# Probe ET3DV6

## SN:1531

| | |
|---|---|
| Manufactured: | July 15, 2000 |
| Last calibrated: | January 22, 2007 |
| Recalibrated: | January 29, 2008 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

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# DASY - Parameters of Probe: ET3DV6 SN:1531

## Sensitivity in Free Space[A] Diode Compression[B]

| | | | | |
|---|---|---|---|---|
| NormX | 1.52 ± 10.1% | $\mu V/(V/m)^2$ | DCP X | 95 mV |
| NormY | 1.66 ± 10.1% | $\mu V/(V/m)^2$ | DCP Y | 94 mV |
| NormZ | 1.71 ± 10.1% | $\mu V/(V/m)^2$ | DCP Z | 93 mV |

## Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

## Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

| Sensor Center to Phantom Surface Distance | | 3.7 mm | 4.7 mm |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 8.3 | 4.5 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.7 | 0.0 |

TSL 1750 MHz Typical SAR gradient: 10 % per mm

| Sensor Center to Phantom Surface Distance | | 3.7 mm | 4.7 mm |
|---|---|---|---|
| $SAR_{be}$ [%] | Without Correction Algorithm | 11.9 | 8.0 |
| $SAR_{be}$ [%] | With Correction Algorithm | 0.5 | 0.1 |

## Sensor Offset

| | |
|---|---|
| Probe Tip to Sensor Center | 2.7 mm |

**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%.**

[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

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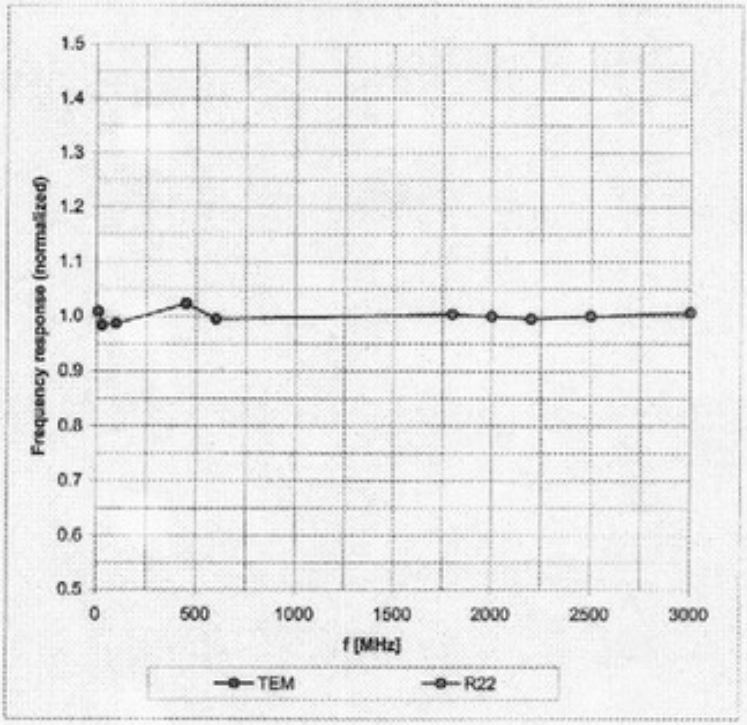
## Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)




Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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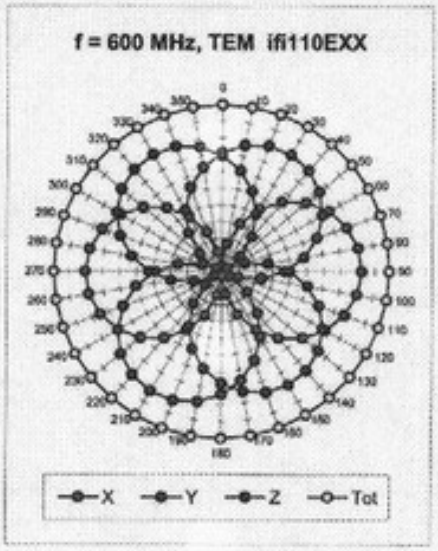
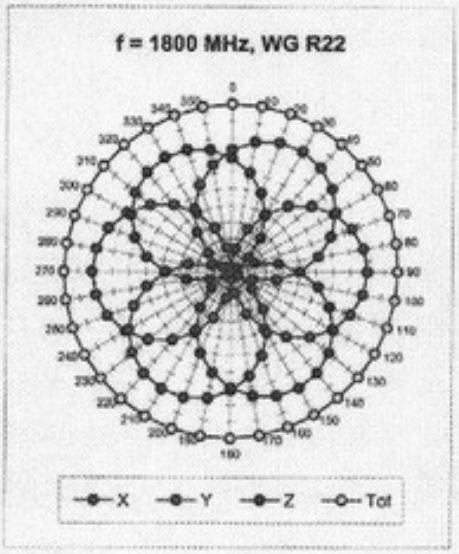
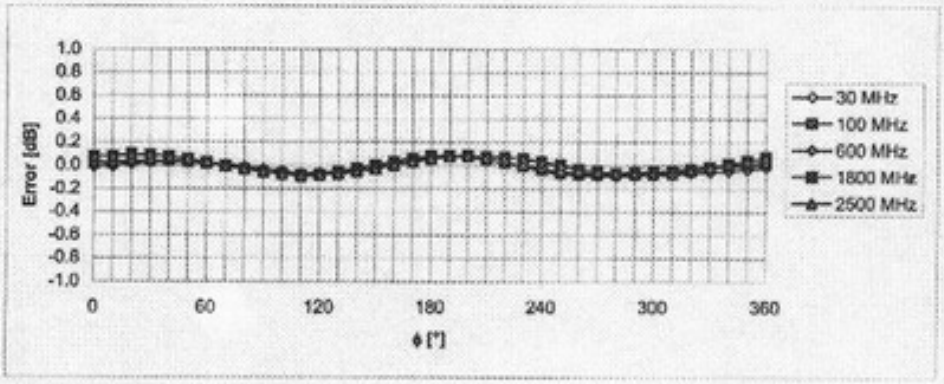
## Receiving Pattern ($\phi$), $\vartheta$ = 0°




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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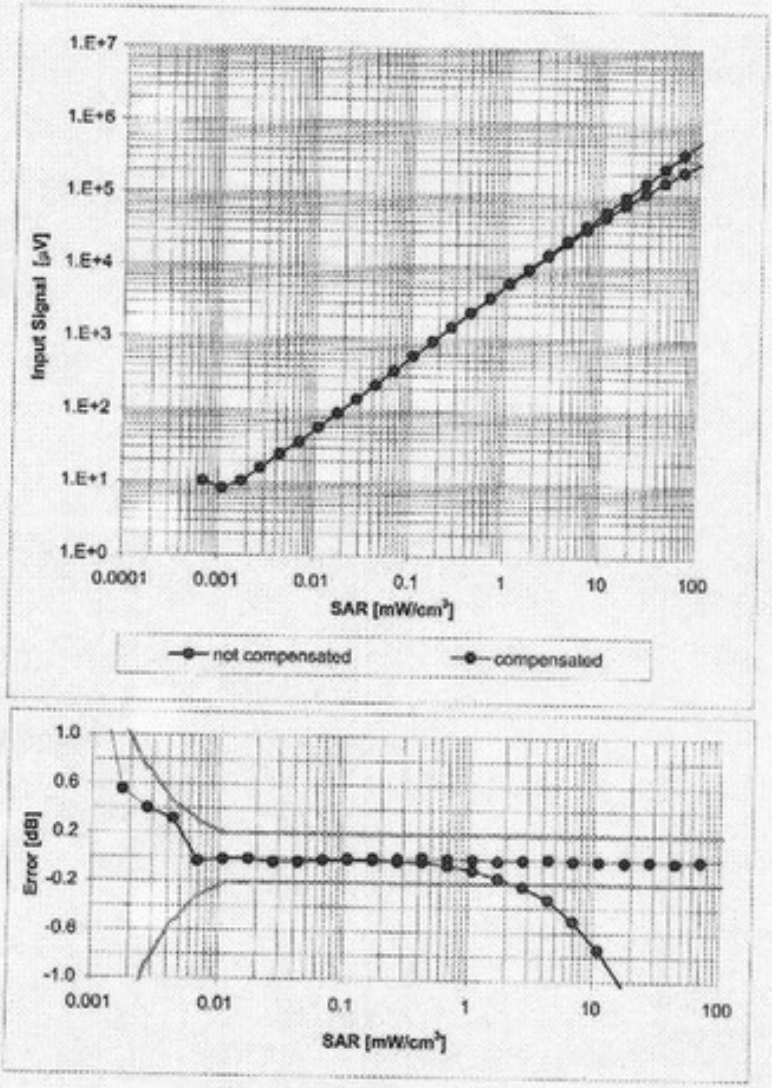
## Dynamic Range f($SAR_{head}$)

(Waveguide R22, f = 1800 MHz)




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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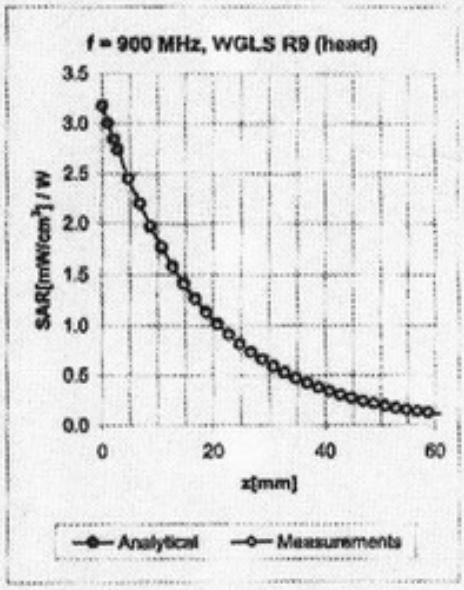
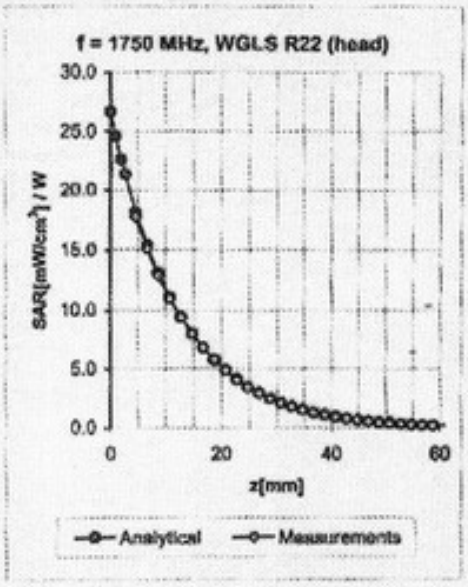
# Conversion Factor Assessment




| f [MHz] | Validity [MHz][C] | TSL | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty |
|---|---|---|---|---|---|---|---|
| 900 | ± 50 / ± 100 | Head | 41.5 ± 5% | 0.97 ± 5% | 0.27 | 2.89 | 6.85 ± 11.0% (k=2) |
| 1750 | ± 50 / ± 100 | Head | 40.1 ± 5% | 1.37 ± 5% | 0.52 | 2.56 | 5.42 ± 11.0% (k=2) |
| 1950 | ± 50 / ± 100 | Head | 40.0 ± 5% | 1.40 ± 5% | 0.49 | 2.89 | 5.15 ± 11.0% (k=2) |
| 900 | ± 50 / ± 100 | Body | 55.0 ± 5% | 1.05 ± 5% | 0.35 | 2.82 | 6.52 ± 11.0% (k=2) |
| 1750 | ± 50 / ± 100 | Body | 53.4 ± 5% | 1.49 ± 5% | 0.56 | 2.68 | 4.97 ± 11.0% (k=2) |
| 1950 | ± 50 / ± 100 | Body | 53.3 ± 5% | 1.52 ± 5% | 0.68 | 2.07 | 4.64 ± 11.0% (k=2) |
| 2450 | ± 50 / ± 100 | Body | 52.7 ± 5% | 1.95 ± 5% | 0.66 | 2.16 | 4.10 ± 11.8% (k=2) |

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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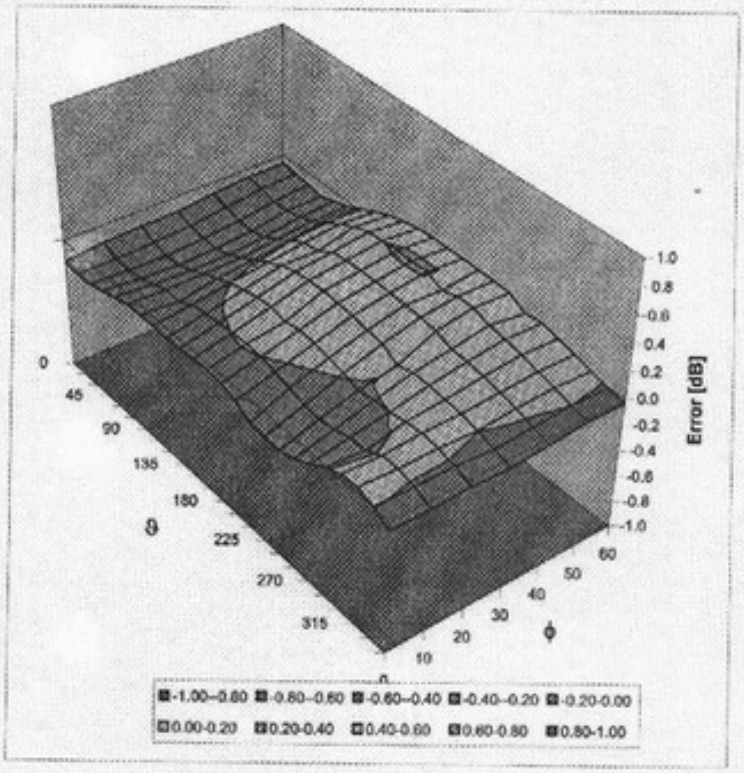
## Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz




Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

# ANNEX F： D1900V2 DIPOLE CALIBRATION CERTIFICATE

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

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C Service suisse d'étalonnage
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Accredited by the Swiss Federal Office of Metrology and Accreditation
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

**Accreditation No.: SCS 108**

Client **Auden**

**Certificate No: D1900V2-5d018_Mar08**

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1900V2 - SN: 5d018 |
| Calibration procedure(s) | QA CAL-05.v6<br>Calibration procedure for dipole validation kits |
| Calibration date: | March 21, 2008 |
| Condition of the calibrated item | In Tolerance |

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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 23-Sep-07 (METAS, No. 217-00608) | Sep-08 |
| Power sensor HP 8481A | US37292783 | 23-Sep-07 (METAS, No. 217-00608) | Sep-08 |
| Reference 20 dB Attenuator | SN: 5086 (20g) | 21-Jun-07 (METAS, No 217-00591) | Jun-08 |
| Reference 10 dB Attenuator | SN: 5047.2 (10r) | 21-Jun-07 (METAS, No 217-00591) | Jun-08 |
| Reference Probe ET3DV6 | SN: 1507 | 11-Sep-07 (SPEAG, No. ET3-1507_Sep07) | Sep-08 |
| Reference Probe ES3DV3 | SN: 3025 | 11-Sep-07 (SPEAG, No. ES3-3025_Sep07) | Sep-08 |
| DAE4 | SN 601 | 15-Jan-08 (SPEAG, No. DAE4-601_Jan08) | Jan-09 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (SPEAG, in house check Oct-07) | In house check: Oct-09 |
| RF generator Agilent E4421B | MY41000675 | 11-May-05 (SPEAG, in house check Nov-07) | In house check: Nov-09 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (SPEAG, in house check Oct-07) | In house check: Oct-08 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: March 22, 2008

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**Accreditation No.: SCS 108**

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY4 | V4.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V5.0 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1900 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.0 | 1.40 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.6 ± 6 % | 1.43 mho/m ± 6 % |
| **Head TSL temperature during test** | (21.3 ± 0.2) °C | — | — |

## SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.45 mW / g |
| SAR normalized | normalized to 1W | 37.8 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **36.4 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.98 mW / g |
| SAR normalized | normalized to 1W | 19.9 mW / g |
| SAR for nominal Head TSL parameters [1] | normalized to 1W | **19.5 mW / g ± 16.5 % (k=2)** |

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.3 | 1.52 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 52.0 ± 6 % | 1.55 mho/m ± 6 % |
| **Body TSL temperature during test** | (21.3 ± 0.2) °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.63 mW / g |
| SAR normalized | normalized to 1W | 38.5 mW / g |
| SAR for nominal Body TSL parameters [2] | normalized to 1W | **36.8 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.21 mW / g |
| SAR normalized | normalized to 1W | 20.8 mW / g |
| SAR for nominal Body TSL parameters [2] | normalized to 1W | **20.2 mW / g ± 16.5 % (k=2)** |

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 52.5 Ω + 3.3 jΩ |
| Return Loss | - 27.9 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 48.5 Ω + 2.9 jΩ |
| Return Loss | - 29.6 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.203 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | June 4, 2002 |