

Client

CCS

## CALIBRATION CERTIFICATE

Object(s)

D835V2 - SN:4d002

Calibration procedure(s)

QA CAL-05.v2

Calibration procedure for dipole validation kits

Calibration date:

February 12, 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 (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

Calibrated by:

Name

Judith Mueller

Function

Technician

Signature



Approved by:

Katja Pokovic

Laboratory Director



Date issued: February 18, 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.

# DASY

## Dipole Validation Kit

Type: D835V2

Serial: 4d002

Manufactured: July 10, 2003

Calibrated: February 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	<b>42.1</b>	$\pm 5\%$
Conductivity	<b>0.89 mho/m</b>	$\pm 5\%$

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.3 at 835 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  $250 \text{ mW} \pm 3\%$ . The results are normalized to 1 W 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 1 W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over $1 \text{ cm}^3$ (1 g) of tissue:	<b>9.96 mW/g <math>\pm 16.8\%</math> (k=2)<sup>1</sup></b>
averaged over $10 \text{ cm}^3$ (10 g) of tissue:	<b>6.48 mW/g <math>\pm 16.2\%</math> (k=2)<sup>1</sup></b>

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<sup>1</sup> 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:	<b>1.391 ns</b>	(one direction)
Transmission factor:	<b>0.991</b>	(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:                       $\text{Re}\{Z\} = 51.4 \, \Omega$

$\text{Im}\{Z\} = -1.2 \, \Omega$

Return Loss at 900 MHz                                      **-34.5 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 835 MHz; Type: D835V2; Serial: D835V2 - SN4d002**

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL 835 MHz

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.89 \text{ mho/m}$ ;  $\epsilon_r = 42.1$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.3, 6.3, 6.3); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn411; Calibrated: 11/6/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.2 Build 25; Postprocessing SW: SEMCAD, V1.8 Build 98

**Pin = 250 mW; d = 15 mm/Area Scan (81x81x1):** Measurement grid: dx=15mm, dy=15mm

Reference Value = 56.5 V/m

Power Drift = 0.002 dB

Maximum value of SAR = 2.68 mW/g

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

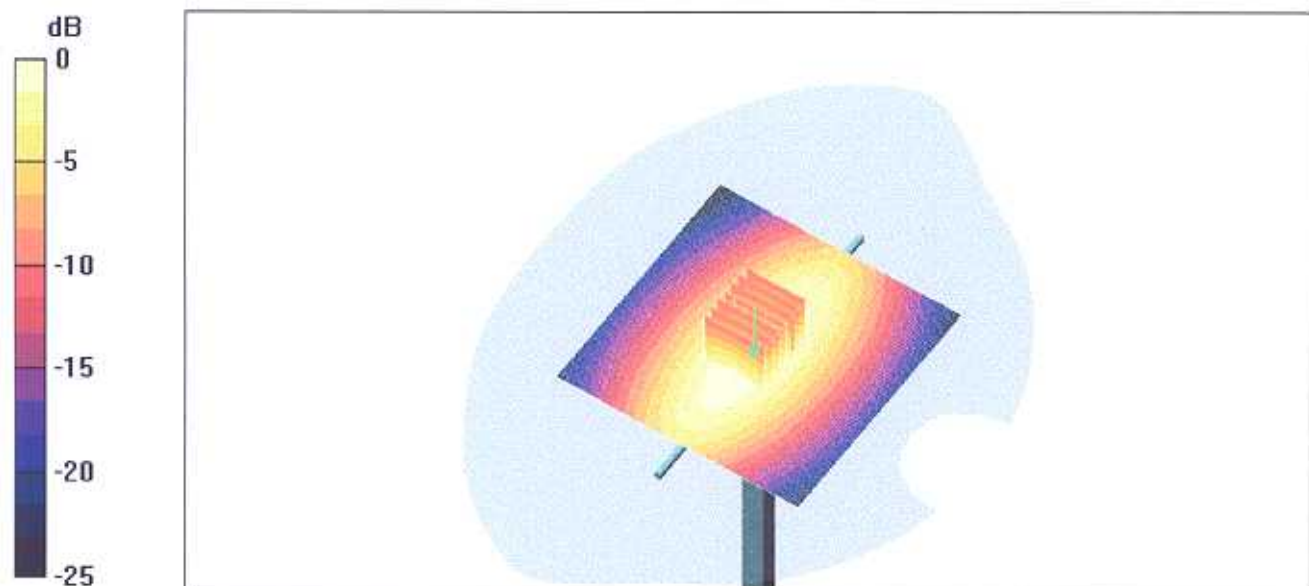
Peak SAR (extrapolated) = 3.82 W/kg

**SAR(1 g) = 2.49 mW/g; SAR(10 g) = 1.62 mW/g**

Reference Value = 56.5 V/m

Power Drift = 0.002 dB

Maximum value of SAR = 2.68 mW/g



0 dB = 2.68mW/g

4d002

12 Feb. 2004 10:53:38

[CH1] S11 1 U FS

1: 51.434  $\Omega$  -1.2441  $\Omega$  153.20 pF

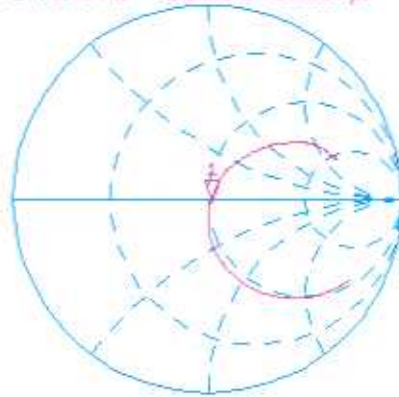
835.000 000 MHz

De1

Con

Avg  
16

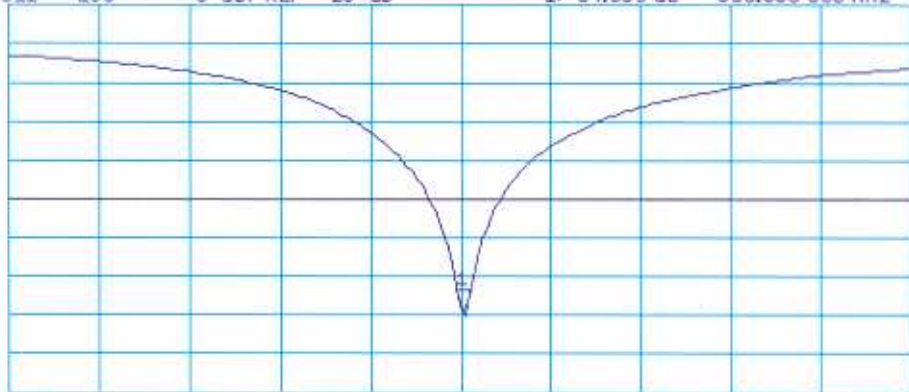
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CH2 S11 LOG 5 dB/REF -20 dB 1:-34.539 dB 835.000 000 MHz

Con

↑



CENTER 835.000 000 MHz

SPAN 400.000 000 MHz