

Fig. 16 Z-Scan at power reference point (CDMA 835MHz CH384)

CDMA 1X Right Cheek Low

Date/Time: 2006-9-11 14:36:34

Electronics: DAE3 Sn589

Medium: HEAD 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 824.7 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

Cheek Low/Area Scan (51x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.579 mW/g

Cheek Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 20.6 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.721 W/kg

SAR(1 g) = 0.515 mW/g; SAR(10 g) = 0.347 mW/g

Maximum value of SAR (measured) = 0.550 mW/g

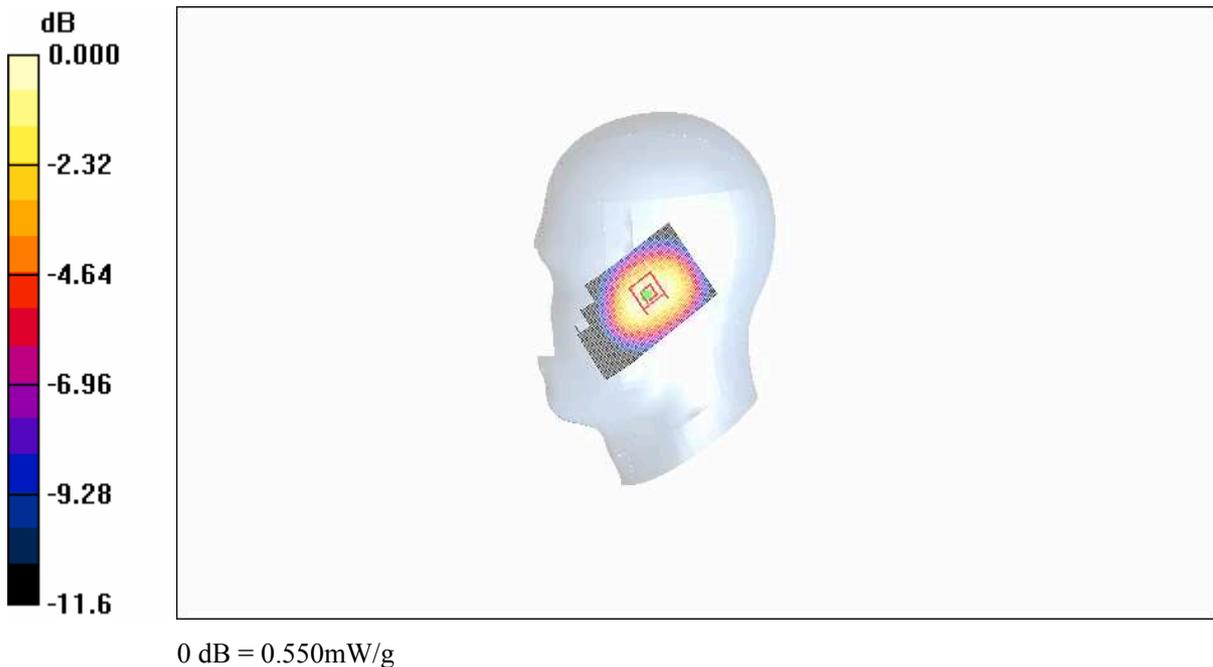


Fig. 17 Right Hand Touch Cheek CDMA 835MHz CH1013

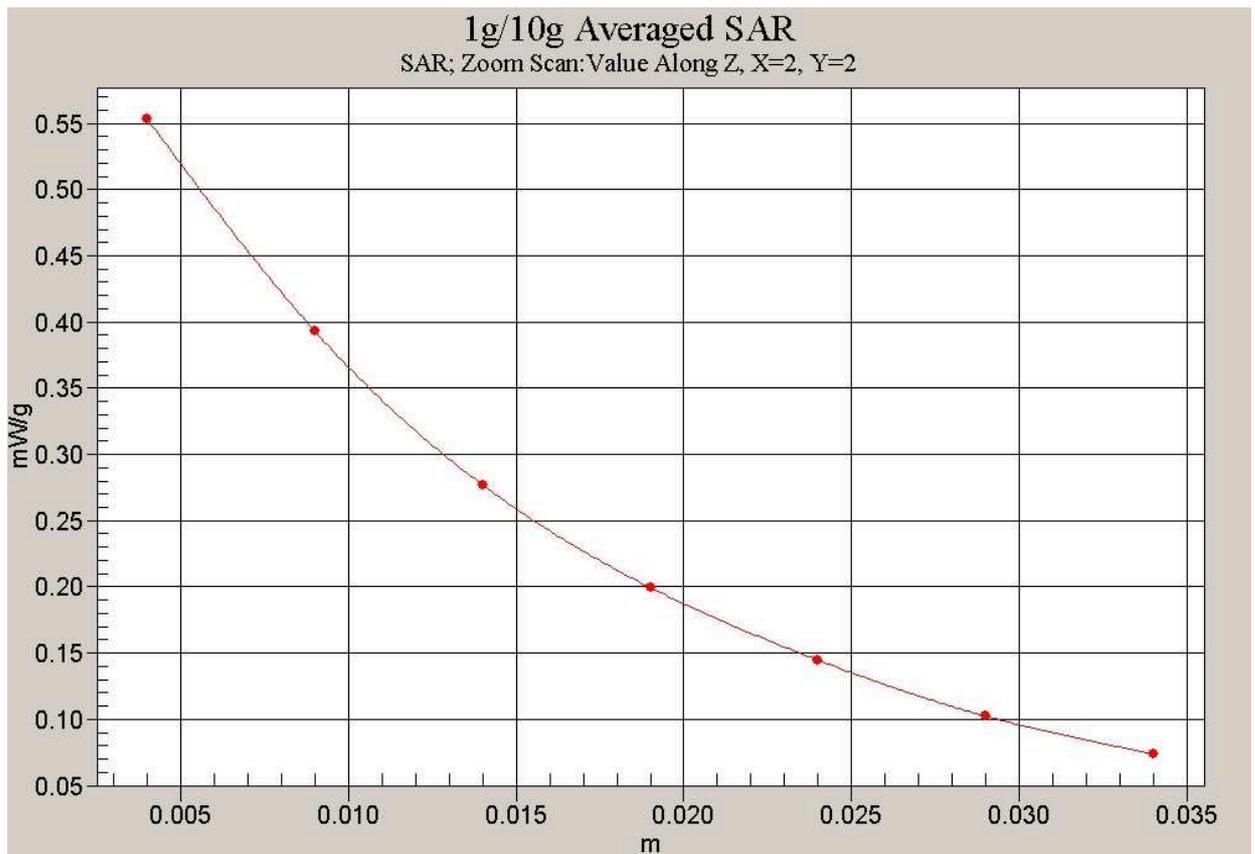


Fig. 18 Z-Scan at power reference point (CDMA 835MHz CH1013)

CDMA 1X Right Tilt High

Date/Time: 2006-9-11 13:54:57

Electronics: DAE3 Sn589

Medium: HEAD 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 848.31 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

Tilt High/Area Scan (51x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.597 mW/g

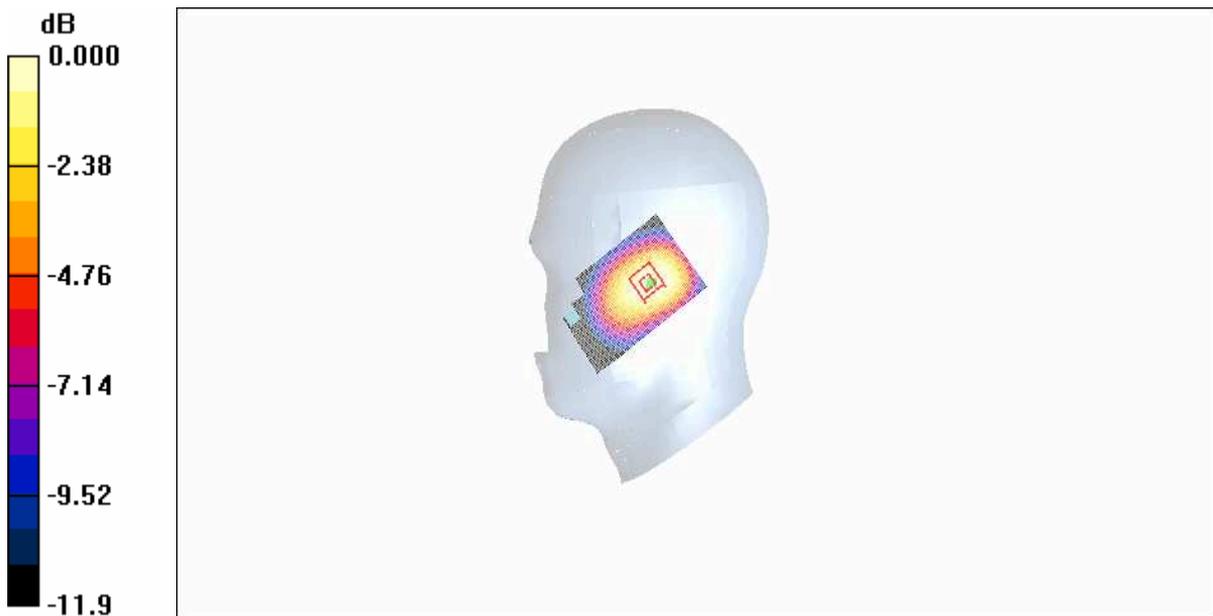
Tilt High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.5 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.748 W/kg

SAR(1 g) = 0.538 mW/g; SAR(10 g) = 0.361 mW/g

Maximum value of SAR (measured) = 0.578 mW/g



0 dB = 0.578mW/g

Fig. 19 Right Hand Tilt 15°CDMA 835MHz CH777

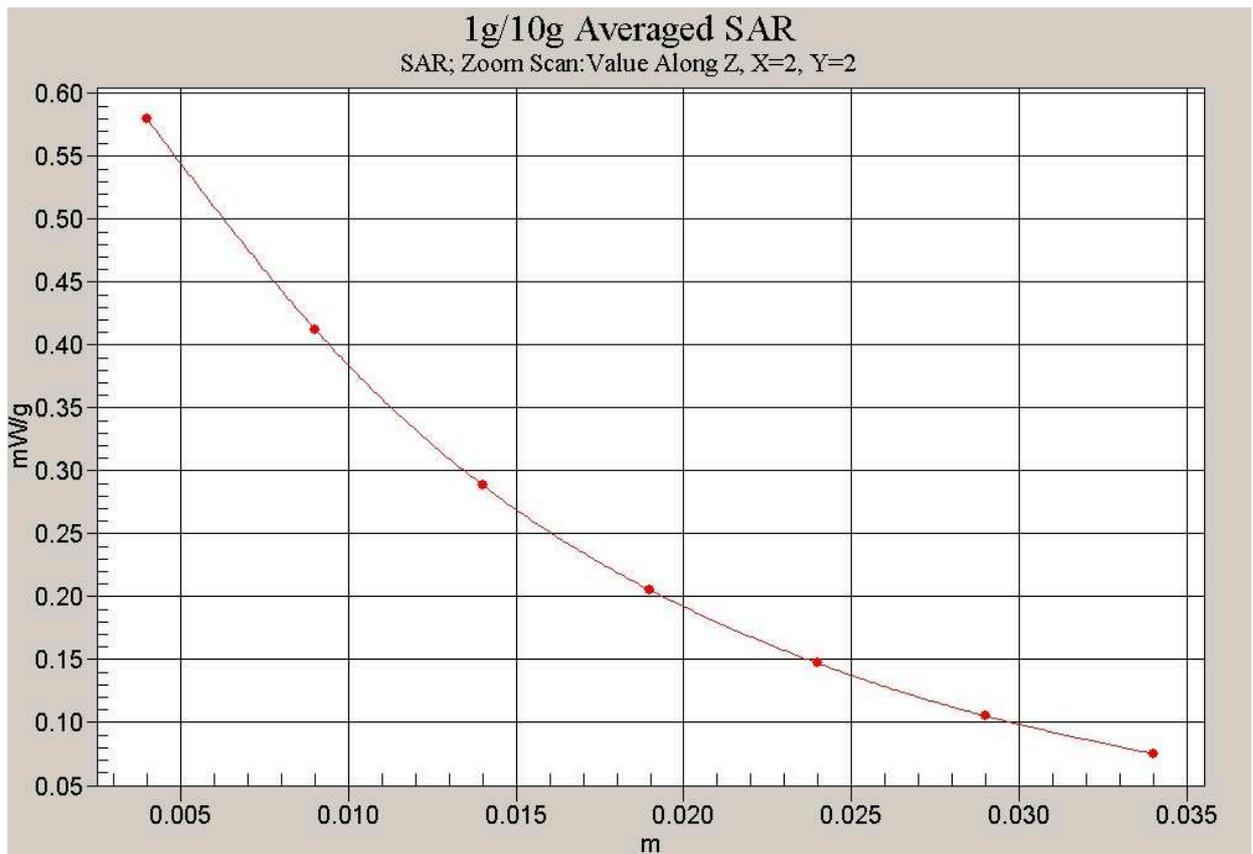


Fig. 20 Z-Scan at power reference point (CDMA 835MHz CH777)

CDMA 1X Right Tilt Middle

Date/Time: 2006-9-11 14:21:27

Electronics: DAE3 Sn589

Medium: HEAD 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 836.52 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

Tilt Middle/Area Scan (51x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.479 mW/g

Tilt Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.9 V/m; Power Drift = -0.151 dB

Peak SAR (extrapolated) = 0.609 W/kg

SAR(1 g) = 0.443 mW/g; SAR(10 g) = 0.299 mW/g

Maximum value of SAR (measured) = 0.473 mW/g

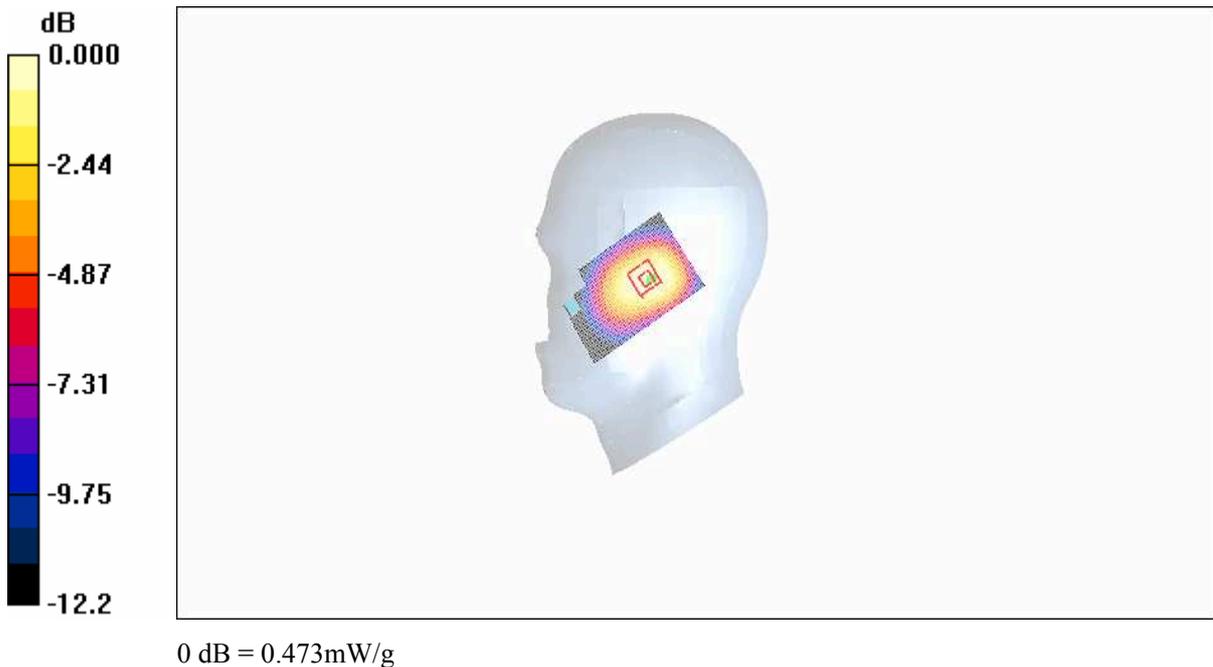


Fig. 21 Right Hand Tilt 15°CDMA 835MHz CH384

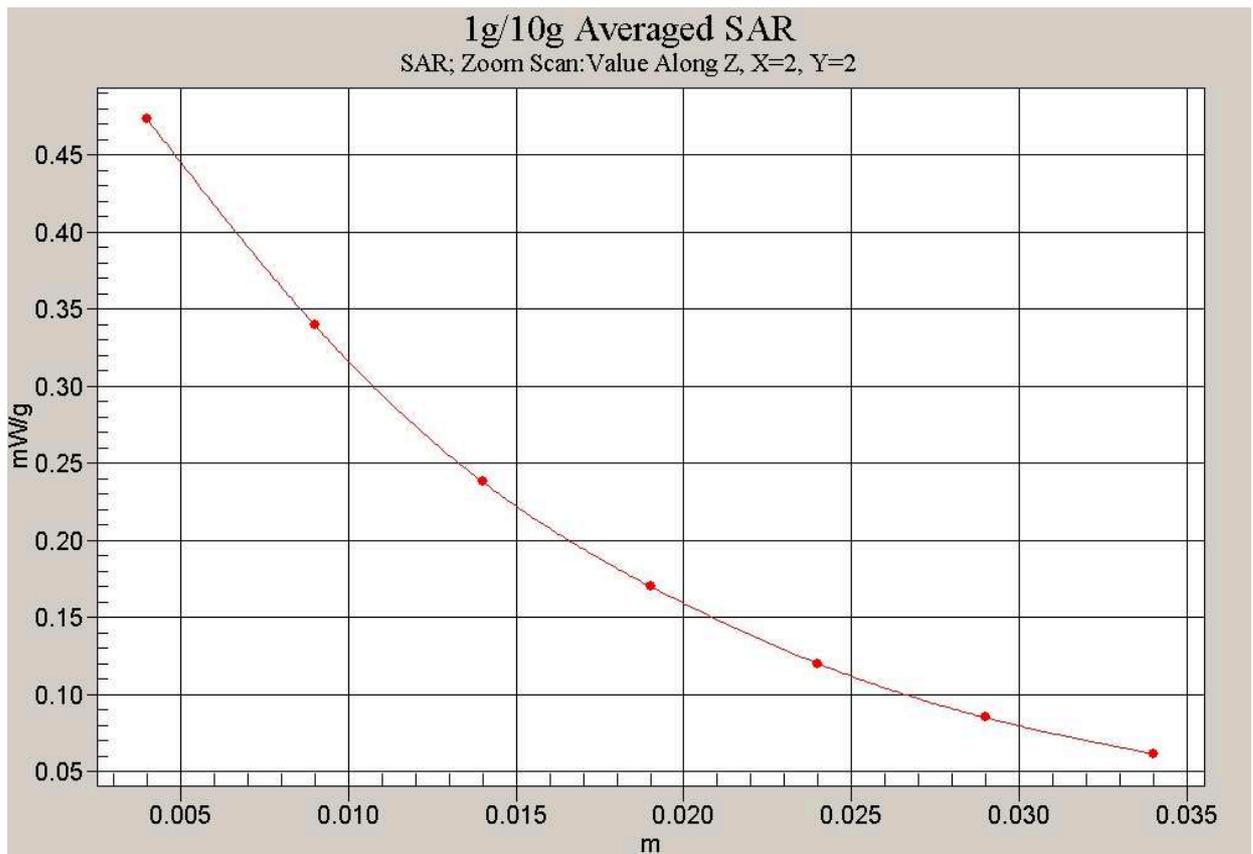


Fig. 22 Z-Scan at power reference point (CDMA 835MHz CH384)

CDMA 1X Right Tilt Low

Date/Time: 2006-9-11 14:48:32

Electronics: DAE3 Sn589

Medium: HEAD 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.92$ mho/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 824.7 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

Tilt Low/Area Scan (51x81x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.315 mW/g

Tilt Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.8 V/m; Power Drift = 0.056 dB

Peak SAR (extrapolated) = 0.394 W/kg

SAR(1 g) = 0.290 mW/g; SAR(10 g) = 0.198 mW/g

Maximum value of SAR (measured) = 0.310 mW/g

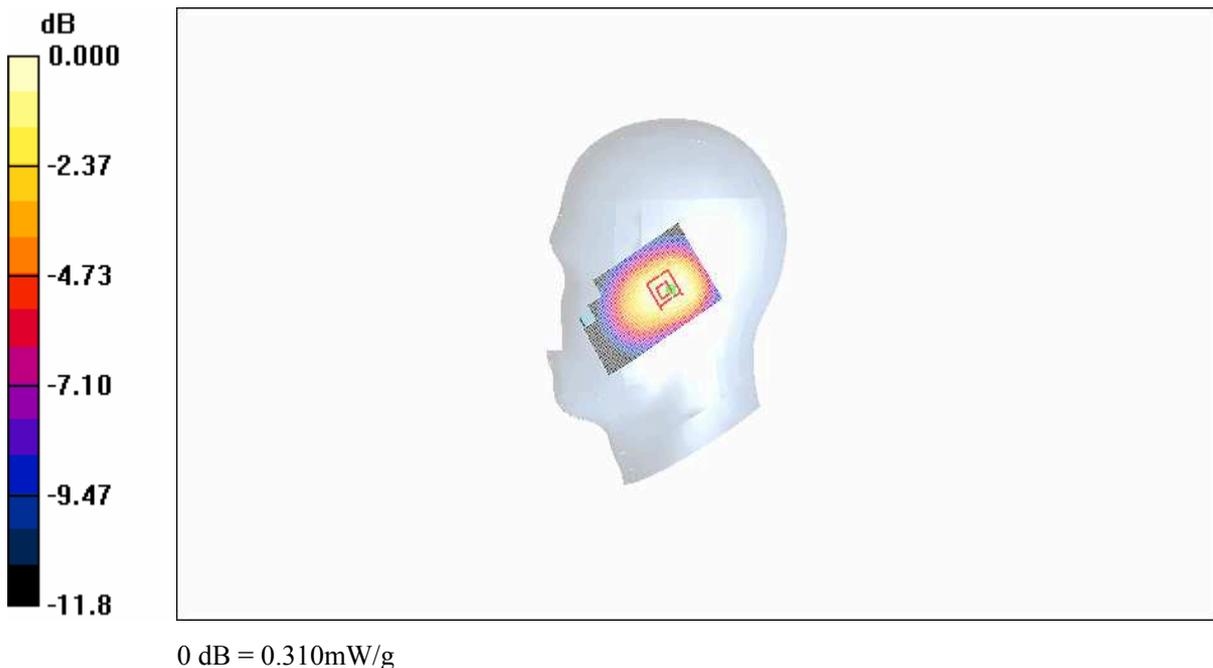


Fig. 23 Right Hand Tilt 15°CDMA 835MHz CH1013

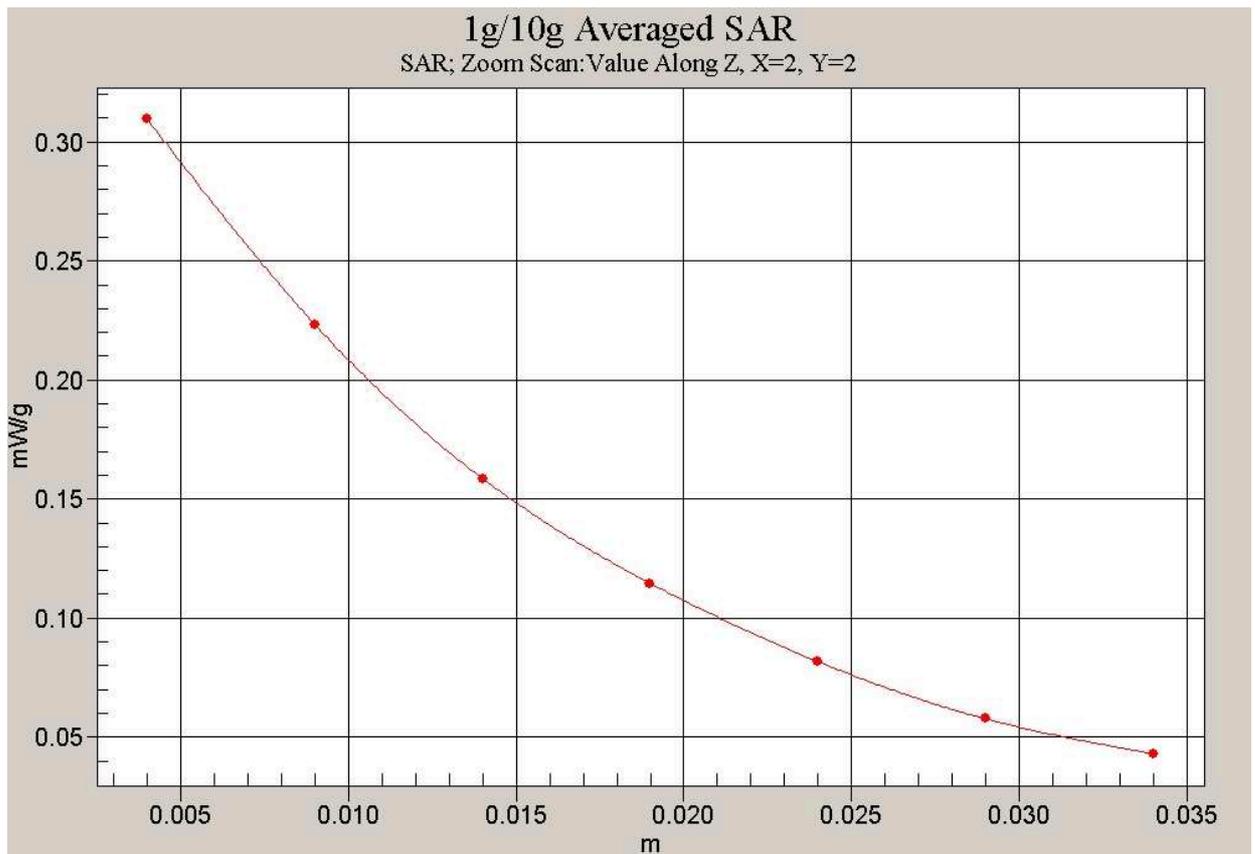


Fig. 24 Z-Scan at power reference point (CDMA 835MHz CH1013)

CDMA 1X Body Toward Phantom High

Date/Time: 2006-9-7 13:51:32

Electronics: DAE3 Sn589

Medium: Body 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.95$ mho/m; $\epsilon_r = 54.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 848.31 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.45, 6.45, 6.45)

Toward Phantom High/Area Scan (71x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.356 mW/g

Toward Phantom High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.6 V/m; Power Drift = -0.127 dB

Peak SAR (extrapolated) = 0.426 W/kg

SAR(1 g) = 0.329 mW/g; SAR(10 g) = 0.231 mW/g

Maximum value of SAR (measured) = 0.351 mW/g

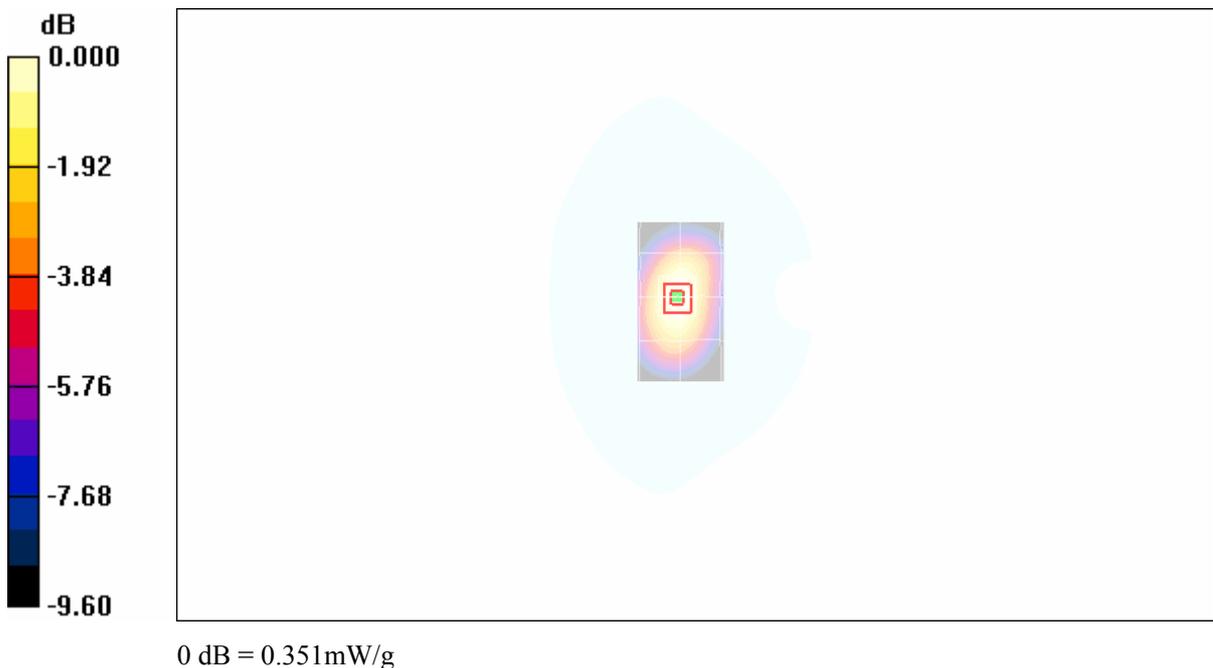


Fig. 25 CDMA 835MHz, Body, Towards Phantom, CH777

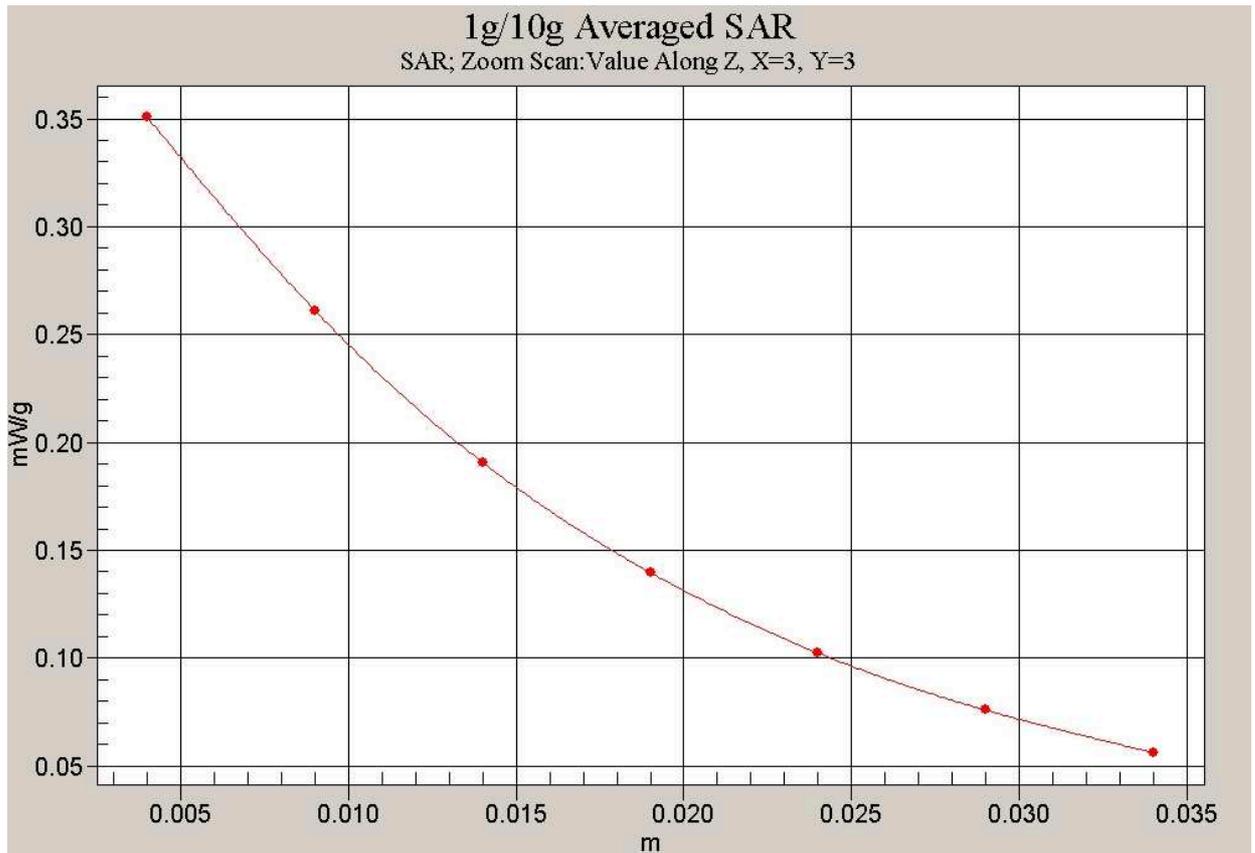


Fig. 26 Z-Scan at power reference point (CDMA 835MHz, Body, Towards Phantom, CH777)

CDMA 1X Body Toward Phantom Middle

Date/Time: 2006-9-7 14:33:46

Electronics: DAE3 Sn589

Medium: Body 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.95$ mho/m; $\epsilon_r = 54.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 836.52 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.45, 6.45, 6.45)

Toward Phantom Middle/Area Scan (71x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.285 mW/g

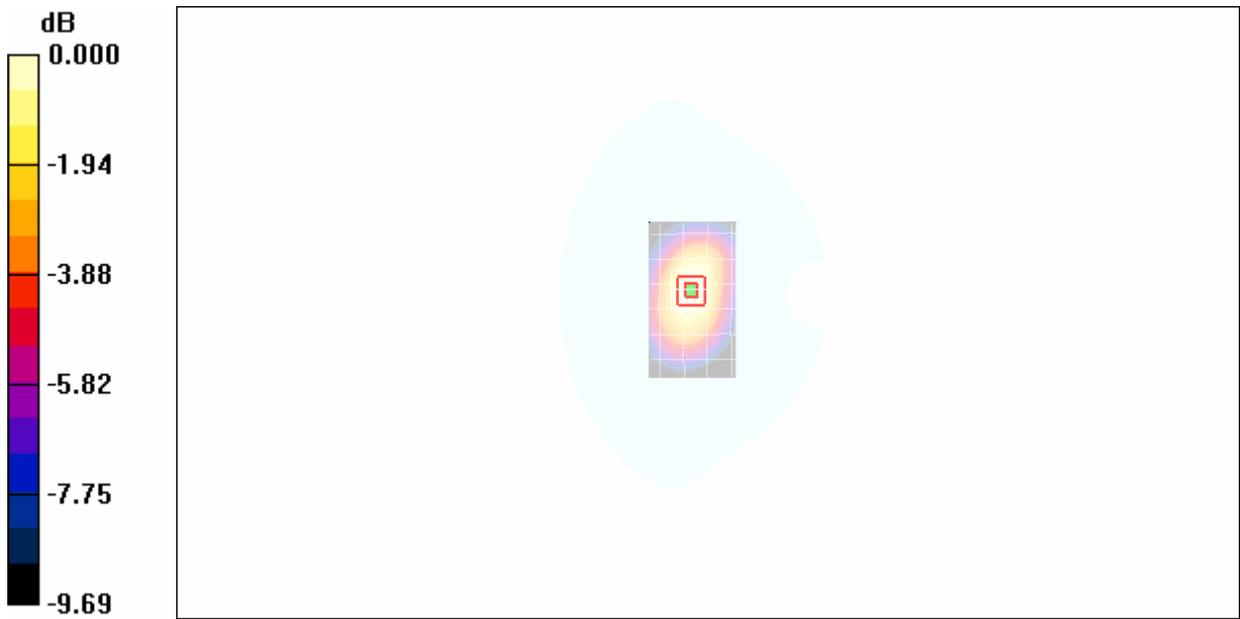
Toward Phantom Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.2 V/m; Power Drift = 0.055 dB

Peak SAR (extrapolated) = 0.354 W/kg

SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.186 mW/g

Maximum value of SAR (measured) = 0.284 mW/g



0 dB = 0.284mW/g

Fig. 27 CDMA 835MHz, Body, Towards Phantom, CH384

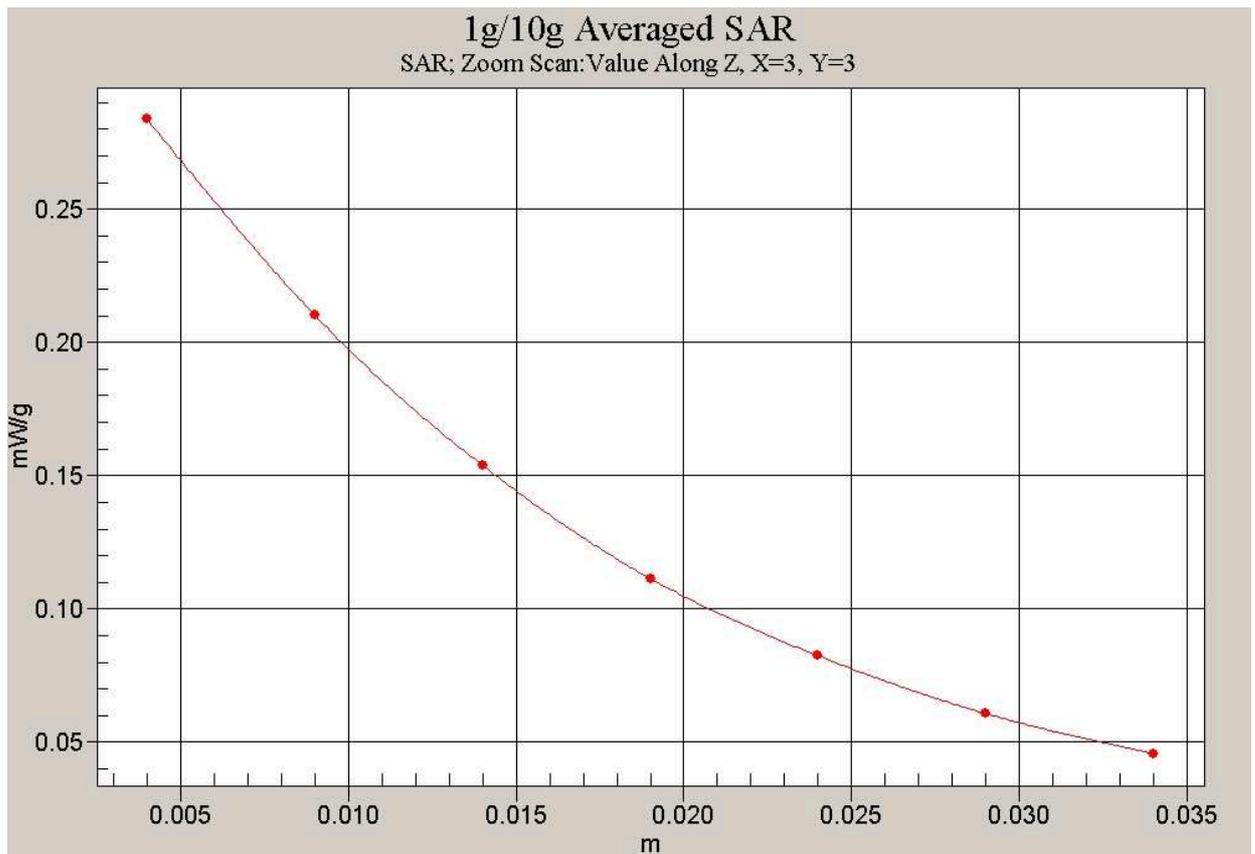


Fig. 28 Z-Scan at power reference point (CDMA 835MHz, Body, Towards Phantom, CH384)

CDMA 1X Body Toward Phantom Low

Date/Time: 2006-9-7 15:15:01

Electronics: DAE3 Sn589

Medium: Body 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.95$ mho/m; $\epsilon_r = 54.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 824.7 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.45, 6.45, 6.45)

Toward Phantom Low/Area Scan (71x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.230 mW/g

Toward Phantom Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 15.9 V/m; Power Drift = -0.136 dB

Peak SAR (extrapolated) = 0.277 W/kg

SAR(1 g) = 0.211 mW/g; SAR(10 g) = 0.151 mW/g

Maximum value of SAR (measured) = 0.224 mW/g

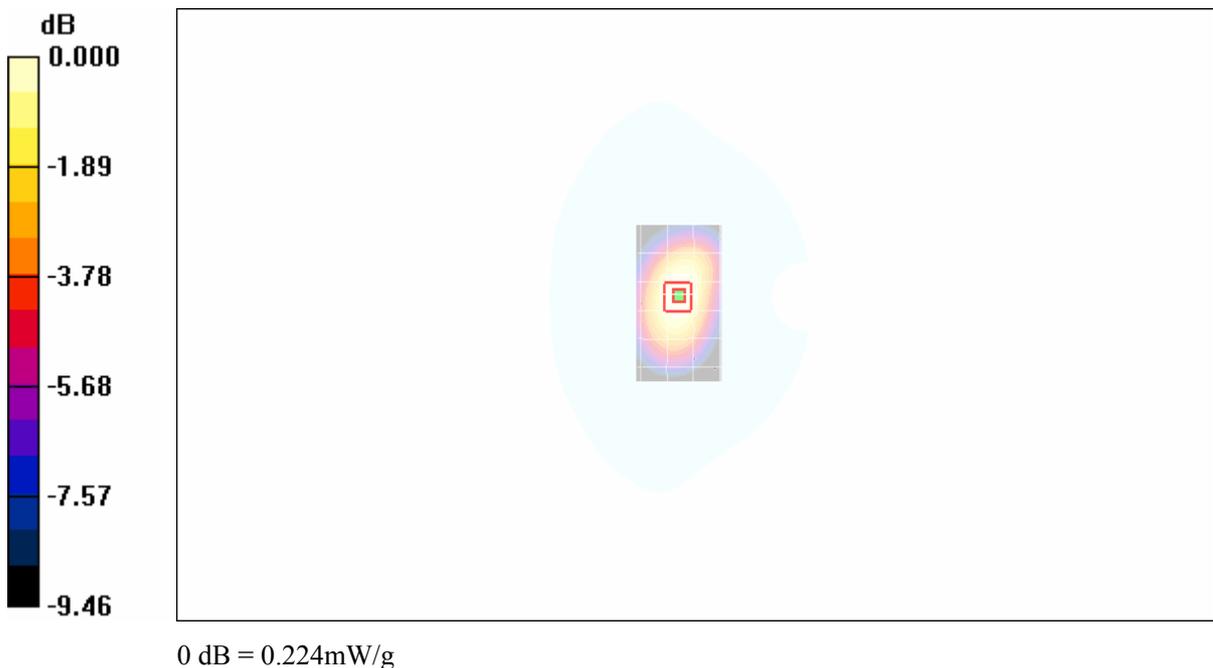


Fig. 28 CDMA 835MHz, Body, Towards Phantom, CH1013

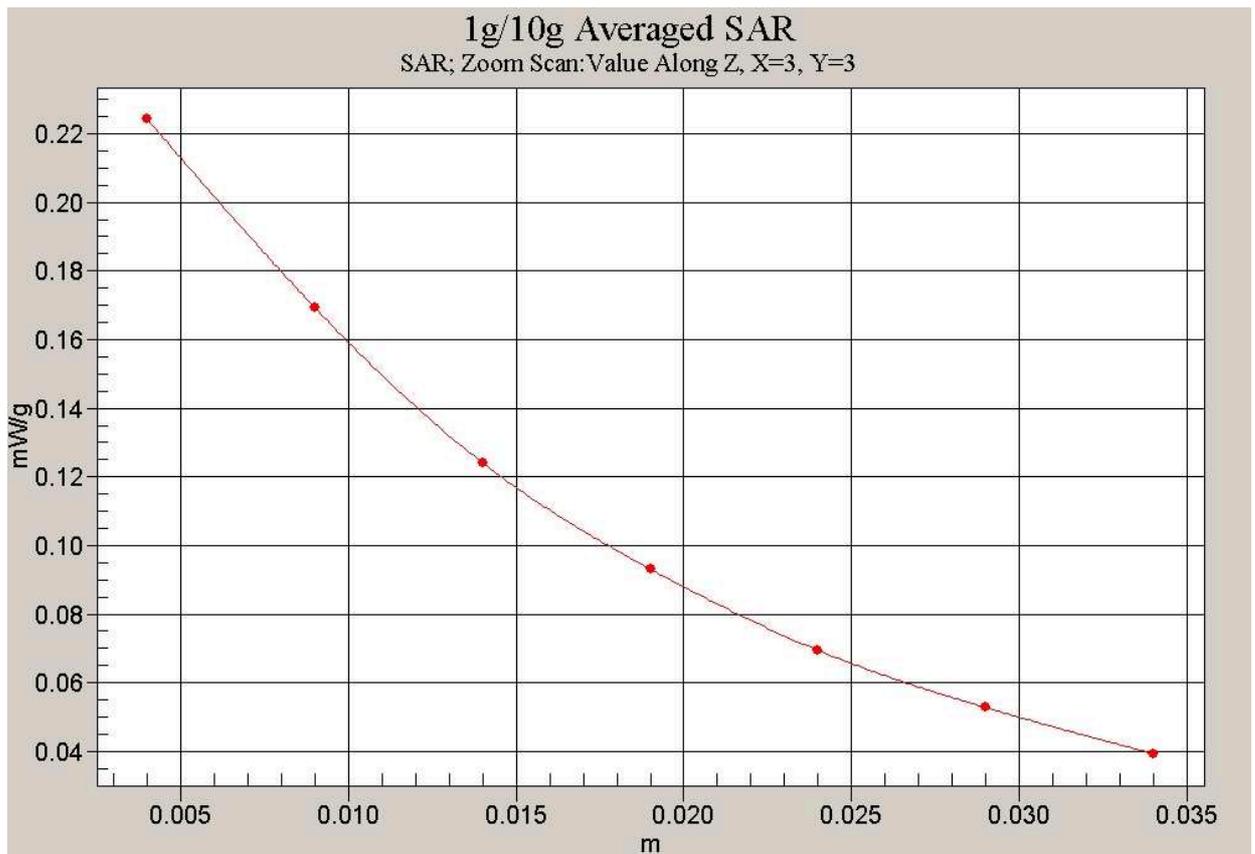


Fig. 30 Z-Scan at power reference point (CDMA 835MHz, Body, Towards Phantom, CH1013)

CDMA 1X Body Toward Ground High

Date/Time: 2006-9-7 13:30:43

Electronics: DAE3 Sn589

Medium: Body 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.95$ mho/m; $\epsilon_r = 54.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 848.31 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.45, 6.45, 6.45)

Toward Ground High/Area Scan (71x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.04 mW/g

Toward Ground High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 33.7 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.950 mW/g; SAR(10 g) = 0.672 mW/g

Maximum value of SAR (measured) = 1.01 mW/g

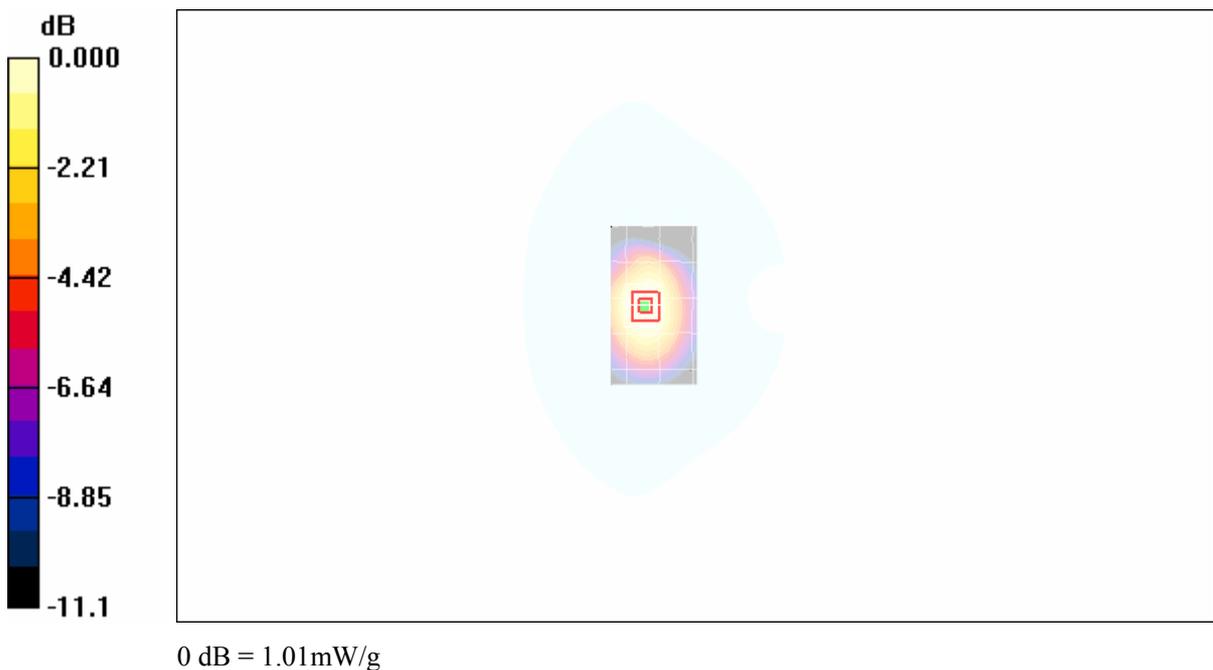


Fig. 31 CDMA 835MHz, Body, Towards Ground, CH777

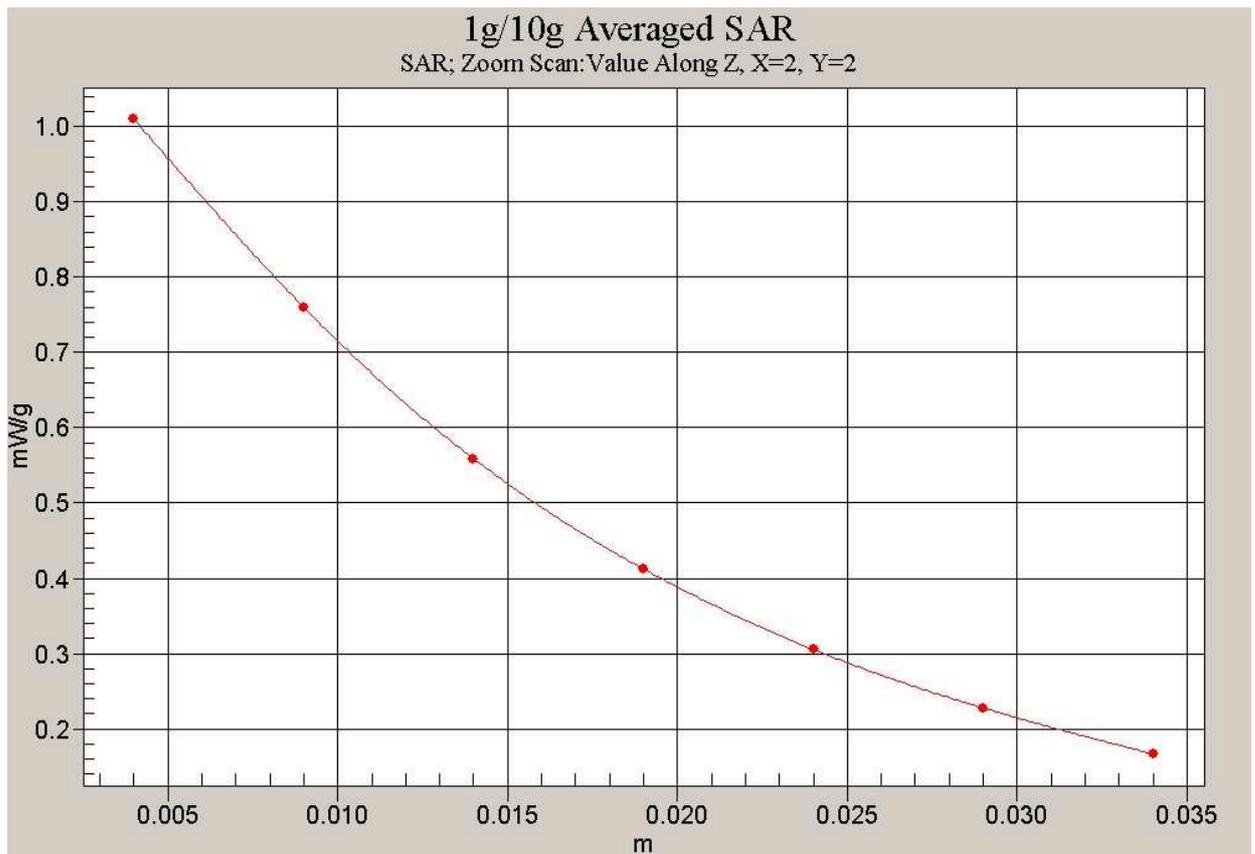


Fig. 232 Z-Scan at power reference point (CDMA 835MHz, Body, Towards Ground, CH777)

CDMA 1X Body Toward Ground Middle

Date/Time: 2006-9-7 14:16:24

Electronics: DAE3 Sn589

Medium: Body 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.95$ mho/m; $\epsilon_r = 54.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 836.52 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.45, 6.45, 6.45)

Toward Ground Middle/Area Scan (71x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.793 mW/g

Toward Ground Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 28.4 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.940 W/kg

SAR(1 g) = 0.726 mW/g; SAR(10 g) = 0.516 mW/g

Maximum value of SAR (measured) = 0.773 mW/g

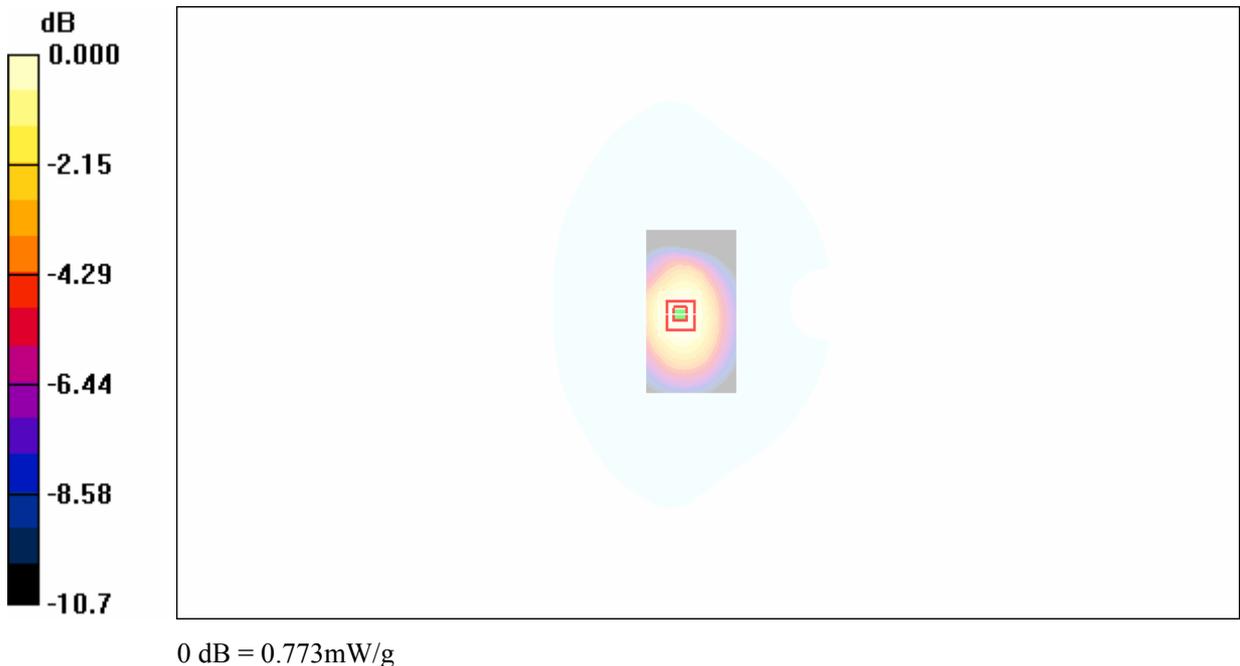


Fig. 33 CDMA 835MHz, Body, Towards Ground, CH384

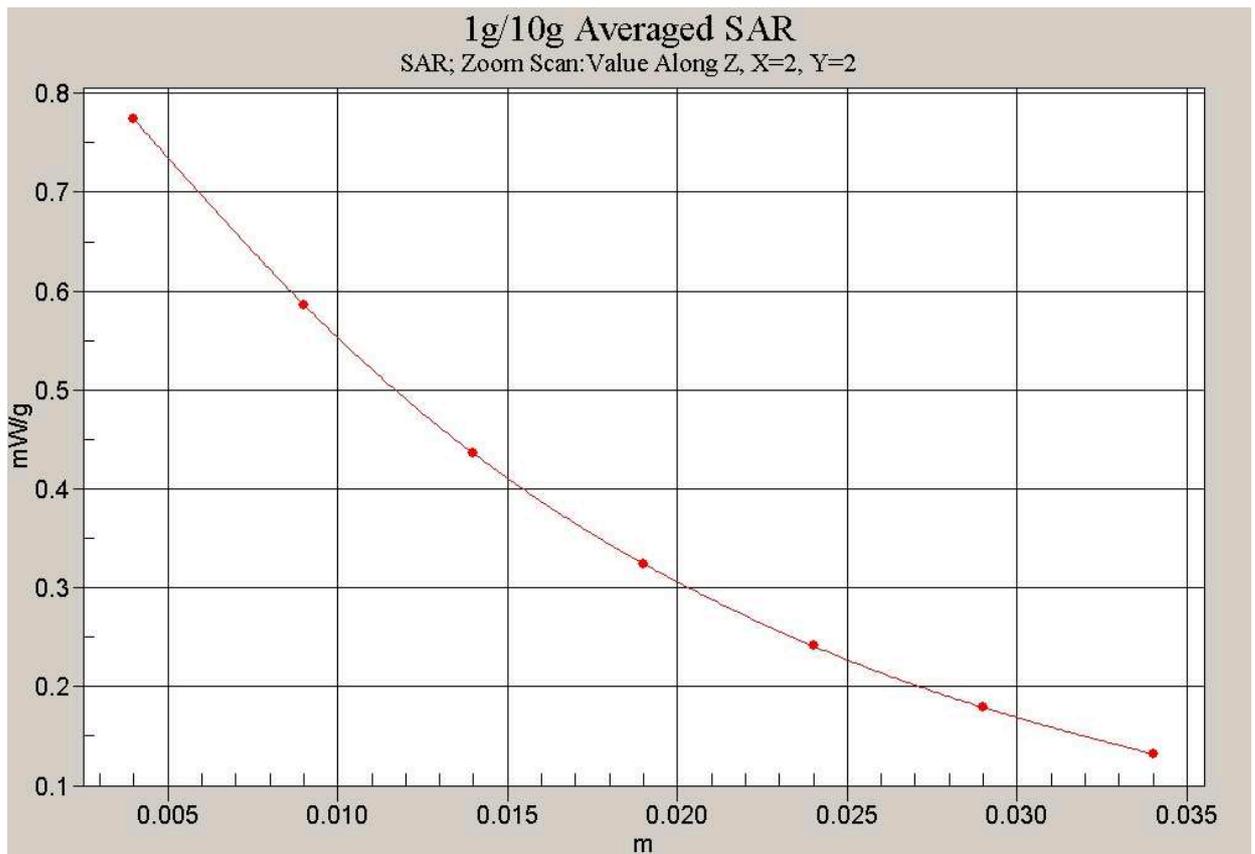


Fig. 34 Z-Scan at power reference point (CDMA 835MHz, Body, Towards Ground, CH384)

CDMA 1X Body Toward Ground Low

Date/Time: 2006-9-7 14:59:17

Electronics: DAE3 Sn589

Medium: Body 835

Medium parameters used (interpolated): $f = 835$ MHz; $\sigma = 0.95$ mho/m; $\epsilon_r = 54.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 23.3°C Liquid Temperature: 22.5°C

Communication System: CDMA 1X-new Frequency: 824.7 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.45, 6.45, 6.45)

Toward Ground Low/Area Scan (71x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.739 mW/g

Toward Ground Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 27.7 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.839 W/kg

SAR(1 g) = 0.656 mW/g; SAR(10 g) = 0.469 mW/g

Maximum value of SAR (measured) = 0.698 mW/g

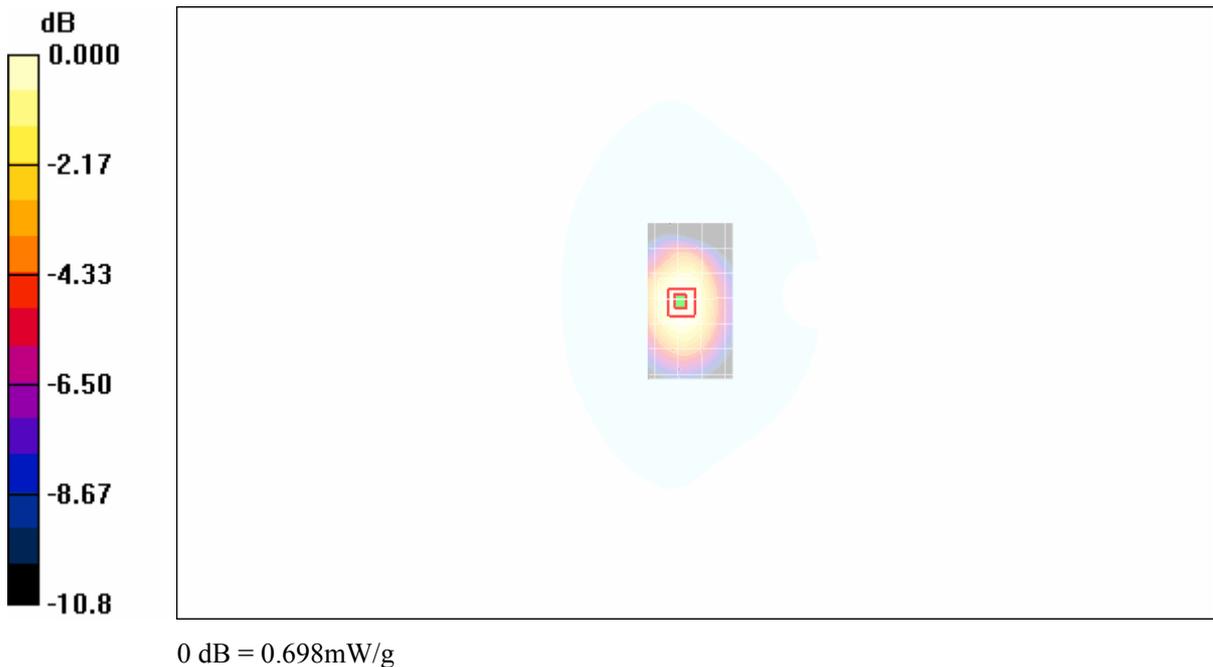


Fig. 35 CDMA 835MHz, Body, Towards Ground, CH1013

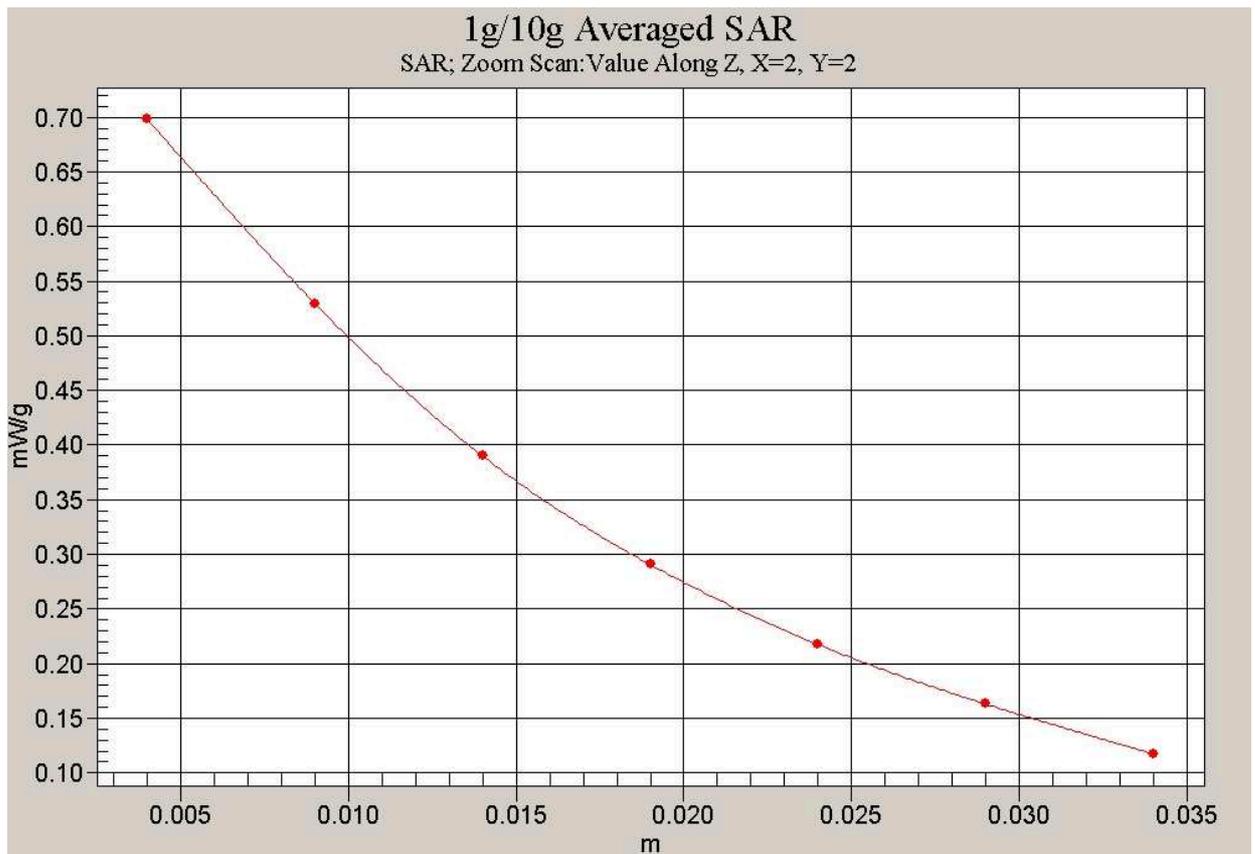


Fig. 36 Z-Scan at power reference point (CDMA 835MHz, Body, Towards Ground, CH1013)

ANNEX D SYSTEM VALIDATION RESULTS

835MHzDAE589Probe1736

Electronics: DAE3 Sn589

Communication System: CW Frequency: 835 MHz Duty Cycle: 1:1

Probe: ET3DV6 - SN1736 ConvF(6.51, 6.51, 6.51)

835MHz/Area Scan (101x101x1): Measurement grid: dx=10mm, dy=10mm

Reference Value = 56.8 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 2.68 mW/g

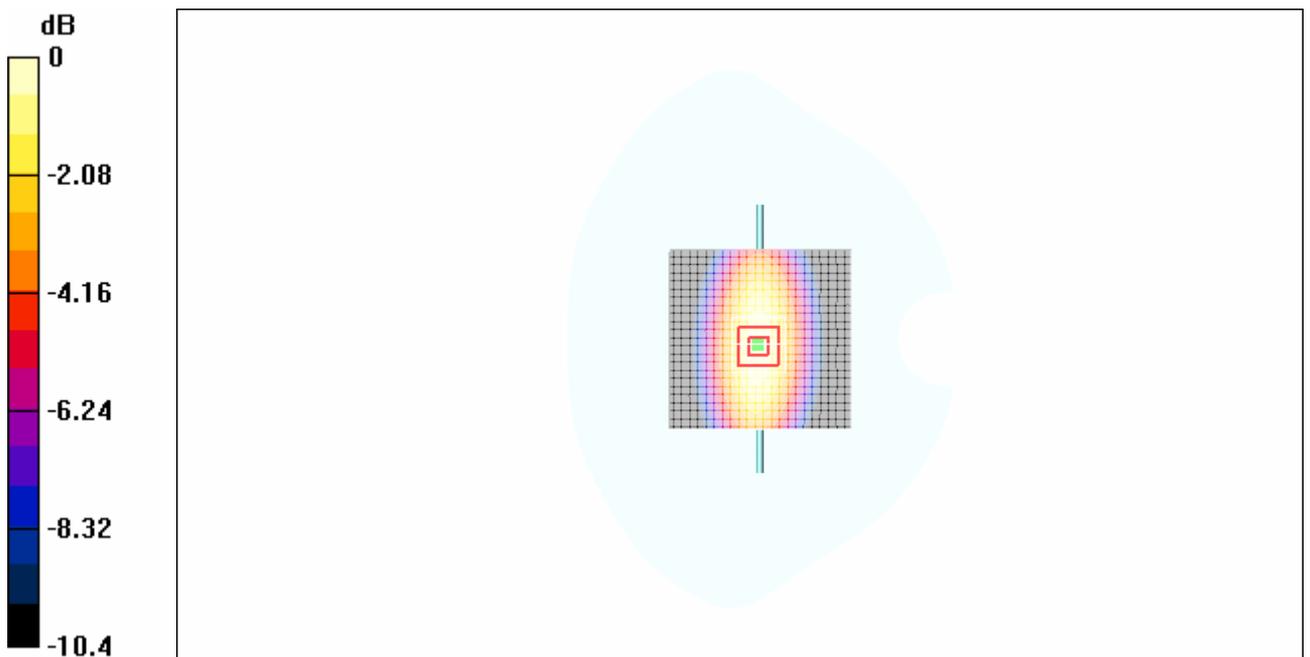
835MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.8 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 2.69 mW/g

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.48 mW/g; SAR(10 g) = 1.62 mW/g



0 dB = 2.69mW/g

Fig.37 validation 835MHz 250mW

**Telecommunication Metrology Center
of Ministry of Information Industry**

No. 2006E01417

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ANNEX E PROBE CALIBRATION CERTIFICATE

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TMC-Auden**

Certificate No: **ET3-1736_Nov05**

CALIBRATION CERTIFICATE

Object: **ET3DV6 - SN:1736**

Calibration procedure(s): **QA CAL-01.v5
Calibration procedure for dosimetric E-field probes**

Calibration date: **November 25, 2005**

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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference Probe ES3DV2	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
DAE4	SN: 3013	7-Jan-05 (SPEAG, No. ES3-3013_Jan05)	Jan-06
Reference Probe ES3DV2	SN: 907	21-Jun-05 (SPEAG, No. DAE4-907_Jun05)	Jun-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

Calibrated by:	Name	Function	Signature
	Nico Vetterli	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 25, 2005

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

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



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}:** Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}:** DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 SN:1736

November 25, 2005

Probe ET3DV6

SN:1736

Manufactured:	September 27, 2002
Last calibrated:	July 14, 2005
Recalibrated:	November 25, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1736

November 25, 2005

DASY - Parameters of Probe: ET3DV6 SN:1736

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.97 ± 10.1%	$\mu V/(V/m)^2$	DCP X	93 mV
NormY	1.75 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	93 mV
NormZ	1.97 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	93 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	9.6	5.0
SAR _{be} [%]	With Correction Algorithm	0.1	0.3

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	13.2	8.8
SAR _{be} [%]	With Correction Algorithm	0.6	0.1

Sensor Offset

Probe Tip to Sensor Center 2.7 mm

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

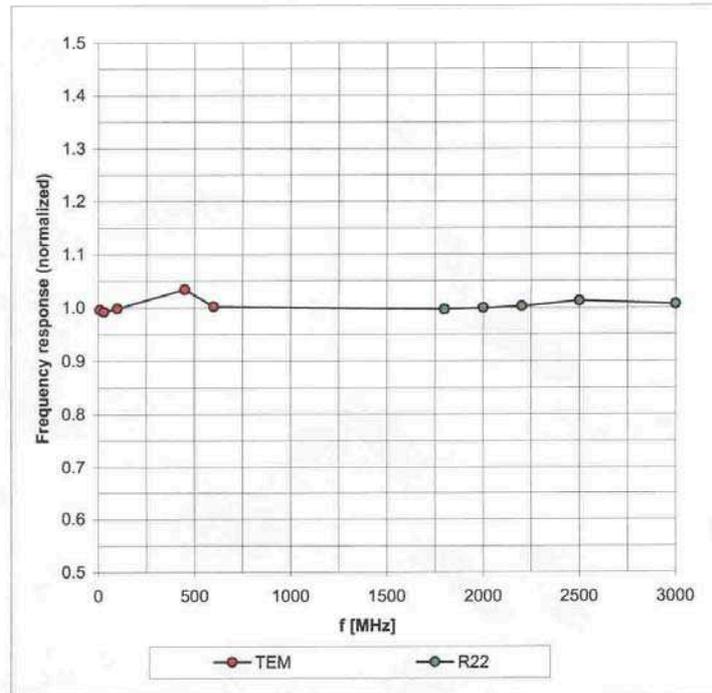
^B Numerical linearization parameter: uncertainty not required.

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Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

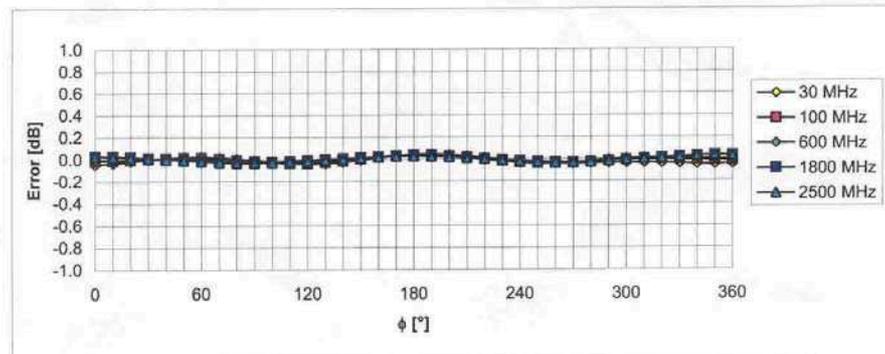
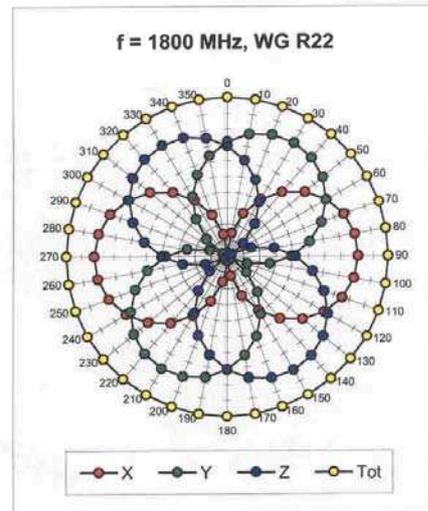
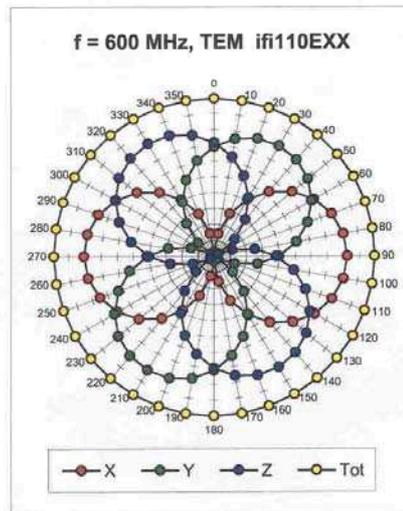


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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Receiving Pattern (ϕ), $\vartheta = 0^\circ$

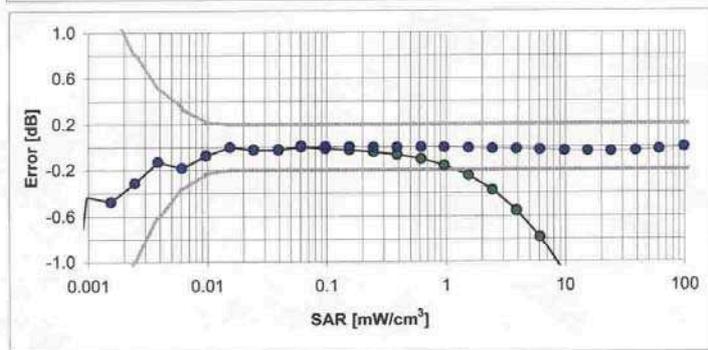
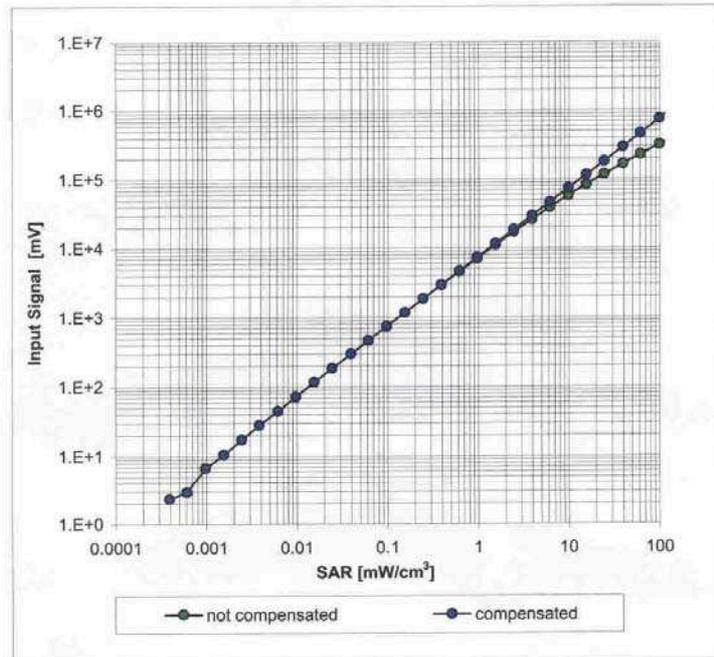


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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Dynamic Range $f(SAR_{head})$
(Waveguide R22, $f = 1800$ MHz)

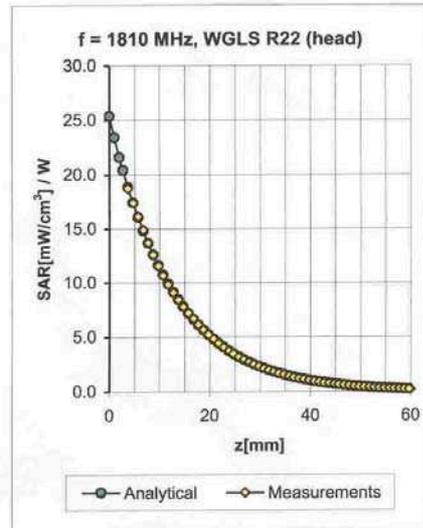
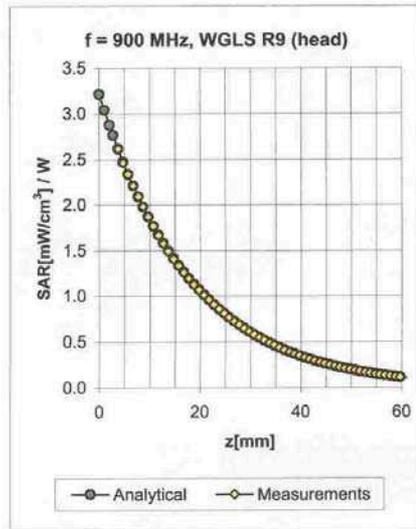


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

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Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.56	1.85	6.51 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.47	5.40 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.62	2.29	4.67 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.12	1.61	7.74 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.47	2.15	6.45 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.53	2.78	4.88 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.65	2.11	4.35 ± 11.8% (k=2)

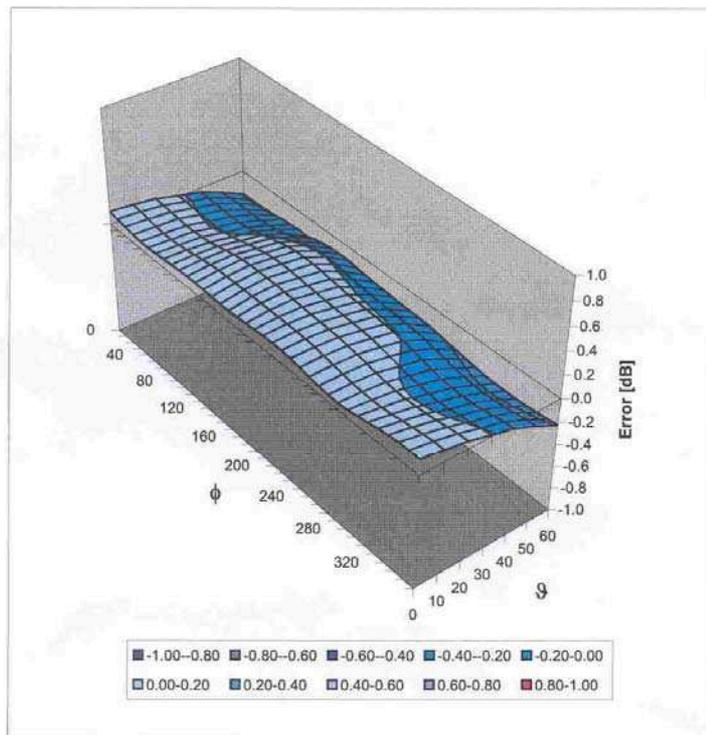
^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the Indicated frequency band.

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Deviation from Isotropy in HSL

Error (ϕ, ϑ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

ANNEX F DIPOLE CALIBRATION CERTIFICATE

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

Client **TMC China**

Certificate No: **CD835V3-1023_Apr05**

CALIBRATION CERTIFICATE

Object **CD835V3 - SN: 1023**

Calibration procedure(s) **QA CAL-20.v3
Calibration procedure for dipoles in air**

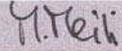
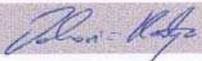
Calibration date: **April 27, 2005**

Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
All calibrations have been conducted at an environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Power sensor HP 8481A	US37292783	12-Oct-04 (METAS, No. 251-00412)	Oct-05
20 dB Attenuator	SN: 5086 (20g)	10-Aug-04 (METAS, No 251-00402)	Aug-05
10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-4419B	GB43310788	10-Aug-03 (SPEAG, in house check Jan-04)	In house check: Oct-05
Power sensor HP 8481A	MY41092312	10-Aug-03 (SPEAG, in house check Jan-04)	In house check: Oct-05
Power sensor HP 8481A	MY41093315	10-Aug-03 (SPEAG, in house check Jan-04)	In house check: Oct-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov-05
RF generator R&S SMT06	1039.2000.06	26-Jul-04 (SPEAG, in house check Jul-04)	In house check: Jan-06
DAE4	SN: 901	29-Jun-04 (SPEAG, No. DAE4-901_Jun04)	Calibration, Jun-05
Probe ER3DV6	SN: 2336	20-Jan-05 (SPEAG, No. ER3-2336_Jan05)	Calibration, Jan-06
Probe H3DV6	SN: 6065	10-Dec-04 (SPEAG, No. H3-6065-Dec04)	Calibration, Dec-05

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Director	

Issued: May 23, 2005

This calibration certificate is issued as an intermediate solution until the specific calibration procedure is accepted in the frame of the accreditation of the Calibration Laboratory of Schmid & Partner Engineering AG (based on ISO/IEC 17025 International Standard)

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

References

- [1] ANSI-PC63.19-2003 (Draft)
American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- *Coordinate System:* y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with standard [1], the measurement planes (probe sensor center) are selected to be at a distance of 10 mm above the the top edge of the dipole arms.
- *Measurement Conditions:* Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- *Antenna Positioning:* The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections. It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY4 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- *Feed Point Impedance and Return Loss:* These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- *E-field distribution:* E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 10 mm (in z) above the top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, 10mm above the dipole surface.
- *H-field distribution:* H-field is measured with an isotropic H-field probe with 100mW forward power to the antenna feed point, in the x-y-plane. The scan area and sensor distance is equivalent to the E-field scan. The maximum of the field is available at the center (subgrid 5) above the feed point. The H-field value stated as calibration value represents the maximum of the interpolated H-field, 10mm above the dipole surface at the feed point.

1 Measurement Conditions

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

DASY Version	DASY4	V4.5 B19
DASY PP Version	SEMCAD	V1.8 B146
Phantom	HAC Test Arch	SD HAC P01 BA, #1002
Distance Dipole Top - Probe Center	10 mm	
Scan resolution	dx, dy = 5 mm	area = 20 x 180 mm
Frequency	835 MHz ± 1 MHz	
Forward power at dipole connector	20.0 dBm = 100mW	
Input power drift	< 0.05 dB	

2 Maximum Field values

H-field 10 mm above dipole surface	condition	interpolated maximum
Maximum measured	100 mW forward power	0.451 A/m

Uncertainty for H-field measurement: 8.2% (k=2)

E-field 10 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW forward power	155.0 V/m
Maximum measured above low end	100 mW forward power	171.6 V/m
Averaged maximum above arm	100 mW forward power	163.3 V/m

Uncertainty for E-field measurement: 12.8% (k=2)

3 Appendix

3.1 Antenna Parameters

Frequency	Return Loss	Impedance
800 MHz	17.0 dB	(40.9 - j9.1) Ohm
835 MHz	24.6 dB	(52.7 + j5.4) Ohm
900 MHz	17.7 dB	(51.4 - j13.2) Ohm
950 MHz	21.0 dB	(52.0 + j8.9) Ohm
960 MHz	15.5 dB	(63.0 + j14.1) Ohm

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.

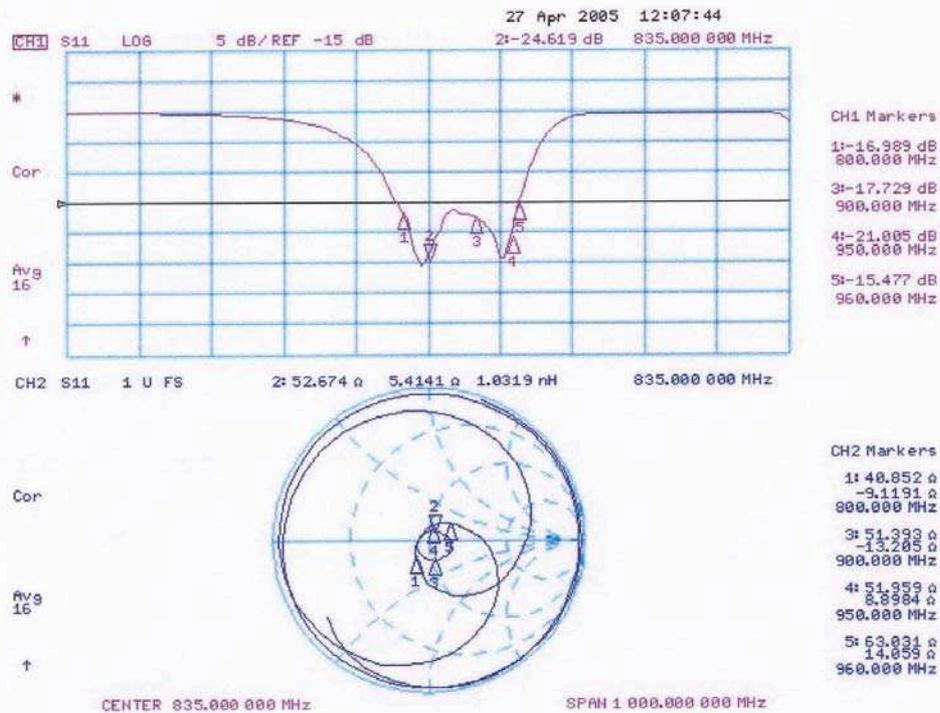
The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.

Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

3.3 Measurement Sheets

3.3.1 Return Loss and Smith Chart



3.3.2 DASYS H-field result

Date/Time: 27.04.2005 12:44:32

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1023

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Air

Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Phantom section: H Dipole Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASYS4 Configuration:

- Probe: H3DV6 - SN6065; Calibrated: 10.12.2004
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn901; Calibrated: 29.06.2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA
- Measurement SW: DASYS4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

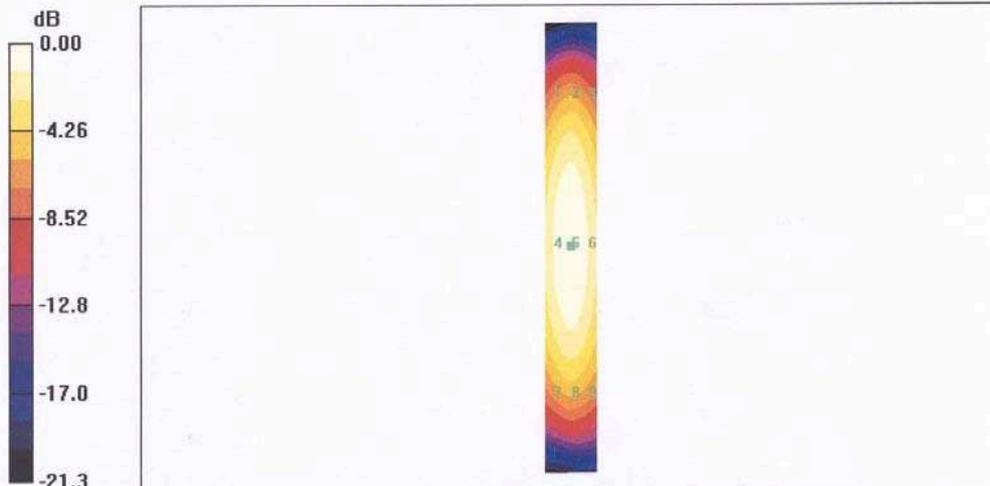
H Scan 10mm above CD 835 MHz/Hearing Aid Compatibility Test (41x361x1):

Measurement grid: dx=5mm, dy=5mm

Maximum value of Total field (slot averaged) = 0.451 A/m

Hearing Aid Near-Field Category: M2 (AWF 0 dB)

H in A/m (Time averaged)			H in A/m (Slot averaged)		
Grid 1	Grid 2	Grid 3	Grid 1	Grid 2	Grid 3
0.376	0.400	0.375	0.376	0.400	0.375
Grid 4	Grid 5	Grid 6	Grid 4	Grid 5	Grid 6
0.426	0.451	0.425	0.426	0.451	0.425
Grid 7	Grid 8	Grid 9	Grid 7	Grid 8	Grid 9
0.372	0.395	0.375	0.372	0.395	0.375



0 dB = 0.451 A/m

3.3.3 DASY4 E-Field result

Date/Time: 27.04.2005 16:17:52

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: HAC-Dipole 835 MHz; Type: D835V3; Serial: 1023

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Air

Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³

Phantom section: E Dipole Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 20.01.2005
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn901; Calibrated: 29.06.2004
- Phantom: HAC Phantom; Type: SD HAC P01 BA
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

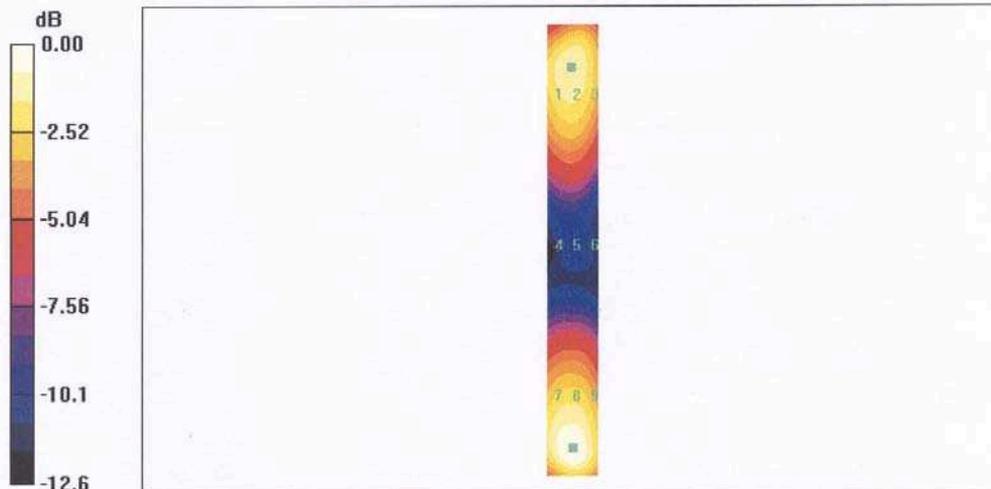
E Scan 10mm above CD 835 MHz/Hearing Aid Compatibility Test (41x361x1): Measurement

grid: dx=5mm, dy=5mm

Maximum value of Total field (slot averaged) = 171.6 V/m

Hearing Aid Near-Field Category: M2 (AWF 0 dB)

E in V/m (Time averaged)			E in V/m (Slot averaged)		
Grid 1	Grid 2	Grid 3	Grid 1	Grid 2	Grid 3
151.0	155.0	149.6	151.0	155.0	149.6
Grid 4	Grid 5	Grid 6	Grid 4	Grid 5	Grid 6
85.1	87.1	83.3	85.1	87.1	83.3
Grid 7	Grid 8	Grid 9	Grid 7	Grid 8	Grid 9
164.3	171.6	166.1	164.3	171.6	166.1



0 dB = 171.6V/m