

1900 Right Tilt Low

Date/Time: 2007-12-14 18:22:41

Electronics: DAE4 Sn777

Medium: Head 1900 MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.36$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz Frequency: 1850.2 MHz Duty Cycle: 1:8.3

Probe: ES3DV3 – SN3142 ConvF(4.87, 4.87, 4.87)

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

Maximum value of SAR (interpolated) = 0.364 mW/g

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

Reference Value = 16.5 V/m; Power Drift = -0.083 dB

Peak SAR (extrapolated) = 0.649 W/kg

SAR(1 g) = 0.344 mW/g; SAR(10 g) = 0.190 mW/g

Maximum value of SAR (measured) = 0.324 mW/g

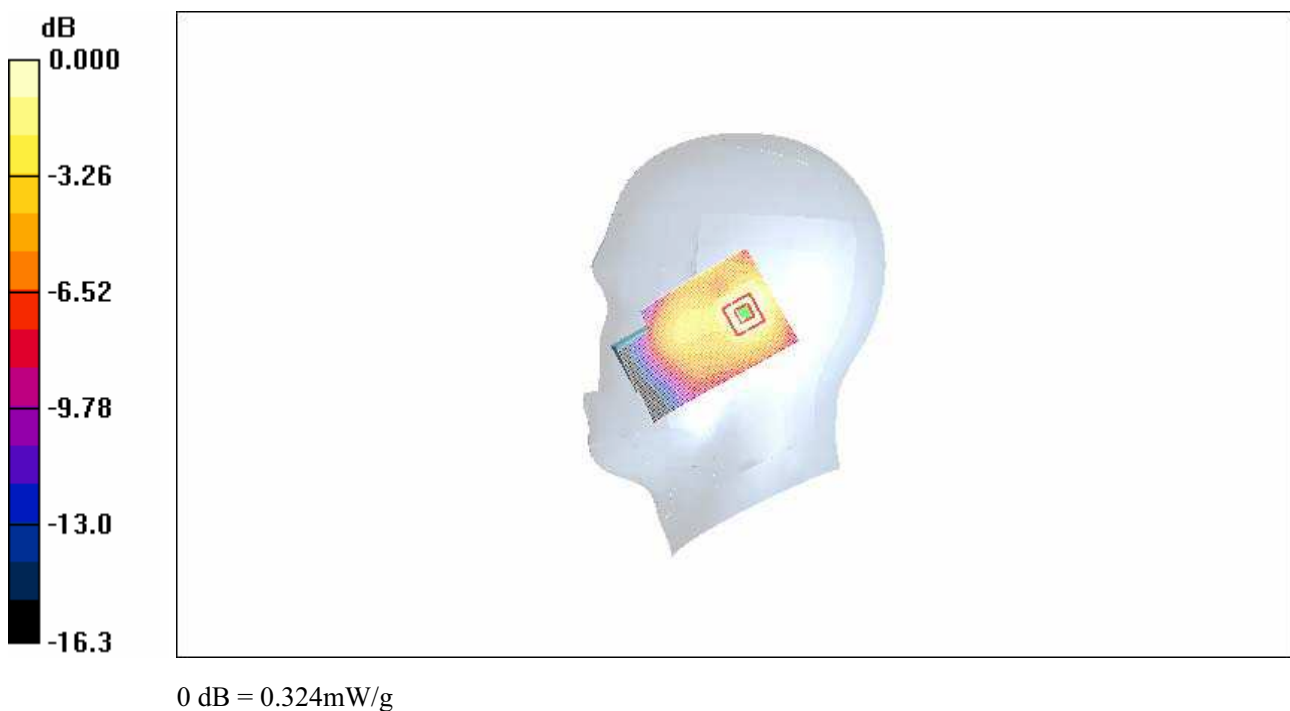


Fig.23 1900 MHz CH512

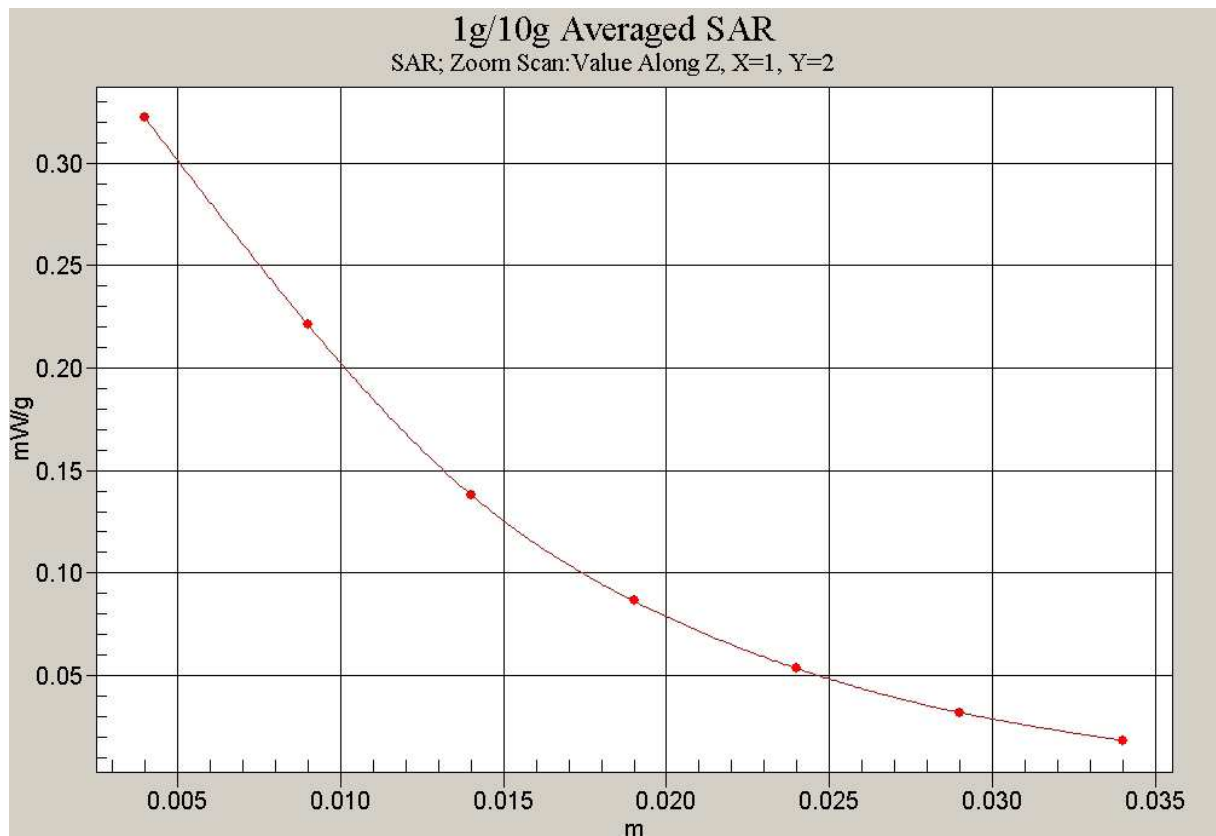


Fig. 24 Z-Scan at power reference point (1900 MHz CH512)

1900 Body Towards Phantom High with Headset

Date/Time: 2007-12-14 19:15:11

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1909.8 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.080 mW/g

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

Reference Value = 5.99 V/m; Power Drift = -0.168 dB

Peak SAR (extrapolated) = 0.108 W/kg

SAR(1 g) = 0.074 mW/g; SAR(10 g) = 0.048 mW/g

Maximum value of SAR (measured) = 0.078 mW/g

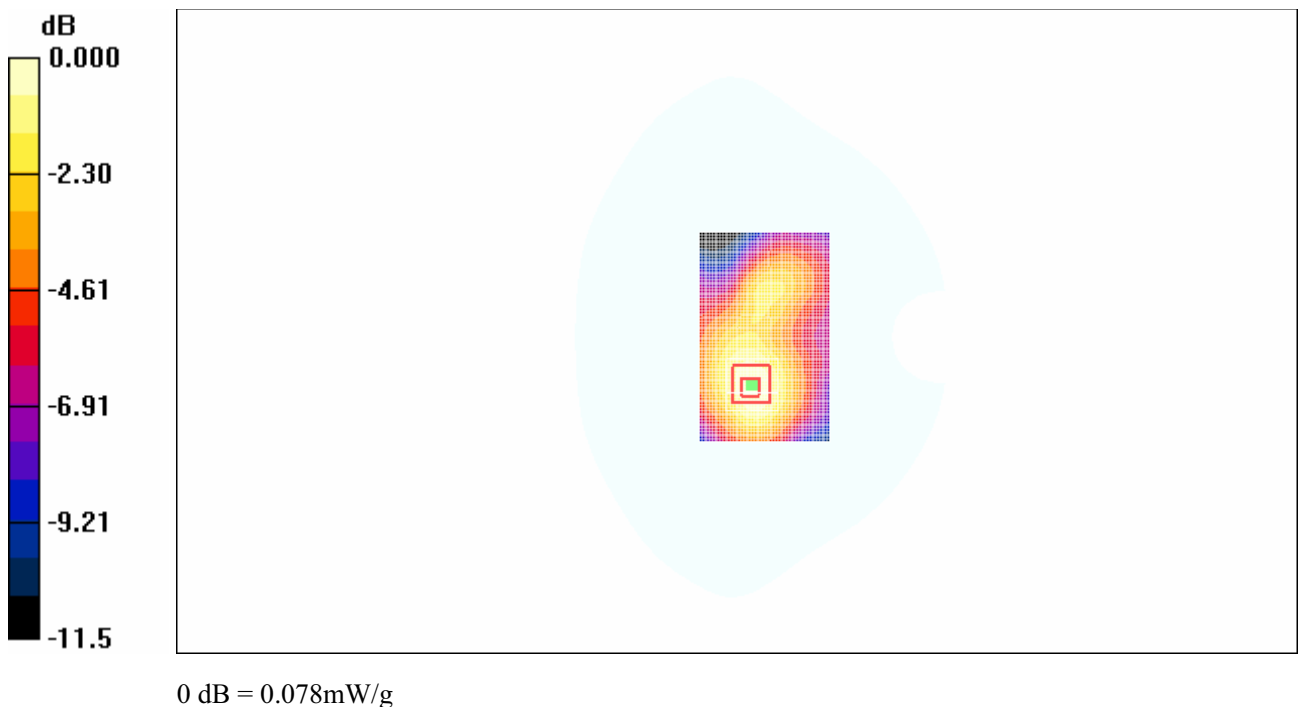


Fig. 25 1900 MHz CH810

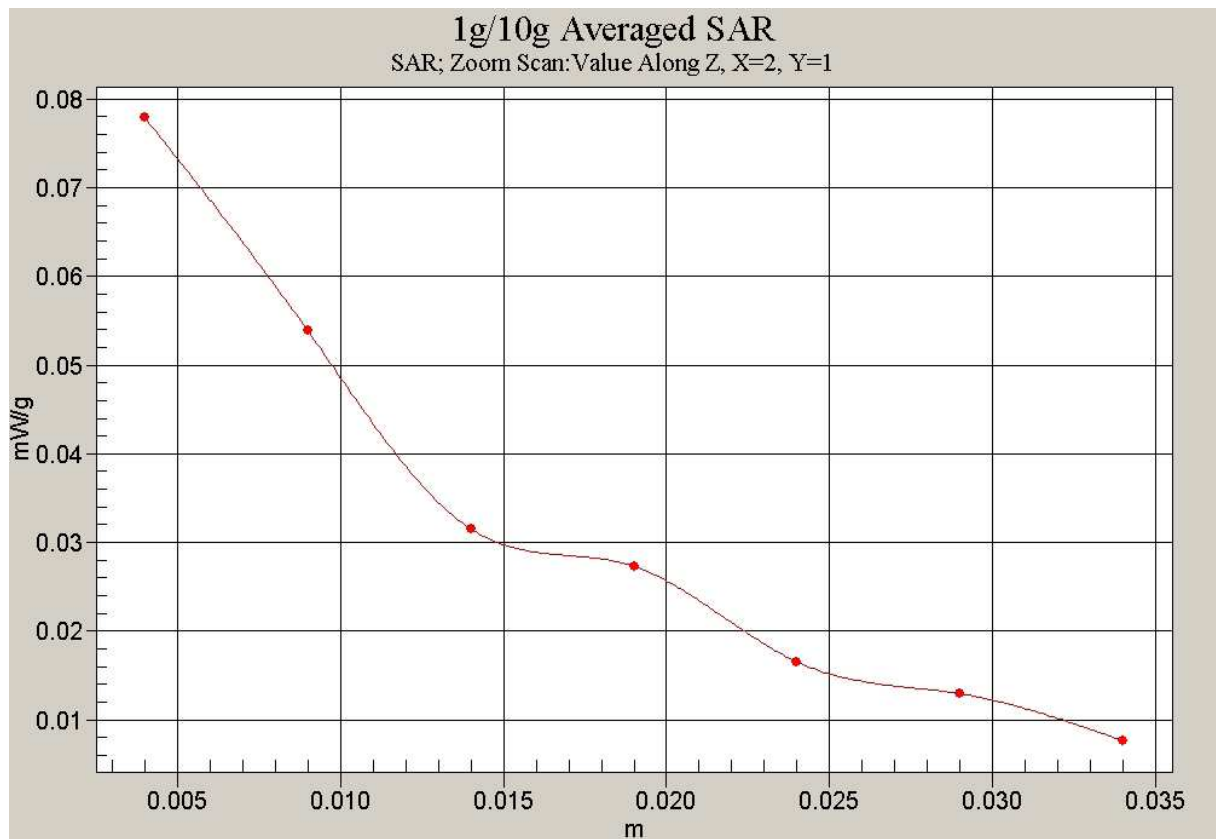


Fig. 26 Z-Scan at power reference point (1900 MHz CH810)

1900 Body Towards Phantom Middle with Headset

Date/Time: 2007-12-14 19:27:32

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.113 mW/g

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

Reference Value = 6.81 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.152 W/kg

SAR(1 g) = 0.104 mW/g; SAR(10 g) = 0.067 mW/g

Maximum value of SAR (measured) = 0.108 mW/g

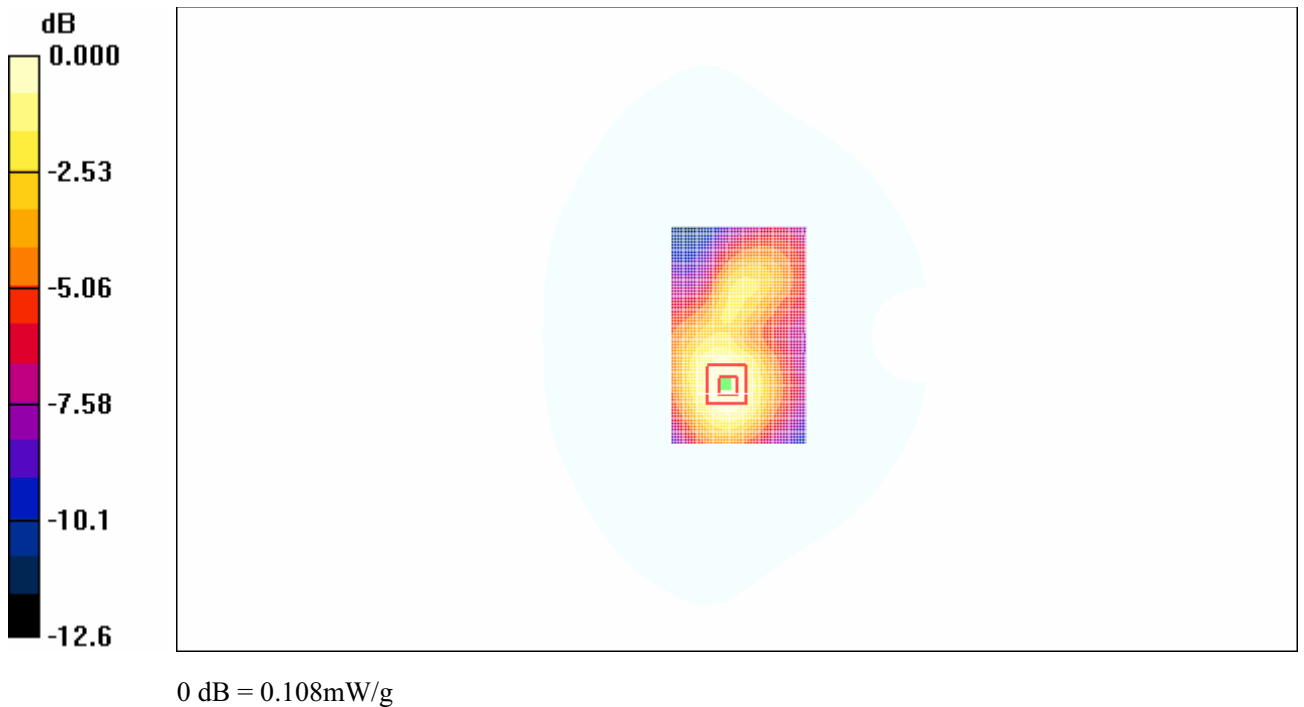


Fig. 27 1900 MHz CH661

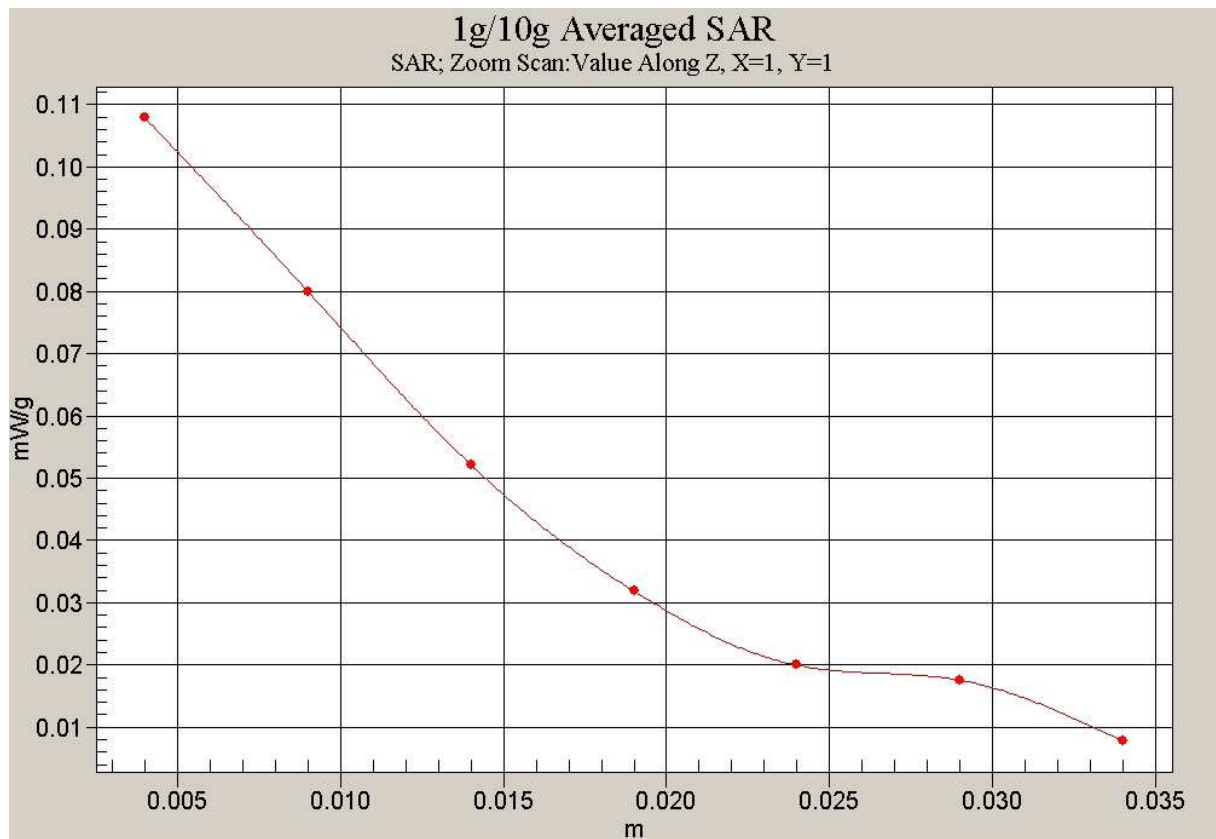


Fig. 28 Z-Scan at power reference point (1900 MHz CH661)

1900 Body Towards Phantom Low with Headset

Date/Time: 2007-12-14 19:39:42

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.127 mW/g

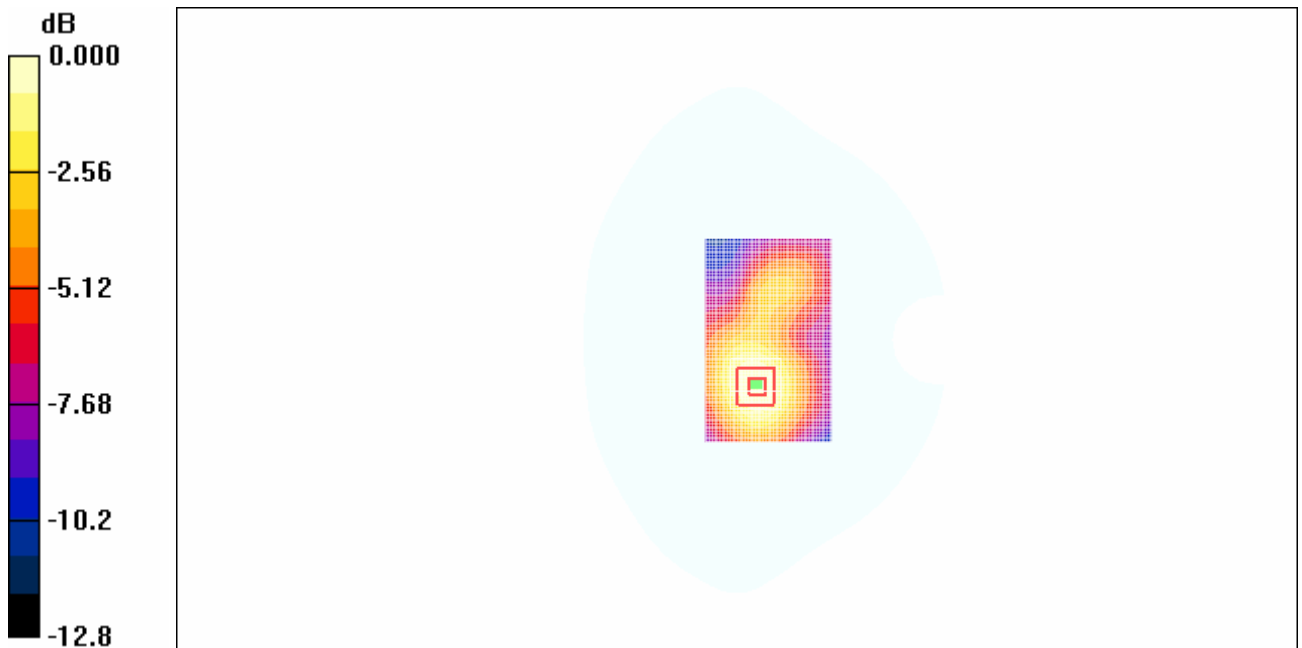
Toward Phantom Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.83 V/m; Power Drift = 0.054 dB

Peak SAR (extrapolated) = 0.173 W/kg

SAR(1 g) = 0.118 mW/g; SAR(10 g) = 0.076 mW/g

Maximum value of SAR (measured) = 0.122 mW/g



0 dB = 0.122mW/g

Fig. 29 1900 MHz CH512

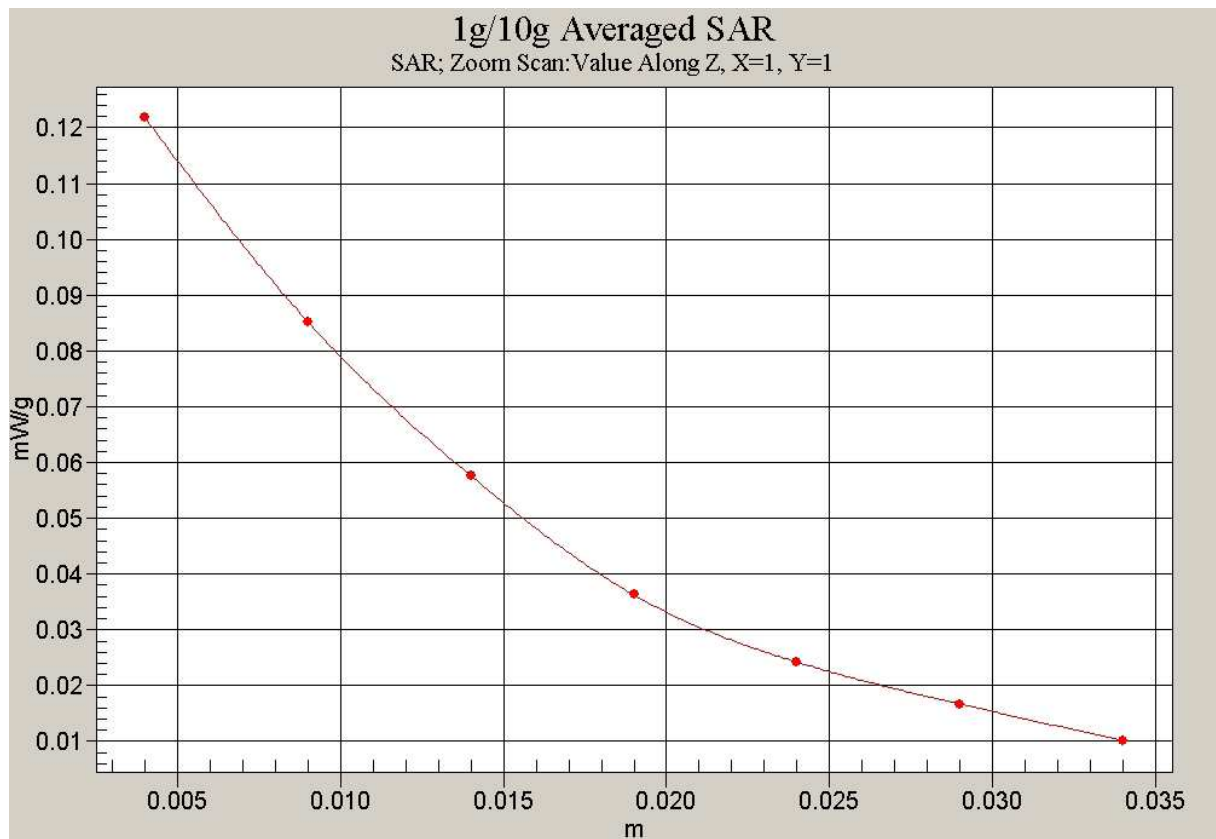


Fig. 30 Z-Scan at power reference point (1900 MHz CH512)

1900 Body Towards Ground High with Headset

Date/Time: 2007-12-14 20:21:27

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1909.8 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.476 mW/g

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

Reference Value = 13.2 V/m; Power Drift = -0.114 dB

Peak SAR (extrapolated) = 0.682 W/kg

SAR(1 g) = 0.392 mW/g; SAR(10 g) = 0.226 mW/g

Maximum value of SAR (measured) = 0.396 mW/g

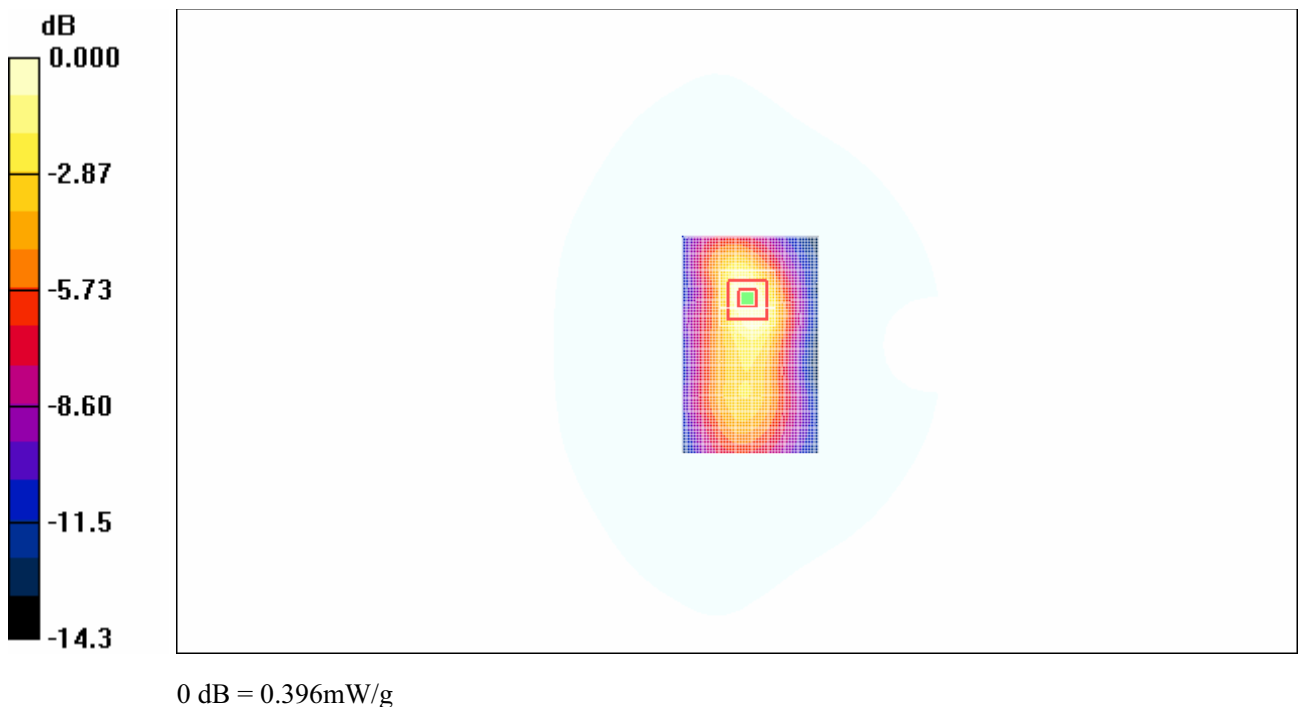


Fig. 31 1900 MHz CH810

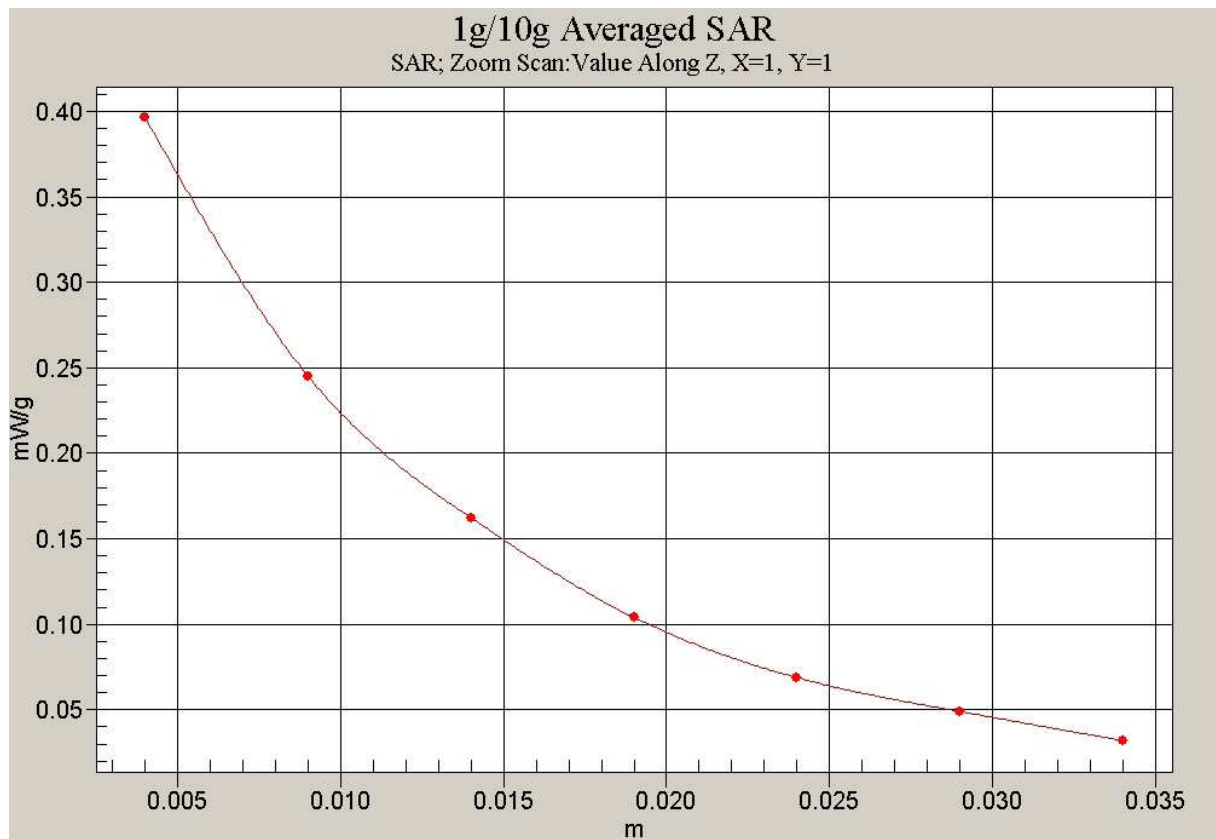


Fig. 32 Z-Scan at power reference point (1900 MHz CH810)

1900 Body Towards Ground Middle with Headset

Date/Time: 2007-12-14 20:07:18

Electronics: DAE4 Sn536

Medium: Body 1900 MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.630 mW/g

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

Reference Value = 15.6 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 0.912 W/kg

SAR(1 g) = 0.532 mW/g; SAR(10 g) = 0.306 mW/g

Maximum value of SAR (measured) = 0.543 mW/g

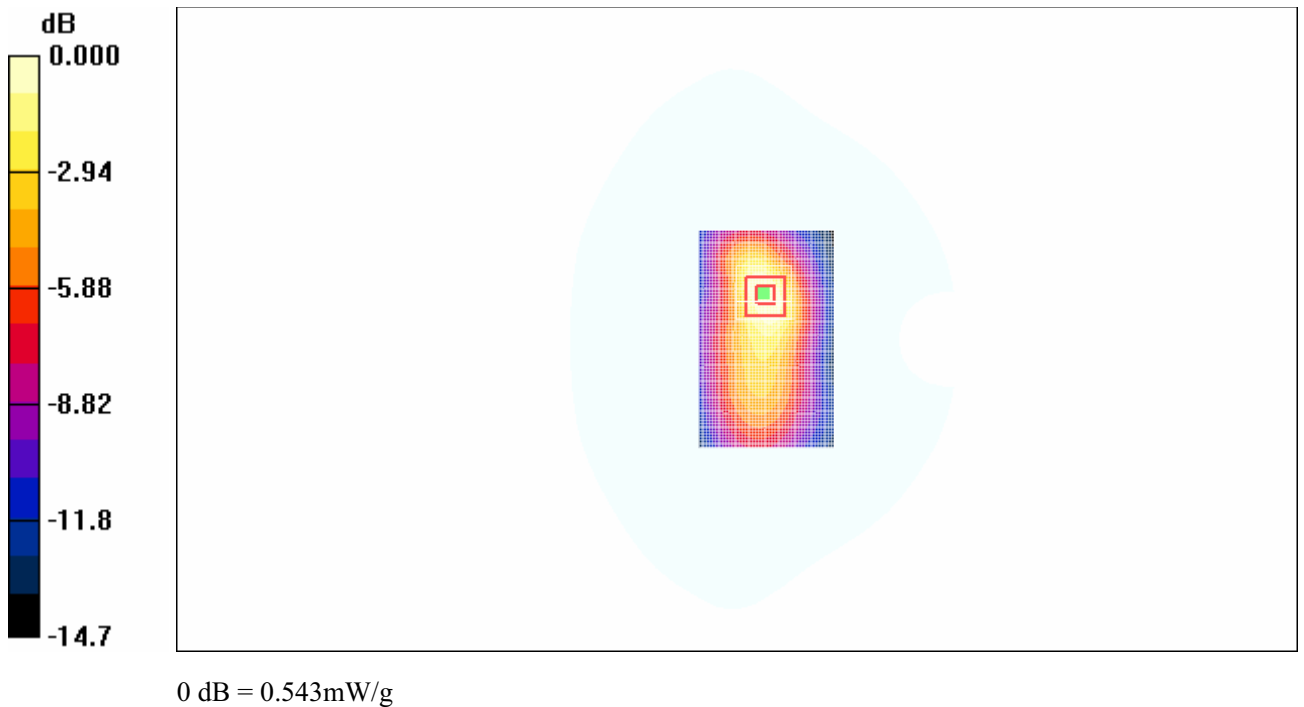


Fig. 33 1900 MHz CH661

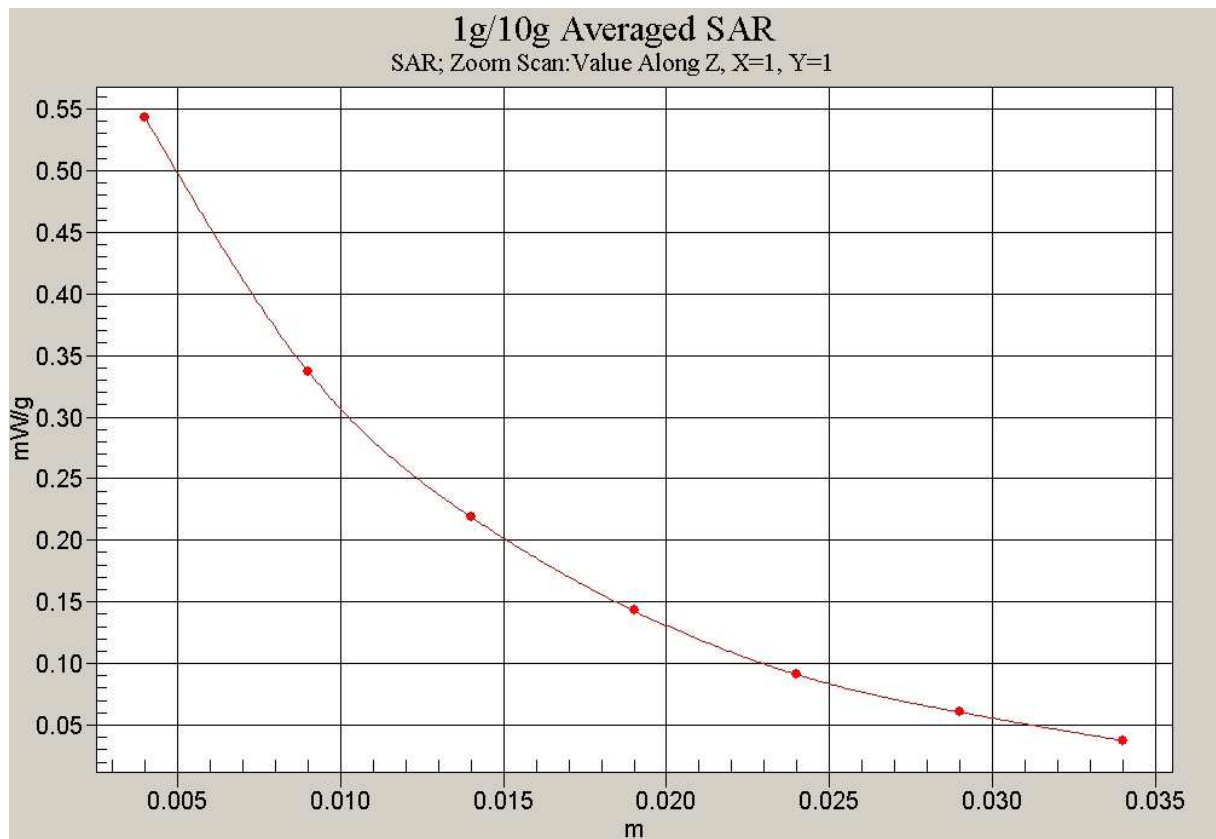


Fig. 34 Z-Scan at power reference point (1900 MHz CH661)

1900 Body Towards Ground Low with Headset

Date/Time: 2007-12-14 19:54:33

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

Toward Ground Low/Area Scan (51x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.650 mW/g

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

Reference Value = 15.6 V/m; Power Drift = -0.038 dB

Peak SAR (extrapolated) = 0.918 W/kg

SAR(1 g) = 0.545 mW/g; SAR(10 g) = 0.313 mW/g

Maximum value of SAR (measured) = 0.567 mW/g

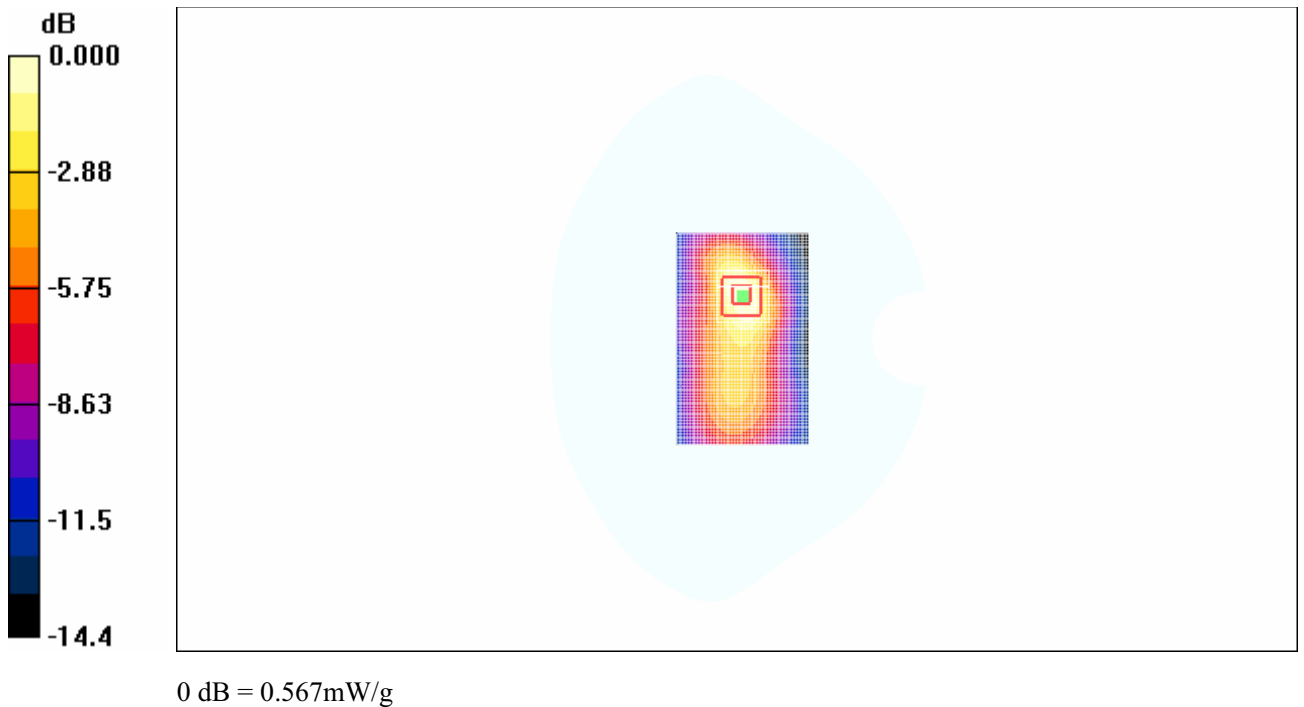


Fig. 35 1900 MHz CH512

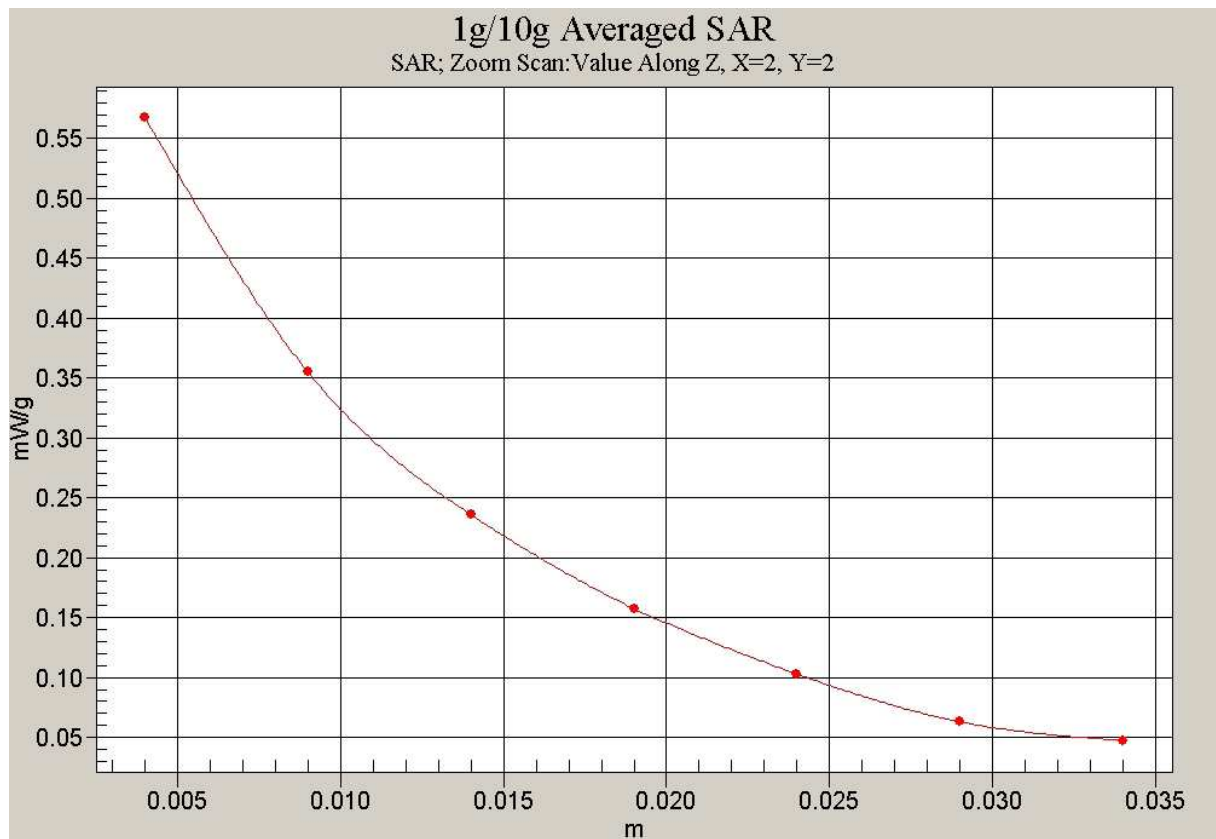


Fig. 36 Z-Scan at power reference point (1900 MHz CH512)

1900 Body Towards Phantom High with GPRS

Date/Time: 2007-12-14 9:58:30

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1909.8 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.197 mW/g

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

Reference Value = 8.88 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.294 W/kg

SAR(1 g) = 0.183 mW/g; SAR(10 g) = 0.116 mW/g

Maximum value of SAR (measured) = 0.184 mW/g

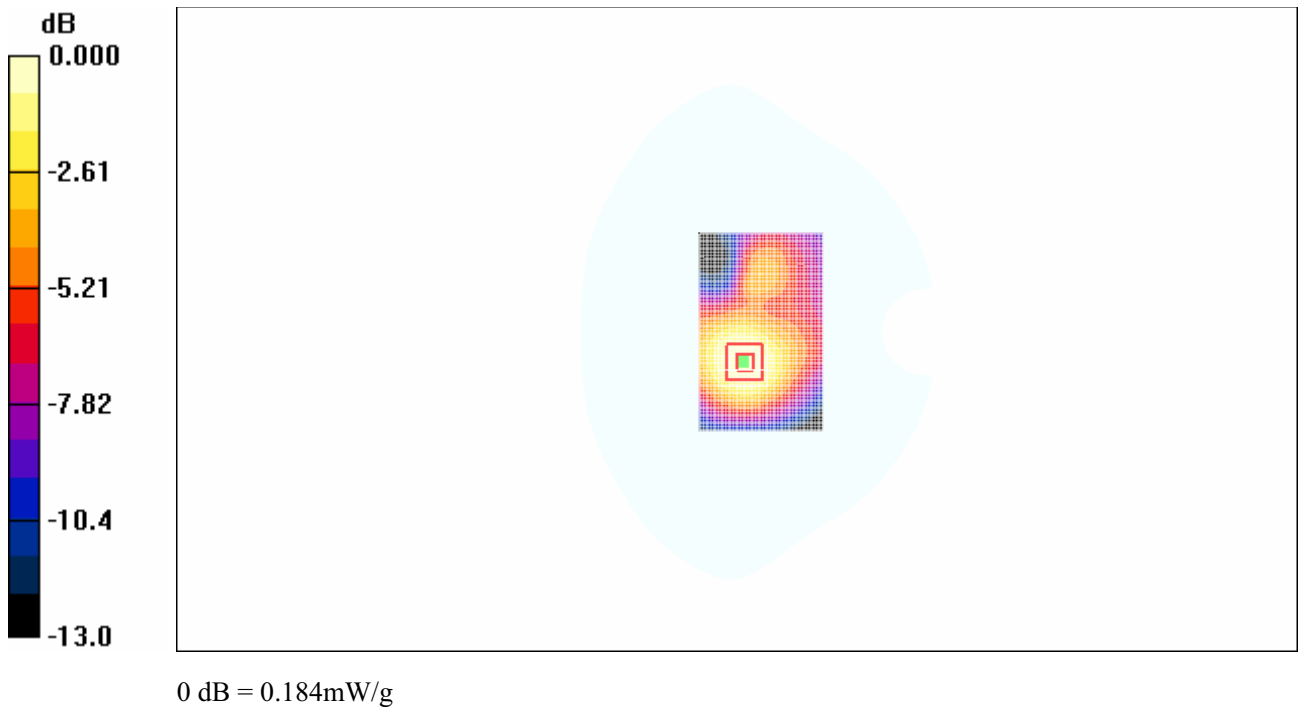


Fig. 37 1900 MHz CH810

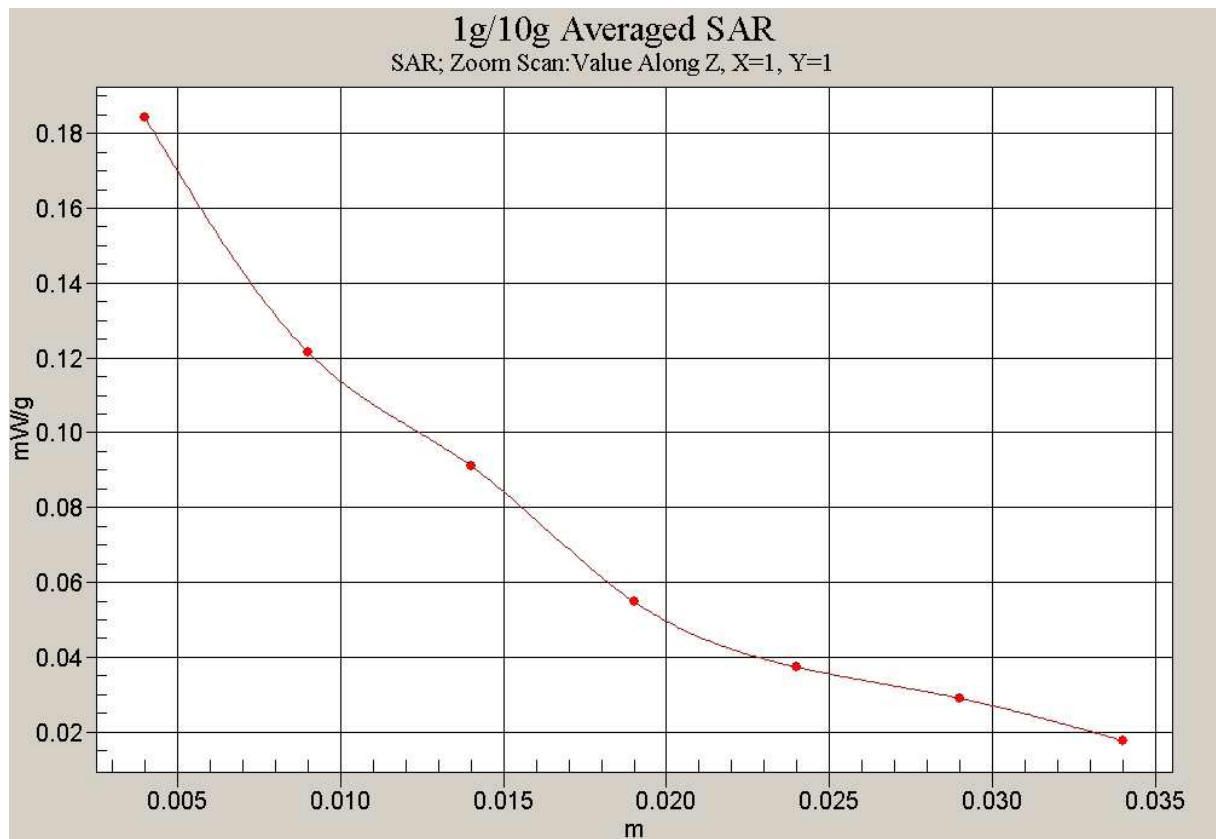


Fig. 38 Z-Scan at power reference point (1900 MHz CH810)

1900 Body Towards Phantom Middle with GPRS

Date/Time: 2007-12-14 10:15:04

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.282 mW/g

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

Reference Value = 11.1 V/m; Power Drift = -0.153 dB

Peak SAR (extrapolated) = 0.401 W/kg

SAR(1 g) = 0.259 mW/g; SAR(10 g) = 0.164 mW/g

Maximum value of SAR (measured) = 0.261 mW/g

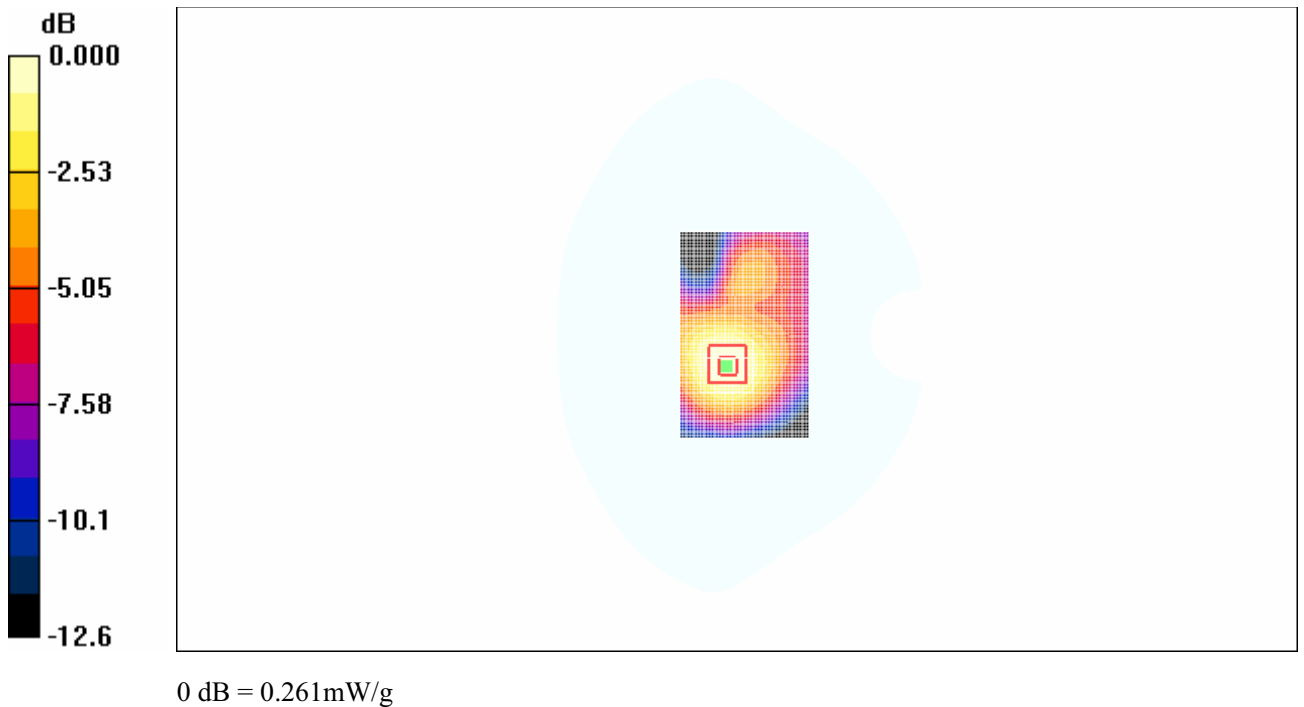


Fig. 39 1900 MHz CH661

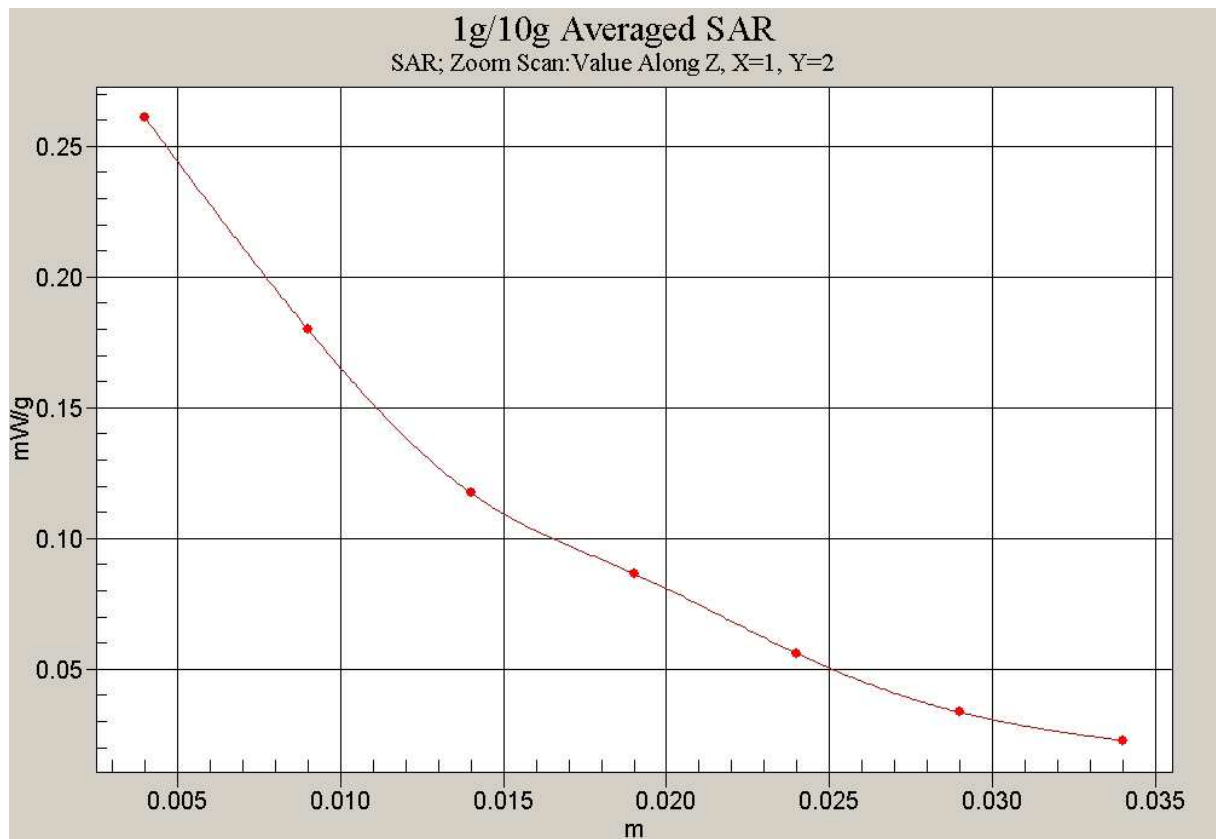


Fig. 40 Z-Scan at power reference point (1900 MHz CH661)

1900 Body Towards Phantom Low with GPRS

Date/Time: 2007-12-14 10:26:09

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.336 mW/g

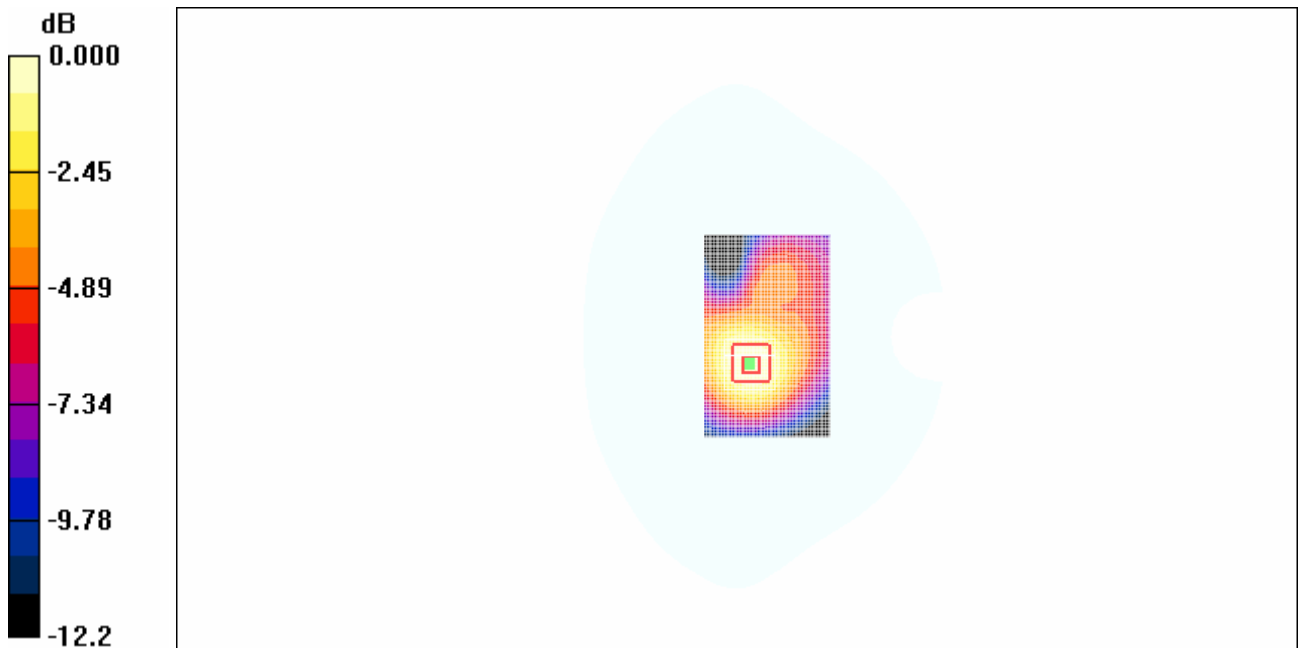
Toward Phantom Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.6 V/m; Power Drift = -0.035 dB

Peak SAR (extrapolated) = 0.464 W/kg

SAR(1 g) = 0.310 mW/g; SAR(10 g) = 0.198 mW/g

Maximum value of SAR (measured) = 0.314 mW/g



0 dB = 0.314mW/g

Fig.41 1900 MHz CH512

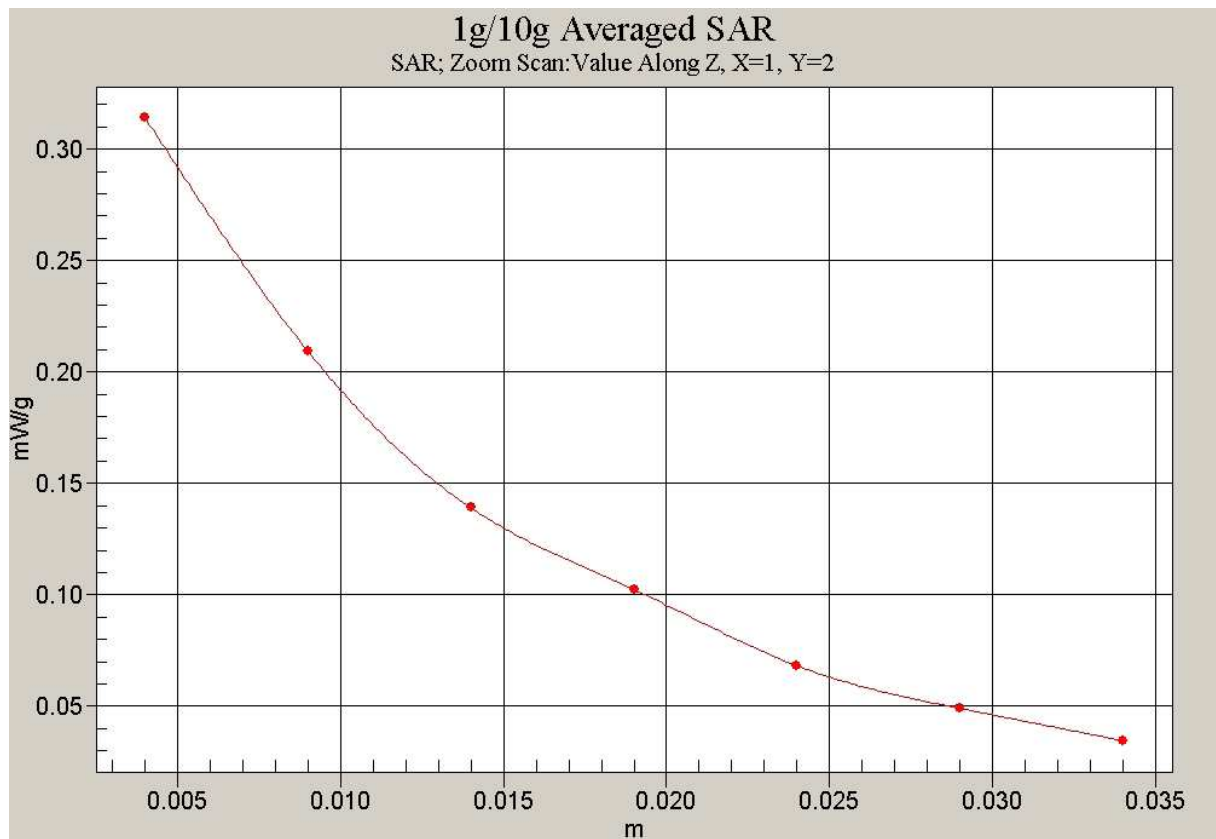


Fig. 42 Z-Scan at power reference point (1900 MHz CH512)

1900 Body Towards Ground High with GPRS

Date/Time: 2007-12-14 9:11:09

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1909.8 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 0.658 mW/g

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

Reference Value = 18.1 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 1.01 W/kg

SAR(1 g) = 0.569 mW/g; SAR(10 g) = 0.320 mW/g

Maximum value of SAR (measured) = 0.574 mW/g

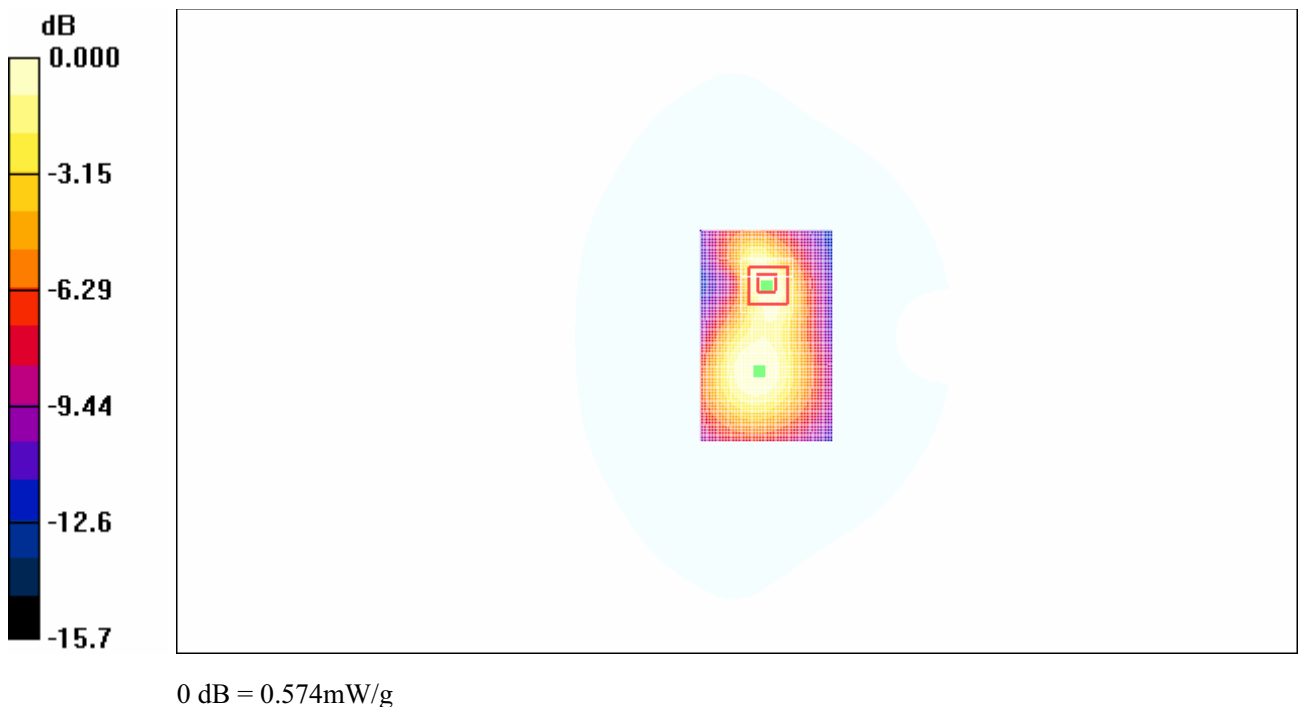


Fig. 43 1900 MHz CH810

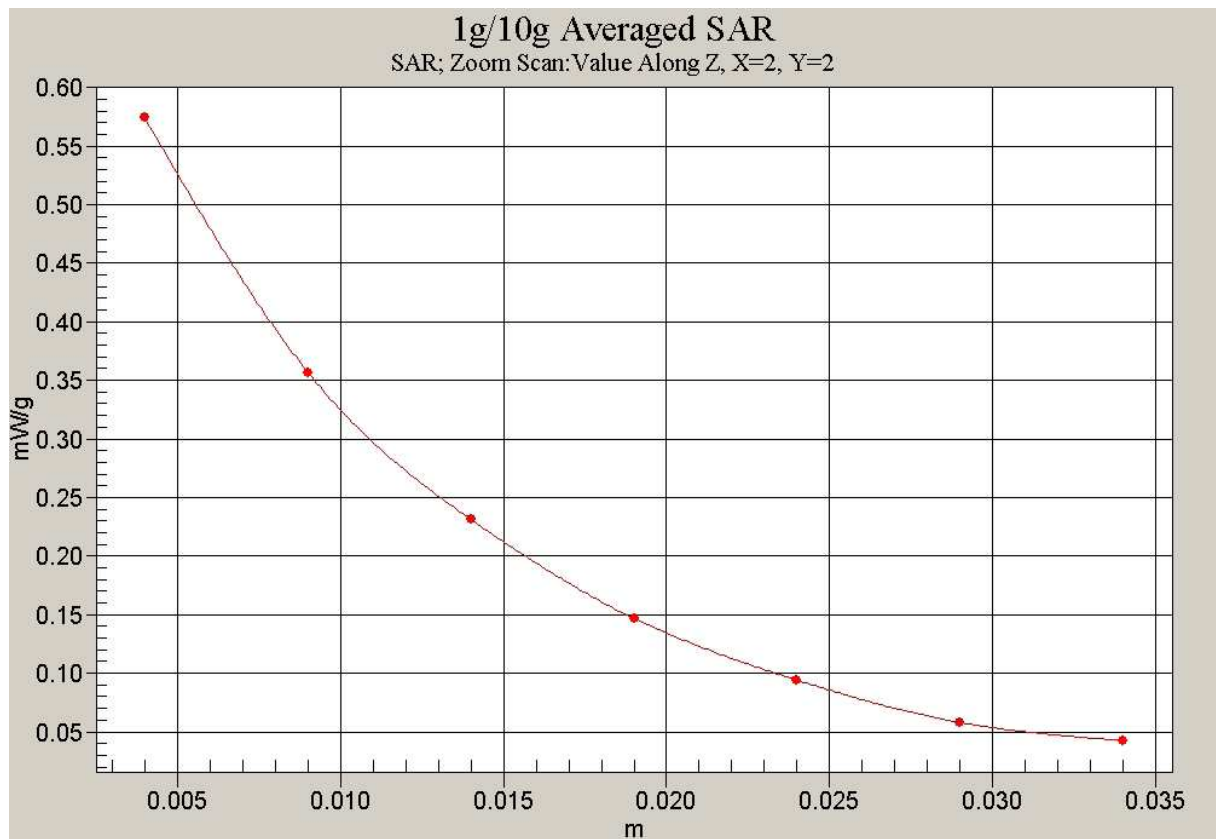


Fig. 44 Z-Scan at power reference point (1900 MHz CH810)

1900 Body Towards Ground Middle with GPRS

Date/Time: 2007-12-14 9:26:16

Electronics: DAE4 Sn536

Medium: Body 1900 MHz

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1880 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

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

Maximum value of SAR (interpolated) = 1.07 mW/g

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

Reference Value = 22.4 V/m; Power Drift = -0.029 dB

Peak SAR (extrapolated) = 1.53 W/kg

SAR(1 g) = 0.887 mW/g; SAR(10 g) = 0.502 mW/g

Maximum value of SAR (measured) = 0.926 mW/g

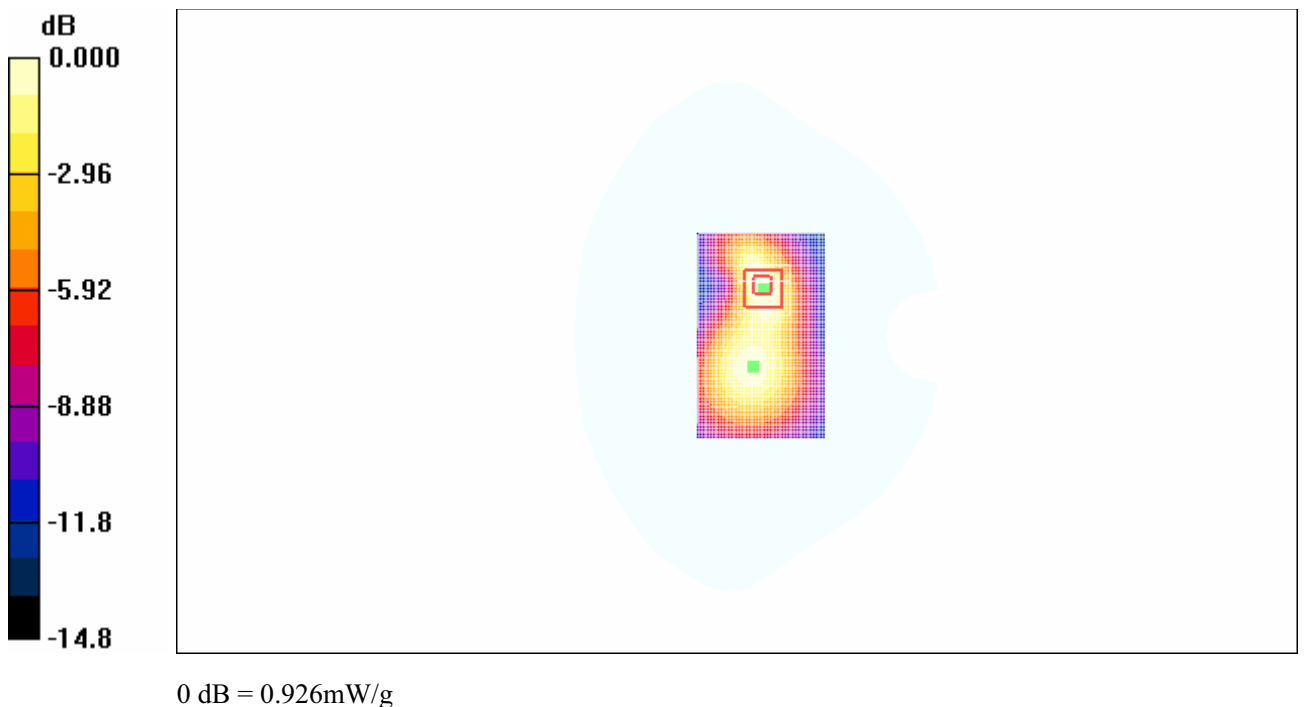


Fig. 45 1900 MHz CH661

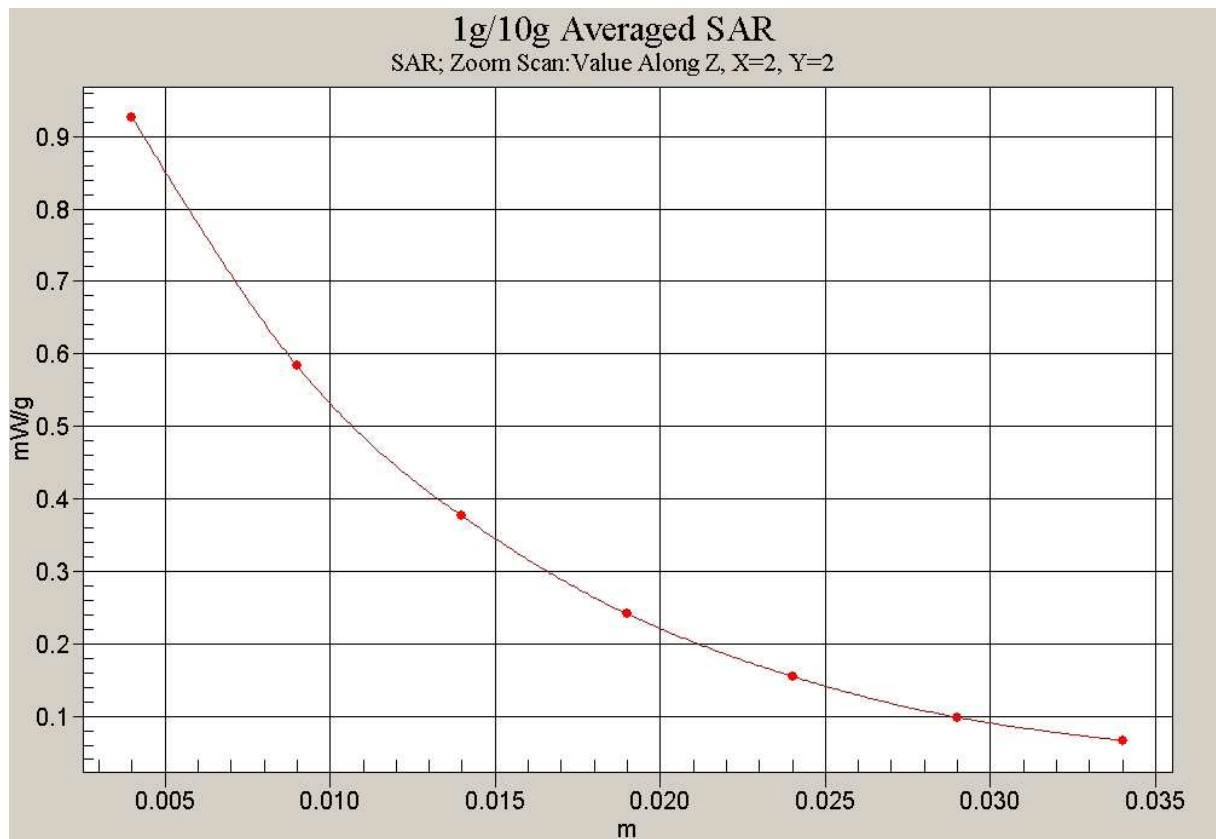


Fig. 46 Z-Scan at power reference point (1900 MHz CH661)

1900 Body Towards Ground Low with GPRS

Date/Time: 2007-12-14 9:40:06

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

Toward Ground Low/Area Scan (51x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.27 mW/g

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

Reference Value = 24.2 V/m; Power Drift = -0.089 dB

Peak SAR (extrapolated) = 1.83 W/kg

SAR(1 g) = 1.06 mW/g; SAR(10 g) = 0.598 mW/g

Maximum value of SAR (measured) = 1.09 mW/g

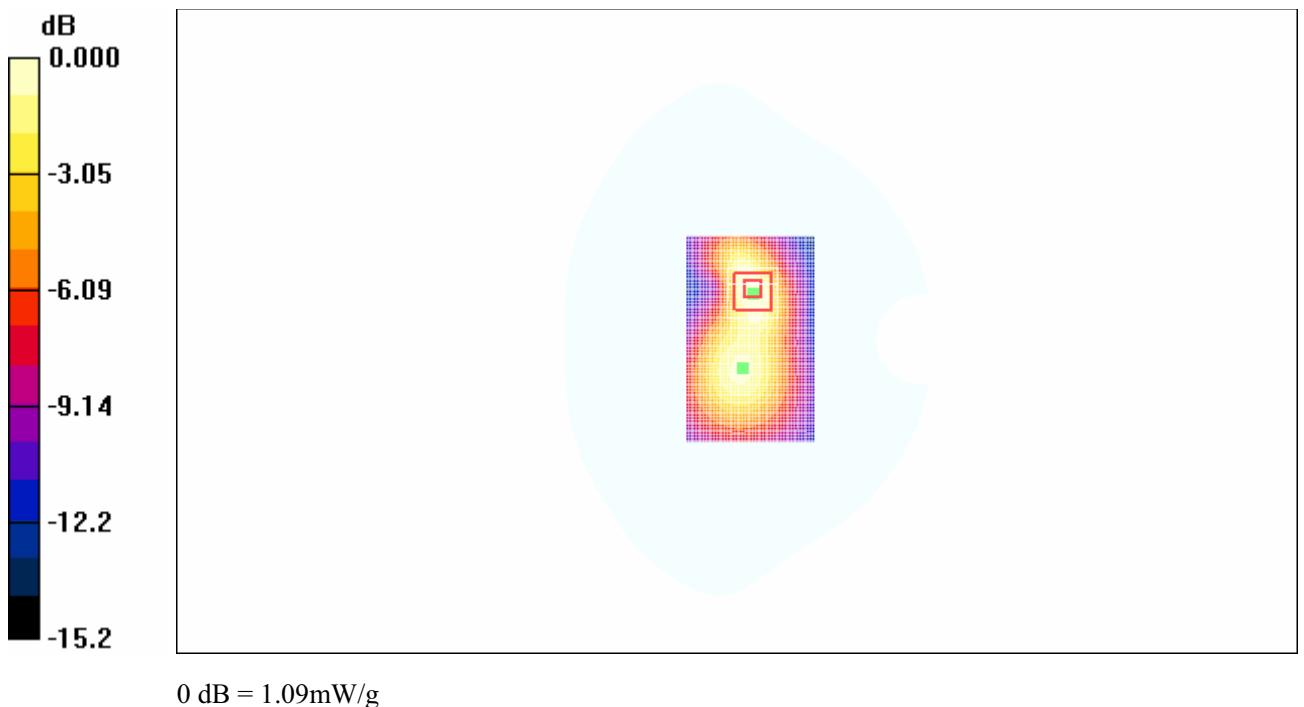


Fig. 47 1900 MHz CH512

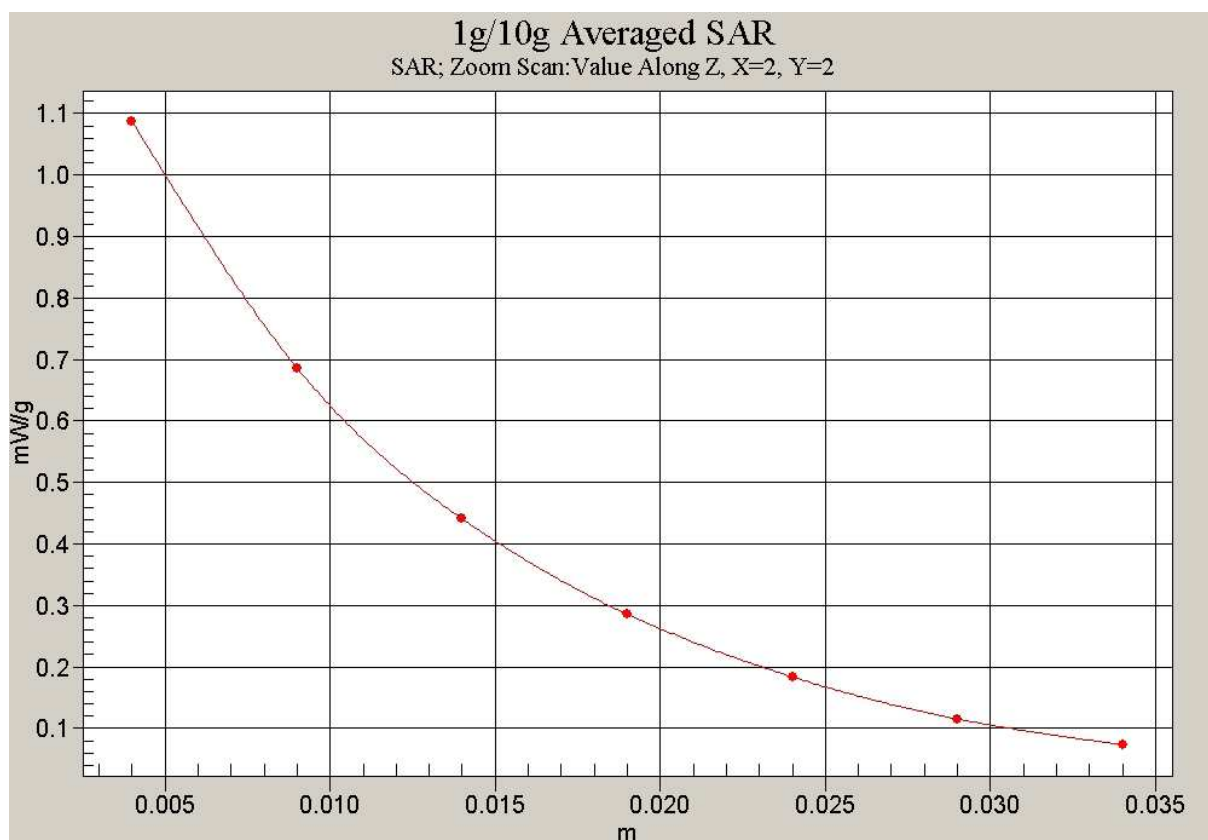


Fig. 48 Z-Scan at power reference point (1900 MHz CH512)

1900 Body Towards Ground Low with EGPRS

Date/Time: 2007-12-14 10:41:14

Electronics: DAE4 Sn777

Medium: Body 1900 MHz

Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

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

Communication System: GSM 1900MHz GPRS Frequency: 1850.2 MHz Duty Cycle: 1:4

Probe: ES3DV3 – SN3142 ConvF(4.61, 4.61, 4.61)

Toward Ground Low/Area Scan (51x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.599 mW/g

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

Reference Value = 16.6 V/m; Power Drift = -0.200 dB

Peak SAR (extrapolated) = 0.850 W/kg

SAR(1 g) = 0.498 mW/g; SAR(10 g) = 0.282 mW/g

Maximum value of SAR (measured) = 0.511 mW/g

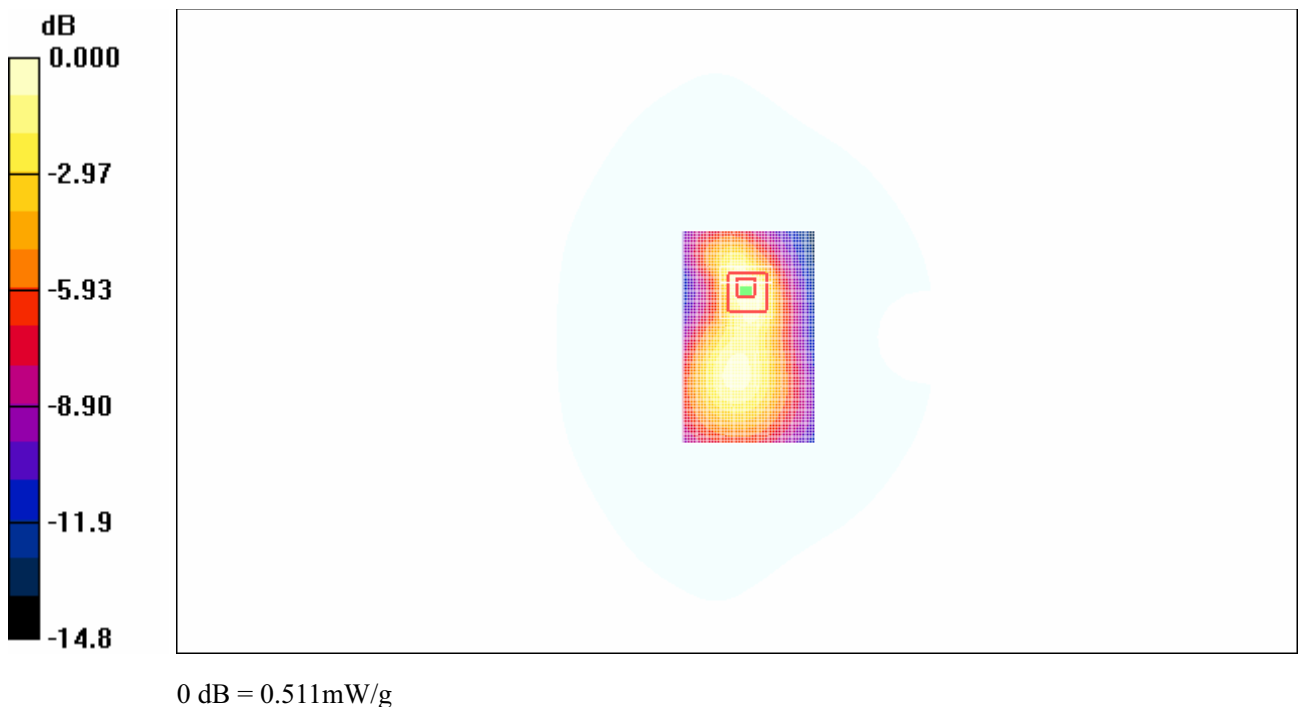


Fig. 49 1900 MHz CH512

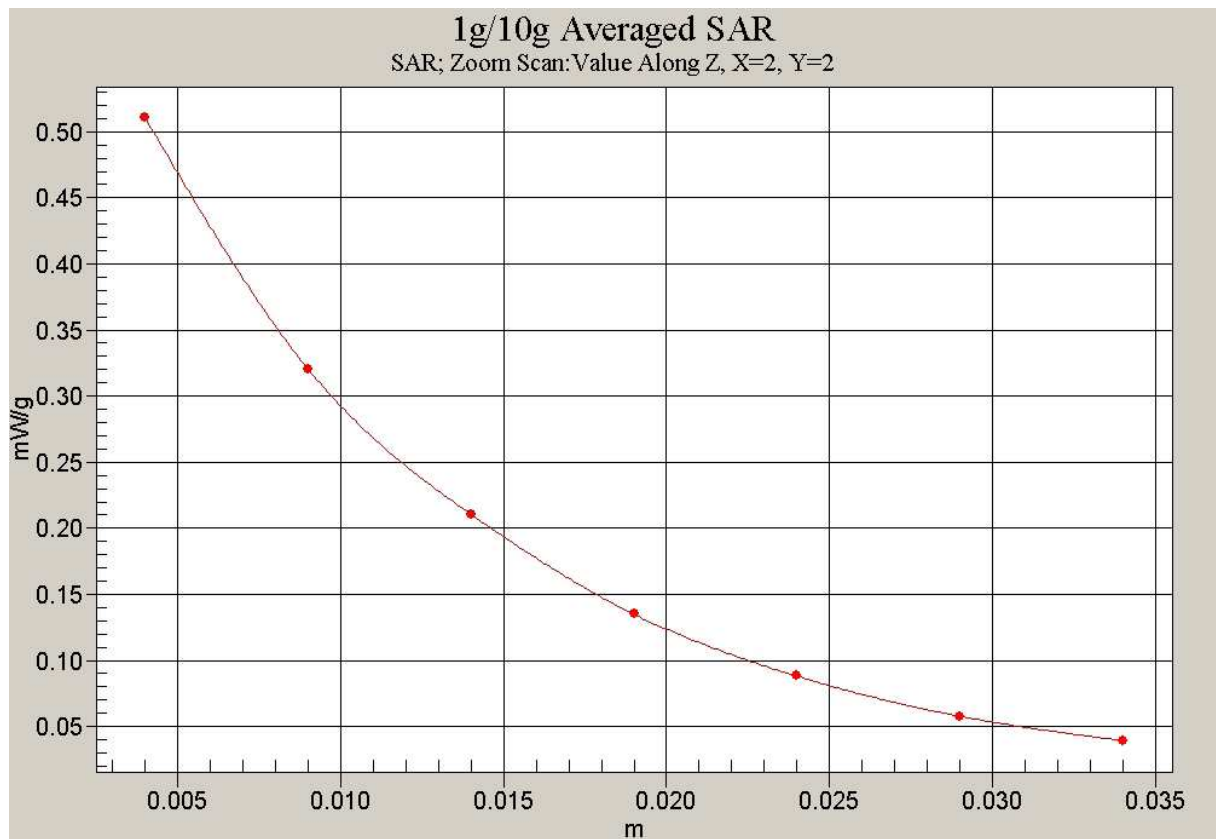


Fig. 50 Z-Scan at power reference point (1900 MHz CH512)

ANNEX D: SYSTEM VALIDATION RESULTS

1900MHz Results

Date/Time: 2007-12-14 07:50:29

Electronics: DAE4 Sn777

Medium: Head 1900 MHz

Medium parameters used (interpolated): $f = 1900\text{MHz}$; $\sigma = 1.38\text{ mho/m}$; $\epsilon_r = 40.9$; $\rho = 1000\text{ kg/m}^3$

Ambient Temperature: 23.3°C Liquid Temperature: 22.3°C

Communication System: CW Frequency: 1900 MHz Duty Cycle: 1:1

Probe: ES3DV3 – SN3142 ConvF(4.87, 4.87, 4.87)

System Validation/Area Scan (101x101x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
Maximum value of SAR (interpolated) = 11.2 mW/g

System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 92.1 V/m ; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 9.91 mW/g ; SAR(10 g) = 5.27 mW/g

Maximum value of SAR (measured) = 11.3 mW/g

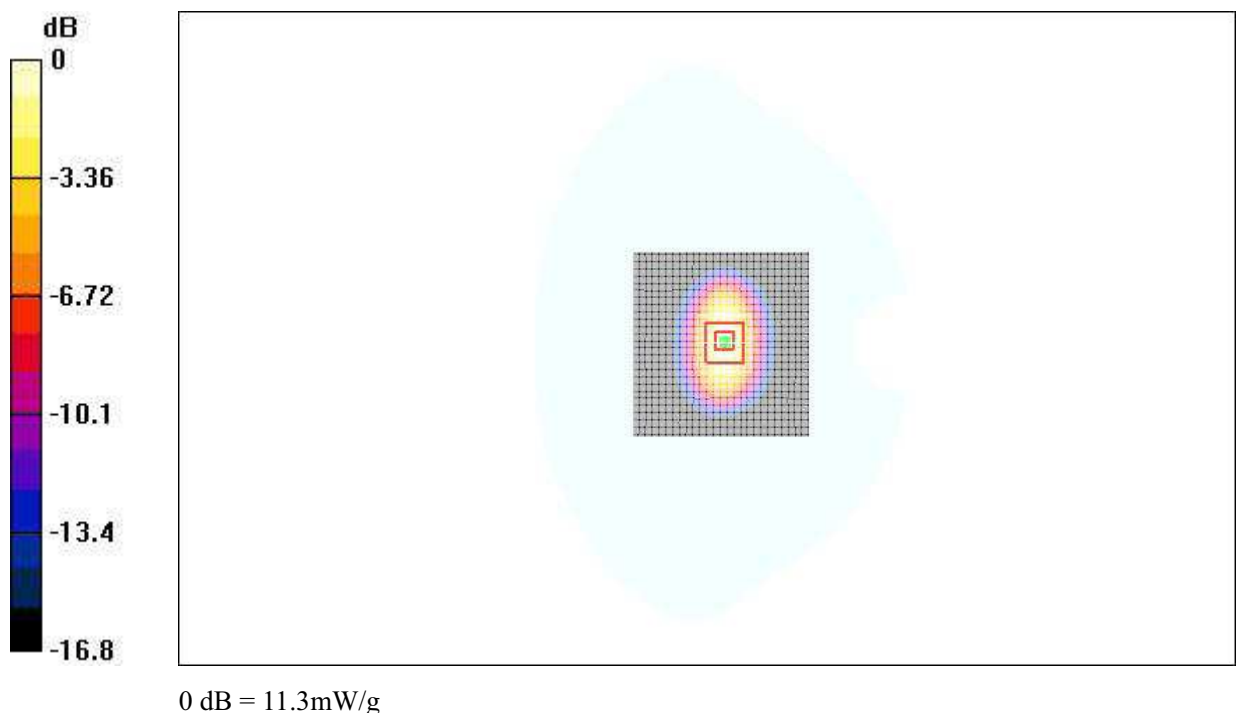


Fig.51 validation 1900MHz 250mW

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 Beijing**

Certificate No: **ES3-3142_Sep07**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3142**

Calibration procedure(s) **QA CAL-01.v6 and QA CAL-12.v5
Calibration procedure for dosimetric E-field probes**

Calibration date: **September 7, 2007**

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 meter E4419B	GB41293874	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Jan-08
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: September 10, 2007

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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
ConF	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:

- a) 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
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

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.

ES3DV3 SN:3142

September 7, 2007

Probe ES3DV3

SN:3142

Manufactured:

March 13, 2007

Calibrated:

September 7, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ES3DV3 SN:3142

September 7, 2007

DASY - Parameters of Probe: ES3DV3 SN:3142

Sensitivity in Free Space^A

NormX	1.21 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.28 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.15 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression^B

DCP X	96 mV
DCP Y	95 mV
DCP Z	96 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	3.0 mm	4.0 mm
SAR _{be} [%] Without Correction Algorithm	2.6	0.8
SAR _{be} [%] With Correction Algorithm	0.0	0.4

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance	3.0 mm	4.0 mm
SAR _{be} [%] Without Correction Algorithm	7.6	4.5
SAR _{be} [%] With Correction Algorithm	0.2	0.1

Sensor Offset

Probe Tip to Sensor Center 2.0 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).

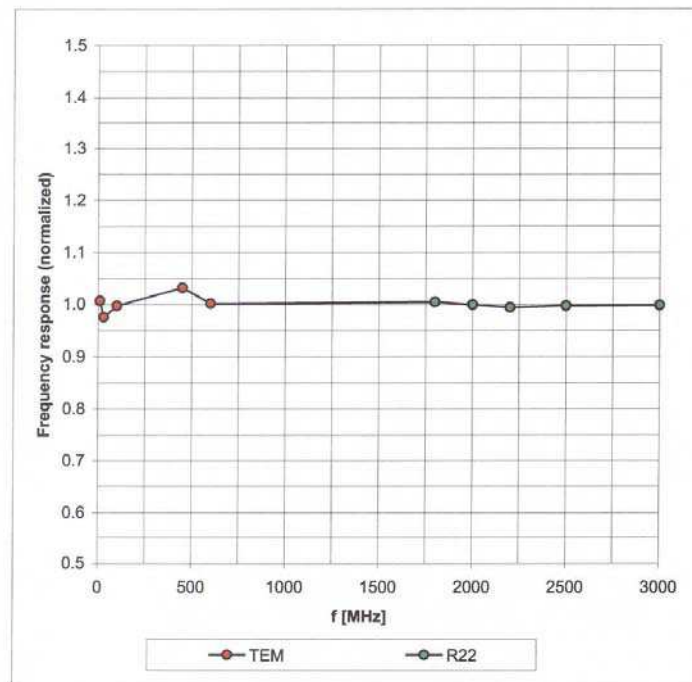
^B Numerical linearization parameter: uncertainty not required.

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Frequency Response of E-Field

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

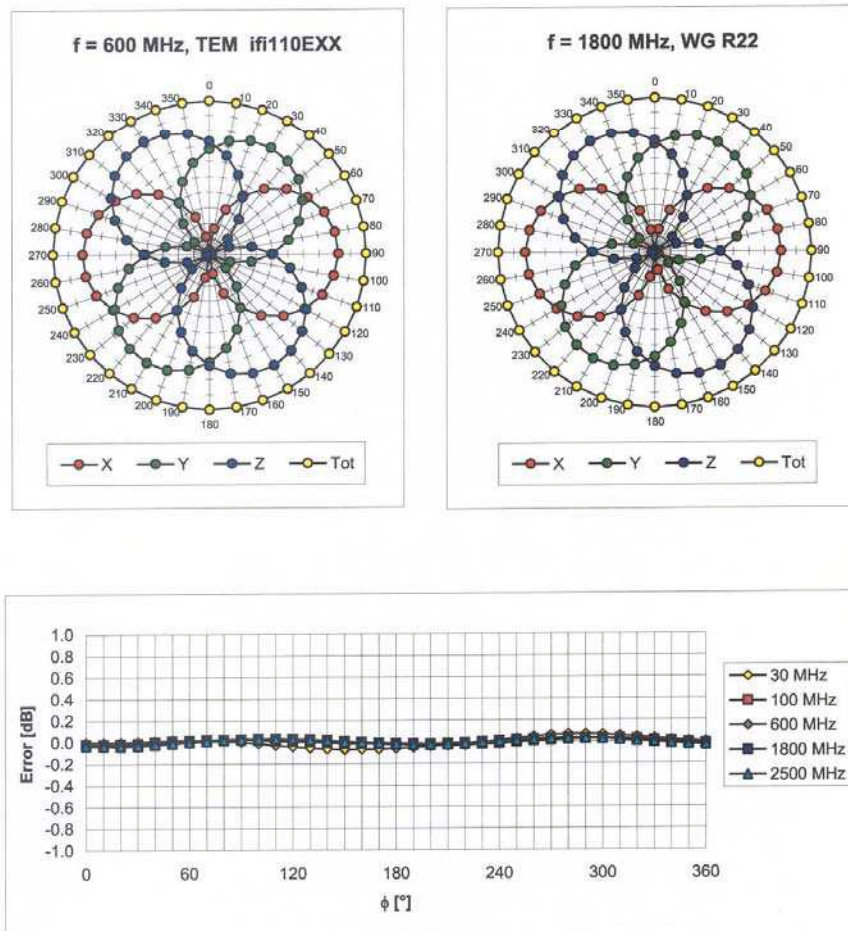


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

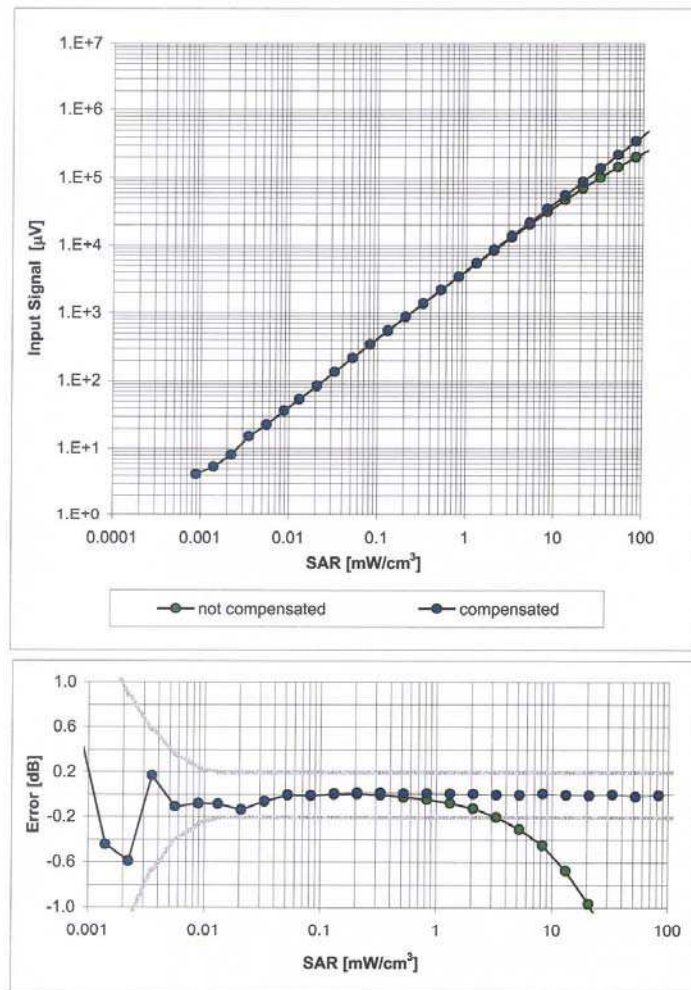


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ES3DV3 SN:3142

September 7, 2007

Dynamic Range $f(\text{SAR}_{\text{head}})$
(Waveguide R22, $f = 1800 \text{ MHz}$)

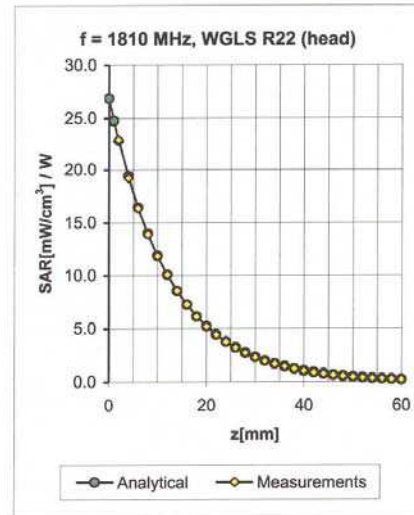
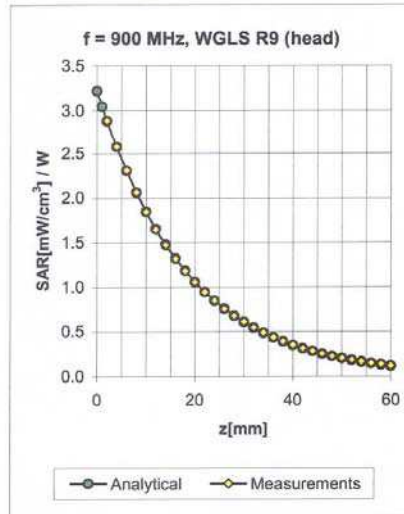


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ES3DV3 SN:3142

September 7, 2007

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.32	1.29	6.16 ± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.00	1.09	5.97 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.60	1.41	4.87 ± 11.0% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.24	1.24	6.68 ± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.94	1.16	5.66 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.73	1.33	4.61 ± 11.0% (k=2)

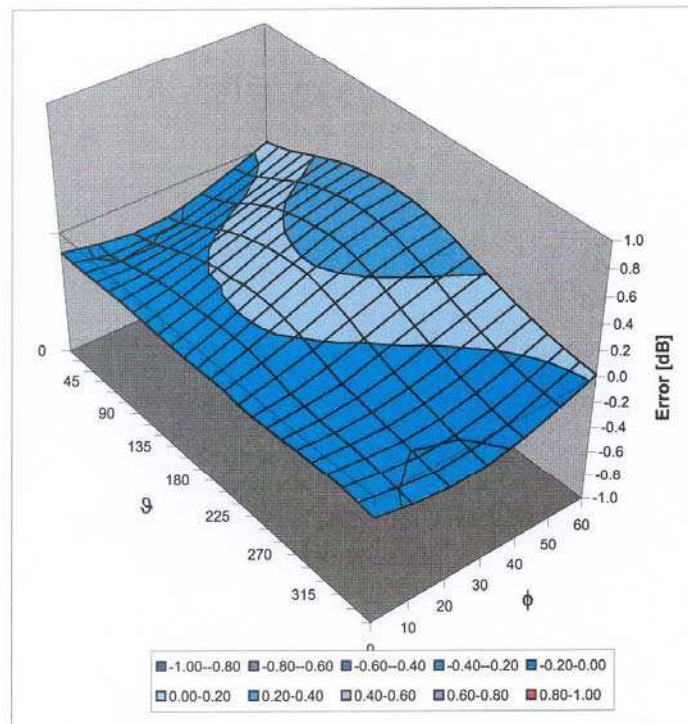
^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ES3DV3 SN:3142

September 7, 2007

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

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Accreditation No.: SCS 108

Client: TMC China

Certificate No.: D1900V2-541_Feb07

CALIBRATION CERTIFICATE

Object	D1900V2-SN: 541
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	February 20, 2007
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 at an environment temperature (22±3)°C and humidity<70%

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID#	Cal Data (Calibrated by, Certification NO.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	03-Oct-06 (METAS, NO. 217-00608)	Oct-07
Power sensor 8481A	US37282783	03-Oct-06 (METAS, NO. 217-00608)	Oct-07
Reference 20 dB Attenuator	SN:5086 (20g)	10-Aug-06 (METAS, NO. 217-00591)	Aug-07
Reference 10 dB Attenuator	SN:5047_2 (10r)	10-Aug-06 (METAS, NO. 217-00591)	Aug-07
DAE4	SN:501	30-Jan-07 (SPEAG, NO. DAE4-601_Jan07)	Jan-08
Reference Probe ET3DV6 (HF)	SN: 1507	16-Oct-06 (SPEAG, NO. ET3-1507_Oct06)	Oct-07
Secondary Standards	ID#	Check Data (in house)	Scheduled Calibration
Power sensor HP 8481A	MY41082317	18-Oct-02(SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000676	11-May-05(SPEAG, in house check Nov-05)	In house check: Nov -07
Network Analyzer HP 8753E	US37390585S4206	18-Oct-01(SPEAG, in house check Oct-06)	In house check: Oct-07

Calibrated by:	Name Marcel Fehr	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Director	

Issued: February 21, 2007

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

Certificate No.: D1900V2-541_Feb07

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Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
ConvF	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 50381, "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	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.9 $\pm$ 6 %	1.38 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.1 $\pm$ 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	9.73 mW /g
SAR normalized	normalized to 1W	38.9 mW /g
SAR for nominal Head TSL parameters ¹	normalized to 1W	38.6 mW / g $\pm$ 17.8 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.09 mW /g
SAR normalized	normalized to 1W	20.4 mW /g
SAR for nominal Head TSL parameters ¹	normalized to 1W	20.2 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	48.4 Ω - 8.9 j Ω
Return Loss	- 26.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.214 ns
----------------------------------	----------

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	October 4 , 2001

DASY4 Validation Report for Head TSL

Date/Time: 20.02.2007 09:25:37

Test laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; serial: D1900V2-SN: 541

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL 1900 MHz;

Medium parameters used: $f=1900$ MHz; $\sigma=1.38$ mho/m; $\epsilon_r=38.9$; $\rho=1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6-SN1507(HF); ConvF(5.03, 5.03, 5.03); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.1_2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA;
- Measurement SW: DASY, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

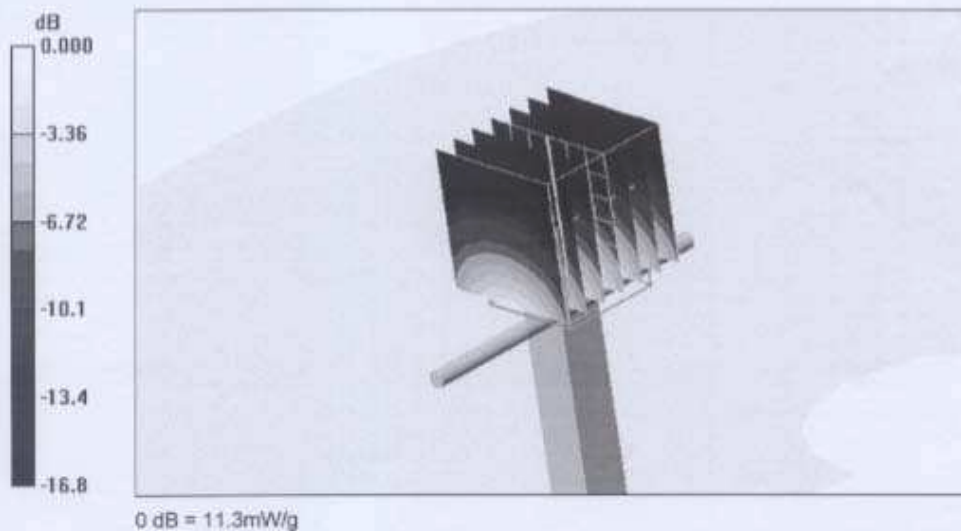
$P_{in} = 250$ mW; $d = 15$ mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 92.1 V/m; Power Drift = 0.059 dB

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 9.73 mW/g; SAR(10 g) = 5.09 mW/g

Maximum value of SAR (measured) = 11.3 mW/g



Impedance measurement Plot for Head TSL

