Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client **CCS, USA**

CALIBRATION CERTIFICATE

Object(s)	EX3DV3 - SN:3531
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	July 18, 2004
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	5-May-04 (METAS, No 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No 251-00388)	May-05
Reference 20 dB Attenuator	SN: 5086 (20b)	3-May-04 (METAS, No 251-00389)	May-05
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct 03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug 02)	In house check: Aug 05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct 03)	In house check: Oct 05

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

Date issued: July 19, 2004

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 EX3DV3

SN:3531

Manufactured:	May 17, 2004
Last calibrated:	July 18, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV3 SN:3531

Sensitivity in Free Space

Diode Compression[A]

NormX	**0.81** $\mu V/(V/m)^2$	DCP X	**95**	mV
NormY	**0.76** $\mu V/(V/m)^2$	DCP Y	**95**	mV
NormZ	**0.79** $\mu V/(V/m)^2$	DCP Z	**95**	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Plese see Page 7.

Boundary Effect

Head **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	3.4	1.1
SAR_{be} [%]	With Correction Algorithm	0.0	0.0

Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	4.1	2.3
SAR_{be} [%]	With Correction Algorithm	0.1	0.3

Sensor Offset

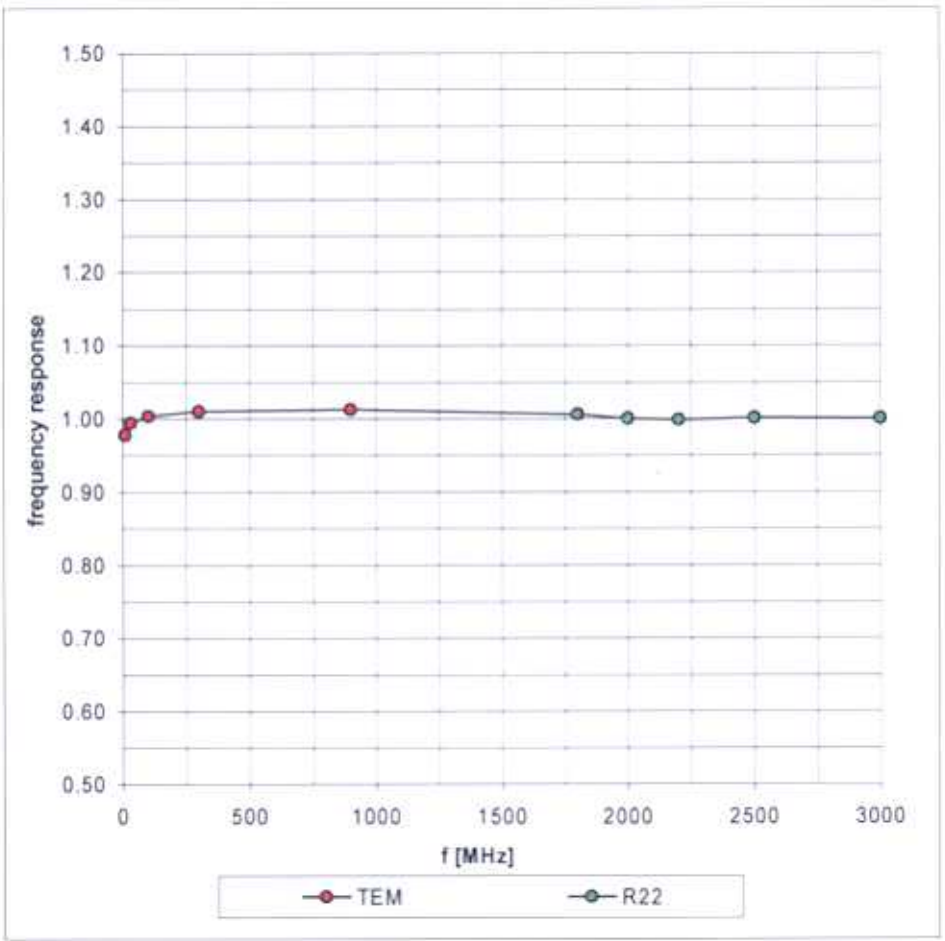
Probe Tip to Sensor Center	**1.2**	mm

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

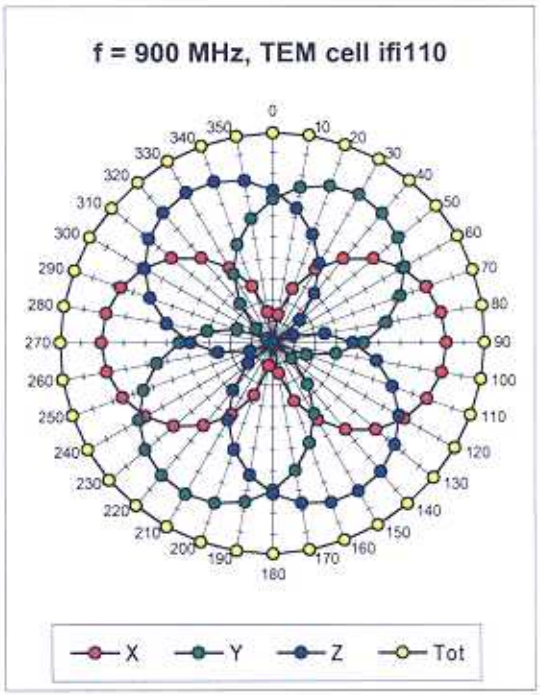
[A] numerical linearization parameter: uncertainty not required

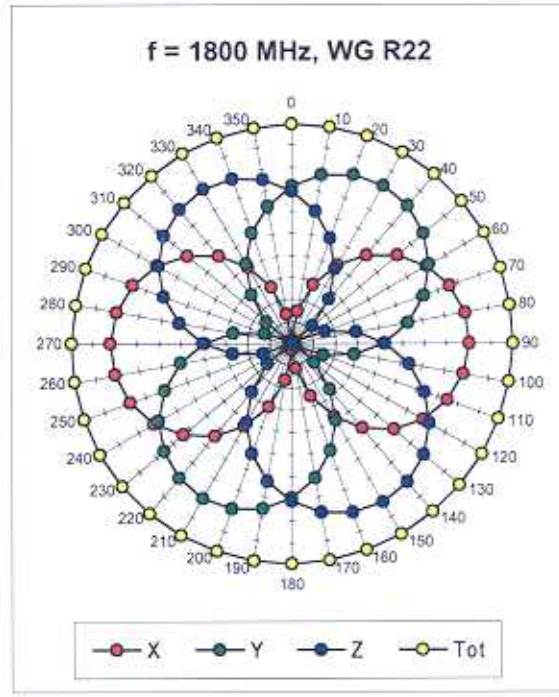
Frequency Response of E-Field

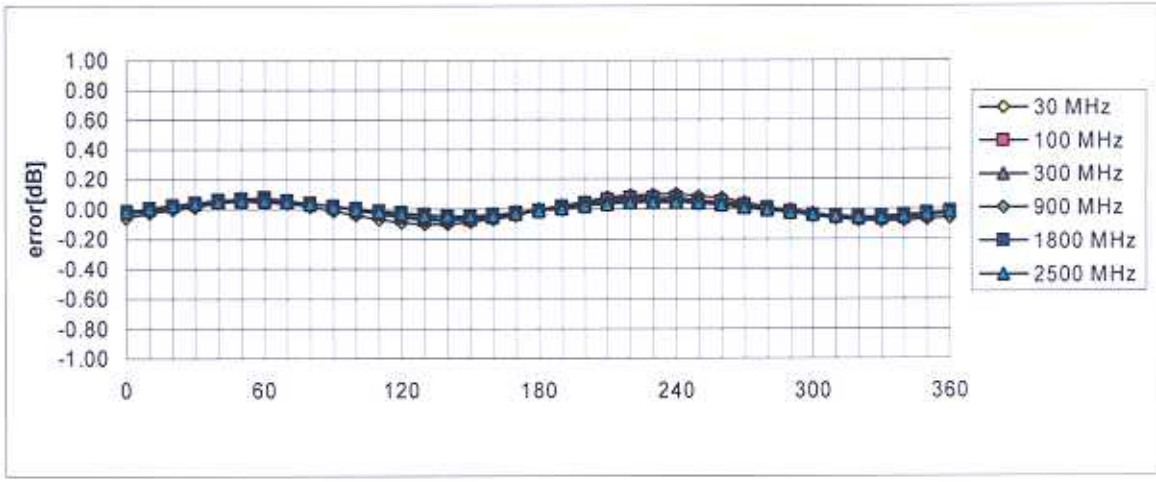
(TEM-Cell:ifi110, Waveguide R22)



Receiving Pattern (ϕ), θ = 0°



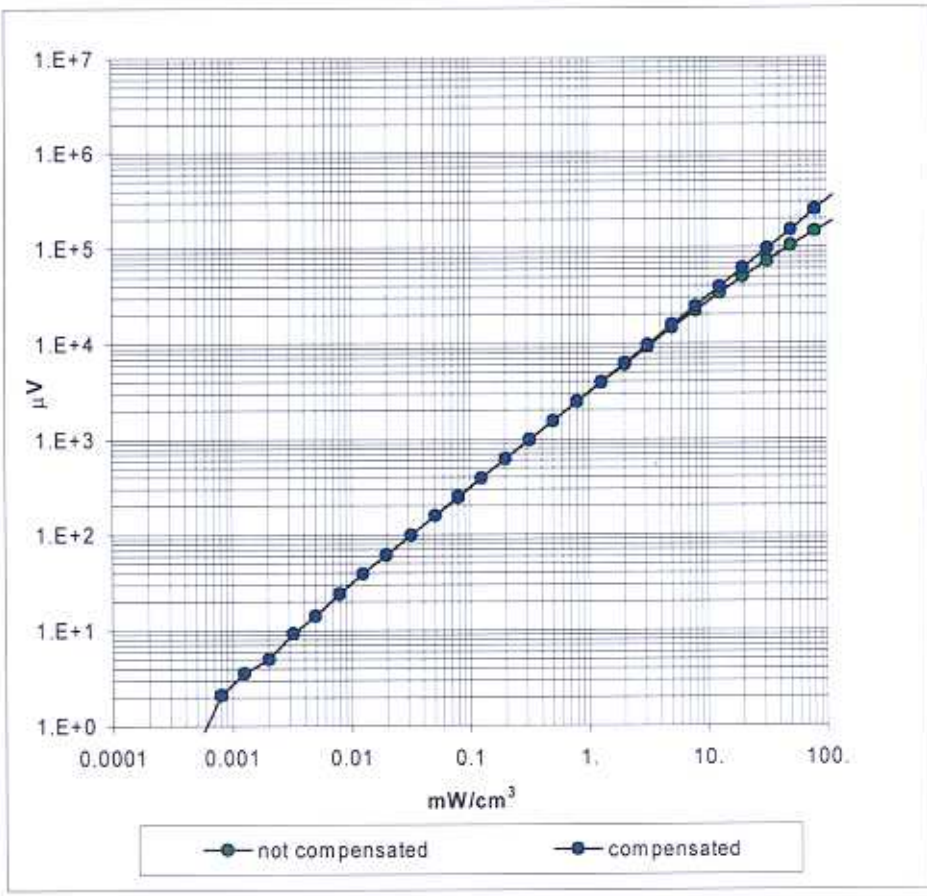


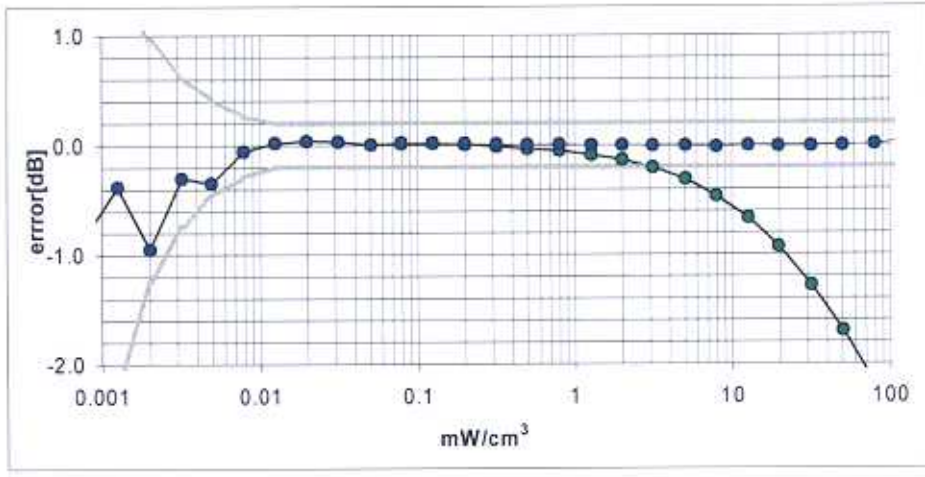


Axial Isotropy Error < ± 0.2 dB

Dynamic Range f(SAR_{head})

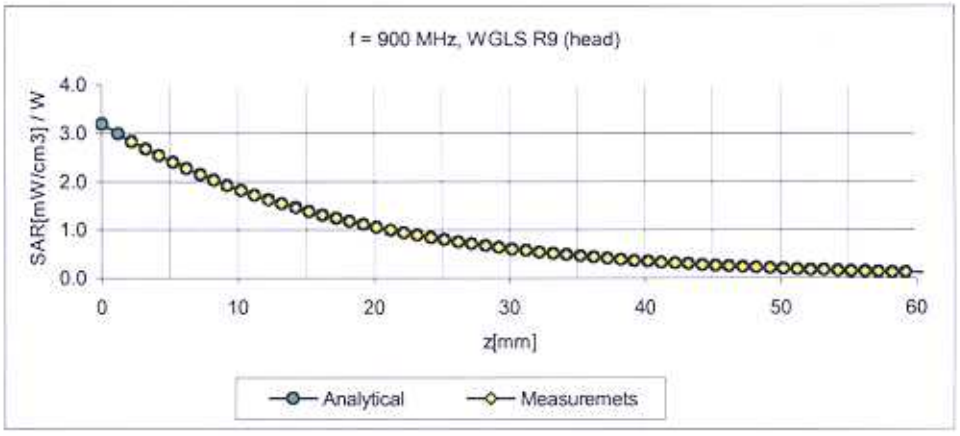
(Waveguide R22)





Probe Linearity Error < ± 0.2 dB

Conversion Factor Assessment

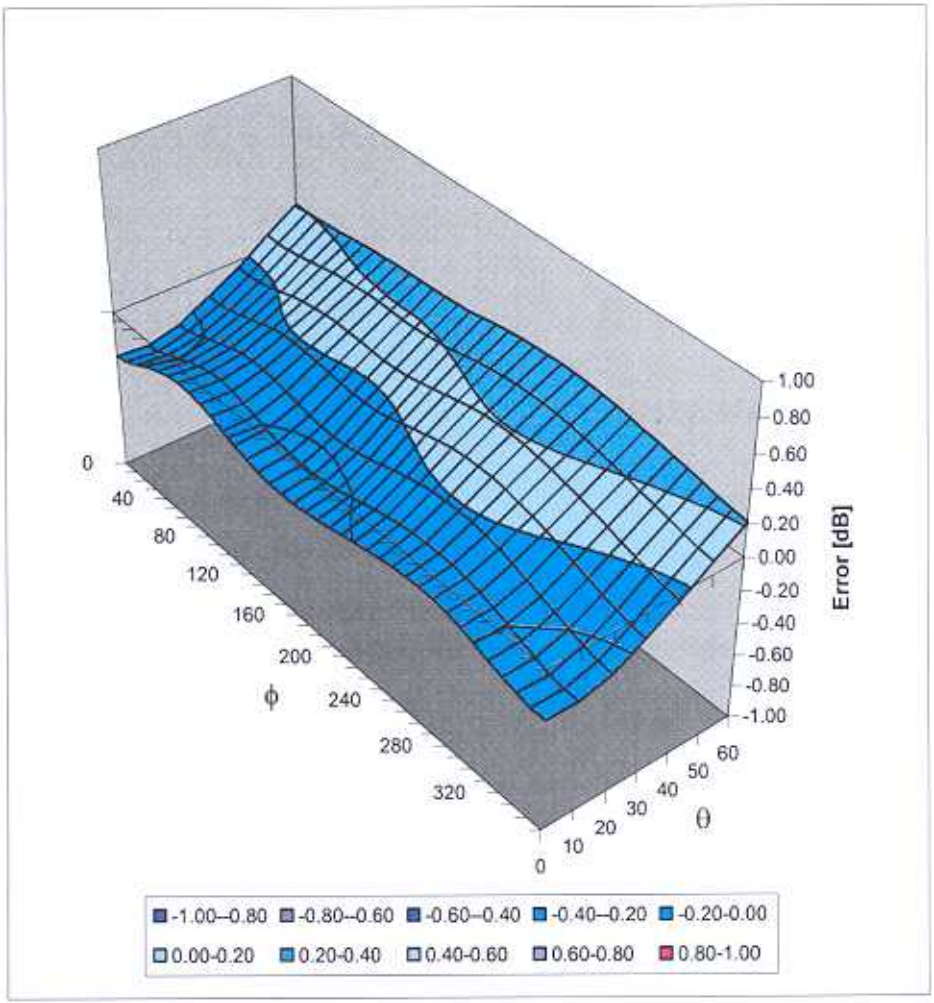


f [MHz]	Validity [MHz][8]	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	400-500	Head	43.5 ± 5%	0.87 ± 5%	0.09	1.86	10.3 ± 15.5% (k=2)
835	785-885	Head	41.5 ± 5%	0.90 ± 5%	0.32	0.99	10.7 ± 9.7% (k=2)
900	850-950	Head	41.5 ± 5%	0.97 ± 5%	0.36	0.92	10.2 ± 9.7% (k=2)
1450	1400-1500	Head	40.5 ± 5%	1.20 ± 5%	0.06	4.04	9.32 ± 9.7% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.10	2.26	9.03 ± 9.7% (k=2)
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.11	2.27	8.98 ± 9.7% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	0.33	0.92	8.11 ± 9.7% (k=2)
5200	5150-5250	Head	36.0 ± 5%	4.66 ± 5%	0.50	1.80	5.43 ± 13.6% (k=2)
5500	5450-5550	Head	35.6 ± 5%	4.96 ± 5%	0.50	1.90	4.94 ± 13.6% (k=2)
5800	5750-5850	Head	35.3 ± 5%	5.27 ± 5%	0.50	1.90	4.82 ± 13.6% (k=2)
450	400-500	Body	56.7 ± 5%	0.94 ± 5%	0.14	1.99	10.4 ± 15.5% (k=2)
835	785-885	Body	55.2 ± 5%	0.97 ± 5%	0.23	1.24	10.5 ± 9.7% (k=2)
900	850-950	Body	55.0 ± 5%	1.05 ± 5%	0.28	1.08	10.1 ± 9.7% (k=2)
1450	1400-1500	Body	54.0 ± 5%	1.30 ± 5%	0.07	4.66	9.19 ± 9.7% (k=2)
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.11	4.18	8.49 ± 9.7% (k=2)
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.12	4.68	8.10 ± 9.7% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	0.36	0.96	8.32 ± 9.7% (k=2)
5200	5150-5250	Body	49.0 ± 5%	5.30 ± 5%	0.50	1.90	4.83 ± 13.6% (k=2)
5500	5450-5550	Body	48.6 ± 5%	5.65 ± 5%	0.50	1.90	4.64 ± 13.6% (k=2)
5800	5750-5850	Body	48.2 ± 5%	6.00 ± 5%	0.45	1.90	4.64 ± 13.6% (k=2)

[8] The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (θ, φ), f = 900 MHz



Spherical Isotropy Error < ± 0.4 dB