

Test Laboratory: Advance Data Technology

**259IA1 11g Auxiliary Antenna Bottom Mode 7 Ch 1****DUT: Notebook PC ; Type: 259IA1 ; Test Channel Frequency: 2412 MHz**

Communication System: 802.11g ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: OFDM

Medium: MSL2450 Medium parameters used:  $f = 2412$  MHz;  $\sigma = 1.95$  mho/m;  $\epsilon_r = 51.1$ ;  $\rho = 1000$ kg/m<sup>3</sup> ; Liquid level : 155mm

Phantom section: Flat Section ; Separation distance : 0 mm (The bottom side of the EUT to the Phantom)

Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1687 ; ConvF(4.23, 4.23, 4.23) ; Calibrated: 2004/8/26
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2004/8/17
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.3 Build 22 ; Postprocessing SW: SEMCAD, V1.8 Build 127

**Low Channel/Area Scan (6x8x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.0067 mW/g

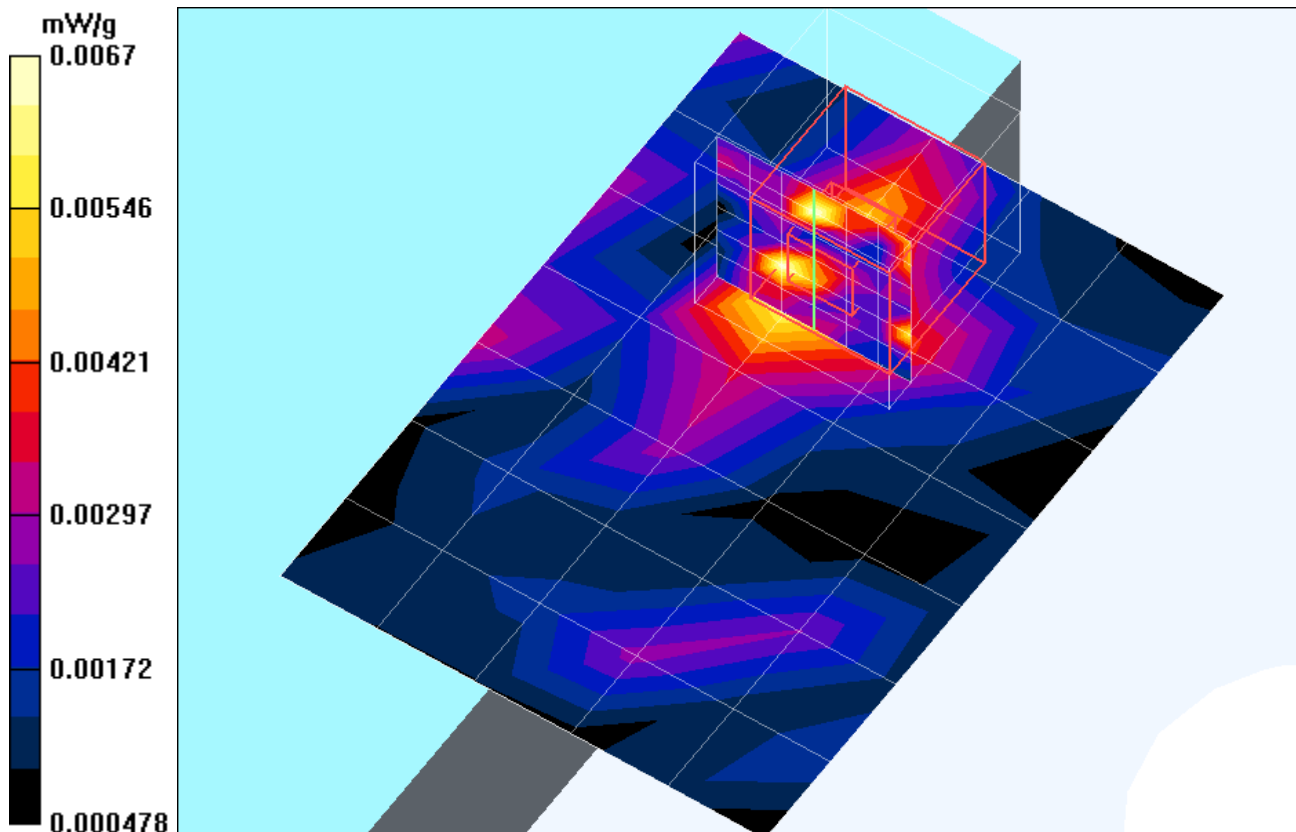
**Low Channel/Zoon Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.847 V/m; Power Drift = -0.2 dB

Peak SAR (extrapolated) = 0.00955 W/kg

**SAR(1 g) = 0.00102 mW/g; SAR(10 g) = 0.000177 mW/g**

Maximum value of SAR (measured) = 0.011 mW/g



Test Laboratory: Advance Data Technology

**259IA1 11g Auxiliary Antenna Bottom Mode 7 Ch 6****DUT: Notebook PC ; Type: 259IA1 ; Test Channel Frequency: 2437 MHz**

Communication System: 802.11g ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: OFDM

Medium: MSL2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.98 \text{ mho/m}$ ;  $\epsilon_r = 51$ ;  $\rho = 1000$  $\text{kg/m}^3$  ; Liquid level : 155mm

Phantom section: Flat Section ; Separation distance : 0 mm (The bottom side of the EUT to the Phantom)

Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1687 ; ConvF(4.23, 4.23, 4.23) ; Calibrated: 2004/8/26
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2004/8/17
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.3 Build 22 ; Postprocessing SW: SEMCAD, V1.8 Build 127

**Middle Channel/Area Scan (6x8x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.010 mW/g

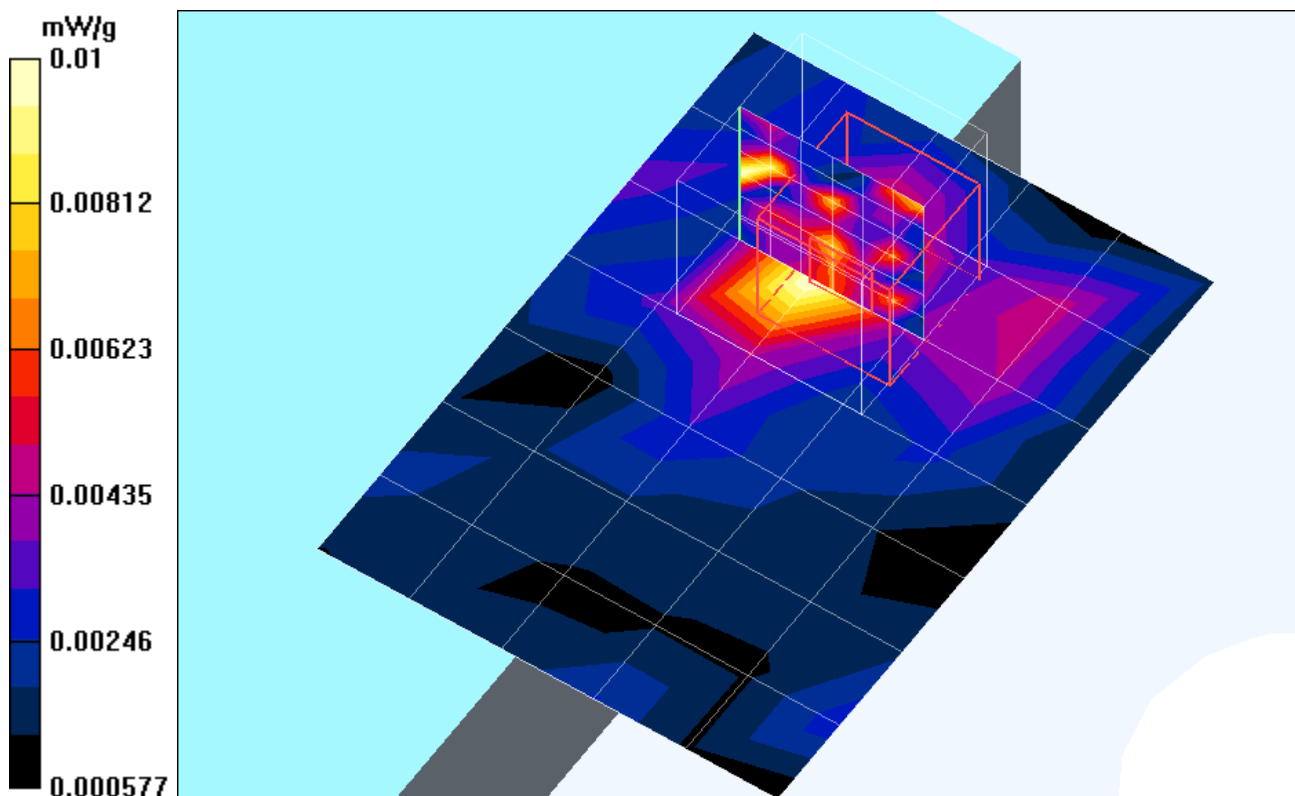
**Middle Channel/Zoon Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 1.46 V/m; Power Drift = -0.2 dB

Peak SAR (extrapolated) = 251.9 W/kg

**SAR(1 g) = 0.00341 mW/g; SAR(10 g) = 0.00068 mW/g**

Maximum value of SAR (measured) = 0.015 mW/g



Test Laboratory: Advance Data Technology

**259IA1 11g Auxiliary Antenna Bottom Mode 7 Ch 11****DUT: Notebook PC ; Type: 259IA1 ; Test Channel Frequency: 2462 MHz**

Communication System: 802.11g ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: OFDM

Medium: MSL2450 Medium parameters used:  $f = 2462$  MHz;  $\sigma = 2.01$  mho/m;  $\epsilon_r = 50.8$ ;  $\rho = 1000$  $\text{kg/m}^3$  ; Liquid level : 155mm

Phantom section: Flat Section ; Separation distance : 0 mm (The bottom side of the EUT to the Phantom)

Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1687 ; ConvF(4.23, 4.23, 4.23) ; Calibrated: 2004/8/26
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2004/8/17
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.3 Build 22 ; Postprocessing SW: SEMCAD, V1.8 Build 127

**High Channel/Area Scan (6x8x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.00437 mW/g

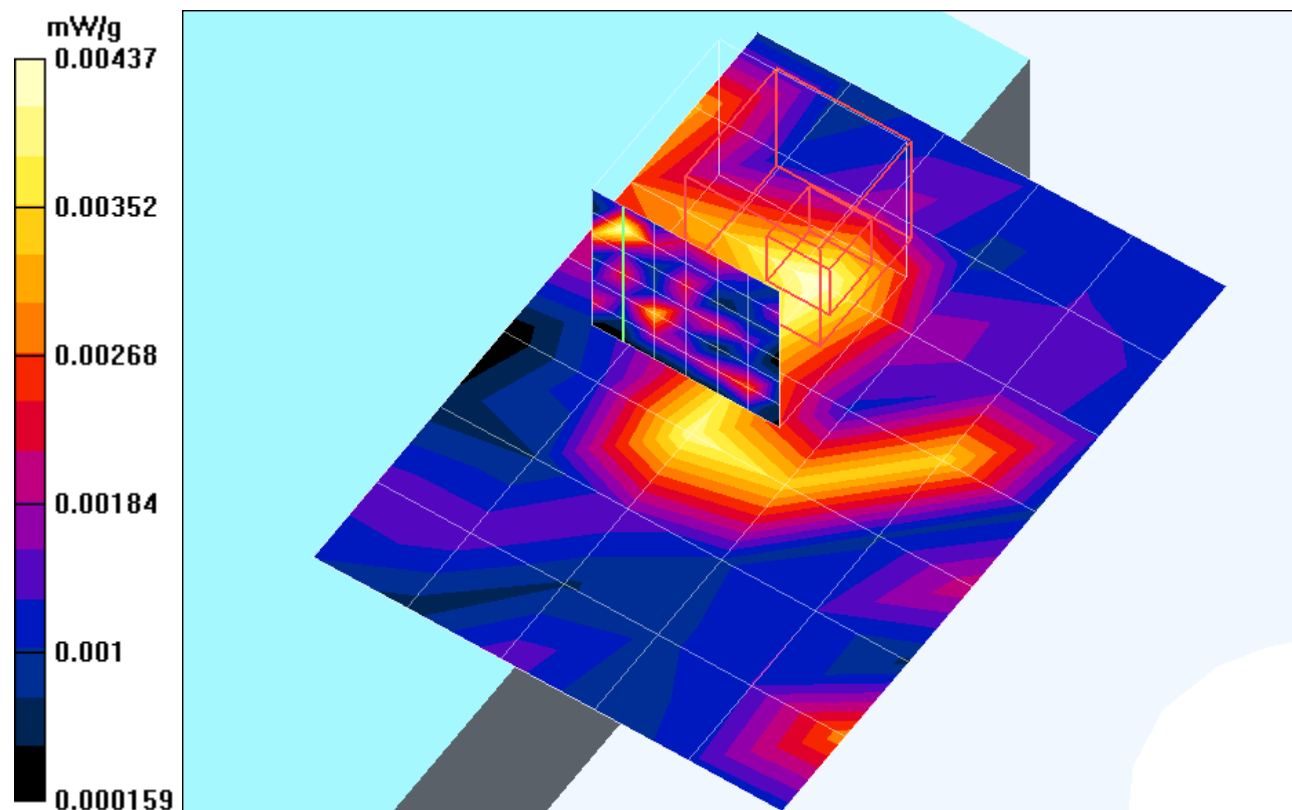
**High Channel/Zoon Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 0.790 V/m; Power Drift = 0.2 dB

Peak SAR (extrapolated) = 0.019 W/kg

**SAR(1 g) = 0.00135 mW/g; SAR(10 g) = 0.00024 mW/g**

Maximum value of SAR (measured) = 0.019 mW/g



Test Laboratory: Advance Data Technology

**259IA1 11g Auxiliary Antenna Tip Mode 8 Ch 1****DUT: Notebook PC ; Type: 259IA1 ; Test Channel Frequency: 2412 MHz**

Communication System: 802.11g ; Frequency: 2412 MHz; Duty Cycle: 1:1; Modulation type: OFDM

Medium: MSL2450 Medium parameters used:  $f = 2412$  MHz;  $\sigma = 1.95$  mho/m;  $\epsilon_r = 51.1$ ;  $\rho = 1000$ kg/m<sup>3</sup> ; Liquid level : 155 mm

Phantom section: Flat Section ; Separation distance : 0 mm (The tip of the EUT to the Phantom)

Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1687 ; ConvF(4.23, 4.23, 4.23) ; Calibrated: 2004/8/26
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2004/8/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

**Low Channel/Area Scan (6x7x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.038 mW/g

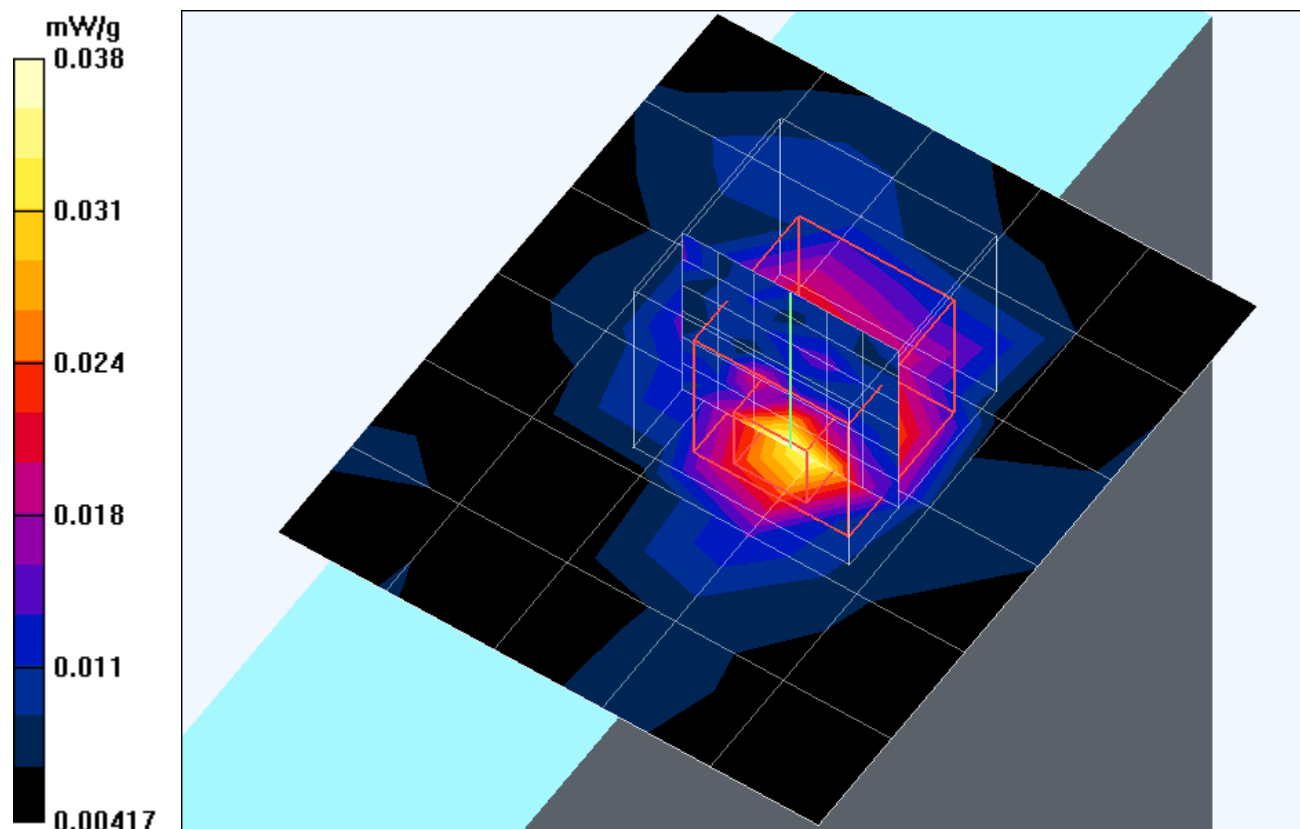
**Low Channel/Zoon Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.6 V/m; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 1632.6 W/kg

**SAR(1 g) = 0.026 mW/g; SAR(10 g) = 0.014 mW/g**

Maximum value of SAR (measured) = 0.039 mW/g



Test Laboratory: Advance Data Technology

**259IA1 11g Auxiliary Antenna Tip Mode 8 Ch 6****DUT: Notebook PC ; Type: 259IA1 ; Test Channel Frequency: 2437 MHz**

Communication System: 802.11g ; Frequency: 2437 MHz; Duty Cycle: 1:1; Modulation type: OFDM

Medium: MSL2450 Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.98$  mho/m;  $\epsilon_r = 51$ ;  $\rho = 1000$  kg/m<sup>3</sup> ; Liquid level : 155 mm

Phantom section: Flat Section ; Separation distance : 0 mm (The tip of the EUT to the Phantom)

Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1687 ; ConvF(4.23, 4.23, 4.23) ; Calibrated: 2004/8/26
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2004/8/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

**Middle Channel/Area Scan (6x7x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.063 mW/g

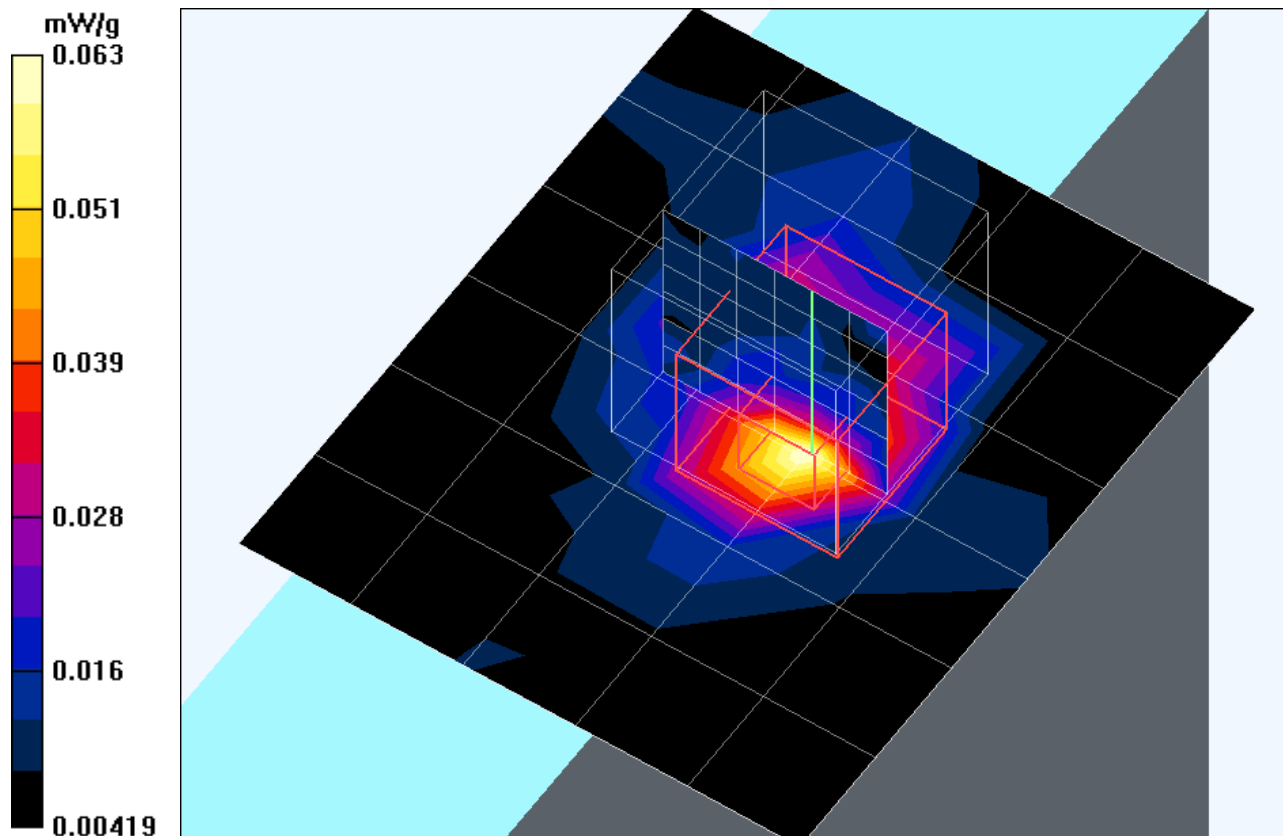
**Middle Channel/Zoon Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.03 V/m; Power Drift = -0.2 dB

Peak SAR (extrapolated) = 1516.9 W/kg

**SAR(1 g) = 0.037 mW/g; SAR(10 g) = 0.017 mW/g**

Maximum value of SAR (measured) = 0.063 mW/g



Test Laboratory: Advance Data Technology

**259IA1 11g Auxiliary Antenna Tip Mode 8 Ch 11****DUT: Notebook PC ; Type: 259IA1 ; Test Channel Frequency: 2462 MHz**

Communication System: 802.11g ; Frequency: 2462 MHz; Duty Cycle: 1:1; Modulation type: OFDM

Medium: MSL2450 Medium parameters used:  $f = 2462$  MHz;  $\sigma = 2.01$  mho/m;  $\epsilon_r = 50.8$ ;  $\rho = 1000$  $\text{kg/m}^3$  ; Liquid level : 155 mm

Phantom section: Flat Section ; Separation distance : 0 mm (The tip of the EUT to the Phantom)

Antenna type : Internal Antenna ; Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1687 ; ConvF(4.23, 4.23, 4.23) ; Calibrated: 2004/8/26
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2004/8/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

**High Channel/Area Scan (6x7x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (measured) = 0.020 mW/g

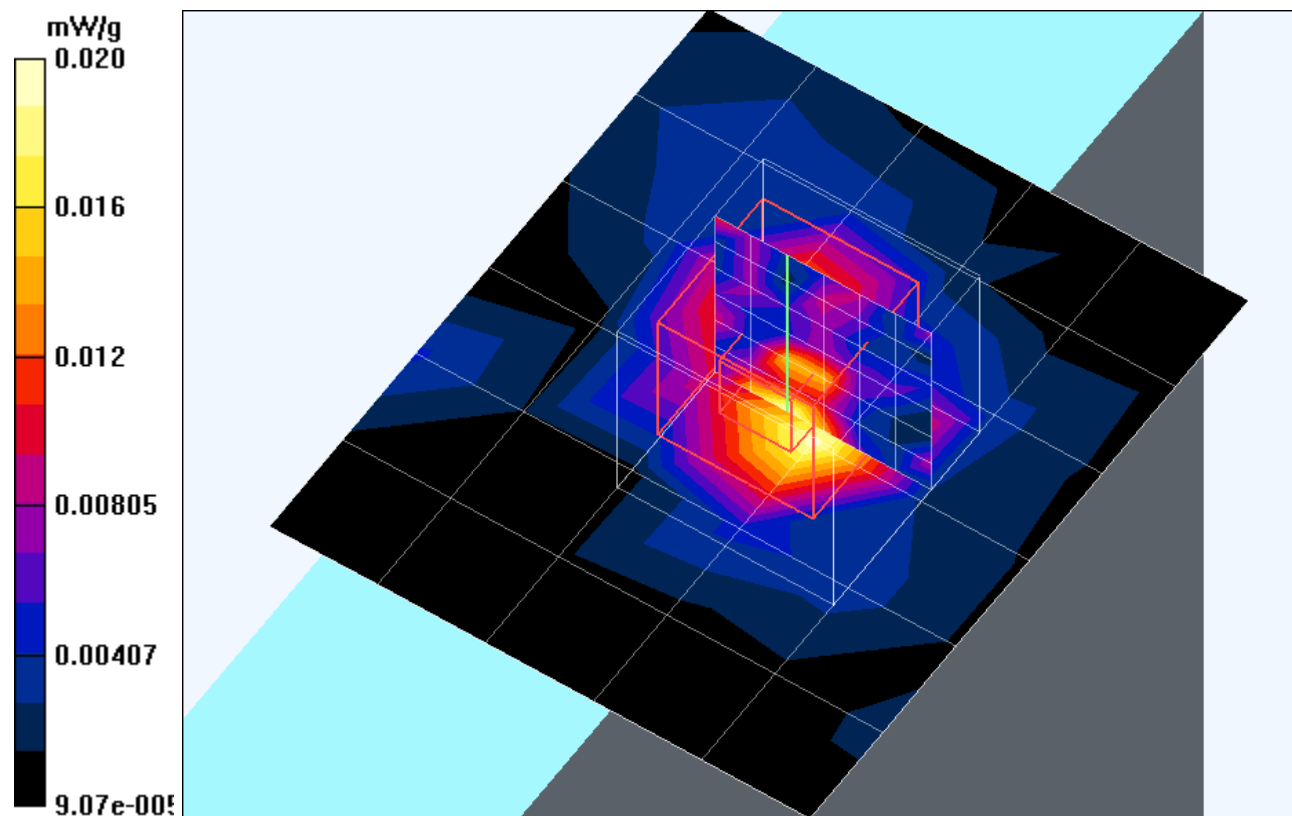
**High Channel/Zoon Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 3.07 V/m; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 447.2 W/kg

**SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00277 mW/g**

Maximum value of SAR (measured) = 0.024 mW/g



## A3 : SYSTEM VALIDATION

Date/Time: 10/08/04 09:26:31

Test Laboratory: Advance Data Technology

### System Validation Check-MSL 2450MHz

**DUT: Dipole 2450 MHz ; Type: D2450V2 ; Test Channel Frequency: 2450 MHz**

Communication System: CW ; Frequency: 2450 MHz; Duty Cycle: 1:1; Modulation type: CW  
Medium: MSL2450; Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.99$  mho/m;  $\epsilon_r = 50.8$ ;  $\rho = 1000$

kg/m<sup>3</sup> ; Liquid level : 155mm

Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom) Air temp. : 22.0 degrees ; Liquid temp. : 21.0 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1687 ; ConvF(4.23, 4.23, 4.23) ; Calibrated: 2004/8/26
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2004/8/17
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

**d=10mm, Pin=250mW/Area Scan (5x6x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (measured) = 11.4 mW/g

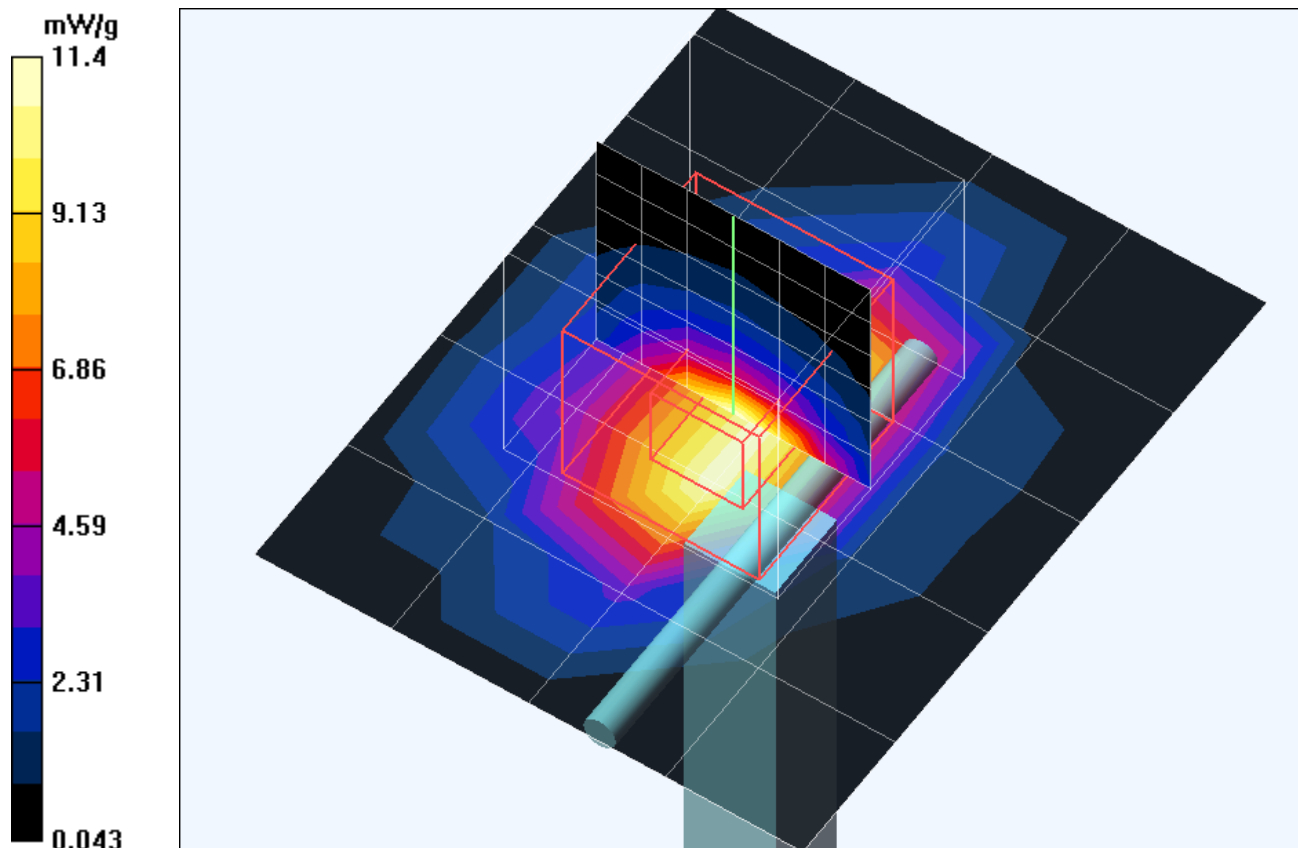
**d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 84.8 V/m; Power Drift = -0.1 dB

Peak SAR (extrapolated) = 25.7 W/kg

**SAR(1 g) = 12.1 mW/g; SAR(10 g) = 5.64 mW/g**

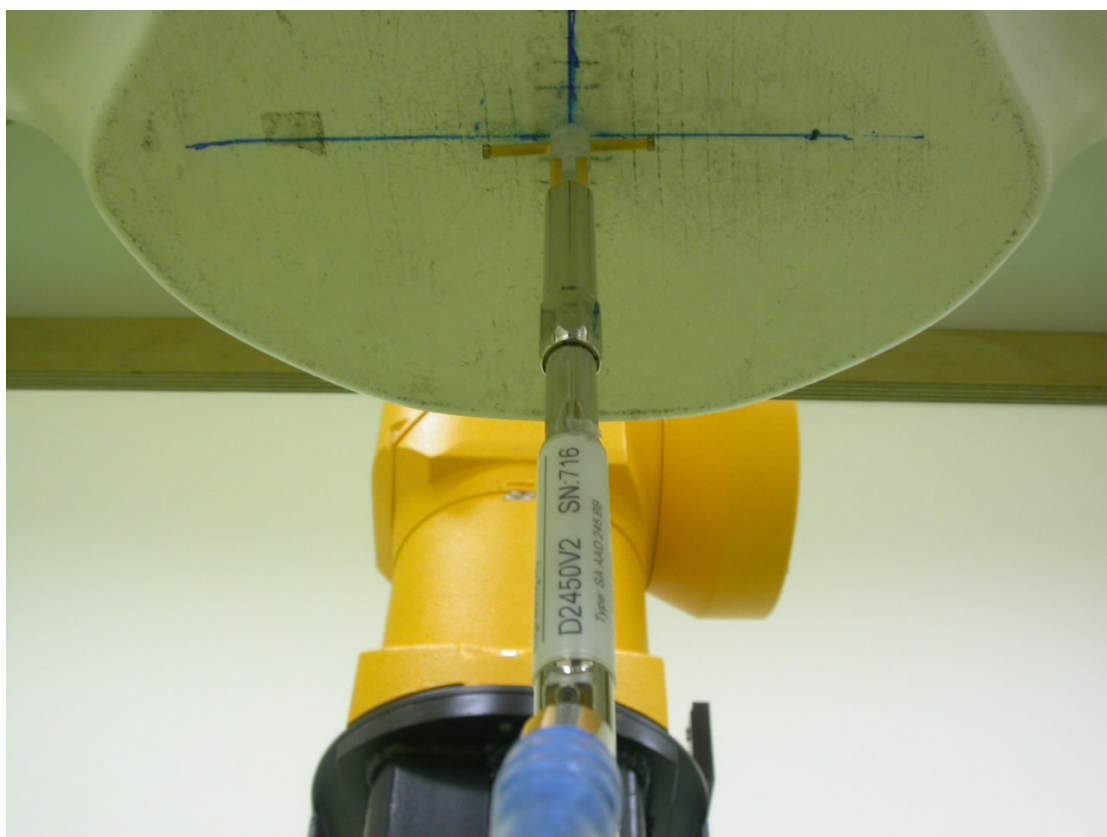
Maximum value of SAR (measured) = 13.7 mW/g



## APPENDIX B : ADT SAR MEASUREMENT SYSTEM



## APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION





## **APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION**

### **D1: SAM PHANTOM**

# Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

## Certificate of conformity / First Article Inspection

|                       |                                                                          |
|-----------------------|--------------------------------------------------------------------------|
| Item                  | SAM Twin Phantom V4.0                                                    |
| Type No               | QD 000 P40 CA                                                            |
| Series No             | TP-1150 and higher                                                       |
| Manufacturer / Origin | Untersee Composites<br>Hauptstr. 69<br>CH-8559 Fruthwilen<br>Switzerland |

### Tests

The series production process used allows the limitation to test of first articles. Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

| Test                 | Requirement                                                                             | Details                                                              | Units tested              |
|----------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------|
| Shape                | Compliance with the geometry according to the CAD model.                                | IT'IS CAD File (*)                                                   | First article, Samples    |
| Material thickness   | Compliant with the requirements according to the standards                              | 2mm +/- 0.2mm in specific areas                                      | First article, Samples    |
| Material parameters  | Dielectric parameters for required frequencies                                          | 200 MHz – 3 GHz<br>Relative permittivity < 5<br>Loss tangent < 0.05. | Material sample TP 104-5  |
| Material resistivity | The material has been tested to be compatible with the liquids defined in the standards | Liquid type HSL 1800 and others according to the standard.           | Pre-series, First article |

### Standards

- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9

(\*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

### Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 28.02.2002

Signature / Stamp

*F. Bombault*

**Schmid & Partner  
Engineering AG**

Zeughausstrasse 43, CH-8004 Zurich  
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

*Thomas Kofler*



## **D2: DOSIMETRIC E-FIELD PROBE**

## **IMPORTANT NOTICE**

### **USAGE OF PROBES IN ORGANIC SOLVENTS**

Diethylene Glycol Monobutyl Ether (the basis for liquids above 1 GHz), as many other organic solvents, is a very effective softener for synthetic materials. These solvents can cause irreparable damage to certain SPEAG products, except those which are explicitly declared as compliant with organic solvents.

**Compatible Probes:**

- ET3DV6
- ET3DV6R
- ES3DV2
- ER3DV6
- H3DV6

**Important Note for ET3DV6 Probes:**

**The ET3DV6 probes shall not be exposed to solvents longer than necessary for the measurements and shall be cleaned daily after use with warm water and stored dry.**

**s p e a g**

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info@speag.com, <http://www.speag.com>

Schmid & Partner Engineering AG

**Client**      **ADT (Auden)**

## CALIBRATION CERTIFICATE

**Object(s)**      **ET3DV6 - SN:1687**

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

**Calibration date:**      **August 26, 2004**

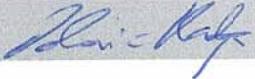
**Condition of the calibrated item**      **In Tolerance (according to the specific calibration document)**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).  
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 +/- 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  |
|-----------------------------------|----------------|-------------------------------------------|------------------------|
| Power meter EPM E4419B            | GB41293874     | 5-May-04 (METAS, No 251-00388)            | May-05                 |
| Power 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                 |
| Fluke Process Calibrator Type 702 | SN: 6295803    | 8-Sep-03 (Sintrel SCS No. E030020)        | Sep-04                 |
| Power sensor HP 8481A             | MY41092180     | 18-Sep-02 (SPEAG, in house check Oct03)   | In house check: Oct 05 |
| RF generator HP 8684C             | US3642U01700   | 4-Aug-99 (SPEAG, in house check Aug02)    | In house check: Aug05  |
| Network Analyzer HP 8753E         | US37390585     | 18-Oct-01 (SPEAG, in house check Oct03)   | In house check: Oct 05 |

|                       |               |                     |                                                                                       |
|-----------------------|---------------|---------------------|---------------------------------------------------------------------------------------|
|                       | <b>Name</b>   | <b>Function</b>     | <b>Signature</b>                                                                      |
| <b>Calibrated by:</b> | Nico Vetterli | Technician          |  |
| <b>Approved by:</b>   | Katja Pokovic | Laboratory Director |  |

Date issued: August 26, 2004

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.

# Probe ET3DV6

## SN:1687

|                  |                   |
|------------------|-------------------|
| Manufactured:    | May 28, 2002      |
| Last calibrated: | November 24, 2003 |
| Recalibrated:    | August 26, 2004   |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

## DASY - Parameters of Probe: ET3DV6 SN:1687

### Sensitivity in Free Space

|       |                                          |
|-------|------------------------------------------|
| NormX | $1.87 \mu\text{V}/(\text{V}/\text{m})^2$ |
| NormY | $1.84 \mu\text{V}/(\text{V}/\text{m})^2$ |
| NormZ | $1.64 \mu\text{V}/(\text{V}/\text{m})^2$ |

### Diode Compression<sup>A</sup>

|       |    |    |
|-------|----|----|
| DCP X | 95 | mV |
| DCP Y | 95 | mV |
| DCP Z | 95 | mV |

### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

### Boundary Effect

Head                      900 MHz      Typical SAR gradient: 5 % per mm

|                                           |                              |        |        |
|-------------------------------------------|------------------------------|--------|--------|
| Sensor Center to Phantom Surface Distance |                              | 3.7 mm | 4.7 mm |
| SAR <sub>te</sub> [%]                     | Without Correction Algorithm | 10.4   | 6.1    |
| SAR <sub>te</sub> [%]                     | With Correction Algorithm    | 0.3    | 0.5    |

Head                      1800 MHz      Typical SAR gradient: 10 % per mm

|                                           |                              |        |        |
|-------------------------------------------|------------------------------|--------|--------|
| Sensor Center to Phantom Surface Distance |                              | 3.7 mm | 4.7 mm |
| SAR <sub>te</sub> [%]                     | Without Correction Algorithm | 13.0   | 8.9    |
| SAR <sub>te</sub> [%]                     | With Correction Algorithm    | 0.2    | 0.1    |

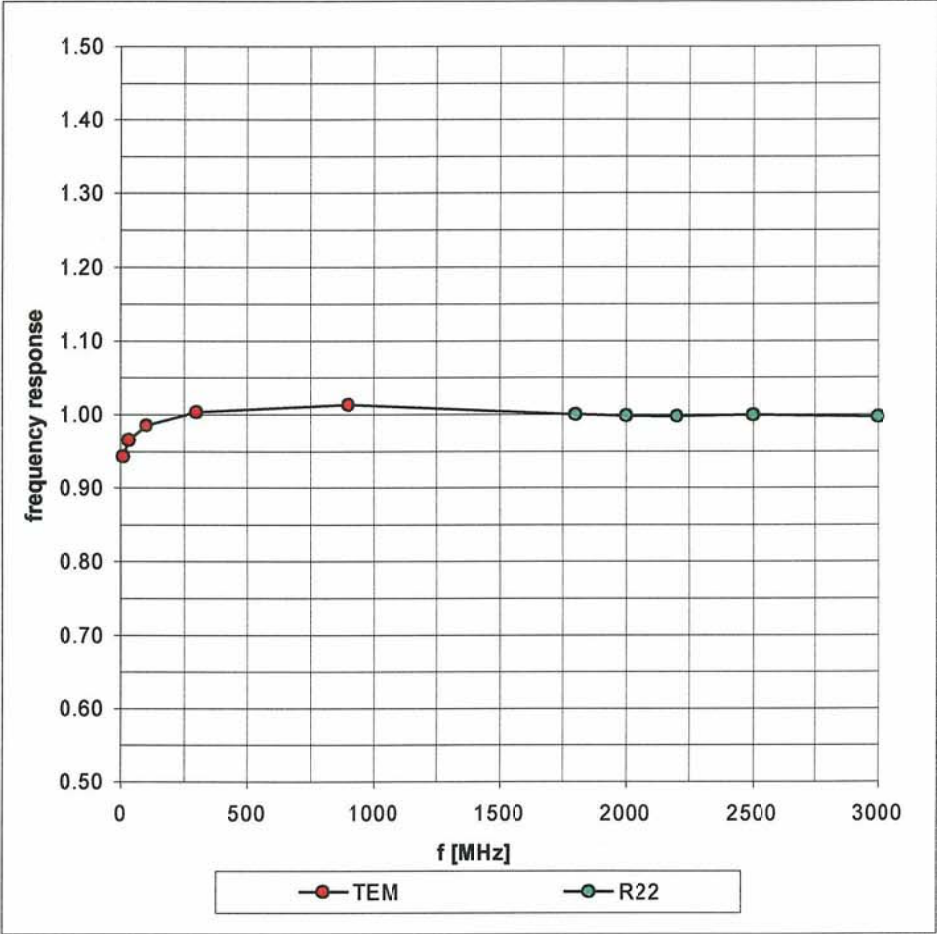
### Sensor Offset

|                            |              |
|----------------------------|--------------|
| Probe Tip to Sensor Center | 2.7 mm       |
| Optical Surface Detection  | in tolerance |

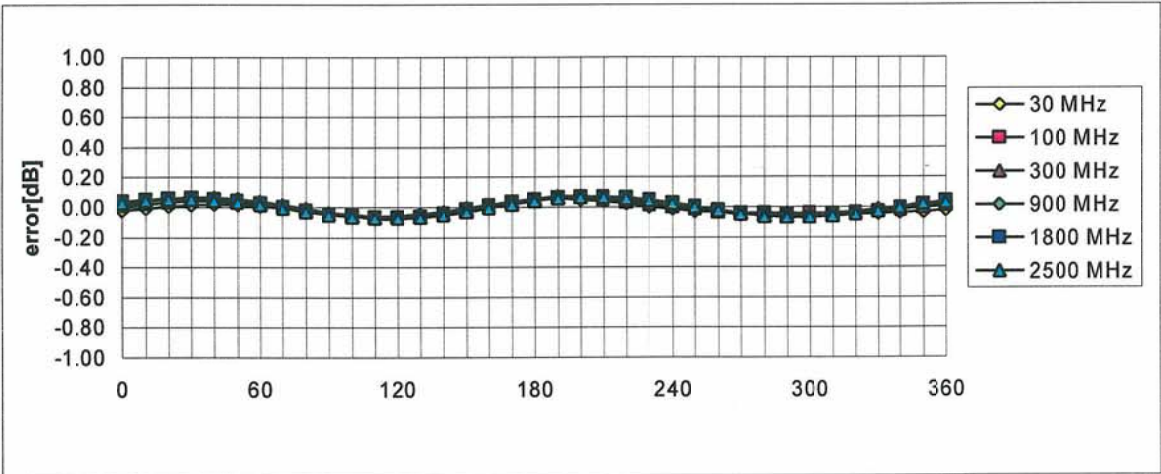
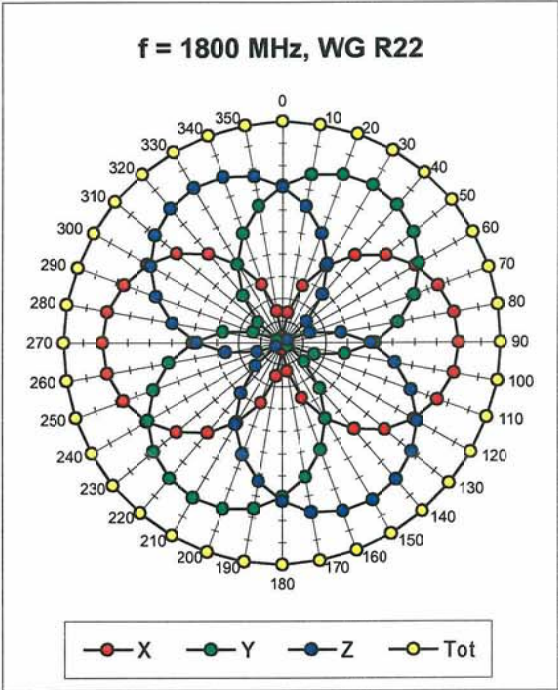
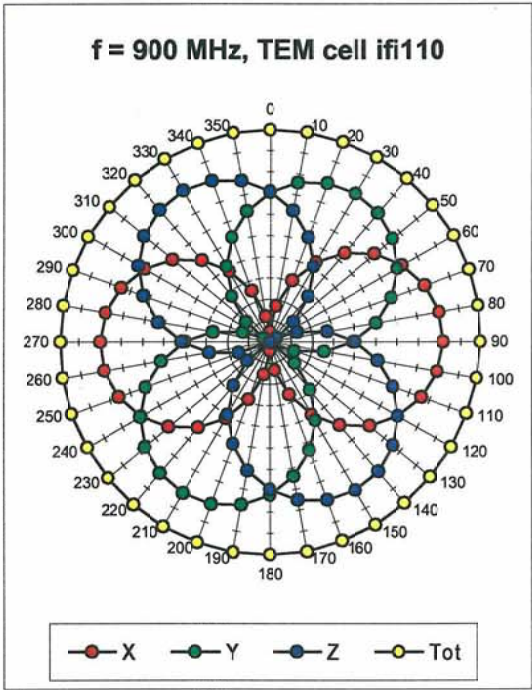
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

Frequency Response of E-Field  
( TEM-Cell:ifi110, Waveguide R22)

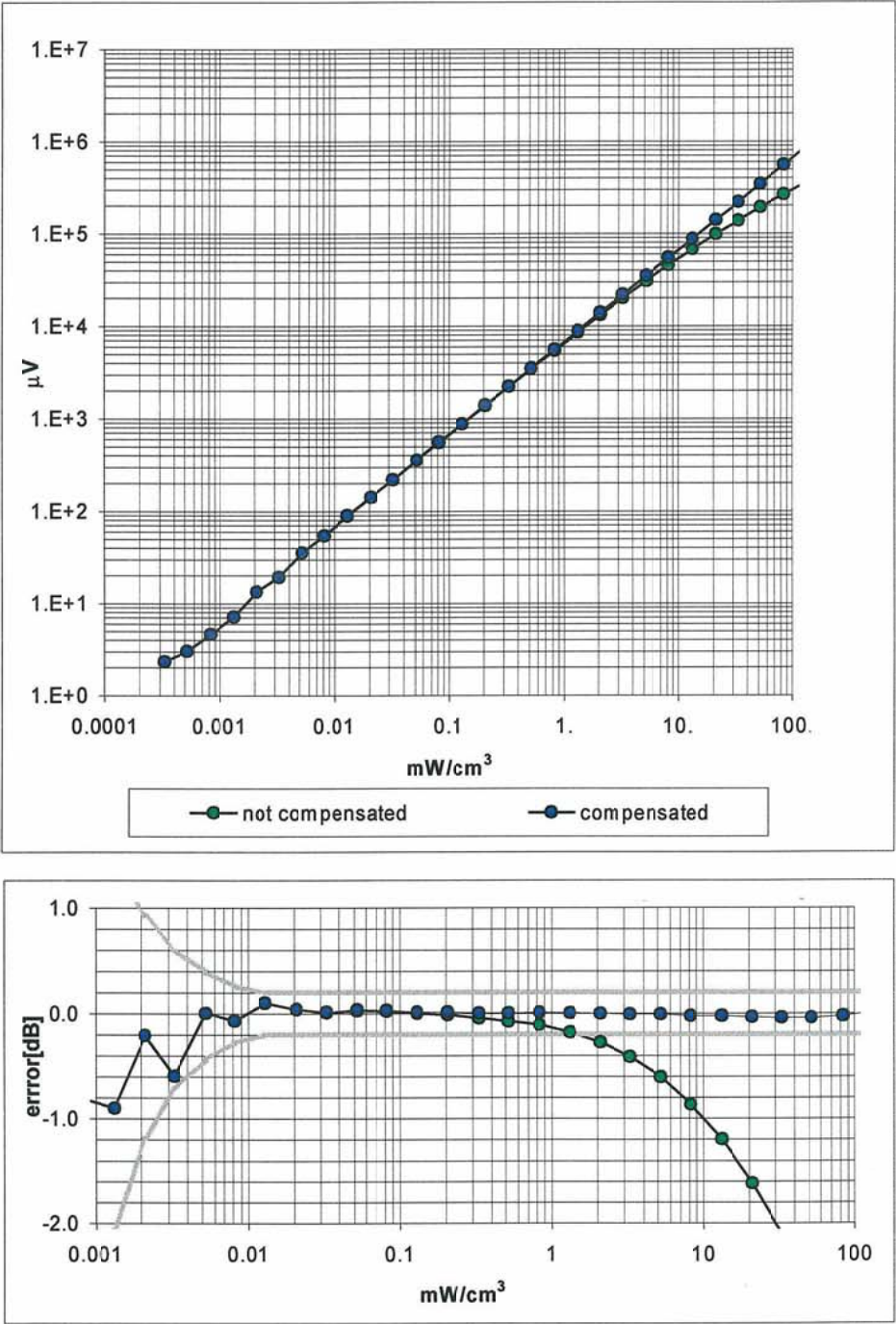


Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$



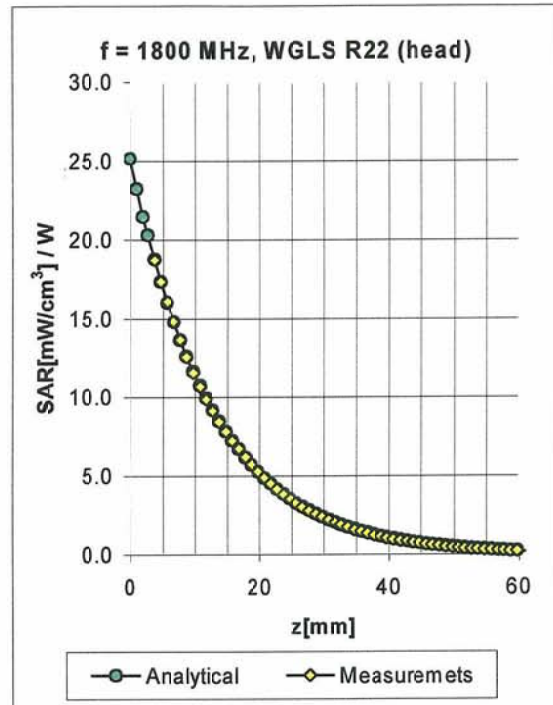
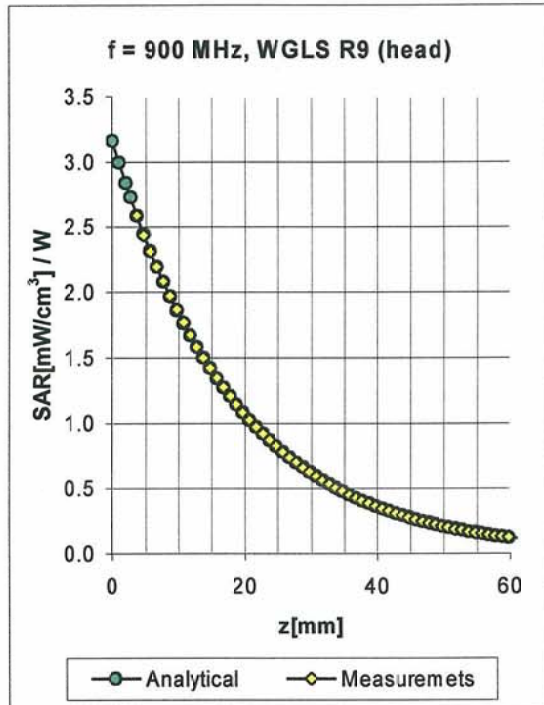
Axial Isotropy Error <  $\pm 0.2$  dB

Dynamic Range f(SAR<sub>head</sub>)  
( Waveguide R22 )



Probe Linearity Error <  $\pm 0.2$  dB

## Conversion Factor Assessment

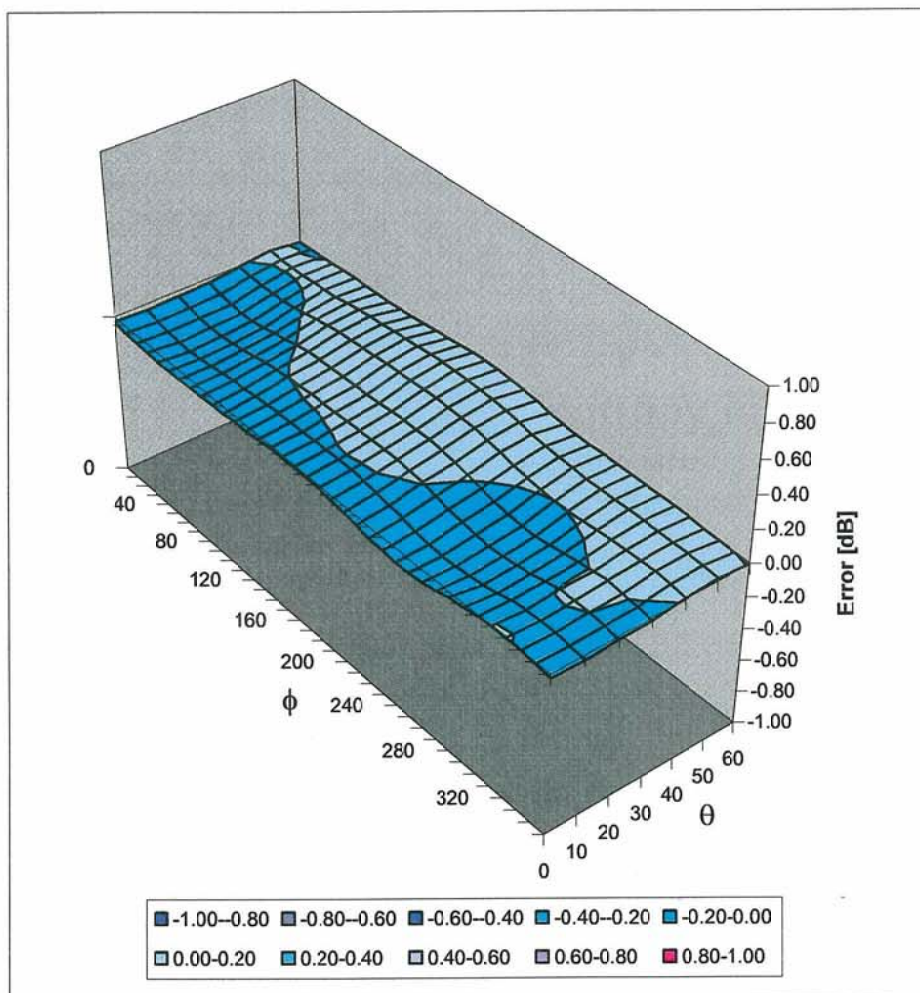


| f [MHz] | Validity [MHz] <sup>B</sup> | Tissue | Permittivity | Conductivity | Alpha | Depth | ConvF | Uncertainty   |
|---------|-----------------------------|--------|--------------|--------------|-------|-------|-------|---------------|
| 900     | 800-1000                    | Head   | 41.5 ± 5%    | 0.97 ± 5%    | 0.38  | 2.58  | 6.34  | ± 11.3% (k=2) |
| 1800    | 1710-1910                   | Head   | 40.0 ± 5%    | 1.40 ± 5%    | 0.46  | 2.71  | 5.16  | ± 11.7% (k=2) |
| 2450    | 2400-2500                   | Head   | 39.2 ± 5%    | 1.80 ± 5%    | 0.90  | 1.93  | 4.41  | ± 9.7% (k=2)  |
| 900     | 800-1000                    | Body   | 55.0 ± 5%    | 1.05 ± 5%    | 0.52  | 2.10  | 6.06  | ± 11.3% (k=2) |
| 1800    | 1710-1910                   | Body   | 53.3 ± 5%    | 1.52 ± 5%    | 0.52  | 2.88  | 4.54  | ± 11.7% (k=2) |
| 2450    | 2400-2500                   | Body   | 52.7 ± 5%    | 1.95 ± 5%    | 1.04  | 1.62  | 4.23  | ± 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.

## Deviation from Isotropy in HSL

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



Spherical Isotropy Error  $< \pm 0.4$  dB

**D3: DAE**

## IMPORTANT NOTICE

### USAGE OF THE DAE 3

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

**Battery Exchange:** The battery cover of the DAE3 unit is connected to a fragile 3-pin battery connector. Customer is responsible to apply utmost caution not to bend or damage the connector when changing batteries.

**Shipping of the DAE:** Before shipping the DAE to SPEAG for calibration Customer shall remove the batteries and pack the DAE in an antistatic bag. The packaging shall protect the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

**E-Stop Failures:** Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, Customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

**Repair:** Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

**Important Note:**

**Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.**

**Important Note:**

**Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.**

**Client**

**Auden ADT**

## CALIBRATION CERTIFICATE

Object(s) **DAE3 - SD 000 D03 AA - SN: 510**

Calibration procedure(s) **QA CAL-06.v7**  
**Calibration procedure for the data acquisition unit (DAE)**

Calibration date: **17.08.2004**

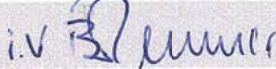
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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: 6295303 | 8-Sep-03 | Sep-04                |

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

Date issued: 17.08.2004

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.

## 1. DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V, full range = -100...+300 mV

Low Range: 1LSB = 61nV, full range = -1.....+3mV

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

| Calibration Factors        | X                   | Y       | Z       |
|----------------------------|---------------------|---------|---------|
| High Range                 | 403.405             | 403.470 | 403.844 |
| Low Range                  | 3.95588             | 3.93301 | 3.95923 |
| Connector Angle to be used | in DASY System 43 ° |         |         |

| High Range        | Input ( $\mu$ V) | Reading ( $\mu$ V) | Error (%) |
|-------------------|------------------|--------------------|-----------|
| Channel X + Input | 200000           | 199999.5           | 0.00      |
| Channel X + Input | 20000            | 20004.1            | 0.02      |
| Channel X - Input | 20000            | -19988.8           | -0.06     |
| Channel Y + Input | 200000           | 199999.9           | 0.00      |
| Channel Y + Input | 20000            | 19999.3            | 0.00      |
| Channel Y - Input | 20000            | -19993.8           | -0.03     |
| Channel Z + Input | 200000           | 199999.6           | 0.00      |
| Channel Z + Input | 20000            | 20005.6            | 0.03      |
| Channel Z - Input | 20000            | -19995.4           | -0.02     |

| Low Range         | Input ( $\mu$ V) | Reading ( $\mu$ V) | Error (%) |
|-------------------|------------------|--------------------|-----------|
| Channel X + Input | 2000             | 1999.96            | 0.00      |
| Channel X + Input | 200              | 200.00             | 0.00      |
| Channel X - Input | 200              | -200.34            | 0.17      |
| Channel Y + Input | 2000             | 2000.03            | 0.00      |
| Channel Y + Input | 200              | 199.39             | -0.31     |
| Channel Y - Input | 200              | -200.81            | 0.41      |
| Channel Z + Input | 2000             | 2000.07            | 0.00      |
| Channel Z + Input | 200              | 199.29             | -0.36     |
| Channel Z - Input | 200              | -201.07            | 0.53      |

## 2. Common mode sensitivity

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

|           | Common mode Input Voltage (mV) | High Range Reading ( $\mu$ V) | Low Range Reading ( $\mu$ V) |
|-----------|--------------------------------|-------------------------------|------------------------------|
| Channel X | 200                            | 17.42                         | 16.88                        |
|           | - 200                          | -17.00                        | -17.10                       |
| Channel Y | 200                            | 14.86                         | 14.26                        |
|           | - 200                          | -15.53                        | -16.14                       |
| Channel Z | 200                            | -8.63                         | -8.44                        |
|           | - 200                          | 7.15                          | 7.51                         |

### 3. Channel separation

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

|           | Input Voltage (mV) | Channel X ( $\mu$ V) | Channel Y ( $\mu$ V) | Channel Z ( $\mu$ V) |
|-----------|--------------------|----------------------|----------------------|----------------------|
| Channel X | 200                | -                    | 2.45                 | 1.22                 |
| Channel Y | 200                | 0.25                 | -                    | 4.38                 |
| Channel Z | 200                | -1.29                | 0.37                 | -                    |

### 4. AD-Converter Values with inputs shorted

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

|           | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 15983            | 16854           |
| Channel Y | 16210            | 16793           |
| Channel Z | 16173            | 16131           |

### 5. Input Offset Measurement

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

Input 10M $\Omega$

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 0.46               | -0.28                  | 1.02                   | 0.27                      |
| Channel Y | -1.06              | -1.87                  | -0.38                  | 0.25                      |
| Channel Z | -0.15              | -1.01                  | 0.88                   | 0.36                      |

### 6. Input Offset Current

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

### 7. Input Resistance

|           | Zeroing (MOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 0.2001         | 201.3            |
| Channel Y | 0.2001         | 199.6            |
| Channel Z | 0.2001         | 200.7            |

### 8. Low Battery Alarm Voltage

| typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9              |
| Supply (- Vcc) | -7.6              |

### 9. Power Consumption

| typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.0              | +6            | +14               |
| Supply (- Vcc) | -0.01             | -8            | -9                |