



Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 6/13/2006 1:45:31 AM

Body_PCS Ch512_20060612_No Camera_EDGE10_Battery-Main_Bluetooth On_2D**DUT: 660618; Type: PDA Phone**

Communication System: PCS 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:4

Medium: MSL_1900 Medium parameters used : $f = 1850.2$ MHz; $\sigma = 1.49$ mho/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.4 °C; Liquid Temperature : 21.3 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(4.66, 4.66, 4.66); Calibrated: 5/31/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/11/2005
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

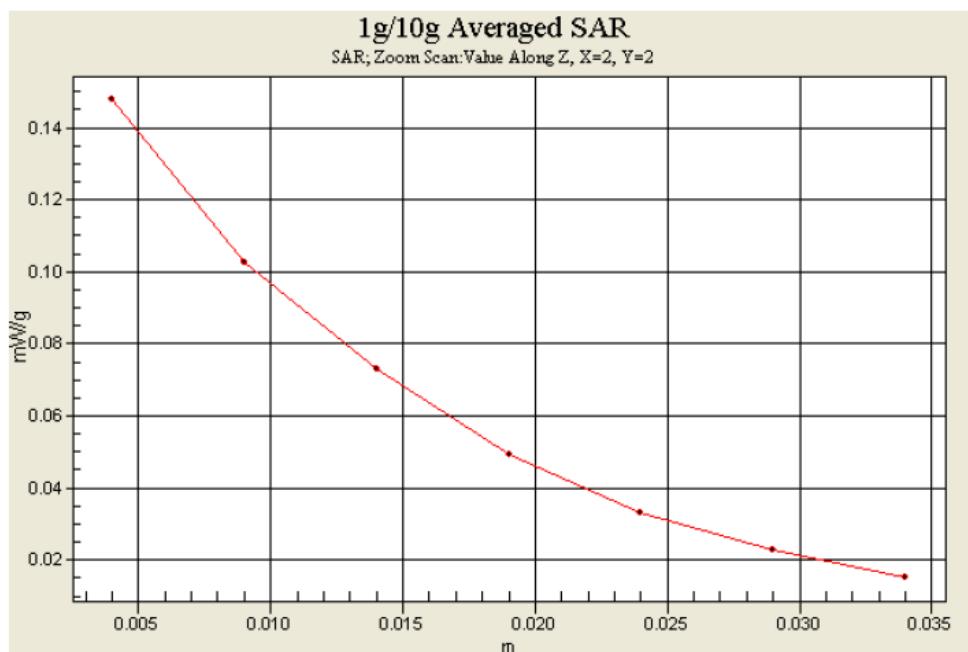
Ch512/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.151 mW/g**Ch512/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.16 V/m; Power Drift = 0.120 dB

Peak SAR (extrapolated) = 0.192 W/kg

SAR(1 g) = 0.139 mW/g; SAR(10 g) = 0.094 mW/g

Maximum value of SAR (measured) = 0.148 mW/g





Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 6/12/2006 1:24:22 PM

Body_WCDMA Band 5 Ch4233_20060612_No Camera_Battery-Main_Bluetooth On_2D

DUT: 660618; Type: PDA Phone

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

Medium: MSL_850 Medium parameters used: $f = 847$ MHz; $\sigma = 0.977$ mho/m; $\epsilon_r = 55.4$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.5 °C; Liquid Temperature : 21.3 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(6.18, 6.18, 6.18); Calibrated: 5/31/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/11/2005
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

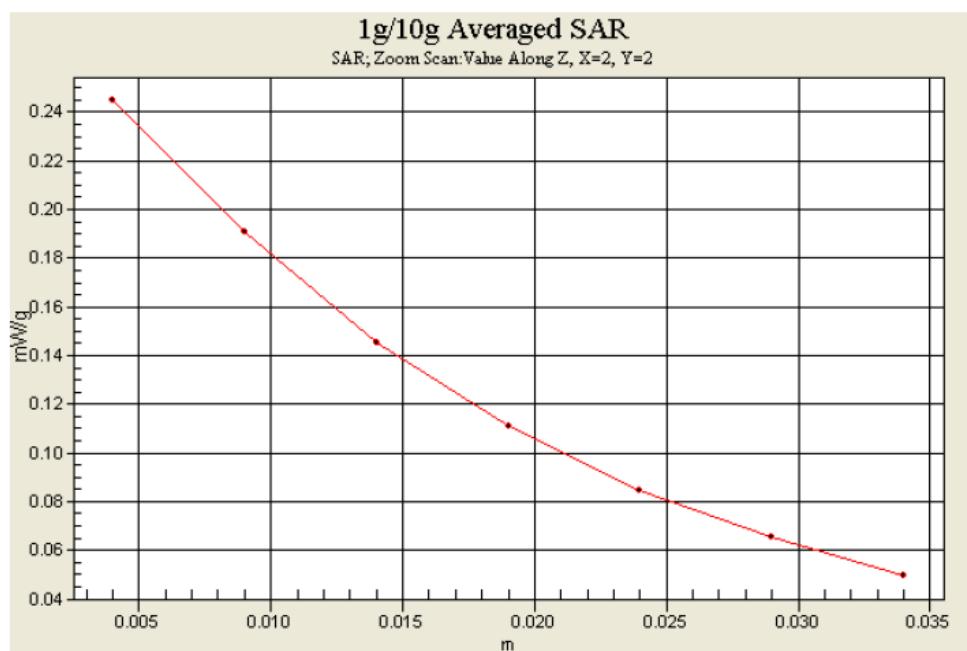
Ch4233/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.242 mW/g

Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.3 V/m; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 0.284 W/kg

SAR(1 g) = 0.231 mW/g; SAR(10 g) = 0.171 mW/g

Maximum value of SAR (measured) = 0.244 mW/g





Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 6/13/2006 4:03:59 AM

Body_WCDMA Band 2 Ch9262_20060612_No Camera_Battery-Main_2D**DUT: 660618; Type: PDA Phone**

Communication System: WCDMA; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: MSL_1900 Medium parameters used : $f = 1852.4$ MHz; $\sigma = 1.49$ mho/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³

Ambient Temperature : 23.4 °C; Liquid Temperature : 21.3 °C

DASY4 Configuration:

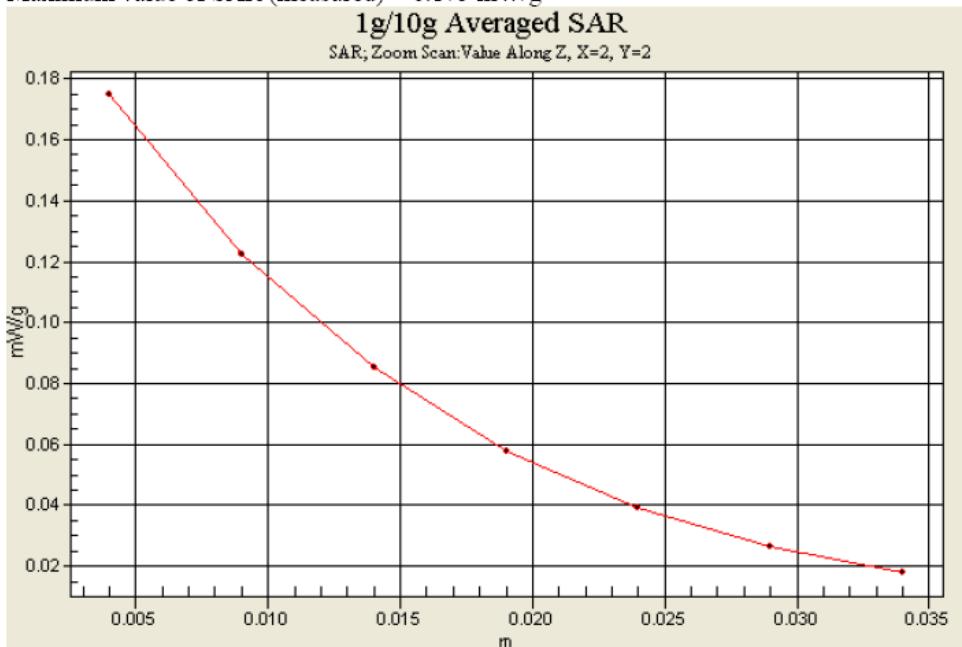
- Probe: ET3DV6 - SN1787; ConvF(4.66, 4.66, 4.66); Calibrated: 5/31/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn577; Calibrated: 11/11/2005
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

Ch9262/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.176 mW/g**Ch9262/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.8 V/m; Power Drift = -0.138 dB

Peak SAR (extrapolated) = 0.228 W/kg

SAR(1 g) = 0.164 mW/g; SAR(10 g) = 0.111 mW/g

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





Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 11/10/2006 9:28:32 AM

Body_WCDMA Ch4132 Keypad Up with Holster Touch_20061110_HSDPA

DUT: 660618-01

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

Medium: MSL_850 Medium parameters used : $f = 826.4$ MHz; $\sigma = 0.955$ mho/m; $\epsilon_r = 56.6$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C; Liquid Temperature : 21.1 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(6.33, 6.33, 6.33); Calibrated: 9/19/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 3/21/2006
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

Ch4132/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.246 mW/g

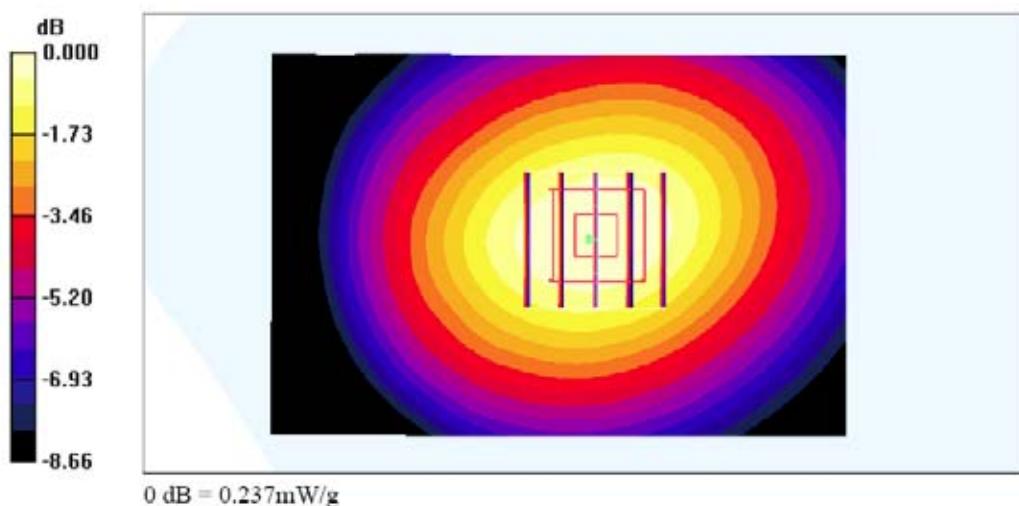
Ch4132/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.4 V/m; Power Drift = -0.178 dB

Peak SAR (extrapolated) = 0.277 W/kg

SAR(1 g) = 0.223 mW/g; SAR(10 g) = 0.164 mW/g

Maximum value of SAR (measured) = 0.237 mW/g





Test Laboratory: Sporton International Inc. SAR Testing Lab

Date/Time: 11/10/2006 10:19:59 AM

Body_WCDMA Ch9262 Keypad Up with Holster Touch_20061110_HSDPA**DUT: 660618-01**

Communication System: WCDMA; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: MSL_1900 Medium parameters used : $f = 1852.4$ MHz; $\sigma = 1.47$ mho/m; $\epsilon_r = 52.6$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.4 °C; Liquid Temperature : 20.9 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1788; ConvF(4.67, 4.67, 4.67); Calibrated: 9/19/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 3/21/2006
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

Ch9262/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.150 mW/g

Ch9262/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.40 V/m; Power Drift = -0.150 dB

Peak SAR (extrapolated) = 0.183 W/kg

SAR(1 g) = 0.132 mW/g; SAR(10 g) = 0.088 mW/g

Maximum value of SAR (measured) = 0.142 mW/g

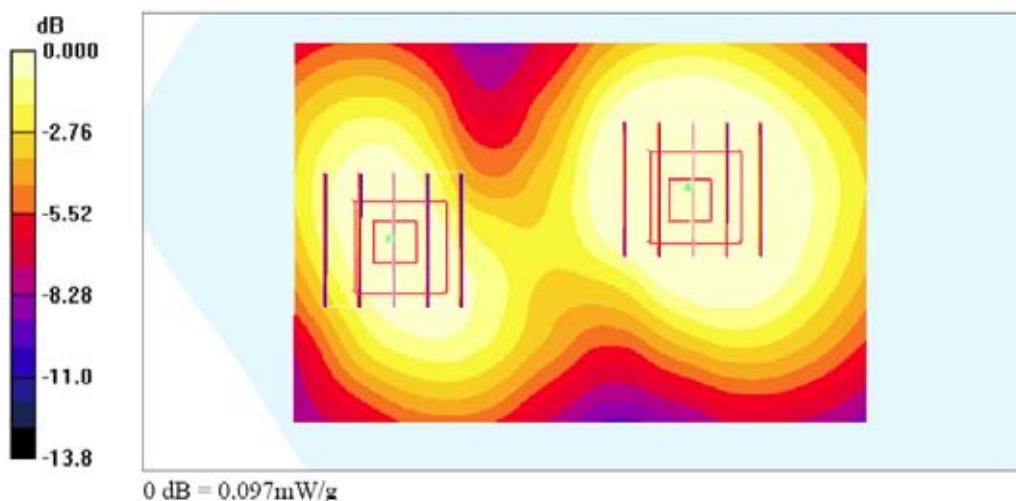
Ch9262/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.40 V/m; Power Drift = -0.150 dB

Peak SAR (extrapolated) = 0.127 W/kg

SAR(1 g) = 0.090 mW/g; SAR(10 g) = 0.060 mW/g

Maximum value of SAR (measured) = 0.097 mW/g



**Appendix C – Calibration Data**

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland



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Accreditation No.: **SCS 108**

Client

Sporton (Auden)Certificate No: **D835V2-499_Mar06****CALIBRATION CERTIFICATE**Object **D835V2 - SN: 499**Calibration procedure(s) **QA CAL-05.v6**
 Calibration procedure for dipole validation kitsCalibration date: **March 15, 2006**Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference Probe ET3DV6	SN 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06

Secondary Standards	ID #	Check Date (In house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000575	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by:	Name	Function	Signature
	Judith Müller	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 16, 2006

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
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) 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
- 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 V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.1 ± 6 %	0.94mho/m ± 6 %
Head TSL temperature during test	(22.2 ± 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	2.35 mW / g
SAR normalized	normalized to 1W	9.40 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.24 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 mW / g
SAR normalized	normalized to 1W	6.12 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.07 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	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.8 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature during test	(21.4 ± 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	2.45 mW / g
SAR normalized	normalized to 1W	9.80 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	9.91 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 mW / g
SAR normalized	normalized to 1W	6.48 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	6.55 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	52.1 Ω - 2.9 $j\Omega$
Return Loss	- 29.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.9 Ω - 5.1 $j\Omega$
Return Loss	- 24.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391ns
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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	July 10, 2003



DASY4 Validation Report for Head TSL

Date/Time: 15.03.2006 12:51:44

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:499

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

Medium: HSL U10 BB;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.942$ mho/m; $\epsilon_r = 42.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(6.09, 6.09, 6.09); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 14; Postprocessing SW: SEMCAD, V1.8 Build 165

Pin = 250 mW; d = 10 mm/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.54 mW/g

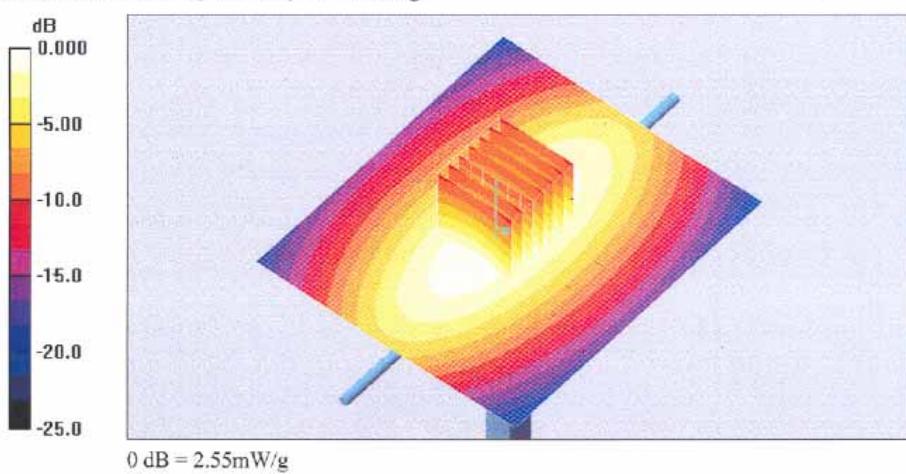
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.7 V/m; Power Drift = -0.008 dB

Peak SAR (extrapolated) = 3.53 W/kg

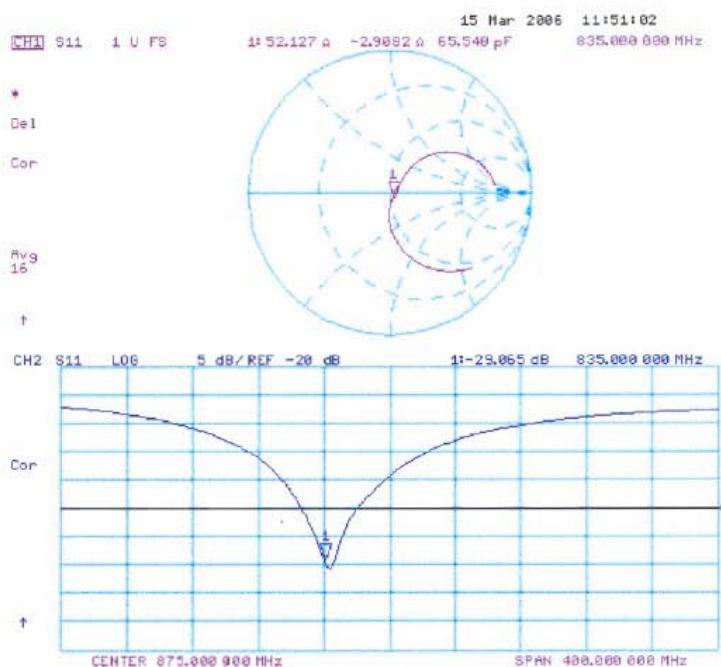
SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.53 mW/g

Maximum value of SAR (measured) = 2.55 mW/g





Impedance Measurement Plot for Head TSL





DASY4 Validation Report for Body TSL

Date/Time: 14.03.2006 12:37:15

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:499

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

Medium: MSL U10;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.972$ mho/m; $\epsilon_r = 56.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

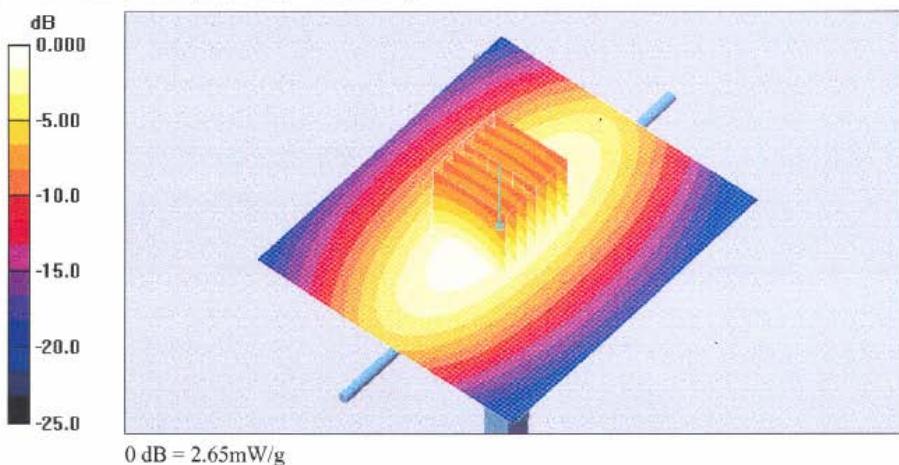
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.84, 5.84, 5.84); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 14; Postprocessing SW: SEMCAD, V1.8 Build 165

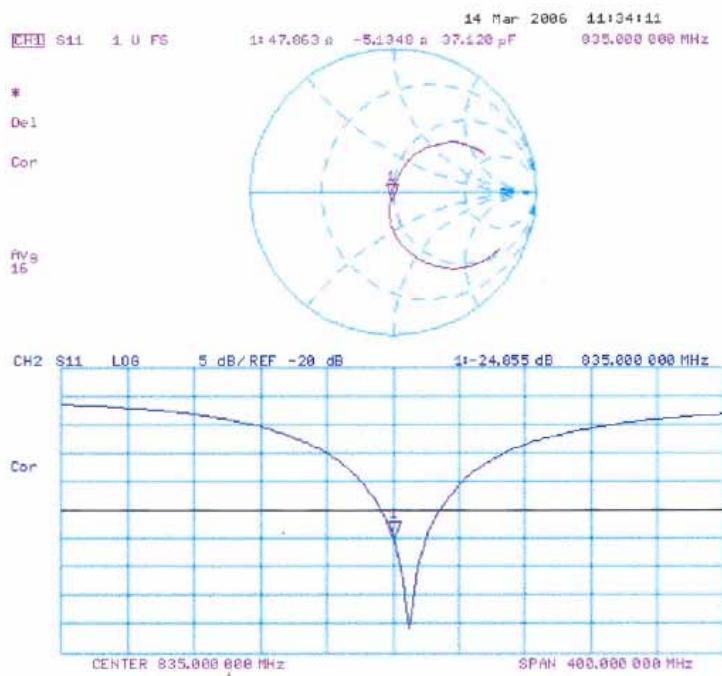
Pin = 250 mW; d = 10 mm/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.63 mW/g

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.3 V/m; Power Drift = 0.026 dB
Peak SAR (extrapolated) = 3.51 W/kg
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.62 mW/g
Maximum value of SAR (measured) = 2.65 mW/g





Impedance Measurement Plot Body TSL





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Accreditation No.: **SCS 108**Client **Sporton (Auden)**Certificate No: **D1900V2-5d041_Mar06****CALIBRATION CERTIFICATE**Object **D1900V2 - SN: 5d041**Calibration procedure(s) **QA CAL-05.v6**
Calibration procedure for dipole validation kitsCalibration date: **March 21, 2006**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	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 6461A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No. 251-00498)	Aug-06
Reference Probe ET3DV6	SN: 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN: 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 6461A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by:	Name	Function	Signature
	Judith Müller	Laboratory Technician	

Approved by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Issued: March 22, 2006

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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:

- 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) 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
- 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
Area Scan resolution	dx, dy = 15 mm	
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	39.4 \pm 6 %	1.42 mho/m \pm 6 %
Head TSL temperature during test	(21.5 \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	9.75 mW / g
SAR normalized	normalized to 1W	39.0 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	38.4 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	5.17 mW / g
SAR normalized	normalized to 1W	20.7 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	20.5 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	54.7 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature during test	(21.6 ± 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	10.2 mW / g
SAR normalized	normalized to 1W	40.8 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	41.1 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.40 mW / g
SAR normalized	normalized to 1W	21.6 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	21.8 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	$53.5 \Omega + 5.1 j\Omega$
Return Loss	-24.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$47.9 \Omega + 6.3 j\Omega$
Return Loss	-23.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 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	July 4, 2003



DASY4 Validation Report for Head TSL

Date/Time: 14.03.2006 16:18:53

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041

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

Medium: HSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

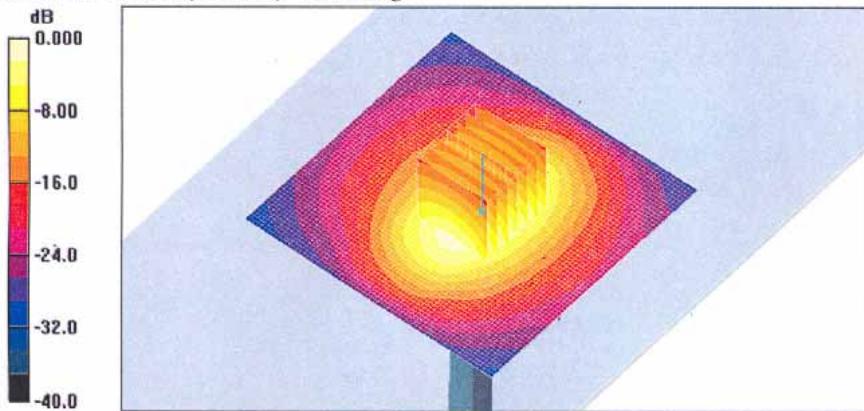
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.74, 4.74, 4.74); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA;
- Measurement SW: DASY4, V4.7 Build 14; Postprocessing SW: SEMCAD, V1.8 Build 165

Pin = 250 mW; d = 10 mm/Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.7 mW/g

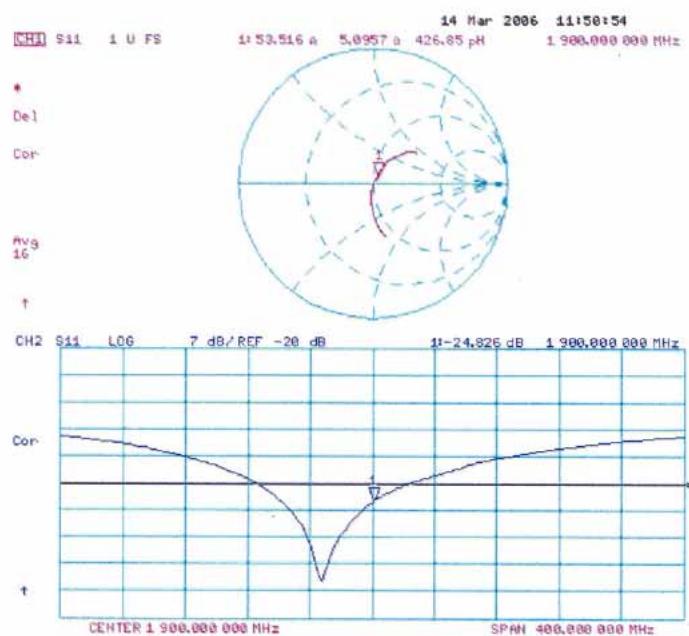
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.9 V/m; Power Drift = -0.093 dB
Peak SAR (extrapolated) = 16.6 W/kg
SAR(1 g) = 9.75 mW/g; SAR(10 g) = 5.17 mW/g
Maximum value of SAR (measured) = 11.1 mW/g



0 dB = 11.1mW/g



Impedance Measurement Plot for Head TSL





DASY4 Validation Report for Body TSL

Date/Time: 21.03.2006 13:59:55

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d041

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

Medium: MSL U10;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 54.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.3, 4.3, 4.3); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA;;
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161

Pin = 250 mW; d = 10 mm/Area Scan (71x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.8 mW/g

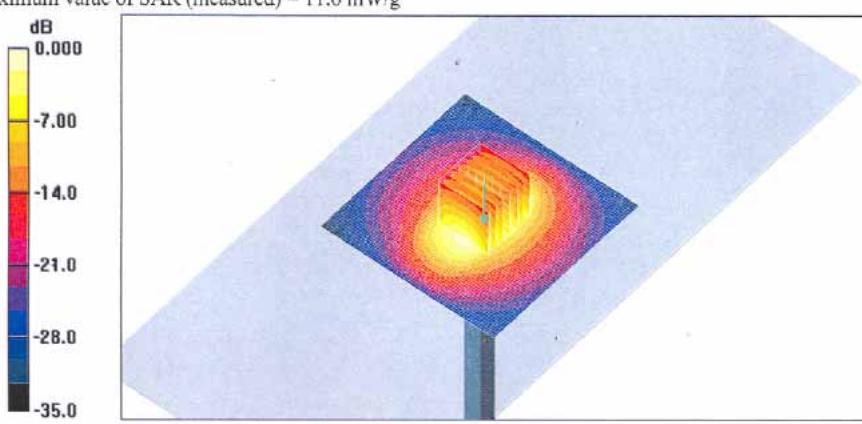
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.3 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 17.4 W/kg

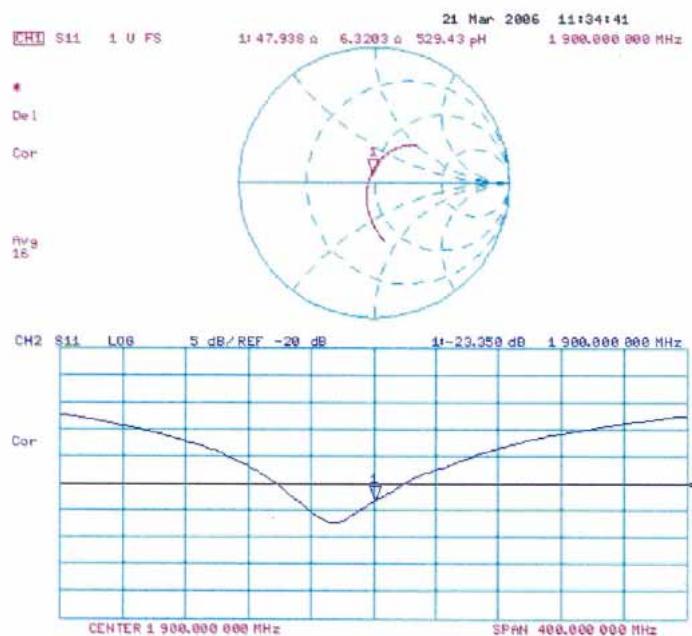
SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.4 mW/g

Maximum value of SAR (measured) = 11.6 mW/g





Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**Client **Sporton (Auden)**Certificate No: **ET3-1787_May06**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN: 1787**
 Calibration procedure(s) **QA CAL-01.v5**
 Calibration procedure for dosimetric E-field probes
Calibration date: **May 31, 2006**Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642J01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

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

Issued: May 31, 2006

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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., $\theta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz)", July 2001

Methods Applied and Interpretation of Parameters:

- $NORM_{x,y,z}$: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ 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*.
- $DCPx,y,z$: 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

May 31, 2006

Probe ET3DV6

SN:1787

Manufactured:	May 28, 2003
Last calibrated:	August 29, 2003
Recalibrated:	May 31, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



ET3DV6 SN:1787

May 31, 2006

DASY - Parameters of Probe: ET3DV6 SN:1787**Sensitivity in Free Space^A**

NormX	1.57 \pm 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.71 \pm 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	2.09 \pm 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression^B

DCP X	94 mV
DCP Y	94 mV
DCP Z	94 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance	3.7 mm	4.7 mm
SAR ₉₉ [%] Without Correction Algorithm	7.2	3.8
SAR ₉₉ [%] With Correction Algorithm	0.0	0.2

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance	3.7 mm	4.7 mm
SAR ₉₉ [%] Without Correction Algorithm	6.3	3.6
SAR ₉₉ [%] With Correction Algorithm	0.1	0.3

Sensor OffsetProbe Tip to Sensor Center **2.7** mm

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

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

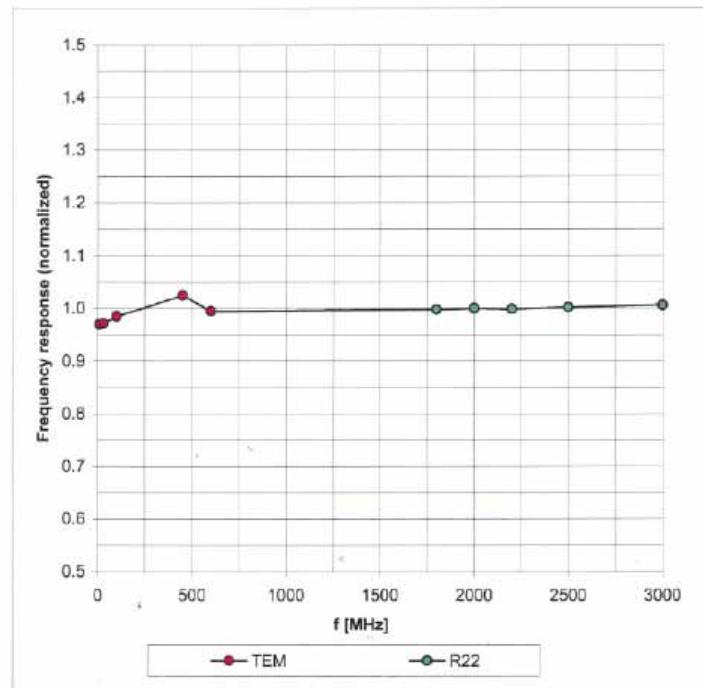


ET3DV6 SN:1787

May 31, 2006

Frequency Response of E-Field

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



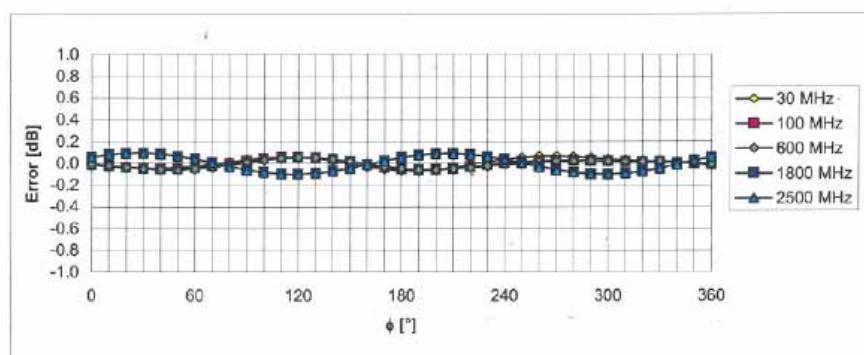
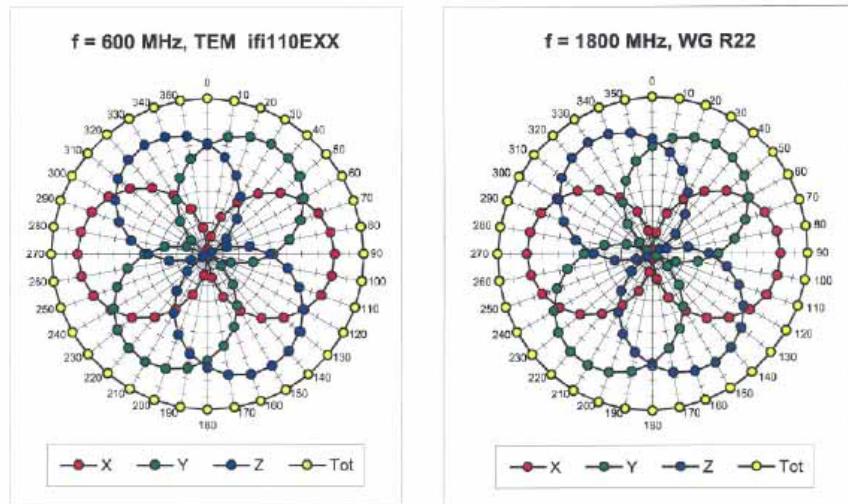
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)



ET3DV6 SN:1787

May 31, 2006

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



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

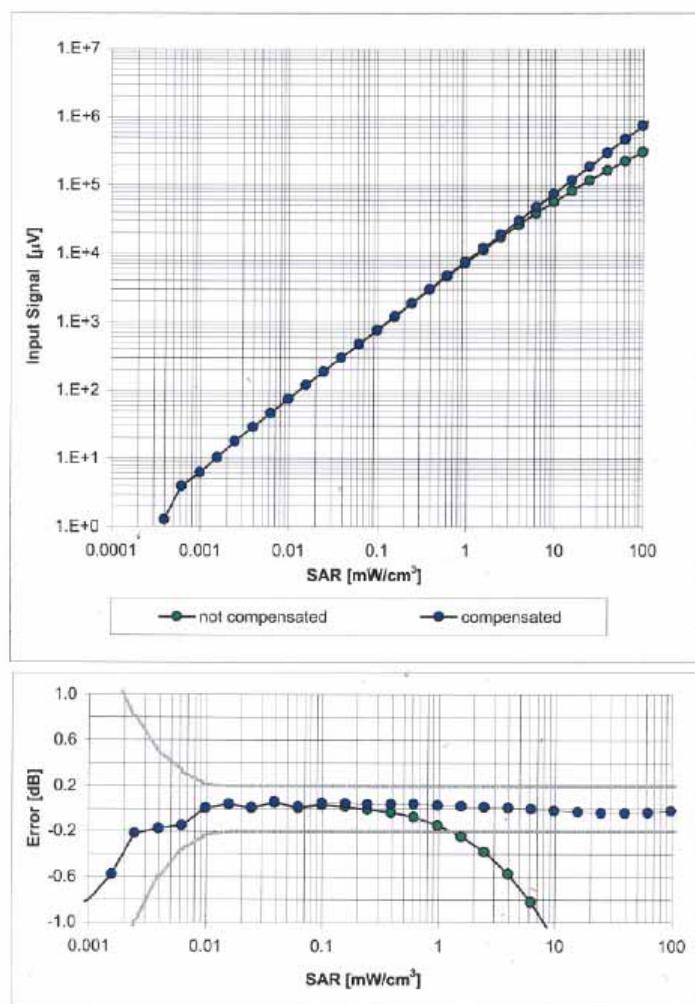


ET3DV6 SN:1787

May 31, 2006

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)



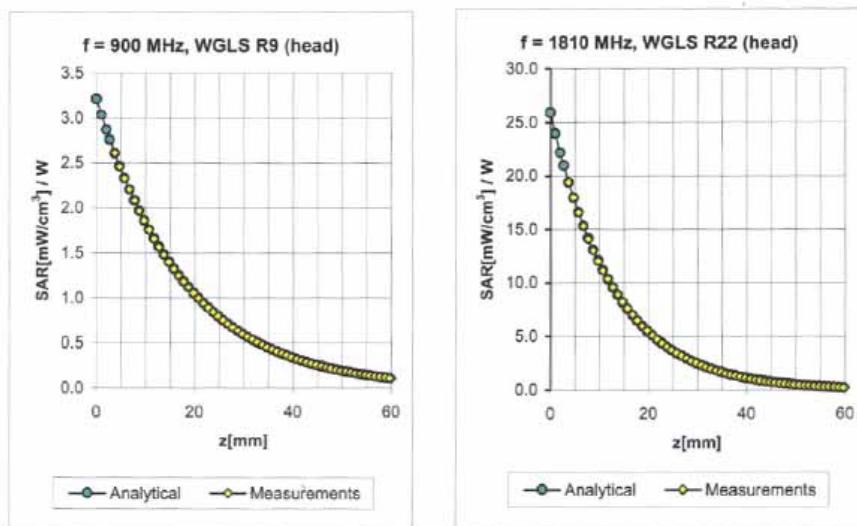
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)



ET3DV6 SN:1787

May 31, 2006

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	$\pm 50 / \pm 100$	Head	$41.5 \pm 5\%$	$0.97 \pm 5\%$	0.50	1.85	6.38	$\pm 11.0\% (k=2)$
1810	$\pm 50 / \pm 100$	Head	$40.0 \pm 5\%$	$1.40 \pm 5\%$	0.59	2.46	5.26	$\pm 11.0\% (k=2)$
900	$\pm 50 / \pm 100$	Body	$55.0 \pm 5\%$	$1.05 \pm 5\%$	0.44	2.10	6.18	$\pm 11.0\% (k=2)$
1810	$\pm 50 / \pm 100$	Body	$53.3 \pm 5\%$	$1.52 \pm 5\%$	0.62	2.44	4.66	$\pm 11.0\% (k=2)$
2450	$\pm 50 / \pm 100$	Body	$52.7 \pm 5\%$	$1.95 \pm 5\%$	0.62	2.13	4.13	$\pm 11.8\% (k=2)$

^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.

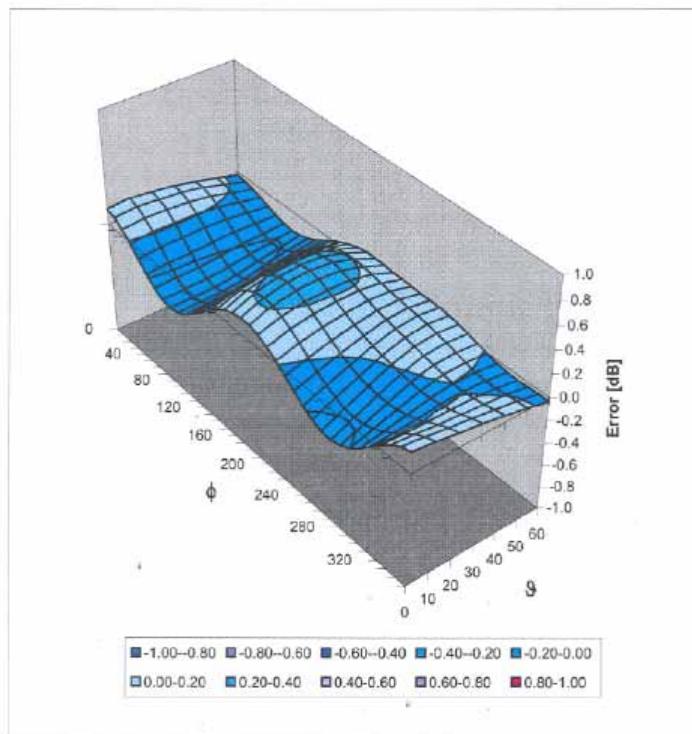


ET3DV6 SN:1787

May 31, 2006

Deviation from Isotropy in HSL

Error (ϕ, θ), f = 900 MHz



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



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Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: ET3-1788_Sep06

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1788		
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes		
Calibration date:	September 19, 2006		
Condition of the calibrated item	In Tolerance		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility; environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41496087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00559)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	2-Jun-06 (SPEAG, No. ES3-3013_Jun06)	Jan-07
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3542U01700	4-Aug-06 (SPEAG, in house check Nov-06)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06
Calibrated by:	Name Katja Pokovic	Function Technical Manager	Signature
Approved by:	Niels Kuster	Quality Manager	
Issued: September 19, 2006			
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Certificate No: ET3-1788_Sep06

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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., $\theta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz)", July 2001

Methods Applied and Interpretation of Parameters:

- $NORMx,y,z$: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). $NORMx,y,z$ are only intermediate values, i.e., the uncertainties of $NORMx,y,z$ does not effect the E^2 -field uncertainty inside TSL (see below *ConvF*).
- $NORM(f)x,y,z = NORMx,y,z * frequency_response$ (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*.
- $DCPx,y,z$: 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 $NORMx,y,z * ConvF$ 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:1788

September 19, 2006

Probe ET3DV6

SN:1788

Manufactured:	May 28, 2003
Last calibrated:	September 30, 2004
Recalibrated:	September 19, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



ET3DV6 SN:1788

September 19, 2006

DASY - Parameters of Probe: ET3DV6 SN:1788**Sensitivity in Free Space^A**

NormX	$1.73 \pm 10.1\%$	$\mu\text{V}/(\text{V}/\text{m})^2$
NormY	$1.67 \pm 10.1\%$	$\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	$1.70 \pm 10.1\%$	$\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression^B

DCP X	95 mV
DCP Y	101 mV
DCP Z	93 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{eo} [%]	Without Correction Algorithm	7.9	4.3
SAR _{eo} [%]	With Correction Algorithm	0.1	0.3

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{eo} [%]	Without Correction Algorithm	11.8	7.0
SAR _{eo} [%]	With Correction Algorithm	0.2	0.4

Sensor Offset

Probe Tip to Sensor Center 2.7 mm

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

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

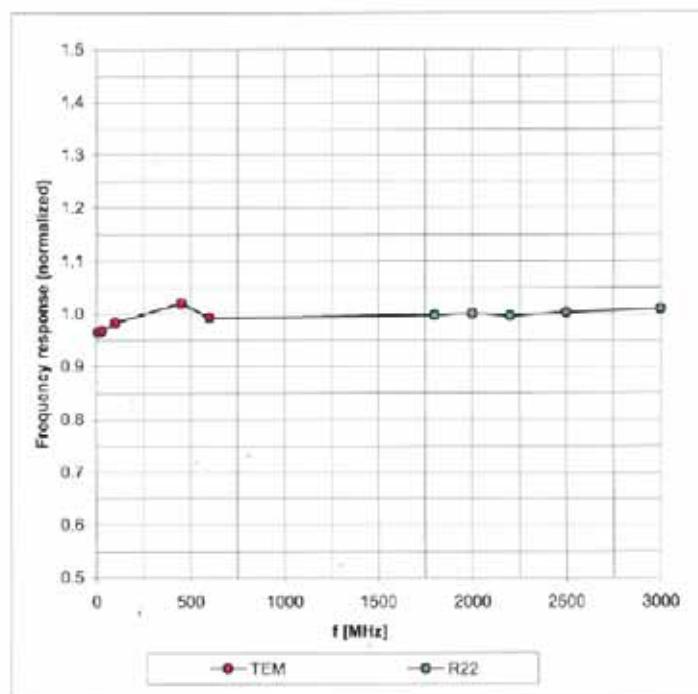


ET3DV6 SN:1788

September 19, 2006

Frequency Response of E-Field

(TEM-Cell:ifl110 EXX, Waveguide: R22)



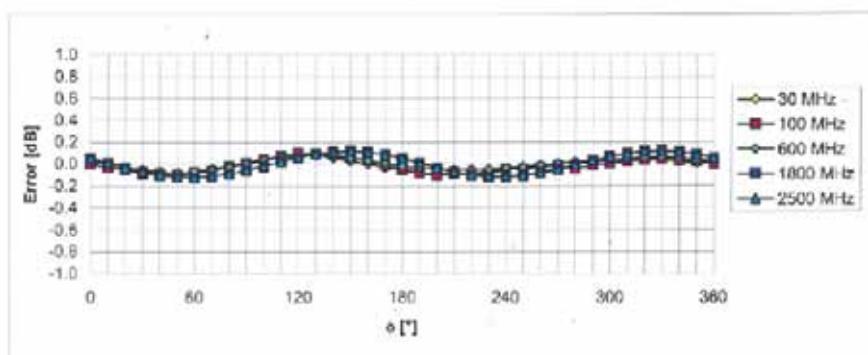
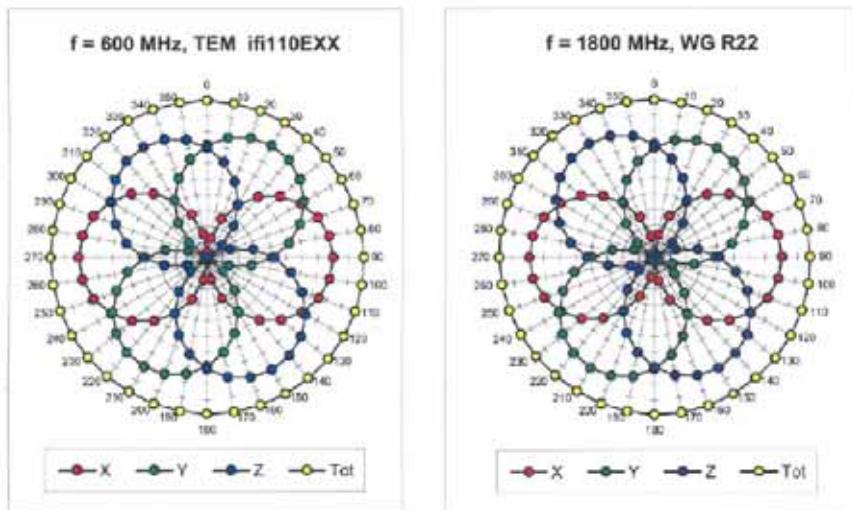
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)



ET3DV6 SN:1788

September 19, 2006

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



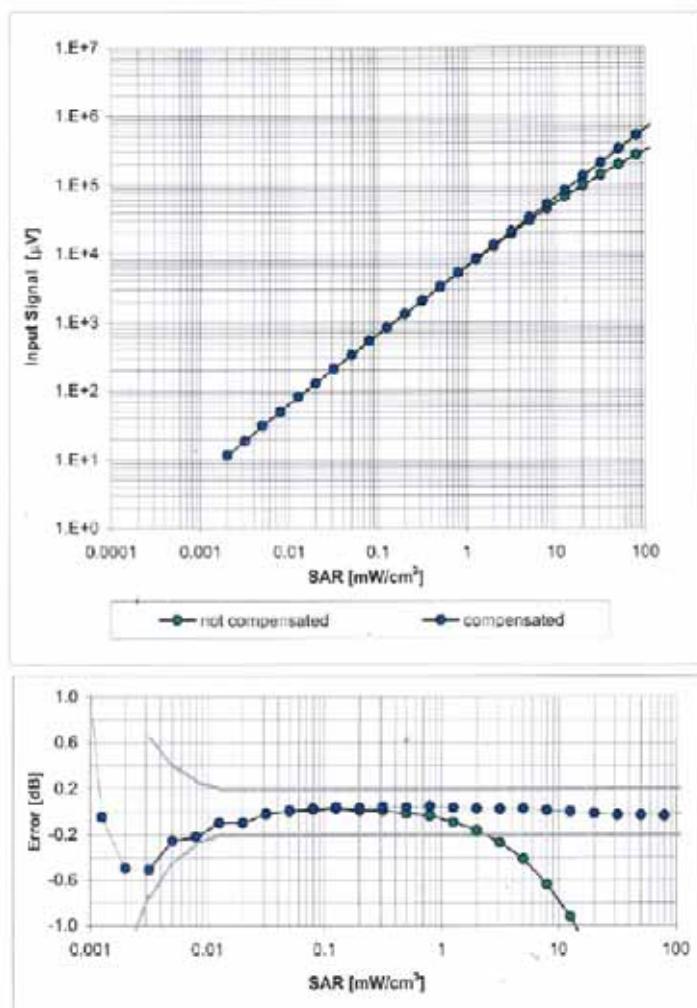
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)



ET3DV6 SN:1788

September 19, 2006

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



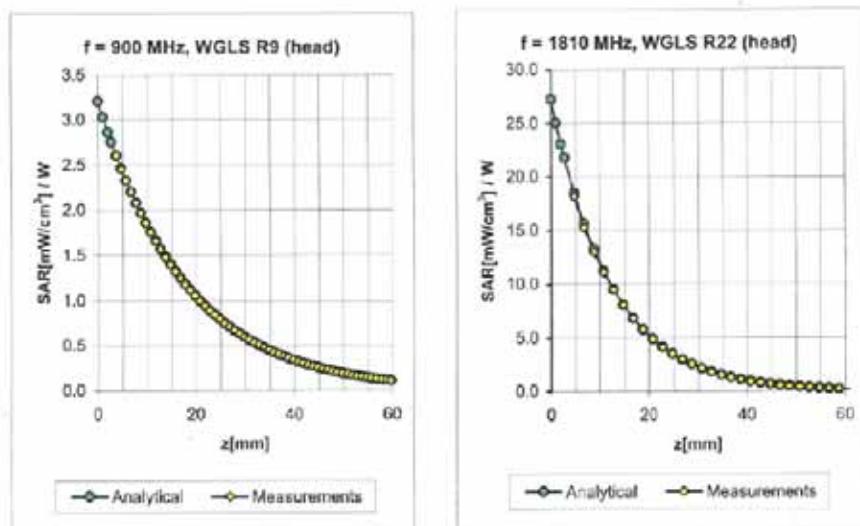
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)



ET3DV6 SN:1788

September 19, 2006

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^g	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.87 ± 5%	0.49	1.94	6.60 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.48	2.74	5.30 ± 11.0% (k=2)
2000	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.53	2.75	5.00 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.68	1.96	4.86 ± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.45	2.12	6.33 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.59	2.89	4.87 ± 11.0% (k=2)
2000	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.58	2.79	4.50 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.60	1.70	4.11 ± 11.8% (k=2)

^g The validity of ± 100 MHz only applies for DABY 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.

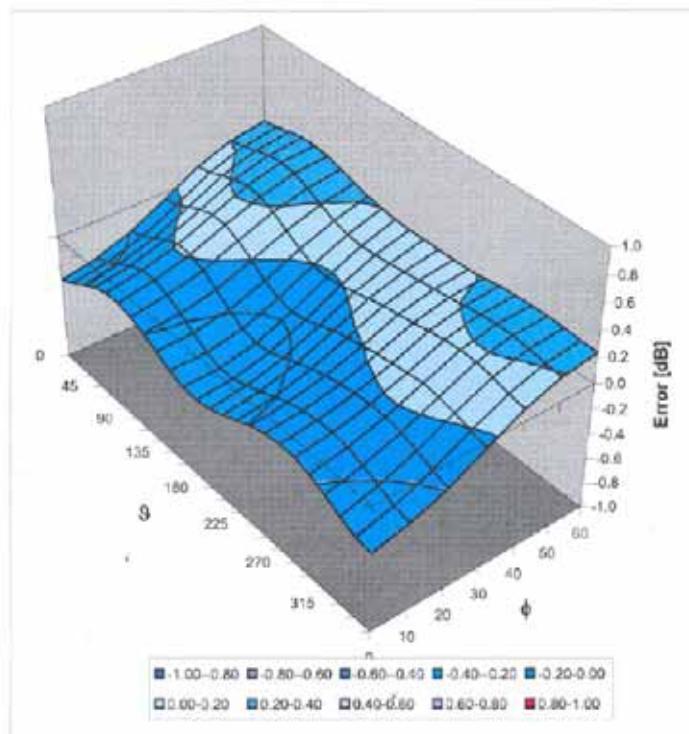


ET3DV6 SN:1788

September 19, 2006

Deviation from Isotropy in HSL

Error (ϕ, θ), $f = 900$ MHz



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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**client **Sporton (Auden)**Certificate No: **DAE3-577_Nov05****CALIBRATION CERTIFICATE**Object **DAE3 - SD 000 D03 AA - SN: 577**Calibration procedure(s) **QA CAL-06.v12**
Calibration procedure for the data acquisition electronics (DAE)Calibration date: **November 11, 2005**Condition of the calibrated item **In Tolerance**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility; environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	7-Oct-05 (Sintrel, No.E-050073)	Oct-06
Secondary Standards	ID #	Check Date (In house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1002	29-Jun-05 (SPEAG, in house check)	In house check Jun-06

Calibrated by: Name **Daniel Steinacher** Function **Technician** Signature Approved by: Name **Fin Bomholt** Function **R&D Director** Signature

Issued: November 11, 2005

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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 = $6.1\mu\text{V}$, full range = $-100...+300\text{ mV}$ Low Range: 1LSB = 61nV , full range = $-1.....+3\text{mV}$

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

Calibration Factors	X	Y	Z
High Range	$404.445 \pm 0.1\% \text{ (k=2)}$	$403.896 \pm 0.1\% \text{ (k=2)}$	$404.369 \pm 0.1\% \text{ (k=2)}$
Low Range	$3.94241 \pm 0.7\% \text{ (k=2)}$	$3.89919 \pm 0.7\% \text{ (k=2)}$	$3.95427 \pm 0.7\% \text{ (k=2)}$

Connector Angle

Connector Angle to be used in DASY system	$130^\circ \pm 1^\circ$
---	-------------------------

**Appendix****1. DC Voltage Linearity**

High Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	200000	199999.3	0.00
Channel X	+ Input	20000	20006.75	0.03
Channel X	- Input	20000	-19997.90	-0.01
Channel Y	+ Input	200000	200000.3	0.00
Channel Y	+ Input	20000	20004.58	0.02
Channel Y	- Input	20000	-20000.75	0.00
Channel Z	+ Input	200000	199999.6	0.00
Channel Z	+ Input	20000	20001.43	0.01
Channel Z	- Input	20000	-20003.93	0.02

Low Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	2000	2000.1	0.00
Channel X	+ Input	200	200.42	0.21
Channel X	- Input	200	-200.30	0.15
Channel Y	+ Input	2000	2000.1	0.00
Channel Y	+ Input	200	199.35	-0.32
Channel Y	- Input	200	-200.96	0.48
Channel Z	+ Input	2000	1999.9	0.00
Channel Z	+ Input	200	199.37	-0.31
Channel Z	- Input	200	-200.62	0.31

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	13.40	12.55
	-200	-12.29	-13.06
Channel Y	200	-6.93	-7.43
	-200	6.72	6.47
Channel Z	200	0.71	0.36
	-200	-1.67	-1.93

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	-	1.59	0.08
Channel Y	200	1.69	-	3.62
Channel Z	200	-0.73	-1.49	-

**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	15946	15679
Channel Y	15960	16151
Channel Z	16233	15968

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	0.08	-1.13	2.31	0.51
Channel Y	-0.35	-2.00	0.81	0.43
Channel Z	-0.38	-2.76	1.68	0.40

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	200.8
Channel Y	0.2000	201.4
Channel Z	0.2001	200.3

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



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Accreditation No.: SCS 108

Client

Certificate No: DAE4-679_Mar06

CALIBRATION CERTIFICATE

Object DAE4 - SD 000 D04 BA - SN: 679

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

Calibration date: March 21, 2006

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 Data (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6265803	7-Oct-05 (Sintrel, No.E-050073)	Oct-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1002	29-Jun-05 (SPEAG, in house check)	In house check Jun-06

Calibrated by:	Name: Daniel Steinacher	Function: Technician	Signature:
Approved by:	Fin Bomholt	R&D Director	Signature:

Issued: March 21, 2006

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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 =	6.1 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	$404.506 \pm 0.1\% (k=2)$	$404.916 \pm 0.1\% (k=2)$	$405.168 \pm 0.1\% (k=2)$
Low Range	$3.97518 \pm 0.7\% (k=2)$	$3.93494 \pm 0.7\% (k=2)$	$3.94609 \pm 0.7\% (k=2)$

Connector Angle

Connector Angle to be used in DASY system	$316^\circ \pm 1^\circ$
---	-------------------------

**Appendix****1. DC Voltage Linearity**

High Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	200000	200000.3	0.00
Channel X	+ Input	20000	20004.54	0.02
Channel X	- Input	20000	-20001.87	0.01
Channel Y	+ Input	200000	200000.1	0.00
Channel Y	+ Input	20000	20002.40	0.01
Channel Y	- Input	20000	-20005.36	0.03
Channel Z	+ Input	200000	199999.9	0.00
Channel Z	+ Input	20000	20001.63	0.01
Channel Z	- Input	20000	-20004.08	0.02

Low Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	2000	1999.9	0.00
Channel X	+ Input	200	200.53	0.26
Channel X	- Input	200	-200.41	0.20
Channel Y	+ Input	2000	1999.9	0.00
Channel Y	+ Input	200	199.71	-0.14
Channel Y	- Input	200	-200.68	0.34
Channel Z	+ Input	2000	1999.9	0.00
Channel Z	+ Input	200	199.34	-0.33
Channel Z	- Input	200	-200.83	0.42

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	3.35	2.88
	-200	-1.82	-2.79
Channel Y	200	4.34	4.68
	-200	-4.77	-5.36
Channel Z	200	-6.43	-6.32
	-200	5.10	5.01

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	-	2.22	0.92
Channel Y	200	2.14	-	3.64
Channel Z	200	-1.06	-0.37	-

**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	16168	17178
Channel Y	15424	17687
Channel Z	16097	16450

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	0.09	-0.82	1.50	0.45
Channel Y	-1.24	-3.13	0.44	0.68
Channel Z	-0.73	-1.74	0.35	0.44

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MΩ)	Measuring (MΩ)
Channel X	0.2000	200.2
Channel Y	0.2000	198.5
Channel Z	0.2000	197.4

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



Appendix D – WCDMA Test Modes

1. Conducted Output Power

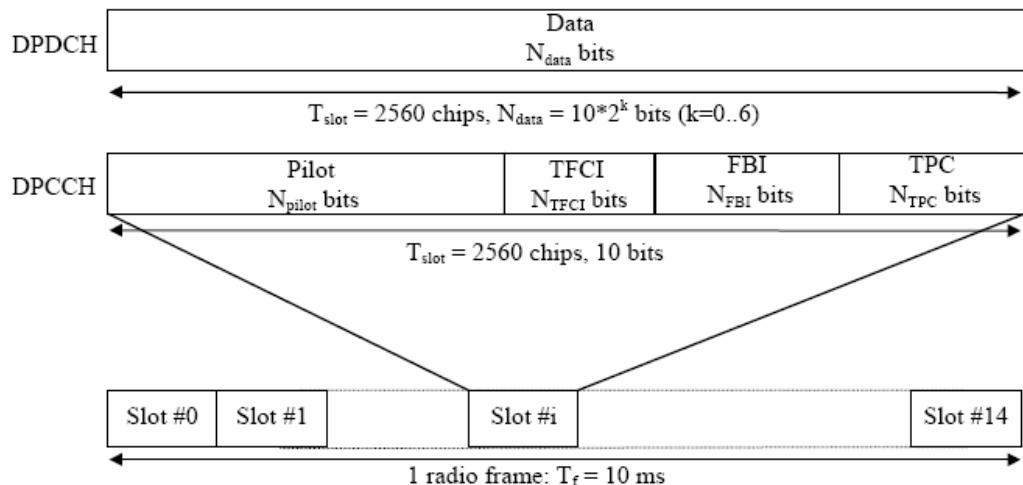
RMC 12.2 kbps is the main WCDMA test mode for both EMC and SAR reports. A detailed analysis of the output power for other WCDMA modes is provided in the table below. The mobile phone supports only one DPDCH1 with a various of data rates, such as 12.2Kbps, 64kbps, 144Kbps and 384Kbps.

	Symbol Rates (Kbps)	SF	K	Data	Reference Channel Type (Data Rates)	Band II			Band V		
						Ch 9262	Ch9400	Ch9538	Ch 4132	Ch4182	Ch4233
						1852.4	1880	1907.6	826.4	836.4	846.6
DPDCH1	15	256	0	10	RAB 3.4Kbps	23.68	23.61	23.66	23.19	23.37	23.2
	30	128	1	20	RAB 13.6Kbps	23.7	23.64	23.57	23.18	23.41	23.16
	60	64	2	40	RMC 12.2Kbps	23.73	23.72	23.69	23.36	23.45	23.18
	120	32	3	80	Not support						
	240	16	4	160	RMC 64Kbps	23.71	23.67	23.66	23.3	23.42	23.19
	480	8	5	320	RMC 144Kbps	23.71	23.65	23.66	23.32	23.37	23.17
	960	4	6	640	RMC 384Kbps	23.7	23.65	23.62	23.31	23.4	23.15
	60	64	2	40	Vocie AMR 12.2Kbps	23.73	23.71	23.68	23.15	23.43	23.13
DPCCH	15	256	0	10							

Data: Bits/Slot ; SF:Spreading Factor ; K: Number of bits per uplink DPDCH slot.

Table 1 Conducted output power

Followed by FCC suggestinons[1]:



Frame structure for uplink DPDCH/DPCCH

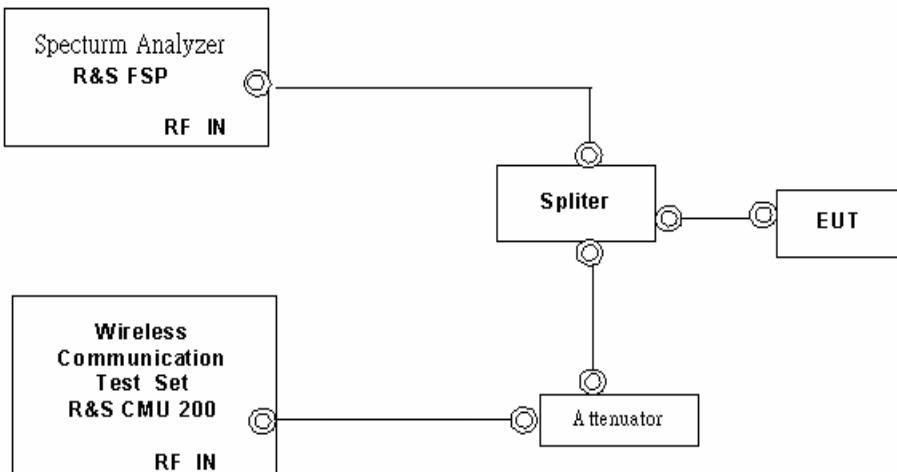


The parameter K in the figure determines the number of bits per uplink DPDCH slot. It is related to the spreading factor SF of the DPDCH as $SF = 256/2^k$. The DPDCH spreading factor may range from 256 down to 4. The spreading factor of the uplink DPCCH is always equal to 256, i.e. there are 10 bits per uplink DPCCH slot.

	Channel Bit Rate (kbps)	Channel Symbol Rate (ksp/s)	Spreading Factor	Spreading Code Number	Bits/Slot
DPCCH	15	15	256	0	10
DPDCH ₁	15	15	256	64	10
	30	30	128	32	20
	60	60	64	16	40
	120	120	32	8	80
	240	240	16	4	160
	480	480	8	2	320
	960	960	4	1	640
DPDCH _n	960	960	4	1, 2, 3	640

DPCCH and DPDCH

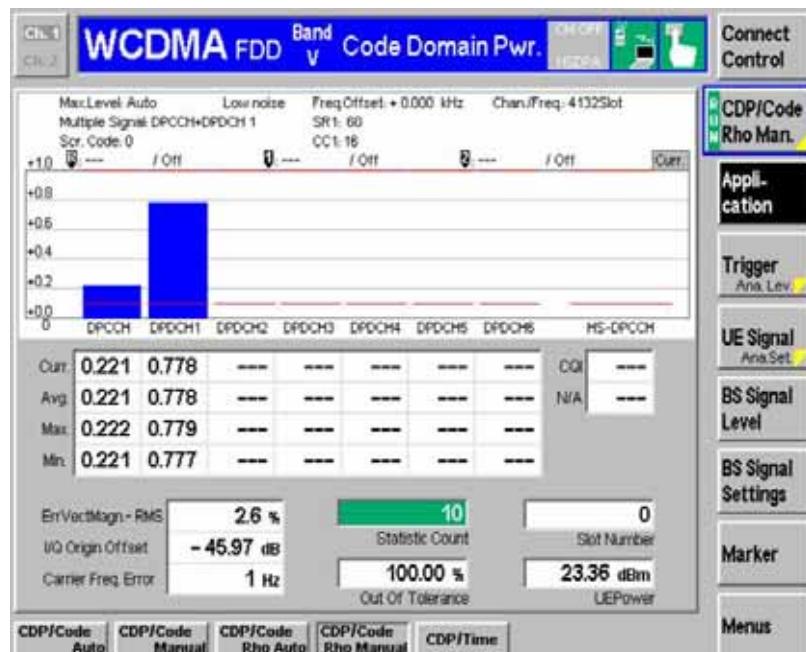
There is only one DPCCH per radio link. Data rates, channelization codes and spread factor information for DPCCH and DPDCH_n are indicated in the following Table. Spreading Rate (SF) * Symbol Rate = 3.84 Mcps.



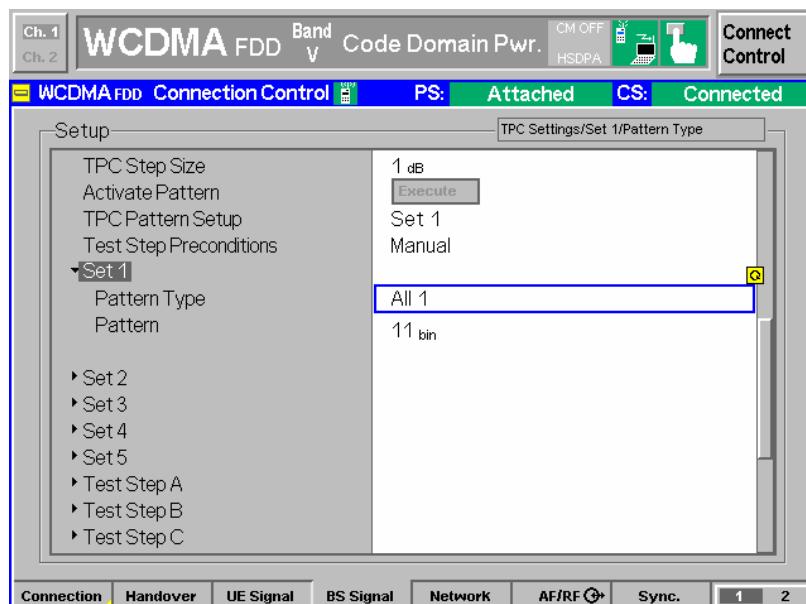


Setup Configuration

1. The EUT was connected to Spectrum Analyzer and Base Station via power splitter. Refer to the drawing of Setup Configuration.
2. The RF path losses was compensated into the measurements.
3. A call was established between EUT and Base Station with following setting
 - a. Data rates : Varied RAB,RMC and Voice for each measurements.
 - b. TPC with All Up
4. The transmitted maximum output power was recorded.



Single DPCCCH with only one DPDCH at RMC 12.2Kbps (Symbol Rate 60 Kbps)



TPC with All "1" (Continuous transmitting)



2. Band Edge and Conducted Spurious Emission

The band edge and conducted spurious emission do not have obvious difference for all different WCDMA modes. As those results were far from the limit line, -13dBm, the test mode RMC 12.2Kbps can take as the main test mode for EMC requirement.

Symbol Rates	SF	K	Data	Ref. Channel Type	Band II		Band V	
					Ch 9262	Ch9538	Ch 4132	Ch4233
					1852.4(MHz)	1907.6(MHz)	826.4(MHz)	846.6(MHz)
15	256	0	10	RAB 3.4Kbps	-27.59dBm	-25.6dBm	-27.08dBm	-25.08dBm
30	128	1	20	RAB 13.6Kbps	-27.57dBm	-25.48dBm	-26.94dBm	-25.45dBm
60	64	2	40	RMC 12.2KbpsDL/UL	-27.49dBm	-27.96dBm	-27.28dBm	-26.38dBm
240	16	4	160	RMC 64KbpsDL/UL	-27.42dBm	-28.4dBm	-27.71dBm	-26.03dBm
480	8	5	320	RMC 144KbpsDL/UL	-27.02dBm	-27.86dBm	-26.33dBm	-25.15dBm
960	4	6	640	RMC 384KbpsDL/UL	-27.16dBm	-26.97dBm	-27.02dBm	-25.65dBm
60	64	2	40	Voice AMR 12.2Kbps	-26.93dBm	-26.44dBm	-27.53dBm	-26.51dBm

Table 2 Worst band edge data

Ref. Channel Type	Band II Ch9400				Band V Ch4182			
	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
RAB 3.4Kbps	142.52	-26.83	-13	-13.83	1672	-57.98	-13	-44.98
	3760	-33.6	-13	-20.6	2508	-47.55	-13	-34.55
RAB 13.6Kbps	142.52	-29.08	-13	-16.08	1672	-58.64	-13	-45.64
	3760	-35.44	-13	-22.44	2508	-47.79	-13	-34.79
RMC 12.2KbpsDL/UL	142.52	-28.4	-13	-15.4	1672	-58	-13	-45
	3760	-33.92	-13	-20.92	2508	-48.01	-13	-35.01
RMC 64KbpsDL/UL	142.52	-29.16	-13	-16.16	1672	-58.61	-13	-45.61
	3760	-34.76	-13	-21.76	2508	-48.75	-13	-35.75
RMC 144KbpsDL/UL	142.52	-29	-13	-16	1672	-57.73	-13	-44.73
	3760	-34.76	-13	-21.76	2508	-48.17	-13	-35.17
RMC 384KbpsDL/UL	142.52	-28.9	-13	-15.9	1672	-58.44	-13	-45.44
	3760	-33.55	-13	-20.55	2512	-48.27	-13	-35.27
Voice AMR 12.2Kbps	142.52	-29.38	-13	-16.38	1672	-58.36	-13	-45.36
	3760	-34.17	-13	-21.17	2512	-47.87	-13	-34.87

Table 3 Conducted spurious emission



3. HSDPA Test Modes

The EUT is only updated firmware for HSDPA mode from the first version and the hardware is fully identical same as the original sample. Comparing the maximum output power between two version is within 0.5dB variation. The RMC 12.2Kbps with HSDPA are adopted for EMC and SAR testing, and the detail results are exhibited on the test report.

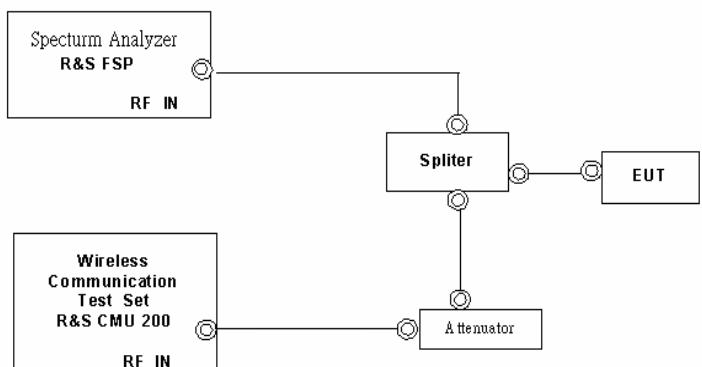
First Version

Reference Channel Type (Data Rates)	Band II			Band V		
	Ch 9262	Ch9400	Ch9538	Ch 4132	Ch4182	Ch4233
	1852.4	1880	1907.6	826.4	836.4	846.6
RMC 12.2Kbps	23.73	23.72	23.69	23.36	23.45	23.18
RMC 64Kbps	23.71	23.67	23.66	23.3	23.42	23.19
RMC 144Kbps	23.71	23.65	23.66	23.32	23.37	23.17
RMC 384Kbps	23.7	23.65	23.62	23.31	23.4	23.15
Voice AMR 12.2Kbps	23.73	23.71	23.68	23.15	23.43	23.13
RMC 12.2Kbps with HSDPA	Not support					

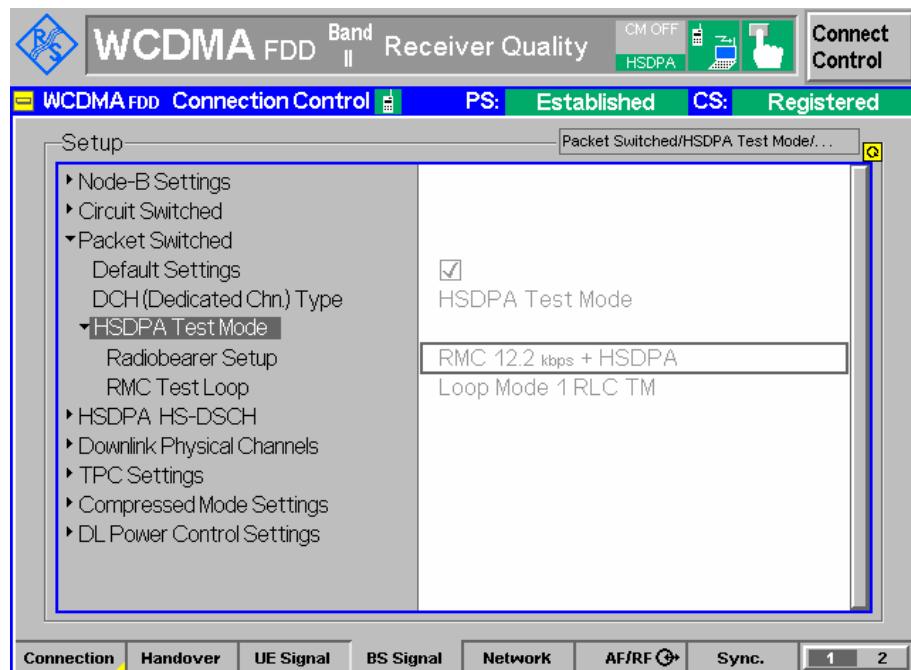
Second Version

Reference Channel Type (Data Rates)	Band II			Band V		
	Ch 9262	Ch9400	Ch9538	Ch 4132	Ch4182	Ch4233
	1852.4	1880	1907.6	826.4	836.4	846.6
RMC 12.2Kbps	23.88	23.97	23.93	23.1	23.17	23.28
RMC 64Kbps	23.93	23.95	23.93	23.05	23.16	23.15
RMC 144Kbps	23.76	23.9	23.9	23.03	23.19	23.22
RMC 384Kbps	23.91	23.87	23.9	23.02	23.15	23.23
Voice AMR 12.2Kbps	23.96	23.92	23.86	23.16	23.1	23.1
RMC 12.2Kbps with HSDPA	23.86	23.96	23.93	23.26	23.26	23.23

1. The EUT was connected to Spectrum Analyzer and Base Station via power splitter. Refer to the drawing of Setup Configuration.
2. The RF path losses was compensated into the measurements.
3. A call was established between EUT and Base Station with following setting:
 - a. Set RMC12.2Kbps with HSDPA mode.
 - b. TPC with All Up with H-set .
4. The transmitted maximum output power was recorded.



Setup Configuration



RMC 12.2Kbps with HSDPA function



Reference:

- [1.] SAR Measurement Procedures for 3G Devices CDMA 2000/Ev-Do/WCDMA/HSDPA June 2006
Laboratory Division Office of Engineering and Technology Federal Communications Commission
- [2.] TS 34.121 Universal Mobile Telecommunications System (UMTS); Terminal Conformance Specification, Radio Transmission and Reception (FDD)