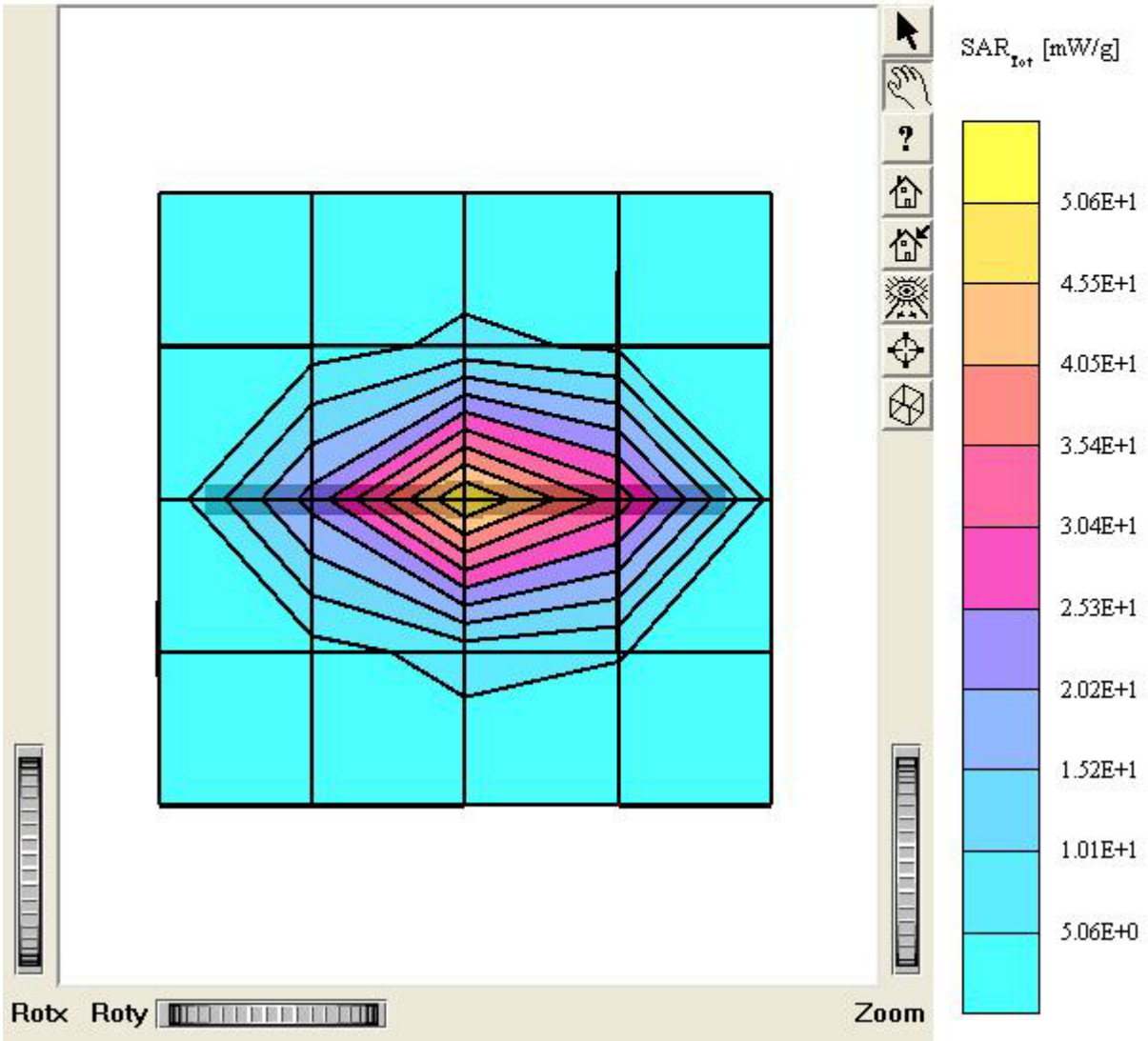
■ Validation Data (1900MHz Brain)

Dipole 1900 MHz

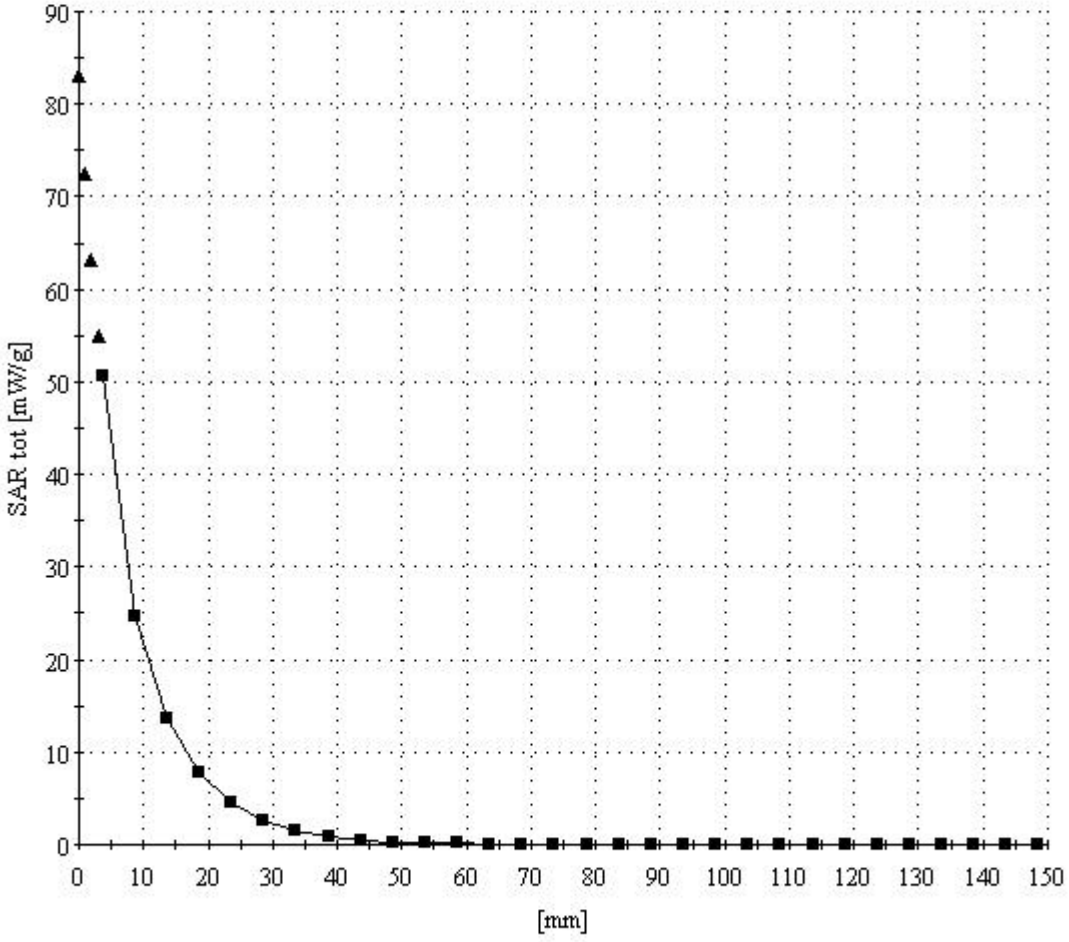
SAM II Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1609; ConvF(5.34,5.34,5.34); Crest factor: 1.0; Brain 1900 MHz: σ = 1.41 mho/m ε_r = 39.7 ρ = 1.00 g/cm^3
Cubes (2): SAR (1g): 42.9 mW/g ± 0.10 dB, SAR (10g): 21.5 mW/g ± 0.08 dB
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.01 dB
Comment :
1900 MHz Brain Dipole Validation (D1900V2/ S.N: 5d032)
Antenna Input Power : 30 dBm (1W)
HCT Co., Ltd. Brain Tissue Simulating Liquid
Liquid Temperature : 21.4 °C
Date Tested : November 12, 2004



Dipole 1900 MHz

SAM II Phantom; Section; Position: ; Frequency: 1900 MHz
Probe: ET3DV6 - SN1609; ConvF(5.34,5.34,5.34); Crest factor: 1.0; Brain 1900 MHz: σ = 1.41 mho/m ε_r = 39.7 ρ = 1.00 g/cm^3
:
Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

Comment :
1900 MHz Brain Dipole Validation (D1900V2/ S.N: 5d032)
Antenna Input Power : 30 dBm (1W)
HCT Co., Ltd. Brain Tissue Simulating Liquid
Liquid Temperature : 21.4 ℃
Date Tested : November 12, 2004



■ Dielectric Parameter (1900MHz Brain)

Title : AXW-D1900
SubTitle : 1900MHz Brain
November 12, 2004 09:11 AM

Frequency	e'	e''
1.800000000 GHz	40.1110	12.9809
1.806666667 GHz	40.0609	13.0286
1.813333333 GHz	39.9938	13.0625
1.820000000 GHz	39.9642	13.1309
1.826666667 GHz	39.9591	13.1841
1.833333333 GHz	39.9365	13.2419
1.840000000 GHz	39.9685	13.2987
1.846666667 GHz	39.9707	13.3408
1.853333333 GHz	39.9728	13.3434
1.860000000 GHz	39.9739	13.4008
1.866666667 GHz	39.9355	13.4139
1.873333333 GHz	39.9288	13.4098
1.880000000 GHz	39.9012	13.4192
1.886666667 GHz	39.8483	13.4119
1.893333333 GHz	39.7772	13.3987
1.900000000 GHz	39.6888	13.3761
1.906666667 GHz	39.6468	13.3925
1.913333333 GHz	39.5563	13.4018
1.920000000 GHz	39.4651	13.4179
1.926666667 GHz	39.4068	13.4337
1.933333333 GHz	39.3525	13.4591
1.940000000 GHz	39.3292	13.5086
1.946666667 GHz	39.2619	13.5574
1.953333333 GHz	39.2431	13.6070
1.960000000 GHz	39.2553	13.6627

■ Dielectric Parameter (1900MHz Body)

Title : AXW-D1900
SubTitle : 1900MHz Body
November 12, 2004 10:38 AM

Frequency	e'	e''
1.800000000 GHz	51.6727	13.1225
1.806666667 GHz	51.5776	13.1171
1.813333333 GHz	51.5775	13.1729
1.820000000 GHz	51.5987	13.2320
1.826666667 GHz	51.5602	13.2569
1.833333333 GHz	51.5400	13.3475
1.840000000 GHz	51.4757	13.3771
1.846666667 GHz	51.4485	13.4281
1.853333333 GHz	51.4473	13.5202
1.860000000 GHz	51.4165	13.5604
1.866666667 GHz	51.3547	13.6205
1.873333333 GHz	51.3626	13.7188
1.880000000 GHz	51.2863	13.8203
1.886666667 GHz	51.3302	13.8765
1.893333333 GHz	51.3340	13.9538
1.900000000 GHz	51.2794	14.0156
1.906666667 GHz	51.2846	14.1516
1.913333333 GHz	51.2682	14.2222
1.920000000 GHz	51.1671	14.2201
1.926666667 GHz	51.2285	14.2566
1.933333333 GHz	51.2518	14.3165
1.940000000 GHz	51.1789	14.3784
1.946666667 GHz	51.1834	14.4269
1.953333333 GHz	51.1164	14.4734
1.960000000 GHz	51.0802	14.4674

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

Client **H-CT (Dymstec)**

CALIBRATION CERTIFICATE

Object(s)	D1900V2 - SN:5d032
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	April 26, 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

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: April 27, 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.

880-KP0301061-A Page 1 (1)

Schmid & Partner Engineering AG

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info@speag.com, http://www.speag.com

DASY

Dipole Validation Kit

Type: D1900V2

Serial: 5d032

Manufactured: March 17, 2003
Calibrated: April 26, 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 1900 MHz:

Relative Dielectricity	**40.1**	± 5%
Conductivity	**1.45 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 4.96 at 1900 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 10mm 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 ± 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 cm^3 (1 g) of tissue:	**40.0 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**21.0 mW/g** ± 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:	**1.192 ns**	(one direction)
Transmission factor:	**0.999**	(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 1900 MHz:	Re{Z} = **49.8 Ω**
	Im {Z} = **3.4 Ω**
Return Loss at 1900 MHz	**-29.5 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.

Small end caps have been added to the dipole arms in order to improve matching when loaded according to the position as explained in Section 1. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

6. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Date/Time: 04/26/04 13:04:32

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN5d032

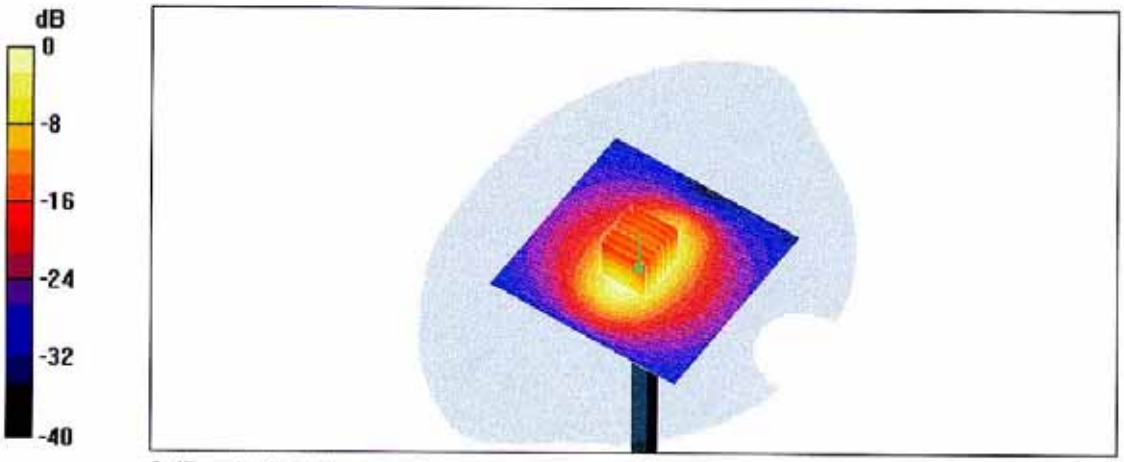
Communication System: CW-1900; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL 1900 MHz;
Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 40.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.96, 4.96, 4.96); 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 44; Postprocessing SW: SEMCAD, V1.8 Build 112

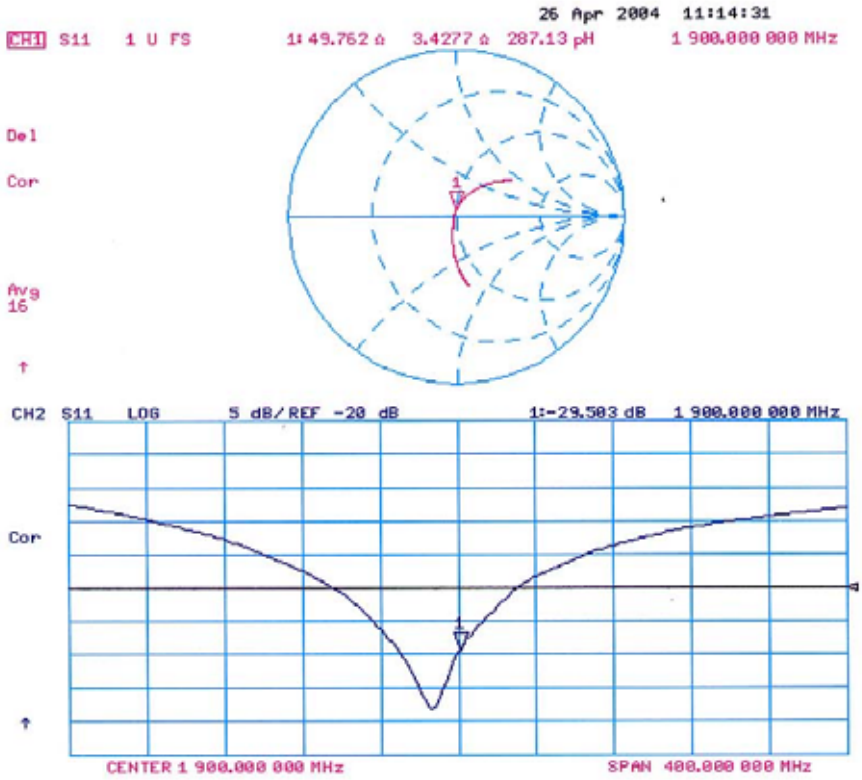
Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 92 V/m; Power Drift = 0.0 dB
Maximum value of SAR (interpolated) = 11.4 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 11.2 mW/g
Peak SAR (extrapolated) = 17.8 W/kg
SAR(1 g) = 10 mW/g; SAR(10 g) = 5.25 mW/g



0 dB = 11.2mW/g

5d052


26 Apr 2004 11:14:31
CH1 S11 1 U FS
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1 900.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG
5 dB/ REF -20 dB
1:-29.583 dB 1 900.000 000 MHz
Cor
CENTER 1 900.000 000 MHz
SPAN 400.000 000 MHz