

# Schmid & Partner Engineering AG

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## Calibration Certificate

### Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1677

Place of Calibration:

Zurich

Date of Calibration:

April 10, 2002

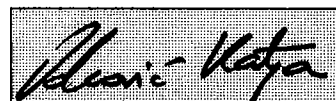
Calibration Interval:

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>  | $\epsilon_r = 41.5 \pm 5\%$  | $\sigma = 0.90 \pm 5\%$ mho/m |
| Head | <b>900 MHz</b>  | $\epsilon_r = 41.5 \pm 5\%$  | $\sigma = 0.97 \pm 5\%$ 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> | $\epsilon_r = 40.0 \pm 5\%$  | $\sigma = 1.40 \pm 5\%$ mho/m |
| Head | <b>1800 MHz</b> | $\epsilon_r = 40.0 \pm 5\%$  | $\sigma = 1.40 \pm 5\%$ 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

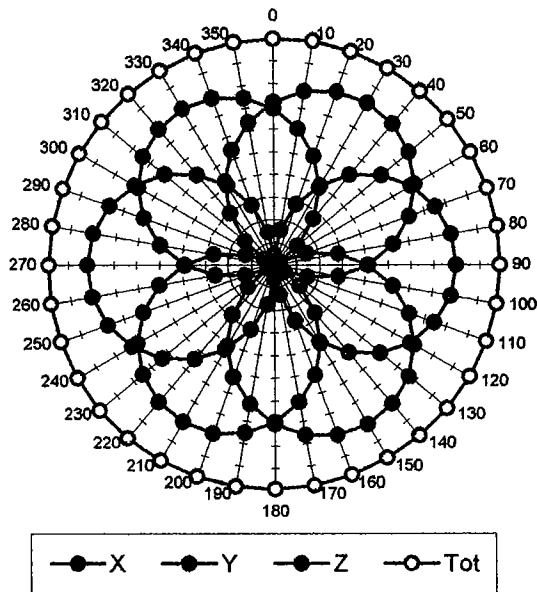
|      |  |  |             |
|------|--|--|-------------|
| Head | <b>835/900 MHz</b>                                 | <b>Typical SAR gradient: 5 % per mm</b>  |             |
|      | Probe Tip to Boundary                              | <b>1 mm</b>                              | <b>2 mm</b> |
|      | 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>                               | <b>Typical SAR gradient: 10 % per mm</b> |             |
|      | 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

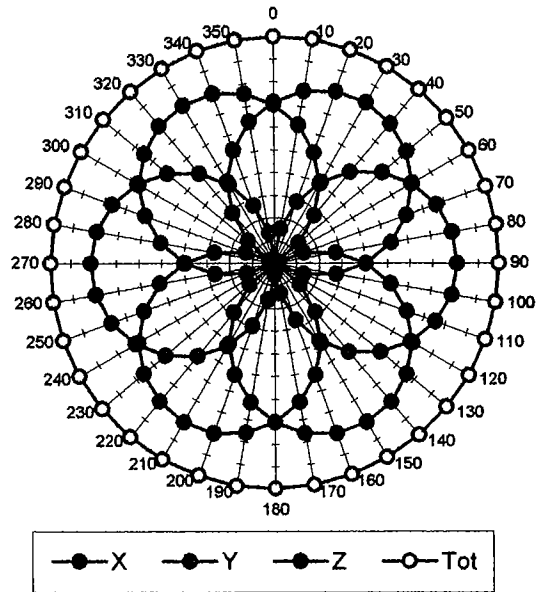
|                            |                                 |    |
|----------------------------|---------------------------------|----|
| Probe Tip to Sensor Center | <b>2.7</b>                      | mm |
| Optical Surface Detection  | <b>1.6 <math>\pm</math> 0.2</b> | mm |

### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

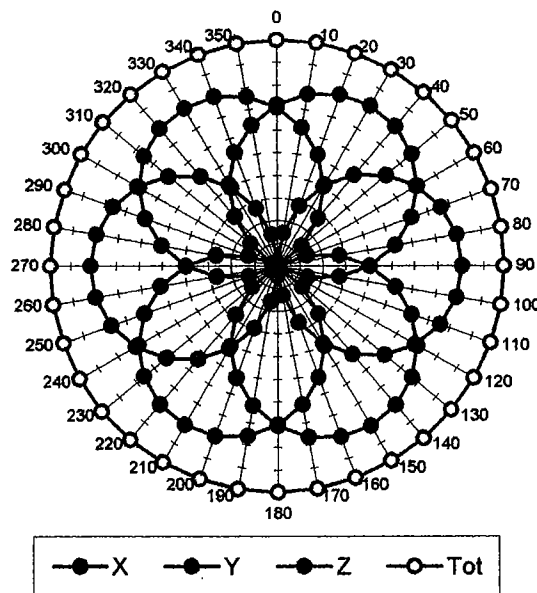
**f = 30 MHz, TEM cell ifi110**



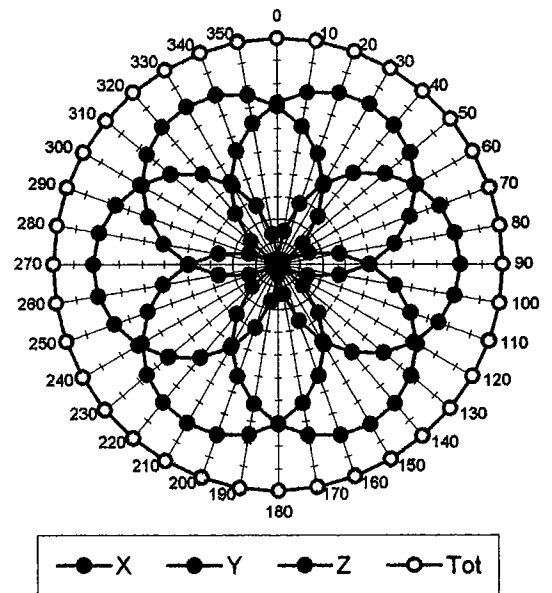
**f = 100 MHz, TEM cell ifi110**



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

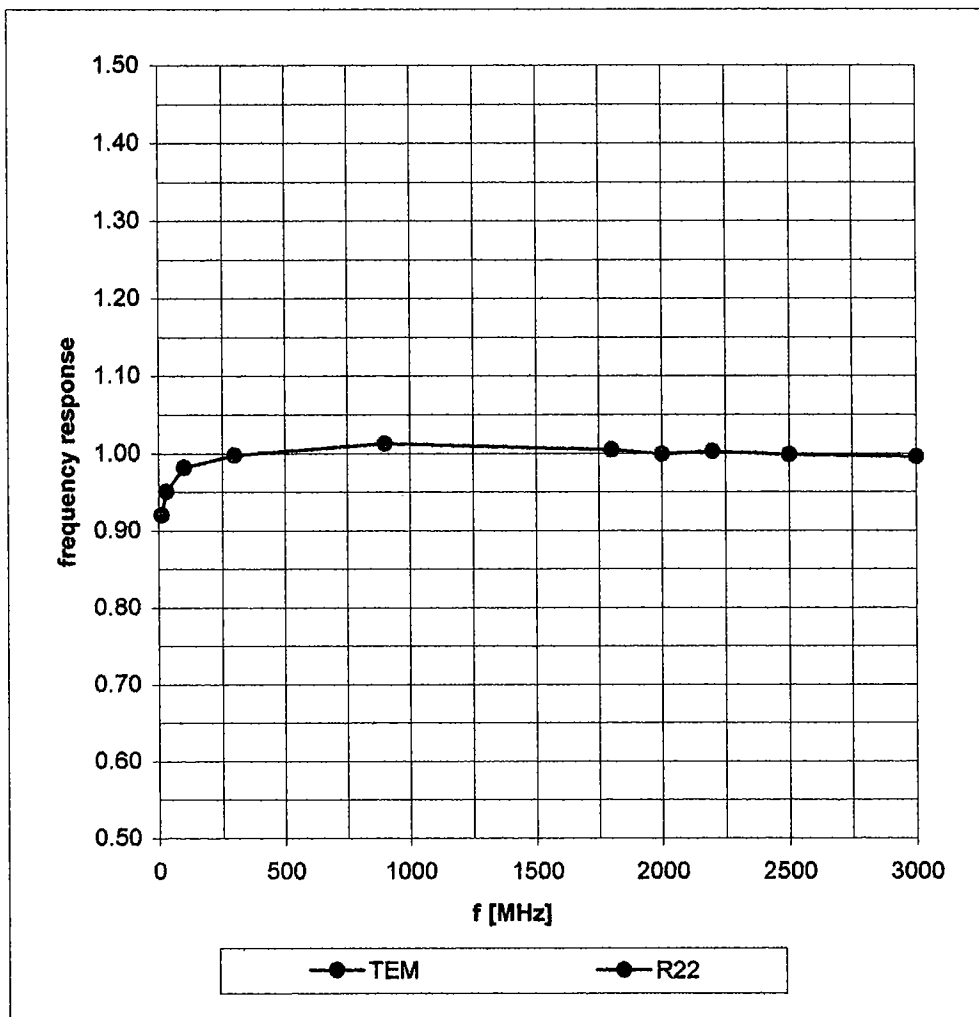


**f = 900 MHz, TEM cell ifi110**

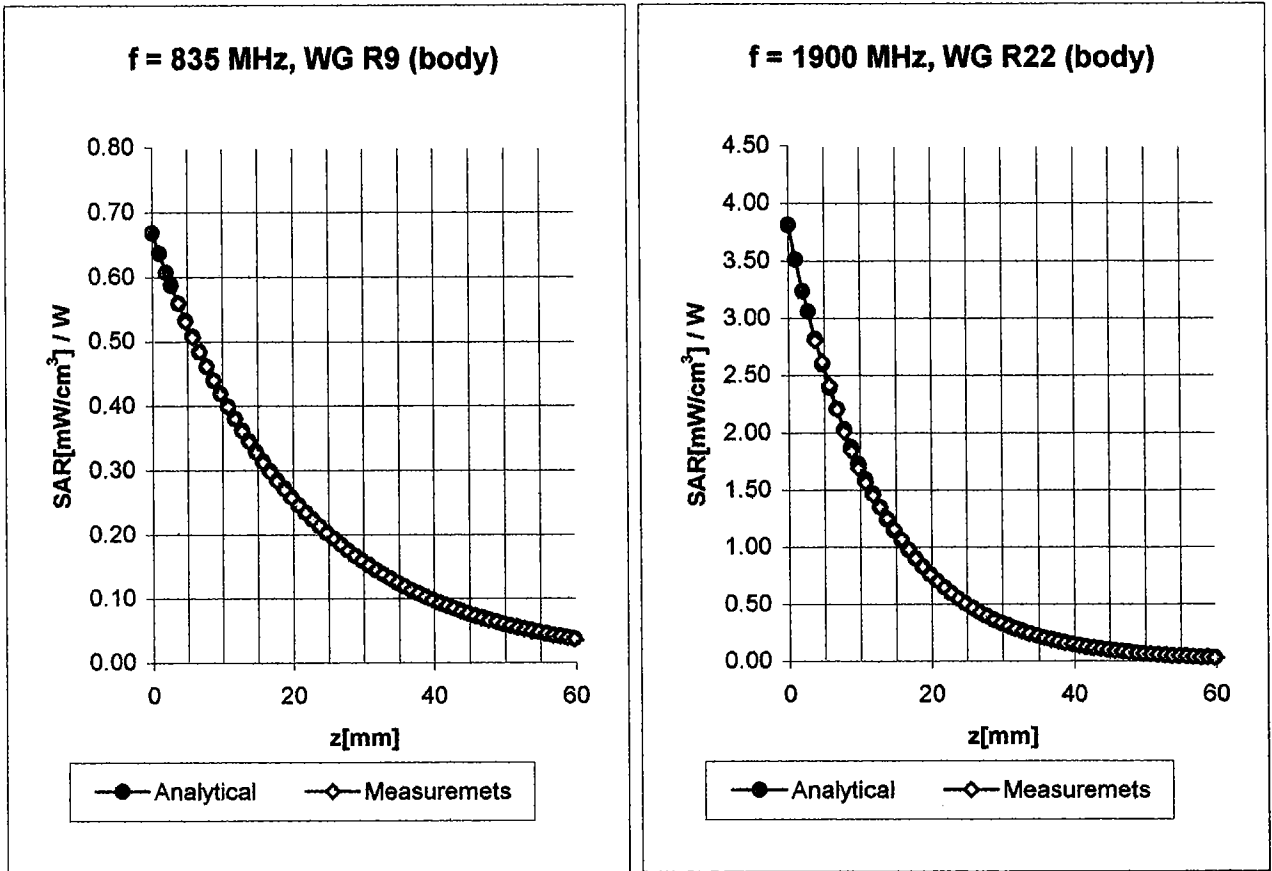


# Frequency Response of E-Field

( 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:

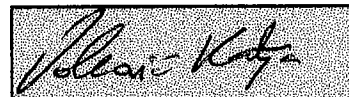
April 11, 2002

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 recalibration 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)