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T117 (EN ISO/IEC 17025)

SAR Compliance Test Report

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Measurements made by:	Leif Funch Klysner		
Tested device:	RH-67		
FCC ID:	QVVRH-67	IC:	661AE-RH67
Supplement reports:	-		
Testing has been carried out in accordance with:	47CFR §2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01) Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields RSS-102 Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields IEEE 1528 - 2003 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Copenhagen.		
Test results:	The tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.		

Date and signatures: September 22, 2004

For the contents:

Leif Funch Klysner
Test Engineer

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	August 13, 2004 – August 20, 2004
SN, HW and SW numbers of tested device	IMEI: 004400/51/170317/3 HW: 2003 SW: 3.0431.0 DUT#234403
Batteries used in testing	BL-5C, DUT#232750, DUT#232579, DUT#232748
Headsets used in testing	HS-5, DUT#232798
Other accessories used in testing	MMC Card, DTS-32, DUT#233526
State of sample	Prototype unit
Notes	

1.2 Maximum Results

The maximum measured SAR values for Head configuration and Body Worn configuration are given in section 1.2.1 and 1.2.2 respectively. The device conforms to the requirements of the standard(s) when the maximum measured SAR value is less than or equal to the limit.

1.2.1 Head Configuration

Mode	Ch / *f* (MHz)	EIRP	Position	SAR limit (1g avg)	Measured SAR value (1g avg)	Result
GSM1900	661 / 1880.0	30.76 dBm	Left,Tilt – Bluetooth On	1.6 W/kg	0.42 W/kg	PASSED

1.2.2 Body Worn Configuration

Mode	Ch / *f* (MHz)	EIRP	Separation distance	SAR limit (1g avg)	Measured SAR value (1g avg)	Result
GPRS1900	661 / 1880.0	31.45 dBm	2.2 cm	1.6 W/kg	0.58 W/kg	PASSED

1.2.3 Maximum Drift

Maximum drift during measurements	-0.3 dB

1.2.4 Measurement Uncertainty

Extended Uncertainty (k=2) 95%	± 29.1 %

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2. DESCRIPTION OF THE DEVICE UNDER TEST

Device category	Portable
Exposure environment	General population/uncontrolled

Modes and Bands of Operation	GSM 1900	GPRS (GSM)	BT
Modulation Mode	GMSK	GMSK	GFSK
Duty Cycle	1/8	1/8 or 2/8	
Transmitter Frequency Range (MHz)	1850.2 - 1909.8	1850.2 - 1909.8	2400.0 – 2483.5

Outside of USA and Canada, the transmitter of the device is capable of operating also in GSM900/GSM1800, which are not part of this filing.

2.1 Picture of the Device

2.2 Description of the Antenna

The device has an internal patch antenna.

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3. TEST CONDITIONS

3.1 Temperature and Humidity

Period of measurement (mm.dd.yyyy):	08.13.2004 – 08.20.2004
Ambient temperature (°C):	22 ±1
Ambient humidity (RH %):	45 ±10

3.2 Test Signal, Frequencies, and Output Power

The device was put into operation by using a call tester. Communication between the device and the call tester was established by air link.

The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.

In all operating bands the measurements were performed on lowest, middle and highest channels.

4. DESCRIPTION OF THE TEST EQUIPMENT

4.1 Measurement System and Components

The measurements were performed using an automated near-field scanning system, DASY 4 software version 4.2, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements on the device was the 'worst-case extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Serial Number	Calibration interval	Calibration expiry
DAE3	501	12 months	01/2005
DAE3	338	12 months	05/2005
E-field Probe ET3DV6R	1429	12 months	01/2005
E-field Probe ET3DV6	1396	12 months	01/2005
Dipole Validation Kit, D1900V2	5d026	24 months	02/2005

Additional test equipment used in testing:

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Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	SMIQ03B	826046/034	36 months	02/2007
Amplifier	ZHL-42W	E012903	-	-
Power Meter	NRVD	840297/008	24 months	11/2005
Power Sensor	NRV-Z51	100184	24 months	11/2005
Call Tester	4400M	0411216	-	-
Vector Network Analyzer	AT8753ES	MY40001091	12 months	08/2005
Dielectric Probe Kit	HP85070B	US33020403	-	-

4.1.1 Isotropic E-field Probe 1429

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

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4.1.2 Isotropic E-field Probe 1396

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.2 Phantoms

The phantom used for all tests i.e. for both validation testing and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528 - 2003.

Validation tests were performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

The SPEAG device holder (see Section 5.1) was used to position the device in all tests whilst a tripod was used to position the validation dipoles against the flat section of phantom.

4.3 Simulating Liquids

Recommended values for the dielectric parameters of the simulating liquids are given in IEEE 1528 - 2003 and FCC Supplement C to OET Bulletin 65. All tests were carried out using liquids whose dielectric parameters were within ± 5% of the recommended values. All tests were carried out within 24 hours of measuring the dielectric parameters.

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The depth of the liquid was 15.0 ± 0.5 cm measured from the ear reference point during validation and device measurements.

4.3.1 Liquid Recipes

The following recipes were used for Head and Body liquids:

1900MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	54.88	69.02
Butyl Diglycol	44.91	30.76
Salt	0.21	0.22

4.3.2 Verification of the System

The manufacturer calibrates the probes annually. Dielectric parameters of the simulating liquids were measured every day using the dielectric probe kit and the network analyser. A SAR measurement was made following the determination of the dielectric parameters of the liquids, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The validation results (dielectric parameters and SAR values) are given in the table below.

System verification, head tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ε_r	σ [S/m]	
1900	Reference result	10.4	38.6	1.46	N/A
	± 10% window	9.36 – 11.44			
	August 13, 2004	9.52	38.9	1.45	22 ±1
	August 16, 2004	9.63	38.3	1.49	22 ±1
	August 18, 2004	9.39	38.4	1.48	22 ±1

System verification, body tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ε_r	σ [S/m]	
1900	Reference result	10.6	51.2	1.59	N/A
	± 10% window	9.54 – 11.66			
	August 19, 2004	10.1	51.0	1.58	22 ±1
	August 20, 2004	10.0	50.7	1.58	22 ±1

Plots of the Verification scans are given in Appendix A.

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4.3.3 Tissue Simulants used in the Measurements

Head tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ε_r	σ [S/m]	
1880	Recommended value	40.0	1.40	N/A
	± 5% window	38.0 – 42.0	1.33 – 1.47	
	August 13, 2004	39.0	1.43	22 ±1
	August 16, 2004	38.4	1.47	22 ±1
	August 18, 2004	38.5	1.46	22 ±1

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ε_r	σ [S/m]	
1880	Recommended value	53.3	1.52	N/A
	± 5% window	50.6 – 56.0	1.44 – 1.60	
	August 19, 2004	51.1	1.55	22 ±1
	August 20, 2004	50.7	1.56	22 ±1

5. DESCRIPTION OF THE TEST PROCEDURE

5.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy system.

Device holder supplied by SPEAG

A Nokia designed spacer (illustrated below) was used to position the device within the SPEAG holder. The spacer positions the device so that the holder has minimal effect on the test results but still holds the device securely. The spacer was removed before the tests.

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Nokia spacer

5.2 Test Positions

5.2.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 1528 - 2003 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”.

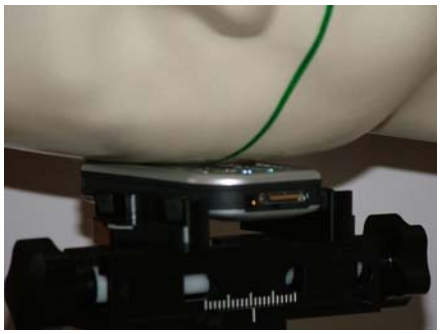

Photo of the device in “cheek” position

Photo of the device in “tilt” position

5.2.2 Body Worn Configuration

The device was placed in the SPEAG holder using the Nokia spacer and placed below the flat section of the phantom. The distance between the device and the phantom was kept at the separation distance indicated in the photo belowcm using a separate flat spacer that was removed before the start of the measurements. The device was oriented with its antenna facing the phantom since this orientation gave higher results.

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Photo of the device positioned for Body SAR measurement. The spacer was removed for the tests.

5.3 Scan Procedures

First coarse scans were used for determination of the field distribution. Next a cube scan, 7x7x7 points covering a volume of 30x30x30 mm was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the coarse scan and again at the end of the cube scan.

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5.4 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy4 are all based on the modified Quadratic Shepard's method (Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).

The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighbouring points by a least-square method. For the cube scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.

In the cube scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

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6. MEASUREMENT UNCERTAINTY

Table 6.1 – Measurement uncertainty evaluation

Uncertainty Component	Section in IEEE 1528	Tol. (%)	Prob Dist	Div	c_i	$c_i . u_i$ (%)	v_i
Measurement System							
Probe Calibration	E2.1	±4.8	N	1	1	±4.8	∞
Axial Isotropy	E2.2	±4.7	R	√3	$(1-c_p)^{1/2}$	±1.9	∞
Hemispherical Isotropy	E2.2	±9.6	R	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary Effect	E2.3	±8.3	R	√3	1	±4.8	∞
Linearity	E2.4	±4.7	R	√3	1	±2.7	∞
System Detection Limits	E2.5	±1.0	R	√3	1	±0.6	∞
Readout Electronics	E2.6	±1.0	N	1	1	±1.0	∞
Response Time	E2.7	±0.8	R	√3	1	±0.5	∞
Integration Time	E2.8	±2.6	R	√3	1	±1.5	∞
RF Ambient Conditions - Noise	E6.1	±3.0	R	√3	1	±1.7	∞
RF Ambient Conditions - Reflections	E6.1	±3.0	R	√3	1	±1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	±0.4	R	√3	1	±0.2	∞
Probe Positioning with respect to Phantom Shell	E6.3	±2.9	R	√3	1	±1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5.2	±3.9	R	√3	1	±2.3	∞
Test sample Related							
Test Sample Positioning	E4.2.1	±6.0	N	1	1	±6.0	11
Device Holder Uncertainty	E4.1.1	±5.0	N	1	1	±5.0	7
Output Power Variation - SAR drift measurement	6.6.3	±10.0	R	√3	1	±5.8	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	±4.0	R	√3	1	±2.3	∞
Liquid Conductivity Target - tolerance	E3.2	±5.0	R	√3	0.64	±1.8	∞
Liquid Conductivity - measurement uncertainty	E3.3	±5.5	N	1	0.64	±3.5	5
Liquid Permittivity Target tolerance	E3.2	±5.0	R	√3	0.6	±1.7	∞
Liquid Permittivity - measurement uncertainty	E3.3	±2.9	N	1	0.6	±1.7	5
Combined Standard Uncertainty			RSS			**±14.5**	187
Coverage Factor for 95%			**k=2**				
Expanded Standard Uncertainty						**±29.1**	

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7. RESULTS

The measured Head SAR values for the test device are tabulated below:

GSM1900 Head SAR results

Position		SAR, averaged over 1g (W/kg)		
		Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
Power level		30.07 dBm	30.76 dBm	30.33 dBm
Left	Cheek		0.35	
	Tilt	0.38	**0.40**	0.39
Right	Cheek		0.28	
	Tilt		0.32	
Highest SAR configuration repeated with MMC card		0.40	**0.42**	0.38
Highest SAR value measurement in this band repeated with BT active		-	0.41	-

The measured Body SAR values for the test device are tabulated below:

GPRS1900 Body SAR results

Body-worn location setup	SAR, averaged over 1g (W/kg)		
	Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
Power level	31.02 dBm	31.45 dBm	30.73 dBm
Without headset	0.52	**0.58**	0.51
Headset HS-5	0.56	0.56	0.53
Highest SAR configuration repeated with MMC card	0.51	0.51	0.48
Highest SAR value measurement in this mode repeated with BT active	-	**0.58**	-

Plots of the Measurement scans are given in Appendix B.

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APPENDIX A: VALIDATION SCANS

See the following pages.

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Date/Time: 08/13/04 11:09:37

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DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026

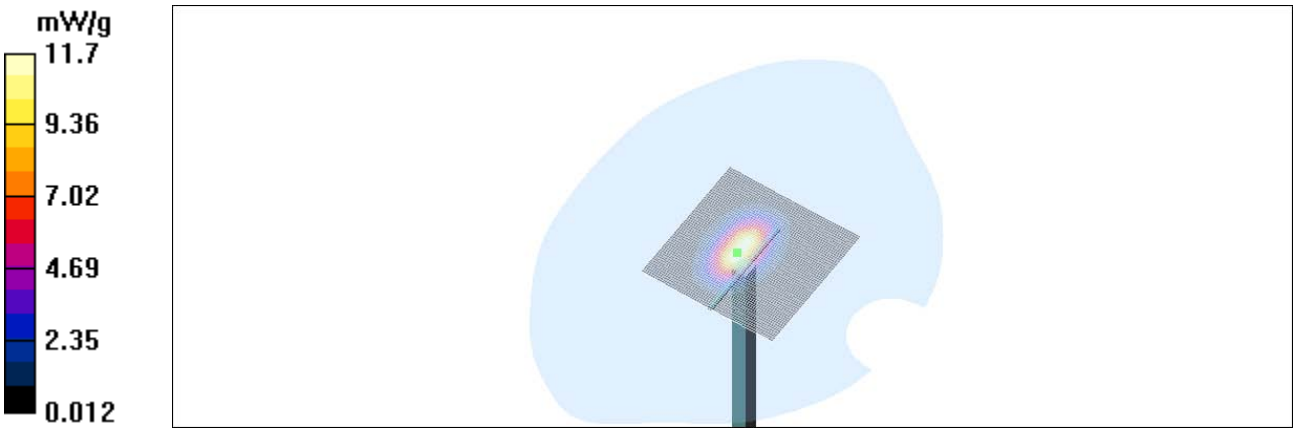
Communication System: Continuous Wave; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: Head 1900 Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.87, 4.87, 4.87); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High Band; Type: QD000P40CB; Serial: TP-1301
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

d=10mm, Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.7 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.5 V/m; Power Drift = 0.008 dB
Peak SAR (extrapolated) = 16.9 W/kg
SAR(1 g) = 9.52 mW/g; SAR(10 g) = 4.96 mW/g
Maximum value of SAR (measured) = 10.7 mW/g


mW/g
11.7
9.36
7.02
4.69
2.35
0.012

Date/Time: 08/16/04 08:59:40

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DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026

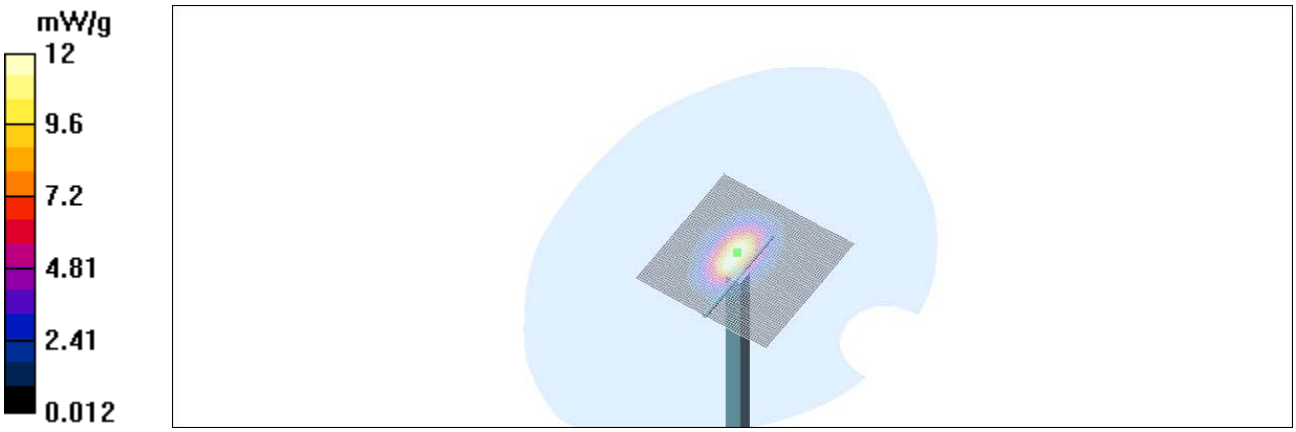
Communication System: Continuous Wave; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: Head 1900 Medium parameters used: f = 1900 MHz; σ = 1.49 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.87, 4.87, 4.87); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High Band; Type: QD000P40CB; Serial: TP-1301
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

d=10mm, Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 12 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.5 V/m; Power Drift = 0.001 dB
Peak SAR (extrapolated) = 17 W/kg
SAR(1 g) = 9.63 mW/g; SAR(10 g) = 5.03 mW/g
Maximum value of SAR (measured) = 10.8 mW/g


mW/g
12
9.6
7.2
4.81
2.41
0.012

Date/Time: 08/18/04 13:17:24

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DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026

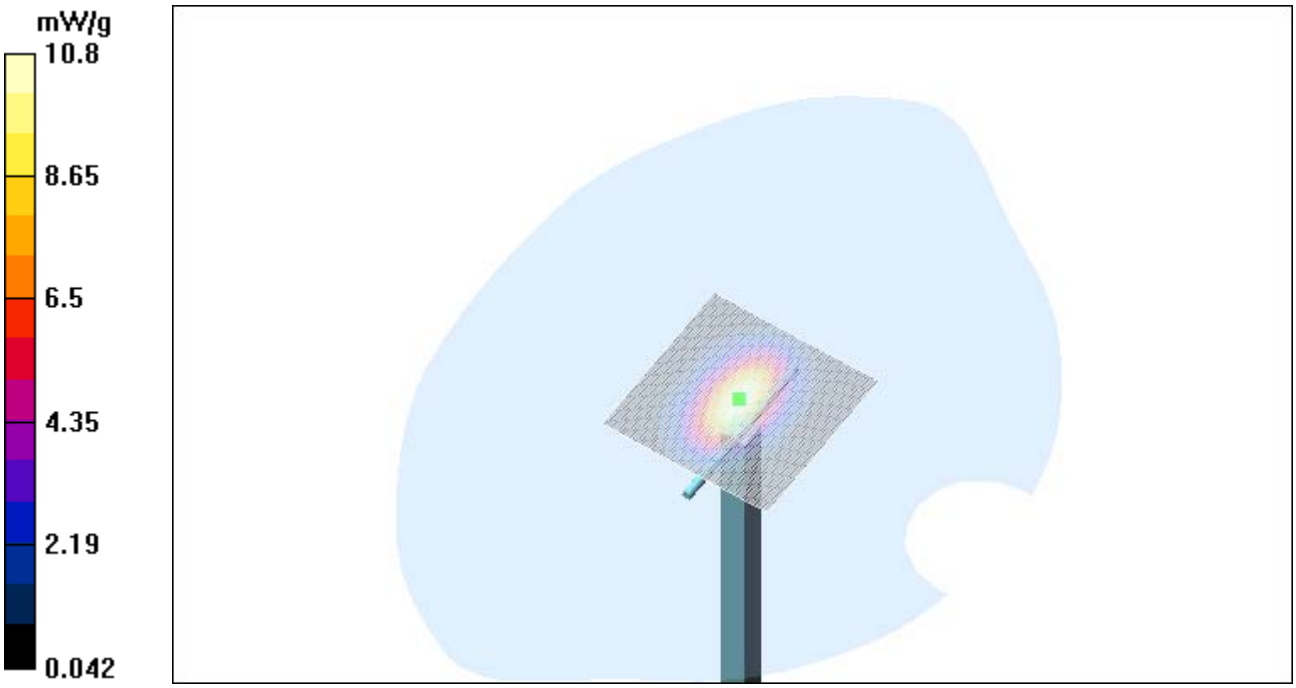
Communication System: Continuous Wave; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: Head 1900 Medium parameters used: f = 1900 MHz; σ = 1.48 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1396; ConvF(5.37, 5.37, 5.37); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn388; Calibrated: 24.05.2004
- Phantom: SAM High Band; Type: QD000P40CB; Serial: TP-1301
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

d=10mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 10.8 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.9 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 16.1 W/kg
SAR(1 g) = 9.39 mW/g; SAR(10 g) = 4.93 mW/g
Maximum value of SAR (measured) = 10.6 mW/g


mW/g
10.8
8.65
6.5
4.35
2.19
0.042

Date/Time: 08/19/04 09:46:18

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DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026

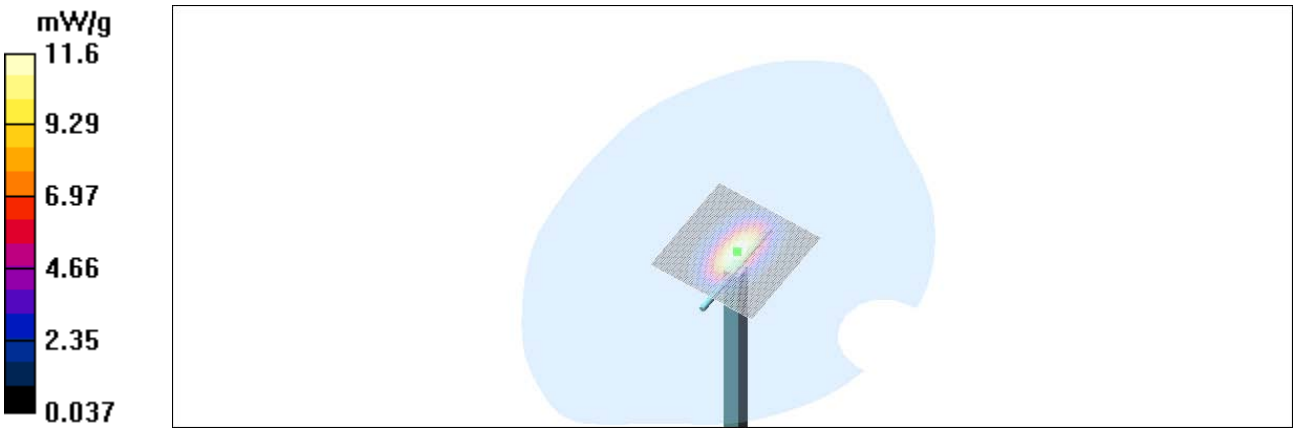
Communication System: Continuous Wave; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: Body 1900 Medium parameters used: f = 1900 MHz; σ = 1.58 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.33, 4.33, 4.33); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High band; Type: Twin Phantom; Serial: TP-1274
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

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

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.8 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.33 mW/g
Maximum value of SAR (measured) = 11.6 mW/g


mW/g
11.6
9.29
6.97
4.66
2.35
0.037

Date/Time: 08/20/04 08:39:28

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DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026

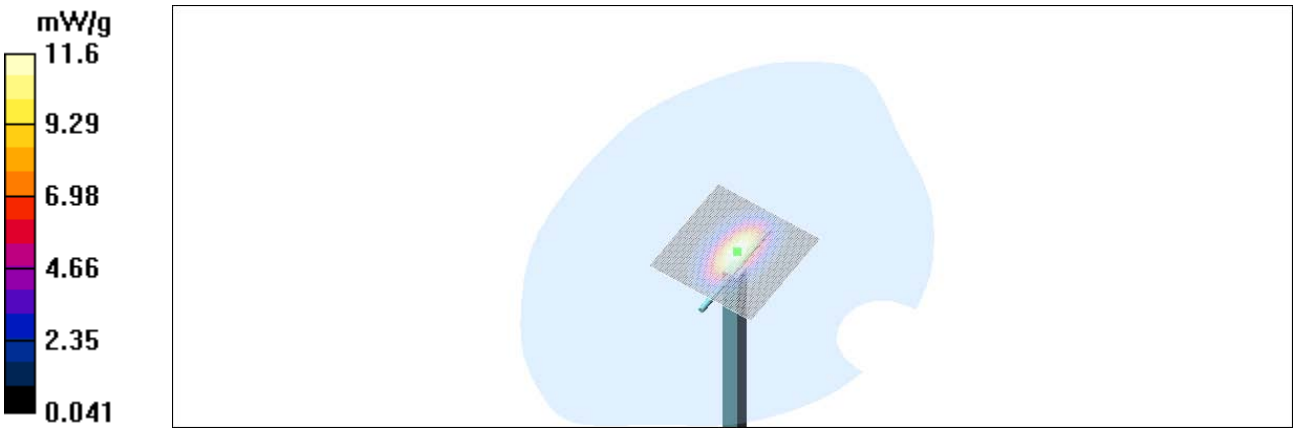
Communication System: Continuous Wave; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: Body 1900 Medium parameters used: f = 1900 MHz; σ = 1.58 mho/m; ε_r = 50.7; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.33, 4.33, 4.33); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High band; Type: Twin Phantom; Serial: TP-1274
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

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

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.3 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 17 W/kg
SAR(1 g) = 10 mW/g; SAR(10 g) = 5.31 mW/g
Maximum value of SAR (measured) = 11.4 mW/g


mW/g
11.6
9.29
6.98
4.66
2.35
0.041

APPENDIX B: MEASUREMENT SCANS

See the following pages.

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Date/Time: 08/13/04 12:02:09

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DUT: 234403; Type: RH-67; Serial: 004400/51/170317/3

Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Head 1900 Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Left Section

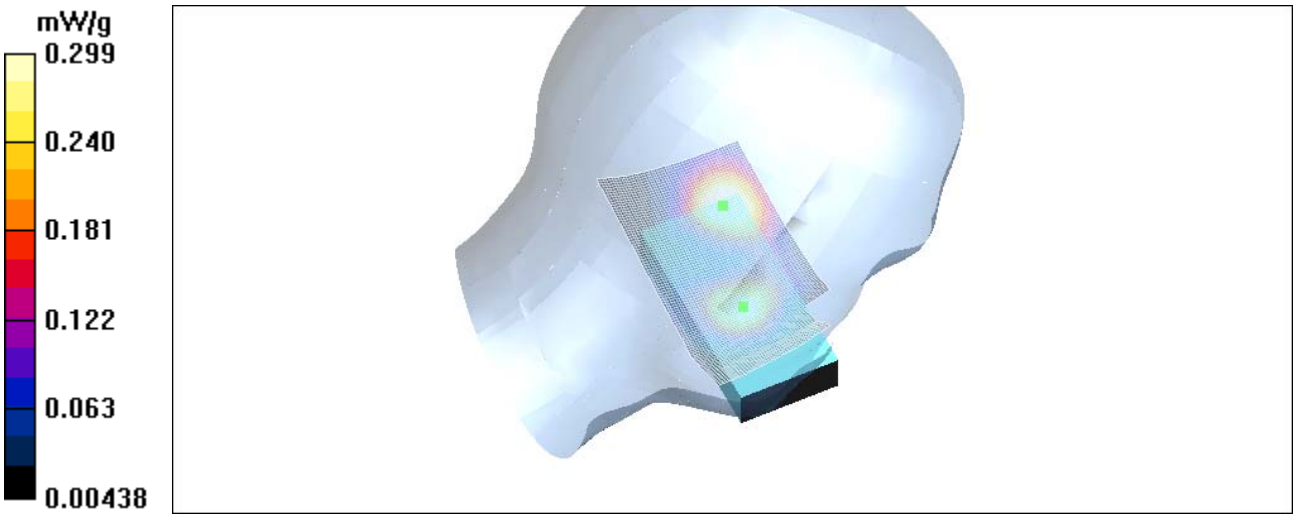
DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.87, 4.87, 4.87); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High Band; Type: QD000P40CB; Serial: TP-1301
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

Touch position - Middle/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.366 mW/g

Touch position - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 0.716 W/kg
SAR(1 g) = 0.351 mW/g; SAR(10 g) = 0.188 mW/g
Maximum value of SAR (measured) = 0.382 mW/g

Touch position - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 0.472 W/kg
SAR(1 g) = 0.275 mW/g; SAR(10 g) = 0.164 mW/g
Maximum value of SAR (measured) = 0.299 mW/g


mW/g
0.299
0.240
0.181
0.122
0.063
0.00438

Date/Time: 08/13/04 13:20:09

TCC

Copenhagen

DUT: 234403; Type: RH-67; Serial: 004400/51/170317/3

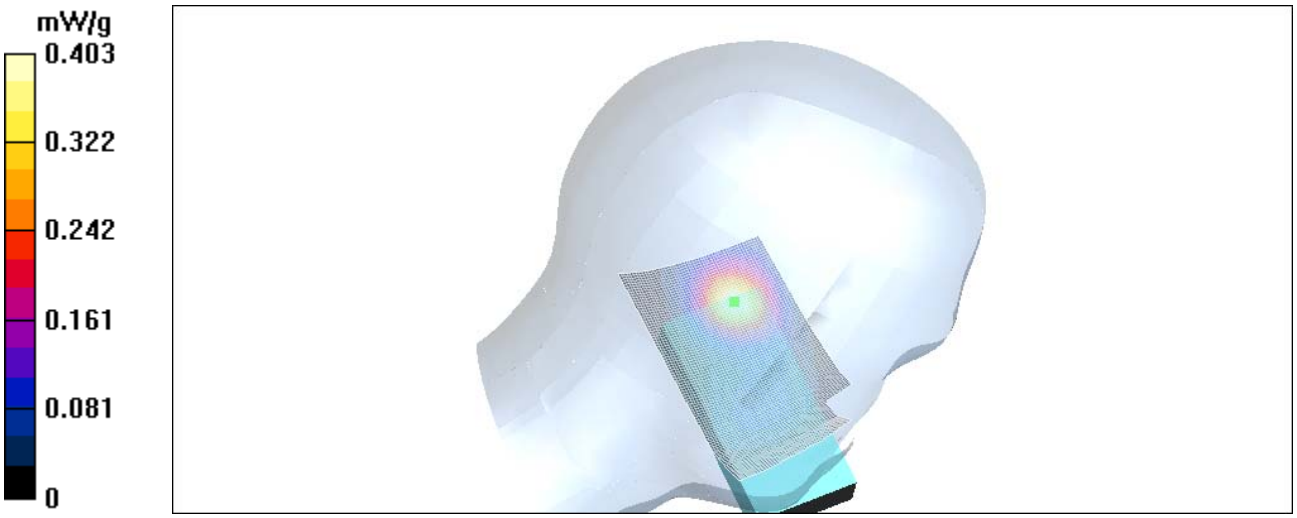
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Head 1900 Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Left Section

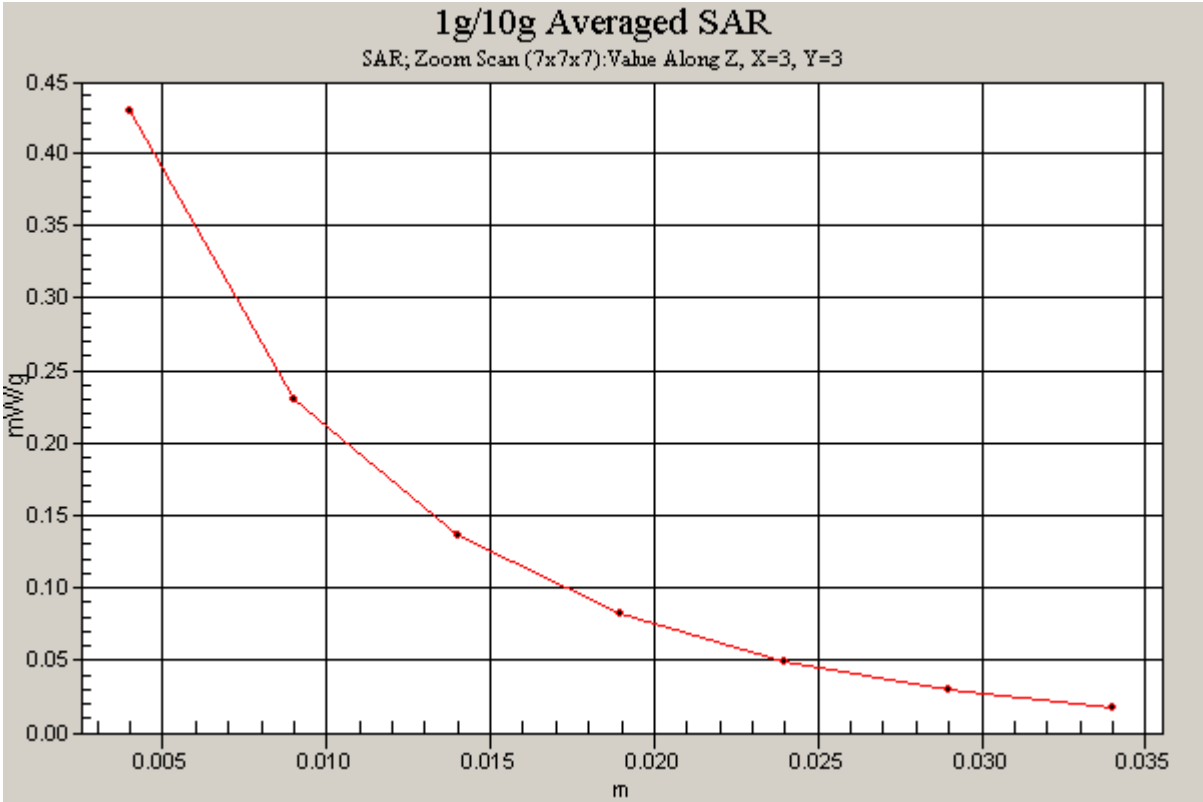
DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.87, 4.87, 4.87); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High Band; Type: QD000P40CB; Serial: TP-1301
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

Tilt position - Middle/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.403 mW/g

Tilt position - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.6 V/m; Power Drift = -0.3 dB
Peak SAR (extrapolated) = 0.858 W/kg
SAR(1 g) = 0.400 mW/g; SAR(10 g) = 0.209 mW/g
Maximum value of SAR (measured) = 0.428 mW/g


mW/g
0.403
0.322
0.242
0.161
0.081
0


1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
mW/g
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date/Time: 08/13/04 13:41:26

TCC

Copenhagen

DUT: 234403; Type: RH-67; Serial: 004400/51/170317/3

Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Head 1900 Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Right Section

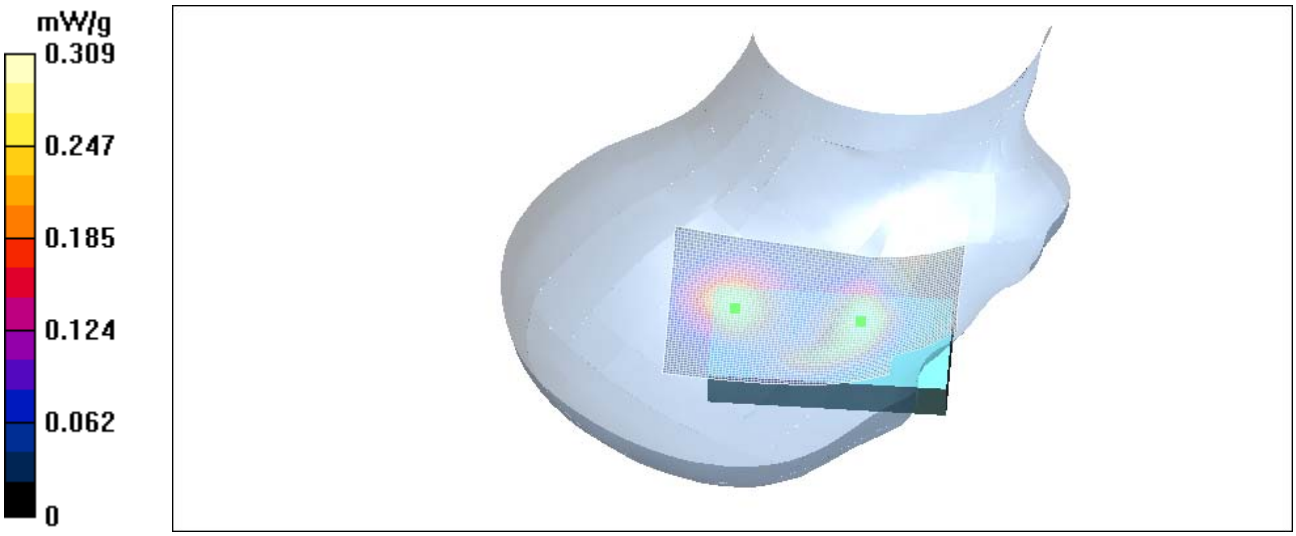
DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.87, 4.87, 4.87); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High Band; Type: QD000P40CB; Serial: TP-1301
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

Touch position - Middle/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.309 mW/g

Touch position - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.6 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 0.522 W/kg
SAR(1 g) = 0.284 mW/g; SAR(10 g) = 0.163 mW/g
Maximum value of SAR (measured) = 0.305 mW/g

Touch position - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.6 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 0.489 W/kg
SAR(1 g) = 0.242 mW/g; SAR(10 g) = 0.135 mW/g
Maximum value of SAR (measured) = 0.256 mW/g


mW/g
0.309
0.247
0.185
0.124
0.062
0

Date/Time: 08/13/04 14:05:33

TCC

Copenhagen

DUT: 234403; Type: RH-67; Serial: 004400/51/170317/3

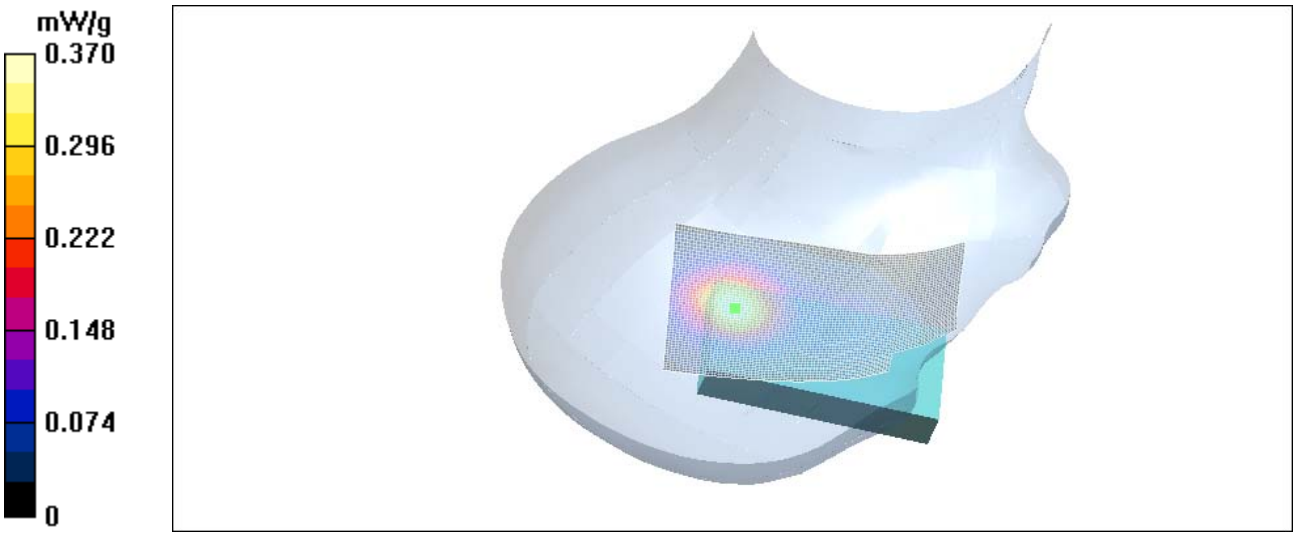
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Head 1900 Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.87, 4.87, 4.87); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High Band; Type: QD000P40CB; Serial: TP-1301
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

Tilt position - Middle/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.370 mW/g

Tilt position - Middle/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 0.647 W/kg
SAR(1 g) = 0.324 mW/g; SAR(10 g) = 0.180 mW/g
Maximum value of SAR (measured) = 0.346 mW/g


mW/g
0.370
0.296
0.222
0.148
0.074
0

Date/Time: 08/16/04 09:23:01

TCC

Copenhagen

DUT: 234403; Type: RH-67; Serial: 004400/51/170317/3

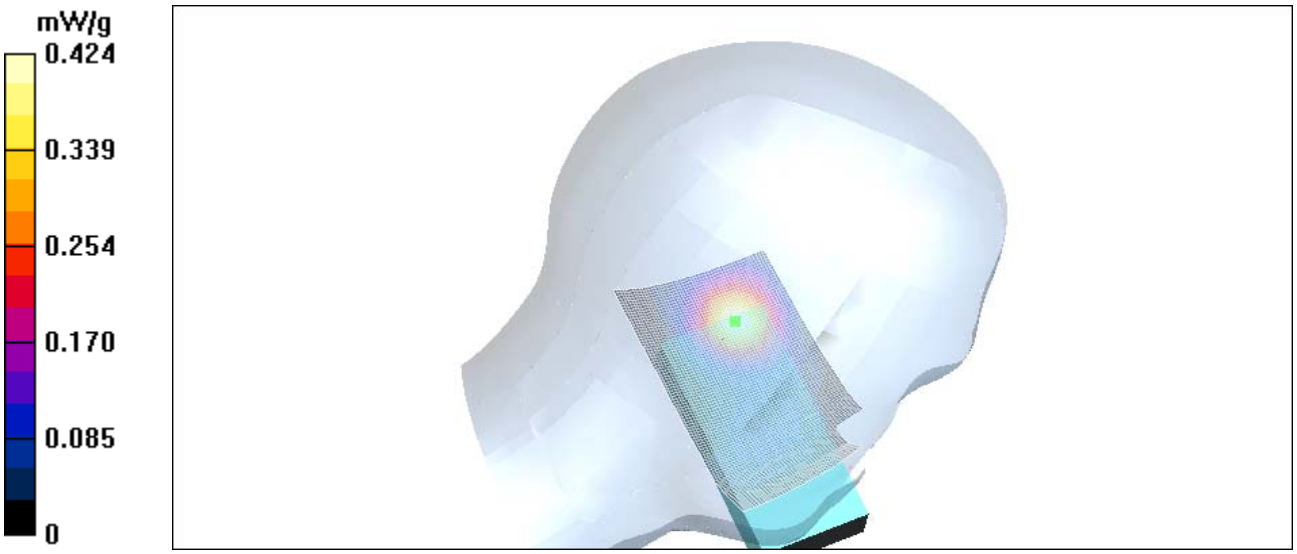
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Head 1900 Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Left Section

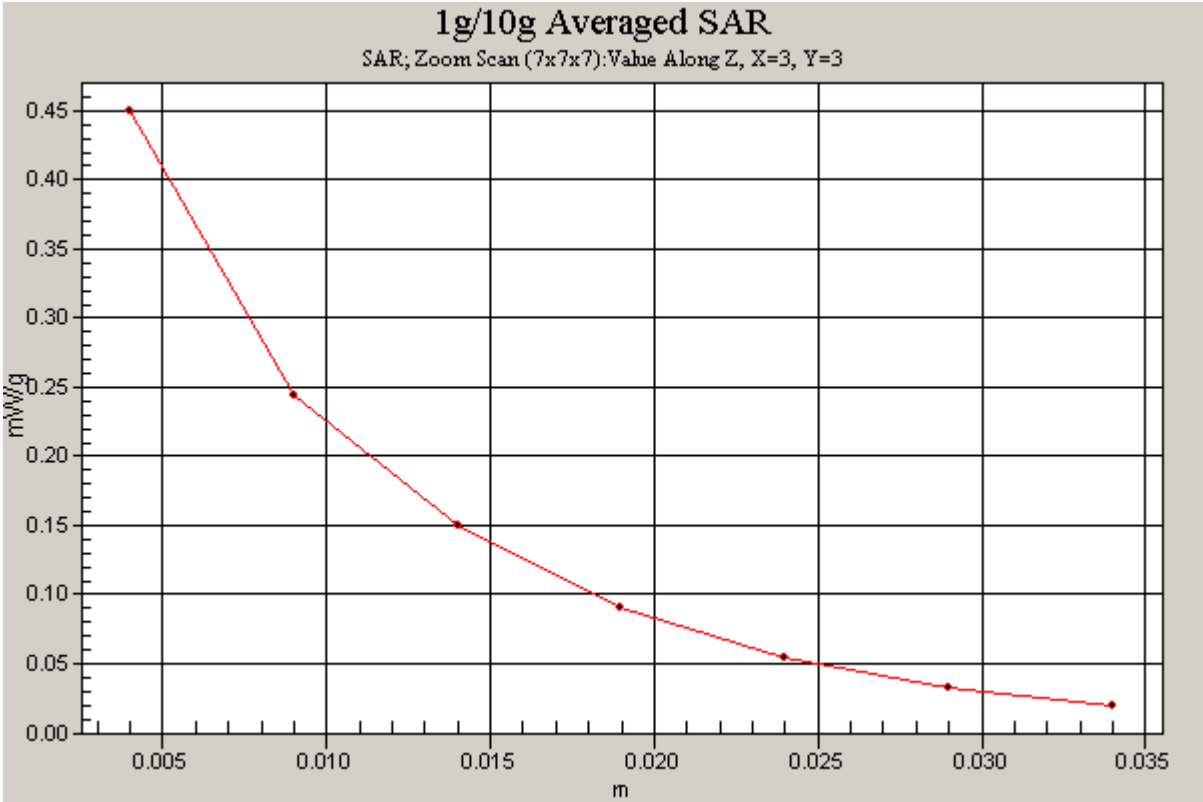
DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.87, 4.87, 4.87); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High Band; Type: QD000P40CB; Serial: TP-1301
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

Tilt position - Middle - MMC Card/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.424 mW/g

Tilt position - Middle - MMC Card/Zoom Scan (7x7x7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.7 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 0.907 W/kg
SAR(1 g) = 0.422 mW/g; SAR(10 g) = 0.223 mW/g
Maximum value of SAR (measured) = 0.449 mW/g


mW/g
0.424
0.339
0.254
0.170
0.085
0


1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
mW/g
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date/Time: 08/19/04 07:15:12

TCC

Copenhagen

DUT: 234403; Type: RH-67; Serial: 004400/51/170317/3

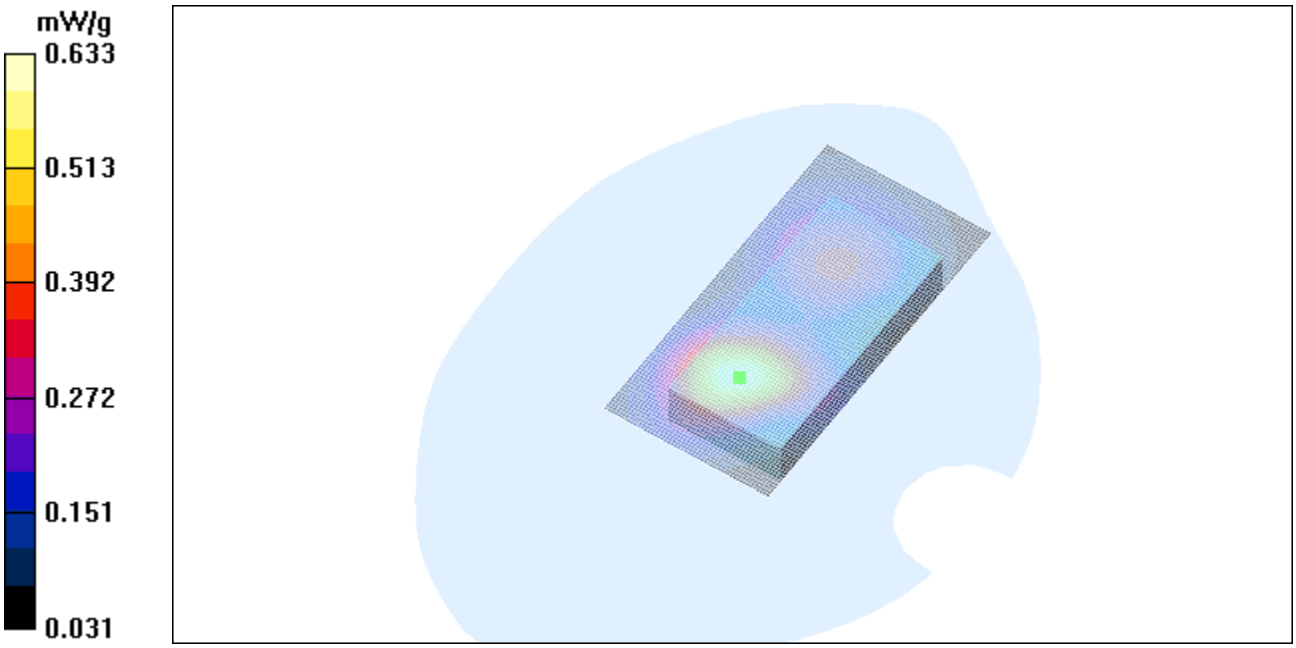
Communication System: DCS 1900 (GPRS 1DL/2UL); Frequency: 1880 MHz;Duty Cycle: 1:4.2
Medium: Body 1900 Medium parameters used: f = 1880 MHz; σ = 1.55 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Flat Section

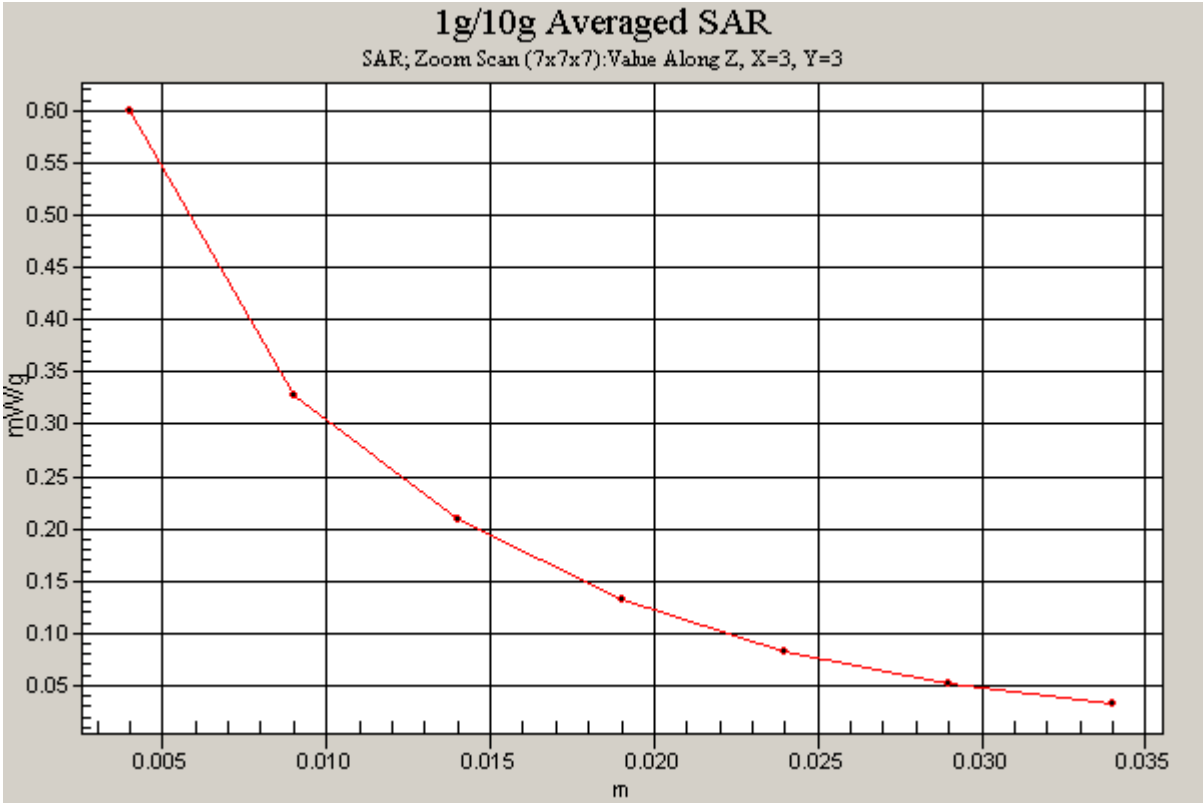
DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.33, 4.33, 4.33); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High band; Type: Twin Phantom; Serial: TP-1274
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

Body - Middle - No Accessory/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.633 mW/g

Body - Middle - No Accessory/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.7 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.578 mW/g; SAR(10 g) = 0.333 mW/g
Maximum value of SAR (measured) = 0.599 mW/g


mW/g
0.633
0.513
0.392
0.272
0.151
0.031


1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
mW/g
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date/Time: 08/19/04 10:07:12

TCC

Copenhagen

DUT: 234403; Type: RH-67; Serial: 004400/51/170317/3

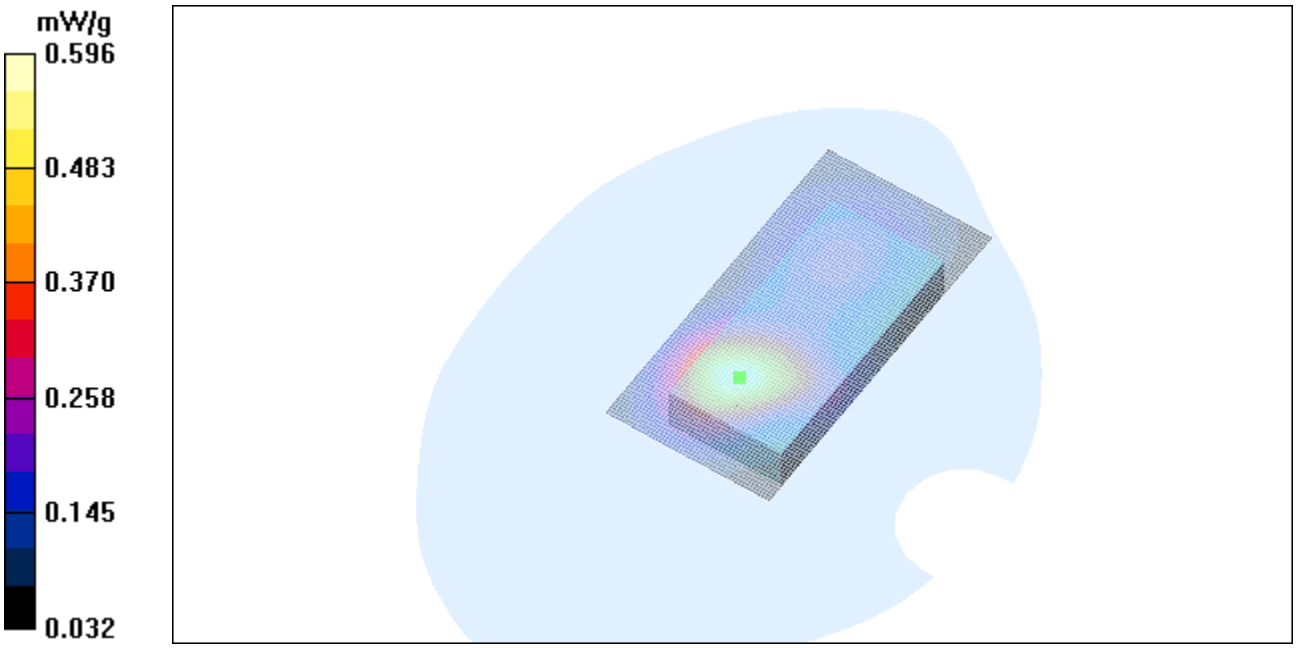
Communication System: DCS 1900 (GPRS 1DL/2UL); Frequency: 1880 MHz;Duty Cycle: 1:4.2
Medium: Body 1900 Medium parameters used: f = 1880 MHz; σ = 1.55 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Flat Section

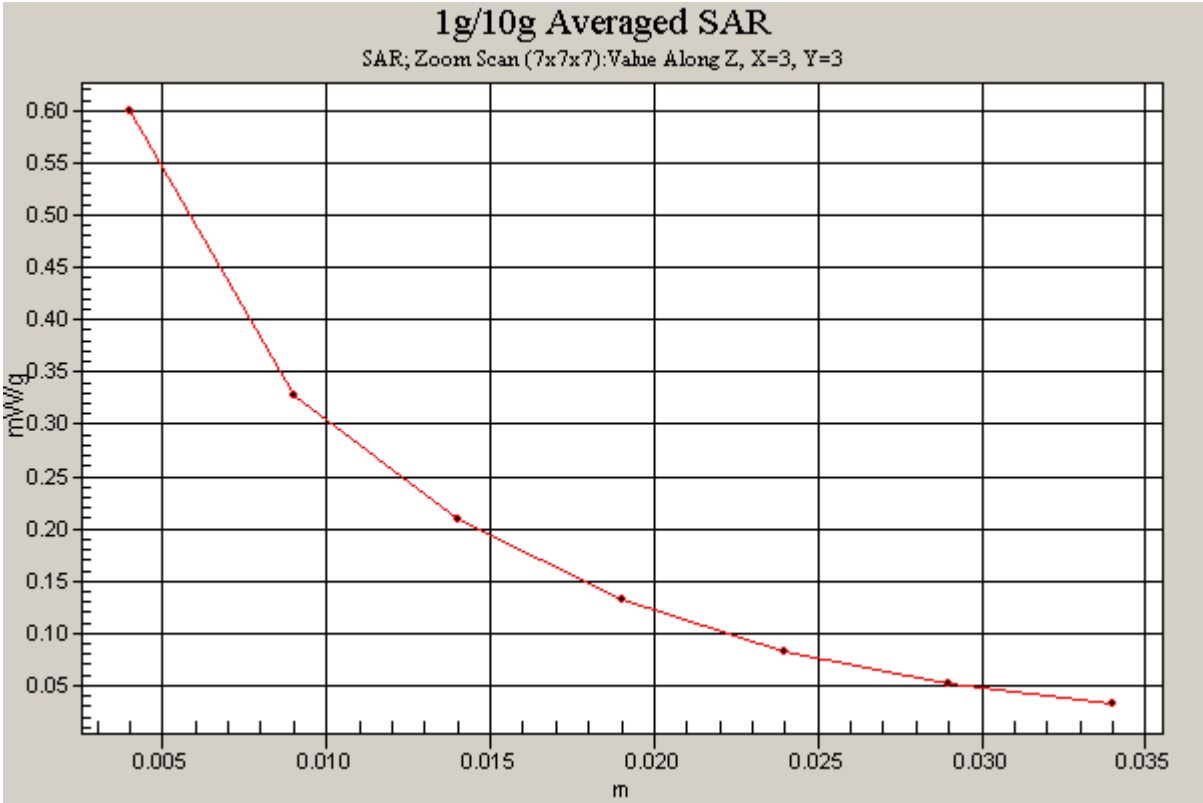
DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.33, 4.33, 4.33); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High band; Type: Twin Phantom; Serial: TP-1274
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

Body - Middle + HS-5/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.596 mW/g

Body - Middle + HS-5/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 1.18 W/kg
SAR(1 g) = 0.558 mW/g; SAR(10 g) = 0.322 mW/g
Maximum value of SAR (measured) = 0.580 mW/g


mW/g
0.596
0.483
0.370
0.258
0.145
0.032


1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
mW/g
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date/Time: 08/20/04 08:40:35

TCC

Copenhagen

DUT: 234403; Type: RH-67; Serial: 004400/51/170317/3

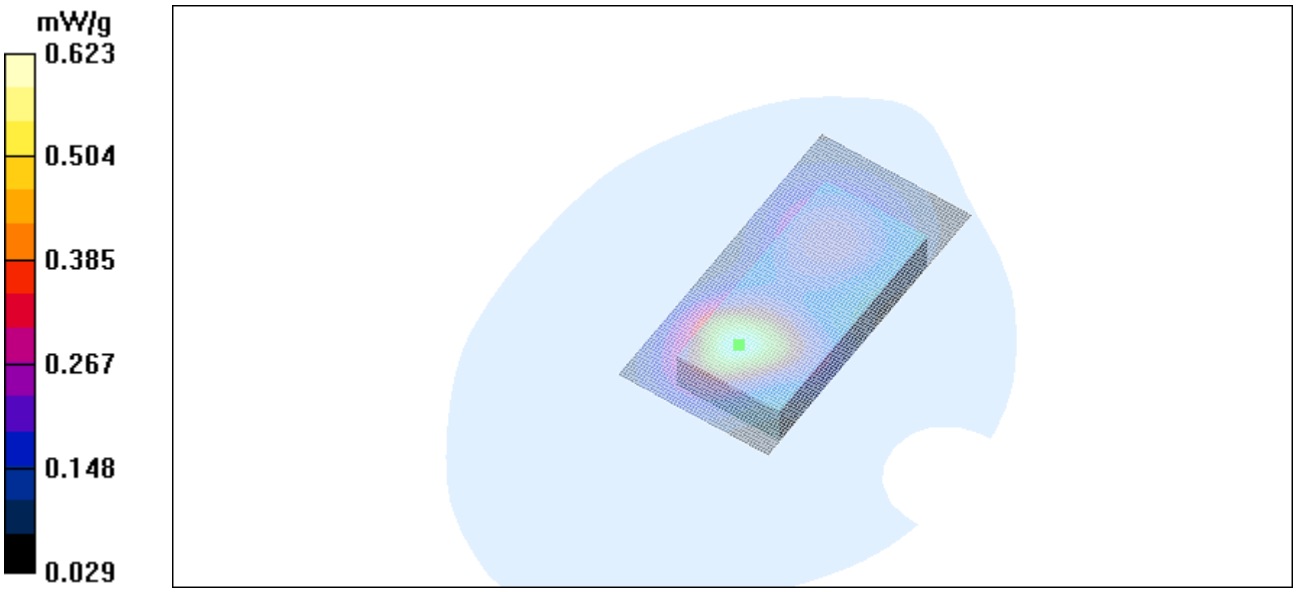
Communication System: DCS 1900 (GPRS 1DL/2UL); Frequency: 1880 MHz;Duty Cycle: 1:4.2
Medium: Body 1900 Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 50.7; ρ = 1000 kg/m^3
Ambient temperature: 22 ±1 [°C]
Ambient humidity: 45 ±10 [RH %]
Phantom section: Flat Section

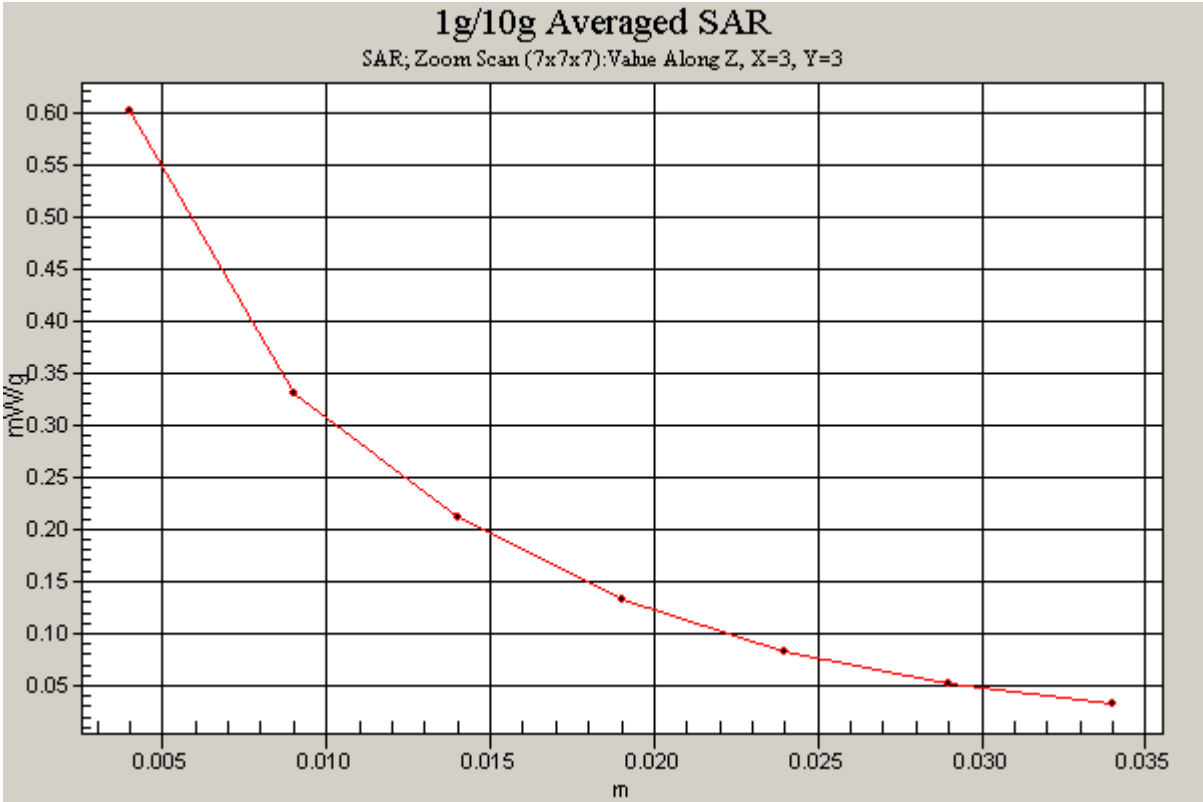
DASY4 Configuration:

- Probe: ET3DV6R - SN1429; ConvF(4.33, 4.33, 4.33); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 15.01.2004
- Phantom: SAM High band; Type: Twin Phantom; Serial: TP-1274
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 123

Body - Middle + BT/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.623 mW/g

Body - Middle + BT/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.4 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.581 mW/g; SAR(10 g) = 0.335 mW/g
Maximum value of SAR (measured) = 0.601 mW/g


mW/g
0.623
0.504
0.385
0.267
0.148
0.029


1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
mW/g
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)

See the following pages.

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1+556

3/2-04

8

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **Nokia DK**

CALIBRATION CERTIFICATE

Object(s)	ET3DV6R - SN:1429
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	January 21, 2004
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

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 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

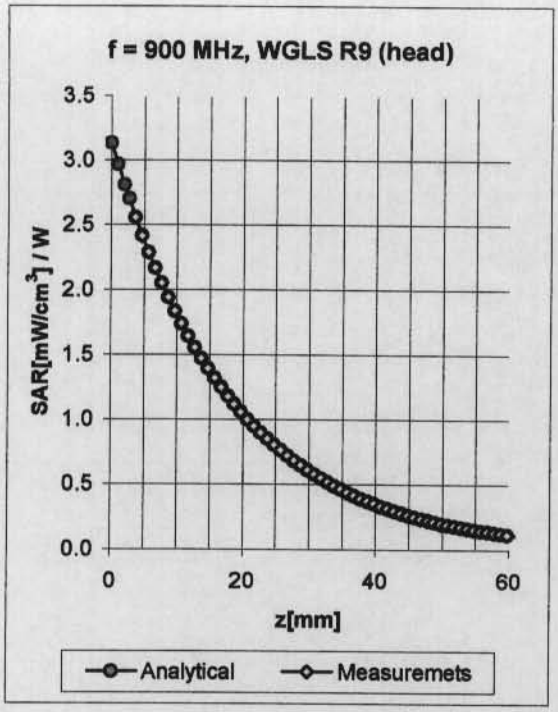
Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS, No. 251-0340)	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

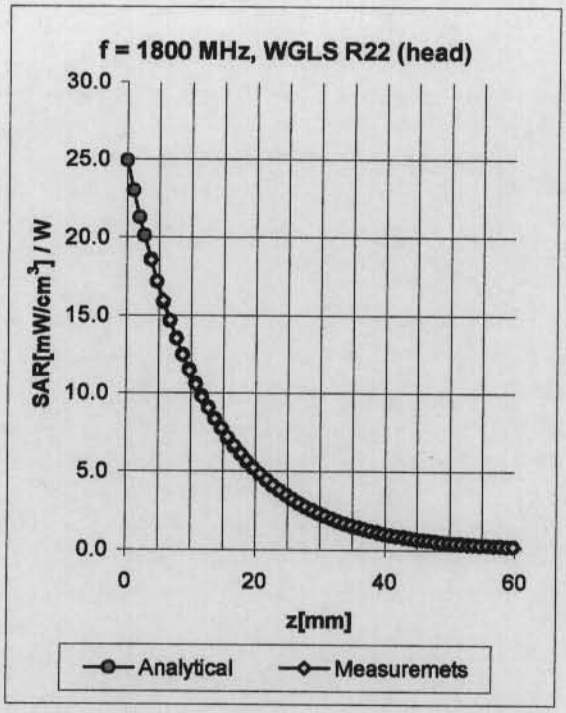
	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	N. Vetterli
Approved by:	Katja Pokovic	Laboratory Director	Pokovic Katja

Date issued: January 22, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Conversion Factor Assessment





f [MHz]	Validity [MHz][B]	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	800-1000	Head	41.5 ± 5%	0.97 ± 5%	0.51	1.96	6.09 ± 11.3% (k=2)
1800	1710-1910	Head	40.0 ± 5%	1.40 ± 5%	0.47	2.60	4.87 ± 11.7% (k=2)
900	800-1000	Body	55.0 ± 5%	1.05 ± 5%	0.48	2.10	5.91 ± 11.3% (k=2)
1800	1710-1910	Body	53.3 ± 5%	1.52 ± 5%	0.55	2.70	4.33 ± 11.7% (k=2)

[B] The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **Nokia TCC Salo**

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1396
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	January 21, 2004
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

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 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

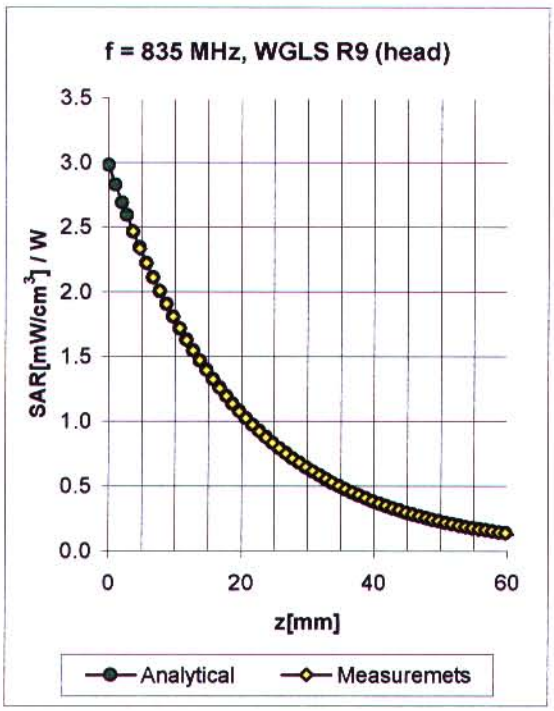
Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS, No. 251-0340)	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

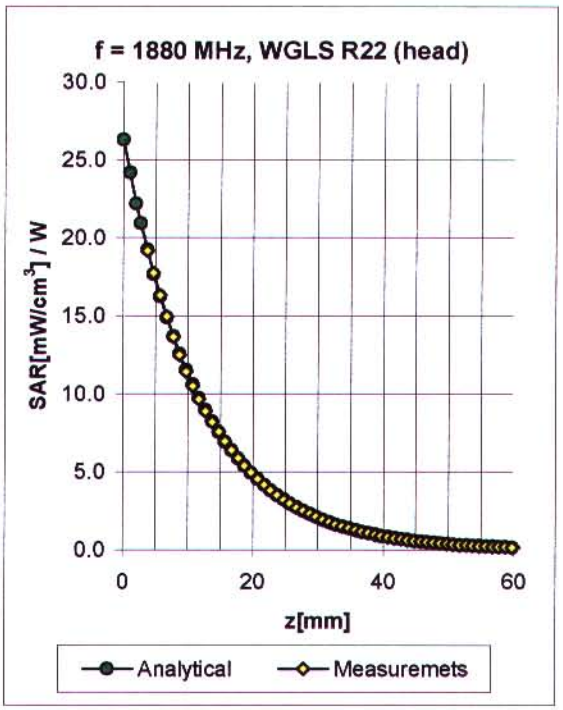
	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	N. Vetterli
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: January 22, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Conversion Factor Assessment





f [MHz]	Validity [MHz][B]	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	750-950	Head	41.5 ± 5%	0.90 ± 5%	0.52	1.86	6.98 ± 11.9% (k=2)
1880	1800-2000	Head	40.0 ± 5%	1.40 ± 5%	0.49	2.69	5.37 ± 11.3% (k=2)
835	750-950	Body	55.2 ± 5%	0.97 ± 5%	0.44	2.09	6.80 ± 11.9% (k=2)
1880	1800-2000	Body	53.3 ± 5%	1.52 ± 5%	0.55	2.88	4.79 ± 11.3% (k=2)

[B] The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

APPENDIX D: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORT(S)

See the following pages.

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18307

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client Nokia Danmark A/S

CALIBRATION CERTIFICATE

Object(s)	D1900V2 - SN:5d026
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	February 26, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator R&S SML-03	100698	27-Mar-2002	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02	Oct-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	Pokovic Katja
Approved by:	Niels Kuster	Quality Manager	

Date issued: February 26, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Date/Time: 02/26/03 17:17:26

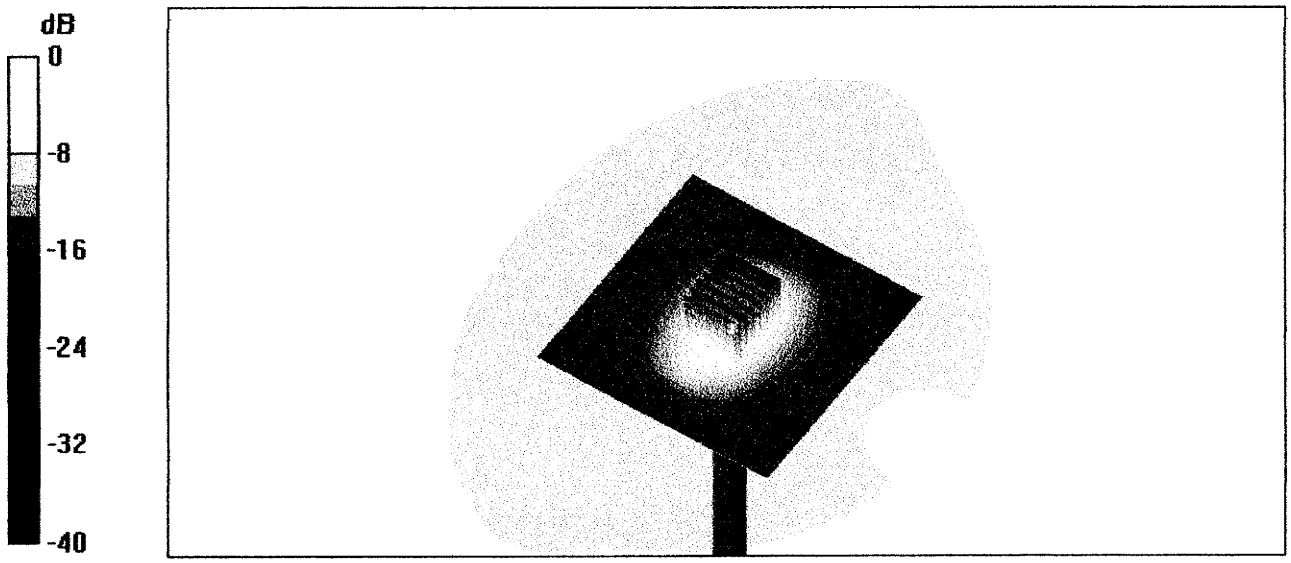
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN5d026_SN1507_HSL1900_260203.da4

DUT: Dipole 1900 MHz; Serial: D1900V2 - SN5d026
Program: Dipole Calibration

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL 1900 MHz; (σ = 1.46 mho/m, ε_r = 38.6, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(5.2, 5.2, 5.2); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 25; Postprocessing SW: SEMCAD, V1.6 Build 105

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.2 V/m
Peak SAR = 18.6 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.31 mW/g
Power Drift = 0.04 dB



18508

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **Nokia Danmark A/S**

CALIBRATION CERTIFICATE

Object(s)	D1900V2 - SN:5d026
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	April 8, 2003
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator R&S SML-03	100698	27-Mar-2002	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02	Oct-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: April 12, 2003

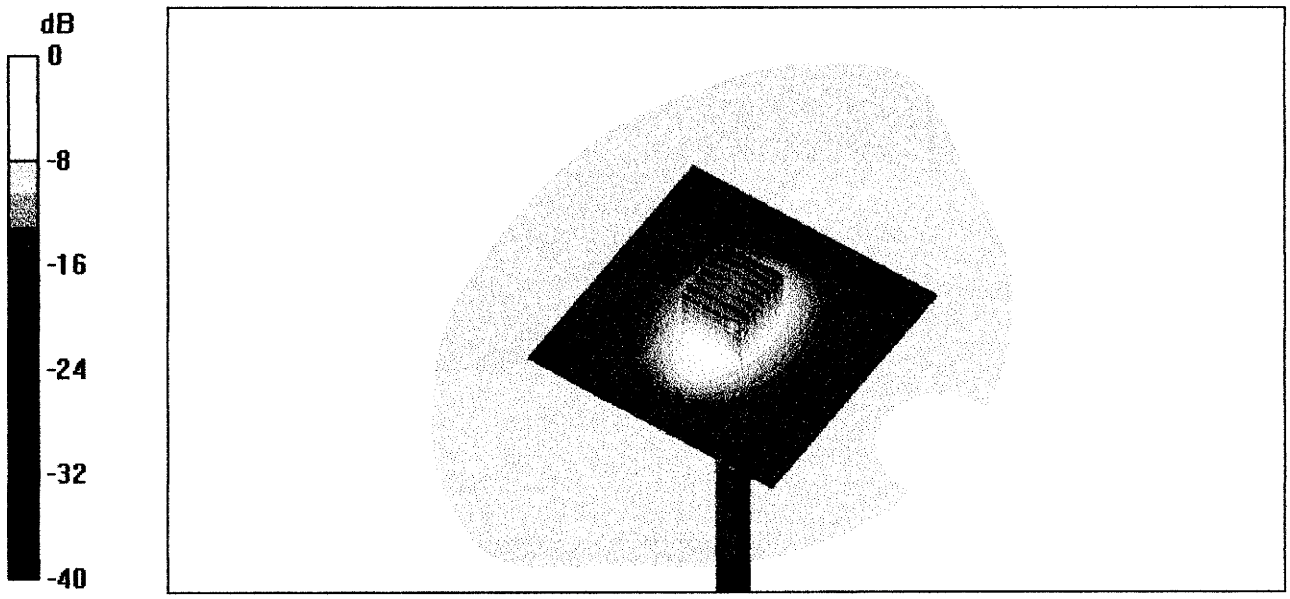
This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Date/Time: 04/08/03 13:41:14

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN5d026_SN1507_M1900_080403.da4

DUT: Dipole 1900 MHz; Serial: D1900V2 - SN5d026
Program: Dipole Calibration

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Muscle 1900 MHz; (σ = 1.59 mho/m, ε_r = 51.2, ρ = 1000 kg/m^3)
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(4.8, 4.8, 4.8); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 33; Postprocessing SW: SEMCAD, V1.6 Build 109

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.2 V/m
Peak SAR = 18.6 W/kg
SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.51 mW/g
Power Drift = 0.09 dB