# Exhibit 11: SAR Test Report IHDT56DR1

**Date of test:** 09/03/2003 – 09/18/2003
**Date of Report:** 09/24/2003

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

**Test Responsible:**
Firass Badaruzzaman
Senior 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 P1528 (*DRAFT*)<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 IHDT56DR1 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.

## Table of Contents


| | | |
|---|---|---|
| 1) | Introduction | 3 |
| 2) | Description of the Device Under Test | 3 |
| | Antenna description | 3 |
| | Device description | 3 |
| 3) | Test Equipment | 4 |
| | 3.1 Dosimetric system | 4 |
| | 3.2 Additional equipment used | 4 |
| 4) | Electrical parameters of the tissue simulating liquid | 5 |
| 5) | System Accuracy Verification | 5 |
| 6) | Test Results | 6 |
| | 6.1 Head Adjacent Test Results | 7 |
| | 6.2 Body-Worn Test Results | 8 |


### References:


| | |
|---|---|
| Appendix 1: SAR distribution comparison for the system accuracy verification | 10 |
| Appendix 2: SAR distribution plots for Phantom Head Adjacent Use | 11 |
| Appendix 3: SAR distribution plots for Body Worn Configuration | 14 |
| Appendix 4. Probe Calibration Certificate | 16 |
| Appendix 5. Dipole Characterization Certificate | 17 |
| Appendix 6: Measurement Uncertainty Budget | 28 |
| Appendix 7. Photographs of the device under test | 21 |

## 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 IHDT56DR1). 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

### Antenna description

| | | |
|---|---|---|
| **Type** | Stubby | |
| **Location** | Right Side | |
| **Dimensions** | Length | 21 mm |
| | Width | 10 mm |
| **Configuration** | Fixed | |

### Device description

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **FCC ID Number** | **IHDT56DR1** | | | | | | | | |
| **Serial number** | LV50520029 | | | | | | | | |
| **Mode(s) of Operation** | GSM 850 | GSM 900 | GSM 1800 | GSM 1900 | GPRS 850 | GPRS 900 | GPRS 1800 | GPRS 1900 | Blue Tooth |
| **Modulation Mode(s)** | GSM | GSM | GSM | GSM | GSM | GSM | GSM | GSM | Blue Tooth |
| **Maximum Output Power Setting** | 33.00 dBm | 33.00 dBm | 30.00 dBm | 30.00 dBm | 33.00 dBm | 33.00 dBm | 30.00 dBm | 30.00 dBm | 4.00 dBm |
| **Duty Cycle** | 1:08 | 1:08 | 1:08 | 1:08 | 2:08 | 2:08 | 2:08 | 2:08 | 1:01 |
| **Transmitting Frequency Rang(s)** | 824.2-848.8 MHz | 880.2-914.8 MHz | 1710.2-1784.8 MHz | 1850.20 – 1909.80 MHz | 824.2-848.8 MHz | 880.2-914.8 MHz | 1710.2-1784.8 MHz | 1850.20 – 1909.80 MHz | 2400 - 2483.5 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 (Dasy3™ v3.1d) 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 ±11.7% (K=1) with an expanded uncertainty of ±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.

| Description | Serial Number | Cal Due Date |
|---|---|---|
| DASY3 DAE V1 | SN385 | 14-May-04 |
| | SN437 | 18-Mar-04 |
| E-Field Probe ET3DV6 | SN1501 | 16-Apr-04 |
| | SN1506 | 14-May-04 |
| Dipole Validation Kit, D900V2 | SN79 | 24-Jun-04 |
| | SN425tr | 24-Jun-04 |
| S.A.M. Phantom used for 800MHz | TP-1154 | |
| Dipole Validation Kit, D1800V2 | SN246tr | 24-Jun-04 |
| | SN250tr | 24-Jun-04 |
| S.A.M. Phantom used for 1900MHz | TP-1005 | |

## 3.2 Additional Equipment

| Description | Serial Number | Cal Due Date |
|---|---|---|
| Signal Generator HP8648C | 3847A04632 | 10/10/2004 |
| Power Meter E4419B | GB39511090 | 02/06/2004 |
| Power Sensor #1 - 8481A | US39211007 | 02/06/2004 |
| Power Sensor #2 - 8481A | US39210931 | 08/05/2004 |
| Network Analyzer HP8753ES | US39172529 | 6/18/2003 |
| Dielectric Probe Kit HP85070B | US33020235 | |

| Description | Serial Number | Cal Due Date |
|---|---|---|
| Signal Generator HP8648C | 3847A04633 | 10/11/2004 |
| Power Meter E4419B | US39250622 | 11/05/2003 |
| Power Sensor #1 - 8481A | US39210916 | 08/05/2004 |
| Power Sensor #2 - 8481A | US39211008 | 08/05/2004 |
| Network Analyzer HP8753ES | US39172529 | 6/18/2003 |
| Dielectric Probe Kit HP85070B | US33020235 | |

## 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) |
| 835 | **Head** | **Measured, 08/29/2003** | 42.20 | 0.91 | 19.8-20.8 |
| | | **Recommended Limits** | 41.50 | 0.90 | 15-30 |
| | **Body** | **Measured, 09/06/2003** | 54.30 | 0.96 | 19.8-20.8 |
| | | **Recommended Limits** | 55.20 | 0.97 | 15-30 |
| | | **Measured, 09/07/2003** | 54.40 | 0.97 | 19.8-20.8 |
| | | **Recommended Limits** | 55.20 | 0.97 | 15-30 |
| 1880 | **Head** | **Measured, 08/28/2003** | 38.20 | 1.45 | 19.8-20.8 |
| | | **Recommended Limits** | 40.00 | 1.40 | 15-30 |
| | **Body** | **Measured, 09/04/2003** | 52.30 | 1.57 | 19.8-20.8 |
| | | **Recommended Limits** | 53.30 | 1.52 | 15-30 |
| | | **Measured, 09/07/2003** | 52.00 | 1.59 | 19.8-20.8 |
| | | **Recommended Limits** | 53.30 | 1.52 | 15-30 |

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 | -- | 30.80 |
| DGBE | -- | -- | 47.0 | -- |
| 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 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 ±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) | | |
| 835 | **Measured, 08/29/2003** | 10.08 | 42.20 | 0.91 | 20 | 20.5 |
| | **Recommended Limits** | 10.10 | 41.5+/-5% | .97 +/- 5% | n/a | n/a |
| 900 | **Measured, 09/06/2003** | 10.95 | 41.00 | 0.96 | 20 | 20.9 |
| | **Recommended Limits** | 10.10 | 41.5+/-5% | .97 +/- 5% | n/a | n/a |
| 1800 | **Measured, 08/28/2003** | 40.00 | 38.60 | 1.36 | 21 | 19.9 |
| | **Recommended Limits** | 39.70 | 40+/- 5% | 1.4 +/- 5% | n/a | n/a |
| | **Measured, 09/04/2003** | 39.90 | 38.50 | 1.35 | 20 | 19.5 |
| | **Recommended Limits** | 39.700 | 40+/- 5% | 1.4 +/- 5% | n/a | n/a |
| | **Measured, 09/05/20032** | 40.20 | 38.600 | 1.35 | 20 | 20.4 |
| | **Recommended Limits** | 39.70 | 40+/- 5% | 1.4 +/- 5% | n/a | n/a |
| | **Measured, 09/07/2003** | 39.80 | 40.00 | 1.38 | 21 | 20.2 |
| | **Recommended Limits** | 39.70 | 40+/- 5% | 1.4 +/- 5% | n/a | n/a |

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 | SN1501 | 900 | 6.4 | 2 of 10 |
| | | 1800 | 5.0 | 2 of 10 |
| | SN1506 | 900 | 6.1 | 2 of 11 |
| | | 1800 | 4.9 | 2 of 11 |

## 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 (± 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 IHDT56DR1) has the following battery options:

SNN5704A - 700 mAH Battery

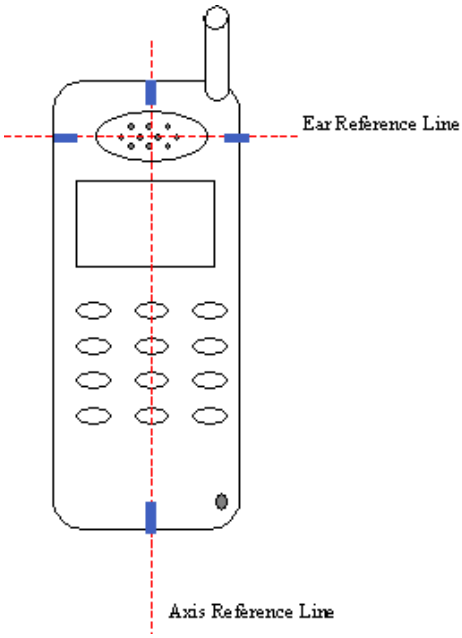
This battery was used to do all of the SAR testing. The phone was placed in the SAR measurement system with a fully charged battery.

## 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 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. 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 | SN1501 | 900 | 6.4 | 2 of 10 |
| | | 1800 | 5.0 | 2 of 10 |
| | SN1506 | 900 | 6.1 | 2 of 11 |
| | | 1800 | 4.9 | 2 of 11 |

| 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 | 33.01 | | | | | 0.767 | -0.31 | 0.82 | 19.9 |
| | Channel 190 | 32.99 | 0.698 | -0.37 | 0.76 | 19.80 | 0.853 | -0.30 | 0.91 | 20 |
| | Channel 251 | 33.00 | | | | | 1.01 | -0.34 | 1.09 | 20 |
| Digital 1900MHz | Channel 512 | 30.00 | | | | | | | | |
| | Channel 661 | 30.00 | 0.555 | -0.01 | 0.56 | 19.20 | 0.696 | -0.09 | 0.71 | 19.20 |
| | Channel 810 | 30.00 | | | | | | | | |

**Table 1: SAR measurement results for the portable cellular telephone FCC ID IHDT56DR1 at highest possible output power. Against the head (Cheek Touch)**

| 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 | 33.01 | | | | | | | | |
| | Channel 190 | 32.99 | 0.225 | -0.52 | 0.25 | 19.80 | 0.238 | -0.16 | 0.25 | 20.00 |
| | Channel 251 | 33.00 | | | | | | | | |
| Digital 1900MHz | Channel 512 | 30.00 | | | | | | | | |
| | Channel 661 | 30.00 | 0.189 | -0.01 | 0.19 | 19.2 | 0.24 | -0.05 | 0.24 | 19.40 |
| | Channel 810 | 30.00 | | | | | | | | |

**Table 2: SAR measurement results for the portable cellular telephone FCC ID IHDT56DR1 at highest possible output power. Against the head (15º Tilt)**

## 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 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. 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 ±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.

There is a Body-Worn Accessory available for this phone:
A Mercury Eva pouch: SYN9941A

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 | SN1501 | 900 | 6.1 | 8 of 10 |
| | | 1800 | 4.6 | 8 of 10 |
| | SN1506 | 900 | 5.8 | 8 of 11 |
| | | 1800 | 4.5 | 8 of 11 |

| f (MHz) | Description | Conducted Output Power (dBm) | Body Worn | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mercury Eva Pouch | | | | Mercury Eva Pouch (GPRS PC10) | | | |
| | | | 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 | 33.01 | | | | | | | | |
| | Channel 190 | 32.99 | 0.231 | -0.29 | 0.25 | 20.50 | 0.445 | -0.47 | 0.50 | 20.50 |
| | Channel 251 | 33.00 | | | | | | | | |
| Digital 1900MHz | Channel 512 | 30.00 | | | | | | | | |
| | Channel 661 | 30.00 | 0.107 | -0.05 | 0.11 | 20.40 | 0.251 | -0.07 | 0.26 | 20.80 |
| | Channel 810 | 30.00 | | | | | | | | |

**Table 5: SAR measurement results for the portable cellular telephone FCC ID IHDT56DR1 at highest possible output power. Measured against the body.**

| f (MHz) | Description | Conducted Output Power (dBm) | Body Worn | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mercury Eva Pouch with blue tooth enabled | | | | | | | |
| | | | 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 | 33.01 | | | | | | | | |
| | Channel 190 | 32.99 | 0.259 | -0.28 | 0.28 | 20.30 | | | | |
| | Channel 251 | 33.00 | | | | | | | | |
| Digital 1900MHz | Channel 512 | 30.00 | | | | | | | | |
| | Channel 661 | 30.00 | 0.128 | -0.05 | 0.13 | 20.0 | | | | |
| | Channel 810 | 30.00 | | | | | | | | |

**Table 6: SAR measurement results for the portable cellular telephone FCC ID IHDT56DR1 at highest possible output power. Measured against the body.**

# Appendix 1

## SAR distribution comparison for the system accuracy verification

# Dipole 1800 MHz

1800 MHz System Performance Check / Dipole Sn# 250TR / Forward Power =248mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 21 C  Simulant Temp at time of measurement = 19.9 C

R1 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (90°,180°); Frequency: 1800 MHz

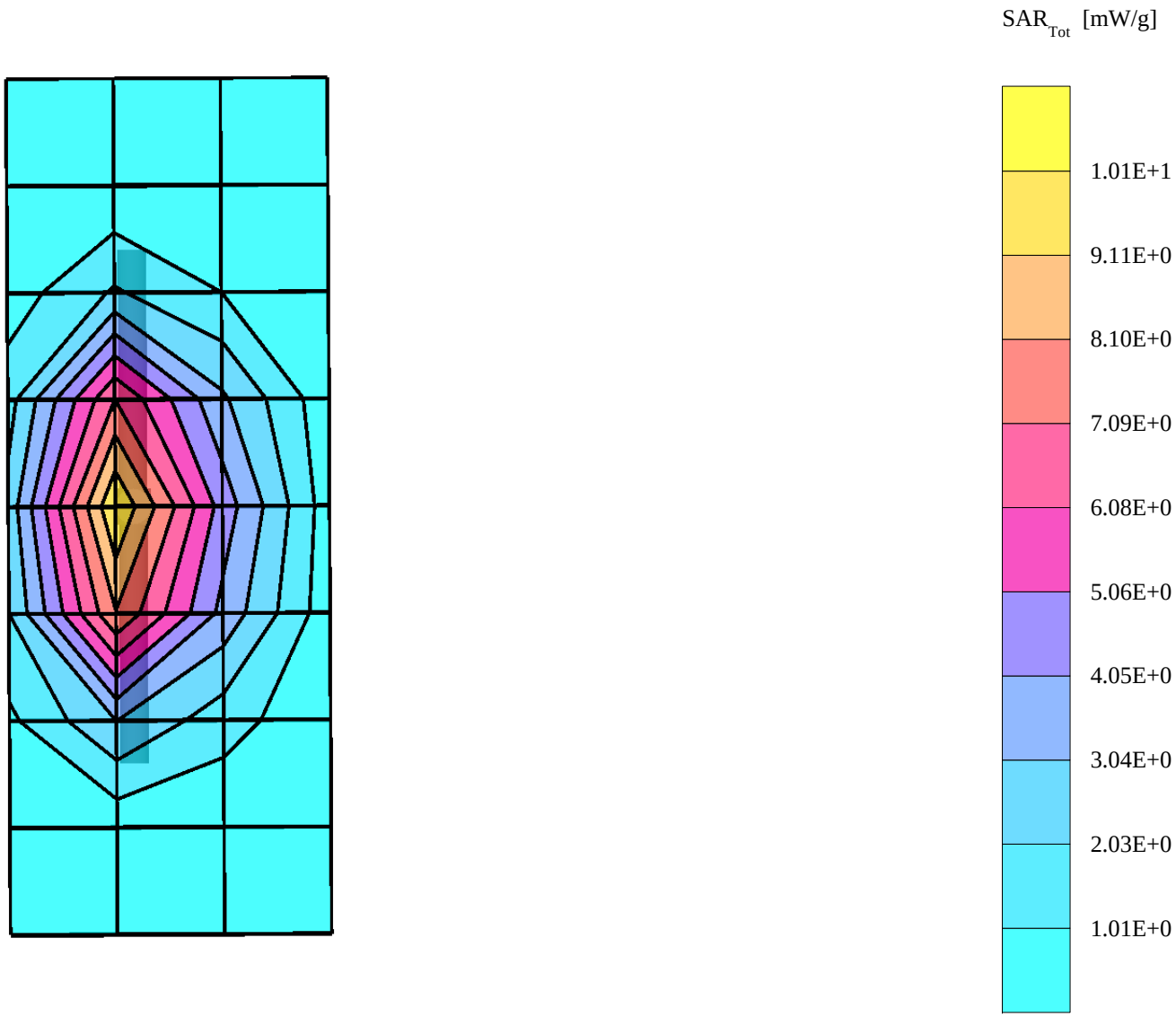
Probe: ET3DV6R - SN1506 - Validation.2; ConvF(4.90,4.90,4.90); Crest factor: 1.0; 1800 MHz VALIDATION: $\sigma$ = 1.36 mho/m $\varepsilon_r$ = 38.6 $\rho$ = 1.00 g/cm$^3$

Cubes (2): SAR (1g): 10.0  mW/g ± 0.04 dB, SAR (10g): 5.28  mW/g ± 0.06 dB, (Worst-case extrapolation)

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

Penetration depth: 8.6 (8.2, 9.3) [mm]

Powerdrift: -0.05 dB



# Dipole 1800 MHz

1800 MHz System Performance Check / Dipole Sn# 250TR / Forward Power =248mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 21 C  Simulant Temp at time of measurement = 19.9 C

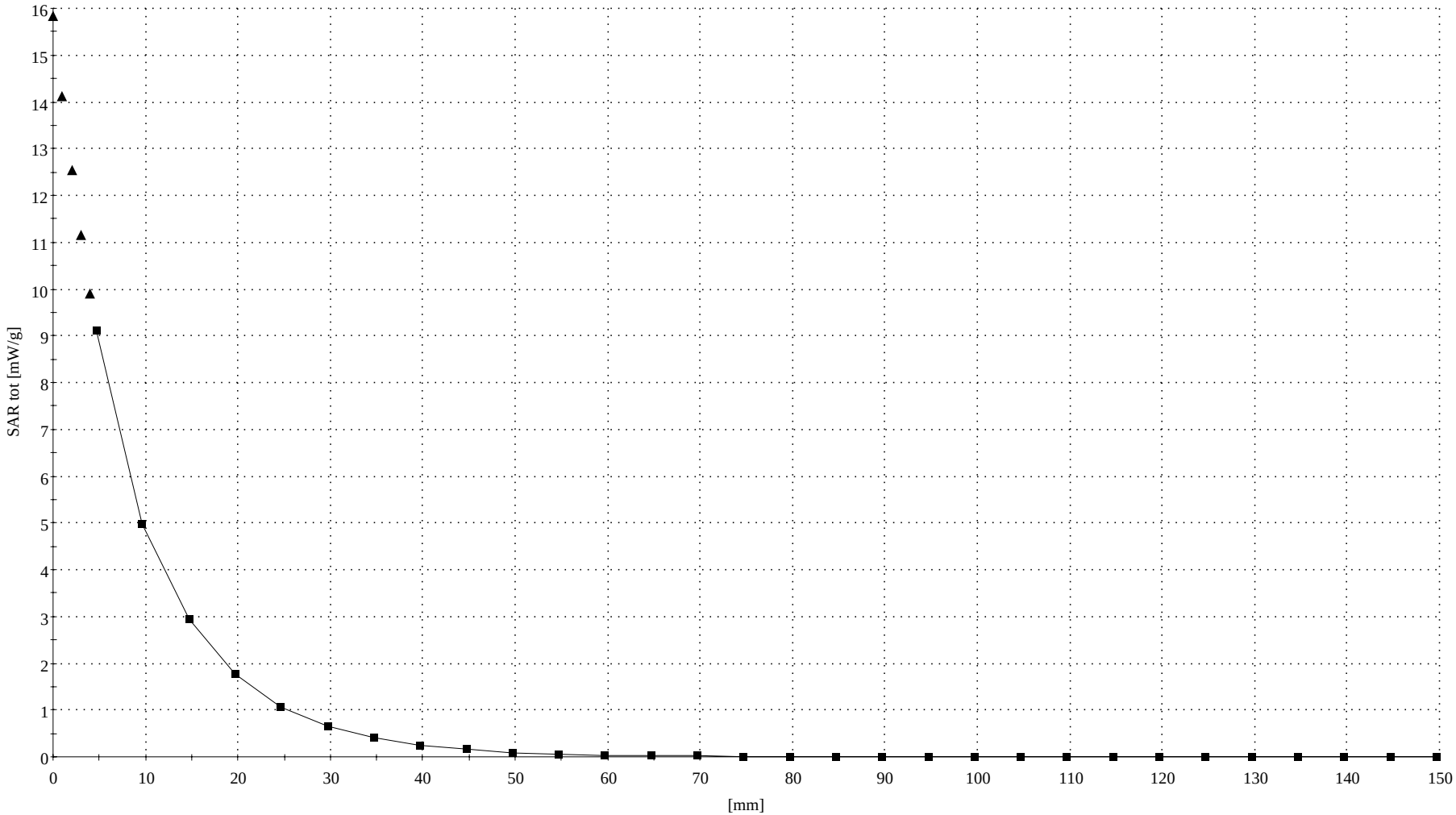
R1 Amy Twin Phantom Rev.4 (22Aug02) Phantom;  Section; Position: ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1506 - Validation.2; ConvF(4.90,4.90,4.90); Crest factor: 1.0; 1800 MHz VALIDATION: $\sigma$ = 1.36 mho/m $\varepsilon_r$ = 38.6 $\rho$ = 1.00 g/cm$^3$

: , ()

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

Penetration depth: 8.7 (8.4, 9.5) [mm]



08/29/03

# Dipole 835 MHz

835 MHz System Performance Check / Dipole Sn# 425TR / Forward Power =249mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 20 C Simulant Temp at time of measurement = 20.5 C

R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz

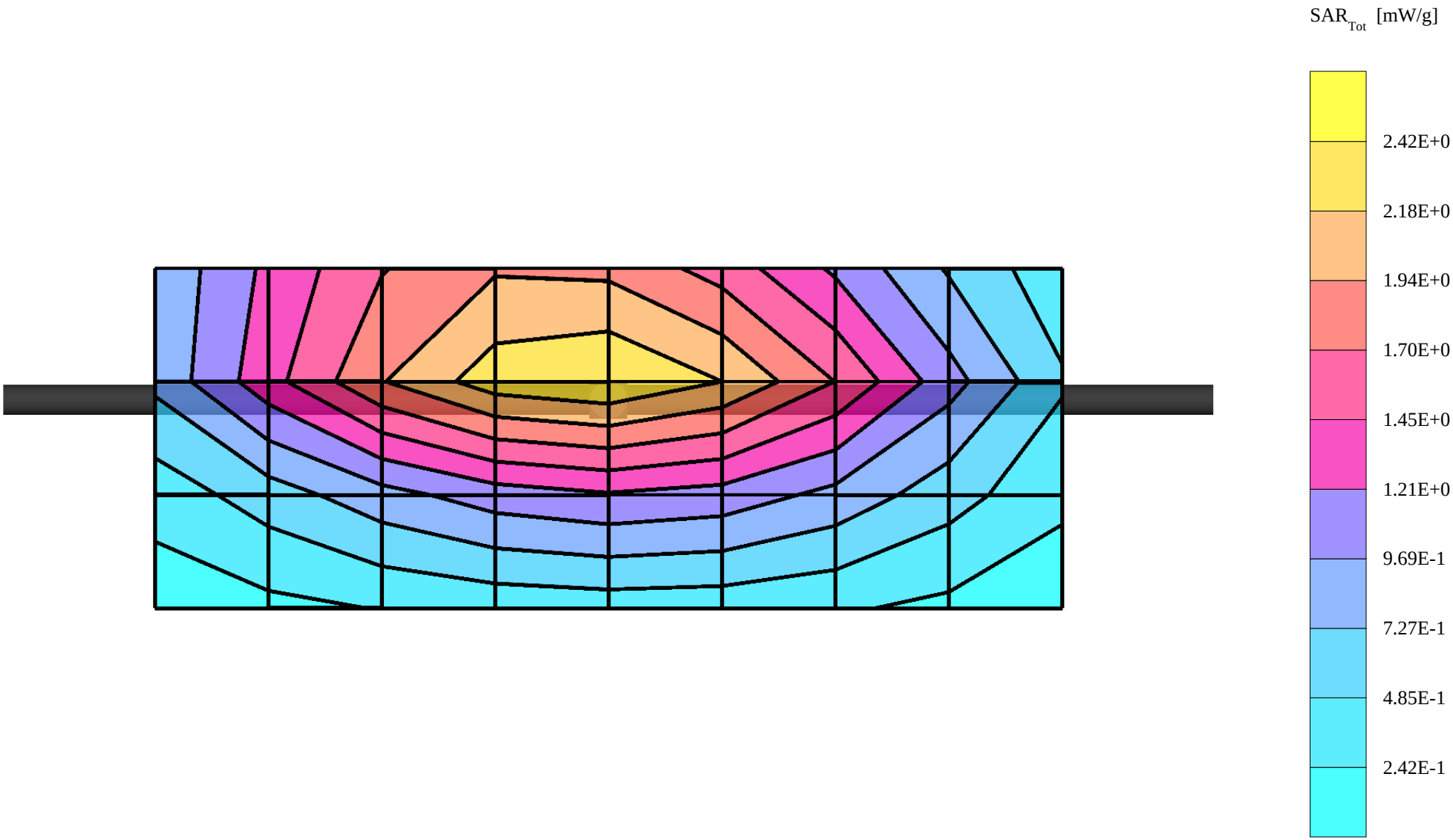
Probe: ET3DV6R - SN1506 - Validation.2; ConvF(6.10,6.10,6.10); Crest factor: 1.0; 835 MHz VALIDATION: $\sigma$ = 0.91 mho/m $\varepsilon_r$ = 42.2 $\rho$ = 1.00 g/cm$^3$

Cubes (2): SAR (1g): 2.51 mW/g ± 0.04 dB, SAR (10g): 1.61 mW/g ± 0.05 dB, (Worst-case extrapolation)

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

Penetration depth: 12.0 (10.9, 13.4) [mm]

Powerdrift: 0.02 dB



# Dipole 835 MHz

835 MHz System Performance Check / Dipole Sn# 450TR / Forward Power =249mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 20 C Simulant Temp at time of measurement = 20.5 C

R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Section; Position: ; Frequency: 835 MHz

Probe: ET3DV6R - SN1506 - Validation.2; ConvF(6.10,6.10,6.10); Crest factor: 1.0; 835 MHz VALIDATION: $\sigma$ = 0.91 mho/m $\varepsilon_r$ = 42.2 $\rho$ = 1.00 g/cm$^3$

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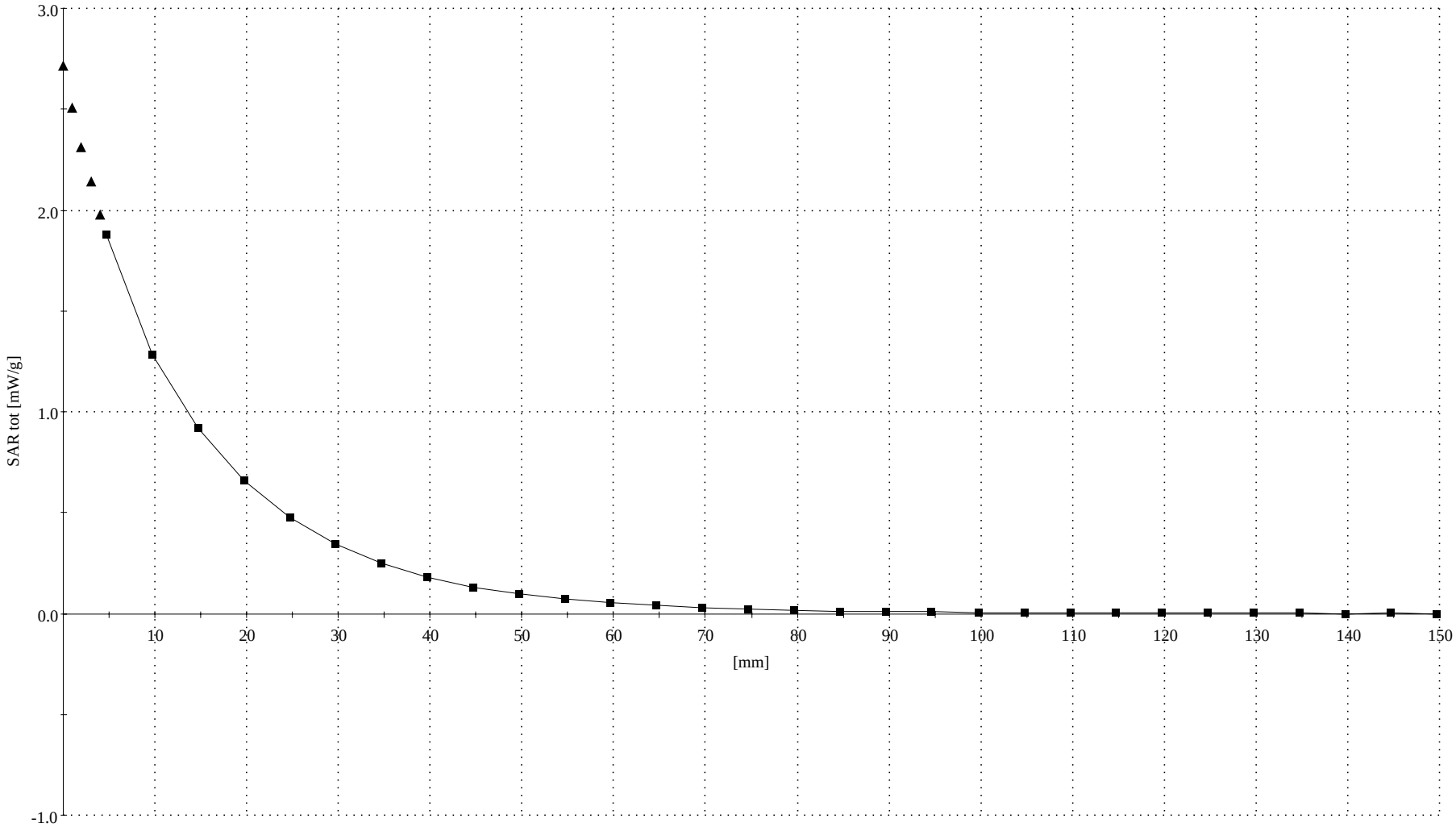
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 13.9 (13.0, 15.0) [mm]



# Dipole 1800 MHz

1800 MHz System Performance Check / Dipole Sn# 246TR / Forward Power = 249mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 20C  Simulant Temp at time of measurement =  19.5C

R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (90°,180°); Frequency: 1800 MHz

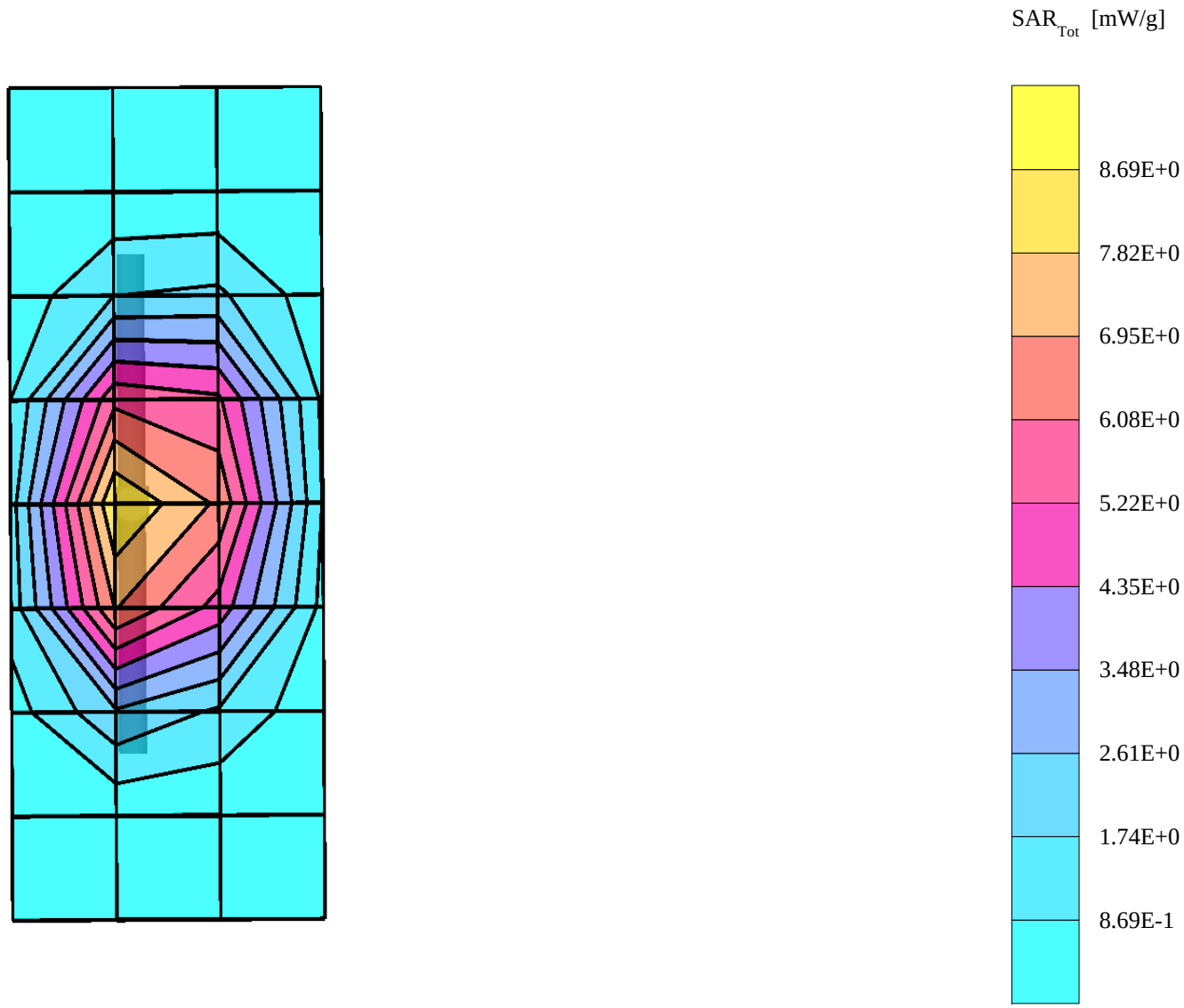
Probe: ET3DV6R - SN1501 - VALIDATION; ConvF(5.00,5.00,5.00); Crest factor: 1.0; 1800 MHz VALIDATION: $\sigma$ = 1.35 mho/m $\varepsilon_r$ = 38.5 $\rho$ = 1.00 g/cm$^3$

Cubes (2): SAR (1g): 9.94  mW/g ± 0.02 dB, SAR (10g): 5.24  mW/g ± 0.06 dB, (Worst-case extrapolation)

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

Penetration depth: 8.5 (8.2, 9.3) [mm]

Powerdrift: 0.02 dB



# Dipole 1800 MHz

1800 MHz System Performance Check / Dipole Sn# 246TR / Forward Power = 249mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 20C  Simulant Temp at time of measurement =  19.5C

R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom;  Section; Position: ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1501 - VALIDATION; ConvF(5.00,5.00,5.00); Crest factor: 1.0; 1800 MHz VALIDATION: $\sigma$ = 1.35 mho/m $\varepsilon_r$ = 38.5 $\rho$ = 1.00 g/cm$^3$

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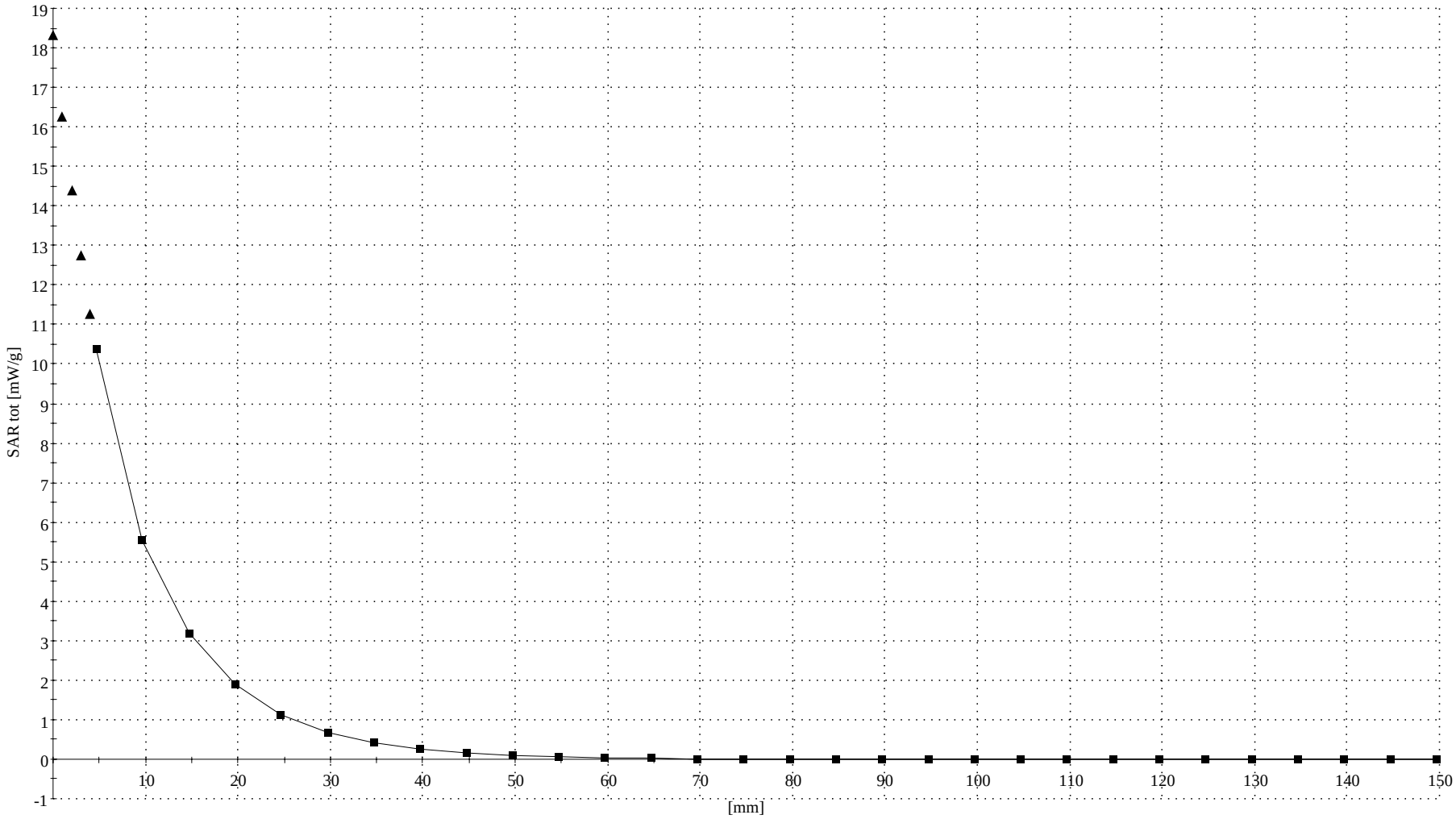
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 8.4 (8.0, 9.1) [mm]



# Dipole 1800 MHz

1800 MHz System Performance Check / Dipole Sn# 246TR / Forward Power = 248mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 20C Simulant Temp at time of measurement = 20.4C

R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (90°,180°); Frequency: 1800 MHz

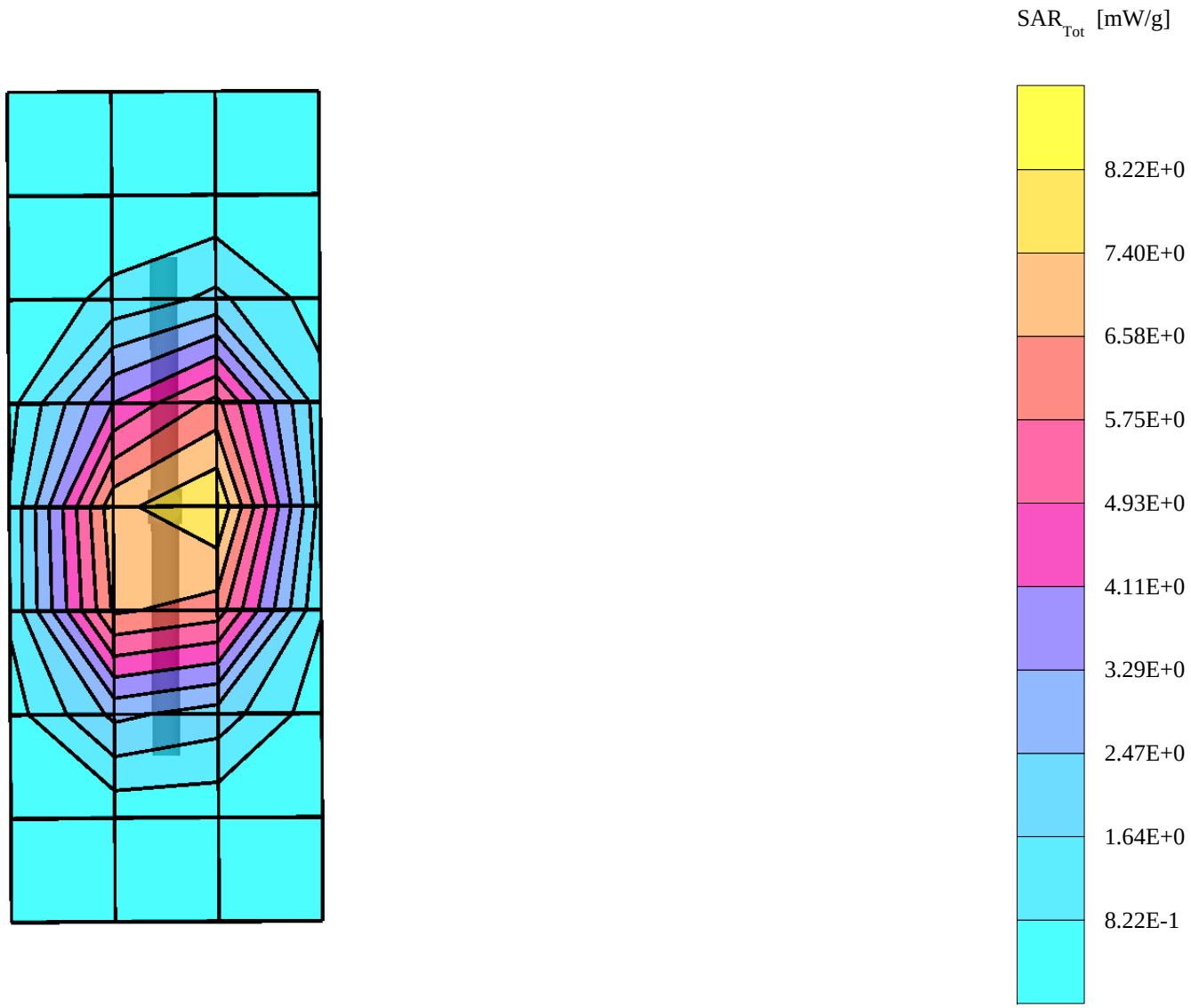
Probe: ET3DV6R - SN1501 - VALIDATION; ConvF(5.00,5.00,5.00); Crest factor: 1.0; 1800 MHz VALIDATION: $\sigma$ = 1.35 mho/m $\varepsilon_r$ = 38.6 $\rho$ = 1.00 g/cm$^3$

Cubes (2): SAR (1g): 9.89 mW/g ± 0.06 dB, SAR (10g): 5.22 mW/g ± 0.07 dB, (Worst-case extrapolation)

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

Penetration depth: 8.4 (8.1, 9.2) [mm]

Powerdrift: 0.02 dB



# Dipole 1800 MHz

1800 MHz System Performance Check / Dipole Sn# 246TR / Forward Power = 248mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 20C Simulant Temp at time of measurement = 20.4C

R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; Section; Position: ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1501 - VALIDATION; ConvF(5.00,5.00,5.00); Crest factor: 1.0; 1800 MHz VALIDATION: $\sigma$ = 1.35 mho/m $\varepsilon_r$ = 38.6 $\rho$ = 1.00 g/cm$^3$

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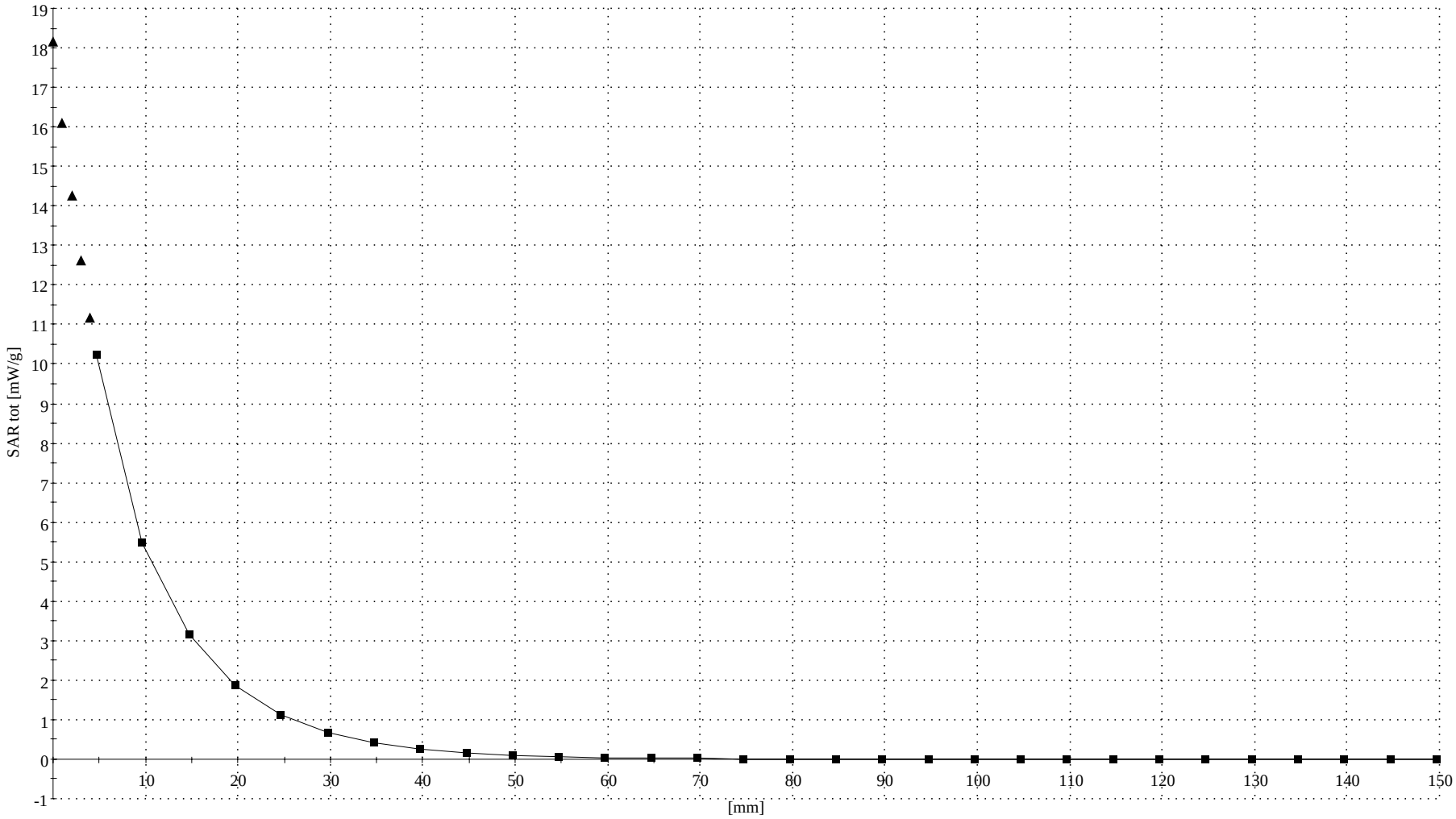
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 8.4 (8.0, 9.1) [mm]



# Dipole 900 MHz

900 MHz System Performance Check / Dipole Sn# 079 / Forward Power = 252mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 20.0C Simulant Temp at time of measurement = 20.9C

R5 TP-1132 Sugar SAM Expanded (Rev. 2)-9Jan03 Phantom; Flat Section; Position: (90°,90°); Frequency: 900 MHz

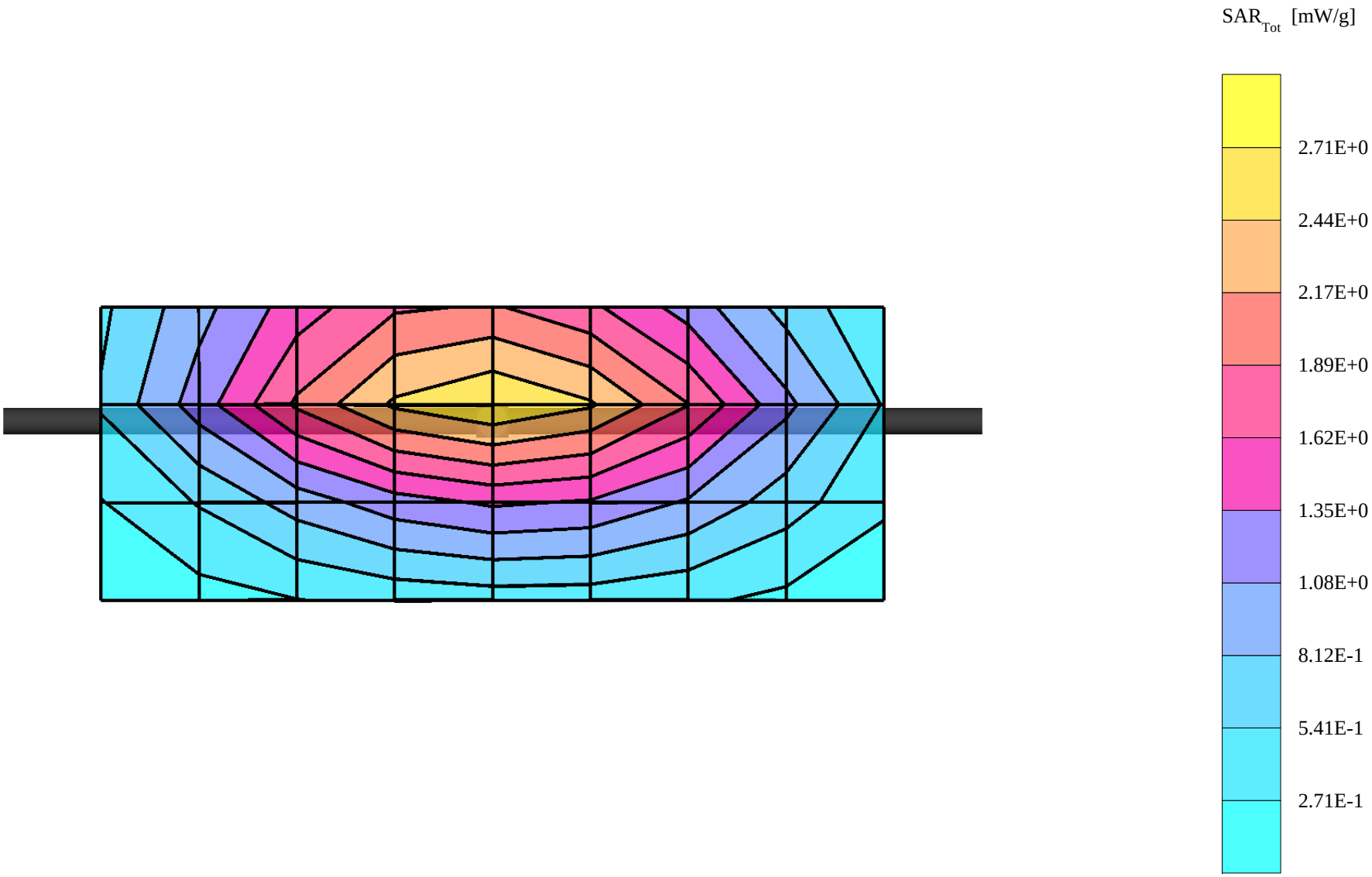
Probe: ET3DV6R - SN1501 - VALIDATION; ConvF(6.40,6.40,6.40); Crest factor: 1.0; 900 MHz VALIDATION: $\sigma$ = 0.96 mho/m $\varepsilon_r$ = 41.0 $\rho$ = 1.00 g/cm$^3$

Cubes (2): SAR (1g): 2.76 mW/g ± 0.08 dB, SAR (10g): 1.75 mW/g ± 0.08 dB, (Worst-case extrapolation)

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

Penetration depth: 11.7 (10.9, 12.7) [mm]

Powerdrift: 0.00 dB



# Dipole 900 MHz

900 MHz System Performance Check / Dipole Sn# 079 / Forward Power = 252mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 20.0C Simulant Temp at time of measurement = 20.9C

R5 TP-1132 Sugar SAM Expanded (Rev. 2)-9Jan03 Phantom; Section; Position: ; Frequency: 900 MHz

Probe: ET3DV6R - SN1501 - VALIDATION; ConvF(6.40,6.40,6.40); Crest factor: 1.0; 900 MHz VALIDATION: $\sigma$ = 0.96 mho/m $\varepsilon_r$ = 41.0 $\rho$ = 1.00 g/cm$^3$

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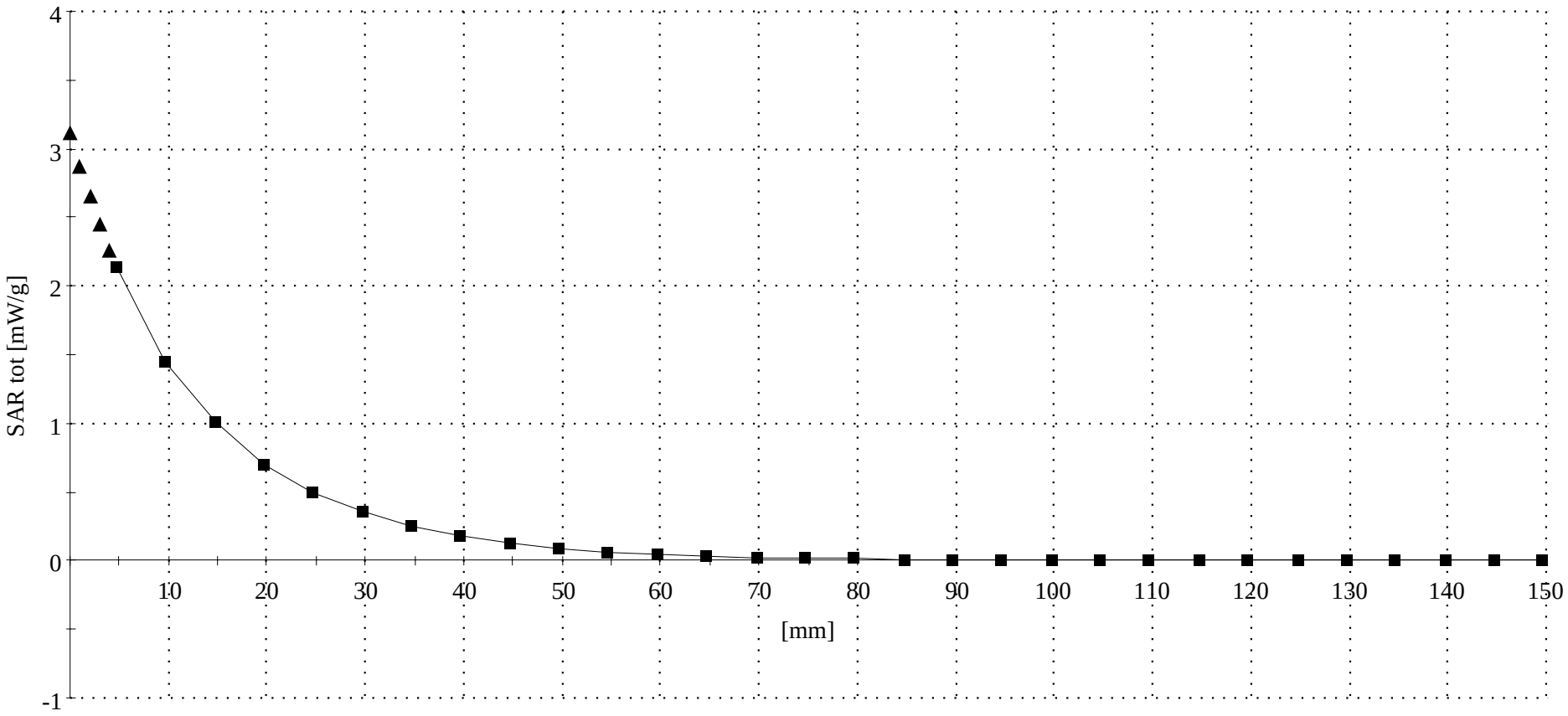
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 13.1 (12.6, 13.8) [mm]



# Dipole 1800 MHz

1800 MHz System Performance Check / Dipole Sn# 246tr / Forward Power = 250mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 21 C Simulant Temp at time of measurement = 20.2 C

R5: TP-1160 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Flat Section; Position: (90°,90°); Frequency: 1800 MHz

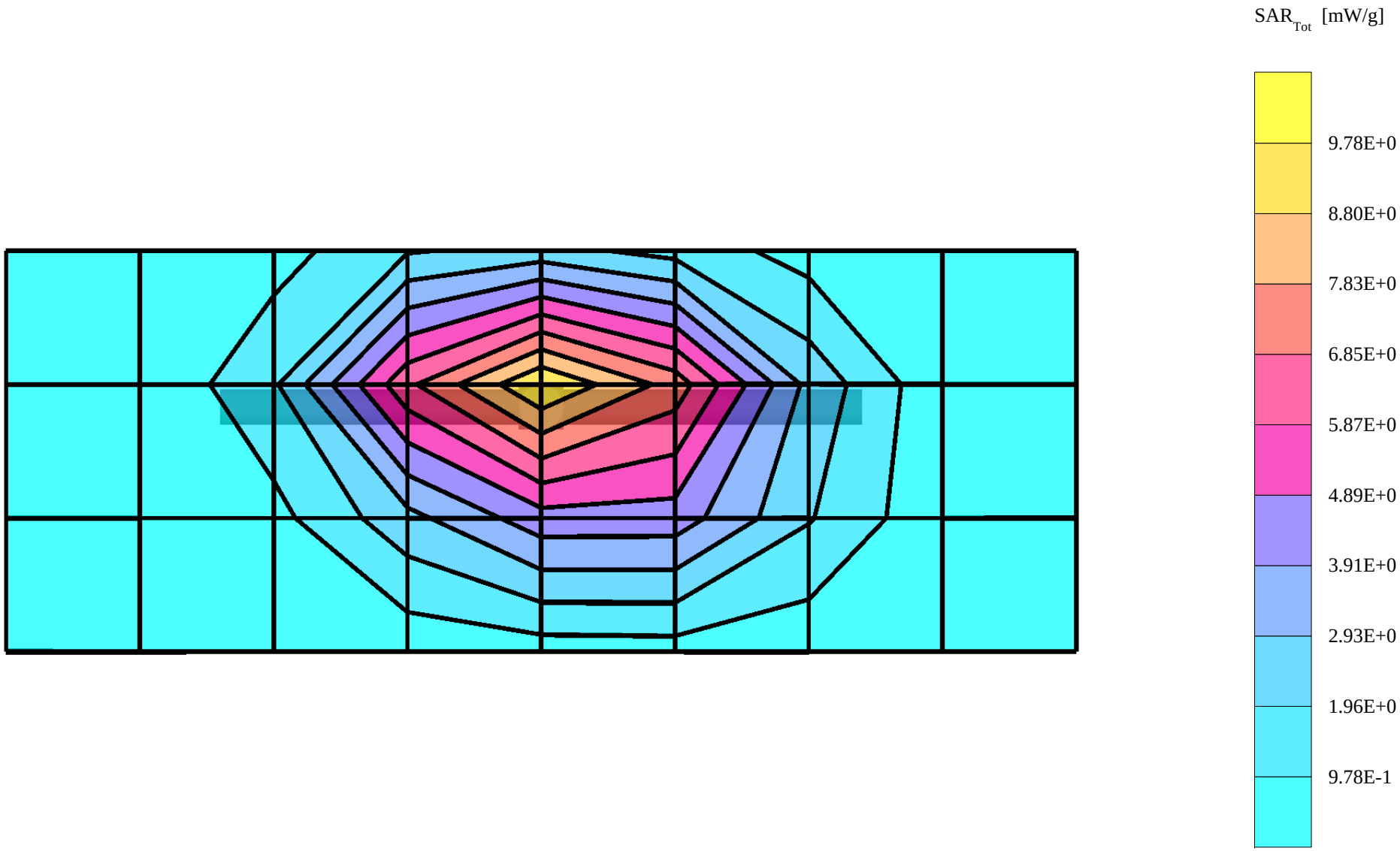
Probe: ET3DV6R - SN1501 - VALIDATION; ConvF(5.00,5.00,5.00); Crest factor: 1.0; 1800 MHz VALIDATION: $\sigma$ = 1.38 mho/m $\varepsilon_r$ = 40.0 $\rho$ = 1.00 g/cm$^3$

Cubes (2): SAR (1g): 9.80 mW/g ± 0.06 dB, SAR (10g): 5.21 mW/g ± 0.03 dB, (Worst-case extrapolation)

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

Penetration depth: 8.7 (8.4, 9.5) [mm]

Powerdrift: 0.09 dB



# Dipole 1800 MHz

1800 MHz System Performance Check / Dipole Sn# 246tr / Forward Power = 250mW / Acceptable Temp Range is 18-25°C Room Temp at time of measurement = 21 C Simulant Temp at time of measurement = 20.2 C

R5: TP-1160 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Section; Position: ; Frequency: 1800 MHz

Probe: ET3DV6R - SN1501 - VALIDATION; ConvF(5.00,5.00,5.00); Crest factor: 1.0; 1800 MHz VALIDATION: $\sigma$ = 1.38 mho/m $\varepsilon_r$ = 40.0 $\rho$ = 1.00 g/cm$^3$

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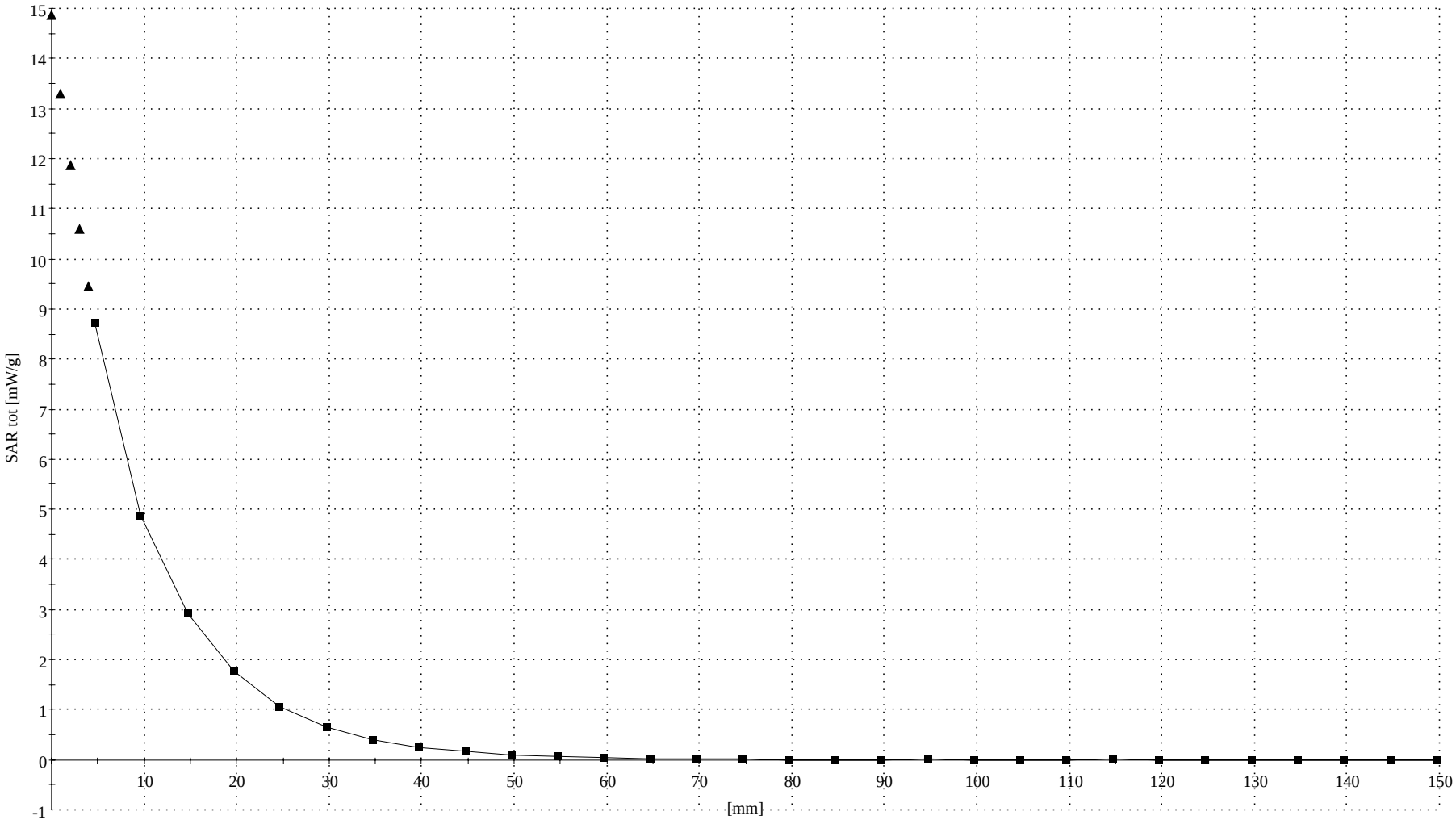
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Penetration depth: 9.0 (8.7, 9.7) [mm]

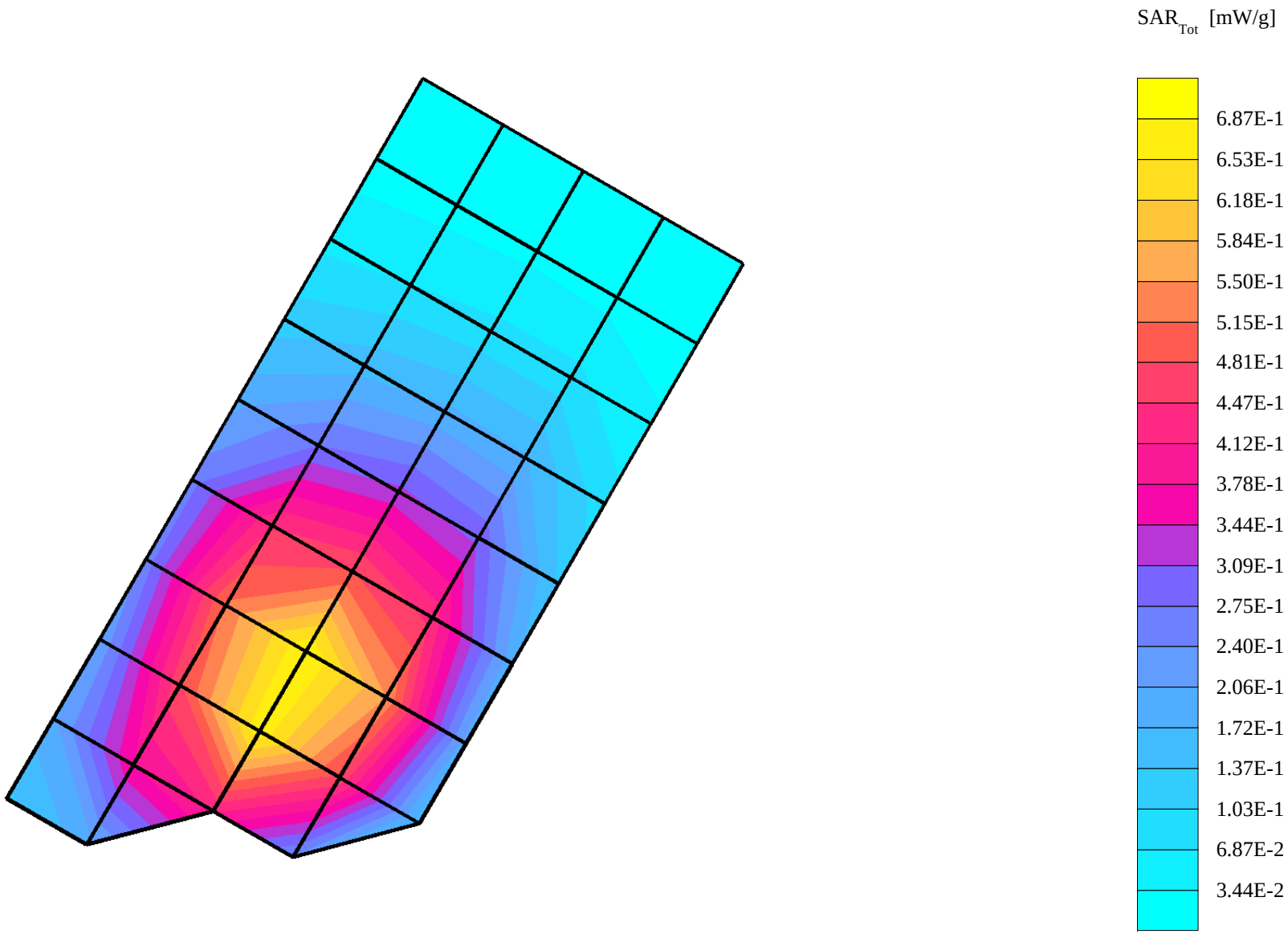


# Appendix 2

## SAR distribution plots for Phantom Head Adjacent Use

# SN# LV50520029

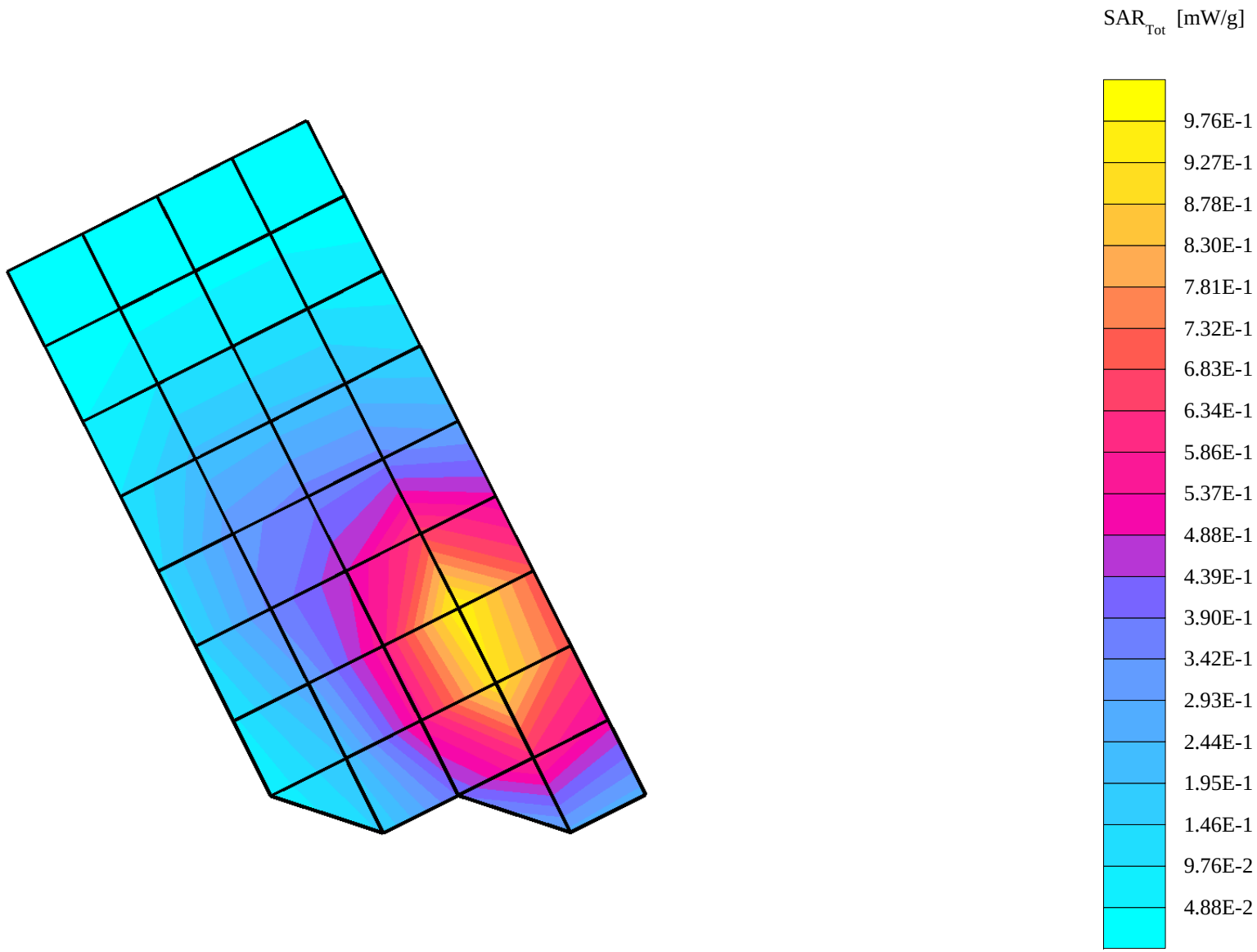
Ch# 190 / Pwr Step:05 / Antenna Position:FIXED / Battery Model #: SNN5704A / DEVICE POSITION (cheek or rotated): CHEEK
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 837 MHz
Probe: ET3DV6R - SN1506 - IEEE Head; ConvF(6.10,6.10,6.10); Crest factor: 8.0; 835 MHz Head & Body: $\sigma$ = 0.91 mho/m $\varepsilon_r$ = 42.2 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.698 mW/g, SAR (10g): 0.482 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 15.8 (13.9, 18.1) [mm]
Powerdrift: -0.37 dB



08/29/03

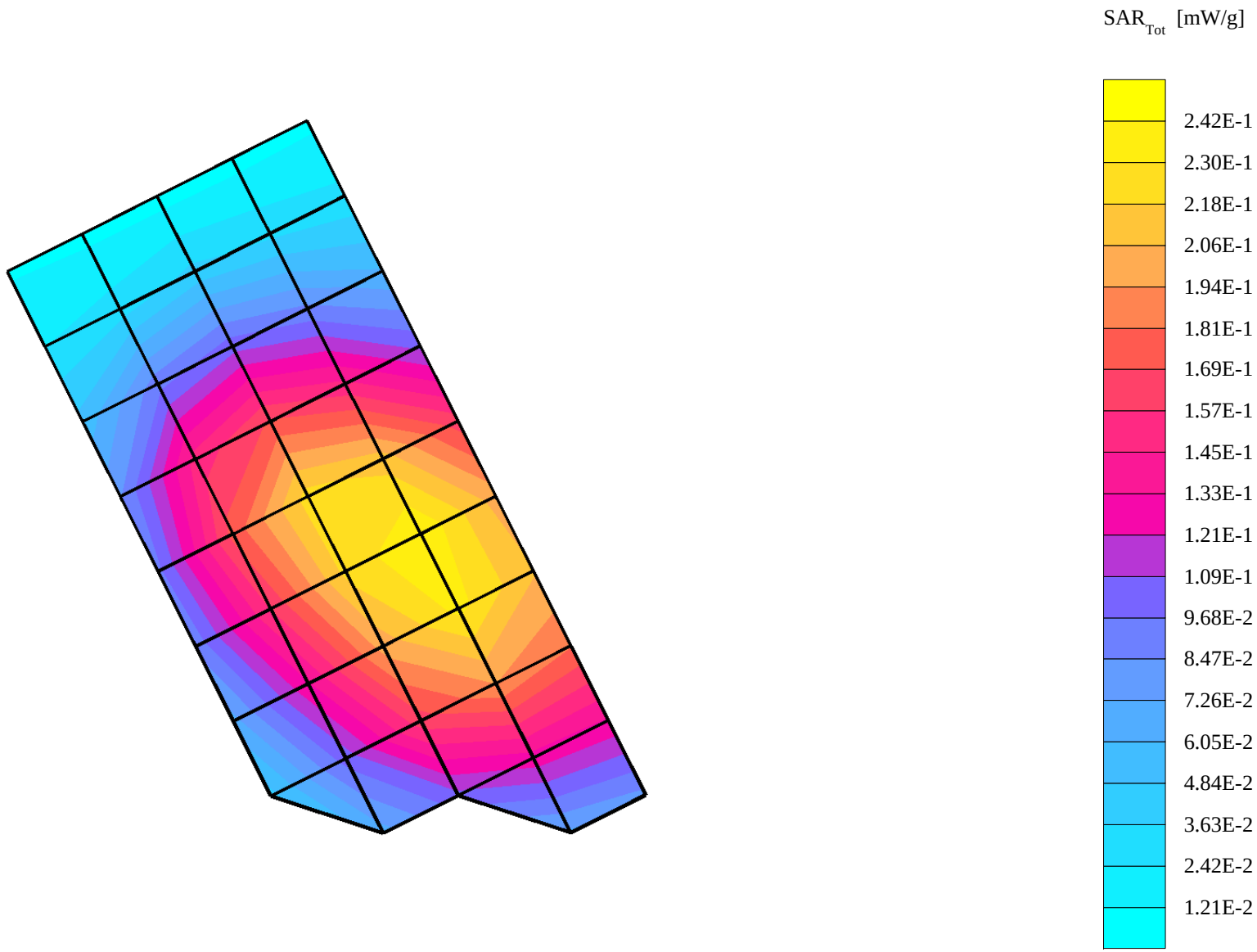
# SN# LV50520029

Ch# 251 / Pwr Step:05 / Antenna Position:FIXED/ Battery Model #: SNN5704A / DEVICE POSITION (cheek or rotated): CHEEK
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 849 MHz
Probe: ET3DV6R - SN1506 - IEEE Head; ConvF(6.10,6.10,6.10); Crest factor: 8.0; 835 MHz Head & Body: $\sigma$ = 0.91 mho/m $\varepsilon_r$ = 42.2 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 1.01 mW/g, SAR (10g): 0.656 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 14.0 (12.2, 16.2) [mm]
Powerdrift: -0.34 dB



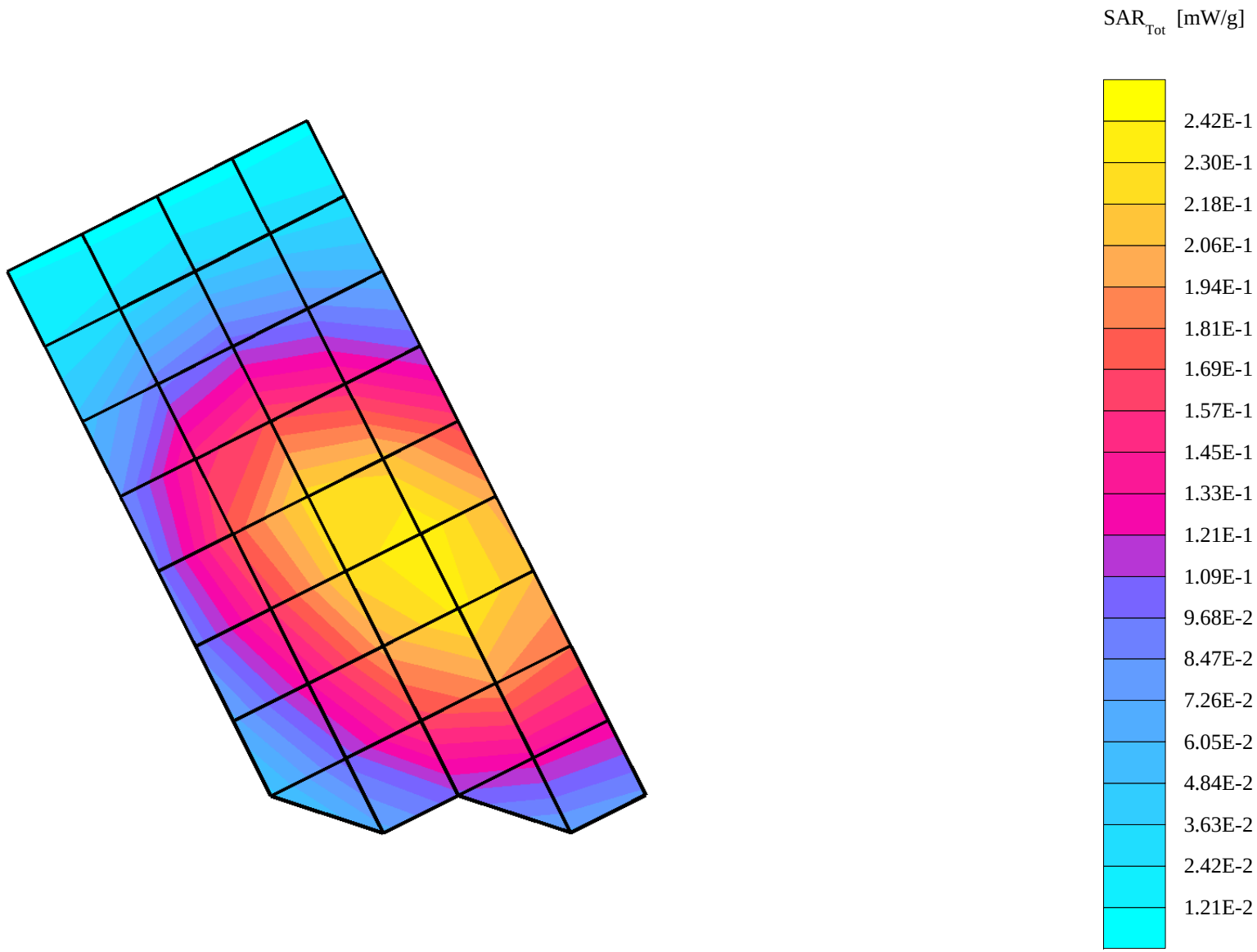
# SN# LV50520029

Ch# 190 / Pwr Step:05 / Antenna Position:FIXED / Battery Model #: SNN5704A / DEVICE POSITION (cheek or rotated): CHEEK
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 837 MHz
Probe: ET3DV6R - SN1506 - IEEE Head; ConvF(6.10,6.10,6.10); Crest factor: 8.0; 835 MHz Head & Body: $\sigma$ = 0.91 mho/m $\varepsilon_r$ = 42.2 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.238 mW/g, SAR (10g): 0.178 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 19.8 (17.8, 21.8) [mm]
Powerdrift: -0.16 dB



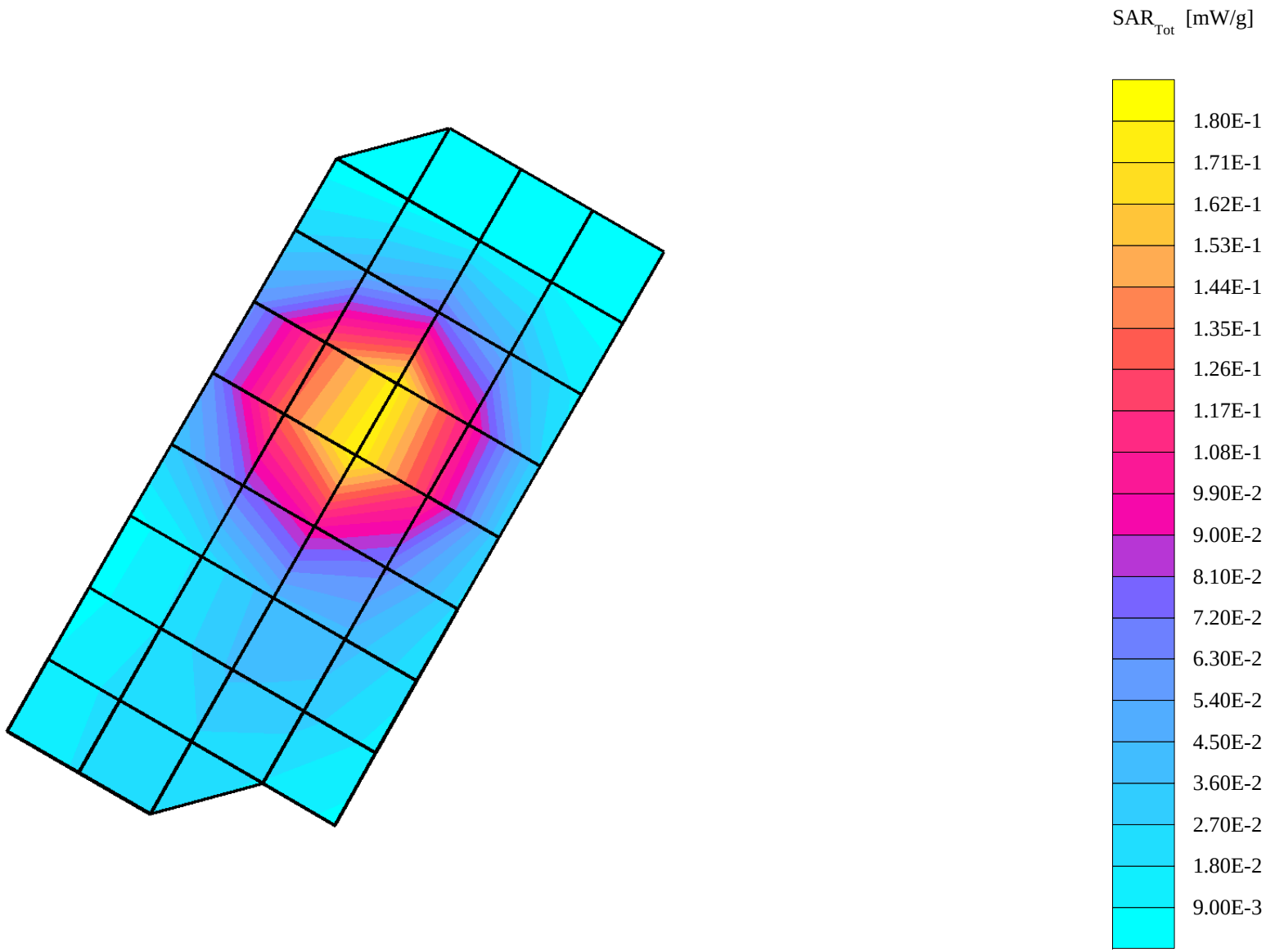
# SN# LV50520029

Ch# 190 / Pwr Step:05 / Antenna Position:FIXED / Battery Model #: SNN5704A / DEVICE POSITION (cheek or rotated): CHEEK
R1 TP-1005 SAM Expanded Sugar (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 837 MHz
Probe: ET3DV6R - SN1506 - IEEE Head; ConvF(6.10,6.10,6.10); Crest factor: 8.0; 835 MHz Head & Body: $\sigma$ = 0.91 mho/m $\varepsilon_r$ = 42.2 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.238 mW/g, SAR (10g): 0.178 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 19.8 (17.8, 21.8) [mm]
Powerdrift: -0.16 dB



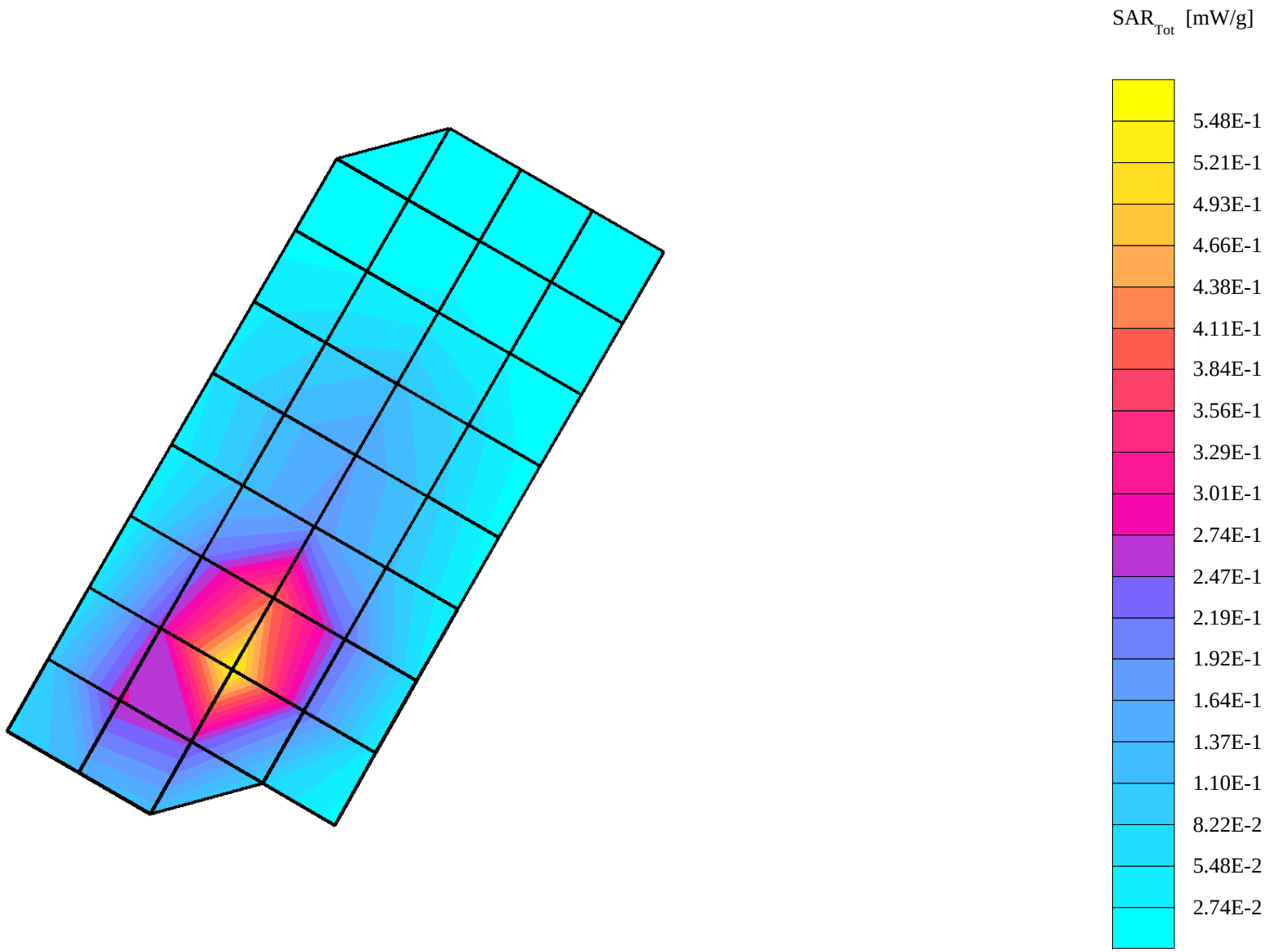
# SN# LV50520029

Ch# 661 / Pwr Step: 0 / Antenna Position: FIXED / Battery Model #: SNN5704A / DEVICE POSITION (cheek or rotated):TILTED
R1 TP-1154 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 1880 MHz
Probe: ET3DV6R - SN1506 - IEEE Head; ConvF(4.90,4.90,4.90); Crest factor: 8.0; 1880 MHz Head & Body: $\sigma$ = 1.45 mho/m $\varepsilon_r$ = 38.2 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.189 mW/g, SAR (10g): 0.115 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 11.2 (10.5, 12.0) [mm]
Powerdrift: -0.01 dB



# SN# LV50520029

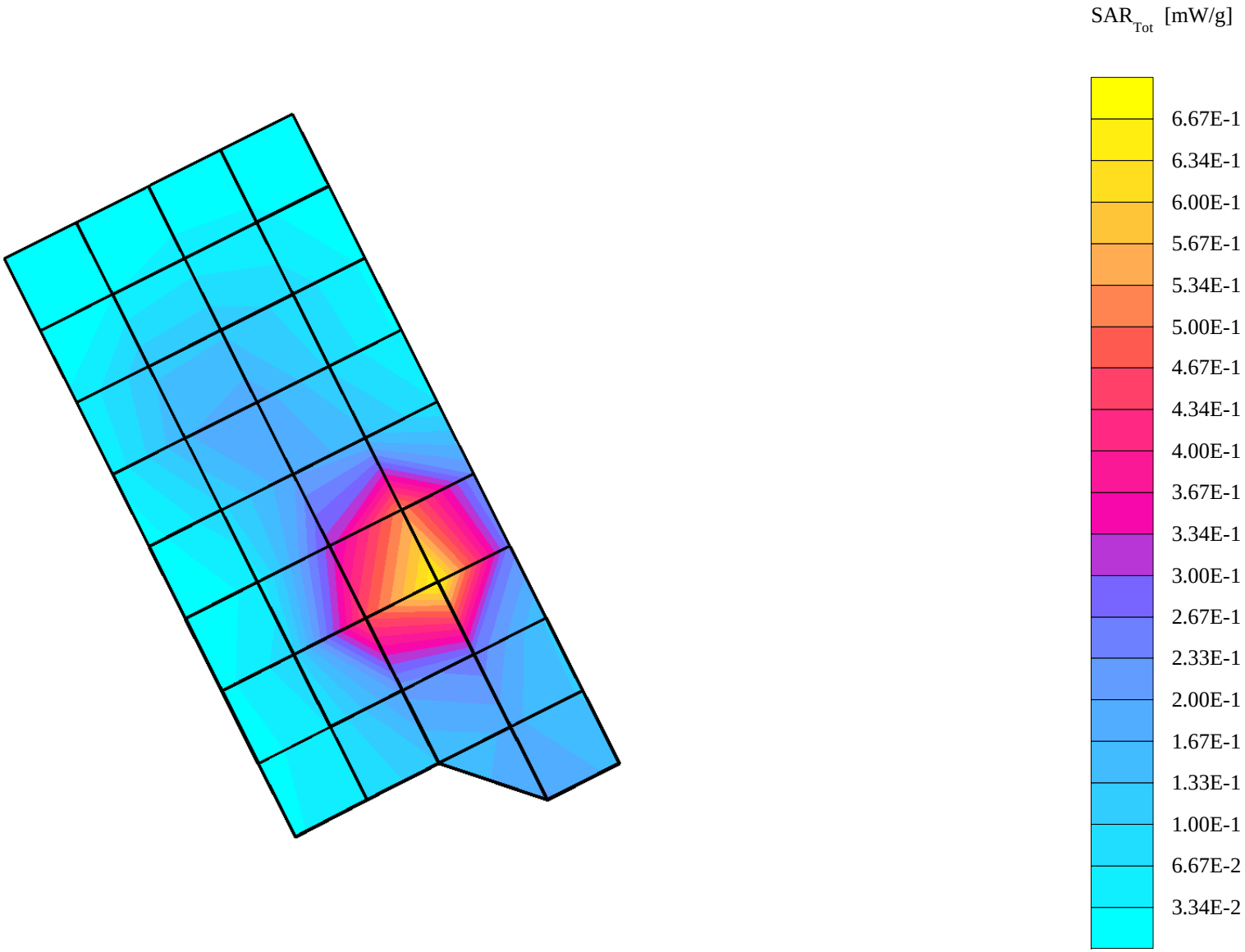
Ch# 661 / Pwr Step: 0 / Antenna Position: FIXED / Battery Model #: SNN5704A / DEVICE POSITION (cheek or rotated): CHEEK
R1 TP-1154 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Left Hand Section; Position: (90°,180°); Frequency: 1880 MHz
Probe: ET3DV6R - SN1506 - IEEE Head; ConvF(4.90,4.90,4.90); Crest factor: 8.0; 1880 MHz Head & Body: $\sigma$ = 1.45 mho/m $\varepsilon_r$ = 38.2 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.555 mW/g, SAR (10g): 0.296 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 9.3 (8.7, 10.4) [mm]
Powerdrift: -0.01 dB



08/28/03

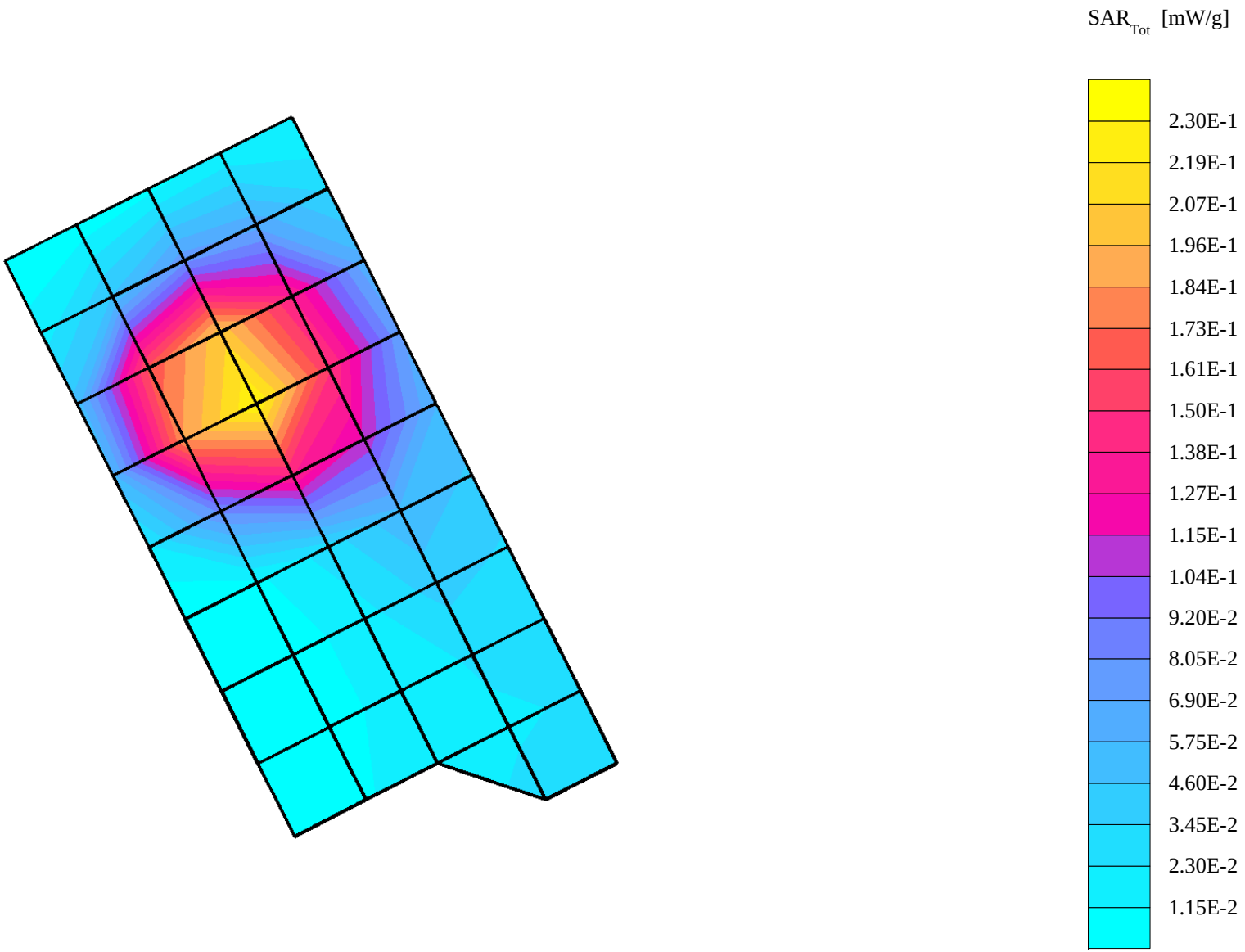
# SN# LV50520029

Ch# 661 / Pwr Step: 0 / Antenna Position: FIXED / Battery Model #: SNN5704A / DEVICE POSITION (cheek or rotated): CHEEK
R1 TP-1154 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 1880 MHz
Probe: ET3DV6R - SN1506 - IEEE Head; ConvF(4.90,4.90,4.90); Crest factor: 8.0; 1880 MHz Head & Body: $\sigma$ = 1.45 mho/m $\varepsilon_r$ = 38.2 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.696 mW/g, SAR (10g): 0.370 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 9.4 (8.9, 10.3) [mm]
Powerdrift: -0.09 dB



# SN# LV50520029

Ch# 661 / Pwr Step: 0 / Antenna Position: FIXED / Battery Model #: SNN5704A / DEVICE POSITION (cheek or rotated): TILTED
R1 TP-1154 GLYCOL SAM Expanded (Rev. 2)-9Jan03 Phantom; Right Hand Section; Position: (90°,180°); Frequency: 1880 MHz
Probe: ET3DV6R - SN1506 - IEEE Head; ConvF(4.90,4.90,4.90); Crest factor: 8.0; 1880 MHz Head & Body: $\sigma$ = 1.45 mho/m $\varepsilon_r$ = 38.2 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.240 mW/g, SAR (10g): 0.146 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 15.0
Penetration depth: 11.2 (10.4, 12.2) [mm]
Powerdrift: -0.05 dB



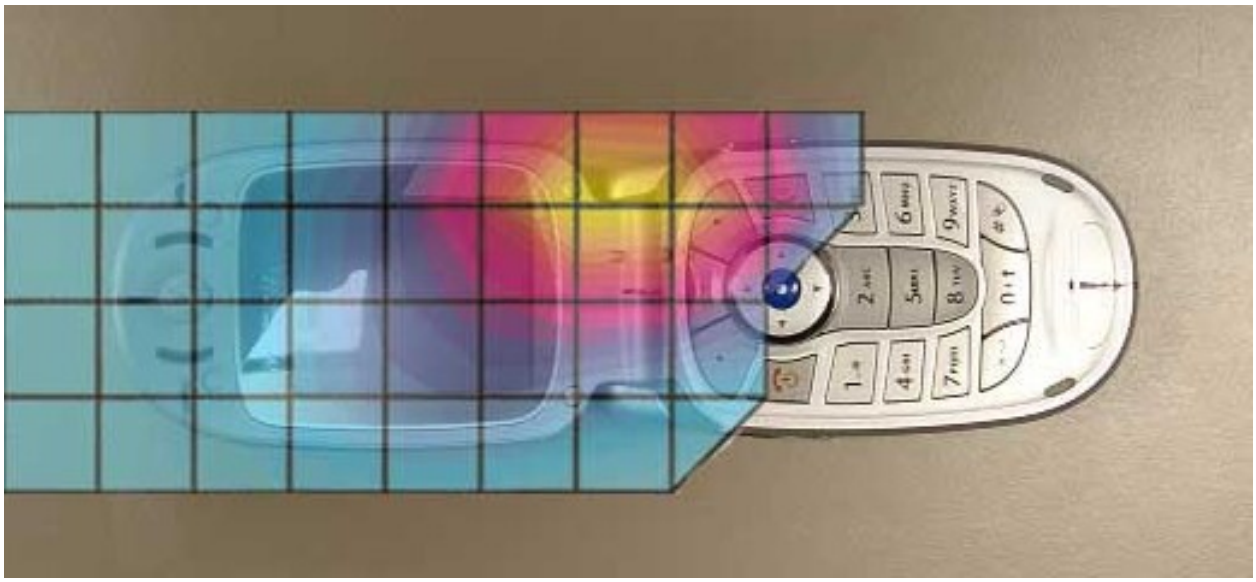


Figure 1.Typical 850MHz Right Head Adjacent Contour Overlaid on Phone with Antenna Fixed (Cheek Touch)

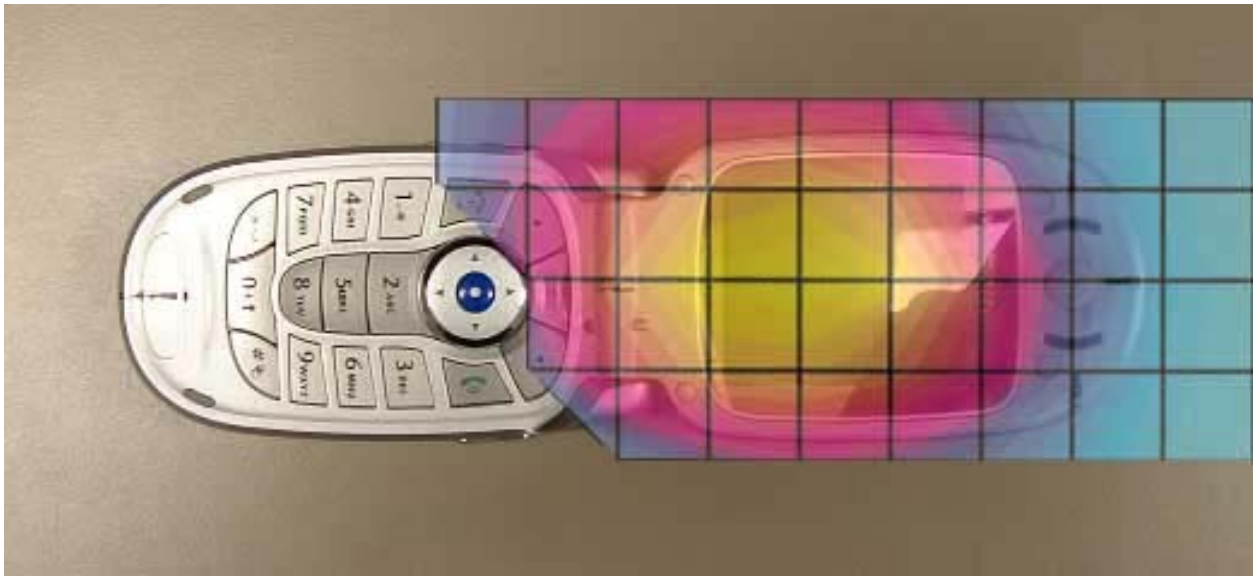


Figure 2.Typical 850MHz Left Head Adjacent Contour Overlaid on Phone with Antenna Fixed (15º Tilt)

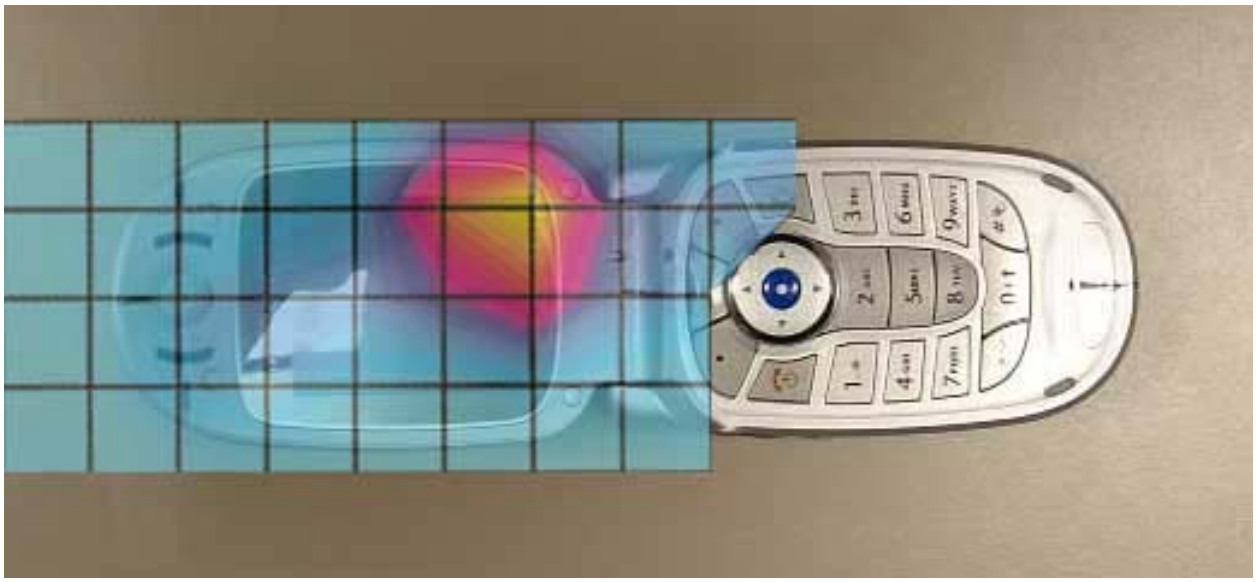


Figure 3.Typical 1900MHz Right Head Adjacent Contour Overlaid on Phone with Antenna Fixed (Cheek Touch)

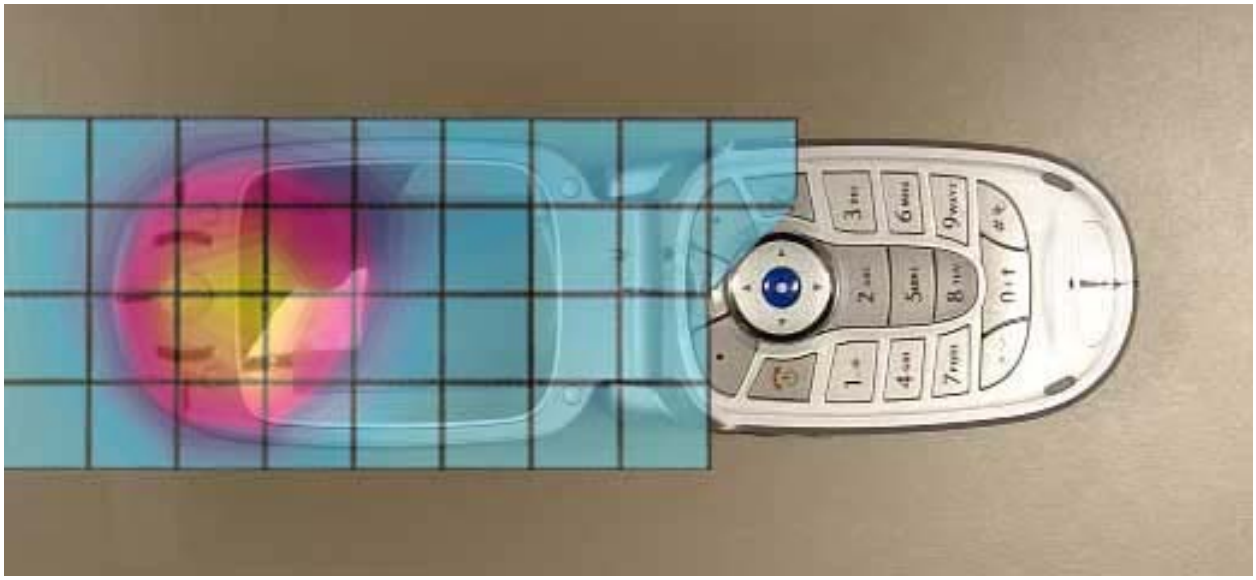


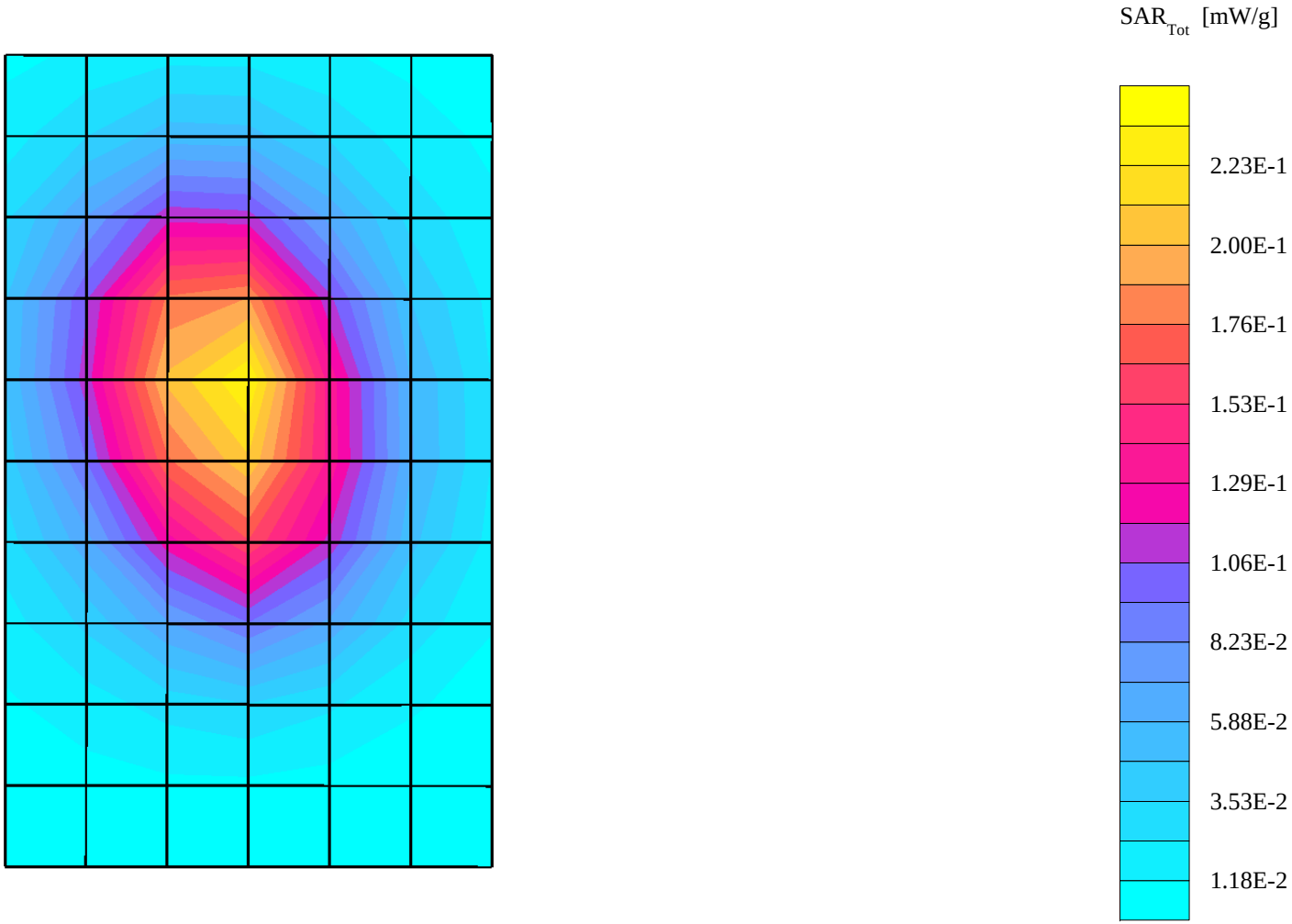
Figure 4.Typical 1900MHz Right Head Adjacent Contour Overlaid on Phone with Antenna Fixed (15º Tilt)

# Appendix 3

## SAR distribution plots for Body Worn Configuration

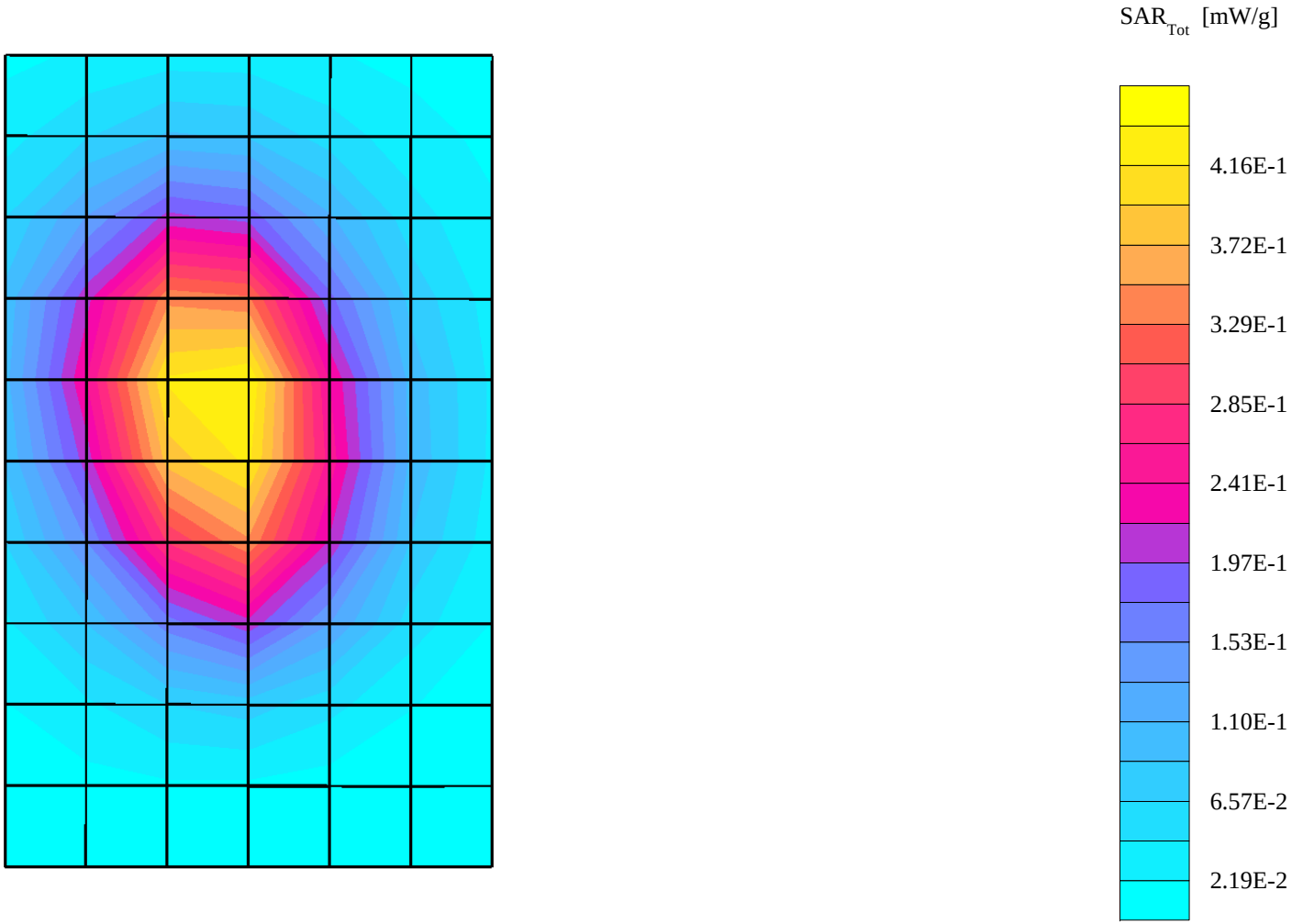
# SN# LV50520029

Ch# 190 / Pwr Step: 05 (OTA) / Antenna Position: FIXED / Battery Model #: SNN5704A / Accessory Model #: EVA Pouch
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 837 MHz
Probe: ET3DV6R - SN1501 - FCC Body; ConvF(6.10,6.10,6.10); Crest factor: 8.0; 835 MHz Head & Body: $\sigma$ = 0.96 mho/m $\varepsilon_r$ = 54.3 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.231 mW/g, SAR (10g): 0.158 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 15.0 (13.7, 16.5) [mm]
Powerdrift: -0.29 dB



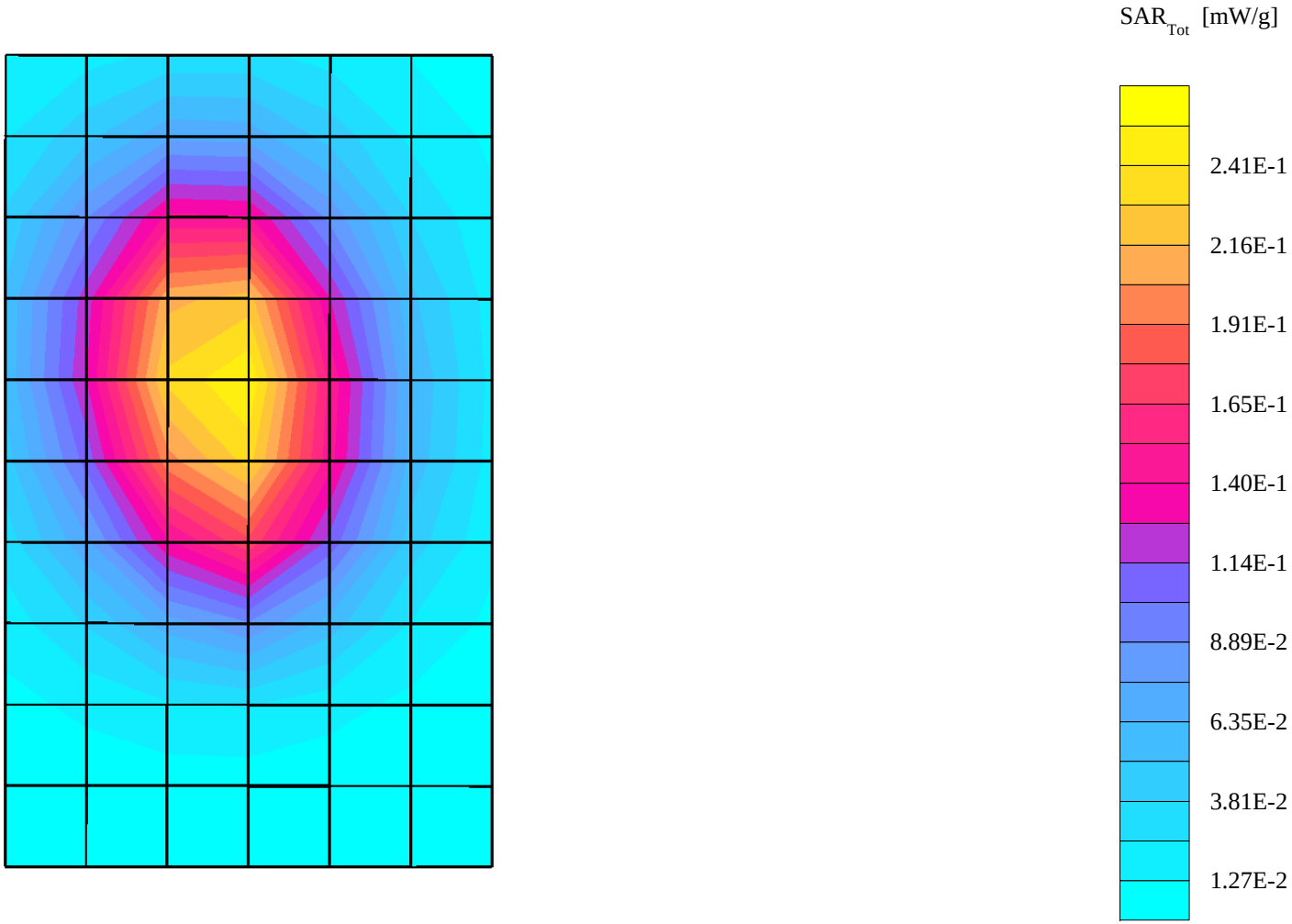
# SN# LV50520029

Ch# 190 / Pwr Step: 05 (OTA) / Antenna Position: FIXED / Battery Model #: SNN5704A / Accessory Model #: EVA Pouch + GPRS
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 837 MHz
Probe: ET3DV6R - SN1501 - FCC Body; ConvF(6.10,6.10,6.10); Crest factor: 4.0; 835 MHz Head & Body: $\sigma$ = 0.96 mho/m $\varepsilon_r$ = 54.3 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.445 mW/g, SAR (10g): 0.307 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 15.3 (14.1, 16.8) [mm]
Powerdrift: -0.47 dB



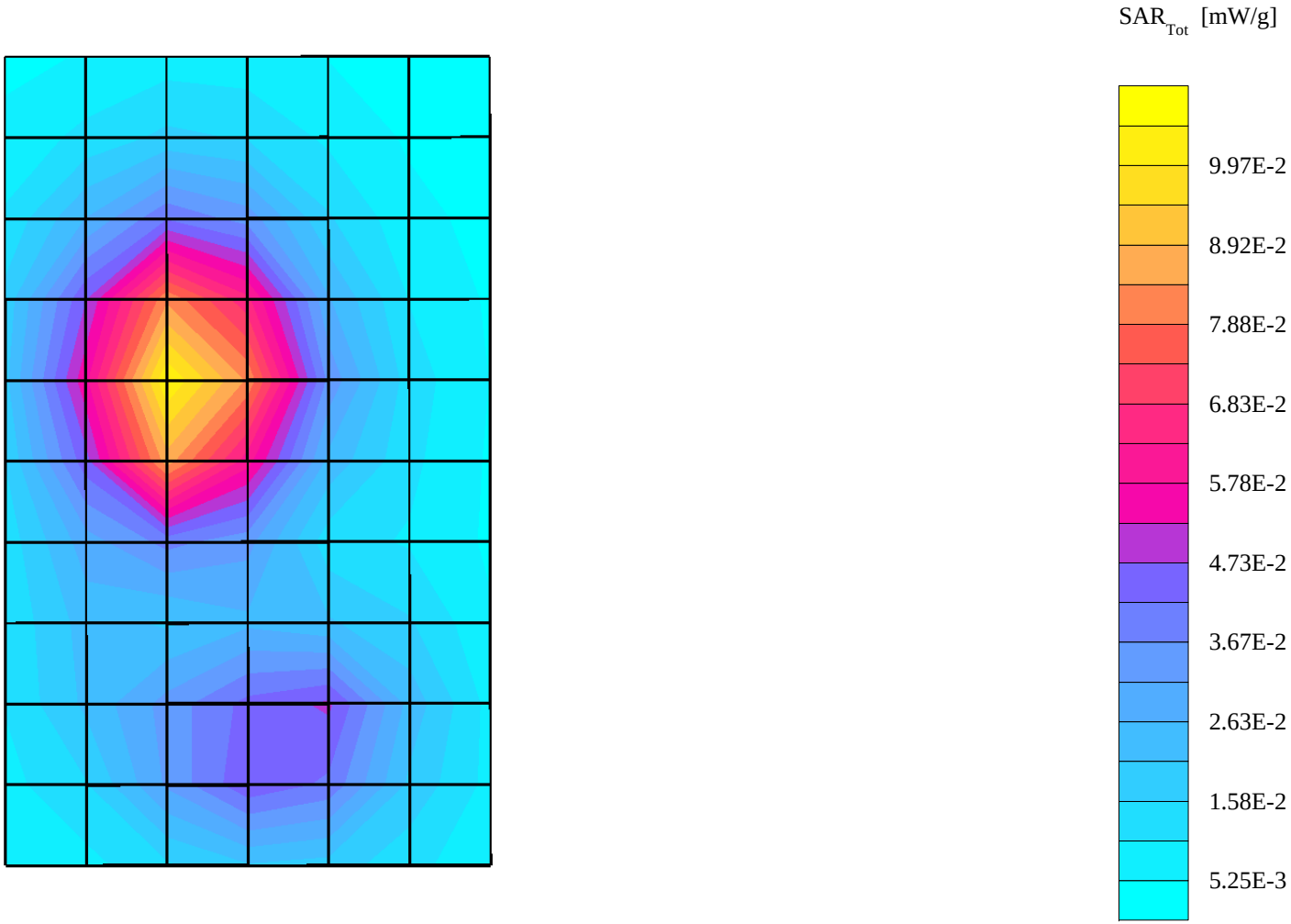
# SN# LV50520029

Ch# 190 / Pwr Step: 05 (OTA) Antenna Position: FIXED / Battery Model #: SNN5704A / Accessory Model #: EVA Pouch w Bluetooth
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 1 Section; Position: (0°,0°); Frequency: 837 MHz
Probe: ET3DV6R - SN1501 - FCC Body; ConvF(6.10,6.10,6.10); Crest factor: 8.0; 835 MHz Head & Body: $\sigma$ = 0.97 mho/m $\varepsilon_r$ = 54.4 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.259 mW/g, SAR (10g): 0.179 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 15.7 (14.5, 17.1) [mm]
Powerdrift: -0.28 dB



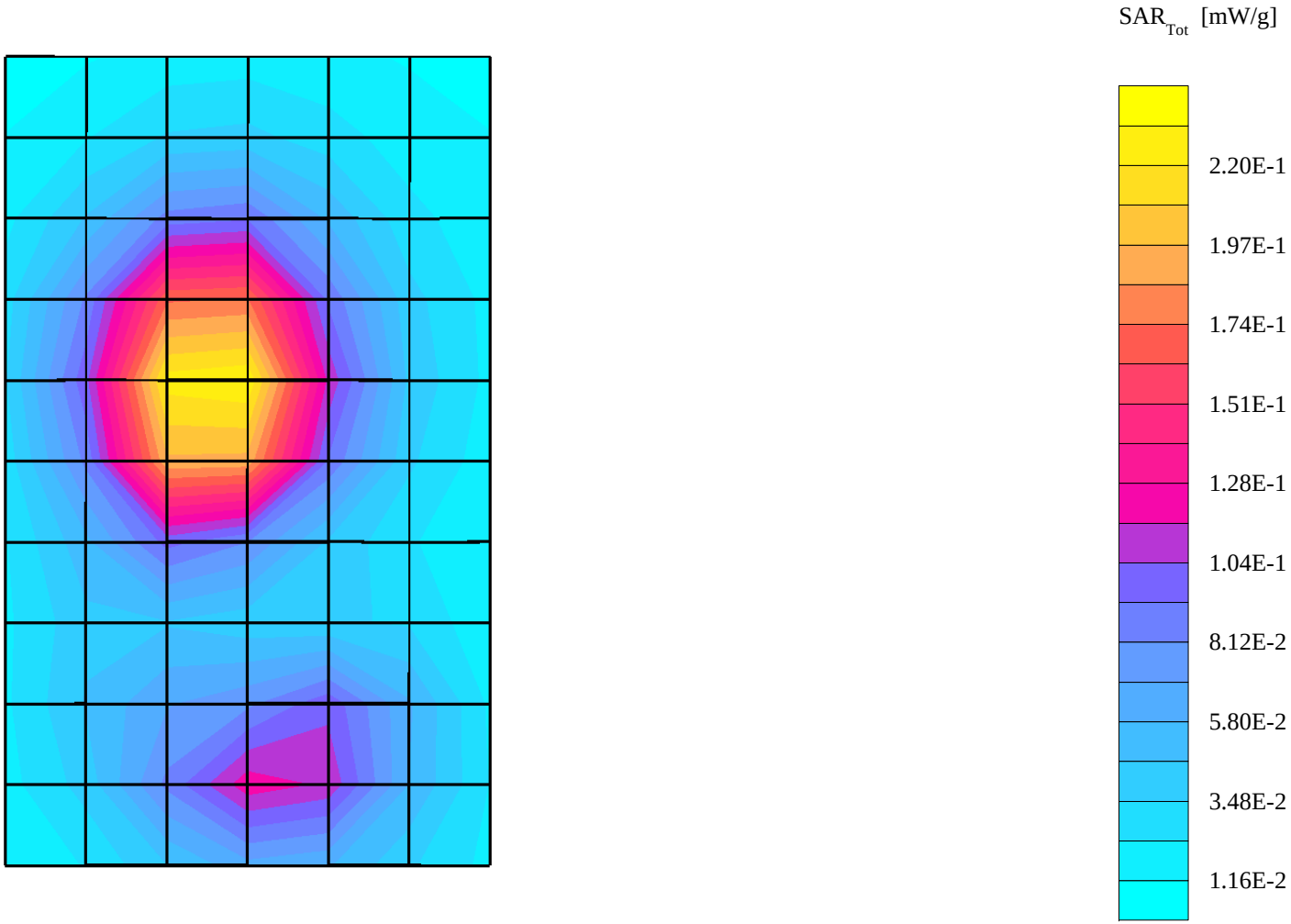
# SN# LV50520029

Ch# 661 / Pwr Step: 00 (OTA) / Antenna Position: FIXED / Battery Model #: SNN5704A
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz
Probe: ET3DV6R - SN1501 - FCC Body; ConvF(4.60,4.60,4.60); Crest factor: 8.0; 1880 MHz Head & Body: $\sigma$ = 1.57 mho/m $\varepsilon_r$ = 52.3 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.107 mW/g, SAR (10g): 0.0648 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 10.6 (9.6, 11.9) [mm]
Powerdrift: -0.05 dB



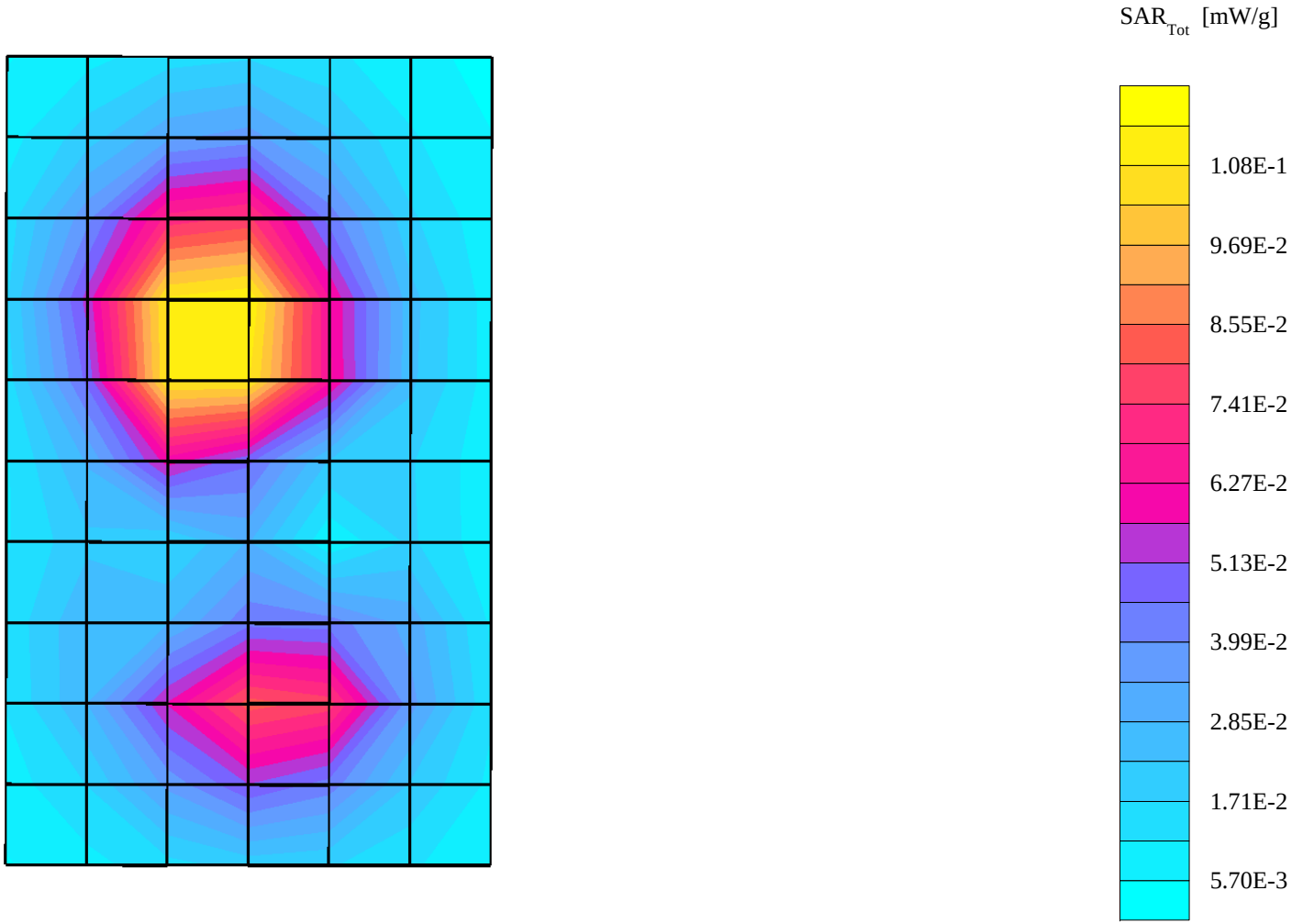
# SN# LV50520029

Ch# 661 / Pwr Step: 00 (OTA) / Antenna Position: FIXED / Battery Model #: SNN5704A / Accessory Model #: EVA Pouch + GPRS
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz
Probe: ET3DV6R - SN1501 - FCC Body; ConvF(4.60,4.60,4.60); Crest factor: 4.0; 1880 MHz Head & Body: $\sigma$ = 1.57 mho/m $\varepsilon_r$ = 52.3 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.251 mW/g, SAR (10g): 0.153 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 10.7 (9.6, 12.3) [mm]
Powerdrift: -0.07 dB



# SN# LV50520029

Ch# 661 / Pwr Step: 00 (OTA) / Antenna Position: FIXED / Battery Model #: SNN5704A / Accessory Model #: EVA Pouch Bluetooth Mode
R5 Amy Twin Phantom Rev.4 (22Aug02) Phantom; section 2 Section; Position: (0°,0°); Frequency: 1880 MHz
Probe: ET3DV6R - SN1501 - FCC Body; ConvF(4.60,4.60,4.60); Crest factor: 8.0; 1880 MHz Head & Body: $\sigma$ = 1.59 mho/m $\varepsilon_r$ = 52.0 $\rho$ = 1.00 g/cm$^3$
Cube 7x7x7: SAR (1g): 0.128 mW/g, SAR (10g): 0.0777 mW/g, (Worst-case extrapolation)
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0
Penetration depth: 10.6 (9.7, 11.9) [mm]
Powerdrift: -0.05 dB



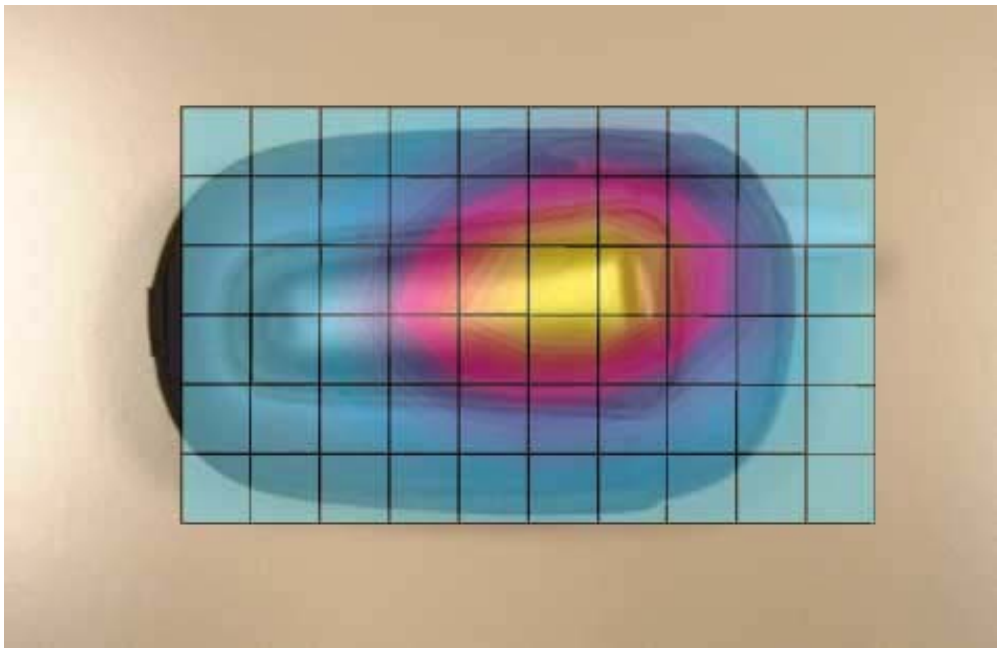


Figure 5.Typical 850 MHz Body-Worn Contour Overlaid on Phone with Antenna Fixed

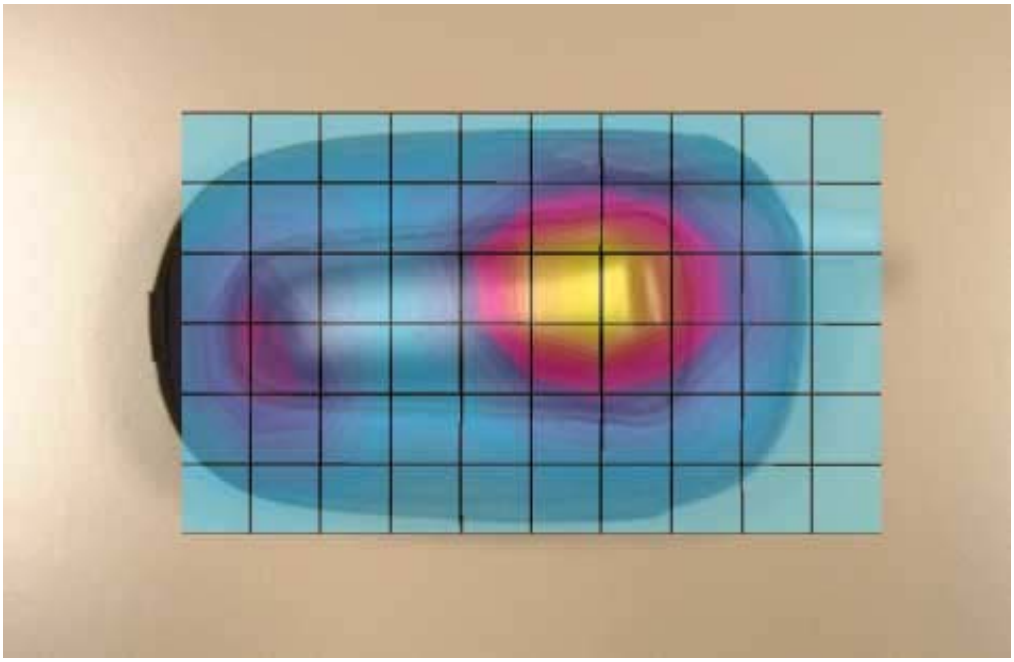


Figure 6. Typical 1900 MHz Body-Worn Contour Overlaid on Phone with Antenna Fixed

# Appendix 4

## Probe Calibration Certificate

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

**Client** Motorola MRO

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object(s) | ET3DV6R - SN:1501 |
| Calibration procedure(s) | QA CAL-01.v2<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | April 16, 2003 |
| Condition of the calibrated item | In Tolerance (according to the specific calibration document) |

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

| Model Type | ID # | Cal Date | Scheduled Calibration |
|---|---|---|---|
| RF generator HP 8684C | US3642U01700 | 4-Aug-99 (in house check Aug-02) | In house check: Aug-05 |
| Power sensor E4412A | MY41495277 | 2-Apr-03 | Apr-04 |
| Power sensor HP 8481A | MY41092180 | 18-Sep-02 | Sep-03 |
| Power meter EPM E4419B | GB41293874 | 13-Sep-02 | Sep-03 |
| Network Analyzer HP 8753E | US38432426 | 3-May-00 | In house check: May 03 |
| Fluke Process Calibrator Type 702 | SN: 6295803 | 3-Sep-01 | Sep-03 |

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

Date issued: April 16, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

# DASY - Parameters of Probe: ET3DV6R SN:1501

## Sensitivity in Free Space

| | | |
|---|---|---|
| NormX | **2.08** | $\mu V/(V/m)^2$ |
| NormY | **2.09** | $\mu V/(V/m)^2$ |
| NormZ | **2.14** | $\mu V/(V/m)^2$ |

## Diode Compression

| | | |
|---|---|---|
| DCP X | **96** | mV |
| DCP Y | **96** | mV |
| DCP Z | **96** | mV |

## Sensitivity in Tissue Simulating Liquid

**Head** **900 MHz** $\varepsilon_r$ **= 41.5 ± 5%** $\sigma$ **= 0.97 ± 5% mho/m**

**Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X**

| | | | | |
|---|---|---|---|---|
| ConvF X | **6.4** | ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | **6.4** | ± 9.5% (k=2) | Alpha | **0.39** |
| ConvF Z | **6.4** | ± 9.5% (k=2) | Depth | **2.31** |

**Head** **1800 MHz** $\varepsilon_r$ **= 40.0 ± 5%** $\sigma$ **= 1.40 ± 5% mho/m**

**Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X**

| | | | | |
|---|---|---|---|---|
| ConvF X | **5.0** | ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | **5.0** | ± 9.5% (k=2) | Alpha | **0.49** |
| ConvF Z | **5.0** | ± 9.5% (k=2) | Depth | **2.55** |

## Boundary Effect

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

| Probe Tip to Boundary | | **1 mm** | **2 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 8.9 | 4.9 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.3 | 0.5 |

**Head** **1800 MHz** **Typical SAR gradient: 10 % per mm**

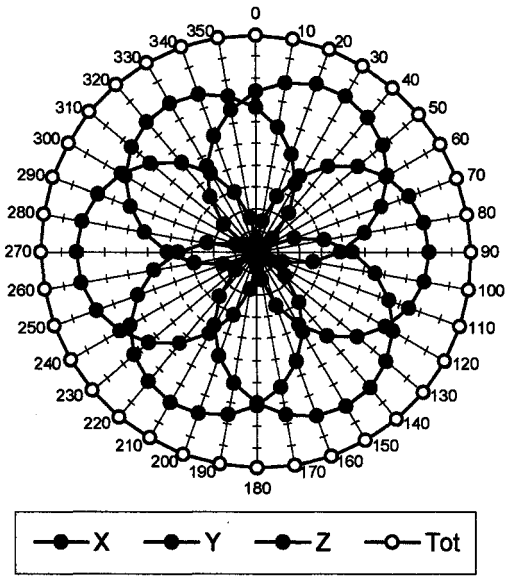
| Probe Tip to Boundary | | **1 mm** | **2 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 12.8 | 8.6 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.2 | 0.2 |

## Sensor Offset

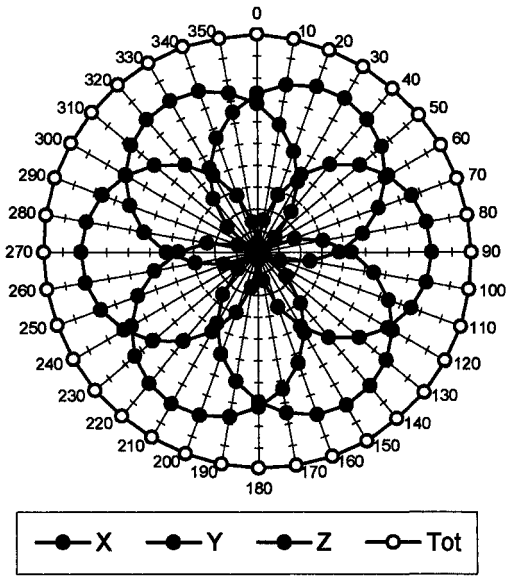
| | | |
|---|---|---|
| Probe Tip to Sensor Center | **2.7** | mm |

# Receiving Pattern ($\phi$ , $\theta$ = 0°

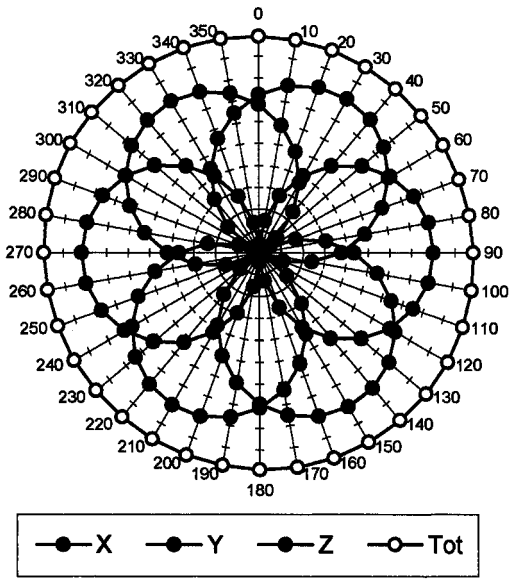
**f = 30 MHz, TEM cell ifi110**



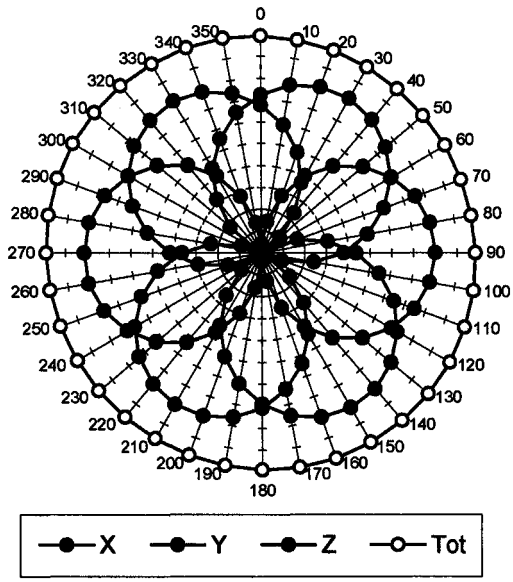

**f = 100 MHz, TEM cell ifi110**

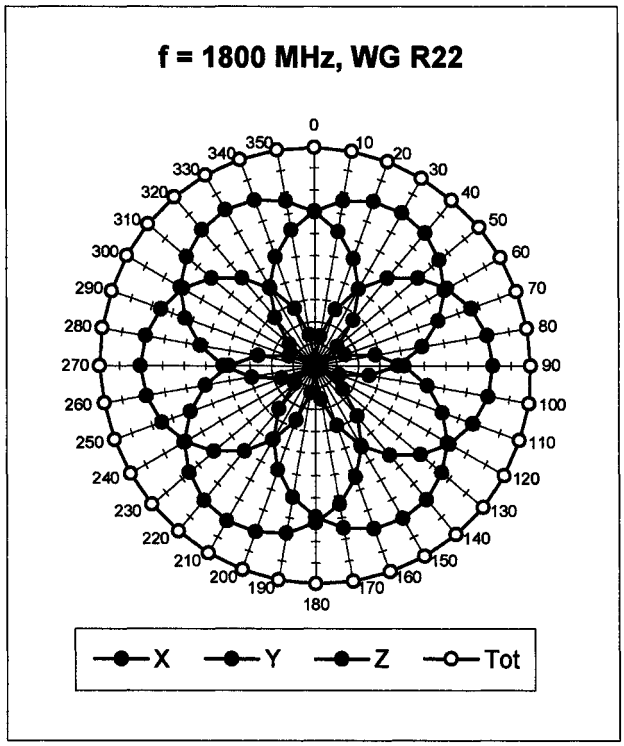


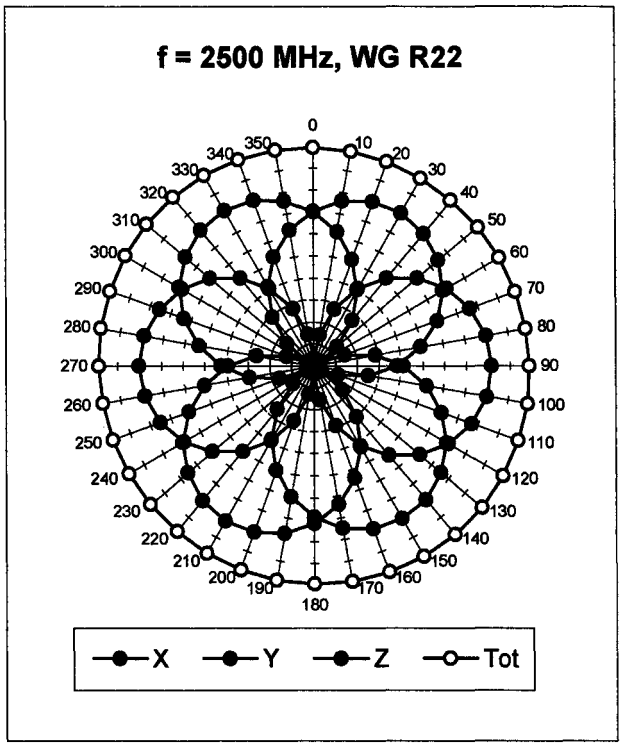

**f = 300 MHz, TEM cell ifi110**



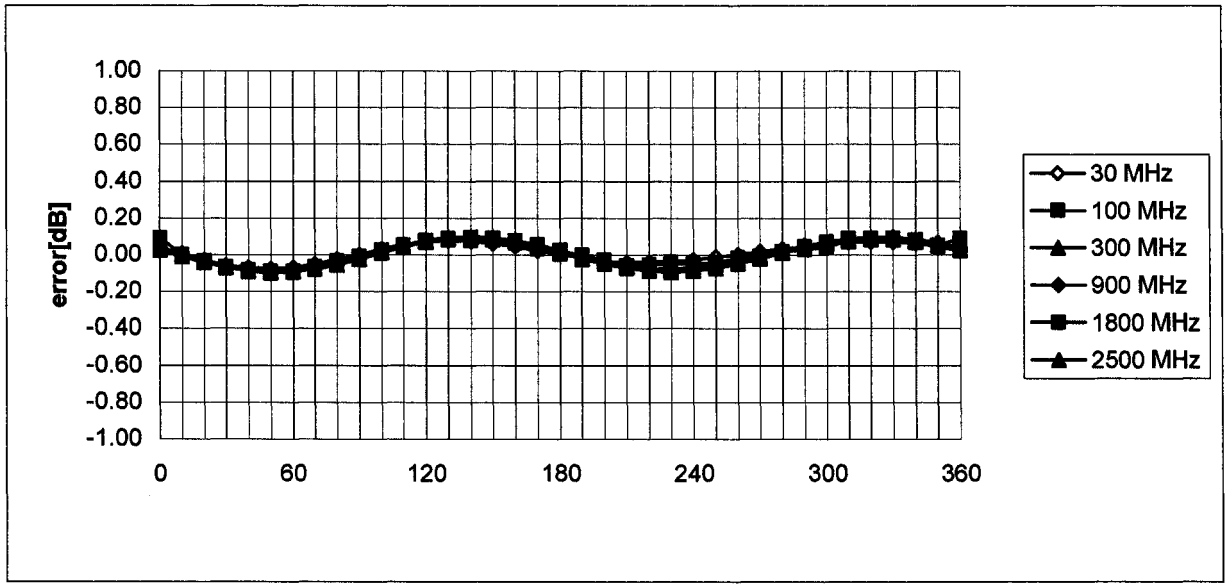

**f = 900 MHz, TEM cell ifi110**





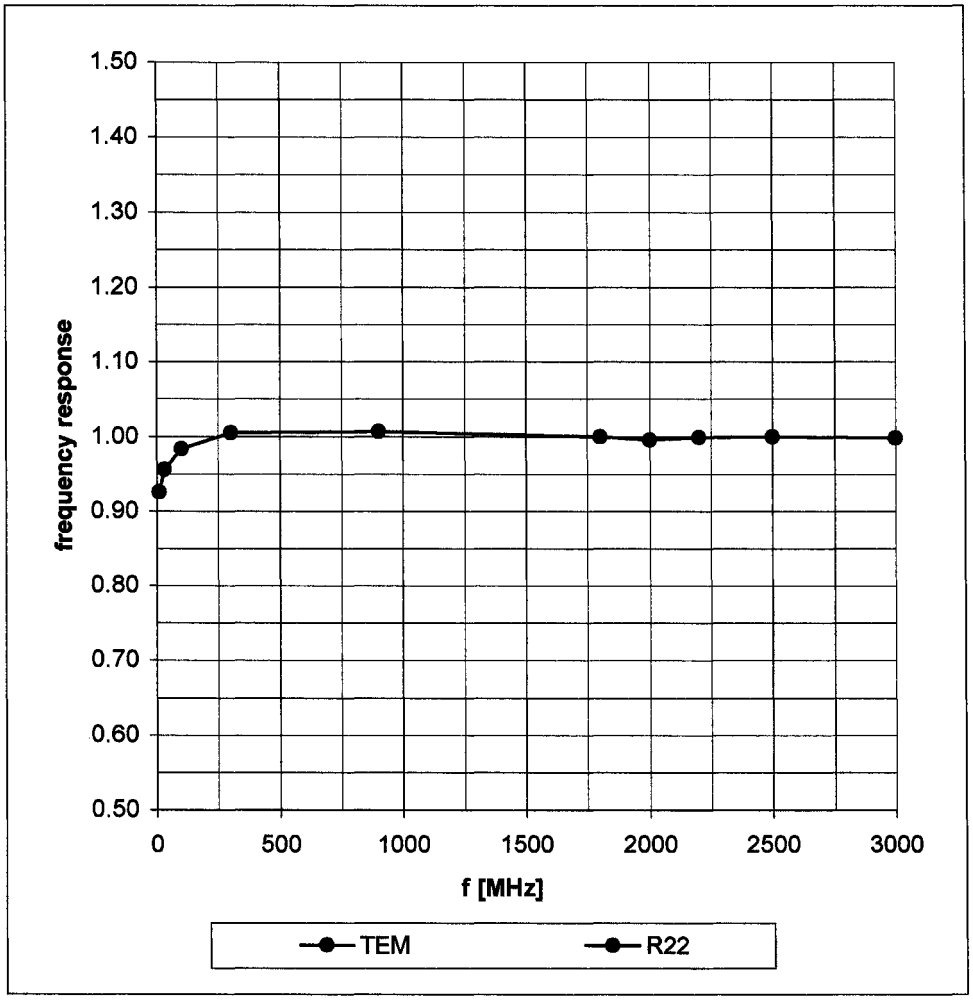




# Isotropy Error ($\phi$), $\theta$ = 0°



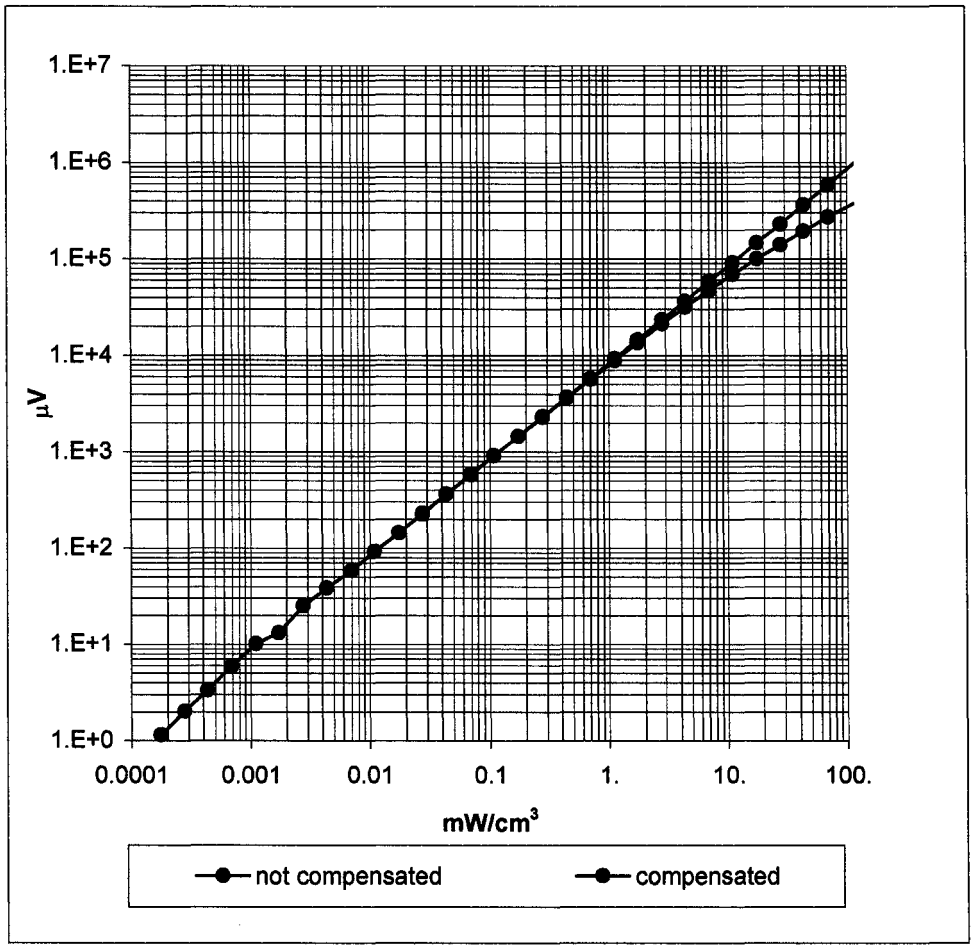
# Frequency Response of E-Field

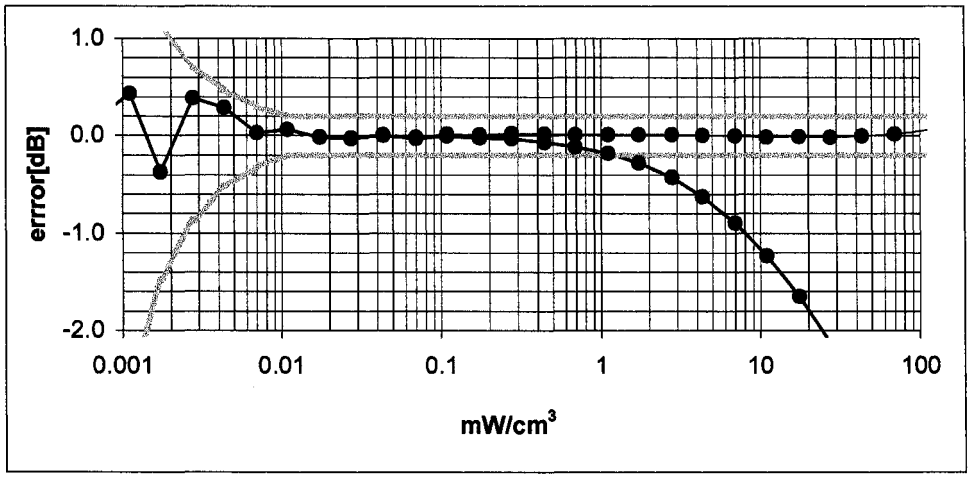
**( TEM-Cell:ifi110, Waveguide R22)**



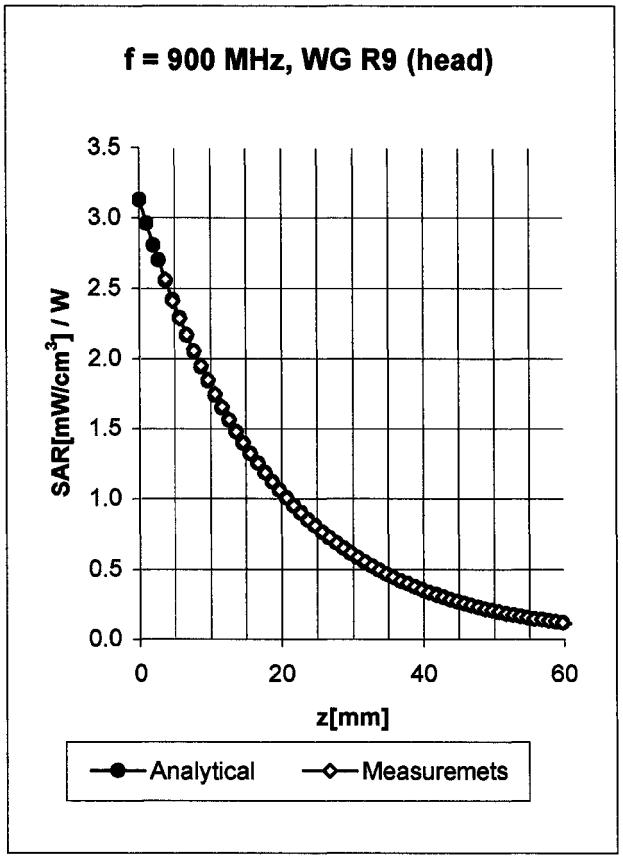
# Dynamic Range f($SAR_{brain}$)

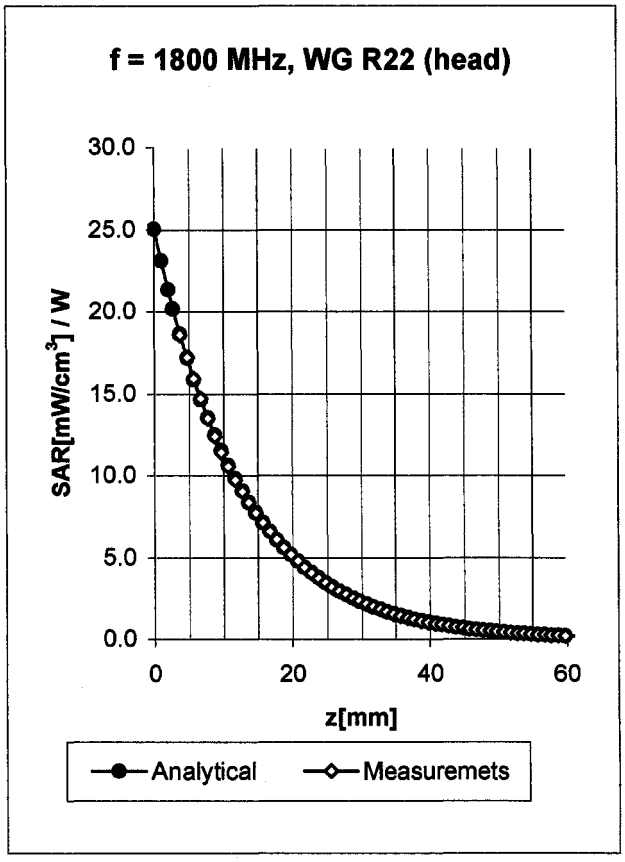
( Waveguide R22 )



# Conversion Factor Assessment




**Head** **900 MHz** $\varepsilon_r$ **= 41.5 ± 5%** $\sigma$ **= 0.97 ± 5% mho/m**

**Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X**

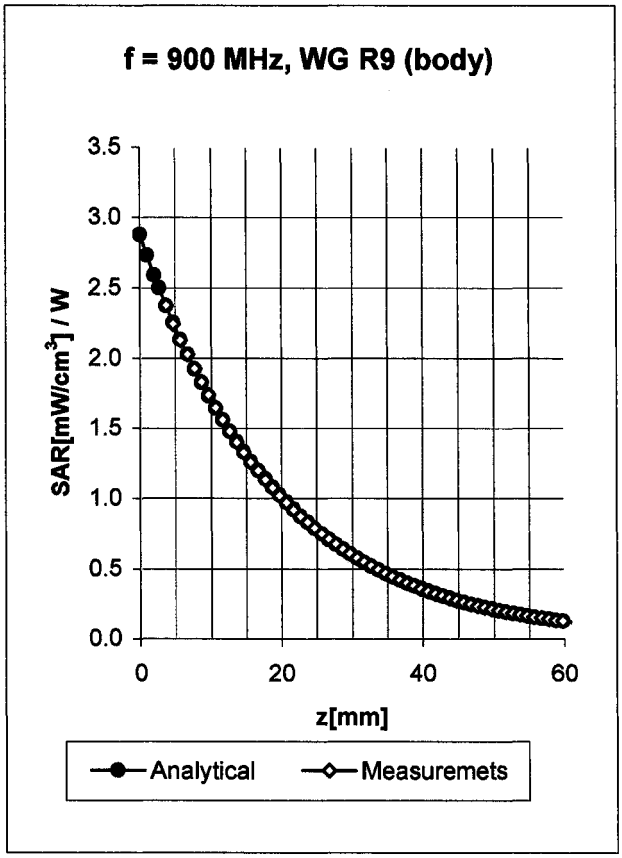
| | | | |
|---|---|---|---|
| ConvF X | **6.4** ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | **6.4** ± 9.5% (k=2) | Alpha | **0.39** |
| ConvF Z | **6.4** ± 9.5% (k=2) | Depth | **2.31** |

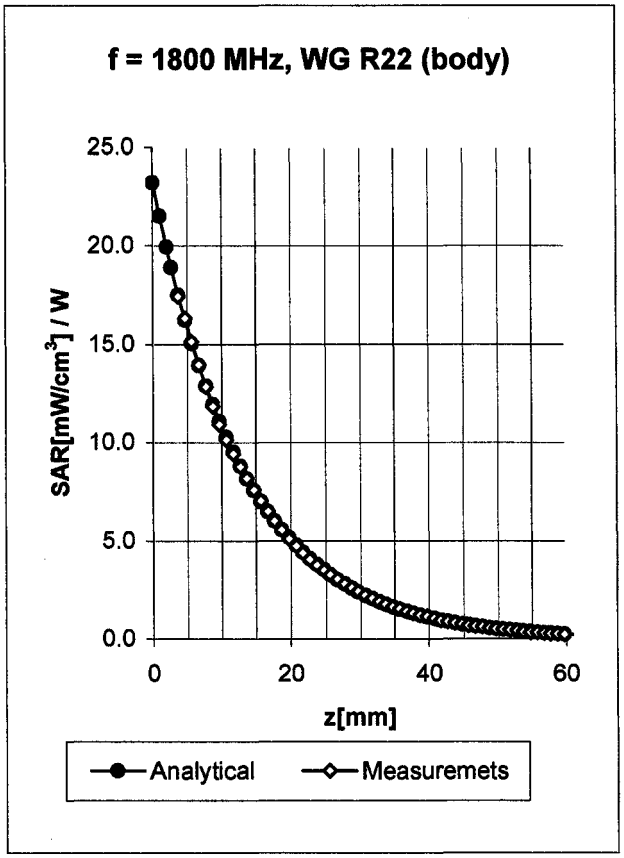
**Head** **1800 MHz** $\varepsilon_r$ **= 40.0 ± 5%** $\sigma$ **= 1.40 ± 5% mho/m**

**Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to IEEE P1528-200X**

| | | | |
|---|---|---|---|
| ConvF X | **5.0** ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | **5.0** ± 9.5% (k=2) | Alpha | **0.49** |
| ConvF Z | **5.0** ± 9.5% (k=2) | Depth | **2.55** |

# Conversion Factor Assessment




**Body** **900 MHz** $\varepsilon_r$ **= 55.0 ± 5%** $\sigma$ **= 1.05 ± 5% mho/m**

**Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C**

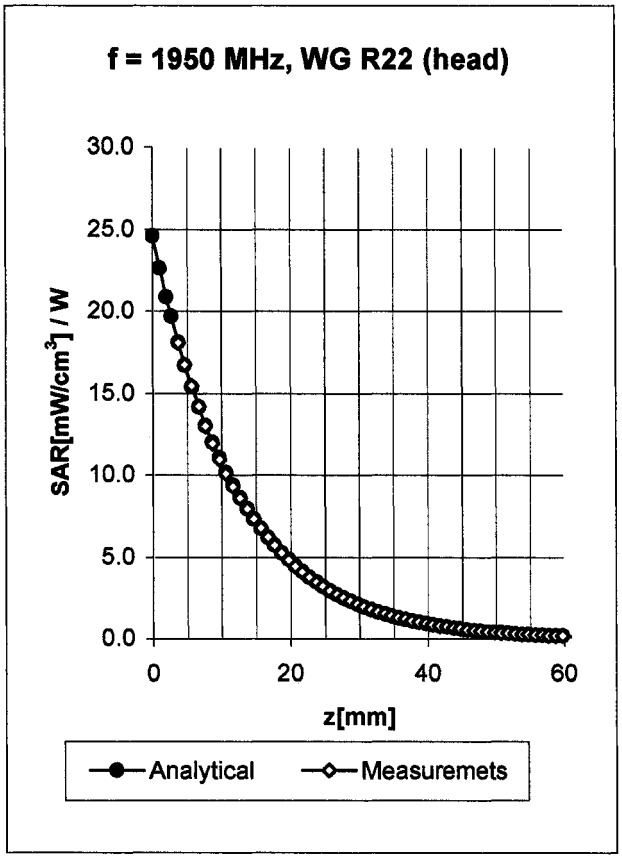
| | | | | |
|---|---|---|---|---|
| ConvF X | **6.1** | ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | **6.1** | ± 9.5% (k=2) | Alpha | **0.40** |
| ConvF Z | **6.1** | ± 9.5% (k=2) | Depth | **2.37** |

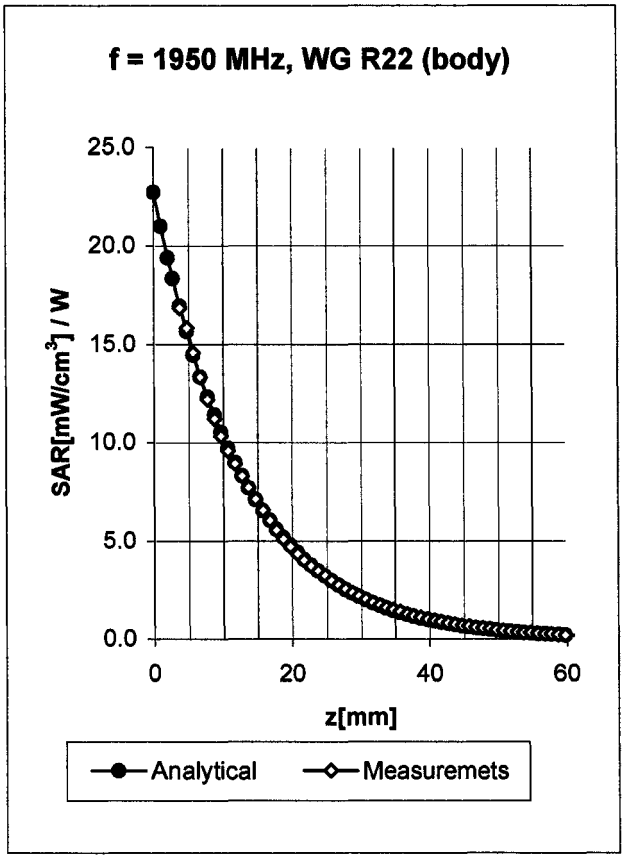
**Body** **1800 MHz** $\varepsilon_r$ **= 53.3 ± 5%** $\sigma$ **= 1.52 ± 5% mho/m**

**Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C**

| | | | | |
|---|---|---|---|---|
| ConvF X | **4.6** | ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | **4.6** | ± 9.5% (k=2) | Alpha | **0.55** |
| ConvF Z | **4.6** | ± 9.5% (k=2) | Depth | **2.59** |

# Conversion Factor Assessment



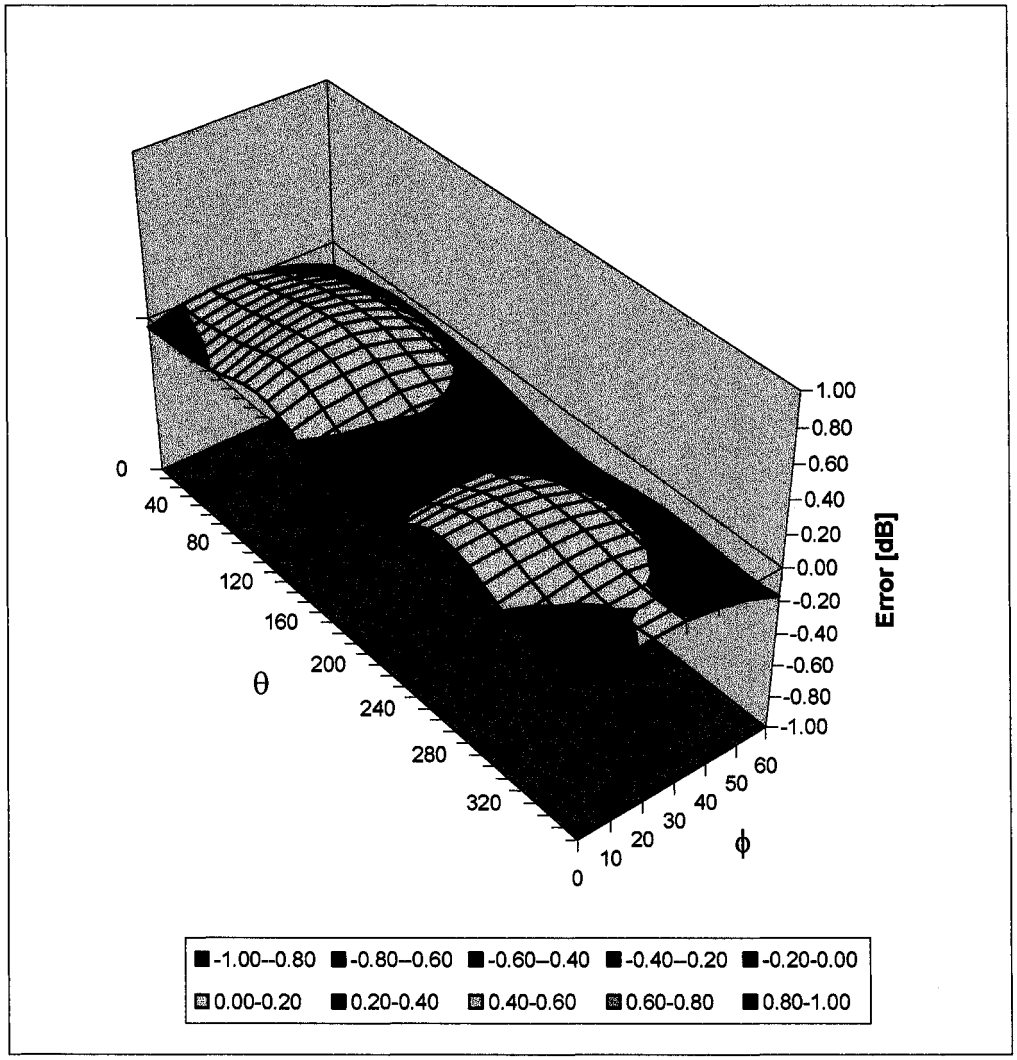




| | | | | | |
|---|---|---|---|---|---|
| **Head** | **1950** | **MHz** | $\varepsilon_r$ **= 40.0 ± 5%** | $\sigma$ **= 1.40 ± 5% mho/m** | |
| | ConvF X | **4.7** ± 8.9% (k=2) | | Boundary effect: | |
| | ConvF Y | **4.7** ± 8.9% (k=2) | | Alpha | **0.53** |
| | ConvF Z | **4.7** ± 8.9% (k=2) | | Depth | **2.53** |

| | | | | | |
|---|---|---|---|---|---|
| **Body** | **1950** | **MHz** | $\varepsilon_r$ **= 53.3 ± 5%** | $\sigma$ **= 1.52 ± 5% mho/m** | |
| | ConvF X | **4.2** ± 8.9% (k=2) | | Boundary effect: | |
| | ConvF Y | **4.2** ± 8.9% (k=2) | | Alpha | **0.70** |
| | ConvF Z | **4.2** ± 8.9% (k=2) | | Depth | **2.26** |

# Deviation from Isotropy in HSL

**Error (θϕ ), f = 900 MHz**



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

**Client** Motorola MRO

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object(s) | ET3DV6R - SN:1506 |
| Calibration procedure(s) | QA CAL-01.v2<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | May 14, 2003 |
| Condition of the calibrated item | In Tolerance (according to the specific calibration document) |

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

| Model Type | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| RF generator HP 8684C | US3642U01700 | 4-Aug-99 (SPEAG, in house check Aug-02) | In house check: Aug-05 |
| Power sensor E4412A | MY41495277 | 2-Apr-03 (METAS, No 252-0250) | Apr-04 |
| Power sensor HP 8481A | MY41092180 | 18-Sep-02 (Agilent, No. 20020918) | Sep-03 |
| Power meter EPM E4419B | GB41293874 | 2-Apr-03 (METAS, No 252-0250) | Apr-04 |
| Network Analyzer HP 8753E | US38432426 | 3-May-00 (Agilent, No. 8702K064602) | In house check: May 03 |
| Fluke Process Calibrator Type 702 | SN: 6295803 | 3-Sep-01 (ELCAL, No.2360) | Sep-03 |

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

Date issued: May 15, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

# Probe ET3DV6R

## SN:1506

| | |
|---|---|
| Manufactured: | October 24, 1999 |
| Last calibration: | May 3, 2002 |
| Recalibrated: | May 14, 2003 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

# DASY - Parameters of Probe: ET3DV6R SN:1506

## Sensitivity in Free Space

| | | |
|---|---|---|
| NormX | **2.22** | $\mu V/(V/m)^2$ |
| NormY | **2.04** | $\mu V/(V/m)^2$ |
| NormZ | **1.22** | $\mu V/(V/m)^2$ |

## Diode Compression

| | | |
|---|---|---|
| DCP X | **97** | mV |
| DCP Y | **97** | mV |
| DCP Z | **97** | mV |

## Sensitivity in Tissue Simulating Liquid

**Head** 900 MHz $\varepsilon_r$ = 41.5 ± 5% $\sigma$ = 0.97 ± 5% mho/m

**Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

| | | | | |
|---|---|---|---|---|
| ConvF X | **6.1** | ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | **6.1** | ± 9.5% (k=2) | Alpha | **0.60** |
| ConvF Z | **6.1** | ± 9.5% (k=2) | Depth | **2.02** |

**Head** 1800 MHz $\varepsilon_r$ = 40.0 ± 5% $\sigma$ = 1.40 ± 5% mho/m

**Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X**

| | | | | |
|---|---|---|---|---|
| ConvF X | **4.9** | ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | **4.9** | ± 9.5% (k=2) | Alpha | **0.61** |
| ConvF Z | **4.9** | ± 9.5% (k=2) | Depth | **2.37** |

## Boundary Effect

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

| Probe Tip to Boundary | | **1 mm** | **2 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 11.0 | 5.7 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.3 | 0.5 |

**Head** **1800 MHz** **Typical SAR gradient: 10 % per mm**

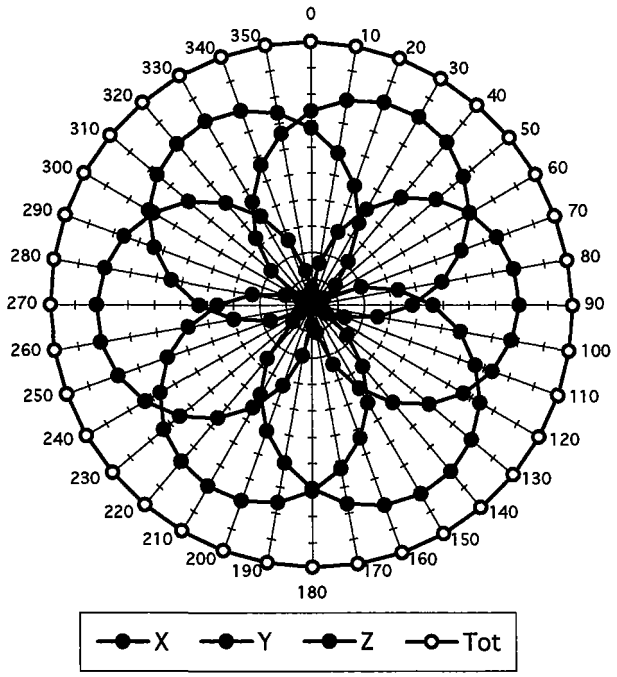
| Probe Tip to Boundary | | **1 mm** | **2 mm** |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 14.6 | 9.3 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.1 | 0.2 |

## Sensor Offset

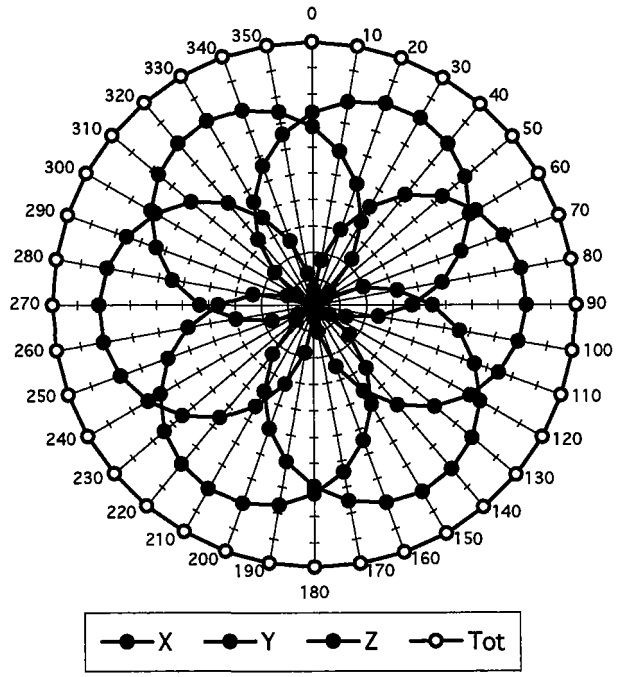
| | | |
|---|---|---|
| Probe Tip to Sensor Center | **2.7** | mm |
| Optical Surface Detection | | mm |

# Receiving Pattern (ϕ), θ = 0°

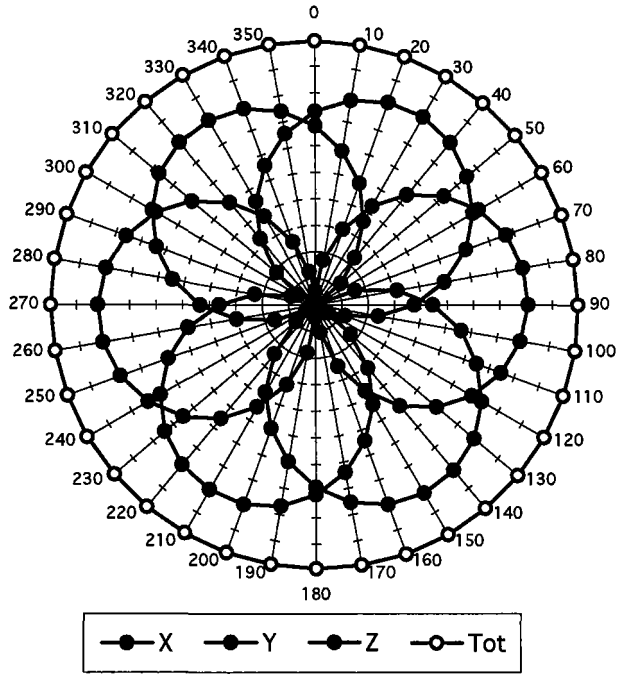
f = 30 MHz, TEM cell ifi110



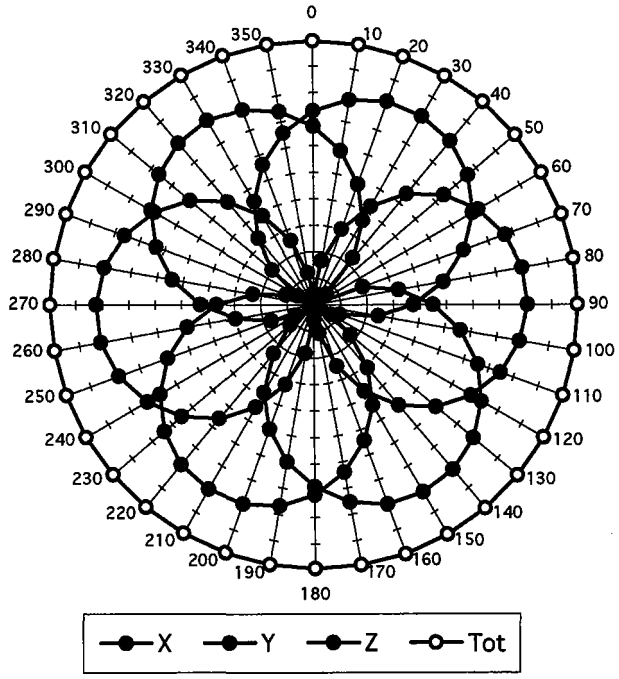

f = 100 MHz, TEM cell ifi110

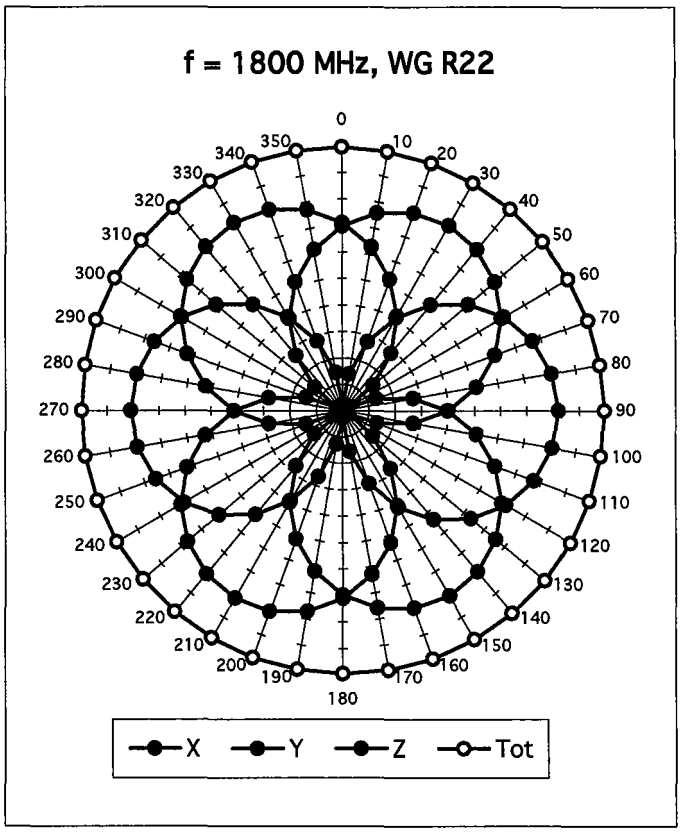


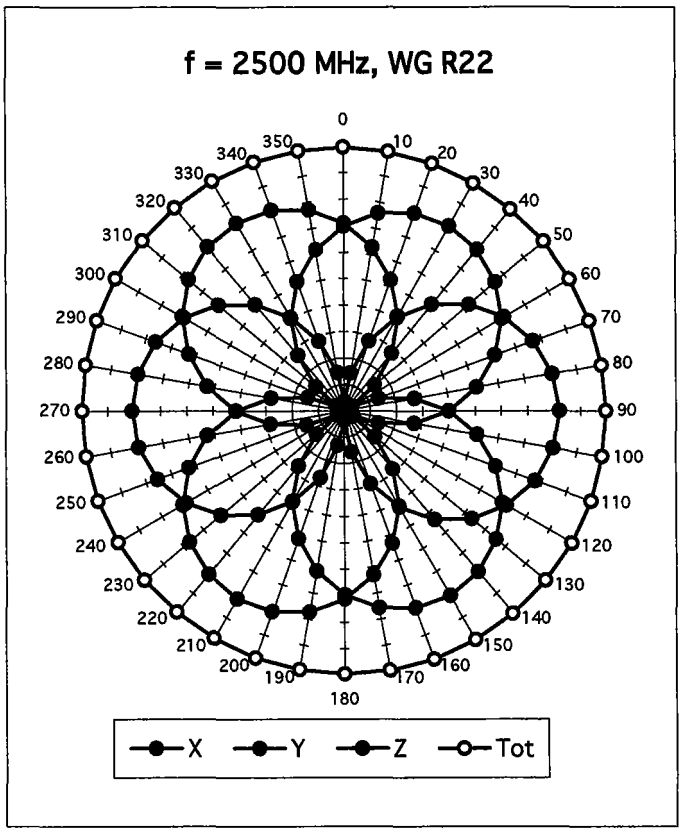

f = 300 MHz, TEM cell ifi110



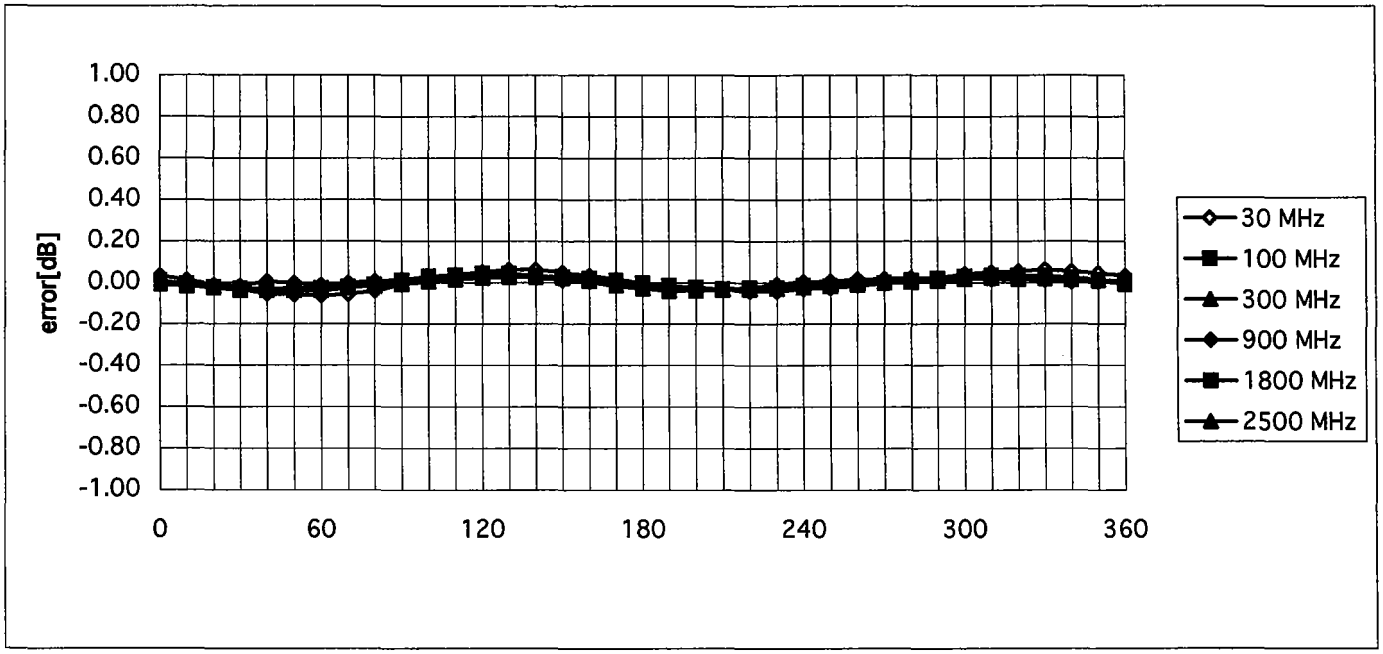

f = 900 MHz, TEM cell ifi110





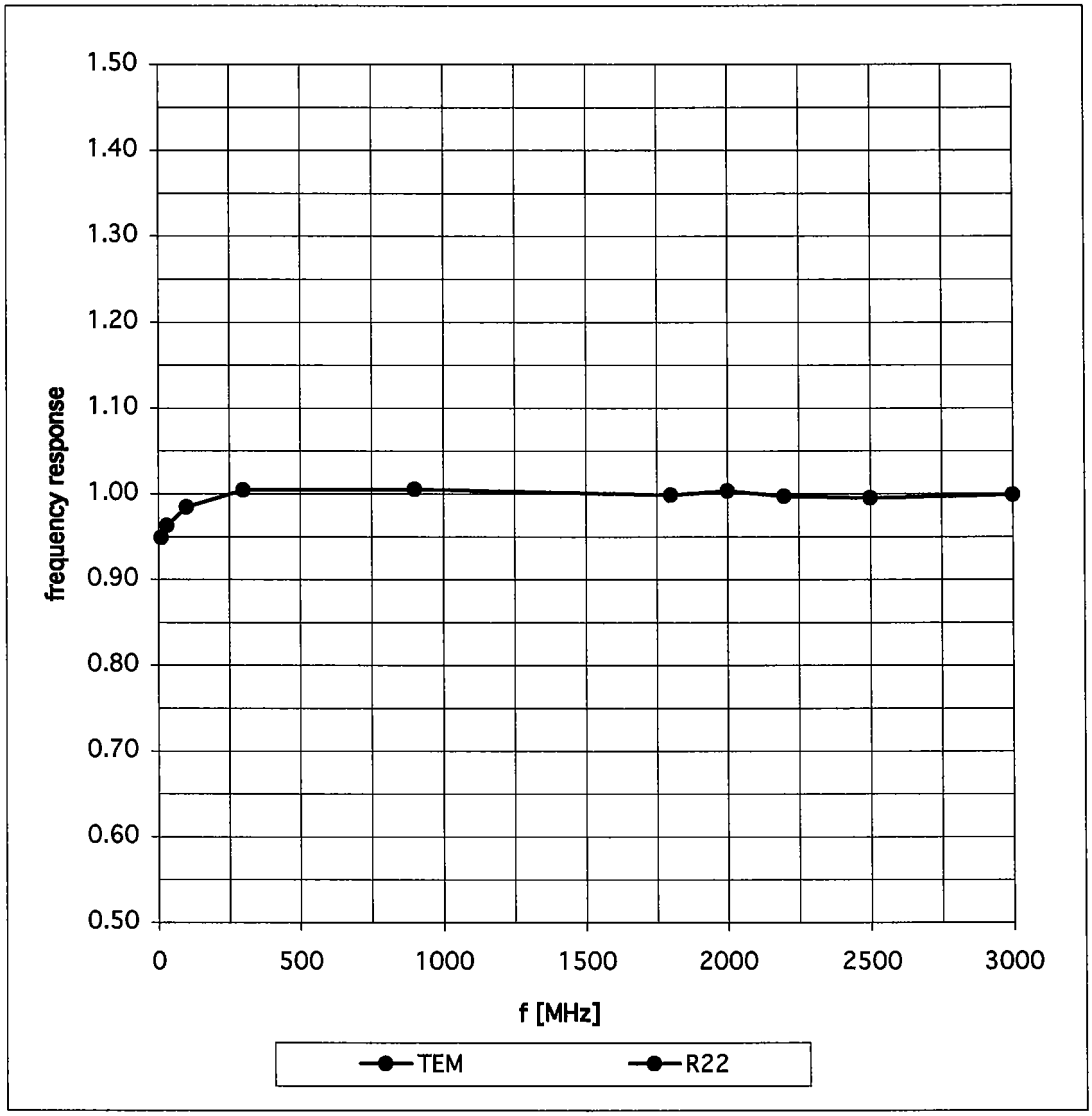




# Isotropy Error (ϕ), θ = 0°



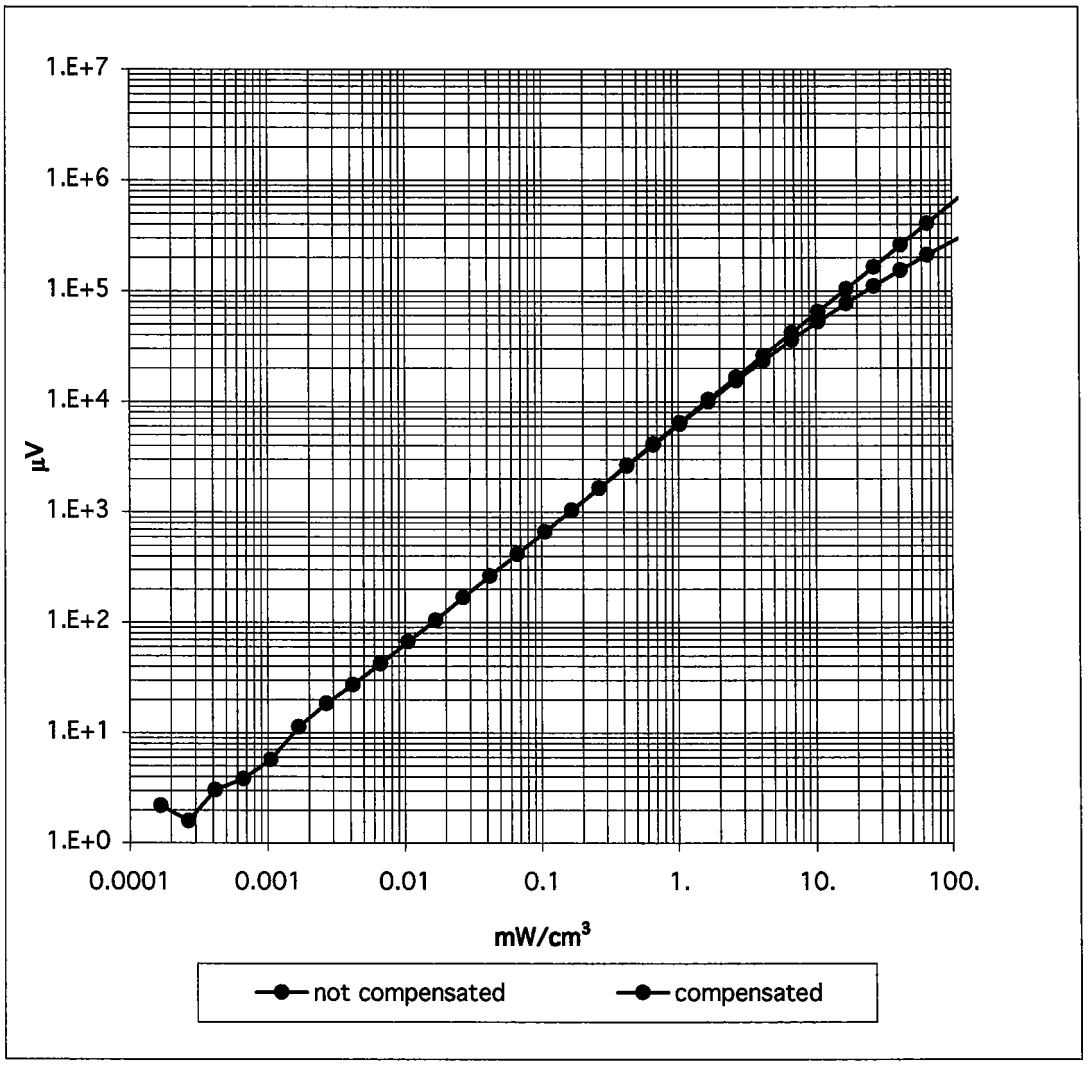
# Frequency Response of E-Field

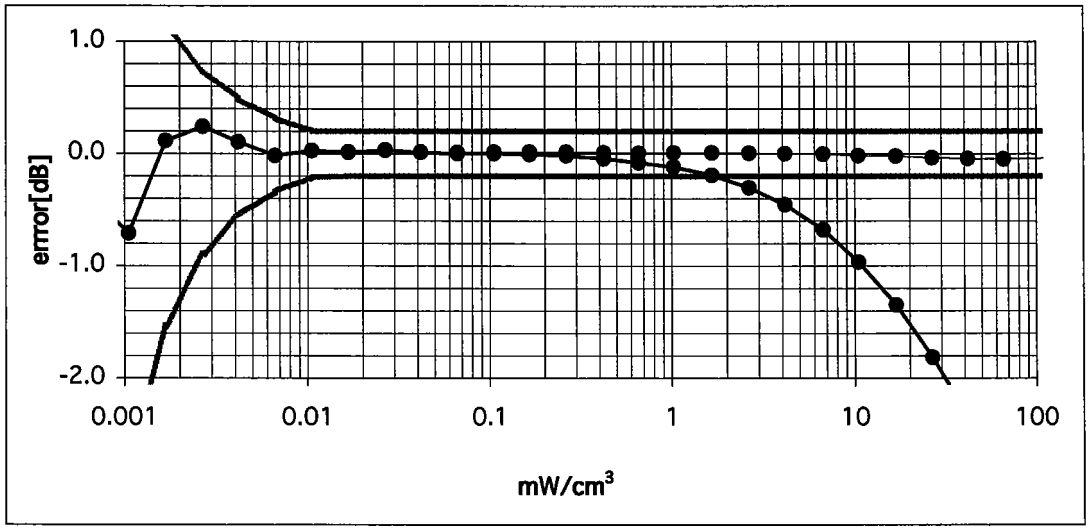
**( TEM-Cell:ifi110, Waveguide R22)**



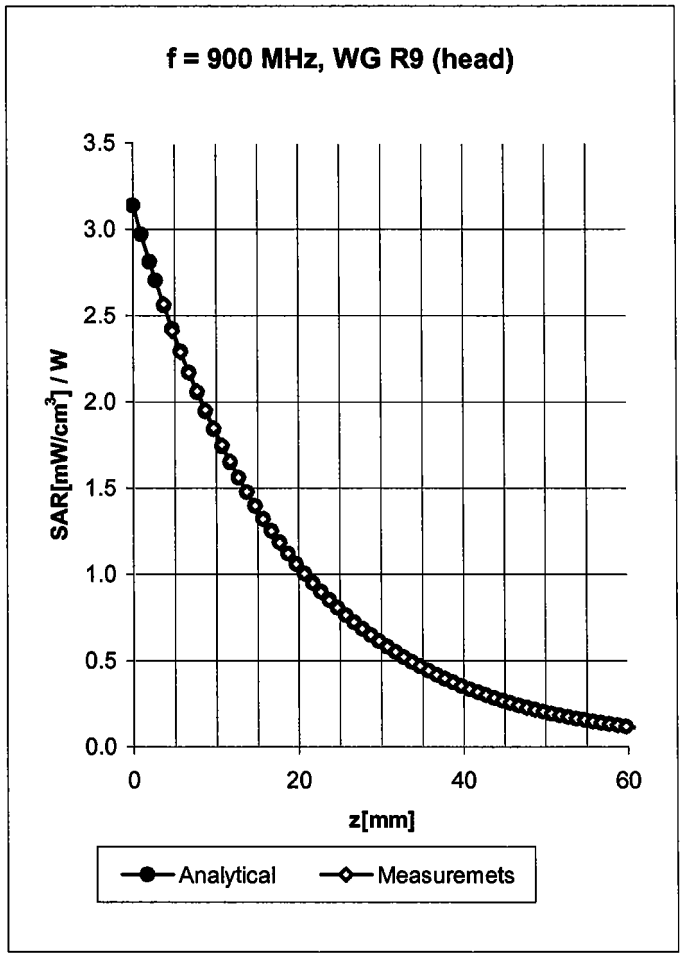
# Dynamic Range f($SAR_{brain}$)

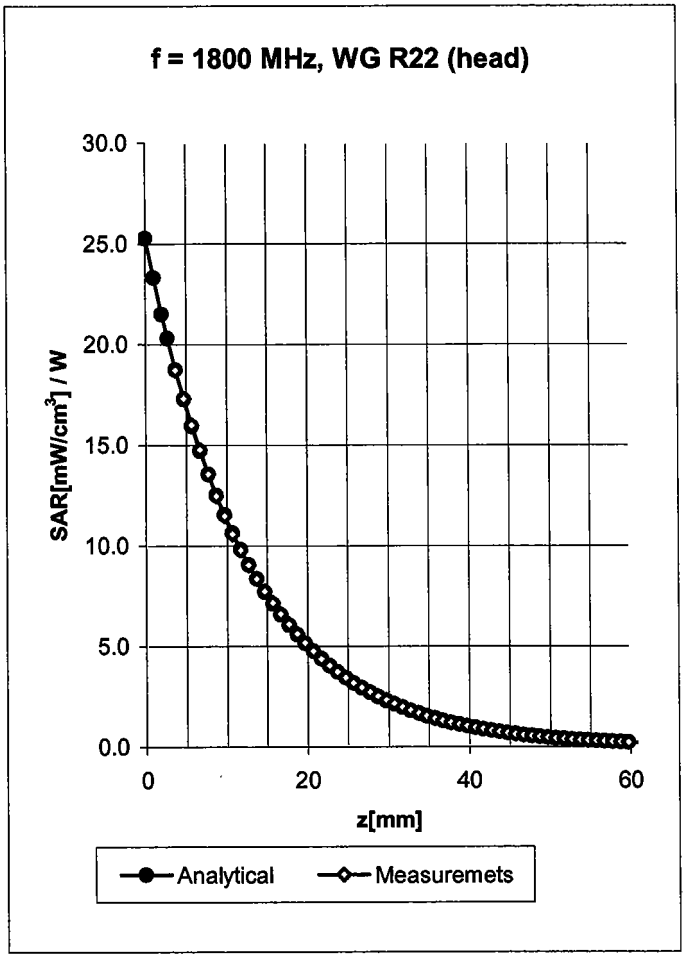
( Waveguide R22 )



# Conversion Factor Assessment




| | | | |
|---|---|---|---|
| Head | 900 MHz | $\varepsilon_r$ = 41.5 ± 5% | $\sigma$ = 0.97 ± 5% mho/m |

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

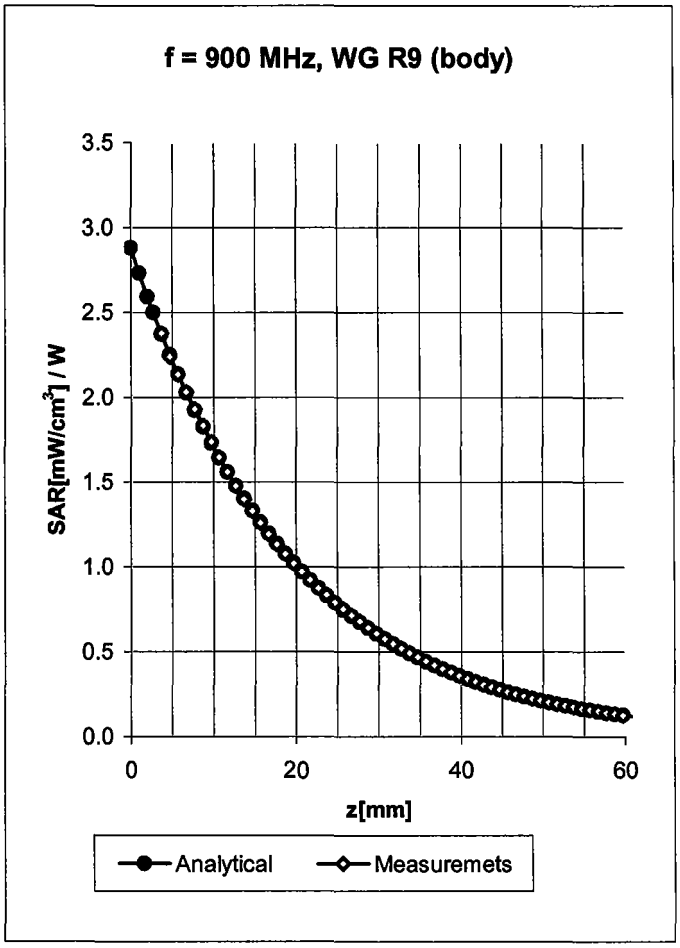
| | | | |
|---|---|---|---|
| ConvF X | 6.1 ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | 6.1 ± 9.5% (k=2) | Alpha | **0.60** |
| ConvF Z | 6.1 ± 9.5% (k=2) | Depth | **2.02** |

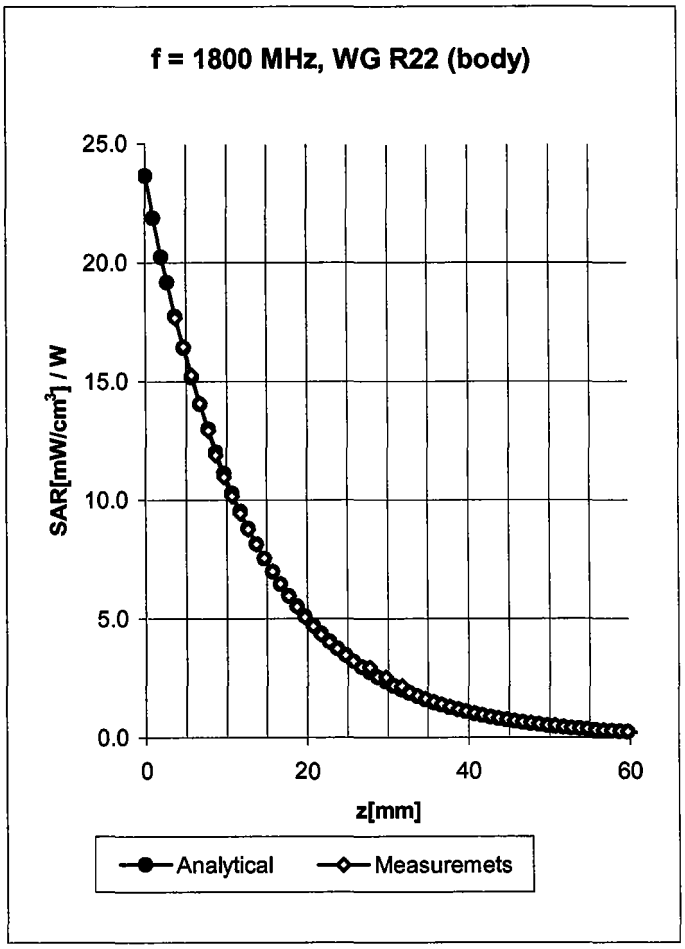
| | | | |
|---|---|---|---|
| Head | 1800 MHz | $\varepsilon_r$ = 40.0 ± 5% | $\sigma$ = 1.40 ± 5% mho/m |

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

| | | | |
|---|---|---|---|
| ConvF X | 4.9 ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | 4.9 ± 9.5% (k=2) | Alpha | **0.61** |
| ConvF Z | 4.9 ± 9.5% (k=2) | Depth | **2.37** |

# Conversion Factor Assessment




| | | | |
|---|---|---|---|
| Body | 900 MHz | $\varepsilon_r$ = 55.0 ± 5% | $\sigma$ = 1.05 ± 5% mho/m |

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

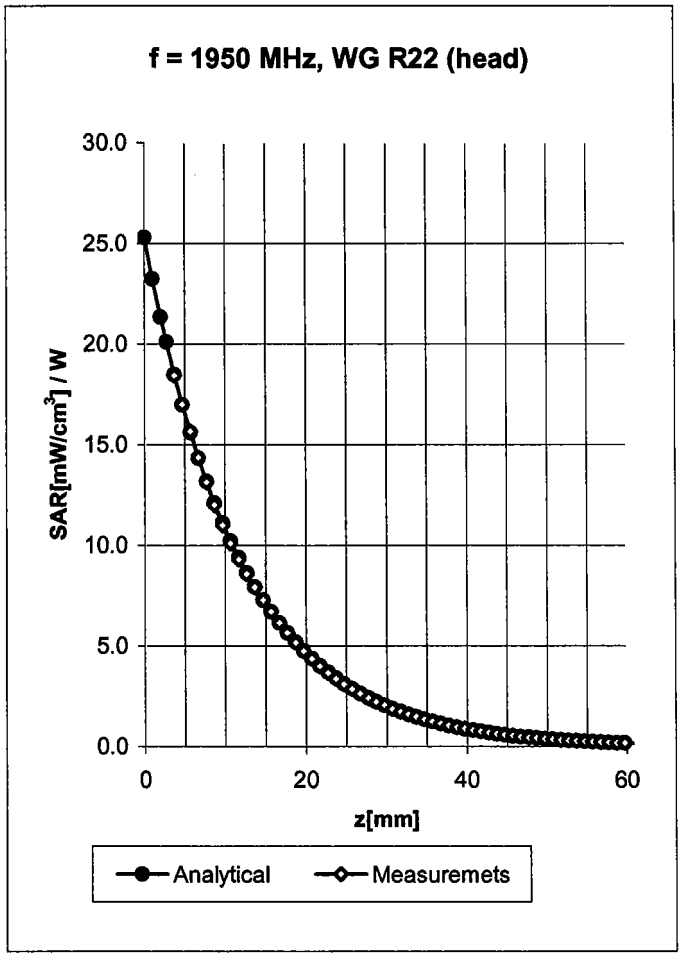
| | | | |
|---|---|---|---|
| ConvF X | 5.8 ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | 5.8 ± 9.5% (k=2) | Alpha | **0.53** |
| ConvF Z | 5.8 ± 9.5% (k=2) | Depth | **2.24** |

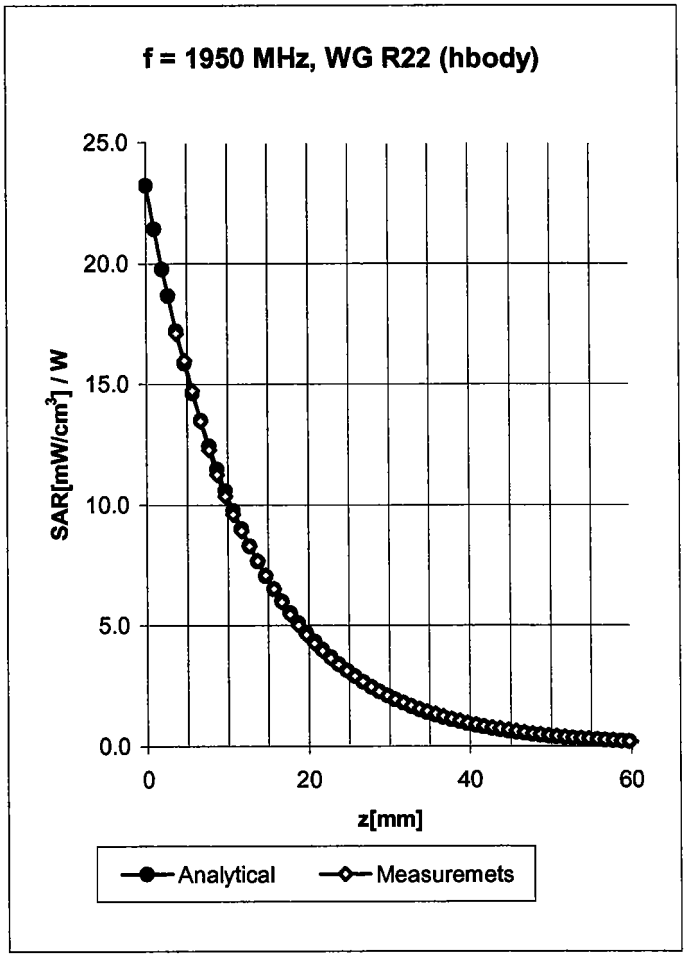
| | | | |
|---|---|---|---|
| Body | 1800 MHz | $\varepsilon_r$ = 53.3 ± 5% | $\sigma$ = 1.52 ± 5% mho/m |

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

| | | | |
|---|---|---|---|
| ConvF X | 4.5 ± 9.5% (k=2) | Boundary effect: | |
| ConvF Y | 4.5 ± 9.5% (k=2) | Alpha | **0.69** |
| ConvF Z | 4.5 ± 9.5% (k=2) | Depth | **2.34** |

# Conversion Factor Assessment




**Head** 1950 MHz $\varepsilon_r$ = 40.0 ± 5% $\sigma$ = 1.40 ± 5% mho/m

Valid for f=1910-2100 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

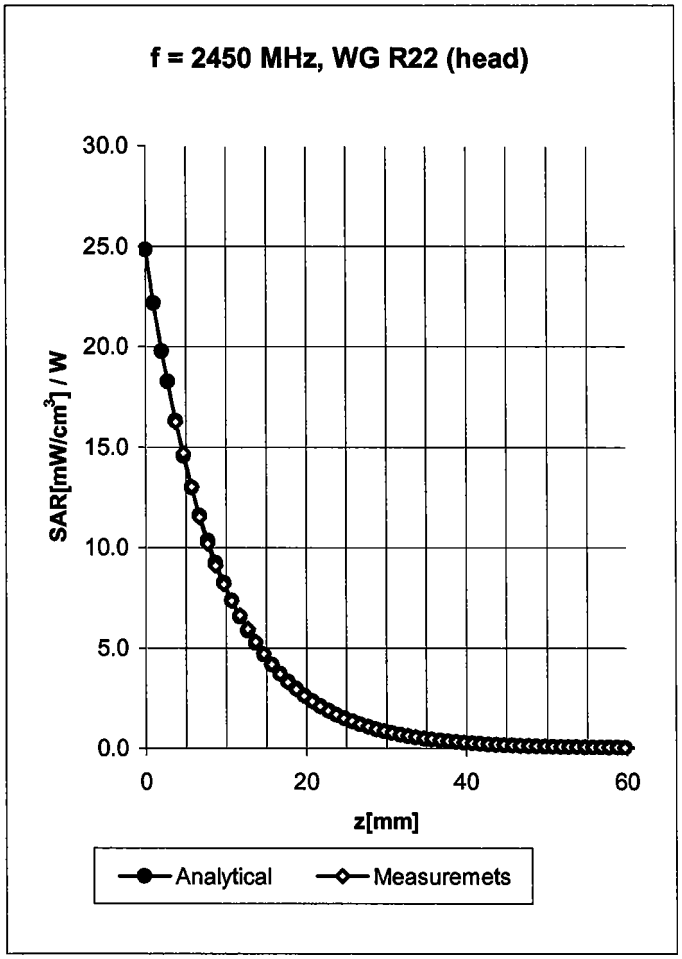
| | | | |
|---|---|---|---|
| ConvF X | **4.6** ± 8.9% (k=2) | Boundary effect: | |
| ConvF Y | **4.6** ± 8.9% (k=2) | Alpha | **0.62** |
| ConvF Z | **4.6** ± 8.9% (k=2) | Depth | **2.45** |

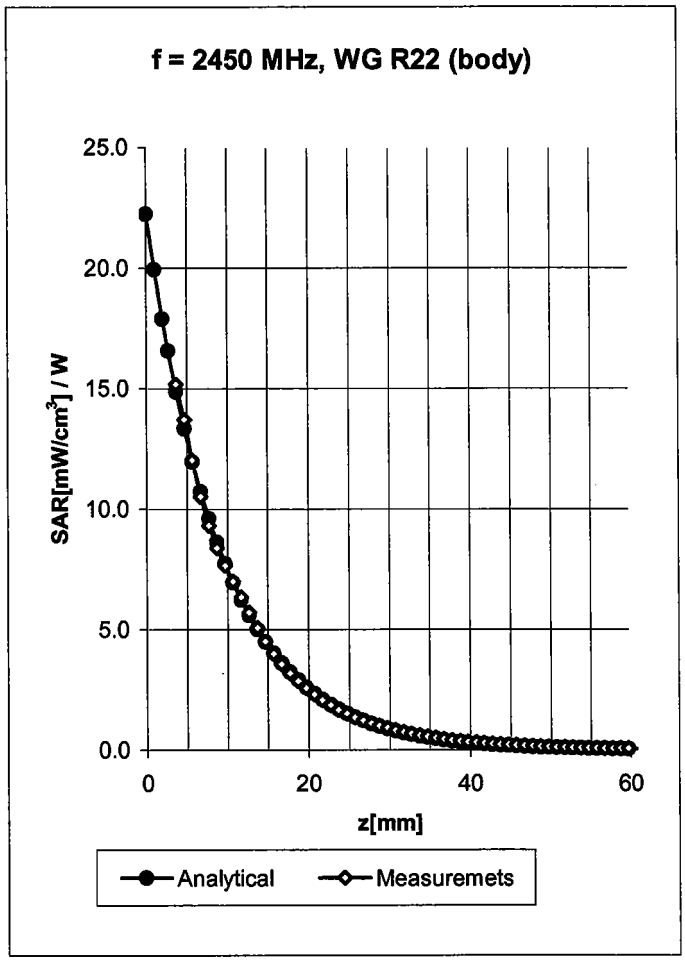
**Body** 1950 MHz $\varepsilon_r$ = 53.3 ± 5% $\sigma$ = 1.52 ± 5% mho/m

Valid for f=1910-2100 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

| | | | |
|---|---|---|---|
| ConvF X | **4.3** ± 8.9% (k=2) | Boundary effect: | |
| ConvF Y | **4.3** ± 8.9% (k=2) | Alpha | **0.85** |
| ConvF Z | **4.3** ± 8.9% (k=2) | Depth | **2.17** |

# Conversion Factor Assessment




| | | | | |
|---|---|---|---|---|
| Head | 2450 | MHz | $\varepsilon_r$ = 39.2 ± 5% | $\sigma$ = 1.80 ± 5% mho/m |

Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

| | | | |
|---|---|---|---|
| ConvF X | 4.5 ± 8.9% (k=2) | Boundary effect: | |
| ConvF Y | 4.5 ± 8.9% (k=2) | Alpha | 1.22 |
| ConvF Z | 4.5 ± 8.9% (k=2) | Depth | 1.73 |

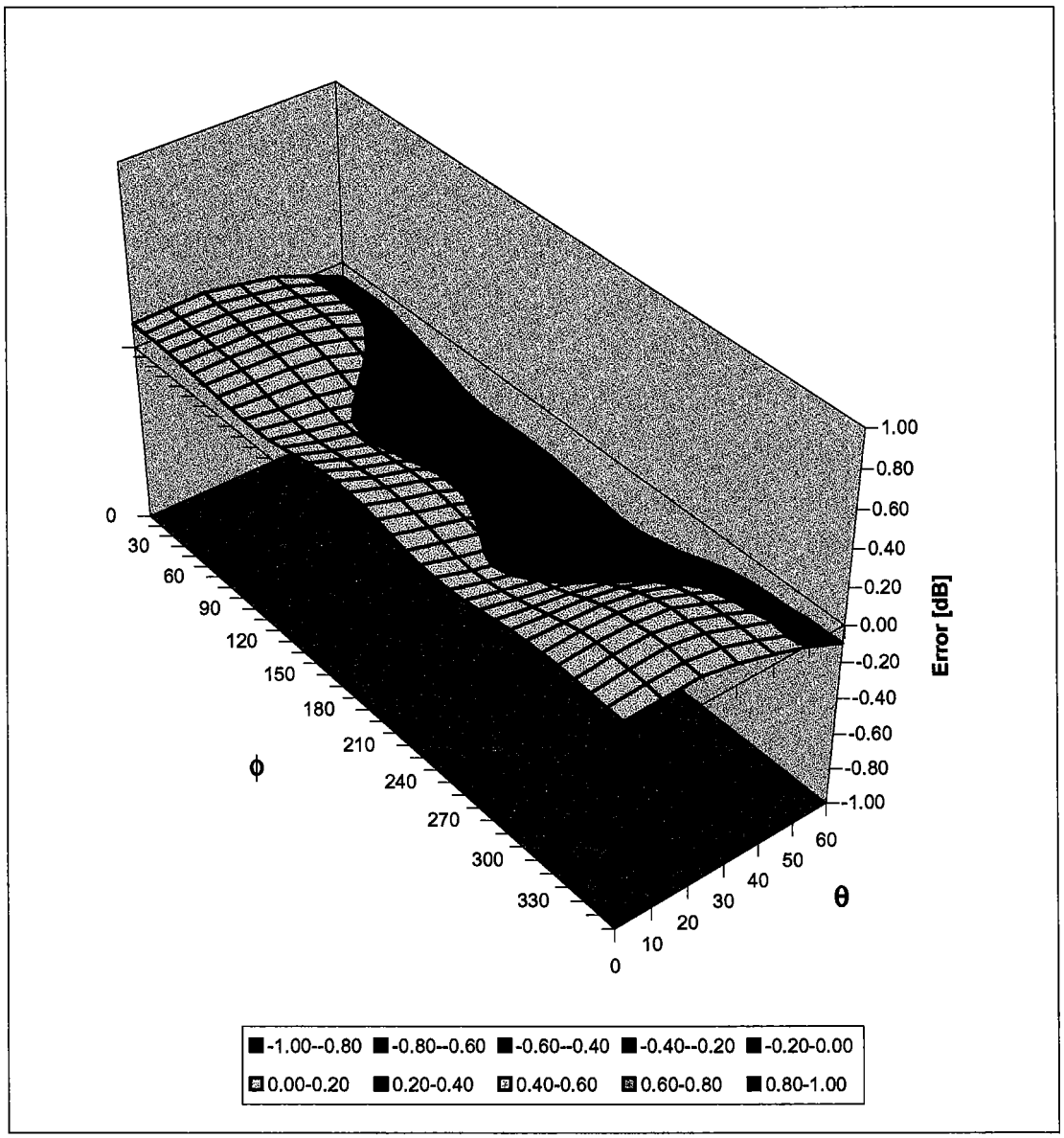
| | | | | |
|---|---|---|---|---|
| Body | 2450 | MHz | $\varepsilon_r$ = 52.7 ± 5% | $\sigma$ = 1.95 ± 5% mho/m |

Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

| | | | |
|---|---|---|---|
| ConvF X | 4.2 ± 8.9% (k=2) | Boundary effect: | |
| ConvF Y | 4.2 ± 8.9% (k=2) | Alpha | 1.90 |
| ConvF Z | 4.2 ± 8.9% (k=2) | Depth | 1.35 |

# Deviation from Isotropy in HSL

**Error (θ,ϕ), f = 900 MHz**



# Appendix 5

## Dipole Characterization Certificate

# Certification of System Performance Check Targets

## Based on APP-0396

**-Historical Data-**

| | 835MHz | 900MHz | 1800MHz | 1900MHz | |
|---|---|---|---|---|---|
| **P1528 Target:** Advanced Extrapolation | 9.5 | 10.8 | 38.1 | 39.7 | **(W/kg)** |
| **Measurement Uncertainty (k=1):** | 10.2% | 10.2% | 10.2% | 10.2% | |
| | | | | | |
| *Measurement Period:* | *November '02 - June '03* | *November '02 - June '03* | *November '02 - June '03* | *November '02 - June '03* | |
| **# of tests performed:** | 169 | 728 | 868 | 26 | |
| **Grand Average:** Worst Case Extrapolation | 10.1 | 11.6 | 39.7 | 42.0 | **(W/kg)** |
| **% Delta** (Average - P1528 Target) | 6.5% | 7.7% | 4.2% | 5.9% | |
| | | | | | |
| **Is % Delta <= Measurement Uncertainty?** | **Yes** | **Yes** | **Yes** | **Yes** | |
| **Accept/Reject Average as new system performance check target?** | **ACCEPT** | **ACCEPT** | **ACCEPT** | **ACCEPT** | |
| | **Applicable 835MHz Dipole Serial Numbers:** | **Applicable 900MHz Dipole Serial Numbers:** | **Applicable 1800MHz Dipole Serial Numbers:** | **Applicable 1900Mhz Dipole Serial Numbers:** | |
| | 420(TR), 421(TR) | 77, 78 | 246(TR), 250(TR) | 514(TR), 518(TR) | |
| | 422(TR), 423(TR) | 79, 80 | 251(TR), 258(TR) | 519(TR), 520(TR) | |
| | 424(TR), 425(TR) | 91, 92 | 259(TR), 262(TR) | 523(TR), 524(TR) | |
| | 431(TR), 432(TR) | 93, 94 | 263(TR), 271(TR) | 526(TR), 527(TR) | |
| | 433(TR), 434(TR) | 95, 96 | 272(TR), 273(TR) | 528(TR), 529(TR) | |
| | 436(TR) | 97 | 276(TR), 277(TR) | 530(TR), 533(TR) | |
| | | | 279(TR), 280(TR) | | |
| | | | 281(TR), 282(TR) | | |
| | | | 283(TR), 284(TR) | | |

**-New System Performance Check Targets-** per APP-0396

(based on analysis of historical data)

| Frequency | SAR Target (W/kg) | Permittivity | Conductivity (S/m) |
|---|---|---|---|
| **835MHz** | **10.1** | 41.5 ± 5% | 0.90 ± 5% |
| **900MHz** | **11.6** | 41.5 ± 5% | 0.97 ± 5% |
| **1800MHz** | **39.7** | 40.0 ± 5% | 1.40 ± 5% |
| **1900MHz** | **42.0** | 40.0 ± 5% | 1.40 ± 5% |

**-Approvals-**

Submitted by: Marge Kaunas Date: 24-Jun-03

Signed: Marge Kaunas

Comments: spreadsheet detailing all measurements available upon request

**Approved by:** Antonio Faraone **Date:** 24-Jun-03

**Signed:** Antonio Faraone

**Comments:** Targets and associated simulant properties are derived from the IEEE P1528 draft standard

# Appendix 6

## Measurement Uncertainty Budget

## Uncertainty Budget for Device Under Test

| *a* | *b* | *c* | *d* | *e = f(d,k)* | *f* | *g* | *h = c x f / e* | *i = c x g / e* | *k* |
|---|---|---|---|---|---|---|---|---|---|
| **Uncertainty Component** | Sec. | **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 | 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 | ∞ |
| **Test sample Related** | | | | | | | | | |
| 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 | ∞ |
| **Phantom and Tissue Parameters** | | | | | | | | | |
| 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 | ∞ |
| **Combined Standard Uncertainty** | | | RSS | | | | 11.72 | 11.09 | 1363 |
| **Expanded Uncertainty** (95% CONFIDENCE LEVEL) | | | *k* =2 | | | | 22.98 | 21.75 | |

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

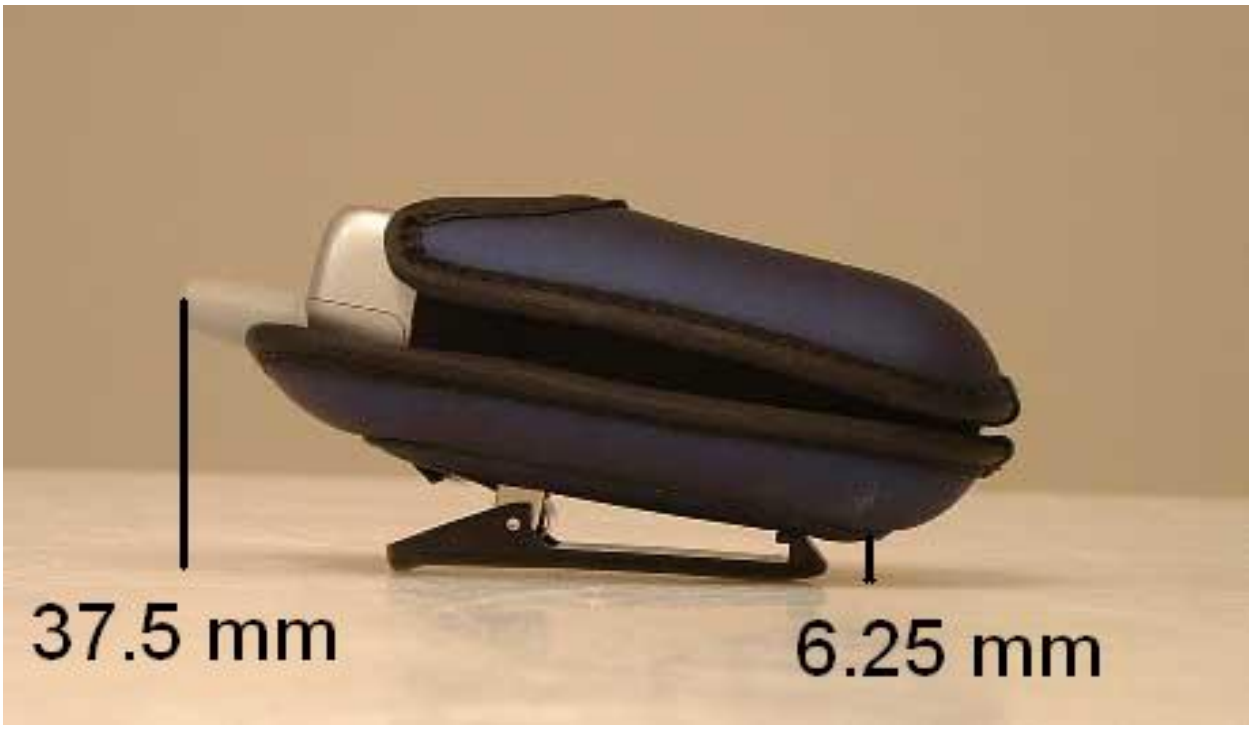
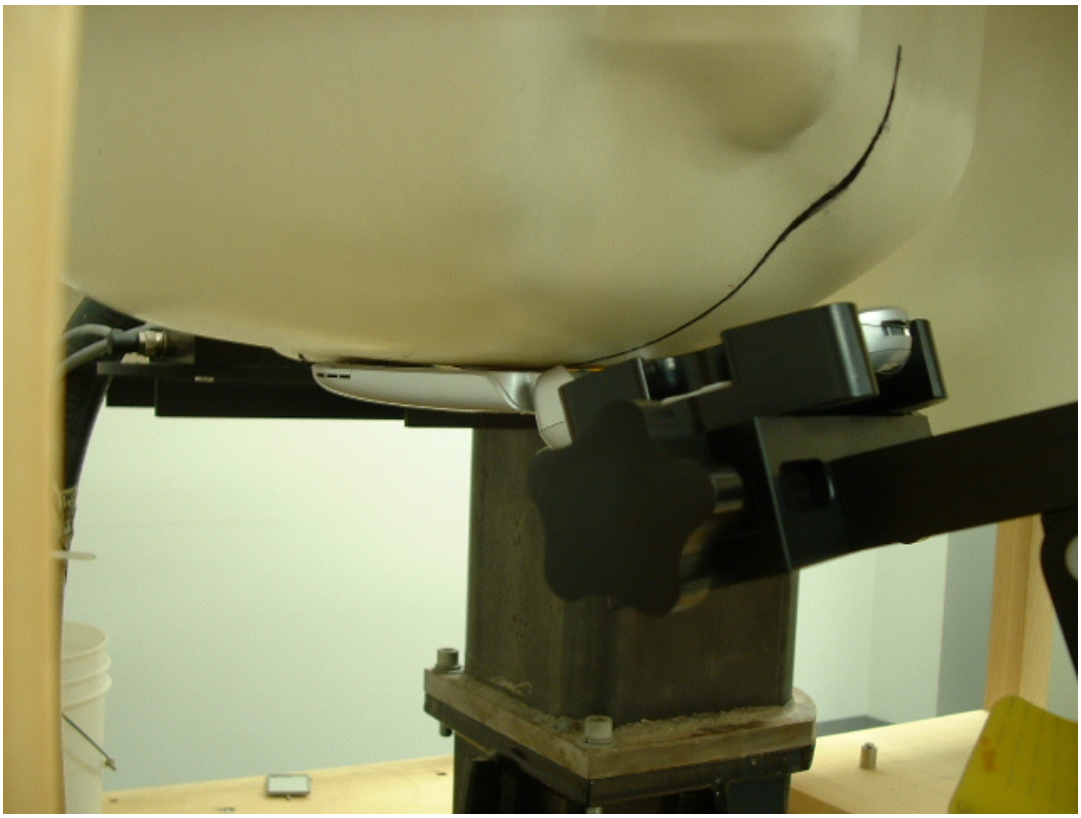
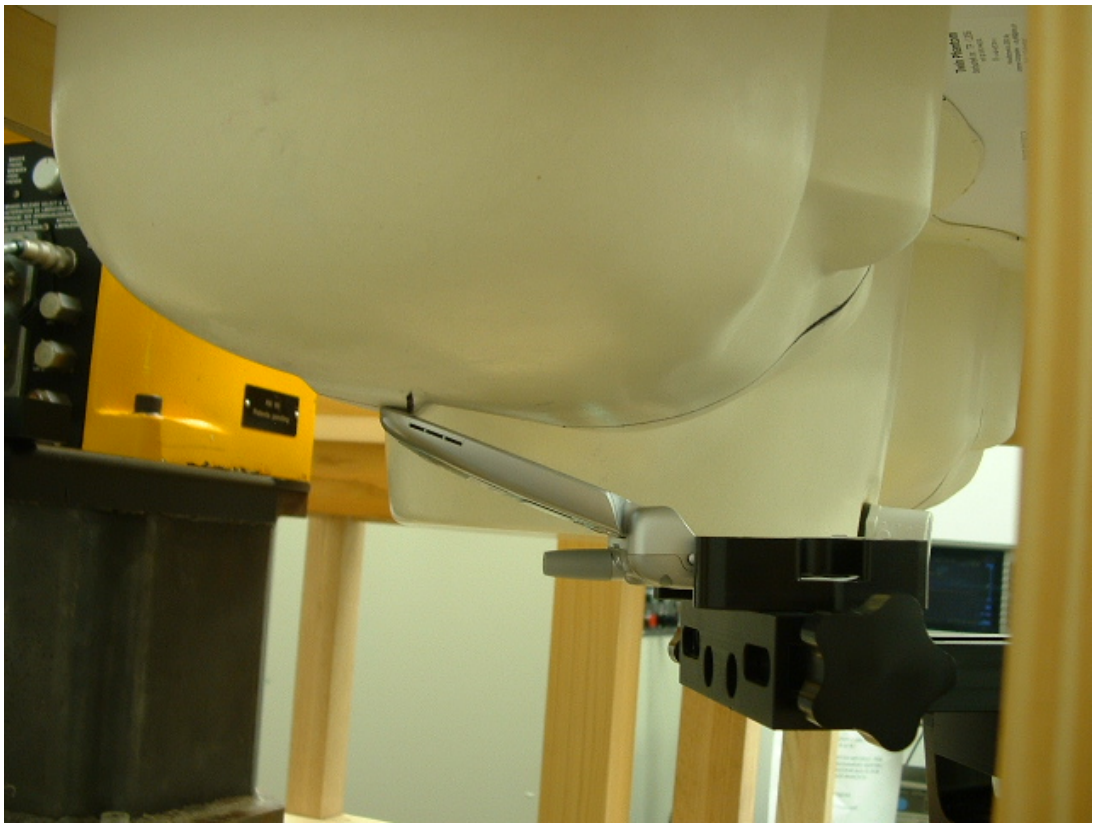
| *a* | *b* | *c* | *d* | *e = f(d,k)* | *f* | *g* | *h = c x f / e* | *i = c x g / e* | *k* |
|---|---|---|---|---|---|---|---|---|---|
| **Uncertainty Component** | Sec. | **Tol. (± %)** | **Prob. Dist.** | **Div.** | $c_i$ **(1 g)** | $c_i$ **(10 g)** | **1 g** $u_i$ **(±%)** | **10 g** $u_i$ **(±%)** | $v_i$ |
| **Measurement System** | | | | | | | | | |
| Probe Calibration | E.2.1 | 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 | ∞ |
| **Dipole** | | | | | | | | | |
| 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 | ∞ |
| **Phantom and Tissue Parameters** | | | | | | | | | |
| 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 | ∞ |
| **Combined Standard Uncertainty** | | | RSS | | | | 10.16 | 9.43 | 99999 |
| **Expanded Uncertainty** (95% CONFIDENCE LEVEL) | | | *k*=2 | | | | 19.92 | 18.48 | |

# Appendix 7

## Photographs of the device under test

Phone #1
11750-1

MOTOROLA


37.5 mm
6.25 mm