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 Efield 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 realities 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. E030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Ool03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug02)	In house check: Aug05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct03)	In house check: Oct 05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oot03)	In house of

Calibrated by:

Name Function
Nico Vetterli Technician

Approved by:

Katja Pokovic Laboratory Director

Date issued: July 19, 2004

Signature

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

Diode Compression^A

NomX	0.81 μV/(V/m) ²	DCP X	95	mV
NormY	0.76 μV/(V/m) ²	DCP Y	95	mV
NomZ	0.79 μV/(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 Cente	er 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

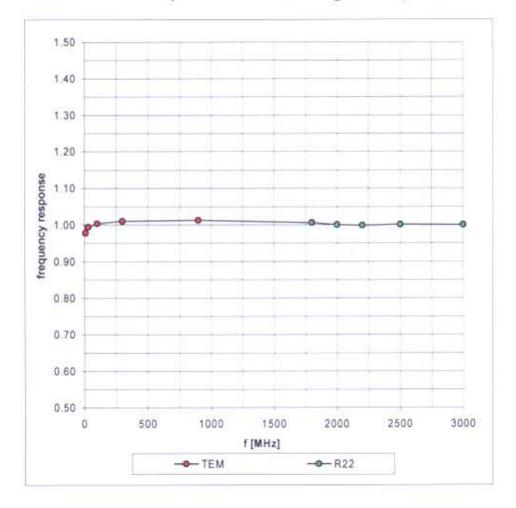
1.2 mm

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%.

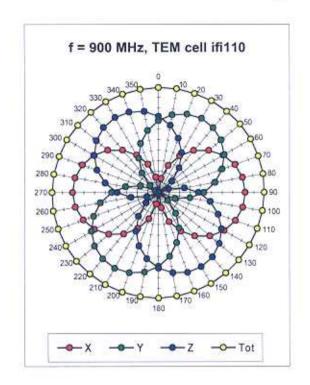
A numerical linearization parameter, uncertainty not required

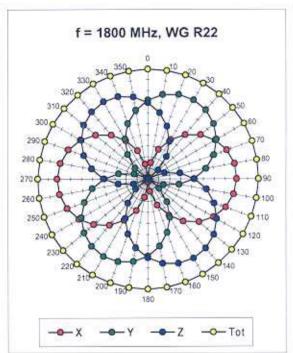
Frequency Response of E-Field

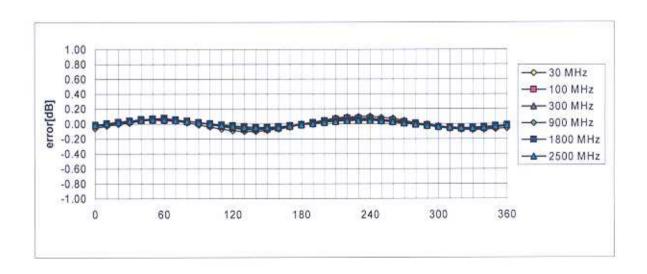
(TEM-Cell:ifi110, Waveguide R22)



Receiving Pattern (ϕ), θ = 0°



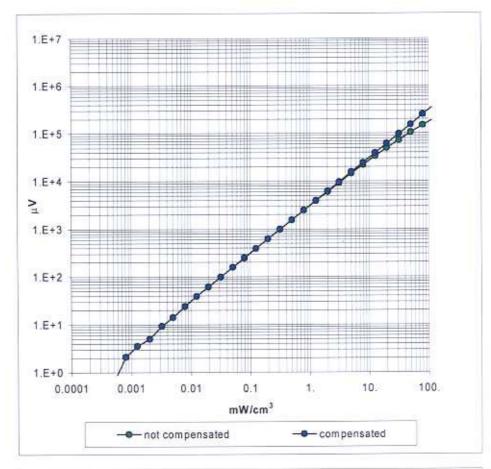


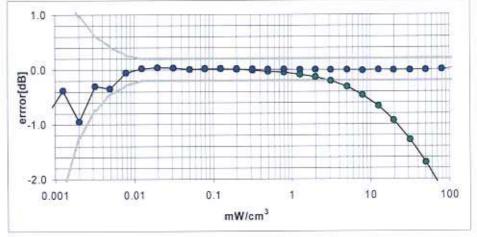


Axial Isotropy Error < ± 0.2 dB

Dynamic Range f(SAR_{head})

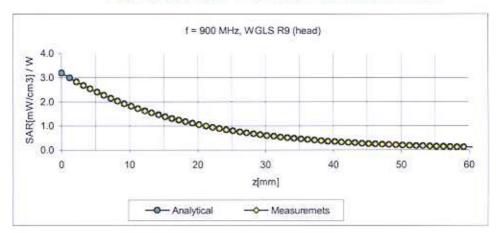
(Waveguide R22)





Probe Linearity Error < ± 0.2 dB

Conversion Factor Assessment

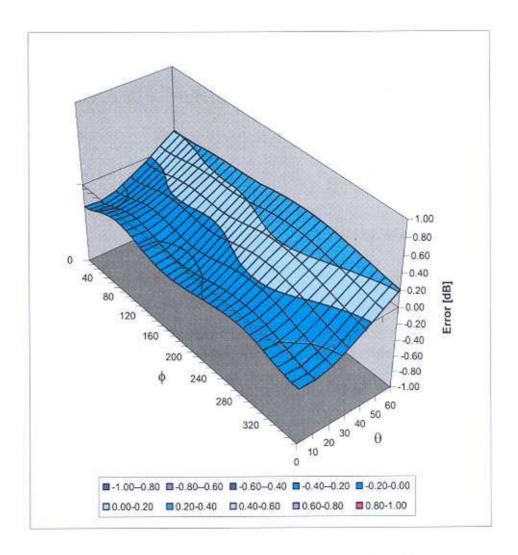


Validity [MHz] ⁸	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
400-500	Head	43.5 ± 5%	0.87 ± 5%	0.09	1.86	10.3	± 15.5% (k=2)
785-885	Head	41.5 ± 5%	0.90 ± 5%	0.32	0.99	10.7	± 9.7% (k=2)
850-950	Head	41.5 ± 5%	0.97 ± 5%	0.36	0.92	10.2	± 9.7% (k=2)
1400-1500	Head	40.5 ± 5%	1.20 ± 5%	0.06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

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