

Client **Celltech Labs**

## CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1387**

Calibration procedure(s) **QA CAL-01.v2  
Calibration procedure for dosimetric E-field probes**

Calibration date: **February 26, 2003**


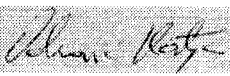
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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

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

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

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

Date issued: February 26, 2003

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

# Probe ET3DV6

## SN:1387

Manufactured:	September 21, 1999
Last calibration:	February 22, 2002
Recalibrated:	February 26, 2003

**Calibrated for DASYS Systems**

(Note: non-compatible with DASYS2 system!)

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

### Sensitivity in Free Space

NormX	<b>1.55</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	<b>1.65</b> $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	<b>1.64</b> $\mu\text{V}/(\text{V}/\text{m})^2$

### Diode Compression

DCP X	<b>92</b>	mV
DCP Y	<b>92</b>	mV
DCP Z	<b>92</b>	mV

### Sensitivity in Tissue Simulating Liquid

Head	<b>900 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	<b>835 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ 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>0.37</b>
ConvF Z	<b>6.6</b> $\pm 9.5\%$ (k=2)		Depth <b>2.61</b>
Head	<b>1800 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	<b>1900 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
ConvF X	<b>5.2</b> $\pm 9.5\%$ (k=2)		Boundary effect:
ConvF Y	<b>5.2</b> $\pm 9.5\%$ (k=2)		Alpha <b>0.50</b>
ConvF Z	<b>5.2</b> $\pm 9.5\%$ (k=2)		Depth <b>2.73</b>

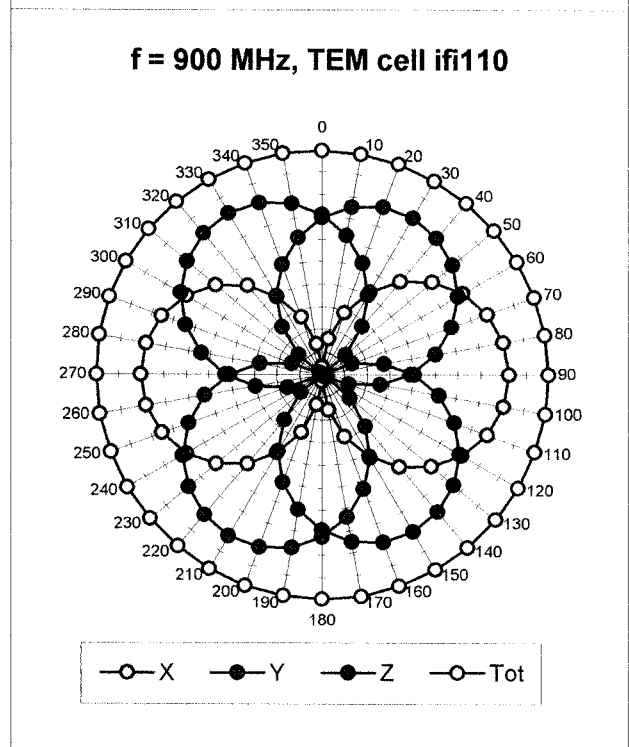
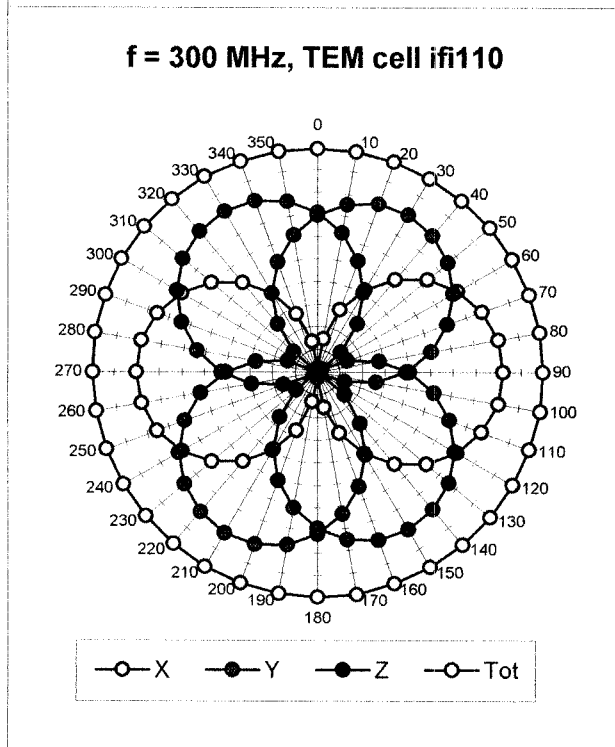
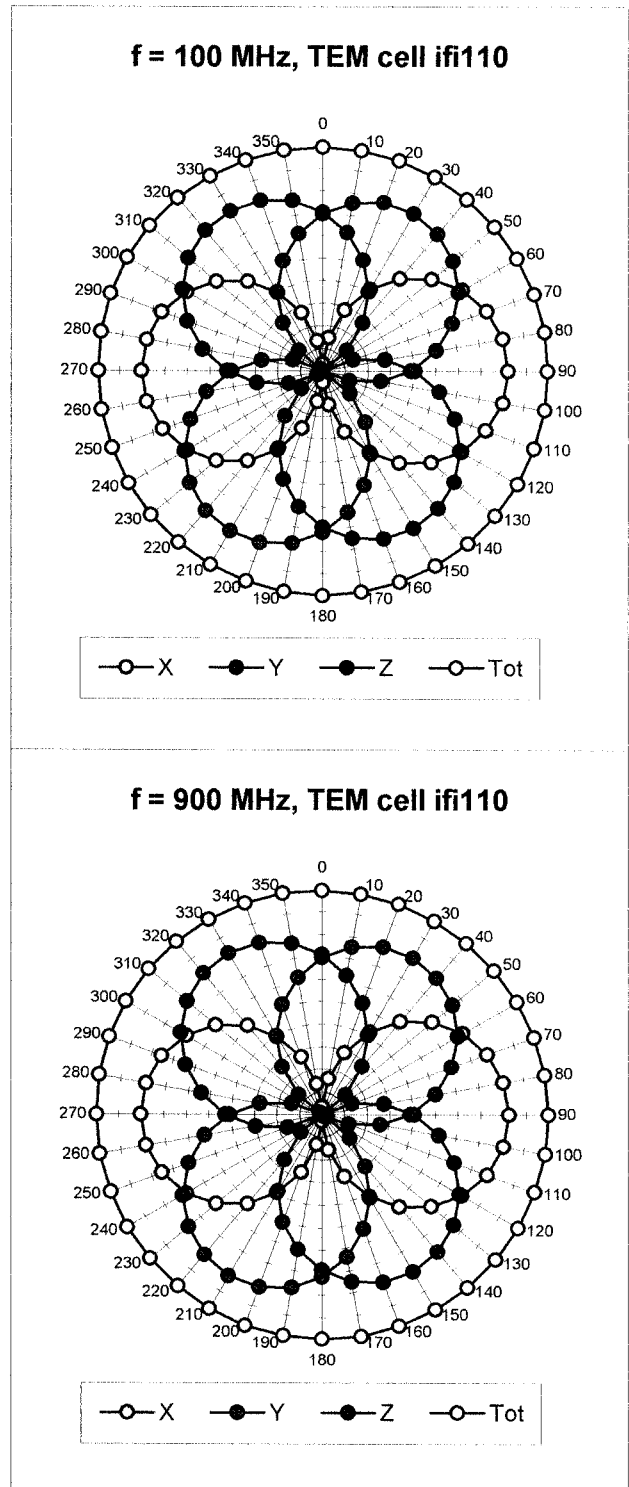
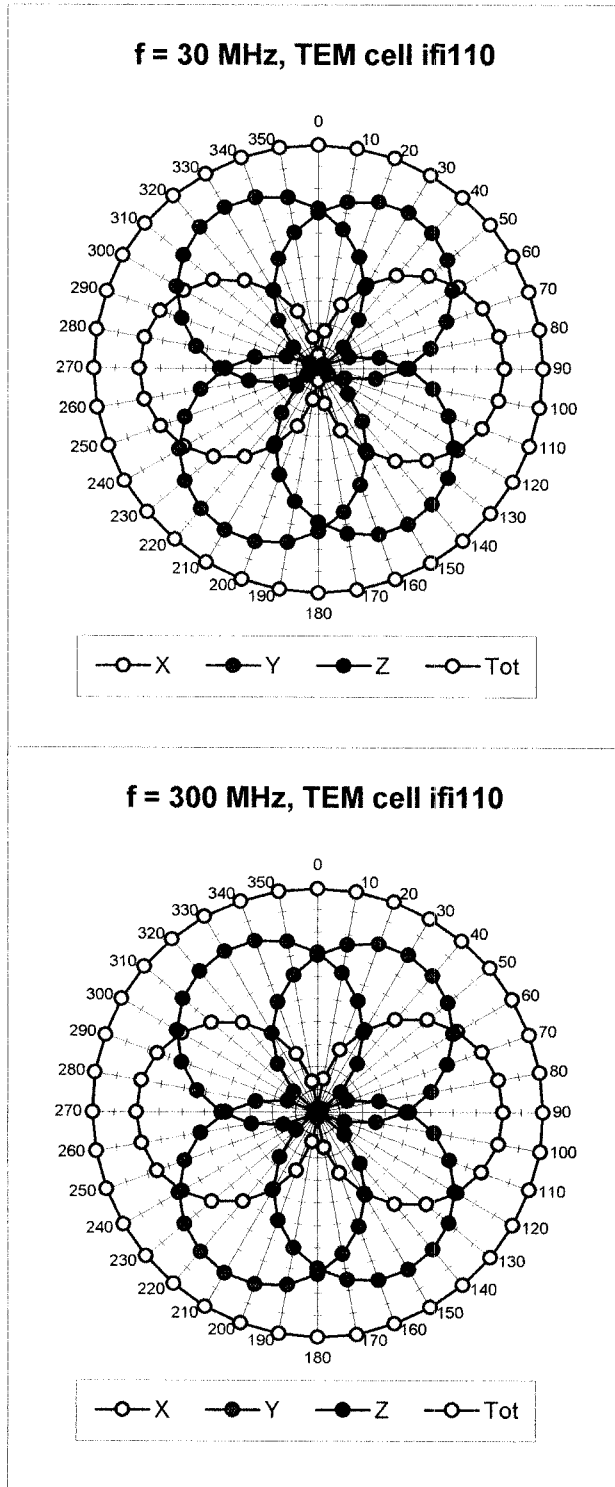
### Boundary Effect

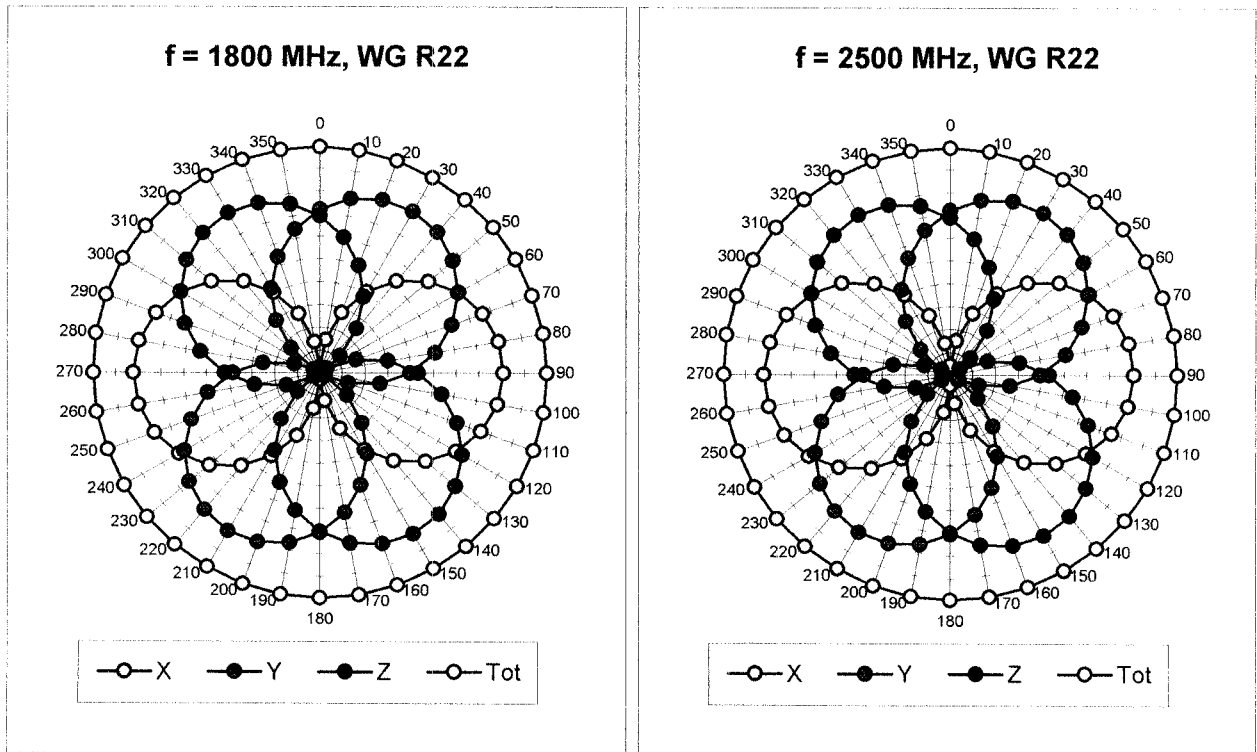
Head	<b>900 MHz</b>	<b>Typical SAR gradient: 5 % per mm</b>	
	Probe Tip to Boundary	<b>1 mm</b>	<b>2 mm</b>
	SAR <sub>be</sub> [%] Without Correction Algorithm	10.2	5.9
	SAR <sub>be</sub> [%] With Correction Algorithm	0.4	0.6
Head	<b>1800 MHz</b>	<b>Typical SAR gradient: 10 % per mm</b>	
	Probe Tip to Boundary	<b>1 mm</b>	<b>2 mm</b>
	SAR <sub>be</sub> [%] Without Correction Algorithm	14.6	9.8
	SAR <sub>be</sub> [%] With Correction Algorithm	0.2	0.0

### Sensor Offset

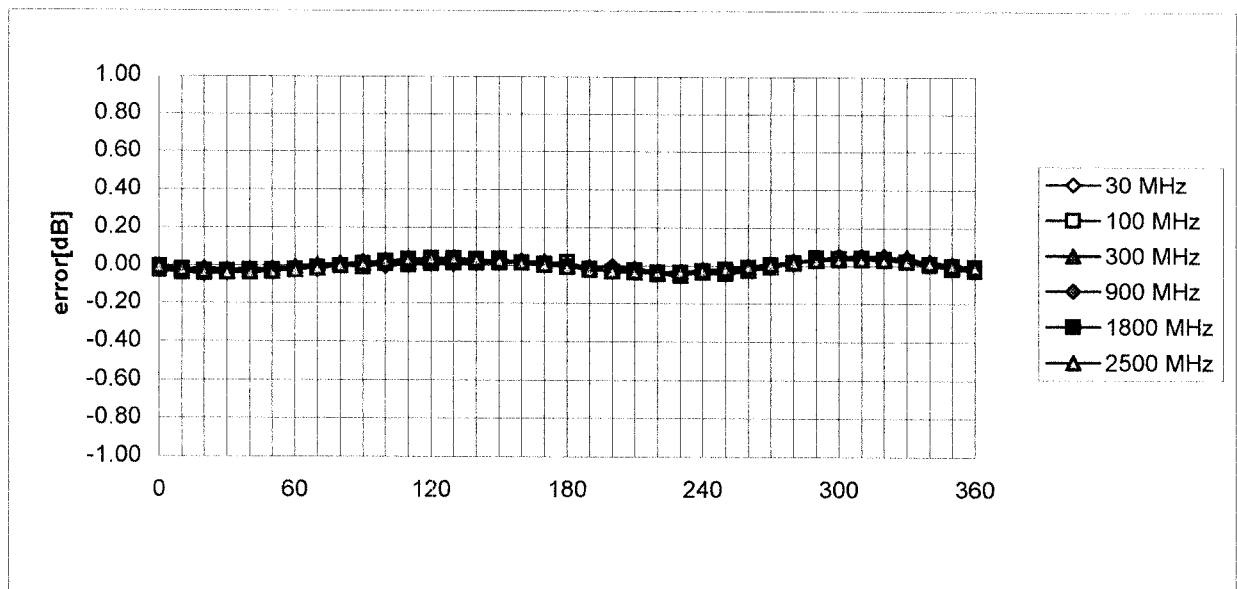
Probe Tip to Sensor Center	<b>2.7</b>	mm
Optical Surface Detection	<b>1.4 <math>\pm</math> 0.2</b>	mm

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



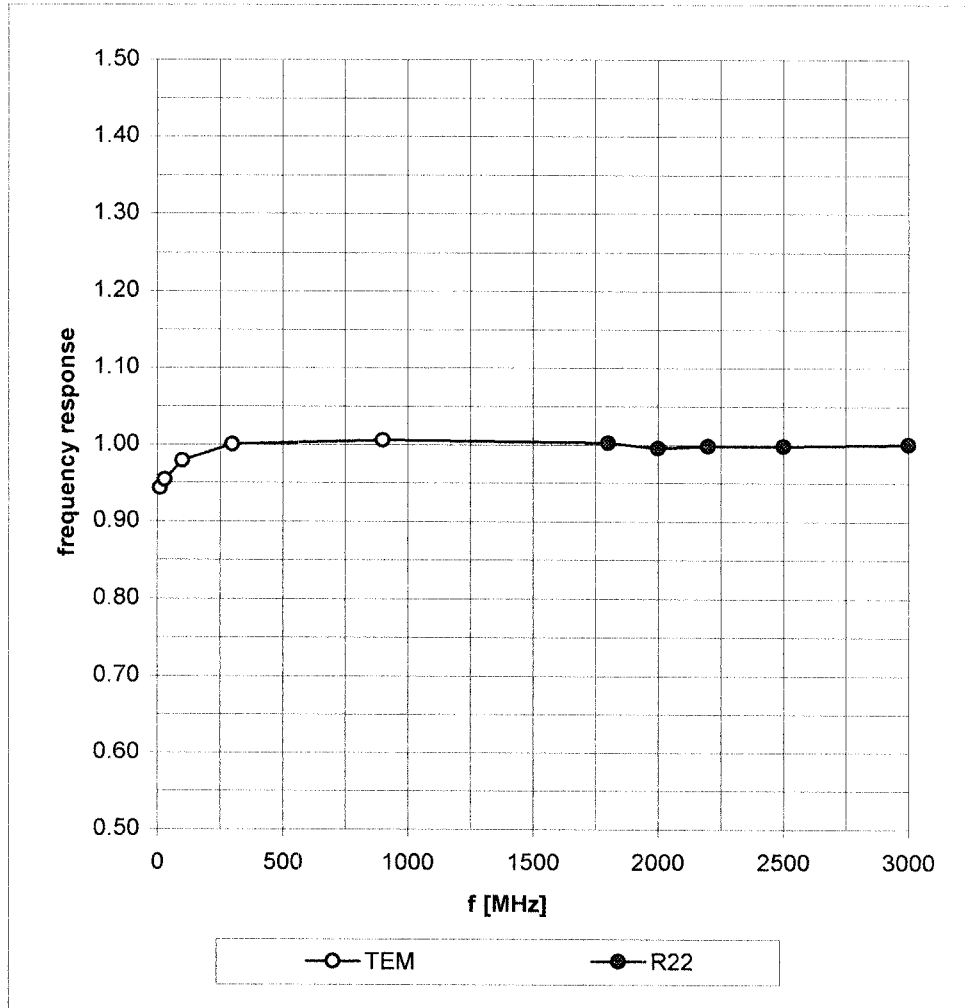


### Isotropy Error ( $\phi$ ), $\theta = 0^\circ$

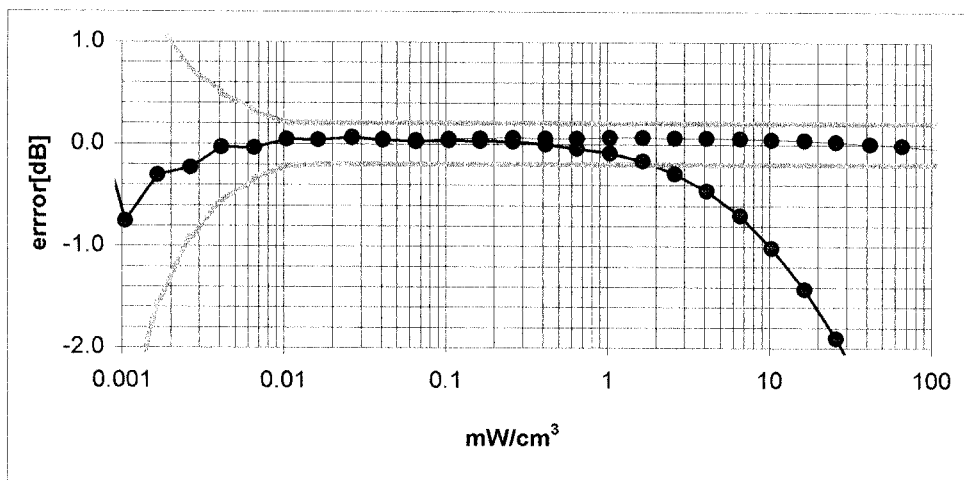
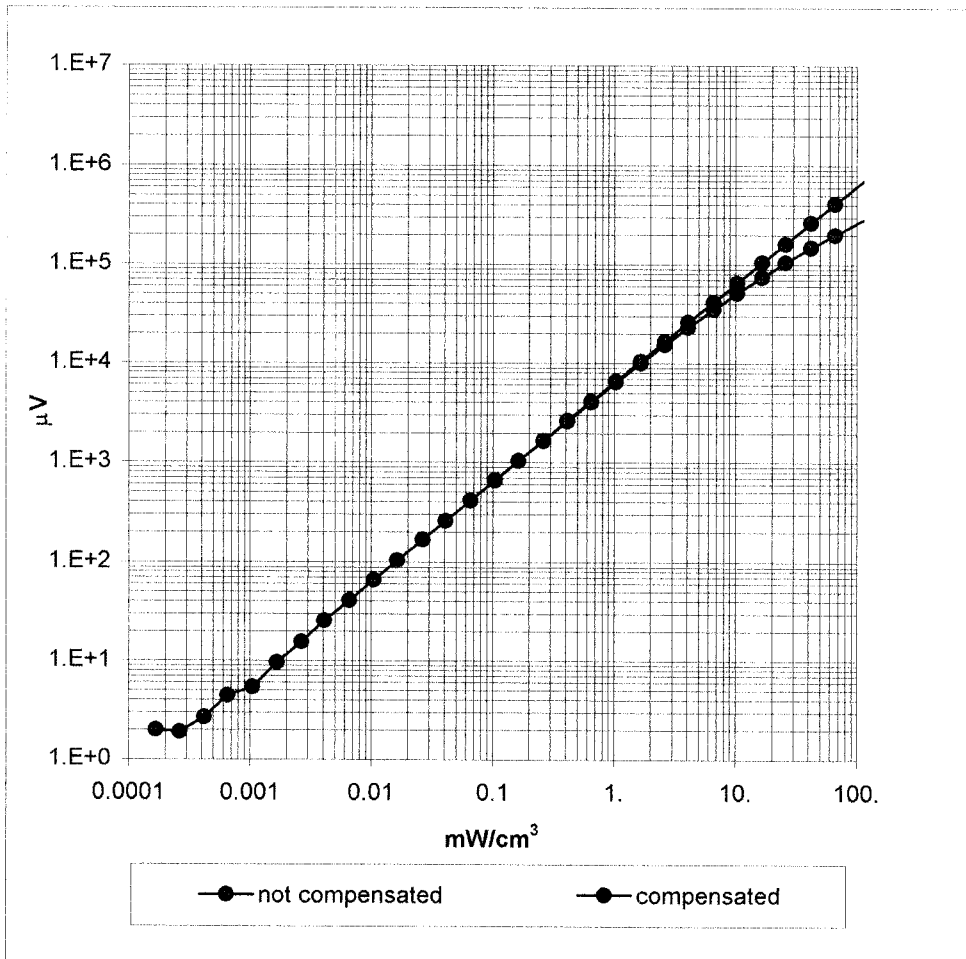


# Frequency Response of E-Field

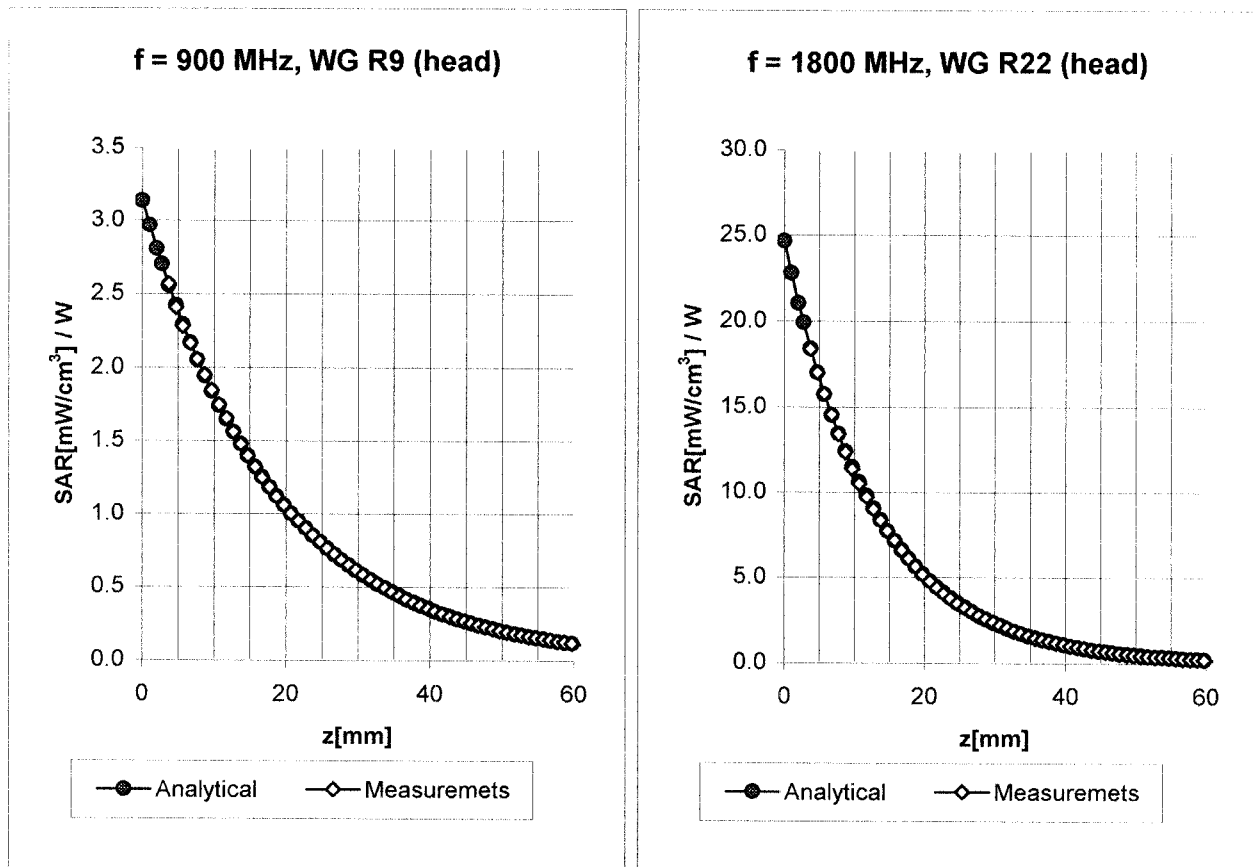
( TEM-Cell:ifi110, Waveguide R22)



### Dynamic Range f(SAR<sub>brain</sub>) ( Waveguide R22 )



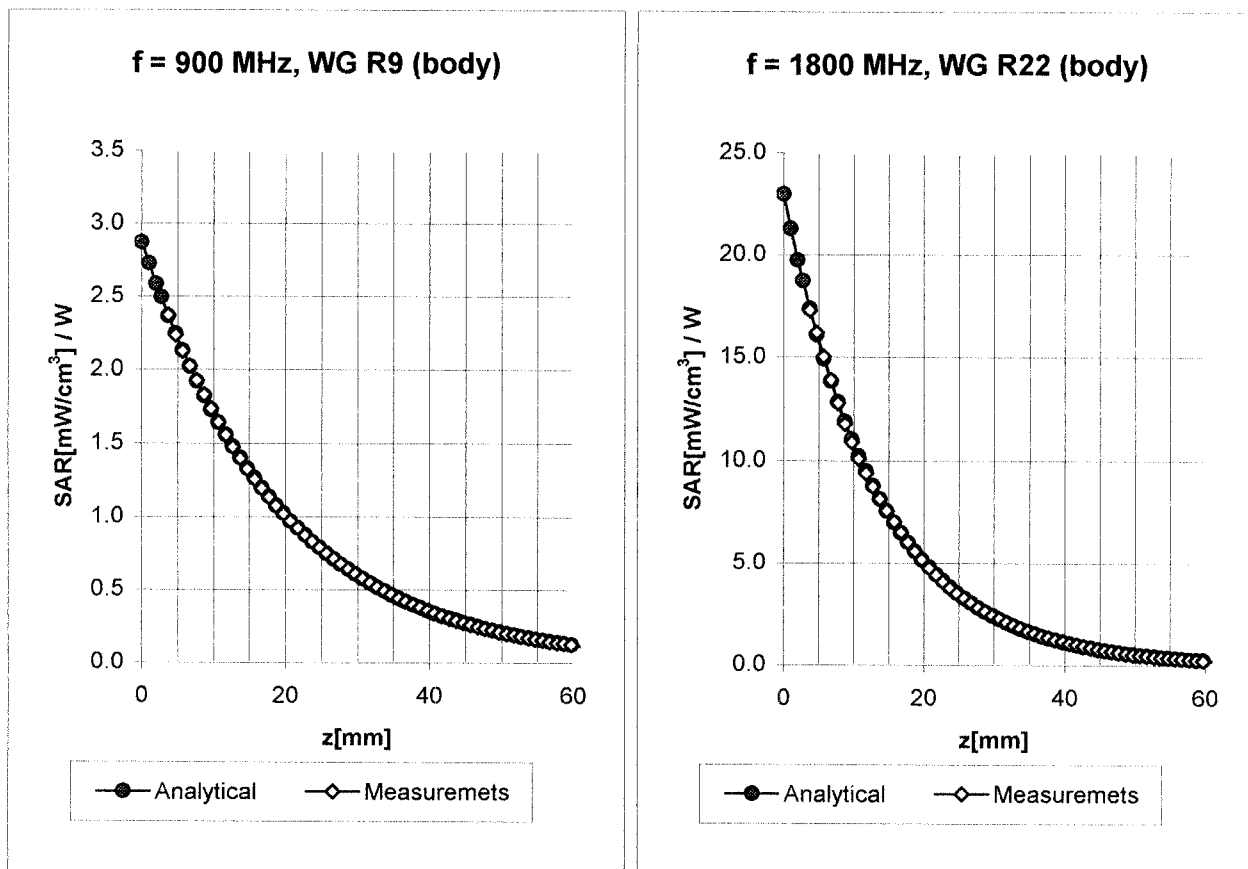
## Conversion Factor Assessment



<b>Head</b>	<b>900 MHz</b>	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
<b>Head</b>	<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>0.37</b>
	ConvF Z	<b>6.6</b> $\pm 9.5\%$ (k=2)	Depth <b>2.61</b>
<b>Head</b>	<b>1800 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
<b>Head</b>	<b>1900 MHz</b>	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\% \text{ mho/m}$
	ConvF X	<b>5.2</b> $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	<b>5.2</b> $\pm 9.5\%$ (k=2)	Alpha <b>0.50</b>
	ConvF Z	<b>5.2</b> $\pm 9.5\%$ (k=2)	Depth <b>2.73</b>

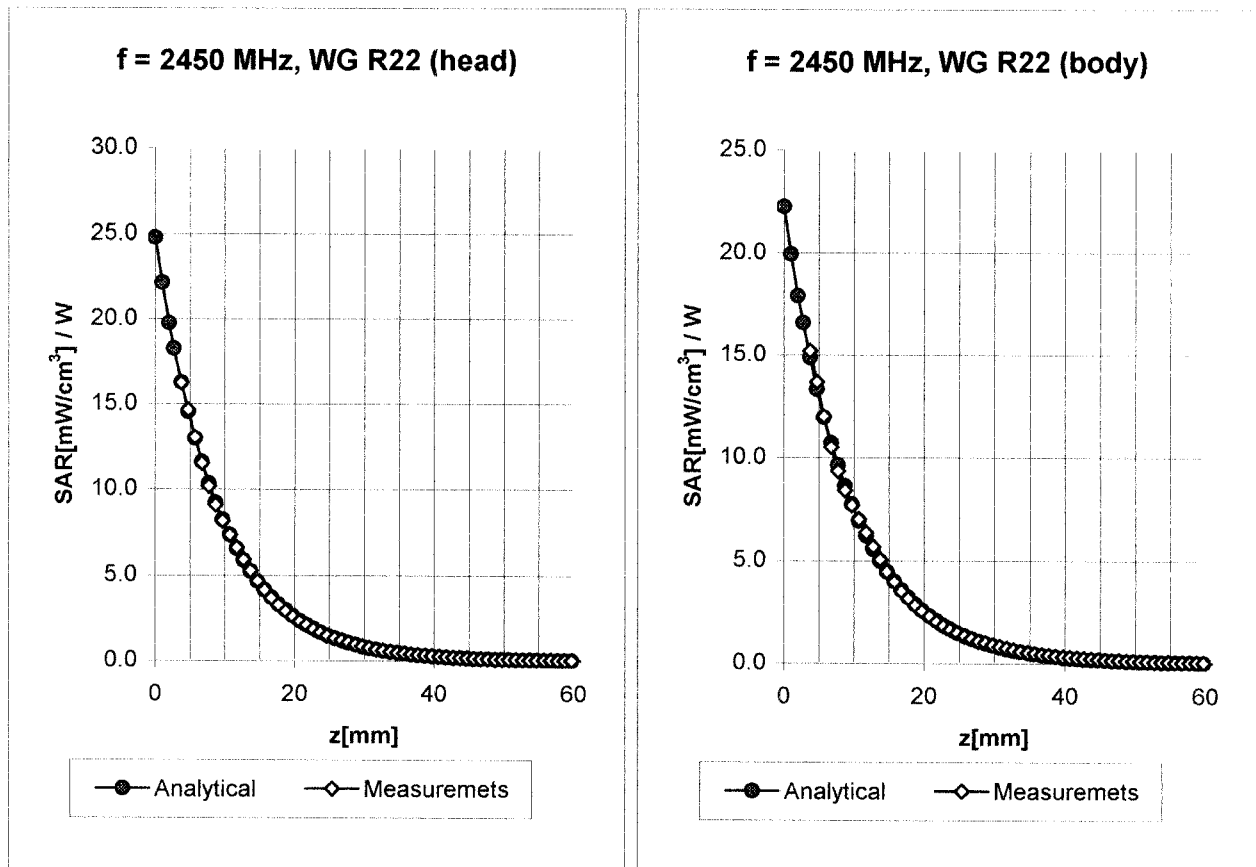


## Conversion Factor Assessment



<b>Body</b>	<b>900 MHz</b>	$\epsilon_r = 55.0 \pm 5\%$	$\sigma = 1.05 \pm 5\% \text{ mho/m}$
<b>Body</b>	<b>835 MHz</b>	$\epsilon_r = 55.2 \pm 5\%$	$\sigma = 0.97 \pm 5\% \text{ mho/m}$
	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>0.45</b>
	ConvF Z	<b>6.4</b> $\pm 9.5\%$ (k=2)	Depth <b>2.35</b>
<b>Body</b>	<b>1800 MHz</b>	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\% \text{ mho/m}$
<b>Body</b>	<b>1900 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>0.60</b>
	ConvF Z	<b>4.9</b> $\pm 9.5\%$ (k=2)	Depth <b>2.59</b>

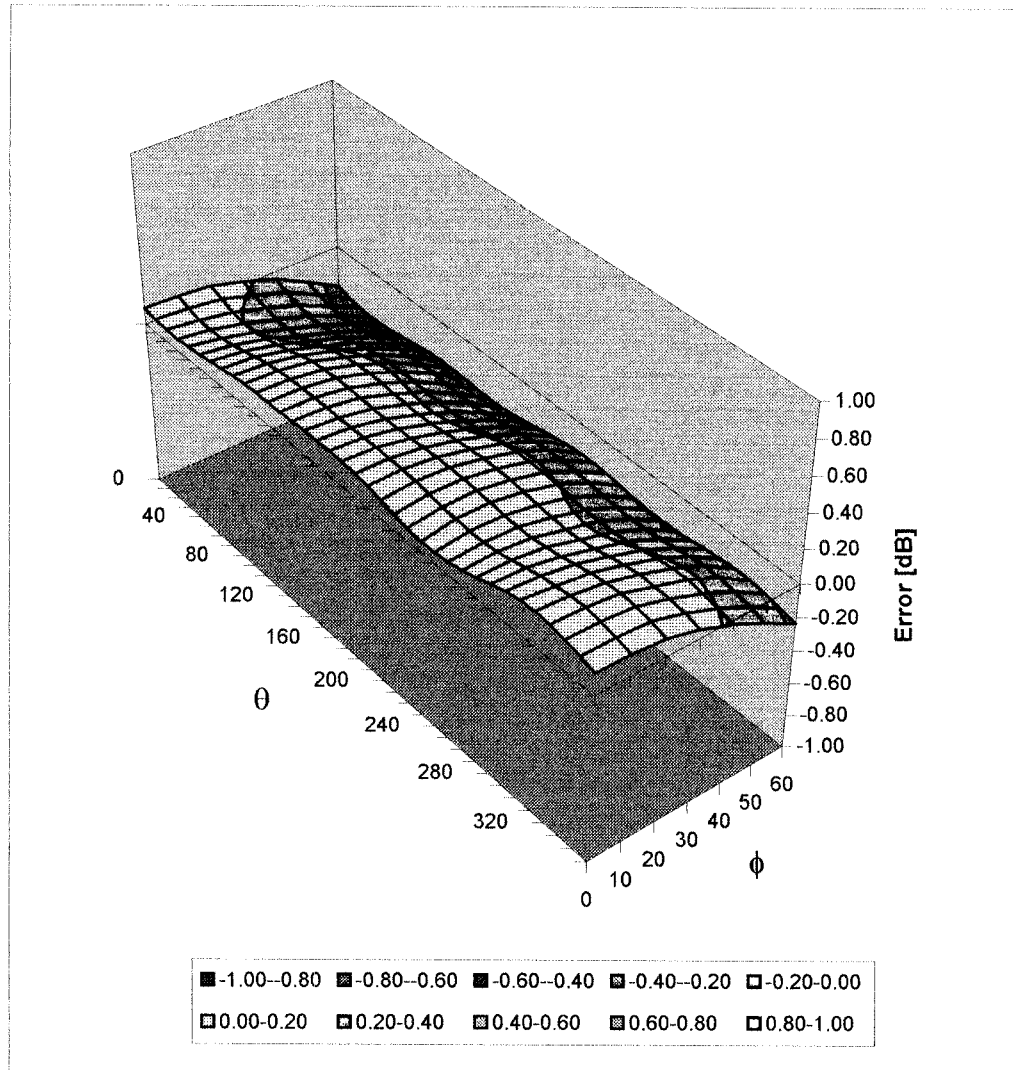
## Conversion Factor Assessment



<b>Head</b>	<b>2450</b>	<b>MHz</b>	$\epsilon_r = 39.2 \pm 5\%$	$\sigma = 1.80 \pm 5\%$ mho/m
	ConvF X		<b>5.0</b> $\pm 8.9\%$ (k=2)	Boundary effect:
	ConvF Y		<b>5.0</b> $\pm 8.9\%$ (k=2)	Alpha <b>1.04</b>
	ConvF Z		<b>5.0</b> $\pm 8.9\%$ (k=2)	Depth <b>1.85</b>
<b>Body</b>	<b>2450</b>	<b>MHz</b>	$\epsilon_r = 52.7 \pm 5\%$	$\sigma = 1.95 \pm 5\%$ mho/m
	ConvF X		<b>4.6</b> $\pm 8.9\%$ (k=2)	Boundary effect:
	ConvF Y		<b>4.6</b> $\pm 8.9\%$ (k=2)	Alpha <b>1.20</b>
	ConvF Z		<b>4.6</b> $\pm 8.9\%$ (k=2)	Depth <b>1.60</b>

# Deviation from Isotropy in HSL

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

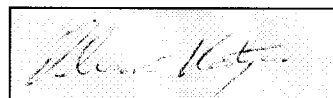


## Additional Conversion Factors for Dosimetric E-Field Probe

Type:	<b>ET3DV6</b>
Serial Number:	<b>1387</b>
Place of Assessment:	<b>Zurich</b>
Date of Assessment:	<b>February 28, 2003</b>
Probe Calibration Date:	<b>February 26, 2003</b>

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	$9.1 \pm 8\%$	$\epsilon_r = 52.3$ $\sigma = 0.76$ mho/m (head tissue)
300 MHz	ConvF	$7.9 \pm 8\%$	$\epsilon_r = 45.3$ $\sigma = 0.87$ mho/m (head tissue)
450 MHz	ConvF	$7.5 \pm 8\%$	$\epsilon_r = 43.5$ $\sigma = 0.87$ mho/m (head tissue)
150 MHz	ConvF	$8.8 \pm 8\%$	$\epsilon_r = 61.9$ $\sigma = 0.80$ mho/m (body tissue)
300 MHz	ConvF	$8.0 \pm 8\%$	$\epsilon_r = 58.2$ $\sigma = 0.92$ mho/m (body tissue)
450 MHz	ConvF	$7.7 \pm 8\%$	$\epsilon_r = 56.7$ $\sigma = 0.94$ mho/m (body tissue)