

Schmid & Partner Engineering AG

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Calibration Certificate

Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1503

Place of Calibration:

Zurich

Date of Calibration:

November 16, 2001

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:

Nikolaus Meriana

Approved by:

Heinrich Käfer

Probe ET3DV6

SN:1503

Manufactured:	October 24, 1999
Remade:	November 2, 2001
Calibrated:	November 16, 2001

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1503

Sensitivity in Free Space

NormX	2.25 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	2.10 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.95 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

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

Sensitivity in Tissue Simulating Liquid

Head **450 MHz** $\epsilon_r = 40.4 \pm 5\%$ $s = 0.87 \pm 5\% \text{ mho/m}$

ConvF X	6.92 extrapolated	Boundary effect:	
ConvF Y	6.92 extrapolated	Alpha	0.31
ConvF Z	6.92 extrapolated	Depth	2.46

Head **900 MHz** $\epsilon_r = 41.5 \pm 5\%$ $s = 0.97 \pm 5\% \text{ mho/m}$

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

ConvF X	6.36 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.36 $\pm 9.5\%$ (k=2)	Alpha	0.39
ConvF Z	6.36 $\pm 9.5\%$ (k=2)	Depth	2.42

Head **1500 MHz** $\epsilon_r = 40.4 \pm 5\%$ $s = 1.23 \pm 5\% \text{ mho/m}$

ConvF X	5.61 interpolated	Boundary effect:	
ConvF Y	5.61 interpolated	Alpha	0.49
ConvF Z	5.61 interpolated	Depth	2.36

Head **1800 MHz** $\epsilon_r = 40.0 \pm 5\%$ $s = 1.40 \pm 5\% \text{ mho/m}$

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

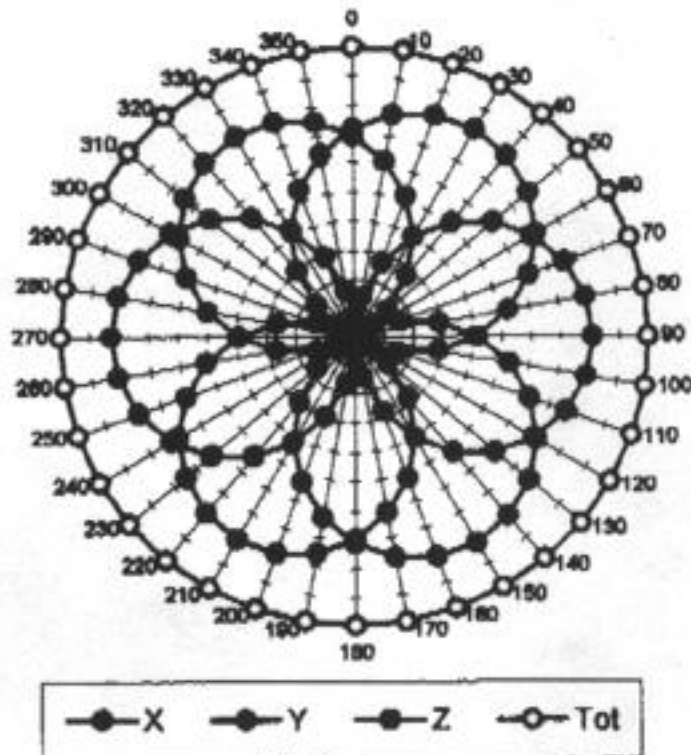
ConvF X	5.24 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.24 $\pm 9.5\%$ (k=2)	Alpha	0.54
ConvF Z	5.24 $\pm 9.5\%$ (k=2)	Depth	2.33

Sensor Offset

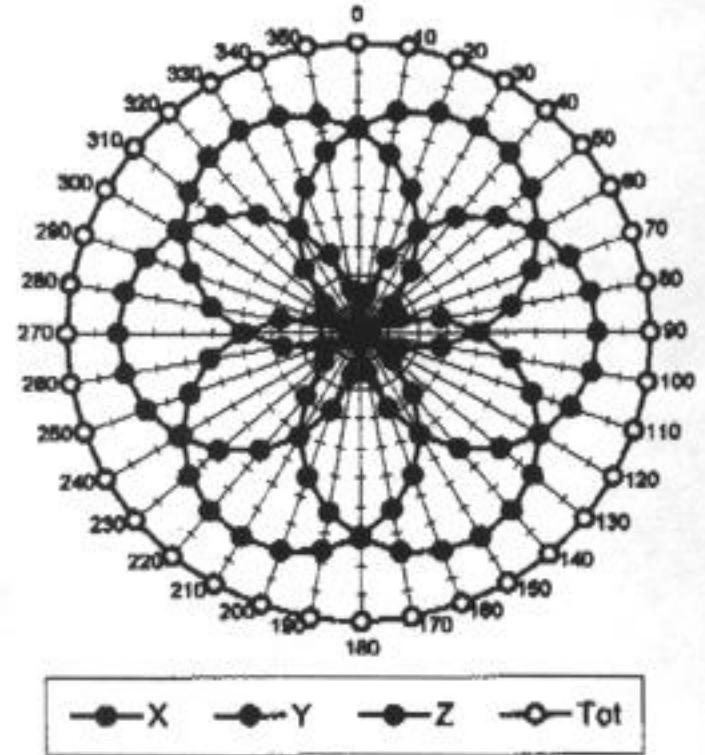
Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.6 $\pm$ 0.2	mm

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

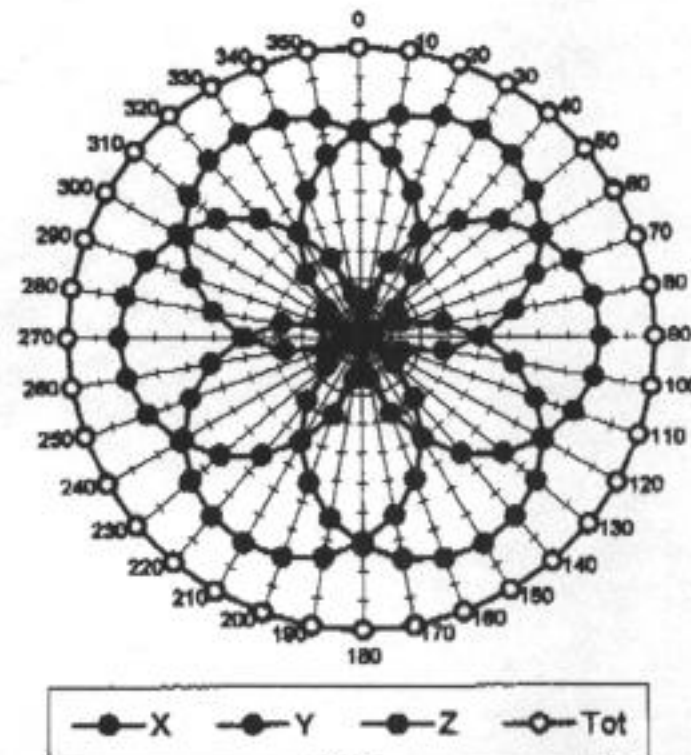
f = 30 MHz, TEM cell if110



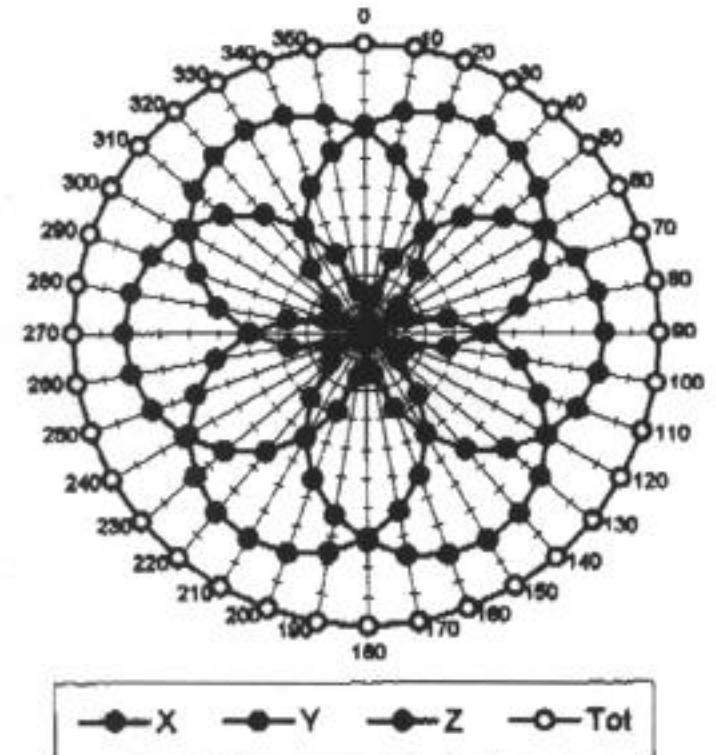
f = 100 MHz, TEM cell if110

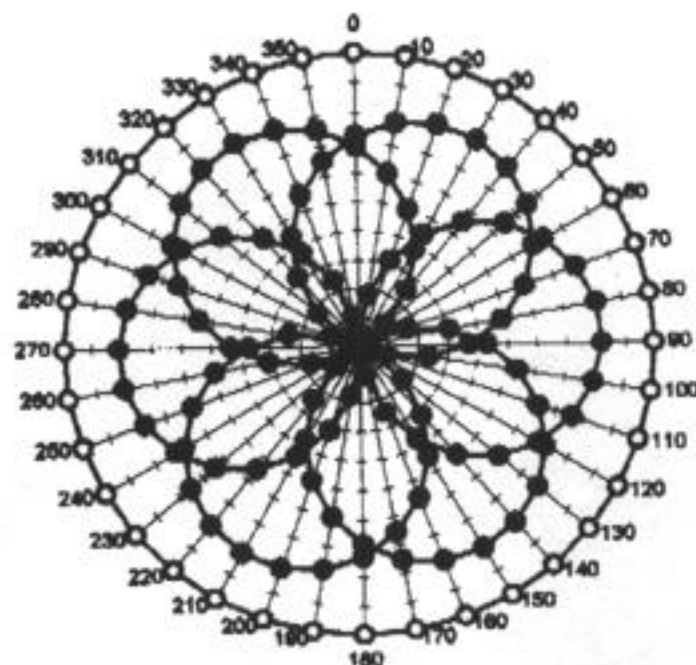


f = 300 MHz, TEM cell if110

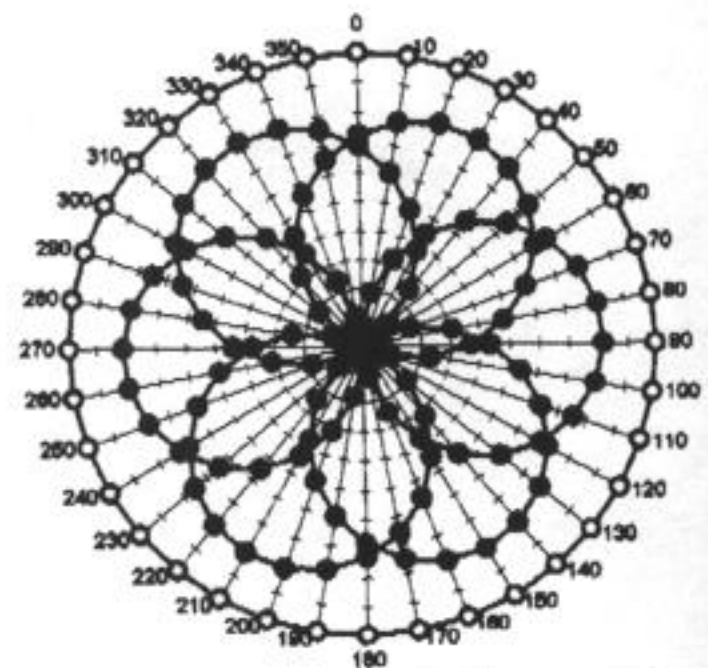


f = 900 MHz, TEM cell if110



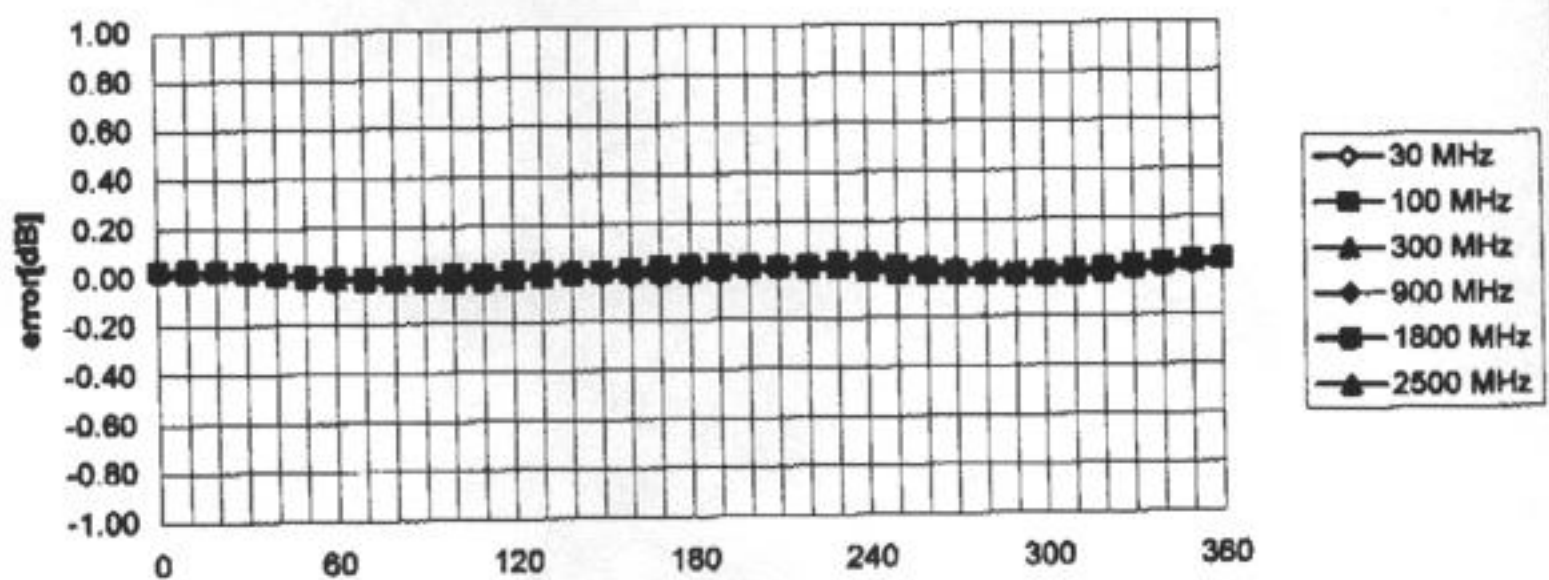
$f = 1800 \text{ MHz, WG R22}$ 

—●— X —●— Y —●— Z —○— Tot

 $f = 2500 \text{ MHz, WG R22}$ 

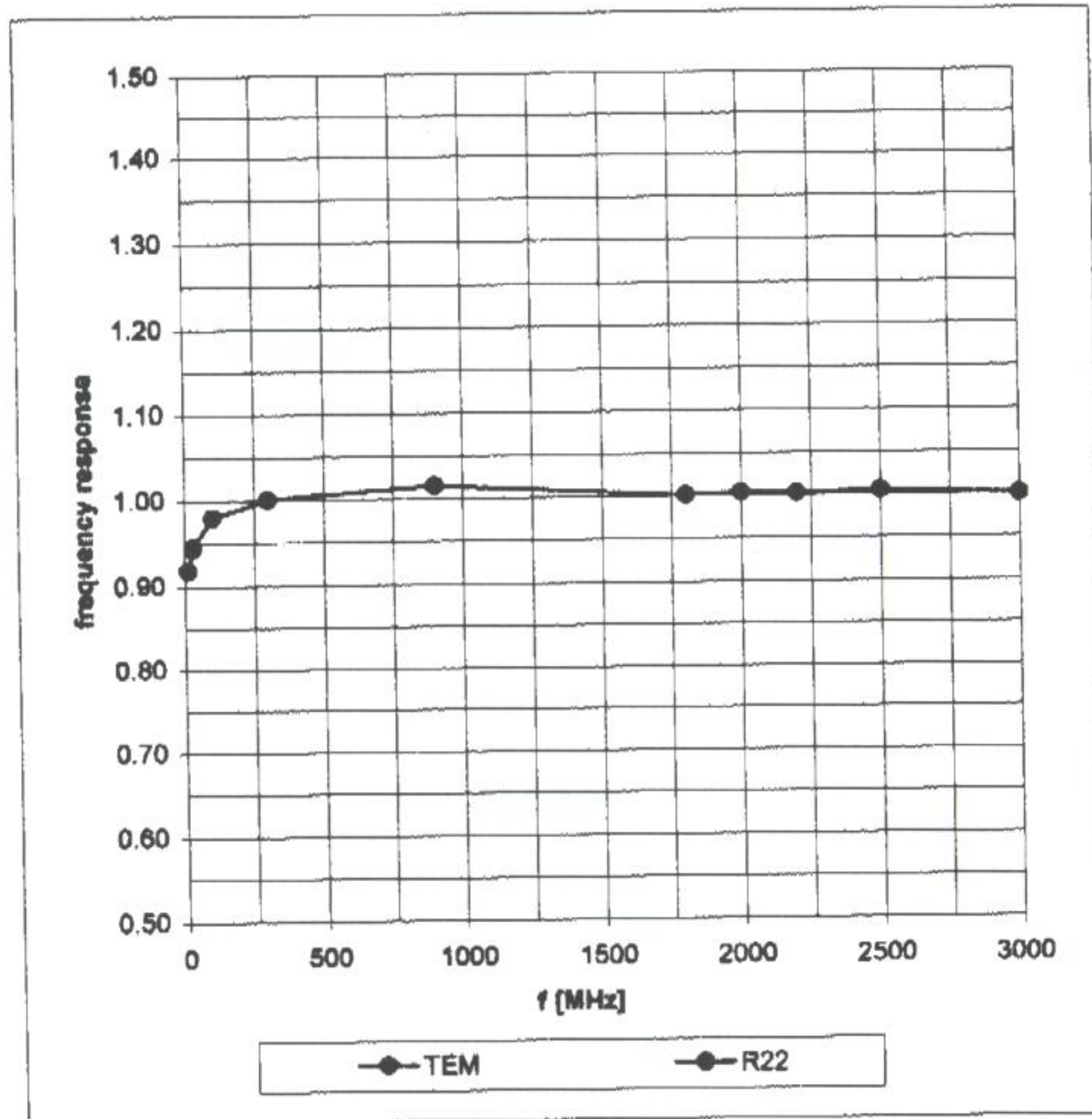
—●— X —●— Y —●— Z —○— Tot

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

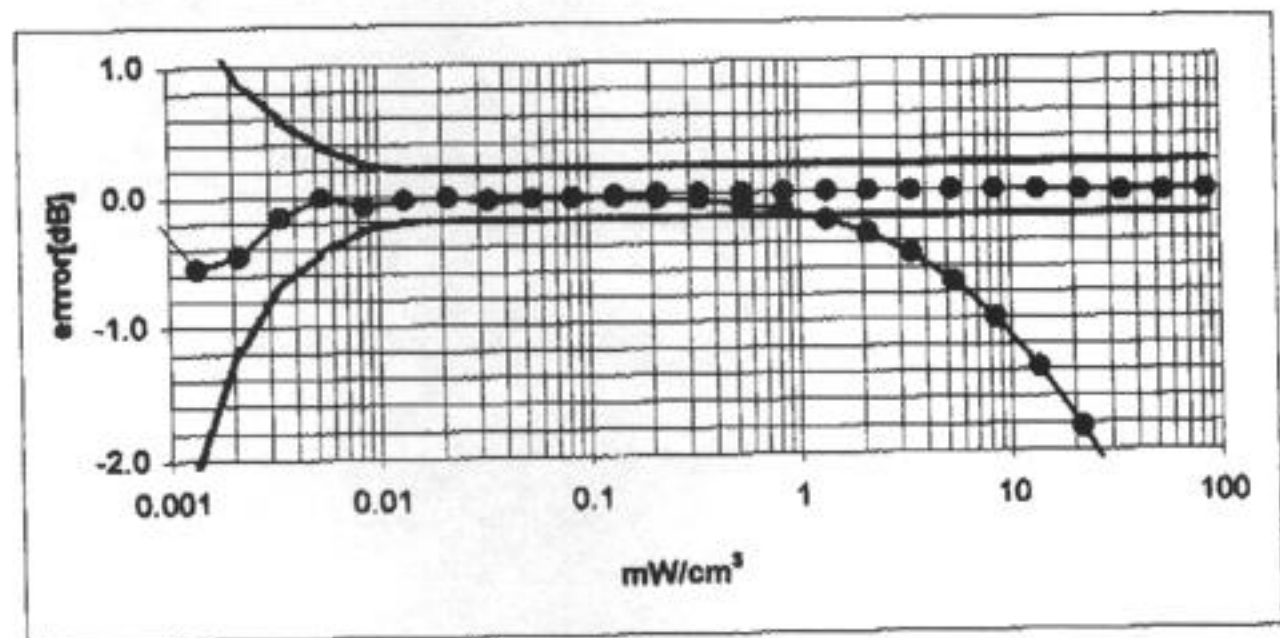
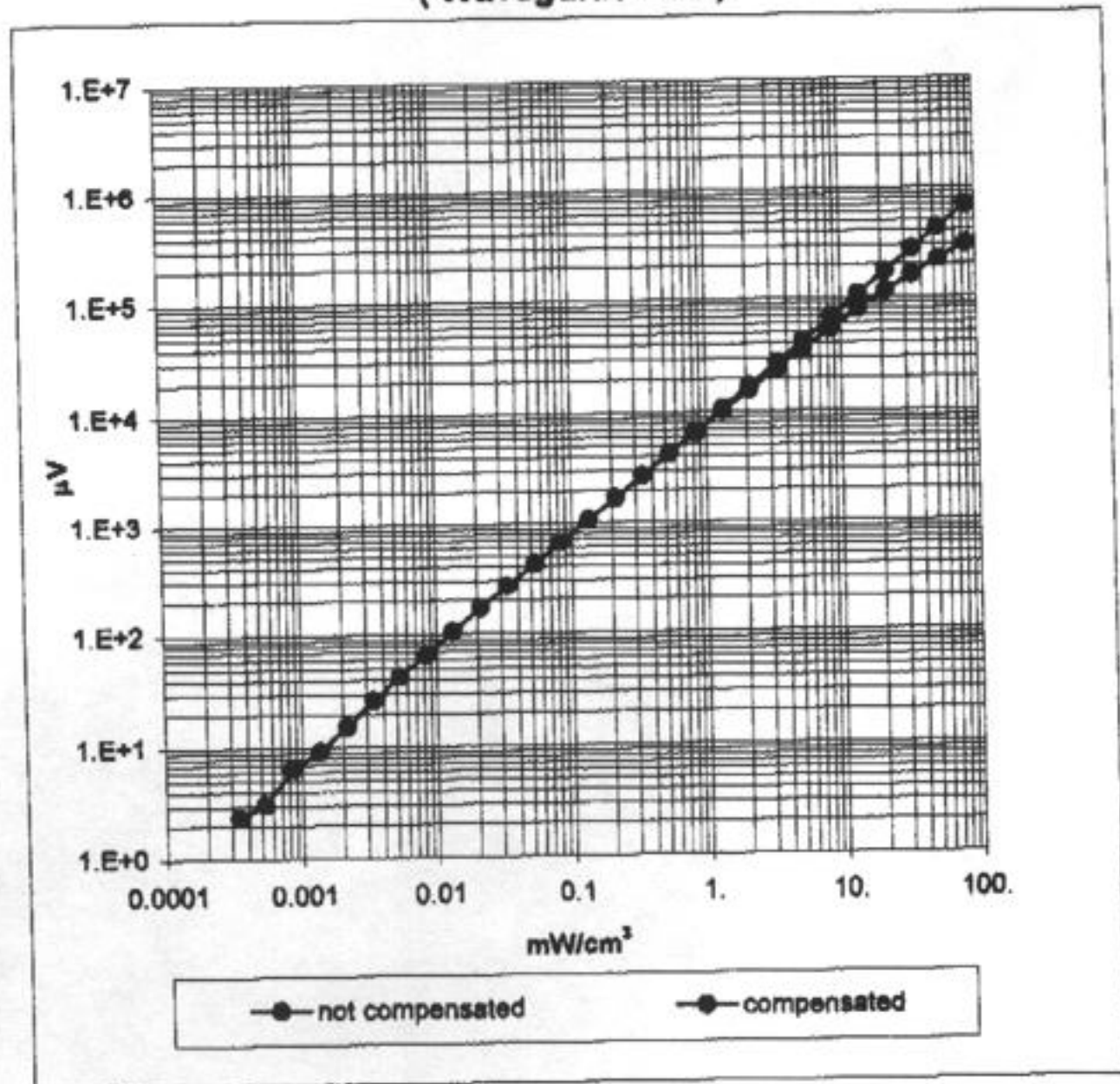


Frequency Response of E-Field

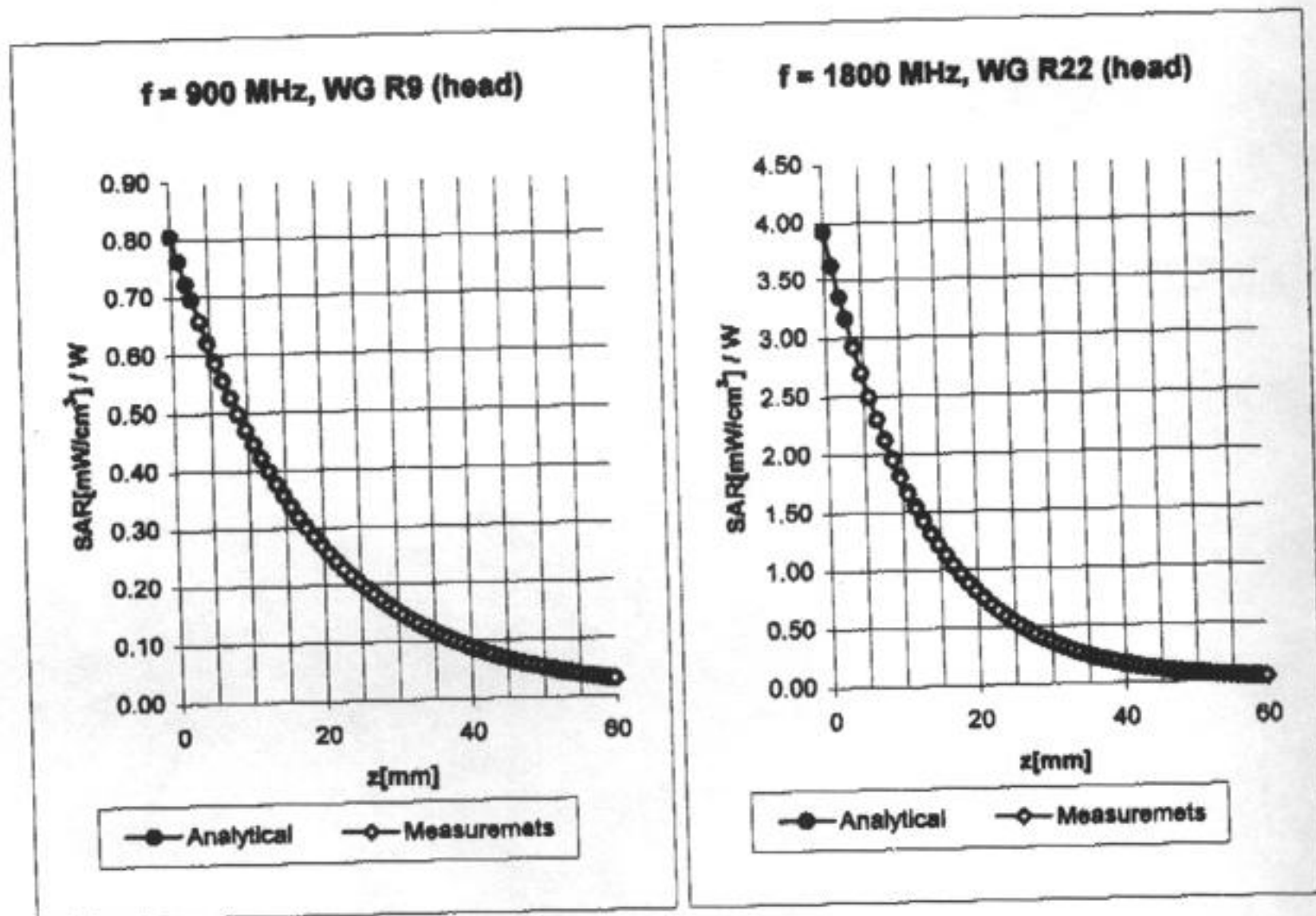
(TEM-Cell:ifl110, Waveguide R22)



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



Conversion Factor Assessment



Head 800 - 1000 MHz

 $\epsilon_r = 39.0 - 43.5$ $\sigma = 0.80 - 1.10 \text{ mho/m}$ ConvF X **6.36** $\pm 9.5\%$ (k=2)ConvF Y **6.36** $\pm 9.5\%$ (k=2)ConvF Z **6.36** $\pm 9.5\%$ (k=2)

Boundary effect:

Alpha **0.39**Depth **2.42**

Head 1700 - 1910 MHz

 $\epsilon_r = 39.5 - 41.0$ $\sigma = 1.20 - 1.55 \text{ mho/m}$ ConvF X **5.24** $\pm 9.5\%$ (k=2)ConvF Y **5.24** $\pm 9.5\%$ (k=2)ConvF Z **5.24** $\pm 9.5\%$ (k=2)

Boundary effect:

Alpha **0.54**Depth **2.33**

Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1503

Place of Assessment:

Zurich

Date of Assessment:

November 22, 2001

Probe Calibration Date:

November 16, 2001

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:

Oliver Kofler

Dosimetric E-Field Probe ET3DV6 SN:1503

Conversion factor ($\pm$ standard deviation)

835 MHz ConvF $6.5 \pm 8\%$

$$\epsilon_r = 41.5$$

$$\sigma = 0.90 \text{ mho/m}$$

(head tissue)

1950 MHz ConvF $5.0 \pm 8\%$

$$\epsilon_r = 40.0$$

$$\sigma = 1.40 \text{ mho/m}$$

(head tissue)

835 MHz ConvF $6.2 \pm 8\%$

$$\epsilon_r = 55.2$$

$$\sigma = 0.97 \text{ mho/m}$$

(body tissue)

900 MHz ConvF $6.1 \pm 8\%$

$$\epsilon_r = 55.0$$

$$\sigma = 1.05 \text{ mho/m}$$

(body tissue)

1800 MHz ConvF $4.9 \pm 8\%$

$$\epsilon_r = 53.3$$

$$\sigma = 1.52 \text{ mho/m}$$

(body tissue)

1950 MHz ConvF $4.7 \pm 8\%$

$$\epsilon_r = 53.3$$

$$\sigma = 1.52 \text{ mho/m}$$

(body tissue)

gaeps94

Spring 94