

Validation Data (835MHz Head)

Dipole 835 MHz

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

Probe: ET3DV6 - SN1609; ConvF(6.63,6.63,6.63); Crest factor: 1.0; Brain 835 MHz: $\sigma = 0.88 \text{ mho/m}$, $\epsilon_r = 41.9$, $\rho = 1.00 \text{ g/cm}^3$

Cubes (2): SAR (1g): $10.2 \text{ mW/g} \pm 0.02 \text{ dB}$, SAR (10g): $6.59 \text{ mW/g} \pm 0.03 \text{ dB}$

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

Peak: $16.2 \text{ mW/g} \pm 0.01 \text{ dB}$; Powerdrift: 0.01 dB

Comment :

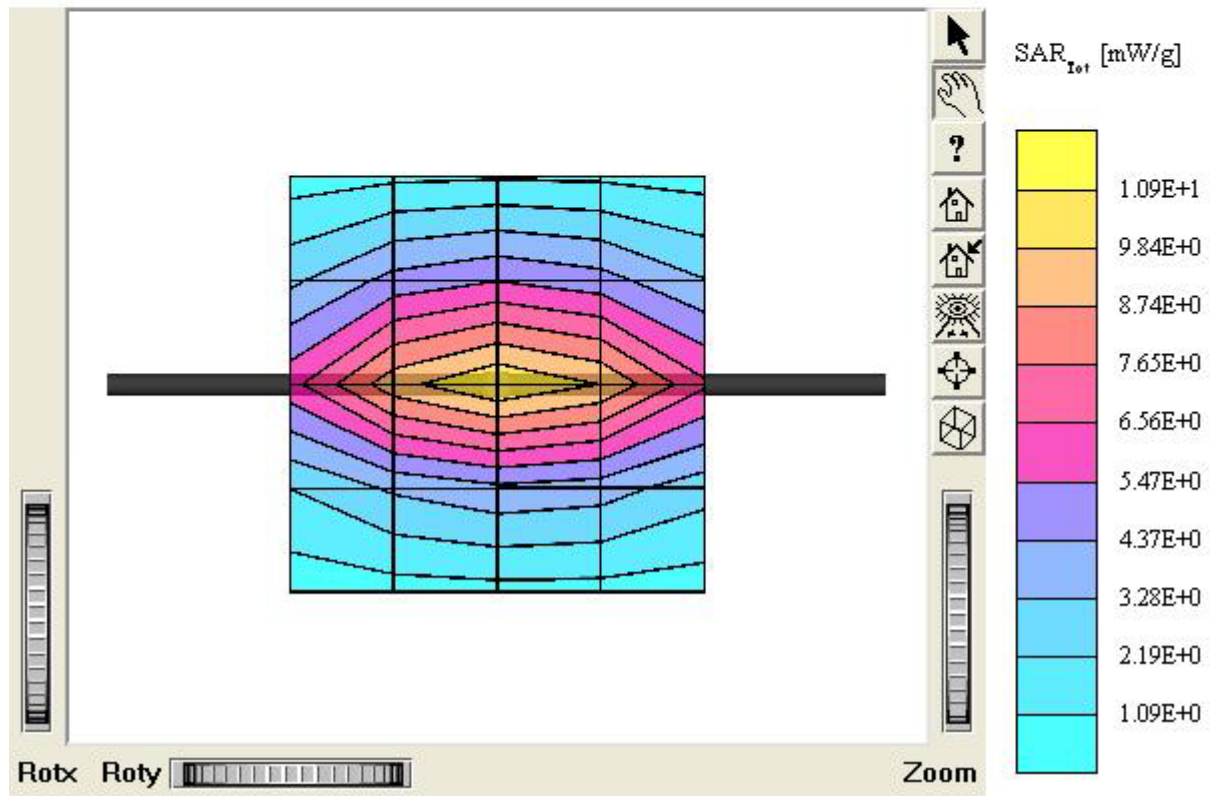
835MHz Brain Dipole Validation (D835V2/ S.N: 441)

Antenna Input Power: 30 dBm (1 W)

HCT Co., Ltd. Brain Tissue Simulating Liquid

Liquid Temperature : 21.8°C

Date Tested : April 11, 2005



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:

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 5.0

:

Comment :

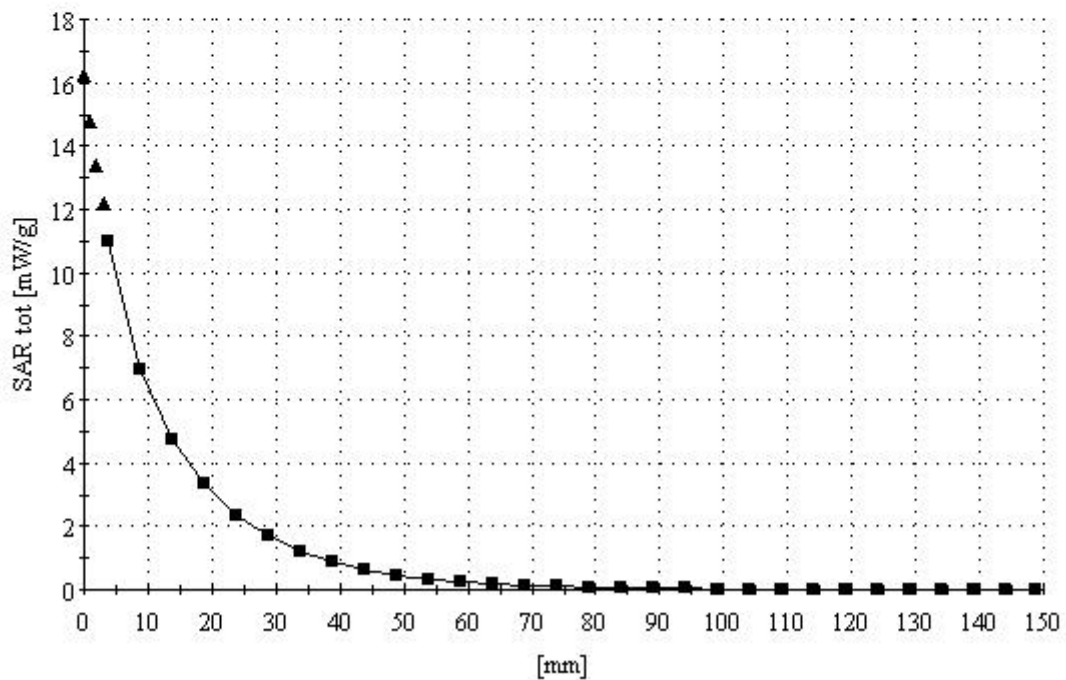
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■ Dielectric Parameter (835MHz Head)

Title : C1222**SubTitle : CDMA HEAD**

April 11, 2005 08:58 AM

Frequency	e'	e''
800.000000 MHz	42.4109	19.1059
805.000000 MHz	42.4044	19.0566
810.000000 MHz	42.2892	19.0808
815.000000 MHz	42.2641	19.0372
820.000000 MHz	42.1852	19.0091
825.000000 MHz	42.0882	19.0450
830.000000 MHz	41.9798	18.9784
835.000000 MHz	41.8594	18.9951
840.000000 MHz	41.7725	18.9399
845.000000 MHz	41.6346	18.9208
850.000000 MHz	41.5927	18.9060
855.000000 MHz	41.4605	18.8247
860.000000 MHz	41.4043	18.8253
865.000000 MHz	41.3086	18.8272
870.000000 MHz	41.1902	18.8158
875.000000 MHz	41.0798	18.7924
880.000000 MHz	41.0232	18.7590
885.000000 MHz	40.8647	18.7509
890.000000 MHz	40.8034	18.7797
895.000000 MHz	40.7193	18.7606
900.000000 MHz	40.6491	18.7181

■ Dielectric Parameter (835MHz Body)

Title : C1222
SubTitle : CDMA BODY
April 11, 2005 02:07 PM

Frequency	e'	e''
800.000000 MHz	54.4487	20.5522
805.000000 MHz	54.3685	20.5802
810.000000 MHz	54.3802	20.6089
815.000000 MHz	54.2918	20.6060
820.000000 MHz	54.2550	20.6181
825.000000 MHz	54.1555	20.6528
830.000000 MHz	54.0443	20.6808
835.000000 MHz	53.9547	20.6572
840.000000 MHz	53.8339	20.6345
845.000000 MHz	53.7966	20.5382
850.000000 MHz	53.6883	20.5125
855.000000 MHz	53.7106	20.5144
860.000000 MHz	53.6483	20.4615
865.000000 MHz	53.5883	20.4405
870.000000 MHz	53.5248	20.4638
875.000000 MHz	53.4842	20.4041
880.000000 MHz	53.4920	20.4003
885.000000 MHz	53.4058	20.4377
890.000000 MHz	53.3991	20.3919
895.000000 MHz	53.3539	20.3665
900.000000 MHz	53.3090	20.3933

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **H-CT (Dymstec)**

Certificate No: **D835V2-441_Sep04**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 441**

Calibration procedure(s) **QA CAL-05.v6**
Calibration procedure for dipole validation kits

Calibration date: **September 16, 2004**

Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power sensor HP 8481A	US37292783	5-Nov-03 (METAS, No. 252-0254)	Nov-04
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference Probe ET3DV6	SN 1507	23-Jan-04 (SPEAG, No. ET3-1507_Jan04)	Jan-05
DAE4	SN 601	6-Nov-03 (SPEAG, No. DAE4-601_Jul04)	Jul-05
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	GB43310788	13-Aug-03 (SPEAG, in house check Jan-04)	In house check: Jan-05
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-03)	In house check: Oct-05
RF generator R&S SML-03	100698	27-Mar-02 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-03)	In house check: Nov-04

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

Issued: September 24, 2004

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D835V2-441_Sep04

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Glossary:

TSL	tissue simulating liquid
ConF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.8 $\pm$ 6 %	0.92 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.2 $\pm$ 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	2.54 mW / g
SAR normalized	normalized to 1W	10.2 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	10.2 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.65 mW / g
SAR normalized	normalized to 1W	6.60 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.63 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	51.6 Ω - 6.8 j Ω
Return Loss	23.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.375 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 9, 2001

DASY4 Validation Report for Head TSL

Date/Time: 09/16/04 14:52:29

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;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 41.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.3, 6.3, 6.3); Calibrated: 23.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 22.07.2004
- Phantom: Flat Phantom half size; Type: QD000P49AA; Serial: SN:1001;
- Measurement SW: DASY4, V4.3 Build 20; Postprocessing SW: SEMCAD, V1.8 Build 126

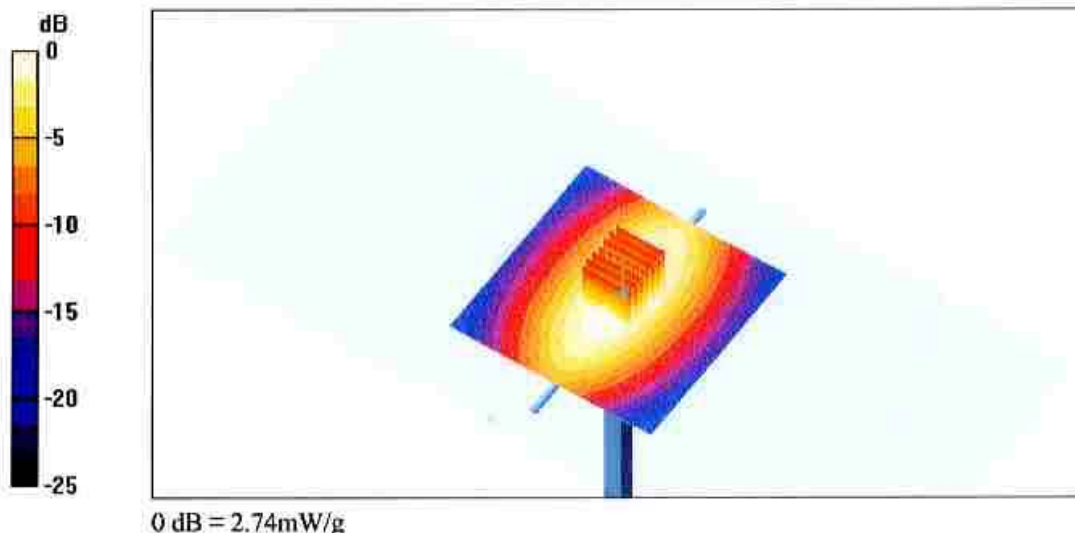
Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.74 mW/g**Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.4 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 3.78 W/kg

SAR(1 g) = 2.54 mW/g; SAR(10 g) = 1.65 mW/g

Maximum value of SAR (measured) = 2.74 mW/g



Impedance Measurement Plot for Head TSL

