Uppgjord - *Prepared*	Tfn - *Telephone*	Datum - *Date*	Rev	Dokumentnr - *Document no*
ERA/T/UD Martin Siegbahn	70811	2000-08-25	B	T/U 00:290
Godkänd - *Approved*	Kontr. - *Checked*	Ert datum - *Your date*		Tillhör referens - *File/reference*
ERA/T/UF Christer Törnevik				

SAR Test Report: R380 world

Date of test: August 9-10, 2000

Laboratory: Ericsson Corporate EMF Research Laboratory,
ERICSSON RADIO SYSTEMS AB
Stockholm, Sweden
(Accredited to IS09001)

Test responsible: Martin Siegbahn, M.Sc
martin.siegbahn@era-t.ericsson.se
Tel: +46 8 757 0811

Statement of Compliance

Telefonaktiebolaget LM Ericsson, declares under its sole responsibility that the product

R380 world (KRD 103 16)

to which this declaration relates, is in conformity with the following 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)

Table of Contents

1 General information

In this test report, compliance of the Ericsson R380 world portable telephone with RF safety guidelines is demonstrated (applicable RF safety guidelines are given in [1]). The device was tested in accordance with the latest available test guidelines [1]. Detailed procedures of the tests are described in the *Ericsson SAR measurement specification* [2].

2 Device Under Test

Photographs of the device under test are presented in Appendix 1.

2.1 Antenna description

Type	Meander dual band	
Location	Back and left side	
Dimensions (mm)	Length	30
	Width at base	15
Configuration	Stub	

2.2 Device description

Device model	**R380 world**
Serial number	A6100P0SWA
Mode	PCS 1900
Multiple access scheme	TDMA
Maximum output power setting[1]	30.0 dBm
Factory tolerance in power setting	+0.5dB/-1.5dB
Maximum peak output power[2]	30.5 dBm
Duty cycle	1/8
Transmitter frequency range	1850-1910 MHz
Prototype or production unit	Prototype

[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 plus the factory tolerance.

3 Test equipment

3.1 Dosimetric system

The SAR measurements were made using the DASY3 professional near-field scanner (software version 3.1c) by Schmid&Partner Engineering AG which was installed in September 1997. The total SAR assessment uncertainty (K=1) of the system is ±16% and includes a +15% offset (overestimation). The extended uncertainty (K=2) is ± 32% with a +15% offset. This results in a total uncertainty range of -1% to +31% for K=1, or -17% to +47% for K=2. The equipment list is given below.

Description	**Asset number**	**Due date**
DASY3 DAE3	S/N 304	2000 09
E-field probe ET3DV6	S/N 1394	2000 10
Dipole validation kit D1900V2	S/N 510	2001 10

3.2 Additional equipment

Description	Asset number	Due date
Signal generator, R&S SMHU58	S/N 843863/034	2000 11
Dielectric probe kit HP85070C	S/N US99360060	2001 03
Network analyzer HP8752C	S/N 3410A03732	2000 11
Power meter R&S NRVS	S/N 848888/052	2001 03
Power sensor R&S NRV-Z32	S/N 825600/030	2001 02
Digital radio tester R&S CTS-55	S/N 827443012	2000 11

4 Electrical parameters of the tissue simulating liquid

The parameters of the tissue simulating liquid were measured with the dielectric probe kit prior to the SAR measurement and the results 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. The depth of the head tissue liquid was 12 cm.

f (MHz)	Liquid type	Measured/Reference	σ (S/m)	ε_r	ρ (kg/m^3)
1900	Head tissue	Measured	1.45	41.0	1.00
		Recommended limits [3]	1.20	43.4	1.03
		Difference	**+21%**	**-5.5%**	**-2.9%**

5 System accuracy verification

A system performance verification for the DASY3 was conducted before the SAR measurements with the D1900V2 validation kit and the obtained results are displayed in the table below. The results are within 5% from the reference values obtained from the manufacturer of the system [4]. The temperature of the test facility during the tests was 22±1°C. Appendix 2 shows the measured SAR distribution and the reference distribution for this antenna.

f (MHz)	Measured/ Reference	SAR 1g (W/kg)	σ (S/m)	ε_r	ρ (kg/m^3)	Date
1900	Measured	38.8	1.45	41.0	1.00	08/09/00
	Reference	37.1[1]	1.40	40.0	1.00	10/24/99
	Difference	**+4.6%**	**+3.6%**	**+2.5%**	-	

[1.] The listed reference value is based on an analysis performed at the laboratory, according to a procedure by the manufacturer [5], for compensating the original reference data since that data uses other dielectric parameters than those listed in the table.

6 Test Results

Table 1 below shows the measured 1g averaged SAR for the device and the corresponding values normalized to 30.5 dBm output power level. 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.

SAR measured against the head phantom 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 Appendix 3 a picture of the device when positioned on the right-hand phantom is shown. For the PCS 1900 mode, the device was tested at the lowest, middle and the highest frequencies of the transmit band corresponding to the traffic channels 512, 661 and 810. The maximum 1g averaged SAR for the tested device was obtained for the right hand side at the lowest frequency. Appendix 4 shows the maximum SAR distributions for the right hand phantoms.

Mode	**Chamber temp. (°C)**	**f (MHz)**	**Output power (dBm)**	**SAR 1g (W/kg)**			
				Left-hand		**Right-hand**	
				Measured	**Normalized to max power**	**Measured**	**Normalized to max power**
PCS 1900	22	1850	29.45	0.38	0.48	0.46	**0.58**
	22	1880	29.51	0.35	0.44	0.43	0.54
	22	1910	29.28	0.29	0.39	0.39	0.51

Table 1 SAR measurement results for the R380 world telephone at highest possible output power. Measured against the head phantom with head tissue liquid.

7 References

[1] C. Törnevik, "Ericsson SAR Measurement Specification, part 1: Introduction and Purpose", Ericsson Internal Document ERA/T/U-98:446, March 2000.

[2] C. Törnevik, M. Siegbahn, T. Persson, M. Douglas and R. Plicanic, "Ericsson SAR Measurement Specification", Ericsson Internal Document, August 2000.

[3] Federal Communications Commission, "Tissue Dielectric Properties", http://www.fcc.gov/fcc-bin/dielec.sh.

[4] Schmid & Partner Engineering AG, "DASY Dipole Validation Kit", Type: D1900V2, S/N: 510, October 1999.

[5] Schmid & Partner Engineering AG, "Application Notes: SAR Sensitivities", 1998.

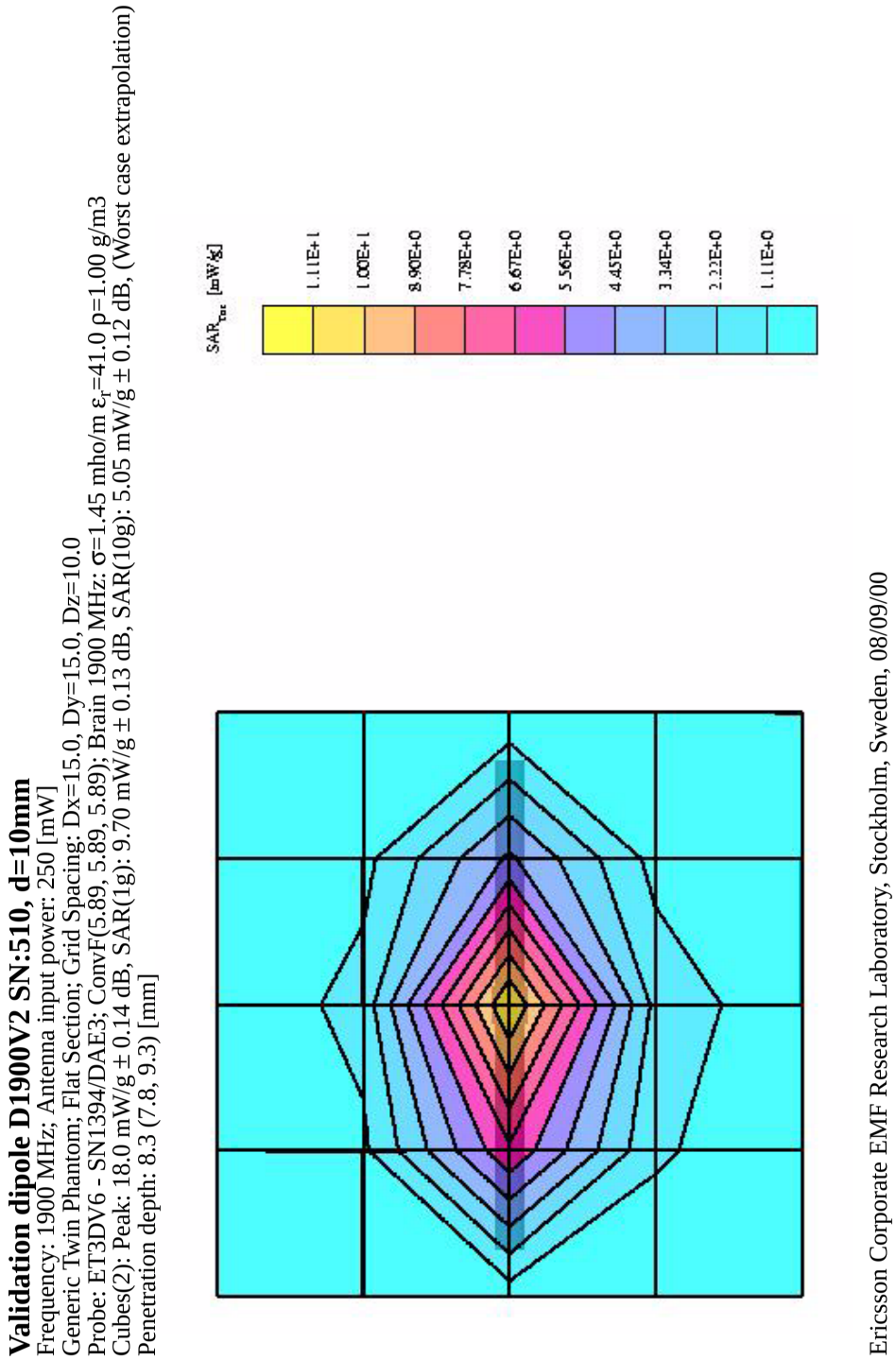
APPENDIX 1: Photographs of the DUT.

Front view of R380 world

Side view of R380 world

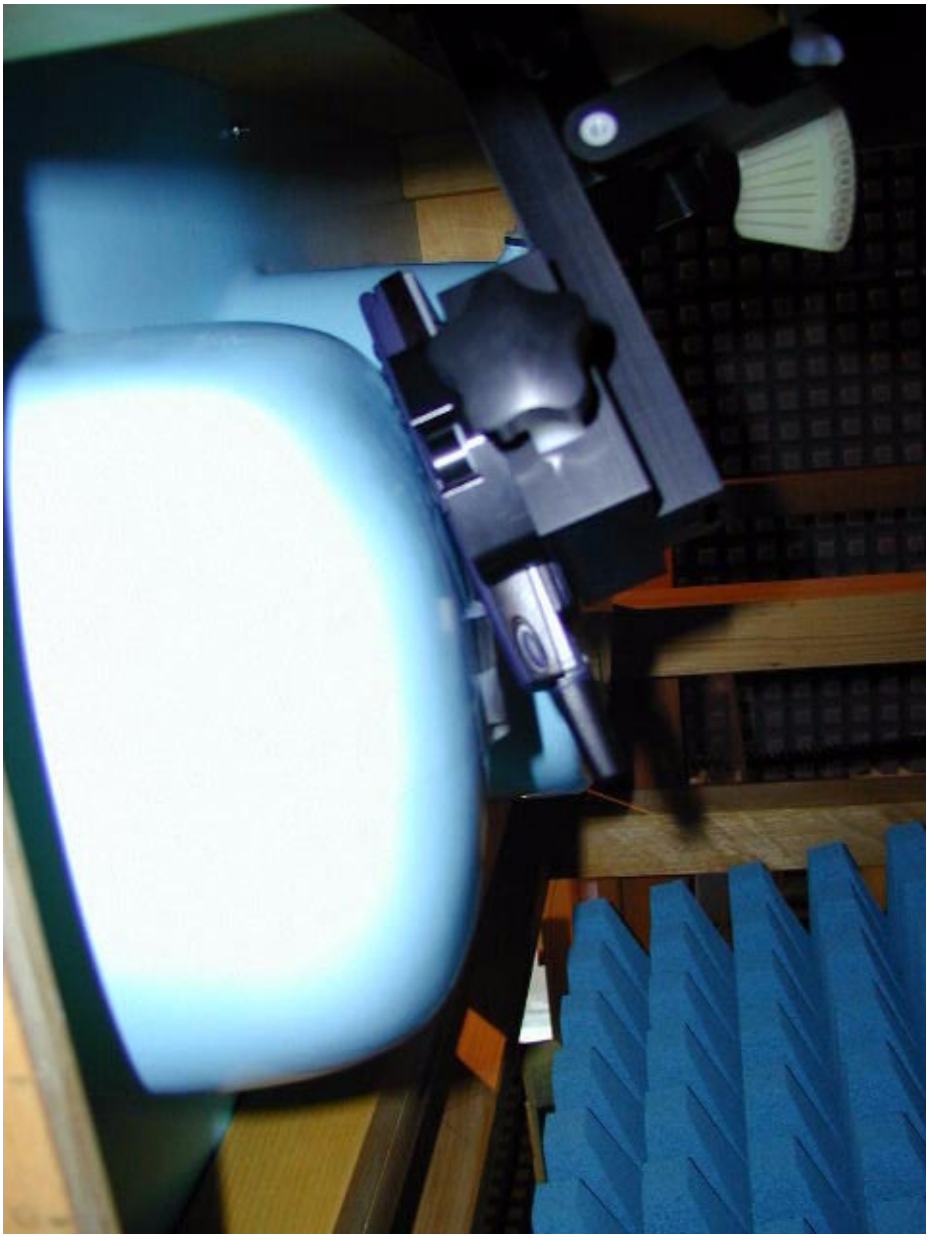
APPENDIX 2: SAR distribution comparison for system accuracy verification

(a) SAR distribution plots for the 1900 MHz validation dipole antenna. The plot shows the reference data obtained from the DASY3 manufacturer.



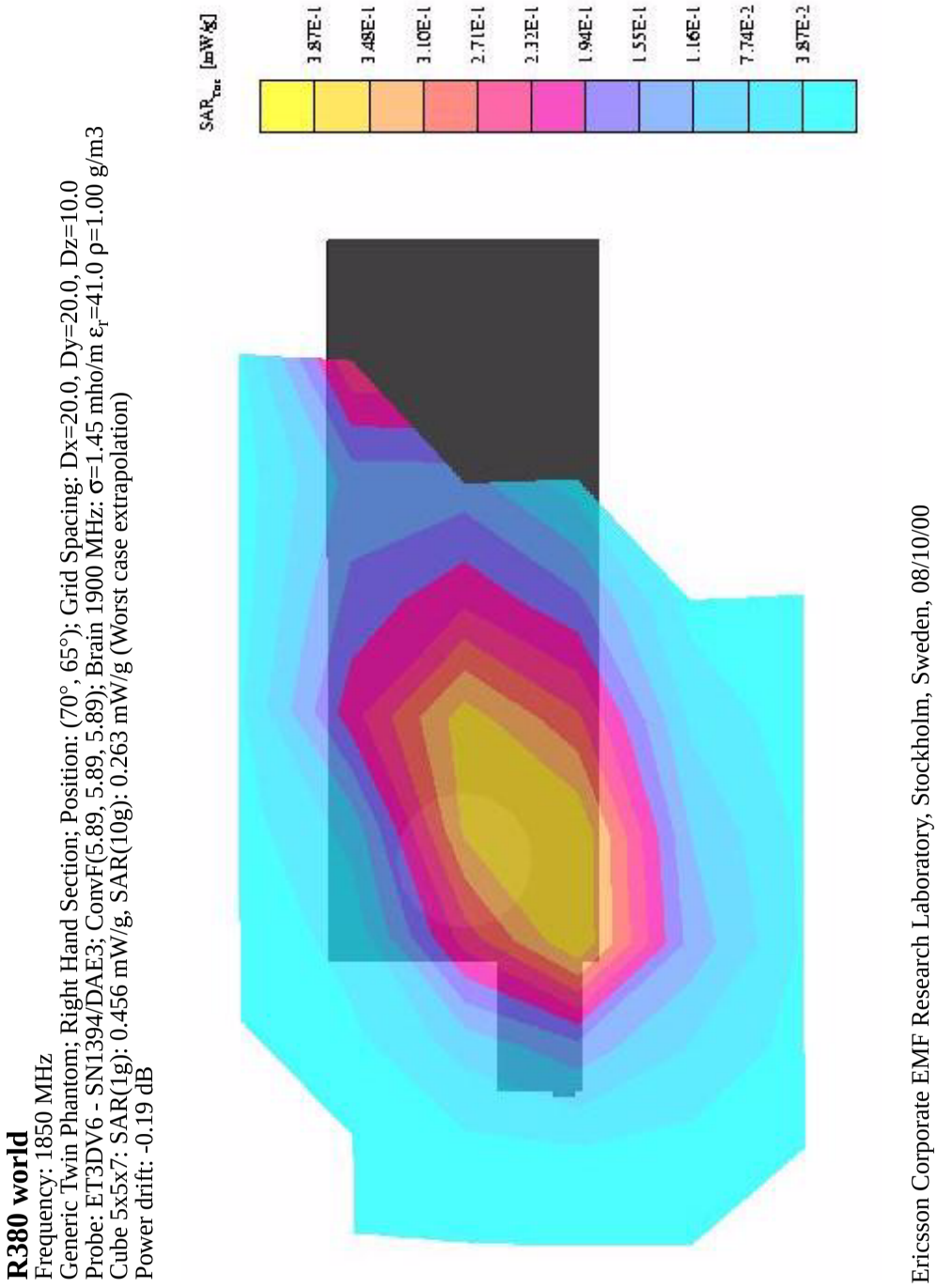
(b) SAR distribution plot for the 1900 MHz validation dipole antenna. The plot shows the measurement data obtained prior to the SAR testing.

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



Position of device on head phantom

APPENDIX 4: SAR distribution plots



Distribution of maximum SAR in PCS 1900 mode (at 1850 MHz). Measured against the right hand side phantom.

APPENDIX 5: Probe calibration parameters for ET3DV6 SN:1394

Diode compression

Parameter	Value in mV
DCP X	98
DCP Y	98
DCP Z	98

Sensitivity in free space:

Parameter	Value in $\mu V/(V/m)^2$
Norm X	1.87
Norm Y	1.92
Norm Z	1.66

Conversion factors for tissue simulating liquid

Liquid for 1800 MHz; ε_r=41 ± 5%, σ=1.69 ± 10% S/m.

Boundary effect: alpha=0.62, Depth=2.31

Parameter	Value
ConvF X	5.99
ConvF Y	5.99
ConvF Z	5.99

Extrapolated parameters for 1900 MHz according to procedure by Schmid & Partner Engineering AG:

Boundary effect: alpha=0.63, Depth=2.33

Parameter	Value
ConvF X	5.89
ConvF Y	5.89
ConvF Z	5.89

Probe tip to sensor center: 2.7 mm

Optical Surface Detection: 1.42 ± 0.2 mm

Uppgjord - *Prepared*	Tfn - *Telephone*	Datum - *Date*	Rev	Dokumentnr - *Document no*
ERA/T/UD Martin Siegbahn	70811	2000-09-07	A	T/U 00:327
Godkänd - *Approved*	Kontr. - *Checked*	Ert datum - *Your date*		Tillhör referens - *File/reference*
ERA/T/UF Christer Törnevik				

Addendum to

"SAR Test Report: R380 world"

Date of test: September 6, 2000

Laboratory: Ericsson Corporate EMF Research Laboratory,
ERICSSON RADIO SYSTEMS AB
Stockholm, Sweden
(Accredited to IS09001)

Test responsible: Martin Siegbahn, M.Sc
martin.siegbahn@era-t.ericsson.se
Tel: +46 8 757 0811

Statement of Compliance

Telefonaktiebolaget LM Ericsson, declares under its sole responsibility that the product

R380 world (KRD 103 16)

to which this declaration relates, is in conformity with the following 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)

Table of Contents

1 General information

This test report is an addendum to report "SAR Test Report: R380 world" (ERA/T/U 00:290, rev. B). In this report compliance of the Ericsson R380 world portable telephone with RF safety guidelines is demonstrated while the device is used against the body (applicable RF safety guidelines are given in [1]). The device was tested in accordance with the latest available test guidelines [1]. Detailed procedures of the tests are described in the *Ericsson SAR measurement specification* [2].

2 Device Under Test

Photographs of the device and the carry case under test are presented in Appendix 1.

2.1 Antenna description

Type	Meander dual band	
Location	Back and left side	
Dimensions (mm)	Length	30
	Width at base	15
Configuration	Stub	

2.2 Device description

Device model	**R380 world**
Serial number	A6100P0SWA
Mode	PCS 1900
Multiple access scheme	TDMA
Maximum output power setting[1]	30.0 dBm
Factory tolerance in power setting	+0.5dB/-1.5dB
Maximum peak output power[2]	30.5 dBm
Duty cycle	1/8
Transmitter frequency range	1850-1910 MHz
Prototype or production unit	Prototype

[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 plus the factory tolerance.

3 Test equipment

3.1 Dosimetric system

The SAR measurements were made using the DASY3 professional near-field scanner (software version 3.1c) by Schmid&Partner Engineering AG which was installed in September 1997. The total SAR assessment uncertainty (K=1) of the system is ±16% and includes a +15% offset (overestimation). The extended uncertainty (K=2) is ± 32% with a +15% offset. This results in a total uncertainty range of -1% to +31% for K=1, or -17% to +47% for K=2. The equipment list is given below.

Description	**Asset number**	**Due date**
DASY3 DAE3	S/N 304	2001 08
E-field probe ET3DV6	S/N 1394	2001 08
Dipole validation kit D1900V2	S/N 510	2001 10

3.2 Additional equipment

Description	Asset number	Due date
Signal generator, R&S SMHU58	S/N 843863/034	2000 11
Dielectric probe kit HP85070C	S/N US99360060	2001 03
Network analyzer HP8752C	S/N 3410A03732	2000 11
Power meter R&S NRVS	S/N 848888/052	2001 03
Power sensor R&S NRV-Z32	S/N 825600/030	2001 02
Digital radio tester R&S CTS-55	S/N 827443012	2000 11

4 Electrical parameters of the tissue simulating liquid

The parameters of the tissue simulating liquid were measured with the dielectric probe kit prior to the SAR measurement and the results 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. The depth of the head tissue liquid was 12 cm.

f (MHz)	Measured/Limits	σ (S/m)	ε_r	ρ (kg/m^3)
1900	Measured	1.52	41.2	1.00
	Limits, muscle [3]	1.20	43.4	1.03

5 System accuracy verification

A system performance verification for the DASY3 was conducted before the SAR measurements with the D1900V2 validation kit and the obtained results are displayed in the table below. The results are within 5% from the reference values obtained from the manufacturer of the system [4]. The temperature of the test facility during the tests was 22±1°C. Appendix 2 shows the measured SAR distribution and the reference distribution for this antenna.

f (MHz)	Measured/ Reference	SAR 1g (W/kg)	σ (S/m)	ε_r	ρ (kg/m^3)
1900	Measured	38.8	1.52	41.2	1.00
	Reference	37.1[1]	1.40	40.0	1.00
	Difference	**+4.6%**	**+8.6%**	**+3.0%**	-

[1.] The listed reference value is based on an analysis performed at the laboratory, according to a procedure by the manufacturer [5], for compensating the original reference data since that data uses other dielectric parameters than those listed in the table.

6 Test Results

For body-worn SAR measurements, the device was positioned against a flat phantom representing the user's body with the dedicated carry case KRY 104 153 which is shown in Appendix 1. A picture of the setup of the device below the flat phantom is given in Appendix 3. Table 1 presents the obtained SAR data for these measurements and SAR normalized to the maximum output level 30.5 dBm. The maximum 1g SAR was found for the lowest frequency and the corresponding SAR distribution is presented in Appendix 4.

Mode	**Chamber temp. (°C)**	**f (MHz)**	**Output power (dBm)**	**SAR 1g (W/kg)**	
				Body worn in carry case KRY 104 153	
				Measured	**Normalized to max power**
PCS 1900	23	1850	29.45	0.35	**0.44**
	23	1880	29.51	0.31	0.39
	23	1910	29.28	0.25	0.33

Table 1 SAR measurement results for the R380 world telephone at highest possible output power. Measured against the flat body phantom.

7 References

[1] C. Törnevik, "Ericsson SAR Measurement Specification, part 1: Introduction and Purpose", Ericsson Internal Document ERA/T/U-98:446, March 2000.

[2] C. Törnevik, M. Siegbahn, T. Persson, M. Douglas and R. Plicanic, "Ericsson SAR Measurement Specification", Ericsson Internal Document, August 2000.

[3] Federal Communications Commission, "Tissue Dielectric Properties", http://www.fcc.gov/fcc-bin/dielec.sh.

[4] Schmid & Partner Engineering AG, "DASY Dipole Validation Kit", Type: D1900V2, S/N: 510, October 1999.

[5] Schmid & Partner Engineering AG, "Application Notes: SAR Sensitivities", 1998.

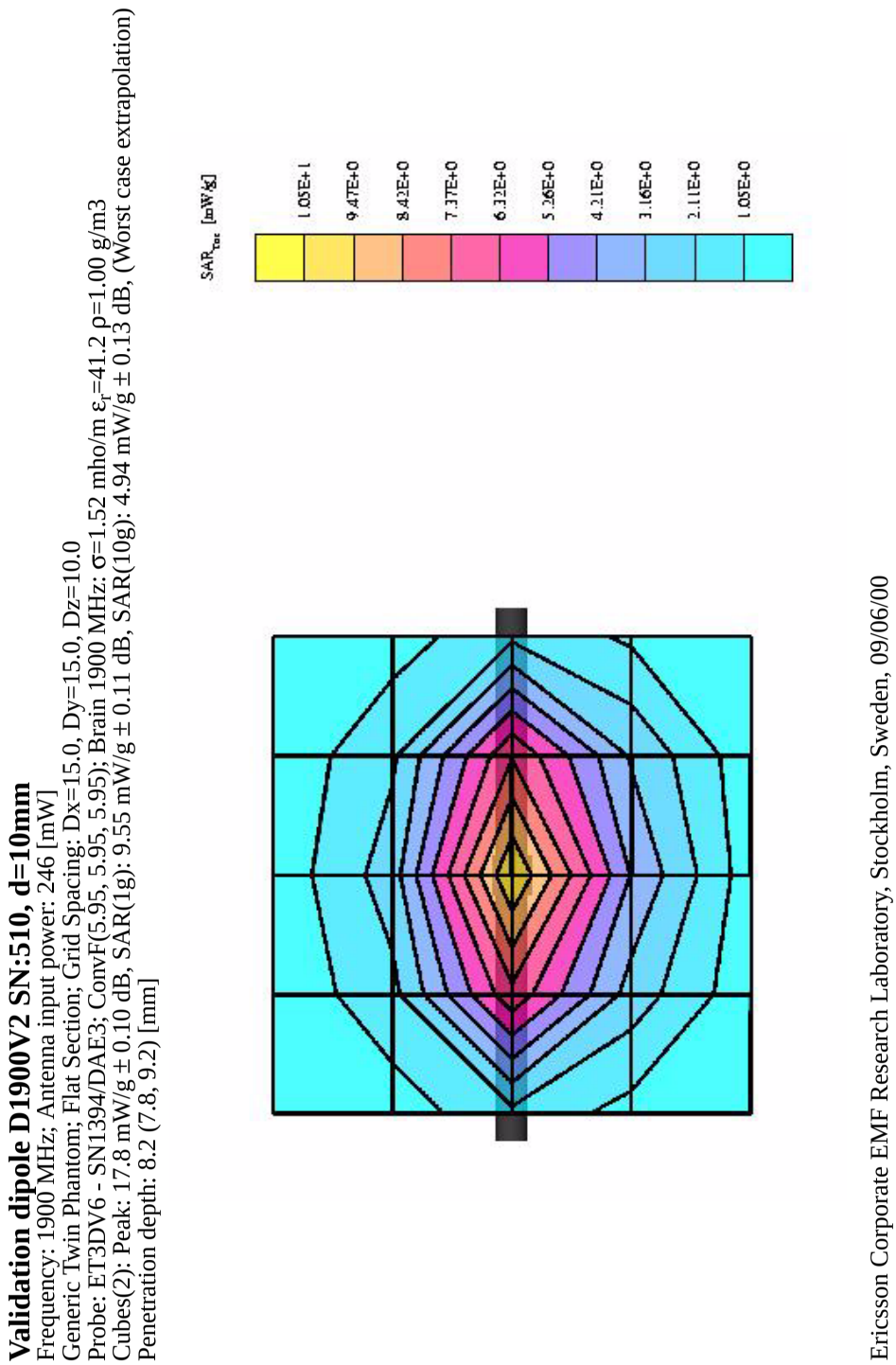
APPENDIX 1: Photographs of the DUT.

(a) R380 world and carry case KRY 104 153

(b) Back side of carry case KRY 104 153

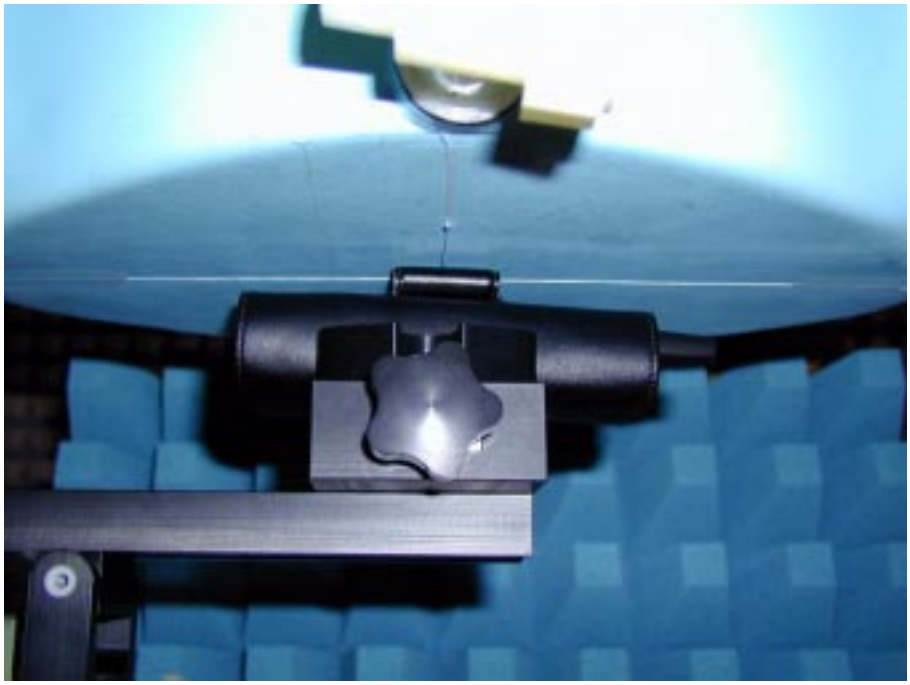
APPENDIX 2: SAR distribution comparison for system accuracy verification

(a) SAR distribution plots for the 1900 MHz validation dipole antenna. The plot shows the reference data obtained from the DASY3 manufacturer.



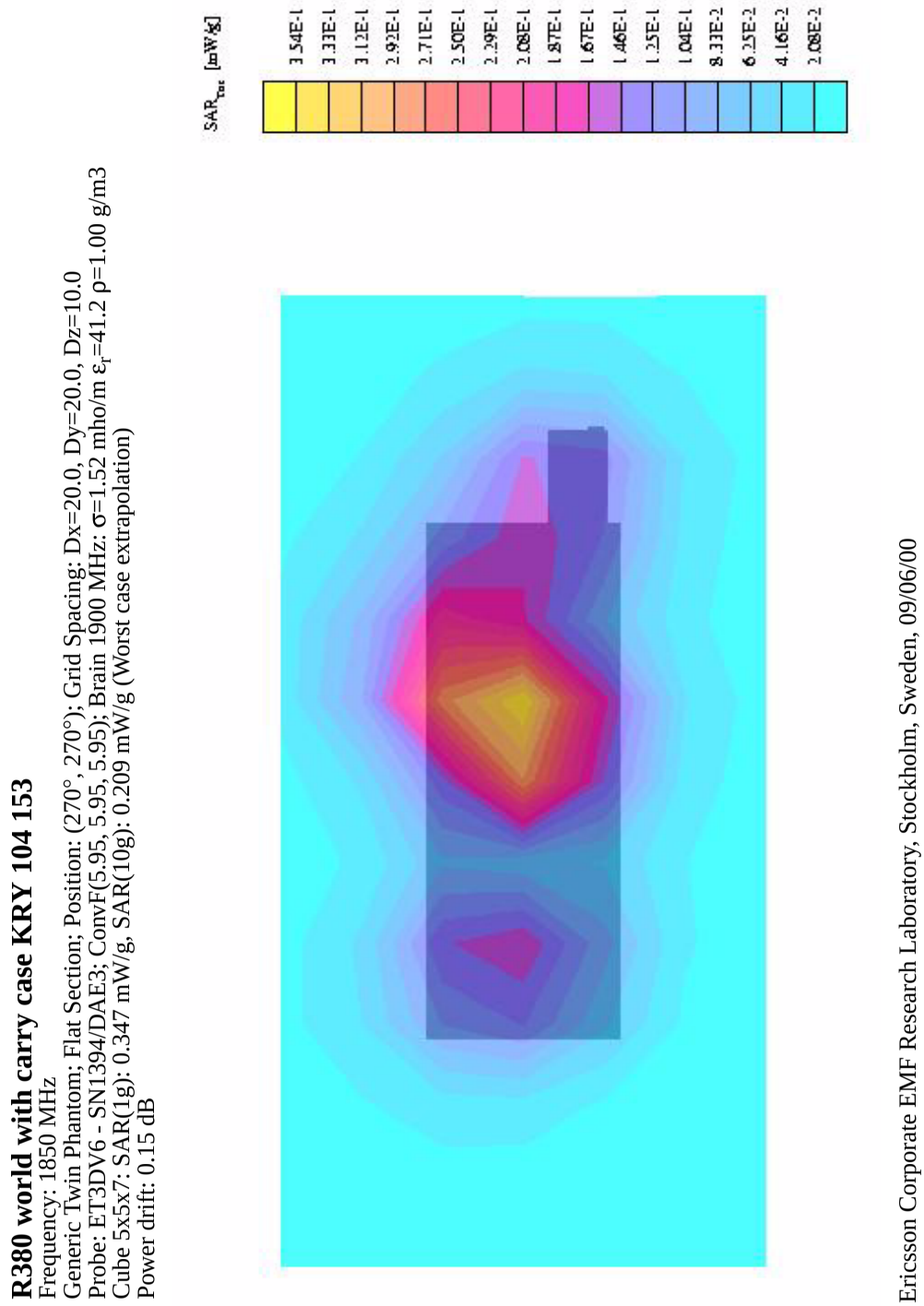
(b) SAR distribution plot for the 1900 MHz validation dipole antenna. The plot shows the measurement data obtained prior to the SAR testing.

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



Position of device and carry case on body phantom

APPENDIX 4: SAR distribution plots



Distribution of maximum SAR in PCS 1900 mode (at 1850 MHz). Measured against the flat body phantom.

APPENDIX 5: Probe calibration parameters for ET3DV6 SN:1394

Diode compression

Parameter	Value in mV
DCP X	98
DCP Y	98
DCP Z	98

Sensitivity in free space:

Parameter	Value in $\mu V/(V/m)^2$
Norm X	1.85
Norm Y	1.90
Norm Z	1.64

Conversion factors for tissue simulating liquid

Liquid for 1800 MHz; $\varepsilon_r = 41 \pm 5\%$, $\sigma = 1.69 \pm 10\%$ S/m.

Boundary effect: alpha=0.78 , Depth=1.84

Parameter	Value
ConvF X	6.04
ConvF Y	6.04
ConvF Z	6.04

Extrapolated parameters for 1900 MHz according to procedure by Schmid & Partner Engineering AG:

Boundary effect: alpha=0.83, Depth=1.75

Parameter	Value
ConvF X	5.95
ConvF Y	5.95
ConvF Z	5.95

Probe tip to sensor center: 2.7 mm

Optical Surface Detection: 1.4 ± 0.2 mm