APPENDIX F – DIPOLE CALIBRATION DATA

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

Client **H-CT (Dymstec)**

CALIBRATION CERTIFICATE

Object(s) **D450V2 - SN:1007**

Calibration procedure(s) **QA CAL-15.v2**
Calibration procedure for dipole validation kits below 800 MHz

Calibration date **May 29, 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 calibrationprocedures 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 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. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	
Approved by:	Niels Kuster	Quality Manager	

Date issued: May 29, 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.

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s p e a g

DASY

Dipole Validation Kit

Type: D450V2

Serial: 1007

Manufactured: July 1, 2002
Calibrated: May 29, 2004

July 04

1. Measurement Conditions

The measurements were performed in the 6mm thick flat phantom filled with **head** simulating liquid of the following electrical parameters at 450 MHz:

Relative Dielectricity	**45.1**	± 5%
Conductivity	**0.85 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.45 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 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 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 398 mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY 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 cm^3 (1 g) of tissue: **5.25 mW/g** ± 20.7 % (k=2)[1]

averaged over 10 cm^3 (10 g) of tissue: **3.49 mW/g** ± 20.2 % (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:	**1.352 ns**	(one direction)
Transmission factor:	**0.993**	(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 450 MHz:	Re{Z} = **53.4 Ω**
	Im {Z} = **-9.9 Ω**
Return Loss at 450 MHz	**-20 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.

July 04

Date/Time: 05/29/04 13:46:10

Test Laboratory: SPEAG, Zurich, Switzerland
DUT: Dipole 450 MHz; Serial: D450V2 - SN:1007

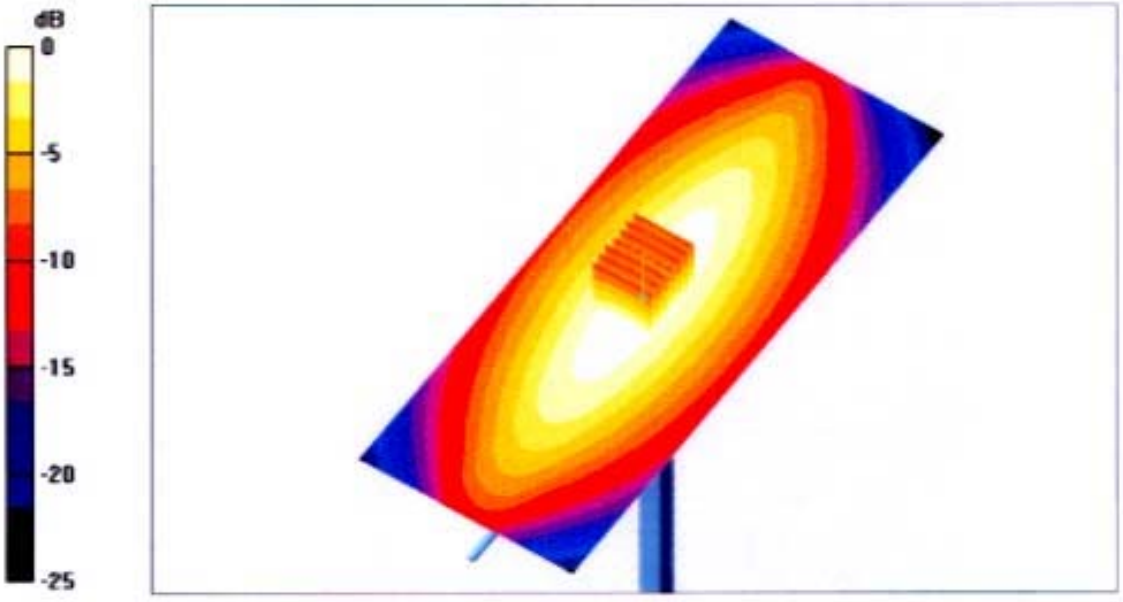
Communication System: CW;Duty Cycle: 1:1; Medium: HSL450
Medium parameters used: f = 450 MHz; σ = 0.85 mho/m; ε_r = 45.1; ρ = 1000 kg/m^3
Phantom: Flat Phantom 4.4; Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.45, 6.45, 6.45);
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Measurement SW: DASY4, V4.2 Build 44;

d=15mm, Pin=398mW/Area Scan (71x181x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 52.3 V/m; Power Drift = -0.0 dB
Maximum value of SAR (interpolated) = 2.21 mW/g

d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.3 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 2.24 mW/g
Peak SAR (extrapolated) = 3.16 W/kg
SAR(1 g) = 2.09 mW/g; SAR(10 g) = 1.39 mW/g



0 dB = 2.24mW/g