

■ Validation Data (1900MHz Head)

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: $\sigma = 1.43 \text{ mho/m}$, $\epsilon_r = 38.5$, $\rho = 1.00 \text{ g/cm}^3$

Cubes (2): SAR (1g): $41.5 \text{ mW/g} \pm 0.01 \text{ dB}$, SAR (10g): $20.8 \text{ mW/g} \pm 0.03 \text{ dB}$

Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0

Powerdrift: -0.02 dB

Comment:

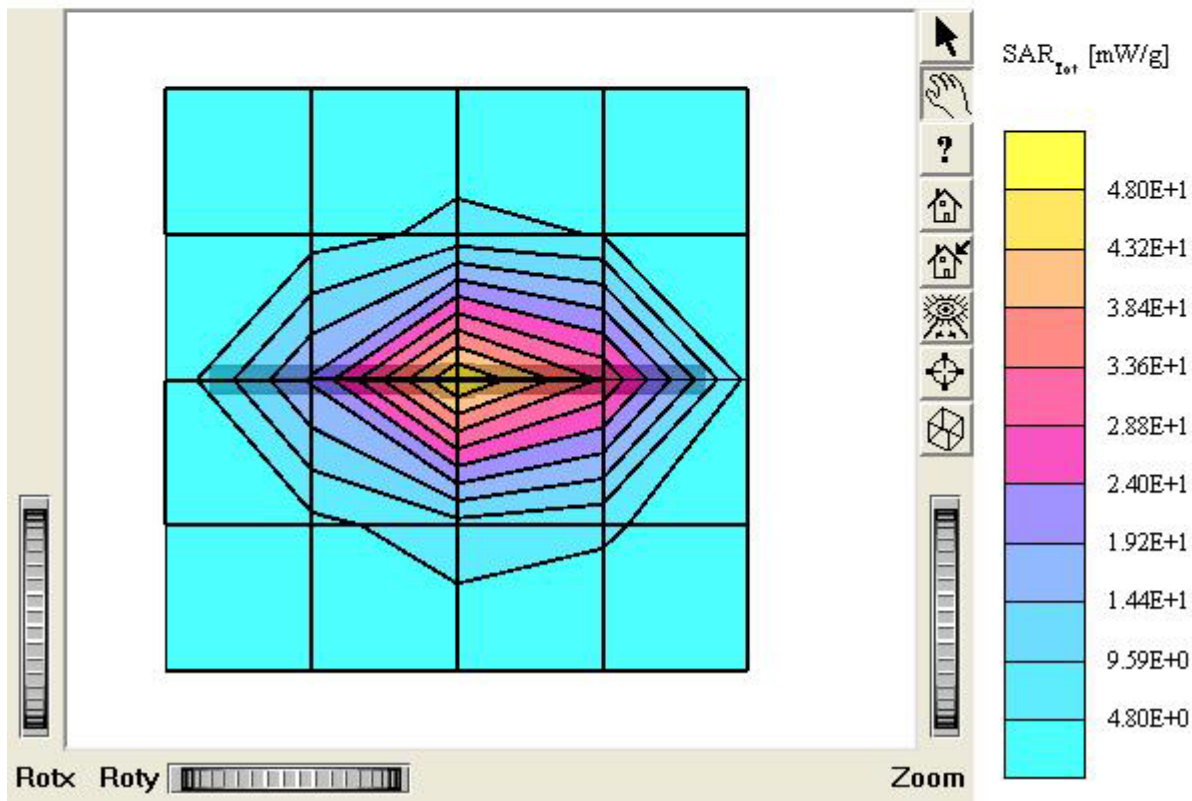
1900 MHz Brain Dipole Validation (D1900V2/ S.N: 5d032)

Antenna Input Power: 30 dBm (1 W)

HCT Co., Ltd. Brain Tissue Simulating Liquid

Liquid Temperature: 21.1 °C

Date Tested : March 25, 2005



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: $\sigma = 1.43 \text{ mho/m}$ $\epsilon_r = 38.5$ $\rho = 1.00 \text{ g/cm}^3$

:

Z-Axis: $D_x = 0.0$, $D_y = 0.0$, $D_z = 5.0$

Comment:

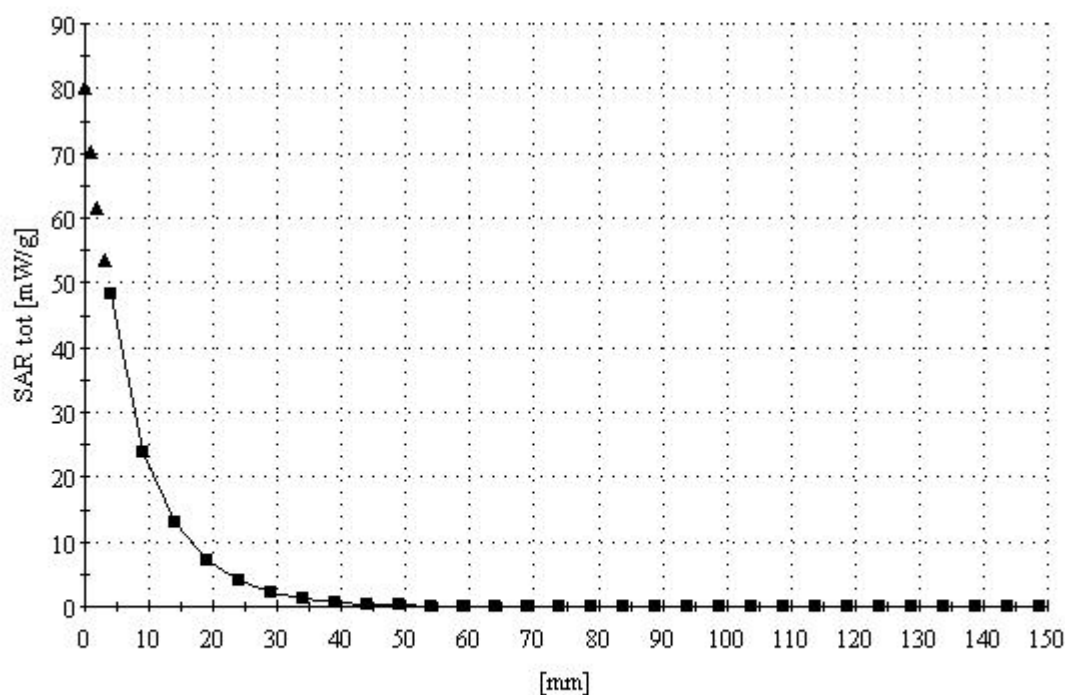
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HCT Co., Ltd. Brain Tissue Simulating Liquid

Liquid Temperature: 21.1 °C

Date Tested : March 25, 2005



■ Dielectric Parameter (1900MHz Brain)

Title : INNO-A20
SubTitle : GSM1900 BRAIN
March 25, 2005 09:34 AM

Frequency	e'	e''
1.800000000 GHz	38.7102	13.2056
1.810000000 GHz	38.6780	13.2590
1.820000000 GHz	38.6348	13.3367
1.830000000 GHz	38.6600	13.4362
1.840000000 GHz	38.7071	13.5249
1.850000000 GHz	38.7216	13.5668
1.860000000 GHz	38.7580	13.6039
1.870000000 GHz	38.7373	13.6188
1.880000000 GHz	38.7049	13.6083
1.890000000 GHz	38.6207	13.5650
1.900000000 GHz	38.5163	13.5116
1.910000000 GHz	38.4197	13.4691
1.920000000 GHz	38.3349	13.4816
1.930000000 GHz	38.2688	13.5266
1.940000000 GHz	38.2350	13.6069
1.950000000 GHz	38.2297	13.7070
1.960000000 GHz	38.2771	13.8052
1.970000000 GHz	38.2941	13.8989
1.980000000 GHz	38.2998	13.9500
1.990000000 GHz	38.3641	13.9687
2.000000000 GHz	38.3314	13.9484

■ Dielectric Parameter (1900MHz Body)

Title : INNO-A20
SubTitle : GSM1900 BODY
March 25, 2005 11:15 AM

Frequency	ϵ'	ϵ''
1.8000000000 GHz	52.5139	13.8898
1.8100000000 GHz	52.5037	13.9562
1.8200000000 GHz	52.4796	13.9913
1.8300000000 GHz	52.4686	13.9935
1.8400000000 GHz	52.4318	14.0219
1.8500000000 GHz	52.3768	14.0233
1.8600000000 GHz	52.2936	14.0681
1.8700000000 GHz	52.1961	14.1227
1.8800000000 GHz	52.0528	14.2118
1.8900000000 GHz	51.9518	14.2892
1.9000000000 GHz	51.8833	14.3562
1.9100000000 GHz	51.8058	14.4464
1.9200000000 GHz	51.7947	14.5165
1.9300000000 GHz	51.7881	14.5970
1.9400000000 GHz	51.8085	14.6027
1.9500000000 GHz	51.8101	14.6328
1.9600000000 GHz	51.7730	14.6308
1.9700000000 GHz	51.7326	14.6465
1.9800000000 GHz	51.6774	14.6408
1.9900000000 GHz	51.5597	14.6695
2.0000000000 GHz	51.4741	14.7189

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

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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	$\pm 5\%$
Conductivity	1.45 mho/m	$\pm 5\%$

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 $\pm 3\%$. 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 $\pm 16.8\%$ (k=2)¹
averaged over 10 cm ³ (10 g) of tissue:	21.0 mW/g $\pm 16.2\%$ (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:	$\text{Re}\{Z\} = $ 49.8 Ω
	$\text{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.

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; $\sigma = 1.45$ mho/m; $\epsilon_r = 40.1$; $\rho = 1000$ kg/m³

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

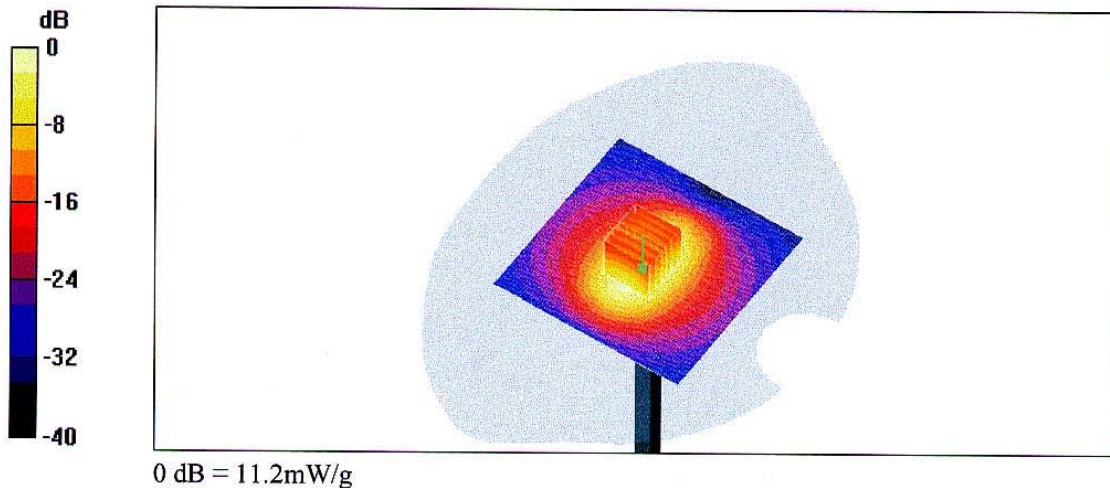
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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



5d032

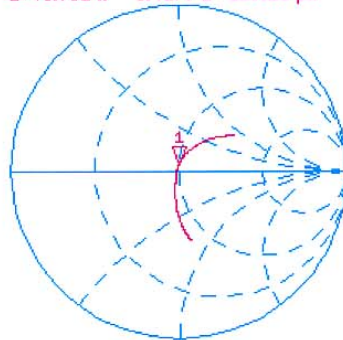
26 Apr 2004 11:14:31
[CH1] S11 1 U FS 1: 49.752 Ω 3.4277 Ω 287.13 pH 1 900.000 000 MHz

De1

Cor

Avg
16

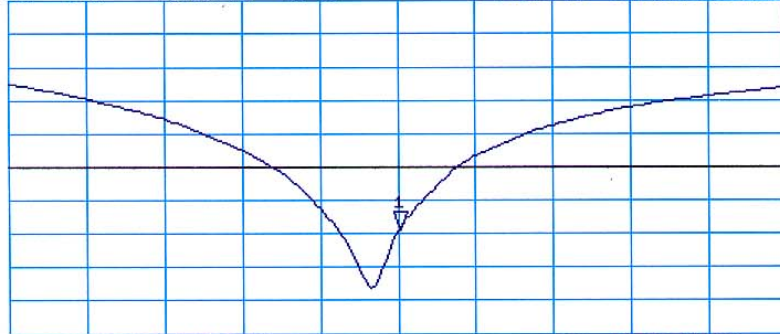
↑



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