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835 MHz Dipole Calibration Certificate

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





S Schweizerischer Kalibrierdienst

C Service suisse d'étalonnage Servizio svizzero di taratura

S Swiss Calibration Service

Accredited by the Swiss Federal Office of Metrology and Accreditation The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client SGS KES (Dymstec)

Certificate No: D835V2-490 Aug07

Accreditation No.: SCS 108

ALIBRATION	ERTIFICATE		
Object	D835V2 - SN: 490		
Calibration procedure(s)	QA CAL-05:v7 Calibration process	dure for dipole validation kits	
Calibration date:	August 27, 2007		
Condition of the calibrated item	In Tolerance		
Calibration Equipment used (M&7	E critical for calibration)	y facility: environment temperature (22 ± 3)°C and	
Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A		Cal Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 07-Aug-07 (METAS, No. 217-00718)	Scheduled Calibration Oct-07 Aug-08
	E critical for calibration) ID # GB37480704 US37292783	Cal Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608)	Scheduled Calibration Oct-07 Oct-07
Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ET3DV6 (HF)	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 1507	Cai Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608) 07-Aug-07 (METAS, No 217-00718) 19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07
Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ET3DV6 (HF) DAE4	G837480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 1507 SN 601	Cai Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608) 07-Aug-07 (METAS, No. 217-00718) 07-Aug-07 (METAS, No. 217-00718) 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) 30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Jan-08
Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ET3DV6 (HF) DAE4 Secondary Standards Power sensor HP 8481A RF generator Agilent E4421B	E critical for calibration) ID # G837480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 1507 SN 601 ID # MY41092317 MY41090675	Cal Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608) 07-Aug-07 (METAS, No. 217-00718) 07-Aug-07 (METAS, No. 217-00718) 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Check Date (in house) 18-Oct-02 (SPEAG, in house check Oct-05) 11-May-05 (SPEAG, in house check Nov-05)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Jan-08 Scheduled Check In house check: Oct-07 In house check: Nov-07
Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ET3DV6 (HF) DAE4 Secondary Standards Power sensor HP 8481A RF generator Agilent E4421B Network Analyzer HP 8753E	ID # GB37480704 US37292783 SN: 5088 (20g) SN: 5047.2 (10r) SN 1507 SN 601 ID # MY41092317 MY4100675 US37390585 S4208	Cai Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608) 07-Aug-07 (METAS, No 217-00718) 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Check Date (in house) 18-Oct-02 (SPEAG, in house check Oct-05) 11-May-05 (SPEAG, in house check Oct-06)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Jan-08 Scheduled Check In house check: Oct-07 In house check: Nov-07 In house check: Oct-07
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Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 108

Accredited by the Swiss Federal Office of Metrology and Accreditation The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL

tissue simulating liquid

ConvF N/A sensitivity in TSL / NORM x,y,z 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.

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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

eters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22,0 °C	41.5	0.90 mha/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature during test	(22.8 ± 0.2) °C	1	

SAR result with Head TSL

SAR averaged over 1 cm3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.27 mW / g
SAR normalized	normalized to 1W	9.08 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	9.05 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.49 mW / g
SAR normalized	normalized to 1W	5.96 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	5.93 mW / g ± 16.5 % (k=2)

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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	50.9 Ω - 4.0 jΩ	
Return Loss	- 27.9 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.380 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	May 19, 2003

Certificate No: D835V2-490_Aug07



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DASY4 Validation Report for Head TSL

Date/Time: 27.08.2007 13:05:22

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:490

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

Medium: HSL 900 MHz;

Medium parameters used: f = 835 MHz; $\sigma = 0.881$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ 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: 19.10.2006

- · Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- · Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:

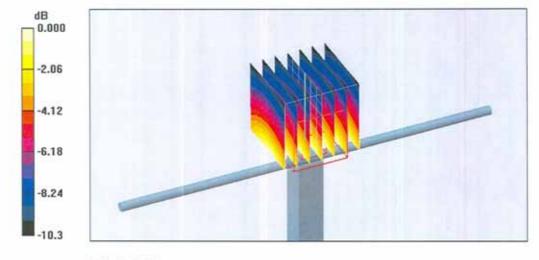
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.4 V/m; Power Drift = -0.041 dB

Peak SAR (extrapolated) = 3.26 W/kg

SAR(1 g) = 2.27 mW/g; SAR(10 g) = 1.49 mW/g

Maximum value of SAR (measured) = 2.45 mW/g



0 dB = 2.45 mW/g

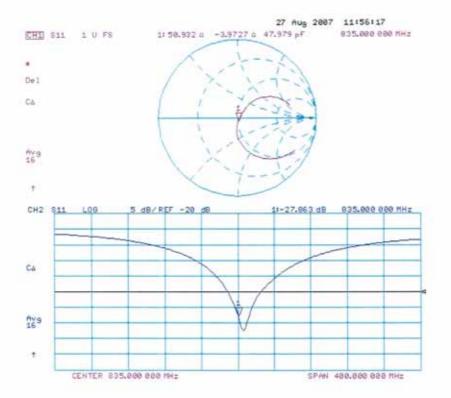


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Impedance Measurement Plot for Head TSL





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- 1900 MHz Dipole Calibration Certificate

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Client

SGS KES (Dymstec)

Certificate No: D1900V2-5d033_Aug07

Accreditation No.: SCS 108

CALIBRATION CERTIFICATE Object D1900V2 - SN: 5d033 Calibration procedure(s) QA CAL-05.v7 Calibration procedure for dipole validation kits August 28, 2007 Calibration date: Condition of the calibrated item In Tolerance This calibration certificate documents the tracesbility 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) Scheduled Calibration ID# Cal Date (Calibrated by, Certificate No.) Primary Standards 03-Oct-06 (METAS, No. 217-00608) Oct-07 GB37480704 Power meter EPM-442A Oct-07 Power sensor HP 8481A US37292783 03-Oct-06 (METAS, No. 217-00608) Reference 20 dB Attenuator SN: 5086 (20g) 07-Aug-07 (METAS, No 217-00718) Aug-08 Reference 10 dB Attenuator SN: 5047.2 (10r) 07-Aug-07 (METAS, No 217-00718) Aug-08 Reference Probe ET3DV6 SN: 1507 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) Oct-07 Reference Probe ES3DV3 SN: 3025 19-Oct-06 (SPEAG, No. ES3-3025_Oct06) Oct-07 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Jan-08 DAE4 SN 601 ID# Scheduled Check Check Date (in house) Secondary Standards In house check: Oct-07 Power sensor HP 8481A MY41092317 18-Oct-02 (SPEAG, in house check Oct-05) 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 Oct-06) In house check: Oct-07 Name Function Calibrated by: Marcel Fehr Laboratory Technician Approved by: Katja Pokovic Technical Manager Issued: August 29, 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

Accredited by the Swiss Federal Office of Metrology and Accreditation The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL

tissue simulating liquid

ConvF N/A sensitivity in TSL / NORM x,y,z 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.



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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL 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 ± 0.2) °C	39.3 ± 6 %	1.47 mho/m ± 6 %
Head TSL temperature during test	(21.3 ± 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	9.39 mW / g
SAR normalized	normalized to 1W	37.6 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	36.3 mW/g ± 17.0 % (k=2)

SAR averaged over 10 cm3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.93 mW / g
SAR normalized	normalized to 1W	19.7 mW/g
SAR for nominal Head TSL parameters 1	normalized to 1W	19.4 mW / g ± 16.5 % (k=2)

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^{*} 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	53.8 Ω + 4.7 jΩ	
Return Loss	- 24.7 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 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	March 17, 2003



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DASY4 Validation Report for Head TSL

Date/Time: 28.08.2007 14:28:53

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d033

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

Medium: HSL U10 BB;

Medium parameters used: f = 1900 MHz; σ = 1.47 mho/m; ϵ_r = 39.3; ρ = 1000 kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006

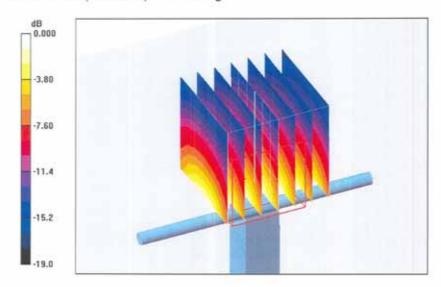
- · Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA;;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 90.7 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 16.1 W/kg

SAR(1 g) = 9.39 mW/g; SAR(10 g) = 4.93 mW/gMaximum value of SAR (measured) = 10.7 mW/g



0 dB = 10.7 mW/g

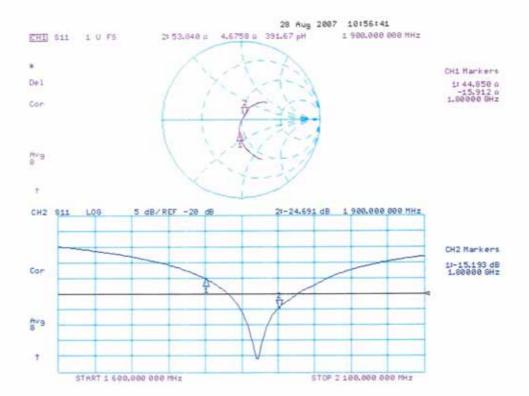


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Impedance Measurement Plot for Head TSL





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- 2450 MHz Dipole Calibration Certificate

Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Client SGS KES (Dymstec)

Certificate No: D2450V2-734 Aug07

Accreditation No.: SCS 108

Object	D2450V2 - SN: 7	34	
Calibration procedure(s)	QA CAL-05.v6 Calibration proce	dure for dipole validation kits	
Calibration date:	August 20, 2007		
Condition of the calibrated item	In Tolerance		
Calibration Equipment used (M&	TE critical for calibration)	ry facility: environment temperature (22 ± 3)°C and Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ES3DV3	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 3025	Call Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608) 07-Aug-07 (METAS, No 217-00718) 07-Aug-07 (METAS, No 217-00718) 19-Oct-06 (SPEAG, No. ES3-3025_Oct08)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07
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Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ES3DV3	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 3025	Call Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608) 07-Aug-07 (METAS, No 217-00718) 07-Aug-07 (METAS, No 217-00718) 19-Oct-06 (SPEAG, No. ES3-3025_Oct08)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07
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Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator Agilent E4421B	TE critical for calibration) ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 3025 SN 601 ID # MY41092317 MY41090675 US37390585 S4206	Cal Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608) 07-Aug-07 (METAS, No 217-00718) 19-Oct-06 (SPEAG, No. ES3-3025_Oct08) 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Check Date (in house) 18-Oct-02 (SPEAG, in house check Oct-05) 11-May-05 (SPEAG, in house check Oct-06)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Jan-08 Scheduled Check In house check: Oct-07 In house check: Oct-07



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C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accreditation No.: SCS 108

Glossary:

TSL ConvF

N/A

tissue simulating liquid

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

Accredited by the Swiss Federal Office of Metrology and Accreditation The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

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
- EC 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.



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Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

	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	38.7 ± 6 %	1.81 mha/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	52.8 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.16 mW / g
SAR normalized	normalized to 1W	24.6 mW / g
SAR for nominal Head TSL parameters 1	normalized to 1W	24.5 mW / g ± 16.5 % (k=2)

Certificate No: D2450V2-734_Aug07

¹ 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	52.3 Ω + 4.7 JΩ	
Return Loss	- 25.9 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns
Electrical Soley (one allocation)	11700710

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	May 07, 2003	

Certificate No: D2450V2-734_Aug07



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DASY4 Validation Report for Head TSL

Date/Time: 20.08.2007 13:22:31

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN734

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; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

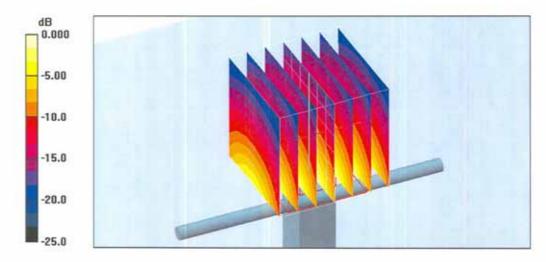
- Probe: ES3DV2 SN3025 (HF); ConvF(4.5, 4.5, 4.5); Calibrated: 19.10.2006
- · Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 91.5 V/m; Power Drift = 0.037 dB

Peak SAR (extrapolated) = 27.8 W/kg

SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.16 mW/g Maximum value of SAR (measured) = 14.6 mW/g



0 dB = 14.6 mW/g



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Impedance Measurement Plot for Head TSL

