Keynotes

K1 Linking the International System of Units to Fundamental Constants
Prof. Joachim Ullrich
PTB President & Chair of Consultative Committee for Units, DE

K2 Gravitational Wave Astronomy: Listening to the Dark Universe
Prof. Karsten Danzmann
Director of Albert-Einstein-Institute Hannover, DE

K3 European XFEL: High precision mirrors and metrology
Dr. Harald Sinn
Group leader X-ray Optics, European XFEL, Hamburg, DE

Session 1: Precision Machine Development

O1.1 Development of an automated assembly machine for the particle tracking system of the ALICE detector upgrade at CERN
Ivo Widdershoven, Arjan van der Wel, Ivo Hamersma, Henny Spaan
IBS Precision Engineering, Eindhoven, the Netherlands

O1.2 Design and manufacture of a high-resolution 1D superconducting gravimeter
Frank Schmaljohann1, Daniel Hagedorn1, Frank Löffler1
1Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

O1.3 Progress on scanning beam interference lithography tool with high environmental robustness for patterning large size grating with nanometre accuracy
Leijie Wang1, Ming Zhang1, Yu Zhu1, Sen Lu1, Kaiming Yang1, Bin Lan2
1The State Key Laboratory of Tribology & Beijing Key Lab of Precision/Ultra-precision Manufacturing Equipments and Control, Department of Mechanical Engineering, Tsinghua University, Beijing, 100084, China
2School of Mechatronics Engineering, University of Electronic Science and Technology, Chengdu 611731, China

O1.4 Utilization of machine tool repeatability in kinematic modelling
Károly Szipka, Andreas Archenti
KTH Royal Institute of Technology, Department of Production Engineering

O1.5 Strength enhancement of precision concrete parts by sol-gel surface coating
Christoph Hahm1, René Theska1, Dagmar Raab2, Monika Mitterhuber3, Anett Kästner3
1Technische Universität Ilmenau, Department of Mechanical Engineering, Institute of Design and Precision Engineering, Precision Engineering Group
2Technische Universität Ilmenau, Department of Mechanical Engineering, Department of Inorganic-Nonmetallic Materials
3ETC Products GmbH (Deggendorf, Germany)

P1.01 Study on protection performance of grinding wheel safety guard against the soft and brittle abrasive projectile
Akinori Yui1, Takuya Fukui1 and Takayuki Kitajima1
1Mechanical Systems Engineering, National Defense Academy, Japan
<table>
<thead>
<tr>
<th>ID</th>
<th>Title</th>
<th>Authors</th>
<th>Affiliations</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1.02</td>
<td>Design of mechanically-optimised lattice structures for vibration isolation</td>
<td>Wahyudin P. Syam¹, Wu Jianwei², Bo Zhao³, Ian Maskery³, Richard Leach¹</td>
<td>¹Manufacturing Metrology Team, Faculty of Engineering, The University of Nottingham, NG7 2RD, UK&lt;br&gt;²Ultra Precision Optoelectronic Instrumentation Engineering Center, Harbin Institute of Technology, 150001, China&lt;br&gt;³Centre for Additive Manufacturing, Faculty of Engineering, The University of Nottingham, NG7 2RD, UK</td>
</tr>
<tr>
<td>P1.03</td>
<td>Distortion of precision assemblies caused by bolted joints</td>
<td>Byron Knapp, Dave Arneson, Dan Oss</td>
<td>Professional Instruments Company, Hopkins, Minnesota, USA</td>
</tr>
<tr>
<td>P1.04</td>
<td>Characterizing precision cutting process by workpiece integrated printed thermocouples</td>
<td>Gerrit Dumstorff¹, Melanie Willert², Oltmann Riemer², Walter Lang¹</td>
<td>¹Institute for Microsensors, Actuators and Systems (IMSAS), Bremen, Germany, University of Bremen&lt;br&gt;²Laboratory for Precision Machining (LFM), Badgasteiner Str. 2, 28359 Bremen, Germany, University of Bremen</td>
</tr>
<tr>
<td>P1.05</td>
<td>Analysis of geometrical errors in measurement data of ultraprecise-turned standards for roughness measurements</td>
<td>Rudolf Meeß, Dorothee Hüser, Lena Jung-Albrecht</td>
<td>Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany</td>
</tr>
<tr>
<td>P1.06</td>
<td>Design of an axially-actuated rotary stage for an ultra-precision machine tool</td>
<td>Niels Bosmans¹, Iwan Sanjaya Awaluddin¹, Dominiek Reynaerts¹</td>
<td>¹KU Leuven, Department of Mechanical Engineering, Division PMA, Heverlee, Belgium, member of Flanders Make (<a href="http://www.flandersmake.be">www.flandersmake.be</a>)</td>
</tr>
<tr>
<td>P1.07</td>
<td>Performance analysis of laser measuring system for an ultra-precision 2D-stage</td>
<td>Lucía Díaz-Pérez ¹, Marta Torralba ², José A. Albajez ¹, José A. Yagüe-Fabra³</td>
<td>¹I3A, Universidad de Zaragoza, Zaragoza, Spain&lt;br&gt;²Centro Universitario de la Defensa, Zaragoza, Spain</td>
</tr>
<tr>
<td>P1.08</td>
<td>Recent Results for Length, Form and Gear Measurement on a New CMM Design for Precision Engineering</td>
<td>Ralf Bernhardt Dietrich Imkamp, Konrad Werner, Alessandro Gabbia, Klaus Bendzulla, Roman Gross³</td>
<td>¹Carl Zeiss Industrielle Messtechnik GmbH, ZEISS Gruppe, 73446 Oberkochen, Germany</td>
</tr>
<tr>
<td>P1.09</td>
<td>Design of a 5-DOF flexure based passive gripper</td>
<td>Varan Gupta¹, Jitendra Prasad Khait³</td>
<td>¹Indian Institute of Technology Delhi, INDIA, 110016</td>
</tr>
</tbody>
</table>
P1.10 The design of a new comparator for form and diameter measurements (KOLD)
Christian Hesse1, Otto Jusko1, Rainer Ziegenbein2, Burkhard Söhne2, Michael
Saat2, and Joachim Hägele- Görlitz2
1Dept. 5.3 "Coordinate Metrology", Physikalisch-Technische Bundesanstalt,
Braunschweig, Germany
2R&D Dept., Mahr GmbH, Göttingen, Germany

P1.11 Development of on-machine measurement for ultra-precision machining
Duo Li1, Xiangqian Jiang1, Liam Blunt1, Zhen Tong1, James Williamson1, Christian
Young1
1University of Huddersfield, Huddersfield, UK

P1.12 Thermal Analysis of a novel five-axis machine tool using measuring probe and R-
test procedure
Christian Brecher, Jan Behrens, Michel Klatte, Tae Hun Lee, Filippos Tzanetos
Fraunhofer Institute for Production Technology IPT, Steinbachstrasse 17 52074
Aachen, Germany

P1.13 Development and performance evaluation of desktop machine too
Satoshi IINO1, Serenn SATO1, Yoshitaka MORIMOTO1, Ryo HIRONO2, Naohiko
SUZUKI2, Yoshiyuki KANEKO2
1Kanazawa institute of technology
2TAKAMAZ Machinery Co.Ltd

P1.14 Recent results of micro geometry measurements using Werth 3D Fibre Probe
Jakob Schlie1, Michael Neugebauer1
1Physikalisch-Technische Bundesanstalt (PTB), 38116
Braunschweig, Germany

P1.15 Nanopositioning and Nanomeasuring Machine NPMM-200 – sub-nanometre
resolu-tion and highest accuracy in extended macroscopic working areas
E Manske1, G Jäger1, T Hausotte2, A. Müller1 and F. Balzer3
1Institute of Process Measurement and Sensor Technology, Technische Universität
Ilmenau, Am Ehrenberg, 98684 Ilmenau, Germany
2Institute of Manufacturing Metrology, Friedrich-Alexander-Universität Erlangen-
Nürnberg (FAU), Nägelsbachstraße 25, 91052 Erlangen, Germany
3Hexagon Metrology GmbH, Siegmund-Hiepe-Straße 2-12, 35578 Wetzlar,
Germany

P1.16 Introducing a new design of 3dof parallel micro-manipulator
Ali Rugbani1 and Kristiaan Schreve2
1Cape Peninsula University of Technology, Department of Mechanical Engineering,
7535 Cape Town, South Africa
2Stellenbosch University, Department of Mechanical and Mechatronic Engineering,
7600 Stellenbosch, South Africa

P1.17 Redundant parallel positioning table device with linear dof
Gheorghe Olea, Norman Huber
HUBER Diffraction and Positioning GmbH & Co.KG
Session 2: Advances in Precision Engineering and Nanotechnologies

02.1 High-pressure aerostatic bearing technology for true full range CNC tool spindles with ultra-precision accuracy
Dr. Ralf Dupont
Levicron GmbH – Non-Contact Precision Motion, Sauerwiesen 6, 67661 Kaiserslautern, Germany

02.2 Additively manufactured metallic compliant structures, a focus on manufacturing strategy and material performances verification
Hervé Saudan1, Lionel Kiener1, Kaushik Vaideeswaran1, Mohammad Mehdi Dadras1
1CSEM SA, Rue Jaquet-Droz 1, CH-2002 Neuchâtel

02.3 Atomistic investigation of FIB-induced damage in diamond cutting tools under various ion irradiation conditions
Zhen Tong1-2, Xiangqian Jiang1, Qingshun Bai2, Liam Blunt1
1Centre for precision technologies, University of Huddersfield, Huddersfield, UK
2Center for Precision Engineering, Harbin Institute of Technology, Harbin 150001, China

02.4 Large stroke three degree-of-freedom spherical flexure joint
M. Naves, R.G.K.M. Aarts, D.M. Brouwer
University of Twente, Enschede, The Netherlands

02.5 Speeding up ultra-precision manufacturing
Ekkard Brinksmeier1 and Lars Schönemann2
1”LFM Laboratory for Precision Machining and MAPEX Center for Materials and Processes, University of Bremen, Germany

P2.01 Dicing by “Crack-and-Fracture” – Novel separation method for MEMS substrates
Manuel Stompe1, Marc Christopher Wurz1
Institute for Micro Production Technology, Garbsen, Germany

P2.02 Efficient manufacturing of large scale structured 3D forming tools through combination of short and ultra-short-pulsed laser processing
Andreas Brenner1, Christian Fornaroli1, Arnold Gillner1
1Fraunhofer-Institute for Laser Technology, Germany

P2.03 Issues in validation of friction in the nanometric domain
Marko Perčić,1 Saša Zelenika1 and Ervin Kamenar1
1 University of Rijeka, Faculty of Engineering & Centre for Micro and Nano Sciences and Technologies, Vukovarska 58, 51000 Rijeka, CROATIA
P2.04 Large stroke ultra-precision planar stage based on compliant mechanisms with polynomial flexure hinge design
Philipp Gräser¹, Sebastian LinB², Felix Harfensteller¹, Lena Zentner², René Theska¹
Technische Universität Ilmenau, Department of Mechanical Engineering
¹Institute of Design and Precision Engineering, Precision Engineering Group
²Mechanism Technology Group

P2.05 Research on key technology for processing high precision aluminium mirror with combined polishing method
Hao Hu¹, Yifan Dai¹, Feng Shi¹, Ci Song¹, Guipeng Tie¹
¹School of Mechatronic Engineering and Automation, National University of Defense Technology, Changsha, China 410073

P2.06 The Hybrid Machining of Ceramic: The choice of production stage
A.Demarbaix¹, E. Rivière - Lorphère¹, F. Ducobu¹, E. Filippi¹, F. Petit²
¹University of Mons, Faculty of Engineering, Machine Design and Production Engineering Lab, Place du Parc 20, 7000 Mons (Belgium)
²Research and Technological Support Department BCRC-INISMa (member of EMRA), Av. Gouverneur Cornez 4, 7000 Mons (Belgium)

P2.07 A contribution to the development of multiaxial nanopositioning machines
Ralf Schienbein, René Theska
Precision Engineering Group, Department of Mechanical Engineering, Technische Universität Ilmenau, Germany

P2.08 Key techniques in Controllable Compliant Manufacturing (CCM) of nano-precision off-axis aspheric optics
Ci Song¹, Yifan Dai¹, Feng Shi¹, Hao Hu¹, Guipeng Tie¹
¹School of Mechatronic Engineering and Automation, National University of Defense Technology, Changsha, China 410073

P2.09 Influence of tool geometry on single-crystal CaF₂ in an ultra-precision machining
Yuta Mizumoto¹, Hikaru Amano¹, Mika Fuchida², Takasumi Tanabe³, Yasuhiro Kakinuma¹
¹Department of System Design Engineering, Faculty of Science and Technology, Keio University, 3-14-1 Hiyoshi, Kohoku-ku, Yokohama 223-8522, Japan
²Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, 3-14-1 Hiyoshi, Kohoku-ku, Yokohama 223-8522, Japan

P2.10 Study of Surface Integrity in Micro-groove Cutting of Anisotropic Material
Hiroyuki Kodama¹, Koichi Okuda¹, Yuji Kishi¹
¹University of Hyogo, Graduate School of Engineering, Japan

P2.11 Integration of a confocal microscope in a desktop machine tool for in situ process control
Martin Bohley¹, Christopher Müller¹, Benjamin Kirsch¹, Jan C. Aurich¹
¹University of Kaiserslautern; Institute for Manufacturing Technology and Production Systems
P2.12 Effect of air blow pressure in ultrasonic vibration cutting of steel using PCD tools
Xinquan Zhang\textsuperscript{1}, Deng Hui\textsuperscript{1}, Kui Liu\textsuperscript{1}, Hao Wang\textsuperscript{2}
\textsuperscript{1}Singapore Institute of Manufacturing Technology, Singapore
\textsuperscript{2}National University of Singapore, Singapore

P2.13 Diamond Micro Chiseling of retroreflective arrays on curved surfaces
Timo Dörgeloh\textsuperscript{1}, Lars Schönemann\textsuperscript{1}, Oltmann Riemer\textsuperscript{1}, Ekkard Brinksmeier\textsuperscript{1}
\textsuperscript{1}Laboratory for Precision Machining LFM – University of Bremen, Germany

P2.14 The isostatic 3-body problem: a complete solution
Johan Kruis\textsuperscript{1,2}, Florent Cosandier\textsuperscript{1}, François Barrot\textsuperscript{1}, Ilan Vardi\textsuperscript{2}, Simon Henein\textsuperscript{2}
\textsuperscript{1}CSEM (Centre Suisse d’Électronique et Microtechnique)
\textsuperscript{2}EPFL (Ecole Polytechnique Fédérale de Lausanne)

P2.15 Determination of material properties by evaluation of machinability in multiscale precision turning
A. Beinhauer, C. Heinzel, O. Riemer
Laboratory for Precision Machining (LFM), Foundation Institute of Materials Science (IWT), MAPEX Center for Materials and Processes, University of Bremen, Germany

P2.16 Control concept to minimize the settling time for a point-to-point motion of a single-axis piezo-actuated nanopositioning system with a displacement amplification mechanism.
Aditya Suryadi Tan\textsuperscript{1}, Thomas Sattel\textsuperscript{1} and Michael Koschig\textsuperscript{2}
\textsuperscript{1}Technische Universität Ilmenau, Germany
\textsuperscript{2}piezosystem Jena GmbH

P2.17 Investigation of various graphene fillers for improving properties of thermoplastic polymers
Jan Edelmann\textsuperscript{1}, Mirko Albrecht\textsuperscript{2}, Henning Zeidler\textsuperscript{3}, Michael Gehde\textsuperscript{2}, Andreas Schubert\textsuperscript{1,3}
\textsuperscript{1}Fraunhofer Institute for Machine Tools and Forming Technology IWU, Chemnitz, Germany
\textsuperscript{2}Chemnitz University of Technology, Chair in Plastics, Chemnitz, Germany
\textsuperscript{3}Chemnitz University of Technology, Chair in Micromanufacturing Technology, Chemnitz, Germany

P2.18 Effect of helical scan grinding with small diameter cBN wheel for hardened steel
Manabu Iwai\textsuperscript{1}, Kiyoshi Suzuki\textsuperscript{2}
\textsuperscript{1}Toyama Prefectural University
\textsuperscript{2}K.Suzuki New R & D Office

P2.19 Nano micro-scratch machining by atomic force microscope (AFM) for investigating fundamental characteristics of polishing
Shinsuke Matsui\textsuperscript{1} and Ken-noshin Kimura\textsuperscript{1}
\textsuperscript{1}Chiba Institute of Technology
P2.20 Fabrication of micro/nanostructures as SERS substrates with the feed-back controlled normal force
Jingran Zhang1,2, Yongda Yan1,2, Jianxiong Cai1,2, Peng Miao3
1The State Key Laboratory of Robotics and Systems, Robotics Institute, Harbin Institute of Technology, Harbin 150080
2Center for Precision Engineering, Harbin Institute of Technology, Harbin, Heilongjiang 150001, P.R. China
3School of Chemistry and Chemical Engineering, Harbin Institute of Technology, Harbin, Heilongjiang 150001, P.R. China

P2.21 An investigation into the creep-deformation behavior of KDP crystals using nanoindentation at room temperature
Ning Hou1, Yong Zhang1
1School of Mechatronics Engineering, The Harbin Institute of Technology, Harbin 150001, China

P2.22 A novel rotational air bearing axis for the manufacturing of ultra-small micro end mills
Christopher Müller1, Martin Bohley1, Benjamin Kirsch1, Jan C. Aurich1
1University of Kaiserslautern; Institute for Manufacturing Technology and Production Systems

P2.23 Design and Fabrication of an Ultrasonic Waveguide with Micro-channels
Hyunse Kim, Euisu Lim and Jong-Kweon Park
Extreme Mechanical Engineering Research Division, Korea Institute of Machinery and Materials, 171 Jang-Dong, Yuseong-Gu, Daejeon, 305-343, Republic of Korea

P2.24 Preparation of surface micro-structured coarse - grained diamond wheels based on high efficiency mechanical conditioning and pico second pulsed laser machining
Mingtao Wu, Bing Guo, Qingliang Zhao
Center for Precision Engineering, School of Mechatronics Engineering, Harbin Institute of Technology, Harbin 150001, China

P2.25 A note on electromagnetic gravity compensation actuators based on soft electro-permanent magnets for adjustable reluctance force
Thorsten Hüfner1, Oliver Radler1, Tom Ströhla1, Thomas Sattel1, Jasper Wesselinge1, Alexander Vogler1,2, Dirk Eicher2
1Technische Universität Ilmenau, Germany
2Zeiss AG, Germany

P2.26 Ultra-precise position and vibration analyses using Fabry-Pérot interferometry
Thomas Ch. Hirschmann2
2attocube systems AG, Munich, Germany

P2.27 Micro-milling tool wear monitoring through a novel method for burrs evaluation
Fabrizio Medeossi1, Marco Sorgato1, Enrico Savio1, Stefania Bruschi1
1Dept. of Industrial Engineering, University of Padova, Via Venezia 1, 35131 Padova, Italy
P2.28 Nanoimprint process for arrayed waveguide grating patterns in silicon photonics
Geehong Kim, Hyungjun Lim, Keebong Choi, Soongeun Kwon, and Jaejong Lee
Korea Institute of Machinery and Materials, 156 Gajeongbuk-Ro, Yuseong-gu, Daejeon 34103, Republic of Korea.

P2.29 Planarization of SiC and oxide surfaces by using Catalyst-Referred Etching with water
Pho Van Bui, Ai Isohashi, Daisetsu Toh, Satoshi Matsuyama, Kouji Inagaki, Yasuhisa Sano, and Kazuto Yamauchi
Department of Precision Science and Technology, Graduate School of Engineering, Osaka University, Osaka, Japan
Research Center for Ultra-Precision Science and Technology, Graduate School of Engineering, Osaka University, Osaka, Japan

Session 3: Non-Mechanical Manufacturing Processes

O3.1 A novel vibration-assisted magnetic abrasive polishing method for complex internal surface finishing
Jiang Guo, Ka Hing Au, Kui Liu, Seow Tong Ng & Kah Chuan Sean Shaw
Singapore Institute of Manufacturing Technology, 73 Nanyang Drive, Singapore 637662, Singapore

O3.2 High rate abrasive-free polishing of single crystal diamond wafer by plasma assisted polishing
Ken Emori, Katsuyoshi Endo, Hideaki Yamada, Akiyoshi Chayahara, Yoshiaki Mokuno, and Kazuya Yamamura
Research Center for Ultra-precision Science and Technology, Graduate School of Engineering, Osaka University, Japan
Advanced Power Electronics Research Center Department of Energy and Environment, National Institute of Advanced Industrial Science and Technology (AIST), Japan

O3.4 Power dissipation investigation of bespoke De-Laval nozzles for rapid Plasma Figuring process
Nan Yu, Renaud Jourdain, Mustapha Gourma, Paul Shore
Precision Engineering Institute, Cranfield University, UK
Power Engineering Centre, Cranfield University, UK
Loxham Precision Ltd, UK

O3.5 Effects of the Cathode Dimension on the Pit Formation by Scanning Micro Electrochemical Flow Cell (SMEFC)
Cheng Guo, Jun Qian, Dominiek Reynaerts
Department of Mechanical Engineering, KU Leuven, Celestijnenlaan 300, bus 2420, 3001 Heverlee, Belgium
Flanders Make, Belgium

P3.01 Fabrication of microlens array mold by indentation method with height control of the indenter
Hideo Takino, Kouta Suzuki, Ryosuke Uchiki, and Takumi Ueno
Chiba Institute of Technology, Japan
P3.02 Simultaneous self-assembly of particles and cellulose nanofibers aiming at fiber-reinforced particle monolayer structure
Nobuyuki Moronuk¹ and Saki Matsuo¹
¹Tokyo Metropolitan University

P3.03 Manufacturing of CVD diamond micro-end mills with electrical discharge machining
E. Uhlmann¹, D. Oberschmidt¹, M. Polte², J. Polte², T.-M. Schimmelpfennig¹, J. Börnstein¹
¹Fraunhofer Institute for Production Systems and Design Technology IPK, Germany
²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany

P3.04 Dry-EDM milling of micro-scale features with high speed rotating tungsten tube electrodes
E. Uhlmann¹, I. Perfilov², T.-M. Schimmelpfennig¹, L. Schweitzer¹, S. Yabroudi²
¹Fraunhofer Institute for Production Systems and Design Technology IPK, Germany
²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany

P3.05 RF network parameter investigation of the plasma delivery system used for Plasma Figuring
Nan Yu¹, Renaud Jourdain¹, Mustapha Gourma², Paul Shore³
¹Precision Engineering Institute, Cranfield University, UK
²Power Engineering Centre, Cranfield University, UK
³Loxham Precision Ltd, UK

P3.06 Machining a small hole to polycrystalline diamond by ultrasonic vibration EDM
Shinichi NINOMIYA¹, Fumio KOGA¹, Manabu IWAI², Kiyoshi SUZUKI³
¹Nippon Institute of Technology
²Toyama Prefectural University
³K. Suzuki New R & D Office

P3.07 Manufacturing of surface microstructures by two-stage laser ablation
Philipp Steinert¹, Mike Zinecker¹, Andreas Schubert¹
¹Professorship Micromanufacturing Technology, Faculty of Mechanical Engineering, Chemnitz University of Technology, 09107 Chemnitz, Germany

P3.08 Multi-wire EDM slicing of semiconductors with group power supplying method
Yasuhiro Okamoto¹, Takayuki Ikeda¹, Haruya Kurihara², Akira Okada¹, Masataka Kido²
¹Nontraditional Machining Laboratory, Okayama University
²Makino Milling Machine Co. Ltd

P3.09 Application of Laser Scanning as a Pre-machining metrology technique in Jet-ECM
Matin Yahyavi Zanjani¹, Henning Zeidler¹, André Martin¹, Andreas Schubert¹,²
¹Professorship Micromanufacturing Technology, Faculty of Mechanical Engineering, Technische Universität Chemnitz, 09107 Chemnitz, Germany
²Fraunhofer Institute for Machine Tools and Forming Technology, 09126 Chemnitz, Germany
P3.10 Micro-structuring of single crystal diamond by ultrasonic assisted friction polishing
Christian Robert, Oltmann Riemer, Ekkard Brinksmeier
Laboratory for Precision Machining LFM, MAPEX Center for Materials and Processes, University of Bremen, Bad gasteiner Str. 2, 28359 Bremen, Germany

P3.11 Influence of tool material and electrolyte on characteristics of Wire ECM with raised low-level voltage
Makoto OGINO¹, Wataru NATSU²
¹Tokyo University of Agriculture and Technology
²Tokyo University of Agriculture and Technology

P3.12 Performance analysis of laser structured surfaces like-honing
Rodrigo L. Stoeterau¹, Neimar S. Silveira², Milton S. F. Lima³, Gilmar Batalha¹
¹University of São Paulo –USP
²São Paulo Federal Institute of Technology – IFSP
³Institute for Advanced Studies – IEAv/DCTA

P3.13 Analysis of voltage and current during the Plasma electrolytic Polishing of stainless steel
Ajeet Singh Rajput¹, Henning Zeidler¹,², Andreas Schubert¹
¹Professorship Micromanufacturing Technology, Faculty of Mechanical Engineering, Technische Universität Chemnitz, 09107 Chemnitz, Germany
²Beckmann-Institut für Technologieentwicklung, Annaberger Straße 73, 09111 Chemnitz, Germany

P3.14 Observation of phenomenon in gap area during micro hole drilling with micro EDM
Guodong Li¹, Wataru Natsu², Zuyuan Yu³
¹²Tokyo University of Agriculture and Technology
³Dalian University of Technology

P3.15 Removal of subsurface damage of 4H-SiC wafer by plasma assisted polishing
Kentaro Tsuiuchi¹, Chika Kageyama¹, Katsuyoshi Endo¹ and Kazuya Yamamura¹
¹Research Center for Ultra-precision Science and Technology, Graduate School of Engineering, Osaka University, Japan

P3.16 Effect of tool coated with conductive and non-conductive layer on micro-EDM characteristic of Ni based X alloy
Maxim Lu¹, Asma Perveen², M.P. Jahan³
¹²Nazarbayev University,
³Miami University

Session 4: Mechanical Manufacturing Processes

O4.1 Nitrides in nitriding steels diminish diffusion wear in diamond turning
Naomichi Furushiro¹, Daisuke Hirooka¹, Tomomi Yamaguchi¹, Shigetaka Matsuda², Yasuhiro Iwasa² and Shuntaro Terauchi²
¹Kansai University
²Osaka Yakin Kogyo Co., Ltd
O4.2 Investigation of ultra-high speed cutting mechanism by considering tool-chip friction property and inertia force derived from chip formation
Jun Shinozuka¹
¹Department of Mechanical Engineering, Yokohama National University, Japan

O4.3 Development of an ultra-precision grinding technique for the production of structured micro-patches on ceramics and tool steel
Christian Young¹, Liam Blunt¹, Zhen Tong¹
¹Centre for Precision Technologies, University of Huddersfield, Huddersfield, HD1 3DH, UK

O4.4 High efficiency and high precision machining of Fresnel microstructure on silicon carbide through integrated sub-nanosecond laser ablating and ultra-precision grinding chain
Yongcheng Pan, Qingliang Zhao, Bing Guo
Center for Precision Engineering, School of Mechatronics Engineering, Harbin Institute of Technology, Harbin 150001, China

O4.5 Modeling approach regarding surface functionalization by force-controlled micro and nano forming
E. Uhlmann¹², S. Kühne¹, M. Jagodzinski¹, M. Malcher¹, R. Trevino¹
¹Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany
²Fraunhofer Institute for Production Systems and Design Technology IPK, Germany

O4.6 An Investigation of surface generation in swing precess bonnet polishing of 3D-structured surfaces possessing high wettability
Cheung Chi Fai¹*, Cao Zhongchen¹ and Ho Lai Ting¹
¹Partner State Key Laboratory of Ultraprecision Machining Technology, Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong
Corresponding Author: benny.cheung@polyu.edu.hk*

A. Davoudinejad¹, G. Tosello¹, M. Annoni²
¹Department of Mechanical Engineering, Technical University of Denmark, Building 427A, Produktionstorvet, 2800 Kgs. Lyngby, Denmark
²Mechanical Engineering Department, Politecnico di Milano, Via La Masa 1, 20156, Milano, Italy

O4.8 Optimized workpiece clamping systems for automated micro production
K. Dröder¹, H.-W. Hoffmeister¹, T. Tounsi¹
¹Institute of Machine Tools and Production Technology, Technische Universität Braunschweig, Germany

O4.9 An automated diamond turning facility
Keith Carlise¹, Marco Castelli¹, Paul Morantz², Paul Shore¹
¹Loxham Precision Ltd, UK
P4.01 Wear detection of brass bond diamond grinding wheel by spectral coherence of grinding forces
Bin Dong, Christian Vogt, Rolf Rascher
Laboratory of Optical Engineering, Technische Hochschule Deggendorf, Edlmairstraße 6 & 8, 94469 Deggendorf, German

P4.02 Setting errors compensation of a workpiece located by industrial robots
Keiichi Nakamoto¹, Ren Kitakawa¹, Yoshimi Takeuchi²
¹Tokyo University of Agriculture and Technology, Japan
²Chubu University, Japan

P4.03 Endless diamond wire saw for monocrystalline silicon cutting
Ricardo Knoblauch¹, Claudio Abilio da Silveira¹, Walter Lindolfo Weingaertner¹, Fabio Antonio Xavier¹, Konrad Wegener²
¹Universidade Federal de Santa Catarina, Mechanical Engineering Department, Trindade, 88010-970 Florianopolis SC, Brazil
²Institute of Machine Tools and Manufacturing, ETH Zurich, Tannenstrasse 3, 8092 Zurich, Switzerland

P4.04 Characterising Damages of the Main Pressing and Heat Transferring Element within the Hybrid Contact Laser Sintering Process
Tobias Montag¹, Jens Wulfsberg¹
¹Helmut-Schmidt-University, University of the Federal Armed Forces Hamburg

P4.05 Ultra-precision grinding of polycrystalline transparent ceramics
Thomas Bletek¹, Olaf Dambon¹, Fritz Klocke¹
¹Fraunhofer-Institute for Production Technology IPT, Steinbachstr. 17, 52074 Aachen, Germany

P4.06 Chatter Attenuation of Five-axis CNC Machining by Eddy Current Damping
Yiqing Yang, Mashhood Asad Butt
School of Mechanical Engineering and Automation, Beihang University, Beijing, 100191, China

P4.07 Liquid covered micro-milling
E. Uhlmann¹², D. Oberschmidt¹, M. Polte², J. Polte²
¹Fraunhofer Institute for Production Systems and Design Technology IPK, Germany
²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany

P4.08 Cutting forces while machining STAVAX ESU with binderless-cBN
E. Uhlmann¹², D. Oberschmidt¹, M. Polte², J. Polte²
¹Fraunhofer Institute for Production Systems and Design Technology IPK, Germany
²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany

P4.09 Real-Time Estimation of Machining Error Caused by Vibrations of End Mill using Indirect Methods
Kenji Shimana¹, Eiji Kondo², Takumi Chifu³, Shinichi Yoshimitsu¹ and Yuya Kobaru¹
¹Department of Electronic Control Engineering, National Institute of Technology, Kagoshima College, Japan
²Graduate School of Science and Engineering, Kagoshima University, Japan
³Kotobuki Paper Co.Ltd., Japan
P4.10 Monitoring of Tool Behavior in End-milling Under Different Cutting Conditions Using Projection Image
Shinichi Yoshimitsu¹, Daiki Iwashita², Kenji Shimana¹, Yuya Kobaru¹, Shunichi Yamashita¹
¹National Institute of Technology, Kagoshima College, Japan
²Makino Milling Machine Co., Ltd

P4.11 Analysis of mould design affecting the filling behaviour of an injection moulded micro part
Antonio Luca, Oltmann Riemer, Carla Flosky
Laboratory for Precision Machining, University of Bremen, Germany

P4.12 An investigation into finite element modelling of micro machining of nano Mg/SiC metal matrix composites
Xiangyu Teng¹, Dehong Huo¹, Wanqun Chen¹,²
¹School of Mechanical and Systems Engineering, Newcastle University, Newcastle upon Tyne, NE1 7RU, UK
²Centre for Precision Engineering, Harbin Institute of Technology, Harbin, 150001, People’s Republic of China

P4.13 Mass production for micro end mills
Berend Denkena², Marc Wurz¹, Thilo Grove², Abdelhamid Bouabid², Esmail Asadi¹
¹Institute for Micro Production Technology, Garbsen, Germany
²Institute for Production Engineering and Machine Tools, Garbsen, Germany

P4.14 Behavioral analysis of tool deflections during micro-end milling
Hiroo Shizuka¹, Katsuhiko Sakai¹, Takumi Kaneko¹ and Mikihisa Nakajima¹
¹Shizuoka University, 3-5-1 Johoku Naka-ku Hamamatsu Shizuoka 432-8561 Japan

P4.15 Cutting force reduction mechanism of lead-free brass cutting by measuring several different tool materials
Ryo Nakazawa¹, Hiroo Shizuka¹, Katsuhiko Sakai¹
¹Shizuoka University, 3-5-1 Johoku Naka-ku Hamamatsu Shizuoka 432-8561 Japan

P4.16 Manufacturing of substrates for curved deterministic areal roughness standards
Rudolf Mee², Matthias Hemmleb², Thorsten Dziomba¹, André Felgner¹, Ulrich Neuschaef neither-Urbe¹
¹Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany
²m2c calibration, Alt Nowawes 83a, 14482 Potsdam, Germany

P4.17 The surface properties of a roll mould according to the fluid jet polishing conditions
Tae-Jin Je¹,², Ji-Young Jeong¹,², Kyu-Min Lee¹, Eun-chae Jeon¹,²
¹Dept. of NanoManufacturing Technology, Korea Institute of Machinery and Materials(KIMM), Korea
²Dept. of NanoMechatronics, University of Science & Technology(UST), Korea
<table>
<thead>
<tr>
<th>Paper No.</th>
<th>Title</th>
<th>Authors</th>
<th>Affiliations</th>
</tr>
</thead>
<tbody>
<tr>
<td>P4.18</td>
<td>Droplet removal from PVD-coated micro-milling tools with the immersed tumbling process</td>
<td>E. Uhlmann¹ ², Y. Kuche², D. Oberschmidt¹, J. Polte²</td>
<td>¹Fraunhofer Institute for Production Systems and Design Technology IPK, Germany ²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany</td>
</tr>
<tr>
<td>P4.19</td>
<td>Characterization of smearing patterns in ball nose end milling process</td>
<td>F. Biondani¹, G. Bissacco¹, H. N. Hansen¹</td>
<td>¹Department of Mechanical Engineering, Technical University of Denmark</td>
</tr>
<tr>
<td>P4.20</td>
<td>Investigation on cutting mechanism in vibration assisted micro milling</td>
<td>Wanqun Chen¹ ², Dehong Huo¹, Jack Hale¹</td>
<td>¹School of Mechanical and Systems Engineering, Newcastle Upon Tyne, NE1 7RU, United Kingdom ²Center for Precision Engineering, Harbin Institute of Technology, Harbin, 150001, People’s Republic of China</td>
</tr>
<tr>
<td>P4.21</td>
<td>Wear behaviour of diamond coated micro-milling tools during micro machining</td>
<td>E. Uhlmann¹ ², Y. Kuche², D. Oberschmidt¹, J. Polte²</td>
<td>¹Fraunhofer Institute for Production Systems and Design Technology IPK, Germany ²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany</td>
</tr>
<tr>
<td>P4.22</td>
<td>Fundamental study of magnetic polishing for Ti-alloy by use of machining centre</td>
<td>Tatsuya Furuki¹, Toshiki Hirogaki² and Eiichi Aoyama²</td>
<td>¹Gifu University, ²Doshisha University</td>
</tr>
<tr>
<td>P4.23</td>
<td>Micro-machining of Monocrystalline Silicon with Improved Edge Quality</td>
<td>Zi Jie Choong¹, Dehong Huo¹, Patrick Degenaar², Anthony O’Neill²</td>
<td>¹School of Mechanical and Systems Engineering, Newcastle University, Newcastle Tyne, NE1 7RU, United Kingdom ²School of Electrical and Electronic Engineering, Newcastle University, Newcastle Tyne, NE1 7RU, United Kingdom</td>
</tr>
<tr>
<td>P4.24</td>
<td>A Computational Fluid Dynamics Approach for Chip Evacuation Optimization in Deep Hole Drilling</td>
<td>K.S. Woon¹, G.L. Tnay²</td>
<td>¹Department of Mechanical Engineering, National University of Singapore, 10 Kent I Crescent, Singapore 119260 ²Machining Technology, Singapore Institute of Manufacturing Technology, 71 Nan Drive, Singapore 638075</td>
</tr>
<tr>
<td>P4.25</td>
<td>Ultraprecision cutting of silicon carbide using micro milling tool made of single crystalline diamond</td>
<td>W. Asai¹, H. Suzuki¹, M. Okada¹, Y. Itoh², K. Fujii²</td>
<td>¹Department of Mechanical Engineering, Chubu University, 1200, Matsumoto, Kasugai, Aichi, Japan ²NS Tool Co., Ltd., 2-11, Matsuzakadaira, Taiwa, Kurokawa, Miyagi, Japan</td>
</tr>
</tbody>
</table>
P4.26 Study on scribing characteristics of wafer with precision of ground scribing wheel
Yusuke AKIYAMA¹, Mutsumi OKADA¹, Yuki MASUDA¹, Hirofumi SUZUKI¹, Toshio FUKUNISHI², Yoshiyuki ASA², Noriyuki OGASAWARA², Kazuma IIIZAWA², Naoko TOMEI²
¹Department of Mechanical Engineering, Chubu University, 1200, Matsumoto, Kasugai, Aichi, Japan
²Mitsubishi Diamond Industrial Co., Ltd, 32-12, Koroen, settsu Osaka, Japan

P4.27 Development of precision polishing machine based on parallel-kinematic system
Zavid Mohamed¹, Liam Blunt¹, Christian Young¹, Zhen Tong, Duo Li¹
¹Centre for precision technology University of Huddersfield, UK

P4.28 CFRP surface finishing using ceramic brush
Maruf Hasan Rakib¹, Min-Keon Lee¹, You-Young Kim¹, Sun-Kyu Lee¹
¹School of Mechanical Engineering, Gwangju Institute of Science and Technology, 123, Cheomdangwagi-ro, Buk-gu, Gwanju, Republic of Korea, 61005

P4.29 Investigation of critical edge radius effect for the variation of ultra-precision machining results of difficult-to-cut materials
M. Azizur Rahman, S. Raj Selvaraja, M. Rahman, A. Senthil Kumar
Department of Mechanical Engineering, National University of Singapore, S117576

P4.30 Development of localized compressive hydrostatic stress-assisted cutting method – Examination by molecular dynamics simulation and microcutting experiment
Jun Shimizu¹, Takeyuki Yamamoto¹, Hirotaka Ojima¹, Teppei Onuki¹, Libo Zhou¹ and Keito Uezaki²
¹College of Engineering, Ibaraki University, 4-12-1 Nakanarusawa, Hitachi 316-8511, Japan
²Graduate School of Science and Engineering, Ibaraki University, 4-12-1 Nakanarusawa, Hitachi 316-8511, Japan

P4.31 Modeling surface generation in ultra-precision grinding based on the surface topography of grinding wheel
Chengyang Zhao¹, Chi Fai Cheung¹, Shanshan Chen¹,², and Zhongchen Cao¹
¹Partner State Key Laboratory of Ultraprecision Machining Technology, Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong
²School of Mechatronics Engineering, Harbin Institute of Technology, Harbin 150001, China

P4.32 Thermal effect on brittle–ductile transition in CaF2 single crystals
Akshay Chaudhari, Yan Jin Lee, Hao Wang, A. Senthil Kumar
Department of Mechanical Engineering, National University of Singapore, EA-07-08, 9 Engineering Drive 1, Singapore 117575

P4.33 Simulation of surface morphology and roughness during helical milling
Yanling Tian¹,², Yudong Zhou¹, Fujun Wang¹, Yunpeng Liu¹, Dawei Zhang¹
¹Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, Tianjin 300072, China
²School of Engineering, University of Warwick, Coventry CV4 7AL, UK
<table>
<thead>
<tr>
<th>Papers</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>P4.34</td>
<td>Simulation and experiments for micro/nano channel scratching</td>
<td>Zhiyong Guo, Yanling Tian, Dawei Zhang, Xianping Liu, Bijan Shirinzadeh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, Tianjin 300072, China</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 School of Engineering, University of Warwick, Coventry CV4 7AL, UK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Department of Mechanical and Aerospace Engineering, Monash University, Clayton 3800, Australia</td>
</tr>
<tr>
<td>P4.35</td>
<td>Honing with a new tooling concept – defined cutting edges coated with CVD-Diamond</td>
<td>K. Droder, H.-W. Hoffmeister, S. Baron</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Institute of Machine Tools and Production Technology, Technische Universität Braunschweig, Germany</td>
</tr>
<tr>
<td>P4.36</td>
<td>Simulation of surface morphology and roughness during helical milling</td>
<td>Yanling Tian, Yudong Zhou, Fujun Wang, Yunpeng Liu, Dawei Zhang</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, Tianjin 300072, China</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 School of Engineering, University of Warwick, Coventry CV4 7AL, UK</td>
</tr>
<tr>
<td>P4.37</td>
<td>The effect of stress on shear dilatation and cutting force during nanometric machining of amorphous alloys</td>
<td>Yan Zhao, Tongtong Li, Yan Zhang, Jiachun Wang, Dehong Huo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 School of Mechanical Engineering, Yanshan University, Qinhuangdao, 066004, China</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 School of Mechanical and Systems Engineering, Newcastle University, Newcastle Upon Tyne, NE1 7RU, UK</td>
</tr>
<tr>
<td>P4.38</td>
<td>A mathematical explanation for the grinding marks in cross and parallel grinding</td>
<td>Yongcheng Pan, Qingliang Zhao, Bing Guo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Center for Precision Engineering, School of Mechatronics Engineering, Harbin Institute of Technology, Harbin 150001, China</td>
</tr>
<tr>
<td>P4.39</td>
<td>Inner centering in parting line area of injection mould using side locks</td>
<td>Rasoul Mahshid, Hans Nørgaard Hansen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Technical University of Denmark, Department of Mechanical Engineering, Lyngby, Denmark</td>
</tr>
<tr>
<td>P4.40</td>
<td>The feasibility study of using a kinematic for 6-degrees tool holder in single point diamond turning</td>
<td>W. Yuan, W.B. Lee, C.Y. Chan and L.H. Li</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 The State Key Laboratory of Ultraprecision Machining Technology, Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hong Kong</td>
</tr>
<tr>
<td>P4.41</td>
<td>Influence of dielectric fluid and tool electrode choice on micro-EDMed nitinol surface integrity</td>
<td>James W. Mwang, Henning Zeidler, Thomas Berger, Andreas Schubert</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Technische Universität Chemnitz, Micromanufacturing Technology, 09107 Chemnitz, Germany</td>
</tr>
</tbody>
</table>
P4.42 Subsurface structure defects beneath fracture area of reaction-bonded silicon carbide in ultra-precision grinding
Feihu Zhang1, Zhipeng Li1, Xichun Luo2
1School of Mechatronics Engineering, Harbin Institute of Technology, Harbin, China
2Department of Design, Manufacture and Engineering Management, Faculty of Engineering, University of Strathclyde, UK

P4.43 Process chain for fabrication of anisotropic optical functional surfaces on polymer components
D. Li1, Y. Zhang1, F. Regi1, G. Tosello1, M. H. Madsen2, J. B. Nielsen3, H. Aanaes3, J. R. Frisvad3
1Technical University of Denmark, Department of Mechanical Engineering, DK-800 Kgs. Lyngby, Denmark
2Danish National Metrology Institute, DK-2800 Kgs. Lyngby, Denmark
3Technical University of Denmark, Department of Applied Mathematics and Computer Sciences, DK-2800 Kgs. Lyngby, Denmark

P4.44 A full factorial numerical investigation and validation of precision end milling process for hardened tool steel
Andreas Reimer1, Stephen Fitzpatrick2, Xichun Luo1
1Centre for Precision Manufacturing, Department of Design, Manufacture and Engineering Management, University of Strathclyde, UK
2Advanced Forming Research Centre, University of Strathclyde, UK

P4.45 A method to recognize the contact area of tool-workpiece on the diamond cutting tool
Ning Yang, Wen Huang, Dajiang Lei, Zhihui Xia
Institute of Machinery Manufacturing Technology, China Academy of Engineering Physics, Chengdu, 621900, P.R. China

P4.46 Study on the critical chip thickness in microcutting SiC single crystals
Melanie Willert, Kai Rickens, Alexander Wolf, Oltmann Riemer
Laboratory for Precision Machining (LFM), Badgasteiner Str. 2, 28359 Bremen, Germany University of Bremen, MAPEX Center for Materials and Processes

P4.47 Modeling and simulating of high chromium alloy based on Molecular Dynamics
Xiaoguang Guo, Yang Li, Zhuji Jin, Renke Kang
Key laboratory for precision and Non-traditional machining of Ministry of Education, Dalian University of technology, Dalian 116024 China

P4.48 3D Finite Element Modelling of Drilling Process of Al2024-T3 Alloy with solid tooling and Experimental Validation
A.Davoudinejad1,2, G. Tosello1
1Department of Mechanical Engineering, Technical University of Denmark, Building 427A, Produktionstorvet, 2800 Kgs. Lyngby, Denmark
2Mechanical Engineering Department, Politecnico di Milano, Via La Masa 1, 20156, Milano, Italy
Session 5: Revision of SI

O5.1 Towards a simplified Kibble balance to realise mass in the new SI
Ian A. Robinson, James Berry, Stuart Davidson & Charles Jarvis
National Physical Laboratory, Hampton Road, Teddington, Middlesex, TW11 0LW, UK

O5.2 Dissemination of the kilogram via silicon spheres
Robin Wegge¹, Horst Bettin¹, Dorothea Knopf¹, and Frank Härtig¹
Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig, Germany

O5.3 Ion beam assisted sphericity error correction of Si spheres as new kg artefacts
Thomas Arnold¹, Fred Pietag¹, Guido Bartl², Torsten Mai², Arnold Nicolaus²
¹Leibniz-Institutfür Oberflächenmodifizierung (IOM), Permoserstr. 15, 04318 Leipzig
²Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig

P5.01 Quantitative surface analysis on 28Si-spheres for the redefinition of the kilogram
Edyta Beyer¹, Erik Darlatt², Rolf Fliegauf², Frank Härtig¹, Michael Kolbe², Matthias Müller¹
¹Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany
²Physikalisch-Technische Bundesanstalt (PTB), Abbestr. 2-12, 10587 Berlin, Germany

P5.02 A displacement interferometer for the calibration of the silicon lattice parameter
Christoph Weichert¹, Paul Köchert¹, Susanne Quabis¹, Jens Flügge¹
¹Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany

Session 6: Metrology

O6.1 Acoustic thermometry for accurate measurement of air temperature
Robin Underwood, Tom Gardiner, Andrew Finlayson, Stephanie Bell, Michael de Podesta
National Physical Laboratory, Teddington, Middlesex, TW118QL, United Kingdom

O6.2 Compact Linear Collider component fiducialisation using frequency scanning interferometry
Solomon William Kamugasa ¹², Jean-Christophe Gayde³, Hélène Mainaud Durand¹
¹CERN, Geneva, Switzerland
²ETHZ, Zurich, Switzerland

O6.3 Magnification Dependent MPE - equation for Dimensional X-ray CT Metrology
Herminso Villarraga – Gómez*,†, and Stuart T. Smith*
*Center for Precision Metrology, University of North Carolina at Charlotte, NC, USA.
†Nikon Metrology, Inc., USA
A 100 µm range linear actuator with picometer resolution, subnanometer accuracy and submicroradian tip-tilt error for the characterization of measuring instruments at the nanoscale
Marco Pisani¹, Andrea Giugni² and Nicola Bancone³
¹Istituto Nazionale di Ricerca Metrologica, INRIM, Torino, Italy, ², ³formerly INRIM

Dimensional optical metrology of deep subwavelength grating structures
Bernd Bodermann, Alexander Diener, Matthias Wurm
Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany

Heterodyne encoders for high-precision displacement measurement
Vivek G. Badami, Jan Liesener, Peter J. de Groot
Zygo Corporation, Middlefield, USA

Measurement models for evaluation of uncertainty of coordinate measurements
Wojciech Płowucha¹, Paweł Rosner¹
¹University of Bielsko-Biała, Laboratory of Metrology, Willowa 2, PL43-309 Bielsko-Biała, Poland

A reference measurement system for roundwood based on fringe projection
Keck C and Schödel R
Physikalisch-Technische Bundesanstalt, Fachbereich 5.4, Bundesallee 100, 38116 Braunschweig, Germany

Effect of process parameters on dimensional accuracy of fiber-reinforced thin-walled micro moulded part
Jitendra Rathore¹², Davide Masato¹, Marco Sorgato¹, Giovanni Lucchetta¹, Simone Carmignato²
¹Department of Industrial Engineering, University of Padova, Padova (Italy)
²Department of Management and Engineering, University of Padova, Vicenza (Italy)

Press hardening tool integrated thin film temperature sensor
F. Dencker¹, A. Schlenkrich¹, M. C. Wurz¹
¹Institute for Micro Production Technology, Leibniz Universität Hannover, Garbsen, Germany, dencker@impt.uni-hannover.de

A bottom-up approach for traceable nano dimensional metrology
Gaoliang Dai¹, Jens Fluegge¹, Harald Bosse¹, Ronald Dixon²
¹Physikalisch-Technische Bundesanstalt, 38116 Braunschweig, Germany
²National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD 20899-8212

Roundness measurements of concave spherical surface using an AFM probe system
Zhuanzhuan Cen¹, Jingran Zhang¹, Xuesen Zhao¹, Tao Sun¹
¹Center for Precision Engineering, Harbin Institute of Technology, Harbin, Heilongjiang 150001, P.R. China
P6.07 Towards metrological computed tomography at METAS
Benjamin A. Bircher, Felix Meli, Alain Künig, Rudolf Thalmann
Federal Institute of Metrology METAS, Laboratory for Length, Nano- and Microtechnology, Lindenweg 50, 3003 Bern-Wabern, Switzerland

P6.08 Laser confocal microscope noise evaluation on injection compression moulded (ICM) transparent polymer Fresnel lenses
Dario Loaldi1,2, Matteo Calaon1, Danilo Quagliotti1, Paolo Parenti2, Guido Tosello1, Massimiliano Annoni2
1Technical University of Denmark, Department of Mechanical Engineering, Kgs. Lyngby, Denmark
2Politecnico di Milano, Department of Mechanical Engineering, Milan, Italy

P6.09 The synthesis and metrology of colloidal semiconductor nanocrystals
Julian Cedric Porsiel1,2,3, Alfred Schirmacher1,2,3, Egbert Bühr2,3, Georg Garnweitner1,3
1Institute for Particle Technology (iPAT) | Technische Universität Braunschweig | Volkmarseder Str. 5, 38104 Braunschweig, Germany
2Physikalisch-Technische Bundesanstalt Braunschweig | Bundesallee 100, 38116 Braunschweig, Germany
3Laboratory of Emerging Nanometry (LENA) | Langer Kamp 6a, 38106 Braunschweig, Germany

P6.10 A portable Large Range Small Angle Generator (LRSAG) for precise calibration of autocollimators
Tanfer Yandayan
TUBITAK Ulusal Metroloji Enstitüsü (UME), Dr. Zeki Acar Cad. No:1, 41470 Gebze-Kocaeli, Turkey

P6.11 In situ strain measurement during a grinding process using a sensor-integrated workpiece
Mridusmita Sarma1, Florian Borchers2, Carsten Heinzel2, Walter Lang1
1Institute for Microsensors Actuators and Systems (IMSAS), University of Bremen, Bremen, Germany
2Foundation Institute for Materials Science (IWT), MAPEX Center for Materials and Processes, University of Bremen, Bremen, Germany

P6.12 Concept of metrological reference surfaces for asphere and freeform metrology
Michael Schulz1, Ines Fortmeier1, David Sommer1, Gernot Blobel1,2
1Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig
2Present address: P+Z Engineering GmbH, Alessandro-Volta-Straße 22, 38440 Wolfsburg

P6.13 Electromagnetic interference and capacitive distance measurements on machine tools
Sebastian Böhl1, Matthias Meier1, Konrad Wegener1
1Institute of Machine Tools and Manufacturing (IWF), ETH Zurich, Leonhardstrasse 21, 8092 Zurich, Switzerland

P6.14 Monitoring of the thermal deformations on polymer parts using a vision system
G. Dalla Costa, D. González-Madruga, L. De Chiffre
Department of Mechanical Engineering, Technical University of Denmark (DTU), Building 425, Produktionstorvet, DK-2800 Kgs. Lyngby, Denmark
P6.15 Demands for nanoradian angle metrology and performance requirements on autocollimators
Tanfer Yandayan\textsuperscript{1} and Ralf Geckeler\textsuperscript{2}
\textsuperscript{1}TUBITAK Ulusal Metroloji Enstitüsü (UME), Dr. Zeki Acar Cad. No:1, 41470 Gebze-Kocaeli, Turkey
\textsuperscript{2}Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany

P6.16 Bringing metrology to high-speed atomic force microscopy (HS-AFM)
Andrew Yacoot\textsuperscript{1}, Loren Picco\textsuperscript{2}, Oliver Payton\textsuperscript{3}, Herve Dongmo\textsuperscript{1}, Freddie Russell-Pavier\textsuperscript{1}, Petr Klapetek\textsuperscript{3}
\textsuperscript{1}National Physical Laboratory, Hampton Road, Teddington, Middlesex, TW11 0LW, UK
\textsuperscript{2}Centre for Nanoscience and Quantum Information, University of Bristol, Tyndall Avenue, Bristol BS8 1FD, UK
\textsuperscript{3}Czech Metrology Institute, Okruzni, 63800, Brno, Czech Republic

P6.17 Experimental investigation on the influence of detector misalignment on X-ray CT measurement accuracy
Valentina Aloisi\textsuperscript{1}, Simone Carmignato\textsuperscript{1}, Joseph Schlecht\textsuperscript{2}, Eric Ferley\textsuperscript{2}, Enrico Savio\textsuperscript{3}
\textsuperscript{1}Department of Management and Engineering, University of Padova, Stradella San Nicola 3, 36100 Vicenza, Italy
\textsuperscript{2}NorthStar Imaging, Inc., Rogers, MN, USA
\textsuperscript{3}Department of Industrial Engineering, University of Padova, Via Venezia 1, 35131 Padova, Italy

P6.18 How to qualify wafer thermal conditioning at milli-Kelvin resolution?
Marnix Tas\textsuperscript{1}, Roland Hanegraaf\textsuperscript{1}, Herman Verbeek\textsuperscript{1}, Willem Dijkstra\textsuperscript{2}
\textsuperscript{1}Sioux CCM (www.sioux.eu), commissioned by VDL ETG (www.vdletg.com)
\textsuperscript{2}VDL ETG (www.vdletg.com)

P6.19 Strain measurements of cylinder magnetostrictive samples by interferometer readings
R. Bellotti\textsuperscript{1}, P. Mei\textsuperscript{2}, G.B. Picotto\textsuperscript{1}, M. Santiano\textsuperscript{1}, M. Zucca\textsuperscript{1}
\textsuperscript{1}INRiM – Istituto Nazionale di Ricerca Metrologica
\textsuperscript{2}Politecnico di Torino – Dipartimento Energia

P6.20 Experimental investigation on multi-material gap measurements by computed tomography using a dedicated reference standard
Petr Hermanek\textsuperscript{1}, Fabricio Borges de Oliveira\textsuperscript{2}, Simone Carmignato\textsuperscript{1}, Markus Bartscher\textsuperscript{1}, Enrico Savio\textsuperscript{1}
\textsuperscript{1}University of Padova, Department of Management and Engineering (DTG), Stradella San Nicola 3, 36100 Vicenza, Italy.
\textsuperscript{2}Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany.
\textsuperscript{3}University of Padova, Department of Industrial Engineering (DII), Via Venezia 1, 35131, Padova, Italy

P6.21 Dynamics modeling of CMM probing systems
Fabrizio Pollastri, Alessandro Balsamo, Andrea Egidi and Gian Bartolo Picotto
Istituto Nazionale di Ricerca Metrologica (INRiM), Strada delle Cacce 91, 10135 Torino, Italy
Results from an interlaboratory comparison of areal surface texture parameter extraction from X-ray computed tomography of additively manufactured parts

Andrew Townsend, Radu Racasan, Paul Bills, Adam Thompson, Nicola Senin, Richard Leach, Liam Blunt

1ESPRC Centre for Innovative Manufacturing in Advanced Metrology, Centre for Precision Technologies, School of Computing and Engineering, University of Huddersfield, Huddersfield HD1 3DH, UK
2Manufacturing Metrology Team, Faculty of Engineering, University of Nottingham, Nottingham NG7 2RD, UK

A comparative study of curvature-based registration methods for dimensional metrology

Yassir Arezki, Charyar Mehdi-Souzani, Xiangchao Zhang, Nabil Anwer, Hichem Nouira

1Laboratoire Commun de Métrologie (LNE-CNAM), Laboratoire National de Métrologie et d'Essais (LNE), 1 Rue Gaston Boissier, 75015 Paris, France
2LURPA, ENS Cachan, Univ. Paris-Sud, Université Paris-Saclay, 94235 Cachan, France
3Shanghai Engineering Centre for Ultra-Precision Optical Manufacturing, Fudan University, Shanghai, 200438, P. R. China

Unrolled 3D confocal measurements of turning parts

Carlos Bermudez, Aitor Matilla, Jordi Mariné, David Martínez, Cristina Cadevall, Roger Artigas

1Sensofar Tech SL

Deformation mechanism of lonsdaleite based on molecular dynamics analysis of nanoindentation

Hiroaki Tanaka, Shoichi Shimada

Osaka Electro-Communication University, Japan

Characterizing the material mechanical properties inside small holes

Min Xu, Uwe Brand, Ludger Koenders

Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, D-38116 Braunschweig, Germany

Surface roughness study on mirror finish surface products using patterned area illumination method

Shaowei Fu, Fang Cheng and David Lee Butler

1School of Mechanical & Aerospace Engineering, Nanyang Technological University, Singapore
2Advanced Remanufacturing and Technology Centre (Agency for Science, Technology and Research), Singapore

An approach to the assessment of cam form

Shan Lin, Otto Jusko, Frank Härtig and Jörg Seewig

1PhysikalischTechnische Bundesanstalt, Bundesallee 100, 38116 Braunschweig, Germany
2Institute for Measurement and Sensor Technology, Technical University of Kaiserslautern, Gottlieb-Daimler-Straße, 67663 Kaiserslautern, Germany
P6.29  Pico litre volume measurement with a laser focus sensor on the nano measuring machine NMM-1
Ingo Ortlepp¹, Rostyslav Mastylo¹, Arne Albrecht², Eberhard Manske¹
¹Technische Universität Ilmenau, Institute of Process Measurement and Sensor Technology
²Technische Universität Ilmenau, Institute of Micro- and Nanotechnologies

P6.30  Integral and traceable evaluation of three-dimensional thread measurements
Sebastian Schädel¹, Achim Wedmann¹, Martin Stein¹
¹Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig

P6.31  Ageing of roughness artefacts - impact on the measurement results
Katja Klauer¹, Matthias Eißler¹, Frank Schneider², Jörg Seewig¹, Jan C. Aurich²
¹University of Kaiserslautern; Institute for Measurement and Sensor-Technology
²University of Kaiserslautern; Institute for Manufacturing Technology and Production Systems

P6.32  On machine measurement of freeform optics fabricated by dynamic servo turning
Guipeng Tie¹, Yifan Dai¹, Feng Shi¹, Hao Hu¹, Ci Song¹
¹School of Mechatronic Engineering and Automation, National University of Defense Technology, Changsha, China 410073

P6.33  Modelling uncertainty associated with comparative coordinate measurement through analysis of variance techniques
M. Papananias¹, S. Fletcher¹, A. P. Longstaff¹, A. Mengot², K. Jonas², A. B. Forbes³
¹Centre for Precision Technologies, University of Huddersfield, UK,
²Renishaw plc, UK,
³National Physical Laboratory, UK

P6.34  Current trends and limitations in the primary realisation of the length
René Schödel, Katharina Rau, Karl Meiners-Hagen, and Florian Pollinger
Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany

P6.35  Contribution to the mechanical enhancement of load cells in precision weighing technology by means of advanced adjustment strategies
Maximilian Darnieder¹, Rafael R. Marangoni², René Theska¹, Thomas Fröhlich², Ilko Rahneberg²
¹Technische Universität Ilmenau, Department of Mechanical Engineering
²Institute of Design and Precision Engineering, Precision Engineering Group
³Institute of Process Measurement and Sensor Technology, Process Measurement Group

P6.36  Profiler tip characterization using a precision sphere
Peter Thomsen-Schmidt
Physikalisch-Technische Bundesanstalt Braunschweig und Berlin

P6.37  A laser based multilateration system for measurement of low-slope surfaces
James Norman, Xavier Tonnellier, Paul Morantz
Precision Engineering Institute, Cranfield University (United Kingdom)
P6.38 High-resolution, high-speed inline optical topography measurement system for laser micro-machining process control
1Demcon Advanced Mechatronics BV, Institutenweg 25, 7521 PH Enschede, The Netherlands
2Focal BV, Institutenweg 25A, 7521 PH Enschede, The Netherlands
3Fraunhofer Institut für Produktionstechnologie IPT, Steinbachstraße 17, 52074 Aachen, Germany
4Werkzeugmaschinenlabor WZL der Rheinisch-Westfälischen Technischen Hochschule Aachen, Steinbachstraße 25, 52074 Aachen, Germany

Session 7: Mechatronics & Control

O7.1 Concept and control strategy for active jerk-decoupling of feed-drives
B. Denkena1, F. Böhse1
1Institute of Production Engineering and Machine Tools (IFW), Leibniz Universität Hannover, An der Universität 2, 30823 Garbsen

O7.2 High accuracy downstream temperature control using a local heater
Michael Ronde1, Ronald Lamers1, Theo Ruijil1
1MI-Partners, Dillenburgstraat 9N, 5652 AM Eindhoven, The Netherlands

O7.3 Non-contact transfer method of thin plate using multiphase air flow
Katsushi Furutani, Yusuke Nakamura, Akira Urita
Toyota Technological Institute

O7.4 Hydrostatic bearings with micro gap sizes – a comparison between theoretical model and measurements
Stephan Purkart1, Matthias Fritz1, Ulrich Westenthanner2
1KERN Microtechnik GmbH, Eschenlohe, DE
2Munich University of Applied Sciences, Munich, DE

O7.5 Modelling and Validation of Position Dependant Structural Deformations of a Machine Tool Structure under Gravitational Loads
Natanael Lanz1, Daniel Spescha2, Adrian Ryser1, Nino Ceresa1 and Sascha Weikert2
1Institute of Machine Tool and Manufacturing (IWF), Swiss Federal Institute of Technology Zurich, Leonhardstrasse 21, CH-8092 Zurich, Switzerland
2Inspire AG, Technoparkstrasse 1, CH-8005 Zurich, Switzerland

O7.6 Design and realisation of a position actuator for the E-ELT primary mirror
Arjo Bos1, Gert Witvoet2, Jan Nijenhuis2, Nick Rosielle1, Maarten Steinbuch1
1Eindhoven University of Technology, Control Systems Technology, Department of Mechanical Engineering, Eindhoven, The Netherlands
2TNO, Optomechatronics department, Delft, The Netherlands
P7.01 Integrated design of controller and JDC by a constrained H2 optimization algorithm
Jun Ma1'2'3, Si-Lu Chen1'3, Chek Sing Teo1'3, Chun Jeng Kong3, Arthur Tay1'2, Wei Lin1'3, Abdullah Al Mamun1'2
1SIM Tech-1NUS Joint Lab on Precision Motion Systems, Department of Electrical and Computer Engineering, National University of Singapore, Singapore 117582
2Department of Electrical and Computer Engineering, National University of Singapore, Singapore 117583
3Agency for Science, Technology and Research, Singapore Institute of Manufacturing Technology, Singapore 138634

P7.02 Data-Based tuning of the reduced order inverse system model in a 3-DOF control structure with application to tray indexing
Xiaocong Li1, Si-Lu Chen 2, Chek Sing Teo2, Kok Kiong Tan1
1Department of Electrical and Computer Engineering, National University of Singapore
2Mechatronics Group, Singapore institute of Manufacturing Technology, Singapore

P7.03 Disturbance Compensation by Set-Point Alteration for Improved Tracking Performance
Kok Kiong Tan1, Xiaocong Li1, Si-Lu Chen2, Tong Heng Lee1
1Department of Electrical and Computer Engineering, National University of Singapore
2Mechatronics Group, Singapore institute of Manufacturing Technology, Singapore

P7.04 Lateral Vibration Control Using Real-time Motion State and Hybrid (MR-Pneumatic) Isolation Systems
HyungTae Kim, AnMok Jeong, HyoYoung Kim, JongWook An, CheolHo Kim and KyungChan Jin1
1Research Institute of Sustainable Manufacturing System, KITECH

P7.05 Feasibility study on nano tracking control of axial displacement of spindle using hydrostatic thrust bearings
Yohichi Nakao1, Yasumasa Yamada1 and Akio Hayashi1
1Kanagawa University

P7.06 Development of a high bandwidth XY stage for vibration-assisted milling
Dehong Huo1'2, Wanqun Chen2'3, Chao Lin1, Lu Zheng2, Jack Hale2
1The State Key Laboratory of Mechanical Transmission, Chongqing University, Chongqing, 400044, China
2School of Mechanical and Systems Engineering, Newcastle University, NewcastleuponTyne, NE17RU, UK
3Center for Precision Engineering, Harbin Institute of Technology, Harbin, 150001, People’s Republic of China

P7.07 Low-dimensional time-discrete models for high dynamic machine tools
E. Uhlmann1'2, T. Reis3, D. Oberschmidt1, O. Rendel3, S. Guhde2
1Fraunhofer Institute for Production Systems and Design Technology IPK, Germany
2Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany
3Universität Hamburg, Department of Mathematics
<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
<th>Institution</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>P7.08</td>
<td>Experimental investigation of an electromagnetic linear guide for ultra-precision high performance machining</td>
<td>B. Denkena, D. Dahlmann, R. Krüger</td>
<td>Institute of Production Engineering and Machine Tools (IFW), Leibniz Universität Hannover, An der Universität 2, 30823 Garbsen, Germany</td>
<td>447</td>
</tr>
<tr>
<td>P7.09</td>
<td>Microscopic behaviour of ultraprecision positioning mechanism driven by ball screw with external axial load</td>
<td>Shigeo Fukada, Soichiro Koike</td>
<td>Shinshu University, Japan</td>
<td>449</td>
</tr>
<tr>
<td>P7.10</td>
<td>Levitation characteristics of an actuator in a non-contact mechatronic system</td>
<td>Akihiro Torii, Kento Tanaka, Suguru Mototani, Kae Doki</td>
<td>Aichi Institute of Technology, Aichi, Japan</td>
<td>451</td>
</tr>
<tr>
<td>P7.11</td>
<td>Architecture Design for Advanced Motion Control</td>
<td>Ir. Wilco Pancras</td>
<td>Bosch-Rexroth, DC- A/EAN</td>
<td>453</td>
</tr>
<tr>
<td>P7.12</td>
<td>Damping of transient vibrations of head on top of flexible column of milling machine using electromagnetic hybrid dynamic vibration absorber</td>
<td>Eiji Kondo, Taishi Nishimura, Daisuke Tabuchi</td>
<td>Kagoshima University</td>
<td>455</td>
</tr>
<tr>
<td>P7.13</td>
<td>Positioning of a 3-DOF inchworm stage with optical navigation</td>
<td>Akihiro Torii, Yuta Mitsuyoshi, Suguru Mototani, Kae Doki</td>
<td>Aichi Institute of Technology, Aichi, Japan</td>
<td>457</td>
</tr>
<tr>
<td>P7.15</td>
<td>ITRS roadmap is pushing wafer handling to milli-Kelvin performance</td>
<td>Marnix Tas, Joeri Loi, Niels de Kleijn, Willem Dijkstra</td>
<td>Sioux CCM (<a href="http://www.sioux.eu">www.sioux.eu</a>), commissioned by VDL ETG (<a href="http://www.vdletg.com">www.vdletg.com</a>), Demcon (<a href="http://www.demcon.nl">www.demcon.nl</a>), commissioned by VDL ETG (<a href="http://www.vdletg.com">www.vdletg.com</a>), ASML (<a href="http://www.asml.com">www.asml.com</a>), VDL ETG (<a href="http://www.vdletg.com">www.vdletg.com</a>)</td>
<td>461</td>
</tr>
</tbody>
</table>
P7.17 The Performance Potential of Superconducting Linear and Planar Motors
H.B. Koolmees¹, B.J.H. de Bruyn², J.P.M.B. Vermeulen¹, J.W. Jansen², E.A. Lomonova²
¹Eindhoven University of Technology, Dep. of Mechanical Engineering, Control Systems Technology – Mechatronic Systems Design
²Eindhoven University of Technology, Dep. of Electrical Engineering, Electromechanics and Power Electronics

P7.18 Fabrication of the lens array mould with embossing type surface by using a fast tool servo with large displacement up to hundreds of micro meter
Ho-Sang Kim¹, Chan-Hee Lee¹, Won-Gi Lee¹
¹Center for Robot and Manufacturing Technology, Institute for Advanced Engineering, Yongin, Kyonggi-do, South Korea

P7.19 Efficient Wavelet-based Discriminant Measure for Surface Defect Detection on Steel Plate
Gyung-Bum Kim¹, Soon-Hwan Moon²
¹Aeronautical & Mechanical Design Eng. Korea National Univ. Of Transportation
²Chungbuk Health & Science Univ. KOREA

P7.20 Magnetically levitated linear drive with repulsive magnetic guidance and nearly zero power emission
Markus Raab¹, Wolfgang Schinköthe¹
¹Institute of Design and Production in Precision Engineering, University of Stuttgart

P7.21 Inertial vibration cancellation for floor fields and stiff machine pedestals
Servaas bank, Ronald Rijkers, Johan van Seggelen and Bernhard Bakker, all work for MECAL High-tech / Systems

P7.22 Development of actively compensated ultra-precision hybrid machining system
Seung-Kook Ro¹, Gyungho Khim¹, Jong-Won Yun¹, Tae-Bum Seo², Tae-Jo Ko³ & Jong-Kweon Park¹
¹Department of ultra-precision machines and systems, Korea institute of machine materials, Daejeon, Korea
²Department of mechanical engineering, Inha University, Incheon, Korea
³Department of mechanical engineering, Youngnam University, Daegu, Korea

Session 8: Applications of Precision Engineering in Biomedical Sciences

P8.01 Determination of efficiency of orthodontic treatment by using engineering tools
Martina Brumini¹, Ervin Kamenar², Petar Glijušić², Saša Zelenika² and Stjepan Špalj¹
¹University of Rijeka, School of Medicine, Braće Branchetta 20, 51000 Rijeka, CROATIA
²University of Rijeka, Faculty of Engineering & Centre for Micro and Nano Sciences and Technologies, Vukovarska 58, 51000 Rijeka, CROATIA
P8.02 E-beam sterilization of microstructures in titanium surfaces for medical implants 481
Sebastian Winkler¹, Marleen Dietze², Jan Edelmann¹
¹Fraunhofer Institute for Machine Tools and Forming Technology IWU, Chemnitz, Germany
²Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, Dresden, Germany

P8.03 Dimensional control in pre-sintered Zirconia machining for Double Pivot Micro Bearings of blood pumps 483
Mariana Maria Aparecida Pinto Hernandes¹, Joaquim Antonio Ferreira da Rocha¹, Michele Aparecida Saito¹, Sérgio Yoshinobu Araki¹, Pamela Silva¹, Rodrigo Lima Stoeterau², Eduardo Guy Perpetuo Bock¹
¹Federal Institute of Technology in Sao Paulo
²Escola Politecnica, University of Sao Paulo

P8.04 Textured layer of titanium oxide in titanium pure to endothelialize ventricular assist devices 485
Rosa Corrêa Leoncio de Sá¹³, Rodrigo Lima Stoeterau², Evandro Drigo¹, Bruno Utiyama¹, Jeison Fonseca¹, Edir Leal¹, Tarcísio Leão⁵, Mariana Hermandes⁵, Aron Andrade¹, Eduardo Guy Perpétuo Bock³
¹Institute Dante Pazzanese of Cardiology, São Paulo, Brazil
²Polytechnic School of Sao Paulo University
³Institute Federal of Technology in Sao Paulo, Brazil

P8.05 Microstructure and tribology regarding precision studies of micro-sintered ceramic bearings for Ventricular Assist Devices 487
Sergio Yoshinobu Araki¹², Rodrigo Lima Stoeterau³, Pâmela Catherine Florentino da Silva¹, Michele Aparecida Saito¹, José Ricardo Corrêa de Sousa Sobrinho¹, Antônio Luiz Marques Júnior¹, Douglas Fontainha de Sousa¹, Eduardo Guy Perpétuo Bock¹, Antônio Celso Fonseca de Arruda²
¹Federal Institute of Education, Science and Technology of Sao Paulo
²Faculty of Mechanical Engineering of Campinas State University
³Sao Paulo University

P8.06 Assembly analysis of titanium dental implants using X-ray computed tomography 489
Filippo Zanini¹, Simone Carmignato¹, Enrico Savio²
¹Department of Management and Engineering, University of Padova, Vicenza, Italy
²Department of Industrial Engineering, University of Padova, Padova, Italy

P8.07 Prototype for optical applications that microscopically affect the cancer cell diagnosis in biological sciences 491
Breno Yuzo Tachibana Nishida¹, Gustavo Alonso Pereira², Evandro Drigo³, Marcello Fonseca⁴, Roberto Baginski Batista Santos⁴, Marcilei Aparecida Guazzelli Silveira⁴, Eduardo Guy Perpétuo Bock¹
¹Instituto Federal de Educação, Ciência e Tecnologia de São Paulo, Rua Pedro Vicente, 625
²Instituto do Câncer do Estado de São Paulo, Av. Dr. Arnaldo, 251
³Instituto Dante Pazzanese de Cardiologia, Av. Dr. Dante Pazzanese, 500
⁴Fundação Educacional Inaciana, Av. Humberto de Alencar Castelo Branco, 3972-B
Session 9: Replication and Additive Manufacturing

P9.01 Replication quality assessment and uncertainty evaluation of a polymer precision injection moulded component
Federico Baruffi¹, Matteo Calaon¹, Guido Tosello¹, Hans N. Hansen¹, Manfred Prantl², Nathan Miller³
¹Technical University of Denmark, Department of Mechanical Engineering, Kgs. Lyngby, Denmark
²Alicona Imaging GmbH, Raaba, Austria
³Flann Microwave Limited, Cornwall, United Kingdom

P9.02 Reproducibility of 3D printed structures
Gorana Baršić¹, Ana Pilipović², Marko Katić³
¹Faculty of Mechanical Engineering and Naval Architecture, Ivana Lučića 5, 10000 Zagreb, Croatia

P9.03 Measurement of in-mould shear rates by x-ray particle image velocimetry
E. Uhlmann¹, C. Hein¹, D. Oberschmidt¹
¹Fraunhofer Institute for Production Systems and Design Technology IPK, Germany
²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany

P0.04 Effects of process temperature in the high speed, mask-less, precision laser deposition of micro-tungsten tracks on silicon, copper and stainless-steel
Jyi Sheuan Ten¹, Martin Sparkes¹, William O’Neill¹
¹Centre for Industrial Photonics, Institute for Manufacturing, Department of Engineering, University of Cambridge

P9.05 Micro Injection Molding Polimeric Diffraction Grating
Renê Mendes Granado¹, Renato Goulart Jasinevicius², Guiseppe Antonio Cirino³, José Ricardo Camilo⁴
¹Instituto de Matemática e Estatística- CTC- UERJ. CEP 20550- 013. Rio de Janeiro-RJ. Brazil
²Lab. Eng. de Precisão – Depto. de Engenharia Mecânica – EESC-USP.CEP 13566-590. São Carlos – SP. Brazil
³Centro de Ciências Exatas e de Tecnologia – CCET-UFSCAR.CEP 13565-905. São Carlos – SP. Brazil
⁴Instituto Federal de Educação, Ciencia e Tecnologia de São Paulo-IFSP.CEP 15503-110. Votuporanga – SP. Brazil

P9.06 Enhancing CT porosity measurements on metal additive manufactured parts
Filippo Zanini¹, Simone Carmignato¹, Enrico Savio²
¹Department of Management and Engineering, University of Padova, Vicenza, Italy
²Department of Industrial Engineering, University of Padova, Padova, Italy

P9.07 Feasibility study on integrated process/product quality assurance framework for precision injection moulding based on vibration monitoring
Nikolaos Giannenas¹, Rene Gammelby¹, Guido Tosello¹, Dmitri Tcherniak², Yang Zhang¹
¹Department of Mechanical Engineering, Technical University of Denmark
²Brüel & Kjær Sound and Vibration Measurement A/S
P9.08  A comparison of reflectance properties on polymer
F. Regi¹, D. Li¹, Y. Zhang¹, J. B. Nielsen², M. H. Madsen³, G. Tosello¹, J. R. Frisvad², H. Aanaes²
¹Technical University of Denmark, Department of Mechanical Engineering, Kgs. Lyngby, Denmark
²Technical University of Denmark, Department of Applied Mathematics and Computer Sciences, Kgs. Lyngby, Denmark
³Danish National Metrology Institute, Kgs. Lyngby, Denmark

P9.09  Investigation of process parameters influence on flash formation in injection moulding of polymer micro features through design of experiments
Abdelkhalik Eladl¹², Guido Tosello¹, Rania Mostafa², Hassan Soltan², Hans N. Hansen¹
¹Technical University of Denmark, Department of Mechanical Engineering, Denmark
²Mansoura University, Faculty of Engineering, Production Engineering and Mechanical Design Department, Egypt