



## Portable Cellular Phone SAR Test Report

**Tests Requested By:** Motorola Mobility, Inc.  
600 N. US Highway 45  
Libertyville, IL 60048

**Test Report #:** 23908-2F Rev. E  
**Date of Report:** Sep-09-2010, revised Oct-5-2010  
**Date of Test:** Jul-15-2010 to Aug-10-2010  
**FCC ID #:** IHDP56LD1  
**Generic Name:** MRQ6-334411F11

**Test Laboratory:** Motorola Mobility, Inc. - Product Safety & Compliance Laboratory  
600 N. US Highway 45  
Libertyville, IL 60048

**Report Author:** Thomas Knipple  
Senior RF Engineer

A handwritten signature in black ink, appearing to read 'Thomas Knipple', on a light-colored background.

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

### Accreditation:



2404

Tests:  
Electromagnetic Specific Absorption Rate

Procedures:  
IEC 62209-1  
RSS-102  
IEEE 1528 - 2003  
FCC OET Bulletin 65 (including Supplement C)  
Australian Communications Authority Radio  
Communications (Electromagnetic Radiation – Human  
Exposure) Standard 2003  
CENELEC EN 50360  
ARIB Std. T-56 (2002)

### 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. 2010

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>3</b>  |
| <b>2. Description of the Device Under Test</b>                                      | <b>4</b>  |
| 2.1 Antenna description                                                             | 4         |
| 2.2 Device description                                                              | 5         |
| <b>3. Test Equipment Used</b>                                                       | <b>6</b>  |
| 3.1 Dosimetric System                                                               | 6         |
| 3.2 Additional Equipment                                                            | 6         |
| <b>4. Electrical parameters of the tissue simulating liquid</b>                     | <b>7</b>  |
| <b>5. System Accuracy Verification</b>                                              | <b>8</b>  |
| <b>6. Test Results</b>                                                              | <b>9</b>  |
| 6.1 Head Adjacent Test Results                                                      | 12        |
| 6.2 Body Worn Test Results                                                          | 18        |
| <b>References</b>                                                                   | <b>23</b> |
| <br>                                                                                |           |
| <b>Appendix 1: SAR distribution comparison for the system accuracy verification</b> |           |
| <b>Appendix 2: SAR distribution plots for Phantom Head Adjacent Use</b>             |           |
| <b>Appendix 3: SAR distribution plots for Body Worn Configuration</b>               |           |
| <b>Appendix 4: Probe Calibration Certificate</b>                                    |           |
| <b>Appendix 5: Measurement Uncertainty Budget</b>                                   |           |
| <b>Appendix 6: Dipole Characterization Certificate</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 ANSI / IEEE C95.1 (1 g), the final stand-alone SAR readings for this phone are 1.55 W/kg for head-adjacent use and 0.50 W/kg for body-worn use. The final simultaneous-transmission SAR readings for this phone are 1.49 W/kg for head-adjacent use and 0.53 W/kg for body-worn use. These measurements were performed using a Dasy4<sup>TM</sup> v4.7 system manufactured by Schmid & Partner Engineering AG (SPEAG), of Zurich Switzerland.

## 2. Description of the Device Under Test

### 2.1 Antenna description

Antenna for 1800/1900 MHz Bands

|                   |                         |       |
|-------------------|-------------------------|-------|
| <b>Type</b>       | Internal                |       |
| <b>Location</b>   | Top Rear of Transceiver |       |
| <b>Dimensions</b> | Length                  | 56 mm |
|                   | Width                   | 13 mm |

Antenna for 850/900 MHz Bands

|                   |                            |       |
|-------------------|----------------------------|-------|
| <b>Type</b>       | Internal                   |       |
| <b>Location</b>   | Bottom Rear of Transceiver |       |
| <b>Dimensions</b> | Length                     | 54 mm |
|                   | Width                      | 12 mm |

Antenna for Bluetooth/Wi-Fi

|                   |                                |       |
|-------------------|--------------------------------|-------|
| <b>Type</b>       | Internal                       |       |
| <b>Location</b>   | Right-Side Rear of Transceiver |       |
| <b>Dimensions</b> | Length                         | 15 mm |
|                   | Width                          | 2 mm  |

**2.2 Device description<sup>1</sup>**

|                                                        |                                                                                                                                             |                   |                     |                     |                   |                     |                     |                     |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|---------------------|-------------------|---------------------|---------------------|---------------------|
| Serial Number(s)                                       | 351574040016601 (GSM/WCDMA conducted power measurements, all SAR testing)<br>351574040021486 (Wi-Fi/Bluetooth conducted power measurements) |                   |                     |                     |                   |                     |                     |                     |
| Mode(s) of Operation                                   | GSM 850                                                                                                                                     | GSM 900           | GSM 1800            | GSM 1900            | WCDMA 850         | WCDMA 1900          | Wi-Fi 802.11b/g/n   | Bluetooth           |
| Modulation Mode(s)                                     | GMSK                                                                                                                                        | GMSK              | GMSK                | GMSK                | QPSK              | QPSK                | BPSK                | GFSK                |
| Maximum Output Power Setting                           | 33.0 dBm                                                                                                                                    | 33.0 dBm          | 30.5 dBm            | 30.5 dBm            | 24.0 dBm          | 23.5 dBm            | 20 dBm              | 10 dBm              |
| Duty Cycle                                             | 1:8                                                                                                                                         | 1:8               | 1:8                 | 1:8                 | 1:1               | 1:1                 | 1:1                 | 1:1                 |
| Transmitting Frequency Range(s)                        | 824.2 - 848.8 MHz                                                                                                                           | 880.2 - 914.8 MHz | 1710.2 - 1784.8 MHz | 1850.2 - 1909.8 MHz | 826.4 - 846.6 MHz | 1852.4 - 1907.6 MHz | 2412.0 - 2462.5 MHz | 2402.0 - 2483.5 MHz |
| Production Unit or Identical Prototype (47 CFR §2.908) | Identical Prototype                                                                                                                         |                   |                     |                     |                   |                     |                     |                     |
| Device Category                                        | Portable                                                                                                                                    |                   |                     |                     |                   |                     |                     |                     |
| RF Exposure Limits                                     | General Population / Uncontrolled                                                                                                           |                   |                     |                     |                   |                     |                     |                     |

|                                 |                   |             |      |      |                   |             |      |      |                     |             |      |      |                     |             |      |      |
|---------------------------------|-------------------|-------------|------|------|-------------------|-------------|------|------|---------------------|-------------|------|------|---------------------|-------------|------|------|
| Mode(s) of Operation            | GPRS 850          |             |      |      | GPRS 900          |             |      |      | GPRS 1800           |             |      |      | GPRS 1900           |             |      |      |
| Modulation                      | GMSK              |             |      |      | GMSK              |             |      |      | GMSK                |             |      |      | GMSK                |             |      |      |
| Maximum Output Power Setting    | 33.0              | <b>31.0</b> | 29.0 | 27.0 | 33.0              | <b>31.0</b> | 29.0 | 27.0 | 30.5                | <b>28.5</b> | 26.5 | 24.5 | 30.5                | <b>28.5</b> | 26.5 | 24.5 |
| Duty Cycle                      | 1:8               | <b>2:8</b>  | 3:8  | 4:8  | 1:8               | <b>2:8</b>  | 3:8  | 4:8  | 1:8                 | <b>2:8</b>  | 3:8  | 4:8  | 1:8                 | <b>2:8</b>  | 3:8  | 4:8  |
| Transmitting Frequency Range(s) | 824.2 - 848.8 MHz |             |      |      | 880.2 - 914.8 MHz |             |      |      | 1710.2 - 1784.8 MHz |             |      |      | 1850.2 - 1909.8 MHz |             |      |      |

|                                 |                   |             |      |      |                   |             |      |      |                     |             |      |      |                     |             |      |      |
|---------------------------------|-------------------|-------------|------|------|-------------------|-------------|------|------|---------------------|-------------|------|------|---------------------|-------------|------|------|
| Mode(s) of Operation            | EDGE 850          |             |      |      | EDGE 900          |             |      |      | EDGE 1800           |             |      |      | EDGE 1900           |             |      |      |
| Modulation                      | 8PSK              |             |      |      | 8PSK              |             |      |      | 8PSK                |             |      |      | 8PSK                |             |      |      |
| Maximum Output Power Setting    | 28.5              | <b>26.5</b> | 24.5 | 22.5 | 28.5              | <b>26.5</b> | 24.5 | 22.5 | 27.5                | <b>25.5</b> | 23.5 | 21.5 | 27.5                | <b>25.5</b> | 23.5 | 21.5 |
| Duty Cycle                      | 1:8               | <b>2:8</b>  | 3:8  | 4:8  | 1:8               | <b>2:8</b>  | 3:8  | 4:8  | 1:8                 | <b>2:8</b>  | 3:8  | 4:8  | 1:8                 | <b>2:8</b>  | 3:8  | 4:8  |
| Transmitting Frequency Range(s) | 824.2 - 848.8 MHz |             |      |      | 880.2 - 914.8 MHz |             |      |      | 1710.2 - 1784.8 MHz |             |      |      | 1850.2 - 1909.8 MHz |             |      |      |

<sup>1</sup> **Bolded** entries in the tables indicate data mode configurations of highest time-average power output per band and data mode type, and thus were utilized for SAR testing in this report.

### 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 Date    | Cal Due Date |
|--------------------------------------------|---------------|-------------|--------------|
| DASY4™ DAE V1                              | 440           | Feb-17-2010 | Feb-17-2011  |
| E-Field Probe ES3DV3                       | 3184          | Sep-18-2009 | Sep-18-2010  |
| DASY4™ DAE V1                              | 703           | Sep-17-2009 | Sep-17-2010  |
| E-Field Probe ES3DV3                       | 3037          | Sep-18-2009 | Sep-18-2010  |
| DASY4™ DAE V1                              | 376           | Jul-13-2010 | Jul-13-2011  |
| E-Field Probe ES3DV3                       | 3124          | Aug-11-2010 | Aug-11-2011  |
| S.A.M. Phantom used for 800/900 MHz        | TP-1131       |             |              |
| S.A.M. Phantom used for 800/900 MHz        | TP-1005       |             |              |
| S.A.M. Phantom used for 1800/1900/2450 MHz | TP-1250       |             |              |
| S.A.M. Phantom used for 1800/1900/2450 MHz | TP-1139       |             |              |
| Dipole Validation Kit, DV835V2             | 436TR         | Mar-17-2010 | Mar-17-2011  |
| Dipole Validation Kit, DV835V2             | 420TR         | Mar-17-2010 | Mar-17-2011  |
| Dipole Validation Kit, DV1800V2            | 272TR         | Mar-17-2010 | Mar-17-2011  |
| Dipole Validation Kit, DV1800V2            | 259TR         | Mar-17-2010 | Mar-17-2011  |
| Dipole Validation Kit, DV2450V2            | 766           | Mar-17-2010 | Mar-17-2011  |

#### 3.2 Additional Equipment

| Description                   | Serial Number | Cal Date    | Cal Due Date |
|-------------------------------|---------------|-------------|--------------|
| Signal Generator HP8648C      | 3847A04822    | Apr-22-2009 | Apr-22-2011  |
| Power Meter E4419B            | GB39511082    | Apr-24-2009 | Apr-24-2011  |
| Power Sensor #1 - E9301A      | US39210915    | Dec-04-2009 | Dec-04-2010  |
| Power Sensor #2 - E9301A      | US39210916    | Nov-16-2009 | Nov-16-2010  |
| Signal Generator HP8648C      | 3847A04843    | Apr-22-2009 | Apr-22-2011  |
| Power Meter E4419B            | US39250622    | Dec-22-2009 | Dec-22-2011  |
| Power Sensor #1 - E9301A      | US39210929    | Nov-19-2009 | Nov-19-2010  |
| Power Sensor #2 - E9301A      | US39210930    | Nov-19-2009 | Nov-19-2010  |
| Signal Generator HP8648C      | 3847A04810    | Oct-30-2009 | Oct-30-2011  |
| Power Meter E4419B            | GB39511087    | Dec-22-2009 | Dec-22-2011  |
| Power Sensor #1 - E9301A      | US39211007    | Dec-04-2009 | Dec-04-2010  |
| Power Sensor #2 - E9301A      | US39211008    | Dec-04-2009 | Dec-04-2010  |
| Network Analyzer HP8753ES     | US39172529    | Jun-04-2010 | Jun-04-2011  |
| 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].

E-field probes calibrated at 1810 MHz were used for "1900 MHz" band (1850 MHz - 1910 MHz) SAR measurements. FCC KDB 450824 provides additional requirements on page 3 of 6 for SAR testing that is performed with probe calibration points that are more than 50 MHz removed from the measured bands. The KDB requires; "(2) When nominal tissue dielectric parameters are specified in the probe calibration data, the tissue dielectric parameters measured for routine measurements should be less than the target  $\epsilon_r$  and higher than the target Sigma values to minimize SAR underestimations". The 1900 MHz simulated tissues listed below meet this criteria.

| $f$<br>(MHz) | Tissue<br>type | Limits / Measured     | Dielectric Parameters |                |           |
|--------------|----------------|-----------------------|-----------------------|----------------|-----------|
|              |                |                       | $\epsilon_r$          | $\sigma$ (S/m) | Temp (°C) |
| 835          | Head           | Measured, Jul-16-2010 | 41.2                  | 0.91           | 20.7      |
|              |                | Measured, Jul-17-2010 | 41.4                  | 0.92           | 20.7      |
|              |                | Measured, Sep-24-2010 | 40.3                  | 0.88           | 21.0      |
|              |                | Recommended Limits    | 41.5 $\pm$ 5%         | 0.90 $\pm$ 5%  | 18-25     |
|              | Body           | Measured, Aug-02-2010 | 55.7                  | 1.00           | 20.4      |
|              |                | Recommended Limits    | 55.2 $\pm$ 5%         | 0.97 $\pm$ 5%  | 18-25     |
| 1880         | Head           | Measured, Jul-15-2010 | 39.6                  | 1.46           | 19.8      |
|              |                | Measured, Jul-16-2010 | 39.6                  | 1.45           | 20.0      |
|              |                | Measured, Jul-22-2010 | 39.2                  | 1.46           | 19.8      |
|              |                | Measured, Sep-08-2010 | 38.0                  | 1.46           | 19.6      |
|              |                | Recommended Limits    | 40.0 $\pm$ 5%         | 1.40 $\pm$ 5%  | 18-25     |
|              | Body           | Measured, Aug-02-2010 | 51.0                  | 1.58           | 20.0      |
|              |                | Recommended Limits    | 53.3 $\pm$ 5%         | 1.52 $\pm$ 5%  | 18-25     |
| 2450         | Head           | Measured, Aug-10-2010 | 36.7                  | 1.84           | 19.9      |
|              |                | Measured, Sep-08-2010 | 38.1                  | 1.84           | 20.0      |
|              |                | Measured, Sep-24-2010 | 37.2                  | 1.86           | 19.8      |
|              |                | Recommended Limits    | 39.2 $\pm$ 10%        | 1.80 $\pm$ 5%  | 18-25     |
|              | Body           | Measured, Aug-02-2010 | 49.9                  | 2.04           | 19.7      |
|              |                | Measured, Aug-10-2010 | 49.7                  | 2.01           | 19.7      |
|              |                | Recommended Limits    | 52.7 $\pm$ 10%        | 1.95 $\pm$ 5%  | 18-25     |

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

| Ingredient | 835 MHz /<br>900 MHz<br>Head | 835 MHz /<br>900 MHz<br>Body | 1800 MHz /<br>1900 MHz<br>Head | 1800 MHz /<br>1900 MHz<br>Body | 2450 MHz<br>Head | 2450 MHz<br>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 in 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.

| <b>f<br/>(MHz)</b> | <b>Description</b>           | <b>SAR (W/kg),<br/>1 gram</b> | <b>Dielectric Parameters</b> |                | <b>Ambient<br/>Temp (°C)</b> | <b>Tissue<br/>Temp (°C)</b> |
|--------------------|------------------------------|-------------------------------|------------------------------|----------------|------------------------------|-----------------------------|
|                    |                              |                               | $\epsilon_r$                 | $\sigma$ (S/m) |                              |                             |
| <b>835</b>         | <b>Measured, Jul-16-2010</b> | 9.30                          | 41.2                         | 0.91           | 20.0                         | 20.7                        |
|                    | <b>Measured, Jul-17-2010</b> | 9.35                          | 41.4                         | 0.92           | 20.3                         | 20.7                        |
|                    | <b>Measured, Jul-21-2010</b> | 9.55                          | 41.4                         | 0.91           | 19.9                         | 19.7                        |
|                    | <b>Measured, Aug-02-2010</b> | 9.25                          | 40.5                         | 0.90           | 20.0                         | 20.4                        |
|                    | <b>Measured, Sep-24-2010</b> | 9.45                          | 40.3                         | 0.88           | 19.9                         | 21.0                        |
|                    | <b>Recommended Limits</b>    | 9.59                          | 41.5 $\pm 5\%$               | 0.90 $\pm 5\%$ | 18-25                        | 18-25                       |
| <b>1800</b>        | <b>Measured, Jul-15-2010</b> | 36.90                         | 39.9                         | 1.37           | 20.0                         | 19.8                        |
|                    | <b>Measured, Jul-16-2010</b> | 36.50                         | 40.0                         | 1.37           | 19.9                         | 20.0                        |
|                    | <b>Measured, Jul-22-2010</b> | 40.85                         | 39.6                         | 1.37           | 20.3                         | 19.8                        |
|                    | <b>Measured, Aug-02-2010</b> | 36.75                         | 39.1                         | 1.37           | 20.1                         | 20.2                        |
|                    | <b>Measured, Sep-08-2010</b> | 35.40                         | 38.3                         | 1.37           | 19.8                         | 19.6                        |
|                    | <b>Recommended Limits</b>    | 38.36                         | 40.0 $\pm 5\%$               | 1.40 $\pm 5\%$ | 18-25                        | 18-25                       |
| <b>2450</b>        | <b>Measured, Aug-01-2010</b> | 54.00                         | 37.3                         | 1.83           | 20.0                         | 19.8                        |
|                    | <b>Measured, Aug-10-2010</b> | 54.50                         | 36.7                         | 1.84           | 20.1                         | 19.9                        |
|                    | <b>Measured, Sep-08-2010</b> | 51.50                         | 38.1                         | 1.84           | 20.0                         | 19.9                        |
|                    | <b>Measured, Sep-24-2010</b> | 54.50                         | 37.2                         | 1.86           | 19.8                         | 19.9                        |
|                    | <b>Recommended Limits</b>    | 54.55                         | 39.2 $\pm 10\%$              | 1.80 $\pm 5\%$ | 18-25                        | 18-25                       |

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

| <b>Description</b>      | <b>Serial Number</b> | <b>f<br/>(MHz)</b> | <b>Conversion Factor</b> | <b>Cal Cert<br/>pg #</b> |
|-------------------------|----------------------|--------------------|--------------------------|--------------------------|
| E-Field Probe<br>ES3DV3 | 3184                 | 835                | 6.26                     | 8 of 9                   |
|                         |                      | 1810               | 5.14                     | 8 of 9                   |
|                         |                      | 2450               | 4.44                     | 8 of 9                   |
| E-Field Probe<br>ES3DV3 | 3037                 | 835                | 6.25                     | 8 of 9                   |
|                         |                      | 1810               | 5.05                     | 8 of 9                   |
|                         |                      | 2450               | 4.41                     | 8 of 9                   |
| E-Field Probe<br>ES3DV3 | 3124                 | 835                | 5.89                     | 5 of 11                  |
|                         |                      | 1810               | 4.89                     | 5 of 11                  |
|                         |                      | 2450               | 4.35                     | 5 of 11                  |

## 6. Test Results

The test sample was operated using an actual transmission through a base station simulator. The base station simulator was set up 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 default settings for the “coarse” and “cube” scans were chosen and used for measurements. The grid spacing of the course scan was set to 15 mm or less 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 SNN5877A - 1500 mAH Battery

The battery with the highest capacity is the SNN5877A. 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. The configurations that resulted in the highest SAR values were tested using the other batteries listed above.

The location of peak SAR for a handset is a function of the type of antenna implemented, the frequencies of transmission, the configuration of phone placement against the measurement phantom, the shape of the measurement phantom, any unintended secondary radiating elements on the DUT, etc.. Therefore the location of peak SAR may not coincide with the location of the transmitting antenna.

### Evaluation of WCDMA Modes

Per the “SAR Measurement Procedures for 3G Devices” released in October, 2007, 12.2 kbps RMC, 12.2 kbps AMR, HS-DPCCH Sub-test 1-4, and E-DCH Sub-test 1-5 modes were considered. The conducted power measurements (per section 5.2 of 3GPP TS 34.121) for each mode are shown in the table below.

| Band       | Channel | Conducted power (dBm) for WCDMA modes |       | Conducted Power (dBm) for WCDMA – HSDPA (Rel 5) Modes |           |           |           | Conducted Power (dBm) for WCDMA – HSPA (HSUPA/HSDPA-Rel 6) Modes |           |           |           |           |
|------------|---------|---------------------------------------|-------|-------------------------------------------------------|-----------|-----------|-----------|------------------------------------------------------------------|-----------|-----------|-----------|-----------|
|            |         | RMC                                   | AMR   | Subtest 1                                             | Subtest 2 | Subtest 3 | Subtest 4 | Subtest 1                                                        | Subtest 2 | Subtest 3 | Subtest 4 | Subtest 5 |
| WCDMA 850  | 4132    | 24.08                                 | 24.08 | 24.13                                                 | 24.12     | 24.10     | 24.16     | 24.08                                                            | 24.12     | 24.07     | 24.12     | 24.12     |
|            | 4180    | 24.18                                 | 24.07 | 24.06                                                 | 24.19     | 24.19     | 24.19     | 24.02                                                            | 24.21     | 24.20     | 24.17     | 24.18     |
|            | 4233    | 24.02                                 | 23.95 | 23.96                                                 | 23.88     | 23.97     | 23.90     | 24.02                                                            | 23.90     | 23.93     | 23.88     | 23.97     |
| WCDMA 1900 | 9262    | 23.99                                 | 23.99 | 24.15                                                 | 24.12     | 24.24     | 24.21     | 24.10                                                            | 24.13     | 24.21     | 24.18     | 24.24     |
|            | 9400    | 23.98                                 | 23.96 | 24.05                                                 | 24.05     | 24.14     | 24.09     | 24.01                                                            | 24.00     | 24.08     | 24.07     | 24.10     |
|            | 9538    | 23.90                                 | 23.89 | 23.86                                                 | 23.89     | 23.91     | 23.86     | 23.93                                                            | 23.96     | 23.98     | 24.00     | 24.00     |

### Maximum Power Reduction (MPR)

According to 3GPP 25.101 sub-clause 6.2.2, the maximum output power is allowed to be reduced by following the table.

**Table 6.1A: UE maximum output power with HS-DPCCH and E-DCH**

| UE transmit channel configuration                                                                                                                                                                       | CM (dB)              | MPR (dB)      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------|
| For all combinations of; DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH                                                                                                                                    | $0 \leq CM \leq 3.5$ | MAX (CM-1, 0) |
| Note 1: CM = 1 for $\beta_c/\beta_d = 12/15$ , $\beta_{hs}/\beta_c = 24/15$ . For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference. |                      |               |

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to-average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present, the beta gains on those channels are reduced first to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done. However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a mechanism to compensate for the power back-off by increasing the gain of TX\_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

### **Evaluation of Wi-Fi 802.11 Modes**

Per “SAR Measurement Procedures for 802.11 a/b/g Transmitters” (FCC KDB 248227), power measurements were performed for 802.11 operational modes. The conducted power measurements for each mode are shown in the table below. SAR testing for 802.11 modes was performed with the transmitter mode and data rate set to the configurations highlighted in bold below.

| Band           | Channel | Conducted Power (dBm) for 802.11b Mode Data Rates |               |                 |                |
|----------------|---------|---------------------------------------------------|---------------|-----------------|----------------|
|                |         | <b>1 Mbps</b>                                     | <b>2 Mbps</b> | <b>5.5 Mbps</b> | <b>11 Mbps</b> |
| Wi-Fi 2450 MHz | 1       | <b>17.46</b>                                      | 17.40         | 17.23           | 17.17          |
|                | 6       | <b>18.07</b>                                      | 18.06         | 17.95           | 17.85          |
|                | 11      | <b>18.49</b>                                      | 18.56         | 18.32           | 18.59          |

| Band           | Channel | Conducted Power (dBm) for 802.11g Mode Data Rates |               |                |                |                |                |                |                |
|----------------|---------|---------------------------------------------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                |         | <b>6 Mbps</b>                                     | <b>9 Mbps</b> | <b>12 Mbps</b> | <b>18 Mbps</b> | <b>24 Mbps</b> | <b>36 Mbps</b> | <b>48 Mbps</b> | <b>54 Mbps</b> |
| Wi-Fi 2450 MHz | 1       | 14.62                                             | 14.32         | 14.27          | 14.07          | 14.00          | 13.95          | 12.43          | 12.47          |
|                | 6       | 17.47                                             | 17.28         | 16.87          | 16.49          | 14.52          | 14.68          | 13.08          | 13.25          |
|                | 11      | 17.98                                             | 17.83         | 17.56          | 17.16          | 15.30          | 15.25          | 13.82          | 13.84          |

| Band           | Channel | Conducted Power (dBm) for 802.11n Mode Data Rates (20 MHz Channel, 800 ns Guard Interval) |                |                  |                |                |                |                  |                |
|----------------|---------|-------------------------------------------------------------------------------------------|----------------|------------------|----------------|----------------|----------------|------------------|----------------|
|                |         | <b>6.5 Mbps</b>                                                                           | <b>13 Mbps</b> | <b>19.5 Mbps</b> | <b>26 Mbps</b> | <b>39 Mbps</b> | <b>52 Mbps</b> | <b>58.5 Mbps</b> | <b>65 Mbps</b> |
| Wi-Fi 2450 MHz | 1       | 14.21                                                                                     | 14.24          | 13.77            | 13.91          | 13.81          | 12.30          | 12.34            | 11.47          |
|                | 6       | 17.10                                                                                     | 16.64          | 16.29            | 14.58          | 14.57          | 13.11          | 12.97            | 12.05          |
|                | 11      | 17.97                                                                                     | 17.32          | 17.00            | 15.30          | 15.21          | 13.76          | 13.67            | 12.89          |

| Band           | Channel | Conducted Power (dBm) for 802.11n Mode Data Rates (20 MHz Channel, 400 ns Guard Interval) |                  |                  |                  |                  |                  |                |                  |
|----------------|---------|-------------------------------------------------------------------------------------------|------------------|------------------|------------------|------------------|------------------|----------------|------------------|
|                |         | <b>7.2 Mbps</b>                                                                           | <b>14.4 Mbps</b> | <b>21.6 Mbps</b> | <b>28.8 Mbps</b> | <b>43.3 Mbps</b> | <b>57.7 Mbps</b> | <b>65 Mbps</b> | <b>72.2 Mbps</b> |
| Wi-Fi 2450 MHz | 1       | 14.14                                                                                     | 14.24            | 13.64            | 13.84            | 13.68            | 12.20            | 12.25          | 11.35            |
|                | 6       | 17.06                                                                                     | 16.60            | 16.17            | 14.55            | 14.40            | 12.89            | 12.94          | 12.04            |
|                | 11      | 17.72                                                                                     | 17.26            | 16.80            | 15.13            | 15.03            | 13.51            | 13.52          | 12.59            |

### Evaluation of Bluetooth Mode

Per "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas" (FCC KDB 648474), the necessity of stand-alone and simultaneous SAR testing was evaluated for the Bluetooth transmitter of the device under test. Note that Bluetooth mode is not intended for use in configurations against the head, and this evaluation considers only the body-worn configurations.

The conditions under which the device under test can be excluded from stand-alone and simultaneous SAR testing, per FCC KDB 648474, are summarized as follows:

Table 1 – Output Power Thresholds for Unlicensed Transmitters

|                  | 2.45 | 5.15 - 5.35 | 5.47 - 5.85 | GHz |
|------------------|------|-------------|-------------|-----|
| $P_{\text{out}}$ | 12   | 6           | 5           | mW  |

Device output power should be rounded to the nearest mW to compare with values specified in this table.

Table 2 – Summary of SAR Evaluation Requirements for a Cell Phone with Multiple Transmitters

|                         | Individual Transmitter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Simultaneous Transmission                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Licensed Transmitters   | Routine evaluation required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SAR not required:<br>Unlicensed only                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Unlicensed Transmitters | <p>When there is no simultaneous transmission –</p> <ul style="list-style-type: none"> <li>output <math>\leq 60</math> f. SAR not required</li> <li>output <math>&gt; 60</math> f. stand-alone SAR required</li> </ul> <p>When there is simultaneous transmission –</p> <p>Stand-alone SAR not required when</p> <ul style="list-style-type: none"> <li>output <math>\leq 2 P_{\text{out}}</math> and antenna is <math>\geq 5.0</math> cm from other antennas</li> <li>output <math>\leq P_{\text{out}}</math> and antenna is <math>\geq 2.5</math> cm from other antennas</li> </ul> | <ul style="list-style-type: none"> <li>when stand-alone 1-g SAR is not required and antenna is <math>\geq 5</math> cm from other antennas</li> </ul> <p>Licensed &amp; Unlicensed</p> <ul style="list-style-type: none"> <li>when the sum of the 1-g SAR is <math>&lt; 1.6</math> W/kg for all simultaneous transmitting antennas</li> <li>when SAR to peak location separation ratio of simultaneous transmitting antenna pair is <math>&lt; 0.3</math></li> </ul>            |
|                         | <p>Otherwise stand-alone SAR is required</p> <p>When stand-alone SAR is required</p> <ul style="list-style-type: none"> <li>test SAR on highest output channel for each wireless mode and exposure condition</li> <li>if SAR for highest output channel is <math>&gt; 50\%</math> of SAR limit, evaluate all channels according to normal procedures</li> </ul>                                                                                                                                                                                                                       | <p>SAR required:</p> <p>Licensed &amp; Unlicensed</p> <p>antenna pairs with SAR to peak location separation ratio <math>\geq 0.3</math>; test is only required for the configuration that results in the highest SAR in stand-alone configuration for each wireless mode and exposure condition</p> <p>Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply</p> |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Per the highlighted criteria:

1. The highest output conducted power measured for Bluetooth on the device under test is 9.62 mW [ $< 12$  mW]
2. The separation distance between the Bluetooth antenna and the nearest main antenna is 1.64 cm [ $< 2.5$  cm]
3. The highest 1-g Body-Worn SAR values for primary transmitters are:  
 GSM 850 ( $0.23 \text{ W/kg}$ ); GSM 1900 ( $0.26 \text{ W/kg}$ ); WCDMA 850 ( $0.27 \text{ W/kg}$ ); WCDMA 1900 ( $0.50 \text{ W/kg}$ ) [ $< 1.2 \text{ W/kg}$ ]

Based on the output power of the Bluetooth transmitter, its antenna separation distance from the nearest primary antenna, and the SAR values of the primary transmitter modes, neither stand-alone nor simultaneous SAR measurements are required for the device under test. Pictorial representation of the antenna locations and separation distances are given in Exhibit 7d.

## 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  $\text{Extrapolated SAR} = \text{Measured SAR} * 10^{(-\text{drift}/10)}$ . 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 tables below also include the highest SAR value summations for primary and secondary co-located transmitters, except as noted, with the results indicated in italics.

The guidelines provided in “SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas” (KDB publication 648474 - D01 v01r05) were utilized for evaluation of the need for simultaneous transmission SAR testing. These guidelines direct that if the SAR-to-peak-location separation ratio for two simultaneously transmitting antennas is < 0.3 then SAR evaluation for simultaneous transmission is not required.

For WCDMA 1900 and Wi-Fi in the Left Head Cheek position the SAR-to-peak-location separation ratio is 0.28, and thus no testing was performed to determine the aggregate 1 g SAR in this configuration. SAR plots with the Wi-Fi SAR overlaid upon the WCDMA 1900 SAR are provided in Appendix 2 for this configuration, to provide visual indication of the separation of the SAR hotspots for each transmitter.

For WCDMA 850 and Wi-Fi in the Left Head Cheek position the SAR-to-peak-location separation ratio is 0.50. For WCDMA 1900 and Wi-Fi in the Left Head 15° Tilt position the SAR-to-peak-location separation ratio is 0.33. For these configurations, combined SAR measurements were required to determine the aggregate 1 g SAR for simultaneous transmission evaluation. The results of these measurements are given in the tables below where noted, with additional SAR plots of the combined measurements provided in Appendix 2.

Additional SAR measurements for simultaneous transmission evaluation were performed for each of the single transmitters using an extended zoom scan. This extended zoom scan was created to encompass the zoom scan volumes that were found previously in each of the single transmit SAR tests.

- For WCDMA 1900 MHz + Wi-Fi, the outer dimensions of the extended zoom scan were X = 40 mm, Y = 64 mm, Z = 30 mm with a step size of X = 8 mm, Y = 8 mm, Z = 5 mm.
- For WCDMA 850 MHz + Wi-Fi, the outer dimensions of the extended zoom scan were X = 56 mm, Y = 56 mm, Z = 30 mm with a step size of X = 8 mm, Y = 8 mm, Z = 5 mm.

The location of this extended zoom scan was established by using X, Y grid offsets from the "Grid Reference Point" in DASY4.7. The results were then combined via the DASY4.7 Multi-Band Combiner feature. A comparison can be performed between the WCDMA 850 MHz Left head cheek stand alone measurement (p56) and the one performed for the simultaneous measurements (p66). Likewise, a comparison can be performed between the WCDMA 1900 Left Head 15 degree tilt standalone measurement (p62) and the one performed for the simultaneous measurements (p 69). The measurements were not performed sequentially and thus may show slightly different results due to a number of reasons including, but not limited to, slight differences in DUT positioning.

The methods used for these additional SAR measurements for simultaneous transmission evaluation are approved per FCC consultation contained within TCB PBA tracking Number 373736 (Pre PBA Tracking Number 294775) for this filing only.

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  $\pm$  0.5 cm.

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

| <b>Description</b>   | <b>Serial Number</b> | <b>f (MHz)</b> | <b>Conversion Factor</b> | <b>Cal Cert pg #</b> |
|----------------------|----------------------|----------------|--------------------------|----------------------|
| E-Field Probe ES3DV3 | 3184                 | 835            | 6.26                     | 8 of 9               |
|                      |                      | 1810           | 5.14                     | 8 of 9               |
|                      |                      | 2450           | 4.44                     | 8 of 9               |
| E-Field Probe ES3DV3 | 3037                 | 835            | 6.25                     | 8 of 9               |
|                      |                      | 1810           | 5.05                     | 8 of 9               |
|                      |                      | 2450           | 4.41                     | 8 of 9               |
| E-Field Probe ES3DV3 | 3124                 | 835            | 5.89                     | 5 of 11              |
|                      |                      | 1810           | 4.89                     | 5 of 11              |
|                      |                      | 2450           | 4.35                     | 5 of 11              |

| Left Head Cheek Position                 |              |                                       |              |               |                    |                        |                    |                        |
|------------------------------------------|--------------|---------------------------------------|--------------|---------------|--------------------|------------------------|--------------------|------------------------|
| <i>f</i><br>(MHz)                        | Description  | Conducted<br>Output<br>Power<br>(dBm) | Temp<br>(°C) | Drift<br>(dB) | 10 g SAR value     |                        | 1 g SAR value      |                        |
|                                          |              |                                       |              |               | Measured<br>(W/kg) | Extrapolated<br>(W/kg) | Measured<br>(W/kg) | Extrapolated<br>(W/kg) |
| <b>GSM<br/>850</b>                       | Channel 128  | 32.88                                 |              |               |                    |                        |                    |                        |
|                                          | Channel 190  | 32.83                                 | 20.4         | 0.052         | 0.566              | 0.57                   | 0.747              | 0.75                   |
|                                          | Channel 251  | 32.92                                 |              |               |                    |                        |                    |                        |
| <b>GSM<br/>1900</b>                      | Channel 512  | 30.57                                 |              |               |                    |                        |                    |                        |
|                                          | Channel 661  | 30.46                                 | <b>20.3</b>  | <b>0.024</b>  | <b>0.313</b>       | <b>0.31</b>            | <b>0.572</b>       | <b>0.57</b>            |
|                                          | Channel 810  | 30.41                                 |              |               |                    |                        |                    |                        |
| <b>WCDMA<br/>850</b>                     | Channel 4132 | 24.08                                 | 19.6         | -0.173        | 0.788              | 0.82                   | 1.05               | 1.09                   |
|                                          | Channel 4180 | 24.18                                 | 20.4         | 0.055         | 0.745              | 0.75                   | 0.983              | 0.98                   |
|                                          | Channel 4233 | 24.02                                 | 19.6         | -0.129        | 0.813              | 0.84                   | 1.08               | 1.11                   |
| <b>WCDMA<br/>1900</b>                    | Channel 9262 | 23.43                                 | <b>19.9</b>  | <b>-0.156</b> | <b>0.695</b>       | <b>0.72</b>            | <b>1.28</b>        | <b>1.33</b>            |
|                                          | Channel 9400 | 23.45                                 | 20.3         | -0.034        | 0.566              | 0.57                   | 1.04               | 1.05                   |
|                                          | Channel 9538 | 23.38                                 | 20.3         | -0.171        | 0.487              | 0.51                   | 0.919              | 0.96                   |
| <b>WI-FI 2450<br/>802.11b<br/>1 Mbps</b> | Channel 1    | 17.46                                 | <b>20.0</b>  | <b>-0.052</b> | <b>0.232</b>       | <b>0.23</b>            | <b>0.535</b>       | <b>0.54</b>            |
|                                          | Channel 6    | 18.07                                 | 19.9         | 0.055         | 0.196              | 0.20                   | 0.456              | 0.46                   |
|                                          | Channel 11   | 18.49                                 | 20.0         | 0.058         | 0.194              | 0.19                   | 0.458              | 0.46                   |
| <b>GSM 850<br/>+ WI-FI</b>               |              |                                       |              |               |                    | 0.80                   |                    | $0.75+0.54=1.29$       |
| <b>GSM 1900<br/>+ WI-FI</b>              |              |                                       |              |               |                    | 0.54                   |                    | $0.57+0.54=1.11$       |
| <b>WCDMA 850<br/>+WI-FI</b>              |              |                                       |              |               |                    | 1.07                   |                    | $1.09^2$               |
| <b>WCDMA 1900<br/>+WI-FI</b>             |              |                                       |              |               |                    | 0.95                   |                    | --- <sup>3</sup>       |

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

<sup>2</sup> Per KDB publication 648474 and a request for clarification in TCB PBA tracking Number 373736 (Pre PBA Tracking Number 294775), simultaneous SAR evaluation was required to determine the aggregate 1-g SAR in this configuration because the simple sum-SAR > 1.6 and the SAR-to-peak-location separation ratio is 0.50 (greater than 0.3 limit). See Appendix 2 for SAR plots and further information.

<sup>3</sup> Per KDB publication 648474, no evaluation was performed to determine the aggregate 1-g SAR in this configuration as the SAR-to-peak-location separation ratio is 0.28. See Appendix 2 for further information.

| Right Head Cheek Position       |              |                                       |              |               |                    |                        |                    |                        |
|---------------------------------|--------------|---------------------------------------|--------------|---------------|--------------------|------------------------|--------------------|------------------------|
| $f$<br>(MHz)                    | Description  | Conducted<br>Output<br>Power<br>(dBm) | Temp<br>(°C) | Drift<br>(dB) | 10 g SAR value     |                        | 1 g SAR value      |                        |
|                                 |              |                                       |              |               | Measured<br>(W/kg) | Extrapolated<br>(W/kg) | Measured<br>(W/kg) | Extrapolated<br>(W/kg) |
| GSM<br>850                      | Channel 128  | 32.88                                 |              |               |                    |                        |                    |                        |
|                                 | Channel 190  | 32.83                                 | 20.5         | -0.059        | 0.587              | 0.60                   | 0.780              | 0.79                   |
|                                 | Channel 251  | 32.92                                 |              |               |                    |                        |                    |                        |
| GSM<br>1900                     | Channel 512  | 30.57                                 |              |               |                    |                        |                    |                        |
|                                 | Channel 661  | 30.46                                 | 20.4         | 0.038         | 0.240              | 0.24                   | 0.436              | 0.44                   |
|                                 | Channel 810  | 30.41                                 |              |               |                    |                        |                    |                        |
| WCDMA<br>850                    | Channel 4132 | 24.08                                 | 20.5         | -0.011        | 0.817              | 0.82                   | 1.08               | 1.08                   |
|                                 | Channel 4180 | 24.18                                 | 20.5         | -0.049        | 0.743              | 0.75                   | 0.987              | 1.00                   |
|                                 | Channel 4233 | 24.02                                 | 20.5         | -0.098        | 0.839              | 0.86                   | 1.11               | 1.14                   |
| WCDMA<br>1900                   | Channel 9262 | 23.43                                 | 20.3         | -0.008        | 0.535              | 0.54                   | 0.999              | 1.00                   |
|                                 | Channel 9400 | 23.45                                 | 20.0         | -0.065        | 0.468              | 0.48                   | 0.843              | 0.86                   |
|                                 | Channel 9538 | 23.38                                 | 20.3         | -0.130        | 0.405              | 0.42                   | 0.784              | 0.81                   |
| WI-FI 2450<br>802.11b<br>1 Mbps | Channel 1    | 17.46                                 |              |               |                    |                        |                    |                        |
|                                 | Channel 6    | 18.07                                 | 19.9         | 0.071         | 0.110              | 0.11                   | 0.248              | 0.25                   |
|                                 | Channel 11   | 18.49                                 |              |               |                    |                        |                    |                        |
| GSM 850<br>+ WI-FI              |              |                                       |              |               |                    | 0.71                   |                    | 0.79+0.25=1.04         |
| GSM 1900<br>+ WI-FI             |              |                                       |              |               |                    | 0.35                   |                    | 0.44+0.25=0.69         |
| WCDMA 850<br>+WI-FI             |              |                                       |              |               |                    | 0.97                   |                    | 1.14+0.25=1.39         |
| WCDMA 1900<br>+WI-FI            |              |                                       |              |               |                    | 0.65                   |                    | 1.00+0.25=1.25         |

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) | 10 g SAR value     |                        | 1 g SAR value      |                        |
|                                 |              |                                       |              |               | Measured<br>(W/kg) | Extrapolated<br>(W/kg) | Measured<br>(W/kg) | Extrapolated<br>(W/kg) |
| GSM<br>850                      | Channel 128  | 32.88                                 |              |               |                    |                        |                    |                        |
|                                 | Channel 190  | 32.83                                 | 20.4         | 0.105         | 0.357              | 0.36                   | 0.472              | 0.47                   |
|                                 | Channel 251  | 32.92                                 |              |               |                    |                        |                    |                        |
| GSM<br>1900                     | Channel 512  | 30.57                                 |              |               |                    |                        |                    |                        |
|                                 | Channel 661  | 30.46                                 | 20.2         | -0.041        | 0.398              | 0.40                   | 0.759              | 0.77                   |
|                                 | Channel 810  | 30.41                                 |              |               |                    |                        |                    |                        |
| WCDMA<br>850                    | Channel 4132 | 24.08                                 |              |               |                    |                        |                    |                        |
|                                 | Channel 4180 | 24.18                                 | 20.4         | 0.120         | 0.458              | 0.46                   | 0.607              | 0.61                   |
|                                 | Channel 4233 | 24.02                                 |              |               |                    |                        |                    |                        |
| WCDMA<br>1900                   | Channel 9262 | 23.43                                 | 20.2         | -0.013        | 0.820              | 0.82                   | 1.55               | 1.55                   |
|                                 | Channel 9400 | 23.45                                 | 20.1         | -0.034        | 0.771              | 0.78                   | 1.46               | 1.47                   |
|                                 | Channel 9538 | 23.38                                 | 20.3         | -0.011        | 0.655              | 0.66                   | 1.29               | 1.29                   |
| WI-FI 2450<br>802.11b<br>1 Mbps | Channel 1    | 17.46                                 |              |               |                    |                        |                    |                        |
|                                 | Channel 6    | 18.07                                 | 19.9         | -0.073        | 0.085              | 0.09                   | 0.167              | 0.17                   |
|                                 | Channel 11   | 18.49                                 |              |               |                    |                        |                    |                        |
| GSM 850<br>+ WI-FI              |              |                                       |              |               |                    | 0.45                   |                    | 0.47+0.17=0.64         |
| GSM 1900<br>+ WI-FI             |              |                                       |              |               |                    | 0.49                   |                    | 0.77+0.17=0.94         |
| WCDMA 850<br>+WI-FI             |              |                                       |              |               |                    | 0.55                   |                    | 0.61+0.17=0.78         |
| WCDMA 1900<br>+WI-FI            |              |                                       |              |               |                    | 0.91                   |                    | 1.49 <sup>4</sup>      |

**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.**

<sup>4</sup> Per KDB publication 648474 and a request for clarification in TCB PBA tracking Number 373736 (Pre PBA Tracking Number 294775), simultaneous SAR evaluation was required to determine the aggregate 1-g SAR in this configuration because the simple sum-SAR > 1.6 and the SAR-to-peak-location separation ratio is 0.33 (greater than 0.3 limit). See Appendix 2 for SAR plots and further information.

| Right Head 15° Tilt Position             |              |                                       |              |               |                    |                        |                    |                        |
|------------------------------------------|--------------|---------------------------------------|--------------|---------------|--------------------|------------------------|--------------------|------------------------|
| <i>f</i><br>(MHz)                        | Description  | Conducted<br>Output<br>Power<br>(dBm) | Temp<br>(°C) | Drift<br>(dB) | 10 g SAR value     |                        | 1 g SAR value      |                        |
|                                          |              |                                       |              |               | Measured<br>(W/kg) | Extrapolated<br>(W/kg) | Measured<br>(W/kg) | Extrapolated<br>(W/kg) |
| <b>GSM<br/>850</b>                       | Channel 128  | 32.88                                 |              |               |                    |                        |                    |                        |
|                                          | Channel 190  | 32.83                                 | 20.5         | 0.048         | 0.345              | 0.35                   | 0.453              | 0.45                   |
|                                          | Channel 251  | 32.92                                 |              |               |                    |                        |                    |                        |
| <b>GSM<br/>1900</b>                      | Channel 512  | 30.57                                 |              |               |                    |                        |                    |                        |
|                                          | Channel 661  | 30.46                                 | 20.0         | 0.033         | 0.321              | 0.32                   | 0.607              | 0.61                   |
|                                          | Channel 810  | 30.41                                 |              |               |                    |                        |                    |                        |
| <b>WCDMA<br/>850</b>                     | Channel 4132 | 24.08                                 |              |               |                    |                        |                    |                        |
|                                          | Channel 4180 | 24.18                                 | <b>20.5</b>  | <b>0.080</b>  | <b>0.466</b>       | <b>0.47</b>            | <b>0.615</b>       | <b>0.62</b>            |
|                                          | Channel 4233 | 24.02                                 |              |               |                    |                        |                    |                        |
| <b>WCDMA<br/>1900</b>                    | Channel 9262 | 23.43                                 | 19.7         | 0.062         | 0.658              | 0.66                   | 1.21               | 1.21                   |
|                                          | Channel 9400 | 23.45                                 | 20.4         | 0.000         | 0.630              | 0.63                   | 1.20               | 1.20                   |
|                                          | Channel 9538 | 23.38                                 | 19.7         | -0.048        | 0.620              | 0.63                   | 1.26               | 1.27                   |
| <b>WI-FI 2450<br/>802.11b<br/>1 Mbps</b> | Channel 1    | 17.46                                 |              |               |                    |                        |                    |                        |
|                                          | Channel 6    | 18.07                                 | 20.0         | -0.146        | 0.068              | 0.07                   | 0.131              | 0.14                   |
|                                          | Channel 11   | 18.49                                 |              |               |                    |                        |                    |                        |
| <b>GSM 850<br/>+ WI-FI</b>               |              |                                       |              |               |                    | 0.42                   |                    | 0.45+0.14=0.59         |
| <b>GSM 1900<br/>+ WI-FI</b>              |              |                                       |              |               |                    | 0.39                   |                    | 0.61+0.14=0.75         |
| <b>WCDMA 850<br/>+WI-FI</b>              |              |                                       |              |               |                    | 0.54                   |                    | 0.62+0.14=0.76         |
| <b>WCDMA 1900<br/>+WI-FI</b>             |              |                                       |              |               |                    | 0.73                   |                    | 1.27+0.14=1.41         |

**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 through 8 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 [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  $\text{Extrapolated SAR} = \text{Measured SAR} * 10^{(-\text{drift}/10)}$ . 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. The tables below also include the highest SAR value summations for primary and secondary co-located transmitters, with the results indicated in italics.

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 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. 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 at the time of testing thus the device was tested per the Supplement C testing guidelines for devices that do not have body-worn accessories. A separation distance of 25 mm between the device and the flat phantom was used for testing body-worn SAR. The chosen separation distance of 25 mm is utilized in order to support any case or holder accessories offered or to be offered by Motorola for this product. The device was tested with the front and back of the device facing the phantom. Both sides of the device were tested for Body SAR for the purpose of including the SAR evaluation for body-worn accessories that support the device with the front side facing the user.

The cellular phone was also tested in data mode operations. For these tests, a separation distance of 25 mm between the device and the flat phantom was used. The device was tested in the worst-case SAR position and channel configuration from the voice-mode body-worn testing.

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

| Description          | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|----------------------|---------------|---------|-------------------|---------------|
| E-Field Probe ES3DV3 | 3184          | 835     | 6.08              | 8 of 9        |
|                      |               | 1810    | 4.84              | 8 of 9        |
|                      |               | 2450    | 4.28              | 8 of 9        |
| E-Field Probe ES3DV3 | 3037          | 835     | 6.17              | 8 of 9        |
|                      |               | 1810    | 4.96              | 8 of 9        |
|                      |               | 2450    | 4.29              | 8 of 9        |
| E-Field Probe ES3DV3 | 3124          | 835     | 5.86              | 6 of 11       |
|                      |               | 1810    | 4.76              | 6 of 11       |
|                      |               | 2450    | 4.19              | 6 of 11       |

| Body-Worn; Front of Phone 25 mm from Phantom |              |                                       |              |               |                    |                        |                    |                        |
|----------------------------------------------|--------------|---------------------------------------|--------------|---------------|--------------------|------------------------|--------------------|------------------------|
| <i>f</i><br>(MHz)                            | Description  | Conducted<br>Output<br>Power<br>(dBm) | Temp<br>(°C) | Drift<br>(dB) | 10 g SAR value     |                        | 1 g SAR value      |                        |
|                                              |              |                                       |              |               | Measured<br>(W/kg) | Extrapolated<br>(W/kg) | Measured<br>(W/kg) | Extrapolated<br>(W/kg) |
| GSM<br>850                                   | Channel 128  | 32.88                                 |              |               |                    |                        |                    |                        |
|                                              | Channel 190  | 32.83                                 | 20.6         | -0.049        | 0.116              | 0.12                   | 0.156              | 0.16                   |
|                                              | Channel 251  | 32.92                                 |              |               |                    |                        |                    |                        |
| GSM<br>1900                                  | Channel 512  | 30.57                                 |              |               |                    |                        |                    |                        |
|                                              | Channel 661  | 30.46                                 | 20.0         | 0.036         | 0.023              | 0.02                   | 0.037              | 0.04                   |
|                                              | Channel 810  | 30.41                                 |              |               |                    |                        |                    |                        |
| WCDMA<br>850                                 | Channel 4132 | 24.08                                 |              |               |                    |                        |                    |                        |
|                                              | Channel 4180 | 24.18                                 | 20.4         | 0.161         | 0.129              | 0.13                   | 0.175              | 0.18                   |
|                                              | Channel 4233 | 24.02                                 |              |               |                    |                        |                    |                        |
| WCDMA<br>1900                                | Channel 9262 | 23.43                                 |              |               |                    |                        |                    |                        |
|                                              | Channel 9400 | 23.45                                 | 20.0         | -0.072        | 0.038              | 0.04                   | 0.060              | 0.06                   |
|                                              | Channel 9538 | 23.38                                 |              |               |                    |                        |                    |                        |
| WI-FI 2450<br>802.11b<br>1 Mbps              | Channel 1    | 17.46                                 |              |               |                    |                        |                    |                        |
|                                              | Channel 6    | 18.07                                 | 19.7         | -0.567        | 0.006              | 0.01                   | 0.011              | 0.01                   |
|                                              | Channel 11   | 18.49                                 |              |               |                    |                        |                    |                        |
| GSM 850<br>+ WI-FI                           |              |                                       |              |               |                    | 0.13                   |                    | 0.16+0.01=0.17         |
| GSM 1900<br>+ WI-FI                          |              |                                       |              |               |                    | 0.03                   |                    | 0.04+0.01=0.05         |
| WCDMA 850<br>+WI-FI                          |              |                                       |              |               |                    | 0.14                   |                    | 0.18+0.01=0.19         |
| WCDMA 1900<br>+WI-FI                         |              |                                       |              |               |                    | 0.05                   |                    | 0.06+0.01=0.07         |

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 25 mm from Phantom |              |                                       |              |               |                    |                        |                    |                        |
|---------------------------------------------|--------------|---------------------------------------|--------------|---------------|--------------------|------------------------|--------------------|------------------------|
| $f$<br>(MHz)                                | Description  | Conducted<br>Output<br>Power<br>(dBm) | Temp<br>(°C) | Drift<br>(dB) | 10 g SAR value     |                        | 1 g SAR value      |                        |
|                                             |              |                                       |              |               | Measured<br>(W/kg) | Extrapolated<br>(W/kg) | Measured<br>(W/kg) | Extrapolated<br>(W/kg) |
| GSM<br>850                                  | Channel 128  | 32.88                                 |              |               |                    |                        |                    |                        |
|                                             | Channel 190  | 32.83                                 | 20.6         | 0.018         | 0.166              | 0.17                   | 0.225              | 0.23                   |
|                                             | Channel 251  | 32.92                                 |              |               |                    |                        |                    |                        |
| GSM<br>1900                                 | Channel 512  | 30.57                                 |              |               |                    |                        |                    |                        |
|                                             | Channel 661  | 30.46                                 | 20.0         | -0.014        | 0.154              | 0.15                   | 0.256              | 0.26                   |
|                                             | Channel 810  | 30.41                                 |              |               |                    |                        |                    |                        |
| WCDMA<br>850                                | Channel 4132 | 24.08                                 |              |               |                    |                        |                    |                        |
|                                             | Channel 4180 | 24.18                                 | 20.4         | 0.050         | 0.200              | 0.20                   | 0.271              | 0.27                   |
|                                             | Channel 4233 | 24.02                                 |              |               |                    |                        |                    |                        |
| WCDMA<br>1900                               | Channel 9262 | 23.43                                 |              |               |                    |                        |                    |                        |
|                                             | Channel 9400 | 23.45                                 | 20.0         | -0.027        | 0.297              | 0.30                   | 0.496              | 0.50                   |
|                                             | Channel 9538 | 23.38                                 |              |               |                    |                        |                    |                        |
| WI-FI 2450<br>802.11b<br>1 Mbps             | Channel 1    | 17.46                                 | 19.7         | -0.024        | 0.019              | 0.02                   | 0.030              | 0.03                   |
|                                             | Channel 6    | 18.07                                 | 19.7         | 0.035         | 0.015              | 0.01                   | 0.023              | 0.02                   |
|                                             | Channel 11   | 18.49                                 | 19.7         | -0.100        | 0.012              | 0.01                   | 0.019              | 0.02                   |
| GSM 850<br>+ WI-FI                          |              |                                       |              |               |                    | 0.19                   |                    | 0.23+0.03=0.26         |
| GSM 1900<br>+ WI-FI                         |              |                                       |              |               |                    | 0.17                   |                    | 0.26+0.03=0.29         |
| WCDMA 850<br>+WI-FI                         |              |                                       |              |               |                    | 0.22                   |                    | 0.27+0.03=0.30         |
| WCDMA 1900<br>+WI-FI                        |              |                                       |              |               |                    | 0.32                   |                    | 0.50+0.03=0.53         |

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

| GPRS Class 10 (2 Uplink Timeslots) Body-Worn; Back of Phone 25 mm from Phantom |             |                                    |              |               |                    |                        |                    |                        |
|--------------------------------------------------------------------------------|-------------|------------------------------------|--------------|---------------|--------------------|------------------------|--------------------|------------------------|
| $f$<br>(MHz)                                                                   | Description | Conducted<br>Output Power<br>(dBm) | Temp<br>(°C) | Drift<br>(dB) | 10 g SAR value     |                        | 1 g SAR value      |                        |
|                                                                                |             |                                    |              |               | Measured<br>(W/kg) | Extrapolated<br>(W/kg) | Measured<br>(W/kg) | Extrapolated<br>(W/kg) |
| <b>GSM<br/>850</b>                                                             | Channel 128 | 30.81                              |              |               |                    |                        |                    |                        |
|                                                                                | Channel 190 | 30.81                              | 19.5         | 0.003         | 0.149              | 0.15                   | 0.201              | 0.20                   |
|                                                                                | Channel 251 | 30.86                              |              |               |                    |                        |                    |                        |
| <b>GSM<br/>1900</b>                                                            | Channel 512 | 28.48                              |              |               |                    |                        |                    |                        |
|                                                                                | Channel 661 | 28.40                              | 19.1         | -0.023        | 0.140              | 0.14                   | 0.231              | 0.23                   |
|                                                                                | Channel 810 | 28.37                              |              |               |                    |                        |                    |                        |
| <i>GSM 850<br/>+ WI-FI</i>                                                     |             |                                    |              |               |                    | 0.17                   |                    | 0.20+0.03=0.23         |
| <i>GSM 1900<br/>+ WI-FI</i>                                                    |             |                                    |              |               |                    | 0.16                   |                    | 0.23+0.03=0.26         |

**Table 7: SAR measurement results at the highest possible output power, measured in a body-worn position against the ICNIRP and ANSI SAR Limit.**

| EDGE Class 10 (2 Uplink Timeslots) Body-Worn; Back of Phone 25 mm from Phantom |             |                                    |              |               |                    |                        |                    |                        |
|--------------------------------------------------------------------------------|-------------|------------------------------------|--------------|---------------|--------------------|------------------------|--------------------|------------------------|
| $f$<br>(MHz)                                                                   | Description | Conducted<br>Output Power<br>(dBm) | Temp<br>(°C) | Drift<br>(dB) | 10 g SAR value     |                        | 1 g SAR value      |                        |
|                                                                                |             |                                    |              |               | Measured<br>(W/kg) | Extrapolated<br>(W/kg) | Measured<br>(W/kg) | Extrapolated<br>(W/kg) |
| <b>GSM<br/>850</b>                                                             | Channel 128 | 26.62                              |              |               |                    |                        |                    |                        |
|                                                                                | Channel 190 | 26.58                              | 19.5         | -0.077        | 0.057              | 0.06                   | 0.076              | 0.08                   |
|                                                                                | Channel 251 | 26.34                              |              |               |                    |                        |                    |                        |
| <b>GSM<br/>1900</b>                                                            | Channel 512 | 25.56                              |              |               |                    |                        |                    |                        |
|                                                                                | Channel 661 | 25.46                              | 19.1         | -0.049        | 0.076              | 0.08                   | 0.126              | 0.13                   |
|                                                                                | Channel 810 | 25.31                              |              |               |                    |                        |                    |                        |
| <i>GSM 850<br/>+ WI-FI</i>                                                     |             |                                    |              |               |                    | 0.08                   |                    | 0.08+0.03=0.11         |
| <i>GSM 1900<br/>+ WI-FI</i>                                                    |             |                                    |              |               |                    | 0.10                   |                    | 0.13+0.03=0.16         |

**Table 8: 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**

Date/Time: 7/16/2010 7:46:28 AM

## Test Laboratory: Motorola - Jul-16-2010 835 MHz

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 436TR; FCC ID: IHDP56LD1**

Procedure Notes: 835 MHz System Performance Check; Dipole Sn# 436TR; Input Power = 200 mW

Sim.Temp@meas = 20.7 °C; Sim.Temp@SPC = 20.7 °C; Room Temp @ SPC = 20.0 °C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.91 \text{ mho/m}$ ;  $\epsilon_r = 41.2$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.26, 6.26, 6.26); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 1.77 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

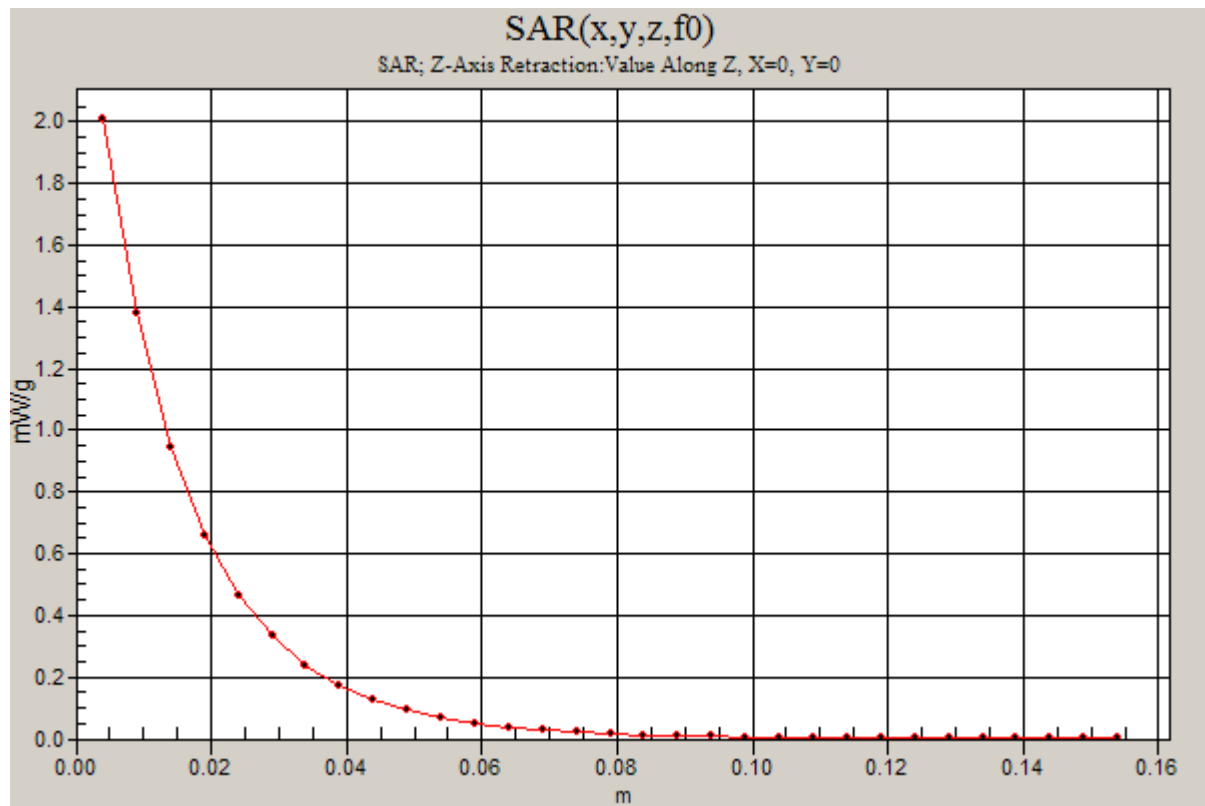
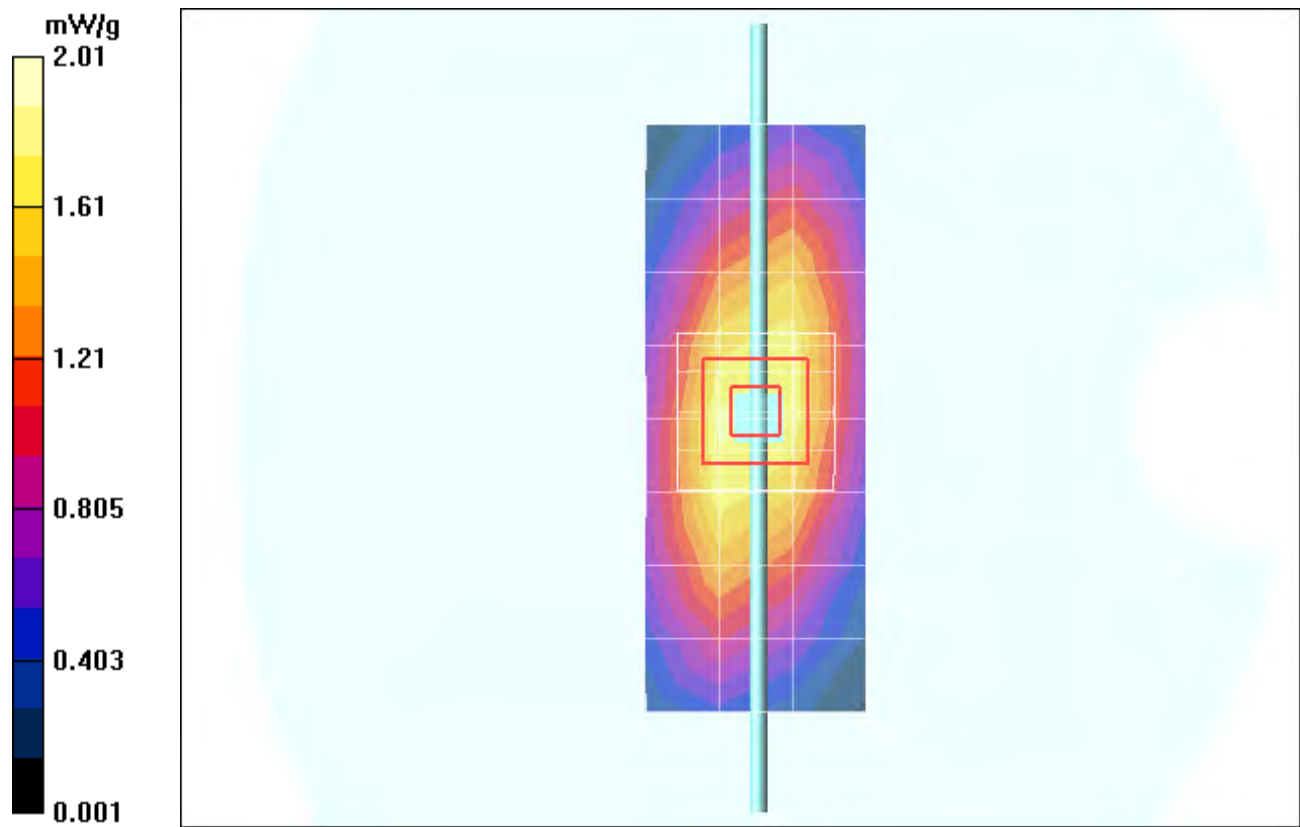
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 48.0 V/m; Power Drift = -0.019 dB; Peak SAR (extrapolated) = 2.64 W/kg

**SAR(1 g) = 1.86 mW/g; SAR(10 g) = 1.23 mW/g;** Maximum value of SAR (measured) = 2.02 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 2.01 mW/g



Date/Time: 7/17/2010 8:00:09 AM

## Test Laboratory: Motorola - Jul-17-2010 835 MHz

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 436TR; FCC ID: IHDP56LD1**

Procedure Notes: 835 MHz System Performance Check; Dipole Sn# 436TR; Input Power = 200 mW

Sim.Temp@meas = 20.7°C; Sim.Temp@SPC = 20.7°C; Room Temp @ SPC = 20.3°C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.92 \text{ mho/m}$ ;  $\epsilon_r = 41.4$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.26, 6.26, 6.26); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 1.79 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

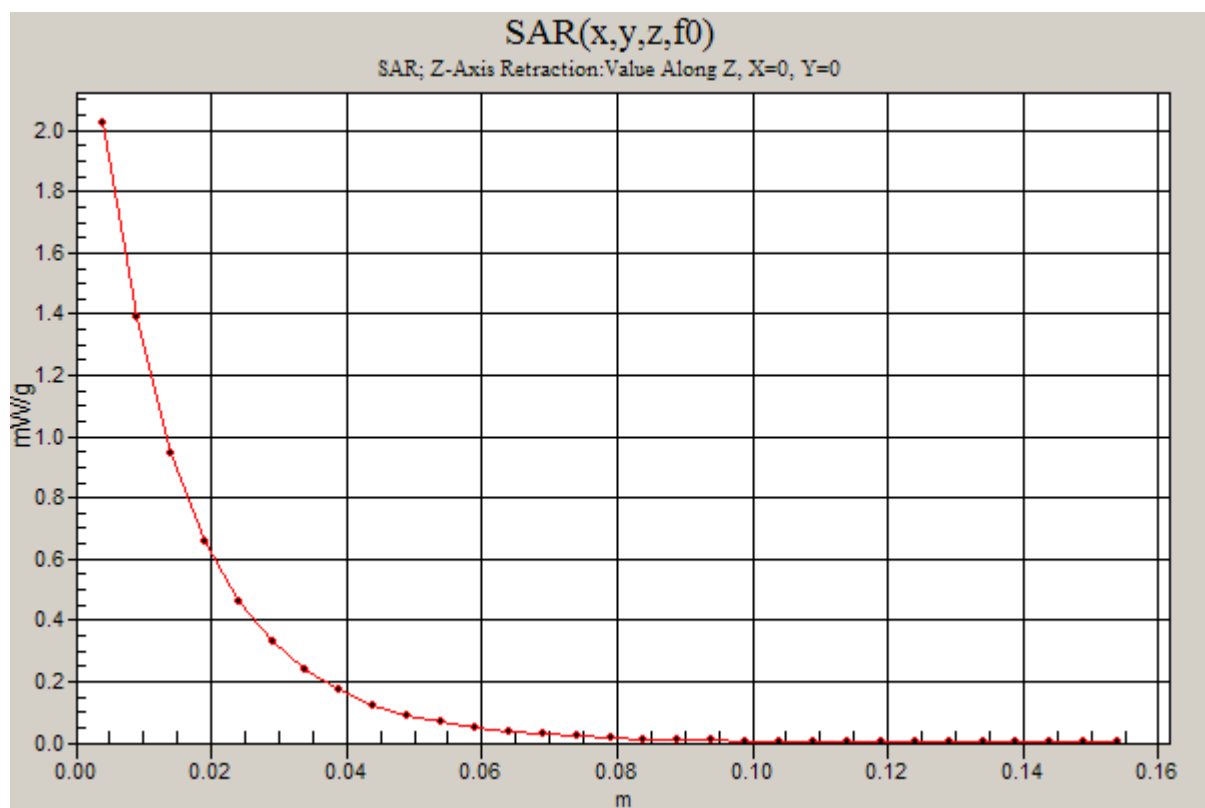
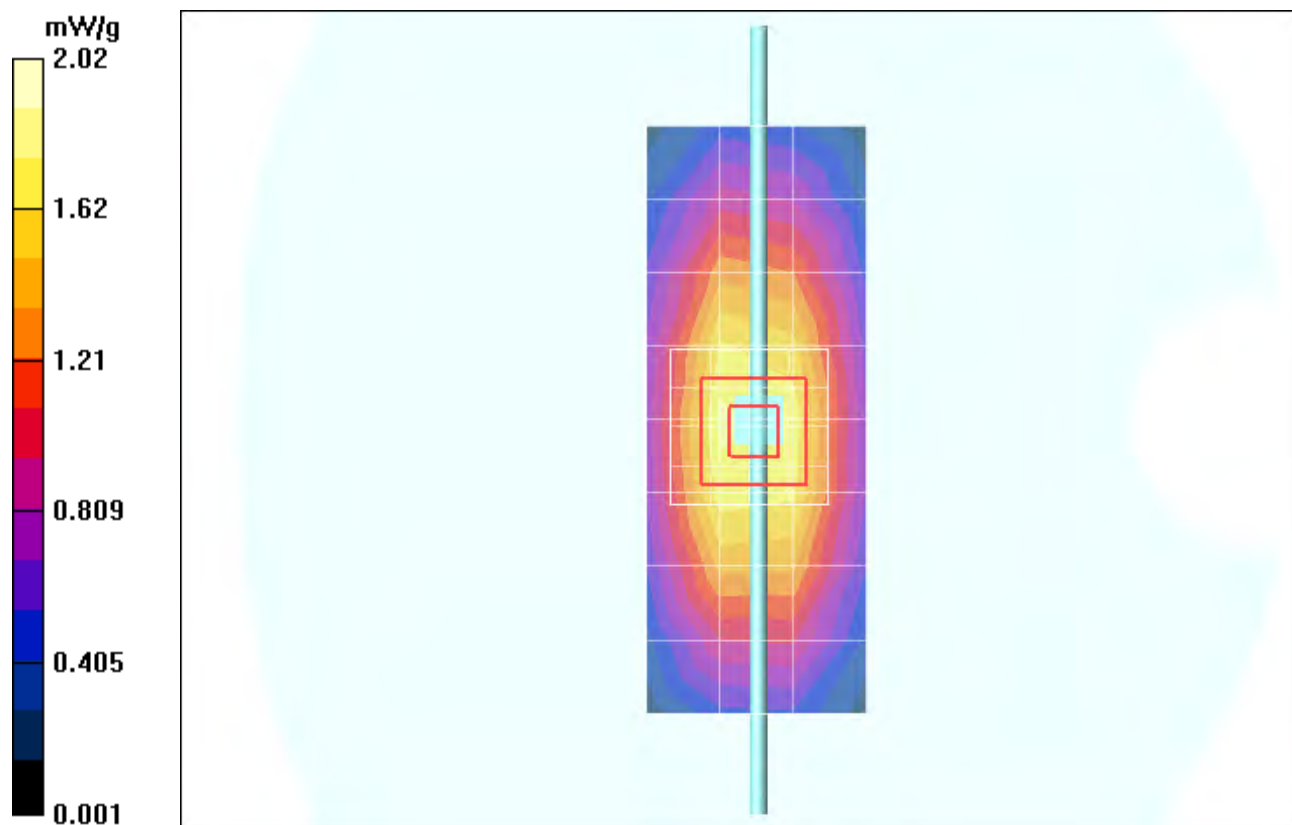
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 48.0 V/m; Power Drift = -0.018 dB; Peak SAR (extrapolated) = 2.66 W/kg

**SAR(1 g) = 1.87 mW/g; SAR(10 g) = 1.23 mW/g;** Maximum value of SAR (measured) = 2.03 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 2.02 mW/g



Date/Time: 7/21/2010 7:31:18 AM

## Test Laboratory: Motorola - Jul-21-2010 835 MHz

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 420TR; FCC ID: IHDP56LD1**

Procedure Notes: 835 MHz System Performance Check; Dipole Sn# 420TR; Input Power = 200 mW

Sim.Temp@meas = 19.7 °C; Sim.Temp@SPC = 19.7 °C; Room Temp @ SPC = 19.9 °C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.91 \text{ mho/m}$ ;  $\epsilon_r = 41.4$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.25, 6.25, 6.25); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1005;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 1.83 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

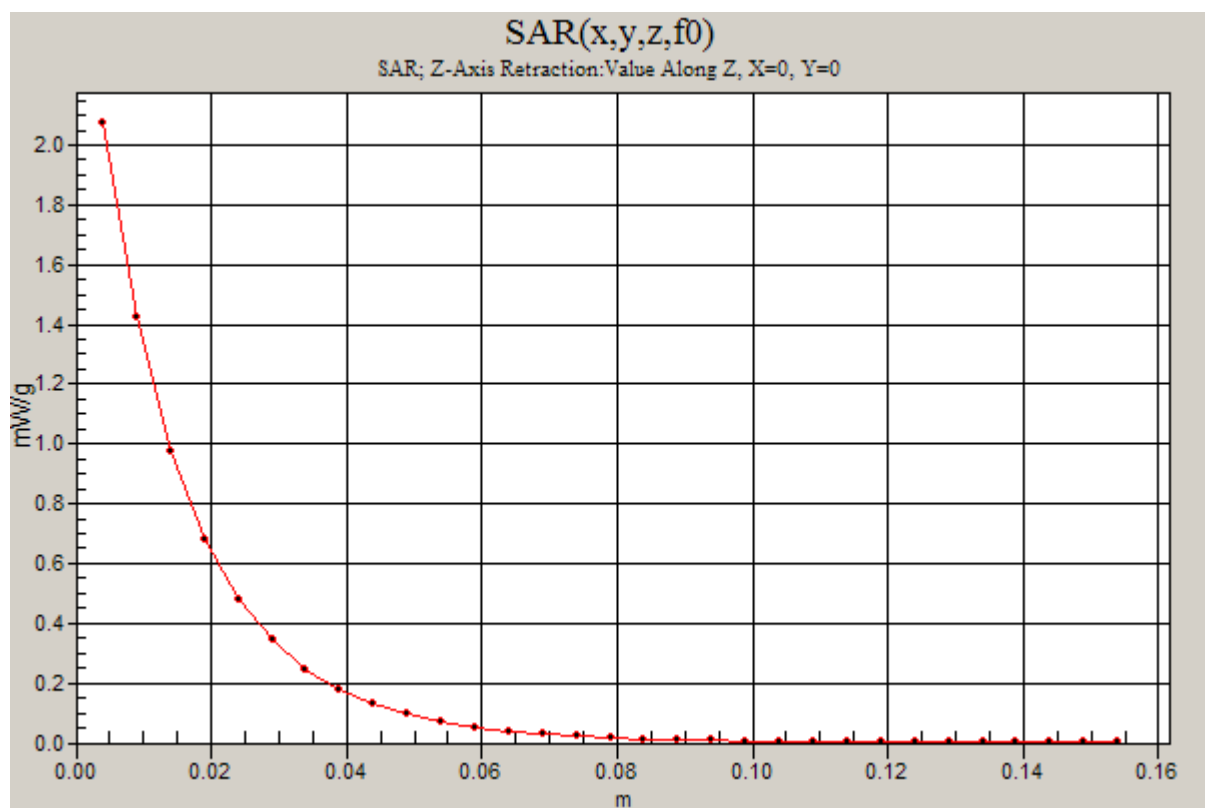
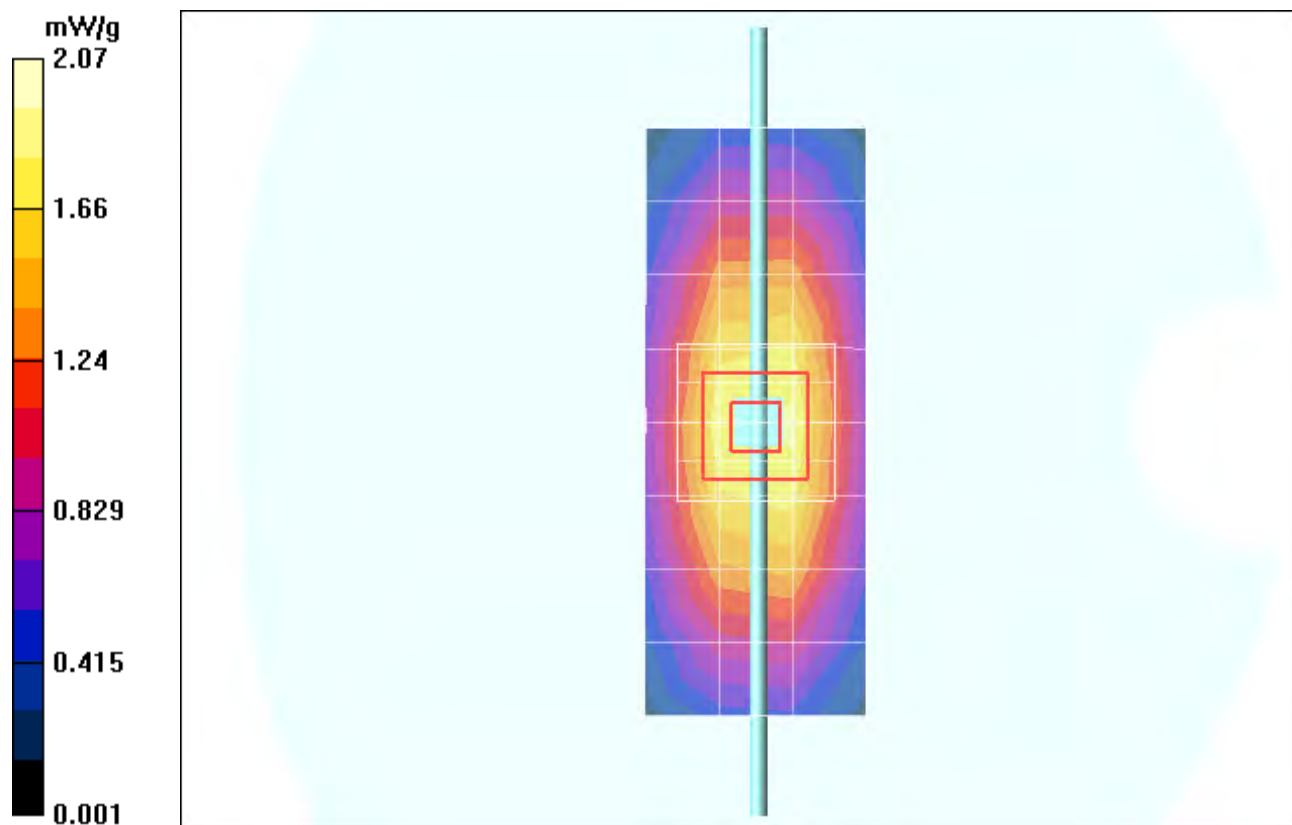
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 48.6 V/m; Power Drift = -0.044 dB; Peak SAR (extrapolated) = 2.73 W/kg

**SAR(1 g) = 1.91 mW/g; SAR(10 g) = 1.26 mW/g;** Maximum value of SAR (measured) = 2.06 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 2.07 mW/g



Date/Time: 8/2/2010 8:17:52 AM

## Test Laboratory: Motorola - Aug-02-2010 835 MHz

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 436TR; FCC ID: IHDP56LD1**

Procedure Notes: 835MHz System Performance Check; Dipole Sn# 436TR; Input Power = 200 mW

Sim.Temp@meas = 20.4°C; Sim.Temp@SPC = 20.4°C; Room Temp @ SPC = 20.0°C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.9 \text{ mho/m}$ ;  $\epsilon_r = 40.5$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.26, 6.26, 6.26); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 1.77 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

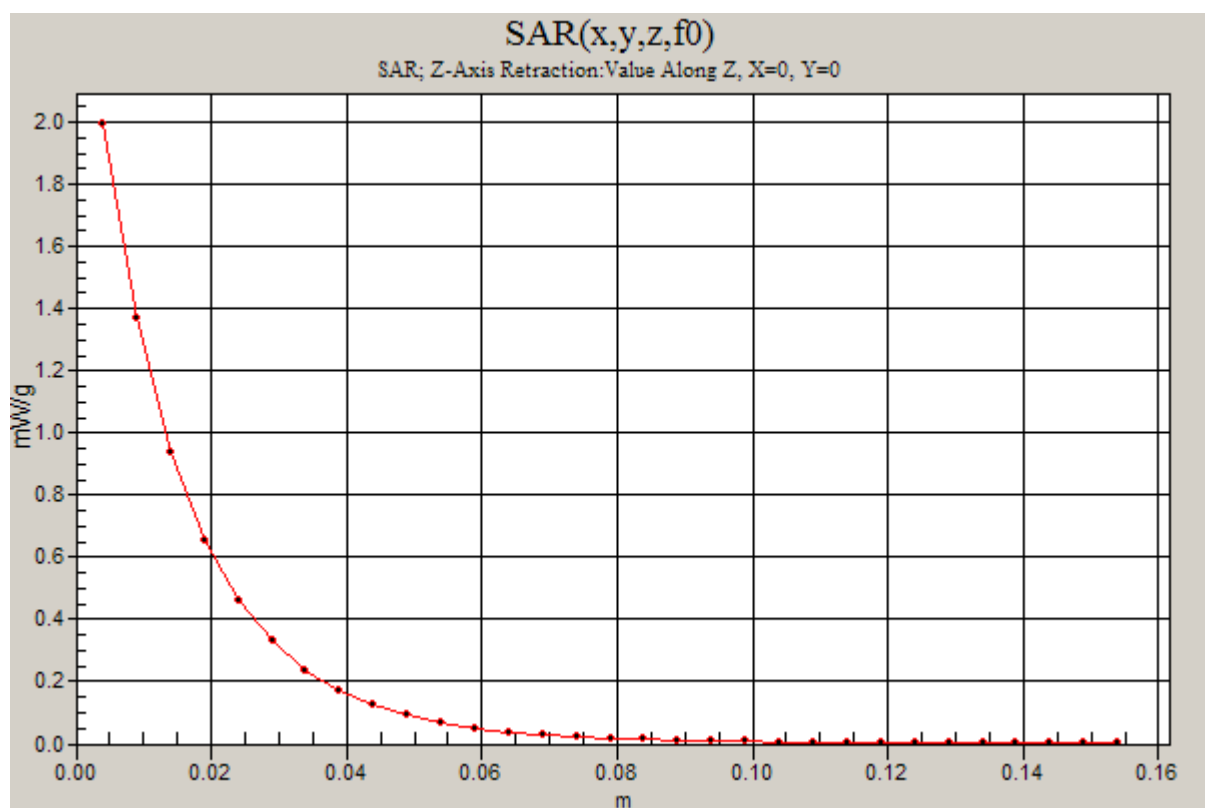
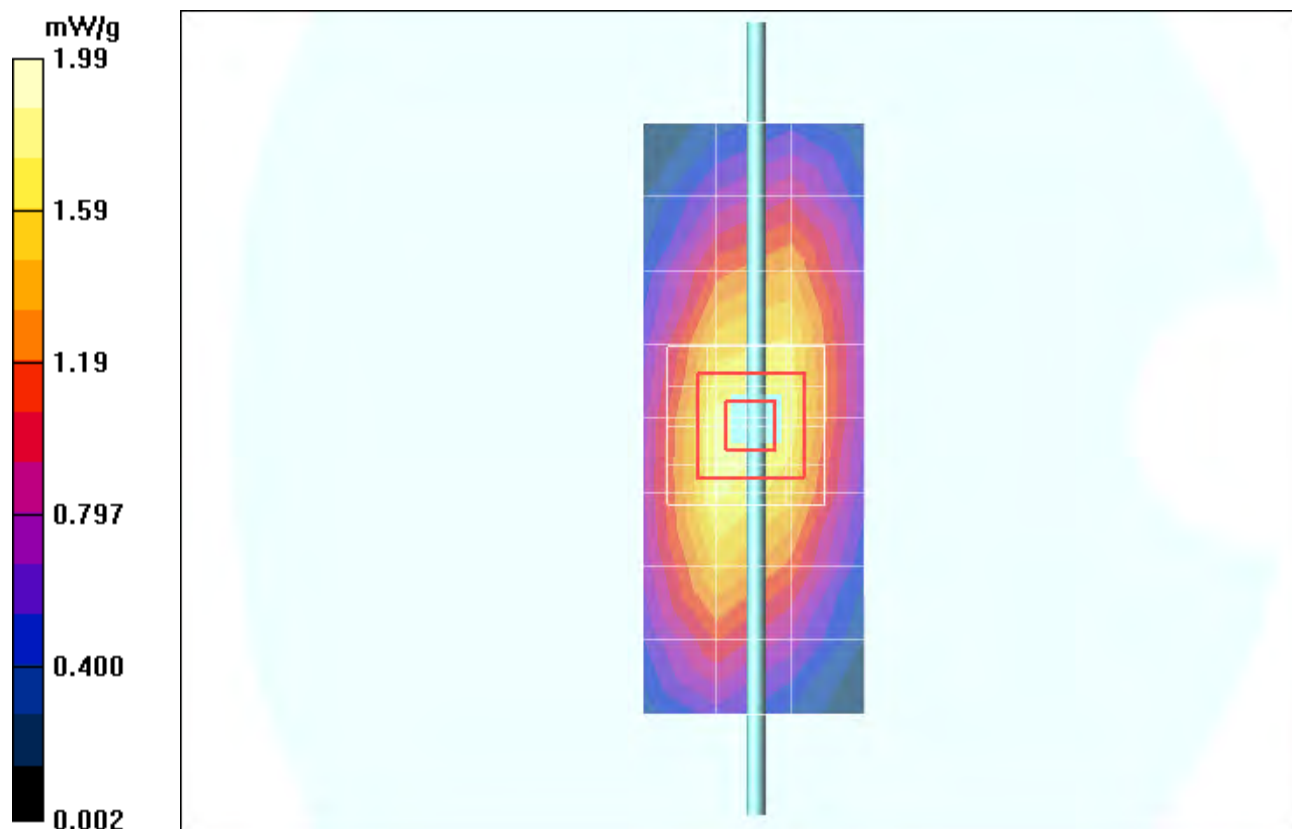
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 48.1 V/m; Power Drift = -0.011 dB; Peak SAR (extrapolated) = 2.62 W/kg

**SAR(1 g) = 1.85 mW/g; SAR(10 g) = 1.22 mW/g;** Maximum value of SAR (measured) = 2.00 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 1.99 mW/g



Date/Time: 9/24/2010 7:43:19 AM

## Test Laboratory: Motorola - Sep-24-2010 835 MHz

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 436TR; FCC ID: IHDP56LD1**

Procedure Notes: 835 MHz System Performance Check; Dipole Sn# 436TR; Input Power = 200 mW

Sim.Temp@meas = 21.0 °C; Sim.Temp@SPC = 21.0 °C; Room Temp @ SPC = 19.9 °C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.88 \text{ mho/m}$ ;  $\epsilon_r = 40.3$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(5.89, 5.89, 5.89); Calibrated: 8/11/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 7/13/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 1.87 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

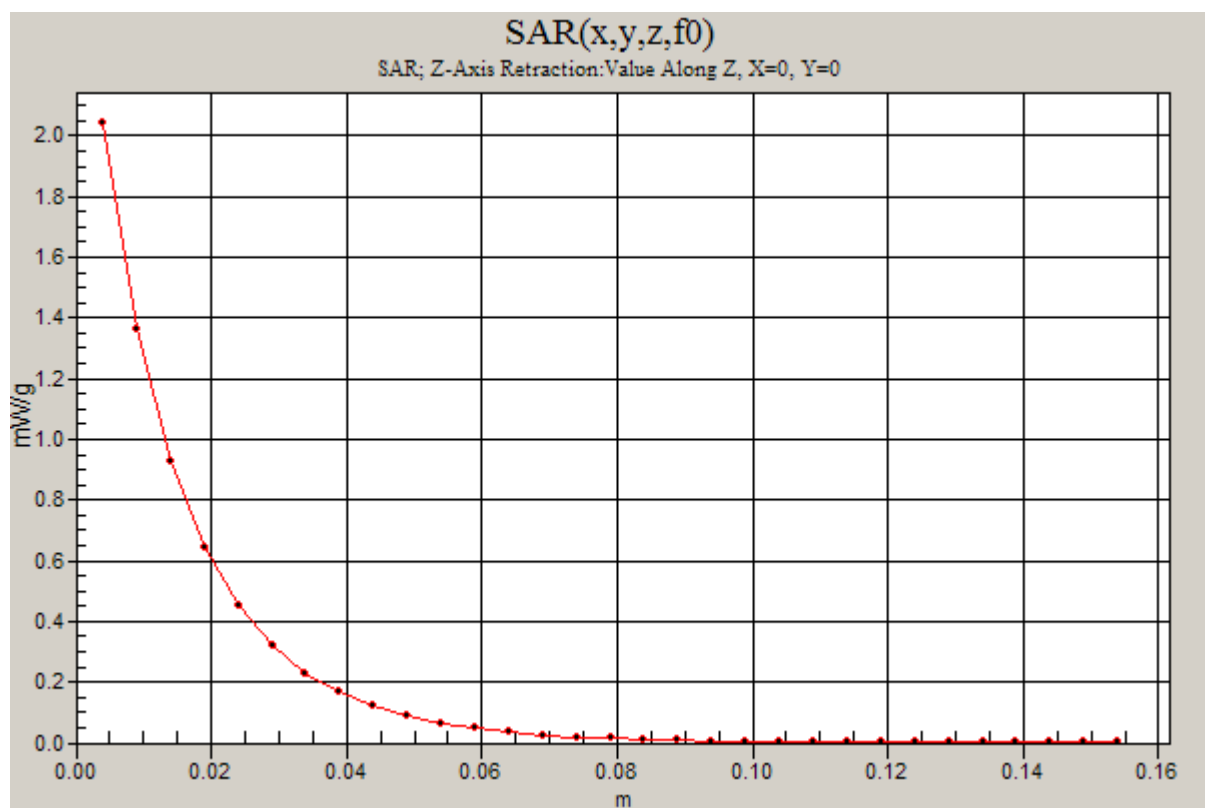
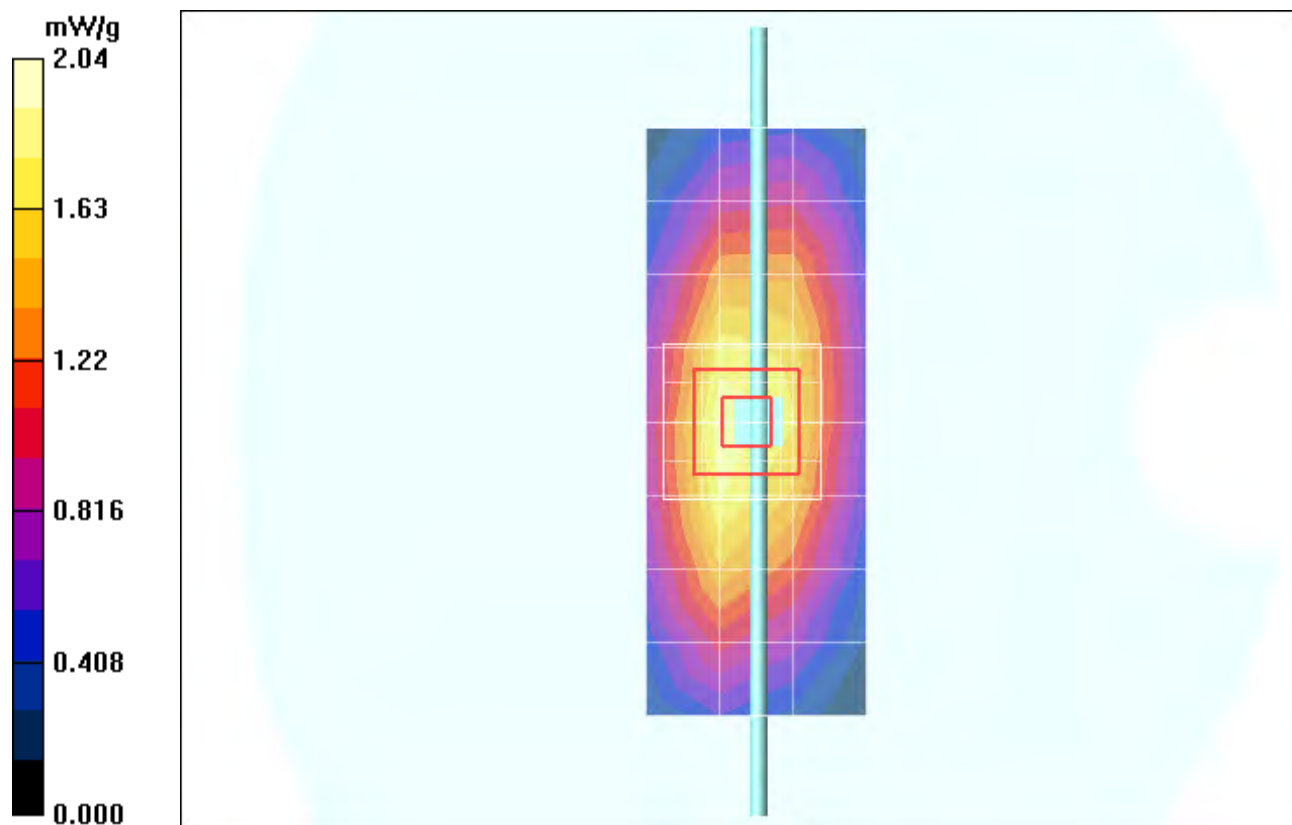
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 48.5 V/m; Power Drift = -0.015 dB; Peak SAR (extrapolated) = 2.83 W/kg

**SAR(1 g) = 1.89 mW/g; SAR(10 g) = 1.23 mW/g;** Maximum value of SAR (measured) = 2.03 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 2.04 mW/g



Date/Time: 7/15/2010 6:39:31 AM

## Test Laboratory: Motorola - Jul-15-2010 1800 MHz

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 272TR; FCC ID: IHDP56LD1**

Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 272TR; Input Power = 200 mW

Sim.Temp@meas = 19.8 °C; Sim.Temp@SPC = 19.8 °C; Room Temp @ SPC = 20.0 °C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 1800 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 39.9$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(5.14, 5.14, 5.14); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R4 : Sect.1, Amy Twin, Rev.3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (9x4x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 6.41 mW/g

### Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:

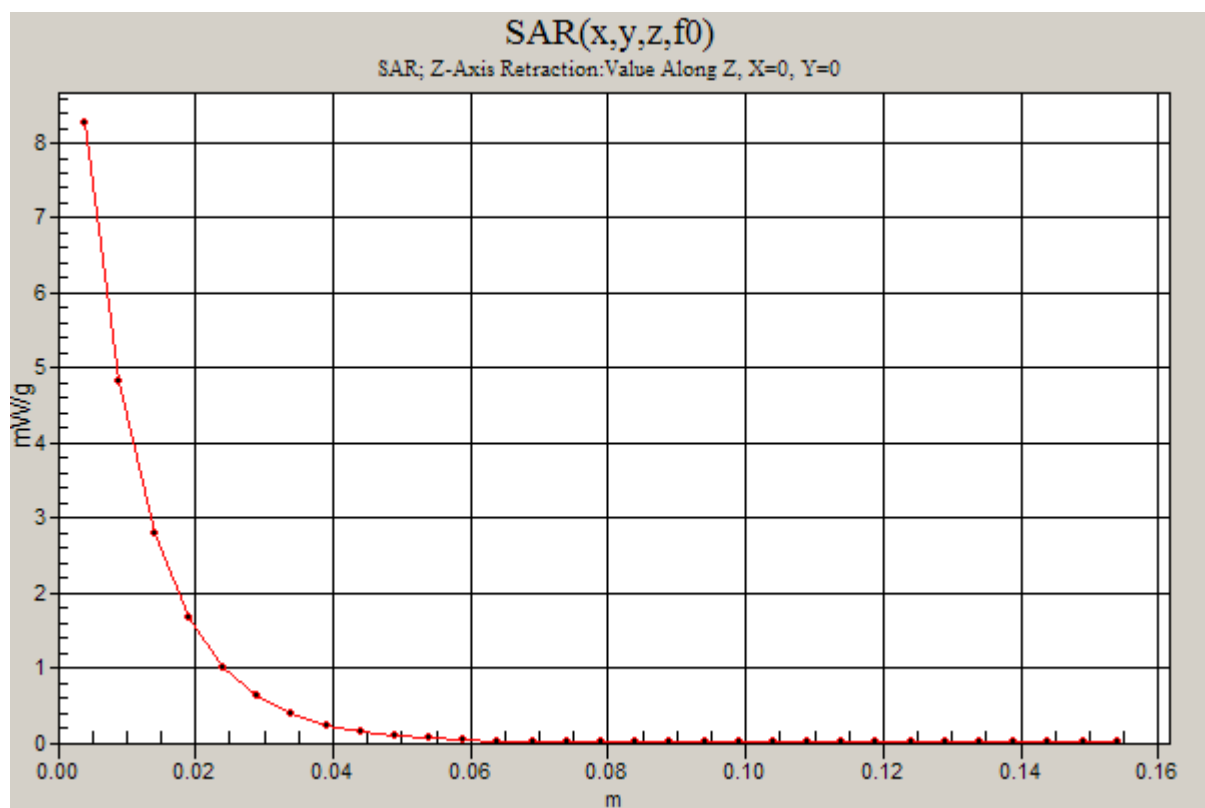
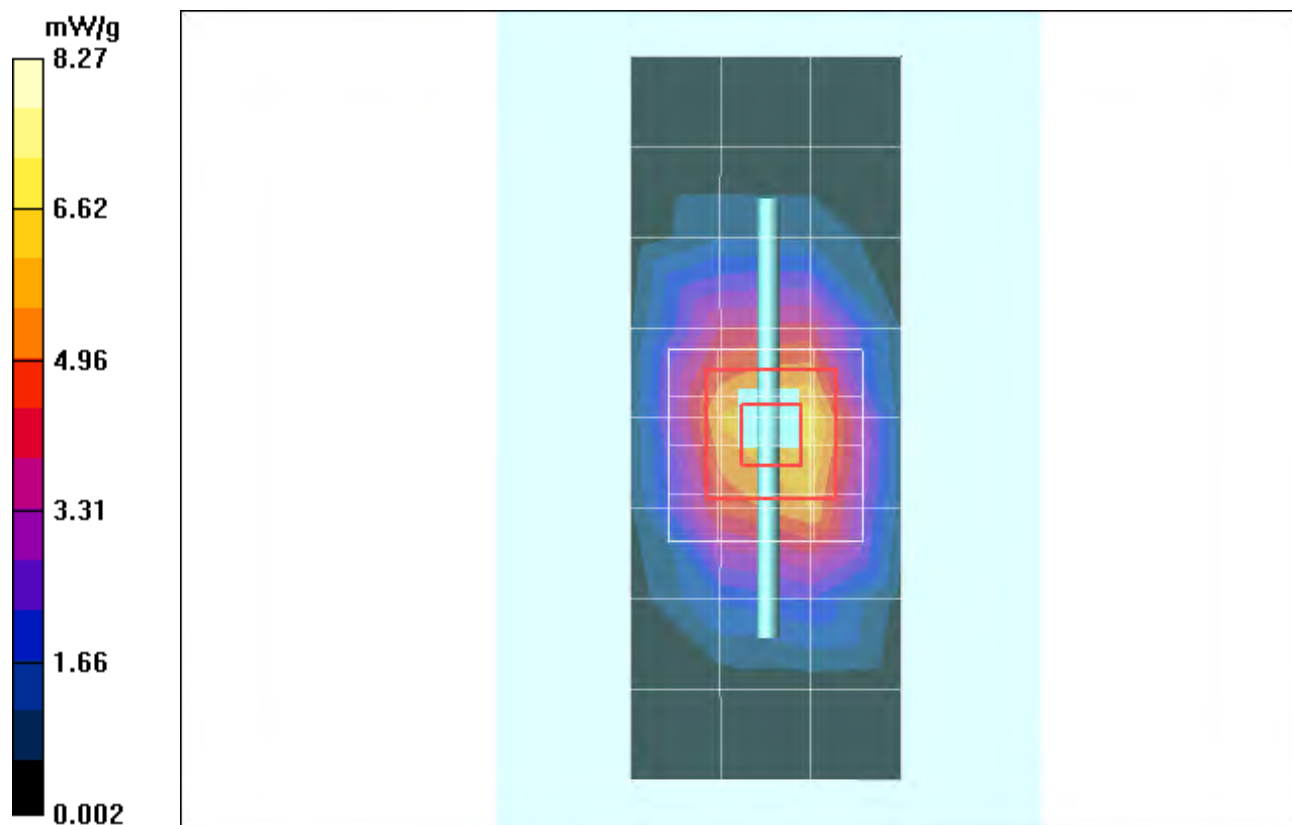
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 80.3 V/m; Power Drift = -0.009 dB; Peak SAR (extrapolated) = 12.4 W/kg

**SAR(1 g) = 7.38 mW/g; SAR(10 g) = 4 mW/g**; Maximum value of SAR (measured) = 8.24 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 8.27 mW/g



Date/Time: 7/16/2010 6:47:37 AM

## Test Laboratory: Motorola - Jul-16-2010 1800 MHz

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 272TR; FCC ID: IHDP56LD1**

Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 272TR; Input Power = 200 mW

Sim.Temp@meas = 20.0 °C; Sim.Temp@SPC = 20.0 °C; Room Temp @ SPC = 19.9 °C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 1800 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 40$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(5.14, 5.14, 5.14); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R4 : Sect.1, Amy Twin, Rev.3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (9x4x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 7.21 mW/g

### Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:

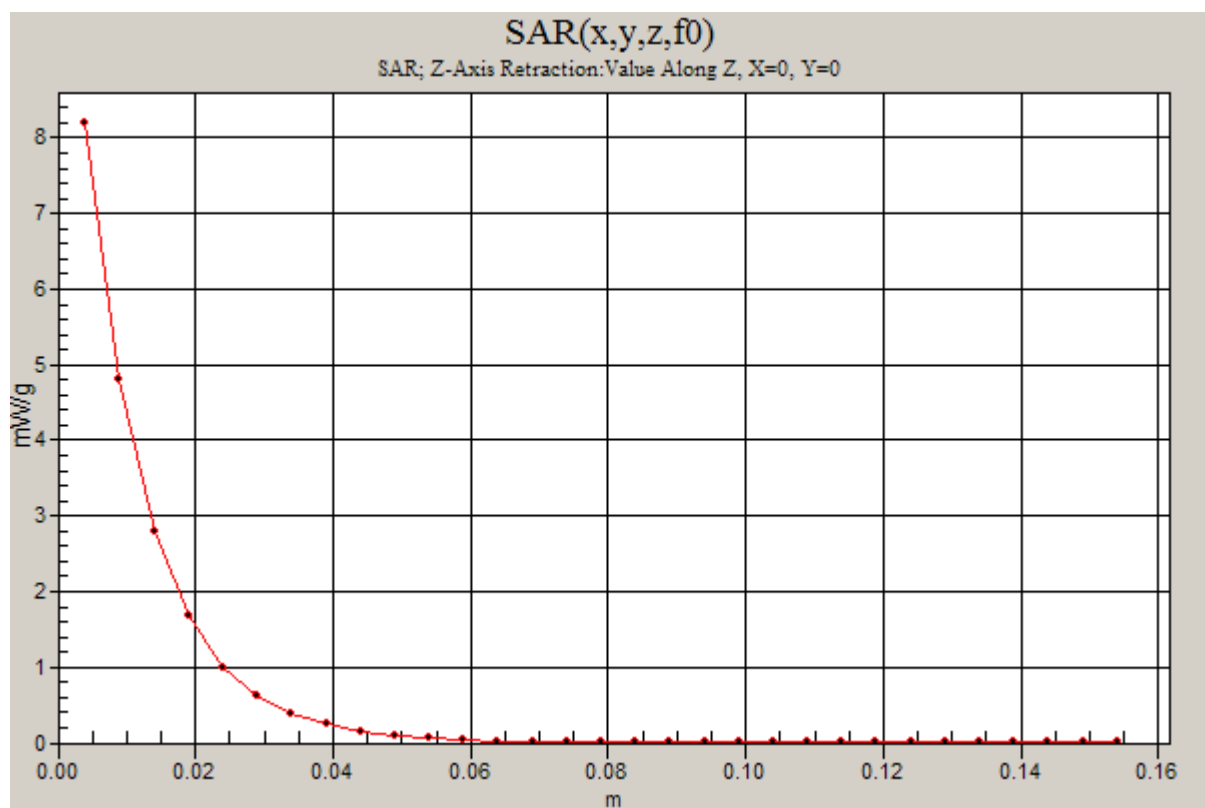
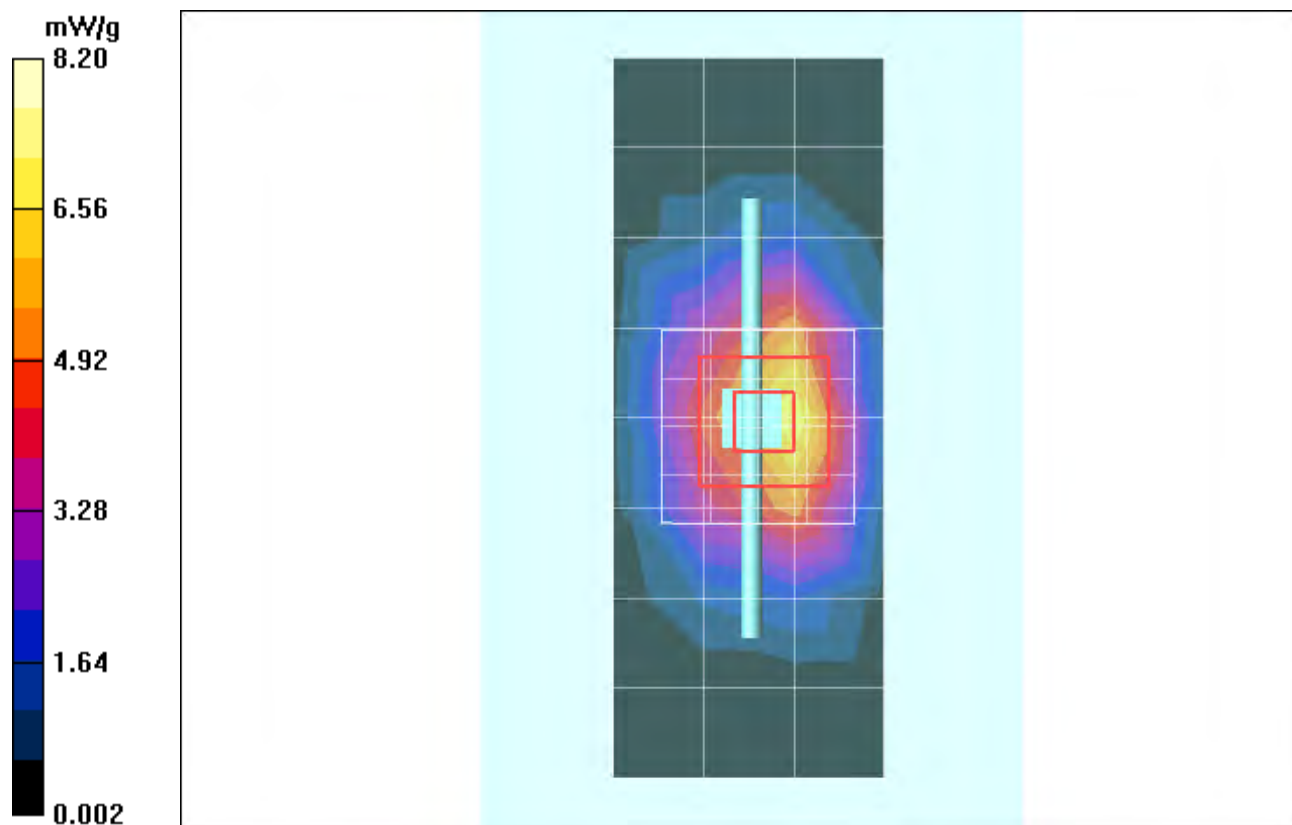
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 79.1 V/m; Power Drift = -0.044 dB; Peak SAR (extrapolated) = 12.3 W/kg

**SAR(1 g) = 7.3 mW/g; SAR(10 g) = 3.94 mW/g**; Maximum value of SAR (measured) = 8.19 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 8.20 mW/g



Date/Time: 7/22/2010 6:50:06 AM

## Test Laboratory: Motorola - Jul-22-2010 1800 MHz

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 259TR; FCC ID: IHDP56LD1**

Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 259TR; Input Power = 200 mW

Sim.Temp@meas = 19.8 °C; Sim.Temp@SPC = 19.8 °C; Room Temp @ SPC = 20.3 °C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.37$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.05, 5.05, 5.05); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Section 2, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (9x4x1):

Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 8.39 mW/g

### Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:

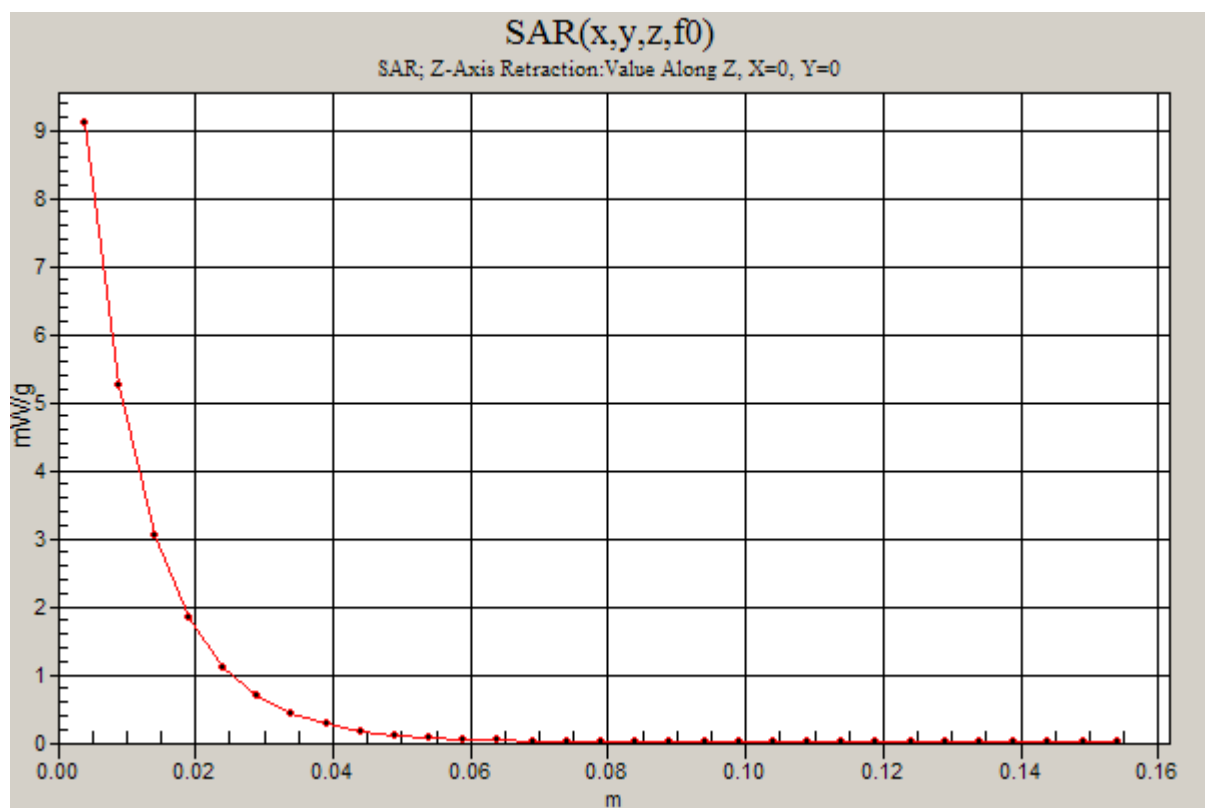
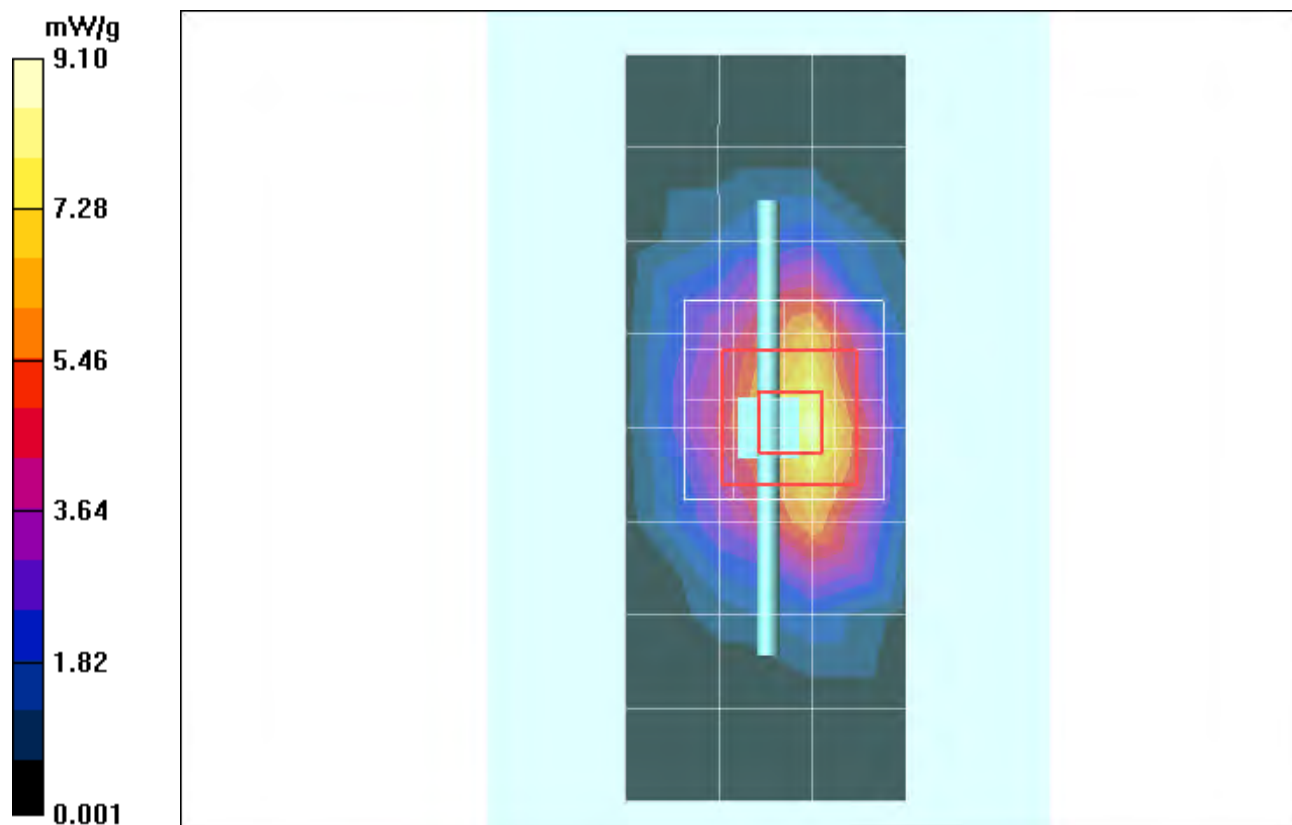
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 80.8 V/m; Power Drift = -0.025 dB; Peak SAR (extrapolated) = 14.4 W/kg

**SAR(1 g) = 8.17 mW/g; SAR(10 g) = 4.37 mW/g;** Maximum value of SAR (measured) = 9.02 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 9.10 mW/g



Date/Time: 8/2/2010 7:57:57 AM

## Test Laboratory: Motorola - Aug-02-2010 1800 MHz

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 272TR; FCC ID: IHDP56LD1**

Procedure Notes: 1800MHz System Performance Check; Dipole Sn# 272TR; Input Power = 200 mW

Sim.Temp@meas = 20.1°C; Sim.Temp@SPC = 20.2°C; Room Temp @ SPC = 20.1°C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 1800 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 39.1$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(5.14, 5.14, 5.14); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R4 : Sect.1, Amy Twin, Rev.3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (9x4x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 6.12 mW/g

### Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:

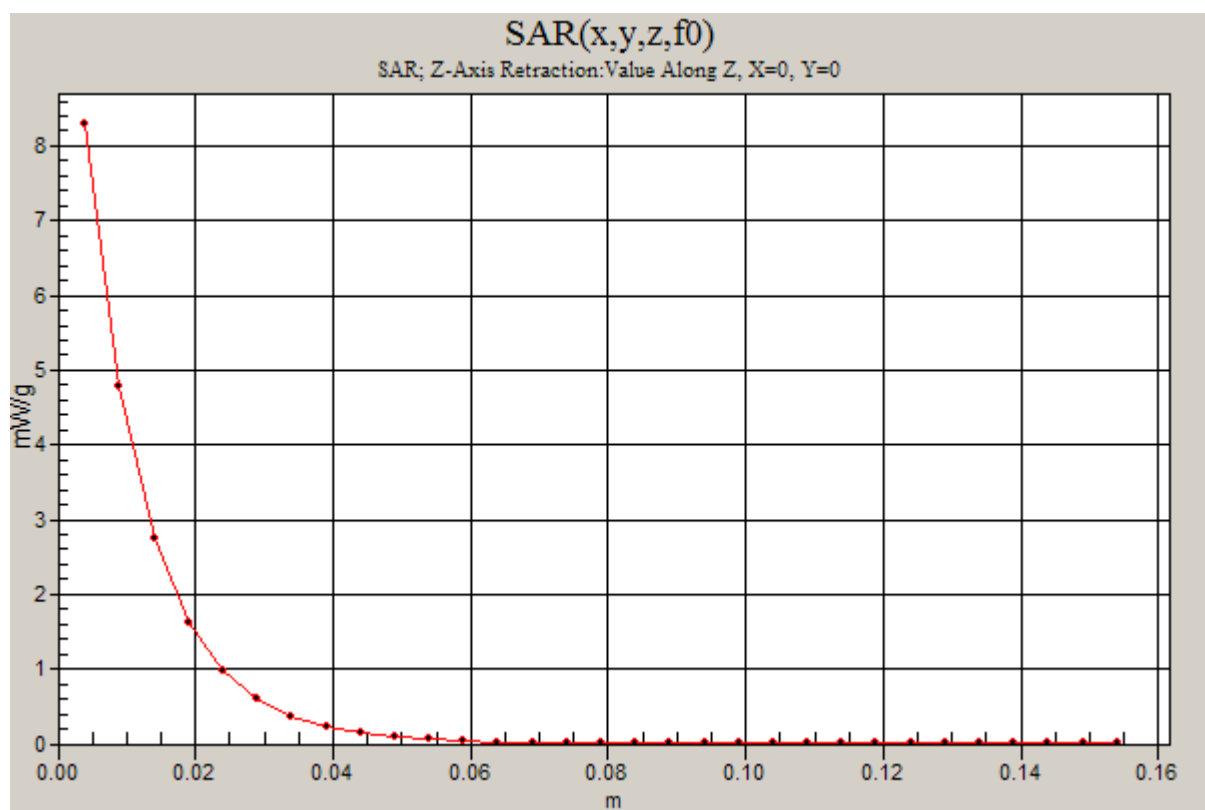
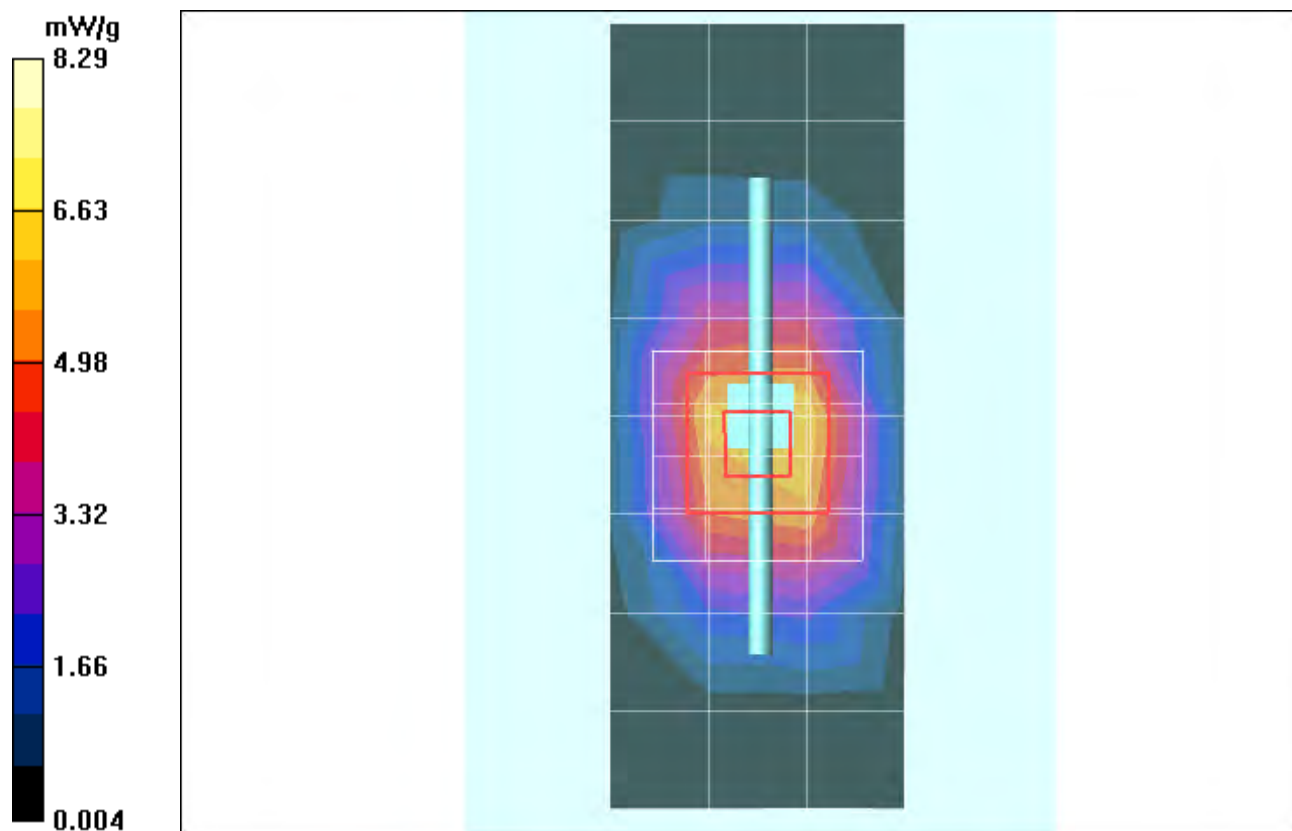
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 79.9 V/m; Power Drift = -0.022 dB; Peak SAR (extrapolated) = 12.5 W/kg

**SAR(1 g) = 7.35 mW/g; SAR(10 g) = 3.96 mW/g;** Maximum value of SAR (measured) = 8.25 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 8.29 mW/g



Date/Time: 9/8/2010 7:40:36 AM

## Test Laboratory: Motorola - Sep-08-2010 1800 MHz

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 272TR; FCC ID: IHDP56LD1**

Procedure Notes: 1800 MHz System Performance Check; Dipole Sn# 272TR; Input Power = 200 mW

Sim.Temp@meas = 19.6 °C; Sim.Temp@SPC = 19.6 °C; Room Temp @ SPC = 19.8 °C

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

Medium: VALIDATION Only

Medium parameters used:  $f = 1800 \text{ MHz}$ ;  $\sigma = 1.37 \text{ mho/m}$ ;  $\epsilon_r = 38.3$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(5.14, 5.14, 5.14); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R4 : Sect.1, Amy Twin, Rev.3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (9x4x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 6.34 mW/g

### Daily SPC Check/0-Degree 5x5x7 Cube (5x5x7)/Cube 0:

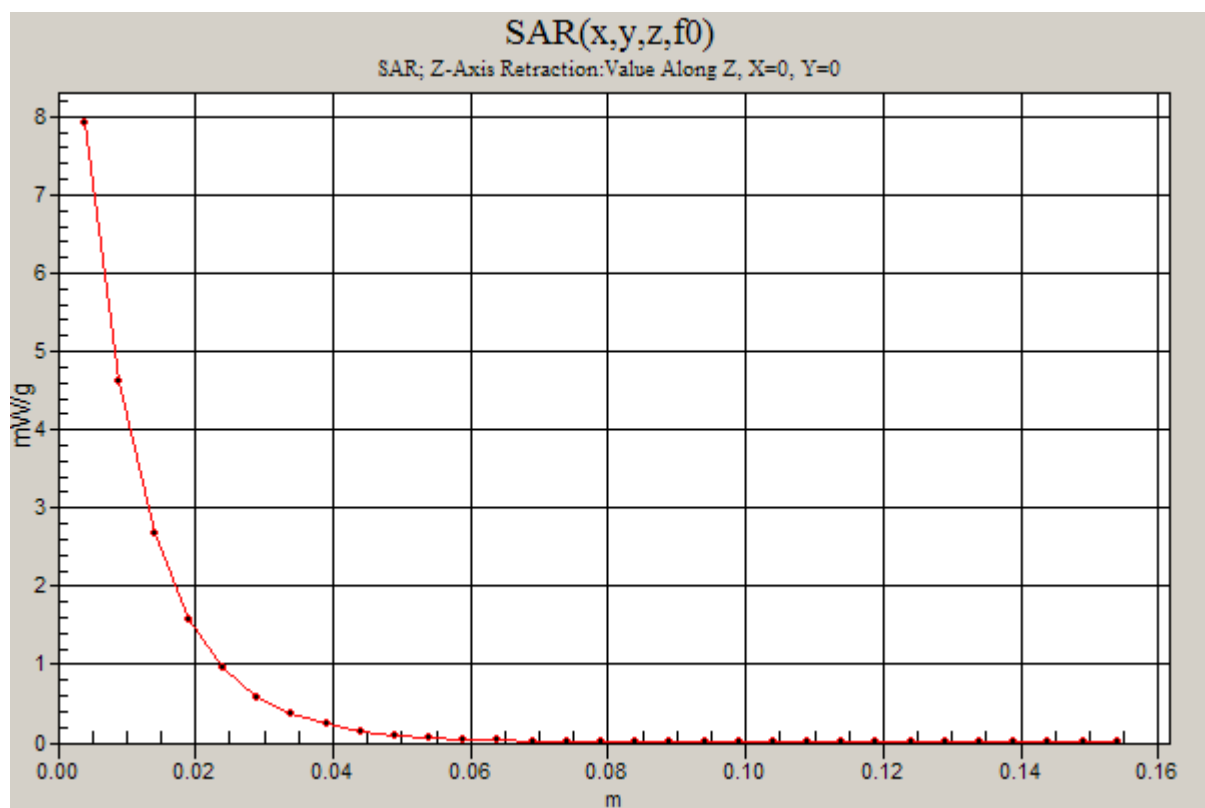
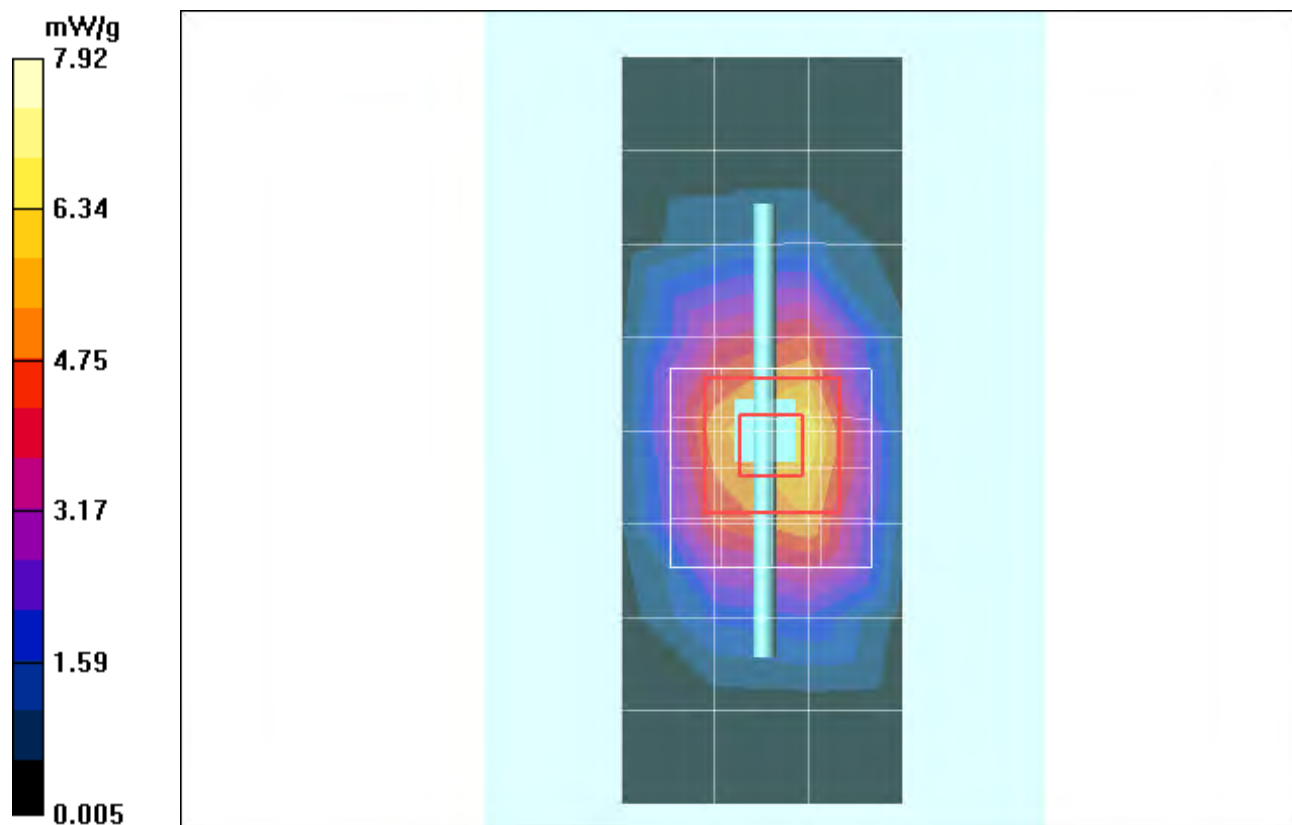
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 78.7 V/m; Power Drift = -0.039 dB; Peak SAR (extrapolated) = 12.0 W/kg

**SAR(1 g) = 7.08 mW/g; SAR(10 g) = 3.82 mW/g;** Maximum value of SAR (measured) = 7.85 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 7.92 mW/g



Date/Time: 8/1/2010 11:26:32 AM

## Test Laboratory: Motorola - Aug-01-2010 2450 MHz

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 766; FCC ID: IHDP56LD1**

Procedure Notes: 2450 MHz System Performance Check; Dipole Sn# 766; Input Power = 200 mW

Sim.Temp@meas = 19.6°C; Sim.Temp@SPC = 19.8°C; Room Temp @ SPC = 20.0°C

Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.83$  mho/m;  $\epsilon_r = 37.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(4.44, 4.44, 4.44); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 9.69 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

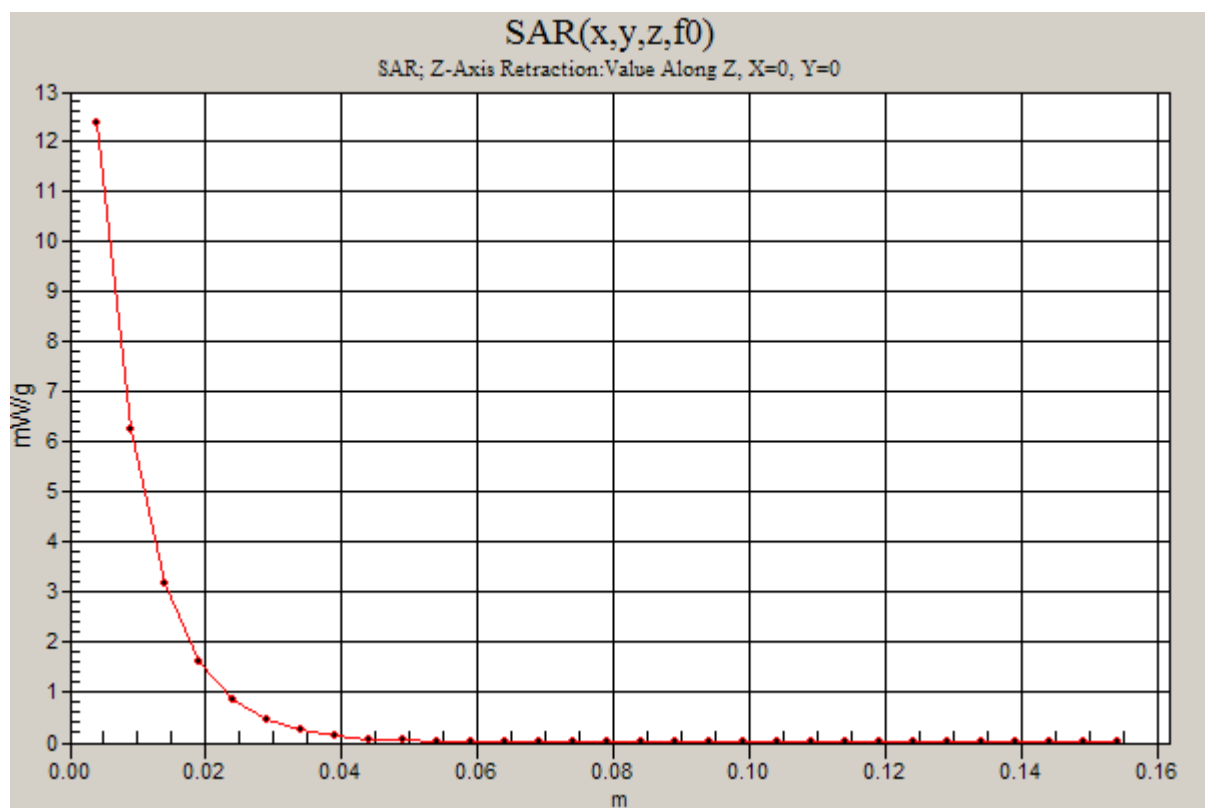
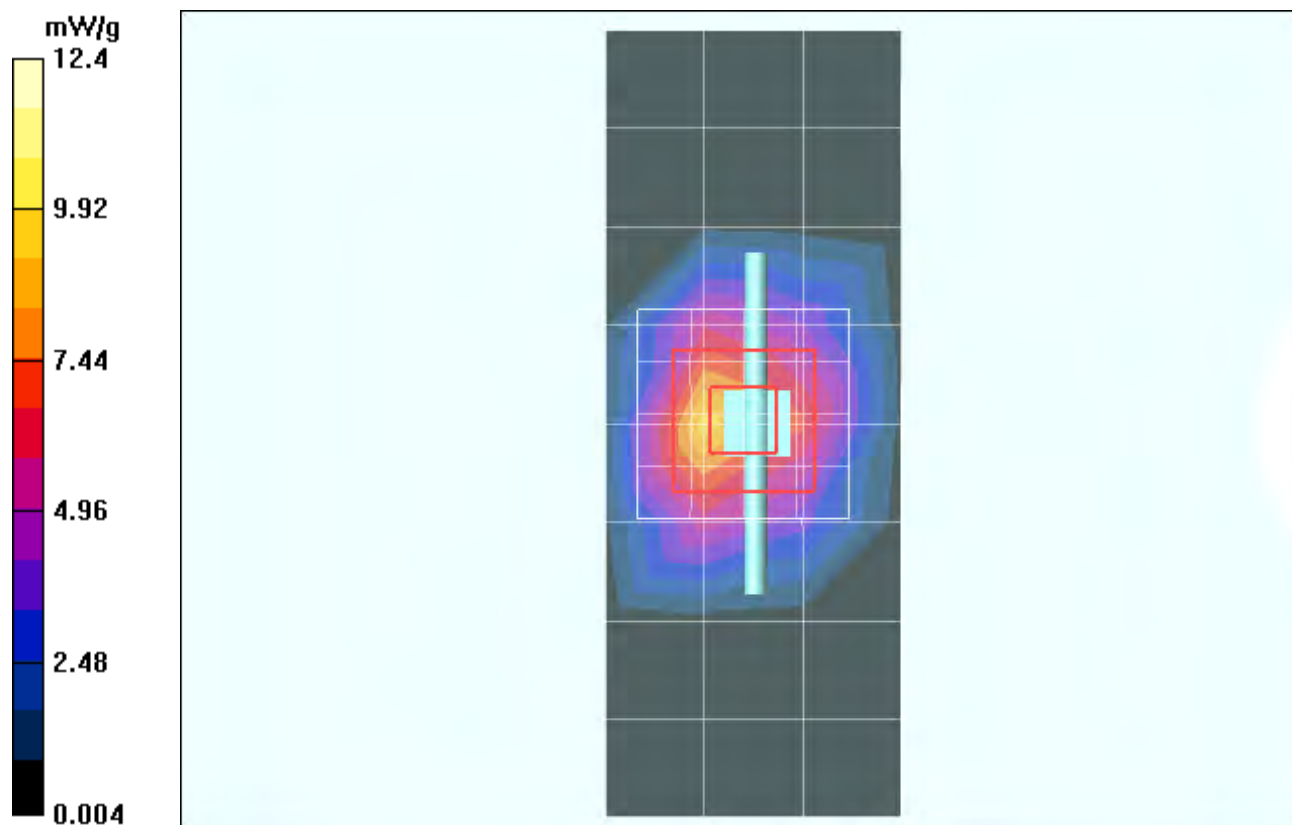
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 83.3 V/m; Power Drift = 0.011 dB; Peak SAR (extrapolated) = 21.7 W/kg

**SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.06 mW/g;** Maximum value of SAR (measured) = 12.4 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid: dx=20mm, dy=20mm, dz=5mm



Date/Time: 8/10/2010 10:40:22 AM

## Test Laboratory: Motorola - Aug-10-2010 2450 MHz

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 766; FCC ID: IHDP56LD1**

Procedure Notes: 2450 MHz System Performance Check; Dipole Sn# 766; Input Power = 200 mW

Sim.Temp@meas = 19.9°C; Sim.Temp@SPC = 19.9°C; Room Temp @ SPC = 20.1°C

Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 36.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.41, 4.41, 4.41); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 9.91 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

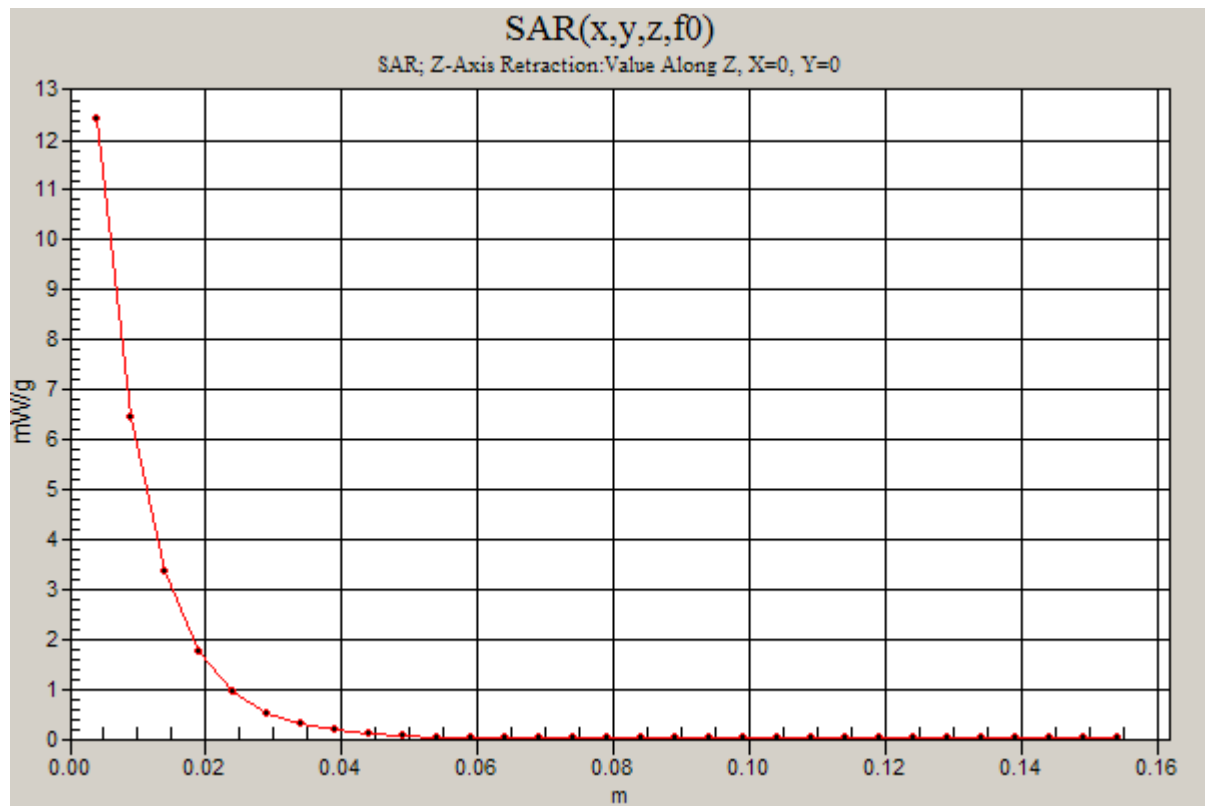
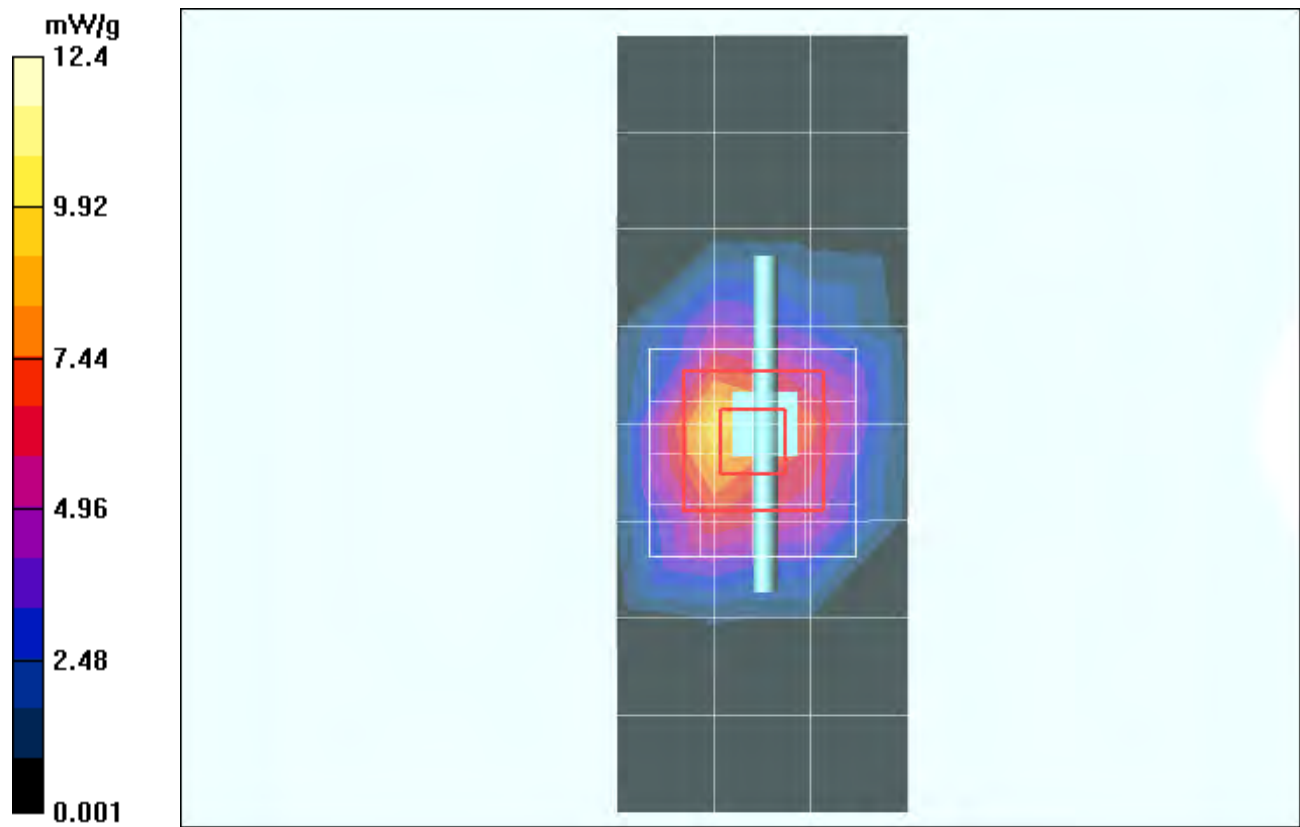
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 82.2 V/m; Power Drift = -0.061 dB; Peak SAR (extrapolated) = 21.3 W/kg

**SAR(1 g) = 10.9 mW/g; SAR(10 g) = 5.19 mW/g;** Maximum value of SAR (measured) = 12.3 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid: dx=20mm, dy=20mm, dz=5mm; Maximum value of SAR (measured) = 12.4 mW/g



Date/Time: 9/8/2010 12:16:17 PM

## Test Laboratory: Motorola - Sep-08-2010 2450 MHz

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 766; FCC ID: IHDP56LD1**

Procedure Notes: 2450 MHz System Performance Check; Dipole Sn# 766; Input Power = 200 mW

Sim.Temp@meas = 20.0°C; Sim.Temp@SPC = 19.9°C; Room Temp @ SPC = 20.0°C

Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 38.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(4.44, 4.44, 4.44); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 8.02 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

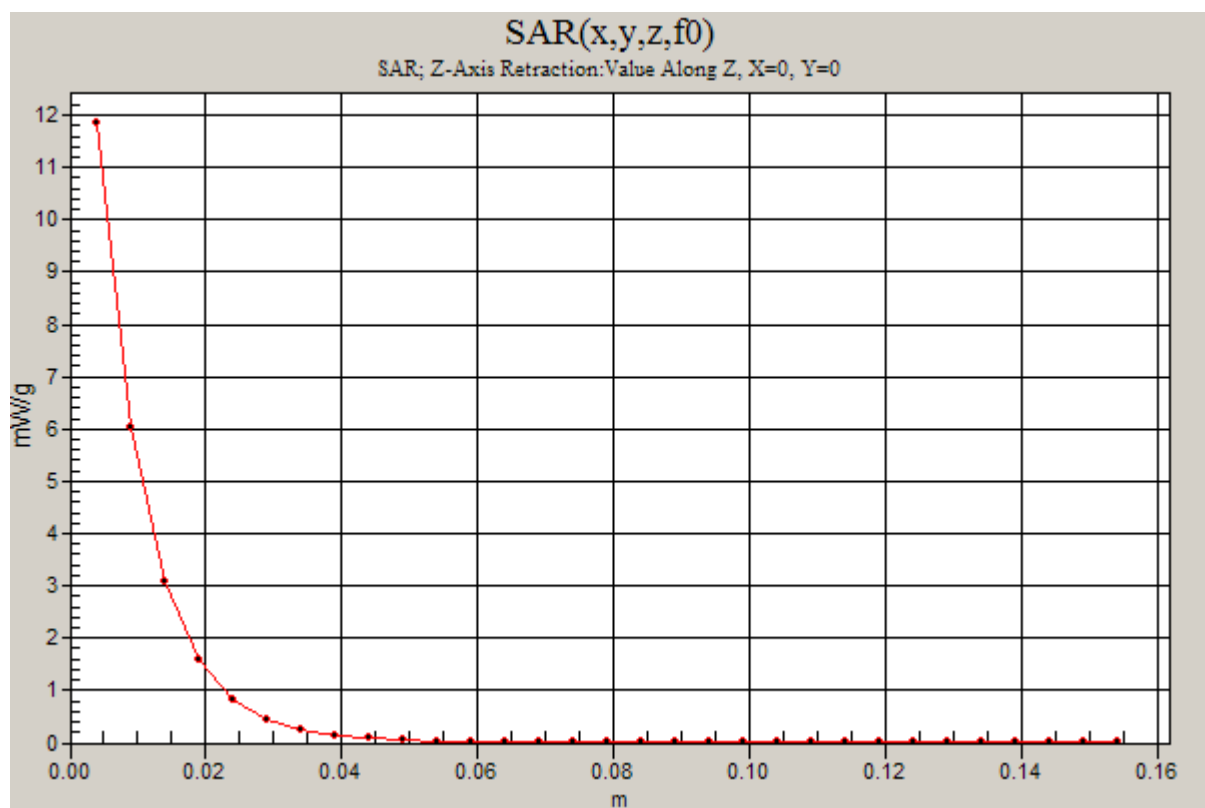
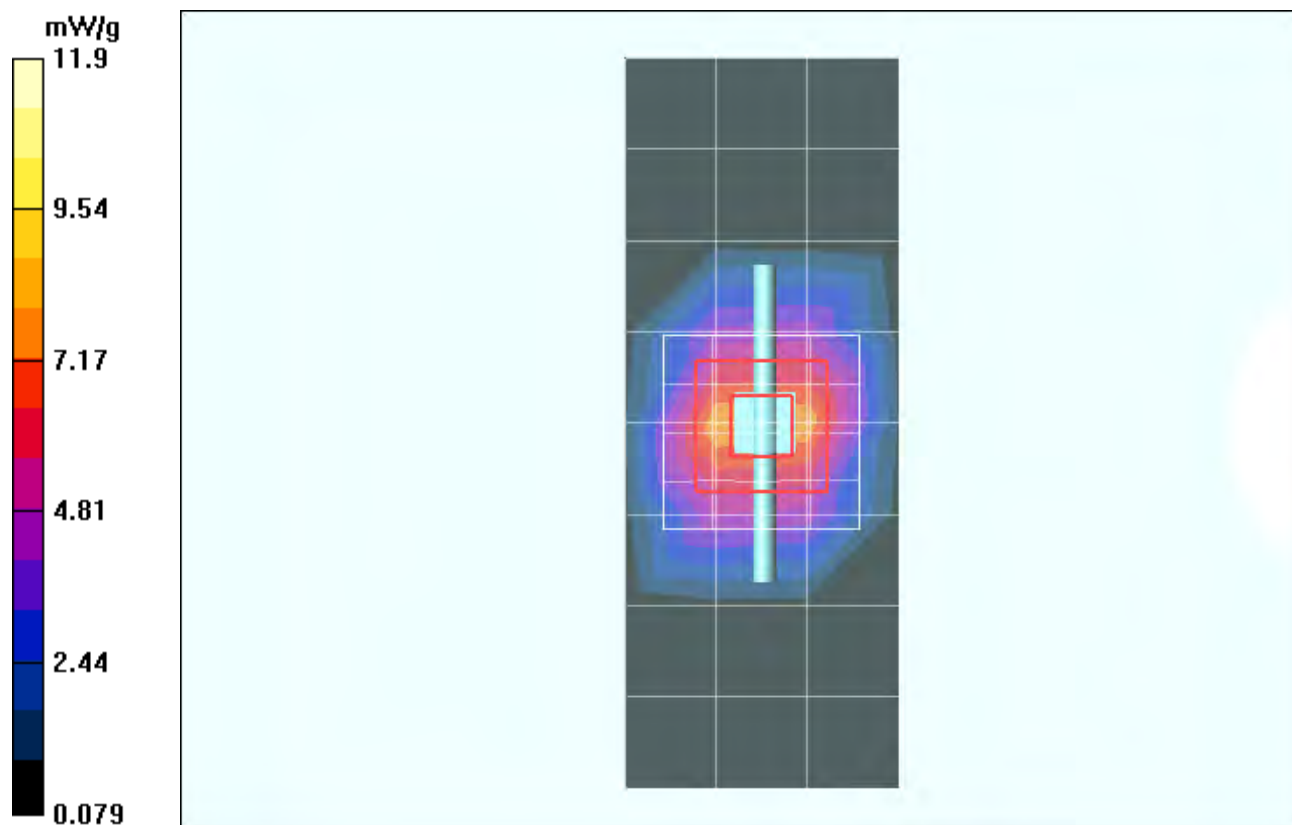
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 82.6 V/m; Power Drift = -0.018 dB; Peak SAR (extrapolated) = 20.5 W/kg

**SAR(1 g) = 10.3 mW/g; SAR(10 g) = 4.84 mW/g;** Maximum value of SAR (measured) = 11.9 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid: dx=20mm, dy=20mm, dz=5mm



Date/Time: 9/24/2010 12:07:39 PM

## Test Laboratory: Motorola - Sep-24-2010 2450 MHz

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 766; FCC ID: IHDP56LD1**

Procedure Notes: 2450 MHz System Performance Check; Dipole Sn# 766; Input Power = 200 mW

Sim.Temp@meas = 19.8 °C; Sim.Temp@SPC = 19.9 °C; Room Temp @ SPC = 19.8 °C

Communication System: CW - Dipole; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: VALIDATION Only

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.86 \text{ mho/m}$ ;  $\epsilon_r = 37.2$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3124; ConvF(4.35, 4.35, 4.35); Calibrated: 8/11/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 7/13/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Daily SPC Check/Dipole Area Scan (4x9x1):

Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 10.6 mW/g

### Daily SPC Check/0-Degree, 5x5x7 Cube (5x5x7)/Cube 0:

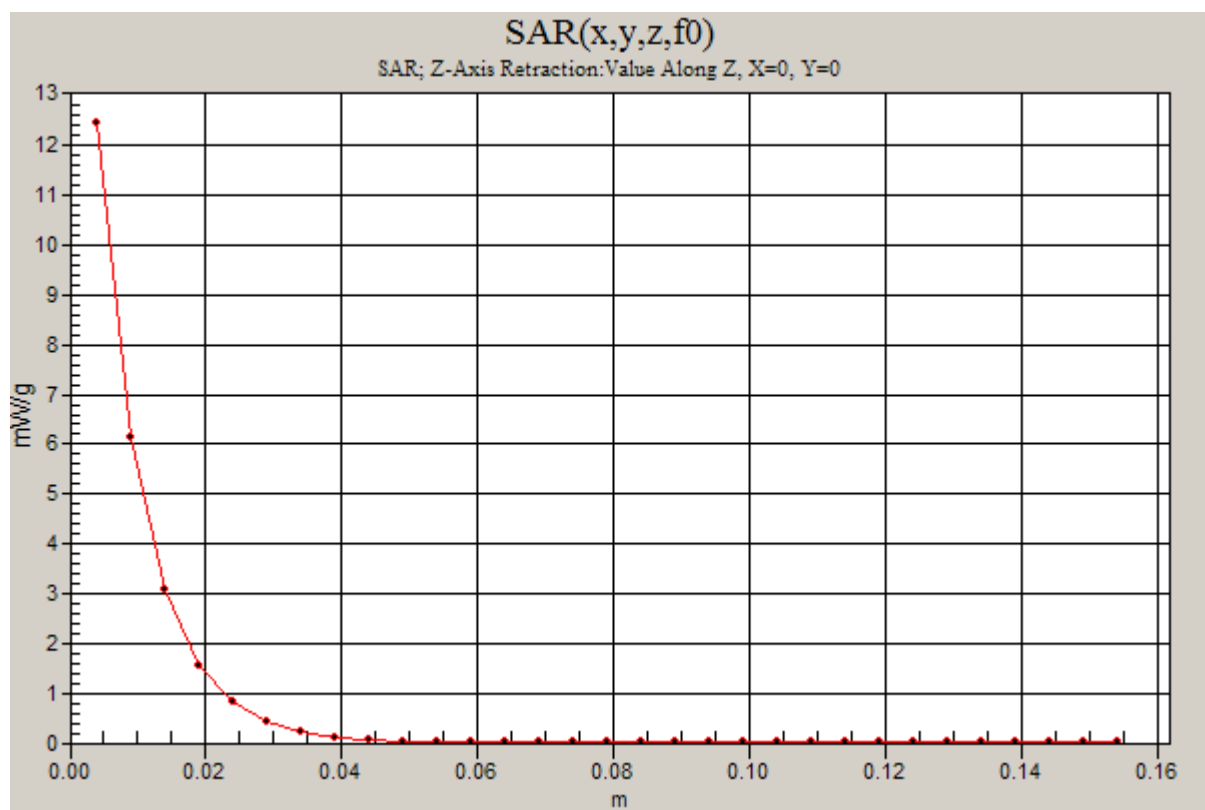
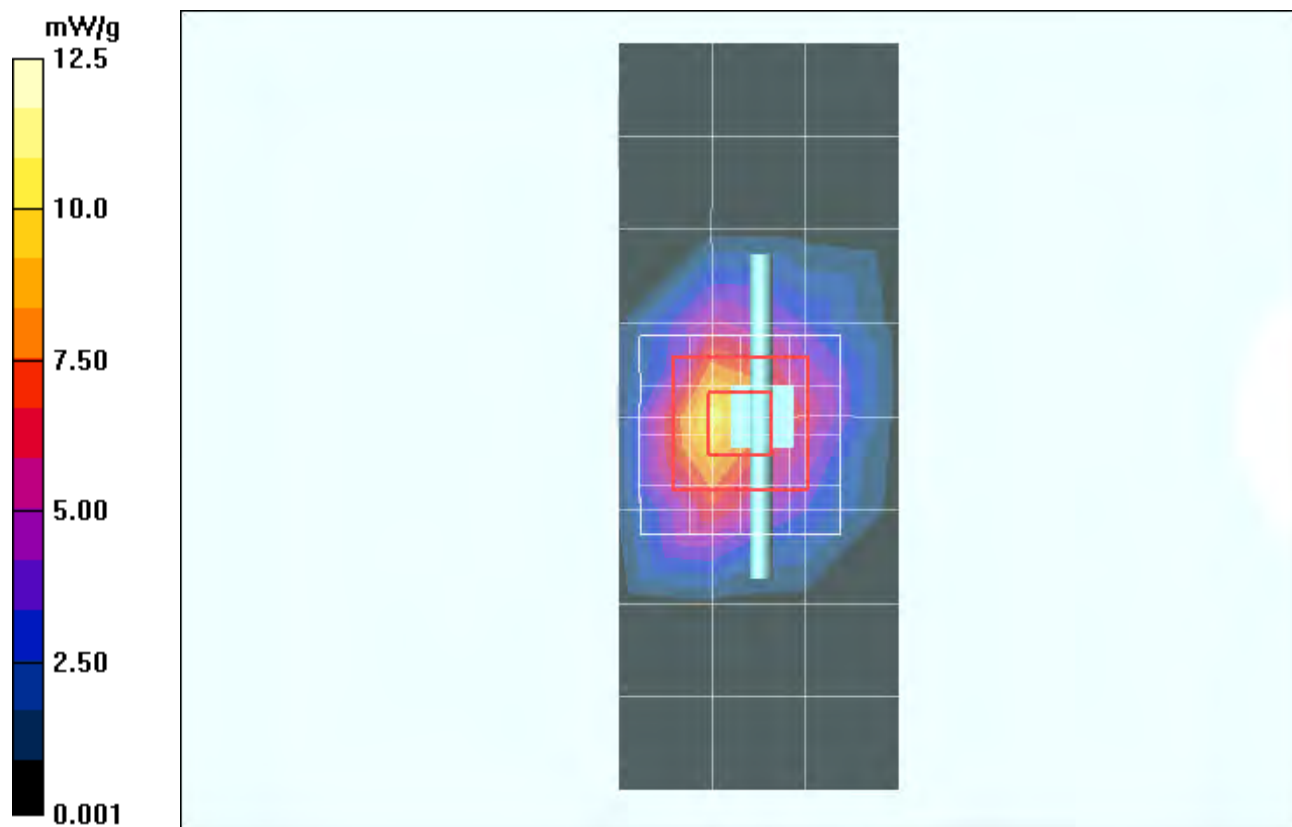
Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 80.2 V/m; Power Drift = 0.060 dB; Peak SAR (extrapolated) = 22.7 W/kg

**SAR(1 g) = 10.9 mW/g; SAR(10 g) = 5.05 mW/g;** Maximum value of SAR (measured) = 12.2 mW/g

### Daily SPC Check/Z-Axis Retraction (1x1x31):

Measurement grid:  $dx=20\text{mm}$ ,  $dy=20\text{mm}$ ,  $dz=5\text{mm}$ ; Maximum value of SAR (measured) = 12.5 mW/g



## **Appendix 2**

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

## Test Laboratory: Motorola - GSM 850 Cheek

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION (cheek or rotated): Cheek

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8.3

Medium: Low Freq Head

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.92$  mho/m;  $\epsilon_r = 41.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.26, 6.26, 6.26); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Right Head Template/Area Scan - Normal (5mm) (7x17x1):

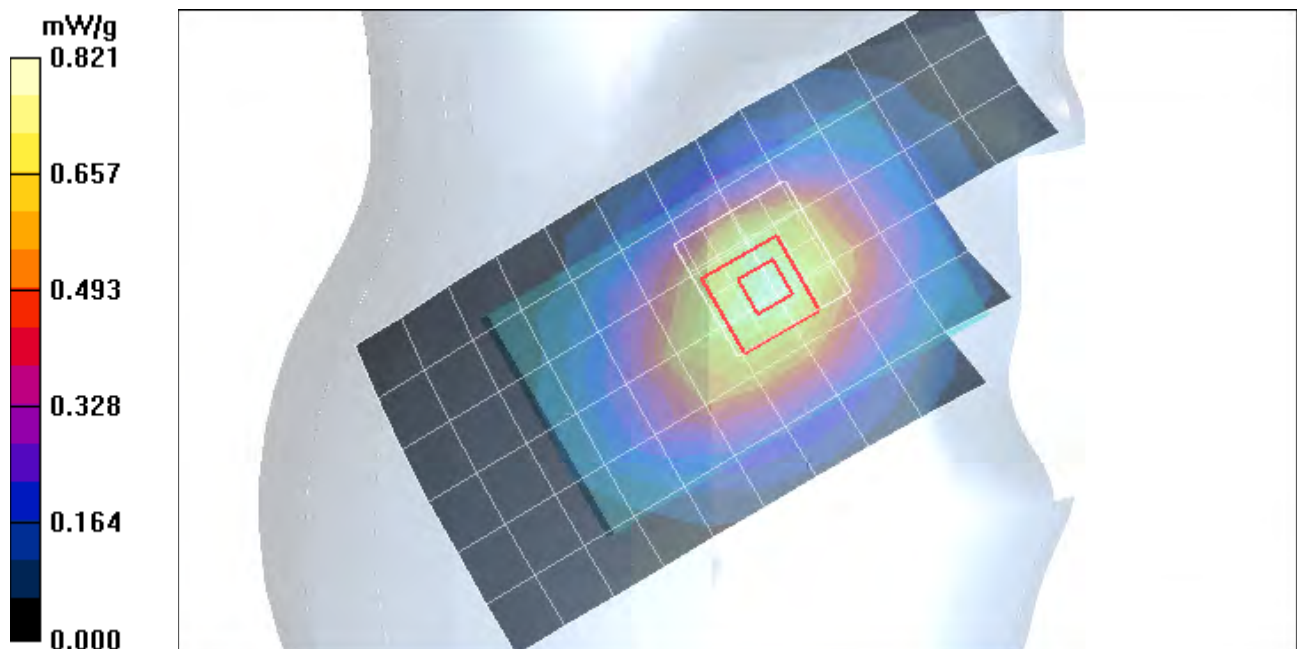
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.821 mW/g

### Right Head Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.8 V/m; Power Drift = -0.059 dB; Peak SAR (extrapolated) = 0.932 W/kg

SAR(1 g) = 0.780 mW/g; SAR(10 g) = 0.587 mW/g; Maximum value of SAR (measured) = 0.809 mW/g



## Test Laboratory: Motorola - GSM 1900 Cheek

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: 0; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION (cheek or rotated): Cheek

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8.3

Medium: Regular Glycol Head 1750/1880

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.46 \text{ mho/m}$ ;  $\epsilon_r = 39.6$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(5.14, 5.14, 5.14); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Left Head Template/Area Scan - Normal (10mm) (10x25x1):

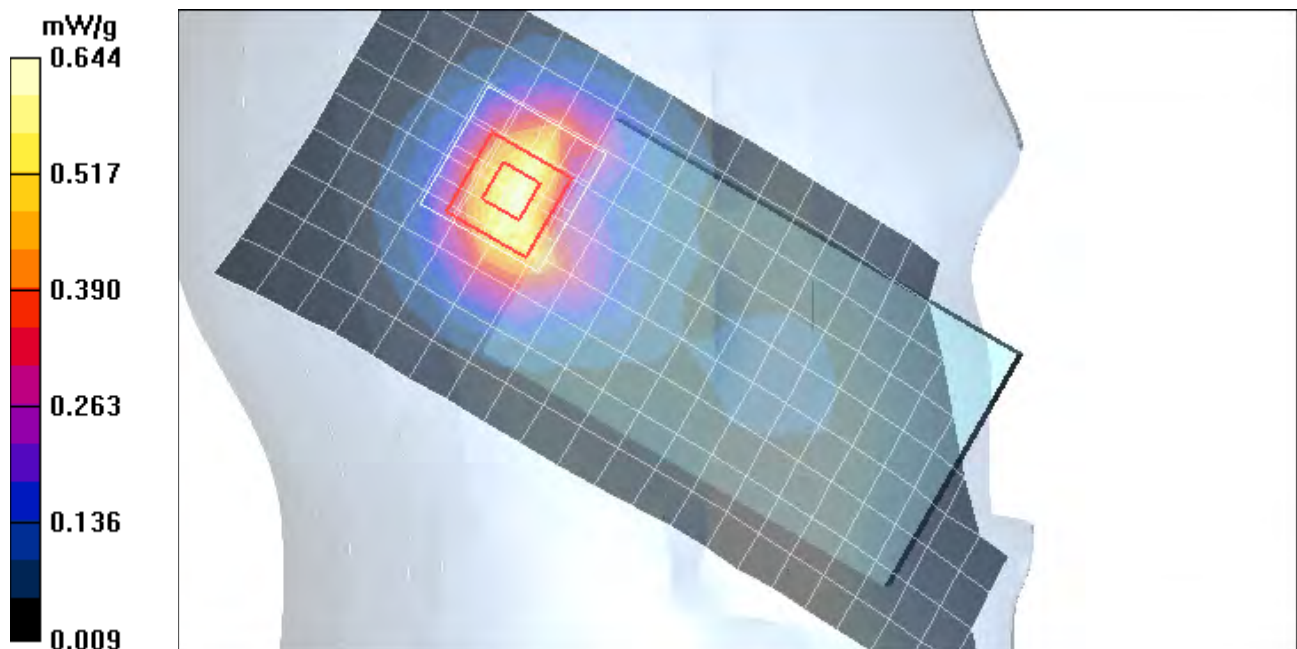
Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$ ; Maximum value of SAR (measured) =  $0.634 \text{ mW/g}$

### Left 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 =  $21.1 \text{ V/m}$ ; Power Drift =  $0.024 \text{ dB}$ ; Peak SAR (extrapolated) =  $0.970 \text{ W/kg}$

**SAR(1 g) =  $0.572 \text{ mW/g}$ ; SAR(10 g) =  $0.313 \text{ mW/g}$ ; Maximum value of SAR (measured) =  $0.644 \text{ mW/g}$**



## Test Laboratory: Motorola - WCDMA 850 Cheek

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION (cheek or rotated): Cheek

Communication System: WCDMA 850; Frequency: 846.6 MHz; Channel Number: 4233; Duty Cycle: 1:1

Medium: Low Freq Head

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.92$  mho/m;  $\epsilon_r = 41.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.26, 6.26, 6.26); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Right Head Template/Area Scan - Normal (15mm) (7x17x1):

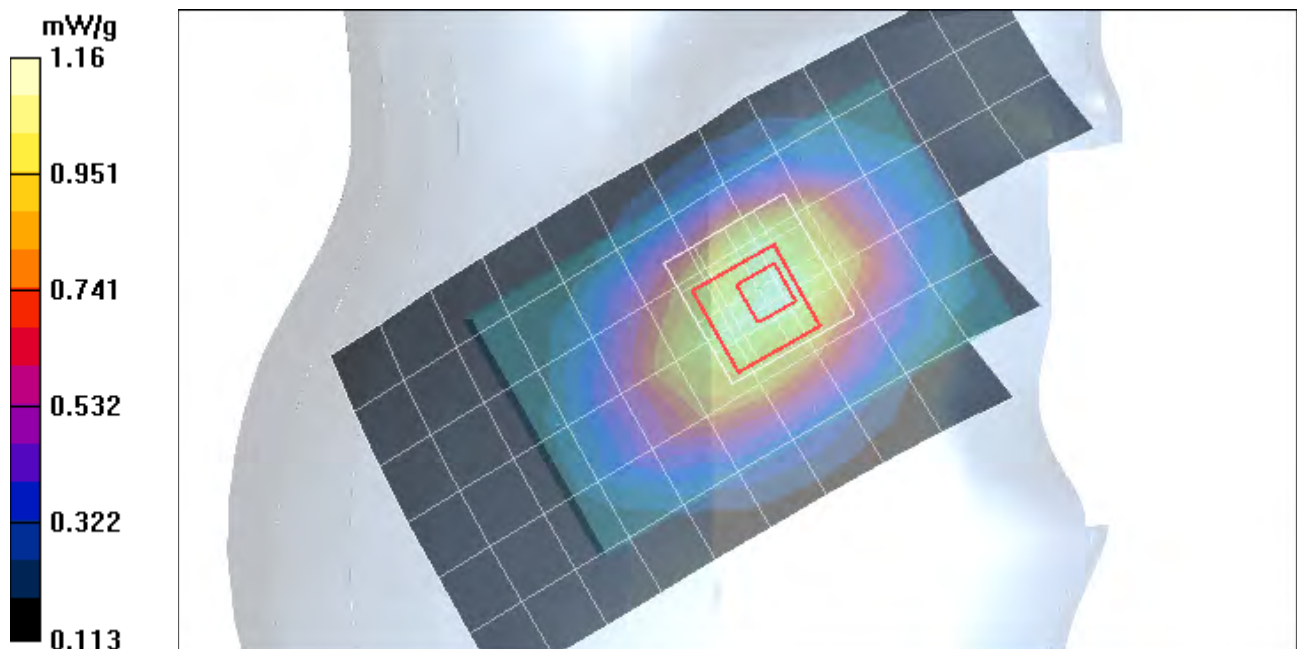
Measurement grid:  $dx=15$ mm,  $dy=15$ mm; Maximum value of SAR (measured) = 1.17 mW/g

### Right Head Template/5x5x7 Zoom Scan ( $\leq 3$ GHz) (5x5x7)/Cube 0:

Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 34.6 V/m; Power Drift = -0.098 dB; Peak SAR (extrapolated) = 1.31 W/kg

**SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.839 mW/g; Maximum value of SAR (measured) = 1.16 mW/g**



## Test Laboratory: Motorola - WCDMA 1900 Cheek

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION (cheek or rotated): Cheek

Communication System: WCDMA 1900; Frequency: 1852.5 MHz; Channel Number: 9262; Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.46 \text{ mho/m}$ ;  $\epsilon_r = 39.2$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.05, 5.05, 5.05); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Left Head Template/Area Scan - Normal (15mm) (7x17x1):

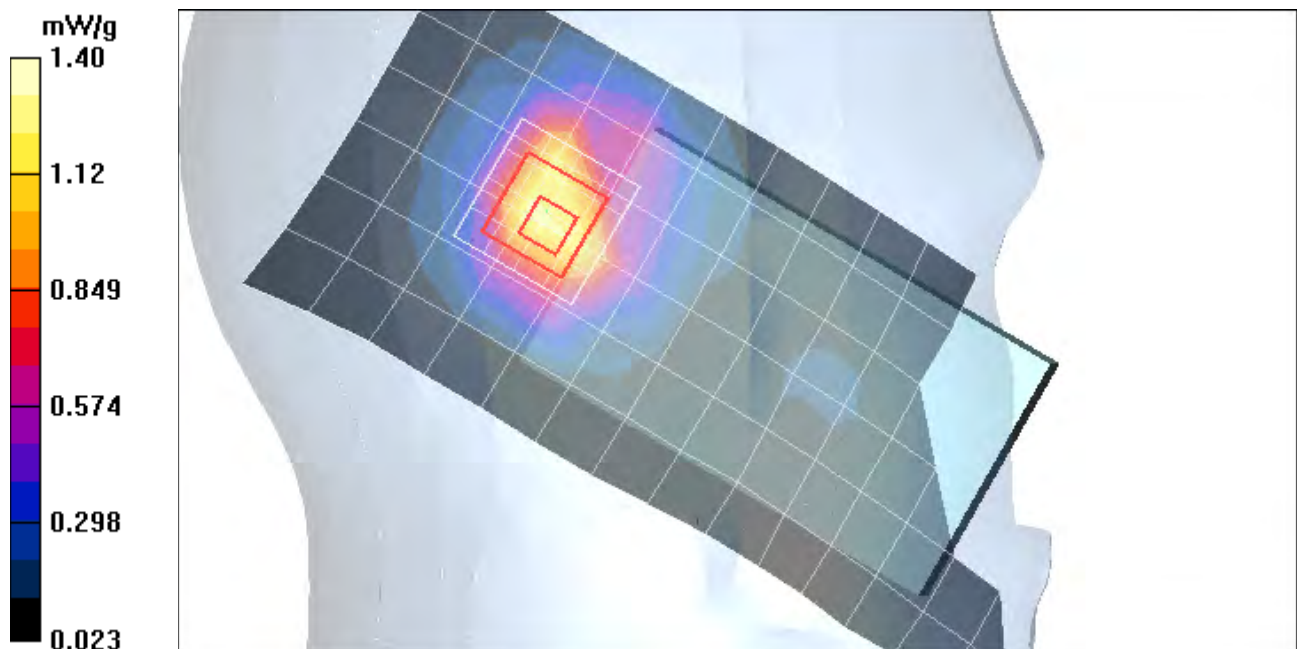
Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 1.23 mW/g

### Left 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 = 30.4 V/m; Power Drift = -0.156 dB; Peak SAR (extrapolated) = 2.28 W/kg

**SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.695 mW/g; Maximum value of SAR (measured) = 1.40 mW/g**



## Test Laboratory: Motorola - Wi-Fi 2450 Cheek

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: N/A; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION: Cheek

Device Mode: 802.11b mode, 1 Mbps data rate

Communication System: Wi-Fi 2450; Frequency: 2412 MHz; Channel Number: 1; Duty Cycle: 1:1

Medium: 2450 Glycol Head

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 36.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.41, 4.41, 4.41); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Left Head Template/Area Scan - Normal (15mm) (7x17x1):

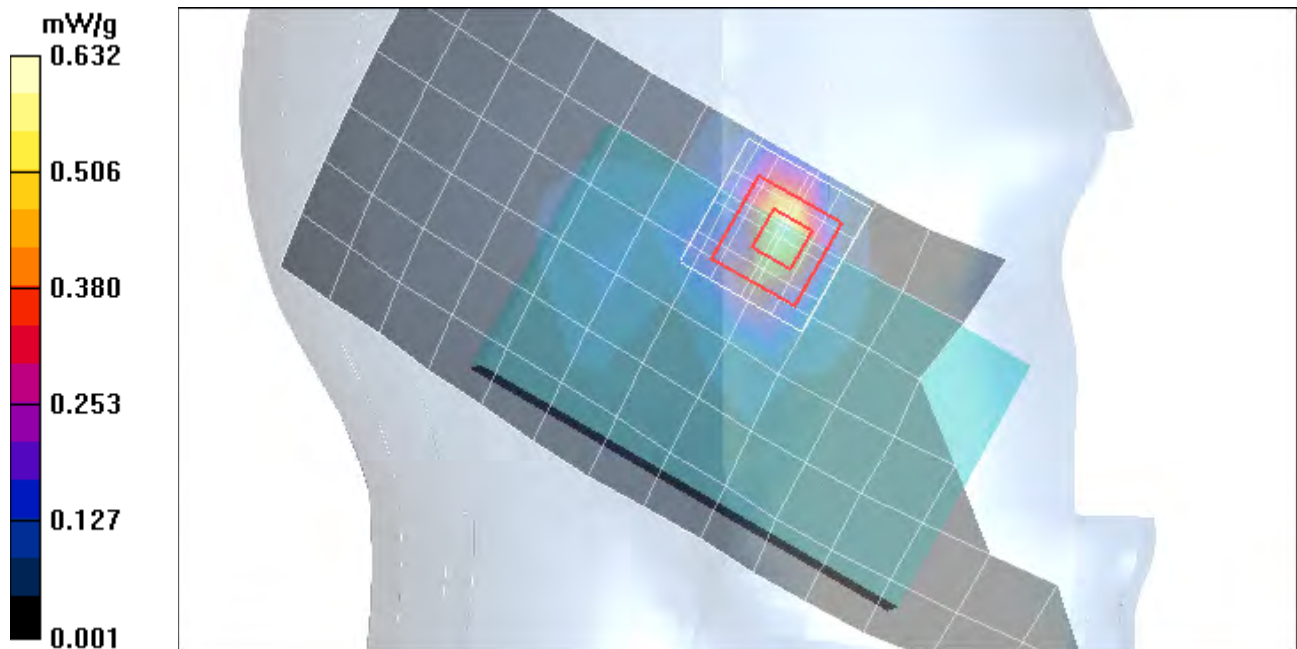
Measurement grid:  $dx=15$ mm,  $dy=15$ mm; Maximum value of SAR (measured) = 0.623 mW/g

### Left Head Template/5x5x7 Zoom Scan ( $\leq 3$ GHz) (5x5x7)/Cube 0:

Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 11.5 V/m; Power Drift = -0.052 dB; Peak SAR (extrapolated) = 1.21 W/kg

**SAR(1 g) = 0.535 mW/g; SAR(10 g) = 0.232 mW/g;** Maximum value of SAR (measured) = 0.632 mW/g



## Test Laboratory: Motorola - GSM 850 Tilt

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION (cheek or rotated): Rotated

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8.3

Medium: Low Freq Head

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.91 \text{ mho/m}$ ;  $\epsilon_r = 41.2$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.26, 6.26, 6.26); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Left Head Template/Area Scan - Normal (10mm) (10x25x1):

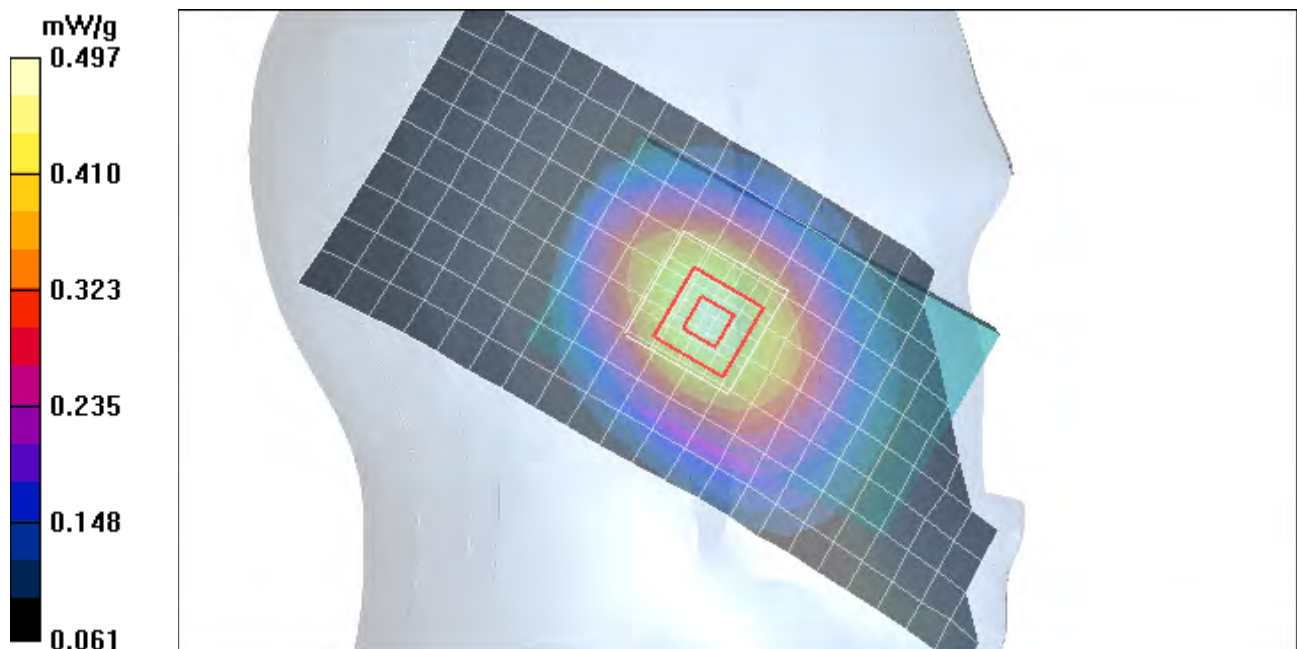
Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$ ; Maximum value of SAR (measured) =  $0.479 \text{ mW/g}$

### Left 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 =  $22.6 \text{ V/m}$ ; Power Drift =  $0.105 \text{ dB}$ ; Peak SAR (extrapolated) =  $0.564 \text{ W/kg}$

**SAR(1 g) =  $0.472 \text{ mW/g}$ ; SAR(10 g) =  $0.357 \text{ mW/g}$ ; Maximum value of SAR (measured) =  $0.497 \text{ mW/g}$**



## Test Laboratory: Motorola - GSM 1900 Tilt

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: 0; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION (cheek or rotated): Rotated

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8.3

Medium: Regular Glycol Head 1750/1880

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.46 \text{ mho/m}$ ;  $\epsilon_r = 39.6$ ;  $\rho = 1000 \text{ kg/m}^3$

### DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(5.14, 5.14, 5.14); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Left Head Template/Area Scan - Normal (10mm) (10x25x1):

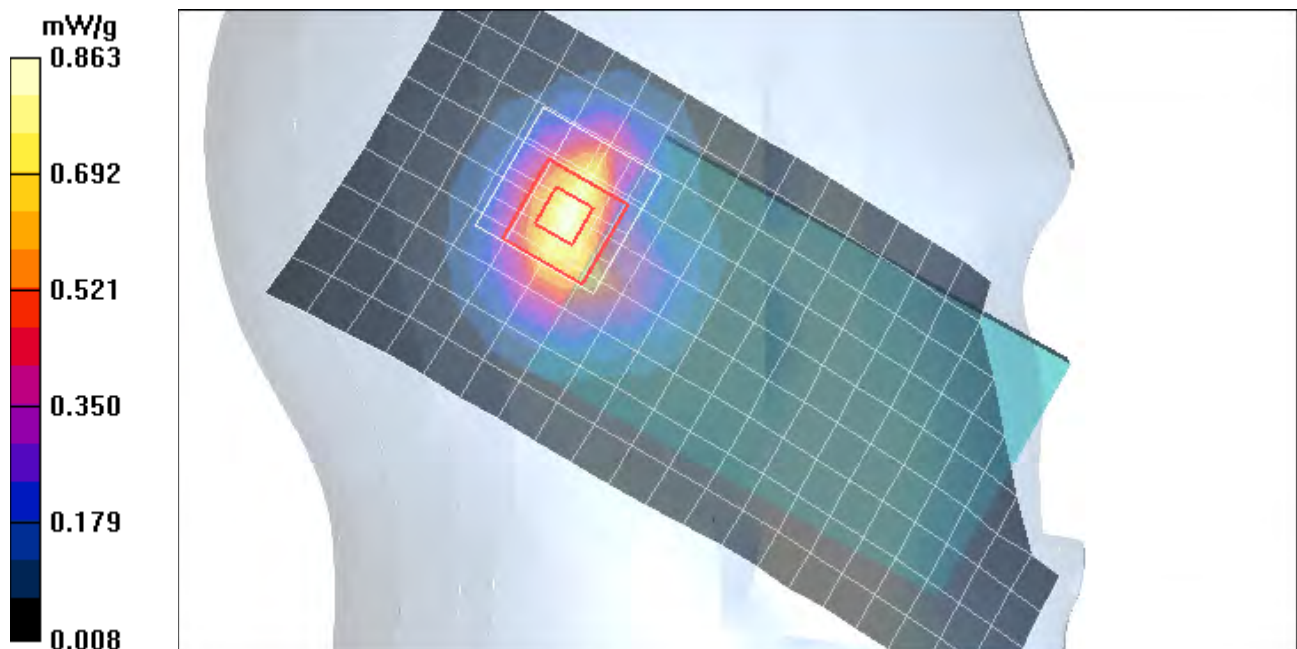
Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$ ; Maximum value of SAR (measured) =  $0.871 \text{ mW/g}$

### Left 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 =  $23.7 \text{ V/m}$ ; Power Drift =  $-0.041 \text{ dB}$ ; Peak SAR (extrapolated) =  $1.35 \text{ W/kg}$

**SAR(1 g) =  $0.759 \text{ mW/g}$ ; SAR(10 g) =  $0.398 \text{ mW/g}$ ; Maximum value of SAR (measured) =  $0.863 \text{ mW/g}$**



## Test Laboratory: Motorola - WCDMA 850 Tilt

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION (cheek or rotated): Tilt

Communication System: WCDMA 850; Frequency: 836 MHz; Channel Number: 4180; Duty Cycle: 1:1

Medium: Low Freq Head

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.92 \text{ mho/m}$ ;  $\epsilon_r = 41.4$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.26, 6.26, 6.26); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Right Head Template/Area Scan - Normal (15mm) (7x17x1):

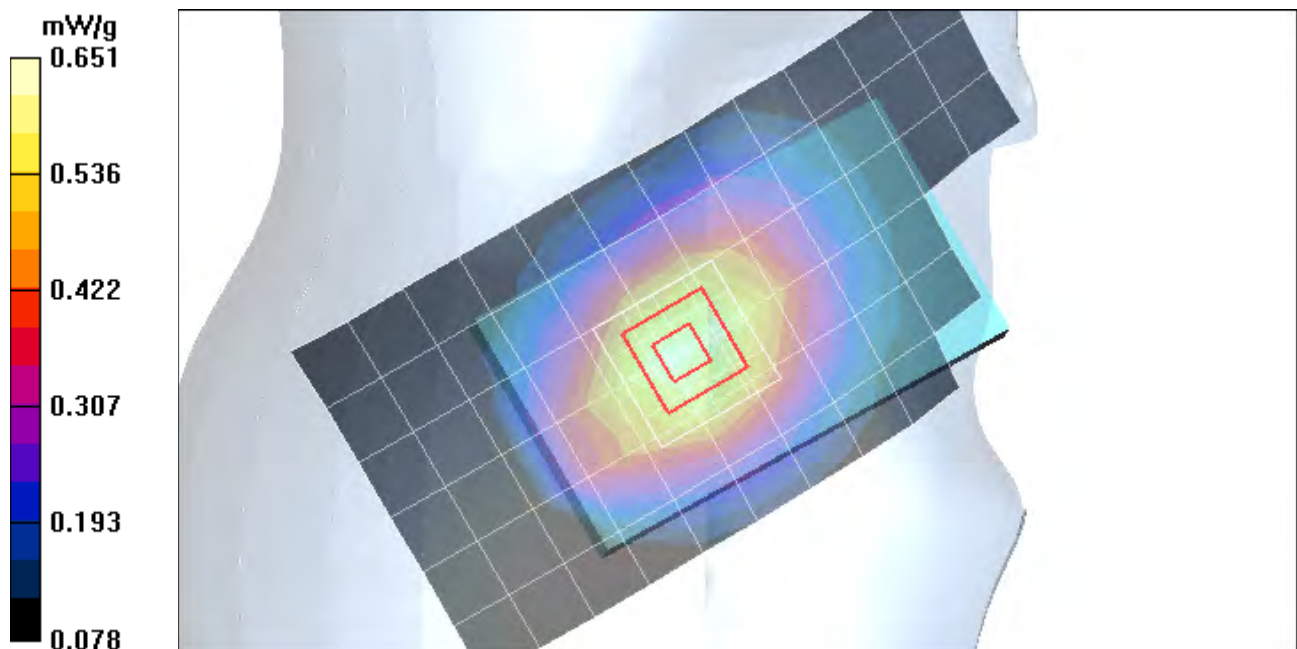
Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) = 0.640 mW/g

### 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 = 26.3 V/m; Power Drift = 0.080 dB; Peak SAR (extrapolated) = 0.730 W/kg

**SAR(1 g) = 0.615 mW/g; SAR(10 g) = 0.466 mW/g; Maximum value of SAR (measured) = 0.651 mW/g**



## Test Laboratory: Motorola - WCDMA 1900 Tilt

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION (cheek or rotated): Rotated

Communication System: WCDMA 1900; Frequency: 1852.5 MHz; Channel Number: 9262; Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

### DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(5.14, 5.14, 5.14); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Left Head Template/Area Scan - Normal (10mm) (10x25x1):

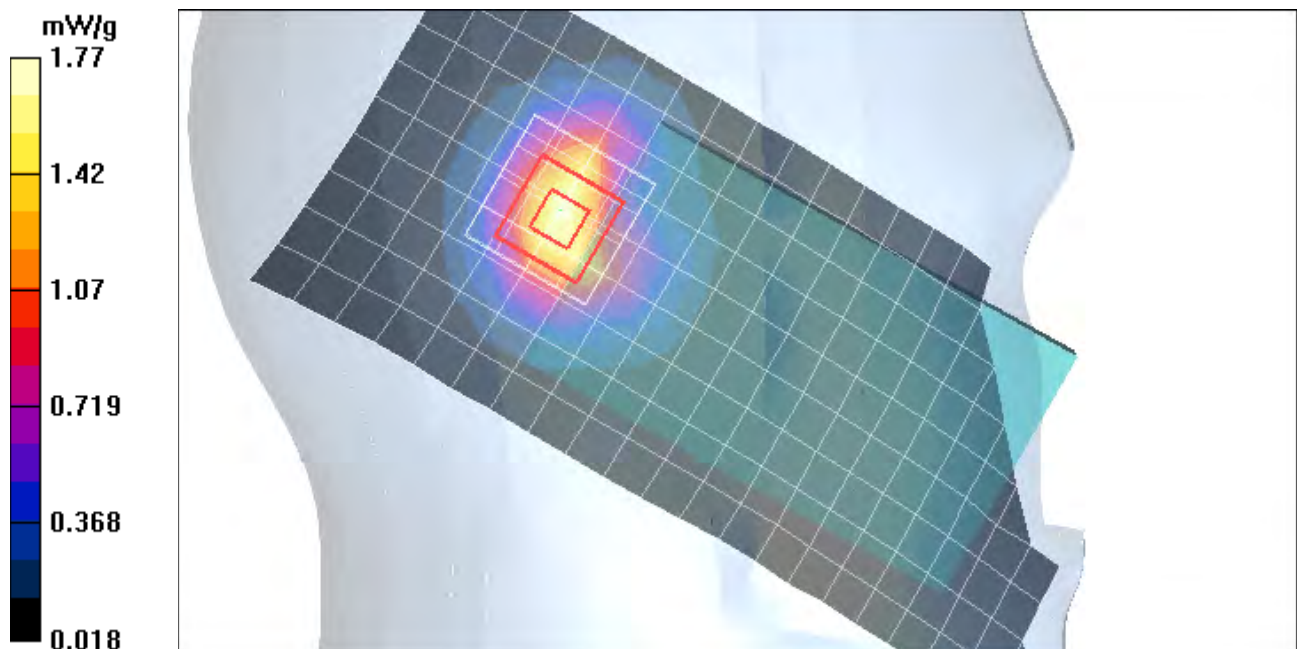
Measurement grid:  $dx=10$ mm,  $dy=10$ mm; Maximum value of SAR (measured) = 1.74 mW/g

### Left Head Template/5x5x7 Zoom Scan ( $\leq 3$ GHz) (5x5x7)/Cube 0:

Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 33.1 V/m; Power Drift = -0.013 dB; Peak SAR (extrapolated) = 2.72 W/kg

**SAR(1 g) = 1.55 mW/g; SAR(10 g) = 0.820 mW/g; Maximum value of SAR (measured) = 1.77 mW/g**



## Test Laboratory: Motorola - Wi-Fi 2450 Tilt

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: N/A; Antenna Position: Internal; Accessory Model #: N/A

Battery Model #: SNN5877A; DEVICE POSITION: Tilt

Device Mode: 802.11b mode, 1 Mbps data rate

Communication System: Wi-Fi 2450; Frequency: 2437 MHz; Channel Number: 6; Duty Cycle: 1:1

Medium: 2450 Glycol Head

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 36.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.41, 4.41, 4.41); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Glycol, SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1139;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Left Head Template/Area Scan - Normal (15mm) (7x17x1):

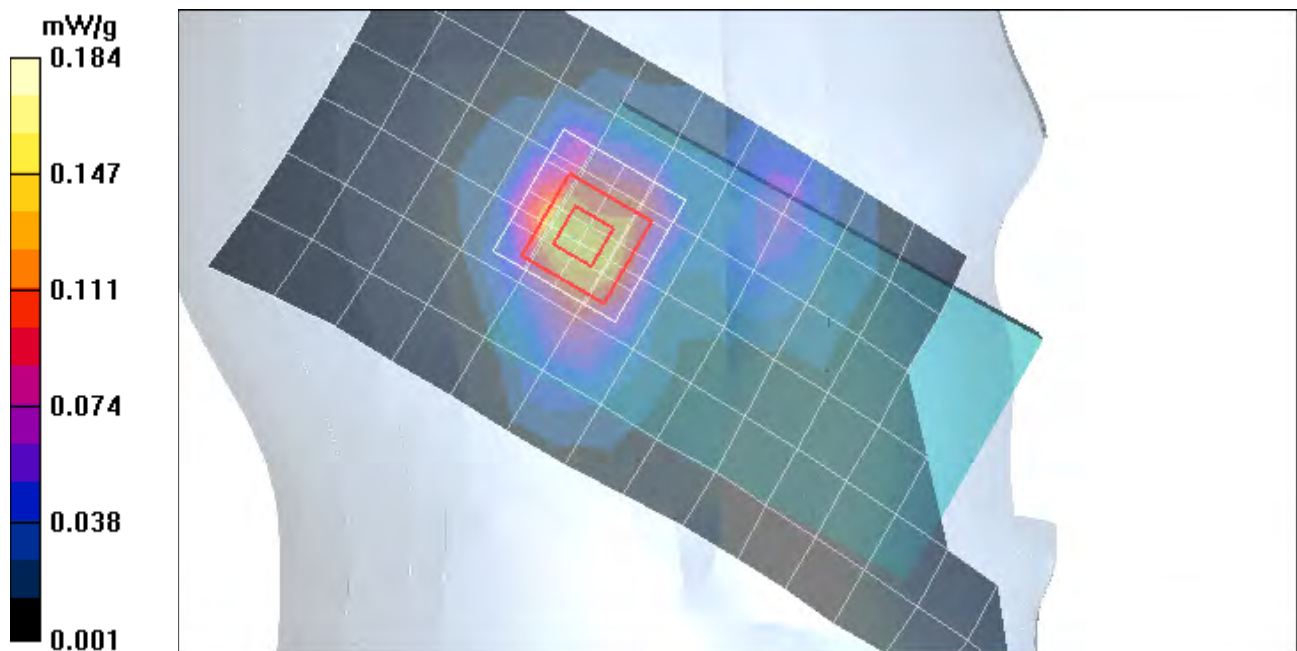
Measurement grid:  $dx=15$ mm,  $dy=15$ mm; Maximum value of SAR (measured) = 0.141 mW/g

### Left Head Template/5x5x7 Zoom Scan ( $\leq 3$ GHz) (5x5x7)/Cube 0:

Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

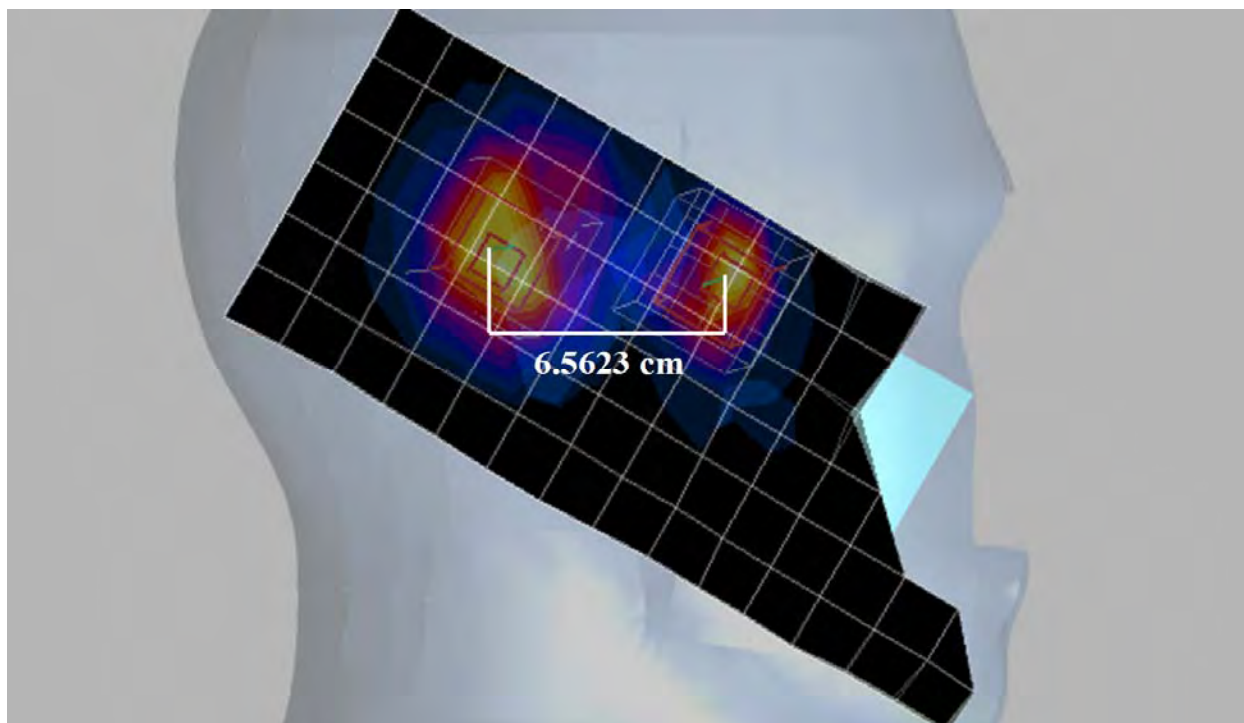
Reference Value = 9.39 V/m; Power Drift = -0.073 dB; Peak SAR (extrapolated) = 0.301 W/kg

**SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.085 mW/g; Maximum value of SAR (measured) = 0.184 mW/g**



The guidelines provided in "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas" (KDB publication 648474 - D01 v01r05) were utilized for evaluation of the need for simultaneous transmission SAR testing. These guidelines direct that if the SAR-to-peak-location separation ratio for two simultaneously transmitting antennas is  $< 0.3$  then SAR evaluation for simultaneous transmission is not required.

For WCDMA 1900 and Wi-Fi in the Left Head Cheek position the SAR-to-peak-location separation ratio is 0.28, and thus no testing was performed to determine the aggregate 1 g SAR in this configuration. SAR plots with the Wi-Fi SAR overlaid upon the WCDMA 1900 SAR are provided below for this configuration, to provide visual indication of the separation of the SAR hotspots for each modulation.



WCDMA 1900 Left Head Cheek SAR overlaid with Wi-Fi Left Head Cheek SAR

For WCDMA 850 and Wi-Fi in the Left Head Cheek position the SAR-to-peak-location separation ratio is 0.50. For WCDMA 1900 and Wi-Fi in the Left Head 15° Tilt position the SAR-to-peak-location separation ratio is 0.33. For these configurations, combined SAR measurements were required to determine the aggregate 1 g SAR for simultaneous transmission evaluation. The results of these measurements are given in the tables in 6.1 where noted, with additional SAR plots of the combined measurements provided below.

Additional SAR measurements for simultaneous transmission evaluation were performed for each of the single transmitters using an extended zoom scan. This extended zoom scan was created to encompass the zoom scan volumes that were found previously in each of the single transmit SAR tests. For WCDMA 1900 MHz + Wi-Fi, the outer dimensions of the extended zoom scan were  $X = 40$  mm,  $Y = 64$  mm,  $Z = 30$  mm with a step size of  $X = 8$  mm,  $Y = 8$  mm,  $Z = 5$  mm. For WCDMA 850 MHz + Wi-Fi, the outer dimensions of the extended zoom scan were  $X = 56$  mm,  $Y = 56$  mm,  $Z = 30$  mm with a step size of  $X = 8$  mm,  $Y = 8$  mm,  $Z = 5$  mm. The location of this extended zoom scan was established by using X, Y grid offsets from the "Grid Reference Point" in DASY4.7. The results were then combined via the DASY4.7 Multi-Band Combiner feature.

## Test Laboratory: Motorola - WCDMA 850 + Wi-Fi 2450 Multiband Combined LH Cheek Expanded Volumetric Measurement

### DASY4 Configuration for DASY4, SAM

Phone Against LEFT Head Template - Rev.13 (4-Apr-07)

/Left Head Template/Manual Super Zoom Scan ( $\leq 3\text{GHz}$ ):

Date/Time: 9/24/2010 12:50:55 PM

Serial: 351574040016601; FCC ID: IHDP56LD1

Communication System: Wi-Fi 2450; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Glycol Head

Medium parameters used:  $f = 2450\text{ MHz}$ ;  $\sigma = 1.86\text{ mho/m}$ ;  $\epsilon_r = 37.2$ ;  $\rho = 1000\text{ kg/m}^3$

Measurement Standard: DASY4 (High Precision Assessment)

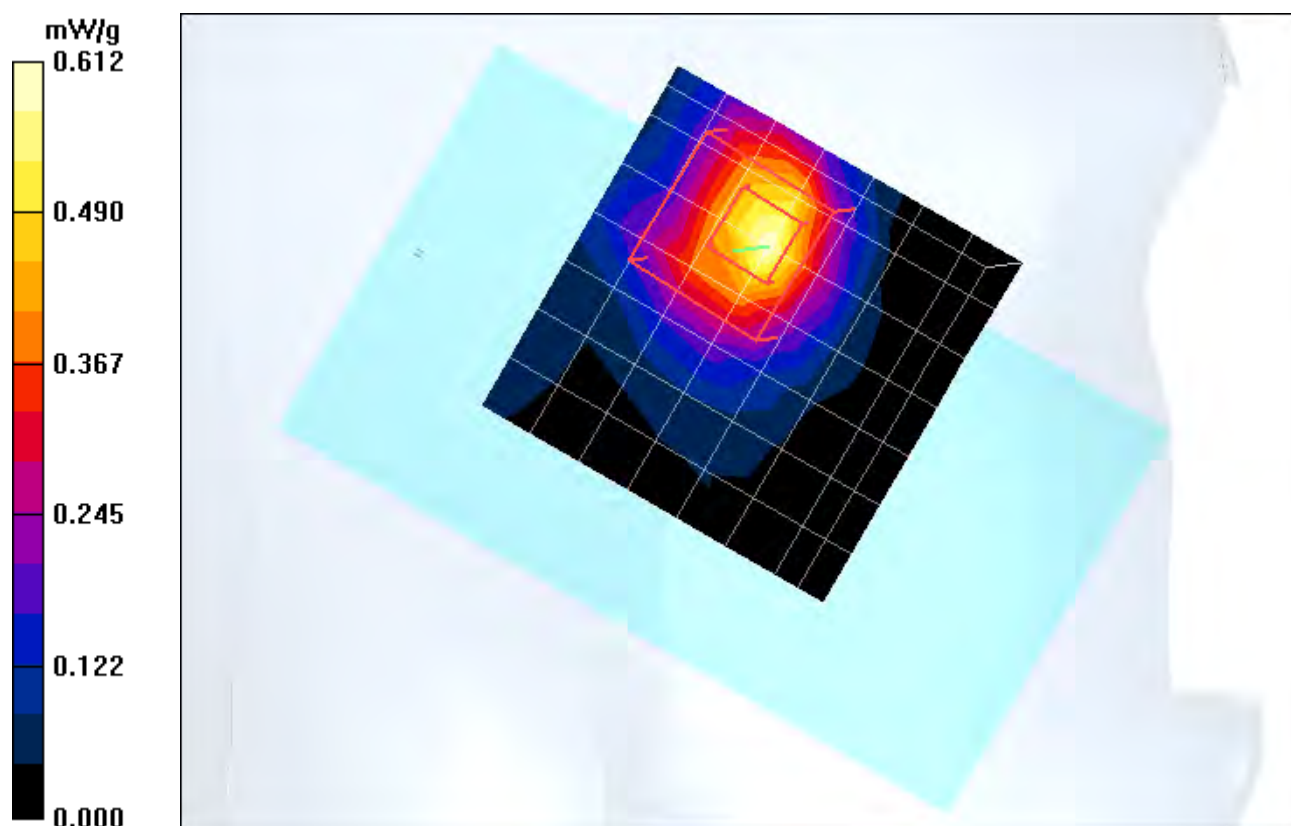
- Probe: ES3DV3 - SN3124; ConvF(4.35, 4.35, 4.35); Calibrated: 8/11/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 7/13/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250
- Measurement SW: DASY4, V4.7 Build 80

### Left Head Template/Manual Super Zoom, Zoom Scan ( $\leq 3\text{GHz}$ ) (8x8x7)/Cube 0:

Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ ; Volume Outer Dimensions:  $x=56\text{mm}$ ,  $y=56\text{mm}$ ,  $z=30\text{mm}$

Reference Value =  $10.9\text{ V/m}$ ; Power Drift =  $-0.196\text{ dB}$ ; Peak SAR (extrapolated) =  $1.24\text{ W/kg}$

SAR(1 g) =  $0.528\text{ mW/g}$ ; SAR(10 g) =  $0.228\text{ mW/g}$ ; Maximum value of SAR (measured) =  $0.612\text{ mW/g}$



2D Plot showing z-axis @ 0 mm layer of measurement volume

**DASY4 Configuration for DASY4, SAM**  
**Phone Against LEFT Head Template - Rev.13 (4-Apr-07)**  
**/Left Head Template/Manual Super Zoom Scan ( $\leq 3\text{GHz}$ ):**

Date/Time: 9/24/2010 11:47:09 AM

Serial: 351574040016601; FCC ID: IHDP56LD1

Communication System: 3G-WCDMA 850; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: Low Freq Head

Medium parameters used:  $f = 835\text{ MHz}$ ;  $\sigma = 0.88\text{ mho/m}$ ;  $\epsilon_r = 40.3$ ;  $\rho = 1000\text{ kg/m}^3$

Measurement Standard: DASY4 (High Precision Assessment)

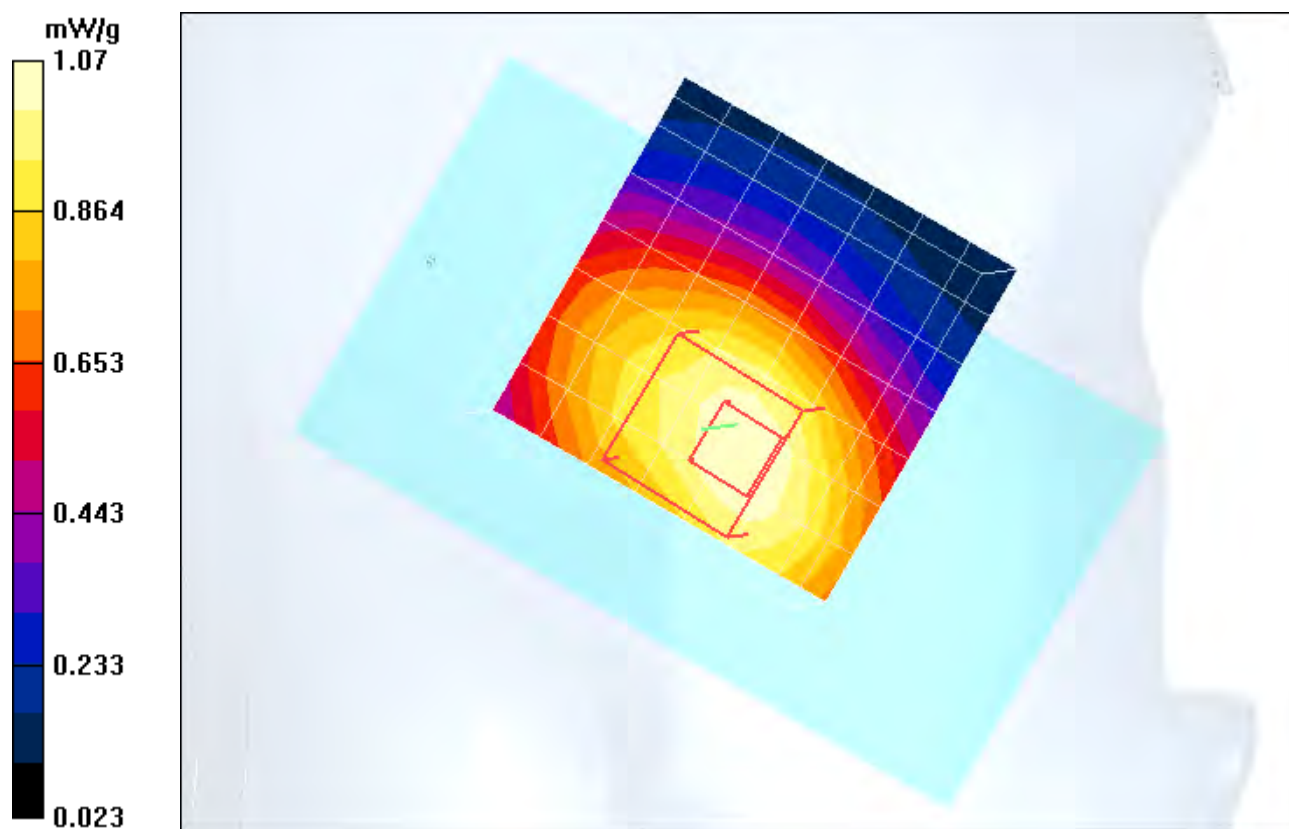
- Probe: ES3DV3 - SN3124; ConvF(5.89, 5.89, 5.89); Calibrated: 8/11/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 7/13/2010
- Phantom: R#4 Sugar SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1131
- Measurement SW: DASY4, V4.7 Build 80

**Left Head Template/Manual Super Zoom, Zoom Scan ( $\leq 3\text{GHz}$ ) (8x8x7)/Cube 0:**

Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ ; Volume Outer Dimensions:  $x=56\text{mm}$ ,  $y=56\text{mm}$ ,  $z=30\text{mm}$

Reference Value =  $34.2\text{ V/m}$ ; Power Drift =  $0.025\text{ dB}$ ; Peak SAR (extrapolated) =  $1.28\text{ W/kg}$

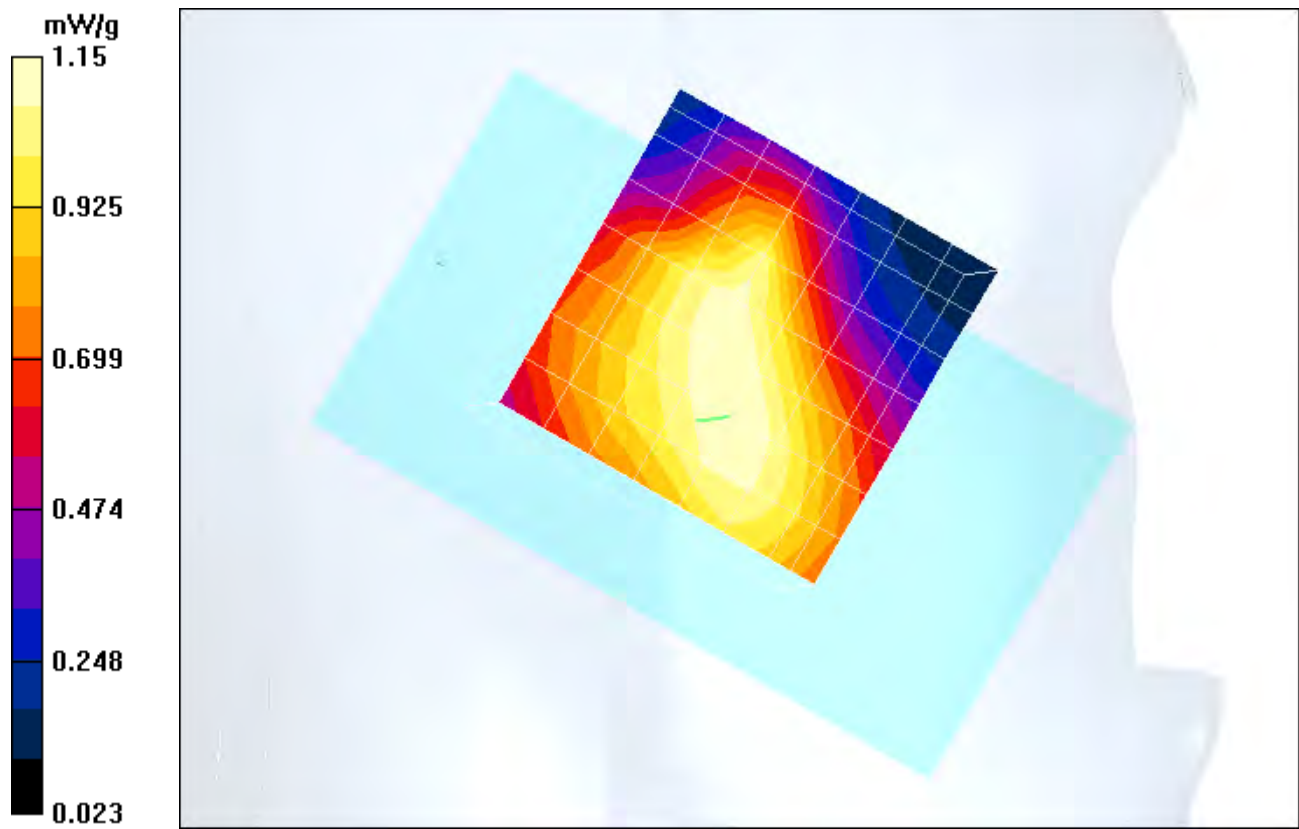
**SAR(1 g) =  $1.03\text{ mW/g}$ ; SAR(10 g) =  $0.767\text{ mW/g}$ ; Maximum value of SAR (measured) =  $1.07\text{ mW/g}$**



2D Plot showing z-axis @ 0 mm layer of measurement volume

**Multi Band Result:****SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.816 mW/g**

Maximum value of SAR (measured) = 1.15 mW/g



2D Plot showing z-axis @ 0 mm layer of measurement volume

## Test Laboratory: Motorola - WCDMA 1900 + Wi-Fi 2450 Multiband Combined LH Tilt Expanded Volumetric Measurement

### DASY4 Configuration for DASY4, SAM

Phone Against LEFT Head Template - Rev.13 (4-Apr-07)

/Left Head Template/Zoom Scan ( $\leq 3\text{GHz}$ ) 2:

Date/Time: 9/8/2010 1:12:56 PM

Serial: 351574040016601; FCC ID: IHDP56LD1

Communication System: Wi-Fi 2450; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 Glycol Head

Medium parameters used:  $f = 2450\text{ MHz}$ ;  $\sigma = 1.84\text{ mho/m}$ ;  $\epsilon_r = 38.1$ ;  $\rho = 1000\text{ kg/m}^3$

Measurement Standard: DASY4 (High Precision Assessment)

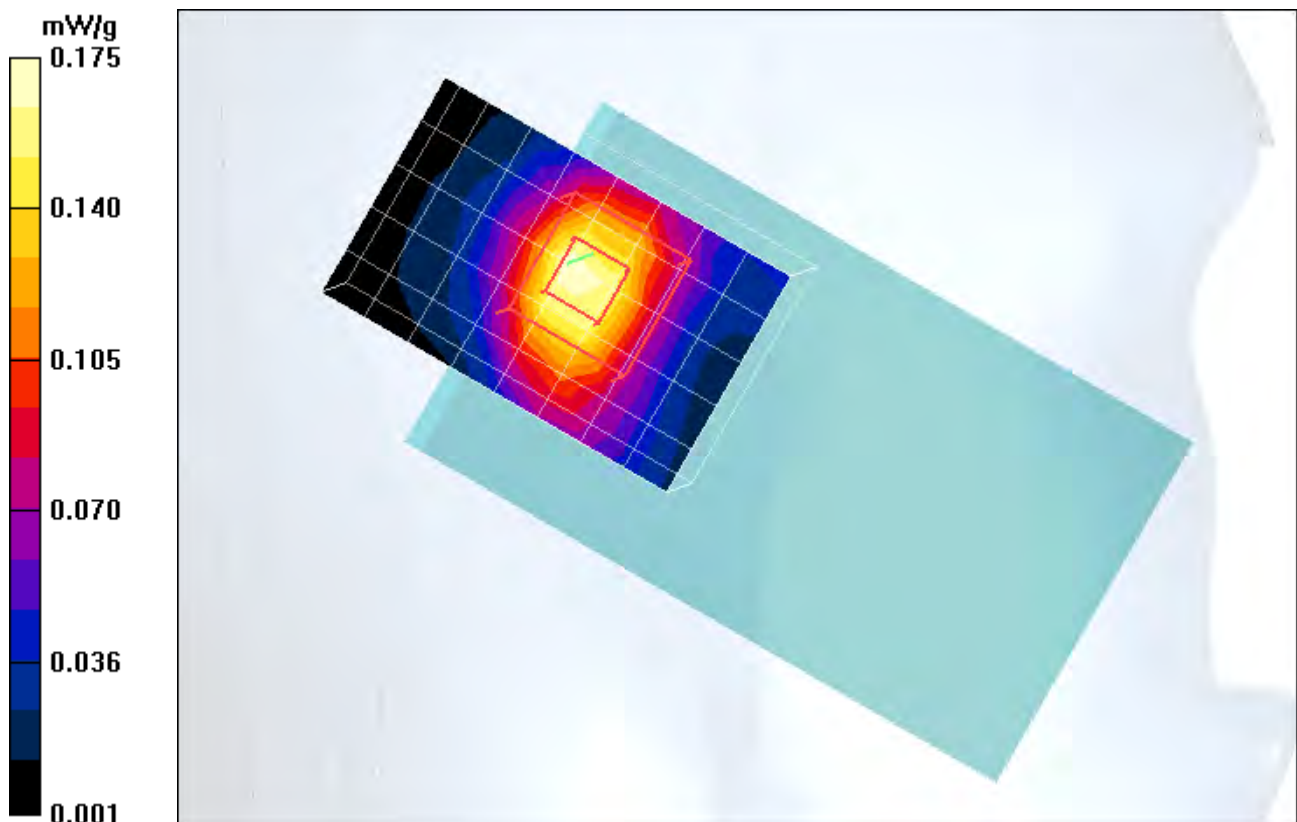
- Probe: ES3DV3 - SN3184; ConvF(4.44, 4.44, 4.44); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250
- Measurement SW: DASY4, V4.7 Build 80

### Left Head Template/Zoom Scan ( $\leq 3\text{GHz}$ ) (6x9x7)/Cube 0:

Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ ; Volume Outer Dimensions:  $x=40\text{mm}$ ,  $y=64\text{mm}$ ,  $z=30\text{mm}$

Reference Value =  $9.75\text{ V/m}$ ; Power Drift =  $-0.038\text{ dB}$ ; Peak SAR (extrapolated) =  $0.297\text{ W/kg}$

SAR(1 g) =  $0.163\text{ mW/g}$ ; SAR(10 g) =  $0.082\text{ mW/g}$ ; Maximum value of SAR (measured) =  $0.175\text{ mW/g}$



2D Plot showing z-axis @ 0 mm layer of measurement volume

**DASY4 Configuration for DASY4, SAM**  
**Phone Against LEFT Head Template - Rev.13 (4-Apr-07)**  
**/Left Head Template/5x5x7 Zoom Scan ( $\leq 3$ GHz) 2:**

Date/Time: 9/8/2010 11:44:08 AM

**Serial: 351574040016601; FCC ID: IHDP56LD1**

Communication System: 3G/WCDMA 1900; Frequency: 1852.5 MHz; Duty Cycle: 1:1

Medium: Regular Glycol Head 1750/1880

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.46$  mho/m;  $\epsilon_r = 38$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Measurement Standard: DASY4 (High Precision Assessment)

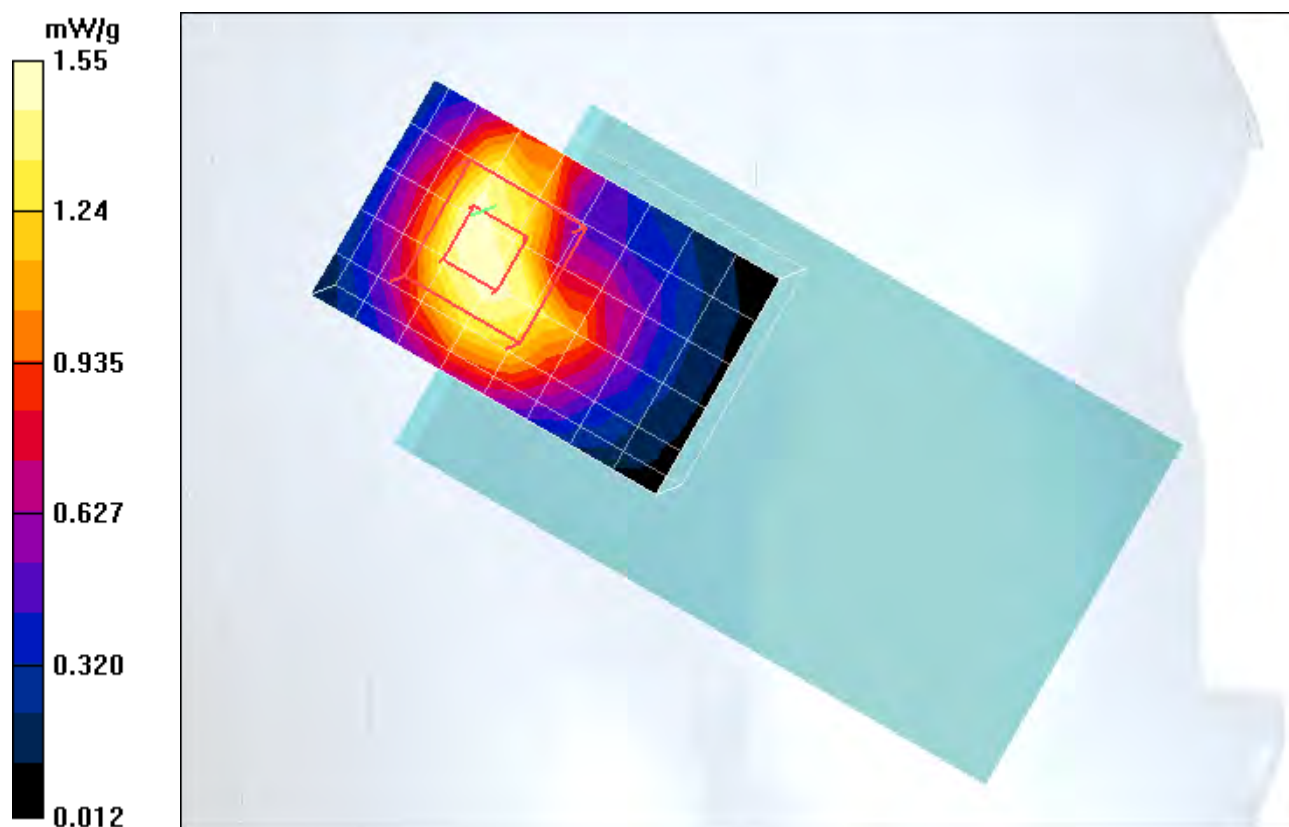
- Probe: ES3DV3 - SN3184; ConvF(5.14, 5.14, 5.14); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R#4 Glycol SAM (extended range), Rev.1 (25-Mar-05); Type: SAM v4.0; Serial: TP-1250
- Measurement SW: DASY4, V4.7 Build 80

**Left Head Template/Zoom Scan ( $\leq 3$ GHz) (6x9x7)/Cube 0:**

Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm; Volume Outer Dimensions:  $x=40$ mm,  $y=64$ mm,  $z=30$ mm

Reference Value = 30.0 V/m; Power Drift = -0.029 dB; Peak SAR (extrapolated) = 2.48 W/kg

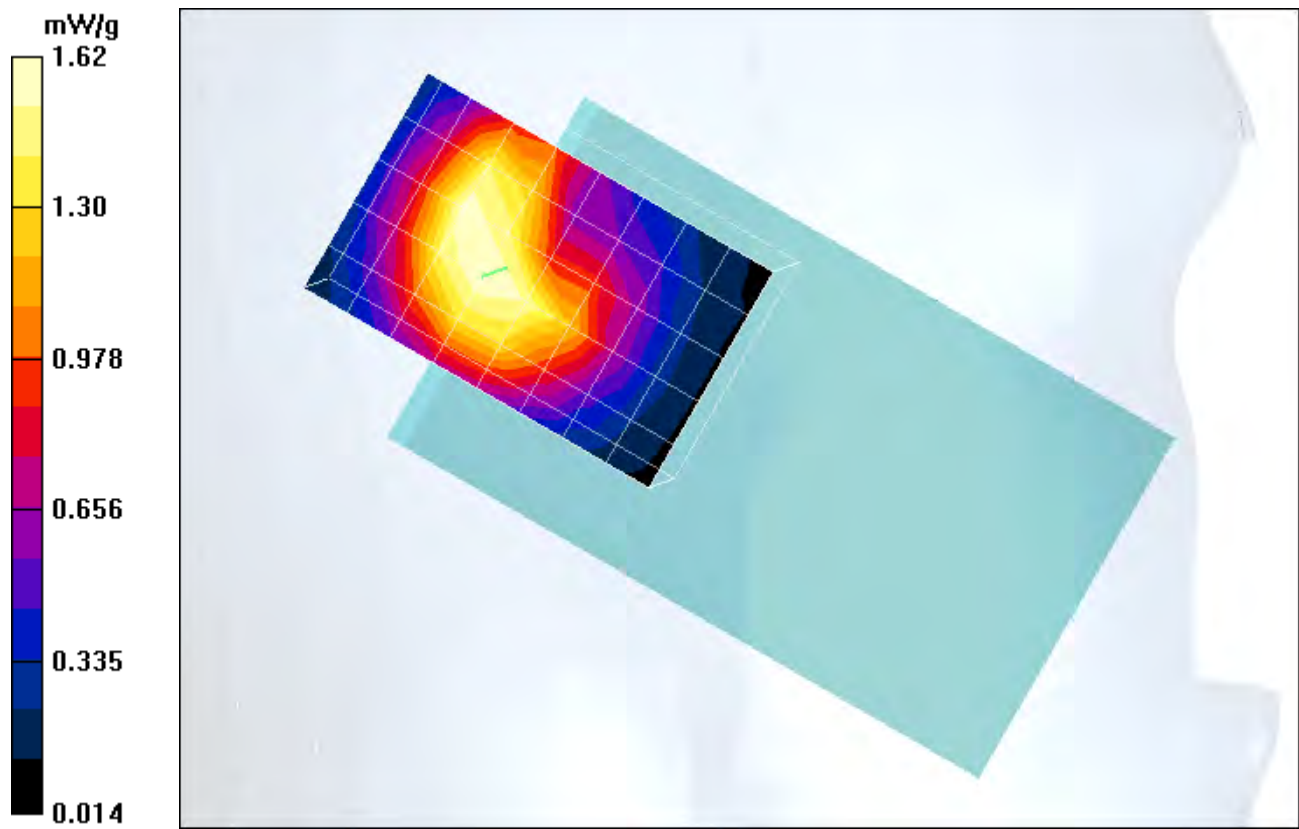
**SAR(1 g) = 1.44 mW/g; SAR(10 g) = 0.782 mW/g; Maximum value of SAR (measured) = 1.55 mW/g**



2D Plot showing z-axis @ 0 mm layer of measurement volume

**Multi Band Result:****SAR(1 g) = 1.49 mW/g; SAR(10 g) = 0.824 mW/g**

Maximum value of SAR (measured) = 1.62 mW/g



2D Plot showing z-axis @ 0 mm layer of measurement volume

## **Appendix 3**

### **SAR distribution plots for Body Worn Configuration**

## Test Laboratory: Motorola - GSM 850 Body-Worn

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: 5; Antenna Position: Internal; Battery Model #: SNN5877A

Device Position: Body Worn, Back of Phone 25 mm from Phantom

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8.3

Medium: Low Freq Body

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1 \text{ mho/m}$ ;  $\epsilon_r = 55.7$ ;  $\rho = 1000 \text{ kg/m}^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.08, 6.08, 6.08); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R4 : Sect.2, Amy Twin, Rev.3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):

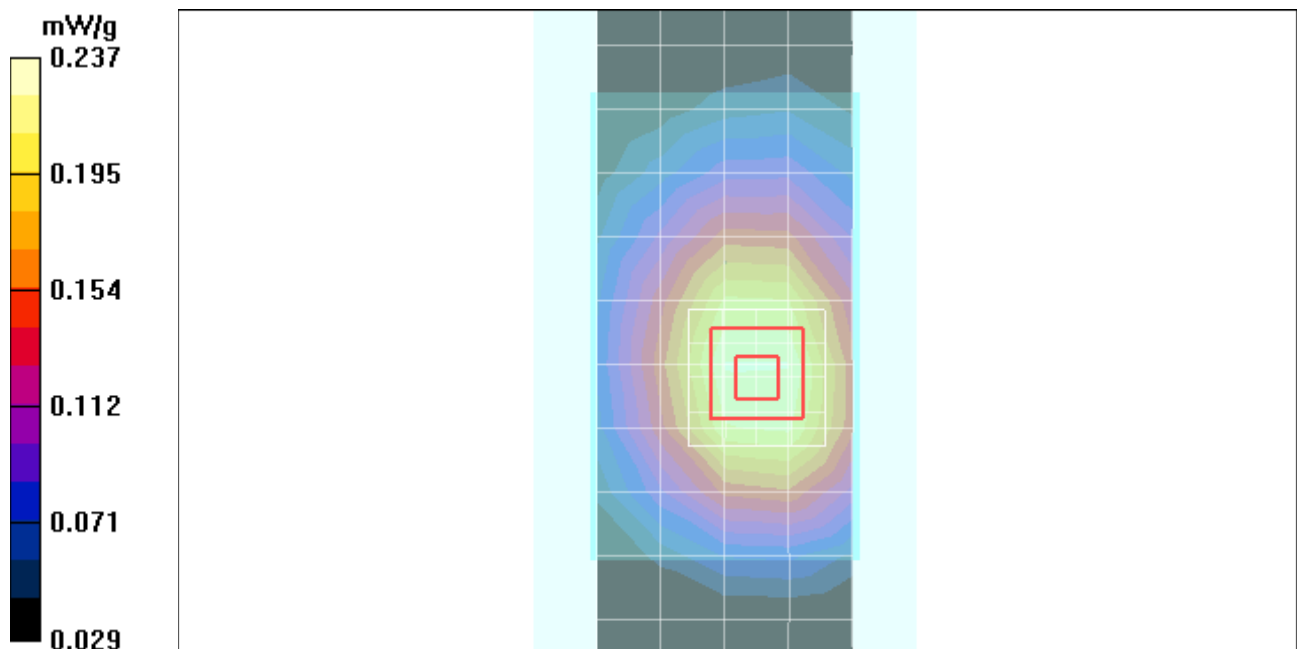
Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ ; Maximum value of SAR (measured) =  $0.225 \text{ mW/g}$

### Amy Twin Phone 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 =  $15.1 \text{ V/m}$ ; Power Drift =  $0.018 \text{ dB}$ ; Peak SAR (extrapolated) =  $0.284 \text{ W/kg}$

**SAR(1 g) =  $0.225 \text{ mW/g}$ ; SAR(10 g) =  $0.166 \text{ mW/g}$ ; Maximum value of SAR (measured) =  $0.237 \text{ mW/g}$**



## Test Laboratory: Motorola - GSM 1900 Body-Worn

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: 0; Antenna Position: Internal; Battery Model #: SNN5877A

Device Position: Body Worn, Back of Phone 25 mm from Phantom

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8.3

Medium: Regular Glycol Body 1750/1880

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 51$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(4.84, 4.84, 4.84); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R4 : Sect.1, Amy Twin, Rev.3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):

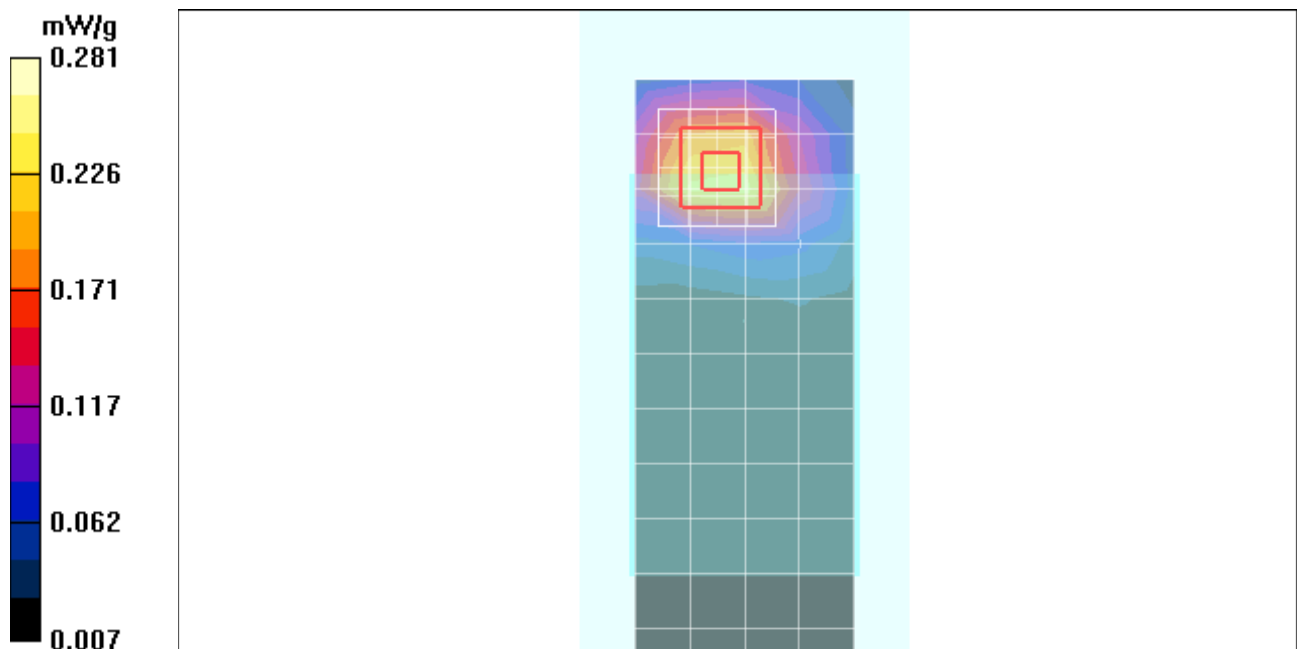
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.239 mW/g

### Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.1 V/m; Power Drift = -0.014 dB; Peak SAR (extrapolated) = 0.393 W/kg

**SAR(1 g) = 0.256 mW/g; SAR(10 g) = 0.154 mW/g; Maximum value of SAR (measured) = 0.281 mW/g**



## Test Laboratory: Motorola - WCDMA 850 Body-Worn

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Battery Model #: SNN5877A

Device Position: Body Worn, Back of Phone 25 mm from Phantom

Communication System: WCDMA 850; Frequency: 836 MHz; Channel Number: 4180; Duty Cycle: 1:1

Medium: Low Freq Body

Medium parameters used:  $f = 835$  MHz;  $\sigma = 1$  mho/m;  $\epsilon_r = 55.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(6.08, 6.08, 6.08); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R4 : Sect.2, Amy Twin, Rev.3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):

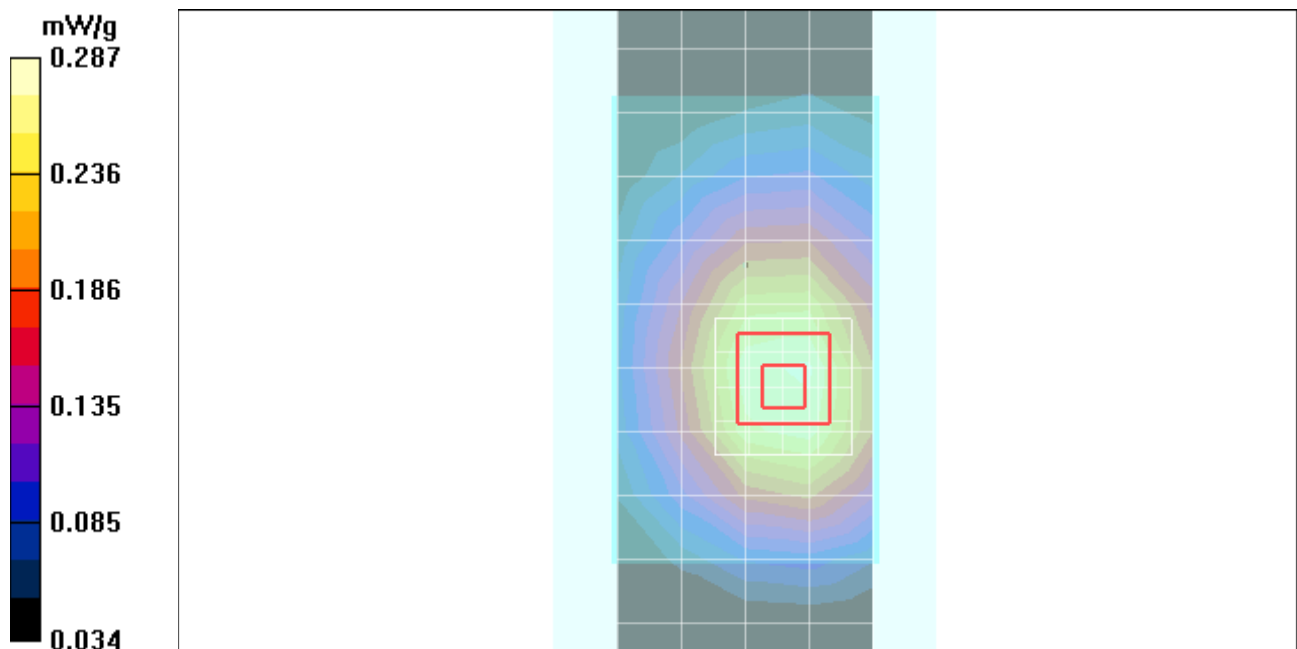
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.274 mW/g

### Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.4 V/m; Power Drift = 0.050 dB; Peak SAR (extrapolated) = 0.344 W/kg

**SAR(1 g) = 0.271 mW/g; SAR(10 g) = 0.200 mW/g; Maximum value of SAR (measured) = 0.287 mW/g**



## Test Laboratory: Motorola - WCDMA 1900 Body-Worn

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: All up Bits; Antenna Position: Internal; Battery Model #: SNN5877A

Device Position: Body Worn, Back of Phone 25 mm from Phantom

Communication System: WCDMA 1900; Frequency: 1880 MHz; Channel Number: 9400; Duty Cycle: 1:1

Medium: Regular Glycol Body 1750/1880

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.58$  mho/m;  $\epsilon_r = 51$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3184; ConvF(4.84, 4.84, 4.84); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn440; Calibrated: 2/17/2010
- Phantom: R4 : Sect.1, Amy Twin, Rev.3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Amy Twin Phone Template/Area Scan - Normal Body (15mm) (13x7x1):

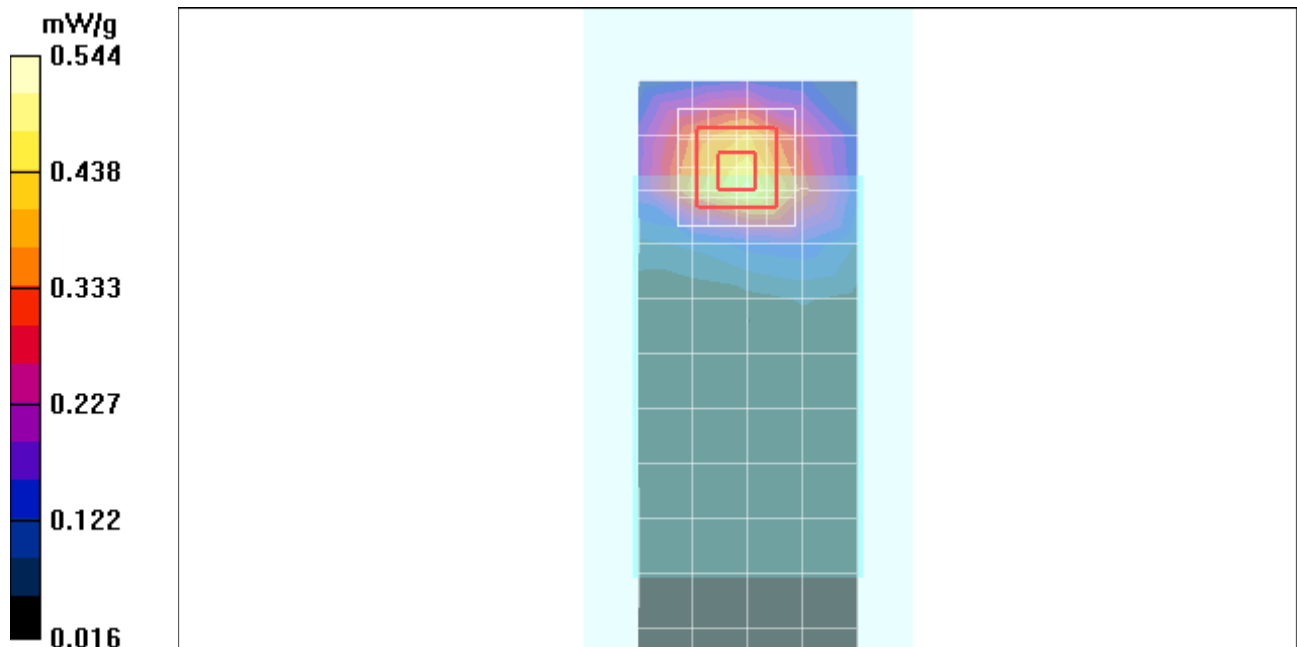
Measurement grid: dx=15mm, dy=15mm; Maximum value of SAR (measured) = 0.488 mW/g

### Amy Twin Phone Template/5x5x7 Zoom Scan (<=3GHz) (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.9 V/m; Power Drift = -0.027 dB; Peak SAR (extrapolated) = 0.760 W/kg

**SAR(1 g) = 0.496 mW/g; SAR(10 g) = 0.297 mW/g; Maximum value of SAR (measured) = 0.544 mW/g**



## Test Laboratory: Motorola - Wi-Fi 2450 Body-Worn

Serial: 351574040016601; FCC ID: IHDP56LD1

Procedure Notes: Pwr Step: N/A; Antenna Position: Internal; Battery Model #: SNN5877A

Device Position: Body Worn, Back of Phone 25 mm from Phantom

Device Mode: 802.11b mode, 1 Mbps data rate

Communication System: Wi-Fi 2450; Frequency: 2412 MHz; Channel Number: 1; Duty Cycle: 1:1

Medium: 2450 Glycol Body

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.01$  mho/m;  $\epsilon_r = 49.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(4.29, 4.29, 4.29); Calibrated: 9/18/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn703; Calibrated: 9/17/2009
- Phantom: R1\_ Section 2, Amy Twin, Rev3 (3-Feb-10); Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

### Amy Twin Phone Template to Shift Cube/Area Scan - Normal Body (15mm) (13x7x1):

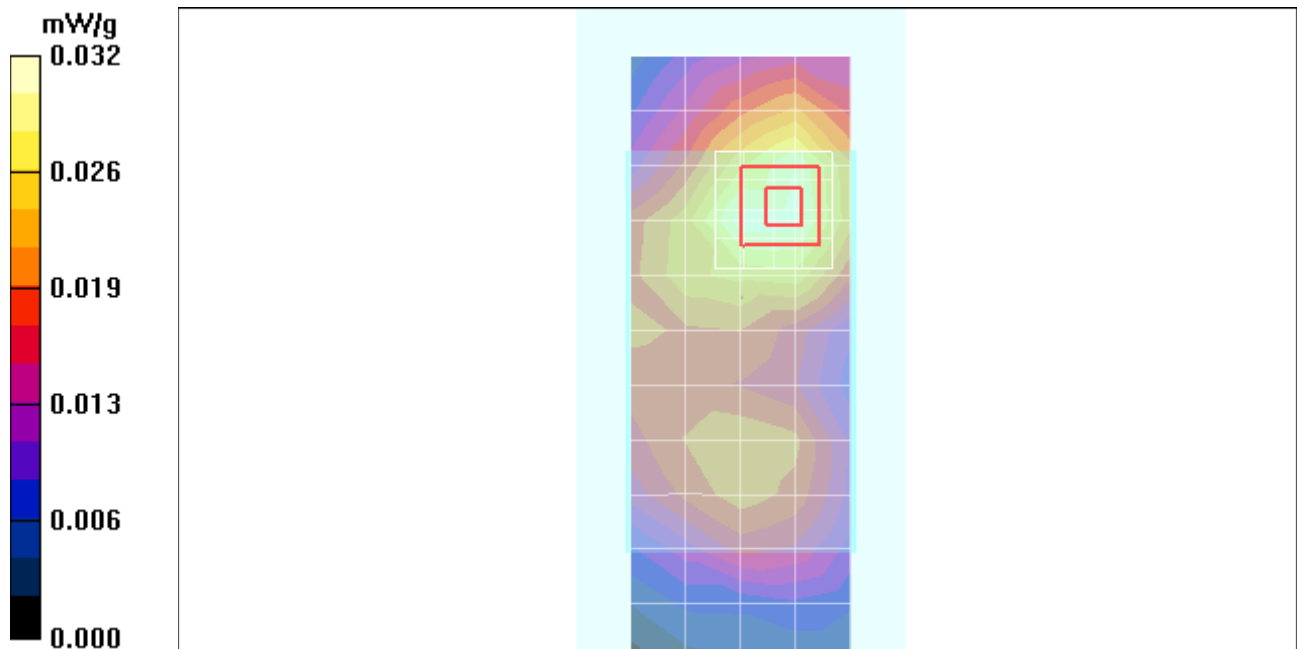
Measurement grid:  $dx=15$ mm,  $dy=15$ mm; Maximum value of SAR (measured) = 0.031 mW/g

### Amy Twin Phone Template to Shift Cube/5x5x7 Zoom Scan ( $\leq 3$ GHz) (5x5x7)/Cube 0:

Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 3.70 V/m; Power Drift = -0.024 dB; Peak SAR (extrapolated) = 0.049 W/kg

**SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.019 mW/g; Maximum value of SAR (measured) = 0.032 mW/g**



## **Appendix 4**

### **Probe Calibration Certificate**



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Client **Motorola MDB**

Certificate No: **ES3-3184\_Sep09**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3184**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-23.v3 and QA CAL-25.v2  
 Calibration procedure for dosimetric E-field probes**

Calibration date: **September 18, 2009**

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 (Certificate No.)    | Scheduled Calibration |
|----------------------------|-----------------|-------------------------------|-----------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-09 (No. 217-01030)      | Apr-10                |
| Power sensor E4412A        | MY41495277      | 1-Apr-09 (No. 217-01030)      | Apr-10                |
| Power sensor E4412A        | MY41498087      | 1-Apr-09 (No. 217-01030)      | Apr-10                |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 31-Mar-09 (No. 217-01026)     | Mar-10                |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 31-Mar-09 (No. 217-01028)     | Mar-10                |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 31-Mar-09 (No. 217-01027)     | Mar-10                |
| Reference Probe ES3DV2     | SN: 3013        | 2-Jan-09 (No. ES3-3013_Jan09) | Jan-10                |
| DAE4                       | SN: 660         | 9-Sep-08 (No. DAE4-660_Sep08) | Sep-09                |

| Secondary Standards       | ID #         | Check Date (in house)             | Scheduled Check        |
|---------------------------|--------------|-----------------------------------|------------------------|
| RF generator HP 8648C     | US3642U01700 | 4-Aug-99 (in house check Oct-07)  | In house check: Oct-09 |
| Network Analyzer HP 8753E | US37390585   | 18-Oct-01 (in house check Oct-08) | In house check: Oct-09 |

|                |                |                       |           |
|----------------|----------------|-----------------------|-----------|
|                | Name           | Function              | Signature |
| Calibrated by: | Jeton Kastrati | Laboratory Technician |           |
| Approved by:   | Katja Pokovic  | Technical Manager     |           |

Issued: September 21, 2009

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



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**

### Glossary:

|                          |                                                                                                                                                      |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                             |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                            |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                           |
| DCP                      | diode compression point                                                                                                                              |
| Polarization $\varphi$   | $\varphi$ 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<sup>2</sup>-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 ES3DV3

## SN:3184

|                  |                    |
|------------------|--------------------|
| Manufactured:    | August 19, 2008    |
| Last calibrated: | September 22, 2008 |
| Recalibrated:    | September 18, 2009 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ES3DV3 SN:3184

### Sensitivity in Free Space<sup>A</sup>

### Diode Compression<sup>B</sup>

|       |                     |                                     |       |              |
|-------|---------------------|-------------------------------------|-------|--------------|
| NormX | <b>1.28</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP X | <b>91</b> mV |
| NormY | <b>1.36</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Y | <b>92</b> mV |
| NormZ | <b>1.27</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Z | <b>95</b> mV |

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

Please see Page 8.

### Boundary Effect

**TSL**                      **835 MHz**      **Typical SAR gradient: 5 % per mm**

|                                           |                              |               |               |
|-------------------------------------------|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.0 mm</b> | <b>4.0 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 11.1          | 7.3           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.8           | 0.5           |

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

|                                           |                              |               |               |
|-------------------------------------------|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.0 mm</b> | <b>4.0 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 12.1          | 8.3           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.8           | 0.4           |

### Sensor Offset

Probe Tip to Sensor Center                      **2.0 mm**

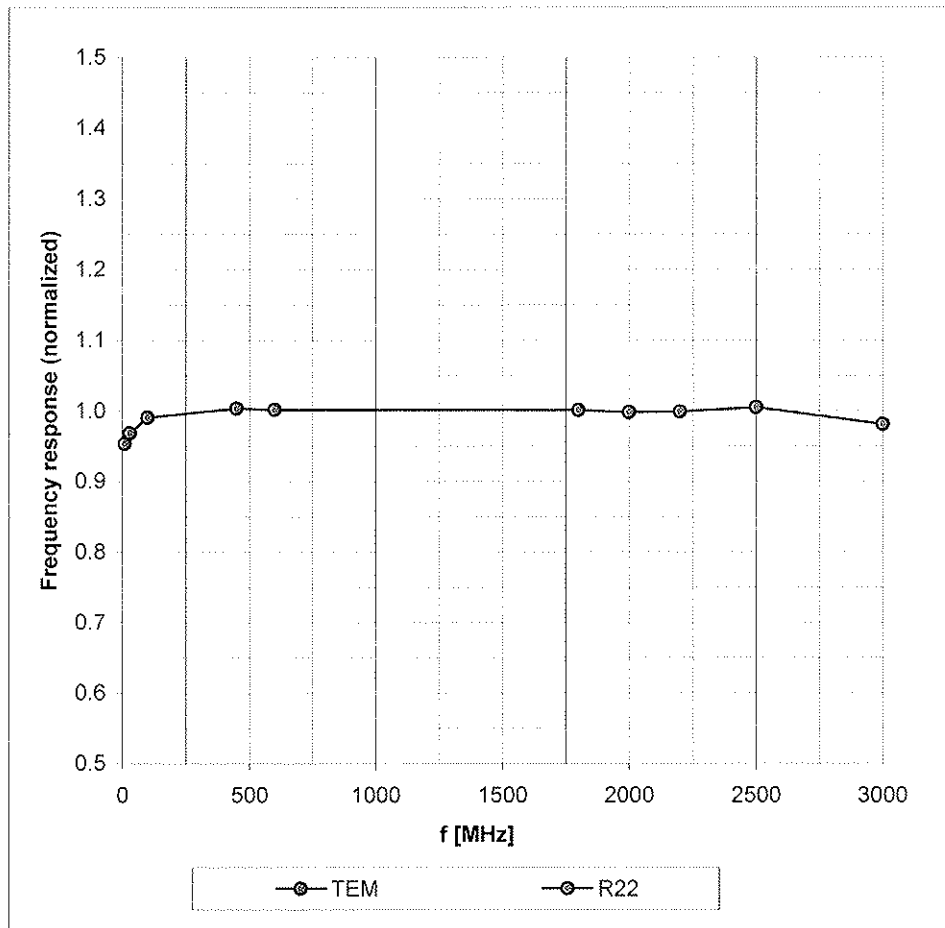
**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

<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.

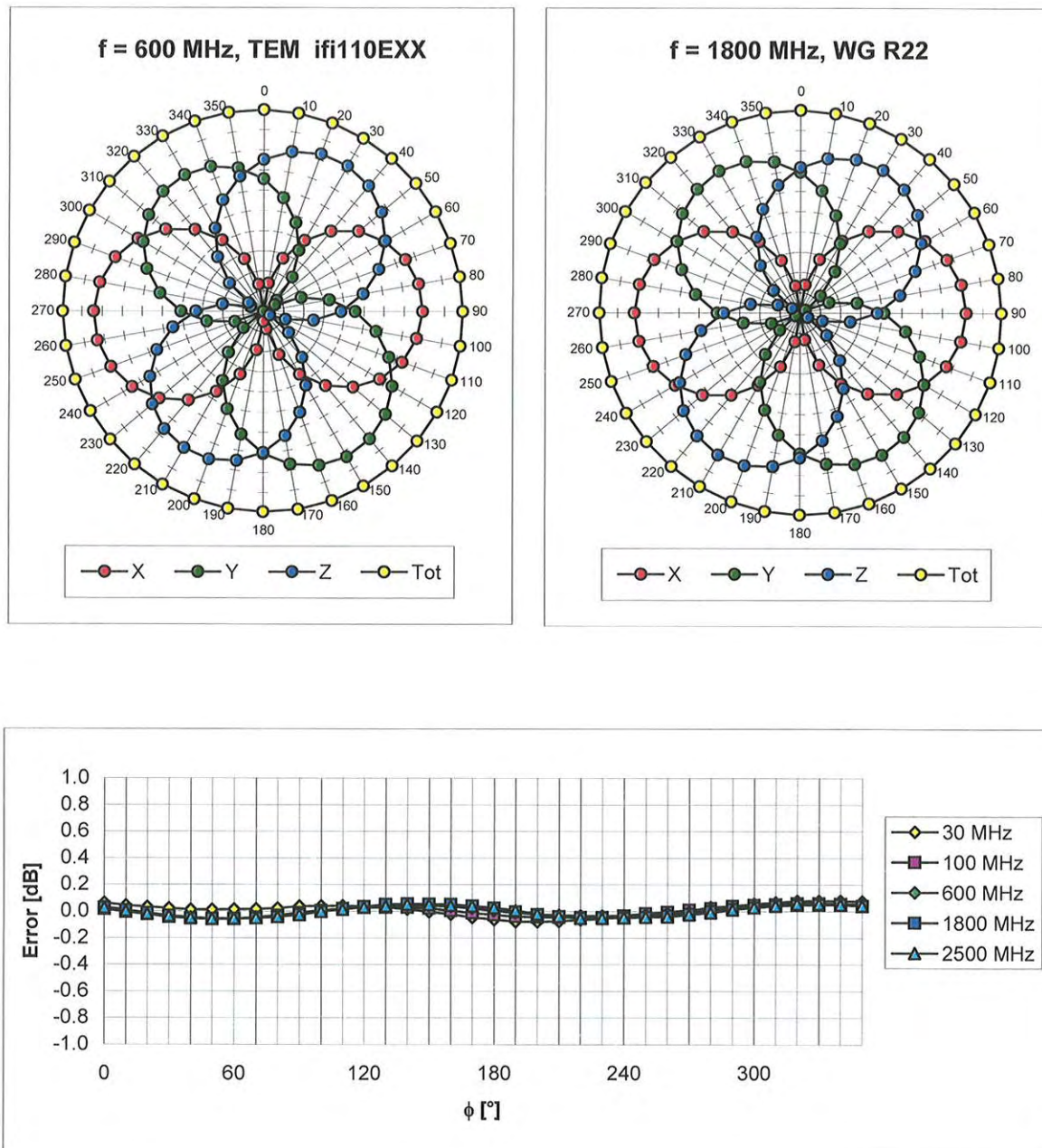
## Frequency Response of E-Field

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



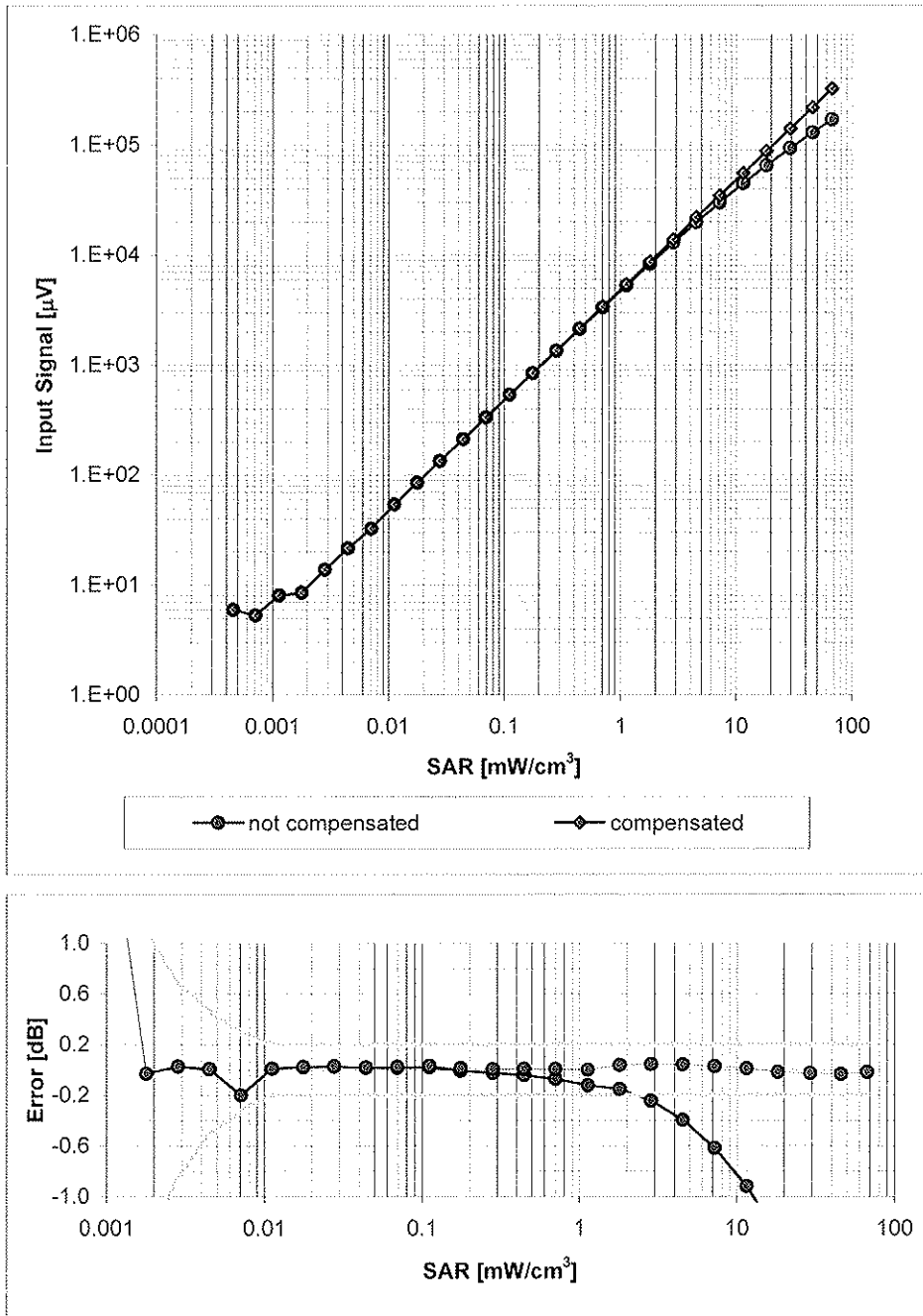
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



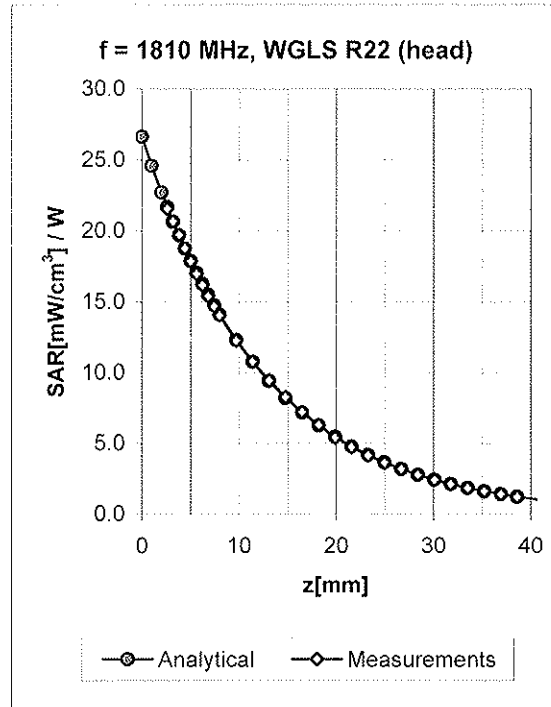
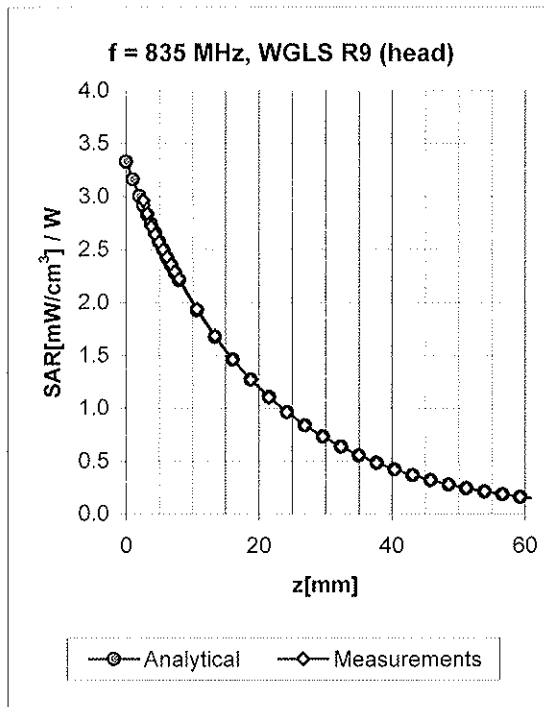
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

# Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$ )



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

## Conversion Factor Assessment

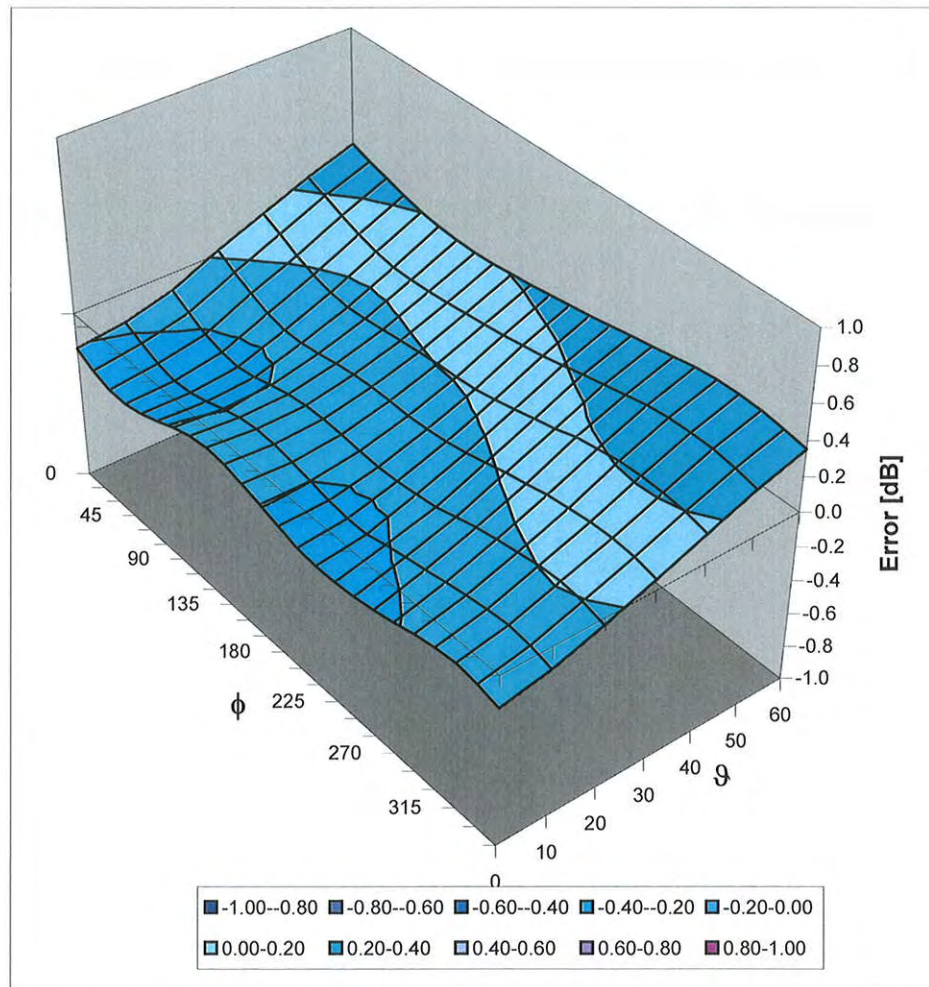


| f [MHz] | Validity [MHz] <sup>c</sup> | TSL  | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty  |
|---------|-----------------------------|------|--------------|--------------|-------|-------|--------------------|
| 835     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.90 ± 5%    | 0.27  | 2.21  | 6.26 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.26  | 2.94  | 5.14 ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.23  | 3.55  | 4.94 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Head | 39.2 ± 5%    | 1.80 ± 5%    | 0.34  | 2.33  | 4.44 ± 11.0% (k=2) |
|         |                             |      |              |              |       |       |                    |
| 835     | ± 50 / ± 100                | Body | 55.2 ± 5%    | 0.97 ± 5%    | 0.32  | 1.92  | 6.08 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.37  | 2.02  | 4.84 ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.30  | 2.95  | 4.81 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Body | 52.7 ± 5%    | 1.95 ± 5%    | 0.99  | 1.20  | 4.28 ± 11.0% (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:  $\pm 2.6\%$  ( $k=2$ )



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Client **Motorola MD6**

Certificate No: **ES3-3037\_Sep09**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3037**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-23.v3 and QA CAL-25.v2  
 Calibration procedure for dosimetric E-field probes**

Calibration date: **September 18, 2009**

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 (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-09 (No. 217-01030)          | Apr-10                 |
| Power sensor E4412A        | MY41495277      | 1-Apr-09 (No. 217-01030)          | Apr-10                 |
| Power sensor E4412A        | MY41498087      | 1-Apr-09 (No. 217-01030)          | Apr-10                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 31-Mar-09 (No. 217-01026)         | Mar-10                 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 31-Mar-09 (No. 217-01028)         | Mar-10                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 31-Mar-09 (No. 217-01027)         | Mar-10                 |
| Reference Probe ES3DV2     | SN: 3013        | 2-Jan-09 (No. ES3-3013_Jan09)     | Jan-10                 |
| DAE4                       | SN: 660         | 9-Sep-08 (No. DAE4-660_Sep08)     | Sep-09                 |
| Secondary Standards        | ID #            | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Oct-07)  | In house check: Oct-09 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-08) | In house check: Oct-09 |

|                |                |                       |                  |
|----------------|----------------|-----------------------|------------------|
|                | <b>Name</b>    | <b>Function</b>       | <b>Signature</b> |
| Calibrated by: | Jeton Kastrati | Laboratory Technician |                  |
| Approved by:   | Katja Pokovic  | Technical Manager     |                  |

Issued: September 21, 2009

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



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**

### Glossary:

|                          |                                                                                                                                                      |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                             |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                            |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                           |
| DCP                      | diode compression point                                                                                                                              |
| Polarization $\varphi$   | $\varphi$ 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<sup>2</sup>-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 ES3DV3

## SN:3037

|                  |                    |
|------------------|--------------------|
| Manufactured:    | August 21, 2003    |
| Last calibrated: | September 23, 2008 |
| Recalibrated:    | September 18, 2009 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ES3DV3 SN:3037

### Sensitivity in Free Space<sup>A</sup>

|       |                     |                                     |
|-------|---------------------|-------------------------------------|
| NormX | <b>1.17</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | <b>0.81</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | <b>0.97</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ |

### Diode Compression<sup>B</sup>

|       |              |
|-------|--------------|
| DCP X | <b>95</b> mV |
| DCP Y | <b>97</b> mV |
| DCP Z | <b>97</b> mV |

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

Please see Page 8.

### Boundary Effect

**TSL**                      **835 MHz**      **Typical SAR gradient: 5 % per mm**

|                                                         |               |               |
|---------------------------------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance               | <b>3.0 mm</b> | <b>4.0 mm</b> |
| SAR <sub>be</sub> [%]      Without Correction Algorithm | 10.0          | 6.2           |
| SAR <sub>be</sub> [%]      With Correction Algorithm    | 0.8           | 0.6           |

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

|                                                         |               |               |
|---------------------------------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance               | <b>3.0 mm</b> | <b>4.0 mm</b> |
| SAR <sub>be</sub> [%]      Without Correction Algorithm | 9.3           | 5.9           |
| SAR <sub>be</sub> [%]      With Correction Algorithm    | 0.6           | 0.4           |

### Sensor Offset

Probe Tip to Sensor Center                      **2.0 mm**

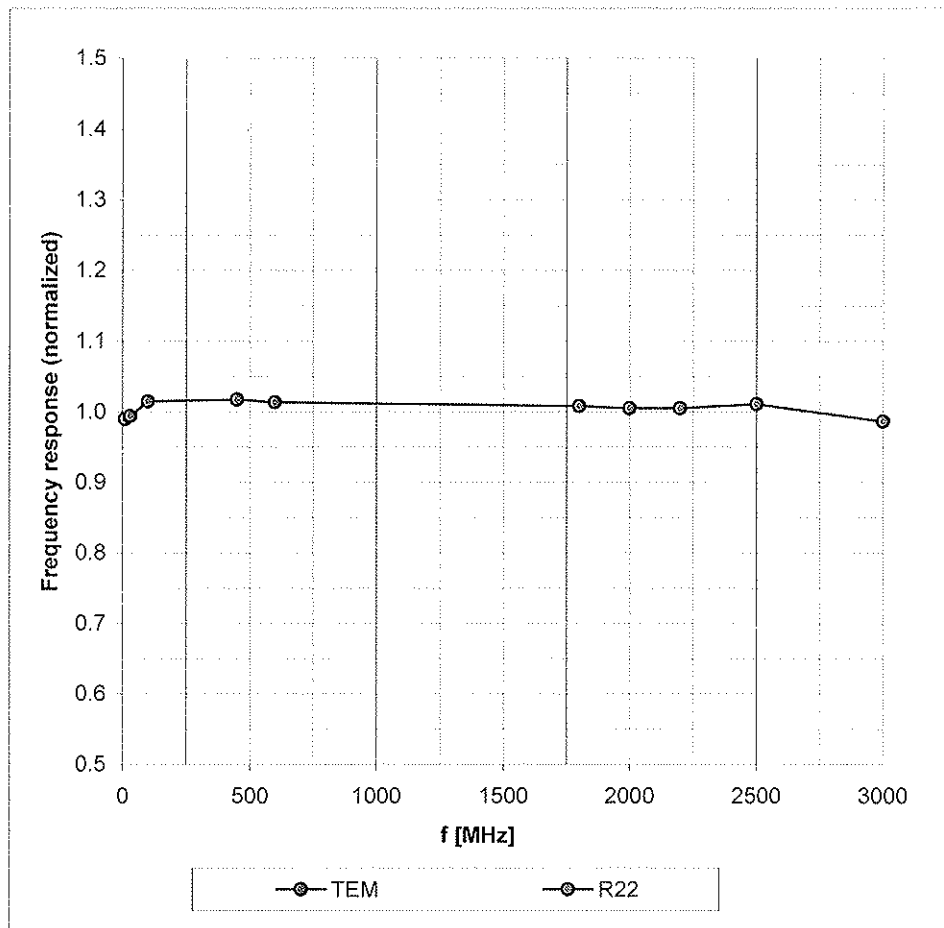
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

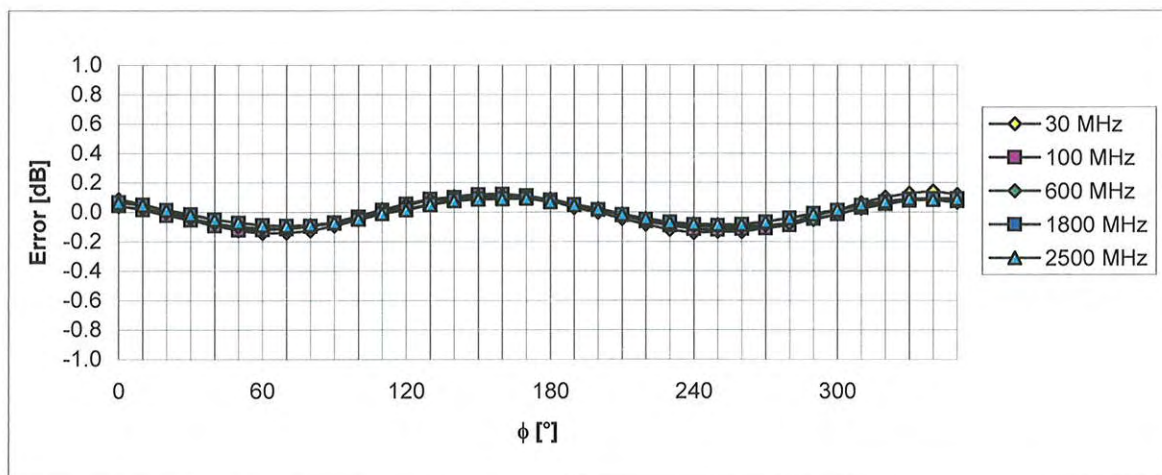
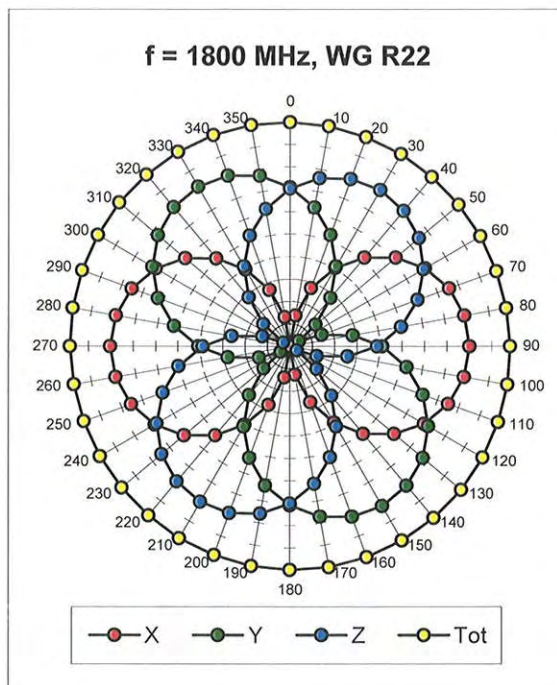
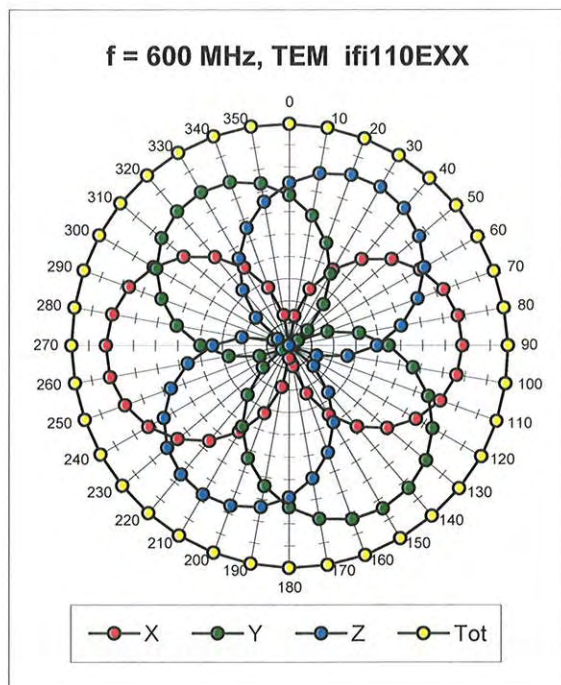
<sup>B</sup> Numerical linearization parameter; uncertainty not required.

## Frequency Response of E-Field

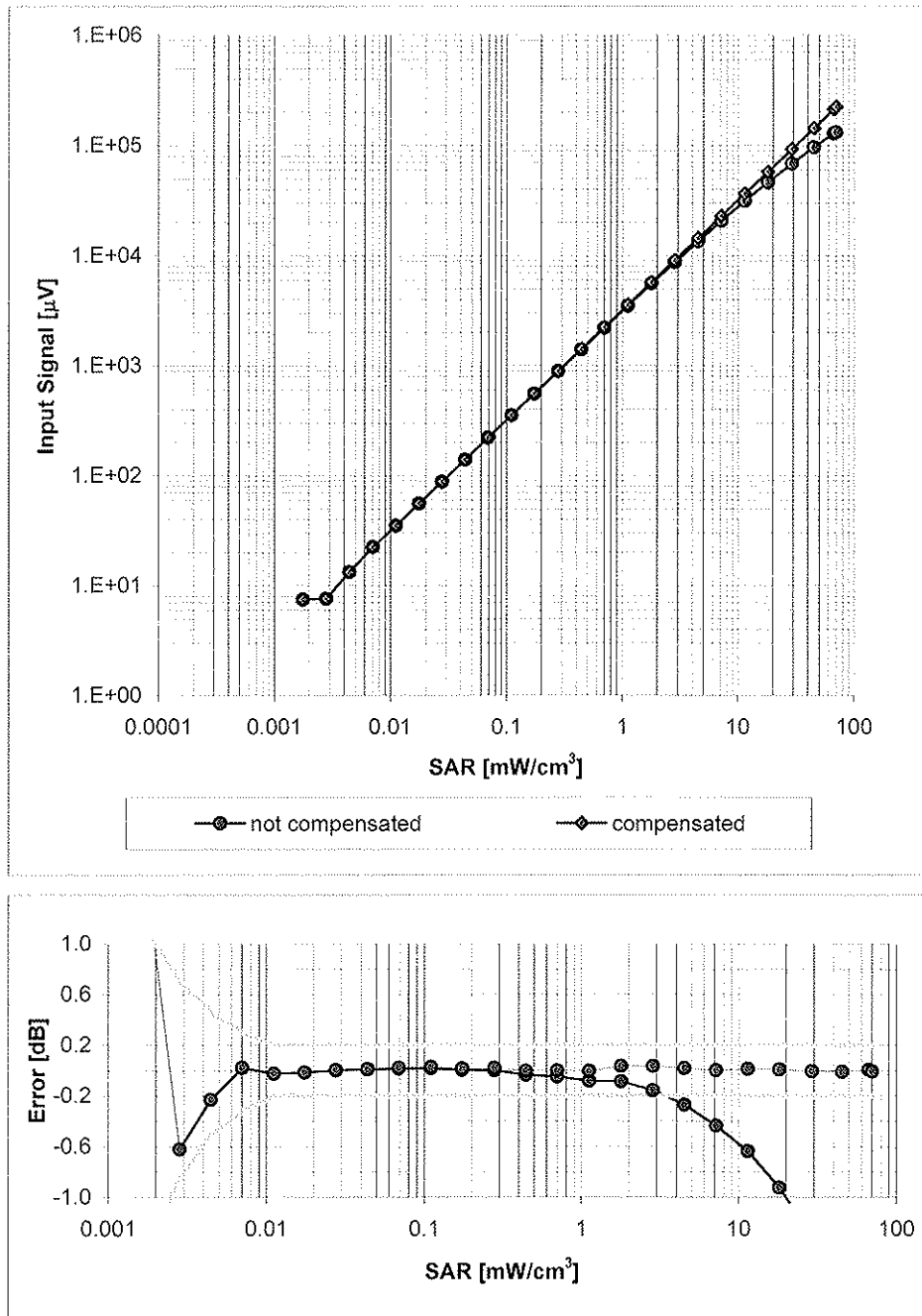
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

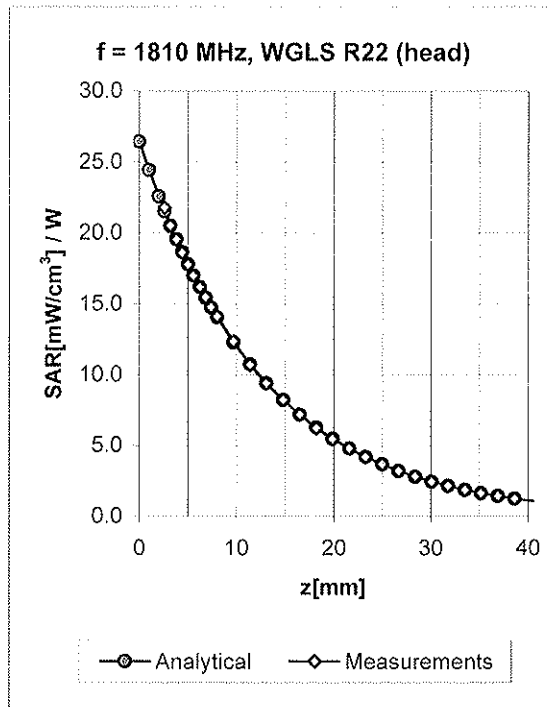
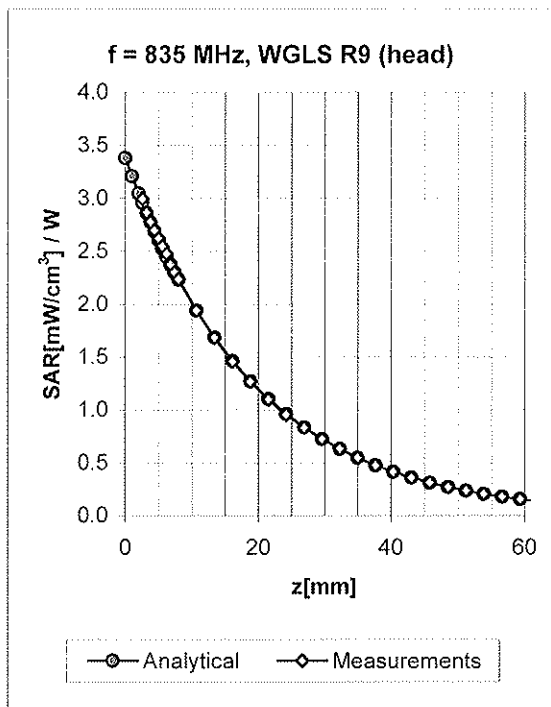
Receiving Pattern ( $\phi$ ),  $\vartheta = 0^\circ$ Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

# Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$ )



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

## Conversion Factor Assessment

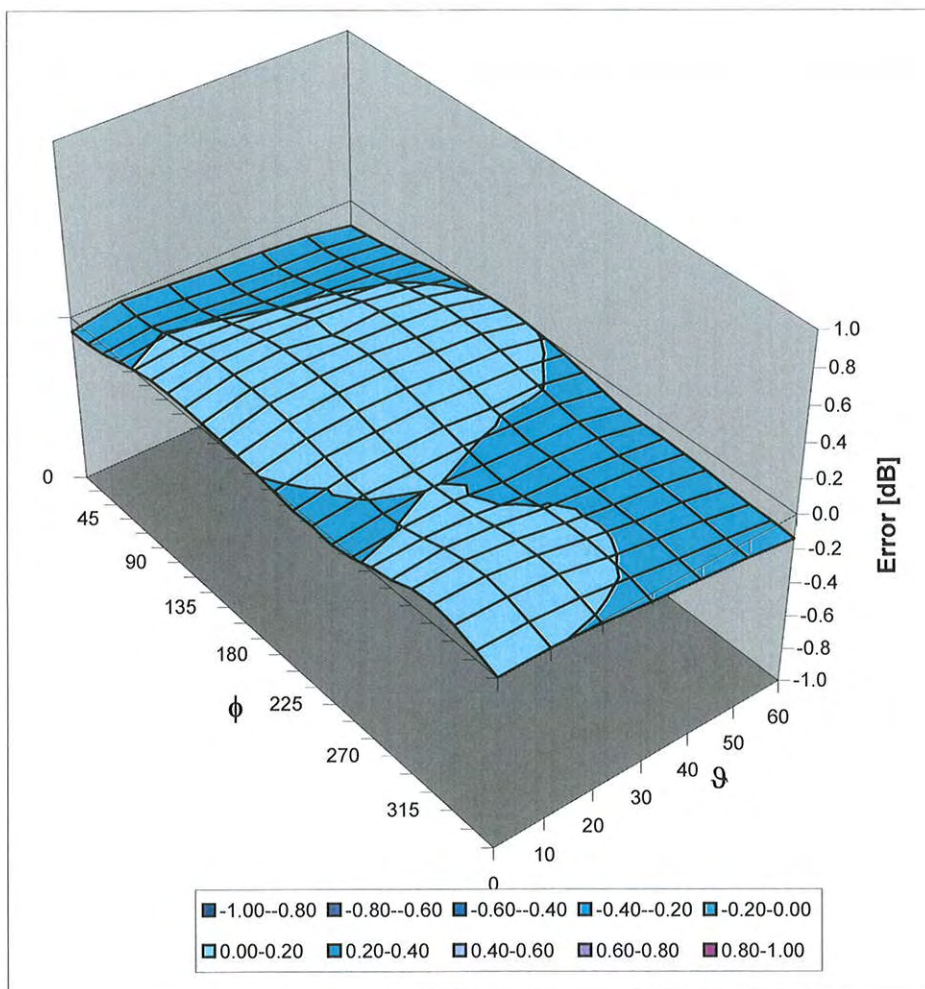


| f [MHz] | Validity [MHz] <sup>c</sup> | TSL  | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty  |
|---------|-----------------------------|------|--------------|--------------|-------|-------|--------------------|
| 835     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.90 ± 5%    | 0.34  | 1.78  | 6.25 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.37  | 1.74  | 5.05 ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.40  | 1.62  | 4.87 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Head | 39.2 ± 5%    | 1.80 ± 5%    | 0.35  | 1.96  | 4.41 ± 11.0% (k=2) |
|         |                             |      |              |              |       |       |                    |
| 835     | ± 50 / ± 100                | Body | 55.2 ± 5%    | 0.97 ± 5%    | 0.75  | 1.16  | 6.17 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.36  | 1.94  | 4.96 ± 11.0% (k=2) |
| 1950    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.27  | 3.10  | 4.78 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Body | 52.7 ± 5%    | 1.95 ± 5%    | 0.70  | 1.18  | 4.29 ± 11.0% (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:  $\pm 2.6\%$  ( $k=2$ )



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 **Motorola MDb**

Certificate No: **ES3-3124\_Aug10**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3124**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-23.v3 and QA CAL-25.v2  
 Calibration procedure for dosimetric E-field probes**

Calibration date: **August 11, 2010**

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 (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Power sensor E4412A        | MY41495277      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Power sensor E4412A        | MY41498087      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 30-Mar-10 (No. 217-01159)         | Mar-11                 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 30-Mar-10 (No. 217-01161)         | Mar-11                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 30-Mar-10 (No. 217-01160)         | Mar-11                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-09 (No. ES3-3013_Dec09)    | Dec-10                 |
| DAE4                       | SN: 660         | 20-Apr-10 (No. DAE4-660_Apr10)    | Apr-11                 |
| Secondary Standards        | ID #            | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Oct-09)  | In house check: Oct-11 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-09) | In house check: Oct10  |

Calibrated by: **Claudio Leubler** **Laboratory Technician**

Signature

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

Issued: August 14, 2010

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



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**

## Glossary:

|                          |                                                                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                                |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                               |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                              |
| DCP                      | diode compression point                                                                                                                                 |
| CF                       | crest factor (1/duty_cycle) of the RF signal                                                                                                            |
| A, B, C                  | modulation dependent linearization parameters                                                                                                           |
| Polarization $\varphi$   | $\varphi$ rotation around probe axis                                                                                                                    |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center),<br>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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- 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 ES3DV3

## SN:3124

|                  |                 |
|------------------|-----------------|
| Manufactured:    | July 11, 2006   |
| Last calibrated: | April 21, 2009  |
| Recalibrated:    | August 11, 2010 |

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

**DASY/EASY - Parameters of Probe: ES3DV3 SN:3124****Basic Calibration Parameters**

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2)    |
|-----------------------------------------------------------|----------|----------|----------|--------------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.26     | 1.33     | 1.34     | $\pm 10.1\%$ |
| DCP (mV) <sup>B</sup>                                     | 92.9     | 96.4     | 96.7     |              |

**Modulation Calibration Parameters**

| UID   | Communication System Name | PAR  |   | A<br>dB | B<br>dBuV | C    | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-------|---------------------------|------|---|---------|-----------|------|----------|---------------------------|
| 10000 | CW                        | 0.00 | X | 0.00    | 0.00      | 1.00 | 300.0    | $\pm 1.5\%$               |
|       |                           |      | Y | 0.00    | 0.00      | 1.00 | 300.0    |                           |
|       |                           |      | Z | 0.00    | 0.00      | 1.00 | 300.0    |                           |

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  $E^2$ -field uncertainty inside TSL (see Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 SN:3124

### Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 835     | ± 50 / ± 100                | 41.5 ± 5%    | 0.90 ± 5%    | 5.89    | 5.89    | 5.89    | 0.97  | 1.07 ± 11.0%    |
| 1810    | ± 50 / ± 100                | 40.0 ± 5%    | 1.40 ± 5%    | 4.89    | 4.89    | 4.89    | 0.49  | 1.54 ± 11.0%    |
| 1950    | ± 50 / ± 100                | 40.0 ± 5%    | 1.40 ± 5%    | 4.68    | 4.68    | 4.68    | 0.50  | 1.52 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 39.2 ± 5%    | 1.80 ± 5%    | 4.35    | 4.35    | 4.35    | 0.45  | 1.78 ± 11.0%    |

<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.

## DASY/EASY - Parameters of Probe: ES3DV3 SN:3124

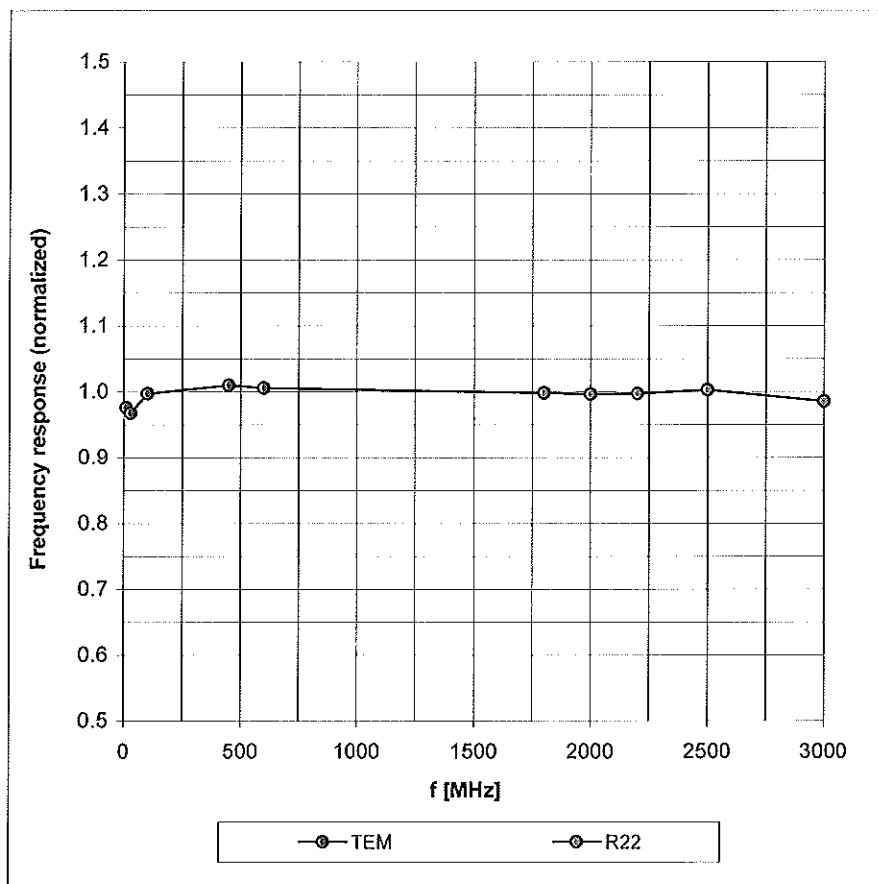
### Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 835     | ± 50 / ± 100                | 55.2 ± 5%    | 0.97 ± 5%    | 5.86    | 5.86    | 5.86    | 0.96  | 1.11 ± 11.0%    |
| 1810    | ± 50 / ± 100                | 53.3 ± 5%    | 1.52 ± 5%    | 4.76    | 4.76    | 4.76    | 0.41  | 1.84 ± 11.0%    |
| 1950    | ± 50 / ± 100                | 53.3 ± 5%    | 1.52 ± 5%    | 4.78    | 4.78    | 4.78    | 0.32  | 2.33 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 52.7 ± 5%    | 1.95 ± 5%    | 4.19    | 4.19    | 4.19    | 0.69  | 1.29 ± 11.0%    |

<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.

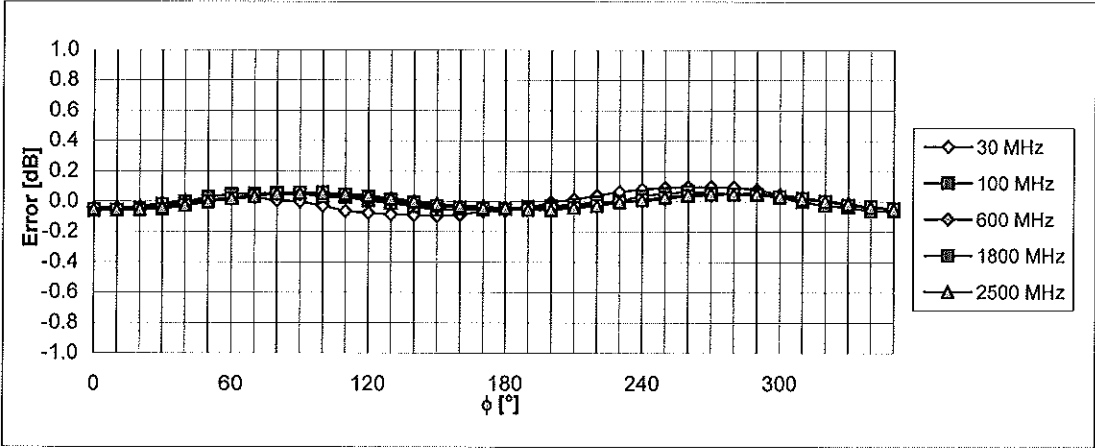
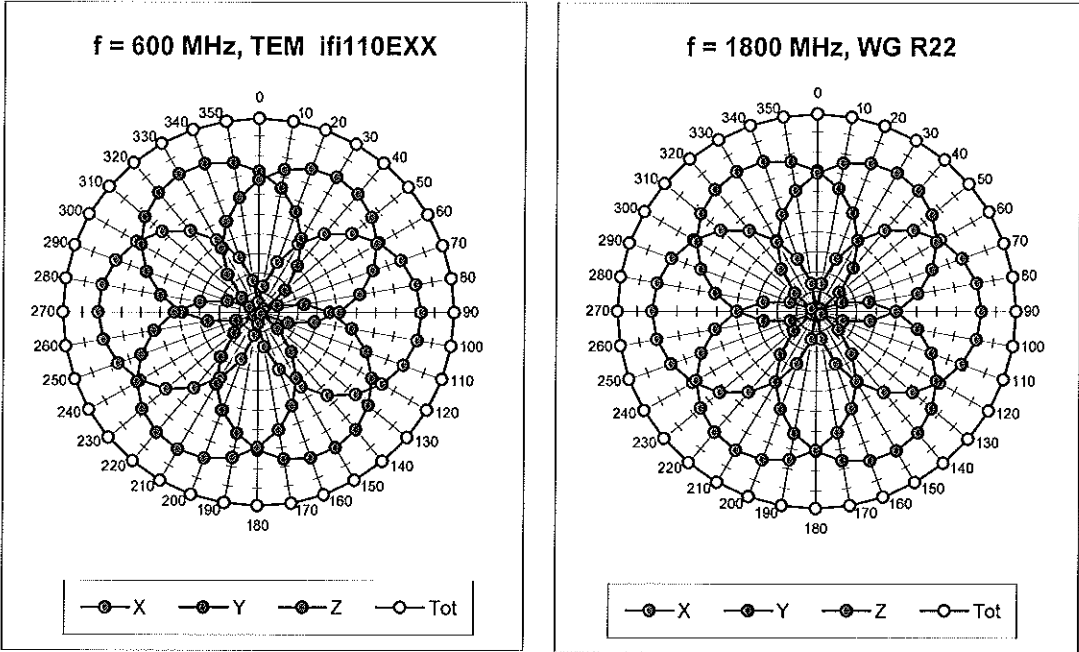
## Frequency Response of E-Field

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



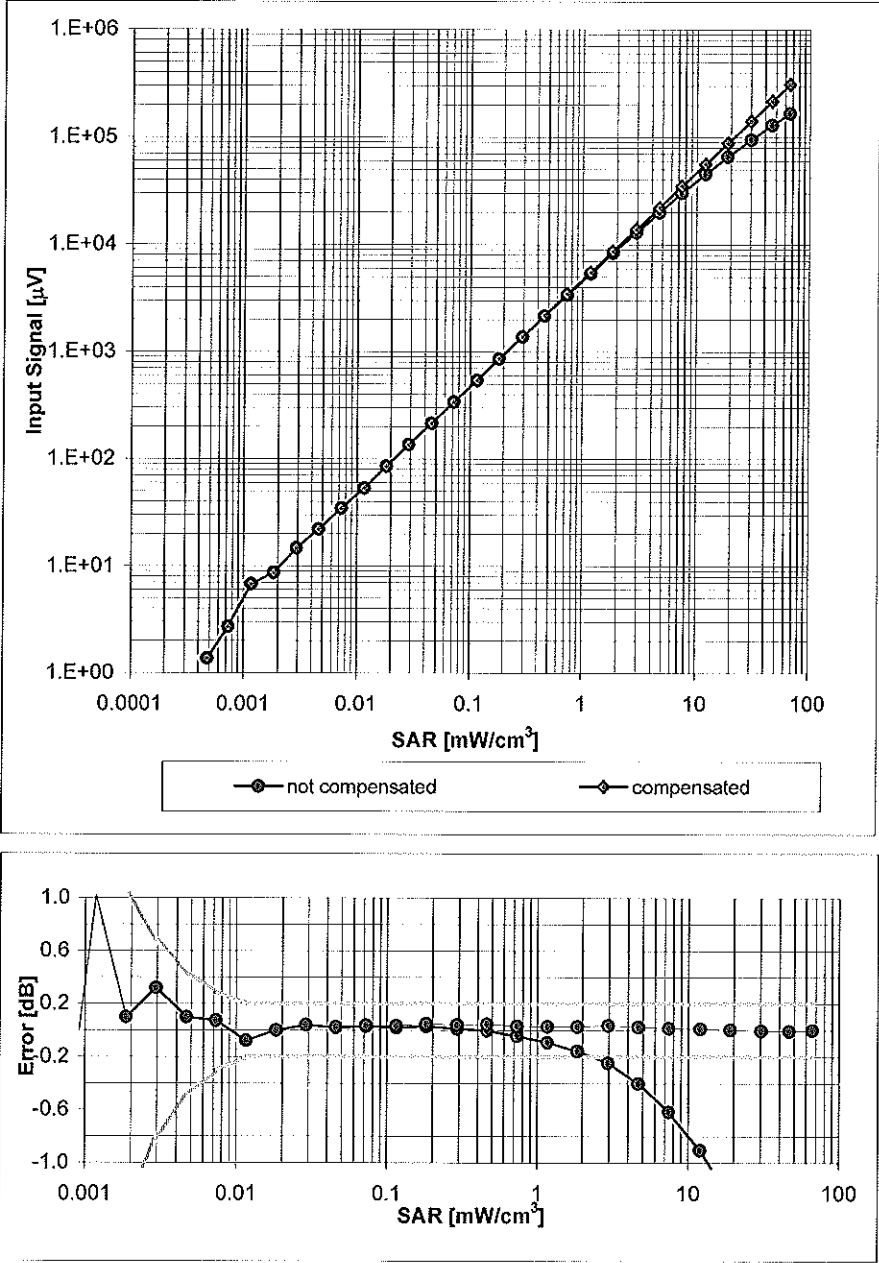
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



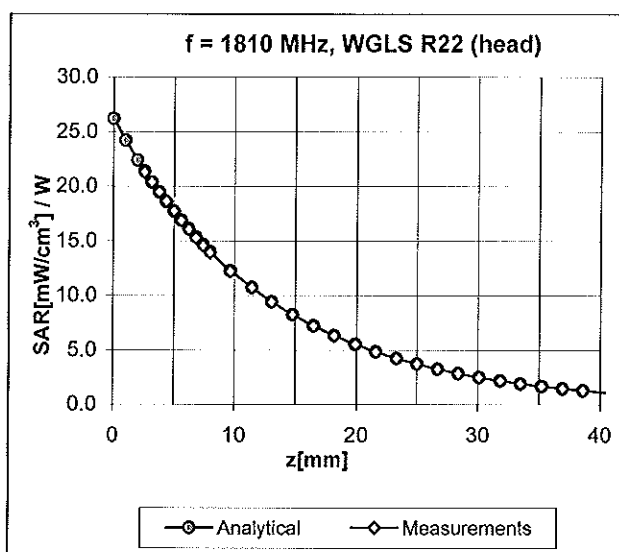
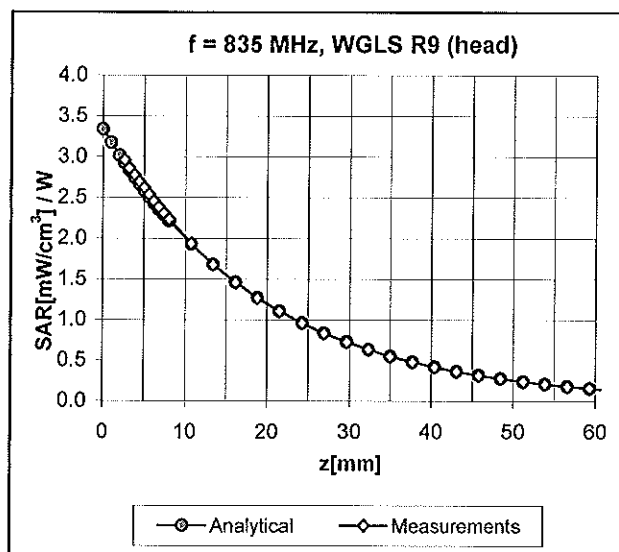
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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



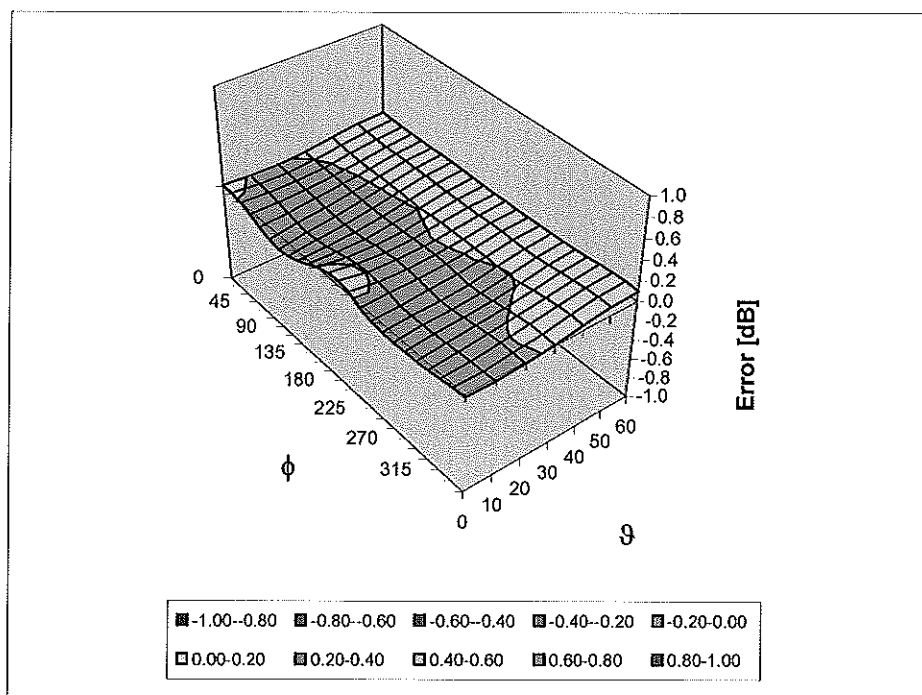
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment



## Deviation from Isotropy in HSL

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



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

## Other Probe Parameters

|                                               |                |
|-----------------------------------------------|----------------|
| Sensor Arrangement                            | Triangular     |
| Connector Angle (°)                           | Not applicable |
| Mechanical Surface Detection Mode             | enabled        |
| Optical Surface Detection Mode                | disabled       |
| Probe Overall Length                          | 337 mm         |
| Probe Body Diameter                           | 10 mm          |
| Tip Length                                    | 10 mm          |
| Tip Diameter                                  | 4.0 mm         |
| Probe Tip to Sensor X Calibration Point       | 2 mm           |
| Probe Tip to Sensor Y Calibration Point       | 2 mm           |
| Probe Tip to Sensor Z Calibration Point       | 2 mm           |
| Recommended Measurement Distance from Surface | 3 mm           |

## **Appendix 5**

### **Measurement Uncertainty Budget**

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

## **Appendix 6**

### **Dipole Characterization Certificate**

# Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

|                                                                      |                                                                                                              |        |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------|
|                                                                      | 835 MHz                                                                                                      |        |
| Reference Target:                                                    | 9.56                                                                                                         | (W/kg) |
| Measurement Uncertainty (k=1):                                       | 9.0%                                                                                                         |        |
|                                                                      |                                                                                                              |        |
| Measurement Period:                                                  | 26March09 - 15Mar10                                                                                          |        |
| # of tests performed:                                                | 244                                                                                                          |        |
| Grand Average:                                                       | 9.59                                                                                                         | (W/kg) |
| % Delta (Average - Reference Target)                                 | 0.3%                                                                                                         |        |
|                                                                      |                                                                                                              |        |
| Is % Delta <= Expanded Measurement Uncertainty (k=2)?                | Yes                                                                                                          |        |
|                                                                      |                                                                                                              |        |
| Accept/Reject <u>Average</u> as new system performance check target? | ACCEPT                                                                                                       |        |
|                                                                      | Applies to Dipole SN's:<br>432tr, 417tr, 420tr, 422tr,<br>423tr, 424tr, 425tr, 431tr,<br>434tr, 421tr, 436tr |        |

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

| Frequency | SAR Target (W/kg) | Permittivity Target +/- % | Conductivity (S/m) Target +/- % |
|-----------|-------------------|---------------------------|---------------------------------|
| 835 MHz   | 9.59              | 41.5 +/- 5%               | 0.90 +/- 5%                     |

=====

-Approvals-

Submitted by: 

Marge Kaunas

Date: 17-Mar-10

Signed: 

Marge Kaunas

Comments: 

Data file available upon request.

Approved by: 

Steve Hauswirth

Date: 17-Mar-10

Signed: 

Steven Hauswirth

Comments:

=====

# Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

|                                                                      |                                                                                                                                                    |        |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|                                                                      | 1800 MHz                                                                                                                                           |        |
| Reference Target:                                                    | 38.4                                                                                                                                               | (W/kg) |
| Measurement Uncertainty (k=1):                                       | 9.0%                                                                                                                                               |        |
| Measurement Period:                                                  | 26March09 - 15Mar10                                                                                                                                |        |
| # of tests performed:                                                | 654                                                                                                                                                |        |
| Grand Average:                                                       | 38.36                                                                                                                                              | (W/kg) |
| % Delta (Average - Reference Target)                                 | -0.1%                                                                                                                                              |        |
| Is % Delta <= Expanded Measurement Uncertainty (k=2)?                | Yes                                                                                                                                                |        |
| Accept/Reject <u>Average</u> as new system performance check target? | ACCEPT                                                                                                                                             |        |
|                                                                      | Applies to Dipole SN's:<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 Target +/- % | Conductivity (S/m) Target +/- % |
|-----------|-------------------|---------------------------|---------------------------------|
| 1800 MHz  | 38.36             | 40.0 +/- 5%               | 1.40 +/- 5%                     |

=====

-Approvals-

Submitted by: 

Marge Kaunas

Signed: 

Comments: 

Data file available upon request.

Date: 

17-Mar-10

Approved by: 

Steve Hauswirth

Signed: 

Comments:

Date: 

17-Mar-10

=====

# Certification of System Performance Check Targets

FCD-1806, rev-1

-Historical Data-

|                                                                      |                         |        |
|----------------------------------------------------------------------|-------------------------|--------|
|                                                                      | 2450 MHz                |        |
| Reference Target:                                                    | 52.4                    | (W/kg) |
| Measurement Uncertainty (k=1):                                       | 9.0%                    |        |
| Measurement Period:                                                  | 26March09 - 15Mar10     |        |
| # of tests performed:                                                | 159                     |        |
| Grand Average:                                                       | 54.55                   | (W/kg) |
| % Delta (Average - Reference Target)                                 | 4.1%                    |        |
| Is % Delta <= Expanded Measurement Uncertainty (k=2)?                | Yes                     |        |
| Accept/Reject <u>Average</u> as new system performance check target? | ACCEPT                  |        |
|                                                                      | Applies to Dipole SN's: |        |
|                                                                      | 740, 766, 767, 788, 789 |        |

-New System Performance Check Targets- per WI-0396

(based on analysis of historical data)

| Frequency | SAR Target (W/kg) | Permittivity Target +/- % | Conductivity (S/m) Target +/- % |
|-----------|-------------------|---------------------------|---------------------------------|
| 2450 MHz  | 54.55             | 39.2 +/- 10%              | 1.80 +/- 5%                     |

-Approvals-

Submitted by: Marge Kaunas Date: 17-Mar-10

Signed: Marge Kaunas

Comments: Data file available upon request.

Approved by: Steve Hauswirth Date: 17-Mar-10

Signed: Steve Hauswirth

Comments:

**END OF REPORT**