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LD/SEMC/BGLIM *Magnus Söderman*

Approved

LD/SEMC/BGLIMC *Peter Lindeborg*

Checked

080207

Company Internal  
REPORT

No.

BGLI08:074

Date

080206

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**Report issued by Accredited SAR Laboratory****for****PY7A1022112 (Z555i)****Date of test:** 30<sup>th</sup> - 31<sup>st</sup> of January, 2008**Laboratory:** Sony Ericsson SAR Test Laboratory  
Sony Ericsson Mobile Communications AB  
Nya Vattentornet  
SE-221 82 LUND, Sweden**Testing Engineer:** Magnus Söderman  
magnus1.soderman@sonyericsson.com  
+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-1022112-BV; FCC ID PY7A1022112; IC 4170B-A1022112***

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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## 1 Introduction

In this test report, compliance of the Sony Ericsson PY7A1022112 (Z555i) 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].

## 2 Device Under Test

### 2.1 Device description

<b>Device model</b>	AAB-1022112-BV		
<b>Market name</b>	Z555i		
<b>Serial number (EUT #)</b>	CB510VWLWC (#10229)		
<b>Mode</b>	GSM 1900		
<b>Crest factor</b>	8.3		
<b>Multiple access scheme</b>	TDMA		
<b>Channel No.</b>	512	661	810
<b>Maximum output power setting [dBm]</b>	30.0	30.0	30.0
<b>Factory tolerance in power setting</b>	±0.5 dB		
<b>Maximum peak output power [dBm]</b>	30.5	30.5	30.5
<b>Data mode</b>	GPRS		
<b>Crest factor</b>	4.15		
<b>Maximum output power setting [dBm]</b>	30.0	30.0	30.0
<b>Factory tolerance in power setting</b>	±0.5 dB		
<b>Maximum peak output power [dBm]</b>	30.5	30.5	30.5
<b>Data mode</b>	EDGE		
<b>Crest factor</b>	4.15		
<b>Maximum output power setting [dBm]</b>	26.5	26.5	26.5
<b>Factory tolerance in power setting</b>	±0.5 dB		
<b>Maximum peak output power [dBm]</b>	27.0	27.0	27.0
<b>Transmitting frequency range [MHz]</b>	1850.2 - 1909.8		
<b>GPRS Multislot class</b>	10		
<b>EDGE class</b>	10		
<b>GPRS Capability class</b>	B		
<b>Prototype or production unit</b>	Preproduction		
<b>Hardware version</b>	AP2		
<b>Software version</b>	R9BA013		
<b>Device category</b>	Portable		
<b>RF exposure environment</b>	General population / uncontrolled		

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**2.2 Antenna Description**

<b>Type</b>	Internal antenna	
<b>Location</b>	At bottom of lowest part	
<b>Dimensions</b>	Max length	11 mm
	Max width	44 mm
<b>Configuration</b>	semi-PIFA	

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### 3 Test equipment

#### 3.1 Dosimetric system

SAR measurements were made using the DASY4 professional system (software version 4.7, Build 55) 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 DAE3	419	2008-03
E-field probe ES3DV6	3111	2008-03
Dipole Validation Kit, D1900V2	5d002	2009-01

#### 3.2 Additional equipment

Description	Inventory Number	Due Date
Signal generator R&S	INV 20007667	2008-03
Directional coupler	S/N 062	2008-03
Power meter R&S NRVD	INV 20007669	2008-03
Power sensor R&S NRV-Z5	INV 20007672	2008-03
Power sensor R&S NRV-Z5	INV 20007673	2008-03
Network analyzer HP8753C	INV 421671	2008-03
S-parameter test set HP85047A	INV 421670	2008-03
Dielectric probe kit HP8507D	INV 20000053	N/A
Base station simulator CMU200	INV 20002149	2008-03
Thermometer Fluke 51	INV 2071	2008-03

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## 4 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	Measured / Recommended	Dielectric Parameters		Density
			$\epsilon_r$	$\sigma$ [S/m]	$\rho$ [g/cm <sup>3</sup> ]
1900	Head	Measured, 2008-01-30	39.3	1.47	1.00
		Recommended	40	1.4	1.00
1900	Body	Measured, 2008-01-31	51.6	1.56	1.00
		Recommended	53.3	1.52	1.00

## 5 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. The measurements were made at an ambient temperature of 22-23 °C and humidity 30-35 %. The obtained results are displayed in the table below.

RF noise had been measured in liquid when all RF equipment in lab was switched off. Measured value was 0.0002 mW/g in 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, 2008-01-30	42.0 / 21.5	39.3	1.47	1.00	20.2
		Reference	38.2 / 20.3	40	1.4	1.00	22.0
1900	Body	Measured, 2008-01-31	41.1 / 21.1	51.6	1.56	1.00	22.5
		Reference	37.9 / 20.3	53.3	1.52	1.00	22.0



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## 6 SAR measurement uncertainty

### SAR measurement uncertainty evaluation for Sony Ericsson PY7A1022112 (Z555i) phone According to IEEE 1528

Uncertainty Component	Uncer. (%)	Prob Dist.	Div.	C <sub>i</sub>	1g mass
<b>Measurement System</b>					
Probe Calibration	±5.9	N	1	1	±5.9
Axial Isotropy	±4.7	R	√3	0.7	±1.9
Spherical Isotropy	±9.6	R	√3	0.7	±3.9
Boundary effect	±1.0	R	√3	1	±0.6
Probe linearity	±4.7	R	√3	1	±2.7
Detection limit	±1.0	R	√3	1	±0.6
Readout electronics	±0.3	N	1	1	±0.3
Response time	±0.8	R	√3	1	±0.5
Integration time	±2.6	R	√3	1	±1.5
RF Ambient Conditions	±3.0	R	√3	1	±1.7
Mech. Constraints of robot	±0.4	R	√3	1	±0.2
Probe positioning	±2.9	R	√3	1	±1.7
Extrap, interpolation and integration	±1.0	R	√3	1	±0.6
<b>Measurement System Uncertainty</b>					±8.4
<b>Test Sample Related</b>					
Device positioning	±3.5	N	1	1	±3.5
Device holder uncertainty	±3.5	N	1	1	±3.5
Power drift	±5.0	R	√3	1	±2.9
<b>Test Sample Related Uncertainty</b>					±5.5
<b>Phantom and Tissue Parameters</b>					
Phantom uncertainty	±4.0	R	√3	1	±2.3
Liquid conductivity (measured)	±2.5	R	1	0.64	±1.6
Liquid conductivity (target)	±5.0	R	√3	0.64	±1.8
Liquid Permittivity (measured)	±2.5	R	1	0.6	±1.5
Liquid Permittivity (target)	±5.0	R	√3	0.6	±1.7
<b>Phantom and Tissue Parameters Uncertainty</b>					±4.1
<b>Combined standard uncertainty</b>					±10.8
<b>Extended standard uncertainty (k=2)</b>					±21.6

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## 7 Test results

The measured 1-gram averaged SAR values of the DUT towards the head are provided in Table 1. The ambient humidity and temperature of test facility were 30-35% and 22-23°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.

Initial measurements of three samples with colors black, pink and sand showed that color sand gave the highest SAR values. Therefore the phone with color sand was selected from a worst-case scenario and assigned as DUT.

For head measurement, the DUT was tested on the right-hand side, and the left-hand side of the phantom in two phone positions, cheek (touch) and tilt (cheek + 15°). The DUT was tested at the lowest, middle and highest frequencies in the transmission band. Results for head position are presented in table 1.

For body measurement the DUT was tested with the back (antenna) and front towards the phantom flat section with 15 mm distance in both speech and data mode. For all modes, the device was tested at the lowest, middle and highest frequencies in the transmission band. For portable hands free (PHF) usage the Sony Ericsson head set HPB-60 was connected to the DUT, and for Bluetooth (BT) the DUT was paired with Sony Ericsson HBH-60. Results for body position are presented in table 2.

Band	Channel	Output power [dBm]	Position	Liquid T [°C]	Measured SAR [W/kg]	
					Right-hand 1g mass	Left-hand 1g mass
GSM 1900	512	30.5	Cheek	20.2	0.47	0.37
			Tilt	20.2	-	-
	661	30.5	Cheek	20.2	0.48	0.39
			Tilt	20.2	0.12	0.09
	810	30.5	Cheek	20.2	0.35	0.26
			Tilt	20.2	-	-

**Table 1: SAR measurement result for Sony Ericsson PY7A1022112 telephone at highest possible output power. Measured towards the head.**

Band	Channel	Output Power [dBm]	Position / Mode	Liquid T [°C]	Measured SAR [W/kg] 1g mass
GSM 1900	512	30.5	Back / GPRS	22.5	0.81
		30.5	Back / BT	22.5	0.37
		30.5	Back / PHF	22.5	0.40
		27.0	Back / EDGE	22.5	0.16
		30.5	Front / BT	22.5	0.14
	661	30.5	Back / GPRS	22.5	0.73
		30.5	Back / BT	22.5	0.35
	810	30.5	Back / GPRS	22.5	0.43
		30.5	Back / BT	22.5	0.25

**Table 2: SAR measurement result for Sony Ericsson PY7A1022112 telephone at highest possible output power. Measured towards the body.**



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## 8 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 ] IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices in the frequency range of 300 MHz to 3 GHz", February 2005.

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## 9 Appendix

### 9.1 Photographs of the device under test



Battery and cover removed



Front side



Rear side



Right side



Left side with system connector

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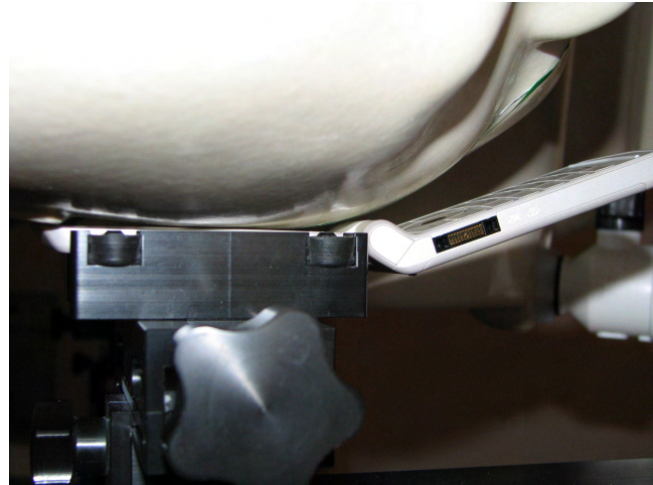
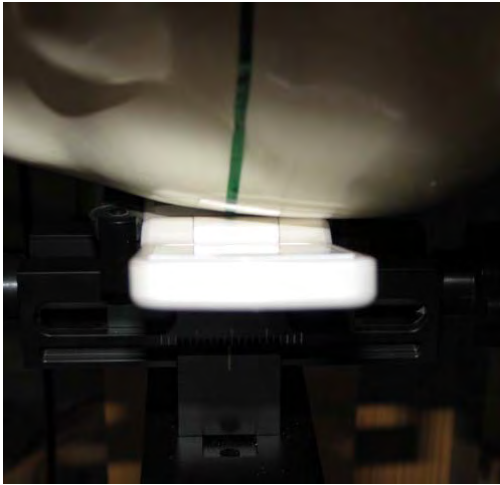
Rev

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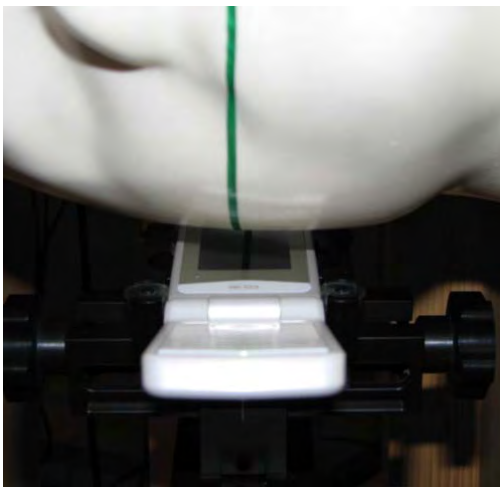
Reference

File

## 9.2 Device position at SAM Twin Phantom



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



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

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*DUT in body position with 15 mm distance*

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**9.3 Attachments**

- System validation
- Measurement plots for head and body position
- Probe calibration
- Dipole calibration

Test Laboratory: Sony Ericsson Mobile Communications AB  
File Name: [1900\\_Right.da4](#)

**DUT: MagdalenaEU; Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Right hand side**

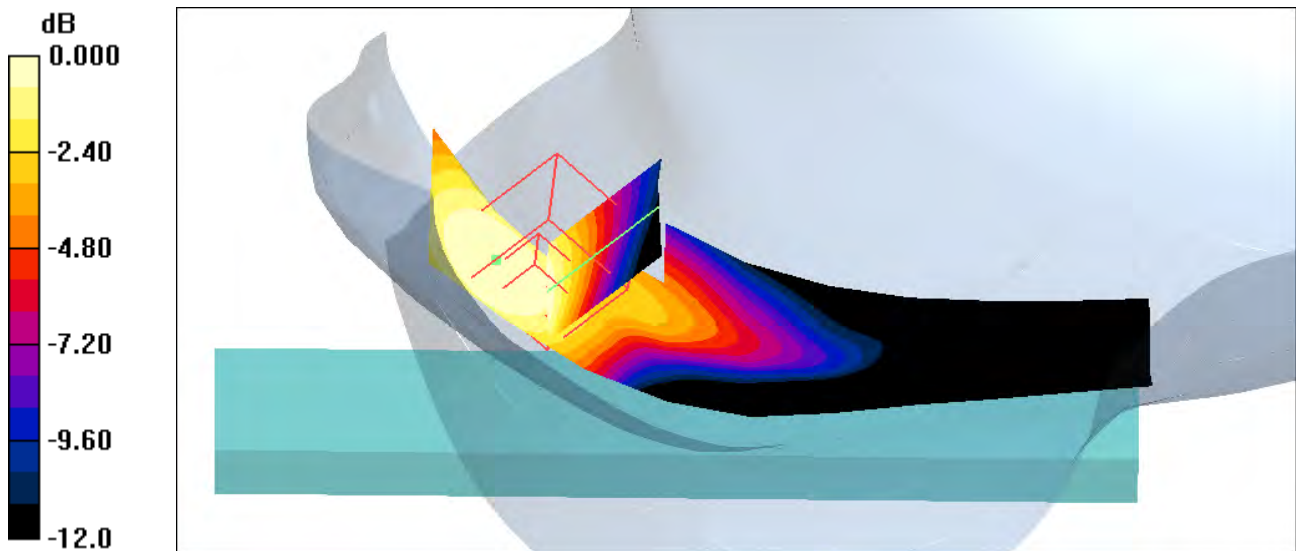
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3111; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)) Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Touch Mid Sand/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.522 mW/g

**Touch Mid Sand/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 9.17 V/m; Power Drift = -0.106 dB  
Peak SAR (extrapolated) = 0.712 W/kg  
**SAR(1 g) = 0.477 mW/g; SAR(10 g) = 0.304 mW/g**  
Maximum value of SAR (measured) = 0.500 mW/g



0 dB = 0.500mW/g

Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [1900\\_Right.da4](#)

**DUT: MagdalenaEU; Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Right hand side**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3111; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-03-12

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated

- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Tilt Mid Sand/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.143 mW/g

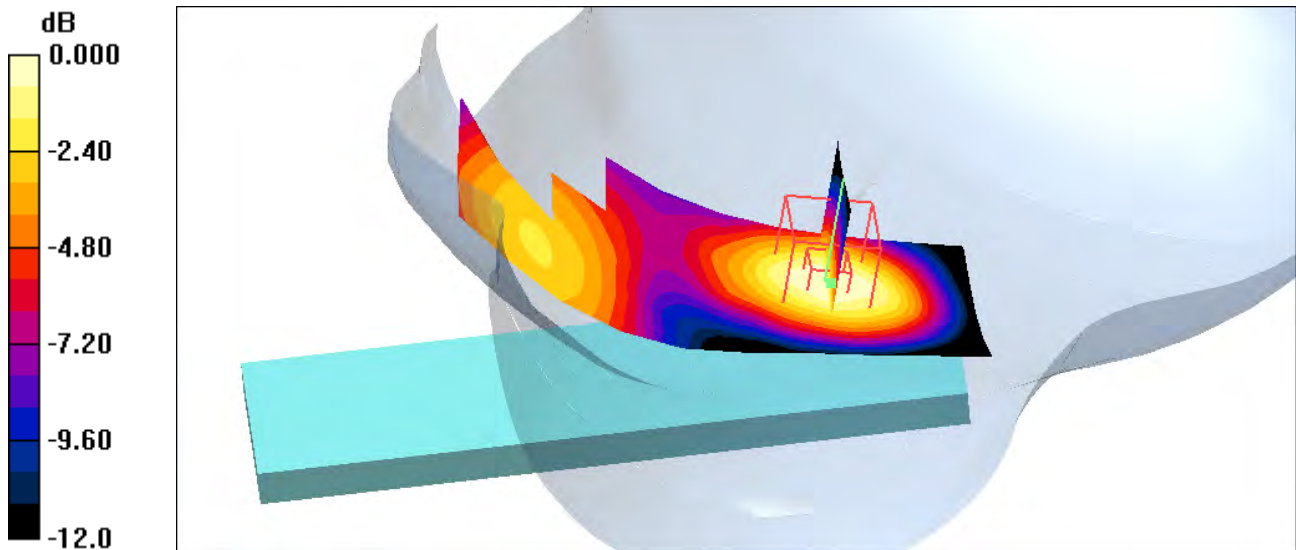
**Tilt Mid Sand/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.08 V/m; Power Drift = 0.106 dB

Peak SAR (extrapolated) = 0.194 W/kg

**SAR(1 g) = 0.122 mW/g; SAR(10 g) = 0.072 mW/g**

Maximum value of SAR (measured) = 0.133 mW/g



0 dB = 0.133mW/g

Test Laboratory: Sony Ericsson Mobile Communications AB  
File Name: [1900\\_Left.da4](#)

**DUT: MagdalenaEU; Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Left Hand Side**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3111; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Touch Mid Sand/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.464 mW/g

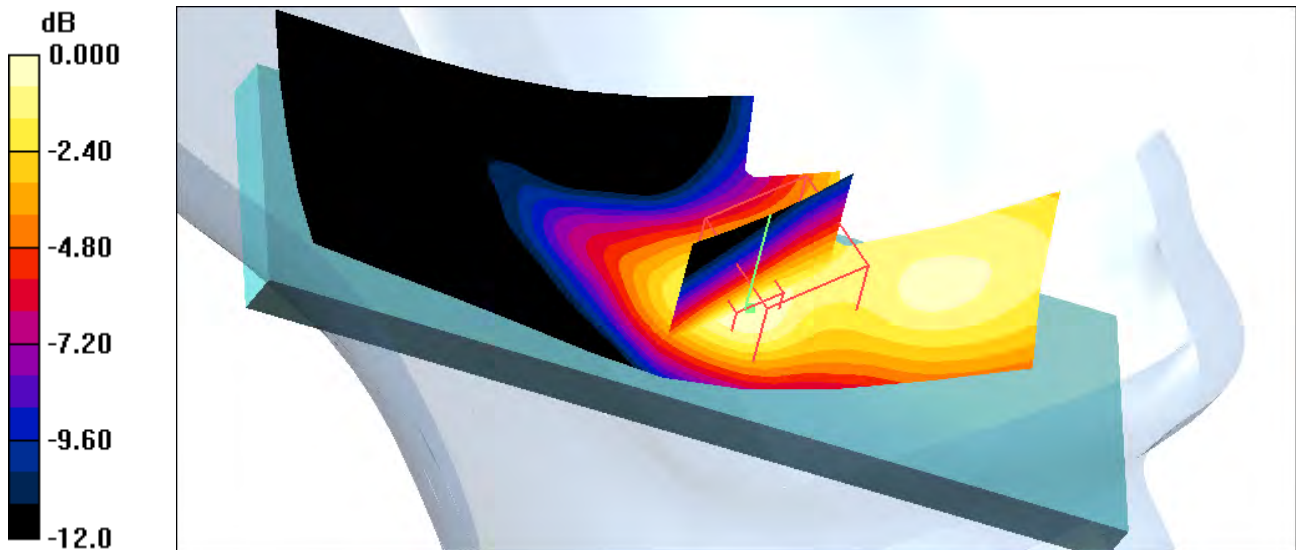
**Touch Mid Sand/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.9 V/m; Power Drift = -0.072 dB

Peak SAR (extrapolated) = 0.722 W/kg

**SAR(1 g) = 0.388 mW/g; SAR(10 g) = 0.218 mW/g**

Maximum value of SAR (measured) = 0.450 mW/g



0 dB = 0.450mW/g



Test Laboratory: Sony Ericsson Mobile Communications AB  
File Name: [1900\\_Left.da4](#)

**DUT: MagdalenaEU; Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Left Hand Side**

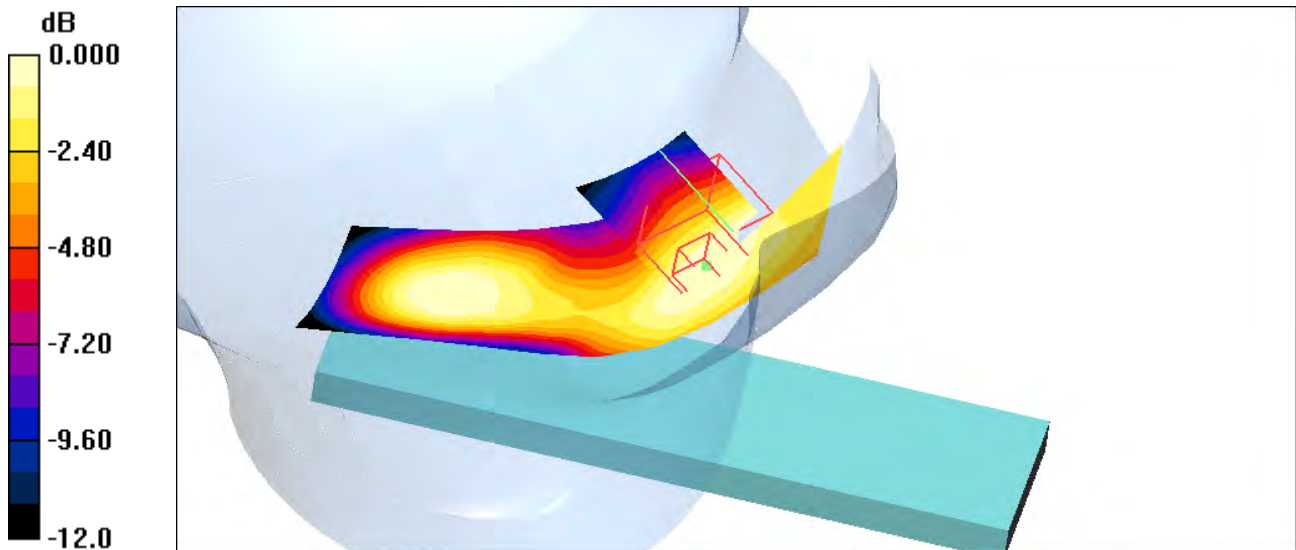
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3111; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Tilt Mid Sand/Area Scan (41x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.092 mW/g

**Tilt Mid Sand/Zoom Scan 2 (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 5.93 V/m; Power Drift = 0.023 dB  
Peak SAR (extrapolated) = 0.127 W/kg  
**SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.059 mW/g**  
Maximum value of SAR (measured) = 0.092 mW/g



0 dB = 0.092mW/g

Test Laboratory: Sony Ericsson Mobile Communications AB  
File Name: [1900\\_Body\\_Speech.da4](#)

**DUT: MagdalenaEU(closed); Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Data**

Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3111; ConvF(4.56, 4.56, 4.56); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Low BT/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.394 mW/g

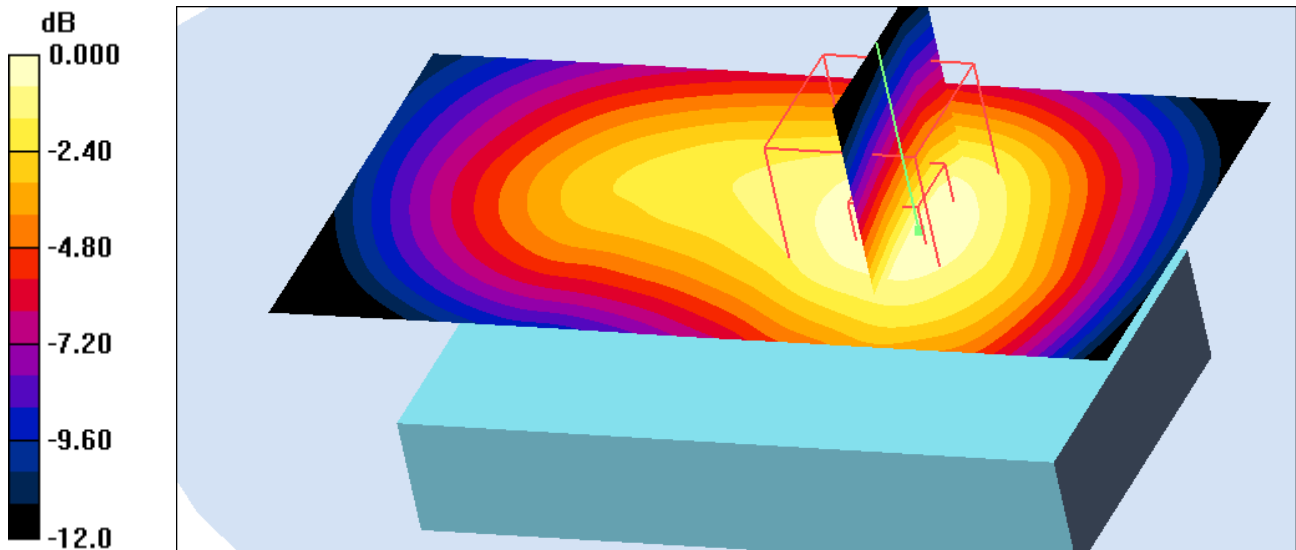
**Low BT/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.2 V/m; Power Drift = -0.093 dB

Peak SAR (extrapolated) = 0.606 W/kg

**SAR(1 g) = 0.374 mW/g; SAR(10 g) = 0.230 mW/g**

Maximum value of SAR (measured) = 0.400 mW/g



0 dB = 0.400mW/g

Test Laboratory: Sony Ericsson Mobile Communications AB  
File Name: [1900\\_Body\\_Data.da4](#)

**DUT: MagdalenaEU(closed); Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Data**

Communication System: GSM1900\_GPRS; Frequency: 1850.2 MHz; Duty Cycle: 1:4.15  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3111; ConvF(4.56, 4.56, 4.56); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Low EDGE/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.177 mW/g

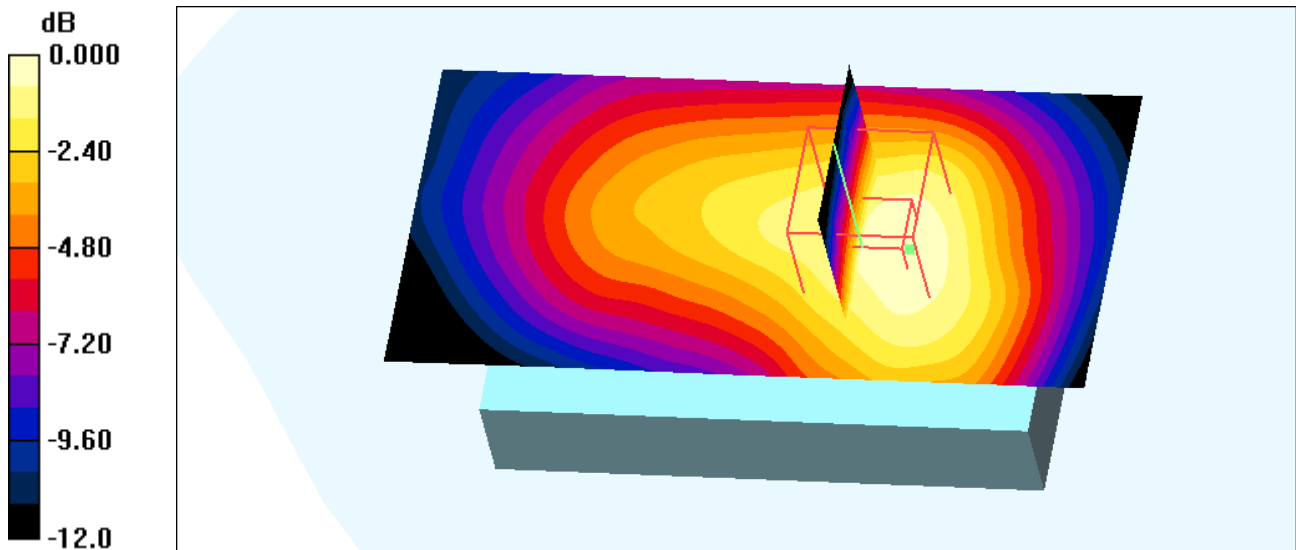
**Low EDGE/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.60 V/m; Power Drift = -0.039 dB

Peak SAR (extrapolated) = 0.282 W/kg

**SAR(1 g) = 0.162 mW/g; SAR(10 g) = 0.097 mW/g**

Maximum value of SAR (measured) = 0.180 mW/g



0 dB = 0.180mW/g

Test Laboratory: Sony Ericsson Mobile Communications AB  
File Name: [1900\\_Body\\_Speech.da4](#)

**DUT: MagdalenaEU(closed); Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Speech**

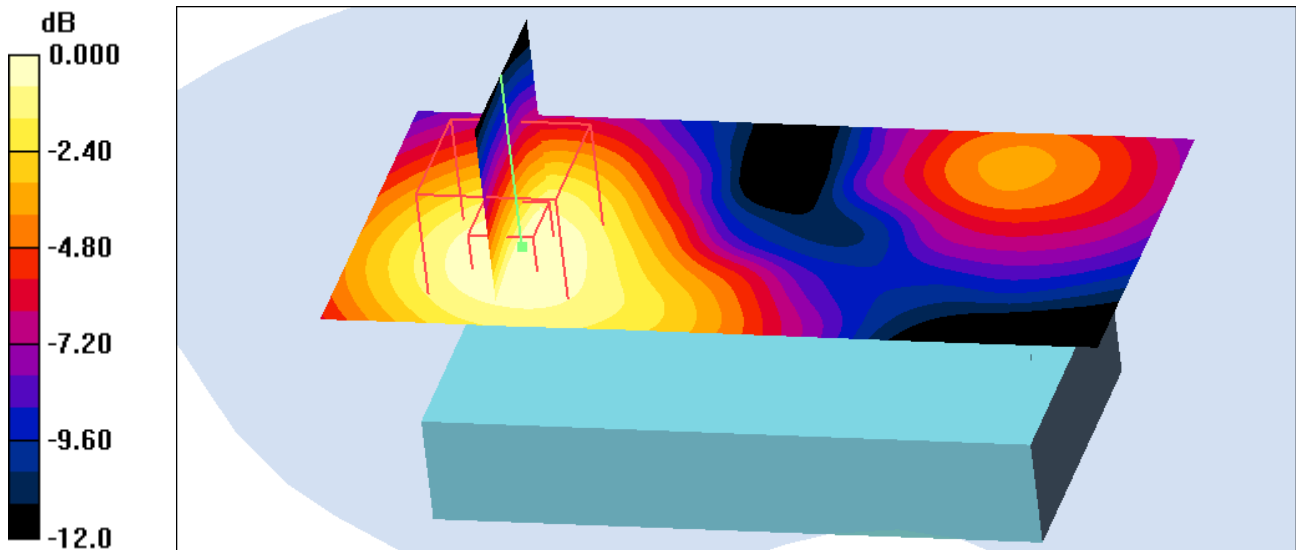
Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3111; ConvF(4.56, 4.56, 4.56); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Low BT Frontside/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.156 mW/g

**Low BT Frontside/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 4.83 V/m; Power Drift = 0.174 dB  
Peak SAR (extrapolated) = 0.223 W/kg  
**SAR(1 g) = 0.143 mW/g; SAR(10 g) = 0.090 mW/g**  
Maximum value of SAR (measured) = 0.154 mW/g



Test Laboratory: Sony Ericsson Mobile Communications AB  
File Name: [1900\\_Body\\_Data.da4](#)

**DUT: MagdalenaEU(closed); Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Data**

Communication System: GSM1900\_GPRS; Frequency: 1850.2 MHz; Duty Cycle: 1:4.15  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3111; ConvF(4.56, 4.56, 4.56); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Low GPRS/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.902 mW/g

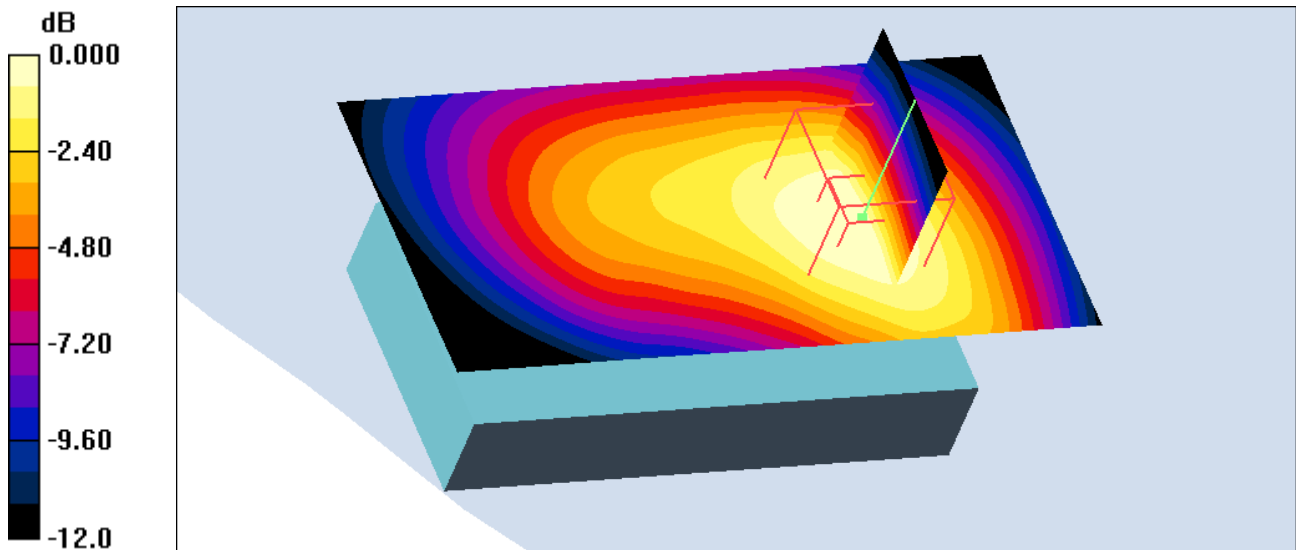
**Low GPRS/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.3 V/m; Power Drift = -0.138 dB

Peak SAR (extrapolated) = 1.30 W/kg

**SAR(1 g) = 0.812 mW/g; SAR(10 g) = 0.499 mW/g**

Maximum value of SAR (measured) = 0.868 mW/g



0 dB = 0.868mW/g

Test Laboratory: Sony Ericsson Mobile Communications AB  
File Name: [1900\\_Body\\_Speech.da4](#)

**DUT: MagdalenaEU(closed); Type: AAB-1022112-BV; Serial: CB510VWLWC**  
**Program Name: Speech**

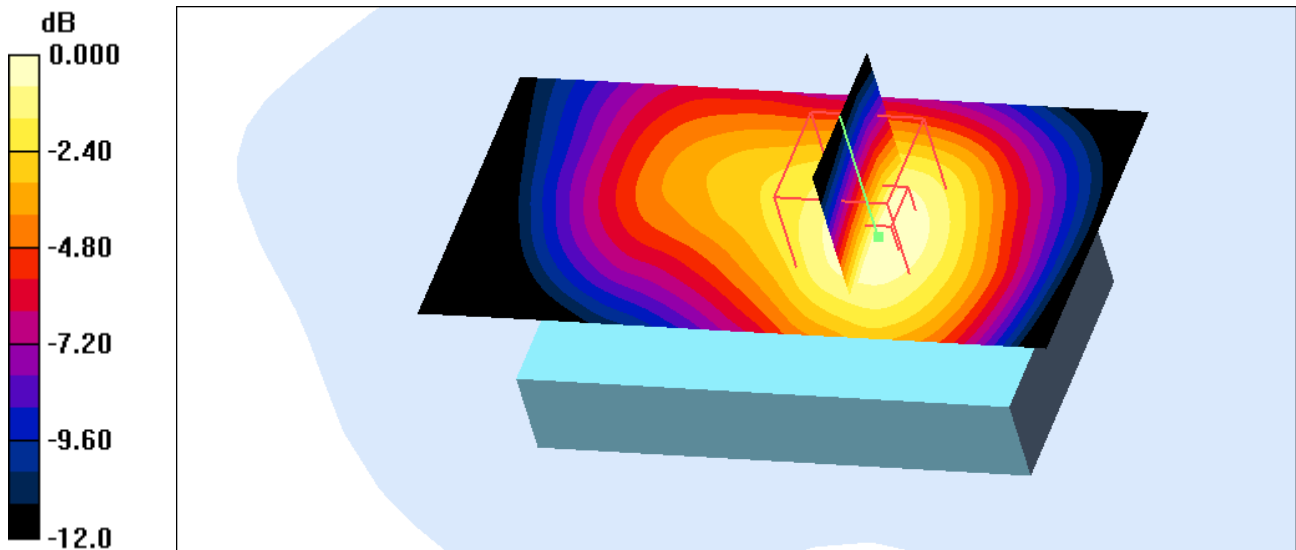
Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3  
Medium parameters used (interpolated):  $f = 1850.2$  MHz;  $\sigma = 1.51$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3111; ConvF(4.56, 4.56, 4.56); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Low PHF/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 10.5 V/m; Power Drift = 0.000 dB  
Peak SAR (extrapolated) = 0.651 W/kg  
**SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.237 mW/g**  
Maximum value of SAR (measured) = 0.430 mW/g

**Low PHF/Area Scan (41x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.423 mW/g



Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [SystemPerformance\\_1900\\_2.da4](#)

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

**Program Name: Dipole@1900**

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3111; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**SystemPerformanceCheck/Area Scan (41x61x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 6.23 mW/g

**SystemPerformanceCheck/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm,

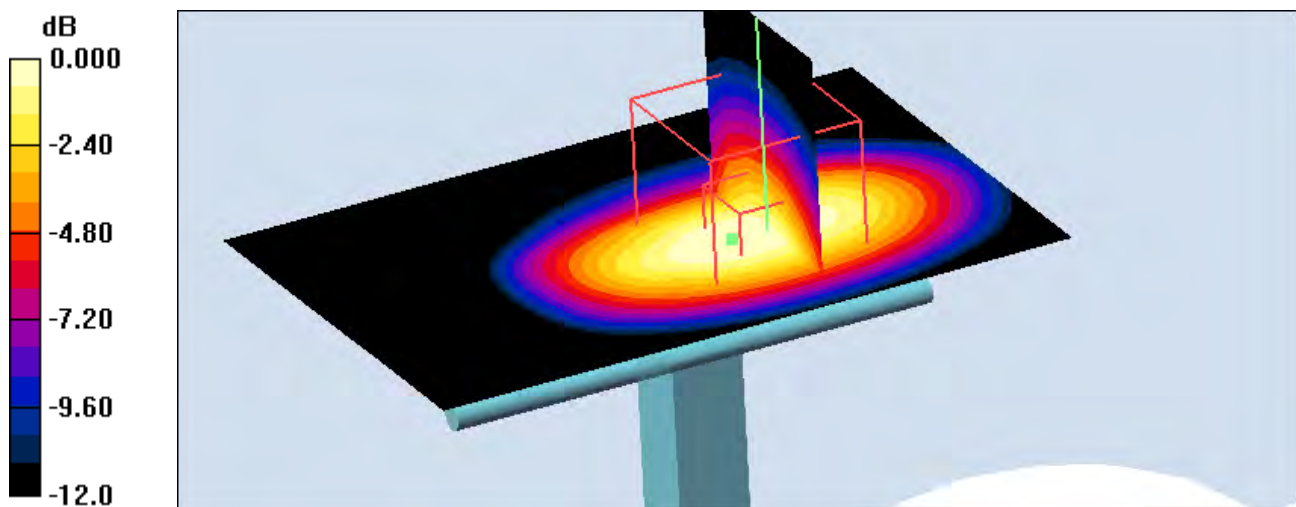
dy=5mm, dz=5mm

Reference Value = 55.1 V/m; Power Drift = 0.089 dB

Peak SAR (extrapolated) = 9.93 W/kg

**SAR(1 g) = 5.25 mW/g; SAR(10 g) = 2.69 mW/g**

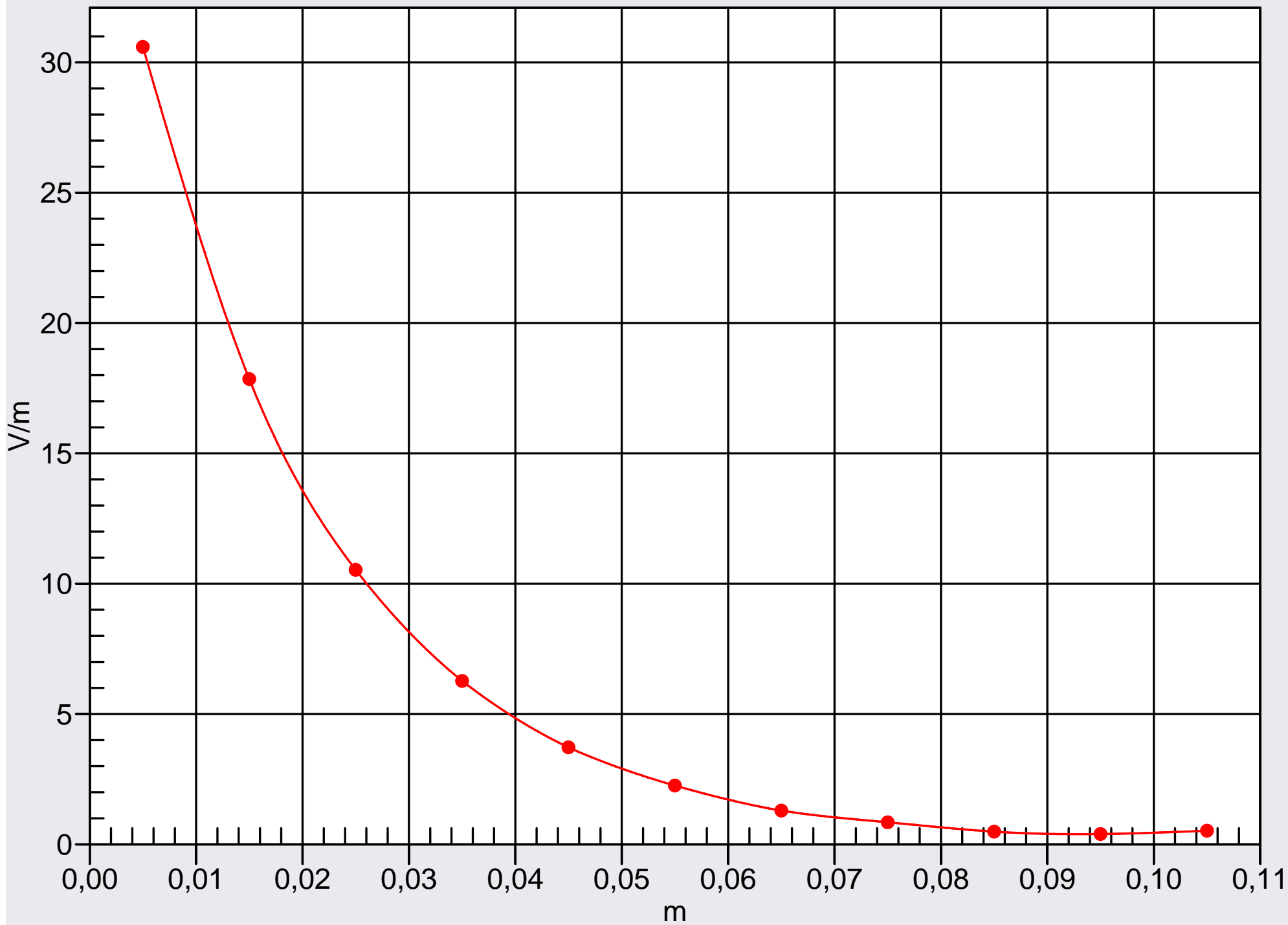
Maximum value of SAR (measured) = 5.87 mW/g



0 dB = 5.87mW/g

# E (x,y,z,f0)

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





Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [SystemPerformance\\_1900\\_1.da4](#)

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

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3111; ConvF(4.79, 4.79, 4.79); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**SystemPerformanceCheck/Area Scan (41x61x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 6.14 mW/g

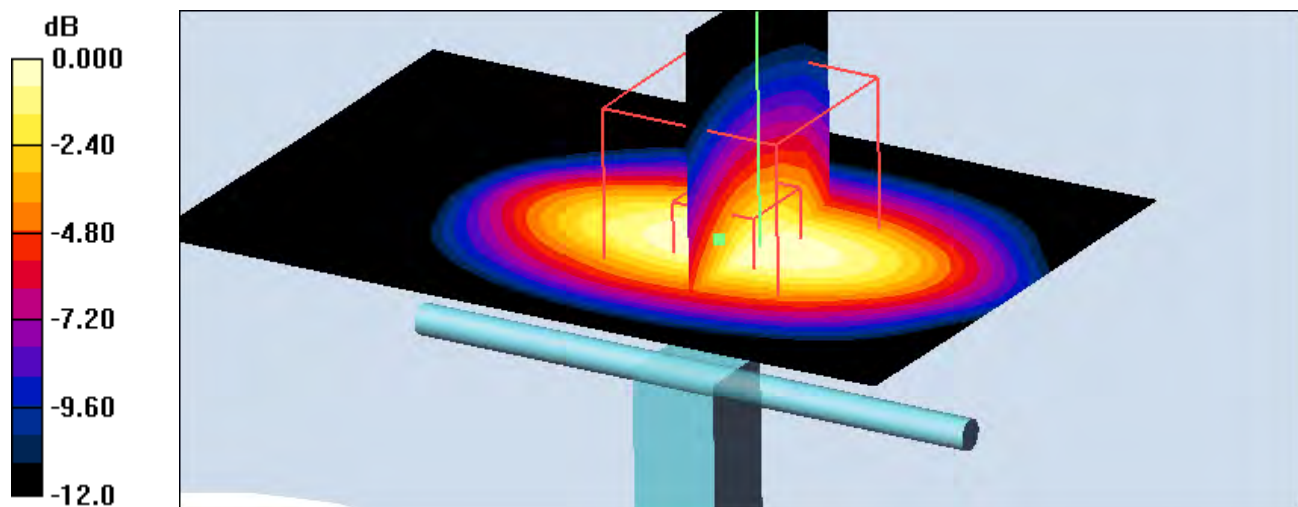
**SystemPerformanceCheck/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 61.5 V/m; Power Drift = -0.019 dB

Peak SAR (extrapolated) = 10.00 W/kg

**SAR(1 g) = 5.22 mW/g; SAR(10 g) = 2.66 mW/g**

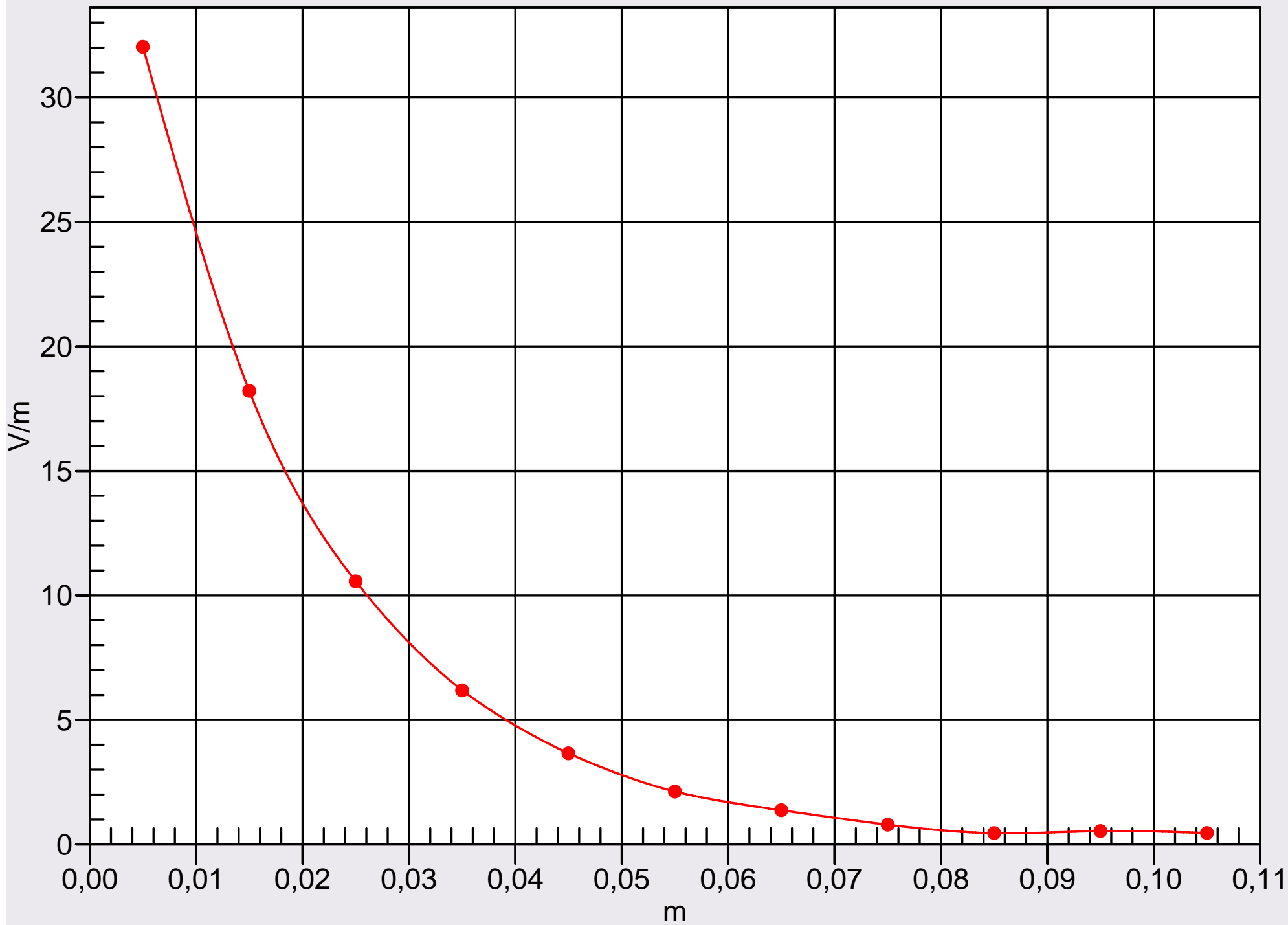
Maximum value of SAR (measured) = 5.87 mW/g



0 dB = 5.87mW/g

# E (x,y,z,f0)

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



Test Laboratory: Sony Ericsson Mobile Communications AB

File Name: [SystemPerformance\\_1900\\_3.da4](#)

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

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.56$  mho/m;  $\epsilon_r = 51.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3111; ConvF(4.56, 4.56, 4.56); Calibrated: 2007-03-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn419; Calibrated: DAE not calibrated
- Phantom: SAM 2; Type: SAM QD 000 P40 CB; Serial: TP-1396
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**SystemPerformanceCheck/Area Scan (41x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 5.91 mW/g

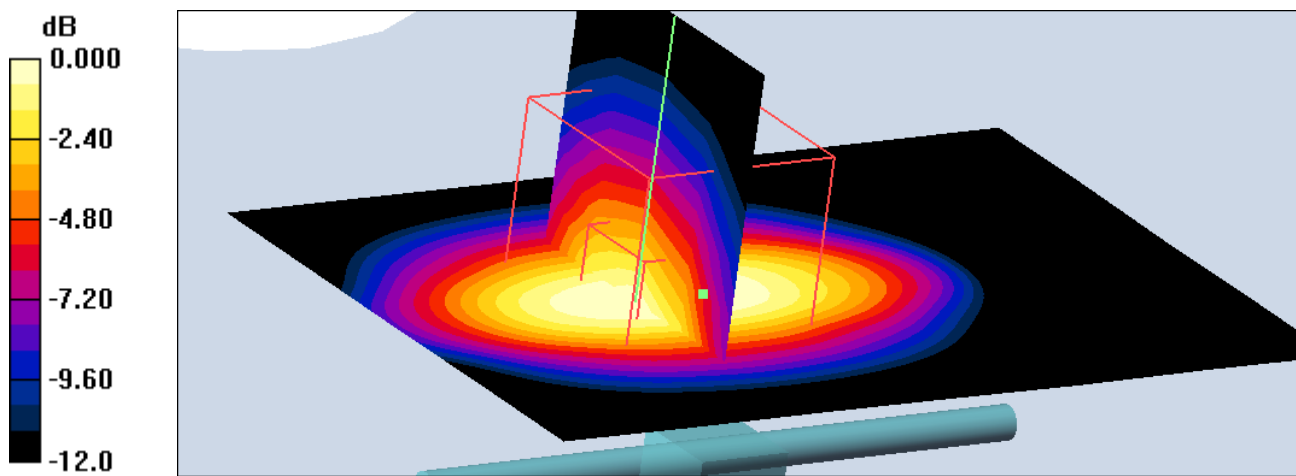
**SystemPerformanceCheck/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 58.4 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 9.60 W/kg

**SAR(1 g) = 5.14 mW/g; SAR(10 g) = 2.64 mW/g**

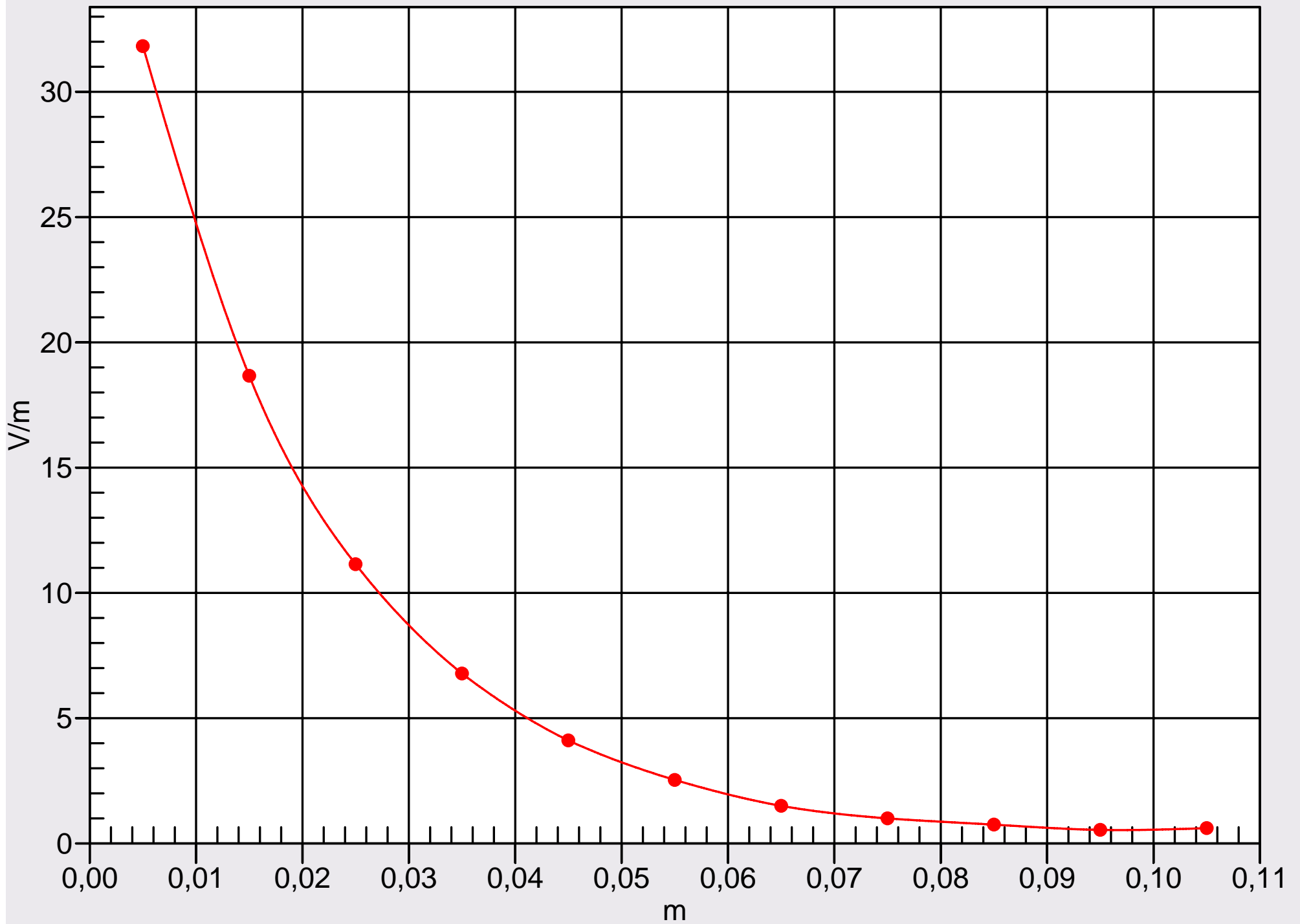
Maximum value of SAR (measured) = 5.73 mW/g



0 dB = 5.73mW/g

# E (x,y,z,f0)

MSL1900; 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: **ES3-3111\_Mar07**

**CALIBRATION CERTIFICATE**

Object: **ES3DV3 - SN:3111**

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

Calibration date: **March 12, 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

Calibrated by: **Katja Pokorny, Technical Manager** [Signature]

Approved by: **Fin. Bernholz, R&D Director** [Signature]

Issued: March 14, 2007

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



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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 $\varphi$	$\varphi$ 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
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### 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 ES3DV3

## SN:3111

Manufactured:	March 6, 2006
Last calibrated:	May 31, 2006
Recalibrated:	March 12, 2007

**Calibrated for DASY Systems**

(Note: non-compatible with DASY2 system!)



## DASY - Parameters of Probe: ES3DV3 SN:3111

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

NormX	<b>1.30</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormY	<b>1.27</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	<b>1.21</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$

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

DCP X	<b>98</b> mV
DCP Y	<b>96</b> mV
DCP Z	<b>95</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>3.0 mm</b>	<b>4.0 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	5.8	2.8
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>3.0 mm</b>	<b>4.0 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	3.9	1.9
SAR <sub>be</sub> [%]	With Correction Algorithm	0.0	0.1

### Sensor Offset

Probe Tip to Sensor Center                      **2.0 mm**

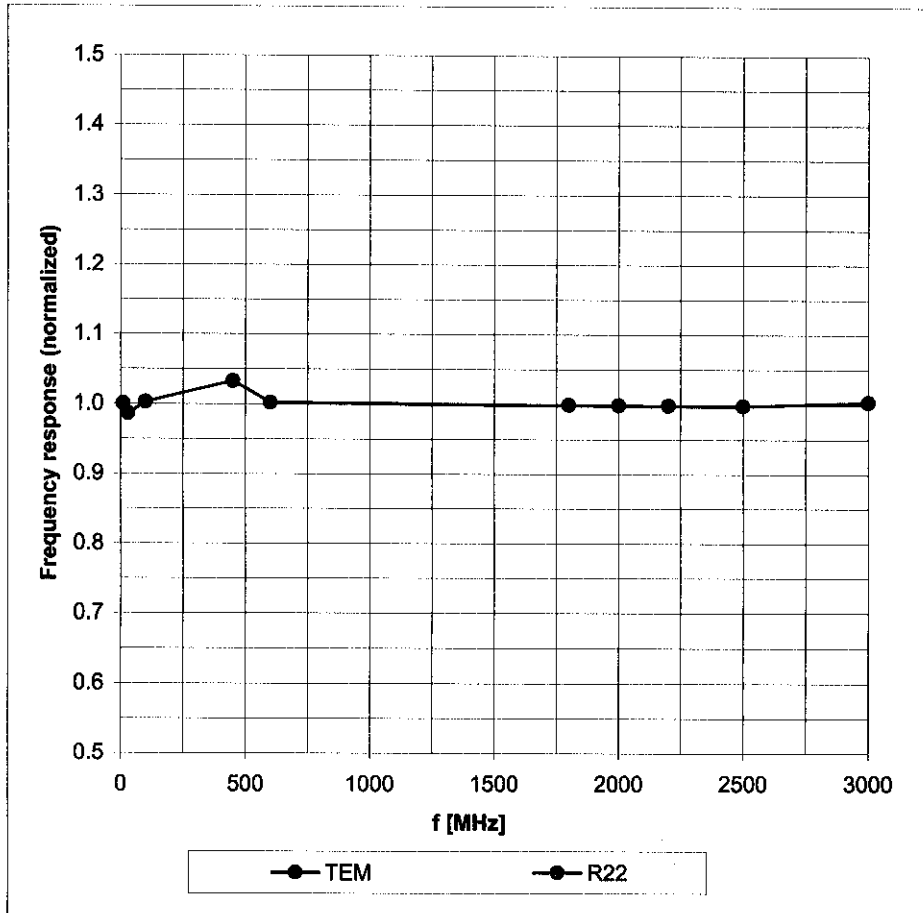
**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

<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.

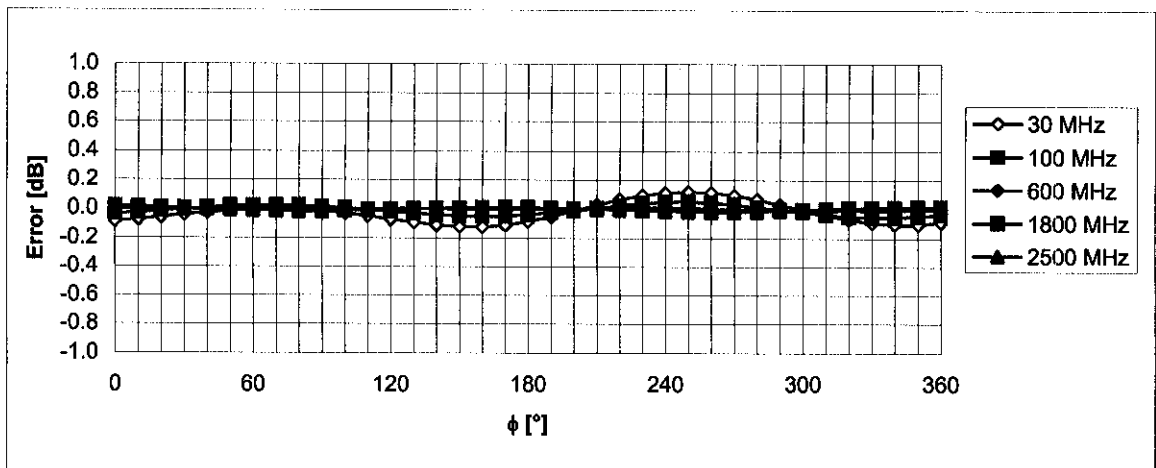
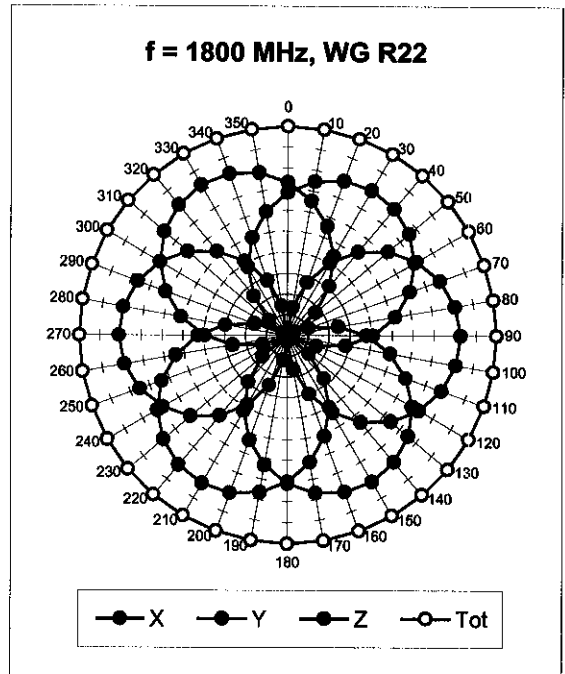
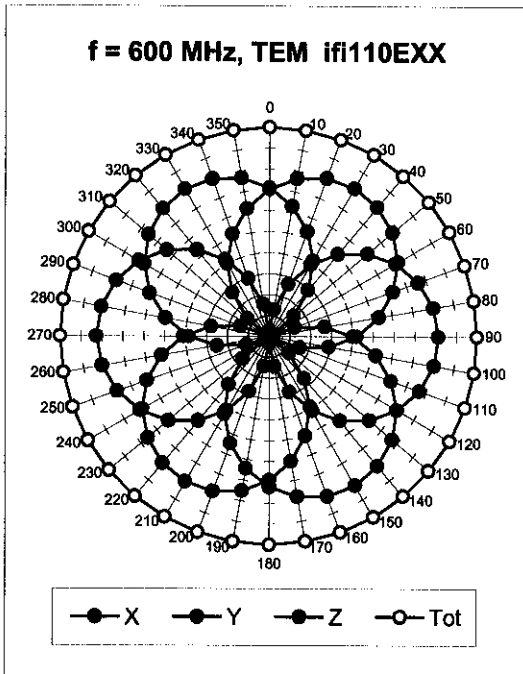
# Frequency Response of E-Field

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



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

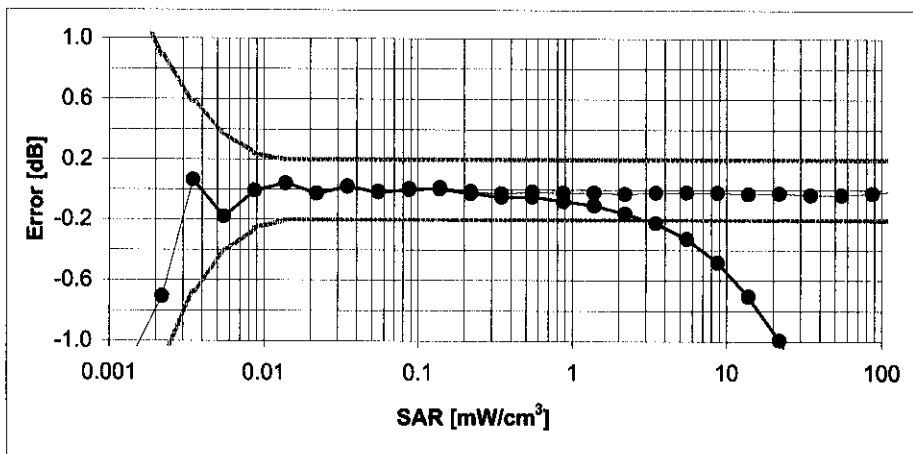
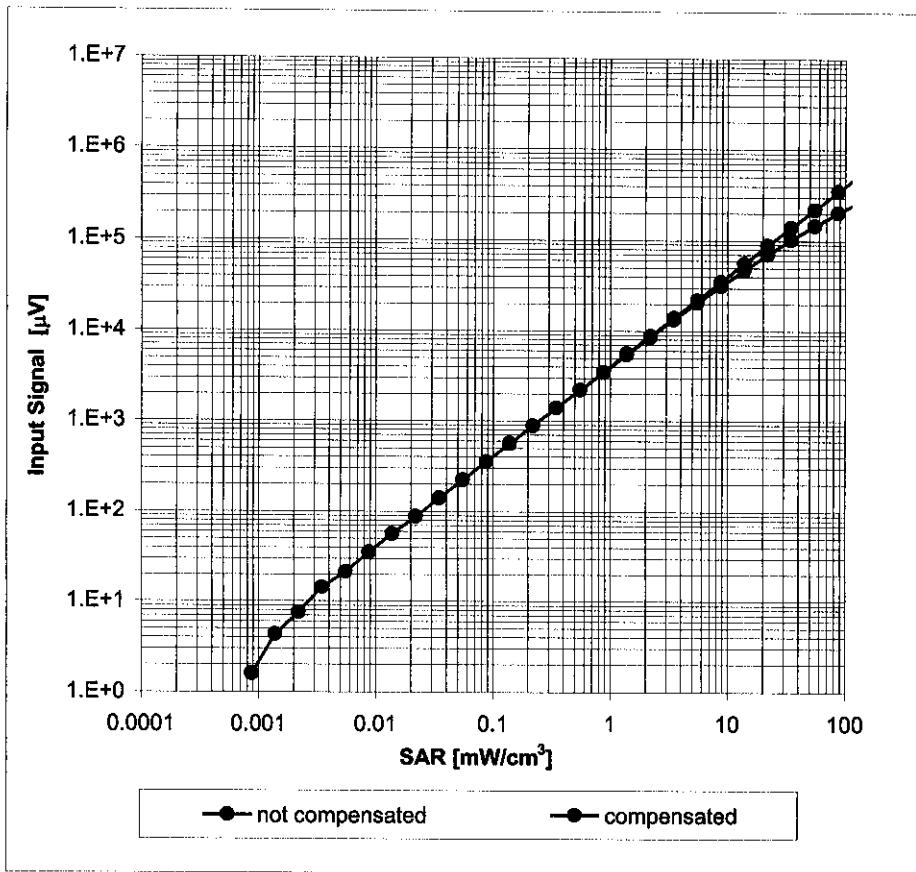
### Receiving Pattern ( $\phi$ ), $\vartheta = 0^\circ$



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

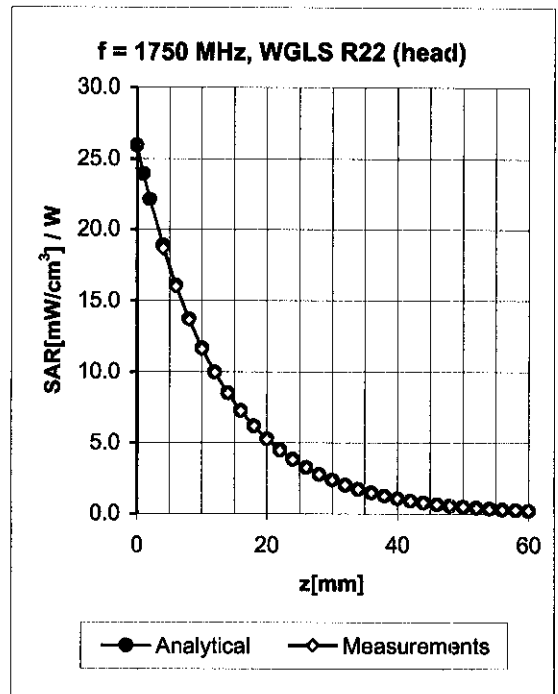
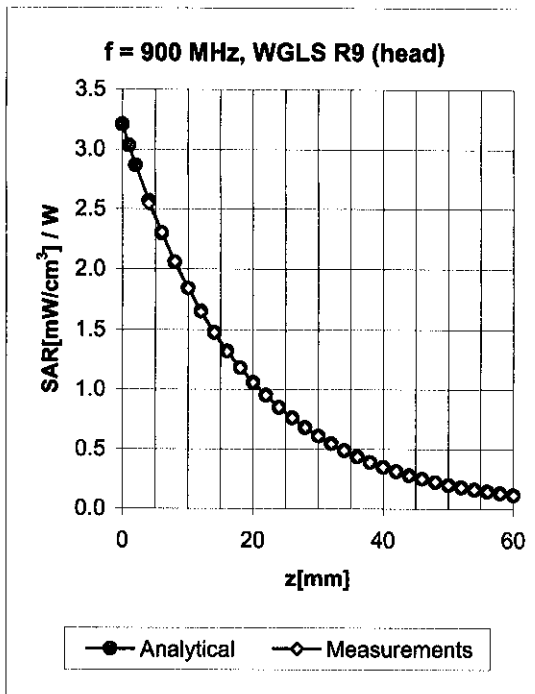
# Dynamic Range $f(\text{SAR}_{\text{head}})$

(Waveguide R22,  $f = 1800 \text{ MHz}$ )



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

## Conversion Factor Assessment

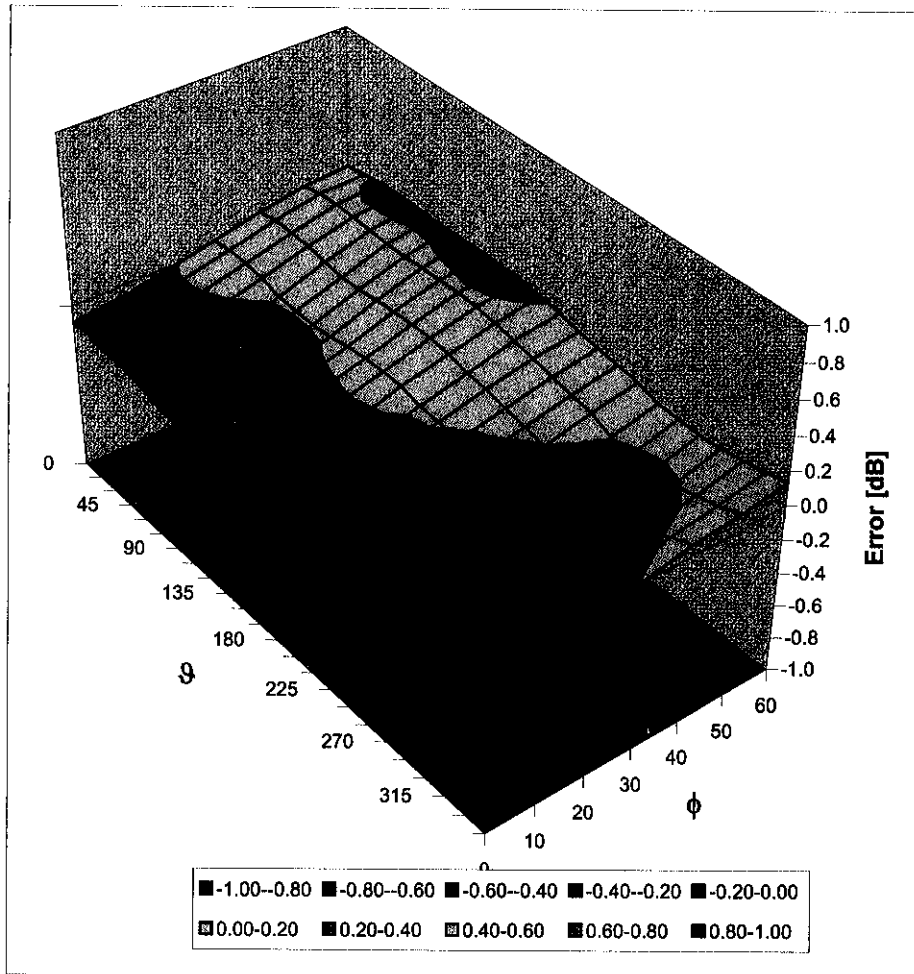


f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.85	1.30	5.77 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.83	1.30	5.57 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.75	1.36	4.84 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.92	1.17	4.79 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.76	1.31	4.32 ± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.80	1.40	5.95 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.80	1.30	5.64 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.99	1.17	4.77 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.90	1.18	4.56 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.80	1.15	4.10 ± 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 ( $\phi$ ,  $\theta$ ),  $f = 900$  MHz



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



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Accreditation No.: **SCS 108**

Client **Ericsson UK**

Certificate No: **D1900V2-539\_Dec06**

**CALIBRATION CERTIFICATE**

Object **D1900V2 - SN: 539**

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

Calibration date: **December 12, 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 ± 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 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: 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 Oct-06)	In house check: Oct-07

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

Approved by: **Name: Katja Pokovic, Function: Technical Manager, Signature: Katja Pokovic**

Issued: December 13, 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:

- 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>Area Scan Resolution</b>	dx, dy = 15 mm	
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	1900 MHz ± 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 ± 0.2) °C	38.4 ± 6 %	1.40 mho/m ± 6 %
<b>Head TSL temperature during test</b>	(21.2 ± 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	9.18 mW / g
SAR normalized	normalized to 1W	36.7 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>35.9 mW / g ± 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	4.85 mW / g
SAR normalized	normalized to 1W	19.4 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>19.1 mW / g ± 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	51.8 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature during test	(21.6 ± 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	9.49 mW / g
SAR normalized	normalized to 1W	38.0 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>37.0 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	5.05 mW / g
SAR normalized	normalized to 1W	20.2 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>19.8 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	54.1 $\Omega$ + 0.9 j $\Omega$
Return Loss	- 27.9 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.0 $\Omega$ + 2.7 j $\Omega$
Return Loss	- 30.7 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 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	July 26, 2001

# DASY4 Validation Report for Head TSL

Date/Time: 11.12.2006 17:13:38

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:539**

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

Medium: HSL U10 BB;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.4$  mho/m;  $\epsilon_r = 38.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

## DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

**Pin = 250 mW; d = 10 mm/Area Scan (101x101x1):**

Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 10.3 mW/g

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

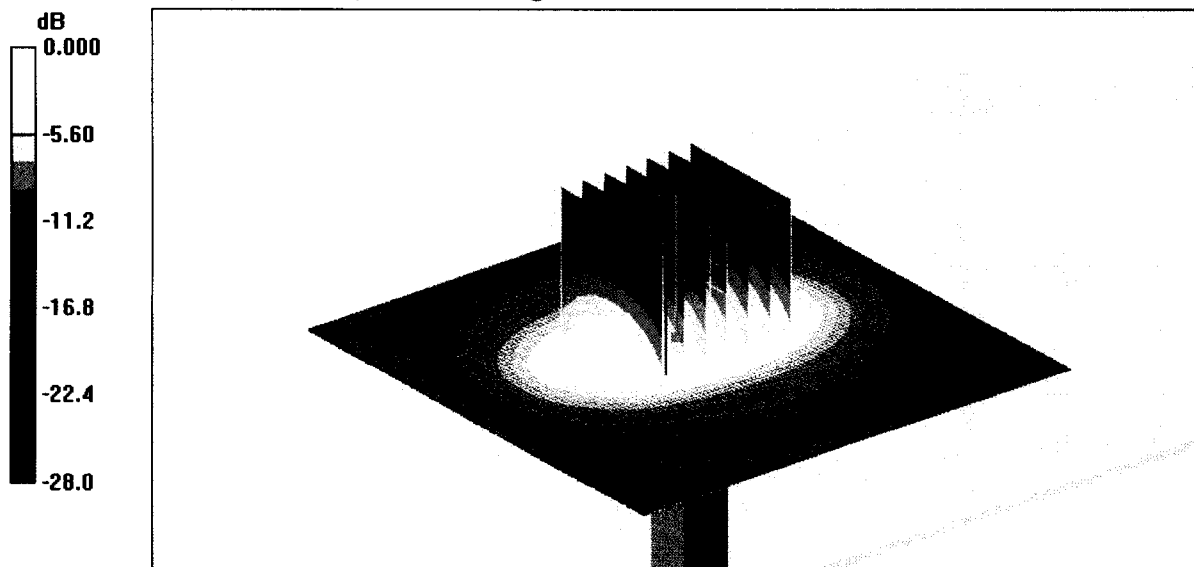
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 86.4 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 15.7 W/kg

**SAR(1 g) = 9.18 mW/g; SAR(10 g) = 4.85 mW/g**

Maximum value of SAR (measured) = 10.5 mW/g



0 dB = 10.5mW/g

# Impedance Measurement Plot for Head TSL

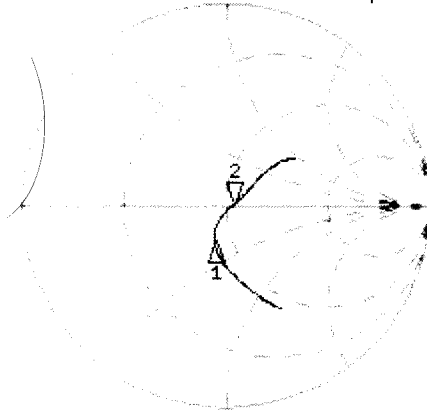
11 Dec 2006 12:34:44

CH1 S11 1 U FS 2: 54.098  $\Omega$  0.8848  $\Omega$  74.113  $\mu\text{H}$  1 900.000 000 MHz

\*  
Del  
Cor

Avg  
16

↑



CH1 Markers

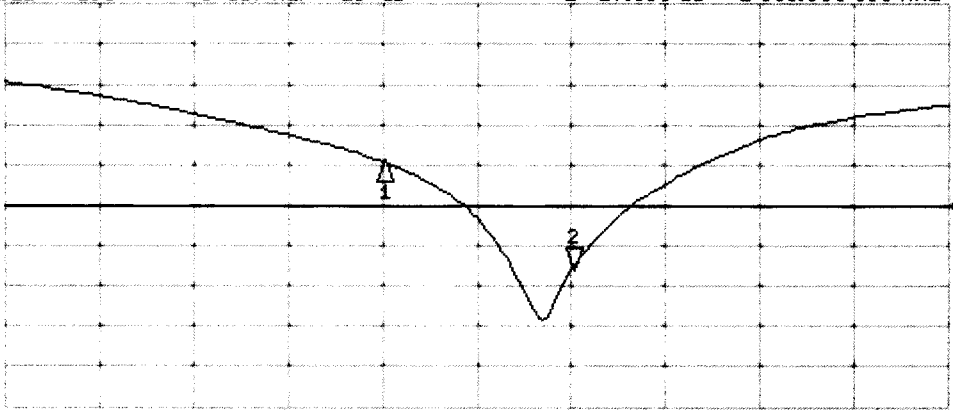
1: 42.035  $\Omega$   
-15.363  $\Omega$   
1.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 2: -27.899 dB 1 900.000 000 MHz

Cor

Avg  
16

↑



CH2 Markers

1: -14.635 dB  
1.80000 GHz

START 1 600.000 000 MHz

STOP 2 100.000 000 MHz

# DASY4 Validation Report for Body TSL

Date/Time: 12.12.2006 15:22:28

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:539**

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

Medium: MSL U10 BB;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.54$  mho/m;  $\epsilon_r = 51.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

## DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.43, 4.43, 4.43); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

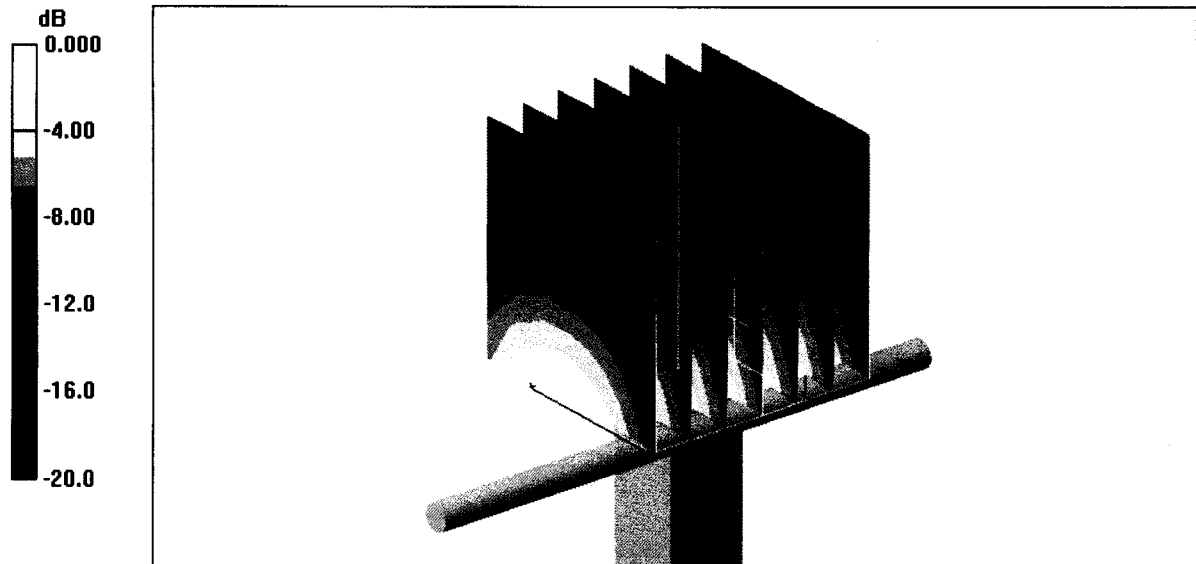
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.4 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 15.8 W/kg

**SAR(1 g) = 9.49 mW/g; SAR(10 g) = 5.05 mW/g**

Maximum value of SAR (measured) = 10.5 mW/g

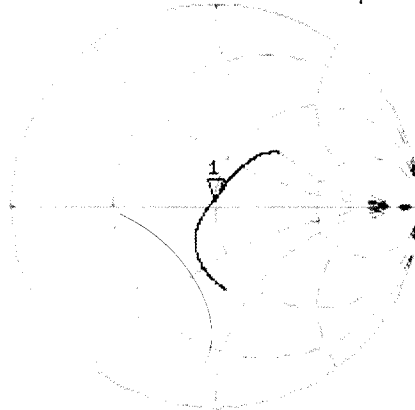


# Impedance Measurement Plot for Body TSL

12 Dec 2006 11:17:34

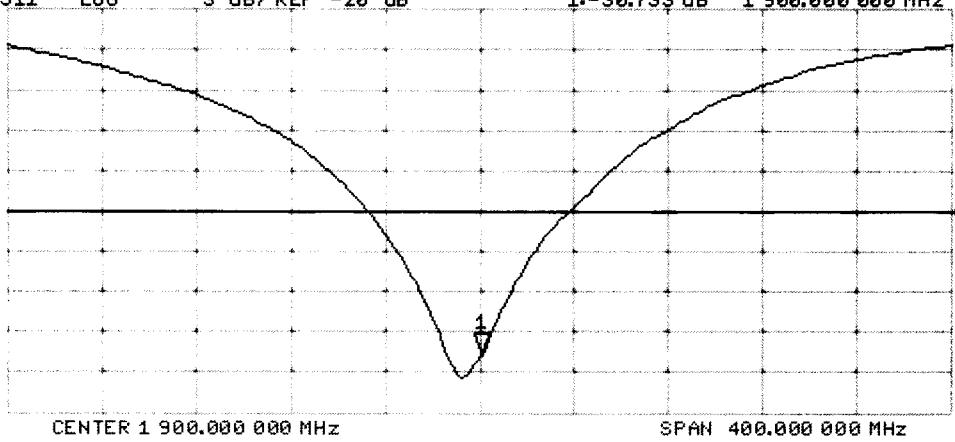
[CH1] S11 1 U FS 1: 48.984  $\Omega$  2.6953  $\Omega$  225.77 pF 1 900.000 000 MHz

\*  
Del  
Cor  
Avg  
16  
↑



CH2 S11 LOG 3 dB/REF -20 dB 1:-30.733 dB 1 900.000 000 MHz

Cor  
Avg  
16  
↑





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Accreditation No.: **SCS 108**

Client **Ericsson UK**

Certificate No: **D835V2-442\_Dec06**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN: 442**

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

Calibration date: **December 06, 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 ± 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 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 (HF)	SN 1507	19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Oct-07
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 Oct-06)	In house check: Oct-07

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

Issued: December 8, 2006

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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:**

- 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 V4.9	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<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.

	Temperature	Permittivity	Conductivity
<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	41.7 $\pm$ 6 %	0.90 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	2.35 mW / g
SAR normalized	normalized to 1W	9.40 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>9.43 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	1.54 mW / g
SAR normalized	normalized to 1W	6.16 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>6.17 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	54.1 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 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	2.51 mW / g
SAR normalized	normalized to 1W	10.0 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>9.70 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	1.67 mW / g
SAR normalized	normalized to 1W	6.68 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>6.51 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	50.3 $\Omega$ - 7.5 j $\Omega$
Return Loss	- 22.5 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.2 $\Omega$ - 9.7 j $\Omega$
Return Loss	- 19.4 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.390 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	July 26, 2001

# DASY4 Validation Report for Head TSL

Date/Time: 05.12.2006 12:25:28

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 442**

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

Medium: HSL 900 MHz;

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.902 \text{ mho/m}$ ;  $\epsilon_r = 42$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

## DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(6.09, 6.09, 6.09); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 46; Postprocessing SW: SEMCAD, V1.8 Build 171

**Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:**

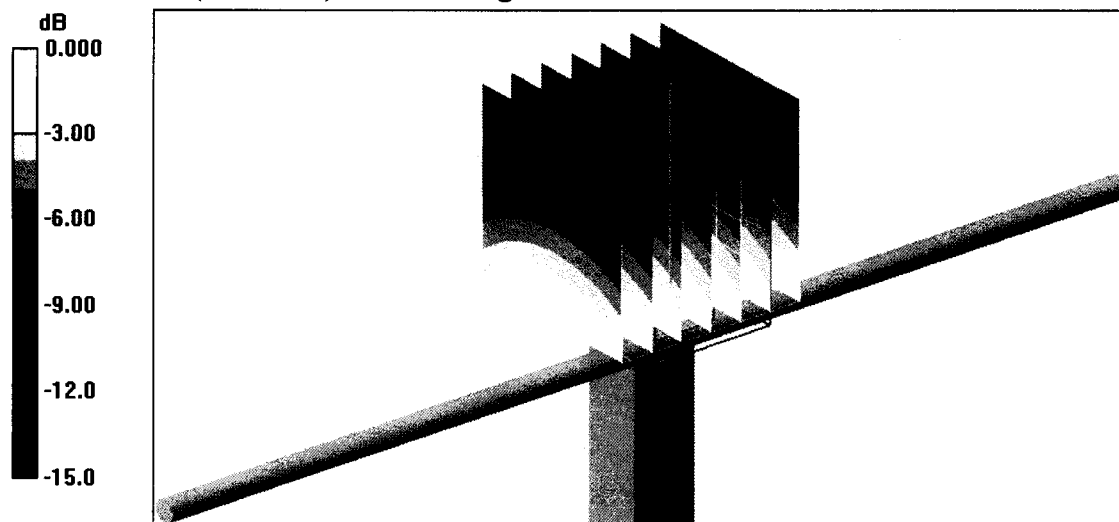
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 55.5 V/m; Power Drift = -0.017 dB

Peak SAR (extrapolated) = 3.40 W/kg

**SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.54 mW/g**

Maximum value of SAR (measured) = 2.55 mW/g



0 dB = 2.55mW/g

# Impedance Measurement Plot for Head TSL

5 Dec 2006 12:03:21

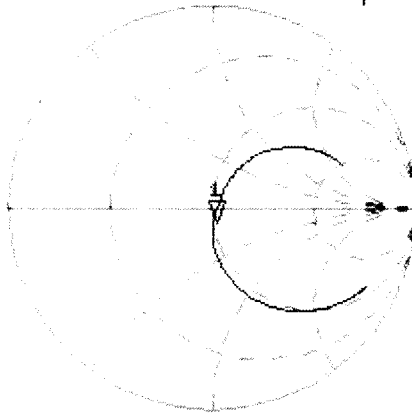
CH1 S11 1 U FS 1: 50.336  $\Omega$  -7.5410  $\Omega$  25.276 pF 835.000 000 MHz

\*  
Del

CA

Avg  
16

↑

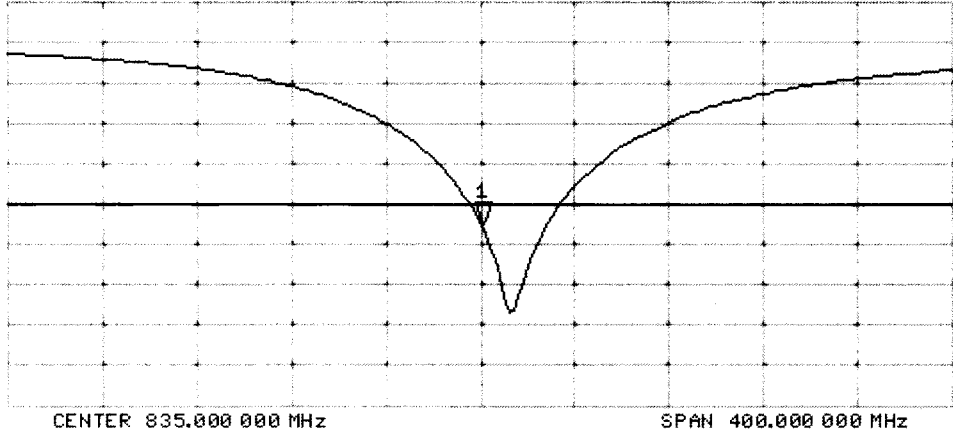


CH2 S11 LOG 5 dB/REF -20 dB 1:-22.494 dB 835.000 000 MHz

CA

Avg  
16

↑



## DASY4 Validation Report for Body TSL

Date/Time: 06.12.2006 13:07:13

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:442**

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

Medium: MSL900;

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1 \text{ mho/m}$ ;  $\epsilon_r = 54.1$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.75, 5.75, 5.75); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 46; Postprocessing SW: SEMCAD, V1.8 Build 171

**Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:**

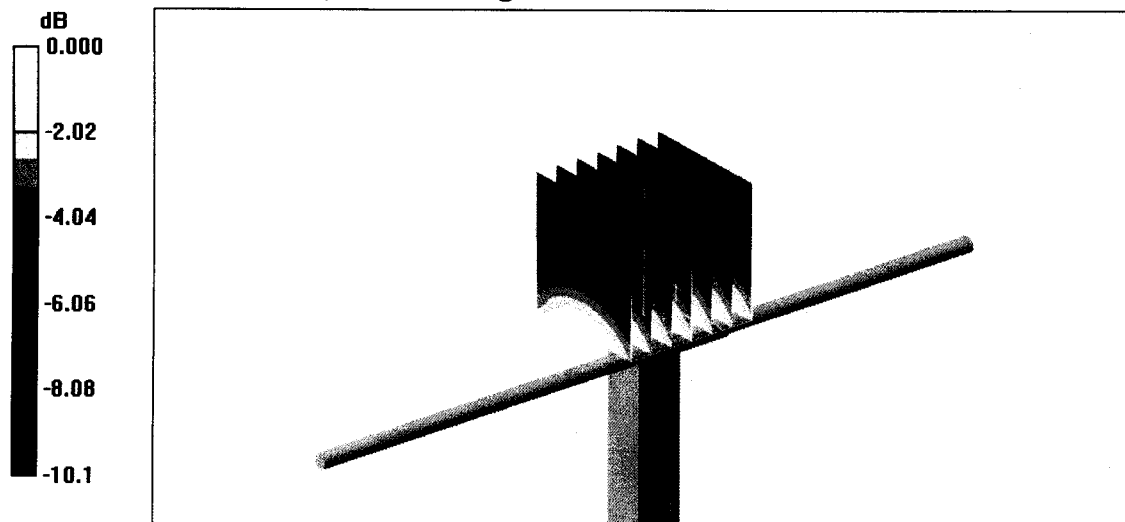
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.7 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 3.49 W/kg

**SAR(1 g) = 2.51 mW/g; SAR(10 g) = 1.67 mW/g**

Maximum value of SAR (measured) = 2.72 mW/g



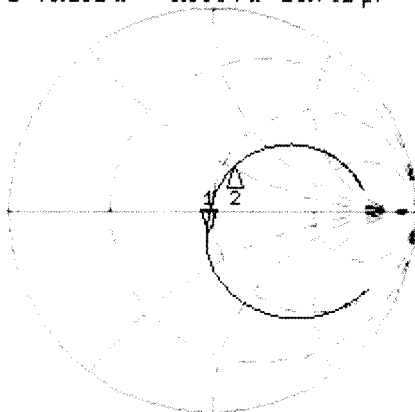
0 dB = 2.72mW/g

# Impedance Measurement Plot for Body TSL

6 Dec 2006 10:32:17

CH1 S11 1 U FS 1: 46.182  $\Omega$  -9.6504  $\Omega$  19.751 pF 835.000 000 MHz

\*  
Del  
Cor



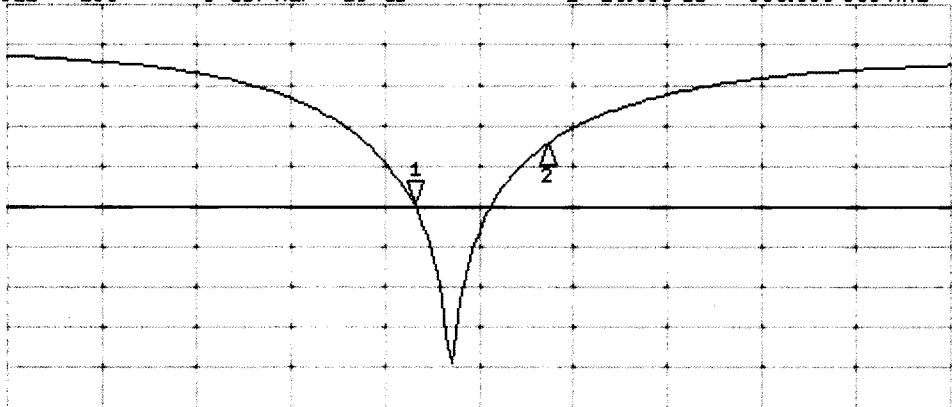
CH1 Markers  
2: 55.250  $\Omega$   
25.500  $\Omega$   
900.000 MHz

Avg  
16

↑

CH2 S11 LOG 5 dB/REF -20 dB 1: -19.385 dB 835.000 000 MHz

Cor



CH2 Markers  
2: -12.379 dB  
-19.385 dB  
900.000 MHz

Avg  
16

↑

START 635.000 000 MHz

STOP 1 100.000 000 MHz





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Sony Electronics UK**

Certificate No: **DAE3-448\_Nov07**

## CALIBRATION CERTIFICATE

Object **DAE3 - SD 000 D03 AE - SN: 448**

Calibration procedure(s) **QA CAL-06.v12  
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **November 15, 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 ( $22 \pm 3$ )°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	04-Oct-07 (Elcal AG, No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (Elcal AG, No: 6465)	Oct-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	25-Jun-07 (SPEAG, in house check)	In house check Jun-08

Calibrated by: **Dominique Steffen** **Technician** **Signature**

Approved by: **Fin Bornholt** **R&D Director**

Issued: November 15, 2007

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



## Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

## Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters contain technical information as a result from the performance test and require no uncertainty.
- *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
- *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
- *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
- *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
- *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
- *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
- *Input resistance:* DAE input resistance at the connector, during internal auto-zeroing and during measurement.
- *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
- *Power consumption:* Typical value for information. Supply currents in various operating modes.

## DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V, full range = -100...+300 mV  
Low Range: 1LSB = 61nV, full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	403.816 $\pm$ 0.1% (k=2)	404.070 $\pm$ 0.1% (k=2)	403.834 $\pm$ 0.1% (k=2)
Low Range	3.95937 $\pm$ 0.7% (k=2)	3.96143 $\pm$ 0.7% (k=2)	3.93067 $\pm$ 0.7% (k=2)

## Connector Angle

Connector Angle to be used in DASY system	277 $^{\circ}$ $\pm$ 1 $^{\circ}$
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## Appendix

### 1. DC Voltage Linearity

High Range	Input ( $\mu\text{V}$ )	Reading ( $\mu\text{V}$ )	Error (%)
Channel X + Input	200000	200000.1	0.00
Channel X + Input	20000	20008.04	0.04
Channel X - Input	20000	-20002.96	0.01
Channel Y + Input	200000	199999.5	0.00
Channel Y + Input	20000	20005.57	0.03
Channel Y - Input	20000	-20005.68	0.03
Channel Z + Input	200000	199999.3	0.00
Channel Z + Input	20000	20006.62	0.03
Channel Z - Input	20000	-20004.64	0.02

Low Range	Input ( $\mu\text{V}$ )	Reading ( $\mu\text{V}$ )	Error (%)
Channel X + Input	2000	1999.9	0.00
Channel X + Input	200	201.18	0.59
Channel X - Input	200	-199.65	-0.17
Channel Y + Input	2000	2000	0.00
Channel Y + Input	200	199.43	-0.28
Channel Y - Input	200	-200.60	0.30
Channel Z + Input	2000	2000.1	0.00
Channel Z + Input	200	199.20	-0.40
Channel Z - Input	200	-200.60	0.30

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading ( $\mu\text{V}$ )	Low Range Average Reading ( $\mu\text{V}$ )
Channel X	200	10.80	9.16
	- 200	-8.06	-8.82
Channel Y	200	-9.03	-8.67
	- 200	7.38	7.30
Channel Z	200	11.34	10.22
	- 200	-11.97	-11.93

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X ( $\mu\text{V}$ )	Channel Y ( $\mu\text{V}$ )	Channel Z ( $\mu\text{V}$ )
Channel X	200	-	1.80	0.18
Channel Y	200	0.22	-	3.40
Channel Z	200	-2.84	-0.85	-

#### 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16252	17093
Channel Y	16361	17876
Channel Z	16104	15739

#### 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M $\Omega$

	Average ( $\mu$ V)	min. Offset ( $\mu$ V)	max. Offset ( $\mu$ V)	Std. Deviation ( $\mu$ V)
Channel X	0.19	-1.33	1.54	0.41
Channel Y	-0.76	-2.61	0.61	0.29
Channel Z	-0.83	-2.27	0.40	0.38

#### 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

#### 7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	199.7
Channel Y	0.1999	200.9
Channel Z	0.1999	201.1

#### 8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

#### 9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9



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Accreditation No.: **SCS 108**

Client

Sony Electronics Inc.

[Redacted]

**CALIBRATION CERTIFICATE**

Object: **ET3DV6 - SN:1610**

Calibration procedure(s): **GR CAL-01-V6**  
Calibration procedure for Frequency Standard: Frequency Standard

Calibration date: **November 14, 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	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	[Redacted]	[Redacted]	[Redacted]
Approved by:	[Redacted]	[Redacted]	[Handwritten Signature]

Issued: November 14, 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 $\varphi$	$\varphi$ 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
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### 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<sup>2</sup>-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:1610

Manufactured:	July 27, 2001
Last calibrated:	November 17, 2006
Recalibrated:	November 14, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



**DASY - Parameters of Probe: ET3DV6 SN:1610****Sensitivity in Free Space<sup>A</sup>****Diode Compression<sup>B</sup>**

NormX	1.73 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	93 mV
NormY	1.70 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	95 mV
NormZ	1.74 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	92 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	10.3	6.1
SAR <sub>be</sub> [%]	With Correction Algorithm	1.6	0.7

**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	9.9	6.1
SAR <sub>be</sub> [%]	With Correction Algorithm	0.0	0.8

**Sensor Offset**

Probe Tip to Sensor Center                      **2.7 mm**

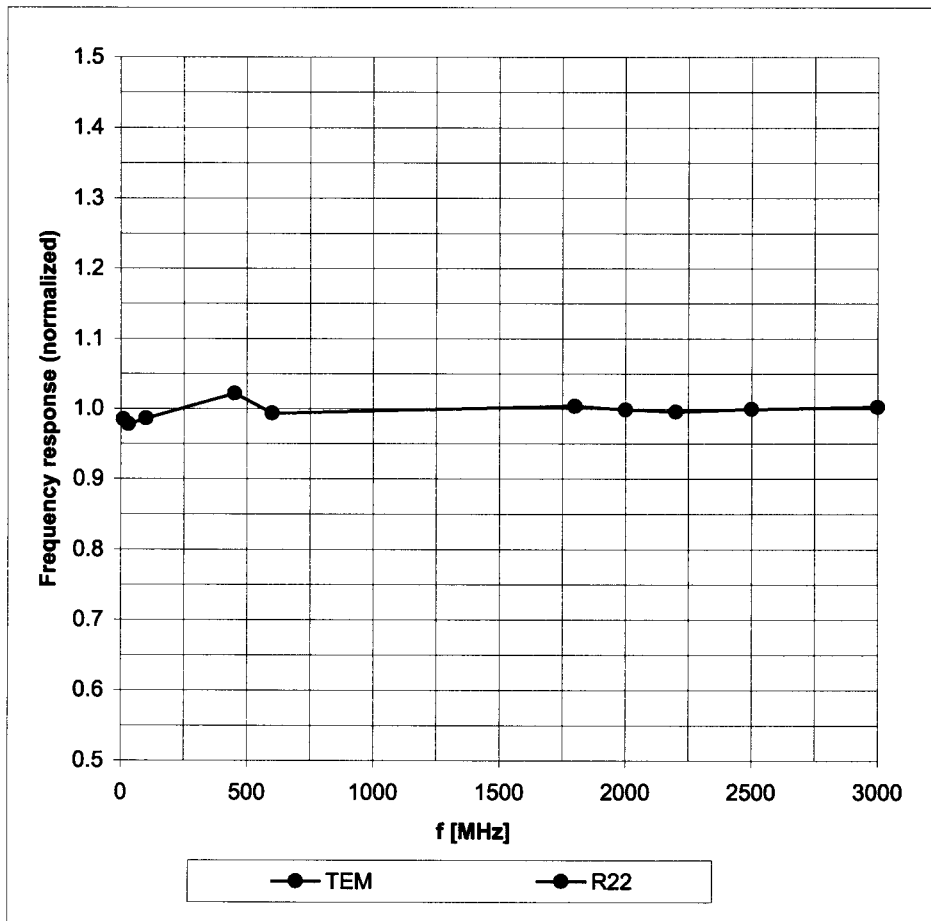
**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

<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.

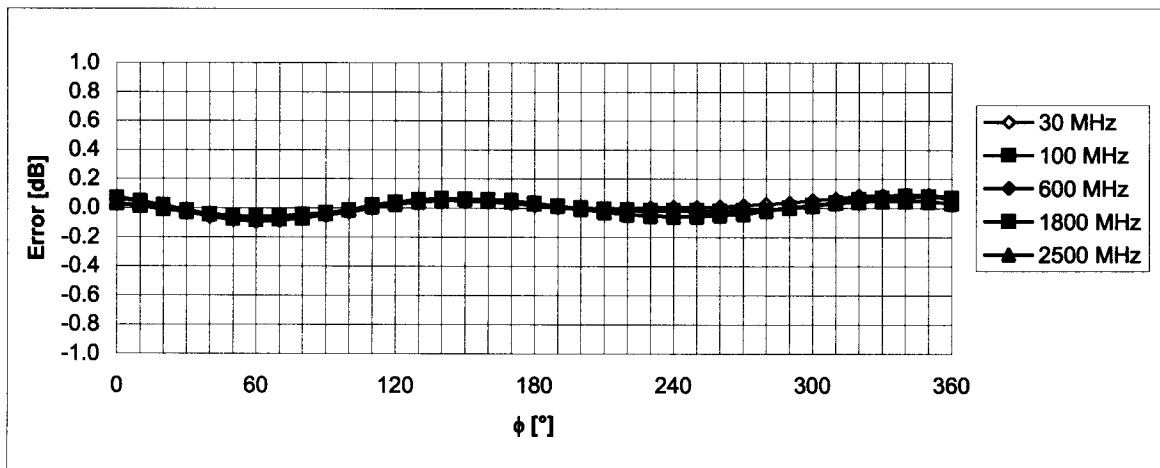
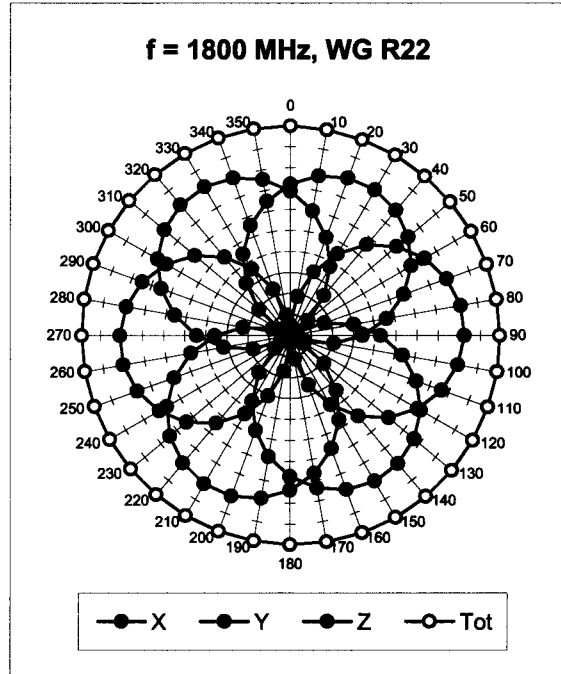
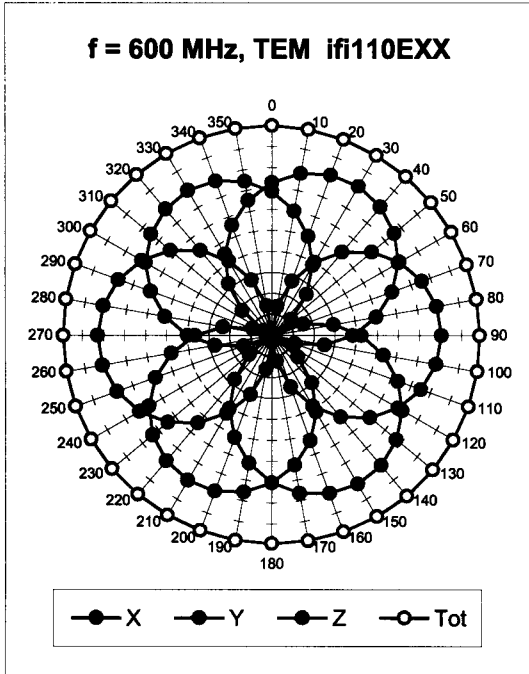
# Frequency Response of E-Field

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



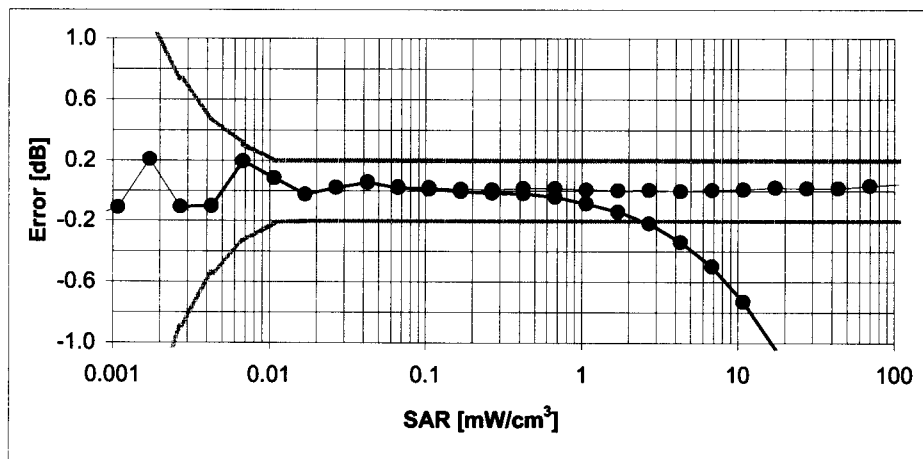
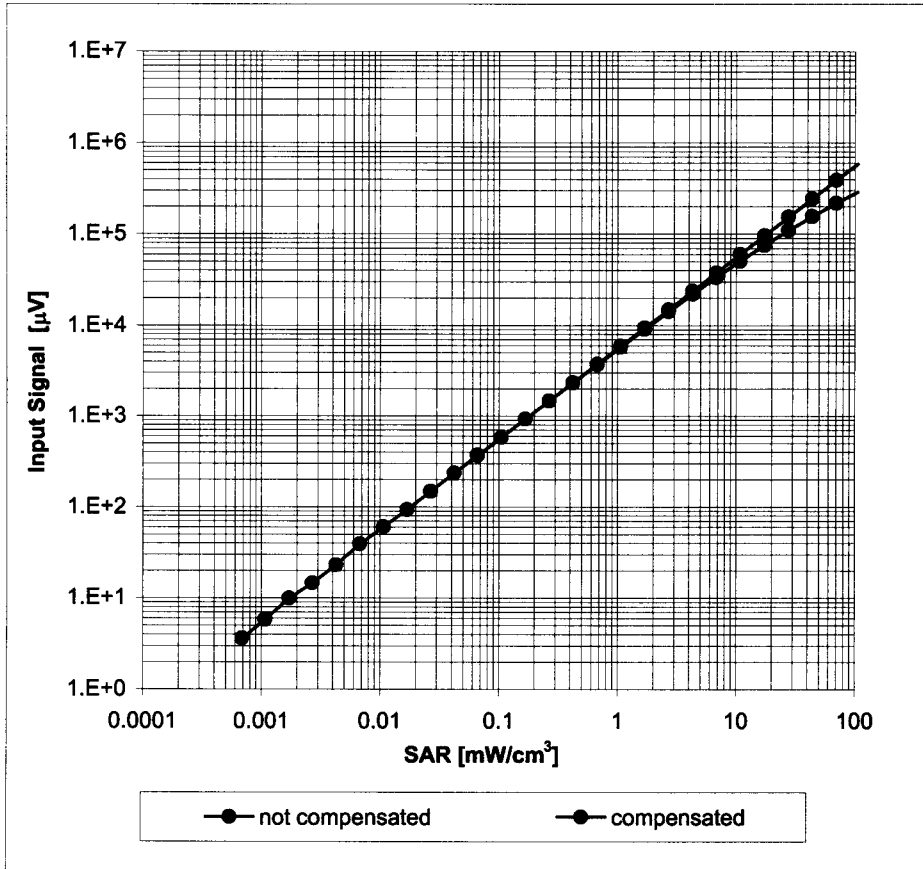
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



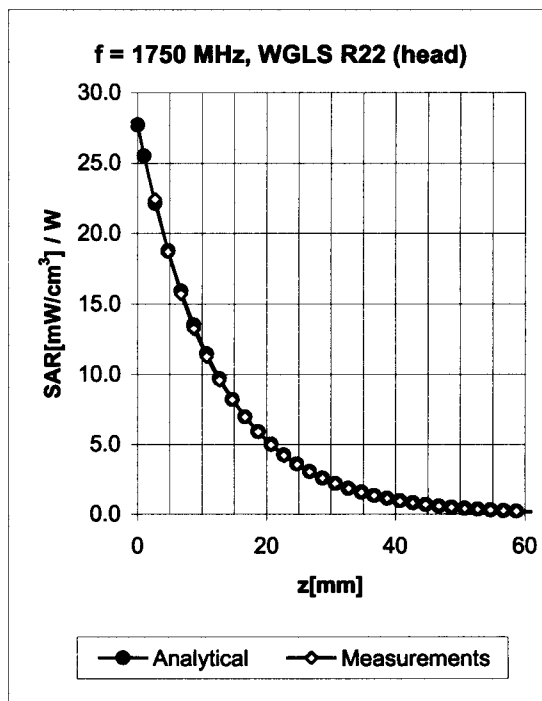
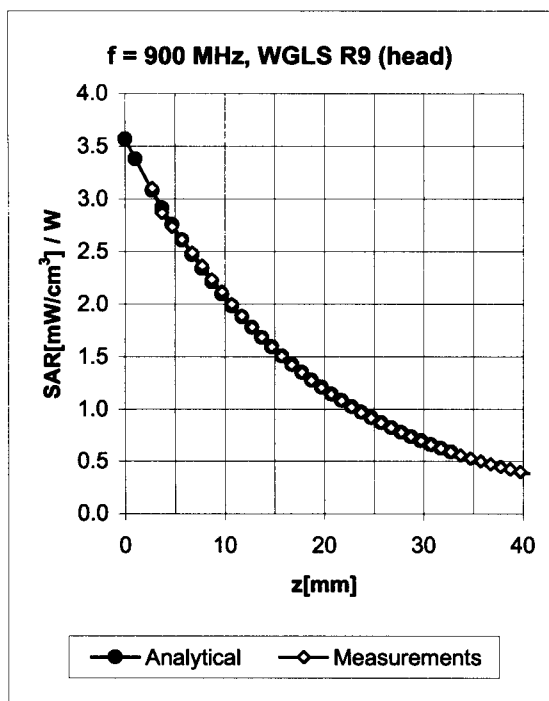
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

### Dynamic Range f(SAR<sub>head</sub>) (Waveguide R22, f = 1800 MHz)



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

### Conversion Factor Assessment

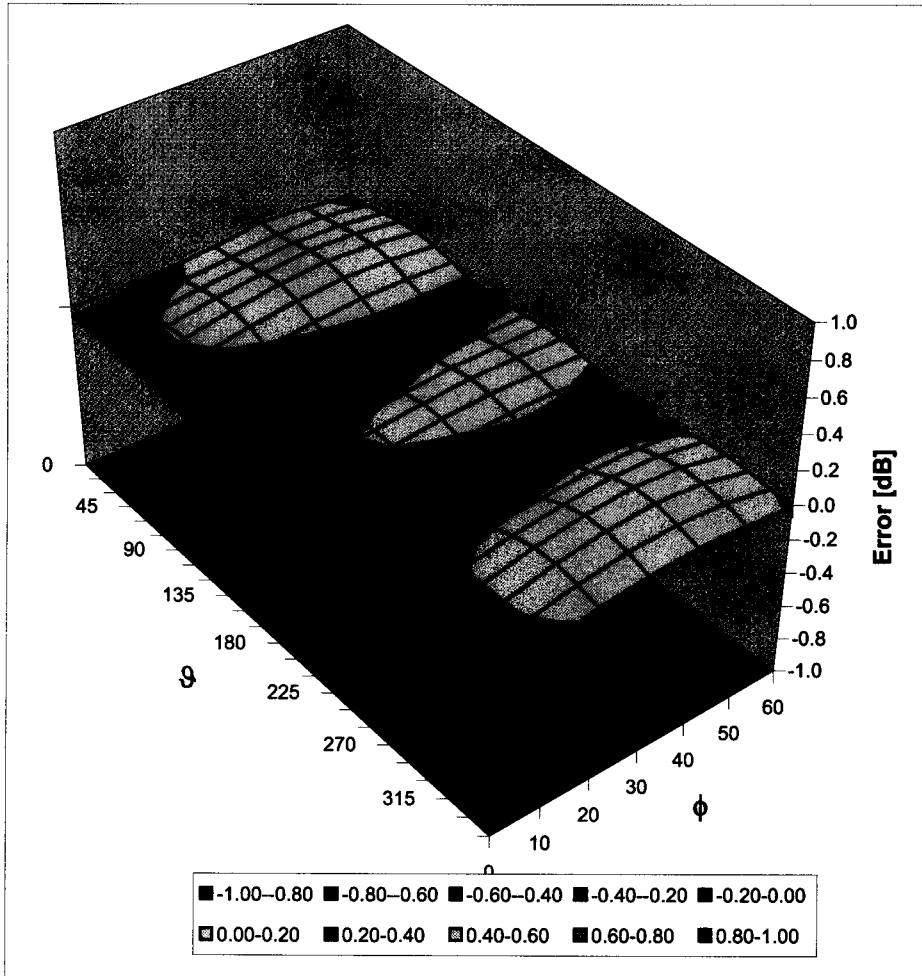


f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.76	1.87	6.69 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.73	1.94	6.59 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.81	1.69	5.35 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.87	1.65	5.18 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.78	1.91	4.70 ± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.76	1.93	6.39 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.66	2.00	6.07 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.77	1.94	4.89 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.74	1.99	4.68 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.90	1.73	4.09 ± 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:  $\pm 2.6\%$  ( $k=2$ )