

Schmid & Partner Engineering AG

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

Calibration Certificate

Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1733

Place of Calibration:

Zurich

Date of Calibration:

December 3, 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. Vella

Approved by:

Blair's Katya

Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1733

Place of Assessment:

Zurich

Date of Assessment:

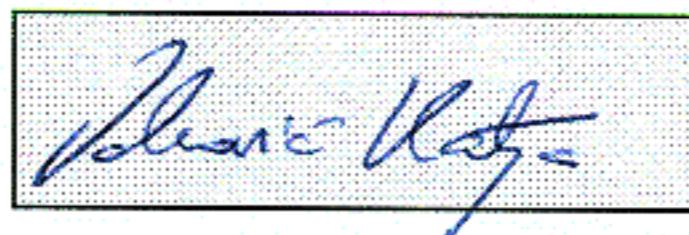
January 23, 2003

Probe Calibration Date:

December 3, 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:1733

Conversion factor (\pm standard deviation)

835 MHz	ConvF	$6.4 \pm 8\%$	$\epsilon_r = 55.2 \pm 5\%$ $\sigma = 0.97 \pm 5\% \text{ mho/m}$ (body tissue)
900 MHz	ConvF	$6.3 \pm 8\%$	$\epsilon_r = 55.0 \pm 5\%$ $\sigma = 1.05 \pm 5\% \text{ mho/m}$ (body tissue)
1800 MHz	ConvF	$5.0 \pm 8\%$	$\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\% \text{ mho/m}$ (body tissue)
1900 MHz	ConvF	$4.8 \pm 8\%$	$\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\% \text{ mho/m}$ (body tissue)
1950 MHz	ConvF	$5.1 \pm 8\%$	$\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\% \text{ mho/m}$ (head tissue)
1950 MHz	ConvF	$4.7 \pm 8\%$	$\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\% \text{ mho/m}$ (body tissue)

X112a2
Due for cal
John G.

Probe ET3DV6

SN:1733

Manufactured: September 27, 2002
Last calibration: December 3, 2002

Calibrated for DASYS Systems

(Note: non-compatible with DASYS2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1733**Sensitivity in Free Space**

NormX	1.50 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.46 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.44 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	93	mV
DCP Y	93	mV
DCP Z	93	mV

Sensitivity in Tissue Simulating Liquid

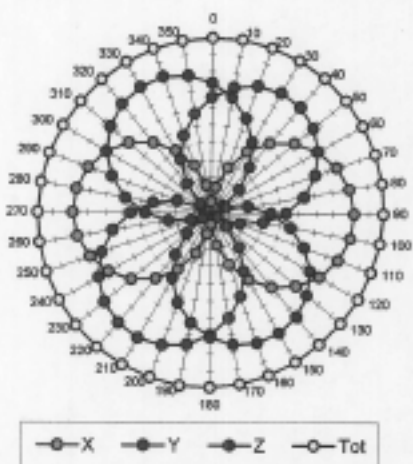
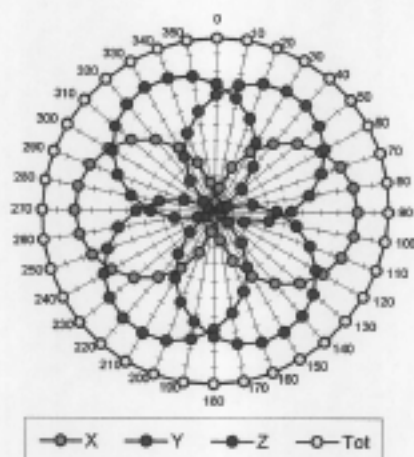
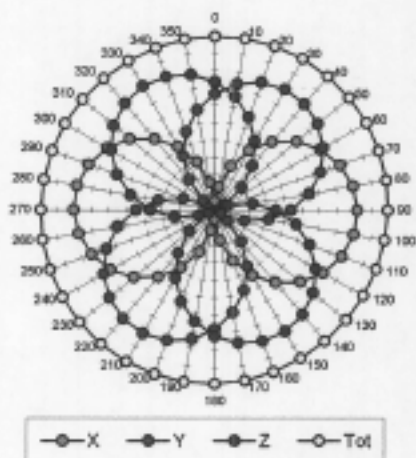
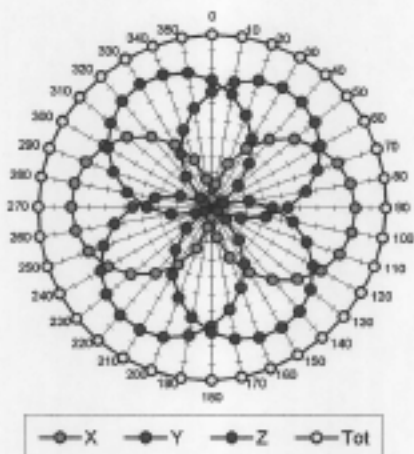
Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ mho/m
Head	835 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.90 \pm 5\%$ mho/m
	ConvF X	6.5 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	6.5 $\pm 9.5\%$ (k=2)	Alpha 0.35
	ConvF Z	6.5 $\pm 9.5\%$ (k=2)	Depth 2.57
Head	1800 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
Head	1900 MHz	$\epsilon_r = 40.0 \pm 5\%$	$\sigma = 1.40 \pm 5\%$ mho/m
	ConvF X	5.4 $\pm 9.5\%$ (k=2)	Boundary effect:
	ConvF Y	5.4 $\pm 9.5\%$ (k=2)	Alpha 0.47
	ConvF Z	5.4 $\pm 9.5\%$ (k=2)	Depth 2.44

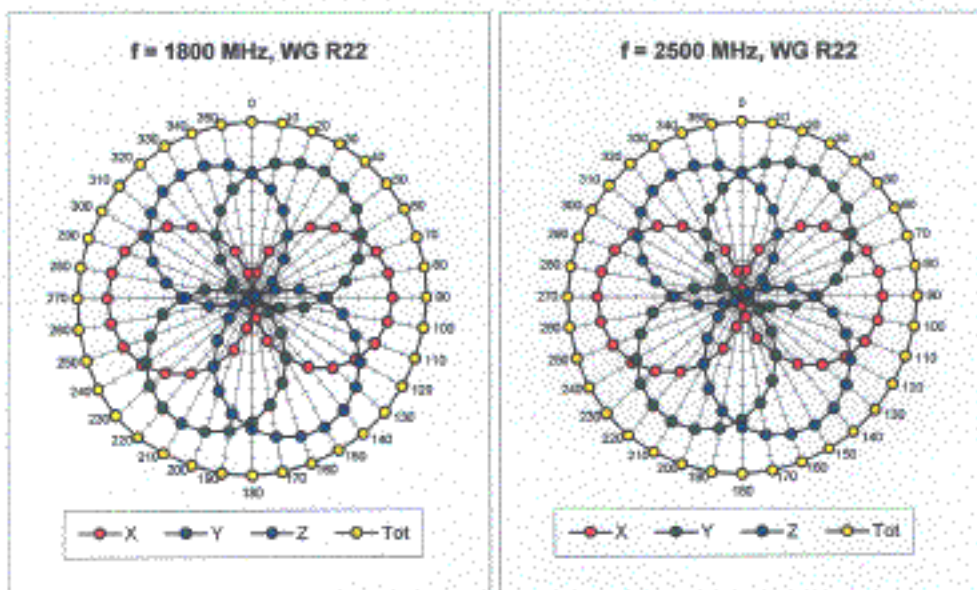
Boundary Effect

Head	900 MHz	Typical SAR gradient: 5 % per mm	
	Probe Tip to Boundary	1 mm	2 mm
	SAR _{tip} [%] Without Correction Algorithm	9.4	5.4
	SAR _{tip} [%] 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 _{tip} [%] Without Correction Algorithm	11.3	7.6
	SAR _{tip} [%] With Correction Algorithm	0.2	0.2

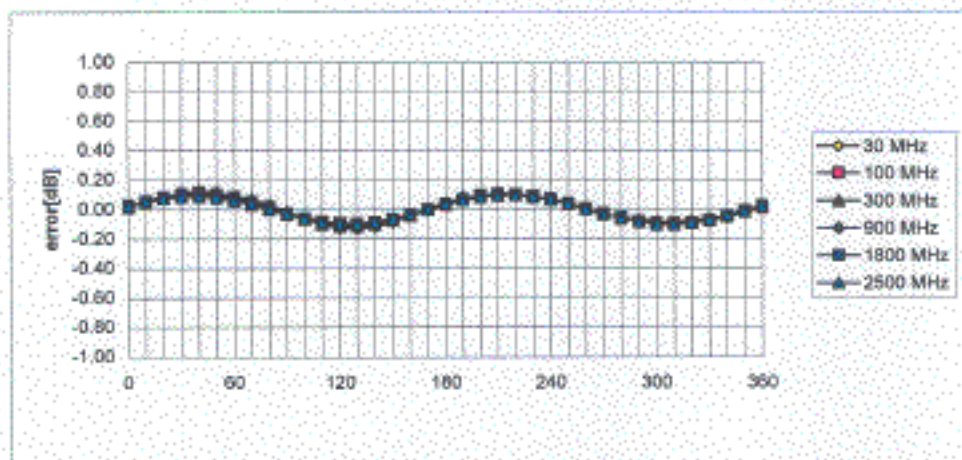
Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.6 \pm 0.2	mm

Receiving Pattern (ϕ), $\theta = 0^\circ$ **f = 30 MHz, TEM cell if110****f = 100 MHz, TEM cell if110****f = 300 MHz, TEM cell if110****f = 900 MHz, TEM cell if110**

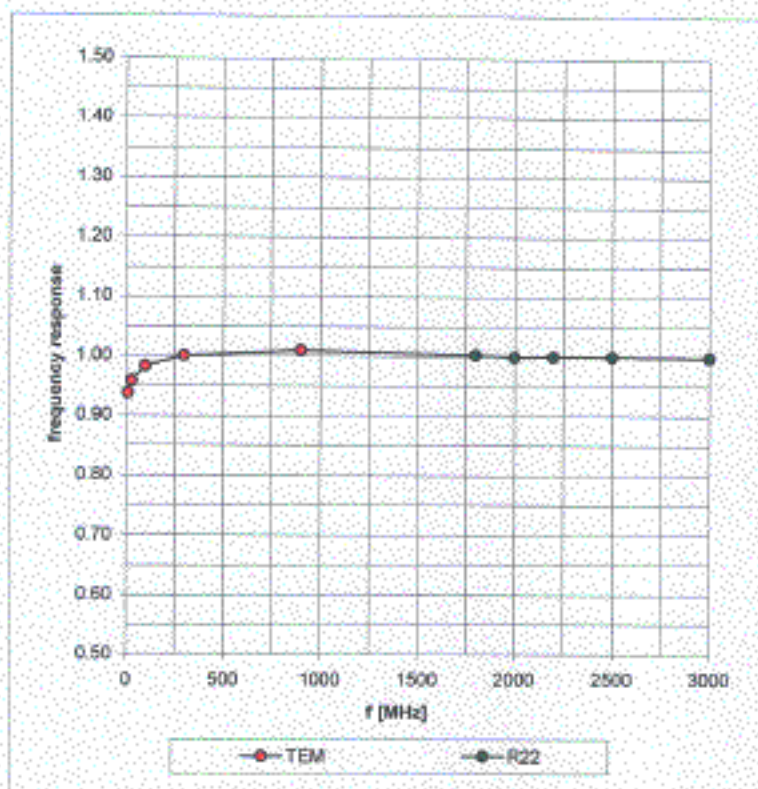


Isotropy Error (ϕ), $\theta = 0^\circ$

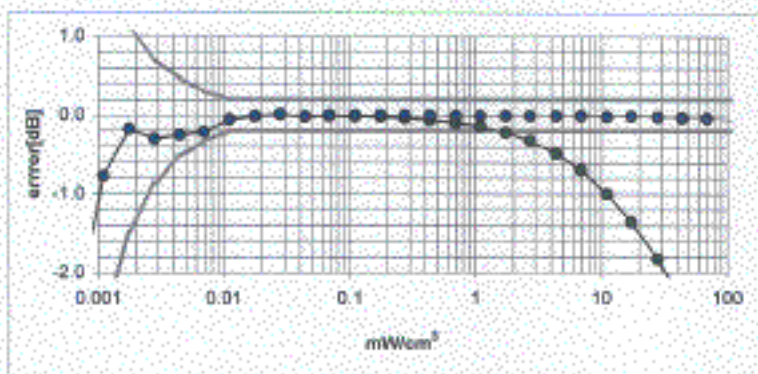
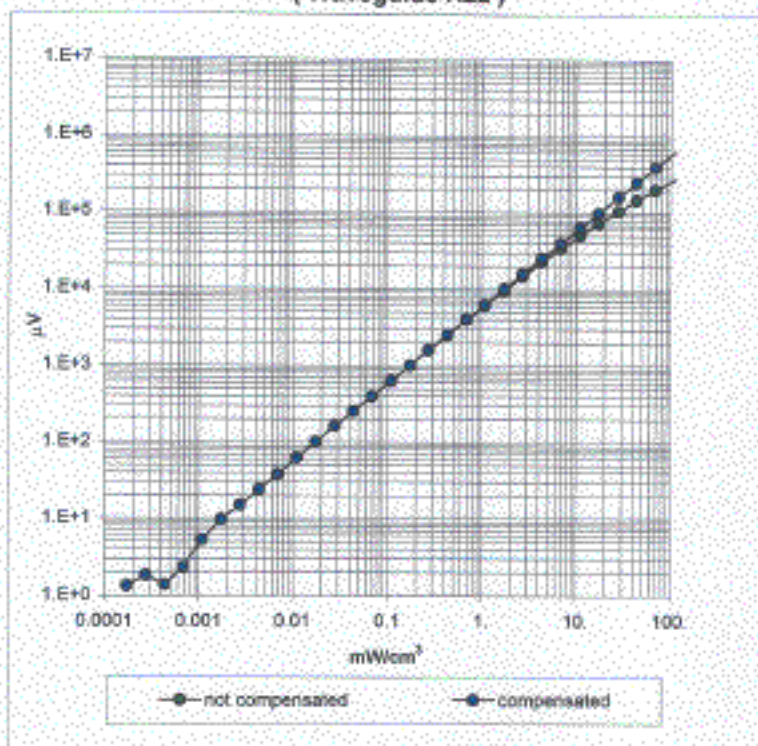


Frequency Response of E-Field

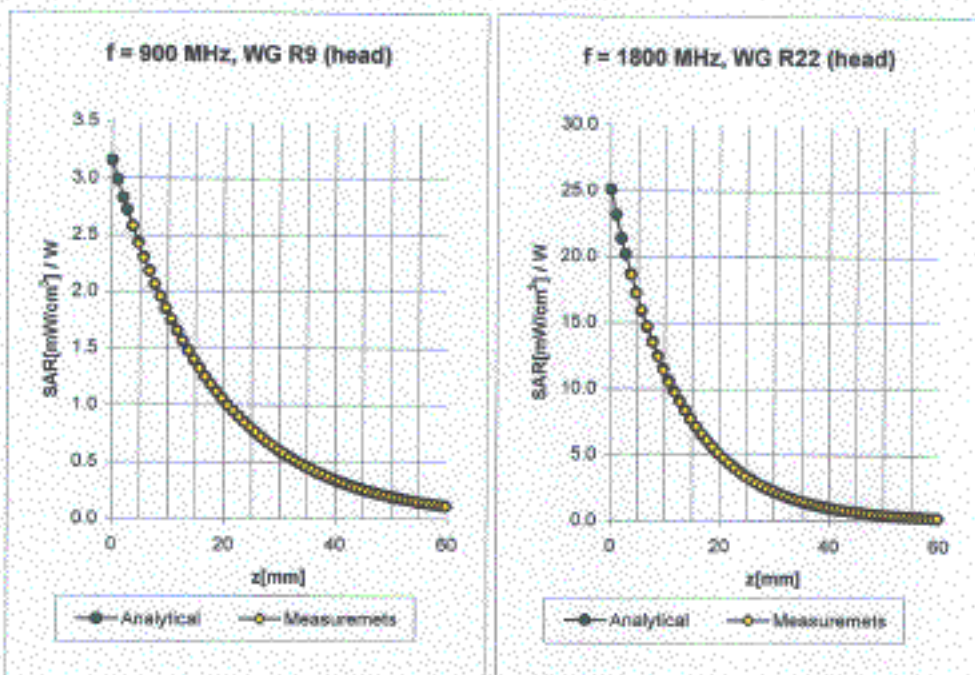
(TEM-Cell:ifi110, Waveguide R22)



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



Conversion Factor Assessment



Head	900 MHz	$\epsilon_r = 41.5 \pm 5\%$	$\sigma = 0.97 \pm 5\%$ 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	0.35
	ConvF Z	$6.5 \pm 9.5\%$ (k=2)	Depth	2.57
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	
	ConvF X	$5.4 \pm 9.5\%$ (k=2)	Boundary effect:	
	ConvF Y	$5.4 \pm 9.5\%$ (k=2)	Alpha	0.47
	ConvF Z	$5.4 \pm 9.5\%$ (k=2)	Depth	2.44

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz

