

## SAR Compliance Test Report

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |                                                                                                                                                   |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Test report no.:                                 | Cph_SAR_0829_09                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Date of report:         | 2008-07-16                                                                                                                                        |
| Template version:                                | 9.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Number of pages:        | 27                                                                                                                                                |
| Testing laboratory:                              | TCC Nokia Copenhagen<br>Laboratory<br>Frederikskaj<br>1790 COPENHAGEN V<br>DENMARK<br>Tel. +45 33 292929<br>Fax. +45 33 292934                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Client:                 | Nokia Corporation<br>PL/P.O. Box 407<br>Itämerenkatu 11-13<br>FIN-00180 HELSINKI, FINLAND<br>Tel. +358 (0) 7180 08000<br>Fax. +358 (0) 7180 36227 |
| Responsible test engineer:                       | Jesper Nielsen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Product contact person: | Vesa Vuorio                                                                                                                                       |
| Measurements made by:                            | Lars Ostermann & Jesper Nielsen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |                                                                                                                                                   |
| Tested device:                                   | RM-396                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                         |                                                                                                                                                   |
| FCC ID:                                          | QTKRM-396                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | IC:                     | 661AD-RM396                                                                                                                                       |
| Supplement reports:                              | Cph_SAR_0824_06                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |                                                                                                                                                   |
| Testing has been carried out in accordance with: | <b>47CFR §2.1093</b><br>Radiofrequency Radiation Exposure Evaluation: Portable Devices<br><b>FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01)</b><br>Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields<br><b>RSS-102</b><br>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<br><b>IEEE 1528 - 2003</b><br>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:                                    | <b>The tested device complies with the requirements in respect of all parameters subject to the test.</b> 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:                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |                                                                                                                                                   |

## CONTENTS

|                                                                              |           |
|------------------------------------------------------------------------------|-----------|
| <b>1. SUMMARY OF SAR TEST REPORT.....</b>                                    | <b>3</b>  |
| 1.1 TEST DETAILS.....                                                        | 3         |
| 1.2 MAXIMUM RESULTS.....                                                     | 3         |
| 1.2.1 Head Configuration.....                                                | 3         |
| 1.2.2 Body Worn Configuration .....                                          | 3         |
| 1.2.3 Maximum Drift .....                                                    | 4         |
| 1.2.4 Measurement Uncertainty .....                                          | 4         |
| <b>2. DESCRIPTION OF THE DEVICE UNDER TEST .....</b>                         | <b>4</b>  |
| 2.1 DESCRIPTION OF THE ANTENNA .....                                         | 4         |
| <b>3. TEST CONDITIONS .....</b>                                              | <b>5</b>  |
| 3.1 TEMPERATURE AND HUMIDITY .....                                           | 5         |
| 3.2 TEST SIGNAL, FREQUENCIES AND OUTPUT POWER .....                          | 5         |
| <b>4. DESCRIPTION OF THE TEST EQUIPMENT .....</b>                            | <b>6</b>  |
| 4.1 MEASUREMENT SYSTEM AND COMPONENTS .....                                  | 6         |
| 4.1.1 Isotropic E-field Probe Type ES3DV3 .....                              | 7         |
| 4.2 PHANTOMS .....                                                           | 7         |
| 4.3 TISSUE SIMULANTS .....                                                   | 8         |
| 4.3.1 Tissue Simulant Recipes .....                                          | 8         |
| 4.3.2 System Checking .....                                                  | 8         |
| 4.3.3 Tissue Simulants used in the Measurements.....                         | 9         |
| <b>5. DESCRIPTION OF THE TEST PROCEDURE .....</b>                            | <b>10</b> |
| 5.1 DEVICE HOLDER.....                                                       | 10        |
| 5.2 TEST POSITIONS.....                                                      | 11        |
| 5.2.1 Against Phantom Head.....                                              | 11        |
| 5.2.2 Body Worn Configuration .....                                          | 11        |
| 5.3 SCAN PROCEDURES.....                                                     | 11        |
| 5.4 SAR AVERAGING METHODS.....                                               | 11        |
| <b>6. MEASUREMENT UNCERTAINTY .....</b>                                      | <b>12</b> |
| <b>7. RESULTS .....</b>                                                      | <b>13</b> |
| <b>APPENDIX A: SYSTEM CHECKING SCANS.....</b>                                | <b>15</b> |
| <b>APPENDIX B: MEASUREMENT SCANS.....</b>                                    | <b>18</b> |
| <b>APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S) .....</b>     | <b>26</b> |
| <b>APPENDIX D: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORT(S) .....</b> | <b>27</b> |

## 1. SUMMARY OF SAR TEST REPORT

### 1.1 Test Details

|                                        |                                                        |
|----------------------------------------|--------------------------------------------------------|
| Period of test                         | 2008-07-14 to 2008-07-15                               |
| SN, HW and SW numbers of tested device | SN: 004401/01/803324/7, HW: 0301, SW: 0330, DUT: 25430 |
| Batteries used in testing              | BL-4U, DUT: 25431, 25432                               |
| Headsets used in testing               | HS-40, DUT: 28521                                      |
| 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 /<br>f (MHz) | Radiated<br>power | Position    | Measured<br>SAR value<br>(1g avg) | Scaled*<br>SAR value<br>(1g avg) | SAR limit<br>(1g avg) | Result        |
|---------------------|-----------------|-------------------|-------------|-----------------------------------|----------------------------------|-----------------------|---------------|
| 3-slot<br>GPRS 1900 | 661 /<br>1880.0 | 28.0 dBm<br>EIRP  | Left, Cheek | 0.653 W/kg                        | <b>0.73 W/kg</b>                 | 1.6 W/kg              | <b>PASSED</b> |

#### 1.2.2 Body Worn Configuration

| Mode                | Ch /<br>f (MHz) | Radiated<br>power | Separation<br>distance | Measured<br>SAR value<br>(1g avg) | Scaled*<br>SAR value<br>(1g avg) | SAR limit<br>(1g avg) | Result        |
|---------------------|-----------------|-------------------|------------------------|-----------------------------------|----------------------------------|-----------------------|---------------|
| 3-slot<br>GPRS 1900 | 661 /<br>1880.0 | 28.0 dBm<br>EIRP  | 1.5 cm                 | 0.632 W/kg                        | <b>0.71 W/kg</b>                 | 1.6 W/kg              | <b>PASSED</b> |

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

### 1.2.3 Maximum Drift

| Maximum drift covered by<br>12% scaling up of the SAR values | Maximum drift during measurements |
|--------------------------------------------------------------|-----------------------------------|
| 0.5dB                                                        | 0.28 dB                           |

### 1.2.4 Measurement Uncertainty

|                                |         |
|--------------------------------|---------|
| Expanded Uncertainty (k=2) 95% | ± 25.8% |
|--------------------------------|---------|

## 2. DESCRIPTION OF THE DEVICE UNDER TEST

|                      |                                   |
|----------------------|-----------------------------------|
| Device category      | Portable                          |
| Exposure environment | General population / uncontrolled |

| Modes of Operation | Bands        | Modulation Mode | Duty Cycle | Transmitter Frequency Range (MHz) |
|--------------------|--------------|-----------------|------------|-----------------------------------|
| GSM                | 850<br>1900  | GMSK            | 1/8        | 824 – 849<br>1850 – 1910          |
| GPRS               | 850<br>1900  | GMSK            | 1/8 to 3/8 | 824 – 849<br>1850 – 1910          |
| EGPRS              | 850<br>1900  | GMSK / 8PSK     | 1/8 to 3/8 | 824 – 849<br>1850 – 1910          |
| WCDMA              | 850 (Band V) |                 | 1          | 826 – 847                         |
| BT                 | 2450         | GFSK            | 1          | 2402 – 2480                       |

Outside of USA and Canada, the transmitter of the device is capable of operating also in GSM/GPRS/EGPRS900, GSM/GPRS/EGPRS1800 and WCDMA2100 bands which are not part of this filing.

### 2.1 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.

The transmission mode of the device in all WCDMA tests was configured to 12.2kbps RMC with all TPC bits set as “1”.

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 reports Cph\_SAR\_0824\_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                           | 501           | 12 months            | 2009-03            |
| E-field Probe ES3DV3           | 3118          | 12 months            | 2008-10            |
| Dipole Validation Kit, D1900V2 | 5d026         | 24 months            | 2010-03            |
| Dipole Validation Kit, D1900V2 | 5d063         | 24 months            | 2009-08            |
| 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               | 2100-BBS3Q8CCJ | 1003          | -                    | -                  |
| Power Meter             | NRP            | 100293        | 24 months            | 2009-07            |
| Power Sensor            | NRP-Z51        | 100830        | 24 months            | 2009-07            |
| Call Tester             | CMU200         | 105900        | -                    | -                  |
| BT Tester               | CBT            | 100263        | -                    | -                  |
| Vector Network Analyzer | AT8753ES       | MY40001091    | 12 months            | 2008-08            |
| Dielectric Probe Kit    | HP85070B       | US33020403    | -                    | -                  |

#### 4.1.1 Isotropic E-field Probe Type ES3DV3

|                      |                                                                                                                                                                                              |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Construction</b>  | Symmetrical design with triangular core<br>Interleaved sensors<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol) |
| <b>Calibration</b>   | Calibration certificate in Appendix C                                                                                                                                                        |
| <b>Frequency</b>     | 10 MHz to 4 GHz (dosimetry); Linearity: $\pm 0.2$ dB (30 MHz to 4 GHz)                                                                                                                       |
| <b>Directivity</b>   | $\pm 0.2$ dB in HSL (rotation around probe axis)<br>$\pm 0.3$ dB in HSL (rotation normal to probe axis)                                                                                      |
| <b>Dynamic Range</b> | 5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ dB                                                                                                                                           |
| <b>Dimensions</b>    | Overall length: 330 mm<br>Tip length: 20 mm<br>Body diameter: 12 mm<br>Tip diameter: 3.9 mm<br>Distance from probe tip to dipole centers: 2.0 mm                                             |
| <b>Application</b>   | General dosimetry up to 4 GHz<br>Compliance tests of mobile phones<br>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  $15.0 \pm 0.5$  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 simulant(s):

| 1900MHz band    |                       |                       |
|-----------------|-----------------------|-----------------------|
| Ingredient      | Head<br>(% by weight) | Body<br>(% 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],<br>1g | Dielectric Parameters |                | Temp<br>[°C] |
|---------|-------------------|-------------------|-----------------------|----------------|--------------|
|         |                   |                   | $\epsilon_r$          | $\sigma$ [S/m] |              |
| 1900    | Reference result  | 9.48              | 39.3                  | 1.47           |              |
|         | $\pm 10\%$ window | 8.53 - 10.43      |                       |                |              |
|         | 2008-07-14        | 10.2              | 39.6                  | 1.47           | 22.2         |

### System checking, body tissue simulant

| f [MHz] | Description       | SAR [W/kg],<br>1g | Dielectric Parameters |                | Temp<br>[°C] |
|---------|-------------------|-------------------|-----------------------|----------------|--------------|
|         |                   |                   | $\epsilon_r$          | $\sigma$ [S/m] |              |
| 1900    | Reference result  | 10.5              | 51.7                  | 1.57           |              |
|         | $\pm 10\%$ window | 9.5 - 11.5        |                       |                |              |
|         | 2008-07-15        | 9.69              | 52.7                  | 1.52           | 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<br>[MHz] | Description       | Dielectric Parameters |                | Temp<br>[°C] |
|------------|-------------------|-----------------------|----------------|--------------|
|            |                   | $\epsilon_r$          | $\sigma$ [S/m] |              |
| 1880       | Recommended value | 40.0                  | 1.40           |              |
|            | $\pm 5\%$ window  | 38.0 – 42.0           | 1.33 – 1.47    |              |
|            | 2008-07-14        | 39.7                  | 1.45           | 22.2         |

#### Body tissue simulant measurements

| f<br>[MHz] | Description       | Dielectric Parameters |                | Temp<br>[°C] |
|------------|-------------------|-----------------------|----------------|--------------|
|            |                   | $\epsilon_r$          | $\sigma$ [S/m] |              |
| 1880       | Recommended value | 53.3                  | 1.52           |              |
|            | $\pm 5\%$ window  | 50.6 – 56.0           | 1.44 – 1.60    |              |
|            | 2008-07-15        | 52.7                  | 1.50           | 22.1         |

---

## 5. DESCRIPTION OF THE TEST PROCEDURE

### 5.1 Device Holder

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



Device holder supplied by SPEAG

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



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".

### 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 Section 1.2.2 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.

## 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 | $C_i$           | $C_i \cdot U_i$ (%) | $V_i$ |
|---------------------------------------------------------------------------------|----------------------|----------|-----------|-----|-----------------|---------------------|-------|
| <b>Measurement System</b>                                                       |                      |          |           |     |                 |                     |       |
| 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                | ∞     |
| <b>Test sample Related</b>                                                      |                      |          |           |     |                 |                     |       |
| 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                | ∞     |
| <b>Phantom and Tissue Parameters</b>                                            |                      |          |           |     |                 |                     |       |
| 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     |
| <b>Combined Standard Uncertainty</b>                                            |                      |          | RSS       |     |                 | ±12.9               | 116   |
| <b>Coverage Factor for 95%</b>                                                  |                      |          | k=2       |     |                 |                     |       |
| <b>Expanded Uncertainty</b>                                                     |                      |          |           |     |                 | ±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<br>1850.2 MHz         | Ch 661<br>1880.0 MHz | Ch 810<br>1909.8 MHz |
| <b>GSM</b>         | <b>Power</b>          |       | <b>31.7 dBm</b>              | <b>31.3 dBm</b>      | <b>31.4 dBm</b>      |
|                    | Left                  | Cheek | -                            | 0.498                | -                    |
|                    |                       | Tilt  | -                            | -                    | -                    |
|                    | Right                 | Cheek | -                            | -                    | -                    |
|                    |                       | Tilt  | -                            | -                    | -                    |
| <b>2-slot GPRS</b> | <b>Power</b>          |       | <b>29.3 dBm</b>              | <b>28.8 dBm</b>      | <b>28.6 dBm</b>      |
|                    | Left                  | Cheek | -                            | 0.546                | -                    |
|                    |                       | Tilt  | -                            | -                    | -                    |
|                    | Right                 | Cheek | -                            | -                    | -                    |
|                    |                       | Tilt  | -                            | -                    | -                    |
| <b>3-slot GPRS</b> | <b>Power</b>          |       | <b>28.3 dBm</b>              | <b>28.0 dBm</b>      | <b>28.3 dBm</b>      |
|                    | Left                  | Cheek | 0.589                        | <b>0.631</b>         | 0.593                |
|                    |                       | Tilt  | -                            | -                    | -                    |
|                    | Right                 | Cheek | -                            | -                    | -                    |
|                    |                       | Tilt  | -                            | -                    | -                    |
| <b>3-slot GPRS</b> | Left Cheek, BT active |       | -                            | <b>0.653</b>         | -                    |

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

**1900 MHz Body SAR results**

| Option used        | Test configuration           | SAR, averaged over 1g (W/kg) |                      |                      |
|--------------------|------------------------------|------------------------------|----------------------|----------------------|
|                    |                              | Ch 512<br>1850.2 MHz         | Ch 661<br>1880.0 MHz | Ch 810<br>1909.8 MHz |
| <b>3-slot GPRS</b> | <b>Power</b>                 | <b>28.3 dBm</b>              | <b>28.0 dBm</b>      | <b>28.3 dBm</b>      |
|                    | Without headset              | 0.599                        | <b>0.631</b>         | 0.577                |
|                    | Headset HS-40                | 0.502                        | 0.529                | 0.476                |
| <b>3-slot GPRS</b> | Without headset<br>BT active | -                            | <b>0.632</b>         | -                    |

Plots of the Measurement scans are given in Appendix B.

---

## APPENDIX A: SYSTEM CHECKING SCANS

See the following pages

Date/Time: 2008-07-14 1:34:09 PM

Test Laboratory: TCC Nokia  
Type: D1900V2; Serial: 5d063

**Communication System: CW1900**

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: Head 1900; Medium Notes: Medium Temperature: 22.2 C

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(5.26, 5.26, 5.26); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1037
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**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 = 89.0 V/m

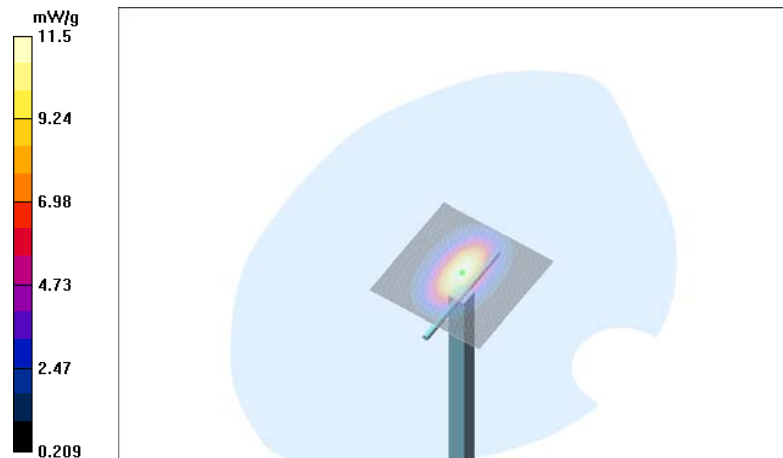
Peak SAR (extrapolated) = 19.2 W/kg

**SAR(1 g) = 10.2 mW/g**

**SAR(10 g) = 5.23 mW/g**

**Power Drift = 0.038 dB**

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



Date/Time: 2008-07-15 2:07:22 PM

Test Laboratory: TCC Nokia  
Type: D1900V2; Serial: 5d026

**Communication System: CW1900**

Frequency: 1900 MHz; Duty Cycle: 1:1

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

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 52.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(4.92, 4.92, 4.92); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

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

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

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

Reference Value = 65.2 V/m

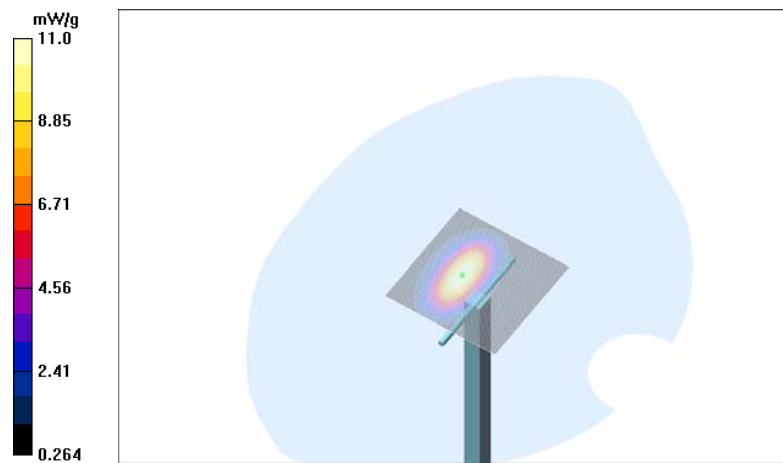
Peak SAR (extrapolated) = 17.1 W/kg

**SAR(1 g) = 9.69 mW/g**

**SAR(10 g) = 5.12 mW/g**

**Power Drift = 0.090 dB**

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



---

## APPENDIX B: MEASUREMENT SCANS

See the following pages

Date/Time: 2008-07-14 3:38:32 PM

Test Laboratory: TCC Nokia

Type: RM-396; Serial: 004401/01/803324/7

**Communication System: GSM 1900**

Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: Head 1900; Medium Notes: Medium Temperature: 22.2 C

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(5.26, 5.26, 5.26); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1037
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Cheek position - Middle/Area Scan (51x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.557 mW/g

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

Reference Value = 17.2 V/m

Peak SAR (extrapolated) = 0.901 W/kg

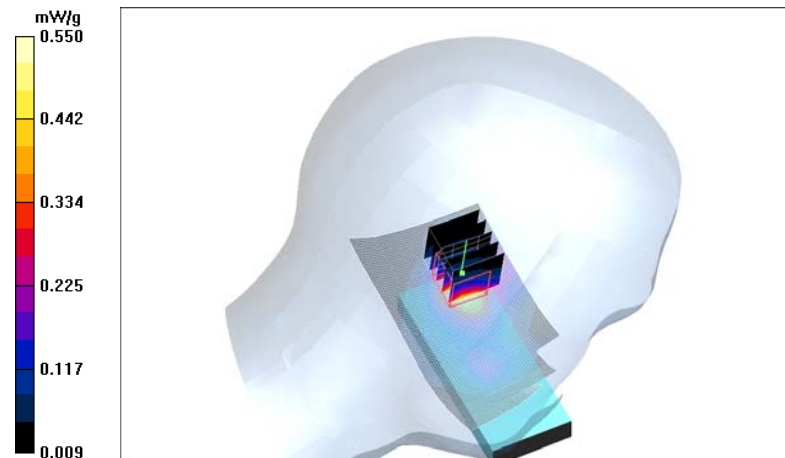
**SAR(1 g) = 0.498 mW/g**

**SAR(10 g) = 0.270 mW/g**

**Power Drift = -0.184 dB**

**Warning:** Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.

Maximum value of SAR (measured) = 0.550 mW/g



Date/Time: 2008-07-14 3:55:53 PM

Test Laboratory: TCC Nokia

Type: RM-396; Serial: 004401/01/803324/7

**Communication System: 2-slot GPRS1900**

Frequency: 1880 MHz; Duty Cycle: 1:4.2

Medium: Head 1900; Medium Notes: Medium Temperature: 22.2 C

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(5.26, 5.26, 5.26); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1037
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Cheek position - Middle/Area Scan (51x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.609 mW/g

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

Reference Value = 17.8 V/m

Peak SAR (extrapolated) = 0.977 W/kg

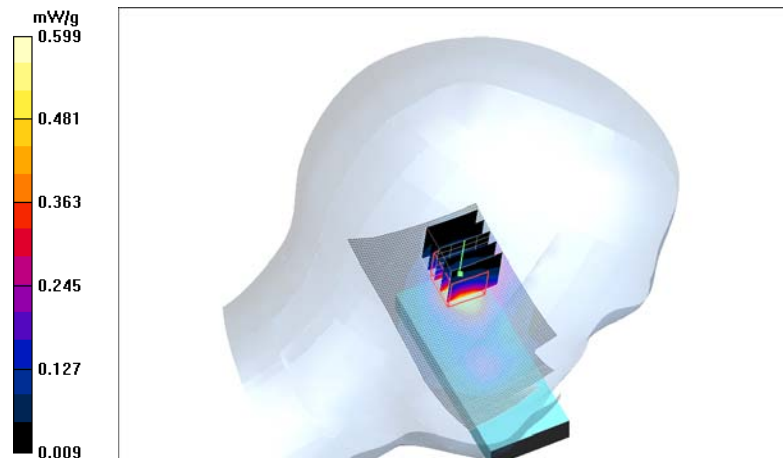
**SAR(1 g) = 0.546 mW/g**

**SAR(10 g) = 0.296 mW/g**

**Power Drift = -0.177 dB**

**Warning:** Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.

Maximum value of SAR (measured) = 0.599 mW/g



Date/Time: 2008-07-14 4:12:42 PM

Test Laboratory: TCC Nokia

Type: RM-396; Serial: 004401/01/803324/7

**Communication System: 3-slot GPRS1900**

Frequency: 1880 MHz; Duty Cycle: 1:2.8

Medium: Head 1900; Medium Notes: Medium Temperature: 22.2 C

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(5.26, 5.26, 5.26); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1037
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Cheek position - Middle/Area Scan (51x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.697 mW/g

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

Reference Value = 18.9 V/m

Peak SAR (extrapolated) = 1.13 W/kg

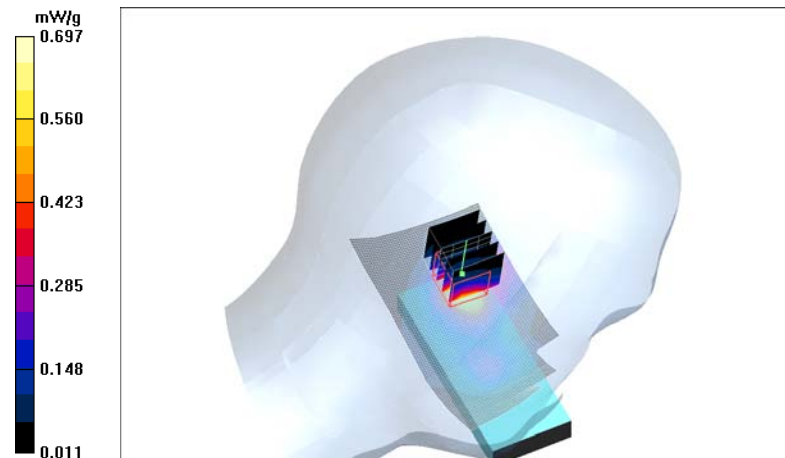
**SAR(1 g) = 0.631 mW/g**

**SAR(10 g) = 0.343 mW/g**

**Power Drift = -0.057 dB**

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.

Maximum value of SAR (measured) = 0.697 mW/g



Date/Time: 2008-07-14 6:04:25 PM

Test Laboratory: TCC Nokia

Type: RM-396; Serial: 004401/01/803324/7

**Communication System: 3-slot GPRS1900**

Frequency: 1880 MHz; Duty Cycle: 1:2.8

Medium: Head 1900; Medium Notes: Medium Temperature: 22.2 C

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(5.26, 5.26, 5.26); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 2; Type: Twin Phantom; Serial: TP-1037
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Cheek position - Middle - BT Active/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm**

Maximum value of SAR (interpolated) = 0.756 mW/g

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

Reference Value = 19.7 V/m

Peak SAR (extrapolated) = 1.17 W/kg

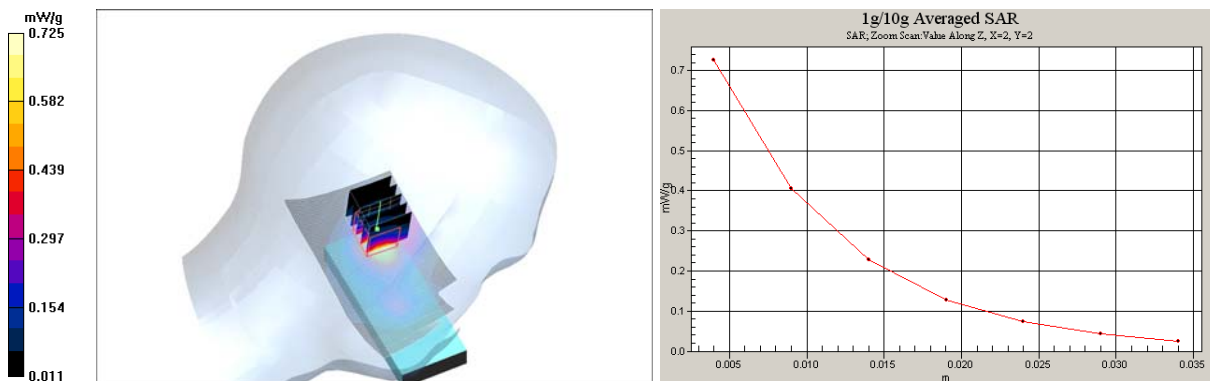
**SAR(1 g) = 0.653 mW/g**

**SAR(10 g) = 0.355 mW/g**

**Power Drift = -0.280 dB**

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.

Maximum value of SAR (measured) = 0.725 mW/g



Date/Time: 2008-07-15 4:16:15 PM

Test Laboratory: TCC Nokia

Type: RM-396; Serial: 004401/01/803324/7

**Communication System: 3-slot GPRS1900**

Frequency: 1880 MHz; Duty Cycle: 1:2.8

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

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.5$  mho/m;  $\epsilon_r = 52.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(4.92, 4.92, 4.92); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Body - Middle - No Accessory/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm**

Maximum value of SAR (interpolated) = 0.691 mW/g

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

Reference Value = 19.5 V/m

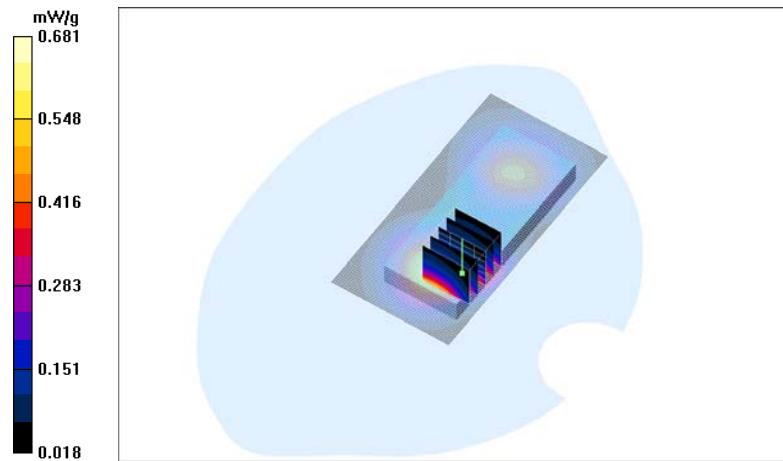
Peak SAR (extrapolated) = 1.01 W/kg

**SAR(1 g) = 0.631 mW/g**

**SAR(10 g) = 0.382 mW/g**

**Power Drift = -0.145 dB**

Maximum value of SAR (measured) = 0.681 mW/g



Date/Time: 2008-07-15 4:57:31 PM

Test Laboratory: TCC Nokia

Type: RM-396; Serial: 004401/01/803324/7

**Communication System: 3-slot GPRS1900**

Frequency: 1880 MHz; Duty Cycle: 1:2.8

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

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.5$  mho/m;  $\epsilon_r = 52.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(4.92, 4.92, 4.92); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Body - Middle - HS-40/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm**

Maximum value of SAR (interpolated) = 0.579 mW/g

**Body - Middle - HS-40/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm**

Reference Value = 17.7 V/m

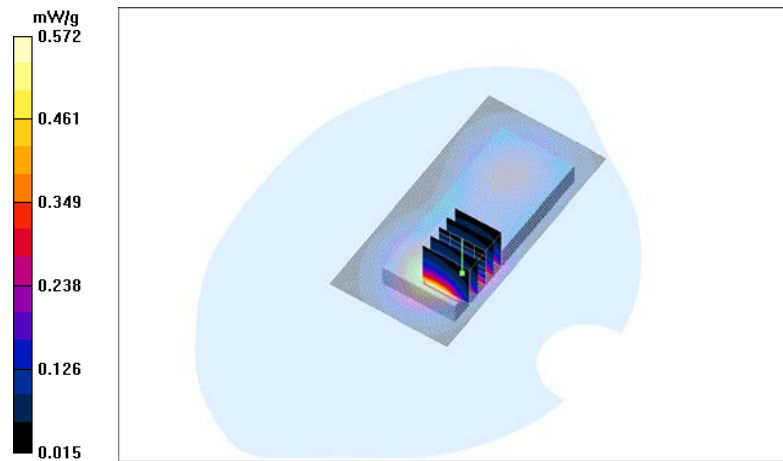
Peak SAR (extrapolated) = 0.860 W/kg

**SAR(1 g) = 0.529 mW/g**

**SAR(10 g) = 0.319 mW/g**

**Power Drift = -0.131 dB**

Maximum value of SAR (measured) = 0.572 mW/g



Date/Time: 2008-07-15 5:28:42 PM

Test Laboratory: TCC Nokia

Type: RM-396; Serial: 004401/01/803324/7

**Communication System: 3-slot GPRS1900**

Frequency: 1880 MHz; Duty Cycle: 1:2.8

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

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.5$  mho/m;  $\epsilon_r = 52.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

**DASY4 Configuration:**

- Probe: ES3DV3 - SN3118; Probe Notes:
- ConvF(4.92, 4.92, 4.92); Calibrated: 10/26/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn501; Calibrated: 3/17/2008
- Phantom: SAM 3; Type: Twin Phantom; Serial: TP-1302
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Body - Middle - No Accessory - BT Active/Area Scan (51x101x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.696 mW/g

**Body - Middle - No Accessory - BT Active/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 19.4 V/m

Peak SAR (extrapolated) = 1.01 W/kg

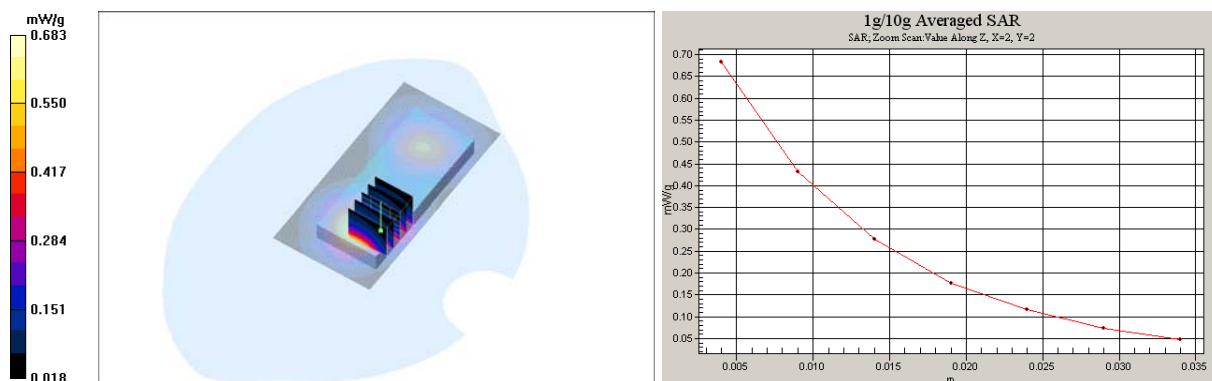
**SAR(1 g) = 0.632 mW/g**

**SAR(10 g) = 0.385 mW/g**

**Power Drift = -0.118 dB**

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.

Maximum value of SAR (measured) = 0.683 mW/g



---

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

See the following pages



Accredited by the Swiss Accreditation Service (SAS)  
 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: **ES3-3118\_Oct07**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3118**

Calibration procedure(s) **QA CAL-01.v6**  
**Calibration procedure for dosimetric E-field probes**

Calibration date: **October 26, 2007**

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      | 29-Mar-07 (METAS, No. 217-00670)          | Mar-08                 |
| Power sensor E4412A        | MY41495277      | 29-Mar-07 (METAS, No. 217-00670)          | Mar-08                 |
| Power sensor E4412A        | MY41498087      | 29-Mar-07 (METAS, No. 217-00670)          | Mar-08                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 8-Aug-07 (METAS, No. 217-00719)           | Aug-08                 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-07 (METAS, No. 217-00671)          | Mar-08                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 8-Aug-07 (METAS, No. 217-00720)           | Aug-08                 |
| Reference Probe ES3DV2     | SN: 3013        | 4-Jan-07 (SPEAG, No. ES3-3013_Jan07)      | Jan-08                 |
| DAE4                       | SN: 654         | 20-Apr-07 (SPEAG, No. DAE4-654_Apr07)     | Apr-08                 |
| 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 Oct-06)  | In house check: Oct-07 |

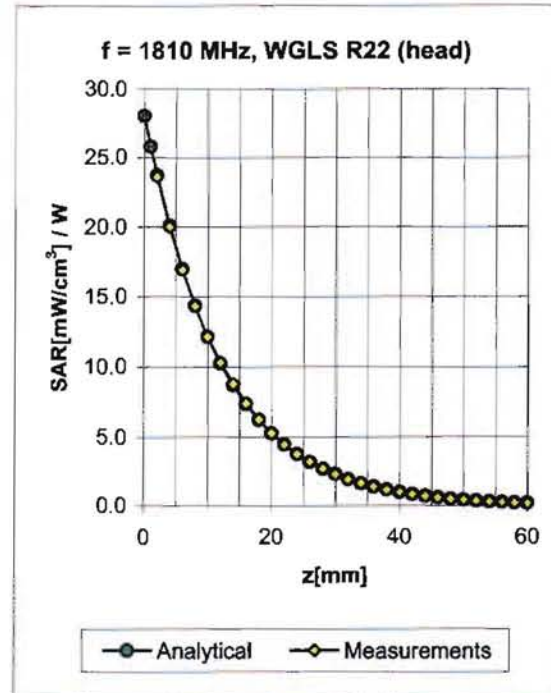
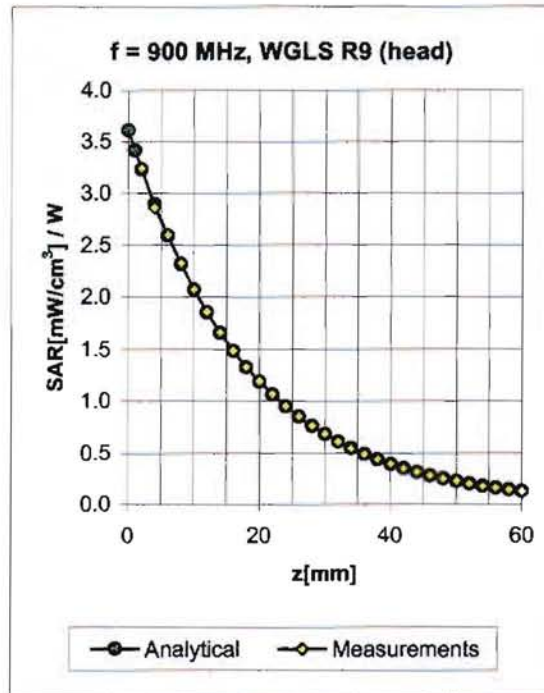
Calibrated by: **Katja Pokovic** **Technical Manager**

Approved by: **Niels Kuster** **Quality Manager**

Issued: October 29, 2007

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

## Conversion Factor Assessment



| f [MHz] | Validity [MHz] <sup>c</sup> | TSL  | Permittivity | Conductivity | Alpha | Depth | ConvF | Uncertainty   |
|---------|-----------------------------|------|--------------|--------------|-------|-------|-------|---------------|
| 900     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.97 ± 5%    | 0.85  | 1.30  | 5.99  | ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.90  | 1.21  | 5.26  | ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.85  | 1.26  | 5.05  | ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Head | 39.2 ± 5%    | 1.80 ± 5%    | 0.85  | 1.21  | 4.68  | ± 11.8% (k=2) |
| 900     | ± 50 / ± 100                | Body | 55.0 ± 5%    | 1.05 ± 5%    | 0.85  | 1.34  | 5.59  | ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.89  | 1.31  | 4.92  | ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.89  | 1.27  | 4.66  | ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Body | 52.7 ± 5%    | 1.95 ± 5%    | 0.80  | 1.19  | 4.30  | ± 11.8% (k=2) |

<sup>c</sup> 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

18307

**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 Denmark A/S**

Certificate No: **D1900V2-5d026\_Mar08**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d026**

Calibration procedure(s) **QA CAL-05.v7**  
**Calibration procedure for dipole validation kits**

Calibration date: **March 18, 2008**

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 ( $22 \pm 3$ )°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-07 (METAS, No. 217-00736)          | Oct-08                 |
| Power sensor HP 8481A      | US37292783       | 04-Oct-07 (METAS, No. 217-00736)          | Oct-08                 |
| Reference 20 dB Attenuator | SN: 5086 (20g)   | 07-Aug-07 (METAS, No 217-00718)           | Aug-08                 |
| Reference 10 dB Attenuator | SN: 5047.2 (10r) | 07-Aug-07 (METAS, No 217-00718)           | Aug-08                 |
| Reference Probe ES3DV2     | SN: 3025         | 01-Mar-08 (SPEAG, No. ES3-3025_Mar08)     | Mar-09                 |
| DAE4                       | SN 909           | 3-Sep-08 (SPEAG, No. DAE4-909_Sep07)      | Sep-07                 |
| Secondary Standards        | ID #             | Check Date (in house)                     | Scheduled Check        |
| Power sensor HP 8481A      | MY41092317       | 18-Oct-02 (SPEAG, in house check Oct-07)  | In house check: Oct-08 |
| RF generator R&S SMT-06    | 100005           | 4-Aug-99 (SPEAG, in house check Oct-07)   | In house check: Oct-09 |
| Network Analyzer HP 8753E  | US37390585 S4206 | 18-Oct-01 (SPEAG, in house check Oct-07)  | In house check: Oct-08 |
| Power meter EPM-442A       | GB37480704       | 04-Oct-07 (METAS, No. 217-00736)          | Oct-08                 |

|                |               |                       |           |
|----------------|---------------|-----------------------|-----------|
|                | Name          | Function              | Signature |
| Calibrated by: | Marcel Fehr   | Laboratory Technician |           |
| Approved by:   | Katja Pokovic | Technical Manager     |           |

Issued: March 18, 2008

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

## DASY4 Validation Report for Head TSL

Date/Time: 18.03.2008 11:48:54

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;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 40.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.9, 4.9, 4.9); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 03.09.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

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

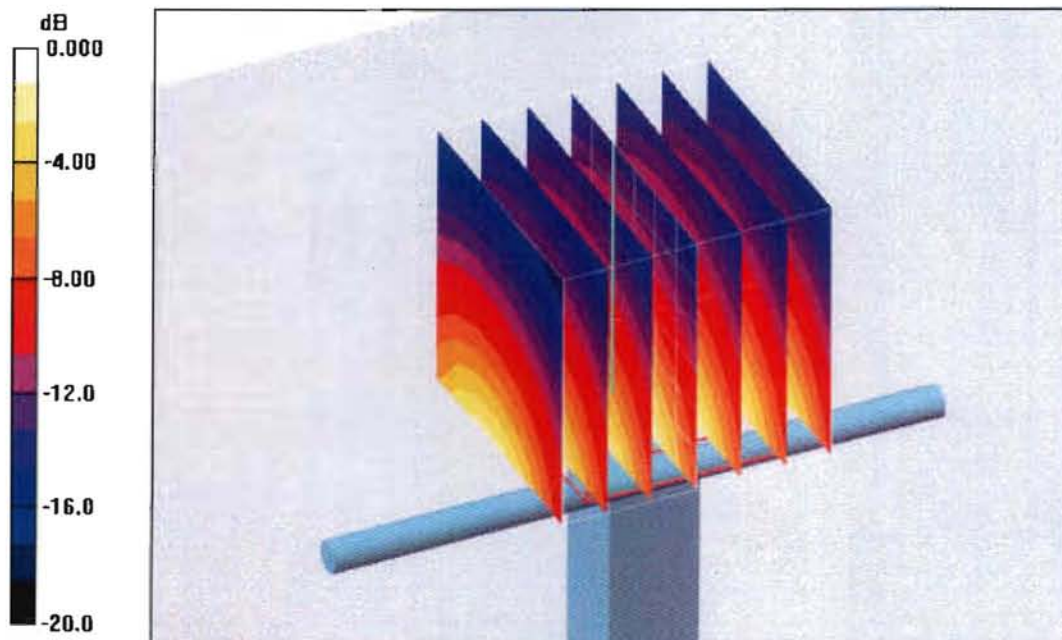
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.7 V/m; Power Drift = 0.071 dB

Peak SAR (extrapolated) = 19.3 W/kg

**SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.27 mW/g**

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



0 dB = 12.0mW/g

## DASY4 Validation Report for Body TSL

Date/Time: 14.03.2008 12:53:13

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 BB;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.57$  mho/m;  $\epsilon_r = 51.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.5, 4.5, 4.5); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 03.09.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

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

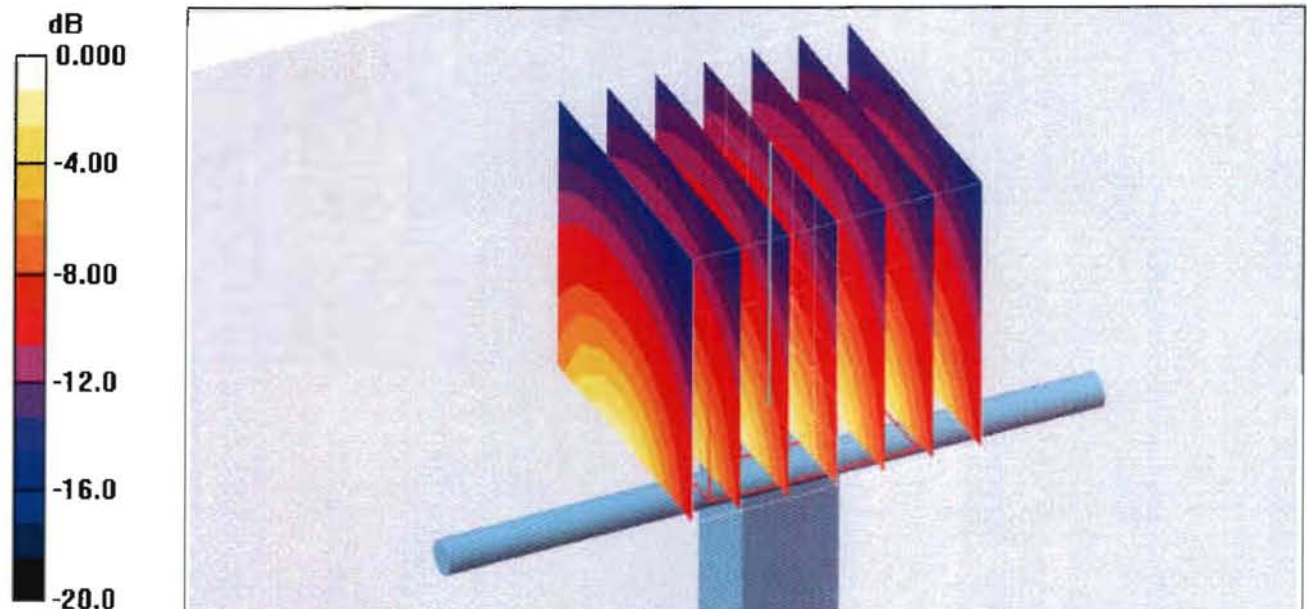
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.8 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 18.7 W/kg

**SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.5 mW/g**

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



0 dB = 12.1 mW/g



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: **D1900V2-5d063\_Aug07**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d063**

Calibration procedure(s) **QA CAL-05.v7  
 Calibration procedure for dipole validation kits**

Calibration date: **August 28, 2007**

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 ( $22 \pm 3$ )°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       | 03-Oct-06 (METAS, No. 217-00608)          | Oct-07                 |
| Power sensor HP 8481A       | US37292783       | 03-Oct-06 (METAS, No. 217-00608)          | Oct-07                 |
| Reference 20 dB Attenuator  | SN: 5086 (20g)   | 07-Aug-07 (METAS, No 217-00718)           | Aug-08                 |
| Reference 10 dB Attenuator  | SN: 5047.2 (10r) | 07-Aug-07 (METAS, No 217-00718)           | Aug-08                 |
| Reference Probe ET3DV6      | SN: 1507         | 19-Oct-06 (SPEAG, No. ET3-1507_Oct06)     | Oct-07                 |
| Reference Probe ES3DV3      | SN: 3025         | 19-Oct-06 (SPEAG, No. ES3-3025_Oct06)     | Oct-07                 |
| DAE4                        | SN 601           | 30-Jan-07 (SPEAG, No. DAE4-601_Jan07)     | Jan-08                 |
| 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 Oct-06)  | In house check: Oct-07 |

Calibrated by: **Marcel Fehr** **Laboratory Technician** 

Approved by: **Katja Pokovic** **Technical Manager** 

Issued: August 29, 2007

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

## DASY4 Validation Report for Head TSL

Date/Time: 28.08.2007 14:48:39

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: HSL U10 BB;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.47$  mho/m;  $\epsilon_r = 39.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

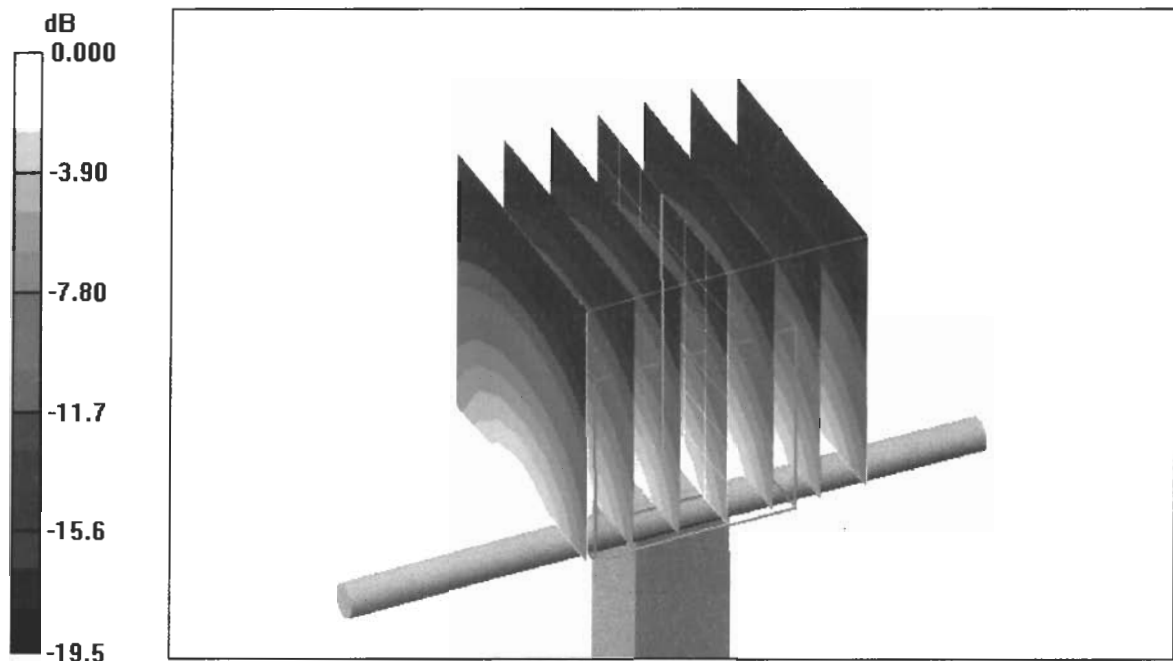
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.3 V/m; Power Drift = -0.005 dB

Peak SAR (extrapolated) = 16.3 W/kg

**SAR(1 g) = 9.48 mW/g; SAR(10 g) = 4.98 mW/g**

Maximum value of SAR (measured) = 10.8 mW/g



0 dB = 10.8mW/g

## DASY4 Validation Report for Body TSL

Date/Time: 21.08.2007 12:19:17

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 BB;

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.59$  mho/m;  $\epsilon_r = 55.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.43, 4.43, 4.43); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

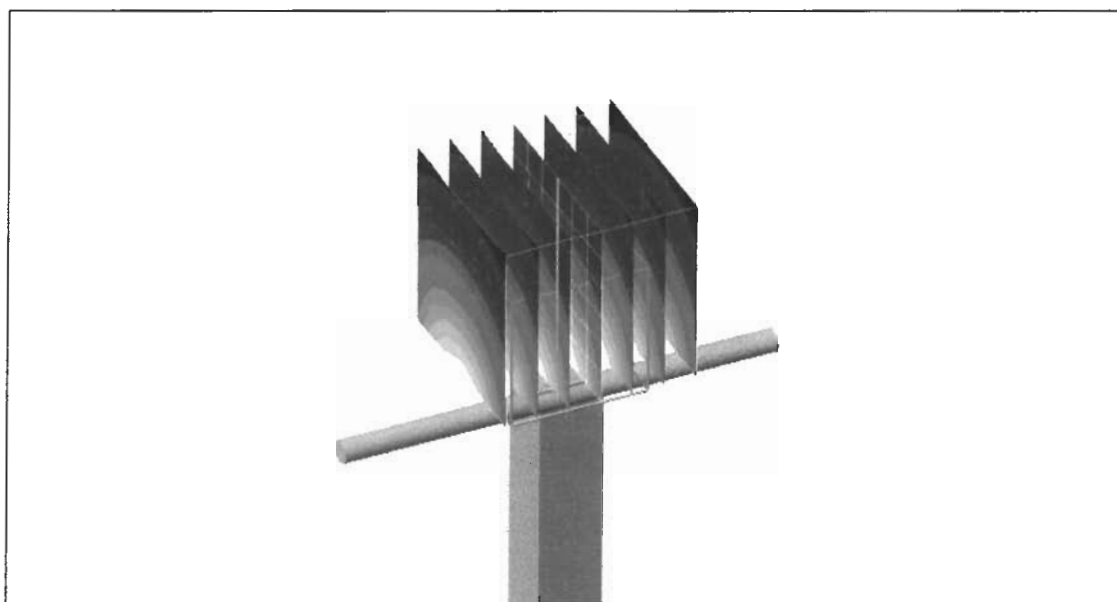
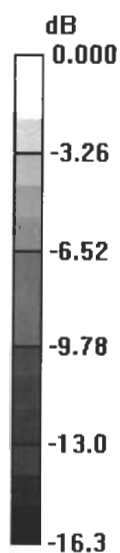
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.5 V/m; Power Drift = 0.017 dB

Peak SAR (extrapolated) = 15.7 W/kg

**SAR(1 g) = 9.45 mW/g; SAR(10 g) = 5.1 mW/g**

Maximum value of SAR (measured) = 10.7 mW/g



0 dB = 10.7mW/g