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Prepared (also subject responsible if other)		No.		
LD/SEM/GUG/NM/H. Kami Shirazi		GUG/N03 :352		
Approved	Checked	Date	Rev	Reference
LD/SEM/GUG/NMC/Mats Hansson		031103	A	File

SAR Test Report: T106 (PY71022101)

Date of test: January 15 to 22, 2003

Laboratory:
Electromagnetic Near Field and Radio Frequency
Dosimetry Lab Sony Ericsson Mobile Communications AB
Nya Vatenttornet
SE-221 82 LUND, Sweden

Test Responsible:
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Statement of Compliance

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

Sony Ericsson Type 1022101-BV (T106); FCC ID: PY71022101

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)

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

In this test report, compliance of the Sony Ericsson T106 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	T106
Serial number	M12C27B13163
Mode	GSM 1900
Multiple Access Scheme	TDMA
Maximum Output Power Setting	29.5dBm
Factory Tolerance in Power Setting	± 0.5dB
Maximum Peak Output Power	30dBm
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	428	4/2003
E-field probe ET3DV6	1584	12/2003
Dipole Validation Kit, D1900 V2	5d002	2/2004
Dipole Validation Kit, D835 V2	438	2/2004

4.2 Additional equipment

Description	***Inventory Number***	***Due Date***
Signal generator ESG-D4000A	INV 462935	9/2003
Directional coupler HP778D	INV 2903	1/2003
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	1/2003
Network analyzer HP8753C	INV421671	8/2003
S-parameter test set HP85047A	INV 421670	8/2003
Dielectric probe kit HP8507D	INV 20000053	2/2004
Wavetek STABILOK 4031D	INV 421578	7/2003

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%, 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 January 20, 2003	38.1	1.44	1.0
		Recommended	40.0	1.40	1.0
	Muscle	Measured January 21, 2003	50.7	1.55	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 had been measured in liquid when all RF equipment in 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)
				ε_r	σ (S/m)	ρ (g/cm³)	
1900	Head	Measured, January 20, 2003	43.1	38.1	1.44	1.0	23.2
		Reference, February 20,2002	45.2	39.1	1.47	1.0	-
	Muscle	Measured, January 21, 2003	44.9	50.7	1.55	1.0	23.1
		Reference, February 20,2002	44.0	51.9	1.58	1.0	-

7 SAR measurement uncertainty

SAR measurement uncertainty evaluation for Sony Ericsson T106 phone

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	√3	1.9	1.9
Hemispherical Isotropy		9.6	R	√3	3.9	3.9
Boundary Effect		11.0	R	√3	6.4	6.4
Linearity		4.7	R	√3	2.7	2.7
System Detection Limits		1.0	R	√3	0.6	0.6
Readout Electronics		1.0	N	1	1.0	1.0
Response Time		0.8	R	√3	0.5	0.5
Integration Time		1.8	R	√3	1.1	1.1
RF Ambient Conditions		3.0	R	√3	1.7	1.7
Probe Positioned Mechanical Tolerance		0.4	R	√3	0.2	0.2
Probe Positioning respect to Phantom Shell		2.9	R	√3	1.7	1.7
Extrapolation, Interpolation and Integration Algorithm for Max. SAR		3.9	R	√3	2.3	2.3
Measurement System Uncertainty					**9.4**	**9.4**
Test Sample Related						
Test Sample Positioning			R	√3	6.7	6.7
Device Holder Uncertainty			R	√3	5.9	5.9
Output Power Variation – Drift			R	√3		
	GSM1900	0.2/0.4			0.1	0.2
Test Sample Related Uncertainty					**8.9**	**8.9**
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)		4.0	R	√3	2.3	2.3
Liquid Conductivity (deviation from target value)			R	√3		
	GSM1900	2.8/2.0			1.6	1.2
Liquid Conductivity – measurement uncertainty		5	R	√3	2.9	2.9
Liquid Permitivity (deviation from target value)			R	√3		
	GSM1900	4.7/4.9			2.7	2.8
Liquid Permitivity – measurement uncertainty		5	R	√3	2.9	2.9
Phantom and Tissue Parameters Uncertainty					**5.6**	**5.6**
Combined Standard Uncertainty			RSS		**14.1**	**14.1**
Expanded Uncertainty (95% CONFIDENCE LEVEL)					***28.2***	***28.2***

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). 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) in 1g/10g mass	
					Right-hand	Left-hand
					Measured	Measured
1900 GSM	512	30	Cheek	22.5/22.7	0.67/0,37	**0.89/0,46**
			Tilt	22.7/23.0	0.61/0,33	0.82/0,41
	661	29.9	Cheek	22.5/22.8	0.64/0,35	0.86/0,43
			Tilt	22.7/23.0	0.62/0,32	0.79/0,40
	810	29.9	Cheek	22.6/22.9	0.50/0,27	0.70/0,35
			Tilt	22.6/22.9	0.49/0,26	0.62/0,31

Table1: SAR measurement results for Sony Ericsson T106 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 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) in 1g/10g mass
					Measured
1900 GSM	512	30	Back	22.5	**0.57/0,35**
			Front	22.7	0.20/0,12
	661	29.9	Back	22.5	0.47/0,29
			Front	22.7	0.21/0,12
	810	29.9	Back	22.6	0.40/0,22
			Front	22.6	0.17/0,10

Table 2: SAR measurement results for Sony Ericsson T106 telephone. Measured against the body.

9 References

[1] M.Douglas, “SAR Measurement Specification of Wireless Handsets”, Sony Ericsson 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 Wireless Communications Devices: Experimental Techniques,” Std 1528-200x, Draft 6.5 – August 20, 2001.

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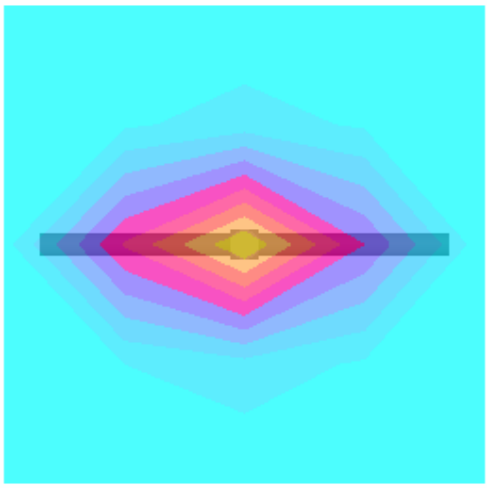
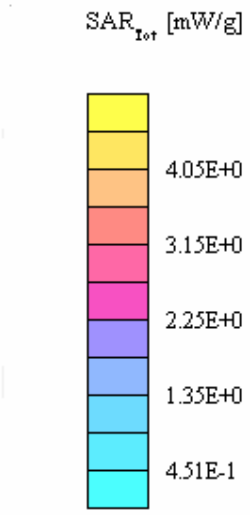
10 Appendix

10.1 SAR distribution comparison for system accuracy verification

Dipole 1900 MHz
SAM 1800 and 1900 Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1584;ConvF(5.40,5.40,5.40); Crest factor: 1.0; Head 1900MHz: σ = 1.44 mho/m ε_r = 38.1 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 4.14 mW/g, SAR (10g): 2.12 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.01 dB





Validation Dipole, measured with head simulating tissue on January 20, 2003

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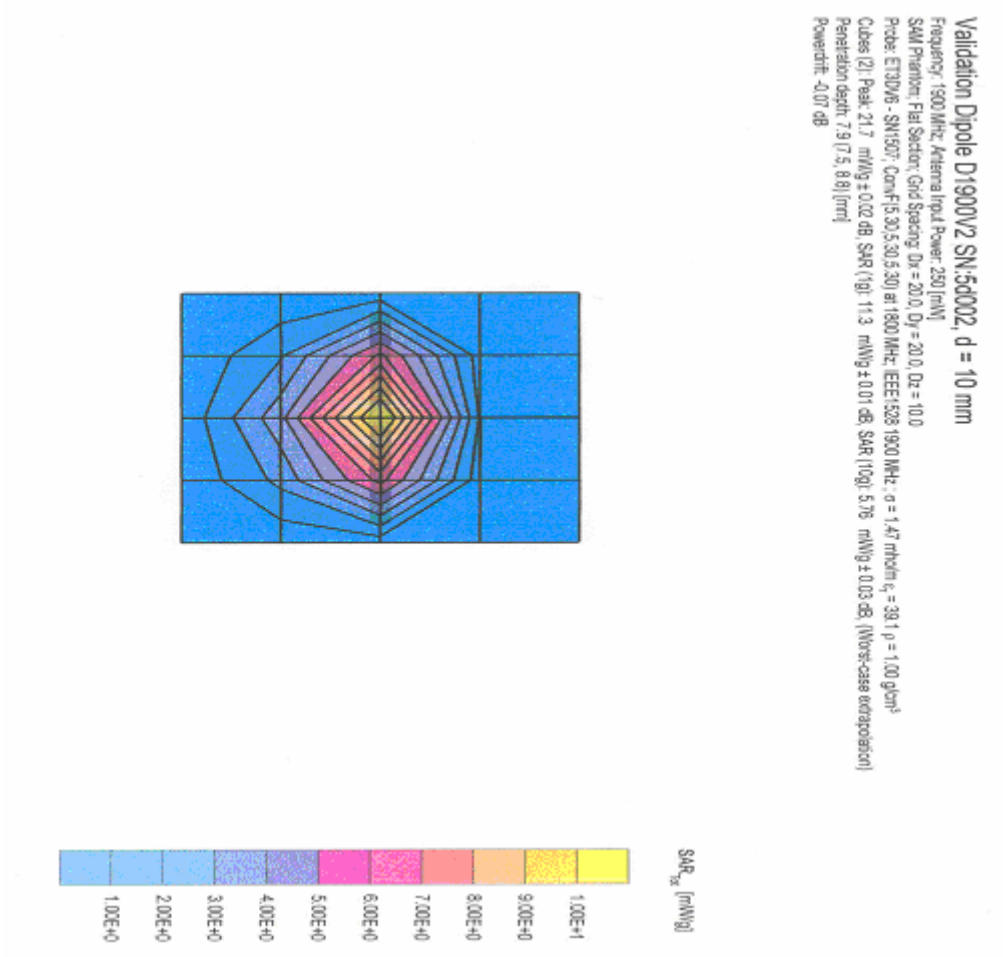

SAR distribution plot for the 1900 MHz validation dipole antenna. The plot shows the reference data obtained from the DASY3 manufacturer and with brain simulating solution February 20, 2002

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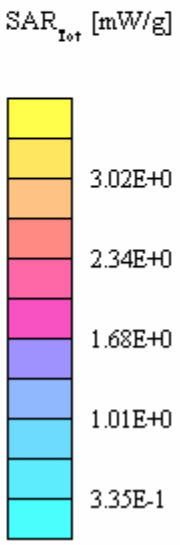
Dipole 1900 MHz

SAM 1800 and 1900 Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1584;ConvF(5.00,5.00,5.00); Crest factor: 1.0; Muscle1900 MHz: σ = 1.55 mho/m ε_r = 50.7 ρ = 1.00 g/cm^3
Cubes (2): SAR (1g): 4.18 mW/g ± 0.05 dB, SAR (10g): 2.19 mW/g ± 0.03 dB, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.04 dB



Validation Dipole, measured with muscle simulating tissue on January 21, 2003

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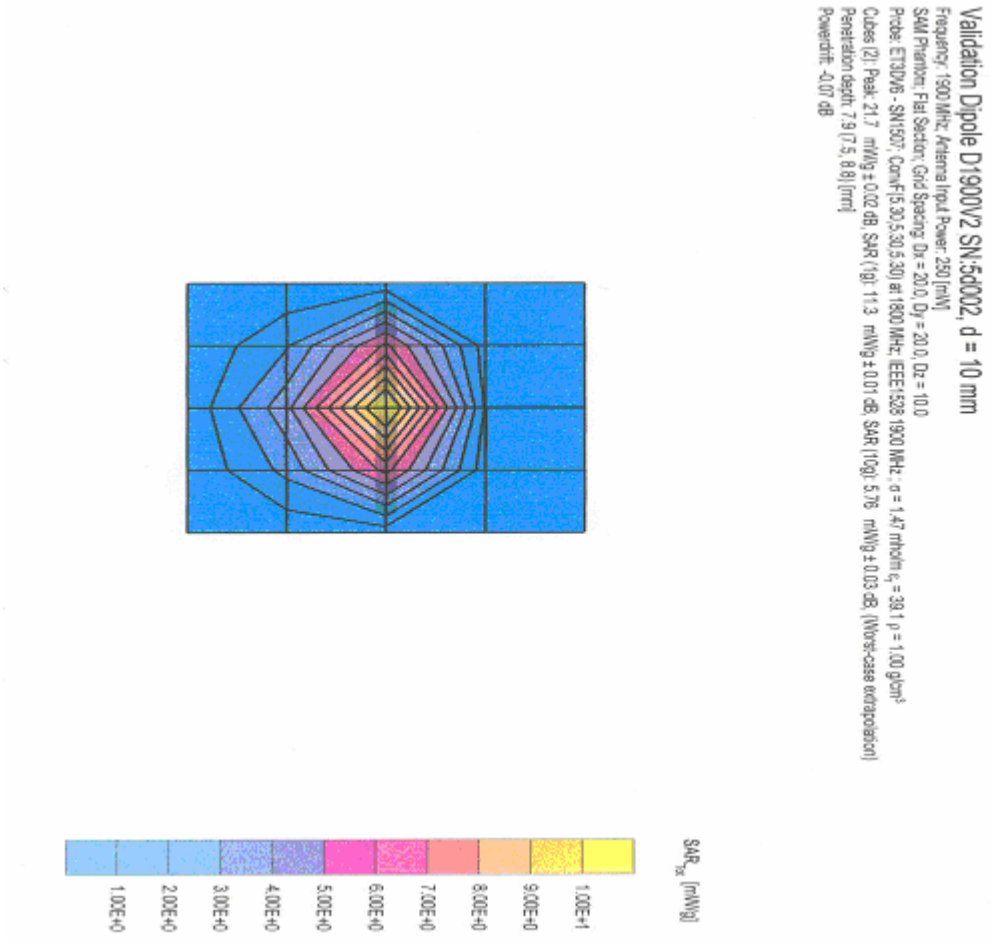

SAR distribution plot for the 1900 MHz validation dipole antenna. The plot shows the reference data obtained from the DASY3 manufacturer and with muscle simulating solution February 20, 2002

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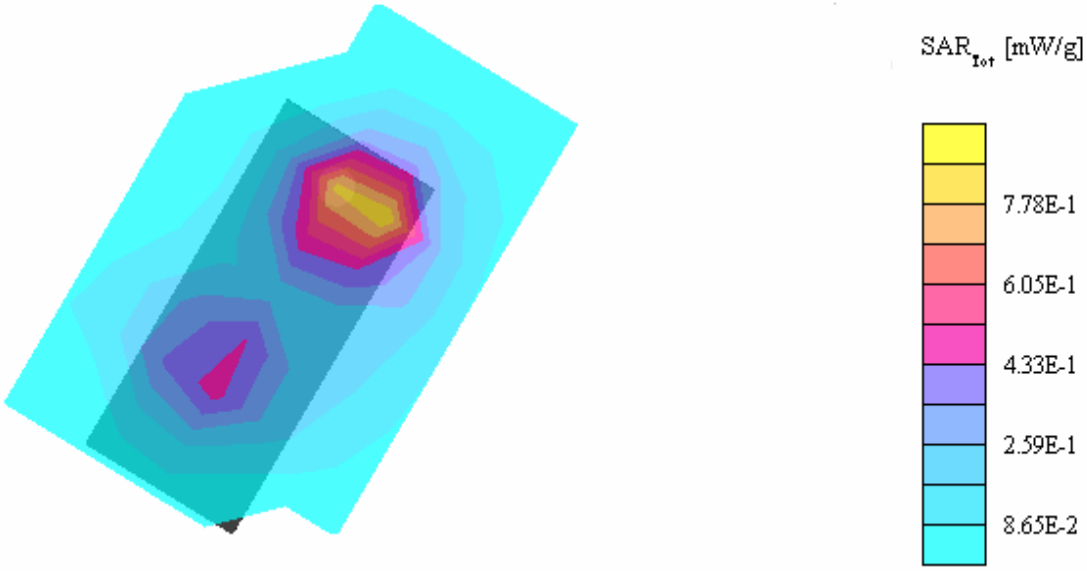
10.2 SAR distribution plot

T106
SAM 1800 and 1900 Phantom; Left Hand Section; Position: (91°,59°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1584;ConvF(5.40,5.40,5.40); Crest factor: 8.0; Head 1900MHz: σ = 1.44 mho/m ε_r = 38.1 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.891 mW/g, SAR (10g): 0.456 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.01 dB



Distributions of max SAR in GSM1900 mode at 1850.2MHz. Measured against the head for cheek phone position January 20, 2003

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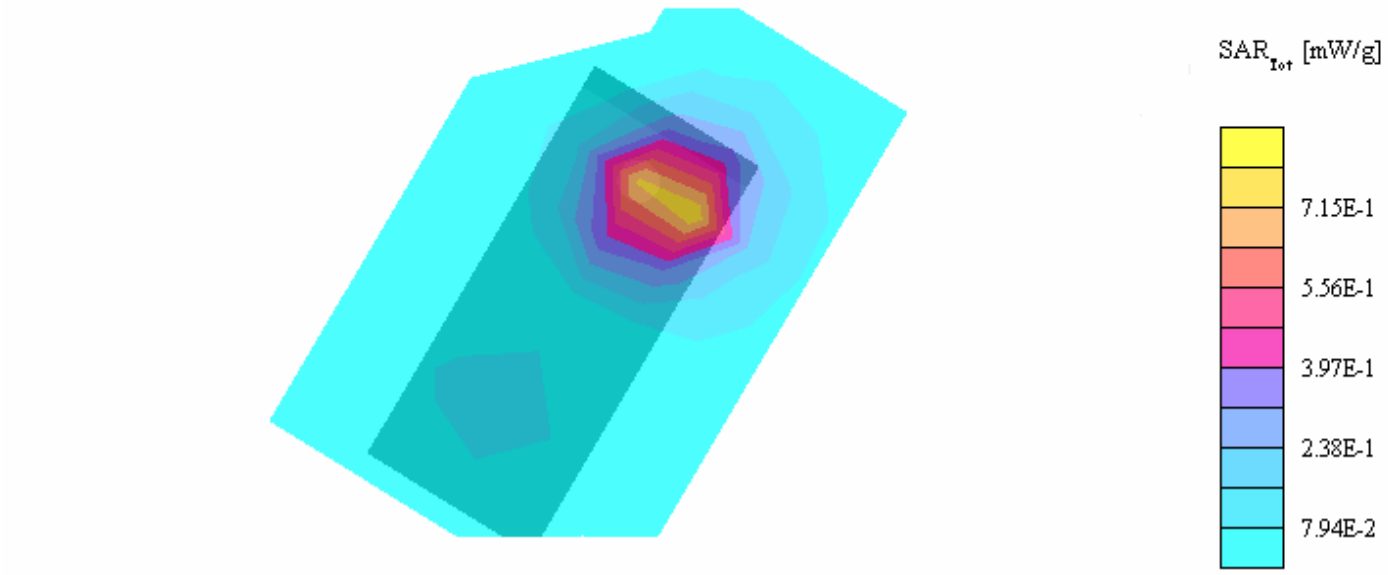
T106

SAM 1800 and 1900 Phantom; Left Hand Section; Position: (106°,59°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1584;ConvF(5.40,5.40,5.40); Crest factor: 8.0; Head 1900MHz: σ = 1.44 mho/m ε_r = 38.1 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.821 mW/g, SAR (10g): 0.414 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Powerdrift: -0.14 dB



Distributions of max SAR in GSM1900 mode at 1850.2MHz. Measured against the head for tilt phone position January 20, 2003

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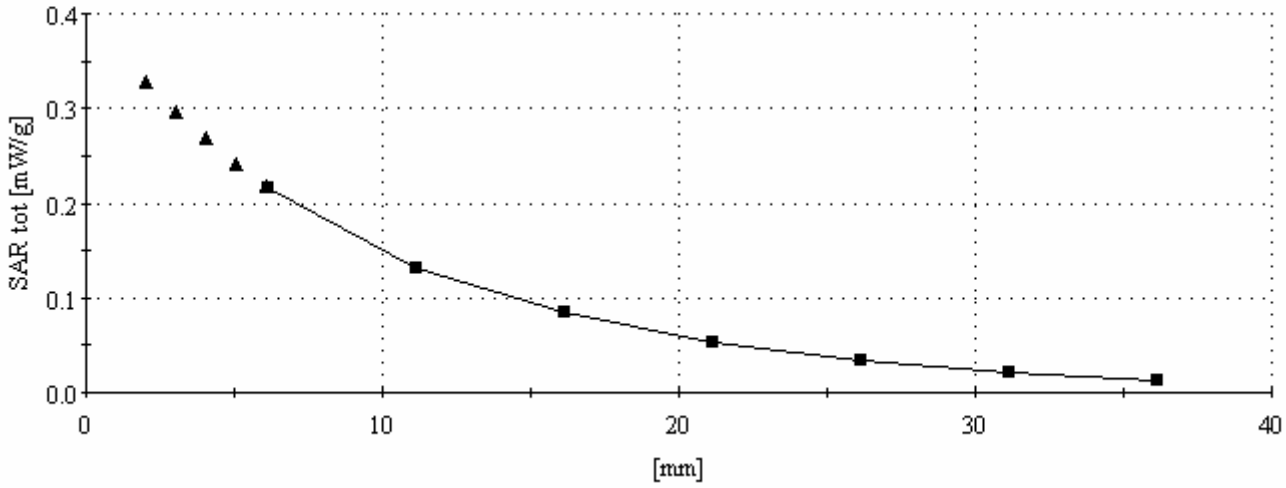
T106

SAM 1800 and 1900 Phantom; Left Hand Section; Position: (91°,59°); Frequency: 1850 MHz
Probe: ET3DV6 - SN1584;ConvF(5.40,5.40,5.40); Crest factor: 8.0; Head 1900MHz: σ = 1.44 mho/m ε_r = 38.1 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.891 mW/g, SAR (10g): 0.456 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0



Z(x) distribution of max SAR in GSM1900 mode at 1850.2MHz. Measured against the head for cheek phone position January 20, 2003

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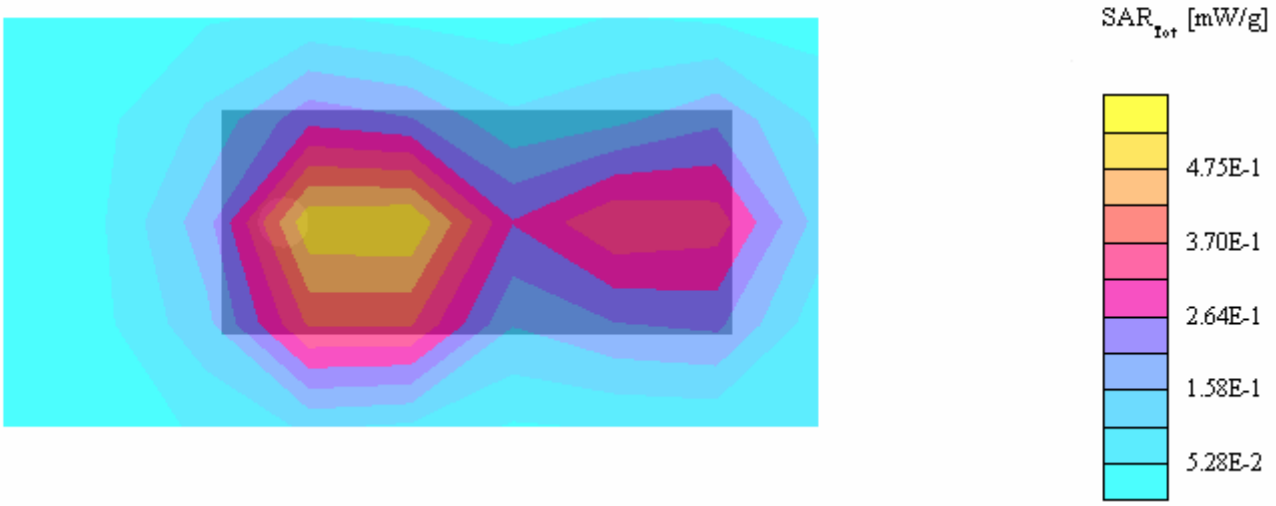
T106

SAM 1800 and 1900 Phantom; Flat Section; Position: (90°,270°); Frequency: 1910 MHz
Probe: ET3DV6 - SN1584;ConvF(5.00,5.00,5.00); Crest factor: 8.0; Muscle1900 MHz: σ = 1.55 mho/m ε_r = 50.7 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.569 mW/g, SAR (10g): 0.350 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.16 dB



Distributions of max SAR in GSM1900 mode at 1850.2 MHz. measured against the body for back phone+15mm distance from flat position of the phantom January 21, 2003

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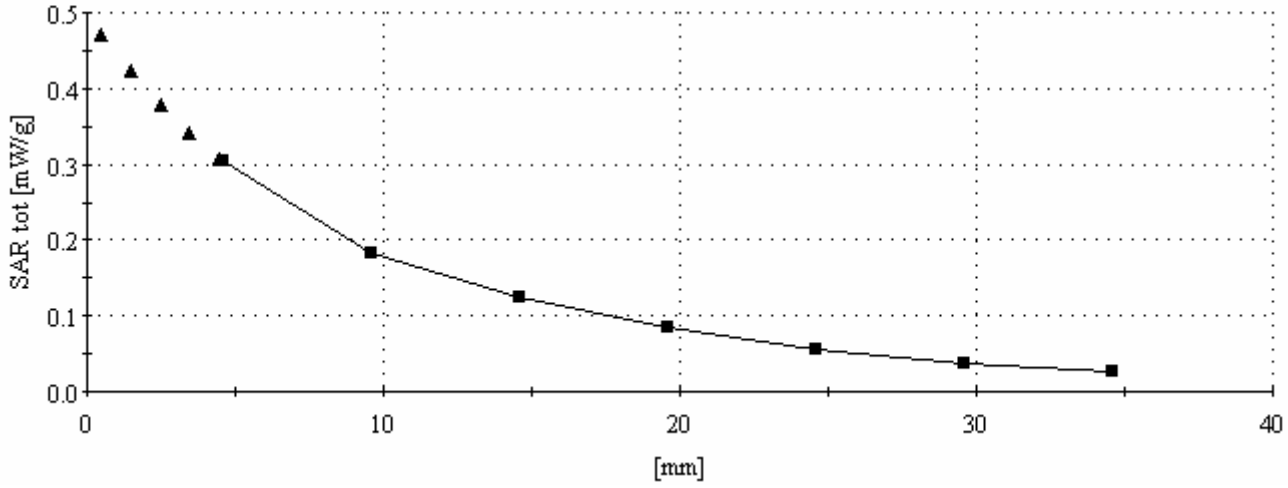
T106

SAM 1800 and 1900 Phantom; Flat Section; Position: (90°,270°); Frequency: 1910 MHz
Probe: ET3DV6 - SN1584;ConvF(5.00,5.00,5.00); Crest factor: 8.0; Muscle1900 MHz: σ = 1.55 mho/m ε_r = 50.7 ρ = 1.00 g/cm^3
Cube 5x5x7: SAR (1g): 0.569 mW/g, SAR (10g): 0.350 mW/g, (Worst-case extrapolation)
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0



Z(x) distribution of max SAR in GSM1900 mode at 1850.2MHz.measured against the body for back phone+15mm distance from flat position of the phantom Jan 21, 2003

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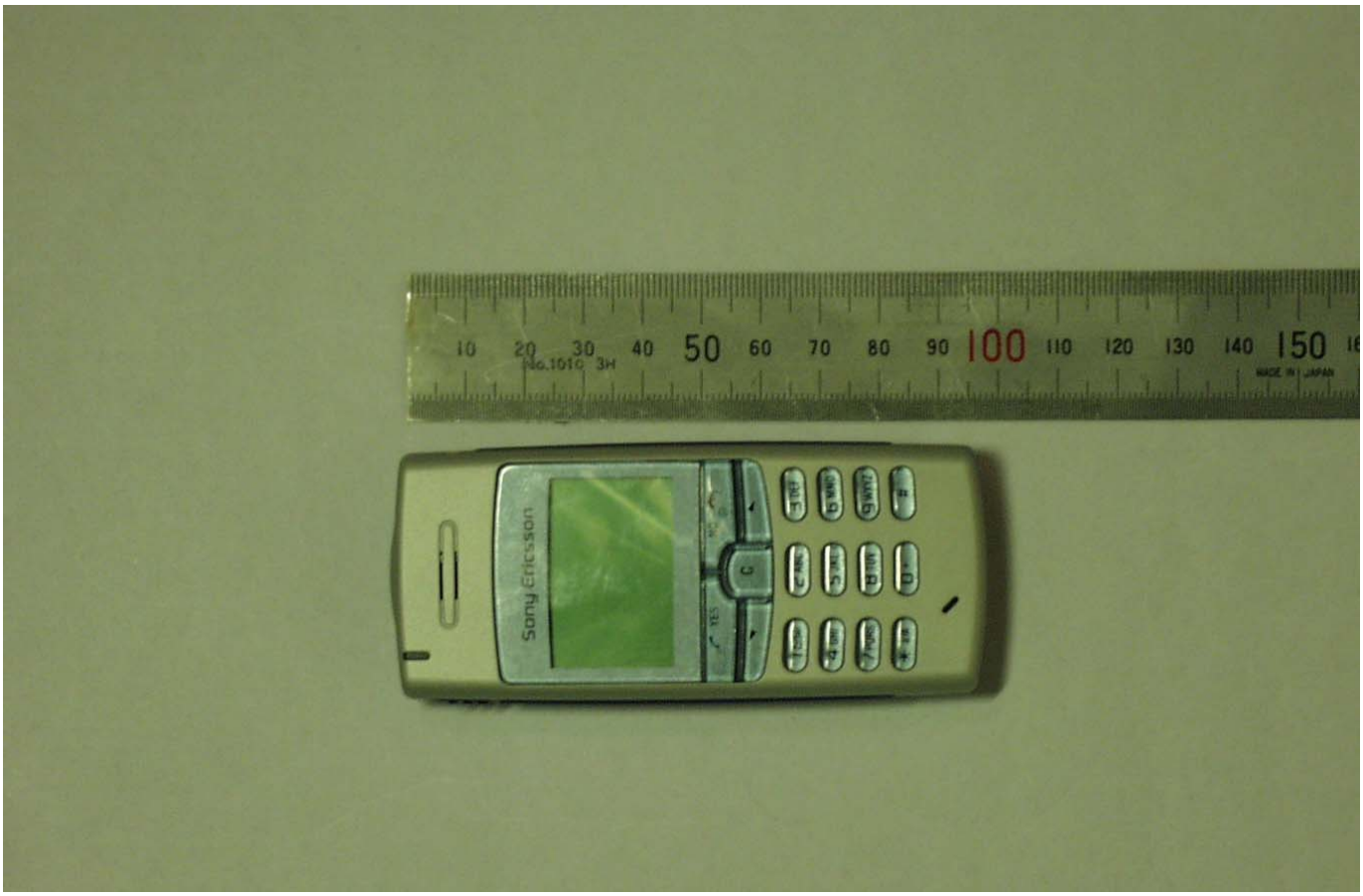
10.3 Photographs of the device under test



Front side

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Left side

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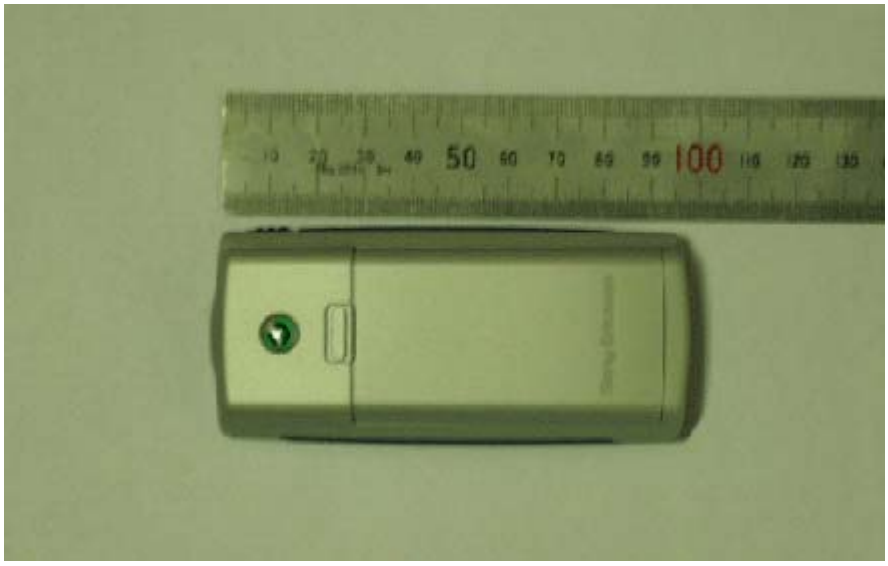
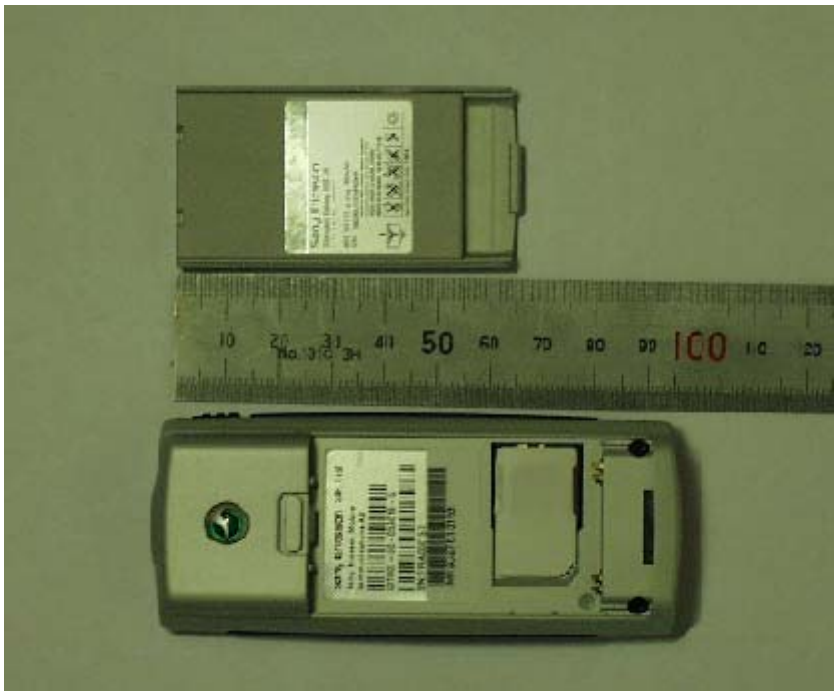


Back side



Battery

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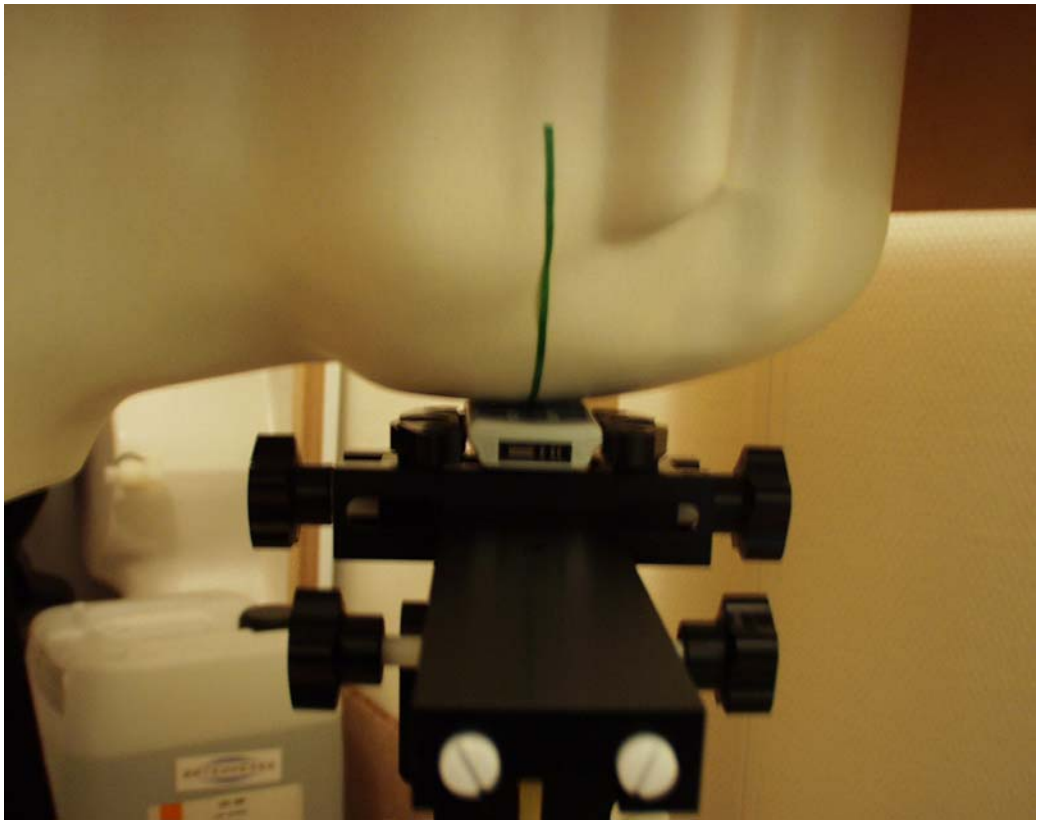
10.4 Device position on SAM Twins Phantom



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

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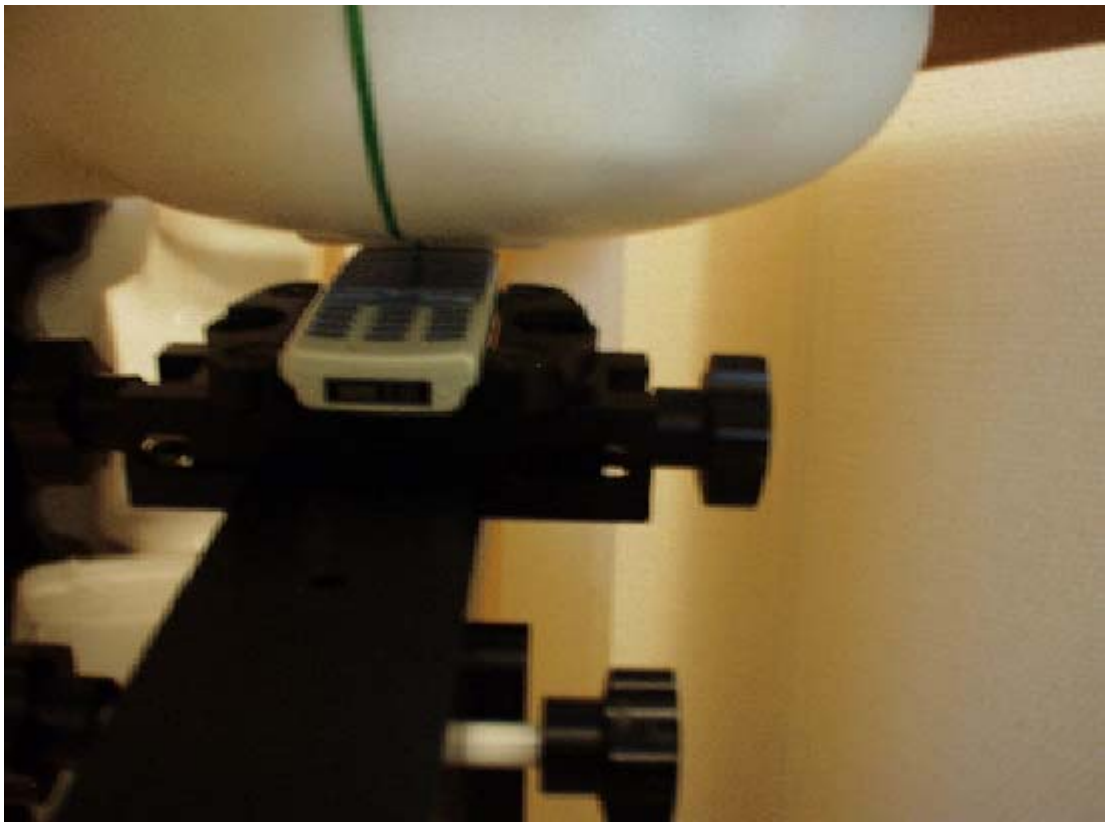
LD/SEM/GUG/NMC/Mats Hansson		031103	A	File



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

Device position against the body: Backside Phone holds 15cm away from the flat position of phantom

Sony Ericsson

SecurityClass
REPORT

Prepared (also subject responsible if other)		No.		
LD/SEM/GUG/NM/H. Kami Shirazi		GUG/NV 03:352		
Approved	Checked	Date	Rev	Reference
LD/SEM/GUG/NMC/Mats Hansson		031103	A	File

10.5 Probe calibration parameters

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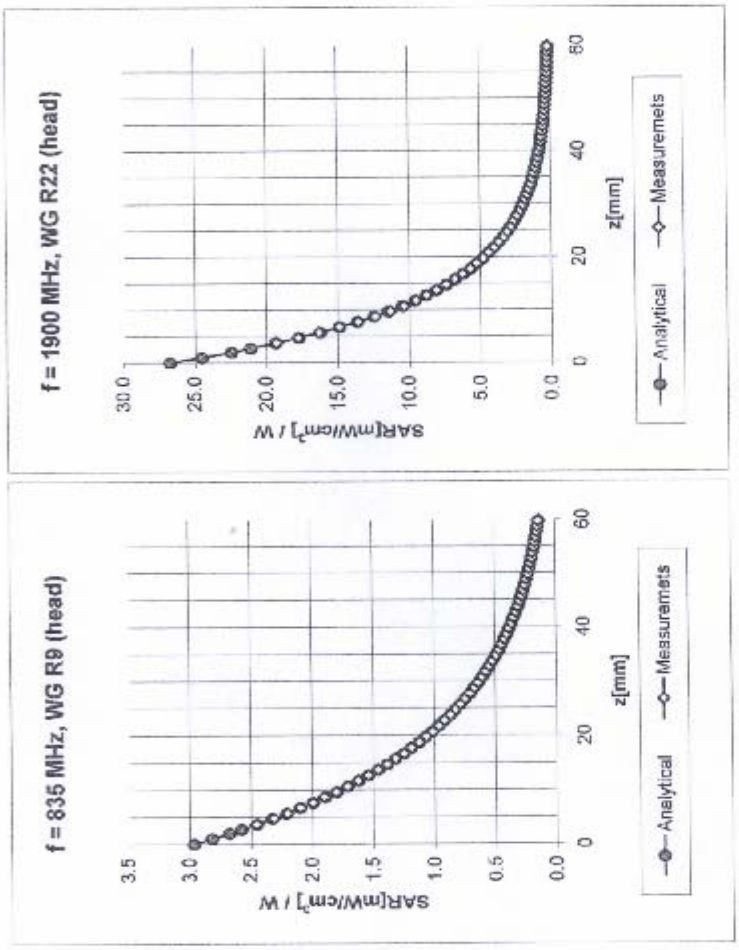
Conversion Factor Assessment



Head	835 MHz	ε_r = 41.5 ± 5%	σ = 0.90 ± 5% mho/m	
Head	900 MHz	ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m	
	ConvF X	7.0 ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	7.0 ± 9.5% (k=2)	Alpha	0.37
	ConvF Z	7.0 ± 9.5% (k=2)	Depth	2.32

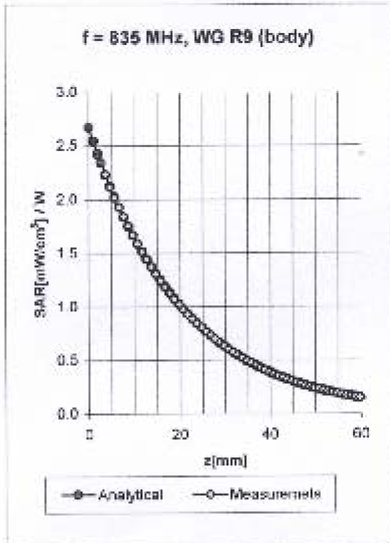
Head	1900 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m	
Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m	
	ConvF X	5.4 ± 9.5% (k=2)	Boundary effect:	
	ConvF Y	5.4 ± 9.5% (k=2)	Alpha	0.51
	ConvF Z	5.4 ± 9.5% (k=2)	Depth	2.36

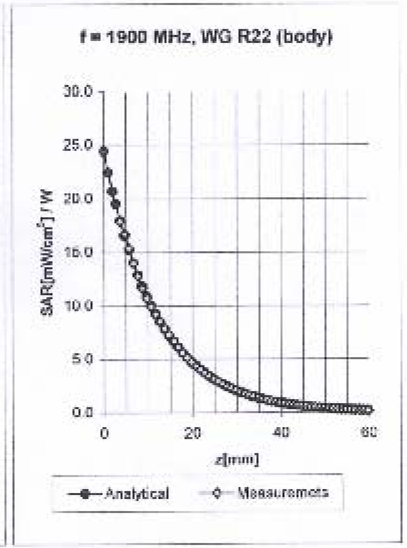
SecurityClass
REPORT

Prepared (also subject responsible if other): LD/SEM/GUG/NM/H. Kami Shirazi
No.: GUG/NV 03:352
Approved: LD/SEM/GUG/NMC/Mats Hansson
Checked:
Date: 031103
Rev: A
Reference: File

ET3DV6 SN:1584 December 19, 2002

Conversion Factor Assessment





Body	835 MHz	ε_r = 55.2 ± 5%		σ = 0.97 ± 5% mho/m	
Body	900 MHz	ε_r = 55.0 ± 5%		σ = 1.05 ± 5% mho/m	
	ConvF X	6.6	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	6.6	± 9.5% (k=2)	Alpha	0.35
	ConvF Z	6.6	± 9.5% (k=2)	Depth	2.50

Body	1900 MHz	ε_r = 53.3 ± 5%		σ = 1.52 ± 5% mho/m	
Body	1800 MHz	ε_r = 53.3 ± 5%		σ = 1.52 ± 5% mho/m	
	ConvF X	5.0	± 9.5% (k=2)	Boundary effect:	
	ConvF Y	5.0	± 9.5% (k=2)	Alpha	0.67
	ConvF Z	5.0	± 9.5% (k=2)	Depth	2.14