



**MOTOROLA**

**Portable Cellular Phone SAR Test Report**

**Test Report #:** 22076-1F  
**Date of Report:** 6/6/2008  
**Date of Test:** 6/3/2008 – 6/5/2008  
**FCC ID #:** **IHDP56JG1**  
**Generic Name:** N/A

**Laboratory:** Motorola Mobile Devices Business Product Safety & Compliance Laboratory  
600 N. US Highway 45  
Libertyville, Illinois 60048

**Report Author:** Paul Ma  
RF Engineer

This laboratory is accredited to ISO/IEC 17025-2005 to perform the following tests:

- |  |   |
|--|---|
| <u>Tests:</u>                            | <u>Procedures:</u>                                    |
| Electromagnetic Specific Absorption Rate | IEC 62209-1   |
|  | RSS-102   |
|  | IEEE 1528 - 2003                                      |
|  | FCC OET Bulletin 65 ( <i>including Supplement C</i> ) |
|  | Australian Communications Authority Radio             |
|  | Communications (Electromagnetic Radiation – Human     |
|  | Exposure) Standard 2003                               |
|  | CENELEC EN 50360 (2001)                               |
|  | CENELEC EN 50361 (2001)                               |
|  | ARIB Std. T-56 (2002)                                 |

**Accreditation:**



TESTING CERT #2518-02

On the following products or types of products:  
Wireless Communications Devices (Examples): Two Way Radios; Portable Phones (including Cellular, Licensed Non-Broadcast and PCS); Low Frequency Readers; and Pagers

**Statement of Compliance:** Motorola declares under its sole responsibility that the portable cellular telephone model to which this declaration relates, is in conformity with the appropriate General Population/Uncontrolled RF exposure standards, recommendations and guidelines (FCC 47 CFR §2.1093) as well as with CENELEC en50360:2001 and ANSI / IEEE C95.1. It also declares that the product was tested in accordance with IEEE 1528 / CENELEC EN62209-1 (2006), as well as other appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(none)

©Motorola, Inc. 2008  
This test report shall not be reproduced except in full, without written approval of the laboratory.

The results and statements contained herein relate only to the items tested. The names of individuals involved may be mentioned only in connection with the statements or results from this report.

Motorola encourages all feedback, both positive and negative, on this test report.

## Table of Contents

|   |           |
|---|-----------|
| <b>1. Introduction</b>  | <b>2</b>  |
| <b>2. Description of the Device Under Test</b>                                  | <b>2</b>  |
| 2.1 Antenna description   | 2         |
| 2.2 Device description  | 2         |
| <b>3. Test Equipment Used</b>   | <b>3</b>  |
| 3.1 Dosimetric System   | 3         |
| 3.2 Additional Equipment  | 3         |
| <b>4. Electrical parameters of the tissue simulating liquid</b>                 | <b>4</b>  |
| <b>5. System Accuracy Verification</b>  | <b>5</b>  |
| <b>6. Test Results</b>  | <b>6</b>  |
| 6.1 Head Adjacent Test Results  | 7         |
| 6.2 Body Worn Test Results  | 10        |
| <b>References</b>   | <b>12</b> |
| <b>Appendix 1: SAR distribution comparison for system accuracy verification</b> | <b>13</b> |
| <b>Appendix 2: SAR distribution plots for Phantom Head Adjacent Use</b>         | <b>14</b> |
| <b>Appendix 3: SAR distribution plots for Body Worn Configuration</b>           | <b>15</b> |
| <b>Appendix 4: Probe Calibration Certificate</b>                                | <b>16</b> |
| <b>Appendix 5: Measurement Uncertainty Budget</b>                               | <b>17</b> |
| <b>Appendix 6: Dipole Characterization Certificate</b>                          | <b>19</b> |

## 1. Introduction

The Motorola Mobile Devices Business Product Safety Laboratory has performed measurements of the maximum potential exposure to the user of the portable cellular phone covered by this test report. The Specific Absorption Rate (SAR) of this product was measured. The portable cellular phone was tested in accordance with [1], [4] and [5]. The SAR values measured for the portable cellular phone are below the maximum recommended levels of 1.6 W/kg in a 1 g average set in [3] and 2.0 W/kg in a 10 g average set in [2].

For ICNIRP (10 g), the final SAR reading for this phone is 0.38 W/kg for head adjacent use and 0.46 W/kg for body worn use. For ANSI / IEEE C95.1 (1 g), the final SAR reading for this phone is 0.56 W/kg for head adjacent use and 0.69 W/kg for body worn use. These measurements were performed using a Dasy4™ v4.7 system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich Switzerland.

## 2. Description of the Device Under Test

### 2.1 Antenna description

|                      |                       |         |
|----------------------|-----------------------|---------|
| <b>Type</b>          | Internal              |         |
| <b>Location</b>      | Bottom of Transceiver |         |
| <b>Dimensions</b>    | Length                | 39.5 mm |
|                      | Width                 | 7 mm    |
| <b>Configuration</b> | FJA                   |         |

### 2.2 Device description

|   |                                   |                     |
|---|-----------------------------------|---------------------|
| <b>Serial number</b>  | 01154300000071                    |                     |
| <b>Mode(s) of Operation</b>                                   | GSM 850                           | GSM 1900            |
| <b>Modulation Mode(s)</b>                                     | GMSK                              | GMSK                |
| <b>Maximum Output Power Setting</b>                           | 32.80 dBm                         | 30.00 dBm           |
| <b>Duty Cycle</b>   | 1:8                               | 1:8                 |
| <b>Transmitting Frequency Range(s)</b>                        | 824.2 - 848.8 MHz                 | 1850.2 - 1909.8 MHz |
| <b>Production Unit or Identical Prototype (47 CFR §2.908)</b> | Identical Prototype               |                     |
| <b>Device Category</b>  | Portable                          |                     |
| <b>RF Exposure Limits</b>                                     | General Population / Uncontrolled |                     |

### 3. Test Equipment Used

#### 3.1 Dosimetric System

The Motorola Mobile Devices Business Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy4™ v4.7) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall 10 g RSS uncertainty of the measurement system is  $\pm 10.8\%$  (K=1) with an expanded uncertainty of  $\pm 21.6\%$  (K=2). The overall 1 g RSS uncertainty of the measurement system is  $\pm 11.1\%$  (K=1) with an expanded uncertainty of  $\pm 22.2\%$  (K=2). The measurement uncertainty budget is given in Appendix 5. Per IEEE 1528, this uncertainty budget is applicable to the SAR range of 0.4 W/kg to 10 W/kg.

The list of calibrated equipment used for the measurements is shown in the following table.

| Description                           | Serial Number | Cal Due Date |
|---------------------------------------|---------------|--------------|
| DASY4™ DAE4                           | 376           | 3/18/2009    |
| E-Field Probe ET3DV6                  | 1514          | 7/11/2008    |
| S.A.M. Phantom used for 800/900 MHz   | TP-1005       |              |
| S.A.M. Phantom used for 1800/1900 MHz | TP-1139       |              |
| Dipole Validation Kit, DV900V2        | 91            | 4/22/2009    |
| Dipole Validation Kit, DV1800V2       | 259TR         | 4/22/2009    |

#### 3.2 Additional Equipment

| Description                   | Serial Number | Cal Due Date |
|-------------------------------|---------------|--------------|
| Signal Generator HP8648C      | 3847A04810    | 6/13/2009    |
| Power Meter E4419B            | GB39510961    | 1/24/2010    |
| Power Sensor #1 - E9301A      | US39210917    | 9/10/2008    |
| Power Sensor #2 - E9301A      | US39210918    | 9/10/2008    |
| Network Analyzer HP8753ES     | US39171846    | 7/19/2008    |
| Dielectric Probe Kit HP85070C | US99360070    |              |

**4. Electrical parameters of the tissue simulating liquid**

Prior to conducting SAR measurements, the relative permittivity,  $\epsilon_r$ , and the conductivity,  $\sigma$ , of the tissue simulating liquids were measured with a HP85070 Dielectric Probe Kit. These values, along with the temperature of the simulated tissue are shown in the table below. The recommended limits for permittivity and conductivity are also shown. A mass density of  $\rho = 1 \text{ g/cm}^3$  was entered into the system in all the cases. It can be seen that the measured parameters are within tolerance of the recommended limits specified in [1] and [5].

| f (MHz) | Tissue type | Limits / Measured  | Dielectric Parameters |                |          |
|---------|-------------|--------------------|-----------------------|----------------|----------|
|         |             |                    | $\epsilon_r$          | $\sigma$ (S/m) | Temp (C) |
| 835     | Head        | Measured, 6/3/2008 | 41.9                  | 0.91           | 19.9     |
|         |             | Recommended Limits | 41.5 $\pm$ 5%         | 0.90 $\pm$ 5%  | 18-25    |
|         | Body        | Measured, 6/3/2008 | 53.6                  | 0.98           | 19.9     |
|         |             | Recommended Limits | 55.2 $\pm$ 5%         | 0.97 $\pm$ 5%  | 18-25    |
| 1880    | Head        | Measured, 6/3/2008 | 38.6                  | 1.46           | 20.0     |
|         |             | Recommended Limits | 40.0 $\pm$ 5%         | 1.40 $\pm$ 5%  | 18-25    |
|         | Body        | Measured, 6/3/2008 | 50.7                  | 1.57           | 20.0     |
|         |             | Recommended Limits | 53.3 $\pm$ 5%         | 1.52 $\pm$ 5%  | 18-25    |

The list of ingredients and the percent composition used for the tissue simulates are indicated in the table below.

| Ingredient | 835 MHz / 900 MHz Head | 835 MHz / 900 MHz Body | 1800 MHz / 1900 MHz Head | 1800 MHz / 1900 MHz Body | 2450 MHz Head | 2450 MHz Body |
|------------|------------------------|------------------------|--------------------------|--------------------------|---------------|---------------|
| Sugar      | 57                     | 44.9                   | --                       | --                       | --            | --            |
| DGBE       | --                     | --                     | 47                       | 30.8                     | --            | 30            |
| Diacetin   | --                     | --                     | --                       | --                       | 51            | --            |
| Water      | 40.45                  | 53.06                  | 52.62                    | 68.8                     | 48.75         | 70            |
| Salt       | 1.45                   | 0.94                   | 0.38                     | 0.4                      | 0.15          | --            |
| HEC        | 1                      | 1                      | --                       | --                       | --            | --            |
| Bact.      | 0.1                    | 0.1                    | --                       | --                       | 0.1           | --            |

## 5. System Accuracy Verification

A system accuracy verification of the DASY4™ was performed using the measurement equipment listed in Section 3.1. The daily system accuracy verification occurs within the flat section of the SAM phantom.

A SAR measurement was performed to verify the measured SAR was within  $\pm 10\%$  from the target SAR indicated Appendix 6. These frequencies are within  $\pm 10\%$  of the compliance test mid-band frequency as required in [1] and [5]. The test was conducted on the same days as the measurement of the DUT. Recommended limits for permittivity and conductivity, specified in [5], are shown in the table below. The obtained results from the system accuracy verification are also displayed in the table below. SAR values are normalized to 1 W forward power delivered to the dipole. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). The tissue stimulant depth was verified to be 15.0 cm  $\pm$  0.5 cm. Z-axis scans showing the SAR penetration are also included in Appendix 1.

| f (MHz) | Description        | SAR (W/kg), 1 gram | Dielectric Parameters |                | Ambient Temp (C) | Tissue Temp (C) |
|---------|--------------------|--------------------|-----------------------|----------------|------------------|-----------------|
|         |                    |                    | $\epsilon_r$          | $\sigma$ (S/m) |                  |                 |
| 900     | Measured, 6/3/2008 | 11.5               | 41.2                  | 0.98           | 20.8             | 20.6            |
|         | Recommended Limits | 11.29              | 41.5 $\pm$ 5%         | 0.97 $\pm$ 5%  | 18-25            | 18-25           |
| 1800    | Measured, 6/3/2008 | 40.1               | 38.9                  | 1.37           | 20.8             | 20.0            |
|         | Recommended Limits | 37.7               | 40.0 $\pm$ 5%         | 1.4 $\pm$ 5%   | 18-25            | 18-25           |

The following probe conversion factors were used on the E-Field probe(s) used for the system accuracy verification measurements:

| Description          | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|----------------------|---------------|---------|-------------------|---------------|
| E-Field Probe ET3DV6 | 1514          | 900     | 5.98              | 8 of 9        |
|                      |               | 1810    | 4.92              | 8 of 9        |

## **6. Test Results**

The test sample was operated using an actual transmission through a base station simulator. The base station simulator was setup to the proper channel, transmitter power level and transmit mode of operation. The phone was tested in the configurations stipulated in [1], [4] and [5]. The phone was positioned into these configurations using the device holder supplied with the DASY4™ SAR measurement system. The measured dielectric constant of the material used for the device holder is less than 2.9 and the loss tangent is less than 0.02 ( $\pm 30\%$ ) at 850 MHz. The default settings for the “coarse” and “cube” scans were chosen and used for measurements. The grid spacing of the coarse scan was set to 15 cm as shown in the SAR plots included in Appendix 2 and 3. Please refer to the DASY4™ manual for additional information on SAR scanning procedures and algorithms used.

The Cellular Phone model covered by this report has the following battery options:  
Model SNN5804A - 910 mAH Battery

The battery with the highest capacity is the Model SNN5804A. This battery was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

## 6.1 Head Adjacent Test Results

The SAR results shown in tables 1 through 4 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the measured conducted output power levels, the temperature of the simulated tissue after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is  $\text{New SAR} = \text{Old SAR} * 10^{(-\text{drift}/10)}$ . The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The left head and right head SAR contour distributions are similar. Because of this similarity, the cheek/touch and 15° tilt test conditions with the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 2. All other test conditions measured lower SAR values than those included in Appendix 2.

The SAR measurements were performed using the SAM phantoms listed in section 3.1. Since the same phantoms and simulated tissue were used for the system accuracy verification and the device SAR measurements, the Z-axis scans included in Appendix 1 are applicable for verification of simulated tissue depth to be 15.0 cm ± 0.5 cm.

The following probe conversion factors were used on the E-Field probe(s) used for head-adjacent measurements:

| Description          | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|----------------------|---------------|---------|-------------------|---------------|
| E-Field Probe ET3DV6 | 1514          | 900     | 5.98              | 8 of 9        |
|                      |               | 1810    | 4.92              | 8 of 9        |

| Left Head Cheek Position |             |                              |          |            |                       |                     |                      |                     |
|--------------------------|-------------|------------------------------|----------|------------|-----------------------|---------------------|----------------------|---------------------|
| <i>f</i><br>(MHz)        | Description | Conducted Output Power (dBm) | Temp (C) | Drift (dB) | <i>10 g SAR value</i> |                     | <i>1 g SAR value</i> |                     |
|                          |             |                              |          |            | Measured (W/kg)       | Extrapolated (W/kg) | Measured (W/kg)      | Extrapolated (W/kg) |
| 850 MHz                  | Channel 128 | 32.76                        |          |            |                       |                     |                      |                     |
|                          | Channel 190 | 32.64                        | 19.9     | -0.16      | 0.37                  | 0.38                | 0.54                 | 0.56                |
|                          | Channel 251 | 32.64                        |          |            |                       |                     |                      |                     |
| 1900 MHz                 | Channel 512 | 30.00                        |          |            |                       |                     |                      |                     |
|                          | Channel 661 | 30.00                        | 20.0     | -0.11      | 0.20                  | 0.21                | 0.32                 | 0.32                |
|                          | Channel 810 | 29.91                        |          |            |                       |                     |                      |                     |

Table 1: SAR measurement results at the highest possible output power, measured in a head cheek position against the ICNIRP and ANSI SAR Limit.

| Right Head Cheek Position |             |                              |          |            |                       |                     |                      |                     |
|---------------------------|-------------|------------------------------|----------|------------|-----------------------|---------------------|----------------------|---------------------|
| <i>f</i><br>(MHz)         | Description | Conducted Output Power (dBm) | Temp (C) | Drift (dB) | <i>10 g SAR value</i> |                     | <i>1 g SAR value</i> |                     |
|                           |             |                              |          |            | Measured (W/kg)       | Extrapolated (W/kg) | Measured (W/kg)      | Extrapolated (W/kg) |
| 850 MHz                   | Channel 128 | 32.76                        |          |            |                       |                     |                      |                     |
|                           | Channel 190 | 32.64                        | 19.7     | 0.08       | 0.28                  | 0.28                | 0.41                 | 0.41                |
|                           | Channel 251 | 32.64                        |          |            |                       |                     |                      |                     |
| 1900 MHz                  | Channel 512 | 30.00                        |          |            |                       |                     |                      |                     |
|                           | Channel 661 | 30.00                        | 20.0     | 0.03       | 0.14                  | 0.14                | 0.21                 | 0.21                |
|                           | Channel 810 | 29.91                        |          |            |                       |                     |                      |                     |

Table 2: SAR measurement results at the highest possible output power, measured in a head cheek position against the ICNIRP and ANSI SAR Limit.

| Left Head 15° Tilt Position |             |                                       |             |               |                       |                        |                      |                        |
|-----------------------------|-------------|---------------------------------------|-------------|---------------|-----------------------|------------------------|----------------------|------------------------|
| <i>f</i><br>(MHz)           | Description | Conducted<br>Output<br>Power<br>(dBm) | Temp<br>(C) | Drift<br>(dB) | <i>10 g SAR value</i> |                        | <i>1 g SAR value</i> |                        |
|                             |             |                                       |             |               | Measured<br>(W/kg)    | Extrapolated<br>(W/kg) | Measured<br>(W/kg)   | Extrapolated<br>(W/kg) |
| 850 MHz                     | Channel 128 | 32.76                                 |             |               |                       |                        |                      |                        |
|                             | Channel 190 | 32.64                                 | 19.9        | 0.02          | 0.08                  | 0.08                   | 0.12                 | 0.12                   |
|                             | Channel 251 | 32.64                                 |             |               |                       |                        |                      |                        |
| 1900 MHz                    | Channel 512 | 30.00                                 |             |               |                       |                        |                      |                        |
|                             | Channel 661 | 30.00                                 | 20.0        | 0             | 0.07                  | 0.07                   | 0.12                 | 0.12                   |
|                             | Channel 810 | 29.91                                 |             |               |                       |                        |                      |                        |

Table 3: SAR measurement results at the highest possible output power, measured in a head 15° Tilt position against the ICNIRP and ANSI SAR Limit.

| Right Head 15° Tilt Position |             |                                       |             |               |                       |                        |                      |                        |
|------------------------------|-------------|---------------------------------------|-------------|---------------|-----------------------|------------------------|----------------------|------------------------|
| <i>f</i><br>(MHz)            | Description | Conducted<br>Output<br>Power<br>(dBm) | Temp<br>(C) | Drift<br>(dB) | <i>10 g SAR value</i> |                        | <i>1 g SAR value</i> |                        |
|                              |             |                                       |             |               | Measured<br>(W/kg)    | Extrapolated<br>(W/kg) | Measured<br>(W/kg)   | Extrapolated<br>(W/kg) |
| 850 MHz                      | Channel 128 | 32.76                                 |             |               |                       |                        |                      |                        |
|                              | Channel 190 | 32.64                                 | 19.9        | 0.06          | 0.09                  | 0.09                   | 0.13                 | 0.13                   |
|                              | Channel 251 | 32.64                                 |             |               |                       |                        |                      |                        |
| 1900 MHz                     | Channel 512 | 30.00                                 |             |               |                       |                        |                      |                        |
|                              | Channel 661 | 30.00                                 | 20.0        | -0.02         | 0.05                  | 0.05                   | 0.08                 | 0.08                   |
|                              | Channel 810 | 29.91                                 |             |               |                       |                        |                      |                        |

Table 4: SAR measurement results at the highest possible output power, measured in a head 15° Tilt position against the ICNIRP and ANSI SAR Limit.

## 6.2 Body Worn Test Results

The SAR results shown in tables 5 and 6 are maximum SAR values averaged over 1 gram of phantom tissue, to demonstrate compliance to [3] and also over 10 grams of phantom tissue, to demonstrate compliance to the [6]. Also shown are the measured conducted output power levels, the temperature of the test facility during the test, the temperature of the tissue simulate after the test, the measured drift and the extrapolated SAR. The exact method of extrapolation is  $\text{New SAR} = \text{Old SAR} * 10^{(-\text{drift}/10)}$ . The SAR reported at the end of the measurement process by the DASY4™ measurement system can be scaled up by the measured drift to determine the SAR at the beginning of the measurement process. This is the most conservative SAR because it corresponds to the average output power at the beginning of the SAR test. This extrapolation has been done because when the DUT is operating properly it may exhibit a slump in radiated power and SAR over time. This is verified by measuring the SAR drift after the test.

The test conditions that produced the highest SAR values in each band are indicated as bold numbers in the following tables and are included in Appendix 3. All other test conditions measured lower SAR values than those included in Appendix 3.

A “flat” phantom was for the body-worn tests. This “flat” phantom is made out of 1” thick natural High Density Polyethylene with a thickness at the bottom equal to 2.0 mm. It measures 52.7 cm(long) x 26.7 cm(wide) x 21.2 cm(tall). The measured dielectric constant of the material used is less than 2.3 and the loss tangent is less than 0.0046 all the way up to 2.184 GHz.

The tissue stimulant depth was verified to be 15.0 cm ± 0.5 cm. The same device holder described in section 6 was used for positioning the phone. The functional accessories were divided into two categories, the ones with metal components and the ones with non-metal components. For non-metallic component accessories’, testing was performed on the accessory that displayed the closest proximity to the flat phantom. Each metallic component accessory, if any, was checked for uniqueness of metal component so that each is tested with the device. If multiple accessories shared an identical metal component, only the accessory that dictates the closest spacing to the body was tested. In addition to accessory testing, the cellular phone was tested with the front and back of the phone facing the phantom. For voice mode operation, the phone was placed as a distance of 15 mm from the phantom. For data mode operation, the phone was placed as a distance of 25 mm from the phantom. The cellular phone was tested with a headset connected to the device for all body-worn SAR measurements.

There are no Body-Worn Accessories available for this phone.

The following probe conversion factors were used on the E-Field probe(s) used for body-worn measurements:

| Description             | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|-------------------------|---------------|---------|-------------------|---------------|
| E-Field Probe<br>ET3DV6 | 1514          | 900     | 5.75              | 8 of 9        |
|                         |               | 1810    | 4.59              | 8 of 9        |

| Body-Worn; Front of Phone 15 mm from Phantom |             |                              |          |            |                       |                     |                      |                     |
|--|-------------|------------------------------|----------|------------|-----------------------|---------------------|----------------------|---------------------|
| <i>f</i><br>(MHz)                            | Description | Conducted Output Power (dBm) | Temp (C) | Drift (dB) | <i>10 g SAR value</i> |                     | <i>1 g SAR value</i> |                     |
|  |             |                              |          |            | Measured (W/kg)       | Extrapolated (W/kg) | Measured (W/kg)      | Extrapolated (W/kg) |
| 850 MHz                                      | Channel 128 | 32.76                        |          |            |                       |                     |                      |                     |
|  | Channel 190 | 32.64                        | 19.9     | -0.13      | 0.44                  | 0.46                | 0.67                 | 0.69                |
|  | Channel 251 | 32.64                        |          |            |                       |                     |                      |                     |
| 1900 MHz                                     | Channel 512 | 30.00                        |          |            |                       |                     |                      |                     |
|  | Channel 661 | 30.00                        | 20.0     | -0.14      | 0.06                  | 0.06                | 0.11                 | 0.11                |
|  | Channel 810 | 29.91                        |          |            |                       |                     |                      |                     |

Table 5: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

| Body-Worn; Back of Phone 15 mm from Phantom |             |                              |          |            |                       |                     |                      |                     |
|---|-------------|------------------------------|----------|------------|-----------------------|---------------------|----------------------|---------------------|
| <i>f</i><br>(MHz)                           | Description | Conducted Output Power (dBm) | Temp (C) | Drift (dB) | <i>10 g SAR value</i> |                     | <i>1 g SAR value</i> |                     |
|   |             |                              |          |            | Measured (W/kg)       | Extrapolated (W/kg) | Measured (W/kg)      | Extrapolated (W/kg) |
| 850 MHz                                     | Channel 128 | 32.76                        |          |            |                       |                     |                      |                     |
|   | Channel 190 | 32.64                        | 19.9     | -0.07      | 0.38                  | 0.38                | 0.57                 | 0.58                |
|   | Channel 251 | 32.64                        |          |            |                       |                     |                      |                     |
| 1900 MHz                                    | Channel 512 | 30.00                        |          |            |                       |                     |                      |                     |
|   | Channel 661 | 30.00                        | 20.0     | -0.08      | 0.09                  | 0.09                | 0.16                 | 0.16                |
|   | Channel 810 | 29.91                        |          |            |                       |                     |                      |                     |

Table 6: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.

## References

- [1] CENELEC, en62209-1:2006 “Human Exposure to Radio Frequency Fields From Hand - Held and Body - Mounted Wireless Communication Devices – Human Models, Instrumentation, and Procedures”
- [2] CENELEC, en50360:2001 “Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)”.
- [3] ANSI / IEEE, C95.1 1999 Edition “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”
- [4] FCC OET Bulletin 65 Supplement C 01-01
- [5] IEEE 1528 2003 Edition “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”
- [6] ICNIRP Guidelines “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)”

## **Appendix 1**

### **SAR distribution comparison for the system accuracy verification**

## Test Laboratory: Motorola

**060308 900MHz GOOD at +2.1%**

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:91 ; FCC ID# IHDP56JG1**

Procedure Notes: 900 MHz System Performance Check / Dipole Sn# 91 PM1 Power = 200 mW

Sim.Temp@meas = 20.6C; Sim.Temp@SPC = 20.6C; Room Temp @ SPC = 20.8C

Communication System: CW - Dipole; Frequency: 900 MHz; Channel Number: 4; Duty Cycle: 1:1

Medium: VALIDATION Only; Medium parameters used:  $f = 900$  MHz;  $\sigma = 0.98$  mho/m;  $\epsilon_r = 41.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ET3DV6 - SN1514; ConvF(5.98, 5.98, 5.98); Calibrated: 7/11/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 3/18/2008
- Phantom: R1\_Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Daily SPC Check/Dipole Area Scan (4x9x1):** Measurement grid: dx=15mm, dy=15mm

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

**Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 51.0 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 3.58 W/kg

**SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.5 mW/g**

Maximum value of SAR (measured) = 2.53 mW/g

**Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 51.0 V/m; Power Drift = 0.027 dB

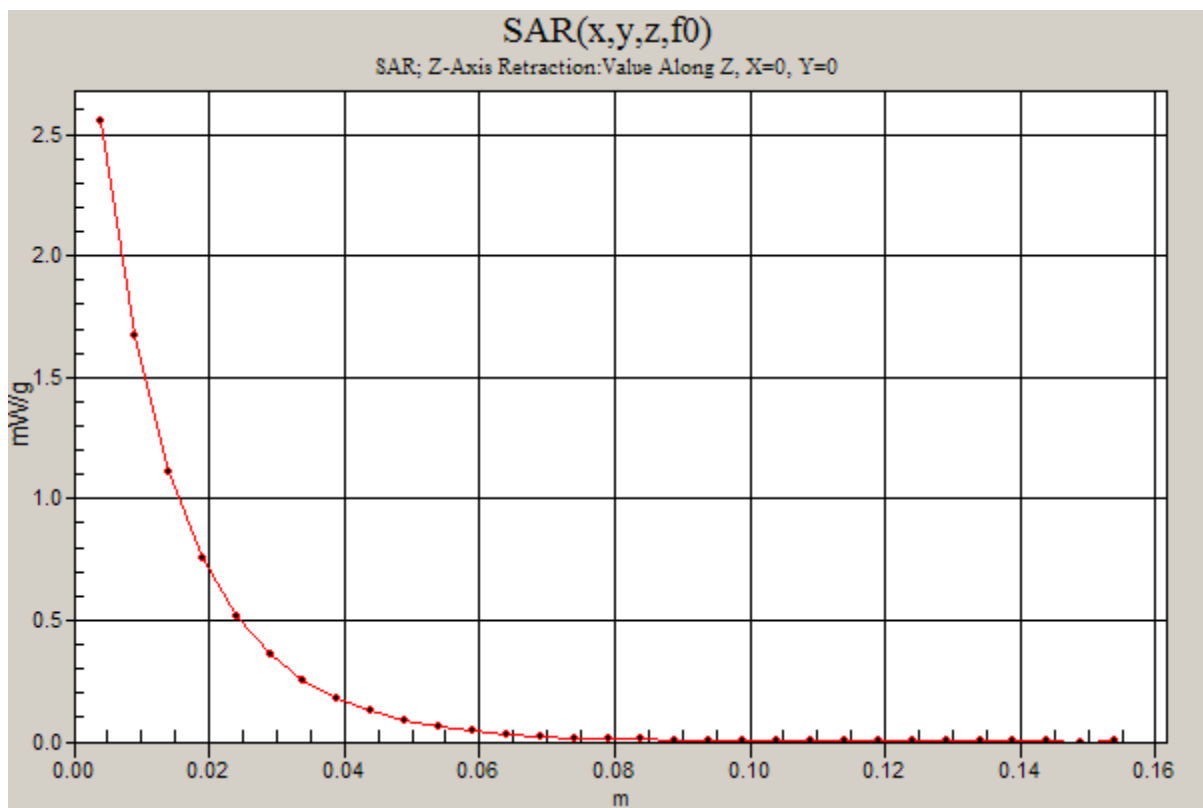
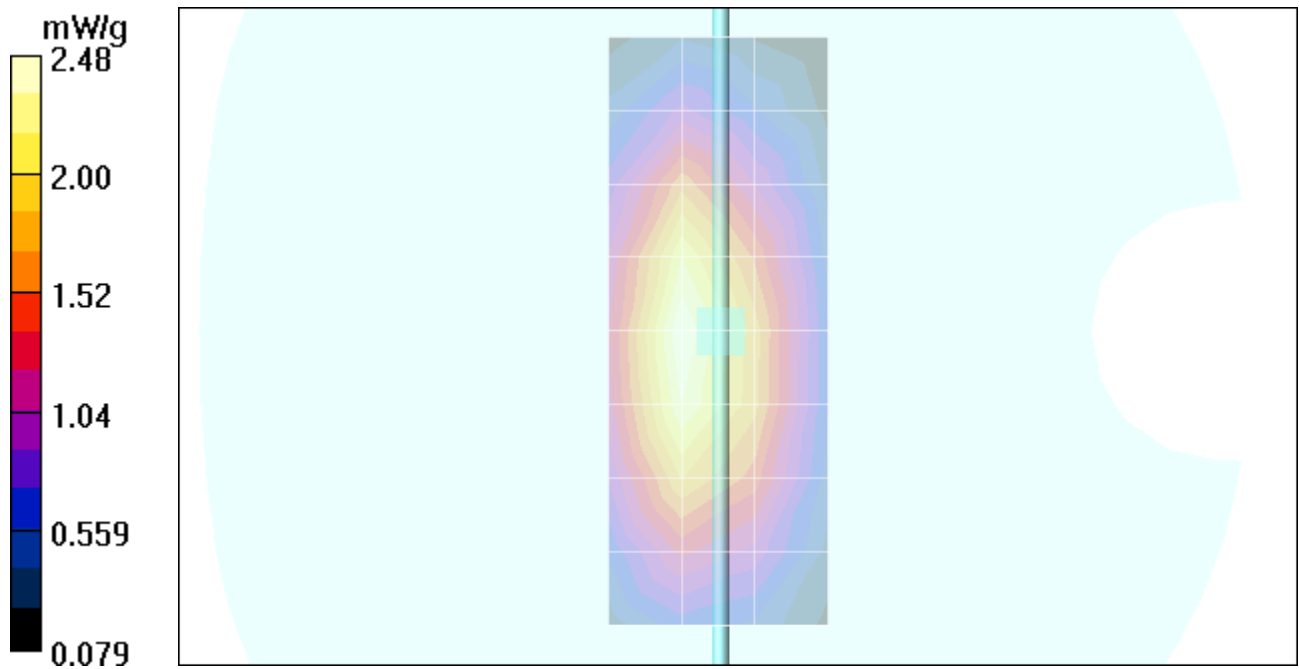
Peak SAR (extrapolated) = 3.41 W/kg

**SAR(1 g) = 2.26 mW/g; SAR(10 g) = 1.44 mW/g**

Maximum value of SAR (measured) = 2.41 mW/g

**Daily SPC Check/Z-Axis Retraction (1x1x31):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

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



## Test Laboratory: Motorola

**060308 1800MHz GOOD at +6.4%**

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:259TR ; FCC ID# IHDP56JG1**

Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 259tr PM1 Power = 200 mW

Sim.Temp@meas = 20.0 °C; Sim.Temp@SPC = 20.0 °C; Room Temp @ SPC = 20.8 °C

Communication System: CW - Dipole; Frequency: 1800 MHz; Channel Number: 8; Duty Cycle: 1:1

Medium: VALIDATION Only; Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 38.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ET3DV6 - SN1514; ConvF(4.92, 4.92, 4.92); Calibrated: 7/11/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 3/18/2008
- Phantom: R1\_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Daily SPC Check/Dipole Area Scan (9x4x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 7.03 mW/g

**Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 84.7 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 13.8 W/kg

**SAR(1 g) = 8.12 mW/g; SAR(10 g) = 4.35 mW/g**

Maximum value of SAR (measured) = 9.12 mW/g

**Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 84.7 V/m; Power Drift = -0.018 dB

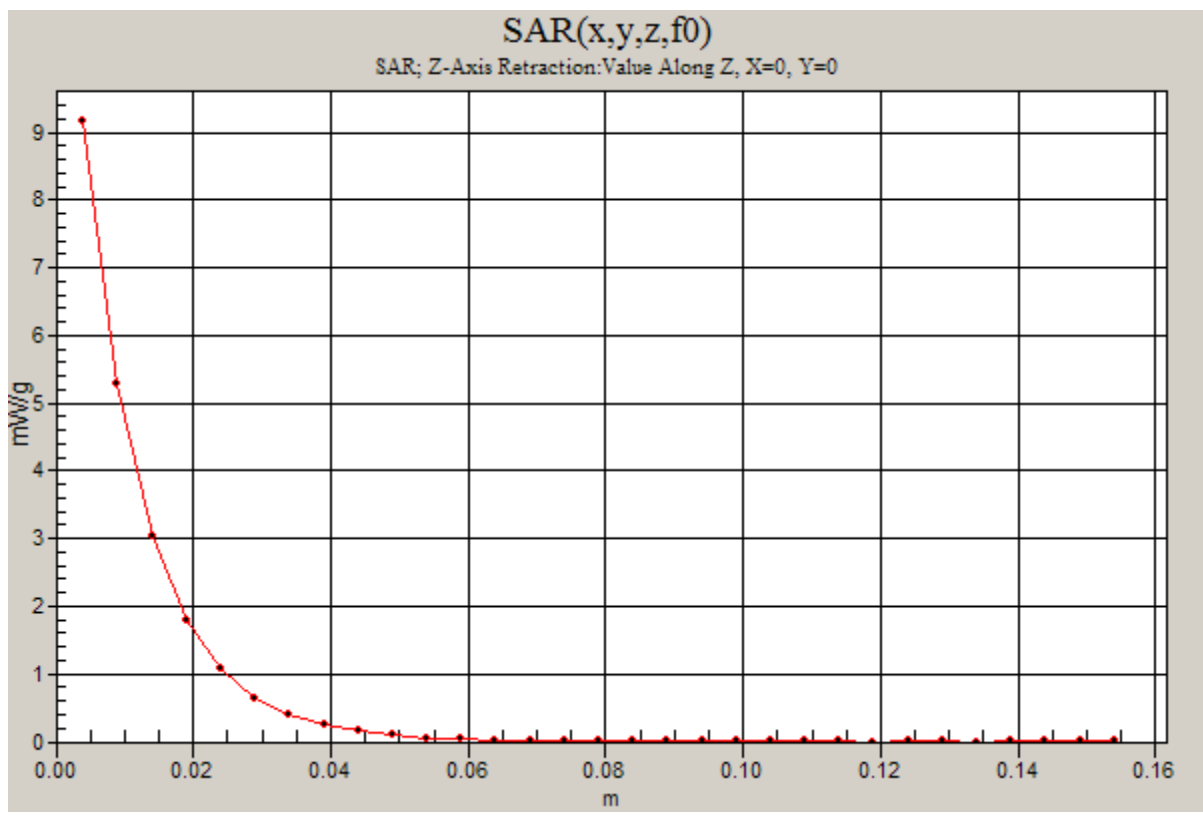
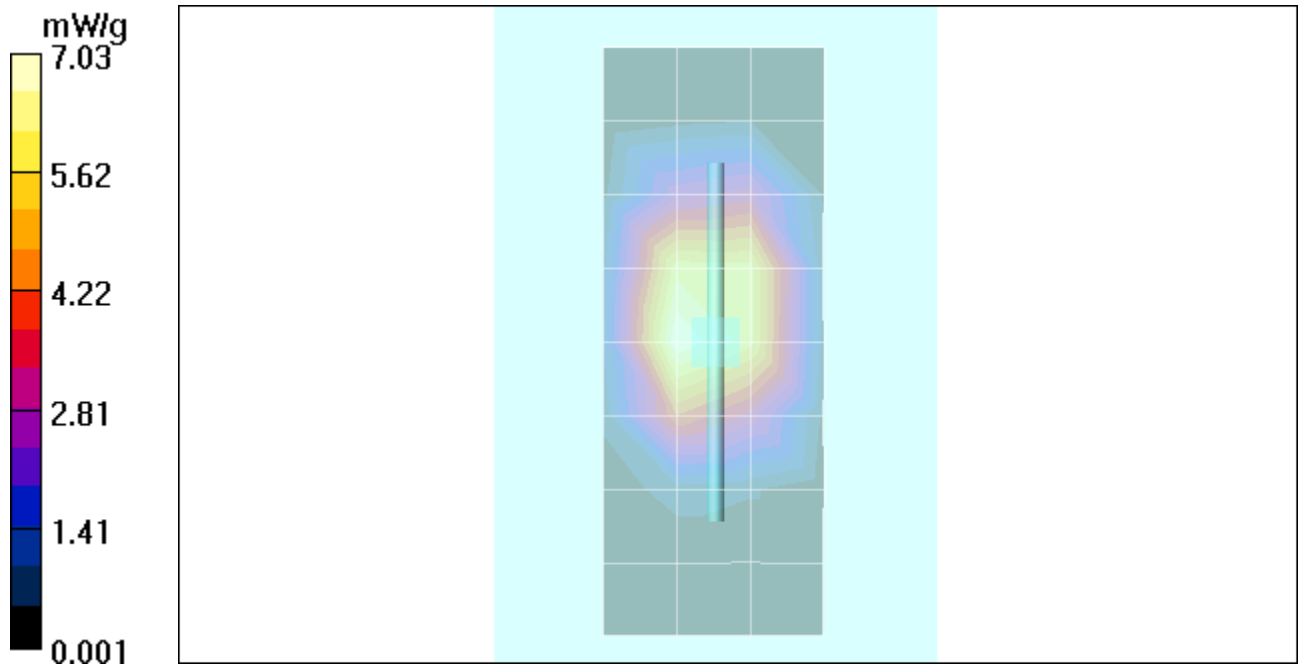
Peak SAR (extrapolated) = 13.6 W/kg

**SAR(1 g) = 7.93 mW/g; SAR(10 g) = 4.23 mW/g**

Maximum value of SAR (measured) = 8.93 mW/g

**Daily SPC Check/Z-Axis Retraction (1x1x31):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 9.17 mW/g



**Appendix 2**

**SAR distribution plots for Phantom Head Adjacent Use**

# Test Laboratory: Motorola

850 LH Cheek

Serial: 11543000000071; FCC ID # IHDP56JG1

Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Battery Model #: SNN5804A;

DEVICE POSITION (cheek or rotated): Cheek

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8

Medium: Low Freq Head; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ET3DV6 - SN1514; ConvF(5.98, 5.98, 5.98); Calibrated: 7/11/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 3/18/2008
- Phantom: R1\_Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Left Head Template/Area Scan - Normal (15mm) (7x17x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 0.557 mW/g

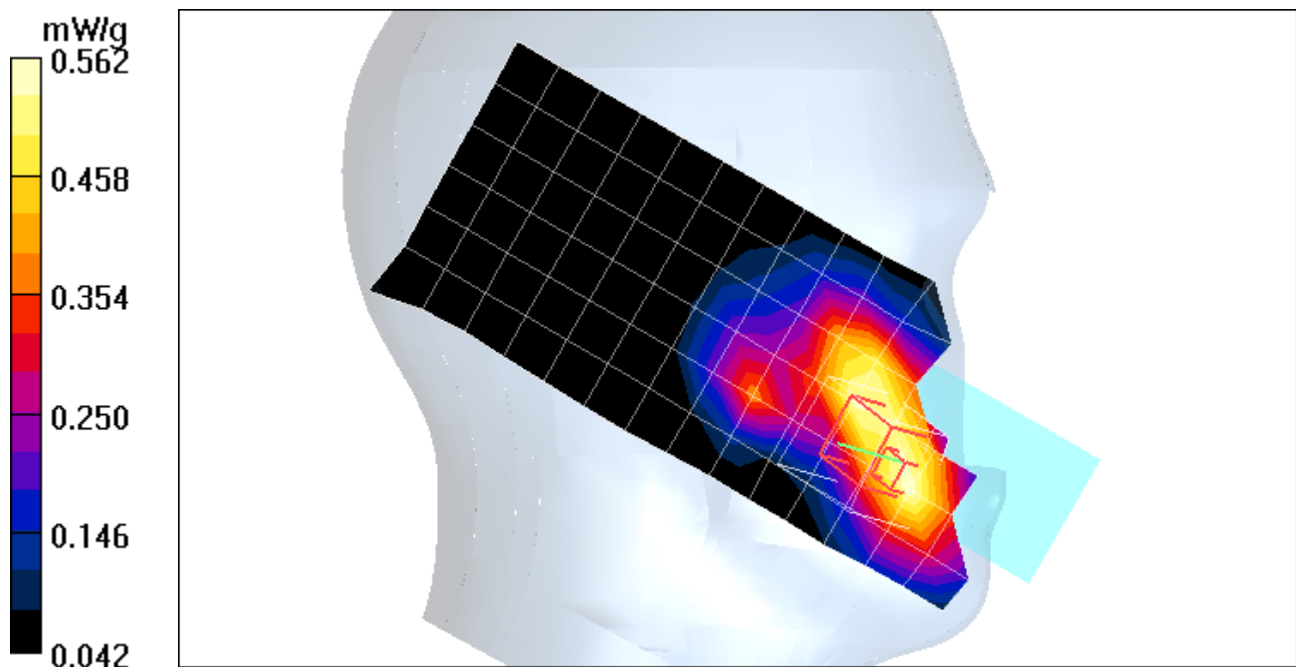
**Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.2 V/m; Power Drift = -0.155 dB

Peak SAR (extrapolated) = 0.787 W/kg

**SAR(1 g) = 0.537 mW/g; SAR(10 g) = 0.370 mW/g**

Maximum value of SAR (measured) = 0.562 mW/g



# Test Laboratory: Motorola 850 RH Tilt

Serial: 11543000000071; FCC ID # IHDP56JG1

Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Battery Model #: SNN5804A

DEVICE POSITION (cheek or rotated): Rotated

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8

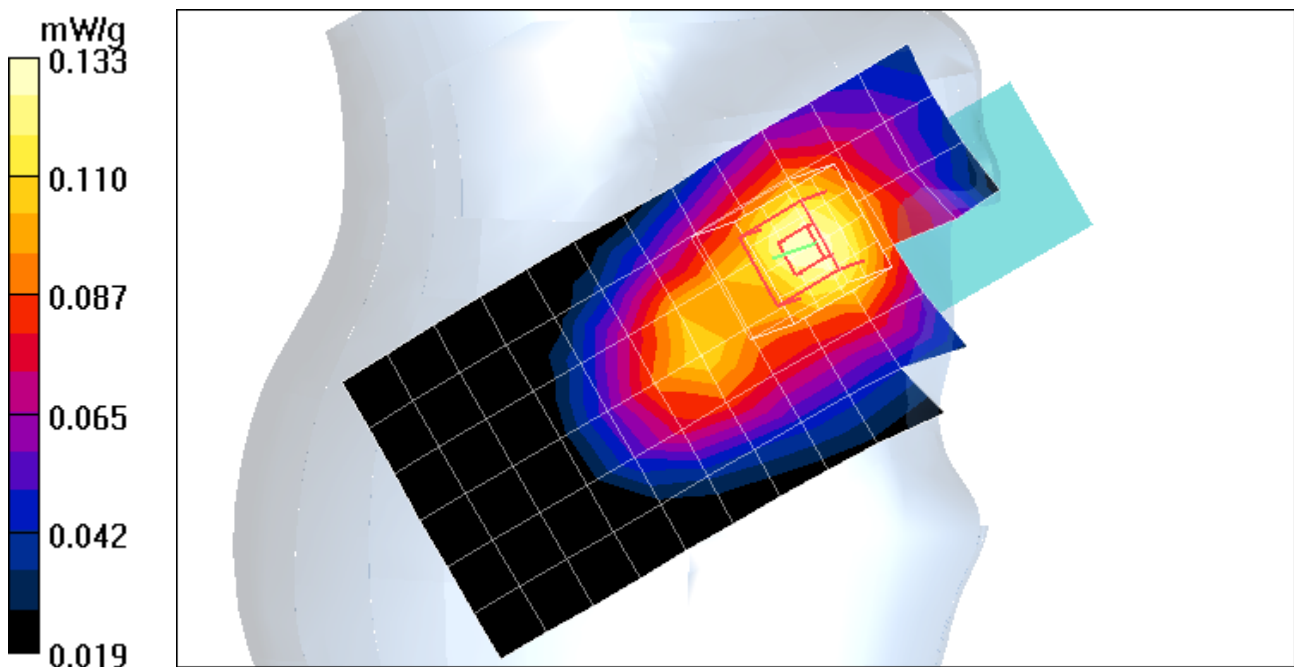
Medium: Low Freq Head; Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.91 \text{ mho/m}$ ;  $\epsilon_r = 41.9$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ET3DV6 - SN1514; ConvF(5.98, 5.98, 5.98); Calibrated: 7/11/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 3/18/2008
- Phantom: R1\_Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Right Head Template/Area Scan - Normal (15mm) (7x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (measured) = 0.129 mW/g

**Right Head Template/5x5x7 Zoom Scan ( $\leq 3\text{GHz}$ ) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 12.4 V/m; Power Drift = 0.060 dB  
Peak SAR (extrapolated) = 0.164 W/kg  
**SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.092 mW/g**  
Maximum value of SAR (measured) = 0.133 mW/g



# Test Laboratory: Motorola

1900 LH Cheek

Serial: 11543000000071; FCC ID # IHDP56JG1

Procedure Notes: Pwr Step: 0; Antenna Position: Internal; Battery Model #: SNN5804A

DEVICE POSITION (cheek or rotated): Cheek

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8  
Medium: Regular Glycol Head 1750/1880; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ET3DV6 - SN1514; ConvF(4.92, 4.92, 4.92); Calibrated: 7/11/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 3/18/2008
- Phantom: R1\_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Left Head Template/Area Scan - Normal (15mm) (7x17x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.334 mW/g

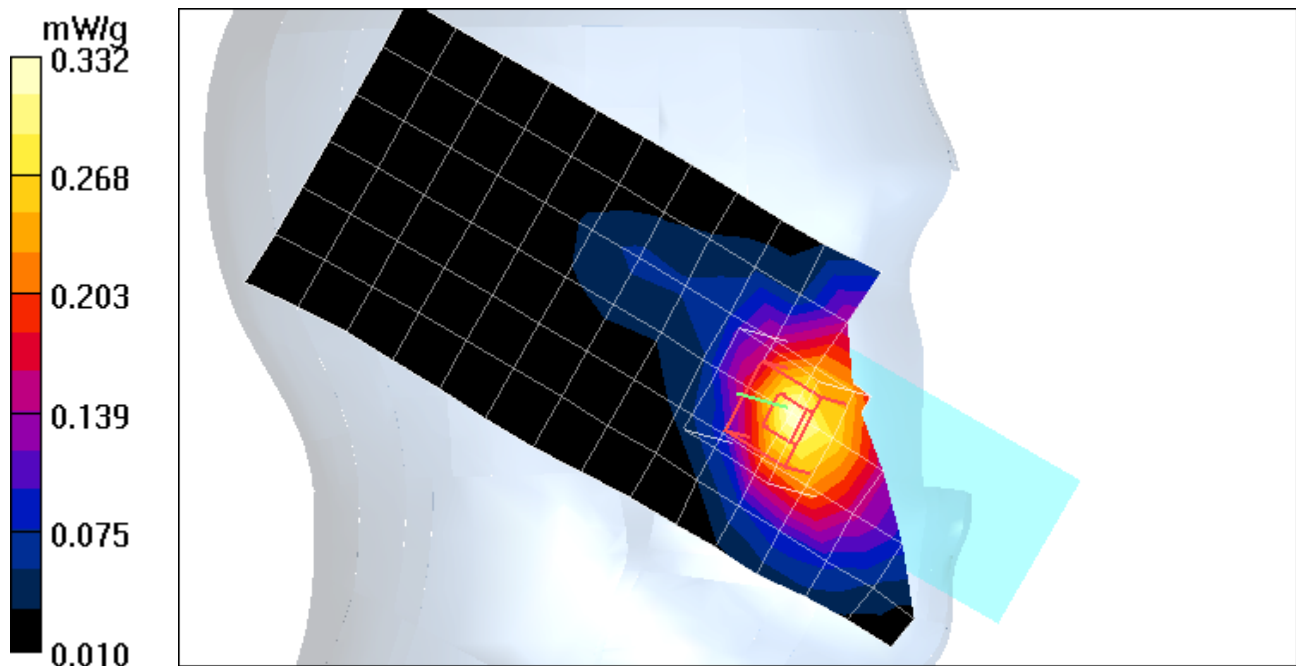
**Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.6 V/m; Power Drift = -0.108 dB

Peak SAR (extrapolated) = 0.446 W/kg

**SAR(1 g) = 0.315 mW/g; SAR(10 g) = 0.202 mW/g**

Maximum value of SAR (measured) = 0.332 mW/g



# Test Laboratory: Motorola

1900 LH Tilt

Serial: 11543000000071; FCC ID # IHDP56JG1

Procedure Notes: Pwr Step: 0; Antenna Position: Internal; Battery Model #: SNN5804A

DEVICE POSITION (cheek or rotated): Rotated

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8  
Medium: Regular Glycol Head 1750/1880; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ET3DV6 - SN1514; ConvF(4.92, 4.92, 4.92); Calibrated: 7/11/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 3/18/2008
- Phantom: R1\_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Left Head Template/Area Scan - Normal (15mm) (7x17x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.117 mW/g

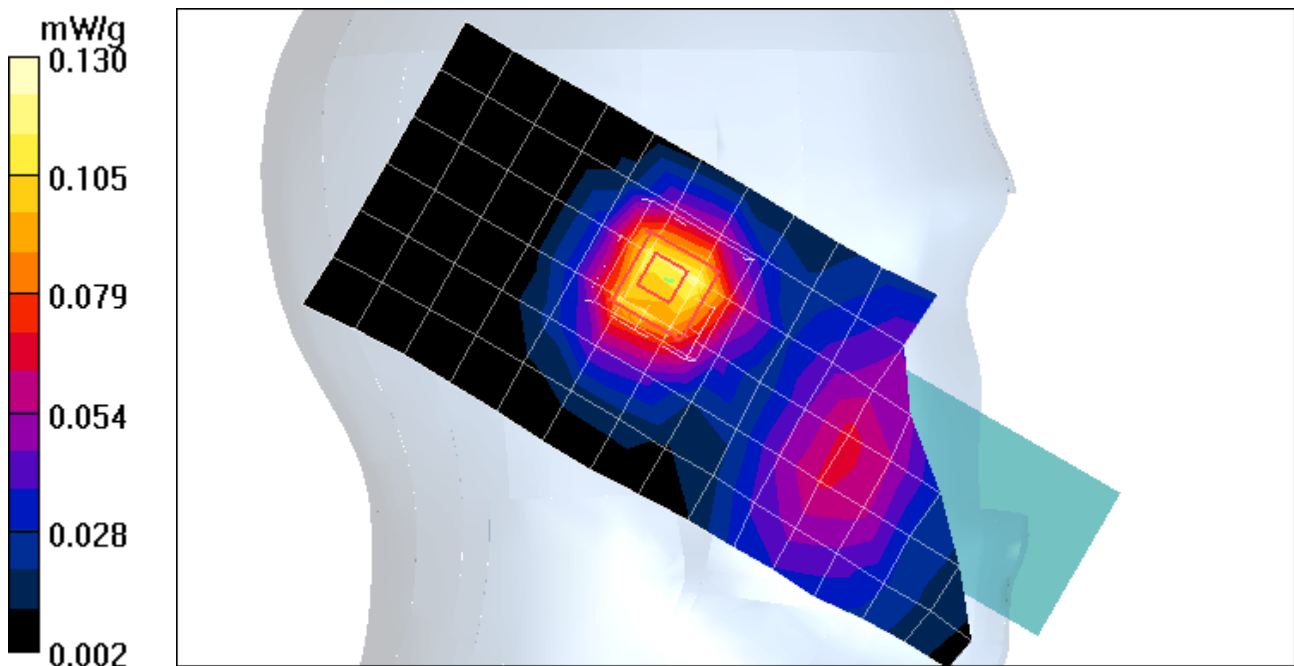
**Left Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.88 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.177 W/kg

**SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.072 mW/g**

Maximum value of SAR (measured) = 0.130 mW/g



**Appendix 3**

**SAR distribution plots for Body Worn Configuration**

**Test Laboratory: Motorola****850 Bodyworn****Serial: 11543000000071; FCC ID # IHDP56JG1**

Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Battery Model #: SNN5804A

Accessory Model # = Front of Phone 15mm from Phantom

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8

Medium: Low Freq Body; Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.98$  mho/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ET3DV6 - SN1514; ConvF(5.75, 5.75, 5.75); Calibrated: 7/11/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 3/18/2008
- Phantom: R1\_ Section 1, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.705 mW/g

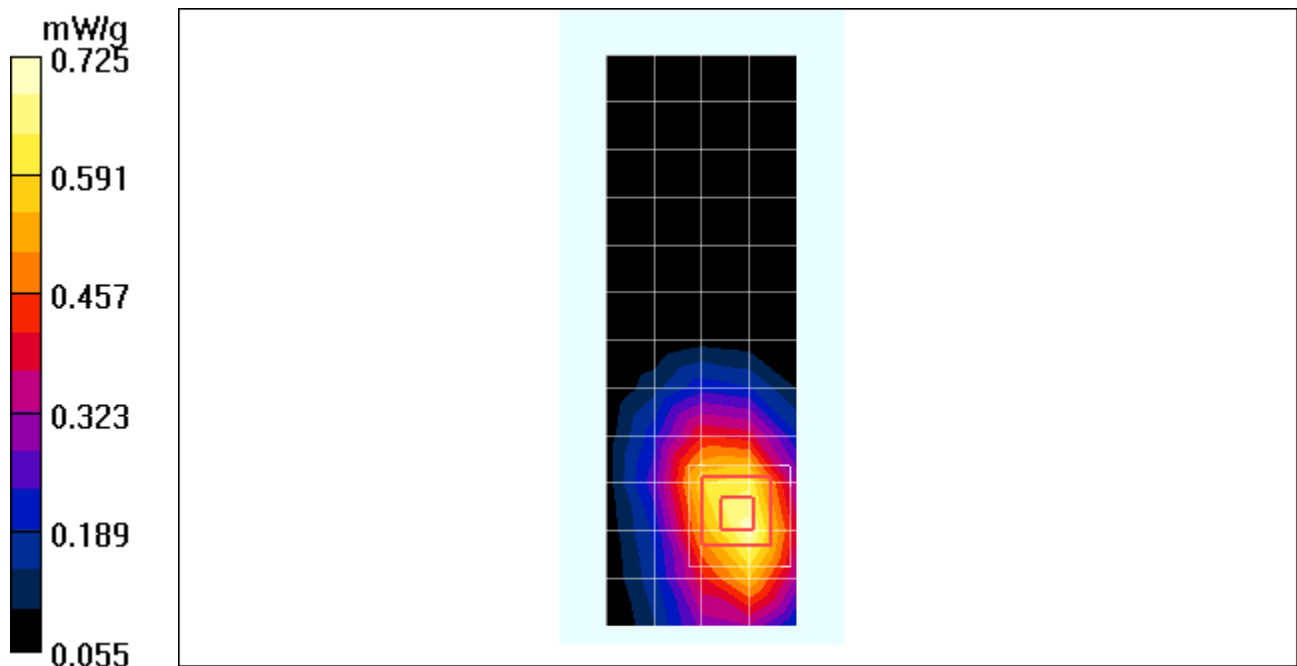
**Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 25.3 V/m; Power Drift = -0.132 dB

Peak SAR (extrapolated) = 0.952 W/kg

**SAR(1 g) = 0.671 mW/g; SAR(10 g) = 0.443 mW/g**

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



**Test Laboratory: Motorola****1900 Bodyworn****Serial: 11543000000071; FCC ID # IHDP56JG1**

Procedure Notes: Pwr Step: 0; Antenna Position: internal; Battery Model #: SNN5804A

Accessory Model # = Bodyworn Back of Phone 15mm From Phantom

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8

Medium: Regular Glycol Body 1750/1880; Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.57$  mho/m;  $\epsilon_r = 50.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ET3DV6 - SN1514; ConvF(4.59, 4.59, 4.59); Calibrated: 7/11/2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 3/18/2008
- Phantom: R1\_ Section 2, Amy Twin, Rev2 (23-June-04); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

**Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.166 mW/g

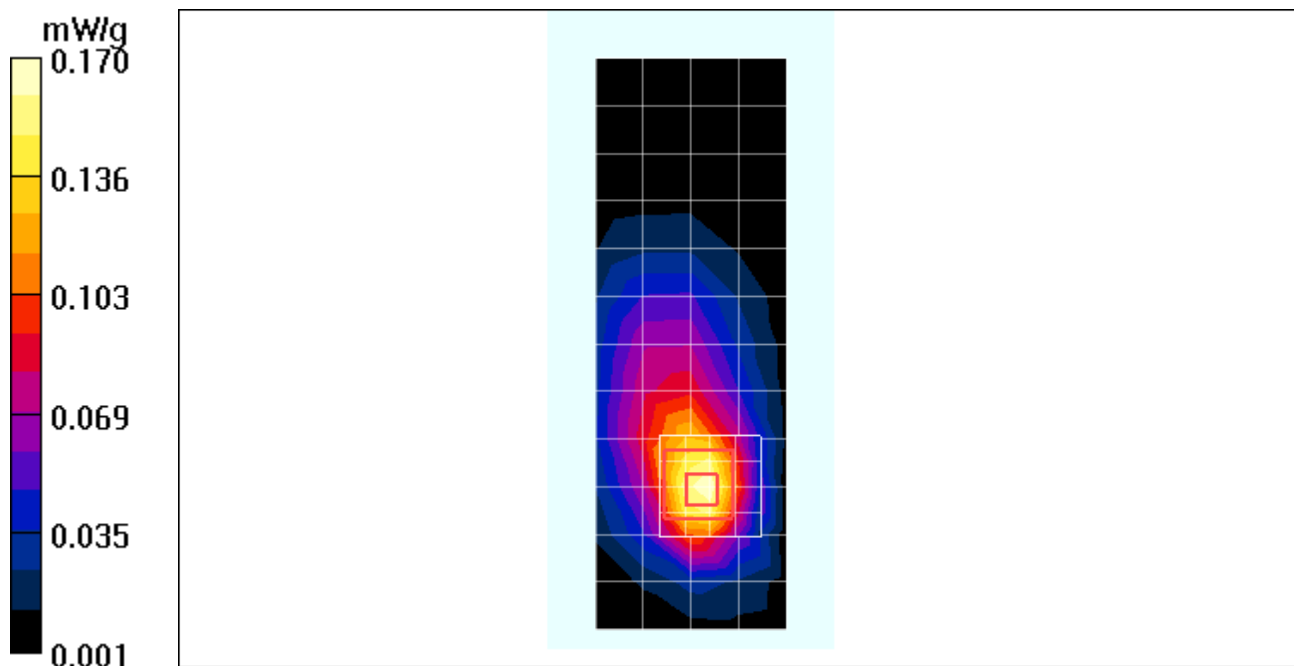
**Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.96 V/m; Power Drift = -0.080 dB

Peak SAR (extrapolated) = 0.248 W/kg

**SAR(1 g) = 0.158 mW/g; SAR(10 g) = 0.092 mW/g**

Maximum value of SAR (measured) = 0.170 mW/g



**Appendix 4**  
**Probe Calibration Certificate**



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 **Motorola MDb**

Certificate No: **ET3-1514\_Jul07**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1514**

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

Calibration date: **July 11, 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|----------------------------|-----------------|---|-----------------------|
| Power meter E4419B         | GB41293874      | 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)  | 10-Aug-06 (METAS, No. 217-00592)          | Aug-07                |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-07 (METAS, No. 217-00671)          | Mar-08                |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 10-Aug-06 (METAS, No. 217-00593)          | Aug-07                |
| 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 |

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

Issued: July 12, 2007

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



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**

### Glossary:

|                          |  |
|--------------------------|--|
| TSL                      | tissue simulating liquid   |
| NORM <sub>x,y,z</sub>    | sensitivity in free space  |
| ConF                     | sensitivity in TSL / NORM <sub>x,y,z</sub>   |
| DCP                      | diode compression point  |
| Polarization $\phi$      | $\phi$ rotation around probe axis  |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis |

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the  $E^2$ -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* *frequency\_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

# Probe ET3DV6

## SN:1514

|                  |                   |
|------------------|-------------------|
| Manufactured:    | November 24, 1999 |
| Last calibrated: | July 17, 2006     |
| Recalibrated:    | July 11, 2007     |

Calibrated for DASYS Systems

(Note: non-compatible with DASYS2 system!)

**DASY - Parameters of Probe: ET3DV6 SN:1514****Sensitivity in Free Space<sup>A</sup>**

|       |                     |                                     |
|-------|---------------------|-------------------------------------|
| NormX | <b>1.70</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | <b>1.94</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | <b>1.85</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ |

**Diode Compression<sup>B</sup>**

|       |              |
|-------|--------------|
| DCP X | <b>91</b> mV |
| DCP Y | <b>91</b> mV |
| DCP Z | <b>89</b> mV |

**Sensitivity in Tissue Simulating Liquid (Conversion Factors)**

Please see Page 8.

**Boundary Effect**

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

|   |                              |               |               |
|---|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 10.2          | 5.3           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.1           | 0.3           |

**TSL**                      **1810 MHz**      **Typical SAR gradient: 10 % per mm**

|   |                              |               |               |
|---|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 14.0          | 9.1           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.1           | 0.0           |

**Sensor Offset**

Probe Tip to Sensor Center                      **2.7 mm**

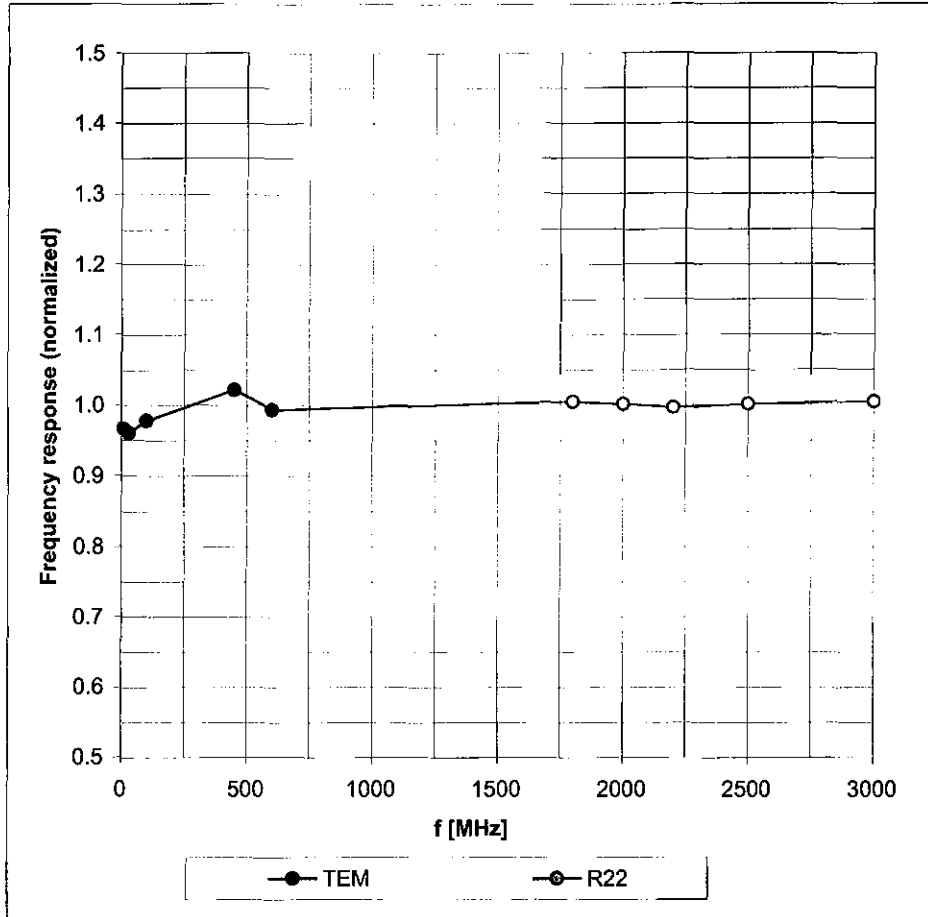
**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

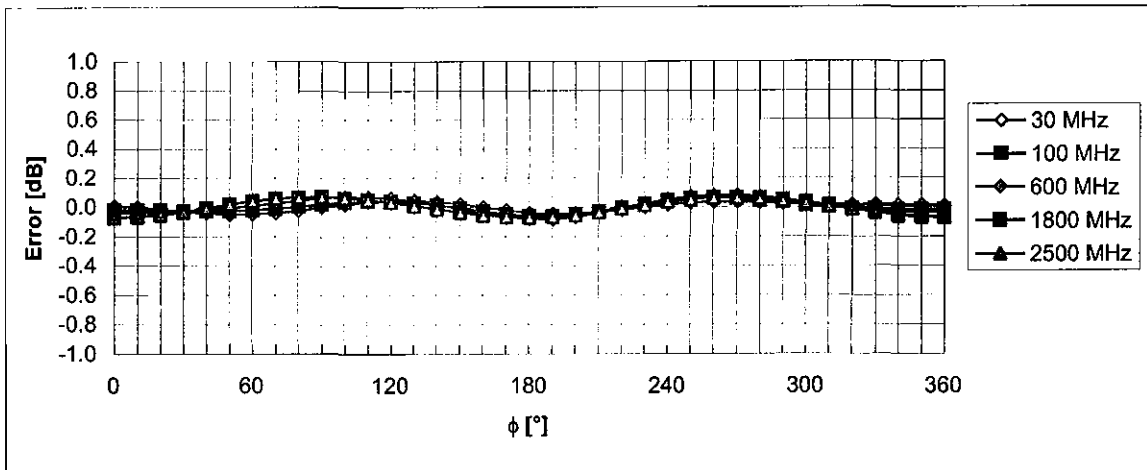
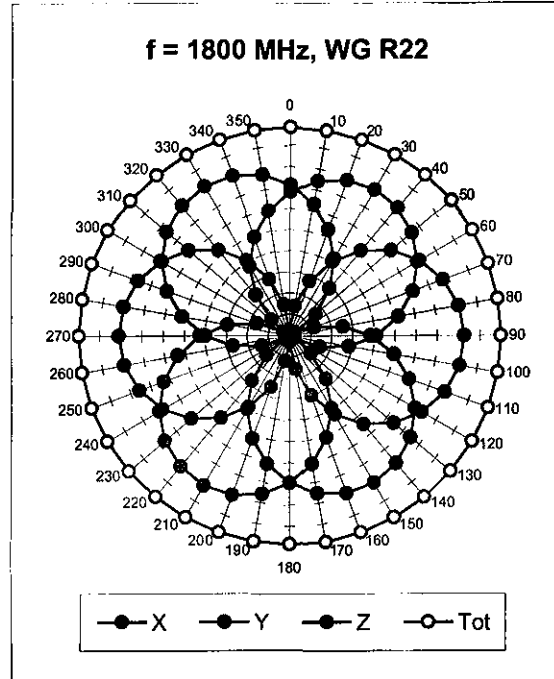
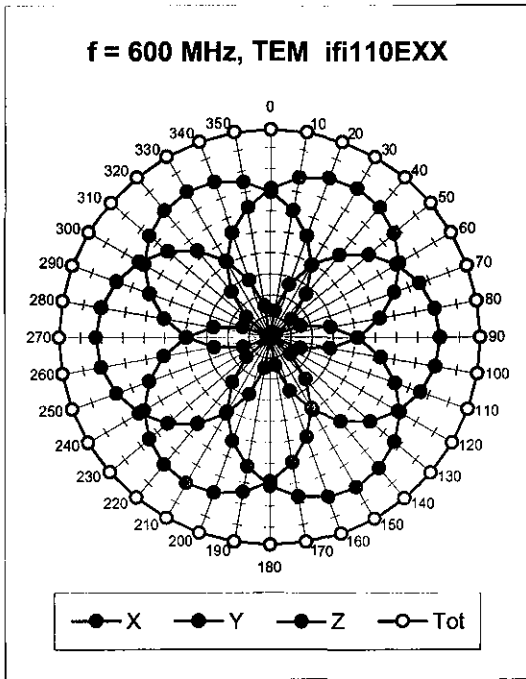
# Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



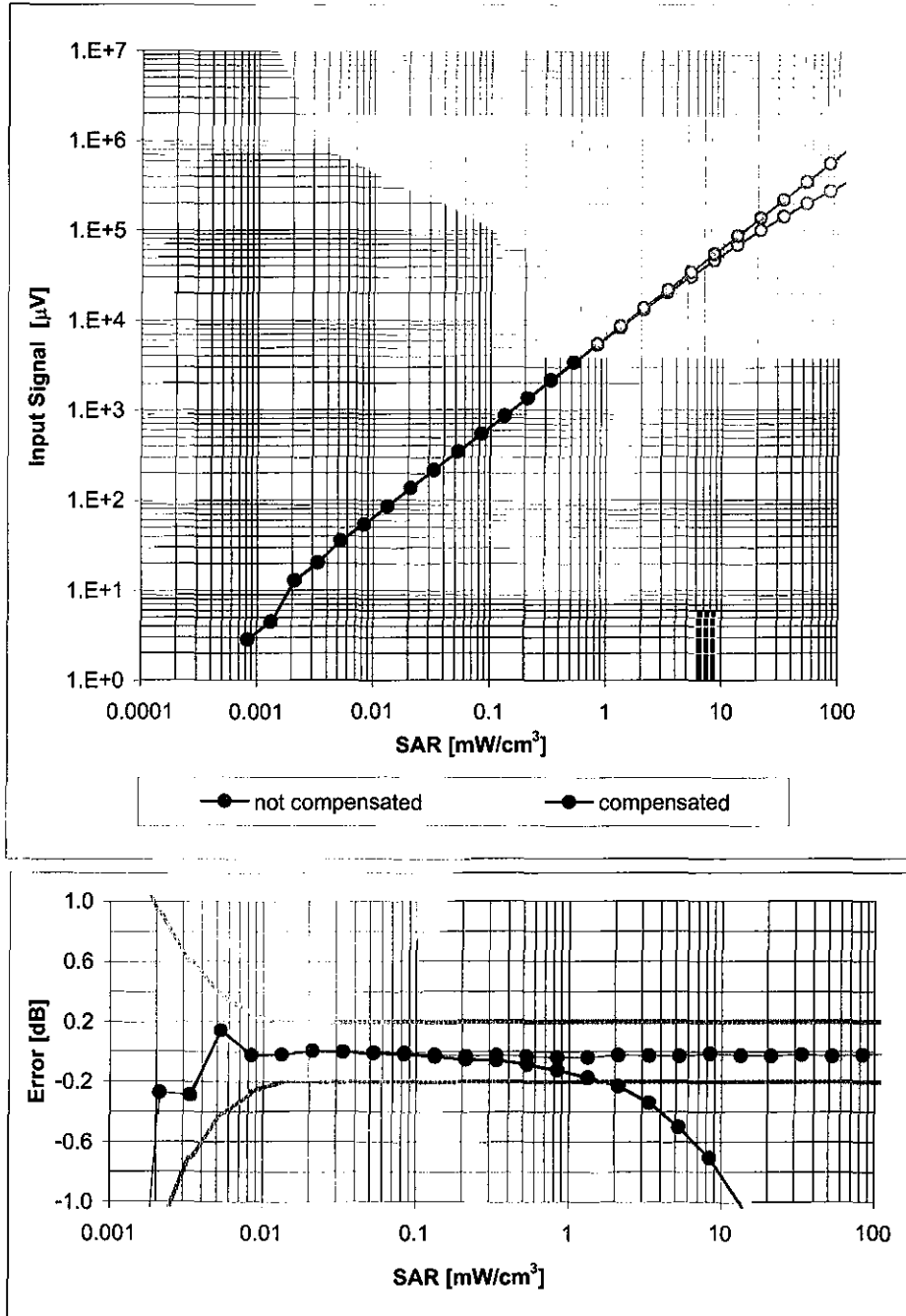
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

### Receiving Pattern ( $\phi$ ), $\vartheta = 0^\circ$



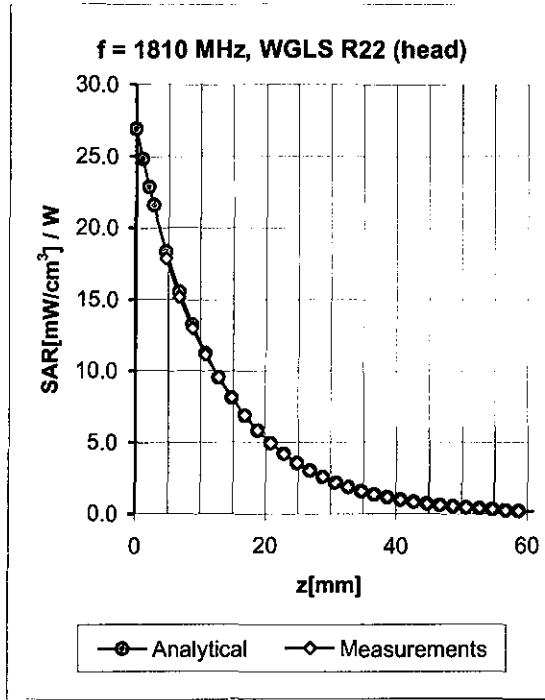
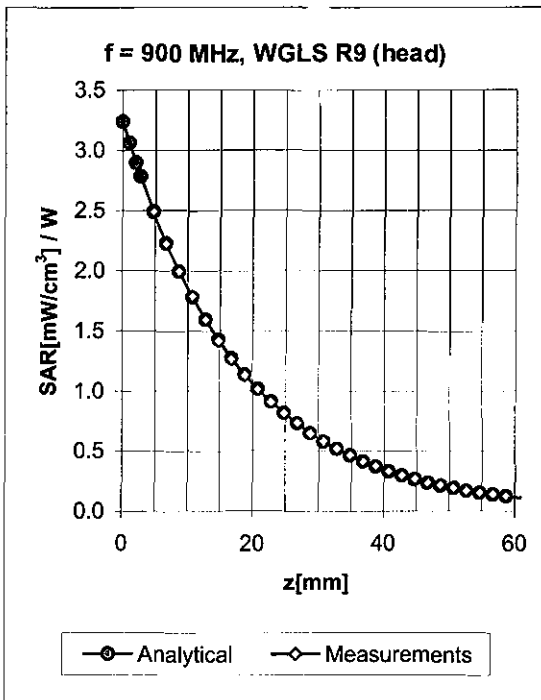
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

### Dynamic Range f(SAR<sub>head</sub>) (Waveguide R22, f = 1800 MHz)



Uncertainty of Linearity Assessment:  $\pm 0.6\%$  (k=2)

## Conversion Factor Assessment

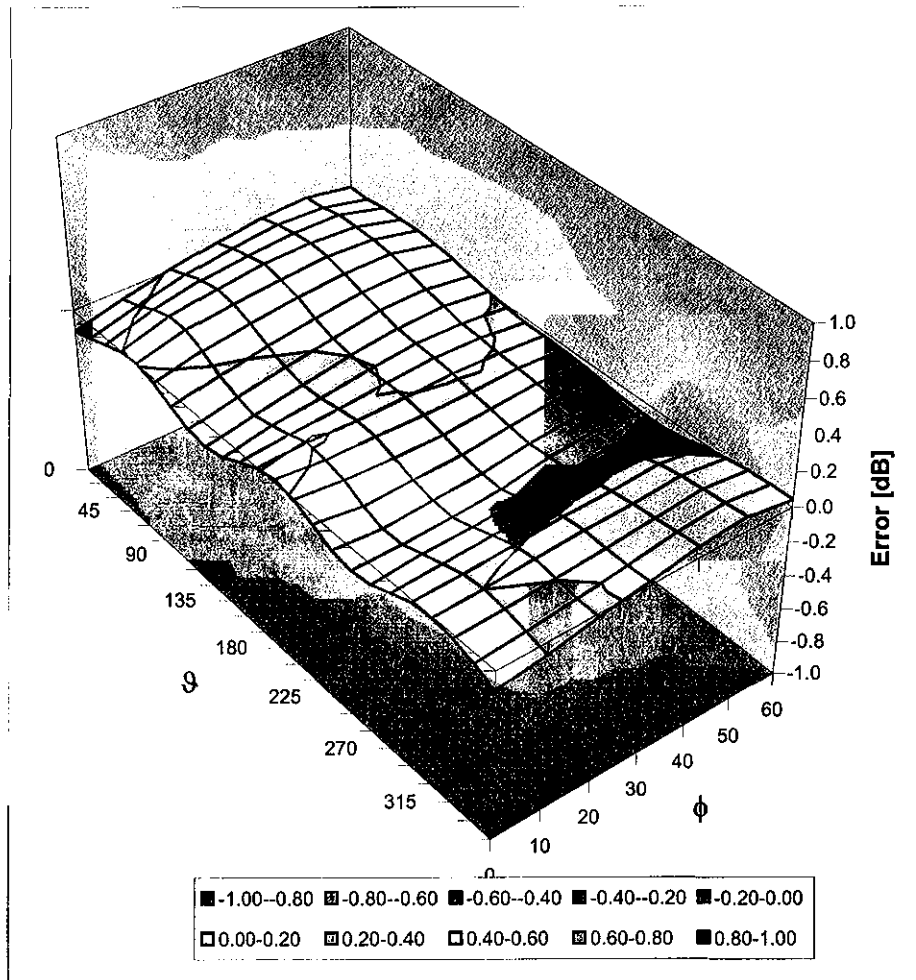


| f [MHz] | Validity [MHz] <sup>c</sup> | TSL  | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty  |
|---------|-----------------------------|------|--------------|--------------|-------|-------|--------------------|
| 900     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.97 ± 5%    | 0.33  | 2.62  | 5.98 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.54  | 2.61  | 4.92 ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.62  | 2.50  | 4.72 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Head | 39.2 ± 5%    | 1.80 ± 5%    | 0.94  | 1.62  | 4.44 ± 11.8% (k=2) |
| 900     | ± 50 / ± 100                | Body | 55.0 ± 5%    | 1.05 ± 5%    | 0.33  | 2.79  | 5.75 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.74  | 2.31  | 4.59 ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.97  | 1.96  | 4.34 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Body | 52.7 ± 5%    | 1.95 ± 5%    | 0.79  | 1.94  | 4.07 ± 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.

### Deviation from Isotropy in HSL

Error ( $\phi, \vartheta$ ),  $f = 900$  MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )

**Appendix 5**

**Measurement Uncertainty Budget**

| <i>a</i>   | <i>b</i>          | <i>c</i>        | <i>d</i>  | $e = f(d,k)$ | <i>f</i>    | <i>g</i>     | $h = c \times f / e$ | $i = c \times g / e$  | <i>k</i> |
|--|-------------------|-----------------|-----------|--------------|-------------|--------------|----------------------|-----------------------|----------|
| <b>Uncertainty Component</b>                       | IEEE 1528 section | Tol. ( $\pm$ %) | Prob Dist | Div.         | $c_i$ (1 g) | $c_i$ (10 g) | 1 g $u_i$ ( $\pm$ %) | 10 g $u_i$ ( $\pm$ %) | $v_i$    |
| <b>Measurement System</b>                          |                   |                 |           |              |             |              |                      |                       |          |
| Probe Calibration                                  | E.2.1             | 5.9             | N         | 1.00         | 1           | 1            | 5.9                  | 5.9                   | $\infty$ |
| Axial Isotropy                                     | E.2.2             | 4.7             | R         | 1.73         | 0.707       | 0.707        | 1.9                  | 1.9                   | $\infty$ |
| Hemispherical Isotropy                             | E.2.2             | 9.6             | R         | 1.73         | 0.707       | 0.707        | 3.9                  | 3.9                   | $\infty$ |
| Boundary Effect                                    | E.2.3             | 1.0             | R         | 1.73         | 1           | 1            | 0.6                  | 0.6                   | $\infty$ |
| Linearity  | E.2.4             | 4.7             | R         | 1.73         | 1           | 1            | 2.7                  | 2.7                   | $\infty$ |
| System Detection Limits                            | E.2.5             | 1.0             | R         | 1.73         | 1           | 1            | 0.6                  | 0.6                   | $\infty$ |
| Readout Electronics                                | E.2.6             | 0.3             | N         | 1.00         | 1           | 1            | 0.3                  | 0.3                   | $\infty$ |
| Response Time                                      | E.2.7             | 1.1             | R         | 1.73         | 1           | 1            | 0.6                  | 0.6                   | $\infty$ |
| Integration Time                                   | E.2.8             | 1.1             | R         | 1.73         | 1           | 1            | 0.6                  | 0.6                   | $\infty$ |
| RF Ambient Conditions - Noise                      | E.6.1             | 3.0             | R         | 1.73         | 1           | 1            | 1.7                  | 1.7                   | $\infty$ |
| RF Ambient Conditions - Reflections                | E.6.1             | 0.0             | R         | 1.73         | 1           | 1            | 0.0                  | 0.0                   | $\infty$ |
| Probe Positioner Mech. Tolerance                   | E.6.2             | 0.4             | R         | 1.73         | 1           | 1            | 0.2                  | 0.2                   | $\infty$ |
| Probe Positioning w.r.t Phantom                    | E.6.3             | 1.4             | R         | 1.73         | 1           | 1            | 0.8                  | 0.8                   | $\infty$ |
| Max. SAR Evaluation (ext., int., avg.)             | E.5               | 3.4             | R         | 1.73         | 1           | 1            | 2.0                  | 2.0                   | $\infty$ |
| <b>Test sample Related</b>                         |                   |                 |           |              |             |              |                      |                       |          |
| Test Sample Positioning                            | E.4.2             | 3.2             | N         | 1.00         | 1           | 1            | 3.2                  | 3.2                   | 29       |
| Device Holder Uncertainty                          | E.4.1             | 4.0             | N         | 1.00         | 1           | 1            | 4.0                  | 4.0                   | 8        |
| SAR drift  | 6.6.2             | 5.0             | R         | 1.73         | 1           | 1            | 2.9                  | 2.9                   | $\infty$ |
| <b>Phantom and Tissue Parameters</b>               |                   |                 |           |              |             |              |                      |                       |          |
| Phantom Uncertainty                                | E.3.1             | 4.0             | R         | 1.73         | 1           | 1            | 2.3                  | 2.3                   | $\infty$ |
| Liquid Conductivity (target)                       | E.3.2             | 5.0             | R         | 1.73         | 0.64        | 0.43         | 1.8                  | 1.2                   | $\infty$ |
| Liquid Conductivity (measurement)                  | E.3.3             | 3.3             | N         | 1.00         | 0.64        | 0.43         | 2.1                  | 1.4                   | $\infty$ |
| Liquid Permittivity (target)                       | E.3.2             | 5.0             | R         | 1.73         | 0.6         | 0.49         | 1.7                  | 1.4                   | $\infty$ |
| Liquid Permittivity (measurement)                  | E.3.3             | 1.9             | N         | 1.00         | 0.6         | 0.49         | 1.1                  | 0.9                   | $\infty$ |
| <b>Combined Standard Uncertainty</b>               |                   |                 | RSS       |              |             |              | 11.1                 | 10.8                  | 411      |
| <b>Expanded Uncertainty (95% CONFIDENCE LEVEL)</b> |                   |                 | $k=2$     |              |             |              | 22.2                 | 21.6                  |          |

**Appendix 6**

**Dipole Characterization Certificate**

# Certification of System Performance Check Targets

Based on WI-0396

-Historical Data-

| 900MHz  |                            |
|---|----------------------------|
| Reference Target:   | 10.9 (W/kg)                |
| Measurement Uncertainty (k=1):  | 9.0%                       |
| Measurement Period:   | 18-April-07 to 14-April-08 |
| # of tests performed:   | 1,125                      |
| Grand Average:  | 11.29 (W/kg)               |
| % Delta (Average - Reference Target)  | 3.6%                       |
| Is % Delta <= Expanded Measurement Uncertainty (k=2)?   | Yes                        |
| Accept/Reject Average as new system performance check target?                                     | ACCEPT                     |
| Applies to Dipole SN's:<br>55, 69, 77, 78, 79,<br>80, 91, 92, 93, 94,<br>95, 96, 97, 1d034, 1d035 |                            |

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

| Frequency | SAR Target (W/kg) | Permittivity | Conductivity (S/m) |
|-----------|-------------------|--------------|--------------------|
| 900MHz    | 11.29             | 41.5 ± 5%    | 0.97 ± 5%          |

-Approvals-

Submitted by:  Date:

Signed: 

Comments:

Approved by:  Date:

Signed: 

Comments:

# Certification of System Performance Check Targets

Based on WI-0396

-Historical Data-

| <b>1800MHz</b>  |                            |
|---|----------------------------|
| Reference Target:   | 38.4 (W/kg)                |
| Measurement Uncertainty (k=1):  | 9.0%                       |
| Measurement Period:   | 18-April-07 to 14-April-08 |
| # of tests performed:   | 1,028                      |
| Grand Average:  | 37.7 (W/kg)                |
| % Delta (Average - Reference Target)  | -1.7%                      |
| Is % Delta <= Expanded Measurement Uncertainty (k=2)?   | <b>Yes</b>                 |
| Accept/Reject <u>Average</u> as new system performance check target?  | <b>ACCEPT</b>              |
| <u>Applies to Dipole SN's:</u><br>246tr, 250tr, 251tr, 259tr,<br>263tr, 271tr, 272tr, 276tr,<br>277tr, 279tr, 280tr, 281tr,<br>283tr, 284tr, 2d128, 2d129 |                            |

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

| Frequency | SAR Target (W/kg) | Permittivity | Conductivity (S/m) |
|-----------|-------------------|--------------|--------------------|
| 1800MHz   | 37.7              | 40.0 ± 5%    | 1.40 ± 5%          |

-Approvals-

Submitted by:  Date:

Signed: 

Comments:

Approved by:  Date:

Signed: 

Comments: