

Prepared (also subject responsible if other) LD/ECS/GUF/KG Ramadan Plicanic		No. GTX/FG 01:086		
Approved GUF/KG Ramadan Plicanic	Checked ECSRAPL	Date 2001-12-03	Rev A	File H:\RR\SAR_FCC Report\T68i.doc

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SAR Test Report: T68i (PY71130202)

Date of test: November 30 , 2001

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

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

Ericsson Type 1130202-BV (T68i); FCC ID: PY 71130202

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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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 test report.

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1. Introduction

In this test report, compliance of the Ericsson T68i 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 Specification of Wireless Handsets* [1].

2. Device Under Test

2.1 Antenna description

Type	Internal antenna	
Location	Inside the back cover, near the top	
Dimensions	Max length	22mm
	Max width	35mm
Configuration	PIFA	

2.1 Device description

Device model	T68i
Serial number	A6101T53PA
Mode	1900 TDMA
Multiple Access Scheme	TDMA
Maximum Output Power Setting¹	29.0 dBm
Factory Tolerance in Power Setting	± 0.5dB
Maximum Peak Output Power²	29.5 dBm
Duty Cycle	1 / 8
Transmitting Frequency Range	1850 – 1910 MHz
Prototype or Production Unit	Prototype
Device Category	Portable
RF exposure environment[2]	General population / uncontrolled

3. Test equipment

3.1 Dosimetric system

SAR measurements were made using the DASY3 professional system (software version 3.1c) with a SAM twin phantom, manufactured by Schmid & Partner Engineering AG (SPEAG). The extended SAR assessment uncertainty ($K = 2$) is ± 24% [1]. The list of calibrated equipment is given below.

Description	Serial Number	Due Date
DASY3 DAE V2	215	5/02
E-field probe ETDV6	1569	5/02
Dipole Validation Kit, D1900V2	510	5/03

¹ This is the conducted power measured at the antenna port when the device is set to its highest power setting. It is measured at the middle of the transmit frequency band. Note that the output power may be different at other frequencies.

² This equals the maximum output power setting plus the factory tolerance.

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3.2 Additional equipment

Description	Serial Number	Due Date
Signal Generator ESG-D4000A	INV 562935	4/02
Dielectric probe kit HP 85070B	INV 443029	7/02
Network analyzer HP 8753C	INV 421670	6/02
Power meter R&S NRVD	INV 483920	12/01
Power sensor R&S NRV-Z5	INV 2334	12/01
Wavetek 4106GPP	INV 462991	7/02

4. Electrical parameters of 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 program is also given. Recommended limits for maximum permittivity, minimum conductivity and maximum mass density are also shown.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ϵ_r	σ (S/m)	ρ (g/cm ³)
1900	Head	Measured, 11/30/01	39.2	1.4	1.00
		Recommended	40.0	1.4	1.03
	Muscle	Measured, 11/30/01	39.2	1.4	1.00
		Recommended	53.3	1.52	1.04

5. 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 22.7 °C, liquids temperature 21.8 °C and humidity 40.2%. The obtained results are displayed in the table below. It is seen that the system is operating within its specification, as the results are within $\pm 10\%$ of the reference values. At 1900 MHz, reference values are provided by the manufacturer. The distributions of SAR compare well with those of the reference measurements (see Appendix 1).

f (MHz)	Tissue type	Measured / Reference	SAR (W/kg), 1 gram	Dielectric Parameters			Temp. (°C)
				ϵ_r	σ (S/m)	ρ (g/cm ³)	
1900	Head / Muscle	Measured, 11/30/01	40.1	39.2	1.4	1.00	22.7
		Reference	43.2	39.2	1.47	1.00	?

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6. Test results

The measured 1-gram averaged SAR values of the device are provided in Tables 1 and 2. Also shown are the measured conducted output powers and the temperature of the test facility during the test. The humidity and ambient temperature of test facility were 40.2%-41.3% and 22.7 °C – 24.5 °C respectively. The depth of the tissue simulating liquid was 15.3 cm. A base station simulator was used to control the device during the SAR measurements. The phone was supplied with a fully-charged battery for the tests.

SAR measured against the head is presented in Table 1. 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 1900 TDMA modes, the device was tested at the lowest, middle and highest frequencies of the transmit band.

Mode	f (MHz)	Output power (dBm)	Phone Positions	Liquid Temp (°C)	SAR, 1g (W/kg)			
					left-hand		right-hand	
					measured	calculated to max. power	measured	calculate to max. power
1900 TDMA	1850	29.0	Cheek	22.5/21.8	0.2	0.22	0.2	0.22
			Tilt	22.6/21.9	0.22	0.25	0.22	0.25
	1880	29.1	Cheek	22.5/21.8	0.195	0.21	0.2	0.22
			Tilt	22.7/22.0	0.2	0.22	0.21	0.23
	1910	29.2	Cheek	22.6/21.9	0.19	0.2	0.19	0.2
			Tilt	22.7/22.0	0.21	0.22	0.22	0.24

Table 1: SAR measurement results for the SonyEricsson T68i telephone at highest possible output power. Measured against the head.

For body-worn measurements, the device was tested against a flat phantom representing the user body. Under measurement was Bluetooth transmitter on. Phone was 15mm on distance from flat phantom. In Table 2, SAR values are provided for both front and back part of the phone to the phantom.

Mode	f(MHz)	Output Power (dBm)	Phone Position	SAR, 1g (W/kg)	
				measured	calculated to max. power
1900 TDMA	1850	29.0	Front	0.08	0.09
			Back	0.27	0.3
	1880	29.1	Front	0.07	0.08
			Back	0.21	0.23
	1910	29.2	Front	0.07	0.08
			Back	0.27	0.29

Table 2: SAR measurement results for the SonyEricsson T68i telephone at highest possible output power. Measured against the body.

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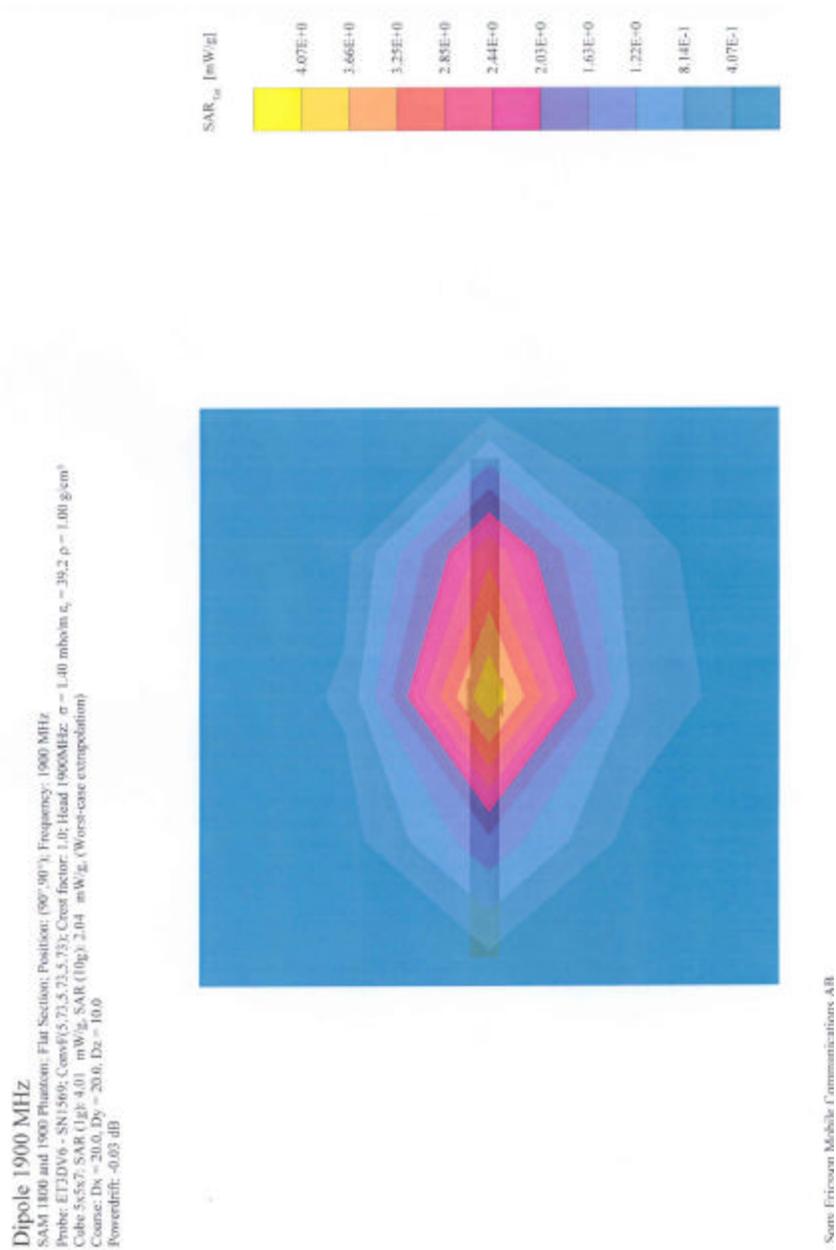
References

- [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 Radiofrequency Electromagnetic Fields: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency 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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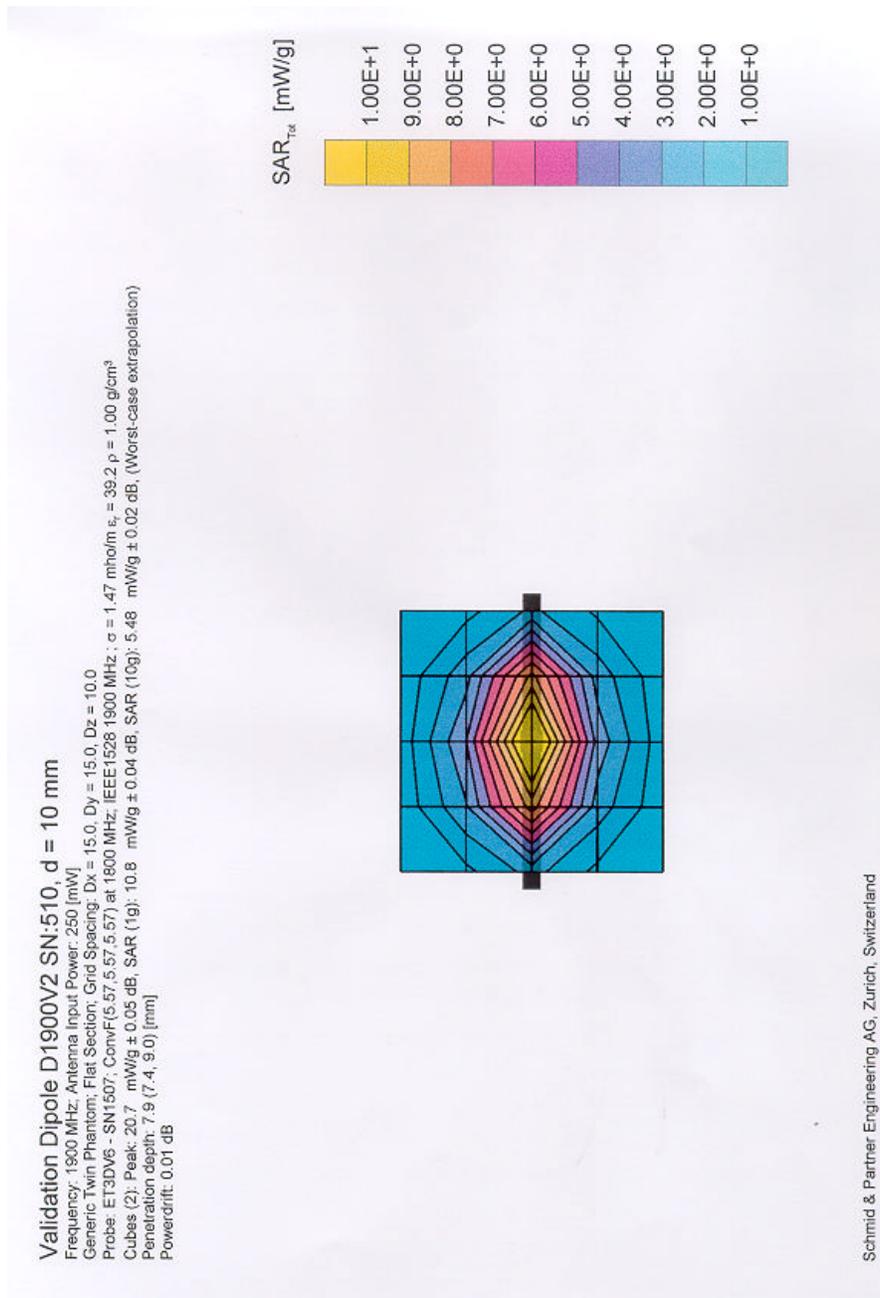
Appendix 1: SAR distribution comparison for system accuracy verification



1900 MHz SAR distribution of validation dipole antenna from system accuracy verification test. Measured with head/muscle simulating tissue on 11/30/01.

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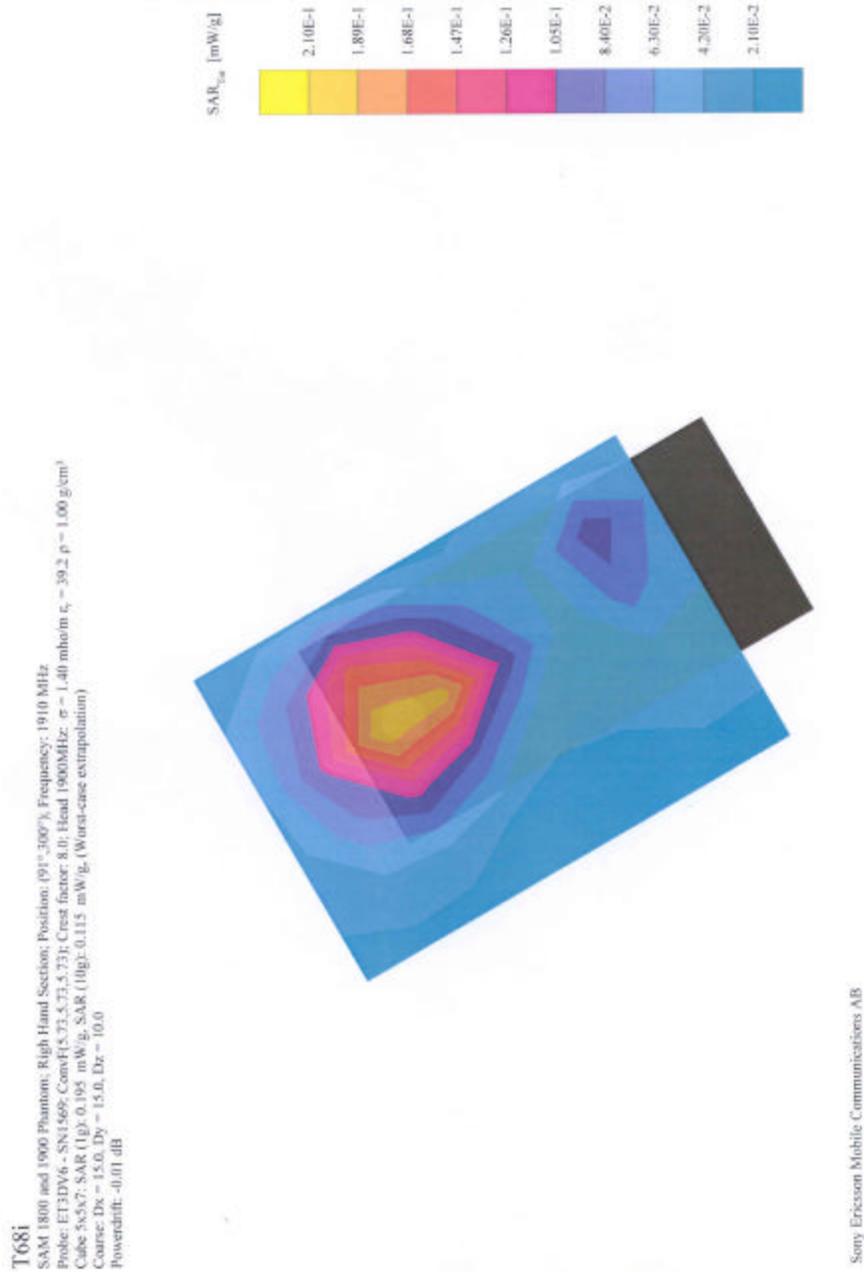


1900 MHz SAR distribution of validation dipole antenna from reference measurement.

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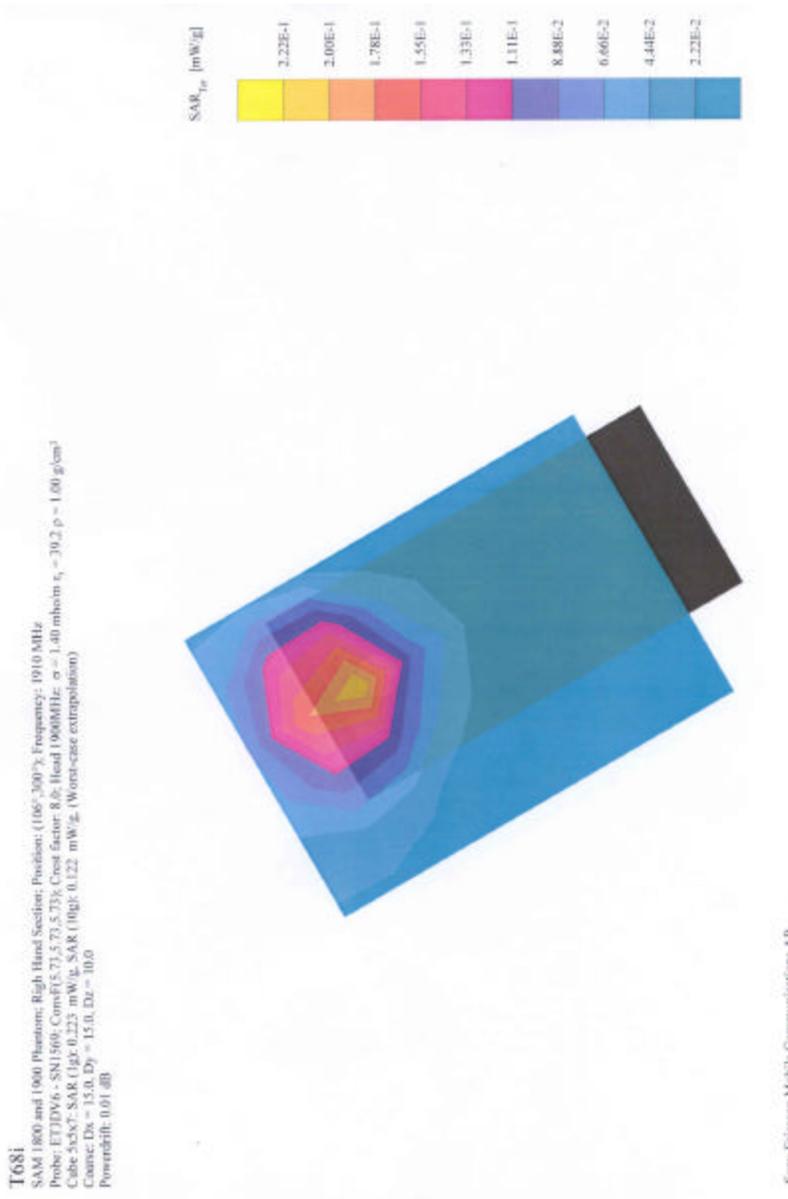
Appendix 2: SAR distribution plots



Distribution of maximum SAR in 1900 TDMA mode (at 1850 MHz). Measured against the head for cheek phone position.

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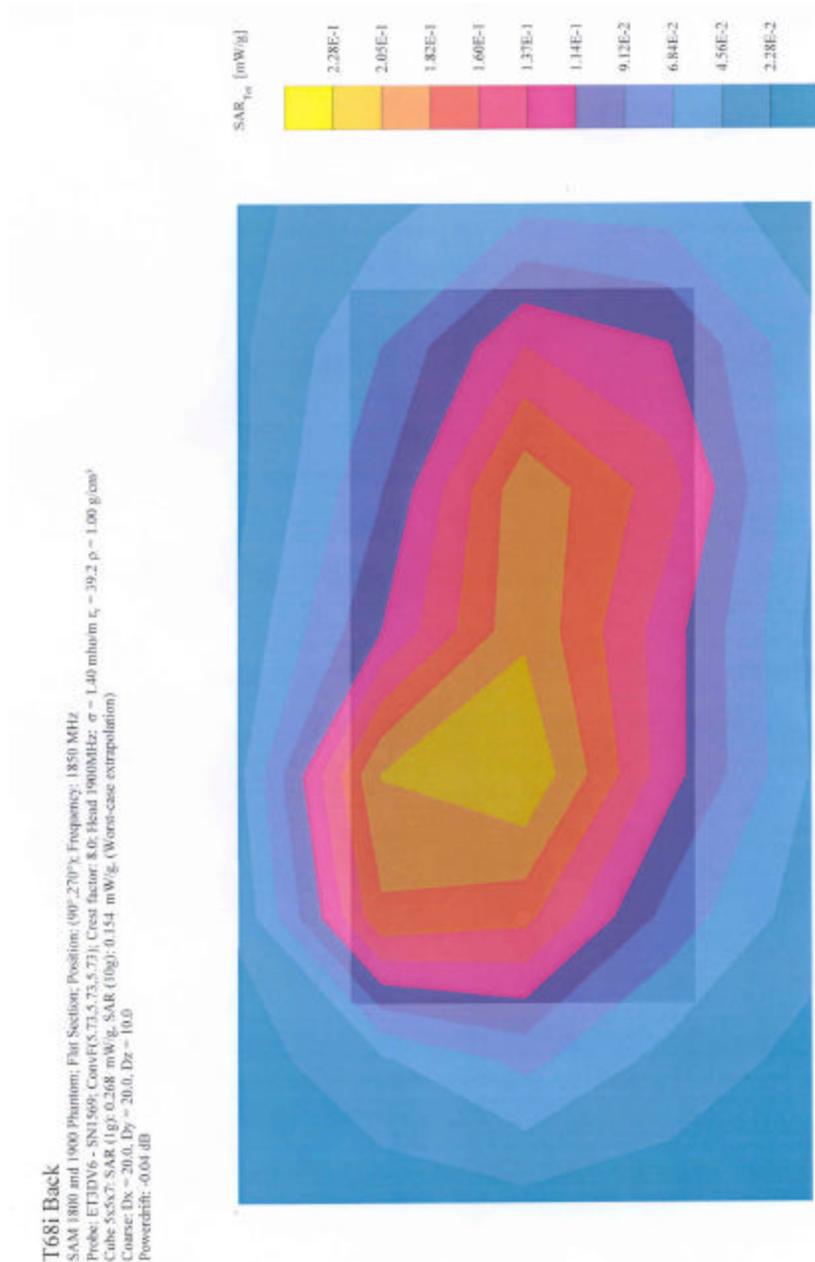
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Distribution of maximum SAR in 1900 TDMA mode (at 1850 MHz). Measured against the head for tilt phone position.

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Distribution of maximum SAR in 1910 TDMA mode. Measured against the body and back side to the phantom

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Appendix 3: Photographs of the device under test**Front view of device.**

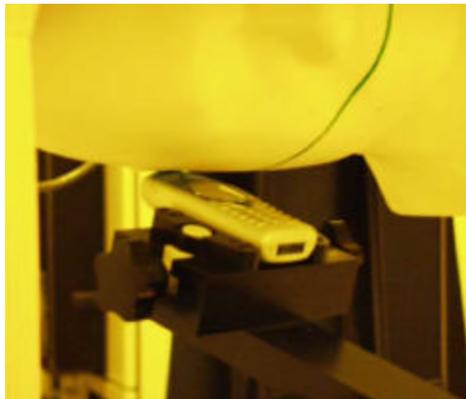
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**Side view of device.****Back view of device**

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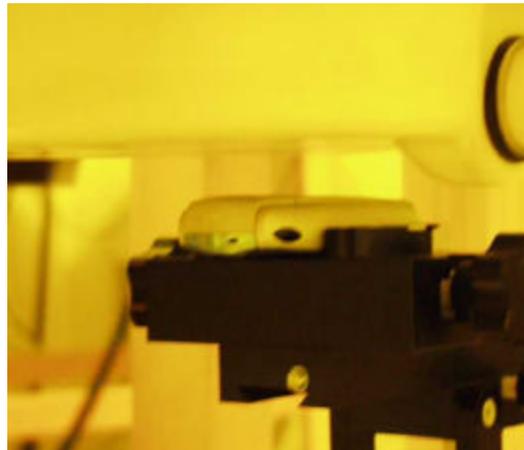
Appendix 4: Position of device on SAM Twin Phantom**Device position against the head, cheek (touch) phone position.****Device position against the head, tilt (106deg) phone position**

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Front part of the phone 15mm away from the Flat Phantom



Back part of the phone 15mm away from the Flat Phantom

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Appendix 5: Probe calibration parameters for ET3DV4 SN:1569

ET3DV6 SN:1569

DASY3 - Parameters of Probe: ET3DV6 SN:1569

Sensitivity in Free Space

NormX	1.77 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.98 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.91 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	100 mV
DCP Y	100 mV
DCP Z	100 mV

Sensitivity in Tissue Simulating Liquid

Head	450 MHz	$\epsilon_r = 43.5 \pm 5\%$	$\sigma = 0.87 \pm 10\% \text{ mho/m}$	
ConvF X	7.39	extrapolated	Boundary effect:	
ConvF Y	7.39	extrapolated	Alpha	0.29
ConvF Z	7.39	extrapolated	Depth	2.69
Head	900 MHz	$\epsilon_r = 42 \pm 5\%$	$\sigma = 0.97 \pm 10\% \text{ mho/m}$	
ConvF X	6.84	$\pm 7\% (k=2)$	Boundary effect:	
ConvF Y	6.84	$\pm 7\% (k=2)$	Alpha	0.35
ConvF Z	6.84	$\pm 7\% (k=2)$	Depth	2.50
Head	1500 MHz	$\epsilon_r = 40.4 \pm 5\%$	$\sigma = 1.23 \pm 10\% \text{ mho/m}$	
ConvF X	6.10	interpolated	Boundary effect:	
ConvF Y	6.10	interpolated	Alpha	0.43
ConvF Z	6.10	interpolated	Depth	2.26
Head	1800 MHz	$\epsilon_r = 40 \pm 5\%$	$\sigma = 1.40 \pm 10\% \text{ mho/m}$	
ConvF X	5.73	$\pm 7\% (k=2)$	Boundary effect:	
ConvF Y	5.73	$\pm 7\% (k=2)$	Alpha	0.47
ConvF Z	5.73	$\pm 7\% (k=2)$	Depth	2.14

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.7 \pm 0.2	mm