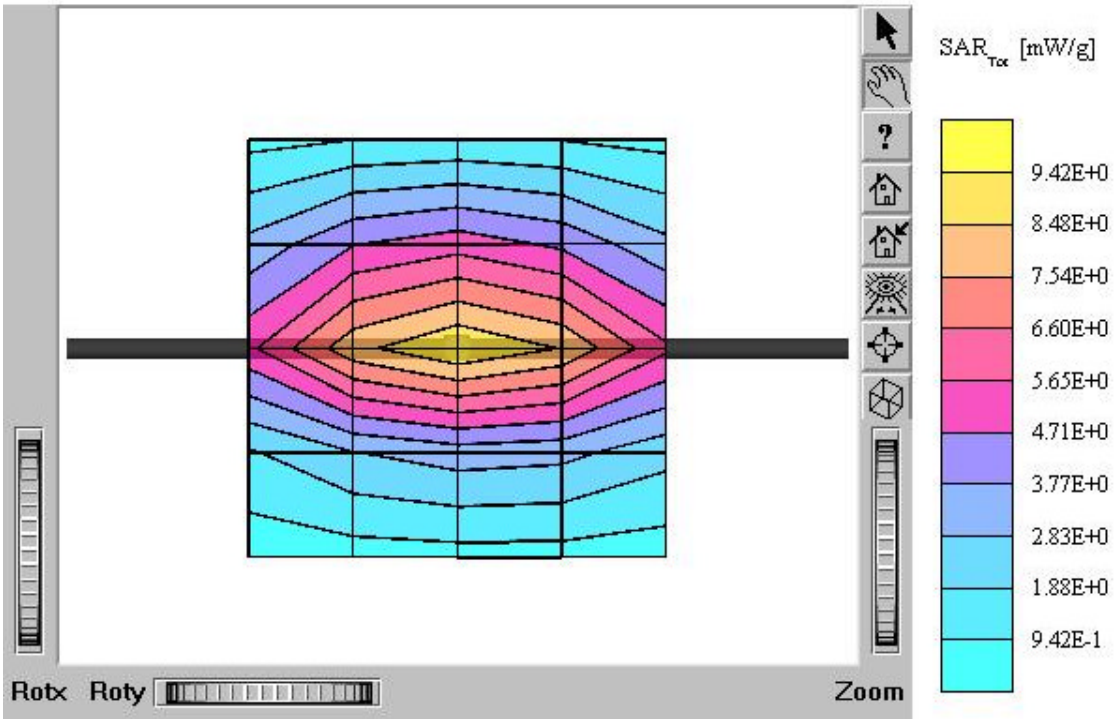
Validation Data (835MHz Brain)

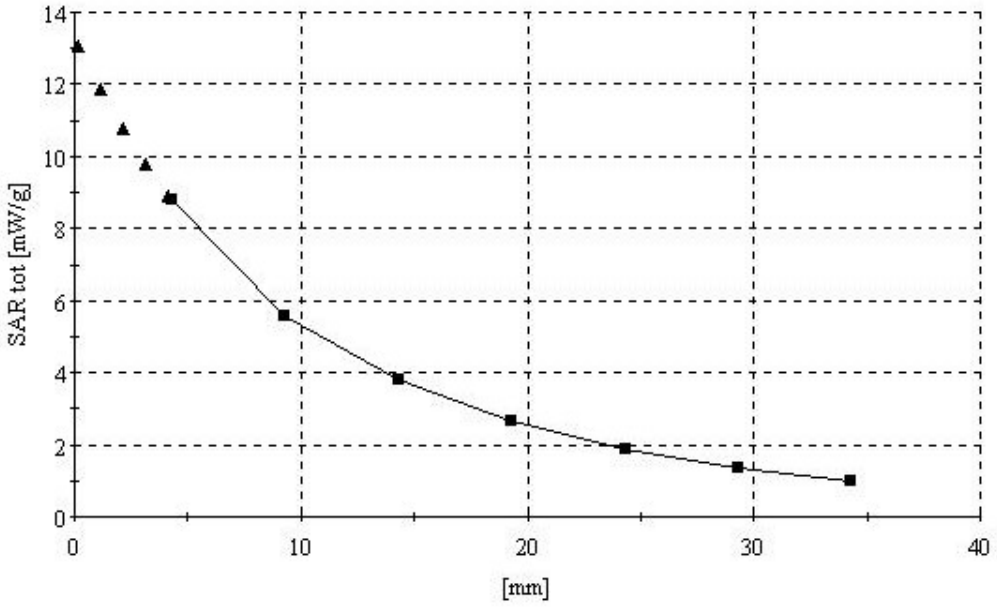
Dipole 835 MHz
SAM I Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1609; ConvF(6.62,6.62,6.62); Crest factor: 1.0; Brain 835 MHz: σ = 0.90 mho/m ε_r = 42.7 ρ = 1.00 g/cm^3
Cubes (2): SAR (1g): 9.68 mW/g ± 0.25 dB, SAR (10g): 6.18 mW/g ± 0.25 dB
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.03 dB
Comment:
835MHz Brain Dipole Validation (D835V2/ S.N: 441)
Antenna Input Power: 30 dBm (1 W)
HCT Co., Ltd. Brain Tissue Simulating Liquid
Liquid Temperature: 21.3 ℃
Date Tested: February 16, 2004



Dipole 835 MHz

SAM I Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz
Probe: ET3DV6 - SN1609; ConvF(6.62,6.62,6.62); Crest factor: 1.0; Brain 835 MHz: σ = 0.90 mho/m ε_r = 42.7 ρ = 1.00 g/cm^3
Cubes (2): SAR (1g): 9.68 mW/g ± 0.25 dB, SAR (10g): 6.18 mW/g ± 0.25 dB
Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

Comment:
835MHz Brain Dipole Validation (D835V2/ S.N: 441)
Antenna Input Power: 30 dBm (1 W)
HCT Co., Ltd. Brain Tissue Simulating Liquid
Liquid Temperature: 21.3 ℃
Date Tested: February 16, 2004



¦ Dielectric Parameter (835MHz Brain)

Title : ACH-700

SubTitle : 835 MHz Brain

February 16, 2004 08:35 AM

Frequency	e'	e''
800.000000 MHz	43.1895	19.6328
805.000000 MHz	43.1305	19.5604
810.000000 MHz	43.0794	19.5516
815.000000 MHz	42.9780	19.5141
820.000000 MHz	42.9333	19.4451
825.000000 MHz	42.8083	19.4105
830.000000 MHz	42.7508	19.3839
835.000000 MHz	42.7383	19.4187
840.000000 MHz	42.5876	19.4089
845.000000 MHz	42.5353	19.3713
850.000000 MHz	42.5113	19.3571
855.000000 MHz	42.4077	19.3871
860.000000 MHz	42.3609	19.3593
865.000000 MHz	42.3609	19.3487
870.000000 MHz	42.2918	19.3790
875.000000 MHz	42.2509	19.4314
880.000000 MHz	42.2517	19.4507
885.000000 MHz	42.1809	19.4307
890.000000 MHz	42.0999	19.3740
895.000000 MHz	42.0843	19.3982
900.000000 MHz	42.0063	19.4113

¦ Dielectric Parameter (835MHz Muscle)

Title : ACH-700
SubTitle : 835 MHz Body
February 16, 2004 09:13 AM

Frequency	e'	e''
800.000000 MHz	54.4486	21.6795
805.000000 MHz	54.4163	21.6399
810.000000 MHz	54.4127	21.6469
815.000000 MHz	54.3855	21.6170
820.000000 MHz	54.3609	21.5919
825.000000 MHz	54.3047	21.5393
830.000000 MHz	54.2559	21.5347
835.000000 MHz	54.2125	21.5115
840.000000 MHz	54.1813	21.4290
845.000000 MHz	54.1229	21.3902
850.000000 MHz	54.0392	21.3395
855.000000 MHz	54.0091	21.3129
860.000000 MHz	53.8969	21.2957
865.000000 MHz	53.8652	21.2596
870.000000 MHz	53.8003	21.2470
875.000000 MHz	53.7767	21.2136
880.000000 MHz	53.6479	21.2368
885.000000 MHz	53.5698	21.2355
890.000000 MHz	53.5004	21.2259
895.000000 MHz	53.4489	21.1781
900.000000 MHz	53.4535	21.2450

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

Client Hyundai (Dymstec)

CALIBRATION CERTIFICATE

Object(s) D835V2 - SN:441

Calibration procedure(s) QA CAL-05.v2
Calibration procedure for dipole validation kits

Calibration date: October 3, 2003

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 sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02 (METAS, No. 252-0236)	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02 (METAS, No. 252-0236)	Oct-03
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 (Agilent, No. 24BR1033101)	In house check: Oct 03

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

Date issued: October 10, 2003

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)

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DASY

Dipole Validation Kit

Type: D835V2

Serial: 441

Manufactured: March 9, 2001
Calibrated: October 3, 2003

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 835 MHz:

Relative Dielectricity	**43.0**	± 5%
Conductivity	**0.90 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.7 at 835 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 15mm 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:	**9.24 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**6.08 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:	**1.377 ns**	(one direction)
Transmission factor:	**0.983**	(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 835 MHz:	Re{Z} = **52.0 Ω**
	Im {Z} = **-6.1 Ω**
Return Loss at 835 MHz	**-24.1 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.

ConvF(6.7, 6.7, 6.7)Date/Time: 10/03/03 12:18:18

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN441

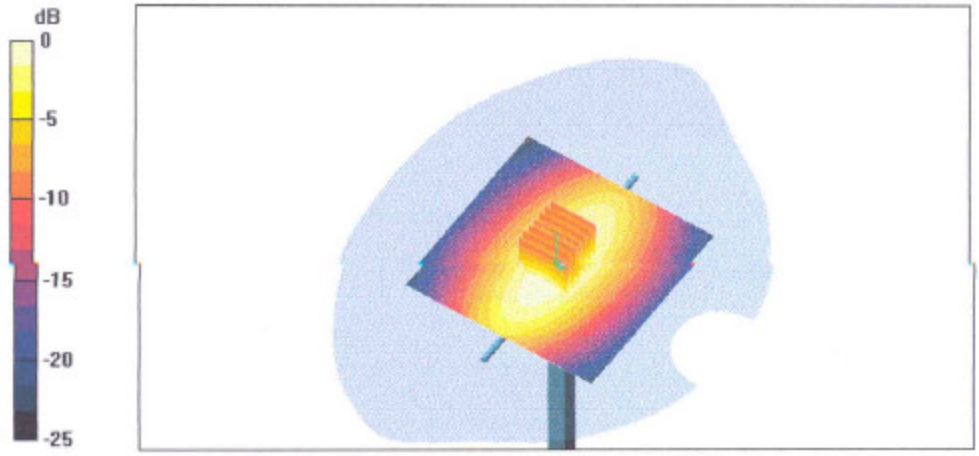
Communication System: CW-835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL 835 MHz (σ = 0.9 mho/m, ε_r = 43, ρ = 1000 kg/m^3)
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

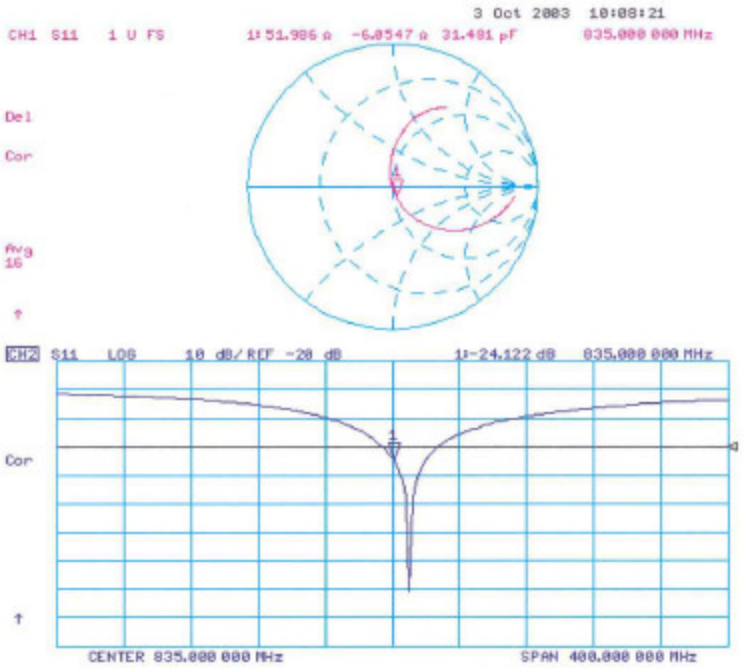
- Probe: ET3DV6 - SN1507; ConvF(6.7, 6.7, 6.7); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 47; Postprocessing SW: SEMCAD, V1.8 Build 60

Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 54.7 V/m
Power Drift = 0.003 dB
Maximum value of SAR = 2.48 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 3.45 W/kg
SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.52 mW/g
Reference Value = 54.7 V/m
Power Drift = 0.003 dB
Maximum value of SAR = 2.5 mW/g



0 dB = 2.5mW/g


3 Oct 2003 10:08:21
CH1 S11 1 U FS
1: 51.986 Ω -6.8547 Ω 31.481 pF
835.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG 10 dB/ REF -20 dB
1: -24.122 dB 835.000 000 MHz
Cor
CENTER 835.000 000 MHz
SPAN 400.000 000 MHz