



ET3DV6 SN:1788

August 29, 2003

**DASY - Parameters of Probe: ET3DV6 SN:1788****Sensitivity in Free Space****Diode Compression**

|       |                                          |       |    |    |
|-------|------------------------------------------|-------|----|----|
| NormX | 1.68 $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP X | 95 | mV |
| NormY | 1.62 $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Y | 95 | mV |
| NormZ | 1.71 $\mu\text{V}/(\text{V}/\text{m})^2$ | 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 | 6.6 $\pm 9.5\%$ (k=2) | Boundary effect: |      |
| ConvF Y | 6.6 $\pm 9.5\%$ (k=2) | Alpha            | 0.34 |
| ConvF Z | 6.6 $\pm 9.5\%$ (k=2) | Depth            | 2.48 |

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 | 5.3 $\pm 9.5\%$ (k=2) | Boundary effect: |      |
| ConvF Y | 5.3 $\pm 9.5\%$ (k=2) | Alpha            | 0.43 |
| ConvF Z | 5.3 $\pm 9.5\%$ (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 <sub>te</sub> [%] | Without Correction Algorithm | 8.7  | 5.0  |
| SAR <sub>te</sub> [%] | 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 <sub>te</sub> [%] | Without Correction Algorithm | 12.8 | 8.9  |
| SAR <sub>te</sub> [%] | With Correction Algorithm    | 0.3  | 0.1  |

**Sensor Offset**

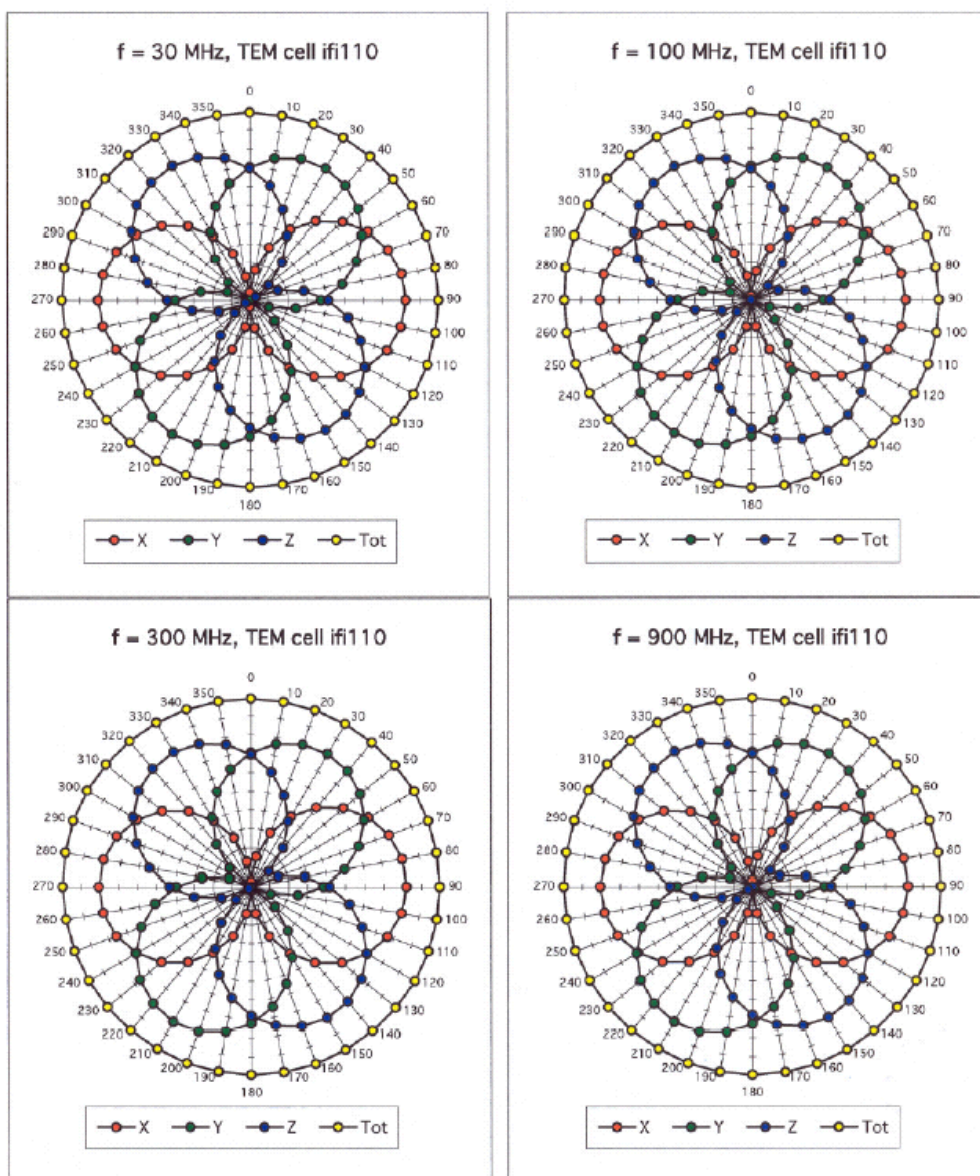
|                            |               |    |
|----------------------------|---------------|----|
| Probe Tip to Sensor Center | 2.7           | mm |
| Optical Surface Detection  | 1.6 $\pm$ 0.2 | mm |



ET3DV6 SN:1788

August 29, 2003

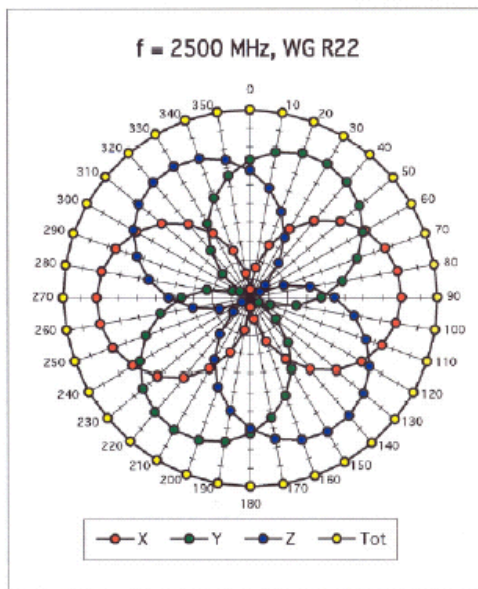
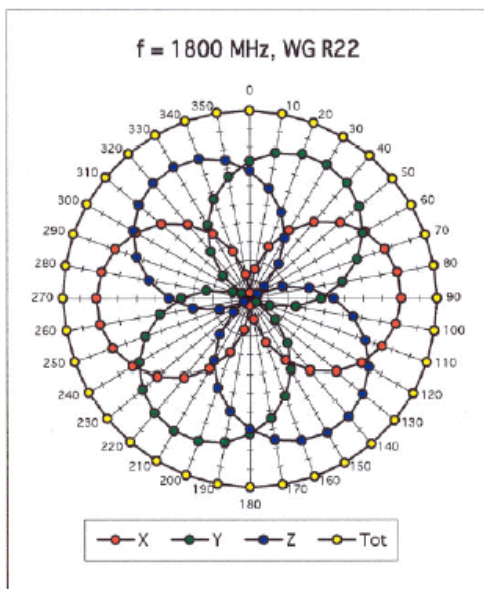
Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$



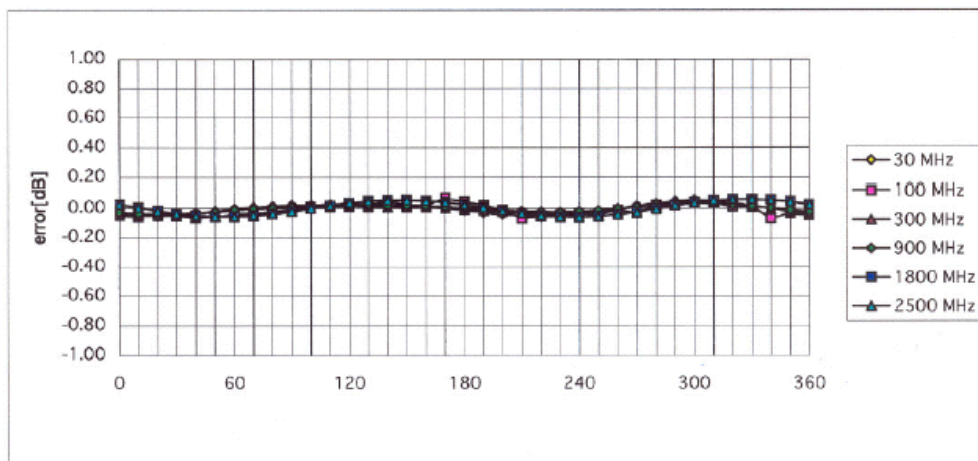


ET3DV6 SN:1788

August 29, 2003



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



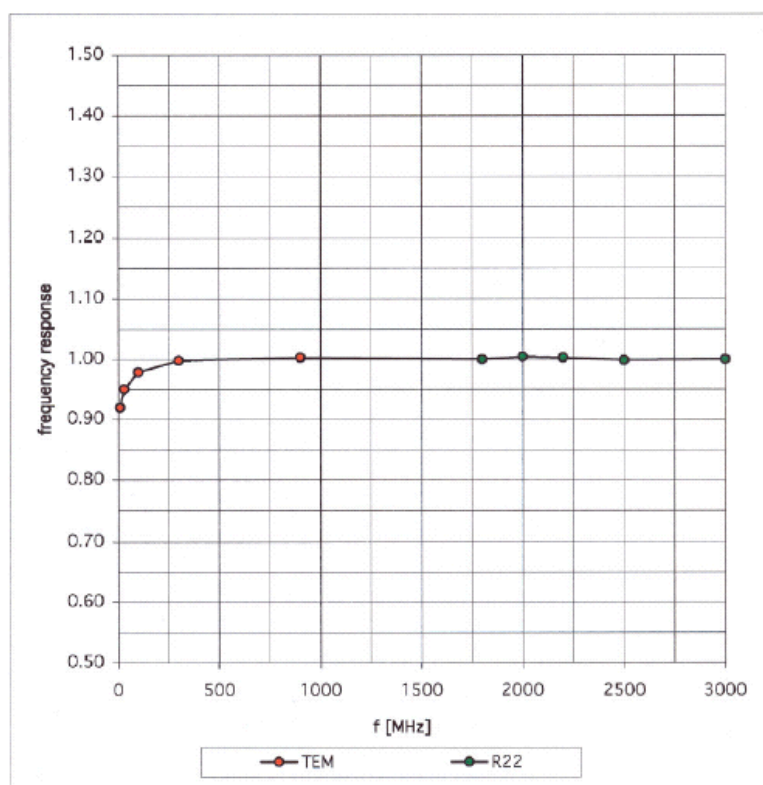


ET3DV6 SN:1788

August 29, 2003

## Frequency Response of E-Field

( TEM-Cell:ifi110, Waveguide R22)



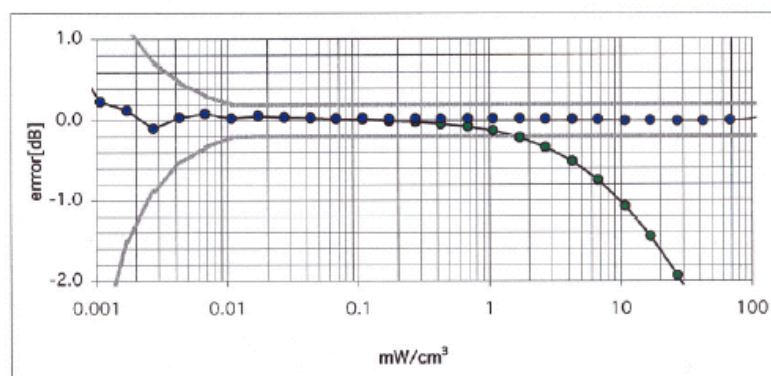
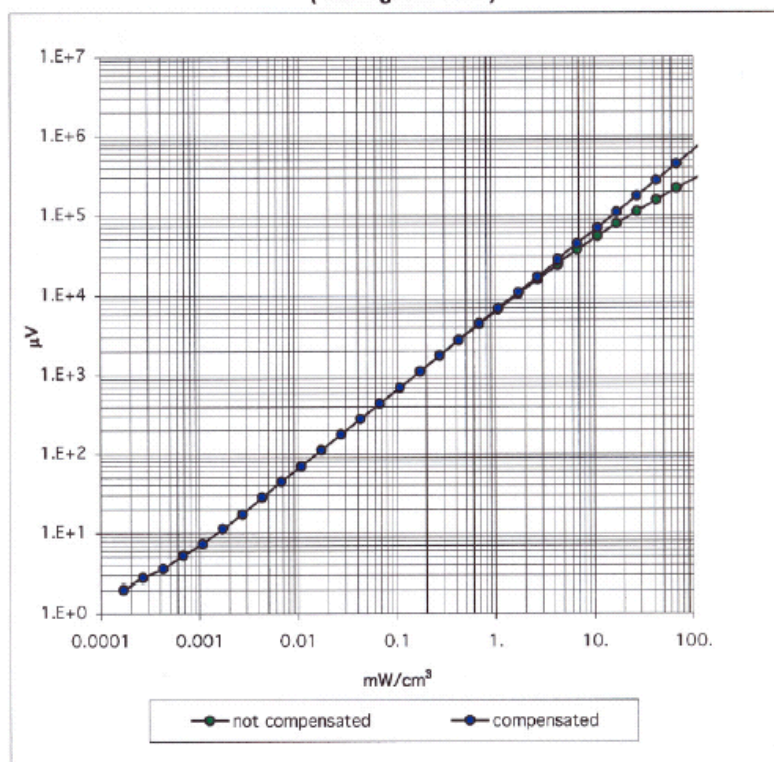


ET3DV6 SN:1788

August 29, 2003

### Dynamic Range $f(\text{SAR}_{\text{brain}})$

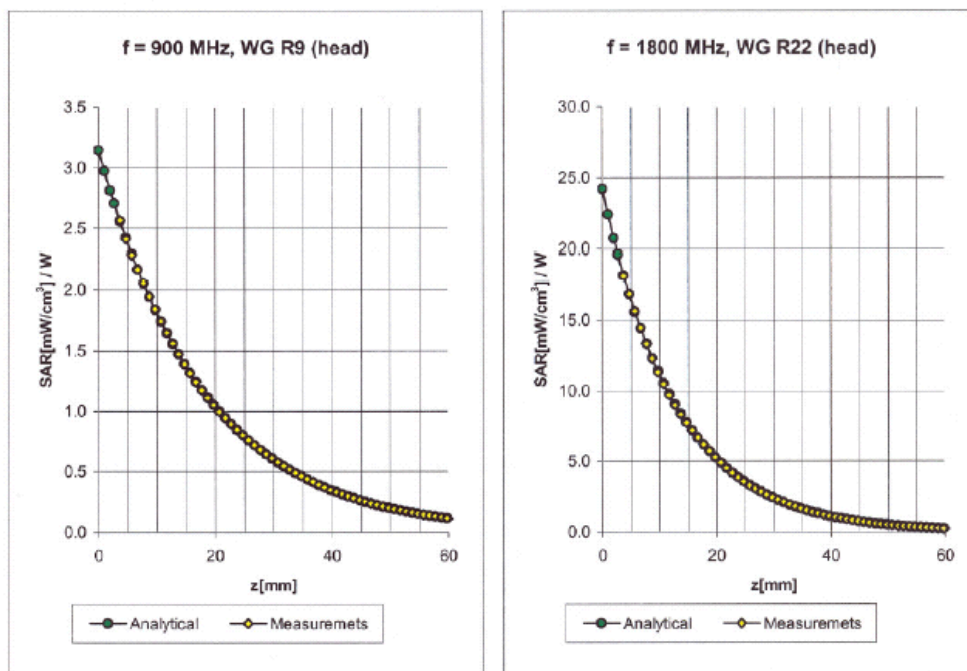
( Waveguide R22 )





ET3DV6 SN:1788

August 29, 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 | 6.6 $\pm 9.5\%$ (k=2) | Boundary effect: |      |
| ConvF Y | 6.6 $\pm 9.5\%$ (k=2) | Alpha            | 0.34 |
| ConvF Z | 6.6 $\pm 9.5\%$ (k=2) | Depth            | 2.48 |

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

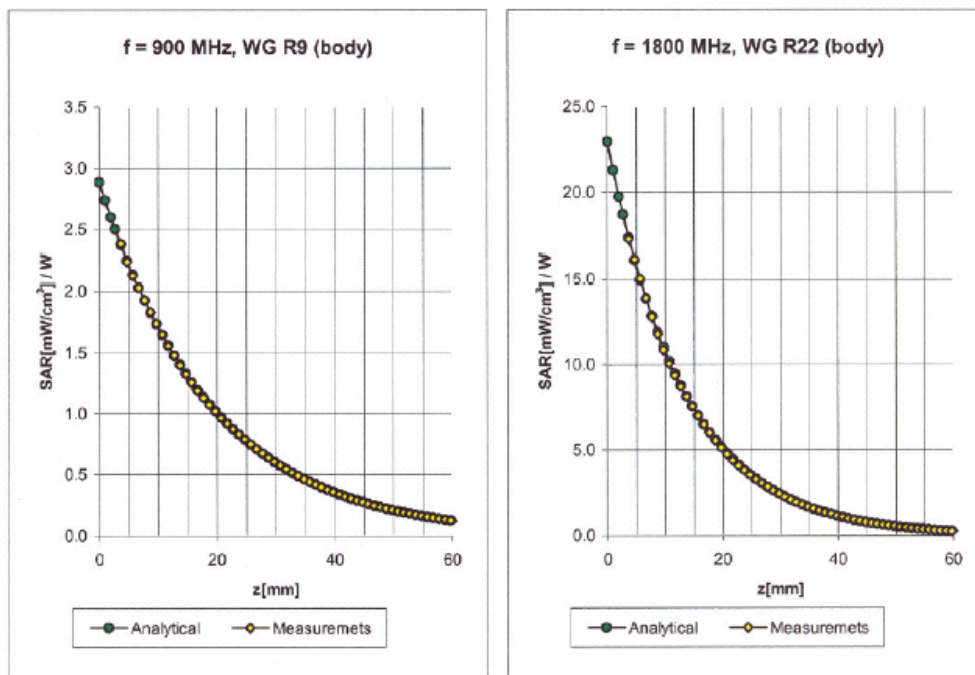
|         |                       |                  |      |
|---------|-----------------------|------------------|------|
| ConvF X | 5.3 $\pm 9.5\%$ (k=2) | Boundary effect: |      |
| ConvF Y | 5.3 $\pm 9.5\%$ (k=2) | Alpha            | 0.43 |
| ConvF Z | 5.3 $\pm 9.5\%$ (k=2) | Depth            | 2.60 |



ET3DV6 SN:1788

August 29, 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 | $6.5 \pm 9.5\%$ (k=2) | Boundary effect: |             |
| ConvF Y | $6.5 \pm 9.5\%$ (k=2) | Alpha            | <b>0.31</b> |
| ConvF Z | $6.5 \pm 9.5\%$ (k=2) | Depth            | <b>2.92</b> |

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

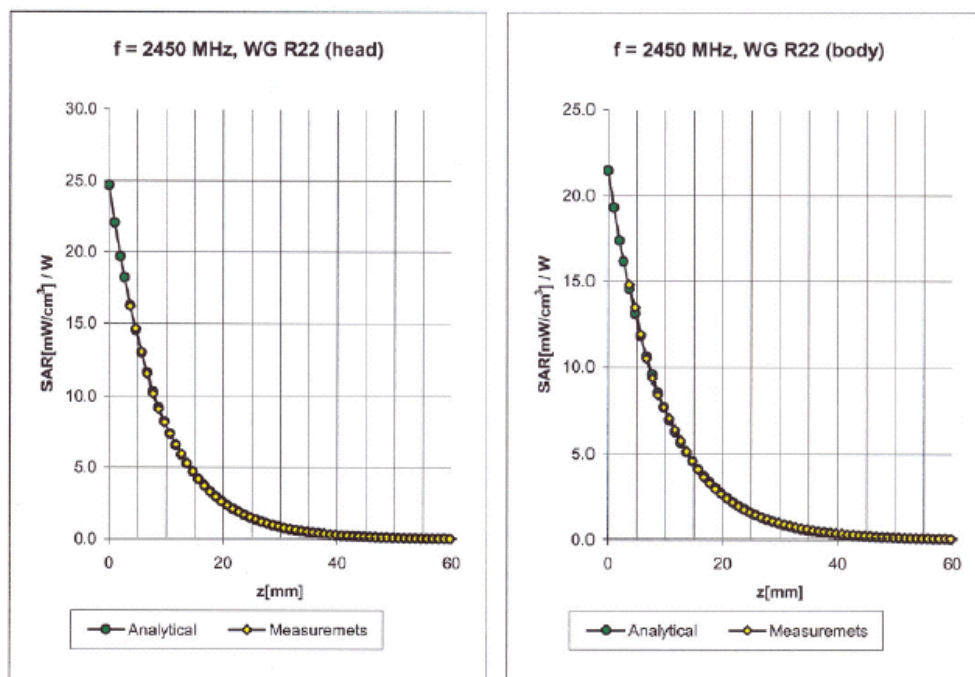
Valid for f=1710-1910 MHz with Body Tissue Simulating Liquid according to OET 65 Suppl. C

|         |                       |                  |             |
|---------|-----------------------|------------------|-------------|
| ConvF X | $5.0 \pm 9.5\%$ (k=2) | Boundary effect: |             |
| ConvF Y | $5.0 \pm 9.5\%$ (k=2) | Alpha            | <b>0.51</b> |
| ConvF Z | $5.0 \pm 9.5\%$ (k=2) | Depth            | <b>2.78</b> |



ET3DV6 SN:1788

August 29, 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 | $4.7 \pm 8.9\%$ (k=2) | Boundary effect: |             |
| ConvF Y | $4.7 \pm 8.9\%$ (k=2) | Alpha            | <b>0.99</b> |
| ConvF Z | $4.7 \pm 8.9\%$ (k=2) | Depth            | <b>1.81</b> |

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 | $4.5 \pm 8.9\%$ (k=2) | Boundary effect: |             |
| ConvF Y | $4.5 \pm 8.9\%$ (k=2) | Alpha            | <b>1.01</b> |
| ConvF Z | $4.5 \pm 8.9\%$ (k=2) | Depth            | <b>1.74</b> |

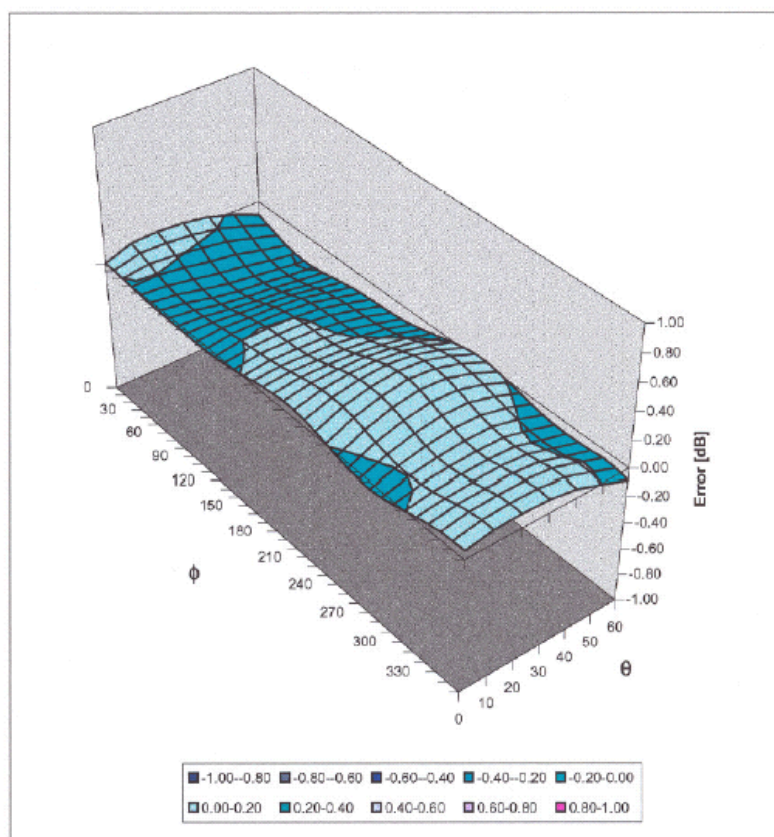


ET3DV6 SN:1788

August 29, 2003

### Deviation from Isotropy in HSL

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

Page 2 of 4



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 $\mu\text{V}$ | 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 $\mu\text{V}$ | 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<br>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**

Page 3 of 4



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 10M $\Omega$ 

| in $\mu$ V | 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 $\mu$ V | 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: &lt;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        |