



SAR Compliance Test Report

Test report no.:	WR1187.001_V1	Date of report:	2006-12-14
Template version:	5	Number of pages:	34
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Measurements made by:	Julian Kim		
Tested device:	RH-103		
FCC ID:	QMNRH-103	IC:	-
Supplement reports:	-		
Testing has been carried out in accordance with:	47CFR §2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01) Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields RSS-102 Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields IEEE 1528 - 2003 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC San Diego.		
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:

2006-12-14

For the contents:

Julian Kim
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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2006-12-06 to 2006-12-11
SN, HW and SW numbers of tested device	SN: 037/06357397 HWID: 2200 SW: ER_GEN_QS02251_B0100_EB14mA
Batteries used in testing	BL-4C
Headsets used in testing	HS-9
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)	Conducted power	Position	Measured SAR value (1g avg)	Scaled* SAR value (1g avg)	SAR limit (1g avg)	Result
CDMA 800	1013 / 824.70	24.8 dBm	Right Cheek	1.04 W/kg	1.16 W/kg	1.6 W/kg	PASSED

1.2.2 Body Worn Configuration

Mode	Ch / f (MHz)	Conducted power	Separation distance	Measured SAR value (1g avg)	Scaled* SAR value (1g avg)	SAR limit (1g avg)	Result
CDMA 800	384 / 836.52	25.5 dBm	2.2 cm	0.565 W/kg	0.63 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	0.23 dB

1.2.4 Measurement Uncertainty

Expanded Uncertainty (k=2) 95%	$\pm 25.8\%$
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2. DESCRIPTION OF THE DEVICE UNDER TEST

Device category	Portable
Exposure environment	General population / Uncontrolled

Modes and Bands of Operation	CDMA 800
Modulation Mode	QPSK
Duty Cycle	1
Transmitter Frequency Range (MHz)	824 – 849

2.1 Picture of the Device



2.2 Description of the Antenna

The device has an internal patch antenna.

3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature (°C):	21.5 to 21.8
Ambient humidity (RH %):	30 to 59

3.2 Test Signal, Frequencies, and Output Power

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

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

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



4. DESCRIPTION OF THE TEST EQUIPMENT

4.1 Measurement System and Components

The measurements were performed using an automated near-field scanning system, DASY 4 software, 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	308	12 months	2007-02
E-field Probe ET3DV6	1805	12 months	2007-05
Dipole Validation Kit, D835V2	479	24 months	2007-09
DASY Software	Version 4.7	-	-

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	Agilent E4432B	US 40052231	24 months	2008-05
Amplifier	Milmega AS0825-20L	1009777	-	-
Power Meter	Agilent E4417A	GB41290918	12 months	2007-11
Power Sensor	Agilent E9327A	US 40440897	12 months	2007-03
Power Sensor	Agilent E9327A	US 40440896	12 months	2007-03
Call Tester	Agilent 8960/E5515C	US 40440119	24 months	2007-12
Vector Network Analyzer	Agilent 8753ES	MY40002861	12 months	2007-06
Dielectric Probe Kit	Agilent 85070D	US 01440165	-	-



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 checking 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 simulating liquids 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 recipes were used for Head and Body tissue simulants:

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

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	2.20	42.3	0.87	
	$\pm 10\%$ window	1.98 – 2.42			
	2006-12-06	2.40	41.2	0.91	21.8
	2006-12-07	2.38	40.5	0.88	21.8

System checking, body tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ϵ_r	σ [S/m]	
835	Reference result	2.36	55.3	1.01	
	$\pm 10\%$ window	2.12 – 2.60			
	2006-12-11	2.46	53.4	0.96	21.5

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	
	$\pm 5\%$ window	39.4 – 43.6	0.86 – 0.95	
	2006-12-06	41.2	0.91	21.8
	2006-12-07	40.5	0.89	21.8

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ϵ_r	σ [S/m]	
836	Recommended value	55.2	0.97	
	$\pm 5\%$ window	52.4 – 58.0	0.92 – 1.02	
	2006-12-11	53.4	0.96	21.5

5. DESCRIPTION OF THE TEST PROCEDURE

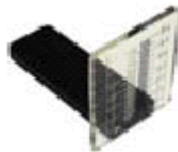
5.1 Device Holder

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".

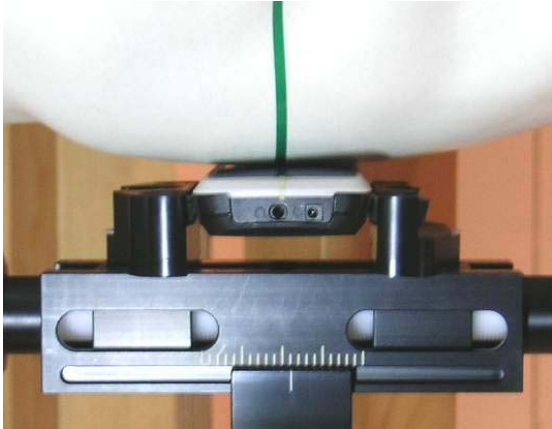


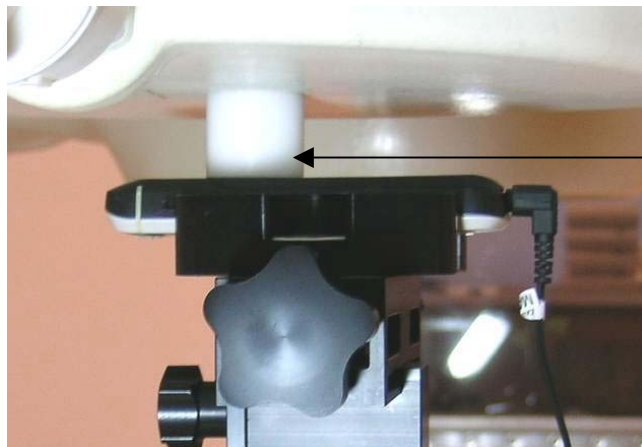
Photo of the device in "cheek" position



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.



2.2cm Spacer

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	√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:

CDMA800 Head SAR Results

Test configuration		SAR, averaged over 1g (W/kg)		
		Ch 1013 824.70 MHz	Ch 384 836.52 MHz	Ch 777 848.31 MHz
Power		24.8 dBm	25.5 dBm	24.9 dBm
Left	Cheek	1.01	0.984	0.968
	Tilt	-	0.727	-
Right	Cheek	1.04	0.970	0.989
	Tilt	-	0.651	-

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

CDMA800 Body SAR Results

Test configuration	SAR, averaged over 1g (W/kg)		
	Ch 1013 824.70 MHz	Ch 384 836.52 MHz	Ch 777 848.31 MHz
Power	24.8 dBm	25.5 dBm	24.9 dBm
Without headset	0.480	0.565	0.459
Headset HS-9	0.378	0.370	0.372

Plots of the Measurement scans are given in Appendix B.



APPENDIX A: SYSTEM CHECKING SCANS

Date/Time: 2006-12-06 13:54:55

Test Laboratory: TCC San Diego

Dipole 835 MHz; Type: D835V2; Serial: 479; Head System Check

Communication System: CW

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Cellular; Medium Notes: Medium Temperature: 21.8 C

Medium parameters used: $f = 835$ MHz; $\sigma = 0.905$ mho/m; $\epsilon_r = 41.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.57, 6.57, 6.57); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1035
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835MHz System Check/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.60 mW/g

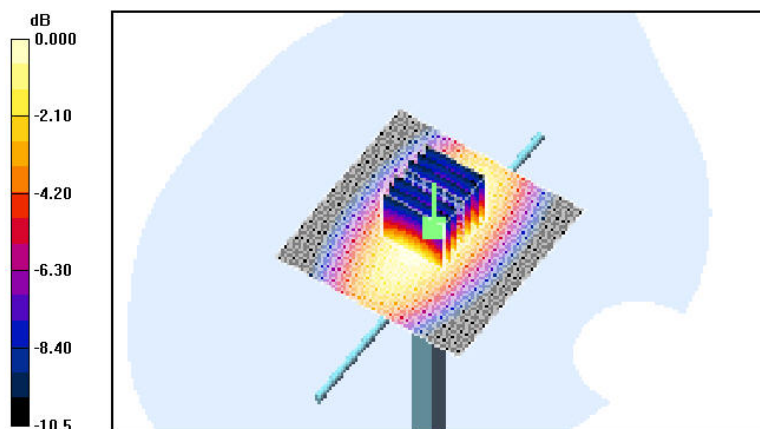
835MHz System Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.1 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 3.61 W/kg

SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.56 mW/g

Maximum value of SAR (measured) = 2.59 mW/g



Date/Time: 2006-12-07 13:39:30

Test Laboratory: TCC San Diego

Dipole 835MHz; Type: D835V2; Serial: 479; Head System Check

Communication System: CW

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Cellular Head; Medium Notes: Medium Temperature: 21.8 C

Medium parameters used: $f = 835$ MHz; $\sigma = 0.883$ mho/m; $\epsilon_r = 40.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.57, 6.57, 6.57); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1035
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835MHz System Check/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.61 mW/g

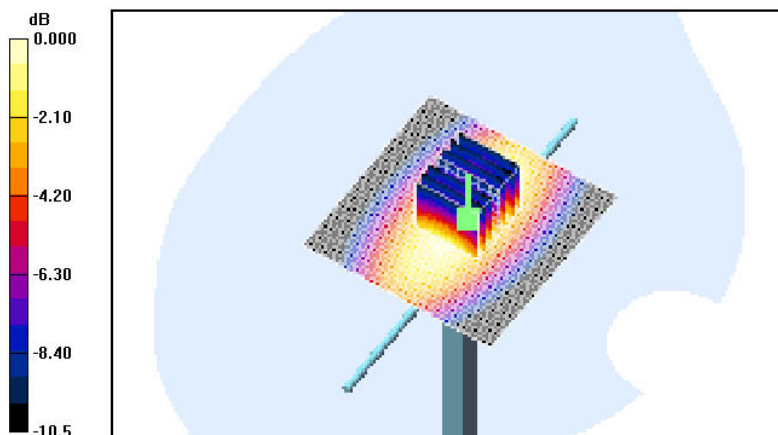
835MHz System Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.9 V/m; Power Drift = -0.011 dB

Peak SAR (extrapolated) = 3.58 W/kg

SAR(1 g) = 2.38 mW/g; SAR(10 g) = 1.55 mW/g

Maximum value of SAR (measured) = 2.59 mW/g



Date/Time: 2006-12-11 10:44:06

Test Laboratory: TCC San Diego

Dipole 835MHz; Type: D835V2; Serial: 479; Body System Check

Communication System: CW

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Cellular Body; Medium Notes: Medium Temperature: 21.5 C

Medium parameters used: $f = 835$ MHz; $\sigma = 0.962$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.33, 6.33, 6.33); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1279
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835MHz System Check/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

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

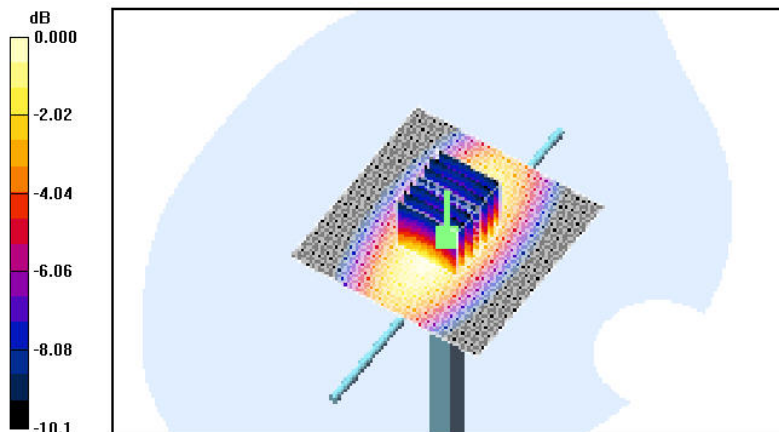
835MHz System Check/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.4 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 3.60 W/kg

SAR(1 g) = 2.46 mW/g; SAR(10 g) = 1.62 mW/g

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





APPENDIX B: MEASUREMENT SCANS

Date/Time: 2006-12-06 16:38:42

Test Laboratory: TCC San Diego
Type: RH-103; Serial: 037/06357397

Communication System: CDMA800
Frequency: 824.7 MHz; Duty Cycle: 1:1
Medium: Cellular Head; Medium Notes: Medium Temperature: 21.8 C
Medium parameters used (interpolated): $f = 824.7$ MHz; $\sigma = 0.896$ mho/m; $\epsilon_r = 41.4$; $\rho = 1000$ kg/m³
Phantom section: Left Section

DASY4 Configuration:

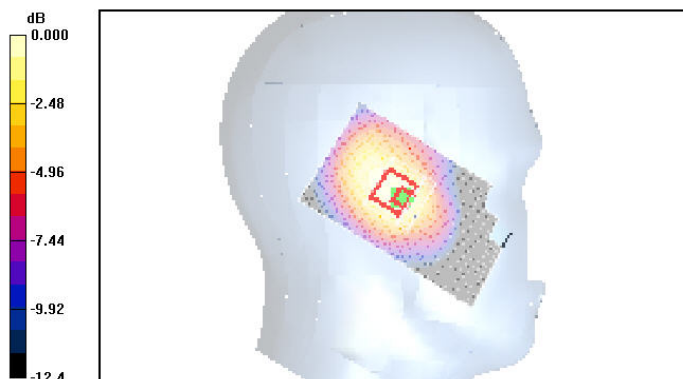
- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.57, 6.57, 6.57); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1035
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Left Cheek - Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.15 mW/g

Left Cheek - Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.1 V/m
Peak SAR (extrapolated) = 1.45 W/kg
SAR(1 g) = 1.01 mW/g
SAR(10 g) = 0.687 mW/g
Power Drift: 0.133 dB

[Info: Interpolated medium parameters used for SAR evaluation.](#)

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



Date/Time: 2006-12-07 11:35:04

Test Laboratory: TCC San Diego
Type: RH-103; Serial: 037/06357397

Communication System: CDMA800
Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: Cellular Head; Medium Notes: Medium Temperature: 21.8 C
Medium parameters used (interpolated): $f = 836.52$ MHz; $\sigma = 0.907$ mho/m; $\epsilon_r = 41.2$; $\rho = 1000$ kg/m³
Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.57, 6.57, 6.57); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1035
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Left Tilt - Middle/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.779 mW/g

Left Tilt - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.7 V/m

Peak SAR (extrapolated) = 1.15 W/kg

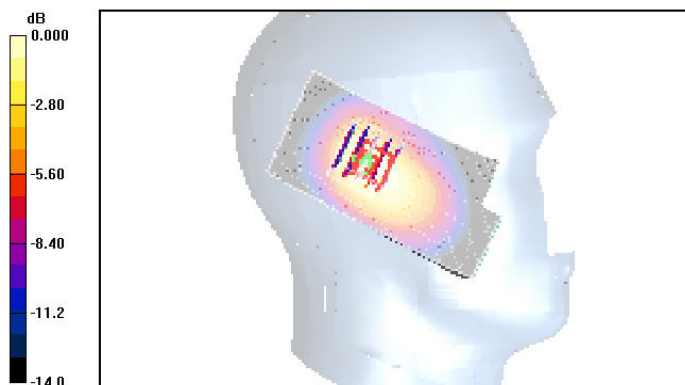
SAR(1 g) = 0.727 mW/g

SAR(10 g) = 0.464 mW/g

Power Drift = 0.119 dB

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.786 mW/g



Date/Time: 2006-12-07 15:01:50

Test Laboratory: TCC San Diego
Type: RH-103; Serial: 037/06357397

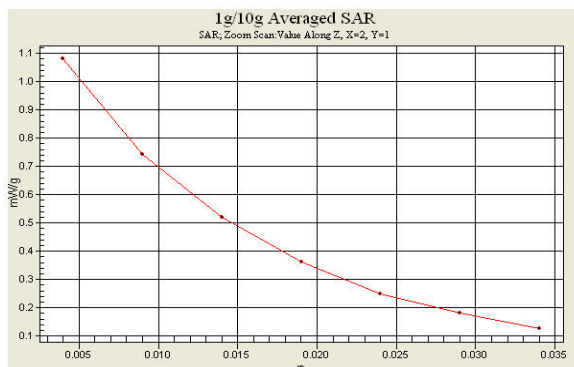
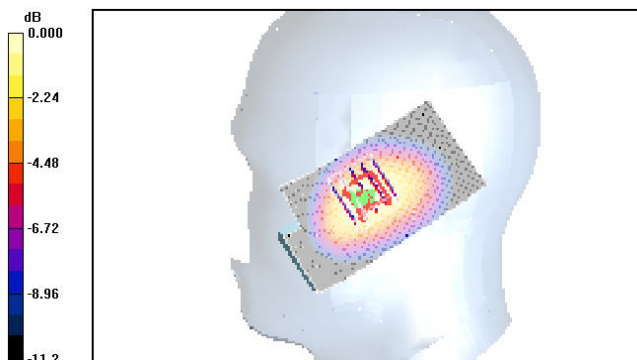
Communication System: CDMA800
Frequency: 824.7 MHz; Duty Cycle: 1:1
Medium: Cellular Head; Medium Notes: Medium Temperature: 21.8 C
Medium parameters used (interpolated): $f = 824.7$ MHz; $\sigma = 0.874$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³
Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.57, 6.57, 6.57); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1035
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Right Cheek - Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.12 mW/g

Right Cheek - Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.7 V/m
Peak SAR (extrapolated) = 1.50 W/kg
SAR(1 g) = 1.04 mW/g
SAR(10 g) = 0.717 mW/g
Power Drift: 0.201 dB
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.09 mW/g



Date/Time: 2006-12-07 11:50:14

Test Laboratory: TCC San Diego
Type: RH-103; Serial: 037/06357397

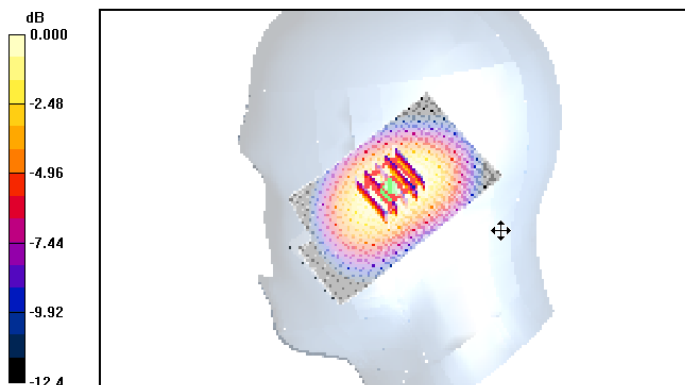
Communication System: CDMA800
Frequency: 824.7 MHz; Duty Cycle: 1:1
Medium: Cellular Head; Medium Notes: Medium Temperature: 21.8 C
Medium parameters used (interpolated): $f = 836.52$ MHz; $\sigma = 0.885$ mho/m; $\epsilon_r = 40.5$; $\rho = 1000$ kg/m³
Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.57, 6.57, 6.57); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 1; Type: Twin Phantom; Serial: TP-1035
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Right Tilt - Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.732 mW/g

Right Tilt - Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.3 V/m
Peak SAR (extrapolated) = 0.905 W/kg
SAR(1 g) = 0.651 mW/g
SAR(10 g) = 0.441 mW/g
Power Drift = -0.225dB
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.690 mW/g



Date/Time: 2006-12-11 12:03:36

Test Laboratory: TCC San Diego
Type: RH-103; Serial: 037/06357397

Communication System: CDMA800
Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: Cellular; Medium Notes: Medium Temperature at 21.5 C
Medium parameters used (interpolated): $f = 836.52$ MHz; $\sigma = 0.963$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.33, 6.33, 6.33); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1279
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body - Middle - No Accessory/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.596 mW/g

Body - Middle - No Accessory/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.3 V/m

Peak SAR (extrapolated) = 0.784 W/kg

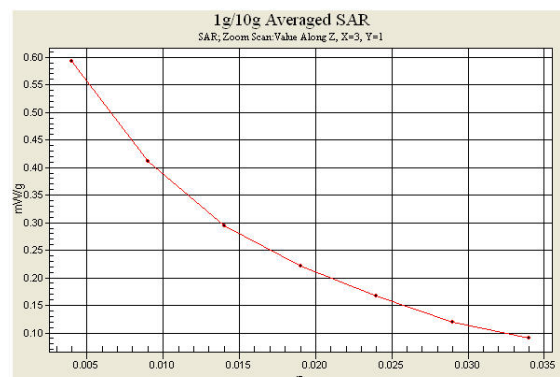
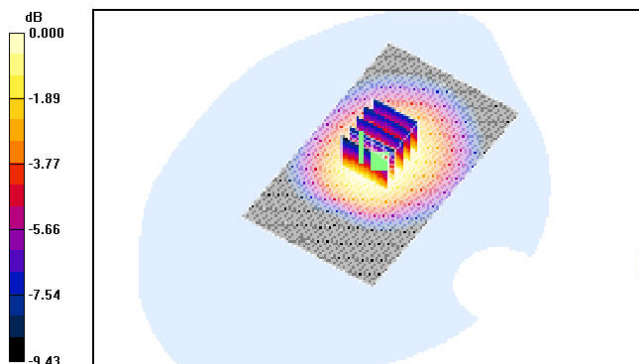
SAR(1 g) = 0.565 mW/g

SAR(10 g) = 0.401 mW/g

Power Drift = 0.036 dB

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.592 mW/g



Date/Time: 2006-12-11 16:45:46

Test Laboratory: TCC San Diego
Type: RH-103; Serial: 037/06357397

Communication System: CDMA800
Frequency: 824.7 MHz; Duty Cycle: 1:1
Medium: Cellular; Medium Notes: Medium Temperature at 21.5 C
Medium parameters used (interpolated): $f = 824.7 \text{ MHz}$; $\sigma = 0.949 \text{ mho/m}$; $\epsilon_r = 53.6$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1805; Probe Notes: Advanced Extrapolation
- ConvF(6.33, 6.33, 6.33); Calibrated: 2006-05-03
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn308; Calibrated: 2006-02-16
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1279
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body - Low - HS-9/Area Scan (71x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.461 mW/g

Body - Low - HS-9/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 15.6 V/m

Peak SAR (extrapolated) = 0.520 W/kg

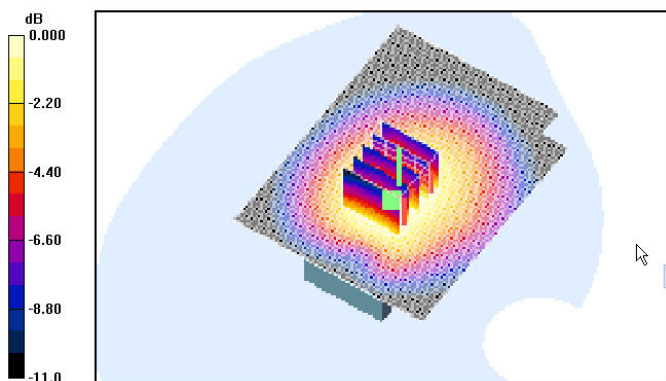
SAR(1 g) = 0.378 mW/g

SAR(10 g) = 0.267 mW/g

Power Drift = 0.065 dB

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.437 mW/g





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



**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

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 SD TCC**

Certificate No: **ET3-1805_May06**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN: 1805**

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

Calibration date: **May 3, 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)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

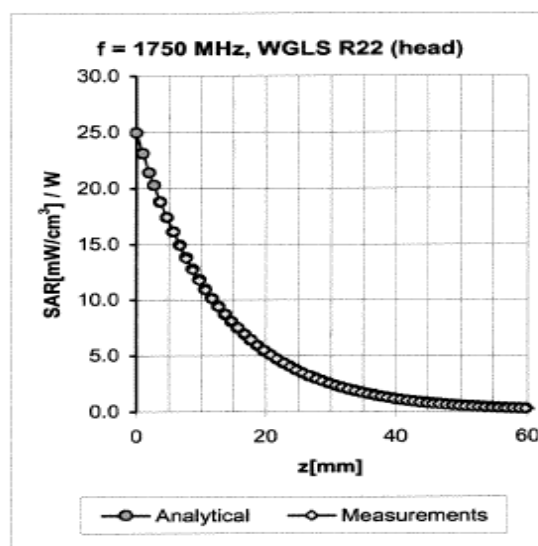
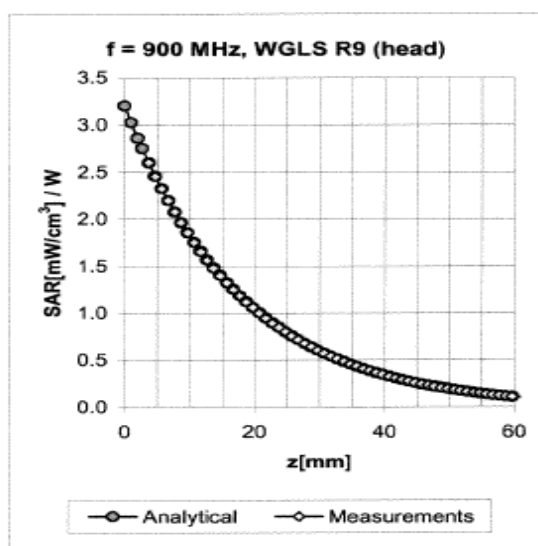
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

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

Issued: May 3, 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
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.61	1.72	6.57 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.59	1.78	6.37 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.48	2.76	5.31 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.44	5.08 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.71	1.78	4.48 ± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.49	1.98	6.33 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.51	1.98	6.07 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.57	2.58	4.72 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.67	2.34	4.51 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.70	1.85	4.21 ± 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)



**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

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 SD**

Certificate No: **D835V2-479_Sep05**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 479**

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

Calibration date: **September 19, 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>

	Name	Function	Signature
Approved by:	Katja Pokovic	Technical Manager	<i>Katja Pokovic</i>

Issued: September 22, 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: 15.09.2005 10:40:41

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN479

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

Medium: HSL 835 MHz;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.87$ mho/m; $\epsilon_r = 42.3$; $\rho = 1000$ 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 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1):

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

Maximum value of SAR (interpolated) = 2.38 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:

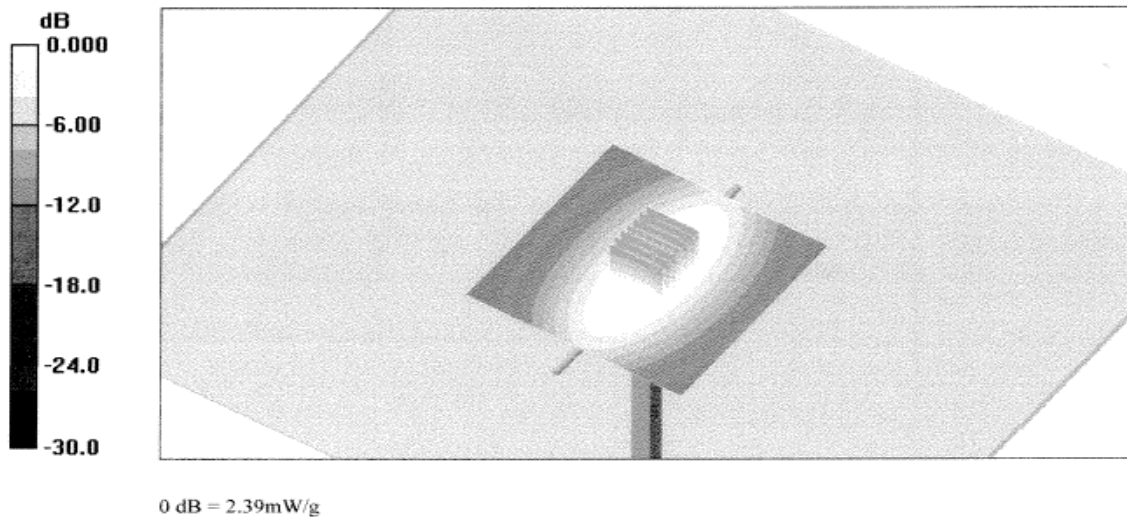
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.0 V/m; Power Drift = -0.032 dB

Peak SAR (extrapolated) = 3.21 W/kg

SAR(1 g) = 2.2 mW/g; SAR(10 g) = 1.44 mW/g

Maximum value of SAR (measured) = 2.39 mW/g



DASY4 Validation Report for Body TSL

Date/Time: 19.09.2005 14:39:53

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:479

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

Medium: MSL835MHz;

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 55.3$; $\rho = 1000 \text{ kg/m}^3$

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 Sn601; Calibrated: 07.01.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1):

Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 52.8 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 3.34 W/kg

SAR(1 g) = 2.36 mW/g; SAR(10 g) = 1.55 mW/g

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

