

## DECLARATION OF COMPLIANCE SAR EVALUATION

### Test Lab

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|                               |                                                                                                                                                                      |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Rule Part(s):</b>          | <b>FCC 47 CFR §2.1093</b>                                                                                                                                            |
| <b>Test Procedure(s):</b>     | <b>FCC OET Bulletin 65, Supplement C (01-01)</b>                                                                                                                     |
| <b>Device Type:</b>           | <b>Portable UHF GMRS/FRS PTT Radio Transceiver</b>                                                                                                                   |
| <b>FCC ID:</b>                | <b>BBOPR135</b>                                                                                                                                                      |
| <b>Model(s):</b>              | <b>PR135/PR140</b>                                                                                                                                                   |
| <b>Modulation:</b>            | <b>FM (UHF)</b>                                                                                                                                                      |
| <b>Tx Frequency Range(s):</b> | <b>462.5500 - 462.7250 MHz (GMRS Channels 15-22)</b><br><b>462.5625 - 462.7125 MHz (FRS/GMRS Channels 1-7)</b><br><b>467.5625 - 467.7125 MHz (FRS Channels 8-14)</b> |
| <b>Max. RF Output Power:</b>  | <b>0.5 Watts (ERP)</b>                                                                                                                                               |
| <b>No. of Channels:</b>       | <b>22</b>                                                                                                                                                            |
| <b>Antenna Type(s):</b>       | <b>Fixed</b>                                                                                                                                                         |
| <b>Battery Type(s):</b>       | <b>1.5V AAA Alkaline (x4)</b>                                                                                                                                        |
| <b>Max. SAR Measured:</b>     | <b>0.282 W/kg Face-held / 0.704 W/kg Body-worn</b>                                                                                                                   |

Celltech Research Inc. declares under its sole responsibility that this device was found to be in compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC §2.1093. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C, Edition 01-01 (General Population / Uncontrolled Exposure).

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Research Inc. The results and statements contained in this report pertain only to the device(s) evaluated.



**Russell W. Pipe**  
Senior Compliance Technologist  
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| <b>TABLE OF CONTENTS</b>                                       |                                       |           |
|----------------------------------------------------------------|---------------------------------------|-----------|
| <b>1.0</b>                                                     | <b>INTRODUCTION.....</b>              | <b>3</b>  |
| <b>2.0</b>                                                     | <b>DESCRIPTION OF DUT.....</b>        | <b>3</b>  |
| <b>3.0</b>                                                     | <b>SAR MEASUREMENT SYSTEM .....</b>   | <b>4</b>  |
| <b>4.0</b>                                                     | <b>MEASUREMENT SUMMARY.....</b>       | <b>5</b>  |
| <b>5.0</b>                                                     | <b>DETAILS OF SAR EVALUATION.....</b> | <b>6</b>  |
| <b>6.0</b>                                                     | <b>EVALUATION PROCEDURES.....</b>     | <b>7</b>  |
| <b>7.0</b>                                                     | <b>SYSTEM VALIDATION.....</b>         | <b>8</b>  |
| <b>8.0</b>                                                     | <b>SIMULATED TISSUES.....</b>         | <b>9</b>  |
| <b>9.0</b>                                                     | <b>SAR LIMITS.....</b>                | <b>9</b>  |
| <b>10.0</b>                                                    | <b>SYSTEM SPECIFICATIONS.....</b>     | <b>10</b> |
| <b>11.0</b>                                                    | <b>PROBE SPECIFICATION.....</b>       | <b>11</b> |
| <b>12.0</b>                                                    | <b>SAM PHANTOM.....</b>               | <b>11</b> |
| <b>13.0</b>                                                    | <b>LARGE PLANAR PHANTOM.....</b>      | <b>11</b> |
| <b>14.0</b>                                                    | <b>DEVICE HOLDER.....</b>             | <b>11</b> |
| <b>15.0</b>                                                    | <b>TEST EQUIPMENT LIST.....</b>       | <b>12</b> |
| <b>16.0</b>                                                    | <b>MEASUREMENT UNCERTAINTIES.....</b> | <b>13</b> |
| <b>17.0</b>                                                    | <b>REFERENCES.....</b>                | <b>14</b> |
| <b>APPENDIX A - SAR MEASUREMENT DATA.....</b>                  |                                       | <b>15</b> |
| <b>APPENDIX B - SYSTEM VALIDATION.....</b>                     |                                       | <b>16</b> |
| <b>APPENDIX C - DIPOLE CALIBRATION.....</b>                    |                                       | <b>17</b> |
| <b>APPENDIX D - PROBE CALIBRATION.....</b>                     |                                       | <b>18</b> |
| <b>APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS.....</b>  |                                       | <b>19</b> |
| <b>APPENDIX F - SAM PHANTOM CERTIFICATE OF CONFORMITY.....</b> |                                       | <b>20</b> |
| <b>APPENDIX G - SAR TEST SETUP &amp; EUT PHOTOGRAPHS.....</b>  |                                       | <b>21</b> |

## 1.0 INTRODUCTION

This measurement report demonstrates compliance of the Cobra Electronics Corporation Models: PR135/PR140 Portable UHF GMRS/FRS PTT Radio Transceiver FCC ID: BBOPR135 with FCC 47 CFR §2.1093 (see reference [1]) for the General Population environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [2]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

## 2.0 DESCRIPTION of Device Under Test (DUT)

|                             |                                                                                                                                                 |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FCC Rule Part(s)</b>     | 47 CFR §2.1093                                                                                                                                  |
| <b>Test Procedure</b>       | FCC OET Bulletin 65, Supplement C (01-01)                                                                                                       |
| <b>Device Type</b>          | Portable GMRS/FRS PTT Radio Transceiver                                                                                                         |
| <b>FCC ID</b>               | BBOPR135                                                                                                                                        |
| <b>Model(s)</b>             | PR135 (without headset jack)<br>PR140 (with headset jack)                                                                                       |
| <b>Serial No.</b>           | Pre-production                                                                                                                                  |
| <b>Modulation</b>           | FM (UHF)                                                                                                                                        |
| <b>Tx Frequency Range</b>   | 462.5500 - 462.7250 MHz (GMRS Channels 15-22)<br>462.5625 - 462.7125 MHz (FRS/GMRS Channels 1-7)<br>467.5625 - 467.7125 MHz (FRS Channels 8-14) |
| <b>Max. RF Output Power</b> | 0.5 Watts (ERP)                                                                                                                                 |
| <b>Battery Type(s)</b>      | 1.5V AAA Alkaline (x4)                                                                                                                          |
| <b>Antenna Type(s)</b>      | Fixed                                                                                                                                           |

### 3.0 SAR MEASUREMENT SYSTEM

Celltech Research SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY system is comprised of the robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card. The DAE3 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.



DASY3 SAR Measurement System with SAM Phantom



DASY3 SAR Measurement System with validation phantom

## 4.0 MEASUREMENT SUMMARY

The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.

| SAR EVALUATION RESULTS                                                                                                                                       |          |               |                       |                  |                  |                      |                          |            |                 |                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------|-----------------------|------------------|------------------|----------------------|--------------------------|------------|-----------------|----------------|
| Freq. (MHz)                                                                                                                                                  | Channel  | Mode          | RF Output Power (ERP) | Power Drift (dB) | Antenna Position | Battery Type         | Separation Distance (cm) | Fluid Type | SAR (w/kg)      |                |
|                                                                                                                                                              |          |               |                       |                  |                  |                      |                          |            | 100% Duty Cycle | 50% Duty Cycle |
| 462.7125                                                                                                                                                     | 7 (GMRS) | CW            | 0.5 W                 | -0.14            | Fixed            | Alkaline             | 2.5                      | Brain      | 0.282           | 0.141          |
| 467.5625                                                                                                                                                     | 8 (FRS)  | CW            | 0.5 W                 | -0.04            | Fixed            | Alkaline             | 2.5                      | Brain      | 0.264           | 0.132          |
| 462.7125                                                                                                                                                     | 7 (GMRS) | CW            | 0.5 W                 | -0.15            | Fixed            | Alkaline             | 0.7                      | Muscle     | 0.704           | 0.352          |
| 467.5625                                                                                                                                                     | 8 (FRS)  | CW            | 0.5 W                 | -0.11            | Fixed            | Alkaline             | 0.7                      | Muscle     | 0.465           | 0.233          |
| <b>ANSI / IEEE C95.1 1992 - SAFETY LIMIT</b><br>Spatial Peak - Uncontrolled Exposure / General Population<br>BRAIN & BODY: 1.6 W/kg / (averaged over 1 gram) |          |               |                       |                  |                  |                      |                          |            |                 |                |
| Dielectric Constant                                                                                                                                          |          | Brain 450MHz  |                       | Body 450MHz      |                  | Atmospheric Pressure |                          | 101.8 kPa  |                 |                |
|                                                                                                                                                              |          | Target        | Measured              | Target           | Measured         | Relative Humidity    |                          | 57 %       |                 |                |
|                                                                                                                                                              |          | 43.5 (+/- 5%) | 44.0                  | 56.7 (+/- 5%)    | 57.8             | Ambient Temperature  |                          | 22.8 °C    |                 |                |
| Conductivity                                                                                                                                                 |          | Brain 450MHz  |                       | Body 450MHz      |                  | Fluid Temperature    |                          | 21.4 °C    |                 |                |
|                                                                                                                                                              |          | Target        | Measured              | Target           | Measured         | Fluid Depth          |                          | ≥ 15 cm    |                 |                |
|                                                                                                                                                              |          | 0.87 (+/- 5%) | 0.86                  | 0.94 (+/- 5%)    | 0.92             | Phantom Section      |                          | Planar     |                 |                |

Note(s):

1. The transmission band of the DUT is less than 10 MHz, therefore mid channel data only is reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).

## 5.0 DETAILS OF SAR EVALUATION

The Cobra Electronics Corporation Model: PR135/PR140 Portable UHF GMRS/FRS PTT Radio Transceiver FCC ID: BBOPR135 was found to be compliant for localized Specific Absorption Rate (Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix G.

1. The DUT was evaluated in a face-held configuration with the front of the device placed parallel to the outer surface of the SAM planar phantom. A 2.5 cm separation distance was maintained between the front side of the DUT and the outer surface of the SAM planar phantom for the duration of the tests.
2. The DUT was tested in a body-worn configuration with the back of the device placed parallel to the outer surface of the SAM planar phantom. The attached belt-clip was placed touching the planar phantom and provided a 0.7 cm separation distance between the back of the DUT and the outer surface of the SAM planar phantom. An ear-microphone accessory was connected to the DUT for the duration of the body-worn evaluation.
3. The DUT was operated for an appropriate period prior to the evaluation in order to minimize power drift.
4. The conducted power level could not be measured for the SAR evaluation. The DUT was evaluated for SAR at the maximum conducted power level set by the manufacturer.
5. The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key continuously depressed. The 50% duty cycle compensation reported for this push-to-talk device assumes a transmit/receive cycle of equal time base.
6. The location of the maximum spatial SAR distribution (Hot Spot) was determined relative to the device and its antenna.
7. The DUT was tested with fully charged alkaline batteries.



Face-held SAR Test Setup



Body-worn SAR Test Setup

## 6.0 EVALUATION PROCEDURES

- The SAR evaluation was performed using the applicable phantom type depending on the device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom. For body-worn and face-held devices a planar phantom was used.
- The SAR was determined by a pre-defined procedure within the DASY3 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.
- A 5x5x7 matrix was performed around the greatest spatial SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.

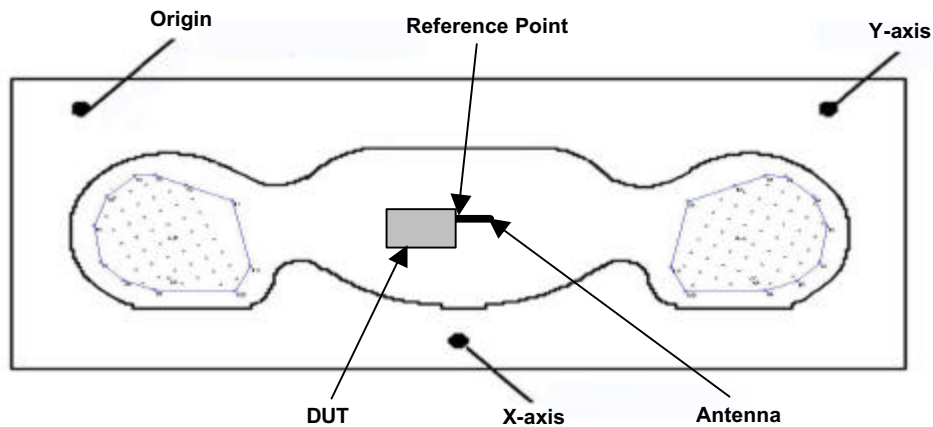


Figure 1. Phantom Reference Point & DUT Positioning (Face-held)

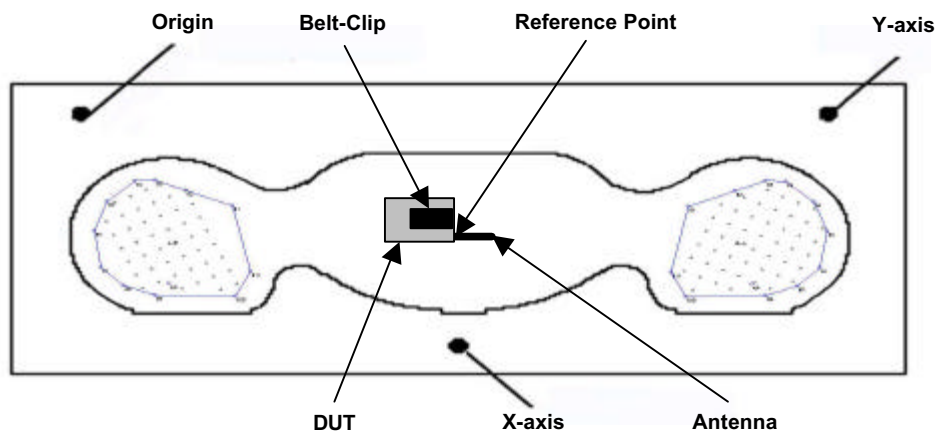


Figure 2. Phantom Reference Point & DUT Positioning (Body-worn)

## 7.0 SYSTEM VALIDATION

Prior to the evaluation the system was verified using a planar phantom with a 450MHz dipole (see Appendix C for dipole calibration procedure). The simulated tissue fluids were verified prior to the validation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters). A forward power of 250mW was applied to the dipole and system was verified to a tolerance of  $\pm 10\%$  (see Appendix B for system validation test plot).

| SYSTEM VALIDATION |                |                     |          |                                  |          |                               |          |                             |               |             |              |
|-------------------|----------------|---------------------|----------|----------------------------------|----------|-------------------------------|----------|-----------------------------|---------------|-------------|--------------|
| Test Date         | Equiv. Tissue  | SAR 1g (w/kg)       |          | Dielectric Constant $\epsilon_r$ |          | Conductivity $\sigma$ (mho/m) |          | $\rho$ (Kg/m <sup>3</sup> ) | Ambient Temp. | Fluid Temp. | Fluid Depth  |
|                   |                | Target              | Measured | Target                           | Measured | Target                        | Measured |                             |               |             |              |
| 10/02/02          | 450MHz (Brain) | 1.44 ( $\pm 10\%$ ) | 1.33     | 43.5 ( $\pm 5\%$ )               | 44.0     | 0.87 ( $\pm 5\%$ )            | 0.86     | 1000                        | 22.8 °C       | 21.4 °C     | $\geq 15$ cm |

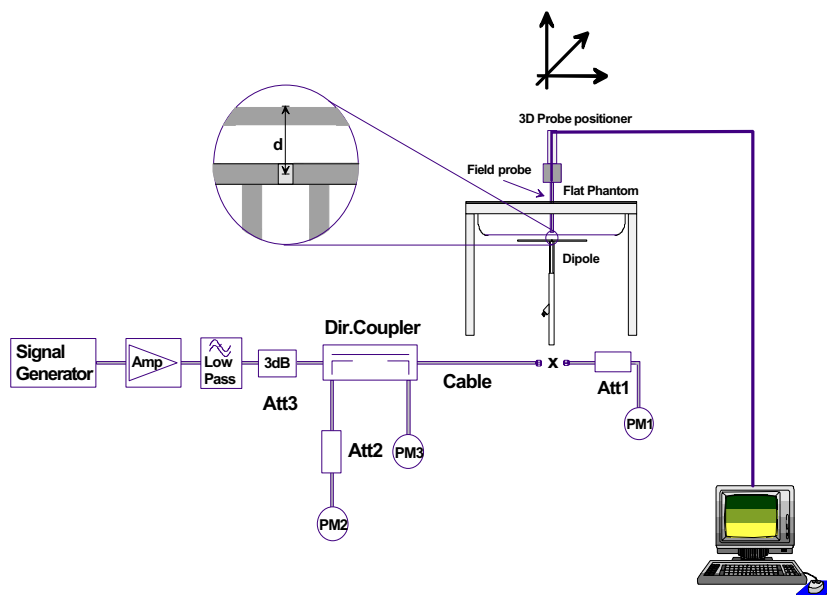


Figure 3. System Validation Setup Diagram



450MHz Dipole Validation Setup

## 8.0 SIMULATED TISSUES

The 450MHz brain and body tissue mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures, and measured for dielectric parameters (permittivity and conductivity).

| TISSUE MIXTURES |                                                      |                                 |
|-----------------|------------------------------------------------------|---------------------------------|
| INGREDIENT      | 450MHz Brain<br>(System Validation & DUT Evaluation) | 450MHz Body<br>(DUT Evaluation) |
| Water           | 38.56 %                                              | 52.00 %                         |
| Sugar           | 56.32 %                                              | 45.65 %                         |
| Salt            | 3.95 %                                               | 1.75 %                          |
| HEC             | 0.98 %                                               | 0.50 %                          |
| Bactericide     | 0.19 %                                               | 0.10 %                          |

## 9.0 SAR SAFETY LIMITS

| EXPOSURE LIMITS                                                 | SAR (W/kg)                                                     |                                                        |
|-----------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------|
|                                                                 | (General Population /<br>Uncontrolled Exposure<br>Environment) | (Occupational /<br>Controlled Exposure<br>Environment) |
| Spatial Average<br>(averaged over the whole body)               | 0.08                                                           | 0.4                                                    |
| Spatial Peak<br>(averaged over any 1g of tissue)                | 1.60                                                           | 8.0                                                    |
| Spatial Peak<br>(hands/wrists/feet/ankles<br>averaged over 10g) | 4.0                                                            | 20.0                                                   |

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

## 10.0 ROBOT SYSTEM SPECIFICATIONS

### Specifications

**POSITIONER:** Stäubli Unimation Corp. Robot Model: RX60L  
**Repeatability:** 0.02 mm  
**No. of axis:** 6

### Data Acquisition Electronic (DAE) System

#### Cell Controller

**Processor:** Pentium III  
**Clock Speed:** 450 MHz  
**Operating System:** Windows NT  
**Data Card:** DASY3 PC-Board

#### Data Converter

**Features:** Signal Amplifier, multiplexer, A/D converter, and control logic  
**Software:** DASY3 software  
**Connecting Lines:** Optical downlink for data and status info.  
Optical uplink for commands and clock

### PC Interface Card

**Function:** 24 bit (64 MHz) DSP for real time processing  
Link to DAE3  
16-bit A/D converter for surface detection system  
serial link to robot  
direct emergency stop output for robot

### E-Field Probe

**Model:** ET3DV6  
**Serial No.:** 1387  
**Construction:** Triangular core fiber optic detection system  
**Frequency:** 10 MHz to 6 GHz  
**Linearity:**  $\pm 0.2$  dB (30 MHz to 3 GHz)

### Evaluation Phantom

**Type:** SAM V4.0C  
**Shell Material:** Fiberglass  
**Thickness:**  $2.0 \pm 0.1$  mm  
**Volume:** Approx. 20 liters

### Validation Phantom (for devices $\leq 450$ MHz)

**Type:** Large Planar Phantom  
**Shell Material:** Plexiglas  
**Bottom Thickness:**  $6.2 \text{ mm} \pm 0.1 \text{ mm}$   
**Dimensions:** 83.5 cm (L) x 36.9 cm (W) x 21.8 cm (H)

## 11.0 PROBE SPECIFICATION (ET3DV6)

|                |                                                                                                                                                              |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction:  | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g. glycol) |
| Calibration:   | In air from 10 MHz to 2.5 GHz<br>In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy $\pm 8\%$ )                                      |
| Frequency:     | 10 MHz to $> 6$ GHz; Linearity: $\pm 0.2$ dB<br>(30 MHz to 3 GHz)                                                                                            |
| Directivity:   | $\pm 0.2$ dB in brain tissue (rotation around probe axis)<br>$\pm 0.4$ dB in brain tissue (rotation normal to probe axis)                                    |
| Dynam. Rnge:   | 5 $\mu$ W/g to $> 100$ mW/g; Linearity: $\pm 0.2$ dB                                                                                                         |
| Srfce. Detect. | $\pm 0.2$ mm repeatability in air and clear liquids over diffuse reflecting surfaces                                                                         |
| Dimensions:    | Overall length: 330 mm<br>Tip length: 16 mm<br>Body diameter: 12 mm<br>Tip diameter: 6.8 mm<br>Distance from probe tip to dipole centers: 2.7 mm             |
| Application:   | General dosimetry up to 3 GHz<br>Compliance tests of mobile phone                                                                                            |



ET3DV6 E-Field Probe

## 12.0 LARGE PLANAR PHANTOM

The large planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for SAR validations at and below 450MHz. The large planar phantom is mounted in the DASY3 compact system in place of the SAM phantom.



Large Planar Phantom

## 13.0 SAM PHANTOM V4.0C

The SAM phantom V4.0C is a fiberglass shell phantom with a 2.0mm shell thickness for left and right head and flat planar area integrated in a wooden table. The shape of the fiberglass shell corresponds to the phantom defined by SCC34-SC2. The device holder positions are adjusted to the standard measurement positions in the three sections.



SAM Phantom

## 14.0 DEVICE HOLDER

The DASY3 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of  $65^\circ$ . The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.



Device Holder

## 15.0 TEST EQUIPMENT LIST

| SAR MEASUREMENT SYSTEM                                                                                                                                                                                                                                                                                      |                                                                                  |                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| EQUIPMENT                                                                                                                                                                                                                                                                                                   | SERIAL NO.                                                                       | CALIBRATION DATE                                                                                          |
| <b>DASY3 System</b><br>-Robot<br>-ET3DV6 E-Field Probe<br>-300MHz Validation Dipole<br>-450MHz Validation Dipole<br>-900MHz Validation Dipole<br>-1800MHz Validation Dipole<br>-2450MHz Validation Dipole<br>-SAM Phantom V4.0C<br>-Small Planar Phantom<br>-Medium Planar Phantom<br>-Large Planar Phantom | 599396-01<br>1387<br>135<br>136<br>054<br>247<br>150<br>N/A<br>N/A<br>N/A<br>N/A | N/A<br>Feb 2002<br>Oct 2001<br>Oct 2001<br>June 2001<br>June 2001<br>Oct 2001<br>N/A<br>N/A<br>N/A<br>N/A |
| <b>85070C Dielectric Probe Kit</b>                                                                                                                                                                                                                                                                          | N/A                                                                              | N/A                                                                                                       |
| <b>Gigatronics 8652A Power Meter</b><br>-Power Sensor 80701A<br>-Power Sensor 80701A                                                                                                                                                                                                                        | 1835272<br>1833535<br>1833542                                                    | Feb 2002<br>Feb 2002<br>Mar 2002                                                                          |
| <b>E4408B Spectrum Analyzer</b>                                                                                                                                                                                                                                                                             | US39240170                                                                       | Nov 2001                                                                                                  |
| <b>8594E Spectrum Analyzer</b>                                                                                                                                                                                                                                                                              | 3543A02721                                                                       | Feb 2002                                                                                                  |
| <b>8753E Network Analyzer</b>                                                                                                                                                                                                                                                                               | US38433013                                                                       | Feb 2002                                                                                                  |
| <b>8648D Signal Generator</b>                                                                                                                                                                                                                                                                               | 3847A00611                                                                       | Feb 2002                                                                                                  |
| <b>5S1G4 Amplifier Research Power Amplifier</b>                                                                                                                                                                                                                                                             | 26235                                                                            | N/A                                                                                                       |

## 16.0 MEASUREMENT UNCERTAINTIES

| Error Description                                           | Uncertainty Value<br>$\pm\%$ | Probability Distribution | Divisor    | $C_i$<br>1g | Standard Uncertainty<br>$\pm\%$ (1g) | $v_i$ or $v_{eff}$ |
|-------------------------------------------------------------|------------------------------|--------------------------|------------|-------------|--------------------------------------|--------------------|
| <b>Measurement System</b>                                   |                              |                          |            |             |                                      |                    |
| Probe calibration                                           | $\pm 4.8$                    | Normal                   | 1          | 1           | $\pm 4.8$                            | $\infty$           |
| Axial isotropy of the probe                                 | $\pm 4.7$                    | Rectangular              | $\sqrt{3}$ | $(1-c_p)$   | $\pm 1.9$                            | $\infty$           |
| Spherical isotropy of the probe                             | $\pm 9.6$                    | Rectangular              | $\sqrt{3}$ | $(c_p)$     | $\pm 3.9$                            | $\infty$           |
| Spatial resolution                                          | $\pm 0.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.0$                            | $\infty$           |
| Boundary effects                                            | $\pm 5.5$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 3.2$                            | $\infty$           |
| Probe linearity                                             | $\pm 4.7$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 2.7$                            | $\infty$           |
| Detection limit                                             | $\pm 1.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.6$                            | $\infty$           |
| Readout electronics                                         | $\pm 1.0$                    | Normal                   | 1          | 1           | $\pm 1.0$                            | $\infty$           |
| Response time                                               | $\pm 0.8$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.5$                            | $\infty$           |
| Integration time                                            | $\pm 1.4$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.8$                            | $\infty$           |
| RF ambient conditions                                       | $\pm 3.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 1.7$                            | $\infty$           |
| Mech. constraints of robot                                  | $\pm 0.4$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 0.2$                            | $\infty$           |
| Probe positioning                                           | $\pm 2.9$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 1.7$                            | $\infty$           |
| Extrapolation & integration                                 | $\pm 3.9$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 2.3$                            | $\infty$           |
| <b>Test Sample Related</b>                                  |                              |                          |            |             |                                      |                    |
| Device positioning                                          | $\pm 6.0$                    | Normal                   | $\sqrt{3}$ | 1           | $\pm 6.7$                            | 12                 |
| Device holder uncertainty                                   | $\pm 5.0$                    | Normal                   | $\sqrt{3}$ | 1           | $\pm 5.9$                            | 8                  |
| Power drift                                                 | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ |             | $\pm 2.9$                            | $\infty$           |
| <b>Phantom and Setup</b>                                    |                              |                          |            |             |                                      |                    |
| Phantom uncertainty                                         | $\pm 4.0$                    | Rectangular              | $\sqrt{3}$ | 1           | $\pm 2.3$                            | $\infty$           |
| Liquid conductivity (target)                                | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$           |
| Liquid conductivity (measured)                              | $\pm 10.0$                   | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 3.5$                            | $\infty$           |
| Liquid permittivity (target)                                | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$           |
| Liquid permittivity (measured)                              | $\pm 5.0$                    | Rectangular              | $\sqrt{3}$ | 0.6         | $\pm 1.7$                            | $\infty$           |
|                                                             |                              |                          |            |             |                                      |                    |
| <b>Combined Standard Uncertainty</b>                        |                              |                          |            |             | $\pm 13.7$                           |                    |
| <b>Expanded Uncertainty (k=2)</b><br>(95% Confidence Level) |                              |                          |            |             | $\pm 27.5$                           |                    |

Measurement Uncertainty Table in accordance with IEEE Std 1528 (Draft - see reference [3])

## 17.0 REFERENCES

- [1] Federal Communications Commission, "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093: 1999.
- [2] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.
- [3] IEEE Standards Coordinating Committee 34, Std 1528-200X, "DRAFT Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques".

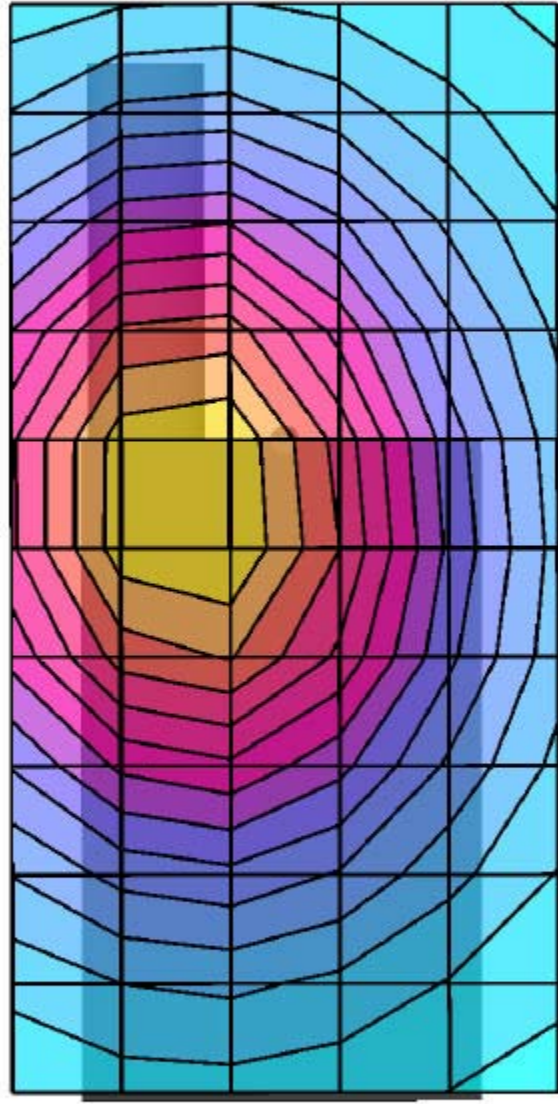
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## APPENDIX A - SAR MEASUREMENT DATA

# Cobra Electronics Corporation FCC ID: BBOPR135

SAM Phantom; Flat Section; Position: (90°,90°)  
Probe: ET3DV6 - SN1387; ConvF(7.30,7.30,7.30); Crest factor: 1.0  
450 MHz Brain:  $\sigma = 0.86 \text{ mho/m}$   $\epsilon_r = 44.0$   $\rho = 1.00 \text{ g/cm}^3$   
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0  
Cube 5x5x7; Powerdrift: -0.14 dB  
SAR (1g): 0.282 mW/g, SAR (10g): 0.197 mW/g

Face-Held SAR at 2.5cm Separation Distance  
Models: PR135/PR140 GMRS/FRS PTT Radio Transceiver  
Alkaline Batteries (x4)  
Continuous Wave Mode  
GMRS Mid Channel [462.7125 MHz]  
Power Level: 0.5 Watts (ERP)  
Ambient Temp. 22.8°C; Fluid Temp. 21.4°C  
Date Tested: October 2, 2002



# Cobra Electronics Corporation FCC ID: BBOPR135

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1387; ConvF(7.30,7.30,7.30); Crest factor: 1.0

450 MHz Brain:  $\sigma = 0.86 \text{ mho/m}$   $\epsilon_r = 44.0$   $\rho = 1.00 \text{ g/cm}^3$

## Z-Axis Extrapolation at Peak SAR Location

Face-Held SAR at 2.5cm Separation Distance

Models: PR135/PR140 GMRS/FRS PTT Radio Transceiver

Alkaline Batteries (x4)

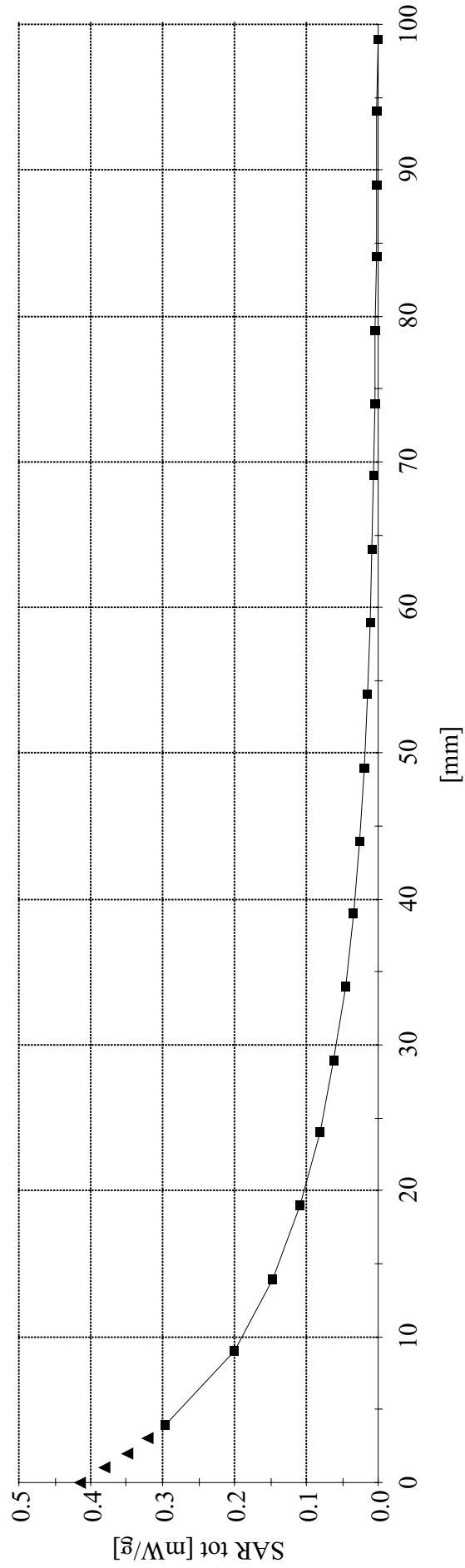
Continuous Wave Mode

GMRS Mid Channel [462.7125 MHz]

Power Level: 0.5 Watts (ERP)

Ambient Temp. 22.8°C; Fluid Temp. 21.4°C

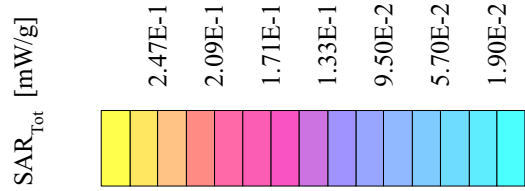
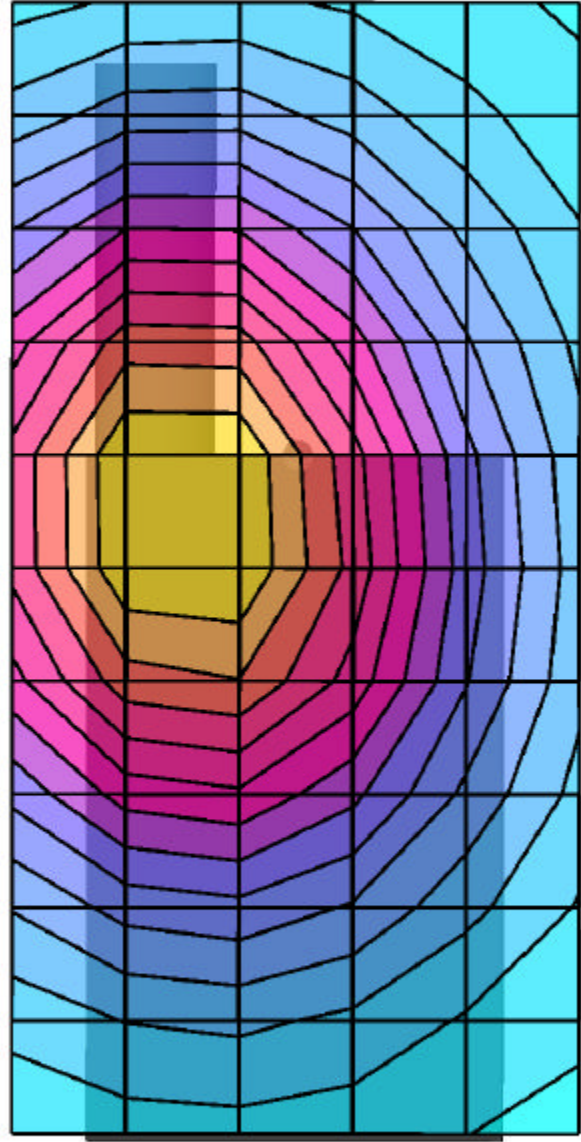
Date Tested: October 2, 2002



# Cobra Electronics Corporation FCC ID: BBOPR135

SAM Phantom; Flat Section; Position: (90°,90°)  
Probe: ET3DV6 - SN1387; ConvF(7.30,7.30,7.30); Crest factor: 1.0  
450 MHz Brain:  $\sigma = 0.86 \text{ mho/m}$   $\epsilon_r = 44.0$   $\rho = 1.00 \text{ g/cm}^3$   
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0  
Cube 5x5x7; Powerdrift: -0.04 dB  
SAR (1g): 0.264 mW/g, SAR (10g): 0.185 mW/g

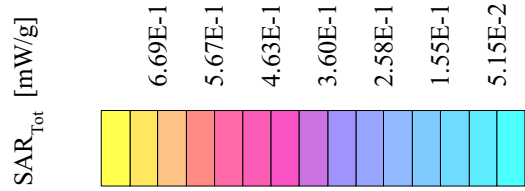
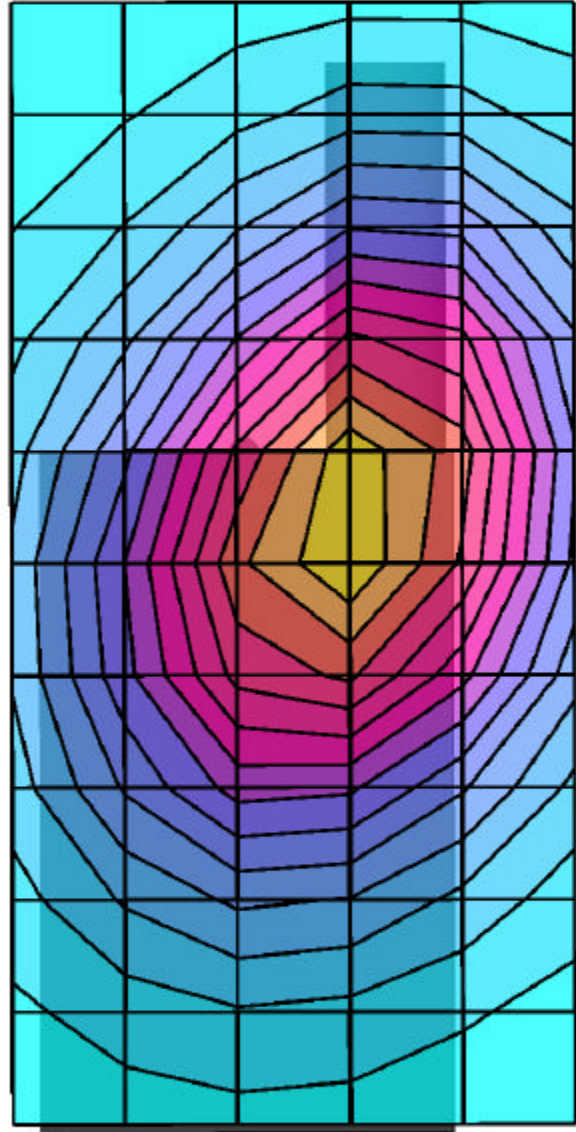
Face-Held SAR at 2.5cm Separation Distance  
Models: PR135/PR140 GMRS/FRS PTT Radio Transceiver  
Alkaline Batteries (x4)  
Continuous Wave Mode  
FRS Mid Channel [467.5625 MHz]  
Power Level: 0.5 Watts (ERP)  
Ambient Temp. 22.8°C; Fluid Temp. 21.4°C  
Date Tested: October 2, 2002



# Cobra Electronics Corporation FCC ID: BBOPR135

SAM Phantom; Flat Section; Position: (270°,270°)  
Probe: ET3DV6 - SN1387; ConvF(7.70,7.70,7.70); Crest factor: 1.0  
450 MHz Muscle:  $\sigma = 0.92 \text{ mho/m}$   $\epsilon_r = 57.8$   $\rho = 1.00 \text{ g/cm}^3$   
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0  
Cube 5x5x7; Powerdrift: -0.15 dB  
SAR (1g): 0.704 mW/g, SAR (10g): 0.484 mW/g

Body-Worn SAR with 0.7cm Belt-Clip & Ear-Mic Accessory  
Models: PR135/PR140 GMRS/FRS PTT Radio Transceiver  
Alkaline Batteries (x4)  
Continuous Wave Mode  
GMRS Mid Channel [462.7125 MHz]  
Power Level: 0.5 Watts (ERP)  
Ambient Temp. 22.8°C; Fluid Temp. 21.4°C  
Date Tested: October 2, 2002



# Cobra Electronics Corporation FCC ID: BBOPR135

SAM Phantom; Flat Section

Probe: ET3DV6 - SN1387; ConvF(7.70,7.70,7.70); Crest factor: 1.0

450 MHz Muscle:  $\sigma = 0.92$  mho/m  $\epsilon_r = 57.8$   $\rho = 1.00$  g/cm<sup>3</sup>

## Z-Axis Extrapolation at Peak SAR Location

Body-Worn SAR with 0.7cm Belt-Clip & Ear-Mic Accessory

Models: PR135/PR140 GMRS/FRS PTT Radio Transceiver

Alkaline Batteries (x4)

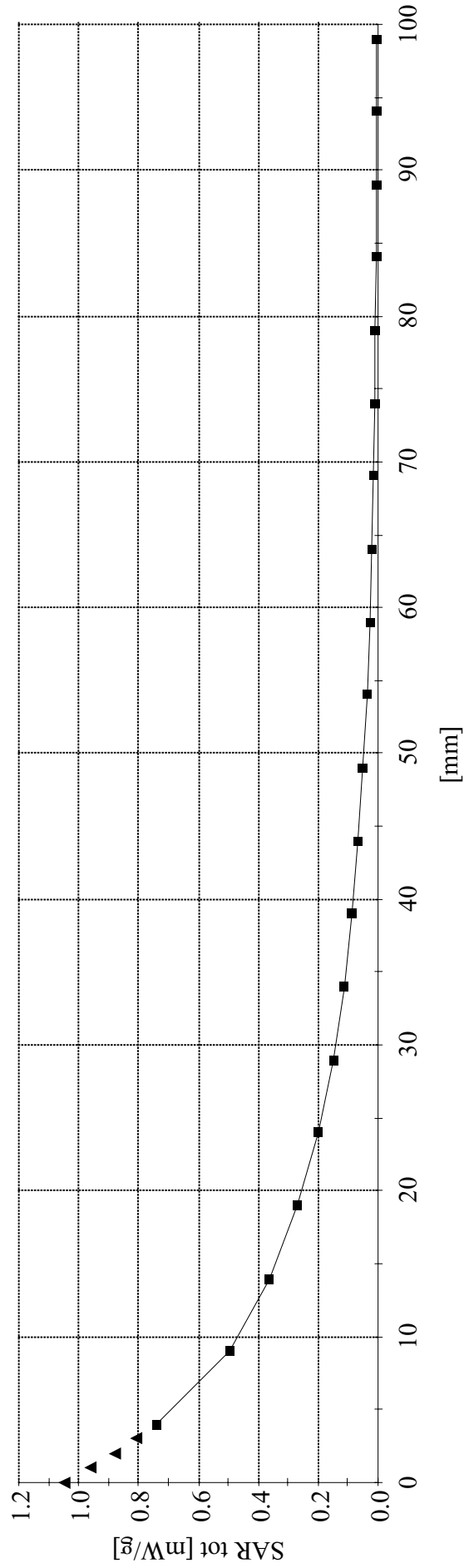
Continuous Wave Mode

GMRS Mid Channel [462.7125 MHz]

Power Level: 0.5 Watts (ERP)

Ambient Temp. 22.8°C; Fluid Temp. 21.4°C

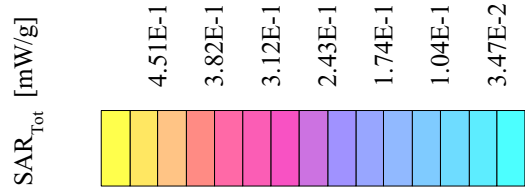
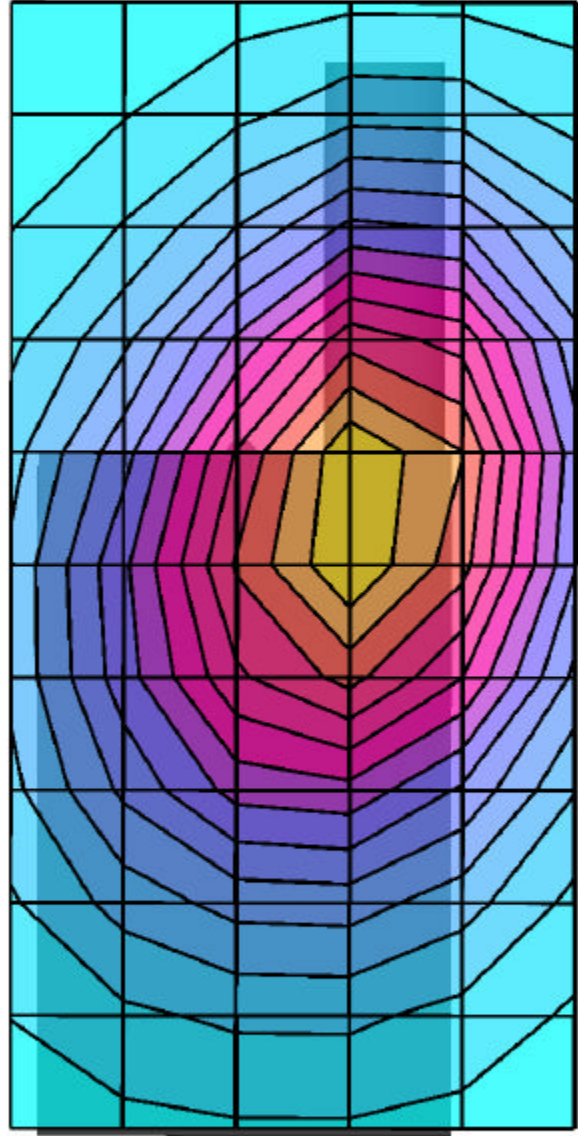
Date Tested: October 2, 2002



# Cobra Electronics Corporation FCC ID: BBOPR135

SAM Phantom; Flat Section; Position: (270°,270°)  
Probe: ET3DV6 - SN1387; ConvF(7.70,7.70,7.70); Crest factor: 1.0  
450 MHz Muscle:  $\sigma = 0.92 \text{ mho/m}$   $\epsilon_r = 57.8$   $\rho = 1.00 \text{ g/cm}^3$   
Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0  
Cube 5x5x7; Powerdrift: -0.11 dB  
SAR (1g): 0.465 mW/g, SAR (10g): 0.319 mW/g

Body-Worn SAR with 0.7cm Belt-Clip & Ear-Mic Accessory  
Models: PR135/PR140 GMRS/FRS PTT Radio Transceiver  
Alkaline Batteries (x4)  
Continuous Wave Mode  
FRS Mid Channel [467.5625 MHz]  
Power Level: 0.5 Watts (ERP)  
Ambient Temp. 22.8°C; Fluid Temp. 21.4°C  
Date Tested: October 2, 2002



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## APPENDIX B - SYSTEM VALIDATION

# Dipole 450MHz

Large Planar Phantom; Planar Section

Probe: ET3DV6 - SNI1387; ConvF(7.30,7.30,7.30); Crest factor: 1.0; 450 MHz Brain:  $\sigma = 0.86 \text{ mho/m}$   $\epsilon_r = 44.0$   $\rho = 1.00 \text{ g/cm}^3$

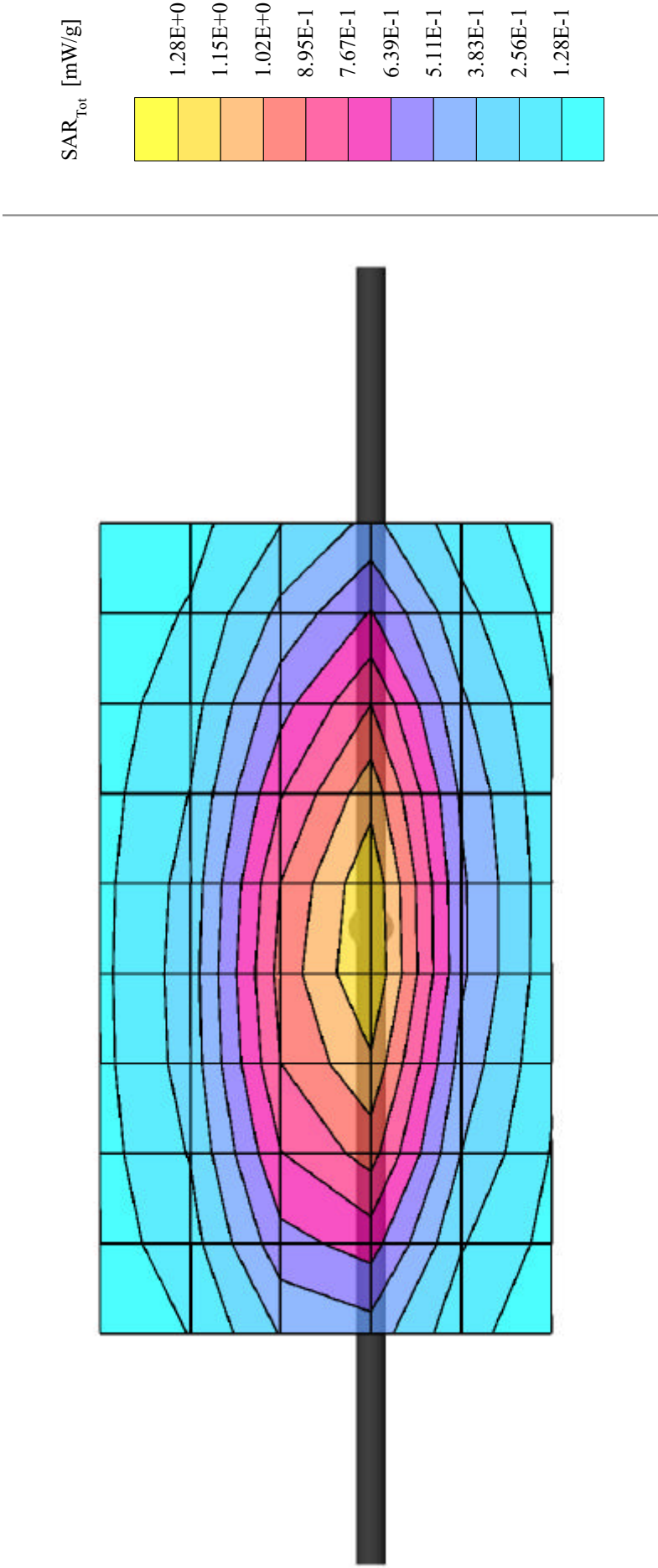
Cube 5x5x7: Peak: 2.13 mW/g, SAR (1g): 1.33 mW/g, SAR (10g): 0.868 mW/g, (Worst-case extrapolation)

Penetration depth: 12.2 (10.6, 14.4) [mm]; Ambient Temp. 22.8°C; Fluid Temp. 21.4°C

Powerdrift: 0.01 dB

450MHz Validation

Date: October 2, 2002



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## APPENDIX C - DIPOLE CALIBRATION

## 450MHz SYSTEM VALIDATION DIPOLE

Type:

**450MHz Validation Dipole**

Serial Number:

**136**

Place of Calibration:

**Celltech Research Inc.**

Date of Calibration:

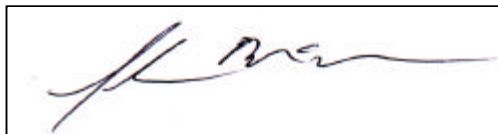
**October 17, 2001**

Celltech Research Inc. hereby certifies that this device has been calibrated on the date indicated above.

Calibrated by:



Approved by:

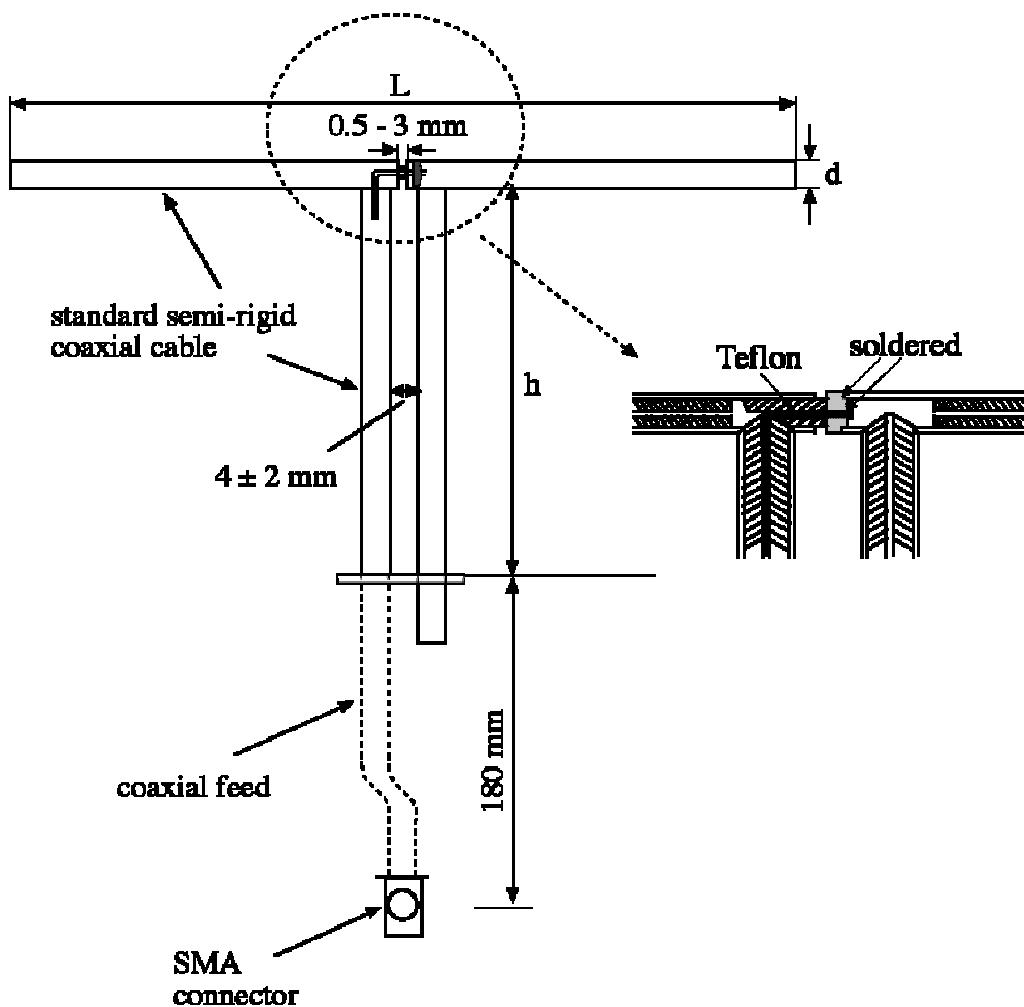


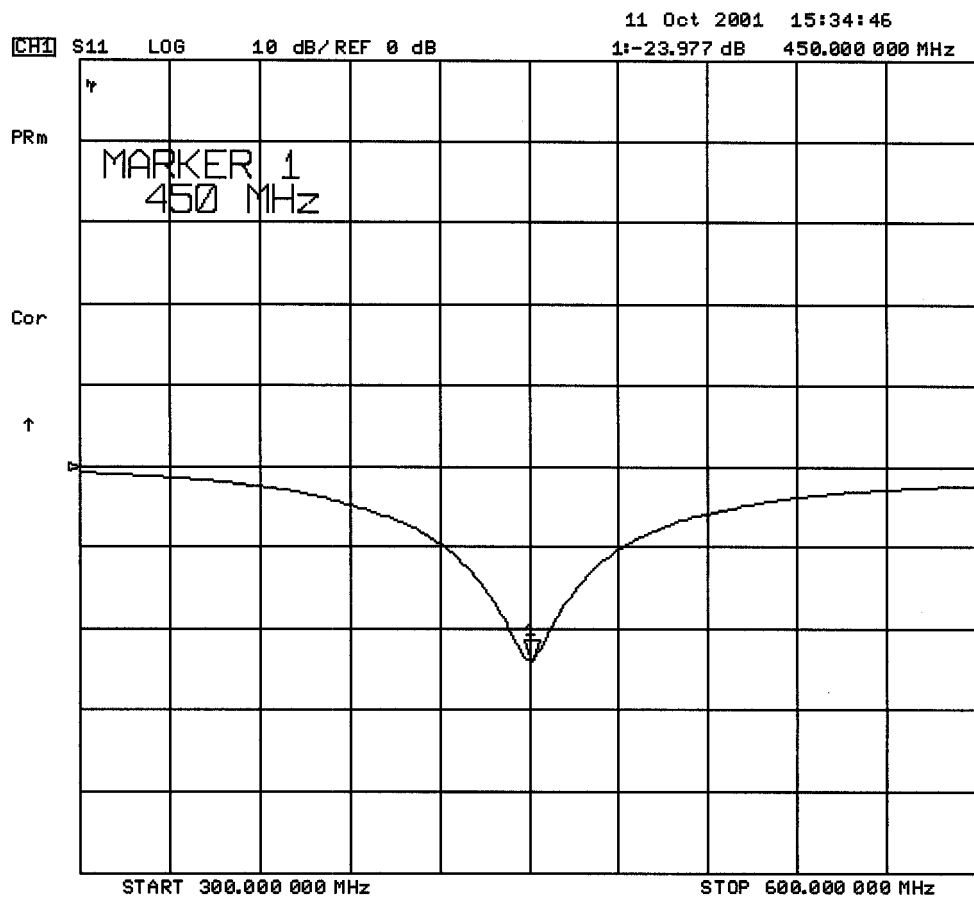
## 1. Dipole Construction & Electrical Characteristics

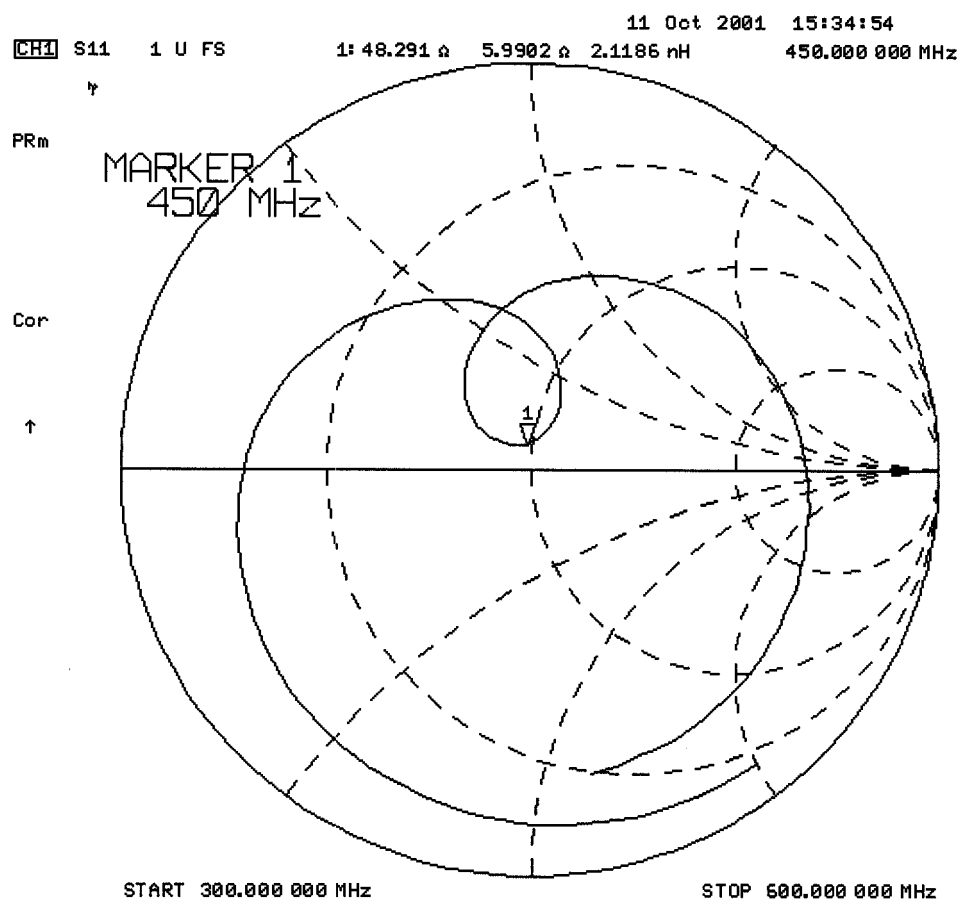
The validation dipole was constructed in accordance with the IEEE Std “Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”. The electrical properties were measured using an HP 8753E Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 15.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

|                                |                                 |
|--------------------------------|---------------------------------|
| Feed point impedance at 450MHz | $\text{Re}\{Z\} = 48.291\Omega$ |
|                                | $\text{Im}\{Z\} = 5.9902\Omega$ |

|                       |            |
|-----------------------|------------|
| Return Loss at 450MHz | -23.9777dB |
|-----------------------|------------|







## Validation Dipole Dimensions

| Frequency (MHz) | L (mm) | h (mm) | d (mm) |
|-----------------|--------|--------|--------|
| 300             | 420.0  | 250.0  | 6.2    |
| 450             | 288.0  | 167.0  | 6.2    |
| 835             | 161.0  | 89.8   | 3.6    |
| 900             | 149.0  | 83.3   | 3.6    |
| 1450            | 89.1   | 51.7   | 3.6    |
| 1800            | 72.0   | 41.7   | 3.6    |
| 1900            | 68.0   | 39.5   | 3.6    |
| 2000            | 64.5   | 37.5   | 3.6    |
| 2450            | 51.8   | 30.6   | 3.6    |
| 3000            | 41.5   | 25.0   | 3.6    |

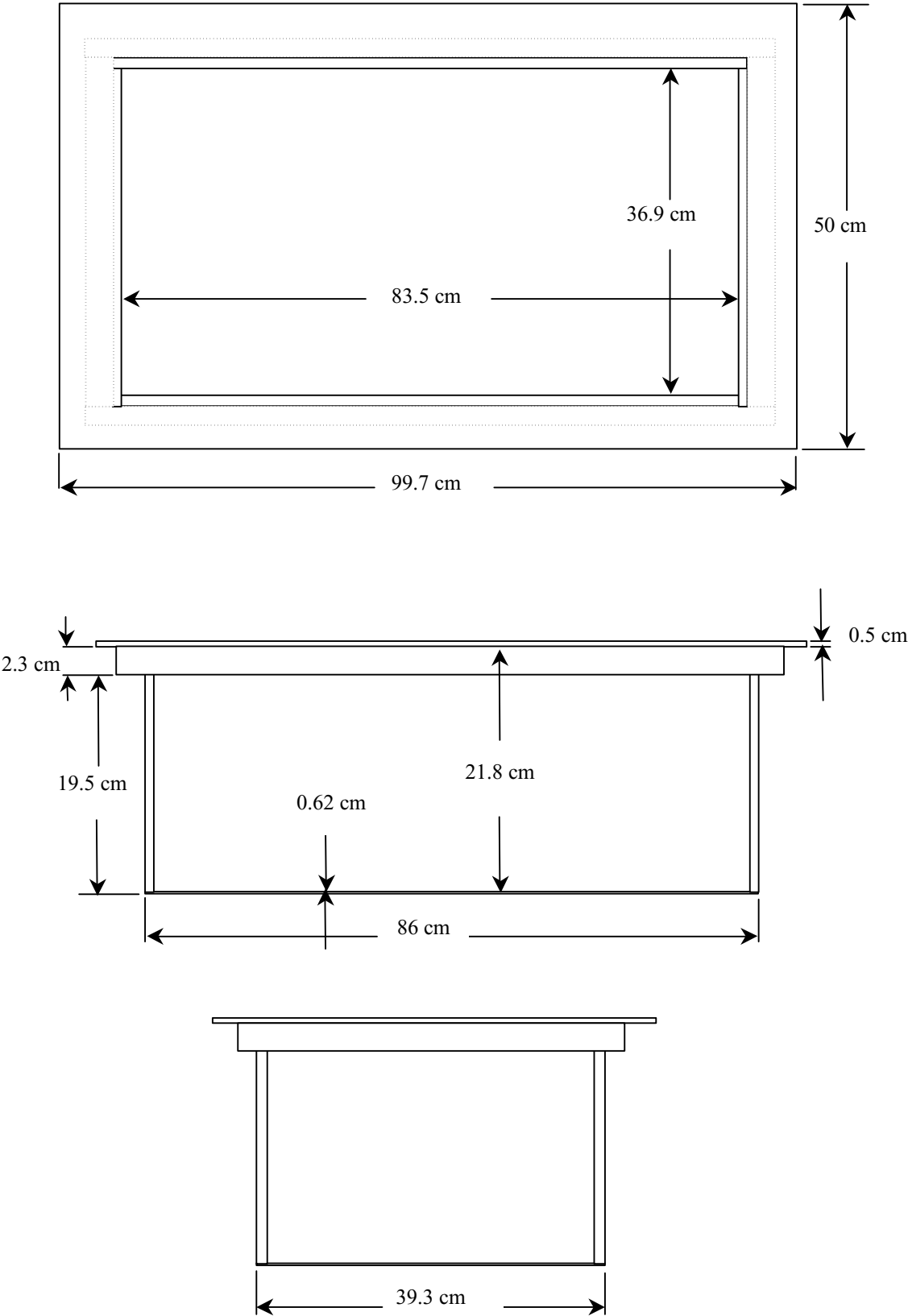
## 2. Validation Phantom

The validation phantom was constructed using relatively low-loss tangent Plexiglas material. The dimensions of the phantom are as follows:

Length: 83.5 cm  
Width: 36.9 cm  
Height: 21.8 cm

The bottom of the phantom is constructed of  $6.2 \pm 0.1$ mm Plexiglas.

Dimensions of Plexiglas Planar Phantom



## 450MHz Dipole Calibration Setup



## 450MHz Dipole Calibration Setup



### **3. Measurement Conditions**

The planar phantom was filled with brain simulating tissue having the following electrical parameters at 450MHz:

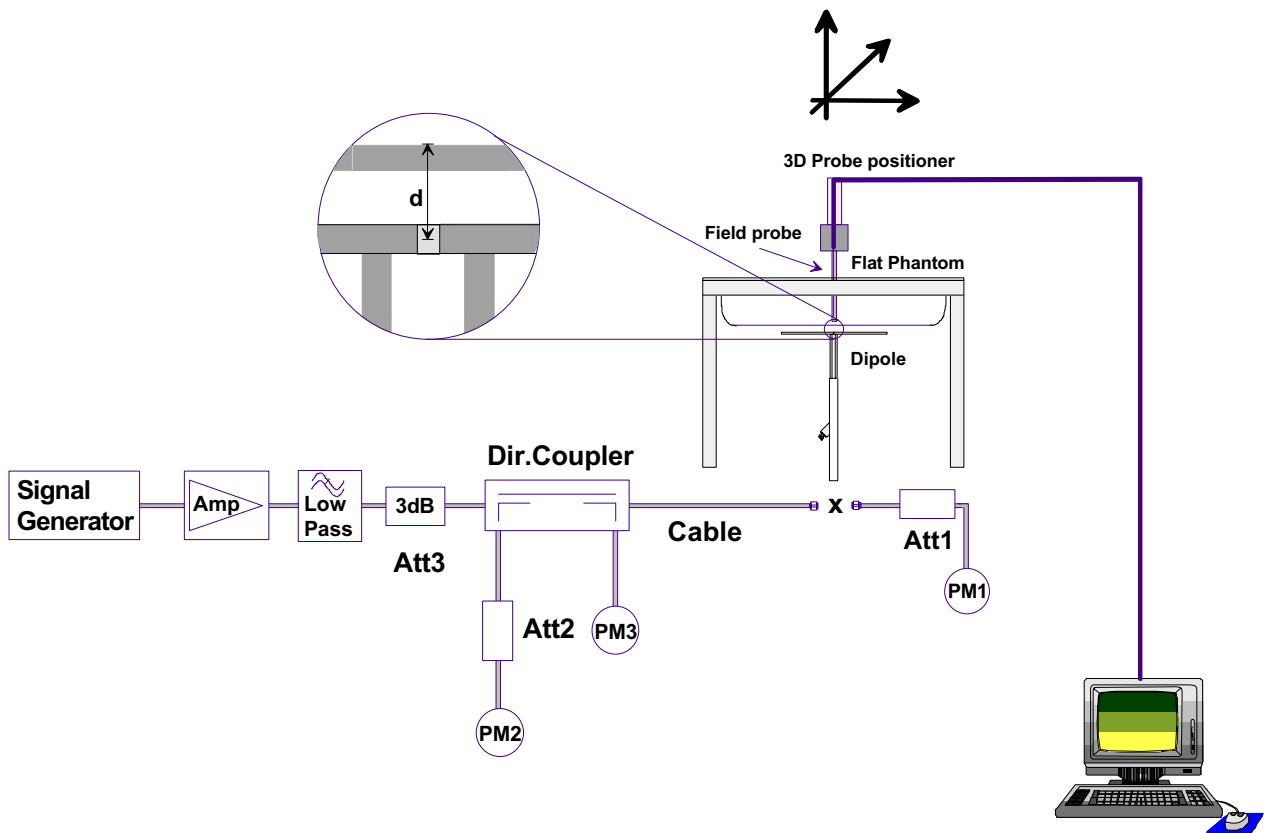
Relative Permittivity: 43.5  $\pm$  5%  
Conductivity: 0.86 mho/m  $\pm$  5%  
Temperature: 23.1°C

The 450MHz simulating tissue consists of the following ingredients:

| Ingredient                              | Percentage by weight                               |
|-----------------------------------------|----------------------------------------------------|
| Water                                   | 38.56%                                             |
| Sugar                                   | 56.32%                                             |
| Salt                                    | 3.95%                                              |
| HEC                                     | 0.98%                                              |
| Dowicil 75                              | 0.19%                                              |
| Target Dielectric Parameters<br>at 22°C | $\epsilon_r = 43.5$<br>$\sigma = 0.87 \text{ S/m}$ |

#### 4. SAR Measurement

The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the following procedures.



First the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power should be 20dB below the forward power.

Ten SAR measurements were performed in order to achieve repeatability and to establish an average target value.

### Validation Dipole SAR Test Results

| Validation Measurement | SAR @ 0.25W<br>Input averaged<br>over 1g | SAR @ 1W<br>Input averaged<br>over 1g | SAR @ 0.25W<br>Input averaged<br>over 10g | SAR @ 1W<br>Input averaged<br>over 10g | Peak SAR @<br>0.25W Input |
|------------------------|------------------------------------------|---------------------------------------|-------------------------------------------|----------------------------------------|---------------------------|
| Test 1                 | 1.47                                     | 5.88                                  | 0.971                                     | 3.88                                   | 2.31                      |
| Test 2                 | 1.43                                     | 5.72                                  | 0.949                                     | 3.80                                   | 2.25                      |
| Test 3                 | 1.45                                     | 5.80                                  | 0.961                                     | 3.84                                   | 2.27                      |
| Test 4                 | 1.44                                     | 5.76                                  | 0.954                                     | 3.82                                   | 2.26                      |
| Test 5                 | 1.46                                     | 5.84                                  | 0.969                                     | 3.88                                   | 2.29                      |
| Test 6                 | 1.42                                     | 5.68                                  | 0.939                                     | 3.76                                   | 2.23                      |
| Test 7                 | 1.45                                     | 5.80                                  | 0.960                                     | 3.84                                   | 2.27                      |
| Test 8                 | 1.41                                     | 5.64                                  | 0.928                                     | 3.71                                   | 2.22                      |
| Test 9                 | 1.43                                     | 5.72                                  | 0.950                                     | 3.80                                   | 2.25                      |
| Test10                 | 1.46                                     | 5.84                                  | 0.971                                     | 3.88                                   | 2.29                      |
| Average Value          | 1.44                                     | 5.77                                  | 0.946                                     | 3.82                                   | 2.26                      |

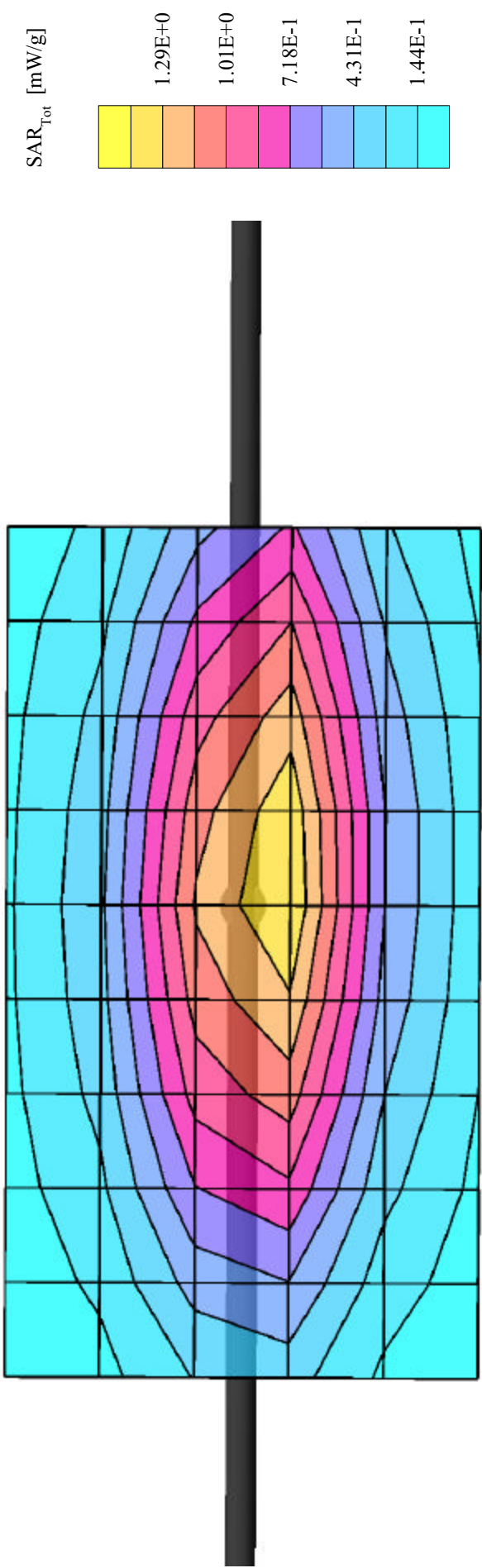
The results have been normalized to 1W (forward power) into the dipole.

Averaged over 1cm (1g) of tissue: 5.77 mW/g

Averaged over 10cm (10g) of tissue: 3.82 mW/g

# Validation Dipole 450MHz, d = 15 mm

Frequency: 450 MHz; Antenna Input Power: 250 [mW]  
Large Planar Phantom; Planar Section  
Probe: ET3DV6 - SNI590; ConvF(7.36,7.36,7.36); Crest factor: 1.0  
450 MHz Brain:  $\sigma = 0.87$  mho/m  $\epsilon_r = 43.5$   $\rho = 1.00$  g/cm<sup>3</sup>  
Cube 5x5x7: Peak: 2.34 mW/g, SAR (1g): 1.47 mW/g, SAR (10g): 0.963 mW/g, (Worst-case extrapolation)  
Penetration depth: 12.3 (10.7, 14.4) [mm]  
Powerdrift: 0.02 dB  
Calibration Date: Oct. 17, 2001



## Validation Dipole 450MHz, d = 15 mm

Large Planar Phantom; Planar Section

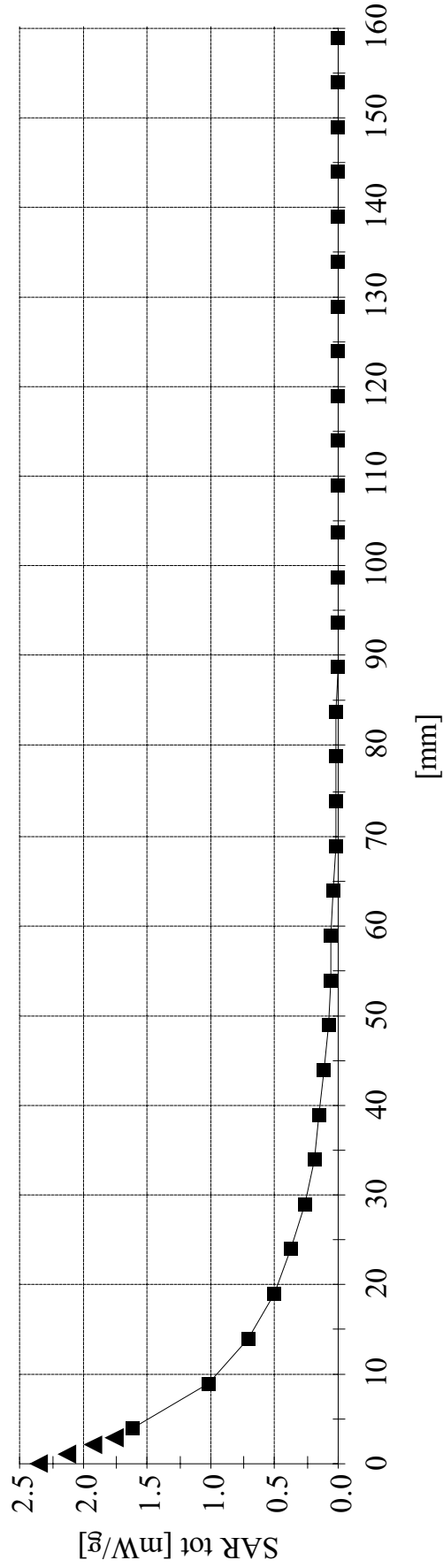
Probe: ET3DV6 - SN1590; ConvF(7.36,7.36,7.36); Crest factor: 1.0

450 MHz Brain:  $\sigma = 0.87$  mho/m  $\epsilon_r = 43.5$   $\rho = 1.00$  g/cm<sup>3</sup>

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

Test Date: October 17, 2001

conducted power: 250 mW



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## APPENDIX D - PROBE CALIBRATION

## Calibration Certificate

### Dosimetric E-Field Probe

Type:

**ET3DV6**

Serial Number:

**1387**

Place of Calibration:

**Zurich**

Date of Calibration:

**February 22, 2002**

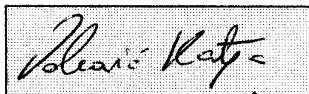
Calibration Interval:

**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:



Approved by:



# Probe ET3DV6

SN:1387

|                   |                    |
|-------------------|--------------------|
| Manufactured:     | September 21, 1999 |
| Last calibration: | September 22, 1999 |
| Recalibrated:     | February 22, 2002  |

Calibrated for System DASY3

## DASY3 - Parameters of Probe: ET3DV6 SN:1387

### Sensitivity in Free Space

|       |                                                 |
|-------|-------------------------------------------------|
| NormX | <b>1.58</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | <b>1.67</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | <b>1.67</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |

### Diode Compression

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

### Sensitivity in Tissue Simulating Liquid

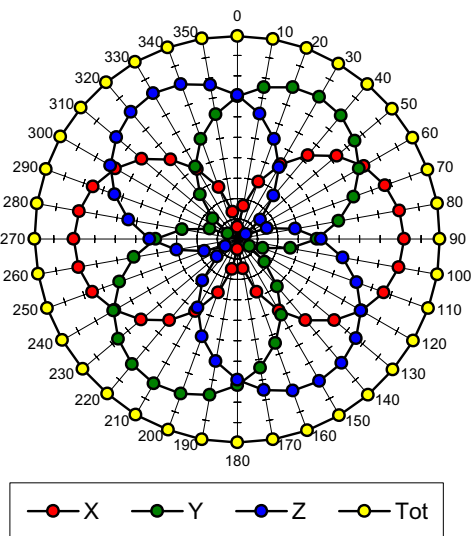
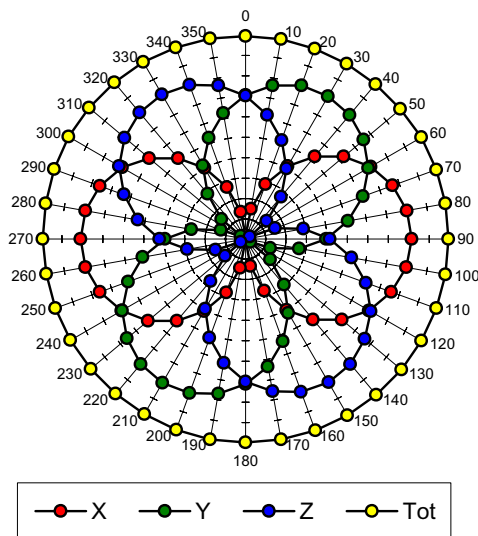
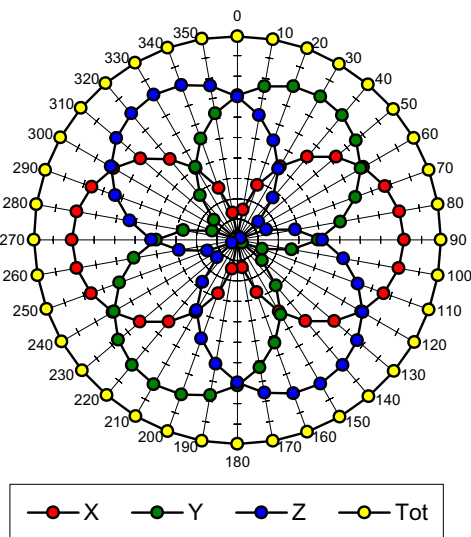
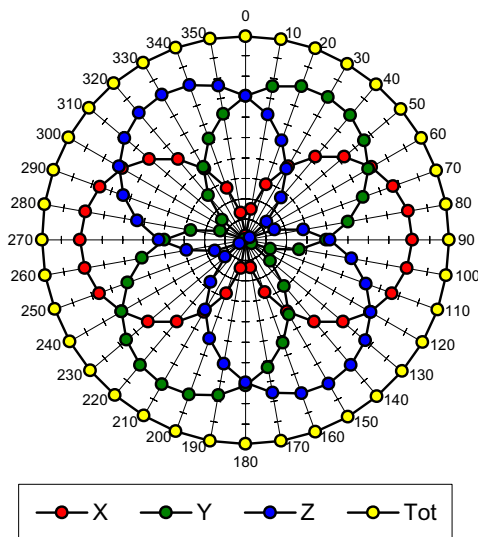
|         |                              |                             |                                       |
|---------|------------------------------|-----------------------------|---------------------------------------|
| Head    | <b>900 MHz</b>               | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| Head    | <b>835 MHz</b>               | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\% \text{ mho/m}$ |
| ConvF X | <b>6.6</b> $\pm 9.5\%$ (k=2) | Boundary effect:            |                                       |
| ConvF Y | <b>6.6</b> $\pm 9.5\%$ (k=2) | Alpha                       | <b>0.40</b>                           |
| ConvF Z | <b>6.6</b> $\pm 9.5\%$ (k=2) | Depth                       | <b>2.38</b>                           |
| Head    | <b>1800 MHz</b>              | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| Head    | <b>1900 MHz</b>              | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| ConvF X | <b>5.4</b> $\pm 9.5\%$ (k=2) | Boundary effect:            |                                       |
| ConvF Y | <b>5.4</b> $\pm 9.5\%$ (k=2) | Alpha                       | <b>0.57</b>                           |
| ConvF Z | <b>5.4</b> $\pm 9.5\%$ (k=2) | Depth                       | <b>2.18</b>                           |

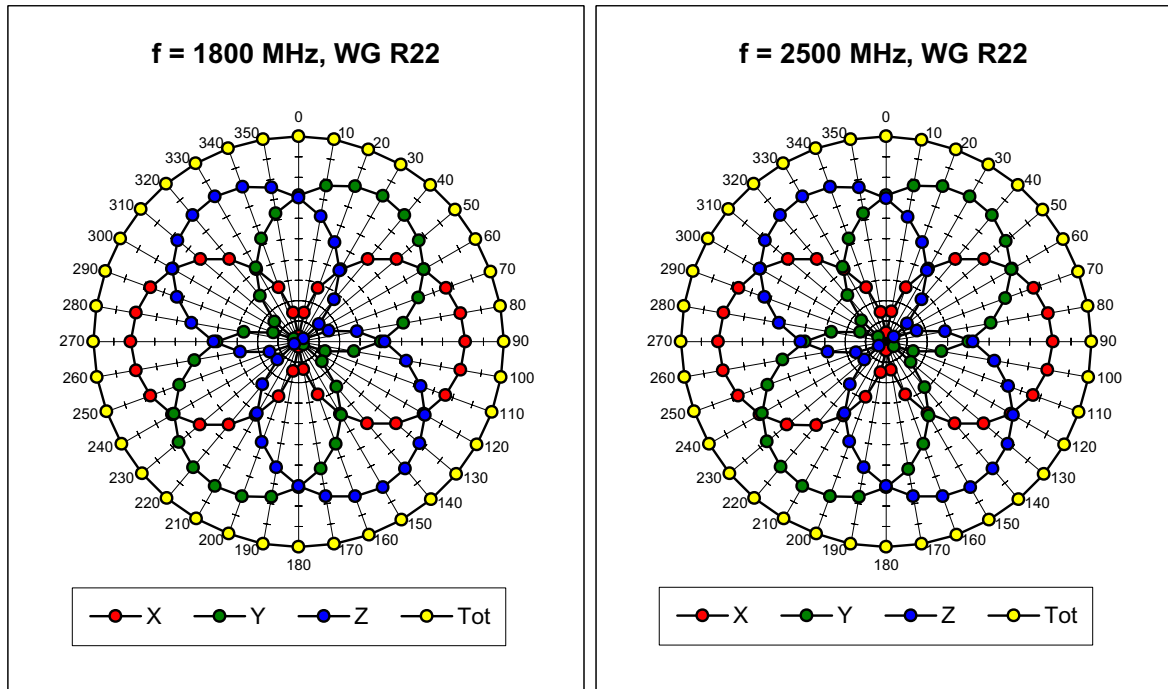
### Boundary Effect

|                                                    |                 |                                   |             |
|----------------------------------------------------|-----------------|-----------------------------------|-------------|
| 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>be</sub> [%] Without Correction Algorithm |                 | 9.7                               | 5.4         |
| SAR <sub>be</sub> [%] With Correction Algorithm    |                 | 0.3                               | 0.6         |
| 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>be</sub> [%] Without Correction Algorithm |                 | 11.5                              | 7.3         |
| SAR <sub>be</sub> [%] With Correction Algorithm    |                 | 0.1                               | 0.3         |

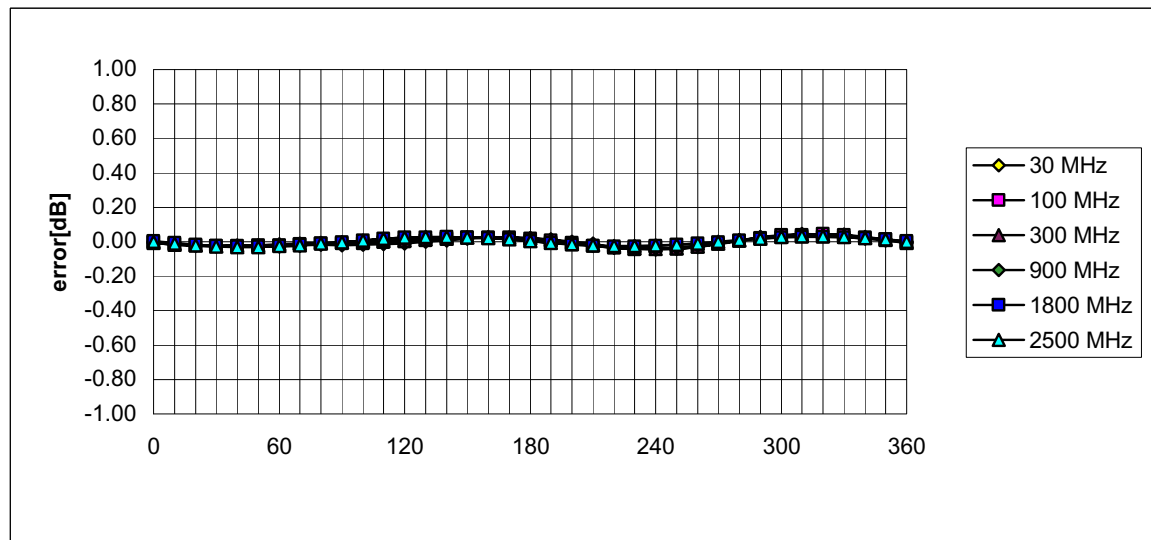
### Sensor Offset

|                            |                                 |    |
|----------------------------|---------------------------------|----|
| Probe Tip to Sensor Center | <b>2.7</b>                      | mm |
| Optical Surface Detection  | <b>1.3 <math>\pm</math> 0.2</b> | mm |

Receiving Pattern ( $\phi$  ,  $\theta = 0^\circ$ )**f = 30 MHz, TEM cell ifi110****f = 100 MHz, TEM cell ifi110****f = 300 MHz, TEM cell ifi110****f = 900 MHz, TEM cell ifi110**

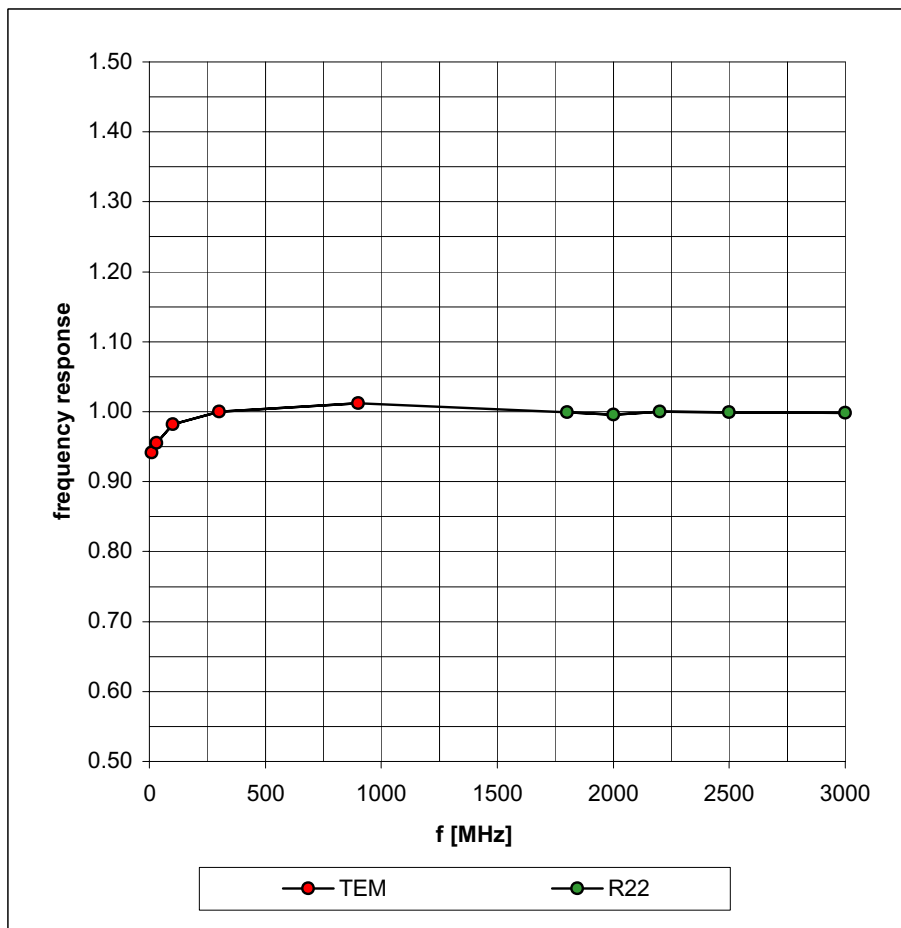


### Isotropy Error ( $\phi$ ), $\theta = 0^\circ$

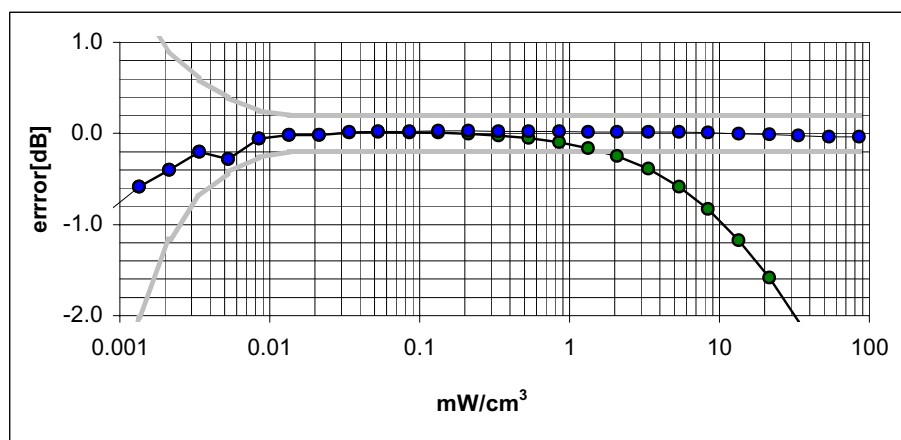
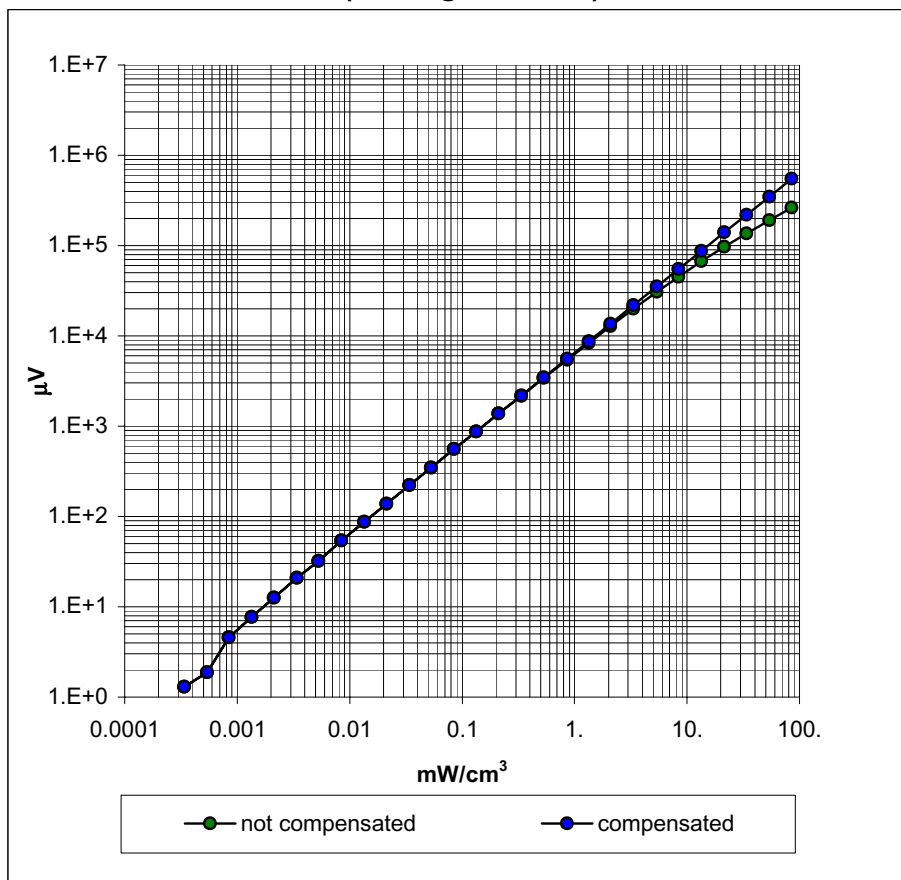


## Frequency Response of E-Field

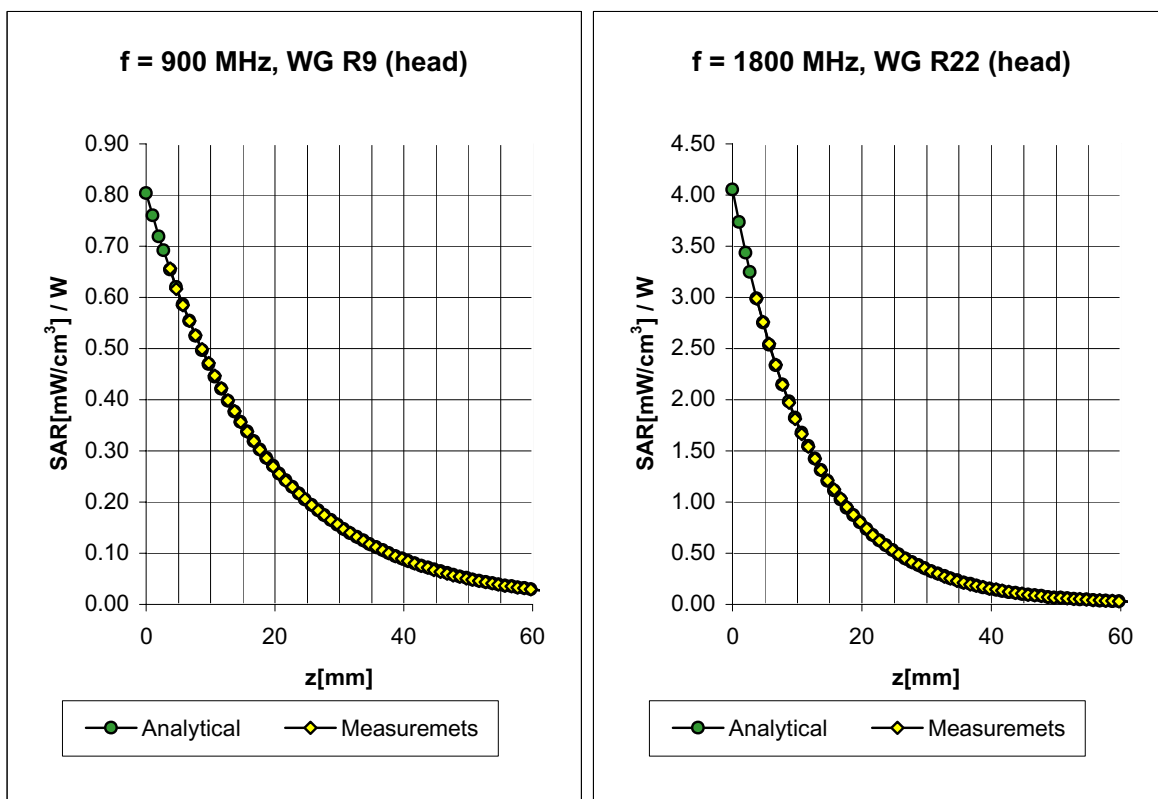
( TEM-Cell:ifi1110, Waveguide R22)



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



# Conversion Factor Assessment

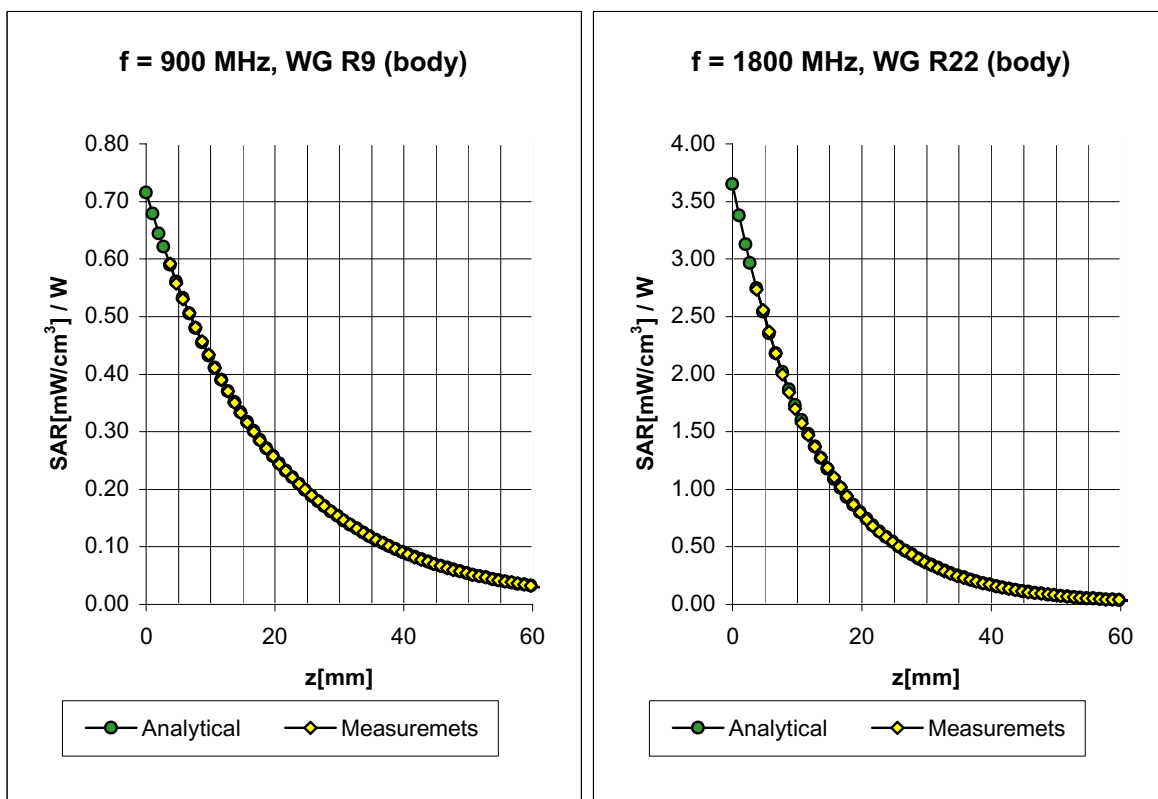


|      |          |                              |                                       |
|------|----------|------------------------------|---------------------------------------|
| Head | 900 MHz  | $\epsilon_r = 41.5 \pm 5\%$  | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| Head | 835 MHz  | $\epsilon_r = 41.5 \pm 5\%$  | $\sigma = 0.90 \pm 5\% \text{ mho/m}$ |
|      | ConvF X  | <b>6.6</b> $\pm 9.5\%$ (k=2) | Boundary effect:                      |
|      | ConvF Y  | <b>6.6</b> $\pm 9.5\%$ (k=2) | Alpha <b>0.40</b>                     |
|      | ConvF Z  | <b>6.6</b> $\pm 9.5\%$ (k=2) | Depth <b>2.38</b>                     |
| Head | 1800 MHz | $\epsilon_r = 40.0 \pm 5\%$  | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| Head | 1900 MHz | $\epsilon_r = 40.0 \pm 5\%$  | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
|      | ConvF X  | <b>5.4</b> $\pm 9.5\%$ (k=2) | Boundary effect:                      |
|      | ConvF Y  | <b>5.4</b> $\pm 9.5\%$ (k=2) | Alpha <b>0.57</b>                     |
|      | ConvF Z  | <b>5.4</b> $\pm 9.5\%$ (k=2) | Depth <b>2.18</b>                     |

ET3DV6 SN:1387

February 22, 2002

# Conversion Factor Assessment



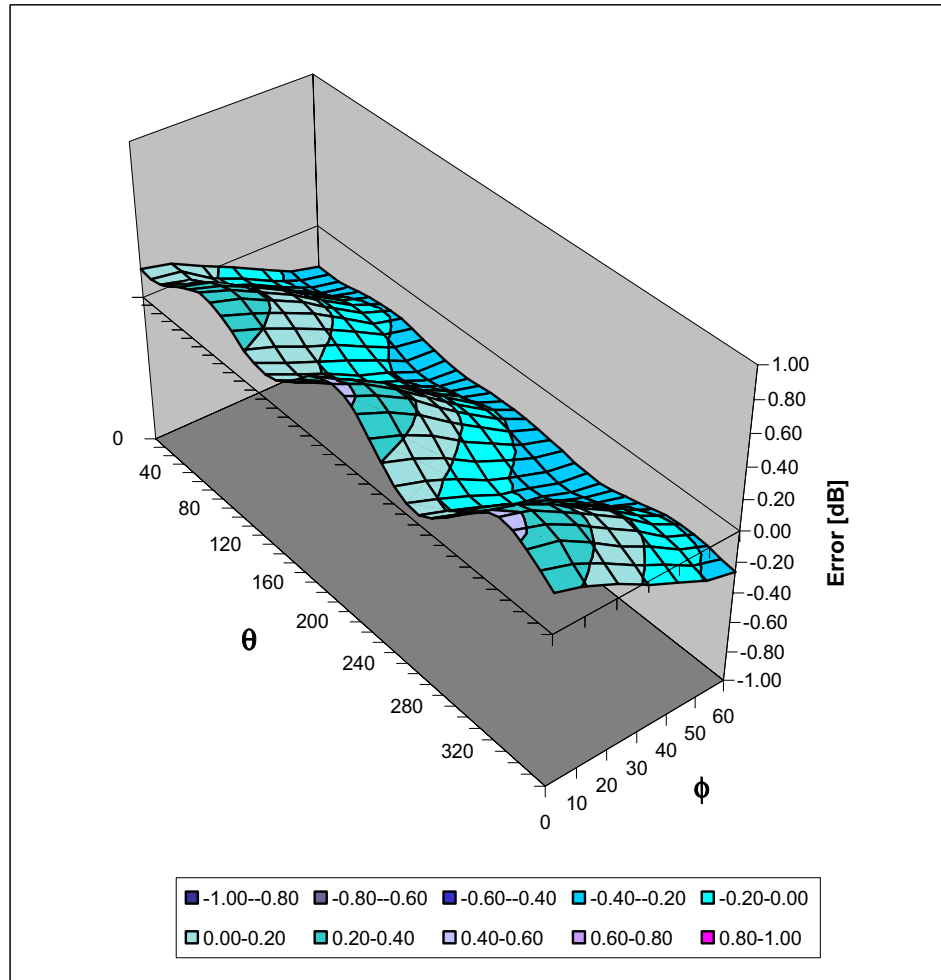
|      |          |                              |                                       |
|------|----------|------------------------------|---------------------------------------|
| Body | 900 MHz  | $\epsilon_r = 55.0 \pm 5\%$  | $\sigma = 1.05 \pm 5\% \text{ mho/m}$ |
| Body | 835 MHz  | $\epsilon_r = 55.2 \pm 5\%$  | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
|      | ConvF X  | <b>6.3</b> $\pm 9.5\%$ (k=2) | Boundary effect:                      |
|      | ConvF Y  | <b>6.3</b> $\pm 9.5\%$ (k=2) | Alpha <b>0.42</b>                     |
|      | ConvF Z  | <b>6.3</b> $\pm 9.5\%$ (k=2) | Depth <b>2.44</b>                     |
| Body | 1800 MHz | $\epsilon_r = 53.3 \pm 5\%$  | $\sigma = 1.52 \pm 5\% \text{ mho/m}$ |
| Body | 1900 MHz | $\epsilon_r = 53.3 \pm 5\%$  | $\sigma = 1.52 \pm 5\% \text{ mho/m}$ |
|      | ConvF X  | <b>5.0</b> $\pm 9.5\%$ (k=2) | Boundary effect:                      |
|      | ConvF Y  | <b>5.0</b> $\pm 9.5\%$ (k=2) | Alpha <b>0.76</b>                     |
|      | ConvF Z  | <b>5.0</b> $\pm 9.5\%$ (k=2) | Depth <b>2.01</b>                     |

ET3DV6 SN:1387

February 22, 2002

# Deviation from Isotropy in HSL

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



## Additional Conversion Factors for Dosimetric E-Field Probe

Type:

**ET3DV6**

Serial Number:

**1387**

Place of Assessment:

**Zurich**

Date of Assessment:

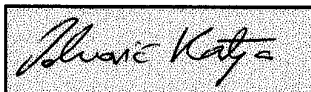
**February 25, 2002**

Probe Calibration Date:

**February 22, 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 ET3DV6 SN:1387

Conversion Factor ( $\pm$  standard deviation)

|          |       |               |                                                                       |
|----------|-------|---------------|-----------------------------------------------------------------------|
| 150 MHz  | ConvF | $9.2 \pm 8\%$ | $\epsilon_r = 52.3$<br>$\sigma = 0.76 \text{ mho/m}$<br>(head tissue) |
| 300 MHz  | ConvF | $8.0 \pm 8\%$ | $\epsilon_r = 45.3$<br>$\sigma = 0.87 \text{ mho/m}$<br>(head tissue) |
| 450 MHz  | ConvF | $7.3 \pm 8\%$ | $\epsilon_r = 43.5$<br>$\sigma = 0.87 \text{ mho/m}$<br>(head tissue) |
| 2450 MHz | ConvF | $4.7 \pm 8\%$ | $\epsilon_r = 39.2$<br>$\sigma = 1.80 \text{ mho/m}$<br>(head tissue) |
| 150 MHz  | ConvF | $8.8 \pm 8\%$ | $\epsilon_r = 61.9$<br>$\sigma = 0.80 \text{ mho/m}$<br>(body tissue) |
| 450 MHz  | ConvF | $7.7 \pm 8\%$ | $\epsilon_r = 56.7$<br>$\sigma = 0.94 \text{ mho/m}$<br>(body tissue) |
| 2450 MHz | ConvF | $4.3 \pm 8\%$ | $\epsilon_r = 52.7$<br>$\sigma = 1.95 \text{ mho/m}$<br>(body tissue) |

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## APPENDIX E - MEASURED FLUID DIELECTRIC PARAMETERS

# 450MHz System Validation & EUT Evaluation (Face-held)

## Measured Fluid Dielectric Parameters (Brain)

October 02, 2002

| Frequency      | e'     | e''     |
|----------------|--------|---------|
| 400.000000 MHz | 45.366 | 37.0285 |
| 405.000000 MHz | 45.269 | 36.7724 |
| 410.000000 MHz | 45.133 | 36.5079 |
| 415.000000 MHz | 44.951 | 36.1958 |
| 420.000000 MHz | 44.865 | 35.9574 |
| 425.000000 MHz | 44.698 | 35.6970 |
| 430.000000 MHz | 44.580 | 35.4159 |
| 435.000000 MHz | 44.455 | 35.2005 |
| 440.000000 MHz | 44.345 | 34.9400 |
| 445.000000 MHz | 44.166 | 34.7719 |
| 450.000000 MHz | 44.048 | 34.5514 |
| 455.000000 MHz | 43.939 | 34.3717 |
| 460.000000 MHz | 43.848 | 34.1196 |
| 465.000000 MHz | 43.785 | 33.9685 |
| 470.000000 MHz | 43.615 | 33.7657 |
| 475.000000 MHz | 43.520 | 33.5643 |
| 480.000000 MHz | 43.411 | 33.3695 |
| 485.000000 MHz | 43.309 | 33.2125 |
| 490.000000 MHz | 43.138 | 33.0360 |
| 495.000000 MHz | 43.061 | 32.7958 |
| 500.000000 MHz | 42.935 | 32.6540 |

# 450MHz EUT Evaluation (Body-worn)

## Measured Fluid Dielectric Parameters (Muscle)

October 02, 2002

| Frequency      | e'     | e''     |
|----------------|--------|---------|
| 400.000000 MHz | 58.745 | 39.7586 |
| 405.000000 MHz | 58.672 | 39.3762 |
| 410.000000 MHz | 58.480 | 39.1293 |
| 415.000000 MHz | 58.441 | 38.7974 |
| 420.000000 MHz | 58.309 | 38.5108 |
| 425.000000 MHz | 58.274 | 38.1916 |
| 430.000000 MHz | 58.123 | 37.8918 |
| 435.000000 MHz | 58.075 | 37.5980 |
| 440.000000 MHz | 57.996 | 37.3850 |
| 445.000000 MHz | 57.865 | 37.1481 |
| 450.000000 MHz | 57.787 | 36.9246 |
| 455.000000 MHz | 57.699 | 36.6415 |
| 460.000000 MHz | 57.645 | 36.4695 |
| 465.000000 MHz | 57.554 | 36.2063 |
| 470.000000 MHz | 57.504 | 35.9948 |
| 475.000000 MHz | 57.352 | 35.7728 |
| 480.000000 MHz | 57.372 | 35.4997 |
| 485.000000 MHz | 57.169 | 35.3521 |
| 490.000000 MHz | 57.150 | 35.0606 |
| 495.000000 MHz | 57.092 | 34.9060 |
| 500.000000 MHz | 56.988 | 34.6949 |

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## APPENDIX F - SAM PHANTOM CERTIFICATE OF CONFORMITY

# Schmid & Partner Engineering AG

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

## Certificate of conformity / First Article Inspection

|                       |                                                                          |
|-----------------------|--------------------------------------------------------------------------|
| Item                  | SAM Twin Phantom V4.0                                                    |
| Type No               | QD 000 P40 BA                                                            |
| Series No             | TP-1002 and higher                                                       |
| Manufacturer / Origin | Untersee Composites<br>Hauptstr. 69<br>CH-8559 Fruthwilen<br>Switzerland |

### Tests

The series production process used allows the limitation to test of first articles. Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

| Test                 | Requirement                                                                             | Details                                                              | Units tested                |
|----------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------|
| Shape                | Compliance with the geometry according to the CAD model.                                | IT'IS CAD File (*)                                                   | First article, Samples      |
| Material thickness   | Compliant with the requirements according to the standards                              | 2mm +/- 0.2mm in specific areas                                      | First article, Samples      |
| Material parameters  | Dielectric parameters for required frequencies                                          | 200 MHz – 3 GHz<br>Relative permittivity < 5<br>Loss tangent < 0.05. | Material sample<br>TP 104-5 |
| Material resistivity | The material has been tested to be compatible with the liquids defined in the standards | Liquid type HSL 1800 and others according to the standard.           | Pre-series, First article   |

### Standards

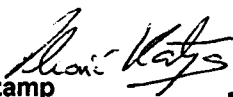
- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9
- (\*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

### Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp



**Schmid & Partner  
Engineering AG**

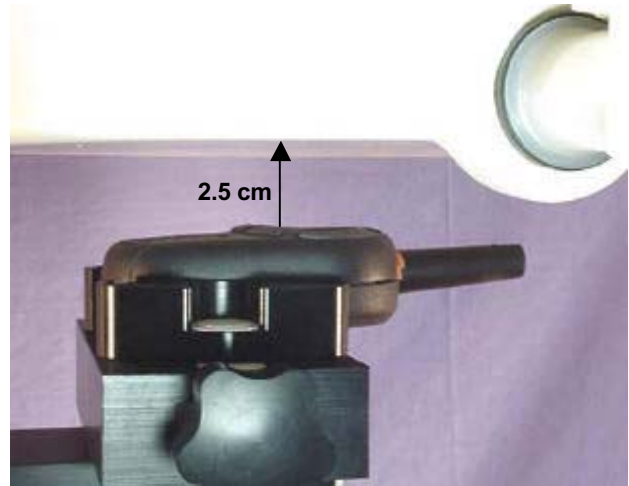


Zeughausstrasse 43, CH-8004 Zurich  
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

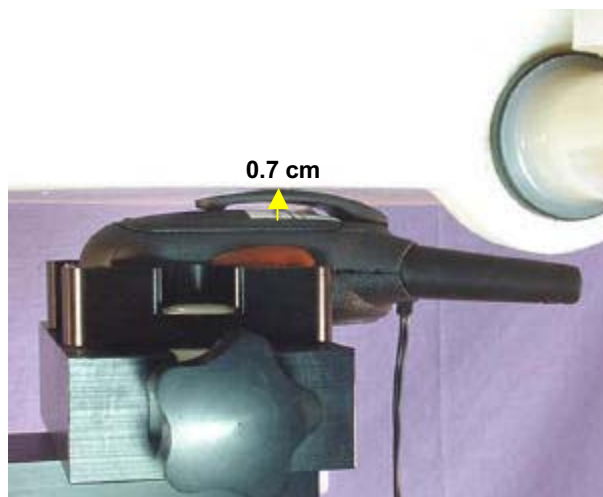
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## **APPENDIX G - SAR TEST SETUP AND DUT PHOTOGRAPHS**

## FACE-HELD SAR TEST SETUP PHOTOGRAPHS (2.5cm Separation Distance)



## BODY-WORN SAR TEST SETUP PHOTOGRAPHS (with 0.7cm Belt-Clip & Ear-Microphone Accessory)



## DUT PHOTOGRAPHS

