

Appendix C:

Probe Calibration Parameters

03 9929

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

Client **Kyocera USA**

CALIBRATION CERTIFICATE																																			
Object(s)	ET3DV6 - SN:1664																																		
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes																																		
Calibration date:	September 2, 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) <table border="1"> <thead> <tr> <th>Model Type</th> <th>ID #</th> <th>Cal Date (Calibrated by, Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter EPM E4419B</td> <td>GB41293874</td> <td>5-May-04 (METAS, No 251-00388)</td> <td>May-05</td> </tr> <tr> <td>Power sensor E4412A</td> <td>MY41495277</td> <td>5-May-04 (METAS, No 251-00388)</td> <td>May-05</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: 5086 (20b)</td> <td>3-May-04 (METAS, No 251-00389)</td> <td>May-05</td> </tr> <tr> <td>Fluke Process Calibrator Type 702</td> <td>SN: 6295803</td> <td>8-Sep-03 (Sintrel SCS No. E030020)</td> <td>Sep-04</td> </tr> <tr> <td>Power sensor HP 8481A</td> <td>MY41092180</td> <td>18-Sep-02 (SPEAG, in house check Oct03)</td> <td>In house check: Oct 05</td> </tr> <tr> <td>RF generator HP 8684C</td> <td>US3642U01700</td> <td>4-Aug-99 (SPEAG, in house check Aug02)</td> <td>In house check: Aug05</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585</td> <td>18-Oct-01 (SPEAG, in house check Oct03)</td> <td>In house check: Oct 05</td> </tr> </tbody> </table>				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 Oct03)	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
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Calibrated by:	Name Nico Vetterli	Function Technician	Signature 																																
Approved by:	Name Katja Pokovic	Function Laboratory Director	Signature 																																
Date issued: September 2, 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 ET3DV6

SN:1664

Manufactured:	February 8, 2002
Last calibrated:	August 29, 2003
Repaired:	August 25, 2004
Recalibrated:	September 2, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1664

September 2, 2004

DASY - Parameters of Probe: ET3DV6 SN:1664

Sensitivity in Free Space

Diode Compression^A

NormX	$1.89 \mu V/(V/m)^2$
NormY	$1.82 \mu V/(V/m)^2$
NormZ	$1.66 \mu V/(V/m)^2$

DCP X	96	mV
DCP Y	96	mV
DCP Z	96	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	9.0	4.6
SAR _{be} [%]	With Correction Algorithm	0.1	0.3

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

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	13.0	8.7
SAR _{be} [%]	With Correction Algorithm	0.1	0.1

Sensor Offset

Probe Tip to Sensor Center	2.7 mm
Optical Surface Detection	in tolerance

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%.

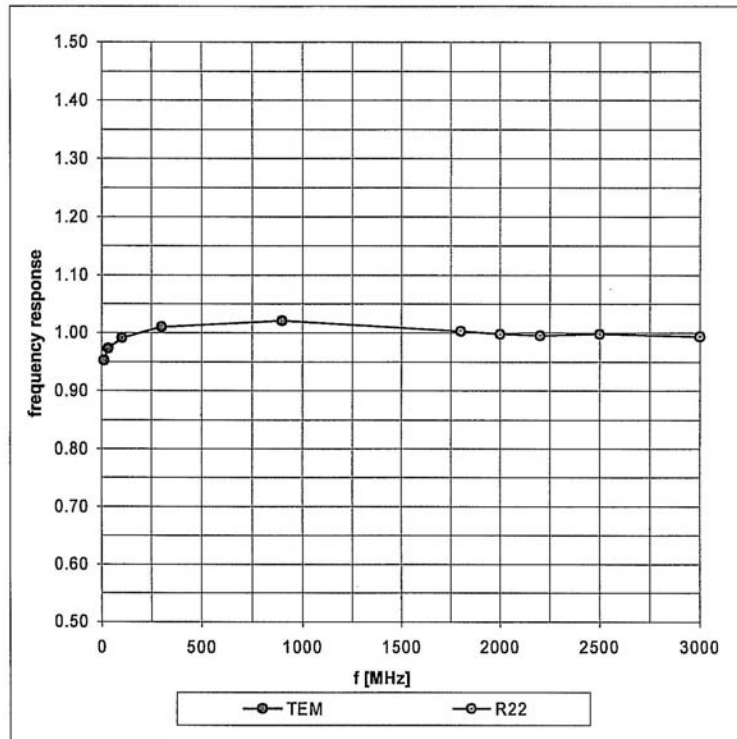
^A numerical linearization parameter: uncertainty not required

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Frequency Response of E-Field

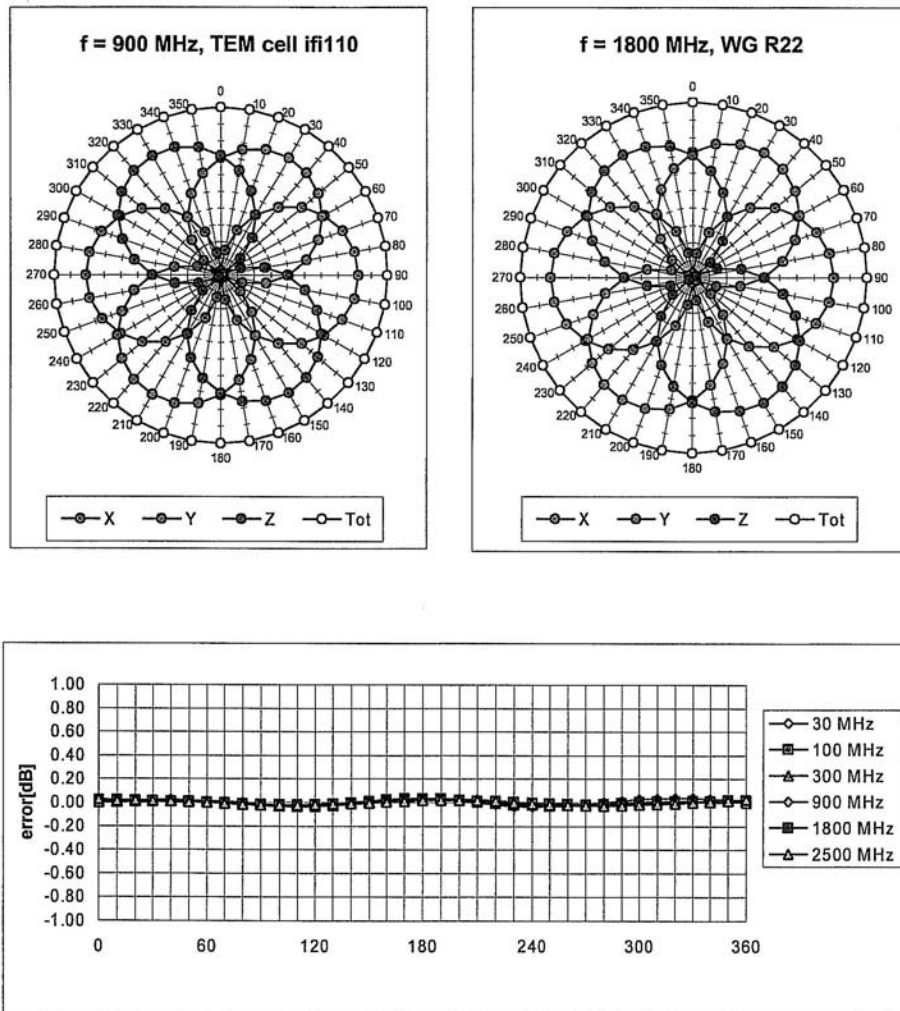
(TEM-Cell:ifi110, Waveguide R22)



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

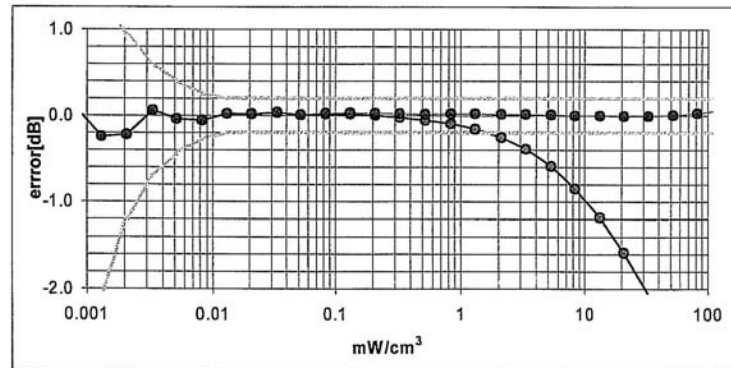
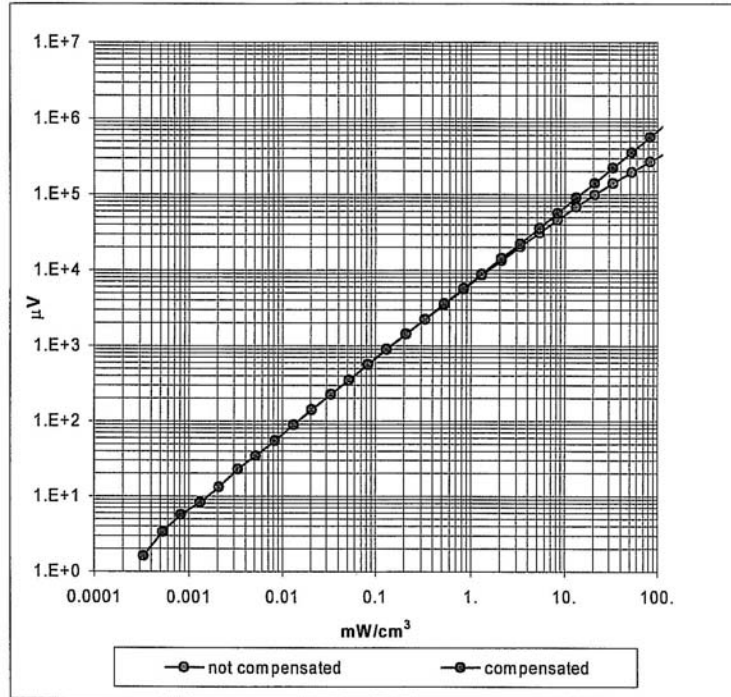


Axial Isotropy Error $< \pm 0.2$ dB

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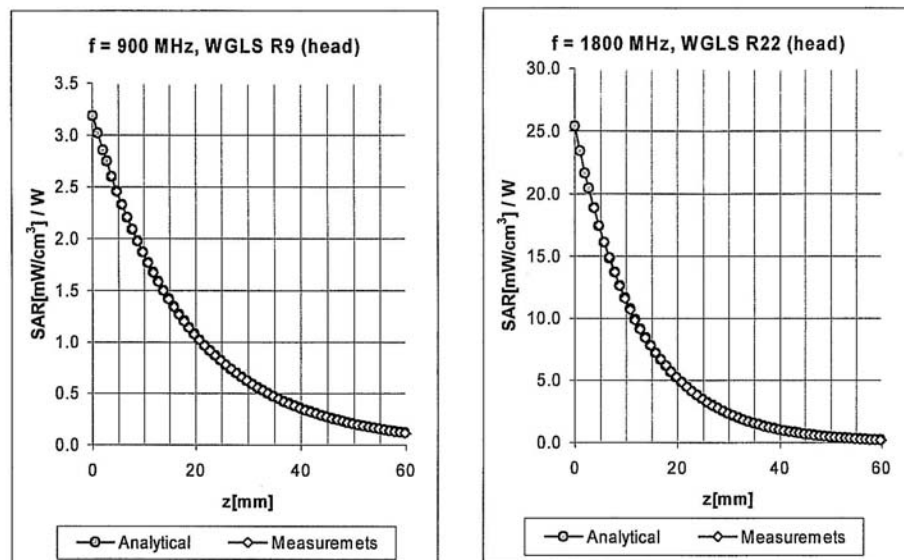
Dynamic Range f(SAR_{head}) (Waveguide R22)


Probe Linearity Error $< \pm 0.2$ dB

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Conversion Factor Assessment



f [MHz]	Validity [MHz] ^B	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	800-1000	Head	41.5 ± 5%	0.97 ± 5%	0.64	1.80	6.56 ± 11.3% (k=2)
1800	1710-1910	Head	40.0 ± 5%	1.40 ± 5%	0.48	2.61	5.43 ± 11.7% (k=2)
900	800-1000	Body	55.0 ± 5%	1.05 ± 5%	0.52	2.11	6.17 ± 11.3% (k=2)
1800	1710-1910	Body	53.3 ± 5%	1.52 ± 5%	0.55	2.73	4.72 ± 11.7% (k=2)

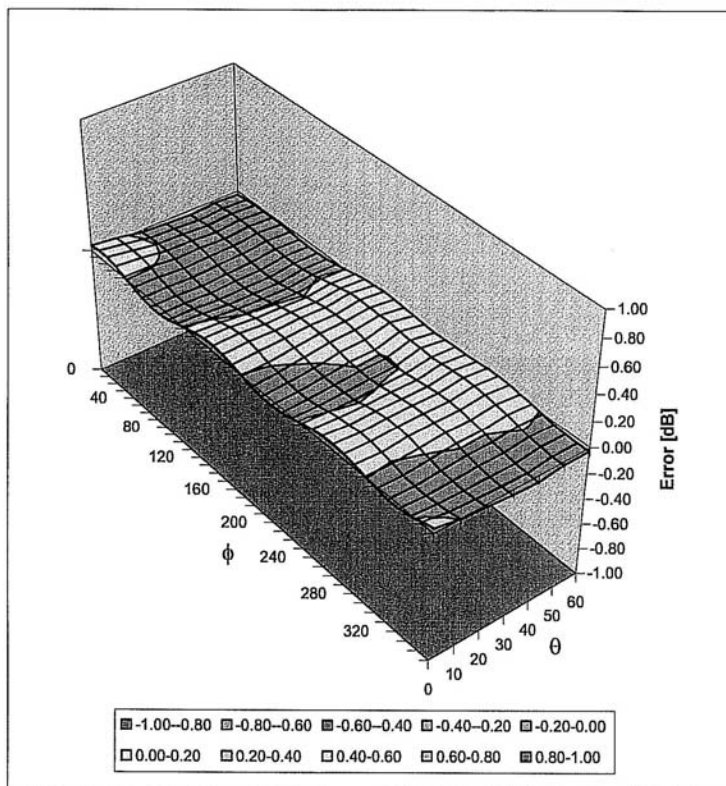
^B The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

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Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



Spherical Isotropy Error $< \pm 0.4$ dB

Schmid & Partner Engineering AG

s p e a g

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**CUSTOMER
COPY**

PROBE REPAIR REPORT – SPEAG Production Center

PRODUCT:		ET3DV6 Probe	
SERIAL Nr.:	1664	IN DATE:	23-Aug-2004
CUSTOMER:		Kyocera USA	
PROBE REPAIR	WORK DESCRIPTION		WORKING TIME (h)
MATERIAL			
Proximity Sensor (PEEK)	fixed ☐	exchanged ☒	3.50 hours
Core replacement:	fixed ☐	exchanged ☒	2.00 hours
Dipole sensor:	fixed ☐	exchanged ☐	hours
Substrate:	fixed ☐	exchanged ☒	1.50 hours
Components (diodes)	fixed ☐	exchanged ☒	1.50 hours
Components (capacitors)	fixed ☐	exchanged ☒	1.50 hours
Bonding R-lines - substrate	fixed ☐	exchanged ☒	1.50 hours
Probe tip:	fixed ☐	exchanged ☒	hours
Probe connector:	fixed ☐	exchanged ☒	0.50 hours
Probe tube	fixed ☐	exchanged ☐	hours
Analaysys:			hours
Final Assembly:			1.00 hours
Total hours			13.00 hours
COMMENTS: After the probe was opened, glycol was found inside the probe. This Glycol has damaged the electronic components inside the probe and softened the bonding. The complete core including all components were exchanged and the probe re assembled with a new proximity sensor and a new probe tip.			
CONDUCTED BY:		APPROVED BY:	
i.v. Blumer		Blumer	
DATE:		DATE:	
25. Aug 04		26. Aug 04	
REPAIR COST:			
MATERIAL COST:		USD	Euro
1965.00		☒	☐
REPAIR:		USD	Euro
1950.00		☒	☐
TOTAL COST:		QUOTATION #:	
S+M			
APPROVED BY:			
[Signature]			
DATE:			
27. Aug 04			
860-SPET3006_1664_040826-C.xls			

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