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ERA/TF (Christer Törnevik)				

SAR Test Report: Sony Ericsson P800 mobile telephone model for GSM900, GSM1800 and GSM1900

Date of test	4-10 June, 2002
Laboratory	Ericsson EMF Research Laboratory Ericsson AB Torshamnsgatan 23, SE-164 80 Stockholm, Sweden
Job No	2002-1
Customer	Kristina Gold KI/SEM/GKT/TR Sony Ericsson Mobile Communications AB Torshamnsgatan 39, Kista SE-164 80 Stockholm, Sweden

Test responsible

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Statement of Compliance

The tests reported herein show that the product model

Sony Ericsson P800 (Type Number 7130501-BV/CN)

is in compliance with the appropriate RF exposure standards, recommendations and limits.

Table of Contents

Test report summary

The table below summarises the SAR measurement results obtained for the Sony Ericsson P800 mobile phone mode. The results show that the maximum SAR values are below the 2 W/kg (10g) and 1.6 W/kg (1g) limits and thus the P800 model is in compliance with the appropriate RF exposure standards and recommendations.

Mode	***Maximum SAR_{1g} (W/kg)***	***Maximum SAR_{10g} (W/kg)***
GSM900	***0.89***	***0.64***
GSM1800	*0.76*	*0.43*
GSM1900	*0.80*	*0.46*

1 General information

The tests reported in this document have been performed in accordance with the SAR measurement standards CENELEC EN 50361 [1] and IEEE P1528 (draft) [2]. The purpose of the tests was to verify that the Sony Ericsson P800 mobile phone model is in compliance with the appropriate RF exposure standards, recommendations and limits [3-8].

2 Device Under Test

The table below summarizes the technical data for the tested device. Photographs of the device are presented in Appendix 1.

Device model	Sony Ericsson P800
Serial number of tested unit	A6101TR9HJ
Hardware revision	R2A
Mode	GSM900, GSM1800, GSM1900
Antenna	Internal
Maximum output power level[1] (dBm)	GSM900: 32.5 GSM1800: 29.5 GSM1900: 29.5
Duty cycle	1/8
Transmitter frequency range (MHz)	GSM900: 880.2-914.8 GSM1800: 1710.2-1784.8 GSM1900: 1850.2-1909.8

[1] Output power level of the phone model at the antenna port for the maximum power setting. This equals the nominal output power level plus the factory variation.

3 Test equipment

3.1 SAR test system

The SAR measurements were made using the DASY3 professional near-field scanner (software version 3.1d) by Schmid & Partner Engineering AG which was installed in September 1997. The total SAR assessment uncertainty (k=1) of the system is ±13.6% for 1g SAR assessments and 13.3% for 10g SAR assessments The corresponding extended uncertainties (k=2) are ±27.1% and ±26.6%, respectively. The equipment list is given below. In Appendix 5 calibration parameters for the SAR test probe are listed.

Description	**Asset number**	**Calibration due date**
DASY3 DAE3	S/N 422	2003-04-25
E-field probe, ET3DV6	S/N 1572	2003-04-25
Dipole validation kit, D900V2	S/N 015	2003-05-14
Dipole validation kit, D1800V2	S/N 203	2003-05-15
Dipole validation kit, D1900V2	S/N 510	2003-05-15
SAM Phantom[2]	S/N TP-1004	NA
SAM Phantom[3]	S/N TP-1204	NA

3.2 Additional equipment

Description	**Asset number**	**Calibration due date**
Signal generator, R&S SMHU58	S/N 843863/034	2004-01-02
Dielectric probe kit, HP 85070C	S/N US99360060	NA
Network analyzer, HP 8752C	S/N 3410A03732	2002-11-20
Power meter, R&S NRVS	S/N 848888/052	2003-03-26
Power sensor, R&S NRV-Z5	S/N 849895/030	2003-03-26
Digital radio tester, R&S CTS-55	S/N 827443/012	2003-01-03
Thermometer, EBRO TFX-392SKWT	S/N 10130918	2002-08-14
Thermo/Hygrometer Testo 608-H2	S/N 60013082	2003-01-25

[2] This equipment was used for the tests at 900 MHz.
[3] This equipment was used for the tests at 1800 MHz and 1900 MHz.

4 Electrical parameters of the tissue simulating liquid

The parameters of the tissue simulating liquids were measured with the dielectric probe kit prior to the SAR measurement and the results are shown in the table below. Specified standard values for the permittivity and the conductivity are also given [1][2]. The measured values are within 5% of the standard values. The mass density of the liquid entered into the DASY3 program was 1000 kg/m^3. The depth of the head tissue liquid was 15 cm.

f (MHz)	Liquid type	Measured/Specification	ε_r	σ (S/m)	Liquid Temp (°C)
900	Head tissue	Measured	42.4/41.2[4]	0.97/0.97[4]	22.4/21.6
		Specified value [1]	42.0	0.99	-
		Difference (%)	+1.0/-1.9	-2.0/-2.0	-
1800	Head tissue	Measured	38.5/38.5[4]	1.35/1.34[4]	22.9/23.0
		Specified value [1]	40.0	1.38	-
		Difference (%)	-3.8/-3.8	-2.2/-2.9	-
1900	Head tissue	Measured	38.2	1.43	23.2
		Specified value [2]	40	1.40	-
		Difference (%)	-4.5	+2.1	-

5 System performance check

Simplified system performance checks for the DASY3 were conducted before the SAR measurements with the D900V2, D1800V2 and D1900V2 validation kits and the obtained results are displayed in the table below. The results are within 10% of the reference values obtained from the manufacturer of the system [9][10][11]. An evaluation of the test facility showed that the SAR system noise met the standard requirements [12]. The temperature of the test facility during the tests was in the range 22.9°C to 24.2°C and the relative humidity was 35.8%-44.1%. Appendix 2 shows the measured SAR distributions and the reference distributions.

f (MHz)	Measured/ Reference	SAR 1g (W/kg)	SAR 10g (W/kg)	ε_r	σ (S/m)	Date
900	Measured	11.16	7.00	42.4	0.97	2002-06-04
	Reference [9]	10.90	6.92	42.4	0.97	2001-05-14
	Difference (%)	+2.4	+1.2	±0.0	±0.0	-
1800	Measured	37.3	19.5	38.5	1.35	2002-06-06
	Reference [10]	39.0	20.5	39.7	1.36	2001-05-15
	Difference (%)	-4.5	-4.7	-3.0	-0.7	-
1900	Measured	40.1	20.6	38.2	1.43	2002-06-10
	Reference [11]	43.2	21.9	39.2	1.47	2001-05-15
	Difference (%)	-7.2	-5.9	-2.6	-2.7	-

[4] The SAR measurements for the 900 MHz and 1800 MHz bands were conducted during two separate days.

6 Test Results

The tables in this section show the measured 1g and 10g averaged SAR for the device and the corresponding values normalized to 32.5 dBm maximum output power level for the GSM900 mode, 29.5 dBm for the GSM1800 mode and 29.5 dBm for the GSM1900 mode. A digital radio tester was used to control the device during the SAR measurements. The phone was supplied with a fully charged battery for the tests.

The device was tested on the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom for both flip configurations, with and without flip. In Appendix 3 pictures of the device when placed on the left-hand phantom in the cheek and tilt positions are shown.

For the GSM900, GSM1800 and GSM1900 mode, the device was tested at the lowest, middle and the highest frequencies of the transmit bands corresponding to the traffic channels 975, 37 and 124 for GSM900, channels 512, 699 and 885 for GSM1800 and channels 512, 661 and 810 for GSM1900.

6.1 Results for the GSM900 mode

Configuration	**Hand side**	**Phone position**	**f (MHz)**	**Liquid Temp (°C)**	**Measured output power (dBm)**	**Measured (W/kg)**		**Normalized to max power, 32.5 dBm (W/kg)**	
						SAR_{1g}	**SAR_{10g}**	**SAR_{1g}**	**SAR_{10g}**
Flip	Left	Cheek	880.2	21.7	32.1	0.81	0.58	**0.89**	**0.64**
			897.4	21.4	32.0	0.71	0.50	0.80	0.56
			914.8	21.7	32.1	0.70	0.50	0.77	0.55
		Tilt	897.4	21.6	32.0	0.43	0.27	0.48	0.30
	Right	Cheek	897.4	21.7	32.0	0.64	0.46	0.72	0.52
		Tilt	897.4	21.7	32.0	0.42	0.26	0.47	0.29
No flip	Left	Cheek	880.2	21.7	32.1	0.81	0.58	0.89	0.64
			897.4	21.7	32.0	0.70	0.50	0.79	0.56
			914.8	21.7	32.1	0.69	0.49	0.76	0.54
		Tilt	897.4	22.0	32.0	0.47	0.31	0.53	0.35
	Right	Cheek	897.4	22.0	32.0	0.69	0.49	0.77	0.55
		Tilt	897.4	22.0	32.0	0.49	0.33	0.55	0.37

Appendix 4 (a) shows the maximum SAR distribution for the left-hand phantom giving the maximum 1g SAR of 0.89 W/kg and the maximum 10g averaged SAR of 0.64 W/kg at 900 MHz.

6.2 Results for the GSM1800 mode

Configuration	Hand side	Phone position	f (MHz)	Liquid Temp (°C)	Measured output power (dBm)	Measured (W/kg)		Normalized to max power, 29.5 dBm (W/kg)	
						SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
Flip	Left	Cheek	1747.6	22.3	28.9	0.39	0.22	0.45	0.25
		Tilt	1747.6	22.3	28.9	0.46	0.26	0.53	0.30
	Right	Cheek	1747.6	22.4	28.9	0.44	0.27	0.51	0.31
		Tilt	1710.2	23.0	29.0	0.31	0.18	0.35	0.20
			1747.6	22.3	28.9	0.51	0.30	0.59	0.34
			1784.8	22.7	28.8	0.65	0.37	**0.76**	**0.43**
No flip	Left	Cheek	1747.6	22.4	28.9	0.36	0.21	0.41	0.24
		Tilt	1747.6	22.5	28.9	0.45	0.26	0.52	0.30
	Right	Cheek	1747.6	22.7	28.9	0.41	0.26	0.47	0.30
		Tilt	1710.2	22.4	29.0	0.31	0.18	0.35	0.20
			1747.6	22.5	28.9	0.51	0.30	0.59	0.34
			1784.8	22.3	28.8	0.64	0.37	0.75	0.43

Appendix 4 (b) shows the maximum SAR distribution for the right-hand phantom giving the maximum 1g SAR of 0.76 W/kg and the maximum 10g averaged SAR of 0.43 W/kg at 1800 MHz.

6.3 Results for the GSM1900 mode

Configuration	Hand side	Phone position	f (MHz)	Liquid Temp (°C)	Measured output power (dBm)	Measured (W/kg)		Normalized to max power, 29.5 dBm (W/kg)	
						SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
Flip	Left	Cheek	1880.0	22.9	28.8	0.41	0.23	0.48	0.27
		Tilt	1880.0	22.8	28.8	0.53	0.28	0.62	0.33
	Right	Cheek	1880.0	22.9	28.8	0.49	0.28	0.58	0.33
		Tilt	1850.2	22.8	28.9	0.70	0.40	**0.80**	**0.46**
			1880.0	22.8	28.8	0.57	0.32	0.67	0.38
			1909.8	22.7	28.8	0.47	0.26	0.55	0.31
No flip	Left	Cheek	1880.0	22.7	28.8	0.39	0.23	0.46	0.27
		Tilt	1880.0	22.7	28.8	0.49	0.27	0.58	0.32
	Right	Cheek	1880.0	22.8	28.8	0.45	0.28	0.53	0.33
		Tilt	1850.2	22.6	28.9	0.70	0.40	0.80	0.46
			1880.0	22.7	28.8	0.55	0.31	0.65	0.36
			1909.8	22.5	28.8	0.46	0.26	0.54	0.31

Appendix 4 (c) shows the maximum SAR distribution for the right-hand phantom giving the maximum 1g SAR of 0.80 W/kg and the maximum 10g averaged SAR of 0.46 W/kg at 1900 MHz.

6.4 Maximum SAR values

The table below summarises the obtained maximum 1g and 10g averaged SAR values for the device.

Mode	**Configuration**	**Test position**	**f (MHz)**	**Maximum SAR_{1g} (W/kg)**	**Maximum SAR_{10g} (W/kg)**
GSM900	Flip	Left side, cheek	880.2	**0.89**	**0.64**
GSM1800	Flip	Right side, tilt	1784.8	0.76	0.43
GSM1900	Flip	Right side, tilt	1850.2	0.80	0.46

7 Conclusion

The results above show that the maximum SAR for the Sony Ericsson P800 mobile phone is below the 2 W/kg (10g) and 1.6 W/kg (1g) limits. Consequently, the P800 model is in compliance with the appropriate RF exposure standards and recommendations.

8 References

[1] CENELEC, European Standard EN 50361, “Basic Standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz – 3 GHz)”, European Committee for Electrotechnical Standardization (CENELEC), July 2001.

[2] IEEE, P1528-2001 (draft), “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”, The Institute for Electrical and Electronics Engineers (IEEE) Inc., Standards Coordinating Committee 34, August 20, 2001.

[3] CENELEC, European Standard EN 50360, “Product standard to demonstrate the compliance of mobile telephones with basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz), European Committee for Electrotechnical Standardization (CENELEC), July 2001.

[4] European Council Recommendation 1999/519/EC.

[5] FCC, "Evaluating Compliance with FCC Guidelines from Human Exposure To Radiofrequency Electromagnetic Fields", Supplement C Edition 01-01 to OET Bulletin 65 Edition 97-01, June 2001.

[6] ANSI/IEEE C95.1-1992, “Safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz”, The Institute of Electrical and Electronics Engineers (IEEE)Inc., New York, 1991.

[7] ACA; Radiocommunications (Electromagnetic Radiation Human Exposure) Standard 1999, Australian Communications Authority (ACA), May 1999.

[8] AS/NZS 2772.1(Int):1998, Interim Australian/New Zealand Standard, “Radiofrequency fields, Part 1: Maximum exposure levels – 3 kHz to 300 GHz”, Standards Australia/Standards New Zealand, December 1998

[9] Schmid & Partner Engineering AG, "DASY3 Dipole Validation Kit, Type: D900V2 Serial: 015”, 2002-05-14.

[10] Schmid & Partner Engineering AG, "DASY3 Dipole Validation Kit, Type: D1800V2 Serial: 203”, 2002-05-15.

[11] Schmid & Partner Engineering AG, "DASY3 Dipole Validation Kit, Type: D1900V2 Serial: 510”, 2002-05-15.

[12] Martin Siegbahn, “Measurements of SAR system noise in the Ericsson EMF Research Laboratory”, Ericsson report ERA/T/F-01:137, Rev. A, December 13, 2001.

APPENDIX 1: Photographs of the DUT

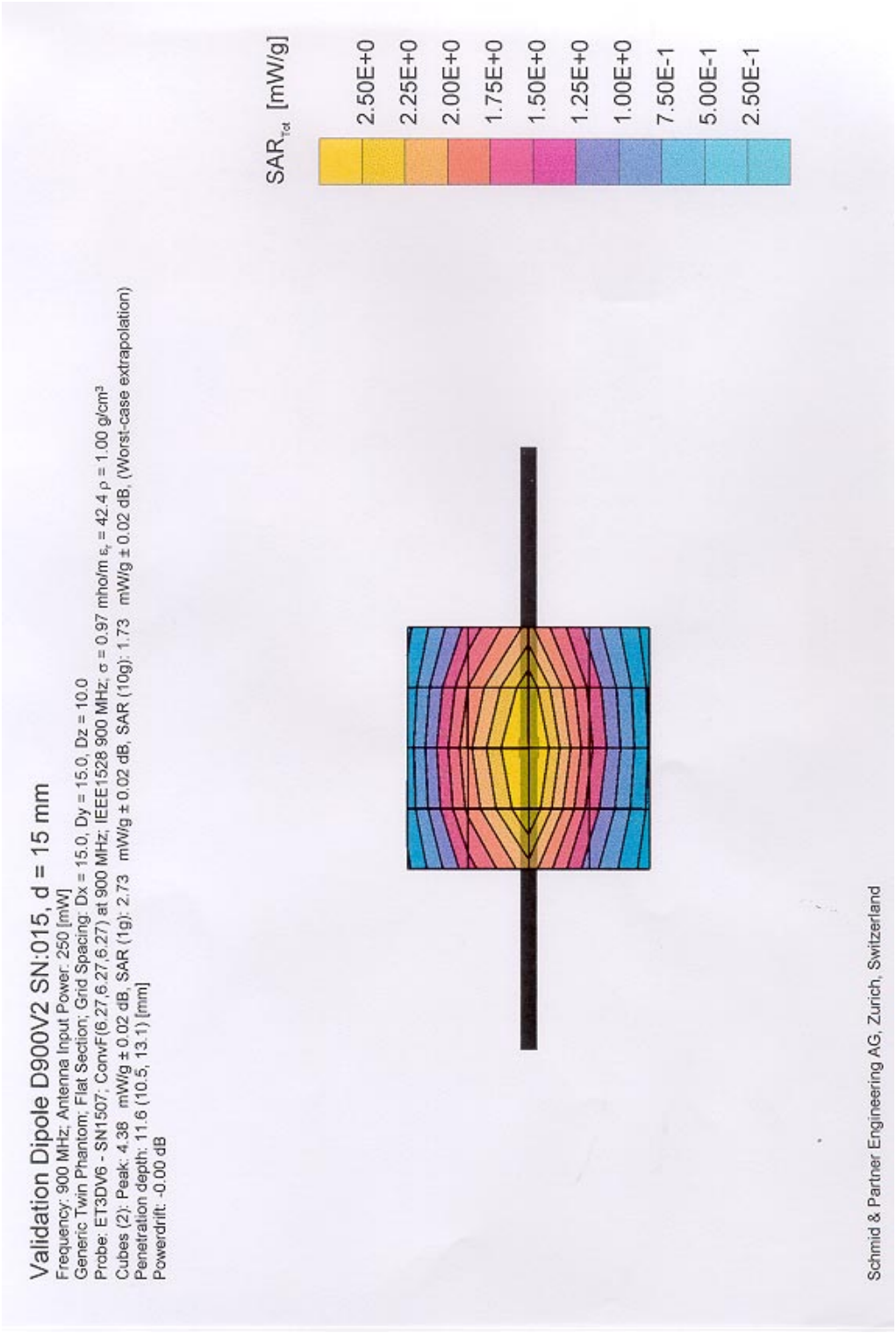
(a) **(b)**

Front view of the Sony Ericsson P800 mobile phone with flip (a) and without flip (b).

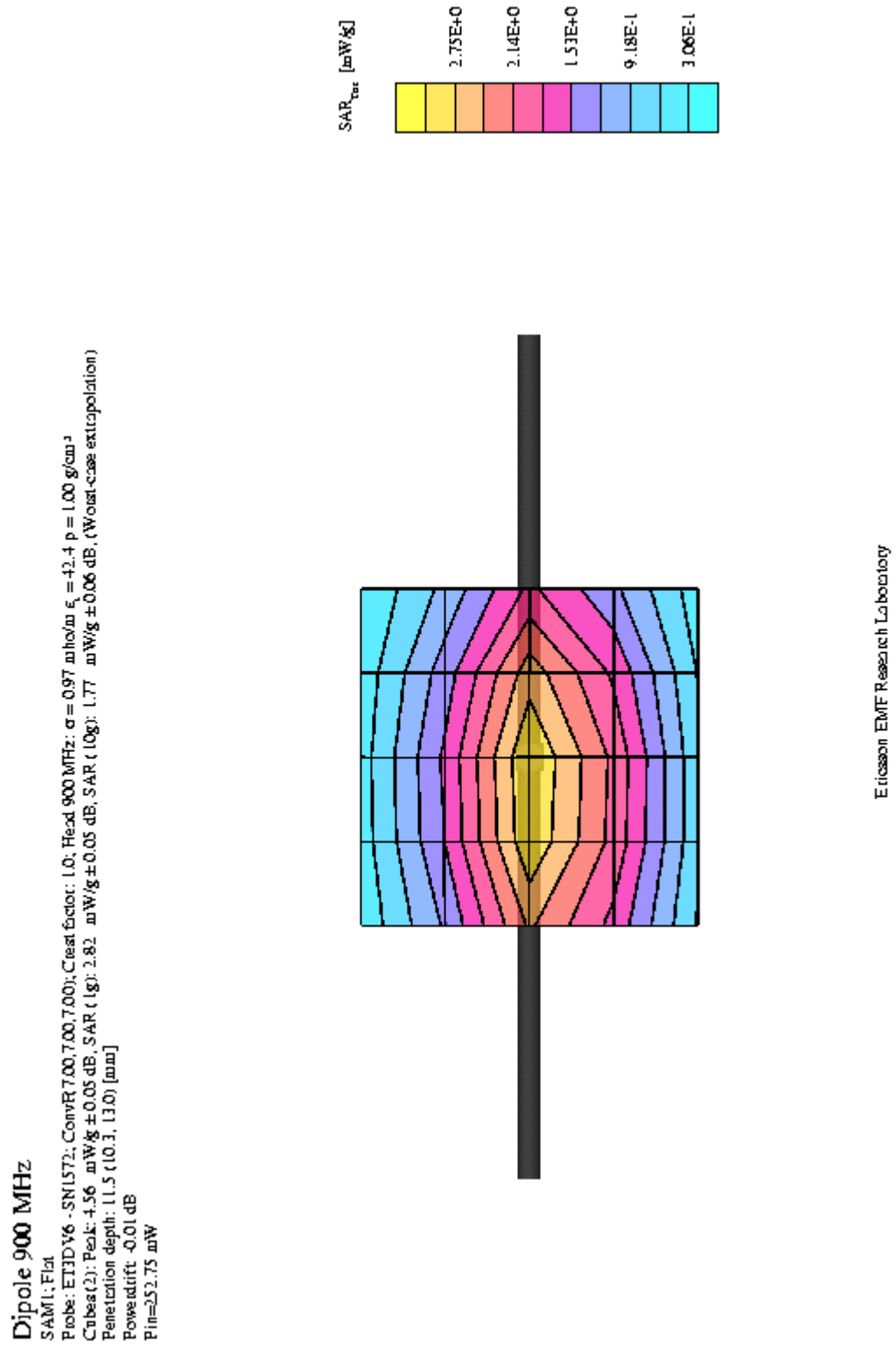
(a) **(b)**

Side view of the Sony Ericsson P800 mobile phone with flip (a) and without flip (b).

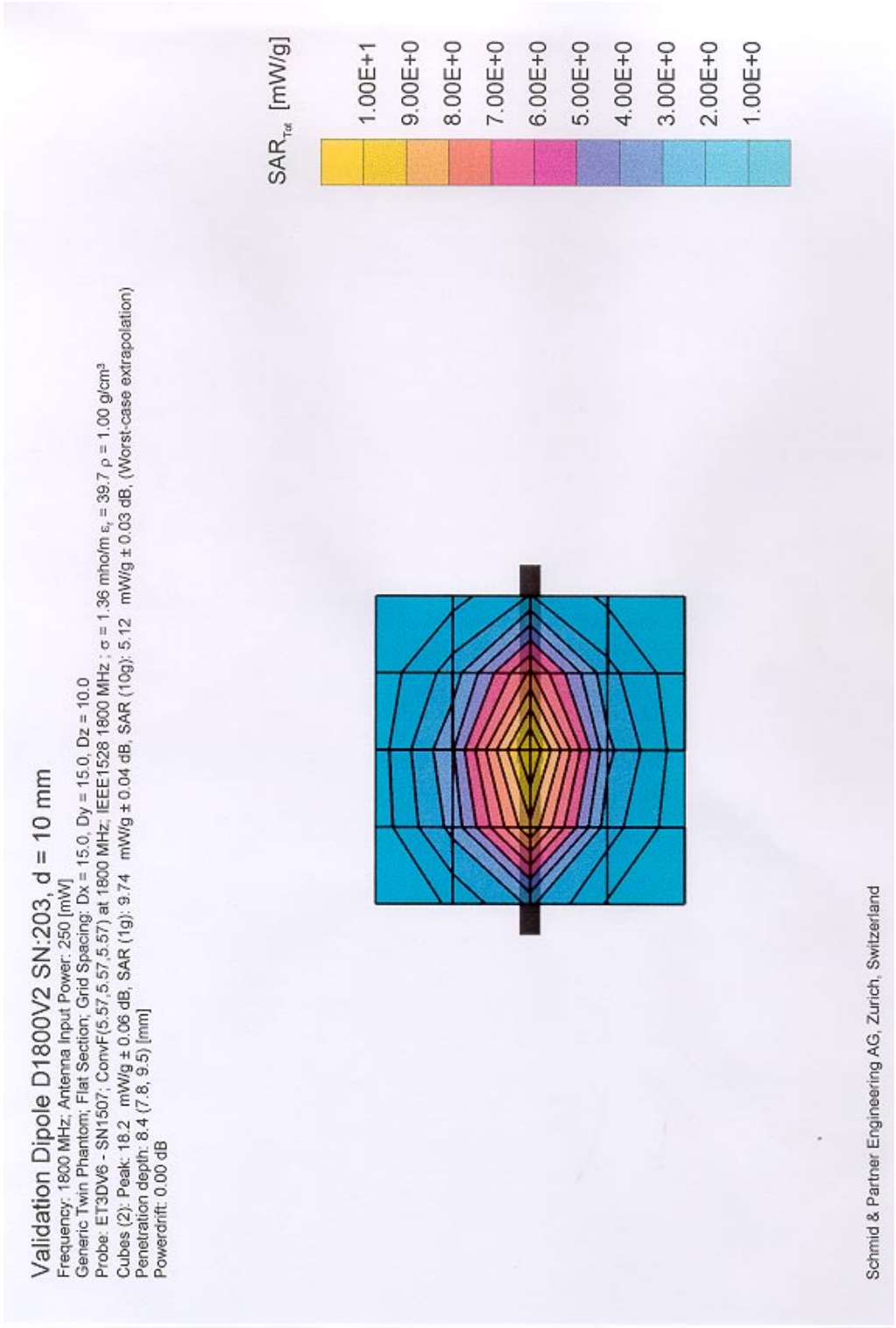
APPENDIX 2: SAR distribution comparisons for system performance check



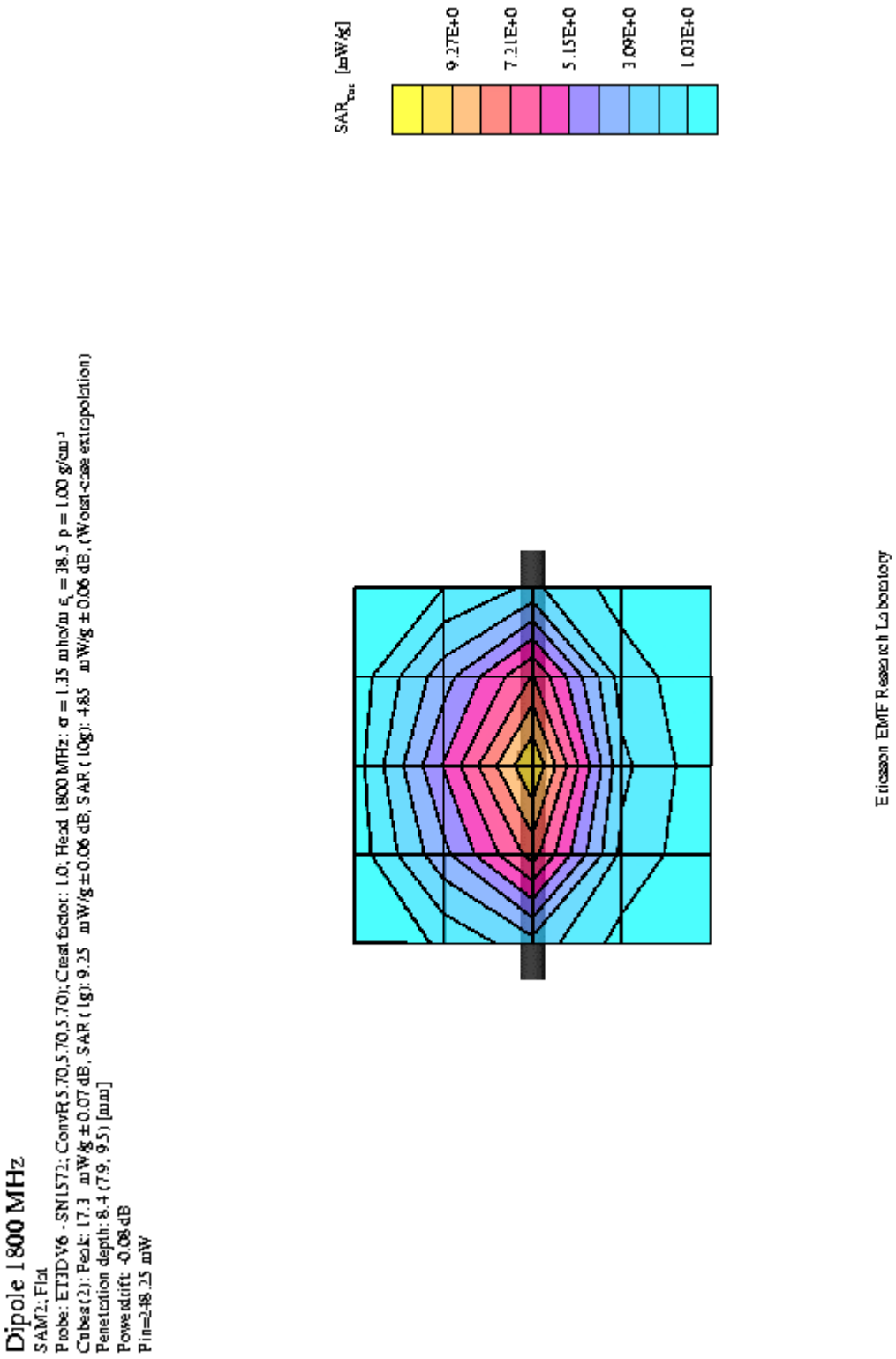
(a) SAR distribution plots for the 900 MHz validation dipole antenna (S/N 015). The plot shows the reference data obtained from the DASY3 manufacturer.



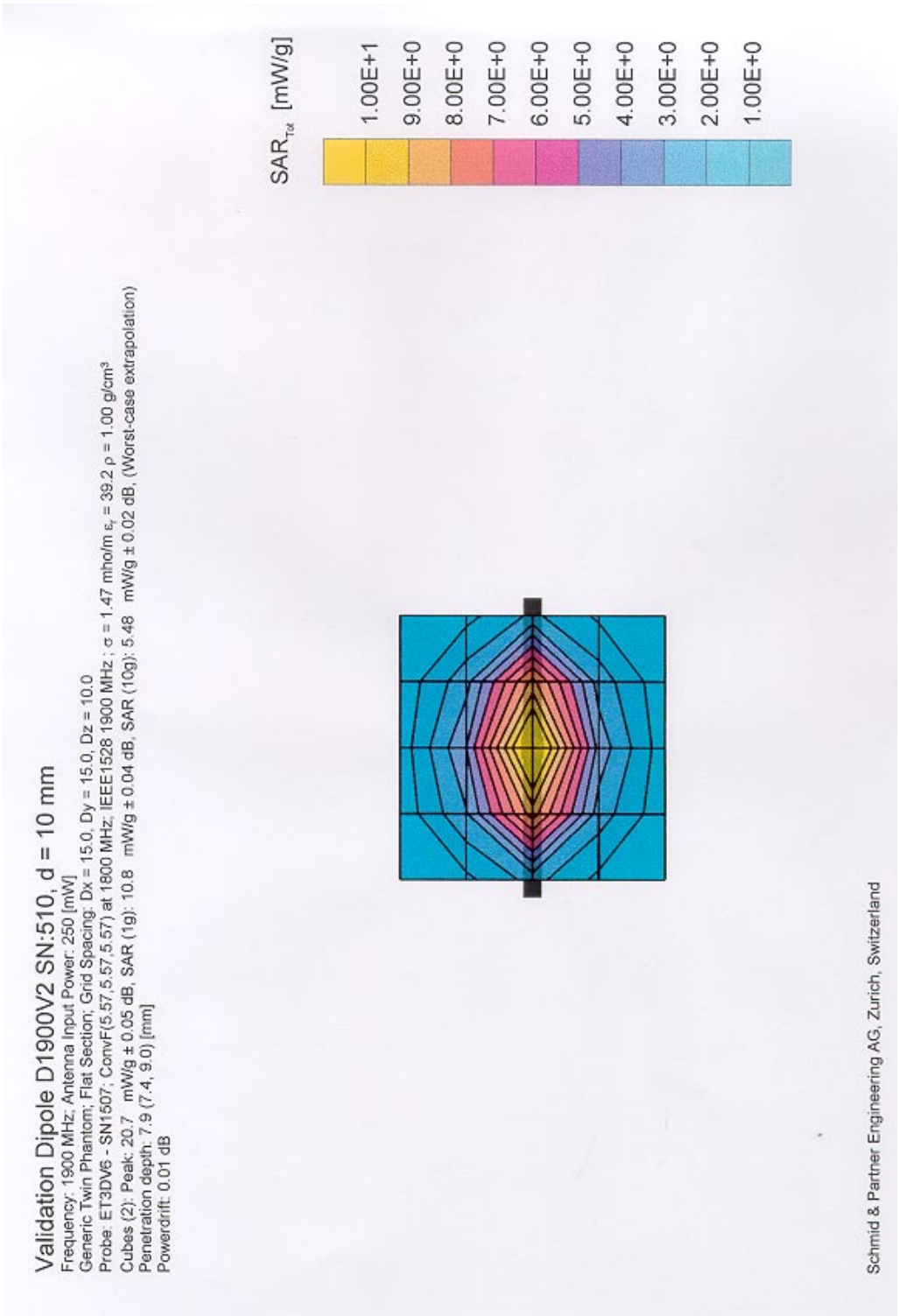
(b) SAR distribution plots for the 900 MHz validation dipole antenna (S/N 015). The plot shows the measurement data obtained prior to the SAR testing.



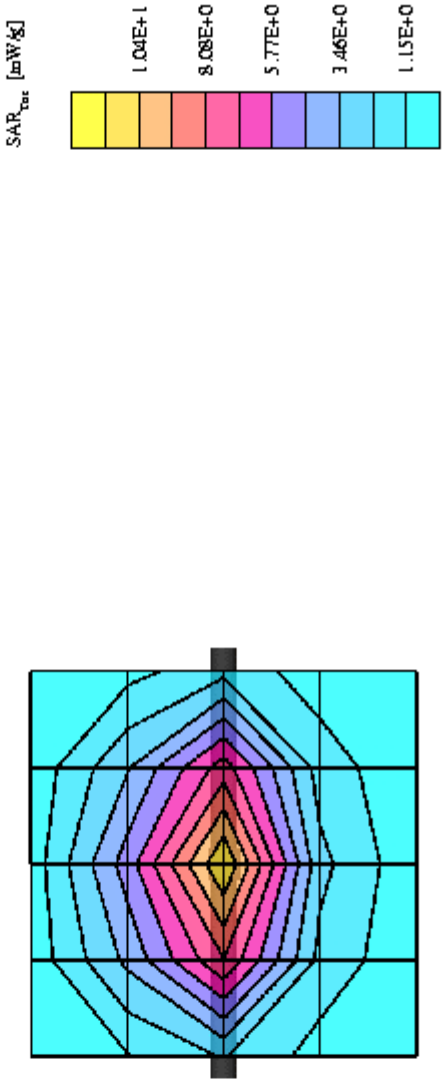
(c) SAR distribution plots for the 1800 MHz validation dipole antenna (S/N 203). The plot shows the reference data obtained from the DASY3 manufacturer.



(d) SAR distribution plots for the 1800 MHz validation dipole antenna (S/N 203). The plot shows the measurement data obtained prior to the SAR testing.



(e) SAR distribution plots for the 1900 MHz validation dipole antenna (S/N 510). The plot shows the reference data obtained from the DASY3 manufacturer.



(f) SAR distribution plots for the 1900 MHz validation dipole antenna (S/N 510). The plot shows the measurement data obtained prior to the SAR testing.

APPENDIX 3: Photographs of the DUT when positioned for SAR measurements

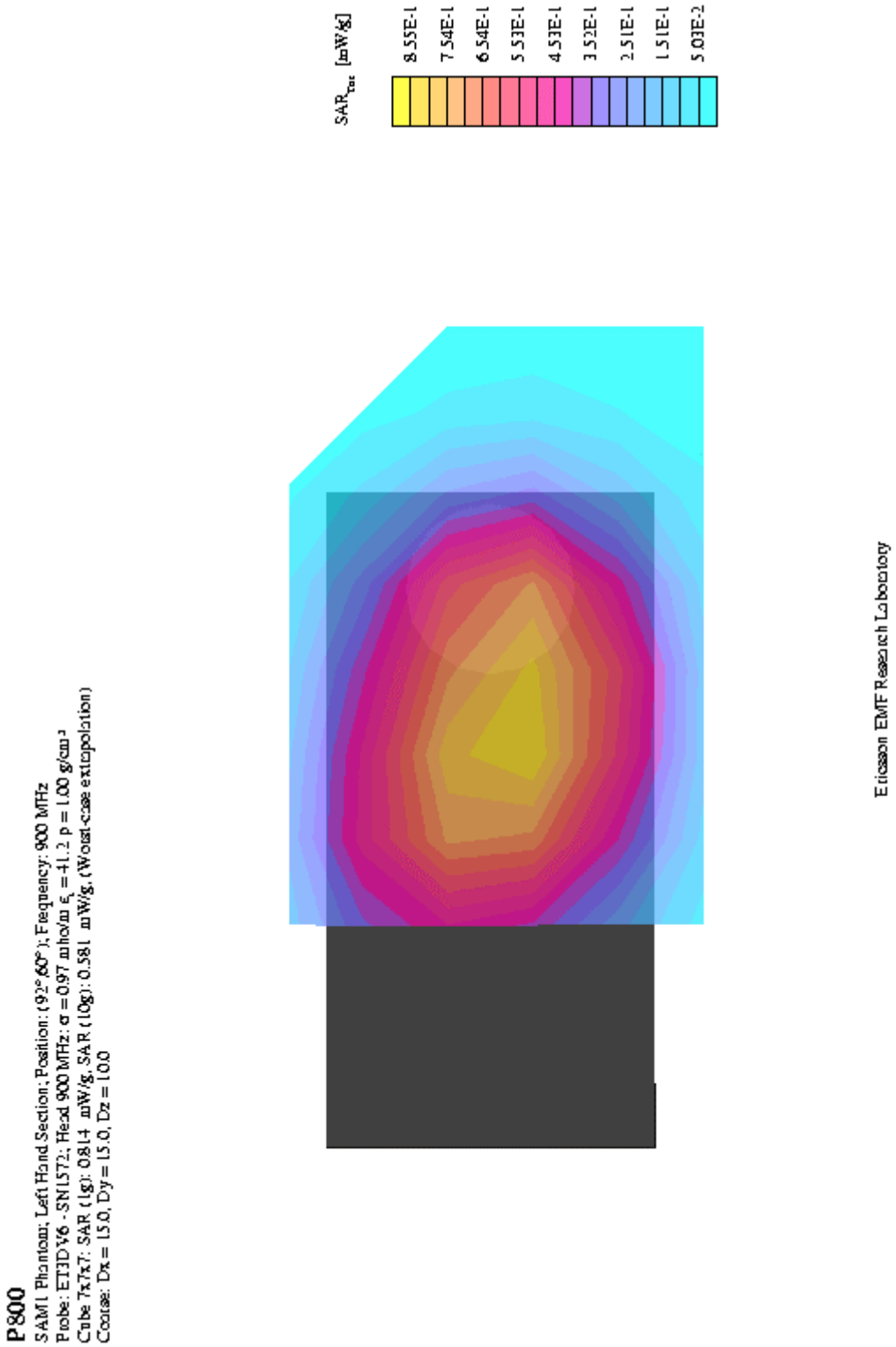
The P800 with flip on head phantom in the cheek position.

The P800 with flip on head phantom in the tilt position.

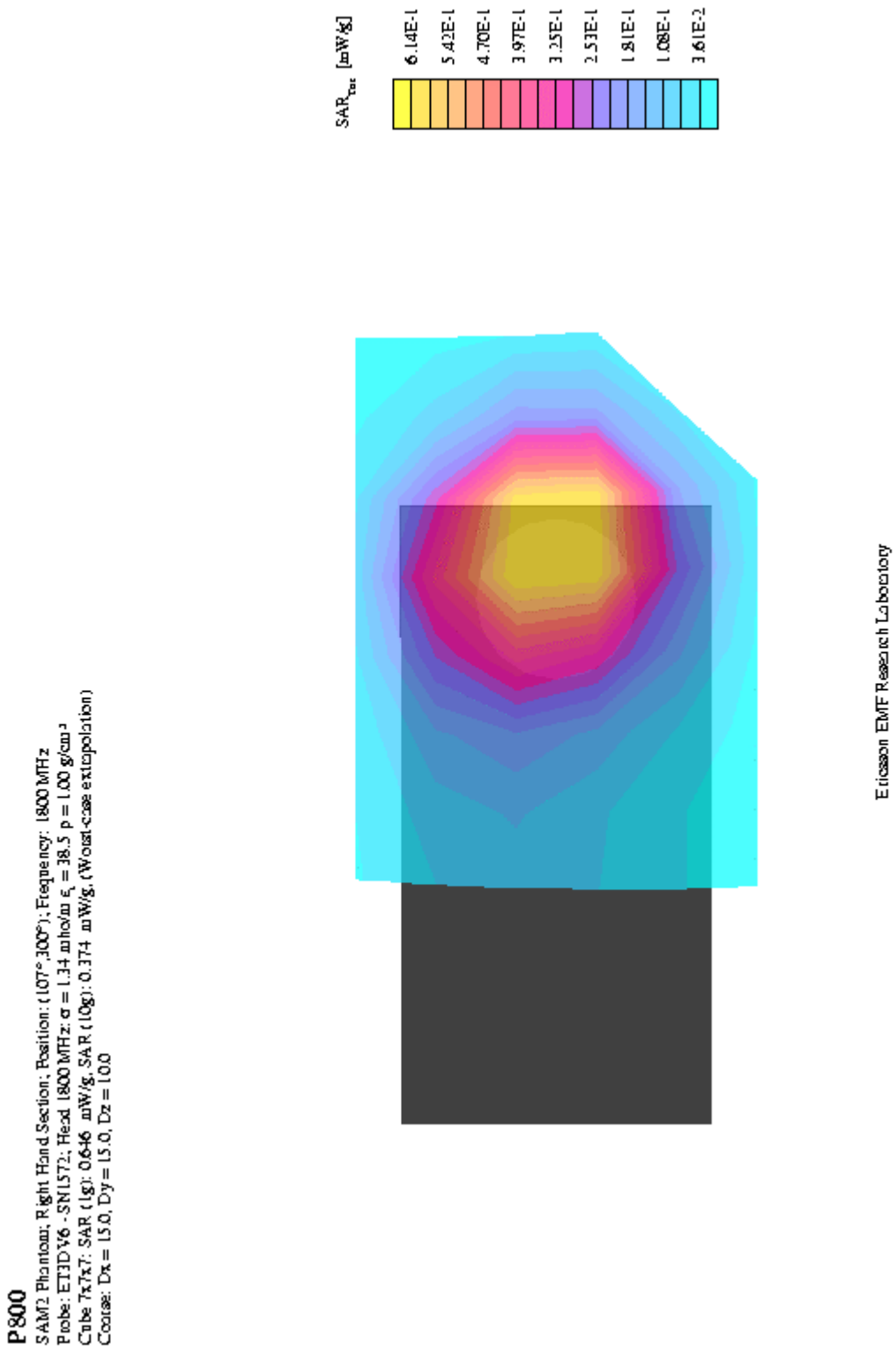
The P800 without flip on head phantom in the cheek position.

The P800 without flip on head phantom in the tilt position.

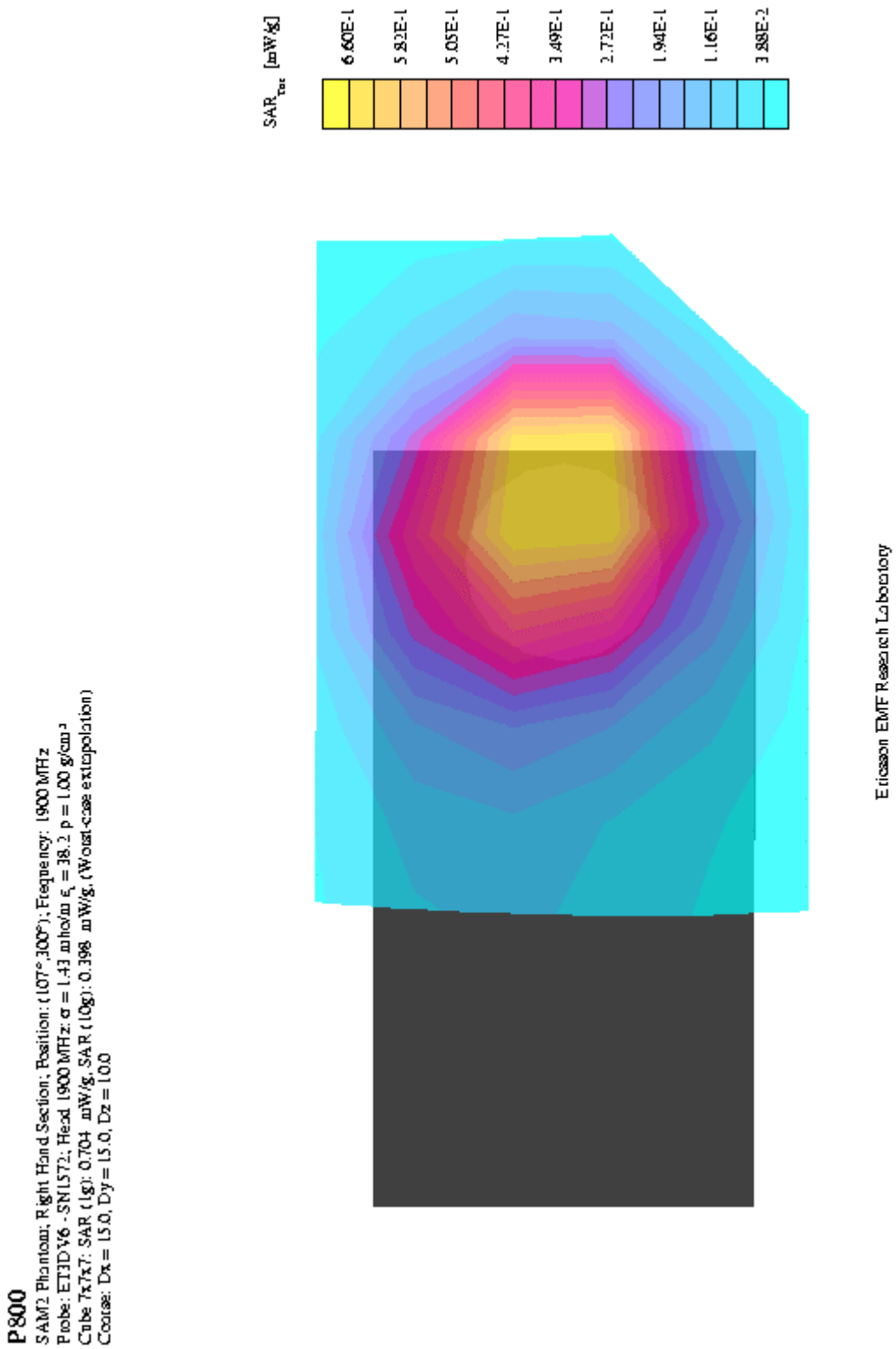
APPENDIX 4: SAR distribution plots



(a) Distribution of maximum SAR in GSM900 mode giving the maximum 1g and 10g averaged SAR. Measured against the left hand side phantom for the cheek phone position.



(b) Distribution of maximum SAR in GSM1800 mode giving the maximum 1g and 10g averaged SAR. Measured against the right hand side phantom for the tilt phone position.



(c) Distribution of maximum SAR in GSM1900 mode giving the maximum 1g and 10g averaged SAR. Measured against the right hand side phantom for the tilt phone position.

APPENDIX 5: Probe calibration parameters for ET3DV6 SN:1572

Sensitivity in Free Space | Diode Compression

Norm X	**1.92** μV/(V/m)^2	DCP X	**96**	mV
Norm Y	**1.80** μV/(V/m)^2	DCP Y	**96**	mV
Norm Z	**1.98** μV/(V/m)^2	DCP Z	**96**	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz ε_r=41.5 ± 5% σ=0.97± 5% mho/m

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

ConvF X	**7.0** ± 9.5 % (k=2)	Boundary effect	
ConvF Y	**7.0** ± 9.5 % (k=2)	Alpha	**0.85**
ConvF Z	**7.0** ± 9.5 % (k=2)	Depth	**1.42**

Head 1800 MHz ε_r=40.0 ± 5% σ=1.40± 5% mho/m

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

ConvF X	**5.7** ± 9.5 % (k=2)	Boundary effect	
ConvF Y	**5.7** ± 9.5 % (k=2)	Alpha	**0.42**
ConvF Z	**5.7** ± 9.5 % (k=2)	Depth	**2.52**

Boundary Effect

Head 900 MHz Typical SAR gradient: 5% per mm

Probe Tip to Boundary	**1 mm**	**2 mm**
SAR_{be} [%] Without Correction Algorithm	6.7	3.3
SAR_{be} [%] With Correction Algorithm	0.0	0.0

Head 1800 MHz Typical SAR gradient: 10% per mm

Probe Tip to Boundary	**1 mm**	**2 mm**
SAR_{be} [%] Without Correction Algorithm	10.4	7.1
SAR_{be} [%] With Correction Algorithm	0.2	0.2

Sensor Offset

Probe Tip to Sensor Center:	**2.7**	mm
Optical Surface Detection:	**1.1 ± 0.2**	mm

APPENDIX 6. Accreditation information

SWEDAC

Styrelsen för ackreditering och teknisk kontroll
Swedish Board for Accreditation and Conformity Assessment

ACKREDITERINGSBEVIS

ACCREDITATION CERTIFICATE

Ericsson Radio Systems AB

Ericsson EMF Research Laboratory

har genom beslut den
following the decision on

27 april 2001

ackrediterats som
is accredited as

provningslaboratorium
testing laboratory

och därvid erhållit registreringsnummer
and has been assigned registration number

1761

Styrelsen för ackreditering och teknisk kontroll
Swedish Board for Accreditation and Conformity Assessment

Lars Ettarp
Generaldirektör
Director General

Ackrediterat organ har rätt att använda nedanstående märke.
An accredited body is entitled to use the following logotype.

SWEDAC ACKREDITERING

Ackrediteringens omfattning och villkor framgår av ackrediteringsbeslutet.
The scope and conditions of accreditation are specified in the accreditation decision.