



S-039-4

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

Client **EMC Technologies**

| CALIBRATION CERTIFICATE | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---|--|------------|------|---|-----------------------|----------------------|------------|--------------------------------|--------|-----------------------|------------|--------------------------------|--------|-----------------------|------------|-----------------------------------|--------|-------------------------|--------|---------------------------------|------------------------|---------------------------|------------|--|------------------------|
| Object(s) | D900V2 - SN:047 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calibration procedure(s) | QA CAL-05.v2 Calibration procedure for dipole validation kits | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calibration date: | July 12, 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Condition of the calibrated item | In Tolerance (according to the specific calibration document) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1"><thead><tr><th>Model Type</th><th>ID #</th><th>Cal Date (Calibrated by, Certificate No.)</th><th>Scheduled Calibration</th></tr></thead><tbody><tr><td>Power meter EPM E442</td><td>GB37480704</td><td>6-Nov-03 (METAS, No. 252-0254)</td><td>Nov-04</td></tr><tr><td>Power sensor HP 8481A</td><td>US37292783</td><td>6-Nov-03 (METAS, No. 252-0254)</td><td>Nov-04</td></tr><tr><td>Power sensor HP 8481A</td><td>MY41092317</td><td>18-Oct-02 (Agilent, No. 20021018)</td><td>Oct-04</td></tr><tr><td>RF generator R&S SML-03</td><td>100698</td><td>27-Mar-2002 (R&S, No. 20-92389)</td><td>In house check: Mar-05</td></tr><tr><td>Network Analyzer HP 8753E</td><td>US37390585</td><td>18-Oct-01 (SPEAG, in house check Nov-03)</td><td>In house check: Oct 05</td></tr></tbody></table> | | | | Model Type | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration | Power meter EPM E442 | GB37480704 | 6-Nov-03 (METAS, No. 252-0254) | Nov-04 | Power sensor HP 8481A | US37292783 | 6-Nov-03 (METAS, No. 252-0254) | Nov-04 | Power sensor HP 8481A | MY41092317 | 18-Oct-02 (Agilent, No. 20021018) | Oct-04 | RF generator R&S SML-03 | 100698 | 27-Mar-2002 (R&S, No. 20-92389) | In house check: Mar-05 | Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (SPEAG, in house check Nov-03) | In house check: Oct 05 |
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| Calibrated by: | Name Judith Mueller | Function Technician | Signature  | | | | | | | | | | | | | | | | | | | | | | | | |
| Approved by: | Name Katja Pokovic | Function Laboratory Director | Signature  | | | | | | | | | | | | | | | | | | | | | | | | |
| Date issued: July 14, 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>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.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | |

DASY

Dipole Validation Kit

Type: D900V2

Serial: 047

Manufactured: October 7, 1998
Calibrated: July 12, 2004

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 900 MHz:

| | | |
|------------------------|-------------------|-----------|
| Relative Dielectricity | 41.0 | $\pm 5\%$ |
| Conductivity | 0.97 mho/m | $\pm 5\%$ |

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.18 at 900 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 15mm from dipole center to the solution surface. The included distance spacer 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.

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 cm³ (1 g) of tissue: **11.1 mW/g $\pm 16.8\%$ (k=2)¹**

averaged over 10 cm³ (10 g) of tissue: **7.08 mW/g $\pm 16.2\%$ (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: | 1.397 ns | (one direction) |
| Transmission factor: | 0.985 | (voltage transmission, one direction) |

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

| | |
|---------------------------------|-----------------------------------|
| Feedpoint impedance at 900 MHz: | $\text{Re}\{Z\} = 49.5 \, \Omega$ |
|---------------------------------|-----------------------------------|

| | |
|--|-----------------------------------|
| | $\text{Im}\{Z\} = -4.4 \, \Omega$ |
|--|-----------------------------------|

| | |
|------------------------|-----------------|
| Return Loss at 900 MHz | -27.0 dB |
|------------------------|-----------------|

4. 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.

5. 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.

6. Power Test

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

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN047

Communication System: CW-900; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: HSL 900 MHz;

Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 0.97 \text{ mho/m}$; $\epsilon_r = 41$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.18, 6.18, 6.18); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn903; Calibrated: 2/19/2004
- Phantom: Flat Phantom half size; Type: QD000P49AA; Serial: SN:1001;
- Measurement SW: DASY4, V4.3 Build 8; Postprocessing SW: SEMCAD, V1.8 Build 117

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 3.00 mW/g

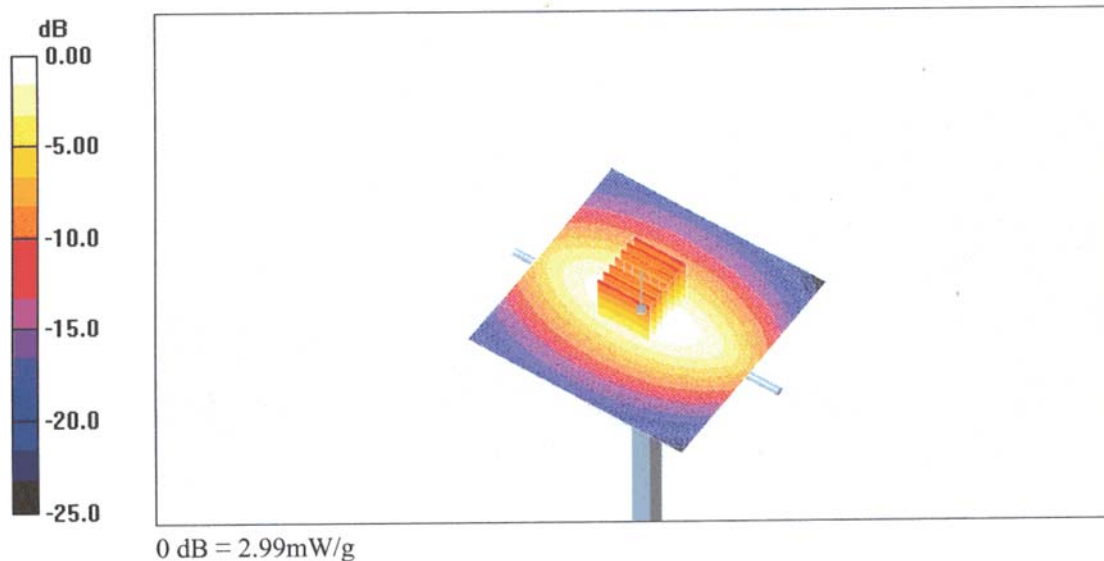
Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$,
 $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.7 V/m ; Power Drift = -39.5 dB

Peak SAR (extrapolated) = 4.19 W/kg

SAR(1 g) = 2.77 mW/g ; SAR(10 g) = 1.77 mW/g

Maximum value of SAR (measured) = 2.99 mW/g



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12201

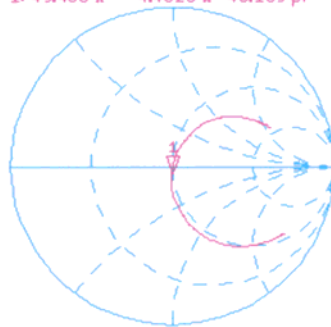
12 Jul 2004 09:48:54
CH1 S11 1 U FS 1: 49.480 Ω -4.4023 Ω 40.169 pF 900.000 000 MHz

De1

Cor

Avg
16

↑



CH2 S11 L06 6 dB/REF -20 dB 1:-27.000 dB 900.000 000 MHz

Cor

↑

