

WCDMA Band V Right Cheek High Close

Communication System: WCDMA Band V; Frequency: 846.6 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 847$ MHz; $\sigma = 0.947$ mho/m; $\epsilon_r = 42.8$; $\rho = 1000$ kg/m³
Probe: ET3DV6 - SN1531; ConvF(6.85, 6.85, 6.85);
Electronics: DAE4 Sn452;

Cheek High/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.221 mW/g

Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.09 V/m; Power Drift = 0.053 dB
Peak SAR (extrapolated) = 0.274 W/kg
SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.155 mW/g
Maximum value of SAR (measured) = 0.228 mW/g

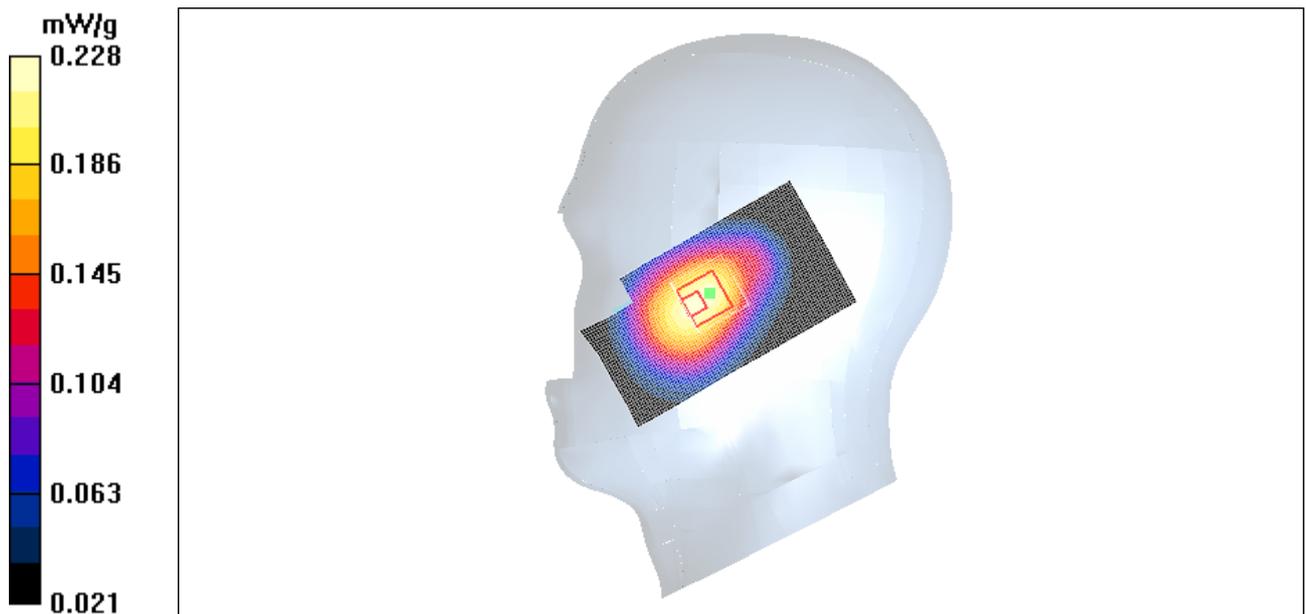


Figure 168 Right Hand Touch Cheek Close WCDMA Band V Channel 4233

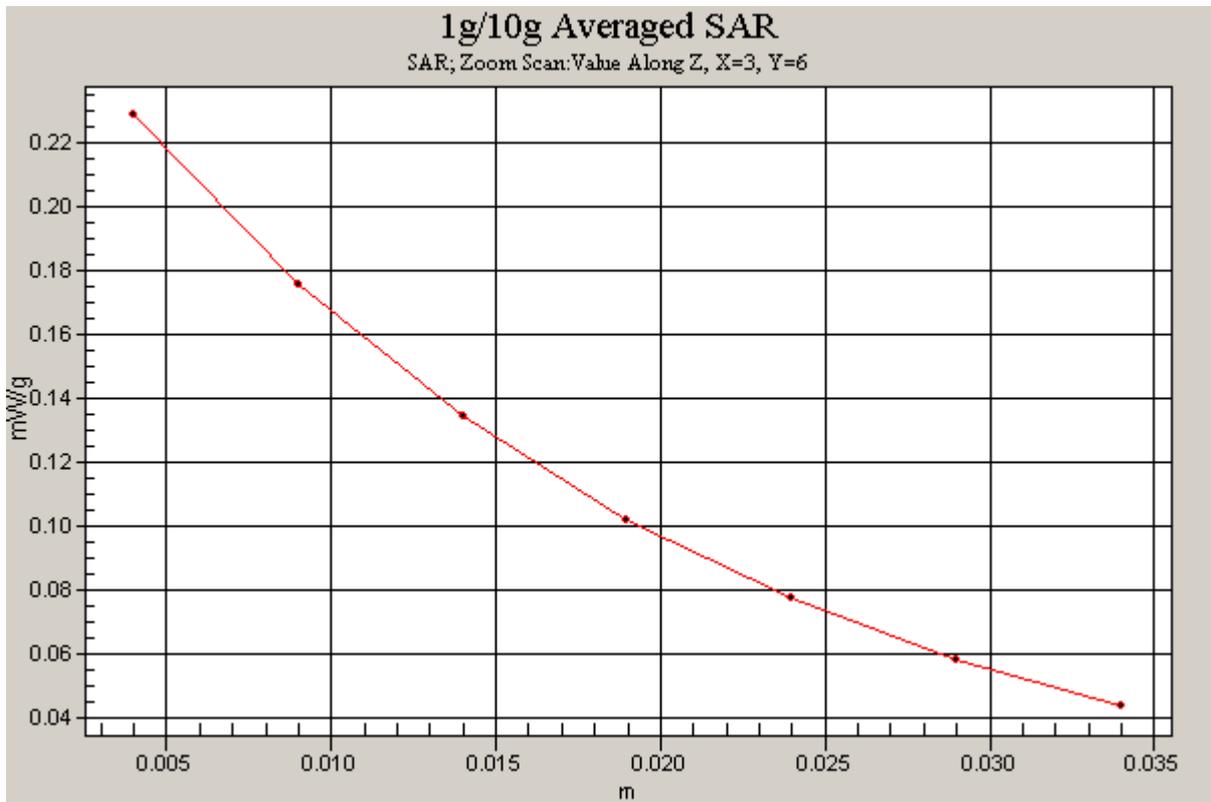


Figure 169 Z-Scan at power reference point (Right Hand Touch Cheek Close WCDMA Band V Channel 4233)

WCDMA Band V Right Cheek Middle Close

Communication System: WCDMA Band V; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.936$ mho/m; $\epsilon_r = 42.9$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.85, 6.85, 6.85);

Electronics: DAE4 Sn452;

Cheek Middle/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.195 mW/g

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

Reference Value = 8.62 V/m; Power Drift = -0.088 dB

Peak SAR (extrapolated) = 0.239 W/kg

SAR(1 g) = 0.189 mW/g; SAR(10 g) = 0.139 mW/g

Maximum value of SAR (measured) = 0.201 mW/g

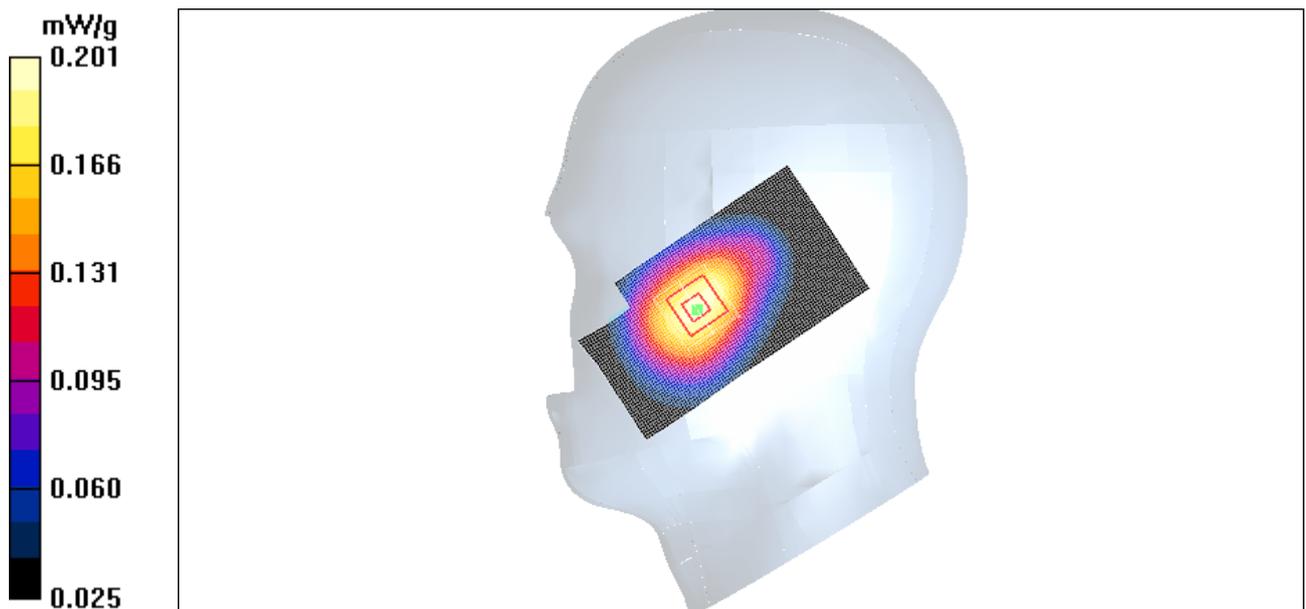


Figure 170 Right Hand Touch Cheek Close WCDMA Band V Channel 4182

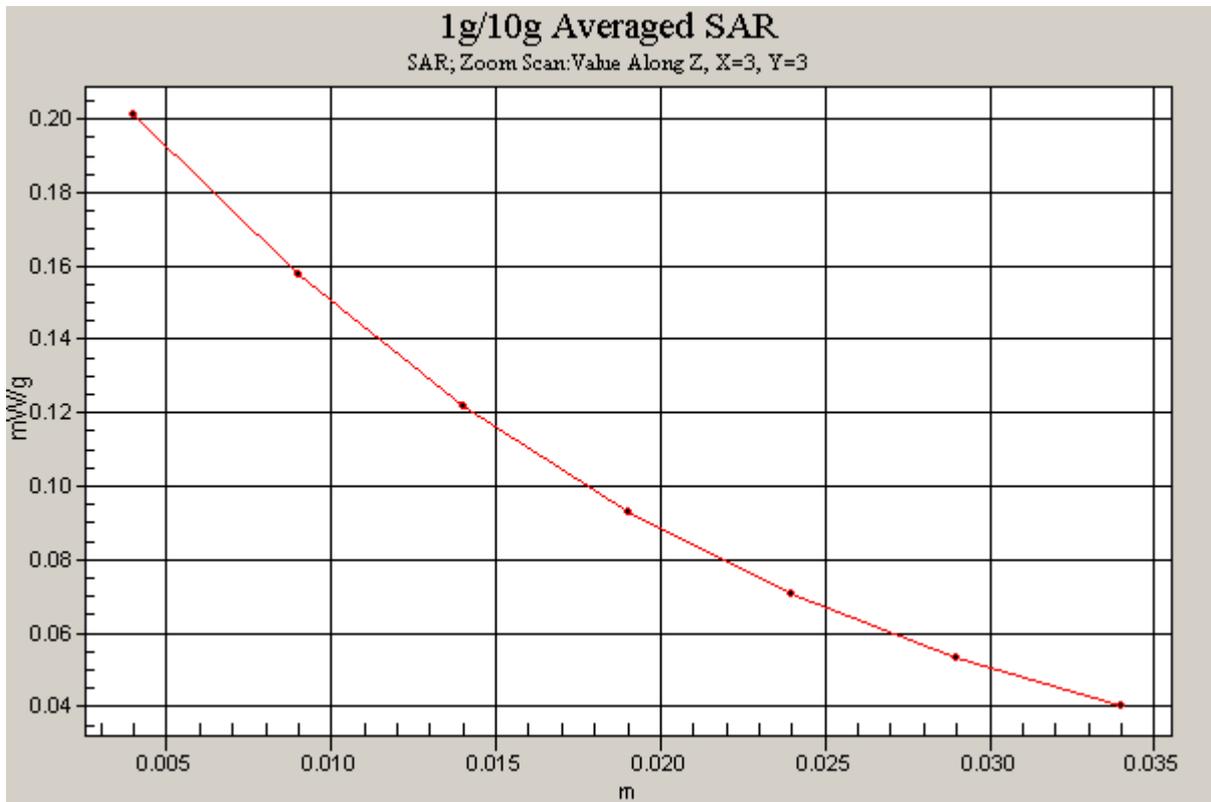


Figure 171 Z-Scan at power reference point (Right Hand Touch Cheek Close WCDMA Band V Channel 4182)

WCDMA Band V Right Cheek Low Close

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 0.923$ mho/m; $\epsilon_r = 43.1$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.85, 6.85, 6.85);

Electronics: DAE4 Sn452;

Cheek Low/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.219 mW/g

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

Reference Value = 8.93 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 0.265 W/kg

SAR(1 g) = 0.209 mW/g; SAR(10 g) = 0.154 mW/g

Maximum value of SAR (measured) = 0.220 mW/g

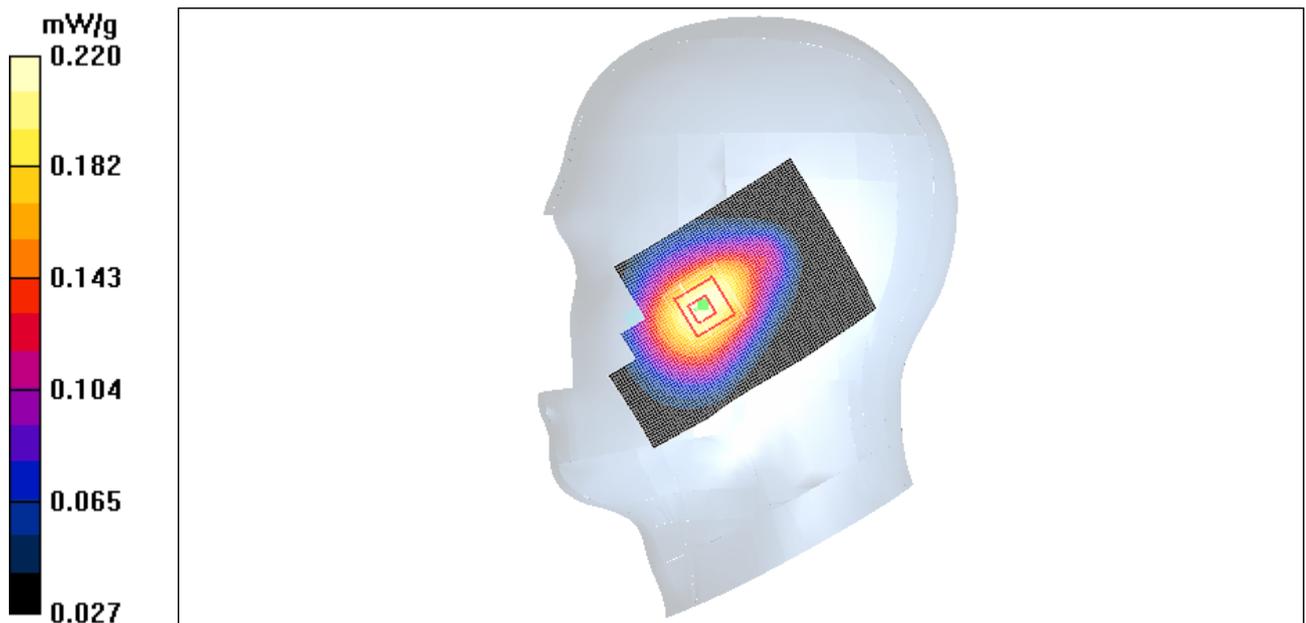


Figure 172 Right Hand Touch Cheek Close WCDMA Band V Channel 4132

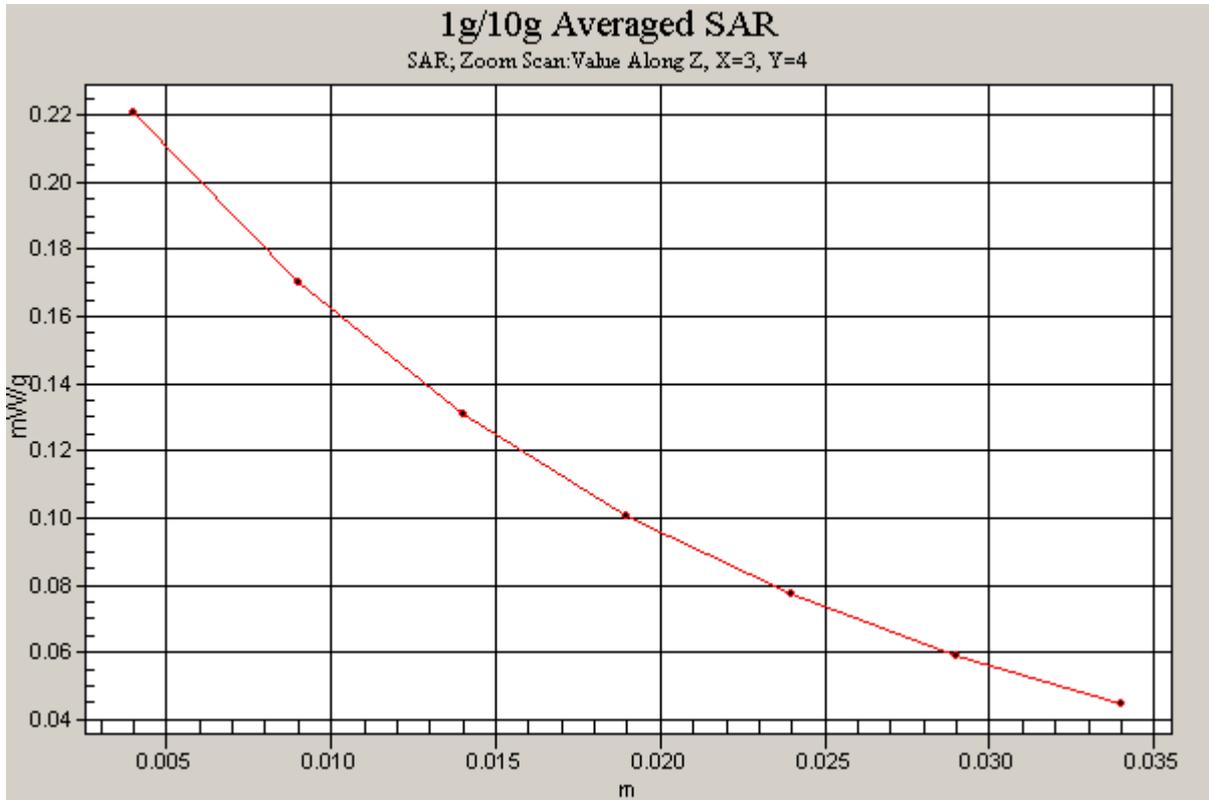


Figure 173 Z-Scan at power reference point (Right Hand Touch Cheek Close WCDMA Band V Channel 4132)

WCDMA Band V Right Tilt High Close

Communication System: WCDMA Band V; Frequency: 846.6 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 847$ MHz; $\sigma = 0.947$ mho/m; $\epsilon_r = 42.8$; $\rho = 1000$ kg/m³
Probe: ET3DV6 - SN1531; ConvF(6.85, 6.85, 6.85);
Electronics: DAE4 Sn452;

Tilt High/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.176 mW/g

Tilt High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.5 V/m; Power Drift = -0.079 dB
Peak SAR (extrapolated) = 0.217 W/kg
SAR(1 g) = 0.164 mW/g; SAR(10 g) = 0.119 mW/g
Maximum value of SAR (measured) = 0.174 mW/g

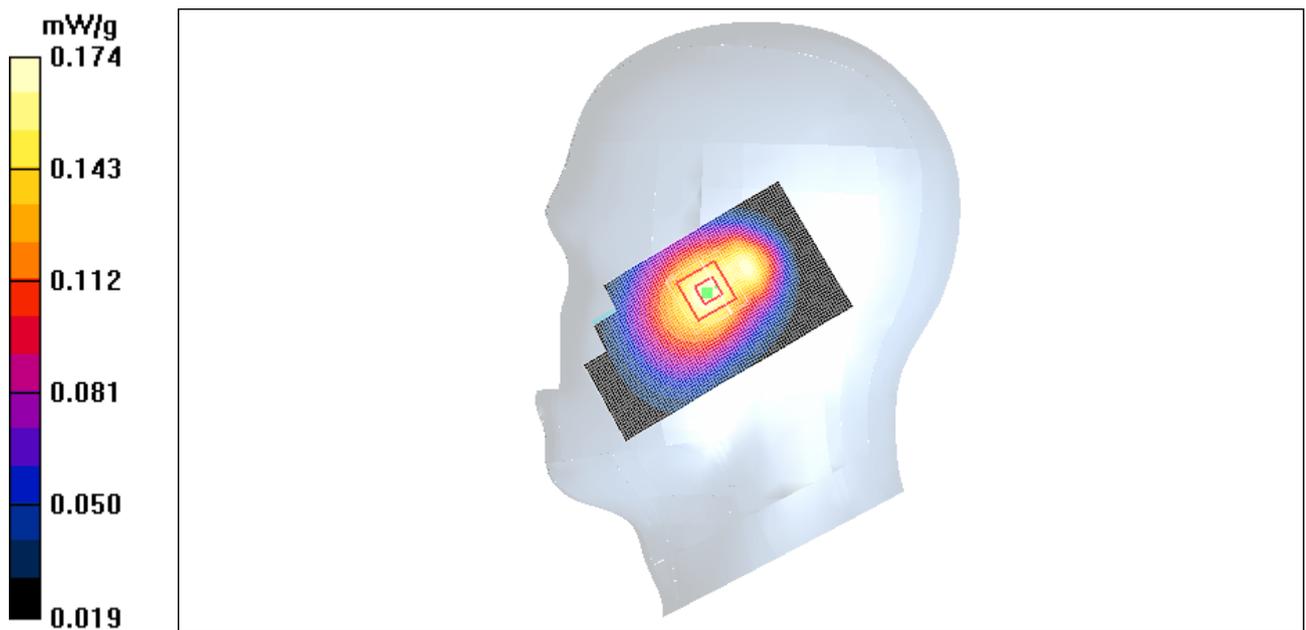


Figure 174 Right Hand Tilt 15 ° Close WCDMA Band V Channel 4233

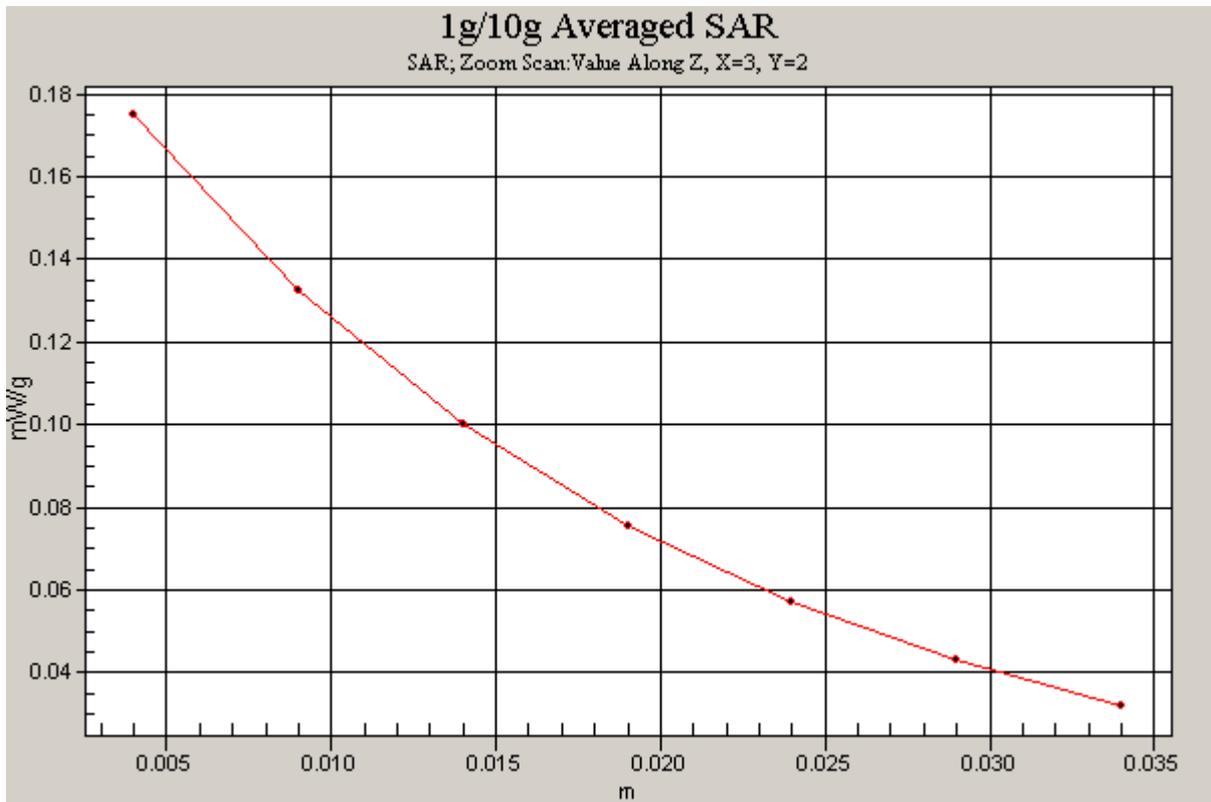


Figure 175 Z-Scan at power reference point (Right Hand Tilt 15 ° Close WCDMA Band V Channel 4233)

WCDMA Band V Right Tilt Middle Close

Communication System: WCDMA Band V; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 0.936$ mho/m; $\epsilon_r = 42.9$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.85, 6.85, 6.85);

Electronics: DAE4 Sn452;

Tilt Middle/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.163 mW/g

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

Reference Value = 12.0 V/m; Power Drift = -0.068 dB

Peak SAR (extrapolated) = 0.199 W/kg

SAR(1 g) = 0.152 mW/g; SAR(10 g) = 0.109 mW/g

Maximum value of SAR (measured) = 0.160 mW/g

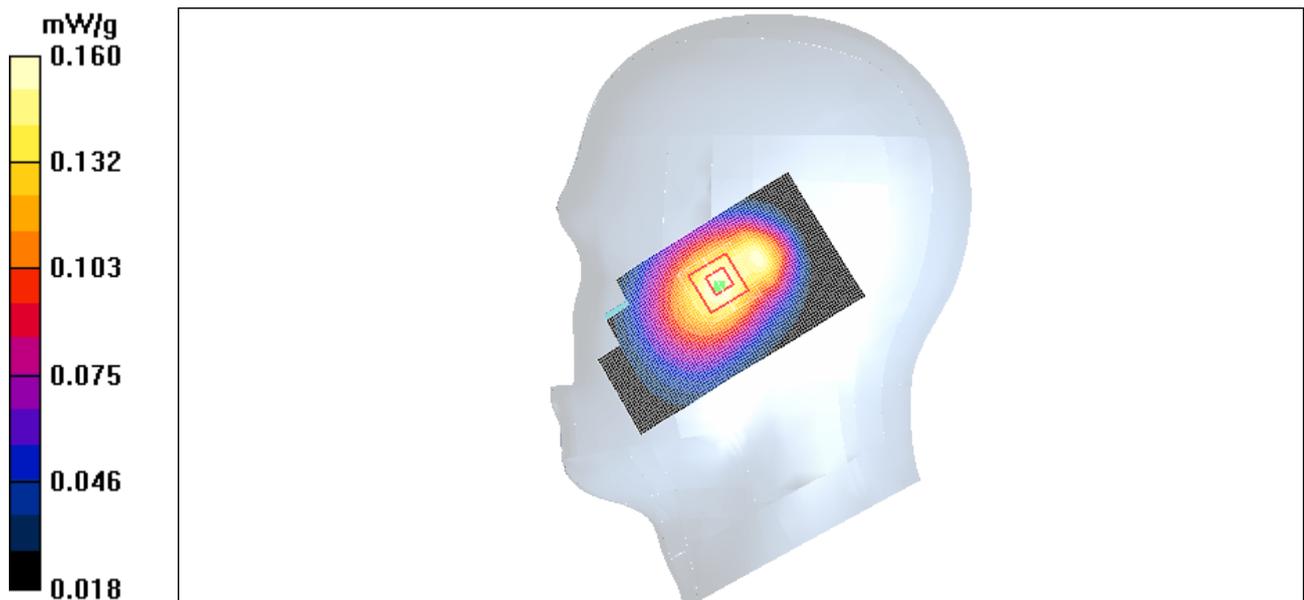


Figure 176 Right Hand Tilt 15 ° Close WCDMA Band V Channel 4182

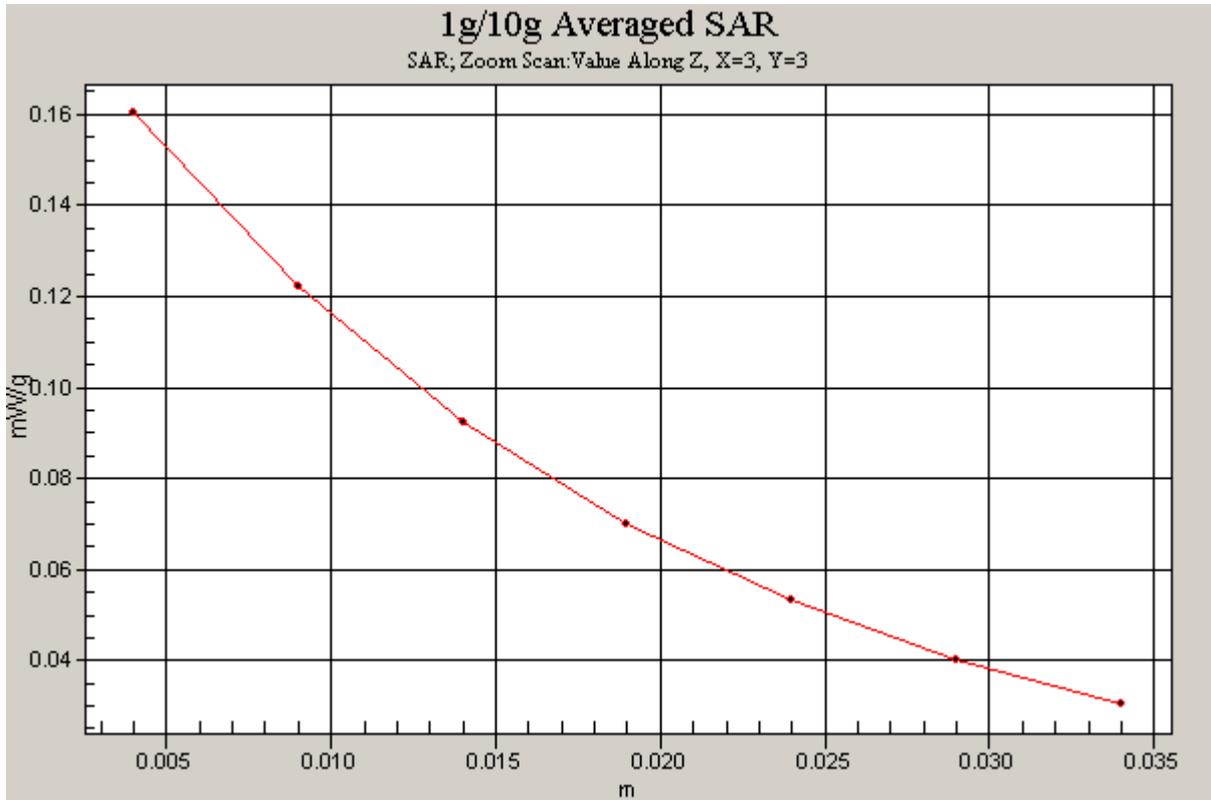


Figure 177 Z-Scan at power reference point (Right Hand Tilt 15 ° Close WCDMA Band V Channel 4182)

WCDMA Band V Right Tilt Low Close

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 0.923$ mho/m; $\epsilon_r = 43.1$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.85, 6.85, 6.85);

Electronics: DAE4 Sn452;

Tilt Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.175 mW/g

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

Reference Value = 12.5 V/m; Power Drift = 0.021 dB

Peak SAR (extrapolated) = 0.213 W/kg

SAR(1 g) = 0.164 mW/g; SAR(10 g) = 0.118 mW/g

Maximum value of SAR (measured) = 0.175 mW/g

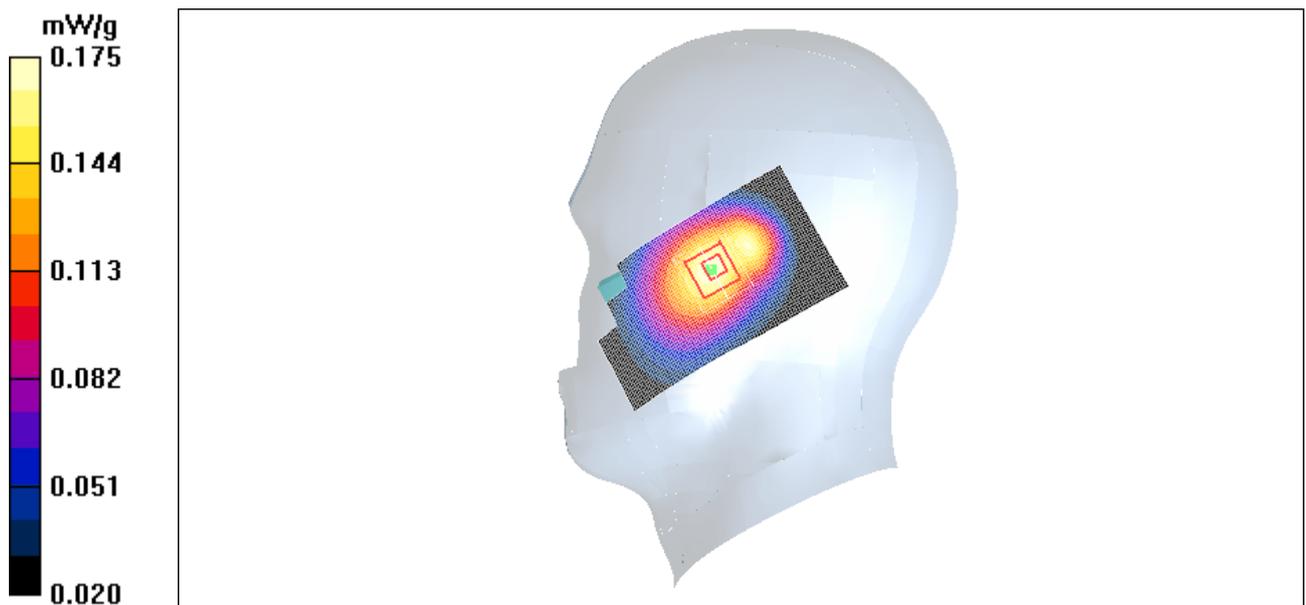


Figure 178 Right Hand Tilt 15 ° Close WCDMA Band V Channel 4132

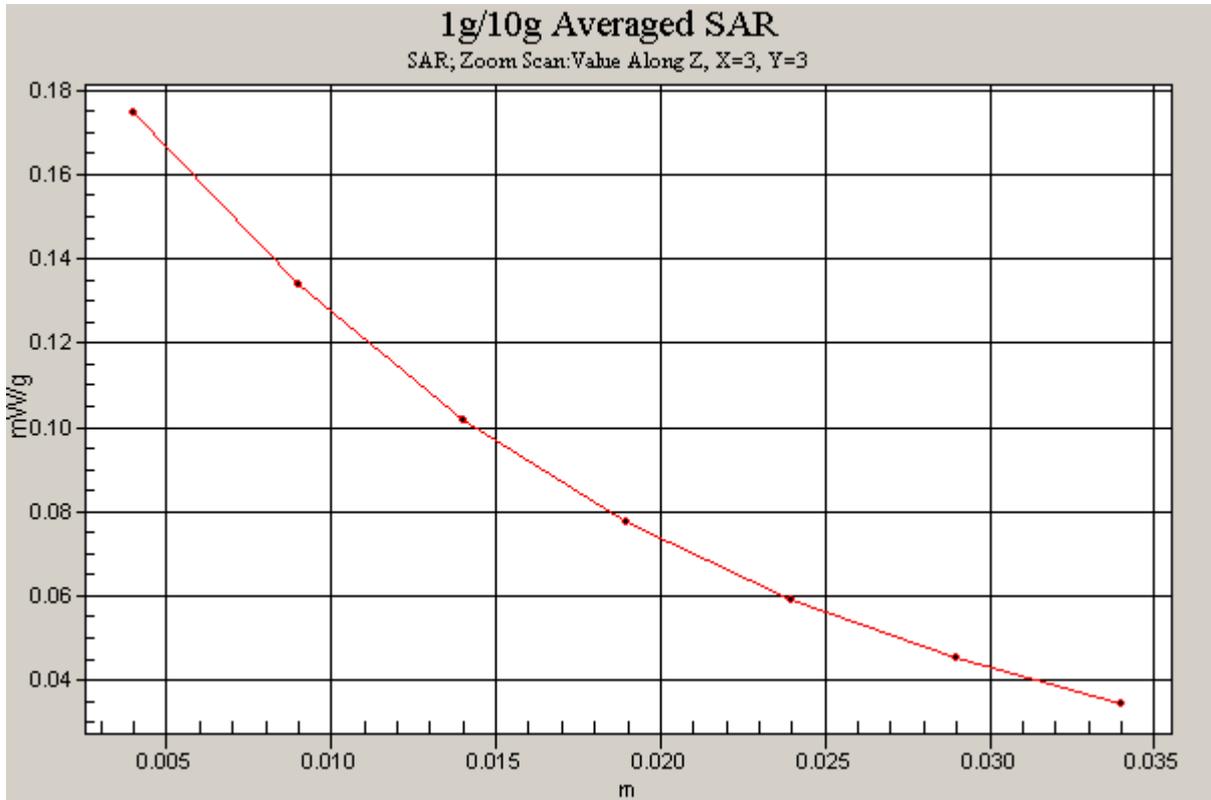


Figure 179 Z-Scan at power reference point (Right Hand Tilt 15 ° Close WCDMA Band V Channel 4132)

WCDMA Band V Towards Ground High Close

Communication System: WCDMA Band V; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 847$ MHz; $\sigma = 1.03$ mho/m; $\epsilon_r = 55.6$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

Towards Ground High 2/Area Scan (71x131x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.383 mW/g

Towards Ground High 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.65 V/m; Power Drift = -0.064 dB

Peak SAR (extrapolated) = 0.501 W/kg

SAR(1 g) = 0.360 mW/g; SAR(10 g) = 0.247 mW/g

Maximum value of SAR (measured) = 0.386 mW/g

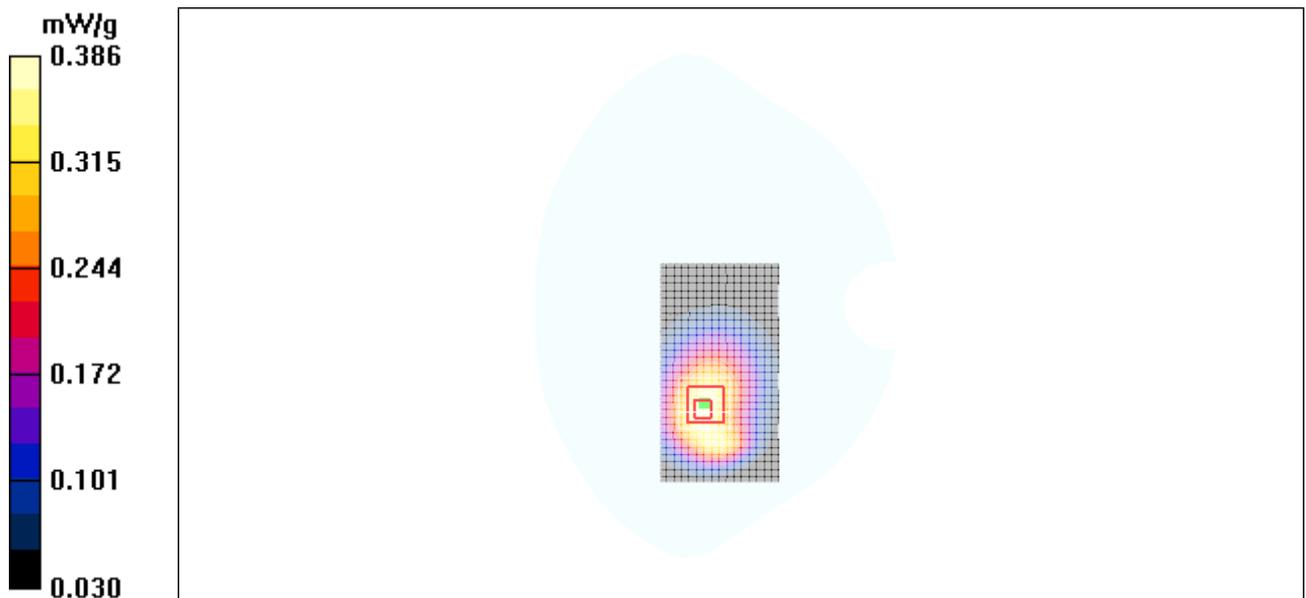


Figure 180 Body, Towards Ground, Close WCDMA Band V Channel 4233

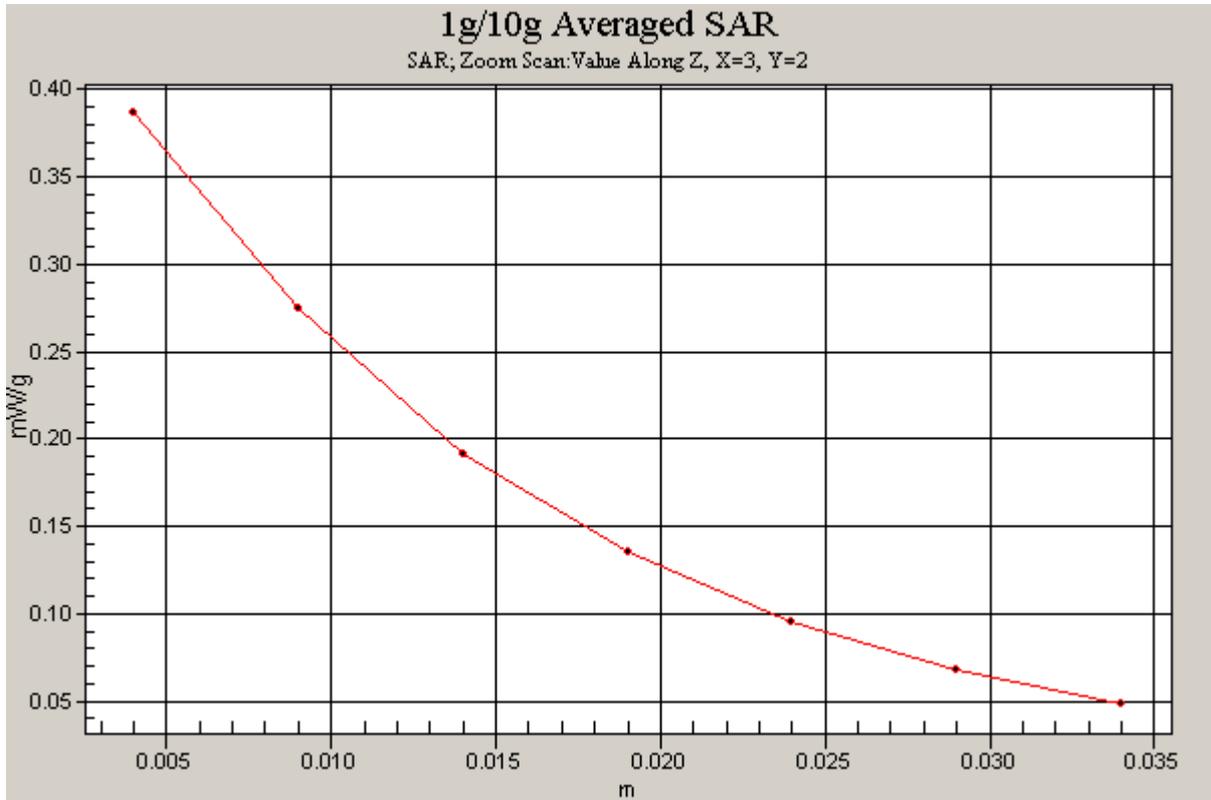


Figure 181 Z-Scan at power reference point (Body, Towards Ground, Close WCDMA Band V Channel 4233)

WCDMA Band V Towards Ground Middle Close

Communication System: WCDMA Band V; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 1.02$ mho/m; $\epsilon_r = 55.7$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

Towards Ground Middle 2/Area Scan (71x131x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.338 mW/g

Towards Ground Middle 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.02 V/m; Power Drift = 0.040 dB

Peak SAR (extrapolated) = 0.449 W/kg

SAR(1 g) = 0.313 mW/g; SAR(10 g) = 0.217 mW/g

Maximum value of SAR (measured) = 0.332 mW/g

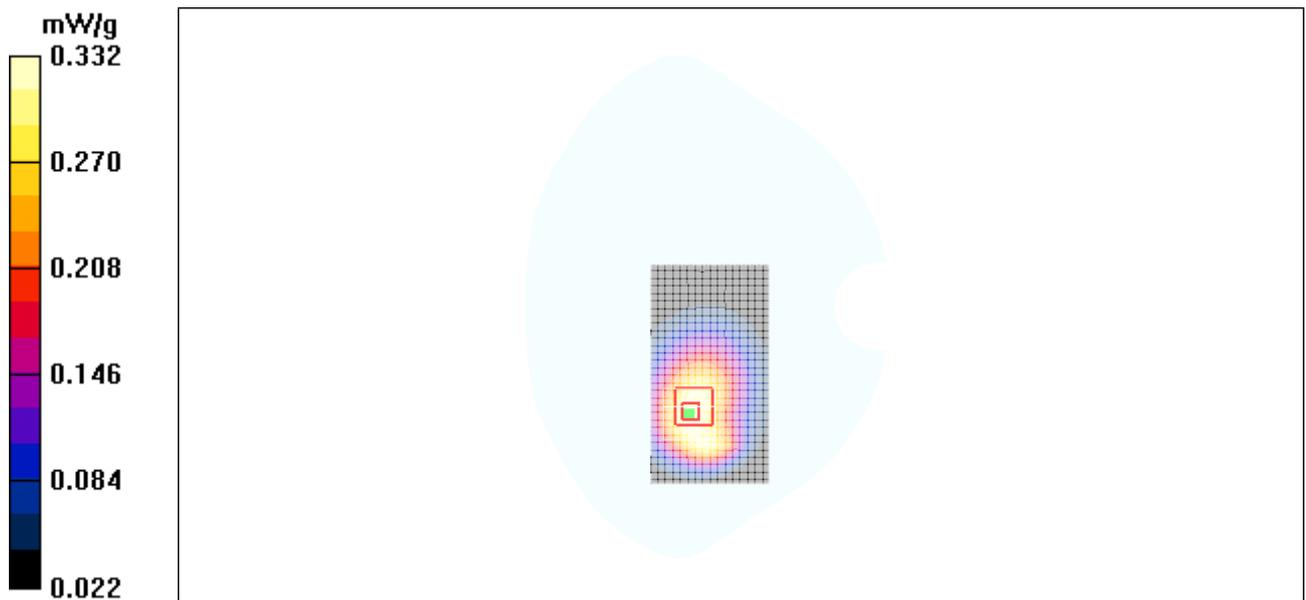


Figure 182 Body, Towards Ground, Close WCDMA Band V Channel 4182

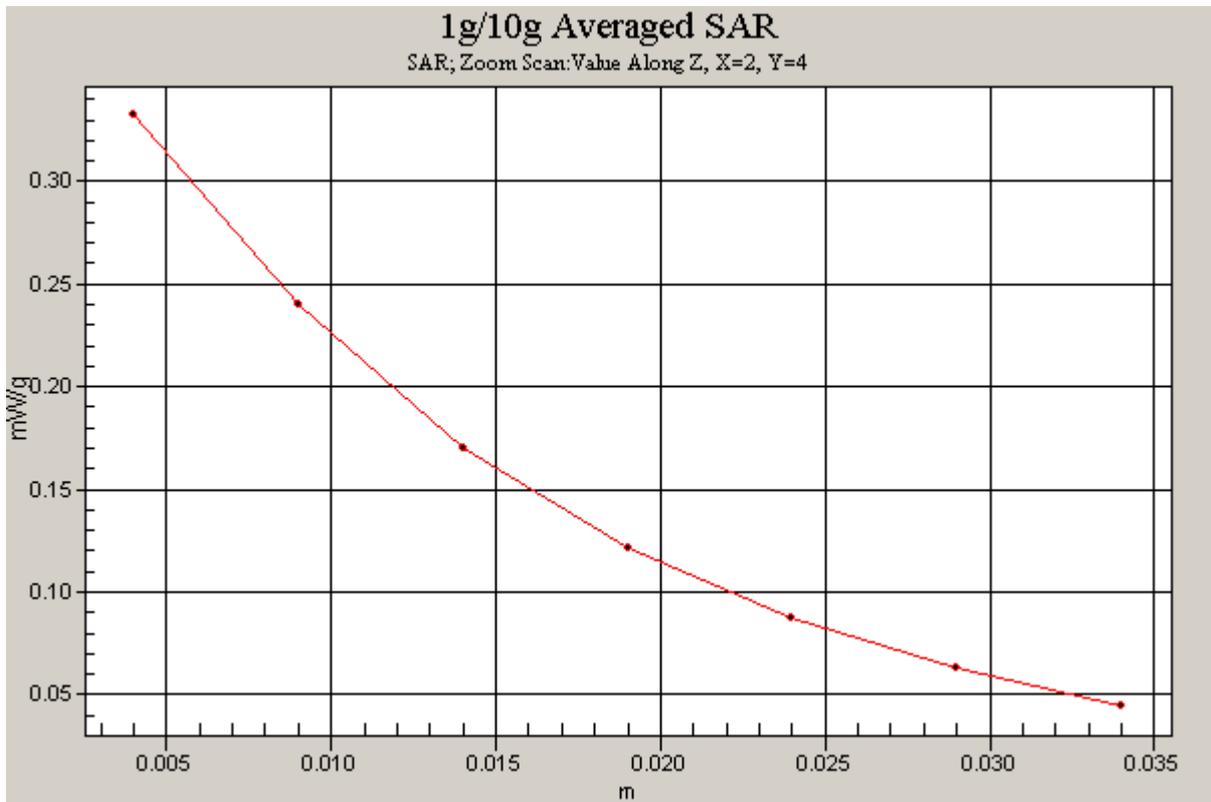


Figure 183 Z-Scan at power reference point (Body, Towards Ground, Close WCDMA Band V Channel 4182)

WCDMA Band V Towards Ground Low Close

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.7$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

Towards Ground Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.407 mW/g

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

Reference Value = 7.53 V/m; Power Drift = 0.111 dB

Peak SAR (extrapolated) = 0.523 W/kg

SAR(1 g) = 0.365 mW/g; SAR(10 g) = 0.242 mW/g

Maximum value of SAR (measured) = 0.391 mW/g

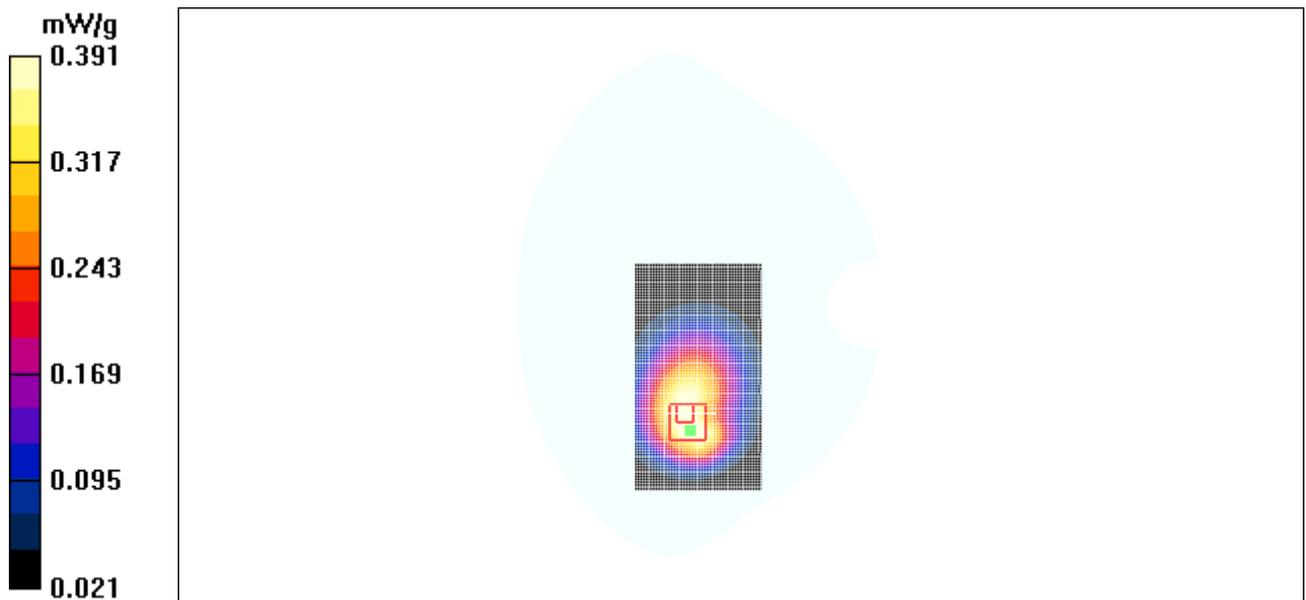


Figure 184 Body, Towards Ground, Close WCDMA Band V Channel 4132

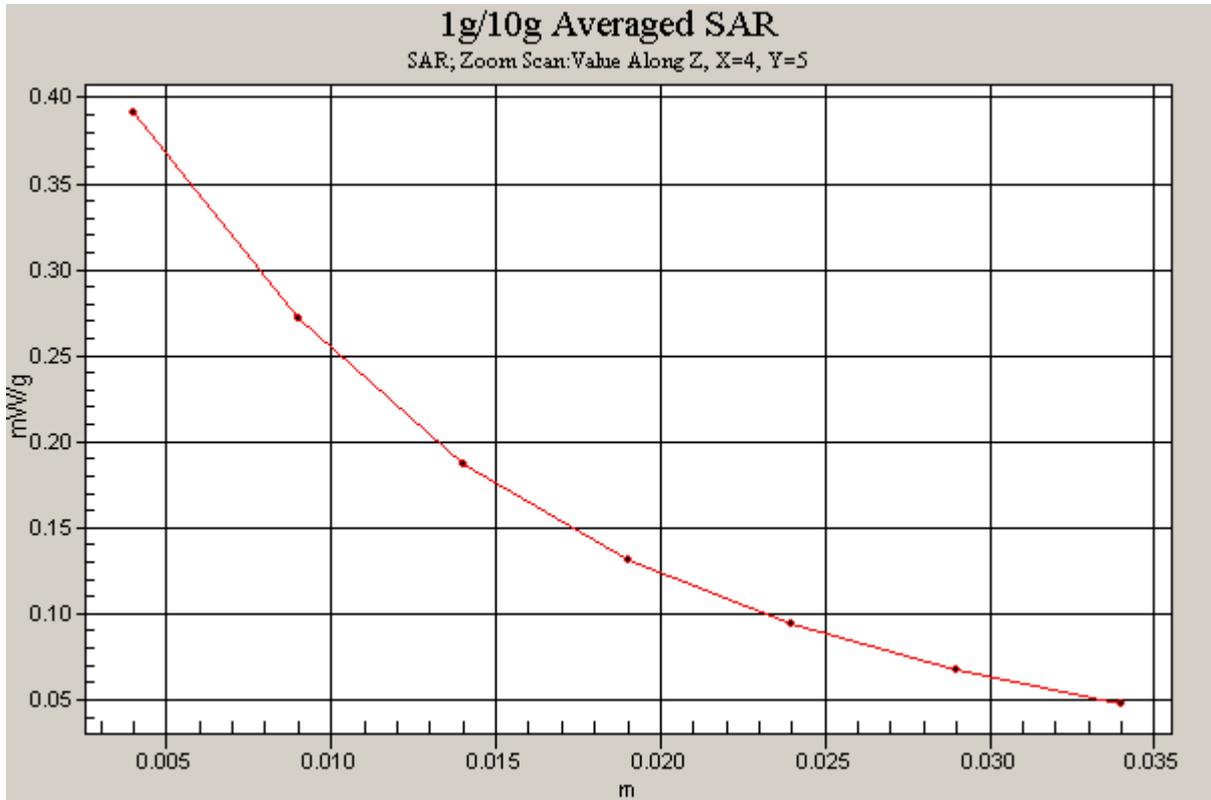


Figure 185 Z-Scan at power reference point (Body, Towards Ground, Close WCDMA Band V Channel 4132)

WCDMA Band V Towards Phantom High Close

Communication System: WCDMA Band V; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 847$ MHz; $\sigma = 1.03$ mho/m; $\epsilon_r = 55.6$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

Towards Phantom High/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.138 mW/g

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

Reference Value = 5.54 V/m; Power Drift = -0.010 dB

Peak SAR (extrapolated) = 0.163 W/kg

SAR(1 g) = 0.130 mW/g; SAR(10 g) = 0.095 mW/g

Maximum value of SAR (measured) = 0.138 mW/g

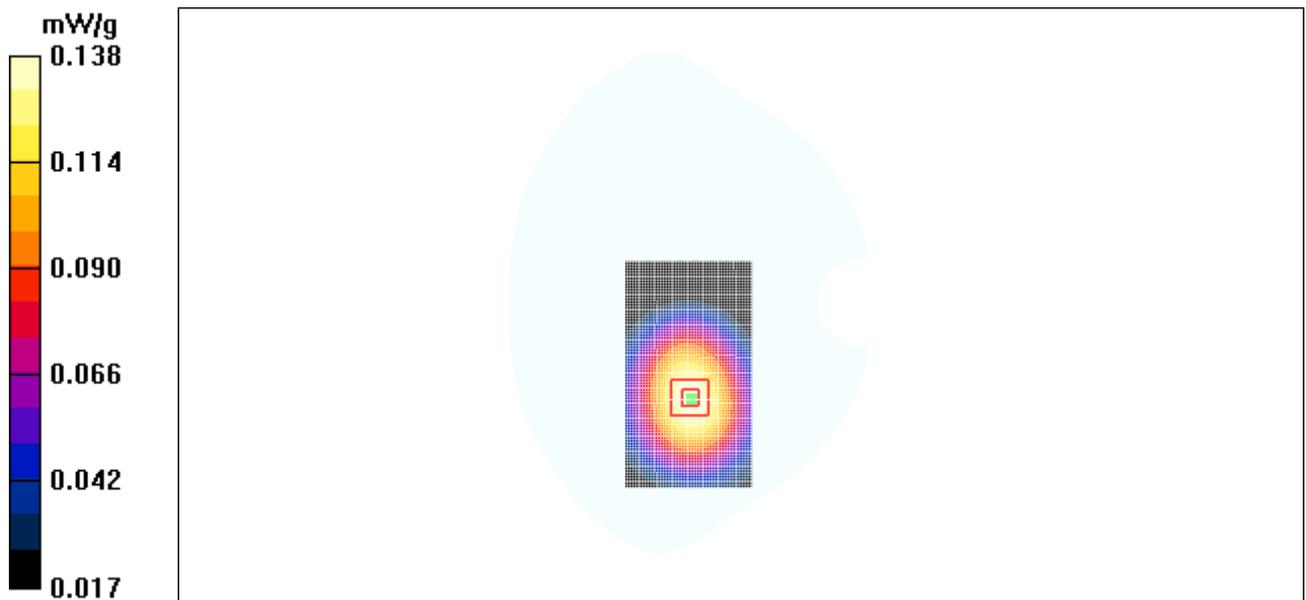


Figure 186 Body, Towards Phantom, Close WCDMA Band V Channel 4233

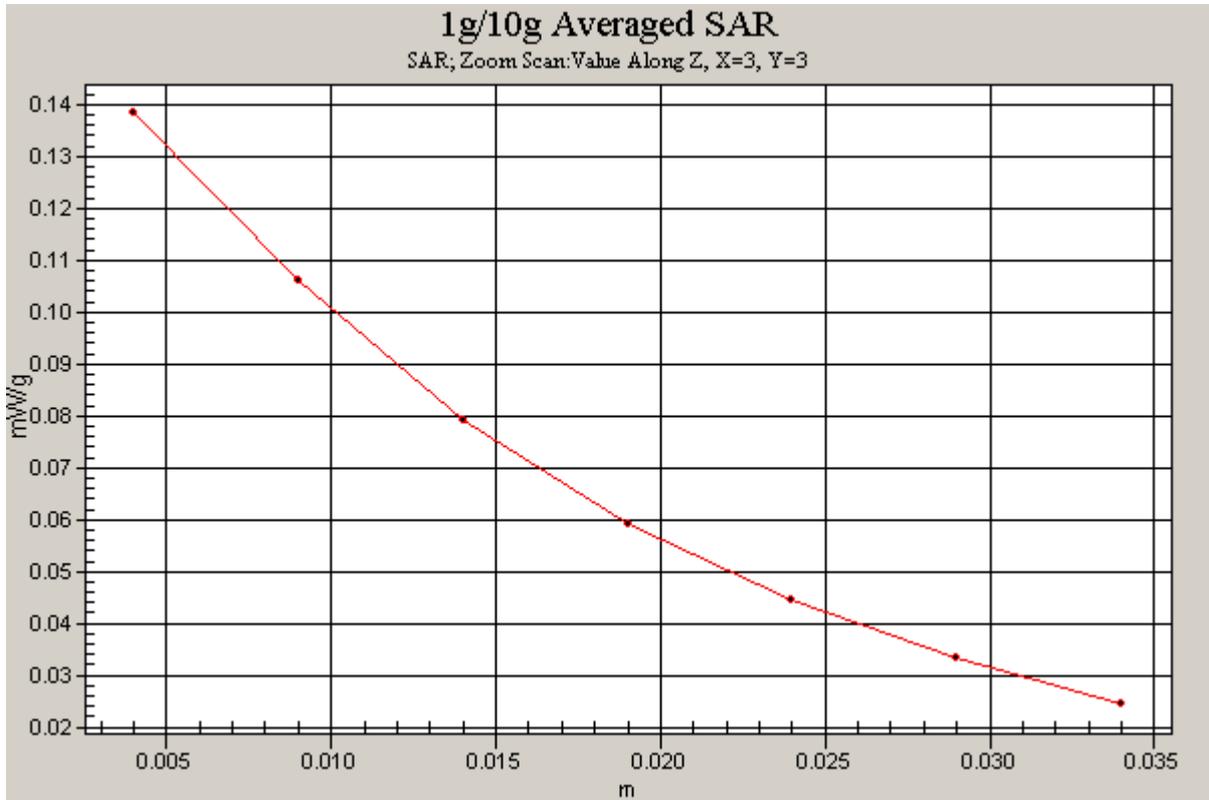


Figure 187 Z-Scan at power reference point (Body, Towards Phantom, Close WCDMA Band V Channel 4233)

WCDMA Band V Towards Phantom Middle Close

Communication System: WCDMA Band V; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.4$ MHz; $\sigma = 1.02$ mho/m; $\epsilon_r = 55.7$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

Towards Phantom Middle/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.118 mW/g

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

Reference Value = 5.14 V/m; Power Drift = 0.015 dB

Peak SAR (extrapolated) = 0.141 W/kg

SAR(1 g) = 0.111 mW/g; SAR(10 g) = 0.081 mW/g

Maximum value of SAR (measured) = 0.118 mW/g

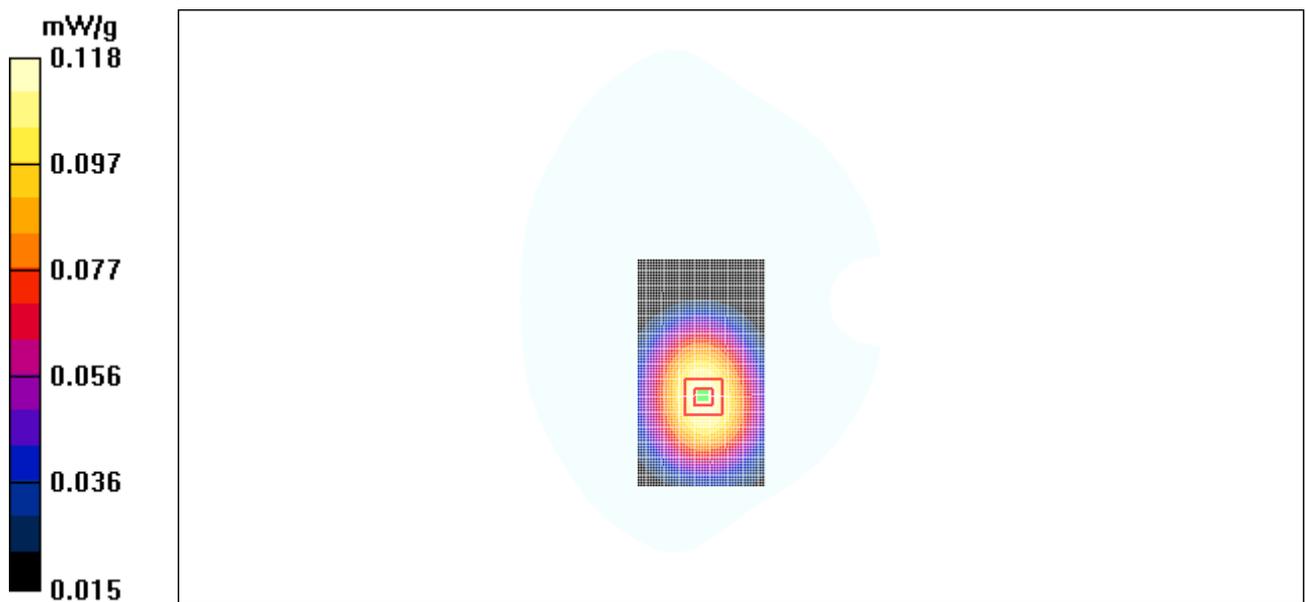


Figure 188 Body, Towards Phantom, Close WCDMA Band V Channel 4182

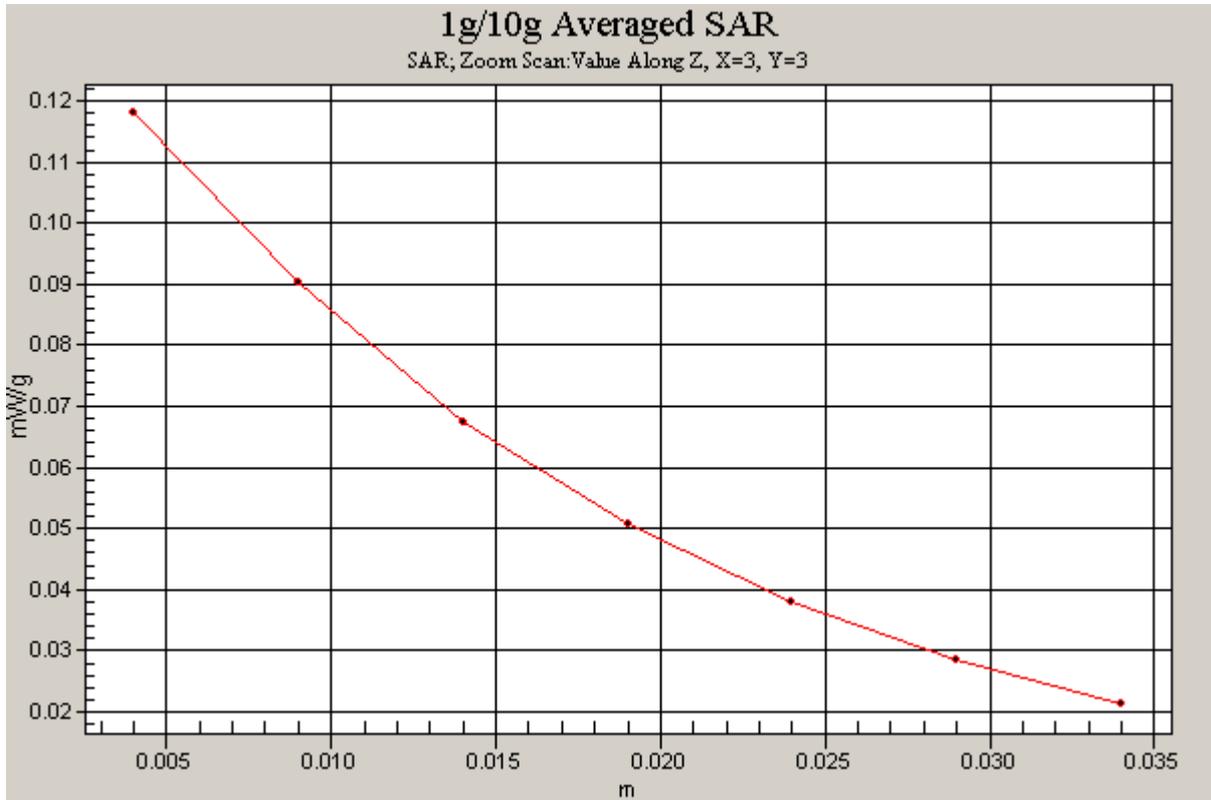


Figure 189 Z-Scan at power reference point (Body, Towards Phantom, Close WCDMA Band V Channel 4182)

WCDMA Band V Towards Phantom Low Close

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.7$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

Towards Phantom Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.128 mW/g

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

Reference Value = 5.75 V/m; Power Drift = 0.065 dB

Peak SAR (extrapolated) = 0.153 W/kg

SAR(1 g) = 0.122 mW/g; SAR(10 g) = 0.090 mW/g

Maximum value of SAR (measured) = 0.129 mW/g

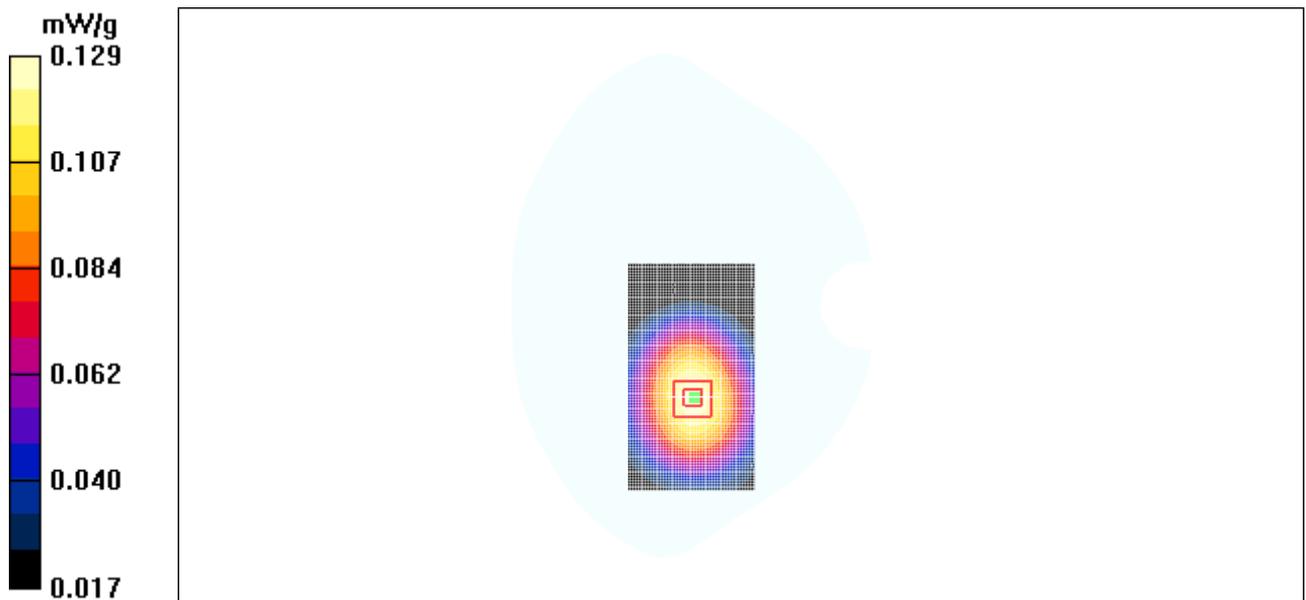


Figure 190 Body, Towards Phantom, Close WCDMA Band V Channel 4132

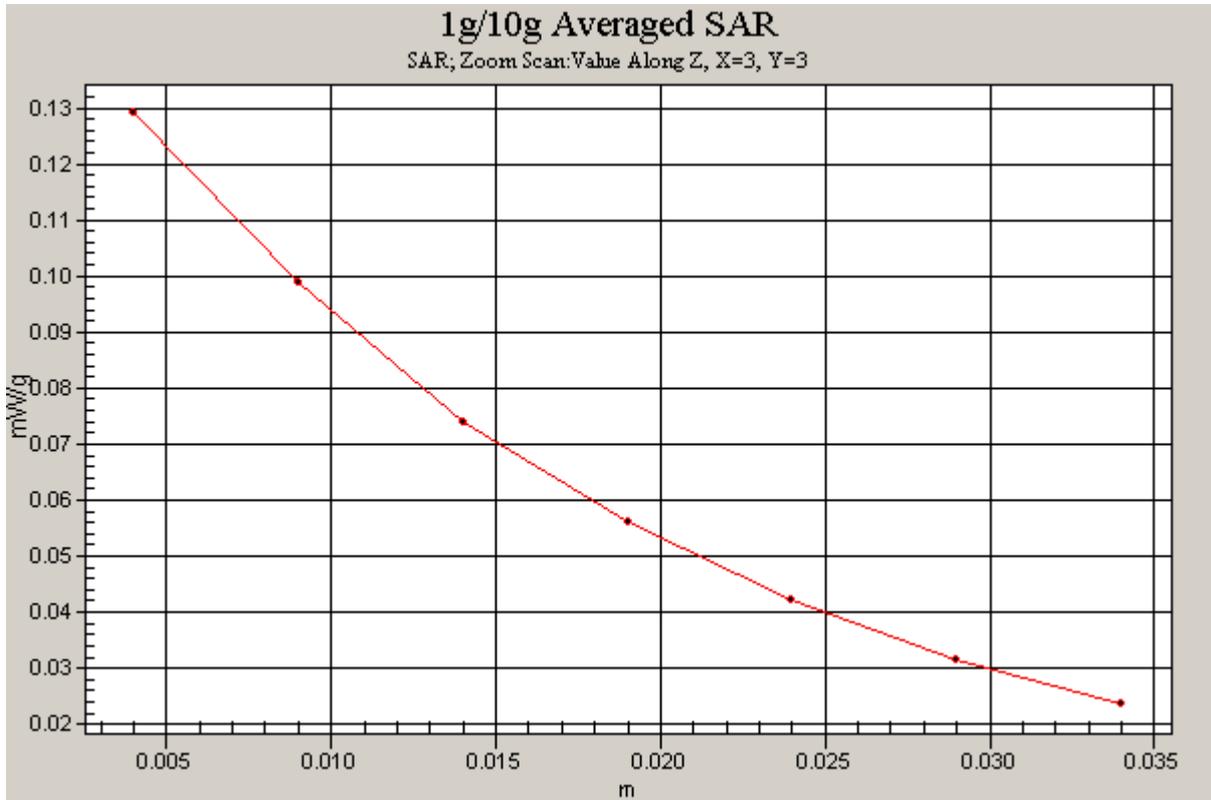


Figure 191 Z-Scan at power reference point (Body, Towards Phantom, Close WCDMA Band V Channel 4132)

WCDMA Band V Earphone Towards Ground Low Close

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.7$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

Towards Ground Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.346 mW/g

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

Reference Value = 5.65 V/m; Power Drift = -0.003 dB

Peak SAR (extrapolated) = 0.469 W/kg

SAR(1 g) = 0.289 mW/g; SAR(10 g) = 0.191 mW/g

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

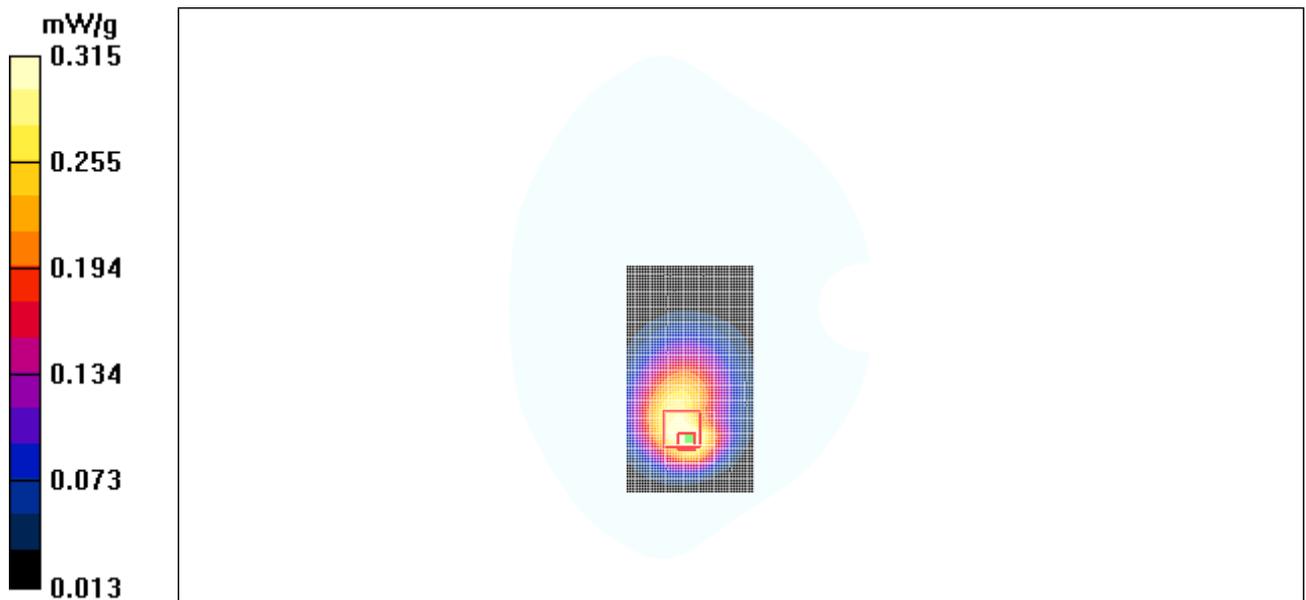


Figure 192 Body with Earphone, Towards Ground, Close WCDMA Band V Channel 4132

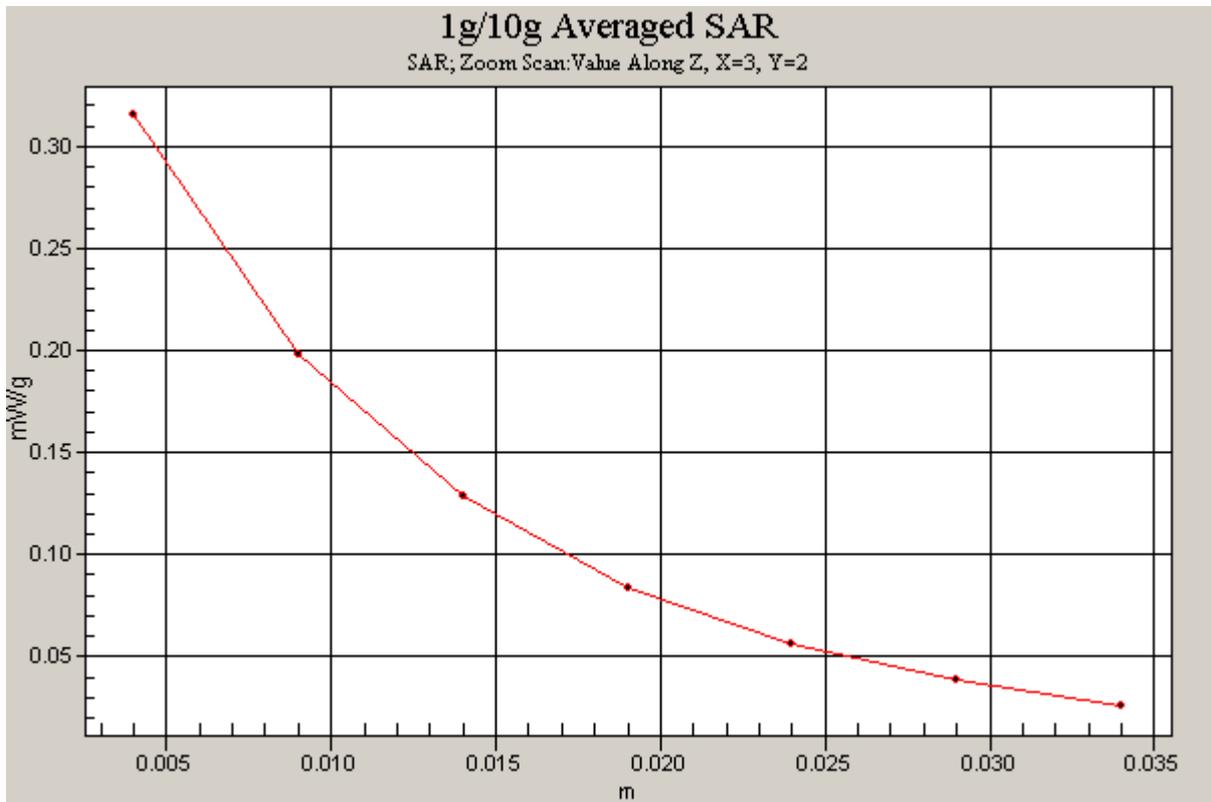


Figure 193 Z-Scan at power reference point (Body with Earphone, Towards Ground, Close WCDMA Band V Channel 4132)

WCDMA Band V Bluetooth Earphone Towards Ground Low Close

Communication System: WCDMA Band V; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 826.4$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.7$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(6.52, 6.52, 6.52);

Electronics: DAE4 Sn452;

Towards Ground Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.405 mW/g

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

Reference Value = 7.81 V/m; Power Drift = -0.043 dB

Peak SAR (extrapolated) = 0.509 W/kg

SAR(1 g) = 0.350 mW/g; SAR(10 g) = 0.231 mW/g

Maximum value of SAR (measured) = 0.379 mW/g

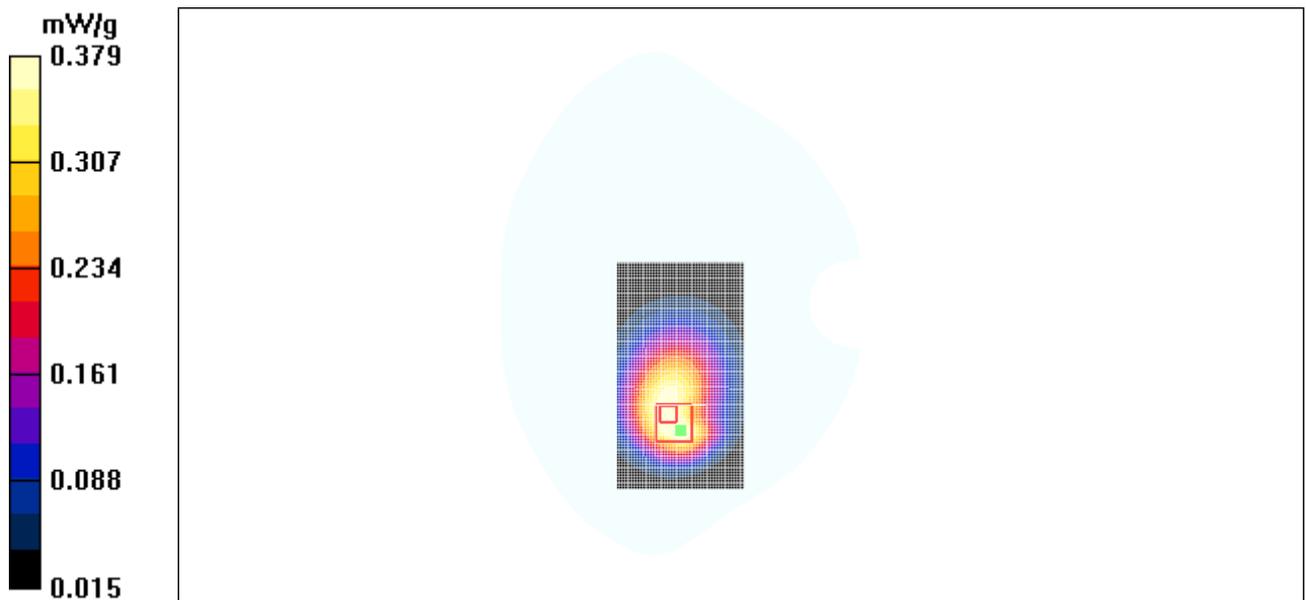


Figure 194 Body with Bluetooth earphone, Towards Ground, Close WCDMA Band V, Channel 4132

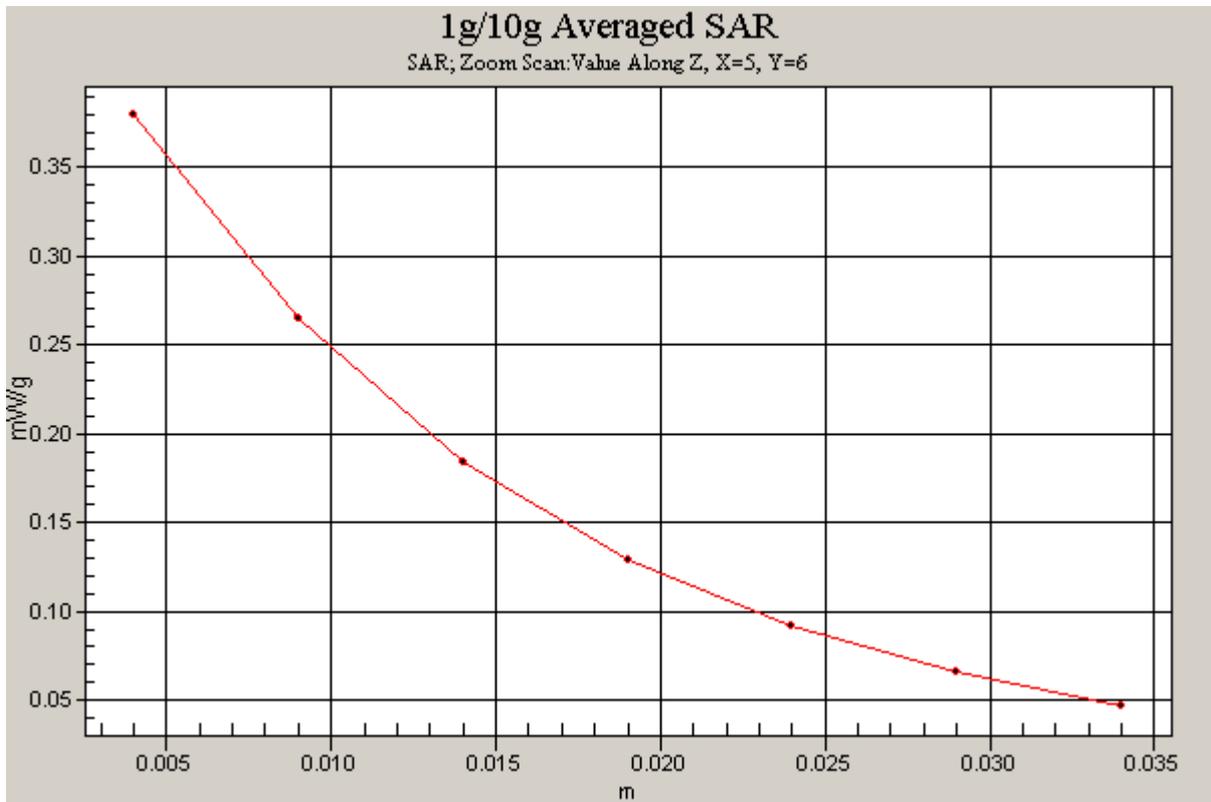


Figure 195 Z-Scan at power reference point (Body with Bluetooth earphone, Towards Ground, Close WCDMA Band V, Channel 4132)

ANNEX D : SYSTEM VALIDATION RESULTS

System Performance Check at 835 MHz

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 443

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

Medium: Head 835MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.93 \text{ mho/m}$; $\epsilon_r = 42.95$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1531; ConvF(6.85, 6.85, 6.85);

- Electronics: DAE4 Sn452;

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.54 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.0 V/m; Power Drift = -0.061 dB

Peak SAR (extrapolated) = 3.44 W/kg

SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.53 mW/g

Maximum value of SAR (measured) = 2.52 mW/g

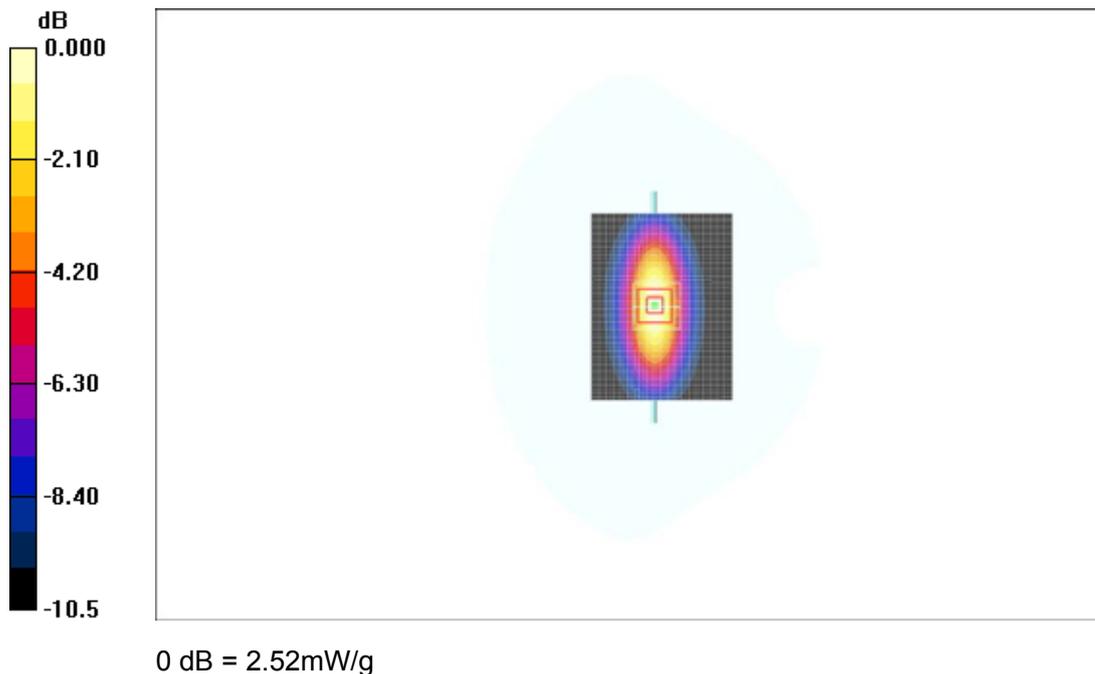


Figure 196 System Performance Check 835MHz 250mW

System Performance Check at 1900 MHz

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

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

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.43$ mho/m; $\epsilon_r = 40.18$; $\rho = 1000$ kg/m³

Probe: ET3DV6 - SN1531; ConvF(5.15, 5.15, 5.15);

Electronics: DAE4 Sn452;

d=10mm, Pin=250mW /Area Scan (101x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 10.8 mW/g

d=10mm, Pin=250mW /Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.8 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 16.0 W/kg

SAR(1 g) = 9.36 mW/g; SAR(10 g) = 4.93 mW/g

Maximum value of SAR (measured) = 10.7 mW/g

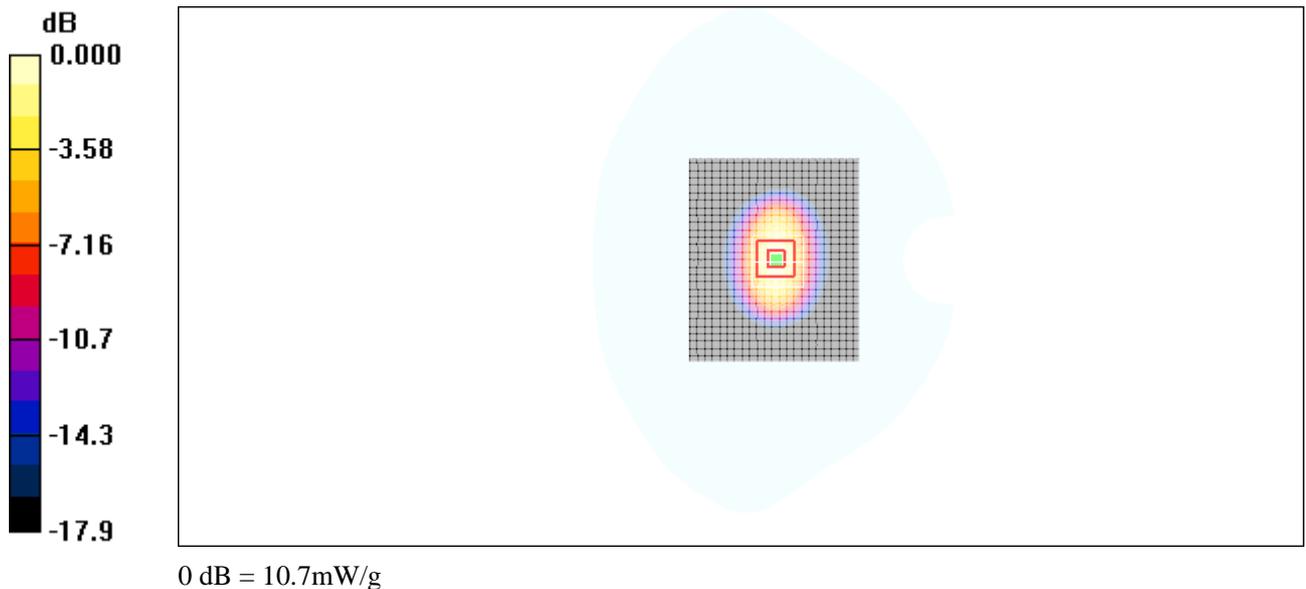


Figure 197 System Performance Check 1900MHz 250mW

TA Technology (Shanghai) Co., Ltd. Test Report

No. RZA2008-1135FCC

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ANNEX E : PROBE CALIBRATION CERTIFICATE

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



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Accredited by the Swiss Accreditation Service (SAS)
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 **ATL (Auden)**

Certificate No: **ET3-1531_Jan08**

CALIBRATION CERTIFICATE

Object: **ET3DV6 - SN:1531**

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

Calibration date: **January 29, 2008**

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&PE 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	MY41498067	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: S5088 (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	2-Jan-08 (SPEAG, No. ES3-3013_Jan08)	Jan-09
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 Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Kolja Pokovic	Technical Manager	
Approved by:	Nils Kuster	Quality Manager	

Issued: January 29, 2008

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

Certificate No: ET3-1531_Jan08

Page 1 of 9

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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
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:

- 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
- 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 E^2 -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:1531

January 29, 2008

Probe ET3DV6

SN:1531

Manufactured:	July 15, 2000
Last calibrated:	January 22, 2007
Recalibrated:	January 29, 2008

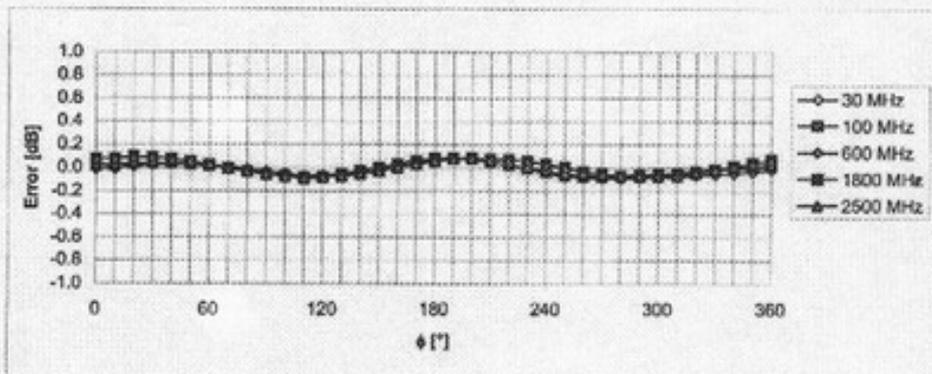
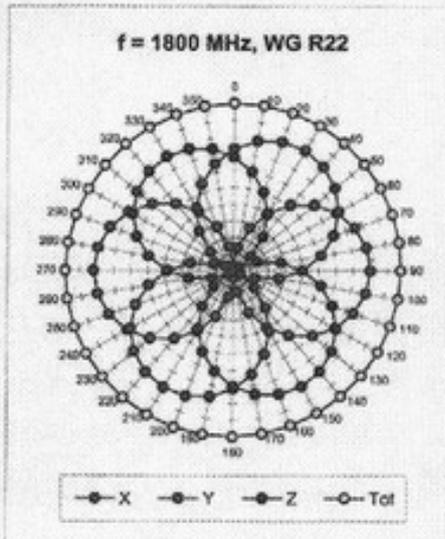
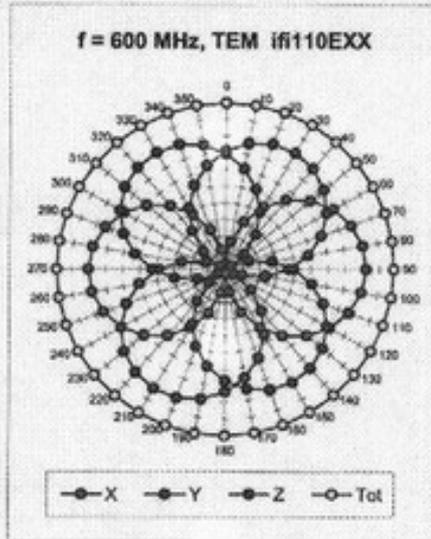
Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1531

January 29, 2008

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

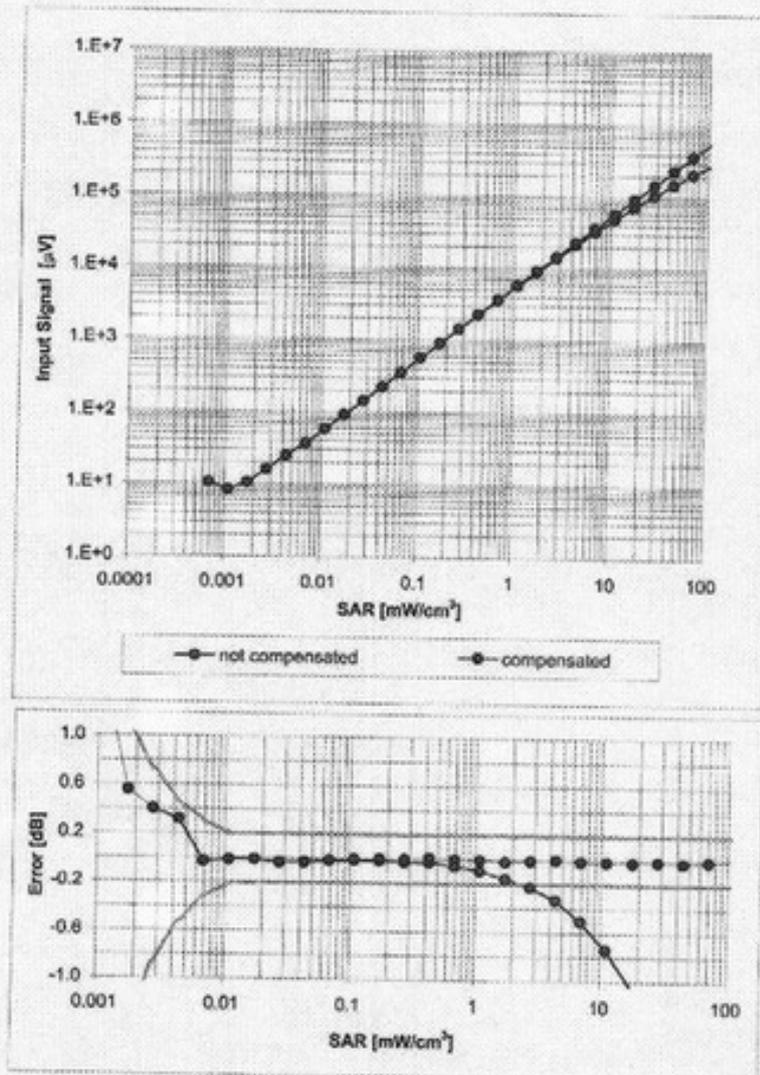


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ET3DV6 SN:1531

January 29, 2008

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

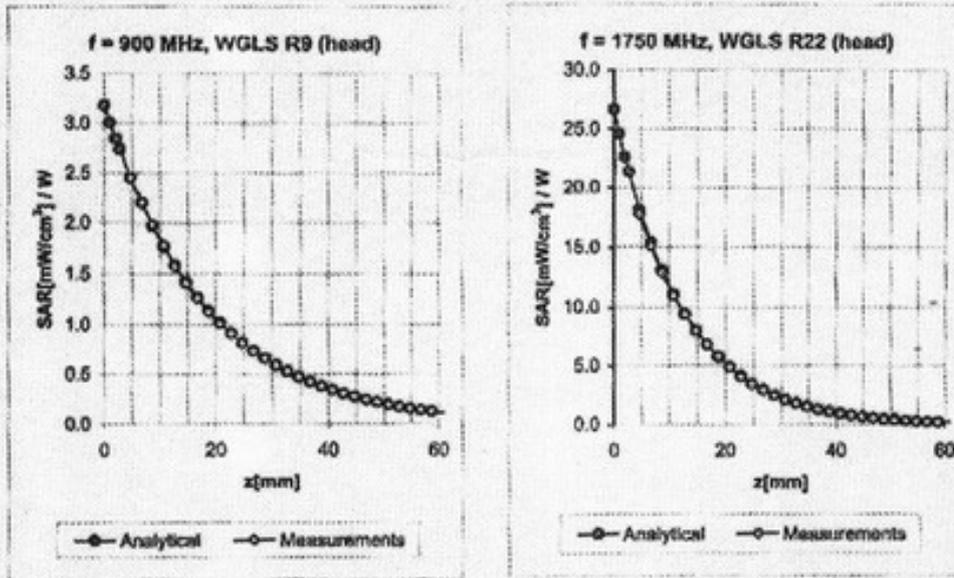


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET3DV6 SN:1531

January 29, 2008

Conversion Factor Assessment



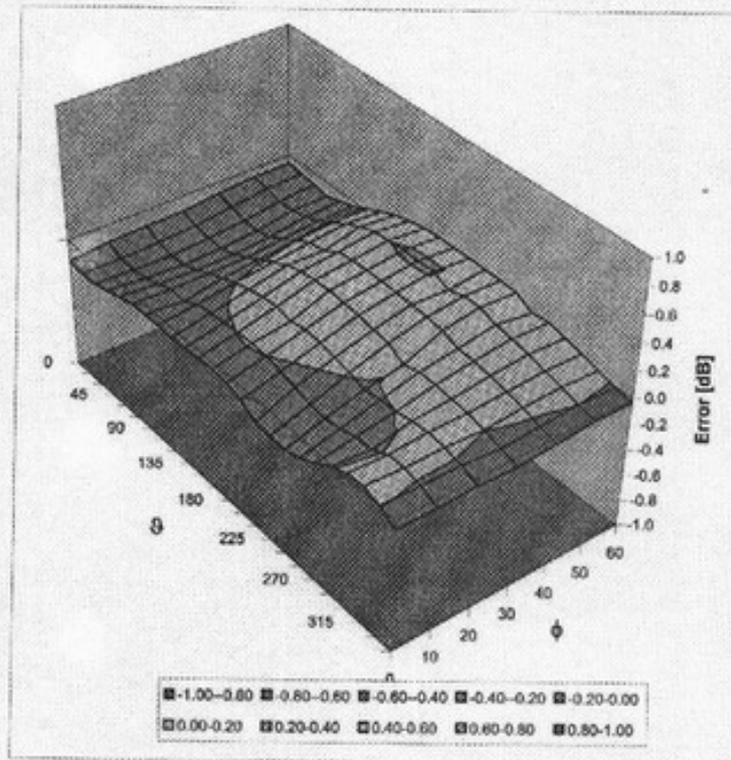
f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.27	2.89	6.85 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.52	2.56	5.42 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.49	2.89	5.15 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.35	2.82	6.52 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.56	2.68	4.97 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.68	2.07	4.64 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.66	2.16	4.10 ± 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.

ET3DV6 SN:1531

January 29, 2008

Deviation from Isotropy in HSL
Error (ϕ , θ), $f = 900$ MHz



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

TA Technology (Shanghai) Co., Ltd. Test Report

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ANNEX F : D835V2 DIPOLE CALIBRATION CERTIFICATE

**Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **TMC China**

Certificate No: **D835V2-443_Dec07**

CALIBRATION CERTIFICATE

Object	D835V2-SN: 443
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	December 9, 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	13-Sep-07 (METAS, NO. 217-00608)	Sep-08
Power sensor 8481A	US37292783	13-Sep-07 (METAS, NO. 217-00608)	Sep-08
Reference 20 dB Attenuator	SN:5088 (20g)	12-Jul-07 (METAS, NO. 217-00591)	Jul-08
Reference 10 dB Attenuator	SN:5047_2 (10r)	12-Jul-07 (METAS, NO. 217-00591)	Jul-08
DAE4	SN:601	30-Jan-07 (SPEAG, NO.DAE4-601_Jan07)	Jan-08
Reference Probe ET3DV6 (HF)	SN: 1507	19-Sep-07 (SPEAG, NO. ET3-1507_Sep07)	Sep-08
Secondary Standards	ID#	Check Data (In house)	Scheduled Calibration
Power sensor HP 8481A	MY41092317	18-Oct-02(SPEAG, in house check Oct-07)	In house check: Oct-09
RF generator Agilent E4421B	MY41000878	11-May-05(SPEAG, in house check Nov-07)	In house check: Nov-09
Network Analyzer HP 8753E	US37390585S4208	18-Oct-01(SPEAG, in house check Oct-07)	In house check: Oct-08

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

Issued: **December 10, 2007**

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

TA Technology (Shanghai) Co., Ltd. Test Report

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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 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.

TA Technology (Shanghai) Co., Ltd. Test Report

No. RZA2008-1135FCC

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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 V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
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	0.80 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	40.2 \pm 6 %	0.89 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	2.43 mW / g
SAR normalized	normalized to 1W	9.72 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.70 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	1.56 mW / g
SAR normalized	normalized to 1W	6.24 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.31 mW / g \pm 16.5 % (k=2)

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9Ω - 6.8 jΩ
Return Loss	- 25.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.402 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	September 3, 2001

DASY4 Validation Report for Head TSL

Date/Time: 9.12.2007 14:20:15

Test laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; serial: D835V2-SN: 443

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

Medium: HSL 835 MHz;

Medium parameters used: $f=835$ MHz; $\sigma=0.89$ mho/m; $\epsilon_r=40.2$; $\rho= 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6-SN1507(HF); ConvF(6.01,6.01,6.01); Calibrated: 19.9.2007
- 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

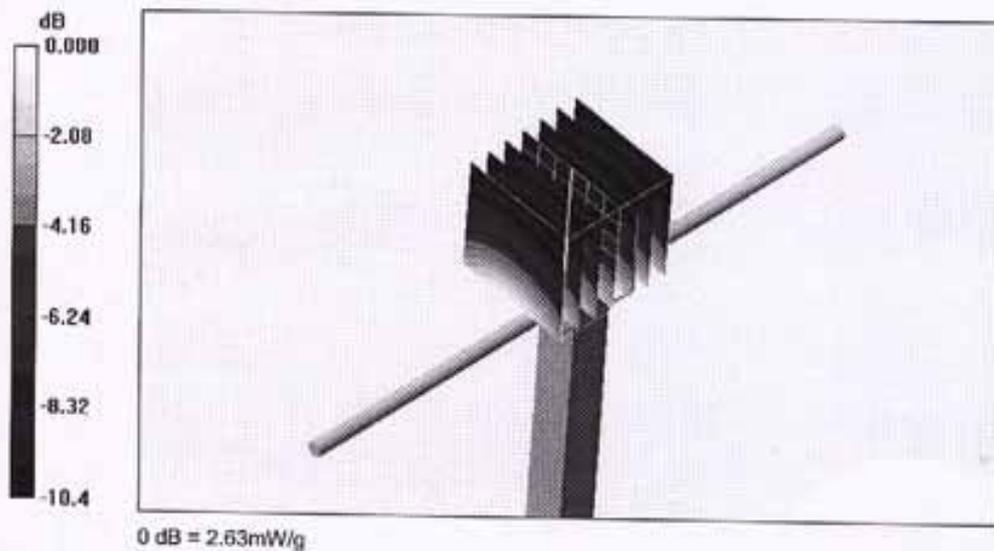
Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.3 V/m; Power Drift = 0.015dB

Peak SAR (extrapolated) = 3.65 W/kg

SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.56 mW/g

Maximum value of SAR (measured) = 2.63 mW/g



TA Technology (Shanghai) Co., Ltd.
Test Report

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ANNEX G : D1900V2 DIPOLE CALIBRATION CERTIFICATE

**Calibration Laboratory of
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Accreditation No.: **SCS 108**

Client: **Auden**

Certificate No: **D1900V2-5d018_Mar08**

CALIBRATION CERTIFICATE

Object: **D1900V2 - SN: 5d018**

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

Calibration date: **March 21, 2008**

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 EPM-442A	GB37480704	23-Sep-07 (METAS, No. 217-00608)	Sep-08
Power sensor HP 8481A	US37292783	23-Sep-07 (METAS, No. 217-00608)	Sep-08
Reference 20 dB Attenuator	SN: 5086 (20g)	21-Jun-07 (METAS, No 217-00581)	Jun-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	21-Jun-07 (METAS, No 217-00591)	Jun-08
Reference Probe ET3DV6	SN: 1507	11-Sep-07 (SPEAG, No. ET3-1507_Sep07)	Sep-08
Reference Probe ES3DV3	SN: 3025	11-Sep-07 (SPEAG, No. ES3-3025_Sep07)	Sep-08
DAE4	SN 601	15-Jan-06 (SPEAG, No. DAE4-601_Jan06)	Jan-09
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-09
RF generator Agilent E4421B	MY41000875	11-May-05 (SPEAG, in house check Nov-07)	In house check: Nov-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

Calibrated by: **Claudio Leubler** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

Issued: **March 22, 2008**

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

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Multilateral Agreement for the recognition of calibration certificates

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
- 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
- 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.

TA Technology (Shanghai) Co., Ltd. Test Report

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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	39.6 \pm 6 %	1.43 mho/m \pm 6 %
Head TSL temperature during test	(21.3 \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	9.45 mW / g
SAR normalized	normalized to 1W	37.8 mW / g
SAR for nominal Head TSL parameters. ¹	normalized to 1W	36.4 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	4.98 mW / g
SAR normalized	normalized to 1W	19.9 mW / g
SAR for nominal Head TSL parameters. ¹	normalized to 1W	19.5 mW / g \pm 16.5 % (k=2)

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

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.0 ± 6 %	1.55 mho/m ± 6 %
Body TSL temperature during test	(21.3 ± 0.2) °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.63 mW / g
SAR normalized	normalized to 1W	38.5 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	36.8 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.21 mW / g
SAR normalized	normalized to 1W	20.8 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	20.2 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

TA Technology (Shanghai) Co., Ltd.
Test Report

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5 Ω + 3.3 j Ω
Return Loss	-27.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.5 Ω + 2.9 j Ω
Return Loss	-29.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 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	June 4, 2002

4

DASY4 Validation Report for Head TSL

Date/Time: 21.03.2008 15:30:20

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

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

Medium: HSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.43$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 11.09.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.01.2008
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

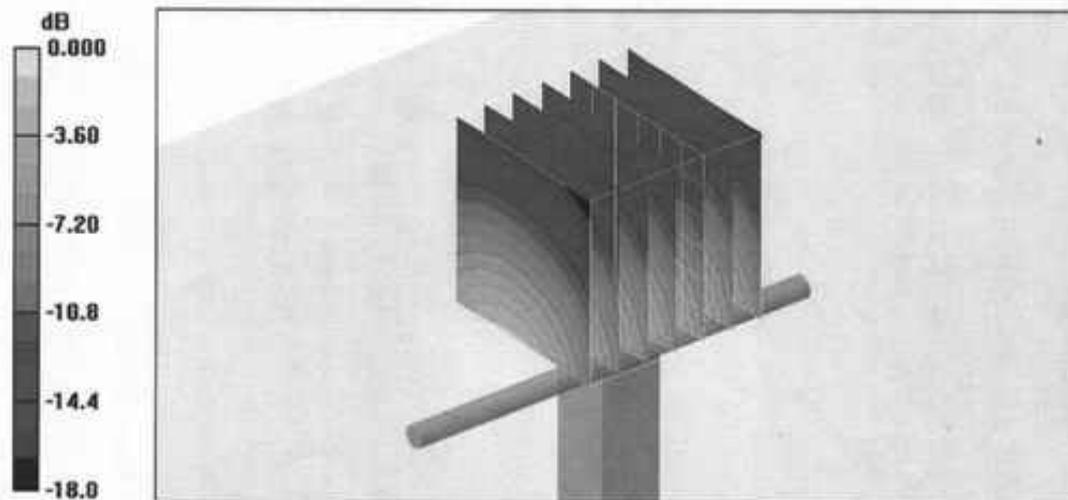
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.8 V/m; Power Drift = 0.057 dB

Peak SAR (extrapolated) = 16.2 W/kg

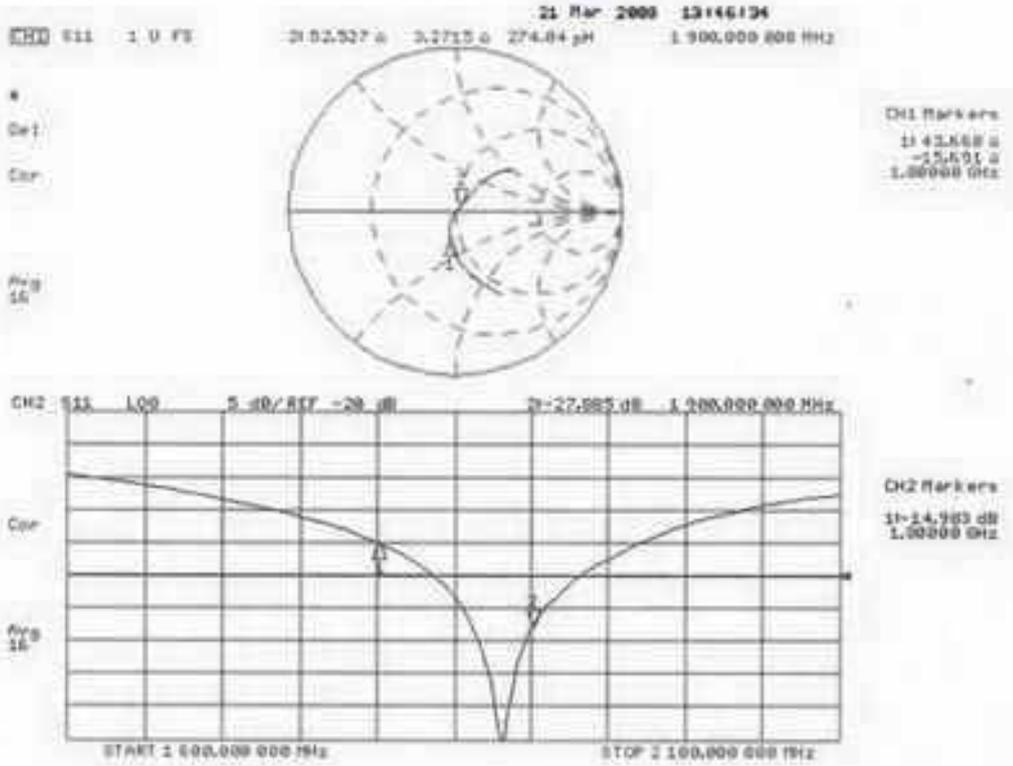
SAR(1 g) = 9.45 mW/g; SAR(10 g) = 4.98 mW/g

Maximum value of SAR (measured) = 10.7 mW/g



0 dB = 10.7mW/g

Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 21.03.2008 16:41:02

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d018

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

Medium: MSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.55$ mho/m; $\epsilon_r = 52$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.43, 4.43, 4.43); Calibrated: 11.09.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.01.2008
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

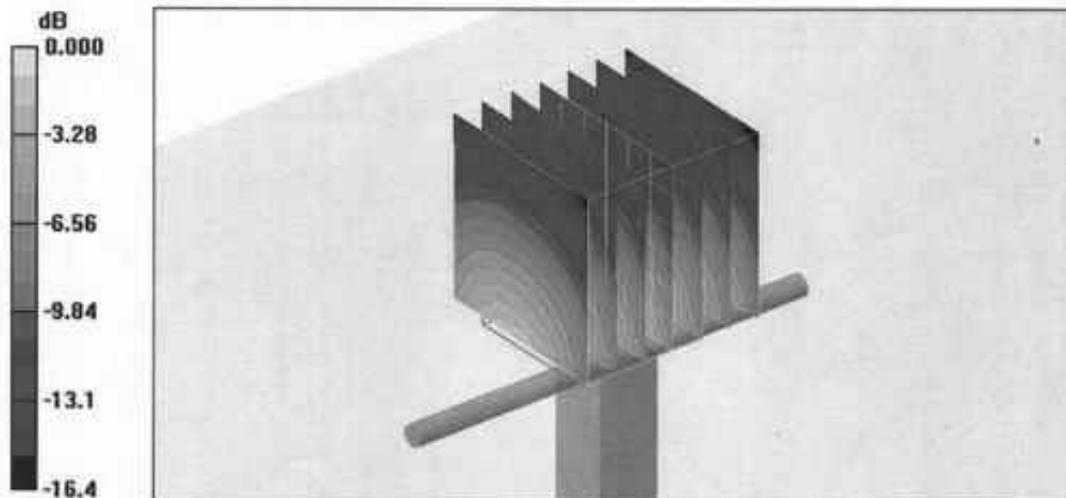
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.2 V/m; Power Drift = 0.021 dB

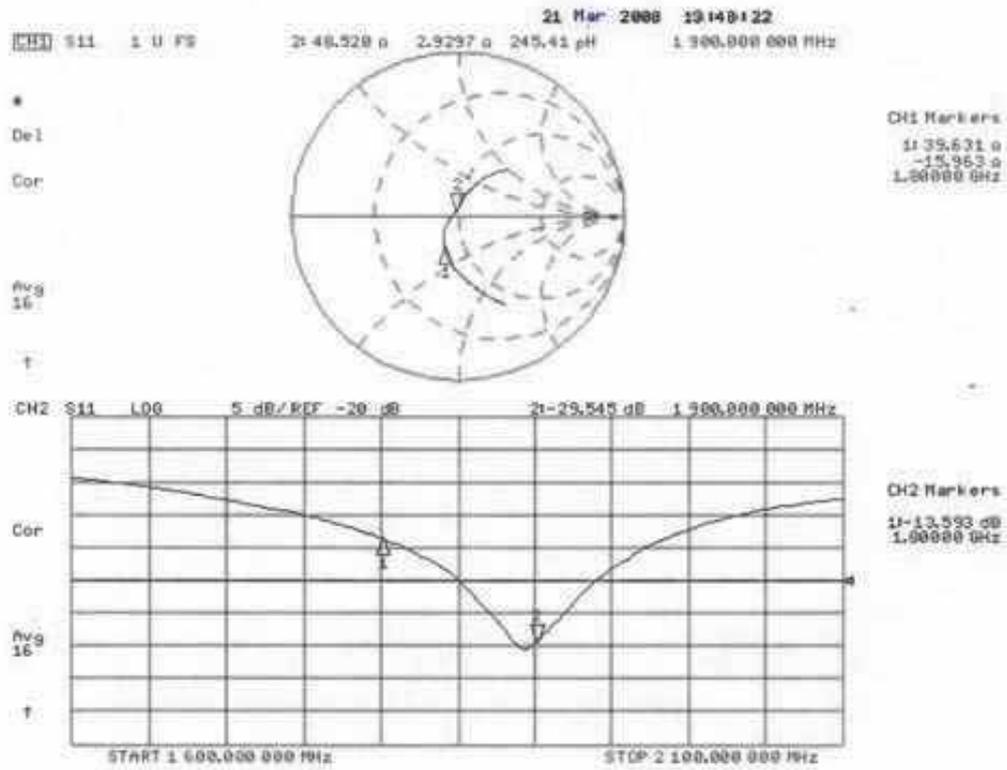
Peak SAR (extrapolated) = 16.1 W/kg

SAR(1 g) = 9.63 mW/g; SAR(10 g) = 5.21 mW/g

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



Impedance Measurement Plot for Body TSL



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ANNEX H : DAE4 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 Accreditation Service (SAS)
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 **TA (Auden)**

Certificate No: **DAE4-452_Jul08**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BA - SN: 452**

Calibration procedure(s) **QA CAL-06.v12
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **July 21, 2008**

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 (Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	04-Oct-07 (No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (No: 6465)	Oct-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	06-Jun-08 (in house check)	In house check: Jun-09

	Name	Function	Signature
Calibrated by:	Andrea Guntli	Technician	
Approved by:	Fin Bornholt	R&D Director	

Issued: July 21, 2008

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 Accreditation Service (SAS)
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

DAE data acquisition electronics
Connector angle information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement:** Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle:** The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
 - **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
 - **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
 - **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
 - **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - **Input resistance:** DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
 - **Power consumption:** Typical value for information. Supply currents in various operating modes.

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DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.675 \pm 0.1% (k=2)	404.426 \pm 0.1% (k=2)	404.582 \pm 0.1% (k=2)
Low Range	3.97902 \pm 0.7% (k=2)	3.97676 \pm 0.7% (k=2)	3.97703 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	57 $^{\circ}$ \pm 1 $^{\circ}$
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Test Report

Appendix

1. DC Voltage Linearity

High Range	Input (μV)	Reading (μV)	Error (%)
Channel X + Input	200000	199999.6	0.00
Channel X + Input	20000	20010.85	0.05
Channel X - Input	20000	-20007.22	0.04
Channel Y + Input	200000	199999.7	0.00
Channel Y + Input	20000	20004.64	0.02
Channel Y - Input	20000	-20007.87	0.04
Channel Z + Input	200000	199999.9	0.00
Channel Z + Input	20000	20006.37	0.03
Channel Z - Input	20000	-20004.56	0.02

Low Range	Input (μV)	Reading (μV)	Error (%)
Channel X + Input	2000	2000.1	0.00
Channel X + Input	200	200.31	0.16
Channel X - Input	200	-200.05	0.03
Channel Y + Input	2000	2000.1	0.00
Channel Y + Input	200	200.32	0.16
Channel Y - Input	200	-201.77	0.89
Channel Z + Input	2000	1999.9	0.00
Channel Z + Input	200	199.01	-0.50
Channel Z - Input	200	-201.29	0.64

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	4.04	3.25
	- 200	-2.86	-3.04
Channel Y	200	-8.82	-8.52
	- 200	6.51	7.21
Channel Z	200	10.37	10.27
	- 200	-12.69	-12.80

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	2.55	-0.94
Channel Y	200	0.77	-	2.38
Channel Z	200	-1.41	-0.39	-

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4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16118	16294
Channel Y	15879	15841
Channel Z	16155	16260

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	0.35	-1.09	1.93	0.35
Channel Y	-1.29	-2.07	-0.24	0.35
Channel Z	-0.68	-1.73	0.45	0.36

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	198.4
Channel Y	0.2000	200.1
Channel Z	0.2001	199.5

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9