

Test Laboratory: AUDEN TECHNO CORP. RF Testing Lab

Date/Time: 06/30/03 07:07:05

Flat BenQ C260 PCS Ch25

DUT: BenQ C260 Close; Type: Single-Mode Cellular Phone (PCS CDMA); Serial: 71380001
Program: SAR-00679

Communication System: PCS 1900; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: Body 1800MHz ($\sigma = 1.50426 \text{ mho/m}$, $\epsilon_r = 53.3746$, $\rho = 1000 \text{ kg/m}^3$)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1753; ConvF(4.9, 4.9, 4.9); Calibrated: 5/23/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Flat/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 15.8 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.472 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.672 W/kg

SAR(1 g) = 0.456 mW/g; SAR(10 g) = 0.292 mW/g

Reference Value = 15.8 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.481 mW/g

Flat/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

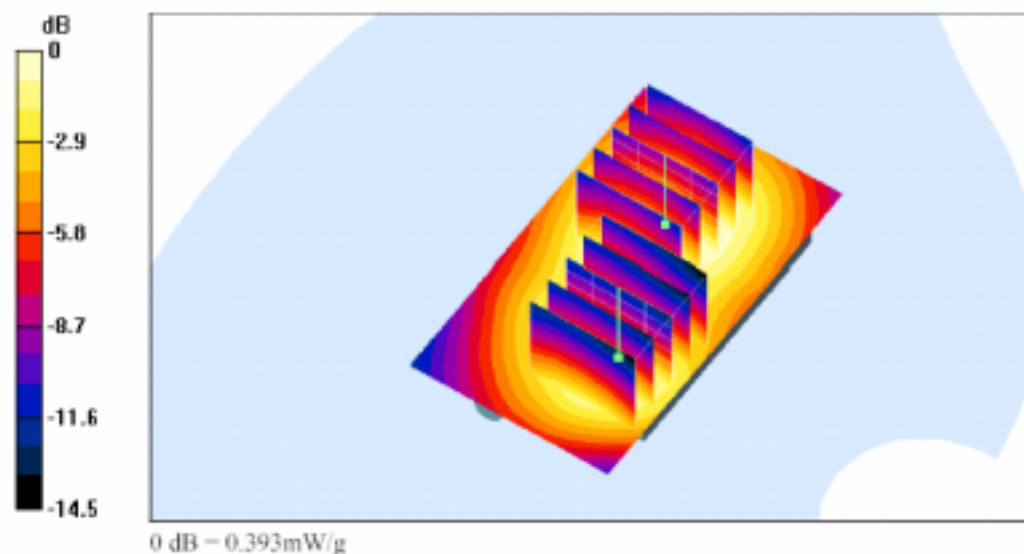
Peak SAR (extrapolated) = 0.586 W/kg

SAR(1 g) = 0.369 mW/g; SAR(10 g) = 0.224 mW/g

Reference Value = 15.8 V/m

Power Drift = -0.02 dB

Maximum value of SAR = 0.393 mW/g



SAR Test Result for Flat Position – Channel 25

Test Laboratory: AUDEN TECHNO CORP. RF Testing Lab

Date/Time: 06/30/03 07:42:54

Flat BenQ C260 PCS Ch600

DUT: BenQ C260 Close; Type: Single-Mode Cellular Phone (PCS CDMA); Serial: 71380001
Program: SAR-00679

Communication System: PCS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: Body 1800MHz ($\sigma = 1.53221 \text{ mho/m}$, $\epsilon_r = 53.2647$, $\rho = 1000 \text{ kg/m}^3$)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1753; ConvF(4.9, 4.9, 4.9); Calibrated: 5/23/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Flat/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 17.6 V/m

Power Drift = -0.1 dB

Maximum value of SAR = 0.464 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.618 W/kg

SAR(1 g) = 0.415 mW/g; SAR(10 g) = 0.267 mW/g

Reference Value = 17.6 V/m

Power Drift = -0.1 dB

Maximum value of SAR = 0.439 mW/g

Flat/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

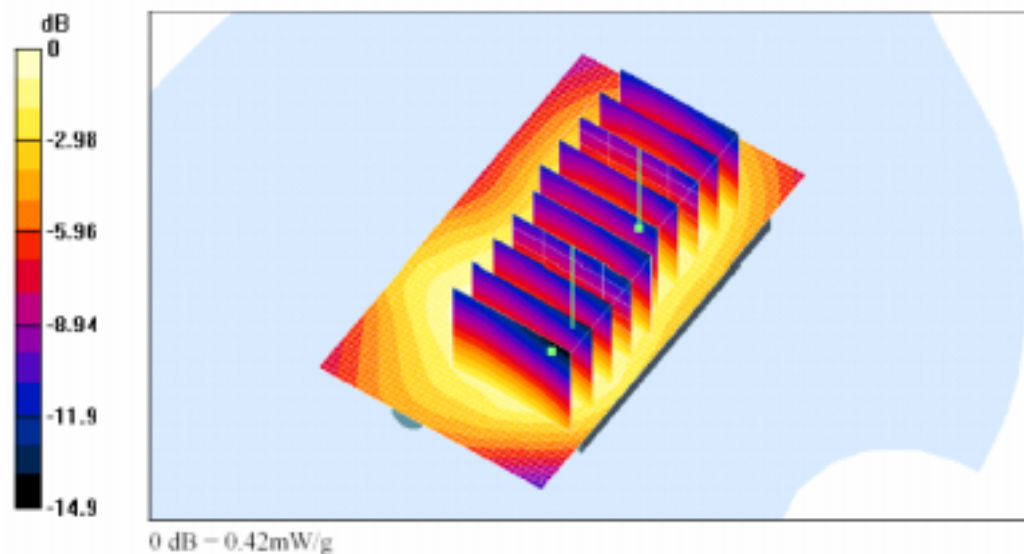
Peak SAR (extrapolated) = 0.607 W/kg

SAR(1 g) = 0.399 mW/g; SAR(10 g) = 0.258 mW/g

Reference Value = 17.6 V/m

Power Drift = -0.1 dB

Maximum value of SAR = 0.42 mW/g



SAR Test Result for Flat Position – Channel 600

Test Laboratory: AUDEN TECHNO CORP. RF Testing Lab

Date/Time: 06/30/03 08:21:45

Flat BenQ C260 PCS Ch1175

DUT: BenQ C260 Close; Type: Single-Mode Cellular Phone (PCS CDMA); Serial: 71380001
Program: SAR-00679

Communication System: PCS 1900; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium: Body 1800MHz ($\sigma = 1.56285 \text{ mho/m}$, $\epsilon_r = 53.2203$, $\rho = 1000 \text{ kg/m}^3$)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1753; ConvF(4.9, 4.9, 4.9); Calibrated: 5/23/2003
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn393; Calibrated: 12/18/2002
- Phantom: SAM 12; Type: SAM v4.0; Serial: TP:1009
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Flat/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 16.2 V/m

Power Drift = -0.06 dB

Maximum value of SAR = 0.449 mW/g

Flat/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Peak SAR (extrapolated) = 0.645 W/kg

SAR(1 g) = 0.4 mW/g; SAR(10 g) = 0.241 mW/g

Reference Value = 16.2 V/m

Power Drift = -0.06 dB

Maximum value of SAR = 0.423 mW/g

Flat/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

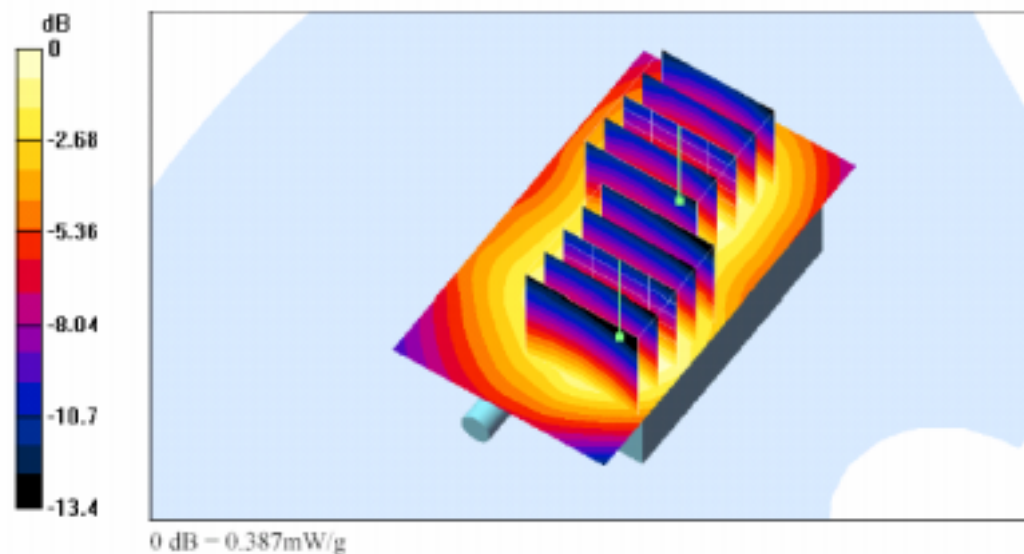
Peak SAR (extrapolated) = 0.554 W/kg

SAR(1 g) = 0.369 mW/g; SAR(10 g) = 0.236 mW/g

Reference Value = 16.2 V/m

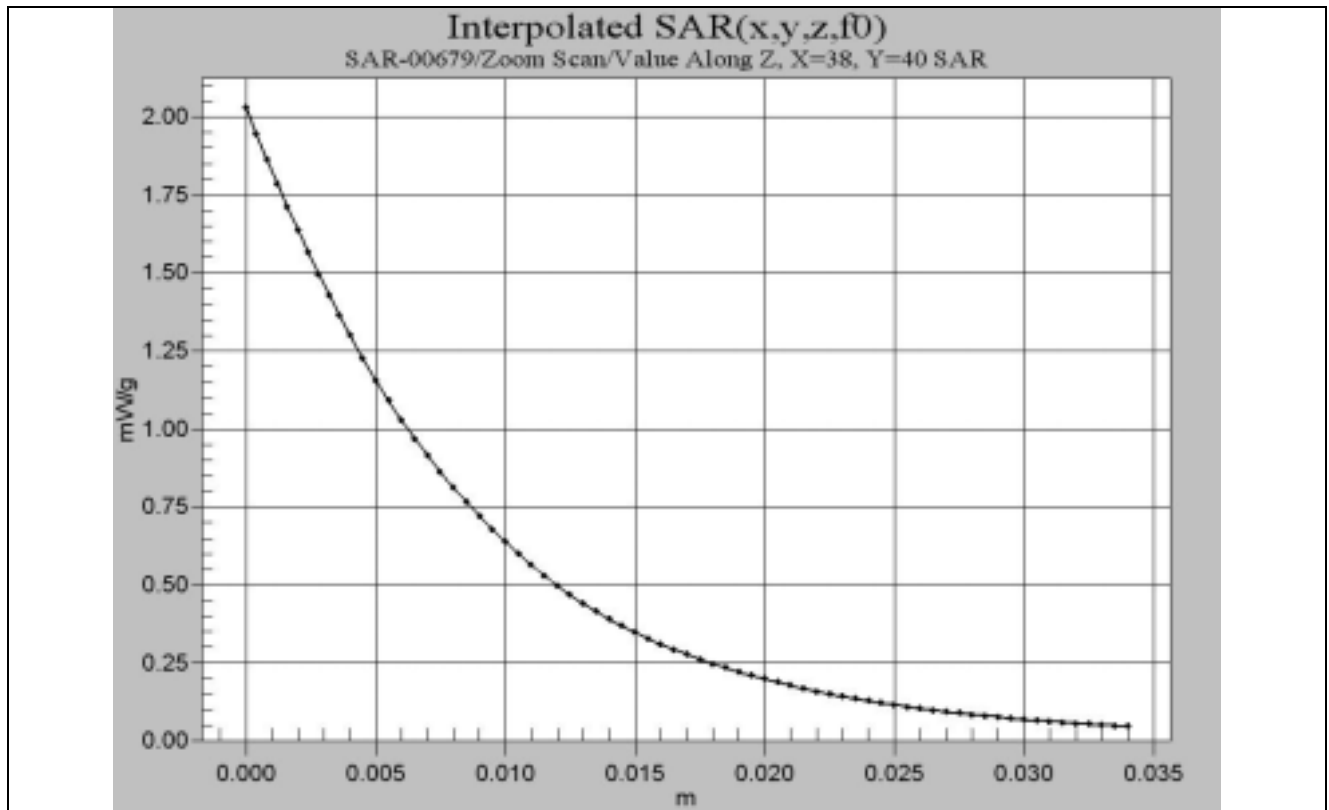
Power Drift = -0.06 dB

Maximum value of SAR = 0.387 mW/g



SAR Test Result for Flat Position – Channel 1175

Z-axis Plot for Maximum SAR



SAR Test Result for Left Cheek Position – Channel 600

Appendix C – Dipole Calibration

AUDEN

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

Client: Auden

CALIBRATION CERTIFICATE			
Object(s)	D1800V2 - SN:265		
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits		
Calibration date:	May 14, 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 R&S SMJ-03	100698	27-Mar-2002 (R&S, No. 20-02388)	In house check: Mar-05
Power sensor HP 8481A	MY41082317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292703	30-Oct-02 (METAS, No. 252-0230)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0230)	Oct-03
Network Analyzer HP 8753E	US38432420	3-May-00 (Agilent, No. 8792X064602)	In house check: May 03
Calibrated by:	Name Juerg Myerli	Function Technician	Signature 
Approved by:	Name Kulja Petrovic	Function Laboratory Director	Signature 
Date issued: May 14, 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.			

880-KP0301001-A

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Schmid & Partner Engineering AG

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Phone +41 1 245 8700, Fax +41 1 245 8778
info@speag.com, <http://www.speag.com>

DASY

Dipole Validation Kit

Type: D1800V2

Serial: 265

Manufactured: March 5, 2000
Calibrated: May 14, 2003

1. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with head simulating solution of the following electrical parameters at 1800 MHz:

Relative Dielectricity	39.2	± 5%
Conductivity	1.36 mho/m	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.3 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was 250 mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm ³ (1 g) of tissue:	38.2 mW/g ± 16.8 % (k=2) ¹
averaged over 10 cm ³ (10 g) of tissue:	20.2 mW/g ± 16.2 % (k=2) ¹

¹ validation uncertainty

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	1.165 ns	(one direction)
Transmission factor:	0.998	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 1800 MHz:	$\text{Re}\{Z\} = 48.3 \Omega$
	$\text{Im}\{Z\} = -5.6 \Omega$
Return Loss at 1800 MHz	-24.5 dB

4. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with body simulating glycol solution of the following electrical parameters at 1800 MHz:

Relative Dielectricity	51.6	$\pm 5\%$
Conductivity	1.49 mho/m	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.0 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.

The dipole input power (forward power) was 250 mW $\pm 3\%$. The results are normalized to 1W input power.

5. SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm ³ (1 g) of tissue:	37.6 mW/g \pm 16.8 % (k=2) ²
averaged over 10 cm ³ (10 g) of tissue:	20.0 mW/g \pm 16.2 % (k=2) ²

6. Dipole Impedance and Return Loss

The dipole was positioned at the flat phantom sections according to section 4 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 1800 MHz:	Re{Z} = 44.4 Ω Im {Z} = -5.9 Ω
Return Loss at 1800 MHz	-21.3 dB

7. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

8. Design

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

9. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

² validation uncertainty

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Date/Time: 05/12/03 14:45:52

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN265_SN1507_HSL1800_120503.da4

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN265
Program: Dipole Calibration

Communication System: CW-1800; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: HSL 1800 MHz ($\sigma = 1.36 \text{ mho/m}$, $\epsilon_r = 39.22$, $\rho = 1000 \text{ kg/m}^3$)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

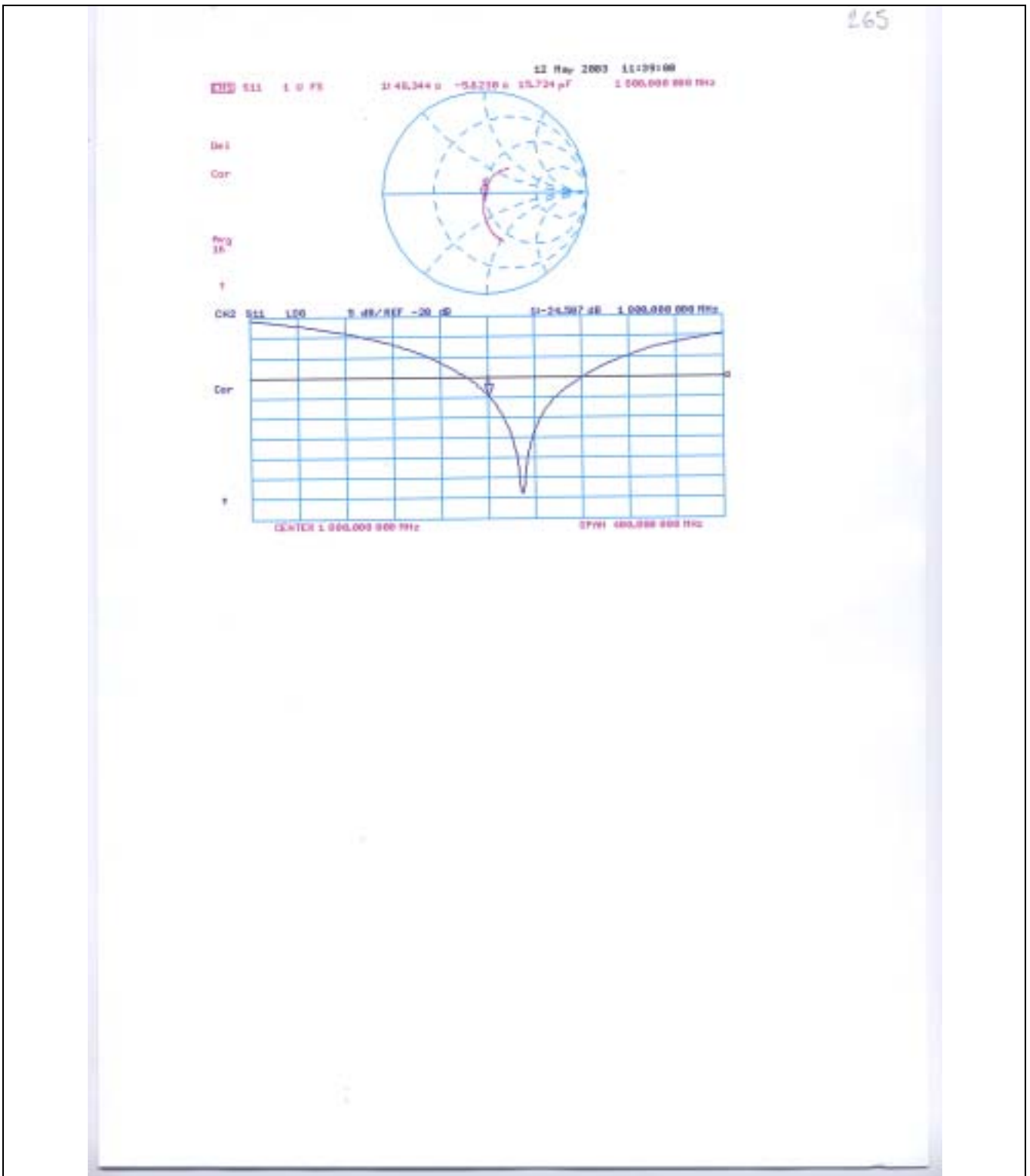
DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5.3, 5.3, 5.3); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1); Measurement grid: dx=15mm, dy=15mm
Reference Value = 93.1 V/m
Power Drift = 0.05 dB
Maximum value of SAR = 10.5 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0; Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 16.3 W/kg
SAR(1 g) = 9.55 mW/g; SAR(10 g) = 5.06 mW/g
Reference Value = 93.1 V/m
Power Drift = 0.05 dB
Maximum value of SAR = 10.6 mW/g





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Date/Time: 05/14/03 12:24:50

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN265_SN1507_M1800_140503da4.da4

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN265
Program: Dipole Calibration

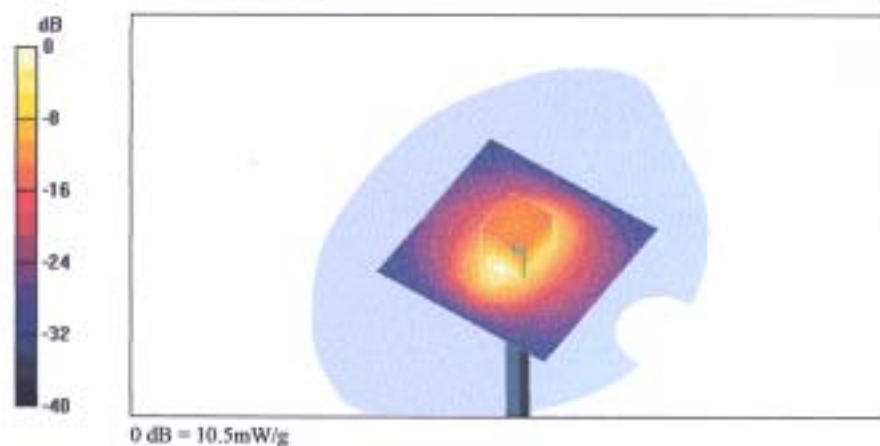
Communication System: CW-1800; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium: Muscle 1800 MHz ($\sigma = 1.49 \text{ mho/m}$, $\epsilon_r = 51.55$, $\rho = 1000 \text{ kg/m}^3$)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

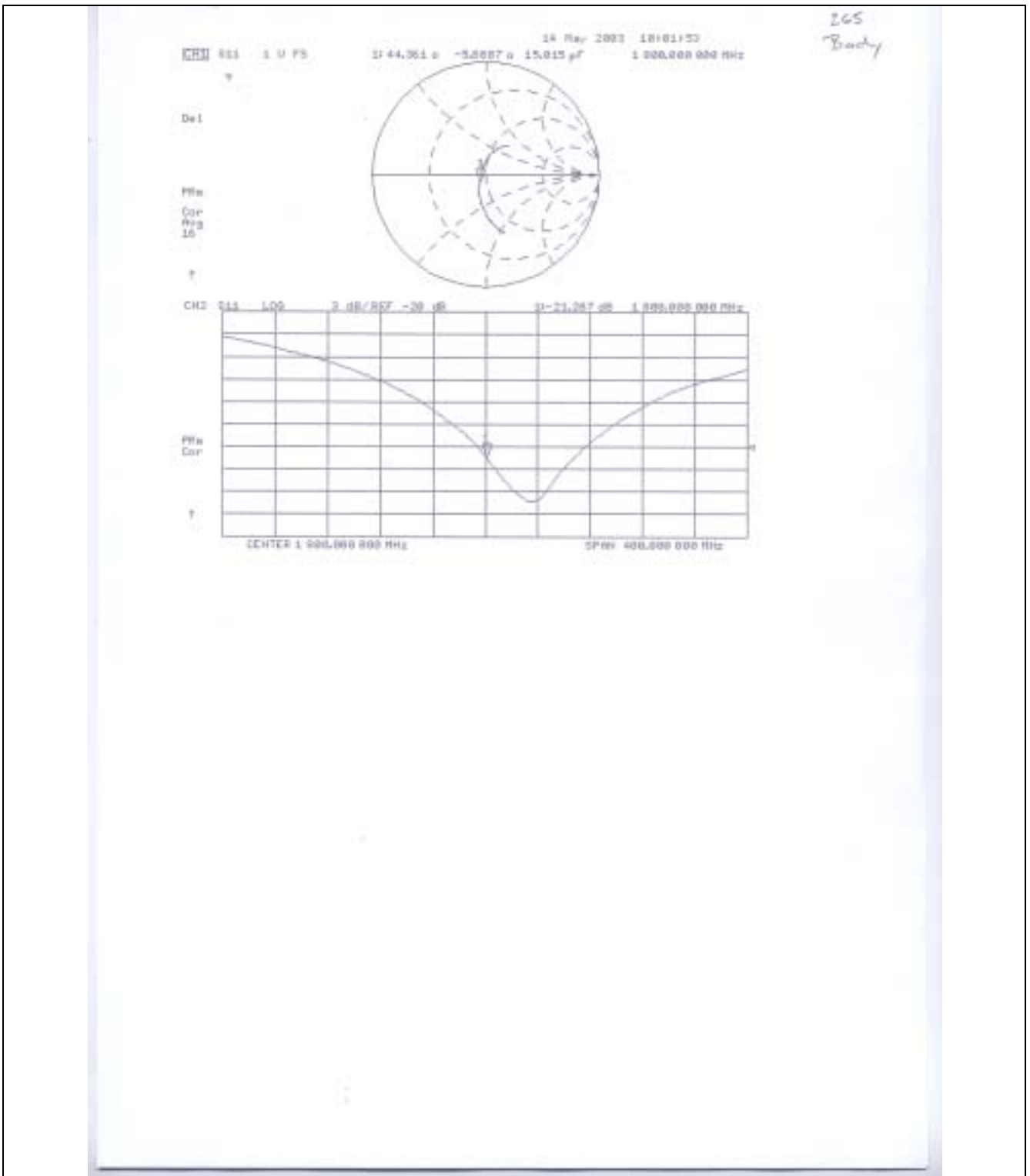
DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5, 5, 5); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.6 Build 115

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1); Measurement grid: dx=15mm, dy=15mm
Reference Value = 89.7 V/m
Power Drift = 0.03 dB
Maximum value of SAR = 10.5 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0; Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 15.5 W/kg
SAR(1 g) = 9.39 mW/g; SAR(10 g) = 5.01 mW/g
Reference Value = 89.7 V/m
Power Drift = 0.03 dB
Maximum value of SAR = 10.5 mW/g





Appendix D – Probe Calibration

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

Client **HTC (Auden)**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1720**

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

Calibration date: **May 15, 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	US3642US1730	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Power sensor B4412A	MY41486277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor HP 8481A	MY41062160	16-Sep-02 (Agilent, No. 20020918)	Sep-03
Power meter GPM E4419B	0841293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Network Analyzer HP 8753E	US38432428	3-May-03 (Agilent, No. 8702K064932)	In house check: May 03
Fuke Process Calibrator Type 702	SN: 0295803	3-Sep-01 (ELCAL, No 2360)	Sep-03

Calibrated by:

Nico Vetterli

Function:

Technician

Signature:




Approved by:

Kolja Froschke

Function:

Laboratory Director

Signature:



Date issued: May 15, 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.

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Schmid & Partner Engineering AG

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Zeughausstrasse 43, 8004 Zurich, Switzerland
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info@speag.com, <http://www.speag.com>

Probe ET3DV6

SN:1720

Manufactured:	August 26, 2002
Last calibration:	October 2, 2002
Recalibrated:	May 15, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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ET3DV6 SN:1720

May 15, 2003

DASY - Parameters of Probe: ET3DV6 SN:1720

Sensitivity in Free Space

Diode Compression

NormX	1.68 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	95	mV
NormY	1.87 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	95	mV
NormZ	1.78 $\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	95	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz $\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.97 \pm 5\%$ mho/m

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

ConvF X	6.5 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	6.5 $\pm 9.5\%$ (k=2)	Alpha	0.41
ConvF Z	6.5 $\pm 9.5\%$ (k=2)	Depth	2.51

Head 1800 MHz $\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\%$ mho/m

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

ConvF X	5.2 $\pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	5.2 $\pm 9.5\%$ (k=2)	Alpha	0.50
ConvF Z	5.2 $\pm 9.5\%$ (k=2)	Depth	2.70

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR ₉₅ [%]	Without Correction Algorithm	10.7	6.0
SAR ₉₅ [%]	With Correction Algorithm	0.4	0.6

Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary		1 mm	2 mm
SAR ₉₅ [%]	Without Correction Algorithm	14.3	9.6
SAR ₉₅ [%]	With Correction Algorithm	0.2	0.1

Sensor Offset

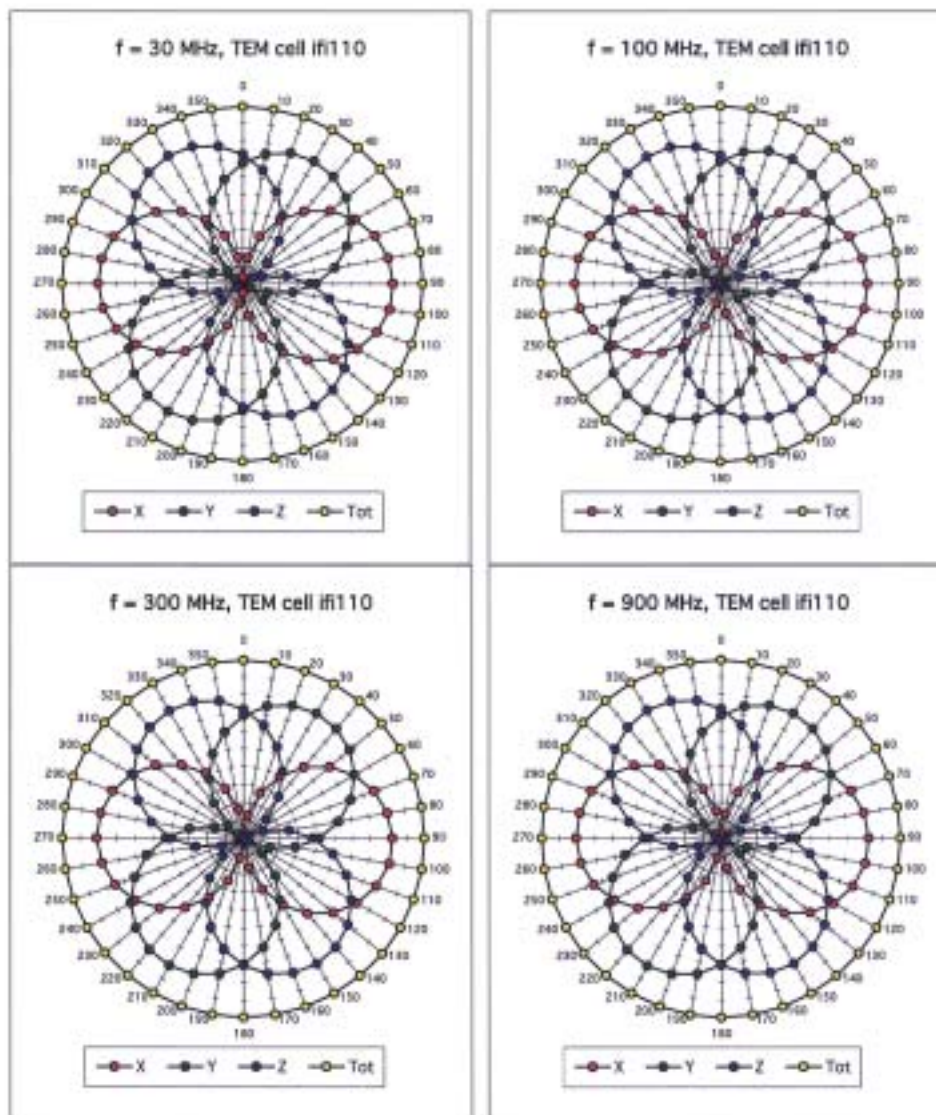
Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.5 \pm 0.2	mm

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ET3DV6 SN:1720

May 15, 2003

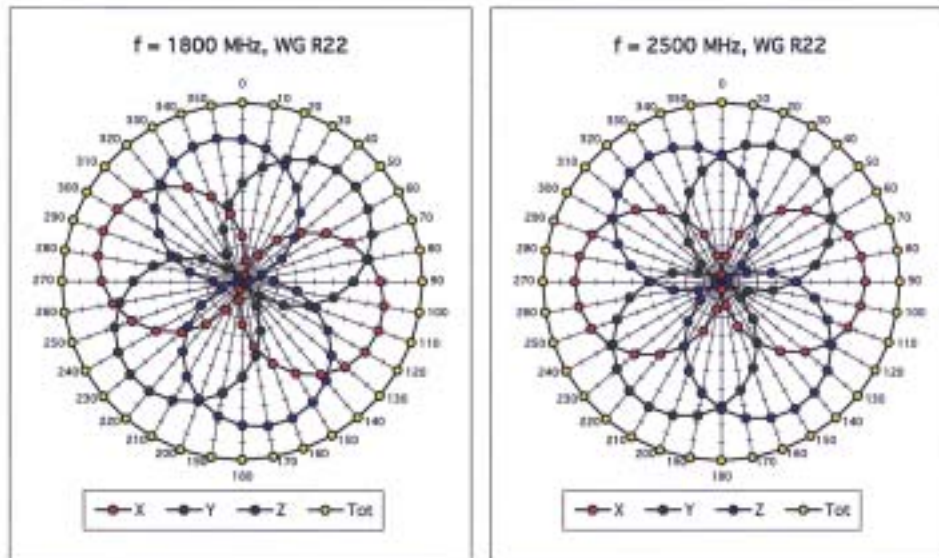
Receiving Pattern (ϕ), $\theta = 0^\circ$



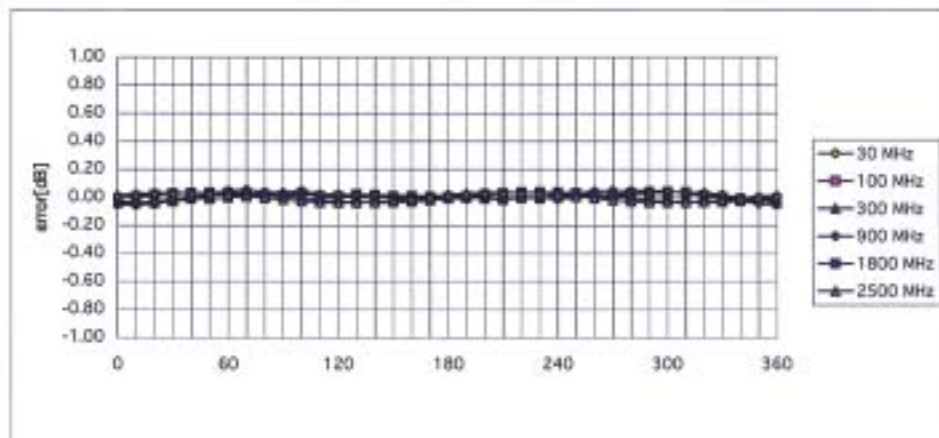
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ET3DV6 SN:1720

May 15, 2003



Isotropy Error (ϕ), $\theta = 0^\circ$



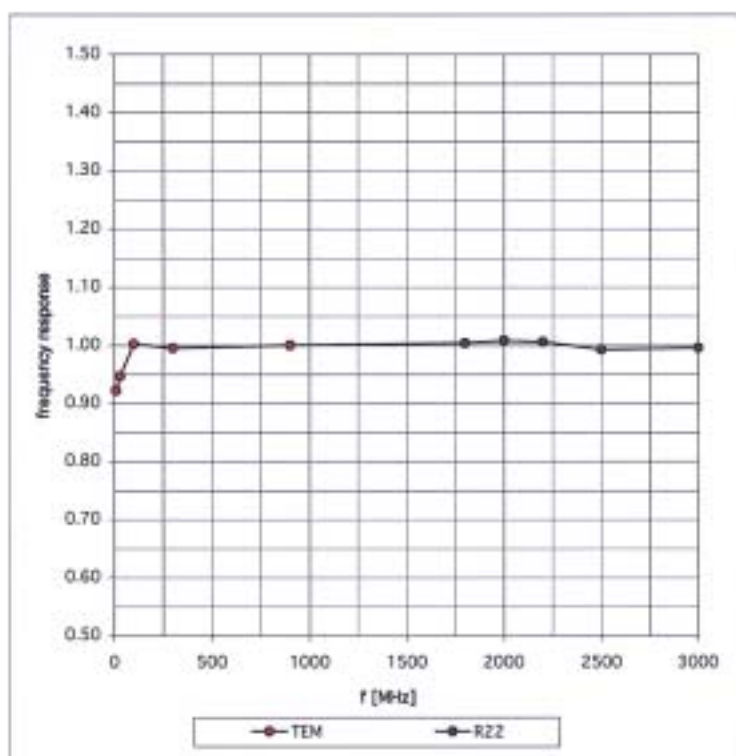
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ET3DV6 SN:1720

May 15, 2003

Frequency Response of E-Field

(TEM-Cell:ifi110, Waveguide R22)



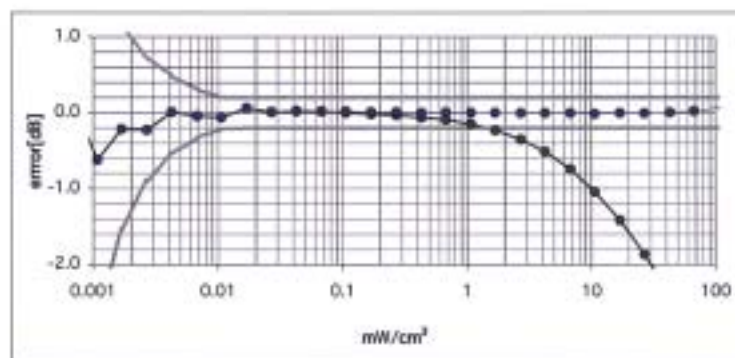
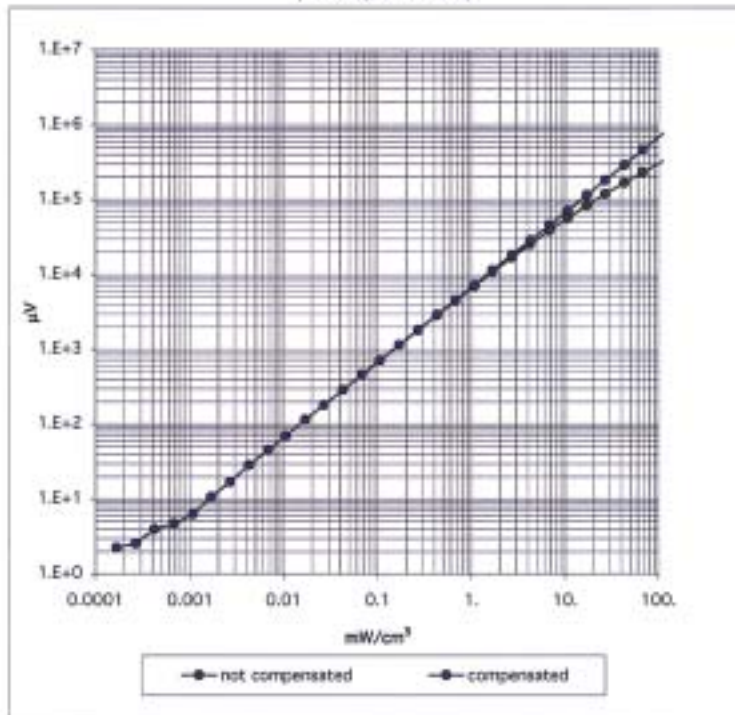
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ET3DV6 SN:1720

May 15, 2003

Dynamic Range f(SAR_{brain})

(Waveguide R22)

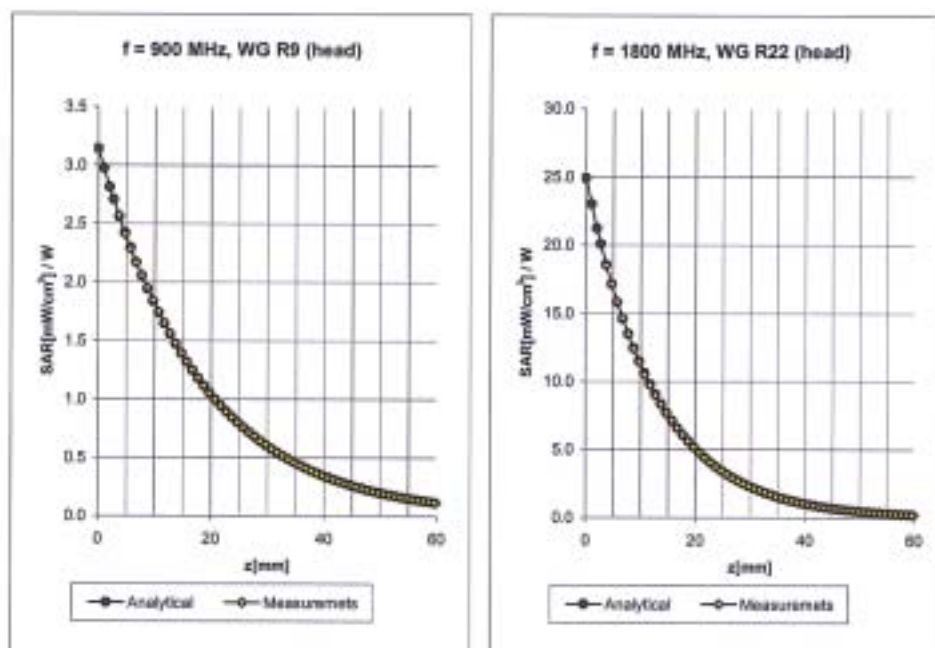


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ET3DV6 SN:1720

May 15, 2003

Conversion Factor Assessment



Head 900 MHz $\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.97 \pm 5\% \text{ mho/m}$

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

ConvF X	$6.5 \pm 9.5\% (k=2)$	Boundary effect:	
ConvF Y	$6.5 \pm 9.5\% (k=2)$	Alpha	0.41
ConvF Z	$6.5 \pm 9.5\% (k=2)$	Depth	2.51

Head 1800 MHz $\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\% \text{ mho/m}$

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

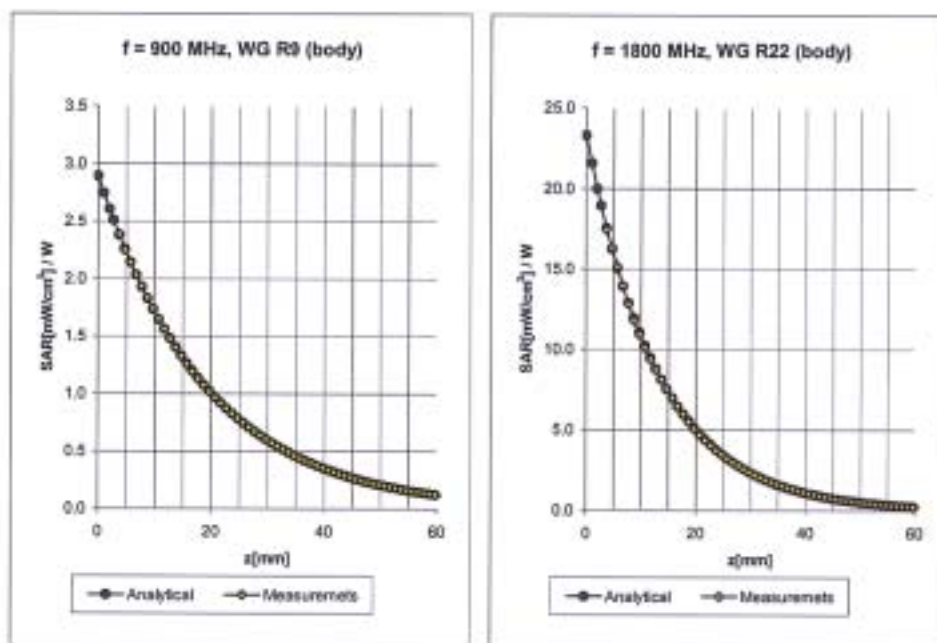
ConvF X	$5.2 \pm 9.5\% (k=2)$	Boundary effect:	
ConvF Y	$5.2 \pm 9.5\% (k=2)$	Alpha	0.50
ConvF Z	$5.2 \pm 9.5\% (k=2)$	Depth	2.70

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ET3DV6 SN:1720

May 15, 2003

Conversion Factor Assessment



Body 900 MHz $\epsilon_r = 55.0 \pm 5\%$ $\sigma = 1.05 \pm 5\% \text{ mho/m}$

Valid for $f=800\text{-}1000 \text{ MHz}$ with Body Tissue Simulating Liquid according to IEC 65 Suppl. C

ConvF X	$6.3 \pm 9.5\% (k=2)$	Boundary effect:	
ConvF Y	$6.3 \pm 9.5\% (k=2)$	Alpha	0.42
ConvF Z	$6.3 \pm 9.5\% (k=2)$	Depth	2.54

Body 1800 MHz $\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\% \text{ mho/m}$

Valid for $f=1710\text{-}1910 \text{ MHz}$ with Body Tissue Simulating Liquid according to IEC 65 Suppl. C

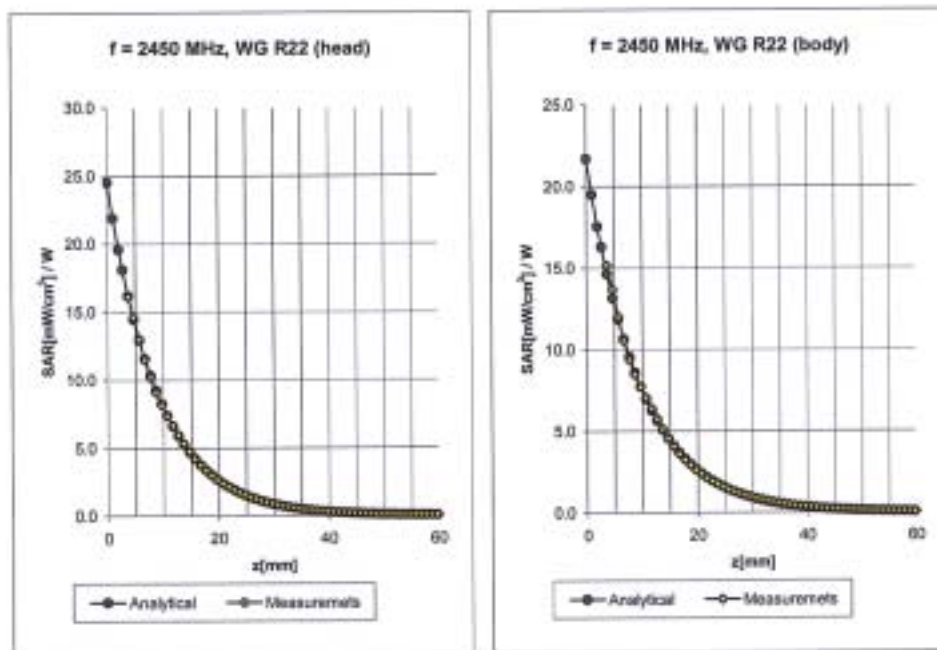
ConvF X	$4.8 \pm 9.5\% (k=2)$	Boundary effect:	
ConvF Y	$4.8 \pm 9.5\% (k=2)$	Alpha	0.57
ConvF Z	$4.8 \pm 9.5\% (k=2)$	Depth	2.63

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ET3DV6 SN:1720

May 15, 2003

Conversion Factor Assessment



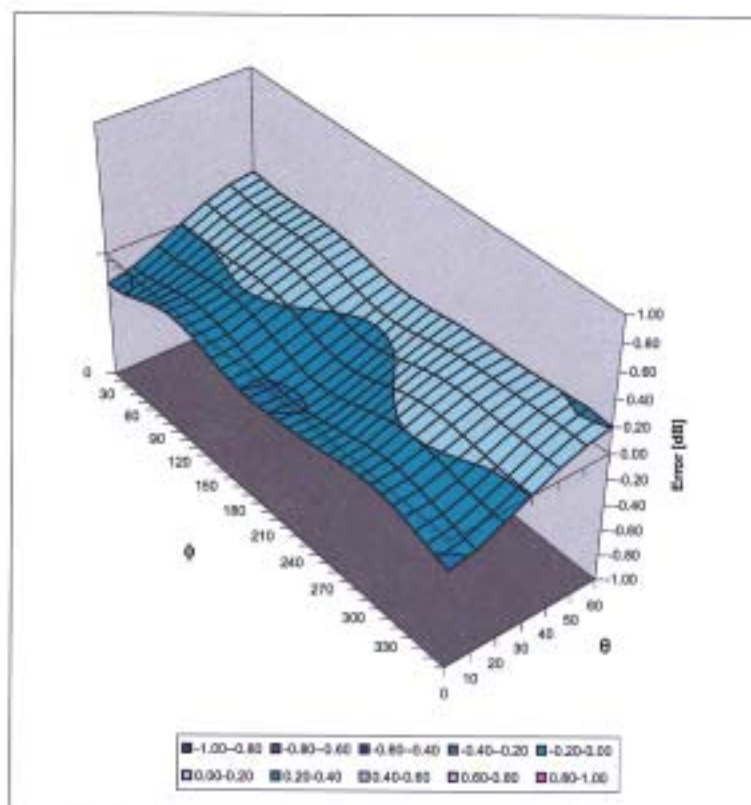
Head	2450	MHz	$\epsilon_r = 39.2 \pm 5\%$	$\sigma = 1.80 \pm 5\%$ mho/m
Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X				
ConvF X	$4.8 \pm 8.9\%$ (k=2)		Boundary effect:	
ConvF Y	$4.8 \pm 8.9\%$ (k=2)		Alpha	1.01
ConvF Z	$4.8 \pm 8.9\%$ (k=2)		Depth	1.85
Body	2450	MHz	$\epsilon_r = 52.7 \pm 5\%$	$\sigma = 1.95 \pm 5\%$ mho/m
Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C				
ConvF X	$4.4 \pm 8.9\%$ (k=2)		Boundary effect:	
ConvF Y	$4.4 \pm 8.9\%$ (k=2)		Alpha	1.20
ConvF Z	$4.4 \pm 8.9\%$ (k=2)		Depth	1.60

ET3DV6 SN:1720

May 15, 2003

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



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

Client JWIT (Auden)

CALIBRATION CERTIFICATE

Object(s) ET3DV6 - SN:1753

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

Calibration date May 23, 2003

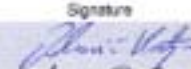
Condition of the calibrated item In Tolerance (according to the specific calibration document)

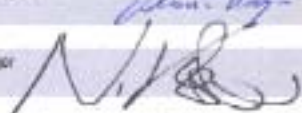
This calibration statement documents traceability of MSTE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 International standard.

All calibrations have been conducted in the closed laboratory facility; environment temperature 22 ± 2 degrees Celsius and humidity < 70%.

Calibration Equipment used (MSTE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
RF generator HP 8094C	US3642UD1700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41465277	2-Apr-03 (MSTAS, No 252-0250)	Apr-04
Power sensor HP 8481A	MY41062180	18-Sep-02 (Agilent, No. 28C20918)	Sep-03
Power meter EPM E4419B	GB41293874	2-Apr-03 (MSTAS, No 252-0250)	Apr-04
Network Analyser HP 8753E	US38432426	3-May-02 (Agilent, No. 6702K064602)	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295603	3-Sep-01 (ELCAL, No.2360)	Sep-03

Calibrated by: Name: Kolja Pokovic Function: Laboratory Director Signature: 

Approved by: Name: Niels Kuster Quality Manager: 

Date issued: May 24, 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

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, <http://www.speag.com>

Probe ET3DV6

SN:1753

Manufactured: April 15, 2003
Last calibration: May 23, 2003

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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ET3DV6 SN:1753

May 23, 2003

DASY - Parameters of Probe: ET3DV6 SN:1753

Sensitivity in Free Space

NormX	1.59 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.88 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.92 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	92	mV
DCP Y	92	mV
DCP Z	92	mV

Sensitivity in Tissue Simulating Liquid

Head 900 MHz $\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.97 \pm 5\%$ mho/m

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

ConvF X	6.9 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	6.9 $\pm 9.5\%$ (k=2)	Alpha 0.35
ConvF Z	6.9 $\pm 9.5\%$ (k=2)	Depth 2.63

Head 1800 MHz $\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\%$ mho/m

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

ConvF X	5.4 $\pm 9.5\%$ (k=2)	Boundary effect:
ConvF Y	5.4 $\pm 9.5\%$ (k=2)	Alpha 0.52
ConvF Z	5.4 $\pm 9.5\%$ (k=2)	Depth 2.45

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR _{iso} [%] Without Correction Algorithm	9.8	5.5
SAR _{iso} [%] With Correction Algorithm	0.5	0.6

Head 1800 MHz Typical SAR gradient: 10 % per mm

Probe Tip to Boundary	1 mm	2 mm
SAR _{iso} [%] Without Correction Algorithm	12.8	8.5
SAR _{iso} [%] With Correction Algorithm	0.2	0.2

Sensor Offset

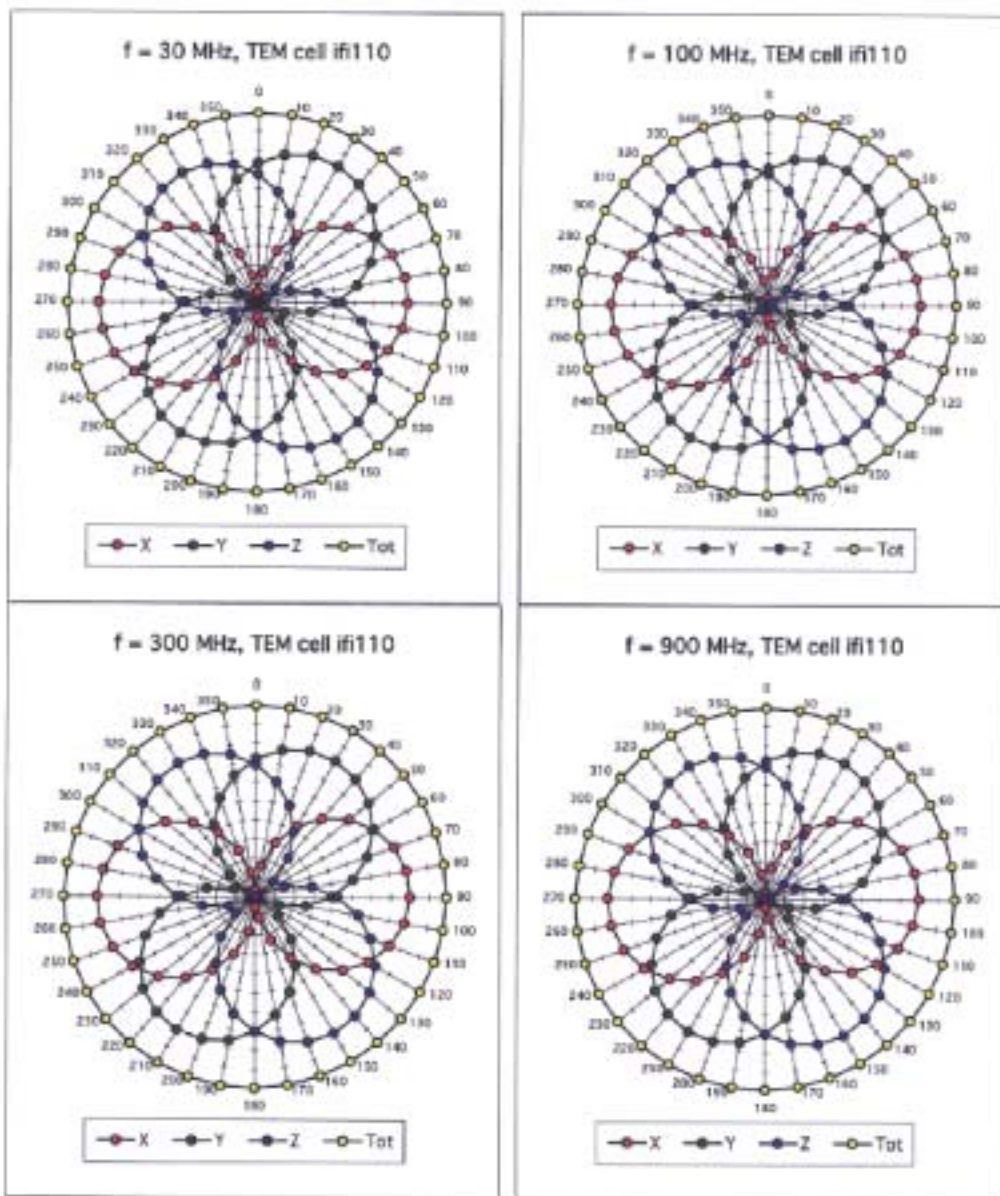
Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	1.5 \pm 0.2	mm

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ET3DV6 SN:1753

May 23, 2003

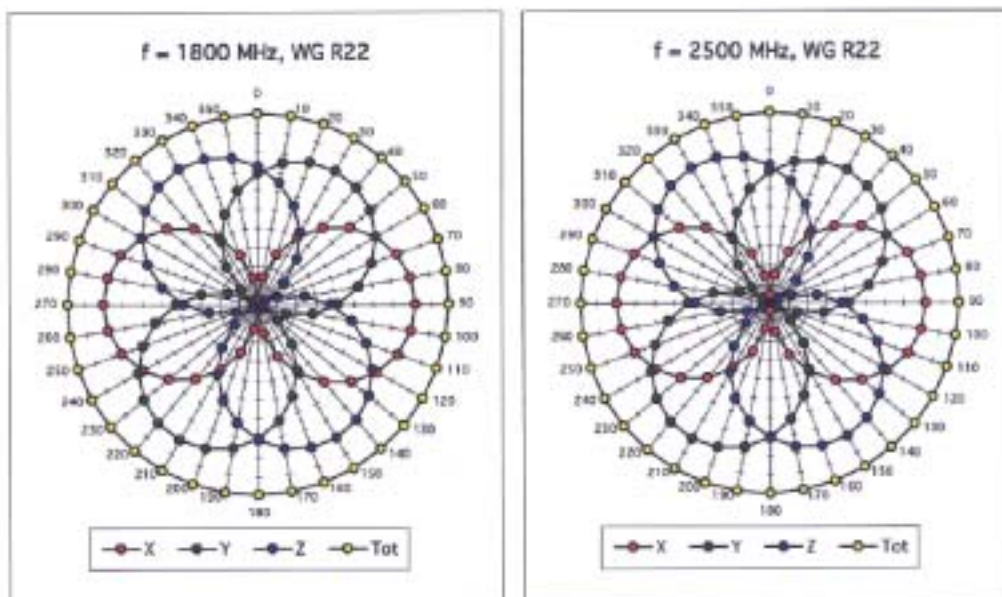
Receiving Pattern (ϕ), $\theta = 0^\circ$



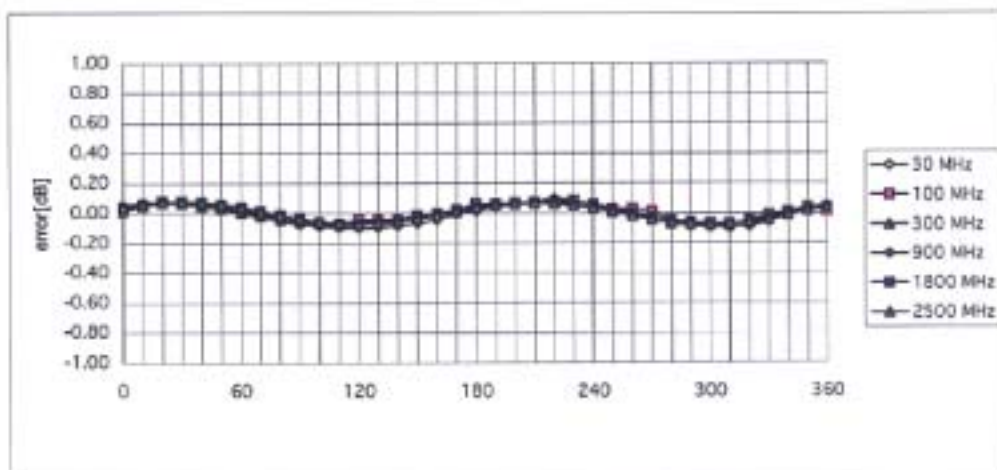
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ET3DV6 SN:1753

May 23, 2003



Isotropy Error (ϕ), $\theta = 0^\circ$



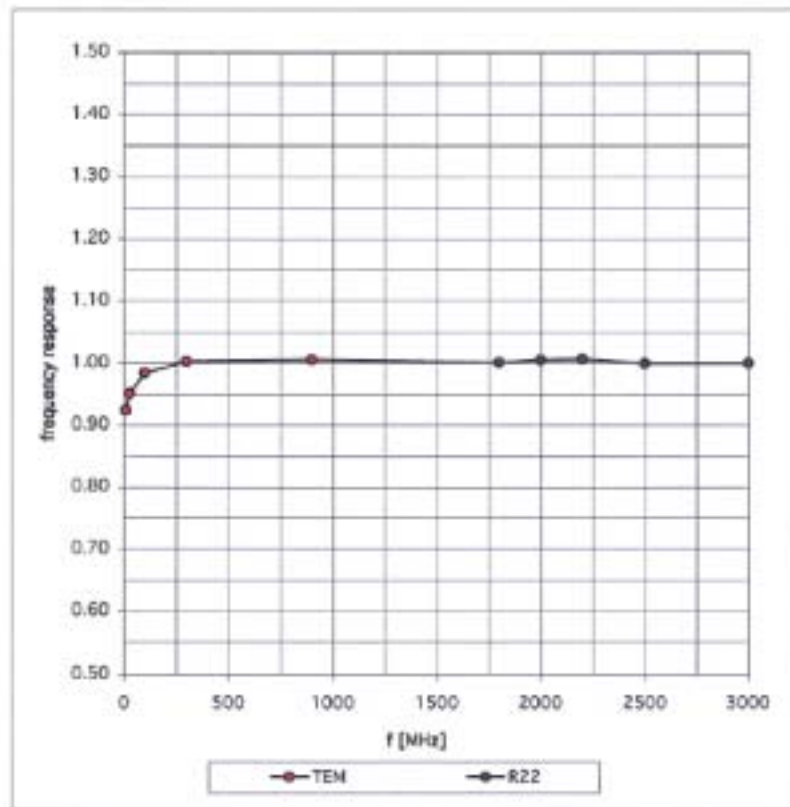
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ET3DV6 SN:1753

May 23, 2003

Frequency Response of E-Field

(TEM-Cell:IF1110, Waveguide R22)

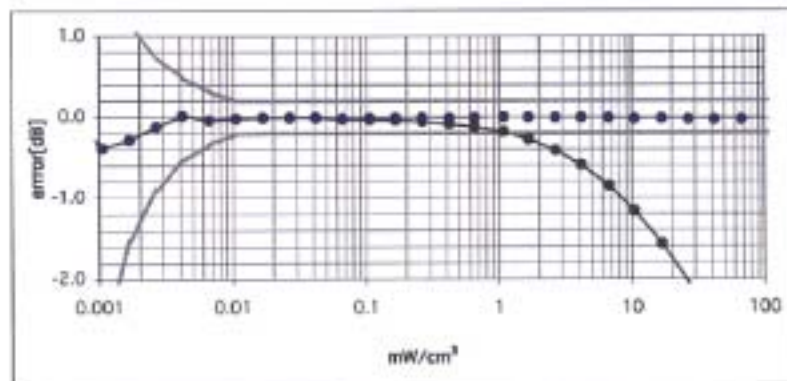
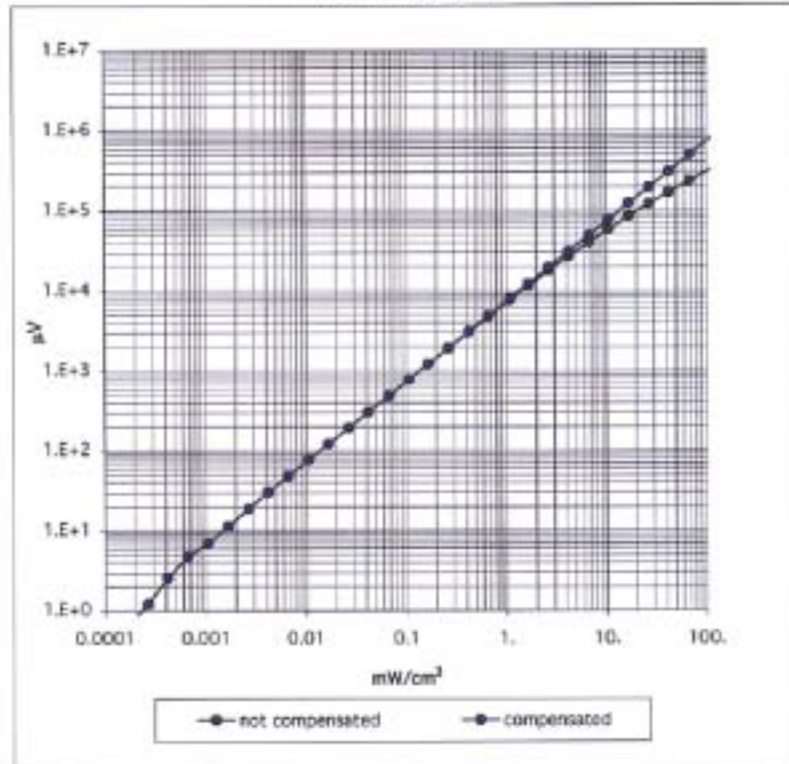


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ET3DV6 SN:1753

May 23, 2003

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

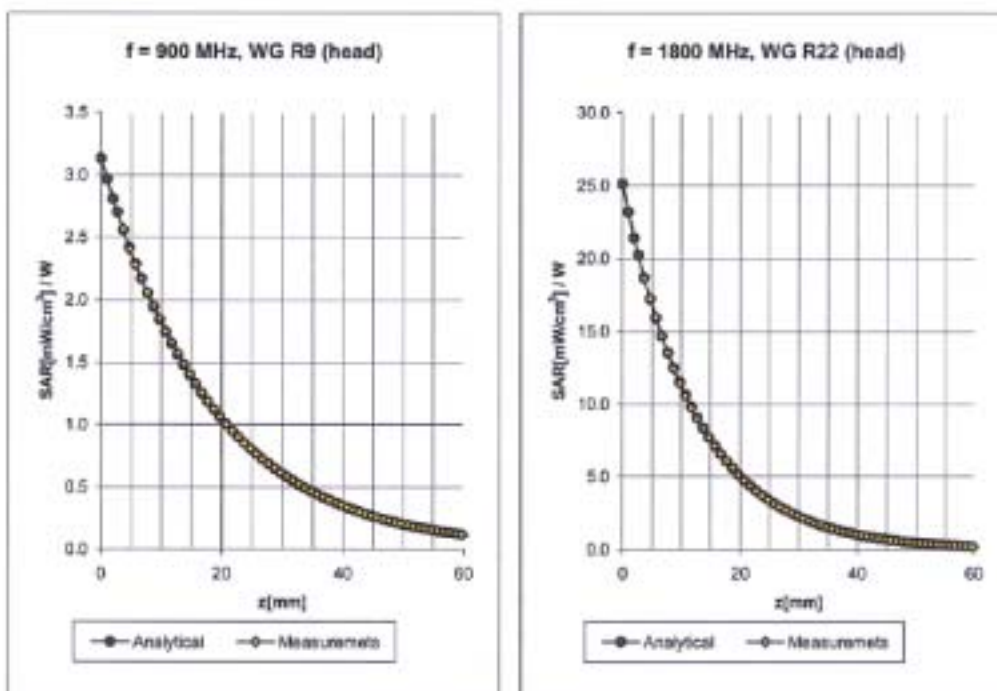


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ET3DV6 SN:1753

May 23, 2003

Conversion Factor Assessment



Head 900 MHz $\epsilon_r = 41.5 \pm 5\%$ $\sigma = 0.97 \pm 5\%$ mho/m

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

ConvF X	$6.9 \pm 0.5\%$ (k=2)	Boundary effect:	
ConvF Y	$6.9 \pm 0.5\%$ (k=2)	Alpha	0.35
ConvF Z	$6.9 \pm 0.5\%$ (k=2)	Depth	2.63

Head 1800 MHz $\epsilon_r = 40.0 \pm 5\%$ $\sigma = 1.40 \pm 5\%$ mho/m

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

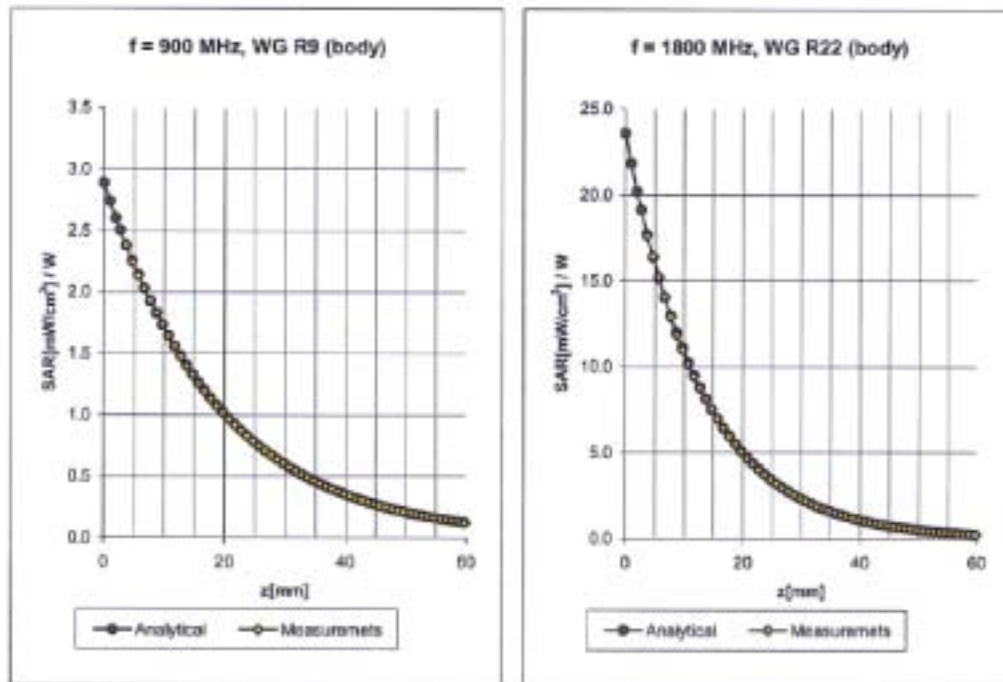
ConvF X	$5.4 \pm 0.5\%$ (k=2)	Boundary effect:	
ConvF Y	$5.4 \pm 0.5\%$ (k=2)	Alpha	0.52
ConvF Z	$5.4 \pm 0.5\%$ (k=2)	Depth	2.45

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ET3DV6 SN:1753

May 23, 2003

Conversion Factor Assessment



Body 900 MHz $\epsilon_r = 55.0 \pm 5\%$ $\sigma = 1.05 \pm 5\%$ mho/m

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

ConvF X	$6.6 \pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	$6.6 \pm 9.5\%$ (k=2)	Alpha	0.39
ConvF Z	$6.6 \pm 9.5\%$ (k=2)	Depth	2.46

Body 1800 MHz $\epsilon_r = 53.3 \pm 5\%$ $\sigma = 1.52 \pm 5\%$ mho/m

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

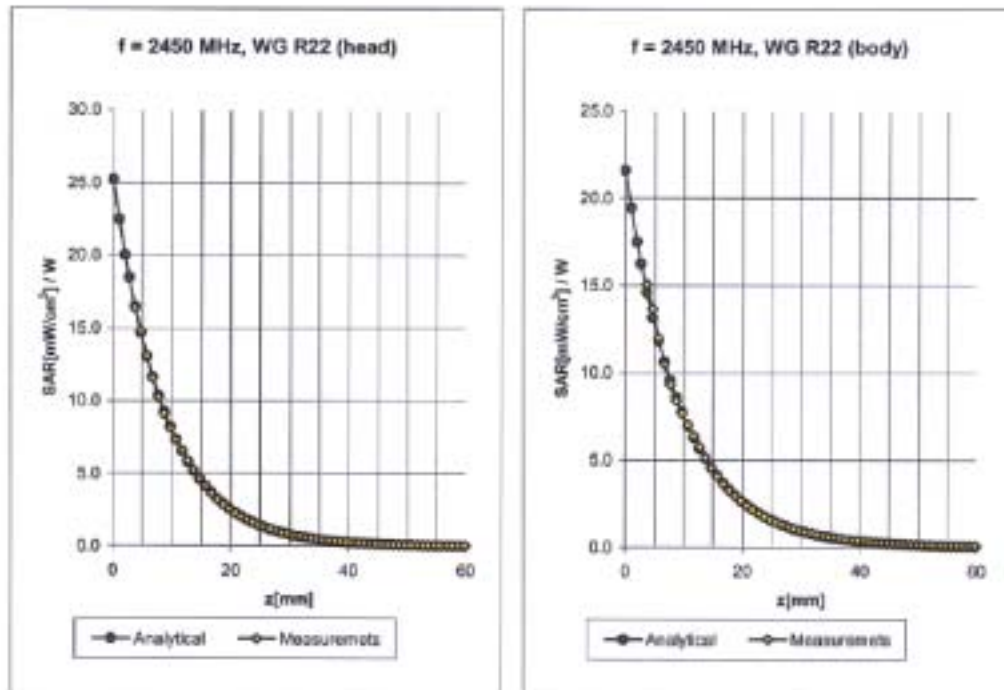
ConvF X	$4.9 \pm 9.5\%$ (k=2)	Boundary effect:	
ConvF Y	$4.9 \pm 9.5\%$ (k=2)	Alpha	0.55
ConvF Z	$4.9 \pm 9.5\%$ (k=2)	Depth	2.59

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ET3DV6 SN:1753

May 23, 2003

Conversion Factor Assessment



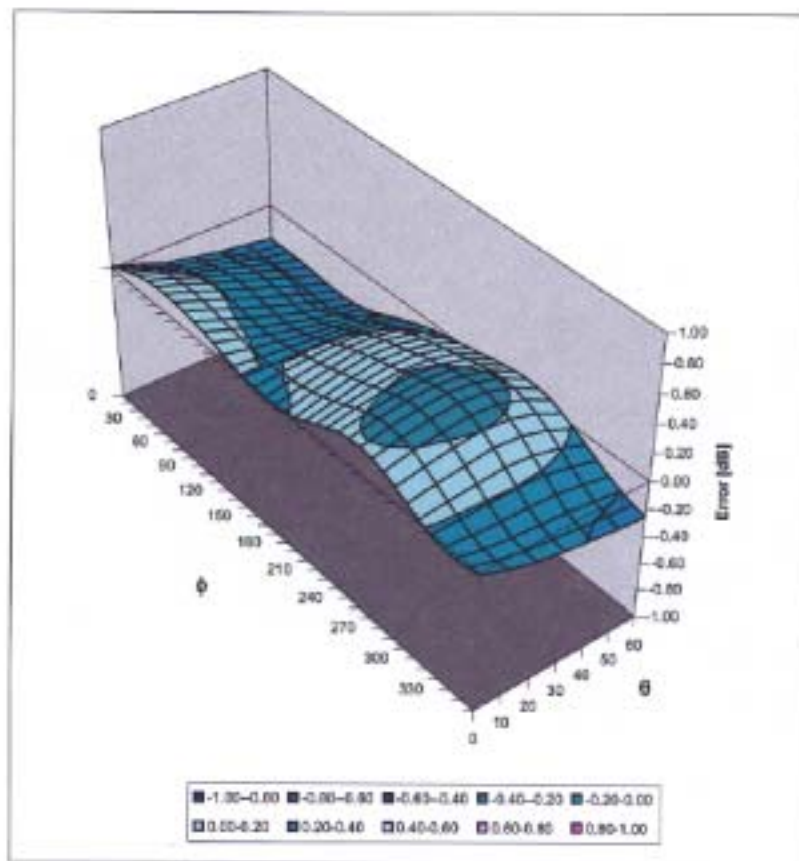
Head	2450	MHz	$\epsilon_r = 39.2 \pm 5\%$	$\sigma = 1.80 \pm 5\% \text{ mho/m}$
Valid for f=2400-2500 MHz with Head Tissue Simulating Liquid according to EN 50361, P1528-200X				
ConvF X	5.0	$\pm 8.9\% (k=2)$	Boundary effect:	
ConvF Y	5.0	$\pm 8.9\% (k=2)$	Alpha	0.96
ConvF Z	5.0	$\pm 8.9\% (k=2)$	Depth	1.90
Body	2450	MHz	$\epsilon_r = 52.7 \pm 5\%$	$\sigma = 1.95 \pm 5\% \text{ mho/m}$
Valid for f=2400-2500 MHz with Body Tissue Simulating Liquid according to IEC 65 Suppl. C				
ConvF X	4.6	$\pm 8.9\% (k=2)$	Boundary effect:	
ConvF Y	4.6	$\pm 8.9\% (k=2)$	Alpha	1.55
ConvF Z	4.6	$\pm 8.9\% (k=2)$	Depth	1.35

ET3DV6 SN:1753

May 23, 2003

Deviation from Isotropy in HSL

Error (θ, ϕ), $f = 900$ MHz



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Appendix E – Data Acquisition Electronic (DAE) Calibration

Schmid & Partner
Engineering AG

DASY - DOSIMETRIC ASSESSMENT SYSTEM

CALIBRATION REPORT

DATA ACQUISITION ELECTRONICS

MODEL: DAE3 V1

SERIAL NUMBER: 393

This Data Acquisition Unit was calibrated and tested using a FLUKE 702 Process Calibrator. Calibration and verification were performed at an ambient temperature of 23 ± 5 °C and a relative humidity of < 70%.

Measurements were performed using the standard DASY software for converting binary values, offset compensation and noise filtering. Software settings are indicated in the reports.

Results from this calibration relate only to the unit calibrated.

Calibrated by: Storchenegger

Calibration Date: 18.12. 2002

DASY Software Version: DASY3 V3.1c



唐從奇
Dae393c

1. DC Voltage Measurement

DA - Converter Values from DAE

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

Software Set-up: Calibration time: 3 sec Measuring time: 3 sec

Setup	X	Y	Z
High Range	404.0746844	404.3390978	404.1879964
Low Range	3.97137	3.94142	3.95498
Connector Position	19 °		

High Range	Input	Reading in μ V	% Error
Channel X + Input	200mV	199999.6	0.00
	20mV	19995.32	-0.02
Channel X - Input	20mV	-19993.79	-0.03
	200mV	199999.5	0.00
Channel Y + Input	20mV	19993.39	-0.03
	200mV	199999.5	0.00
Channel Y - Input	20mV	-19994.02	-0.03
	200mV	199999.5	0.00
Channel Z + Input	20mV	19994.5	-0.03
	200mV	199999.5	0.00
Channel Z - Input	20mV	-20003.01	0.02
	200mV	199999.5	0.00

Low Range	Input	Reading in μ V	% Error
Channel X + Input	2mV	2000.05	0.00
	0.2mV	200.366	0.18
Channel X - Input	0.2mV	-200.379	0.19
	2mV	2000.02	0.00
Channel Y + Input	0.2mV	199.114	-0.44
	2mV	2000.02	0.00
Channel Y - Input	0.2mV	-200.753	0.38
	2mV	2000.02	0.00
Channel Z + Input	0.2mV	199.202	-0.40
	2mV	2000.02	0.00
Channel Z - Input	0.2mV	-201.2	0.60
	2mV	2000.02	0.00

Dae393c

2. Common mode sensitivity

Software Set-up
 Calibration time: 3 sec, Measuring time: 3 sec
 High/Low Range

in μ V	Common mode Input Voltage	High Range Reading	Low Range Reading
Channel X	200mV	11.5195	10.6443
	- 200mV	-9.45899	-10.7877
Channel Y	200mV	8.8208	9.04838
	- 200mV	-10.7208	-10.4891
Channel Z	200mV	2.57815	2.58048
	- 200mV	-3.83723	-5.33249

3. Channel separation

Software Set-up
 Calibration time: 3 sec, Measuring time: 3 sec
 High Range

in μ V	Input Voltage	Channel X	Channel Y	Channel Z
Channel X	200mV	-	3.87894	-0.249448
Channel Y	200mV	0.754446	-	5.51548
Channel Z	200mV	-1.16639	0.548042	-

4. AD-Converter Values with inputs shorted

in LSB	Low Range	High Range
Channel X	15563	16112
Channel Y	15059	15995
Channel Z	17960	16464

Dec369c

5. Input Offset Measurement

Measured after 15 min warm-up time of the Data Acquisition Electronic.
 Every Measurement is preceded by a calibration cycle.

Software set-up:
 Calibration time: 3 sec
 Measuring time: 3 sec
 Number of measurements: 100, Low Range

Input 10M Ω

in μ V	Average	min. Offset	max. Offset	Std. Deviation
Channel X	0.63	-0.63	2.29	0.31
Channel Y	-1.70	-3.57	-0.50	0.32
Channel Z	-0.63	-2.32	0.23	0.30

Input shorted

in μ V	Average	min. Offset	max. Offset	Std. Deviation
Channel X	0.13	-0.34	0.56	0.16
Channel Y	-0.75	-1.29	-0.24	0.18
Channel Z	-1.06	-1.66	-0.49	0.18

6. Input Offset Current

in fA	Input Offset Current
Channel X	< 25
Channel Y	< 25
Channel Z	< 25

7. Input Resistance

	Calibrating	Measuring
Channel X	200 k Ω	200 M Ω
Channel Y	200 k Ω	200 M Ω
Channel Z	200 k Ω	200 M Ω

Das993c

8. Low Battery Alarm Voltage

In V	Alarm Level
Supply (+ Vcc)	7.38 V
Supply (- Vcc)	-7.32 V

9. Power Consumption

In mA	Switched off	Stand by	Transmitting
Supply (+ Vcc)	0.000	5.29	13.8
Supply (- Vcc)	-0.011	-7.58	-8.8

10. Functional test

Touch async pulse 1	ok
Touch async pulse 2	ok
Touch status bit 1	ok
Touch status bit 2	ok
Remote power off	ok
Remote analog Power control	ok
Modification Status	B - C

Date: 11.12.02

Signature: P. H. L.

0ae993c