AOMATT 2012

The 6th 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
- (*Technical Co-Sponsor*)

Supported by:

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

Honorary Chair:

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

Symposium General Chair:

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*

Contents

AOMATT China 2012 Organizing Committee • Tel/Fax +86 028 85100583
optfab@163.com

26-29 April 2012
Xiamen China

IVITATION

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
The Chinese Optical Society

IOE - Institute of Optics and Electronics, Chinese Academy of Sciences

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

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

SPIE

Supported by:

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

Cooperating Organizations:

- 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
- Xiamen University
- 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:

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

Symposium General Chair:

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

Symposium General Co-Chairs:

CAO Jianlin, Vice Director, Ministry of Science and Technology of China

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

ZHANG Yudong, Director of the Institute of Optics and Electronics (IOE), Chinese Academy of Sciences8

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

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

XU Jianzhong, Academician, Chinese Academy of Sciences Institute of Engineering Thermophysics, CAS

ZHANG Ying, Vice Director, Xiamen University

XU Xipeng, Vice Director, Huaqiao University

International Academic Committee:

Jiang Wenhan, Academician, Chinese Academy of Engineering (*Chair*), IOE, CAS (China)

Zhou Liwei, Academician, Chinese Academy of Engineering, Beijing Institute of Technology (China)

XU Jianzhong, Academician, Chinese Academy of Sciences Institute of Engineering Thermophysics, CAS

LIN Xiangdi, Academician, Chinese Academy of Engineering, IOE, CAS (China)

Pan Junhua, Academician, Chinese Academy of Engineering, Soochow University (China)
Hiroki Kuwano, Tohoku University (Japan)
Fritz Klocke, Fraunhofer Institute for Production Technology IPT (Germany)
James R. Torley, University of Colorado (USA)
Yoshiharu Namba, Chubu University (Japan)
Jim Burge, University of Arizona (USA)
Myung K. Cho, NOAO (USA)
Jose M. Sasian, Prof. of University of Arizona (USA)

Organizing Committee:

Zhang Yudong, Director of IOE, CAS (*Co-Chair*)
Cao Jinghua, Deputy Secretary for International Cooperation, CAS (*Co-Chair*)
Xiang Libin, Director for Academy of Opto-electronics, CAS (*Co-Chair*)
Anand Asundi, Director of Singapore Institute of Optics and Photonics (*Co-Chair*)
Ni Guoqiang, Secretary-General of Chinese Optical Society (*Co-Chair*)
WU Chenxu, president, School of Physics and Mechanical & Electrical Engineering, Xiamen University (*Co-Chair*)
JIANG Yadong, president, School of Optoelectronic Information, University of Electronic Science and technology (*Co-Chair*)
WANG Jiaxian, president, College of information science and Engineering, Huaqiao University (*Co-Chair*)
WANG Zhifeng, president, the use of solar thermal and Photovoltaic Systems Laboratory, The institute of electrical engineering (IEE), CAS (*Co-Chair*)
WANG Lin, Optics and optoelectronics industry society of China (*Co-Chair*)
etc.

Program Committee:

Lin Xiangdi, Academician, Chinese Academy of Engineering (China) *Chair*
Yang Hu, IOE, CAS(China) *Co-Chair*
Qing Yuwen, Natural Science Foundation of China, *Co-Chair*
YU Haodong, Changchun University of Science and Technology (China) *Co-Chair*
Yoshiharu Namba, Chubu University (Japan), Co-Chair
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

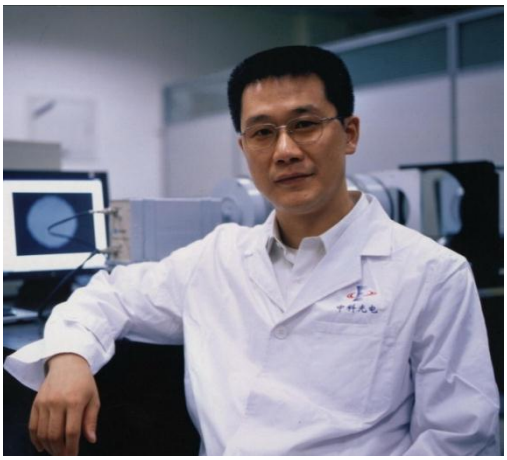
Zhou Liwei, Professor, Ph.D, Member of Chinese Academy of Engineering, was born in Shanghai in 1932. He was graduated from Beijing Institute of Technology (BIT) in 1958 and received the USSR Candidate Degree (Ph.D) of physics-mathematical science in 1966. In 1984 he was titled " Outstanding Expert at 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 in1991 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.

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

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

Daily Event Schedule

Date	Time	Contents	Place
Wednesday April 25, 2012	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
Thursday April 26, 2012	8:30-9:00	Opening Ceremony	Haixia hall, Xiamen International Conference Center
	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 www.xicec.com
Friday April 27, 2012	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
Saturday April 28, 2012	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	
Sunday April 29, 2012	8:00-18:00	A Day Tour in the Seaside City of Xiamen Detail in see Technical Program of AOMATT2012	
April 30, 2012		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-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

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*
	Session4-1	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

MLOPTIC Optical Component & Assembly 茂莱

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

ZEEKO Ltd

Tea Time (15:00-15:20)

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

YUANCH 上海元成光学器材有限公司

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

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
91220 Saint Pierre du Perray
France
Tel: 33 1 69 89 72 12
Fax: 33 1 69 89 72 40
Email: eric.ruch@sagem.com

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 sable 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
Steinbachstraße 17, 52074 Aachen Germany
Phone: +49 241 8904 -233
Mobile: +49 (0) 1 62/219 49 48
Fax: +49 241 8904 -6233
E-Mail: olaf.dambon@ipt.fraunhofer.de
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 Engi-neering 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

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
東北大学大学院工学研究科ナノメカニクス専攻・教授
マイクロ・ナノマシニング研究教育センター長
〒980-8579 仙台市青葉区荒巻字青葉6-6-01
Hiroki Kuwano, Dr.Eng. Professor, Director of Micro/Nano Center Dept.
Nanomechanics, Graduate School of Engineering Tohoku University Sendai
Director(2010-2012) of Japan Society of Mechanical Engineering
980-8579 JAPAN tel. 022-795-6255, fax. 022-795-4679
hiroki.kuwano@nanosys.mech.tohoku.ac.jp
http://www.nanosys.mech.tohoku.ac.jp/

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 μm. 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

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 Sceince 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 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 if 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.gfkcbs.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
National Optical Astronomy Observatory
950 N. Cherry Ave. Tucson, Arizona 85719
U.S.A.

(phone) 520-318-8544,
(fax) 520-318-8424
mcho@noao.edu

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 servers 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 sub-aperture 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 mm3/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. 1µm.
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 Insititute 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

QED Technologies

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.

Session 2-3 Invited Talk

■ ***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 fileds 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 technics 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 inculde 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: he front side of lotus leafs 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 a 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 includes 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: ptical 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 reflectomers 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 reflectomers 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 ~0.1nm.

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 PROLITHTM X3 and in-house software IntLitho, we study the cross-talk of the errors of numerical aperture (ΔNA), coherent factors ($\Delta\sigma$), mask dimension and phase, flare and their impact on the lithography performance. The results show that an individual ΔNA 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.

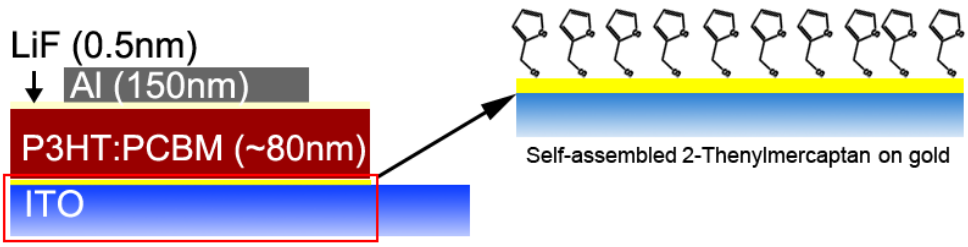


Fig. 1. Structure of the solar cells, a thin gold film was deposited on cleaned ITO substrate, and then the substrate was immersed in a solution of 2-thenylmercaptan in ethanol (2-Thenylmercaptan: ethanol = 1:40) for 24 hours. Then the self-assembled substrate was rinsed by ethanol and stored in vacuum 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 faction 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°C, and the strain resolution 20εμ.

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)

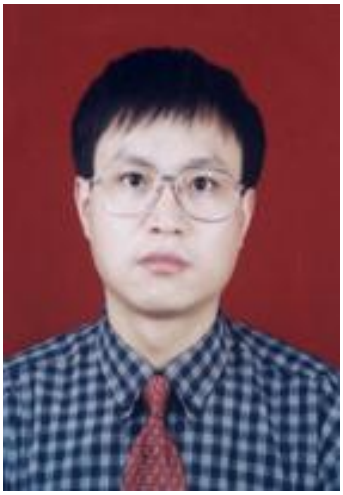
Abstract: Optical free-form surface could be non-rotational symmetric irregular high-order surface or function-structure surface based on micro-structure array, or both. In the photon electronics application field, the utilization of optical free-form surfaces can make the system or product become miniaturization, 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 μm, 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]

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 SiO2 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]

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

- ✓ 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]

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]
- ✓ ptical 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 Al2O3 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 Extrended 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]

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 Superlesns, 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 Azobenezene 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 Microprocessinging System based on PMAC, LIU Mingyan(China) ·····[4-0006]
- ✓ Maskless lithography alignment method based on phase-shifting moiré 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]

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-Hänchen 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 filed-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 Cd1-xZnxTe 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/ Al0.45Ga0.55N Schottky contacts, Caijing Cheng(China) ····· [5-0007]
- ✓ Large Area PERC-type Solar Cells with ALD-Al2O3 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]

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]

Conference 7: Opto-Electronic Materials, Devices and System Technology for Solor 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]

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 Centrefor 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 TE0 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]

13:00-14:00 April 28 Workshop Conference Hall

MLoptic ***http://www.mloptic.com/*** **13:00-14:00**

MLOPTIC Optical Components & Assemblies 茂莱

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, weigth 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 λ/20.

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

MLOPTIC Corp.

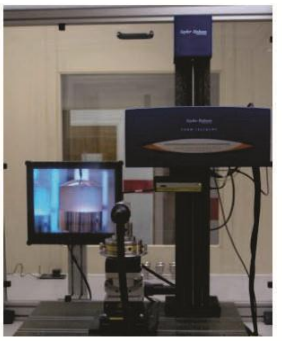
ADD：南京江宁开发区铺岗街 398 号（211102）
TEL：0086-25-84436288 FAX：0086-25-84433188
E-MAIL：info@mloptic.com WEBSITE：Http://www.mloptic.com

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

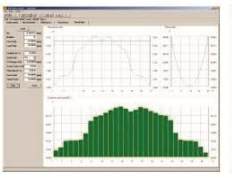
Production range:
Optical Components
Optical Coating
Optical, Electronical & mechanical Design
Optical System Assembly

Satisloh Sphere & Asphere Manufacture

Asphere Testing



Data Correct



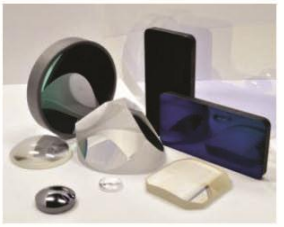
QED MRF

Aspheres

High-speed Polishing

Optical Coating

Precision Optics



Partner SPANOPTIC satisloh

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
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

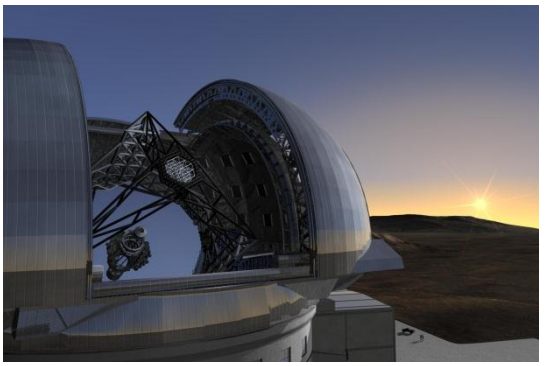
THE QUEEN'S AWARDS FOR ENTERPRISE 2011

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

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.

日本OPTORUN真空镀膜机系列

LGS75型光学数控加工设备

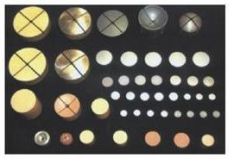
F601系列干涉仪

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 were 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。

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。

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。

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。

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

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。

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。

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。

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。

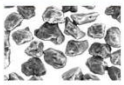
金刚石刀具，天然金刚石切削刃，同时提供返厂修磨维护服务。

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.

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。

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。



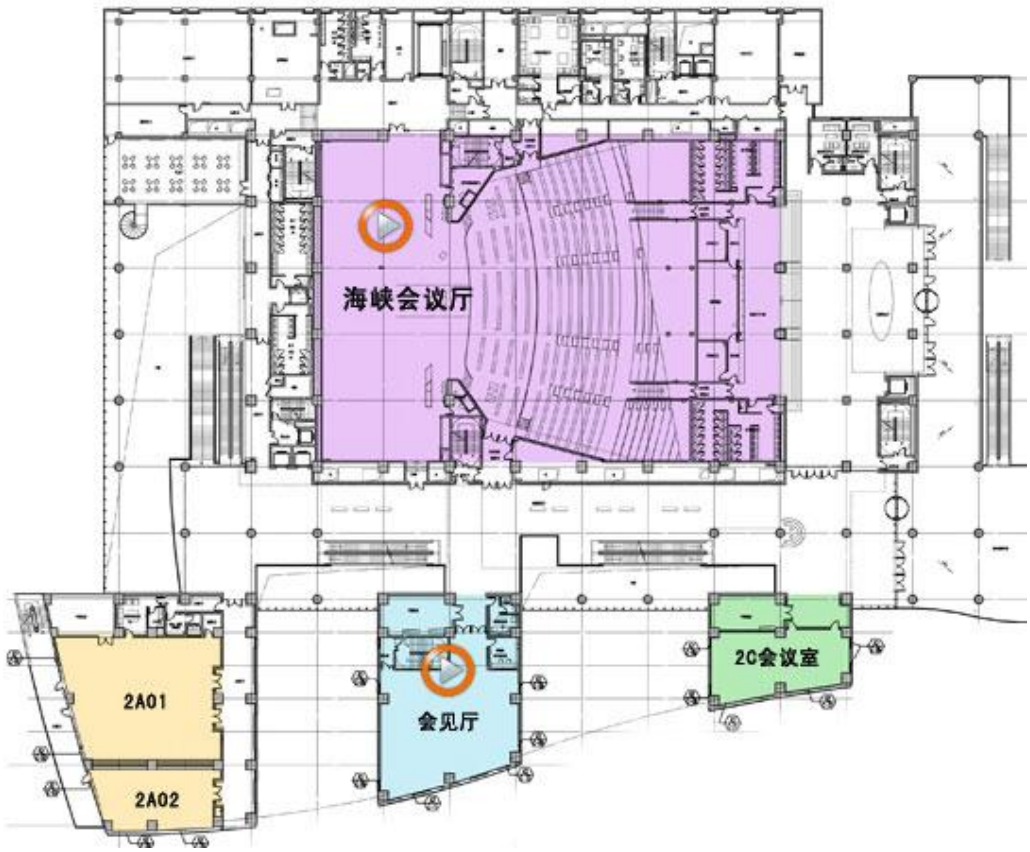
瑞士高等级抛光精细金刚石微粉，质量稳定，切削效率高，不易破碎，可以保证微粉粒度与研磨粗糙度的稳定对应。

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。

Xiamen International Conference Center

http://co.xicec.com/

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

AOMATT China 2012 Organizing Committee • Tel/Fax +86 028 85100583
optfab@163.com