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**

Accredited by the Swiss Accreditation Service (SAS)

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Accreditation No.: SCS 108

Certificate No: DAE4-778_Sep08 Sporton (Auden) Client CALIBRATION CERTIFICATE DAE4 - SD 000 D04 BG - SN: 778 Object QA CAL-06.v12 Calibration procedure(s) Calibration procedure for the data acquisition electronics (DAE) September 22, 2008 Calibration date: Condition of the calibrated item In Tolerance This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%. Calibration Equipment used (M&TE critical for calibration) Scheduled Calibration Cal Date (Certificate No.) Primary Standards ID# Oct-08 Fluke Process Calibrator Type 702 SN: 6295803 04-Oct-07 (No: 6467) Keithley Multimeter Type 2001 SN: 0810278 03-Oct-07 (No: 6465) Oct-08 Check Date (in house) Scheduled Check Secondary Standards Calibrator Box V1.1 SE UMS 006 AB 1004 06-Jun-08 (in house check) In house check: Jun-09 Function Name Calibrated by: Andrea Guntli Technician Fin Bomholt R&D Director Approved by: Issued: September 22, 2008 This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: DAE4-778_Sep08

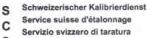
Page 1 of 5

Calibration Laboratory of

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland







Test Report No : FA8O1007

Swiss Calibration Service

Accreditation No.: SCS 108

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Glossary

DAE data acquisition electronics

Connector angle information used in DASY system to align probe sensor X to the robot

coordinate system.

Methods Applied and Interpretation of Parameters

- DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement
 - Common mode sensitivity: Influence of a positive or negative common mode voltage on the differential measurement.
 - Channel separation: Influence of a voltage on the neighbor channels not subject to an input voltage.
 - AD Converter Values with inputs shorted: Values on the internal AD converter corresponding to zero input voltage
 - Input Offset Measurement: Output voltage and statistical results over a large number of zero voltage measurements.
 - Input Offset Current: Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - Input resistance: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - Low Battery Alarm Voltage: Typical value for information. Below this voltage, a battery
 alarm signal is generated.
 - Power consumption: Typical value for information. Supply currents in various operating modes.

Certificate No: DAE4-778_Sep08 Page 2 of 5

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = $6.1\mu V$, full range = -100...+300 mVLow Range: 1LSB = 61nV, full range = -1......+3mV

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

Calibration Factors	x	Y	Z
High Range	404.686 ± 0.1% (k=2)	403.490 ± 0.1% (k=2)	405.045 ± 0.1% (k=2)
Low Range	3.99455 ± 0.7% (k=2)	3.96369 ± 0.7% (k=2)	3.99417 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	309 ° ± 1 °
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Certificate No: DAE4-778_Sep08

Page 3 of 5



Appendix

1. DC Voltage Linearity

High Range	Input (μV)	Reading (µV)	Error (%)
Channel X + Input	200000	200000.3	0.00
Channel X + Input	20000	20004.24	0.02
Channel X - Input	20000	-20002.46	0.01
Channel Y + Input	200000	200000.4	0.00
Channel Y + Input	20000	20002.60	0.01
Channel Y - Input	20000	-20002.26	0.01
Channel Z + Input	200000	200000.6	0.00
Channel Z + Input	20000	20000.78	0.00
Channel Z - Input	20000	-20005.75	0.03

Low Range	Input (μV)	Reading (μV)	Error (%)
Channel X + Input	2000	2000	0.00
Channel X + Input	200	199.37	-0.31
Channel X - Input	200	-200.28	0.14
Channel Y + Input	2000	2000	0.00
Channel Y + Input	200	199.63	-0.19
Channel Y - Input	200	-200.88	0.44
Channel Z + Input	2000	2000.1	0.00
Channel Z + Input	200	198.60	-0.70
Channel Z - Input	200	-201.07	0.53

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-7.46	-6.40
	- 200	10.00	6.86
Channel Y	200	-2.73	-2.45
	- 200	0.84	0.43
Channel Z	200	-10.91	-10.94
	- 200	7.89	8.22

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	-	3.08	-1.34
Channel Y	200	1.18	-	4.64
Channel Z	200	-1.74	1.44	-

Certificate No: DAE4-778_Sep08

Page 4 of 5

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	16048	16021
Channel Y	16167	15166
Channel Z	16416	15977

5. Input Offset Measurement

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

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (µV)
Channel X	-0.13	-0.88	0.92	0.33
Channel Y	-0.88	-2.47	0.72	0.55
Channel Z	-1.16	-2.17	-0.19	0.42

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	201.1
Channel Y	0.2000	201.0
Channel Z	0.2001	201.7

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

Certificate No: DAE4-778_Sep08

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Client Sporton (Auden)

Certificate No: ET3-1787 Aug08

Accreditation No.: SCS 108

Calibration procedure(s) Calibration date: Condition of the calibrated item This calibration certificate documents the the measurements and the uncertaintients.	alibration procuration procur	and QA CAL-23.v3 edure for dosimetric E-field probe tional standards, which realize the physical un probability are given on the following pages a	nits of measurements (SI).
Calibration date: At Condition of the calibrated item This calibration certificate documents the the measurements and the uncertaintients.	alibration procuration procur	edure for dosimetric E-field probe 3 tional standards, which realize the physical ur probability are given on the following pages a	nits of measurements (SI). und are part of the certificate.
Calibration date: At Condition of the calibrated item This calibration certificate documents the the measurements and the uncertaintients.	alibration procuration procur	edure for dosimetric E-field probe 3 tional standards, which realize the physical ur probability are given on the following pages a	nits of measurements (SI). und are part of the certificate.
Condition of the calibrated item In This calibration certificate documents the measurements and the uncertainties.	Tolerance ne traceability to na es with confidence	tional standards, which realize the physical ur probability are given on the following pages a	and are part of the certificate.
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	es with confidence	probability are given on the following pages a	and are part of the certificate.
Calibration Equipment used (M&TE crit		ory facility: environment temperature (22 ± 3)*	'C and humidity < 70%.
Primary Standards ID)#	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B G	B41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A M	Y41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A M	Y41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator S	N: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator Si	N: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
	N: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
	N: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4 S	N: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08
Secondary Standards)#	Check Date (in house)	Scheduled Check
	S3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	\$37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08
TOTAL CONTRACTOR OF THE PARTY O	ame	Function	Signature
Calibrated by: Ka	atja Pokovic	Technical Manager	Son las
Approved by:	els Kuster	Quality Manager	1

Certificate No: ET3-1787_Aug08

Page 1 of 9

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Glossary:

TSL NORMx,y,z

ConvF

tissue simulating liquid sensitivity in free space sensitivity in TSL / NORMx.v.z

DCP Polarization φ diode compression point φ rotation around probe axis

Polarization 9

9 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: ET3-1787_Aug08

Page 2 of 9

DRITON LAB. FCC SAR Test Report Test Report No : FA8O1007

ET3DV6 SN:1787

August 26, 2008

Probe ET3DV6

SN:1787

Manufactured:

May 28, 2003 August 28, 2007

Last calibrated: Recalibrated:

August 26, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: ET3-1787_Aug08

Page 3 of 9

ET3DV6 SN:1787

August 26, 2008

DASY - Parameters of Probe: ET3DV6 SN:1787

Name of the Control o	1214	-	Λ.
Sensitivity	in	Eroo	Snaco
Sensitivity	1111	riee	Space

Diode Compression^B

NormX	1.63 ± 10.1%	$\mu V/(V/m)^2$	DCP X	90 mV
NormY	1.67 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	93 mV
NormZ	2.18 ± 10.1%	$\mu V/(V/m)^2$	DCP Z	92 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL

900 MHz

Typical SAR gradient: 5 % per mm

Sensor Cente	er to Phantom Surface Distance	3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	11.3	7.5
SAR _{be} [%]	With Correction Algorithm	0.8	0.5

TSL

1750 MHz

Typical SAR gradient: 10 % per mm

Sensor Cente	r to Phantom Surface Distance	3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	10.1	6.5
SAR _{be} [%]	With Correction Algorithm	8.0	0.6

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: ET3-1787_Aug08

Page 4 of 9

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

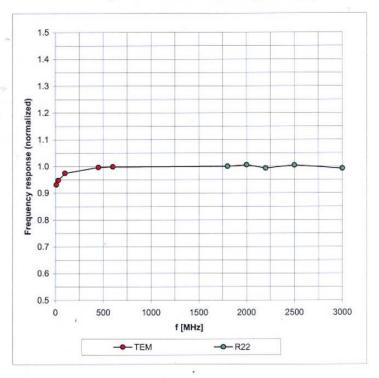
^B Numerical linearization parameter: uncertainty not required.



August 26, 2008

Frequency Response of E-Field

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



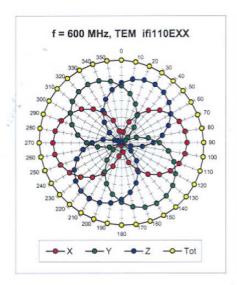
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

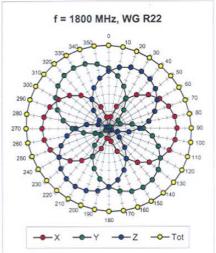
Certificate No: ET3-1787_Aug08

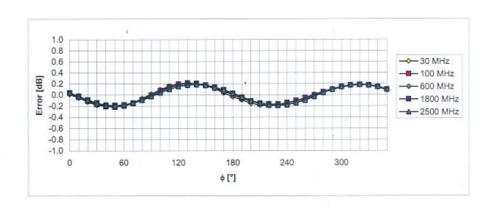
Page 5 of 9

August 26, 2008

Receiving Pattern (ϕ), ϑ = 0°







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

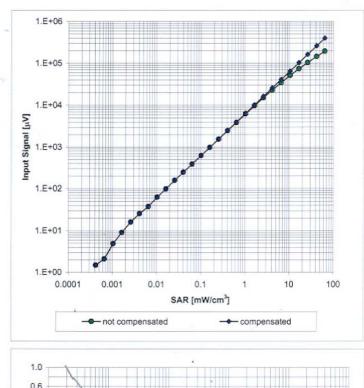
Certificate No: ET3-1787_Aug08

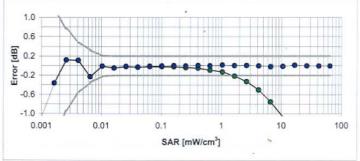
Page 6 of 9

August 26, 2008

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)





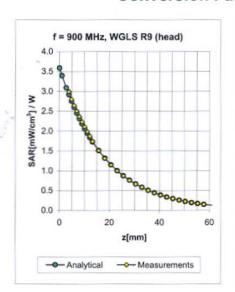
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

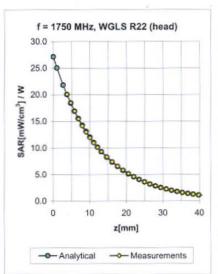
Certificate No: ET3-1787_Aug08

Page 7 of 9

August 26, 2008

Conversion Factor Assessment





f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	±50/±100	Head	41.5 ± 5%	0.97 ± 5%	0.30	2.80	6.06 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.53	2.11	5.36 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.59	1.96	5.01 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1,80 ± 5%	0.77	1.57	4.49 ± 11.0% (k=2)
				*			
900	$\pm 50 / \pm 100$	Body	$55.0 \pm 5\%$	$1.05 \pm 5\%$	0.31	2.98	5.91 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	$1.49 \pm 5\%$	0.60	2.20	4.73 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.68	1.95	4.49 ± 11.0% (k=2)
2450	±50/±100	Body	52.7 ± 5%	1.95 ± 5%	0.90	1.51	3.79 ± 11.0% (k=2)

Certificate No: ET3-1787_Aug08

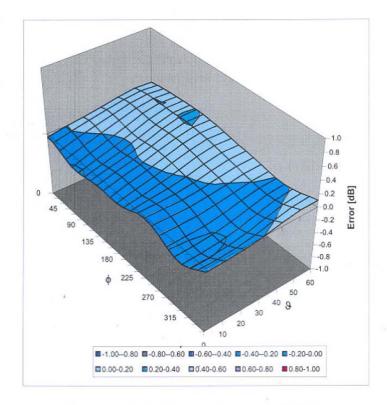
Page 8 of 9

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

August 26, 2008

Deviation from Isotropy in HSL

Error (φ, θ), f = 900 MHz



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

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Page 9 of 9

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CALIBRATION (EKTIFICAT		
Object	ET3DV6 - SN:1	788	
Calibration procedure(s)	Commence of the Commence of th	and QA CAL-23.v3 edure for dosimetric E-field probe	8
Calibration date:	September 23, 2	2008	
Condition of the calibrated item	In Tolerance		
All calibrations have been conduct Calibration Equipment used (M&T		ory facility: environment temperature (22 ± 3)°C	C and humidity < 70%.
rimary Standards	ID#	Cal Date (Certificate No.)	Scheduled Calibration
	ID# GB41293874	Cal Date (Certificate No.) 1-Apr-08 (No. 217-00788)	Scheduled Calibration Apr-09
Power meter E4419B			CONTRACTOR OF THE PARTY OF THE
Power meter E4419B Power sensor E4412A	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power meter E4419B Power sensor E4412A Power sensor E4412A	GB41293874 MY41495277	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788)	Apr-09 Apr-09
Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator	GB41293874 MY41495277 MY41498087	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788)	Apr-09 Apr-09 Apr-09
Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b)	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00865) 31-Mar-08 (No. 217-00787) 1-Jul-08 (No. 217-00866)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09
Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe ES3DV2	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 3013	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00865) 31-Mar-08 (No. 217-00787) 1-Jul-08 (No. 217-00866) 2-Jan-08 (No. ES3-3013_Jan08)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09 Jan-09
Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe ES3DV2	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b)	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00865) 31-Mar-08 (No. 217-00787) 1-Jul-08 (No. 217-00866)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09
Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe ES3DV2 DAE4	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 3013	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00865) 31-Mar-08 (No. 217-00787) 1-Jul-08 (No. 217-00866) 2-Jan-08 (No. ES3-3013_Jan08)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09 Jan-09
Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe ES3DV2 DAE4 Secondary Standards	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 3013 SN: 660	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00865) 31-Mar-08 (No. 217-00787) 1-Jul-08 (No. 217-00866) 2-Jan-08 (No. ES3-3013_Jan08) 9-Sep-08 (No. DAE4-660_Sep08)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09 Jan-09 Sep-09
Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe ES3DV2 DAE4 Secondary Standards RF generator HP 8648C	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 3013 SN: 660	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00865) 31-Mar-08 (No. 217-00787) 1-Jul-08 (No. 217-00866) 2-Jan-08 (No. ES3-3013_Jan08) 9-Sep-08 (No. DAE4-660_Sep08) Check Date (in house)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09 Jan-09 Sep-09 Scheduled Check
Primary Standards Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference Probe ES3DV2 DAE4 Secondary Standards RF generator HP 8648C Network Analyzer HP 8753E	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 3013 SN: 660	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00865) 31-Mar-08 (No. 217-00787) 1-Jul-08 (No. 217-00866) 2-Jan-08 (No. ES3-3013_Jan08) 9-Sep-08 (No. DAE4-660_Sep08) Check Date (in house) 4-Aug-99 (in house check Oct-07)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09 Jan-09 Sep-09 Scheduled Check In house check: Oct-09
Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe ES3DV2 DAE4 Secondary Standards RF generator HP 8648C Network Analyzer HP 8753E	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 3013 SN: 660 ID # US3642U01700 US37390585	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00865) 31-Mar-08 (No. 217-00787) 1-Jul-08 (No. 217-00866) 2-Jan-08 (No. ES3-3013_Jan08) 9-Sep-08 (No. DAE4-660_Sep08) Check Date (in house) 4-Aug-99 (in house check Oct-07) 18-Oct-01 (in house check Oct-07)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09 Jan-09 Sep-09 Scheduled Check In house check: Oct-09 In house check: Oct-08
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Power meter E4419B Power sensor E4412A Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe ES3DV2 DAE4 Secondary Standards RF generator HP 8648C	GB41293874 MY41495277 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: 3013 SN: 660 ID # US3642U01700 US37390585	1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Apr-08 (No. 217-00788) 1-Jul-08 (No. 217-00787) 1-Jul-08 (No. 217-00787) 1-Jul-08 (No. 217-00866) 2-Jan-08 (No. ES3-3013_Jan08) 9-Sep-08 (No. DAE4-660_Sep08) Check Date (in house) 4-Aug-99 (in house check Oct-07) 18-Oct-01 (in house check Oct-07)	Apr-09 Apr-09 Apr-09 Jul-09 Apr-09 Jul-09 Jan-09 Sep-09 Scheduled Check In house check: Oct-09 In house check: Oct-08

Certificate No: ET3-1788_Sep08

Page 1 of 9

Calibration Laboratory of Schmid & Partner **Engineering AG**

Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst Service suisse d'étalonnage

C Servizio svizzero di taratura

Accreditation No.: SCS 108

Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

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

Glossary:

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

ConvF

sensitivity in TSL / NORMx,y,z

DCP Polarization o diode compression point φ rotation around probe axis

Polarization 9

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

measurement center), i.e., $\theta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- 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,v,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: ET3-1788 Sep08

Page 2 of 9

September 23, 2008

Probe ET3DV6

SN:1788

Manufactured:

May 28, 2003

Last calibrated: Recalibrated:

September 26, 2007

September 23, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: ET3-1788_Sep08

Page 3 of 9



September 23, 2008

DASY - Parameters of Probe: ET3DV6 SN:1788

Sensitivity in Free Space ^A			Diode Compressi		
	NormX	1.73 ± 10.1%	$\mu V/(V/m)^2$	DCP X	95 mV
	NormY	1.59 ± 10.1%	$\mu V/(V/m)^2$	DCP Y	98 mV
	NormZ	1.72 ± 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 Cente	er to Phantom Surface Distance	3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	10.6	6.8
SAR _{be} [%]	With Correction Algorithm	8.0	0.3

TSL 1750 MHz Typical SAR gradient: 10 % per mm

Sensor Cente	r to Phantom Surface Distance	3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	8.8	4.9
SAR _{be} [%]	With Correction Algorithm	0.7	0.6

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: ET3-1788_Sep08

Page 4 of 9

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

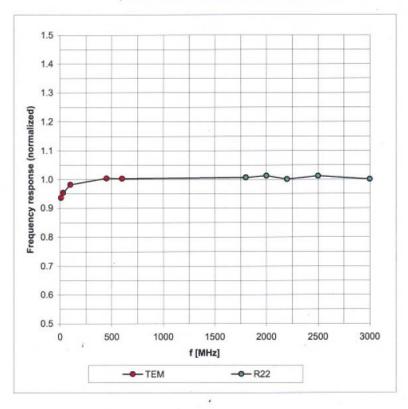
⁸ Numerical linearization parameter: uncertainty not required.



September 23, 2008

Frequency Response of E-Field

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



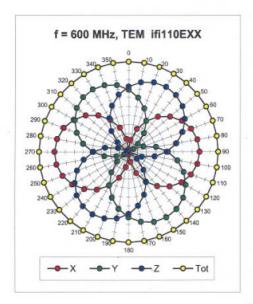
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

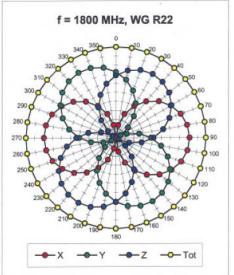
Certificate No: ET3-1788_Sep08

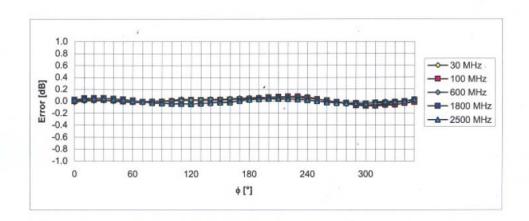
Page 5 of 9

September 23, 2008

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







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

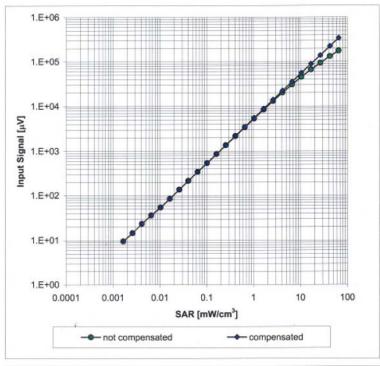
Certificate No: ET3-1788_Sep08

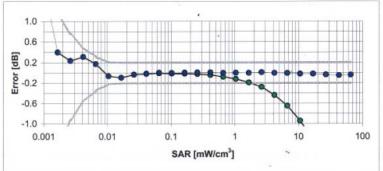
Page 6 of 9

September 23, 2008

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)





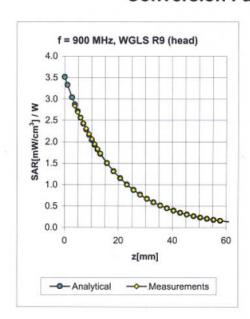
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

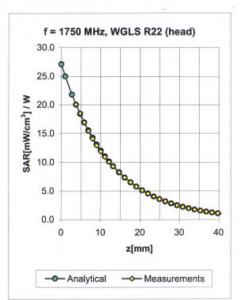
Certificate No: ET3-1788_Sep08

Page 7 of 9

September 23, 2008

Conversion Factor Assessment





Validity [MHz] ^C	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.44	2.65	6.55 ± 11.0% (k=2)
± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.68	1.98	5.59 ± 11.0% (k=2)
± 50 / ± 100	Head	40.0 ± 5%	$1.40 \pm 5\%$	0.75	1.75	5.13 ± 11.0% (k=2)
\pm 50 / \pm 100	Head	39.2 ± 5%	1.80 ± 5%	0.80	1.45	4.68 ± 11.0% (k=2)
± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.50	, 2.48	6.34 ± 11.0% (k=2)
± 50 / ± 100	Body	53.4 ± 5%	$1.49 \pm 5\%$	0.63	2.33	4.87 ± 11.0% (k=2)
± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.74	1.99	4.73 ± 11.0% (k=2)
± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.94	1.75	3.98 ± 11.0% (k=2)
	±50/±100 ±50/±100 ±50/±100 ±50/±100 ±50/±100 ±50/±100 ±50/±100	±50/±100 Head ±50/±100 Head ±50/±100 Head ±50/±100 Head ±50/±100 Body ±50/±100 Body ±50/±100 Body	±50/±100 Head 41.5±5% ±50/±100 Head 40.1±5% ±50/±100 Head 40.0±5% ±50/±100 Head 39.2±5% ±50/±100 Body 55.0±5% ±50/±100 Body 53.4±5% ±50/±100 Body 53.3±5%	$\pm 50 / \pm 100$ Head $41.5 \pm 5\%$ $0.97 \pm 5\%$ $\pm 50 / \pm 100$ Head $40.1 \pm 5\%$ $1.37 \pm 5\%$ $\pm 50 / \pm 100$ Head $40.0 \pm 5\%$ $1.40 \pm 5\%$ $\pm 50 / \pm 100$ Head $39.2 \pm 5\%$ $1.80 \pm 5\%$ $\pm 50 / \pm 100$ Body $55.0 \pm 5\%$ $1.05 \pm 5\%$ $\pm 50 / \pm 100$ Body $53.4 \pm 5\%$ $1.49 \pm 5\%$ $\pm 50 / \pm 100$ Body $53.3 \pm 5\%$ $1.52 \pm 5\%$	$\pm 50 / \pm 100$ Head $41.5 \pm 5\%$ $0.97 \pm 5\%$ 0.44 $\pm 50 / \pm 100$ Head $40.1 \pm 5\%$ $1.37 \pm 5\%$ 0.68 $\pm 50 / \pm 100$ Head $40.0 \pm 5\%$ $1.40 \pm 5\%$ 0.75 $\pm 50 / \pm 100$ Head $39.2 \pm 5\%$ $1.80 \pm 5\%$ 0.80 $\pm 50 / \pm 100$ Body $55.0 \pm 5\%$ $1.05 \pm 5\%$ 0.50 $\pm 50 / \pm 100$ Body $53.4 \pm 5\%$ $1.49 \pm 5\%$ 0.63 $\pm 50 / \pm 100$ Body $53.3 \pm 5\%$ $1.52 \pm 5\%$ 0.74	$\pm 50/\pm 100$ Head $41.5\pm 5\%$ $0.97\pm 5\%$ 0.44 2.65 $\pm 50/\pm 100$ Head $40.1\pm 5\%$ $1.37\pm 5\%$ 0.68 1.98 $\pm 50/\pm 100$ Head $40.0\pm 5\%$ $1.40\pm 5\%$ 0.75 1.75 $\pm 50/\pm 100$ Head $39.2\pm 5\%$ $1.80\pm 5\%$ 0.80 1.45 $\pm 50/\pm 100$ Body $55.0\pm 5\%$ $1.05\pm 5\%$ 0.50 2.48 $\pm 50/\pm 100$ Body $53.4\pm 5\%$ $1.49\pm 5\%$ 0.63 2.33 $\pm 50/\pm 100$ Body $53.3\pm 5\%$ $1.52\pm 5\%$ 0.74 1.99

Certificate No: ET3-1788_Sep08

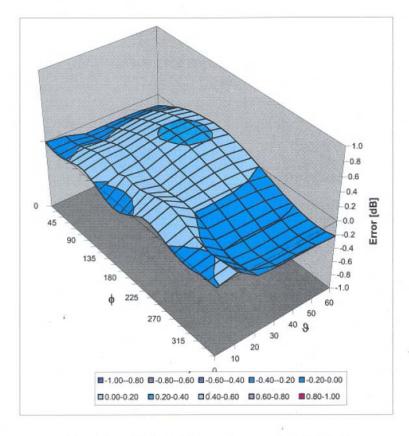
Page 8 of 9

 $^{^{\}rm C}$ The validity of \pm 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.

September 23, 2008

Deviation from Isotropy in HSL

Error (♦, ३), f = 900 MHz



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

Certificate No: ET3-1788_Sep08

Page 9 of 9

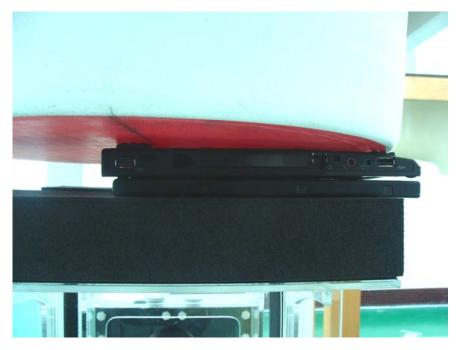


Appendix D - Product Photos





Appendix E - Test Setup Photos



Lap Held Position with Tablet Mode



Secondary Portrait Position with Tablet Mode