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LD/SEM/GUG/NM/H. Kami Shirazi		GUG/N03 :059		
Approved	Checked	Date	Rev	Reference
LD/SEM/GUG/NM/ Mats Hansson	MHAN	030402	A	File

SAR Test Report: T610 (PY7AAB-1021011)

Date of test: Mars 30 to 31, 2003

Laboratory:
Electromagnetic Near Field and Radio Frequency
Dosimetry LAB
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Statement of Compliance

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

Sony Ericsson Type AAB-1021011-BV (T610); FCC ID: PY7AAB-1021011

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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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 3

4.1 DOSIMETRIC SYSTEM 3
4.2 ADDITIONAL EQUIPMENT 4

5 ELECTRICAL PARAMETERS ON THE TISSUE SIMULATING LIQUID 5

6 SYSTEM ACCURACY VERIFICATION 5

7 SAR MEASUREMENT UNCERTAINTY 6

8 TEST RESULTS 7

9 REFERENCES 8

10 APPENDIX 9

10.1 SAR DISTRIBUTION COMPARISON FOR SYSTEM ACCURACY VERIFICATION 9
10.2 SAR DISTRIBUTION PLOTS 12
10.3 PHOTOGRAPHS OF THE DEVICE UNDER TEST 15
10.4 DEVICE POSITION ON SAM PHANTOM 17
10.5 PROBE CALIBRATION PARAMETERS 23

2 Introduction

In this test report, compliance of the Sony Ericsson T610 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 the back cover, near the top	
Dimensions	Max length	38mm
	Max width	14mm
Configuration	PIFA	

3.2 Device description

Device model	T610
Serial number	A6101TUXTK
Mode	GSM 1900
Multiple Access Scheme	TDMA
Maximum Output Power Setting	28.8dBm
Factory Tolerance in Power Setting	± 0.5dB
Maximum Peak Output Power	29.3
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 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	April23, 2003
E-field probe ET3DV6	1569	April25, 2002
Dipole Validation Kit, D1900 V2	5d002	April29, 2002

4.2 Additional equipment

Description	*Inventory Number*	*Due Date*
Signal generator ESG-D4000A	INV 483972	9/2003
Directional coupler HP778D	INV 39656	1/2004
Power meter R&S NRVD	INV 483920	1/2004
Power sensor R&S NRV-Z5	INV 2333	1/2004
Power sensor R&S NRV-Z5	INV 2334	1/2004
Termination 65N50-0-11	INV 2903	1/2004
Network analyzer HP8753C	INV421671	8/2003
S-parameter test set HP85047A	INV 421670	8/2003
Dielectric probe kit HP8507D	INV 20000053	2/2004
Termometer Fluke 51	INV 2071	3/2004
Multimeter Almemo 2290-4 V5	INV2391	3/2004
Wavetek STABILOK 4031D	INV 421578	7/2003

5 Electrical parameters on the tissue simulating liquid

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

Application Note: The head and body tissue dielectric parameter recommended by the IEEE SCC-34/SC in P1528 have been incorporated in the following table is prepared according the following receipt.

For 1900MHz head: Water 54.9% Salt 0.18% and DGBE 44.92%; for 1900 body: Water 56.1%, Salt 0.5%, and DGBE 33.4%.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			e	s (S/m)	? (g/cm³)
1900	Head	Measured Mars 18, 2003	38.0	1.47	1.0
		Recommended	40.0	1.40	1.0
	Muscle	Measured Mars 19, 2003	50.5	1.50	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 was conducted on the same day as the measurement of the DUT. Measurement made in ambient temperature 23.2 °C and humanity 40.8%. The obtained results are displayed in the table below.
RF noise in liquid measured when all RF equipment in the lab was set off. Measured value was 0.001 mW/g in 1g mass.

f (MHz)	Tissue type	Measured / Reference	SAR (W/kg) 1g mass	Dielectric Parameters			t (°c)
				e	s (S/m)	? (g/cm³)	
1900	Head	Measured, Mars 18, 2003	43.1	38.1	1.44	1.0	22.5
		Reference , February 20, 2002	45.2	39.1	1.47	1.0	-
	Muscle	Measured, Mars 19, 2003	44.9	50.7	1.55	1.0	22.6
		Reference , April 29, 2002	44.0	51.9	1.58	1.0	-

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7 SAR measurement uncertainty

Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	GSM 1900 Head	GSM 1900 Body
Measurement System					
Probe Calibration	2.6	N	1	2.6	2.6
Axial Isotropy	4.7	R	v3	1.9	1.9
Hemispherical Isotropy	9.6	R	v3	3.9	3.9
Boundary Effect	11.0	R	v3	6.4	6.4
Linearity	4.7	R	v3	2.7	2.7
System Detection Limits	1.0	R	v3	0.6	0.6
Readout Electronics	1.0	N	1	1.0	1.0
Response Time	0.8	R	v3	0.5	0.5
Integration Time	1.8	R	v3	1.1	1.1
RF Ambient Conditions	3.0	R	v3	1.7	1.7
Probe Positioned Mechanical Tolerance	0.4	R	v3	0.2	0.2
Probe Positioning respect to Phantom Shell	2.9	R	v3	1.7	1.7
Extrapolation, Interpolation and Integration Algorithm for Max. SAR	3.9	R	v3	2.3	2.3
Measurement System Uncertainty				**9.4**	**9.4**
Test Sample Related					
Test Sample Positioning		R	v3	6.7	6.7
Device Holder Uncertainty		R	v3	5.9	5.9
Output Power Variation – Drift	0.9/3.5	R	v3	0.52	2
Test Sample Related Uncertainty				**8.9**	**9.2**
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness tolerances)	4.0	R	v3	2.3	2.3
Liquid Conductivity (deviation from target value)	5/1,3	R	v3	2,9	0,8
Liquid Conductivity – measurement uncertainty	5	R	v3	2.9	2.9
Liquid Permitivity (deviation from target value)	5/5,3	R	v3	2,9	3
Liquid Permitivity – measurement uncertainty	5	R	v3	2.9	2.9
Phantom and Tissue Parameters Uncertainty				**6.2**	**5.6**
Combined Standard Uncertainty		RSS		**14.4**	**14.3**
Expanded Uncertainty (95% CONFIDENCE LEVEL)				***28.8***	***28.6***

SAR measurement uncertainty evaluation for Sonyericsson T610 phone

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 44.4% - 40.8% and 22.5 °C – 24.2 °C respectively. The depth of the head tissue simulating liquid was 15.1cm and of the muscle tissue simulating liquid was 15.5cm. 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 device 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)in1g/10g mass	
					Right-hand	Left-hand
GSM 1900	512	29.29	Cheek	22.4/22.6	1,06/0,58	0,73/0,43
			Tilt	22.5/22.9	**1,21/0,66**	1,02/0,57
			Tilt and blue tooth on	22.5/22.9	**1,21/0,66**	-
	661	29.23	Cheek	22.8/23.0	1,04/0,58	0,73/0,42
			Tilt	23.1/23.1	1,10/0,60	0,77/0,43
	810	29.26	Cheek	23.1/23.2	0,54/0,30	0,45/0,29
			Tilt	23.2/23.2	0,63/0,34	0,51/0,29

Table1: SAR measurement results for Sonyericsson T610 phone. Measured against the head.

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

Mode	Channel	Peak Output Power(dBm)	Phone Position	Liquid temp(°C)	SAR (w/kg)in1g/10g mass
					Measured
1900 GSM	512	29.23	Back	22.5	**0,97/0,55**
			Front	22.7	0,25/0,15
	661	29.23	Back	22.5	0,58/0,33
			Front	22.7	0,14/0,09
	810	29.26	Back	22.6	0,32/0,18
			Front	22.6	0,08/0,05

Table 2: SAR measurement results for Sonyericsson T610 phone. Measured against the body.

9 References

[1] M.Douglas, “SAR Measurement Specification of Wireless Handsets”, Sonyericsson internal document EUS/CV/R-01:1061/REP

[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 Wirelles Communications Devices: Experimental Techniques,” Std 1528-200x, Draft 6.5 – August 20, 2001.

10 Appendix

10.1 SAR distribution comparison for system accuracy verification

Validation Dipole, measured with head simulating tissue on Mars 30, 2003

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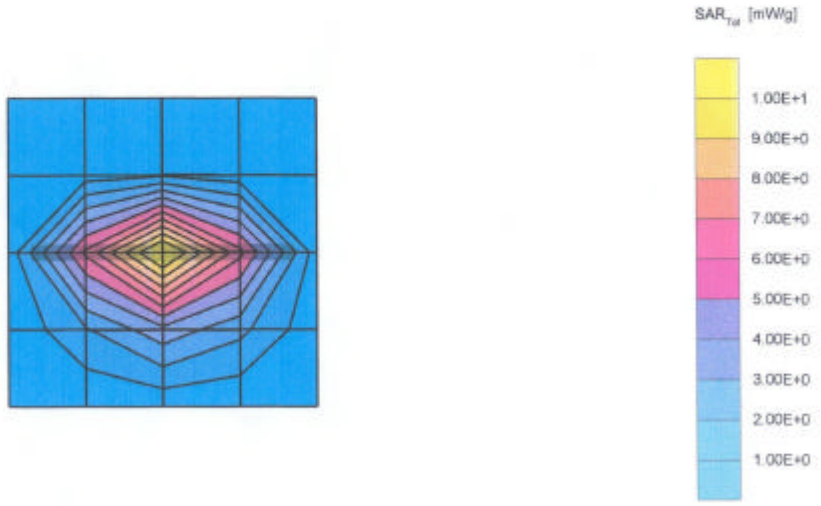
02/20/02

Validation Dipole D1900V2 SN:5d002, d = 10 mm
Frequency: 1900 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.30,5.30,5.30) at 1800 MHz; IEEE1528 1900 MHz ; σ = 1.47 mho/m ε_r = 39.1 ρ = 1.00 g/cm³
Cubes (2): Peak: 21.7 mW/g ± 0.02 dB, SAR (1g): 11.3 mW/g ± 0.01 dB, SAR (10g): 5.78 mW/g ± 0.03 dB, (Worst-case extrapolation)
Penetration depth: 7.9 (7.5, 8.8) [mm]
Powerdrift: -0.07 dB



Schmid & Partner Engineering AG, Zurich, Switzerland

1900MHz SAR distribution of validation dipole from reference measurement

Measured with head simulating tissue on February 20, 2002

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03/31/03 Hamid Kami

D1900 V2 SN5d002,d=10
SAM 1800 and 1900 Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1569;ConvF(5.00,5.00,5.00); Crest factor: 1.0; Muscle1900 MHz: σ = 1.50 mho/m ε_r = 50.5 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 4.23 mW/g ± 0.04 dB, SAR (10g): 2.23 mW/g ± 0.02 dB, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.11 dB

Validation Dipole, measured with muscle simulating tissue.

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Validation Dipole, measured with muscle simulating tissue on mars 31, 2003

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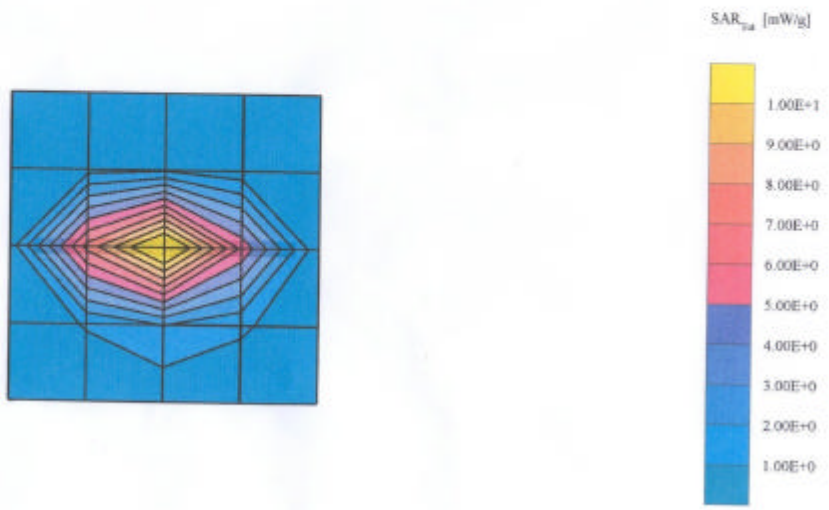
04/29/02

Validation Dipole D1900V2 SN5d002, d = 10 mm
Frequency: 1900 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.10,5.10,5.10) at 1800 MHz; IEEE1528 1900 MHz: σ = 1.58 mho/m ε_r = 51.9 ρ = 1.00 g/cm³
Cubes (2): Peak: 21.0 mW/g ± 0.03 dB, SAR (1g): 11.0 mW/g ± 0.01 dB, SAR (10g): 5.01 mW/g ± 0.00 dB, (Worst-case extrapolation)
Penetration depth: 8.4 (7.7, 9.6) [mm]
Powerdrift: -0.01 dB



Schmid & Partner Engineering AG, Zurich, Switzerland

1900MHz SAR distribution of validation dipole from reference measurement

Measured with Body simulating tissue on April 29, 2002

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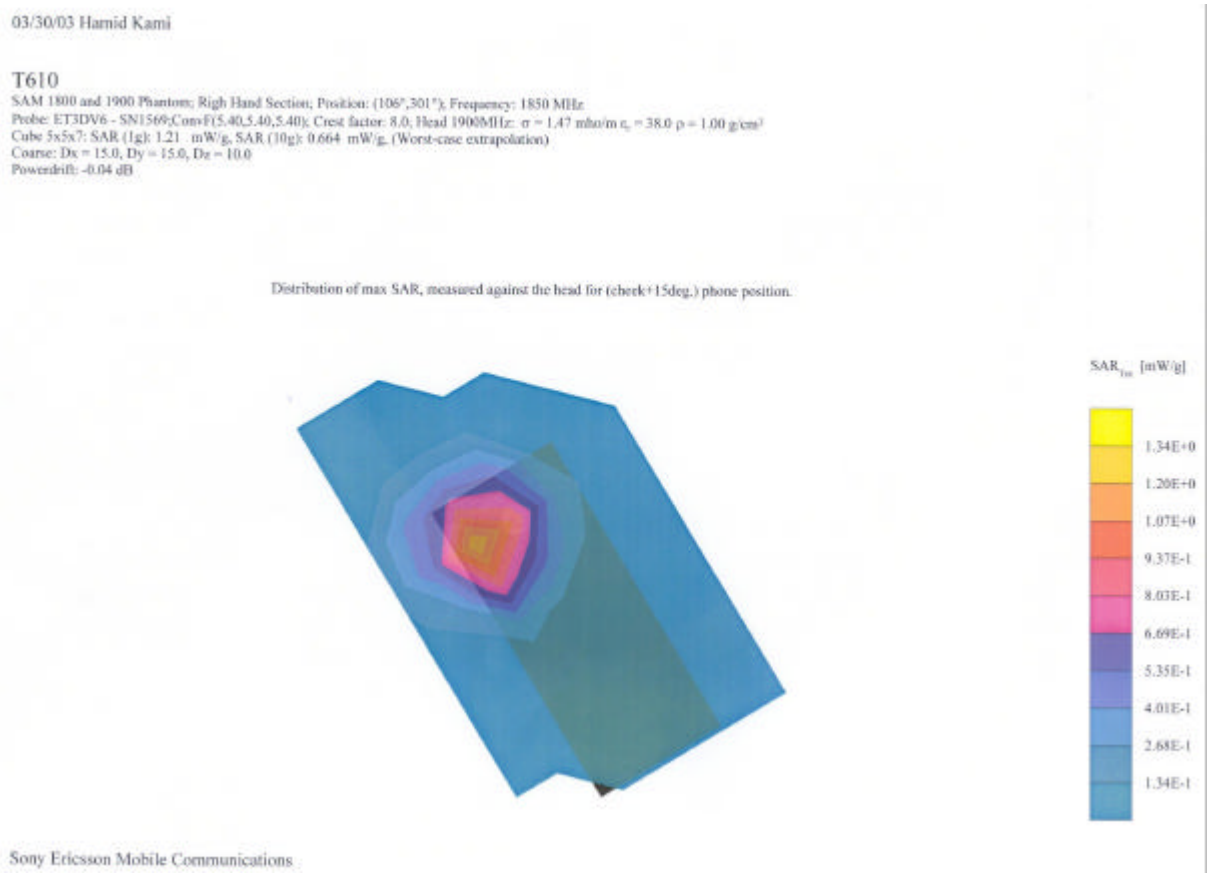
10.2 SAR distribution plot



Distributions of max SAR in GSM1900 mode at 1850.2MHz. Measured against the head for Tilt phone position

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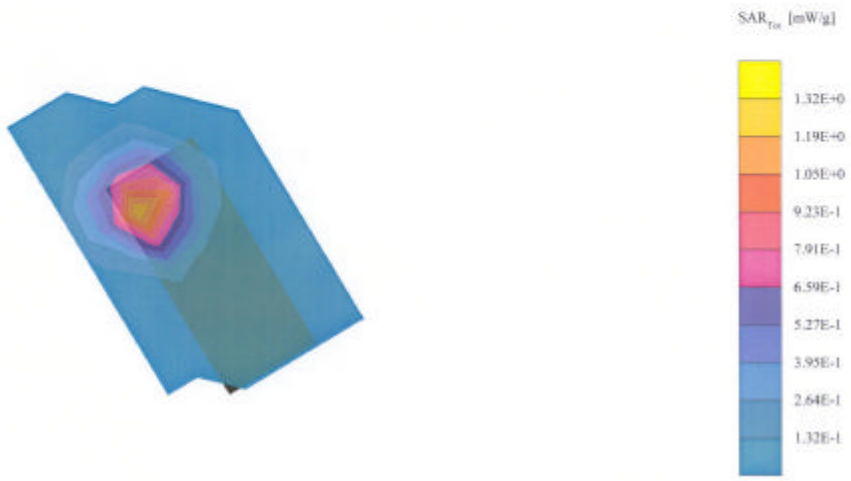
03/30/03 Hamid Kami

T610
SAM 1800 and 1900 Phantom; Righ Hand Section; Position: (106°,301°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1569;ConvF(5.40,5.40,5.40); Crest factor: 8.0; Head 1900MHz: σ = 1.47 mho/m ε_r = 38.0 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 1.21 mW/g, SAR (10g): 0.657 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.01 dB
Blue Tooth ON

Distribution of max SAR,measured against the head for (cheek+15deg.) phone position and blue tooth is activatated.



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Distributions of max SAR in GSM1900 mode at 1850.2MHz. Measured against the head for tilt phone position and Bluetooth is activated .

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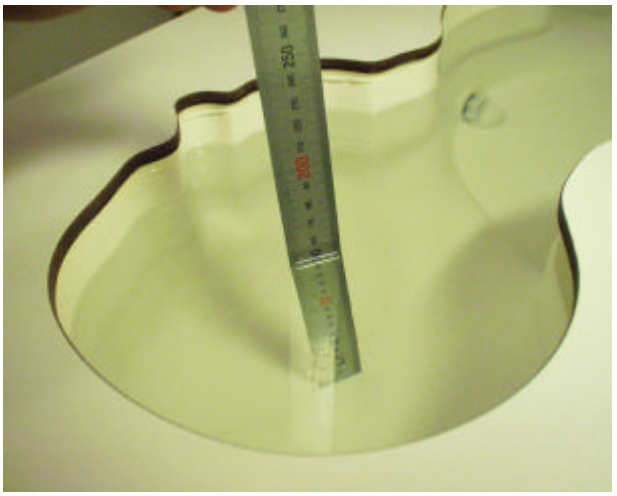
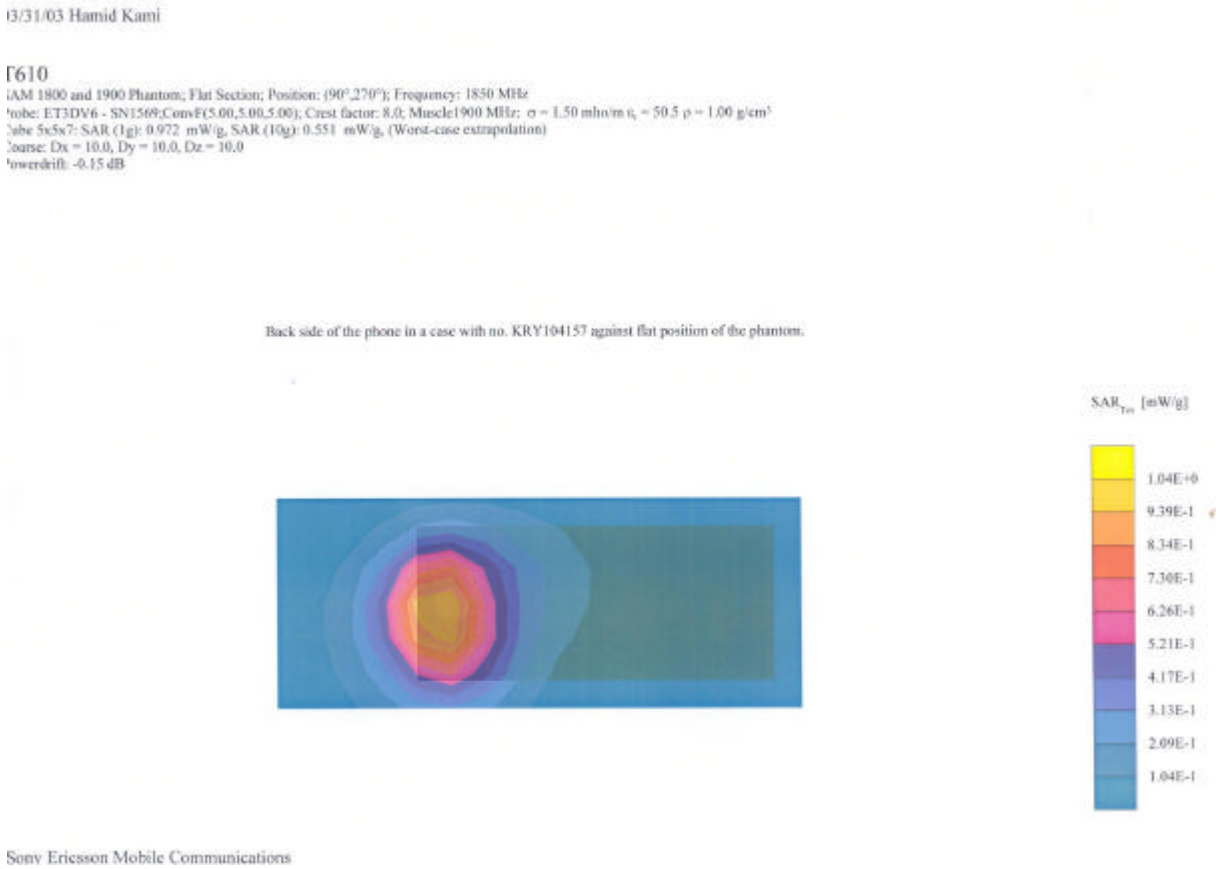


Tissue within the phantom shell measured from the ear reference point is 15cm



Distributions of max SAR in GSM1900 mode at 1850.2MHz. Measured against the body for back phone position to the phantom

10.3 Photographs of the device under test

Front side

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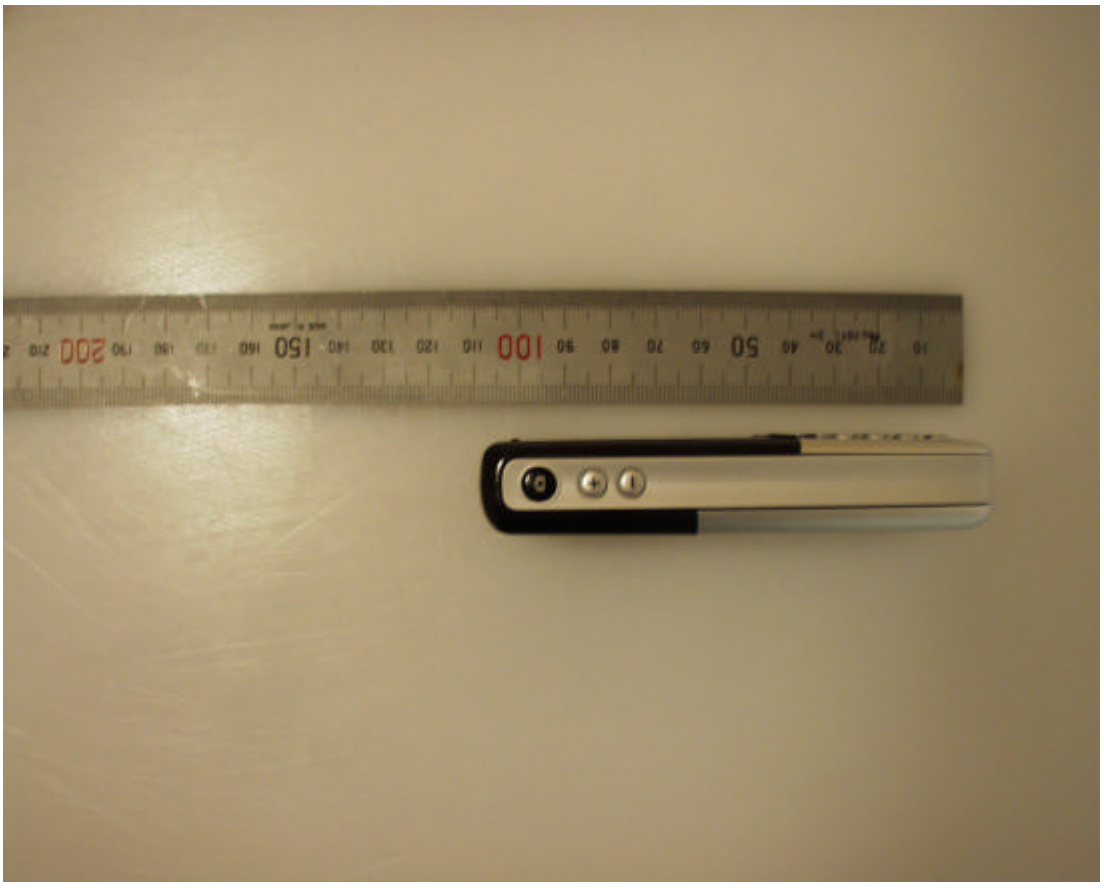

Side

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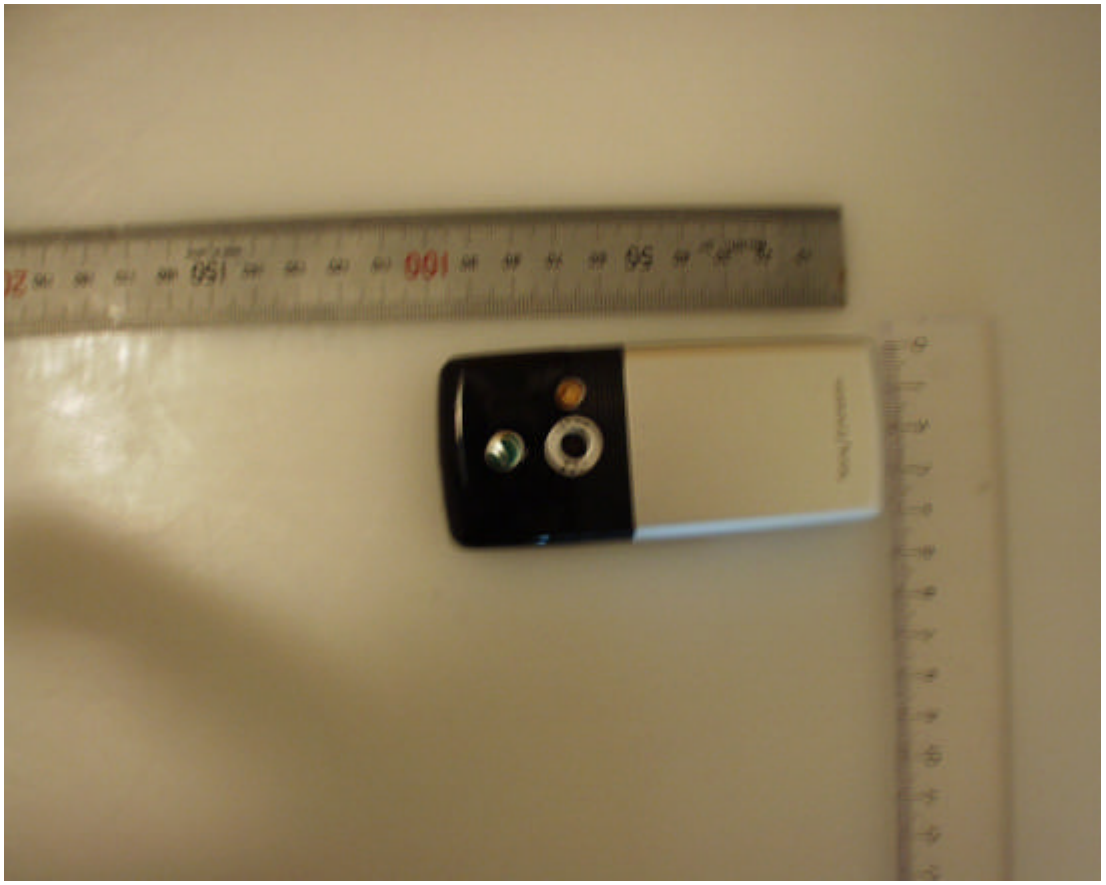

Back side

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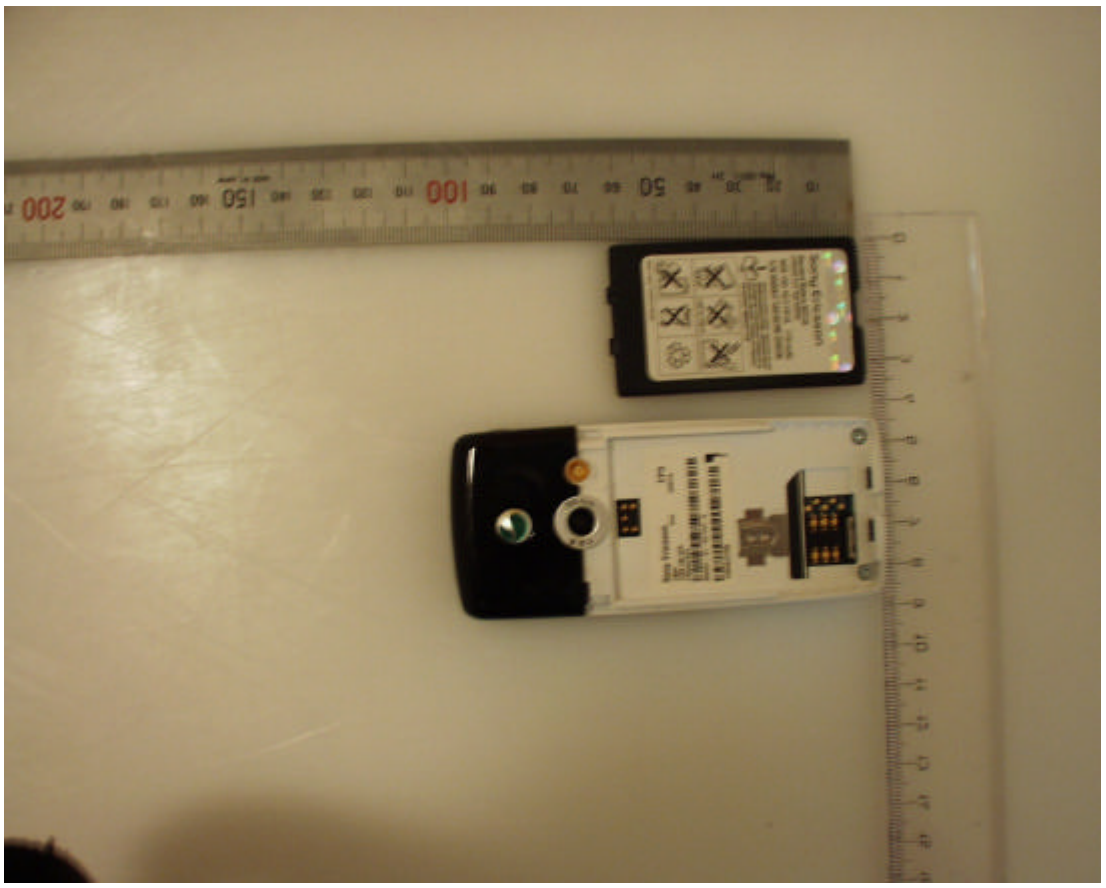
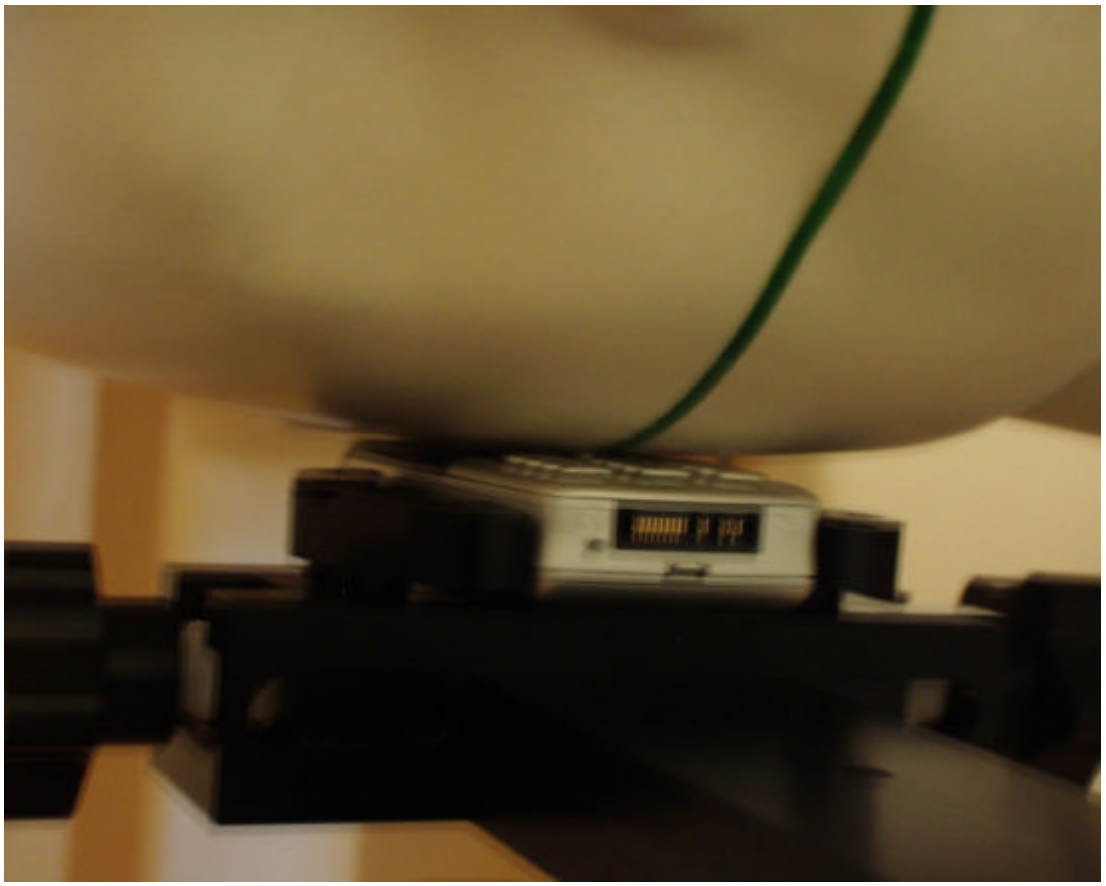
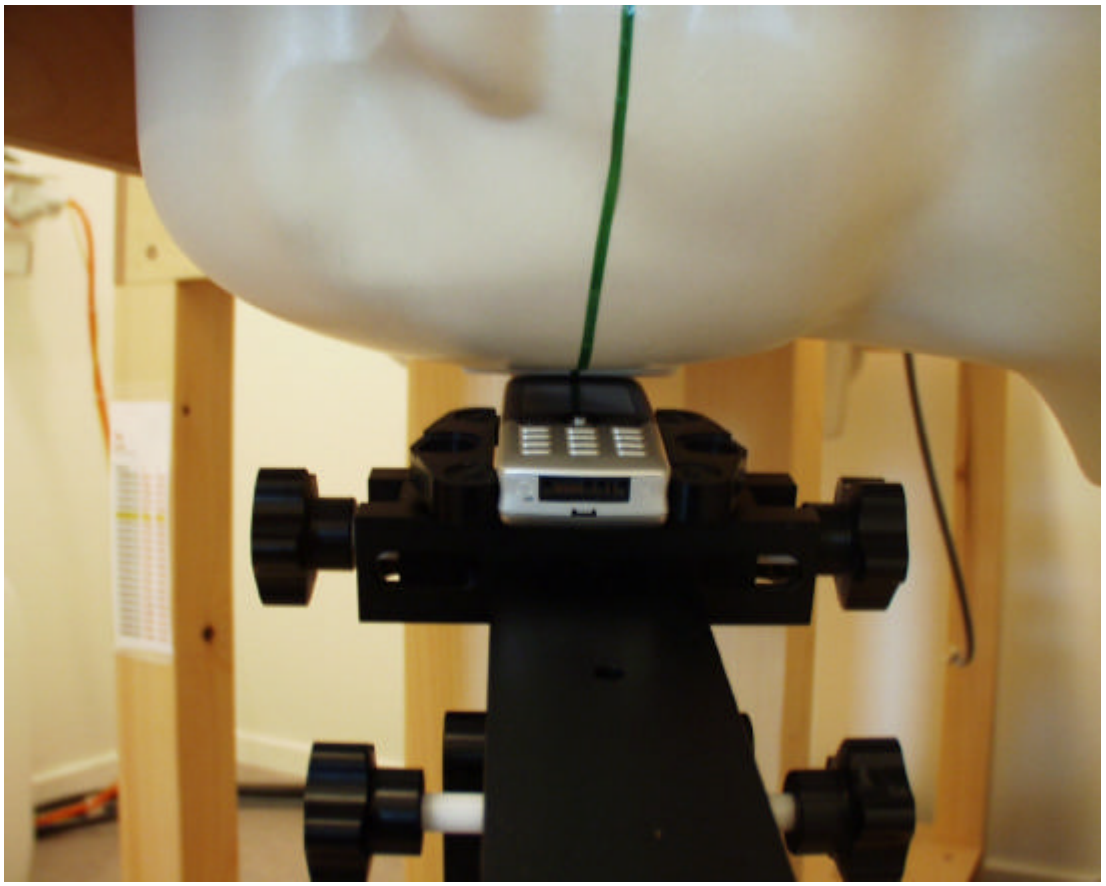


Battery

10.4 Device position on SAM Phantom



Device position against the head: Cheek (touch) phone position



Device position against the head: Tilt (cheek+15deg) phone position

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Device position against the body: Phone inside case and in touch with the flat position of phantom

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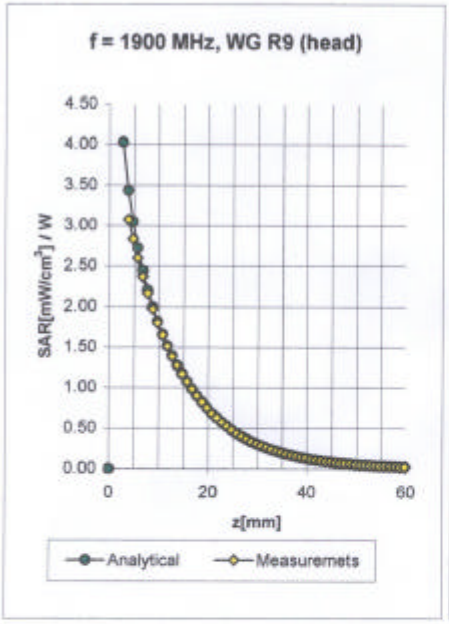
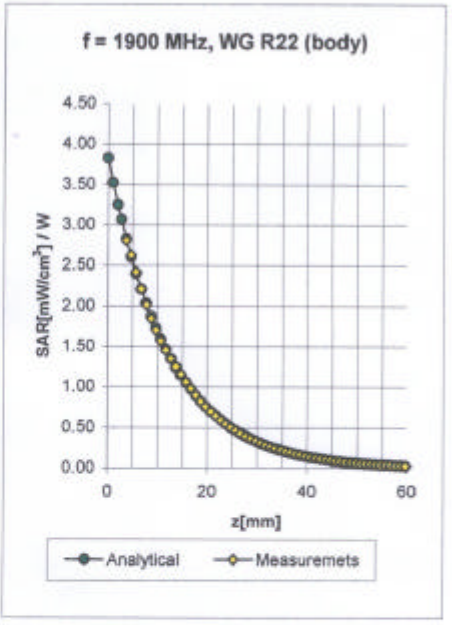
10.5 Probe calibration parameters

ET3DV6 SN:1569 April 25, 2002

Conversion Factor Assessment





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

ConvF X	**5.4** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**5.4** ± 8.9% (k=2)	Alpha	**0.47**
ConvF Z	**5.4** ± 8.9% (k=2)	Depth	**2.44**

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

ConvF X	**5.0** ± 8.9% (k=2)	Boundary effect:	
ConvF Y	**5.0** ± 8.9% (k=2)	Alpha	**0.65**
ConvF Z	**5.0** ± 8.9% (k=2)	Depth	**2.16**