## **APPENDIX C CALIBRATION DOCUMENTS**

- 1. SN: 1380 Probe Calibration Certificate
- 2. SN: 047 D900V2 Dipole Calibration Certificate
- 3. SN: 1051 D750V2 Dipole Calibration Certificate
- 4. SN: 442 DAE3 Data Acquisition Electronics Calibration Certificate



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

Client



Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 108

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EMC Technologies

Certificate No:	ET3-1380	Dec11
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CALIBRATION	CERTIFICATI		
Object	ET3DV6 - SN:13	80	
Calibration procedure(s)		QA CAL-12.v7, QA CAL-23.v4, QA dure for dosimetric E-field probes	CAL-25.v4
Calibration date:	December 12, 20	011	
The measurements and the unc	ertainties with confidence p ucted in the closed laborator	onal standards, which realize the physical units robability are given on the following pages and y facility: environment temperature $(22 \pm 3)^{\circ}C$ is	are part of the certificate.
Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12
	Name	Function	Signature .
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	2ekg2
This calibration certificate shall r	not be reproduced except in	full without written approval of the laboratory.	Issued: December 12, 2011

Certificate No: ET3-1380\_Dec11

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Glossary: TSL tissue simulating liquid

ISL	ussue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization 9	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

#### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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 affect the E<sup>2</sup>-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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C are numerical linearization parameters assessed based on the data of
  power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the
  maximum calibration range expressed in RMS voltage across the diode.
- 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: ET3-1380\_Dec11

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December 12, 2011

# Probe ET3DV6

# SN:1380

Manufactured: Calibrated: August 16, 1999 December 12, 2011

Calibrated for DASY/EASY Systems (Note: non-compatible with DASY2 system!)

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December 12, 2011

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1380

#### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm $(\mu V/(V/m)^2)^A$	1.68	1.60	1.72	± 10.1 %
DCP (mV) <sup>B</sup>	93.1	92.7	94.2	

#### **Modulation Calibration Parameters**

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	137.2	±3.0 %
			Y	0.00	0.00	1.00	129.6	
			Z	0.00	0.00	1.00	103.8	

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%.

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 <sup>&</sup>lt;sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).
 <sup>B</sup> Numerical linearization parameter: uncertainty not required.
 <sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value. field value.

#### December 12, 2011

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1380

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
300	45.3	0.87	7.79	7.79	7.79	0.30	1.56	± 13.4 %
450	43.5	0.87	7.00	7.00	7.00	0.23	2.37	± 13.4 %
900	41.5	0.97	5.88	5.88	5.88	0.80	1.92	± 12.0 %
1640	40.3	1.29	5.35	5.35	5.35	0.68	2.22	± 12.0 %
1810	40.0	1.40	5.05	5.05	5.05	0.72	2.09	± 12.0 %
1950	40.0	1.40	4.80	4.80	4.80	0.71	2.17	± 12.0 %
2450	39.2	1.80	4.35	4.35	4.35	1.00	1.61	± 12.0 %

Calibration Paramete	r Determined in Hea	d Tissue Simulating Media
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<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. <sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Certificate No: ET3-1380\_Dec11

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#### December 12, 2011

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1380

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.41	7.41	7.41	0.16	2.29	± 13.4 %
900	55.0	1.05	5.94	5.94	5.94	1.00	1.63	± 12.0 %
1810	53.3	1.52	4.66	4.66	4.66	0.69	2.50	± 12.0 %
1950	53.3	1.52	4.68	4.68	4.68	0.72	2.35	± 12.0 %
2450	52.7	1.95	4.15	4.15	4.15	1.00	1.29	± 12.0 %

Calibration Parameter Determined in Body Tissue Simulating Media

<sup>C</sup> Frequency validity of  $\pm$  100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to  $\pm$  50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. <sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to  $\pm$  10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to  $\pm$  5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Certificate No: ET3-1380\_Dec11

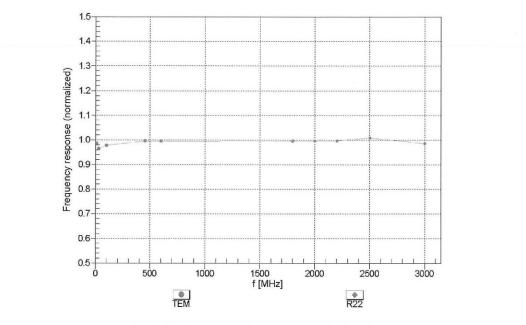
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December 12, 2011

#### Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



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

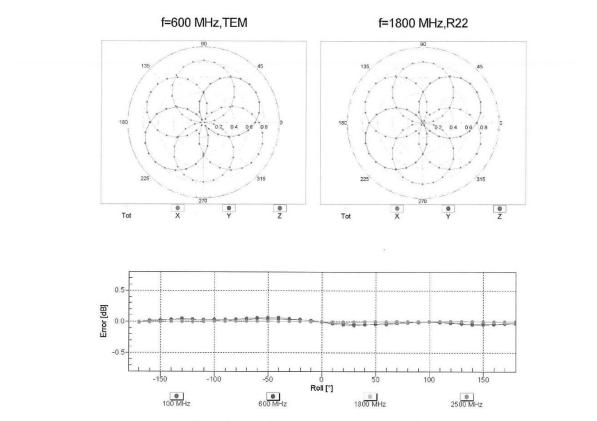
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December 12, 2011



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

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

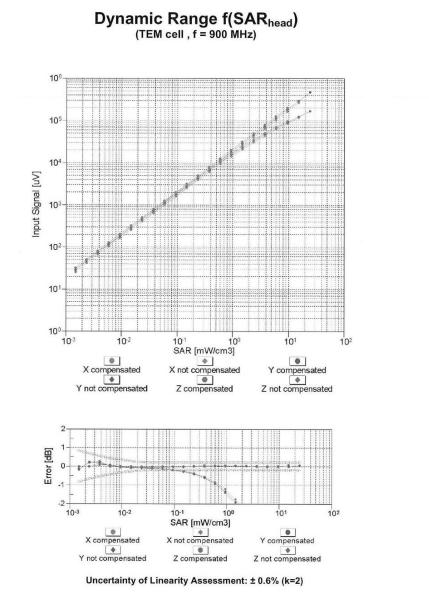
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December 12, 2011

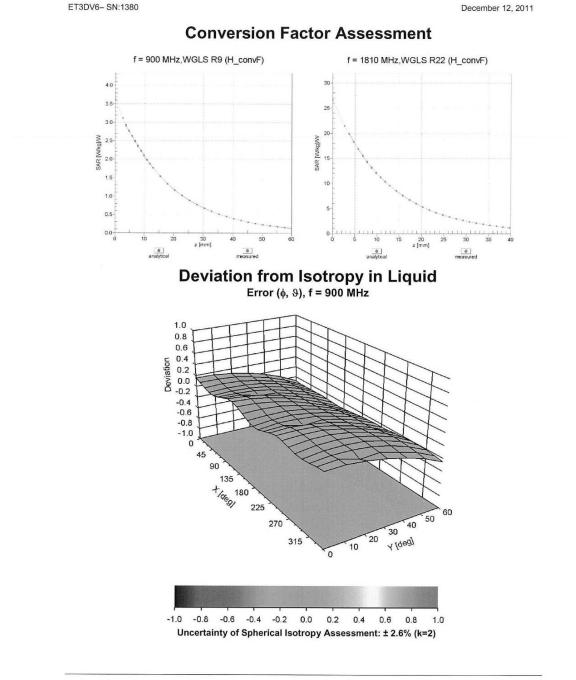


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December 12, 2011

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1380

#### **Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

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eughausstrasse 43, 8004 Zurich, Switzerland hone +41 44 245 9700, Fax +41 44 245 9779 ifo@speag.com, http://www.speag.com	
Additional Con	version Factors ric E-Field Probe
Туре:	ET3DV6
Serial Number:	1380
Place of Assessment:	Zurich
Date of Assessment:	October 4, 2012
Probe Calibration Date:	December 12, 2011
have been evaluated on the date indicated a FDTD numerical code SEMCAD of Schm evaluation is coupled with measured conve following the re-calibration schedule of the	ersion factors, it has to be recalculated yearly,

Assessed by:

done they

ET3DV6-SN:1380

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October 4, 2012



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Conversion factor (± standard deviation) 750 ± 50 MHz ConvF 6.14 ± 7%	380	
	380	
<u>K-</u>	$\epsilon_r = 41.9 \pm 59$ $\sigma = 0.89 \pm 59$ ad tissue)	
Important Note:	$\sigma = 0.89 \pm 5\%$	

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October 4, 2012



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Zeuchausstrasse 43. 8004 Zurich. Switzerland Phone +41 44 245 9700, Fax +41 44 245 9779 info@speag.com, http://www.speag.com		
	version Factors	
Туре:	ET3DV6	
Serial Number:	1380	
Place of Assessment:	Zurich	
Date of Assessment:	June 14, 2012	
Probe Calibration Date:	December 12, 2011	
have been evaluated on the date indicated the FDTD numerical code SEMCAD of S evaluation is coupled with measured conv i.e., following the re-calibration schedule	y certifies that conversion factor(s) of this pro above. The assessment was performed using chmid & Partner Engineering AG. Since the ersion factors, it has to be recalculated yearly of the probe. The uncertainty of the numerica rom measured value at 450, 900 MHz or at 18	r, al
have been evaluated on the date indicated the FDTD numerical code SEMCAD of S evaluation is coupled with measured conv i.e., following the re-calibration schedule assessment is based on the extrapolation f	above. The assessment was performed using chmid & Partner Engineering AG. Since the ersion factors, it has to be recalculated yearly of the probe. The uncertainty of the numerica	s , al
Assessed by:	Jal 15-	

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June 14, 2012



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Zeughausstrasse 43, Phone +41 1 245 970 info@speag.com, http	0, Fax +41 1 245 9	9779					
Dosimetric		<b>robe ET3DV6</b> deviation)	SN:13	80			
750 ± 50 MHz	ConvF	6.13 ± 7%	(body		55.5 ± 5 0.96 ± 5	% % mho/	m
	assessed pro	be conversion fac e following entrie:					ta in the

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June 14, 2012



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chmid & Partner Engineering AG ughausstrasse 43, 8004 Zuri	ory of	BC MRA	Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service
ccredited by the Swiss Accredit he Swiss Accreditation Servio ultilateral Agreement for the	ce is one of the signatories	to the EA	lo.: SCS 108
lient EMC Technol	ogies	Certificate No:	ET3-1380_Dec12
CALIBRATION	CERTIFICATE		
Dbject	ET3DV6 - SN:138	30	
Calibration procedure(s)		A CAL-12.v7, QA CAL-23.v4, QA dure for dosimetric E-field probes	CAL-25.v4
Calibration date:	December 10, 20	12	
The measurements and the unc	certainties with confidence pr ucted in the closed laboratory	onal standards, which realize the physical units obability are given on the following pages and a y facility: environment temperature (22 ± 3)°C a	are part of the certificate.
The measurements and the unc All calibrations have been condu- Calibration Equipment used (MA	certainties with confidence pr ucted in the closed laboratory &TE critical for calibration)	obability are given on the following pages and a y facility: environment temperature $(22 \pm 3)^{\circ}$ C a	are part of the certificate. Ind humidity < 70%.
The measurements and the unc All calibrations have been condi- Calibration Equipment used (Ma Primary Standards	ertainties with confidence pr ucted in the closed laboratory &TE critical for calibration)	obability are given on the following pages and a y facility: environment temperature (22 ± 3)°C a Cat Date (Certificate No.)	are part of the certificate. and humidity < 70%. Scheduled Calibration
he measurements and the unc Il calibrations have been cond Calibration Equipment used (Ma Primary Standards Power meter E4419B	ertainties with confidence pr ucted in the closed laborator &TE critical for calibration) ID GB41293874	obability are given on the following pages and a y facility: environment temperature (22 ± 3)°C a Cal Date (Certificate No.) 29-Mar-12 (No. 217-01508)	are part of the certificate. and humidity < 70%. Scheduled Calibration Apr-13
he measurements and the unc Il calibrations have been cond Calibration Equipment used (Ma Primary Standards Power meter E4419B Power sensor E4412A	Exertainties with confidence pr ucted in the closed laborator &TE critical for calibration) ID GB41293874 MY41498087	obability are given on the following pages and a y facility: environment temperature (22 ± 3)°C a Cal Date (Certificate No.) 29-Mar-12 (No. 217-01508) 29-Mar-12 (No. 217-01508)	are part of the certificate. and humidity < 70%. Scheduled Calibration
The measurements and the unc All calibrations have been cond Calibration Equipment used (MA Primary Standards Power meter E4419B Power sensor E4412A Reference 3 dB Attenuator	ertainties with confidence pr ucted in the closed laborator &TE critical for calibration) ID GB41293874	obability are given on the following pages and a y facility: environment temperature (22 ± 3)°C a Cal Date (Certificate No.) 29-Mar-12 (No. 217-01508)	are part of the certificate. and humidity < 70%. Scheduled Calibration Apr-13 Apr-13
The measurements and the unc All calibrations have been cond Calibration Equipment used (Ma Primary Standards Power sensor E4419B Power sensor E4412A Reference 3 dB Attenuator Reference 3 dB Attenuator	Errainties with confidence pr ucted in the closed laboratory &TE critical for calibration) ID GB41293874 MY41498087 SN: S5054 (3c)	obability are given on the following pages and it         y facility: environment temperature (22 ± 3)°C a         Cal Date (Certificate No.)         29-Mar-12 (No. 217-01508)         29-Mar-12 (No. 217-01508)         27-Mar-12 (No. 217-01531)	are part of the certificate. and humidity < 70%. Scheduled Calibration Apr-13 Apr-13 Apr-13
The measurements and the unconstructions have been condi- Calibration Equipment used (Material Primary Standards Power meter E4419B Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator	ertainties with confidence pr ucted in the closed laboratory &TE critical for calibration) ID GB41293874 MY41498087 SN: S5054 (3c) SN: S5086 (20b)	Obability are given on the following pages and it           y facility: environment temperature (22 ± 3)°C a           Cal Date (Certificate No.)           29-Mar-12 (No. 217-01508)           29-Mar-12 (No. 217-01508)           27-Mar-12 (No. 217-01531)           27-Mar-12 (No. 217-01529)	are part of the certificate. and humidity < 70%. Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13
The measurements and the unc All calibrations have been condi- Calibration Equipment used (Ma Primary Standards Power meter E44198 Power sensor E4412A Reference 3 dB Attenuator Reference 20 dB Attenuator Reference 20 dB Attenuator Reference Probe ES3DV2	ertainties with confidence pr ucted in the closed laboratory &TE critical for calibration) ID GB41293874 MY41498087 SN: \$5054 (3c) SN: \$5056 (20b) SN: \$5129 (30b)	Cal Date (Certificate No.)           29-Mar-12 (No. 217-01508)           27-Mar-12 (No. 217-01508)           27-Mar-12 (No. 217-01529)           27-Mar-12 (No. 217-01522)	are part of the certificate. and humidity < 70%. Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Apr-13
The measurements and the unconstruction of the second construction of the s	Exertainties with confidence pr ucted in the closed laboratory BTE critical for calibration) ID GB41293874 MY41498087 SN: S5054 (3c) SN: S5086 (20b) SN: S5129 (30b) SN: S5129 (30b) SN: 660	Cal Date (Certificate No.)           29-Mar-12 (No. 217-01508)           29-Mar-12 (No. 217-01508)           27-Mar-12 (No. 217-01531)           27-Mar-12 (No. 217-01529)           29-Dec-11 (No. ES3-3013_Dec11)           20-Jun-12 (No. DAE4-660_Jun12)	are part of the certificate. and humidity < 70%. Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jun-13
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#### Calibration Laboratory of Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



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#### Glossary:

Glossary:	
TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\phi$	φ rotation around probe axis
Polarization 9	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

#### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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 affect the E<sup>2</sup>-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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C are numerical linearization parameters assessed based on the data of
  power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the
  maximum calibration range expressed in RMS voltage across the diode.
- 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.

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December 10, 2012

# Probe ET3DV6

# SN:1380

Manufactured: Calibrated: August 16, 1999 December 10, 2012

Calibrated for DASY/EASY Systems (Note: non-compatible with DASY2 system!)

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December 10, 2012

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1380

#### **Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm $(\mu V/(V/m)^2)^A$	1.68	1.60	1.71	± 10.1 %
DCP (mV) <sup>8</sup>	94.6	94.2	95.9	=

#### **Modulation Calibration Parameters**

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	0.00	X	0.0	0.0	1.0	185.0	±3.3 %
			Y	0.0	0.0	1.0	174.8	
			Z	0.0	0.0	1.0	192.3	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).
<sup>B</sup> Numerical linearization parameter: uncertainty not required.
<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value. field value.

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#### December 10, 2012

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1380

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
300	45.3	0.87	8.20	8.20	8.20	0.33	1.69	± 13.4 %
450	43.5	0.87	7.21	7.21	7.21	0.27	2.49	± 13.4 %
900	41.5	0.97	6.09	6.09	6.09	0.40	2.62	± 12.0 %
1640	40.3	1.29	5.42	5.42	5.42	0.76	2.16	± 12.0 %
1810	40.0	1.40	5.11	5.11	5.11	0.80	2.46	± 12.0 %
1950	40.0	1.40	4.87	4.87	4.87	0.80	2.39	± 12.0 %
2450	39.2	1.80	4.50	4.50	4.50	0.80	2.20	± 12.0 %

# Calibration Parameter Determined in Head Tissue Simulating Media

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. <sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters (c and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (c and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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#### December 10, 2012

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1380

f (MHz) <sup>c</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.57	7.57	7.57	0.19	2.46	± 13.4 %
750	55.5	0.96	6.19	6.19	6.19	0.53	2.12	± 12.0 %
900	55.0	1.05	6.00	6.00	6.00	0.38	2.75	± 12.0 %
1810	53.3	1.52	4.70	4.70	4.70	0.80	2.52	± 12.0 %
1950	53.3	1.52	4.69	4.69	4.69	0.80	2.30	± 12.0 %
2450	52.7	1.95	4.12	4.12	4.12	0.60	2.20	± 12.0 %

# Calibration Parameter Determined in Body Tissue Simulating Media

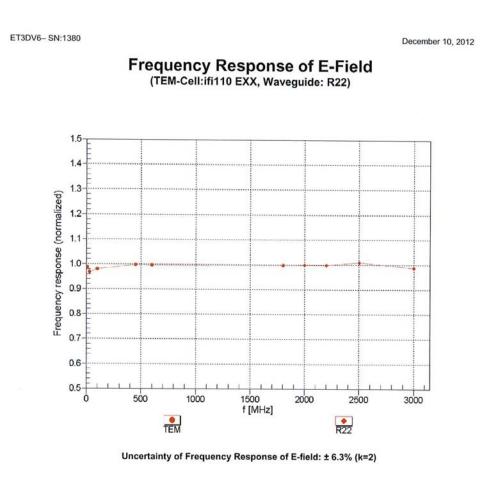
<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. <sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters (t and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (t and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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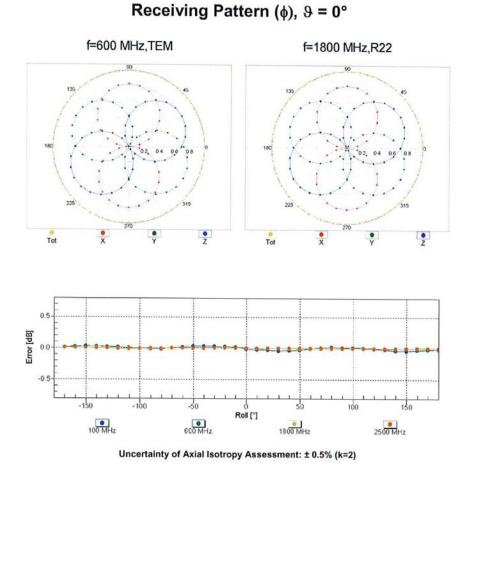
Certificate No: ET3-1380\_Dec12

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December 10, 2012



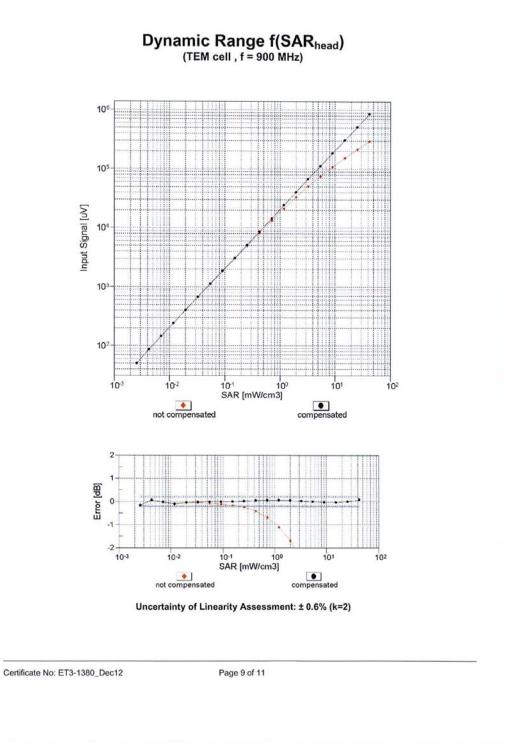
Certificate No: ET3-1380\_Dec12

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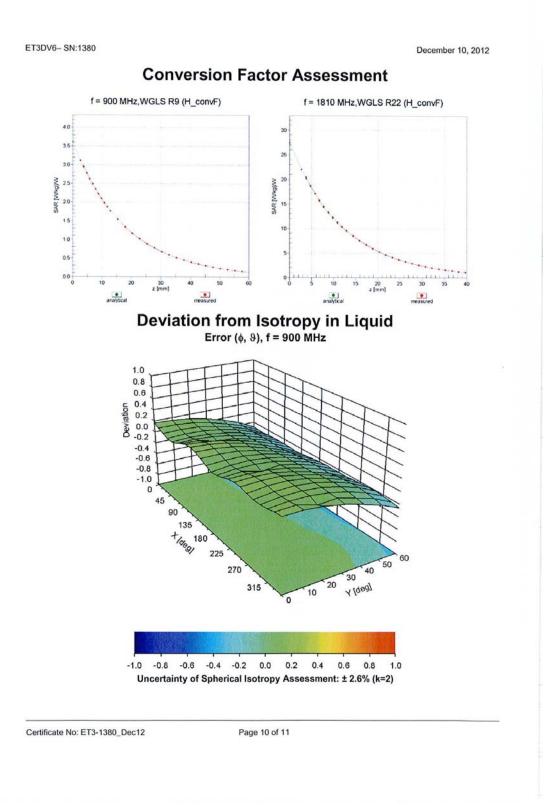
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December 10, 2012

# DASY/EASY - Parameters of Probe: ET3DV6 - SN:1380

#### **Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-20.4
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

Certificate No: ET3-1380\_Dec12

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Client EMC Technolog			to: D900V2-047_Jun12
CALIBRATION C	ERTIFICATE		
Object	D900V2 - SN: 04	timis Med Sta	, 1948 , (g. 1945)
Calibration procedure(s)	QA CAL-05.v8 Calibration proce	dure for dipole validation kits at	oove 700 MHz
			그는 사람은 것에 봐.
Calibration date:	June 22, 2012		「学校で、「美いすいです
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The measurements and the unce All calibrations have been conduct Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination	Artainties with confidence p cted in the closed laborator TE critical for calibration) ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.2 / 06327	Cal Date (Certificate No.)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Mar-12 (No. 217-01530)           27-Mar-12 (No. 217-01533)	and are part of the certificate. )°C and humidity < 70%. Scheduled Calibration Oct-12 Oct-12 Apr-13 Apr-13 Dec-12
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M&1 Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards	Artainties with confidence p cted in the closed laborator TE critical for calibration) ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5058 (20k) SN: 5047.2 / 06327 SN: 3205 SN: 901 ID #	Cal Date (Certificate No.)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           27-Mar-12 (No. 217-01530)           27-Mar-12 (No. 217-01533)           30-Dec-11 (No. ES3-3205_Dec11)           05-Jul-11 (No. DAE4-901_Jul11)           Check Date (in house)	and are part of the certificate. y°C and humidity < 70%. Scheduled Calibration Oct-12 Oct-12 Apr-13 Apr-13 Dec-12 Jul-12 Scheduled Check
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A	Artainties with confidence p cted in the closed laborator TE critical for calibration) ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5058 (20k) SN: 5058 (20k) SN: 5057.2 / 06327 SN: 3205 SN: 901 ID # MY41092317	Cal Date (Certificate No.)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           27-Mar-12 (No. 217-01530)           27-Mar-12 (No. 217-01533)           30-Dec-11 (No. ES3-3205_Dec11)           05-Jul-11 (No. DAE4-901_Jul11)           Check Date (in house)           18-Oct-02 (in house check Oct-11)	and are part of the certificate. y°C and humidity < 70%. Scheduled Calibration Oct-12 Oct-12 Apr-13 Apr-13 Dec-12 Jul-12 Scheduled Check In house check: Oct-13
The measurements and the unce All calibrations have been conduct Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06	Artainties with confidence p cted in the closed laborator TE critical for calibration) ID # GB37480704 US37292783 SN: 5058 (20k) SN: 50	Cal Date (Certificate No.)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           27-Mar-12 (No. 217-01530)           27-Mar-12 (No. 217-01533)           30-Dec-11 (No. ES3-3205_Dec11)           05-Jul-11 (No. DAE4-901_Jul11)           Check Date (in house)           18-Oct-02 (in house check Oct-11)           04-Aug-99 (in house check Oct-11)	and are part of the certificate. )°C and humidity < 70%. Scheduled Calibration Oct-12 Oct-12 Oct-12 Apr-13 Apr-13 Dec-12 Jul-12 Scheduled Check In house check: Oct-13 In house check: Oct-13
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A	Artainties with confidence p cted in the closed laborator TE critical for calibration) ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5058 (20k) SN: 5058 (20k) SN: 5057.2 / 06327 SN: 3205 SN: 901 ID # MY41092317	Cal Date (Certificate No.)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           27-Mar-12 (No. 217-01530)           27-Mar-12 (No. 217-01533)           30-Dec-11 (No. ES3-3205_Dec11)           05-Jul-11 (No. DAE4-901_Jul11)           Check Date (in house)           18-Oct-02 (in house check Oct-11)	and are part of the certificate. y°C and humidity < 70%. Scheduled Calibration Oct-12 Oct-12 Apr-13 Apr-13 Dec-12 Jul-12 Scheduled Check In house check: Oct-13
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M&1 Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E	artainties with confidence p           cted in the closed laborator           TE critical for calibration)           ID #           GB37480704           US37292783           SN: 5058 (20k)           SN: 5058 (20k)           SN: 3005           SN: 901           ID #           MY41092317           100005           US37390585 S4206	Cal Date (Certificate No.)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           27-Mar-12 (No. 217-01530)           27-Mar-12 (No. 217-01533)           30-Dec-11 (No. DAE4-901_Jul11)           Check Date (in house)           18-Oct-02 (in house check Oct-11)           04-Aug-99 (in house check Oct-11)           18-Oct-01 (in house check Oct-11)           Function	and are part of the certificate. )°C and humidity < 70%. Scheduled Calibration Oct-12 Oct-12 Oct-12 Apr-13 Apr-13 Dec-12 Jul-12 Scheduled Check In house check: Oct-13 In house check: Oct-13
The measurements and the unce All calibrations have been conduct Calibration Equipment used (M&T Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06	artainties with confidence p           cted in the closed laborator           TE critical for calibration)           ID #           GB37480704           US37292783           SN: 5058 (20k)           SN: 50547.2 / 06327           SN: 3205           SN: 901           ID #           MY41092317           100005           US37390585 \$4206	Cal Date (Certificate No.)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01530)           27-Mar-12 (No. 217-01533)           30-Dec-11 (No. ES3-3205_Dec11)           05-Jul-11 (No. DAE4-901_Jul11)           Check Date (in house check Oct-11)           04-Aug-99 (in house check Oct-11)           18-Oct-01 (in house check Oct-11)	and are part of the certificate. 9°C and humidity < 70%. Scheduled Calibration Oct-12 Oct-12 Apr-13 Apr-13 Dec-12 Jul-12 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-12
The measurements and the unce All calibrations have been conduc Calibration Equipment used (M&1 Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E	artainties with confidence p           cted in the closed laborator           TE critical for calibration)           ID #           GB37480704           US37292783           SN: 5058 (20k)           SN: 5058 (20k)           SN: 3005           SN: 901           ID #           MY41092317           100005           US37390585 S4206	Cal Date (Certificate No.)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           05-Oct-11 (No. 217-01451)           27-Mar-12 (No. 217-01530)           27-Mar-12 (No. 217-01533)           30-Dec-11 (No. DAE4-901_Jul11)           Check Date (in house)           18-Oct-02 (in house check Oct-11)           04-Aug-99 (in house check Oct-11)           18-Oct-01 (in house check Oct-11)           Function	and are part of the certificate. 9°C and humidity < 70%. Scheduled Calibration Oct-12 Oct-12 Apr-13 Apr-13 Dec-12 Jul-12 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-12



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