Body TSL parameters
The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.6 ± 6 %	1.0 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.41 mW / g
SAR normalized	normalized to 1W	9.64 mW / g°
SAR for nominal Body TSL parameters [2]	normalized to 1W	**9.28 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 mW / g
SAR normalized	normalized to 1W	6.36 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**6.19 mW / g ± 16.5 % (k=2)**

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

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω -3.7 jΩ
Return Loss	- 25.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.4 Ω -5.1 jΩ
Return Loss	- 25.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.390 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	April 22, 2004

DASY4 Validation Report for Head TSL

Date/Time: 21.07.2008 10:08:05

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d020

Communication System: CW-835; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL 900 MHz;
Medium parameters used: $f = 835$ MHz; $\sigma = 0.89$ mho/m; $\varepsilon_r = 40.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.97, 5.97, 5.97); Calibrated: 28.04.2008

- Sensor-Surface: 3.4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn601; Calibrated: 14.03.2008

- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;

- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184
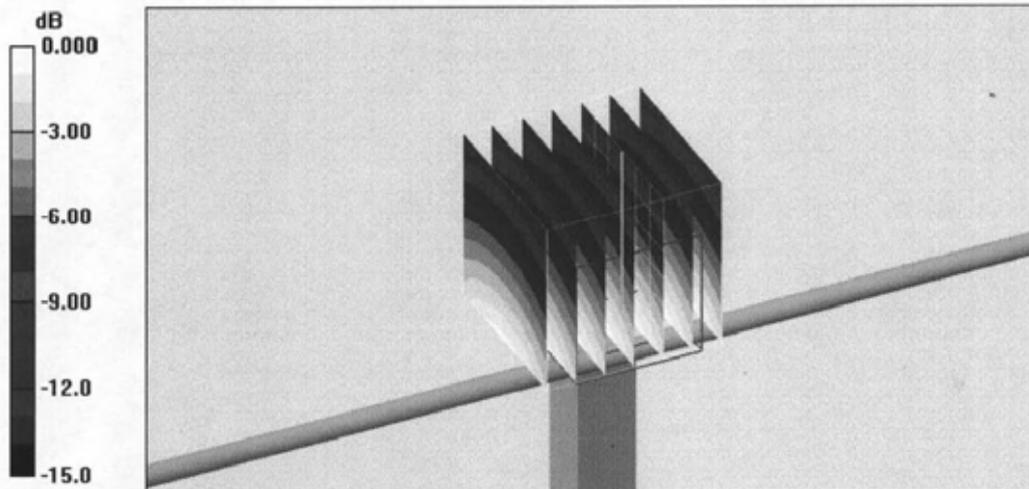
Pin=250mW; dip=15mm; dist=3.4mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.4 V/m; Power Drift = 0.011 dB
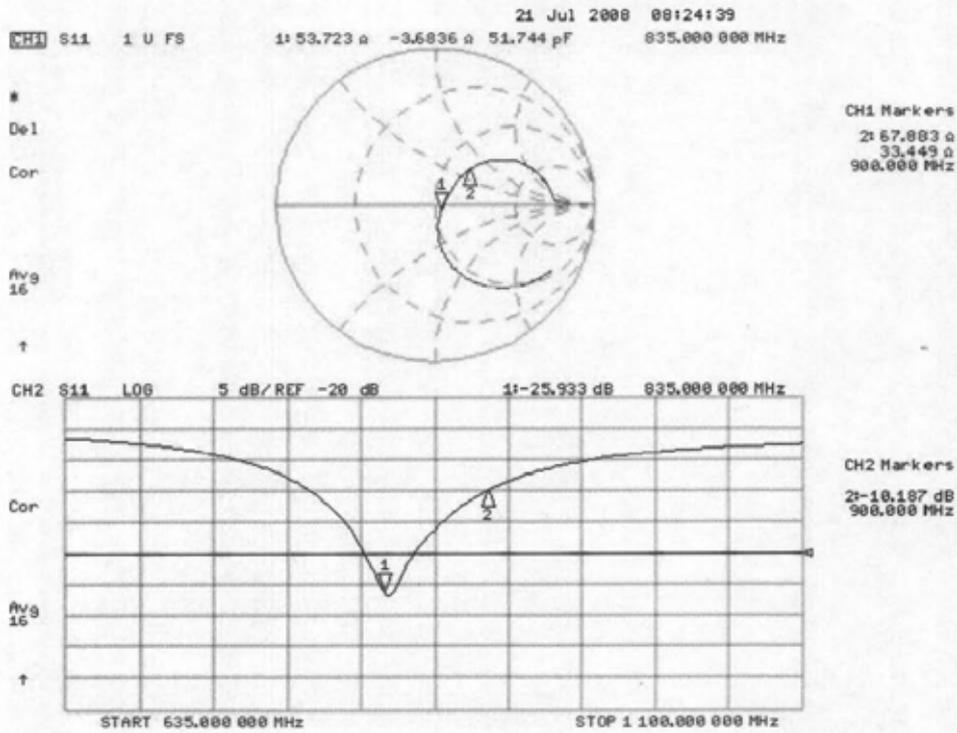Peak SAR (extrapolated) = 3.36 W/kg
SAR(1 g) = 2.3 mW/g; SAR(10 g) = 1.52 mW/g
Maximum value of SAR (measured) = 2.61 mW/g

0 dB = 2.61mW/g

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Impedance Measurement Plot for Head TSL

21 Jul 2008 08:24:39

CH1 S11 1 U FS   1: 53.723 Ω   -3.6836 Ω 51.744 pF   835.000 000 MHz

Del

Cor

CH1 Markers
2: 67.883 Ω
33.449 Ω
900.000 MHz

Avg
16

CH2 S11 LOG   5 dB/REF -20 dB   1:-25.933 dB   835.000 000 MHz

Cor

CH2 Markers
2:-10.187 dB
900.000 MHz

Avg
16

START 635.000 000 MHz   STOP 1 100.000 000 MHz

DASY4 Validation Report for Body TSL

Date/Time: 14.07.2008 09:46:38

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d020

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL900;
Medium parameters used: f = 835 MHz; σ = 1 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.9, 5.9, 5.9); Calibrated: 28.04.2008

- Sensor-Surface: 3.4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn601; Calibrated: 14.03.2008

- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;

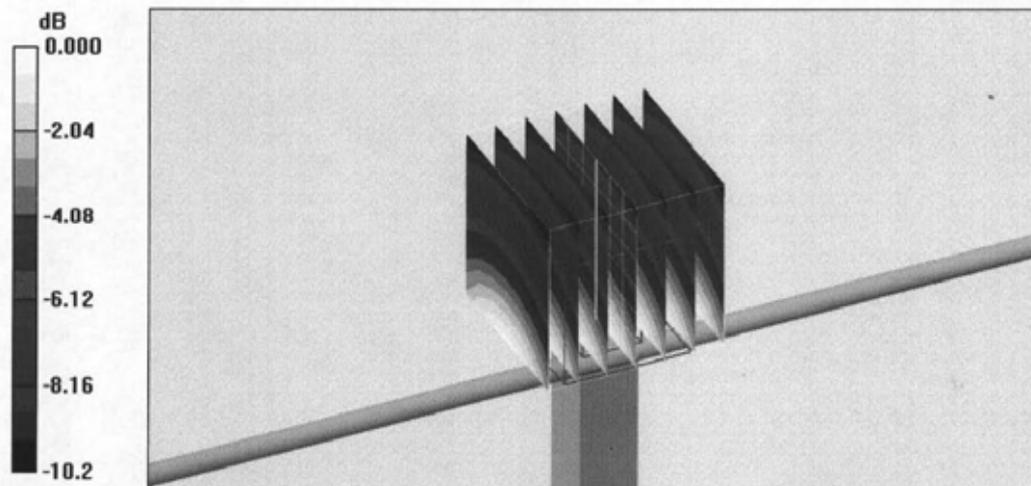- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.3 V/m; Power Drift = 0.008 dB
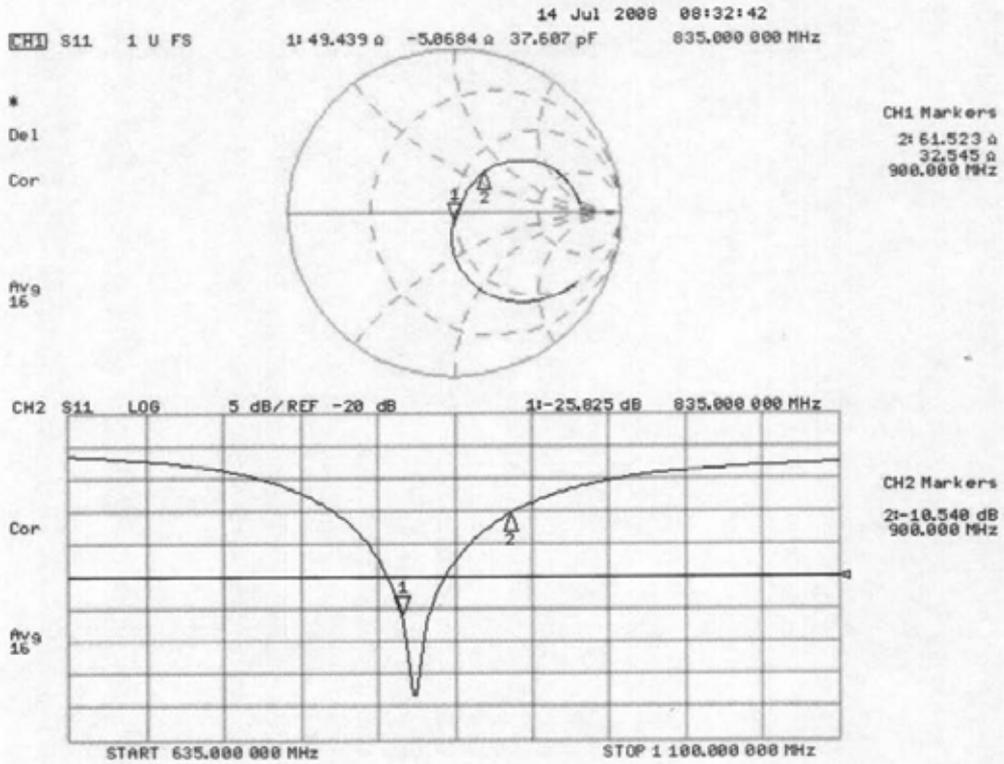Peak SAR (extrapolated) = 3.49 W/kg
SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 2.73 mW/g

0 dB = 2.73mW/g

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Impedance Measurement Plot for Body TSL

14 Jul 2008 08:32:42

CH1 S11 1 U FS 1: 49.439 Ω -5.0684 Ω 37.607 pF 835.000 000 MHz

Del

Cor

CH1 Markers
2: 61.523 Ω
32.545 Ω
900.000 MHz

Avg
16

CH2 S11 LOG 5 dB/REF -20 dB 1:-25.825 dB 835.000 000 MHz

Cor

CH2 Markers
2:-10.540 dB
900.000 MHz

Avg
16

START 635.000 000 MHz STOP 1 100.000 000 MHz

ANNEX G   DAE3 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
		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   **TMC**

Certificate No: **DAE3-536_Aug08**

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 536
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	August 28, 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:	Eric Hainfeld	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: August 28, 2008

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

Certificate No: DAE3-536_Aug08   Page 1 of 5

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

ilac-MRA

SWISS CALIBRATION

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.

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	405.300 ± 0.1% (k=2)	405.268 ± 0.1% (k=2)	405.016 ± 0.1% (k=2)
Low Range	3.99714 ± 0.7% (k=2)	3.98326 ± 0.7% (k=2)	3.99748 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	29 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	200000	200000.1	0.00
Channel X	+ Input	20000	20004.02	0.02
Channel X	- Input	20000	-19999.39	0.00
Channel Y	+ Input	200000	200000.2	0.00
Channel Y	+ Input	20000	20005.47	0.03
Channel Y	- Input	20000	-20000.81	0.00
Channel Z	+ Input	200000	200000.2	0.00
Channel Z	+ Input	20000	20003.45	0.02
Channel Z	- Input	20000	-20004.17	0.02

Low Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	2000	2000.1	0.00
Channel X	+ Input	200	199.94	-0.03
Channel X	- Input	200	-199.87	-0.06
Channel Y	+ Input	2000	2000	0.00
Channel Y	+ Input	200	199.53	-0.24
Channel Y	- Input	200	-199.88	-0.06
Channel Z	+ Input	2000	2000.1	0.00
Channel Z	+ Input	200	198.68	-0.66
Channel Z	- Input	200	-201.09	0.55

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	20.74	20.84
	- 200	-20.15	-21.59
Channel Y	200	20.84	20.81
	- 200	-22.13	-21.66
Channel Z	200	-8.34	-8.84
	- 200	6.99	7.01

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	-	-0.48	-0.24
Channel Y	200	-0.12	-	2.63
Channel Z	200	-2.59	-0.19	-

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	16047	15921
Channel Y	16153	16136
Channel Z	16201	16095

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	0.89	-0.27	2.49	0.47
Channel Y	-1.24	-2.18	0.71	0.43
Channel Z	-1.23	-2.13	-0.11	0.38

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	202.1
Channel Y	0.2000	202.1
Channel Z	0.2000	203.3

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

ANNEX H   THE EUT APPEARANCES AND TEST CONFIGURATION

Picture 4: Constituents of the sample

Picture 5: Left Hand Touch Cheek Position

Picture 6: Left Hand Tilt 15 Degree Position

Picture 7: Right Hand Touch Cheek Position

Picture 8: Right Hand Tilt 15 Degree Position

Picture 9: Body, The EUT display towards ground, the distance from handset to the bottom of the
Phantom is 15mm)

Picture 10: Body, towards phantom, the distance from handset to the bottom of
the Phantom is 15mm)

Picture 11: Body with earphone, The EUT display towards ground, the distance from handset to the
bottom of the Phantom is 15mm)