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APPENDIX F – DIPOLE CALIBRATION DATA

Schmid & Partner
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Calibration Certificate

450 MHz System Validation Dipole

Type:	**D450V2**
Serial Number:	**1007**
Place of Calibration:	**Zurich**
Date of Calibration:	**July 4, 2002**
Calibration Interval:	**24 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	D.Vetter
Approved by:	[signature]

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DASY

Dipole Validation Kit

Type: D450V2

Serial: 1007

Manufactured: July 1, 2002
Calibrated: July 4, 2002

1. Measurement Conditions

The measurements were performed in the flat phantom filled with head simulating liquid of the following electrical parameters at 450 MHz:

Relative Dielectricity	**44.4**	± 5%
Conductivity	**0.87 mho/m**	± 5%

The DASY3 System (Software version 3.1d) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 7.2 at 450 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 and the dipole was oriented parallel to the longer side of the phantom. The standard measuring distance was 15mm from dipole center to the liquid surface including the 6mm thick phantom shell. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 397 mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm^3 (1 g) of tissue: **4.78 mW/g** (Advanced Extrapolation)

averaged over 10 cm^3 (10 g) of tissue: **3.17 mW/g** (Advanced Extrapolation)

Advanced extrapolation has been applied to the measured SAR values to compensate for the probe boundary effect (see DASY User Manual for details).

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well.

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:	**1.352 ns**	(one direction)
Transmission factor:	**0.996**	(voltage transmission, one direction)

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

Feedpoint impedance at 450 MHz:	Re{Z} = **57.7 Ω**
	Im {Z} = **-5.7 Ω**
Return Loss at 450 MHz	**-21.0 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.

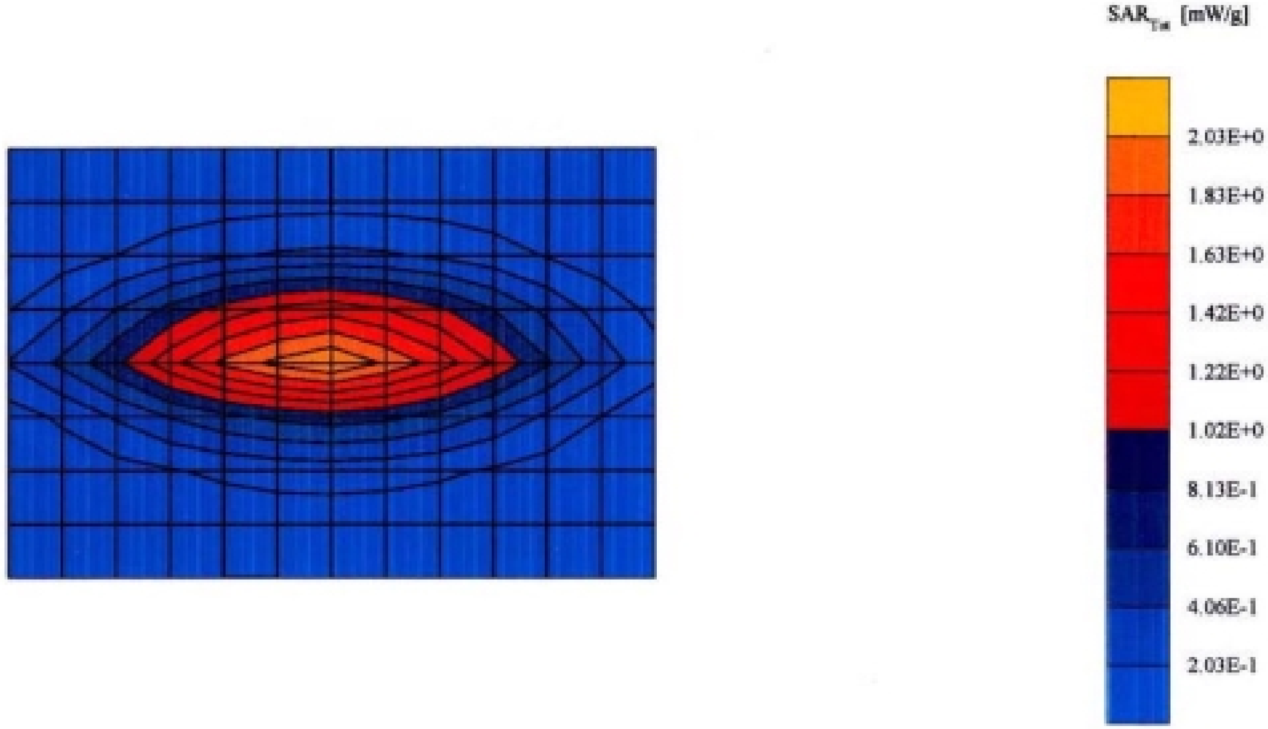
6. Power Test

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

07/04/02

Validation Dipole D450V2 SN:1007, d = 15 mm

Frequency: 450 MHz; Antenna Input Power: 397 [mW]
Phantom Name: Calibration, Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(7.20,7.20,7.20); Crest factor: 1.0; Head 450 MHz: σ = 0.87 mho/m ε_r = 44.4 ρ = 1.00 g/cm³
Cubes (2): Peak: 2.87 mW/g ± 0.02 dB, SAR (1g): 1.89 mW/g ± 0.03 dB, SAR (10g): 1.26 mW/g ± 0.03 dB , (Advanced extrapolation)
Penetration depth: 13.2 (11.9, 14.8) [mm]



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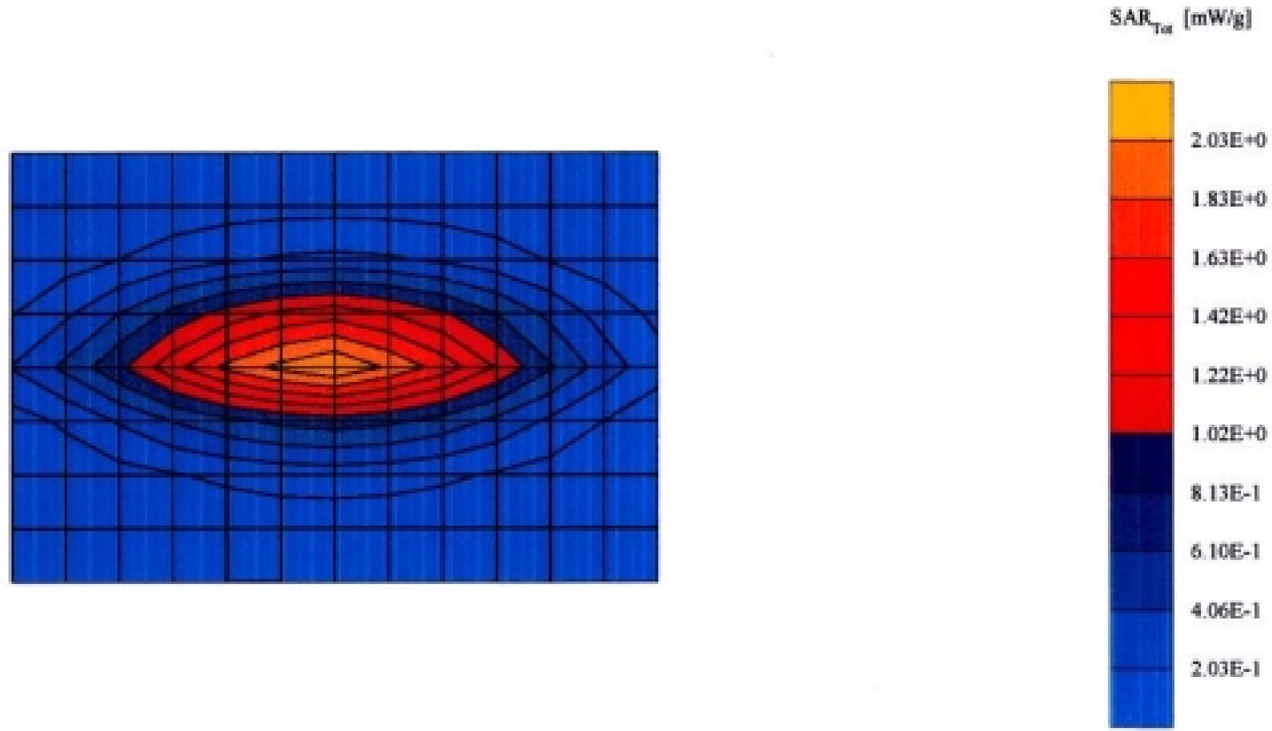
Frequency: 450 MHz; Antenna Input Power: 397 [mW]
Phantom Name: Calibration, Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(7.20,7.20,7.20); Crest factor: 1.0; Head 450 MHz: σ = 0.87 mho/m ε_r = 44.4 ρ = 1.00 g/cm^3
Cubes (2): Peak: 3.17 mW/g ± 0.02 dB, SAR (1g): 2.00 mW/g ± 0.03 dB, SAR (10g): 1.31 mW/g ± 0.03 dB , (Worst-case extrapolation)
Penetration depth: 12.4 (10.7, 14.5) [mm]



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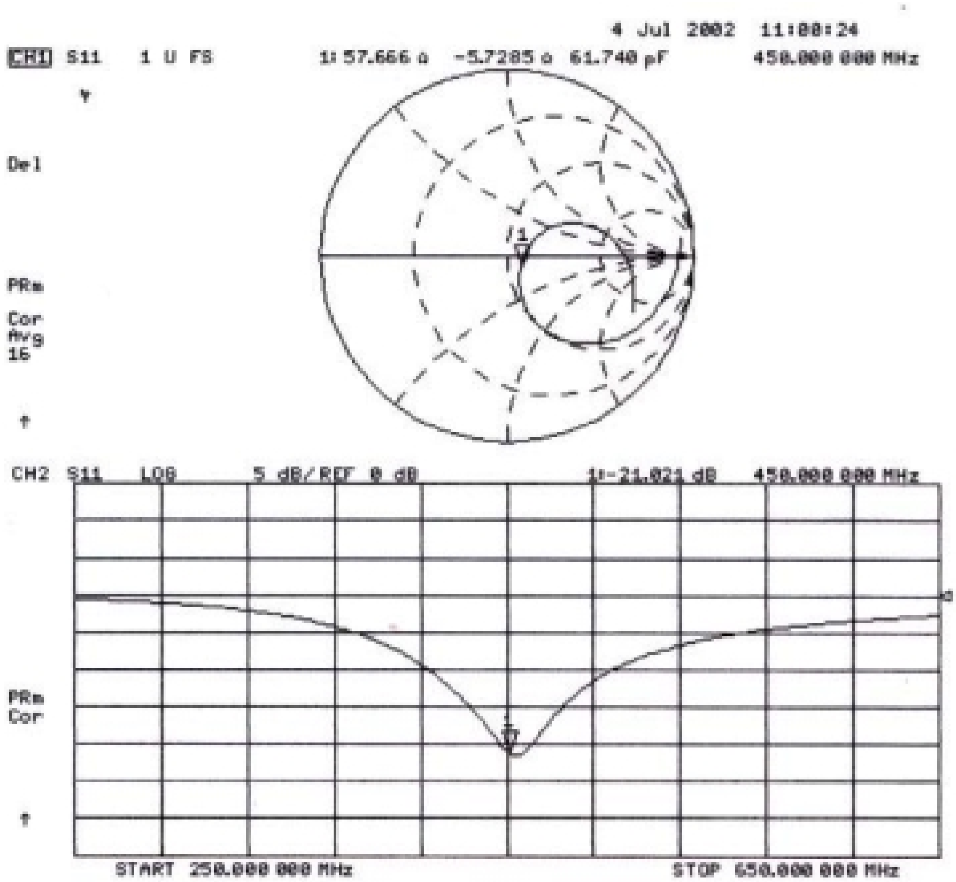
4 Jul 2002 11:08:24
CH1 S11 1 U FS 1: 57.666 Ω -5.7285 Ω 61.740 pF 450.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF 0 dB 1:-21.021 dB 450.000 000 MHz
PRm
Cor
START 250.000 000 MHz
STOP 650.000 000 MHz

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