

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date : 2007/12/25

Body_802.11n Ch52_NB Bottom with 0cm Gap_Ant-1&3 2Tx_DELL D500_BW 20M_2D

DUT: 7D1410

Communication System: 802.11n; Frequency: 5260 MHz; Duty Cycle: 1:1

Medium: MSL_5G Medium parameters used: $f = 5300$ MHz; $\sigma = 5.31$ mho/m; $\epsilon_r = 48.4$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.6 °C; Liquid Temperature : 21.6 °C

DASY4 Configuration:

- Probe: EX3DV3 - SN3514; ConvF(4.31, 4.31, 4.31); Calibrated: 2007/2/21
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch52/Area Scan (91x71x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.59 mW/g

Ch52/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 9.52 V/m; Power Drift = -0.037 dB

Peak SAR (extrapolated) = 2.79 W/kg

SAR(1 g) = 0.877 mW/g; SAR(10 g) = 0.392 mW/g

Maximum value of SAR (measured) = 1.51 mW/g

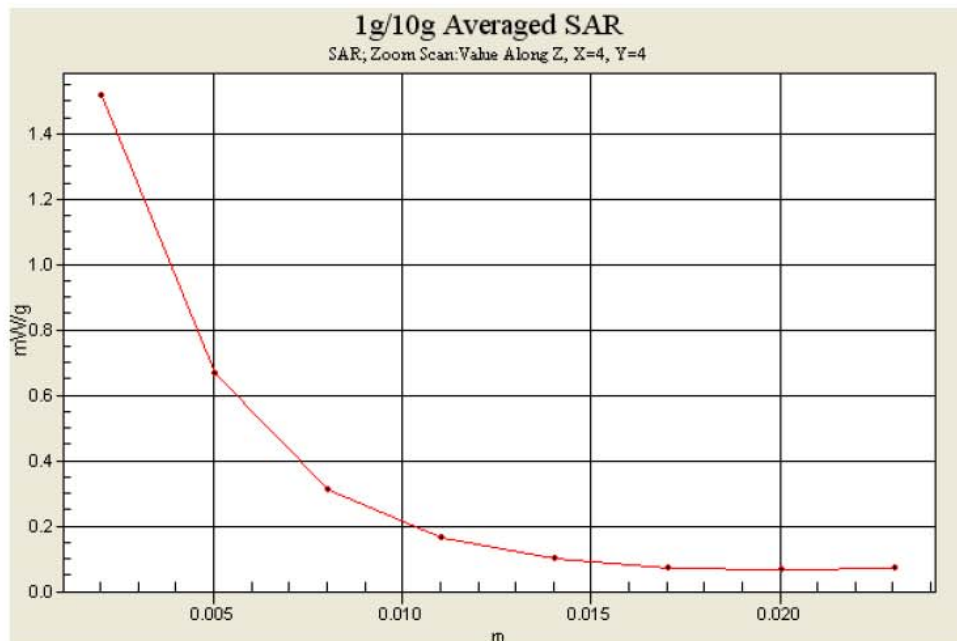
Ch52/Zoom Scan (8x8x8)/Cube 1: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 9.52 V/m; Power Drift = -0.037 dB

Peak SAR (extrapolated) = 2.78 W/kg

SAR(1 g) = 0.653 mW/g; SAR(10 g) = 0.296 mW/g

Maximum value of SAR (measured) = 1.46 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/25

Body_802.11n Ch102_NB Bottom with 0cm Gap_Ant-1&3 2Tx_BW 40M_DELL D500_2D

DUT: 7D1410

Communication System: 802.11n; Frequency: 5510 MHz; Duty Cycle: 1:1

Medium: MSL_5G Medium parameters used: $f = 5500$ MHz; $\sigma = 5.54$ mho/m; $\epsilon_r = 48.1$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.6 °C; Liquid Temperature : 21.6 °C

DASY4 Configuration:

- Probe: EX3DV3 - SN3514; ConvF(4.09, 4.09, 4.09); Calibrated: 2007/2/21
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch102/Area Scan (91x71x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.51 mW/g

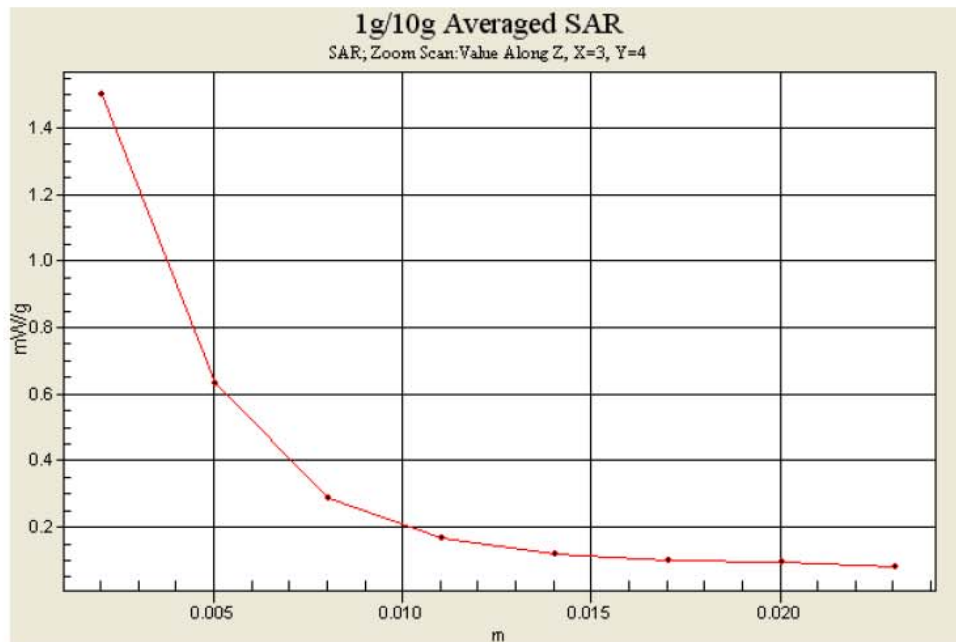
Ch102/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 8.52 V/m; Power Drift = 0.070 dB

Peak SAR (extrapolated) = 2.89 W/kg

SAR(1 g) = 0.852 mW/g; SAR(10 g) = 0.379 mW/g

Maximum value of SAR (measured) = 1.50 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/25

Body_802.11n Ch151_NB Bottom with 0cm Gap_Ant-1&3 2Tx_BW 40M_DELL D500_2D

DUT: 7D1410

Communication System: 802.11n; Frequency: 5755 MHz; Duty Cycle: 1:1

Medium: MSL_5G Medium parameters used: $f = 5800$ MHz; $\sigma = 5.88$ mho/m; $\epsilon_r = 47.7$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.6 °C; Liquid Temperature : 21.6 °C

DASY4 Configuration:

- Probe: EX3DV3 - SN3514; ConvF(4.16, 4.16, 4.16); Calibrated: 2007/2/21
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1029
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch151/Area Scan (91x71x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.50 mW/g

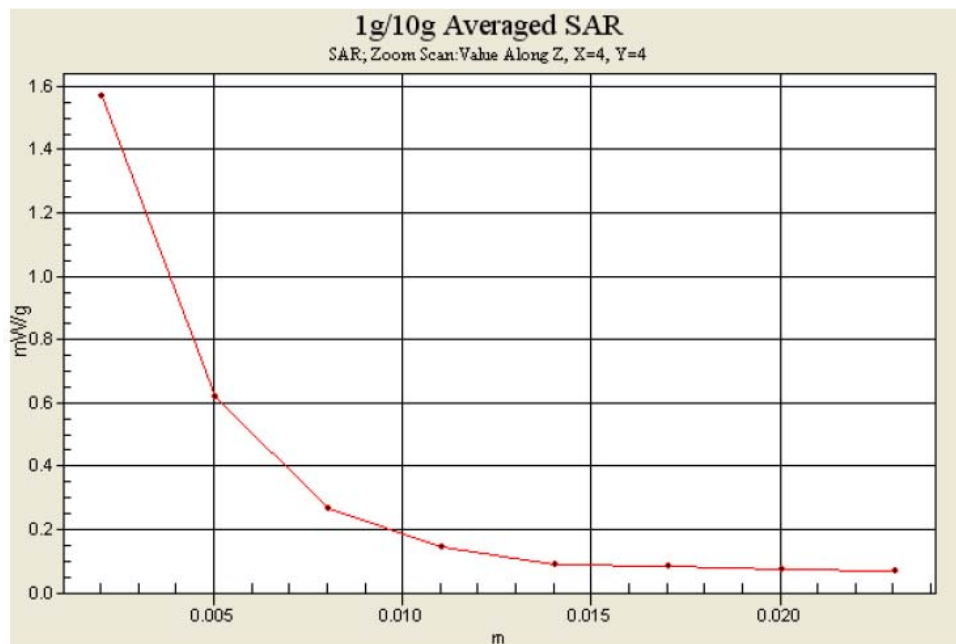
Ch151/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 7.34 V/m; Power Drift = -0.101 dB

Peak SAR (extrapolated) = 3.28 W/kg

SAR(1 g) = 0.881 mW/g; SAR(10 g) = 0.387 mW/g

Maximum value of SAR (measured) = 1.57 mW/g





Appendix C – Calibration Data

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



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Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: D2450V2-736_Jul07

CALIBRATION CERTIFICATE form containing fields for Object, Calibration procedure(s), Calibration date, Condition of the calibrated item, and tables for Primary and Secondary Standards.



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



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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
ConvF sensitivity in TSL / NORM x,y,z
N/A not applicable or not measured

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
c) 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:

- d) 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 | 2450 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 39.2 | 1.80 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 38.6 ± 6 % | 1.81 mho/m ± 6 % |
| Head TSL temperature during test | (22.0 ± 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 | 13.3 mW / g |
| SAR normalized | normalized to 1W | 53.2 mW / g |
| SAR for nominal Head TSL parameters ¹ | normalized to 1W | 52.7 mW / g ± 17.0 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
|---|--------------------|----------------------------|
| SAR measured | 250 mW input power | 6.17 mW / g |
| SAR normalized | normalized to 1W | 24.7 mW / g |
| SAR for nominal Head TSL parameters ¹ | normalized to 1W | 24.5 mW / g ± 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 | 52.7 | 1.95 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 53.5 ± 6 % | 1.94 mho/m ± 6 % |
| Body TSL temperature during test | (22.0 ± 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 | 13.0 mW / g |
| SAR normalized | normalized to 1W | 52.0 mW / g |
| SAR for nominal Body TSL parameters ² | normalized to 1W | 52.5 mW / g ± 17.0 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
|---|--------------------|-----------------------------------|
| SAR measured | 250 mW input power | 6.05 mW / g |
| SAR normalized | normalized to 1W | 24.2 mW / g |
| SAR for nominal Body TSL parameters ² | normalized to 1W | 24.4 mW / g ± 16.5 % (k=2) |

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



Appendix

Antenna Parameters with Head TSL

| | |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 53.1 Ω + 3.0 j Ω |
| Return Loss | - 27.6 dB |

Antenna Parameters with Body TSL

| | |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 48.7 Ω + 4.6 j Ω |
| Return Loss | - 26.3 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.158 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 | August 26, 2003 |

DASY4 Validation Report for Head TSL

Date/Time: 12.07.2007 11:00:03

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN736

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB;

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 38.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025 (HF); ConvF(4.5, 4.5, 4.5); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- 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:

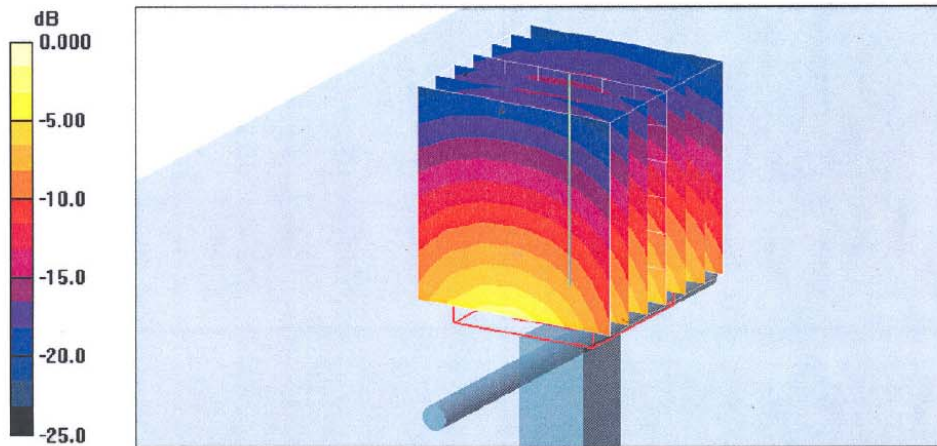
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.0 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 28.1 W/kg

SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.17 mW/g

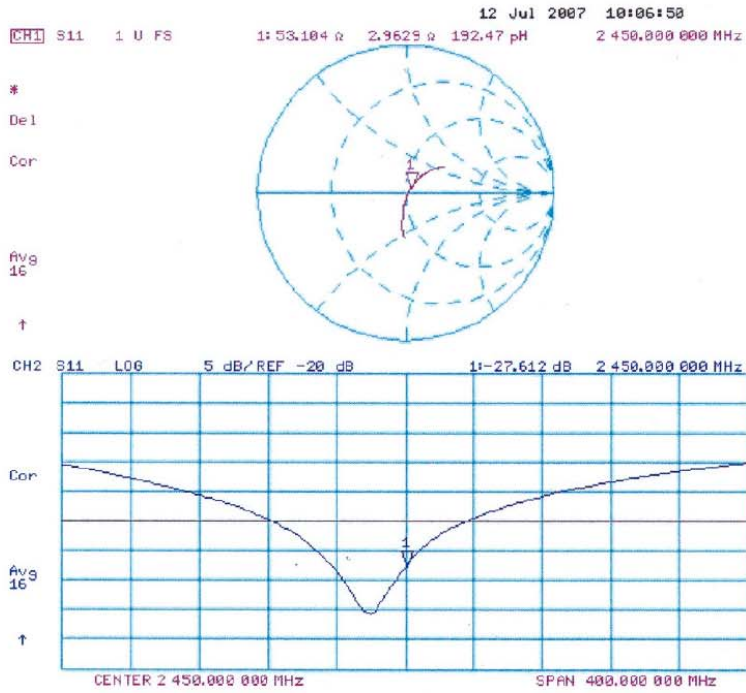
Maximum value of SAR (measured) = 15.0 mW/g



0 dB = 15.0mW/g



Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 12.07.2007 12:28:49

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN736

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB;

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025 (HF); ConvF(4.16, 4.16, 4.16); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- 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:

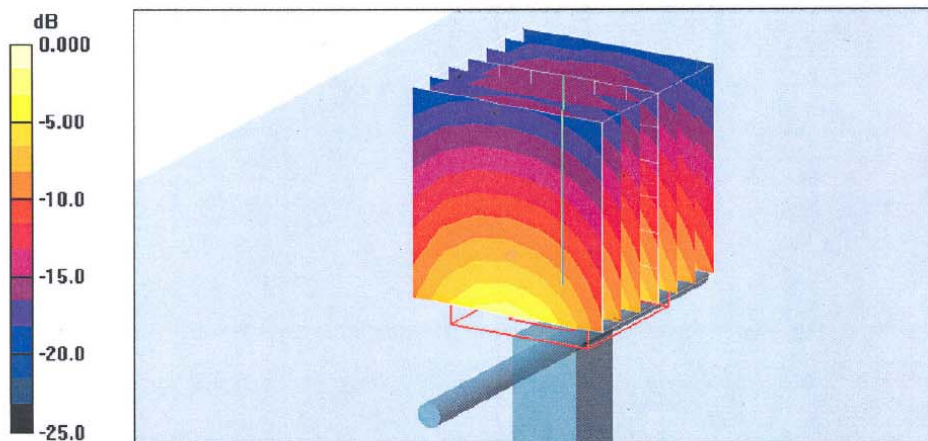
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.6 V/m; Power Drift = 0.005 dB

Peak SAR (extrapolated) = 27.0 W/kg

SAR(1 g) = 13 mW/g; SAR(10 g) = 6.05 mW/g

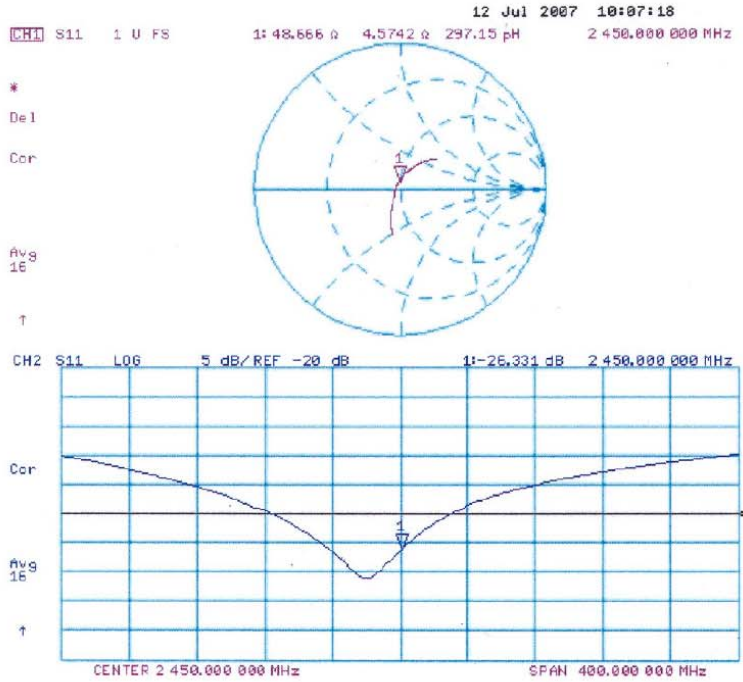
Maximum value of SAR (measured) = 14.8 mW/g



0 dB = 14.8mW/g



Impedance Measurement Plot for Body TSL





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Accreditation No.: SCS 108

Client Sporton (Autoren)

Certificate No: DAE4-778_Sep07

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BG - SN: 778
Calibration procedure(s): QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date: September 17, 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Table with 4 columns: Primary Standards, ID #, Cal Date (Calibrated by, Certificate No.), Scheduled Calibration. Includes entries for Fluke Process Calibrator Type 702 and Keithley Multimeter Type 2001.

Table with 4 columns: Secondary Standards, ID #, Check Date (in house), Scheduled Check. Includes entry for Calibrator Box V1.1.

Calibrated by: Dominique Steffen, Technician
Approved by: Fin Bornholt, R&D Director

Signatures of Dominique Steffen and Fin Bornholt

Issued: September 17, 2007

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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 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.



DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1µV , 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 | 404.715 ± 0.1% (k=2) | 403.520 ± 0.1% (k=2) | 405.065 ± 0.1% (k=2) |
| Low Range | 3.99539 ± 0.7% (k=2) | 3.96323 ± 0.7% (k=2) | 3.97102 ± 0.7% (k=2) |

Connector Angle

| | |
|---|-------------|
| Connector Angle to be used in DASY system | 309 ° ± 1 ° |
|---|-------------|

Appendix
1. DC Voltage Linearity

| High Range | Input (μV) | Reading (μV) | Error (%) |
|-------------------|-------------------------|---------------------------|-----------|
| Channel X + Input | 200000 | 199999.5 | 0.00 |
| Channel X + Input | 20000 | 20004.41 | 0.02 |
| Channel X - Input | 20000 | -20002.56 | 0.01 |
| Channel Y + Input | 200000 | 200000.3 | 0.00 |
| Channel Y + Input | 20000 | 20003.67 | 0.02 |
| Channel Y - Input | 20000 | -20003.41 | 0.02 |
| Channel Z + Input | 200000 | 200000.3 | 0.00 |
| Channel Z + Input | 20000 | 20002.49 | 0.01 |
| Channel Z - Input | 20000 | -20006.25 | 0.03 |

| Low Range | Input (μV) | Reading (μV) | Error (%) |
|-------------------|-------------------------|---------------------------|-----------|
| Channel X + Input | 2000 | 1999.9 | 0.00 |
| Channel X + Input | 200 | 199.47 | -0.26 |
| Channel X - Input | 200 | -200.56 | 0.28 |
| Channel Y + Input | 2000 | 2000.1 | 0.00 |
| Channel Y + Input | 200 | 199.15 | -0.43 |
| Channel Y - Input | 200 | -200.77 | 0.39 |
| Channel Z + Input | 2000 | 2000 | 0.00 |
| Channel Z + Input | 200 | 199.22 | -0.39 |
| Channel Z - Input | 200 | -201.39 | 0.69 |

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 | -6.00 | -6.42 |
| | - 200 | 7.17 | 6.60 |
| Channel Y | 200 | -2.49 | -2.64 |
| | - 200 | 2.04 | 1.25 |
| Channel Z | 200 | -10.83 | -10.80 |
| | - 200 | 9.19 | 8.80 |

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 | - | 2.57 | 0.15 |
| Channel Y | 200 | 0.11 | - | 4.08 |
| Channel Z | 200 | -1.80 | 1.03 | - |

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 | 16068 | 16321 |
| Channel Y | 16180 | 16239 |
| Channel Z | 16405 | 16167 |

5. Input Offset Measurement

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

Input 10MΩ

| | Average (μV) | min. Offset (μV) | max. Offset (μV) | Std. Deviation (μV) |
|-----------|--------------|------------------|------------------|---------------------|
| Channel X | -0.14 | -1.23 | 0.61 | 0.34 |
| Channel Y | -0.85 | -2.24 | 0.48 | 0.49 |
| Channel Z | -1.24 | -2.43 | 0.38 | 0.51 |

6. Input Offset Current

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

7. Input Resistance

| | Zeroing (MOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 0.2000 | 201.7 |
| Channel Y | 0.2000 | 201.7 |
| Channel Z | 0.1999 | 202.5 |

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 |



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Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: ET3-1787_Aug07

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1787
Calibration procedure(s): QA CAL-01.v6 Calibration procedure for dosimetric E-field probes
Calibration date: August 28, 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 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Table with 4 columns: Primary Standards, ID #, Cal Date (Calibrated by, Certificate No.), Scheduled Calibration. Lists various power meters, sensors, and attenuators with their respective IDs and calibration dates.

Table with 4 columns: Secondary Standards, ID #, Check Date (in house), Scheduled Check. Lists RF generator and Network Analyzer with their IDs and check dates.

Calibrated by: Katja Pokovic, Technical Manager
Approved by: Niels Kuster, Quality Manager
Includes handwritten signatures for both individuals.

Issued: August 28, 2007

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

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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.



ET3DV6 SN:1787

August 28, 2007

Probe ET3DV6

SN:1787

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|------------------|-----------------|
| Manufactured: | May 28, 2003 |
| Last calibrated: | May 31, 2006 |
| Recalibrated: | August 28, 2007 |

Calibrated for DASYS Systems

(Note: non-compatible with DASYS2 system!)