

# Probe ET3DV6

SN: 1560

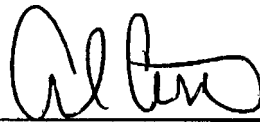
Manufactured:  
Calibrated:

December 1, 2000  
February 20, 2002

Calibrated for System DASY3

PCTEST Calibration Laboratory

Approved By:



Alfred Cirwithian  
Vice President Engineering

## ET3DV6 SN: 1560

### DASY3 – Parameters of Probe: ET3DV6 SN:1560

#### Sensitivity in Free Space

NormX      **1.48**  $\mu\text{V}/(\text{V}/\text{m})^2$   
NormY      **1.51**  $\mu\text{V}/(\text{V}/\text{m})^2$   
NormZ      **1.43**  $\mu\text{V}/(\text{V}/\text{m})^2$

#### Diode Compression

DCP X      98 mV  
DCP X      98 mV  
DCP X      98 mV

#### Sensitivity in Tissue Simulating Liquid

Head              **835 MHz Brain**               $e_r = 41.5 \pm 5\%$                $s = 0.90 \pm 5\% \text{ mho/m}$

ConvF X = **6.78**  
ConvF Y = **6.78**  
ConvF Z = **6.78**

Boundary Effect:  
Alpha      **0.30**  
Depth      **2.90**

Body              **835 MHz Brain**               $e_r = 56.2 \pm 5\%$                $s = 0.95 \pm 5\% \text{ mho/m}$

ConvF X = **6.52**  $\pm 7\%$  (k=2)  
ConvF Y = **6.52**  $\pm 7\%$  (k=2)  
ConvF Z = **6.52**  $\pm 7\%$  (k=2)

Boundary Effect:  
Alpha      **0.30**  
Depth      **2.90**

Head              **1900 MHz Brain**               $e_r = 40.0 \pm 5\%$                $s = 1.40 \pm 5\% \text{ mho/m}$

ConvF X = **5.16**  
ConvF Y = **5.16**  
ConvF Z = **5.16**

Boundary Effect:  
Alpha      **0.48**  
Depth      **2.40**

Body              **1900 MHz Muscle**               $e_r = 54.2 \pm 5\%$                $s = 1.50 \pm 5\% \text{ mho/m}$

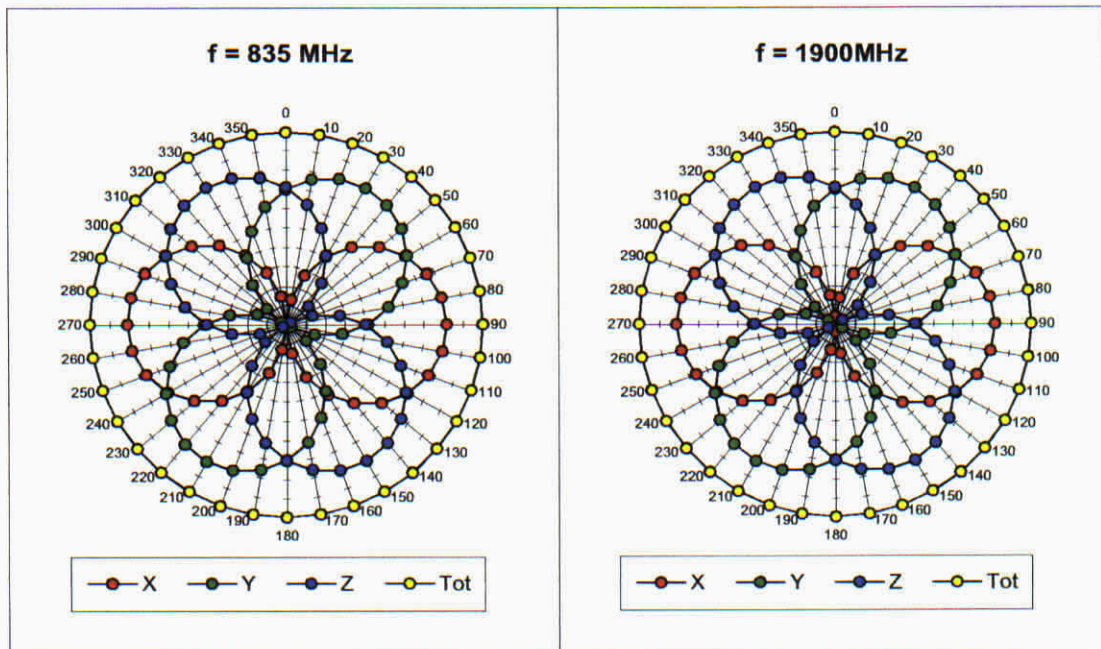
ConvF X = **4.70**  $\pm 7\%$  (k=2)  
ConvF Y = **4.70**  $\pm 7\%$  (k=2)  
ConvF Z = **4.70**  $\pm 7\%$  (k=2)

Boundary Effect:  
Alpha      **0.48**  
Depth      **2.40**

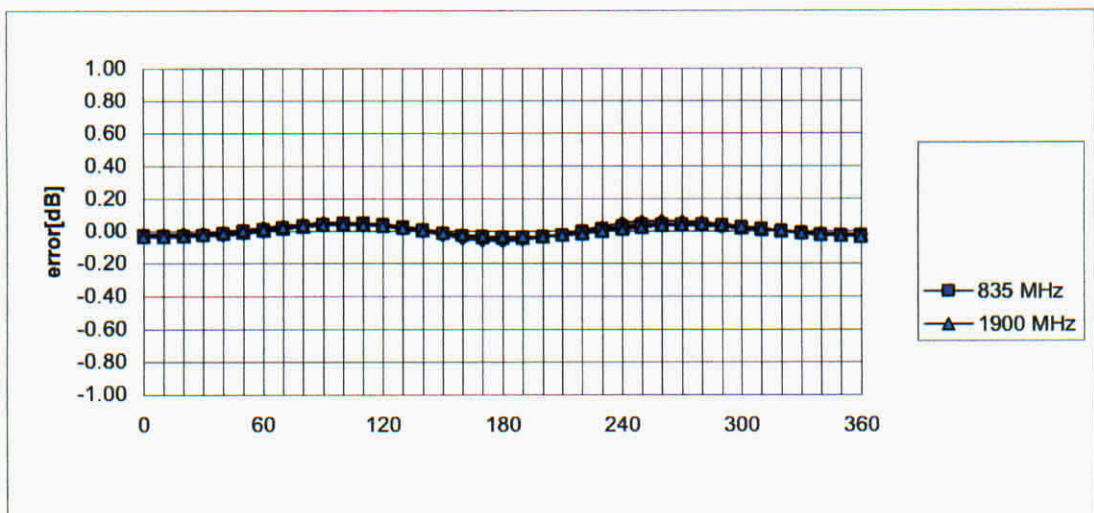
#### Sensor Offset

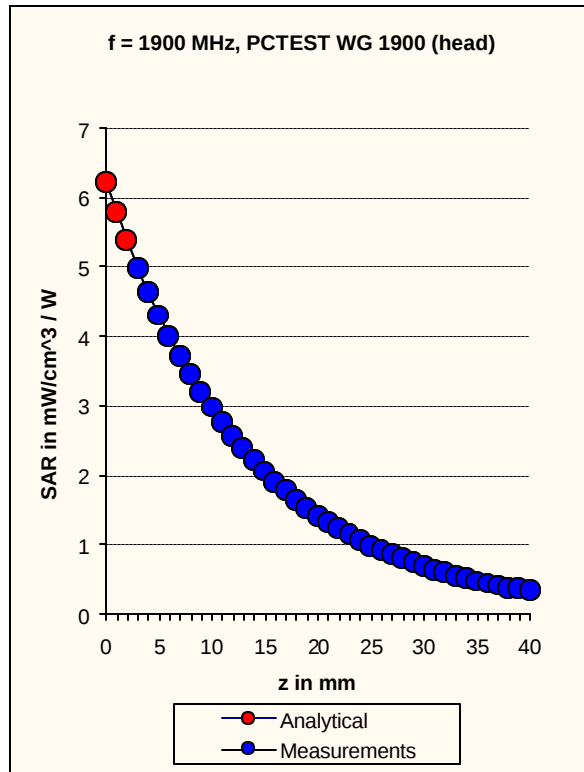
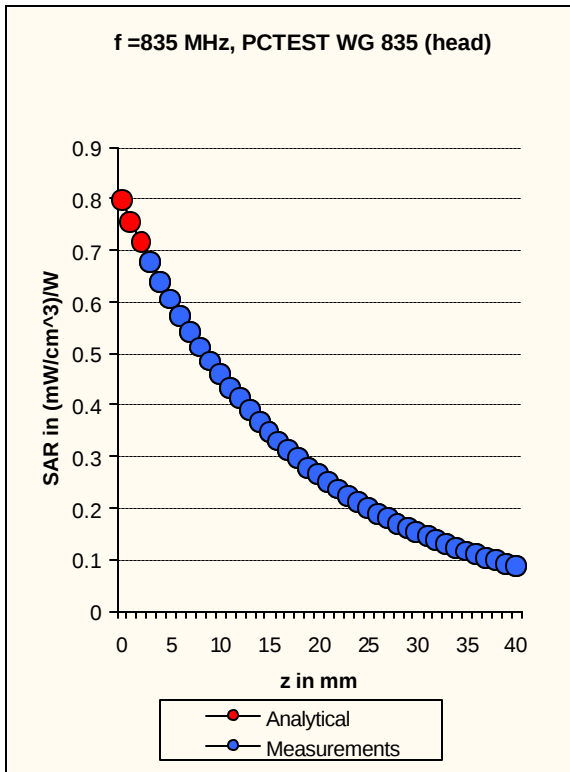
Probe Tip to Sensor Center              **2.7**              mm  
Optical Surface Detection              **2.0  $\pm$  0.2**              mm

# ET3DV6 SN:1560



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





## Conversion Factor Assessment for *DASY3* SAR Measurement System

ET3DV6 S/N: 1560

### 835 MHz Brain

$$\epsilon_r = 42 \pm 5\%$$

$$s = 0.90 \pm 5\% \text{ mho/m}$$

$$\text{ConvF X} = 6.78 \pm 7\% (k=2)$$

$$\text{ConvF Y} = 6.78 \pm 7\% (k=2)$$

$$\text{ConvF Z} = 6.78 \pm 7\% (k=2)$$

Boundary Effect:

$$\text{Alpha} \quad 0.30$$

$$\text{Depth} \quad 2.90$$

### 1900 MHz Brain

$$\epsilon_r = 40 \pm 5\%$$

$$s = 1.40 \pm 5\% \text{ mho/m}$$

$$\text{ConvF X} = 5.16 \pm 7\% (k=2)$$

$$\text{ConvF Y} = 5.16 \pm 7\% (k=2)$$

$$\text{ConvF Z} = 5.16 \pm 7\% (k=2)$$

Boundary Effect:

$$\text{Alpha} \quad 0.48$$

$$\text{Depth} \quad 2.40$$

# Schmid & Partner Engineering AG

Zughausstrasse 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].

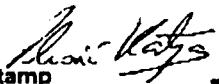
### Conformity

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**



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

## Calibration Certificate

### Dosimetric E-Field Probe

Type:

**ET3DV6**

Serial Number:

**1677**

Place of Calibration:

**Zurich**

Date of Calibration:

**April 10, 2002**

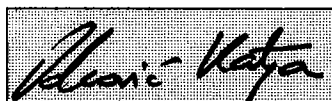
Calibration Interval:

**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:1677**

|                   |                |
|-------------------|----------------|
| Manufactured:     | March 7, 2002  |
| Last calibration: | April 10, 2002 |

**Calibrated for System DASY3**

## DASY3 - Parameters of Probe: ET3DV6 SN:1677

### Sensitivity in Free Space

|       |                                                 |
|-------|-------------------------------------------------|
| NormX | <b>1.70</b> $\mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | <b>1.76</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>93</b> | mV |
| DCP Y | <b>93</b> | mV |
| DCP Z | <b>93</b> | mV |

### Sensitivity in Tissue Simulating Liquid

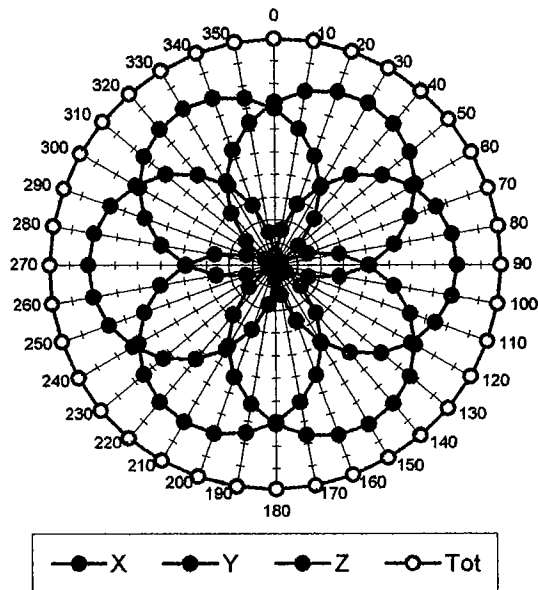
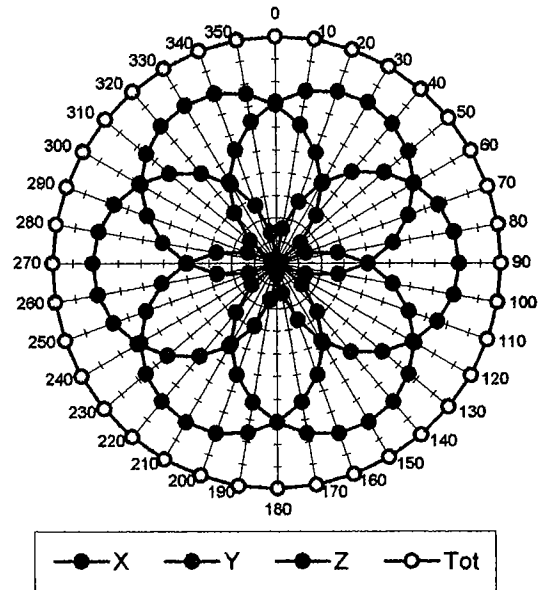
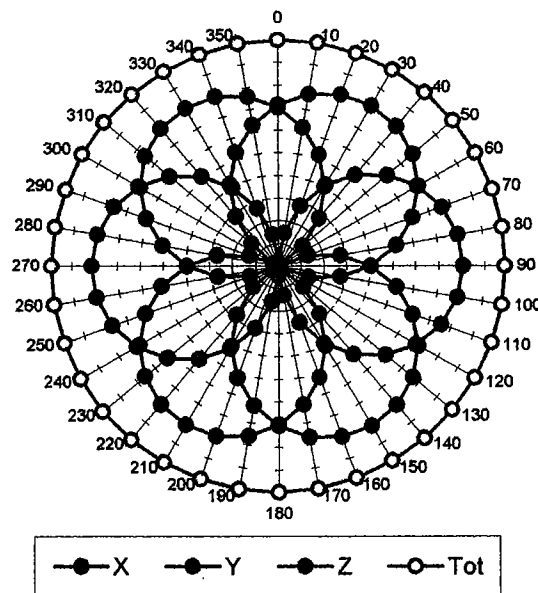
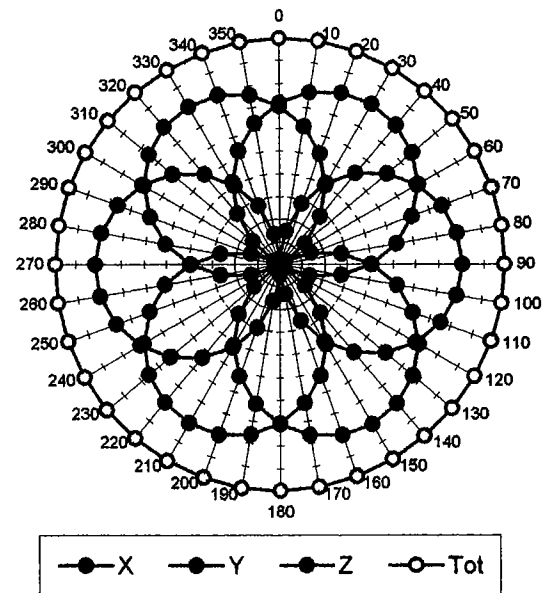
|         |                              |                             |                                       |
|---------|------------------------------|-----------------------------|---------------------------------------|
| Head    | <b>835 MHz</b>               | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.90 \pm 5\% \text{ mho/m}$ |
| Head    | <b>900 MHz</b>               | $\epsilon_r = 41.5 \pm 5\%$ | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| ConvF X | <b>6.7</b> $\pm 9.5\%$ (k=2) | Boundary effect:            |                                       |
| ConvF Y | <b>6.7</b> $\pm 9.5\%$ (k=2) | Alpha                       | <b>0.33</b>                           |
| ConvF Z | <b>6.7</b> $\pm 9.5\%$ (k=2) | Depth                       | <b>2.62</b>                           |
| Head    | <b>1900 MHz</b>              | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| Head    | <b>1800 MHz</b>              | $\epsilon_r = 40.0 \pm 5\%$ | $\sigma = 1.40 \pm 5\% \text{ mho/m}$ |
| ConvF X | <b>5.3</b> $\pm 9.5\%$ (k=2) | Boundary effect:            |                                       |
| ConvF Y | <b>5.3</b> $\pm 9.5\%$ (k=2) | Alpha                       | <b>0.54</b>                           |
| ConvF Z | <b>5.3</b> $\pm 9.5\%$ (k=2) | Depth                       | <b>2.35</b>                           |

### Boundary Effect

|                       |                              |                                   |             |
|-----------------------|------------------------------|-----------------------------------|-------------|
| Head                  | <b>835/900 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 | <b>9.1</b>                        | <b>5.2</b>  |
| SAR <sub>be</sub> [%] | With Correction Algorithm    | <b>0.3</b>                        | <b>0.5</b>  |
| Head                  | <b>1800/1900 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 | <b>10.4</b>                       | <b>6.5</b>  |
| SAR <sub>be</sub> [%] | With Correction Algorithm    | <b>0.3</b>                        | <b>0.3</b>  |

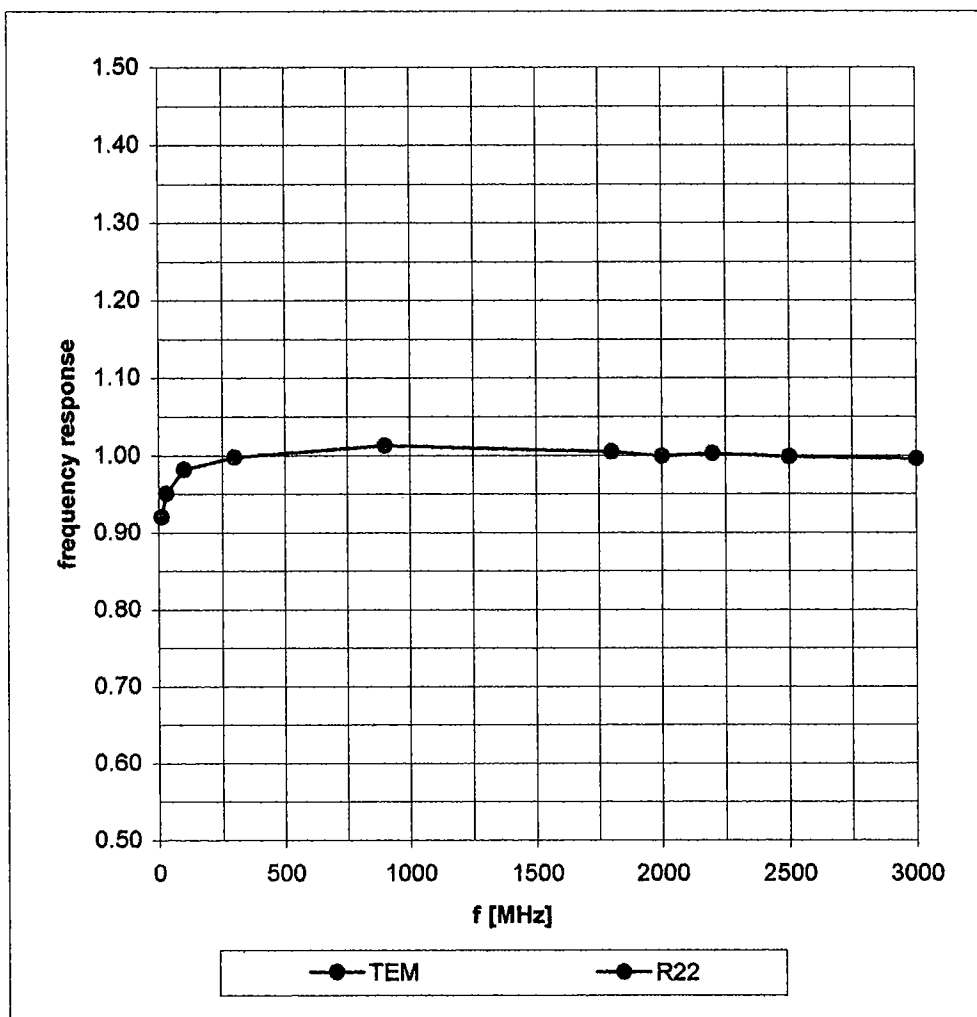
### Sensor Offset

|                            |                                 |    |
|----------------------------|---------------------------------|----|
| Probe Tip to Sensor Center | <b>2.7</b>                      | mm |
| Optical Surface Detection  | <b>1.6 <math>\pm</math> 0.2</b> | mm |

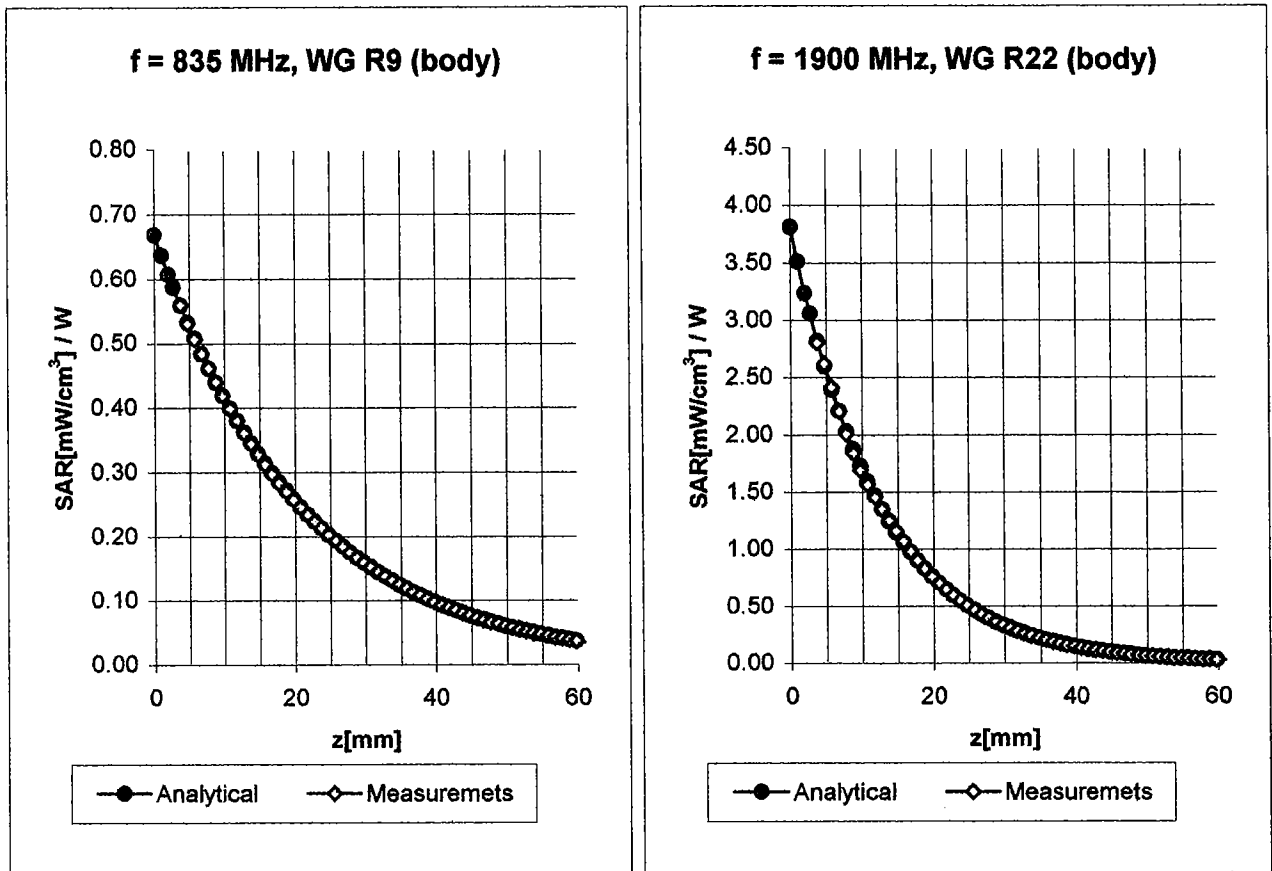
Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$  $f = 30 \text{ MHz}$ , TEM cell if110 $f = 100 \text{ MHz}$ , TEM cell if110 $f = 300 \text{ MHz}$ , TEM cell if110 $f = 900 \text{ MHz}$ , TEM cell if110

## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



## Conversion Factor Assessment



|             |                 |                              |                                       |
|-------------|-----------------|------------------------------|---------------------------------------|
| <b>Body</b> | <b>835 MHz</b>  | $\epsilon_r = 55.2 \pm 5\%$  | $\sigma = 0.97 \pm 5\% \text{ mho/m}$ |
| <b>Body</b> | <b>900 MHz</b>  | $\epsilon_r = 55.0 \pm 5\%$  | $\sigma = 1.05 \pm 5\% \text{ mho/m}$ |
|             | ConvF X         | <b>6.4</b> $\pm 9.5\%$ (k=2) | Boundary effect:                      |
|             | ConvF Y         | <b>6.4</b> $\pm 9.5\%$ (k=2) | Alpha <b>0.43</b>                     |
|             | ConvF Z         | <b>6.4</b> $\pm 9.5\%$ (k=2) | Depth <b>2.27</b>                     |
| <b>Body</b> | <b>1900 MHz</b> | $\epsilon_r = 53.3 \pm 5\%$  | $\sigma = 1.52 \pm 5\% \text{ mho/m}$ |
| <b>Body</b> | <b>1800 MHz</b> | $\epsilon_r = 53.3 \pm 5\%$  | $\sigma = 1.52 \pm 5\% \text{ mho/m}$ |
|             | ConvF X         | <b>4.9</b> $\pm 9.5\%$ (k=2) | Boundary effect:                      |
|             | ConvF Y         | <b>4.9</b> $\pm 9.5\%$ (k=2) | Alpha <b>0.78</b>                     |
|             | ConvF Z         | <b>4.9</b> $\pm 9.5\%$ (k=2) | Depth <b>2.01</b>                     |

## Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1677

Place of Assessment:

Zurich

Date of Assessment:

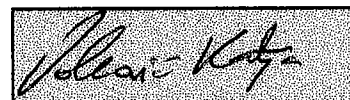
April 11, 2002

Probe Calibration Date:

April 10, 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:1677

Conversion factor ( $\pm$  standard deviation)

450 MHz                  ConvF                   $7.5 \pm 8\%$

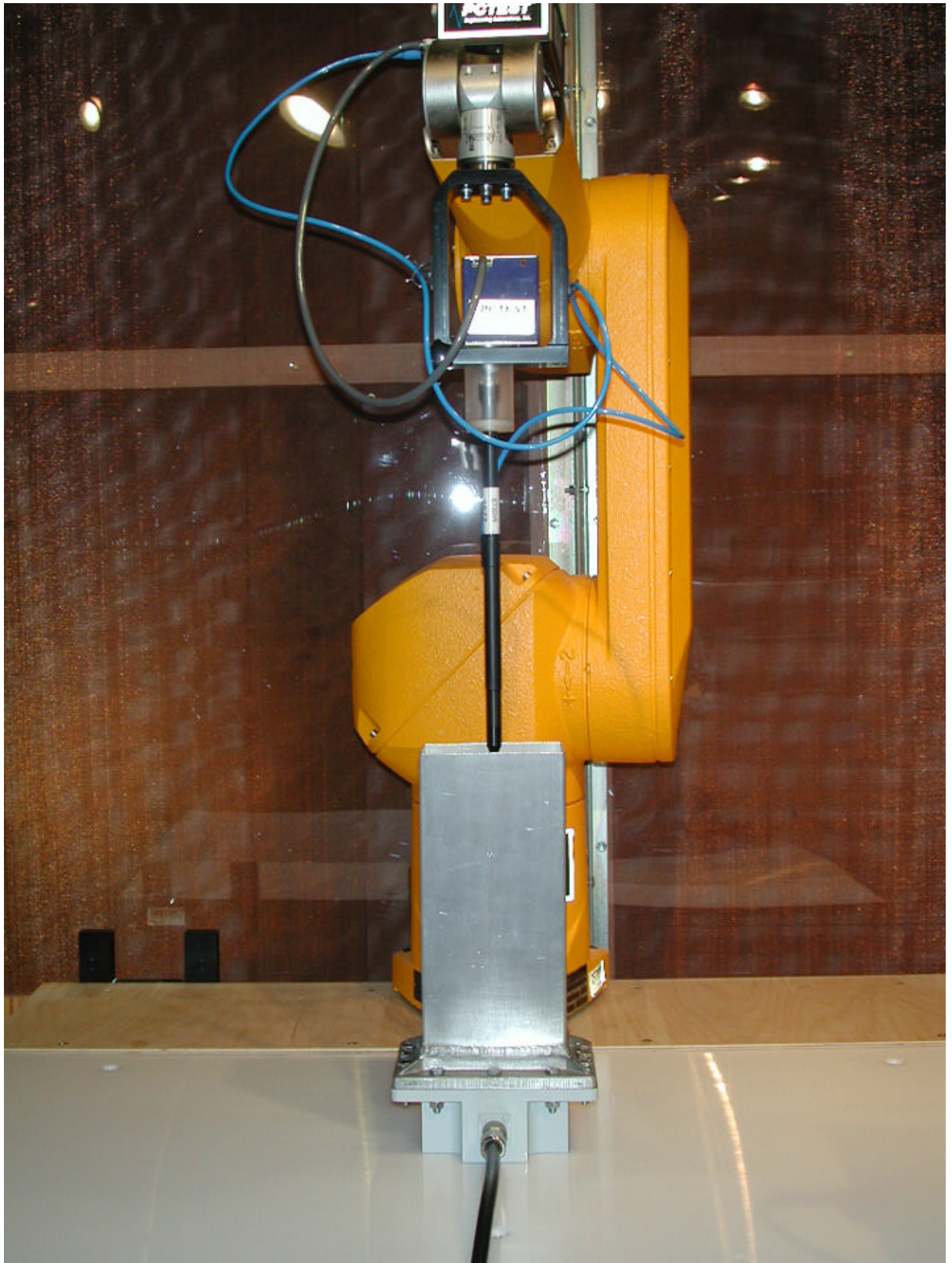
$\epsilon_r = 56.7 \pm 5\%$   
 $\sigma = 0.94 \pm 5\% \text{ mho/m}$   
(body tissue)

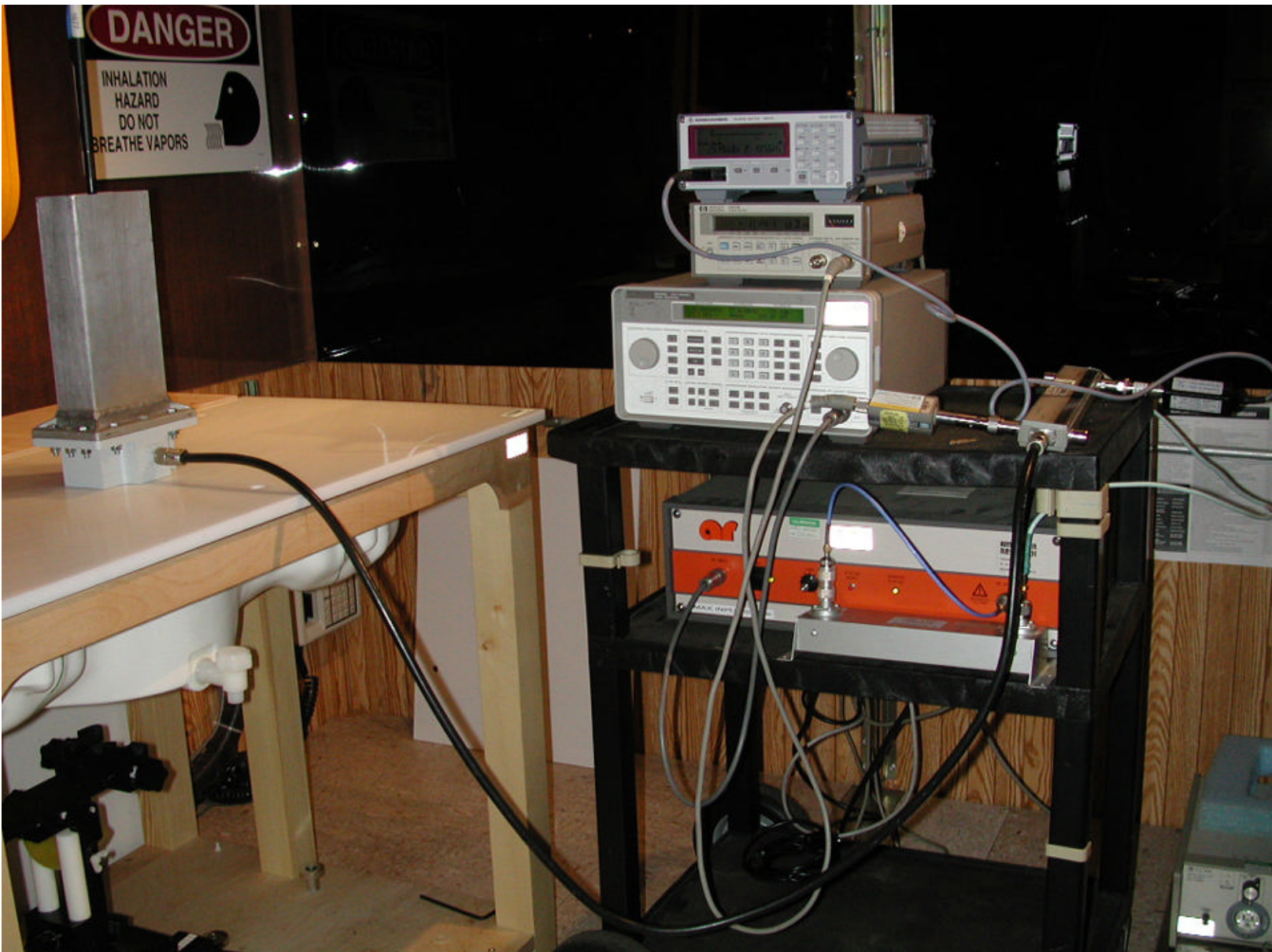
2450 MHz                  ConvF                   $4.4 \pm 8\%$

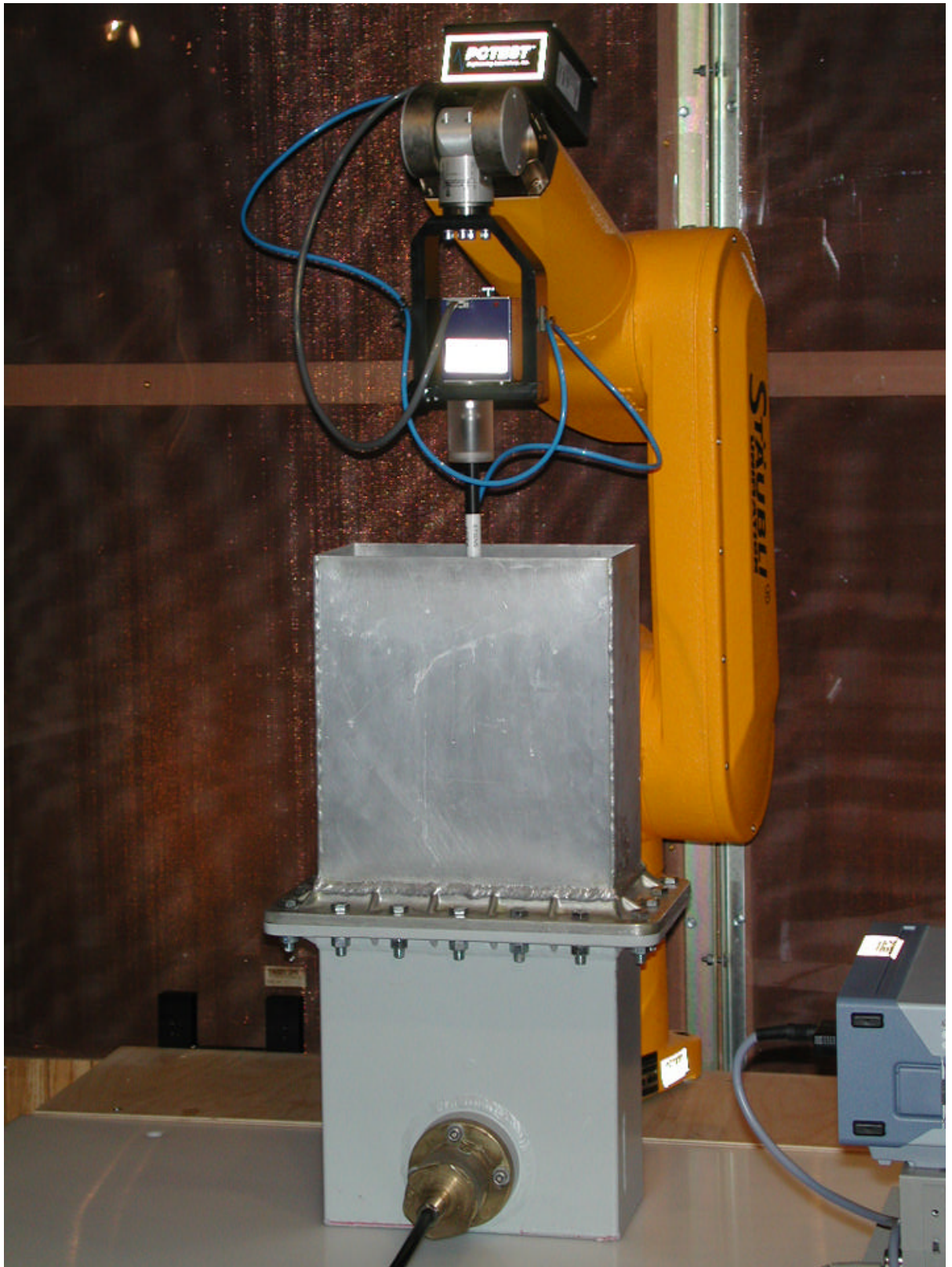
$\epsilon_r = 39.2 \pm 5\%$   
 $\sigma = 1.80 \pm 5\% \text{ mho/m}$   
(head tissue)

2450 MHz                  ConvF                   $4.0 \pm 8\%$

$\epsilon_r = 52.7 \pm 5\%$   
 $\sigma = 1.95 \pm 5\% \text{ mho/m}$   
(body tissue)









# Uncertainty Budget for Waveguide Calibration of E-Field Probe

K=1

| Uncertainty Description   | Uncertainty +/- % | Distribution | Weight     | Std Deviation |
|---------------------------|-------------------|--------------|------------|---------------|
| Incident Power            | 1.5               | Rectangular  | $\sqrt{3}$ | 0.55          |
| Mismatch Uncertainty      | 1.0               | Rectangular  | $\sqrt{3}$ | 0.40          |
| Liquid Conductivity       | 5.0               | Rectangular  | $\sqrt{3}$ | 1.8           |
| Exponential fitting error | 0.1               | Normal       | 1          | 0.1           |
| Probe Positioning         | 0.4               | Normal       | 1          | 0.4           |
| Field Homogeneity         | 0.3               | Rectangular  | $\sqrt{3}$ | 0.3           |
| Combined Std Uncertainty  |                   | Rectangular  | $\sqrt{3}$ | 3.55          |

|                                           |                                                                                                                                                                                                   |                                          |                                |                                        |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------|----------------------------------------|
| <b>PCTEST™ SAR REPORT</b>                 |  <b>FCC CERTIFICATION</b>  |                                          |                                | <b>Reviewed by:</b><br>Quality Manager |
| <b>SAR Filename:</b><br>SAR-220423185.CJ6 | <b>Test Dates:</b><br>Apr. 23-26 & 30, 2002                                                                                                                                                       | <b>Phone Type:</b><br>Tri-Mode Dual-Band | <b>FCC ID:</b><br>CJ6DCE46036A | Page 15 of 38                          |