

Validation Data (835MHz Brain)

Dipole 835 MHz

SAM I Phantom; Flat Section; Position: (90°,90°); Frequency: 835 MHz

Probe: ET3DV6 - SN1798; ConvF(6.60,6.60,6.60); Crest factor: 1.0; Brain 835 MHz: $\sigma = 0.89$

mho/m $\epsilon_r = 42.8$ $\rho = 1.00$ g/cm³

Cubes (2): SAR (1g): 10.3 mW/g ± 0.07 dB, SAR (10g): 6.53 mW/g ± 0.07 dB

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

Powerdrift: -0.02 dB

Comment:

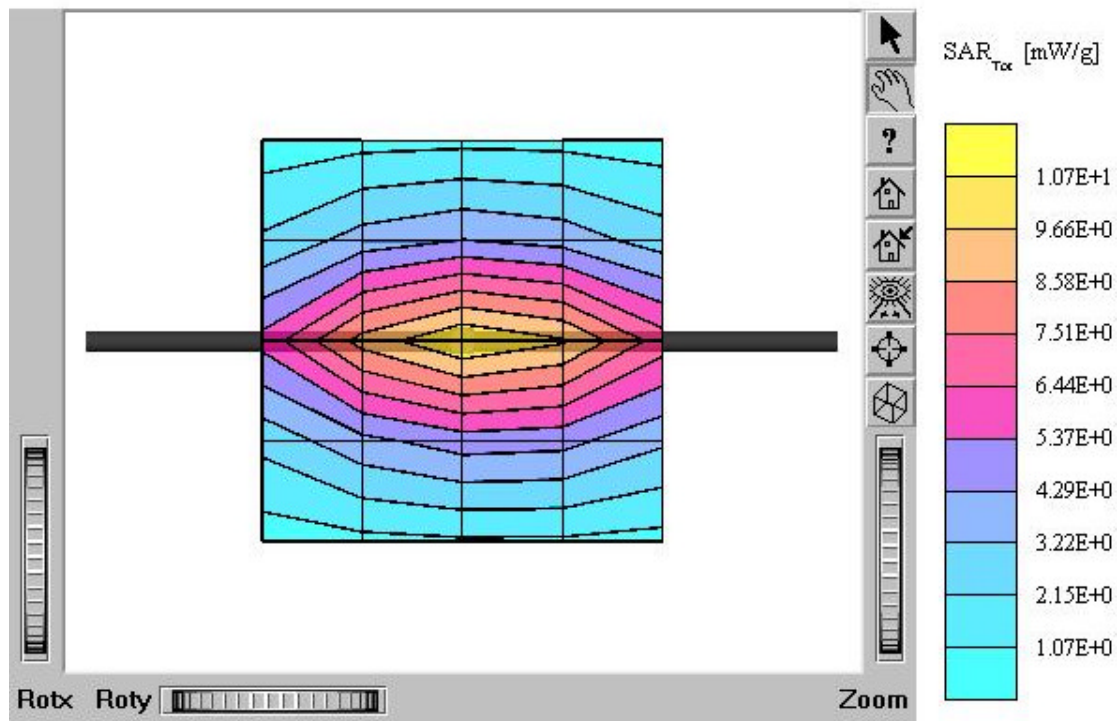
835MHz Brain Dipole Validation (D835V2/ S.N: 441)

Antenna Input Power : 30 dBm (1W)

HCT Co., Ltd. Brain Tissue Simulating Liquid

Liquid Temperature : 21.4 °C

Date Tested : January 5, 2004



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Cube 5x5x7: Dx = 8.0, Dy = 8.0, Dz = 5.0

Comment:

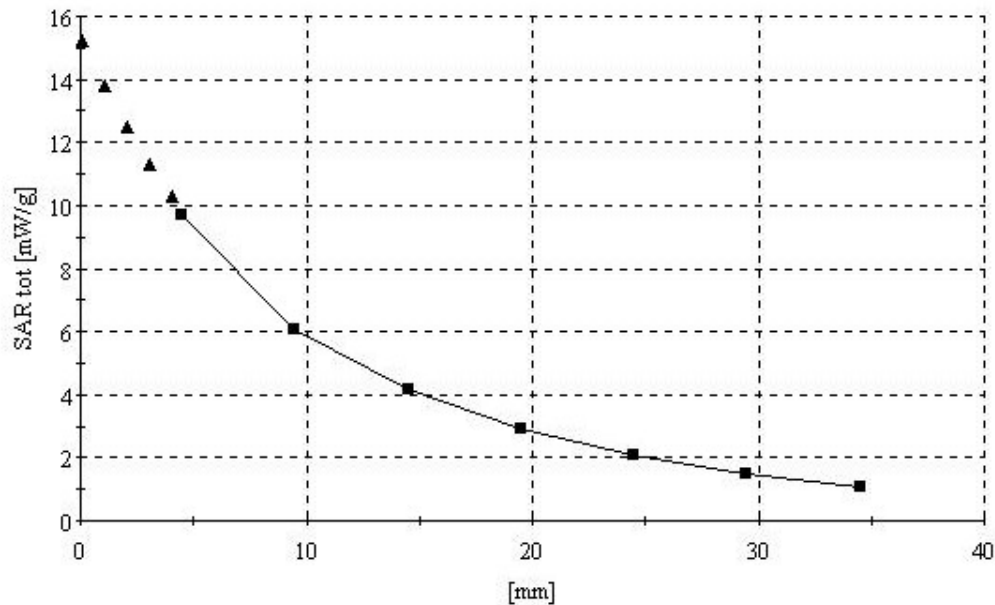
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! Dielectric Parameter (835MHz Brain)

Title : AXW-P800B

SubTitle : 835 MHz Brain

January 05, 2004 09:35 AM

Frequency	e'	e''
800.000000 MHz	43.2397	19.2254
805.000000 MHz	43.1453	19.1867
810.000000 MHz	43.0908	19.1698
815.000000 MHz	42.9875	19.1671
820.000000 MHz	42.9903	19.0811
825.000000 MHz	42.8303	19.0955
830.000000 MHz	42.7731	19.0915
835.000000 MHz	42.7557	19.0762
840.000000 MHz	42.6075	19.0779
845.000000 MHz	42.5642	19.0392
850.000000 MHz	42.5082	19.0255
855.000000 MHz	42.4642	19.0498
860.000000 MHz	42.4300	18.9991
865.000000 MHz	42.4159	19.0147
870.000000 MHz	42.3191	19.0240
875.000000 MHz	42.3335	19.0612
880.000000 MHz	42.2913	19.1099
885.000000 MHz	42.2401	19.0754
890.000000 MHz	42.1516	19.0475
895.000000 MHz	42.0813	19.0596
900.000000 MHz	42.0520	19.0395

! Dielectric Parameter (835MHz Body)

Title : AXW-P800B

SubTitle : 835 MHz Body

January 05, 2004 09:15 AM

Frequency	e'	e''
800.000000 MHz	54.4743	21.5905
805.000000 MHz	54.5101	21.5838
810.000000 MHz	54.3805	21.5566
815.000000 MHz	54.4182	21.5827
820.000000 MHz	54.3453	21.5022
825.000000 MHz	54.3160	21.5241
830.000000 MHz	54.3014	21.5069
835.000000 MHz	54.2603	21.4608
840.000000 MHz	54.2140	21.4280
845.000000 MHz	54.1433	21.4156
850.000000 MHz	54.1349	21.3911
855.000000 MHz	54.0413	21.3117
860.000000 MHz	53.9964	21.3015
865.000000 MHz	53.9395	21.2853
870.000000 MHz	53.8895	21.2560
875.000000 MHz	53.8200	21.2291
880.000000 MHz	53.7516	21.2715
885.000000 MHz	53.6522	21.2568
890.000000 MHz	53.6431	21.2129
895.000000 MHz	53.5306	21.1990
900.000000 MHz	53.4902	21.1784

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**

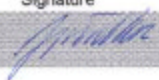
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

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
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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.

Schmid & Partner Engineering AG

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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 cm³ (1 g) of tissue: 9.24 mW/g ± 16.8 % (k=2)¹

averaged over 10 cm³ (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: $\text{Re}\{Z\} = 52.0 \Omega$
 $\text{Im}\{Z\} = -6.1 \Omega$
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.

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 ($\sigma = 0.9 \text{ mho/m}$, $\epsilon_r = 43$, $\rho = 1000 \text{ kg/m}^3$)

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

