating tissue on 11/06/04

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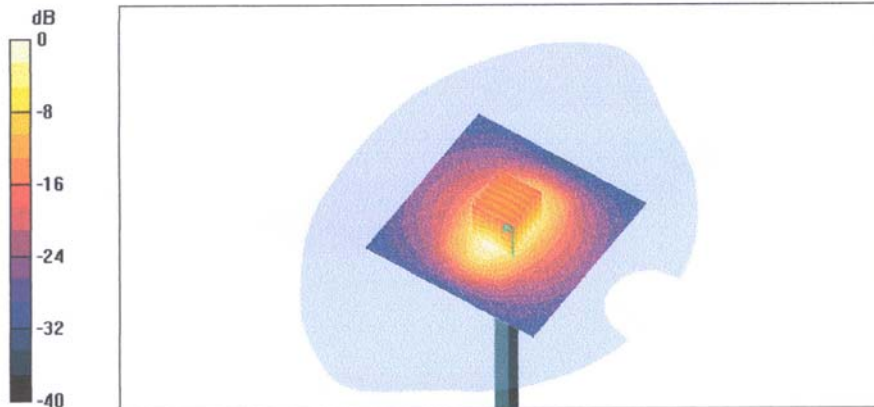
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN5d002
Program: Dipole Calibration

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL 1900 MHz ($\sigma = 1.44$ mho/m, $\epsilon_r = 38.78$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5.2, 5.2, 5.2); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 33; Postprocessing SW: SEMCAD, V1.6 Build 109

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.2 V/m
Peak SAR = 18.2 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.38 mW/g
Power Drift = 0.01 dB



1900MHz SAR distribution of validation dipole from reference measurement with head simulating tissue

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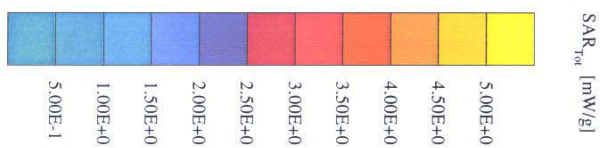
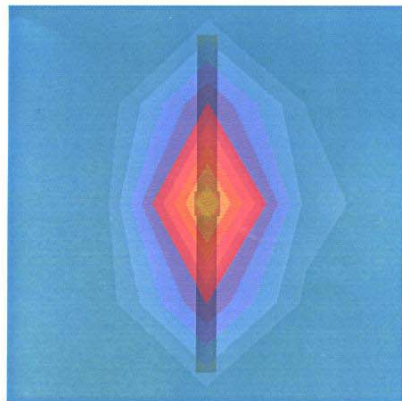
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Dipole 1900 MHz

SAM 4 Phantom; Flat Section; Position: (90°, 90°); Frequency: 1900 MHz
 Probe: ET3DV6 - SNI585; ConvF:4.56,4.56,4.56; Crest factor: 1.0; Muscle 1900: $\sigma = 1.52$ mho/m, $\epsilon_r = 50.0$, $\rho = 1.00$ g/cm³
 Cubes (2): SAR (1g): 4.41 mW/g \pm 0.03 dB, SAR (10g): 2.27 mW/g \pm 0.02 dB, (Worst-case extrapolation)
 Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
 Powerdrift: -0.02 dB
 P=100mW, d=10mm, 1900MHz dipol D1900V2 s/n 54002
 Target values: 1g mass 43.2 mW/g, 10g mass 22.4 mW/g
 Measured values: 1g mass 44.1mW/g(+2%), 10g mass 22.7 mW/g(+1.3%)
 BODY LIQUIDS Temperature 22C ; Room's Temperature 25


Validation Dipole, measured with muscle simulating tissue on 14/06/04

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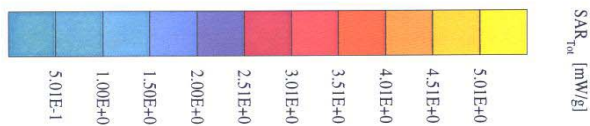
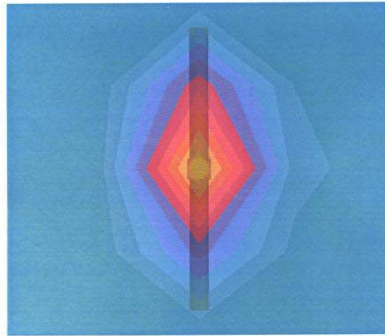
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Dipole 1900 MHz

SAM 4 Phantom; Flat Section; Position: (90° 90°); Frequency: 1900 MHz
 Probe: ET3DV6 - SN1585; Conv(4.56,4.56,4.56); Crest factor: 1.0; Muscle 1900: $\sigma = 1.52$ mho/m $\epsilon_r = 50.0$ $\rho = 1.00$ g/cm³
 Cube 5x5x7; SAR (1g): 4.40 mW/g; SAR (10g): 2.28 mW/g; (Worst-case extrapolation)
 Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
 Powerdrift: -0.03 dB
 P = 100mW, d = 10mm, 1900MHz dipol D1900V2 s/n 50002
 Target values: 1g mass 43.2 mW/g; 10g mass 22.4 mW/g
 Measured values: 1g mass 44.0mW/g(+1.8%); 10g mass 22.8 mW/g(+1.8%)
 BODY LIQUIDS Temperature 22C ; Room's Temperature 25


Validation Dipole, measured with muscle simulating tissue on 15/06/04

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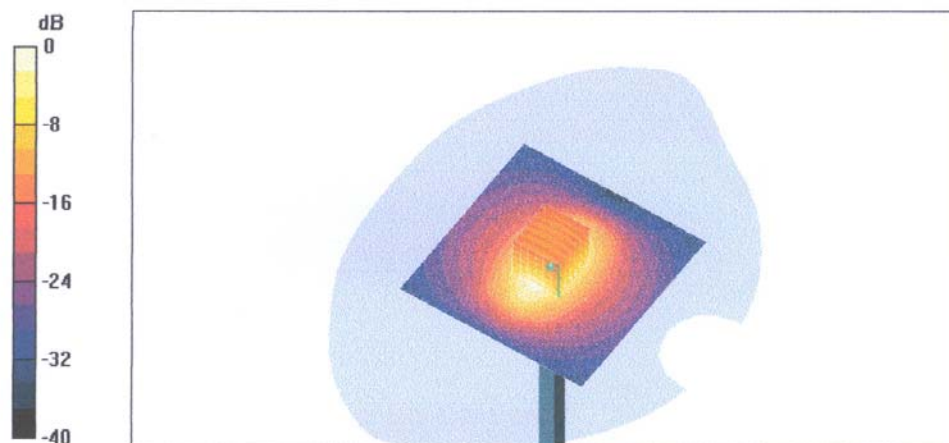
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DUT: Dipole 1900 MHz; Serial: D1900V2 - SN5d002
Program: Dipole Calibration

 Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
 Medium: Muscle 1900 MHz; ($\sigma = 1.59$ mho/m, $\epsilon_r = 51.2$, $\rho = 1000$ kg/m³)
 Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.8, 4.8, 4.8); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 33; Postprocessing SW: SEMCAD, V1.6 Build 109

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 92.8 V/m
 Peak SAR = 18.9 W/kg
 SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.6 mW/g
 Power Drift = 0.02 dB



1900MHz SAR distribution of validation dipole from reference measurement with muscle simulating tissue

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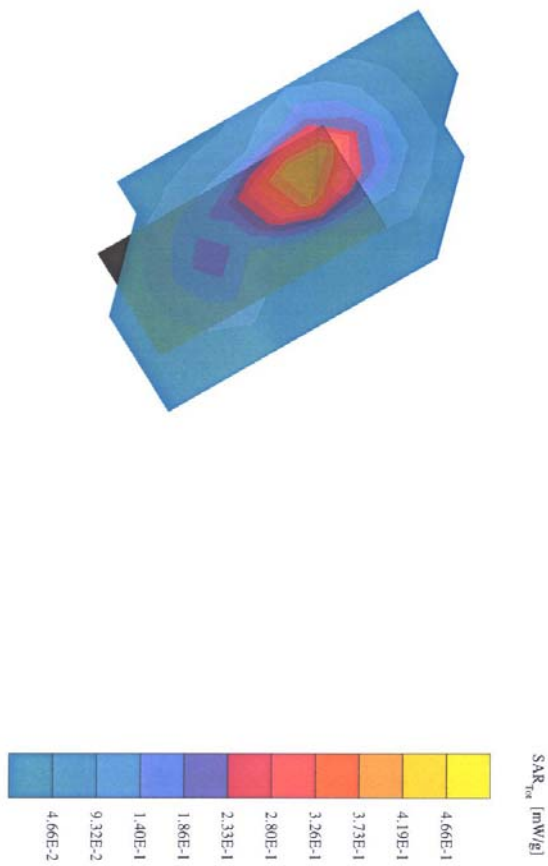
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10.2 SAR distribution plot

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PY7A1021044

SAM 4 Phantom; Right Hand Section; Position: (92°, 301°); Frequency: 1910 MHz
 Probe: ET3DV6 - SNI585; Corners: 26.5, 26.5, 26; Crest factor: 8.0; Head 1900MHz; $\sigma = 1.47$ mho/m, $\epsilon_r = 39.1$, $\rho = 1.00$ g/cm³
 Cube: 5x5x7; SAR (1g): 0.485 mW/g; SAR (10g): 0.266 mW/g; (Worst-case extrapolation)
 Course: Dx = 15.0, Dy = 15.0, Dz = 10.0
 Powerdnt: -0.16 dB
 PY7A1021044;SN:CB500T82L;Q4W20;FP2;Freq:1910MHz;Ch:810;Cheek position:
 Right hand side phantom;ambient temperature: 258c-degree; liquid temperature: 22(C-degree)
 Date: 040611



**Distribution of max SAR in GSM 1900 mode at ch810,
Measured against the head for Cheek phone position**

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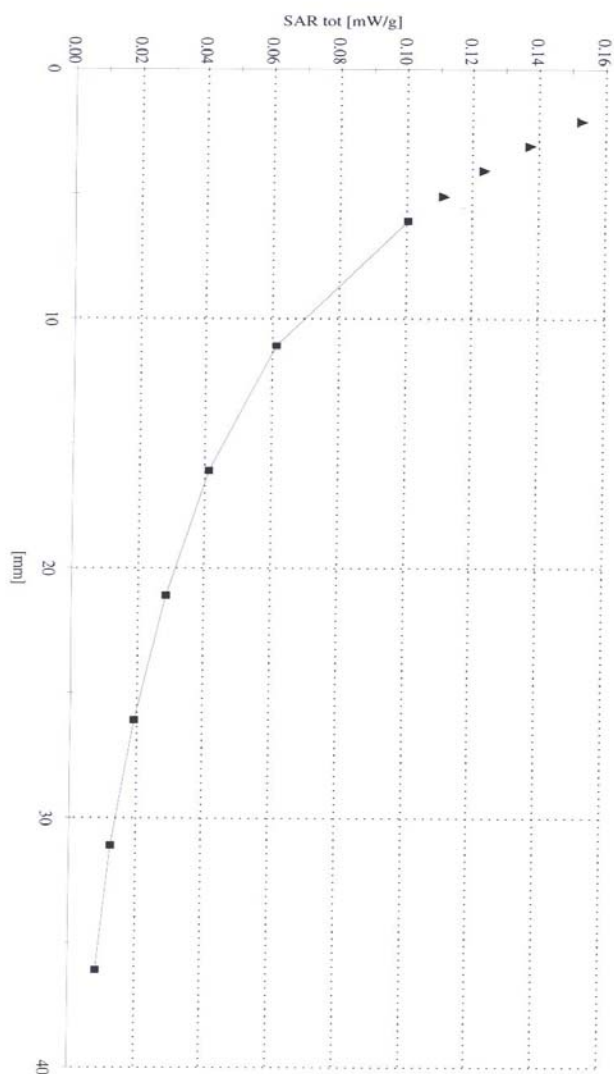
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PY7A1021044
 SAM 4 Phantom; Right Hand Section; Position: (92° 30)°; Frequency: 1910 MHz
 Probe: ET3DY6 - SNI585; CornF(5:26.5,26.5,26); Crest factor: 8.0; Head 1900MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 39.1$; $\rho = 1.00$ g/cm³
 Cube 5x5x7; SAR (1g): 0.485 mW/g; SAR (10g): 0.266 mW/g; (Worst-case extrapolation)
 Cube 5x5x7; Dx = 8.0; Dy = 8.0; Dz = 5.0

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Z(x) distribution of max SAR in GSM1900 mode at ch810, Measured against the head position.

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PY7A1021044

SAM 4 Phantom; Flat Section; Position: (270° 90°); Frequency: 1910 MHz
 Probe: ET3DY6 - SN1585; ComFH(4,56,4,56); Crest factor: 8.0; Muscle 1900; $\sigma = 1.52$ mho/m $\epsilon_r = 50.0$ $\rho = 1.00$ g/cm³
 Cube 5x5x7; SAR (1g): 1.50 mW/g; SAR (10g): 0.779 mW/g; (Worst-case extrapolation)
 Course: Dx = 10.0, Dy = 20.0, Dz = 10.0
 Powerdrift: -0.11 dB
 PY7A1021044; SN:CB500T182L; QMW20FP2; Freq: 1910MHz; Ch810; Back side phone
 Flat phantom section; ambient temperature 25(C-degree); liquid temperature 22(C-degree)
 Data Communication with time slots; Date :040614



Sony Ericsson Mobile Communications AB

Distribution of max SAR in GSM1900 mode at ch810, Measured against the body for back phone part phone with 15mm space to phantom, data communication with two time slots.

Prepared (also subject responsible if other)

LD/SEMC/BGUG/NM Hamid Kami Shirazi

Approved

LD/SEMC/BGUG/NMC Mats Hansson

Checked

040625
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No.

GUG/N 04:134

Date

040624

Rev

A

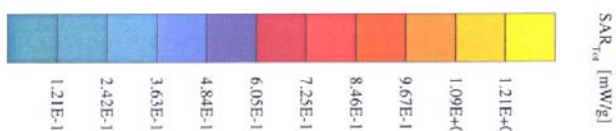
Reference

File

06/15/04 Hamid Kami Shirazi

PY7A1021044

SAM 4 Phantom: Flat Section; Position: (270°; 90°); Frequency: 1910 MHz
 Probe: ET3DV6 - SN1585; ConvF4.564;564;56; Crest factor: 4.0; Muscle 1900; $\sigma = 1.52$ mho/m $\epsilon_r = 50.0$ $\rho = 1.00$ g/cm³
 Cube 5x5x7; SAR (1g): 1.22 mW/g, SAR (10g): 0.662 mW/g. (Worst-case extrapolation)
 Course: Dx = 10.0, Dy = 20.0, Dz = 10.0
 Powerdft: -0.13 dB
 PY7A1021044;SN:CB500TH82L;04W20;FP2;Freq(1910MHz);Ch(810); Back side phone
 and with 15mm distance from Flat phantom section;ambient temperature 25(c-degree);
 liquid temperature 22(C-degree) Date :040615



Distribution of max SAR in GSM1900 mode at ch810, Measured against the body for back phone part with 15mm space to phantom.



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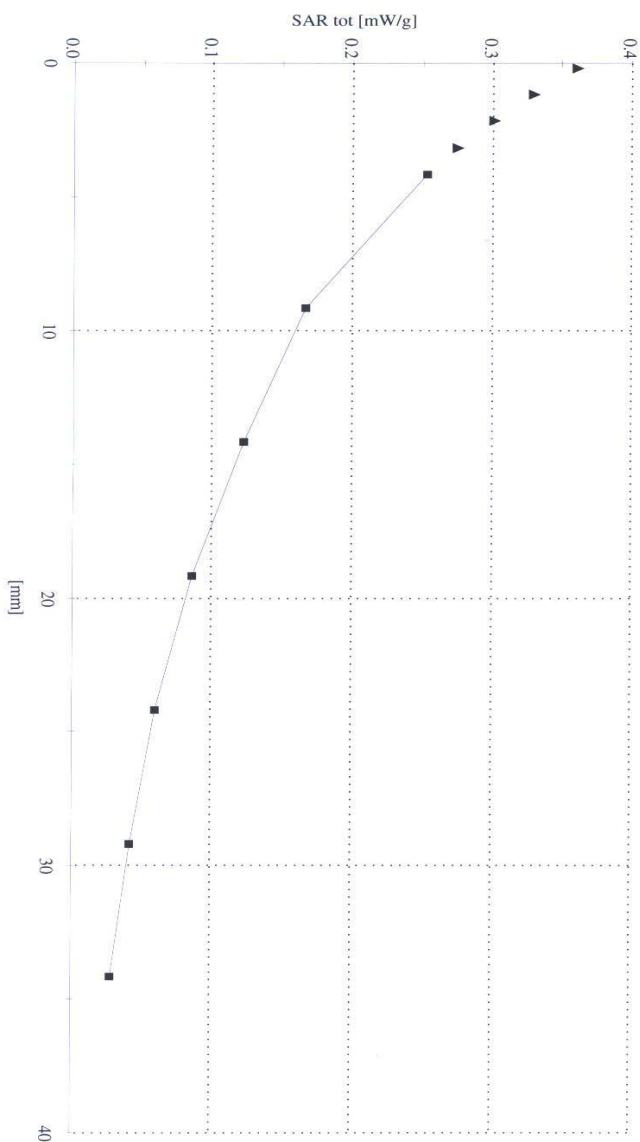
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File

06/14/04 Hamid Kami Shirazi

PY7A1021044

SAM 4 Phantom; Flat Section; Position: (270°, 90°); Frequency: 1910 MHz
Probe: ET3DV6 - SNI585; CornF(4,56,4,56,4,56); Crest factor: 8.0; Muscle 1900; $\sigma = 1.52$ mho/m $\epsilon_r = 50.0$ $\rho = 1.00$ g/cm³
Cube 3x3x7; SAR (1g): 1.50 mW/g; SAR (10g): 0.779 mW/g; (Worst-case extrapolation)
Cube 3x3x7; Dx = 8.0, Dy = 8.0, Dz = 5.0



Sony Ericsson Mobile Communications AB

Z(x) distribution of max SAR in GSM1900 mode at ch810, Measured against the body

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10.3 Photographs of the device under test



Front and back view



Side view

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Battery

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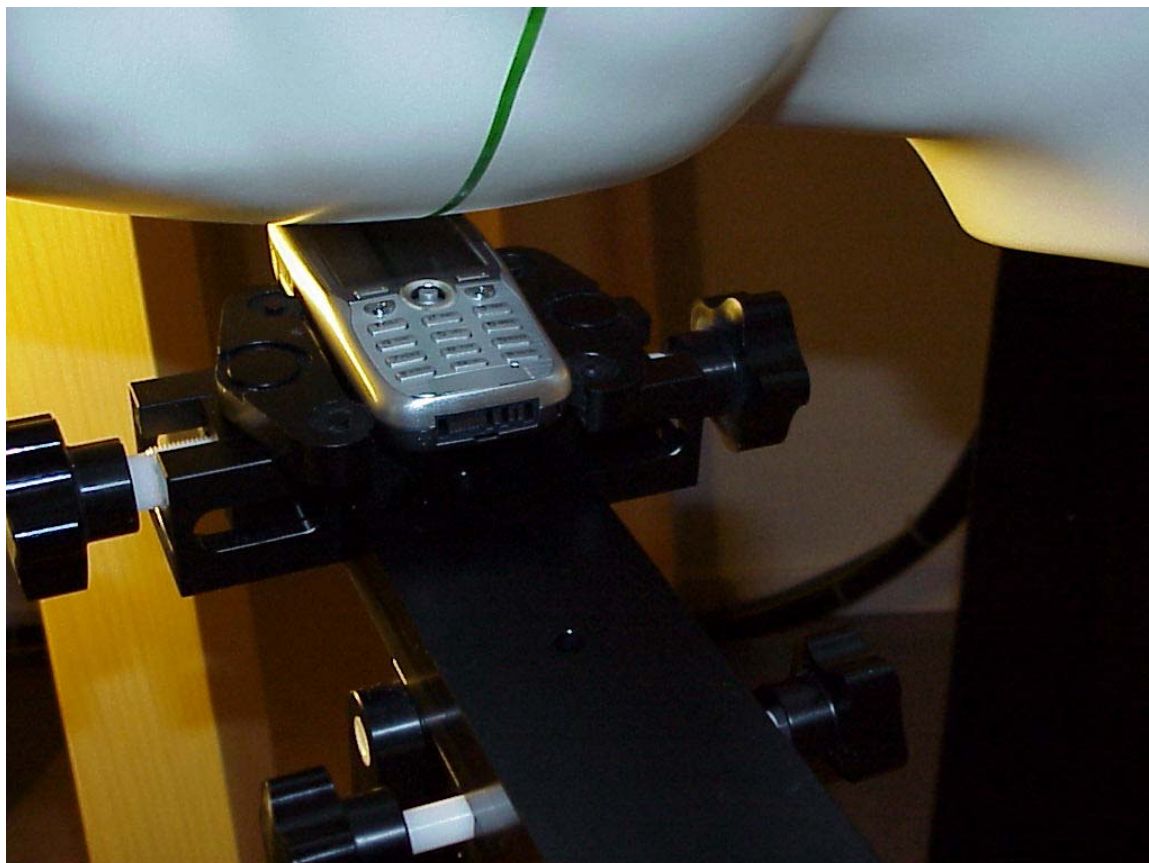
Rev

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Reference

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10.4 Device position on SAM Twins Phantom



Device position against the head: Tilt phone position

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Device position against the head: Cheek phone position

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Device position against the body: Phone with 15mm space to phantom

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Reference

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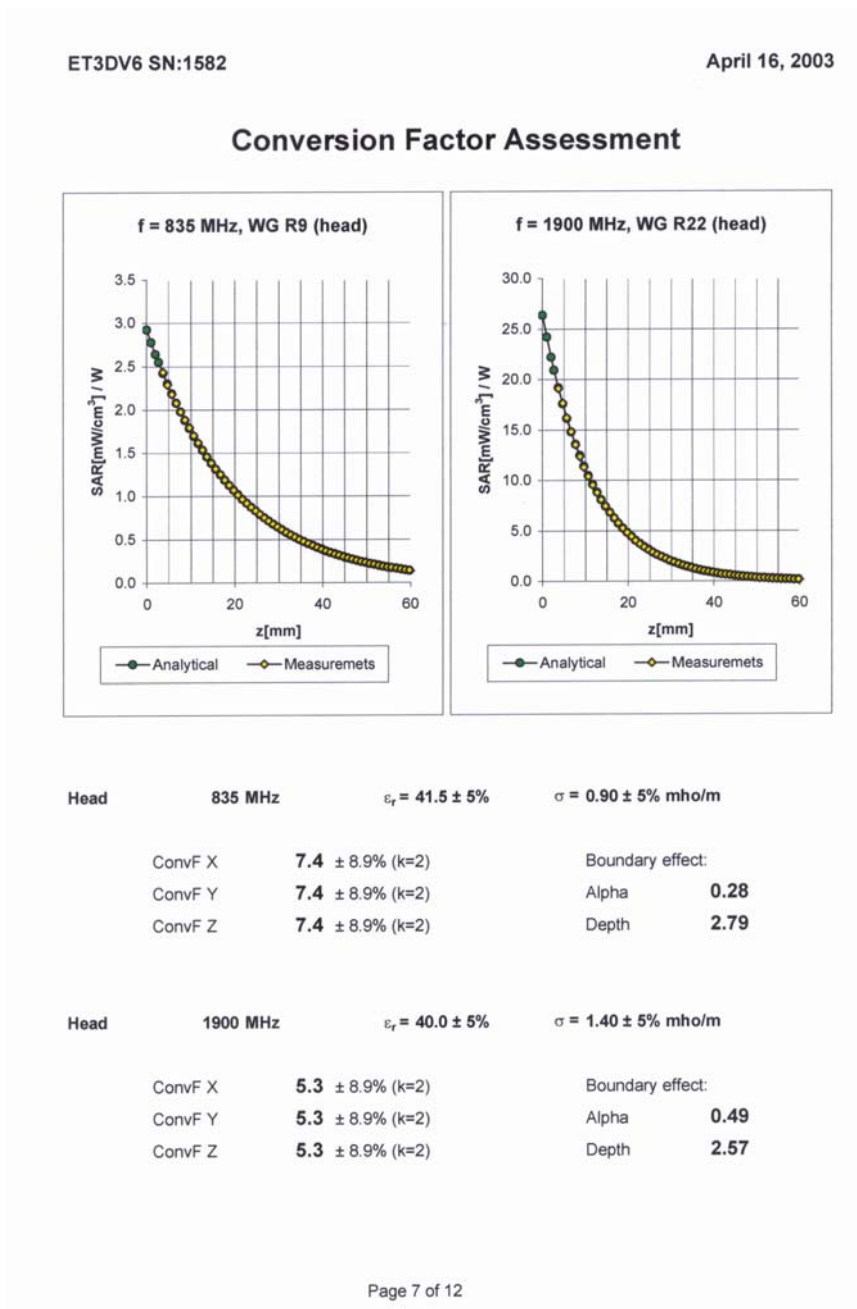
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10.5 Probe calibration parameters



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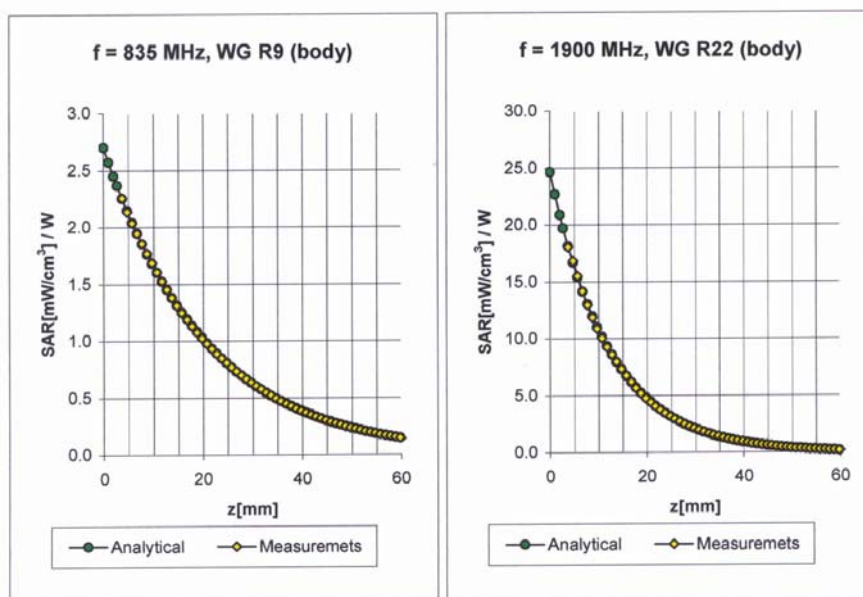
Reference

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ET3DV6 SN:1585

April 16, 2003

Conversion Factor Assessment



Body **835 MHz** $\epsilon_r = 55.2 \pm 5\%$ $\sigma = 0.97 \pm 5\% \text{ mho/m}$

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	6.7 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.7 $\pm 9.5\%$ (k=2)	Alpha 0.34
ConvF Z	6.7 $\pm 9.5\%$ (k=2)	Depth 2.48

Body **1900 MHz** $\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\% \text{ mho/m}$

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	4.8 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	4.8 $\pm 9.5\%$ (k=2)	Alpha 0.59
ConvF Z	4.8 $\pm 9.5\%$ (k=2)	Depth 2.55