

# **AOMATT 2012**

**The 6<sup>th</sup> SPIE International Symposium on  
Advanced Optical Manufacturing and Testing Technologies**

**26-29 April 2012**

**Xiamen International Conference Center  
Xiamen China**

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

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**ZHOU Liwei**, President of Beijing Optical Society, Academician, CAE

**Conferences:**

- 1 Large Mirror and Telescopes [VOL. 8415](#)
- 2 Advanced Optical Manufacturing Technologies [VOL. 8416](#)
- 3 Optical Test and Measurement Technology and Equipments [VOL. 8417](#)
- 4 Design, Manufacturing and Testing of Micro and Nano Optical Devices and Systems [VOL. 8418](#)
- 5 Opto Electronics Material and Devices for Sensing and Imaging [VOL. 8419](#)
- 6 Smart Structure and Materials for Manufacturing and Testing [VOL. 8418](#)
- 7 Opto-Electronic Materials, Devices and System Technology for Solor Energy [VOL. 8419](#)
- 8 Precision Optics and Engineering for Imaging, Information Storage, Display and Transmission [VOL. 8420](#)

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26-29 April 2012

Xiamen China

## INVITATION

### Dear Authors and Friends!

The International Symposium of AOMATT has been grew up 12 yeas since 2000 the first symposium. It has just passed a close loop of Chinese new era from Dragon year 2000 to the new Dragon year 2012. It becomes more and more popular in domestic and abroad.

On behalf of the Organization Committee of the Symposium, I would like sincerely to invite you to participate in the AOMATT2012 to be held in Xiamen, China in April 26-29, 2012. It will be very appreciative that you submit your abstracts and manuscripts to the SPIE proceedings of this conference in time. We believe that the beautiful costal city-Xiamen, China and also the successful symposium of AOMATT2012 will leave you a pleasant and impressive memory.

We are looking forward to meeting you at the symposium AOMATT2012 in Xiamen, China.

Sincerely Yours,



Prof. ZHANG Yudong

*Director of the Institute of Optics & Electronics, CAS  
General Co-Chair of AOMATT2012  
Chairman of the Organization Committee of AOMATT2012*

**Organizations & Committees****Sponsored by:**

**COS** - The Chinese Optical Society



**中国光学学会**  
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**中国科学院光电技术研究所**  
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THE CHINESE ACADEMY OF SCIENCES

**SPIE** - The International Society for Optics and Photonics (*Technical Co-Sponsor*)



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- Micro nano science and Technology Branch, Japan Society of Mechanical Engineering
- Application Optical Society of Germany
- Optics and photonics society of Singapore
- Opt-electronic Industry Association of China
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- Huaqiao University
- National University of Defense Technology
- University of Electronic Science and Technology of China

- Sichuan University
- Harbin Institute of Technology
- Hong Kong Polytechnic University
- Changchun University of Science and Technology
- Beijing Institute of Technology
- University of Shanghai for Science & Technology
- Nanjing University of Science and Technology
- The Chinese Optical Society (COS) of Sichuan
- the State Key Laboratory of Optical Technologies for Microfabrication, IOE, CAS
- the State Key Laboratory of Adaptive Optics, IOE, CAS
- Institute of Electrical Engineering Chinese Academy of Sciences
- Changchun Institute of Optics, Fine Mechanics and Physics, CAS

#### ***Honorary Chair:***

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**Hiroki Kuwano**, Director, Nano Center of Tohoku University, Japan; President of Mechanical Engineering Society of Japan

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etc.

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**Myung K. Cho**, NOAO (USA), *Co-Chair*

etc.

#### **Secretary General of the Symposium:**

**YANG Li**, Committee of Optical Manufacturing Technology, COS

**Jinxue Wang**, SPIE Technical Advisor (USA)

**Honorary Chair:**

**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 Chair:***

**ZHOU Liwei**, President of Beijing Optical Society, Academician, CAE

**Zhou Liwei**, Professor, Ph.D, Member of Chinese Academy of Engineering, was born in Shanghai in 1932. He was graduated from Beijing Institute of Technology (BIT) in 1958 and received the USSR Candidate Degree (Ph.D) of physics-mathematical science in 1966. In 1984 he was titled " Outstanding Expert at the State Level" for developing a school of his own in the electron optics study, and in the same year he was promoted to the rank of full professor. He used to be the Chairman of Academic Committee, BIT, the vice president of Chinese Optical Society and Chairman of Association of Science and Technology, BIT. Now he is the Chair-Expert of BIT, Honorary Director of School of Basic Education of BIT and president of Beijing Optical Society.



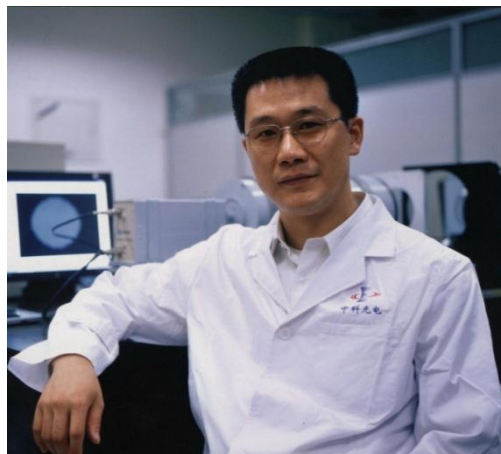
Prof. Zhou Liwei is engaged in electron optics and photoelectronic imaging. Since 1978, Prof. Zhou Liwei has published 6 monographs and 6 printed teaching materials and more 270 academic and technical papers at home and abroad. His monograph "Electron Optics with Wide Beam Focusing" has been awarded the Chinese Books Prize in 1994, the National Books Prize (nominative prize) in 1995 and the Nation-wide Scientific Excellent Books First Prize in 1995.

Achievements of Prof. Zhou Liwei in scientific research were awarded the National Science Congress Prize in 1978, the Ministry 's First and Second Prizes for Science and Technology Progress in 1980, 1990, 1995 and 1996, the Guang Hua Fund First Prize for Science and Technology in 1991. He was also twice of the winner of State Prize for Science and Technology Progress in 1991 and 1996. In 1996 , he was given a title of "Advanced Worker" by State Personnel Ministry for his outstanding service in educational and scientific field. In 1997, he got an Honorary Degree of Doctor of Science by Samara State Aerospace University, Russia. In 1999, he was elected member of Chinese Academy of Sciences, and in 2000, he was elected Foreign member of Academy of Engineering Sciences of the Russian Federation.

### **Chairman of the Organization Committee:**

**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.

From 1998 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  $9\lambda$  to about  $1.5\lambda$  in China. This extends the application of adaptive optics in the ICF field and is at the advanced world level.

**Daily Event Schedule**

<i>Date</i>	<i>Time</i>	<i>Contents</i>	<i>Place</i>
<b>Wednesday April 25, 2012</b>	8:00-20:00	Registration for domestic authors	Acceptance Hall, Xiamen International Conference Center
	8:00-20:00	Registration for overseas authors	Acceptance Hall, Xiamen International Conference Center
	After 20:00	Late attendee contact Hotel reception counter for help	Xiamen International Conference Center Hotel or Xiamen HUALIN Hotel
<b>Thursday April 26, 2012</b>	8:30-9:00	Opening Ceremony	
	9:00-12:40	Plenary Presentation 1 to 5	
	14:00-17:00	Plenary Presentation 6 to 9	
	18:00-21:00	Welcome Banquet	Xiamen International Conference and Exhibition Center No.198 Exhibition Road, Siming Sistrict, Xiamen, China <a href="http://www.xicec.com">www.xicec.com</a>
<b>Friday April 27, 2012</b>	8:30-12:00	Session 1-1, Session 2-1 Session 3-1, Session 4-1 Session 5-1, Session 6-1 Session 8-1	room1, room2 room3, room4 room5, room6 room7
	13:00-17:00	Session 1-2, Session 2-2 Session 3-2, Session 4-2 Session 5-2, Session 7-1 Session 8-2	room1, room2 room3, room4 room5, room6 room7
<b>Saturday April 28, 2012</b>	8:30-12:00	Session 2-3, Session 3-3 Session 5-3	room2, room3 room5
	13:00-17:20	Poster Presentations	Conference room 1F, Xiamen International Conference Center
		Workshop	Conference hall, Xiamen International Conference Center
	19:30-21:00	Xiamen Philharmonic Orchestra Symphony Concert The conductor: Zheng Xiaoying International Conference Center Music Hall	
<b>Sunday April 29, 2012</b>	8:00-18:00	A Day Tour in the Seaside City of Xiamen Detail in see Technical Program of AOMATT2012	
<b>April 30, 2012</b>		The Meeting Ended.	

**Opening Ceremony**

**8:30-9:00 April 26, 2012** **Opening Ceremony**

**Location: Haixia hall, Xiamen International Conference Center**

**Chair: YANG Li**, Committee of Optical Manufacturing Technology, COS  
**WANG Jinxue**, SPIE, USA

**Plenary Presentation**

**9:00-12:40 April 26** **Plenaries 1 to 5** **Haixia Hall, floor 2**

**Location: Haixia hall, Xiamen International Conference Center**

**Plenary Session 1**

**Chair: JIANG Wenhan**, Academician, Institute of Optics and Electronics (IOE), CAS

**(Time: 9:00 to 9:40)**

**1. 50 Years of NASA Mirror Technology Development**

**Dr. H. Philip Stahl (USA)**

*NASA Marshall Space Flight Center, Vice President of SPIE*

**(Time: 9:40 to 10:20)**

**2. Recent developments in high technology optical manufacturing for astronomy and space applications**

**Dr. Eric Ruch (France)**

*SAGEM Défense Sécurité*

**(Time: 10:20 to 11:00)**

**3. Optics Manufacturing Technologies - Challenges and Future Trends**

**Prof. Fritz Klocke & Dr. Olaf Dambon (German)**

*Fraunhofer Institute for Production Technology IPT*

*Tea time (11:00-11:20)*

**Plenary Session 2**

**Chair: WU Chenxu**, School of Physics and Mechanical & Electrical Engineering, Xiamen University

**(Time: 11:20 to 12:00)**

**4. Fabrication of Nano-optics**

**Prof. FANG Fengzhou (China)**

*State Key Laboratory of Precision Measuring Technology & Instruments, Centre of Micro Nano Manufacturing Technology, Tianjin University*

**(Time: 12:00 to 12:40)**

**5. MEMS and Energy Harvesting**

**Prof. Hiroki Kuwano (Japan)**

*Micro/Nano Center, Dept. Nanomechanics, Graduate School of Engineering, Tohoku University, Sendai*

*Group Photo (12:40-13:00)*

*Lunch time (13:00-14:00)*

**14:00-17:00 April 26**

**Plenaries 6 to 9**

**Haixia Hall, floor 2**

***Location: Haixia hall, Xiamen International Conference Center***

***Plenary Session 3***

**Chair: LIN Xiangdi**, Academician, Institute of Optics and Electronics (IOE), CAS (China)

**(Time: 14:00 to 14:40)**

**6. Optical metrology for freeform Aspheres**

**Prof. James H. Burge (USA)**

*Large Optics Fabrication and Testing Lab., University of Arizona, USA*

**(Time: 14:40 to 15:20)**

**7. Ultra-precision manufacture of free-form optical components for imaging and illumination applications**

**Prof. W. B. Lee (HongKong, China)**

*State Key Laboratory of Ultra-precision Machining Technology, The Hong Kong Polytechnic University, Hong Kong*

*Tea time (15:20-15:40)*

***Plenary Session 4***

**Chair: Myung K. Cho**, National Optical Astronomy Observatory (USA)

**(Time: 15:40 to 16:20)**

**8. Optical Technology Enabling Nanolithographic Chip Manufacturing**

**Dr. Tilmann Heil (German)**

*System Engineering at Carl Zeiss SMT GmbH*

**(Time: 16:20 to 17:00)**

**9. Research on the manufacturing technology and equipment for optic elements with nanometer accuracy**

**Prof. LI Shengyi (China)**

*National University of Defense Technology*

### 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	WEN Shangming
	Session 4-1	room 4	LIU Xuefeng
	Session 5-1	room 5	ZHANG Lei
	Session 6-1	room 6	LUO Xiangang
	Session 8-1	Room 7	XING Tingwen
13:00-17:00 April 27	Session 1-2	room 1	FAN Bin
	Session 2-2	room 2	ZHANG Rongzhu
	Session 3-2	room 3	Sandy To
	Session 4-2	room 4	LI Yanqiu
	Session 5-2	room 5	LIN Hui
	Session 7-1	room 6	WEN Shangming
	Session 8-2	Room 7	XU Min
8:30-12:00 April 28	Session 2-3	room 2	CHEN Qiang
	Session 3-3	room 3	WANG Haiying
	Session 5-3	room 5	MA Zhu

### Workshop Schedule

**13:00-17:00 April 28**      **Workshop**      **Conference Hall**

1. MLOptic      <http://www.mloptic.com/>      13:00-14:00



2. Zeeko Ltd. (UK)      <http://www.zeeko.co.uk>      14:00-15:00



**Tea Time (15:00-15:20)**

3. YUANCH Optical Material <http://www.yuanch.com> 15:20-16:20



4. OPTurn      <http://www.opturn.com>      16:20-17:20

北京欧唐科技发展有限公司  
OPTurn Company Limited

9:00-9:40 April 26..... Plenary Presentation 1  
Haixia Hall, floor 2

■ **Plenary Presentation 1**

**Title: 50 Years of NASA Mirror Technology Development**



**Dr. H. Philip Stahl (USA)**

*NASA Marshall Space Flight Center*

*SPIE*

*USA*

*Email: [H.Philip.Stahl@nasa.gov](mailto:H.Philip.Stahl@nasa.gov)*

**Abstract:** For over 50 years, NASA has relied on advanced mirror technology development to enable space telescope missions: from Hubble to JWST. Currently NASA is engaged in technology development to enable even larger and more sophisticated future telescopes. This presentation reviews the needs for space telescopes which drives technology development; traces the history of mirror technology development from the 1957 to the present; and discusses potential future trends in mirror technology development. Specific technology areas include: evolution of mirror architectures, substrate material development, and improvements in optical

fabrication and testing technology.

**Principal Author's Biography:** Dr. H. Philip Stahl is a Senior Optical Physicist at NASA MSFC and the Astrophysics Division Deputy Assistant Director for Technology and Chair Pro Tem of the Astrophysics Technology Team. Since joining NASA in 1999, he has been responsible for multiple technology development activities. He was responsible for developing candidate mirror technologies for the James Webb Space Telescope (JWST) and is the JWST Optical Telescope Element Mirror Optics Lead. Dr. Stahl co-authored two NASA technology studies: Office of Chief Technologist Science Instruments, Observatories and Sensor Systems Technology Assessment (2011); and Advance Planning and Integration Office Advanced Telescope and Observatory Capability Roadmap (2005). Additionally, he is the originator of the annual "Mirror Technology Days in the Government" workshops.

Dr. Stahl is a leading authority in optical metrology, optical engineering, and phase-measuring interferometry. Many of the world's largest telescopes have been fabricated with the aid of high-speed and infrared phase-measuring Interferometers developed by him, including the Keck, VLT and Gemini telescopes. At Raytheon Danbury he was lead optical engineer for the 4 meter LAMP mirror and the Spitzer secondary mirror.

Dr. Stahl is a member of OSA, Fellow of SPIE, a past SPIE Director, past ICO Vice President and current SPIE Vice-President Elect. He earned his PhD in Optical Science at the University of Arizona Optical Sciences Center in 1985.

9:40-10:20 April 26..... Plenary Presentation 2  
Haixia Hall, floor 2

■ **Plenary Presentation 2**

**Title: Recent developments in high technology optical manufacturing for astronomy and space applications**



**Dr. Eric Ruch (France)**  
SAGEM Défense Sécurité  
REOSC Department  
Avenue de la Tour Maury  
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**Abstract:** The manufacturing technologies for astronomy and space instruments are continuously progressing and have tremendously improved over the last decade enabling the design and the production of more challenging optical systems.

Telescope for ground based observatories are using larger, faster, more accurate mirrors and deformable mirrors for adaptive correction of the atmospheric turbulence are nowadays a must in all future projects. For space based telescope, new materials such as silicon carbide are used to achieve lighter and more stable mirrors, and off-axis, aspheric shaped surfaces are used in more powerful and more compact configurations. Segmented pupils will be used in the next generation of ground based Extremely Large Telescope but also in large space based observatories and the optical industry will have to face the challenge of producing thousands of meter class off-axis aspheric segments with accuracy never achieved so far.

The progress of material, optical processing technologies and optical metrology will be reported through some examples of ground based and space based telescopes projects.

**Principal Author's Biography:** Eric Ruch is a graduate in optical engineering from the Institute of Optics in Paris.

He has joined REOSC in 1985, has work in lens design for various space and astronomy projects, precision metrology, and development of new optical manufacturing technology; He has also been project manager for many space and astronomy projects. Since 2006, he has been responsible for the business development for the space and the astronomy activities of the REOSC department in SAGEM and more recently he is in charge of the all the space and the astronomy projects in REOSC – SAGEM.

He gives courses and lectures of optical systems technology at the Institute of Optics Graduate School in Paris.

10:20-11:00 April 26 ..... Plenary Presentation 3  
Haixia Hall, floor 2

■ **Plenary Presentation 3**

**Title: Optics Manufacturing Technologies - Challenges and Future Trends**



**Prof. Fritz Klocke (German)**

**Dr. Olaf Dambon (German)**

Fraunhofer Institute for Production Technology IPT

Head of Department, Fine Machining and Optic

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Internet: <http://www.ipt.fraunhofer.de>

**Abstract:** Optics and optical application face an increasing demand. The number of applications is steadily rising leading to increasing requirements of the optical components used. In order to meet these future requirements, the manufacturing technologies

themselves have to be continuously further developed. Despite many efforts in alternative manufacturing technologies, however, in optics fabrication the technologies grinding, polishing and molding are still the main technologies for optics manufacturing. This talk gives an overview about current research and development trends in glass optics fabrication. In particular, the grinding and polishing of technical ceramics (Silicon Nitride, Silicon Carbide) is presented as well as new insights in the molding of glass optics. However, the presentation gives also concrete application examples in which this technology know-how was applied, e.g. grinding and polishing of silicon carbide mirrors, grinding of glass ceramics for space optic applications or the molding of micro-optical glass components out of a 4"-wafer. Furthermore, process simulation approaches as well as results compared with real experiments will be presented in order to underline the upcoming necessity of simulation techniques for the design of manufacturing processes.

**Principal Author's Biography:** Prof. Fritz Klocke (German)

1950, Born on October 10 in Vlotho, Germany.

1970 – 1973, Studied manufacturing technology at Lippe Polytechnic in Lemgo.

1973 – 1976, Studied manufacturing technology at the Technical University in Berlin.

1977 – 1981, Scientific researcher at the Institute for Machine Tools and Production Engineering at the Technical University in Berlin.

1981, Chief engineer in the Department of Production Engineering at the Institute for Machine Tools and Production Engineering.

1982, Received doctorate of engineering from the Faculty for Design and Manufacturing at the Technical University in Berlin. From April 1984, Worked for Ernst Winter & Sohn GmbH & Co., Norderstedt. Assistant to the technical director. From October 1984, Head of Process Monitoring at Ernst Winter & Sohn.

From September 1985, Head of Mechanics at Ernst Winter & Sohn.

1985, Received Otto-Kienzle commemorative medal from the Production Engineering Universities Group.

Since 1995, Head of the Chair of Manufacturing Technology at the Laboratory of Machine Tools and Production Engineering (WZL) RWTH Aachen. Head of the Fraunhofer Institute for Production Technology in Aachen.

2001 – 2002, Dean of the Faculty for Mechanical Engineering.

2006, Received an honorary doctor title from the University of Hanover.

2007 – 2008, President of the International Academy for Production Engineering (CIRP).

2009, Received a honorary degree of doctor from the Aristoteles University of Thessaloniki (Greece).

2010, Received a honorary degree of doctor from the Keio University Tokyo, Japan.

11:20-12:00 April 26 ..... Plenary Presentation 4  
Haixia Hall, floor 2

■ ***Plenary Presentation 4***

**Title: Fabrication of Nano-optics**



**Prof. FANG Fengzhou (China)**

*State Key Laboratory of Precision Measuring  
Technology & Instruments  
Centre of MicroNano Manufacturing Technology,  
Tianjin University  
China  
[fzfang@tju.edu.cn](mailto:fzfang@tju.edu.cn)*

**Abstract:** Nano-optics is the study of the behavior of light on the nanometer scale. A wide variety of novel optical properties would appear in nano-optics, such as, strongly enhanced light transmission, beyond diffraction limit, etc. With the rapid development of nano-optics, surface plasmon based nano optical elements development have attracted extensive attention, which can be used in the surface plasmon interference nanolithography, plasmon-enhanced sensing and spectroscopy, and superfocusing on the nanoscale, etc. This report will present the latest development in the fabrication of nano-optics, which has been recognized as one of the most important area in developing nano-optics.

**Principal Author's Biography:** Dr F. Z. Fang is currently working as a professor at Tianjin University. He has been involved as a project leader or principal investigator in more than 80 projects in the fields of ultra-precision machining, freeform machining, micro/nano machining and metrology funded by government or industrial partners. He is also the chief scientist for the national key program of 973 on fundamentals of manufacturing freeform optics. He is a fellow of the International Academy for Production Engineering (CIRP), the president of the International Society for Nanomanufacturing (ISNM), and the editor-in-chief of the International Journal of Nanomanufacturing (IJNM).

12:00-12:40 April 26 ..... Plenary Presentation 5  
Haixia Hall, floor 2

■ **Plenary Presentation 5**

**Title: MEMS and energy harvesting**



**Prof. Hiroki Kuwano (Japan)**

桑野博喜

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**Abstract:** Energy harvesting (or scavenging) plays an important role from the viewpoints of creating new services, solving business and environmental problems in the fields of mobile phones, personal computers, and remotely controlled or autonomous monitoring systems in ubiquitous networks. These systems need cost-effective, long-lifetime electric energy supplies, although to date these have usually been electrochemical batteries as a one of power devices which have to be replaced or recharged. The author will describe the research and development of MEMS(Micro Electro Mechanical Systems) and energy harvesting MEMS that is expected to replace electrochemical batteries in the field of low-power industrial and consumer electronic devices.

Recent developments in mobile phones, personal computers, robotics, and artificial organs have highlighted the necessity for high-density and long-lifetime micro electric power supplies. Also, a wireless micro electric power supply is essential for ubiquitous network services such as active RF-ID and sensor-network systems, since for these systems a battery replacement is impractical or impossible.

A micro energy harvester applied by MEMS technology, so called energy harvesting MEMS, is one of powerful candidate to meet the requirement of a long-lifetime micro energy. It is expected to play an important role to advance the next generation electrical communication services. The device is a promising device to develop not only new services in the field of medical, information, and communication technologies, but also to address environmental issues such as the reduction of harmful-waste. Moreover, and ultra-distributed micro energy systems are considered to reduce electric transmission loss.

**Principal Author's Biography:** Hiroki Kuwano received the B.Eng. and M.Eng. degrees in mechanical engineering and the Ph.D. degree in electrical engineering from Tohoku University, Sendai, Japan, in 1975, 1977, and 1990, respectively. He was a Member of the Electrical Communication Laboratories, Nippon Telephone and Telegraph Public Corporation (NTT). Since 2003, he has been a Professor at Tohoku University. He has 35 years of experience in research and has authored or coauthored over 80 technical papers and books in the fields of MEMS and particle beam processing. His research interests are nanoenergy systems including energy-harvesting systems, as well as sensor networks, particularly for safety and medical applications. Prof. Kuwano was the recipient of the NTT President Award in 1993 and 1994 and the Best Paper Award of The Japanese Society for Precision Engineering in 1997.

14:00-14:40 April 26 ..... Plenary Presentation 6  
Haixia Hall, floor 2

■ ***Plenary Presentation 6***

**Title: Optical Metrology for Freeform Aspheres**



**Prof. James H. Burge (USA)**

*Large Optics Fabrication and Testing Lab.*

*University of Arizona*

*USA*

*JBurge@optics.Arizona.EDU*

**Abstract:** Modern computer-controlled machines and precision molding capabilities allow manufacture of precise surfaces that have general aspheric shape. The University of Arizona has developed and implemented advanced methods of measuring such general shapes, spanning a wide range of size and accuracy. Fizeau interferometry is combined with computer general holography to measure surfaces to precision of nanometers. A Swingarm Optical CMM measures surfaces as large as 1.8 meters with accuracy of 10 nm. A reflective slope test we call SCOTS Software Configurable Optical Test System, measures general shapes to accuracy much less than 1  $\mu\text{m}$ . It is often said that "If you can measure it, then you can manufacture it." This talk shows how nearly any precision surface can be measured.

**Principal Author's Biography:** Jim Burge is Professor of Optical Sciences and Astronomy at the University of Arizona where he directs the Large Optics Fabrication and Testing and Optomechanics groups. Dr. Burge has published over 250 papers that span the fields of optical design, fabrication, testing, alignment, instrumentation, and optomechanics. Dr. Burge is Fellow of SPIE and OSA, and recipient of the OSA Fraunhofer Burley award.

14:40-15:20 April 26 ..... Plenary Presentation 7  
Haixia Hall, floor 2

■ ***Plenary Presentation 7***

**Title: Ultra-precision manufacture of free-from optical componenets for imaging and illumination applications**



**Prof. W. B. Lee (HongKong, China)**

*State Key Laboratory of Ultra-precision Machining Technology*

*The Hong Kong Polytechnic University  
Hong Kong*

*[WB.Lee@inet.polyu.edu.hk](mailto:WB.Lee@inet.polyu.edu.hk)*

**Abstract:** In view of the fast growing development of photonics and telecommunication technologies, the demand for application of novel freeform optics has been increasing. The application of freeform optics breaks through the traditional design of optical imaging. Because of the special requirements for transmission, receiving, transformation, and storage of information in modern photonics and telecommunication technologies, complex

freeform surfaces are needed for use in the development of advanced optical systems. The freeform machining process makes use of ultra-precision CNC manufacturing technology. The processes can be used to produce optical freeform surfaces with nanometre level surface finishing and sub-micrometer level form accuracy. The novel optical components formed from freeform optics have become indispensable elements used in information transmission products, computers, photonics and telecommunication products, mobile phones, digital cameras and audio-visual equipment. The successful development of freeform optical surfaces has helped to improve the imaging quality in optical systems as well as enhancing the uniformity of light distribution and efficiency of light transmission in illumination systems. With freeform optics, the flexibility in the design of the layout for prism lenses and optical reflectors can be improved. As a result, the size and the weight of the optical systems can be greatly reduced and the structure and performance can also be optimized. Also, it is possible to adopt mass production techniques which can dramatically reduce the costs. Thus, freeform optics is able to significantly expand the application of optical components so as to support the ability of the industry to keep pace with the rapid growth in market demand.

**Principal Author's Biography:** Prof. W.B.Lee, is the Cheng Yick-chi Chair Professor of Manufacturing Engineering, and the Director of the Advanced Technology Manufacturing Research Centre of The Hong Kong Polytechnic University. He has been the ex-President of the Hong Kong Advancement of the Association of Science and Technology, and Past Chairman of the Institution of Electrical Engineers Hong Kong. Professor Lee established the Ultra-precision Machining Centre (UMC) in 1996 and the Advanced Optics Manufacturing Centre in 2003 which is the first of its kind in Hong Kong and mainland China to be engaged in the promotion and application of ultra-precision machining technology for precision mould and advanced optics industries. In 2009, The Centre was endorsed by the Ministry of Science and Technology of PRC China as a Hong Kong State key laboratory in Ultra-precision Machining Technology. Professor Lee has chaired various international conferences in manufacturing (IMCC) and materials processing (APCMP), and is the founder chairman of the Asia-Pacific Conference in Engineering Plasticity and its Applications (AEPA). He had also been elected as the President of the Asian-Pacific Symposium on Precision Engineering and Nanotechnology (ASPEN) for the period 2009-2011. He currently serves on the Editorial Board of the Proceedings of the Institution of Mechanical Engineers UK, Part B : Journal of Engineering Manufacture, Journal of Materials Processing Technology, and the Directorate Board of the Chinese Journal of Mechanical Engineering. In addition, he is the co-chief editor of the Journal of Information and Knowledge Management Systems. His research interests include advanced manufacturing technology, materials processing, ultra-precision machining, manufacturing strategy and knowledge based systems. He has published two books as well as more than 300 papers in international journals.

15:40-16:20 April 26 ..... Plenary Presentation 8  
Haixia Hall, floor 2

■ **Plenary Presentation 8**

**Title: Optical Technology Enabling Nanolithographic Chip Manufacturing**



**Dr. Tilmann Heil (German)**

*System Engineering at Carl Zeiss SMT GmbH*

**Abstract:** Optical nanolithography is a key manufacturing technology of the semiconductor industry. For more than four decades, the ever increasing performance of integrated circuits is closely linked to the progress of the optical technologies used in lithography systems. Already back in 1965, Intel founder Gordon Moore had observed that the structures on a chip shrink over time such that the transistor density on a chip doubles approximately every second year. This so-called "Moore`s law" is still valid today since the timely increase in chip transistor density is the most efficient way to improve the chip performance and reduce the chip`s cost per function. Hence, the

maximum achievable resolution of the structures on a chip is a key success factor which is directly linked to the performance of the optical system of the lithography tool used for the chip structuring. Therefore, optical technologies play a key role in enabling today`s and future chip manufacturing.

In this paper, we address the challenges to optical technologies in nanolithography systems used for the most advanced chip manufacturing. Special emphasis is given to the optical technology developments related to the manufacturing of Extreme Ultra-Violet (EUV) lithography systems. In particular, we review requirements and actual performance data of EUV optics for high-volume chip manufacturing. Based on this data and future design studies, we underline the potential of the EUV lithography optics for further increasing the resolution which will enable chip mass production in continuation of Moore`s Law throughout the next decade at least.

**Principal Author`s Biography:** Dr. Tilmann Heil is currently Director System Engineering at Carl Zeiss SMT GmbH. He joined Carl Zeiss in 2002 where he started his career in the field of lithography optics as a scientist for imaging applications. Subsequently, he held several positions in system engineering, technical marketing, and R&D cooperation program management. He received his Diploma and PhD in Physics from Darmstadt University of Technology in 1997, and 2001, respectively.

16:20-17:00 April 26 ..... Plenary Presentation 9  
Haixia Hall, floor 2

■ **Plenary Presentation 9**

**Title: Research on the manufacturing technology and equipment for optic elements with nanometer accuracy**



**Prof. LI Shengyi (China)**

*National University of Defense Technology*

**Abstract:** The high precision manufacturing of optical elements represents the frontier of ultra-precision machining currently, and it demands nanometer or even sub-nanometer machining accuracy. For example, high precision optical instrument parts, lithography projection lens of microelectronics manufacturing, soft and hard X-ray telescope in space, optic elements of Inertial Confinement Fusion (ICF) System, etc. higher requirement for manufacturing technology and equipments. The controllable compliant tool (CCT) technology, Magnetorheological Finishing (MRF) and Ion Beam Figuring (IBF) technology as typical examples, are new methods of optic surface machining with nanometer accuracy based on energy currents controlled by computer

exactly. It is a new challenge to traditional manufacturing technology and equipments affirmatively.

In this paper, our research about MRF and IBF technology and equipments is briefly introduced, Such as the material removal mechanism and mathematic model, strategy of redundance control, 4D NC technology, theory of error evolvement and control technology, and equipment design and developing technology. The state-of-the-art of nanometer accuracy lens machining and experiments of our Lab. are also introduced.

**Principal Author's Biography:** Professor Li Shengyi, who was borne in April 1946, graduated from south-centre university in 1968 on undergraduate education, and Zhejiang university in 1981 on postgraduate education respectively. He is a professor of the school of Mechatronics Engineering and Automation, National University of Defense Technology. He is the chairperson of The Committee for Precision Engineering and Micro-Nanotechnology of CMES, the chief scientist of the National Important Foundational research project(973).

Since 1981, he focused on the teaching and research of precision engineering. His research includes ultra-precision machining, MEMS, optical machining and measuring. He published more than 100 papers and 6 books including "Accuracy modeling technology of precision and ultra-precision machine tool", "On-situ measurement and error compensation technology of precision and ultra-precision machine tool", "Control technology of precision and ultra-precision machine tool" and "The design theory and method for precision and ultra-precision machine tool" published by press of NUDT(<http://www.gfkcb.com>). "New technology for manufacturing and measurement of large and middle-scale aspheric mirror" published by press of NDI(<http://www.ndip.cn>).

In recent years his group focuses on the optical elements manufacturing and equipments research, such as diamond cutting, grading, lapping and polishing processes and equipmenst, CCOS, Magnetorheological finishing (MRF), Ion Beam Figuring (IBF) and Fluid Jet Polishing (FJP) etc.

## Session 1-1

## Invited Talk

■ Invited Talk**Title: Design and development of a Prototype of the GMT Fast Steering Secondary Mirror****Dr. Myung K. Cho**

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**Abstract:** The Giant Magellan Telescope (GMT) will be a 25m Gregorian telescope currently in the design and development phase. The GMT is equipped with a fast-steering secondary mirror (FSM) which is a 3.2 m in diameter with a fast focal ratio of 0.65. The FSM consists of seven segments, each of which is 1m in diameter, and its surrounding six segments except the center one are off-axis mirrors. The FSM has a feature to compensate the

image degradations caused by wind disturbances and structure jitter by using a tip-tilt mechanism. The Korea Astronomy and Space Science Institute (KASI) is developing a prototype of the FSM together with several collaborators in Korea and the National Optical Astronomy Observatory (NOAO) in USA. The prototype is a full-size FSM segment, which is divided into two features functionally; an off-axis mirror and a test-bed for tip-tilt actuation. The off-axis mirror with a diameter of 1.06m is being fabricated and the tip-tilt system will be demonstrated. A parametric design study to optimize the FSM mirror configuration was performed. In this trade study, the optical image qualities and structure functions for the axial and lateral gravity print-through cases, thermal gradient effects, and dynamic performances will be discussed. In this paper, current progress of the prototype development and future works are to be addressed.

**Principal Author's Biography:** Dr. Myung Cho serves as a principal engineer at the National Optical Astronomy Observatory (NOAO). He has been involved in the design and development of the optical telescopes and optical instruments including the Thirty Meter Telescope Project, the Giant Magellan Telescope, the Advanced Technology Solar Telescope, the Large Synoptic Survey Telescope, the GEMINI 8m Telescopes, the WIYN 3.5m telescope, Gemini Near Infrared Spectrograph, and a variety of other telescopes and optical systems. Prior to joining NOAO, he was on the faculty at the College of Optical Sciences at the University of Arizona. Dr. Cho also serves as an adjunct professor at the Engineering Mechanics and the College of Optical Sciences. He earned his Ph.D. from the University of Arizona in 1989.

## Session 1-2

## Invited Talk 2-0099

■ Invited Talk 2-0099**Title: Research On The Fabrication of Mirror Segments For E-ELT****Dr. Guoyu Yu**

*Optic Glyndwr, Ffordd William Morgan, St Asaph, LL17 0JD, UK*

**Abstract:** The primary mirror of the European Extremely Large Telescope (E-ELT), under development by the European Southern Observation (ESO) [1], will nearly 1000 hexagonal segments of 1.45m across the flats. Fast processing of these segments with high form and edge specifications has proven to be a challenge. The Zeeko Precessions bonnet polishing then provides capability for polishing the surface and correcting the form to meet this target.

BoXTM grinding has been adopted. This technology has the advantage of fast generating of aspheric surface with very low subsurface damage (SSD). This will avoid the need of removing thick layer of stock at polishing stage to remove SSD. However the result grinding signatures has proven to be problematic for direct polishing with Zeeko's standard bonnet technology. A novel 'grolishing' process which stands between 'grinding' and 'polishing' has been developed to deal with mid-spatial features left by BoXTM grinding. This tool is designed base on Zeeko's R80 bonnet which will fits directly into the company's IRP series machines. The process parameters has been optimised to have signatures less than 10 nm PV. The edge profile is 1µm upstand within 40 mm edge zone.

The 'grolished' surface can be directly pre-polished together with all the form corrections. To meet the fabrication time target, R160 bonnet is used with 50 mm polishing spot, this will provide removal rate of 9.8 mm<sup>3</sup>/minute, which can be employed at pre-polishing stage and some form correction. Process parameters have been developed to leave slow upstand at edge zone without any form of sharp edge downturn. The following form correction stage, which employs smaller polishing spot of about 20 mm diameter, will continue to remove form errors of spatial frequency between 0.02 – 0.05 1/mm. Furthermore, the upstand edge will be, to a large part, removed at this stage. It is demonstrated that the form specs can be achieved after this process. The following smoothing process will improve surface textures and remove edge errors. Local edge rectification is normally necessary to bring the edge at same level. A final smoothing process will bring the bulk area and edge zone to meet all the specifications.

**Principal Author's Biography:** Dr. Guoyu Yu is a University of Wales senior research fellow at Glyndwr University. His recent research experience is on the fabrication of large aspherical mirror segments for European Extremely Large Telescopes. He received his PhD in Photonics from Aston University. Other research experience includes fibre Bragg gratings, GaAs modulators and optical backplane.

## Session 2-1

## Invited Talk

■ ***Invited Talk 2-0100*****Title: Development of a Flexible and Reliable Numerical Simulation for Precision Glass Molding of Complex Glass Optics****Prof. Fei Wang***Fraunhofer-Institut für Produktionstechnologie IPT*

Abstract: In the last two decades, precision glass molding is gradually becoming a competitive hot-replicating manufacturing technology for precision glass optical components such as aspherical lenses, lens arrays and freeform lenses. During the process, however, different factors may cause shrinkage errors on the final lens shape and index drop which affect the optical performance of the final molded lens. Currently, such errors have to be compensated by time-consuming and cost intensive iteration loops featuring tryout molding and mold revising.

In order to avoid this iteration process by the precision glass molding, an integrated numerical simulation tool developed at Fraunhofer IPT is introduced in this paper, which can be used to provide optimized mold design, process design and automated mold compensation of the mold insert. In this process simulation, the entire molding process, including the heating, molding and cooling steps, are precisely described by a combined thermal and structural model. Generalized Maxwell Model is used to describe the complex stress and structural relaxation behavior of the glass, and detailed test series are conducted to acquire precise knowledge about the material properties of optical glass. In this way, the deformation of glass pre-form during the molding phase and thermal shrinkage of the molded glass optics during the cooling phase can be precisely predicted in the process simulation. Based on this information, a compensated contour layout for the mold inserts can be defined in advance and directly applied to the initial mold inserts during manufacturing, so that the annoying practical integration is eliminated. The simulation results for several molding tasks show an average prediction accuracy of approx. 1 $\mu$ m.

In order to adapt this simulation method to the requirements of industrial applications, a Graphical User Interface is also developed. With this GUI, The customer will be able to use this interface to perform simulations of his own without technical knowledge of the FEM. The positive feedback from customer shows that the developed flexible and reliable numerical simulation is a useful tool to reduce the development cost and enhance the performance of precision glass molding for industrial application.

**Principal Author's Biography:** Born in Nei Mongol China and graduated at Tsinghua University in Beijing, Mr. Fei Wang is currently working as a research assistant at Fraunhofer Institute for Production Technology IPT in Aachen Germany. His main research field is the replicative manufacturing of advanced optical elements made of glass and the corresponding process simulation. He has been involved in several research projects on this topic funded by European Commission, German Research Foundation, Federal Ministry of Education and Research of Germany and many industry customers worldwide. Recently, his research group is focusing on the realization of industry scale molding of Wafer-Level-Optics, hybrid optics and Free-Form optics by precision glass molding technology and the commercialization of the corresponding process simulation software as a important tool for the process and mold optimization.

## Session 2-2

## Invited Talk

■ Invited Talk 2-0115**Title: Asphere Metrology Using Variable Optical Null Technology****Dr. Chuck McFee**

**Abstract:** Aspheric surfaces can provide significant benefits to optical systems, but manufacturing high-precision aspheric surfaces is often limited by the availability of surface metrology. Aspheres typically require dedicated null correction optics in addition to the interferometer itself. The cost, lead time, inflexibility, and calibration difficulty of such null optics, however, makes interferometric aspheric testing a far less attractive proposition than the relatively simple spherical test. Subaperture stitching interferometry was originally developed to allow for the full-aperture measurement of large-aperture spheres and flats using commercially available 4" or 6" interferometers and transmission elements. The method was then extended

to the measurement of mild aspheric surfaces, by exploiting the local best-fitting and magnification of the high density fringe patterns associated with non-null interferometry. Subaperture stitching interferometry has been extended to the measurement of high-departure aspheres through the use of a Variable Optical Null (VON). The configurable VON can have a variety of realizations that serve to generate an optical wavefront that closely matches the surface of the asphere within a local subaperture. The residual wavefront error is measured with a standard interferometer, and the full-aperture surface profile of the asphere is reconstructed using advanced stitching algorithms. This method allows for the accurate measurement of aspheres with more than 1000 waves of departure from best-fit sphere, without the use of dedicated null lenses.

**Principal Author's Biography:** In 1984 Chuck graduated from West Virginia Tech with a BS in Mechanical Engineering. He started his career in the General Electric Technical Marketing Program, in Turbine/Generator Power Systems. After graduating from the program, he left General Electric to work for a young Silicon Valley company called Measurex. Measurex was the first company to apply digital computer measurement and controls to the sheet goods process industries. These measurements included laser, nuclear, electromagnetic, spectral and more. Mr. McFee held various management roles in Sales, Applications and Service on a Global basis. Measurex was purchased by Honeywell, and, in 2000, Mr. McFee joined Zygo Corporation as a Director of Sales. He started with positions in the USA, and received a patent for a novel measuring system used for automotive applications. From 2004 he lived in the USA but managed the Southeast Asia Singapore office and then the Flat Panel division in Taiwan. The Flat Panel division made systems for large glass flat panel TV color filter and TFT metrology. After that division was sold, Mr. McFee moved to QED Technologies as North American sales manager. Soon after, he was promoted to Global Sales and Marketing and is responsible for all of QED's products and sales.

■ Invited Talk**Title: Research on Off-axis Aspheric Optics manufacturing****Prof. Xiaoqiang Peng**

*Lab of Precision Engineering,  
College of Mechatronic Engineering and Automation,  
National Univ. of Defense Technology*

*Post Address: College of Mechatronic Engineering &  
Automation  
National University of Defence Technology  
Changsha, Hunan, P. R. China*

**Abstract:** With the rapid development of modern science and technology, off-axis aspheric optics are employed widely in many fields such as space-based observation, ground-based observation, and extreme-ultraviolet lithography (EUVL) etc. Compared to these on-axis optical elements, the reachability of figuring accuracy, the control of characteristic parameters, the metrology of surface form error and the processing techniques are all present in the process due to the complicated manufacturing features of the off-axis aspheric optics. Therefore, the fabrication of off-axis aspheric optics is always the difficulty in the field of optical manufacturing. As one of new optical machining methods, Magnetorheological Finishing (MRF) owns many unique advantages including invariable and controllable influence function, deterministic and controllable figuring process, accurate and forecast machining result etc, which is proposed to be potentially applied in the fabrication of off-axis aspheric optics. This thesis focuses on the fabrication of off-axis aspheric optics with MRF technology. All of the surface form accuracy and characteristic parameters are controlled. The national manufacturing ability of the off-axis aspheric optical elements should to be improved.

**Principal Author's Biography:** He was born in 1977. He received his M.S. and Ph.D. degrees in mechanical engineering from National Univ. of Defense Technology in 2001 and 2007, respectively. As an associate Professor of Precision Engineering Lab of National Univ. of Defense Technology, he is the director of the Lab. His research interests include advanced optical fabrication and mechatronic techniques. He holds twelve Chinese patents. About twenty papers are published in the international journals.

## Session 3-1

## Invited Talk

■ Invited Talk**Title: Design and modeling of Biomimetic Structures for Self-cleaning in Ultra-precision Machining****Dr. Sandy To and Dr. Thomas Cheng**

*State Key Laboratory in Ultra-precision Machining Technology, The Hong Kong Polytechnic University, Hong Kong, P. R. China*

**Abstract:** The front side of lotus leaves consists of microstructure patterns which can possess self-cleaning properties. Self-cleaning implies that dirt will be easily rolled off by the water droplet. This research aims to design and model different geometrical parameters of a biomimetic structure pattern, in micrometer range, machined by ultra-precision machining technology such as raster milling which is able to achieve the form accuracy in micrometer range and surface roughness in nanometer range in order to facilitate the development of the

theoretical model of self-cleaning surfaces. The mathematical model is able to control different combinations of geometrical parameters of the specific microstructure patterns which help to build the theoretical model of self-cleaning surfaces machined by ultra-precision raster milling technology in order to predict the wetting transition of the water droplet on microstructure patterns. The success of the theoretical model will give a better understanding and development of self-cleaning surfaces.

**Principal Author's Biography:** Dr. Sandy To (BSc, MPhil, PhD) is an Associate Professor and Associate Head of State Key Laboratory in Ultra-precision Machining Technology of the Department of Industrial and Systems Engineering of The Hong Kong Polytechnic University. Dr. To is an active researcher who focuses on industry-related and applied research. Her research interests include ultra-precision machining and material science. She has published more than 120 international journal papers and international conference papers in various fields of precision engineering, advanced optics manufacturing and material science.

## Session 3-2

## Invited Talk

■ Invited Talk**Title: Sub-Aperture Finishing and Stitching Test of Optical Surface****Prof. Shi feng**

*The National University of Defense Technology*

**Abstract:** (1) Introduction

- (2) Applications of Sub-Aperture Finishing
- (3) Basic theory and algorithm for stitching
- (4) Sub-aperture lattice design for aspheric surfaces
- (5) Stitching test of large planar wavefronts
- (6) Stitching test of hyper hemi-spheres
- (7) Stitching test of convex aspheres
- (8) Stitching technology in coordinate measurement
- (9) Conclusion

**Principal Author's Biography:**

## 1. Education:

BS, National University of Defense technology , 2003

MS, National University of Defense technology, 2005

DR, National University of Defense technology, 2009

## 2. Employment:

National University of Defense technology, College of Mechatronic Engineering & Automation, Prelector, 2009-date;

Bremen University, Visiting Scholar, October 2007 to October 2008

## 3. Professional Affiliations:

China Mechanical Engineering, Member

## 4. Research Interests:

Shi's research activities have been supported by more than 5 grants from universities, local industry, the Natural Science Foundation of China and the Ministry of Science and Technology of China. His current research interests include:

Ultra-precision machining technology

Theory and technology of computer-controlled optical manufacturing

Magnetorheological Finishing (MRF)

Measurement of nano-scale accuracy

Theory and technology of modern optical testing

## 5. Selected Publication:

To July 2011, Shi has had some 10 publications, including 8 refereed journal articles, 1 edited books (all in Chinese) and 1 invited reports.

## Session 3-3

## Invited Talk

■ Invited Talk

**Title: Optical CD metrology technologies and applications: a sub-nanometer optical metrology method based on rigorous numerical processes**

**Prof. Shifang Li**

*Timbre Technologies Inc., a company of Tokyo Electron Ltd*

**Abstract:** Ellipsometers and reflectometers has been proved as accurate, precise and reliable metrology equipment, and are widely used for metrology of surface properties such as thickness of thin film layers, optical quality of coated materials, ultra-thin oxidization layers and airborne molecular contamination. These metrology systems are well adopted in semiconductor manufacturers for process control, such as gate layers, deposition thickness and properties, photo resist characteristics.

Critical Dimension (CD) metrology plays an important role for yield enhancement in semiconductor industry; AFM, CDSEM, and Optic CD (OCD) metrology methods are commonly used in contemporary fabs. The OCD method, also known as scatterometry, uses ellipsometers and reflectometers to measure the optic signal emerged from a test target similar to thin film metrology, except that the test target is a grating structure fabricated with the same lithography processes as the functional cells. The enabling technology of OCD metrology is rigorous numerical calculation, specifically solving the Maxwell's equations rigorously to find the electromagnetic (EM) field in the grating structure and the scattered signal in far field, and solving the inverse problem to find the grating structure that gives the scattering signal detected by the metrology tools.

In this paper, we will review typical performance of ellipsometer and reflectometer, then review enabling technologies in OCD, and conclude with the challenges ahead to meet the industrial requirement for 20nm node and below where the metrology budget is  $\sim 0.1\text{nm}$ .

**Principal Author's Biography:** Dr. Shifang Li graduated from SIOFM, Chinese Academy of Sciences, in 1988, in the field of atom spectroscopy and laser spectroscopy. He worked on laser manipulation of bio-cells at the Physics Dept. of Texas A&M University; laser cooling and trapping of atoms at the Physics Dept. of UC Berkeley. He worked as Director of R&D in TTI Medical Inc. for opto-mechanical engineering of medical equipment; research scientist in Therma-Wave Inc. for development of spectroscopic ellipsometer; Sr. Dir. of R&D in Oplink Inc. for development of optical fiber communication devices; and Sr. member of Tech Staff in Tokyo Electron Ltd for development of scatterometry technologies. He has published more than 30 scientific papers and has been granted more than 40 US patents.

## Session 4-1

## Invited Talk 4-0056

■ ***Invited Talk 4-0056***

**Title: The Cross Talk of Multi-errors Impacts on Lithography Performance and the Method of Its Control**

**Prof. Yanqiu Li**

*Key Laboratory of Photoelectronic Imaging Technology and System, Ministry of Education of China*

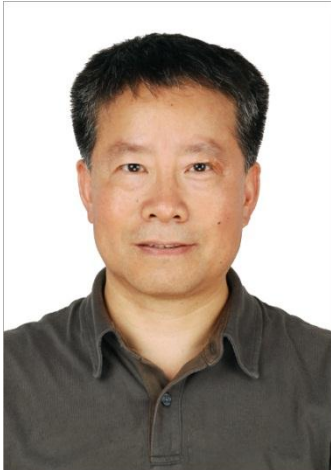
**Abstract:** The requirement of Critical Dimension (CD) control is quite strict in 45nm node lithography and beyond. While multi-errors source coexist in lithography tool and process, such as stepper errors, mask errors and resist stack errors. On the other hand the simultaneous influence of multi-errors on the CD is not linearly. It is impossible to control CD error effectively and rigorously without exploring the CD dependence of cross talk of multi-errors. It is also important to analyze and balance the influence of various errors on CD in order to co-design and co-optimize the lithography tool and process.

In this paper, by using PROLITH™ X3 and in-house software Intlitho, we study the cross-talk of the errors of numerical aperture ( $\Delta NA$ ), coherent factors ( $\Delta\sigma$ ), mask dimension and phase, flare and their impact on the lithography performance. The results show that an individual  $\Delta NA$  or flare impacts on CD linearly when the error is not so much, but CD depends on multi-errors simultaneously is rather completed. We explore the mechanism of various error influence on CD and establish a method to compensate the influence of some errors on the CD in order to co-design and co-optimize lithography tool and process.

**Principal Author's Biography:** Yanqiu Li received her MS and PhD degrees in optics from Harbin Institute of Technology of China. She worked as a director of the micro & nano fabrication division at IEECAS, as an associate professor at Harbin Institute of Technology of China, as a Senior Engineer at Nikon, as an invited professor of Tohoku University of Japan, as a frontier researcher at RIKEN of Japan. She is currently a professor of School of Optoelectronics at Beijing Institute of Technology, Beijing, China. She holds over 40 Chinese patents and has published many articles on lithographic science.

## Session 4-2

## Invited Talk 4-0058

■ ***Invited Talk 4-0058*****Title: Integrated Wavefront Aberration Measurement in Extremely Large Scale Integrated Circuit Optical Lithography****Prof. Xuefeng Liu***Institute of Optics and Electronics, CAS*

**Abstract:** As extremely large scale integrated circuit lithography (ELSIC) have been advancing rapidly, forefront exposure optics have reached the incredible resolution of 20~50 nm, and yet the industry is pushing the further improvement of resolution that has by now put the crucially important wavefront monitoring and control to the limit of the existing aberration measurement systems. In the world most advanced optical lithography development centers, there are a few but one of them may be regarded as being really capable of tackling the unavoidable accuracy issue, for the existing and the foreseeable sub 20 nm lithography and on process lines. This measurement method integrates hybrid pinhole array gratings for incident, 2D checkboard

gratings for shearing, phase shifting through stepping and corresponding aerial phase vector solving for wavefront reconstruction and aberration quantification. As phase gratings have been inserted into both the object and image planes of the system-to-be-measured, the filling becomes multi-directional and absolutely full; the shearing is also directional but can be conveniently arranged to coincide with the most wanted lithographic coordination. As a result, the wavefront measurement goes down to the pupil substantially locally, and of cause the aberration quantification comes with ever higher resolution. Moreover, there are also other techniques to be integrated, such as pixel-independent intensity modulation in fast phase stepping, highly effective phase retrieving etc., to levy the dependence on sensor optics and to avoid error bound interferogram data solving. Altogether with the lithographic system, the integrated method forms an effective dynamic accuracy improvement approach.

**Principal Author's Biography:****CURRENT JOB:**

Optical Exposure System for Extremely Large Scale Integrated Circuit Lithography, Projects on Wavefront Aberration measurement and New lithographic System Development.

**EXPERIENCE:**

2007—2011: Senior Optical Engineer, Team Leader, Modern Semiconductor Lithographic System Optical Qualification and Control System Development, ASML, Netherlands

2002—2007: Product Manager, Analytical Imaging IP Exploration: Diffraction Limit Broken Physical Parameter Imaging by Optical Vector Modulation, Angular and Vector Resolved Laser Back Scattering, Oxford Cryosystems Ltd/ Oxford University/ Nanometrics Inc(UK).

1998—2002: Senior Engineer, Core Member, Product Owner, Team Leader of Passive/Active Optical Device/ Broadband 40G/s System Monitoring Module Development, Bookham Tech, UK

1993—1998: Research Fellow, Holographic Phase Mask and Micro Laser Grating Optics, Micro Engineering: Ebeam and Optical Lithography, DEEE, Univ. Glasgow, UK

1986—1988: Group Leader, Optical Materials: National 7-5 Optoelectronics Project, Research Institute of Silica Glass, CBMA, China

**MEMBERSHIP:** Member of IEEE, Member of T&M, EDS, Member of Nano and Micro Test and Measurement Soc of IOP, Associate Editor of Optoelectronics.

## Session 5-1

## Invited Talk

■ Invited Talk**Title: Organic Solar Cells with 2-Thenylmercaptan/Au (Film/Nano-Particles) Self-assembly Film as Buffer Layer****Prof. Zhijian Chen**

*State Key Laboratory for Mesoscopic Physics and Department of Physics, Peking University, Beijing, China*

**Abstract:** A buffer layer of 2-Thenylmercaptan/Au self-assembly film was introduced into organic solar cell to substitute PEDOT: PSS layer to reduce the series resistance. 2-Thenylmercaptan/Au self-assembly nano-particle as buffer layer was also investigated, and a slightly increase of short circuit current was observed.

In this study, a self-assembled 2-thenylmercaptan on a thin gold film as a hole injection and transport layer in OSCs is introduced to substitute the PEDOT:PSS layer. The devices' structure is shown in Figure 1.

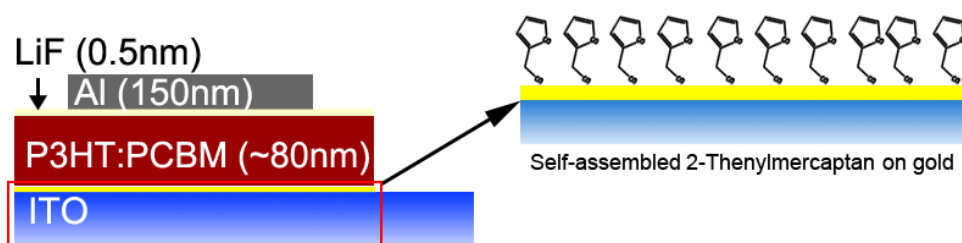


Fig. 1. Structure of the solar cells, a thin gold film was deposited on cleaned ITO substrate, and then the substrate was immersed in a solution of 2-thenylmercaptan in ethanol (2-Thenylmercaptan: ethanol = 1:40) for 24 hours. Then the self-assembled substrate was rinsed by ethanol and stored in vacuum to remove extra 2-thenylmercaptan. The P3HT:PCBM bulk layer and the anode were fabricated according to reference [1].

**Principal Author's Biography:** professor of physics, Department of physics, Peking University.

The main research subjects are organic light-emitting diodes and organic solar cells.

## Session 6-1

## Invited Talk

■ Invited Talk

**Title: High precision distributed fiber sensors based on Brillouin scattering**

**Prof. Xiaoyi Bao**

*Professor, FRSC, FOSA*

*Canada Research Chair in Fiber Optics and Photonics  
(Tier I)*

*Physics Department*

*University of Ottawa*

*Ottawa, ON K1N 6N5*

*Canada*

**Abstract:** Brillouin scattering in fiber describes the interaction of a photon with a characteristic density wave. The density variation is associated with local temperature, strain and vibration. Through the measurement of the local Brillouin frequency change one can realize a distributed fiber sensor for temperature, strain and vibration over tens to one hundred kilometers. The progress on improving sensing performance parameters like spatial resolution, sensing length limitation is reviewed. This kind of sensors can be used in civil structural monitoring of pipelines, bridges, dams and railroad for disaster prevention. The high precision sensor can also find application in aerospace, material processing and fine structures.

**Principal Author's Biography:** Xiaoyi Bao is Tier I Canada Research Chair professor in the Physics Department at the University of Ottawa. Her research involves nonlinear effects in optical fibers and their applications for sensors, lasers, devices and communications. She is fellow of Academy of Science, Royal Society of Canada (RSC), Optical Society of America (OSA), and SPIE. She served as the honorary secretary of Academy of Science (2009-2011) of RSC. She received the Ontario Premier's Research Excellence Award in 2001, the 1st University of Ottawa Inventor of the Year Award in 2003, Researcher of the Year Award in 2004 from Faculty of Science (U of Ottawa), the NCE (National Centers of Excellence of Canada) Chair's Medal in 2006, the Canadian Association of Physics (CAP)-National Optics Institute (NOI) Medal for Outstanding Achievement in Applied Photonics in 2010.

## Session 6-1

## Invited Talk

■ ***Invited Talk 6-0013***

**Title: A novel temperature-strain decoupling method for distributed fiber sensing system based on backscattered light**



**Prof. Hong-Liang Cui & Dr. Tianying Chang**  
*Polytechnic Institute of New York University*

**Abstract:** As all known, Brillouin backscattered light in sensing fiber is sensitive to both temperature and strain, so it can be used to measure temperature and strain simultaneously. However, both its intensity and frequency shift vary with the change of the temperature and the strain. Therefore, how to decouple them is the key point in distributed fiber temperature and strain sensing system (DTSS).

In this paper, a novel decoupling method is proposed to solve this issue conveniently and economically. A fraction of backscattered light works as a reference light to eliminate the influence from emitting light instability and circumstance interference factors such as light path's disturbance, which mainly is Rayleigh backscattered light and has no sensation to either temperature or strain. On the other hand, the filtered and amplified heterodyning signal between Brillouin backscattered light and Rayleigh backscattered light enters the frequency splitter with central frequency 11.35GHz and band width 1GHz. The frequency splitter has two output ports, one output intensity of which increases with increase in frequency and the other output intensity decreases with increase in frequency, so it can be used to distinguish the different factors from Brillouin backscattered light intensity and its frequency shift on the heterodyning signal. After that, the three signals enter high-speed data acquisition card and are calculated by some calculation methods in the computer software in order to get the corresponding temperature and strain. In this paper, the related principles are illustrated and some experiment results are given out. Through calibration, it is estimated that the system parameters which will be gotten are as follows: the length of the sensing fiber 13km, the spatial resolution 5m, the temperature resolution 1 $\times$ 10 $\mu$ C, and the strain resolution 20 $\mu$ .

**Principal Author's Biography:** Tianying Chang, PhD, graduated from Shandong University in 2009 and worked as joint PhD candidate at Stevens Institute of Technology (USA) from 2007 to 2008. The research field was optical fiber sensor and its application. After graduation, she was a lecturer in Shandong University at Weihai. Now she is a research associate at NYU poly and her research focus on optical fiber sensor and THz system.

## Session 7-1

## Invited Talk

■ Invited Talk

**Title: Nanophotonic light-trapping methods for thin film solar cells**



**Prof. Chunlei Du**

*State Key Laboratory of Optical Technologies for Microfabrication,  
Institute of Optics and Electronics, Chinese Academy of Sciences*

**Abstract:** The progress developed in the group for high efficiency thin film solar cell based on the nanophotonics light-trapping structures is reported in this talk. Some physical mechanism and special nano-structures are investigated for the purposes of light-trapping and broadband absorption enhancement by considering the interaction with thin film active layer like organic active layer of P3HT: PCBM and an active thin film of a-Si:H. In order to optimizing the parameters of metallic

nanoparticles introduced into ultra-thin film organic solar cells (OSCs), a relationship is set up between the Scattering Efficiency of localized surface plasmon resonance and the Size Parameter of metallic nanoparticles by means of Mie theory. A plasmonic organic solar cells is demonstrated with light absorption increase of 26% at an average wavelength of incident light; with the proposed periodic pyramidal structured layers introduced to the active a-Si:H film as multi-function layers, a broadband absorption enhancement up to 30% can be realized which is supported by the powerful effects of the localized surface Plasmon resonance and the waveguide light-trapping. The methods provides good guidance for the experiment being developed in the lab.

**Principal Author's Biography:** Chunlei Du, received the Ph.D. degree in physics from Sichuan University, Chengdu, Sichuan Province, China. She is currently a Professor at the Institute of Optics and Electronics, Chinese Academic of Sciences, China, where she leads a research group in micro- and nano-optics. As project leader, she has directed numerous projects that include projects from the 973 and the 863 programs in China, and projects in the Chinese Natural Science and Key Project portfolios. Since the 1990s, her group has been engaged in the experimental as well as the theoretical aspects of research in the design and fabrication of micro- and nano-optical components and systems. She has previously worked as a visiting scholar in the Micro-Optics group at the Paul Scherrer Institute, Zurich, Switzerland, the Applied Optics group at Erlangen University, Erlangen, Germany, and at the Centre for Micro-Photonics at Swinburne University of Technology, Melbourne, Australia. Dr. Du is a fellow of the SPIE and is a recipient of several awards that include the Progress in Science and Technology prize of the Chinese Academy of Sciences and Sichuan Province, the Chinese Youth prize in Science and Technology, the State level project of a billion persons with ability in China, and the excellent expert with outstanding contributions to Sichuan award. She is the author of more than 180 publications and 60 presentations.

## Session 8-1

## Invited Talk

■ Invited Talk

**Title: Application and development of internal reflection optical free-form surface**



**Prof. XU Min**

*Fudan University(China)*

**Abstract:** Optical free-form surface could be non-rotational symmetric irregular high-order surface or function-structure surface based on micro-structure array, or both. In the photon electronics application field, the utilization of optical free-form surfaces can make the system or product become miniaturization, low-cost, high-performance, updating, and obtain new-function, as not only improves the product competitiveness but also takes great market demand. With the development of technology, the rapid development of research and application on optical free-form surfaces makes it become a popular field. At present, many developed countries have invested heavily for developing the optical

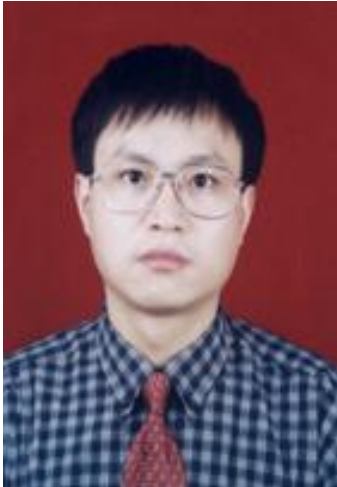
free-form surfaces research and obtained theory and application achievements.

This report mainly focuses on the research & development the optical free-form surfaces on the helmet-eyepiece and 360o non-scan camera. Different with the other areas, there are many people in researching and design free-form in China. They are all obtained great result on this with the updating of optical design software, including Beijing Institute of Technology, Zhejiang University, University of Shanghai for Science and Technology. However, because of the restricted features of manufacture equipments and metrology techniques, also the lack of processing techniques in China, the design has very difficult to transform to a sample or industry product. The ultra-precision optical manufacturing engineering technology research center in Fudan University, with the help of oversea team and the use of advanced optical manufacturing equipments, successfully design and fabricate the samples about the helmet-eyepiece and 360o circular camera based on optical free-form surface. This report describes the design results, processing technology and effects about them, and simultaneously discusses and explores the difficulty in the measurement.

**Principal Author's Biography:** Dr. Min Xu has been with the Department of Optics Science and Engineering, Fudan University as a Research fellow, the head of Shanghai ultra-precision manufacturing center, and the supervisor of doctoral students. He received his M.S and Ph.D. degree on the optical precision measuring and technology, from the Department of photon-electronics, Zhejiang University in 1992 and 1998 respectively. From 1984 to 1998, he worked at Zhejiang University, where he researched precision optical detection, advanced optical manufacturing and thermal imaging technology. From 1998 to 2006, he worked at Raytheon Company in American as a senior engineer on optical adjustment and detection. He has published more than 40 papers in the academic journal and conference, and won 9 patents also. He founded Shanghai ultra-precision manufacturing center. Now, he is the distinguished expert of the innovative national "thousand talent plan" and the chief scientist and project header of national funds project of "Ultra-precision optical component manufacturing Platform".

## Session 8-2

## Invited Talk

■ ***Invited Talk 8-0080*****Title: Advanced Optical Manufacturing Digital Integrated System****Prof. Tao Yi-zheng**

*Institute of Computer Application on,China Academy of Engineering Physics(China)*

**Abstract:** It is necessarily to adapt development of advanced optical manufacturing technology with modern science technology development. To solved these problems which low of ration, ratio of finished product, repetition, consistent in big size and high precision in advanced optical component manufacturing. Applied business driven and method of Rational Unified Process, this paper has researched advanced optical manufacturing process flow, requirement of Advanced Optical Manufacturing integrated System, and put forward architecture and key technology of it. Designed Optical component core and Manufacturing process driven of

Advanced Optical Manufacturing Digital Integrated System. the result displayed effective well, realized dynamic planning Manufacturing process, information integration improved ratio of production manufactory.

**Principal Author's Biography:** Tao Yizheng (1971birth), Male, From Guang'An city, SiChuan province , Master, Professor. He mainly engaged in the design and development of large-scale software architecture, enterprise dynamic modeling, cloud services, model, project management and other key core technologies of information technology research. and was responsible for over twenty items of the CAEP Development Fund Key Project of Science and Technology Foundation, information pre-feasibility study and software development projects, Awarded the Military Scientific and Technological Progress Award 2 items, Awarded the second prize of CAEP Science and Technology Fund 2 items. Owned Software copyright registration 6 items, Published over 20 papers.

## Conference 1: Large Mirror and Telescopes

***(SPIE Proceedings VOL.8415)***

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*

- ✓ Design and development of a Prototype of the GMT Fast Steering Secondary Mirror, Myung K. Cho(USA) ..... (Invited)
- ✓ Compute Simulation of Oscillation Characteristic on Plane Matrix Multiple Coherence Based on Phase Modulation, Wang Ping (China)..... [1-0004]
- ✓ Analysis Driven Design and Structural Optimization for Large Primary Mirror, Haifei Hu(China)..... [1-0011]
- ✓ Comparison of optimization algorithms for adaptive optics system without a wavefront sensor, Ying Liu(China)..... [1-0019]

*Tea time*

- ✓ Parametric definition for the CGH patterns and error analysis in interferometric measurements, Ping Zhou(USA) ..... [1-0020]
- ✓ Research on Eliminating High-order Spectrum in Broadband Miniature Spectrometer system, Liu Kang(China)..... [1-0026]

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

*Session chair: FAN Bin*

- ✓ Research on Fabrication of Mirror Segments for E-ELT, Guoyu Yu(UK) ..... (Invited)[2-0099]
- ✓ Large field-of-view configurations for large-telescope adaptive optics systems: advantages and tradeoffs, Xianyu Zhang(China)..... [1-0034]
- ✓ Integrated modeling and optical jitter analysis of a high resolution space , Bowen Zhang(China)..... [1-0045]
- ✓ Ultra smooth mirror's backscattering measuring technique, Wang Jingxian(China)..... [1-0061]

*Tea time*

- ✓ Dwell time Calculation for Computer-controlled Large-tool, Fan Bin(China) ..... [1-0070]
- ✓ Development Status of the Prototype of the GMT Fast Steering Mirror, Young-Soo KIM(Korea) ..... [1-0074]
- ✓ Error Budgeting as Applied to the Design of the International X-Ray Observatory Mandrel Measuring Machine, Daniel C. Thompson(USA)..... [1-0078]

**13:00-17:00 April 28****POSTER****1F hall, floor 1**

- ✓ Push-Pull-Shear Lateral Support of Thin Meniscus Mirror and its Optimization, Chen Fulin(China) ..... [1-0001]
- ✓ A New Method that Indicates the Peak Stress of Random Vibration Response, YAN Yong(China)..... [1-0003]
- ✓ Alignment technology of the large telescope main optical system, XU qi-rui(China)..... [1-0005]
- ✓ A Study of Contact property of Ni(Ti)/Pt/Au on p-In0.52Al0.48As, WEI Peng(China) .... [1-0006]
- ✓ Infrared reflectance of silicon monoxide protected aluminum mirrors from 0.2 to 50  $\mu\text{m}$ , Bin Li(China) ..... [1-0007]
- ✓ Thermodynamics Research on Optical System based on finite element method, MING HaoYue(China) ..... [1-0008]
- ✓ Designing of Supports for a 1.2 m Thin Mirror, Ping Yao(China) ..... [1-0010]
- ✓ A Novel Large Scale Focal Plane Telescope Using Focal Plane Pointing Method, Lin Jianchun(China)..... [1-0012]
- ✓ Study of polishing parameter of HgCdTe wafers, ZHANG Li-yao(China) ..... [1-0013]
- ✓ Detecting of Defects in Processing of Lightweight Mirror Substrate, Wu Zongming(China)..... [1-0014]
- ✓ Research on Hardpoints in Axial Support System for Large Aperture Mirror, Fan lei(China) ..... [1-0016]
- ✓ Measurement of an Off-Axis Parabolic mirror using Coordinates Measurement Machine and Swing Arm Profilometer during the grinding process, Hongwei Jing(China)[1-0017]
- ✓ Research of Alignment Methods and Evaluation of Reflective Zoom Systems, Jun Chang(China)..... [1-0018]
- ✓ Thermal Analysis of a 4m Honeycomb Telescope Primary Mirror, ZHANG Jun(China).... [1-0021]
- ✓ Design of Large Aperture Focal Plane Shutter, HU Jia-wen(China) ..... [1-0022]
- ✓ The Design for off-axis Multi-Mirror Optical System with Large Field and Small F Number Using Coaxial Assembly of Two Mirrors, LIU Hui(China) ..... [1-0024]
- ✓ Influence of off-axis beam's transmission in optical fibers by scrambler, Dan dan Mu (China)..... [1-0024]
- ✓ Restoration of Observed Image with an Unknown, Space-variant Blur from Wide-field Telescope, Chaolan HE(China) ..... [1-0025]
- ✓ A Thin-Film Thickness Measurement Method Based on the Interference Reflection Spectrum, LiNaJiang(China) ..... [1-0027]
- ✓ LINC-NIRVANA: Cryogenic optics for diffraction limited beam combination, Peter Bizenberger(Germany) ..... [1-0028]
- ✓ Finite element analysis of lightweight, active integrated primary mirror, Lu Wei xin(China) ..... [1-0029]
- ✓ A novel computer control method for telescope mount driving, Wangping Zhou(China) ..... [1-0030]
- ✓ Design of Automatic Leveling and Centering System of Theodolite, Liu Chuntong(China) ..... [1-0031]
- ✓ Pneumatic support for Telescope prototype Primary Mirror, TANG Jin-long(China) ..... [1-0032]

- ✓ Herschel Space Observatory Telescope characterization with Hartmann Wavefront Sensor, Guillaume Dovillaire(France) ..... [1-0033]
- ✓ Real Time Controller for 37-Element Low-order Solar Adaptive Optics System at 1-m New Vacuum Solar Telescope, ZHU Lei(China) ..... [1-0035]
- ✓ Simulation Result of Multi-Conjugate Adaptive Optics System for small Aperture Telescope based on Minimum Mean Square Error Approach Wavefront Reconstruction, Zhang Lanqiang(China)..... [1-0036]
- ✓ Adaptive filter and linear quadratic Gaussian with loop transfer recovery compensator combination control of a non-linear tip-tilt, Youming Guo(China)..... [1-0037]
- ✓ Extrinsic and intrinsic distortions correction in software configurable optical test system, Da-Hai Li(China) ..... [1-0038]
- ✓ Optimization of yoke of a 4 meters telescope for mechanical reliability, Kai He(China) ..... [1-0039]
- ✓ Optical Design of Cassegrain System with Wide Field of View for Spaceborne Remote Sensing Application , XIAOYAN Yang(China)..... [1-0040]
- ✓ Design and analysis of structure of Large aperture three-mirror off-axis optical system, WANG KEJUN(China) ..... [1-0041]
- ✓ Design and analysis on primary reflector support structure based on thermal compensation principle, Conglin Yan(China)..... [1-0042]
- ✓ Research on thermal controlling of a 2m class solar telescope primary mirror, LiCheng(China)..... [1-0043]
- ✓ Active Thin Meniscus Mirror Made of Float Glass for Large Telescopes, YANG Fei(China) ..... [1-0044]
- ✓ Applications of liquid crystal adaptive optics for larger aperture telescope, Zhaoliang Cao(China) ..... [1-0046]
- ✓ Design Optimization of a 1-m Lightweight Mirror using Genetic Algorithm, Hagyong Kihm(South Korea) ..... [1-0047]
- ✓ Development of space imaging technology based on diffractive optics, LIU Tao (China) ..... [1-0048]
- ✓ Study on Numerical Simulation of The Dynamic Impact Effect for Optical Glass Grinding with Single Grit, CHEN Jiang(China)..... [1-0049]
- ✓ The study of streak camera dynamic distortion, Dengbo(China) ..... [1-0050]
- ✓ Preliminary Study of the Designing and Testing of Mirror Dispersed Support, Gong Hui(China) ..... [1-0051]
- ✓ The Stress-free Alignment Simulation Technology For Flexible Back-support Large Mirror, Wang Jianyong(China)..... [1-0052]
- ✓ Comparison of subaperture testing method with Hartmann Shack sensor and Interferometer, Hongyan XU(China) ..... [1-0053]
- ✓ A novel method for calibrating the image distortion of the interferometer, Yan Fengtao(China)..... [1-0054]
- ✓ Coating the 2-m primary mirror with protected aluminum, PEI Wenjun(China) [1-0055]
- ✓ Techniques for hyperSpectral Detection based on spectral unmixing, SUN Xuguang(China) ..... [1-0056]
- ✓ Study of Gray Image Pseudo-Color Processing Algorithms, HU Jinlong(China) · [1-0057]
- ✓ Phase Rebuilding Method for Thermal Deformation of Large Primary Mirror Surface of Space Telescope, Tan Fan-jiao(China)..... [1-0058]

- ✓ Design and finite element analysis of  $\Phi 510\text{mm}$  SiC ultra-lightweight mirror, Zhang Yuanyuan(China) ..... [1-0059]
- ✓ Fabrication Of 1.8M Standard Spherical Mirror, Yu Jun(China) ..... [1-0060]
- ✓ Research on the refocusing system of a space camera with TMA optical system , Lv Shiliang(China)..... [1-0062]
- ✓ Analysis of deforming a 1.5-m ultra-thin spherical mirror , Chunmei Zeng(China)..... [1-0063]
- ✓ Testing of  $\Phi 340\text{mm}$  F/1.3 aspherical mirror, Ren Jianfeng(China) ..... [1-0065]
- ✓ Remote Telescope Control of Astronomical Site Testing with ASCOM, Kaifan Ji(China) ..... [1-0066]
- ✓ Design of Free-form Fresnel Lens for LEDs collimating and Uniform Illuminance Distribution , Zhouping Su(China) ..... [1-0068]
- ✓ The research of transparent surface polarization imaging measurement technology, Zhang li(China) ..... [1-0069]
- ✓ Research on reflective optical telescope system's wavefront aberration compensation method, Duanxueting(China)..... [1-0071]
- ✓ Full-Color Organic Light-Emitting Device Display System Based on ARM7, Jiang Quan(China) ..... [1-0072]
- ✓ Theoretical and experimental study on the active support for thin mirror, WU Yongqian(China) ..... [1-0073]
- ✓ Heat stop optical analysis for Chinese Giant Solar Telescope, Xiaowei Xu(China) ..... [1-0076]
- ✓ Optimal design of satellite laser communication integrative transceiver, Cheng Yanyan (China)..... [1-0077]
- ✓ The Study of large aperture SiC mirror Technology, Kerong GAI(China) ..... [1-0079]
- ✓ Integrated Optimum Design for a Honeycomb Mirror, TANG Jin-long (China) .. [1-0080]
- ✓ The research of energy harvesting system using in RFID tag, Yu Li-yang(China) ..... [1-0081]
- ✓ Design of the autocollimator interface based on TMS320F2812, Gao Lina(China) ..... [1-0082]

## Conference 2: Advanced Optical Manufacturing Technologies

***(SPIE Proceedings VOL.8416)***

Conference Chairs:

**YANG Li**, COMT, COS (China)

**Eric Ruch**, SAGEM Défense Sécurité REOSC Department Avenue de la Tour Maury 91220 Saint Pierre du Perray (France)

**LI Shengyi**, National University of Defense Technology (China)

### 8:30-12:00 April 27 ..... SESSION 2-1 room 2 (16 min/report)

*Session chair: XIN Qiming*

- ✓ Numerical Simulation of Temperature Field and Experimental Inquiry of TC4 Titanium Alloy Laser Rapid Forming , Youbin Lai (China) ..... [2-0002]
- ✓ Development of a Flexible and Reliable Numerical Simulation for Precision Glass Molding of Complex Glass Optics, Fei Wang(Germany) .....(Invited)[2-0100]
- ✓ Chemo-Mechanical Manufacturing of Fused Silica Glass by Combining Bound-Abrasive Polishing and Ultrasonic Vibration, Yaguo Li(Japan) ..... [2-0004]
- ✓ A large ion beam figuring plant used for manufacturing astronomical telescope, Weiyuan Guo(China) ..... [2-0009]
- ✓ Progresses in Optical Design and Simulation Optimization Methods, LIU Hua(China) .... [2-0013]

#### *Tea Time*

- ✓ An Adaptive Interpolation Method for Tool Path, Ningning Zhang(China) ..... [2-0015]
- ✓ Simulation and Quality Assessment of High Resolution Linear CCD Satellite Image, Rui Zhang(China) ..... [2-0032]
- ✓ Lapping Application Research for Touch Screen Glass using 3M Fine Grade Trizact Diamond Tile, Zheng LianBin(China) ..... [2-0033]
- ✓ A novel method for fabricating steep aspheric mirrors, Shu Yong(China) ..... [2-0037]

### 13:00-17:00 April 27 ..... SESSION 2-2 room 2(16 min/report)

*Session chair: ZHANG Rongzhu*

- ✓ Research on the machining position and attitude of magnetorheological finishing for off-axis aspheric, Ci Song(China) ..... [2-0041]
- ✓ Asphere metrology using variable optical null technology, Chris Supranowitz(United States) .....(Invited)[2-0115]
- ✓ Development of an externally-pressurized bearing-rotor system for a 5-axis ultra-precision machine tool used for optical manufacture & the static performance analysis of the externally-pressurized bearing, Enbing Qi(China) [2-0048]

- ✓ Study on combination technology in off-axis asphere manufacture, Wang Yin(China) … [2-0049]
- ✓ Insights into effects of annealing on optical properties of SiO<sub>2</sub> thin films, JIANG Yugang(China) … [2-0052]

*Tea Time*

- ✓ The Application and Research of Miniature Uninverted Pyramid Prism in the Laser System, XI Zhe(China) … [2-0058]
- ✓ The study of UVC ultraviolet filter film, Yang Kou(China) … [2-0062]
- ✓ An Inductively Coupled Plasma Polishing Instrument Using Magnetic Force to Reshape Removal Function, XIE Bin(China) … [2-0065]
- ✓ Ultrasonic Vibration Assisted Grinding of Microstructures on Binderless Tungsten Carbide (WC), Qingliang Zhao(China) … [2-0081]

**8:00-12:00 April 28 …… SESSION 2-3**  
**room 2(16 min/report)**

*Session chair: CHENG Qiang*

- ✓ Research on Off-axis Aspheric Optics manufacturing, Xiaoqiang Peng(China) .. (*Invited*)
- ✓ The Study of Synthesis and optical properties of Polyurethane-imide, Tong Zhang(China) … [2-0091]
- ✓ Illuminator Design for Small Field ArF Lithography System, Lidong Wei(China) [2-0094]
- ✓ Design Method of LED Headlamp Low-beam Freeform Optical Reflector, Hong Wang(China) … [2-0104]
- ✓ High Interface Quality and Low Residual Stress EUV Multilayer Technology Research, YU Bo(China) … [4-0059]

*Tea Time*

- ✓ Measuring data processing of optical free-form based on 2D robust cascaded spline filter , SONG Qichang(China) … [2-0108]
- ✓ Research on spectrum domain white light interference demodulation mechanism of the optical fibersensing coal gas, ZHOU Meng-Ran(China) … [2-0112]
- ✓ Stress evolution and control of optical thin films, Ming Fang(China) … [2-0114]
- ✓ Measuring the surface morphology of coated high-reflection mirror based on the differential polarization interference method, ZHAO Yong(China) … [2-0124]

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- ✓ Study on the technology of fabricating and testing about free-form micro-lens and array, Sun-YanJun(China) … [2-0001]
- ✓ Research on An On-line Condition Monitoring and Monitoring Point Position Visual System in Grinding, HAN Wei(China) … [2-0003]
- ✓ High performance narrow band-pass filter for the NIR/MWIR range, Su Xianjun(China) … [2-0005]
- ✓ Tri-rotors Movement in Computer Controlled Optical Surfacing, Chen xi(China) [2-0006]
- ✓ The research on making large-size aspherical mirrors by vacuum evaporation technique, WANG Jin-feng(China) … [2-0007]
- ✓ Polishing Large Aperture Mirror Using Ultra-Precise Bonnet and PSD Result Analysis, WangWei(China) … [2-0008]

- ✓ Influence of Precision Compression Molding Parameters on the Replicability of Spherical Glass Lens Array, Lu Jinghong(China)..... [2-0010]
- ✓ Manufacturing technology of lightweight mirror for space optics, CHEN Ya (China)..... [2-0011]
- ✓ Design and Manufacture of Anti-IR Films for Resin Lens, FENG Haihua(China)· [2-0012]
- ✓ Research on The Online Test Principle and Error Analysis of Aspherical Optical Surfaces, MU Da(China)..... [2-0014]
- ✓ The Vehicle anti-tank missile goniometer system design, Yan Mingliang(China) ..... [2-0016]
- ✓ Measurement of a convex aspheric mirror by subaperture stitching interferometry, WANG Xiao-kun(China)..... [2-0017]
- ✓ The Analysis on the Deposition Method Influencing on the Microstructure and Surface Morphology of Ge and Si Thin Films, Haihan Luo(China) ..... [2-0018]
- ✓ Study on applications of high precision optical wedge machining, assembling and adjustment technologies, Su Ying (China)..... [2-0019]
- ✓ High efficient and super precision machining of large aperture SiC plano-mirror, Guo Rui(China) ..... [2-0020]
- ✓ Effects analysis of large area polishing tool on aspheric surface quality , Zhang Yun Long(China)..... [2-0021]
- ✓ An approach for machining and measurements of toric surface optics, Liu Xuanmin(China) ..... [2-0022]
- ✓ Curved surface profile effects analysis in polishing with ballonet polishing tool, Zhang Feng(China)..... [2-0023]
- ✓ Design and fabrication of high efficiency diffuser film based on laser speckle, LI Yanshuang(China)..... [2-0025]
- ✓ Bonnet Polishing Aspheric Surface with a large aperture and a high slope, Zhang Jian(China) ..... [2-0026]
- ✓ The Research on the Micro Processing Used LD-pumped Low Repetition Frequency Pico-second Laser, Bai Zhenxu(China) ..... [2-0027]
- ✓ Supersmooth polishing technology with sub-angstrom roughness, Wang Junlin (China) ..... [2-0028]
- ✓ Curve compensation in aspherical lens fabrication controlled by electrostatic force, Zhaolou(China) ..... [2-0029]
- ✓ Study on range selection of key parameters in bonnet polishing using FEA, Pan Ri(China)..... [2-0030]
- ✓ Research on a two ball lens system POF connector, Huang Zhen(China)..... [2-0031]
- ✓ Fiber Microstructure Machining and Analysis based on Ultra-short Laser, Gang Xu(China) ..... [2-0034]
- ✓ Study of Object-oriented Petri Net in Modeling for Infrared Dome Optical Manufacturing, (China)..... [2-0035]
- ✓ Custom design of aspherical RGP lens, HU Chuan(China) ..... [2-0036]
- ✓ The Processing and Precision Analysis High Precision Five Angle Prism, LI Jianzhang(China)..... [2-0038]
- ✓ Study on the Optical Manufacture and Testing Methods of a Refractive-reflective Meniscus Primary Mirror, Kang Jian (China) ..... [2-0039]

- ✓ Key technologies for diamond turning of non-rotational symmetrical micro-structured surfaces, Jingbo Zhou(China) ..... [2-0040]
- ✓ Design of 8-Mega Pixel Mobile Phone Lens based on Code V, Xuefeng Peng(China) ..... [2-0042]
- ✓ An efficient CNC polishing technology of aspheric parabolic mirror, HUANG Qiong(China) ..... [2-0043]
- ✓ Effects of structured surface errors on MTF of off-axis TMA optical system, ZENG Xuefeng(China) ..... [2-0044]
- ✓ Study on Distributing Characteristics of Machining Errors in Deterministic Polishing, Guilin wang(China) ..... [2-0045]
- ✓ The Research of Errors for Splitting Prisms, XiePeng(China) ..... [2-0046]
- ✓ Research on chemical mechanical polishing technology of SiC mirror, Ma Zhenfang(China)..... [2-0047]
- ✓ Study on the control of surface roughness in Single Point Diamond Turning, Honghuai XU(China)..... [2-0050]
- ✓ Magnetic Medium Assistant Polishing Technology and its Experiment results, Deng Weijie(China) ..... [2-0051]
- ✓ Aging effect of optical properties of SiO<sub>2</sub> films grown on Si substrates by ion beam sputtering, JI Yiqing(China) ..... [2-0053]
- ✓ Design and manufacture of high reflective coatings deposited on metal substrate, Wang Lishuan(China) ..... [2-0054]
- ✓ Design and test of dichroic beam splitter having optical freeform surface, YU Qinghua(China) ..... [2-0055]
- ✓ Study of HfSiO Thin Films Prepared by Electron Beam Evaporation for optical properties and Laser-induced Damage Threshold, Xi Yingxue(China) ..... [2-0056]
- ✓ Multi-channel optical telescope with free-form surface splitters, Xinglong li(China) ..... [2-0057]
- ✓ The Planetary Motion Grinding Tool for Optical Manufacturing Based on Industrial Robots, Sha Shengchun(China)..... [2-0059]
- ✓ Preparation and performance of SiC surface modification coatings on RB-SiC mirror, Yong-Tao Yuan (China) ..... [2-0060]
- ✓ The optimization of freeform cylindrical lens in Czerny-Turner spectrometer system to correct the astigmatism by using user defined error function, Bixiang Qu(China) ..... [2-0061]
- ✓ Analysis and optimization of tooth shapes of roll stampers for optical micro-structured array imprinting, Su Yang(China) ..... [2-0063]
- ✓ Eight-axis-polishing machine for 2 m off-axis aspheric optics, Hyug-Gyo Rhee(South Korea)..... [2-0064]
- ✓ Investigation on the MTF for the large-aperture long focal length TDICCD camera , jiaxin(China) ..... [2-0066]
- ✓ Correction of full spatial frequency errors with Ion Beam Figuring, Gu Yongqiang(China) ..... [2-0067]
- ✓ Surface figure control in the plane polishing process based on the annular polyurethane pad, defeng liao(China) ..... [2-0068]
- ✓ Analysis of Chemical Polishing for Optical Elements, Jiao Ling-yan(China) ..... [2-0069]
- ✓ Design and preparation of multilayer optical coatings for Nd:YVO<sub>4</sub> and KTP, JIANG Yugang(China) ..... [2-0070]

- ✓ Ultra-precision surface polishing using ion beam figuring, Young-Sik Ghim(South Korea) ..... [2-0071]
- ✓ Design of the primary mirror supporting structure and lightweight of space camera, ZHU Chuanmin(China) ..... [2-0072]
- ✓ Anti-reflection coating on calcium fluoride substrate using ion-assisted deposition, zhangyaoping(China) ..... [2-0073]
- ✓ Research on Spectral Calibration for Hyper-spectral Imager, GUO Yongxiang(China) ..... [2-0074]
- ✓ Rigidity controllable polishing tool based on Magnetorheological effect, Jia Wang(China) ..... [2-0075]
- ✓ A method of estimating bonnet-polishing capability and thereof test in the correction processing of intermediate-frequency surface error, Wang Fei(China) ..... [2-0076]
- ✓ Manufacturing method for Pyramid wavefront sensor by traditional optical fabrication, Jianxin wang(China) ..... [2-0077]
- ✓ Laser beam shaping and packaging system, Luodaxin(China) ..... [2-0078]
- ✓ The Exploration of Cloud Manufacturing Service Mode for High Power Laser Optical Elements, WANG Juan(China) ..... [2-0079]
- ✓ Effect of hydrodynamic pressure on ultraprecision grinding, Yeon Hwang(Rep. Korea) ..... [2-0080]
- ✓ The optimization of tool path of the square off-axis aspheric mirror based on vertex cover method and edge effects, Feng Xiao(China) ..... [2-0082]
- ✓ PMP-based Micro-3D Dental Measuring Technology, Zhongwei Li(China) ..... [2-0083]
- ✓ Research on the best arrangement of sensors used in the deformation measurement of active lap based on Genetic Algorithm, Zhao Hongshen(China) ..... [2-0084]
- ✓ Introduction and manufacturing of oblate spheroid mirror, Li Depei(China) ..... [2-0086]
- ✓ Ultra-precision Optical Fabrication on Fused Silica, Wang Junlin (China) ..... [2-0087]
- ✓ Generation of Radially Polarized Femtosecond Pulse Beam by a Phase-only Liquid Crystal Spatial Light Modulator, Junli Qi(China) ..... [2-0088]
- ✓ Mathematical model for active lap to achieve unsymmetrical fabrication, Haitao Liu(China) ..... [2-0089]
- ✓ A Study of New Optimization of LED projector with High efficiency and contrast, Yi-Chin Fang(Taiwan) ..... [2-0090]
- ✓ Study and Fabrication of Multi-band Filter Film On ZnS Substrate, Zhang jing(China) ..... [2-0092]
- ✓ Perform rod feeding module of the Optical Fiber Drawing Tower and its algorithm design based on embedded development platform, Zhang Tao(China) ..... [2-0095]
- ✓ A Reconstruction Method for Laser Wavelength Scanning Interference Testing of Aspherical Surface, LI Lulu(China) ..... [2-0097]
- ✓ Research of Engineering Change Analysis, Fang Yongze(China) ..... [2-0098]
- ✓ Experiment of grinding technics using manipulator, Zhang Wei(China) ..... [2-0101]
- ✓ A method to calibrate the gauging stations on the long distance , WangXiaoFeng (China) ..... [2-0102]
- ✓ Ultra-precision Turning Experiments of Micro-Holes on GDP Capsule , LI Guo(China) ..... [2-0103]

- ✓ Study on the elimination of the &quot;imprinting effect&quot; of the lightweight aspheric polished by CCAL technology using Immersed inflation, ZhongXianyun(China) ..... [2-0105]
- ✓ Two-dimensional of uniform irradiation on target with the use of an concentricity deviation Lens Arrays Focus System of Variable Focus Length, ZHENG Jianzhou(China) ..... [2-0106]
- ✓ Effects of Colloid Rheological Characters in Ultra-smooth Polishing by Nanoparticle Colloid Jet Machining, SongXiaoZong (China) ..... [2-0107]
- ✓ Energetic Electron Generation and Self-Generated Magnetic Field in the Interaction of High Intensity Laser Pulses with Plasmas, Abuduresuli Abudurexiti(China)..... [2-0109]
- ✓ The comparative analysis of three-position measurement technique and multi-position average measurement technology, Peng Yang (China) ..... [2-0110]
- ✓ Research on SiO<sub>2</sub> Film Laser Damage Threshold, WANG Tao(China) ..... [2-0111]
- ✓ The manufacture of rectangle aperture off-axis ellipsoidal aspheric mirror, Xiaoyin Yao(China)..... [2-0113]
- ✓ S+C+L Ultra Broadband Light Source Research, Xi Cong-ling(China) ..... [2-0116]
- ✓ Thermal-structural-optical Analysis for the lens of High-precision Interferometer , ZhangJuan (China)..... [2-0117]
- ✓ Optical alignment and measuring methods of large aperture coaxial three-mirror system , ZHANG Xuemin(China)..... [2-0118]
- ✓ Noise Factor of Micro-channel Plate with Ion Barrier Film, liu shu-lin(China) ... [2-0119]
- ✓ Kinematic Analysis of One-axis Polisher Acting on Spherical Mirror , XU Liang(China) ..... [2-0120]
- ✓ Manufacture of Glass Based Optical Power Splitter by Ion-exchange Method, XIAO Yi(China) ..... [2-0121]
- ✓ Design and Experiments of A Novel Micro-Displacement Mechanism Based on Piezoelectricity Actuator, LI YA(China) ..... [2-0122]
- ✓ Self-Generated Magnetic fields in the Relativistic Laser-Plasma Interaction , Abuduresuli Abudurexiti(China)..... [2-0123]
- ✓ High interface quality and low residual stress EUV multilayer technology research, Chunshui Jin(China) ..... [2-0125]
- ✓ Hybrid refractive/diffractive optical system design for the lightweight uncooled longwave infrared imager, Wang Hu(China) ..... [2-0126]
- ✓ The preferential sputtering of Ar ion processing SiO<sub>2</sub> mirror, Duan Guping(China) ..... [2-0127]
- ✓ Optimization of the Boundary Extension in Dwell Time Algorithm for Ion Beam Figuring, Liangxuan Shu(China) ..... [2-0128]
- ✓ Hybrid refractive/diffractive optical system design for light and compact uncooled longwave infrared imager , Wang Hu(China) ..... [2-0129]
- ✓ A New Numerical Calculation Method for the Characteristics of Hydrostatic Slide, Guoan Hou(China) ..... [2-0130]
- ✓ Research on theoretical analysis of active fluid jet polishing, SUN Tianxiang(China) ..... [2-0131]

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

***(SPIE Proceedings VOL.8417)***

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 (16 min/report)

*Session chair: WEN Shangming*

- ✓ Online Non-destructive Citrus Sugar content Based on Multispectral imaging, Wenqiang Wu(China)..... [3-0012]
- ✓ Na LGS system based on the near Space Aircraft Platform, WU Hui-yun (China) ..... [3-0015]
- ✓ Design and modeling of Biomimetic Structures for Self-cleaning in Ultra-precision Machining, Sandy To(HK,China) ..... (Invited)
- ✓ Research on sensing characteristics of low-finesse fiber-optic Fabry-Perot cavity , Jianghai Zhao(China)..... [3-0021]
- ✓ Design of a panoramic annular lens with a horizontal symmetric FOV, Yao Yuan(China) ..... [3-0043]

#### *Tea time*

- ✓ Comparison and analysis of three different methods for the paraboloid testing, Miao Er-long(China)..... [3-0056]
- ✓ Analysis of the configuration of the electro-optical crystal in an intracavity modulation laser, Xianwang Feng(China) ..... [3-0071]
- ✓ Confocal microscope method for curvature radius measurement of small lens, LIU Qian(China) ..... [3-0074]
- ✓ A quality criterion algorithm used for automatic measurement of spectrum shape of band-pass filters and its equipment implementation, Liu Qian-shun(China)..... [3-0076]

### 13:00-17:00 April 27 ..... SESSION 3-2 room 3(16 min/report)

*Session chair: Sandy To*

- ✓ 3-D Detection Technique of Surface Defects for Heavy Rail Based on Binocular Stereo Vision, Ke Xu(China) ..... [3-0084]
- ✓ Cylindrically Symmetric Vector Beams Obtained by Overlapping Optical Vortices, ZONG zhengyue(China) ..... [3-0108]
- ✓ Sub-Aperture Finishing and Stitching Test of Optical Surface, Shi feng(China) ..... (Invited)

- ✓ Two-dimensional Interferogram Extrapolation Method Using Linear Carrier-frequency, Wang Hai(China) ..... [3-0113]

*Tea time*

- ✓ Photogrammetric scale-bar measurement method based on microscopic image aiming, Gan Xiao-chuan(China) ..... [3-0114]
- ✓ Phase Error Analysis for Stress Birefringence Measurements of Large-scale Optical Materials with Spherical Mirror, Zhang Xiao(China) ..... [3-0136]
- ✓ Study on detection of infrared characteristic of space interferences, Mao Hongxia(China) ..... [3-0143]
- ✓ Laser scattering properties of short, Su Li-ping (China) ..... [3-0156]

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

*Session chair: WANG Haiying*

- ✓ High precision distance measurement with the monolithic femtosecond optical frequency comb, WU Tenfei(China) ..... [3-0182]
- ✓ Optical CD metrology technologies and applications: a sub-nanometer optical metrology method based on rigorous numerical processes, Shifang Li(Japan) ..... (*Invited*)
- ✓ Development of a Computer-Aided Alignment Simulator for the Optical System Alignment of an EO/IR Dual- Band Airborne Camera, Jun Ho Lee(South Korea) ..... [3-0183]
- ✓ Two-dimensional structural surface measurement based on spectrally resolved white-light interferometry, Kaiwei Wang(China) ..... [3-0184]

*Tea time*

- ✓ A new half-film method to measuring Al<sub>2</sub>O<sub>3</sub> film MTF of 3rd generation image intensifier, Cheng Yaojin(China) ..... [3-0187]
- ✓ Characterization of optical components using contact and non-contact interferometry techniques, Yang Yu(British) ..... [3-0190]
- ✓ Parametric definition for the CGH patterns and error analysis in interferometric measurements, Ping Zhou(USA) ..... [3-0196]
- ✓ Correlation between UV radiation intensity and current strength during corona discharge, Ligang Wu(China) ..... [3-0199]
- ✓ Phase Retrieval through Single Defocus Intensity Pattern Using Extended Nijboer-Zernike Expansion Method, Shao Jing(China) ..... [4-0059]

**13:00-17:00 April 28****POSTER****1F hall, floor 1**

- ✓ Study of Exposure Process of Photoresist Using Phase-Modulated Ellipsometer, Wende Liu(China) ..... [3-0001]
- ✓ Polarized bidirectional reflectance distribution function for optical substrate and different films, Gong Lei(China) ..... [3-0002]
- ✓ Influence of lattice's tilt angle in "cat-eye" target on intensity distributions of echo wave, Bingqi LIU(China) ..... [3-0004]
- ✓ Research of processing method for infrared image of sandwich structure composite, HUO Yan (China) ..... [3-0005]
- ✓ Application of 32-anode photomultiplier tube in ultraviolet spectral measurements for exposure assessment, LU Li-gen(China) ..... [3-0006]

- ✓ The computer-aided alignment study of three-mirror off-axis field bias optical system, Pang Zhihai(China) ..... [3-0007]
- ✓ Development of two-framing camera with large format and ultrahigh speed, Xiaoguo Jiang(China) ..... [3-0008]
- ✓ Aerial camera auto focusing system, WANG Xuan(China)..... [3-0009]
- ✓ Analyze and research the Moire fringe with information entropy theory, Yu Honglei(China) ..... [3-0010]
- ✓ Study on Testing for the Volume of the, liyijun(China) ..... [3-0011]
- ✓ Simulation of the TPIF collection efficiency and the improvement of the collection device, desheng Li (China) ..... [3-0013]
- ✓ Compensation Method for Random Drifts of Laser Beams Based on Moving Average Feedback Control, Lixia ZHANG (China)..... [3-0014]
- ✓ Applied research to analyse wavelet de-noising in the heavy metal X-ray fluorescence spectrum in soils, Zhang Wei(China)..... [3-0016]
- ✓ Wavefront Error Sensing Technology based on Phase Diversity Method and Image Restoration, Qiang Cheng(China) ..... [3-0017]
- ✓ Analysis of Cr in the water of Poyang Lake by laser-induced breakdown spectroscopy, Yongzeng Lin(China) ..... [3-0018]
- ✓ Research on Digital Holographic Interferometry Based on EALCD in Three Dimensional Deformation Measurements of Objects, LI Quanyong(China) ..... [3-0019]
- ✓ Design of "Eye Closure" System for the Stealth of Photoelectric Equipments, ZHANG Yue(China) ..... [3-0020]
- ✓ A Gravity Unloading Method for Optical Testing of the Large Aperture Reflector, JIN Zhao(China)..... [3-0022]
- ✓ A new test technology research base on image method of thin film damage threshold , su junhong(China) ..... [3-0023]
- ✓ Judgement and analysis of optical film laser-induced damage , SHI Wei(China) ..... [3-0024]
- ✓ Research on precision measurement of the high-flux large diameter beam sampling grating parameters, YUAN Hao-yu(China)..... [3-0025]
- ✓ Design of a novel optical system for investigation on the characteristics of long plasma column discharge, LI Xuechen(China) ..... [3-0026]
- ✓ Experiment study on Dynamic Random Ball Test, Lu Liming(China) ..... [3-0027]
- ✓ LASER ALIGNMENT MEASUREMENT MODEL WITH DOUBLE BEEM, Mo Chang-Tao (China)..... [3-0028]
- ✓ Novel Determination Method of Laser Damage Threshold, Yang Lihong(China) [3-0029]
- ✓ Measuring Film Thickness Technology Research With Fringe Scanning Method, Su Junhong(China) ..... [3-0030]
- ✓ Test Methods of Dynamic Range for Infrared Optical System with Wide Field of View, Du Bao-Lin(China) ..... [3-0031]
- ✓ Wavelength demodulation based on balance structure of PZT stack and reference gratings, Guo Zhenwu(China) ..... [3-0032]
- ✓ Camouflage Target Detection Based on Infrared Polarization Characteristic, Guo Zecheng(China) ..... [3-0033]
- ✓ flatness standard equipment, LIU Mengxia(China) ..... [3-0034]

- ✓ Method to measurement of the thin film thickness based on Digital Moir&#233; technique, Su Junhong(China) ..... [3-0035]
- ✓ Study on thermal damage of Diamond-like carbon films based on the finite element method, ZengYao(China) ..... [3-0036]
- ✓ The impact of mechanical error and random noise on flat sub-aperture stitching , Deng Wantao(China) ..... [3-0037]
- ✓ Hindle testing of SiC convex conic hyperboloid, LI JUNfeng(China) ..... [3-0038]
- ✓ Research on the Photoacoustic Imaging Reconstruction based on Improved Filtered Back-projection Algorithm, REN Zhong(China) ..... [3-0039]
- ✓ Automation Test System for Motion Characteristics of Optical Scanning Mirror, wen yan(China)..... [3-0040]
- ✓ The phase unwrapping algorithm in 3-D measurement of the specular objects with an improved composite grating, Liu Shugui(China)..... [3-0041]
- ✓ Sparse Sub-aperture Stitching Method Testing Optical System Wave-front , Wang Lihua(China) ..... [3-0042]
- ✓ Design of Visual Light and MWIR Zoom Optical System, Yu-jun Du (China)..... [3-0044]
- ✓ Photon-counting image system performance assessment method based on improved 2D entropy, He Ruiqing(China) ..... [3-0045]
- ✓ Diffraction Characteristics of Transmission Grating, Mingli Tian (China) ..... [3-0046]
- ✓ A laboratory prototype of Image Slicer Integral Field Unit for 1m Telescope, Hangxin Ji (China)..... [3-0047]
- ✓ Research on Method for Improving Measurement Precision of CCD Laser Collimation System with Adaptability to the Environment, Zhao Xiaofeng(China) ..... [3-0048]
- ✓ A multi-object fixed delay Michelson interferometer for astronomical observation, Kai Zhang(China)..... [3-0049]
- ✓ Measurement of Power Spectral Density of Optical Super-Smooth Surface, Dai Lei(China)..... [3-0050]
- ✓ A Simplified Optical Train Model, Lvke(China)..... [3-0051]
- ✓ Parameters measurement of rigid gas permeable contact lens based on optical coherence tomography, Dexi Zhu(China)..... [3-0052]
- ✓ Application of CGH for Testing Unsymmetrical Optical Sufaces with Uncomplex Shape, Xu Yingchao(China)..... [3-0053]
- ✓ Focal length measurement of Microlens-array by definition of digital image processing, Xianchang Zhu(China) ..... [3-0054]
- ✓ Scanning measurement system of transmissivity for large aperture optic components, Yang Yi(China) ..... [3-0055]
- ✓ Laser-induced Breakdown Spectroscopy Detection of Heavy Metal in Water based on Graphite Conch Method, Wang Chunlong(China)..... [3-0057]
- ✓ Study on phase-lock detection technique applied in fluorescence-lifetime based dissolved oxygen measurement, Shi Chaoyi(China)..... [3-0058]
- ✓ Measuring method for free-form surface based on optical theodolite measuring system , Yu Caili(China) ..... [3-0059]
- ✓ A new type of algae photosynthesis activity modulation fluorometer in situ, Liu Jing(China) ..... [3-0060]
- ✓ A Type of Compact Very High Accuracy Star Simulator, SUN Gaofei(China) .... [3-0061]

- ✓ Study on the new manufacture and detection technologies of Free-form surface optic, Wang Wei(China)..... [3-0062]
- ✓ kalman filtering for noise removal and state prediction in optical fiber sensing system, LIU Tao (China) ..... [3-0063]
- ✓ Infrared Face Recognition based on Multiwavelet and PCA, Xie Zhihua(China)· [3-0064]
- ✓ The microscopic observation of the hyperspectral imaging based on the visible acousto-optic tunable filter, Hao Wang(China)..... [3-0065]
- ✓ Definition of the laser-induced damage in light scattering, Liang Haifeng(China) ..... [3-0066]
- ✓ The relativistic correcting on Gauss spectrum profile function in one-dimensional gas system, YIN Zengqian(China) ..... [3-0067]
- ✓ Application of LabVIEW in Optical Fiber Carbon Dioxide Real-time Monitoring System Based on TDLAS, ZHANG Ting-ting (China) ..... [3-0068]
- ✓ Application of laser differential confocal technique in back vertex power measurement for phoropters , Li Fei(China) ..... [3-0069]
- ✓ A New Approach to Accuracy Enhancement and Traceability Realization of Radius of Curvature Measurement, Xiang Ding(China) ..... [3-0070]
- ✓ Head Motion Tracking based on EKF, Kai Ma(China) ..... [3-0072]
- ✓ Novel Determination Method of Laser Damage Threshold, Yang Lihong(China) [3-0075]
- ✓ The Research of Plasma Spectrometry to Determine the Optical Film Damage, Zhao Dan(China) ..... [3-0077]
- ✓ Computer-aided Alignment of Off-axis Two-mirror Reflective System, Wang Bin(China) ..... [3-0078]
- ✓ Acoustic method study of laser damage in optical thin films, Ding Yi(China)..... [3-0079]
- ✓ Opto-mechanical structure design and analysis of 300mm aperture Reference sphere lens, WANG Baoxu(China) ..... [3-0080]
- ✓ Determination of long focal length of lenses with Talbot interferometer, Xiaorong Jin (China)..... [3-0081]
- ✓ Engineering comparison between the variable aperture and CCD for measuring divergence angle of the laser beam, Xing Ji-chuan(China)..... [3-0082]
- ✓ Radiometric Calibration of a Three-Channel Imaging Polarimeter , Zhang Lei(China) ..... [3-0083]
- ✓ Design of Null compensator for 1.5m primary mirror, Meng Xiao-hui(China) ... [3-0085]
- ✓ A new calibrating plate for infrared laser target recognition, Weisheng Liu(China) ..... [3-0086]
- ✓ Co-phasing Measured for Segmented Mirrors and Image Retrieval Technology Based on Phase Diversity, Luo Qun(China)..... [3-0087]
- ✓ A Measurement Method of Spherical Large Curvature Radius, Guo Youhan(China) ..... [3-0088]
- ✓ Error analysis of Gaussian beam spot width measured with CCD imaging sensor , HE Yuanxing(China) ..... [3-0089]
- ✓ Analysis of the Diffraction Wave from Pinhole in Point Diffraction Interferometer, Rulin WANG (China) ..... [3-0090]
- ✓ Wall thickness detection based on X-ray image processing technology, Zhang Lei(China)..... [3-0091]

- ✓ A three-dimensional imaging lidar using silicon photomultiplier arrays for underwater target acquisition, Nie Ruijie(China) ..... [3-0092]
- ✓ Surface figure measurement of flat mirrors based on the subaperture stitching interferometry, Pengqian Yang(China) ..... [3-0093]
- ✓ Research of High Precision and Continues Misalignment Detecting Technology of Moving mirror in Fourier Transform Infrared Spectrometer, Sun Xiao-jie(China) ..... [3-0094]
- ✓ A comprehensive measurement method for freeform surfaces, CHANG Suping(China) ..... [3-0095]
- ✓ Flexible Laser Polarization Coding Modulation Technology of Space Optical Communication, ZhaoHaiLi(China) ..... [3-0096]
- ✓ Micro-profile measurement of transparent coating using Windowed Fourier Transform in white-light vertical scanning interferometry, Suodong Ma(China) ..... [3-0097]
- ✓ Measurement of Non-common Path Static Aberrations by Use of Phase Diversity, Yan Zhaojun(Germany) ..... [3-0098]
- ✓ Research on the Technology for Processing Errors of Photoelectric Theododlite based on Error Design Idea, Guo xiaosong(China) ..... [3-0099]
- ✓ Measurement of Soft X-ray Grazing Incidence Optical Scattering Phenomena, CHEN Shu-yan(China) ..... [3-0100]
- ✓ Computer aided alignment for a Cassegrain telescope, Zhang Xiao-ming(China) ..... [3-0101]
- ✓ Analysis of the Output Irradiance Uniformity of Integrating Sphere Source in Optoelectronic Device Test, He Yingwei(China) ..... [3-0102]
- ✓ Experimental study on absolute testing of spherical surfaces with shift-rotation method, Song Wei-hong(China) ..... [3-0103]
- ✓ Two-flat absolute test solutions based on pixel rotation averaging, Sun wenqing(China) ..... [3-0104]
- ✓ Simulation of surface deformation for the lithographic object lens by Zernike polynomials, Hongwei Zhu(China) ..... [3-0105]
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- ✓ The effect of the length-width ratio of rectangle aperture on the characteristics of alignment mark, LI Shijie(China) ..... [3-0110]
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- ✓ The Digital Optical Transfer Function Measuring Technique on Image Analysis, Changqing Liu(China) ..... [3-0118]

- ✓ PCI Express Bus Design of Large Format Array IRFPA High-Speed Acquisition System, Huang Zewu(China) ..... [3-0119]
- ✓ Cameras calibration method in the high precision visual measuring system, LIU Jiantao(China) ..... [3-0120]
- ✓ Application and Research of D/0 measuring condition on Spectrophotometer , Wang Cong(China) ..... [3-0121]
- ✓ Study on the uniformity measurement of the diffraction efficiency of beam sampling grating, Sun Hao(China) ..... [3-0122]
- ✓ Analyzing of mid-friquency-errors based on optical manufacture, Guowen(China) ..... [3-0123]
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- ✓ Dynamic Deformation Analysis of Light-Weight Mirror, Zhang Yingtao(China) · [3-0125]
- ✓ Analysis on the thermal distortion influence of high power laser beam splitter mirror based on a proposed real-time detection technique using two Hartmann-Shack sensors, Yu Ning(China) ..... [3-0126]
- ✓ Method on Echoed Signal Denoising of Bathymetric Sounding Laser Radar, Cheng Hua (China) ..... [3-0127]
- ✓ Study on the stress birefringence measurement of uni-axial crystal, WEI Xiaohong(China) ..... [3-0128]
- ✓ Error Analysis for aspherical lens's eccentricity during the testing process , Wang Peng(China) ..... [3-0129]
- ✓ Measuring System for Cable length and Diameter Based , ZHU Weimin(China) [3-0131]
- ✓ Analysis of Transmission and Applitation of UV Radiance of Missile Plume , Huang Hongxi(China) ..... [3-0132]
- ✓ Study and application about a set of millimeter wave detecting system to test the insertion loss, WANG Xuan-yu (China) ..... [3-0133]
- ✓ Study on Near-field scattering characteristic base on Ray-tracing, WU Kaifeng(China) ..... [3-0134]
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- ✓ Experimental investigation of wake vortex in a water-towing-tank, Liu Yue(China) ..... [3-0139]
- ✓ Research on Laser Optic Gyro North-Finder Error Analysis and Compensating Arithmetic, Wang Lifen(China) ..... [3-0140]
- ✓ Study on Terahertz Radiation Test of Blackbody, Li Hongguang(China) ..... [3-0141]
- ✓ Noiseproof wavefront testing method in time- and spatial-domain, Tang Lei(China) ..... [3-0142]
- ✓ The Aspheric Surface Test and Clamping Based On ZYGO Interferometer, Wenhui Li(China) ..... [3-0144]
- ✓ Spectral Recognition of Target Based on the Hyperspectral Image Data, HU Qili(China) ..... [3-0145]
- ✓ The Research on Measurement Accuracy of RIM-FOS, Jin Yuanqiang(China) ... [3-0146]

- ✓ Design of integrated compensation system for intensity modulated optical fiber sensor, Jin Yuanqiang(China)..... [3-0147]
- ✓ Fiber optic turbulence sensing system, XIAO Shumei(China) ..... [3-0148]
- ✓ Novel Thermal Cycle System Based on PLC for Space Borne Infrared Detectors, XianliangZhu(China)..... [3-0149]
- ✓ A new measurement of the alignment of the deployed telescope, FENG Xuegui (China) ..... [3-0150]
- ✓ High Peak-Power Q-switched All-fiber Laser with Tunable ns-us Pulse Durations and Hz-MHz Repetition Rates, JI Xiang(China)..... [3-0151]
- ✓ Test System for Infrared Search and Track Precision, QU Hui-ming(China) ..... [3-0152]
- ✓ Measurement of Soft X-ray Grazing Incidence Optical Scattering Phenomena, CHEN Shu-yan(China) ..... [3-0153]
- ✓ Research on analog system with the wide range and high-precision laser energy characteristics, Dong Keyan(China) ..... [3-0154]
- ✓ Freeform Ophthalmic Lenses Power Map Measurement , Wang YuanYuan(China) ..... [3-0155]
- ✓ Research on new stitching interferometric testing for CPP, YAN Hao(China) ..... [3-0157]
- ✓ Point Spread Function modeling method for X-ray Flat Panel Detector imaging, Hua Zhang (China) ..... [3-0158]
- ✓ The testing and the calibration for the geometry parameter of the off-axis aspheric surface , Lei Bai-ping(China) ..... [3-0159]
- ✓ Conformal elliptical concave surface test, Weiqun(China) ..... [3-0160]
- ✓ Research and Experiment of a Transducer Based on Piezoelectric Ceramics, Fan Zhen(China)..... [3-0161]
- ✓ Steel Plate Flaw NDT Using Laser Ultrasonic, Qing-yuan Meng(China) ..... [3-0162]
- ✓ The study of catadioptric lens' optical simulation and unwrapped distortion correction algorithm, Wei zhu(China)..... [3-0163]
- ✓ The analysis of measuring error on the index homogeneity of the optical material, Liao Zhiyuan(China) ..... [3-0164]
- ✓ Study on Distortion Correction for Image Mosaic in Large Aperture Surface Defects Detection, Shitong WANG(China) ..... [3-0165]
- ✓ A new interferometric method to locate aspheric in the partial null aspheric testing system, Wei Tao(China)..... [3-0166]
- ✓ A New Method of Directly Measuring the Rotation Angle Based on Conoscopic Interference in Polarimeter, Huang yantang(China)..... [3-0167]
- ✓ Application of image entropy function in the leveling of large aperture components during automatic defects detection, Cao Pin(China)..... [3-0168]
- ✓ Research on Scattering Characteristics of Optical Elements Subsurface Damage, WangHui(China) ..... [3-0169]
- ✓ Research on Digital Calibration Method for Optical Surface Defect Dimension, xiaoyu CHEN(China)..... [3-0170]
- ✓ The study of optical detection on the surface defects in ceramic balls, Zhao Xiaoli(China) ..... [3-0171]
- ✓ Measurement of dynamic parameters for NO Resonant-enhanced multiphoton ionization, Guiyin Zhang(China) ..... [3-0172]

- ✓ In indoor evaluation method of infrared system detecting ability, ZHANG Jiaxin(China) ..... [3-0173]
- ✓ Experiment research on the birefringence test of aspherical glass, yang wei(China) ..... [3-0174]
- ✓ Stress evolution in HfO<sub>2</sub>/SiO<sub>2</sub> multilayers, LI Jingping(China) ..... [3-0175]
- ✓ Polarization Properties of Polarization Maintaining Photonic Crystal Fibers under Thermal Effect, Pan Ma (China) ..... [3-0176]
- ✓ Principal component analysis of interferograms with random phase shifts, Jiancheng Xu(China) ..... [3-0177]
- ✓ High speed rolling bearing cage rotation speed monitoring using optical sensor, Dezhi Zheng(China) ..... [3-0178]
- ✓ Analysis of influence factors for coupling efficiency of single mode fiber, Hongjiang Sheng (China) ..... [3-0179]
- ✓ Optical design and certification of correctors , WU Yongqian(China) ..... [3-0180]
- ✓ Simultaneous Stitching Testing of Aspheric Surface based on Constrained Optimization, wang weibo(China) ..... [3-0181]
- ✓ Online Calibration Technology and Stability Evaluation of Long-Baseline Homodyne Laser Interferometry , Bing Wu(China) ..... [3-0185]
- ✓ Design, development and application of tapered fiber-optic surface plasmon resonance sensor, WANG Yanjie(China) ..... [3-0186]
- ✓ Design and Performance Experiment of Ultraviolet Off-axis Cassegrain system, Feng Liangjie(China) ..... [3-0188]
- ✓ An automatic recognizing method of effective welded area for non-destructive testing of ultrasonic welding based on shearography technique, Wang Ji(China) ..... [3-0189]
- ✓ Calculation Method for Boresight on Aerial Remote Sensing Camera, XING Hui(China) ..... [3-0191]
- ✓ Evaluation of High Power Laser Beam Quality and the Effect in Far-field Irradiance, Zheng Wei(China) ..... [3-0192]
- ✓ Measurements of spectrum on HF chemical lasers with MOPA configuration, CHEN Yubin(China) ..... [3-0193]
- ✓ Research progress of wavefront aberration metrology equipment of lithography projection lens, Yu Changsong(China) ..... [3-0194]
- ✓ Experiments study on virtual spatially extended source, Xu Yan(China) ..... [3-0195]
- ✓ Variation of Infrared Spectrum of Ethane with the Change of Temperature and Pressure, MingKong(China) ..... [3-0197]
- ✓ A novel fiber-optic acoustic vector sensor, Hong Luo(China) ..... [3-0198]
- ✓ Study on the profile measurement for big relative aperture aspherical surface, Wang Yi(China) ..... [3-0200]

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

**(SPIE Proceedings Vol.8418)**

Conference Chairs:

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

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

**LI Yanqiu**, Key Laboratory of Photoelectronic Imaging Technology and System, Ministry of Education of China

### **8:30-12:00 April 27 ..... SESSION 4-1 room 4 (15 min/report)**

*Session chair: LIU Xuefeng*

- ✓ Focal Length and Focal Depth of Metallic Superlenses, Pengfei Cao(China) ..... [4-0004]
- ✓ Amplitude-modulation mechanism for designing long-focal-depth cylindrical microlenses with a uniform axial intensity profile, Jia-Sheng Ye(China) ..... [4-0007]
- ✓ Spherical compound eye imaging system with a large field of view based on a plano-concave substrate, Hongxia Zhang(China) ..... [4-0011]
- ✓ The Cross Talk of Multi-errors Impacts on Lithography Performance and the Method of Its Control, Yanqiu Li(China).....(Invited)[4-0056]
- ✓ Ultra-precision Stylus measurement of micro V-groove array for optical fiber Location, Yong Liu(China)..... [4-0013]

#### Tea time

- ✓ A free-form polymeric micro lens array molded by electrostatic force driven flexible membrane, WU Zhao(China) ..... [4-0014]
- ✓ Research on Low-Temperature Au/Amorphous Si Wafer Bonding, Mifeng Liu(China) ..... [4-0015]
- ✓ A kind of Real Time Processor based on FPGA and DSP for Atmospheric Parameters Measurement, Jie Mu(China) ..... [4-0016]
- ✓ Finite-difference time domain method for light scattering by carbon nano coils in three-dimensional space, Li Hong(China)..... [4-0025]

### **13:00-17:00 April 27 ..... SESSION 4-2 room 4(15 min/report)**

*Session chair: LI Yanqiu*

- ✓ Properties of Photon Sieve Diffraction Based on FDTD Method, He Yu(China) .. [4-0029]
- ✓ High-precision Assembly and Testing for the FPA of Space camera, LI YANCHUN(China) ..... [4-0034]
- ✓ A high stroke actuator with lever structure designed for micro-mirror, Sun Quan(China) ..... [4-0040]

- ✓ Impact of MSD and Mask Manufacture Errors on 45nm-node Lithography, Chunying Han(China) ..... [4-0041]
- ✓ Integrated Wavefront Aberration Measurement in Extremely Large Scale Integrated Circuit Optical Lithography, Xuefeng Liu(China) .....(Invited)[4-0058]

*Tea time*

- ✓ Influence of Flare and NA Error on Lithography, Xuxia Wang(China) ..... [4-0043]
- ✓ Verification of the Numerical Aperture of Laser Scanning Confocal Microscope Objective lens, Yushu Shi(China) ..... [4-0044]
- ✓ Diffractive Devices Fabricated on Azobenzene Polymer by Polarization Laser Direct-writing, Hao Peng(China)..... [4-0045]
- ✓ A Framework of an Ultra-precision Roller Machining Equipment for the Fabrication of Patterned Microstructured Optics, L.B. Kong (China) ..... [4-0051]
- ✓ Fabrication of the Microtoroidal and the fiber tapers, Guo Changlei(China)..... [4-0053]

**13:00-17:00 April 28**

**POSTER**

**1F hall, floor 1**

- ✓ Fast-steering Mirror with Self-aligning ball bearing Supporting Structure, XU Xin-hang(China) ..... [4-0001]
- ✓ The Research of Infrared Micro-Scanning Technology, zhang liang(China) ..... [4-0002]
- ✓ Laser Diode Array Beam Shaping System Based on Fly's Eye Lens, Feng HUANG(China) ..... [4-0003]
- ✓ Analysis and test of an image motion compensation mechanism of space camera, Quo Quanfeng(China) ..... [4-0005]
- ✓ Design of Nanosecond Pulse Laser Microprocessing System based on PMAC, LIU Mingyan(China) ..... [4-0006]
- ✓ Maskless lithography alignment method based on phase-shifting moir&#233; fringes technology, JiangPing Zhu(China) ..... [4-0008]
- ✓ Study on Synchronous Control Strategy of Wafer and Reticle Stage of Step & Scan Projection Lithography, Li Lanlan(China) ..... [4-0009]
- ✓ A field lens design of illumination and projection optics for dynamic infrared scene generator based on DMD, Jian Yi(China)..... [4-0010]
- ✓ Fabrication of a new type of transmission grating with holography interferometry and wet anisotropic etching, CHEN Yong(China) ..... [4-0012]
- ✓ Depth-segmented partial-wave microscopic spectroscopy for subsurface defects' micro-nano structure detection and characterization, Wang Qianqian(China) .. [4-0017]
- ✓ Design and Analysis of Diffractive Optical Elements for Flattening of Single Modal Gaussian Beams, Kewei Yin (China)..... [4-0018]
- ✓ Design of aspheric surfaces testing system based on the computer-generated holograms, Jie FENG (China) ..... [4-0019]
- ✓ Development of a Motion Imagery Quality Metric based on Image Chain Analysis, Honggang Bai(China) ..... [4-0020]
- ✓ Research of image denoising based on high precision of star sensors, Zhen-zhen LI (China)..... [4-0021]
- ✓ Manufacture of optic micro-lens generated on needing positions and its application on biochips, Kuanxin Yu (China) ..... [4-0022]
- ✓ Effect of chain length on nanoscratching of polystyrene, Junjie Zhang(China) · [4-0023]

- ✓ Research on method of measuring pattern distortion of circularly symmetrical phase etched CGHs and eliminating the effect of pattern distortion, Chao DENG (China) ..... [4-0024]
- ✓ Design and Simulation of tunable CW THz source based on laser photomixing and Archimedean spiral antenna, Tianying Chang(USA) ..... [4-0026]
- ✓ Influence of working face roughness on load capacity of aerostatic thrust bearing , lijnlong(China) ..... [4-0027]
- ✓ Optical Components Damage Parameters Database System, Tao yizheng(China) ..... [4-0028]
- ✓ Study on Synchronous Error Control Strategy of Ultra-Precision Stages of Step & Scan Lithography, Liu Qi(China) ..... [4-0030]
- ✓ Technology of focus test for 193nm projection lithographic tool, Di Chengliang(China) ..... [4-0031]
- ✓ Research on Micro-Displacement Driving Technology based on Piezoelectric Ceramic , Hu Bo(China) ..... [4-0032]
- ✓ Effects of environmental factors on imaging performance of long focal length space camera, GUO QUANFENG(China) ..... [4-0033]
- ✓ Effects of structural perturbation on the optical properties of , Jingjuan Li(China) ..... [4-0035]
- ✓ Design of Phase Grating based on Alignment System, LI Weichao(China) ..... [4-0036]
- ✓ Auto focusing system for laser direct writing based on fuzzy control strategy, Fengchao Liang(China) ..... [4-0037]
- ✓ Subwavelength photolithography based on a surface plasmon resonant cavity with two beams, Genhua Chen(China) ..... [4-0038]
- ✓ Characteristics of Two-Dimensional Surface Plasmonic Interference Using Different Polarized Light, XIAO Wei(China) ..... [4-0039]
- ✓ Simulation of Sub-wavelength 3D Photomask Induced Polarization Effect by RCWA, Liang Yang(China) ..... [4-0042]
- ✓ Microchannel Detection of Microfluidic Chips with Digital Holography Imaging System, Yunxin Wang(China) ..... [4-0046]
- ✓ Research on ROC Measurement for Micro-accessory in Precision and Ultra-precision Machining, Tian Xinli(China) ..... [4-0047]
- ✓ White light interferometry test and analysis of LiNbO3 polarizer, Liu Huilan(China) ..... [4-0048]
- ✓ One kind based on the YUV space for color image fusion algorithm, Zhang Lei(China) ..... [4-0049]
- ✓ Synchronization control research of communication mechanism based wafer stage of lithography, ShengZhuang(China) ..... [4-0050]
- ✓ A precision robotic assembly system for fusion ignition targets , Yu Dahai(China) ..... [4-0052]
- ✓ Characteristics of the annular beam using a single axicon and a pair of lens, Ke Ji(China) ..... [4-0054]
- ✓ The Study on Large Aperture Ratio Machining of the Z-cut Quartz Base on MEMS, XIE Haihe(China) ..... [4-0055]
- ✓ Analysis of Pinhole Vector Diffraction in Visible-Light, WANG Li(China) ..... [4-0057]

## Conference 5: Opto Electronics Material and Devices for Sensing and Imaging

*(SPIE Proceedings Vol.8419)*

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: ZHANG Lei*

- ✓ Organic Solar Cells with 2-Thenylmercaptan/Au (Film/Nano-Particles) Self-assembly Film as Buffer Layer, Zhijian Chen(China) ..... *(Invited)*
- ✓ Wavelength sensing based on the Goos-H&#228;nchen effect in the symmetrical metal-cladding waveguide structure, Yi Wang(China) ..... [5-0005]
- ✓ Primary Research on Lock-in Error Compensation Based on Synchronize Filtering for Mechanically Dithered Ring Laser Gyro, Zhenfang Fan(China) ..... [5-0009]
- ✓ Dark current analysis of long wavelength InAs/GaSb superlattice infrared detector, Zhou Yi (China) ..... [5-0013]

#### *Tea time*

- ✓ Research In the Modulation Transfer Function (MTF) Measurement of Near-Infrared InGaAs Focal Plane Arrays, Xu ZhongHua(China) ..... [5-0018]
- ✓ Study on strain and stress distribution of LW HgCdTe on Si, Wang Yuanzhang(China) .. ..... [5-0022]
- ✓ Performance of Low Dark Current InGaAs Shortwave Infrared Detector, Li Tao(China) ..... [5-0052]
- ✓ A multimode input, broad band arrayed waveguide grating (AWG) for micro Raman spectrometer, Cheng Yaqin(China) ..... [5-0054]

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

*Session chair: LIN Hui*

- ✓ New Unimorph Deformable Mirror for Laser Beam Shaping, Jianqiang Ma(China) ..... [5-0055]
- ✓ Study on Optical Axis Azimuth Variation of Liquid Crystal Variable Retarders, Zhang Zhiyong(China) ..... [5-0056]
- ✓ Electric Field Distribution of Photoconductive Dipole Antennas for Terahertz Pulses Generation, Zou Sheng Wu(China) ..... [5-0075]
- ✓ Effect of a delta-doping green emitting layer in white organic light-emitting device, Juan Zhao(China) ..... [5-0077]

Tea time

- ✓ Depth estimation based on Adaptive Support-Weight and SIFT For multi-lenslet cameras, GAO yuan (China) ..... [5-0078]
- ✓ A novel solar-blind photodetector using AlGaN in combination with a PVDF-based structure, liu Xiujuan(China) ..... [5-0079]
- ✓ Metallophthalocyanine and Subphthalocyanine films as electron-transport layer in organic light-emitting diodes, Zhu Ma(China) ..... [5-0081]

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

*Session chair: MA Zhu*

- ✓ Introducing a high performance organic field-effect transistor with oxide/metal bilayer electrodes, Xinge Yu(China) ..... [5-0087]
- ✓ Linear CCD Pixel-Response Non-Uniformity Correction Algorithm, Lei Ning(China) ..... [5-0108]
- ✓ The research of energy harvesting system using in RFID tag, Liyang yu(China) ..... [5-0116]
- ✓ Synthesis and Properties of novel photopolymer with high photosensitivity for holographic memory, Li Jingming(China) ..... [5-0131]

Tea time

- ✓ High-order Total Variation Regularization Based Infrared Image Background Suppression, Qin Hanlin(China) ..... [5-0138]
- ✓ Shearlet Transform Based Anomaly Detection for Hyperspectral Image, ZHOU Huixin(China) ..... [5-0139]
- ✓ Flexible top-emitting electroluminescent devices based on metal foil substrates, LIN Hui(China) ..... [5-0142]

**13:00-17:00 April 28****POSTER****1F hall, floor 1**

- ✓ Study for Routing Arithmetic of Rearrangeable Nonblocking Matrix Optical Switches with Extended Banyan Network, Ying Zhang(China) ..... [5-0001]
- ✓ Characteristic Distribution of the Transducer Ultrasonic Beam of the Acousto-optic Modulator, HUO Lei(China) ..... [5-0002]
- ✓ Chirped-pulse propagation and spectral compression in all-normal dispersion photonic crystal fibers, LI Ying(China) ..... [5-0003]
- ✓ Terahertz time-domain spectroscopy of Cd<sub>1-x</sub>Zn<sub>x</sub>Te single crystal, WANG Reng(China) ..... [5-0004]
- ✓ The effects of vacuum annealing and oxygen ion beam bombarding on the electrical and optical properties of ITO films deposited by e-beam evaporation , Pan Yongqiang(China) ..... [5-0006]
- ✓ Thermal annealing effect on the electrical properties of the Pt/ Al<sub>0.45</sub>Ga<sub>0.55</sub>N Schottky contacts, Caijing Cheng(China) ..... [5-0007]
- ✓ Large Area PERC-type Solar Cells with ALD-Al<sub>2</sub>O<sub>3</sub> Passivation Layer, Dou Yanan(China) ..... [5-0008]
- ✓ CCD Star Image Rapid Locating Method Based on Cross Projection and Differential Extremum Algorithm, Wei Xu(China) ..... [5-0010]

- ✓ Third-order nonlinear optical properties of two organometallic complexes-doped PMMA thin film irradiated by picosecond pulse, Sun Jing(China) ..... [5-0011]
- ✓ Front-illuminated planar type InGaAs sub-pixels infrared detector, DENG Honghai(China) ..... [5-0012]
- ✓ Optical and mechanical design of 10X zoom lens for low-vision aid devices, Li-Yiyu(China) ..... [5-0014]
- ✓ The accurate measurement of background carrier concentration in longwave infrared InAs/GaSb superlattices on GaSb substrates, Xu Zhicheng (China)..... [5-0015]
- ✓ Study on Application of Spectral Filter in Detecting Stars in Daytime, ZHANG Rui-jin(China) ..... [5-0016]
- ✓ Electron emission characteristics of C-Ti granular films, Ren Wen(China) ..... [5-0017]
- ✓ Molecular Beam Epitaxy of HgCdTe on CdZnTe Substrates, WeiQiangWang(China) ..... [5-0019]
- ✓ Design of High-resolution Digital Microscope Eyepiece based on FPGA, Jin Cai(China) ..... [5-0020]
- ✓ Embedded three-dimensional shape measurement with micro projector, Farong Hu(China)..... [5-0021]
- ✓ Noise model and simulation analysis of the low noise Pre-amplifier of CCD camera, CHEN Zhi(China) ..... [5-0023]
- ✓ The Design and Precision measurement of TDICCD Focal Plane , Xuezhi Jia (China) ..... [5-0024]
- ✓ Polarization Properties of High-birefringence Polymer Photosnic Crystal Fiber, XU Qiang(China)..... [5-0026]
- ✓ Comparison of photoemission characteristics of exponential-doping AlGaAs/GaAs photocathodes grown by MOCVD and MBE, Yijun Zhang(China) ..... [5-0027]
- ✓ Large single-mode rib waveguide in lithium niobate on insulator, Yujie Zhou(China) ..... [5-0028]
- ✓ Application of Au/Sn in the formation of p-HgCdTe photoconductive detectors' electrodes, Tang Yi-dan(China) ..... [5-0029]
- ✓ Design of Micro-channel Heat Sink with Diamond Heat Spreader for High Power LD, Liu Gang (China) ..... [5-0030]
- ✓ Silicon-on-insulator electro-optically tunable microring resonators with gear-shaped p-i-n diodes, Hong wei(China) ..... [5-0031]
- ✓ Study of longitudinal mode calculation of DFB fiber laser and it's realization of single longitudinal mode operation, Yanjie Zhao(China)..... [5-0032]
- ✓ Mobility spectrum analysis of ion-etching-induced p-to-n type converted layers in HgCdTe single crystal, Xu Guoqing(China) ..... [5-0033]
- ✓ Analysis of oversampling for Noise Reduction of UV Image, Liu Fei (China)..... [5-0034]
- ✓ Pyroelectric infrared linear arrays based on PIMNT, Ma Xueliang(China) ..... [5-0035]
- ✓ Effects of growing conditions on preparation of InSb thin films by femtosecond pulsed laser deposition, ZHU Xubo(China) ..... [5-0036]
- ✓ Study on Platinum Thermal Sensitive Films Deposited Using Magnetic Sputtering, Cai Changlong(China) ..... [5-0037]
- ✓ Research on enhancing light output efficiency of OLED using mesh micro-structure, Chen Zhe(China) ..... [5-0038]

- ✓ The key technologies of image sensor dynamic range expansion, Xueyi Gong(China) ..... [5-0039]
- ✓ Electrical Properties of Black Silicon, Cheng Zhengxi(China) ..... [5-0040]
- ✓ Growth and Characterization of Type II InAs/GaSb Superlattice for Midwave Infrared Detection, Zhang Lixue(China)..... [5-0041]
- ✓ First-principles Calculations for Electronic Structures of Carbon-doped ZnO, Qixin Wan(China) ..... [5-0042]
- ✓ Analysis of dark current in variable-area long-wavelength HgCdTe junction diodes at low temperature, Hua Hua(China) ..... [5-0043]
- ✓ The warpage and thermal stress analysis of hybrid infrared focal plane assembly, Chenxing (China)..... [5-0044]
- ✓ Research of a Wavelength Division Multiplexer Applied in LAN Plastic Optical Fiber, LIN Baoqing(China) ..... [5-0045]
- ✓ Study on ICP etching of GaSb and InAs/GaSb super lattices in Cl<sub>2</sub>/Ar plasma, ZHANG Xiangfeng(China)..... [5-0046]
- ✓ The Interfacial Properties of AOF/ZnS and LWIR Bulk HgCdTe Materials By MIS Structures, Wang Nili(China) ..... [5-0047]
- ✓ The analysis of the microscopic spectral imaging performance for the noncollinear acousto-optic tunable filter, Chunguang zhang(China) ..... [5-0048]
- ✓ A study on 808nm AlGaAs/GaAs VCSEL Arrays, WANG Yuxia(China)..... [5-0049]
- ✓ Investigation on the propagation velocity of plasma jet at atmospheric pressure, WANG Yongjie(China) ..... [5-0050]
- ✓ MTF measurement of CMOS detector using slanted edge methodology, Lin Yang(China) ..... [5-0051]
- ✓ Single crystalline InAs<sub>0.02</sub>Sb<sub>0.98</sub> grown on (100) InSb substrate by liquid phase epitaxy, SUN Changhong (China) ..... [5-0053]
- ✓ Growth and optical properties of GaSb quantum dot by liquid phase epitaxy technique, QIU Feng (China)..... [5-0057]
- ✓ Fast Exposure Time Decision in Multi-Exposure HDR Imaging, Yongjie Piao(China) ..... [5-0058]
- ✓ Surface treatment effects on the characteristics of HgCdTe Infrared photovoltaic detectors, Xie Xiaohui(China) ..... [5-0059]
- ✓ MR Image Segmentation Based on Curvelet Transform Algorithm, Xiaojun WANG(China)..... [5-0060]
- ✓ A Study of Contact property of Ni(Ti)/Pt/Au on p-In<sub>0.52</sub>Al<sub>0.48</sub>As, WEI Peng(China) ..... [5-0061]
- ✓ Analysis of cross talk in high density mesa InGaAs linear detector array using tiny light dot, Zhu Yaoming(China) ..... [5-0062]
- ✓ Aerial mapping camera based on single panchromatic objective, reflective four-sided pyramid and four large format CCD, LanGongpu(China)..... [5-0063]
- ✓ Minority carrier lifetimes in different doped LWIR HgCdTe Grown by LPE, Qiuguang-yin (China)..... [5-0064]
- ✓ Spectral and laser characteristics of the erbium-bismuth co-doped silica fibers, Wei Xie(China) ..... [5-0065]
- ✓ Camshift object tracing method with Unscented Kalman filtering motion estimation, Da-ke Chen(China) ..... [5-0066]

- ✓ Using the way of quantum coherence to realize left-handed media in optical frequency band, Fan Liming(China).....[5-0067]
- ✓ Optical characterization for off-axis illumination in DLP system, Zhenfeng Zhuang(China) .....[5-0068]
- ✓ Fabrication and Testing of 980nm High-Power VCSEL with AlN Film Passivation Layer, Hou Lifeng (China) .....[5-0069]
- ✓ Influence of material morphology on fabrication of large format IRFPA, Wang Wei (China).....[5-0070]
- ✓ A color image processing pipeline for digital microscope, Yan Liu(China) .....[5-0071]
- ✓ An automatic measuring system for the lifetime test of Infrared Detectors, Caolan(China) .....[5-0072]
- ✓ Photoinduced diffraction grating in hybrid semiconductor quantum dot (SQD)-metal nanoparticle , XIAO Zhihong(China).....[5-0073]
- ✓ The analysis of layout and correction performance of adaptive optics system based on bimorph deformable mirror, Fei Xiao(China) .....[5-0074]
- ✓ Moving Scene Based Nonuniformity Correction Algorithm, Chen Baoguo (China) .....[5-0076]
- ✓ Design for the Correction of the Real Time Non-Uniformity of Large Area-Array CCD Image , Wang Yan(China) .....[5-0080]
- ✓ A Monolithically Integrated Dual-Wavelength Photodetector With a Step-Shaped Fabry-Pérot Filter, Xinye Fan(China) .....[5-0082]
- ✓ Design and Analysis of InGaAs PIN Photodetectors Integrated on Silicon-on-Insulator Racetrack Resonators, Fuquan Hu(China) .....[5-0084]
- ✓ Novel photoluminescence from porous SiGe/Si multilayer structure, Bi Zhou(China) .....[5-0085]
- ✓ Different configurations of phosphorescent yellow emissive layer in white organic light-emitting device, Shengqiang Liu(China) .....[5-0086]
- ✓ Syntheses and luminescent properties of Nd<sub>3</sub>PO<sub>7</sub>, jingli(China) .....[5-0089]
- ✓ Growth and characterization of high Nd-concentration single crystals La<sub>x</sub>Nd<sub>1-x</sub>PO<sub>4</sub>, Yongzheng Wang(China) .....[5-0090]
- ✓ Surface Target Edge Detection Based on Local Energy Model in Sea Clutter Background, Su wenbo(China) .....[5-0091]
- ✓ Novel quantum real-space transfer in semiconductor heterostructures, Chuan Jin (China).....[5-0092]
- ✓ Simulation of PSO based PIDNN decoupling control in Laser Diode, Zou Wen-dong(China) .....[5-0093]
- ✓ An algorithm for automated labeling cone photoreceptors in AO retinal images, Liu Xu(China) .....[5-0094]
- ✓ Surface cleaning for negative electron affinity GaN photocathode, Jianliang Qiao(China) .....[5-0095]
- ✓ Nondestructive Readout of Holographic Data Storage with BR-D96N, Zhang JunPing(China) .....[5-0096]
- ✓ Research on spectral response calibration of Au and CsI transmission photocathode of X-ray high speed scanning camera, Yuan Zheng(China).....[5-0097]
- ✓ A Research on Surface Waveguide in Metal-LHM-Metal, Qiang-Hua Lu(China) · [5-0098]

- ✓ A Novel Read-out IC Allowing infrared detector to Operate with High Frame Rate, Yun Zhou(China)..... [5-0099]
- ✓ Research of the Effects of TEC act on UFPA Noise Performance, JIANG Qiao(China) ..... [5-0100]
- ✓ Design and Implementation of the Data Acquisition System of UIRFPA Based on Virtual Instrument, Xiong Lixia(China) ..... [5-0101]
- ✓ Design of Ramp Generator for Uncooled Infrared Focal Plane Array, Liao Baobin(China) ..... [5-0102]
- ✓ Crystal growth and its large-capacity storage properties for Sc:Ce:Cu:LiNbO<sub>3</sub>, ZHANG Tao(China)..... [5-0103]
- ✓ The LED driver Based on the Data Clock Regeneration Design, Que Longcheng(China) ..... [5-0104]
- ✓ A Hardware Circuit Implementation Method of LED Gamma Correction, DU Yiyi(China) ..... [5-0105]
- ✓ A three channels' drive circuit of LED with single line transportation technique., YU Caideng(China) ..... [5-0106]
- ✓ Uncooled IRFPA Pixel-by-Point Bias Correction , He Wei(China)..... [5-0107]
- ✓ Highly efficient low color temperature organic LED using blend carrier modulation layer, Yao-Ching Hsieh(Taiwan) ..... [5-0109]
- ✓ Novel Tetrabrominated Naphthalocyanines and Their Optical Limiting Properties Study, Wei Liu(China) ..... [5-0110]
- ✓ Improvement of CdTe passivation by vacuum evaporation on HgCdTe infrared focus planar arrays, Xu Jingjie(China) ..... [5-0111]
- ✓ Characteristics of GaN Material and Application in UV Detection, Jianliang Qiao (China) ..... [5-0112]
- ✓ Air-brush multi-walled carbon nanotube capacitive sensor for dimethyl methylphosphonate detection, Hongjun Jing(China) ..... [5-0113]
- ✓ A CFD analysis and optimization of a cooling solution for LED in micro-projector , Cai Dingjin(China) ..... [5-0114]
- ✓ Investigation of Negative Photocurrent in AlGaIn-based solar-blind photodetector, Liu Fuhao(China) ..... [5-0115]
- ✓ Research on ICP Etching Technology of InGaAs Based on Orthogonal Experimental Design, YANG Bo(China) ..... [5-0117]
- ✓ Effect of N<sub>2</sub>-based annealing for repairing ICP induced damage in HgCdTe , HUANG Jian(China) ..... [5-0118]
- ✓ Using iteration method to analyze the characteristics of the doping fiber laser, Bin Li(China) ..... [5-0119]
- ✓ CT/MR Medical Image Fusion Based on wavelet and Fuzzy Algorithm, WANG Xiao-jun (China)..... [5-0120]
- ✓ Free-form Lens Design of Ultra-thin Direct-Type LED Backlight System, Hong Wang(China)..... [5-0122]
- ✓ Temperature stability of thin-film narrow-bandpass filters produced by thermal evaporation, Yun-ji WANG(China)..... [5-0123]
- ✓ Temperature stability of thin-film narrow-bandpass filters produced by thermal evaporation, Yun-ji WANG(China)..... [5-0124]
- ✓ Spectrum analysis and design of underwater LED fish aggregation lamp, Chang Shou Shi(China) ..... [5-0125]

- ✓ The study of selective heating of indium bump in MCT infrared focal plane array, Zhang Haiyan(China) ..... [5-0126]
- ✓ Study on a red fluorescent top-emitting organic light-emitting devices using a phosphorescent sensitizer, Lei Zhang(China) ..... [5-0127]
- ✓ Nonlocal structure tensor for pixel level image fusion, Fen Luo(China) ..... [5-0128]
- ✓ Design and Performance of A Low Noise Circuit For VLWIR HgCdTe Photoconductive Detectors, Yuan Hong-hui (China) ..... [5-0129]
- ✓ Study on spectral reflectance of Na<sub>2</sub>KSb (Cs) multi-alkali photocathode, Li xiaofeng(China) ..... [5-0130]
- ✓ Surface wettability and nanomechanical properties of TiO<sub>2</sub> films prepared by magnetron sputtering, Weiwei An(China) ..... [5-0132]
- ✓ Fabrication and characteristics of Zn<sup>2+</sup> doped MgO films prepared by sol-gel method, Xiaojun Wang(China) ..... [5-0133]
- ✓ Classification of Hyperspectral Images by Enhancing Absorption Bands in Spectral Dimension, LIU De-lian (China) ..... [5-0134]
- ✓ An improved multi-resolution method for image denoising, LU Bibo(China) ..... [5-0135]
- ✓ Research and Implementation of Optical Electric Field Probe, Bin Li(China) ..... [5-0136]
- ✓ Study on P-N codoping p-type ZnO thin films by sputtering and diffusing, Huiqun Zhu(China) ..... [5-0137]
- ✓ Infrared Spectral Data Denoising Method Based on Non-subsampled Wavelet Transform, ZONG Jing-guo(China) ..... [5-0140]
- ✓ Simulation and Design consideration of Mid-wavelength InSb Infrared Focal Plane Arrays, Zhang Xiao-lei(China) ..... [5-0141]
- ✓ design and fabrication of silver superlens , Chaoping Yao(China) ..... [5-0143]
- ✓ Ohmic contact and electrical property of InAs/GaSb superlattice material, Zhang Liang (China) ..... [5-0144]
- ✓ The optical properties of ZnS thin film prepared under different deposition conditions, Ming Zhou(China) ..... [5-0145]
- ✓ Research on voltage characteristic of the 3rd generation low-light-level image intensifier tube's output signal to noise ratio, Bai Xiaofeng(China) ..... [5-0146]
- ✓ Study on performance of low-light-level night vision device affected by backscattered electron from ion barrier film, Yan Lei(China) ..... [5-0147]
- ✓ Studying of linearly Graded Buffer layer effect on quality of InGaAs on GaAs Substrate, JIAO Gangcheng(China) ..... [5-0148]
- ✓ Study on CMOS cameras based on TDI in digital domain for space high resolution imaging applications, Tao Shuping(China) ..... [5-0149]
- ✓ Two-dimensional optical gap solitons based on photovoltaic effect, GUO Jianbang(China) ..... [5-0150]
- ✓ Numerical simulation of the energy distribution characteristics in the far-field of the single-mode annular core optical fibers, XiangYun Hui(China) ..... [5-0151]
- ✓ Bandwidth Optical Parametric Amplifier Using Photonic Crystal Fiber with Pump Depletion, Hong Na Zhu(China) ..... [5-0152]
- ✓ Influence of different hole transport layer on the performance of organic light-emitting devices, Qing Li(China) ..... [5-0153]
- ✓ Influence of different hole transport layer on the performance of organic light-emitting devices, Qing Li(China) ..... [5-0154]

✓ A SAW oscillator designed for sensor application, Jia Hu (China) .....[5-0155]

## Conference 6: Smart Structure and Materials for Manufacturing and Testing

*(SPIE Proceedings Vol.8418)*

Conference Chairs:

**LUO Xiangang**, Institute of Optics and Electronics, CAS (China)

**Xiaoyi Bao**, Prof. of University of Ottawa(Canada)

**8:30-12:00 April 27 ..... SESSION 6-1**  
**room 1 (15 min/report)**

*Session chair: LUO Xiangang*

- ✓ High precision distributed fiber sensors based on Brillouin scattering, Xiaoyi Bao(Canada) ..... *(Invited)*
- ✓ Influence of Grating Fabrication on Radiation Sensitivity of Fiber Bragg Gratings, Song Lin(China)..... [6-0001]
- ✓ Fabrication large area photonic crystals with periodic waveguide by one-step holographic lithography based on spatial light modulator, Yongchun Zhong(China) ..... [6-0007]
- ✓ In situ loading and real-time X-ray computed tomography system for function materials, Sun Lijuan(China) ..... [6-0008]
- ✓ Effect of Er doping on the electronic structure and optical properties of ZnO, Xiangqian (China)..... [6-0009]

### *Tea time*

- ✓ A novel temperature-strain decoupling method for distributed fiber sensing system based on backscattered light, Tianying Chang(USA) .....*(Invited)*[6-0013]
- ✓ Transmission and Emission characteristics of Porous Silicon in Terahertz from 0.5T to 10T, Xiao-min LIU (China)..... [6-0011]
- ✓ Inverse Open loop Control of a Nano-positioner Based on Piezo-electric Actuators, Shu Qiang(China)..... [6-0015]
- ✓ A topological structure based on Michelson single arm and Mach-Zehnder interferometer hybrid cascaded system, LIU Yanlei(China) ..... [6-0016]

**13:00-17:00 April 28**

**POSTER**

**1F hall, floor 1**

- ✓ Dither-frequency-track method based on Phase Sensitive Detector technology in mechanically dithered ring laser gyros, Guangfeng Lu(China) ..... [6-0002]
- ✓ Tracking Control Strategy of Opto-Electronic System Fixed on Rope Hanged Platform Based on Backstepping Method, YU Wei(China) ..... [6-0003]
- ✓ Research on the FBG strain gauge used for the safety monitoring of high temperature pressure pipes, CAI Qingmu(China) ..... [6-0004]
- ✓ Temperature control method used in Antarctic telescope, Gu Qing(China) ..... [6-0005]
- ✓ Mechanism and simulation of bi-layered micro optical fiber resonator, Liu Yueming (China)..... [6-0006]

- ✓ Applying infrared thermal wave technology to study the bonding structure defects of steel shell/insulation, Wei Zhang(China)..... [6-0010]
- ✓ Research on the Demodulation Techniques of Long-Period Fiber Grating Strain Sensing with Low Cost, Wang Qingwei(China)..... [6-0012]
- ✓ Thick Metal Coating Long- Period Fiber Grating , Chunfang Rao(China) ..... [6-0014]
- ✓ Multi -ring combined fiber optic rotation measuring approach based on the Rayleigh Backscattering, LIU Yanlei(China)..... [6-0017]
- ✓ Thermal Nonreciprocity in Fiber optic sensors based on Sagnac interferometer, Xingfan Chen(China)..... [6-0018]
- ✓ Optical properties and microstruture of the VO2 films grown on different substrates, Huiqun Zhu(China)..... [6-0019]
- ✓ Thermal Stress Analysis of Laminated LCDs for Aircraft Cockpits, Feng Qibin(China) ..... [6-0020]
- ✓ A novel dual FBG based self-compensating fiber optic flow sensor, Wenjuan Yao(China) ..... [6-0021]
- ✓ FBG vibration sensor for perimeter defense, ZHANG Cui(China) ..... [6-0022]

## Conference 7: Opto-Electronic Materials, Devices and System Technology for Solar Energy

**(SPIE Proceedings Vol.8419)**

Conference Chairs:

**Jianzhong XU**, Academician, Chinese Academy of Sciences (China),  
Institute of Engineering Thermal Physics, Chinese Academy of Science

**Zhifeng Wang**, Director of Solar Energy Laboratory of Chinese Academy of Sciences, Institute of Electronical Engineering, CAS

**13:00-17:00 April 27 ..... SESSION 7-1**  
**room 6 (20 min/report)**

*Session chair: WEN Shangming*

- ✓ Design of astromesh deployment concentrator used in space concentrating photovoltaic system, MA Hongcai(China) ..... [7-0001]
- ✓ A Measurement System of Atmospheric Refractive Index Structure Parameter based on Solar Power Device, Junwei Zhao(China) ..... [7-0003]
- ✓ Many-light beams precisely leading and target precisely fixed position technique research in ICF actuator, Wang liquan(China) ..... [7-0004]

*Tea time*

- ✓ Nanophotonic light-trapping methods for thin film solar cells, Chunlei Du(China) ..... (Invited)
- ✓ Technique for Solar Simulator, Liu Shi(China) ..... [7-0008]
- ✓ Uncertainty Analysis of Solar Simulator's Spectral Irradiance Measurement, MENG Haifeng(China) ..... [7-0012]

**13:00-17:00 April 28**

**POSTER**

**1F hall, floor 1**

- ✓ Compensative grating mosaic for laser pulse compressor in high-energy laser systems, Yao Hu(China) ..... [7-0002]
- ✓ Investigation on Heat Pipe Sink for cooling High Power LED, ZhiBin Wang (China) ..... [7-0005]
- ✓ A Design of Solar Concentrator Using Freeform Surface, QIAO Qing-fei(China) [7-0006]
- ✓ A high power Condenser ratio membrane mirror light Condenser Optical system design , Chunyu Liu (China) ..... [7-0009]
- ✓ A design for solar anti-reflection coating with self-cleaning function , GuoQiang Liu(China)..... [7-0010]
- ✓ Analysis of Non-uniformity of Irradiance Measurement Uncertainties of Pulsed Solar Simulator, He Yingwei(China) ..... [7-0013]
- ✓ Research On Outdoor Testing Of Solar Modules, Liu Dingpu(China) ..... [7-0014]

- ✓ A High Energy Picosecond Laser for Applications in Microstructuring of Crystalline Silicon , Xue-Chun Lin(China) ..... [7-0016]
- ✓ Research and analysis of the surface charges of MWIR and SWIR PV detector chips, Meifeng Dong(China)..... [7-0017]
- ✓ Sulfide red phosphors film reduces the color temperature of LED lamps, yipingwu(China) ..... [7-0018]
- ✓ Realization of nanoscale hole array by using polystyrene sphere and silver superlens , Qiming Dong(China)..... [7-0019]
- ✓ Charge carrier losses of organic solar cells based on Subphthalocyanine/C60 heterojunction, Yue Zang(China)..... [7-0020]
- ✓ InformationAuthor GuideHelpDownloadModify PasswordExitOrganic solar cell based on poly, Zhong Jian(China)..... [7-0021]

## Conference 8: Precision Optics and Engineering for Imaging, Information Storage, Display and Transmission

**(SPIE Proceedings Vol.8420)**

Conference Chairs:

**Xiangdi LIN**, Academician, Chinese Academy of Engineering (China)

**Yoshiharu Namba**, Head of Innovation Centre for Production Technology,  
Head of Centre for Advanced Metrology, Chubu University (Japan)

**Tingwen Xing**, Director of Lab. of Applied Optics of Institute of Optics and  
Electronics, CAS

**8:30-12:00 April 27 ..... SESSION 8-1**  
**room 7 (20 min/report)**

*Session chair: XING Tingwen*

- ✓ Feedback control system for laser beam alignment, Li Mengting(China) ..... [8-0011]
- ✓ Application and development of internal reflection optical free-form surface, XU Min(China) ..... (Invited)
- ✓ Diffracted beam parameters of TE<sub>0</sub> mode symmetrical MQW planar waveguide, Fuyuan Guo(China) ..... [8-0018]
- ✓ Study on Technique of Measuring Single Grating Incremental Angle, Mu YiNing(China) ..... [8-0024]
- ✓ An Improved Color Interpolation Method Based on Bayer Image, Wang Jin(China) ..... [8-0032]

Tea time

- ✓ Using Liquid Crystal Spatial Light Modulators with Binary Power Spectrum in Pattern Recognition System, Chulung Chen(Taiwan) ..... [8-0041]
- ✓ Study of zero error in large-scale laser interferometric measurement system, Li Jian-shuang(China) ..... [8-0043]
- ✓ Camera calibration based on three-dimensional optical plate in close-range photogrammetry system, Mingzhao He(China) ..... [8-0044]
- ✓ A Three-Dimensional Grid Algorithm for All-Sky Autonomous Star Identification, YI Wenjun(China) ..... [8-0047]
- ✓ The study of diffractive pyramid wave-front sensor for adaptive optics, Dongmei Cai(China) ..... [8-0051]

**13:00-17:00 April 27 ..... SESSION 8-2**  
**room 7 (20 min/report)**

*Session chair: XU Min*

- ✓ An approach of increasing the stability of tracking by the use of random ferns, DENG Li (China) ..... [8-0053]
- ✓ The target positioning method based on compound eye, Guo Fang(China) ..... [8-0054]

- ✓ Advanced Optical Manufacturing Digital Integrated System, Tao Yizheng (China) .....(Invited)[8-0080]
- ✓ Optical Design Method of Freeform Lens for High-power LED Extended Sources, Hong Wang(China) ..... [8-0064]
- ✓ Analysis of image reconstruction for collinear holographic data storage, Jianhua Li(China) ..... [8-0065]

*Tea time*

- ✓ Study of the modulation characterization of phase-only liquid crystal spatial light modulator by digital holography, Jie Zhao(China) ..... [8-0066]
- ✓ Performance analysis of a volume holographic correlator based opto-electronic hybrid system for digital remote sensing image processing, Tian Zhao(China) ..... [8-0070]
- ✓ A Research on Reconstruction of Spatial Density Distribution Using Optical Interferometry and Tomography, Tong LING(China)..... [8-0072]
- ✓ Studying of Nonlinear Polarization Rotation law in a Bulk Semiconductor Optical Amplifier in a Pump-Probe Scheme, Feng Xianghua(China) ..... [8-0073]
- ✓ The principle and implementation of thousand-trit ternary optical encoder, Zhang-yi Shen(China)..... [8-0078]

**13:00-17:00 April 28****POSTER****1F hall, floor 1**

- ✓ Character Analysis of The Atmospheric turbulence Vertical distribution Profile over Desert, HU YueHong(China) ..... [8-0001]
- ✓ di-huige, DI Hui-ge (China) ..... [8-0002]
- ✓ Study of Optical Network Safety Strategy, Tang Ke (China)..... [8-0003]
- ✓ Research of Position and Tracking Based on High Frame-rate Beacon Image , Cao Yang(China)..... [8-0004]
- ✓ Optical security system based on general phase-shifting joint transform correlator architecture, SHI Xiaoyan(China) ..... [8-0005]
- ✓ An Information Hiding Method Based on the Theory of Wavelet Transform Domain, HUA Wenshen(China) ..... [8-0006]
- ✓ Research on reflective terahertz time-domain spectroscopy, Sun Qing(China)· [8-0008]
- ✓ Research On Intelligent Focusing System In Space Camera Based on Temperature and Image, WANG Shaoju(China)..... [8-0009]
- ✓ Research of parameter optimization of Dome A Site testing DIMM by data mining, XU lingze(China)..... [8-0010]
- ✓ Coupling efficiency analysis of a Gradient-index planar Waveguide coupler based on ABCD matrix, Xiaojian Kong(China) ..... [8-0012]
- ✓ A Novel Transmission System Design for Electronic Endoscope, Jiaquan Yan(China) ..... [8-0013]
- ✓ Man-made moving object dynamical identification algorithm based in space observing system, Tuo Qi Xu (China) ..... [8-0014]
- ✓ Thermal Management for CCD performance of A Space Telescope, Yang Wengang(China)..... [8-0015]
- ✓ High-Resolution Long-Range Distance Measurement Based on Time-of-Flight Principle Using Femtosecond Laser, Xing Shujian(China) ..... [8-0016]
- ✓ Research on Tracking Approach to Weak Small Target, Chen Jinling(China) .... [8-0017]

- ✓ Modeling Directional Thermal Radiance Anisotropy for Urban Canopy, Zhao Limin(China) ..... [8-0019]
- ✓ Design of superresolving continuous phase filter with radially polarized light beam, CHEN Huifang(China) ..... [8-0020]
- ✓ Beforehand Alarm System against Vehicle Rear-end Accident Based on Laser Sensor, Li Jinlong(China) ..... [8-0021]
- ✓ Applied research of image rotator scan in infrared Optical System, Deng Jian(China) ..... [8-0022]
- ✓ Remote sensing image stitch using modified structure deformation, Pankecheng (China)..... [8-0023]
- ✓ Segment and spline synthesis optimization method for LED based freeform reflector design, Enguo Chen(China) ..... [8-0025]
- ✓ Design of Speaker Recognition System Based on Artificial Neural Network, Yanhong Chen(China)..... [8-0026]
- ✓ Defocus Insensitive Projection Len for CF-LCOS Pico-projector, Liu Peng(China) ..... [8-0027]
- ✓ Study on MTF of remote sensing imaging under arbitrary known vibration, Qin Deng(China) ..... [8-0028]
- ✓ Research on the impact of field spectral calibration accuracy with different gas composition, Lin Li(China) ..... [8-0029]
- ✓ The Effect of Laser Detuning Frequency and Polarization State on Populations of The Zeeman Sublevels in Cesium Atoms of Optical Pumping Cesium Magnetometer Sensor, Liu Yuyuan(China) ..... [8-0030]
- ✓ Lateral shearing interferometry applied for phase measurement in wavefront coherent synthesis, Yao Hu(China) ..... [8-0031]
- ✓ A NOVEL GEOMETRIC CORRECTION METHOD OF DISTORTED IMAGE, Wang Jin(China) ..... [8-0033]
- ✓ Experimental Study of Photo Counting Imaging Based on APD, QU Hui-ming(China) ..... [8-0034]
- ✓ A novel auto-focusing function, Wang Jian(China)..... [8-0035]
- ✓ A Infrared Focal Plane Non-uniformity Correction Algorithm using Characteristic Decomposition, HeMing(China) ..... [8-0036]
- ✓ The Second-Order Moment Estimation of Pointing Errors in Laser Pointing System Using Return Photons , Zhou Lei (China) ..... [8-0037]
- ✓ Concentrating entanglement via two-level atom interacting with the coherent state of cavity fields, Cai Xinhua (China)..... [8-0038]
- ✓ Analysis of Noise Tolerance for High Precision Tilting Measurement Algorithm of Moving Mirror in Fourier Transform Infrared Spectrometer, Sun Xiaojie(China) ..... [8-0039]
- ✓ Real-time visual simulation for ATP system based on RTW and Vega, Xiong Shuai(China) ..... [8-0040]
- ✓ The design of computer-generated holographic diffraction optics element used for holographic sight, liu ying(China) ..... [8-0042]
- ✓ A Method for Motion Blurred Image Restoration Based on Hartmann-Shack Wavefront Sensor, Yu Yuhua(China) ..... [8-0045]
- ✓ Research on vision-based waveguide alignment of optical fiber, Tao Geng(China) ..... [8-0046]

- ✓ New technique for enhancement of high dynamic range infrared images, LIU Yu (China) ..... [8-0048]
- ✓ Simulation and Testing Platform for Free-Space Quantum Communication, Jiang Hao(China) ..... [8-0049]
- ✓ Simulations and Experiments on optical focusing characteristics using an Imaging fiber bundle, Yuhong wan(China)..... [8-0050]
- ✓ Dynamical phase grating array using liquid crystal spatial light modulator, Dongmei Cai(China) ..... [8-0052]
- ✓ Endmember extraction method based on space-region segmentation and NFINDR, Lili Jiang(China) ..... [8-0055]
- ✓ Observing high frequency optical turbulence properties by the usage of fiber optic turbulence sensing system, Qi-kai HUANG (China)..... [8-0056]
- ✓ Influence of illumination mode in lithographic imaging, Liu Yong(China)..... [8-0057]
- ✓ Design and Analysis of Supporting Structure of Cubic Prism for Three-frame in High-speed Multi-frame Camera, Xing Lina(China)..... [8-0058]
- ✓ Color Reconstruction of Medium Infrared Polarization Images Based onHSV and Wavelet Packet Transform, CHEN Weili(China) ..... [8-0059]
- ✓ Reaserch on a method for on-line monitoring the power in microstructure fiber core based on machine vision, GENG Tao(China)..... [8-0060]
- ✓ Multifocus Image Fusion Algorithm using the Contourlet Transform, YANG Lei(China) ..... [8-0061]
- ✓ Optimizing design method of Progressive Addition Lenses, Qin LinLin(China) .. [8-0062]
- ✓ Adaptive bilateral filter for extended object imaging in adaptive optics system without a wavefront sensor, YANG Huizhen(China)..... [8-0063]
- ✓ Fuzzy-PID control for airborne optoelectronic stabilized platform, Liu Lei(China)..... [8-0067]
- ✓ Saliency map based active contour method for automatic image segmentation, Changcai Yang(China) ..... [8-0068]
- ✓ Analysis on the tolerance character of continuous phase plate, Yang Chunlin(China) ..... [8-0069]
- ✓ Dynamic measurement of three dinmensional shape measurement based on sigle-shot color Schlieren, Yang Dong(China) ..... [8-0071]
- ✓ S+C+L Ultra Broadband Light Source Research, Xi Cong-ling(China) ..... [8-0074]
- ✓ Effect of wet chemical treatment on BK-7 substrate, Xiaowen Ye(China) ..... [8-0075]
- ✓ The synthesis of BaTeMo2O9 fine particle via supercritical water route and property characterization, Bo Li(China) ..... [8-0076]
- ✓ Research of Re-injection Technology for Software, XU Wei(China)..... [8-0077]
- ✓ Reconfigurable module of ternary optical computer, Linli Wu(China) ..... [8-0079]
- ✓ Studying of Nonlinear Polarization Rotation law in a Bulk Semiconductor Optical Amplifier in a Pump-Probe Scheme, Feng Xianghua(China) ..... [8-0081]
- ✓ The application of ASAP in integral imaging, Wang Hong-xia(China) ..... [8-0082]

13:00-14:00 April 28

Workshop

Conference Hall

MLOptic

<http://www.mloptic.com/>

13:00-14:00



## Mloptic Ltd. , Nanjing, China

**Lead units:** Satisloh Asia Ltd. & Mloptic Ltd.

**Speech unit:** Mloptic Ltd. & Spanoptic Ltd.

**Speechmaker:** Richard

**Curriculum vitae:** Male, 40 years old .Current position is the technical manager of Spanoptic, working in modern optics manufacturing field for 20 years.

**Speech subject:** Numerical control aspherical processing & magnetorheological finishing technology

### ABSTRACT

The aspherical lens's complex surface profile can reduce or eliminate spherical aberration and reduce device's size, weight and possibly cost. Compare to traditional processing methods' inefficiency and poor repeatability precision, numerical control (NC) aspherical processing technology not only improves processing accuracy and quality but also shortens the production cycle. Magnetorheological finishing (MRF) is a precision surface finishing technology, which improves the aspherical surface figure after NC aspherical processing to P-V  $\lambda/20$ .

This speech will mainly introduce NC aspherical processing and MRF in our aspherical lens manufacture.

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E-MAIL: info@mloptic.com WEBSITE: Http://www.mloptic.com



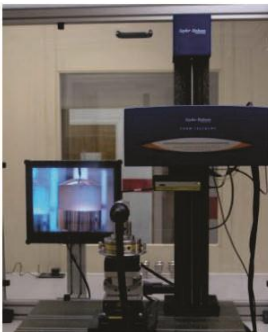
Mloptic is a leading customized precision optics manufacturer and service provider to clients world widely.

### Satisloh Sphere & Asphere Manufacture

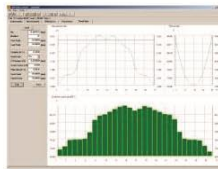
Production range:  
Optical Components  
Optical Coating  
Optical, Electrical &  
mechanical Design  
Optical System Assembly



#### Asphere Testing



#### Data Correct



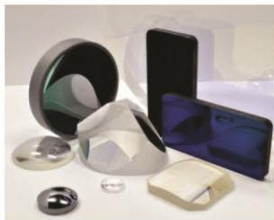
#### QED MRF



#### Aspheres



#### Precision Optics



#### High-speed Polishing



#### Optical Coating



Partner

SPANOPTIC **satisloh**<sup>®</sup>

**MLOPTIC Corp.**  
398 Pugang St., Jiangning Development Zone Nanjing, Jiangsu 211102, China  
Tel: +86-25-84436288 Fax: +86-25-84433188 Web Site: www.mloptic.com E-mail: info@mloptic.com

14:00-15:00 April 28

Workshop

Conference Hall

Zeeko Ltd. (UK)

<http://www.zeeko.co.uk>

14:00-15:00



Zeeko Ltd  
[www.zeeko.co.uk](http://www.zeeko.co.uk)  
[info@zeeko.co.uk](mailto:info@zeeko.co.uk)

Name: Mr. Richard Freeman  
 Job Title: Managing Director

Address:  
 Zeeko Ltd -  
 4 Vulcan Court  
 Vulcan Way  
 Coalville  
 Leicestershire  
 LE67 3FW.  
 Graphic of company logo



THE QUEEN'S AWARDS  
 FOR ENTERPRISE  
 2011

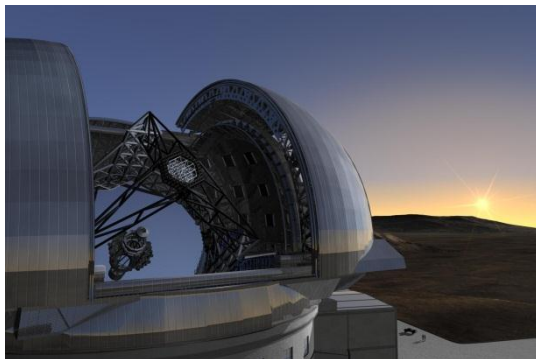
Established in 2000, Zeeko has progressed from being a start-up company with innovative technology to polish ultra precision surfaces for telescope mirrors and other optical surfaces, to become a market leading company with a wide polishing and metrology product portfolio that competes impressively in a global market place. Zeeko remains to be 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). These Robots are manufactured for fabricating high precision optics, orthopaedic joints, semiconductor applications and precision moulds in a number of different materials.

The machines are supplied with state of the art 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.



Zeeko has worked hard to establish itself as a viable business and, having learned some of the skills needed to survive and prosper, it has more recently developed a number of ideas for ways in which the business and the product base can grow laterally across sectors, thus protecting the business in times of market slow-down.

Zeeko Optic Fabrication Centre for which Zeeko was recently awarded the Queen's Award for Enterprise: Innovation 2011

The ESO European Extremely Large Telescope – (42Metre)  
Zeeko Machines to Polish and Grolish 7 sample segments which are 1.45M wide. The telescope will consist of over 1000 segments.

### **Richard Freeman Profile**

Richard himself is a mechanical engineer with a manufacturing background. He first managed a volume manufacturer of components for the global diesel engine market before becoming Managing Director of Rank Taylor Hobson, a well known name in both precision metrology and cinematography optics. Shortly after leaving Taylor Hobson he founded Zeeko Ltd. With a background both in volume manufacture and also in metrology he was well equipped to study the similar challenges of segmented telescope production.



15:20-16:20 April 28

Workshop

Conference Hall

YUANCH Optical Material <http://www.yuanch.com> 15:20-16:20

YUANCH 上海元成光学器材有限公司

## 元成光学

上海元成光学器材有限公司是一家全球性的贸易公司。产品来自本行业国际著名的生产企业，业务涉及精密光学和眼镜光学两部分。可为您提供从玻璃材料到各种加工用的设备、仪器、辅料等成套产品和服务，并在全国设有四个联络处，能更便利地为您提供优质服务，详情请登陆本公司网站：[www.yuanch.com](http://www.yuanch.com)

Shanghai Yuanch is a global trading company with the business covering the Precision Optics and Ophthalmic Optics. Our products are all from internationally renowned companies across the industry. We can provide series of products and good service for you such as the glass material, the machineries, measurement equipments and various consumables etc. And we have 4 liaison offices in China so that we could provide good and quick service to you. Please browse website of our company:[www.yuanch.com](http://www.yuanch.com).



日本OPTORUN真空镀膜机系列



LGS75型光学数控加工设备



F601系列干涉仪



PX-100偏芯仪



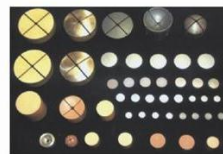
LDT500型超精密单点金刚车床



YJ系列氧化铈抛光粉



LP系列抛光片



各种金刚石制品

## 国产光学数控加工设备

### ——北京龙创

北京龙创光学机械有限公司是 2007 年创办的高新技术企业。公司的创始人之一，陈耀龙博士是国内外先进光学制造技术领域富有盛名的专家。公司主要从事数控光学加工设备的研发、设计、生产和装配。通过几年的努力，公司已经成功研制了多款数控设备产品。

Beijing Long Creation Optic Machines Co., Ltd. Was found in 2007. It belongs to the High Tech Enterprises of Beijing. One of the founders, Dr. Chen Yaolong, is a international well known expertise in the optical manufacture industry. We are a team working on R&D, design, manufacturing and assemble the CNC optic machines. We have a lot products depend on our struggle in a few year.



75/150 型系列数控铣磨抛光机



300 型数控光学加工中心



1000 型数控主动环抛机



LDT500 型精密单点金刚石车

16:20-17:20 April 28

Workshop

Conference Hall

OPTurn <http://www.opturn.com>

16:20-17:20

北京欧唐科技发展有限公司  
OPTurn Company Limited

**Talk 1 :****High precision Finishing of Optical Elements by Advanced Sample Movements**

Michael Zeuner, CEO  
MicroSystems , Germany

**Abstract**

The application of Ion Beam Figuring for high precision aspherical optics and ultra-thin gradient optical layers on large optics in the range of sub-nanometer is getting more and more critical in advanced optical systems.

Both technologies ion beam figuring as well as gradient multilayer deposition require strategies of advanced sample and/or source movement in vacuum.

This contribution presents the theoretical background for the process arrangements as well as the basics for the exact pre-calculation of the movement paths and velocity profiles for ion beam figuring and gradient multilayer deposition. Two examples will be shown how these movement strategies are implemented in advanced vacuum equipment. The IonScan 3D of MicroSystems utilizes a multiple linear axis system for ion beam figuring whereas the MicroSys 2000 applies a multiple sample rotation for large area deposition of multilayer x-ray mirrors. Finally for both equipment results will be presented which demonstrate impressively an outstanding performance quality.

**Biography**

Michael Zeuner received his Ph.D. in Physics at the University of Technology in Chemnitz in 1993. Following various management positions in companies specialized in vacuum technology and energy supply he joined the company in 2006 and became CEO of MicroSystems in 2009.

**Talk 2:****Title: Dynamic Interferometry Quality Control of Large Aperture Astronomical and Aerospace Optics**

Stephen J. Martinet, Director of International Sales and Marketing  
4D Technology Corp., USA

**Abstract:** Environmentally insensitive Dynamic Interferometry has significantly reduced the difficulty in the manufacture and testing of large aperture optics for use in ground and space based astronomy and aerospace systems. This fast data acquisition technique provides high lateral resolution and nanometer vertical resolution quality control of meter scale optics for these challenging applications. The application of this technique will be discussed with a focus on specific programs: the James Webb Space Telescope, Mars HiRise imaging system, Kepler spacecraft telescope primary mirror and various ground based telescopes including LBT, LSST, GMT and E-ELT. Test configurations, data and measurement challenges will be discussed

**Biography:** Steve Martinek joins 4D Technology Corp. following 15 years with WYKO Corporation. Prior to WYKO, he was employed by the TRW Space and Technology Group where his experience included analysis and testing of satellite based optical systems and by Pacific Sierra Research performing system analysis, test planning and ground tests of defense optical systems. Steve received degrees in Physics (BS - 1973, MS-1975) from the University of Illinois and an MS (1980) in Optics from the Optical Sciences Center at the University of Arizona.



动态激光干涉仪, 动态光学轮廓仪, 高精度静态非索型干涉仪。用于振动和静态环境下的光学元件、系统的波前精密测量, 以及大口径表面的粗糙度测量。



Opto-Alignment Technology

激光定心装配工作台(定心仪), 精度优于TIR 0.5um。具有中波红外和长波红外光源模块。

FOGALE nanotech

镜面定位仪, 非接触测量镜片中心厚、镜头系统镜面间的相对位置关系、光学镜面的间隔控制、玻璃材料的实际折射率等。测量精度1um/0.1um。



OPTICAL PERSPECTIVES

PSM装调定位仪, 用于复杂光学系统的装调, 确定光学元件各表面的球心位置, 辅助校准系统光轴。



ROTH & RAU

离子源与等离子体源, 双离子束溅射镀膜机(DIBSD)、磁控溅射镀膜机(MSD)、离子束抛光机(IBF)、反应离子束刻蚀机(RIE)、化学气相沉积(PECVD)设备

OPTOCRAFT

OPTICAL METROLOGY

夏克-哈特曼波前探测器, 大动态范围, 软件分析功能强, 应用于光学系统的辅助装调、激光光束的波前诊断。



SPTS

弱的热吸收测量仪, 应用于薄膜面吸收和材料体吸收的测量, 对镀膜过程微变化的间接监控。测量分辨率可达0.1ppm。



ilis

材料应力双折射测量仪, 应用于高精密光学玻璃材料的应力测试、玻璃器皿残余应力实时测量。对于大尺寸元件, 可以进行拼接测量。

OptiLayer

光学薄膜设计与反演分析软件, 基于针式算法, 进行薄膜设计、薄膜材料光学常数的测定、镀膜后膜系的反演分析, 计算速度快, 分析精准。



CONTOUR FINE TOOLING

金刚石刀具, 天然金刚石切削刃, 同时提供返厂修磨维护服务。



SON

超声波车削系统, 使金刚石车床在削领域实现对硬化钢模具及玻璃材料的超精密加工。

DIFFSYS



光学超精密金刚石车削软件, 非球面、衍射光学元件、离轴非球面、环面、自由曲面等车削设计, 二维、三维测量校正、CAD数据导入等。



Photonic

精密表面清洁保护剂, 刷涂或喷在表面后, 起到保护作用, 无任何残留。应用于光学镜面、CCD、光栅、晶体、光学系统的表面清洁、防护与维护。



薄膜型光学器件, 定制的薄膜型器件, 厚度仅数微米。可应用于分束、衰减、滤波, 适用波长从UV到IR。最常见为干涉仪的光强衰减器。



瑞士高等级抛光精细金刚石微粉, 质量稳定, 切削效率高, 不易破碎, 可以保证微粉粒度与研磨粗糙度的稳定对应。



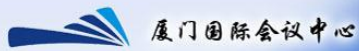
OATI镜头纸, 吸水性强, 用于光学表面的清洁。适用于光学装配和装调。

北京欧唐科技发展有限公司

www.OPTurn.com · OPTurn.blog.sohu.com · sales@OPTurn.com

中国·北京 Tel 010-6252-7842 · Fax 010-6252-7843

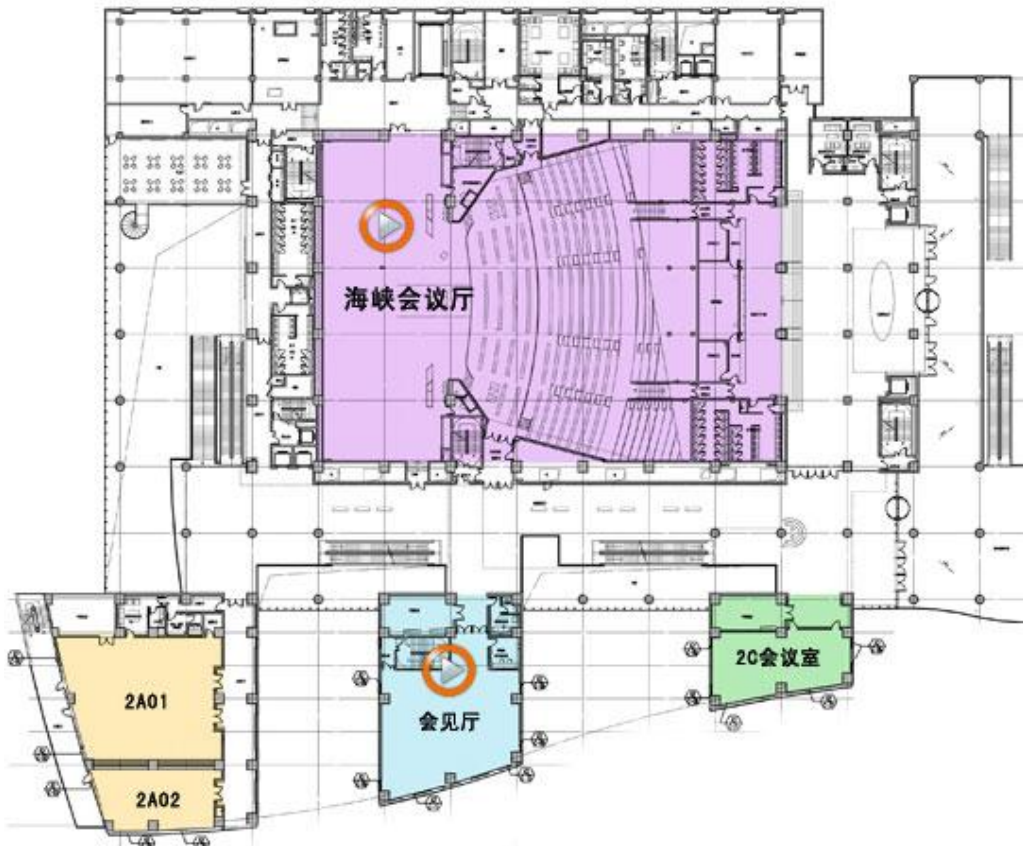
## Xiamen International Conference Center

<http://co.xicec.com/>

ENGLISH



The conference hall for Plenary Presentation. (haixia hall, floor 2)



For more information, please see: <http://co.xicec.com/web/guest/12>

## Floor 1



## Floor 2

