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

Client Auden > Sporton Int. Inc.

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1788
Calibration procedure(s)	QA CAL-01 v2 Calibration procedure for dosimetric E-field probes
Calibration date:	August 29, 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 (Calibrated by, Certificate No.)	Scheduled Calibration
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (Agilent, No. 20020918)	Sep-03
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Network Analyzer HP 8753E	US37390585	18-Oct-01 (Agilent, No. 24BR1033101)	In house check: Oct 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01 (ELCAL, No.2360)	Sep-03

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: August 28, 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.

Schmid & Partner Engineering AG

s p e a g

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Probe ET3DV6

SN:1788

Manufactured: May 28, 2003
Last calibration: August 29, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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DASY - Parameters of Probe: ET3DV6 SN:1788

Sensitivity in Free Space

Diode Compression

NormX	1.68 $\mu V/(V/m)^2$	DCP X	95	mV
NormY	1.62 $\mu V/(V/m)^2$	DCP Y	95	mV
NormZ	1.71 $\mu V/(V/m)^2$	DCP Z	95	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz ε_r = 41.5 ± 5% σ = 0.97 ± 5% mho/m

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	6.6 ±9.5% (k=2)	Boundary effect:	
ConvF Y	6.6 ±9.5% (k=2)	Alpha	0.34
ConvF Z	6.6 ±9.5% (k=2)	Depth	2.48

Head 1800 MHz ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	5.3 ±9.5% (k=2)	Boundary effect:	
ConvF Y	5.3 ±9.5% (k=2)	Alpha	0.43
ConvF Z	5.3 ±9.5% (k=2)	Depth	2.80

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	8.7	5.0
SAR_{be} [%]	With Correction Algorithm	0.3	0.5

Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR_{be} [%]	Without Correction Algorithm	12.8	8.9
SAR_{be} [%]	With Correction Algorithm	0.3	0.1

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.6 ± 0.2	mm

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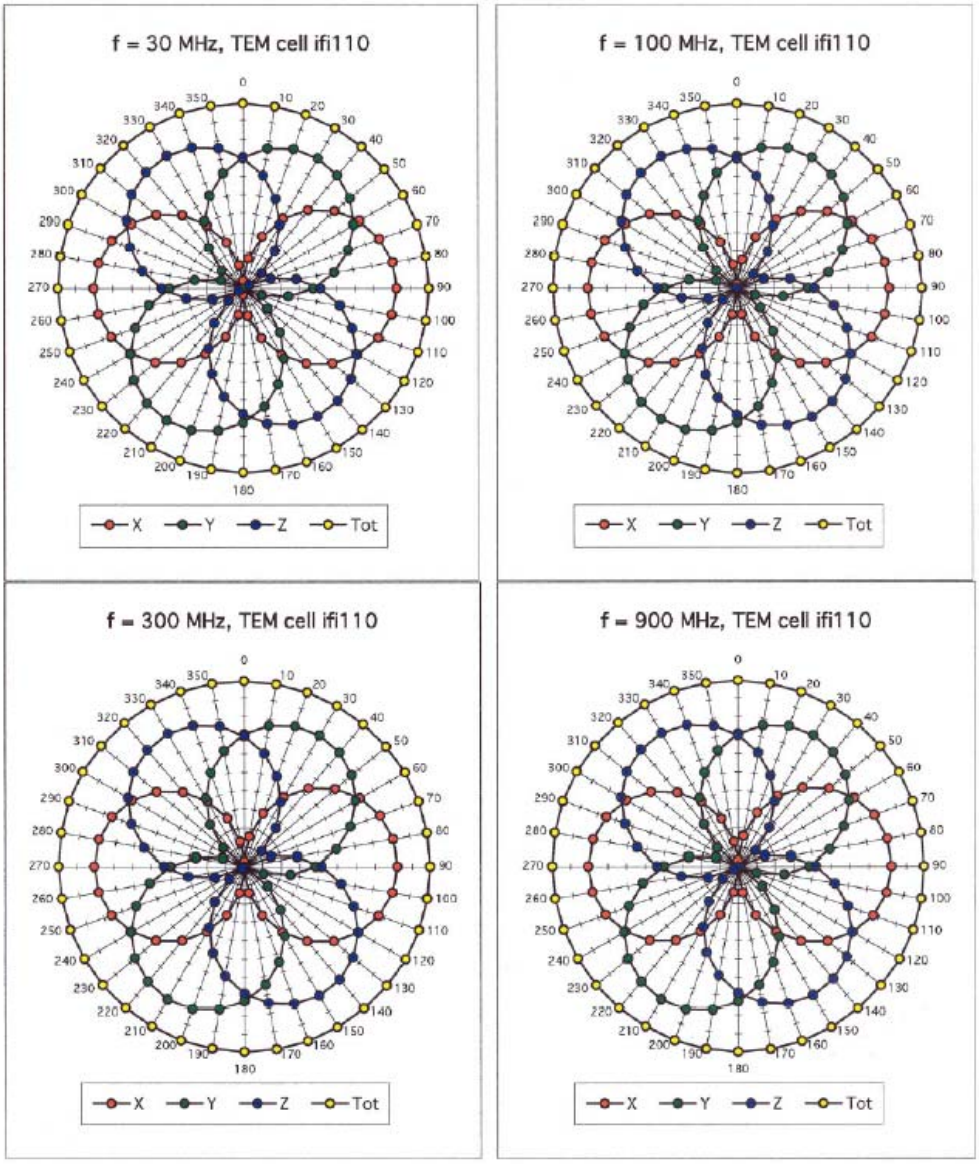
Receiving Pattern (ϕ), θ = 0°



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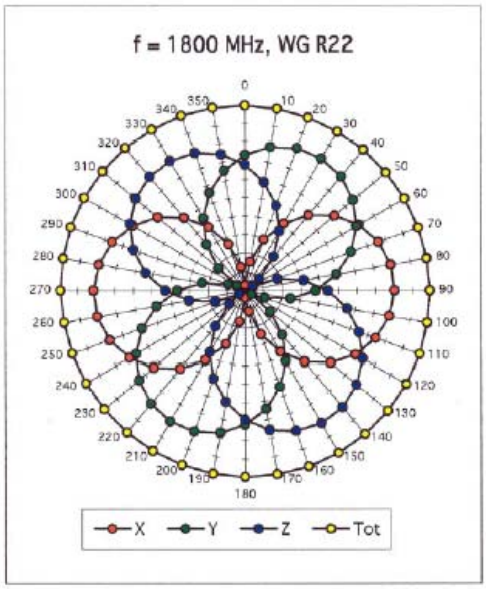
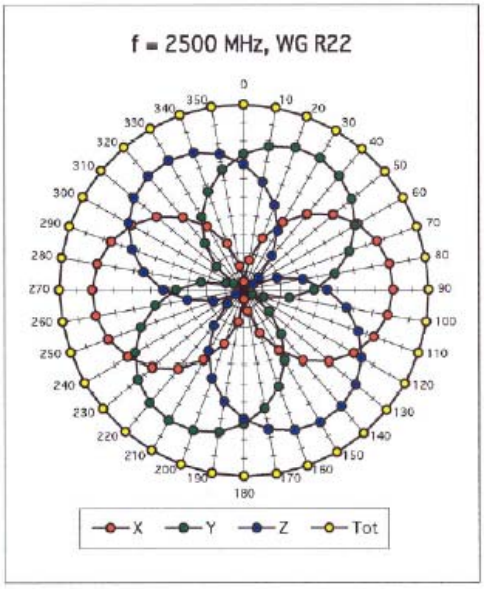
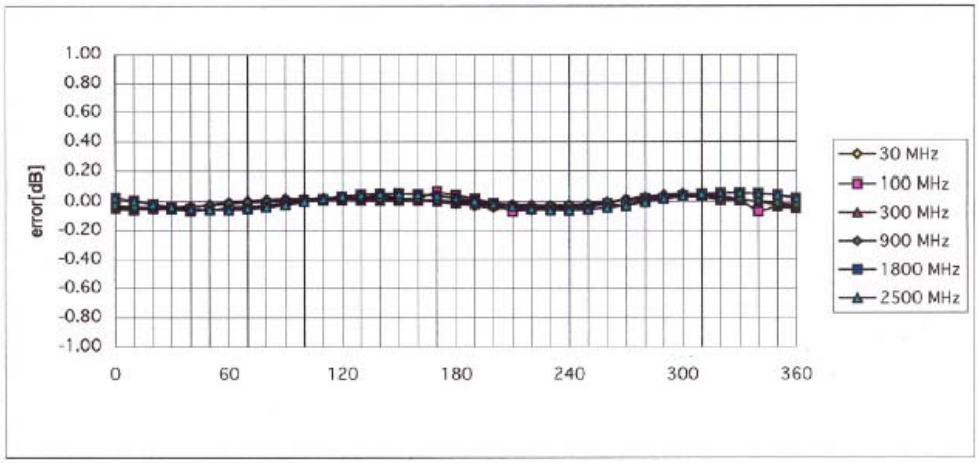




Isotropy Error (ϕ), θ = 0°



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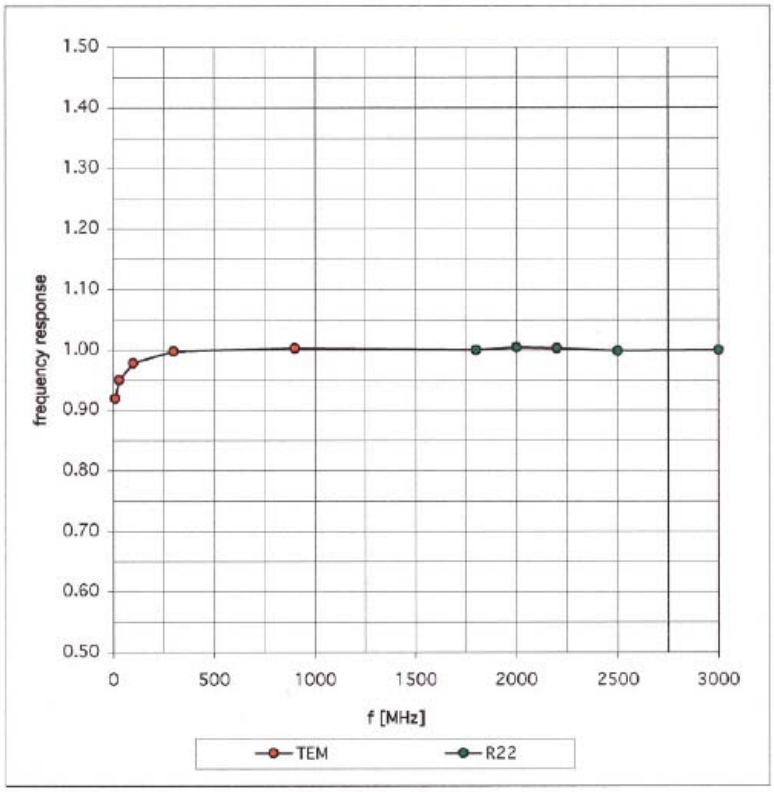
Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)



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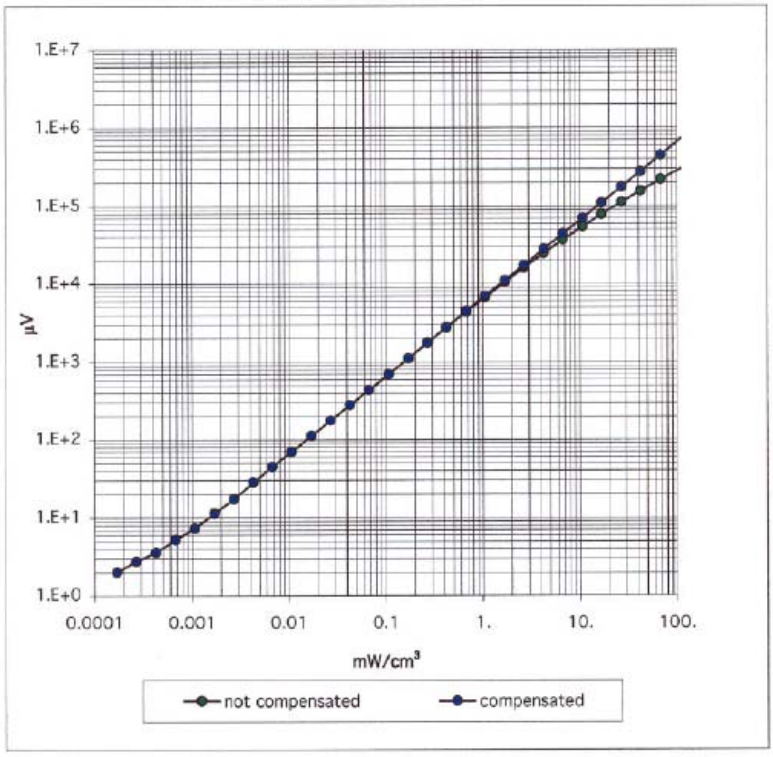
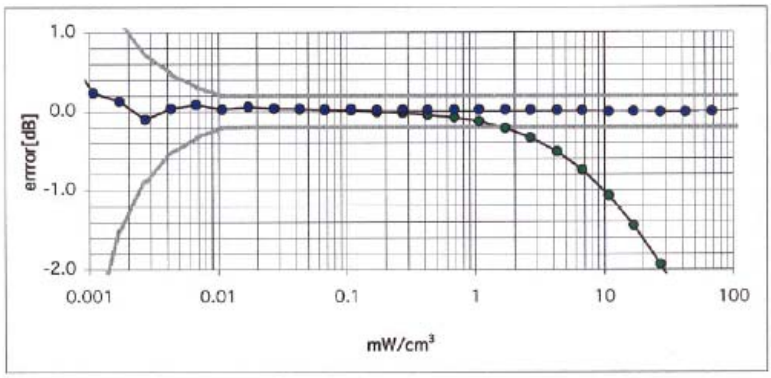
Dynamic Range f(SAR_{brain})

(Waveguide R22)





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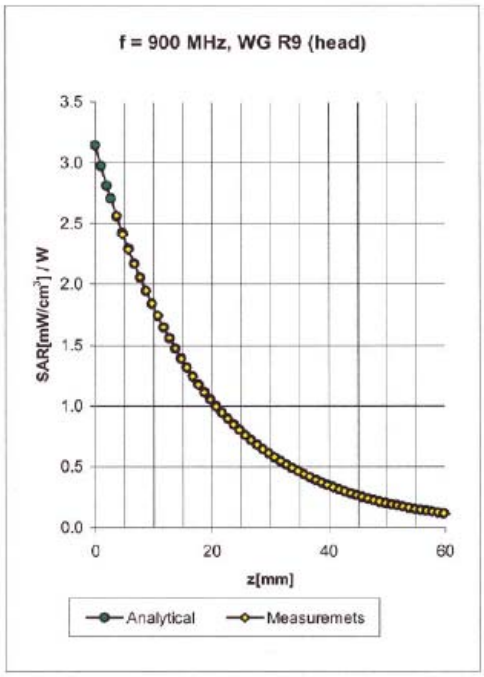
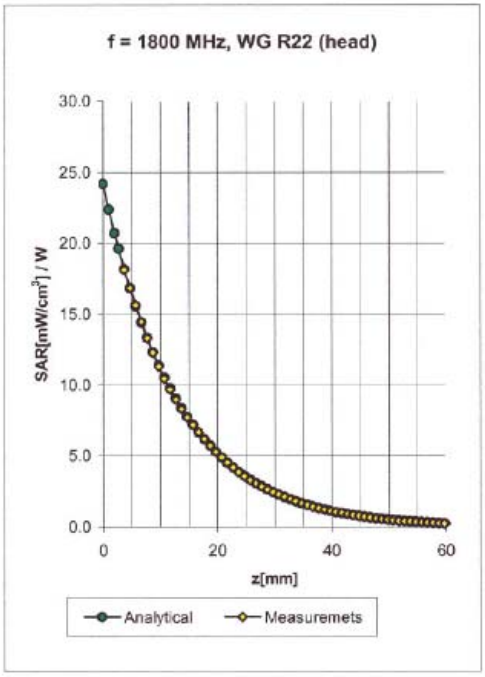
Conversion Factor Assessment





Head	900 MHz	ε_r = 41.5 ± 5%	σ = 0.97 ± 5% mho/m

Valid for f=800-1000 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	6.6 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	6.6 ± 9.5% (k=2)	Alpha	0.34
ConvF Z	6.6 ± 9.5% (k=2)	Depth	2.48

Head	1800 MHz	ε_r = 40.0 ± 5%	σ = 1.40 ± 5% mho/m

Valid for f=1710-1910 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	5.3 ± 9.5% (k=2)	Boundary effect:	
ConvF Y	5.3 ± 9.5% (k=2)	Alpha	0.43
ConvF Z	5.3 ± 9.5% (k=2)	Depth	2.80

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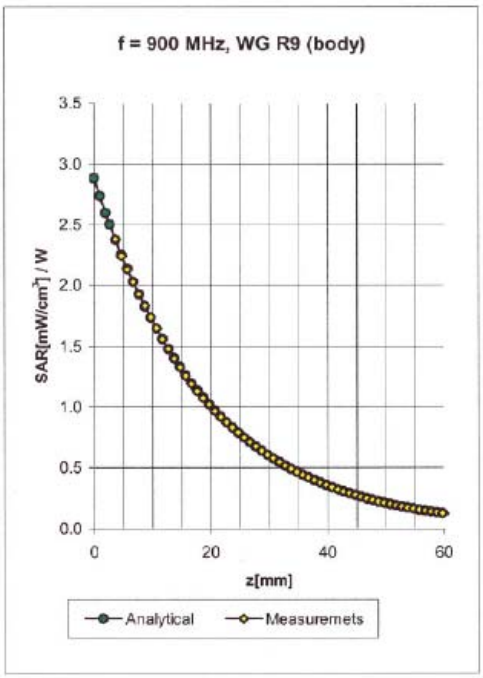
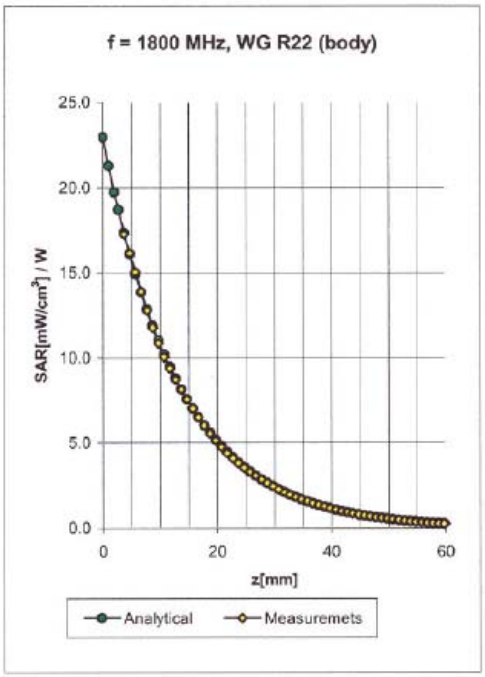
Conversion Factor Assessment





Body 900 MHz ε_r = 55.0 ± 5% σ = 1.05 ± 5% mho/m

Valid for f=800-1000 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	6.5 ±9.5% (k=2)	Boundary effect:	
ConvF Y	6.5 ±9.5% (k=2)	Alpha	0.31
ConvF Z	6.5 ±9.5% (k=2)	Depth	2.92

Body 1800 MHz ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m

Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	5.0 ±9.5% (k=2)	Boundary effect:	
ConvF Y	5.0 ±9.5% (k=2)	Alpha	0.51
ConvF Z	5.0 ±9.5% (k=2)	Depth	2.78

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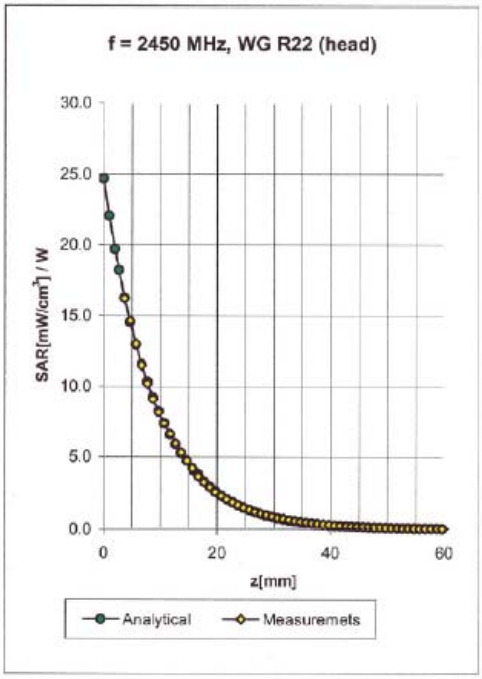
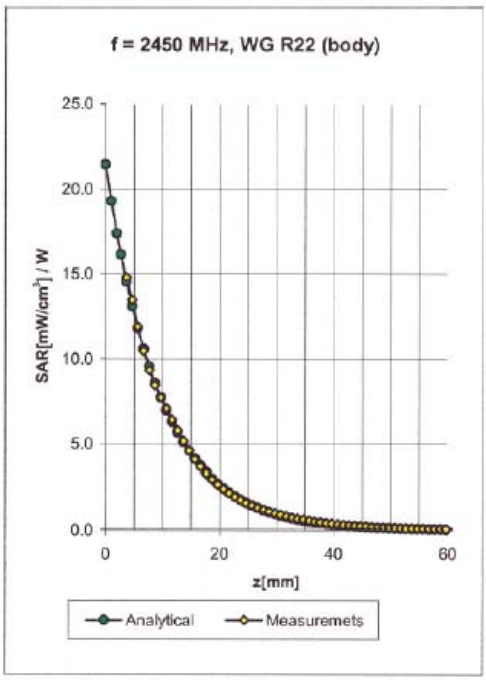
Conversion Factor Assessment





Head 2450 MHz ε_r = 39.2 ± 5% σ = 1.80 ± 5% mho/m

Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X

ConvF X	4.7 ±8.9% (k=2)	Boundary effect:	
ConvF Y	4.7 ±8.9% (k=2)	Alpha	0.99
ConvF Z	4.7 ±8.9% (k=2)	Depth	1.81

Body 2450 MHz ε_r = 52.7 ± 5% σ = 1.95 ± 5% mho/m

Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

ConvF X	4.5 ±8.9% (k=2)	Boundary effect:	
ConvF Y	4.5 ±8.9% (k=2)	Alpha	1.01
ConvF Z	4.5 ±8.9% (k=2)	Depth	1.74

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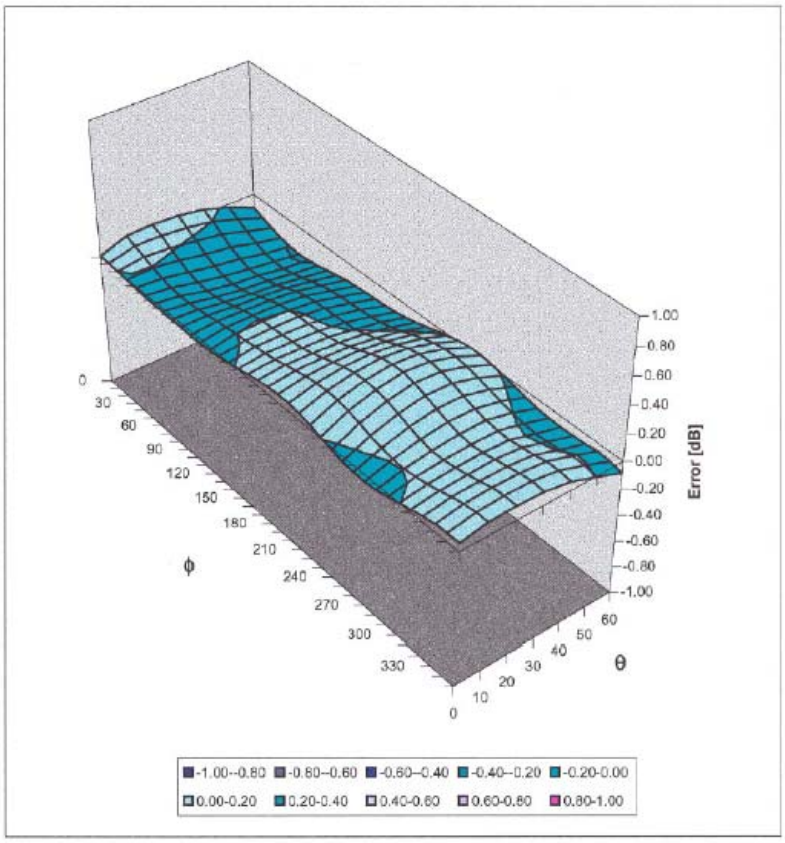
Deviation from Isotropy in HSL

Error (θ,ϕ), f = 900 MHz



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

Client **Sporton (Auden)**

CALIBRATION CERTIFICATE

Object(s)	DAE3 – SD 000 D03 AA – SN:577
Calibration procedure(s)	QA CAL-06.v4 Calibration procedure for the data acquisition unit (DAE)
Calibration date:	21.11.2003
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
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03	Sep-05

	Name	Function	Signature
Calibrated by:	Philipp Storchenegger	Technician	
Approved by:	Fin Bomholt	R&D Director	

Date issued: 21.11.2003

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.

DAE3 SN: 577 DATE: 21.11.2003

1. Cal Lab. Incoming Inspection & Pre Test

Modification Status	Note Status here → → → →	BC
Visual Inspection	Note anomalies.....	None
	.....	.....
Pre Test	**Indication**	**Yes/No**
Probe Touch	Function	Yes
Probe Collision	Function	Yes
Probe Touch&Collision	Function	Yes

2. DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = 400 mV
Low Range: 1LSB = 61nV , full range = 4 mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	**X**	**Y**	**Z**
High Range	404.434	403.889	404.352
Low Range	3.94303	3.94784	3.9501
Connector Angle to be used	in DASY System	127 °	

High Range	**Input**	**Reading in μV**	**% Error**
Channel X + Input	200mV	200000.6	0.00
	20mV	20000.9	0.00
Channel X - Input	20mV	-19992.7	-0.04
Channel Y + Input	200mV	200000.6	0.00
	20mV	19999.1	0.00
Channel Y - Input	20mV	-19994.7	-0.03
Channel Z + Input	200mV	199999.8	0.00
	20mV	19998.1	-0.01
Channel Z - Input	20mV	-19999.2	0.00

Low Range	**Input**	**Reading in μV**	**% Error**
Channel X + Input	2mV	1999.94	0.00
	0.2mV	199.08	-0.46
Channel X - Input	0.2mV	-200.24	0.12
Channel Y + Input	2mV	1999.98	0.00
	0.2mV	199.50	-0.25
Channel Y - Input	0.2mV	-200.80	0.40
Channel Z + Input	2mV	1999.98	0.00
	0.2mV	199.11	-0.44
Channel Z - Input	0.2mV	-201.12	0.56

DAE3 SN: 577 DATE: 21.11.2003

3. Common mode sensitivity

DASY measurement parameters:
Auto Zero Time: 3 sec, Measuring time: 3 sec
High/Low Range

in μV	Common mode Input Voltage	High Range Reading	Low Range Reading
Channel X	200mV	12.00	11.9
	- 200mV	-10.76	-12.44
Channel Y	200mV	-8.55	-8.51
	- 200mV	7.58	6.67
Channel Z	200mV	-0.86	-0.58
	- 200mV	-0.85	-0.77

4. Channel separation

DASY measurement parameters:
Auto Zero Time: 3 sec, Measuring time: 3 sec
High Range

in μV	Input Voltage	Channel X	Channel Y	Channel Z
Channel X	200mV	-	1.96	0.28
Channel Y	200mV	0.66	-	3.59
Channel Z	200mV	-0.89	-0.11	-

5.1 AD-Converter Values with Input Voltage set to 2.0 VDC

in Zero Low	Low Range Max - Min	Max.	Min
Channel X	17	16137	16120
Channel Y	27	16767	16740
Channel Z	8	15103	15077

5.2 AD-Converter Values with inputs shorted

in LSB	Low Range	High Range
Channel X	16134	15955
Channel Y	16740	15960
Channel Z	15093	16252

6. Input Offset Measurement

DAE3 SN: 577 DATE: 21.11.2003

DASY measurement parameters:
Auto Zero Time: 3 sec, Measuring time: 3 sec
Number of measurements: 100, Low Range

Input 10MΩ

in µV	Average	min. Offset	max. Offset	Std. Deviation
Channel X	-0.64	-1.84	0.71	0.49
Channel Y	-1.77	-3.93	0.94	0.58
Channel Z	-2.21	-3.14	-0.81	0.34

Input shorted

in µV	Average	min. Offset	max. Offset	Std. Deviation
Channel X	0.12	-1.34	1.45	0.69
Channel Y	-0.69	-1.39	0.30	0.26
Channel Z	-0.94	-1.58	-0.30	0.23

7. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

8. Input Resistance

In MOhm	Calibrating	Measuring
Channel X	0.2000	197.1
Channel Y	0.1999	200.3
Channel Z	0.2001	198.3

9. Low Battery Alarm Voltage

in V	Alarm Level
Supply (+ Vcc)	7.58
Supply (- Vcc)	-7.65

10. Power Consumption

in mA	Switched off	Stand by	Transmitting
Supply (+ Vcc)	0.00	5.65	13.7
Supply (- Vcc)	-0.01	-7.69	-8.97