Fax: -8475





Phone: +49 (0) 681 598-8454

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 2-3816-01-03/04 Calibration data, Phantom certificate and detail information of the DASY4 System

Calibration Data and Phantom Information to test report no.: 2-3816-01-03/04



### **Table of Content**

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	Calibration report "900 MHz System validation dipole"	
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	Certificate of "SAM Twin Phantom V4.0/V4.0C"	
	Application Note System Performance Check	
	- Tr	



# 1 Calibration report "Probe ET3DV6"

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

Client Cetecom

Dbject(s)	ET3DV6 - SN:	1558					
bbjeci(s)	L13040-014	1000					
Calibration procedure(s)	QA CAL-01.v2 Calibration pro	2 ocedure for dosimetric E-field prob	es				
Calibration date:	September6,	2004					
Condition of the calibrated item In Tolerance (according to the specific calibration document)							
he measurements and the unce	ertainties with confidence p	ional standards, which realize the physical units of m probability are given on the following pages and are p any facility: environment temperature 22 +/- 2 degrees	part of the certificate.				
Calibration Equipment used (M&	TE critical for calibration)						
Nodel Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration				
ower meter EPM E4419B	GB41293874	5-May-04 (METAS, No 251-00388)	May-05				
ower 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 RF generator HP 8684C	MY41092180 US3642U01700	18-Sep-02 (SPEAG, in house check Oct03) 4-Aug-99 (SPEAG, in house check Aug02)	In house check: Oct 05 In house check: Aug05				
letwork Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct03)	In house check: Oct 05				
	Name	Function	Signature				
Calibrated by:	Nico Vetterli	Technician	N. Kter				
pproved by:	Katja Pokovic	Laboratory Director	D. Ctel				
			Date issued:September6, 2004				
his calibration certificate is issue alibration Laboratory of Schmid	ed as an intermediate solu	tion until the accreditation process (based on ISO/IE	C 17025 International Standard) for				

880-KP0301061-A

Page 1 of 8



# Probe ET3DV6

# SN:1558

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

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Page 2 of 8

Calibration Data and Phantom Information to test report no.: 2-3816-01-03/04



#### September 6, 2004 ET3DV6 SN:1558 DASY - Parameters of Probe: ET3DV6 SN:1558 Diode Compression<sup>A</sup> Sensitivity in Free Space 2.03 µV/(V/m)<sup>2</sup> DCP X m٧ NormX 94 **1.92** μV/(V/m)<sup>2</sup> DCP Y NormY 94 mV 1.63 μV/(V/m)<sup>2</sup> m٧ NormZ DCP Z 94 Sensitivity in Tissue Simulating Liquid (Conversion Factors) Please see Page 7. **Boundary Effect** Head 900 MHz Typical SAR gradient: 5 % per mm 3.7 mm 4.7 mm Sensor Center to Phantom Surface Distance 9.6 5.2 SAR<sub>be</sub> [%] Without Correction Algorithm 0.1 02 SAR<sub>be</sub> [%] With Correction Algorithm 1750 MHz Typical SAR gradient: 10 % per mm Head Sensor Center to Phantom Surface Distance 3.7 mm 4.7 mm 13.8 9.0 SAR<sub>be</sub> [%] Without Correction Algorithm SAR<sub>be</sub> [%] With Correction Algorithm 0.2 0.1 Sensor Offset 2.7 Probe Tip to Sensor Center mm in tolerance **Optical Surface Detection** 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

A numerical linearization parameter: uncertainty not required

corresponds to a coverage probability of approximately 95%.

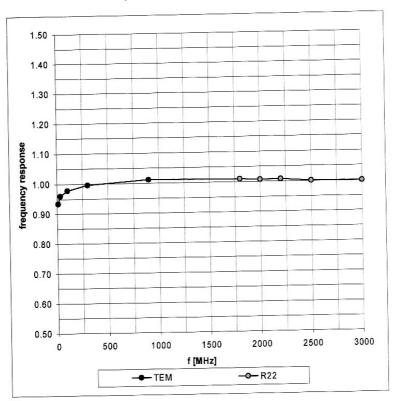
Page 3 of 8



#### ET3DV6 SN:1558

September 6, 2004

# Frequency Response of E-Field



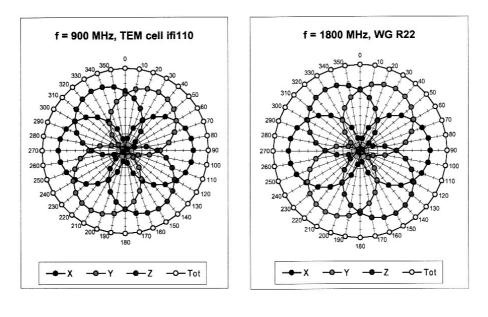
(TEM-Cell:ifi110, Waveguide R22)

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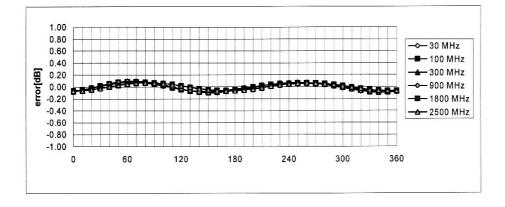


#### ET3DV6 SN:1558

September 6, 2004



## Receiving Pattern ( $\phi$ ), $\theta$ = 0°



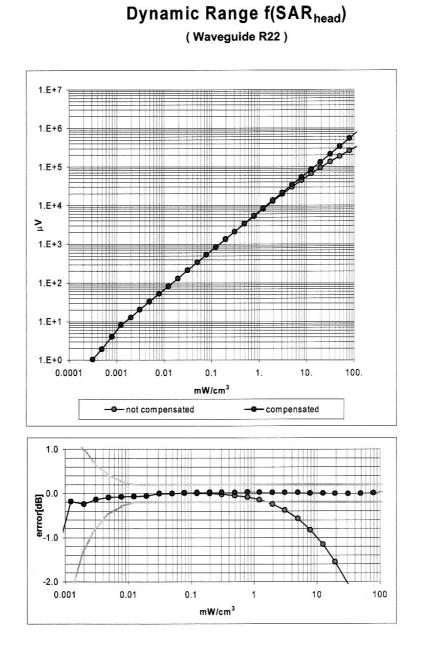
Axial Isotropy Error < ± 0.2 dB

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# CETECOM

#### ET3DV6 SN:1558

September 6, 2004



Probe Linearity Error < ± 0.2 dB

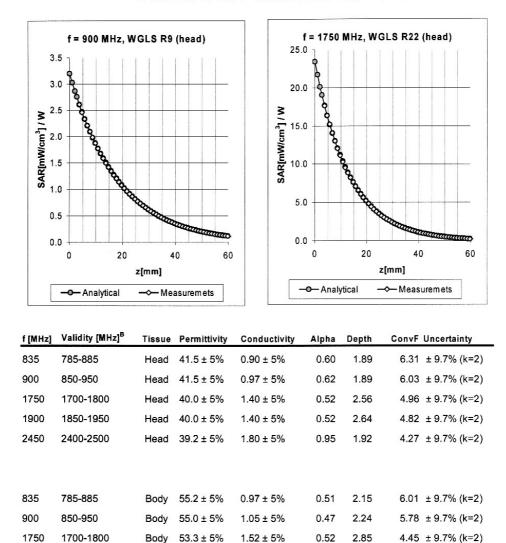
Page 6 of 8

Calibration Data and Phantom Information to test report no.: 2-3816-01-03/04



#### ET3DV6 SN:1558

September 6, 2004



#### **Conversion Factor Assessment**

<sup>8</sup> 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.

 $1.52 \pm 5\%$ 

 $1.95 \pm 5\%$ 

0.57

1.01

2.83

1.69

4.32 ± 9.7% (k=2)

4.06 ± 9.7% (k=2)

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1900

2450

1850-1950

2400-2500

Body

Body

 $53.3 \pm 5\%$ 

52.7 ± 5%

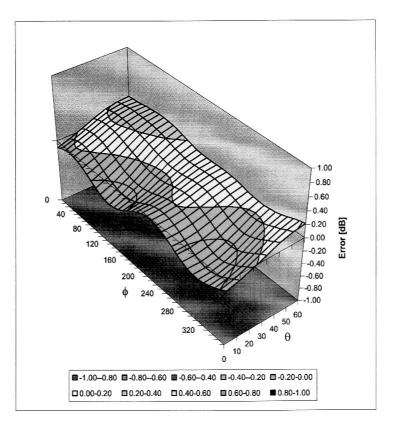


ET3DV6 SN:1558

September 6, 2004

### Deviation from Isotropy in HSL

Error ( $\theta$ ,  $\phi$ ), f = 900 MHz



Spherical Isotropy Error < ± 0.4 dB

Page 8 of 8



Calibration Data and Phantom Information to test report no.: 2-3816-01-03/04

Calibration Laboratory Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich,						
Engineering AG Zeughausstrasse 43, 8004 Zurich,	. Switzerland					
Zeughausstrasse 43, 8004 Zurich,	Switzerland					
Client Ceteco	m					
CALIBRATION	ERTIFICAT	ſE				
	ET3DV6 - SN					
Object(s)	ETODVO-SN.	1009				
Calibration procedure(s)	QA CAL-01.V2					
	Calibration pr	ocedure for dosimetric Field prol	Des			
Calibration date:	July 18, 2004					
Condition of the calibrated item	In Tolerance (according to the specific calibration document)					
This calibration certificate docume	ents the traceability to na	according to the specific calibrat tional standards, which realize physical units of m probability are given on the following pages and are	easurements (SI).			
This calibration certificate docume The measurements and the uncer All calibrations have been conduct	ents the traceability to na tainties with confidence and in the closed laborate	tional standards, which realiate physical units of m probability are given on the following pages and are pry facility: enviroment temperature 22 +/ 2 degrees (	easurements (SI). e part of the certificate.			
This calibration certificate docume The measurements and the uncer All calibrations have been conduct Calibration Equipment used (M&T	ents the traceability to na tainties with confidence ted in the closed laborato E critical for calibration)	tional standards, which realize physical units of m probability are given on the following pages and are pry facility: enviroment temperature 22 +# 2 degrees (	easurements (SI). a part of the certificate. Celsius and humidity < `			
This calibration certificate docume The measurements and the uncer All calibrations have been conduct Calibration Equipment used (M&T Model Type Power meter EPM E4419B	ents the traceability to na tainties with confidence ted in the closed laborato E critical for calibration) ID # GB41293874	tional standards, which realize physical units of m probability are given on the following pages and are by facility: environent temperature 22 +/ 2 degrees ( Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388)	easurements (SI). part of the certificate. Celsius and humidity < Celsius Celsius and humidity < Scheduled Calibrati May-05			
This calibration certificate docume The measurements and the uncer All calibrations have been conduct Calibration Equipment used (M&T Model Type Power meter EPM E44198 Power sensor E4412A	ents the traceability to na tainties with confidence led in the closed laborato E critical for calibration) ID # GB41293874 MY41495277	tional standards, which realiate physical units of m probability are given on the following pages and are bry facility: environent temperature 22 +/ 2 degrees ( Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388)	easurements (SI). part of the certificate. Celsius and humidity < Celsius and humidity < Scheduled Calibrati May-05 May-05			
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This calibration certificate docume The measurements and the uncer All calibrations have been conduct Calibration Equipment used (M&T Model Type Power meter EPM E44198 Power sensor E4412A Reference 20 dB Attenuator Fluke Process Calibrator Type 70: Power sensor HP 8481A RF generator HP 8684C	ents the traceability to na tainties with confidence ted in the closed laborato E critical for calibration) ID # GB41293874 MY41495277 SN: 5086 (20b) 2 SN: 6295803 MY41092180 US3642U01700	tional standards, which realize physical units of m probability are given on the following pages and are ony facility: environent temperature 22 +/ 2 degrees ( Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 8-Sep-03 (Sintrel SCS No. 5030020) 18-Sep-03 (SPEAG, in house check Cod03) 4-Aug-99 (SPEAG, in house check Aug02)	easurements (SI). part of the certificate. Celsius and humidity < Scheduled Calibrati May-05 May-05 May-05 Sep-04 In house check: Oc In house check: Au			
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This calibration certificate docume The measurements and the uncer All calibrations have been conduct Calibration Equipment used (M&T Model Type Power meter EPM E44198 Power sensor E4412A Reference 20 dB Attenuator Fluke Process Calibrator Type 70: Power sensor HP 8481A RF generator HP 8684C	ents the traceability to na tainties with confidence ted in the closed laborator E critical for calibration) ID # GB41293874 MY41495277 SN: 5086 (20b) 2 SN: 6295803 MY41092180 US3642U01700 US37390585	tional standards, which realiate physical units of m probability are given on the following pages and are ory facility: environent temperature 22 +/ 2 degrees ( Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 8-Sep-03 (Sintrel SCS No. 5030020) 18-Sep-02 (SPEAG, in house check Cod03) 4-Aug-99 (SPEAG, in house check Cod03) 18-Oct-01 (SPEAG, in house check Cod03) Function	easurements (SI). part of the certificate. Celsius and humidity < Scheduled Calibrati May-05 May-05 Sep-04 In house check: Oc In house check: Oc Signature			
This calibration certificate docume The measurements and the uncer All calibrations have been conduct Calibration Equipment used (M&T Model Type Power meter EPM E44198 Power sensor E4412A Reference 20 dB Attenuator Fluke Process Calibrator Type 702 Power sensor HP 8481A RF generator HP 8684C Network Analyzer HP 8753E	ents the traceability to na tainties with confidence and in the closed laborato E critical for calibration) ID # GB41293874 MY41495277 SN: 5086 (20b) 2 SN: 6295803 MY41092180 US3642U01700 US37390585 Name	tional standards, which realiate physical units of m probability are given on the following pages and are ory facility: environent temperature 22 +/ 2 degrees ( Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 8-Sep-03 (Sintrel SCS No. 5030020) 18-Sep-02 (SPEAG, in house check Cod03) 4-Aug-99 (SPEAG, in house check Cod03) 18-Oct-01 (SPEAG, in house check Cod03) Function	easurements (SI). part of the certificate. Celsius and humidity < Scheduled Calibrati May-05 May-05 Sep-04 In house check: Oc In house check: Oc Signature			
This calibration certificate docume The measurements and the uncer All calibrations have been conduct Calibration Equipment used (M&T Model Type Power meter EPM E44198 Power sensor E4412A Reference 20 dB Attenuator Fluke Process Calibrator Type 70: Power sensor HP 8481A RF generator HP 8684C Network Analyzer HP 8753E Calibrated by:	ents the traceability to na tainties with confidence ted in the closed laborato E critical for calibration) ID # GB41293874 MY41495277 SN: 5086 (20b) 2 SN: 6295803 MY41092180 US3642U01700 US37390585 Name Nico Vetterli	tional standards, which realiate physical units of m probability are given on the following pages and are ory facility: environent temperature 22 +/ 2 degrees ( Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 8-Sep-03 (Sintrel SCS No. 5030020) 18-Sep-02 (SPEAG, in house check Cod03) 4-Aug-99 (SPEAG, in house check Cod03) 18-Oct-01 (SPEAG, in house check Cod03) Function	easurements (SI). part of the certificate. Celsius and humidity < Scheduled Calibrat May-05 May-05 May-05 Sep-04 In house check: Oc In house check: Oc			

Calibration Data and Phantom Information to test report no.: 2-3816-01-03/04



# Probe ET3DV6

# SN:1559

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

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system):

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#### ET3DV6 SN:1559

July 18, 2004

#### DASY - Parameters of Probe: ET3DV6 SN:1559

Sensitivity in Free Space

Diode Compression<sup>A</sup>

NormX	<b>1.76</b> μV/(V/m) <sup>2</sup>	DCP X	94	۳V
Norm Y	<b>1.56</b> μV/(V/m) <sup>2</sup>	DCP Y	94	m٧
NormZ	1.71 μV/(V/m) <sup>2</sup>	DCP Z	94	Vrr

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

#### Plese see Page 7.

#### **Boundary Effect**

#### Head

900 MHz Typical SAR gradient: 5 % per mm

Sensor Cente	r to Phantom Surface Distance	3,7 mm	4.7 mm	
SAR., [%]	Without Correction Algorithm	85	47	
SAR., [%]	With Correction Algorithm	0.0	0.1	

#### Head

1750 MHz Typical SAR gradient: 10 % per mm

Sensor Cente	r to Phantom Surface Distance	3.7 mm 4	1.7 mm	
SAR, [%]	Without Correction Argorithm	12.2	77	
SAR. [%]	With Correction Algorithm	0.0	03	

#### Sensor Offset

Probe Tip to Sensor Ceriter	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%.

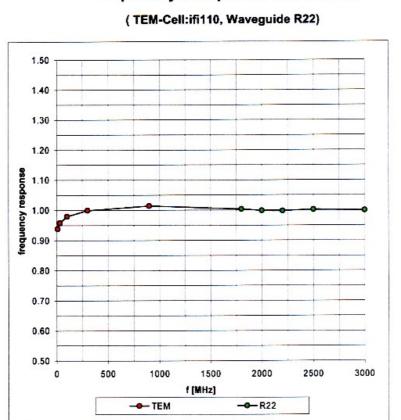
<sup>6</sup> numerical linearization parameter uncertainly not recurred.

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#### ET3DV6 SN:1559

July 18, 2004



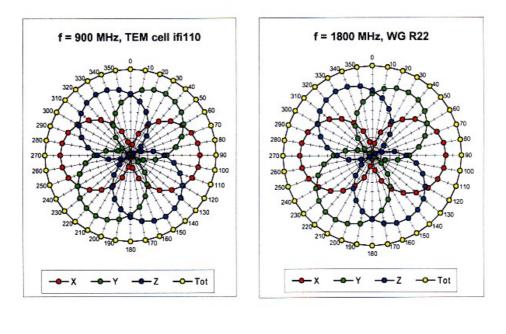
## Frequency Response of E-Field

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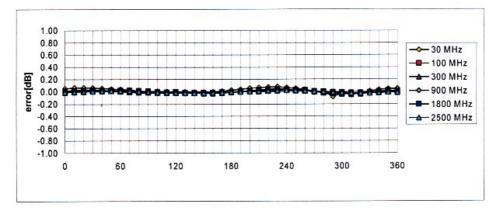


#### ET3DV6 SN:1559

July 18, 2004



## Receiving Pattern ( $\phi$ ), $\theta$ = 0°



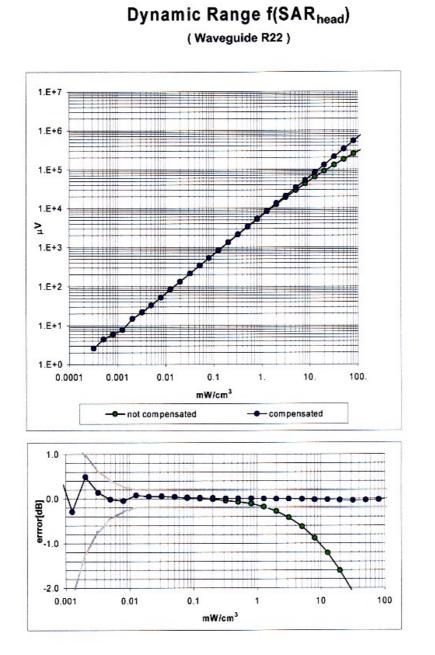
Axial Isotropy Error < ± 0.2 dB

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# CETECOM

#### ET3DV6 SN:1559

July 18, 2004



Probe Linearity Error < ± 0.2 dB

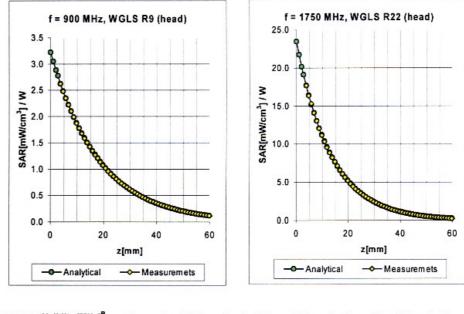
Page 6 of 8

Calibration Data and Phantom Information to test report no.: 2-3816-01-03/04



#### ET3DV6 SN:1559

July 18, 2004



#### **Conversion Factor Assessment**

f [MHz]	Validity [MHz] <sup>B</sup>	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)

<sup>B</sup> 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.

Page 7 of 8

Calibration Data and Phantom Information to test report no.: 2-3816-01-03/04

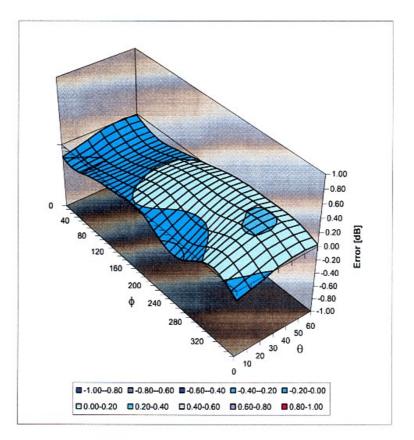


ET3DV6 SN:1559

July 18, 2004

## Deviation from Isotropy in HSL

Error (θ, φ), f = 900 MHz



Spherical Isotropy Error < ± 0.4 dB

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**\$**27

# 3 Calibration report "900 MHz System validation dipole"

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

Client Cetecol	nm						
CALIBRATION C	ERTIEICATE						
Object(s)	D900V2 - SN:10	2					
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 (ac	cording to the specific calibration	document)				
17025 international standard. All calibrations have been conducted Calibration Equipment used (M&TE		acility: environment temperature 22 +/- 2 degrees (	Celsius and humidity < 75%.				
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				
	Name	Function	Signature				
Calibrated by:	Nica Vetterli	Technician	D.Vellah				
Approved by:	Katja Pokovic	Laboratory Director	D. Vella Schonie Katza				
			Date issued: February 7, 2003				
This calibration certificate is issued a Calibration Laboratory of Schmid &		until the accreditation process (based on ISO/IEC completed.	17025 International Standard) for				

880-KP0301061-A

Page 1 (1)