

# PROGRAMME

Address: Technopolis Ruoholahti, Hiilikatu 3, 00180 Helsinki, Finland

Finnish time is EEST (East-European Summer Time), i. e. 1 hour ahead of Central Europe and 2 hours ahead of Britain!

Tuesday, 2023-10-10

Check-In		
11:00		<b>Check-In opens</b> handout of Booklet of Abstracts and name badges, poster boards are ready <i>Note for participants of TracOptic M27 and EURAMET TC-L: Participants of these side meetings will have an early lunch in Espoo directly after the closure their meetings and then be brought to NanoScale by a chartered bus.</i>
11:00		<b>Coffee &amp; Cookies</b> <i>Please note: <b>No lunch</b> provided by NanoScale on Tuesday! We recommend to have lunch in town, on the way to NanoScale or in the restaurant of Technopolis before checking in at NanoScale.</i>
Welcome		
13:00		<b>Welcome</b> by Martti Heinonen, Vice-President, VTT MIKES
13:10		<b>Opening remarks</b> by Virpi Korpelainen, Thorsten Dziomba
1 <sup>st</sup> Session – Crystalline calibration standards		
Chaired by Alexandra Delvallee		
13:15	A-1 p. 13	<b>New ways to calibrate microscopes at nanoscale: How the Silicon lattice parameter is used for new type calibration artefacts</b> I. Busch*, L. Daul, L. Bergemann, J. Ostermann, M. Fernandez Scarioni, Z. Wang Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
13:35	A-2 p. 15	<b>Step height measurement of monoatomic silicon crystal lattice steps with a commercial Atomic Force Microscope</b> M. A. Lawn*, Z. Bolton, L. Murphy, Y. Oh, S. Gartner, V. A. Coleman National Measurement Institute Australia (NMIA), Lindfield, NSW, Australia
13:55	A-3 p. 17	<b>New UHV facility for series production of low-cost crystalline standards</b> L. Daul*, I. Busch, J. Ostermann, M. Fernandez-Scarioni, F. Weiser Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
14:15	A-4 p. 19	<b>Evaluation of the influence of magnification variation on the silicon lattice spacing measurement in high-resolution transmission electron microscope</b> Fang Wang, Yushu Shi* National Institute of Metrology (NIM), Chaoyang District, Beijing, China
14:35		<b>Coffee and sweet pastry in Valopiha</b>
15:00	P	<b>First Poster Session</b> <i>Please have your posters ready on the poster boards</i>

## 2<sup>nd</sup> Session – MetExSPM Session I

Chaired by Antti Lassila

<b>16:40</b>	<b>B-1</b> p. 25	<p><b>MetExSPM (EMPIR-project 20IND08): Development of traceable methods for high speed and large range SPM</b></p> <p>1) Virpi Korpelainen*, Bruno Sauvet                  2) Gaoliang Dai, Jan Thiesler, Bernd Kaestner                  3) Petr Klapetek                  4) Dariusz Czudek, Piotr Sosinowski                  5) Teodor Gotszalk, Dominik Badura                  6) Ivo Rangelow, Hans-Georg Pietscher                  7) Weichang Xie                  8) Rudolf Krüger</p> <p>1) VTT MIKES, Tekniikantie 1, Espoo, Finland                  2) Physikalisch-Technische Bundesanstalt, Braunschweig and Berlin, Germany                  3) Czech Metrology Institute (CMI), Brno, Czechia                  4) Central Office of Measures, Warsaw, Poland                  5) Wrocław University of Science &amp; Technology, Wrocław, Poland                  6) Nano analytik GmbH, Ilmenau, Germany                  7) Carl Zeiss SMT GmbH, Oberkochen, Germany                  8) Physik Instrumente (PI) GmbH &amp; Co. KG, Karlsruhe, Germany</p>
<b>17:00</b>	<b>B-2</b> p. 27	<p><b>Application of active piezoresistive cantilevers in high-eigenmode surface imaging</b></p> <p>1) Teodor Gotszalk*, Dominik Badura, Bartosz Pruchnik, Wiktor Połacik, Władysław Kopczyński                  2) Andrew Yacoot;      3) Ivo W. Rangelow;      4) Virpi Korpelainen</p> <p>1) Wrocław University of Science and Technology, Wrocław, Poland                  2) National Physical Laboratory, Teddington, Middlesex, United Kingdom                  3) Nano Analytik GmbH, Ilmenau, Germany                  4) National Metrology Institute VTT MIKES, Espoo, Finland</p>
<b>17:20</b>	<b>B-3</b> p. 29	<p><b>A high speed large-range SPM scanner based on a hybrid combination of a magnetic levitation stage and piezo scanners</b></p> <p>1) J. Thiesler*, G. Dai                  2) R. Krueger, R. Gloess, M. Mohr, F. Moehler, H. Marth</p> <p>1) Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany                  2) Physik Instrumente (PI) GmbH &amp; Co. KG, Karlsruhe, Germany</p>
<b>17:40</b>	<b>B-4</b> p. 31	<p><b>Data processing in metrological high-speed Scanning Probe Microscopes</b></p> <p>1) P. Klapetek*, P. Grolich, M. Valtr;      2) D. Nečas;      3) A. Yacoot, E. Heaps</p> <p>1) Czech Metrology Institute, Brno, Czech Republic                  2) CEITEC BUT, Brno, Czech Republic                  3) National Physical Laboratory, Teddington, Middlesex, United Kingdom</p>
<b>18:00</b>		<b>End of the session</b>
<b>18:15</b>		<p><b>Welcome Reception in Valopiha</b></p> <p><i>Drinks and snacks. Your name badge is your ticket. A limited number of drinks is included for all participants, further drinks can be bought.</i></p>

Wednesday, 2023-10-11

08:30		Check-in, coffee and cookies
<b>3<sup>rd</sup> Session – AI methods for nanometrology</b> Chaired by Petr Klapetek		
09:00	C-1 p. 33	<b>Deep-learning based thickness and refractive index measurement of a thin-film layer</b> 1), 2) J. Jin; 2) J. Lee 1) Korea Research Institute of Standards and Science (KRISS), 267 Gajeong-ro, Yuseong-gu, Daejeon, 34113, Republic of Korea 2) University of Science and Technology (UST), 217 Gajeong-ro, Yuseong-gu, Daejeon, 34113, Republic of Korea
09:20	C-2 p. 35	<b>Accuracy aspects of focused ion beam tomography data reconstruction</b> 1) Trushal Sardhara                      2) Alexander Shkurmanov 3) Roland Aydin                              4) Christian Cyron                      5) Martin Ritter*  1) and 4) Institute for Continuum and Material Mechanics, Hamburg University of Technology, Hamburg, Germany 2) and 5) Electron Microscopy Unit, Hamburg University of Technology, Hamburg, Germany 3) and 4) Institute of Material Systems Modeling, Helmholtz-Zentrum Hereon, Geesthacht, Germany
09:40	C-3 p. 37	<b>AFM calibration at the nanoscale using DNA origami pitch standards and artificial-intelligence-based data refinement</b> 1) Ziba Akbarian*, Tim J. Seifert, Uta Schlickum 2) Ingo Busch, Harald Bosse; 3) Ziba Akbarian, Birka Lalkens, Uta Schlickum  1) Institute of Applied Physics, Technische Universität Braunschweig, Germany 2) Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany 3) Laboratory for Emerging Nanometrology LENA, TU Braunschweig, Germany
10:00	C-4 p. 39	<b>Artificial Neural Network-Assisted Spectral Scatterometry for Grating Quality Control</b> 1) A. Mattila*, J. Nysten, V. Heikkinen, V. Korpelainen, J. Kilpi, A. Lassila 2) P.-E. Hansen;                              3) P. Karvinen, M. Kuittinen 1) VTT MIKES Metrology, Tekniikantie 1, 02150 Espoo, Finland 2) DFM Danish Metrology Institute, Kogle Allé 5, 2970 Hørsholm, Denmark 3) University of Eastern Finland, Yliopistokatu 2, 80100 Joensuu, Finland
10:20		<b>Coffee &amp; Cookies in Valopiha</b> – please also take a look at the posters during the coffee breaks

## 4<sup>th</sup> Session – TracOptic Session

Open and free TracOptic Stakeholder Meeting (hybrid) – Chaired by Uwe Brand

10:50	D-1 p. 43	<b>The TracOptic-Project – An Overview</b> Ulrich Neuschaefer-Rube*, Sai Gao, Uwe Brand on behalf of all project partners Physikalisch-Technische Bundesanstalt, Braunschweig, Germany * Corresponding author: Ulrich Neuschaefer-Rube (PTB) Project Coordinator: Uwe Brand (PTB)
11:00	D-2 p. 45	<b>Exemplary instrument characterization</b> Ville Heikkinen*, Antti Lassila on behalf of all partners active in TracOptic WP1 VTT MIKES Metrology, Espoo, Finland * Work Package leader TracOptic WP1: Ville Heikkinen (VTT MIKES)
11:20	D-3 p. 47	<b>Systematic performance deviations of optical surface topography measuring instruments</b> Sai Gao* on behalf of all partners active in TracOptic WP2 Physikalisch-Technische Bundesanstalt, Braunschweig, Germany * corresponding author: Sai Gao (PTB) Work Package leaders TracOptic WP2: Lauryna Siaudinyte, Richard Koops (VSL)
11:40	D-4 p. 49	<b>Scattering methods for modelling optical surface topography measurement instruments</b> Helia Hooshmand <sup>1*</sup> , Tobias Pahl <sup>2</sup> , Poul-Erik Hansen <sup>3</sup> , Liwei Fu <sup>4</sup> , Peter J. de Groot <sup>5</sup> , Peter Lehmann <sup>2</sup> , Athanasios Pappas <sup>1</sup> , Alexander Brik <sup>4</sup> , Richard Leach <sup>1</sup> and Samanta Piano <sup>1</sup>  1) University of Nottingham, Nottingham NG8 1BB, UK 2) Measurement Technology Group, University of Kassel, Kassel, Germany 3) Danish Fundamental Metrology, Hoersholm, Denmark 4) Institute of Applied Optics, University of Stuttgart Stuttgart, Germany 5) Zygo Corporation, Middlefield, CT 06455, USA  * corresponding author: Helia Hooshmand (Nottingham) Work Package leader TracOptic WP3: Samanta Piano (Nottingham)
12:00	D-5 p. 53	<b>Selection of appropriate instrumentation and procedures for data evaluation and uncertainty estimation</b> M. Zucco* and all partners active in TracOptic WP4 Istituto Nazionale di Ricerca Metrologica, Torino, Italy * Work Package leader TracOptic WP4: Massimo Zucco (INRiM)
12:20		<b>Lunch Buffet in restaurant next building</b> <i>included for all NanoScale participants.</i> <i>Your name badge is your ticket.</i>

## Overview presentation

Chaired by Marco Pisani

13:20	E-0 p. 57	<b>European Metrology Network (EMN) for Advanced Manufacturing — Focus on nanometrology</b> 1) Harald Bosse*, Anita Przyklenk 2) Daniel O'Connor, Fernando A. Castro 3) Alessandro Balsamo 4) Georges Favre 5) Alexander Evans  1) Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany 2) National Physical Laboratory (NPL), Teddington, United Kingdom 3) Istituto Nazionale di Ricerca Metrologica (INRIM), Torino, Italy 4) Laboratoire national de métrologie et d'essais (LNE), Paris, France 5) Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
<b>5<sup>th</sup> Session – Simulation and modelling</b> Chaired by Bakir Babic		
13:50	E-1 p. 61	<b>Simulative prediction of work-piece influences on chromatic confocal distance measurements</b> 1) D. Linnert*, U. Neuschaefer-Rube 2) M. Stavridis 3) R. Tutsch  1) Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany 2) Physikalisch-Technische Bundesanstalt (PTB), Berlin, Germany 3) Institut für Produktionsmesstechnik, TU Braunschweig, Germany
14:10	E-2 p. 65	<b>Modelling the measurement process for the radius and roundness measurement of micro spheres</b> E. Oertel* and E. Manske Technische Universität Ilmenau, Fakultät Maschinenbau, Institut für Prozessmess- und Sensortechnik, PF 100565, 98684 Ilmenau
14:30	E-3 p. 69	<b>Validation of data evaluation algorithm for the calibration of 3D standards using an AFM simulator</b> 1) Min Xu*, Gaoliang Dai 2) Matthias Hemmleb  1) Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany 2) Point electronic GmbH, 06120 Halle (Saale), Germany
14:50		<b>Coffee &amp; sweet pastry in Valopiha</b>
15:10	P	<b>Second Poster Session B</b> <i>Please keep your posters at the boards until the end of the conference.</i>

## 6<sup>th</sup> Session – SPM methods

Chaired by Teodor Gotszalk

17:00	<b>F-1</b> p. 73	<b>A robust, high-throughput scanning microwave microscope</b> B. Eckmann, S. de Préville*, J. Hoffmann, M. Zeier Federal Institute of Metrology METAS, Bern-Wabern, Switzerland
17:20	<b>F-2</b> p. 77	<b>Calibrating Resistance Measurements in Conductive Probe Atomic Force Microscopy: development of the first universal standard sample</b> 1) F. Piquemal*, K. Kaja, J. Morán - Meza 2) K. Kaja 3) P. Chrétien, F. Houzé 4) P. Chrétien, F. Houzé 5) C. Ulysse and A. Harouri  1) Laboratoire national de métrologie et d'essais - LNE, Trappes, France 2) Present address: Oxford Instruments Asylum Research, Les Ulis, France 3) Université Paris-Saclay, CentraleSupélec, CNRS, Laboratoire de Génie Électrique et Électronique de Paris, 91192, Gif-sur-Yvette, France 4) Sorbonne Université, CNRS, Laboratoire de Génie Électrique et Électronique de Paris, 75250, Paris, France 5) Centre de Nanosciences et de Nanotechnologies - C2N, Université Paris-Saclay, CNRS, UMR 9001, Palaiseau, 91120, France
17:40	<b>F-3</b> p. 79	<b>Immersive visualisation for metrological Scanning Probe Microscopy data sets</b> Bakir Babic*, Victoria A. Coleman, Jan Herrmann National Measurement Institute Australia (NMIA), Lindfield, NSW, Australia
18:00	<b>P-62</b> p. 243 <i>now as talk</i>  <i>F-4 now as poster P-62</i>	<b>A numerical environment for evaluating the robustness of Short Open Load calibration for capacitance measurements in Scanning Microwave Microscopy</b> 1) D. Richert, K. Kaja, J. A. Morán, F. Piquemal* 2) K. Kaja 3),4) B. Gautier, D. Deleruyelle  1) Laboratoire National de Métrologie et d'essais (LNE), Trappes, France 2) Oxford Instruments Asylum Research, 91940, Les Ulis, France 3) Institut National Sciences Appliquées de Lyon (INSA), Villeurbanne, France 4) Institut des Nanotechnologies de Lyon (INL), Villeurbanne, France
18:20		<b>End of the session</b>
19:00		<b>Conference Dinner in the restaurant next building</b> <i>included for all NanoScale participants who have registered for this dinner. Your name badge is your ticket again. A limited number of alcoholic drinks is included, further drinks can be bought.</i>
21:00		<b>End of Dinner</b>

Thursday, 2023-10-12

08:30		Check-In, coffee and cookies
<b>7<sup>th</sup> Session – MetExSPM Session II</b> Chaired by Andrew Yacoot		
09:00	G-1 p. 87	<p><b>Application of nanometrology to improve nanopositioning stages with applications in High-Speed AFM</b></p> <p>1) Edward Heaps*, Andrew Yacoot, Alistair Forbes 2) Graham Bartlett, John Clarke, Jayesh Patel, Sam Frost, Simon Levy, Alison Raby, Craig Goodman</p> <p>1) National Physical Laboratory, Hampton Road, Teddington, TW11 0LW, UK 2) Queensgate (Prior Scientific Instruments Ltd.), Fulbourn, Cambridge, UK</p>
09:20	G-2 p. 91	<p><b>Progress on traceable surface and nanometrology: 2nd nanomeasuring and nanopositioning machine (NMM) at PTB</b></p> <p>Gaoliang Dai*, Frank Pohlenz, Helmut Wolff, Min Xu, Uwe Brand, Jens Flügge Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany</p>
09:40	G-3 p. 95	<p><b>Surface measurements using Omega type active piezoresistive SPM cantilevers</b></p> <p>1) Hans-Georg Pietscher, Aditya Suryadi Tan, Fabian Dietrich, Robert Reichert 2) Bartosz Pruchnik, Dominik Badura, Teodor Gotszalk* 3) Thomas Sattel 4) Virpi Korpelainen 5) Andrew Yacoot 6) Jaqueline Staufenberg , Thomas Froehlich, Eberhard Manske, Ivo Rangelow</p> <p>1) Nano Analytik GmbH, Ehrenbergstraße 3, 98693 Ilmenau, Germany 2) Wroclaw University of Science and Technology, Wroclaw, Poland 3) Department of Mechatronics, Ilmenau University of Technology, Germany 4) National Metrology Institute VTT MIKES, Espoo, Finland. 5) National Physical Laboratory, Teddington, Middlesex, United Kingdom 6) Inst. of Process Measurement &amp; Sensor Technology, TU Ilmenau, Germany</p>
10.00		<p><b>Coffee &amp; Cookies in Valopiha</b> – please also take a look at the posters during the coffee breaks</p>

## 8<sup>th</sup> Session – SEM and interferometry

Chaired by Christian Kottler

10:30	H-1 p. 99	<b>Refined image analysis and simulation allowing traceable size measurement of nanoparticles over a wide size range using SEM in transmission mode</b> T. Klein, D. Hüser, D. Bergmann, E. Buhr Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
10:50	H-2 p.103	<b>New demodulation method without low-pass filters for sinusoidal phase modulation interferometer</b> Masato Aketagawa*, Masato Higuchi, Katsumoto Katagiri and Taku Sato Department of Mechanical Engineering, Nagaoka University of Technology Kamitomioka 1603-1, Nagaoka, Niigata, 940-2188 Japan
11:10	H-3 p.107	<b>Interferometers at the nanoscale for space applications</b> M. Pisani, M. Zucco Istituto Nazionale di Ricerca Metrologica (INRIM), Torino, Italy
11:30		<b>Discussion – NanoScale Closing remarks</b> <b>Organisation of lab tours in the afternoon</b>
11:50		<b>Removal of posters</b>
12:00		<b>Lunch Buffet in the restaurant next building</b> <i>Once more included for all NanoScale participants. Your name badge is your ticket again.</i>
13:00		<b>Lab tours</b> <i>Transfer by chartered bus directly from NanoScale to VTT MIKES in Espoo (tentative departure: 1<sup>st</sup> bus at 13:00, 2<sup>nd</sup> bus at 13:15) Please have your ID card / passport ready when entering VTT!</i>
17:00		<b>Approximate end of lab tours</b> <i>Please allow ample time at VTT MIKES on the campus in Espoo. Return on individual basis e. g. by Metro.</i>