



## Exhibit 11: SAR Class II Permissive Change SAR Test Report - IHDT56AS1

**Date of test:** 01/14/2003 – 01/17/2003  
**Date of Report:** 01/23/2003

**Laboratory:** Motorola Personal Communications Sector Product Safety & Compliance Laboratory  
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**Accreditation:** This laboratory is accredited to ISO/IEC 17025-1999 to perform the following electromagnetic exposure tests:  
 System Validation & Interlaboratory Comparison  
 Simulated Tissue Specifications and Procedure  
 EME Cellular Phone Testing Procedure



On the following 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 IHDT56AS1 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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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**

|                                                          |   |
|----------------------------------------------------------|---|
| 1) Introduction                                          | 3 |
| 2) Description of the Device Under Test                  | 3 |
| Antenna description                                      | 3 |
| Device description                                       | 3 |
| 3) Test Equipment                                        | 3 |
| 3.1 Dosimetric system                                    | 3 |
| 3.2 Additional equipment used                            | 4 |
| 4) Electrical parameters of the tissue simulating liquid | 4 |
| 5) System Accuracy Verification                          | 4 |
| 6) Test Results                                          | 5 |
| 6.1 Head Adjacent Test Results                           | 6 |
| 6.2 Body-Worn Test Results                               | 8 |

**References:**

|                                                                              |    |
|------------------------------------------------------------------------------|----|
| Appendix 1: SAR distribution comparison for the system accuracy verification | 11 |
| Appendix 2: SAR distribution plots for Phantom Head Adjacent Use             | 12 |
| Appendix 3: SAR distribution plots for Body Worn Configuration               | 15 |
| Appendix 4. Probe Calibration Certificate                                    | 17 |
| Appendix 5. Dipole Characterization Certificate                              | 18 |
| Appendix 6: Measurement Uncertainty Budget                                   | 19 |
| Appendix 7. Photographs of the device under test                             | 22 |

## 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 IHDT56AS1). The Specific Absorption Rate (SAR) of this product was measured. The measurements have resulted in a higher SAR value than what was granted earlier dated May 24<sup>th</sup> 2001. The differences in measurement results have occurred due to cost reduction of parts in the portable cellular unit and also because the portable unit was tested in accordance with FCC OET Bulletin 65 Supplement C 01-01.

## 2. Description of the Device Under Test

### Antenna description

|                      |            |       |
|----------------------|------------|-------|
| <b>Type</b>          | Helix      |       |
| <b>Location</b>      | Right Side |       |
| <b>Dimensions</b>    | Length     | 25 mm |
|                      | Width      | 6 mm  |
| <b>Configuration</b> | Stubby     |       |

### Device description

|                                                               |                                   |                     |                      |
|---------------------------------------------------------------|-----------------------------------|---------------------|----------------------|
| <b>FCC ID Number</b>                                          | IHDT56AS1                         |                     |                      |
| <b>Serial number</b>                                          | 195651232003 & 295651232003       |                     |                      |
| <b>Mode(s) of Operation</b>                                   | 800 AMPS                          | 800 TDMA            | 1900 PCS             |
| <b>Modulation Mode(s)</b>                                     | AMPS                              | CDMA                | PCS                  |
| <b>Maximum Output Power Setting</b>                           | 27.10 dBm                         | 27.50 dBm           | 26.90 dBm            |
| <b>Duty Cycle</b>                                             | 1:1                               | 1:3                 | 1:3                  |
| <b>Transmitting Frequency Rang(s)</b>                         | 824.04 – 848.97 MHz               | 824.70 – 848.31 MHz | 1850.0 – 1909.95 MHz |
| <b>Production Unit or Identical Prototype (47 CFR §2.908)</b> | Identical Prototype               |                     |                      |
| <b>Device Category</b>                                        | Portable                          |                     |                      |
| <b>RF Exposure Limits</b>                                     | General Population / Uncontrolled |                     |                      |

## 3. Test Equipment Used

### 3.1 Dosimetric System

The Motorola Personal Communications Sector Product Safety & Compliance Laboratory utilizes a Dosimetric Assessment System (Dasy3™ v3.1d) manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The overall RSS uncertainty of the measurement system is  $\pm 11.7\%$  (K=1) with an expanded uncertainty of  $\pm 23.0\%$  (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.

| <b>Description</b>              | <b>Serial Number</b> | <b>Cal Due Date</b> |
|---------------------------------|----------------------|---------------------|
| DASY3 DAE V1                    | SN434                | 12-Feb-03           |
| E-Field Probe ET3DV6            | SN1522               | 2-Apr-03            |
| Dipole Validation Kit, D900V2   | SN80                 | 13-Nov-04           |
| S.A.M. Phantom used for 800MHz  | TP-1155              |                     |
| Dipole Validation Kit, D1800V2  | SN259                | 25-Jan-04           |
| S.A.M. Phantom used for 1900MHz | TP-1157              |                     |

### 3.2 Additional Equipment

| Description                   | Serial Number | Cal Due Date |
|-------------------------------|---------------|--------------|
| Signal Generator HP8648C      | 3847A04832    | 18-Jan-03    |
| Power Meter                   | GB39511082    | 18-Jan-03    |
| Power Sensor #1               | US39210932    | 14-Feb-03    |
| Power Sensor #2               | US39210931    | 23-Feb-03    |
| Network Analyzer HP8753ES     | US39171846    | 2-May-03     |
| Dielectric Probe Kit HP85070B | US99360074    | N/A          |

### 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 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<br>(MHz) | Tissue<br>type | Limits / Measured    | Dielectric Parameters |                |             |
|------------|----------------|----------------------|-----------------------|----------------|-------------|
|            |                |                      | $\epsilon_r$          | $\sigma$ (S/m) | Temp (°C)   |
| 835        | Head           | Measured, 01/14/2003 | 41.80                 | 0.91           | 20.7 - 21.7 |
|            |                | Recommended Limits   | 41.50                 | 0.90           | 20-25       |
|            |                | Measured, 01/15/2003 | 41.20                 | 0.90           | 20.7 - 21.7 |
|            |                | Recommended Limits   | 41.50                 | 0.90           | 20-25       |
|            | Body           | Measured, 01/16/2003 | 54.20                 | 0.95           | 20.7 - 21.7 |
|            |                | Recommended Limits   | 55.20                 | 0.97           | 20-25       |
| 1880       | Head           | Measured, 01/16/2003 | 38.60                 | 1.44           | 20.7 - 21.7 |
|            |                | Recommended Limits   | 40.00                 | 1.40           | 20-25       |
|            | Body           | Measured, 01/17/2003 | 52.50                 | 1.59           | 20.7 - 21.7 |
|            |                | Recommended Limits   | 53.30                 | 1.52           | 20-25       |

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

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

### 5. System Accuracy Verification

A system accuracy verification of the DASY3 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 on the dipole certification sheet. 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  $\pm$ 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.

Daily, prior to conducting tests, measurements were made with the RF sources powered off to determine the system noise level. The highest system noise was 0.00 W/kg, which is below the recommended limit.

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 ETDV6 | SN1522        | 900     | 4.5               | 2 of 8        |
|                     |               | 1800    | 3.4               | 2 of 8        |

| f (MHz) | Description          | SAR (W/kg), 1gram | Dielectric Parameters |                | Ambient Temp (°C) | Tissue Temp (°C) |
|---------|----------------------|-------------------|-----------------------|----------------|-------------------|------------------|
|         |                      |                   | $\epsilon_r$          | $\sigma$ (S/m) |                   |                  |
| 900     | Measured, 01/14/2003 | 11.55             | 41.00                 | 0.97           | 23                | 21.8             |
|         | Recommended Limits   | 11.40             | 40.30                 | 0.95           | 20-25             | 20-25            |
|         | Measured, 01/15/2003 | 11.46             | 40.20                 | 0.96           | 22                | 20.8             |
|         | Recommended Limits   | 11.40             | 40.30                 | 0.95           | 20-25             | 20-25            |
| 1800    | Measured, 01/16/2003 | 38.66             | 39.00                 | 1.36           | 22                | 21.3             |
|         | Recommended Limits   | 40.40             | 39.60                 | 1.37           | 20-25             | 20-25            |
|         | Measured, 01/17/2003 | 39.12             | 38.40                 | 1.37           | 23                | 20.6             |
|         | Recommended Limits   | 40.40             | 39.60                 | 1.37           | 20-25             | 20-25            |

## 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 DASY v3.1d 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 DASY 3.1d 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 ( $\pm$  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.

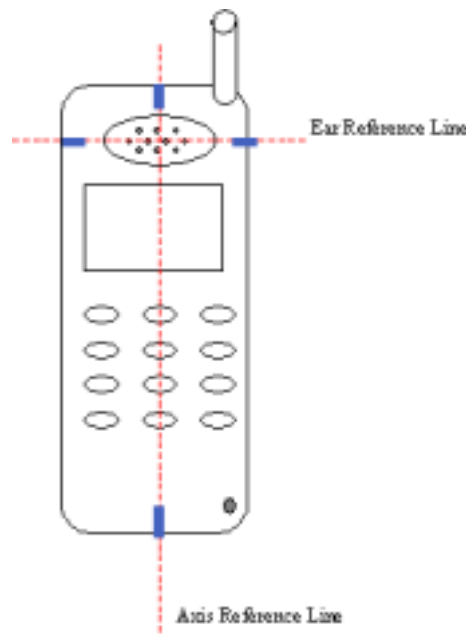
The Cellular Phone (FCC ID IHDT56AS1) has the SNN5705A as the only available battery option. This battery was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

## 6.1 Head Adjacent Test Results

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 4 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  $\text{New SAR} = \text{Old SAR} * 10^{-(\text{drift}/10)}$ . 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. Note that 800MHz digital mode SAR measurements were performed in accordance with Supplement C.

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 ETDV6 | SN1522        | 835     | 4.6               | 2 of 2        |
|                     |               | 1900    | 3.4               | 2 of 8        |

| f (MHz)         | Description  | Conducted Output Power (dBm) | Left Head (Cheek / Touch Position) |             |                     |                |                    |
|-----------------|--------------|------------------------------|------------------------------------|-------------|---------------------|----------------|--------------------|
|                 |              |                              | Ant Fixed                          |             |                     |                |                    |
|                 |              |                              | Measured (W/kg)                    | Drift (dB)  | Extrapolated (W/kg) | Amb. Temp (°C) | Simulate Temp (°C) |
| Analog 800MHz   | Channel 991  | 27.00                        | 0.986                              | 0.08        | 0.99                | 21.80          | 21.70              |
|                 | Channel 384  | 27.06                        | 1.05                               | -0.42       | 1.16                | 21.80          | 21.70              |
|                 | Channel 799  | 27.06                        | 1.17                               | -0.05       | 1.18                | 21.80          | 21.70              |
| Digital 800MHz  | Channel 1013 | 27.41                        |                                    |             |                     |                |                    |
|                 | Channel 384  | 27.41                        | 0.404                              | -0.15       | 0.42                | 21.80          | 21.60              |
|                 | Channel 779  | 27.44                        |                                    |             |                     |                |                    |
| Digital 1900MHz | Channel 2    | 26.82                        |                                    |             |                     |                |                    |
|                 | Channel 1001 | 26.84                        | <b>0.201</b>                       | <b>0.02</b> | <b>.201</b>         | <b>21.30</b>   | <b>20.40</b>       |
|                 | Channel 1998 | 26.84                        |                                    |             |                     |                |                    |

**Table 1: SAR measurement results for the portable cellular telephone FCC ID IHDT56AS1 at highest possible output power. Measured against the left head in the Cheek/Touch Position.**

| f (MHz)         | Description  | Conducted Output Power (dBm) | Right Head (Cheek / Touch Position) |              |                     |                |                    |
|-----------------|--------------|------------------------------|-------------------------------------|--------------|---------------------|----------------|--------------------|
|                 |              |                              | Ant Fixed                           |              |                     |                |                    |
|                 |              |                              | Measured (W/kg)                     | Drift (dB)   | Extrapolated (W/kg) | Amb. Temp (°C) | Simulate Temp (°C) |
| Analog 800MHz   | Channel 991  | 27.00                        | 0.965                               | 0.12         | 0.97                | 21.8           | 21.6               |
|                 | Channel 384  | 27.06                        | 1.14                                | -0.19        | 1.19                | 21.8           | 21.7               |
|                 | Channel 799  | 27.06                        | <b>1.30</b>                         | <b>-0.05</b> | <b>1.32</b>         | <b>21.8</b>    | <b>21.6</b>        |
| Digital 800MHz  | Channel 1013 | 27.41                        |                                     |              |                     |                |                    |
|                 | Channel 384  | 27.41                        | 0.432                               | -0.03        | 0.43                | 20.9           | 20.7               |
|                 | Channel 779  | 27.44                        |                                     |              |                     |                |                    |
| Digital 1900MHz | Channel 2    | 26.82                        |                                     |              |                     |                |                    |
|                 | Channel 1001 | 26.84                        | 0.188                               | -0.18        | 0.196               | 21.3           | 20.4               |
|                 | Channel 1998 | 26.84                        |                                     |              |                     |                |                    |

**Table 2: SAR measurement results for the portable cellular telephone FCC ID IHDT56AS1 at highest possible output power. Measured against the right head in the Cheek/Touch Position.**

| f<br>(MHz)         | Description  | Conducted<br>Output<br>Power<br>(dBm) | Left Head (15° Tilt Position) |               |                        |                      |                          |
|--------------------|--------------|---------------------------------------|-------------------------------|---------------|------------------------|----------------------|--------------------------|
|                    |              |                                       | Ant Fixed                     |               |                        |                      |                          |
|                    |              |                                       | Measured<br>(W/kg)            | Drift<br>(dB) | Extrapolated<br>(W/kg) | Amb.<br>Temp<br>(°C) | Simulate<br>Temp<br>(°C) |
| Analog<br>800MHz   | Channel 991  | 27.00                                 |                               |               |                        |                      |                          |
|                    | Channel 384  | 27.06                                 | <b>0.216</b>                  | <b>-0.25</b>  | <b>0.23</b>            | <b>21.80</b>         | <b>21.70</b>             |
|                    | Channel 799  | 27.06                                 |                               |               |                        |                      |                          |
| Digital<br>800MHz  | Channel 1013 | 27.41                                 |                               |               |                        |                      |                          |
|                    | Channel 384  | 27.41                                 | 0.083                         | -0.21         | 0.09                   | 20.90                | 20.70                    |
|                    | Channel 779  | 27.44                                 |                               |               |                        |                      |                          |
| Digital<br>1900MHz | Channel 2    | 26.82                                 |                               |               |                        |                      |                          |
|                    | Channel 1001 | 26.84                                 | <b>0.0607</b>                 | <b>-0.15</b>  | <b>0.063</b>           | <b>21.30</b>         | <b>20.40</b>             |
|                    | Channel 1998 | 26.84                                 |                               |               |                        |                      |                          |

**Table 3: SAR measurement results for the portable cellular telephone FCC ID IHDT56AS1 at highest possible output power. Measured against the left head in the 15° Tilt Position.**

| f<br>(MHz)         | Description  | Conducted<br>Output<br>Power<br>(dBm) | Right Head (15° Tilt Position) |               |                        |                      |                          |
|--------------------|--------------|---------------------------------------|--------------------------------|---------------|------------------------|----------------------|--------------------------|
|                    |              |                                       | Ant Fixed                      |               |                        |                      |                          |
|                    |              |                                       | Measured<br>(W/kg)             | Drift<br>(dB) | Extrapolated<br>(W/kg) | Amb.<br>Temp<br>(°C) | Simulate<br>Temp<br>(°C) |
| Analog<br>800MHz   | Channel 991  | 27.00                                 |                                |               |                        |                      |                          |
|                    | Channel 384  | 27.06                                 | 0.182                          | -0.43         | 0.20                   | 21.80                | 21.60                    |
|                    | Channel 799  | 27.06                                 |                                |               |                        |                      |                          |
| Digital<br>800MHz  | Channel 1013 | 27.41                                 |                                |               |                        |                      |                          |
|                    | Channel 384  | 27.41                                 | 0.073                          | -0.26         | 0.08                   | 20.90                | 20.70                    |
|                    | Channel 779  | 27.44                                 |                                |               |                        |                      |                          |
| Digital<br>1900MHz | Channel 2    | 26.82                                 |                                |               |                        |                      |                          |
|                    | Channel 1001 | 26.84                                 | 0.0574                         | -0.14         | 0.059                  | 21.30                | 20.40                    |
|                    | Channel 1998 | 26.84                                 |                                |               |                        |                      |                          |

**Table 4: SAR measurement results for the portable cellular telephone FCC ID IHDT56AS1 at highest possible output power. Measured against the right head in the 15° Tilt Position.**

## 6.2 Body-Worn Test Results

The SAR results shown in table 5 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  $\text{New SAR} = \text{Old SAR} * 10^{(\text{drift}/10)}$ . 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. Note that 800MHz digital mode SAR measurements were performed in accordance with OET Bulletin 65 Supplement C 01-01. 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  $\pm$  0.5cm. 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.

The following Body-Worn Accessory is available for this phone:

A Plastic Holster: SYN0375A

A Leather Holster: SYN8875A

The plastic holster SYN0375A is a rotating Holster/Belt Clip, the antenna is at the closest proximity to the flat phantom when the belt clip along with the phone is rotated +90° (clockwise direction). See Figure 11 for reference (Appendix 7).

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 ETDV6 | SN1522        | 835     | 4.40              | 2 of 2        |
|                     |               | 1900    | 3.10              | 2 of 2        |

| f (MHz)         | Description  | Conducted Output Power (dBm) | Body Worn w/SYN0375A |            |                     |                |                    |
|-----------------|--------------|------------------------------|----------------------|------------|---------------------|----------------|--------------------|
|                 |              |                              | Ant Extended         |            |                     |                |                    |
|                 |              |                              | Measured (W/kg)      | Drift (dB) | Extrapolated (W/kg) | Amb. Temp (°C) | Simulate Temp (°C) |
| Analog 800MHz   | Channel 991  | 27.00                        |                      |            |                     |                |                    |
|                 | Channel 384  | 27.06                        | 0.497                | -0.36      | 0.54                | 21.2           | 21.2               |
|                 | Channel 799  | 27.06                        |                      |            |                     |                |                    |
| Digital 800MHz  | Channel 1013 | 27.41                        |                      |            |                     |                |                    |
|                 | Channel 384  | 27.41                        | 0.248                | -0.12      | 0.29                | 21.2           | 20.8               |
|                 | Channel 779  | 27.44                        |                      |            |                     |                |                    |
| Digital 1900MHz | Channel 2    | 26.82                        |                      |            |                     |                |                    |
|                 | Channel 1001 | 26.84                        | 0.279                | -0.08      | 0.28                | 21.1           | 21.3               |
|                 | Channel 1998 | 26.84                        |                      |            |                     |                |                    |

**Table 5: SAR measurement results for the portable cellular telephone FCC ID IHDT56AS1 at highest possible output power. Measured against the body.**

| f<br>(MHz)         | Description  | Conducted<br>Output<br>Power<br>(dBm) | Body Worn w/SYN8875A |               |                        |                      |                          |
|--------------------|--------------|---------------------------------------|----------------------|---------------|------------------------|----------------------|--------------------------|
|                    |              |                                       | Ant Extended         |               |                        |                      |                          |
|                    |              |                                       | Measured<br>(W/kg)   | Drift<br>(dB) | Extrapolated<br>(W/kg) | Amb.<br>Temp<br>(°C) | Simulate<br>Temp<br>(°C) |
| Analog<br>800MHz   | Channel 991  | 27.00                                 |                      |               |                        |                      |                          |
|                    | Channel 384  | 27.06                                 | <b>0.332</b>         | <b>-0.38</b>  | <b>0.36</b>            | <b>21.2</b>          | <b>21.0</b>              |
|                    | Channel 799  | 27.06                                 |                      |               |                        |                      |                          |
| Digital<br>800MHz  | Channel 1013 | 27.41                                 |                      |               |                        |                      |                          |
|                    | Channel 384  | 27.41                                 | 0.183                | -0.06         | 0.19                   | 21.2                 | 21.0                     |
|                    | Channel 779  | 27.44                                 |                      |               |                        |                      |                          |
| Digital<br>1900MHz | Channel 2    | 26.82                                 |                      |               |                        |                      |                          |
|                    | Channel 1001 | 26.84                                 | <b>0.287</b>         | <b>-0.10</b>  | <b>0.29</b>            | <b>21.1</b>          | <b>20.8</b>              |
|                    | Channel 1998 | 26.84                                 |                      |               |                        |                      |                          |

**Table 6: SAR measurement results for the portable cellular telephone FCC ID IHDT56AS1 at highest possible output power. Measured against the body.**

## **Appendix 1**

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

# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 080 / Forward Power = 251mW / Acceptable Temp Range is 15-25°C Room Temp at time of measurement = 23 C Simulant Temp at time of measurement = 21.8C

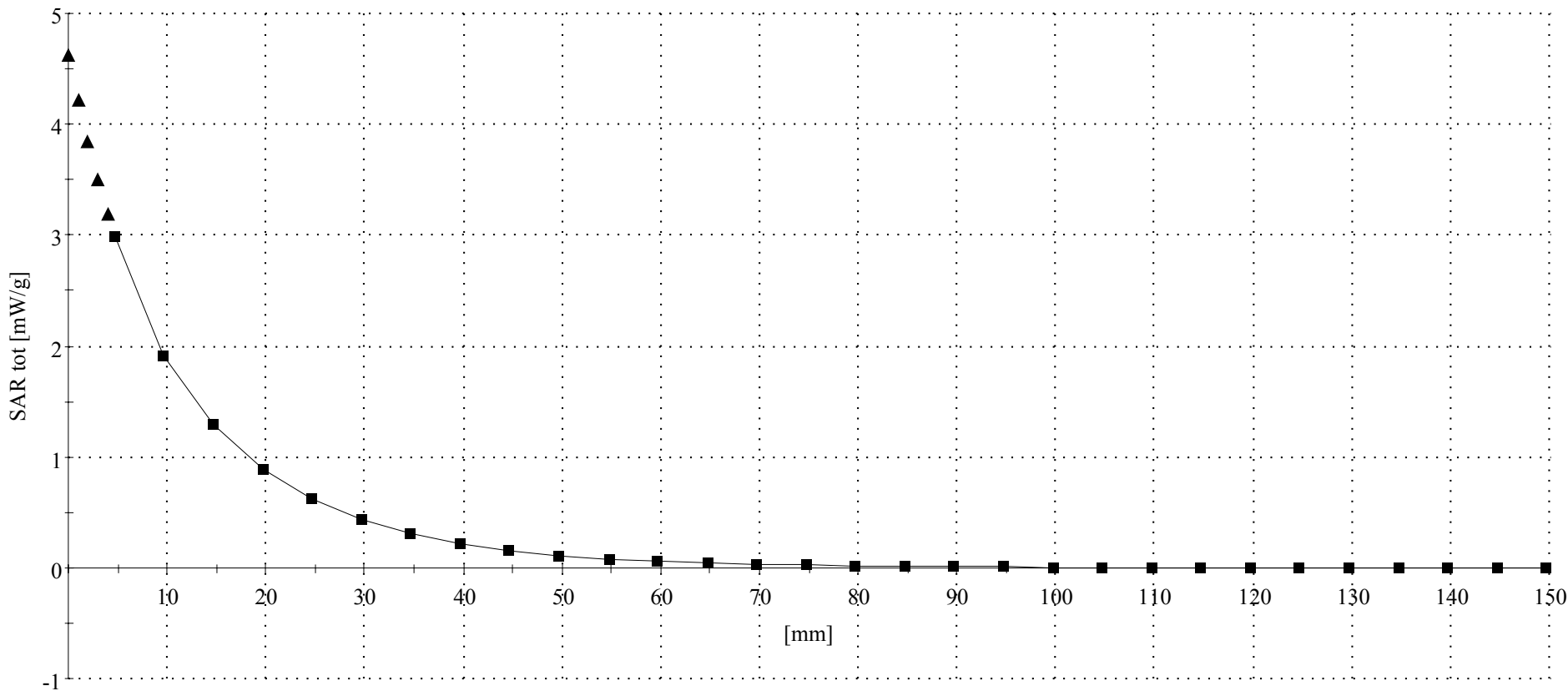
R3 Suger TP-1155 SAM (rev. 4) 26Apr02 Phantom; Section; Position: ; Frequency: 900 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 0.97$  mho/m  $\epsilon_r = 41.0$   $\rho = 1.00$  g/cm<sup>3</sup>

; , 0

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 11.8 (10.9, 12.9) [mm]



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259tr / Forward Power = 251mW / Acceptable Temp Range is 15-25°C Room Temp at time of measurement = 23 C Simulant Temp at time of measurement = 20.6

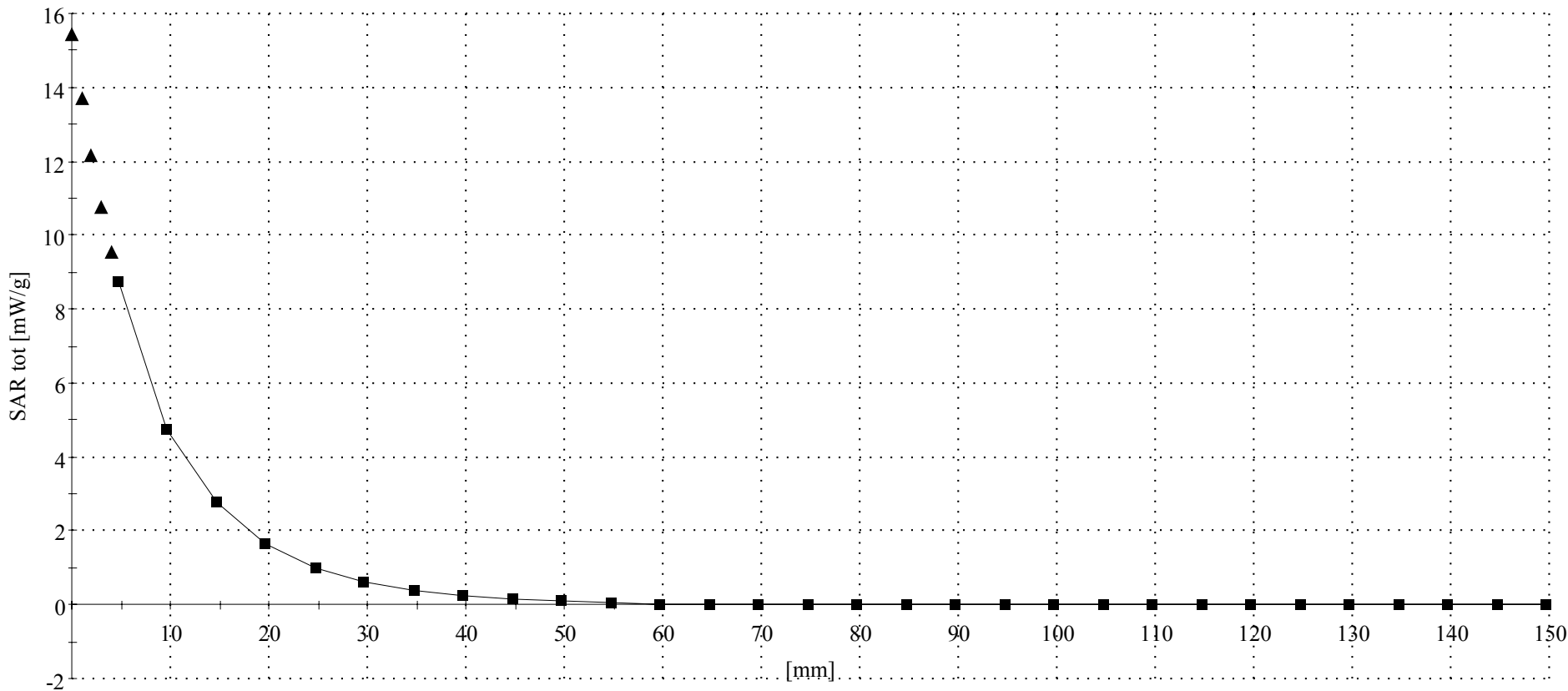
R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; Section; Position: ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.37$  mho/m  $\epsilon_r = 38.4$   $\rho = 1.00$  g/cm<sup>3</sup>

; , 0

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 8.5 (8.2, 9.4) [mm]



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259tr / Forward Power = 254mW / Acceptable Temp Range is 15-25°C Room Temp at time of measurement = 22 Simulant Temp at time of measurement = 21.3

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (90°,180°); Frequency: 1800 MHz

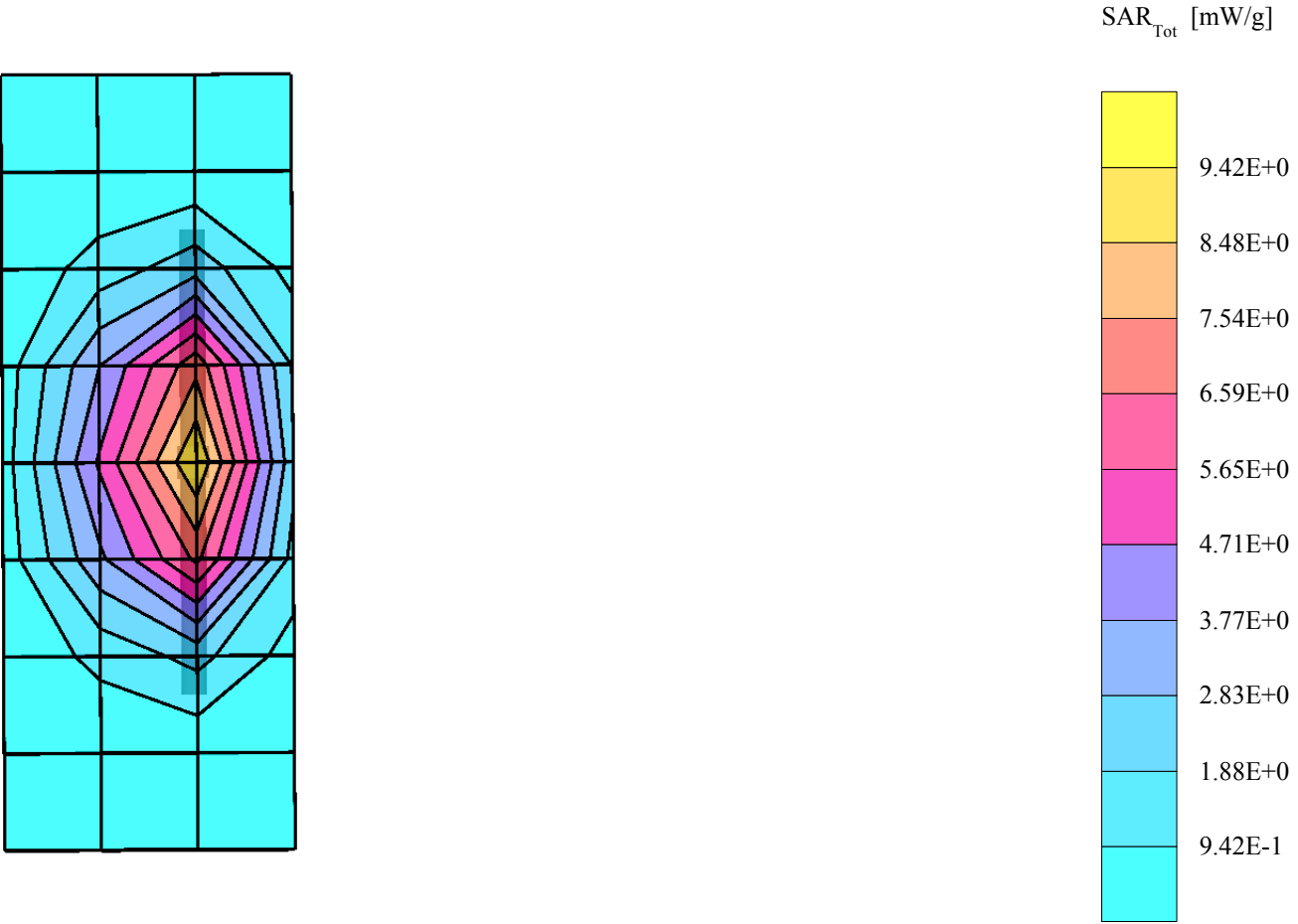
Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.36$  mho/m  $\epsilon_r = 39.0$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): SAR (1g): 9.82 mW/g  $\pm 0.16$  dB, SAR (10g): 5.19 mW/g  $\pm 0.11$  dB, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 8.6 (8.2, 9.4) [mm]

Powerdrift: 0.01 dB



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259tr / Forward Power = 254mW / Acceptable Temp Range is 15-25°C Room Temp at time of measurement = 22 Simulant Temp at time of measurement = 21.3

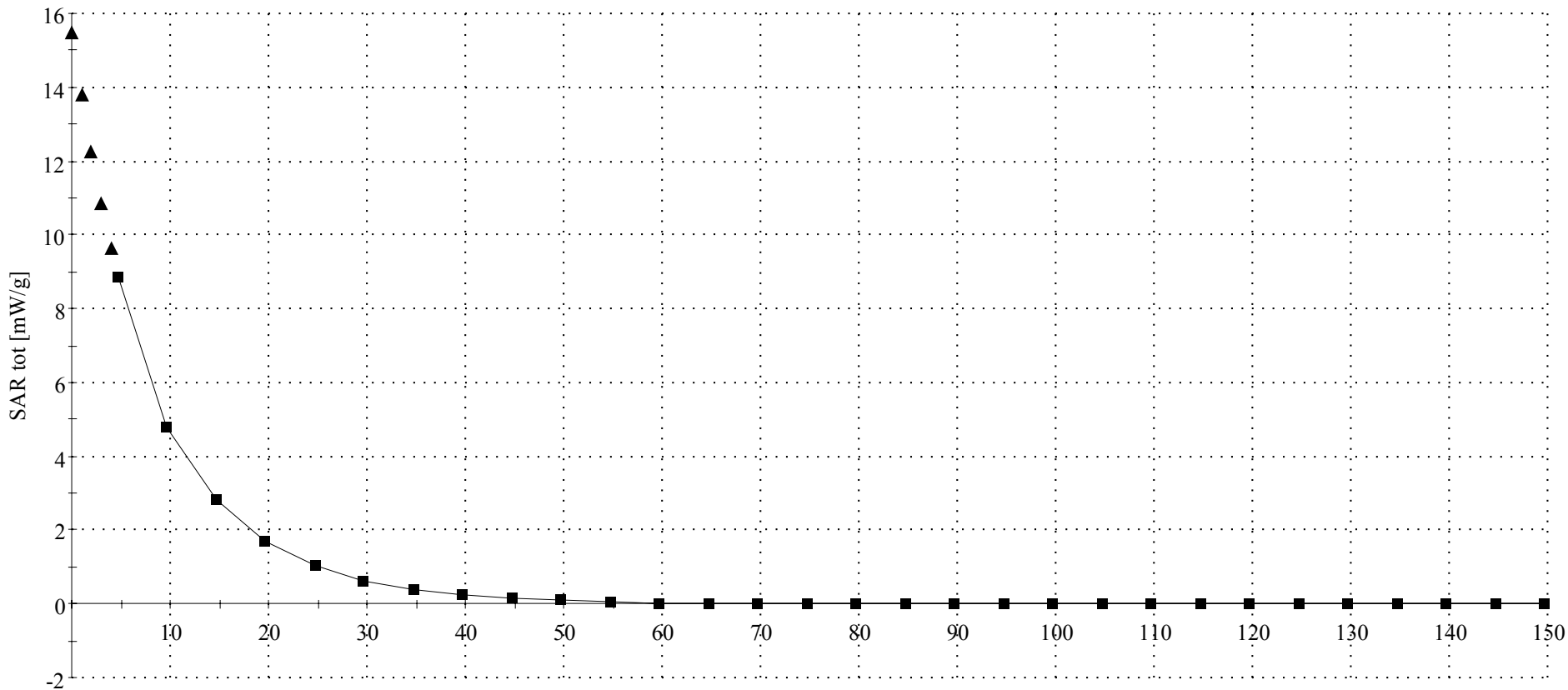
R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; Section; Position: ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.36$  mho/m  $\epsilon_r = 39.0$   $\rho = 1.00$  g/cm<sup>3</sup>

; , 0

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 8.6 (8.2, 9.5) [mm]



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 080 / Forward Power = 253mW / Acceptable Temp Range is 15-25°C Room Temp at time of measurement = 22C Simulant Temp at time of measurement = 20.8C

R3 Suger TP-1155 SAM (rev. 4) 26Apr02 Phantom; Flat Section; Position: (90°,90°); Frequency: 900 MHz

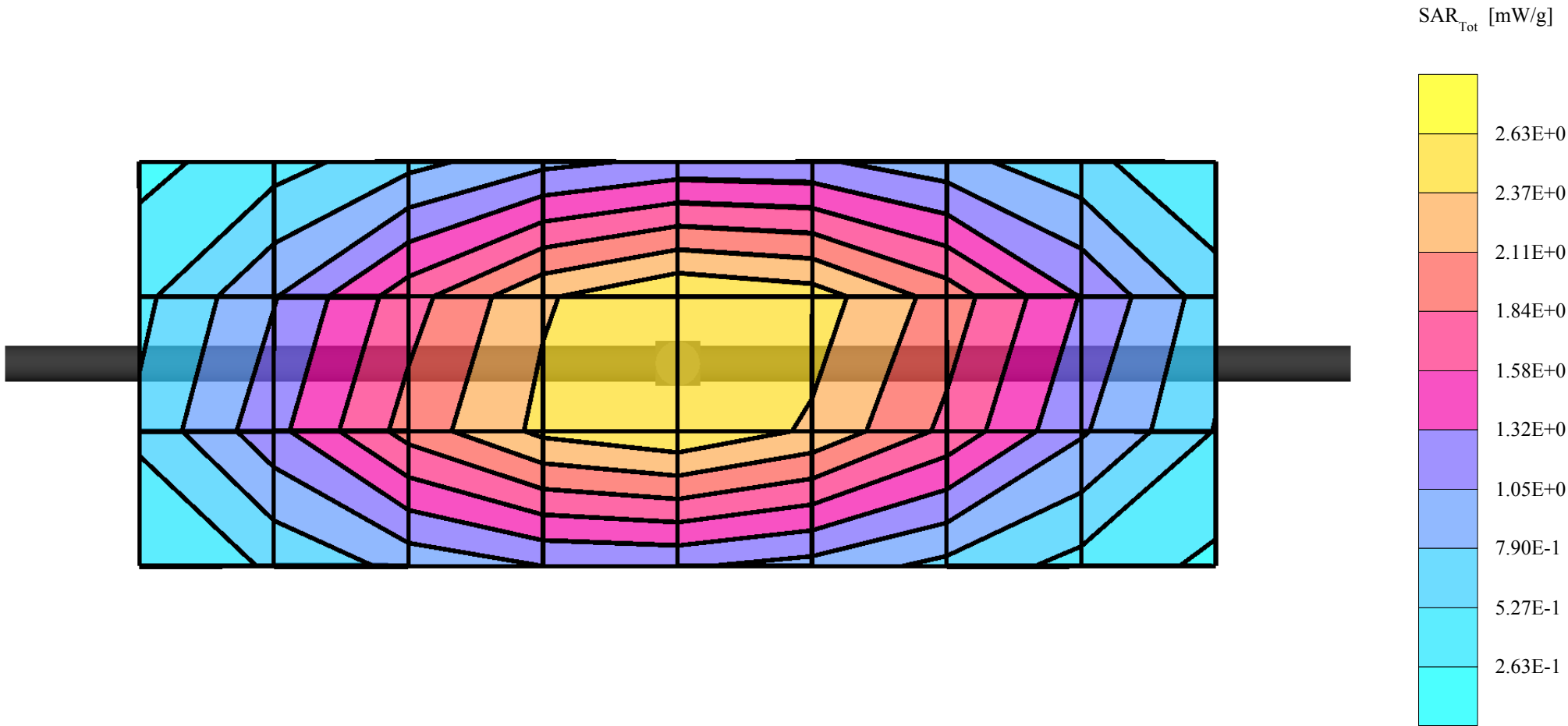
Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 0.96$  mho/m  $\epsilon_r = 40.2$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): SAR (1g): 2.90 mW/g  $\pm$  0.09 dB, SAR (10g): 1.83 mW/g  $\pm$  0.09 dB, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 11.6 (10.8, 12.7) [mm]

Powerdrift: 0.03 dB



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 080 / Forward Power = 253mW / Acceptable Temp Range is 15-25°C Room Temp at time of measurement = 22C Simulant Temp at time of measurement = 20.8C

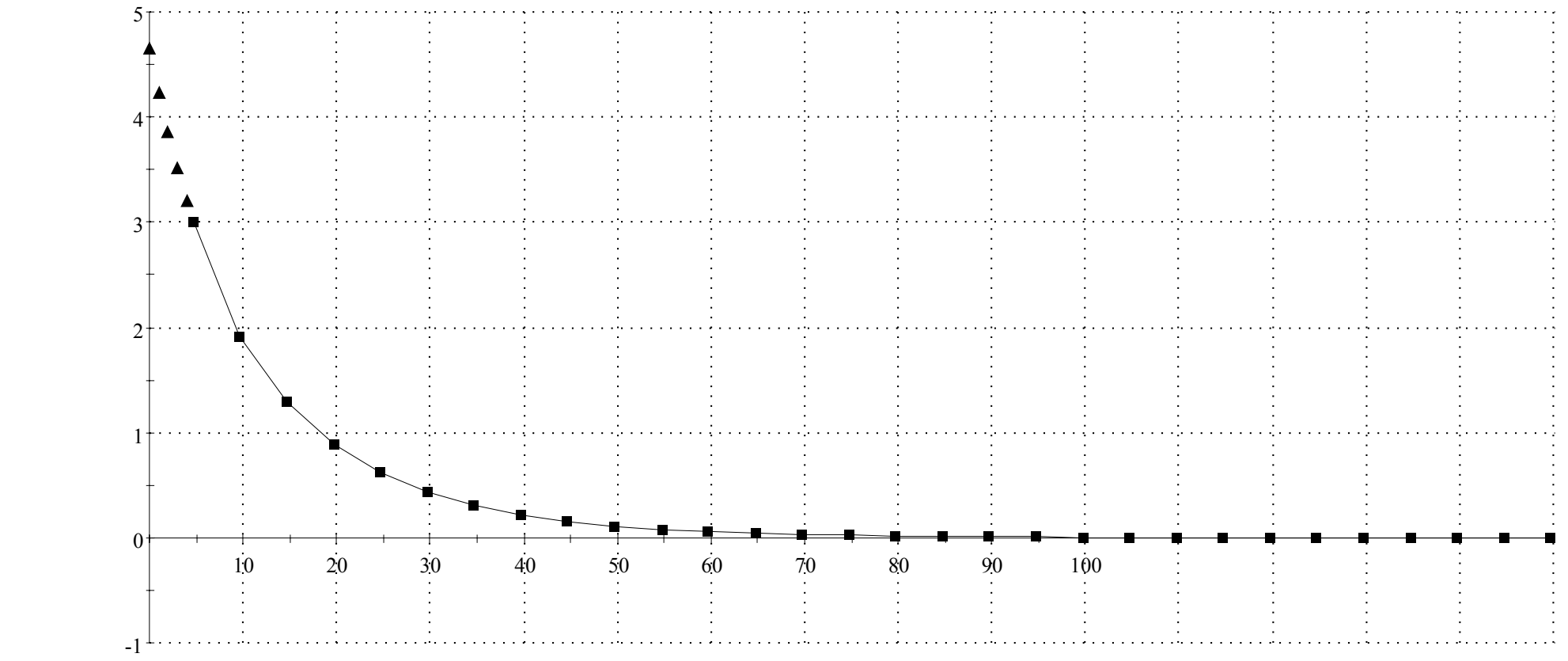
R3 Suger TP-1155 SAM (rev. 4) 26Apr02 Phantom; Section; Position; ; Frequency: 900 MHz

Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 0.96$  mho/m  $\epsilon_r = 40.2$   $\rho = 1.00$  g/cm<sup>3</sup>

; , 0

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 11.7 (10.9, 12.8) [mm]



# Dipole 900 MHz

900 MHz Dipole Validation / Dipole Sn# 080 / Forward Power = 251mW / Acceptable Temp Range is 15-25°C Room Temp at time of measurement = 23 C Simulant Temp at time of measurement = 21.8C

R3 Suger TP-1155 SAM (rev. 4) 26Apr02 Phantom; Flat Section; Position: (90°,90°); Frequency: 900 MHz

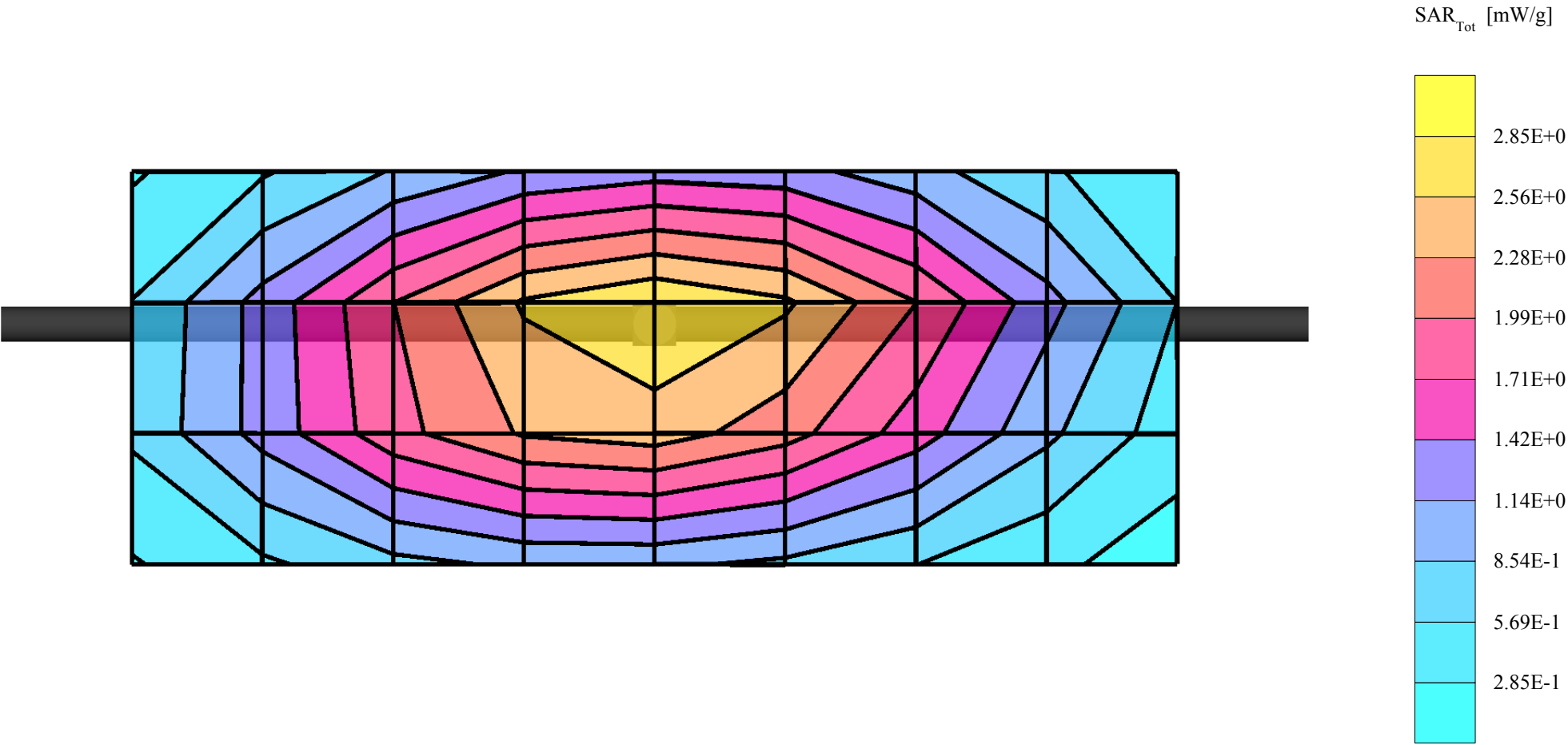
Probe: ET3DV6R - SN1522 - Validation2; ConvF(4.50,4.50,4.50); Crest factor: 1.0; 900 MHz VALIDATION:  $\sigma = 0.97 \text{ mho/m}$   $\epsilon_r = 41.0$   $\rho = 1.00 \text{ g/cm}^3$

Cubes (2): SAR (1g): 2.90 mW/g  $\pm 0.13 \text{ dB}$ , SAR (10g): 1.84 mW/g  $\pm 0.14 \text{ dB}$ , (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 11.8 (10.9, 13.0) [mm]

Powerdrift: 0.01 dB



# Dipole 1800 MHz

1800 MHz Dipole Validation / Dipole Sn# 259tr / Forward Power = 251mW / Acceptable Temp Range is 15-25°C Room Temp at time of measurement = 23 C Simulant Temp at time of measurement = 20.6

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (90°,180°); Frequency: 1800 MHz

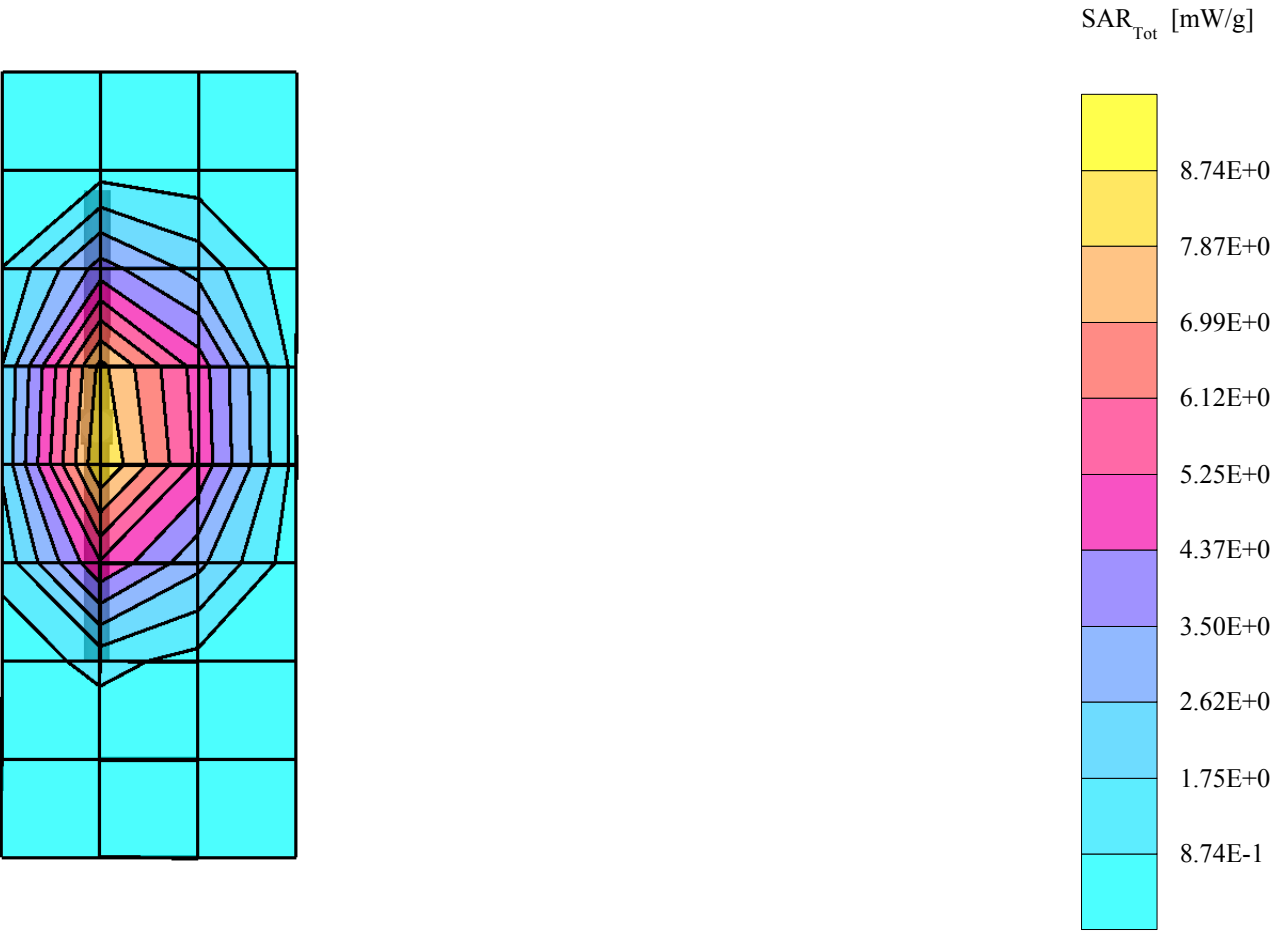
Probe: ET3DV6R - SN1522 - Validation2; ConvF(3.40,3.40,3.40); Crest factor: 1.0; 1800 MHz VALIDATION:  $\sigma = 1.37$  mho/m  $\epsilon_r = 38.4$   $\rho = 1.00$  g/cm<sup>3</sup>

Cubes (2): SAR (1g): 9.82 mW/g  $\pm 0.16$  dB, SAR (10g): 5.19 mW/g  $\pm 0.13$  dB, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 8.5 (8.1, 9.3) [mm]

Powerdrift: 0.02 dB



## **Appendix 2**

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

SN# 19565232003

Ch#799 / Pwr Step: 2 (OTA) / Antenna Position: Fixed / Battery Model #: SNN5705A / DEVICE POSITION (cheek or rotated): Cheek  
R3 Suger TP-1155 SAM (rev. 4) 26Apr02 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 849 MHz

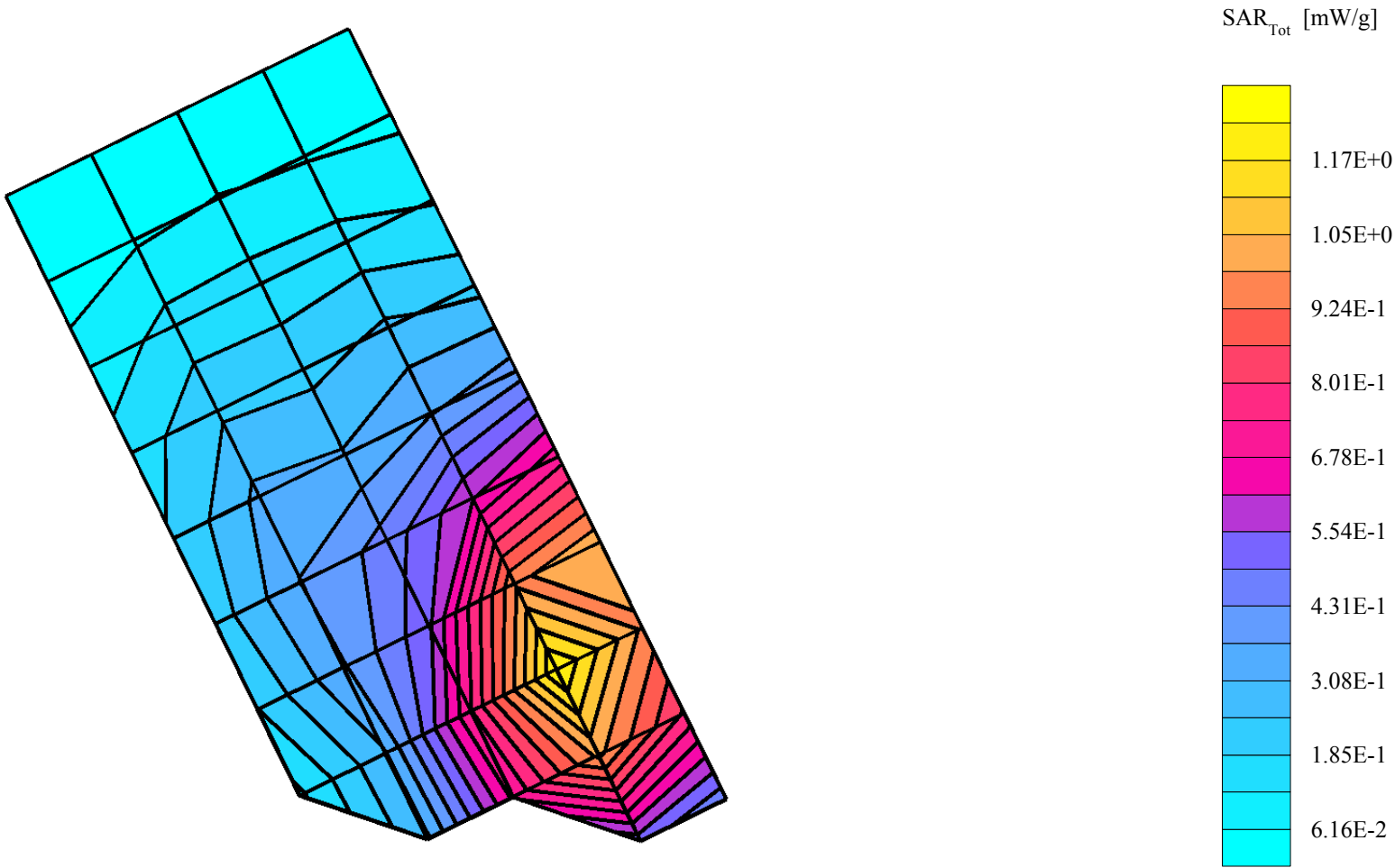
Probe: ET3DV6R - SN1522 - IEEE Head; ConvF(4.60,4.60,4.60); Crest factor: 1.0; 835 MHz Head & Body:  $\sigma = 0.91$  mho/m  $\epsilon_r = 41.8$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 1.30 mW/g, SAR (10g): 0.842 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0

Penetration depth: 14.2 (12.4, 16.4) [mm]

Powerdrift: -0.05 dB



s/n: 295651232003

Ch# 1001 / Pwr Step: 2 (OTA) / Antenna Position: Fixed / Battery Model #: SNN5705A / DEVICE POSITION (cheek or rotated): Cheek  
R3 Glycol TP-1157 SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 1880 MHz  
Probe: ET3DV6R - SN1522 - IEEE Head; ConvF(3.40,3.40,3.40); Crest factor: 3.0; 1880 MHz Head & Body:  $\sigma = 1.44$  mho/m  $\epsilon_r = 38.6$   $\rho = 1.00$  g/cm<sup>3</sup>  
Cube 7x7x7: SAR (1g): 0.201 mW/g, SAR (10g): 0.105 mW/g \* Max outside, (Worst-case extrapolation)  
Coarse: Dx = 10.0, Dy = 10.0, Dz = 10.0  
Penetration depth: 7.6 (7.4, 8.3) [mm]  
Powerdrift: 0.02 dB

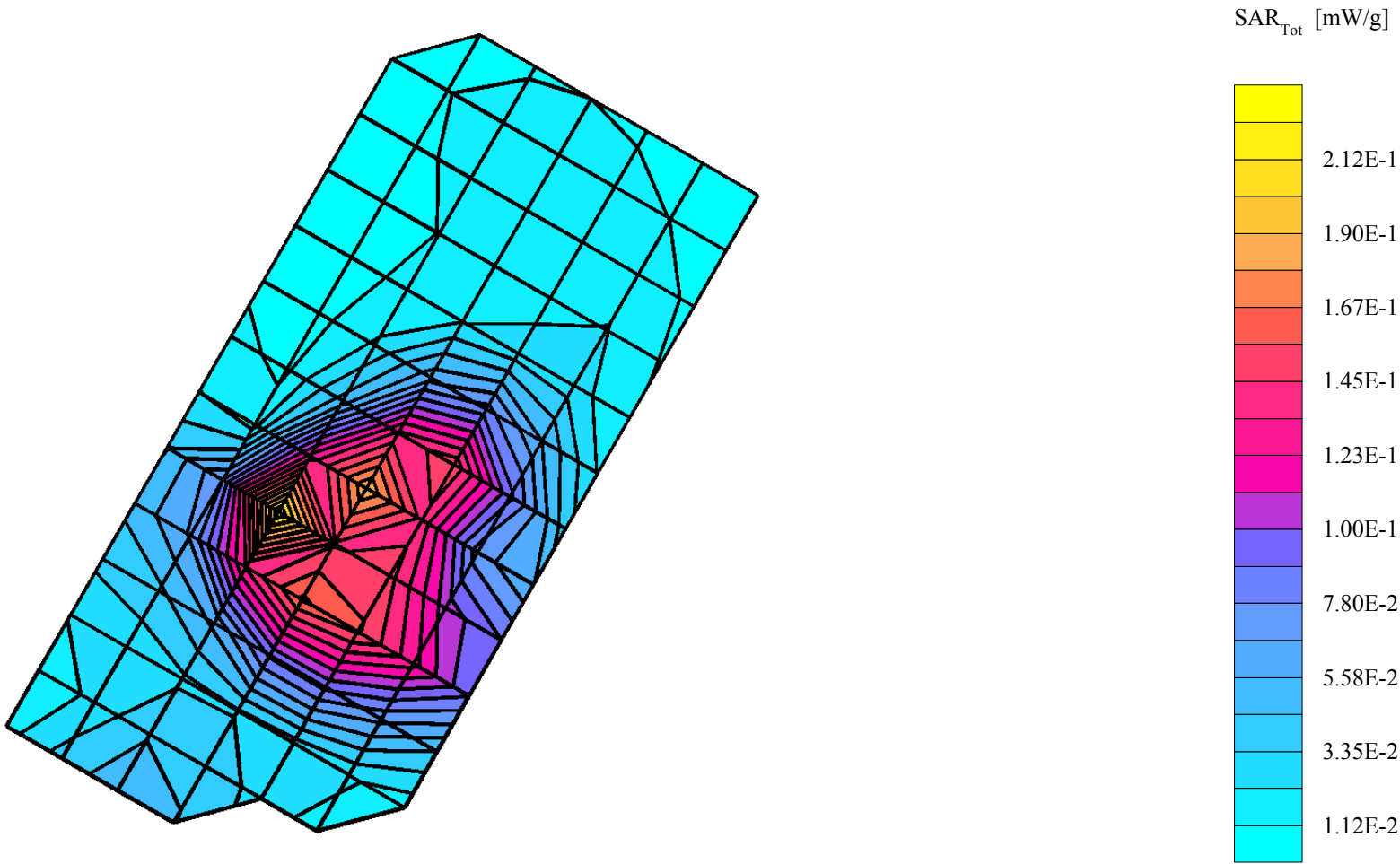




Figure 1. Typical 800MHz Head Adjacent Contour Overlaid on Phone (Cheek Touch)

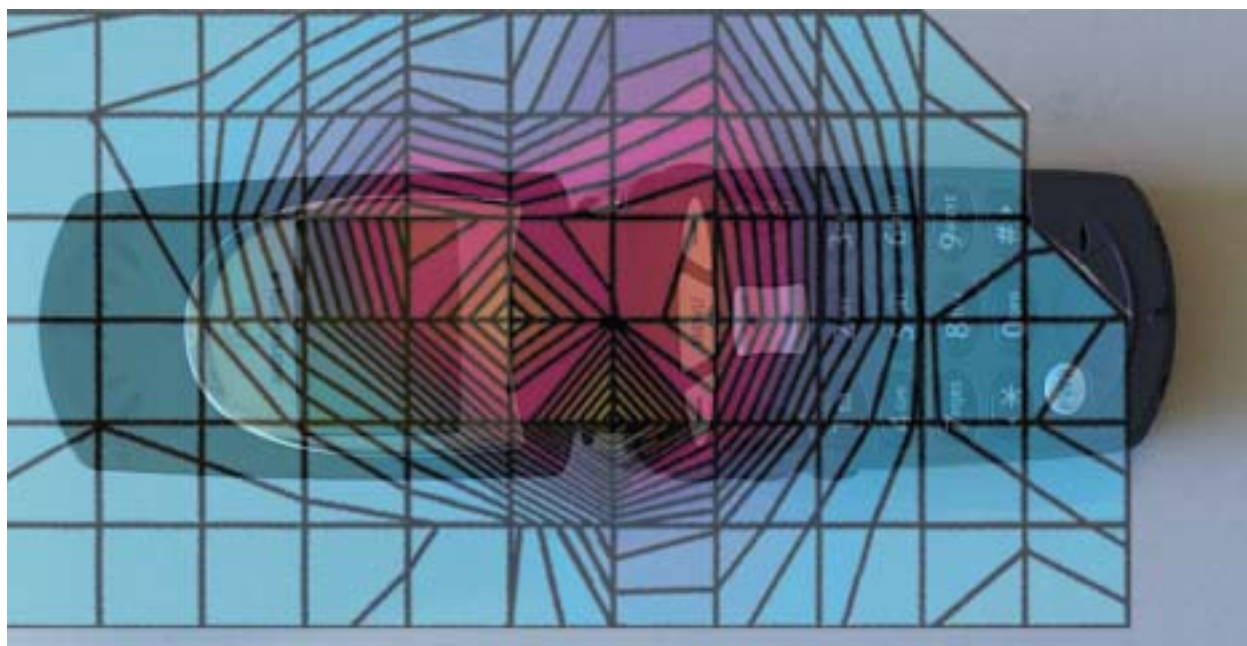
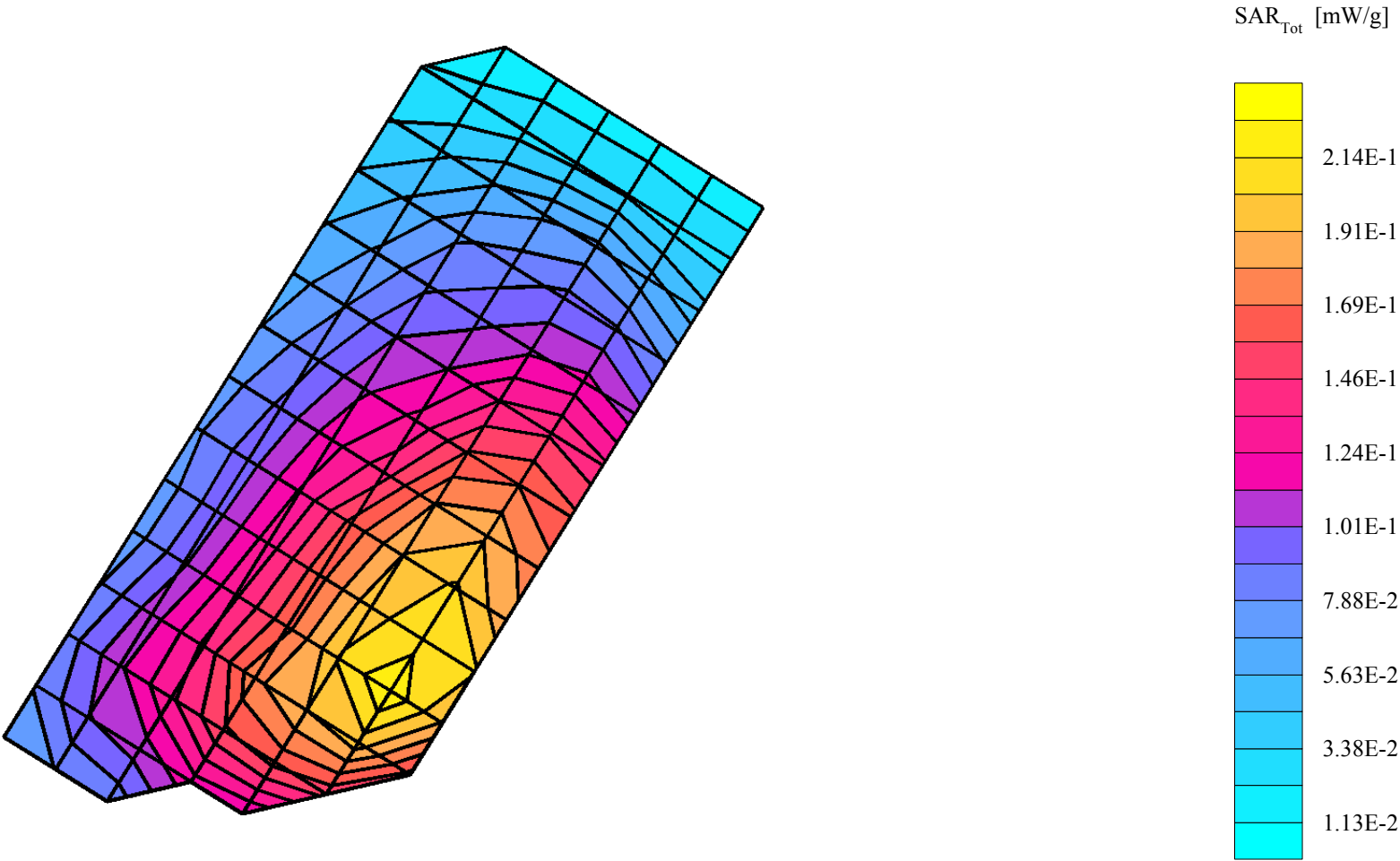


Figure 2. Typical 1900MHz Head Adjacent Contour Overlaid on Phone (Cheek Touch)

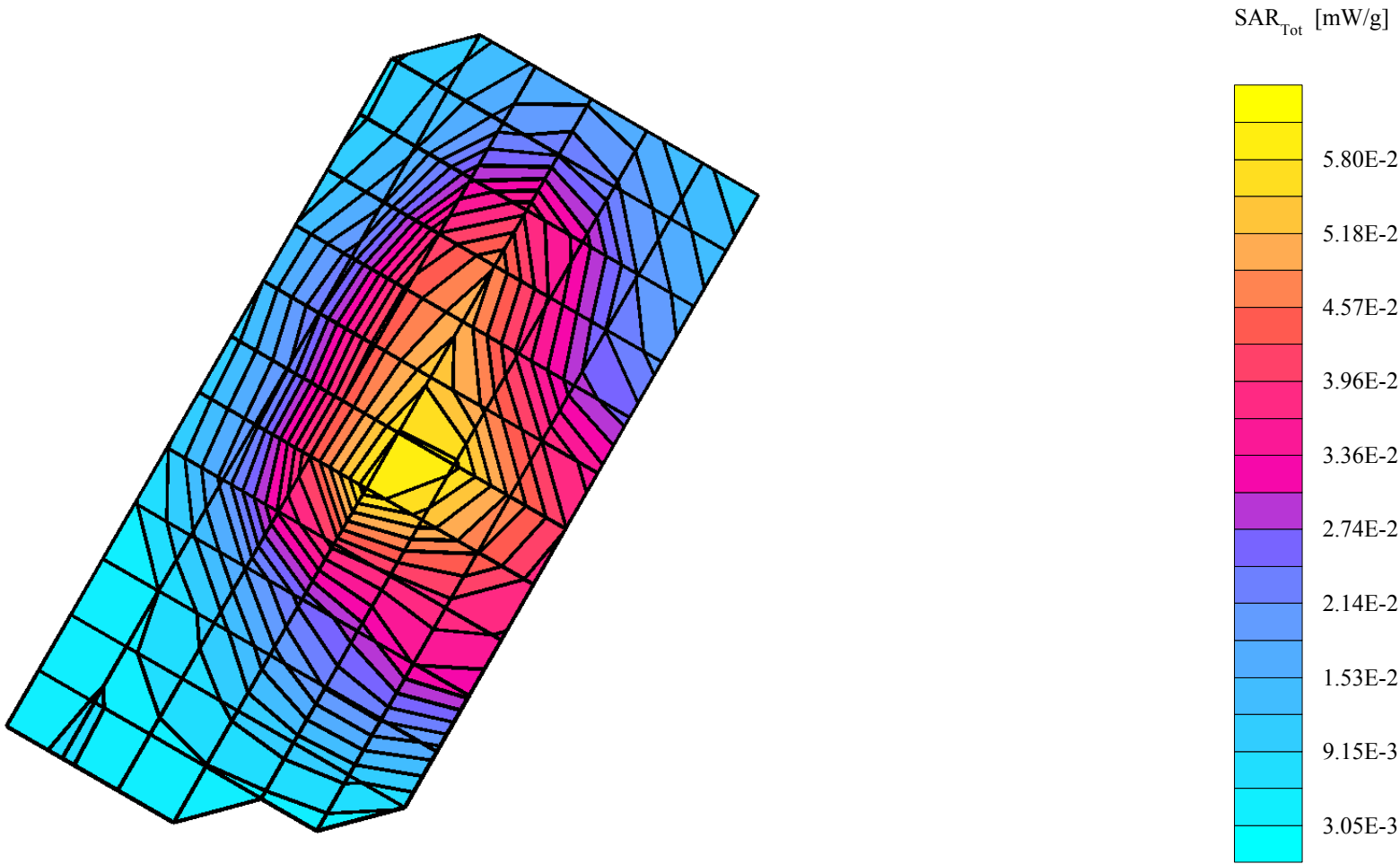
SN# 195651232003

Ch# 383 / Pwr Step: 2 (OTA) / Antenna Position: Fixed / Battery Model #: SNN5705A / DEVICE POSITION (cheek or rotated): Tilted  
R3 Suger TP-1155 SAM (rev. 4) 26Apr02 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 836 MHz  
Probe: ET3DV6R - SN1522 - IEEE Head; ConvF(4.60,4.60,4.60); Crest factor: 1.0; 835 MHz Head & Body:  $\sigma = 0.91$  mho/m  $\epsilon_r = 41.8$   $\rho = 1.00$  g/cm<sup>3</sup>  
Cube 7x7x7: SAR (1g): 0.216 mW/g, SAR (10g): 0.159 mW/g \* Max outside, (Worst-case extrapolation)  
Coarse: Dx = 10.0, Dy = 10.0, Dz = 10.0  
Penetration depth: 18.5 (15.3, 22.0) [mm]  
Powerdrift: -0.25 dB



SN# 295651232003

Ch# 1001 / Pwr Step: 2 (OTA) / Antenna Position: Fixed / Battery Model #: SNN5705A / DEVICE POSITION (cheek or rotated): Tilted  
R3 Glycol TP-1157 SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 1880 MHz  
Probe: ET3DV6R - SN1522 - IEEE Head; ConvF(3.40,3.40,3.40); Crest factor: 3.0; 1880 MHz Head & Body:  $\sigma = 1.44$  mho/m  $\epsilon_r = 38.6$   $\rho = 1.00$  g/cm<sup>3</sup>  
Cube 7x7x7: SAR (1g): 0.0607 mW/g, SAR (10g): 0.0375 mW/g, (Worst-case extrapolation)  
Coarse: Dx = 10.0, Dy = 10.0, Dz = 10.0  
Penetration depth: 11.0 (9.7, 12.6) [mm]  
Powerdrift: -0.15 dB



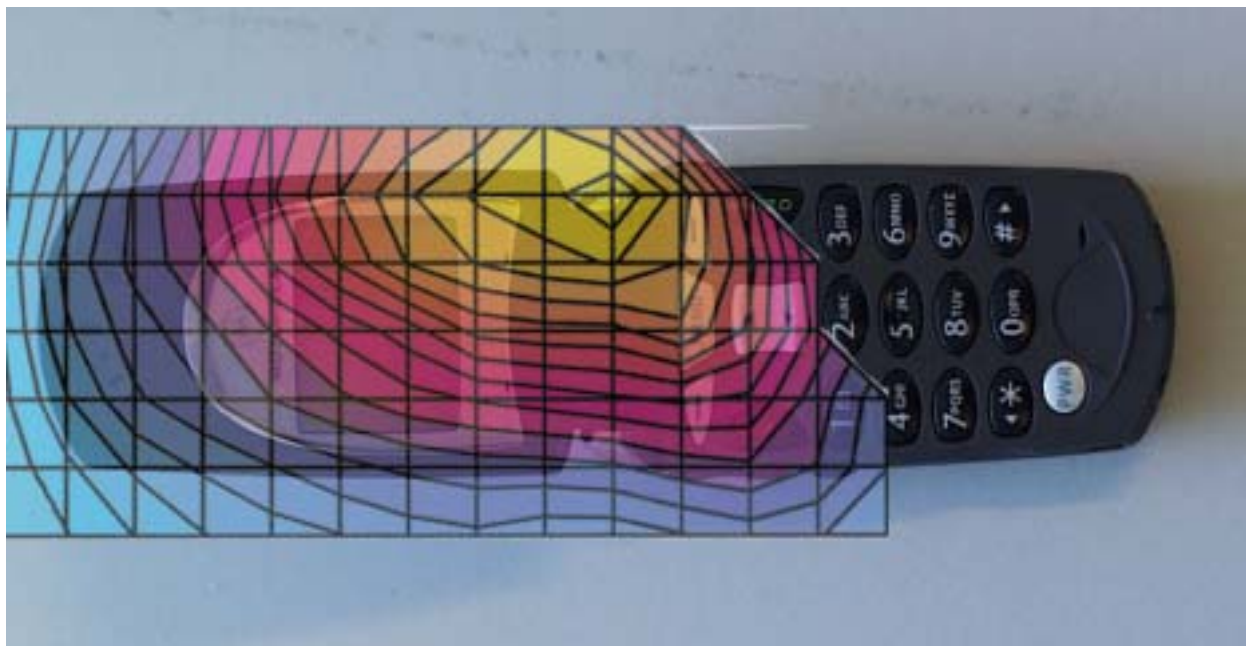


Figure 3. Typical 800MHz Head Adjacent Contour Overlaid on Phone (15 ° Tilt)

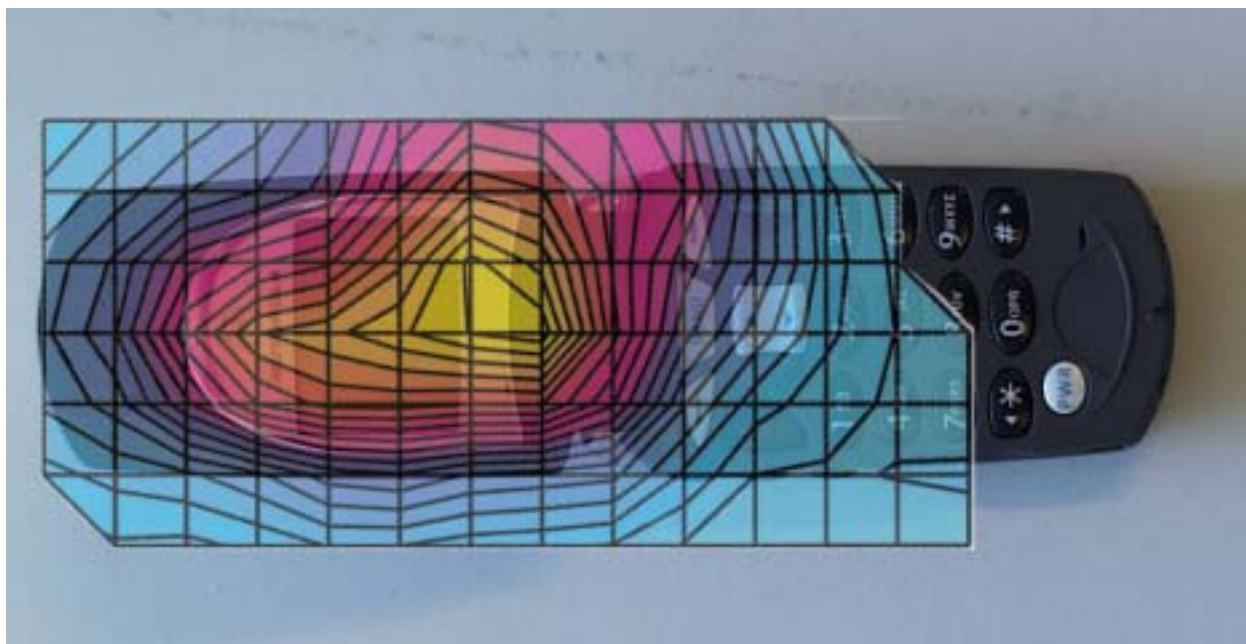


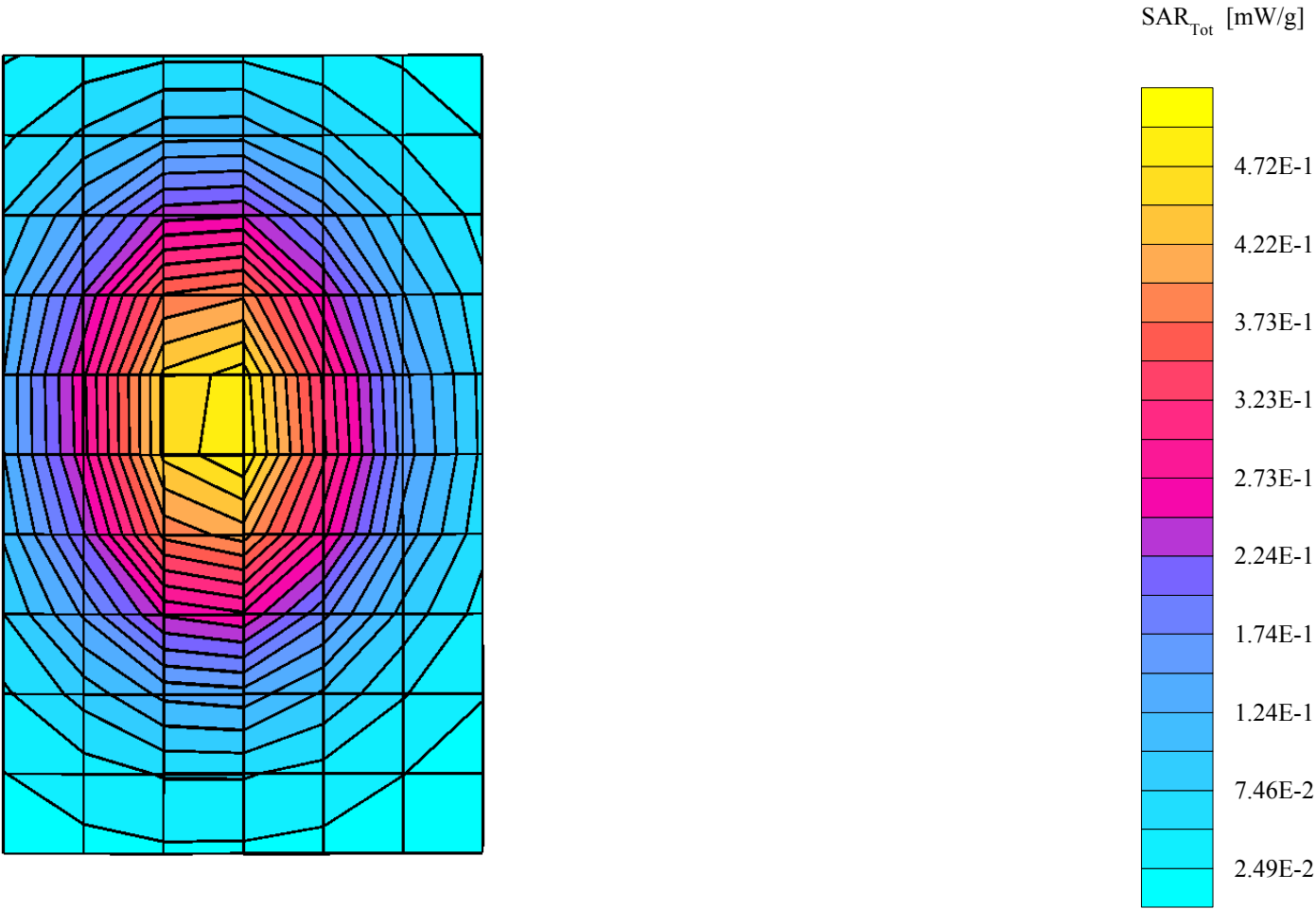
Figure 4. Typical 1900MHz Head Adjacent Contour Overlaid on Phone (15 ° Tilt)

### **Appendix 3**

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

# SN# 195651232002

Ch# 383 / Pwr Step: 2 / Antenna Position: FIXED / Battery Model #: SNN5705A / Accessory Model #: SYN0375A  
R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 836 MHz  
Probe: ET3DV6R - SN1522 - FCC Body; ConvF(4.40,4.40,4.40); Crest factor: 1.0; 835 MHz Head & Body:  $\sigma = 0.95$  mho/m  $\epsilon_r = 54.2$   $\rho = 1.00$  g/cm<sup>3</sup>  
Cube 7x7x7: SAR (1g): 0.497 mW/g, SAR (10g): 0.351 mW/g, (Worst-case extrapolation)  
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0  
Penetration depth: 16.3 (15.0, 17.7) [mm]  
Powerdrift: -0.36 dB



SN# 1956501232003

Ch# 1001 / Pwr Step: 2 / Antenna Position:FIXED / Battery Model #: SNN5705A / Accessory Model #: SYN0375A

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz

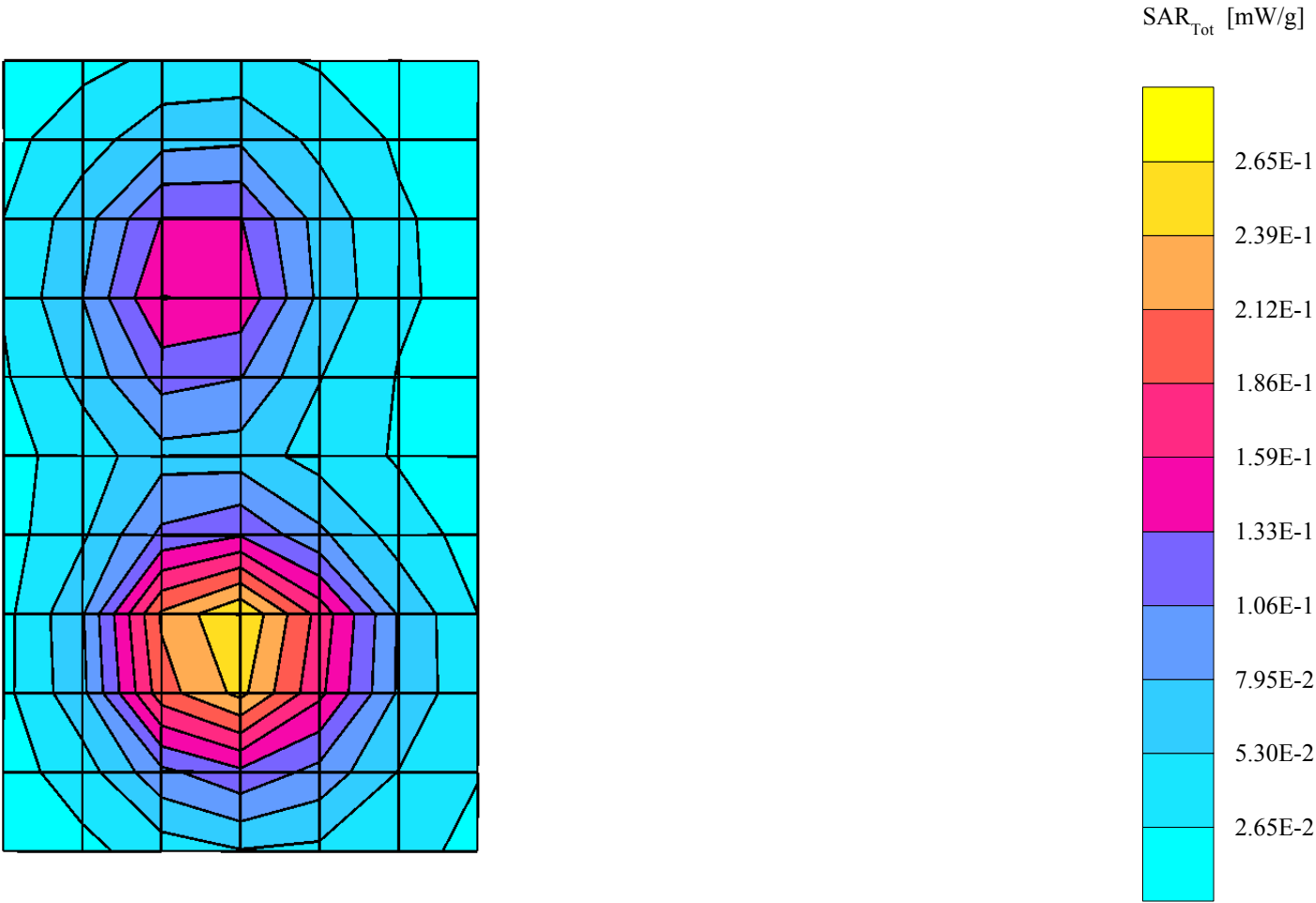
Probe: ET3DV6R - SN1522 - FCC Body; ConvF(3.10,3.10,3.10); Crest factor: 3.0; 1880 MHz Head & Body:  $\sigma = 1.59$  mho/m  $\epsilon_r = 52.5$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.279 mW/g, SAR (10g): 0.170 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 11.0 (9.6, 13.0) [mm]

Powerdrift: -0.08 dB



s/n: 195651232003

Ch# 383 / Pwr Step: 2 / Type of Modulation: Analog / Battery Model #: SNN5705A

Accessory Model #: Leather Holster SNN8875A

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 836 MHz

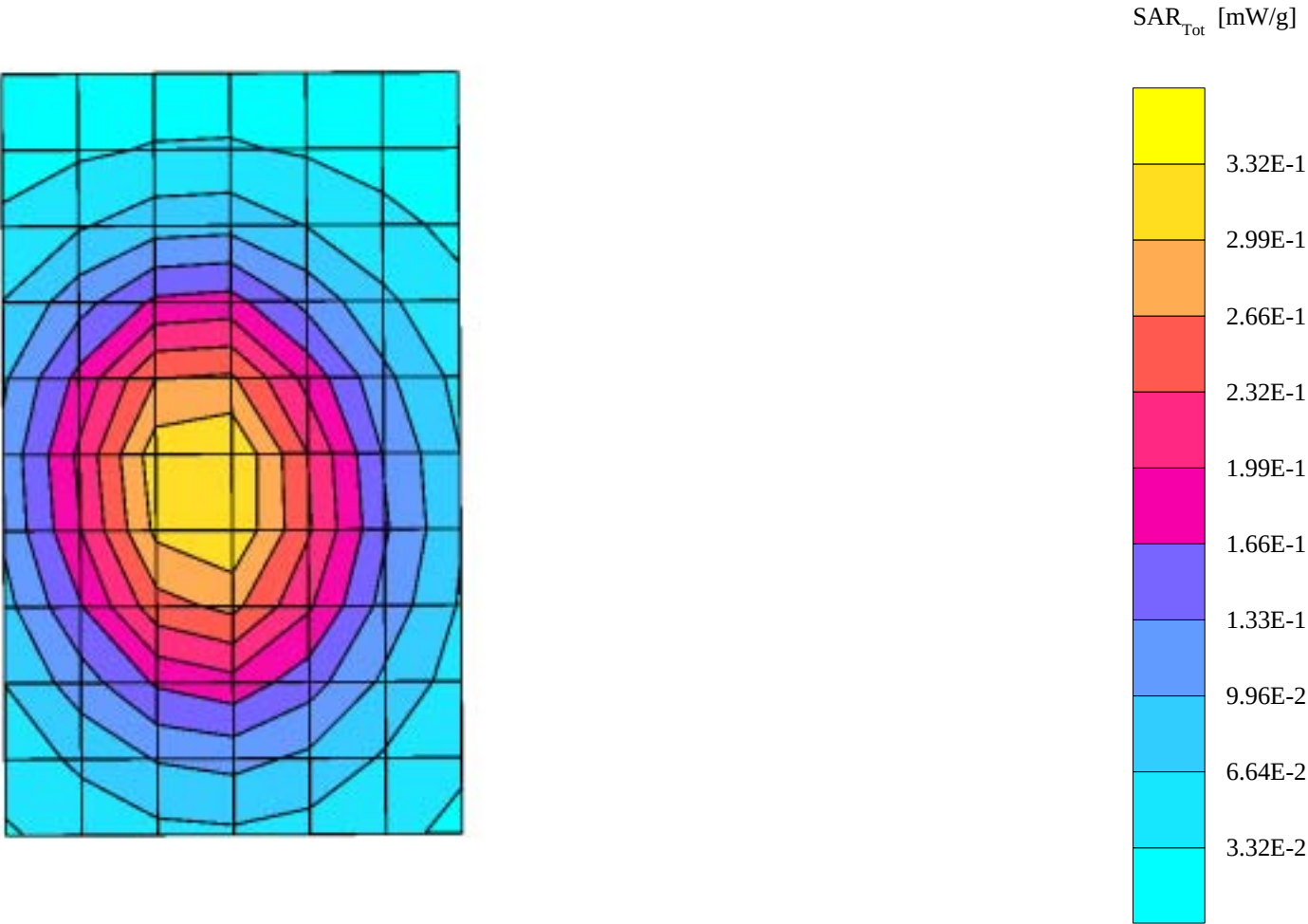
Probe: ET3DV6R - SN1522 - FCC Body; ConvF(4.40,4.40,4.40); Crest factor: 1.0; 835 MHz Head & Body:  $\sigma = 0.95$  mho/m  $\epsilon_r = 54.2$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.332 mW/g, SAR (10g): 0.238 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 16.4 (15.4, 17.5) [mm]

Powerdrift: -0.38 dB



s/n: 295651232003

Ch# 1001 / Pwr Step: 2 / Type of Modulation: TDMA1900 / Battery Model #: SNN5705A

Accessory Model #: SYN8875A

R3 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz

Probe: ET3DV6R - SN1522 - FCC Body; ConvF(3.10,3.10,3.10); Crest factor: 3.0; 1880 MHz Head & Body:  $\sigma = 1.59$  mho/m  $\epsilon_r = 52.5$   $\rho = 1.00$  g/cm<sup>3</sup>

Cube 7x7x7: SAR (1g): 0.287 mW/g, SAR (10g): 0.150 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0

Penetration depth: 8.8 (8.3, 9.9) [mm]

Powerdrift: -0.10 dB



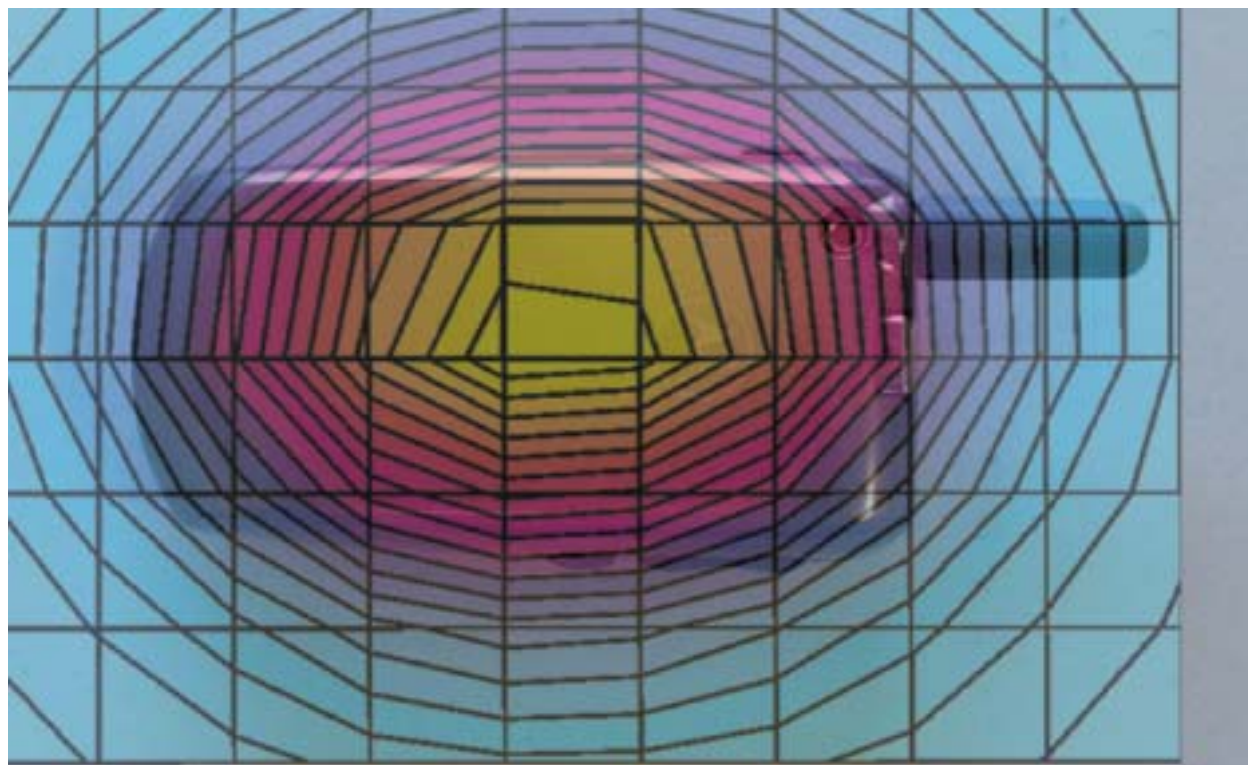


Figure 5. Typical 800 MHz Body-Worn Contour Overlaid on Phone

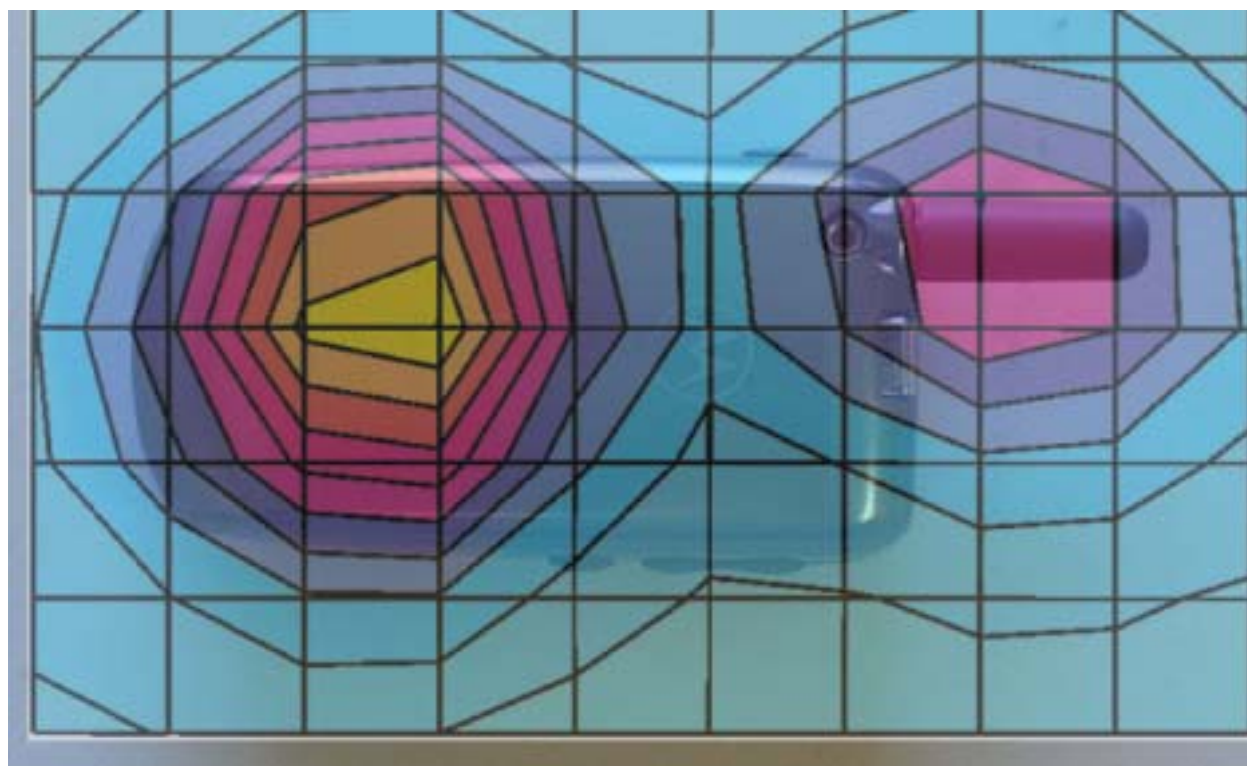


Figure 6. Typical 1900 MHz Body-Worn Contour Overlaid on Phone

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

# Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

## Calibration Certificate

### Dosimetric E-Field Probe

Type:

**ET3DV6R**

Serial Number:

**1522**

Place of Calibration:

**Zurich**

Date of Calibration:

**April 25, 2002**

Calibration Interval:

**12 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

*U. Vella*

Approved by:

*Marie Kutz*

# Probe ET3DV6R

## SN:1522

|                   |                |
|-------------------|----------------|
| Manufactured:     | March 21, 2000 |
| Last calibration: | May 11, 2001   |
| Remade ET3DV6R:   | April 12, 2002 |
| Recalibrated:     | April 25, 2002 |

Calibrated for System DASY3

**DASY3 - Parameters of Probe: ET3DV6R SN:1522****Sensitivity in Free Space**

|       |                                          |
|-------|------------------------------------------|
| NormX | $1.41 \mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | $1.26 \mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | $1.29 \mu\text{V}/(\text{V}/\text{m})^2$ |

**Diode Compression**

|       |           |    |
|-------|-----------|----|
| DCP X | <b>96</b> | mV |
| DCP Y | <b>96</b> | mV |
| DCP Z | <b>96</b> | mV |

**Sensitivity in Tissue Simulating Liquid**

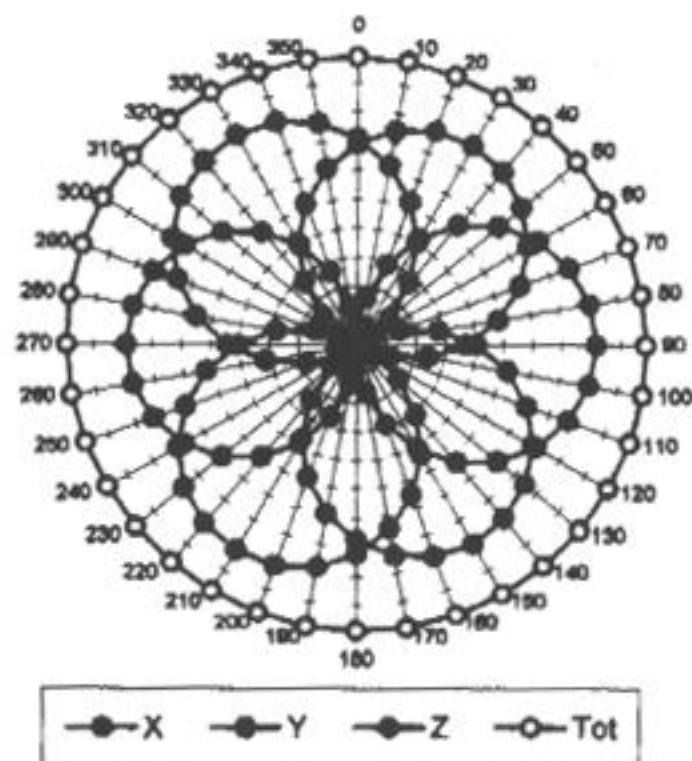
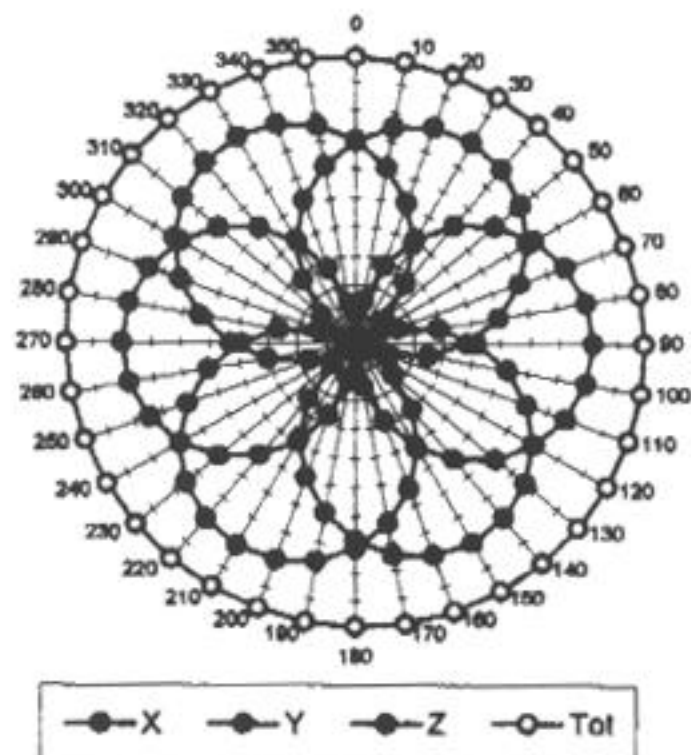
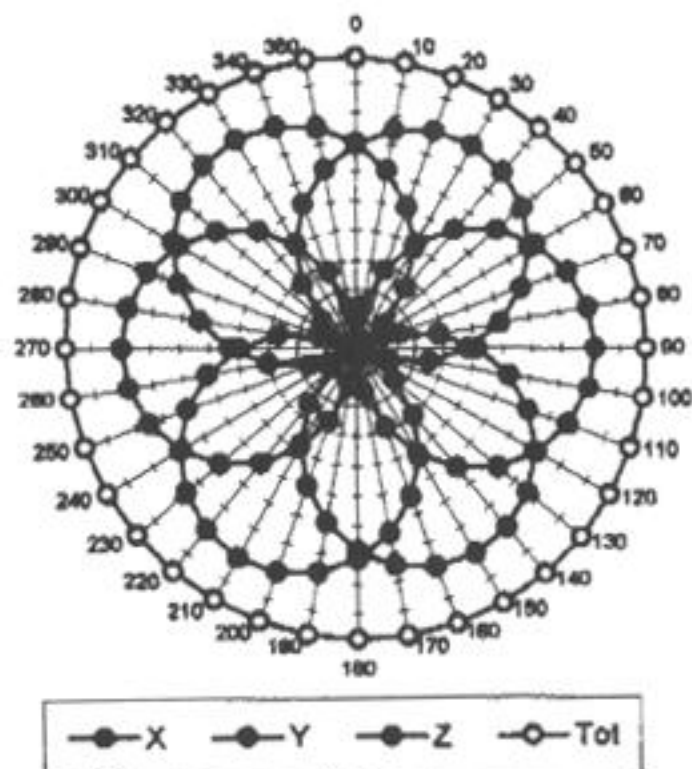
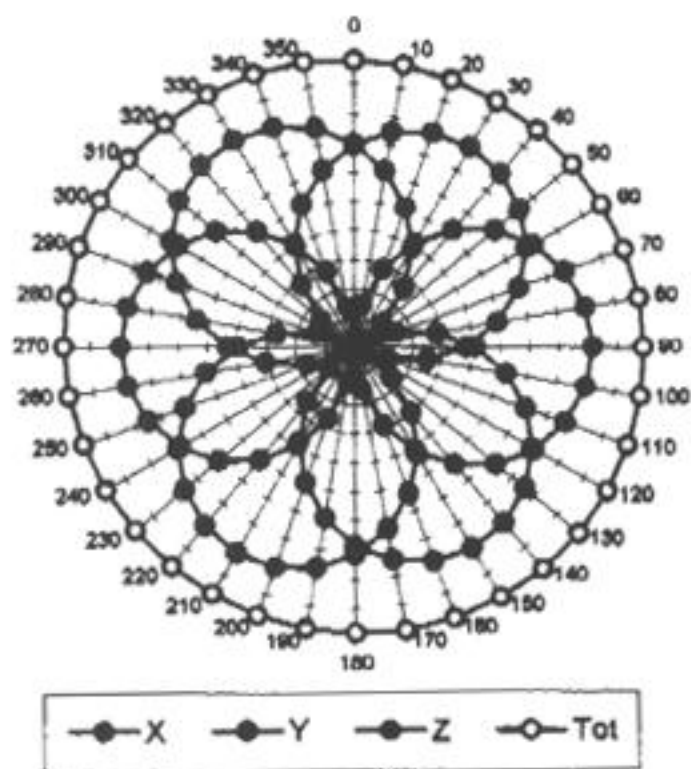
|         |                 |                             |                                              |
|---------|-----------------|-----------------------------|----------------------------------------------|
| Head    | <b>900 MHz</b>  | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho}/\text{m}$ |
| Head    | <b>835 MHz</b>  | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\% \text{ mho}/\text{m}$ |
| ConvF X | <b>4.5</b>      | $\pm 9.5\% (k=2)$           | Boundary effect:                             |
| ConvF Y | <b>4.5</b>      | $\pm 9.5\% (k=2)$           | Alpha <b>0.50</b>                            |
| ConvF Z | <b>4.5</b>      | $\pm 9.5\% (k=2)$           | Depth <b>1.97</b>                            |
| Head    | <b>1800 MHz</b> | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho}/\text{m}$ |
| Head    | <b>1900 MHz</b> | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho}/\text{m}$ |
| ConvF X | <b>3.4</b>      | $\pm 9.5\% (k=2)$           | Boundary effect:                             |
| ConvF Y | <b>3.4</b>      | $\pm 9.5\% (k=2)$           | Alpha <b>0.46</b>                            |
| ConvF Z | <b>3.4</b>      | $\pm 9.5\% (k=2)$           | Depth <b>2.74</b>                            |

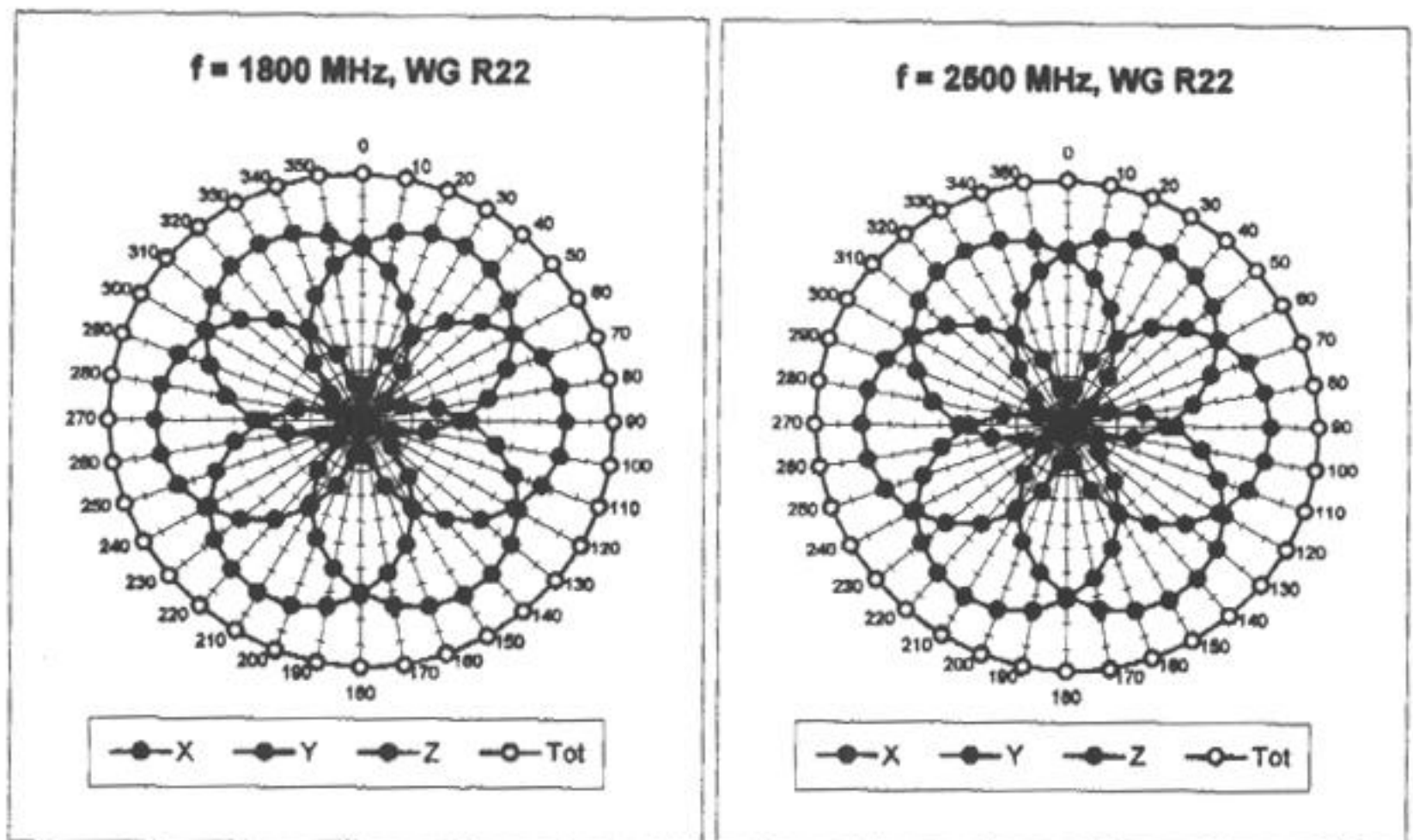
**Boundary Effect**

|                                                    |                 |                                   |             |
|----------------------------------------------------|-----------------|-----------------------------------|-------------|
| Head                                               | <b>900 MHz</b>  | Typical SAR gradient: 5 % per mm  |             |
| Probe Tip to Boundary                              |                 | <b>1 mm</b>                       | <b>2 mm</b> |
| SAR <sub>ba</sub> [%] Without Correction Algorithm |                 | <b>8.3</b>                        | <b>4.8</b>  |
| SAR <sub>ba</sub> [%] With Correction Algorithm    |                 | <b>0.0</b>                        | <b>0.1</b>  |
| Head                                               | <b>1800 MHz</b> | Typical SAR gradient: 10 % per mm |             |
| Probe Tip to Boundary                              |                 | <b>1 mm</b>                       | <b>2 mm</b> |
| SAR <sub>ba</sub> [%] Without Correction Algorithm |                 | <b>13.1</b>                       | <b>9.6</b>  |
| SAR <sub>ba</sub> [%] With Correction Algorithm    |                 | <b>0.4</b>                        | <b>0.5</b>  |

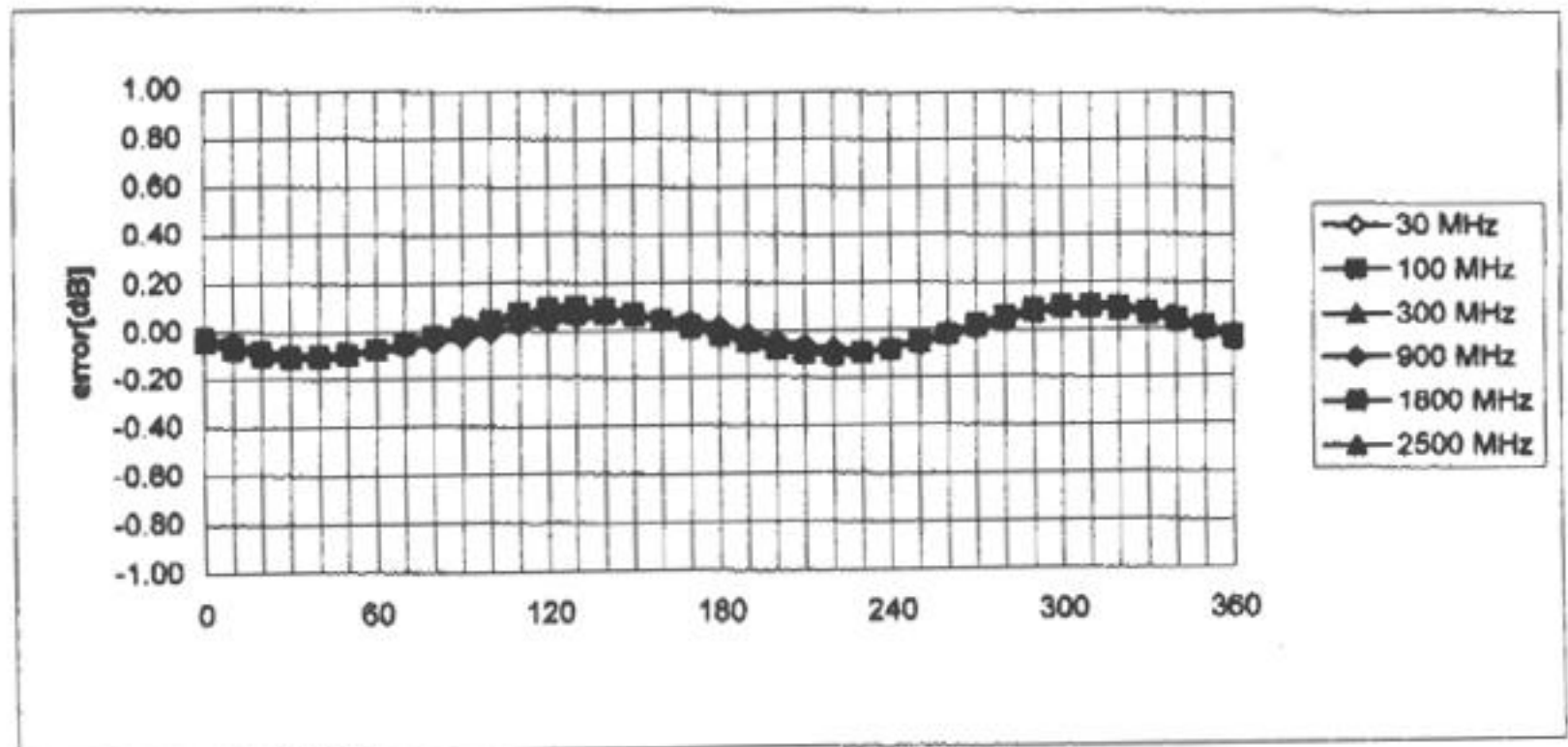
**Sensor Offset**

|                            |            |    |
|----------------------------|------------|----|
| Probe Tip to Sensor Center | <b>2.7</b> | mm |
|----------------------------|------------|----|

Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$  $f = 30$  MHz, TEM cell I#110 $f = 100$  MHz, TEM cell I#110 $f = 300$  MHz, TEM cell I#110 $f = 900$  MHz, TEM cell I#110

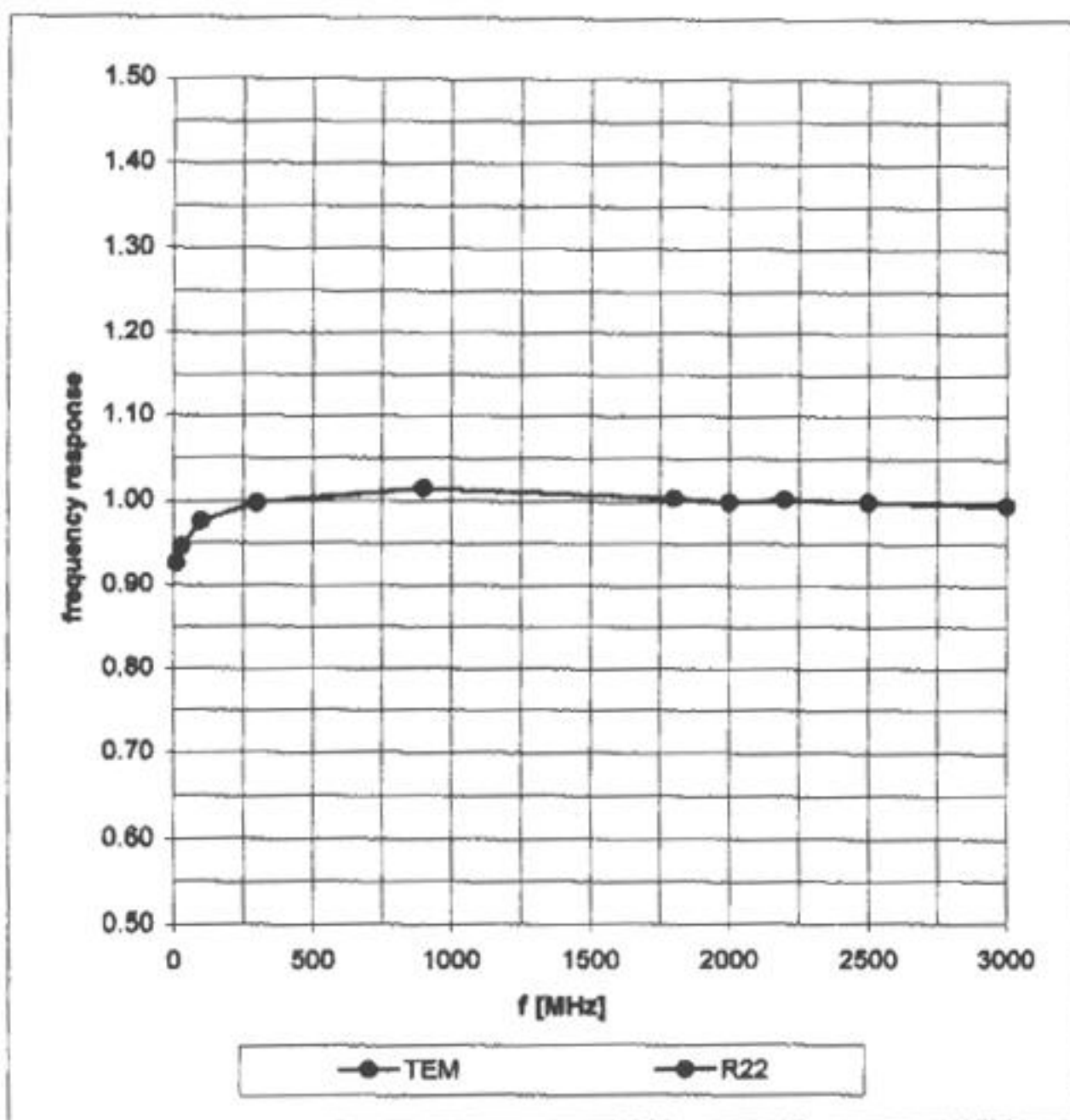


### Isotropy Error ( $\phi$ ), $\theta = 0^\circ$

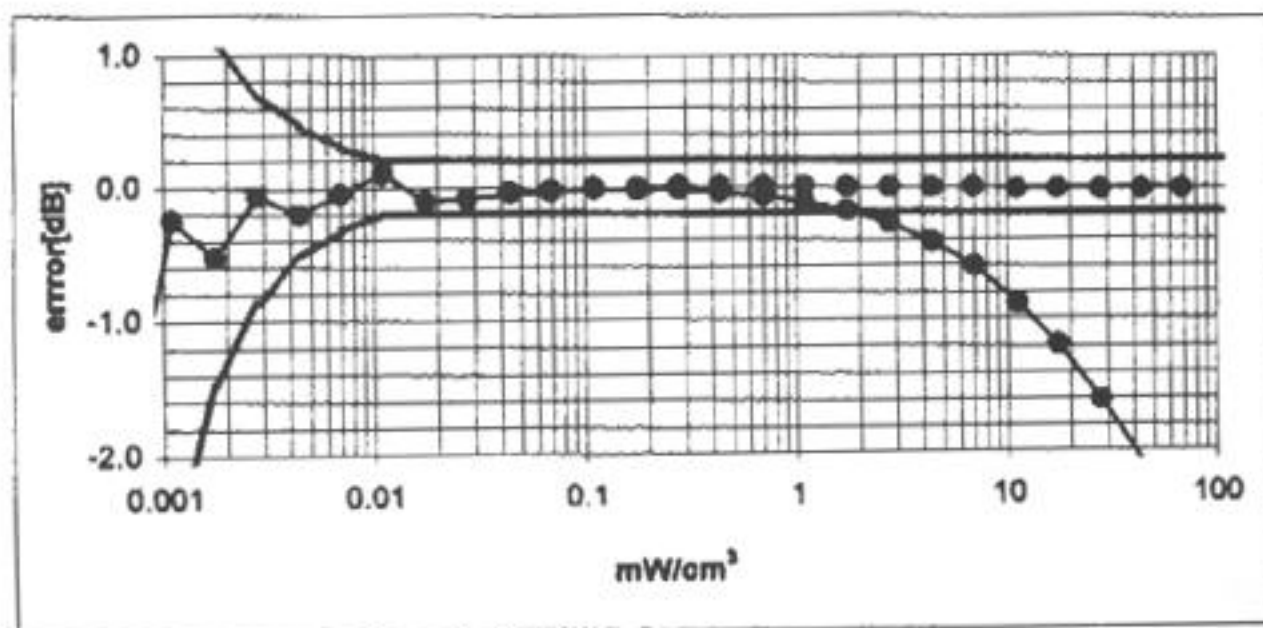
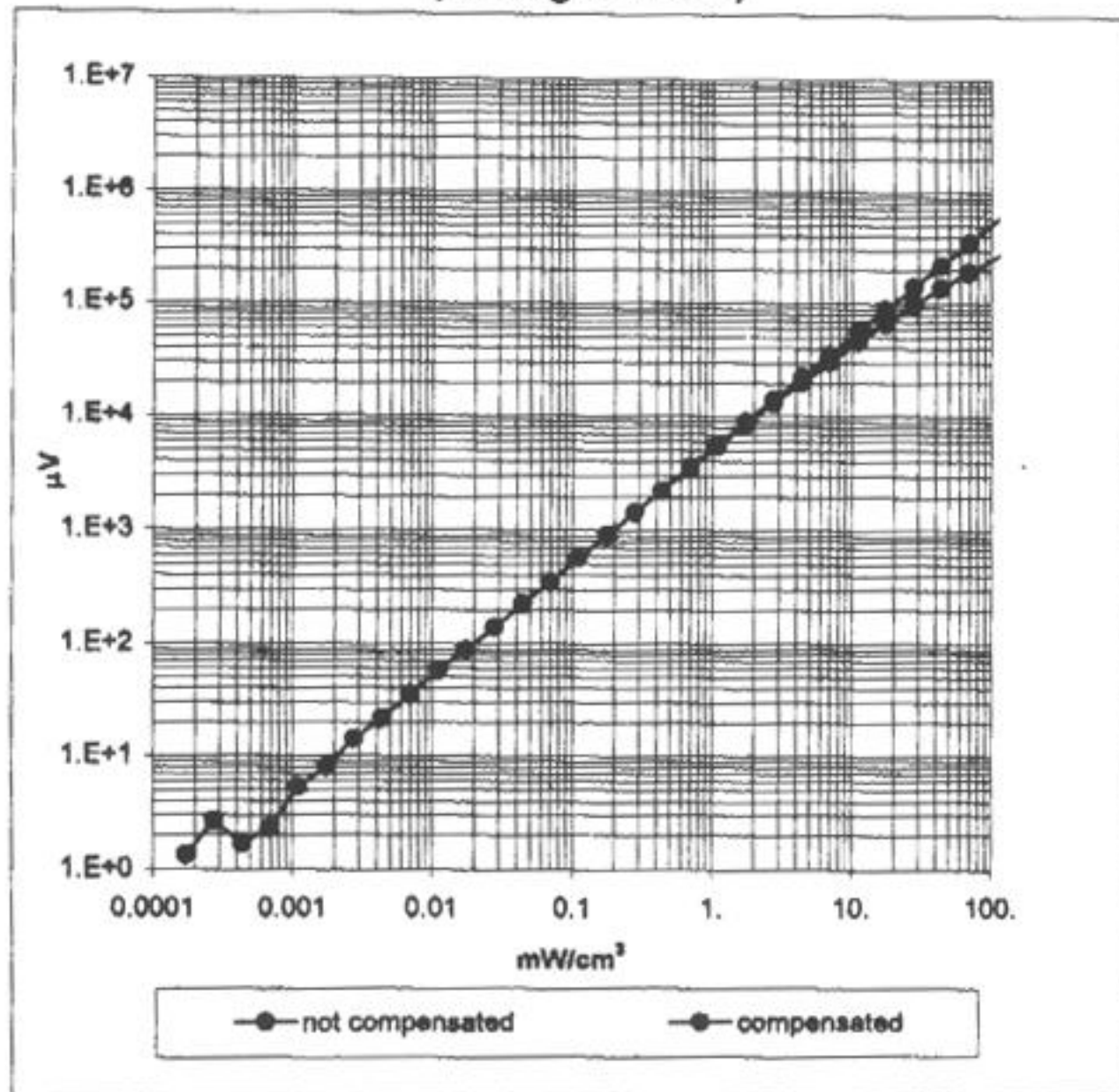


## Frequency Response of E-Field

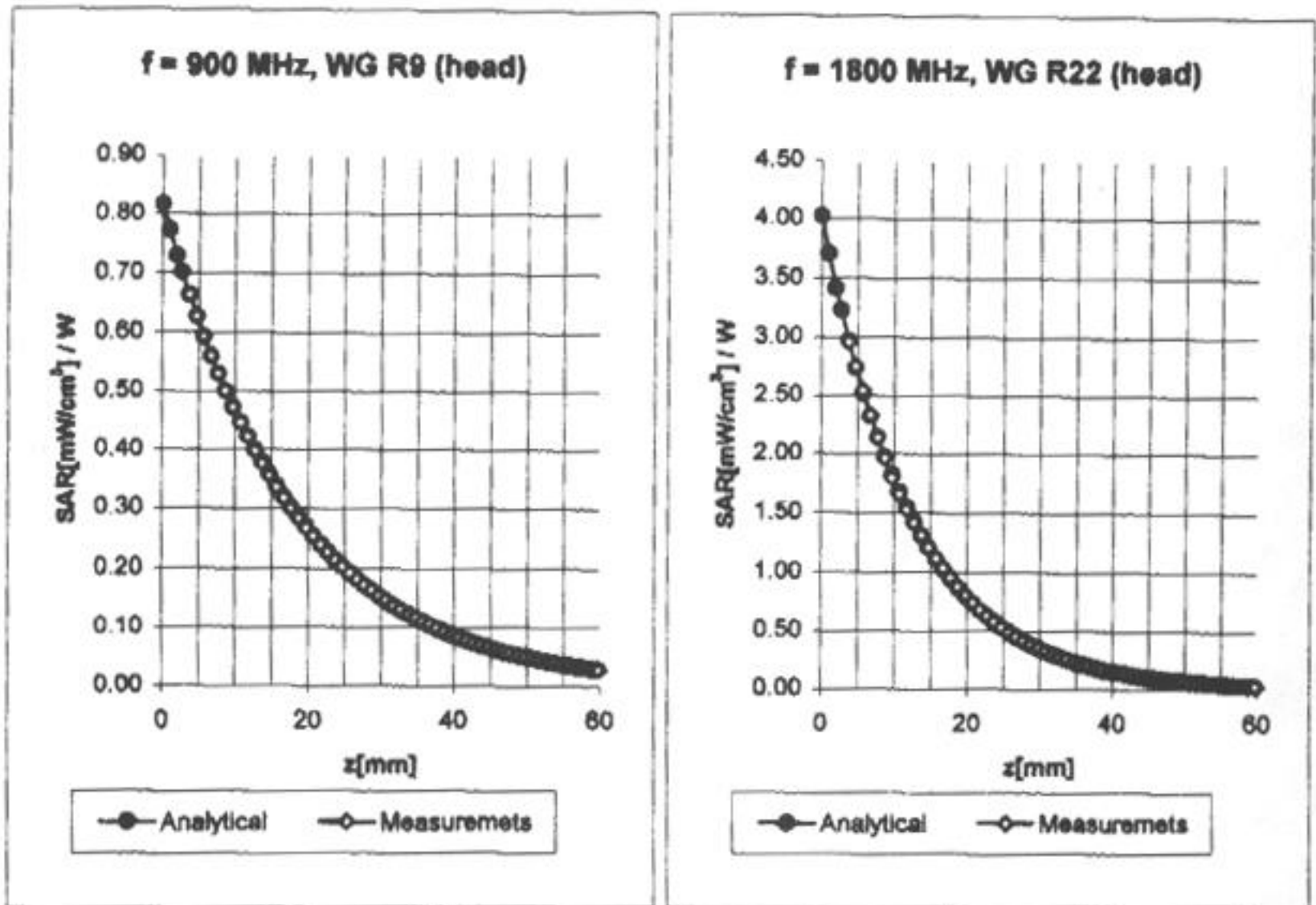
( TEM-Cell:ifl110, Waveguide R22)



# Dynamic Range $f(\text{SAR}_{\text{brain}})$ ( Waveguide R22 )



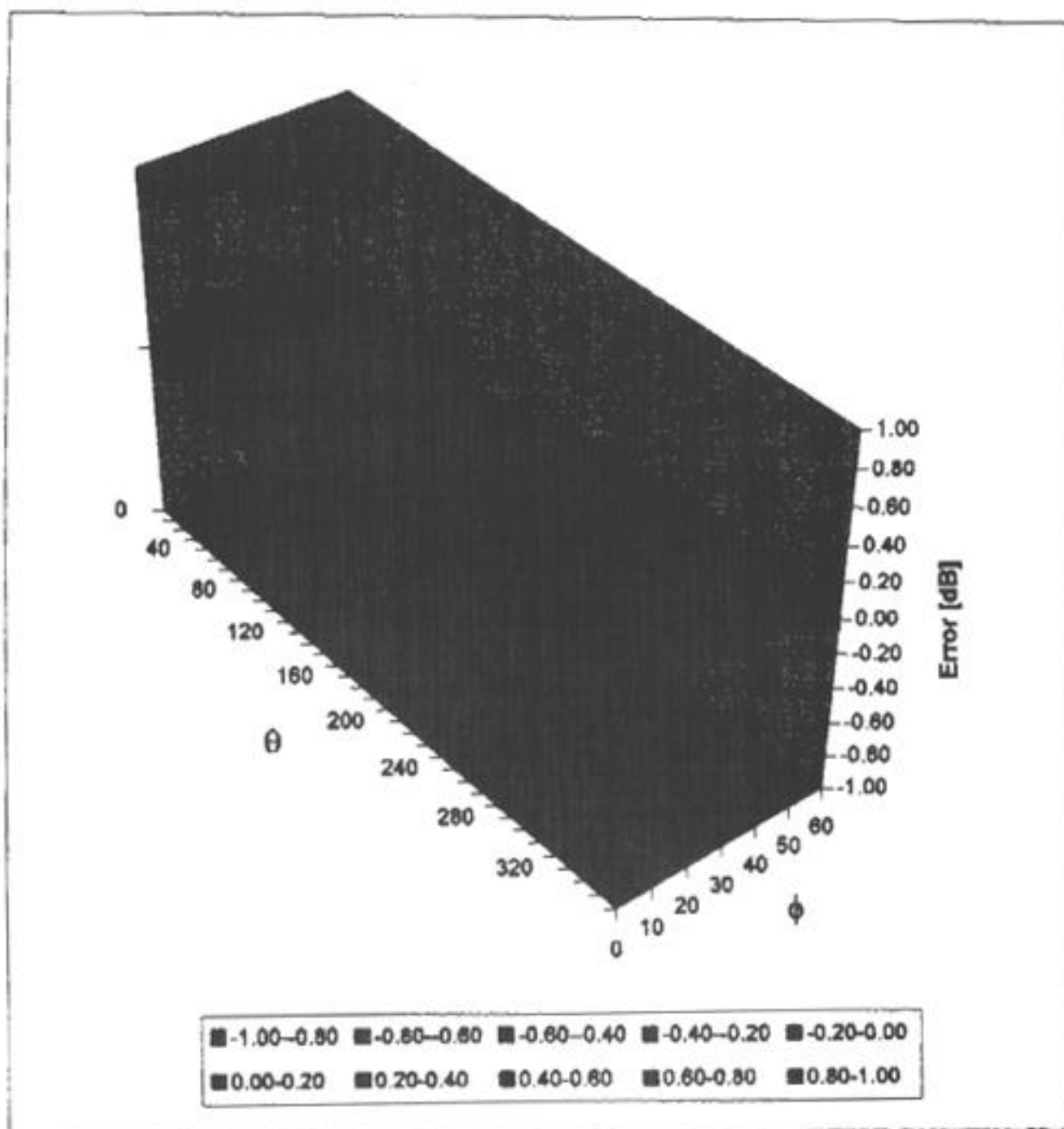
## Conversion Factor Assessment



|      |          |                             |                               |
|------|----------|-----------------------------|-------------------------------|
| Head | 900 MHz  | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\%$ mho/m |
| Head | 835 MHz  | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\%$ mho/m |
|      | ConvF X  | 4.5 $\pm$ 9.5% (k=2)        | Boundary effect:              |
|      | ConvF Y  | 4.6 $\pm$ 9.5% (k=2)        | Alpha 0.50                    |
|      | ConvF Z  | 4.5 $\pm$ 9.5% (k=2)        | Depth 1.97                    |
|      |          |                             |                               |
| Head | 1800 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\%$ mho/m |
| Head | 1900 MHz | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\%$ mho/m |
|      | ConvF X  | 3.4 $\pm$ 9.5% (k=2)        | Boundary effect:              |
|      | ConvF Y  | 3.4 $\pm$ 9.5% (k=2)        | Alpha 0.46                    |
|      | ConvF Z  | 3.4 $\pm$ 9.5% (k=2)        | Depth 2.74                    |

# Deviation from Isotropy in HSL

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



## Additional Conversion Factors for Dosimetric E-Field Probe

Type:

**ET3DV6R**

Serial Number:

**1522**

Place of Assessment:

**Zurich**

Date of Assessment:

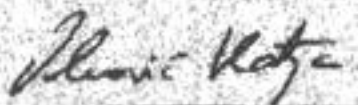
**May 8, 2002**

Probe Calibration Date:

**April 25, 2002**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:



# Dosimetric E-Field Probe ET3DV6R SN:1522

Conversion factor ( $\pm$  standard deviation)

835 MHz      ConvF       $4.6 \pm 8\%$

$\epsilon_r = 41.5 \pm 5\%$   
 $\sigma = 0.90 \pm 5\% \text{ mho/m}$   
(head tissue)

1950 MHz      ConvF       $3.2 \pm 8\%$

$\epsilon_r = 40.0 \pm 5\%$   
 $\sigma = 1.40 \pm 5\% \text{ mho/m}$   
(head tissue)

835 MHz      ConvF       $4.4 \pm 8\%$

$\epsilon_r = 55.2 \pm 5\%$   
 $\sigma = 0.97 \pm 5\% \text{ mho/m}$   
(body tissue)

900 MHz      ConvF       $4.3 \pm 8\%$

$\epsilon_r = 55.0 \pm 5\%$   
 $\sigma = 1.05 \pm 5\% \text{ mho/m}$   
(body tissue)

1800 MHz      ConvF       $3.1 \pm 8\%$

$\epsilon_r = 53.3 \pm 5\%$   
 $\sigma = 1.52 \pm 5\% \text{ mho/m}$   
(body tissue)

1950 MHz      ConvF       $3.0 \pm 8\%$

$\epsilon_r = 53.3 \pm 5\%$   
 $\sigma = 1.52 \pm 5\% \text{ mho/m}$   
(body tissue)

**Appendix 5**  
**Dipole Characterization Certificate**

# Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

## Calibration Certificate

### 1800 MHz System Validation Dipole

Type:

**D1800V2**

Serial Number:

**259**

Place of Calibration:

**Zurich**

Date of Calibration:

**January 25, 2002**

Calibration Interval:

**24 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

*N. Łolaski Nevia*

Approved by:

*Heinrich Kitz*

**Schmid & Partner  
Engineering AG**

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

**DASY**

**Dipole Validation Kit**

**Type: D1800V2**

**Serial: 259**

**Manufactured: December 23, 1999**  
**Calibrated: January 25, 2002**

## **1. Measurement Conditions**

The measurements were performed in the flat section of the new generic twin phantom filled with head simulating solution of the following electrical parameters at 1800 MHz:

|                        |            |      |
|------------------------|------------|------|
| Relative Dielectricity | 39.6       | ± 5% |
| Conductivity           | 1.37 mho/m | ± 5% |

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.31 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.

The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

## **2. SAR Measurement**

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1 (description of the modifications performed on the dipole are presented in section 4.). The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

|                                                    |           |
|----------------------------------------------------|-----------|
| averaged over 1 cm <sup>3</sup> (1 g) of tissue:   | 39.3 mW/g |
| averaged over 10 cm <sup>3</sup> (10 g) of tissue: | 20.6 mW/g |

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

### **3. Dipole Impedance and Return Loss**

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

|                      |          |                                       |
|----------------------|----------|---------------------------------------|
| Electrical delay:    | 1.171 ns | (one direction)                       |
| Transmission factor: | 0.990    | (voltage transmission, one direction) |

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

|                                  |                                |
|----------------------------------|--------------------------------|
| Feedpoint impedance at 1800 MHz: | $\text{Re}\{Z\} = 52.8 \Omega$ |
|                                  | $\text{Im}\{Z\} = 5.6 \Omega$  |
| Return Loss at 1800 MHz          | -24.4 dB                       |

### **4. Modification**

Small end caps (3 mm in length) made of Teflon have been added to the dipole arms by the Client. The overall dipole length has not been affected and is still according to the Standard.

### **5. SAR Measurement (w/o Teflon rings)**

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

|                                                    |           |
|----------------------------------------------------|-----------|
| averaged over 1 cm <sup>3</sup> (1 g) of tissue:   | 40.4 mW/g |
| averaged over 10 cm <sup>3</sup> (10 g) of tissue: | 21.0 mW/g |

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

#### **6. Dipole Impedance and Return Loss (w/o Teflon rings)**

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 1800 MHz:  $\text{Re}\{Z\} = 47.3 \Omega$

$\text{Im}\{Z\} = -6.2 \Omega$

Return Loss at 1800 MHz **-23.2 dB**

#### **7. Handling**

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

#### **8. Design**

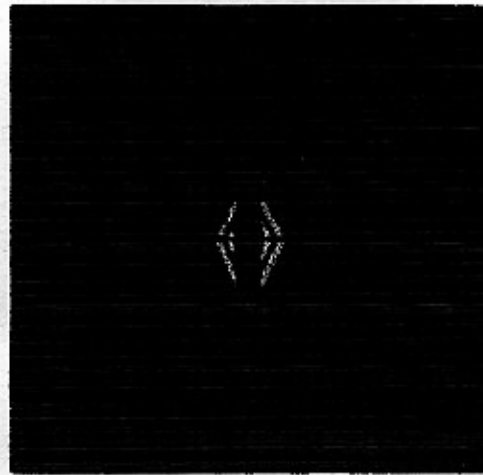
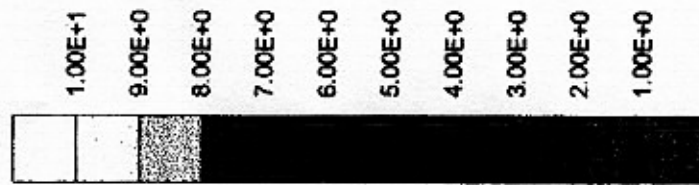
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

#### **9. Power Test**

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

# Validation Dipole D1800V2 SN:259, d = 10 mm (with Teflon rings)

Frequency: 1800 MHz, Antenna Input Power: 250 [mW]  
 SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0  
 Probe: ET3DV6 - SN1507; ConvF(5.31, 5.31, 5.31) at 1800 MHz; IEEE1528 1800 MHz;  $\sigma = 1.37$  mho/m  $\epsilon_r = 39.6$   $\rho = 1.00$  g/cm<sup>3</sup>  
 Cubes (2): Peak: 18.5 mW/g  $\pm 0.01$  dB, SAR (1g): 9.83 mW/g  $\pm 0.02$  dB, SAR (10g): 5.15 mW/g  $\pm 0.01$  dB, (Worst-case extrapolation)  
 Penetration depth: 8.3 (7.8, 9.3) [mm]  
 Powerdrift: 0.00 dB

SAR<sub>Tot</sub> [mW/g]

25 Jan 2002 15:48:33

CH1 S11 1 U FS

1: 52.838  $\alpha$  5.5547  $\alpha$  491.14 pH

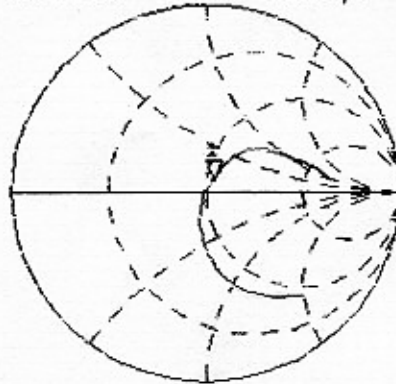
1 800.000 000 MHz

Del

Cor

Avg  
16

↑

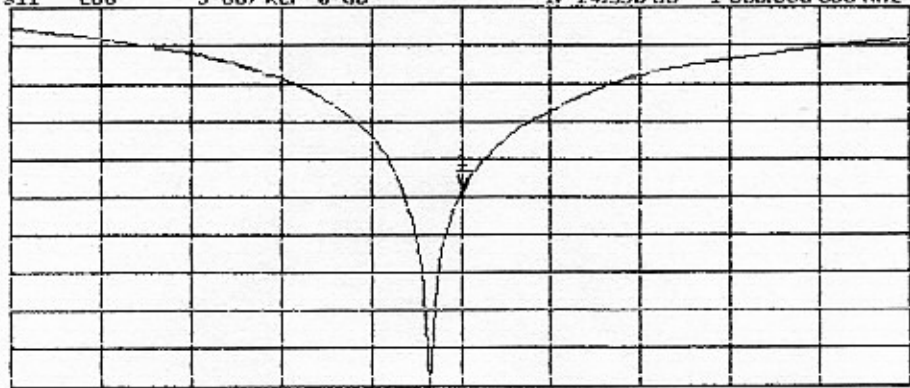


CH2 S11 LOG 5 dB/REF 0 dB 1: -24.350 dB 1 800.000 000 MHz

Cor

Avg  
16

↑

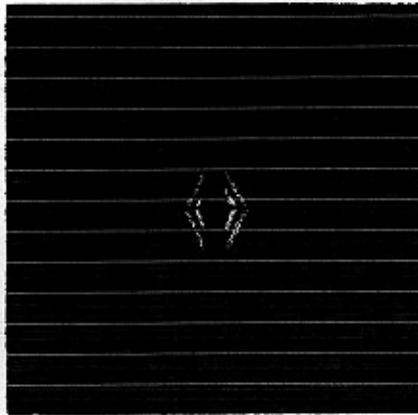
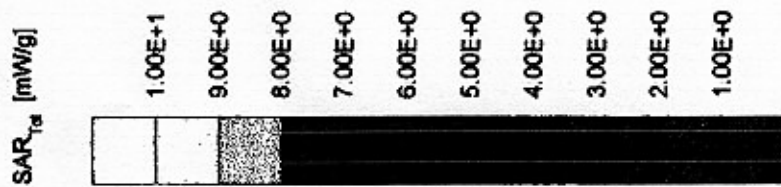


CENTER 1 800.000 000 MHz

SPAN 800.000 000 MHz

# Validation Dipole D1800V2 SN:259, d = 10 mm (w/o Teflon rings)

Frequency: 1800 MHz; Antenna Input Power: 250 [mW]  
 SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0  
 Probe: ET3DV6 - SN1507; ConvF(5.31, 5.31, 5.31) at 1800 MHz; IEEE1528 1800 MHz;  $\sigma = 1.37$  mho/m  $\epsilon_r = 39.6$   $\rho = 1.00$  g/cm<sup>3</sup>  
 Cubes (2): Peak: 19.1 mW/g  $\pm 0.03$  dB, SAR (1g): 10.1 mW/g  $\pm 0.01$  dB, SAR (10g): 5.25 mW/g  $\pm 0.01$  dB, (Worst-case extrapolation)  
 Penetration depth: 8.3 (7.8, 9.3) [mm]  
 Powerdrift: -0.03 dB



25 Jan 2002 15:46:50

[CH1] S11 1 U FS

1: 47.332  $\Omega$  -6.2207  $\Omega$  14.214 pF

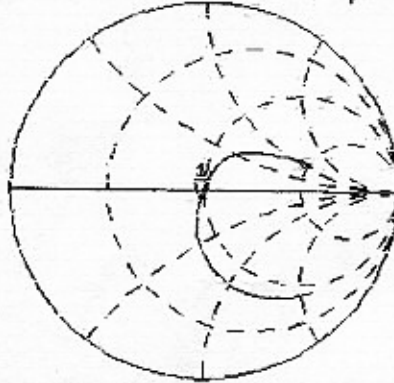
1 000.000 000 MHz

Del

Cor

Avg  
16

↑

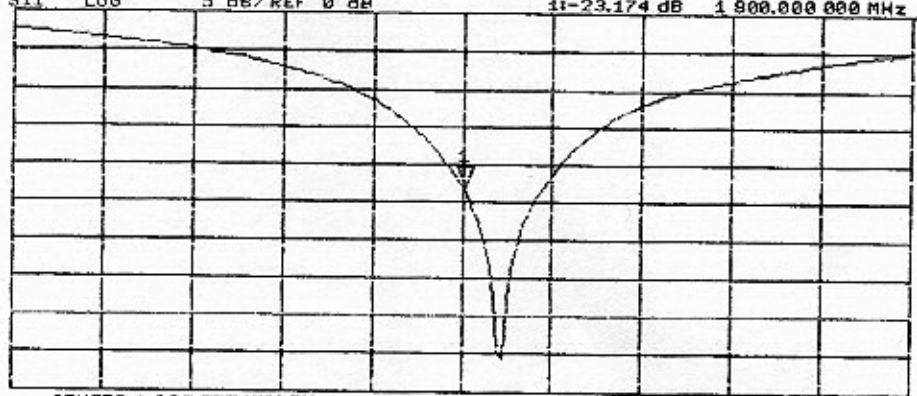


CH2 S11 LOG 5 dB/REF 0 dB 1: -23.174 dB 1 000.000 000 MHz

Cor

Avg  
16

↑



CENTER 1 000.000 000 MHz

SPAN 000.000 000 MHz

# Interim Dipole Correlation Certificate

FCD-0359, Rev.001

Dipole Serial Number:

080

Last Calibration Date:

13-Nov-02

Dipole Type (MHz):

900MHz dipole

Calibration Due:

13-Nov-04

Manufacturer:

SPEAG

## -Manufacturer's Original Calibration Information-

Dipole to be correlated: [Serial Number: 080 ]

|                                               |           |
|-----------------------------------------------|-----------|
| 1g SAR normalized to 1W forward power (mW/g): | 10.4 mW/g |
| Relative Dielectric:                          | 42.4      |
| Conductivity:                                 | 0.97      |
| Probe Serial Number:                          | 1507      |
| Forward Power:                                | 250 mW    |

Primary Dipole Referenced: [Serial Number: 77 ]

|                                               |           |
|-----------------------------------------------|-----------|
| 1g SAR normalized to 1W forward power (mW/g): | 11.4 mW/g |
| Relative Dielectric:                          | 40.3      |
| Conductivity:                                 | 0.95      |
| Probe Serial Number:                          | 1507      |
| Forward Power:                                | 250mW     |

## -Correlation Method Utilized- per DOI-1265

(select one)

By Similarity: ☒

By Transfer Calibration: ☐

## -Measured Data-

Probe S/N: 1308  
Robot Cell #: PCS-1

Conductivity (meas.): 0.96  
Permittivity (meas.): 40.0

Primary Standard (average of 0-degree & 90-degree 1g cubes):

3.07 mW/g (1W) (if required) (if required)

Secondary Standard (average of 0-degree & 90-degree 1g cubes):

3.02 mW/g (1W) (if required) (if required)

## -NEW Correlated Target-

|                                               |           |
|-----------------------------------------------|-----------|
| 1g SAR normalized to 1W forward power (mW/g): | 11.4 mW/g |
| Relative Dielectric:                          | 40.3      |
| Conductivity:                                 | 0.95      |

Approved by:

Antonio Fonseca

Date: 12/12/2002

Comments:

Correlated to get worst case extrapolation targets. Secondary measured within 2% of the primary standard.

**Appendix 6**  
**Measurement Uncertainty Budget**

| Uncertainty Budget for Device Under Test                                       |          |               |                |                   |                               |                                |                                     |                                      |                      |
|--------------------------------------------------------------------------------|----------|---------------|----------------|-------------------|-------------------------------|--------------------------------|-------------------------------------|--------------------------------------|----------------------|
| <i>a</i>                                                                       | <i>b</i> | <i>c</i>      | <i>d</i>       | <i>e = f(d,k)</i> | <i>f</i>                      | <i>g</i>                       | <i>h =<br/>c x f / e</i>            | <i>i =<br/>c x g / e</i>             | <i>k</i>             |
| Uncertainty Component                                                          | Sec.     | 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    | 9.5           | N              | 2.00              | 1                             | 1                              | 4.8                                 | 4.8                                  | ∞                    |
| Axial Isotropy                                                                 | E.2.2    | 4.7           | R              | 1.73              | 0.707                         | 0.707                          | 1.9                                 | 1.9                                  | ∞                    |
| Spherical Isotropy                                                             | E.2.2    | 9.6           | R              | 1.73              | 0.707                         | 0.707                          | 3.9                                 | 3.9                                  | ∞                    |
| Boundary Effect                                                                | E.2.3    | 5.8           | R              | 1.73              | 1                             | 1                              | 3.3                                 | 3.3                                  | ∞                    |
| 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    | 1.0           | N              | 1.00              | 1                             | 1                              | 1.0                                 | 1.0                                  | ∞                    |
| Response Time                                                                  | E.2.7    | 0.8           | R              | 1.73              | 1                             | 1                              | 0.5                                 | 0.5                                  | ∞                    |
| Integration Time                                                               | E.2.8    | 1.3           | R              | 1.73              | 1                             | 1                              | 0.8                                 | 0.8                                  | ∞                    |
| RF Ambient Conditions                                                          | E.6.1    | 3.0           | R              | 1.73              | 1                             | 1                              | 1.7                                 | 1.7                                  | ∞                    |
| Probe Positioner Mechanical Tolerance                                          | E.6.2    | 0.3           | R              | 1.73              | 1                             | 1                              | 0.2                                 | 0.2                                  | ∞                    |
| Probe Positioning with respect to Phantom Shell                                | E.6.3    | 1.1           | R              | 1.73              | 1                             | 1                              | 0.6                                 | 0.6                                  | ∞                    |
| Extrapolation, interpolation and Integration Algorithms for Max SAR Evaluation | E.5      | 3.9           | R              | 1.73              | 1                             | 1                              | 2.3                                 | 2.3                                  | ∞                    |
| <b>Test sample Related</b>                                                     |          |               |                |                   |                               |                                |                                     |                                      |                      |
| Test Sample Positioning                                                        | E.4.2    | 3.6           | N              | 1.00              | 1                             | 1                              | 3.6                                 | 3.6                                  | 29                   |
| Device Holder Uncertainty                                                      | E.4.1    | 2.8           | N              | 1.00              | 1                             | 1                              | 2.8                                 | 2.8                                  | 8                    |
| Output Power Variation - SAR drift measurement                                 | 6.6.2    | 5.0           | R              | 1.73              | 1                             | 1                              | 2.9                                 | 2.9                                  | ∞                    |
| <b>Phantom and Tissue Parameters</b>                                           |          |               |                |                   |                               |                                |                                     |                                      |                      |
| Phantom Uncertainty (shape and thickness tolerances)                           | E.3.1    | 4.0           | R              | 1.73              | 1                             | 1                              | 2.3                                 | 2.3                                  | ∞                    |
| Liquid Conductivity - deviation from target values                             | E.3.2    | 5.0           | R              | 1.73              | 0.64                          | 0.43                           | 1.8                                 | 1.2                                  | ∞                    |
| Liquid Conductivity - measurement uncertainty                                  | E.3.3    | 10.0          | R              | 1.73              | 0.64                          | 0.43                           | 3.7                                 | 2.5                                  | ∞                    |
| Liquid Permittivity - deviation from target values                             | E.3.2    | 10.0          | R              | 1.73              | 0.6                           | 0.49                           | 3.5                                 | 2.8                                  | ∞                    |
| Liquid Permittivity - measurement uncertainty                                  | E.3.3    | 5.0           | R              | 1.73              | 0.6                           | 0.49                           | 1.7                                 | 1.4                                  | ∞                    |
| <b>Combined Standard Uncertainty</b>                                           |          |               | RSS            |                   |                               |                                | 11.72                               | 11.09                                | 1363                 |
| <b>Expanded Uncertainty (95% CONFIDENCE LEVEL)</b>                             |          |               | <i>k</i> = 2   |                   |                               |                                | 22.98                               | 21.75                                |                      |

**Uncertainty Budget for System Performance Check (dipole & flat phantom)**

| <i>a</i>                                                                        | <i>b</i> | <i>c</i>      | <i>d</i>       | $e = f(d, k)$ | <i>f</i>       | <i>g</i>        | $h = c \times f / e$ | $i = c \times g / e$  | <i>k</i> |
|---------------------------------------------------------------------------------|----------|---------------|----------------|---------------|----------------|-----------------|----------------------|-----------------------|----------|
| Uncertainty Component                                                           | Sec.     | Tol.<br>(± %) | Prob.<br>Dist. | Div.          | $c_i$<br>(1 g) | $c_i$<br>(10 g) | 1 g<br>$u_i$<br>(±%) | 10 g<br>$u_i$<br>(±%) | $v_i$    |
| <b>Measurement System</b>                                                       |          |               |                |               |                |                 |                      |                       |          |
| Probe Calibration                                                               | E.2.1    | 9.5           | N              | 2.00          | 1              | 1               | 4.8                  | 4.8                   | ∞        |
| 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    | 5.8           | R              | 1.73          | 1              | 1               | 3.3                  | 3.3                   | ∞        |
| 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    | 1.0           | N              | 1.00          | 1              | 1               | 1.0                  | 1.0                   | ∞        |
| Response Time                                                                   | E.2.7    | 0.0           | R              | 1.73          | 1              | 1               | 0.0                  | 0.0                   | ∞        |
| Integration Time                                                                | E.2.8    | 0.0           | R              | 1.73          | 1              | 1               | 0.0                  | 0.0                   | ∞        |
| RF Ambient Conditions                                                           | E.6.1    | 3.0           | R              | 1.73          | 1              | 1               | 1.7                  | 1.7                   | ∞        |
| Probe Positioner Mechanical Tolerance                                           | E.6.2    | 0.3           | R              | 1.73          | 1              | 1               | 0.2                  | 0.2                   | ∞        |
| Probe Positioning with respect to Phantom Shell                                 | E.6.3    | 1.1           | R              | 1.73          | 1              | 1               | 0.6                  | 0.6                   | ∞        |
| Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation | E.5      | 3.9           | R              | 1.73          | 1              | 1               | 2.3                  | 2.3                   | ∞        |
| <b>Dipole</b>                                                                   |          |               |                |               |                |                 |                      |                       |          |
| Dipole Axis to Liquid Distance                                                  | 8, E.4.2 | 1.0           | R              | 1.73          | 1              | 1               | 0.6                  | 0.6                   | ∞        |
| Input Power and SAR Drift Measurement                                           | 8, 6.6.2 | 4.7           | R              | 1.73          | 1              | 1               | 2.7                  | 2.7                   | ∞        |
| <b>Phantom and Tissue Parameters</b>                                            |          |               |                |               |                |                 |                      |                       |          |
| Phantom Uncertainty (shape and thickness tolerances)                            | E.3.1    | 4.0           | R              | 1.73          | 1              | 1               | 2.3                  | 2.3                   | ∞        |
| Liquid Conductivity - deviation from target values                              | E.3.2    | 5.0           | R              | 1.73          | 0.64           | 0.43            | 1.8                  | 1.2                   | ∞        |
| Liquid Conductivity - measurement uncertainty                                   | E.3.3    | 10.0          | R              | 1.73          | 0.64           | 0.43            | 3.7                  | 2.5                   | ∞        |
| Liquid Permittivity - deviation from target values                              | E.3.2    | 10.0          | R              | 1.73          | 0.6            | 0.49            | 3.5                  | 2.8                   | ∞        |
| Liquid Permittivity - measurement uncertainty                                   | E.3.3    | 5.0           | R              | 1.73          | 0.6            | 0.49            | 1.7                  | 1.4                   | ∞        |
| <b>Combined Standard Uncertainty</b>                                            |          |               | RSS            |               |                |                 | 10.16                | 9.43                  | 99999    |
| <b>Expanded Uncertainty (95% CONFIDENCE LEVEL)</b>                              |          |               | $k=2$          |               |                |                 | 19.92                | 18.48                 |          |

## **Appendix 7**

### **Photographs of the device under test**



Figure 7 . Front of Phone



Figure 8 . Back of Phone



Figure 9 Front of Phone (Flip Open)



Figure 10 . Side of Phone (Flip Open)



Figure 11 . Separation Distance of 25 mm from Tip of Antenna to Flat Phantom and 8 mm from the bottom of the clip when rotated +90° (Clockwise Direction)



Figure 12. Phone Against the Head (Front View)



Figure 13. Phone Against the Head (Back View)



Figure 14. Phone Against the Head (15° Tilt) Front View



Figure 15. Phone Against the Head (15° Tilt) Back View