NanoScale 2010

9th Seminar on
Quantitative Microscopy (QM)
and
5th Seminar on
Nanoscale Calibration Standards and Methods

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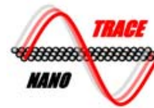
Workshops of European projects

- Thin films
- SPM, SEM and CD



- Interferometry at picometre scale

Location

Hotel International Brno
Czech Republic

Oct 27th - 29th, 2010

Organized and supported by

NanoScale 2010
Workshop NANOTRACE and
Co-Nanomet workshops SPM and CD and Thin Films

Oct. 26th 2010

17:30 – 18:30	**Guided tour of Brno's historical centre.**
19:00 – 20:00	**Registration desk opened**

Oct. 27th, 2010

08:00		**Registration**
09:00		**Welcome by CMI**
		1st Session
09:10	**1.1**	Tactile 3-D microprobe system with exchangeable styli F. G. Balzer, T. Hausotte, N. Dorozhovets, E. Manske, G. Jäger TU-Ilmenau, Ilmenau, Germany
09:30	**1.2**	Recent advances in the development of the LNE metrological atomic force microscope Benoit Poyet (1,2), Sébastien Ducourtieux (1) 1) Laboratoire National de Métrologie et d'Essais, 29 Avenue Roger Hennequin, 78190 Trappes 2) Laboratoire d'Ingénierie des Systèmes de Versailles, 45 avenue des Etats-Unis, 78000 Versailles
09:50	**1.3**	Aztec- a novel 3D calibration artefact for high precision coordinate measuring machines S. Bütefisch, H.-U. Danzebrink, T. Weimann, J. Flügge, L. Koenders Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
10:10	**Coffee**	**POSTER**
		2nd Session
10:50	**2.1**	Measurement of deep groove structures using a long tip height cantilever in a large range metrological atomic force microscope S H Wang (1), S L Tan (1), G Xu (1) and K Koyama (2) 1) National Metrology Centre, Agency for Science, Technology and Research, Singapore 2) Namiki Precision Jewel Co., Ltd., Tokyo, Japan
11:10	**2.2**	Characterization of a traceable profiler instrument for areal roughness measurement P. Thomsen-Schmidt, R. Krüger-Sehm Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
11:30	**2.3**	Fully minaturized long-range interferometric displacement sensing attocube systems A.G, München, Germany
11:50	**Lunch**	
13:00 – 14:00		**POSTERSESSION 1**

3rd session - Workshop NANOTRACE

14:00	3.1	**Fabry-Perot Displacement Metrology using Fiber Lasers** **John R. Lawall, National Institute of Standards and Technology, Gaithersburg, USA**
14:30	**3.2**	The Nanotrace Project “New traceability routes for nanometrology” M. Pisani et al. INRiM(IT), BEV(A), CMI(CZ), NPL(UK), MIKES(FI), PTB(D), UME(TK)
14:50	**3.3**	In situ determination of the interferometer dead path at the level of a few micrometers Christoph Weichert, Paul Köchert, Rainer Köning, Jens Flügge Physikalisch Technische Bundesanstalt (PTB), Braunschweig, Germany
15:10	**3.4**	Sub-nanometer Displacement Measurements using Laser Beat Frequency Technique Mehmet Celik, Ramiz Hamid, Cengiz Birlikseven, Ersoy Sahin, Levent Yagmur TÜBİTAK, Gebze-Kocaeli, Turkey
15:30	**Coffee**	**POSTER**
16:00	**3.5**	Measurement for Free Spectral Range of Fabry-Perot Cavity using Frequency Modulation and Null Method under Off-resonance Condition Masato Aketagawa*, Takuya Yashiki, Shohei Kimura, Hiroshi Iwata and Tuan Quoc Banh Nagaoka University of Technology, Kamiomioka, Nagaoka, 940-2188 JAPAN
16:20	**3.6**	Compact FPGA based multi-axial interferometer for simultaneous tilt and distance measurements in the sub-nanometre range Sebastian Strube, Gabor Molnar, Hans-Ulrich Danzebrink Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
16:40	**3.7**	Two wavelength homodyne interferometer residual mutual nonlinearity Petr Křen Czech Metrology Institute
17:00	**3.8**	A method for linearization of laser interferometer down to picometre level with a capacitive sensor J. Seppä, V. Korpelainen, M. Merimaa, A. Lassila Centre for metrology and accreditation (MIKES), P.O. Box 9, FI-02151 Espoo, Finland
17:20		**NANOTRACE Summary**

Workshop Co- Nanomet

18:00	4.1	**Strategy for European national (nano)metrology in 2020** **Leslie Pendrill, Chair, EURAMET e. V.**
19:00		**Come together**
19:30		**Concert**
20:00		**Banquet**

Oct. 28 th, 2010

Workshop Co- Nanomet

4th Session – SPM and CD

Time	No.	Presentation
09:00	4.2	**Recent development in nanometer-scale dimensional metrology at NMIJ** **Satoshi Gonda, Kentaro Sugawara and Ichiko Misumi** **National Metrology Institute of Japan (NMIJ), National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba Central 3, Umezono 1-1-1, Tsukuba 305-8563, Japan**
09:30	4.3	Scatterometer for dimensional characterisation of nanostructures: system modifications and test measurements M. Wurm, S. Bonifer, B. Bodermann Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
09:50 – 10:20	Coffee	**POSTER**
10:20	4.4	Linewidth measurement using a commercial atomic force microscope Richard G. Green, Brian J. Eves National Research Council of Canada – Institute for National Measurement Standards Ottawa, Ontario, Canada K1A 0R6
10:40	4.5	Calibration of particle diameter by correlation of height and packing distance Jørgen Garnaes and Kai Dirscherl, Danish Fundamental Metrology, Matematiktorvet 307, DK-2800 Lyngby, Denmark
11:00	4.6	Large sample 3D metrology AFM with differential Jamin type interferometers Felix Meli and Alain Küng Swiss Federal Office of Metrology, METAS Lindenweg 50, CH-3003 Bern-Wabern, Switzerland
11:20	4.7	A novel 3D-AFM using combined vertical and torsional oscillation mode for true 3D measurements of nano structures G. Dai, W. Häßler-Grohne, D. Hüser, H. Wolff, H. U. Danzebrink, L. Koenders, H. Bosse Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
11:40	4.8	Modelling and Simulating the Scanning Force Microscope to assess measurement uncertainty M. Xu, T. Dziomba, L. Koenders Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
12:00		Discussion
12:30	Lunch	**POSTER**
13:30 - 14:30		**Co-Nanomet Stakeholder Meeting** — **POSTERSESSION 2**

5th session - Thin films

14:30	5.1	**Atomic and chemical resolution of surfaces using AFM/STM** **P. Jelínek** **Institute of Physics, Academy of Sciences of the Czech Republic, Prague, Czech Rebublic**
15:00	5.2	Nanolayer Characterisation, Elemental Depth Profiling and Con-tamination Analysis by Reference-Free X-Ray Spectrometry Burkhard Beckhoff, Philipp Hönicke, Michael Kolbe, Matthias Müller, Beatrix Pollakowski, Falk Reinhardt, Rainer Unterumsberger, Jan Weser Physikalisch Technische Bundesanstalt (PTB), Berlin, Germany
15:20	5.3	Quantitative Characterization of Dielectric and Electronic Properties on the Nanometer Scale M. Fenner *(1), F. Kienberger (1), H. Tanabakuchi (1), H.-P. Huber (2), M. Hochleitner (2), 1) Agilent Technologies Inc., Kronberg, Germany 2) Christian-Doppler-Laboratory for Nanoscopic Methods in Biophysics, Johannes Kepler University Linz, Austria
15:40	Coffee	**POSTER**
16:10	5.4	Interlaboratory Comparision and Evaluation of Analytical Tech-niques for Nano- and Microelectronics A. Nutsch (1), B. Beckhoff (2), M. Kolbe(2), J. A. Van Den Berg (3), L. Pfitzner(1) 1) Fraunhofer Institute Integrated Systems and Device Technology 2) Physikalisch Technische Bundesanstalt, Berlin, Germany 3) University of Salford, Institute for Materials Research, Salford, United Kingdom
16:30	5.5	Synchrotron radiation based X-ray techniques for dimensional nanometrology Michael Krumrey Physikalisch-Technische Bundesanstalt (PTB), Berlin, Germany
16:50	5.6	Traceable measurement of nanoparticle size using an SEM in transmission mode (TSEM) T. Klein, E. Buhr, C. G. Frase and K.-P. Johnsen Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
17:10	5.7	Traceable measurements of small forces and local mechanical properties Anna Campbellová, Miroslav Valtr, Petr Klapetek Department of Nanometrology, Czech Metrology Institute, Brno, Czech Republic
17:30 - 18:00		Discussion
18:00		**Transfer by bus**
19:00		**Workshop Dinner**
22:30		**Transfer back to Brno**

Oct. 29 th, .2010

6th session - SPM and CD

08:30 **6.1**

Dynamic force microscopy probing in 3D complementing fast scanning electron microscopy targeting at high resolution CD measurements

W. Häßler-Grohne, D. Hüser, K.-P. Johnsen, C. G. Frase, H. Bosse
Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany

08:50 **6.2**

Design of a mechanism for sample approach and alignment of a metrological atomic force microscope

J. Piot (1), J. Qian (1), H. Pirée (2), G. Kotte (2), J. Petry (2), J.-P. Kruth (1), C. Van Haesendonck (3), D. Reynaerts (1)
1) KULeuven, Department of Mechanical Engineering, Belgium
2) FPS Economy, SMEs, Self Employed & Energy, Scientific Metrology - SMD, Belgium
3) KULeuven, Laboratory of Solid-State Physics and Magnetism, Belgium

09:10 **6.3**

Study of the sensitivity and the thermomechanical noise in cantilever arrays with thermal actuation and piezoresistive readout

G. Jóźwiak 1, D. Kopiec (1), P. Zawierucha (1), T. Gotszalk (1), Y. Sarov (2), T. Ivanow (2), I. W. Rangelow (2)
1) Faculty of Microsystems Electronics and Photonics, Wrocław University of Technology, Wroclaw,
2) Institute of Micro- and Nanoelectronics, Technical University Ilmenau, Ilmenau, Germany

09:30 **6.4**

Force mapping and elasticity evaluation using the Brownian Motion of an AFM tip

G. Malegori, G. Ferrini
Dipartimento di Matematica e Fisica, Università Cattolica, Brescia, Italy

09:50 **6.5**

A Comparative study of Line Scale measurement using Laser Interferometer and optical profilometry using wavelet transform

K P Chaudhary,Girija Moona & Rina Sharma
National Physical laboratory, New Delhi, India

10:10 **Coffee**

7th session – SPM & Thin Flms

10:40 **7.1**

Radial motion error measurement of precise spindle with sub-nanometer uncertainty using two-dimensional atom encoder

Patamaporn Chaikool (1), Masato Aketagawa * (1), Eiki Okuyama (2), Jaratsri Soeatuptim (1), Nusorn Nimnual (1)
1) Department of Mechanical Engineering, Nagaoka University of Technology; Kamitomioka, Nagaoka, Niigata, 940-2188 JAPAN
2) Department of Mechanical Engineering, Akita University,Tegata-gakuen-machi, Akita, 010-8502 JAPAN

11:00 **7.2**

Reference Material for TEM calibration

Gavrilenko V.P. (1), Filippov M.N. (2), Kovalchuk M.V. (3), Mityukhlyaev V.B. (1), Ozerin Yu.V. (4), Rakov A.V.(1), Roddatis V.V. (3), Todua P.A. (1), Vasiliev A.L. (3)
1) Center for Surface and Vacuum Research, Moscow;
2) Kurnakov Institute of General and Inorganic Chemistry, Moscow,
3) Russian Research Center "Kurchatov Institute", Moscow,
4) Mikron Corporation, Zelenograd-Moscow

11:20 **7.3**

Roundness deviations of spherical reference nanoparticles measured with an AFM and SEM

Kai Dirscherl, Danish Fundamental Metrology, Lyngby, Denmark

11:40 **7.4**

Graphene – a challenge for dimensional nanometrology

T. Dziomba*, H. –U. Danzebrink, M. Friedemann, M. Woszczyna,
P. Hinze, T. Weimann, F.-J. Ahlers
Physikalisch-Technische Bundesanstalt, Braunschweig, Germany

12:00 Discussion

12:20 Final remarks and closing

12:30 **Lunch**

13:30 – 16:30 **Tour to CMI and other very interesting facilities**