

SAR Compliance Test Report

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Tested device:	RM-132		
FCC ID:	QFXRM-132X	IC:	661Z-RM132
Supplement reports:	Cph_SAR_0625_06		
Testing has been carried out in accordance with:	<p>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</p> <p>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</p> <p>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 Technique</p>		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test results:	<p>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.</p>		

Date and signatures:

For the contents:

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2006-11-03 to 2006-11-17
SN, HW and SW numbers of tested device	SN: 004400/71/175094/1, HW: 6008, SW: V.3.0636.0.0.6_rm132, DUT: 28513
Batteries used in testing	BP-6M, DUT: 28492
Headsets used in testing	HS-6, DUT: 28715
Other accessories used in testing	Memory Card, Type: SD, DUT: 28473
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)	Radiated power	Position	Measured SAR value (1g avg)	Scaled* SAR value (1g avg)	SAR limit (1g avg)	Result
2-slot GPRS850	128 / 824.2	29.1 dBm ERP	Left, Cheek	1.01 W/kg	1.13 W/kg	1.6 W/kg	PASSED
GSM1900	810 / 1909.8	31.4 dBm EIRP	Right, Cheek	1.13 W/kg	1.27 W/kg	1.6 W/kg	PASSED

1.2.2 Body Worn Configuration

Mode	Ch / f(MHz)	Radiated power	Separation distance	Measured SAR value (1g avg)	Scaled* SAR value (1g avg)	SAR limit (1g avg)	Result
2-slot GPRS850	128 / 824.2	29.1 dBm ERP	2.2 cm	0.686 W/kg	0.77 W/kg	1.6 W/kg	PASSED
GSM1900	810 / 1909.8	31.4 dBm EIRP	2.2 cm	0.188 W/kg	0.21 W/kg	1.6 W/kg	PASSED

*SAR values are scaled up by 12% to cover measurement drift.

1.2.3 Maximum Drift

Maximum drift covered by 12% scaling up of the SAR values	Maximum drift during measurements
0.5dB	0.33 dB

1.2.4 Measurement Uncertainty

Expanded Uncertainty (k=2) 95%	± 25.8%
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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 850 / 1900	GPRS 850 / 1900	EGPRS 850 / 1900	BT
Modulation Mode	GMSK	GMSK	GMSK / 8PSK	GFSK
Duty Cycle	1/8	1/8 to 2/8	1/8 to 2/8	
Transmitter Frequency Range (MHz)	824 - 849 1850 - 1910	824 - 849 1850 - 1910	824 - 849 1850 - 1910	2402-2480

Outside of USA and Canada, the transmitter of the device is capable of operating also in 900 / 1800 MHz bands, which are not part of this filing.

This device has Dual Transfer Mode capability for use at the ear. Therefore, SAR for multi slot GPRS mode was evaluated against the head profile of the phantom.

2.1 Picture of the Device



2.2 Description of the Antenna

The device has an internal antenna.

3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature (°C):	20.5 to 22.5
Ambient humidity (RH %):	35 to 55

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.

The radiated output power of the device was measured by a separate test laboratory on the same unit(s) as used for SAR testing.

The number of test cases reported in this document has been minimized based on the earlier report Cph_SAR_0625_06.

4. DESCRIPTION OF THE TEST EQUIPMENT

4.1 Measurement System and Components

The measurements were performed using an automated near-field scanning system, DASY4, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements was the 'advanced extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Serial Number	Calibration interval	Calibration expiry
DAE3	573	12 months	2007-09
E-field Probe ET3DV6	1813	12 months	2007-09
Dipole Validation Kit, D835V2	476	24 months	2007-01
Dipole Validation Kit, D1900V2	5d026	24 months	2008-02
Dipole Validation Kit, D1900V2	5d063	24 months	2007-10
DASY4 software	Version 4.7	-	-

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	SME06	848650/011	36 months	2008-07
Amplifier	ZHL-42W	E012903	-	-
Power Meter	NRP	100808	24 months	2008-03
Power Sensor	NRP-Z51	100412	12 months	2007-02
Call Tester	4400M	0411216	-	-
BT Tester	CBT	100263	-	-
Vector Network Analyzer	AT8753ES	MY40001091	12 months	2007-08
Dielectric Probe Kit	HP85070B	US33020403	-	-

4.1.1 Isotropic E-field Probe Type ET3DV6

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 μ W/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 system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528 - 2003.

System checking was 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 Tissue Simulants

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

The depth of the tissue simulant was 15.0 ± 0.5 cm measured from the ear reference point during system checking and device measurements.

4.3.1 Tissue Simulant Recipes

The following recipe(s) were used for Head and Body tissue stimulant(s):

800MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	39.74	55.97
HEC	0.25	1.21
Sugar	58.31	41.76
Preservative	0.15	0.27
Salt	1.55	0.79

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 System Checking

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyser. A system check measurement was made following the determination of the dielectric parameters of the simulant, 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 system checking results (dielectric parameters and SAR values) are given in the table below.

System checking, head tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ϵ_r	σ [S/m]	
835	Reference result	2.27	42.0	0.91	
	$\pm 10\%$ window	2.04 - 2.50			
	2006-11-09	2.28	41.1	0.90	21.1
	2006-11-13	2.36	41.1	0.90	21.1
1900	Reference result	9.83	39.4	1.42	
	$\pm 10\%$ window	8.85 - 10.81			
	2006-11-03	9.52	39.2	1.41	20.9

System checking, body tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ϵ_r	σ [S/m]	
835	Reference result	2.47	54.9	1.01	
	$\pm 10\%$ window	2.22 - 2.72			
	2006-11-14	2.46	54.1	0.97	21.3
1900	Reference result	10.5	53.0	1.53	
	$\pm 10\%$ window	9.4 - 11.6			
	2006-11-17	9.87	51.7	1.57	21.6

Plots of the system checking scans are given in Appendix A.

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]	
836	Recommended value	41.5	0.90	
	± 5% window	39.4 – 43.6	0.86 – 0.95	
	2006-11-09	41.1	0.90	21.1
	2006-11-13	41.1	0.90	21.1
1880	Recommended value	40.0	1.40	
	± 5% window	38.0 – 42.0	1.33 – 1.47	
	2006-11-03	39.2	1.39	20.9

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ϵ_r	σ [S/m]	
836	Recommended value	55.2	0.97	
	± 5% window	52.4 – 58.0	0.92 – 1.02	
	2006-11-14	54.1	0.97	21.3
1880	Recommended value	53.3	1.52	
	± 5% window	50.6 – 56.0	1.44 – 1.60	
	2006-11-17	51.8	1.54	21.6

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.



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 below 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 gives higher results.



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

5.3 Scan Procedures

First, area scans were used for determination of the field distribution. Next, a zoom scan, a minimum of 5x5x7 points covering a volume of at least 30x30x30mm, 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 area scan and again at the end of the zoom scan.

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

6. MEASUREMENT UNCERTAINTY

Table 6.1 – Measurement uncertainty evaluation

Uncertainty Component	Section in IEEE 1528	Tol. (%)	Prob Dist	Div	g_i	$g_i \cdot u_i$ (%)	v_i
Measurement System							
Probe Calibration	E2.1	± 5.9	N	1	1	± 5.9	∞
Axial Isotropy	E2.2	± 4.7	R	$\sqrt{3}$	$(1-c_p)^{1/2}$	± 1.9	∞
Hemispherical Isotropy	E2.2	± 9.6	R	$\sqrt{3}$	$(c_p)^{1/2}$	± 3.9	∞
Boundary Effect	E2.3	± 1.0	R	$\sqrt{3}$	1	± 0.6	∞
Linearity	E2.4	± 4.7	R	$\sqrt{3}$	1	± 2.7	∞
System Detection Limits	E2.5	± 1.0	R	$\sqrt{3}$	1	± 0.6	∞
Readout Electronics	E2.6	± 1.0	N	1	1	± 1.0	∞
Response Time	E2.7	± 0.8	R	$\sqrt{3}$	1	± 0.5	∞
Integration Time	E2.8	± 2.6	R	$\sqrt{3}$	1	± 1.5	∞
RF Ambient Conditions - Noise	E6.1	± 3.0	R	$\sqrt{3}$	1	± 1.7	∞
RF Ambient Conditions - Reflections	E6.1	± 3.0	R	$\sqrt{3}$	1	± 1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	± 0.4	R	$\sqrt{3}$	1	± 0.2	∞
Probe Positioning with respect to Phantom Shell	E6.3	± 2.9	R	$\sqrt{3}$	1	± 1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5	± 3.9	R	$\sqrt{3}$	1	± 2.3	∞
Test sample Related							
Test Sample Positioning	E4.2	± 6.0	N	1	1	± 6.0	11
Device Holder Uncertainty	E4.1	± 5.0	N	1	1	± 5.0	7
Output Power Variation - SAR drift measurement	6.6.3	± 0.0	R	$\sqrt{3}$	1	± 0.0	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	± 4.0	R	$\sqrt{3}$	1	± 2.3	∞
Conductivity Target - tolerance	E3.2	± 5.0	R	$\sqrt{3}$	0.64	± 1.8	∞
Conductivity - measurement uncertainty	E3.3	± 5.5	N	1	0.64	± 3.5	5
Permittivity Target - tolerance	E3.2	± 5.0	R	$\sqrt{3}$	0.6	± 1.7	∞
Permittivity - measurement uncertainty	E3.3	± 2.9	N	1	0.6	± 1.7	5
Combined Standard Uncertainty				RSS		± 12.9	116
Coverage Factor for 95%				k=2			
Expanded Uncertainty						± 25.8	

7. RESULTS

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

850 MHz Head SAR results

Option used	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz
2-slot GPRS	Power	29.1 dBm	27.9 dBm	27.2 dBm
Without MC Camera cover closed	Left	Cheek	0.947	0.873
		Tilt	-	-
	Right	Cheek	0.838	0.770
		Tilt	-	-
With MC Camera cover closed	Left Cheek	1.01	-	-
With MC Camera cover open	Left Cheek	1.00	-	-
With MC Camera cover closed	Left Cheek BT active	0.975	-	-

1900 MHz Head SAR results

Option used	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
GSM	Power	29.2 dBm	32.8 dBm	31.4 dBm
Without MC Camera cover closed	Left	Cheek	-	-
		Tilt	-	-
	Right	Cheek	0.604	0.876
		Tilt	0.589	0.888
With MC Camera cover closed	Right Cheek	-	-	1.10
Without MC Camera cover open	Right Cheek	-	-	1.10
Without MC Camera cover closed	Right Cheek BT active	-	-	1.13

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

850 MHz Body SAR results

Option used	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz
2-slot GPRS	Power	29.1 dBm	27.9 dBm	27.2 dBm
Without MC Camera cover closed	Without headset	0.686	0.644	0.609
	Headset HS-6	-	-	-
With MC Camera cover closed	Without headset	0.655	-	-
Without MC Camera cover open	Without headset	0.675	-	-
Without MC Camera cover closed	Without headset BT active	0.645	-	-

1900 MHz Body SAR results

Option used	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
GSM	Power	29.2 dBm	32.8 dBm	31.4 dBm
Without MC Camera cover closed	Without headset	0.162	0.181	0.187
	Headset HS-6	0.134	0.156	0.172
With MC Camera cover closed	Without headset	-	-	0.187
Without MC Camera cover open	Without headset	-	-	0.188
Without MC Camera cover open	Without headset BT active	-	-	0.187

Plots of the Measurement scans are given in Appendix B.

APPENDIX A: SYSTEM CHECKING SCANS

See the following pages

Date/Time: 2006-11-09 15:25:34

Test Laboratory: TCC Copenhagen

Type: D835V2; Serial: 476

Communication System: Continuous Wave

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Head 850; Medium Notes: Medium Temperature: $t=21,1$ CMedium parameters used: $f = 835$ MHz; $\sigma = 0.903$ mho/m; $\epsilon_r = 41.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(6.26, 6.26, 6.26); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1215
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

d=15mm, Pin=250mW/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 2.48 mW/g

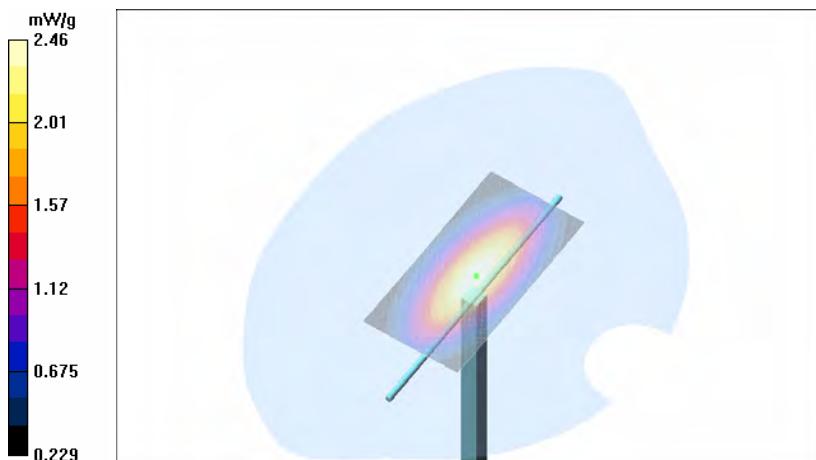
d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.4 V/m

Peak SAR (extrapolated) = 3.27 W/kg

SAR(1 g) = 2.28 mW/g**SAR(10 g) = 1.5 mW/g****Power Drift = 0.024 dB**

Maximum value of SAR (measured) = 2.46 mW/g



SAR Report

Cph_SAR_0647_01

Applicant: Nokia Corporation

Type: RM-132

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Date/Time: 2006-11-13 13:12:24

Test Laboratory: TCC Copenhagen

Type: D835V2; Serial: 476

Communication System: Continuous Wave

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Head 850; Medium Notes: Medium Temperature: $t=21,1$ CMedium parameters used: $f = 835$ MHz; $\sigma = 0.904$ mho/m; $\epsilon_r = 41.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(6.26, 6.26, 6.26); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1215
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

d=15mm, Pin=250mW/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 2.56 mW/g

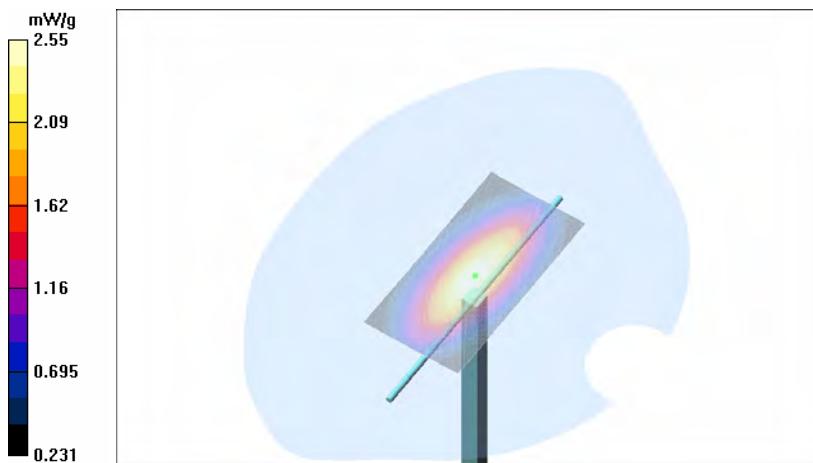
d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.0 V/m

Peak SAR (extrapolated) = 3.44 W/kg

SAR(1 g) = 2.36 mW/g**SAR(10 g) = 1.55 mW/g****Power Drift = 0.016 dB**

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



SAR Report

Cph_SAR_0647_01

Applicant: Nokia Corporation

Type: RM-132

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Date/Time: 2006-11-03 07:54:40

Test Laboratory: TCC Copenhagen

Type: D1900V2; Serial: 5d026

Communication System: Continuous Wave

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: Head 1900; Medium Notes: Medium Temperature: $t=20.8^{\circ}\text{C}$ Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.41 \text{ mho/m}$; $\epsilon_r = 39.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(5.26, 5.26, 5.26); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

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

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

Reference Value = 93.3 V/m

Peak SAR (extrapolated) = 16.5 W/kg

SAR(1 g) = 9.52 mW/g**SAR(10 g) = 5.01 mW/g****Power Drift = 0.052 dB**

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



SAR Report

Cph_SAR_0647_01

Applicant: Nokia Corporation

Type: RM-132

Copyright © 2006 TCC Nokia

Date/Time: 2006-11-14 14:32:19

Test Laboratory: TCC Copenhagen

Type: D835V2; Serial: 476

Communication System: Continuous Wave

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Body 850; Medium Notes: Medium Temperature: $t = 21.3 \text{ }^{\circ}\text{C}$ Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.972 \text{ mho/m}$; $\epsilon_r = 54.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(6.07, 6.07, 6.07); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1037
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

d=15mm, Pin=250mW/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 2.66 mW/g

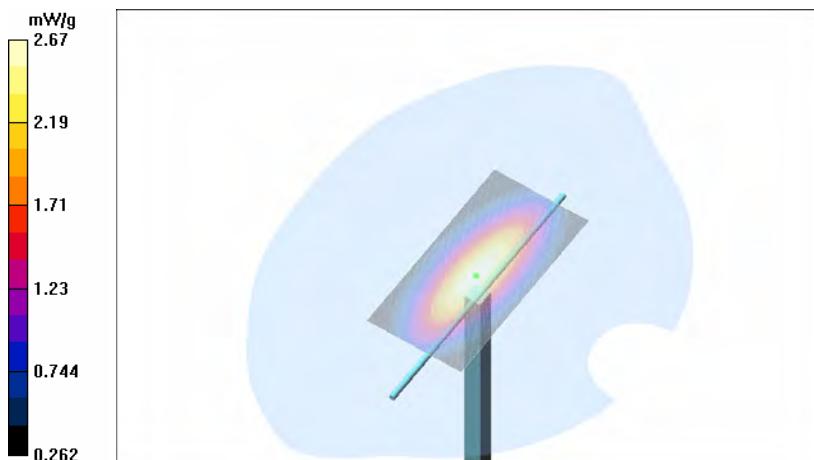
d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.3 V/m

Peak SAR (extrapolated) = 3.56 W/kg

SAR(1 g) = 2.46 mW/g**SAR(10 g) = 1.62 mW/g****Power Drift = 0.012 dB**

Maximum value of SAR (measured) = 2.67 mW/g



SAR Report

Cph_SAR_0647_01

Applicant: Nokia Corporation

Type: RM-132

Copyright © 2006 TCC Nokia

Date/Time: 2006-11-17 15:33:08

Test Laboratory: TCC Copenhagen

Type: D1900V2; Serial: 5d063

Communication System: Continuous Wave

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: Body 1900; Medium Notes: Medium Temperature: $t=21.6\text{ }^{\circ}\text{C}$

Medium parameters used: $f = 1900\text{ MHz}$; $\sigma = 1.57\text{ mho/m}$; $\epsilon_r = 51.7$; $\rho = 1000\text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(4.64, 4.64, 4.64); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

Maximum value of SAR (interpolated) = 11.5 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

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 9.87 mW/g

SAR(10 g) = 5.26 mW/g

Power Drift = 0.012 dB

Maximum value of SAR (measured) = 11.4 mW/g



SAR Report

Cph_SAR_0647_01

Applicant: Nokia Corporation

Type: RM-132

Copyright © 2006 TCC Nokia

APPENDIX B: MEASUREMENT SCANS

See the following pages

Date/Time: 2006-11-09 17:12:56

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: 2-slot GPRS850

Frequency: 824.2 MHz; Duty Cycle: 1:4.2

Medium: Head 850; Medium Notes: Medium Temperature: $t=21.1\text{ C}$ Medium parameters used (interpolated): $f = 824.2\text{ MHz}$; $\sigma = 0.894\text{ mho/m}$; $\epsilon_r = 41.3$; $\rho = 1000\text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes: Worst Case Extrapolation.
- ConvF(6.37, 6.37, 6.37); Calibrated: 2004-09-30
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1215
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek position - Low - Camera cover closed/Area Scan (51x101x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 1.01 mW/g

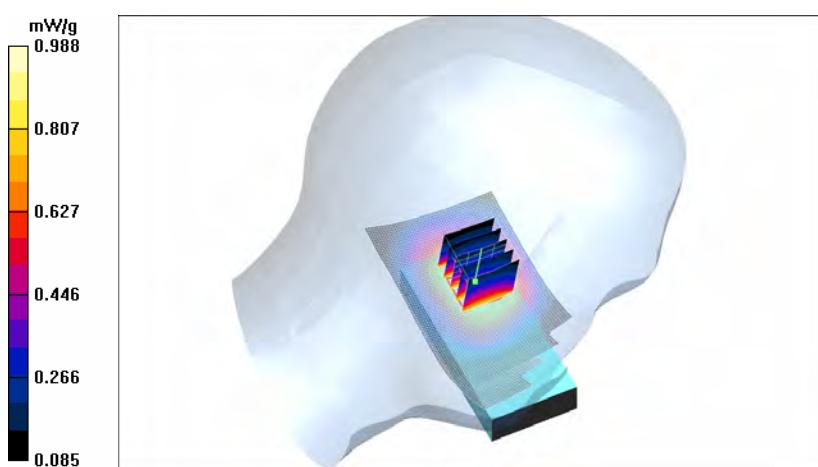
Cheek position – Low - Camera cover closed/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid:
 $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 28.3 V/m

Peak SAR (extrapolated) = 1.40 W/kg

SAR(1 g) = 0.947 mW/g**SAR(10 g) = 0.659 mW/g****Power Drift = -0.214 dB**

Maximum value of SAR (measured) = 0.988 mW/g



Date/Time: 2006-11-09 18:08:23

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: 2-slot GPRS850

Frequency: 824.2 MHz; Duty Cycle: 1:4.2

Medium: Head 850; Medium Notes: Medium Temperature: $t=21.1\text{ C}$

Medium parameters used (interpolated): $f = 824.2\text{ MHz}$; $\sigma = 0.894\text{ mho/m}$; $\epsilon_r = 41.3$; $\rho = 1000\text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(6.26, 6.26, 6.26); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1215
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek position – Low - Camera cover closed/Area Scan (61x101x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.912 mW/g

Cheek position – Low - Camera cover closed/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid:
 $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 23.0 V/m

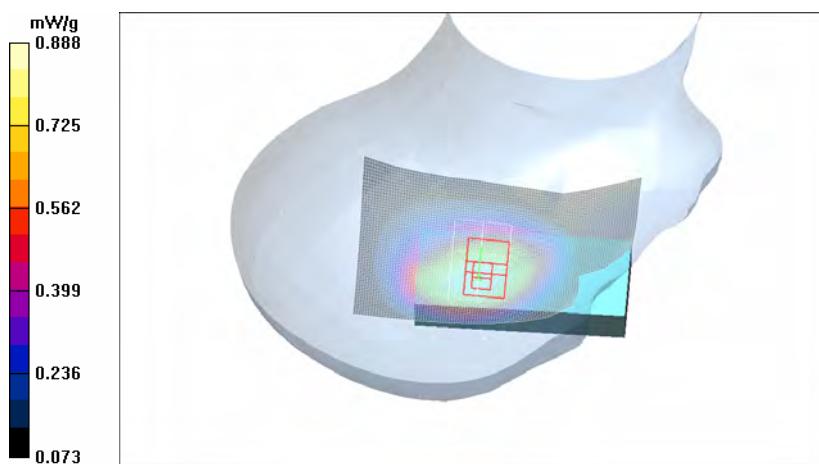
Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.838 mW/g

SAR(10 g) = 0.600 mW/g

Power Drift = 0.326 dB

Maximum value of SAR (measured) = 0.888 mW/g



Date/Time: 2006-11-09 19:08:26

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: 2-slot GPRS850

Frequency: 824.2 MHz; Duty Cycle: 1:4.2

Medium: Head 850; Medium Notes: Medium Temperature: $t=21.1$ C

Medium parameters used (interpolated): $f = 824.2$ MHz; $\sigma = 0.894$ mho/m; $\epsilon_r = 41.3$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes: Worst Case Extrapolation.
- ConvF(6.37, 6.37, 6.37); Calibrated: 2004-09-30
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1215
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek position - Low - Camera cover closed - MC/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.08 mW/g

Cheek position - Low - Camera cover closed - MC/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid:

dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 28.8 V/m

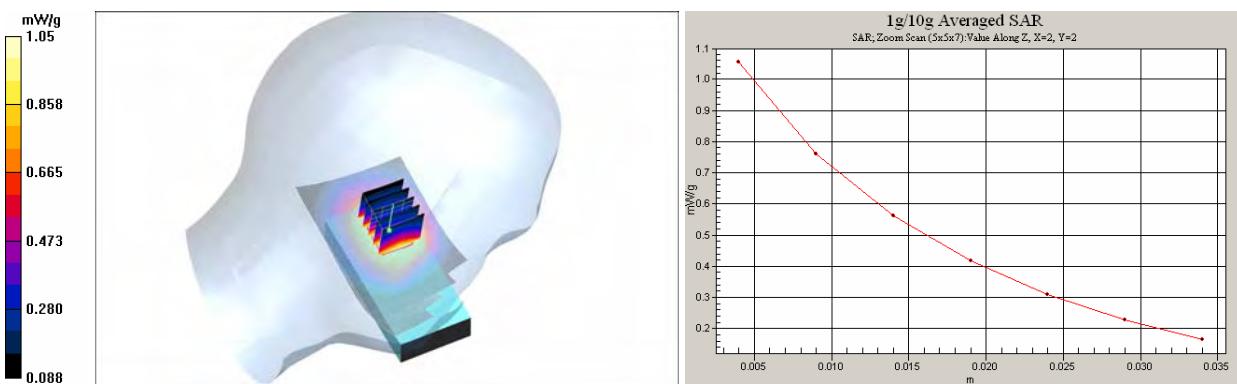
Peak SAR (extrapolated) = 1.56 W/kg

SAR(1 g) = 1.01 mW/g

SAR(10 g) = 0.709 mW/g

Power Drift = -0.155 dB

Maximum value of SAR (measured) = 1.05 mW/g



Date/Time: 2006-11-03 12:52:10

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: GSM 1900

Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: Head 1900; Medium Notes: Medium Temperature: $t=20.8^{\circ}\text{C}$

Medium parameters used: $f = 1910 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 39.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(5.26, 5.26, 5.26); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek position - High - Camera cover closed/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 1.20 mW/g

Cheek position - High - Camera cover closed/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid:
 $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 16.5 V/m

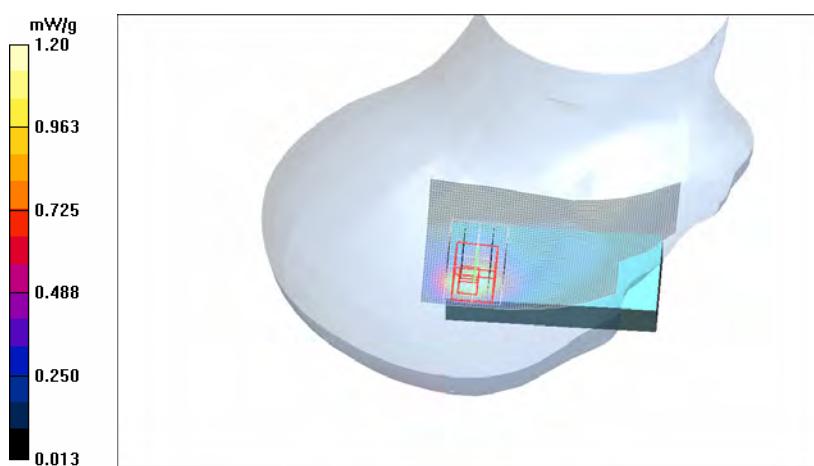
Peak SAR (extrapolated) = 2.09 W/kg

SAR(1 g) = 1.11 mW/g

SAR(10 g) = 0.566 mW/g

Power Drift = -0.112 dB

Maximum value of SAR (measured) = 1.20 mW/g



Date/Time: 2006-11-03 11:05:32

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: GSM 1900

Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: Head 1900; Medium Notes: Medium Temperature: $t=20.8^{\circ}\text{C}$

Medium parameters used: $f = 1910 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 39.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(5.26, 5.26, 5.26); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Tilt position - High - Camera cover closed/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 1.21 mW/g

Tilt position - High - Camera cover closed/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 20.1 V/m

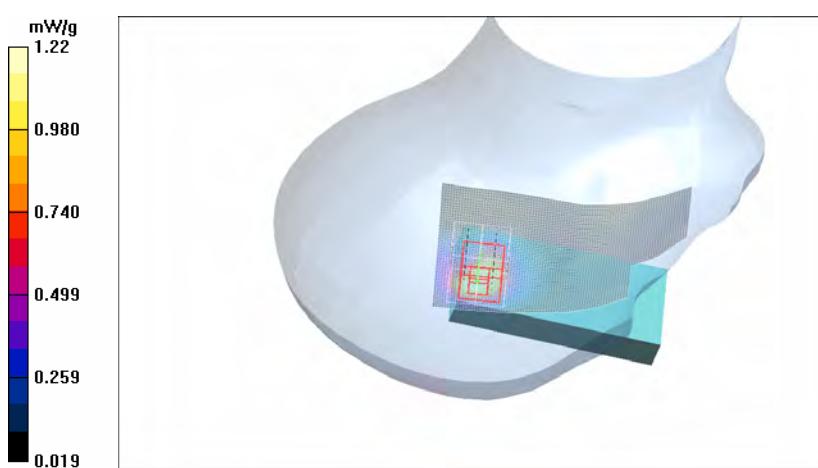
Peak SAR (extrapolated) = 1.91 W/kg

SAR(1 g) = 1.07 mW/g

SAR(10 g) = 0.559 mW/g

Power Drift = -0.095 dB

Maximum value of SAR (measured) = 1.22 mW/g



Date/Time: 2006-11-03 14:26:10

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: GSM 1900
Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium: Head 1900; Medium Notes: Medium Temperature: $t=20.8^{\circ}\text{C}$
Medium parameters used: $f = 1910 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 39.1$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section

DASY4 Configuration:
 - Probe: ET3DV6 - SN1813; Probe Notes:
 - ConvF(5.26, 5.26, 5.26); Calibrated: 2006-09-19
 - Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
 - Electronics: DAE3 Sn573; Calibrated: 2006-09-08
 - Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
 - Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Cheek position - High - Camera cover closed - BT active/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 1.18 mW/g

Cheek position - High - Camera cover closed - BT active/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 15.9 V/m

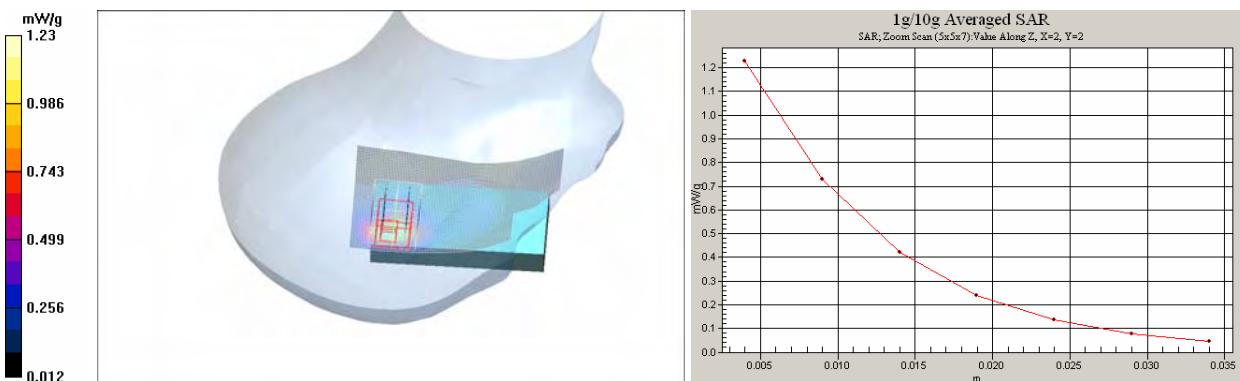
Peak SAR (extrapolated) = 2.15 W/kg

SAR(1 g) = 1.13 mW/g

SAR(10 g) = 0.572 mW/g

Power Drift = -0.134 dB

Maximum value of SAR (measured) = 1.23 mW/g



Date/Time: 2006-11-14 15:18:59

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: 2-slot GPRS850

Frequency: 824.2 MHz; Duty Cycle: 1:4.2

Medium: Body 850; Medium Notes: Medium Temperature: $t = 21.3^\circ\text{C}$

Medium parameters used (interpolated): $f = 824.2 \text{ MHz}$; $\sigma = 0.961 \text{ mho/m}$; $\epsilon_r = 54.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(6.07, 6.07, 6.07); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1037
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body - Low - Camera cover closed - No Accessory/Area Scan (51x101x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.740 mW/g

Body - Low - Camera cover closed - No Accessory/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 17.5 V/m

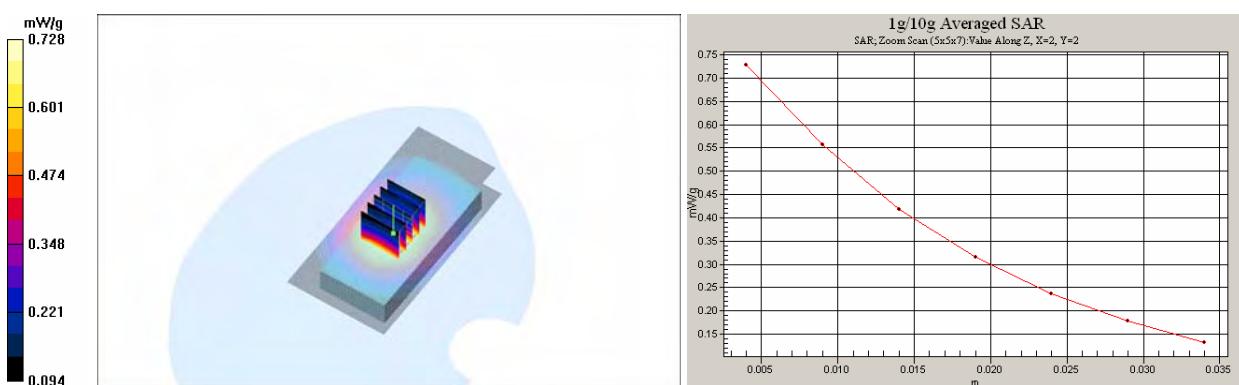
Peak SAR (extrapolated) = 0.874 W/kg

SAR(1 g) = 0.686 mW/g

SAR(10 g) = 0.502 mW/g

Power Drift = -0.208 dB

Maximum value of SAR (measured) = 0.728 mW/g



Date/Time: 2006-11-17 16:33:08

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: GSM 1900

Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: Body 1900; Medium Notes: Medium Temperature: t=21.6 C

Medium parameters used: f = 1910 MHz; σ = 1.58 mho/m; ϵ_r = 51.6; ρ = 1000 kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(4.64, 4.64, 4.64); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body - High - Camera cover closed - No Accessory/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.203 mW/g

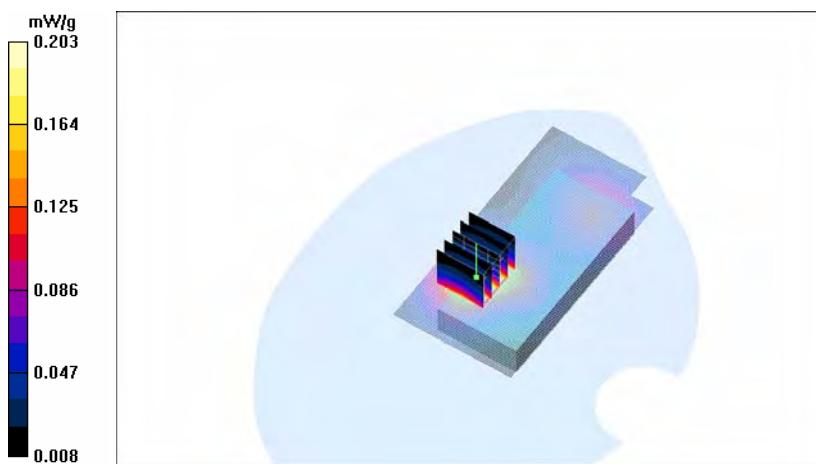
Body - High - Camera cover closed - No Accessory/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 7.45 V/m

Peak SAR (extrapolated) = 0.284 W/kg

SAR(1 g) = 0.187 mW/g**SAR(10 g) = 0.116 mW/g****Power Drift = -0.063 dB**

Maximum value of SAR (measured) = 0.203 mW/g



Date/Time: 2006-11-17 16:45:31

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: GSM 1900

Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: Body 1900; Medium Notes: Medium Temperature: t=21.6 C

Medium parameters used: f = 1910 MHz; σ = 1.58 mho/m; ϵ_r = 51.6; ρ = 1000 kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(4.64, 4.64, 4.64); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body - High - Camera cover closed - HS-6/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (interpolated) = 0.186 mW/g

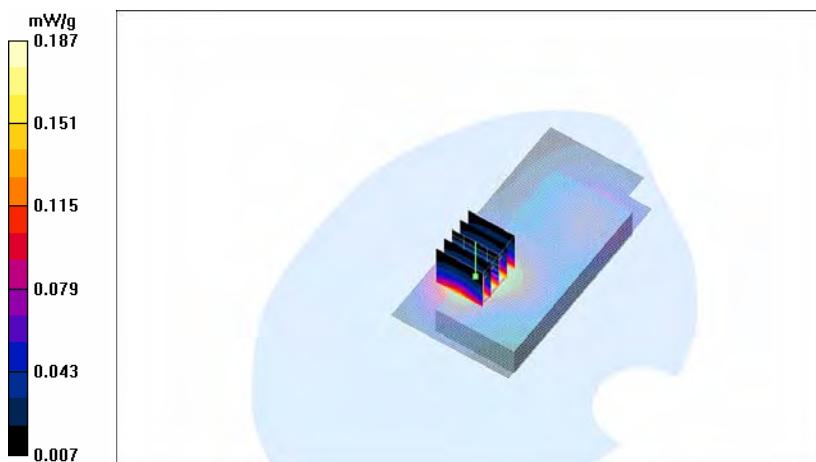
Body - High - Camera cover closed - HS-6/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 6.81 V/m

Peak SAR (extrapolated) = 0.260 W/kg

SAR(1 g) = 0.172 mW/g**SAR(10 g) = 0.108 mW/g****Power Drift = 0.052 dB**

Maximum value of SAR (measured) = 0.187 mW/g



Date/Time: 2006-11-17 17:39:08

Test Laboratory: TCC Copenhagen
Type: RM-132; Serial: 004400/71/175094/1

Communication System: GSM 1900

Frequency: 1909.8 MHz; Duty Cycle: 1:8.3

Medium: Body 1900; Medium Notes: Medium Temperature: t=21.6 C

Medium parameters used: f = 1910 MHz; σ = 1.58 mho/m; ϵ_r = 51.6; ρ = 1000 kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1813; Probe Notes:
- ConvF(4.64, 4.64, 4.64); Calibrated: 2006-09-19
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn573; Calibrated: 2006-09-08
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body - High - Camera cover open - No Accessory /Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.198 mW/g

Body - High – Camera cover open - No Accessory /Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 7.31 V/m

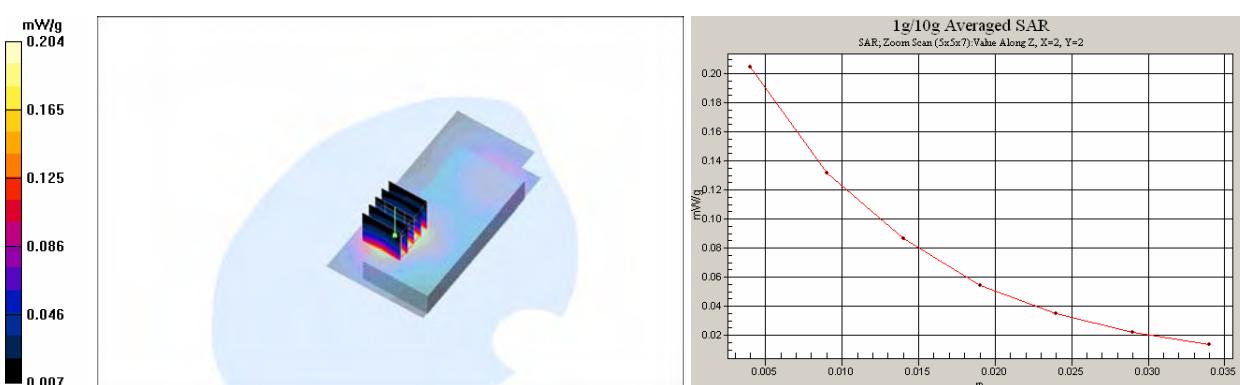
Peak SAR (extrapolated) = 0.290 W/kg

SAR(1 g) = 0.188 mW/g

SAR(10 g) = 0.116 mW/g

Power Drift = -0.033 dB

Maximum value of SAR (measured) = 0.204 mW/g



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

See the following pages

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
C Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
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 **Nokia Denmark A/S**

Certificate No: **ET3-1813_Sep06**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1813**

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

Calibration date: **September 19, 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 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	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
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 Nov-05)	In house check: Nov 06

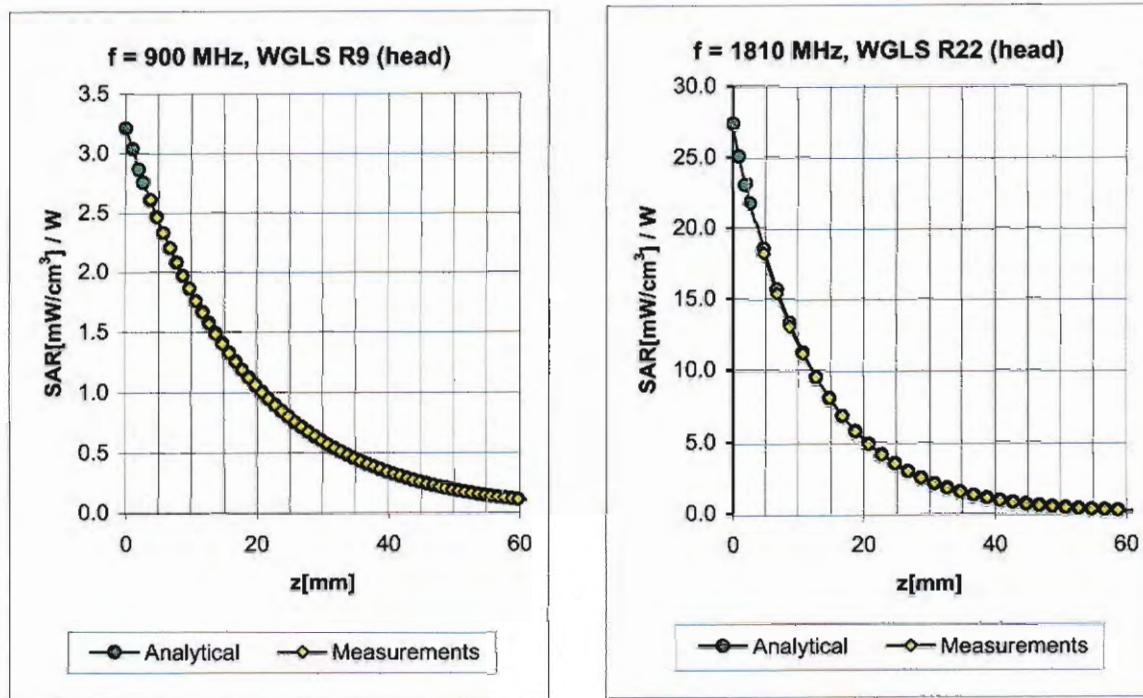
Calibrated by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Approved by:	Name	Function	Signature
	Niels Kuster	Quality Manager	

Issued: September 19, 2006

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

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	$\pm 50 / \pm 100$	Head	$41.5 \pm 5\%$	$0.97 \pm 5\%$	0.57	1.86	$6.26 \pm 11.0\% \text{ (k=2)}$
1810	$\pm 50 / \pm 100$	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.51	2.59	$5.26 \pm 11.0\% \text{ (k=2)}$
1950	$\pm 50 / \pm 100$	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.55	2.58	$4.96 \pm 11.0\% \text{ (k=2)}$
2450	$\pm 50 / \pm 100$	Head	$39.2 \pm 5\%$	$1.80 \pm 5\%$	0.74	1.85	$4.65 \pm 11.8\% \text{ (k=2)}$

900	$\pm 50 / \pm 100$	Body	$55.0 \pm 5\%$	$1.05 \pm 5\%$	0.51	2.06	$6.07 \pm 11.0\% \text{ (k=2)}$
1810	$\pm 50 / \pm 100$	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.59	2.80	$4.64 \pm 11.0\% \text{ (k=2)}$
1950	$\pm 50 / \pm 100$	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.68	2.58	$4.47 \pm 11.0\% \text{ (k=2)}$
2450	$\pm 50 / \pm 100$	Body	$52.7 \pm 5\%$	$1.95 \pm 5\%$	0.77	1.59	$4.18 \pm 11.8\% \text{ (k=2)}$

^c 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.

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

See the following pages

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Nokia DK 2

Certificate No: D835V2-476_Jan05

CALIBRATION CERTIFICATE

Object D835V2 - SN: 476

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

Calibration date: January 18, 2005

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 E442	GB37480704	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Power sensor HP 8481A	US37292783	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference Probe ET3DV6	SN 1507	26-Oct-04 (SPEAG, No. ET3-1507_Oct04)	Oct-05
DAE4	SN 601	07-Jan-05 (SPEAG, No. DAE4-601_Jan05)	Jan-06
DAE4	SN 907	03-May-04 (SPEAG, No. DAE4-907_May04)	May-05
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-03)	In house check: Oct-05
RF generator R&S SML-03	100698	27-Mar-02 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov-05

Calibrated by: Name Judith Müller Function Laboratory Technician

Approved by: Name Katja Pokovic Function Technical Manager

Issued: January 19, 2005

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DASY4 Validation Report for Head TSL

Date/Time: 01/18/05 14:32:56

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN476

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

Medium: HSL 900 MHz;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.91$ mho/m; $\epsilon_r = 42$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.24, 6.24, 6.24); Calibrated: 26.10.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.01.2005
- Phantom: Flat Phantom half size; Type: QD000P49AA; Serial: SN:1001;
- Measurement SW: DASY4, V4.4 Build 11; Postprocessing SW: SEMCAD, V1.8 Build 133

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.47 mW/g

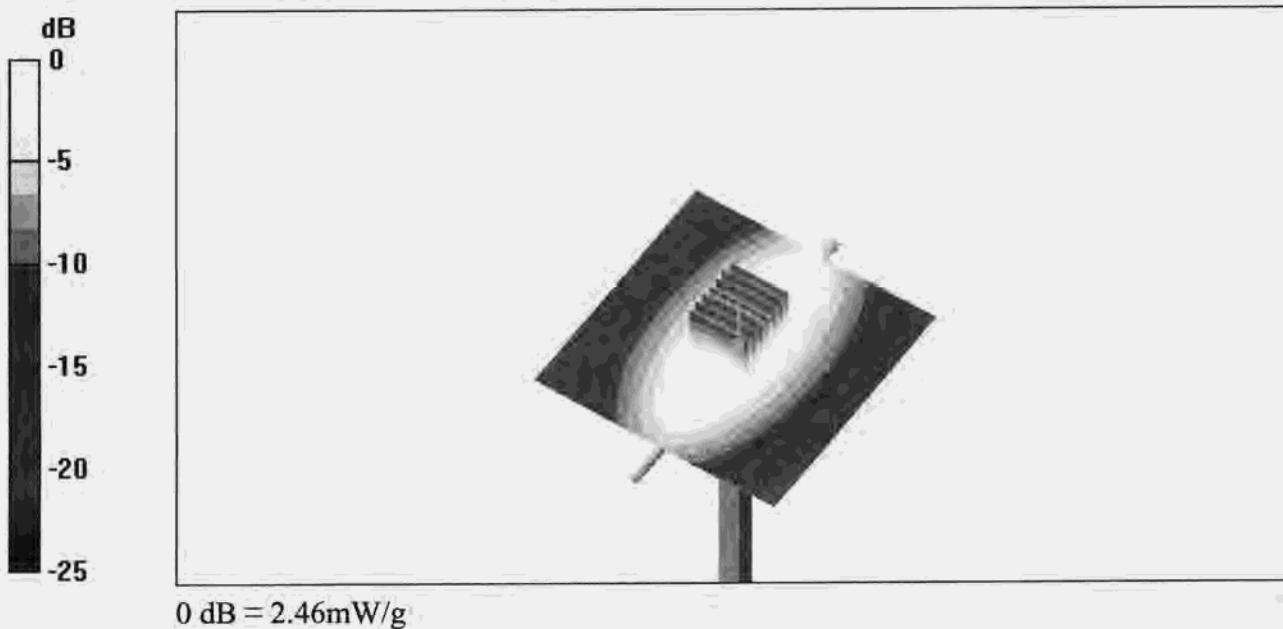
Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54 V/m; Power Drift = 0.0 dB

Peak SAR (extrapolated) = 3.32 W/kg

SAR(1 g) = 2.27 mW/g; SAR(10 g) = 1.49 mW/g

Maximum value of SAR (measured) = 2.46 mW/g



DASY4 Validation Report for Body TSL

Date/Time: 01/11/05 10:36:02

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN476

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

Medium: MSL 900 MHz;

Medium parameters used: $f = 835$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5.98, 5.98, 5.98); Calibrated: 26.10.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn907; Calibrated: 03.05.2004
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001;
- Measurement SW: DASY4, V4.4 Build 10; Postprocessing SW: SEMCAD, V1.8 Build 133

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.68 mW/g

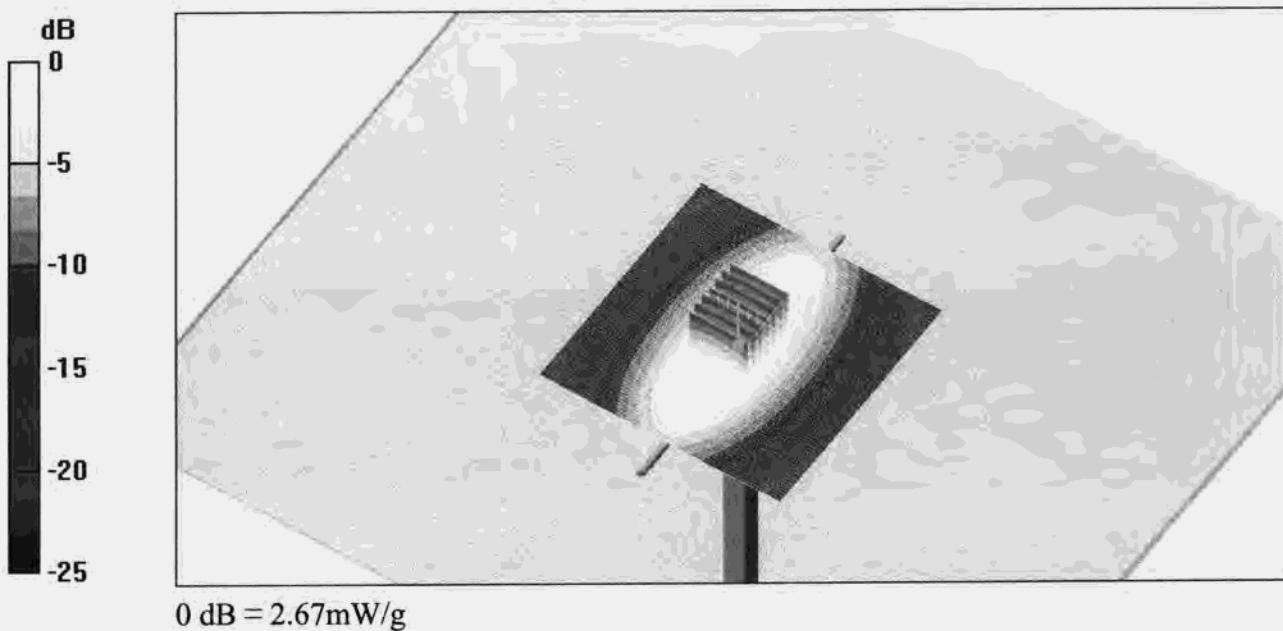
Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.7 V/m; Power Drift = 0.0 dB

Peak SAR (extrapolated) = 3.56 W/kg

SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g

Maximum value of SAR (measured) = 2.67 mW/g





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Accreditation No.: **SCS 108**

Client **Nokia Denmark A/S**

Certificate No: **D1900V2-5d026_Feb06/2**

CALIBRATION CERTIFICATE (Replacement of No: D1900V2-5d026_Feb06)

Object **D1900V2 - SN: 5d026**

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

Calibration date: **February 21, 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	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference Probe ET3DV6	SN 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by:	Name	Function	Signature
	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 9, 2006

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DASY4 Validation Report for Head TSL

Date/Time: 21.02.2006 13:52:34

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: HSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.74, 4.74, 4.74); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.6 Build 57; Postprocessing SW: SEMCAD, V1.8 Build 160

Pin = 250 mW; d = 10 mm/Area Scan (71x71x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.1 mW/g

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

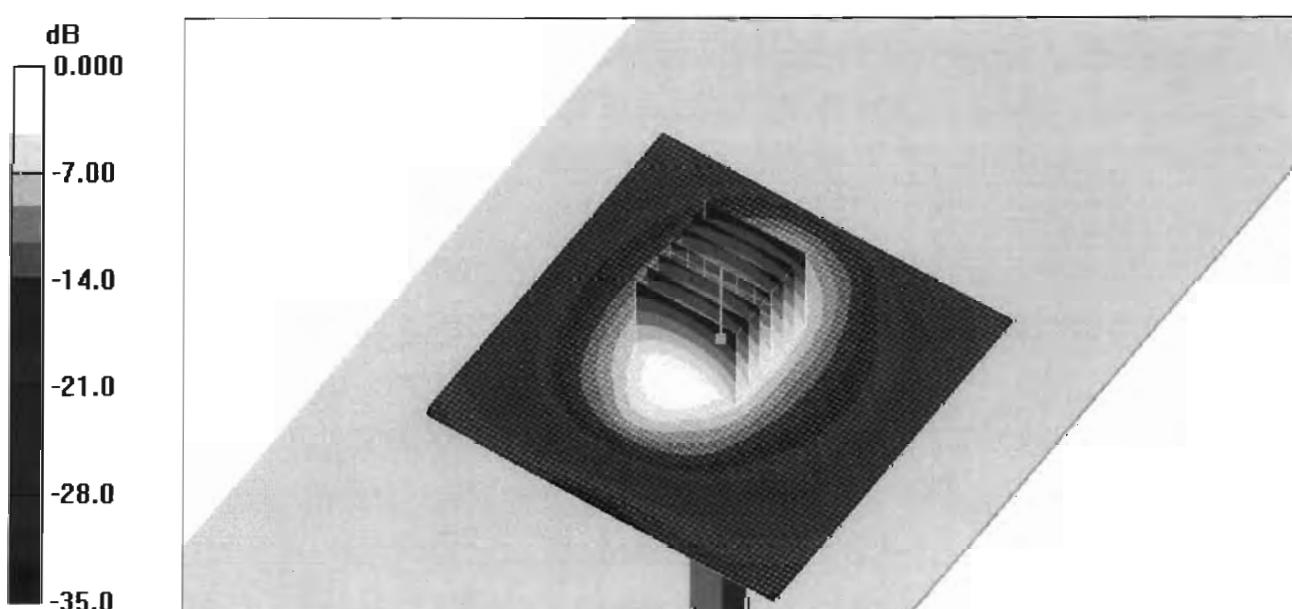
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 84.2 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 16.6 W/kg

SAR(1 g) = 9.83 mW/g; SAR(10 g) = 5.2 mW/g

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



0 dB = 11.0mW/g

DASY4 Validation Report for Body TSL

Date/Time: 21.02.2006 15:46:28

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: MSL U10;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 54.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.3, 4.3, 4.3); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA
- Measurement SW: DASY4, V4.6 Build 57; Postprocessing SW: SEMCAD, V1.8 Build 160

Pin = 250 mW; d = 10 mm/Area Scan (71x71x1):

Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.1 mW/g

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

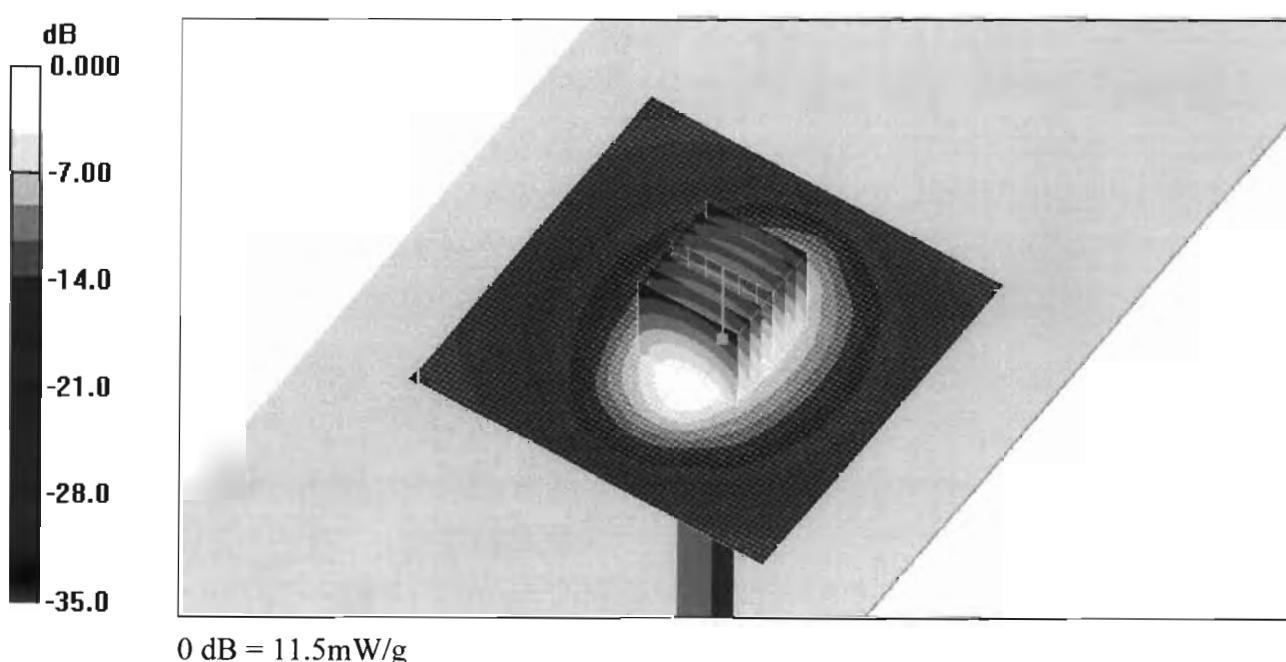
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 83.1 V/m; Power Drift = -0.066 dB

Peak SAR (extrapolated) = 17.3 W/kg

SAR(1 g) = 10 mW/g; SAR(10 g) = 5.38 mW/g

Maximum value of SAR (measured) = 11.5 mW/g





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Accreditation No.: **SCS 108**

Client **Nokia Denmark**

Certificate No. **D1900V2-5d063_Jan06**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d063**

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

Calibration date: **January 10, 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	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference Probe ET3DV6	SN 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN 601	16-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by:	Name	Function	Signature
	Judith Müller	Laboratory Technician	
Approved by:	Katja Pollicic	Technical Manager	

Issued: January 17, 2006

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DASY4 Validation Report for Body TSL

Date/Time: 10.01.2006 15:46:39

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d063

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

Medium: MSL U10;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 53$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.3, 4.3, 4.3); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Pin = 250 mW; d = 10 mm 2/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 13.0 mW/g

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

Reference Value = 94.2 V/m; Power Drift = -0.036 dB

Peak SAR (extrapolated) = 18.0 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.6 mW/g

Maximum value of SAR (measured) = 12.0 mW/g

