

ATTACHMENT R – PROBE CALIBRATION DATA

Schmid & Partner Engineering AG

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Calibration Certificate

Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1609

Place of Calibration:

Zurich

Date of Calibration:

June 20, 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:

D. Vetter

Approved by:

Alexandra Kutz

**Schmid & Partner
Engineering AG**

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

Probe ET3DV6

SN:1609

Manufactured:	July 27, 2001
Last calibration:	August 10, 2001
Recalibrated:	June 20, 2002

Calibrated for System DASY3

ET3DV6 SN:1609

June 20, 2002

DASY3 - Parameters of Probe: ET3DV6 SN:1609

Sensitivity in Free Space

NormX	$1.74 \mu V/(V/m)^2$
NormY	$1.76 \mu V/(V/m)^2$
NormZ	$1.76 \mu V/(V/m)^2$

Diode Compression

DCP X	95	mV
DCP Y	95	mV
DCP Z	95	mV

Sensitivity in Tissue Simulating Liquid

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	$6.5 \pm 9.5\% (k=2)$	Boundary effect:	
ConvF Y	$6.5 \pm 9.5\% (k=2)$	Alpha	0.38
ConvF Z	$6.5 \pm 9.5\% (k=2)$	Depth	2.56
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	$5.4 \pm 9.5\% (k=2)$	Boundary effect:	
ConvF Y	$5.4 \pm 9.5\% (k=2)$	Alpha	0.60
ConvF Z	$5.4 \pm 9.5\% (k=2)$	Depth	2.14

Boundary Effect

Head	900 MHz	Typical SAR gradient: 5 % per mm		
	Probe Tip to Boundary	1 mm	2 mm	
	SAR _{be} [%] Without Correction Algorithm	10.1	5.9	
	SAR _{be} [%] With Correction Algorithm	0.3	0.5	
Head	1800 MHz	Typical SAR gradient: 10 % per mm		
	Probe Tip to Boundary	1 mm	2 mm	
	SAR _{be} [%] Without Correction Algorithm	11.5	7.3	
	SAR _{be} [%] With Correction Algorithm	0.3	0.2	

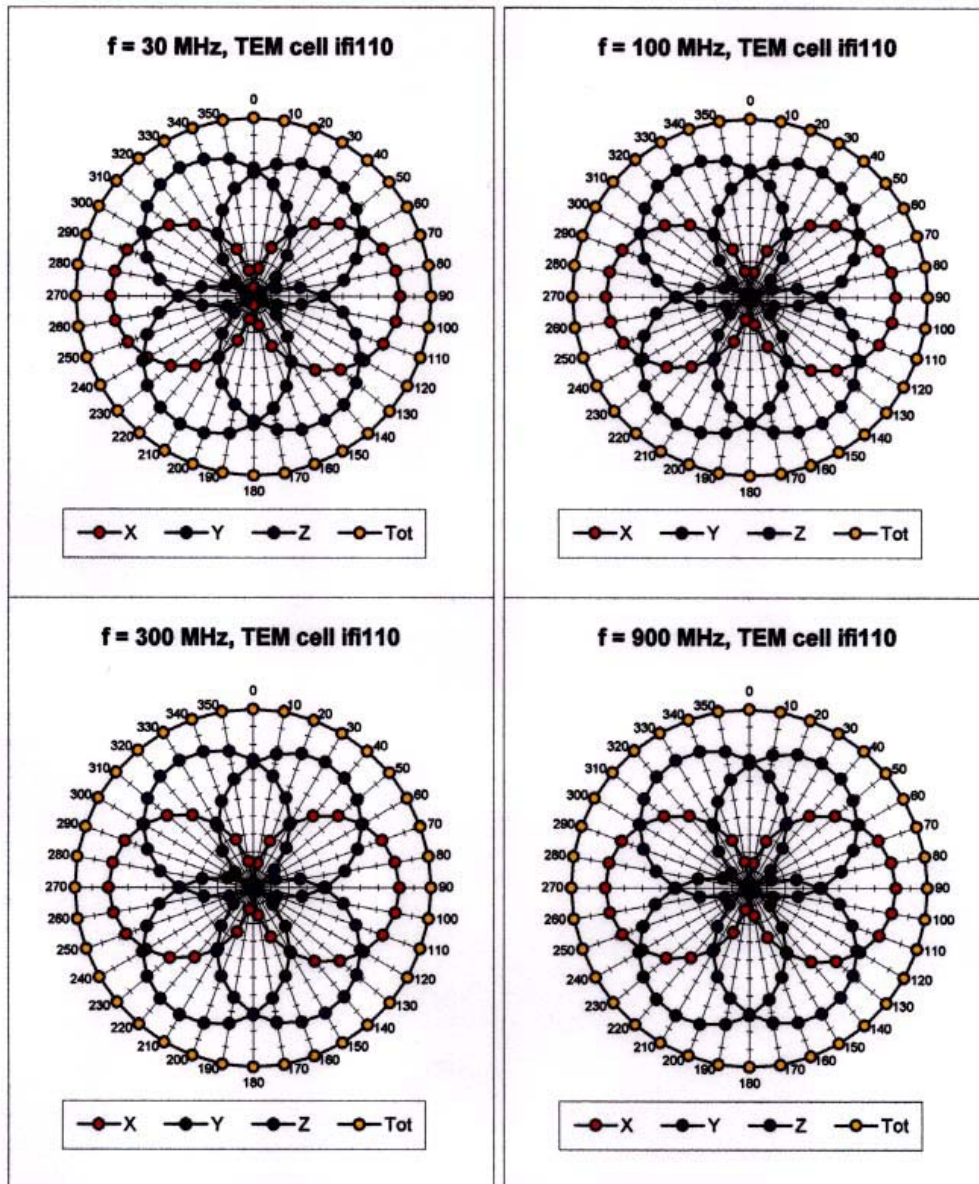
Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.3 ± 0.2	mm

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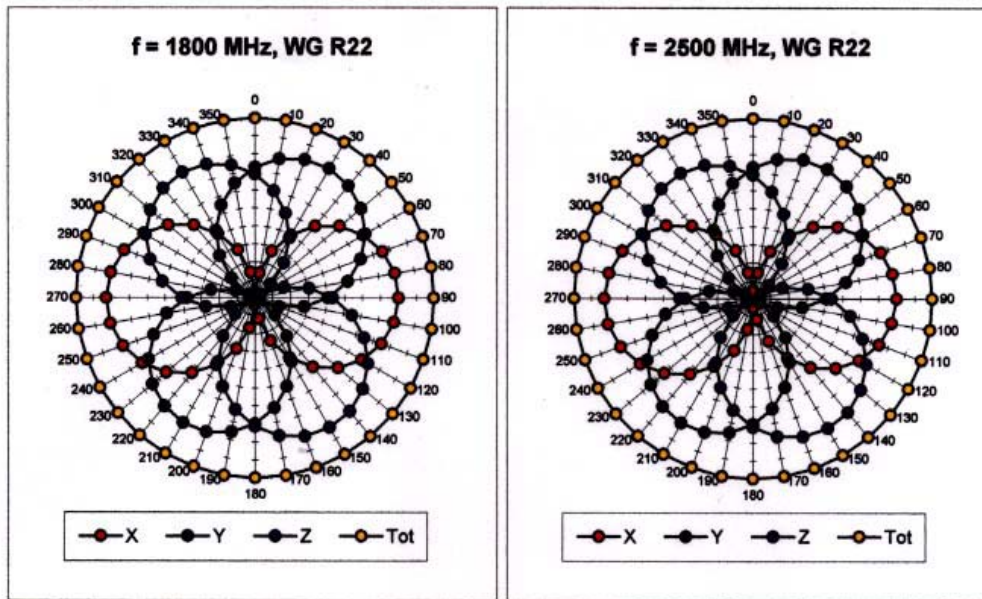
June 20, 2002

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

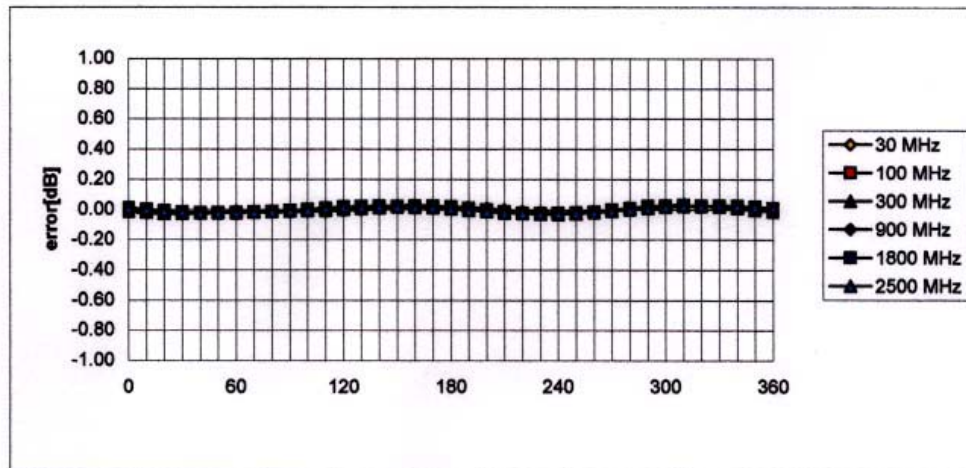


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Isotropy Error (ϕ), $\theta = 0^\circ$

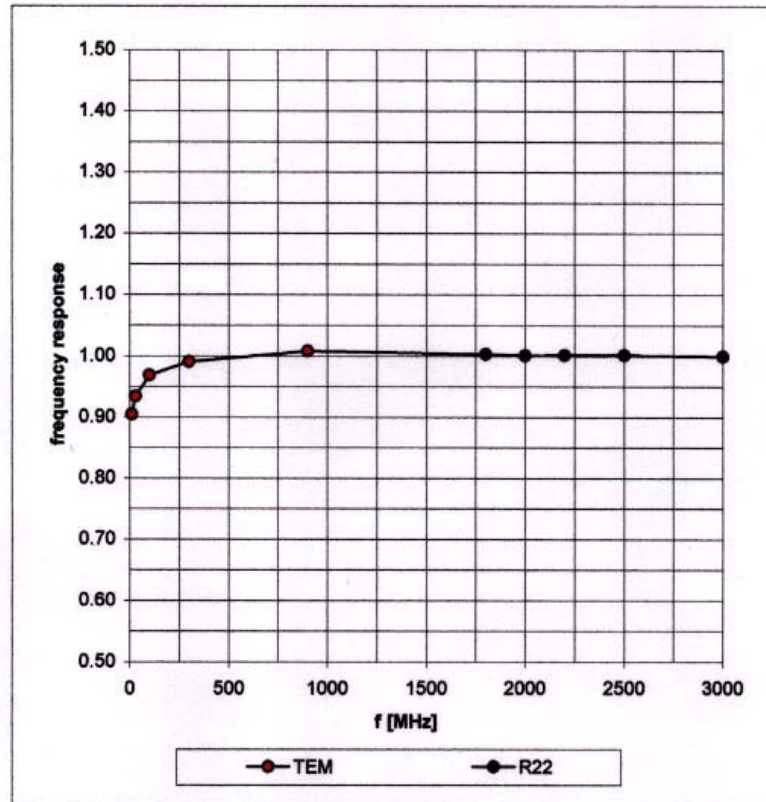


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Frequency Response of E-Field

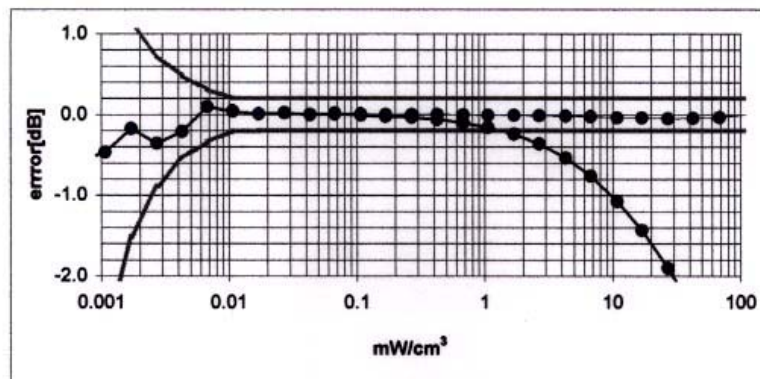
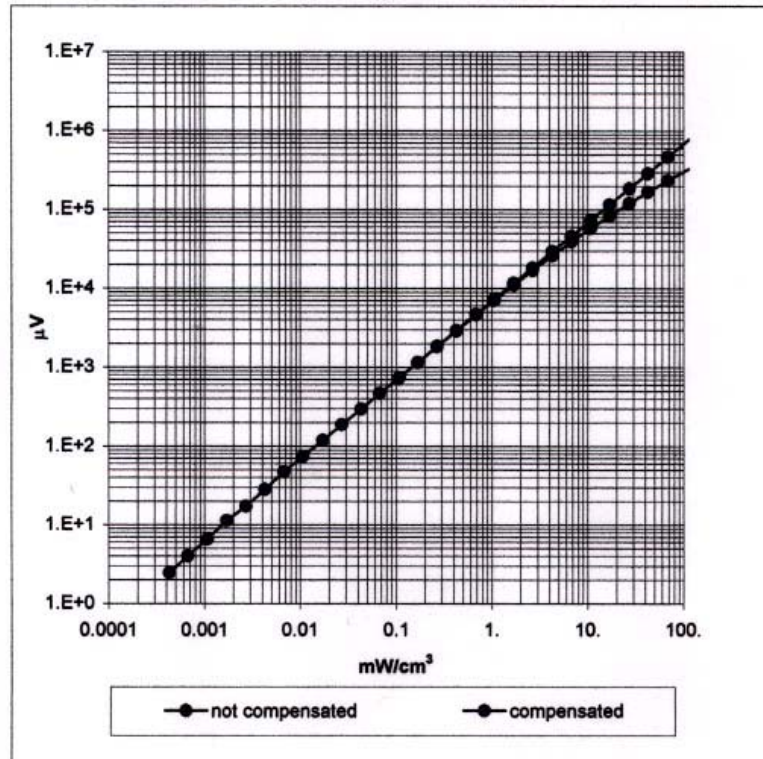
(TEM-Cell:ifi110, Waveguide R22)



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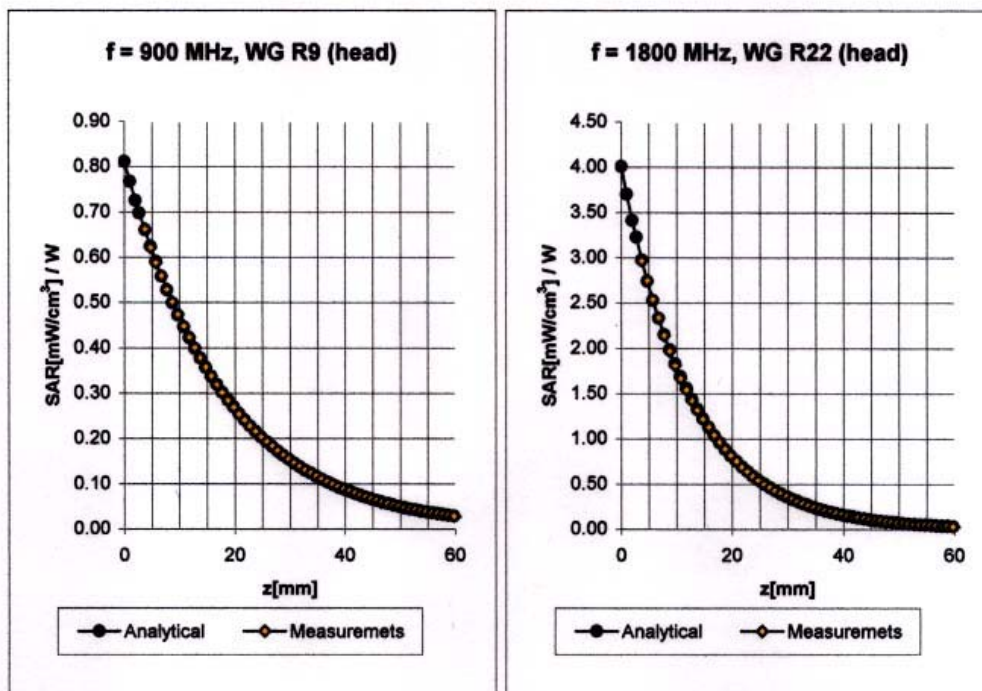
Dynamic Range f(SAR_{brain}) (Waveguide R22)



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Conversion Factor Assessment

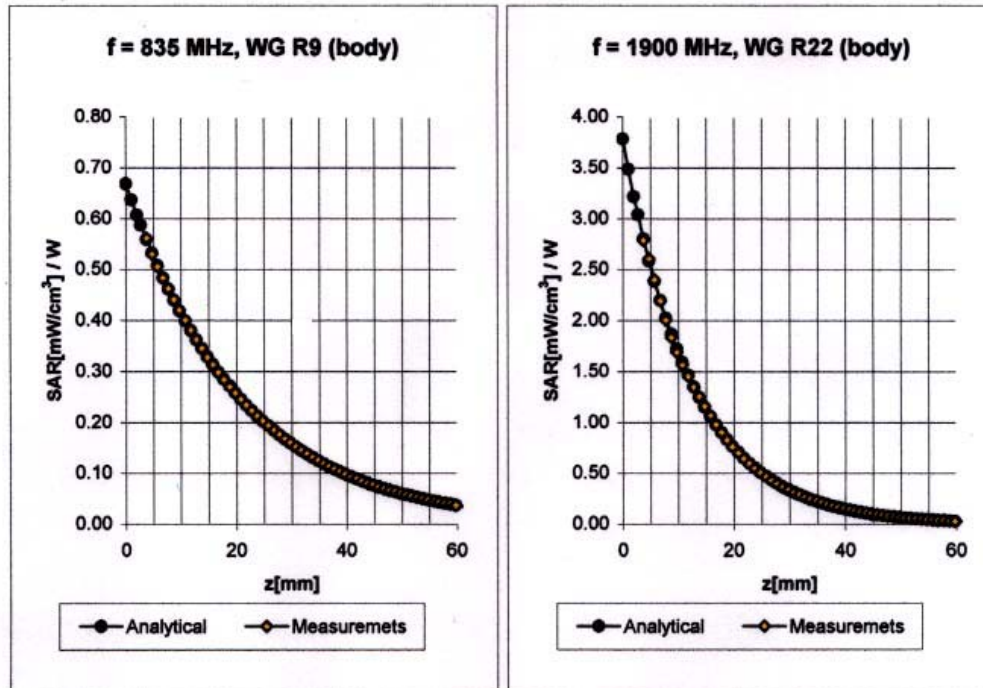


Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m
	ConvF X	6.5 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	6.5 $\pm 9.5\%$ (k=2)	Alpha 0.38
	ConvF Z	6.5 $\pm 9.5\%$ (k=2)	Depth 2.56
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
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	ConvF Y	5.4 $\pm 9.5\%$ (k=2)	Alpha 0.60
	ConvF Z	5.4 $\pm 9.5\%$ (k=2)	Depth 2.14

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June 20, 2002

Conversion Factor Assessment



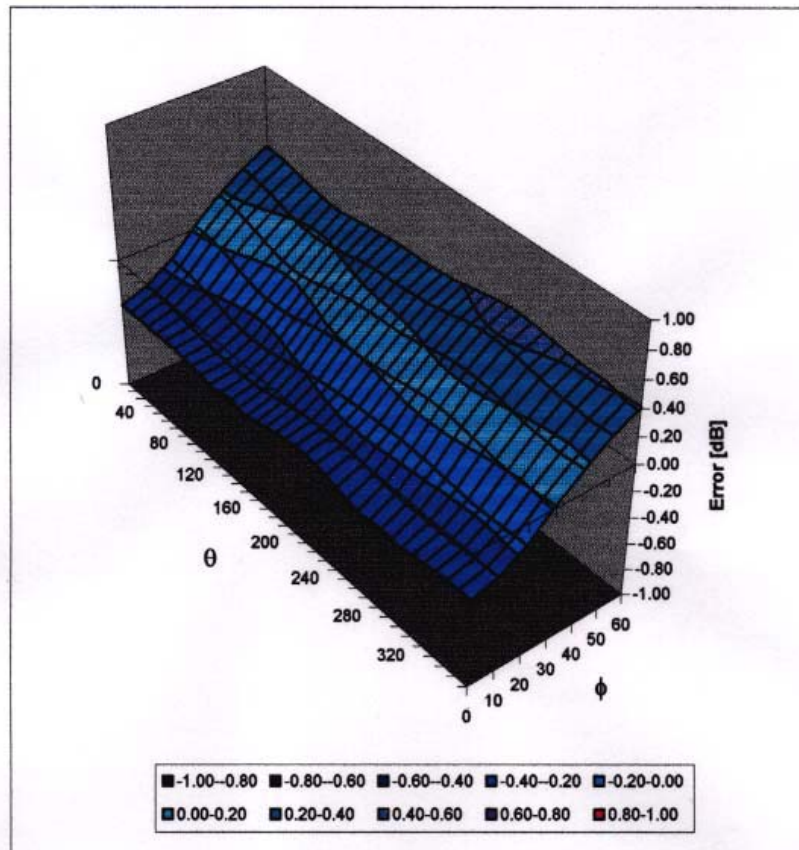
Body	835 MHz	$\epsilon_r = 55.2 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Body	900 MHz	$\epsilon_r = 55.0 \pm 5\%$	$\sigma = 1.05 \pm 5\%$ mho/m
	ConvF X	6.3 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	6.3 $\pm 9.5\%$ (k=2)	Alpha 0.36
	ConvF Z	6.3 $\pm 9.5\%$ (k=2)	Depth 2.71
Body	1900 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\%$ mho/m
Body	1800 MHz	$\epsilon_r = 53.3 \pm 5\%$	$\sigma = 1.52 \pm 5\%$ mho/m
	ConvF X	4.9 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	4.9 $\pm 9.5\%$ (k=2)	Alpha 0.77
	ConvF Z	4.9 $\pm 9.5\%$ (k=2)	Depth 2.05

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Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



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Additional Conversion Factors for Dosimetric E-Field Probe

Type:

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Serial Number:

1609

Place of Assessment:

Zurich

Date of Assessment:

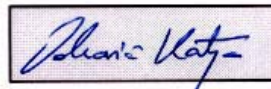
June 21, 2002

Probe Calibration Date:

June 20, 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. The evaluation is coupled with measured conversion factors. 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:1609Conversion factor ($\pm$ standard deviation)**450 MHz** ConvF **$7.4 \pm 8\%$**

$\epsilon_r = 43.5 \pm 5\%$
 $\sigma = 0.87 \pm 5\% \text{ mho/m}$
(head tissue)

450 MHz ConvF **$7.6 \pm 8\%$**

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