

Report File No.: STROS-07-016-A1 Date of Issue:

2007-10-19 61 / 94

Appendix C

Uncertainty Analysis

Uncertainty of SAR equipments for measurement

Items	Uncertainty value %	Probability Distribution	Divisor	ci 1 1g	Standard unc (1g)	vi or Veff
Measurement System						
Probe calibration	4.8	normal	1	1	4.8%	∞
Axial isotropy	4.7	rectangular	√ 3	$(1-c_p)^{1/2}$	1.9%	∞
Hemispherical isotropy	9.6	rectangular	√ 3	$(c_p)^{1/2}$	3.9%	∞
Boundary effects	1.0	rectangular	√ 3	1	0.6%	∞
Linearity	4.7	rectangular	√ 3	1	2.7%	∞
System Detection limits	1.0	rectangular	√ 3	1	0.6%	∞
Readout Electronics	1.0	normal	1	1	1.0%	∞
Response time	0.8	rectangular	√ 3	1	0.5%	∞
Integration time	2.6	rectangular	√ 3	1	1.5%	∞
RF Ambient Conditions	3.0	rectangular	√ 3	1	1.7%	∞
Mech. constrains of robot	0.4	rectangular	√ 3	1	0.2%	∞
Probe positioning	2.9	rectangular	√ 3	1	1.7%	∞
Extrap. and integration	1.0	rectangular	√ 3	1	0.6%	∞

Uncertainty of measurements

•						
Test Sample Related						
Device positioning	2.9	normal	1	1	2.9%	145
Device holder uncertainty	3.6	normal	1	1	3.6%	5
Power drift	5.0	rectangular	√ 3	1	2.9%	∞
Phantom and Setup						
Phantom uncertainty	4.0	rectangular	√ 3	1	2.3%	∞
Liquid conductivity(target)	5.0	rectangular	√ 3	0.64	1.8%	∞
Liquid conductivity(meas.)	5.0	normal	1	0.64	3.2%	∞
Liquid permittivity(target)	5.0	rectangular	√ 3	0.6	1.7%	∞
Liquid permittivity(meas.)	5.0	normal	1	0.6	3.0%	∞

Uncertainty of SAR system

Combined Standard Uncertainty		10.6%	
Expanded Standard Uncertainty(k=2)		20.6%	



Report File No.: Report 1...

Date of Issue: STROS-07-016-A1 2007-10-19

62 / 94

Appendix D

Calibration Certificate

- PROBE
- DAE
- $835 \, \mathrm{MHz}$, $1900 \, \mathrm{MHz}$, $2450 \, \mathrm{MHz}$ DIPOLE



STROS-07-016-A1 2007-10-19

Date of Issue: Page:

63 / 94

- PROBE 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 Multillateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

	mstec)	Certificate No: E	- in out_repres	
CALIBRATION	CERTIFICAT	ΓE	WINDLESS CO.	
Object	ET3DV6 - SN:1	1782		
Calibration procedure(s)		QA CAL-01.v5 and QA CAL-12.v4 Calibration procedure for dosimetric E-field probes		
Calibration date:	April 23, 2007	HE DESCRIPTION OF		
Condition of the calibrated item	In Tolerance			
Calibration Equipment used (M8	STE critical for calibration)		o number / 10%.	
Calibration Equipment used (M8	STE critical for calibration)	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration	
alibration Equipment used (M8 rimary Standards lower meter E4419B	ID # GB41293874	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670)	Scheduled Calibration Mar-08	
alibration Equipment used (M8 rimary Standards ower meter E4419B ower sensor E4412A	ID # GB41293874 MY41495277	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670)	Scheduled Calibration Mar-08 Mar-08	
alibration Equipment used (M3 rimary Standards ower meter E4419B ower sensor E4412A ower sensor E4412A	ID # GB41293874 MY41496277 MY41498087	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670)	Scheduled Calibration Mar-08 Mar-08	
Calibration Equipment used (M8 himary Standards Yower meter E4419B Yower sensor E4412A Yower sensor E4412A Reference 3 dB Attenuator	ID # GB41293874 MY41496277 MY4149607 SN: S5054 (3c)	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-08 (METAS, No. 217-00592)	Scheduled Calibration Mar-08 Mar-08 Mar-08 Aug-07	
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator	ID # GB41293874 MY41496277 MY41496277 MY41496087 SN: 55054 (3c) SN: 55086 (20b)	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-06 (METAS, No. 217-00592) 29-Mar-07 (METAS, No. 217-00671)	Scheduled Calibration Mar-08 Mar-08 Mar-08 Aug-07 Mar-08	
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator	ID # GB41293874 MY41496277 MY4149607 SN: S5054 (3c)	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-08 (METAS, No. 217-00671) 10-Aug-08 (METAS, No. 217-00671) 10-Aug-08 (METAS, No. 217-00593)	Scheduled Calibration Mar-08 Mar-08 Aug-07 Mar-08 Aug-07	
Calibration Equipment used (M3 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference Probe E530V2	ID # GB41293874 MY41496277 MY41496267 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b)	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-06 (METAS, No. 217-00592) 29-Mar-07 (METAS, No. 217-00671)	Scheduled Calibration Mar-08 Mar-08 Mar-08 Aug-07 Mar-08	
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference Probe ES3DV2 JAE4	ID # GB41293874 MY41496277 MY41496267 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 3013	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-06 (METAS, No. 217-00592) 29-Mar-07 (METAS, No. 217-00671) 10-Aug-06 (METAS, No. 217-00593) 4-Jan-07 (SPEAG, No. ES3-3013_Jan07)	Scheduled Calibration Mar-08 Mar-08 Aug-07 Mar-08 Aug-07 Jan-08	
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Power sensor E4412A Reference 3 of B Attenuator Reference 20 of B Attenuator Reference 30 of B Attenuator Reference Probe ES30V2 JAE4 Secondary Standards RF generator HP 8848C	ID # GB41293874 MY41495277 MY41496277 MY4149687 SN: S5054 (3c) SN: S5056 (20b) SN: S5129 (30b) SN: 3013 SN: 654	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-06 (METAS, No. 217-00592) 29-Mar-07 (METAS, No. 217-00671) 10-Aug-06 (METAS, No. 217-00593) 4-Jan-07 (SPEAG, No. ES3-3013_Jan07) 21-Jun-06 (SPEAG, No. DAE4-654_Jun08)	Scheduled Calibration Mar-08 Mar-08 Aug-07 Mar-08 Aug-07 Jan-08 Jun-07	
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Power sensor E4412A Reference 3 of B Attenuator Reference 20 of B Attenuator Reference 30 of B Attenuator Reference Probe ES30V2 JAE4 Secondary Standards RF generator HP 8848C	ID # GB41293874 MY41496277 MY41496277 MY41496067 SN: 55054 (3c) SN: 55086 (20b) SN: S5129 (30b) SN: 3013 SN: 654	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-08 (METAS, No. 217-00671) 10-Aug-08 (METAS, No. 217-00671) 10-Aug-08 (METAS, No. 217-00693) 4-Jan-07 (SPEAG, No. E33-3013_Jan07) 21-Jun-08 (SPEAG, No. DAE4-654_Jun08) Check Date (in house)	Scheduled Calibration Mar-08 Mar-08 Aug-07 Mar-08 Aug-07 Jan-08 Jun-07 Scheduled Check	
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference Probe E530V2 DAE4 Secondary Standards RF generator HP 8848C Vetwork Analyzer HP 8753E	ID # GB41293874 MY41496277 MY41496277 MY41496087 SN: 55054 (3c) SN: 55056 (20b) SN: 55129 (30b) SN: 3013 SN: 654 ID # US3642U01700 US37390565 Name	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-08 (METAS, No. 217-00592) 29-Mar-07 (METAS, No. 217-00671) 10-Aug-08 (METAS, No. 217-00593) 4-Jan-07 (SPEAG, No. E33-3013_Jan07) 21-Jun-08 (SPEAG, No. DAE4-654_Jun08) Check Date (in house) 4-Aug-99 (SPEAG, in house check Nov-05) 18-Oct-01 (SPEAG, in house check Cct-08)	Scheduled Calibration Mar-08 Mar-08 Aug-07 Mar-08 Aug-07 Jan-08 Jun-07 Scheduled Check In house check: Nov-07 In house check: Oct-07	
Calibration Equipment used (M8 Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Power sensor E4412A Reference 3 of B Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference Probe E530V2 JAE4 Secondary Standards RF generator HP 8848C	ID # GB41293874 MY41496277 MY41496267 SN: 55054 (3c) SN: 55054 (3c) SN: 55129 (30b) SN: 55129 SN: 3013 SN: 654 ID # US3642U01700 US37390565	Cal Date (Calibrated by, Certificate No.) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 29-Mar-07 (METAS, No. 217-00670) 10-Aug-08 (METAS, No. 217-00592) 29-Mar-07 (METAS, No. 217-00671) 10-Aug-08 (METAS, No. 217-00593) 4-Jan-07 (SPEAG, No. E33-3013_Jan07) 21-Jun-08 (SPEAG, No. DAE4-654_Jun08) Check Date (in house) 4-Aug-99 (SPEAG, in house check Nov-05) 18-Oct-01 (SPEAG, in house check Cct-08)	Scheduled Calibration Mar-08 Mar-08 Aug-07 Mar-08 Aug-07 Jan-08 Jun-07 Scheduled Check In house check: Nov-07 In house check: Oct-07	

Certificate No: ET3-1782_Apr07

Page 1 of 9



Report File No.: Date of Issue:

STROS-07-016-A1 2007-10-19

Page:

64 / 94

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





Schweizerischer Kalibrierdienst Service suisse d'étalonnage C 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

NORMx,y,z ConF

tissue simulating liquid sensitivity in free space sensitivity in TSL / NORMx,y,z

DCP Polarization o diode compression point φ rotation around probe axis

Polarization 8

3 rotation around an axis that is in the plane normal to probe axis (at

measurement center), i.e., 9 = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques*, December 2003

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORMx,y,z: Assessed for E-field polarization 9 = 0 (f ≤ 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 E2-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 ≤ 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.

Certificate No: ET3-1782_Apr07

Page 2 of 9



Date of Issue:

2007-10-19

STROS-07-016-A1

Page:

65 / 94

ET3DV6 SN:1782

April 23, 2007

Probe ET3DV6

SN:1782

Manufactured: Last calibrated: Recalibrated: April 15, 2003 May 2, 2006 April 23, 2007

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: ET3-1782_Apr07

Page 3 of 9



Date of Issue:

STROS-07-016-A1 2007-10-19

Page:

66 / 94

ET3DV6 SN:1782

April 23, 2007

DASY - Parameters of Probe: ET3DV6 SN:1782

Sensitivity in Free	e Space ^A		Diode C	ompression ^B
NormX	2.02 ± 10.1%	$\mu V/(V/m)^2$	DCP X	92 mV
NormY	1.75 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	93 mV
NormZ	1.75 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	91 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 Phanto	m Surface Distance	3.7 mm	4.7 mi	
	CAR MAIN MAIN			4.4	

 SAR_{tel} (%) Without Correction Algorithm 8.9 4.6 SAR_{tel} (%) With Correction Algorithm 0.1 0.2

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance 3.7 mm 4.7 mm SAR_{be} [%] Without Correction Algorithm 12.7 8.5 SAR_{be} [%] With Correction Algorithm 0.2 0.1

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%.

Certificate No: ET3-1782_Apr07

Page 4 of 9

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

^{*} Numerical linearization parameter; uncertainty not required.



Date of Issue: 2007-10-19

Page:

67 / 94

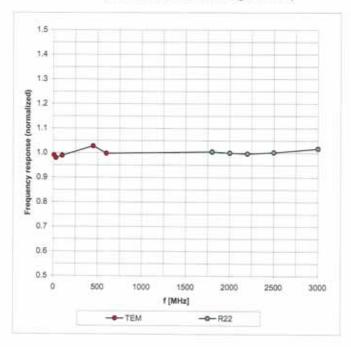
STROS-07-016-A1

ET3DV6 SN:1782

April 23, 2007

Frequency Response of E-Field

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



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: ET3-1782_Apr07

Page 5 of 9



Date of Issue:

STROS-07-016-A1 2007-10-19

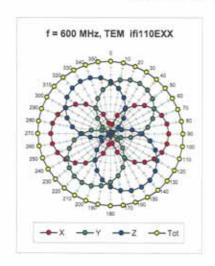
Page:

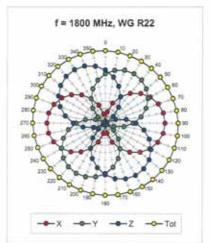
68 / 94

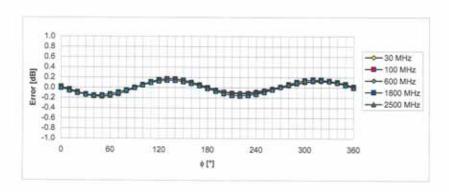
ET3DV6 SN:1782

April 23, 2007

Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$







Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Certificate No: ET3-1782_Apr07

Page 6 of 9



Date of Issue:

Page:

STROS-07-016-A1

2007-10-19

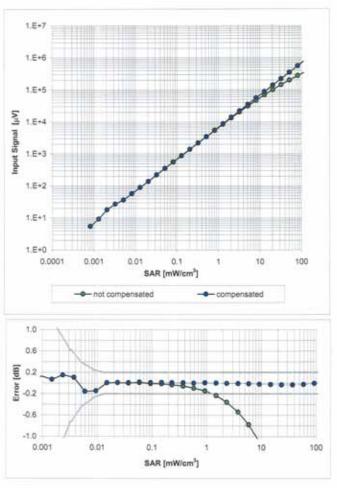
69 / 94

ET3DV6 SN:1782

April 23, 2007

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)



Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: ET3-1782_Apr07

Page 7 of 9



Report File No. : Date of Issue : STROS-07-016-A1 2007-10-19

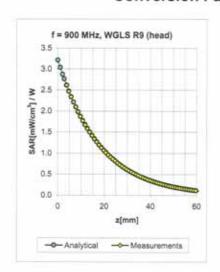
Page:

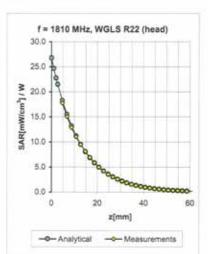
70 / 94

ET3DV6 SN:1782

April 23, 2007

Conversion Factor Assessment





f [MHz]	Validity [MHz] ^C	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	±50/±100	Head	43.5 ± 5%	0.87 ± 5%	0.40	1,93	7.08 ± 13.3% (k=2)
900	±50/±100	Head	41.5 ± 5%	$0.97 \pm 5\%$	0.36	2.79	6.18 ± 11.0% (k=2)
1810	±50/±100	Head	40.0 ± 5%	1.40 ± 5%	0.44	2.87	5.16 ± 11.0% (k=2)
2000	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.51	2.77	4.82 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.59	2.36	4.62 ± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.33	1.93	7.86 ± 13.3% (k=2)
900	±50/±100	Body	55.0 ± 5%	1.05 ± 5%	0.59	2.23	5.96 ± 11.0% (k=2)
1810	± 50/± 100	Body	53.3 ± 5%	1.52 ± 5%	0.57	2.78	4.84 ± 11.0% (k=2)
2000	±50/±100	Body	$53.3 \pm 5\%$	1.52 ± 5%	0.58	2.61	4.51 ± 11.0% (k=2)
2450	±50/±100	Body	52.7 ± 5%	1.95 ± 5%	0.66	2.22	4.14 ± 11.8% (k=2)

[©] 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.

Certificate No: ET3-1782_Apr07

Page 8 of 9



Date of Issue:

2007-10-19

Page:

71 / 94

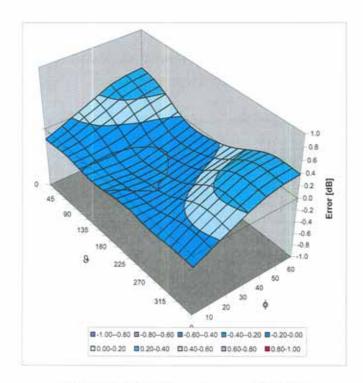
STROS-07-016-A1

ET3DV6 SN:1782

April 23, 2007

Deviation from Isotropy in HSL

Error (φ, θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: ET3-1782_Apr07

Page 9 of 9



Date of Issue:

STROS-07-016-A1 2007-10-19

Page: 72 / 94

-DAE 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: DAE3-567_Sep06

Accreditation No.: SCS 108

CALIBRATION C	ERTIFICATE		
Object	DAE3 - SD 000 D	03 AA - SN: 567	
Calibration procedure(s)	QA CAL-06.v12 Calibration proced	lure for the data acquisition electr	onics (DAE)
Calibration date:	September 22, 20	06	
Condition of the calibrated item	In Tolerance		
The measurements and the uncert All calibrations have been conduct Calibration Equipment used (M&TI	tainties with confidence pro ed in the closed laboratory E critical for calibration)	nal standards, which realize the physical units obablity are given on the following pages and facility: environment temperature (22 \pm 3) $^{\circ}$ C (are part of the certificate. and humidity < 70%.
Primary Standards Fluke Process Calibrator Type 702	ID# SN: 6295803	Call Date (Calibrated by, Certificate No.) 7-Oct-05 (Sintrel, No.E-050073)	Scheduled Calibration Oct-06
Fluke Process Calibrator Type 702	SN: 6290603	7-Oct-ub (Sintrel, No.E-000073)	Oct-06
Secondary Standards	ID#	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1002	15-Jun-06 (SPEAG, in house check)	In house check Jun-07
Calibrated by	Name States Circostto	Function	Signature
Calibrated by:	Stefano Giannotta	Technician	Graniotashifen
Approved by:	Fin Bomholt	R&D Director	01 110
			118 Julian Hay



Report File No. : Date of Issue :

STROS-07-016-A1 2007-10-19

Page:

73 / 94

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

Accreditation No.: SCS 108

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accredited by the Swiss Federal Office of Metrology and Accreditation

Glossary

DAE Connector angle data acquisition electronics

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.



STROS-07-016-A1

Date of Issue:

2007-10-19

Page:

74 / 94

DC Voltage Measurement A/D - Converter Resolution nominal High Range: $1LSB = 6.1 \mu V$, full range = -100...+300 mV. Low Range: 1LSB = 61 nV, full range = -1.....+3 mV DASY measurement parameters: Auto Zero Time: $3 \sec$; Measuring time: $3 \sec$

Calibration Factors	X	Y	Z
High Range	404.730 ± 0.1% (k=2)	404.463 ± 0.1% (k=2)	404.549 ± 0.1% (k=2)
Low Range	3.94024 ± 0.7% (k=2)	3.95155 ± 0.7% (k=2)	3.94145 ± 0.7% (k=2)

Connector Angle

-		
	Connector Angle to be used in DASY system	85°±1°

Certificate No: DAE3-567_Sep06

Page 3 of 5



STROS-07-016-A1 2007-10-19

Date of Issue: Page:

75 / 94

Appendix

1. DC Volt

High Range	Input (µV)	Reading (µV)	Error (%)
Channel X + Input	200000	199999.3	0.00
Channel X + Input	20000	20004,56	0.02
Channel X - Input	20000	-20000.83	0.00
Channel Y + Input	200000	200000.1	0.00
Channel Y + Input	20000	20003.03	0.02
Channel Y - Input	20000	-19999.89	0.00
Channel Z + Input	200000	200000.0	0.00
Channel Z + Input	20000	20001.12	0.01
Channel Z - Input	20000	-20000.55	0.00

Low Range	Input (µV)	Reading (µV)	Error (%)
Channel X + Input	2000	1999.9	0.00
Channel X + Input	200	199.29	-0.35
Channel X - Input	200	-200,60	0.30
Channel Y + Input	2000	1999.9	0.00
Channel Y + Input	200	199.26	-0.37
Channel Y - Input	200	-201.02	0.51
Channel Z + Input	2000	1999.9	0.00
Channel Z + Input	200	199.42	-0.29
Channel Z - Input	200	-201.14	0.57

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	4,31	2.86
gira	- 200	-2.40	-2.89
Channel Y	200	2.32	1.93
	- 200	-3.29	-3.48
Channel Z	200	6.47	5.99
	- 200	-7.71	-8.18

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		2.90	0.11
Channel Y	200	1.27	7-	3.38
Channel Z	200	-2.29	0.51	- 2



STROS-07-016-A1

Date of Issue:

2007-10-19

Page:

76 / 94

4. AD-Converter Values with inputs shorted

arameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16355	16182
Channel Y	16140	16592
Channel Z	15903	14675

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec Input $10 M\Omega$

White the state of the	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (µV)
Channel X	-0.31	-1.40	0.62	0.39
Channel Y	-1.04	-1.81	-0.18	0.30
Channel Z	-1.09	-1.96	-0.20	0.35

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	201,5
Channel Y	0.2001	200.7
Channel Z	0.2000	201.4

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



Report File No.: STROS-07-016-A1 Date of Issue: 2007-10-19

77 / 94 Page:

- 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

Object	D835V2 - SN: 490	0	
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		
		y facility: environment temperature (22 ± 3)°C and	1 humidity < 70%.
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)		y facility: environment temperature (22 ± 3)°C and Cal Date (Calibrated by, Certificate No.) 03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (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
All calibrations have been conduct Calibration Equipment used (M&1 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	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 1507	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)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07
Calibration Equipment used (M&1 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&1 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	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) 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&1 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	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 1507 SN 601 ID # MY41092317 MY41000675 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) 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: Oct-07

Certificate No: D835V2-490_Aug07 Page 1 of 6



Report File No. : Date of Issue :

STROS-07-016-A1 2007-10-19

Page:

78 / 94

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





S Schweizerischer Kalibrierdienst
Service suisse d'étalonnage
Servizio svizzero di taratura
S 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.

Page 2 of 6

Certificate No: D835V2-490_Aug07



Report File No. : STROS-07-016-A1

Date of Issue : 2007-10-19

Page : 79 / 94

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

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	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 cm ³ (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)

Page 3 of 6 Certificate No: D835V2-490_Aug07

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



STROS-07-016-A1 2007-10-19

Date of Issue : Page :

80 / 94

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



STROS-07-016-A1 2007-10-19

Date of Issue : Page :

81 / 94

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:

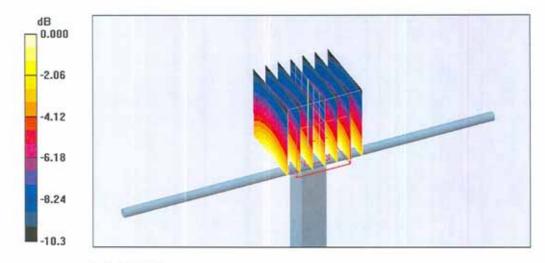
- Probe: ET3DV6 SN1507 (HF); ConvF(6.09, 6.09, 6.09); Calibrated: 19.10.2006
- · Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 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/gMaximum value of SAR (measured) = 2.45 mW/g



0 dB = 2.45 mW/g



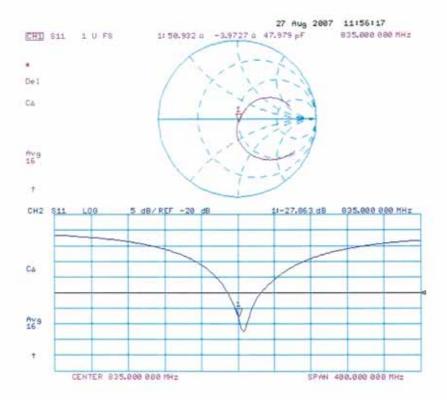
Date of Issue :

STROS-07-016-A1 2007-10-19

Page:

82 / 94

Impedance Measurement Plot for Head TSL





Report File No.: STROS-07-016-A1 Date of Issue: 2007-10-19

Page: 83 / 94

- 1900 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: D1900V2-5d033_Aug07

Accreditation No.: SCS 108

Calibration procedure(s) OA CAL-05.v7 Calibration procedure for dipole validation kits Calibration procedure for dipole validation kits Calibration date: August 28, 2007 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. 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 Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Calibration Primary Standards ID # Cal Date (Calibrated by, Certificate No.) Scheduled Check In Nouse Check Nov-05 In Nous	Object	D1900V2 - SN: 5	d033	
In Tolerance In House check In Tolerance In House Check In House check Oct-06 In House check In Tolerance In House Check In In House check Oct-06 In House check In In Hous	alibration procedure(s)	SAREST AND CARD AGAIN AND CARD OF THE REAL PROPERTY AND ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY ADDRESS OF THE P	dure for dipole validation kits	
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. If 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) Construction Equipment used (M&TE critical for calibration on the construction of the calibration of the cali	alibration date:	August 28, 2007		#10 M8/A
the measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. It calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%. It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration Equipment used (M&TE critical for calibration) It is alibration (M&TE critical for calibration used (M&TE critical for calibration (M&TE calibration) It is alibration (M&TE critical for calibration (M&TE calibration) It is alibration (M&TE critical for calibration (M&TE calibration) It is alibration (M&TE critical for calibration (M&TE calibration) It is alibration (M&TE critical for calibration (M&TE critical for calibration (M&TE calibration) It is alibration (M&TE critical for calibration (M&TE calibration) It is alibration (M&TE calibration) It is alibration (M&TE calibration) I	ondition of the calibrated item	In Tolerance		
Content Cont				
ower sensor HP 8481A US37292783 03-Oct-06 (METAS, No. 217-00606) Oct-07 eference 20 dB Attenuator SN: 5086 (20g) 07-Aug-07 (METAS, No. 217-00718) Aug-08 eference 10 dB Attenuator SN: 5047.2 (10r) 07-Aug-07 (METAS, No. 217-00718) Aug-08 eference Probe ET3DV6 SN: 1507 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) Oct-07 eference Probe ES3DV3 SN: 3025 19-Oct-06 (SPEAG, No. ES3-3025_Oct06) Oct-07 AE4 SN 601 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Jan-06 econdary Standards ID # Check Date (in house) Scheduled Check ower sensor HP 8481A MY41092317 18-Oct-02 (SPEAG, in house check Oct-05) In house check: Oct-07 F generator Agilent E4421B MY41000675 11-May-05 (SPEAG, in house check Nov-05) In house check: Oct-07 Name Function Signature		THE STATE OF	Cal Date (Calibrated by Cortificate No.)	Scheduled Calibration
eference 10 dB Attenuator SN: 5047.2 (10r) 07-Aug-07 (METAS, No 217-00718) Aug-08 eference Probe ET3DV6 SN: 1507 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) Oct-07 eference Probe ES3DV3 SN: 3025 19-Oct-06 (SPEAG, No. ES3-3025_Oct06) Oct-07 AE4 SN 601 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Jan-08 econdary Standards ID # Check Date (in house) Scheduled Check ower sensor HP 8481A MY41092317 18-Oct-02 (SPEAG, in house check Oct-05) In house check: Oct-07 F generator Agillent E4421B MY41000675 11-May-05 (SPEAG, in house check Nov-05) In house check: Nov-07 etwork Analyzer HP 8753E US37390585 S4206 18-Oct-01 (SPEAG, in house check Oct-06) In house check: Oct-07 Name Function Signature	rimary Standards	D #		
eference 10 dB Attenuator SN: 5047.2 (10r) 07-Aug-07 (METAS, No 217-00718) Aug-08 eference Probe ET3DV6 SN: 1507 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) Oct-07 eference Probe ES3DV3 SN: 3025 19-Oct-06 (SPEAG, No. ES3-3025_Oct06) Oct-07 AE4 SN 601 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Jan-08 econdary Standards ID # Check Date (in house) Scheduled Check ower sensor HP 8481A MY41092317 18-Oct-02 (SPEAG, in house check Oct-05) In house check: Oct-07 F generator Agilent E4421B MY41000675 11-May-05 (SPEAG, in house check Nov-05) In house check: Nov-07 etwork Analyzer HP 8753E US37390585 S4206 18-Oct-01 (SPEAG, in house check Oct-06) In house check: Oct-07 Name Function Signature	rimary Standards ower meter EPM-442A	ID# GB37480704	03-Oct-06 (METAS, No. 217-00608)	Oct-07
eference Probe ES3DV3 SN: 3025 19-Oct-06 (SPEAG, No. ES3-3025_Oct06) Oct-07 AE4 SN 601 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Jan-08 econdary Standards ID # Check Date (in house) Scheduled Check ower sensor HP 8481A MY41092317 18-Oct-02 (SPEAG, in house check Oct-05) In house check: Oct-07 F generator Agillent E4421B MY41000675 11-May-05 (SPEAG, in house check Nov-05) In house check: Nov-07 etwork Analyzer HP 8753E US37390585 S4206 18-Oct-01 (SPEAG, in house check Oct-06) In house check: Oct-07 Name Function Signature	rimary Standards ower meter EPM-442A ower sensor HP 8481A	ID # GB37480704 US37292783	03-Oct-06 (METAS, No. 217-00608) 03-Oct-06 (METAS, No. 217-00608)	Oct-07 Oct-07
AE4 SN 601 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) Jan-08 econdary Standards ID # Check Date (in house) Scheduled Check ower sensor HP 8481A MY41092317 18-Oct-02 (SPEAG, in house check Oct-05) In house check: Oct-07 F generator Agilent E4421B MY41000675 11-May-05 (SPEAG, in house check Nov-05) In house check: Nov-07 etwork Analyzer HP 8753E US37390585 S4206 18-Oct-01 (SPEAG, in house check Oct-06) In house check: Oct-07 Name Function Signature	nimary Standards ower meter EPM-442A ower sensor HP 8481A eference 20 dB Attenuator	ID# GB37480704 US37292783 SN: 5086 (20g)	03-Oct-06 (METAS, No. 217-00606) 03-Oct-06 (METAS, No. 217-00606) 07-Aug-07 (METAS, No. 217-00718)	Oct-07 Oct-07 Aug-08
Check Date (in house) Scheduled Check	rimary Standards ower meter EPM-442A ower sensor HP 8481A leference 20 dB Attenuator leference 10 dB Attenuator	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r)	03-Oct-06 (METAS, No. 217-00606) 03-Oct-06 (METAS, No. 217-00606) 07-Aug-07 (METAS, No. 217-00718) 07-Aug-07 (METAS, No. 217-00718)	Oct-07 Oct-07 Aug-08 Aug-08
ower sensor HP 8481A MY41092317 18-Oct-02 (SPEAG, in house check Oct-05) In house check: Oct-07 F generator Agilent E4421B MY41000675 11-May-05 (SPEAG, in house check Nov-05) In house check: Nov-07 letwork Analyzer HP 8753E US37390585 S4206 18-Oct-01 (SPEAG, in house check Oct-06) In house check: Oct-07 Name Function Signature	rimary Standards ower meter EPM-442A ower sensor HP 8481A eference 20 dB Attenuator eference 10 dB Attenuator eference Probe ET3DV6	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507	03-Oct-06 (METAS, No. 217-00606) 03-Oct-06 (METAS, No. 217-00606) 07-Aug-07 (METAS, No 217-00718) 07-Aug-07 (METAS, No 217-00718) 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) 19-Oct-06 (SPEAG, No. ES3-3025_Oct06)	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07
Tower sensor HP 8481A MY41092317 18-Oct-02 (SPEAG, in house check Oct-05) In house check: Oct-07 IF generator Agilent E4421B MY41000675 11-May-05 (SPEAG, in house check Nov-05) In house check: Nov-07 In house check: Nov-07 In house check: Oct-07 Name Function Signature	rimary Standards ower meter EPM-442A ower sensor HP 8481A leference 20 dB Attenuator leference 10 dB Attenuator leference Probe ET30V6 leference Probe ES3DV3	ID# GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507 SN: 3025	03-Oct-06 (METAS, No. 217-00606) 03-Oct-06 (METAS, No. 217-00606) 07-Aug-07 (METAS, No 217-00718) 07-Aug-07 (METAS, No 217-00718) 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) 19-Oct-06 (SPEAG, No. ES3-3025_Oct06)	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07
letwork Analyzer HP 8753E US37390585 S4206 18-Oct-01 (SPEAG, in house check Oct-06) In house check: Oct-07 Name Function Signature	rimary Standards tower meter EPM-442A tower sensor HP 8481A teference 20 dB Attenuator teference 10 dB Attenuator teference Probe ET3DV6 teference Probe ES3DV3	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507 SN: 3025 SN 601	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) 19-Oct-06 (SPEAG, No. ES3-3025_Oct06) 30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07 Jan-08
Name Function Signature	rimary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ET3DV6 Reference Probe ES3DV3 PAE4 Recondary Standards	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507 SN: 3025 SN 601	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) 19-Oct-06 (SPEAG, No. ES3-3025_Oct06) 30-Jan-07 (SPEAG, No. DAE4-801_Jan07) Check Date (in house)	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07 Jan-08 Scheduled Check In house check: Oct-07
	rimary Standards ower meter EPM-442A ower sensor HP 8481A eference 20 dB Attenuator eference 10 dB Attenuator eference Probe ET3DV6 eference Probe ES3DV3 AE4 econdary Standards ower sensor HP 8481A	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507 SN: 3025 SN 601 ID # MY41092317	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) 19-Oct-06 (SPEAG, No. ES3-3025_Oct08) 30-Jan-07 (SPEAG, No. DAE4-801_Jan07) Check Date (in house) 18-Oct-02 (SPEAG, in house check Oct-05)	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07 Jan-08 Scheduled Check
	Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ET3DV6 Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator Agilent E4421B	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507 SN: 3025 SN 601 ID # MY41092317 MY41090675	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) 19-Oct-06 (SPEAG, No. ES3-3025_Oct06) 30-Jan-07 (SPEAG, No. DAE4-801_Jan07) Check Date (in house) 18-Oct-02 (SPEAG, in house check Oct-05) 11-May-05 (SPEAG, in house check Nov-05)	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07 Jan-08 Scheduled Check In house check: Oct-07 In house check: Nov-07
opproved by: Katja Pokovic Technical Manager	rimary Standards rower meter EPM-442A rower sensor HP 8481A teference 20 dB Attenuator teference 10 dB Attenuator teference Probe ET3DV6 teference Probe ES3DV3 toAE4 secondary Standards rower sensor HP 8481A tF generator Agilent E4421B	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507 SN: 3025 SN 601 ID # MY41092317 MY41090675 US37390585 S4206	03-Oct-06 (METAS, No. 217-00606) 03-Oct-06 (METAS, No. 217-00606) 07-Aug-07 (METAS, No. 217-00718) 07-Aug-07 (METAS, No. 217-00718) 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) 19-Oct-06 (SPEAG, No. ES3-3025_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) 18-Oct-01 (SPEAG, in house check Oct-06)	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07 Jan-08 Scheduled Check In house check: Oct-07 In house check: Nov-07 In house check: Oct-07
oproved by: Katja Pokovic Technical Manager	ower meter EPM-442A ower sensor HP 8481A eference 20 dB Attenuator eference 10 dB Attenuator eference Probe ET3DV6 eference Probe ES3DV3 AE4 econdary Standards ower sensor HP 8481A F generator Agilent E4421B etwork Analyzer HP 8753E	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507 SN: 3025 SN 601 ID # MY41092317 MY41090675 US37390585 S4206 Name	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) 19-Oct-06 (SPEAG, No. ES3-3025_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) Function	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07 Jan-08 Scheduled Check In house check: Oct-07 In house check: Nov-07 In house check: Oct-07
	rimary Standards ower meter EPM-442A ower sensor HP 8481A eference 20 dB Attenuator leference 10 dB Attenuator leference Probe ET3DV6 leference Probe ES3DV3 lAE4 econdary Standards ower sensor HP 8481A F generator Agilent E4421B letwork Analyzer HP 8753E	ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN: 1507 SN: 3025 SN 601 ID # MY41092317 MY41090675 US37390585 S4206 Name	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) 19-Oct-06 (SPEAG, No. ES3-3025_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) Function	Oct-07 Oct-07 Aug-08 Aug-08 Oct-07 Oct-07 Jan-08 Scheduled Check In house check: Oct-07 In house check: Oct-07

Certificate No: D1900V2-5d033_Aug07

Page 1 of 6



Report File No. : Date of Issue :

STROS-07-016-A1 2007-10-19

Page:

84 / 94

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

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.



Report File No. : STROS-07-016-A1

Date of Issue :

2007-10-19

Page:

85 / 94

Measurement Conditions

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

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 ± 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)

^{*} Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"



Report File No.: Date of Issue:

STROS-07-016-A1 2007-10-19

Page:

86 / 94

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



Date of Issue: 2007-10-19

Page:

87 / 94

STROS-07-016-A1

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; $\sigma = 1.47 \text{ mho/m}$; $\epsilon_r = 39.3$; $\rho = 1000 \text{ kg/m}^3$

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

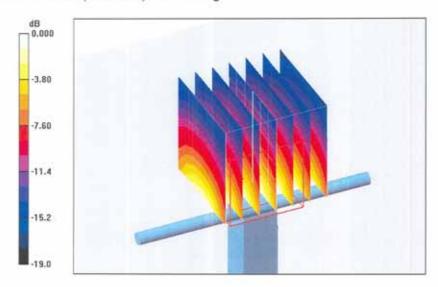
- · Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA;;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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



0 dB = 10.7 mW/g



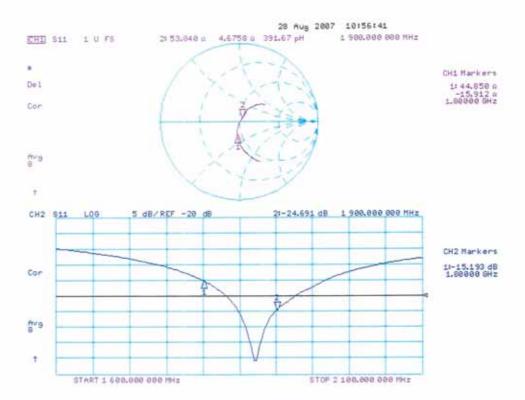
Date of Issue:

STROS-07-016-A1 2007-10-19

Page:

88 / 94

Impedance Measurement Plot for Head TSL





Report File No.: STROS-07-016-A1 Date of Issue: 2007-10-19

89 / 94 Page:

- 2450 MHz Dipole Calibration Certificate

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





Schweizerischer Kalibrierdienst S Service suisse d'étalonnage C 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: D2450V2-734 Aug07

Accreditation No.: SCS 108

Object	D2450V2 - SN: 7	34	1811
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&		ry facility: environment temperature (22 ± 3)°C and Cal Date (Calibrated by, Certificate No.)	d humidity < 70%. 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	TE critical for calibration) ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 3025	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. ES3-3025_Oct08)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07
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	TE critical for calibration) ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 3025 SN 601	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. ES3-3025_Oct08) 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& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Reference 10 dB Attenuator Reference Probe ES3DV3	TE critical for calibration) ID # GB37480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 3025	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. ES3-3025_Oct08)	Scheduled Calibration Oct-07 Oct-07 Aug-08 Aug-08 Oct-07
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 # G837480704 US37292783 SN: 5086 (20g) SN: 5047.2 (10r) SN 3025 SN 601 ID # MY41092317 MY41000675	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. 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 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& 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

Page 1 of 6



Report File No. : Date of Issue :

STROS-07-016-A1 2007-10-19

Page:

90 / 94

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





S Schwelzerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S 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.



Report File No. : STROS-07-016-A1

2007-10-19

Date of Issue: Page:

91 / 94

Measurement Conditions

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

Head TSL parameters
The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.7 ± 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

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



STROS-07-016-A1 2007-10-19

Date of Issue : Page :

92 / 94

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.3 Ω + 4.7 ΙΩ	
Return Loss	- 25.9 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns
Electrical policy (ellip all colors)	11.100 110

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

Page 4 of 6



Date of Issue: 2007-10-19

Page:

93 / 94

STROS-07-016-A1

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

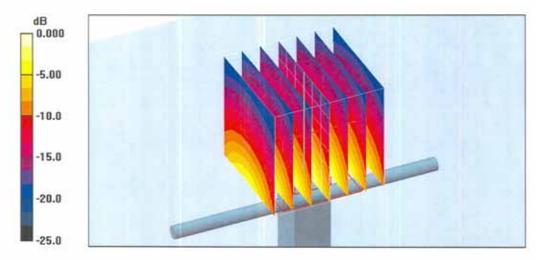
- · Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

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/gMaximum value of SAR (measured) = 14.6 mW/g



0 dB = 14.6 mW/g



Date of Issue:

Page:

STROS-07-016-A1

2007-10-19

94 / 94

Impedance Measurement Plot for Head TSL

