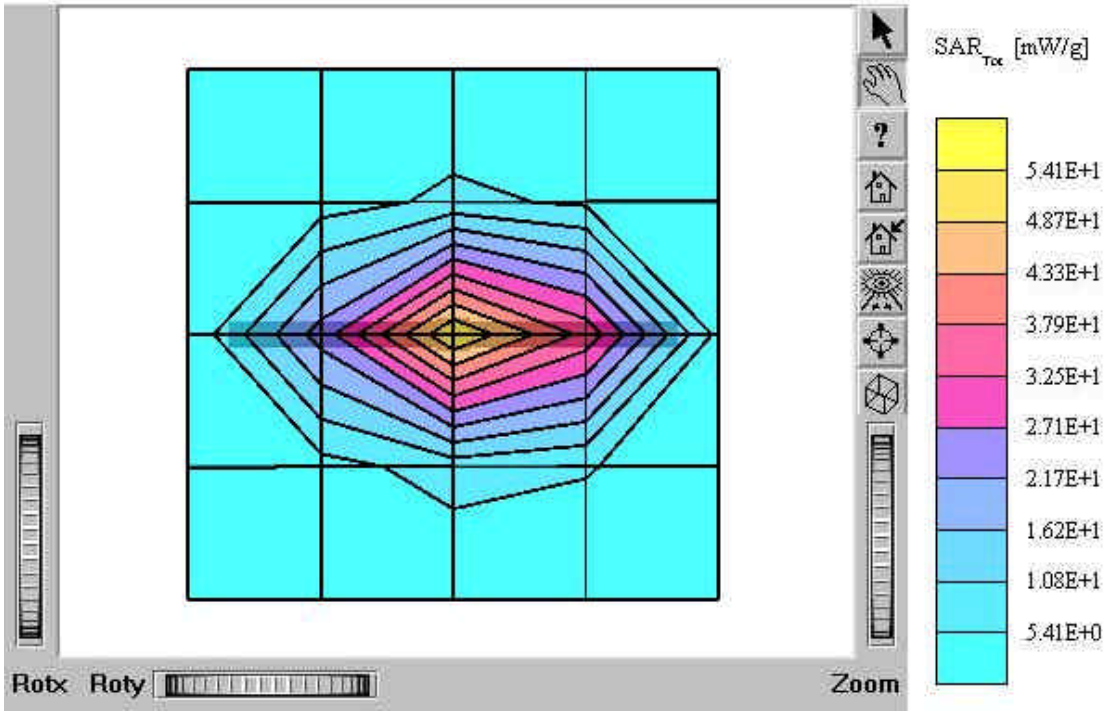
¦ Validation Data (1900MHz Brain)

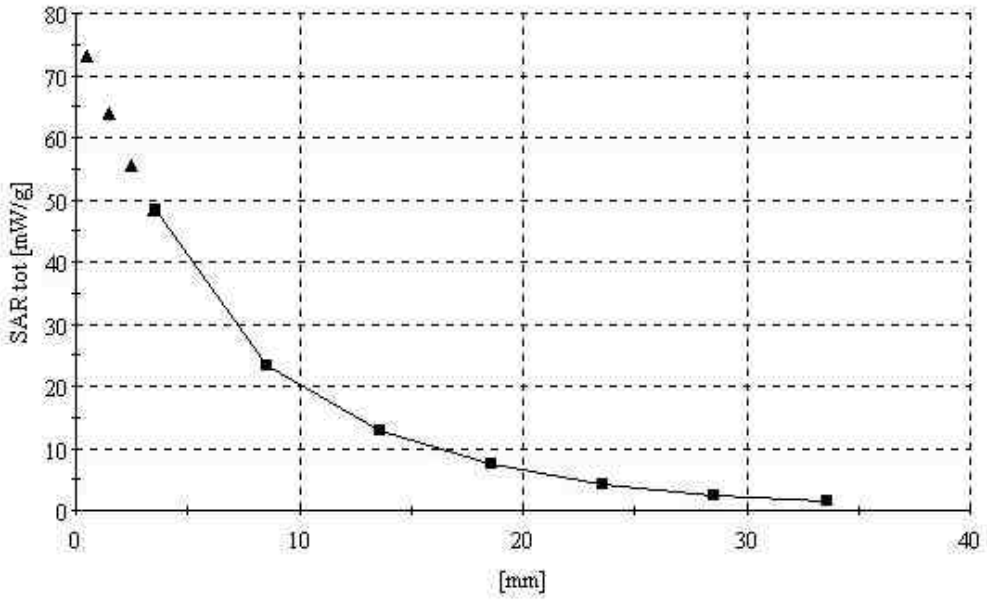
Dipole 1900 MHz
SAM II Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1609; ConvF(5.29,5.29,5.29); Crest factor: 1.0; Brain 1900 MHz: σ = 1.41 mho/m ε_r = 40.3 ρ = 1.00 g/cm^3
Cubes (2): SAR (1g): 42.1 mW/g ± 0.02 dB, SAR (10g): 21.2 mW/g ± 0.03 dB
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.02 dB
Comment:
1900 MHz Brain Dipole Validation (D1900V2/ S.N: 5d032)
Antenna Input Power: 30 dBm (1 W)
HCT Co., Ltd. Brain Tissue Simulating Liquid
Liquid Temperature: 21.7℃
Date Tested : May 29, 2004



Dipole 1900 MHz

SAM II Phantom; Flat Section; Position: (90°,90°); Frequency: 1900 MHz
Probe: ET3DV6 - SN1609; ConvF(5.29,5.29,5.29); Crest factor: 1.0; Brain 1900 MHz: σ = 1.41 mho/m ε_r = 40.3 ρ = 1.00 g/cm^3
Cubes (2): SAR (1g): 42.1 mW/g ± 0.02 dB, SAR (10g): 21.2 mW/g ± 0.03 dB
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

Comment:
1900 MHz Brain Dipole Validation (D1900V2/ S.N: 5d032)
Antenna Input Power: 30 dBm (1 W)
HCT Co., Ltd. Brain Tissue Simulating Liquid
Liquid Temperature: 21.7℃
Date Tested : May 29, 2004



¦ Dielectric Parameter (1900MHz Brain)

Title : HTT-1900

SubTitle : 1900 MHz Brain

May 29, 2004 08:38 AM

Frequency	e'	e''
1.800000000 GHz	40.7346	12.9918
1.810000000 GHz	40.6521	13.0657
1.820000000 GHz	40.6564	13.1001
1.830000000 GHz	40.5802	13.1641
1.840000000 GHz	40.5637	13.1901
1.850000000 GHz	40.5070	13.2085
1.860000000 GHz	40.4858	13.2376
1.870000000 GHz	40.4776	13.3036
1.880000000 GHz	40.4347	13.2953
1.890000000 GHz	40.3797	13.3313
1.900000000 GHz	40.3079	13.3215
1.910000000 GHz	40.2287	13.3440
1.920000000 GHz	40.1671	13.3822
1.930000000 GHz	40.1046	13.4035
1.940000000 GHz	40.0425	13.4188
1.950000000 GHz	39.9808	13.4551
1.960000000 GHz	39.9612	13.5345
1.970000000 GHz	39.9368	13.5607
1.980000000 GHz	39.9143	13.6183
1.990000000 GHz	39.8795	13.6516
2.000000000 GHz	39.8658	13.6795

¦ Dielectric Parameter (1900MHz Body)

Title : HTT-1900
SubTitle : 1900 MHz Body
May 29, 2004 09:28 AM

Frequency	e'	e''
1.850000000 GHz	53.7960	14.9051
1.855000000 GHz	53.7920	14.8820
1.860000000 GHz	53.7428	14.9147
1.865000000 GHz	53.6707	14.9501
1.870000000 GHz	53.5890	14.9538
1.875000000 GHz	53.5343	14.9664
1.880000000 GHz	53.5122	14.9496
1.885000000 GHz	53.4471	14.9578
1.890000000 GHz	53.4233	14.9502
1.895000000 GHz	53.3460	14.9482
1.900000000 GHz	53.3029	14.9626
1.905000000 GHz	53.2748	14.9928
1.910000000 GHz	53.2279	14.9745
1.915000000 GHz	53.2259	14.9881
1.920000000 GHz	53.2236	15.0168
1.925000000 GHz	53.2393	15.0249
1.930000000 GHz	53.2583	15.0555
1.935000000 GHz	53.2574	15.0645
1.940000000 GHz	53.2429	15.0973
1.945000000 GHz	53.2514	15.1267
1.950000000 GHz	53.2751	15.1638

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.

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

s p e a g

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 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 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

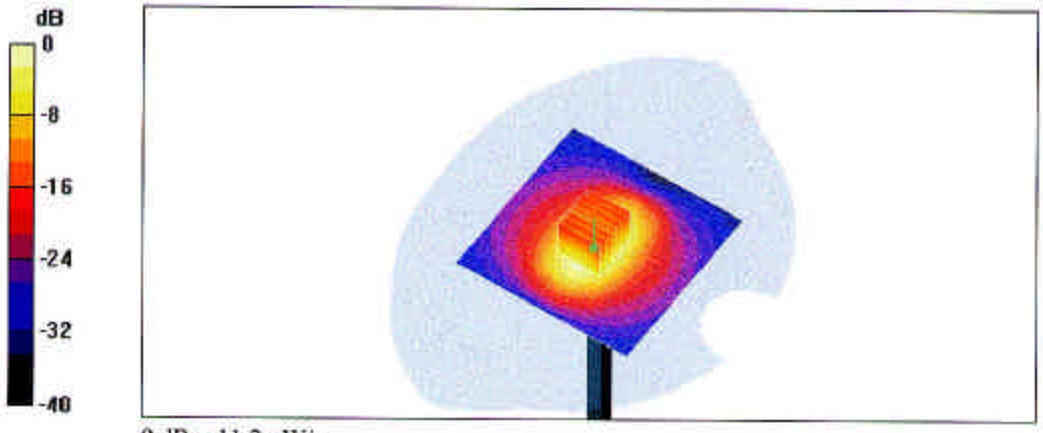
Communication System: CW-1900; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL 1900 MHz;
Medium parameters used: f = 1900 MHz; σ = 1.45 mho/m; ε_r = 40.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

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

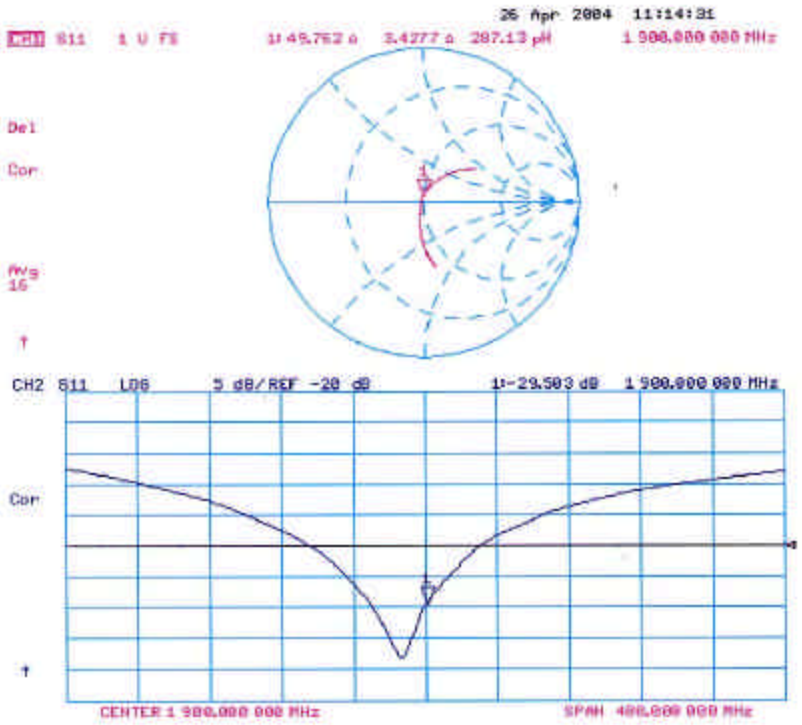
Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 92 V/m; Power Drift = 0.0 dB
Maximum value of SAR (interpolated) = 11.4 mW/g

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
1: 48.752 Ω 3.4277 Ω 287.13 pH 1 900.000 000 MHz
Del
Cor
Avg 16
CH2 S11 LOG 5 dB/ REF -20 dB
1: -29.503 dB 1 900.000 000 MHz
Cor
CENTER 1 900.000 000 MHz
SPAN 400.000 000 MHz