Technical Program

AOMATT 2010

The 5th SPIE International Symposium on Advanced Optical Manufacturing and Testing Technologies

26-29 April 2010, Dalian World Expo Center
Dalian China

Sponsored by

中国光学学会
The Chinese Optical Society

中国科学院光电技术研究所
THE INSTITUTE OF OPTICS AND ELECTRONICS
THE CHINESE ACADEMY OF SCIENCES

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Daily Event Schedule

Date	*Time*	*Contents*	*Place*
Sunday April 25, 2010	8:00-20:00	Registration for domestic authors	No. 10, F Area, first floor, Dalian World Expo Center
	8:00-22:00	Registration for overseas authors	Howard Johnson Parkland Hotel Dalian
	20:00-24:00	Registration for domestic authors	Air China Hotel - Dalian
Monday April 26, 2010	8:30-9:00	Opening Ceremony	Multi-functional Hall, second floor, Dalian World Expo Center
	9:00-12:30	Plenary Prenary 1-5	
	13:30-17:00	Academician Plenary 1-4	
	18:00-21:00	Welcome Dinner	Dalian sweetland hotel
Tuesday April 27, 2010	8:30-12:00	Session 1-1, Session 2-1 Session 3-1, Session 4-1 Session 5-1, Session 6-1	room1, room2 room3, room4 room5, room6
	13:30-17:00	Session 1-2, Session 2-2 Session 3-2, Session 4-2 Session 5-2, Session 6-2	room1, room2 room3, room4 room5, room6
Wednesday April 28, 2010	8:30-12:00	Session 2-3 Session 3-3, Session 4-3 Session 5-3, Session 6-3	room2 room3, room4 room5, room6
	13:30-17:00	Post Presentations	Exhibition hall, second floor, Dalian World Expo Center
		Workshop	No. 1 Lecture hall, second floor, Dalian World Expo Center
Thursday April 29, 2010	The whole day	Touring	
Friday April 30, 2010		The end.	

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Advanced Optical Manufacturing and Testing Technologies

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Sponsored by:

COS - The Chinese Optical Society
IOE - Institute of Optics and Electronics,
- Chinese Academy of Sciences
SPIE - The International Society for Optics and Photonics
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Supported by:

Ministry of Science and Technology of China
Chinese Academy of Sciences (CAS)
National Natural Science Foundation of China

Honorary Chair:

WANG Daheng, Academician, CAS & CAE (China)

Symposium General Chair:

ZHOU Bingkun, President of Chinese Optical Society (COS), Academician, CAS

Conferences:

1 Large Mirror and Telescopes
2 Advanced Optical Manufacturing Technologies
3 Optical Test and Measurement Technology and Equipments
4 Design, Manufacturing and Testing of Micro and Nano Optical Devices and Systems
5 Opto Electronics Material and Devices for Detector, Imager, Display and Energy Conversion Technology
6 Smart Structure and Materials in Manufacturing and Testing

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26-29 April 2010
Dalian China

IVITATION

Dear Authors and Friends!

Advanced optical manufacturing and testing technologies are closely associated with technology developments of information, bioscience, materials and NANO technologies. At the same time, optical manufacturing has been developed into a new global high tech. business. At the mean time, the International Symposium of AOMATT has become more and more popular in domestic and (abroad) foreign countries.

On behalf of the Organization Committee of the Symposium, I would like sincerely to invite you to participate in the AOMATT2010 to be held in Dalian, China on April 26-29, 2010. It will be appreciative that you submit your abstracts and manuscripts to the SPIE proceedings of the conference in time. We believe that the beautiful costal city-Dalian, China and also the successful symposium of AOMATT2010 will leave you a pleasant and impressive memory.

We are looking forward to meeting you at the symposium next year in Dalian.
Sincerely Yours,

Prof. ZHANG Yudong

Director of the Institute of Optics & Electronics, CAS
General Co-Chair of AOMATT2010
Chairman of the Organization Committee of AOMATT2010

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Jose M. Sasian, University Arizona (USA)

Fritz Klocke, Fraunhofer Institute for Production Technology IPT (Germany)

James R. Torley, University of Colorado (USA)

Yoshiharu Namba, Chubu University (Japan)

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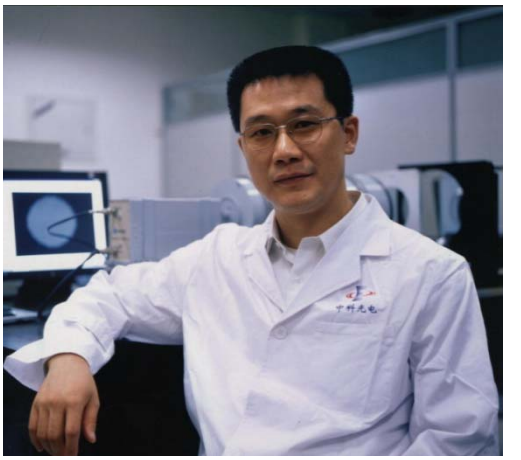
Zhou Bingkun, President of Chinese Optical Society (COS), Academician, Chinese Academy of Sciences

Zhou Bingkun was born in Sichuan, China in 1936. He graduated from Tsinghua University, Beijing, China in 1956. Since 1956 he has been with the Electronic Engineering Department at the same University. From 1960 to 1962 he was a visiting scholar at Leningrad Electrotechnical Institute, Leningrad, former USSR . From 1983 to 1984 he was a visiting scholar and then professor of Applied Physics Department, Stanford University, U.S.A. From 1985, he has been a professor of Electronic Engineering Department at Tsinghua University, Beijing, China. He was elected as a member of Chinese Academy of Sciences in 1991 and was elected as a member of the Third world Academy of Sciences in 2001. At present he is president of the Chinese Optical Society and vice-chairman of the science and technology committee of Ministry of Education. He was the vice-president of the National Natural Science Foundation of China (1996-2003), director of Information Science Department of CAS (2003-2006), the Chairman of the Steering Committee of Optoelectronic Devices and System Integration Technology, High Technology Research & Development Program of China and the Director of National Research Center for Optoelectronic Technology, Beijing(1987-1996). He is fellow of the Optical Society of America and Chinese Institute of Electronics.

He has been engaged in laser and optoelectronics research and teaching for a long time. In 1984, He made key contributions to development of diode pumped, narrow linewidth and frequency stable Solid State Lasers. He with his research group has made scientific research achievements in the area of "Single Mode, Narrow Linewidth, Frequency-Stable and Tunable External Cavity Semiconductor Lasers"; "semiconductor laser pumped solid state laser"; "fiber ring cavity and their application"; "doped fiber amplifiers and lasers" and "DWDM optical fiber transmission technology". He has won 11 national and ministry-level prizes. He is the author or co-authors of about 100 papers, presentations, patents and one book : " Laser Principle" , which was awarded the state excellent prize.

Symposium General Co-Chair:



ZHANG Yudong, President of Institute of Optics and Electronics, CAS (China)

Mr. Zhang Yudong, PhD and Research Professor, President of IOE (Institute of Optics and Electronics), CAS (Chinese Academy of Sciences) is a member of the Appraisal Expert Team of Information Directorate of NSFC (National Natural Science Foundation of China), a vice-chair of Bio-optics and Laser Medicine Subcommittee of COS (Chinese Optical Society), a vice-Chair of Electro-Optical Specialty Committee of Chinese Society of Astronautics, and a committeeman of Quantum Electronics and Electro-Optical Subcommittee of CIE (Chinese Institute of Electronics), an adjunct professor of UESTC (University of Electronic Science and Technology of China) and Zhejiang University respectively.

Mr. Zhang received his BS from Zhejiang University in 1984, his MS from IOE in 1987, and his PhD from Shanghai Institute of Optics and Fine Mechanics, CAS, in 1991. From 1991 to 1997 he held the technical posts of Research Assistant, Research Associate Professor and Research Professor in Fujian Institute of Research on the Structure of Matter, CAS. He has been working in IOE since 1998 and serving as President since 2003.

For more than 10 years, he has carried out many frontier researches in the fields of adaptive optics, microlithography and new materials of non-linear optics and has obtained many innovative achievements which are leading in China or advanced in the world. He has won one first-grade award of CAS Prize for S&T Progress and CAS Prize for Invention respectively. Altogether, he has applied for and obtained 38 pieces of patents, and published more than 50 theses among which 30 are included in EI Database and 10 in SCI Database.

From 1985 to 1987, he participated in the development of Wavefront Correction System with Dither Technology for the ICF (Inertial Confinement Fusion) experiment in China and proposed an adaptive search method for multiple-extreme optimization. It is the first time to successfully apply the adaptive optical technology to laser atomic fusion system in the world.

From 1998 to 1991, he engaged in the development of Submicron Excimer Laser Lithography System, which worked out the first prototype system in China. He successfully developed the precision submicron objective lens which was the core component of the system and obtained two related patents.

From 1991 to 1997, he took part in the research into new nonlinear optical crystal materials and related devices, obtained five national invention patents and won one first-grade award of CAS Prize for Invention.

From1998 to present, he has been taking charge of the development of the adaptive optical (AO) system for imaging live human eye retina with high resolution. The system is the first practical compact AO system for this application in the world.

He is also in charge of the development of Dynamic Wavefront Correction AO System for the new generation of ICF prototype system in China. It is the first AO system which can reduce the wavefront distortion of laser beam in ICF system from 9λ to about 1.5λ in China. This extends the application of adaptive optics in the ICF field and is at the advanced world level.

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Plenary Schedule

9:00-12:30 April 27 Plenary 1-5 Multi-functional Hall, 2 floor

1. **The Challenges From VLT to ELT project in astronomy and from DUV to EUV in lithography optics**
   Dr. Roland Geyl (France)
   REOSC Optics
2. **Laser Precision Engineering: A Versatile Micro- & Nano-manufacturing Means**
   Dr. Hong Minghui (Singapore)
   Department of Electrical & Computer Engineering, National University of Singapore and Data Storage Institute, ASTAR, Singapore
3. **Fabrication of Pt/C Multilayer-Coated Mirrors for Hard X-Ray Telescopes**
   Dr. Yoshiharu Namba (Japan)
   Department of Mechanical Engineering, Chubu University
4. **Developments in Optical Testing Technology during the Last Decade**
   Dr. James C. Wyant (USA)
   College of Optical Sciences, University of Arizona, Tucson, AZ
5. **IBF-Technology for Nano-Manufacturing Technology**
   Dr. T. Franz (German)
   NTG Neue Technologien GmbH, Germany

13:30-17:00 April 27 Academician 1-4 Multi-functional Hall, 2 floor

1. **Progress of Chemical Oxygen Iodine Laser**
   Prof. Fengting Sang (China)
   Dalian Institute of Chemical Physics, CAS
2. **The challenges to the advanced optical manufacturing technology from laser fusion engineering**
   Prof. Dianyuan Fan (China)
   Shanghai Institute of Optics and Fine Mechanics, CAS
3. **Advanced Spectroscopy for characterization of materials**
   Prof. Junhao Chu (China)
   Shanghai Institute of Technical Physics, CAS
4. **The advance optical technologies of LAMOST telescope**
   Prof. Xiangqun Cui (China)
   National Astronomical Observatories/Nanjing Institute of Astronomical Optics and Technology, CAS

Session Schedule and Session Chair

Time	Session No.	Place	Session Chair
8:30-12:00 April 27	Session 1-1	room 1	*Wu Fan*
	Session 2-1	room 2	*Xin Qiming*
	Session 3-1	room 3	*Wu Shibin*
	Session4-1	room 4	*Peng Changsi*
	Session 5-1	room 5	*Wu Zhiming, Wen Wen*
	Session 6-1	room 6	*Luo Xiangang*
13:30-17:00 April 27	Session 1-2	room 1	*Fan Bin*
	Session 2-2	room 2	*Yu Jingchi*
	Session 3-2	room 3	*Li Shengyi*
	Session 4-2	room 4	*Ye Shuliang*
	Session 5-2	room 5	*Chen Zhijian, Xiao Lixin*
	Session 6-2	room 6	*Luo Xiangang*
8:30-12:00 April 28			
	Session 2-3	room 2	*Wan Yongjian*
	Session 3-3	room 3	*Jing Hongwei*
	Session 4-3	room 4	*Hu Song*
	Session 5-3	room 5	*Yu Junsheng, Zhang Lei*
	Session 6-3	room 6	*Hong Minghui*

Workshop Schedule

13:30-17:00 April 28 Workshop No.1 Lecture Hall, 2 floor

1. **Zeeko Ltd. (UK)** ***http://www.zeeko.co.uk*** **13:30-14:30**

2. **ESDI, Inc. (USA)** ***http://www.engsynthesis.com*** **14:45-15:45**

3. **NTG (German)** ***http://www.ntg.de*** **16:00-17:00**

9:00-12:30 April 27 ····· Plenary Presentations 1-5
Multi-functional Hall, second floor

■ ***Plenary Presentation 1***

Title: The Challenges From VLT to ELT project in astronomy and from DUV to EUV in lithography optics

Dr. Roland Geyl (France)
REOSC Optics
Email: roland.geyl@sagem.com

Abstract: The science (or the art) of precision optical component manufacturing and testing and the design of the systems including these components is continuously progressing and is presently pushing hard and moving fast along two directions we want to briefly report in this talk.
On one side, astronomy is planning to build soon Extremely Large Telescopes of the 30 to 40-m class based on segmented primary mirror technology and intensive use fo active and adaptive mirror technology. We will report our work done for the 11-m Gran Telescopio Canarias and show first results of latest developments aiming to produce these segments now really faster, cheaper and probably better too.
Looking down to the surface of the silicon wafer patterned through lithography process, the semiconductor industry is making gigantic progress on DUV optics operating at 193 nm and providing few 10 nanometers resolution thanks to hyper NA lens design and immersion technology. The next generation of lithograpgy optics is also well maturing presently thanks to the use of mirror systems operating at the soft X wavelength of 13,5 nm. Optical manufacturing and testing art is moving fast again for the production of ultra precise and ultra smooth optical components. Surprizingly, the active optics technology coming from large astronomical mirrors is finding new proof of effectiveness for these type of very challenging optical systems.

Principal Author's Biography: Roland GEYL graduated from the Ecole Superieure d'Optique in Orsay-France in 1979.
He worked in the various domains of lens design for high performance space and defense optics, precision metrology including absolute calibration and precision manufacturing with computer controlled technology of large aspheric optics. His latest work is focused on DUV and EUV optics as well as large segmented optics manufacturing and testing.
He holds 10 patents and gave many talks at international symposia. Roland GEYL managed several key space optics and astronomy projects at REOSC, now SAGEM and is now VP Sales and Business Development of the Business Unit. In parallel, Roland GEYL ensurred theoretical and practical lens design courses at the Ecole Superieure d'Optique for nearly 20 years.

■ ***Plenary Presentation 2***

Title: Laser Precision Engineering: A Versatile Micro- & Nanomanufacturing Means

Dr. Hong Minghui (Singapore)
Department of Electrical & Computer Engineering, National University of Singapore and Data Storage Institute, ASTAR, Singapore

Abstract: Laser precision engineering has unique advantages of being non-contact process, flexible setup and high speed processing in air. In the last decades, we have witnessed its extensive applications in various production lines. Combined with other advanced processing tools, laser nanofabrication will play a much more important role in the next generation manufacturing.

Principal Author's Biography: Dr. Hong Minghui received his B.S. & M.S. (solar cell fabrication) from Physics Dept., Xiamen Univ., China in 1985 and 1988. After teaching in the Univ. as a lecturer from 1988 to 1994, he continued his higher degree studies in Dept. of Electrical and Computer Engineering (ECE), National University of Singapore (NUS) and obtained his M.E. (laser surface processing & real-time monitoring) in 1996 and Ph.D. in 2000 (laser ablation & real-time monitoring). His research interest includes laser ablation, optical signal diagnostics/process real time monitoring and its industrial applications on laser microprocessing and nanoengineering. He has co-authored 8 book chapters, 23 patents granted, 200+ scientific papers and 25+ keynote/invited talks in the international conferences. He is a member of organizing committees for Laser Precision Micromachining International Conference (2001~2010), International Symposium of Functional Materials (2005 and 2007), Chair of International Workshop of Plasmonics and Applications in Nanotechnologies (2006) and Chair of Conference on Laser Ablation (2009). He was invited to be a peer reviewer of European Science Foundation (2002~2010) projects/workshops. He was invited to serve as an Associated Editor of International Journal of Optomechatronics, an Editor of Journal of Laser Micro/Nanoengineering and a Guest Editor of Applied Physics A. He is Simon Industrial and Professional Fellow in the University of Manchester, UK in the area of laser processing. He won IES Prestigious Engineering Achievement Award 2004, "Laser Microprocessing and Nanofabrication". Dr. Hong is currently an Associate Professor in ECE Dept, NUS and a Senior Scientist in Data Storage Institute, ASTAR, Singapore.

■ ***Plenary Presentation 3***

TITLE: Fabrication of Pt/C Multilayer-Coated Mirrors for Hard X-Ray Telescopes

Dr. Yoshiharu Namba (Japan)
Department of Mechanical Engineering, Chubu University
E-mail: namba@isc.chubu.ac.jp

Abstract: In future satellite missions for X-ray astronomy, hard X-ray imaging will become one of the major observation techniques. It allows astronomers to observe the distribution of hard X-ray objects in the Universe with a high sensitivity. Since hard X-rays can penetrate thick absorbing materials, astronomers are able to discover many massive black holes embedded in thick gas. High-energy phenomena are well studied in hard X-rays, which are essentially produced by accelerated high-energy particles in the universe. The sixth Japanese X-ray astronomy

satellite ASTRO-H to be launched in 2014 is expected to provide the first opportunity to perform hard X-ray imaging observations with a supermirror hard X-ray telescope. This telescope will be constructed with multiple grazing incidence reflecting mirrors of conical shape. The mirrors are fabricated by replication technology from Pt/C multilayer-coated glass tubes of different diameters. The next-generation hard X-ray telescopes after ASTRO-H program require highly nested aspherical thin mirrors of 100 nm shape accuracy and less than 0.3 nm rms surface roughness. Thin mirror substrates or shells consisting of a paraboloid and hyperboloid of revolution are fabricated by replication from molding dies consisting of a paraboloid and hyperboloid of revolution. The ultra-precision molding dies of electroless nickel were single-point diamond turning and ultra-precision polishing.

KEYWORDS: Aspheric Surfaces, Ultra-Precision Molding Dies, Mirror Replication, Single-Point Diamond Turning, Ultra-Precision Polishing

Principal Author's Biography: Graduated from the department of precision engineering, Osaka University in 1964, Dr. of Engineering from Osaka University in 1970. Associate professor of Osaka University from 1972 to 1987. Professor of Chubu University from 1987. Winner of David Richardson Medal from the Optical Society of America in 1998. Fellow of JSME and JSPE.

■ *Plenary Presentation 4*

Title: Developments in Optical Testing Technology during the Last Decade

Dr. James C. Wyant (USA)
College of Optical Sciences, University of Arizona, Tucson, AZ
Email: jcwyant@optics.arizona.edu

Abstract: Modern electronics, computers, and software have made it possible to greatly improve the testing of optical components and optical systems and the resulting improvements in the new optical instruments and devices we use are evident. This talk discusses some of these new techniques and in particular the talk will discuss new metrology techniques for evaluating high quality lithographic optics essential for the manufacturing of modern electronics, techniques for the testing of aspheric optics used in most modern optical instruments, special techniques for the evaluation of large astronomical optics, and techniques for performing high quality measurements in less than ideal environments. The impact of these improvements on electronic chips, data storage devices, and various optical instruments will be discussed.

Principal Author's Biography: James C. Wyant received a B.S. in physics from Case Western Reserve University and M.S. and Ph.D. in optics from the University of Rochester and he is currently Dean and Professor at the College of Optical Sciences at the University of Arizona. Wyant is a member of the National Academy of Engineering and a Fellow of OSA, SPIE, and the Optical Society of India. Wyant was the 1986 president of SPIE and he is the 2010 president of OSA. Wyant has received several awards including the SPIE Gold Medal, the SPIE Technology Achievement Award, the OSA Joseph Fraunhofer Award, and the Optical Society of India Lifetime Achievement Award. In 2008 he received a Doctorado Honoris Causa from the Instituto Nacional de Astrofisica, Optica y Electronica in Puebla, Mexico. He was a founder of the WYKO Corporation and served as its president and board chairman from 1984 to 1997 and he was a founder of the 4D Technology Corporation and currently serves as its board chairman.

■ ***Plenary Presentation 5***

Title: IBF-Technology for Nano-Manufacturing Technology

Dr. T. Franz (German)
NTG Neue Technologien GmbH & Co. KG,

Abstract: Over the last ten years IBF-Technology has been established as a very effective deterministic method to produce ultra-high-precision plane, spherical and aspherical surfaces. The present state of the art is the correction of polishing errors from the long spatial wavelength range from centimeters to meters up to the long spatial wavelength part of the so called mid spatial frequency roughness (MSFR).
Whereas in the past the main technology driver has been the semiconductor industry, within the last three years new applications came up due to the fact that specifications for optical equipment were tightened.
Very precisely figured surfaces are very important for advanced DUV, EUV and synchrotron optics and for telescope optics for earth and space observation. This led to the development of new types of Ion Beam Figuring plants.
The report reflects upon these most efficient systems able to produce high quality optics and mirrors and gives an overview about NTG′ s nearly 20 years lasting experience & capabilities in IBF-Technology including an outlook to future projects and R&D-Tasks.

Principal Author's Biography: Thomas Franz studied mechanical engineering at the Technical University of Darmstadt and gratuated in 1995.

For NTG he is working since 1995/06/01. He started as a project engineer in the Design office. During that time he was senior project manager of international projects in Europe, Japan, USA and U.A.E (Dubai). All the time in NTG Th. Franz was involved in IBF related projects. The last project in the Design Office was the realisation of the IBF-100 which was an idea of Dr. Haensel and him.

Since 2008/07/01 T. Franz is Chief Technical Officer and Chief Marketing Officer at NTG. His first challenge here was the decision to develop the IBF 1500 plant for mirrors used in astronomical applications.

Thomas Franz was born 1967/03/09 and lives in a small village near Gelnhausen, Germany. He is married since 1998 and has three children (Two boys, age 4 & 8; one girl, age 6).

13:30-17:00 April 27 ····· Academician Plenary Presentations 1-4
Multi-functional Hall, second floor

■ ***Academician Plenary Presentation 1***

Title: Progress of Chemical Oxygen Iodine Laser

Prof. Fengting Sang (China)
Dalian Institute of Chemical Physics, CAS
Academician of Chinese Academy of Engineering

Abstract: Since the initial demonstration of chemical oxygen iodine laser (COIL) in 1977. The COIL is well known as a reliable source to produce laser output power up the multi megawatt level. In addition, the high homogeneity of the gain medium provides the near diffraction limited generation of laser radiation. The COIL is a high power, continuous-wave, operating wavelength at 1315 nm which is in the minimum-loss band of the silica optical fiber. Therefore the COIL has a significant future as industrial and military applications. Especially, COIL is one of the most promising candidates for directed energy applications. In the COIL , Researchers have realized that heart of the COIL system is the singlet oxygen generator. Singlet oxygen molecule $O_2(^1\Delta)$ is the energy source of COIL. A efficient singlet oxygen generator (SOG) is based on the reaction of basic hydrogen peroxide solution (BHP) with gases chlorine: $Cl_2 + 2\ HO_2^- \rightarrow 2\ Cl + H_2O_2 + O_2(^1\Delta)$. For this reason the singlet oxygen generator has been the focus of intense research and development efforts over the last 30 years. The iodine is both dissociated and pumped by energy transfer from singlet oxygen $O_2(^1\Delta)$. The iodine then lases at 1315nm.Very important parameter of the COIL is the chemical efficiency, η_{chem}, defined as the number of emitted photons per number of chlorine molecules passed through the $O_2(^1\Delta)$ generator. Efficiency around 30% for the supersonic COIL seemed to be the state-the art in the last decade. Recently, Rosenwaks reported on the achievement of a record (40%) chemical efficiency of the supersonic COIL using a small-scale (5-cm gain length) device with supersonic mixing scheme in 2008. This paper reports on the chemical efficiency of COIL, singlet oxygen generators, optical resonator, and potential application examples.

Principal Author's Biography: Prof. *Fengting Sang*, born at *Dalian* in 1942, graduated from the department of engineering mechanics, *Harbin Polytechnic University* in 1964, now is an academician of *Chinese Academy of Engineering*, a senior professor and a supervisor for Ph.D. student in *Dalian Institute of Chemical Physics*.

In the period of more than 40 years from 1962, he has engaged in the research of CO_2 gas dynamic laser, HF/DF chemical laser, new species of chemical lasers with visible wavelength, and especially after 1987, chemical oxygen iodine laser (COIL).

He has many achievements approved by the *Chinese Academy of Sciences* (CAS) and the State, including a second-prize of the *National Award for Science & Technology Progress*, two first-prize and one second-prize of the *CAS Awards of Science & Technology Progress*, and many first-prize of *Provincial-level Awards for Science & Technology Progress*.

He has published about 70 papers in professional journals, and is the co-author of the following three books written in Chinese: *"Chemical Lasers"*, *"Short-wavelength Chemical Lasers"* and *"Chemical Lasers & Applications"*.

■ ***Academician Plenary Presentation 2***

Title: The challenges to the advanced optical manufacturing technology from laser fusion engineering

Prof. Dianyuan Fan (China)
Shanghai Institute of Optics and Fine Mechanics CAS
Academician of Chinese Academy of Engineering

Abstract: Laser Fusion (ICF) facility is the largest laser system in the world. The facility will require more than 10,000 optics which comprise total surface area of more than 4000m^2. A rigorous and numerous challenges for ultra-precision optical fabrication are all than ever before and to do at unprecedentent speeds as well. The ICF optics difference with conventional optics, has to work under high peak power laser. So that they not only have rigorous form error tolerance (PSD) with difference scale spatial frequency zone also require good subsurface finishing quality .
We must develop advanced optical fabrication technology to meet the challenges. In the report, we will briefly describe CNC milling and polishing technique, diamond turning technique for KDP cutting. An accurate metrology ensures successful fabrication, we will present the on-line and subaperture stitching measurements implement the error control effectively in production environment.

Principal Author's Biography: Fan Dianyuan, research professor of SIOFM,CAS. Postgraduated from the Chinese Academy of Sciences in 1966, and was elected member of the Chinese Academy of Engineering in 1995. During the passed 40 years, he was responsible for designing and completing a series of laser fusion facilities, and has published more than 250 scientific articles and reports.

■ ***Academician Plenary Presentation 3***

Title: Advanced Spectroscopy for characterization of materials

Prof. Junhao Chu (China)
Shanghai Institute of Technical Physics, CAS
Academician of Chinese Academy of Science

Abstract: Some advanced spectroscopic techniques, such as spectroscopic ellipsometry (SE), infrared photo-reflectance (PR) and photo-luminescence (PL), cyclotron resonance (CR) and spin resonance (SR) spectroscopy, and their applications in the characterization of functional materials have been reported in the talk. Some new results on the optical transitions of narrow gap semiconductors and ferroelectric thin film materials were also reported in the talk.

Principal Author's Biography: He is born at YiXin city in JiangSu province in March 1945, graduated from Physics Department in Shanghai Normal University in 1966, and got Master degree and PhD degree from Shanghai Institute of Technical Physics, CAS in 1981 and 1984, respectively, elected as Member of Chinese Academy of Sciences in 2005. He is professor in Shanghai Institute of Technical Physics in CAS, and Director of Research center for Solar cells in CAS, he is also Dean of School of Information Science and

Technology in East China Normal University, and Chief Editor of Chinese Journal of Infrared and Millimeter Waves. He had been the director of National Laboratory for Infrared Physics from 1993 to 2003. He has made a systematically investigation on the infrared opto-electronic materials and devices such as narrow gap semiconductors and ferroelectric thin films. He presented widely used expressions for energy band gap, absorption coefficient etc. for HgCdTe, set up a theoretical model to describe the two-dimensional electron subband structures in the MIS structure of narrow gap semiconductors. He found the properties of fundamental opto-electronic transitions, determined opto-electric territorial for HgCdTe materials and devices. He developed researches on the physics of ferroelectric thin film materials and devices, fabricated PZT and BST uncooled infrared detectors to realize thermal imaging. He has published more than 300 papers, and 3 books. He is also an author for Landolt-Boernstein "Numerical Data and Functional Relationships in Science and Technology". He acquired the second class Awards of Natural Science in China (2005).

■ ***Academician Plenary Presentation 4***

Title: The advance optical technologies of LAMOST telescope

Prof. Xiangqun Cui (China)
National Astronomical Observatories/Nanjing Institute of Astronomical Optics and Technology, CAS
Academician of Chinese Academy of Science

Abstract: Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST) is an innovative telescope with both large aperture and wide field of view to achieve the large scale spectroscopic survey observation. LAMOST has completed its engineering work in 2008, and is going to finish commissioning around the end of 2010. It consists of a 5.72m×4.40m active deformable reflecting Schmidt mirror, a 6.67m×6.05m primary mirror and a focal surface with 4000 optical fibers. There are 16 spectrographs to get 4000 spectra which recorded by 32 4KX4K CCD detectors. Both the active deformable reflecting Schmidt mirror and the primary mirror are segmented. This presentation introduces its innovation of optical system, the technique challenges in active optics, mirror fabrication, and the optical fiber positioning. The success show that LAMOST project has pushed the Chinese technologies for developing large telescope to the forefront of world, and let China got capability to build extremely large telescope itself or join international ELT projects.

Keywords: Wide field telescope, Reflecting Schmidt system, Active optics, Segmented mirror

Principal Author's Biography: Xiangqun Cui is an academician of Chinese Academy of Sciences, the general engineer of LAMOST project, the vice president of Chinese Astronomical Society, the associate director of National Astronomical Observatories of CAS, the associate director of Chinese Center of Antarctic Astronomy. She got her MSC and PhD in Purple Mountain Observatory, CAS in China. During the years of 1985 to 1994 she visited and worked in Jodrell Bank Observatory in England for radio telescopes and in European Southern Observatory (ESO) in Germany for VLT project. In 1994 to 2009, she worked for the Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST).

Conference 1: Large Mirror and Telescopes

(SPIE Proceedings VOL.7654)

Conference Chairs:

JIANG Wenhan, Academician, Chinese Academy of Engineering (China)
Myung K. Cho, National Optical Astronomy Observatory (USA)
WU Fan, Institute of Optics and Electronics, CAS (China)

8:30-12:00 April 27 ····· SESSION 1-1 room 1 (20 min/report)

Session chair: Wu Fan

- ✓ Research on Technique of Wavefront Retrieval Based on Foucault Test, Wu Zhonghua(China)·····[1-0001]
- ✓ ELT Primary Mirror Prototype Segment Manufacturing and Testing, Eric Ruch(France) ·····[1-0031]
- ✓ Active Support Technology Research Based on 400mm Diameter Thin Mirror, Li Hong-zhuang(China) ·····[1-0004]
- ✓ Study on Computer-aided Alignment Method , Wang bin(China) ·····[1-0014]

Tea Time

- ✓ Blind Deconvolution in Phased Telescope Array with Phase Error, Zhou zhiwei(China) ·····[1-0017]
- ✓ The accuracy problem of FEA in the deformation of larger-aperture optical components, Li Shimeng(China) ·····[1-0020]
- ✓ Fabrication of large off-axis asymmetry aspherics using stressed lap with orbital tool motion, Luo xiao(China)·····[1-0024]

13:30-17:00 April 27 ····· SESSION 1-2 room 1(20 min/report)

Session chair: Fan Bin

- ✓ granding and poslishing technology with computer controlled active-lap for Φ1250mm f/1.5 aspercical mirror, Fan Bin(China)·····[1-0081]
- ✓ Nonlinear Analysis Method for Predicting Optical Surface Deformations Resulted from Assembly Process, WANG Dong(China) ·····[1-0036]
- ✓ Development Plan of Korea for the GMT, Young-Soo KIM(Korea)·····[1-0066]
- ✓ A method of tracking performance, Gaomin(China)·····[1-0047]

Tea Time

- ✓ A large aspherical surfaces diamond turning and measurement on line methods, Cheng-Shen Han(China) ·····[1-0049]
- ✓ The Application of Wavefront Coding Technology to a Large Segmented Synthetic Aperture Telescope, Litong FENG(China) ·····[1-0062]
- ✓ Studing on working tolerance of off-axis three mirrors anastigmatic telescope, Qinghua YU(China)·····[1-0076]

13:30-17:00 April 28 POSTER Exhibition hall, 2 floor

Conference 2: Advanced Optical Manufacturing Technologies

(SPIE Proceedings VOL.7655)

Conference Chairs:

YANG Li, COMT, COS (China)
Yoshiharu Namba, Chubu University (Japan)
David D. Walker, University College Landon (UK)
LI Shengyi, National University of Defense Technology (China)

8:30-12:00 April 27 ····· SESSION 2-1 room 2 (15 min/report)

Session chair: Xin Qiming

- ✓ Material removal mechanisms in abrasive vibration polishing of complex molds, Heiko Schulte(Germany)·····[2-0084]
- ✓ Optical Finishing of Lightweight Silicon Carbide Asphere Using Sub-Aperture Polishing Technology , Dr. John Kong(USA)·····[2-0036]
- ✓ Design and experiments of a 629nm He-Ne Laser with internal Fabry-Perot etalon, Liang Jing(China)·····[2-0007]
- ✓ Microstructure evolution and FT-IR spectra of silicon induced by pulsed laser irradiation, Weiwei An(China) ·····[2-0012]
- ✓ A Novel Ultraprecision Surface Grinding Machine for Advanced Optic Manufacture, Y. Guo(China) ·····[2-0021]
- ✓ Research on Stiffness of Aerostatic Bearing of Ultra-precision Machine Tool for KDP Crystal, Lu Lihua(China) ·····[2-0114]
- ✓ Characteristics of Two-Dimensional Vertical Ultrasonic Vibration-assisted Grinding Technology, Y. Peng(China)·····[2-0140]

Tea Time

- ✓ Research on Controllable Compliant Tools(CCT) Theory and Technology, Shengyi Li(China) ·····[2-0160]
- ✓ Review on active optics methods – What can we do by elastic bending ?, Gerard R. Lemaitre(France) ·····[2-0096]
- ✓ Blaze Wavelength of Convex Blazed Grating in An Offner Spectrometer, Yang Bo(China) ·····[2-0031]
- ✓ Mechanism and techniques of mechanical lapping of nature diamond cutting tools' nose arc, Li Zengqiang(China) ·····[2-0032]
- ✓ Depth of focus extended intraocular lenses and their optical performances in a pseudophakic eye model, Zhao-Qi Wang(China) ·····[2-0035]
- ✓ Acrylic-based Y-Branch POF Coupler for "Do-it-Yourself" Next Generation Optical Devices, Abang Annuar Ehsan(Malaysia) ·····[2-0093]
- ✓ Workspace Analysis of a 3SPS+1PS Bionic Parallel Processing Platform Based on Unit Quaternion, Jing-li Yu(China)·····[2-0158]

13:30-17:00 April 27 ····· SESSION 2-2 room 2(15 min/report)

Session chair: Yu Jingchi

- ✓ loop-polishing machining technology of large area lightweiht mirror, Chen Xianhe(China) ·····[2-0074]
- ✓ Research on the critical cutting thickness in ductile mode cutting of CaF2 crystals, Haofeng Chen(China) ·····[2-0058]
- ✓ Ultra Precision Machining of Nitrocarburized Steels, Jens Osmer(Germany)·····[2-0089]
- ✓ Automatic Manufacturing Methods for the Precision Centering of Lenses, Stefan Krey(Germany) ·····[2-0135]
- ✓ Effect of Growth Temperature on the Properties of Al-doped ZnO Thin Film Prepared by RF Magnetron Sputtering, Zhou Yang(China) ·····[2-0086]
- ✓ Atomics Simulation of Single-crystal Copper Nanocutting Prcess: Removal Mechanism, Defects Evolvement and Characterization, Jiaxuan Chen(China)·····[2-0132]
- ✓ Development in Optical Design and Simulation Optimization Methods, Liu hua(China) ·····[2-0091]

Tea Time

- ✓ Processing Micro Grooves and Craters on the Surface of Wide Band Gap Mold Material Using Femtosecond Laser, Prof. Qingliang Zhao(China) ·····[2-0024]
- ✓ Finishing of Display Glass for Mobile Electronics using 3M Trizact™ Diamond Tile Abrasive Pads, ZHENG Lianbin(China)·····[2-0136]
- ✓ Thermal research in fluid jet polishing process, Shi Chunyan(China)·····[2-0169]
- ✓ Production grinding capability for 1m Zerodur hexagonal mirror segment using the BoX® grinding machine, Xavier Tonnellier(UK)·····[2-0153]
- ✓ Pilot Study for Ion Beam Figuring Process, weiyuan GUO(China)·····[2-0159]
- ✓ Analysis About Diamond Tool Wear in Nano-metric Cutting of Single Crystal Silicon Using Molecular Dynamics Method, Wang zhiguo(China)·····[2-0128]
- ✓ Tool decentration effect in slow too servo diamond turning sinusoidal surface, Guan Chaoliang(China)·····[2-0043]
- ✓ Temperature sensor using a Long Period Fiber Grating Fabricated by 800 nm Femtosecond Laser Pulses, Yu Yongqin(China) ·····[2-0111]

8:30-12:00 April 28 ····· SESSION 2-3 room 2(15 min/report)

Session chair: Wan Yongjian

- ✓ Ultra-precision Cutting of Fresnel lenses on Single Crystal Germanium and the machining processing analysis , Fan yufeng(China)·····[2-0122]
- ✓ ELID supported grinding of thin sapphire wafers, Christian Vogt(Germany) ····[2-0092]
- ✓ Alignment methods of large aperture reflecting system, Yifan Huang(China)···[2-0105]
- ✓ Fabrication of Optical Microstructure Component by Using Five-axis Ultra-precision Machine Tool, Peng Zhang(China) ·····[2-0139]
- ✓ Drilling of optical glass with electroplated diamond tools, Wang aijun(China) ··[2-0148]
- ✓ Simulation Analysis and Structure Optimization of the Polishing Disc with the Tiny-grinding Wheel Cluster Based on MR Effect, Jiabin Lu(China)·····[2-0155]

Tea Time

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- ✓ Theoretical Analysis and Experimental Study of Material Removal Characteristics in Ion Beam Figuring Process, DAI Yifan(China)·····[2-0151]
- ✓ Relationship between influence function accuracy and polishing quality in magnetorheological finishing, Markus Schinhaerl(Germany) ·····[2-0083]
- ✓ Singularity Analysis of a Novel 3SPS+PS Bionic Parallel Processing Platform based on Grassmann Line-geometry, Wei Gu(China) ·····[2-0157]
- ✓ The tool path algorithm and Implementation of Ultrasonic- magnetorheological combined finishing optical surfaces, Xingbin Yu(China) ·····[2-0145]
- ✓ Research on middle and high spatial-frequency errors by discrete particles abrasion, Wan Yongjian(China)·····[2-0167]
- ✓ CAD of The unstable optical resonator, Zhou haiguang(China) ·····[2-0054]

13:30-17:00 April 28 POSTER Exhibition hall, 2 floor

- ✓ Research on the planarizaion of the large optic wafer in the fast polishing process, Wei. Y(China)·····[2-0000]
- ✓ Study on Stable Output of Fiber Laser with Complex Ring Cavities, Liu Tianshan(China) ·····[2-0001]
- ✓ Thermal Tuning On Narrow Linewidth Fiber Laser, Han Peiqi(China) ·····[2-0002]
- ✓ New magnetic constraint magnetron sputtering source, Mib Qian(China)·····[2-0003]
- ✓ The optimal control of the surface residual stress by laser shock peening, Su-min Yin(China) ·····[2-0004]
- ✓ The Main Parameters Relationship Analysis of the Erbium-doped Fiber Ring Laser , Lian Wang(CHINA) ·····[2-0005]
- ✓ Athermal Research on High Resolution Imaging for Visible Optical System on Airborne CCD Camera, Yixian Qian(China)·····[2-0006]
- ✓ Antireflective gradient index silica films for high power laser applications, lianghong yan(China)·····[2-0008]
- ✓ Using new method of CCOS to the fast focal ratio off-axis aspherical segment, analyzing its movement feature & the technological parameter, Gao Bilie(China) ·····[2-0009]
- ✓ Three Dimensional Finite Element Simulation and Analysis of Residual Stress in Milling, Liu Haitao(China)·····[2-0010]
- ✓ Laser imaging scanning devices based on integrated , Xu xijun(China) ·····[2-0013]
- ✓ Design of Athermal Collimator by Hybrid refractive and diffractive Method, Zhai Xuhua(China)·····[2-0014]
- ✓ Optical thin film design with immume optimization algorithm, Wang wenliang(China) ·····[2-0015]
- ✓ Study on high-performance whole spectrum and multi-band antireflective films on ZnS optical windows, Zhang tao(China)·····[2-0016]
- ✓ Antirefledtion with multilayer structure used on solar cell , Wang wenliang(China) ·····[2-0017]
- ✓ Finite Element Analysis for PZT Actuated Deformable Polishing Lap, huziqiang(China) ·····[2-0018]
- ✓ Influence of Ion Beam Bombardment on Surface Roughness , Pan Yongqiang(China) ·····[2-0019]
- ✓ Study on sub-wavelength nano-porous silica reflection reducing coating, Ye Xin(China) ·····[2-0020]
- ✓ Design and Analysis on the Kinematics of the Lap-Polisher for Optical Fiber End face Based on Tribological Theory, Lu Yu-Shan(China) ·····[2-0022]
- ✓ The cleaning of BK7 substrate, Xiao-Dong Wang(China)·····[2-0023]

Conference 3: Optical Test, and Measurement Technology, and Equipments

(SPIE Proceedings VOL.7656)

Conference Chairs:

ZHANG Yudong, Director of Institute of Optics and Electronics, CAS (China)
Jose M. Sasian, Prof. of University of Arizona (USA)
XIANG Libin, Director of Opto-electronic Research Academy of Chinese Academy of Science (China)
Sandy To, Hong Kong Polytechnic University (China)

8:30-12:00 April 27 ····· SESSION 3-1 room 3 (10 min/report)

Session chair: Wu Shibin

- ✓ Phase retrieval in-situ measurement for large aperture parabolic mirror, Ding Lingyan(China) ·····[3-0114]
- ✓ Subaperture Stitching Based on Hartmann Wavefront Sensor, He Yu-mei(China) ·····[3-0141]
- ✓ Characterization of Micro-optics using Physically Spherical Phase Compensated Digital Holographic Microscope, Qu Weijuan fin(Singapore) ·····[3-0371]
- ✓ Fully automatic wavefront measurement of miniature aspheric lenses – a fast and accurate inspection technology, Iris Erichsen(Germany) ·····[3-0324]
- ✓ Precision Measurement of Centering Error and Aspherical Axis Orientation, Josef Heinisch(Germany) ·····[3-0329]
- ✓ Optimizing the Operating Parameters of Spectrophotometer for Testing Transmission Spectrum of Optical Substrate, Liu Huasong(China) ·····[3-0232]
- ✓ Fiber Bragg Grating Demodulation System Based on ARM and LABVIEW, Zhang Ying(China)·····[3-0168]
- ✓ Modeling of LED Far-Field Radiation Pattern by using LabVIEW, Rakesh Chandra Prajapati(Canada)·····[3-0330]

Tea Time

- ✓ Design of null lenses for testing of an F/0.8 concave oblate elliptical surface, Ding xuezhuan(China) ·····[3-0095]
- ✓ Phase Modulating Two Fabry-Perot Interferometry and Its Application to Nanometrology, Zhu Ruogu(China)·····[3-0011]
- ✓ Study of ocean red tide multi-parameter monitoring technology based on double-wavelength airborne lidar system, Lin Hong(China) ·····[3-0036]
- ✓ Optical balanced detection with single photoreceiver, Prof Hui-Kang Teng(Taiwan,China) ·····[3-0078]
- ✓ Water environmental pollutant detecting and implement system based on of fluorescence mechanism, Shutao Wang(China) ·····[3-0102]
- ✓ Application of Wavelet Analysis in Laser Doppler Vibratory Signal Denoising, Lan Yu-fei(China)·····[3-0180]

- ✓ Super-smooth Surface Defects Measurement and Evaluation System, GAO Xin(China) ……[3-0218]
- ✓ Space composite colloidal crystal growth research, Yang Hao(China) ……[3-0224]

13:30-17:00 April 27 …… SESSION 3-2 room 3(10 min/report)

Session chair: Li Shengyi

- ✓ Study and Preliminary Measurement of Nanometer and Nanoradian Surface Profiler , Shinan Qian(USA) ……[3-0126]
- ✓ lecturer, Yanguang(australia) ……[3-0106]
- ✓ Polarization point-diffraction interferometer for high-precision testing of spherical surface, Daodang Wang(China)……[3-0096]
- ✓ A Novel Tuning Fork Atomic Force Microscope for Optical Surfaces Characterization, Jian Zhao(China) ……[3-0118]
- ✓ Identification and quantification of Non-commonpath error in lateral shearing interferometry, Liu Bingcai(China)……[3-0132]
- ✓ study of the transverse chromatic aberration after LASIK refractive surgery applying the individual eye model, Zhang(China) ……[3-0136]
- ✓ Test of Visible Spectral Transmittance of Large Aperture Optical Lens, Wang Jianmin(China) ……[3-0143]
- ✓ Nondestructive detecting soluble solid contents and weight of intact pears base on online near-infrared spectroscopy, Yan-De Liu(China) ……[3-0153]

Tea Time

- ✓ Overview on the profile measurement of turbine blade and its development, Huang junhui(China) ……[3-0163]
- ✓ Measurement Method for the Transition Width of Precision Approach Path Indicator based on Spectral Means, Haiping Shen(China) ……[3-0239]
- ✓ Performance of Modal-biased Wavefront Sensor to Detect Multiple Modes Aberration, Liu Changhai(China)……[3-0241]
- ✓ Error analysis and system optimization of nonnull aspheric testing system, Yongjie Luo(China)……[3-0249]
- ✓ Error Analysis of Spherical Surfaces Ultra-Precision Measurement, Dongsheng Wang (China)……[3-0251]
- ✓ A hybrid phase retrieval method for solving the twin image problem in digital holography, Zhao Jie(China)……[3-0270]
- ✓ An Efficient Compound de-noise Approach to Eliminate the Speckle Noise, YANG Xu(China)……[3-0278]
- ✓ Automatic procedure for non-coplanar aberration compensation in lensless Fourier transform digital holography, Huakun Cui(China)……[3-0285]

8:30-12:00 April 28 …… SESSION 3-3 room 3(16min/report)

Session chair: Jing Hongwei

- ✓ Certification, self-calibration and uncertainty in testing optical flats, Chris J. Evans(USA) ……[3-0237]

- ✓ Measurement of high-departure aspheres using subaperture stitching with the Variable Optical Null(VON™), Mike DeMarco(USA) ·····[2-0137]
- ✓ Research on measurement of terahertz spectroscopy, Dr. Yuqiang Deng(China) ·····[3-0039]
- ✓ Spectrum deductive method to determine depth and duty cycle of photo-resist grating with multilayer dielectric stack, CHEN Xin-rong(China) ·····[3-0119]
- ✓ Performance Comparison of Optical Path Difference Calculation Algorithms for Wavelength Scanning Interferometry, Kaiwei Wang(China) ·····[3-0293]
- ✓ Study of optimum pumping intensity at Cs vapor magnetometer, Zhang Junhai(China) ·····[3-0296]
- ✓ Surface roughness measurement by the digital holography, Yan Li(China)·····[3-0300]
- ✓ The Application of the Laser Scanning Confocal Microscope in Fluorescent Film Sensor Research , Zhang Hongyan(China)·····[3-0306]

Tea Time

- ✓ Dynamic Closed-loop Test for Real-time Drift Angle Adjustment of Space Camera on Earth, Jun Hu(China)·····[3-0385]
- ✓ Investigation of a Laser frequency stabilization method based on linear magneto-optics effect, Zeng Xianjin(China)·····[3-0309]
- ✓ Effects of mechanical inaccuracies on the measurement result in metrology systems, Florian Schneider(Germany) ·····[3-0317]
- ✓ Study on phase demodulation of a single closed fringe interferogram in radial shearing interferometer for aspheric testing, Tian chao(China) ·····[3-0320]
- ✓ Development and Innovation on Integrated Engineering Optics System Design, Ding quanxin(China)·····[3-0339]
- ✓ Uniform Illumination Research For Large Area Digital Speckle Pattern Interferometry, Huang zhanhua(China) ·····[3-0346]
- ✓ Zernike Polymomials for rectangular area and applications in off-axis asphere testing, He pinjiang(China)·····[3-0372]
- ✓ Apparatus for femtosecond laser measurement, Sun Qing(China) ·····[3-0304]

13:30-17:00 April 28 POSTER Exhibition hall, 2 floor

- ✓ The detection of infrared dim targets based on crossover matching operator, zhang haiying(China)·····[3-0000]
- ✓ Research on Doppler Frequency in Incoherent FM/CW Laser Detection, LIU Kai (China) ·····[3-0001]
- ✓ Measurement of the Muller matrix for painted surfaces with a kind of scatterometer, FENG Weiwei(China) ·····[3-0002]
- ✓ Study on ‘vertical bright line’ image of CCD camera irradiated by Laser, Jiang Tian(China)·····[3-0003]
- ✓ A novel algorithm for a rotation invariant template matching, MING LEI(China) ·····[3-0004]
- ✓ Theodolite Self-stabilization Tracking Servo System Based on Mobile Platform, Wangchen(China) ·····[3-0005]
- ✓ Wall-Drag E®ect of Dense Brownian Particles Close toSolid-Liquid Interface in Low-Coherence Dynamic Light Scattering, Hui Xia(China) ·····[3-0006]
- ✓ Noise Filtering for MoiréFringe Signal Based on Variable Step Size Adaptive Neural network Algorithm, Lv Mengjun(China) ·····[3-0007]

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Conference 4: Design, Manufacturing and Testing of Micro and Nano Optical Devices and Systems

(SPIE Proceedings Vol.7657)

Conference Chairs:

YE Tianchun, Director of Institute of Microelectronics, Chinese Academy of Science (China)

Sen Han, Veeco, Inc. (USA)

Masaomi Kameyama, Nikon Corporation (Japan)

HU Song, Institute of Optics and Electronics (IOE), CAS (China)

8:30-12:00 April 27 ····· SESSION 4-1 room 4 (20 min/report)

Session chair: Peng Changsi

- ✓ The Force Sensor Based on ITO Material With Large Strain, Chao-Heng Chien(taiwan,China)·····[4-0111]
- ✓ A Novel Technique of Phase-locked Interference Positioning and Phase Discrimination, Ye Shuliang(China) ·····[4-0033]
- ✓ Manufacturing and quality analysis of high precision thermoplastic optical lenses, Sebastian Hessner(Germany) ·····[4-0082]
- ✓ miniature Fabry-Perot Optic Fiber pressure sensor, Chen shuang(China) ·····[4-0041]

Tea Time

- ✓ Analysis of silicon-based optical racetrack resonator for acceleration sensing, Wenqin Mo(China)·····[4-0090]
- ✓ Application of holographic technique to the photonic crystal quantum cascade lasers, Quan-Yong Lu(China) ·····[4-0015]
- ✓ Nano-Devices Fabricated by Soft Press and Temperature-Pressure Variation Imprint, Lei Wang(China)·····[4-0035]
- ✓ Simulation of Modal Wavefront Sensor Employed Multiple Holographic Optical Elements, Liu Changhai(China) ·····[4-0053]

13:30-17:00 April 27 ····· SESSION 4-2 room 4(20 min/report)

Session chair: Ye Shuliang

- ✓ Fast, high efficiency and cost-effective laser nano-lithography, Changsi Peng(China) ···[4-0094]
- ✓ Numerical Simulation Investigation the Effect of Tool Edge Radius on Cutting Temperature in Micro-end-milling Process, Yingchun Liang(China)·····[4-0060]
- ✓ Topology Optimization of 3-axis Micro-milling Machine Composition Based on Density Method, Chen Wanqun(China) ·····[4-0059]
- ✓ Application and Influence of Aspheric Surfaces in Lithographic Objectives Design, Mr. MA Bin(China) ·····[4-0065]

Tea Time

- ✓ Metal nanostrip arrays for transmission enhancement in subwavelength-slit, Xu-Feng Li(China) ·····[4-0071]
- ✓ Optical Response of Bowtie Antennas, Guo Ying-Nan(China)·····[4-0073]
- ✓ Numerical Calculation of the Optical Probe's Polarization Characteristics, Hao Peng(China)·····[4-0079]
- ✓ A Highly Sensitive NanofiberSensor for Measuring the Refractive Index Change of a Solution Based on Differential Frequency Technique, Biqing Ye(China)·····[4-0037]
- ✓ Design, manufacture and Focus Properties of micro-lens array , Wei Mingyue(China) ·····[4-0118]

8:30-12:00 April 28 ····· SESSION 4-3 room 4 (20 min/report)

Session chair: Hu Song

- ✓ Dynamic Glass pattern based on the random microlens array, Shen suo(China) ·····[4-0108]
- ✓ Thinned-Cladding Zeolite Long Period Fiber Grating Chemical Sensors, Shengao(China) ·····[4-0105]
- ✓ Characterization of a 61 channel bulk-PZT thick film deformable mirror and generation of Zernike polynomials, Jianqiang Ma(China)·····[4-0046]
- ✓ The mode characteristics of Photonic crystal vertical cavity surface emitting laser , Yiyang Xie(China) ·····[4-0083]

Tea Time

- ✓ Design and fabrication of dual-bandpass fiber Bragg grating filter with terahertz wavelength spacing, Jianguan Tang(China)·····[4-0089]
- ✓ Enhancing The Efficiency Of Photocells By Inserting Into Bow-tie Antenna, Zhu Chenguang(China) ·····[4-0087]
- ✓ The analysis of holographic mosaic gratings' error, Guolin Qian(China) ·····[4-0034]
- ✓ Periodic microstructures induced by interfered femtosecond laser pulses, Zhongyi Guo(Korea)·····[4-0113]
- ✓ Novel Design and Characterization of Piezoelectric Ultrasonic Motors Used for Nano-scale Precision Driving and Positioning , ZHAO Xiangdong(China) ·····[4-0030]

13:30-17:00 April 28 POSTER Exhibition hall, 2 floor

- ✓ Study on Measure System of Vibration Acceleration Based on Fiber Grating, TENG Feng-cheng(China) ·····[4-0000]
- ✓ Self collimation in square lattice two dimensional photonic crystals with ring-shaped holes, Quan Xu(China)·····[4-0001]
- ✓ Influence on digital photolithography intensity by collimated Gaussian beam, Yiqing Gao(China) ·····[4-0002]
- ✓ External laser intensity modulation basing on MEMS micro-mirror applied to gas sensing, Li Li(China)·····[4-0003]
- ✓ Dynamic adjustment system of Space-borne Fourier Transform Spectrometer, WEI Huan-dong(China) ·····[4-0004]
- ✓ Research on VESEL of Single Model Multilayer Photonic Crystal, Wenchao Li(China)····· ·····[4-0005]

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Conference 5: Opto Electronics Material and Devices for Detector, Imager, Display and Energy Conversion Technology

(SPIE Proceedings Vol.7658)

Conference Chairs:

JIANG Yadong, Dean of School of Optoelectronic Information, University of Electronic Science and Technology of China

Bernard Kippelen, Vice Director, Center of Organic Photonics and Electronics, Georgia Institute of Technology (USA)

YU Junsheng, State Key Laboratory of Electronic Thin Films and Integrated devices (China)

8:30-12:00 April 27 ····· SESSION 5-1 room 5 (16 min/report)

Session chair: Wu Zhiming, Wen Wen

- ✓ Dependence of silicon thin-film growth characteristics on substrate temperature, Longzhi Lin, Haojie Zhang, Shaoji Jiang (China) ·····[5-0014]
- ✓ Assess Image Blur in Photoelectric Imaging System, Xiaofu Xie, Jin Zhou, Qinzhang Wu (China) ·····[5-0100]
- ✓ Photoluminescence and photovoltaic performance of poly3-octylthiophene and poly3-alkylthiophene, Lengliang Li, Fujun Zhang, Changrong Guan, Zuliang Zhuo, Bangzhi Cao, Yitao Li (China)·····[5-0044]
- ✓ Research Progress on Optical Wireless Communication in Xi'an University of Technology, Ke Xizheng (China)·····[5-0041]
- ✓ Energy transfer from both triplet and singlet energy levels of PVK to DCM2 induced by heavy-ion, Jiaxiu Luo, Lixin Xiao, Zhijian Chen, Bo Qu, Qihuang Gong (China) [5-0114]
- ✓ SAW ethanol gas sensors based on cryptophane-A sensitive film, Sun Ping, Jiang Yadong, Xie Guangzhong, Du Xiaosong, Li Xian, Hu Hengbo (China)·····[5-0071]

Tea Time

- ✓ Realization of p-type conductivity in ZnO by (N, Ag) dual acceptor codoping: A first-principles study, Zhihua Xiong, Lanli Chen, Qixin Wan, Dongmei Li (China) ·····[5-0031]
- ✓ Electrical and Optical Properties of Amorphous Vanadium Oxide Thin Films Deposited by DC Magnetron Sputtering, Zhenfei Luo, Zhiming Wu, Mingjun Du, Xiangdong Xu, Junsheng Yu, Tao Wang, Yadong Jiang(China)·····[5-0039]
- ✓ Optimizing the growth condition of optoelectronic material (ZnO film) by imaging technology, Jun Wang, Shi Pan, Yi Zhang (China)·····[5-0205]
- ✓ Effect of variable substrate temperature for SrTiO3 thin films using pulsed laser deposition, Xiaojing Wan, Li Wang*, Xueqiong Su, Jiangbo Chen (China) ·····[5-0067]
- ✓ Numerical Simulation of Multilayer Organic Light-Emitting Devices, Hansong Gao, Haibo Rao, Yue Hu, Jianjun Ju, Yuan He, Yuantao Wan (China)·····[5-0022]

- ✓ The Low-cost Preparation of Pyramid-like Texture ZnO Thin Films and the Application As a Front Electrode in Hydrogen Amorphous Silicon Solar Cells, Y. H. Hu, L. F. Wang, H. J. Xu, Y. C. Chen, W. H. Jiang (China)·····[5-0036]

13:30-17:00 April 27 ····· SESSION 5-2 room 5(16 min/report)

Session chair: Chen Zhijian, Xiao Lixin

- ✓ Substrate temperature influence on the properties of InGaZnO thin films grown by PLD technique, Jiangbo Chen, Li Wang, Xiaojing Wan, Xueqiong Su, Le Kong (China) ·····[5-0068]
- ✓ Feature Point Tracking for Incomplete Trajectories with Multi-View Constraint, Wang Kun-peng, Zhang Xiao-hu, Yu Qi-feng (China)·····[5-0113]
- ✓ Polymer PSQ-L Notch Filter Fabricated by Simple Nanoimprint Process, Jie Teng, Xiuyou Han, Hongbo Zhang, Jinyan Wang, Xigao Jian, Stijn Scheerlinck, Geert Morthier, Roel Baets, Mingshan Zhao (China) ·····[5-0132]
- ✓ Fast Near Natural Color Polarimetric Imagery Fusion Approach, Pucheng Zhou, Yusheng Han, Feng Wang, Hongkun Zhang (China)·····[5-0121]
- ✓ Effect of triplet energy and transporting property of electron transporting material on iridium complex yellow phosphorescent organic light-emitting devices , Wen Wen, Junsheng Yu, Sujie Chen, Chunhua Huang, Yadong Jiang (China) ·····[5-0136]
- ✓ Solvothermal Synthesis of Platinum Nanoparticles and Their SERS Properties, Yong Yang, Zhengren Huang, Masayuki Nogami (China)·····[5-0140]

Tea Time

- ✓ Theoretical and experimental demonstration of phase locking technology by utilizing cubic susceptibility medium, Zhao Liang, Sun Junqiang (China) ·····[5-0195]
- ✓ Steady enhancement of organic solar cell performance by doping phosphorescent iridium complex, Jiang Huang, Junsheng Yu, Hong Wang, Yadong Jiang (China)····· ·····[5-0147]
- ✓ The Application of ALD Process on Special Fiber , Guangyuan Wei, Ru Zhang, Peilin Lang (China) ·····[5-0176]
- ✓ Research on High-speed Single Photon Detector, Wang Chao, Yang Hao, Wang Di, Ma Haiqiang, Luo Kaihong, Sun Zhibin, Zhai Guangjie (China)·····[5-0213]
- ✓ A Simple Defogging Method for Outdoor Images Based on Physical Model, Guo Jia, Wang Xiaotong, Hu Chengpeng, Yang Changqing (China) ·····[5-0221]
- ✓ Quantitative analysis on flyback region problem of 1D transmissive liquid crystal optical phased array device, Xu Lin, Huang Ziqiang (China)·····[5-0208]

8:30-12:00 April 28 ····· SESSION 5-3 room 5 (16 min/report)

Session chair: YU Junsheng, Zhang Lei

- ✓ Nano-Optical Microscopy: Now and Its Industrialization, Wu Shifa, Wang Zhao, Zhang jian, Xu Chenbiao, LI Hong, Pan Shi (China) ·····[5-0235]
- ✓ Study of the transfer function of atmosphere to operation range of IRFPA, Dong Wei, An Ying Chen Wenjian (China) ·····[5-0236]
- ✓ Waveguide Design Consideration of A High Power and Fast Speed Directional Coupling Photo Diode, Xuecai Yu (China)·····[5-0288]

- ✓ Thickness Effect and Etching Implement of Silicon Substrate of LiTaO3 Thin Film Infrared Detector, De-Yin ZHANG, Wen-Tian LUO, Yong BAO, Feng GAO, Wei QIAN (China)……[5-0243]
- ✓ Realization of large open circuit voltage in organic photovoltaic cells by introducing a fluorescent dye layer, Nana Wang, Junsheng Yu, Yue Zang, Yadong Jiang (China)……[5-0145]
- ✓ Electroluminescence performance of organic light-emitting diode with molybdenum trioxide inside hole transport layer, Ye Zou, Zhenbo Deng, Zhaoyue Lü, Zheng Chen, Yuehong Yin, Hailiang Du, Yongsheng Wang (China) ……[5-0086]

Tea Time

- ✓ Fraunhofer Diffraction of the Object with Inclined Plane, Anqing Zhao (China)·[5-0295]
- ✓ Thin Film AlGaInP Power LEDs with Roughened Surface, Guo Jing, Zou Deshu, Gao Wei, Qin Yuan, Liu Zike, and Shen Guangdi (China) ……[5-0258]
- ✓ The Research and Analysis of TDICCD Dynamic Driving Design, Yun Cheng, Tao LI (China)……[5-0302]
- ✓ Research On Accelerometer Based On Multi-mode Interference, Qiaofen Zhou, Changlun Hou, Guoguang Yang, Jian Bai, Shuangshuang Zhao (China)……[5-0311]
- ✓ Novel Chemically Selective Siloxane Polymer for Chemical Vapor Sensing, Jia Huang , Yadong Jiang, Xiaosong Du, and Juan Bi (China) ……[5-0095]
- ✓ Investigation of bright spatial solitons in SBN: 75 photorefractive crystal, Qinlin Guo, Guiying Deng, Baolai Liang, Panlai Li, Yan Li, Xu Li (China) ……[5-0111]

13:30-17:00 April 28 POSTER Exhibition hall, 2 floor

- ✓ Daytime Star Detection Device Using Polarization and Spectral Filtering Method, Lan Gongpu(China)……[5-0000]
- ✓ Study of Quantitative Identification of Infrared Thermal Wave Testing Based on BP Neural Networks, Zhang Wei(China) ……[5-0001]
- ✓ Quantum Teleportation and Survey Technology, Wang Zhiguo(China)……[5-0002]
- ✓ Effect of carrier gas on crystal quality of thick HVPE-GaN films, Wangru(China) ……[5-0003]
- ✓ Experimental research on liquid level measurement with linear CCD, Qiang Wen who(China)……[5-0004]
- ✓ DATA PROCESSING BASED ON 3D MEASUREMENT SYSTEM USING DISPARITY METHOD, Yang Shuping(China)……[5-0005]
- ✓ Traceable dynamic calibration for CHAL-010 thermocouple, Hao Xiaojian(China) ……[5-0006]
- ✓ Time constant measurement of thermocouple by use of modulated laser, Hao Lina(China)……[5-0007]
- ✓ The design of mirror's temperature control system of three Antarctic Schmidt Telescopes, Zhao jianlin(China)……[5-0008]
- ✓ Viewing angle changeable display, JinBi Leng(China)……[5-0009]
- ✓ Principle and Design of Small-Sized and High Definition X-Ray Machine, Anqing Zhao(China)……[5-0010]
- ✓ Patterned geometrical effect on the spetral absorptance of wafers, WANG Aihua(China) ……[5-0011]
- ✓ Influence of neutron irradiation on the deep levels in GaN, Zhang minlan(China)……[5-0012]
- ✓ The Impact Model of Cumulative Damage on the Detection Threshold of Space Optical Communication, Chang Guolong(China) ……[5-0013]

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Conference 6: Smart Structure and Materials in Manufacturing and Testing

(SPIE Proceedings Vol.7659)

Conference Chairs:
LUO Xiangang, Institute of Optics and Electronics, CAS (China)
George Von Freymann, University of Karlsruhe (Germany)

8:30-12:00 April 27 ····· SESSION 6-1
room 1 (20 min/report)

Session chair: Luo Xiangang

- ✓ Methods for Expanding the bandwidth of Metamaterials and its application, Luo Xiangang(China)·····[6-0039]
- ✓ Numerical study of slow-light induced by SBS in an optical fiber, Zhou hongyan(China) ·····[6-0034]
- ✓ A Study on Ultrasonic On-Line Testing System of Oil Coiled Tubing, Qiu wenbin(China) ·····[6-0035]

Tea Time

- ✓ Analysis of High Contrast Nano-lithography Using Array of Subwavelength Metallic Apertures, Yanxia Cui(US)·····[6-0036]
- ✓ The research of diagnose for structural damage based on piezoelectric phased array, Li xingang(China)·····[6-0040]
- ✓ Carbon nanocoils manipulated by optical tweezers, Jiangtao Lv(China) ·····[6-0048]

13:30-17:00 April 27 ····· SESSION 6-2
room 6 (20 min/report)

Session chair: Luo Xiangang

- ✓ Surface plasmon imaging and lithography beyond the diffraction limit, Yao Hanmin(China)·····[6-0068]
- ✓ Fiber Optic Surface Plasmon Resonance Technology based on Gold Nanoparticle embedded Polymerzation Technology for Chemical Gas Detection, Dr. Wei Peng(China) ·····[6-0055]
- ✓ Automatic Impedance Matching in Passive Far-Field RFID, Rakesh Chandra Prajapati(Switzerland) ·····[6-0060]

Tea Time

- ✓ Exploration on propagation properties of, Qing Zhao(China)·····[6-0025]
- ✓ Infrared turbidity sensor validation based on ARMA model, chen jian(China)···[6-0030]
- ✓ Application Research of the Synthetic Image Segmentation Algorithm on the Multi-Lens Video Logging , Jia huiqin(China) ·····[6-0069]

8:30-12:00 April 28 ····· SESSION 6-3 room 6 (20 min/report)

Session chair: Hong Minghui

- ✓ Highly efficient Fresnel zone plate design for terahertz frequency, Dehua Li(China)····· ·····[6-0009]
- ✓ Femtosecond Laser Fabriracation of Long Period Fiber Gratings and Index Sensitivity Analysis, Li Benye(China)·····[6-0074]
- ✓ Optical fiber sensors with Farby-Perot thin film coating as sensitive element, Minghong Yang(China)·····[6-0031]

Tea Time

- ✓ Analysis on optical absorption, Electromagnetic & thermal polarity of metal nanoshells, Wang Hao(China) ·····[6-0082]
- ✓ Improving Iterative Closed Points Algorithm for Sparse Range Image Registration, Xu Li(China) ·····[6-0083]

13:30-17:00 April 28 POSTER Exhibition hall, 2 floor

- ✓ Optimization design of the precision opto-electronic tracking turntable frame , Li jie(China) ·····[6-0000]
- ✓ Study of Fluorescence Spectrometer with Optical Fiber Based on Modular, Wang Jiulong(China) ·····[6-0001]
- ✓ Temperature-Insensitive Fiber Bragg Grating tilt sensor, Kai Ni(China) ·····[6-0002]
- ✓ Study of White High-power AC-LED Based on the Bridge Structure SMD Package , Wang zhibin(China)·····[6-0003]
- ✓ Study on Tracking Technology of the Moving Object, Zhengying Xu(China)·····[6-0004]
- ✓ The design of missile’ s dome that fits both optical and aerodynamic needs, Wei Qun(China)·····[6-0005]
- ✓ The Design of Laser Atmosphere Transmission Characteristic Measurement System Based on Virtual Instrument, Zhang Laixian(China)·····[6-0007]
- ✓ Research on the the device of non-angular vibration for opto-electronic platform , An yuan(China)·····[6-0008]
- ✓ Development of Mini LD Laser Rangefinder, Jianfeng Wang(China) ·····[6-0010]
- ✓ Optical fiber refractive-index sensor based on multimode interference, Jin Yongxing(China) ·····[6-0011]
- ✓ Laser bar code applied in Computer aided design of power fittings, Yang Xiao-hong(China)·····[6-0012]
- ✓ The temperature sensitivity of fiber loop mirror based on the pressure-induced birefringence in singlemode fiber, Yu Zhao(China) ·····[6-0013]
- ✓ Development and Application of Low-frequency FBG Vibration Sensor, Nan qiuming(CHINA) ·····[6-0014]
- ✓ Rapid face detection using feature reducing by GA, LI Xi-lai(China) ·····[6-0015]
- ✓ Iterative classification Algorithm Based on Rough Set and Support Vector Machine, Guo Zhijun(China)·····[6-0016]
- ✓ Application of precision harmonic gear drive in focusing mechanism of space camera, Zhang Xinjie(China) ·····[6-0017]
- ✓ Study of Moving Object Detecting and Tracking Algorithm for Video Surveillance System, wangtao(China)·····[6-0019]
- ✓ A novel Fiber Bragg Grating Pressure Sensor with the full metal structure Based on the Flat Diaphragm, Guo Ming-jin(China)·····[6-0020]
- ✓ FBG Sensor Networks for the Estimation of Boundary Shear Stress Around the Novel Piers, Chengang Lv(China) ·····[6-0021]

13:30-14:30 April 28 Workshop 1, No.1 Lecture hall

UK Head Quarters Address: 4 Vulcan Court, Vulcan Way, Hermitage Industrial Estate, Coalville,
Leicestershire LE67 3FW, United Kingdom. **Tel:** +44 1530 815 832 **Fax:** +44 1530 839 631
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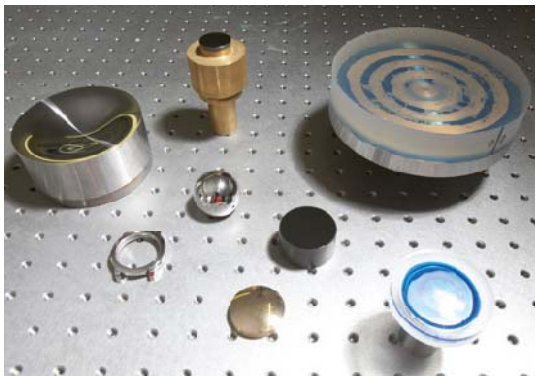
香港九龙弥敦道789号健峰保险大厦1104室. **Tel:** +852 (0) 2380 6080 **Fax:** +852 (0) 2789 8656 **Email:** zhiwa@hkstar.com

Zeeko is an innovative, young and dynamic technology based business with globally protected Intellectual Property extending to over 52 worldwide patents. Zeeko specialise in the manufacturing and commercialisation of Ultra-Precision Polishing Machines famously known as the Intelligent Robotic Polishers (IRP). Zeeko Ltd manufactures corrective polishing machines for fabricating high precision optics, orthopaedic joints, semiconductor applications and precision moulds in a number of different materials.



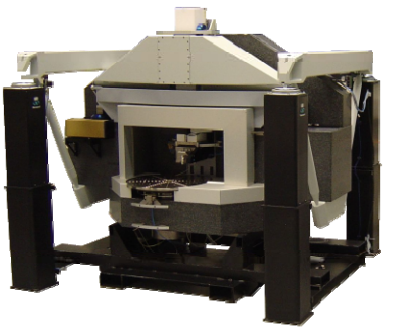
The machines are supplied with software and processes suitable for the production of the most complex freeform artefacts. Covering a range of sizes from 1.5mm to 6m they utilise patented processes including the mechanical "ZeekoClassic" technology and the "ZeekoJet" solution. These cost effective solutions are deterministic and scalable from the smallest cell-phone requirements to the largest astronomy applications and are suitable for polishing most materials from traditional optics materials, stainless steel etc to both tungsten carbide and silicone carbide.

Along with Dr David Walker, Richard founded Zeeko Ltd, the innovative manufacturer of polishing solutions for ultra-precision surfaces. As Managing Director he has lead the

company throughout the development of its current range of equipment. As a part of its business, Zeeko includes the supply of such technologies to the manufacturers of optics for the astronomy community. His Company has, in just nine years, progressed from start-up status to become one of the recipients of a contract to develop manufacturing technologies for the fabrication of the primary mirror segments for the European Extremely Large Telescope.

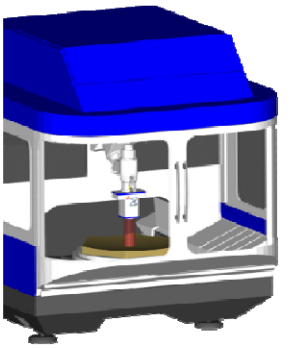
Both in its polishing technology and in its measurement techniques, Zeeko has been a key innovator in the development of processes that in the coming years will be relied upon by at least a part of the astronomical community. Richard will describe these innovations and discuss some of the challenges faced by Zeeko in meeting the aspirations of the scientific community.

NANOMEFOS Specifications



- Measures flat, spherical, free-form and off-axis parts, size up to 500 mm Ø by 100 mm thick
- Granite base with active vibration isolation
- 5-axis servo driven system positions custom probe over surface under test
- Air bearings for 4 main motion axes
- Uncertainty 30 – 90 nm (2σ), dependent upon part to be measured
- Non-contact optical probe:
    - o 5 mm axial range
    - o ±5° angular range
    - o 1 nm resolution
    - o Sample rate >3kHz
- Interferometric and capacitive monitoring on motion axes
- High speed measurement (estimated 15 min for 500 mm Ø part)
- State of the art CNC control of all axes and measurements
- Control and analysis software based around the Zeeko Metrology Toolkit
- Dimensions (W x D x H):2100 mm x 1800 mm x 1800 mm

Stitching Interferometer Specifications



- Measure fast convex or slow concave surfaces and flats by Stitching Interferometry (SI)
- Customized Twyman-Green type interferometer at 633 nm utilizing custom auxiliary optics for surface measurement with 1000 x 1000 pixel CCD camera
- Stitching Interferomtery module fits into Zeeko tool chuck and uses the same CNC axes as the machine system
- SI module fits into Zeeko tool chuck and uses the same CNC axes as the machine system
- Auxiliary optics depend upon application, but nominally based on 4” and 6” apertures for spherical parts
- Supports the production of spherical surfaces to λ/10 P-V
- Accuracy dependent upon application, but for spheres and flats is generally better than λ /50 RMS1
- λ /20 P-V reference optics for spherical systems 1 Results obtained with a development version of the stitching system

Optical Test Tower

- Free-standing optical test towers designed to serve the Zeeko IRP 800-IRP 2400 machines
- Custom designed for your application using CAD /finite element analysis and optical design software
- Interferometers, wavefront sensors OR optical components can be placed at the top of the towers for flexibility in the optical test design.
  - *o Test longer radius concave spheres in situ*
  - *o Fold and shorten the beam path using custom optical test configurations*
- Isolated gantry allows personnel access for adjustment and upper tower configuration, without disturbing measurement frame.

14:45-15:45 April 28 Workshop 2, No.1 Lecture hall

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Advances in Fizeau Interferometry
Donald A. Pearson II
ESDI – Tucson, Arizona, USA

The last several years have seen major technical advances with the design and application of Fizeau interferometers. ESDI in Tucson, Arizona has consistently been a leader in these advances by designing and manufacturing state of the art Fizeau interferometers for vibration insensitivity and for measuring aspheric elements. ESDI's Intellium H2000 is a polarization based vibration insensitive Fizeau interferometer that incorporates simultaneous phase-shifting with its patented *HyperPhase* module. The patented *HyperPhase* module allows for three ultra precise, phase-shifted interferograms to be acquired simultaneously. ESDI has successfully demonstrated less than λ/100 measurement errors in the H2000. ESDI has also developed a nulling Fizeau interferometer, the Intellium Asphere, for measuring aspheric surfaces. The Intellium Asphere incorporates traditional phase-shifting interferometry, sub-Nyquist sampling and ESDI's patent pending CGR technology to measure aspheres in the same manner which flats and spherical surfaces are measured.

Intellium H2000: Like all vibration insensitive interferometers that capture multiple phase-shifted interferograms simultaneously, the H2000 is polarization based. Like all polarization based, vibration insensitive interferometers, the H2000 is also a dual beam interferometer in that the measurement beam and the reference beam are orthogonally polarized with respect to one another. Because the dual beams are orthogonally polarized, they may be affected differently as they travel through the optical path of the interferometer. These affects are due to birefringence that may exist in the internal optics

of the interferometer or the reference optics being used. In the H2000, the illuminating test and reference beams travel through the collimator at a slight angle with respect to one another. However, the reflected reference and test beams travel on-axis back through the optical system. This unique design, coupled with ESDI's SPARC (S-P Advanced Relative Calibration technology) allow for measurement errors of less than λ/100. This may be accomplished by simply by making a measurement with the S and P beams configured as test and reference, saving the result, he reversing the S and P beams to measurement and test. In our presentation, we will demonstrate these measurement results.

Intellium Asphere: The Intellium Asphere is a modified Fizeau interferometer used for measuring aspheric surfaces. The Asphere incorporates traditional phase-shifting, sub-Nyquist sampling and ESDI's patent pending CGR technology. Traditional Fizeau interferometers must be used with computer generated holograms to measure aspheres. This is so because using a standard transmission sphere to measure an aspheric surface generates fringe densities to high to overcome and the fact the test and reference beams travel different paths throughout the system create retrace errors. ESDI has solved this by implementing a sub-Nyquist camera where it is possible to capture and process interferograms with fringe densities of four fringes per pixel, i.e., greater than 2000 fringes and by implementing CGR (computer generated reference) technology to overcome the retrace errors. The CGR is a set of computer generated, synthetic fringes that are easily generated because the optical prescription of the aspheric surface is known, the optical prescription of the transmission sphere is known and the optical prescription of the interferometer is known. Therefore, we generate the CGR and overlay it with the actual fringes being measured. The overlaying of the two interference patterns, the actual fringes from the surface and the CGR, creates the Moire' affect. With the Moire' fringes as the guide, it is now straightforward to align and measure the aspheric surface in a "nulled" condition. In our presentation, ESDI will demonstrate this capability.

ESDI Product Introduction

***Intellium H2000* - Simultaneous Phase-Shifting Fizeau Interferometer for Dynamic Measurements in Harsh Environments**

Features ESDI's patented *HyperPhase* module for Vibration & Turbulent Environments; *SPARC*® Technology demonstrates measurement errors of less than λ/100 PV; Uses industry standard, 100 mm (4") bayonet reference optics; Measure flat, concave and convex surfaces, small to astronomical size; Ideal for long optical path length and remote Fizeau cavity applications; 10μs exposure times; True 1k x 1k resolution; Dimensions 337 x 190 x 254 mm

***Intellium Asphere* - Nulling Fizeau Interferometer for Aspheric Surface Measurements**

Utilizes traditional phase-shifting technology with sub-Nyquist sampling & *CGR* Technology; Data acquisition, processing and retrace compensation in seconds, ***NOT*** minutes; No CGHs, null lenses or long stitching/scanning processes required; Measures aspheric, flat, and spherical surfaces; Operates on the world-renowned IntelliWave™ 6.5 software platform; Output Aperture 100mm; Fringe Resolution 2,000 fringes; Dimensions 338 mm x 190 mm x 254 mm

***Intellium Z100u* – Full Featured 100mm Fizeau Interferometer**

Single cable, total USB connectivity to laptop or desktop computer; Supports PZT

phase-shifting, spatial carrier and fringe tracing interferometry; Compatible with all industry standard 4" (100mm) reference optics and accessories; 6x zoom, focus and attenuation controls; 1k x 1k true spatial resolution; 35µs exposure time; *IntelliPhase* static spatial carrier function for vibration insensitivity; With the single cable USB connectivity option, the Z100u and laptop computer increase portability and flexibility
Also available is the 40mm aperture ***Z40u*** Fizeau interferometer for small part testing

***Intellium PDI* – Self Referencing Point-Diffraction Interferometer**

The PDI measures real-time wavefront data from external sources in vibration and turbulent atmospheric environments. The ***Intellium™ PDI*** with ESDI's patented ***HyperPhase™*** module is a state-of-the-art point-diffraction interferometer that provides real-time wavefront measurements using an internally generated spherical reference and ESDI's simultaneous phase-shifting technology.
Also available is the ***SBSI*** for very small diameter wavefront measurements

***IntelliWave* - The De-facto Standard for Interferometry Software**

Also available is ***IntelliStitch*** for stitching large flat and spherical surface measurements

16:00-17:00 April 28 Workshop 3, No.1 Lecture hall

Partner of NTG in China:
Mr. Shi Zhenxia / 师 振 峡
OEC desino zhenxia Tech.Co.,Ltd.
北京德华振峡科技有限公司 Tel.: 021 6148 2080

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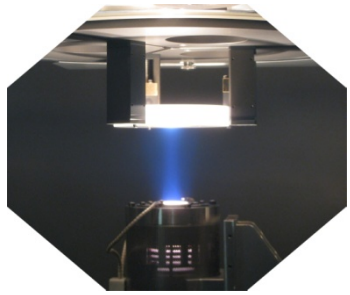
IBF-Technology for Nano Manufacturing Technology
T.Franz
NTG, Neue Technologien GmbH & Co.KG, Im Steinigen Graben 12-14, 63571 Gelnhausen-Hailer, Germany; t.franz@ntg.de

The report in the Forum will reflect upon the informations given in the report of the plenary talk but additionally give a very detailed view of the history and presence of NTG with an sideview on other branches and projects in which NTG is envolved. The main focus also lies on the IBF-Technology. The report will explain the different stages of development of these unique technology at NTG within the last twenty years. All different types of NTG IBF-plants will be explained in details including some intentions which applications are suitable for IBF. The report reflects upon the widespreaded IBF-300, IBF-450 and IBF-700 and places a particular emphasis to the latest developments of NTG: IBF-100 and IBF-1500.
The following informations can be seen as fundamental for all our systems.

NTG Product Introduction
NTG is a worldwide operating mechanical engineering company located in the heart of the european Union. Made in Germany is not just an empty phrase for us. No difference if simple job order parts or complex procedural plants, everything is manufactured inhouse.



Since 1968 NTG Neue Technologien GmbH & Co. KG is an innovative designer and manufacturer of products for mechanical engineering, special machines and appliances. Located in the Frankfurt/Main area, actually approx. 85 employees are working at NTG. NTG co-operates successfully with customers in Industry and Research. Our activities concentrate on Design, Manufacturing, Assembly and Commissioning of parts or complete plants mainly in the fields of vacuum technology, nanotechnology and components for nuclear power plants, as well as special custom-made plants for industrial clients. In our characteristic as designer of custom made solution we are always looking for new challenges. Do not hesitate to describe us your problem, even if it does not fit into the categories listed above. NTG's production equipment is according to the high requested standard and is added by our production independent and TÜV-authorized Quality Control Department. It is equipped with 3D gauging machines. All processes are controlled by an ERP-System. We dispose of valid approvals according to HP0 and DIN/ISO 9001, DIN ISO 13485 as well as KTA 1401 and SVTI. Our Technical Engineering and project planning team is provided with wit the following 3D-CAD and CAM System: Mechanical Engineering: Solid Works 2010, ProE, CAM Works Electrical Engineering:VisiWinNET(.net-Interface), TwinCAT or Siemens S7, TreeCAD. NTG is specialized on stainless steel. With our experience and our large feedstock we are able to serve our customer immediately if required.

Since 1991 NTG is engaged in IBF-technology. IBF-Technology is needed when the required quality of optical surfaces can not be achieved by using conventional polishing techniques. Our Customers are the world leader in fabrication of high performance optics. Whereas in the past the use of technology was limitated in producing stepper objectives for the semiconductor industry recently a growing demand of this technology even in the traditional optic industry can be recognized. Actually five different standard types of IBF-plants are available at NTG for different sizes and applications.

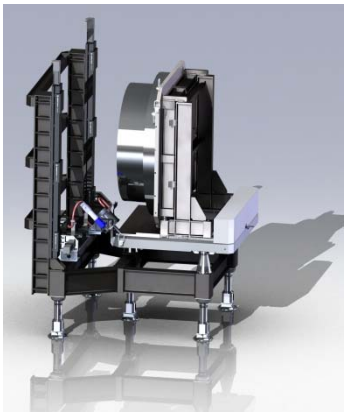
NTG uses inhouse developed control systems for the IBF-plants. Control is done via touchscreen. The process flow is nearly completely automated. This means for the user: insert work piece, load the program, start the process.

IBF-100:
The IBF-100 is beside the IBF-1500 the latest development of NTG. The IBF-100 is a consistent advancement of our bigger plants IBF-300, IBF-450 and IBF-700. Parts with a diameter of 5-70mm, a max. part thickness of 45mm and max. contact angle of 60° can be treated.

IBF-300 & IBF-450:
The IBF-300 and 450 were the first types of IBF plants from NTG. Designed for diameters up to 300 resp. 450mm a height up to 120mm and weights up to 50kg these

plants are perfect tools for the fabrication of high end lenses. For more then 15 years some plants of this type are running in an industrial process partly in 24/7. The system is almost free of wear parts.

IBF-700:
The IBF-700 is for workpieces up to 700mm in diameter approx. 200mm height and a weight up to 100kg. Its main use is in the semiconductor industry.



IBF-1500:
The IBF-1500 is for workpieces up to 1500mm in diameter and a total weight up to 1000kg ! It is actually the biggest NTG-IBF plant and is mainly used for polishing error correction of large mirrors used for astronomical applications.

Advantages of NTG-IBF Process

- Contactless process - no signs on the surface
- no induced stress on the surface
- almost any geometry can be treated
- large spectrum of processable materials
- acquisition costs comparable with MRF plants
- low operating costs
- no abrasives are necessary
- nearly no wearing parts
- less cleaning exprenses (for parts and machine)
- low maintenance
- surface quality PV < λ /10 to λ/20 reachable (depending on the requirements of quality & process speed)
- surface quality PV < λ/100, rms < 1nm reachable without additional investments
- Know-How resulting of nearly 20 years IBF-treatment

Beam Accelerator

Dalian World Expo Center

http://www.dl-expo.com/

The Dalian World Expo center CO.,LTD was founded in June 2004, and is governed by the Dalian XingHai Bay Development & Construction Administration Center. It is equipped to host international and domestic trade fairs, conventions and exhibitions and is a member of The Federation of Consumer Products Trade Center for All China Cities as well as The China Convention and Exhibition society. The governing units of Convention Exhibition Fortune have bestowed the service award of Annual Selection of China Convention and Exhibition industry for 2005-2006, and rated the Expo Center in the Top 20 Profitable Exposition of the Exhibition Industry. It is also won the highest honor award of China Newly Rising Star in the China Convention Exhibition Summit Forum for 2007.

Howard Johnson Parkland Hotel Dalian

ACCOMODATION

Our 262 luxurious guest rooms and suites provide ideal city and sea view rooms. The Interior Decor and elegant furnishings are designed by Top German Design Company GMP with modern amenities to offer the guests the ultimate experience.
The Howard Johnson Club Floors allow for that exclusive private check-in and check-out providing superior comfort and benefits for the discerning business travelers. Each room and suite is stylishly decorated with great attention to detail, featuring state-of-the-art amenities.

RESTAURANTS & LOUNGES:

Loading Restaurant
This restaurant provides a unique open kitchen design which offers an international buffet. Featuring the best of Japanese, Asia, local seafood dishes and genuine pizza. Definitely the place to dine in Dalian Xinghai Square.

Helloker Lobby Lounge
The lobby lounge becomes the ideal meeting place. By day it is the ideal place to meet for a coffee and try our pastries and snacks. At night, the lounge transforms, offering live music and a great selection of evening cocktails.

LOCATION:

"Location is everything", Howard Johnson Parkland Hotel Dalian is located in the Xinghai Square – known as the largest and most scenic restaurant and entertainment square in Asia. This Hotel becomes first choice for exhibition patrons as it is directly adjacent the Dalian World Expo Centre. The hotel also compliments the fast developing Commercial and Finance area where an array of International Brand companies can be found, Your evening can be perfect as this hotel is only a five minutes walk to the beach.

TRANSPORTATION / NEARBY ATTRACTIONS:

Zhou shuizi International Airport	15 minutes by car
Dalian Railway Station	18 minutes by car
Dalian Xinghai Square	3 minutes by walk

FACILITIES & GUEST SERVICES

Hi-speed Internet access
Voice mail system
Luxurious bath amenities
Full size writing desk with writing lamp
Hair drier
In-room safe
Limousine services
Individually controlled air-conditioning
Wheelchair accessible room
Satellite TV programs
Tea/coffee facility
Full-stocked mini-bar/mini shop
Car parking
Howard Johnson Club Floors

MEETING FACILITIES
The ideal meeting solution can be found for that intimate event or meeting. Our facilities are designed for flexibility to meet your needs. Each of the meeting and function spaces feature modern audio-visual equipment, and offer a wide selection of catering and banquet themes Our meeting organizers will ensure that service is delivered in the most professional manner to meet the needs of your company and client.

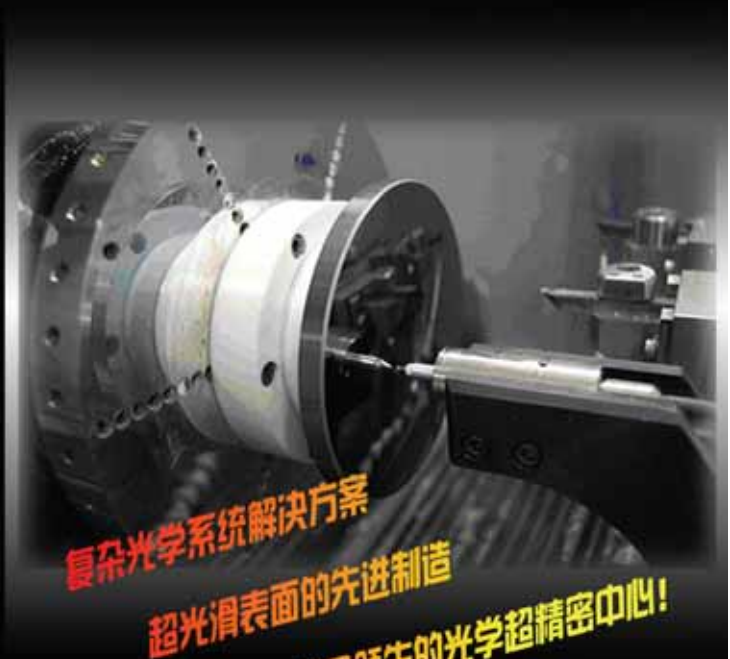
RECREATION & LEISURE
Fitness Centre & Gym
Sauna

maupmc 上海现代先进超精密制造中心有限公司

Shanghai Modern Advanced Ultra Precision Manufacturing Center .LTD

主要产品：

非球面和自由面镜片（Aspheres, Freeform）
微结构表面（Micro Structure Surface）
微阵列和模具（Micro Structure Array and Mold）
各种扫描器件（F-θ Lens, Scanner）
离轴三反光学系统（Off-axis Reflective Imaging System）
立体目镜显示系统/头盔显示器（Helmet-Mounted Displays）
超短焦投影镜头（Ultra Short Focus Project Lens）
热成像镜头（Thermal Imaging Lens）



复杂光学系统解决方案

超光滑表面的先进制造

打造世界领先的光学超精密中心！

公司介绍：

致力于奇异光学系统设计、SDPT、CNC数控抛光、光学测量中心、光学系统制造&集成
建设世界领先的先进紫外/可见/红外光电元件和装配的研发设计中心
专注所有光学材料的非球面、自由面、微结构阵列制造
由国内外多学科专家和学者组成的专业团队为高难度项目客户提供技术支持

Find out more: www.maupmc.com Tel: (86-21)55063801 Fax: (86-21)55063804
Email:maupmc@maupmc.com 地址：上海市黄兴路2005号2号楼20层 邮编：200433

Institute of Optics and Electronics

Chinese Academy of Sciences

URE-2000/35

URE-2000S/25

URE-2000B

URE-2000D

URE2000 aligner's series were successfully developed in 1998. Eight types of them had been delivered to the customers over more than 20 provinces. Some of them had been exported to US, Singapore, Vietnam, P. R. Korea, etc..

URE2000 aligner's series, by the means of proximity or contact method, were used for the fabrication of small scale IC, semi-conductive devices, infrared devices and MEMS etc.. They are also suitable for the small production in factory.

Technical Parameters

Exposure area:
100mm×100mm~430mm×430mm

Overlay:
±0.45μm--±1μm

Resolution:
0.8-1μm（positive resist with thickness of 0.6mm）

Illumination Uniformity:
±3.5% (within Φ100mm)
±5.0% (within Φ150mm)

Power of mercury lamp:
100W~4500W

Mask Aligner

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