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Approved	Checked	Date	Rev	Reference
EAB/TF [Christer Tornevik]		2005-01-14	B	

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SAR Test Report: Type Number FAB-1021012-BV, -CN; FCC ID PY7FB021012; IC 4170B-FB021012 - re-measured at 1900 MHz

Date of test December 16, 21-22, 2004 and January 3-4, 2005

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1 Table of Contents

Test report summary

The table below summarizes the SAR measurement results obtained for the Sony Ericsson FAB-1021012 mobile phone model. The results show that the maximum SAR values are below the 1.6 W/kg (1g) limit and thus the Sony Ericsson FAB-1021012 mobile phone is in compliance with the appropriate RF exposure standards and recommendations.

Mode	***Maximum SAR_{1g} (W/kg)***
GSM1900 (Head)	*1.08*
GSM 1900 (Body)	*0.47*

2 General information

The tests reported in this document have been performed in accordance with the SAR measurement standard IEEE Standard 1528 [1] and the FCC Supplement C [2]. The purpose of the tests was to verify that this version of the Sony Ericsson FAB-1021012 mobile phone model that incorporates a new RF ASIC is in compliance, in the GSM1900 mode, with the appropriate RF exposure standards, recommendations and limits [1-3].

3 Device under test

The table below summarizes the technical data for the tested device. Only the GSM1900 mode was tested. Photographs of the device are presented in Appendix 1.

Device model	Type Number FAB-1021012; FCC ID PY7FB021012; IC 4170B-FB021012
Serial number of tested unit	ALS2Q6S2RT
Mode	GSM900, GSM1800, **GSM1900**
Antenna	Internal
Maximum output power level[1] (dBm)	GSM900: 33.0 GSM1800: 30.0 **GSM1900: 30.0**
Duty cycle	1:8 (GSM), 1:8 (GPRS)
Transmitter frequency range (MHz)	GSM900: 880.2-914.8 GSM1800: 1710.2-1784.8 **GSM1900: 1850.2-1909.8**
Bluetooth	Power class 3 (0 dBm)
Prototype or production unit	Prototype EP1 (HW version B)
Tested accessories	Stereo headset, CCA-0001002 Carry case, KRY 104 164 Portable handsfree, 5050029 Bluetooth headset, 8505002 Battery: 3000054

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

4 Test equipment

4.1 Dosimetric system

The SAR measurements were made using the DASY4 professional near-field scanner by Schmid & Partner Engineering AG that was installed in December 2002. The total SAR assessment uncertainty (k=1) of the system is ±10.3% for 1g SAR assessments and 9.7% for 10g SAR assessments. The corresponding extended uncertainties (k=2) are ±20.6% and ±19.3%, respectively. The equipment list is given below. In Appendix 4 calibration parameters for the SAR test probe are listed.

Description	Asset number	Calibration due date
DAE3	S/N 422	2005-05-21
E-field probe, ET3DV6	S/N 1394	2005-11-01
Dipole validation kit, D1900V2	S/N 510	NA
SAM Phantom	S/N TP-1204	NA

4.2 Additional equipment

Description	Asset number	Calibration due date
Signal generator, R&S SMHU58	S/N 843863/034	2006-12-10
Dielectric probe kit, HP 85070C	S/N US99360060	NA
Network analyzer, HP 8752C	S/N 3410A03732	2005-12-06
Power meter, R&S NRVS	S/N 848888/052	2006-05-24
Power sensor, R&S NRV-Z5	S/N 849895/030	2006-05-24
Digital radio tester, R&S CTS-55	S/N 827443/012	2006-11-26
Thermometer, EBRO TFX-392SKWT	S/N 10130918	2005-12-03
Thermo/Hygrometer, Testo 608-H2	S/N 60013082	2005-02-10

5 Electrical parameters of the tissue simulating liquids

The parameters of the tissue simulating liquids were measured with the dielectric probe kit prior to the SAR measurement and the results are shown in the table below. Specified standard values for the permittivity and the conductivity are also given [1][2]. The measured values are within 5% of the standard values. The mass density of the liquid entered into the DASY4 program was 1000 kg/m^3. The depth of the tissue simulating liquid was 15 cm.

f (MHz)	Liquid type	Measured/Specification	ε_r	σ (S/m)
1900	Head tissue	Measured	38.0-38.7[2]	1.42-1.45[2]
		Specified value	40.0	1.40
		Difference (%)	-5 - -3	1 - 4
1900	Body tissue (muscle)	Measured	50.6-50.8[2]	1.53-1.55[2]
		Specified value	53.3	1.52
		Difference (%)	-5	1 - 2

6 SAR system performance check

System performance checks for the DASY4 were conducted before the SAR measurements with the D1900V2 dipole kit and the obtained results are displayed in the table below. The results are within 10% of the reference values [1][4]. Evaluations prior to the SAR testing showed that the maximum SAR system noise was 3.4 mW/kg, which is below the standard requirements. The temperature of the test facility during the system performance checks was in the range 22.6°C to 23.1°C and the relative humidity was 31%-38%.

f (MHz)	Tissue	Measured/ Reference	SAR 1g (W/kg)	SAR 10g (W/kg)	ε_r	σ (S/m)	Liquid temp (°C)	Date
1900	Head	Measured	41.9	21.9	38.2	1.45	21.3	2004-12-16
		Reference [1]	39.7	20.5	40.0	1.40	-	-
		Difference (%)	+6	+7	-5	+4	-	-
1900	Head	Measured	40.6	21.3	38.7	1.42	23.4	2004-12-21
		Reference [1]	39.7	20.5	40.0	1.40	-	-
		Difference (%)	+2	+4	-3	+2	-	-
1900	Body	Measured	42.8	22.6	50.8	1.55	22.4	2005-01-03
		Reference [4]	40.6	20.9	53.3	1.52	-	-
		Difference (%)	+6	+8	-5	+2	-	-

[2] Tests were conducted during several days and the parameters were within the stated range.

7 Test results

The tables in this section show the measured 1g averaged SAR for the device and the corresponding values normalized to 30.0-dBm maximum output power level for the GSM1900 mode. A digital radio tester was used to control the device during the SAR measurements. The phone was supplied with a fully charged battery for the tests. The temperature of the test facility during the tests was in the range 22.0 to 24.9°C and the relative humidity was 30% to 41%.

The device was tested on the right-hand phantom (corresponding to the right side of the head) and the left-hand phantom for the cheek and tilt phone positions for the centre frequency of the transmit band, corresponding to the traffic channel 661 for the GSM1900 band. In Appendix 2 pictures of the device when positioned on the right-hand phantom are shown. Tests were performed with the flip opened, closed and removed. For the position giving the highest SAR result, the device was then tested at the lowest and the highest frequencies of the transmit band corresponding to the traffic channels 512 and 810 for GSM1900. Finally, for the position and frequency giving the highest SAR result, tests were performed with the Bluetooth transmitter turned on.

The device was also tested in body worn positions with muscle tissue in the GSM1900 mode. Tests were performed with the stereo headset attached and with a carry case or a 15 mm separation between the device and the liquid. In Appendix 2 pictures of the device when positioned under the flat section of the phantom are shown.

7.1 Results for the GSM1900 mode (Head)

Configuration	Hand side	Phone position	f (MHz)	Measured output power (dBm)	SAR_{1g}	
					Measured (W/kg)	Normalized to max power, 30.0 dBm (W/kg)
Flip Closed	Left	Cheek	1880.0	29.89	0.84	0.86
		Tilt	1880.0	29.89	0.87	0.89
	Right	Cheek	1880.0	29.89	0.80	0.82
		Tilt	1880.0	29.89	0.92	0.94
Flip Open	Left	Cheek	1880.0	29.89	0.63	0.64
		Tilt	1880.0	29.89	0.85	0.87
	Right	Cheek	1880.0	29.89	0.88	0.90
		Tilt	1880.0	29.89	0.81	0.83
Flip Removed	Left	Cheek	1880.0	29.89	0.63	0.64
		Tilt	1850.2	29.85	0.77	0.80
			1880.0	29.89	0.93	0.95
			1909.8	29.99	**1.08**	**1.08**
	Right	Cheek	1880.0	29.89	0.85	0.88
		Tilt	1880.0	29.89	0.88	0.91
Flip Removed, Bluetooth on	Left	Tilt	1909.8	29.99	1.07	1.07

During the tests the temperature of the tissue simulating liquid was in the range 21.5 to 23.1 °C, which is within ±2°C from the temperature at system performance check.

Appendix 3 (a-d) shows the maximum SAR distributions giving the maximum 1g SAR for the phone positions cheek and tilt at the right and left-hand phantoms.

7.2 Results for the GSM1900 mode (Body)

Separation	Configuration/ Accessory	Phone position (Front/Back towards the phantom)	f (MHz)	Measured output power (dBm)	SAR_{1g}	
					Measured (W/kg)	Normalized to max power, 30.0 dBm (W/kg)
Carry case touching the phantom	Flip closed Stereo headset	Front	1880.0	29.89	0.21	0.22
		Back	1850.2	29.85	0.30	0.31
			1880.0	29.89	0.34	0.35
			1909.8	29.99	0.34	0.34
	Flip removed Stereo headset	Front	1880.0	29.89	0.26	0.26
		Back	1880.0	29.89	0.31	0.32
	Flip closed Portable handsfree	Back	1909.8	29.99	0.24	0.24
	Flip closed Bluetooth on	Back	1909.8	29.99	0.31	0.31
15mm between the device and the tissue simulating liquid	Flip closed Stereo headset	Front	1880.0	29.89	0.27	0.28
		Back	1850.2	29.85	0.32	0.33
			1880.0	29.89	**0.46**	**0.47**
			1909.8	29.99	0.41	0.41
	Flip removed Stereo headset	Front	1880.0	29.89	0.36	0.37
		Back	1880.0	29.89	0.44	0.45
	Flip closed Portable handsfree	Back	1880.0	29.89	0.33	0.34
	Flip closed Bluetooth on	Back	1880.0	29.89	0.36	0.37

During the tests the temperature of the tissue simulating liquid was in the range 22.3 to 22.7°C, which is within ±2°C from the temperature at system performance check.

Appendix 3 (e) shows the maximum SAR distribution for the flat section of the phantom giving the maximum 1g SAR of 0.47 W/kg at 1900 MHz (body).

8 Conclusion

The results above show that the maximum 1g SAR for the Sony Ericsson FAB-1021012 mobile phone is below 1.6 W/kg. Consequently, the Sony Ericsson FAB-1021012 mobile phone model is in compliance with the appropriate RF exposure standards and recommendations.

9 References

[1] IEEE, Standard 1528, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.”, The Institute for Electrical and Electronics Engineers (IEEE) Inc., June 2003

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

[3] ANSI/IEEE C95.1-1999, “Safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz”, The Institute of Electrical and Electronics Engineers Inc., New York, 1999.

[4] Lennart Hamberg, “Calculation of reference SAR values for system performance checks with muscle tissue simulating liquid”, Ericsson wide internal, Report, EAB/TF-03:090, Rev A, August 2003.

APPENDIX 1: Photographs of the DUT

(a) Front view of the Sony Ericsson FAB-1021012 mobile phone.

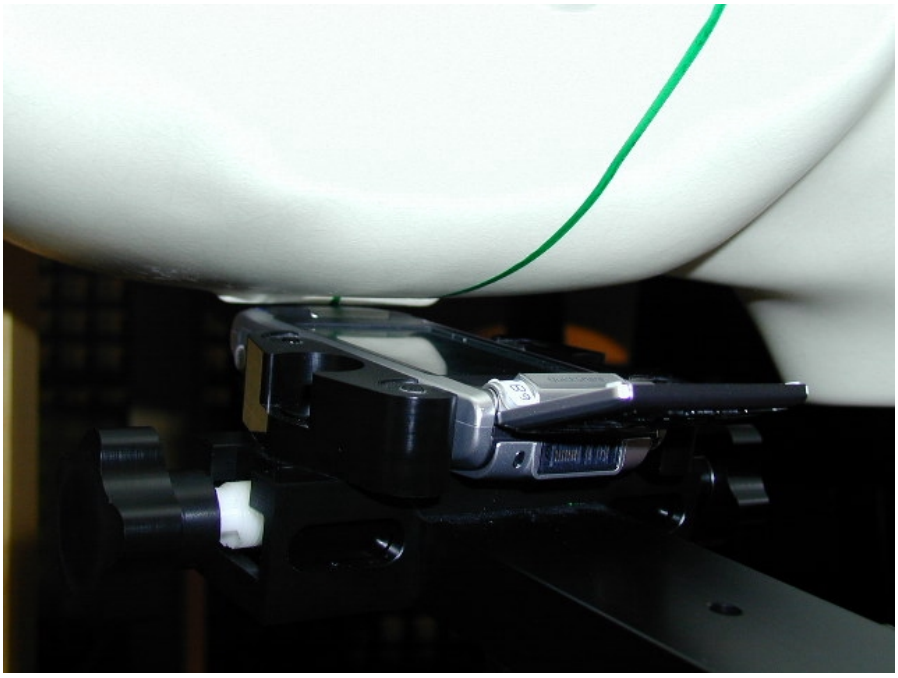
(b) Back and Side views of the Sony Ericsson FAB-1021012 mobile phone.

(c) Carry case

(d) Battery

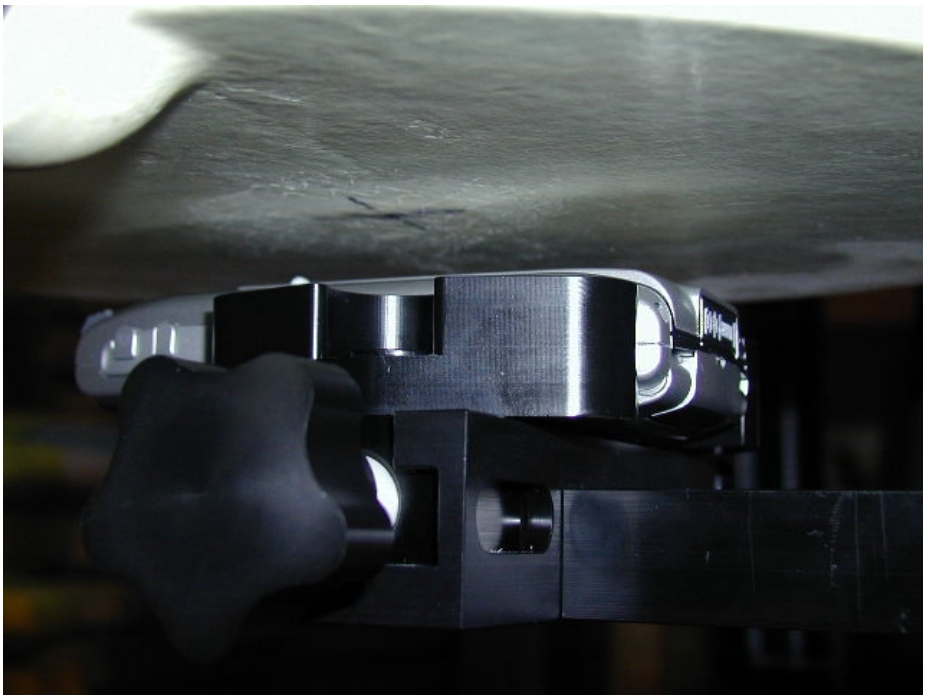
APPENDIX 2: Photographs of the DUT when positioned for SAR measurements

(a) Device on head phantom in the cheek position with the flip closed.



(b) Device on head phantom in the tilt position with the flip open.

(c) Device on flat section of the phantom with the carry case and the stereo headset. The clip was opened 3 mm with a piece of paper.



(d) Device on flat section of the phantom with the stereo headset. The separation was 15 mm between the device and the tissue simulating liquid.

APPENDIX 3: SAR distribution plots

Date/Time: 12/16/04 15:45:51

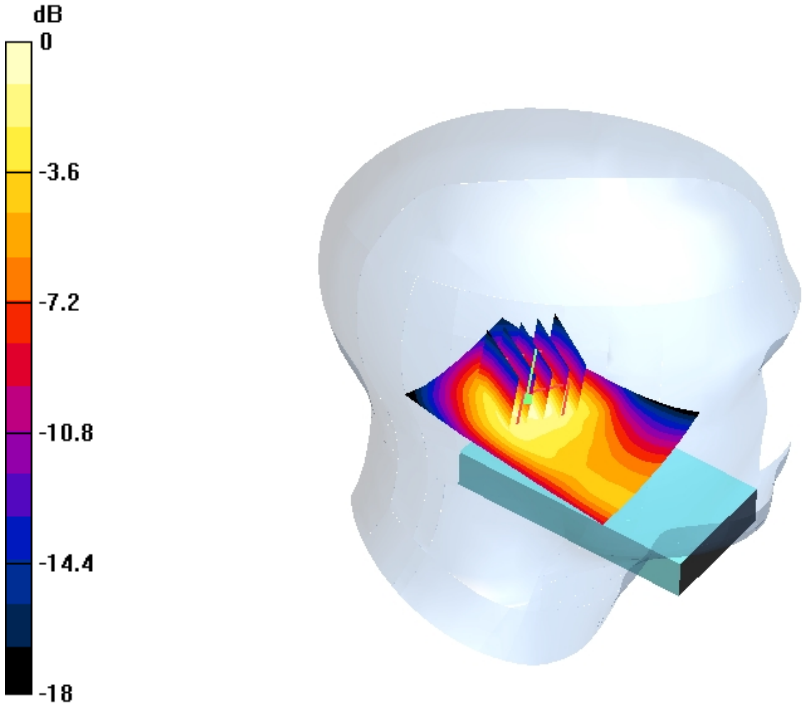
DUT: FAB-1021012; Type: Mobile Terminal; Serial: ALS2Q6S2RT

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: Head 1900 MHz; σ = 1.45 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1394; ConvF(5.59, 5.59, 5.59); Calibrated: 2004-11-01
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn422; Calibrated: 2004-05-21
- Phantom: SAM 2; ;
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Cheek Left Middle/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.999 mW/g

Cheek Left Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.7 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.945 mW/g
Peak SAR (extrapolated) = 1.51 W/kg
SAR(1 g) = 0.84 mW/g



0 dB = 0.945 W/kg

(a) Distribution of SAR in the GSM1900 mode giving the maximum 1g SAR in the left hand side phantom for the cheek position

Date/Time: 12/22/04 13:02:44

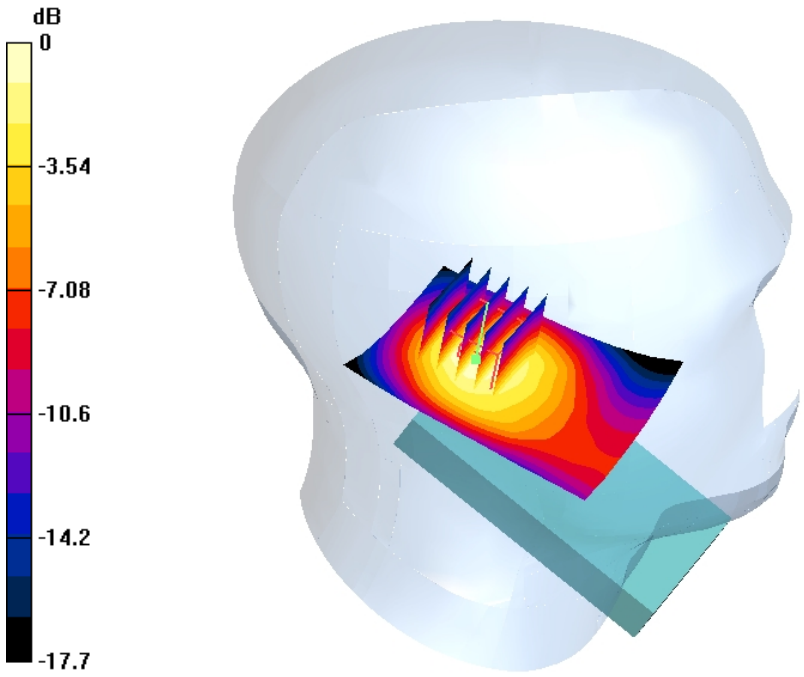
DUT: FAB-1021012; Type: Mobile Terminal; Serial: ALS2Q6S2RT

Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium: Head 1900: f = 1909.8 MHz; σ = 1.43 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1394; ConvF(5.59, 5.59, 5.59); Calibrated: 2004-11-01
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn422; Calibrated: 2004-05-21
- Phantom: SAM 2; ;
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Tilt Left High/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.28 mW/g

Tilt Left High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.5 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 1.18 mW/g
Peak SAR (extrapolated) = 1.99 W/kg
SAR(1 g) = 1.08 mW/g



0 dB = 1.18 mW/g

(b) Distribution of SAR in the GSM1900 mode giving the maximum 1g SAR in the left hand side phantom for the tilt position

Date/Time: 12/21/04 12:32:43

DUT: FAB-1021012; Type: Mobile Terminal; Serial: ALS2Q6S2RT

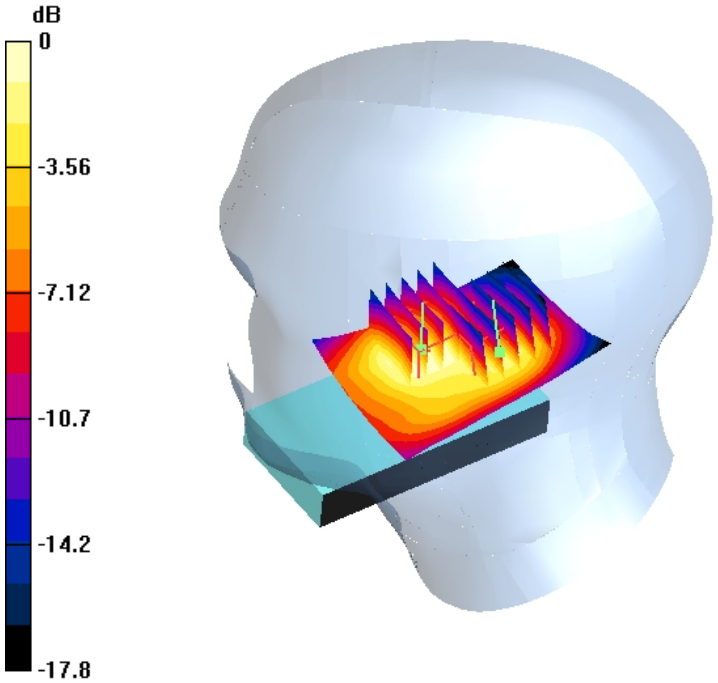
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: Head 1900 MHz: f = 1880 MHz; σ = 1.42 mho/m; ε_r = 38.7; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1394; ConvF(5.59, 5.59, 5.59); Calibrated: 2004-11-01
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn422; Calibrated: 2004-05-21
- Phantom: SAM 2; ;
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Cheek Right Middle/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.973 mW/g

Cheek Right Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.4 V/m; Power Drift = 0.006 dB
Maximum value of SAR (measured) = 0.965 mW/g
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.88 mW/g

Cheek Right Middle/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.4 V/m; Power Drift = 0.006 dB
Maximum value of SAR (measured) = 0.864 mW/g
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.63 mW/g



0 dB = 0.864 mW/g

(c) Distribution of SAR in the GSM1900 mode giving the maximum 1g SAR in the right hand side phantom for the cheek position

Date/Time: 12/16/04 16:25:34

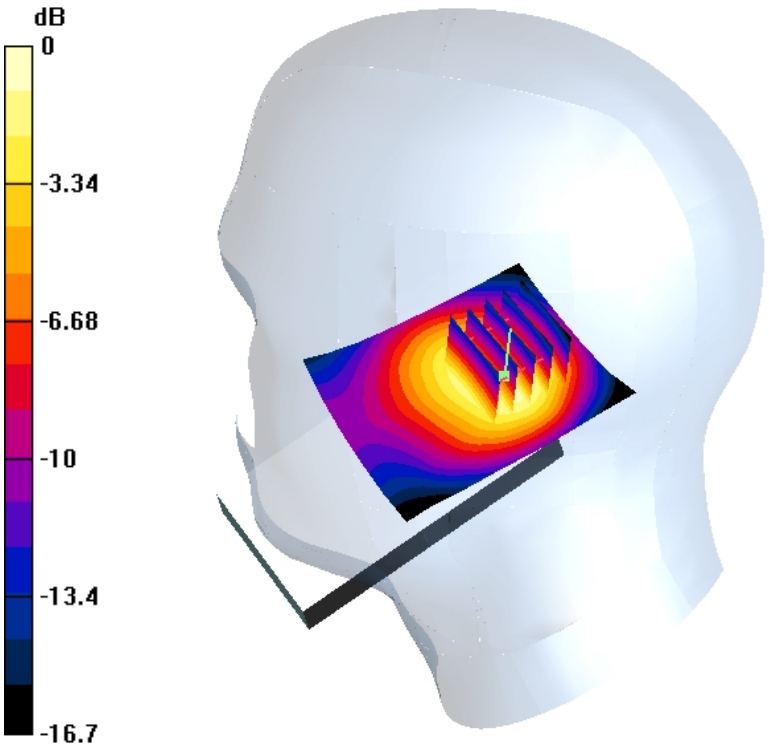
DUT: FAB-1021012; Type: Mobile Terminal; Serial: ALS2Q6S2RT

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: Head 1900 MHz: f = 1880 MHz; σ = 1.45 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1394; ConvF(5.59, 5.59, 5.59); Calibrated: 2004-11-01
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn422; Calibrated: 2004-05-21
- Phantom: SAM 2; ;
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Tilt Right Middle/Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.08 mW/g

Tilt Right Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.4 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.990 mW/g
Peak SAR (extrapolated) = 1.63 W/kg
SAR(1 g) = 0.92 mW/g



0 dB = 0.990 mW/g

(f) Distribution of SAR in the GSM1900 mode giving the maximum 1g SAR in the right hand side phantom for the tilt position

Date/Time: 01/03/05 16:01:08

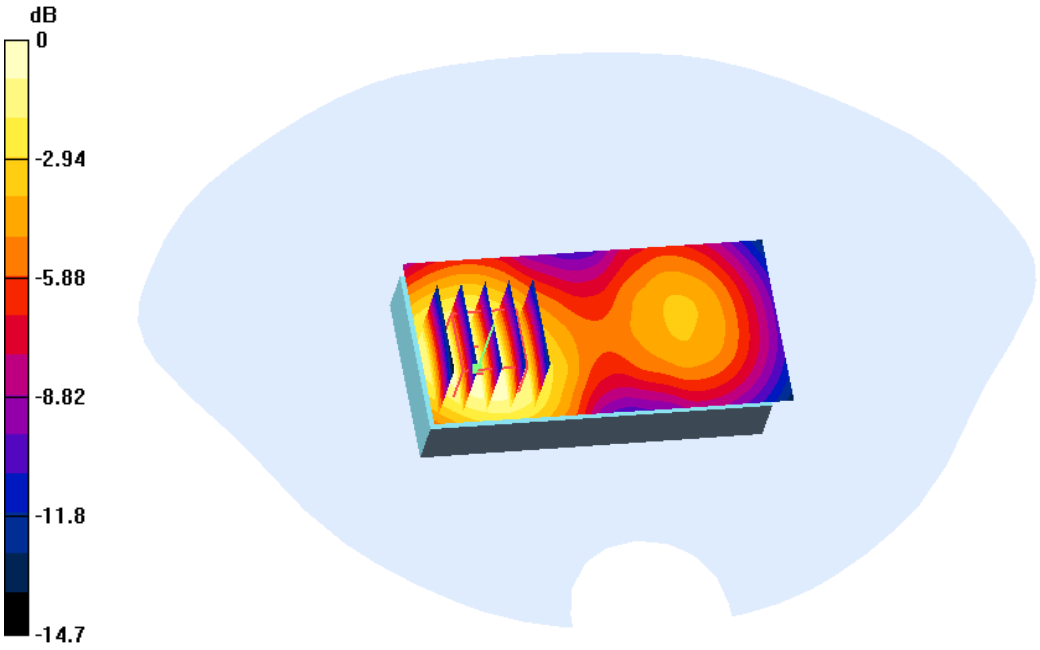
DUT: FAB-1021012; Type: Mobile Terminal; Serial: ALS2Q6S2RT

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: Muscle 1900: f = 1880 MHz; σ = 1.55 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1394; ConvF(4.96, 4.96, 4.96); Calibrated: 2004-11-01
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn422; Calibrated: 2004-05-21
- Phantom: SAM 2; ;
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130

Back to Phantom - Flip Closed - Middle - Stereo/Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.516 mW/g

Back to Phantom - Flip Closed - Middle - Stereo/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.1 V/m; Power Drift = 0.1 dB
Maximum value of SAR (measured) = 0.500 mW/g
Peak SAR (extrapolated) = 0.691 W/kg
SAR(1 g) = 0.46 mW/g



0 dB = 0.500 mW/g

(g) Distribution of maximum SAR in GSM1900 mode with muscle tissue simulating liquid giving the maximum 1g and 10g averaged SAR. Measured against the flat section of the phantom with the back of the device facing the phantom and with a 15 mm separation between the device and the liquid.

APPENDIX 4: Probe calibration parameters for ET3DV6, SN: 1394

Diode compression

Parameter	Value in mV
DCP X	94
DCP Y	94
DCP Z	94

Sensitivity in free space:

Parameter	Value in $\mu V/(V/m)^2$
Norm X	1.90
Norm Y	1.95
Norm Z	1.68

Sensitivity in tissue simulating liquid

Head 900 MHz; ε_r=41.5 ± 5%, σ=0.97± 5% S/m.

Parameter	Value
ConvF X	6.81
ConvF Y	6.81
ConvF Z	6.81

Head 1800 MHz / 1900MHz; ε_r=40 ± 5%, σ=1.40± 5% S/m.

Parameter	Value
ConvF X	5.59
ConvF Y	5.59
ConvF Z	5.59

Muscle 1900 MHz; ε_r=53.3 ± 5%, σ=1.52± 5% S/m.

Parameter	Value
ConvF X	4.96
ConvF Y	4.96
ConvF Z	4.96

Probe tip to sensor center: 2.7 mm

Optical Surface Detection: 1.3 ± 0.2 mm