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2017

SPIE OPTIFAB

TECHNICAL PROGRAM

Conference and Courses: 16–19 October 2017

Exhibition: 17–19 October 2017

Rochester Riverside Convention Center
Rochester, New York, USA

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American Precision Optics Manufacturers Association

Conference and Courses: 16–19 October 2017

Exhibition: 17–19 October 2017

Rochester Riverside Convention Center
Rochester, New York, USA

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American Precision Optics Manufacturers Association

The American Precision Optics Manufacturers Association represents a broad constituency of precision optics manufacturers, and the supporting industry along with academic associates, whose mutual interest is the advancement and expansion of optics manufacturing and technology.

www.APOMA.org



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SPIE and APOMA would like to express their deepest appreciation to the symposium chairs, conference chairs, program committees, session chairs, and authors who have so generously given their time and advice to make this symposium possible.

The symposium would not be possible without the dedicated contribution of our participants and members. This program is based on commitments received up to the time of publication and is subject to change without notice.

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Daily Event Schedule

MONDAY • 16 October	TUESDAY • 17 October	
MORNING		
<p>SESSION 1: Grinding and Polishing Processes I 8:00 to 10:00 am</p>	<p>SESSION 5: PLENARY PRESENTATIONS: Presentation of the 2016 Rudolf Kingslake Medal and Prize to Peter de Groot and James F. Biegen, 8:30 to 8:40 am Freeform Optics: current challenges for future serial production (Schindler, etc.) 8:40 to 9:15 am Concept for a new approach to realize complex optical systems in high volume (Grüger, etc.) 9:15 to 9:50 am</p>	
<p>SC1169 Optical Manufacturing Fundamentals (Williamson) 8:30 am to 5:30 pm</p>		
<p>SC015 Fastening Optical Elements with Adhesives (Daly) 8:30 am to 12:30 pm</p>		
<p>SC700 Understanding Scratch and Dig Specifications (Aikens) 8:30 am to 12:30 pm</p>		
	<p>EXHIBITION — Walk the floor and see the latest in optical technology 10:00 am to 5:00 pm</p> <p>Job Fair 10:00 am to 5:00 pm</p>	
<p>SESSION 2: Grinding and Polishing Processes II 10:30 am to 12:30 pm</p>	<p>SESSION 6: Optical Design and Engineering 10:30 am to 12:10 pm</p>	
Lunch		

WEDNESDAY • 18 October

THURSDAY • 19 October

SESSIONS

SESSION 9:
Freeform Fabrication and Testing
8:00 to 10:00 am

SESSION 13:
Optical Materials
8:00 to 10:00 am

SC863 Introduction to Modern Optical Drawings- the ISO 10110 Standard (Aikens)
8:30 am to 12:30 pm

SC1040 Geometric Dimensioning and Tolerancing (Prystaj) 8:30 am to 5:30 pm

SC1171 Seeing, Analyzing and Controlling Mid-Spatial Frequency (MSF) and Surface Roughness Errors on Optical Surfaces (DeGroote Nelson) 8:30 am to 12:30 pm

latest in optical fabrication technologies

10:00 am to 6:00 pm

10:00 am to 3:00 pm

Job Fair
10:00 am to 6:00 pm

INDUSTRY EVENT:
Training America's Optics Technicians (Alexis Vogt)
10:30 am to 12:00 noon

SESSION 10:
Metrology I
10:30 am to 12:10 pm

SESSION 14:
Coating and Cleaning
10:30 am to 12:10 pm

Break

Daily Event Schedule

MONDAY • 16 October	TUESDAY • 17 October	
AFTERNOON		
<p>SC1017 Optics Surface Inspection Workshop (Aikens) 1:30 to 5:30 pm</p>	<p>SC1003 Optical Scatter Metrology for Industry (Stover) 1:30 to 5:30 pm</p>	
<p>SESSION 3: Grinding and Polishing Processes III 1:30 to 3:30 pm</p>	<p>SC1114 The Proper Care of Optics: Cleaning, Handling, Storage and Shipping (Schalck) 1:30 to 5:30 pm</p>	
	<p>SESSION 7: Diamond Turning 1:40 to 3:20 pm</p>	
<p>SESSION 4: Additive Manufacturing 4:00 to 5:40 pm</p>	<p>SESSION 8: Molding 3:50 to 4:30 pm</p>	
	<p>19th Annual Photonics Clambake 5:30 pm</p>	

WEDNESDAY • 18 October

THURSDAY • 19 October

SESSIONS

INDUSTRY EVENT:
**U.S. Research Funding and
Regulatory Changes: How They
Affect Your Business**
(Jennifer Douris O’Byran)
1:30 to 5:00 pm

INDUSTRY EVENT:
**Recent Developments at the
Luminate Accelerator**
(Sujatha Ramanujan)
1:00 to 1:30 pm

**SC1224 Fundamentals of Optical
Engineering** (Vogt)
1:30 to 5:30 pm

SESSION 11:
Metrology II
1:40 to 3:00 pm

INDUSTRY EVENT:
**The Impact of Standards on
Science, Technology, and
Business in the World of Optics**
(Allen Krisiloff) 3:00 to 4:30 pm

SESSION 12:
Metrology III
3:30 to 4:30 pm

**Networking Reception and
Poster Viewing**
4:30 to 6:00 pm

Symposium-Wide Plenary Session and Award Presentation

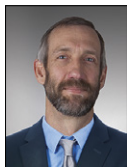
Tuesday 17 October 2017 • 8:30 to 9:50 am

Location: Highland A/B

Don't miss these world-class speakers discussing game-changing technology and valuable insights.

8:30 to 8:40 am

AWARD PRESENTATION



Peter de Groot,
Zygo Corporation
(United States)



James F. Biegen,
Zygo Corporation
(United States)

The 2016 Rudolf Kingslake Medal and Prize is presented to Peter de Groot and James F. Biegen for their paper entitled "Interference microscope objectives for wide-field areal surface topography measurements," Opt. Eng. 55, 074110, published in the July 2016 issue of Optical Engineering.

8:40 to 9:15 am

FREEFORM OPTICS: CURRENT CHALLENGES FOR FUTURE SERIAL PRODUCTION



Christian Schindler,
Carl Zeiss Jena GmbH (Germany)

One of the major developments in the optics industry recently is the commercial manufacturing of freeform surfaces for optical mid- and high performance systems. The loss of limitation on rotational symmetry enables completely new optical design solutions – but causes completely new challenges for the manufacturer too. Adapting the serial production from radial-symmetric to freeform optics cannot be done just by the extension of machine capabilities and software for every process step. New solutions for conventional optics productions or completely new process chains are necessary.

9:15 to 9:50 am

CONCEPT FOR A NEW APPROACH TO REALIZE COMPLEX OPTICAL SYSTEMS IN HIGH VOLUME



Heinrich Grüger,

Fraunhofer-Institut für Photonische Mikrosysteme
(Germany)

We have invented a new approach for the fabrication of off-axis optical systems using planar mounting in combination with a novel folding principle. Lens based optics are limited by chromatic aberration. Applying mirrors helps to suppress chromatic aberrations. Most tools for volume production apply stacking of components in planar technology but off-axis systems are assembled by manually alignment. The novel approach applies planar substrates featuring preprocessed bending lines. After placing the components the sides of the substrate are folded and the optical path is generated. For proof of concept a camera has been realized from a 3D printed substrate successfully.



Special Events

19th Annual Photonics Clambake

Tuesday 17 October • 5:30 to 9:00 pm

Location: Hyatt Ballroom

Tickets are sold separately



Attendees and Exhibitors are welcome to attend. Limited space available. Contact Michael Naselaris, Sydor Inc. via email at miken@sydor.com to inquire about tickets.

PRESENTED BY: **SYDOR**
OPTICS

Networking Reception and Poster Session

Wednesday 18 October 2017 • 4:30 to 6:00 pm

Location: Empire Hall and Lobby

Symposium attendees are invited to attend the Poster/Networking Reception on Wednesday evening. Authors of poster papers will be present during the Poster Session to answer questions. The reception provides an opportunity for attendees to meet with colleagues, network, view poster papers, and interact with the authors. Refreshments will be served in the Exhibition Hall.

Attendees are required to wear their conference badges to this session.

DAILY SCHEDULE

Poster Set Up - Beginning at 10:00

Extended Poster Viewing from 10:00 to 4:30

Poster Session and Reception from 4:30 to 6:00

(with authors present)

POSTER AUTHOR SET-UP INSTRUCTIONS

Paper numbers will be included on the poster boards in numerical order; please find your paper number and display your poster in the designated space. Authors are encouraged to display their posters early in the day for extended viewing. A poster author or coauthor is required to stand by the poster during the scheduled poster session to answer questions from attendees. Presenters who have not displayed their posters on their assigned board at least one-half hour before the interactive poster session begins will be considered a “no show”. Please remove posters at the end of the poster session. Posters not removed will be considered unwanted and will be discarded.



Industry Events

These sessions provide valuable information and networking for anyone, from engineers to CEOs, looking for business insight and opportunities. These sessions take place during exhibition hours at the SPIE Industry Stage, located in the Exhibition Hall and are open to all exhibition visitors and conference attendees.

U.S. RESEARCH FUNDING AND REGULATORY CHANGES: HOW THEY AFFECT YOUR BUSINESS

Wednesday 18 October 2017 • 1:30 to 3:00 pm
Location: Industry Stage, Exhibition Hall



SPEAKER

Jennifer Douris O'Bryan

SPIE Government Affairs Director

Join us for a big picture overview of research and development (R&D) funding for fiscal year 2018 and a look at some of the broader issues coming to bear in a fractured Congress this year that could affect your business. Regulatory changes that affect export controls will also be discussed, including how you can affect the ever-changing landscape of the U.S. and international export control system.

THE IMPACT OF STANDARDS ON SCIENCE, TECHNOLOGY, AND BUSINESS IN THE WORLD OF OPTICS

Wednesday 18 October 2017 • 3:00 to 4:30 pm

Location: Industry Stage, Exhibition Hall



MODERATOR

Allen Krisiloff

Executive Director, Optics and Electro-Optics Standards Council (OEOSC)

With the increasing importance of advanced imaging systems in aerospace and defense applications, a group of U.S. optical engineers and other scientists who manufacture, test, and use infrared materials have formed a working group to update standards for measuring optical material properties in the IR.

Today's panelists will discuss the impact that Standards have had on their technical and business operations. They will relate some personal experiences and take questions from the audience. Q&A to follow.

Allen Krisiloff is currently President of Triptar Lens Company, Inc. He also serves as Executive Director of the Optics and Electro-Optics Standards Council and Leader of the US TAG to ISO TC 172, Optics and Photonics.

PANELISTS:



David Aikens

President and Founder, Savvy Optics Corp



Bruce Truax

Manager of Optical and Systems Engineering, Zygo Corporation



Daniel Palmari, Jr.

Missiles & Fire Control, Lockheed Martin



Tom Ward

Director of Quality Assurance and Operational Excellence, Sydor Optics

Industry Events

TRAINING AMERICA'S OPTICS TECHNICIANS

Thursday 19 October 2017 • 10:30 am to Noon

Location: Industry Stage, Exhibition Hall

The global optics, photonics, and imaging industry is large and growing faster than the overall economy. This, coupled with industry reports that 20% of experienced technicians and engineers are approaching retirement, is creating even greater need for skilled optics and photonics technicians. In fact, 75% of Upstate New York skilled optics technician job openings go unfilled annually due to an insufficient number of optics and photonics graduates.

Learn how Monroe Community College, the nation's only community college awarding associate degrees in optics, is educating diverse optics and photonics technicians with the skills to meet the workforce needs.



SPEAKER

Alexis Vogt

Endowed Chair & Associate Professor,
Monroe Community College

Alexis KS Vogt, Ph.D. is Endowed Chair
and Associate Professor of Optics at
Monroe Community College. In addition

to teaching responsibilities, Dr. Vogt was appointed to her role at MCC in September 2015 to strengthen and grow the optics and photonics program – the nation's oldest two-year degree program for training technicians to work in the optics and photonics industry. Dr. Vogt received her B.S. as well as her Ph.D. in Optics

from the University of Rochester Institute of Optics where her research focused on polarization engineering, coherence theory, and microscopy. Prior to joining MCC, Dr. Vogt was the Applications & Business Development Manager at Melles Griot and previous to that, designed contact lenses and intraocular lenses for Bausch + Lomb. In addition to her industry experience, Dr. Vogt holds three patents and has authored numerous papers, presentations, and publications in the field, including the definitions of "light" and "polarization" for The World Book Encyclopedia. She dedicates time to youth outreach and has been involved with coordinating and presenting optics demonstrations to children and educators both within the Rochester community and internationally. Dr. Vogt is recipient of the Rochester Business Journal 2016 "Forty Under 40" award recognizing individuals under the age of 40 who have achieved professional success and have made significant contributions to the Rochester community.



RECENT DEVELOPMENTS AT THE LUMINATE ACCELERATOR

Thursday 19 October 2017 • 1:00 to 1:30 pm

Location: Industry Stage, Exhibition Hall

Luminate is a new \$5M per year accelerator for optics, photonics, and imaging enabled startups, including but not limited to: machine vision, inspection, biophotonics, security, surveillance, augmented & virtual reality, and autonomous vehicles. Teams will be competing for one of ten available slots in the first cohort, guaranteeing them a minimum investment of \$100,000, and potentially as much as \$1M. Corporate partners, VCs and domain experts are invited to participate in this unique and high impact program.

Come hear an update from the Luminate team, especially if you are thinking about starting your own company.



SPEAKER

Sujatha Ramanujan

Managing Director, Luminate

Sujatha Ramanujan is serial entrepreneur and seasoned executive with 25 years of experience in Clinical Devices and in Consumer Electronics. Sujatha has started, built and grown three startup businesses in cardiac surgical equipment, optical communications and nano materials. In addition, as CTO and Product Line Manager of Mammography CAD and Pediatric Businesses within Kodak and Carestream, her team developed and launched clinical equipment and Clinical IT on every continent. Sujatha has held scientific, technical leadership, and laboratory head positions in Chrysler Corporation, GE, Kodak, Carestream, and Intrinsic Materials. She holds 28 issued US patents. As a corporate investor for Kodak, then later working with regional investment councils she provides guidance to start-ups, M&A strategies for growing businesses and vetting of technologies to investors. She has served on investment advisories in US, Canada, and Israel. Dr. Ramanujan holds a PhD in Electrical Engineering from the University of Michigan and is an Executive Board Member of the National Women's Hall of Fame.

Industry Events



JOB FAIR

Location: Exhibition Hall

Tuesday 17 October10:00 am to 5:00 pm

Wednesday 18 October10:00 am to 6:00 pm

Employers are looking for you for positions like optical engineering, military optics, software development and more. Stop by the Job Fair, and bring copies of your resume to increase your chances of getting hired.

Plus, stop by the SPIE Career Center, at **Booth #408**, and learn more about the SPIE Career Center, recruiting, hiring, online resources and more.

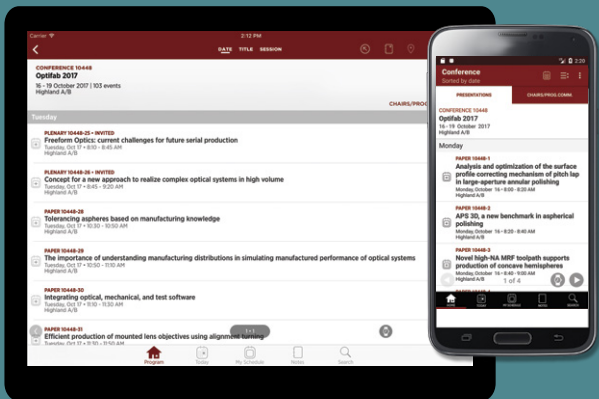


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The image displays two views of the SPIE Optifab 2017 app. The tablet view shows a list of events for Tuesday, October 17, 2017, including:

- CONFERENCE 10448**
Optifab 2017
15 - 19 October 2017 | 103 events
Highland A/B
- PLENARY 10448-25 - INVITED**
Freeform Optics: current challenges for future serial production
Tuesday, Oct 17 | 9:00 - 9:45 AM
Highland A/B
- PLENARY 10448-26 - INVITED**
Concept for a new approach to realize complex optical systems in high volume
Tuesday, Oct 17 | 9:45 - 10:20 AM
Highland A/B
- PAPER 10448-28**
Tolerancing aspheres based on manufacturing knowledge
Tuesday, Oct 17 | 9:30 - 10:00 AM
Highland A/B
- PAPER 10448-29**
The importance of understanding manufacturing distributions in simulating manufactured performance of optical systems
Tuesday, Oct 17 | 9:30 - 10:00 AM
Highland A/B
- PAPER 10448-30**
Integrating optical, mechanical, and test software
Tuesday, Oct 17 | 9:30 - 10:00 AM
Highland A/B
- PAPER 10448-31**
Efficient production of mounted lens objectives using alignment turning
Tuesday, Oct 17 | 9:30 - 10:00 AM

The smartphone view shows the app's main interface with a search bar and a list of presentations for Monday, October 16, 2017:

- PAPER 10448-1**
Analysis and optimization of the surface profile correcting mechanism of pitch lag in large-aperture annular polishing
Monday, October 16 | 8:00 - 9:20 AM
Highland A/B
- PAPER 10448-2**
APS 30, a new benchmark in aspherical polishing
Monday, October 16 | 8:20 - 9:40 AM
Highland A/B
- PAPER 10448-3**
Novel high-NA MRF toolpath supports production of concave hemispheres
Monday, October 16 | 8:40 - 9:50 AM
Highland A/B



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OPTIFAB EXHIBITION

EXHIBITION DAYS AND TIMES

Tuesday 17 October10:00 am to 5:00 pm

Wednesday 18 October10:00 am to 6:00 pm

Poster Reception/Networking . . . 4:30 pm to 6:00 pm

Thursday 19 October10:00 am to 3:00 pm

Experience North America's premier optical fabrication show

Come walk the floor at North America's largest optical fabrication exhibition. Your badge will give you access to over 180 leading companies, Take advantage of this valuable opportunity to learn new methods, improve your processes, cut costs, and discuss your requirements face-to-face.

Product Demos

Learn new possibilities at these in-booth sessions, which are free to all attendees. Exhibiting companies will be showcasing products in half-hour demonstrations.



Wednesday 18 October 2017 • Exhibition Hall

10:30 am

REMOVING THE SUBJECTIVE ANALYSIS OF SCRATCH-DIG

RedLux • Booth #101

Mike Hobby

The non-contact metrology system OptiLux SD offers fully-automated, operator-independent surface measurement and analysis, providing you and your customers with a non-disputable assurance of quality.

11:30 am

FLATNESS CONTROL, PLANO SURFACE “COLD BLOCKING” TECHNIQUE

Universal Photonics • Booth #815

Troy Alley

COLD BLOCKING maintains parallel, critical surface tolerances; group similar substrates & block on same plane, scratch free, using semi-hard, hi-tack, C.T.E. adhesive & monofilament blocking fabric.

12:30 pm

MAXIMUM PRECISION FOR SMALL PARTS

Carl Zeiss Industrial Metrology • Booth #804

Hugh Convery

ZEISS MICURA sets the standard in the compact class. Despite its small size, ZEISS MICURA makes no compromises when it comes to accuracy.

Thursday • 19 October 2017 • Exhibition Hall

10:30 am

BRUKER OPTICAL PROFILERS FOR INSPECTION OF FABRICATED OPTICAL COMPONENTS

Bruker Corporation • Booth #1346

Sandip Basu

Observe Bruker's desktop ContourGTK optical profiler and catch up on the latest technology advances while watching the exceptional ease of use for simple roughness and texture qualification of samples.

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MONDAY

Fastening Optical Elements with Adhesives

SC015 • Course Level: Intermediate • CEU: 0.4 • 8:30 am to 12:30 pm
Instructor: **John Daly**

Understanding Scratch and Dig Specifications

SC700 • Course Level: Introductory • CEU: 0.4 • 8:30 am to 12:30 pm
Instructor: **David Aikens**

Optics Surface Inspection Workshop

SC1017 • Course Level: Introductory • CEU: 0.4 • 1:30 pm to 5:30 pm
Instructor: **David Aikens**

Optical Manufacturing Fundamentals

SC1169 • Course Level: Introductory • CEU: 0.7 • 8:30 am to 5:30 pm
Instructor: **Ray Williamson**

TUESDAY

Optical Scatter Metrology for Industry

SC1003 • Course Level: Intermediate • CEU: 0.4 • 1:30 pm to 5:30 pm
Instructor: **John Stover**

The Proper Care of Optics: Cleaning, Handling, Storage and Shipping

SC1114 • Course Level: Introductory • CEU: 0.4 • 1:30 pm to 5:30 pm
Instructor: **Robert Schalck**

WEDNESDAY

Introduction to Modern Optical Drawings – the ISO 10110 Standard

SC863 • Course Level: Introductory • CEU: 0.4 • 8:30 am to 12:30 pm
Instructor: **David Aikens**

Fundamentals of Optical Engineering

SC1224 • Course Level: Introductory • CEU: 0.4 • 1:30 pm to 5:30 pm
Instructor: **Alexis Vogt**

THURSDAY

Geometric Dimensioning and Tolerancing

SC1040 • Course Level: Introductory • CEU: 0.7 • 8:30 am to 5:30 pm
Instructor: **Walt Prystaj**

Seeing, Analyzing and Controlling Mid-Spatial Frequency (MSF) and Surface Roughness Errors on Optical Surfaces

SC1171 • Course Level: Introductory • CEU: 0.4 • 8:30 am to 12:30 pm
Instructor: **Jessica DeGroot Nelson**

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We are confident that once you experience an SPIE course for yourself you will look to us for your future education needs. However, if for any reason you are dissatisfied, we will gladly refund your money. We just ask that you tell us what you did not like; suggestions for improvement are always welcome.

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JOB FAIR



**LAND THE
PERFECT JOB.**

VISIT THE JOB FAIR IN THE EXHIBITION HALL

FREE ADMISSION

Tuesday · 10 am to 5 pm

Wednesday · 10 am to 6 pm

See participating companies like these and more.

CORNING

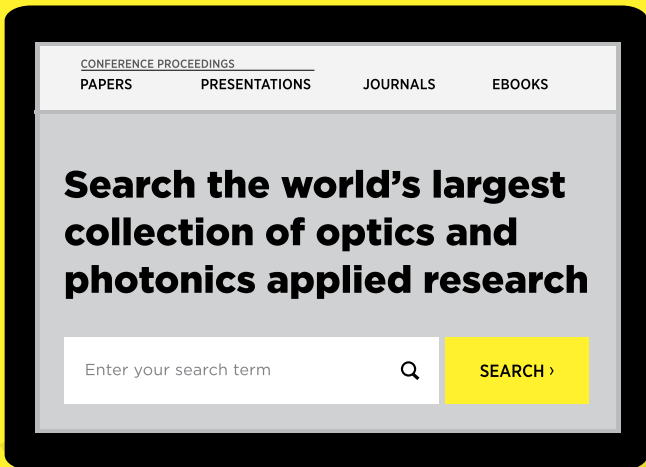
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CONFERENCE 10448

Monday–Thursday 16–19 October 2017
Proceedings of SPIE Vol. 10448

Optifab 2017

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MONDAY 16 OCTOBER

SESSION 1

Room: Highland A/B Mon 8:00 am to 10:00 am

Grinding and Polishing Processes I

Session Chair: **Sebastian Stoebenau**,
OptoTech Optikmaschinen GmbH (Germany)

- 8:00 am: **Analysis and optimization of surface profile correcting mechanism of the pitch lap in large-aperture annular polishing**, Huifang Zhang, Shanghai Univ. (China); Minghong Yang, Xueke Xu, Lunzhe Wu, Shanghai Institute of Optics and Fine Mechanics (China); Weiguang Yang, School of Materials Science and Engineering, Shanghai University (China); Jianda Shao, Shanghai Institute of Optics and Fine Mechanics (China) [10448-1]
- 8:20 am: **APS 3D: a new benchmark in aspherical polishing**, Dan Gauch, Schneider Optical Machines Inc. (USA); Dalibor Mikulic, Christian Veit, Schneider GmbH & Co. KG (Germany) [10448-2]
- 8:40 am: **Novel high-NA MRF toolpath supports production of concave hemispheres**, Chris Maloney, Christopher M. Supranowitz, Paul Dumas, QED Technologies, Inc. (USA) [10448-3]
- 9:00 am: **Ultrasonic grinding of optical materials**, Michael J. Cahill, Michael J. Bechtold, Edward Fess, Thomas Stephan, Rob Bechtold, OptiPro Systems (USA) [10448-4]
- 9:20 am: **Innovative processing of meter-class optics**, Matthias Pfaff, OptoTech Optikmaschinen GmbH (Germany) [10448-5]
- 9:40 am: **Etching hard brittle optical materials by masked ion beam**, Yun Li, Taotao Fu, Jia Xin, Tingwen Xing, Institute of Optics and Electronics, Chinese Academy of Sciences (China) [10448-6]
- Coffee Break Mon 10:00 am to 10:30 am

SESSION 2

Room: Highland A/B Mon 10:30 am to 12:30 pm

Grinding and Polishing Processes II

Session Chair: **Jessica Nelson**, Optimax Systems, Inc. (USA)

- 10:30 am: **New surface smoothing technologies for manufacturing of complex shaped glass components**, Sebastian Henkel, Anne-Marie Schwager, Jens Bliedtner, Kerstin Götze, Ernst-Abbe-Hochschule Jena (Germany); Edda Rädlein, Technische Univ. Ilmenau (Germany); Christian Schulze, Ernst-Abbe-Hochschule Jena (Germany); Martin Gerhardt, Michael Fuhr, Effgen-Laport Schleiftechnik (Germany) [10448-7]

- 10:50 am: **Controlling material removal rate and surface quality in femtosecond laser processing of optical materials**, Lauren L. Taylor, Joshua C. Frechem, Rochester Institute of Technology (USA); Hainian Han, Chinese Academy of Sciences (China) and Rochester Institute of Technology (USA); Jing Xu, Thomas R. Smith, Michael Pomerantz, John C. Lambropoulos, Univ. of Rochester (USA); Jie Qiao, Rochester Institute of Technology (USA) [10448-8]
- 11:10 am: **Beam shaping for efficient femtosecond laser processing of optical glass**, Michael Seiler, Lin J. Schubert, Ernst-Abbe-Hochschule Jena (Germany); Christian Schindler, Carl Zeiss Jena GmbH (Germany); Jens Bliedtner, Ernst-Abbe-Hochschule Jena (Germany). [10448-9]
- 11:30 am: **Novel lubrication strategies for lapping, grinding, and polishing of optical substrates**, Joshua Cobb, Niraj Mahadev, Chemetall Precision Microchemicals (USA) [10448-10]
- 11:50 am: **The broad utility of Trizac diamond tile**, John Gaglardi, Vincent Romero, Bruce A. Sventek, Lijun Zu, 3M Co. (USA) [10448-11]
- 12:10 pm: **Impact of slurry pH on material removal rate and surface quality of polished fused silica**, Melanie Redien, Cedric Maunier, Bertrand Remy, Karine Poliakoff-Lerliche, Jérôme Néauport, Commissariat à l'Énergie Atomique (France) [10448-12]
- Lunch Break Mon 12:30 pm to 1:30 pm

SESSION 3

Room: Highland A/B Mon 1:30 pm to 3:30 pm

Grinding and Polishing Processes III

Session Chair: **John C. Lambropoulos**, Univ. of Rochester (USA)

- 1:30 pm: **Large MRF capabilities at Harris**, James T. Mooney, Harris Corp. (USA). [10448-13]
- 1:50 pm: **New high-precision deep concave optical surface manufacturing capability**, François Piché, Corning Research and Development Corp. (USA); Chris Maloney, QED Technologies, Inc. (USA); Steven J. VanKerkhove, Corning Research and Development Corp. (USA); Christopher M. Supranowitz, Paul Dumas, QED Technologies, Inc. (USA); Keith J. Donohue, Corning Research and Development Corp. (USA) [10448-14]
- 2:10 pm: **Precision production: enabling deterministic throughput for precision aspheres with MRF**, Chris Maloney, QED Technologies, Inc. (USA); Navid Entezarian, Thorlabs, Inc. (USA); Paul Dumas, QED Technologies, Inc. (USA) [10448-15]
- 2:30 pm: **Evolving rocket optics applications drive manufacturing advances**, Brian W. Myer, James Perdue, Kevin Bartlett, Jessica Nelson, Optimax Systems, Inc. (USA) [10448-16]

- 2:50 pm: **Applying MRF® to errors caused by optical and opto-mechanical assembly**, Christopher A. Hall, QED Optics (USA); William J. Messner, QED Technologies, Inc. (USA); Michael A. DeMarco, QED Optics (USA) [10448-17]
- 3:10 pm: **Novel process for production of micro lenses with increased centering accuracy and imaging performance**, Christian Wilde, P. Langehanenberg, T. Schenk, TRIOPTICS GmbH (Germany) . . [10448-18]
- Coffee Break Mon 3:30 pm to 4:00 pm

SESSION 4

Room: Highland A/B Mon 4:00 pm to 5:40 pm

Additive Manufacturing

Session Chair: **Ulrike Fuchs**, asphericon GmbH (Germany)

- 4:00 pm: **Fabrication of free form optics with DLP based 3D printing**, Mohammadreza Riahi, Yasaman Honarmand, Milad Rahimzadeh, Sarah Akbari, Somayeh Pourgholami, K.N. Toosi Univ. of Technology (Iran, Islamic Republic of) [10448-19]
- 4:20 pm: **Simple scattering analysis and simulation of optical components created by additive manufacturing**, Manuel Rank, André Horsak, Andreas Heinrich, Hochschule Aalen (Germany) . [10448-20]
- 4:40 pm: **3d printed optical components with compositional and structural gradients**, Rebecca Dylla-Spears, D. T. Nguyen, J. F. Destino, N. Dudukovic, W. Chen, E.B. Duoss, Mark A. Johnson, Michael C. Rushford, William A. Steele, Christopher M. Spadaccini, Tayyab I. Suratwala, T. D. Yee, Lawrence Livermore National Lab. (USA) [10448-21]
- 5:00 pm: **Current use and potential of additive manufacturing for optical applications**, Matthew J. Brunelle, Ian Ferralli, Rebecca Whitsitt, Kate Medicus, Optimax Systems, Inc. (USA) [10448-22]
- 5:20 pm: **Additive manufacturing of glass lenses using fiber-fed laser-melting process**, Edward C. Kinzel, John Hostetler, Douglas A. Bristow, Missouri Univ. of Science and Technology (USA); Jonathan T. Goldstein, Air Force Research Lab. (USA); Robert G. Landers, Missouri Univ. of Science and Technology (USA). [10448-23]



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TUESDAY 17 OCTOBER

SESSION 5

Room: Highland A/B Tue 8:30 am to 9:50 am

Plenary Session

Session Chair: **Julie L. Bentley**, Univ. of Rochester (USA)

8:30 am: **Presentation of the 2016 Rudolf Kingslake Medal and Prize to Peter de Groot and James F. Biegen**

8:40 am: **Freeform Optics: current challenges for future serial production** (*Plenary Presentation*), Christian Schindler, Thomas Köhler, Eckhard Roth, Carl Zeiss Jena GmbH (Germany) [10448-25]

9:15 am: **Concept for a new approach to realize complex optical systems in high volume** (*Plenary Presentation*), Heinrich Grüger, Jens Knobbe, Tino Pügner, Michael Leuckefeld, Peter Reinig, Sebastian Meyer, Fraunhofer-Institut für Photonische Mikrosysteme (Germany)..... [10448-26]

Coffee Break Tue 9:50 am to 10:30 am

SESSION 6

Room: Highland A/B Tue 10:30 am to 12:10 pm

Optical Design and Engineering

Session Chair: **Blair L. Unger**, Rochester Precision Optics, LLC (USA)

10:30 am: **Tolerancing aspheres based on manufacturing knowledge**, Sven Wickenhagen, Sebastian Kokot, Ulrike Fuchs, asphericon GmbH (Germany) [10448-28]

10:50 am: **The importance of understanding manufacturing distributions in simulating manufactured performance of optical systems**, Mark C. Sanson, Corning Incorporated (USA) [10448-29]

11:10 am: **Integrating optical, mechanical, and test software (with applications to freeform optics)**, Victor L. Genberg, Gregory J. Michels, Sigmadyne, Inc. (USA); Brian Myer, Optimax Systems, Inc (USA) [10448-30]

11:30 am: **Efficient production of mounted lens objectives using alignment turning**, Christian Buss, TRIOPTICS GmbH (Germany) [10448-31]

11:50 am: **Twyman effects in thin curved optics**, John C. Lambropoulos, Univ. of Rochester (USA)..... [10448-32]

Lunch Break Tue 12:10 pm to 1:40 pm

SESSION 7

Room: Highland A/B Tue 1:40 pm to 3:20 pm

Diamond Turning

Session Chair: **James T. Mooney**, Harris Corp. (USA)

1:40 pm: **Analysis of the application of poly-nanocrystalline diamond tools for ultra precision machining of steel with ultrasonic assistance**, Marius Doetz, Olaf Dambon, Fritz Klocke, Fraunhofer-Institut für Produktionstechnologie IPT (Germany); Benjamin Bulla, Karl Schottka, David J. Robertson, son-x GmbH (Germany) [10448-33]

2:00 pm: **Micro-laser assisted machining: the future of manufacturing silicon optics**, Deepak Ravindra, Micro-Laser Assisted Machining Technologies, LLC (USA); Sai Kumar Kode, Chris Stroshine, Micro-Laser Assisted Machining Technologies (USA); Donald E. Morrison, Mike Mitchell, Rochester Precision Optics LLC (USA) [10448-34]

2:20 pm: **UPC 300 ultra precise fast tool freeform machining system with integrated metrology for corrective machining**, Frank Niehaus, Stephan Huttenhuis, Schneider GmbH & Co. KG (Germany); Dan Gauch, Schneider Optical Machines Inc. (USA) [10448-35]

2:40 pm: **Aspheric optics fabrication by single point diamond turning: some issues**, Ramagopal V. Sarepaka, Siva Sakthibalan, Somaiah Doodala, Rakesh Singh Panwar, Rajendra D. Kotaria, Optics & Allied Engineering Pvt. Ltd. (India) [10448-36]

3:00 pm: **Effect of cutting parameters on surface roughness in ultra-high precision turning of a contact lens polymer**, Muhammad Mukhtar Liman, Khaled Abou-El-Hossein, Odedeyi P. Babatunde, Nelson Mandela Metropolitan Univ. (South Africa) [10448-37]

Coffee Break Tue 3:20 pm to 3:50 pm

SESSION 8

Room: Highland A/B Tue 3:50 pm to 4:30 pm

Molding

Session Chair: **Matthias Pfaff**, OptoTech Optikmaschinen GmbH (Germany)

3:50 pm: **Effect of precision glass molding on index of refraction in new and conventional chalcogenide glasses**, George P. Lindberg, Jamie L. Ramsey, Blair L. Unger, John Deegan, Robert Benson, Rochester Precision Optics, LLC (USA) [10448-38]

4:10 pm: **Precision glass molding of sensor/MEMS structures**, Alois Kasberger, Christian Wistl, Maximilian Hasenberger, Raimund Förg, Technische Hochschule Deggendorf (Germany) [10448-39]

WEDNESDAY 18 OCTOBER

SESSION 9

Room: Highland A/B Wed 8:00 am to 10:00 am

Freeform Fabrication and Testing

Session Chair: **Kate Medicus**, Optimax Systems, Inc. (USA)

8:00 am: **Fabrication and correction of freeform surface based on Zernike polynomials by slow tool servo**, Yuan-Chieh Cheng, Ming-Ying Hsu, Wei-Jei Peng, Wei-Yao Hsu, Instrument Technology Research Ctr. (Taiwan) [10448-42]

8:20 am: **Precision asphere and freeform optics manufacturing using plasma jet machining technology**, Thomas Arnold, Georg Böhm, Hendrik Paetzelt, Leibniz-Institut für Oberflächenmodifizierung e.V. (Germany) [10448-43]

8:40 am: **Computer aided manufacturing for complex freeform optics**, Frank L. Wolfs, Edward Fess, Dustin Johns, Gabriel LePage, Greg Matthews, OptiPro Systems (USA) [10448-44]

9:00 am: **Shape measurement of freeform surfaces using experimental ray tracing**, Tobias Binkele, Daniel Vassmer, David Hilbig, Friedrich Fleischmann, Thomas Henning, Hochschule Bremen Univ. of Applied Sciences (Germany) [10448-45]

9:20 am: **Metrology for the manufacturing of freeform optics**, Todd Blalock, Brian W. Myer, Ian Ferralli, Matthew J. Brunelle, Tim Lynch, Optimax Systems, Inc. (USA) [10448-46]

9:40 am: **Enhanced resolution and accuracy of freeform metrology through Subaperture Stitching Interferometry**, Christopher M. Supranowitz, Chris Maloney, Paul E. Murphy, Paul Dumas, QED Technologies, Inc. (USA) [10448-47]

Coffee Break Wed 10:00 am to 10:30 am

SESSION 10

Room: Highland A/B Wed 10:30 am to 12:10 pm

Metrology I

Session Chair: **Dan Gauch**, Schneider Optical Machines Inc. (USA)

10:30 am: **From optics testing to micro optics testing**, Christian Brock, Ralf Dorn, Johannes Pfund, OPTOCRAFT GmbH (Germany) . . . [10448-48]

10:50 am: **Asphere cross testing: an exercise in uncertainty estimation**, Paul E. Murphy, QED Technologies, Inc. (USA) [10448-49]

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- 11:10 am: **Advancements in non-contact metrology of asphere and diffractive optics**, Scott DeFisher, OptiPro Systems (USA). . . . [10448-50]
- 11:30 am: **Spectrally controlled interferometry for measurements of flat and spherical optics**, Chase Salsbury, Artur G. Olszak, Apre Instruments, LLC (USA) and College of Optical Sciences, The Univ. of Arizona (USA) [10448-51]
- 11:50 am: **Surface characterization protocol for precision aspheric optics**, Ramagopal V. Sarepaka, Siva Sakthibalan, Somaiah Doodala, Rakesh Singh Panwar, Rajendra D. Kotaria, Optics & Allied Engineering Pvt. Ltd. (India) [10448-52]
- Lunch BreakWed 12:10 pm to 1:40 pm

SESSION 11

Room: Highland A/BWed 1:40 pm to 3:00 pm

Metrology II

Session Chair: **Paul E. Murphy**, QED Technologies, Inc. (USA)

- 1:40 pm: **SUN: A fully automated interferometric test bench aimed at measuring photolithographic grade lenses with a sub nanometer accuracy**, Rémi Bourgois, Anne-Laure Hamy, Pierre Pourcelot, Safran Reosc (France) [10448-53]
- 2:00 pm: **Test bench for alignment and optical quality measurement of large-field of view objective**, William Boucher, Etienne Homassel, Djamel Brahmi, Antoine Gascon, Benoit Wattellier, PHASICS S.A. (France) [10448-54]
- 2:20 pm: **Centering steep aspheric surfaces**, Robert E. Parks, Optical Perspectives Group, LLC (USA) [10448-55]
- 2:40 pm: **Automated asphere centration testing with AspheroCheck UP**, Felix Hahne, Patrik Langehanenberg, TRIOPTICS GmbH (Germany) [10448-56]
- Coffee BreakWed 3:00 pm to 3:30 pm

SESSION 12

Room: Highland A/BWed 3:30 pm to 4:30 pm

Metrology III

Session Chair: **Christopher T. Cotton**

- 3:30 pm: **Tailored complex degree of mutual coherence for plane-of-interest interferometry with reduced measurement uncertainty**, Gerald Fütterer, Hochschule Deggendorf Technologiecampus Teisnach (Germany) [10448-57]
- 3:50 pm: **Absolute surface form measurement of large flat optics based on oblique incidence method**, Shijie Liu, You Zhou, Jianda Shao, Shanghai Institute of Optics and Fine Mechanics (China) [10448-58]
- 4:10 pm: **Measurement of a concave spherical mirror with sub-50 pm repeatability by 3D nanoprofiler using normal vector tracing**, Takao Kitayama, Hiroki Shiraji, Ryo Kizaki, Kazuya Yamamura, Katsuyoshi Endo, Osaka Univ. (Japan) [10448-59]

WEDNESDAY POSTER SESSION

Room: Highland A/BWed 4:30 pm to 6:00 pm

Symposium attendees are invited to attend the Poster/Networking Reception on Wednesday evening. The reception provides an opportunity for attendees to meet with colleagues, network, view poster papers, and interact with the authors. Refreshments will be served.

Attendees are required to wear their conference registration badges

- Non-conventional optomechanical choppers: Analysis and design of novel prototypes**, Virgil-Florin Duma, Aurel Vlaicu Univ. of Arad (Romania) and Politehnica Univ. of Timisoara (Romania); Dorin Demian, Octavian Cira, Aurel Vlaicu Univ. of Arad (Romania); Nicolina Pop, Politehnica Univ. of Timisoara (Romania) [10448-72]
- Optical properties of Ge-Sb-Se chalcogenide glasses**, Li Wang, Beijing Univ. of Technology (China) [10448-73]
- High precision processing CaF₂ application research based on the magnetorheological finishing technology**, Xianyun Zhong, Institute of Optics and Electronics, Chinese Academy of Sciences (China); Fan Bin II, Wu Fan III, Institute of Optics and Electronics (China) [10448-75]
- An optimized method to calculate error correction ability of tool influence function in frequency domain**, Jia Wang, Institute of Optics and Electronics, Chinese Academy of Sciences (China); Xi Hou, Yongjian Wan, Chunyan Shi, Institute of Optics and Electronics (China) [10448-76]

- Multi-wavelength large optics wave front error metrology bench**, William Boucher, Etienne Homassel, Benoit Wattellier, PHASICS S.A. (France) [10448-77]
- Precision lens assembly with alignment turning system**, Cheng-Fang Ho, Chien-Yao Huang, Yi-Hao Lin, Hui-Jean Kuo, Wei-Yao Hsu, Fong-Zhi Chen, Instrument Technology Research Ctr. (Taiwan) [10448-78]
- Cheap and fast measuring roughness on big surfaces with an imprint method**, Christian Schopf, Rolf Rascher, Johannes Liebl, Hochschule Deggendorf Technologiecampus Teisnach (Germany) [10448-79]
- The study of sub-surface damage distributions during grinding process on different abrasion materials**, Ching-Hsiang Kuo, Chien-Yao Huang, Zong-Ru Yu, Shyu-Cheng Shu, Keng-Shou Chang, Wei-Yao Hsu, Instrument Technology Research Ctr. (Taiwan) [10448-80]
- Manufacturing of three dimensional silicate moldings by selective laser beam sintering**, Anne-Marie Schwager, Jens Bliedtner, Armin Bruder, Kerstin Götze, Ernst-Abbe-Hochschule Jena (Germany) [10448-81]
- Optical characterisation of hydroxide catalysed bonds applied to phosphate glass**, Grégoire Lacaille, Gooch & Housego PLC (United Kingdom); Valentina Mangano, Anna-Maria A. van Veggel, Christian J. Killow, Univ. of Glasgow (United Kingdom); Peter E. MacKay, Gooch & Housego PLC (United Kingdom); Sheila Rowan, James Hough, Univ. of Glasgow (United Kingdom) [10448-82]
- Development of a fully integrated and injection-moldable miniature spectrometer for low-cost applications**, Sebastian Höll, Matthias Haupt, Ulrich H. P. Fischer-Hirchert, Hochschule Harz (Germany) [10448-83]
- Sub-nanometer precision surface shape measurement of optical flat and sphere**, Jia Xin, Yun Li, Xi Hou, Tingwen Xing, Institute of Optics and Electronics, Chinese Academy of Sciences (China) [10448-84]
- Newly patented process enables low-cost solution for increasing white light spectrum of LEDs**, Jan-Marie A. Spanard, Light Spectrum Glazes (USA) [10448-85]
- Enhanced measuring range with aspheric transmission spheres**, Anna Möhl, Sven Wickenhagen, Ulrike Fuchs, asphericon GmbH (Germany) [10448-86]
- Diffraction effect control in measuring off-axis aspheric on axis by using computer-generated holograms**, Chaoyang Wei, Xuyu Li, Wendong Xu, Jianda Shao, Shanghai Institute of Optics and Fine Mechanics (China) [10448-87]
- Glass molding of 3mm diameter aspheric plano-convex lens**, Hayoung Sung, Myung Sang Huh, Giljae Lee, Geunman Ryu, Dongguk Kim, Suncheol Yang, Osong Medical Innovation Foundation (Korea, Republic of) [10448-88]

A MWIR catadioptric optically passive athermal lens with chalcogenide glasses, Yu Bai, Institute of Optics and Electronics, Chinese Academy of Sciences (China) [10448-89]

Measurement of strongly curved surfaces by multi-beam experimental ray tracing, David Hilbig, Jan Schulze, Friedrich Fleischmann, Thomas Henning, Hochschule Bremen Univ. of Applied Sciences (Germany) [10448-90]

Breakthrough for cost-effective mass production of precision optics, Andreas Rack, Harald Liepack, Jörg Weber, Clement David, Solayer GmbH (Germany) [10448-91]

Freeform optics manufacturing, Greg Matthews, James Ross, Jake Gemballa, OptiPro Systems (USA) [10448-92]

Fabrication of advanced glass light pipes for solar concentrators, Yusuf Dogan, Matthew Morrison, Chehao Hu, Robert A. Atkins, Texas A&M Univ. (USA); Mehmet E. Solmaz, Izmir Katip Celebi Univ. (Turkey); Christi K. Madsen, Texas A&M Univ. (USA) [10448-93]

Study on a magneto-rheological removal process of periodic turning marks, Min Woo Jeon, Byeong-Joon Jeong, Sang-Won Hyun, Kye-Sung Lee, Korea Basic Science Institute (Korea, Republic of); Jeong-Yeol Han, Korea Astronomy and Space Science Institute (Korea, Republic of); Geon-Hee Kim, Korea Basic Science Institute (Korea, Republic of) [10448-95]

Material of LAPAN's thermal IR camera equipped with two microbolometers in one aperture, Bustanul Arifin, Andi Mukhtar Tahir, Irwan Priyanto, Indonesia National Institute of Aeronautics and Space (Indonesia) [10448-96]

Design of a solar concentrator considering arbitrary surfaces, Martín Jiménez-Rodríguez, Maximino Avendaño Alejo, Univ. Nacional Autónoma de México (Mexico); Lidia Elizabeth Verdugo-Grajeda, Arturo Martínez-Enríquez, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Mexico); Reyes García-Díaz, Facultad de Ciencias Físico Matemáticas, Universidad Autónoma de Coahuila, (Mexico); Rufino Díaz-Urbe, Univ. Nacional Autónoma de México (Mexico) [10448-97]

Dual band AR coatings of LAPAN's thermal IR camera to enhance system and reduce stray light, Bustanul Arifin, Indonesia National Institute of Aeronautics and Space (Indonesia); Irwan Priyanto, Indonesia National Institute of Aeronautics and Space (Indonesia); Andi Mukhtar Tahir, Indonesia National Institute of Aeronautics and Space (Indonesia) [10448-98]

Laser scattering technique to characterize turbulent liquid, Aissa Manallah, Mohamed Bouafia, Malika Lakhal, Univ. Ferhat Abbas Sétif 1 (Algeria) [10448-100]

Spectroscopic enhancement & phase transformation study in Yb³⁺/Er³⁺ doped ferroelectric SrTiO₃ ceramics, Prasenjit Prasad Sukul, Kaushal Kumar, Indian Institute of Technology (Indian School of Mines), Dhanbad (India) [10448-101]

- An efficient way to fabricate micro transmission grating inside quartz and PDMS material by femtosecond laser micromachining,** Sanyogita Singh, Amar Ghar, Indian Institute of Technology Kanpur (India); U. Das, Indian Institute of Technology-Kanpur (India); P. K. Panigrahi, Indian Institute of Technology Kanpur (India) [10448-102]
- A streak tube multi-spectral three-dimensional imaging system for complex target,** Jingya Cao, Shaokun Han, Wenzhe Xia, Liang Wang, Yu Zhai, Beijing Institute of Technology (China) [10448-103]
- An improved three-dimensional non-scanning laser imaging system based on digital micromirror device,** Wenzhe Xia, Shaokun Han, Jingya Cao, Beijing Institute of Technology (China) [10448-104]
- Design of an ultra-precision CNC chemical mechanical polishing machine and its implementation,** Chupeng Zhang, Huiying Zhao, Xi'an Jiaotong Univ (China); Yawen Gu, Xi'an Jiaotong University (China); Xinxing Ban, Chunye Jiang, Xi'an Jiaotong Univ. (China) [10448-105]
- Optical designs for MWIR and four quadrant detectors by using beam steering methods in missile applications,** Doğan Uğur Sakarya, Roketsan A.S. (Turkey) [10448-106]
- Four and eight faceted domes effects on drag force and image in missile application,** Doğan Uğur Sakarya, Roketsan A.S. (Turkey) [10448-107]

THURSDAY 19 OCTOBER

SESSION 13

Room: Highland A/B Thu 8:00 am to 10:00 am

Optical Materials

Session Chair: **Michael A. Marcus**, Lumetrics, Inc. (USA)

- 8:00 am: Stability requirements for two-beam interference lithography diffraction grating manufacturing,** Felix Koch, Dennis Lehr, Tilman Glaser, Carl Zeiss Jena GmbH (Germany). [10448-60]
- 8:20 am: Thermal instability of BK7 and how it affects the manufacturing of large high precision surfaces,** Michael Hyman, Matthew J. Brunelle, Nohl Schluntz, Michael K. Gregory, Mark Notargiacomo, Gregory Frisch, Jeremiah Triftshauer, Optimax Systems, Inc. (USA). [10448-61]
- 8:40 am: Commercializing potassium terbium fluoride, KTF (KTb3F10) faraday crystals for high laser power optical isolator applications,** Wolfgang Schlichting, Northrop Grumman Corp. (USA); Kevin T. Stevens, Greg Foundos, Alexis Payne, Northrop Grumman SYNOPTICS (USA) [10448-62]

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- 9:00 am: **UV-cured polymer optics**, Victor Pinon III, Sandia National Labs. (USA); Freddie Santiago, U.S. Naval Research Lab. (USA); Ashten Vogelsberg, Amelia Davenport, Neil Cramer, Colorado Photopolymer Solutions (USA) [10448-63]
- 9:20 am: **Brilluoin spectroscopy application for express, non-contact testing of glass and polymer products**, Stephan L. Logunov, Corning Incorporated (USA) [10448-64]
- 9:40 am: **Application of speckle shearing interferometry to the evaluation of creep strain in elastomers**, Juan Benito Pascual Francisco, Alexandre V. Michtchenko, Orlando Susarrey Huerta, Omar Barragán-Pérez, Instituto Politécnico Nacional (Mexico); Antonio de Jesús Ortiz Gonzáles, Instituto tecnológico de Los Mochis (Mexico). [10448-65]
- Coffee Break Thu 10:00 am to 10:30 am

SESSION 14

Room: Highland A/B Thu 10:30 am to 12:10 pm

Coating and Cleaning

Session Chair: **Jennifer D. T. Kruschwitz**, JK Consulting (USA)

- 10:30 am: **Novel cleaning strategy for removing paraffin waxes from optical substrates**, Mark Cyffka, Chemetall Precision Microchemicals (USA) [10448-66]
- 10:50 am: **Rare earth-based low-index films for IR and multispectral thin film solutions**, Markus Stolze, Umicore Thin Film Products AG (Liechtenstein); Joe Neff, Friedrich Waibel, Umicore Thin Film Products AG (Germany) [10448-67]
- 11:10 am: **Prospects for the enhancement of PIAD processes by plasma diagnostics**, Jens Harhausen, Rüdiger Foest, Jochen Wauer, INP Greifswald e.V. (Germany); Olaf Stenzel, Steffen Wilbrandt, Christian Franke, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Moritz Oberberg, Ralf Peter Brinkmann, Ruhr-Univ. Bochum (Germany) [10448-69]
- 11:30 am: **Film stress and surface shape control of dichroic beam-splitter (DBS) with polarization maintaining by stress compensation method**, Chong Ma, Gang Chen Jr., Dingquan Liu, Daqi Li, Shanghai Institute of Technical Physics of the Chinese Academy of Sciences (China) [10448-70]
- 11:50 am: **Multilayer coating of optical substrates by ion beam sputtering**, M. V. Daniel, Marcel Demmler, scia Systems GmbH (Germany) [10448-71]

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Acceptance of Policies and Registration Conditions

The following Policies and Conditions apply to all SPIE Events. As a condition of registration, you will be required to acknowledge and accept the SPIE Registration Policies and Conditions contained herein.

Attendee Registration and Admission Policy

SPIE, or their officially designated event management, in their sole discretion, reserves the right to accept or decline an individual's registration for an event. Further, SPIE, or event management, reserves the right to prohibit entry or to remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, whose conduct is not in keeping with the character and purpose of the event. Without limiting the foregoing, SPIE and event management reserve the right to remove or refuse entry to anyone who has registered or gained access under false pretenses, provided false information, or for any other reason whatsoever that they deem is cause under the circumstances.

Payment Policy

Registrations must be fully paid before access to the conference is allowed. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks and wire transfers. Onsite registrations can also be paid with cash.

SPIE Safe Meeting and Misconduct Policy

SPIE is a professional, not-for-profit society committed to providing valuable and safe conference and exhibition experiences. SPIE is dedicated to equal opportunity and treatment for all its members, meeting attendees, staff, and contractors. Attendees are expected to be respectful to other attendees, SPIE staff, and contractors. Harassment and other misconduct will not be tolerated; violations will be addressed promptly and seriously. Consequences up to and including expulsion from the event as appropriate may be implemented immediately.

The SPIE anti-harassment policy can be found at <http://spie.org/policy>

Reporting of Unethical or Inappropriate Behavior

Onsite at an SPIE meeting, contact any SPIE Staff with concerns or questions for thorough follow-up. If you feel in immediate danger, please dial the local emergency number for police intervention.

SPIE has established a confidential reporting system for staff and all meetings participants to raise concerns about possible unethical or inappropriate behavior within our community. Complaints may be filed by phoning toll-free to +1-888-818-6898 from within the United States and Canada, or online at www.SPIE.ethicspoint.com and may be made anonymously.

Identification Requirement Policy

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued photo identification at registration to collect registration materials.

Individuals are not allowed to pick up badges for other attendees. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.

Access to Conference Events / Access for Children Younger than 18

All conference technical and networking events require a badge for admission. Registered attendees may bring children with them as long as they have been issued a badge. Registration badges for children under 18 are free and available at the SPIE registration desk onsite. Children under 14 years of age must be accompanied by an adult at all times, and guardians are asked to help maintain a professional, disturbance-free conference environment.

Exhibition Hall Access / Access for Children Younger than 18

Everyone who attends the exhibition must be registered and have a badge. Badges for children are free and available onsite at the registration desk. Children under 14 years of age must be accompanied by an adult at all times. Guardians are asked to help maintain a professional, disturbance-free exhibition environment. Children under 18 are not allowed in the exhibition area during exhibition move-in and move-out.

Unauthorized Solicitation Policy

Unauthorized solicitation in the Exhibition Hall is prohibited. Any nonexhibiting manufacturer or supplier observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

Recording Policy

Conferences, courses, and poster sessions: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter or instructor. Attendees may not capture or use materials presented in any meeting/course room or in course notes on display without written permission. Consent forms are available at Speaker Check-In or SPIE Registration. Individuals not complying with this policy will be asked to leave a given session and/or asked to surrender their recording media. Refusal to comply with such requests is grounds for expulsion from the event.

Exhibition Hall: Recordings of any kind are prohibited without explicit permission from on-site company representatives. Individuals not complying with this policy will be asked to surrender their recording media and to leave the exhibition hall. Refusal to comply with such requests is grounds for expulsion from the event.

Capture and Use of a Person's Image

By registering for an SPIE event, you grant full permission to SPIE to capture, store, use, and/or reproduce your image or likeness by any audio and/or visual recording technique and create derivative works of these images and recordings in any SPIE media now known or later developed, for any legitimate SPIE marketing or promotional purpose.

By registering for an SPIE event, you waive any right to inspect or approve the use of the images or recordings or of any written copy. You also waive any right to royalties or other compensation arising from or related to the use of the images, recordings, or materials. By registering, you release, defend, indemnify and hold harmless SPIE from and against any claims, damages or liability arising from or related to the use of the images, recordings or materials, including but not limited to claims of defamation, invasion of privacy, or rights of publicity or copyright infringement, or any misuse, distortion, blurring, alteration, optical illusion or use in composite form that may occur or be produced in taking, processing, reduction or production of the finished product, its publication or distribution.

Laser Pointer Safety Information/Policy

SPIE supplies tested and safety-approved laser pointers for all conference meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers.

Use of a personal laser pointer represents the user's acceptance of liability for use of a non-SPIE-supplied laser pointer. If you choose to use your own laser pointer, it must be tested to ensure <5 mW power output. Laser pointers in Class II and IIIa (<5 mW) are eye safe if power output is correct, but output must be verified because manufacturer labeling may not match actual output. You are required to sign a waiver releasing SPIE of any liability for use of potentially non-safe, personal laser pointers. Waivers are available at Speaker Check-In.

Unsecured Items Policy

Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

Wireless Internet Service Policy

At most events, SPIE provides wireless access for attendees. Properly secure your computer before accessing the public wireless network. SPIE is not responsible for computer viruses or other computer damage.

No-Smoking Policy

Smoking, including e-cigarettes, is not permitted at any SPIE event.

Agreement to Hold Harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

Event Cancellation Policy

If for some unforeseen reason SPIE should have to cancel an event, processed registration fees will be refunded to registrants. Registrants will be responsible for cancellation of travel arrangements or housing reservations and the applicable fees.

SPIE International Headquarters

PO Box 10

Bellingham, WA 98227-0010 USA

Tel: +1 360 676 3290

Fax: +1 360 647 1445

help@spie.org • www.SPIE.org

SPIE Europe Offices

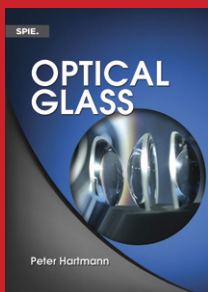
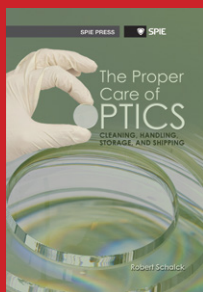
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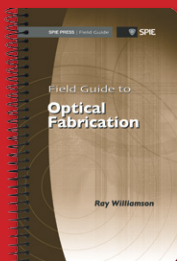
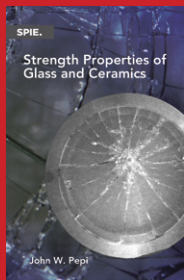
Tel: +44 29 2089 4747

Fax: +44 29 2089 4750

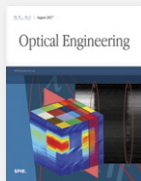
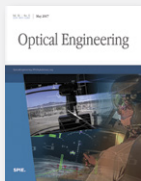
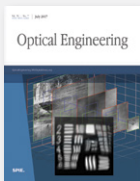
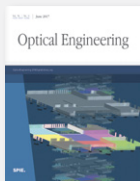
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