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LD/SEMC/BGLIM Magnus Söderman

Approved

LD/SEMC/BGLIM/C Peter Lindeborg

Checked

070807

Company Internal  
REPORT

No.

BGLI07:299

Date

070713

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**Report issued by Accredited SAR Laboratory****for***PY7A1022101 (T658c)***Date of test:** 4<sup>th</sup> - 12<sup>th</sup> of July, 2007**Laboratory:** Sony Ericsson SAR Test Laboratory  
Sony Ericsson Mobile Communications AB  
Nya Vattentorget  
SE-221 82 LUND, Sweden**Testing Engineer:** Magnus Söderman  
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+46-46-2127229**Testing Approval:** Peter Lindeborg  
peter.lindeborg@sonyericsson.com  
+46-46-2126180**Statement of Compliance**

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

***Sony Ericsson Type AAB-1022101-BV; FCC ID: PY7A1022101; IC: 4170B-A1022101***

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)

This laboratory is accredited to ISO/IEC 17025 (SWEDAC accreditation no. 1847).



Laboratories are accredited by the Swedish Board for Accreditation and Conformity Assessment (SWEDAC) under the terms of Swedish legislation. The accredited laboratory activities meet the requirements in SS-EN ISO/IEC 17025 (2005). This report may not be reproduced other than in full, except with the prior written approval of the issuing 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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## 2 Introduction

In this test report, compliance of the Sony Ericsson AAB-1022101-BV (T658c) 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 at bottom of backside	
Dimensions	Max length	40 mm
	Max width	15 mm
Configuration	Meander	

### 3.2 Device description

Device model	PY7A1022101		
Market name	T658c		
Serial numbers	CB510NFFCL (#8173)		
Mode	GSM 1900		
Crest factor	8.3		
Multiple Access Scheme	TDMA		
Maximum Output Power Setting [dBm]	Ch.512	Ch.699	Ch.885
	29.4	29.4	29.4
Factory Tolerance in Power Setting	±0.5dB		
Maximum Peak Output Power	29.9	29.9	29.9
Mode	GSM 1900-GPRS2TX		
Crest factor	4.15		
Multiple Access Scheme	TDMA		
Maximum Output Power Setting [dBm]	Ch.512	Ch.699	Ch.885
	29.4	29.4	29.4
Factory Tolerance in Power Setting	±0.5dB		
Maximum Peak Output Power	29.9	29.9	29.9
Transmitting Frequency Rang [MHz]	1850.2 – 1909.8		
GPRS Multislot Class	10		
GPRS Capability Class	B		
Prototype or Production Unit	Preproduction (HW:FP1.2)		
Device Category	Portable		
RF exposure environment	General population / uncontrolled		



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## 4 Test equipment

### 4.1 Dosimetric system

SAR measurements were made using the DASY4 professional system (software version 4.7, Build 53) with SAM twin phantom, manufactured by Schmid&Partner Engineering AG (SPEAG). The list of calibrated equipment is given below.

Description	Serial Number	Due Date
DASY4 DAE V1	433	2008-01
E-field probe ET3DV6	1569	2008-01
Dipole Validation Kit, D1900V2	5d002	2009-01

### 4.2 Additional equipment

Description	Serial Number	Due Date
Signal generator	INV 20007666	2008-03
Directional coupler	M-941548-0102	2008-03
Power meter R&S NRVD	INV 483920	2008-03
Power sensor R&S NRV-Z5	INV 2333	2008-03
Power sensor R&S NRV-Z5	INV 2334	2008-03
Network analyzer HP8753C	INV421671	2008-03
S-parameter test set HP85047A	INV 421670	2008-03
Dielectric probe kit HP8507D	INV 20000053	N/A
Base station simulator CMU	SER.833870/062	2008-03
Thermometer Fluke 51	INV 2071	2008-03

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## 5 Electrical parameters on the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity,  $\epsilon_r$ , and the conductivity,  $\sigma$ , of the tissue simulating liquids were measured with the dielectric probe kit. These values are shown in the table below. The mass density,  $\rho$ , entered into the DASY4 software is also given. Recommended limits for permittivity  $\epsilon_r$ , conductivity  $\sigma$  and mass density  $\rho$  are also shown.

f [MHz]	Tissue type	Limits / Measured	Dielectric Parameters		Density
			$\epsilon_r$	$\sigma$ [S/m]	$\rho$ [g/cm <sup>3</sup> ]
1900	Head	Measured, 06/07/07	38.0	1.45	1.00
		Recommended	40.0	1.40	1.00
1900	Body	Measured, 04/07/07	50.8	1.57	1.00
		Recommended	53.3	1.52	1.00

## 6 System accuracy verification

A system accuracy verification of the DASY4 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 21-22°C and humidity 55-65%. The obtained results are displayed in the table below.

RF noise had been measured in liquid when all RF equipment in lab was turned off. Measured value was 0.0002 mW/g for 1g mass.

f [MHz]	Tissue type	Measured / Reference	SAR [W/kg] 1g / 10g	Dielectric Parameters		Density	Liquid T[°C]
				$\epsilon_r$	$\sigma$ [S/m]	$\rho$ [g/cm <sup>3</sup> ]	
1900	Head	Measured, 06/07/07	37.7 / 19.8	38.0	1.45	1.00	21.6
		Reference	37.4 / 19.8	40.0	1.40	1.00	22
	Body	Measured, 04/07/07	38.8 / 20.8	50.8	1.57	1.00	22.3
		Reference	38.6 / 20.6	53.3	1.52	1.00	22

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**7 SAR measurement uncertainty****SAR measurement uncertainty evaluation for Sony Ericsson PY7A1022101 (T658c) phone**

Uncertainty Component	Uncert. (%)	Prob. Dist.	Div.	C <sub>i</sub>	GSM 1900 Head	GSM 1900 Body
<b>Measurement System</b>						
Probe Calibration	±5.9	N	1	1	±5.9	±5.9
Axial Isotropy	±4.7	R	√3	0.7	±1.9	±1.9
Spherical Isotropy	±9.6	R	√3	0.7	±3.9	±3.9
Boundary effect	±1.0	R	√3	1	±0.6	±0.6
Probe linearity	±4.7	R	√3	1	±2.7	±2.7
Detection limit	±1.0	R	√3	1	±0.6	±0.6
Readout electronics	±0.3	N	1	1	±0.3	±0.3
Response time	±0.8	R	√3	1	±0.5	±0.5
Integration time	±2.6	R	√3	1	±1.5	±1.5
RF Ambient Conditions	±3.0	R	√3	1	±1.7	±1.7
Mech. Constraints of robot	±0.4	R	√3	1	±0.2	±0.2
Probe positioning	±2.9	R	√3	1	±1.7	±1.7
Extrap, interpolation and integration	±1.0	R	√3	1	±0.6	±0.6
<b>Measurement System Uncertainty</b>					±8.4	±8.4
<b>Test Sample Related</b>						
Device positioning	±3.5	N	1	1	±3.5	±3.5
Device holder uncertainty	±3.5	N	1	1	±3.5	±3.5
Power drift	-3.1 / -4.5	R	√3	1	-1.8	-2.6
<b>Test Sample Related Uncertainty</b>					±5.0	±5.3
<b>Phantom and Tissue Parameters</b>						
Phantom uncertainty	±4.0	R	√3	1	±2.3	±2.3
Liquid conductivity (meas.)	+3.6 / +3.2	R	1	0.64	+2.3	+2.0
Liquid conductivity (target)	±5.0	R	√3	0.64	±1.8	±1.8
Liquid Permittivity (meas.)	-5.0 / -2.8	R	1	0.6	-3.0	-1.7
Liquid Permittivity (target)	±5.0	R	√3	0.6	±1.7	±1.7
<b>Phantom and Tissue Parameters Uncertainty</b>					±5.1	±4.3
<b>Combined standard uncertainty</b>					±11.0	±10.8
<b>Extended standard uncertainty (k=2)</b>					±22.0	±21.7

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## 8 Test results

The measured 1-gram averaged SAR values of the DUT against the head are provided in Table 1. The ambient humidity and temperature of test facility were 55-65% and 21-22°C respectively. A base station simulator was used to control the device during the SAR measurement. The DUT was supplied with a fully charged battery for each measurement.

For head measurement, the DUT was tested on the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom in two phone positions, cheek (touch) and tilt (cheek + 15deg). For all modes, the DUT was tested at the lowest, middle and highest frequencies in the transmission band.

For body measurements was the DUT tested with the back (antenna) and front toward the phantom flat section with 15 mm distance both in speech and data (GPRS) mode. DUT was tested in both modes at the low, middle and high frequency in the transmission band. The Sony Ericsson hands free set (HPB-60) and Bluetooth set (HBH-PV705) was used for measurement at the worst case SAR for body in speech mode. The measured 1-gram averaged SAR values of the DUT against the body are provided in Table 2.

Mode	Chanel	Power [dBm]	Phone Position	Liquid T [°C]	SAR [W/kg]	
					Right-hand 1g mass	Left-hand 1g mass
GSM 1900	512	29.8	Cheek	21.6	1.31	1.19
			Tilt	21.6	0.54	0.34
	661	29.9	Cheek	21.6	1.14	1.10
			Tilt	21.6	0.44	-
	810	29.9	Cheek	21.6	1.14	1.11
			Tilt	21.6	-	-

**Table1: SAR measurement result for Sony Ericsson PY7A1022101 telephone at highest possible output power. Measured towards the head.**

Mode	Channel	Power [dBm]	Phone Position	Mode	Liquid T [°C]	SAR [W/kg] 1 g mass
GSM 1900	512	29.8	Antenna to phantom	Bluetooth	22.3	0.35
			Antenna to phantom	GPRS2TX	22.3	0.70
			Frontside to phantom	Bluetooth	22.3	0.29
	661	29.9	Antenna to phantom	Hands Free	22.3	0.29
			Antenna to phantom	Bluetooth	22.3	0.33
			Antenna to phantom	GPRS2TX	22.3	0.63
	810	29.9	Antenna to phantom	Bluetooth	22.3	0.34
			Antenna to phantom	GPRS2TX	22.3	0.71

**Table2: SAR measurement result for Sony Ericsson PY7A1022101 telephone at highest possible output power. Measured towards the body.**

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**9****References**

[ 1 ] R.Plicanic, "SAR Measurement Specification of Wireless Handsets", Sony Ericsson SAR Test Laboratory internal document GUG/N 03:141

[ 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 1528-2003, June, 2003.

[ 4 ] Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices in the frequency range of 300 MHz to 3 GHz. EN 62209, February 2005.

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## 10 Appendix

### 10.1 Photographs of the device under test



*Front- and back side*



*Left- and right side*



*Battery and battery cover removed*



*Top and bottom*

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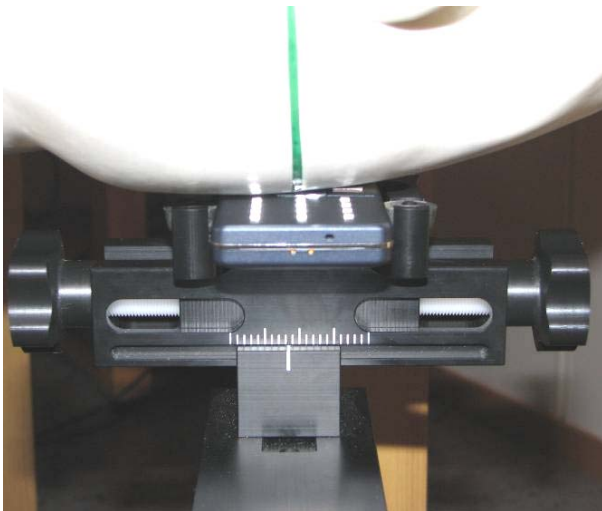
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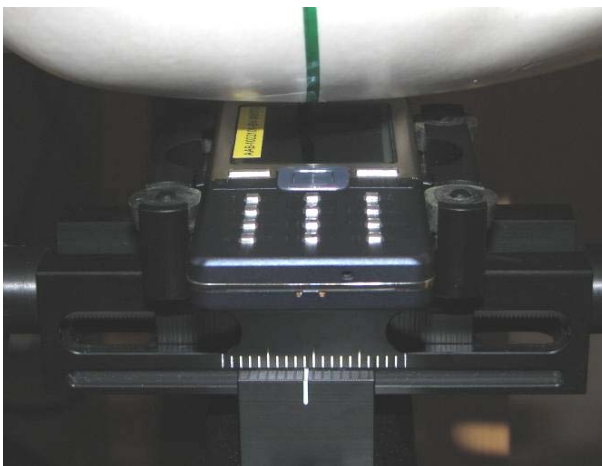
Reference

File

## 10.2 Device position at SAM Twin Phantom



*DUT position towards the head: Cheek (touch) phone position*



*DUT position towards the head: Tilt (touch + 15°) phone position*

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Date

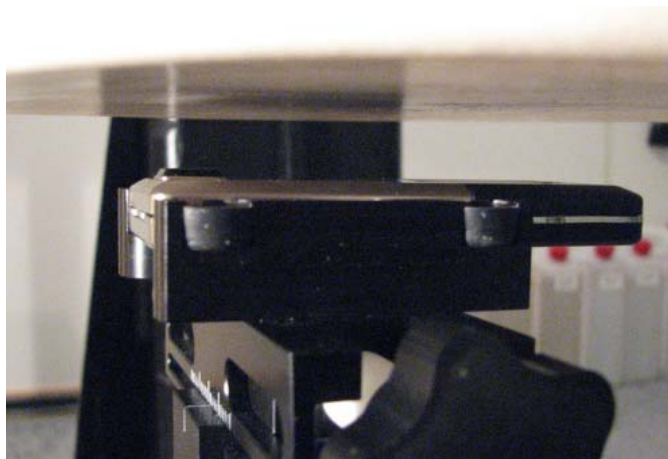
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*DUT position towards the body: 15 mm distance between SAM and DUT*

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**10.3 Attachments**

- Measurement plots and system validation
- Probe and dipole calibration

Date/Time: 2007-07-06 11:16:34

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [SystemPerformanceCheck-D1900\\_Head.da4](#)**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d002****Program Name: System Performance Check at 1900 MHz**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 38$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(5.33, 5.33, 5.33); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**d=10mm, Pin=100mW/Area Scan (41x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 4.48 mW/g

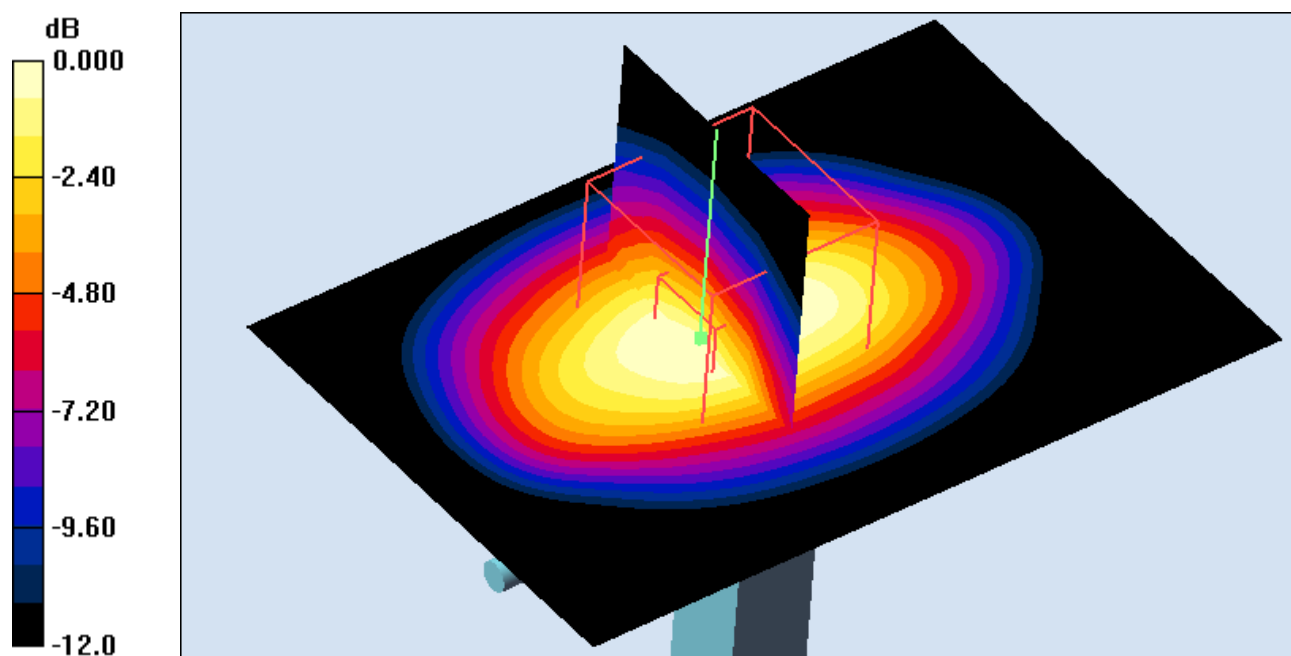
**d=10mm, Pin=100mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 56.3 V/m; Power Drift = -0.071 dB

Peak SAR (extrapolated) = 6.57 W/kg

**SAR(1 g) = 3.77 mW/g; SAR(10 g) = 1.98 mW/g**

Maximum value of SAR (measured) = 4.15 mW/g



0 dB = 4.15mW/g

Date/Time: 2007-07-06 13:07:40

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [LeftHandSide-GSM1900.da4](#)

**DUT: AAB-1022101-BV (Steffi); Type: GSM Tripple Band; Serial:CB510NFFCL**  
**Program Name: Compliance Testing: (Left-Hand Side)**

Communication System: DCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 38.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(5.33, 5.33, 5.33); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Tilt position - Low/Area Scan (51x111x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.368 mW/g

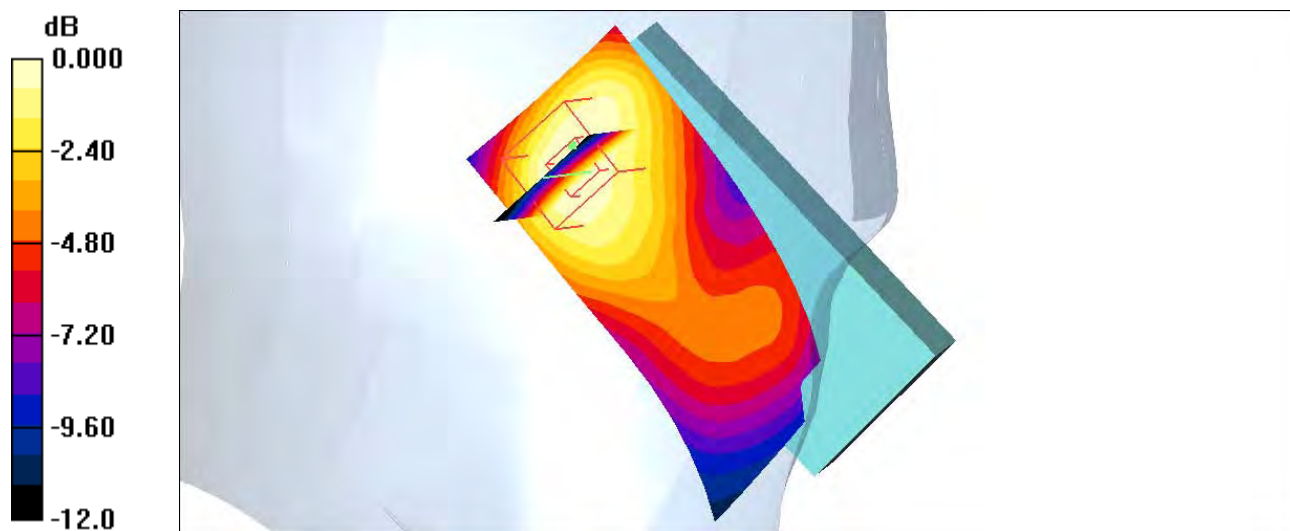
**Tilt position - Low/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.4 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 0.487 W/kg

**SAR(1 g) = 0.335 mW/g; SAR(10 g) = 0.210 mW/g**

Maximum value of SAR (measured) = 0.354 mW/g



0 dB = 0.354mW/g

Date/Time: 2007-07-06 13:47:39

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [RightHandSide-GSM1900.da4](#)

**DUT: AAB-1022101-BV (Steffi); Type: GSM Tripple Band; Serial:CB510NFFCL**  
**Program Name: GSM-1900 (Right-Hand Side)**

Communication System: DCS 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 38.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(5.33, 5.33, 5.33); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Touch position - Low/Area Scan (51x111x1):** Measurement grid: dx=10mm, dy=10mm  
 Maximum value of SAR (interpolated) = 1.46 mW/g

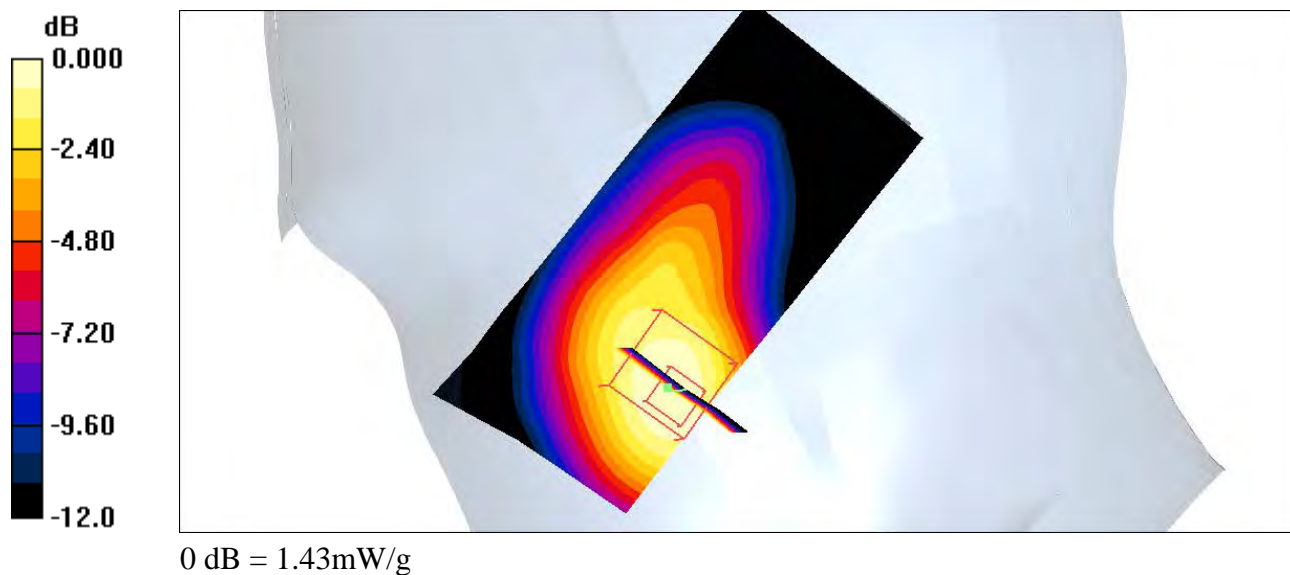
**Touch position - Low/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.98 V/m; Power Drift = -0.055 dB

Peak SAR (extrapolated) = 2.19 W/kg

**SAR(1 g) = 1.31 mW/g; SAR(10 g) = 0.763 mW/g**

Maximum value of SAR (measured) = 1.43 mW/g



Date/Time: 2007-07-06 11:51:38

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [LeftHandSide-GSM1900.da4](#)

**DUT: AAB-1022101-BV (Steffi); Type: GSM Tripple Band; Serial:CB510NFFCL**  
**Program Name: Compliance Testing: (Left-Hand Side)**

Communication System: DCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 38.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(5.33, 5.33, 5.33); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Touch position - Low/Area Scan (51x111x1):** Measurement grid: dx=10mm, dy=10mm  
 Maximum value of SAR (interpolated) = 1.33 mW/g

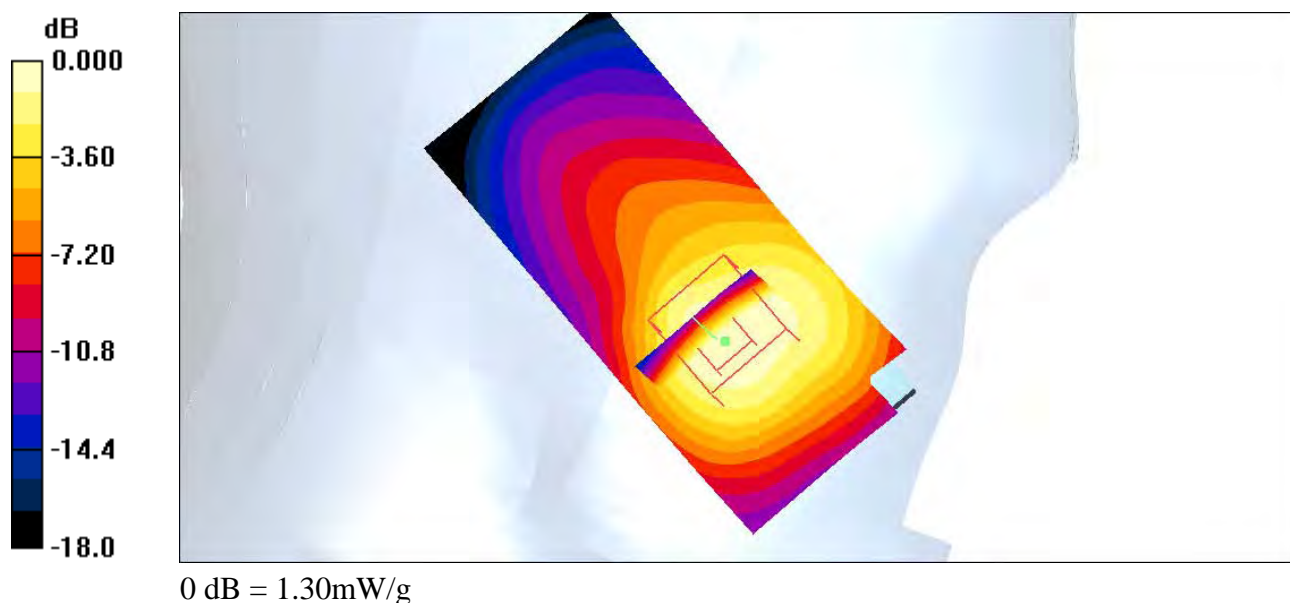
**Touch position - Low/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.47 V/m; Power Drift = -0.132 dB

Peak SAR (extrapolated) = 1.70 W/kg

**SAR(1 g) = 1.19 mW/g; SAR(10 g) = 0.725 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g



Date/Time: 2007-07-06 15:14:14

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [RightHandSide-GSM1900.da4](#)

**DUT: AAB-1022101-BV (Steffi); Type: GSM Tripple Band; Serial:CB510NFFCL**  
**Program Name: GSM-1900 (Right-Hand Side)**

Communication System: DCS 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 38.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(5.33, 5.33, 5.33); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Tilt position - Low/Area Scan (51x111x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.589 mW/g

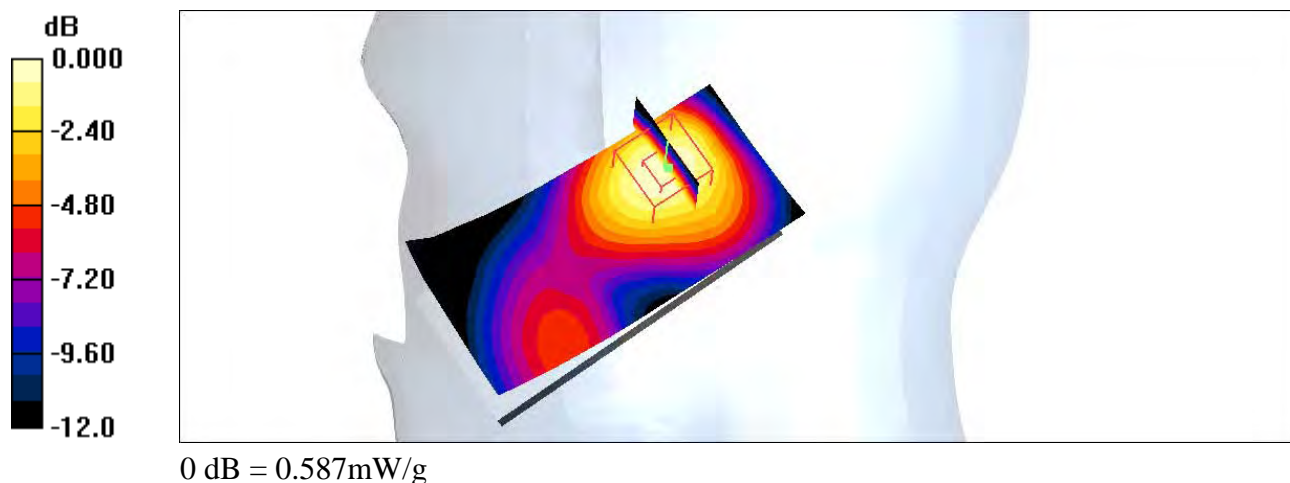
**Tilt position - Low/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.9 V/m; Power Drift = 0.038 dB

Peak SAR (extrapolated) = 0.853 W/kg

**SAR(1 g) = 0.539 mW/g; SAR(10 g) = 0.320 mW/g**

Maximum value of SAR (measured) = 0.587 mW/g



Date/Time: 2007-07-04 08:56:32

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [SystemPerformanceCheck-D1900\\_Body.da4](#)**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d002****Program Name: System Performance Check at 1900 MHz**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 50.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**d=10mm, Pin=100mW/Area Scan (41x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 4.70 mW/g

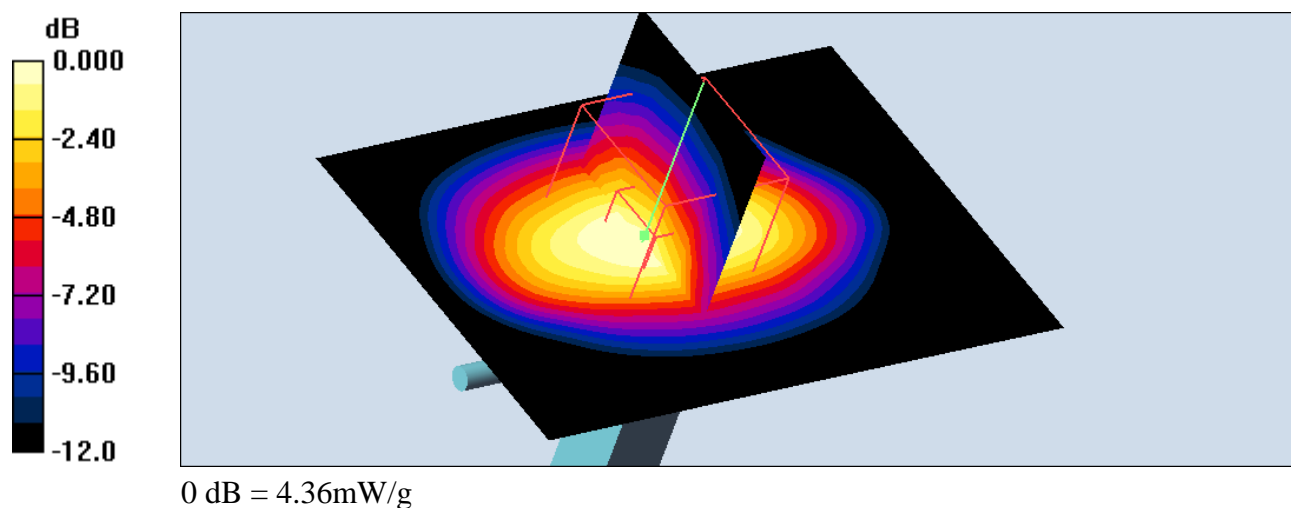
**d=10mm, Pin=100mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.3 V/m; Power Drift = -0.034 dB

Peak SAR (extrapolated) = 6.47 W/kg

**SAR(1 g) = 3.88 mW/g; SAR(10 g) = 2.08 mW/g**

Maximum value of SAR (measured) = 4.36 mW/g



Date/Time: 2007-07-04 13:50:32

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [Body GPRS-1900.da4](#)

**DUT: AAB-1022101-BV (Steffi); Type: GSM Tripple Band; Serial:CB510NFFCL**  
**Program Name: Body GSM-1900**

Communication System: GSM1900\_GPRS; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 50.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**High/Area Scan (51x121x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.791 mW/g

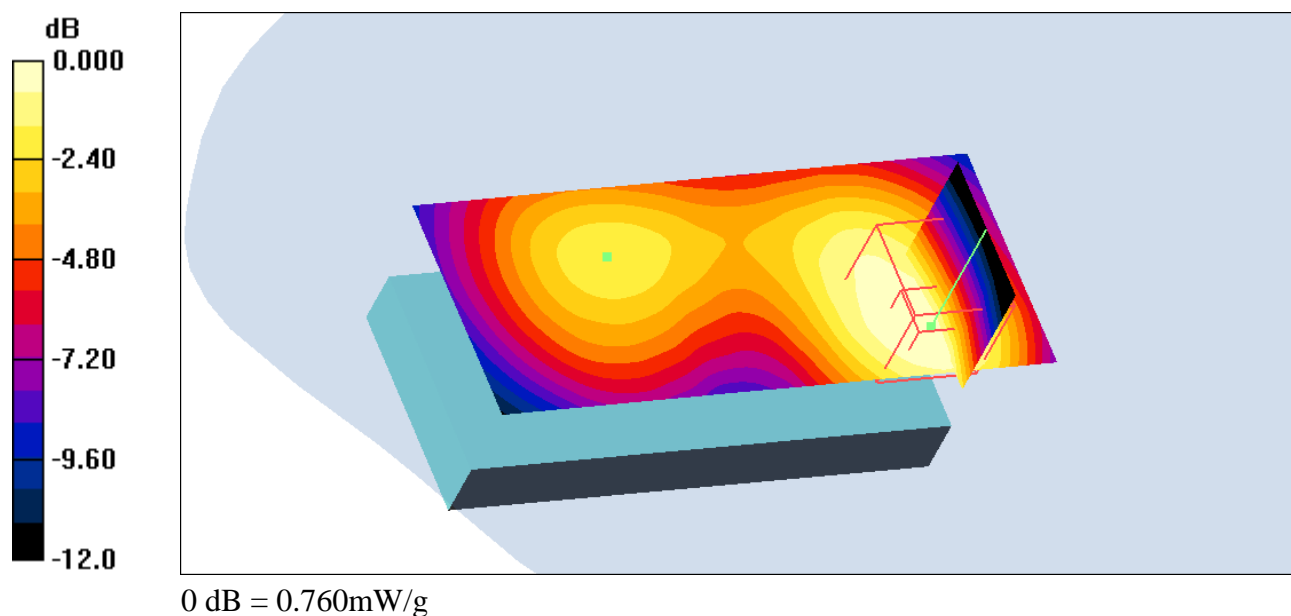
**High/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.5 V/m; Power Drift = -0.096 dB

Peak SAR (extrapolated) = 1.17 W/kg

**SAR(1 g) = 0.709 mW/g; SAR(10 g) = 0.425 mW/g**

Maximum value of SAR (measured) = 0.760 mW/g



Date/Time: 2007-07-04 10:41:40

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [Body GSM-1900.da4](#)

**DUT: AAB-1022101-BV (Steffi); Type: GSM Tripple Band; Serial:CB510NFFCL**  
**Program Name: Body GSM-1900**

Communication System: DCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 51$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Low BT/Area Scan (51x121x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.392 mW/g

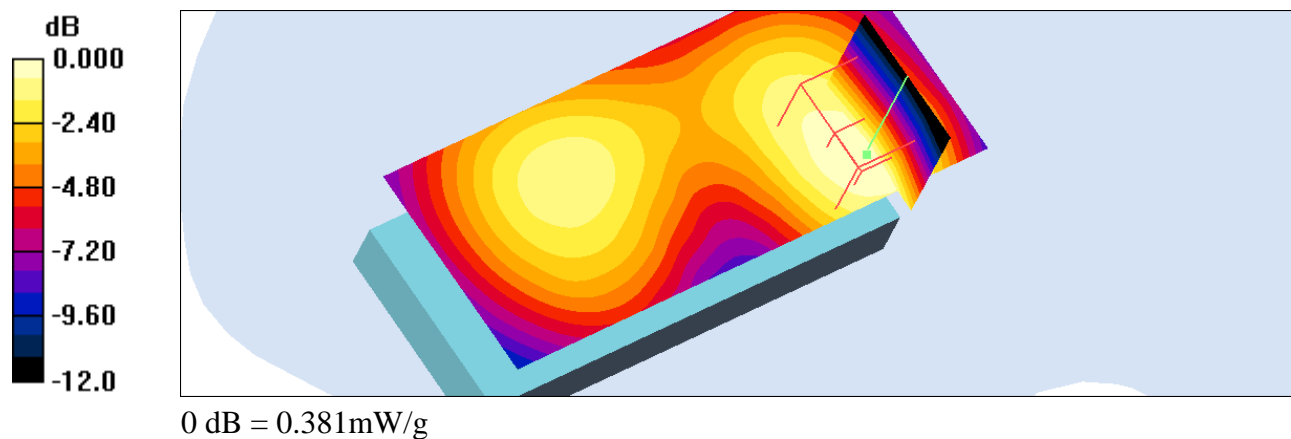
**Low BT/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.2 V/m; Power Drift = 0.190 dB

Peak SAR (extrapolated) = 0.573 W/kg

**SAR(1 g) = 0.352 mW/g; SAR(10 g) = 0.212 mW/g**

Maximum value of SAR (measured) = 0.381 mW/g



Date/Time: 2007-07-04 11:22:17

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [Body GSM-1900.da4](#)

**DUT: AAB-1022101-BV (Steffi); Type: GSM Tripple Band; Serial:CB510NFFCL**  
**Program Name: Body GSM-1900**

Communication System: DCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 51$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Low BT Frontside/Area Scan (51x121x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.376 mW/g

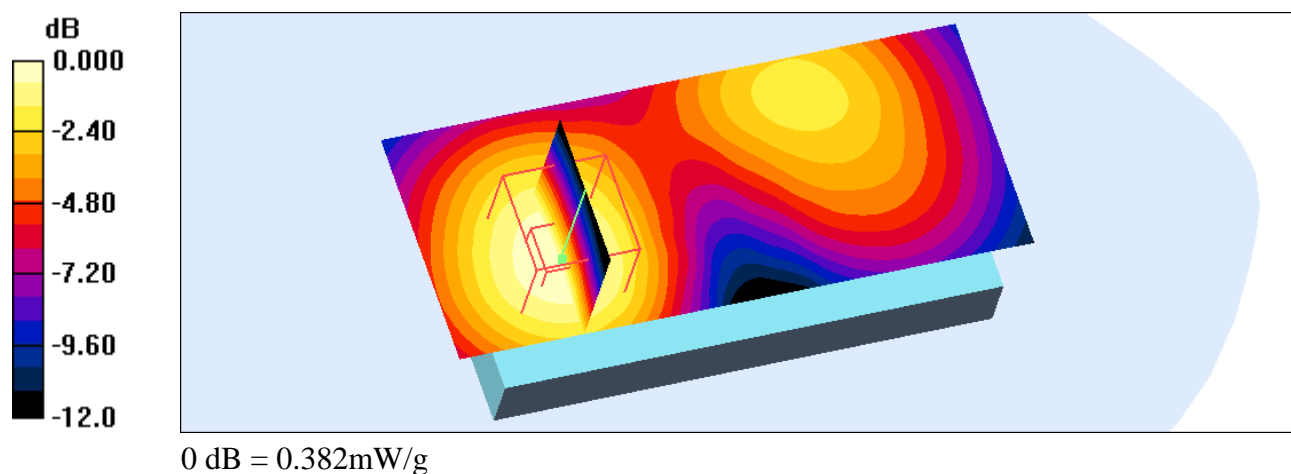
**Low BT Frontside/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.4 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 0.538 W/kg

**SAR(1 g) = 0.349 mW/g; SAR(10 g) = 0.211 mW/g**

Maximum value of SAR (measured) = 0.382 mW/g



Date/Time: 2007-07-04 11:39:56

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [Body GSM-1900.da4](#)

**DUT: AAB-1022101-BV (Steffi); Type: GSM Tripple Band; Serial:CB510NFFCL**  
**Program Name: Body GSM-1900**

Communication System: DCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 51$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1569; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-01-16
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn433; Calibrated: 2007-01-18
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Low PHF/Area Scan (51x121x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.320 mW/g

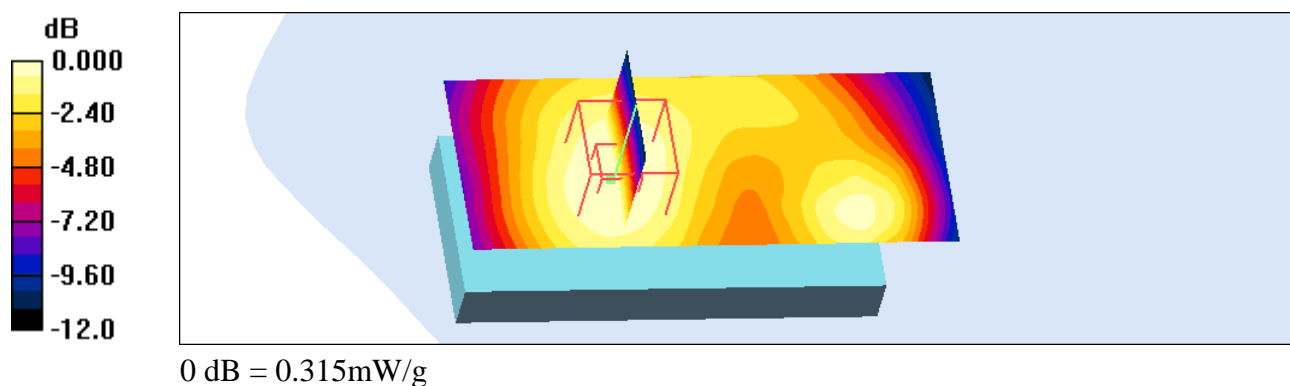
**Low PHF/Zoom Scan (5x5x7) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.3 V/m; Power Drift = -0.029 dB

Peak SAR (extrapolated) = 0.415 W/kg

**SAR(1 g) = 0.292 mW/g; SAR(10 g) = 0.192 mW/g**

Maximum value of SAR (measured) = 0.315 mW/g





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sony Ericsson Ltd**

Certificate No: **ET3-1569\_Jan07**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN: 1569**

Calibration procedure(s) **QA-CAL-01-V5  
Calibration procedure for dosimetric E-field probes**

Calibration date: **January 16, 2007**

Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Nikola Kuster	Quality Manager	

Issued: January 16, 2007

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

## Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\phi$	$\phi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC 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), July 2001

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the  $E^2$ -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* *frequency\_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

# Probe ET3DV6

## SN:1569

Manufactured:	May 19, 2001
Last calibrated:	March 16, 2006
Recalibrated:	January 16, 2007

**Calibrated for DASY Systems**

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1569

### Sensitivity in Free Space<sup>A</sup>

### Diode Compression<sup>B</sup>

NormX	<b>1.79</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	<b>95</b> mV
NormY	<b>2.08</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	<b>95</b> mV
NormZ	<b>1.91</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	<b>93</b> mV

### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

### Boundary Effect

**TSL**                      **900 MHz**      **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		<b>3.7 mm</b>	<b>4.7 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	7.2	3.9
SAR <sub>be</sub> [%]	With Correction Algorithm	0.1	0.1

**TSL**                      **1750 MHz**      **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		<b>3.7 mm</b>	<b>4.7 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	6.2	3.7
SAR <sub>be</sub> [%]	With Correction Algorithm	0.1	0.3

### Sensor Offset

Probe Tip to Sensor Center                      **2.7 mm**

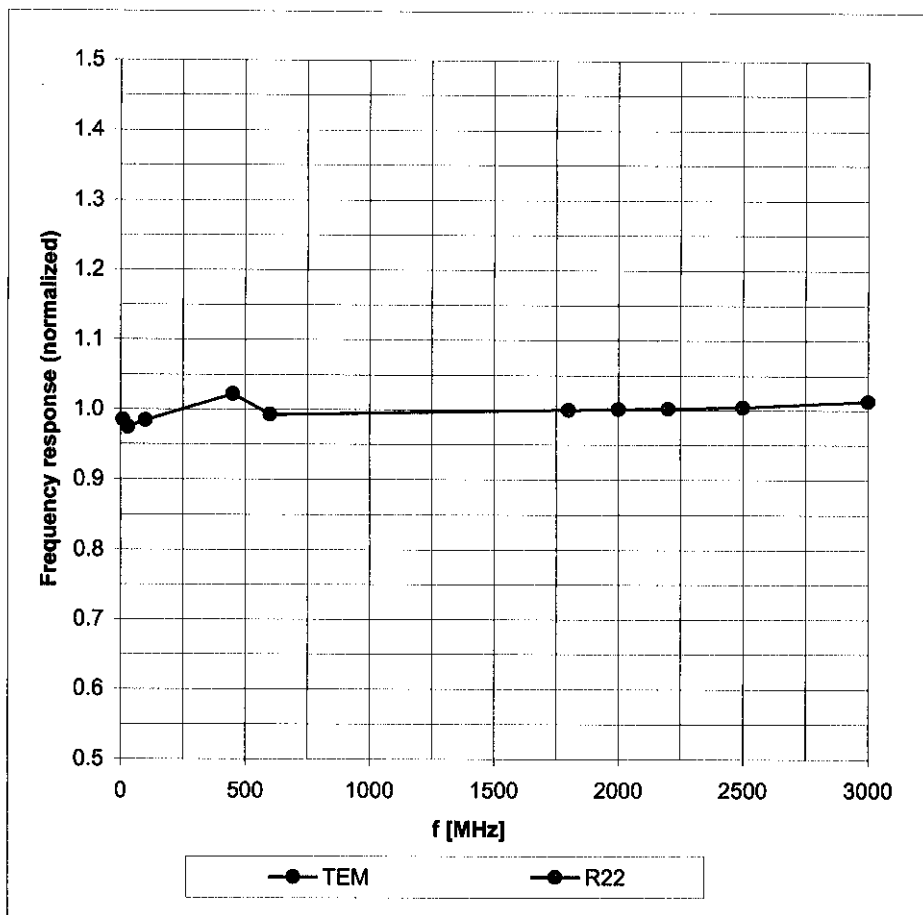
**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

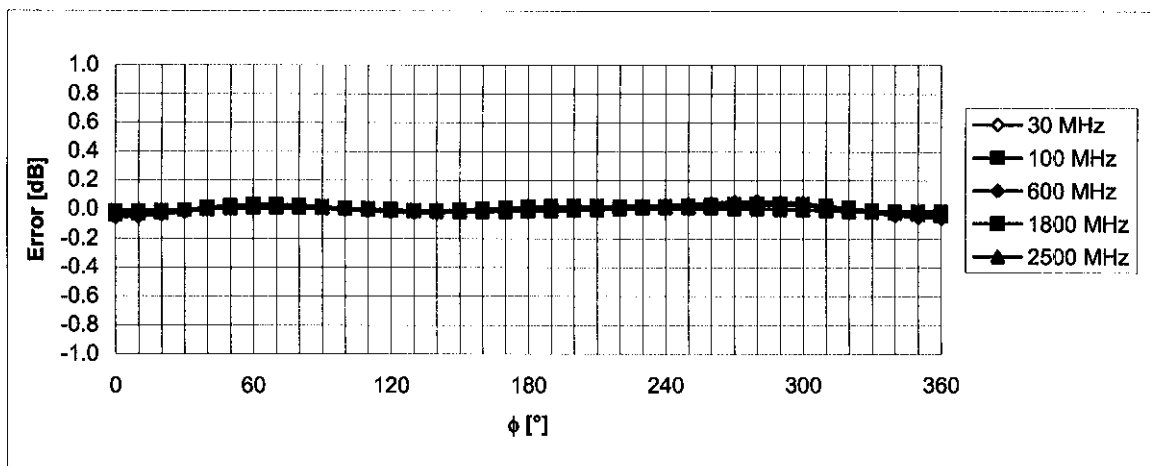
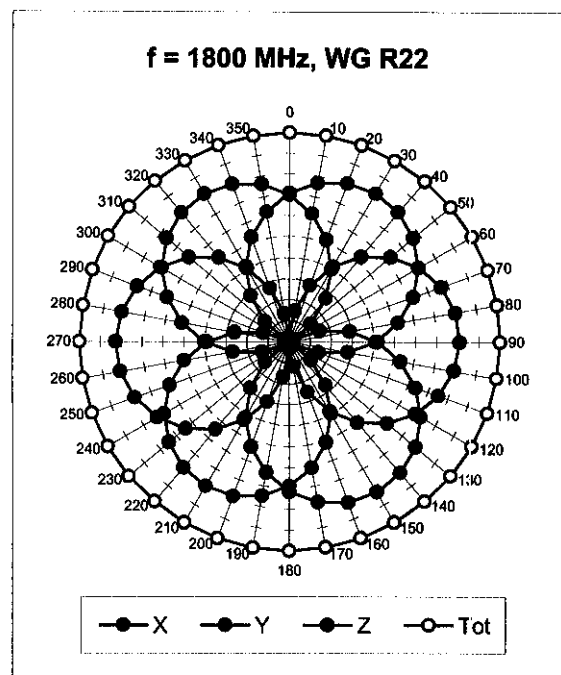
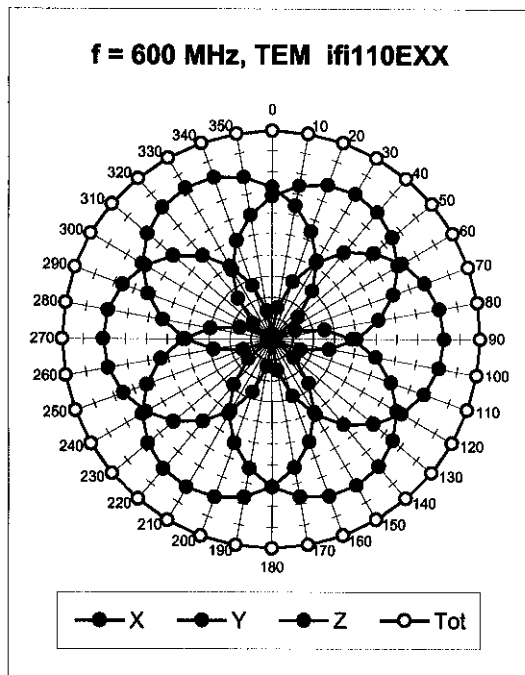
## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



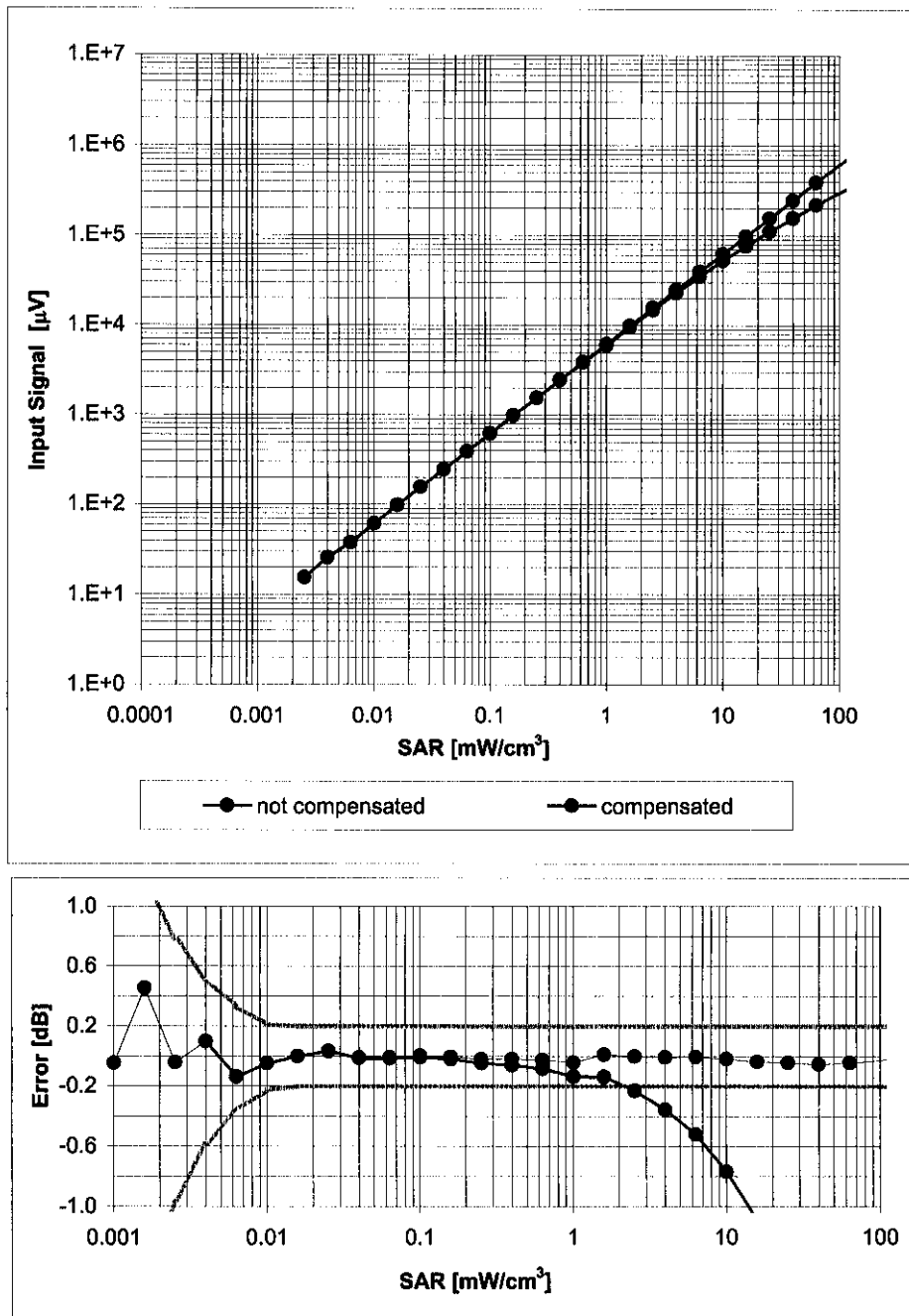
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

## Receiving Pattern ( $\phi$ ), $\vartheta = 0^\circ$



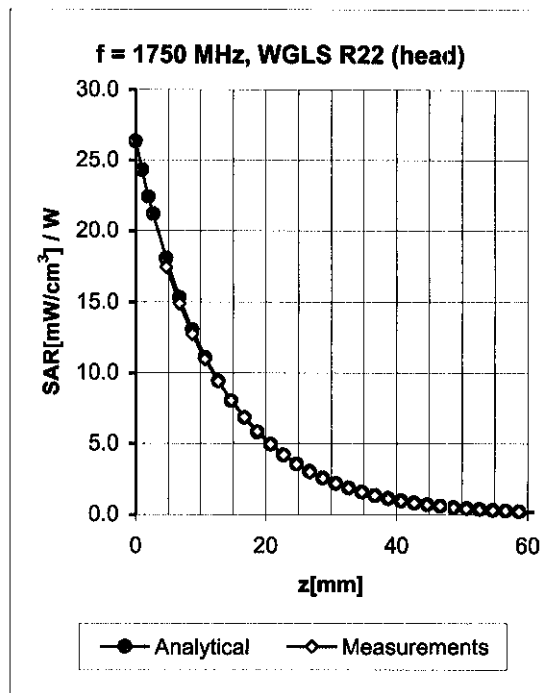
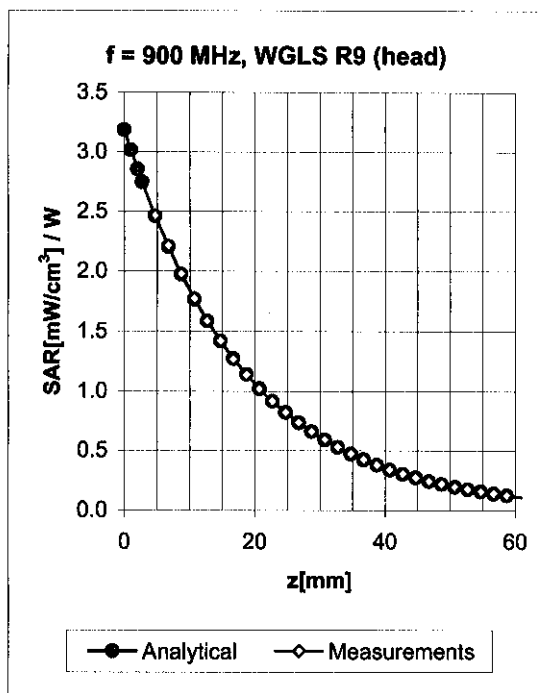
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

# Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$ )



Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment

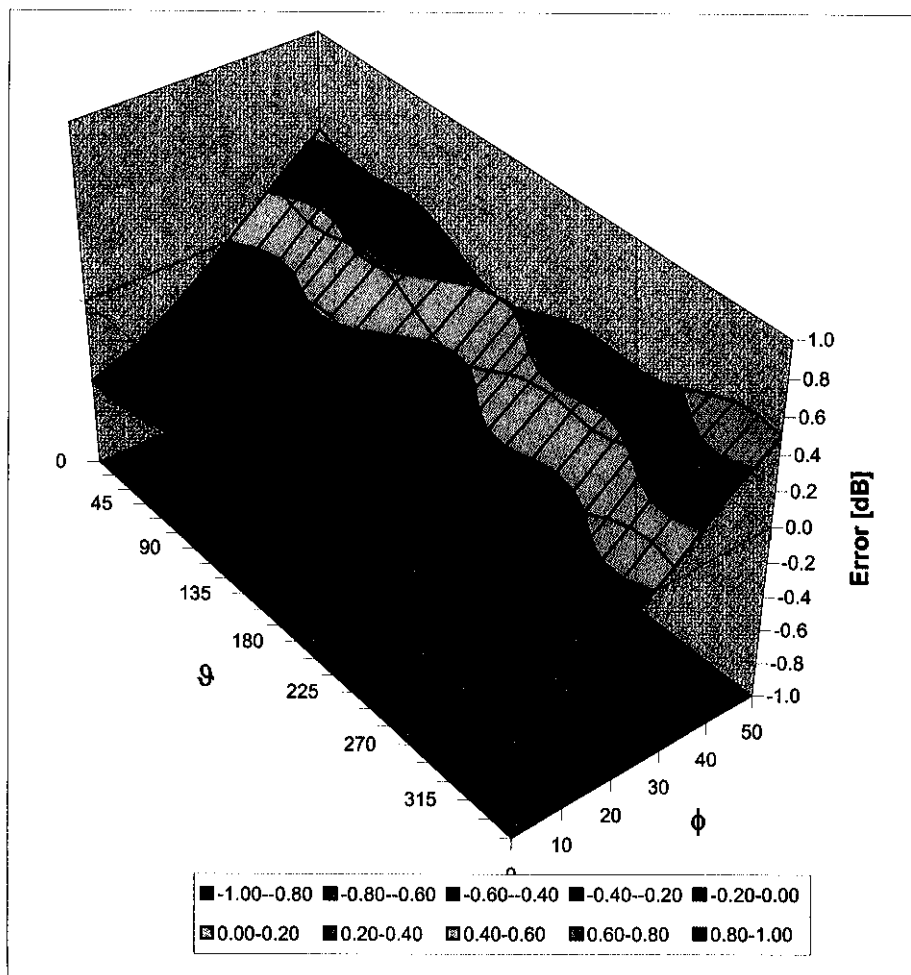


f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.27	2.56	6.89	± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.28	2.66	6.85	± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.44	2.88	5.47	± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.48	2.69	5.33	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.51	2.39	4.72	± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.25	2.73	6.94	± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.28	2.77	6.57	± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.52	2.90	4.96	± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.62	2.56	4.79	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.52	1.97	4.17	± 11.8% (k=2)

<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

## Deviation from Isotropy in HSL

Error ( $\phi$ ,  $\vartheta$ ),  $f = 900$  MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )



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Accreditation No.: **SCS 108**

Client **Sony Ericsson Lund**

Certificate No. **D1900V2-5d002\_Jan07**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d002**

Calibration procedure(s) **QA CAL-05.v6  
Calibration procedure for dipole validation kits**

Calibration date: **January 16, 2007**

Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Power sensor HP 8481A	US37292783	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ET3DV6	SN: 1507	19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Oct-07
Reference Probe ES3DV3	SN: 3025	19-Oct-06 (SPEAG, No. ES3-3025_Oct06)	Oct-07
DAE4	SN 907	20-Jul-06 (SPEAG, No. DAE4-907_Jul06)	Jul-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

Calibrated by: **Marcel Fahr** **Marcel Fahr** **Laboratory Technician**

Approved by: **Katja Pokovic** **Katja Pokovic** **Technical Manager**

Issued: January 17, 2007

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Accreditation No.: **SCS 108**

### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC 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), July 2001
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "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 Bulletin 65

### Additional Documentation:

- DASY4 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

<b>DASY Version</b>	DASY4	V4.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V5.0	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1900 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	38.8 $\pm$ 6 %	1.43 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(22.0 $\pm$ 0.2) °C	---	---

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	9.61 mW / g
SAR normalized	normalized to 1W	38.4 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>37.4 mW / g <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	5.04 mW / g
SAR normalized	normalized to 1W	20.2 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>19.8 mW / g <math>\pm</math> 16.5 % (k=2)</b>

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.9 ± 6 %	1.55 mho/m ± 6 %
Body TSL temperature during test	(21.1 ± 0.2) °C	---	---

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.94 mW / g
SAR normalized	normalized to 1W	39.8 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>38.6 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.24 mW / g
SAR normalized	normalized to 1W	21.0 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>20.6 mW / g ± 16.5 % (k=2)</b>

---

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$51.8 \Omega - 0.3 j\Omega$
Return Loss	- 34.9 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.2 \Omega + 2.3 j\Omega$
Return Loss	- 30.5 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.177 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 14, 2002

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d002**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

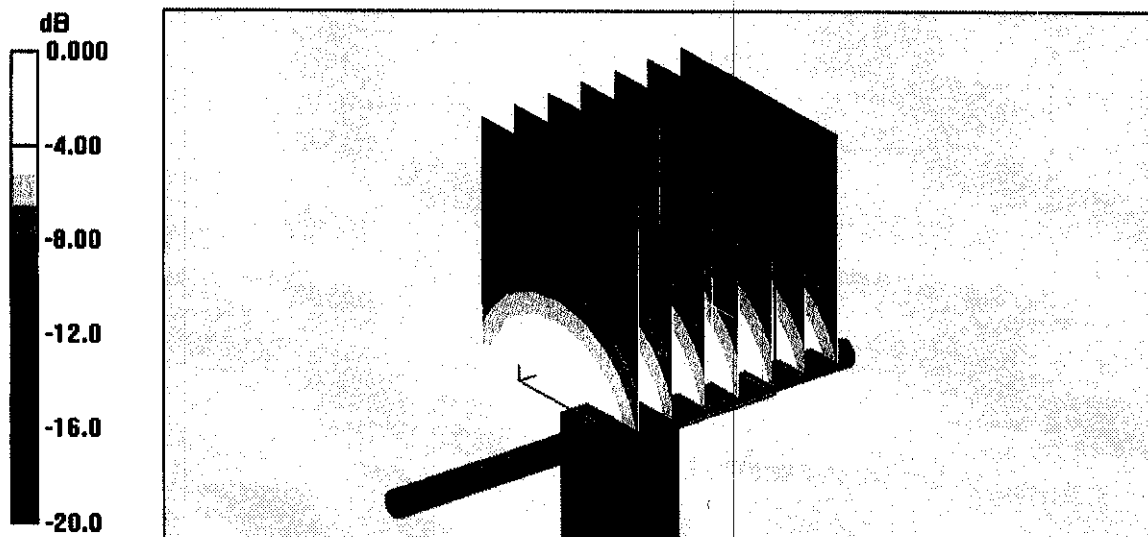
Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.43 \text{ mho/m}$ ;  $\epsilon_r = 38.8$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

**DASY4 Configuration:**

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn907; Calibrated: 20.07.2006
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ Reference Value =  $91.7 \text{ V/m}$ ; Power Drift =  $0.033 \text{ dB}$ Peak SAR (extrapolated) =  $17.0 \text{ W/kg}$ **SAR(1 g) =  $9.61 \text{ mW/g}$ ; SAR(10 g) =  $5.04 \text{ mW/g}$** Maximum value of SAR (measured) =  $11.0 \text{ mW/g}$ 0 dB =  $11.0 \text{ mW/g}$

# Impedance Measurement Plot for Head TSL

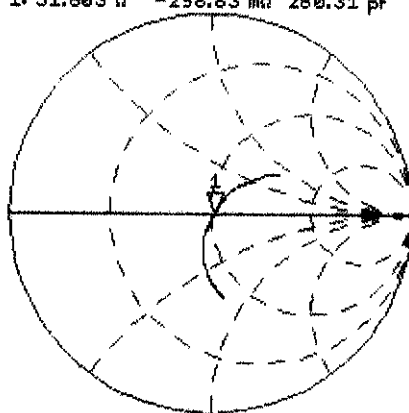
9 Jan 2007 11:53:45  
CH1 S11 1 U FS 1: 51.803  $\Omega$  -298.83 m $\Omega$  280.31 pF 1 900.000 000 MHz

\*  
De1

CA

Avg  
16

↑

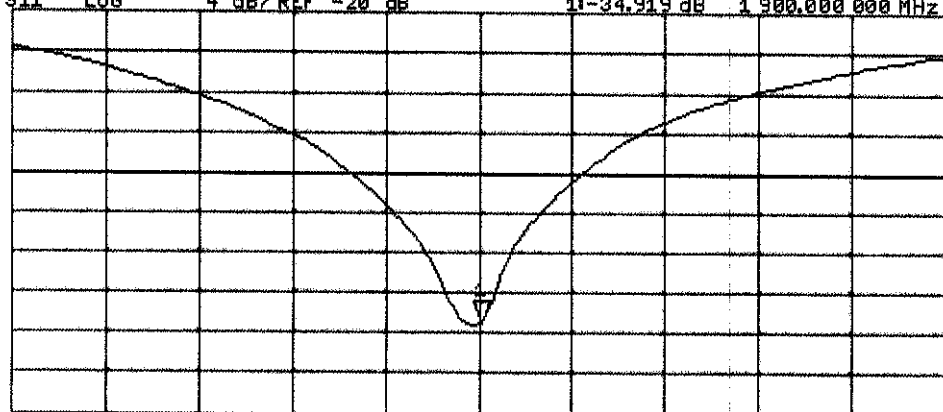


CH2 S11 LOG 4 dB/REF -20 dB 11-34.919 dB 1 900.000 000 MHz

CA

Avg  
16

↑



CENTER 1 900.000 000 MHz

SPAN 400.000 000 MHz

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d002**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB;

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.55 \text{ mho/m}$ ;  $\epsilon_r = 52.1$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

**DASY4 Configuration:**

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.43, 4.43, 4.43); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn907; Calibrated: 20.07.2006
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

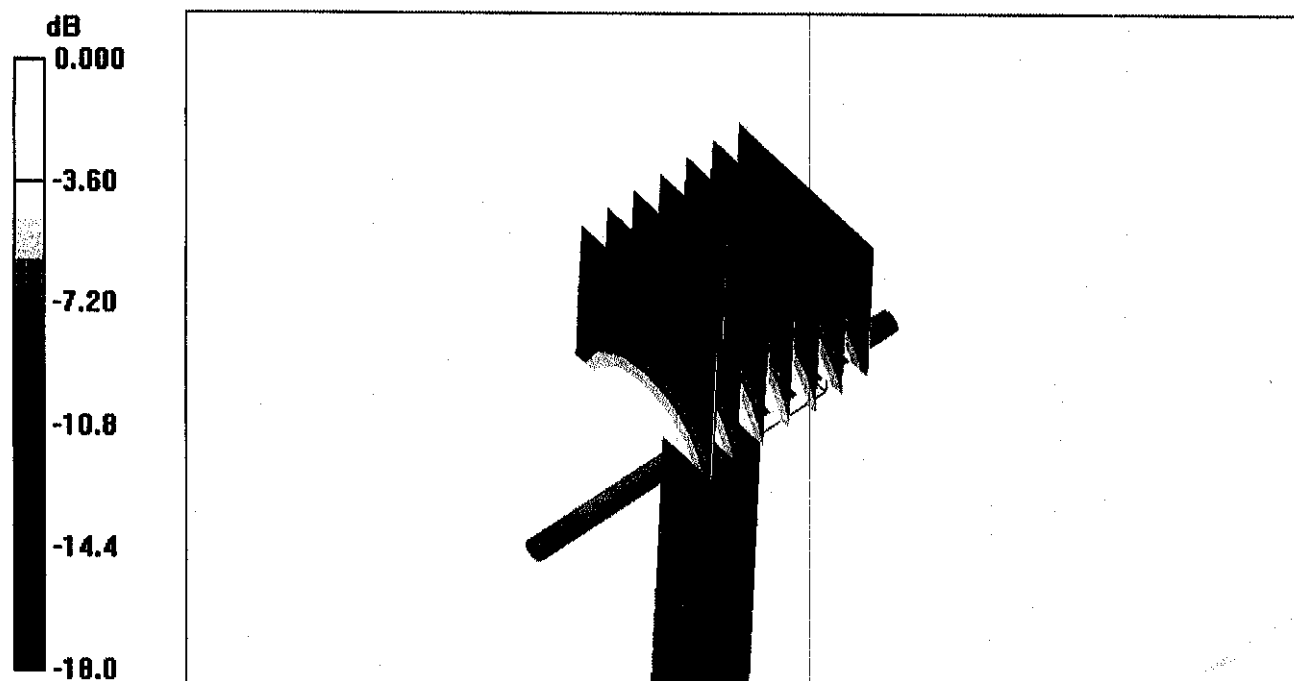
**Pin = 250 mW; d = 10 mm 2/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 85.8 V/m; Power Drift = 0.053 dB

Peak SAR (extrapolated) = 17.0 W/kg

**SAR(1 g) = 9.94 mW/g; SAR(10 g) = 5.24 mW/g**

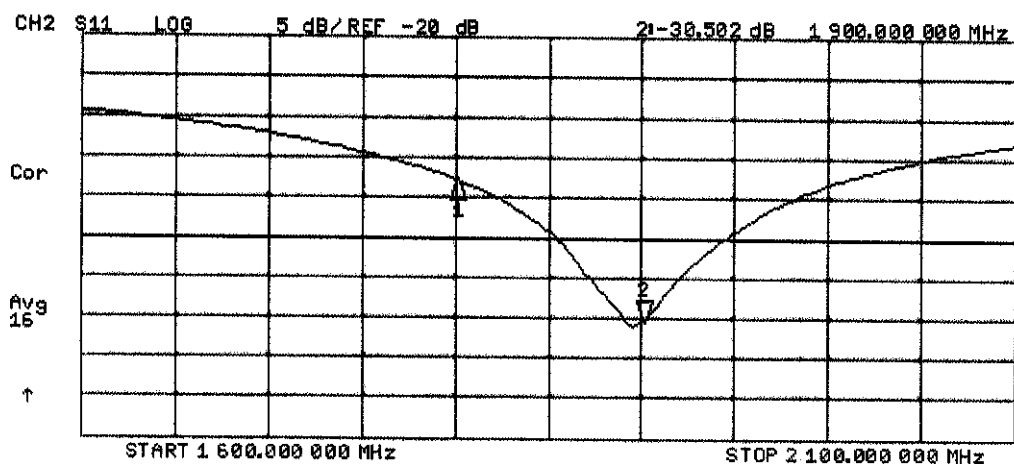
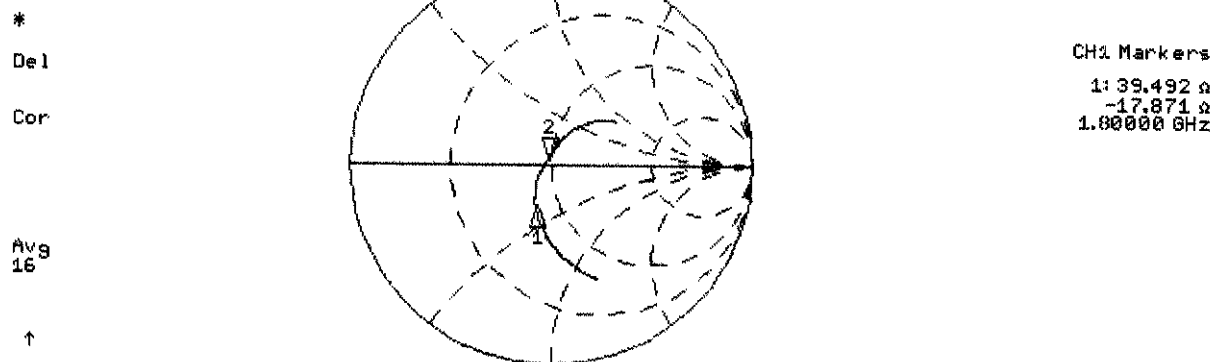
Maximum value of SAR (measured) = 11.3 mW/g



0 dB = 11.3mW/g

# Impedance Measurement Plot for Body TSL

16 Jan 2007 12:04:42  
 CH1 S11 1 U FS 2: 48.154  $\Omega$  2.2793  $\Omega$  190.93 pF 1 900.000 000 MHz



Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d002**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.43$  mho/m;  $\epsilon_r = 38.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

## DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn907; Calibrated: 20.07.2006
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:**

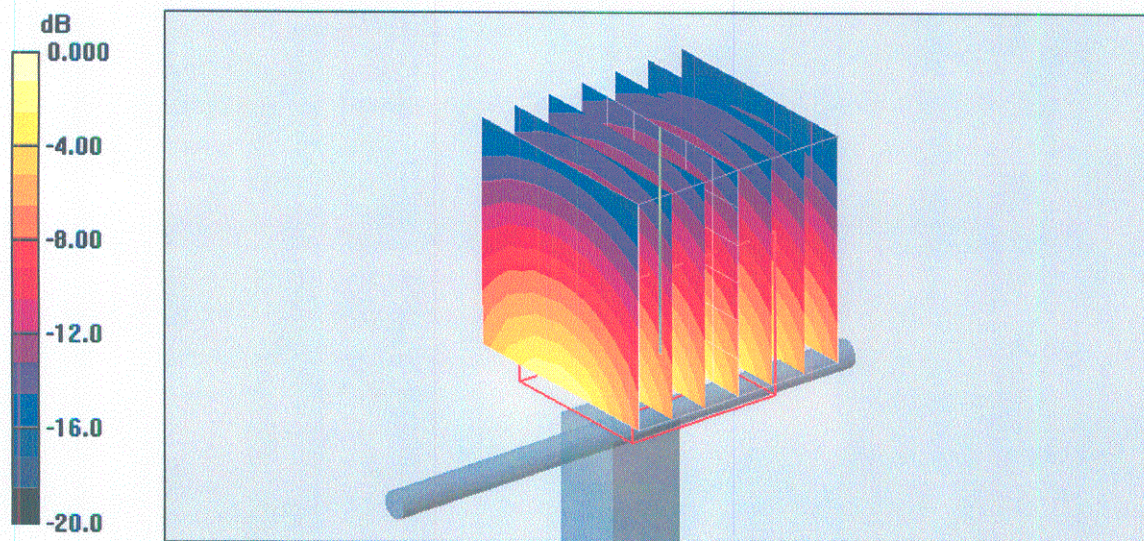
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.7 V/m; Power Drift = 0.033 dB

Peak SAR (extrapolated) = 17.0 W/kg

**SAR(1 g) = 9.61 mW/g; SAR(10 g) = 5.04 mW/g**

Maximum value of SAR (measured) = 11.0 mW/g



0 dB = 11.0mW/g

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d002**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB;

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.55 \text{ mho/m}$ ;  $\epsilon_r = 52.1$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

## DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.43, 4.43, 4.43); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn907; Calibrated: 20.07.2006
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Pin = 250 mW; d = 10 mm 2/Zoom Scan (7x7x7)/Cube 0:**

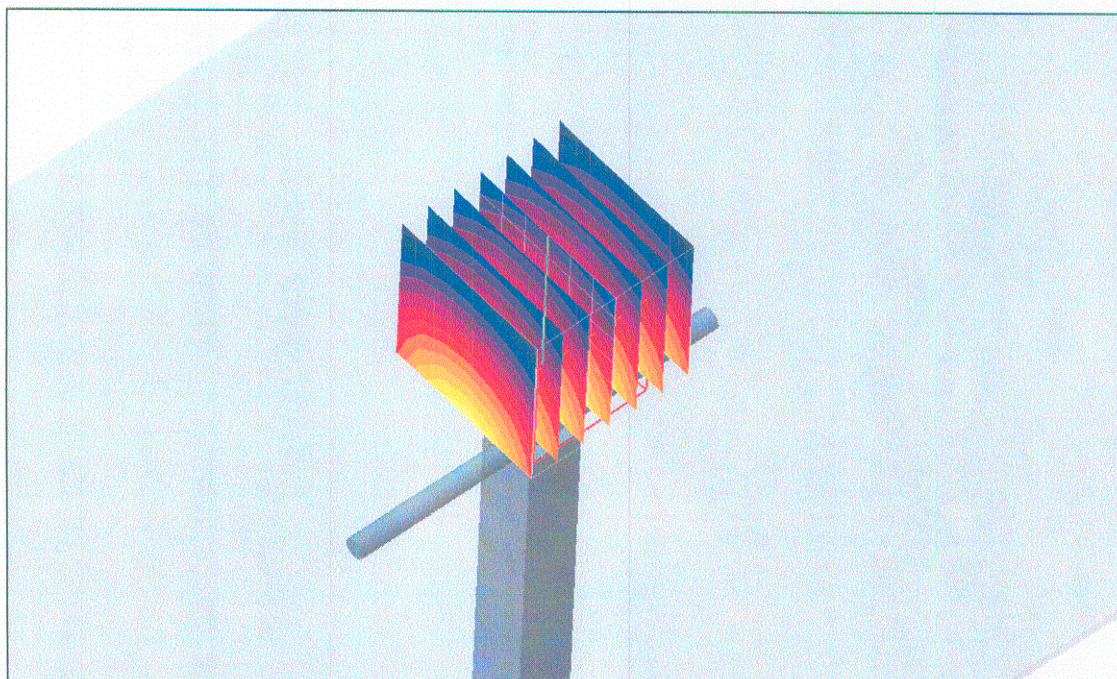
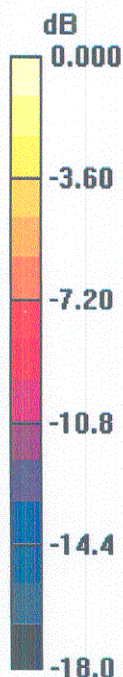
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 85.8 V/m; Power Drift = 0.053 dB

Peak SAR (extrapolated) = 17.0 W/kg

**SAR(1 g) = 9.94 mW/g; SAR(10 g) = 5.24 mW/g**

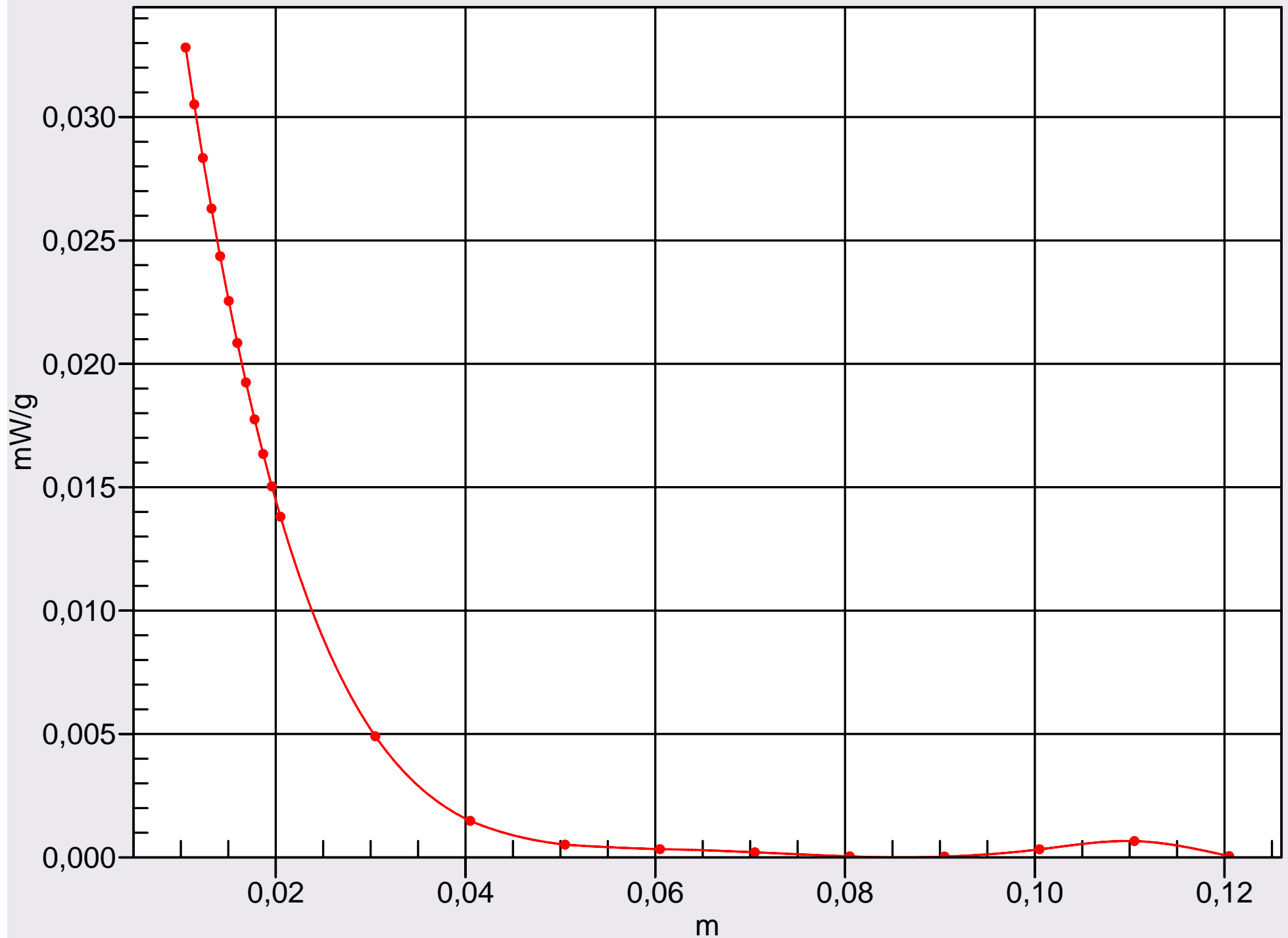
Maximum value of SAR (measured) = 11.3 mW/g



0 dB = 11.3mW/g

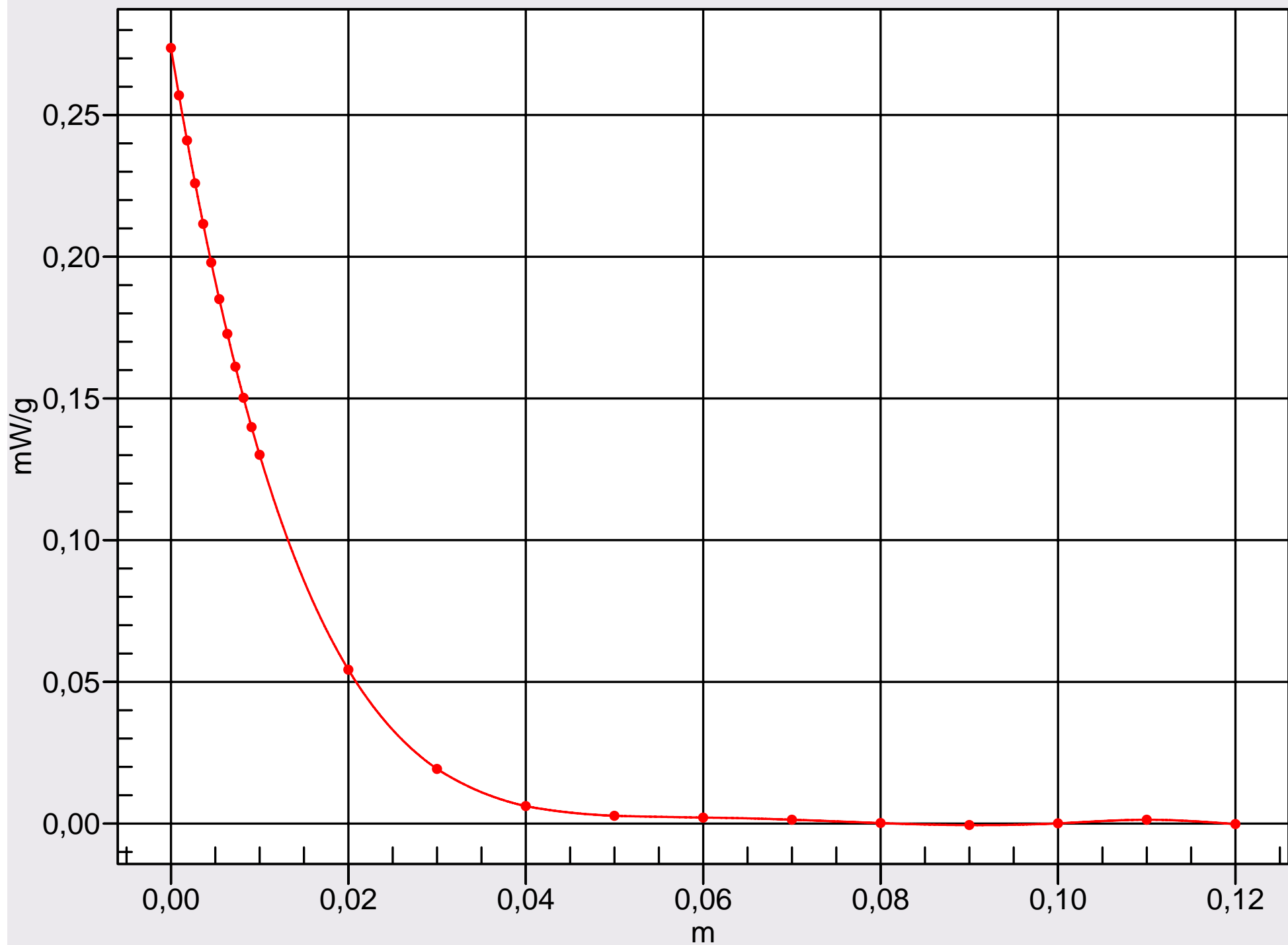
# Interpolated SAR(x,y,z,f0)

HSL1900 SAR; Z Scan: Value Along Z, X=0, Y=0



# Interpolated SAR(x,y,z,f0)

MSL1900 SAR; Z Scan: Value Along Z, X=0, Y=0





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 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sony Ericsson Lund**

Certificate No: **D835V2-4d039\_May06**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d039**

Calibration procedure(s) **QA CAL-05.v6**  
**Calibration procedure for dipole validation kits**

Calibration date: **May 31, 2006**

Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference Probe ET3DV6	SN 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by:	Name <b>Mike Meili</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	<b>Katja Pokovic</b>	<b>Technical Manager</b>	

Issued: June 1, 2006

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

**Glossary:**

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

**Calibration is Performed According to the Following Standards:**

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) CENELEC 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), July 2001
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "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 Bulletin 65

**Additional Documentation:**

- d) DASY4 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

<b>DASY Version</b>	DASY4	V4.6
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V4.9	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Area Scan resolution</b>	dx, dy = 15 mm	
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	835 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	<b>Temperature</b>	<b>Permittivity</b>	<b>Conductivity</b>
<b>Nominal Head TSL parameters</b>	22.0 °C	41.5	0.90 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	41.9 $\pm$ 6 %	0.90 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(23.0 $\pm$ 0.2) °C	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	2.31 mW / g
SAR normalized	normalized to 1W	9.24 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>9.29 mW / g <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	1.50 mW / g
SAR normalized	normalized to 1W	6.00 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>6.03 mW / g <math>\pm</math> 16.5 % (k=2)</b>

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.8 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature during test	(23.2 ± 0.2) °C	----	----

## SAR result with Body TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	2.39 mW / g
SAR normalized	normalized to 1W	9.56 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>9.66 mW / g ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	1.56 mW / g
SAR normalized	normalized to 1W	6.24 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>6.31 mW / g ± 16.5 % (k=2)</b>

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 $\Omega$ - 2.1 j $\Omega$
Return Loss	- 32.5 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.9 $\Omega$ - 3.5 j $\Omega$
Return Loss	- 27.6 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.382 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 20, 2005

## DASY4 Validation Report for Head TSL

Date/Time: 31.05.2006 10:59:32

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d039**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB\_060425;

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.912 \text{ mho/m}$ ;  $\epsilon_r = 41.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(6.09, 6.09, 6.09); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

**Pin = 250 mW; d = 10 mm/Area Scan (71x81x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) =  $2.44 \text{ mW/g}$

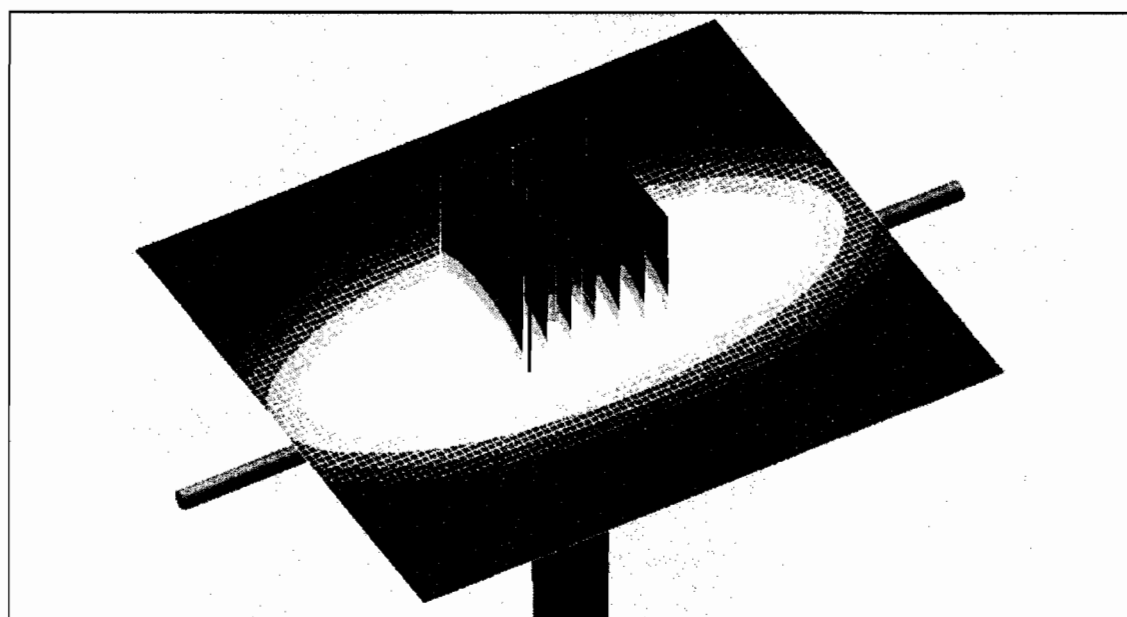
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value =  $54.1 \text{ V/m}$ ; Power Drift =  $0.031 \text{ dB}$

Peak SAR (extrapolated) =  $3.48 \text{ W/kg}$

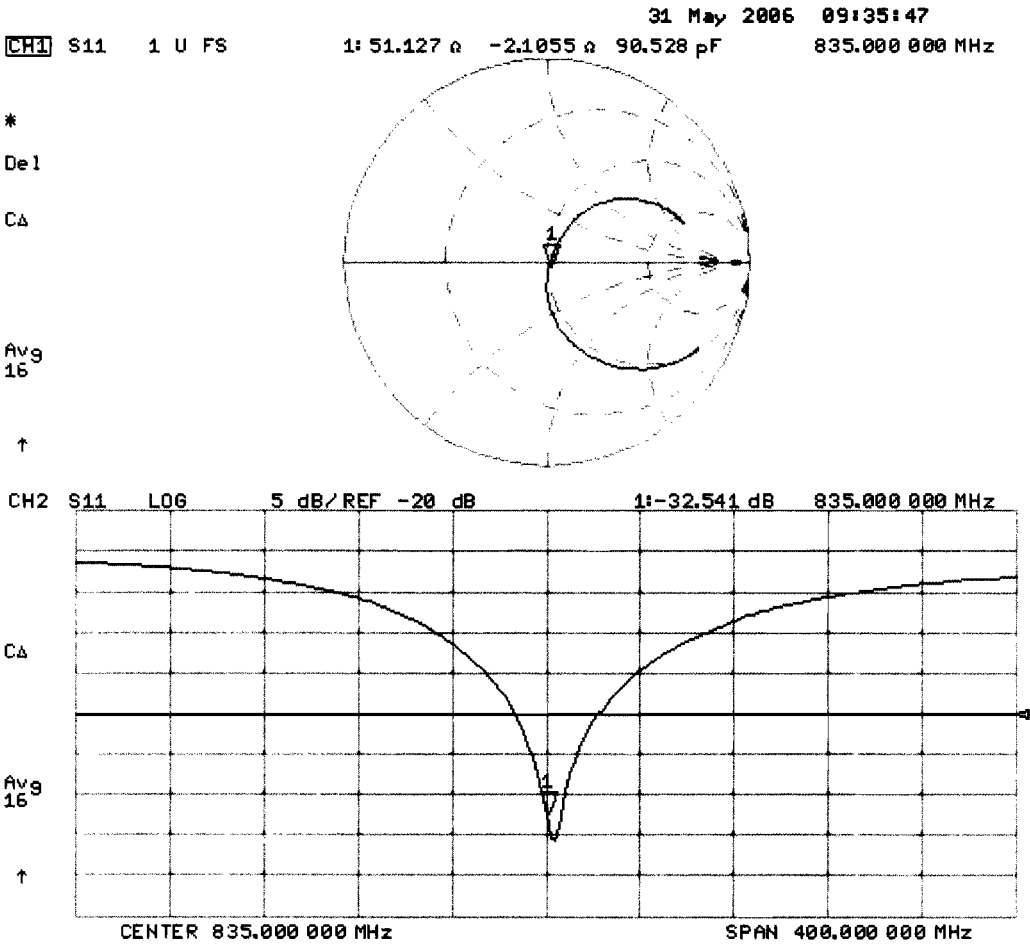
**SAR(1 g) =  $2.31 \text{ mW/g}$ ; SAR(10 g) =  $1.5 \text{ mW/g}$**

Maximum value of SAR (measured) =  $2.48 \text{ mW/g}$



0 dB =  $2.48 \text{ mW/g}$

Impedance Measurement Plot for Head TSL



## DASY4 Validation Report for Body TSL

Date/Time: 31.05.2006 13:23:15

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d039**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB;

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.997 \text{ mho/m}$ ;  $\epsilon_r = 56.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.84, 5.84, 5.84); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

**Pin = 250 mW; d = 15 mm/Area Scan (81x81x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 2.59 mW/g

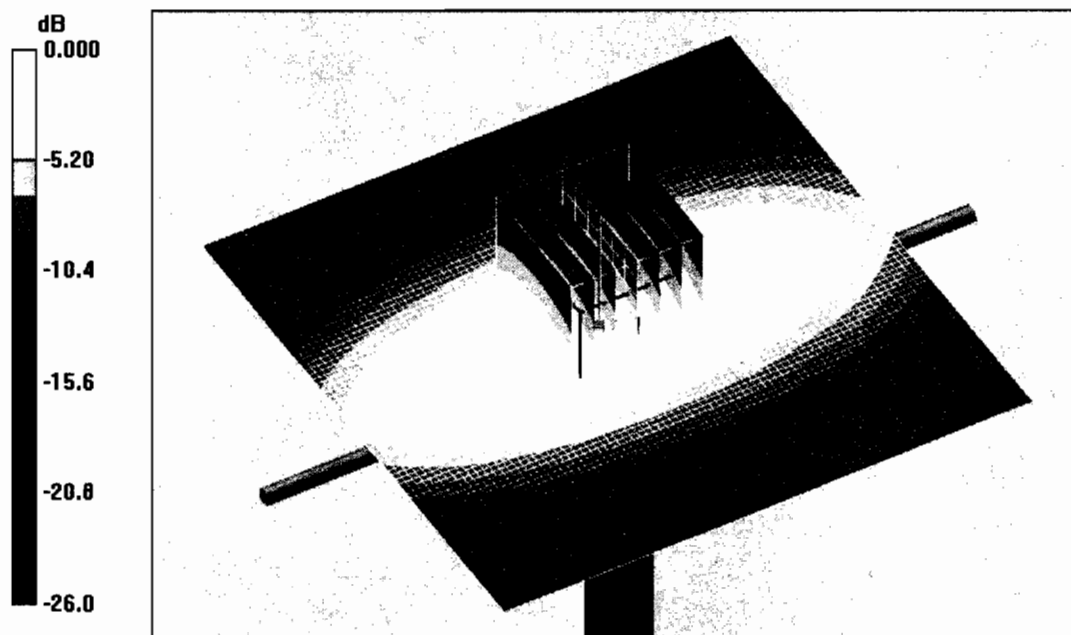
**Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 53.1 V/m; Power Drift = -0.014 dB

Peak SAR (extrapolated) = 3.45 W/kg

**SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.56 mW/g**

Maximum value of SAR (measured) = 2.58 mW/g



0 dB = 2.58mW/g

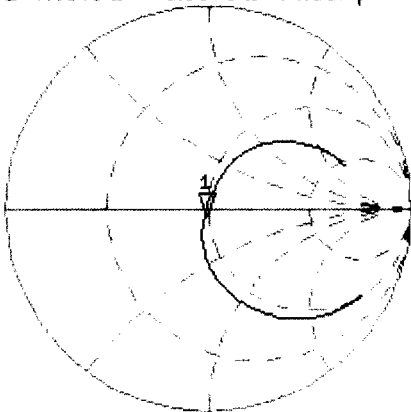
Impedance Measurement Plot Body TSL

31 May 2006 12:26:44  
CH1 S11 1 U FS 1: 47.943  $\Omega$  -3.5078  $\Omega$  54.337 pF 835.000 000 MHz

\*  
De1  
CA

Avg  
16

↑

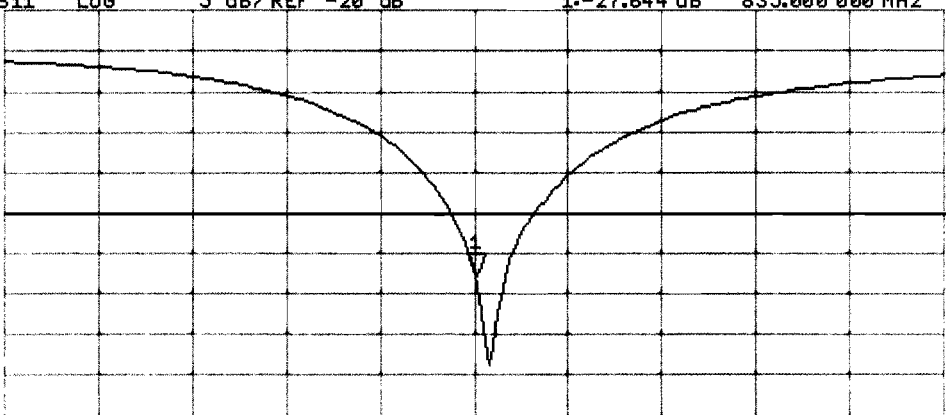


CH2 S11 LOG 5 dB/REF -20 dB 1:-27.644 dB 835.000 000 MHz

CA

Avg  
16

↑



CENTER 835.000 000 MHz SPAN 400.000 000 MHz



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sony Ericsson Lund**

Certificate No: **D1900V2-5d073\_May06**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d073**

Calibration procedure(s) **QA CAL-05.v6**  
**Calibration procedure for dipole validation kits**

Calibration date: **May 31, 2006**

Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference Probe ET3DV6	SN: 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN: 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by: **Name** **Mike Meili** **Function** **Laboratory Technician** **Signature** *M. Meili*

Approved by: **Katja Pokovic** **Technical Manager** *K. Pokovic*

Issued: June 1, 2006

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Accreditation No.: **SCS 108**

### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) CENELEC 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), July 2001
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "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 Bulletin 65

### Additional Documentation:

- d) DASY4 System Handbook

### Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

<b>DASY Version</b>	DASY4	V4.6
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V5.0	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Area Scan resolution</b>	dx, dy = 15 mm	
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1900 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.41 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(22.8 $\pm$ 0.2) °C	---	---

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	9.67 mW / g
SAR normalized	normalized to 1W	38.7 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>38.2 mW / g <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	5.11 mW / g
SAR normalized	normalized to 1W	20.4 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>20.3 mW / g <math>\pm</math> 16.5 % (k=2)</b>

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.7 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature during test	(22.7 ± 0.2) °C	----	----

## SAR result with Body TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	10.4 mW / g
SAR normalized	normalized to 1W	41.6 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>41.9 mW / g ± 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	5.50 mW / g
SAR normalized	normalized to 1W	22.0 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>22.2 mW / g ± 16.5 % (k=2)</b>

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.6 \Omega + 5.7 j\Omega$
Return Loss	- 24.3 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.9 \Omega + 6.4 j\Omega$
Return Loss	- 23.7 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 24, 2006

## DASY4 Validation Report for Head TSL

Date/Time: 31.05.2006 11:49:47

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d073**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.41$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.74, 4.74, 4.74); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

**Pin = 250 mW; d = 10 mm/Area Scan (71x71x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 11.6 mW/g

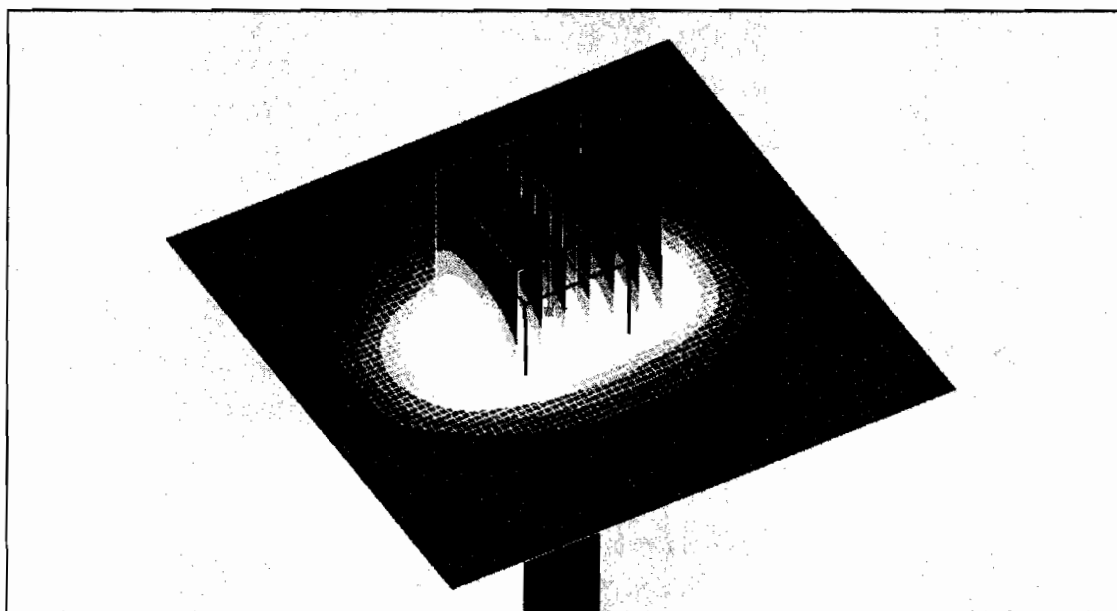
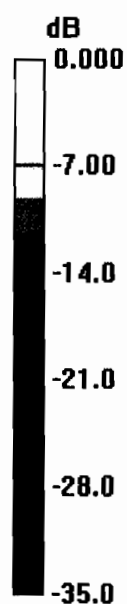
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.1 V/m; Power Drift = -0.023 dB

Peak SAR (extrapolated) = 16.6 W/kg

**SAR(1 g) = 9.67 mW/g; SAR(10 g) = 5.11 mW/g**

Maximum value of SAR (measured) = 10.9 mW/g



0 dB = 10.9mW/g

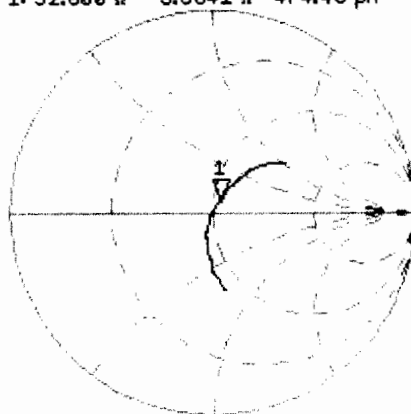
# Impedance Measurement Plot for Head TSL

31 May 2006 09:41:45  
 CH1 S11 1 U FS 1: 52.600  $\Omega$  5.6641  $\Omega$  474.45 pF 1 900.000 000 MHz

\*  
 Del  
 CA

Avg  
 16

↑

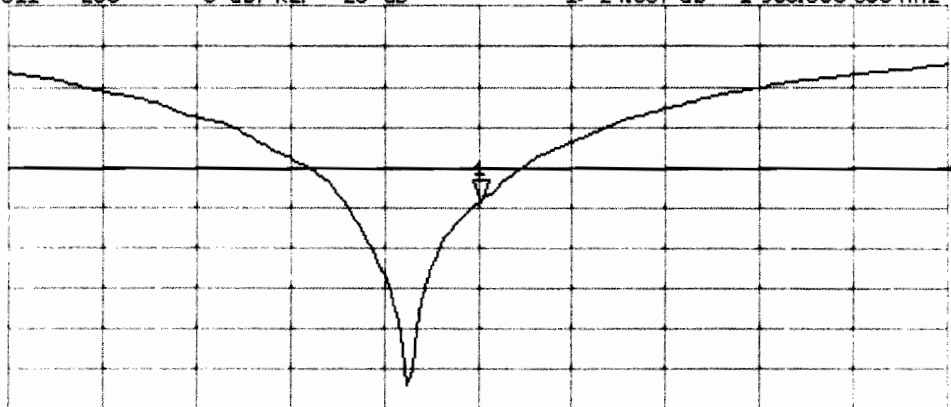


CH2 S11 LOG 5 dB/REF -20 dB 1:-24.337 dB 1 900.000 000 MHz

CA

Avg  
 16

↑



CENTER 1 900.000 000 MHz

SPAN 400.000 000 MHz

## DASY4 Validation Report for Body TSL

Date/Time: 31.05.2006 14:35:04

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d073**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL U10;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 54.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.3, 4.3, 4.3); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

**Pin = 250 mW; d = 10 mm/Area Scan (71x71x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.6 mW/g

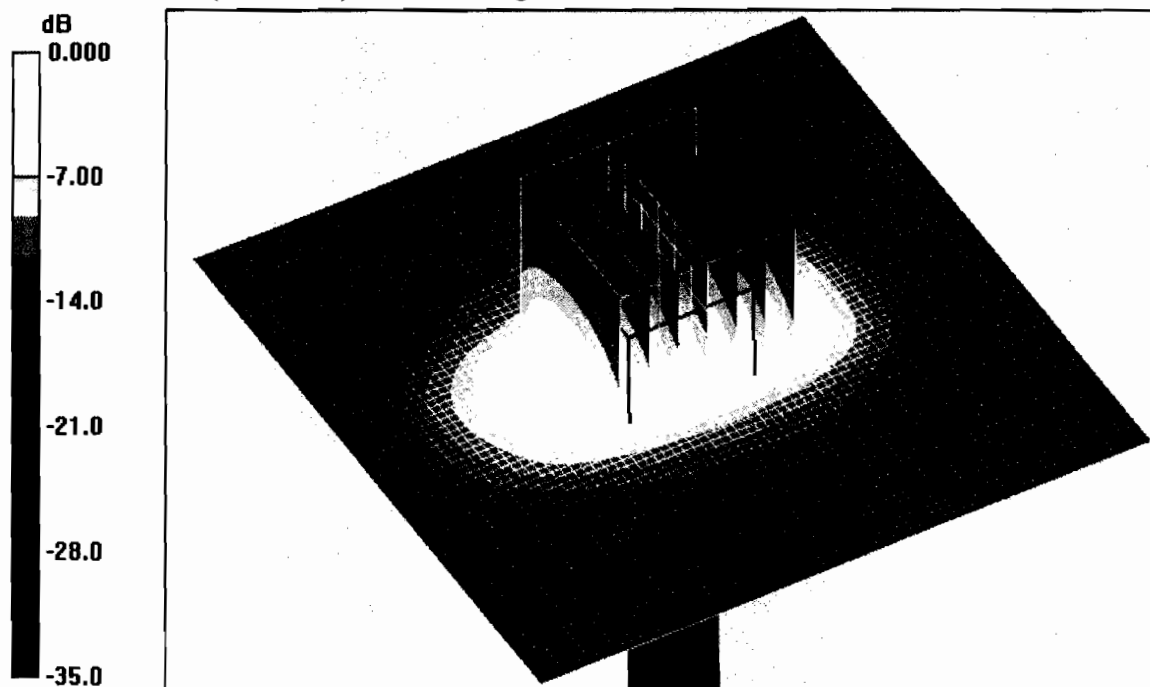
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.4 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 17.8 W/kg

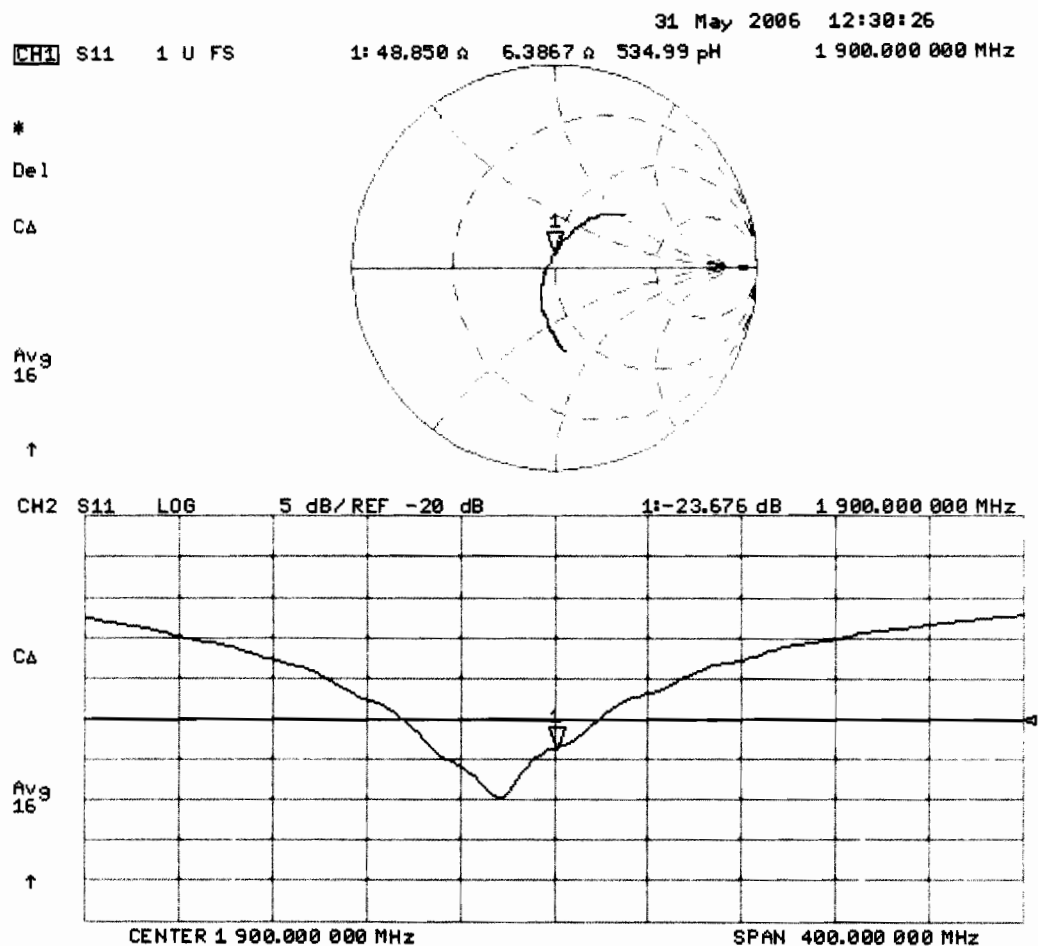
**SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.5 mW/g**

Maximum value of SAR (measured) = 11.7 mW/g



0 dB = 11.7mW/g

Impedance Measurement Plot for Body TSL





S Schweizerischer Kallbrlerdienst  
C Service suisse d'etalonnage  
S Servizio svizzero di taratura  
S Swiss Calibration Service

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Sony Ericsson Lund Certificate No. ET3-1815\_Jan07

CALIBRATION CERTIFICATE

Object ET3DV6 - SN: 1815

Calibration procedure(s) QA CAL-01 v5  
Calibration procedure for dosimetric E-field probes

Calibration date: January 16, 2007

Condition of the calibrated item In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Karla Pokorny	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: January 16, 2007

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## Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC 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), July 2001

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the  $E^2$ -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* frequency\_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>:** DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

# Probe ET3DV6

## SN:1815

Manufactured:	February 27, 2004
Last calibrated:	January 20, 2006
Recalibrated:	January 16, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1815

### Sensitivity in Free Space<sup>A</sup>

### Diode Compression<sup>B</sup>

NormX	<b>1.93</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	<b>90</b> mV
NormY	<b>1.97</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	<b>93</b> mV
NormZ	<b>2.07</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	<b>96</b> mV

### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

### Boundary Effect

**TSL**                      **900 MHz**      **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		<b>3.7 mm</b>	<b>4.7 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	5.0	2.3
SAR <sub>be</sub> [%]	With Correction Algorithm	0.0	0.0

**TSL**                      **1750 MHz**      **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		<b>3.7 mm</b>	<b>4.7 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	6.8	3.9
SAR <sub>be</sub> [%]	With Correction Algorithm	0.1	0.3

### Sensor Offset

Probe Tip to Sensor Center                      **2.7 mm**

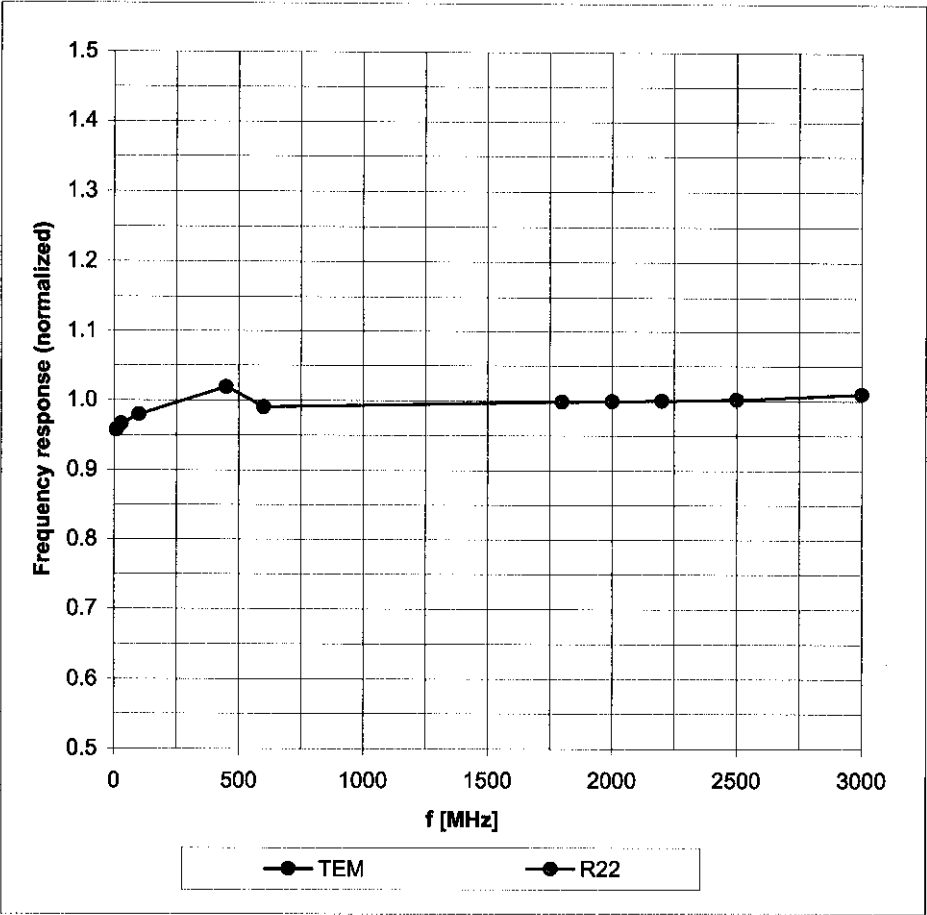
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Page 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

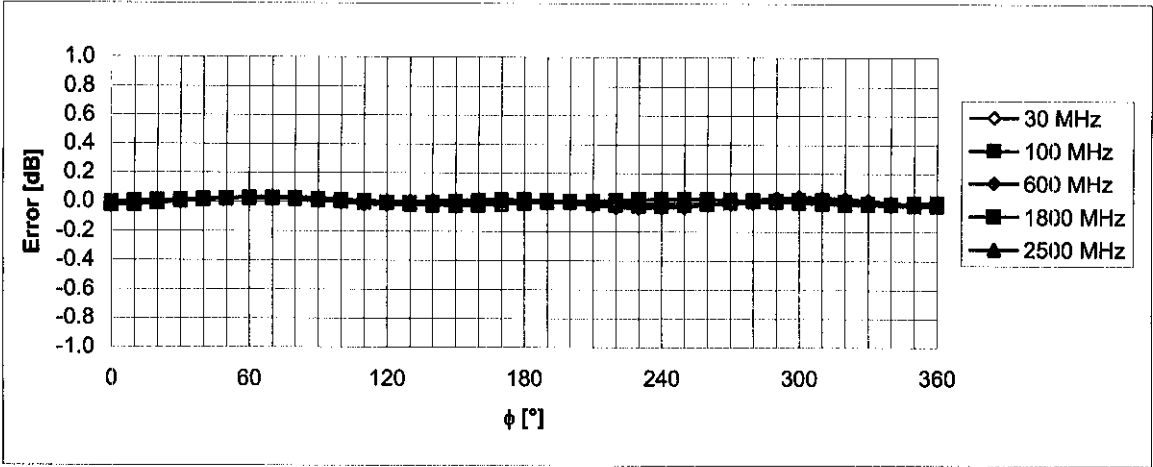
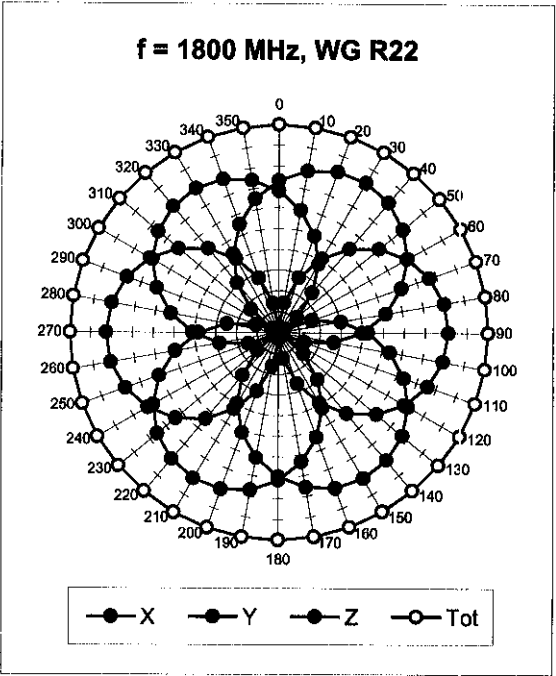
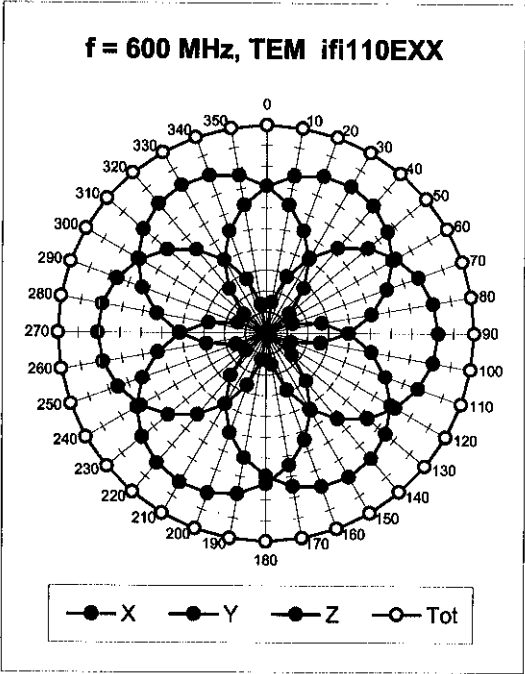
# Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



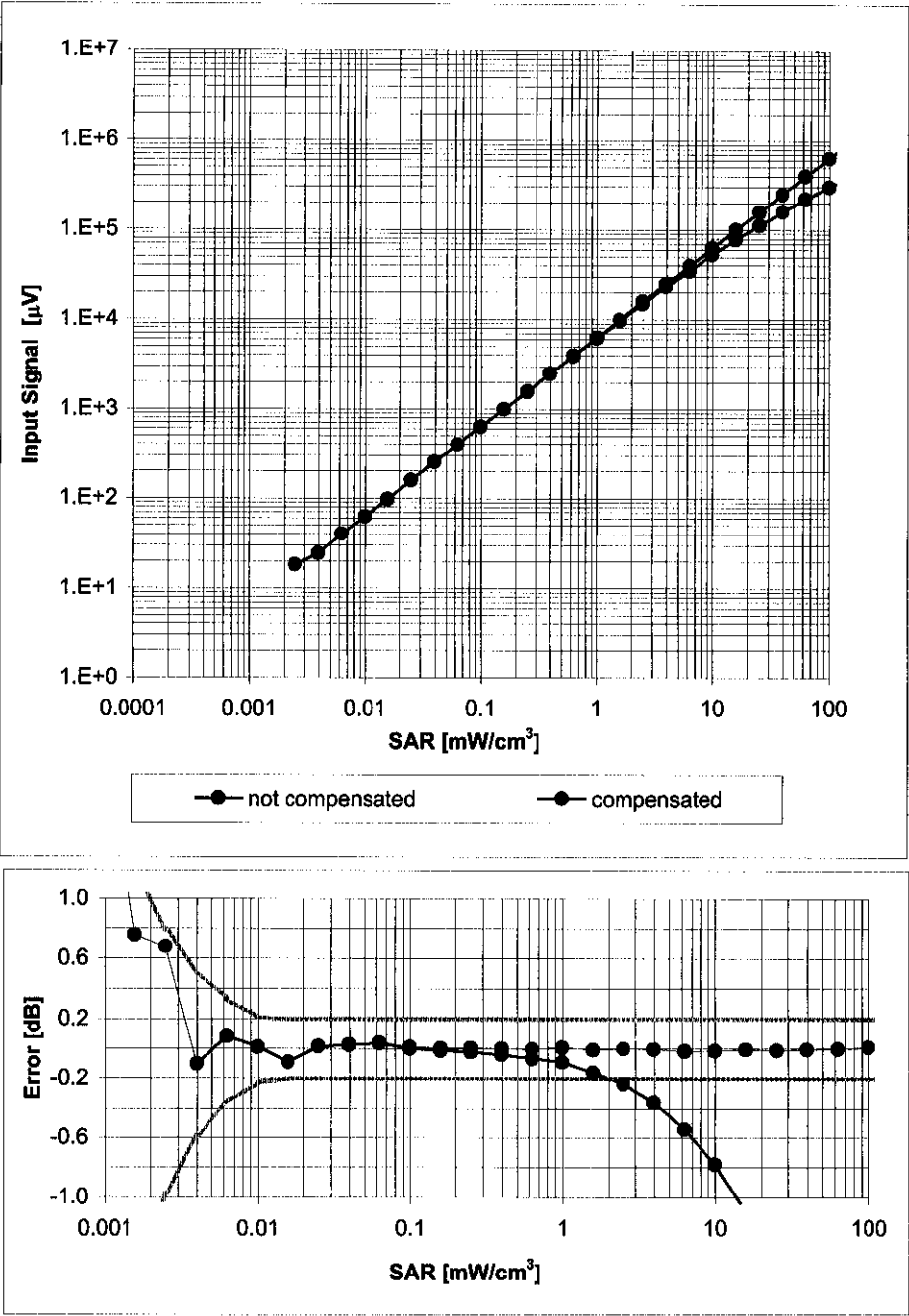
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

Receiving Pattern ( $\phi$ ),  $\vartheta = 0^\circ$



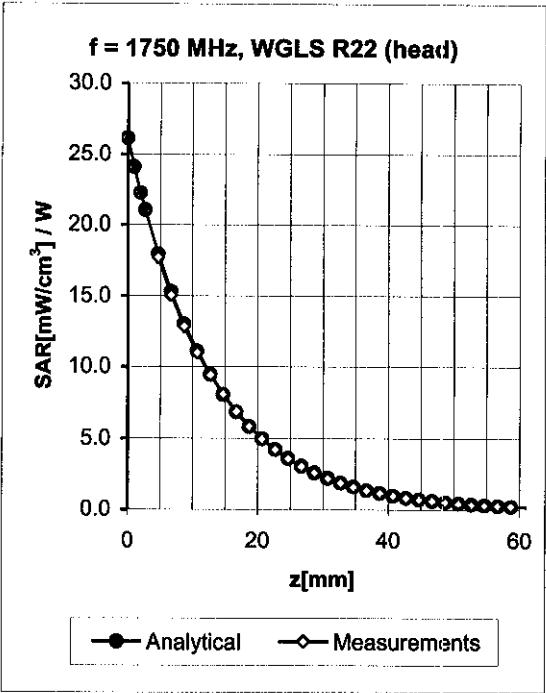
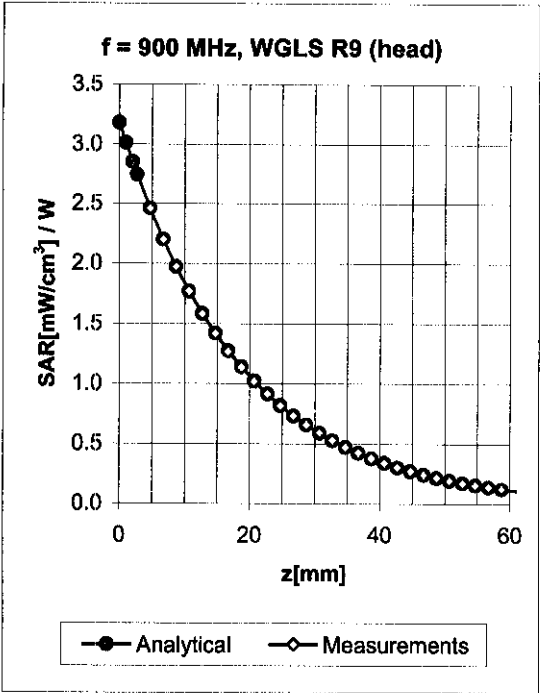
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

**Dynamic Range  $f(\text{SAR}_{\text{head}})$**   
(Waveguide R22,  $f = 1800 \text{ MHz}$ )



Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

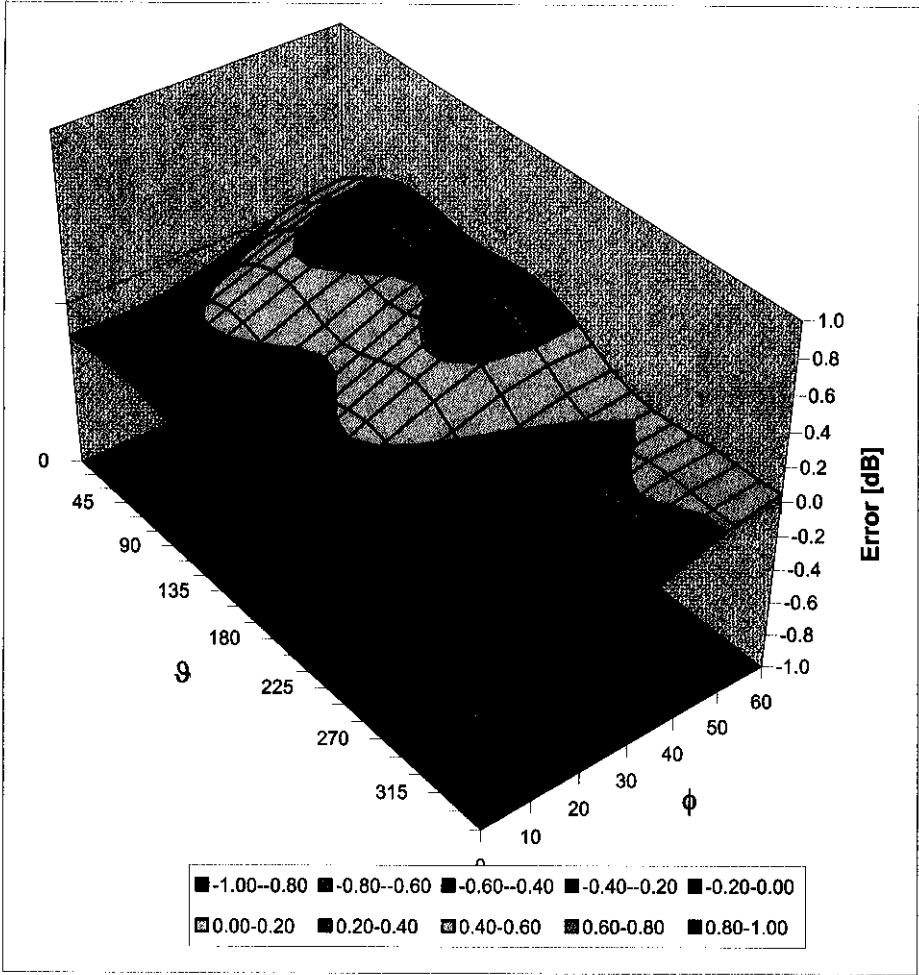
Conversion Factor Assessment



f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.27	2.57	6.79 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.28	2.64	6.73 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.48	2.54	5.36 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.52	2.59	5.21 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.65	2.05	4.71 ± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.25	2.85	6.86 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.28	2.87	6.50 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.50	2.87	4.97 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.65	2.45	4.75 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.66	1.82	4.16 ± 11.8% (k=2)

<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

**Deviation from Isotropy in HSL**  
Error ( $\phi$ ,  $\vartheta$ ),  $f = 900 \text{ MHz}$



**Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )**