

SAR Compliance Test Report

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Tested device:	RM-149		
FCC ID:	OW3RM-149	IC:	661AA-RM149
Supplement reports:	Salo_SAR_0702_02 for RM-135 / OW3RM-135 / 661AA-RM135		
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 Technique		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
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:

For the contents:

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2007-03-14
SN, HW and SW numbers of tested device	SN: 004400/99/170274/5, HW: 0404, SW: 10.1.007, DUT: 50453
Batteries used in testing	BL-4B, DUT: 50452, 50456
Headsets used in testing	HS-43, DUT: 50454
Other accessories used in testing	-
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	190 / 836.6	31.7 dBm ERP	Right, Cheek	1.09 W/kg	1.22 W/kg	1.6 W/kg	PASSED
2-slot GPRS1900	810 / 1909.8	29.1 dBm EIRP	Left, Cheek	0.315 W/kg	0.35 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	251 / 848.8	29.9 dBm ERP	1.5 cm	1.03 W/kg	1.15 W/kg	1.6 W/kg	PASSED
2-slot GPRS1900	512 / 1850.2	26.8 dBm EIRP	1.5 cm	0.328 W/kg	0.37 W/kg	1.6 W/kg	PASSED

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

**SAR data has been taken from Salo_SAR_0702_02 for RM-135.

1.2.3 Maximum Drift

Maximum drift covered by 12% scaling up of the SAR values	Maximum drift during measurements
0.5dB	0.24 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	GPRS	EGPRS	BT
	850 / 1900	850 / 1900	850 / 1900	
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):	21.0 to 22.5
Ambient humidity (RH %):	21 to 28

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 supplement report Salo_SAR_0702_02 for RM-135 / OW3RM-135 / 661AA-RM135.

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
DAE 3	480	12 months	2007-09
E-field Probe ET3DV6	1652	12 months	2007-09
Dipole Validation Kit, D1900V2	547	24 months	2007-09
DASY4 software	Version 4.6	-	-

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	8648C	3847M00258	12 months	2007-06
Call Tester	CMU200	835352/008	-	-
Call Tester	CMU200	100359	-	-
Amplifier	AR 5SIG4M3	302339	12 months	2007-06
RF Network Analyzer	8753ES	My40002096	12 months	2007-06
Dielectric Probe Kit	85070C	01033717	-	-
Power Meter	Aligent E4419B	My41291520	12 months	2007-06
Power Sensor	Agilent 8482A	US37295411	12 months	2007-06

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):

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]	
1900	Reference result	10.1	38.7	1.47	
	$\pm 10\%$ window	9.1 – 11.1			
	2007-03-14	9.31	39.8	1.43	22.1

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]	
1880	Recommended value	40.0	1.40	22.1
	$\pm 5\%$ window	38.0 – 42.0	1.33 – 1.47	
	2007-03-14	39.8	1.41	

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ϵ_r	σ [S/m]	
1880	Recommended value	53.3	1.52	22.1
	$\pm 5\%$ window	50.6 – 56.0	1.44 – 1.60	
	2007-03-14	52.3	1.52	

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	C_i	$C_i \cdot u_i$ (%)	v_i
Measurement System							
Probe Calibration	E2.1	±5.9	N	1	1	±5.9	∞
Axial Isotropy	E2.2	±4.7	R	√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	±1.0	R	√3	1	±0.6	∞
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	±3.9	R	√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	√3	1	±0.0	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	±4.0	R	√3	1	±2.3	∞
Conductivity Target - tolerance	E3.2	±5.0	R	√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	√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:

1900MHz 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		31.7 dBm	27.7 dBm	29.1 dBm
Flip open	Left	Cheek	-	0.154	-
2-slot GPRS	Power		31.6 dBm	27.4 dBm	29.1 dBm
Flip open	Left	Cheek	0.243	0.288	0.292
		Tilt	-	0.163	-
	Right	Cheek	-	0.267	-
		Tilt	-	0.250	-
2-slot 8PSK EGPRS	Power		28.3 dBm	24.3 dBm	25.8 dBm
Flip open	Left Cheek				0.097
2-slot GPRS Flip open	Left Cheek, BT active		-	-	0.315

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

1900MHz 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
2-slot GPRS	Power		26.8 dBm	26.1 dBm	26.3 dBm
Flip closed	Without headset		0.327	0.286	0.282
	Headset HS-43		0.314	0.253	0.324
2-slot GPRS Flip closed	Without headset, BT active		0.328	-	-

Plots of the Measurement scans are given in Appendix B.

APPENDIX A: SYSTEM CHECKING SCANS

Date/Time: 2007-03-14 9:29:24 AM

Test Laboratory: TCC Nokia
Type: D1900V2; Serial: D1900V2 - SN:547

Communication System: CW1900

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: Head 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used: f = 1900 MHz; $\sigma = 1.43$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(5.02, 5.02, 5.02); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM2; Type: SAM; Serial: TP-1099
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

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 = 77.3 V/m

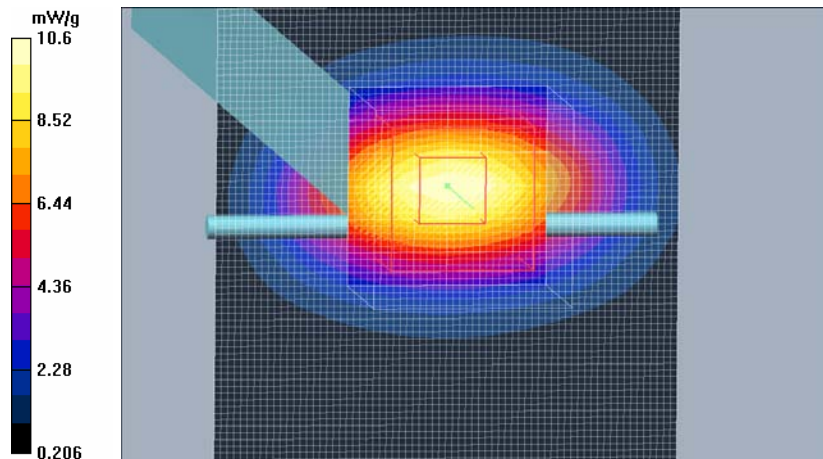
Peak SAR (extrapolated) = 15.8 W/kg

SAR(1 g) = 9.31 mW/g

SAR(10 g) = 4.93 mW/g

Power Drift = -0.085 dB

Maximum value of SAR (measured) = 10.6 mW/g



APPENDIX B: MEASUREMENT SCANS

Date/Time: 2007-03-14 10:00:22 AM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: GSM 1900

Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: Head 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used: f = 1880 MHz; $\sigma = 1.41$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(5.02, 5.02, 5.02); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM2; Type: SAM; Serial: TP-1099
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Cheek position - Middle - Flip open/Area Scan (61x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.167 mW/g

Cheek position - Middle - Flip open/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 3.82 V/m

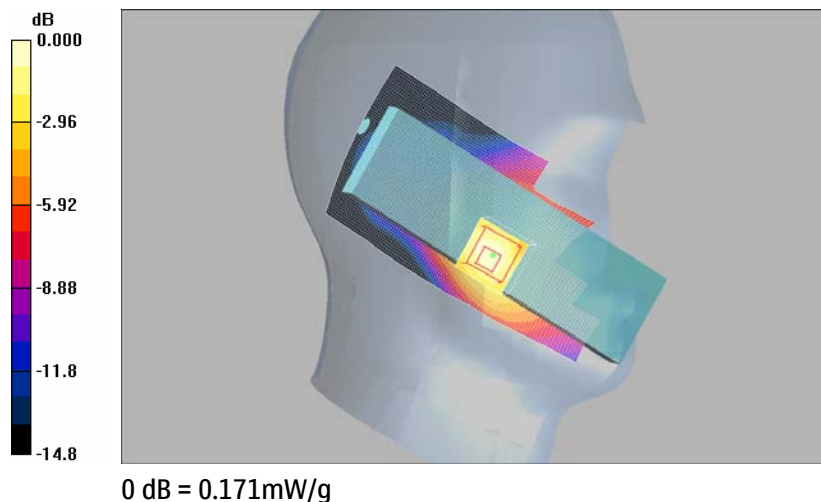
Peak SAR (extrapolated) = 0.257 W/kg

SAR(1 g) = 0.154 mW/g

SAR(10 g) = 0.091 mW/g

Power Drift = -0.016 dB

Maximum value of SAR (measured) = 0.171 mW/g



Date/Time: 2007-03-14 11:55:48 AM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot GPRS1900

Frequency: 1909.8 MHz; Duty Cycle: 1:4.2

Medium: Head 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used: f = 1910 MHz; σ = 1.44 mho/m; ϵ_r = 39.7; ρ = 1000 kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(5.02, 5.02, 5.02); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM2; Type: SAM; Serial: TP-1099
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Cheek position - High - Flip open/Area Scan (61x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.306 mW/g

Cheek position - High - Flip open/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 5.31 V/m

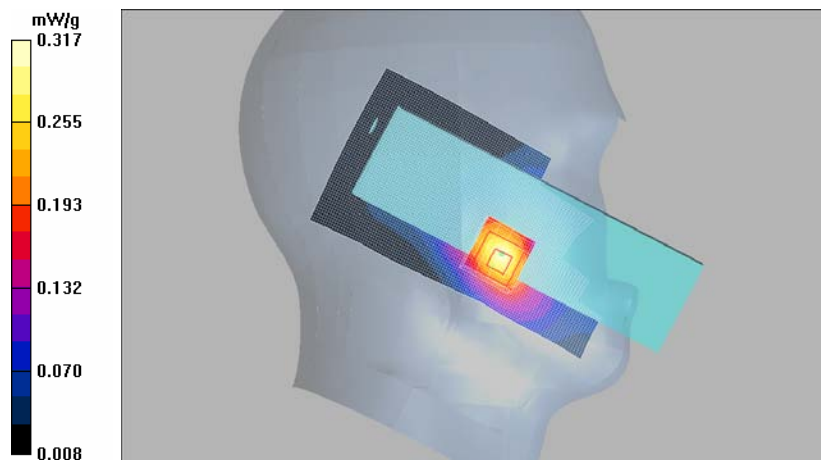
Peak SAR (extrapolated) = 0.478 W/kg

SAR(1 g) = 0.292 mW/g

SAR(10 g) = 0.170 mW/g

Power Drift = -0.028 dB

Maximum value of SAR (measured) = 0.317 mW/g



SAR Report

Bej_SAR_0711_03

Applicant: Nokia Corporation

Type: RM-149

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Date/Time: 2007-03-14 10:44:33 AM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot GPRS1900

Frequency: 1880 MHz; Duty Cycle: 1:4.2

Medium: Head 1900; Medium Notes: Medium Temperature: $t=22.1\text{ }^{\circ}\text{C}$

Medium parameters used: $f = 1880\text{ MHz}$; $\sigma = 1.41\text{ mho/m}$; $\epsilon_r = 39.8$; $\rho = 1000\text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(5.02, 5.02, 5.02); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM2; Type: SAM; Serial: TP-1099
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Tilt position - Middle - Flip open/Area Scan (61x151x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.173 mW/g

Tilt position - Middle - Flip open/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 9.83 V/m

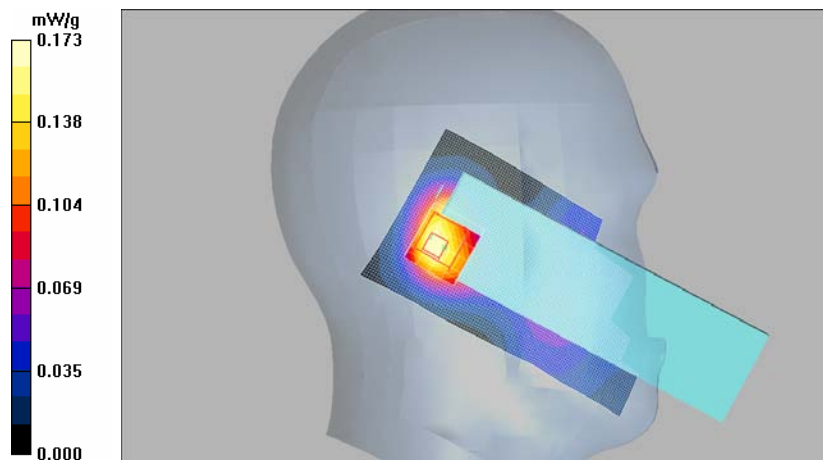
Peak SAR (extrapolated) = 0.238 W/kg

SAR(1 g) = 0.163 mW/g

SAR(10 g) = 0.102 mW/g

Power Drift = -0.017 dB

Maximum value of SAR (measured) = 0.174 mW/g



Date/Time: 2007-03-14 11:05:31 AM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot GPRS1900

Frequency: 1880 MHz; Duty Cycle: 1:4.2

Medium: Head 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used: f = 1880 MHz; σ = 1.41 mho/m; ϵ_r = 39.8; ρ = 1000 kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(5.02, 5.02, 5.02); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM2; Type: SAM; Serial: TP-1099
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Cheek position - Middle - Flip open/Area Scan (61x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.281 mW/g

Cheek position - Middle - Flip open/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 5.80 V/m

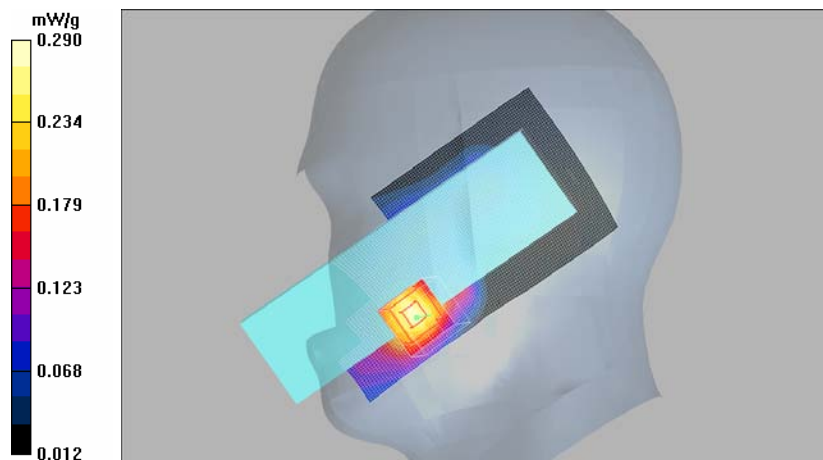
Peak SAR (extrapolated) = 0.413 W/kg

SAR(1 g) = 0.267 mW/g

SAR(10 g) = 0.165 mW/g

Power Drift = 0.051 dB

Maximum value of SAR (measured) = 0.290 mW/g



Date/Time: 2007-03-14 11:22:25 AM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot GPRS1900

Frequency: 1880 MHz; Duty Cycle: 1:4.2

Medium: Head 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used: f = 1880 MHz; $\sigma = 1.41$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(5.02, 5.02, 5.02); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM2; Type: SAM; Serial: TP-1099
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Tilt position - Middle - Flip open/Area Scan (61x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.276 mW/g

Tilt position - Middle - Flip open/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 9.80 V/m

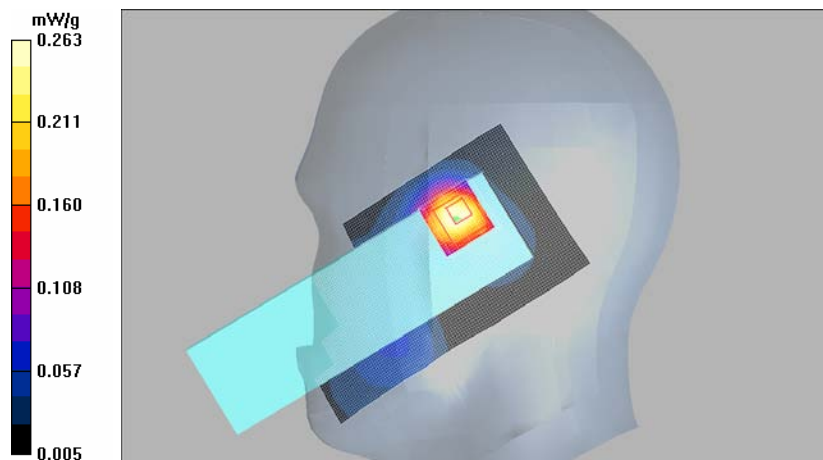
Peak SAR (extrapolated) = 0.378 W/kg

SAR(1 g) = 0.250 mW/g

SAR(10 g) = 0.148 mW/g

Power Drift = -0.075 dB

Maximum value of SAR (measured) = 0.263 mW/g



Date/Time: 2007-03-14 1:37:42 PM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot 8PSK EGPRS1900

Frequency: 1909.8 MHz; Duty Cycle: 1:4.2

Medium: Head 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used: f = 1910 MHz; $\sigma = 1.44$ mho/m; $\epsilon_r = 39.7$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(5.02, 5.02, 5.02); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM2; Type: SAM; Serial: TP-1099
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Cheek position - High - Flip open/Area Scan (61x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.102 mW/g

Cheek position - High - Flip open/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 2.86 V/m

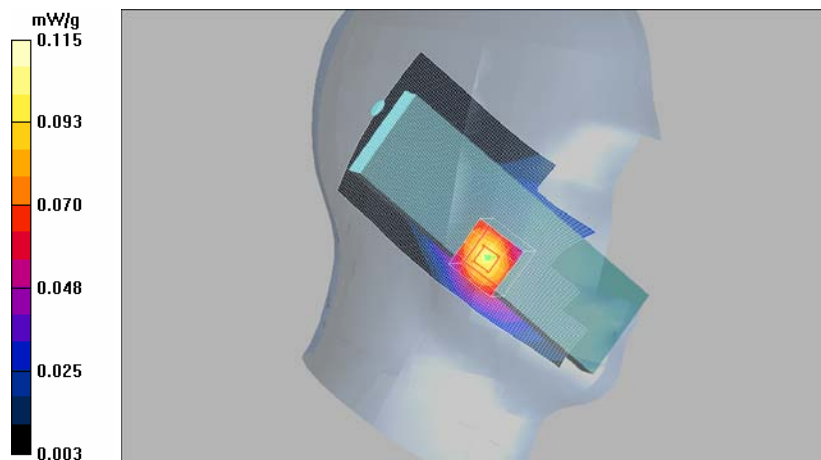
Peak SAR (extrapolated) = 0.156 W/kg

SAR(1 g) = 0.097 mW/g

SAR(10 g) = 0.056 mW/g

Power Drift = 0.197 dB

Maximum value of SAR (measured) = 0.115 mW/g



Date/Time: 2007-03-14 12:58:01 PM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot GPRS1900

Frequency: 1909.8 MHz; Duty Cycle: 1:4.2

Medium: Head 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used: f = 1910 MHz; $\sigma = 1.44$ mho/m; $\epsilon_r = 39.7$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(5.02, 5.02, 5.02); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM2; Type: SAM; Serial: TP-1099
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Cheek position - High - BT active - Flip open/Area Scan (61x151x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.330 mW/g

Cheek position - High - BT active - Flip open/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 5.61 V/m

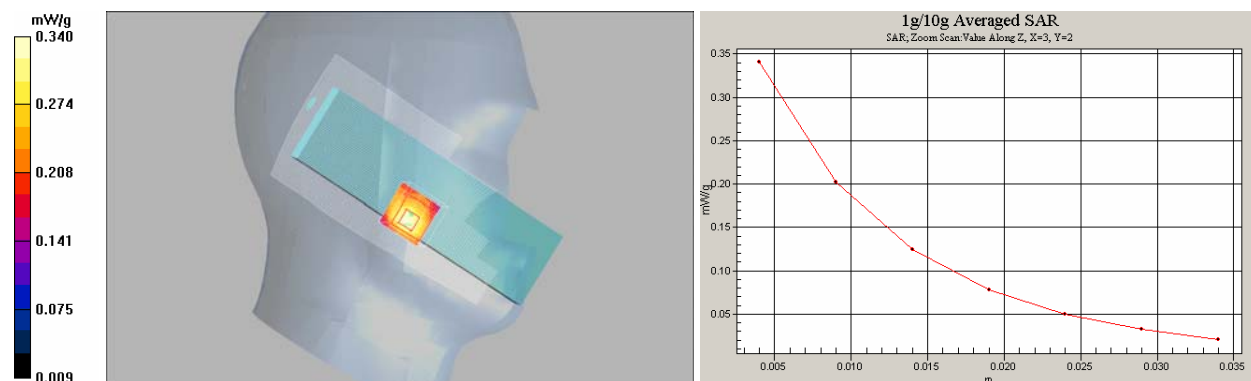
Peak SAR (extrapolated) = 0.523 W/kg

SAR(1 g) = 0.315 mW/g

SAR(10 g) = 0.184 mW/g

Power Drift = -0.035 dB

Maximum value of SAR (measured) = 0.340 mW/g



SAR Report

Bej_SAR_0711_03

Applicant: Nokia Corporation

Type: RM-149

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Date/Time: 2007-03-14 4:28:18 PM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot GPRS1900

Frequency: 1850.2 MHz; Duty Cycle: 1:4.2

Medium: Body 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.49 mho/m; ϵ_r = 52.4; ρ = 1000 kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(4.53, 4.53, 4.53); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM1; Type: SAM; Serial: TP-1097
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Body - Low - No Accessory - Flip closed/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.359 mW/g

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

Reference Value = 7.01 V/m

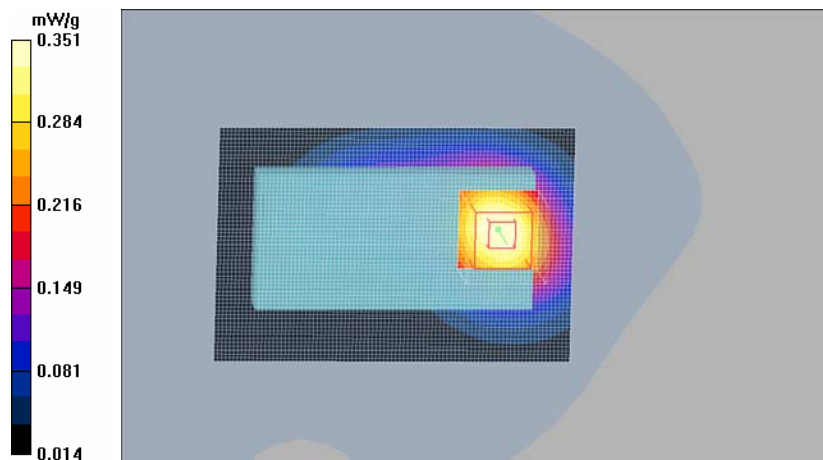
Peak SAR (extrapolated) = 0.494 W/kg

SAR(1 g) = 0.327 mW/g

SAR(10 g) = 0.208 mW/g

Power Drift = -0.009 dB

Maximum value of SAR (measured) = 0.351 mW/g



Date/Time: 2007-03-14 4:16:26 PM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot GPRS1900

Frequency: 1909.8 MHz; Duty Cycle: 1:4.2

Medium: Body 1900; Medium Notes: Medium Temperature: t=22.1 C

Medium parameters used: f = 1910 MHz; σ = 1.54 mho/m; ϵ_r = 52.2; ρ = 1000 kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(4.53, 4.53, 4.53); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM1; Type: SAM; Serial: TP-1097
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Body - High - HS-43 - Flip closed/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.365 mW/g

Body - High - HS-43 - Flip closed/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 4.33 V/m

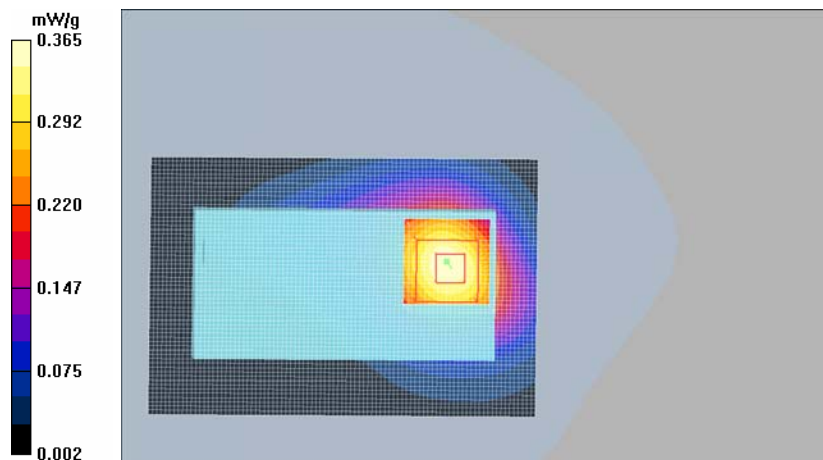
Peak SAR (extrapolated) = 0.477 W/kg

SAR(1 g) = 0.324 mW/g

SAR(10 g) = 0.207 mW/g

Power Drift = -0.112 dB

Maximum value of SAR (measured) = 0.347 mW/g



SAR Report

Bej_SAR_0711_03

Applicant: Nokia Corporation

Type: RM-149

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Date/Time: 2007-03-14 4:52:41 PM

Test Laboratory: TCC Nokia

Type: RM-149; Serial: 004400/99/170274/5

Communication System: 2-slot GPRS1900

Frequency: 1850.2 MHz; Duty Cycle: 1:4.2

Medium: Body 1900; Medium Notes: Medium Temperature: $t=22.1\text{ }^{\circ}\text{C}$

Medium parameters used (interpolated): $f = 1850.2\text{ MHz}$; $\sigma = 1.49\text{ mho/m}$; $\epsilon_r = 52.4$; $\rho = 1000\text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1652; Probe Notes:
- ConvF(4.53, 4.53, 4.53); Calibrated: 2006-09-21
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
- Electronics: DAE3 Sn480; Calibrated: 2006-09-19
- Phantom: SAM1; Type: SAM; Serial: TP-1097
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Body - Low - No Accessory - BT active - Flip closed/Area Scan (61x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.358 mW/g

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

Reference Value = 7.00 V/m

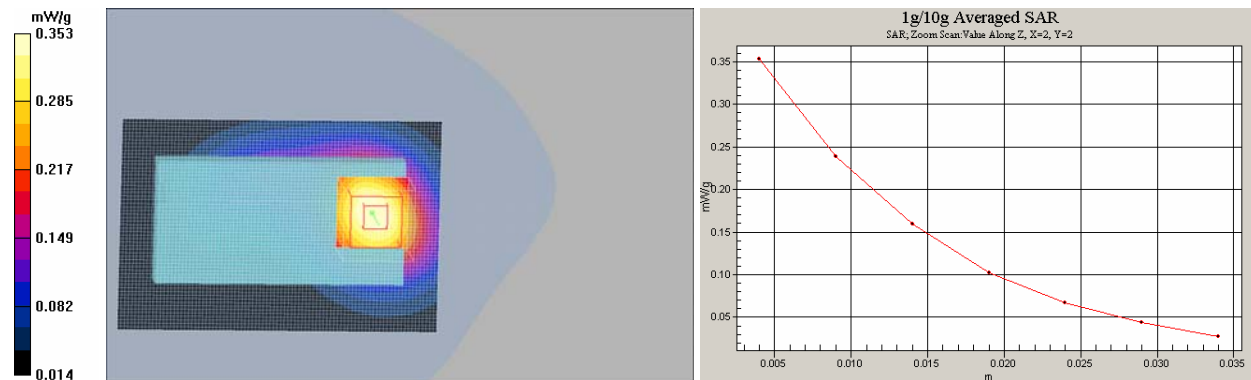
Peak SAR (extrapolated) = 0.483 W/kg

SAR(1 g) = 0.328 mW/g

SAR(10 g) = 0.209 mW/g

Power Drift = -0.086 dB

Maximum value of SAR (measured) = 0.353 mW/g



SAR Report

Bej_SAR_0711_03

Applicant: Nokia Corporation

Type: RM-149

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

E-field probe ET3DV6, SN: 1652
See the next three pages



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 Beijing TCC**

Certificate No: **ET3-1652_Sep06**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1652**

Calibration procedure(s) **QA CAL-01.v5 and QA CAL-12.v4**
Calibration procedure for dosimetric E-field probes

Calibration date: **September 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 $(22 \pm 3)^\circ\text{C}$ 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

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

Issued: September 21, 2006

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

DASY - Parameters of Probe: ET3DV6 SN:1652

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.99 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	95 mV
NormY	2.03 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	94 mV
NormZ	1.89 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	95 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	9.2	4.8
SAR _{be} [%]	With Correction Algorithm	0.1	0.3

TSL **1750 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	12.0	7.5
SAR _{be} [%]	With Correction Algorithm	0.3	0.4

Sensor Offset

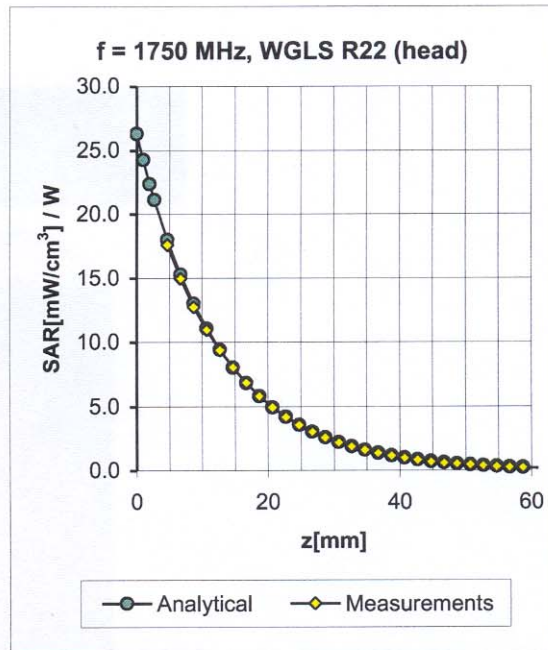
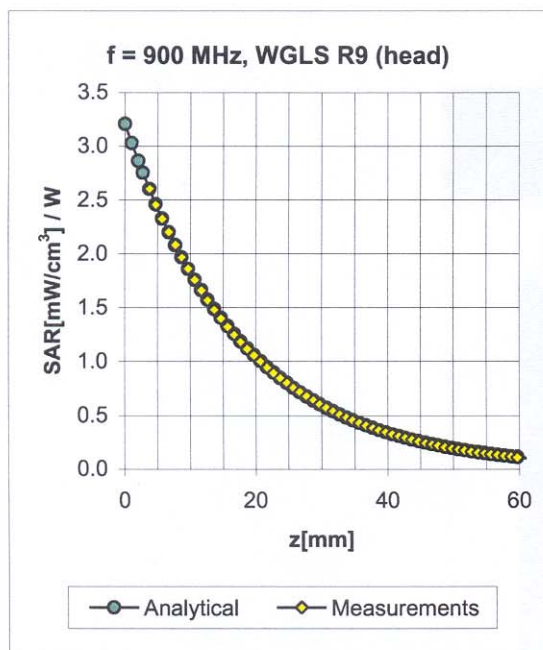
Probe Tip to Sensor Center **2.7 mm**

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

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

^B Numerical linearization parameter: uncertainty not required.

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.35	2.44	6.85 ± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.70	1.72	6.40 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.63	1.83	6.21 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.49	2.72	5.18 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.58	2.59	5.02 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.58	2.57	4.88 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.76	1.87	4.58 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.30	2.70	7.61 ± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.57	1.96	6.28 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.56	2.01	6.10 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.61	2.63	4.65 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.69	2.60	4.53 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.72	2.40	4.43 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.60	1.68	4.11 ± 11.8% (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)

1900MHz dipole, SN: 547
See the next three pages



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 TCC Beijing**

Certificate No: **D1900V2-547_Sep05**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 547**

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

Calibration date: **September 27, 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)	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	26-Oct-04 (SPEAG, No. ET3-1507_Oct04)	Oct-05
DAE4	SN 601	07-Jan-05 (SPEAG, No. DAE4-601_Jan05)	Jan-06
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

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	<i>M. Meili</i>

Approved by:	Katja Pokovic	Technical Manager
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Katja Pokovic

Issued: September 27, 2005

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

DASY4 Validation Report for Head TSL

Date/Time: 23.09.2005 12:58:27

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:547

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

Medium: HSL 1900 MHz;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.96, 4.96, 4.96); Calibrated: 26.10.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.01.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Pin = 250 mW; d = 10 mm/Area Scan (61x81x1):

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

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

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

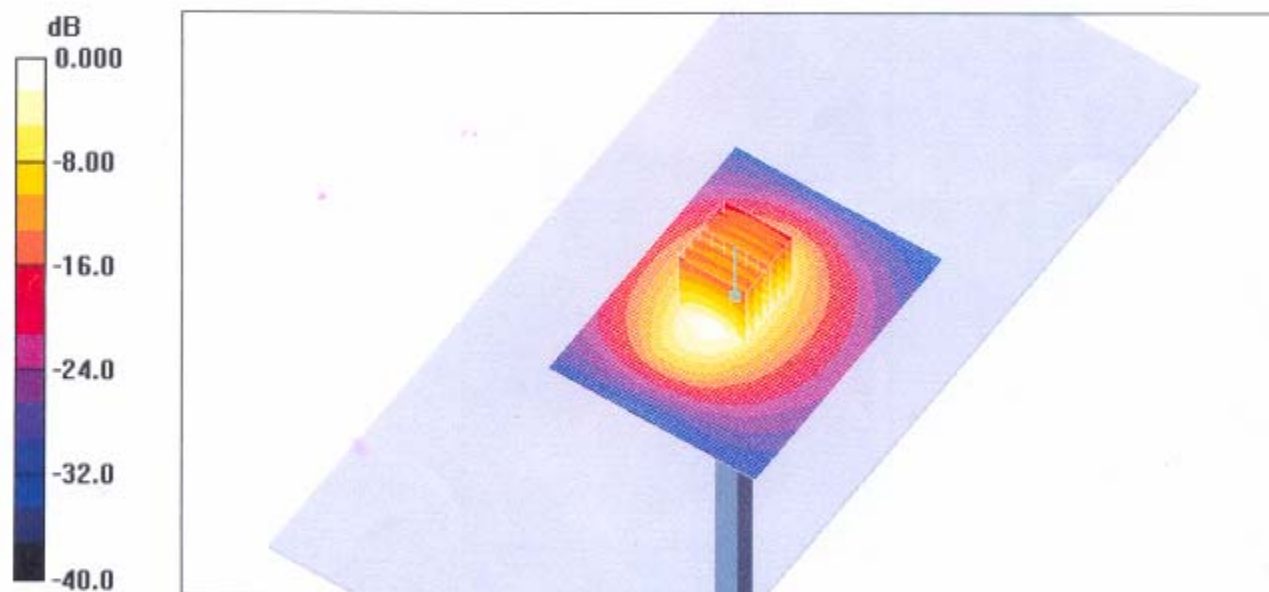
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.0 V/m; Power Drift = 0.030 dB

Peak SAR (extrapolated) = 17.3 W/kg

SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.29 mW/g

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



0 dB = 11.3mW/g

DASY4 Validation Report for Body TSL

Date/Time: 27.09.2005 12:11:20

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:547

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

Medium: MSL 1900 MHz;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.43, 4.43, 4.43); Calibrated: 26.10.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.01.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Pin = 250 mW; d = 10 mm/Area Scan (61x81x1):

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

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

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

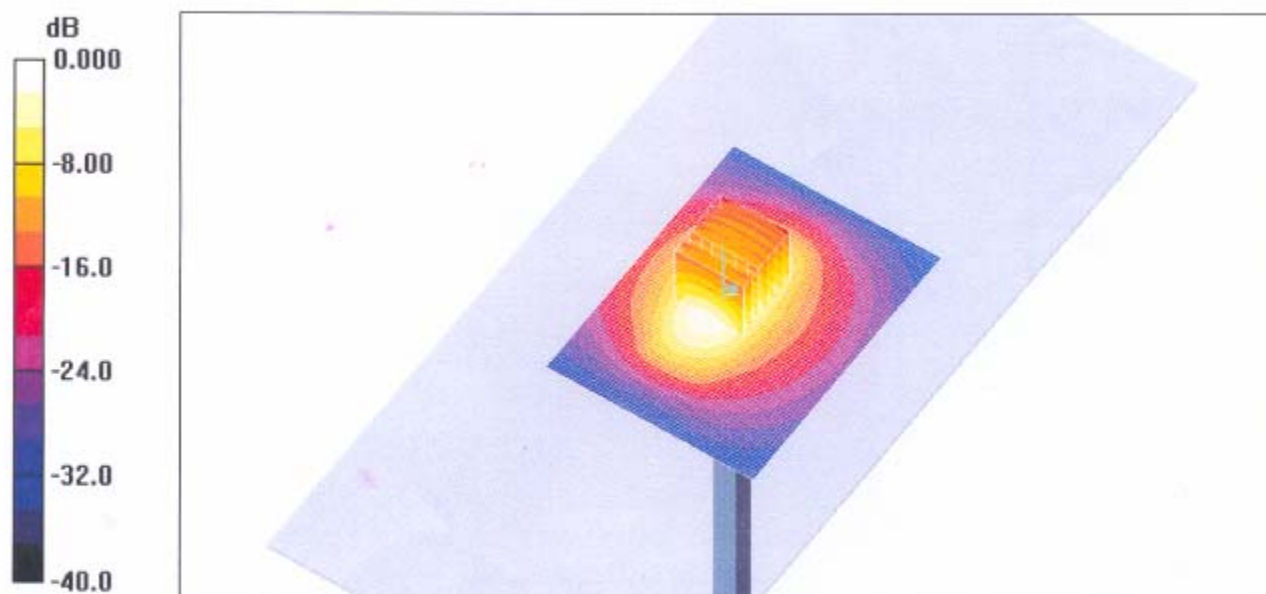
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 85.1 V/m; Power Drift = 0.040 dB

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 9.81 mW/g; SAR(10 g) = 5.23 mW/g

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



0 dB = 11.1mW/g