

Prepared (also subject responsible if other)

LD/SEMC/BGGI/NM Ramadan Plicanic

Approved

LD/SEMC/BGGI/NMC Mats Hansson

Checked

Company Internal
REPORT

No.

BGGIN05:180

Date

2005-06-15

Rev

A

Reference

Report issued by Accredited SAR Laboratory**for****PY7AD021023 (K608i)****Date of test:** 7 and 8 June 2005**Laboratory:** Sony Ericsson SAR Test Laboratory
Sonyericsson Mobile Communications AB
Nya Vattentornet
SE-221 82 LUND, Sweden**Testing Engineer:** Ramadan Plicanic
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+46 46 19 38 62**Testing Approval** Mats Hansson
Mats.Hansson@sonyericsson.com
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Sony Ericsson Mobile Communications AB declares under its sole responsibility that the product

Sony Ericsson Type: AAD-3021023-BV; FCC ID: PY7AD021023; IC: 4170B-AD021023

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 (2000). 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 PY7AD021023 (K608i) 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	
Location	On top on the back side	
Dimensions	Max length	40 mm
	Max width	18 mm
Configuration	PIFA	

3.2 Device description

Device model	PY7AD021023 (K608i)	
Serial number	CB501456SA	
Mode	GSM1900	GSM1900 (GPRS 2 Slots)
Multiple Access Scheme	TDMA	TDMA
Maximum Output Power Setting	30.0 dBm	30.0 dBm
Factory Tolerance in Power Setting	±0.5 dB	±0.5 dB
Maximum Peak Output Power	30.5 dBm	30.5 dBm
Crest Factor	8	4
Transmitting Frequency Range(MHz)	1850.2 – 1909.8	
Prototype or Production Unit	Preproduction	
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 4.4, B 3) 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	640	October, 2005
E-field probe ETDV6	1815	January, 2006
Dipole Validation Kit, D1900V2	5d002	March, 2007

4.2 Additional equipment

Description	Inventory Number	Due Date
Signal generator ESG-D4000A	INV 462935	08, 2005
Directional coupler HP778D	INV 39656	01, 2006
Power meter R&S NRVD	INV 483920	01, 2006
Power sensor R&S NRV-Z5	INV 2333	11, 2005
Power sensor R&S NRV-Z5	INV 2334	01, 2006
Termination 65N50-0-11	INV 2903	02, 2006
Network analyzer HP8753C	INV421671	09, 2005
S-parameter test set HP85047A	INV 421670	09, 2005
Dielectric probe kit HP8507D	INV 20000053	Self cal

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5 Electrical parameters on the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, ϵ_r , and the conductivity, S , of the tissue simulating liquids were measured with the dielectric probe kit. These values are shown in the table below. The mass density, ρ , entered into the DASY3 software is also given. Recommended limits for permittivity ϵ_r , conductivity S and mass density ρ are also shown.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			ϵ_r	S (S/m)	ρ (g/cm ³)
1900	Head	Measured, 07/06/2005	39.5	1.47	1.00
		Recommended	40.0	1.4	1.00
1900	Body	Measured, 08/06/2005	50.8	1.48	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 21.7-22.3 °C and humidity 30.2-33.8%. The obtained results are displayed in the table below.

RF noise had been measured in liquid when all RF equipment in lab was set off. Measured value was 0.0015 mW/g in 1g mass.

f (MHz)	Tissue type	Measured / Reference	SAR (W/kg) 1g/10g	Dielectric Parameters			Liquid t(°C)
				ϵ_r	S (S/m)	ρ (g/cm ³)	
1900	Head	Measured, 07/06/2005	39.6/20.5	39.5	1.47	1.00	21.5
		Reference	39.2 /20.6	39.6	1.45	1.00	-
1900	Body	Measured, 08/06/2005	37.9/20.3	50.8	1.48	1.00	22.0
		Reference	39.6/20.9	51.6	1.58	1.00	-



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7 SAR measurement uncertainty

SAR measurement uncertainty evaluation for Sonyericsson K608i phone

Uncertainty Component	Uncer. (%)	Prob Dist.	Div.	C _i	1900 Head	1900 Body
Measurement System						
Probe Calibration	±4.4	N	1	1	±4.4	±4.4
Axial Isotropy	±4.7	R	√3	0.5	±1.4	±1.4
Spherical Isotropy	±9.6	R	√3	0.5	±2.8	±2.8
Spatial resolution	±0.0	R	√3	1	±0.0	±0.0
Boundary effect	±5.5	R	√3	1	±3.2	±3.2
Probe linearity	±4.7	R	√3	1	±2.7	±2.7
Detection limit	±1.0	R	√3	1	±0.6	±0.6
Readout electronics	±1.0	N	1	1	±1.0	±1.0
Response time	±0.8	R	√3	1	±0.5	±0.5
Integration time	±1.4	R	√3	1	±0.8	±0.8
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	±3.9	R	√3	1	±2.3	±2.3
Measurement System Uncertainty					±7.7	±7.7
Test Sample Related						
Device positioning	±6.0	N	0.89	1	±6.7	±6.7
Device holder uncertainty	±5.0	N	0.84	1	±5.9	±5.9
Power drift	±1.8/±4.7	R	√3	1	±1.0	±2.7
Test Sample Related Uncertainty					±9.0	±9.3
Phantom and Tissue Parameters						
Phantom uncertainty	±4.0	R	√3	1	±2.3	±2.3
Liquid conductivity (meas)	±5.0	R	√3	0.6	±1.7	±1.7
Liquid conductivity (target)	±5.0/±2.6	R	√3	0.6	±1.7	±0.9
Liquid Permittivity (meas)	±5.0	R	√3	0.6	±1.7	±1.7
Liquid Permittivity (target)	±1.25/±4.7	R	√3	0.6	±0.4	±1.6
Phantom and Tissue Parameters Uncertainty					±3.8	±3.8
Combined standard uncertainty					±12.4	±12.7
Extended standard uncertainty (k=2)					±24.8	±25.4

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8 Test results

The measured 1-gram and averaged SAR values of the device against the head are provided in Tables 1 and body are provided in Tables 2. The ambient humidity and temperature of test facility were 33.8% - 30.2% and 21.7 °C – 22.3 °C respectively. The depth of the head tissue simulating liquid was 15.5cm and for body tissue simulating liquid 16.4cm. A base station simulator was used to control the device during the SAR measurement. The phone was supplied with full-charged battery for each measurement.

For head measurement, the device was tested on the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom in two phone position, cheek (touch) and tilt (cheek + 15deg).

For body measurement phone was tested on the antenna to the phantom and back to the phantom in GPRS 2 Slots mode on 15mm distance between phone and phantom. For speech mode phone was antenna to phantom in position with 15mm distance and with connected portable hands free accessory HPM-20. For all modes, the device was tested at the lowest, middle and highest frequencies in the transmit band. For Blue Tooth mode, phone was paired with Sony Ericsson HBH-200 Blue Tooth head sets and measured on worst case speech mode body position.

Mode	Channel	Peak Output Power(dBm)	Phone Position	Liquid temp(°C)	SAR (W/kg) in 1g mass	
					Right-hand	Left-hand
GSM 1900 Head	512	30.2	Cheek	21.0/21.0	0.64	0.7
			Tilt	21.5/21.5	0.43	0.52
	661	30.3	Cheek	21.0/21.0	0.55	0.6
			Tilt	21.5/21.5	0.4	0.47
	810	30.4	Cheek	21.0/21.0	0.46	0.48
			Tilt	21.5/21.5	0.32	0.37

Table1: SAR measurement result for Sony Ericsson PY7AD021023 (K608i) telephone at highest possible output power. Measured against the head.

Mode	Channel	Power (dBm)	Phone Position	Liquid t (°C)	SAR (W/kg) in 1 g mass
GSM 1900 Body	512	30.2	Antenna to phantom, GPRS 2 Slots	21.0	0.68
			Front to phantom, GPRS 2 Slots	21.5	0.33
			Antenna to phantom, Speech	21.0	0.36
			Antenna to phantom +BT, Speech	21.5	0.32
	661	30.3	Antenna to phantom, GPRS 2 Slots	21.0	0.56
			Antenna to phantom, Speech	21.0	0.3
	810	30.4	Antenna to phantom, GPRS 2 Slots	21.0	0.46
			Antenna to phantom, Speech	21.0	0.21

Table2: SAR measurement result for Sony Ericsson PY7AD021023 (K608i) telephone at highest possible output power. Measured against 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] Basic standard for the Measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz-3GHz), European Standard EN 50361, July 2001
- [3] 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).
- [4] 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.

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10 Appendix

10.1 Photographs of Device Under Test



Phone Front



Phone back and battery



Phone System Contact

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Accessories used for measurement

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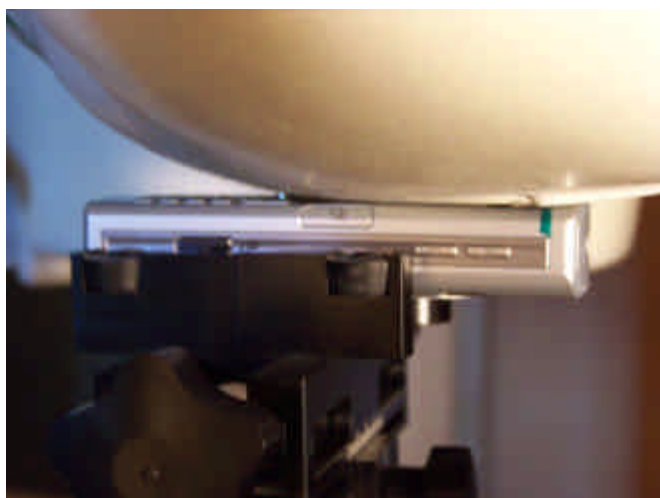
Rev

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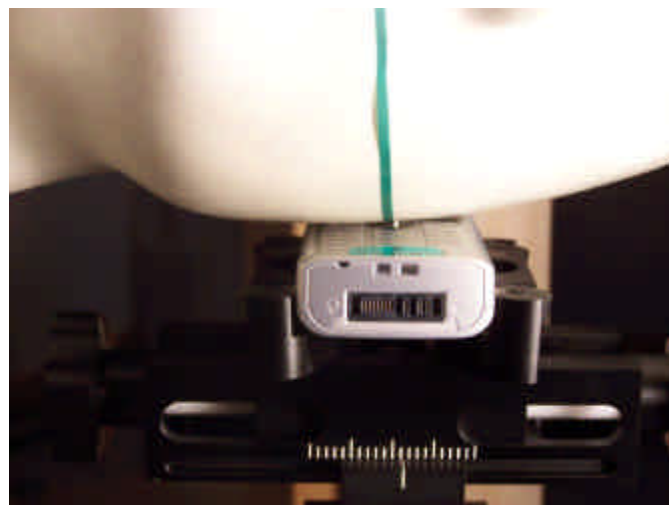
Reference

File

10.2 Photographs of DUT on SAM Twins Phantom



Cheek Phone Position



Tilt Phone Position



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Speech Body Position



GPRS Body Position

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10.3 Attachment

- **Verification measurement (SAR lab, Reference)**
- **SAR Measurements Plots**
- **Probe Calibration Report**

Date/Time: 06/08/05 08:02:48

Test Laboratory: Sony Ericsson Mobile Communications

File Name: [Verification1900MHz_Body_050608.da4](#)**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d002****Program Name: Verification 1900MHz Body**

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 50.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1815; ConvF(4.69, 4.69, 4.69); Calibrated: 2005-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection) Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn640; Calibrated: 2004-10-12
- Phantom: SAM 5; Type: SAM; Serial: 1352
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Pin = 100mW, distance = 10mm**Flat,15mm/Area Scan (61x61x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 4.44 mW/g

Flat,15mm/Z Scan (1x1x6): Measurement grid: dx=20mm, dy=20mm, dz=20mm

Maximum value of SAR (measured) = 2.95 mW/g

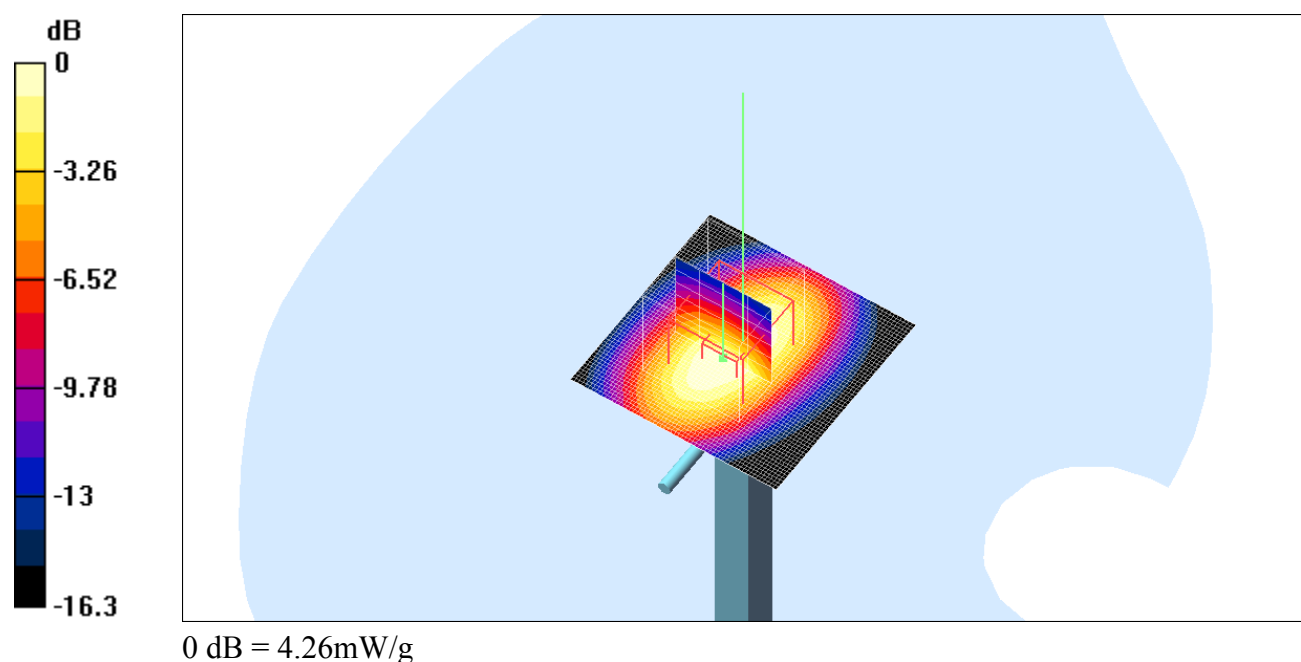
Flat,15mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=5mm

Reference Value = 57.4 V/m; Power Drift = 0.007 dB

Peak SAR (extrapolated) = 6.2 W/kg

SAR(1 g) = 3.79 mW/g; SAR(10 g) = 2.03 mW/g

Maximum value of SAR (measured) = 4.26 mW/g



Date/Time: 06/07/05 10:58:04

Test Laboratory: Sony Ericsson Mobile Communications

File Name: [Verification1900MHz_Head_050607.da4](#)**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d002****Program Name: Mirai GSM1800**

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1815; ConvF(5.31, 5.31, 5.31); Calibrated: 2005-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn640; Calibrated: 2004-10-12
- Phantom: SAM 5; Type: SAM; Serial: 1352
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Power = 100mW, Distance = 10mm**Flat, 15mm, GPRS 2 Slots/Area Scan (61x61x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 4.51 mW/g

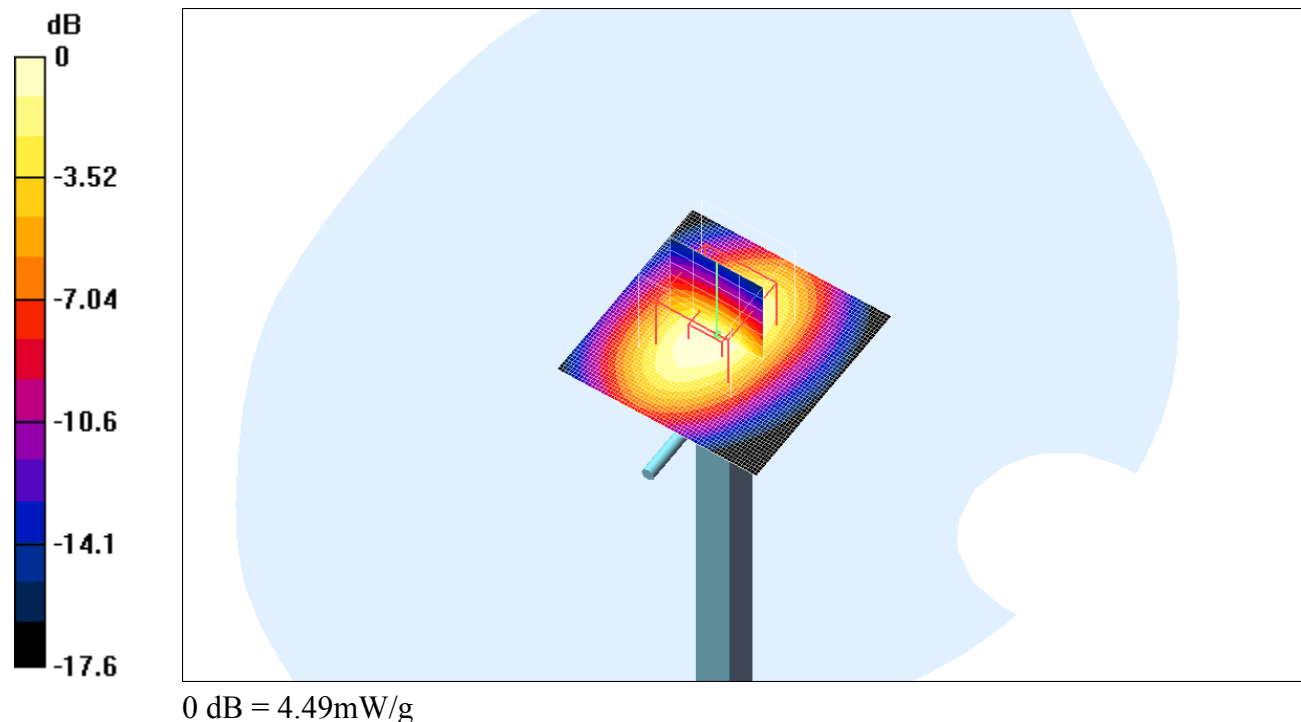
Flat, 15mm, GPRS 2 Slots/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=5mm

Reference Value = 56.5 V/m; Power Drift = -0.0 dB

Peak SAR (extrapolated) = 6.99 W/kg

SAR(1 g) = 3.96 mW/g; SAR(10 g) = 2.05 mW/g

Maximum value of SAR (measured) = 4.49 mW/g



DASY4 Validation Report for Body TSL

Date/Time: 15.03.2005 15:20:32

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: MSL 1900 MHz;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.57$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.43, 4.43, 4.43); Calibrated: 26.10.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.01.2005
- Phantom: Flat Phantom 5.0; Type: QD000P50AA; Serial: 1001;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.4 mW/g

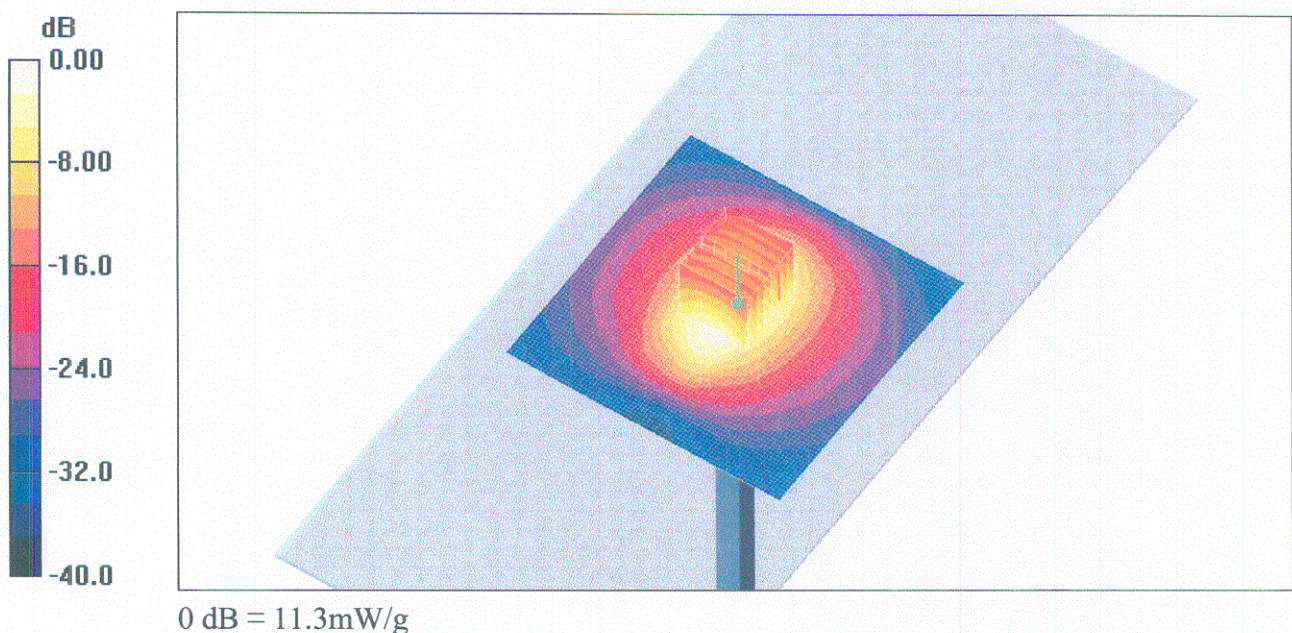
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.3 V/m; Power Drift = 0.061 dB

Peak SAR (extrapolated) = 16.8 W/kg

SAR(1 g) = 9.91 mW/g; SAR(10 g) = 5.23 mW/g

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



DASY4 Validation Report for Head TSL

Date/Time: 09.03.2005 15:20:45

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: HSL 1900 MHz;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.96, 4.96, 4.96); Calibrated: 26.10.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.01.2005
- Phantom: Flat Phantom 5.0; Type: QD000P50AA; Serial: 1001;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.4 mW/g

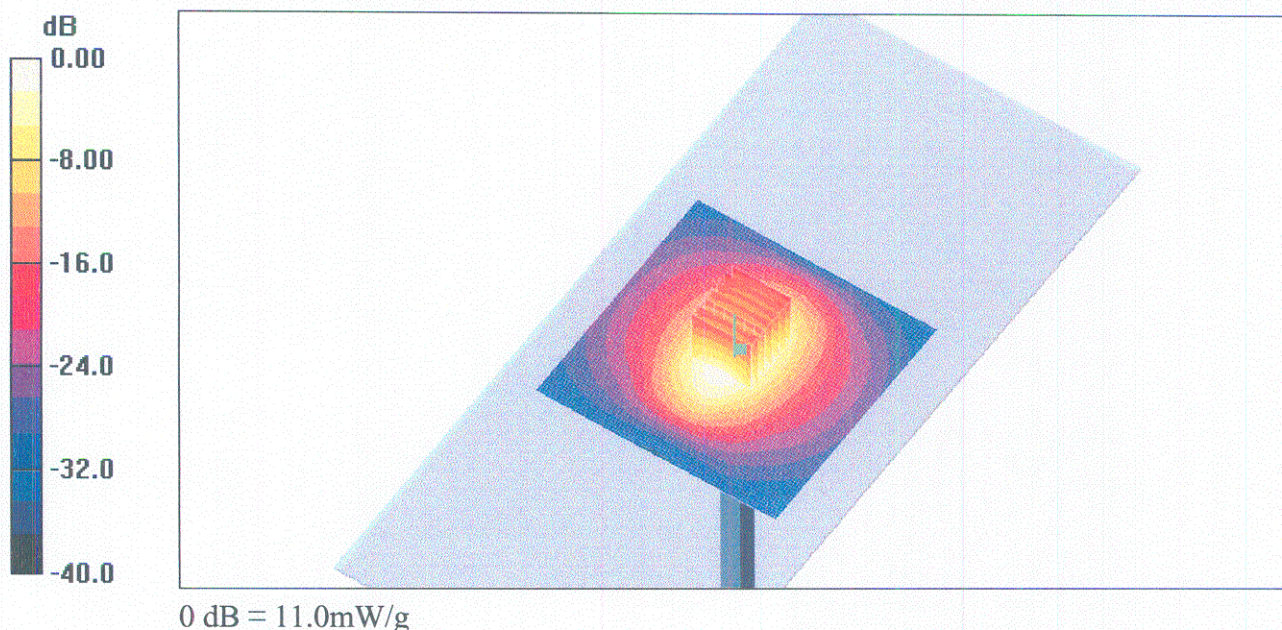
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.4 V/m; Power Drift = 0.037 dB

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 9.81 mW/g; SAR(10 g) = 5.15 mW/g

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



Date/Time: 06/07/05 13:29:40

Test Laboratory: Sony Ericsson Mobile Communications

File Name: [ch810_Right_Cheek_050607_RP.da4](#)**DUT: PY7AD021023; Type: GSM and UMTS; Serial: CB501456SA****Program Name: Mirai GSM1900**

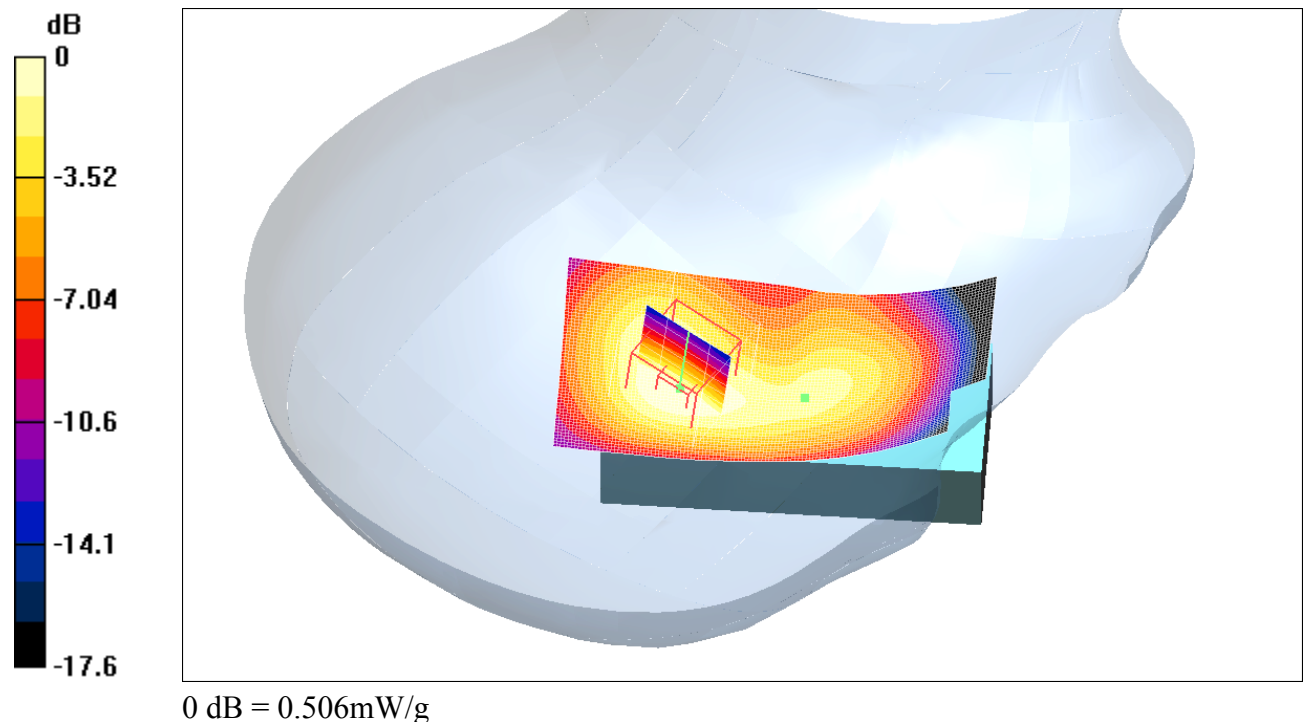
Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used (extrapolated): $f = 1909.8 \text{ MHz}$; $\sigma = 1.48 \text{ mho/m}$; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m^3

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1815; ConvF(5.31, 5.31, 5.31); Calibrated: 2005-01-20
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn640; Calibrated: 2004-10-12
- Phantom: SAM 5; Type: SAM; Serial: 1352
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Right, Cheek/Area Scan (61x121x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$ Maximum value of SAR (interpolated) = 0.522 mW/g **Right, Cheek/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: $dx=7\text{mm}$, $dy=7\text{mm}$, $dz=5\text{mm}$ Reference Value = 16.9 V/m ; Power Drift = -0.0 dB Peak SAR (extrapolated) = 0.678 W/kg **SAR(1 g) = 0.462 mW/g ; SAR(10 g) = 0.275 mW/g** Maximum value of SAR (measured) = 0.506 mW/g 

Date/Time: 06/07/05 16:31:56

Test Laboratory: Sony Ericsson Mobile Communications

File Name: [ch810_Left_Tilt_050607_RP.da4](#)**DUT: PY7AD021023; Type: GSM and UMTS; Serial: CB501456SA****Program Name: Mirai GSM1900**

Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used (extrapolated): $f = 1909.8$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1815; ConvF(5.31, 5.31, 5.31); Calibrated: 2005-01-20

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

- Electronics: DAE4 Sn640; Calibrated: 2004-10-12

- Phantom: SAM 5; Type: SAM; Serial: 1352

- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Left, Tilt/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.421 mW/g

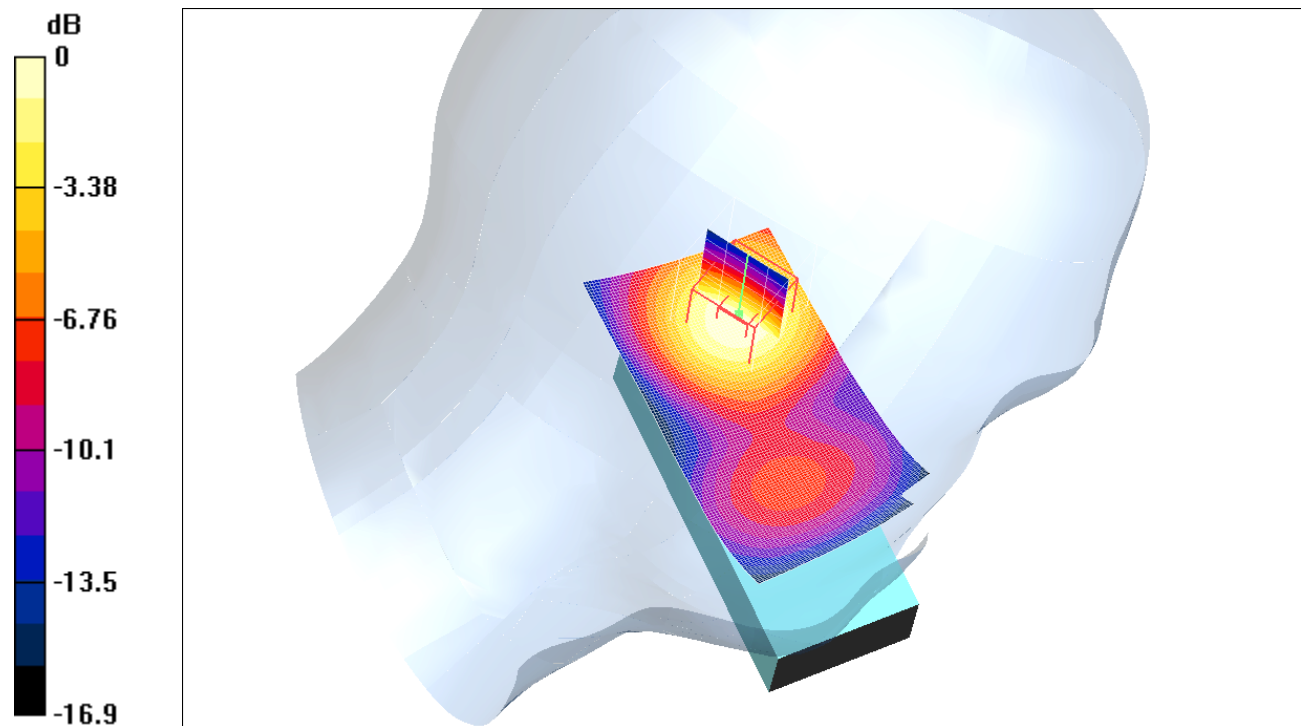
Left, Tilt/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=5mm

Reference Value = 15.6 V/m; Power Drift = -0.0 dB

Peak SAR (extrapolated) = 0.608 W/kg

SAR(1 g) = 0.372 mW/g; SAR(10 g) = 0.209 mW/g

Maximum value of SAR (measured) = 0.411 mW/g



0 dB = 0.411mW/g

Date/Time: 06/07/05 16:06:21

Test Laboratory: Sony Ericsson Mobile Communications

File Name: [ch810_Left_Cheek_050607_RP.da4](#)**DUT: PY7AD021023; Type: GSM and UMTS; Serial: CB501456SA****Program Name: Mirai GSM1900**

Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium parameters used (extrapolated): $f = 1909.8$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1815; ConvF(5.31, 5.31, 5.31); Calibrated: 2005-01-20

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

- Electronics: DAE4 Sn640; Calibrated: 2004-10-12

- Phantom: SAM 5; Type: SAM; Serial: 1352

- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Left, Cheek/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.533 mW/g

Left, Cheek/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=5mm

Reference Value = 16.5 V/m; Power Drift = -0.0 dB

Peak SAR (extrapolated) = 0.759 W/kg

SAR(1 g) = 0.477 mW/g; SAR(10 g) = 0.281 mW/g

Maximum value of SAR (measured) = 0.518 mW/g

