Fax: -8475





#### 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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## **CETECOM ICT Services GmbH**

Calibration Data and Phantom Information to test report no.: 4-1220-31-03/04-C



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## 1 Calibration report "Probe ET3DV6"

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

Client

880-KP0301061-A

Cetecom

Object(s)	ET3DV6 - SN:	1558	
Calibration procedure(s)	QA CAL-01.v2		
	Calibration pro	ocedure for dosimetric E-field prob	es
Calibration date:	September6,	2004	
Condition of the calibrated item	In Tolerance (	according to the specific calibration	n document)
		probability are given on the following pages and are party facility: environment temperature 22 +/- 2 degrees	
5 £ £			A100 100 10 A100 1000
Model Type	ID#	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Model Type Power meter EPM E4419B	ID # GB41293874	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388)	May-05
Model Type Power meter EPM E4419B Power sensor E4412A	ID # GB41293874 MY41495277	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388)	May-05 May-05
Model Type Power meter EPM E4419B Power sensor E4412A Reference 20 dB Attenuator	ID # GB41293874 MY41495277 SN: 5086 (20b)	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389)	May-05 May-05 May-05
Model Type Power meter EPM E4419B Power sensor E4412A Reference 20 dB Attenuator Power sensor HP 8481A	ID # GB41293874 MY41495277 SN: 5086 (20b) MY41092180	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 18-Sep-02 (SPEAG, in house check Octo3)	May-05 May-05 May-05 In house check: Oct 05
Model Type Power meter EPM E4419B Power sensor E4412A Reference 20 dB Attenuator Power sensor HP 8481A RF generator HP 8684C	ID # GB41293874 MY41495277 SN: 5086 (20b)	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389)	May-05 May-05 May-05
Model Type Power meter EPM E4419B Power sensor E4412A Reference 20 dB Attenuator Power sensor HP 8481A RF generator HP 8684C	ID # GB41293874 MY41495277 SN: 5086 (20b) MY41092180 US3642U01700	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 18-Sep-02 (SPEAG, in house check Ool03) 4-Aug-99 (SPEAG, in house check Aug02)	May-05 May-05 May-05 In house check: Oct 05 In house check: Aug05
Model Type Power meter EPM E4419B Power sensor E4412A Reference 20 dB Attenuator Power sensor HP 8481A RF generator HP 8684C Network Analyzer HP 8753E	ID # GB41293874 MY41495277 SN: 5086 (20b) MY41092180 US3642U01700 US37390585	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 18-Sep-02 (SPEAG, in house check Ool03) 4-Aug-99 (SPEAG, in house check Aug02) 18-Oct-01 (SPEAG, in house check Oot03)	May-05 May-05 May-05 In house check: Oct 05 In house check: Aug05 In house check: Oct 05
Model Type Power meter EPM E4419B Power sensor E4412A Reference 20 dB Attenuator Power sensor HP 8481A RF generator HP 8684C Network Analyzer HP 8753E	ID # GB41293874 MY41495277 SN: 5086 (20b) MY41092180 US3642U01700 US37390585	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 18-Sep-02 (SPEAG, in house check Oct03) 4-Aug-99 (SPEAG, in house check Aug02) 18-Oct-01 (SPEAG, in house check Oct03)	May-05 May-05 May-05 In house check: Oct 05 In house check: Aug05 In house check: Oct 05
Calibration Equipment used (M&Model Type Power meter EPM E4419B Power sensor E4412A Reference 20 dB Attenuator Power sensor HP 8481A RF generator HP 8684C Network Analyzer HP 8753E  Calibrated by:	ID # GB41293874 MY41495277 SN: 5086 (20b) MY41092180 US3642U01700 US37390585	Cal Date (Calibrated by, Certificate No.) 5-May-04 (METAS, No 251-00388) 5-May-04 (METAS, No 251-00388) 3-May-04 (METAS, No 251-00389) 18-Sep-02 (SPEAG, in house check Oct03) 4-Aug-99 (SPEAG, in house check Aug02) 18-Oct-01 (SPEAG, in house check Oct03)	May-05 May-05 May-05 In house check: Oct 05 In house check: Aug05 In house check: Oct 05

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# Probe ET3DV6

SN:1558

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

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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ET3DV6 SN:1558

September 6, 2004

#### DASY - Parameters of Probe: ET3DV6 SN:1558

Sensitivity in Fre	Diode C	omp	ressior	1 <sup>A</sup>	
NomX	<b>2.03</b> μV/(V/m) <sup>2</sup>	DCP X	94	mV	
NormY	<b>1.92</b> μV/(V/m) <sup>2</sup>	DCP Y	94	mV	
NormZ	<b>1.63</b> μV/(V/m) <sup>2</sup>	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 mi	m	
	Sensor Center of SAR <sub>be</sub> [%] SAR <sub>be</sub> [%]	Without	m Surface Distance Correction Algorithm rrection Algorithm	<b>3.7 mm</b> 9.6 0.1	<b>4.7 mm</b> 5.2 0.2

Sensor Center	to Phantom Surface Distance	3.7 mm	4.7 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	13.8	9.0
SAR <sub>be</sub> [%]	With Correction Algorithm	0.2	0.1

1750 MHz Typical SAR gradient: 10 % per mm

#### Sensor Offset

Head

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%.

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<sup>&</sup>lt;sup>A</sup> numerical linearization parameter: uncertainty not required

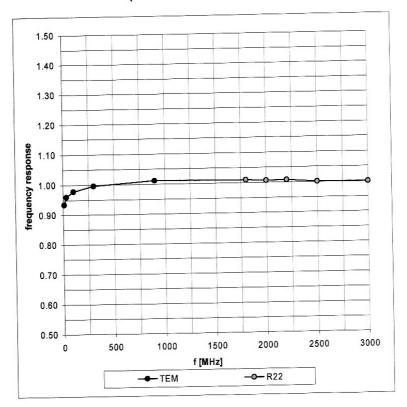


ET3DV6 SN:1558

September 6, 2004

## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



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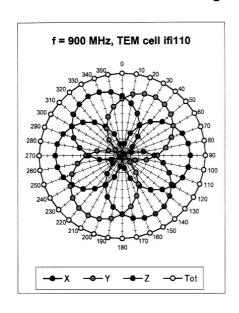
As of 2005-02-02 Page 6 of 46

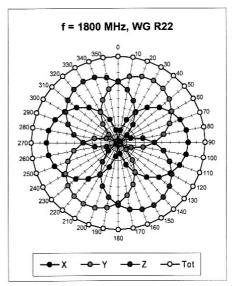


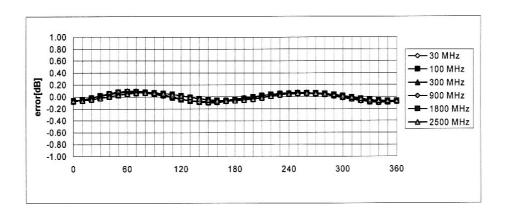
ET3DV6 SN:1558

September 6, 2004

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







Axial Isotropy Error < ± 0.2 dB

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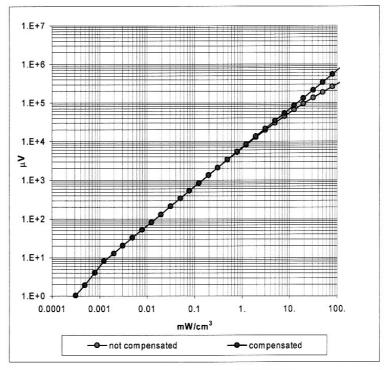


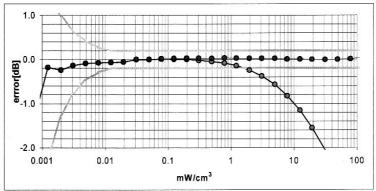
ET3DV6 SN:1558

September 6, 2004

## Dynamic Range f(SAR<sub>head</sub>)

(Waveguide R22)





Probe Linearity Error < ± 0.2 dB

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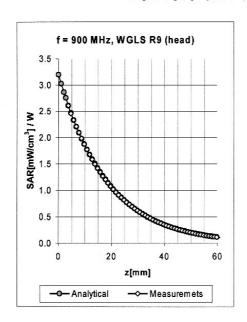
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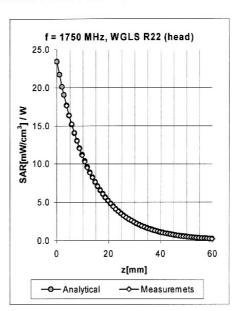


ET3DV6 SN:1558

September 6, 2004

#### **Conversion Factor Assessment**





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

<sup>&</sup>lt;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.

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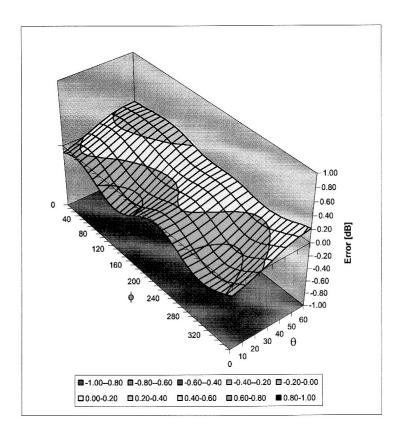


ET3DV6 SN:1558

September 6, 2004

#### **Deviation from Isotropy in HSL**

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



Spherical Isotropy Error < ± 0.4 dB

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### 2 Calibration report "Probe ET3DV6"

Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstresse 43, 8094 Zurich, Switzerland

Cetecom

Client

**CALIBRATION CERTIFICATE** ET3DV6 - SN:1559 Object(s): QA CAL-01.v2 Calibration procedure(s) Calibration procedure for dosimetric Efield probes July 18, 2004 Calibration date: In Tolerance (according to the specific calibration document) Condition of the calibrated item This calibration certificate documents the traceability to national standards, which realities physical units of measurements (St). 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 × 22 degrees Celsius and humidity < 75%. Calibration Equipment used (M&TE critical for calibration) D# Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Power meter EPM E44198 GB41293874 5-May-04 (METAS, No 251-00388) May-05 Power sensor E4412A MY414952TT 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 Pluke Process Calibrator Type 702 SN: 6295803 8-Sep-03 (Sintrel SCS No. 5/030020) Sep-04 18-Sep-02 (SPEAG, in house check OoE0) In house check: Oct 05 Power sensor HP 8481A MY41092180 in house check: Aug05 RF generator HP 8684C US3642U01700 4-Aug-99 (SPEAG, in house check Aug(2)) in house check: Oct 05 US37390585 18-Oct-01 (SPEAG, in house check Ool03) Network Analyzer HP 6753E Function Name Nico Vetterii Calibrated by: Laboratory Director Approved by: Katja Pokovio Date issued:July 19, 2004 This calibration certificate is issued as an intermediate solution until the apprediation process (based on ISO(EC 17005 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

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# 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):

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### **CETECOM ICT Services GmbH**

Calibration Data and Phantom Information to test report no.: 4-1220-31-03/04-C



ET3DV6 SN:1559 July 18, 2004

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

Sensitivity in Fre	Diode (	Comp	oression.A	
NomX	<b>1.76</b> μV/(V/m) <sup>2</sup>	DCP X	94	mV
NormY	<b>1.56</b> μV/(V/m) <sup>2</sup>	DCP Y	94	mV
NormZ	<b>1.71</b> μV/(V/m) <sup>2</sup>	DCP Z	94	'nV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Plese see Page 7.

#### **Boundary Effect**

Sensor Cente	er to Phantom Surface Distance	3,7 mm	4.7 mm
SAR <sub>0</sub> , [%]	Without Correction Algorithm	8.5	4.7
SAR., [%]	With Correction Algorithm	0.0	0.1

900 MHz Typical SAR gradient: 5 % per mm

20,000,000,000		
Head	1750 MHz	Typical SAR gradient: 10 % per mm

Sensor Cente	er to Phantom Surface Distance	3.7 mm	4.7 mm
SAR, [%]	Without Correction Argorithm	12.2	7.7
SAR <sub>56</sub> [%]	With Correction Algorithm	0.0	0.3

#### 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%.

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<sup>\*</sup> numerical linearization parameter, uncertainty not recuired

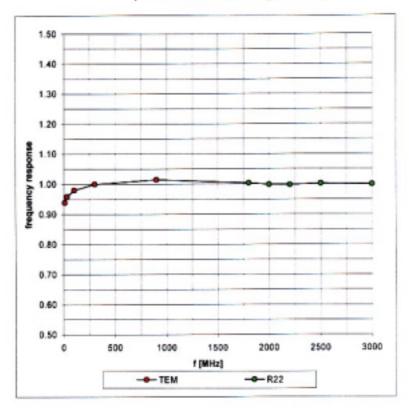


ET3DV6 SN:1559

July 18, 2004

## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



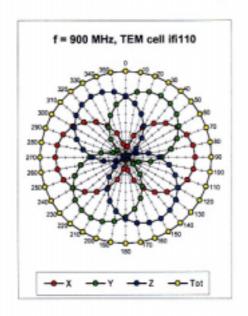
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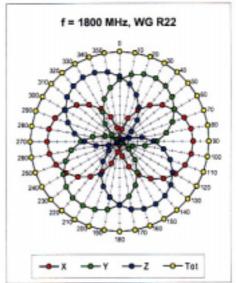
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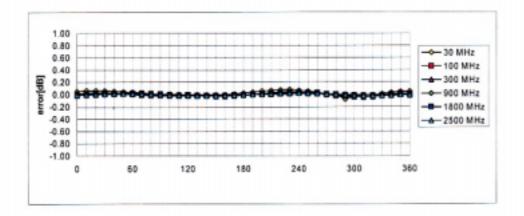


ET3DV6 SN:1559 July 18, 2004

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







Axial Isotropy Error < ± 0.2 dB

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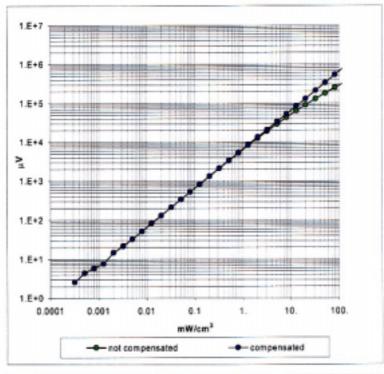
As of 2005-02-02 Page 15 of 46

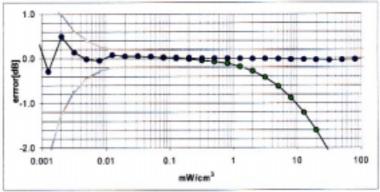


July 18, 2004 ET3DV6 SN:1559

## Dynamic Range f(SAR<sub>head</sub>)

(Waveguide R22)





Probe Linearity Error < ± 0.2 dB

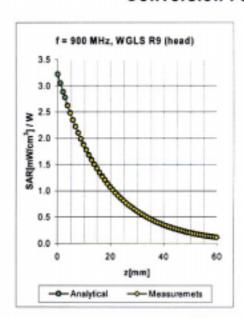
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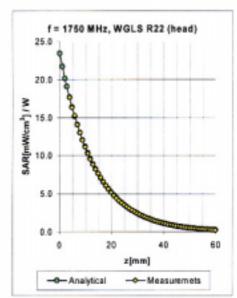
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ET3DV6 SN:1559 July 18, 2004

#### **Conversion Factor Assessment**





f [MHz]	Validity [MHz]®	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	850-950	Head	41.5 ± 5%	$0.97 \pm 5\%$	0.53	1.93	6.59 ± 9.7% (k=2)
1750	1700-1800	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.46	2.58	5.37 ± 9.7% (k=2)
1900	1850-1950	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	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)

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<sup>&</sup>lt;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.

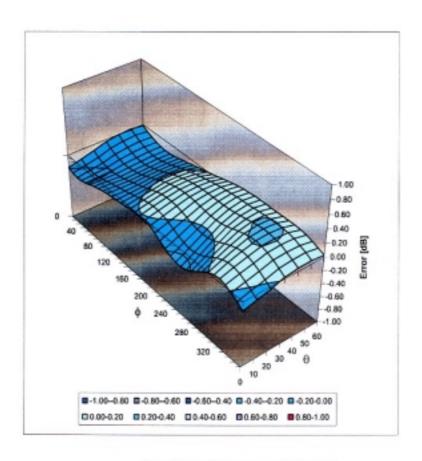


ET3DV6 SN:1559

July 18, 2004

#### Deviation from Isotropy in HSL

Error (θ, φ), f = 900 MHz



Spherical Isotropy Error < ± 0.4 dB

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## 3 Calibration report "900 MHz System validation dipole"

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

Client

880-KP0301061-A

Cetecomm

	***************************************							
Object(s)	D900V2 - SN:102		a Marine Mar					
Calibration procedure(s)	QA CAL-05.v2 Calibration procedu	ure 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 documen	its traceability of M&TE used in	n the calibration procedures and conformity of the	ne procedures with the ISO/IEC					
All calibrations have been conducte	d in the closed laboratory facili	ty: environment temperature 22 +/- 2 degrees 0	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					
	Name	Function	Signature					
Calibrated by:	Nica Vetterii	Technician	N. Vellali)					
		Laboratory Director	Diversion Water					
Approved by:	Katja Pokovic	Laboratory Decidor	· · · · · · · · · · · · · · · · · · ·					
·	Katja Pokovic	Education process	Date issued: February 7, 2003					

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