



Accredited testing laboratory

DAR registration number: TTI-P-G 166/98

**Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97**

**Appendix to test report 4-1220-31-03/04-C
Calibration data, Phantom certificate
and detail information of the DASY4 System**

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1 Calibration report "Probe ET3DV6"

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

Client **Cetecom**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1558**

Calibration procedure(s) **QA CAL-01.v2**
Calibration procedure for dosimetric E-field probes

Calibration date: **September 6, 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
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

Calibrated by: **Name** **Function** **Signature**
Nico Vetterli **Technician** 

Approved by: **Katja Pokovic** **Laboratory Director** 

Date issued: September 6, 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:1558

Manufactured: September 16, 2003
Last calibrated: September 6, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1558

September 6, 2004

DASY - Parameters of Probe: ET3DV6 SN:1558**Sensitivity in Free Space****Diode Compression^A**

NormX	2.03 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.92 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.63 $\mu\text{V}/(\text{V}/\text{m})^2$

DCP X	94	mV
DCP Y	94	mV
DCP Z	94	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	9.6	5.2
SAR _{be} [%]	With Correction Algorithm	0.1	0.2

Head 1750 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	13.8	9.0
SAR _{be} [%]	With Correction Algorithm	0.2	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%.

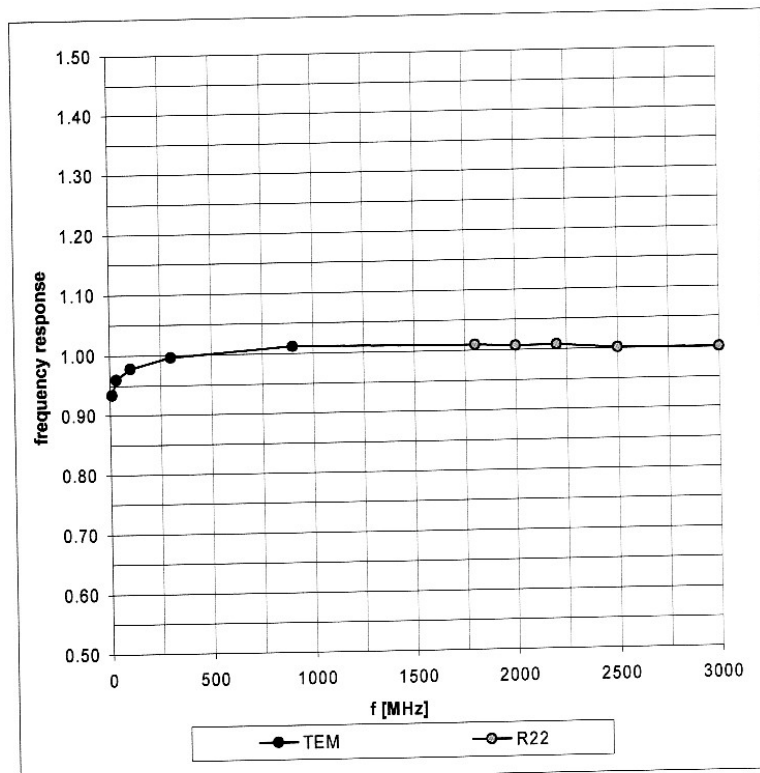
^A numerical linearization parameter: uncertainty not required

ET3DV6 SN:1558

September 6, 2004

Frequency Response of E-Field

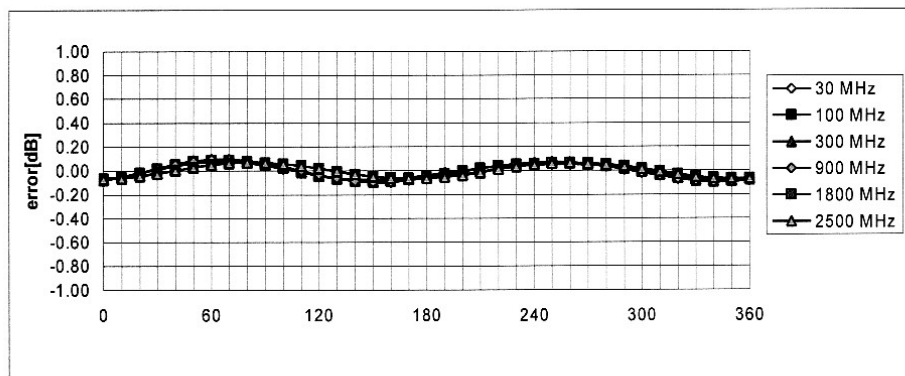
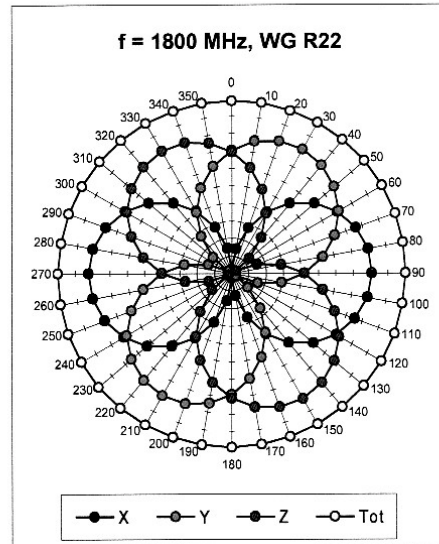
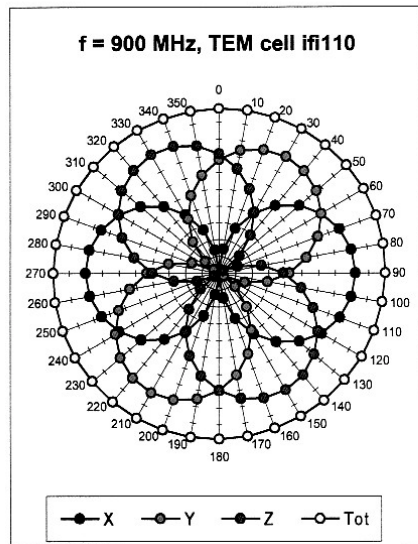
(TEM-Cell:ifi110, Waveguide R22)



ET3DV6 SN:1558

September 6, 2004

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

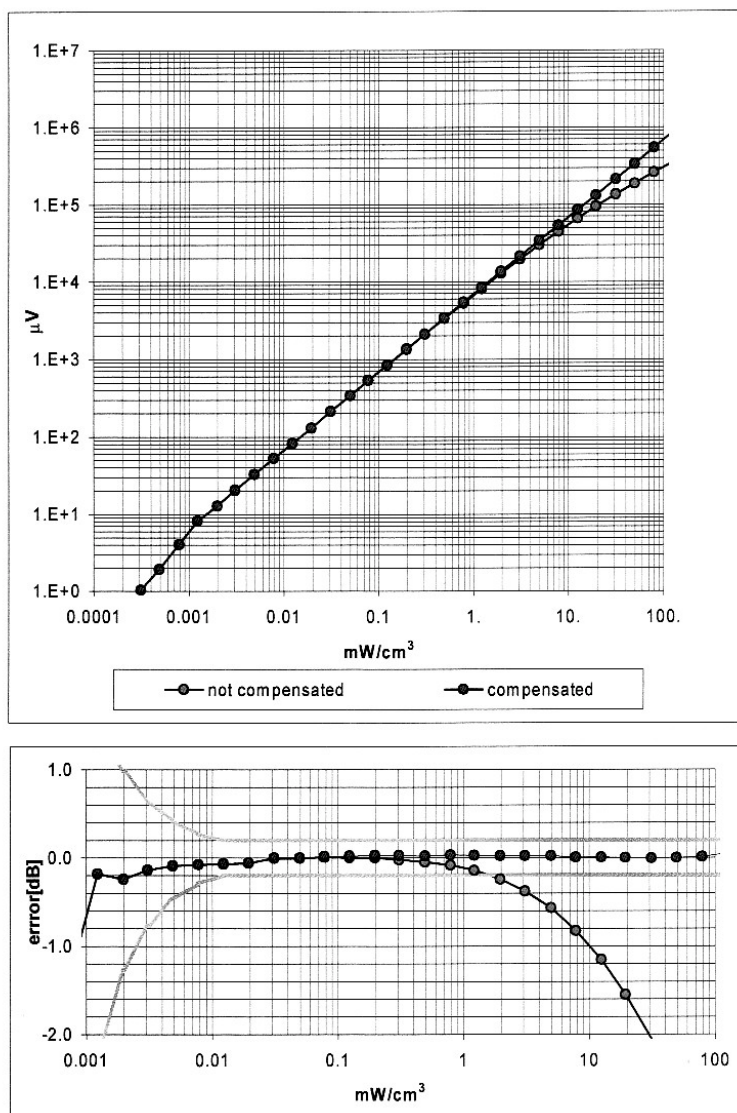


Axial Isotropy Error < ± 0.2 dB

ET3DV6 SN:1558

September 6, 2004

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

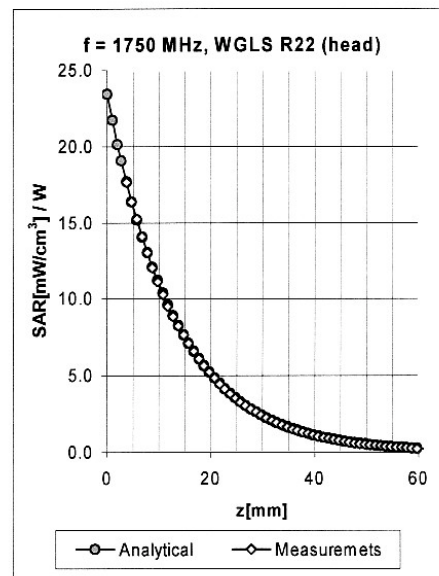
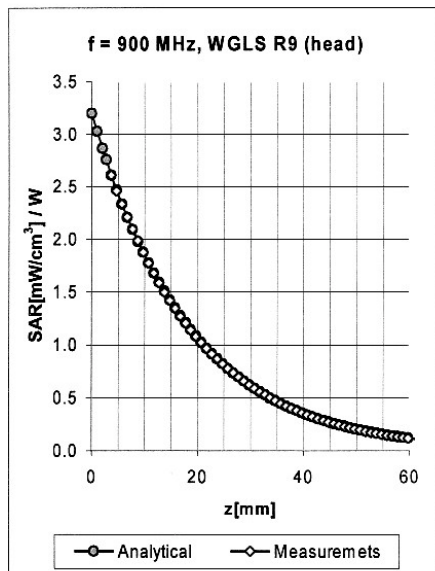


Probe Linearity Error $< \pm 0.2$ dB

ET3DV6 SN:1558

September 6, 2004

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^B	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
835	785-885	Head	41.5 ± 5%	0.90 ± 5%	0.60	1.89	6.31	± 9.7% (k=2)
900	850-950	Head	41.5 ± 5%	0.97 ± 5%	0.62	1.89	6.03	± 9.7% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.52	2.56	4.96	± 9.7% (k=2)
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.52	2.64	4.82	± 9.7% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	0.95	1.92	4.27	± 9.7% (k=2)
835	785-885	Body	55.2 ± 5%	0.97 ± 5%	0.51	2.15	6.01	± 9.7% (k=2)
900	850-950	Body	55.0 ± 5%	1.05 ± 5%	0.47	2.24	5.78	± 9.7% (k=2)
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.52	2.85	4.45	± 9.7% (k=2)
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.57	2.83	4.32	± 9.7% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.01	1.69	4.06	± 9.7% (k=2)

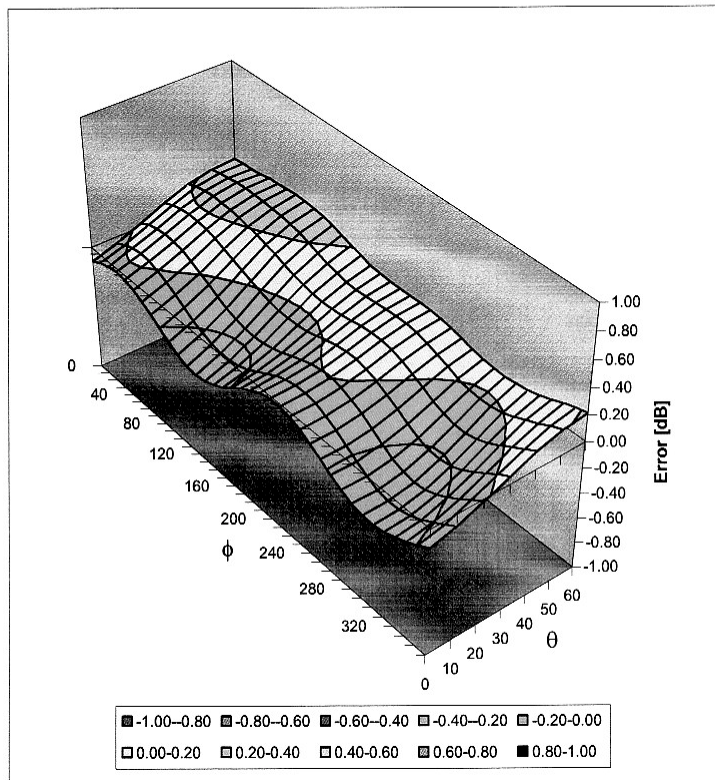
^B The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

ET3DV6 SN:1558

September 6, 2004

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz


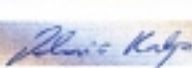


Spherical Isotropy Error $< \pm 0.4$ dB

2 Calibration report "Probe ET3DV6"

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

Client **Cetecom**

CALIBRATION CERTIFICATE																																			
Object(s)	ET3DV6 - SN:1559																																		
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric field probes																																		
Calibration date:	July 18, 2004																																		
Condition of the calibrated item	In Tolerance (according to the specific calibration document)																																		
<p>This calibration certificate documents the traceability to national standards, which realize 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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature 22 \pm 2 degrees Celsius and humidity < 75%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <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>Risik Process Calibrator Type 702</td><td>SN: 6295803</td><td>8-Sep-03 (Sintef SCS No. 5030020)</td><td>Sep-04</td></tr><tr><td>Power sensor HP 8481A</td><td>MY41062180</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>US3842U01700</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>US37396585</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	Risik Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintef SCS No. 5030020)	Sep-04	Power sensor HP 8481A	MY41062180	18-Sep-02 (SPEAG, in house check Oct03)	In house check: Oct 05	RF generator HP 8684C	US3842U01700	4-Aug-99 (SPEAG, in house check Aug02)	In house check: Aug05	Network Analyzer HP 8753E	US37396585	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 Pokorski	Function Laboratory Director	Signature 																																
Date issued: July 19, 2004																																			
<p>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.</p>																																			

Probe ET3DV6

SN:1559

Manufactured:	December 1, 2000
Last calibrated:	April 16, 2003
Recalibrated:	July 18, 2004

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1559

July 18, 2004

DASY - Parameters of Probe: ET3DV6 SN:1559

Sensitivity in Free Space		Diode Compression ^A	
NormX	1.76 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	94 mV
NormY	1.56 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	94 mV
NormZ	1.71 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	94 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 _{ref} [%] Without Correction Algorithm	8.5	4.7
	SAR _{ref} [%] With Correction Algorithm	0.0	0.1
Head	1750 MHz	Typical SAR gradient: 10 % per mm	
	Sensor Center to Phantom Surface Distance	3.7 mm	4.7 mm
	SAR _{ref} [%] Without Correction Algorithm	12.2	7.7
	SAR _{ref} [%] With Correction Algorithm	0.0	0.3

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%.

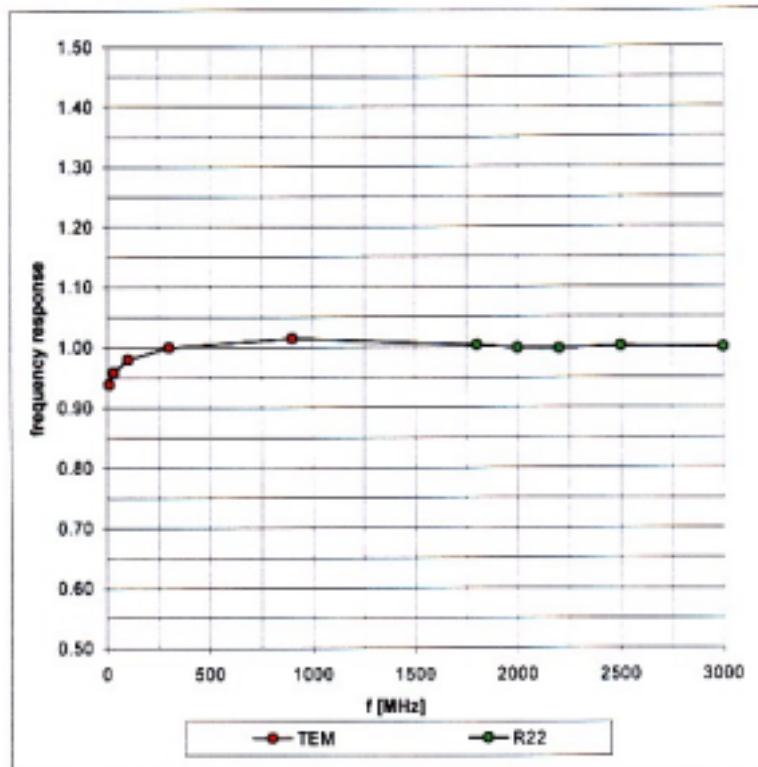
^A numerical linearization parameter, uncertainty not required

ET3DV6 SN:1559

July 18, 2004

Frequency Response of E-Field

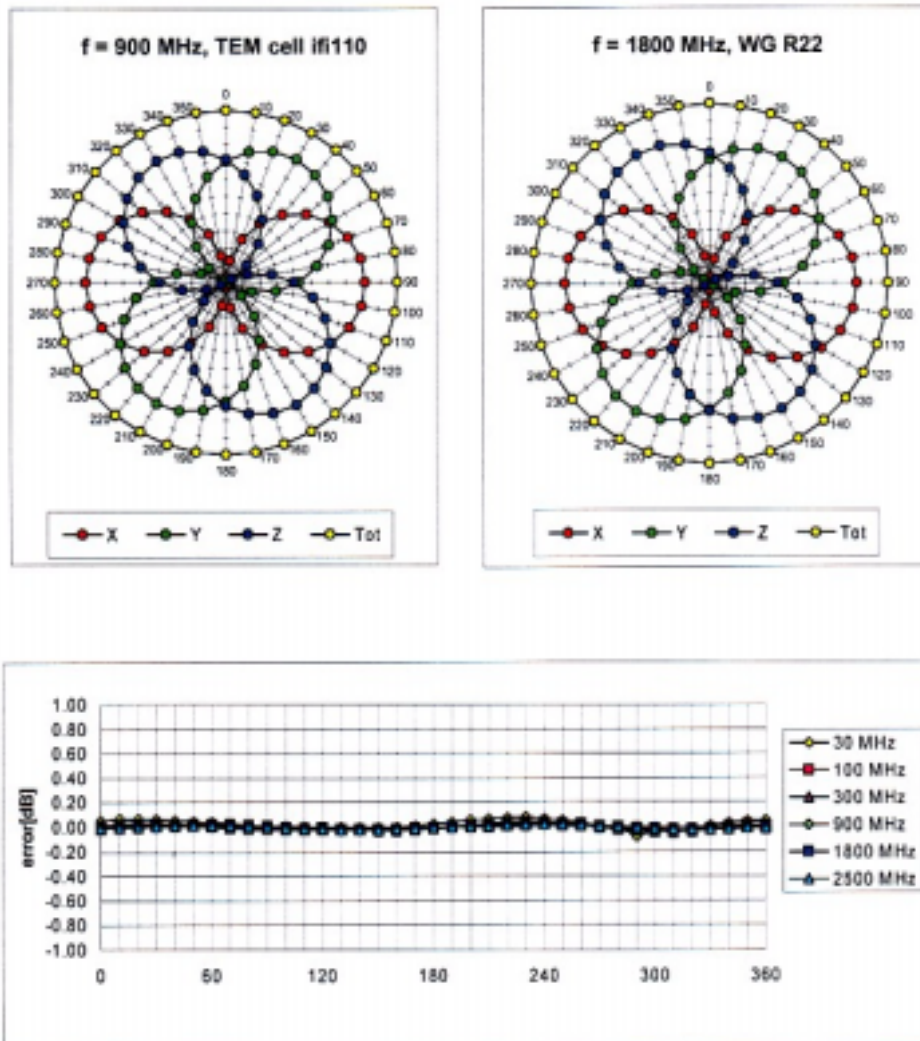
(TEM-Cell:ifi110, Waveguide R22)



ET3DV6 SN:1559

July 18, 2004

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

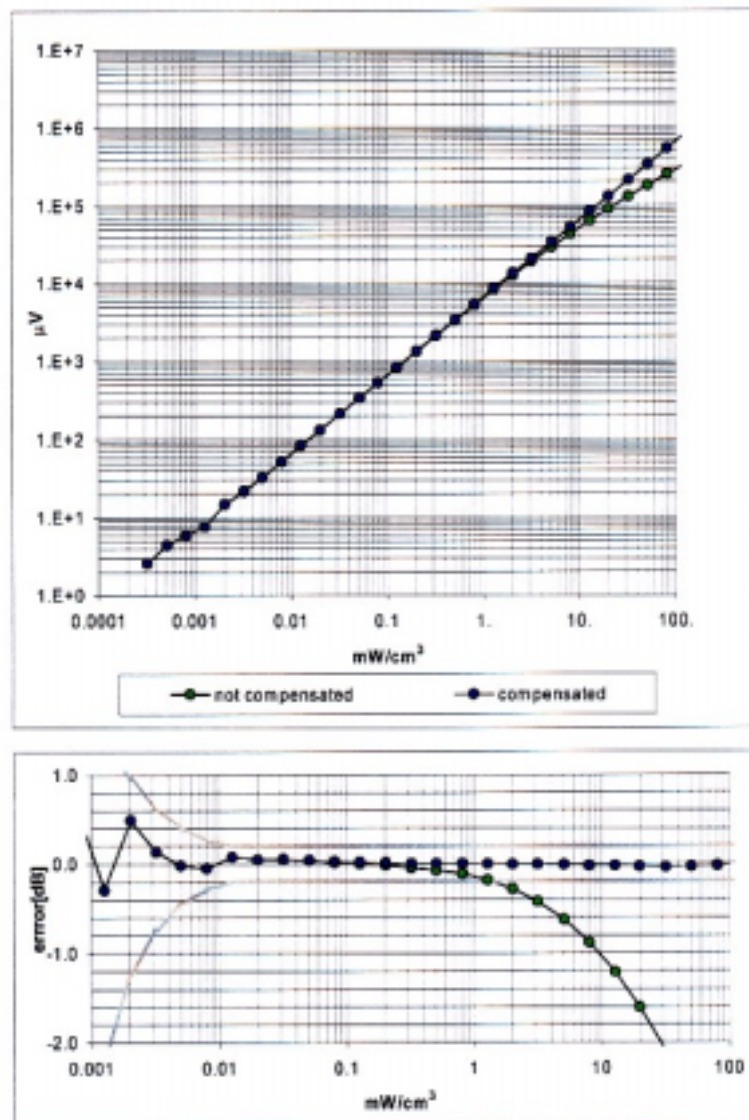


Axial Isotropy Error $< \pm 0.2 \text{ dB}$

ET3DV6 SN:1559

July 18, 2004

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

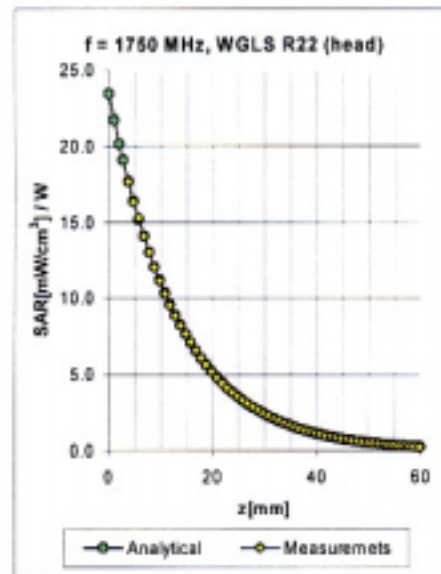
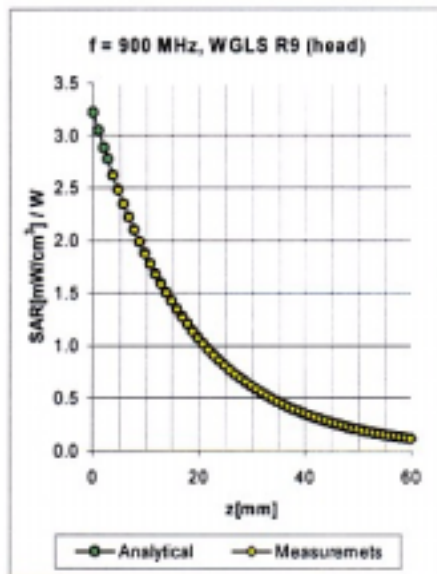


Probe Linearity Error $< \pm 0.2$ dB

ET3DV6 SN:1559

July 18, 2004

Conversion Factor Assessment



f [MHz]	Validity [MHz] [®]	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	850-950	Head	41.5 ± 5%	0.97 ± 5%	0.53	1.93	6.59 ± 9.7% (k=2)
1750	1700-1800	Head	40.0 ± 5%	1.40 ± 5%	0.46	2.58	5.37 ± 9.7% (k=2)
1900	1850-1950	Head	40.0 ± 5%	1.40 ± 5%	0.48	2.79	5.13 ± 9.7% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	0.81	1.92	4.56 ± 9.7% (k=2)
450	400-500	Body	56.7 ± 5%	0.94 ± 5%	0.29	2.46	7.13 ± 15.5% (k=2)
900	850-950	Body	55.0 ± 5%	1.05 ± 5%	0.46	2.26	6.21 ± 9.7% (k=2)
1750	1700-1800	Body	53.3 ± 5%	1.52 ± 5%	0.48	2.94	4.60 ± 9.7% (k=2)
1900	1850-1950	Body	53.3 ± 5%	1.52 ± 5%	0.53	2.90	4.40 ± 9.7% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.11	1.55	4.21 ± 9.7% (k=2)

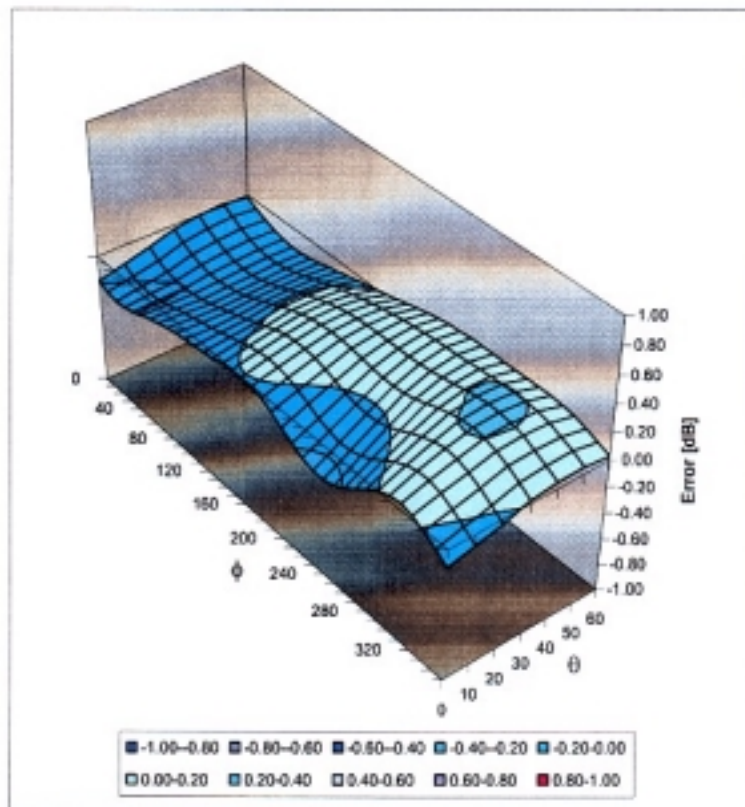
[®] The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

ET3DV6 SN:1559

July 18, 2004

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz


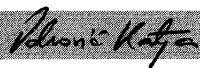


Spherical Isotropy Error $< \pm 0.4$ dB

3 Calibration report "900 MHz System validation dipole"

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

Client **Cetecomm**

CALIBRATION CERTIFICATE			
Object(s)	D900V2 - SN:102		
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits		
Calibration date:	February 4, 2003		
Condition of the calibrated item	In Tolerance (according to the specific calibration document)		
This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.			
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	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03
Calibrated by:	Name Nico Vetterli	Function Technician	Signature 
Approved by:	Katja Pokovic	Laboratory Director	
Date issued: February 7, 2003			
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.			