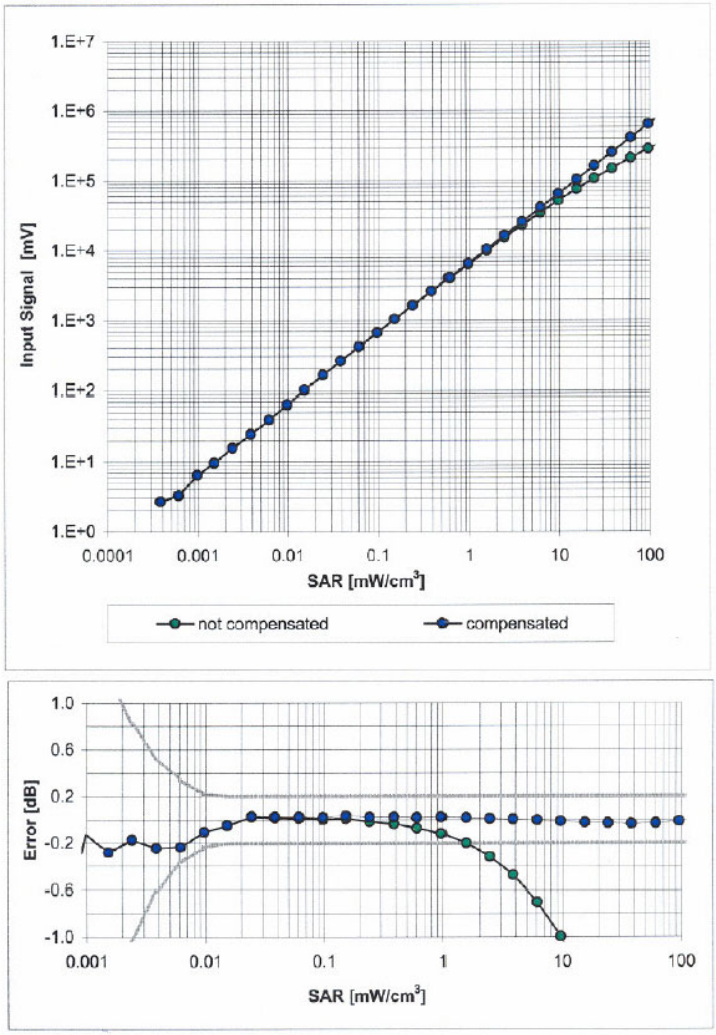
ET3DV6 SN:1788 September 30, 2004

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)



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

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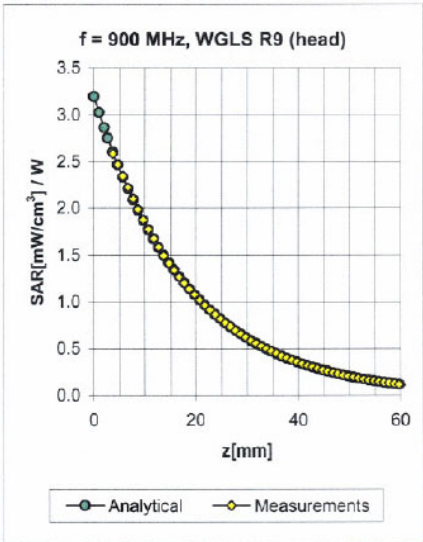
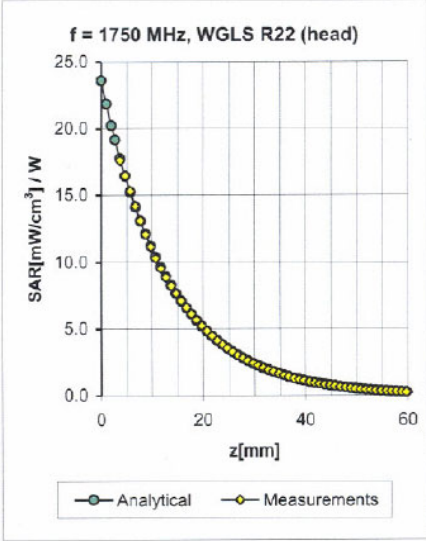
Conversion Factor Assessment





f [MHz]	Validity [MHz][c]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	1.12	1.42	6.74 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.07	1.44	6.63 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.56	2.31	5.37 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.42	5.16 ± 11.0% (k=2)
2000	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.54	2.59	4.88 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.65	2.22	4.56 ± 11.8% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	1.04	1.52	6.53 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.99	1.56	6.17 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.53	2.74	4.73 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.55	2.82	4.56 ± 11.0% (k=2)
2000	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.54	2.98	4.43 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.72	2.00	4.26 ± 11.8% (k=2)

[c] The validity of ± 100 MHz only applies for DASY 4.3 B17 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.

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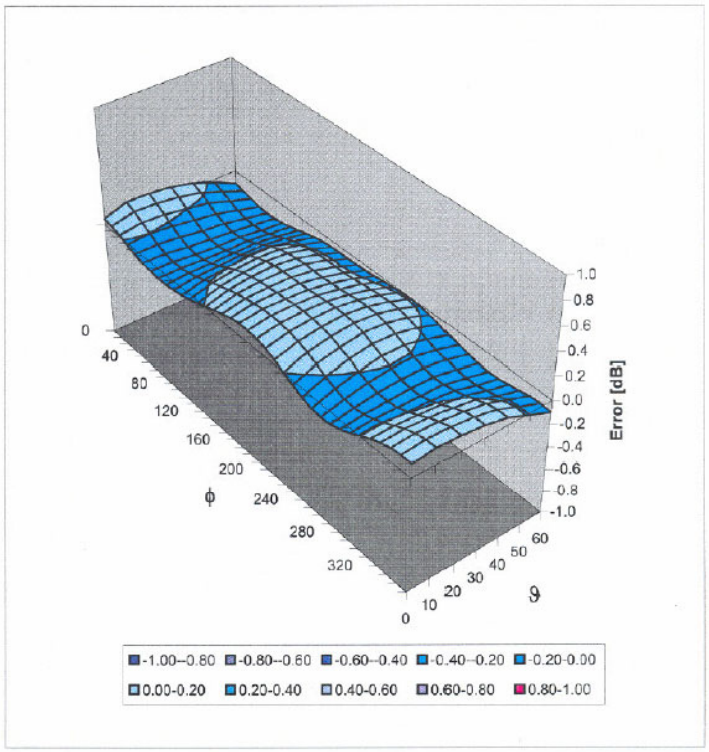
Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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

Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: DAE3-577_Nov05

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 577
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 11, 2005
Condition of the calibrated item	In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: November 11, 2005

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

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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Accreditation No.: SCS 108

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.....+3mV

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

Calibration Factors	X	Y	Z
High Range	404.445 ± 0.1% (k=2)	403.896 ± 0.1% (k=2)	404.369 ± 0.1% (k=2)
Low Range	3.94241 ± 0.7% (k=2)	3.89919 ± 0.7% (k=2)	3.95427 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	130 ° ± 1 °

Appendix

1. DC Voltage Linearity

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

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

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	13.40	12.55
	- 200	-12.29	-13.06
Channel Y	200	-6.93	-7.43
	- 200	6.72	6.47
Channel Z	200	0.71	0.36
	- 200	-1.67	-1.93

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	1.59	0.08
Channel Y	200	1.69	-	3.62
Channel Z	200	-0.73	-1.49	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15946	15679
Channel Y	15960	16151
Channel Z	16233	15968

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.08	-1.13	2.31	0.51
Channel Y	-0.35	-2.00	0.81	0.43
Channel Z	-0.38	-2.76	1.68	0.40

6. Input Offset Current

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

7. Input Resistance

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

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9