# Exhibit 11: SAR Test Report IDHT56FG1

**Date of test:** 7/3/2005 to 7/26/2005
**Date of Report:** 8/3/2005

**Laboratory:**
Motorola Personal Communications Sector Product Safety & Compliance Laboratory
600 N. US Highway 45
Room: MW113
Libertyville, Illinois 60048

**Test Responsible:**
Paul Ma
RF Engineer

**Accreditation:** This laboratory is accredited to ISO/IEC 17025-1999 to perform the following tests:

| Tests: | Procedures: |
|---|---|
| Electromagnetic Specific Absorption Rate | ANSI/IEEE C95.1-1992, 1999<br>(SAR) IEEE C95.3-1991<br>IEEE 1528, IEC 62209-1<br>FCC OET Bulletin 65 (*including Supplements A, B, C*)<br>Australian Communications Authority Radio Communications (Electromagnetic Radiation – Human Exposure) Standard 1999<br>CENELEC EN 50361 (2001) |
| Simulated Tissue Preparation | APP-0247 |
| RF Power Measurement | DOI-0876, 0900, 0902, 0904, 0915 |

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

A2LA certificate #1651-01

**Statement of Compliance:**
Motorola declares under its sole responsibility that portable cellular telephone FCC ID IHDT56FG1 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). It also declares that the product was tested in accordance with the appropriate measurement standards, guidelines and recommended practices. Any deviations from these standards, guidelines and recommended practices are noted below:

(none)

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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.

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# 1 Introduction

The Motorola Personal Communications Sector Product Safety Laboratory has performed measurements of the maximum potential exposure to the user of portable cellular phone (FCC ID IHDT56FG1). The Specific Absorption Rate (SAR) of this product was measured. The portable cellular phone was tested in accordance with FCC OET Bulletin 65 Supplement C 01-01.

# 2 Description of the Device Under Test

## 2.1 Antenna description

| | | |
|---|---|---|
| **Type** | External | |
| **Location** | Upper Right Corner | |
| **Dimensions** | Length | 20mm |
| | Width | 10mm |
| **Configuration** | Helix | |

## 2.2 Device description

| **FCC ID Number** | **IHDT56FG1** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Serial number(s)** | 1 | | | | | | | | | | | |
| **Mode(s) of Operation** | GSM 850 | GSM 900 | GSM 1800 | GSM 1900 | GPRS 850 | GPRS 900 | GPRS 1800 | GPRS 1900 | EDGE 850 | EDGE 900 | EDGE 1800 | EDGE 1900 |
| **Modulation Mode(s)** | GMSK | GMSK | GMSK | GMSK | GMSK | GMSK | GMSK | GMSK | 8PSK | 8PSK | 8PSK | 8PSK |
| **Maximum Output Power Setting** | 32.10 dBm | 32.30 dBm | 30.00 dBm | 30.00 dBm | 32.10 dBm | 32.30 dBm | 30.00 dBm | 30.00 dBm | 29.00 dBm | 29.00 dBm | 28.00 dBm | 28.00 dBm |
| **Duty Cycle** | 1:8 | 1:8 | 1:8 | 1:8 | 2:8 | 2:8 | 2:8 | 2:8 | 2:8 | 2:8 | 2:8 | 2:8 |
| **Transmitting Frequency Rang(s)** | 824.2-848.8 MHz | 880.2-914.8 MHz | 1710.2-1784.8 MHz | 1850.2 – 1909.8 Mhz | 824.2-848.8 MHz | 880.2-914.8 MHz | 1710.2-1784.8 MHz | 1850.2 – 1909.8 MHz | 824.2-848.8 MHz | 880.2-914.8 MHz | 1710.2-1784.8 MHz | 1850.2 – 1909.8 MHz |
| **Production Unit or Identical Prototype (47 CFR §2..908)** | Identical Prototype | | | | | | | | | | | |
| **Device Category** | Portable | | | | | | | | | | | |
| **RF Exposure Limits** | General Population / Uncontrolled | | | | | | | | | | | |

# 3 Test Equipment Used

## 3.1 Dosimetric System

The Motorola Personal Communications Sector Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy4™ v4.5) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. All the SAR measurements are taken within a shielded enclosure. The overall RSS uncertainty of the measurement system is ±11.1% (K=1) with an expanded uncertainty of ±22.2% (K=2). The measurement uncertainty budget is given in Appendix 6. 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 below.

| Description | Serial Number | Cal Due Date |
|---|---|---|
| DASY4 DAE4 | 376 | 01/13/2006 |
| DASY4 DAE3 | 434 | 3/16/2006 |
| E-Field Probe ES3DV3 | 3037 | 11/25/2005 |
| Dipole Validation Kit, D900V2 | 80 | |
| S.A.M. Phantom used for 800MHz | TP-1153 | |
| Dipole Validation Kit, D1800V2 | 251tr | |
| S.A.M. Phantom used for 1900MHz | TP-1159 | |
| S.A.M. Phantom used for 1900MHz | TP-1250 | |

## 3.2 Additional Equipment

| Description | Serial Number | Cal Due Date |
|---|---|---|
| Signal Generator HP8648C | 3847A04844 | 10/25/2005 |
| Power Meter E4419B | GB39511087 | 01/25/2006 |
| Power Sensor #1 – 8481A | US39210931 | 09/16/2005 |
| Power Sensor #2 - 8481A | US39210932 | 09/16/2005 |
| Network Analyzer HP8753ES | US39171846 | 09/03/2005 |
| Dielectric Probe Kit HP85070C | US99360070 | NA |

# 4 Electrical parameters of the tissue simulating liquid

Prior to conducting SAR measurements, the relative permittivity, $\varepsilon_r$, and the conductivity, $\sigma$, of the tissue simulating liquids were measured with the HP85070 Dielectric Probe Kit These values, along with the temperature of the tissue simulate are shown in the table below. The recommended limits for maximum permittivity and minimum conductivity are also shown. These come from the Federal Communication Commission, OET Bulletin 65 Supplement C 01-01. It is seen that the measured parameters are satisfactory for compliance testing.

| *f* (MHz) | Tissue type | Limits / Measured | Dielectric Parameters | | |
|---|---|---|---|---|---|
| | | | $\varepsilon_r$ | $\sigma$ (S/m) | Temp (°C) |
| 850 | **Head** | **Measured,** 7/3/2005 | 42.9 | 0.9 | 20.0 |
| | | **Recommended Limits** | 41.5 ±5% | 0.90 ±5% | 18-25 |
| | **Body** | **Measured,** 7/4/2005 | 53.8 | 0.96 | 20.0 |
| | | **Recommended Limits** | 55.2 ±5% | 0.97 ±5% | 18-25 |
| 1900 | **Head** | **Measured,** 7/4/2005 | 39.7 | 1.45 | 19.8 |
| | | **Measured,** 7/5/2005 | 39.9 | 1.45 | 19.8 |
| | | **Measured,** 7/26/2005 | 38.2 | 1.43 | 20.0 |
| | | **Recommended Limits** | 40.0 ±5% | 1.40 ±5% | 18-25 |
| | **Body** | **Measured,** 7/6/2005 | 51.4 | 1.58 | 19.9 |
| | | **Recommended Limits** | 53.3 ±5% | 1.52 ±5% | 18-25 |

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

| Ingredient | 800MHz Head | 800MHz Body | 1900MHz Head | 1900MHz Body |
|---|---|---|---|---|
| Sugar | 57.0 | 44.9 | -- | -- |
| DGBE | -- | -- | 47.0 | 30.80 |
| Water | 40.45 | 53.06 | 52.8 | 68.91 |
| Salt | 1.45 | 0.94 | 0.2 | 0.29 |
| HEC | 1.0 | 1.0 | -- | -- |
| Bact. | 0.1 | 0.1 | -- | -- |

# 5 System Accuracy Verification

A system accuracy verification of the DASY4 v4.5 was performed using the measurement equipment listed in Section 3.1. The daily system accuracy verification occurs within center section of the SAM phantom.

A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR indicated in Section 8.3.7 Reference SAR Values in IEEE 1528. These tests were done at 900MHz and/or 1800MHz. These frequencies are within 100MHz of the mid-band frequency of the test device. This is within the allowable window given in Supplement C 01-01 *Appendix D System Verification* section item #5. The test was conducted on the same days as the measurement of the DUT. Recommended limits for maximum permittivity, minimum conductivity are shown in the table below. These come from the Federal Communication Commission, OET Bulletin 65 Supplement C 01-01. The obtained results from the system accuracy verification are displayed in the table below. The distributions of SAR compare well with those of the reference measurements (see Appendix 1). The tissue stimulant depth was verified to be 15.0cm ±0.5cm. Z-axis scans showing the SAR penetration are also included in Appendix 1. SAR values are normalized to 1W forward power delivered to the dipole.

| *f* (MHz) | Description | SAR (W/kg), 1gram | Dielectric Parameters | | Ambient Temp (°C) | Tissue Temp (°C) |
|---|---|---|---|---|---|---|
| | | | $\varepsilon_r$ | σ (S/m) | | |
| **900** | **Measured, 7**/3/2005 | 11.15 | 42.3 | 0.98 | 21.0 | 20.5 |
| | **Recommended Limits** | 10.8 | 41.5 ±5% | 0.97 ±5% | 18-25 | 18-25 |
| **1800** | **Measured,** 7/4/2005 | 38.6 | 38.5 | 1.38 | 20.0 | 20.0 |
| | **Measured,** 7/5/2005 | 38.7 | 38.9 | 1.38 | 21.0 | 19.8 |
| | **Measured,** 7/6/2005 | 38.7 | 39.0 | 1.38 | 20.0 | 19.8 |
| | **Measured,** 7/26/2005 | 36.5 | 38.6 | 1.34 | 20.0 | 20.1 |
| | **Recommended Limits** | 38.1 | 40.0 ±5% | 1.4 ±5% | 18-25 | 18-25 |

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

| Description | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|---|---|---|---|---|
| E-Field Probe ES3DV3 | 3037 | 900 | 6.11 | 8 of 9 |
| | | 1810 | 5.16 | 8 of 9 |

# 6 Test Results

The test sample was operated in a test mode that allows control of the transmitter without the need to place actual phone calls. For the purposes of this test the unit is commanded to test mode and manually set to the proper channel, transmitter power level and transmit mode of operation. The phone was tested in the configurations stipulated in OET Bulletin 65 Supplement C 01-01. Motorola also followed the requirements in Supplement. C / Appendix D: SAR Measurement Procedures, section titled "*Devices Operating Next To A Person's Ear* ". These directions state "The device should be tested on the left and right side of the head phantom in the "Cheek/Touch" and "Ear/Tilt" positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s)."

The DASY4 v4.5 SAR measurement system specified in section 3.1 was utilized within the intended operations as set by the SPEAG™ setup. The phone was positioned into the measurement configurations using the positioner supplied with the DASY4 v4.5 SAR measurement system. The measured dielectric constant of the material used for the positioner is less than 2.9 and the loss tangent is less than 0.02 (± 30%) at 850MHz. The default settings for the "coarse" and "cube" scans were chosen and use for measurements. The grid spacing of the course scan was set to 15cm as shown in the SAR plots included in appendix 2 and 3. Please refer to the DASY manual for additional information on SAR scanning procedures and algorithms used.

The Cellular Phone (FCC ID IHDT56FG1) has the following battery options:

SNN5744A 1000mAH Battery
SNN5766A 810mAH Battery

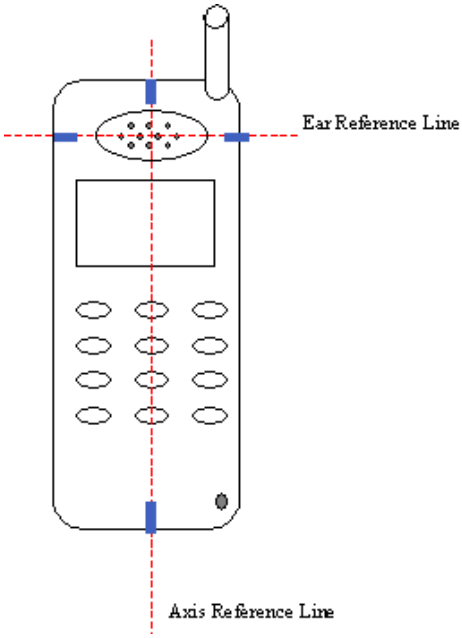
The battery with the highest capacity is the SNN5744A. This battery was used to do most of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery. The configuration that resulted in the highest SAR values were tested using the other battery listed above.

## 6.1 Head Adjacent Test Results

To aid in positioning repeatability, the ear reference line of the device and the axis reference line of the device have been physically added using a non-metallic marker.

- Per Figure 1, the "Ear Reference Line" is centered vertically through the center of the listening area (as defined by the speaker holes in the housing).
- The "Axis Reference Line" bisects the front surface of the device at its top and bottom edges.
- The intersection of these two lines defines the location of the "Ear Reference Point".

The lines drawn on the device extended to the outside edges, as shown in blue in the figure below, & wrap around the sides of the device.




The SAR results shown in tables 1 through 3 are maximum SAR values averaged over 1 gram of phantom tissue. Also shown are the measured conducted output powers, 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 New SAR = Old SAR * 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY™ 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 indicated as bold numbers in the following table are included in Appendix 2

The SAR measurements were performed using the SAM phantoms listed in section 3.1. Since same phantoms and tissue simulate are used for the system accuracy verification as the device SAR measurements, the Z-axis scans included in within Appendix 1 are applicable for verification of tissue simulate depth to be 15.0cm ±0.5cm. All other test conditions measured lower SAR values than those included in Appendix 2.

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

| Description | Serial Number | f (MHz) | Conversion Factor | Cal Cert pg # |
|---|---|---|---|---|
| E-Field Probe ES3DV3 | 3037 | 900 | 6.11 | 8 of 9 |
| | | 1810 | 5.16 | 8 of 9 |

| f (MHz) | Description | Conducted Output Power (dBm) | Cheek / Touch Position | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Left Head | | | | Right Head | | | |
| | | | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) |
| Digital 850MHz | Channel 128 | 32.10 | 1.15 | -0.1 | 1.18 | 20 | 1.22 | 0 | 1.22 | 20 |
| | Channel 190 | 32.10 | 1.16 | -0.13 | 1.19 | 20 | 1.25 | -0.02 | 1.26 | 20 |
| | Channel 251 | 32.10 | 1.23 | -0.01 | 1.23 | 20 | **1.28** | **0.02** | **1.28** | **20** |
| Digital 1900MHz | Channel 512 | 30.00 | 0.928 | -0.06 | 0.94 | 19.8 | 0.958 | -0.04 | 0.97 | 19.8 |
| | Channel 661 | 30.00 | 0.965 | -0.16 | 1.00 | 19.8 | 0.975 | 0.016 | 0.98 | 19.8 |
| | Channel 810 | 30.00 | 1.04 | -0.06 | 1.06 | 19.8 | 0.973 | 0.068 | 0.97 | 19.8 |

**Table 1: SAR measurement results for the portable cellular telephone FCC ID IHDT56FG1 at highest possible output power. Measured against the left and right head in the Cheek/Touch Position.**

| f (MHz) | Description | Conducted Output Power (dBm) | 15° Tilt Position | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Left Head | | | | Right Head | | | |
| | | | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) |
| Digital 850MHz | Channel 128 | 32.10 | | | | | | | | |
| | Channel 190 | 32.10 | 0.313 | 0.02 | 0.31 | 20 | 0.308 | 0.01 | 0.31 | 20 |
| | Channel 251 | 32.10 | | | | | | | | |
| Digital 1900MHz | Channel 512 | 30.00 | | | | | | | | |
| | Channel 661 | 30.00 | 0.296 | 0.05 | 0.30 | 19.8 | 0.29 | -0.16 | 0.30 | 19.8 |
| | Channel 810 | 30.00 | | | | | | | | |

**Table 2: SAR measurement results for the portable cellular telephone FCC ID IHDT56FG1 at highest possible output power. Measured against the left and right head in the 15° Tilt Position**

| f (MHz) | Description | Conducted Output Power (dBm) | Cheek / Touch Position using SNN5766A Battery | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Left Head | | | | Right Head | | | |
| | | | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) |
| Digital 850MHz | Channel 128 | 32.10 | | | | | 1.15 | 0.02 | 1.15 | 20 |
| | Channel 190 | 32.10 | | | | | 1.18 | -0.01 | 1.18 | 20 |
| | Channel 251 | 32.10 | | | | | 1.21 | 0.03 | 1.21 | 20 |
| Digital 1900MHz | Channel 512 | 30.00 | 0.952 | -0.08 | 0.97 | 20 | | | | |
| | Channel 661 | 30.00 | 1 | -0.04 | 1.01 | 20 | | | | |
| | Channel 810 | 30.00 | 1.05 | 0.11 | 1.05 | 20 | | | | |

**Table 3: SAR measurement results for the portable cellular telephone FCC ID IHDT56FG1 at highest possible output power. Measured against the left and right head in the Cheek/Touch Position.**

## 6.2 Body Worn Test Results

The SAR results shown in tables 4 through 7 are the maximum SAR values averaged over 1 gram of phantom tissue. Also shown are the measured conducted output powers, 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 New SAR = Old SAR * 10^(-drift/10). The SAR reported at the end of the measurement process by the DASY™ 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 indicated as bold numbers in the following table are included in Appendix 3. All other test conditions measured lower SAR values than those included in Appendix 3.

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

The tissue stimulant depth was verified to be 15.0cm ±0.5cm. The same device holder described in section 6 was used for positioning the phone. There are no Body-Worn Accessories available for this phone at the time of testing hence the device was tested per the supplement C testing guidelines for devices that do not have body worn accessories. The phone was placed a maximum of 1 inch away from a flat phantom per the supplement C standard guidelines to perform SAR measurement. The cellular phone was tested with a headset connected to the device for all body-worn SAR measurements

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 | 3037 | 900 | 6.00 | 8 of 9 |
| | | 1810 | 4.71 | 8 of 9 |

| f (MHz) | Description | Conducted Output Power (dBm) | Body Worn | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Front of phone 15 mm away from phantom | | | | Back of phone 15 mm away from phantom | | | |
| | | | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) |
| Digital 850MHz | Channel 128 | 32.10 | | | | | | | | |
| | Channel 190 | 32.10 | 0.192 | -0.04 | 0.19 | 20 | 0.486 | 0.01 | 0.49 | 20 |
| | Channel 251 | 32.10 | | | | | | | | |
| Digital 1900MHz | Channel 512 | 30.00 | | | | | | | | |
| | Channel 661 | 30.00 | 0.108 | -0.01 | 0.11 | 19.9 | 0.262 | -0.08 | 0.27 | 19.9 |
| | Channel 810 | 30.00 | | | | | | | | |

**Table 4: SAR measurement results for the portable cellular telephone FCC ID IHDT56FG1 at highest possible output power. Measured against the body.**

| f (MHz) | Description | Conducted Output Power (dBm) | Body Worn | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Back of phone 25 mm away from phantom (GPRS Class 10) | | | | | | | |
| | | | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) | | | | |
| Digital 850MHz | Channel 128 | 32.10 | | | | | | | | |
| | Channel 190 | 32.10 | 0.579 | -0.07 | 0.59 | 20 | | | | |
| | Channel 251 | 32.10 | | | | | | | | |
| Digital 1900MHz | Channel 512 | 30.00 | | | | | | | | |
| | Channel 661 | 30.00 | 0.243 | -0.01 | 0.24 | 19.9 | | | | |
| | Channel 810 | 30.00 | | | | | | | | |

**Table 5: SAR measurement results for the portable cellular telephone FCC ID IHDT56FG1 at highest possible output power. Measured against the body.**

| f (MHz) | Description | Conducted Output Power (dBm) | Body Worn | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Back of phone 25 mm away from phantom (GPRS Class 10) using SNN5766A Battery | | | | Back of phone 15 mm away from phantom Using SNN5766A Battery | | | |
| | | | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) |
| Digital 850MHz | Channel 128 | 32.10 | | | | | | | | |
| | Channel 190 | 32.10 | **0.66** | **-0.02** | **0.67** | **20** | | | | |
| | Channel 251 | 32.10 | | | | | | | | |
| Digital 1900MHz | Channel 512 | 30.00 | | | | | | | | |
| | Channel 661 | 30.00 | | | | | 0.239 | 0.01 | 0.24 | 19.9 |
| | Channel 810 | 30.00 | | | | | | | | |

**Table 6: SAR measurement results for the portable cellular telephone FCC ID IHDT56FG1 at highest possible output power. Measured against the body.**

| f (MHz) | Description | Conducted Output Power (dBm) | Body Worn | | | |
|---|---|---|---|---|---|---|
| | | | Back of phone 25 mm away from phantom (EDGE Class 6) | | | |
| | | | Measured (W/kg) | Drift (dB) | Extrapolated (W/kg) | Simulate Temp (°C) |
| Digital 850MHz | Channel 128 | | | | | |
| | Channel 190 | 29.09 | **0.307** | **-0.08** | **0.31** | **20.0** |
| | Channel 251 | | | | | |
| Digital 1900MHz | Channel 512 | | | | | |
| | Channel 661 | 28.09 | **0.114** | **-0.05** | **0.12** | **19.9** |
| | Channel 810 | | | | | |

**Table 7: SAR measurement results for the portable cellular telephone FCC ID IHDT56FG1 at highest possible output power. Measured against the body.**

# Appendix 1

## SAR distribution comparison for the system accuracy verification

Date/Time: 7/6/2005 7:15:19 AM

# Test Laboratory: Motorola

## 070605 1800 MHz GOOD +1.6%

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:251tr**
Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 251TR PM1 Power = 200 mW
Sim.Temp@meas = 19.8C Sim.Temp@SPC = 19.8C Room Temp @ SPC = 20C

Communication System: CW - Dipole; Frequency: 1800 MHz; Channel Number: 8; Duty Cycle: 1:1
Medium: VALIDATION Only; Medium parameters used: $\sigma$ = 1.38 mho/m, $\varepsilon_r$ = 39; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.16, 5.16, 5.16); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 8.67 mW/g

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

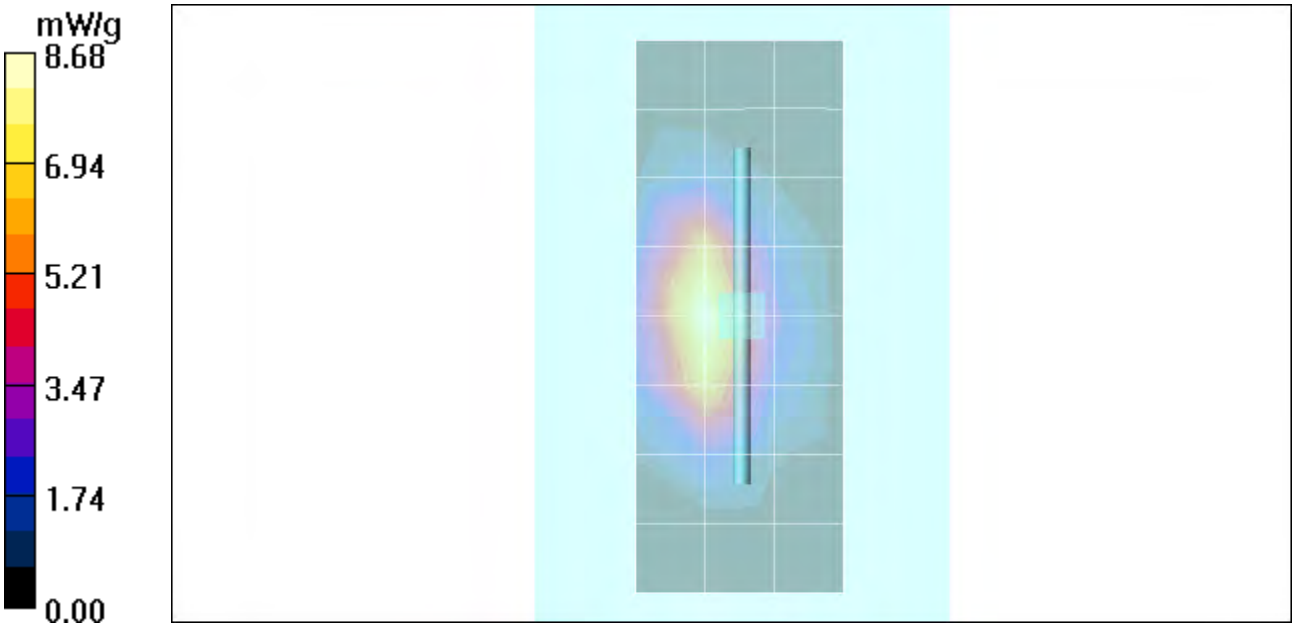
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 67.9 V/m; Power Drift = -0.097 dB
Peak SAR (extrapolated) = 13.8 W/kg
**SAR(1 g) = 7.7 mW/g; SAR(10 g) = 4.05 mW/g**
Maximum value of SAR (measured) = 8.60 mW/g

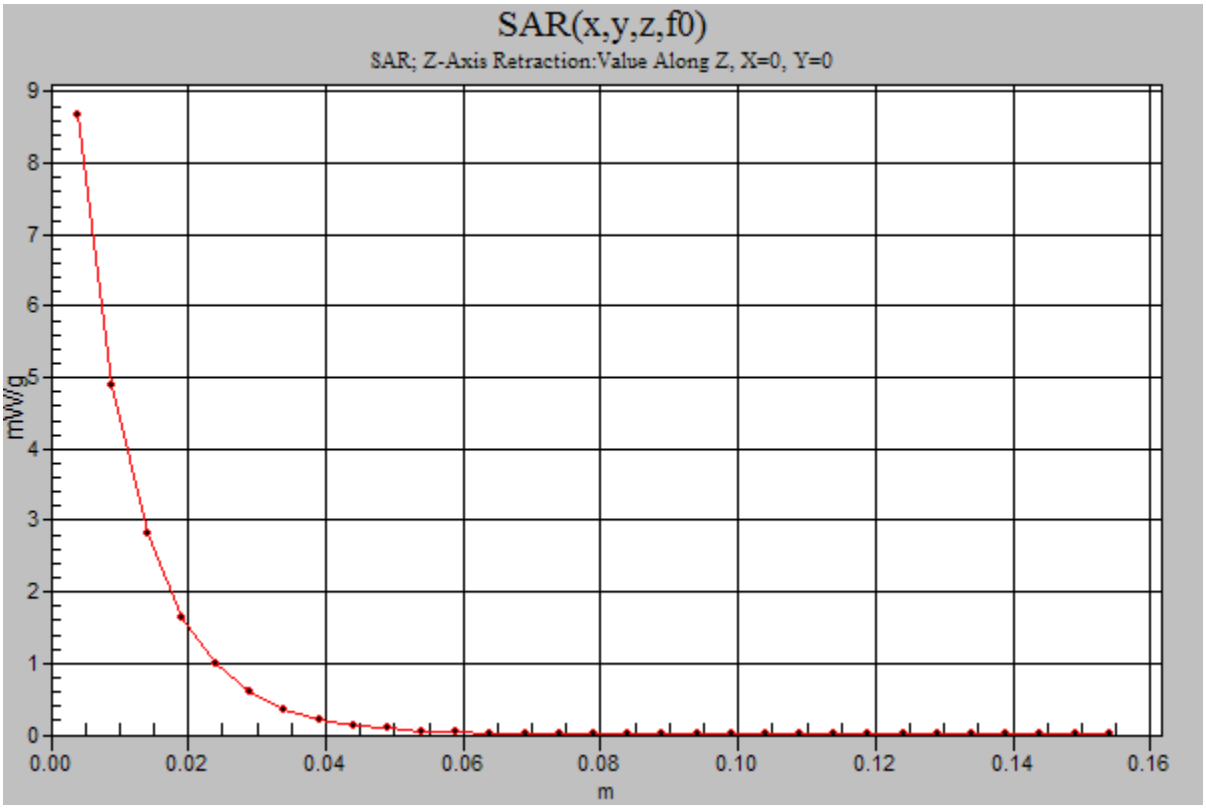
## Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 67.9 V/m; Power Drift = -0.097 dB
Peak SAR (extrapolated) = 13.9 W/kg
**SAR(1 g) = 7.78 mW/g; SAR(10 g) = 4.09 mW/g**
Maximum value of SAR (measured) = 8.69 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.68 mW/g


mW/g
8.68
6.94
5.21
3.47
1.74
0.00


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
0
1
2
3
4
5
6
7
8
9
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 7/5/2005 8:09:41 AM

# Test Laboratory: Motorola

## 070505 1800 MHz GOOD +1.6%

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:251tr**
Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 251TR PM1 Power = 200 mW
Sim.Temp@meas = 19.8C Sim.Temp@SPC = 19.8C Room Temp @ SPC = 21C

Communication System: CW - Dipole; Frequency: 1800 MHz; Channel Number: 8; Duty Cycle: 1:1
Medium: VALIDATION Only; Medium parameters used: $\sigma$ = 1.38 mho/m, $\varepsilon_r$ = 38.9; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.16, 5.16, 5.16); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 7.23 mW/g

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

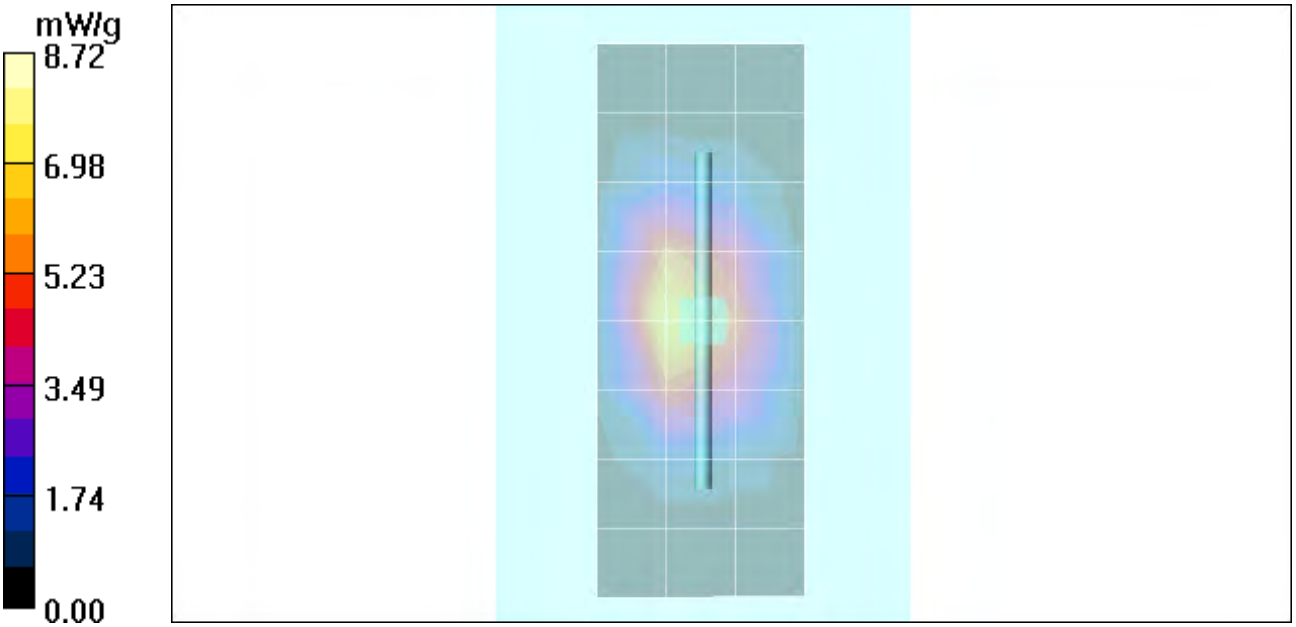
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 80.5 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 13.6 W/kg
**SAR(1 g) = 7.7 mW/g; SAR(10 g) = 4.09 mW/g**
Maximum value of SAR (measured) = 8.60 mW/g

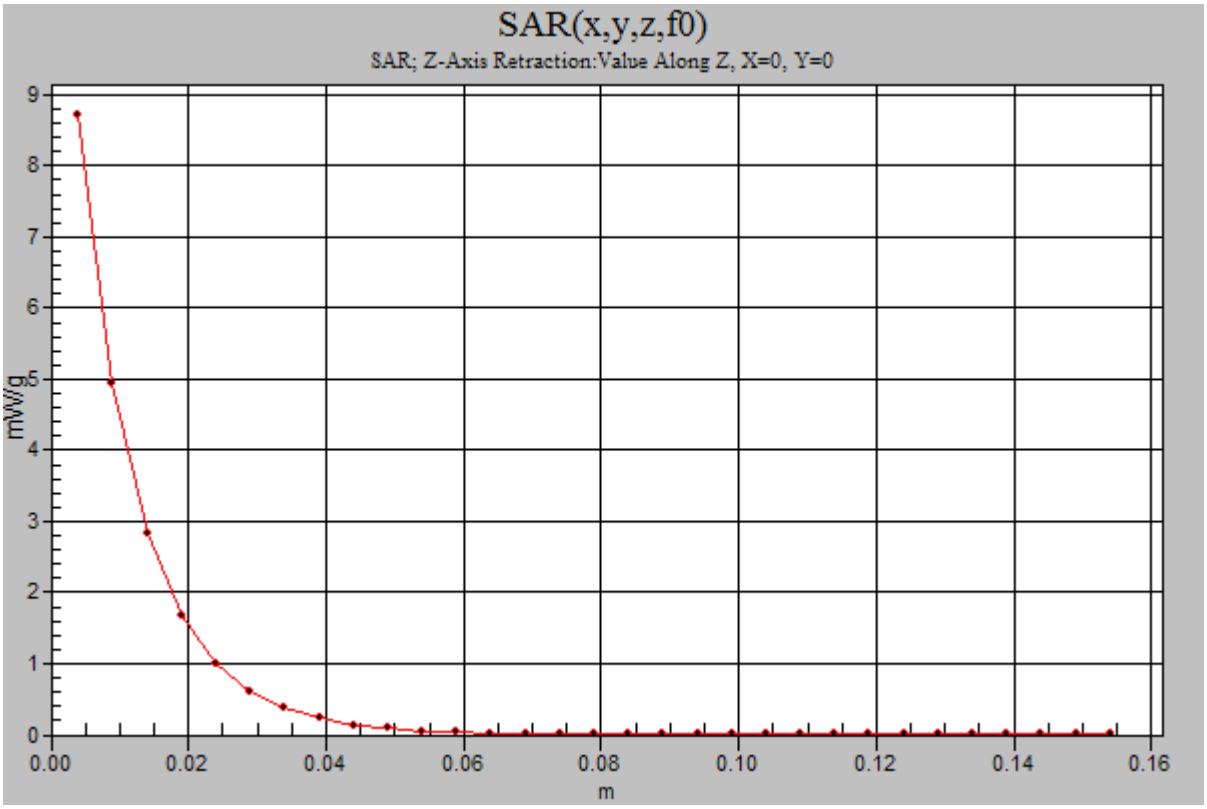
## Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 80.5 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 13.7 W/kg
**SAR(1 g) = 7.78 mW/g; SAR(10 g) = 4.12 mW/g**
Maximum value of SAR (measured) = 8.56 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.72 mW/g


mW/g
8.72
6.98
5.23
3.49
1.74
0.00


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
0
1
2
3
4
5
6
7
8
9
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 7/4/2005 4:34:18 AM

# Test Laboratory: Motorola

## 070405 1800 MHz GOOD +1.2%

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:251tr**
Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 251tr PM1 Power = 200mW
Sim.Temp@meas = 20.2ةC Sim.Temp@SPC = 20*C Room Temp @ SPC = 20ةC

Communication System: CW - Dipole; Frequency: 1800 MHz; Channel Number: 8; Duty Cycle: 1:1
Medium: VALIDATION Only; Medium parameters used: $\sigma$ = 1.38 mho/m, $\varepsilon_r$ = 38.5; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.16, 5.16, 5.16); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 8.34 mW/g

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

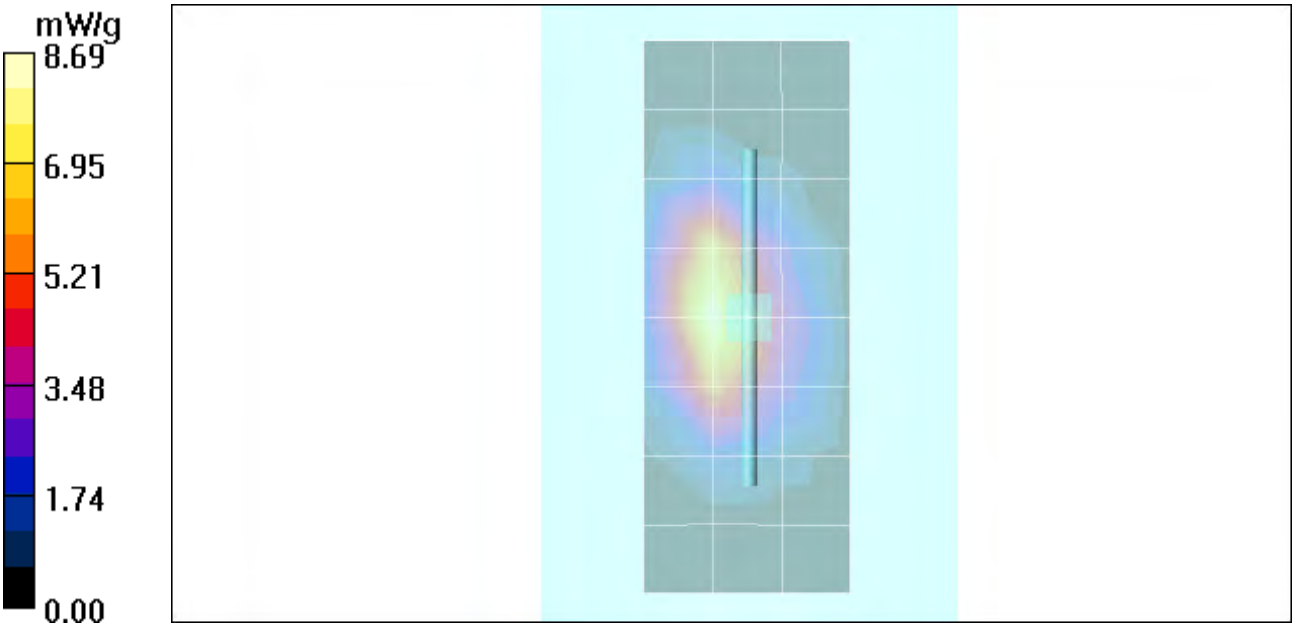
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 73.9 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 13.8 W/kg
**SAR(1 g) = 7.7 mW/g; SAR(10 g) = 4.07 mW/g**
Maximum value of SAR (measured) = 8.52 mW/g

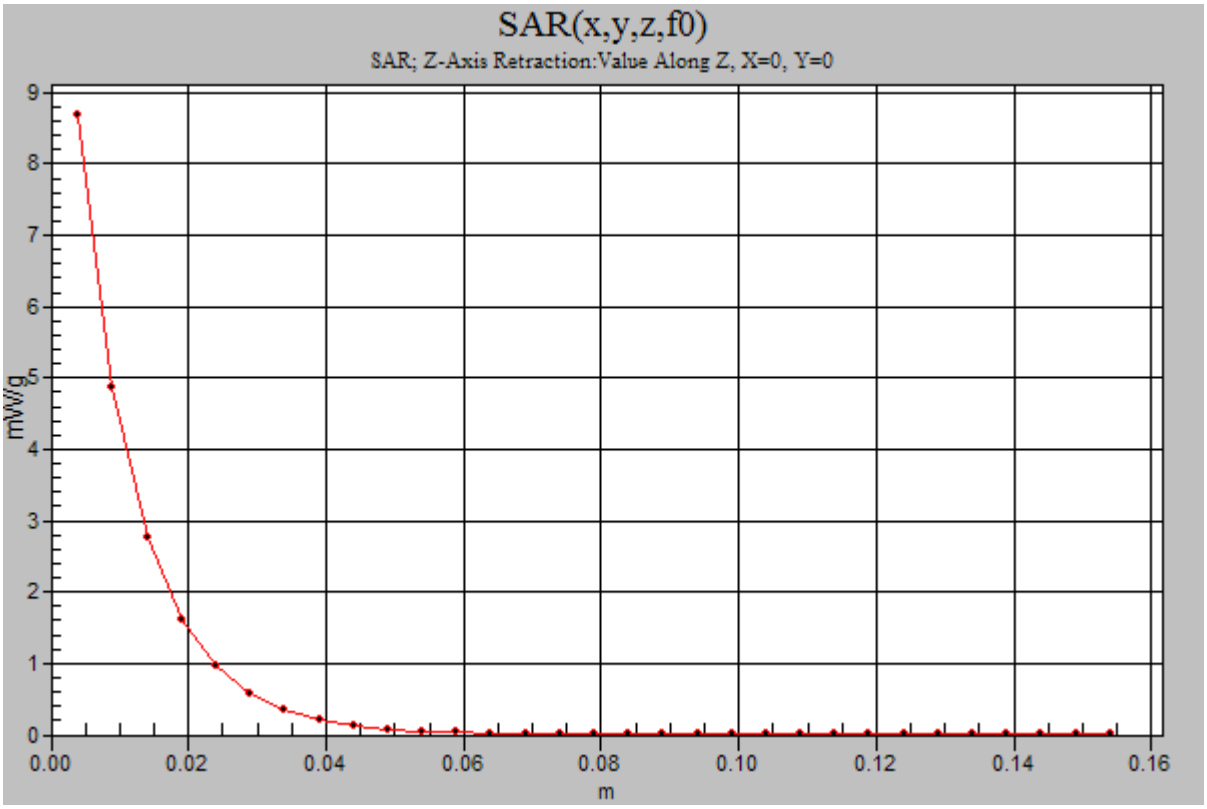
## Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 73.9 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 13.9 W/kg
**SAR(1 g) = 7.73 mW/g; SAR(10 g) = 4.09 mW/g**
Maximum value of SAR (measured) = 8.57 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.69 mW/g


mW/g
8.69
6.95
5.21
3.48
1.74
0.00


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
9
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

Date/Time: 7/3/2005 5:34:49 PM

# Test Laboratory: Motorola

## 070305 900Mhz GOOD -1.3%

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:080**
Procedure Notes: 900MHz System Performance Check / Dipole Sn# 80

PM1 Power = 200 mW Sim.Temp@meas = 20 Sim.Temp@SPC = 20.5 Room Temp @ SPC = 21

Communication System: CW - Dipole; Frequency: 900 MHz; Channel Number: 4; Duty Cycle: 1:1
Medium: VALIDATION Only; Medium parameters used: $\sigma = 0.98$ mho/m, $\varepsilon_r = 42.3$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(6.11, 6.11, 6.11); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sugar Water SAM; Type: SAM; Serial: TP-1153;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.34 mW/g

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

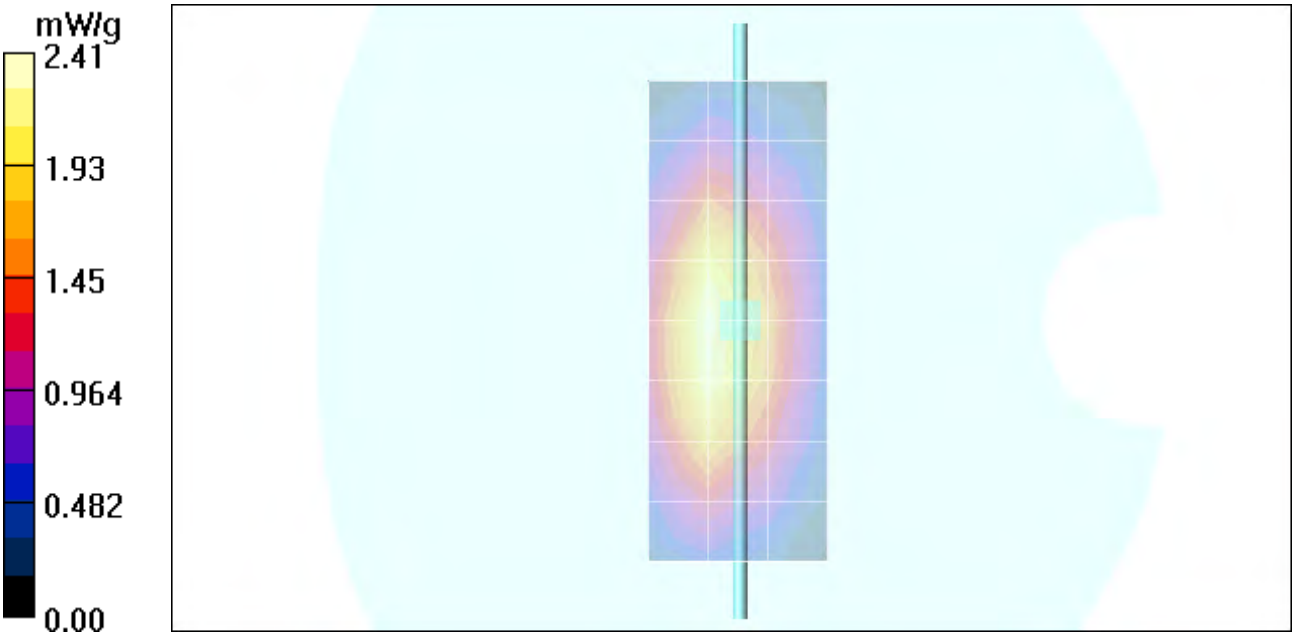
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 48.3 V/m; Power Drift = 0.035 dB
Peak SAR (extrapolated) = 3.37 W/kg
**SAR(1 g) = 2.22 mW/g; SAR(10 g) = 1.42 mW/g**
Maximum value of SAR (measured) = 2.41 mW/g

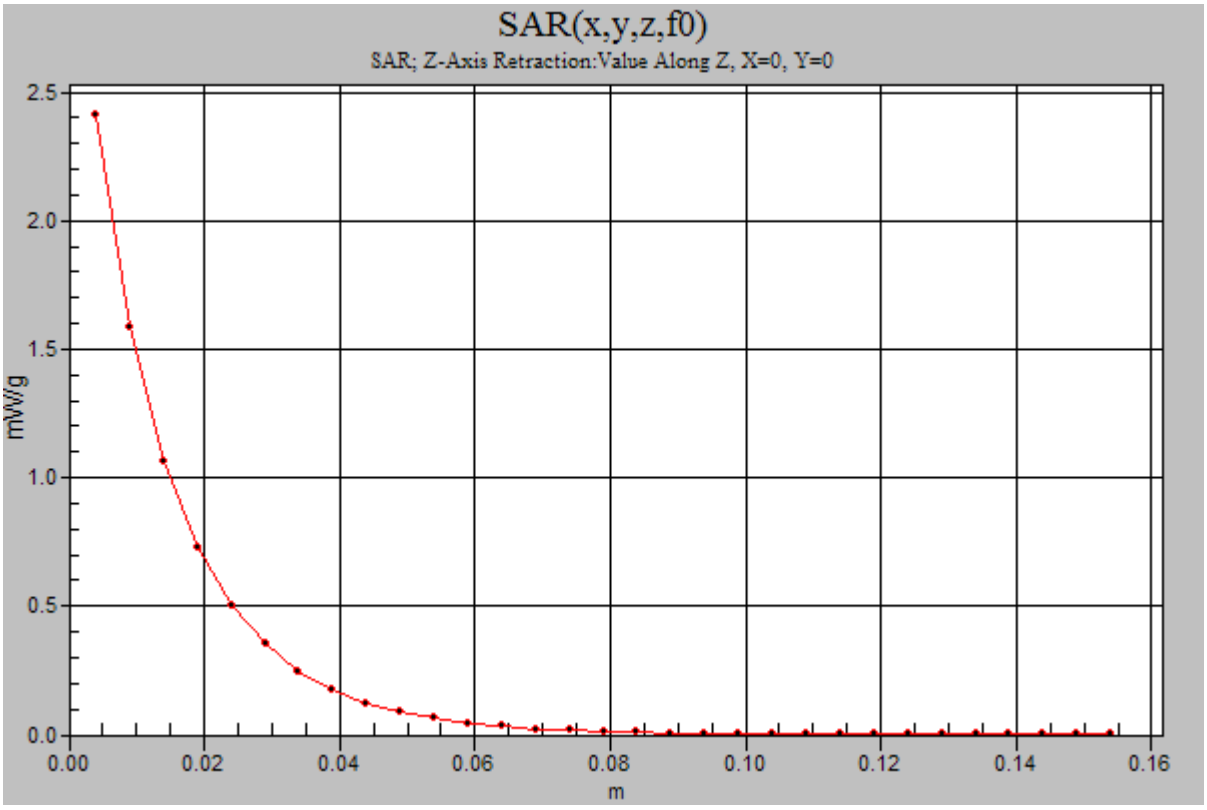
## Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 48.3 V/m; Power Drift = 0.035 dB
Peak SAR (extrapolated) = 3.39 W/kg
**SAR(1 g) = 2.24 mW/g; SAR(10 g) = 1.43 mW/g**
Maximum value of SAR (measured) = 2.42 mW/g

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

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


mW/g
2.41
1.93
1.45
0.964
0.482
0.00


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date/Time: 7/26/2005 6:30:25 AM

# Test Laboratory: Motorola

## 072605 1800Mhz GOOD-4.3%

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN:251tr**
Procedure Notes: 1800 MHz System Performance Check / Dipole Sn# 251tr PM1 Power = 200 mW

Sim.Temp@meas = 20.0ºC Sim.Temp@SPC = 20.1ºC Room Temp @ SPC = 20ºC

Communication System: CW - Dipole; Frequency: 1800 MHz; Channel Number: 8; Duty Cycle: 1:1
Medium: VALIDATION Only; Medium parameters used: $\sigma$ = 1.34 mho/m, $\varepsilon_r$ = 38.6; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

- Probe: ES3DV3 - SN3037; ConvF(5.16, 5.16, 5.16); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn434; Calibrated: 3/16/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 6.88 mW/g

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

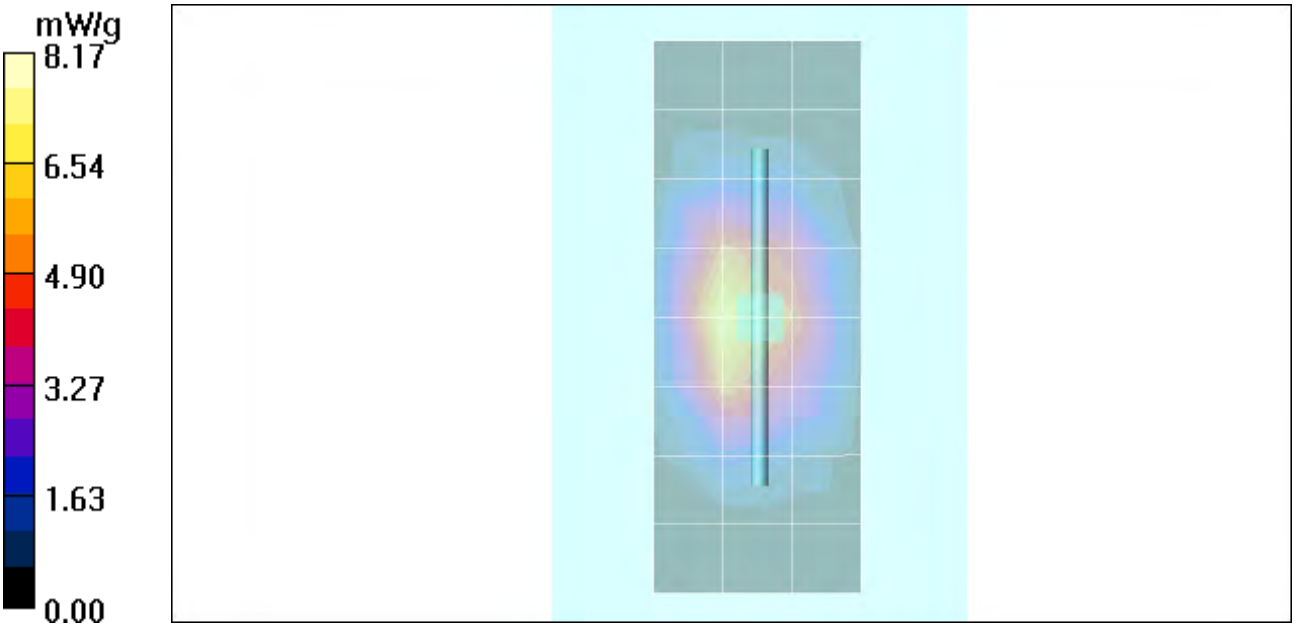
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 78.4 V/m; Power Drift = -0.016 dB
Peak SAR (extrapolated) = 12.8 W/kg
**SAR(1 g) = 7.33 mW/g; SAR(10 g) = 3.94 mW/g**
Maximum value of SAR (measured) = 8.19 mW/g

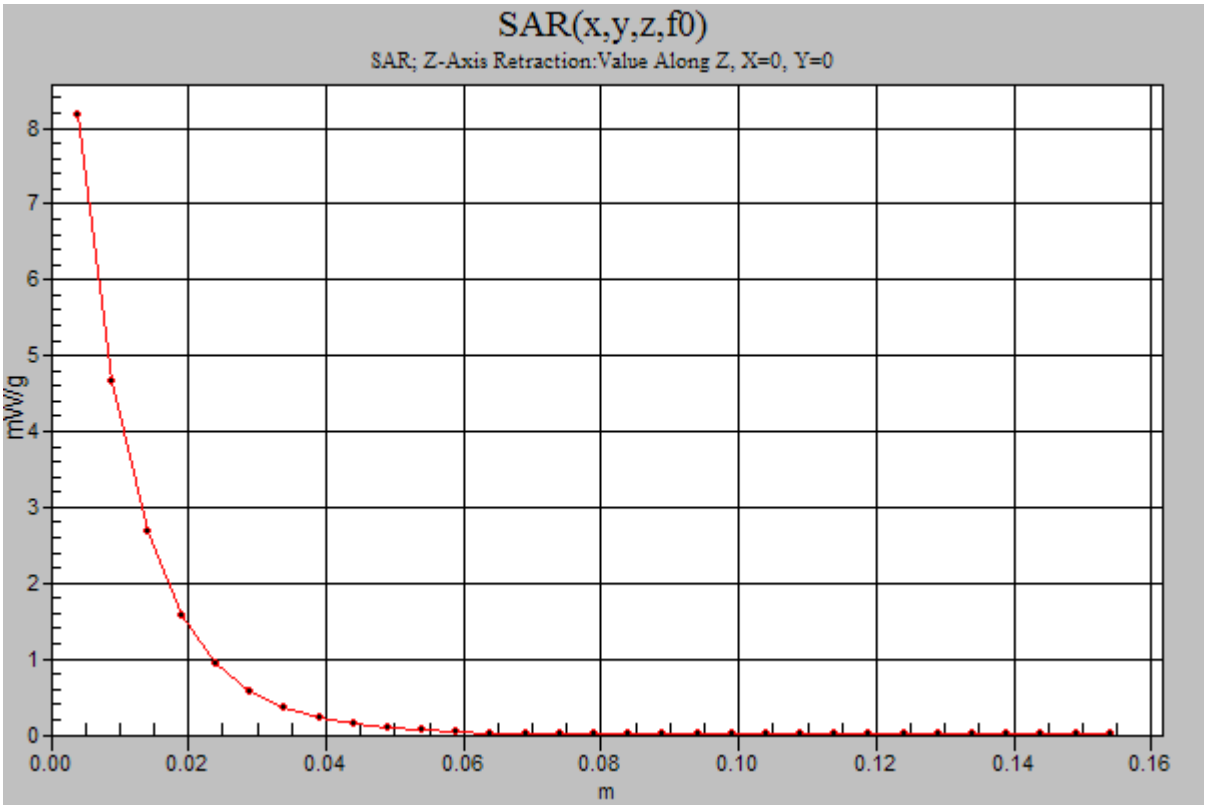
## Daily SPC Check/90-Degree 5x5x7 Cube (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 78.4 V/m; Power Drift = -0.016 dB
Peak SAR (extrapolated) = 12.8 W/kg
**SAR(1 g) = 7.25 mW/g; SAR(10 g) = 3.89 mW/g**
Maximum value of SAR (measured) = 8.02 mW/g

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

Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 8.17 mW/g


mW/g
8.17
6.54
4.90
3.27
1.63
0.00


SAR(x,y,z,f0)
SAR; Z-Axis Retraction:Value Along Z, X=0, Y=0
mW/g
0
1
2
3
4
5
6
7
8
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

# Appendix 2

## SAR distribution plots for Phantom Head Adjacent Use

Date/Time: 7/5/2005 1:10:45 PM

# Test Laboratory: Motorola

**1900 RH Cheek ch661**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED**

## Battery Model #: SNN744A DEVICE POSITION: CHEEK

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8
Medium: Regular Glycol Head; Medium parameters used: $\sigma$ = 1.45 mho/m, $\varepsilon_r$ = 39.9; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

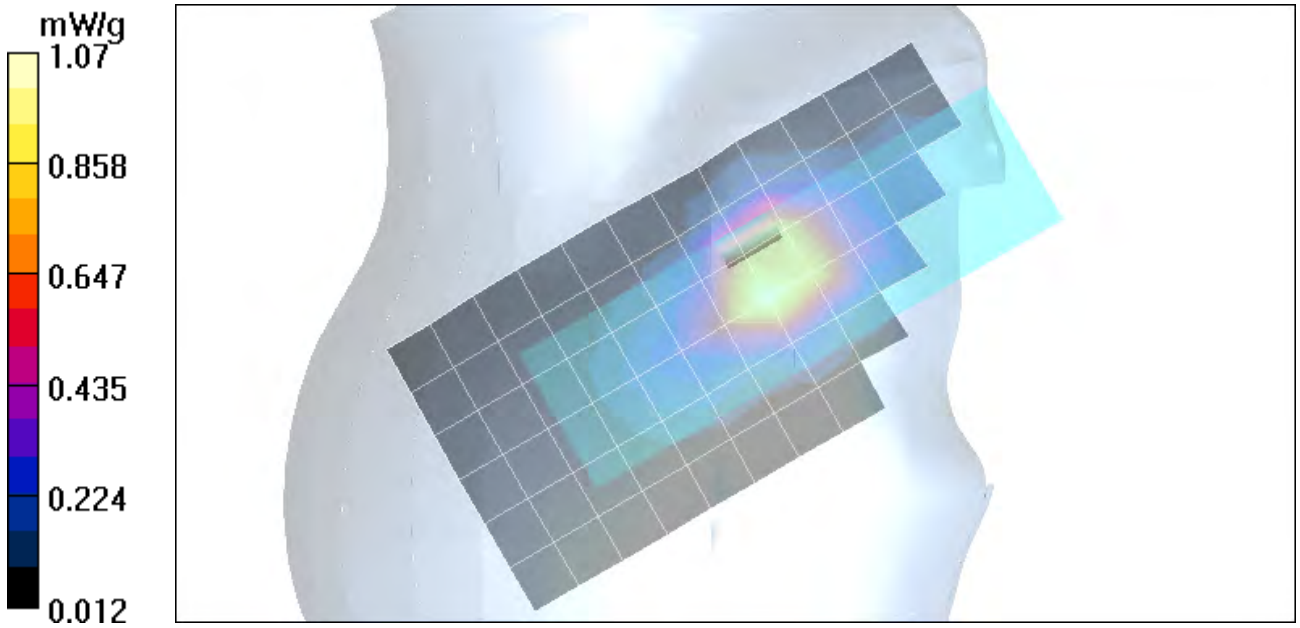
- Probe: ES3DV3 - SN3037; ConvF(5.16, 5.16, 5.16); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Glycol SAM; Type: SAM; Serial: TP-1159;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.04 mW/g

## Right Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 26.7 V/m; Power Drift = 0.016 dB
Peak SAR (extrapolated) = 1.65 W/kg
**SAR(1 g) = 0.975 mW/g; SAR(10 g) = 0.549 mW/g**
Maximum value of SAR (measured) = 1.07 mW/g



Date/Time: 7/4/2005 6:48:49 AM

# Test Laboratory: Motorola

**1900 LH Tilt ch661**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED**

## Battery Model #: SNN5744A DEVICE POSITION: ROTATED 15*

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8
Medium: Regular Glycol Head; Medium parameters used: $\sigma$ = 1.45 mho/m, $\varepsilon_r$ = 39.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

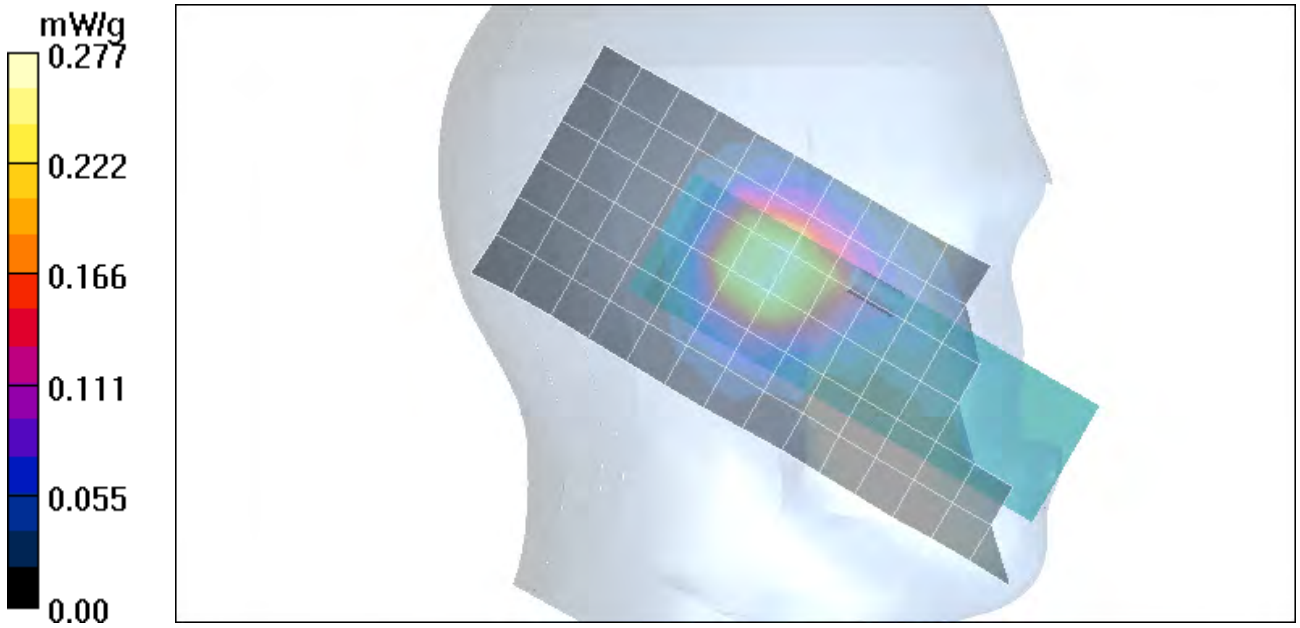
- Probe: ES3DV3 - SN3037; ConvF(5.16, 5.16, 5.16); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Glycol SAM; Type: SAM; Serial: TP-1159;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

## Left Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.8 V/m; Power Drift = 0.054 dB
Peak SAR (extrapolated) = 0.447 W/kg
**SAR(1 g) = 0.296 mW/g; SAR(10 g) = 0.182 mW/g**
Maximum value of SAR (measured) = 0.322 mW/g

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.277 mW/g



Date/Time: 7/4/2005 6:21:26 AM

# Test Laboratory: Motorola

**1900 LH Cheek ch810**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED**

## Battery Model #: SNN5744A DEVICE POSITION: CHEEK

Communication System: GSM 1900; Frequency: 1909.8 MHz; Channel Number: 810; Duty Cycle: 1:8
Medium: Regular Glycol Head; Medium parameters used: $\sigma$ = 1.45 mho/m, $\varepsilon_r$ = 39.7; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

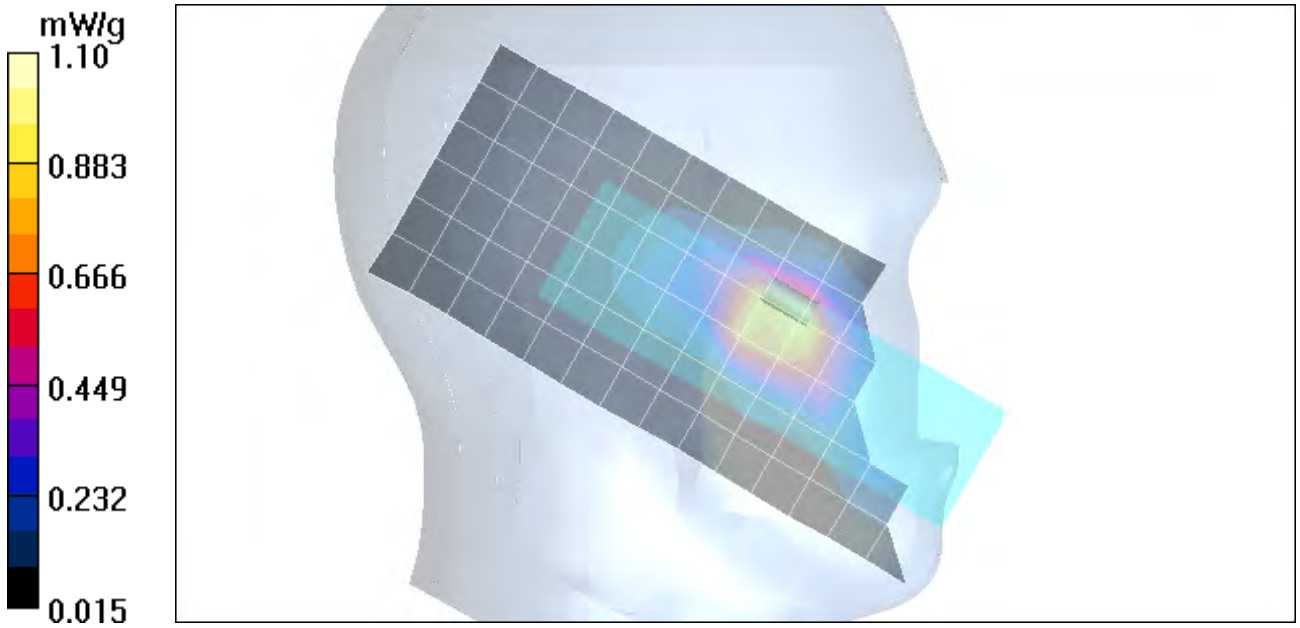
- Probe: ES3DV3 - SN3037; ConvF(5.16, 5.16, 5.16); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Glycol SAM; Type: SAM; Serial: TP-1159;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.906 mW/g

## Left Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 27.8 V/m; Power Drift = -0.062 dB
Peak SAR (extrapolated) = 1.78 W/kg
**SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.572 mW/g**
Maximum value of SAR (measured) = 1.10 mW/g



Date/Time: 7/26/2005 11:56:26 AM

# Test Laboratory: Motorola

**1900 LH Cheek ch810 batt SNN5766A**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED**

## Battery Model #: SNN5766A DEVICE POSITION: CHEEK

Communication System: GSM 1900; Frequency: 1909.8 MHz; Channel Number: 810; Duty Cycle: 1:8
Medium: Regular Glycol Head; Medium parameters used: $\sigma$ = 1.43 mho/m, $\varepsilon_r$ = 38.2; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

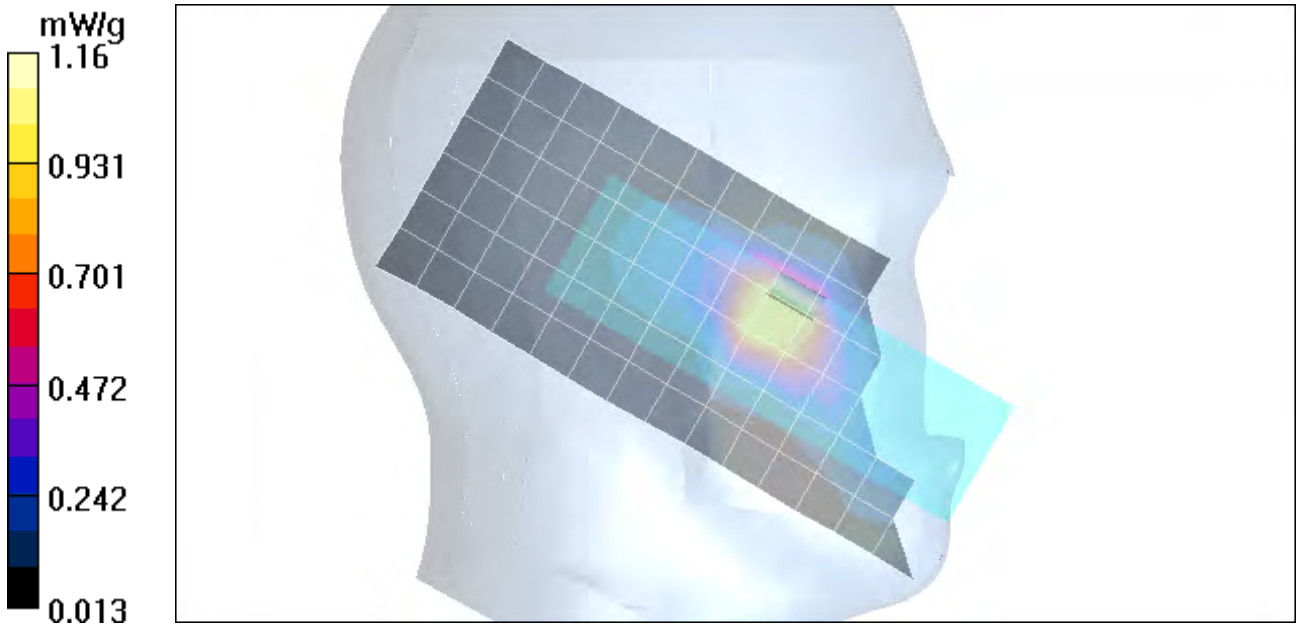
- Probe: ET3DV6 - SN1520; ConvF(5.08, 5.08, 5.08); Calibrated: 4/22/2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn365; Calibrated: 9/22/2004
- Phantom: R4: Glycol SAM; Type: SAM; Serial: TP-1250;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.856 mW/g

## Left Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.7 V/m; Power Drift = 0.110 dB
Peak SAR (extrapolated) = 1.81 W/kg
**SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.571 mW/g**
Maximum value of SAR (measured) = 1.16 mW/g



Date/Time: 7/3/2005 8:50:49 PM

# Test Laboratory: Motorola

**850 RH Tilt ch190**

Serial: 1

**Procedure Notes: Pwr Step: 5 Antenna Position: int**

## Battery Model #: snn5744a DEVICE POSITION tilt

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8
Medium: Low Freq Head; Medium parameters used: $\sigma = 0.9$ mho/m, $\varepsilon_r = 42.9$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

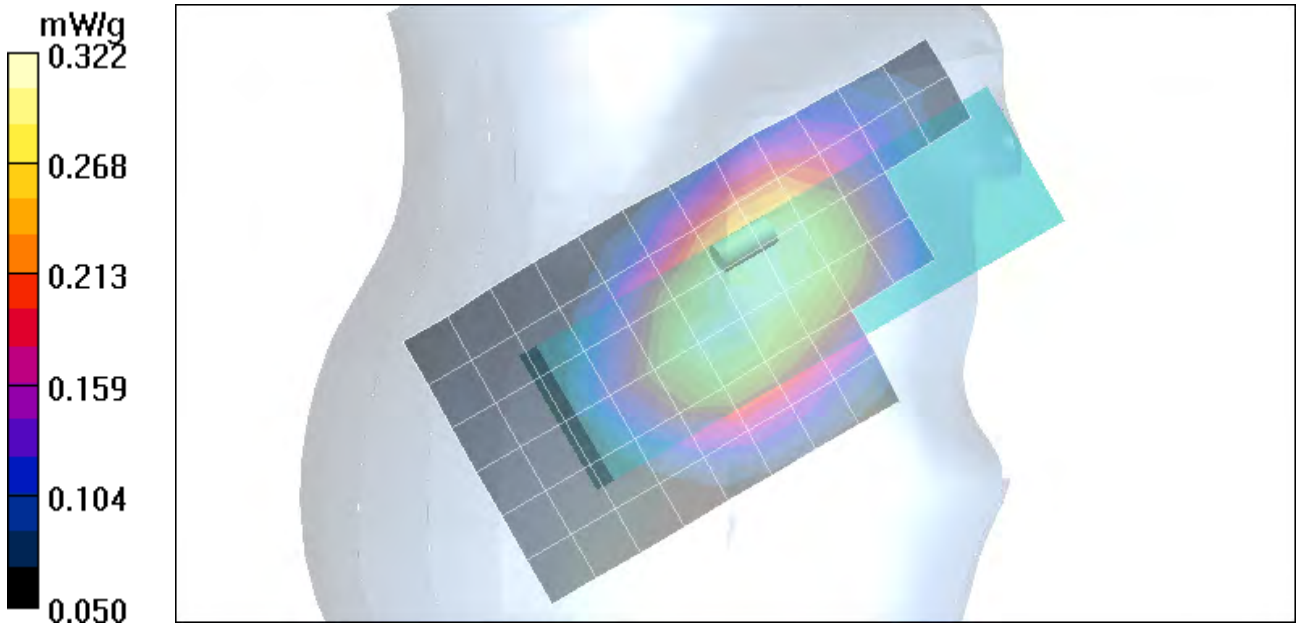
- Probe: ES3DV3 - SN3037; ConvF(6.11, 6.11, 6.11); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sugar Water SAM; Type: SAM; Serial: TP-1153;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.318 mW/g

## Right Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.0 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.390 W/kg
**SAR(1 g) = 0.308 mW/g; SAR(10 g) = 0.238 mW/g**
Maximum value of SAR (measured) = 0.322 mW/g



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# Test Laboratory: Motorola

**850 RH Cheek ch251**

Serial: 1

**Procedure Notes: Pwr Step: 5 Antenna Position: int**

## Battery Model #: snn5744a DEVICE POSITION cheek

Communication System: GSM 850; Frequency: 848.8 MHz; Channel Number: 251; Duty Cycle: 1:8
Medium: Low Freq Head; Medium parameters used: $\sigma = 0.9$ mho/m, $\varepsilon_r = 42.9$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

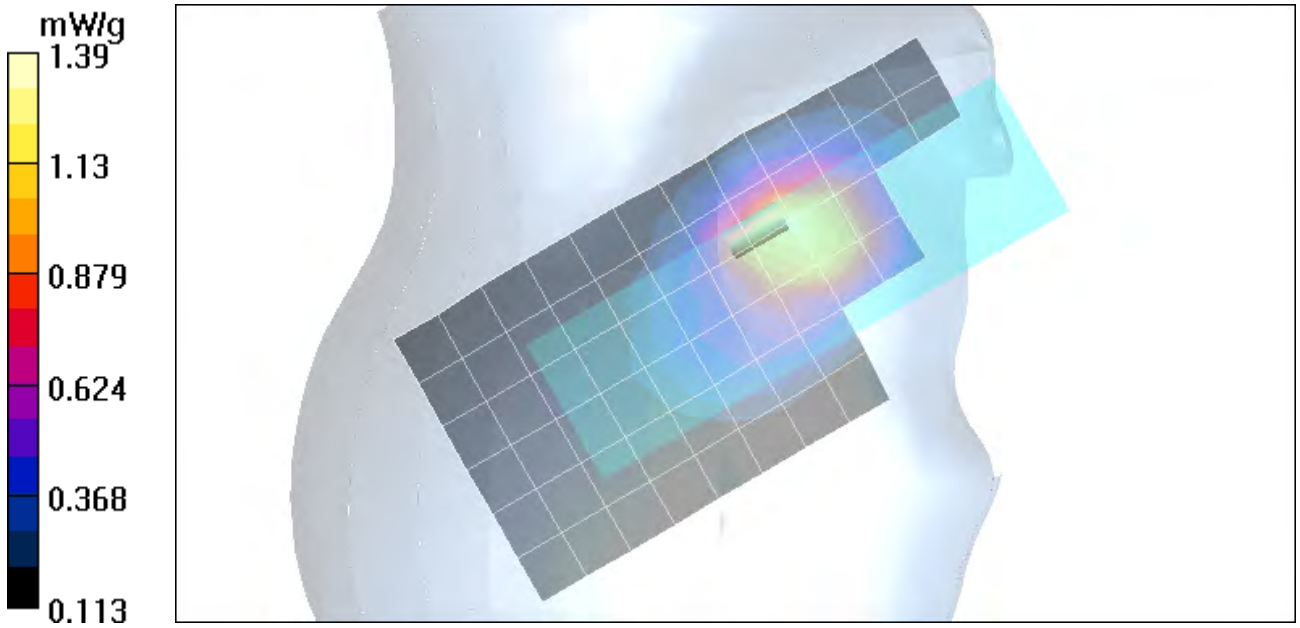
- Probe: ES3DV3 - SN3037; ConvF(6.11, 6.11, 6.11); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sugar Water SAM; Type: SAM; Serial: TP-1153;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.28 mW/g

## Right Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.3 V/m; Power Drift = 0.020 dB
Peak SAR (extrapolated) = 1.92 W/kg
**SAR(1 g) = 1.28 mW/g; SAR(10 g) = 0.830 mW/g**
Maximum value of SAR (measured) = 1.39 mW/g



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# Test Laboratory: Motorola

**850 RH Cheek ch251 batt SNN5766A**

Serial: 1

**Procedure Notes: Pwr Step: 5 Antenna Position: int**

## Battery Model #: snn5766a DEVICE POSITION cheek

Communication System: GSM 850; Frequency: 848.8 MHz; Channel Number: 251; Duty Cycle: 1:8
Medium: Low Freq Head; Medium parameters used: $\sigma = 0.9$ mho/m, $\varepsilon_r = 42.9$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

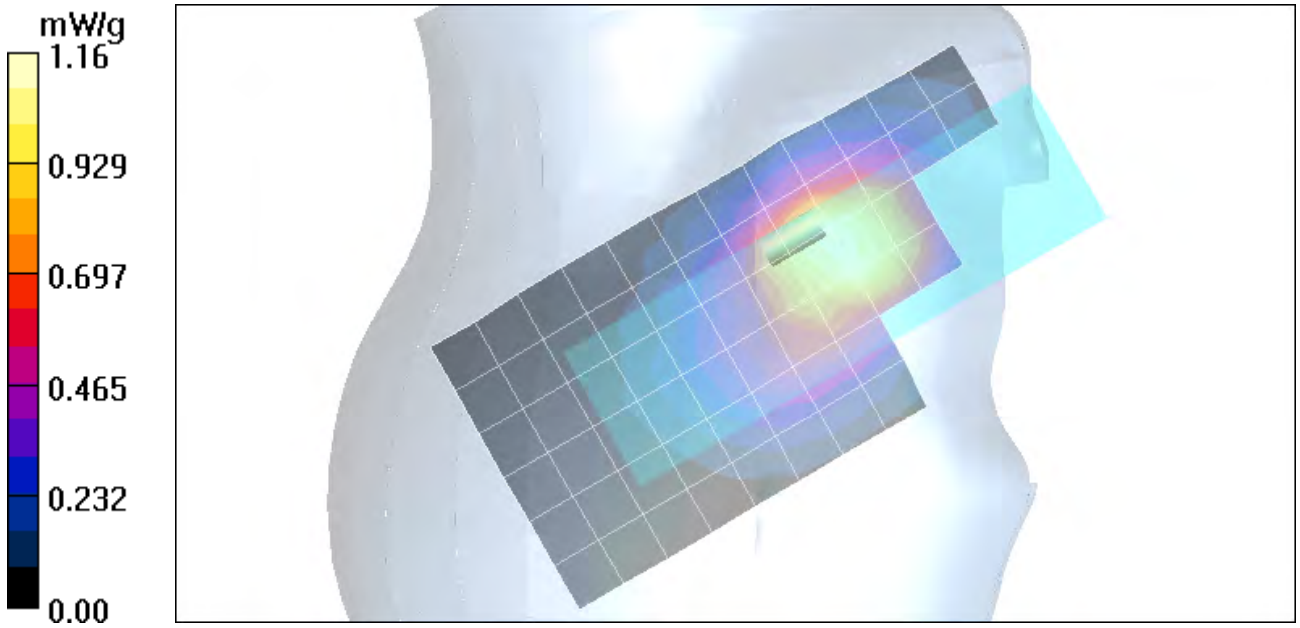
- Probe: ES3DV3 - SN3037; ConvF(6.11, 6.11, 6.11); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sugar Water SAM; Type: SAM; Serial: TP-1153;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

## Right Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 38.0 V/m; Power Drift = 0.034 dB
Peak SAR (extrapolated) = 1.82 W/kg
**SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.792 mW/g**
Maximum value of SAR (measured) = 1.32 mW/g

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.16 mW/g



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# Test Laboratory: Motorola

**850 LH Tilt ch190**

Serial: 1

**Procedure Notes: Pwr Step: 5 Antenna Position: int**

## Battery Model #: snn5744a DEVICE POSITION tilt

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8
Medium: Low Freq Head; Medium parameters used: $\sigma = 0.9$ mho/m, $\varepsilon_r = 42.9$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

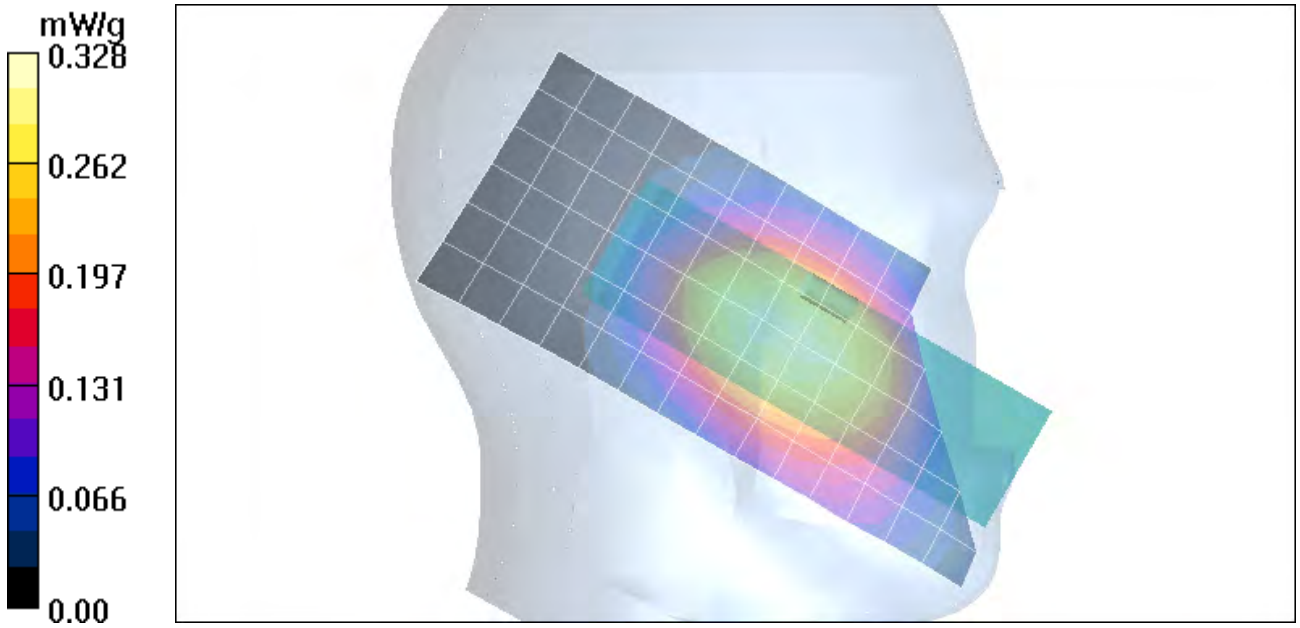
- Probe: ES3DV3 - SN3037; ConvF(6.11, 6.11, 6.11); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sugar Water SAM; Type: SAM; Serial: TP-1153;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

## Left Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.7 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 0.391 W/kg
**SAR(1 g) = 0.313 mW/g; SAR(10 g) = 0.241 mW/g**
Maximum value of SAR (measured) = 0.324 mW/g

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.328 mW/g



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# Test Laboratory: Motorola

**850 LH Cheek ch251**

Serial: 1

**Procedure Notes: Pwr Step: 5 Antenna Position: int**

## Battery Model #: snn5744a DEVICE POSITION cheek

Communication System: GSM 850; Frequency: 848.8 MHz; Channel Number: 251; Duty Cycle: 1:8
Medium: Low Freq Head; Medium parameters used: $\sigma = 0.9$ mho/m, $\varepsilon_r = 42.9$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

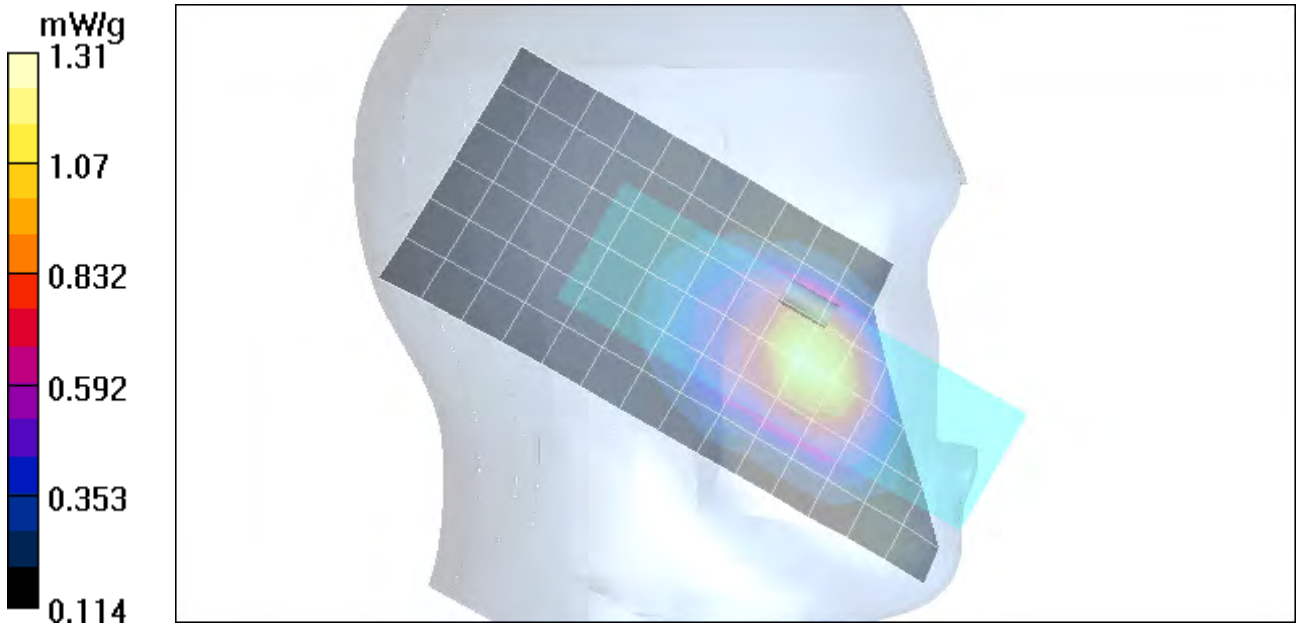
- Probe: ES3DV3 - SN3037; ConvF(6.11, 6.11, 6.11); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sugar Water SAM; Type: SAM; Serial: TP-1153;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.25 mW/g

## Left Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 35.2 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.79 W/kg
**SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.819 mW/g**
Maximum value of SAR (measured) = 1.31 mW/g



Date/Time: 7/5/2005 2:56:59 PM

# Test Laboratory: Motorola

**1900 RH Tilt ch661**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED**

## Battery Model #: SNN5744A DEVICE POSITION: ROTATED 15*

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8
Medium: Regular Glycol Head; Medium parameters used: $\sigma$ = 1.45 mho/m, $\varepsilon_r$ = 39.9; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

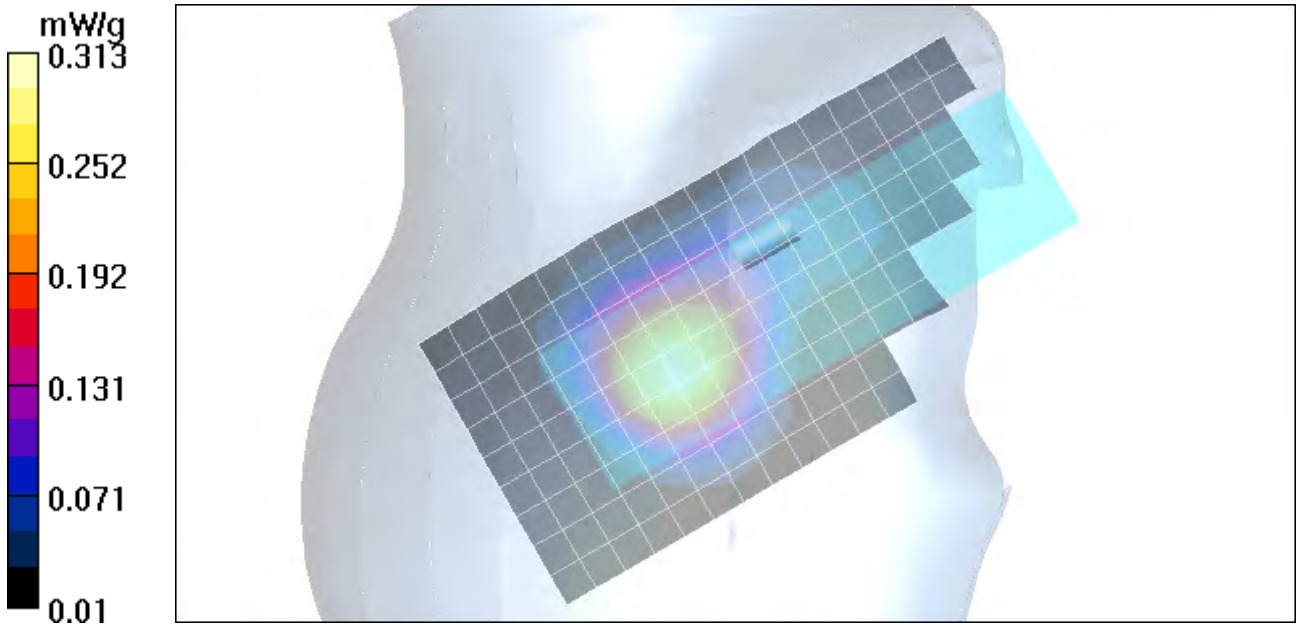
- Probe: ES3DV3 - SN3037; ConvF(5.16, 5.16, 5.16); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Glycol SAM; Type: SAM; Serial: TP-1159;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.310 mW/g

## Right Head Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.4 V/m; Power Drift = -0.163 dB
Peak SAR (extrapolated) = 0.419 W/kg
**SAR(1 g) = 0.290 mW/g; SAR(10 g) = 0.182 mW/g**
Maximum value of SAR (measured) = 0.313 mW/g



# Appendix 3

## SAR distribution plots for Body Worn Configuration

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# Test Laboratory: Motorola

**1900 BW Front ch661**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED Battery Model # SNN5744A Accessory Model # = FRONT OF PHONE 15mm FROM PHANTOM**

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8
Medium: Regular Glycol Body; Medium parameters used: $\sigma$ = 1.58 mho/m, $\varepsilon_r$ = 51.4; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

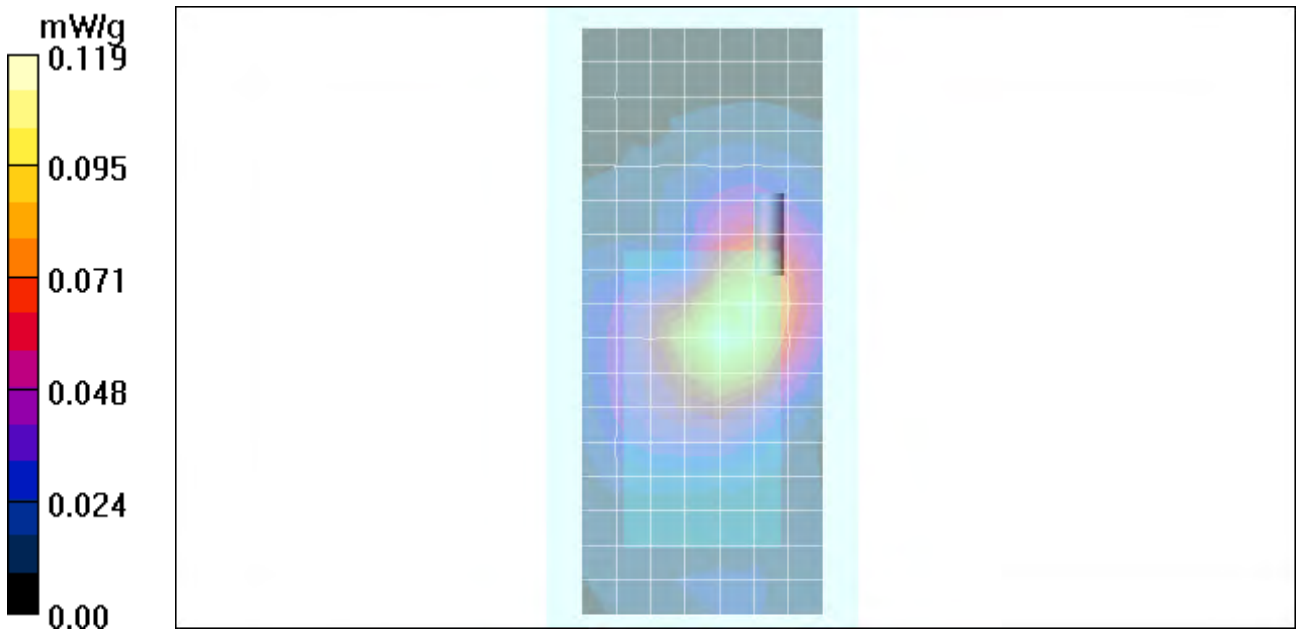
- Probe: ES3DV3 - SN3037; ConvF(4.71, 4.71, 4.71); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

## Amy Twin Phone Template/Area Scan - Normal Body (10mm) (19x10x1):

Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.115 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.15 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 0.163 W/kg
**SAR(1 g) = 0.108 mW/g; SAR(10 g) = 0.065 mW/g**
Maximum value of SAR (measured) = 0.119 mW/g



Date/Time: 7/6/2005 9:18:34 PM

# Test Laboratory: Motorola

**1900 BW Edge back 25mm ch661**

Serial: 1

**Procedure Notes: Pwr Step: 2 ota Antenna Position: FIXED**

**Battery Model # SNN5744A Accessory Model # = BACK OF PHONE 25mm FROM PHANTOM**

Communication System: EDGE 1900 - Class 6; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:4
Medium: Regular Glycol Body; Medium parameters used: $\sigma$ = 1.58 mho/m, $\varepsilon_r$ = 51.4; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

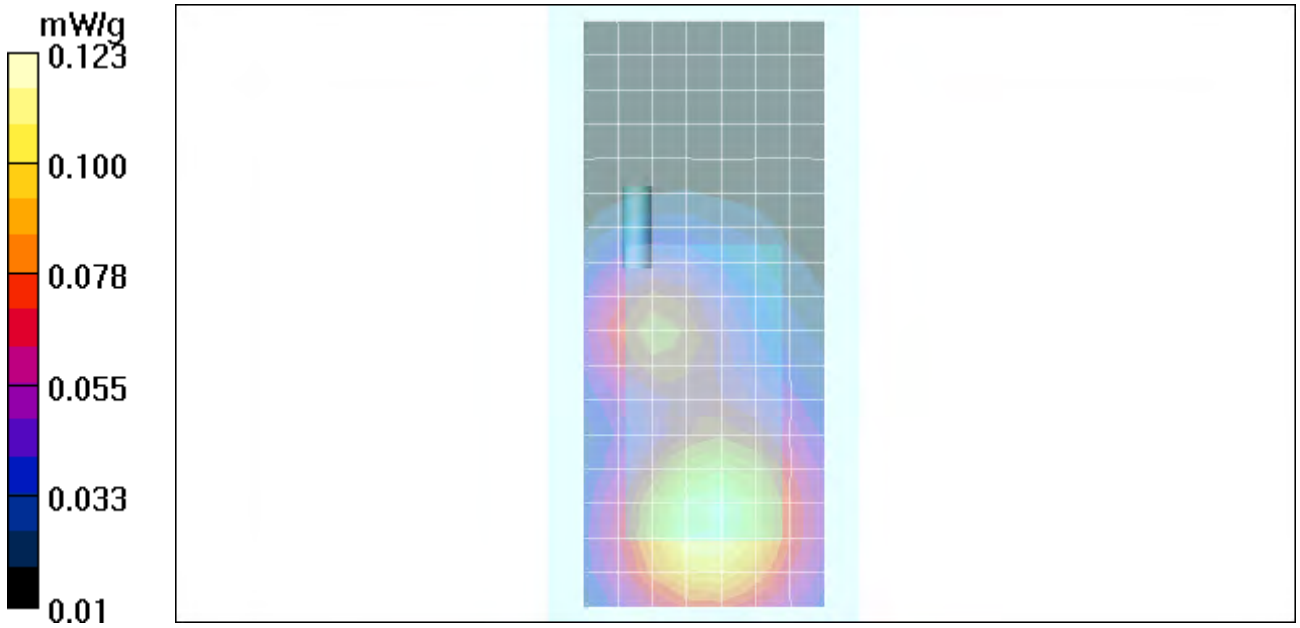
- Probe: ES3DV3 - SN3037; ConvF(4.71, 4.71, 4.71); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

## Amy Twin Phone Template/Area Scan - Normal Body (10mm) (19x10x1):

Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.118 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.18 V/m; Power Drift = -0.049 dB
Peak SAR (extrapolated) = 0.161 W/kg
**SAR(1 g) = 0.114 mW/g; SAR(10 g) = 0.075 mW/g**
Maximum value of SAR (measured) = 0.123 mW/g



Date/Time: 7/6/2005 5:33:22 PM

# Test Laboratory: Motorola **1900 BW Back ch661**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED Battery Model # SNN5744A**

## Accessory Model # = BACK OF PHONE 15mm FROM PHANTOM

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8
Medium: Regular Glycol Body; Medium parameters used: $\sigma$ = 1.58 mho/m, $\varepsilon_r$ = 51.4; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

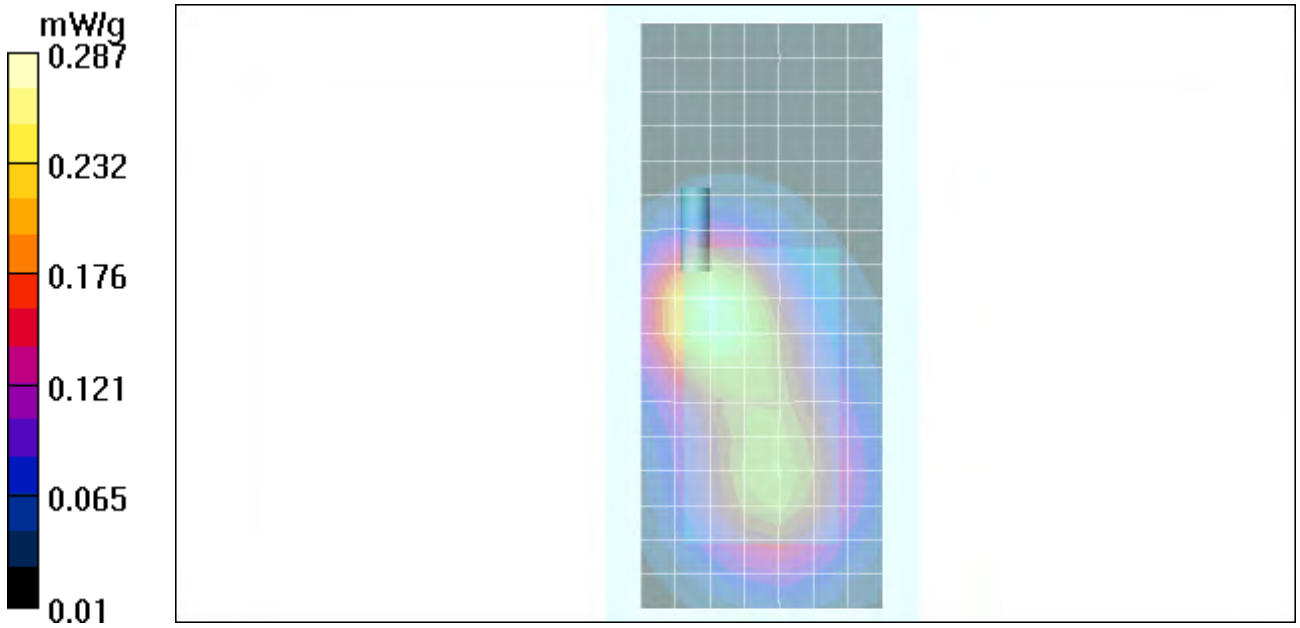
- Probe: ES3DV3 - SN3037; ConvF(4.71, 4.71, 4.71); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

## Amy Twin Phone Template/Area Scan - Normal Body (10mm) (19x10x1):

Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.276 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.0 V/m; Power Drift = -0.075 dB
Peak SAR (extrapolated) = 0.408 W/kg
**SAR(1 g) = 0.262 mW/g; SAR(10 g) = 0.159 mW/g**
Maximum value of SAR (measured) = 0.287 mW/g



Date/Time: 7/6/2005 10:03:40 PM

# Test Laboratory: Motorola **1900 BW back 15mm batt SNN5766A ch661**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED**

## Battery Model # SNN5766A Accessory Model # = BACK OF PHONE 15mm FROM PHANTOM

Communication System: GSM 1900; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:8
Medium: Regular Glycol Body; Medium parameters used: $\sigma$ = 1.58 mho/m, $\varepsilon_r$ = 51.4; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

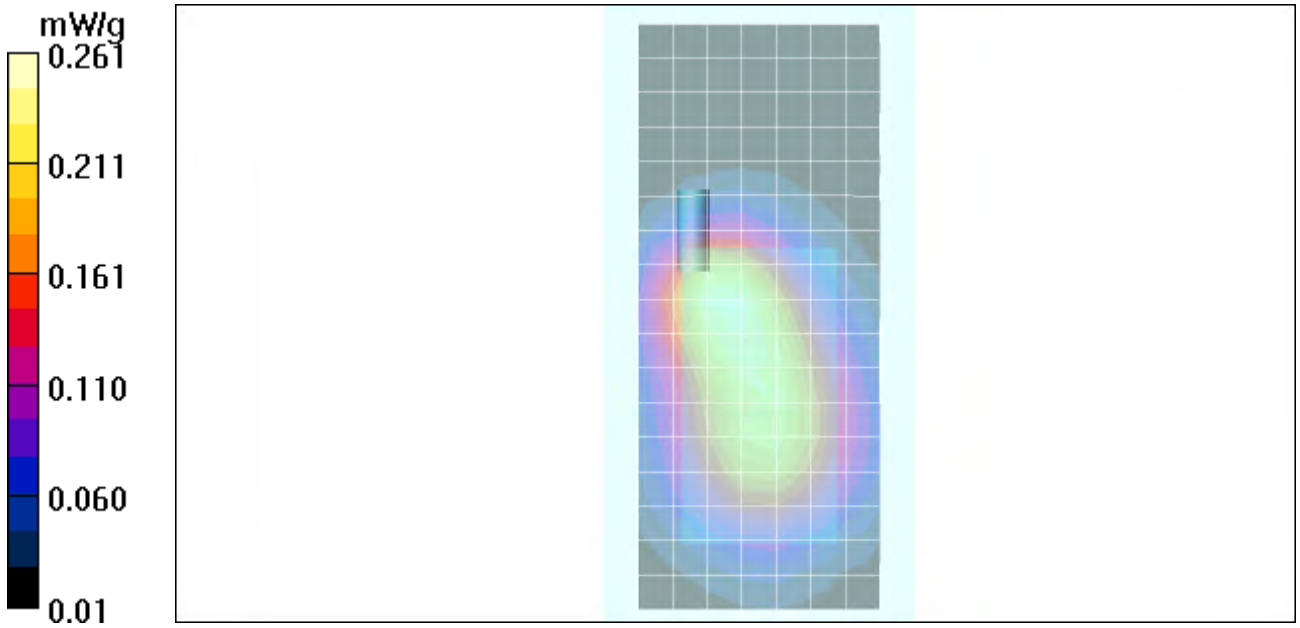
- Probe: ES3DV3 - SN3037; ConvF(4.71, 4.71, 4.71); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

## Amy Twin Phone Template/Area Scan - Normal Body (10mm) (19x10x1):

Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.249 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.5 V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 0.367 W/kg
**SAR(1 g) = 0.239 mW/g; SAR(10 g) = 0.150 mW/g**
Maximum value of SAR (measured) = 0.261 mW/g



Date/Time: 7/4/2005 1:14:19 AM

# Test Laboratory: Motorola

**850 BW GPRS 25mm Back ch190**

Serial: 1

**Procedure Notes: Pwr Step: 5/5 Antenna Position: internal**

**Battery Model #: snn5744a Accessory Model # = Back GPRS Class10 25 mm Away from Phantom**

Communication System: GPRS 850 - Class 10; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:4
Medium: Low Freq Body; Medium parameters used: $\sigma = 0.96$ mho/m, $\varepsilon_r = 53.8$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

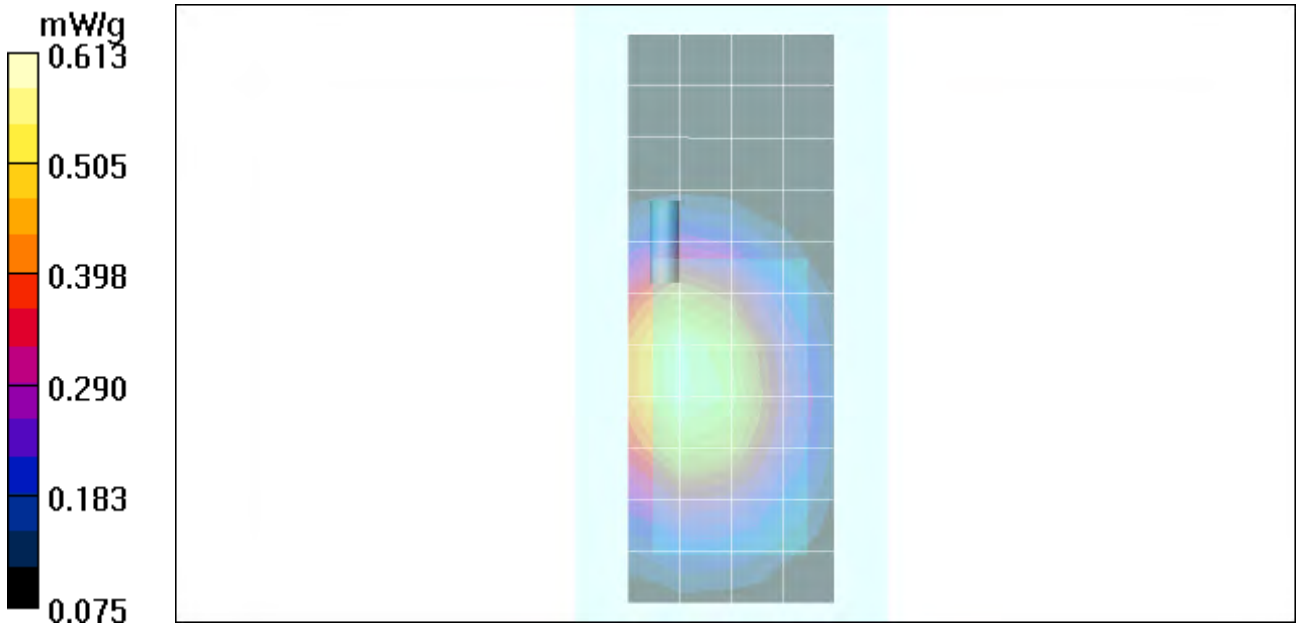
- Probe: ES3DV3 - SN3037; ConvF(6, 6, 6); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.2, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.596 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.9 V/m; Power Drift = -0.067 dB
Peak SAR (extrapolated) = 0.810 W/kg
**SAR(1 g) = 0.579 mW/g; SAR(10 g) = 0.419 mW/g**
Maximum value of SAR (measured) = 0.613 mW/g



Date/Time: 7/4/2005 1:38:09 AM

# Test Laboratory: Motorola

**850 BW GPRS back 25mm batt SNN5766A ch190**

Serial: 1

**Procedure Notes: Pwr Step: 5/5 Antenna Position: internal**

### Battery Model #: snn5766a Accessory Model # = Back GPRS Class10 25 mm Away from Phantom

Communication System: GPRS 850 - Class 10; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:4
Medium: Low Freq Body; Medium parameters used: $\sigma = 0.96$ mho/m, $\varepsilon_r = 53.8$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

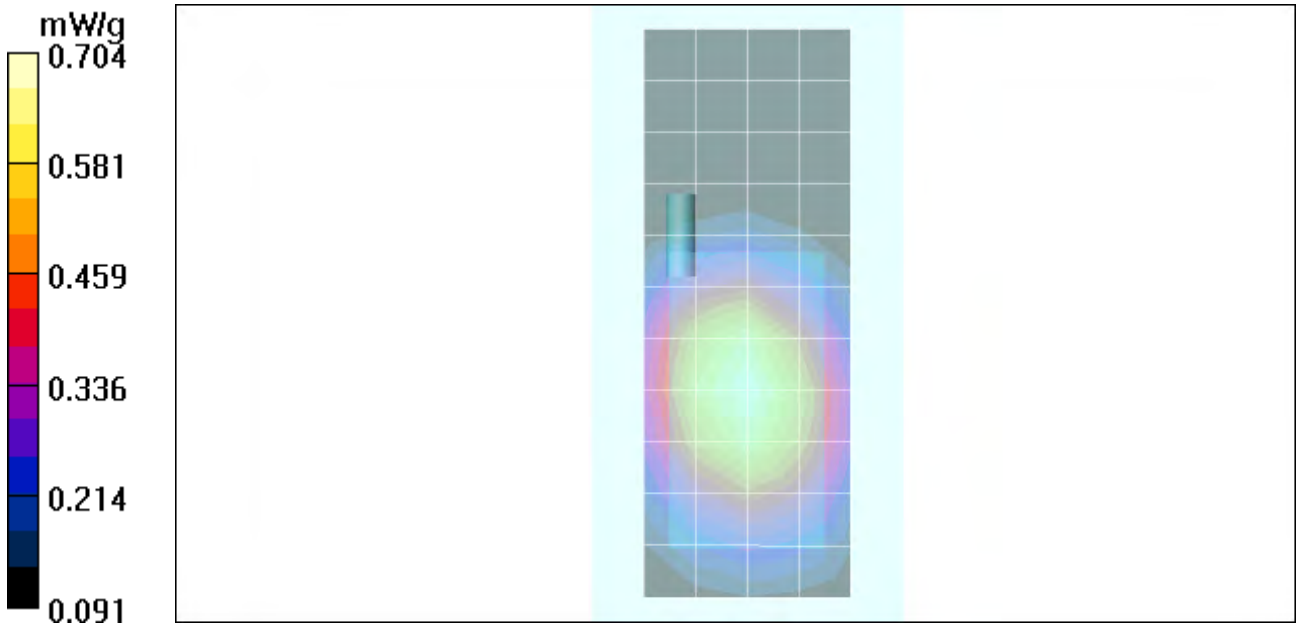
- Probe: ES3DV3 - SN3037; ConvF(6, 6, 6); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.2, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.708 mW/g

### Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 26.7 V/m; Power Drift = -0.024 dB
Peak SAR (extrapolated) = 0.893 W/kg
**SAR(1 g) = 0.666 mW/g; SAR(10 g) = 0.481 mW/g**
Maximum value of SAR (measured) = 0.704 mW/g



Date/Time: 7/4/2005 12:30:57 AM

# Test Laboratory: Motorola

**850 BW front ch190**

Serial: 1

**Procedure Notes: Pwr Step: 5 Antenna Position: int Battery Model #: snn5744a**

**DEVICE POSITION cheek Accessory Model # = Bodyworn Front of Phone 15mm Away from Phantom**

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8
Medium: Low Freq Body; Medium parameters used: $\sigma = 0.96$ mho/m, $\varepsilon_r = 53.8$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

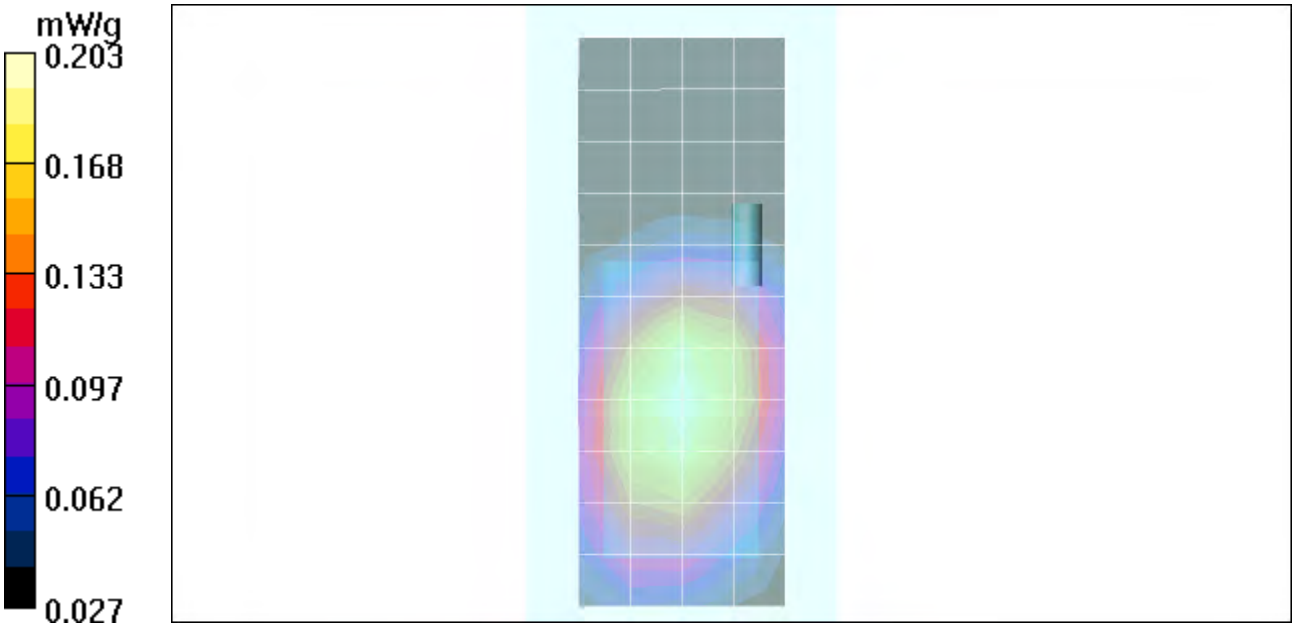
- Probe: ES3DV3 - SN3037; ConvF(6, 6, 6); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.2, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.205 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.5 V/m; Power Drift = -0.038 dB
Peak SAR (extrapolated) = 0.250 W/kg
**SAR(1 g) = 0.192 mW/g; SAR(10 g) = 0.140 mW/g**
Maximum value of SAR (measured) = 0.203 mW/g



Date/Time: 7/4/2005 3:51:39 AM

# Test Laboratory: Motorola

**850 BW EDGE back 25mm ch190**

Serial: 1

**Procedure Notes: Pwr Step: burst1and2=8 ota Antenna Position: FIXED**

**Battery Model # SNN5744A Accessory Model # = back 25mm**

Communication System: EDGE 850 - Class 6; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:4
Medium: Low Freq Body; Medium parameters used: $\sigma = 0.96$ mho/m, $\varepsilon_r = 53.8$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

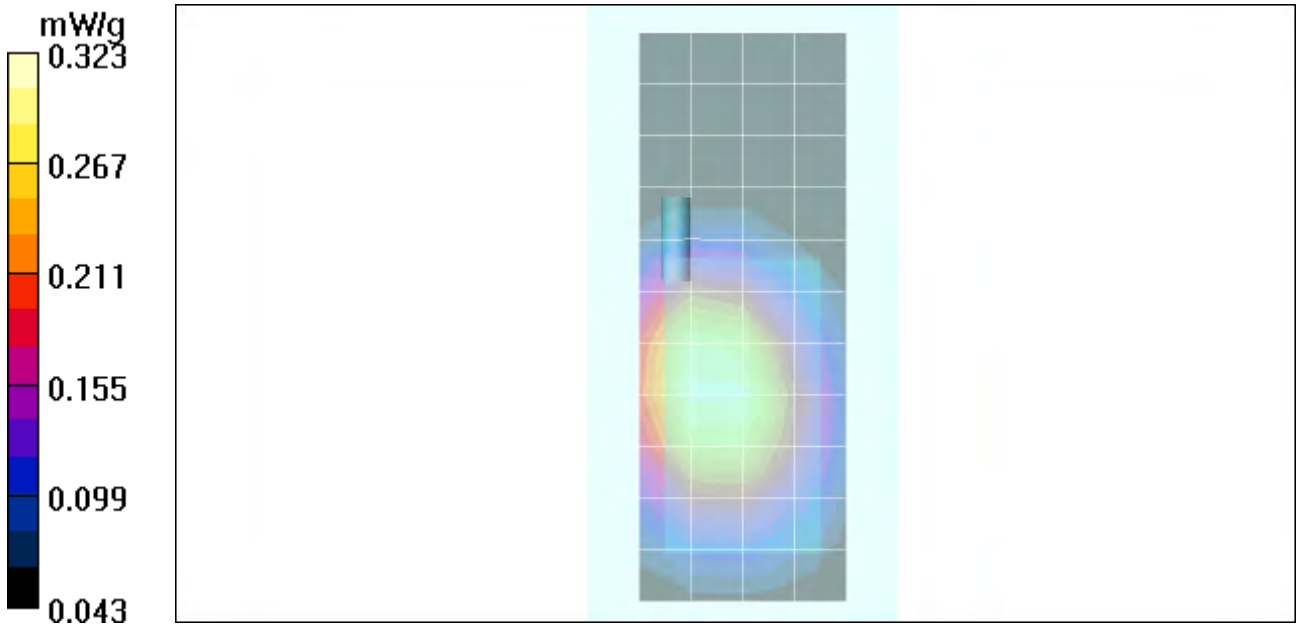
- Probe: ES3DV3 - SN3037; ConvF(6, 6, 6); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.2, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.311 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.6 V/m; Power Drift = -0.077 dB
Peak SAR (extrapolated) = 0.400 W/kg
**SAR(1 g) = 0.307 mW/g; SAR(10 g) = 0.224 mW/g**
Maximum value of SAR (measured) = 0.323 mW/g



Date/Time: 7/4/2005 12:50:49 AM

# Test Laboratory: Motorola

**850 BW Back ch190**

Serial: 1

**Procedure Notes: Pwr Step: 5 Antenna Position: int Battery Model #: snn5744a**

**DEVICE POSITION cheek Accessory Model # = Bodyworn Back of Phone 15mm Away from Phantom**

Communication System: GSM 850; Frequency: 836.6 MHz; Channel Number: 190; Duty Cycle: 1:8
Medium: Low Freq Body; Medium parameters used: $\sigma = 0.96$ mho/m, $\varepsilon_r = 53.8$; $\rho = 1000$ kg/m$^3$

DASY4 Configuration:

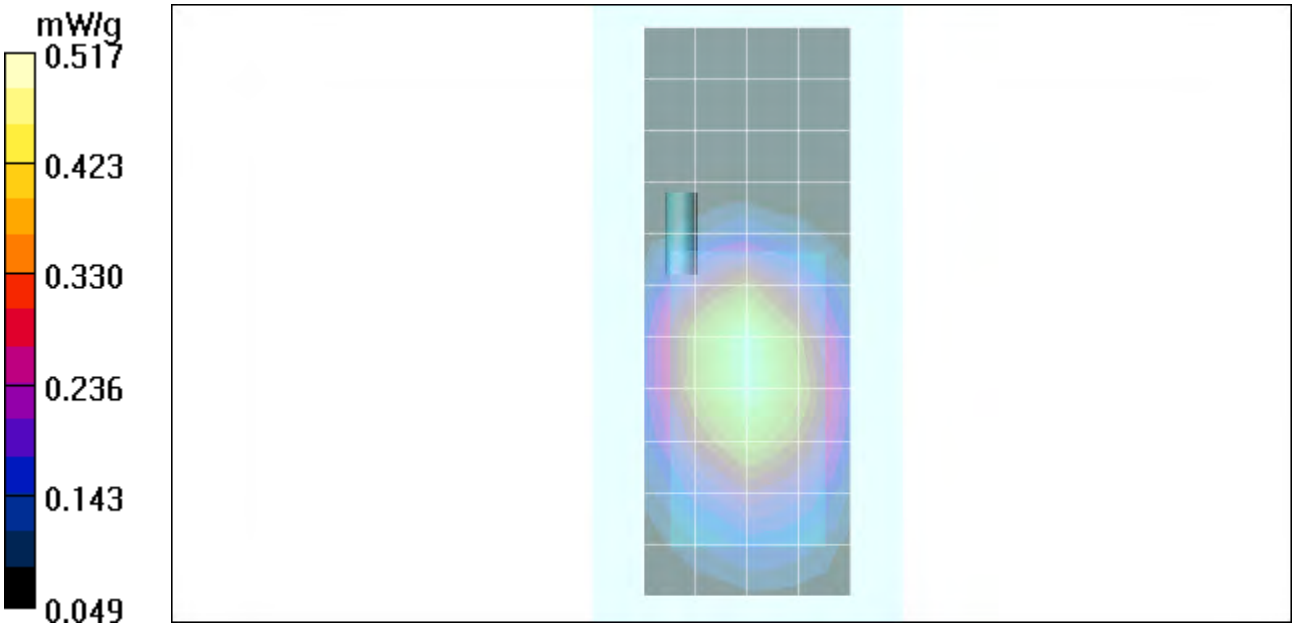
- Probe: ES3DV3 - SN3037; ConvF(6, 6, 6); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.2, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

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

Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.505 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.1 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.657 W/kg
**SAR(1 g) = 0.486 mW/g; SAR(10 g) = 0.342 mW/g**
Maximum value of SAR (measured) = 0.517 mW/g



Date/Time: 7/6/2005 6:59:22 PM

# Test Laboratory: Motorola

**1900 BW GPRS back 25mm ch661**

Serial: 1

**Procedure Notes: Pwr Step: 0 ota Antenna Position: FIXED**

## Battery Model # SNN5744A Accessory Model # = BACK OF PHONE 25mm FROM PHANTOM

Communication System: GPRS 1900 - Class 10; Frequency: 1880 MHz; Channel Number: 661; Duty Cycle: 1:4
Medium: Regular Glycol Body; Medium parameters used: $\sigma$ = 1.58 mho/m, $\varepsilon_r$ = 51.4; $\rho$ = 1000 kg/m$^3$

DASY4 Configuration:

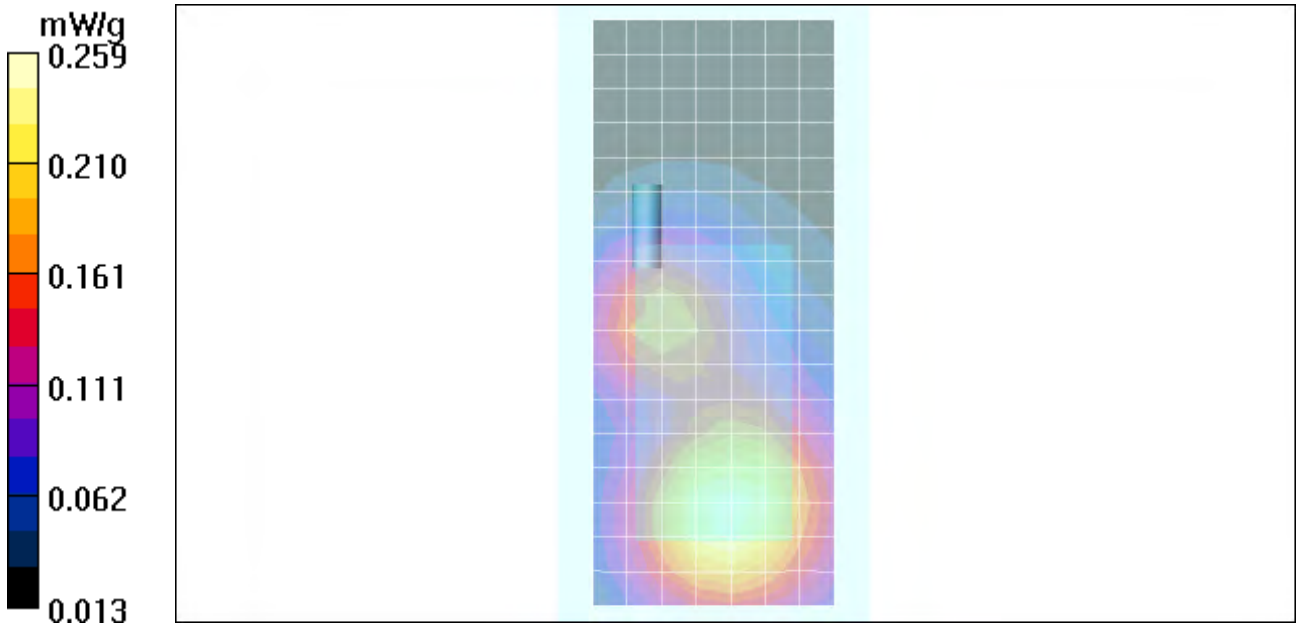
- Probe: ES3DV3 - SN3037; ConvF(4.71, 4.71, 4.71); Calibrated: 11/25/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn376; Calibrated: 1/13/2005
- Phantom: R3: Sect.1, Amy Twin; Type: Amy Twin Flat; Serial: n/a;
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 147

## Amy Twin Phone Template/Area Scan - Normal Body (10mm) (19x10x1):

Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.260 mW/g

## Amy Twin Phone Template/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.2 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.341 W/kg
**SAR(1 g) = 0.243 mW/g; SAR(10 g) = 0.160 mW/g**
Maximum value of SAR (measured) = 0.259 mW/g



# Appendix 4

## Probe Calibration Certificate

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
**Zeughausstrasse 43, 8004 Zurich, Switzerland**

**S** Schweizerischer Kalibrierdienst
**C** Service suisse d'étalonnage
Servizio svizzero di taratura
**S** Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

**Client** Motorola PCS

Certificate No: ES3-3037_Nov04

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | ES3DV3 - SN:3037 |
| Calibration procedure(s) | QA CAL-01.v5<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | November 25, 2004 |
| Condition of the calibrated item | In Tolerance |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 5-May-04 (METAS, No. 251-00388) | May-05 |
| Power sensor E4412A | MY41495277 | 5-May-04 (METAS, No. 251-00388) | May-05 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 10-Aug-04 (METAS, No. 251-00403) | Aug-05 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 3-May-04 (METAS, No. 251-00389) | May-05 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 10-Aug-04 (METAS, No. 251-00404) | Aug-05 |
| Reference Probe ES3DV2 | SN: 3013 | 8-Jan-04 (SPEAG, No. ES3-3013_Jan04) | Jan-05 |
| DAE4 | SN: 617 | 29-Sep-04 (SPEAG, No. DAE4-617_Sep04) | Sep-05 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092180 | 18-Sep-02 (SPEAG, in house check Oct-03) | In house check: Oct 05 |
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (SPEAG, in house check Dec-03) | In house check: Dec-05 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (SPEAG, in house check Nov-03) | In house check: Nov 04 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Nico Vetterli | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: November 26, 2004

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

## Glossary:

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConF | sensitivity in TSL / NORMx,y,z |
| 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:

a) 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
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

## Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the $E^2$-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * 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*.
- *DCPx,y,z:* 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 *NORMx,y,z * 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 ± 50 MHz to ± 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: | October 10, 2003 |
| Recalibrated: | November 25, 2004 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

# DASY - Parameters of Probe: ES3DV3 SN:3037

## Sensitivity in Free Space[A]

| | | | | |
|---|---|---|---|---|
| NormX | **1.15** ± 10.1% | $\mu V/(V/m)^2$ | DCP X | **99** mV |
| NormY | **0.84** ± 10.1% | $\mu V/(V/m)^2$ | DCP Y | **99** mV |
| NormZ | **0.94** ± 10.1% | $\mu V/(V/m)^2$ | DCP Z | **99** mV |

## Diode Compression[B]

## Sensitivity in Tissue Simulating Liquid (Conversion Factors)

**Please see Page 8.**

## Boundary Effect

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

| Sensor Center to Phantom Surface Distance | | **3.0 mm** | **4.0 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 5.8 | 2.5 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.0 | 0.1 |

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

| Sensor Center to Phantom Surface Distance | | **3.0 mm** | **4.0 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 7.7 | 4.5 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.1 | 0.3 |

## Sensor Offset

Probe Tip to Sensor Center **2.0** mm

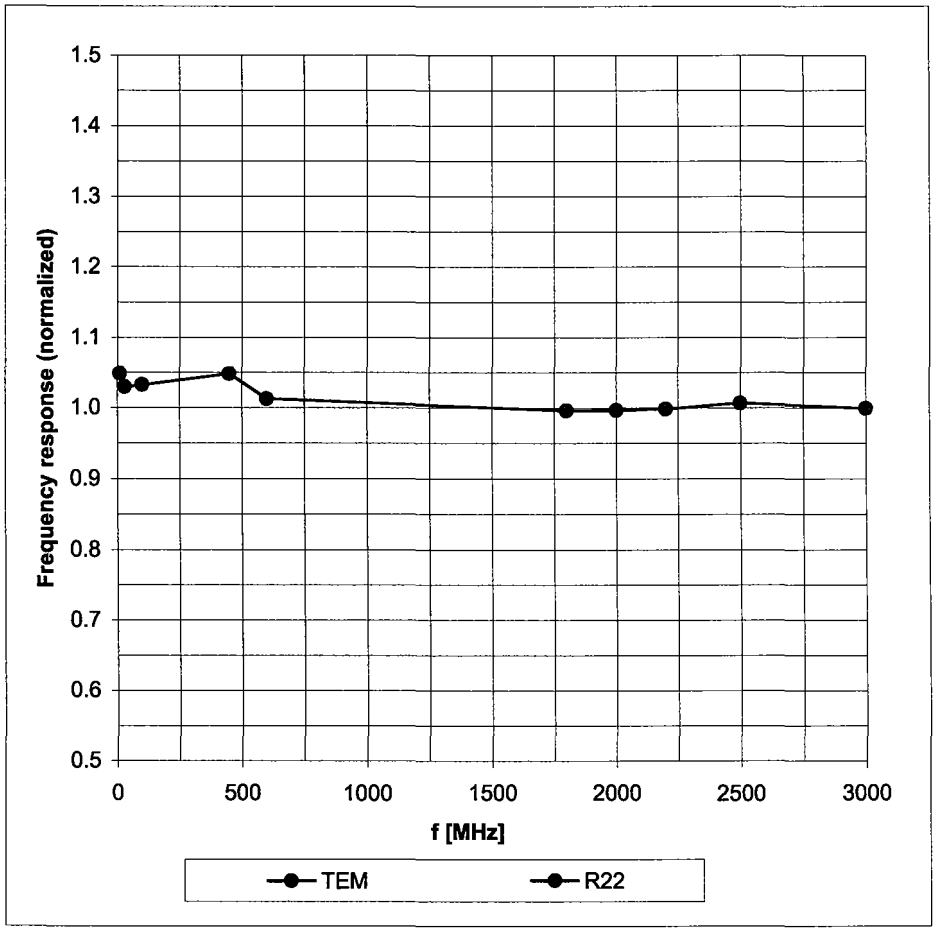
**The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.**

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

[B] Numerical linearization parameter: uncertainty not required.

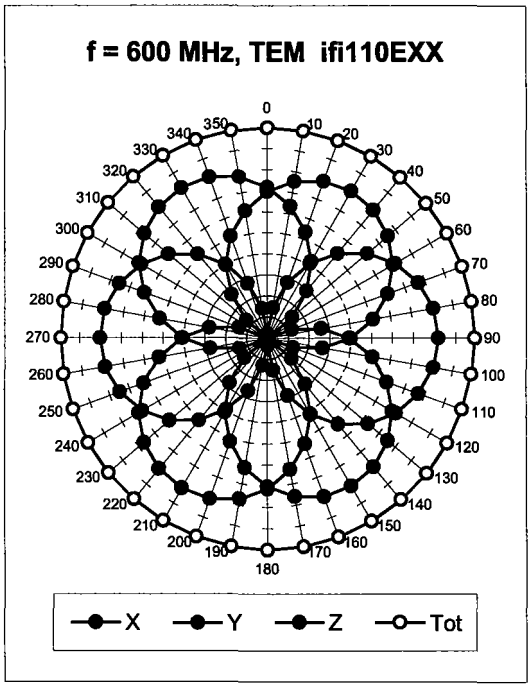
# Frequency Response of E-Field

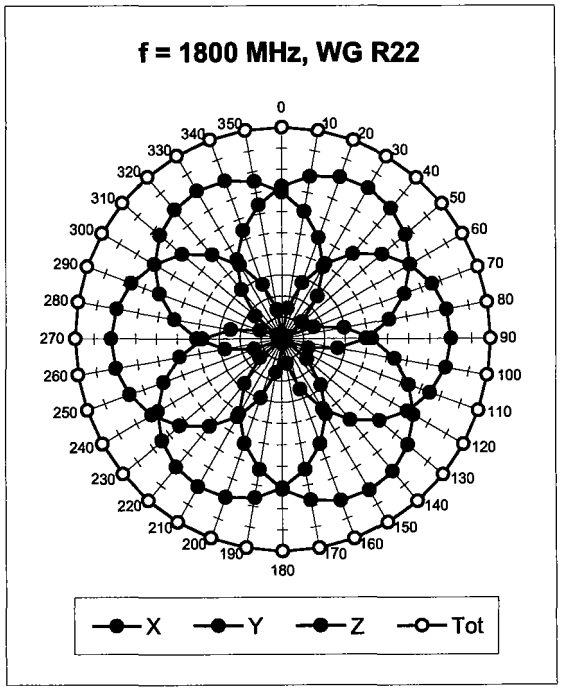
**(TEM-Cell:ifi110 EXX, Waveguide: R22)**

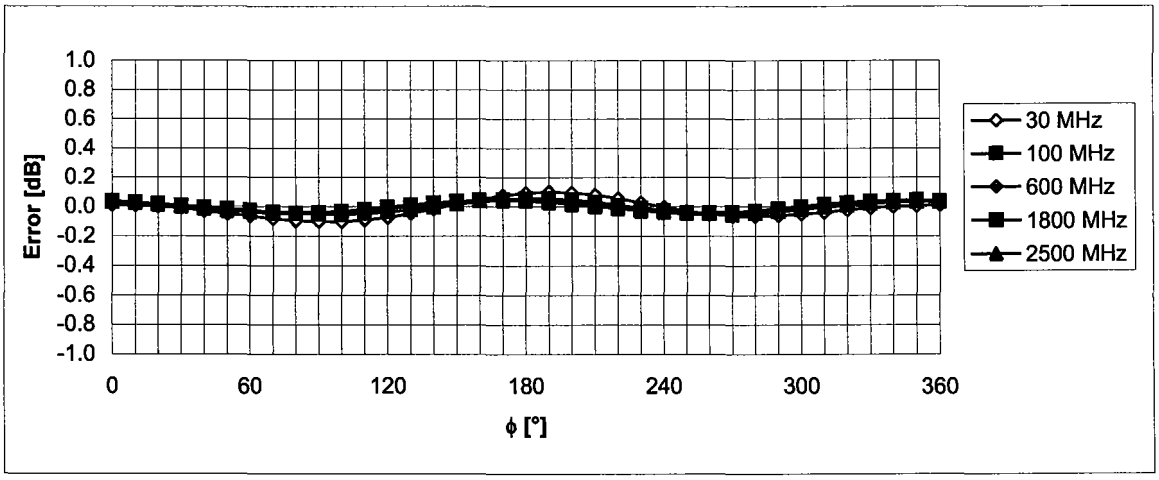



**Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)**

# Receiving Pattern (ϕ), ϑ = 0°



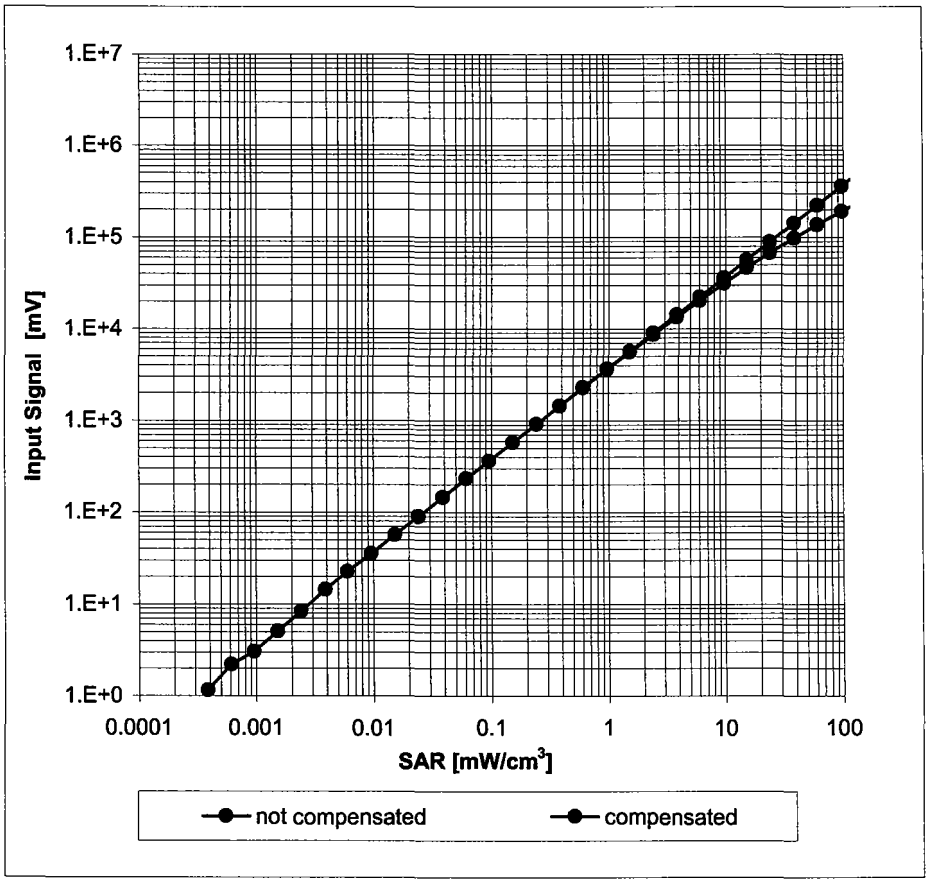



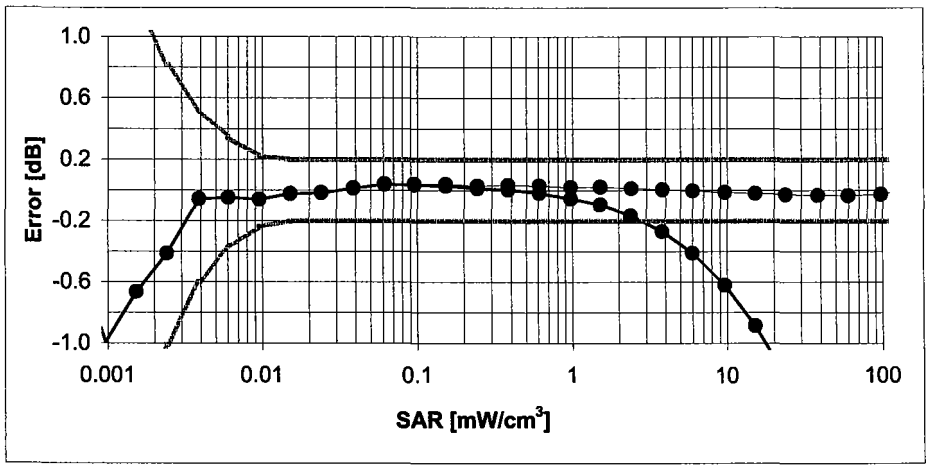




**Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)**

# Dynamic Range f($SAR_{head}$)

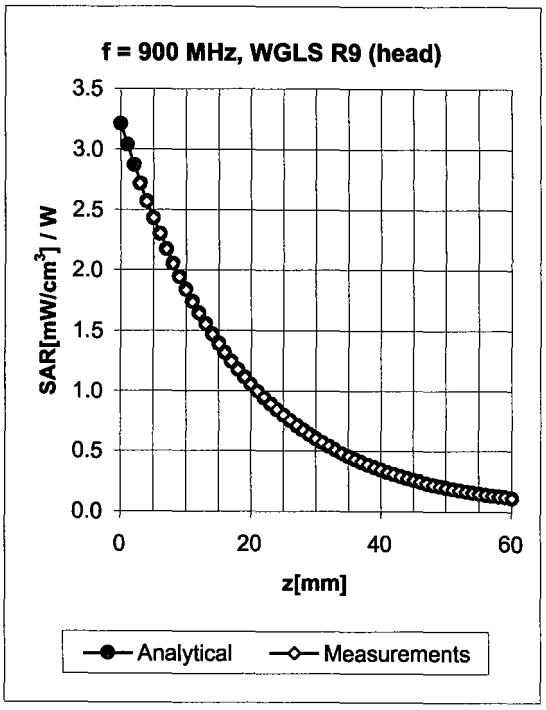
**(Waveguide R22, f = 1800 MHz)**

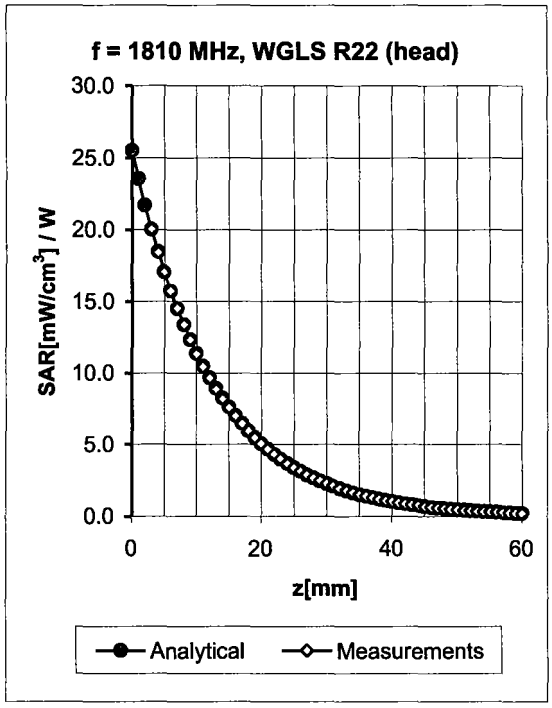



**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

# Conversion Factor Assessment



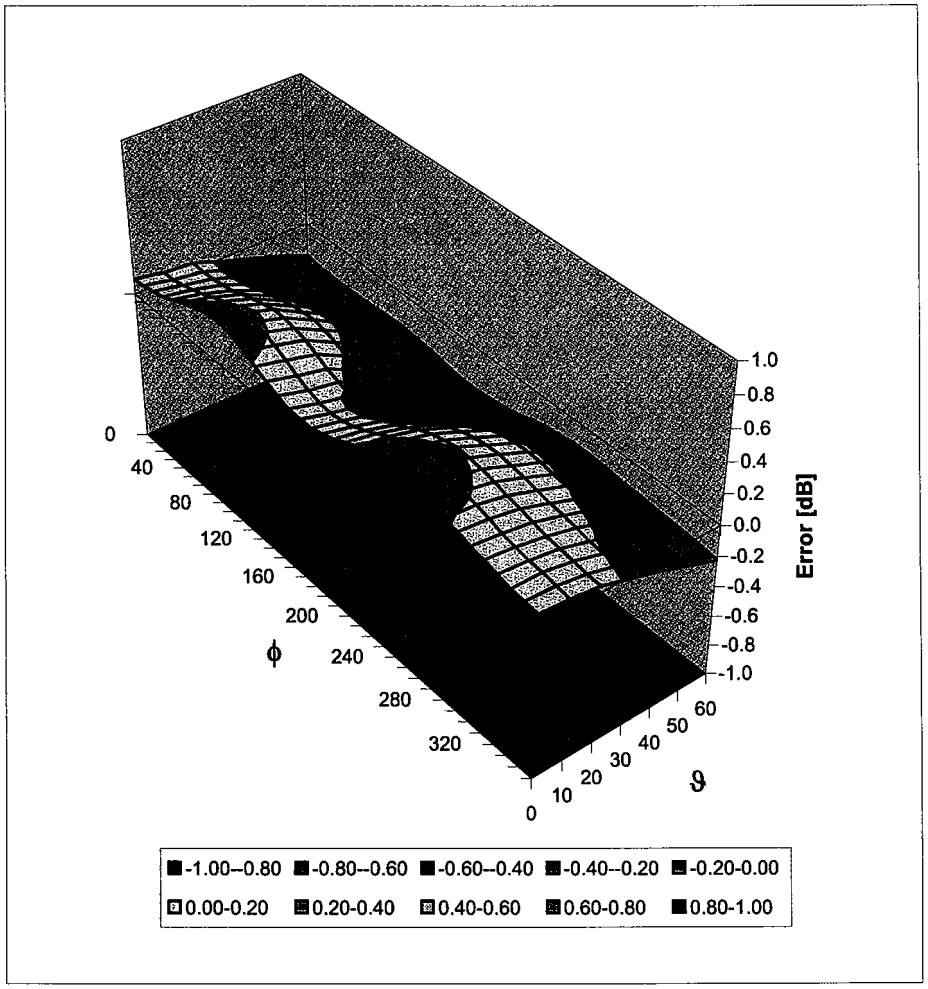




| f [MHz] | Validity [MHz][C] | TSL | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty |
|---|---|---|---|---|---|---|---|
| 900 | ± 50 / ± 100 | Head | 41.5 ± 5% | 0.97 ± 5% | 0.56 | 1.29 | 6.11 ± 11.0% (k=2) |
| 1810 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.25 | 2.34 | 5.16 ± 11.0% (k=2) |
| 1950 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.28 | 2.26 | 4.77 ± 11.0% (k=2) |
| | | | | | | | |
| 900 | ± 50 / ± 100 | Body | 55.0 ± 5% | 1.05 ± 5% | 0.66 | 1.23 | 6.00 ± 11.0% (k=2) |
| 1810 | ± 50 / ± 100 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.23 | 3.26 | 4.71 ± 11.0% (k=2) |
| 1950 | ± 50 / ± 100 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.32 | 2.16 | 4.56 ± 11.0% (k=2) |

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

# Deviation from Isotropy in HSL

**Error (ϕ, ϑ), f = 900 MHz**




**Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)**

# Appendix 5

## Measurement Uncertainty Budget

# Uncertainty Budget for Device Under Test: 30 – 3000 MHz

| *a* | *b* | *c* | *d* | *e = f(d,k)* | *f* | *g* | *h = c x f / e* | *i = c x g / e* | *k* |
|---|---|---|---|---|---|---|---|---|---|
| **Uncertainty Component** | **IEEE 1528 section** | **Tol. (± %)** | **Prob Dist** | **Div.** | **$c_i$ (1 g)** | **$c_i$ (10 g)** | **1 g $u_i$ (±%)** | **10 g $u_i$ (±%)** | **$v_i$** |
| **Measurement System** | | | | | | | | | |
| 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 | ∞ |
| **Test sample Related** | | | | | | | | | |
| 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 | ∞ |
| **Phantom and Tissue Parameters** | | | | | | | | | |
| 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 | ∞ |
| **Combined Standard Uncertainty** | | | RSS | | | | 11.1 | 10.8 | 411 |
| **Expanded Uncertainty** (95% CONFIDENCE LEVEL) | | | *k*=2 | | | | 22.2 | 21.6 | |

## Uncertainty Budget for System Check: 30 – 3000 MHz

| *a* | *b* | *c* | *d* | *e = f(d,k)* | *f* | *g* | *h = c x f / e* | *i = c x g / e* | *k* |
|---|---|---|---|---|---|---|---|---|---|
| **Uncertainty Component** | **IEEE 1528 section** | **Tol. (± %)** | **Prob. Dist.** | **Div.** | **$c_i$ (1 g)** | **$c_i$ (10 g)** | **1 g $u_i$ (±%)** | **10 g $u_i$ (±%)** | **$v_i$** |
| **Measurement System** | | | | | | | | | |
| 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 | 1 | 1 | 2.7 | 2.7 | ∞ |
| Spherical Isotropy | E.2.2 | 9.6 | R | 1.73 | 0 | 0 | 0.0 | 0.0 | ∞ |
| 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 | 0.0 | R | 1.73 | 1 | 1 | 0.0 | 0.0 | ∞ |
| 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 Mechanical 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 | ∞ |
| **Dipole** | | | | | | | | | |
| Dipole Axis to Liquid Distance | 8, E.4.2 | 2.0 | R | 1.73 | 1 | 1 | 1.2 | 1.2 | ∞ |
| Input Power and SAR Drift Measurement | 8, 6.6.2 | 5.0 | R | 1.73 | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and Tissue Parameters** | | | | | | | | | |
| 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 | R | 1.73 | 0.64 | 0.43 | 1.2 | 0.8 | ∞ |
| 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 | R | 1.73 | 0.6 | 0.49 | 0.6 | 0.5 | ∞ |
| **Combined Standard Uncertainty** | | | RSS | | | | 9.0 | 8.8 | 99999 |
| **Expanded Uncertainty** | | | *k*=2 | | | | 17.7 | 17.3 | |

# Appendix 6

## Photographs of the device under test

**Figure 1. Front of Phone**

**Figure 2. Back of Phone**

**Figure 3. Phone Open**

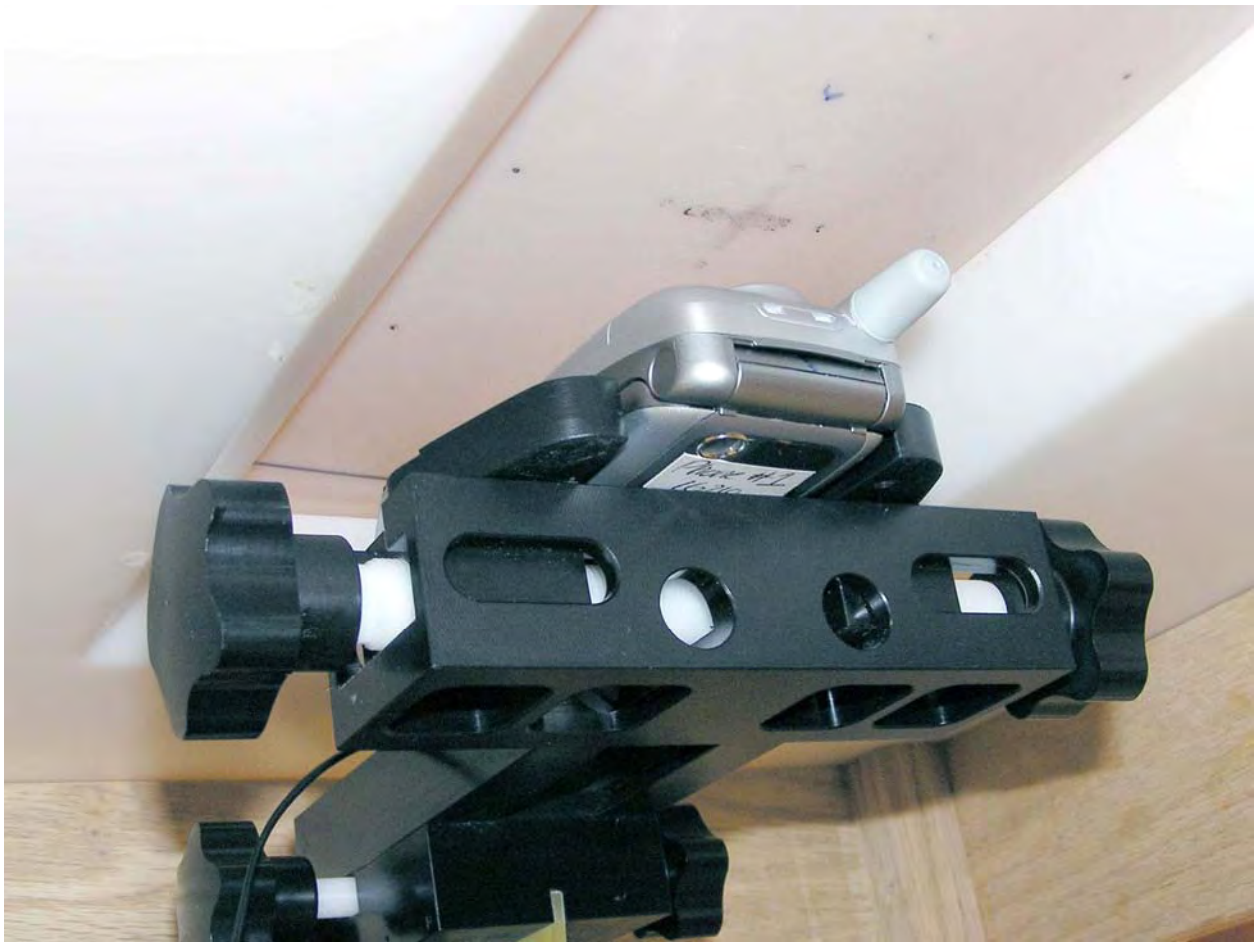


**Figure 4. Phone Against the Flat Phantom**

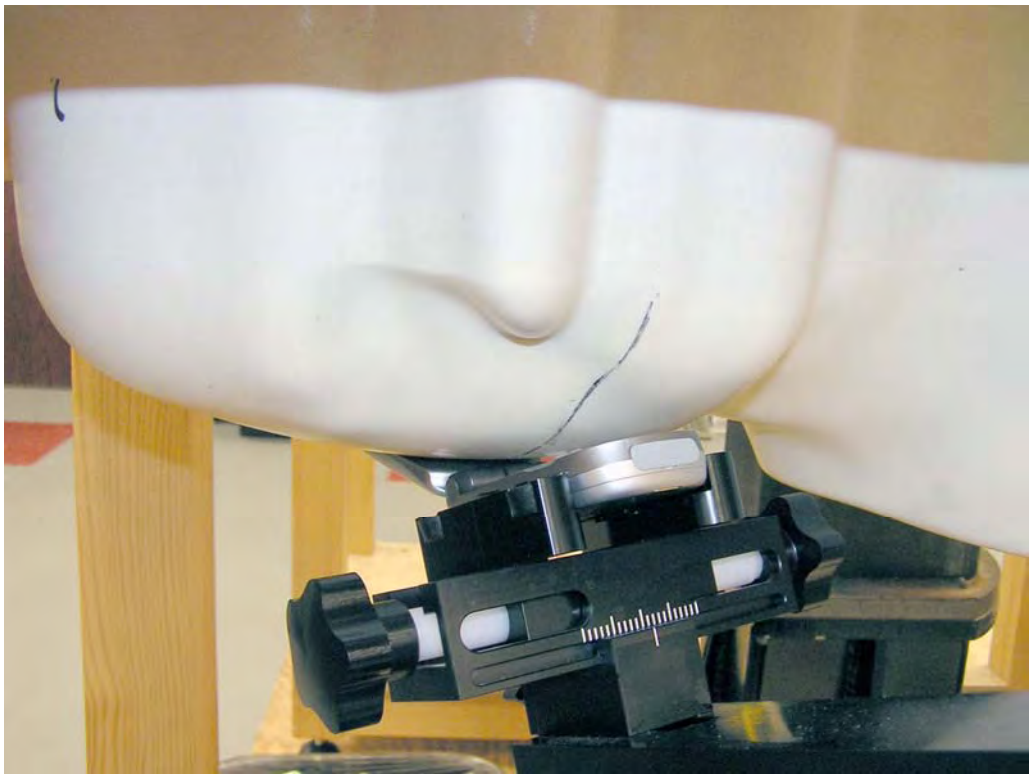


**Figure 5. Phone Against the Head Phantom (Front View - Cheek Touch)**

**Figure 6. Phone Against the Head Phantom (Back View – Cheek Touch)**

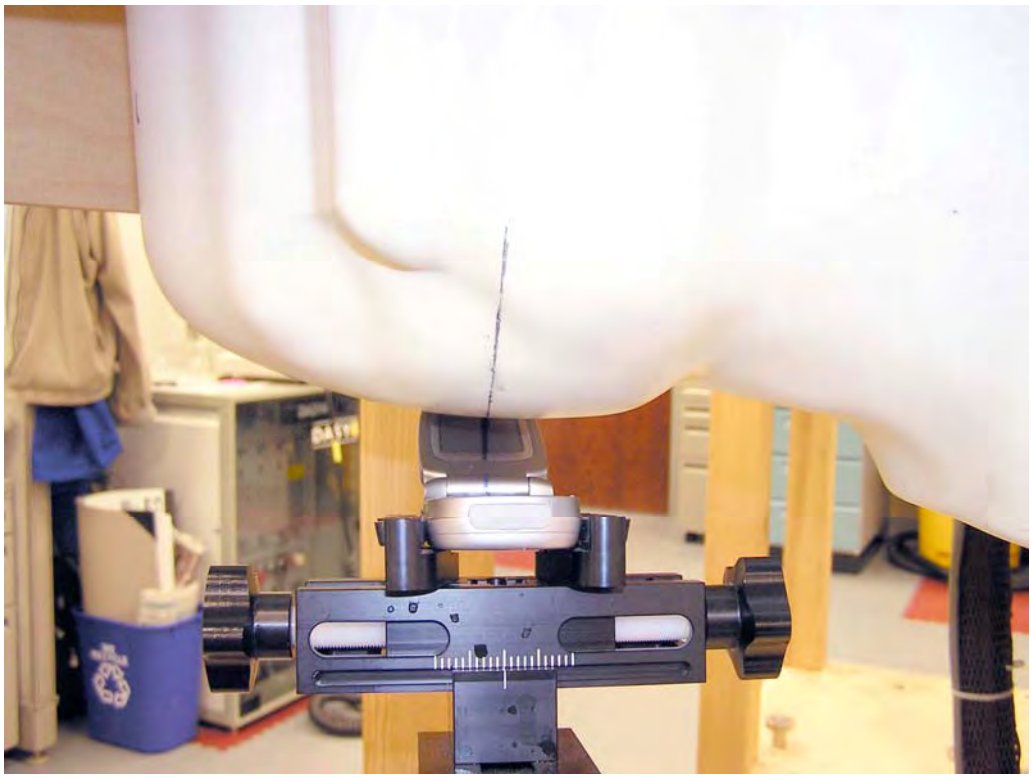


**Figure 7. Phone Against the Head Phantom (Front View – 15°Tilt)**

**Figure 8. Phone Against the Head Phantom (Back View – 15°Tilt)**