Sony Ericsson

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REPORT

Prepared (also subject responsible if other)
LD/SEMC/BGUG/NM Hamid Kami Shirazi

No.
GUG/N 04:270

Approved	Checked	Date	Rev	Reference
LD/SEMC/BGUG/NMC Mats Hansson	041123	041123	A	File

SAR Test Report: PY7A1021071

Date of test: Nov. 15 to 17, 2004

Laboratory:
Sony Ericsson SAR Test Laboratory
Sonyericsson Mobile Communications AB
Nya Vattentornet
SE-221 82 LUND, Sweden

Test Responsible: Hamid kami Shirazi

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Mats.Hansson@sonyericsson.com
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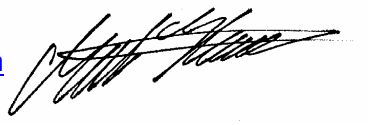

Statement of Compliance

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

Sony Ericsson Type AAB-1021071BV ; FCC ID: PY7A1021071

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)

This laboratory is accredited to ISO/IEC 17025 (SWEDAC accreditation no. 1847).

SWEDAC ACKREDITERING 1847 ISO/IEC 17025

Laboratories are accredited by the Swedish Board for Accreditation and Conformity Assessment (SWEDAC) under the terms of Swedish legislation. The accredited laboratory activities meet the requirements in SS-EN ISO/IEC 17025 (2000). This report may not be reproduced other than in full, except with the prior written approval of the issuing 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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1 Table of contents

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2 Introduction

In this report, compliance of the Sony Ericsson PY7A1021071portable 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	PY7A1021071
Serial number	TP810004VY
Mode	GSM 1900
Multiple Access Scheme	TDMA
Maximum Output Power Setting	28.5
Factory Tolerance in Power Setting	± 0.5dB
Maximum Peak Output Power	29dBm
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

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.

Description	***Serial Number***	***Due Date***
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

Description	***Inventory Number***	***Due Date***
Signal generator ESG-D4000A	INV 483972	9/2005
Directional coupler HP778D	INV 39656	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	8/2005
S-parameter test set HP85047A	INV 421670	9/2005
Dielectric probe kit HP8507D	INV 20001078	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/cm³)
1900	**Head**	**Measured, 15/11/04**	39.1	1.47	1.0
		Recommended	40.0	1.40	1.0
	Muscle	**Measured, 20/10/04**	52.6	1.60	1.0
		Recommended	53.3	1.52	1.0

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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 21-22°C and humanity 40±2%. 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 0.0002W/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/cm³)	
1900	Head	**Measured, 15/11/04**	42.9	38.4	1.52	1.0	21
		Measured, 16/11/04	42.3	38.4	1.52	1.0	21
		Reference	41.6	38.8	1.44	1.0	-
	Muscle	**Measured, 17/11/04**	45.5	52.6	1.60	1.0	21
		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	√3	$(1\text{-}c_p)^{1/2}$	±1.9	±1.9
Spherical isotropy	±9.6	Rectangular	√3	$(c_p)^{1/2}$	±3.9	±3.9
Spatial resolution	±0.0	Rectangular	√3	1	±0.0	±0.0
Boundary effects	±5.5	Rectangular	√3	1	±3.2	±3.2
Probe linearity	±4.7	Rectangular	√3	1	±2.7	±2.7
Detection limit	±1.0	Rectangular	√3	1	±0.6	±0.6
Readout electronics	±1.0	Normal	1	1	±1.0	±1.0
Response time	±0.8	Rectangular	√3	1	±0.5	±0.5
Integration time	±1.4	Rectangular	√3	1	±0.8	±0.8
RF ambient conditions	±3.0	Rectangular	√3	1	±1.7	±1.7
Mech. Constraints of robot	±0.4	Rectangular	√3	1	±0.2	±0.2
Probe positioning	±2.9	Rectangular	√3	1	±1.7	±1.7
Extrap. and integration	±3.9	Rectangular	√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	-3.7/-1.2	Rectangular	√3	1	-2.1	-0.7
Test Sample Related Uncertainty					**±9.2**	**±9**
Phantom and setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	±2.3
Liquid conductivity (target)	±5.0	Rectangular	√3	0.6	±1.7	±1.7
Liquid conductivity (meas)	+8.6/+5	Rectangular	√3	0.6	+3	+1.7
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	±1.7
Liquid permittivity (meas)	-4.2/-1.3	Rectangular	√3	0.6	-1.5	-0.5
Phantom and Tissue parameter Uncertainty					**±4.7**	**±3.8**
Combined standard uncertainty					***±13.3***	***±12.8***
Extended standard uncertainty(k=2)					***±26.6***	***±25.6***

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 40% - 42% and 21-22 °C respectively. The depth of the head tissue simulating liquid was 15.1 cm and of the muscle tissue simulating liquid was 15cm. 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 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	29	**Cheek**	21-22	0.69	0.59
			Tilt	21-22	**0.86**	0.72
	661	29	**Cheek**	21-22	0.63	0.51
			Tilt	21-22	0.69	0.65
	810	29	**Cheek**	21-22	0.51	0.45
			Tilt	21-22	0.60	0.54

Table1: SAR measurement result for Sony Ericsson PY7A1021071 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.

Mode	Chanel	Peak Output Power(dBm)	Phone Position	Liquid temp(°C)	SAR(W/kg) in 1g mass
1900 GSM	512	29	**Front** to Phantom **15mm space**	22	0.15
			Back to Phantom **15mm space**	22	**1.03**
	661	29	**Front** to Phantom **15mm space**	22	0.16
			Back to Phantom **15mm space**	22	0.98
	810	29	**Front** to Phantom **15mm space**	22	0.15
			Back to Phantom **15mm space**	22	0.95

Table 2: SAR measurement result for Sony Ericsson PY7A1021071 telephone. Measured against the body.

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9 References

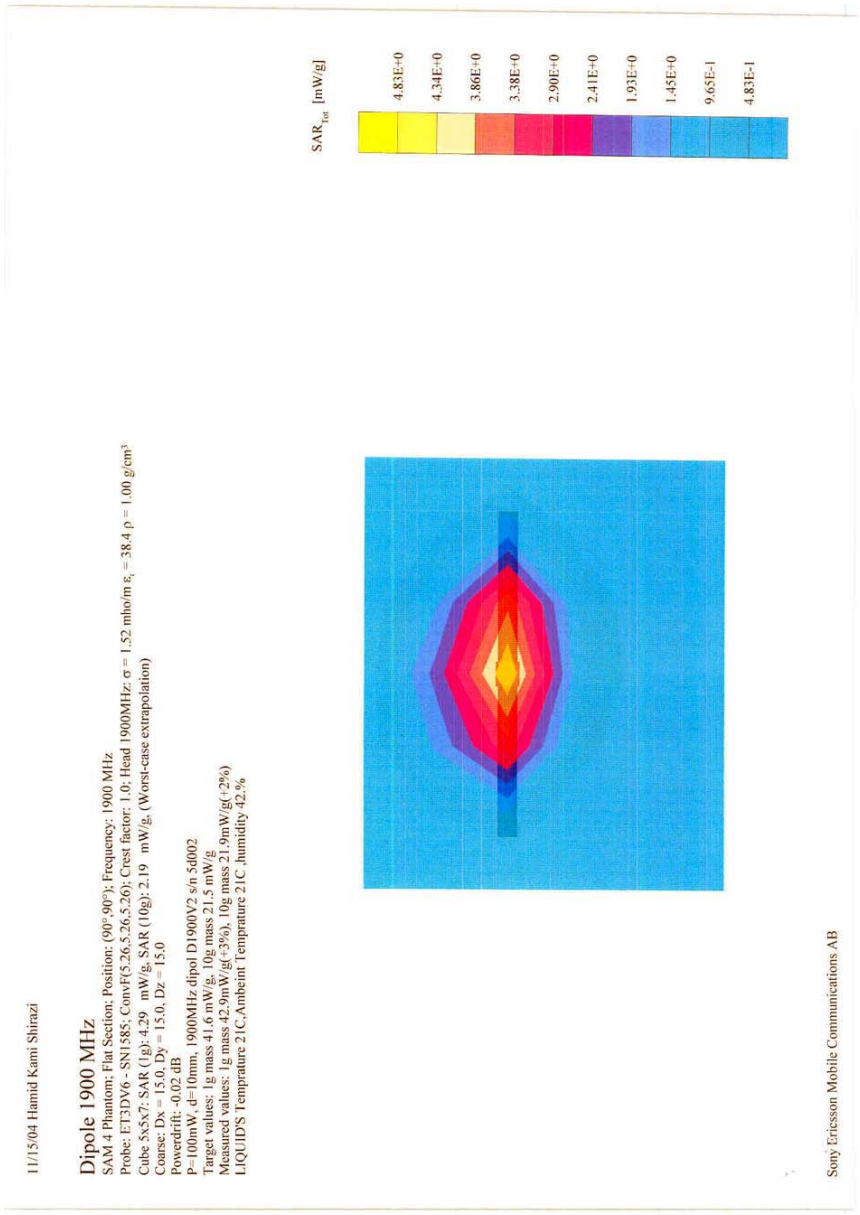
[1] R.Plicanic, “SAR Measurement Specification of Wireless Handsets”, Sony Ericsson internal document LD/SEMC/GUG/N 03:141

[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 .

10 Appendix

10.1 SAR distribution comparison for system accuracy verification



Validation Dipole, measured with head simulating tissue on 15/11/04

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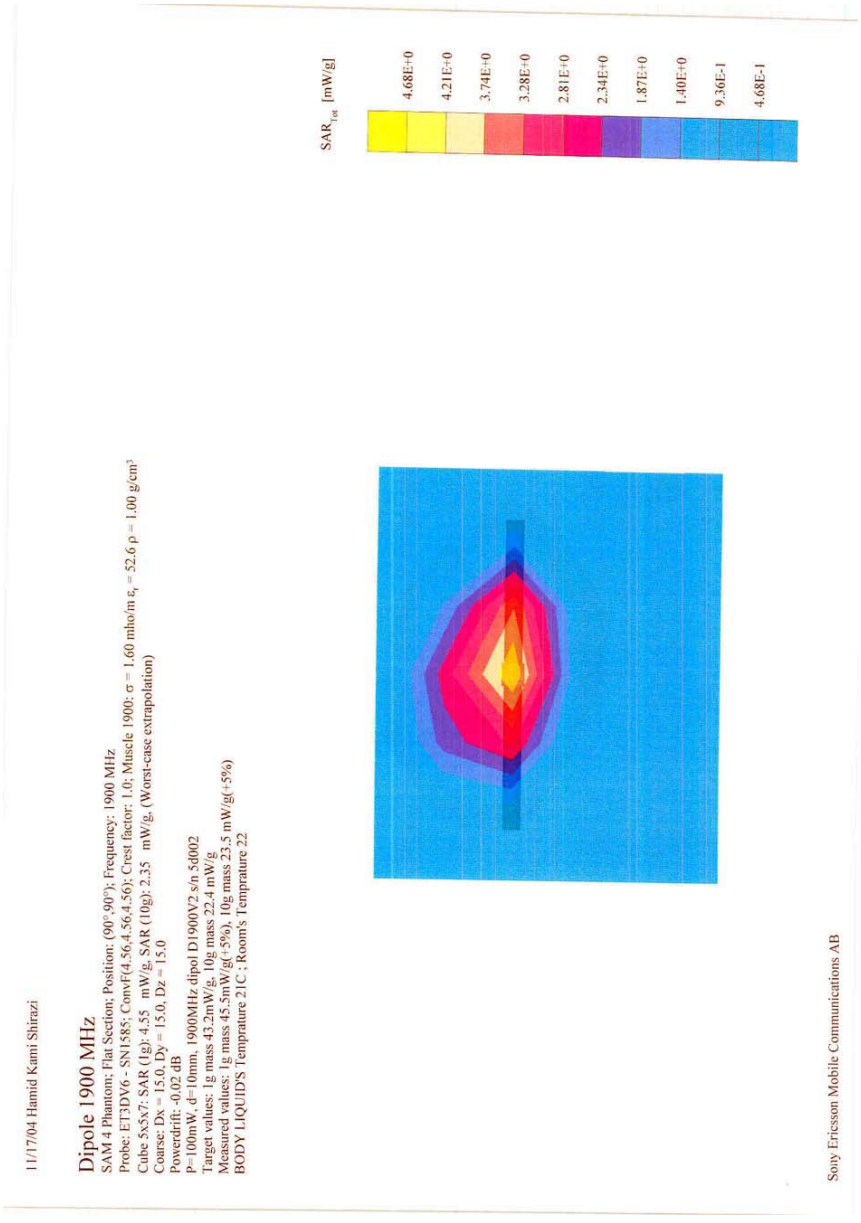

Validation Dipole, measured with head simulating tissue on 16/11/04

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Date/Time: 04/09/03 18:49:39

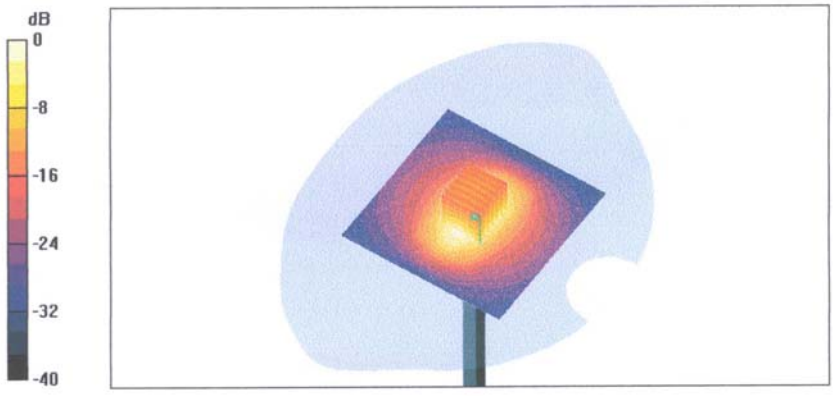
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN5d002_SN1507_HSL1900_090403.da4

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 (σ = 1.44 mho/m, ε_r = 38.78, ρ = 1000 kg/m^3)
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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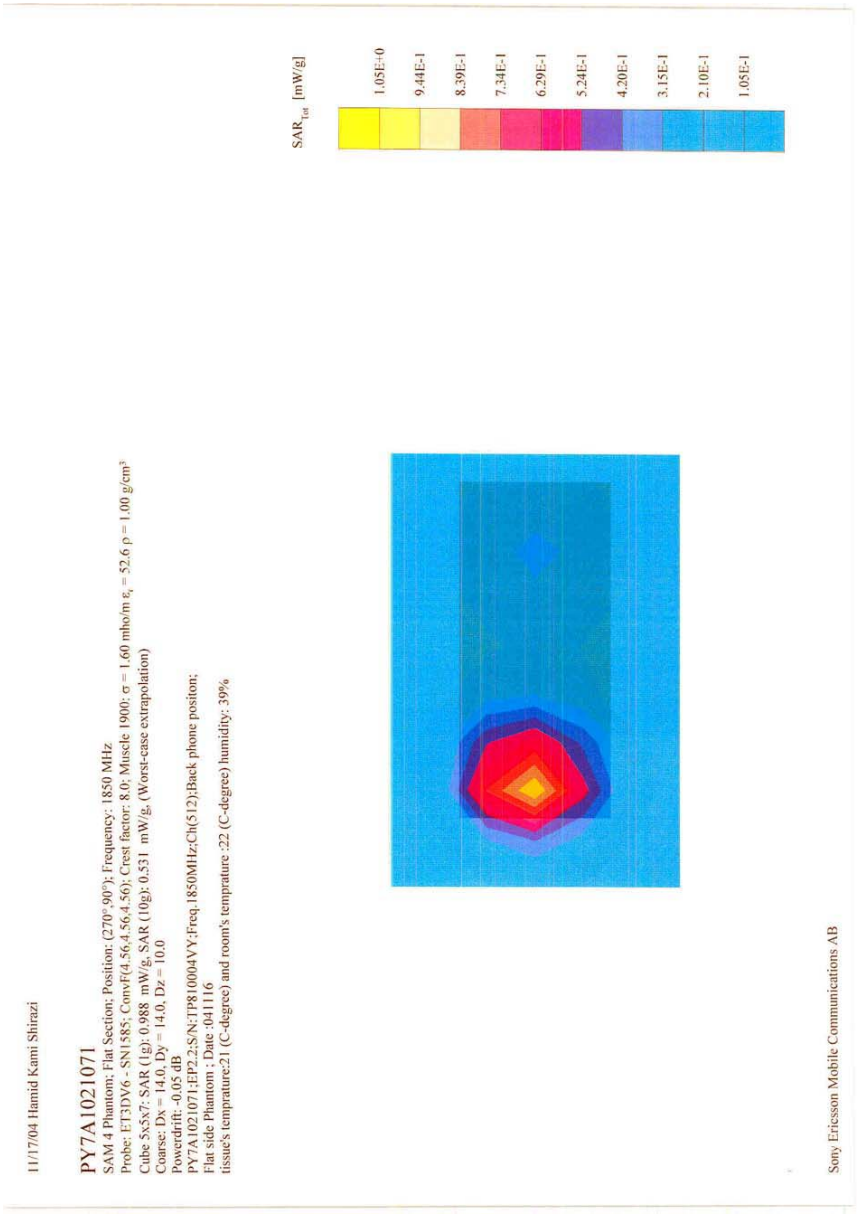

Validation Dipole, measured with muscle simulating tissue on 17/11/04

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Date/Time: 04/08/03 12:31:50

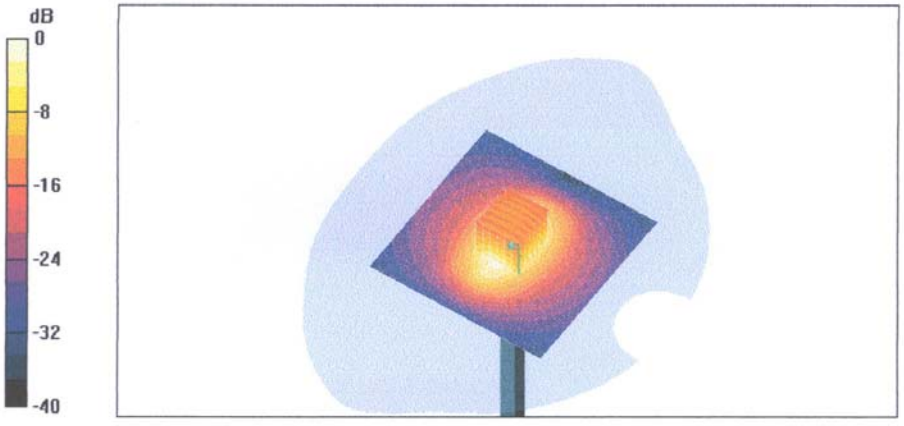
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN5d002_SN1507_M1900_080403.da4

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; (σ = 1.59 mho/m, ε_r = 51.2, ρ = 1000 kg/m^3)
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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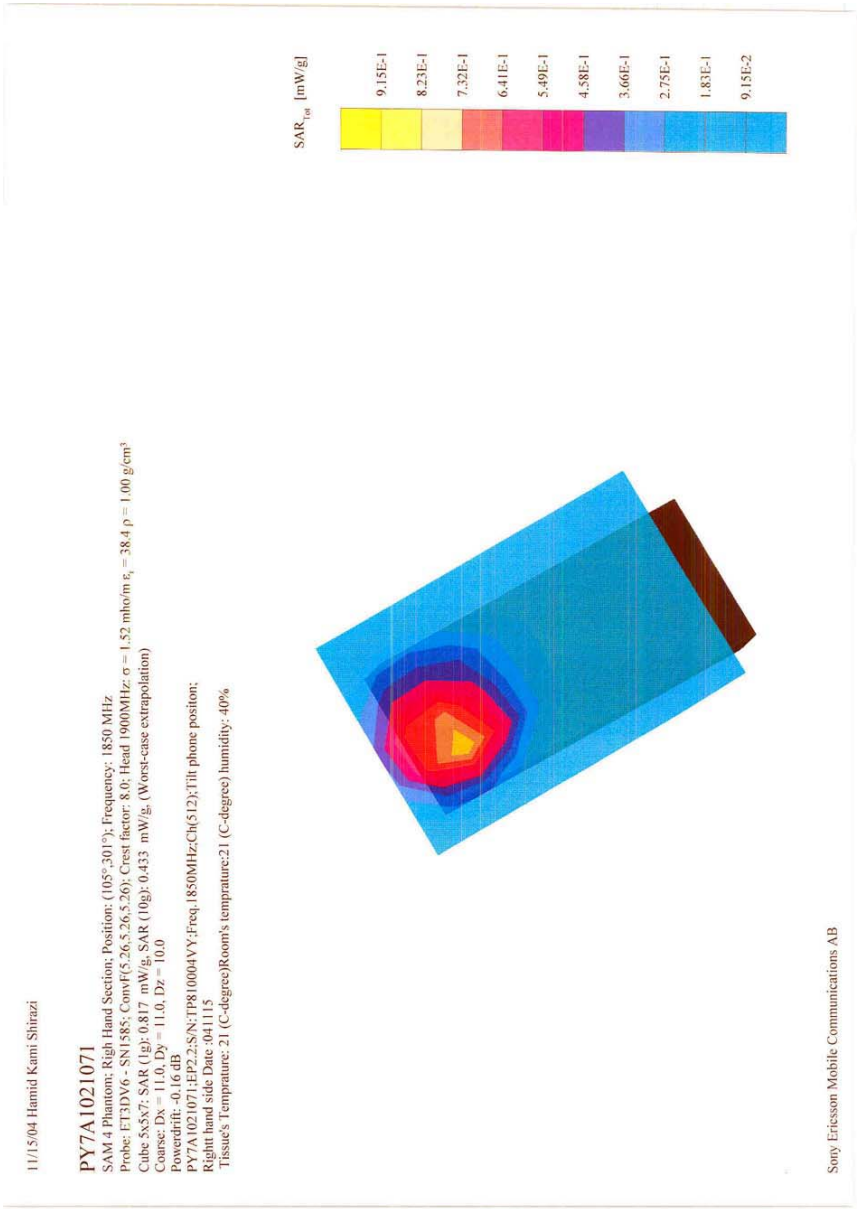
10.2 SAR distribution plot



Distribution of max SAR in GSM 1900 mode at ch512, Measured against the head for Tilt phone position

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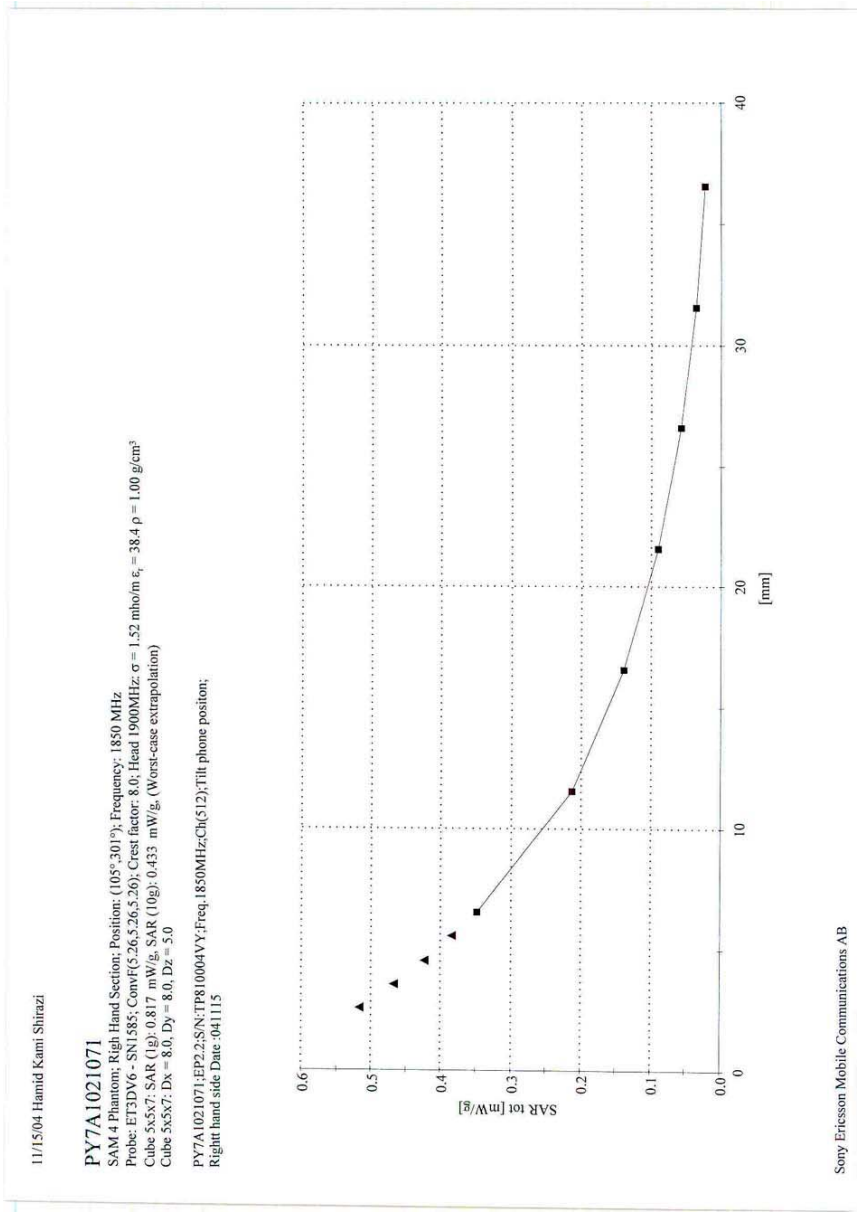

Z(x) distribution of max SAR in GSM1900 mode at ch512, Measured against the head position.

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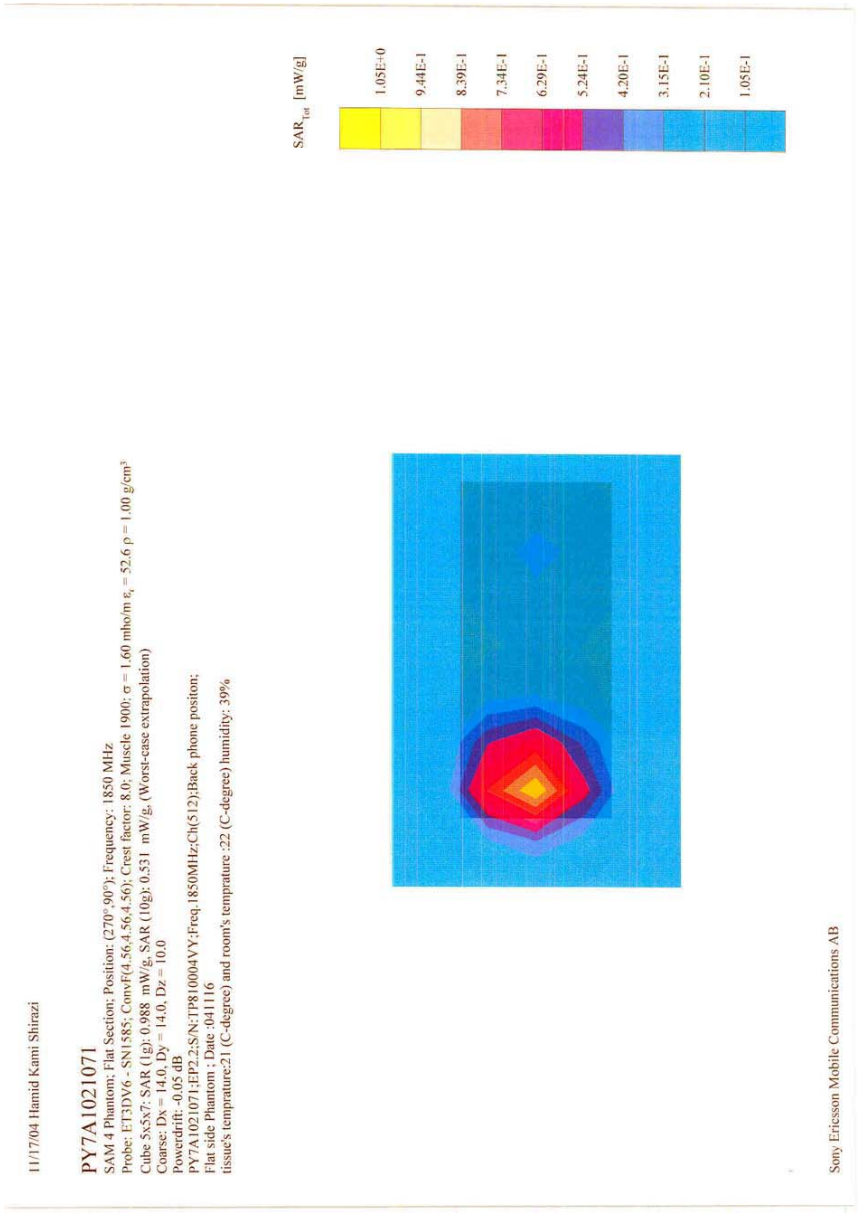

Distribution of max SAR in GSM1900 mode at ch512, Measured against the body for back part phone with 15mm space to phantom, data communication with two time slots.

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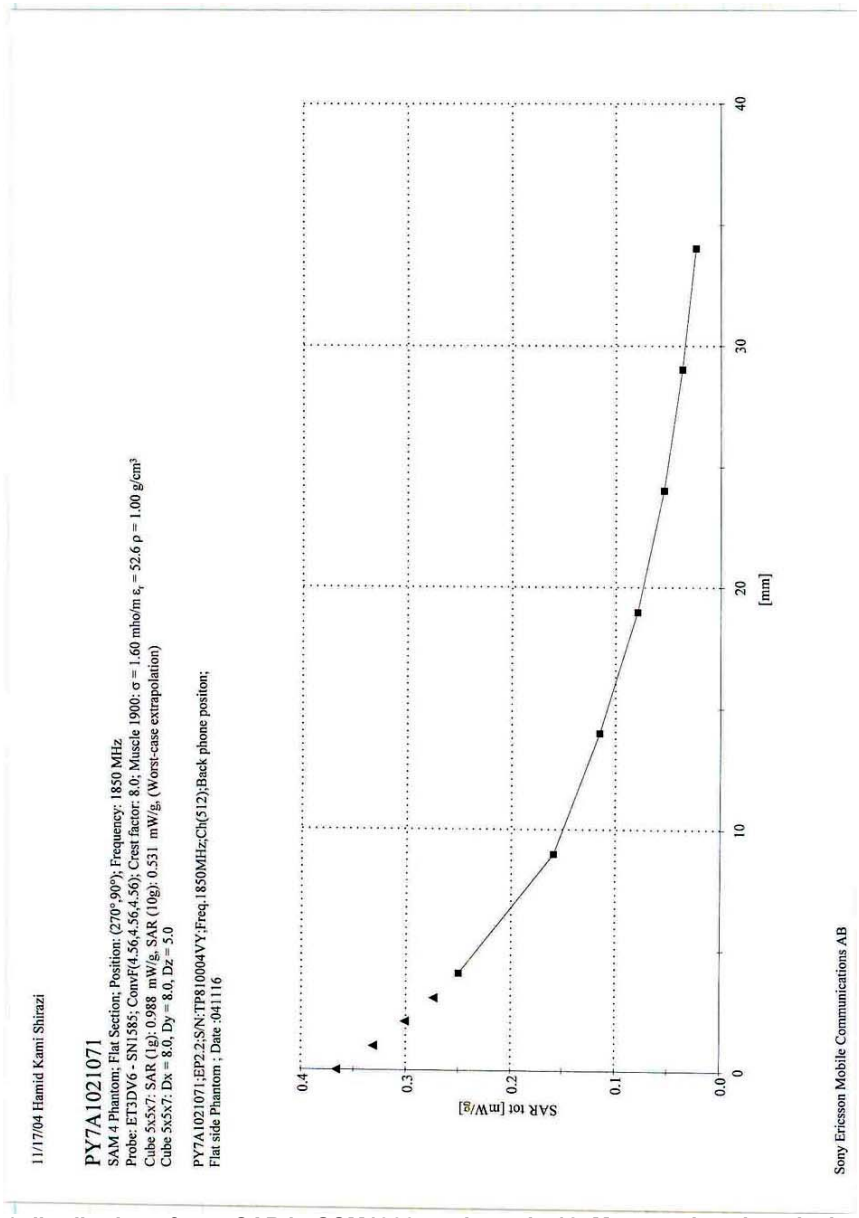

Z(x) distribution of max SAR in GSM1900 mode at ch512, Measured against the body

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10.3 Photographs of the device under test

Front and back view

Sides view

Back & Battery

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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

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

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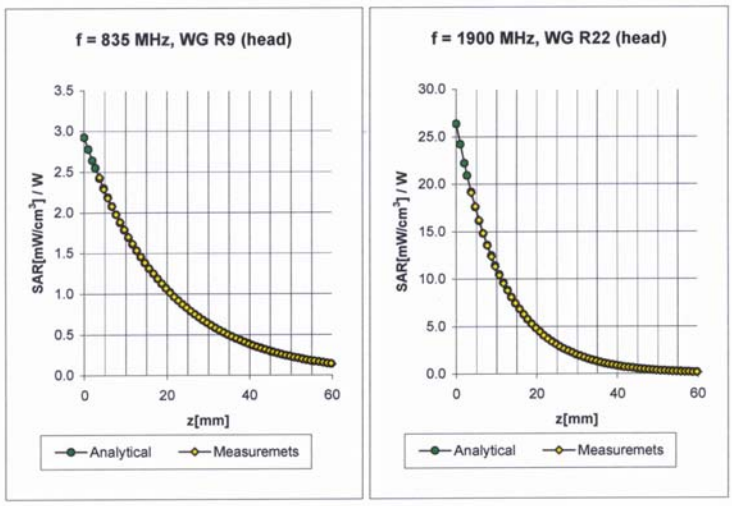
10.5 Probe calibration parameters

ET3DV6 SN:1582 **April 16, 2003**

Conversion Factor Assessment



Head **835 MHz** ε_r **= 41.5 ± 5%** σ **= 0.90 ± 5% mho/m**

ConvF X	**7.4** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**7.4** ± 8.9% (k=2)	Alpha	**0.28**
ConvF Z	**7.4** ± 8.9% (k=2)	Depth	**2.79**

Head **1900 MHz** ε_r **= 40.0 ± 5%** σ **= 1.40 ± 5% mho/m**

ConvF X	**5.3** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**5.3** ± 8.9% (k=2)	Alpha	**0.49**
ConvF Z	**5.3** ± 8.9% (k=2)	Depth	**2.57**

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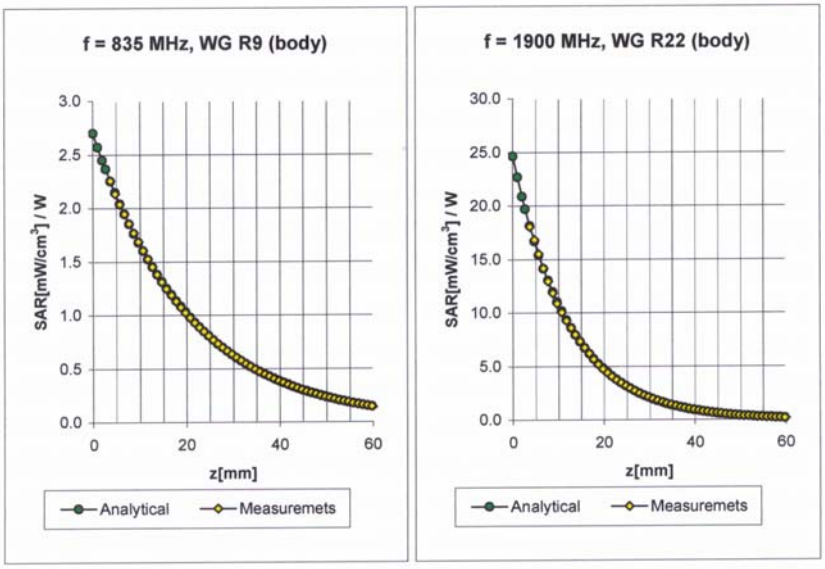
ET3DV6 SN:1585 April 16, 2003

Conversion Factor Assessment



Body **835 MHz** ε_r **= 55.2 ± 5%** σ **= 0.97 ± 5% mho/m**

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

ConvF X	**6.7** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**6.7** ± 9.5% (k=2)	Alpha	**0.34**
ConvF Z	**6.7** ± 9.5% (k=2)	Depth	**2.48**

Body **1900 MHz** ε_r **= 53.3 ± 5%** σ **= 1.52 ± 5% mho/m**

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

ConvF X	**4.8** ± 9.5% (k=2)	Boundary effect:	
ConvF Y	**4.8** ± 9.5% (k=2)	Alpha	**0.59**
ConvF Z	**4.8** ± 9.5% (k=2)	Depth	**2.55**