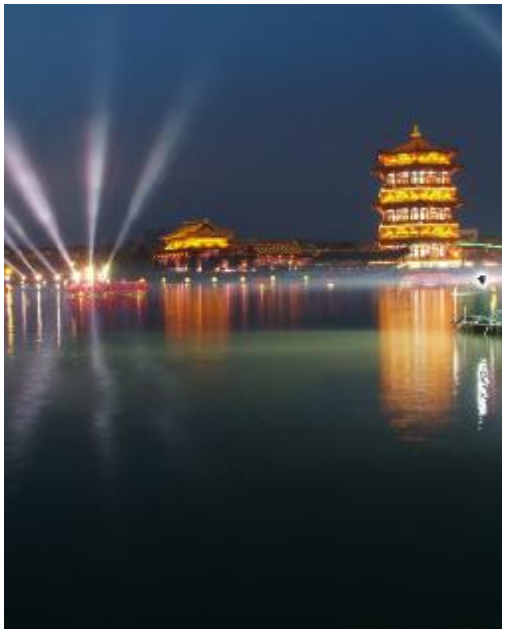
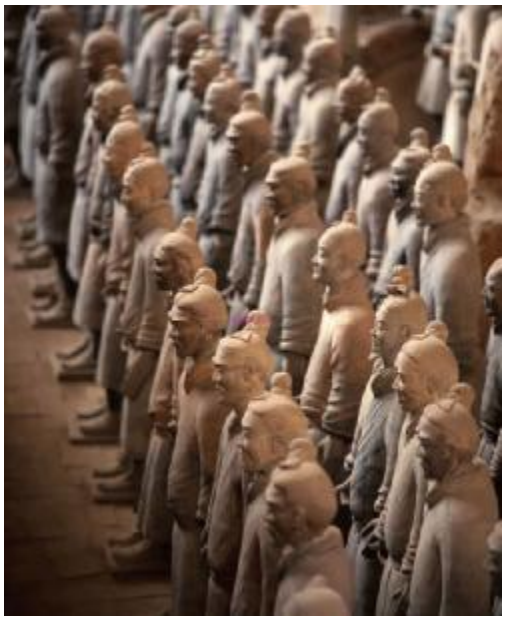
Technical Program

AOMATT 2005



The 2nd SPIE International Symposium on

Advanced Optical Manufacturing and Testing Technologies



2-5 November 2005
Grand New World Hotel
Xi'an China

Sponsored by:

COS -The Chinese Optical Society
IOE -Institute of Optics and Electronics, -Chinese Academy of Sciences
SPIE -The International Society for Optical Engineering -(Technical Co-Sponsor)

Supported by:

National Natural Science Foundation of China

Honorary Chair:

WANG Daheng, Academician, CAS & CAE (China)

Symposium General Chair:

MU Guoguang, President of Chinese Optical Society (COS), Academician, CAS

Three Conferences:

1 Large Mirror and Telescopes
2 Advanced Optical Manufacturing Technologies
3 Optical Test and Measurement Technology and Equipments

AOMATT 2005

AOMATT 2005 Technical Program Contents

Advanced Optical Manufacturing and Testing Technologies

2-5 November 2005

Xi'an China

IVITATION

Welcome!

The 2nd International Symposium on Advanced Optical Manufacturing and Testing Technologies 2005 will be held in Xian Garden Hotel from Nov. 2-5, 2005, in the famous historical city of Xian, China.

Technologies of advanced optical manufacturing and testing become an important branch of optical sciences as well as an indispensable part of industrial manufacturing science. They are closely associated with technologies of information, bioscience, material and manufacturing process, integrated with optics, mechanics, computer, measurement and other new technologies. At present, they construct the important technical support of a nation, even a symbol of the comprehensive national strength. The symposium will review the big progress of the kind since the first conference held in Chengdu in 2000, carry out academic exchange and discuss the development trend, planning and so on in the workshops.

The program committee and local organizing committee of the symposium sincerely invite you to participate in the 2nd International Symposium on Advanced Optical Manufacturing and Testing Technologies. We believe that the ancient historical sceneries and multi-cultural components in China will be a pleasant and impressive memory for the symposium as well as a valuable opportunity for China.

We are looking forward to meeting you in Xian.
Sincerely

Chairman of the Organizing Committee
Director, Institute of Optics & Electronics, CAS

AOMATT 2005 Symposium Organizations & Committees

Sponsored by:

COS - The Chinese Optical Society

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

SPIE - The International Society for Optical Engineering (Technical Co-Sponsor)

Cooperating Organizations:

- Committee of Optical Manufacturing Technology, COS
- Committee of Optical Testing Technology, COS
- Xian Institute of Optics and Precision Mechanics, Chinese Academy of Sciences
- Xian Applied Optics Institute
- Xian Institute of Technology
- Northwestern Polytechnical University

Supported by:

- National Natural Science Foundation of China

Honorary Chair:

WANG Daheng, Academician, Chinese Academy of Sciences and Chinese Academy of Engineering (China)

Symposium General Chair:

MU Guoguang, President of Chinese Optical Society (COS), Academician, Chinese Academy of Sciences

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Hans Lauth, Jenoptik Laser, Optik System, GmbH (Germany)

ZHAO Jianlin, Northwestern Polytechnical Univ. (China)

E.Kley, Friedrich-Schiller-Univ. Jena. (Germany)

Rongbin Li, Hong Kong Polytechnic University (Hong Kong, China)

Kathleen A. Richardson, Univ. of Central Florida/CREOL (USA)

Hexin Wang, Optical Technology Carl Zeiss AG (Germany)

XIN Qiming, Beijing Institute of Technology (China)

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Gerald Klein, LOH Optikmaschinen AG (Germany)

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Masakazu Miyashita, Ashikaga Institute of Technology (Japan)

XU Deyan, Optical Testing Technology Committee, COS (China)

Paul Kloceck, ELCAN Optical Technologies (USA)

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WEN Shangming, Institute of Optics and Electronics, CAS

XIN Qiming, Beijing Institute of Technology

XU Deyan, Optical Testing Technology Committee, COS

AOMATT 2005 Daily Event Schedule General

Date	Time	Content	Place
Tuesday, 1 November	8:00-21:00	Registration	Lobby of the Hotel
Wednesday, 2 November	8:10-8:30	All plenary talkers gathering	(room1)Dongshi room
	8:30- 9:00	Opening Ceremony	Chang' an ball room
	9:00-12:30	Plenary Talk 1-5	
	13:30- 17:40	Plenary Talk 6-11	
	19:30-21:30	Banquet	Chang' an ball room
Thursday, 3 November	8:30-12:00	Session 1-1 Session 2-1,2-3 Session 3-1,3-3	(room1)Dongshi room: Session 1-1 (room2)Dongyi room: Session 2-1 (room3)Dong'er room: Session 2-3 (room4)Dongsan room: Session 3-1 (room5)Qinghuang room: Session 3-3
	13:30-16:00	Poster 1	(room6)Chang' an ball room part B:Poster 1
	14:00-17:30	Conference Workshop 1: Taylor Hobson Co. Ltd	(room7)Chang' an ball room part A: Workshop 1
	16:00- 17:30	Session 1-2 Session 2-2,2-4 Session 3-2,3-4	(room1)Dongshi room: Session 1-2 (room2)Dongyi room: Session 2-2 (room3)Dong'er room: Session 2-4 (room4)Dongsan room: Session 3-2 (room5)Qinghuang room: Session 3-4
	18:30-20:30	Round Table Forum on the Development of Opto-electrical Theologies and Marketing	Qinghuang room
Friday, 4 November	8:30-12:00	Session 1-3 Session 2-5, 2-7 Session 3-5, 3-7	(room1)Dongshi room: Session 1-3 (room2)Dongyi room: Session 2-5 (room3)Dong'er room: Session 2-7 (room4)Dongsan room: Session 3-5 (room5)Qinghuang room: Session 3-7
	13:30-16:00	Poster 2	(room6)Chang' an ball room part B:Poster 2
	14:00-17:30	Conference Workshop 2: Satisloh AG	(room7)Chang' an ball room part A: Workshop 2
	16:00- 17:30	Session 1-4 Session 2-6 Session 3-6,3-8	(room1)Dongshi room: Session 1-4 (room2)Dongyi room: Session 2-6 (room3)Dong'er room: (room4)Dongsan room: Session 3-6 (room5)Qinghuang room: Session 3-8
	18:30-21:00	Conference Activities	
Saturday, 5 November		Travel Routing 1 or Travel Routing 2	City of Xi'an

Wednesday, 2 November

8:10-8:30 All Plenary Talkers Gathering / Dongshi room

8:30-9:00 Opening Ceremony / Chang' an ball room / *Chiar: Yangli (Secretary General)*

9:00-17:40 Plenary Presentation / Chang' an ball room
Chair for P.P. Session 0-1 : Zhang Yudong (Chair of Organizing Committee)
Chair for P.P. Session 0-2 : Zhao Wei (Chair of Program Ccommittee)

	Order	Time	Reporter	Title of the Lecture	Note
P.P. Session 0-1	1	9:00-9:40	Roland GEYL	SAGEM - REOSC : 60 years of High Tech Optics	SAGEM - REOSC France
	2	9:40-10:20	Yuan jiahu	Current development of advanced optical manufacturing and testing technologies in IOE, CAS	IOE, CAS China
	10:20-10:30 Tea Break				
	3	10:30-11:10	Myung K. Cho	Design study of telescope optics for the Thirty Meter Telescope (TMT)	NOAO U.S.A.
	4	11:10-11:50	Hans J. Kaercher	The Mechatronic Approach to the Design of Large Mirrors and Telescopes	MT Aerospace AG Germany
	5	11:50-12:30	Sen Han	Interferometric Techniques Applied in Packaged MEMS and MOEMS Measurement	Veeco Instrument U.S.A.
	12:30-13:30 Lunch Time				
P.P. Session 0-2	6	13:30-14:10	W.B. Lee	Development of Advanced Optics Manufacturing Technologies	Hong Kong Polytechnic University
	7	14:10-14:50	Mike DeMarco	Recent advanced in sub-aperture approaches to finishing and metrology	QED Technologies U.S.A.
	8	14:50-15:30	E.-Bernhard Kley	Lithography for Micro- and Nanooptics	Friedrich-Schiller-University Jena Germany
	15:30-15:40 Tea Break				
	9	15:40-16:20	Hans Lauth	Trends in UV optics	JENOPTIK Laser, Optik, Systeme GmbH Germany
	10	16:20-17:00	Daniel Malacara-Doblado	Recent advances in phase shifting interferograms analysis	Centro de Investigaciones en Optica, A. C. Mexico
	11	17:00-17:40	Yaolong Chen	Fabrication Technologies for Large Ultra Precision Flat Optics	Berliner Glas KGaA Herber Kubartz GmbH &Co Germar

Thursday, 3 November

	Conf 1	Conf 2		Conf 3		Post	Workshop	Forum
	room 1 Dongshi room	**room 2** Dongyi room	**room 3** Dong'er room	**room 4** Dongsan room	**room 5** Qinghuang room	**Room 6** Chang'an ball room part B	**Room 7** Chang' an ball room part A	**Room 1** Dongshi room
8:30 -10:00	Session 1-1	Session 2-1	Session 2-3	Session 3-1	Session 3-3	**Non**	**Non**	**Non**
10:00 -10:30	Tea Break							
10:30 -12:00	Session 1-1	Session 2-1	Session 2-3	Session 3-1	Session 3-3			
12:00 -13:30	Lunch Time							
13:30 -16:00	**Non**					**Poster 1**	**Taylor Hobson Co. Ltd** (14:00 -15:30)	**Non**
15:30 -16:00	Tea Break							
16:00 -17:30	Session 1-2	Session 2-2	Session 2-4	Session 3-2	Session 3-4	**Non**		
18:30 -20:30	**Non**							**Forum**

Friday, 4 November

	Conf 1	Conf 2		Conf 3		Post	Workshop	Activities
	room 1 Dongshi room	**room 2** Dongyi room	**room 3** Dong'er room	**room 4** Dongsan room	**room 5** Qinghuang room	**Room6** Chang'an ball room part B	**Room 7** Chang' an ball room part A	
8:30 -10:00	Session 1-3	Session 2-5	Session 2-7	Session 3-5	Session 3-7	**Non**	**Non**	**Non**
10:00 -10:30	Tea Break							
10:30 -12:00	Session 1-3	Session 2-5	Session 2-7	Session 3-5	Session 3-7			
12:00 -13:30	Lunch Time							
13:30 -16:00	**Non**					**Poster 2**	**Satisloh** (14:00-15:30)	**Non**
15:30 -16:00	Tea Break							
16:00 -17:30	Session 1-4	Session 2-6		Session 3-6	Session 3-8	**Non**		
18:30-	**Non**							**Activities**

Conference Session Chair List

Date	Time	Conf 1	Conf 2		Conf 3	
		room 1 Dongshi room	**room 2** Dongyi room	**room 3** Dong'er room	**room 4** Dongsan room	**room 5** Qinghuang room
3,November	8:30-10:00	Session1-1 **Yu Jingchi**	Session2-1 **Yaolong Chen**	Session2-3 **E-Kley**	Session3-1 **Hexin Wang**	Session3-3 **Sen Han**
	10:00-10:30	Tea Break				
	10:30-12:00	Session1-1 **Yu Jingchi**	Session2-1 **Yaolong Chen**	Session2-3 **E-Kley**	Session3-1 **Hexin Wang**	Session3-3 **Sen Han**
	12:00-13:30	Lunch Time				
	13:30-16:00	**Non**				
	15:30-16:00	Tea Break				
	16:00-17:30	Session1-2 **Gao Bilie**	Session2-2 **Xu Qiao**	Session2-4 **Li Wei**	Session3-2 **Wen Shangming**	Session3-4 **Chen Qiang**
4,November	8:30-10:00	Session1-3 **Wu Fan**	Session2-5 **Xing Tingwen**	Session2-7 **Xing Qiming**	Session3-5 **Zhao Jianlin**	Session3-7 **Liu Weiguo**
	10:00-10:30	Tea Break				
	10:30-12:00	Session1-3 **Wu Fan**	Session2-5 **Xing Tingwen**	Session2-7 **Xing Qiming**	Session3-5 **Zhao Jianlin**	Session3-7 **Liu Weiguo**
	12:00-13:30	Lunch Time				
	13:30-16:00	**Non**				
	15:30-16:00	Tea Break				
	16:00-17:30	Session1-4 **Fang Jingzhong**	Session2-6 **Yan Jie**		Session3-6 **Zhang Rongzhu**	Session3-8 **Gao Limin**

Wednesday
2 November 2005

The 2th AOMATT 2005
Xi'an Grand New World Hotel

Presided by: ***Mu Guoguang***

8:10 to 8:30
Presidium member (including all plenary talker) gathering
Dongshi room

8:30 to 9:00
Opening Ceremony
Chang'an room
Chair: Yangli

9:00 to 17:40
Plenary talk
Chang'an ball room

AOMATT2005 Plenary Presentation
9:00 at to 17:40
Xi'an Grand New World Hotel
Chang'an ball room

P.P. Session 0-1
Chair: Zhang Yudong

09:00-09:40	Roland GEYL
09:40-10:20	Yuan jiahu
10:20-10:30	*Coffee/Tea break*
10:30-11:10	Myung K. Cho
11:10-11:50	Hans J. Kaercher
11:50-12:30	Sen Han

P.P. Session 0-2
Chair: Zhao Wei

13:30-14:10	W.B. Lee
14:10-14:50	Mike DeMarco
14:50-15:30	E.-Bernhard Kley
15:30-15:40	*Coffee/Tea break*
15:40-16:20	Hans Lauth
16:20-17:00	Daniel Malacara-Doblado
17:00-17:40	Yaolong Chen

Plenary Talk 1

SAGEM - REOSC : 60 years of High Tech Optics

9:00 to 9:40

Dr. Roland GEYL
SAGEM - REOSC
France

Abstract

The REOSC company, now part of SAGEM Defense Securité, haspion-neered high performance optics design and manufacturing during morethan 60 years and built a unique panel of skills dedicated to precision-optics for Astro-nomy, Space, Laser and other applica-tions. A rapid tour of some chall- enging opto-mechanical projects will be offered to the audience with highlight on the giant 8-m mirrors for the Very Large Telescope and the segmented Gran Telescopio Canarias.

Brief Biography

Roland GEYL graduated the Ecole Superieure d'Optique in Orsay, near Paris,in 1979 and joined REOSC in 1981. He learned and practiced the various-facets of the profession from lens design, optical polishing, opticalme-trology, align- ment and integration, project management and commercial negotiation. Today he is Deputy Direc-tor of the REOSC Business Unit of SAGEM Defense Securite, in charge of marketing and business development. In parallel, Roland GEYL teaches lens design at the Institute of Optics.

Plenary Talk 2

Current development of advanced optical manufacturing and testing technologies in IOE, CAS

9:40 to 10:20

Dr. Yuan jiahu
IOE,CAS,China

Abstract

Current development of advanced optical manufacturing and testing technologies in Institute of Optics and Electronics, Chinese Academy of Sciences is reported in this present- ation. In advanced optical manufacturing technologies, the large astronomical telescopes, the large mirrors and the light-weighted mirrors are being developed in our Institute. The active manufacture technology of the large mirror is being carried on. In advanced optical testing technologies, we have developed a serial of Hartmann-Shack wave-front sensors used in this field. In this presentation, the applications of Hartmann-Shack wave-front sensors for optical testing of optical components and systems are also presented.

Brief Biography

Prof. Yuan Jiahu is a vice president of the Institute of Optics and Electronics Chinese Academy of Sciences. He received his BS degree in Optical Instrument from HuaZhong Univer- sity of Science and Technology, his Ms degree in Optical Engineering from Institute of Optics and Electronics, Chinese Academy of Sciences (CAS), and his PhD degree on Mechanical Engineering from Sichuan University in 1985, 1988 and 1999 respectively. Prof. Yuan Jiahu has been a visiting scholar at University of Colorado, USA in 1995-1996. He is a member of Committee of Science &Economy of High-tech research on the development center of Ministry of Science and Technology, PRC. Since 1989, he has been engaged in research on optical engineering, such as Opto-electronic technologies, optical apparatus, and space optics technologies.

Plenary Talk 3

Design study of telescope optics for The Thirty Meter Telescope (TMT)

10:30 to 11:10

Dr. Myung K. Cho, National Optical Astronomy Observatory (USA)

ABSTRACT

The Thirty Meter Telescope Project is a collaboration of the California Institute of Technology, the University of California, the Association of Universities for Research in Astronomy, and the Association of Canadian Universities for Research in Astronomy. The telescope will be used for research in astronomy at visible and infrared wavelengths. The optical design is an Aplanatic-Gregorian with a 30 meter diameter, f/1, segmented primary mirror (M1); a 3.6 meter diameter, concave secondary mirror (M2); and an elliptical (4.1m in major axis and 3 meter in minor axis) flat tertiary mirror (M3). These will deliver an f/15 beam to adaptive optic systems and science instruments located on two Nasmyth platforms. This paper will describe an overview and current status in the design and development of the telescope optical systems (M1, M2, and M3) of TMT. Additionally, current design concepts and the optical performances of the telescope optics will be discussed.

Brief Biography

Dr. Myung Cho servers as a principal engineer at the National Optical Astronomy Observatory (NOAO) He is currently working on the optical systems of the Thirty meter Telescope Project. His prior telescope projects are: WIYN 3.5m telescope, the GEMINI 8m Telescopes Project, and many more telescopes.

Plenary Talk 4

The Mechatronic Approach to the Design of Large Mirrors and Telescopes

11:10 to 11:50

Dr. Hans J. Kaercher

MAN Technologie AG(Germany)

ABSTRACT

The challenges for the first telescope designers were the polishing of the lenses or mirrors, thepointing of them to the stars, and the tracking of the sidereal movement. The classical technologies, which they used, were spherical mirror polishing, passive, isostatic supports for themirrors, and equatorial mounts with clockwork drives. The maximal sizes which they could achieve with these technologies, were 5 to 8m main aperture diameter. The practical limits in the sizes of the "mechanical" age were overcome with the upcoming of electronic control elements and digital computers. Now, giant optical telescopes in sizes from10 to 100m are under construction or in planning. For these telescopes – beside the optical-layout itself – the integrated system (= "mechatronic") approach to the structural, mechanicaland control elements, which support the optical components, are a major issue for the finalsuccess of the projects.

The talk will highlight some major aspects of this mechatronic approach, as system design, end-to-end simulation, control architecture for segmented mirrors, and on-site erection and commissioning, and will be supported by photos, sketches and diagrams.

Brief Biography

Hans Juergen Kaercher, borne 1941 in Offenbach, Germany, studied mathematics, mechanical and structural engineering at the Technical University in Darmstadt. PhD on numerical methodsin engineering (finite element methods) at TU Darmstadt. Since 1974 project manager, system engineer for telescopes at MAN Technologie in Mainz, Germany (now MT AerospaceAG).

Major projects: 30m MRT Pico Veleta telescope for MPIfR in Spain; 40x120m EISCATantennas Tromsö, Norway; 15m IRAM telescopes Plateau de Bure, France (carbonfiber); ESO3,5m NTT telescope (design mechanical subsystem); ESO VLT telescopes (design study mirrorcell); 2,7m airborne telescope SOFIA (system design, construction, commissioning); 50mLMT telescope Cerro la Negra, Mexico (system design); 64m SRT telescope Sardinia, Italy(construction); 28m Cherenkov telescopes MPIfK, Heidelberg (design study); and many others!

Plenary Talk 5

Interferometric Techniques Applied in Packaged MEMS and MOEMS Measurement

11:50 to12:30

Dr. Sen Han
Veeco Instruments, Inc. (USA)

ABSTRACT

It is well-known that MEMS (Micro-Electro-Mechanical Systems) and MOEMS (Micro-Opto-Electro- Mechanical Systems) are integrated devices. These devices are manufactured using batch fabrication techniques similar to those used for integrated circuits where quality control is a key to making a successful product. Currently, approximately 50 - 80% of the total cost of MEMS comes from final packaging and test; successful products will require rapid, accurate metrology of the devices to improve yields and profitability of the devices.

Interferometric techniques in optical profiler have proven successful for measuring surface features of unpackaged MEMS devices due to its high speed, accuracy, and flexibility. With the further productization of MEMS technology, however, the devices need to be tested in their final packaged state, typically underneath a protective surface such as glass, plastic, or sapphire. Low-magnification objectives capable of imaging through dispersive media have been available for several years. Increasingly, though, MEMS devices require high-magnifications in order to resolve key features. With high magnification, however, transmissive media can greatly degrade the interferometric measurement due to dispersion and aberration effects. In addition, long working distance optics are required to accommodate the distance between the protective layer and MEMS device.

In this paper, improved techniques are described to measure surfaces through- transmissive-media (TTM) at higher magnifications. Many factors must be optimized, including dispersive compensation, coherence effects, thickness variation insensitivity, and illumination. Measurement results will be presented for a standard objective and a dispersion-compensated objective, as well as some MEMS application examples.

Keywords

Through-Transmissive-Media (TTM) profiler, packaged MEMS or MOEMS measurement, surface profiler, through glass measurement, interferometric profiler.

Brief Biography

Dr. Sen Han, as Senior Staff Scientist, works at Veeco Instrument. Dr. Han is an adjunct professor of College of Optical Sciences, University of Arizona, USA and of Optical Engineering, Changchun University of Science and Technology, China. Dr. Han is also member of SPIE, OSA and ASPE.

plenary Talk 6

Development of advanced Optics Manufacturing Technologies

13:30 to 14:10

Dr. W.B. Lee
The Hong Kong Polytechnic University

ABSTRACT

Advanced Optics is an important catalyst in the development of micro-opto-electro-mechanical devices and systems used in photonics and telecom-munication products. Over the past decades, the optics industry has grown from a skill and manual based industry to one that has been based on advanced manufacturing technologies. In the USA alone, there are more than 5000 such small firms with an estimated turnover of more than US$ 50 billion. The mass production of cheap spherical glass lenses and plastic aspheric lenses has moved to low cost manufacturing centres such as the Far East and mainland China. The more high-value-added part of the product spectrum has shifted to the design and fabrication of novel surfaces involving detail microstructural features such as V-groove, pyramid structures and micro-lens array, and freeform surfaces, which are crucial to the development of complex and micro-optical-electro-mechanical devices used in many photonics and telecommunication products and systems. Typical products include laser printers, hand held scanners, tube TV compensators, phase modulation mirrors, LCD backlights and broad band optical fiber connectors.

Ultra-precision machining based on Single-Point Diamond Turning (SPDT) and Ultra-precision Freeform Machining (UFM) has become an indispensable tool for the design and manufacture of high-technology and high-precision optics. These processes can be used to produce optical quality surfaces with nanometer-level surface finishing and sub-micrometer form accuracy without the need for any subsequent polishing. With the fast growing development of the machining technology, ultra-precision machining technology is no used only for

the manufacture of symmetrical spherical and aspheric workpiece. It can also be used to produce some very complex and non-symmetrical profiles.
In this paper, the trend in the development and application of ultra-precision machining and measurement technology in advanced optics manufacture is presented. The research and development work by Advanced Optics Manufacturing Centre of The Hong Kong Polytechnic University will be introduced.

Brief Biography
Professor W B Lee is the Chair Professor and Head of the Department of Industrial and Systems Engineering of The Hong Kong Polytechnic University. He is also the Director of the Advanced Manufacturing Technology Research Centre and Head of the Ultra-precision Machining Centre of the University. His research interests include manufacturing technology, ultra-precision machining, mesoplasticity and manufacturing strategy. He has published two research books as well as more than 300 papers in international journals and conferences. Prof. Lee is the regional editor of the Journal of Materials Processing Technology, editorial member of the Journal of Engineering Manufacture and the Chinese Journal of Mechanical Engineering. He is the immediate past chairman of Hong Kong Association for the Advancement of Science & Technology, and past chairman of the Institution of Electrical Engineers (Hong Kong)
Prof Lee and his research team are currently focusing on the development of ultra-precision freeform machining technology. This technology can be applied to the manufacture of freeform surfaces and optical microstructures for telecommunications and photonic products. The research include the development of a software of tool path generation for ultra-precision freeform machining; the development of freeform measuring technology as well as the development of the design and the machining process of ultra-precision microgrooves and microlenses.

plenary Talk 7

Recent advanced in sub-aperture approaches to finishing and metrology

14:10 to 14:50

Dr. Mike DeMarco
QED Technologies
(USA)

Abstract
Subaperture polishing technologies have radically changed the landscape of precision optics manufacturing and enabled the production of components with higher accuracies and increasingly difficult figure requirements. Magnetorheological Finishing (MRF®), for example, is a proven, production-worthy, deterministic, sub-aperture finishing technology that has excelled at extending precision finishing well beyond the limitations of traditional polishing. Several recent MRF developments will be presented, including the post polishing of Single Point Diamond Turned (SPDT) surfaces, transmitted wavefront correction, and finishing of increasingly large apertures. The high precision finishing of challenging optics using a newly developed jet-based technology will also be discussed. A series of examples spanning a wide range of materials, geometries and specifications will be presented. Specific areas to be discussed include the finishing of optics less than 5 mm in diameter, which typically require a very labor-intensive, iterative process to finish, and the correction of steeply concave optics, such as domes, which are typically not well suited for sub-aperture polishing processes.
Key words: Optics, polishing, magnetorheological, MRF, Jet Polishing

Brief Biography
Mike DeMarco, Marketing and Sales Manager for QED Technologies, has spent his entire career in the fields of precision optics manufacturing and optical system assembly and test. QED develops, manufactures and markets finishing and metrology equipment for the precision optics industry. Prior to joining QED, he managed the Optical Assembly and Test Department at SVG Lithography Systems in Wilton, CT.
His academic background includes an MBA degree in Marketing and Operations from the University of Connecticut, and a BS degree in Optical Engineering from the University of Rochester. He is the author of many articles and papers in his chosen fields of interest.

plenary Talk 8

Lithography for Micro- and Nanooptics

14:50 to 15:30

Dr. E.-Bernhard Kley
Friedrich-Schiller-University Jena (Germany)

Abstract
Miniaturization and microstructures are keywords in the modern technical world. Optical components and systems are affected by this trend, too. This means, miniaturized optical lenses, prisms, gratings and even artificial materials based on sub-wavelength structures have to be fabricated for a lot of applications.
As a consequence micro- and nanolithography is challenged to realize complex micro-optical elements as well as artificial materials, both on the base of 2D and 3D microstructures. In order to fabricate such optical elements and materials, special demands on lithography or micro- and nano-machining arise from the wave nature of light. This refers to the accuracy, as well as to special 2D and 3D fabrication techniques.
The talk is discussing the basics as well as the vision of Micro- and nanooptics and gives an overview of the technologies (with a focus on lithography). Selected applications illustrates the potential of the field.

Brief Biography
Ernst-Bernhard Kley received his diploma and Ph.D. in physics from the Friedrich-Schiller-University Jena in 1974 and 1987 respectively. After he received his diploma in physics and before he started his doctoral work, he earned three years industrial experience. Dr. Kley general fields of research are micro- and nanolithography, various e-beam writers, scanning electron microscopes, applied to micro-optics, integrated optics, and cryogenic electronics.

Currently he is the head of the Microlithography and Micro-optics Group at the Institute of Applied Physics of Friedrich-Schiller- University Jena. He is author and co-author of more than 90 scientific papers, 3 book chapters and organized or was involved in organization of several conferences. Since the beginning of the 1990s, he was a partner of more than 40 European and national projects and established the cooperation with many international partners.

plenary Talk 9

Trends in UV optics

15:40 to 16:20

Dr. Hans Lauth
JENOPTIK Laser, Optik, Systeme GmbH (Germany)

Abstract
Optical technologies have essential importance as driving forces of innovations in the markets of the 21st century. They are key technologies which create the conditions for a lot of new developments and their applications in the future. It is a general trend to use shorter and shorter wavelengths. This trend is strongly driven by the lithography market, but also noticeable for excimer laser applications in material processing, life sciences, health care, analytical technique and sensors. The demands lead to the physical limits. On the one hand this needs basic research in the fields of laser radiation - material interaction, material science, physical, chemical and micro - structural properties of thin films and surfaces. On the other hand new manufacturing technologies and methods (Computer controlled polishing, Magneto rheological finishing, Ion Milling) and new measurement equipment are required. A general progress in the deterministic production and in the metrology methods and equipment is reached in Europe in the last years.

Brief Biography
Hans Lauth received his Diplom Physiker in 1974, his Dr. rer. nat. in 1991 from the University of Jena, Germany. From 1974 he works in different R&D positions in the JENOPTIK AG (former Kombinat Carl Zeiss Jena) on the field of optical thin films and optical production technologies. Since 1998 he heads the Business Unit Optics in the JENOPTIK Laser, Optik, Systeme GmbH. He has authored a number of papers and patents in the field of thin optical films and optical production technologies.

plenary Talk 10

Recent advancesin phase shifting interferograms analysis

16:20 to 17:00

Dr. Malacara-Doblado Daniel
Centro de Investigaciones en Optica , A. C. (Mexico)

Abstract
Nowadays grate efforts are being made to improved the mathematical analysis of phase shifting interferograms. The aim is to develop algorithms that are inmune to errors due to noise, miscalibrations, vibrations and many others sources. In this presentation I will make a short review of this topic, ending with the most recent advances.

Brief Biography
He was born on June 6, 1967 in México, D. F. He studied the BS in Electronics Engineering at the Universidad Iberoamericana in León, Gto. He obtained his MCs and PhD in Optics at the Centro de Investigaciones en Optica, A. C. On July 1996 he attended the Optical Science Center of University of Arizona in Tucson, AZ. He was an associate researcher from November 1996 and now he is a titular researcher at the CIO. In January 2005 he was appointed head of the Optical Engineering department. His fields of research are optical design, optical testing and interferometry. Recently, his main interests have been to develop new techniques for the cuantitative evaluation of Hartmann test data and also the develoment of new algorithms for phase shifting interferometry.

plenary Talk 11

Fabrication Technologies for Large Ultra Precision Flat Optics

17:00 to 17:40

Dr. Yaolong Chen
Berliner Glas KGaA Herbert Kubartz GmbH &Co. (Germany)

Abstract
Large ultra precision flat optics has been fabricated until now by iterative trials. The success depends strongly on experiences of the opticians. The manufacturing costs in this way are relatively high. Such methods are mostly suitable for small quantities. If a big quantity of large ultra precision flat optics should be made there is a need for fabrication technologies which enable the required high form accuracy and surface quality with reasonable manufacturing costs. A new approach which is called "digital fabrication" was developed to cover this need. The strategy of this approach is to optimize the whole process chain instead of only the finishing process. The target is to make the single steps of the process chain as stable as possible. The whole fabrication procedure will be tuned and controlled digitally. For example, the conventional rough grinding and lapping processes on different machines will be replaced by rough, fine and finest grinding at one clamping on one CNC grinding machine. The polishing will be carried out with polyurethane pad and pitch on CNC polishing machines. Finally the required form accuracy and surface quality will be achieved by ion beam figuring, MRF or computer controlled polishing (CCP). In this way the manufacturing time could be shortened remarkably. The fabrication procedure can be scheduled deterministically and the production costs can be reduced dramatically.
Keywords: Flat optics, grinding, Lapping, Polishing, process chain, surface finish

Brief Biography
Studied Special Manufacturing Systems for Electronic Industry at the Xi'an Jiaotong University in Xi'an/China and got the Bachelor of Mechanical Engineering Science. He started then his master study of precision mechanical engineering at the same university. He continued his work at the Institute for Production Technology and Machine Tools of University of Hanover in Germany. His research work was emphasized on grinding process and machine dynamics. Under the guidance of the professor Hans Kurt Toenshoff he investigated and modeled the surface topography and machine parameters of the grinding process. His PhD thesis was titled "Study on Vibrations and Wavenesses During In-feed Plug Grinding". From 1990 to 2001 he worked with Carl Zeiss in the Technology Center in Oberkochen in Germany. He managed different projects in the area of manufacturing technology of optics, especially the technologies and manufacturing systems for aspherical surfaces. His main interests were diamond turning, micro grinding, fly cutting and polishing of aspherical and free form optics. While working with Carl Zeiss he developed many special machines for production of such products. Then he jointed LOH optical machines until 2002. Since then he has been worked as chief engineer with Berliner Glas KGaA in Berlin Germany. His actual research work is concentrated on high efficiency deterministic processes and machines for manufacturing precision optics.

Workshop 1 *(Room 7: Chang' an ball room part A 14:00—17:30, 3 November)*

Taylor Hobson Co. Ltd: New advances in Ultra – Precision Metrology and Manufacturing Technology for Aspheric Optics

Presentations (14:00 – 16:30):

1. **Taylor Hobson – a leading company in Ultra Precision Metrology and Manufacturing Technology**
   Mr. Isaac Lai (20 + 5 min.)
   Taylor Hobson has long term of experience in precision optics market. The combination of ultra-precision metrology and ultra-precision manufacturing technology has created various successes in the market.

2. **Ultraform 350 – Ultra Precision CNC Single Point Diamond Turning and Ultra Precision Grinding Machine**
   Mr. Tsutomu Miyashita (45 + 5 min.)
   Ultra precision diamond machining of optics and optical moulds and ultra precision grinding of glass and glass moulding material will be introduced.

3. **Talysurf CCI – the world's highest resolution optical 3D profiler**
   Dr. Mike Conroy (45 + 5 min.)
   Talysurf CCI is a non-contact 3D measuring instrument which can be used for the surface finish measurement of optical application. This new technology can be utilized for characterisation and optimisation of grinding, polishing and diamond turning process.

4. **Form Talysurf PGI 1240 & 1250 Aspheric Measuring System**
   Mr. Zhang Zibei (20 + 5 min.)
   Form and surface metrology for aspheric optics will be introduced. Taylor Hobson provides new analysis software for aspheric and asphero-diffractive optics. With new measuring techniques and patented aspheric data fusion software, we are no longer limited by component slope.

Tea Break (16:30 – 16:45)

Questions & Answers (round table; 16:45 – 17:30)

Workshop 2 *(Room 7: Chang'an ball room part A 14:00—17:30, 4 November)*

SATISLOH AG:
Latest Technology developments in surfacing and coating of optics

Presentations (14:00 – 16:00):

1. **Satisloh – a new force in optical surfacing & coating**
   Dr. Michael Sander (15+5 min.)
   The combination of the long tradition of Loh in machines for surfacing of precision optics, and of Satis-Vacuum in vacuum coating technology has created a new force in the market - Satisloh. Both partners contributed many years of experience in both the ophthalmic and the precision optics markets.
2. **Versatile lens processing for 1- 300 mm**
   Joerg Haas (20+5 min.)
   The choice from various system modules allows specific configuration of production lines for applications such as pre-/fine-grinding, polishing, centering. These solutions range from economic to large and fully equipped machines, and cover various workpiece size ranges as well as optional automation.
3. **G-series: Processing centre for complex optics**
   Joerg Haas, Michael Wagner (20+5 min.)
   The G I and G II processing centres stand for reliable, compact and versatile production tools featuring pre- and fine grinding for spheres and aspheres, centring, faceting, contouring, sawing, drilling, pocket grinding, and scooping.
   LohCAM is a support software package enabling a straight forward transition from optical design to CNC control ready to start production.
4. **Aspheric and form-correction production systems**
   Michael Wagner (20+5 min.)
   The polishing of aspheres is the primary domain of the AII and AI (7-axes) robots. A variety of control software algorithms facilitate excellent surface finishing quality and even freeform polishing. In addition form-correction, based on direct data transfer from measurement equipment, is a key feature.
5. **Coating of precision optics**
   Thomas Glomb, Dr. Michael Sander (20+5 min.)
   Optical coating is a critical production step, and of essential importance for the optical performance. Satisloh offers application specific coating technologies - including sputtering, electron-beam-evaporation, and plasma-enhanced chemical vapour deposition (PECVD) – as well as high performance capabilities for dense layers and fast coating based on plasma-assisted deposition.

Tea Break (16:00 – 16:15)

Questions & Answers (round table; 16:15 – 17:30)

Wednesday-Friday, 2-4 November 2005 • SPIE Proceedings Vol.6148

Large Mirror and Telescopes

Conference Chairs: ***JIANG Wenhan****, Academician, Chinese Academy of Engineering (China)*
Dr. Myung K. Cho*, National Optical Astronomy Observatory (USA)*

Program Committee:

Matt Johns, Carnegie Observatories (USA)
Hans J. Kaercher, MAN Technologie AG (Germany)
WU Fan, Institute of Optics and Electronics, Chinese Academy of Sciences (China)
Kathleen A. Richardson, Univ. of Central Florida/CREOL (USA)
YU Jingchi, Suzhou Univ. (China)
Sung-Kie Youn, Korea Advanced Institute of Science and Technology (KAIST) (Korea)
ZHANG Xuejun, Changchun Institute of Fine Mechanics and Physics, CAS
YUAN Lvjun, Nanjing Institute of Astronomical Optics & Sciences (China)
Seung-Woo Kim, Korea Advanced Institute of Science and Technology (Korea)
FANG Jingzhong, Institute of Optics and Electronics, Chinese Academy of Sciences (China)
Yuri Storyalove, State Optics Institute (Russia)
Gao Bilie, Nanjing Institute of Astronomical Optics & Sciences (China)

- Mirrors for large astronomical and space telescopes
- Light-weighted mirror technology
- Large deployable mirror and telescopes
- New and innovative mirror and telescope designs
- Advanced testing methods for large mirror
- Support systems and structures
- New material for large mirrors

Thursday, 3 November 2005

SESSION 1-1 & 1-2

SESSION 1-1 (20+5min / report)

Room 1: Dongshi room ····· Thurs. 8:30-12:00

Chair: **YU Jingchi**

Tesing facility for large optical systems *(Invited)*, Sergeev P.A., Smirnov V.G., Stolyarov Y.V. (Russia) ····· [1-055]

Active polishing technology for large aperture aspherical mirror and ultra thin mirror *(Invited)*, Xiangqun Cui, Bilie Gao, Xinnan Li (China) ····· [1-044]

Dynamic Aspects of Segmented Mirror Position Control *(Invited)*, Hans J. Kärcher(Germany) ····· [1-022]

10:00—10:30 Tea Break

New developments in the Precessions process for manufacturing free-form, large-optical, and precision-mechanical surfaces *(Invited)*, David Walker,Anthony Beaucamp,Vladimir Doubrovski,Robert Evans,Christie Dunn(U.K) ····· [1-031]

Manufacture of Φ600 R-C optical system, HAO Peiming, LI Xilong, YUAN Liyin, LI Kexin, FU Lianxiao, ZHOU Senlin, WANG Xianmin(China) ····· [1-012]

New solutions for innovative extremely large telescopes *(Invited)*, Gianpietro Marchiori (Italy) ····· [1-040]

Test setup for large size convex mirrors and application to an 8m secondary mirror for an ELT *(Invited)*, B.Delabre(Germany) ····· [1-019]

SESSION 1-2 (20+5min / report)

Room 1: Dongshi room ····· Thurs. 16:00-17:30

Chair: **Gao Bilie**

Support Systems for Segmented Mirrors – an Overview *(Invited)*, Hans J. Kärcher (Germany) ····· [1-023]

Application of steel balls to lens calibration in space solar telescope *(Invited)*, ZHANG Haiying, NI Houkun(China) ····· [1-025]

CFRP solutions on the innovative telescope designs, Francesco Rampini (Italy) ····· [1-039]

Analyzing thermal deformation of large mirrors caused by temperature gradient using a simplified way, Xie Bin(China) ····· [1-034]

Method to minimize the gravity sag of a facing ground Φ1m flat mirror, Yongwei Guo, Xuedong Gu, Shimo Yang(China) ····· [1-006]

POSTER 1

✓ Poster 1 – Thursday, 3 November, 2005

Poster 1 will be displayed Thursday, 3 November and can be viewed from 13:30 to 16:00. Poster author will be able to set up their posters from 12:30 to13:30 on Thursday. Poster author will be present at their posters to answer questions between 13:30 to 16:00 pm. Posters must be removed between 16:30 and 17:30 on Thursday. Posters not removed during this time will be considered unwanted and will be discarded.

- ✓ **Lightweight C/SiC mirrors for space application**, ZHOU Hao, ZHANG Chang-rui, CAO Ying-bin, ZHOU Xin-gui(China) ····· [1-001]
- ✓ **A modified stitching algorithm for testing rotationally symmetric aspherical surfaces with annular sub-apertures**, Xi Hou, Fan Wu, Li Yang, Shi-bin Wu, Qiang Chen(China) ····· [1-002]
- ✓ **Study on thermal analysis of polishing optical mirror surface**, Wang Ping Chen Huifang(China) ····· [1-005]
- ✓ **Research of Large Scale Replicate Mirror of IR Radiant Cooler System for Satellite**, Guoqing Liu, Xuejian Guo(China) ····· [1-009]
- ✓ **Tolerance study of the sub-mirror's surface figure for segmented mirror Synthetic Aperture Optics (SAO)**, Zhang Wei, Deng Jian, Liu Jianfeng(China) ····· [1-013]
- ✓ **Support technique of ultra thin mirror in space optics,** Gao Ming hui Ren Jian yue(China) ····· [1-015]
- ✓ **Optimum design and thermal analysis of lightweight silicon carbide mirror**, HAN Yuan-yuan, ZHANG Yu-min, HAN Jie-cai, ZHANG Jian-han, YAO Wang, ZHOU Yu-feng(China) ····· [1-018]
- ✓ **Processing and Compensating Test of Large Convex Spherical Lens**, Chen Weihua Yang Yu Zhang Bao'an(China) ····· [1-026]
- ✓ **Design of lightweight mirror based on genetic algorithm**, ZHANG Wei YANG Yi(China) ····· [1-028]

Friday, 4 November 2005

SESSION 1-3 & 1-4

SESSION 1-3 (20+5min / report)

Room 1: Dongshi room ····· Friday 8:30-12:00

Chair: **Wu Fan**

Development of active/adaptive lightweight optics for the next generation of telescopes *(Invited)*, M. Ghigo, S. Basso, O. Citterio, D. Vernani, F. Mazzoleni (Italy) ····· [1-048]

Ultra Light-weighted support panels of the main mirror for Extremely Large Telescopes, Gianpietro Marchiori(Italy) ····· [1-038]

Cryo optical testing of large aspheric reflectors operating in the sub mm range *(Invited)*, S. Roose, R. Dadato, D. de Chambure, D. Doyle, Y. Houbrechts, A. Mazzoli, Y. Stockman(Belgium) ····· [1-056]

10:00—10:30 Tea Break

Some Considerations about Structure of Off-axis Segments in Stitching Paraboloidal Mirror, Gao Bilie(China) ····· [1-003]

Properties of Zerodur mirror blanks for extremely large telescopes *(Invited)*, Thorsten Doehring,Peter Hartmann,Ralf Jedamzik,Armin Thomas, Frank-Thomas Lentes(Germany) ····· [1-036]

SESSION 1-4 (20+5min / report)

Room 1: Dongshi room ····· Friday 16:00-17:30

Chair: **FANG Jingzhong**

Surface Measurement Array for Mirror Segment Fabrication *(Invited)*, Terry Mast, David Cowley, Brian Dupraw, and Jim Ward(U.S.A) ····· [1-021]

Measurement Of Large Aspherical Mirrors using Coordinate Measurement Machine during the grinding process, Jing Hongwei,Kuang Long,Cao Xuedong,Fan Tianquan(China) ····· [1-004]

The Formation Theory of Aspheric Surface, Wang yi(China) ····· [1-041]

Mechanical Analysis and Experiment Study of the Φ1m Paraboloidal Mirror, Yongwei Guo, Shimo Yang, Xuedong Gu, Shen Wang(China) ····· [1-011]

POSTER 2

✓ Poster 2 – Friday, 4 November, 2005

Poster 2 will be displayed Friday, 4 November and can be viewed from 13:30 to 16:00. Poster author will be able to set up their posters from 12:30 to13:30 on Friday. Poster author will be present at their posters to answer questions between 13:30 to 16:00 pm. Posters must be removed between 16:30 and 17:30 on Friday. Posters not removed during this time will be considered unwanted and will be discarded.

- ✓ **Evaluating Frequency Error Property of Wavefront of Large Optics by PSD Collapse**, Xiaofeng CHENG, Wanguo ZHENG, Xiaodong JIANG, Huan REN, Jing YUAN, Feng JING (China) ····· [1-014]
- ✓ **Design and fabrication of large scale lightweight sic space mirror**, Zhang jianhan, Zhang yumin, , HAN Jiecai, HE Xiaodong, YAO Wang(China) ····· [1-029]
- ✓ **Finite Element Analysis of the Mirror Room of 2-m Telescope,** Zhao Fu, Wang Ping, Zhao Yuejin, Qi Yuejing, Xin Hongbing(China) ····· [1-030]
- ✓ **FEM analysis of ultra thin mirror supporting structure effect on surface deformation in gravity field**, Huangqitai, Gaoqiang, Yujingchi(China) ····· [1-032]
- ✓ **Active Support of Ultra Thin Mirror**, Ni Ying(China) ····· [1-033]
- ✓ **Research on mirror lateral support of large astronomical telescope**, Xuefei Gong and Xiangqun Cui(China) ····· [1-035]
- ✓ **Study on novel lightweight large aperture mirror used in space infrared camera**, Liu xiaohua(China) ····· [1-042]
- ✓ **3-DOF Parallel Mechanism for Fast Steering Mirror (FSM),** Chen Guimin, Nie Pin, Jia Jianyuan(China)·· [1-043]
- ✓ **Manufacturing model for active lap**, Fan Bin, Wan Yongjian, Yang Li, Zeng Zhige, Wu Fan,Wu Shibin,(China) ····· [1-046]
- ✓ **Manufacturing and Testing of Large-aperture Schmidt Correctors**, Yang Qingwei(China) ····· [1-050]
- ✓ **Study on Installment and Adjustment System of High Precision Optical Synthetic Aperture Technology**, Wang Wuyi, Chen Zhigang, Zhang Guangyu(China) ····· [1-051]

Wednesday-Friday, 2-4 November 2005 • Proceedings of SPIE V.6149

Advanced Optical Manufacturing Technologies

Conference Chairs: **YANG Li,** COMT, COS (China)
Yaolong Chen, Herbert Kubatz GmbH & Co. (Germany)
E.Kley, Friedrich-Schiller-Univ. Jena. (Germany)

Program Committee:

Rongbin Li, Hong Kong Polytechnic University (Hong Kong, China)
Paul Kloceck, ELCAN Optical Technologies (USA)
Xin Qiming, Beijing Institute of Technology (China)
Hans Lauth, Jenoptik Laser, Optik System,GmbH (Germany)
Gerald Klein, LOH Optikmaschinen AG (Germany)
HUI Changshun, Tianjin Jinhang Institute of Technology Physics (China)
ZHANG Jinliang, Xi'an Institute of Applied Optics (China)
Matthias Pfaff, OptoTech Optikmaschinen GmbH (Germany)
Li Wei, Chengdu Fine Precision Optical Engineering Research Centre (China)
Xing Tingwen, Institute of Optics and Electronics, Chinese Academy of Sciences (China)
Yan Jie, Xi'an Institute of Applied Optics (China)

- Optical manufacturing technology reviews and roadmaps
- Aspherical optics design and fabrication
- EUVL optical manufacturing
- Super-precision optical manufacturing
- MEMS & MOEMS Technology
- Optical thin film coatings
- Diamond turning technology
- Optical design and simulation software and tool
- Optoelectronics components and modules integration and manufacturing
- Opto-mechanical components and devices

Thursday, 3 November 2005

SESSION 2-1, 2-2 run concurrent with SESSION 2-3, 2-4

SESSION 2-1 (15+5min / report)

Room 2: Dongyi room ····· Thurs. 8:30-12:00

Chair: **Yaolong Chen**

Progress of Advanced Optical Manufacturing Technology Integrated Line *(Invited)*, Xu Qiao (China) ····· [2-082]

Estimation of Z-Pinch Plasma Radiation Source for EUVL by Using Artificial Neural Networks *(Invited)*, Chaohai. Zhang, S. Katsukia, J.G. Shib, A. Kimuraa, H. Fukumotoa, H. Akiyamaa(Japan) ····· [2-165]

Design and Fabrication of antireflection coating on ZnS substrate, Su Xianjun, Sun Weiguo, He Jiayuan (China) ····· [2-028]

Infrared durable Protective/antireflection Coatings with High Performance on Ge and Si Substrates, Yao Xilin(China) ····· [2-031]

Study on Cooling Temperature Control of APD in the Single-photon Detection System, Zhou Jin Yun(China) ····· [2-050]

10:00—10:30 Tea Break

Integration of optical thin film filters by hydrofluoric acid bonding *(Invited)*, L. Chen, K. Kintaka, H. Nishimura, K. Fukumi, J. Nishii and K. Hirao(Japan) ····· [2-094]

PVD SiC and PVD Si coatings on RB SiC for surface modification, Huidong Tang, Zhengren Huang, Shouhong Tan(China) ····· [2-106]

Influence of tantalum doping on the phase transition of IBED VO2 polycrystalline film, Li Jinhua, Yuan Ningyi, Xie Jiansheng, Chen Hansong(China) ····· [2-114]

SESSION 2-2 (15+5min / report)

Room 2: Dongyi room ····· Thurs. 16:00-17:30

Chair: **Xu Qiao**

Further application and amelioration of our novel CNC aspheric grinding machine *(Invited)*, Jianjun HU, Junhua Pan(China) ····· [2-075]

Photoelectrical Properties of Polyaniline/Polyimide Complex Thin Film, Zheng Jianbang, Ren JU, Zhao Jianlin(China) ····· [2-107]

Properties of Carbon Films by MCECR Plasma Sputtering, Changlong Cai(China) ····· [2-018]

Photo-written three-dimensional optical circuits in iron doped lithium niobate crystals, Peng Zhang, Jianlin Zhao, Honglai Xu, Yanghua Ma, and Dexing Yang(China) ····· [2-120]

SESSION 2-3 (15+5min / report)

Room 3: Dong'er room ····· Thurs. 8:30-12:00

Chair: **E.Kley**

Optical precise molding technology *(Invited)*, XIN, Qiming(China) ····· [2-057]

Manufacturing of aspherical optics by ion beam and measuring techniques *(Invited)*, P. Medart, P. Gailly, V. Busurin, JP. Collette, Y. Stockman(Belgium) ····· [2-169]

Analysis and fabrication of a new two dimensional near infrared pincushion silicon based PSD, Xunjun QI, Meide LIN, Bin LIN, Taicai PAN (China) ····· [2-068]

Research on the Mathematical Model of Fluid Jet Polishing, Fang Hui(China) ····· [2-026]

10:00—10:30 Tea Break

Manufacturing of high precision aspheres *(Invited)*, Uwe Birnbaum(Germany) ····· [2-123]

Micro-phenomenon and viscosity features of magnetorheological fluids at external field, Haobo Cheng, Yongtian Wang, Genrui Cao(China) ····· [2-056]

Subsurface damage mechanisms in Diamond Grinding of BK7 on Tetraform 'C', Qingliang Zhao(China) ····· [2-157]

Transferability of Glass Lens Molding *(Invited)*, Masahide Katsuki(Japan) ····· [2-054]

SESSION 2-4 (15+5min / report)

Room3: Dong'er room ····· Thurs. 16:00-17:30

Chair: **Li Wei**

None linear resonance effects on thin micro structured aluminum metal gratings by high power fs-laser pulses *(Invited)*, Ernst -Bernhard Kley, Tobias Erdmann, Hans-Joerg Fuchs, Andreas Tünnermann(Germany) ····· [2-143]

Fabrication of relief gratings on high photosensitive SiO2/ZrO2 gel film by UV exposure, XuXiang, ZhouBin, LiuChunze, ShenJun, WuGuangming, NiXingyuan, XuChao(China) ····· [2-151]

MOnte-carlo STUDY On numerical aperture OF LENS and the size of focal spots IN TURBID MEDIUM, Wang Jie(China) ····· [2-088]

Computer-Aided Alignment for Space Telescope Optical System, Huang Yifan, Li Lin, Cao Yinhua(China) ····· [2-072]

Optimum exposure distances for 3-D optical circuits induced by laser micromachining in LiNbO3 crystals, Honglai Xu, Peng Zhang, Jianlin Zhao, Dexing Yang, Zhijun Ye, and Yuhan Gao(China) ····· [2-119]

POSTER 1

✓ Poster 1 – Thursday, 3 November

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Friday, 4 November 2005

SESSION 2-5, 2-6 run concurrent with SESSION 2-7

SESSION 2-5 (15+5min / report)

Room 2: Dongyi room ····· Fri. 8:30-12:00

Chair: **Xing Tingwen**

Freeform Diamond Machining of Complex Monolithic Metal Optics for Innovative Astronomical Applications *(Invited)*, Cornelis M. Dubbeldam,David J. Robertson(U.K) ····· [2-167]

Design and Fabrication of Microlens Arrays for Photonics and Telecommunications *(Invited)*, Sandy To, W.B. Lee and C.F. Cheung(HongKong) ····· [2-164]

Effects of RET on process capability for 45nm Technology Node, Fei Zhang, Yanqiu Li(China)····· [2-074]

Improving Model-based Optical Proximity Correction Accuracy Using Improved Process Data Generation, Mark Lu, Curtis Liang, Sc Zou, Lawrence S. Melvin III(China)[2-093]

Polarization aberrations in a Very High Resolution Telescope, zhangying(China) ····· [2-061]

10:00—10:30 Tea Break

Machining characteristics and removal mechanisms of reaction bonded silicon carbide, Yao Wang, Zhang Yu-min, Han Jie-cai, Zhang yun-long, Zhang jian-han, Zhou yu-feng, Han yuan-yuan(China)····· [2-052]

Development on Several Kinds of Micro-optics Fabrication Technology, Yulin Li, Guohua Jiao, Lily Wang, Tonghai Li, Junmin Huo, Baowen Hu(China) ····· [2-024]

Micro-fabrication by femtosecond laser pulses, Yudong Li and et al.(China) ····· [2-105]

Design of rotation ellipsoid focusing cavity for detecting ultraweak biophoton, WU Ping, HE Xiang, DONG Da-xing, LIN You-yi(China)····· [2-162]

SESSION 2-6 (15+5min / report)

Room2: Dongyi room ····· Fri. 16:00-17:30

Chair: **Yan Jie**

A profilometer with sub-nanometer resolution for on-line measurement of the fine optical surfaces *(Invited)*, Zhao-fei Zhou, Wei Huang and Tao Zhang (China)····· [2-158]

Fabrication method of multiple VBGs with directly layered structure and its experimental demonstration, Haibin Wang, Dexing Yang, Jianlin Zhao, Xiarui Guo(China) ····· [2-110]

Preparation of the Multi-layer LiTaO3 Infrared-Detected Functional Thin Film, De-Yin Zhang, Da-Gui Huang(China) ····· [2-115]

Defect study on the infrared thin film of 3.8um, ZHANG Yao-ping1, XU Hong1 , LING Ning, ZHANG Yun-dong (China) ····· [2-136]

SESSION 2-7 (15+5min / report)

Room 3: Dong'er room ····· Fri. 8:30-12:00

Chair: **Xin Qiming**

Wheel wear and damages in precision grinding of optical materials, Paul Shore;Xavier Tonnellier;Xichun Luo;David Stephenson(U.K) ····· [2-019]

Polarization Analysis for Laser Optical System, Fan Yang, Zhiqiang Huang , Tingwen Xing (China) ····· [2-025]

Design of Transmitting Optical Antenna of Free Space Optical Communication, CHEN Jianwen，LIU zili，HUANG zailu(China)····· [2-041]

Optical Design of a Kinds of Optical System for Free Space Optical Communication, Shen Chang-yu , Chen Fei , Yu Xiang-dong (China)····· [2-108]

10:00—10:30 Tea Break

Broadband distributed Raman amplifier using single pump, Lichenxia(China) ····· [2-118]

Characteristics front-illuminated visible-blind UV photodetector based on GaN p-i-n photodiodes with high quantum efficiency, You Da(China)····· [2-078]

Detection apparatus for fluorescent microarray slides, Liqiang Wang(China) ····· [2-112]

Effects of Residual Stresses on Mechanical Properties of Segmented Micro Deformable Mirrors, Yiting YU, Weizheng YUAN, Dayong QIAO(China)····· [2-022]

POSTER 2

✓ Poster 2 – Friday, 4 November

Poster 2 will be displayed Friday, 4 November and can be viewed from 13:30 to 16:00. Poster author will be able to set up their posters from 12:30 to13:30 on Friday. Poster author will be present at their posters to answer questions between 13:30 to 16:00 pm. Posters must be removed between 16:30 and 17:30 on Friday. Posters not removed during this time will be considered unwanted and will be discarded.

Wednesday-Friday, 2-4 November 2005 • Proceedings of SPIE V.6150

Optical Test and Measurement Technology and Equipments

Conference Chairs:

HOU Xun, Academician, CAS (China)
James C. Wyant, Director of Optical Sciences Center, Univ. of Arizona (USA)
Hexin Wang, Carl Zeiss AG (Germany)
Sen Han, VECCO (USA)

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Liu Weiguo, Xi'an Institute of Technology (China)
Gao Limin, Xian Institute of optics and fine mechanics, CAS (China)
Chen Qiang, Institute of Optics and Electronics, Chinese Academy of Sciences (China)
Zhang Rongzhu, Sichuan University (China)

- Modern interferometric technologies
- Test for aspherical optical surface
- Test for super- precision optical surface
- Measurement for super smooth surface
- Measurement of optical thin film
- Test with infrared technologies
- Optical contamination
- Optical test and measurement for nanometer technology
- New and innovative metrology and equipment
- Analysis and modeling tools and software

Thursday, 3 November 2005

SESSION 3-1, 3-2 run concurrent with SESSION 3-3, 3-4

SESSION 3-1 (13+5min / report)

Room 4: Dongsan room ····· Thurs. 8:30-12:00

Chair: **Hexin Wang**

Birefringent laterally Sheared beam Splitter-Savart polariscope *(Invited)*, Zhang Chunmin, Zhao Baochang, Xiang Libin ····· [3-211]

Corrective method of null lens's unsymmetrical error *(Invited)*, Guo peiji (China) ····· [3-050]

Coma Aberration Measurement by Lateral Image Displacements at Different Defocus Positions, Mingying Ma, Xiangzhao Wang, Fan Wang(China) ····· [3-037]

OPTICAL PARAMETERS ANALYSIS OF A SEMI-CONDUCTIVE FILM BASED ON GENETIC ALGORITHM, NingYu(China) ····· [3-085]

Development of an instrument for measuring the curvature of lens, Tan Chilie(China) ····· [3-098]

10:00—10:30 Tea Break

Effect of Surface Roughness on the Measurement of High Power Laser with a Cone-shaped Cavity, wanglei(China) ····· [3-017]

Measurement of Weak Losses and Mirrors' Reflectivity Using Cavity Ring-down with High Accuracy, Dexing Yang, Yajun Jiang, Jianlin Zhao, Nan Di(China) ····· [3-144]

Method for Measuring the Granite Topography of Scanning Wafer Stage with Laser Interferometer, Le He, Xiangzhao Wang, Weijie Shi, Jianming Hu(China) ····· [3-048]

New Approach for Infrared Image Contrast Enhancement, Mingli Shao, Guixi Liu, Xianhong Liu , Dongbo Zhu(China) ····· [3-043]

SESSION 3-2 (13+5min / report)

Room 4: Dongsan room ····· Thurs. 16:00-17:30

Chair: **Wen Shangming**

Study on Unaberrational Points Test for Conic Surface *(Invited)*, HAO Peiming, LI Kexin, YUAN Liyin, FU Lianxiao, LI Xinglong(China) ····· [3-008]

Ellipsometric study of silicon based Si:SiO2 composite thin films under different annealing temperature, Bin Sun, Yuerui Chen, Yufei Kong, Conghui Xu, Yuxiang Zheng, Liangyao Chen(China) ····· [3-034]

Resolution improvement of one dimensional comb-type PSD by subdivision, Xunjun QI, Meide LIN, Bin LIN, Wei JIN, Xiangqun CAO(China) ····· [3-114]

Measurement and Analysis for Optical Radiation of the Glow Discharge Plasma at Atmospheric Pressure, Ren Qinglei, Lin Qi(China) ····· [3-134]

Single-Molecule Spectroscopy inside an Optical Cavity, Guangcun Shana, Shuying Baoa, Wei Huang(China) ·· [3-041]

SESSION 3-3 (13+5min / report)

Room 5: Qinghuang room ····· Thurs. 8:30-12:00

Chair: **Sen Han**

500-mm-aperture wavelength-tuning phase-shifting interferometer *(Invited)*, Liqun Chai, Qiao Xu, Yan Deng , Guiping Cheng, JianCheng Xu(China) ····· [3-087]

Digital realization of precise surface imperfections evaluation system, WANG Feng-quan, YANG Yong-ying, SUN Dan-dan, YANG Li-ming, and LI Rui-jie(China) ····· [3-133]

Wavefront fitting of Interferogram with Zernike polynomials based on SVD, Liping Chang, Zihua Wei, Weixing Shen(China) ····· [3-067]

Development of the Laser Alignment System with PSD in the Shaft Calibration, Jiao Guohua(China) ····· [3-032]

Novel Beam Orienting Mechanism Using Beam Nutating And Coherent Detecting Technologies, Tao Jin, Hudi Pan, Jin Liu, Lei Gu (China) ····· [3-110]

10:00—10:30 Tea Break

Analysis on influence of Luminance in MTF measurement within infrared spectral bands, Dong Wei, Zhou Renkui(China) ····· [3-186]

High resolution digital holography with two confocal lenses, Qi Fan, Jianlin Zhao, Jun Wang, Juan Du(China) ····· [3-163]

On an optical fiber interferometric system for the non-contact measurement of atmospheric turbulence, Haiping Mei, Ruizhong Rao(China) ····· [3-070]

Research on Technology of Digital-Edge Testing, Jun ZHANG, RongZhu ZHANG, Bangwei CAI(China) ····· [3-112]

Ultra-sensitive Near-field Raman Detection Technique, Wu shifa, Liu kun(China) ····· [3-180]

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Room 5: Qinghuang room ····· Thurs. 16:00-17:30

Chair: **Chen Qiang**

Study on precise measurement of high reflectivity by cavity ring-down spectroscopy *(Invited)*, ren gang, cai bang wei, zhang bin, xiong sheng ming, huang wei(China) ·· [3-194]

Thermal temperature measurement and dynamic analysis system based on USB 2.0, Lingxue Wang, Shiming Shi, Weiqi Jin, Yuanmeng Zhao, Kun Ding, Xia Wang(China) ····· [3-096]

Measurement of convex aspheric lens' optical performance using Computer Generated Holograms, Qi Yuejing, Wang Ping , Xie Jinghui , Kang Guoguo(China) [3-039]

Long Distance Precision Measurement with Bi-Modulation Laser, FU Jihua, WANG Zhongyu(China) ····· [3-182]

Research on Digitized Integral Test System for Performance Evaluation of Image Intensifier and Intensified CCD, WANG Xia JIN Weiqi GAO Zhiyun WANG Zhihong(China) ····· [3-155]

POSTER 1

✓ Poster 1 – Thursday, 3, November

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Friday, 4 November 2005

SESSION 3-5, 3-6 run concurrent with SESSION 3-7, 3-8

SESSION 3-5 (13+5min / report)

Room 4: Dongsan room ····· Fri. 8:30-12:00

Chair: **Zhao jianlin**

A full-vectorial FDFD analysis of Photonic Crystal Fibers *(Invited)*, Wenwen Gu, Jianlin Zhao, Li Cui, Jianping Hou(China) ····· [3-162]

Study on Near Infrared Technology of Measuring Moisture, Guo yongcai Chen zhao(China) ····· [3-206]

Temperature sensor with microstructure fiber based ruby fluorescence lifetime, Jianping Hou, Jianlin Zhao, Jing Xie, Wenwen Gu(China) ····· [3-205]

Micro-structured optic fiber system for pressure sensing, Xiaosu YI, XIAO Wen, Li Rui(China) ····· [3-199]

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A novel targeting method based on non-diffracting interference technique, Zhongyu Wang, Cong Zhou(China) ····· [3-061]

Design and DSP implementation of star image fast acquisition and star point fast acquiring & tracking, Guohui Zhou，Xiaodong Wang，Zhihang Hao(China) ··· [3-102]

Study on Image matching of 3-D measurement system on dynamic object in long distance, Zhang Xiaoling, Lin Yuchi, Wu bo, Zhao Meirong, Huang Yinguo(China) ····· [3-066]

Wavelet digital filter method of image processing on 3D measurement profilometry, Y.S. WANG1, S. FU, J.Q. XU, C.L. S.C. SI, C.Y. GAO(China) ····· [3-002]

Study on Field Weed Recognition in Real-time, Yong He,Jiazhi Pan, Yun Zhang(China) ····· [3-119]

SESSION 3-6 (13+5min / report)

Room 4: Dongsan room ····· Fri. 16:00-17:30

Chair: **Zhang Rongzhu**

Microscopic Scattering Image-forming System of Defects on Ultra-smooth Surface Suitable for Digital Image Processing, SUN Dan-dan, YANG Yong-ying, WANG Feng-quan,YANG Li-ming, LI Rui-jie(China) ····· [3-126]

A Novel Fusion Scheme for Infrared and Visual Images Based on Wavelet and Color Transfer Algorithm, Guixi Liu, Xianhong Liu, Mingli Shao, Dongbo Zhu(China) ····· [3-044]

Rock fracture image acquisition by using both visible optical and Ultraviolet illuminations, Wang Weixing(China) ····· [3-188]

Bar code Gauge Identification System Based On DSP, LI Jinhui， GONG Jian，Fan Huimin(China) ····· [3-192]

Primary Research on Image of plasma in CO2 Laser welding by High-speed Photography, Jinhe Liu, Licai Ma; Yaozheng Xie(China) ····· [3-193]

SESSION 3-7 (13+5min / report)

Room 5:Qinghuang room ····· Fri. 8:30-12:00

Chair: **Liu Weiguo**

Compensation and Test of Reflective Mirror *(Invited)*, HAO Peiming, FU Lianxiao, YUAN Liyin, LI Weiwei, PAN Baozhu, (China) ····· [3-009]

Parameters Choice in Confocal Technology, Wangzhao， Li jinian， Zhu Shencheng， Jiang Kejian(China) ····· [3-201]

Research on Parameter of Grating Digital Subdivision, Cao Xiangqun(China) ····· [3-080]

Optimum Design of the staring uncooled infrared camera, Li Yingwena, Pan Debin, Liu Aidong, Geng Anbing, Li Yong, He Jun(China) ····· [3-131]

10:00—10:30 Tea Break

Design of coherent optical interferometric system, JianCheng Xu(China) ····· [3-088]

Research on the technique of grating nanometer-subdivision, Xu Jin(China) ····· [3-079]

InGaAs trap detector for use as near-infrared transfer standard for detector calibrations, Jim wang(China) ····· [3-197]

Evaluation of the effective resolution of a machine vision measurement system based on variance and correlation analysis, JiYu(China) ····· [3-149]

Optical-Fiber Interferemetric Spectrometer, Yong LIU, Baosheng LI, Yan LIU, Yufeng ZHAI, An WANG(China) · [3-007]

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Room5:Qinghuang room ····· Fri. 16:00-17:30

Chair: **Gao Limin**

Digitalization measurement of structure parameters of the optic low-pass filter, Yunchuan Li, Bin Lin, Zhuangfei Wu, Liewei Zhu, Xiangqun CAO(China) ····· [3-100]

Resonant spectra of asymmetric microcavity, Yiping Han Guoxia Han Jianyong Liu(China) ····· [3-121]

Image-based Optical Detecting System Used for the Analysis of Human Activities, Jinkuan Tang、Danhua Cao、Yubin Wu(China) ····· [3-111]

Universal tool microscope remanufacture based on CCD, KANG Jian , HU Zhongxiang, ZHANG Xunming ZHANG Jiaying (China) ····· [3-090]

POSTER 2

✓ Poster 2 – Friday, 4, November

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[1-001]	Lightweight C/SiC mirrors for space application	ZHOU Hao, ZHANG Chang-rui, CAO Ying-bin, ZHOU Xin-gui(China)	Poster 1
[1-002]	Modified stitching algorithm for testing rotationally symmetric aspherical surfaces with annular sub-apertures	Xi Hou, Fan Wu, Li Yang, Shi-bin Wu, Qiang Chen(China)	Poster 1
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[1-004]	Measurement Of Large Aspherical Mirrors using Coordinate Measurement Machine during the grinding process	Jing Hongwei,Kuang Long,Cao Xuedong,Fan Tianquan(China)	SESSION 1-4
[1-005]	Thermal analysis of polishing optical mirror surface	Wang Ping Chen Huifang(China)	Poster 1
[1-006]	Method to minimize the gravity sag of a facing ground Φ1m flat mirror	Yongwei Guo, Xuedong Gu, Shimo Yang(China)	SESSION 1-2
[1-009]	Research of Large Scale Replicate Mirror of IR Radiant Cooler System for Satellite, Guoqing Liu	Xuejian Guo(China)	Poster 1
[1-011]	Mechanical Analysis and Experiment Study of the Φ1m Paraboloidal Mirror	Yongwei Guo, Shimo Yang, Xuedong Gu, Shen Wang(China)	SESSION 1-4
[1-012]	Manufacture of Φ600 R-C optical system	HAO Peiming, LI Xilong, YUAN Liyin, LI Kexin, FU Lianxiao, ZHOU Senlin, WANG Xianmin(China)	SESSION 1-1
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[1-014]	Evaluating Frequency Error Property of Wavefront of Large Optics by PSD Collapse	Xiaofeng CHENG, Wanguo ZHENG, Xiaodong JIANG, Huan REN, Jing YUAN, Feng JING	Poster 2
[1-015]	Support technique of ultra thin mirror in space optics	Gao Ming hui Ren Jian yue(China)	Poster 1
[1-018]	Optimum design and thermal analysis of lightweight silicon carbide mirror	HAN Yuan-yuan, ZHANG Yu-min, HAN Jie-cai, ZHANG Jian-han, YAO Wang, ZHOU Yu-feng(China)	Poster 1
[1-019]	Test setup for large size convex mirrors and application to an 8m secondary mirror for an ELT	B.Delabre(Germany)	SESSION 1-1
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[1-023]	Support Systems for Segmented Mirrors – an Overview	Hans J. Kärcher (Germany)	SESSION 1-2
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[1-028]	Design of lightweight mirror based on genetic algorithm	ZHANG Wei YANG Yi(China)	Poster 1
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[1-048]	Development of active/adaptive lightweight optics for the next generation of telescopes	M. Ghigo, S. Basso, O. Citterio, D. Vernani, F. Mazzoleni (Italy)	SESSION 1-3
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[2-004]	Chip Design of Linear CCD Drive Pulse Generator and Control Interface	Cai Rong-tai, Sun Hong-hai, Wang Yan-jie(China)	Poster 1

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[2-008]	Refractive index analysis of graded index coatings prepared by reactive magnetron sputtering	Zicai Shen Weijin Kong Shijie Liu Jian Shen Jianda Shao Zhengxiu Fan (China)	Poster 1
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[2-022]	Effects of Residual Stresses on Mechanical Properties of Segmented Micro Deformable Mirrors	Yiting YU, Weizheng YUAN, Dayong QIAO(China)	SESSION 2-7
[2-023]	Design of Multi-layer Dielectric Grating Film with non-quarter wave coatings	Shijie Liu, Weijing Kong, Zicai Shen, Jian Shen, Hongbo He, Jianda Shao, Zhengxiu Fan(China)	Poster 1
[2-024]	Development on Several Kinds of Micro-optics Fabrication Technology	Yulin Li, Guohua Jiao, Lily Wang, Tonghai Li, Junmin Huo, Baowen Hu(China)	SESSION 2-5
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[2-026]	Research on the Mathematical Model of Fluid Jet Polishing	Fang Hui(China)	SESSION 2-3
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[2-037]	Study of the optical properties of ZnO thin films prepared by laser molecular beam eptaxiay	Ju Kairu, Xu Zhongfeng(China)	Poster 1

[2-038]	Principle and FEA analysis about a Deformable Mirror actuated by liquid drops	WANG Hao(China)	Poster 1
[2-040]	Novel nano-scale overlay alignment method for Room-temperature Imprint Lithography	Li Wang, Yucheng Ding, Bingheng(China)	Poster 1
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[2-049]	Temperature Field Simulation of Thin Plate Heated by CO2 Laser Beam	LI Chongguang, LI Junchang, FAN Zebin(China)	Poster 1
[2-050]	Study on Cooling Temperature Control of APD in the Single-photon Detection System	Zhou Jin Yun(China)	SESSION 2-1
[2-051]	Computer Simulation for the Theory of a New Optical Sensor for Measuring Acceleration	Weijun Kong, Shuhai Jia(China)	Poster 1
[2-052]	Machining characteristics and removal mechanisms of reaction bonded silicon carbide	Yao Wang, Zhang Yu-min, Han Jie-cai, Zhang yun-long, Zhang jian-han, Zhou yu-feng, Han yuan-yuan(China)	SESSION 2-5
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[2-055]	RESEARCH ON THE TECHNOLOGY OF LASER MACHINING INTERIOR CONTOUR	Yao Bin(China)	Poster 1
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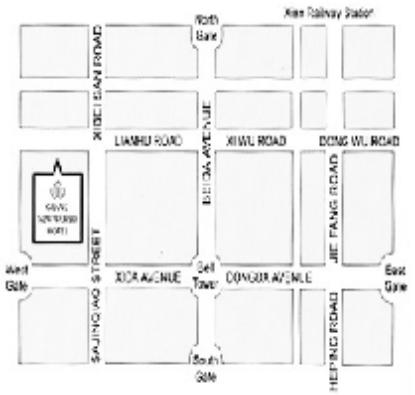
Symposium Location

Grand New World Hotel Xi'an 4★

LOCATION
In central Xi'an, near to the West Gate, around the corner of Sajinqiao and Lianhu Road, ten minutes walk to Xi'an ancient city wall or Islamic Mosque or local people market

General Manager:Mr.Michael Lew
Director of Sales:Ms.Xia Ming
Hotel Opened Feb 18,1989
Transportation:

To airport:	*45km*
To railway station:	*4 km*
To city centre:	*1.5 km*
Museum of Terra-cotta warriors	*35km*
Banpo Museum	*10km*
Big Wild Goose Pagoda	*5km*



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Registration Information

SPIE Members, Conference Committee

Members, and Authors	*$400*
Others	*$450*

Full registration include: one banquet ticket, admission to all conference sessions, and one conference proceeding.

Tea/Coffee and Lunch Breaks

See the individual conference programme for times.

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For visa application letter and information, please send e-mail to: **chq@ioe.ac.cn**
Please consult your travel agent or oversea Chinese Consulate web site for visa requirements. If you plan to tour before or after the conference, you may apply for a tourist visa that does not need visa invitation letter.

Audio Visual Equipment

Meeting rooms will contain overhead and data projectors. Additional equipment will
be made available only by special arrangement and may involve a rental fee.

Oral and Poster Presentation

For Oral Presentation, we will provide a computer to release the paper with the format of PPT (Microsoft PowerPoint).

For Poster presentation, we will provide a bulletin board in an individual room to release the paper.

Overseas Visitors Airport Picking up

Authors from outside of the mainland will be picked up at XianYang Airport (Xi'an) by Conference Organization.

Please take me to the Grand New World Hotel, Thank you!
请送我到西安新世纪大酒店，谢谢！

Currency Exchange

In China, only RMB is used. However, exchange centers can be found at airports, most hotels and large shopping centers. When exchanging money, please keep your receipt by which you can change any remaining RMB back to foreign currency when leaving China. Visa, Master, American Express, Diners Club, JCB, and other credit cards are accepted in many department stores and hotels. But it might be difficult to draw cash with credit cards. The Bank of China and most hotels can cash travelers cheques issued by and foreign bank or financial institution. Participants will need to show a passport and pay a 0.75 percent commission. Traveler's cheque signed over to a third party cannot be cashed in China, but can be presented for collection through for the Bank of China.

Travel Information

The capital of Shaanxi province, **XI'AN** is a manufacturing town of five million inhabitants and holds a key position in the fertile plain between the high loess plateau of the north and the Qingling Mountains to the south. It's one of the more pleasant of Chinese cities, more prosperous than any other city in inland China except Chengdu, with streets full of Japanese cars, stores flooded with consumer goods, and stylish locals in the new discos. As the de facto capital of China's west, Xi'an is also the base of the government's Xibu Da Fazhan (Develop the West) campaign that's sputtering along. Its tourism industry, of course, means Xi'an already is far more developed than the surrounding area, a fact suggested by the large numbers of rural migrants who hang around at informal labour markets near the city gates. The city is also a primer in Chinese history, as between 1000 BC and 1000 AD it served as the imperial capital for eleven dynasties. You'll find a wealth of important sites and relics hereabouts: Neolithic Banpo, the Terracotta Army of the Qin emperor, the Han and Tang imperial tombs, and in the city itself, the Goose Pagodas of the Tang, the Bell and Drum towers and Ming city walls, as well as two excellent museums holding a treasury of relics from the most glamorous parts of Chinese history. Despite the drawbacks of pollution (many of the locals walk around with white face masks on) and congestion, common to all rapidly industrializing Chinese cities, Xi'an is very popular with foreign residents, and many come here to study, as the colleges are regarded as some of the best places to learn Chinese.

Bell Tower

Ban Po Museum

Famen Temple & Museum

Qin Terra-cotta Warrior and Horses Museum

THE MUSEUM OF THE FIRST EMPEROR'S TERRA-COTTA WARRIORS AND HORSES :

The museum is located in Lintong District,35 kilometers away from the urban area. In march,1974 when several farmers were sinking a well ,they came upon many fragments of terra-cotta figures. The results of archaeological excavation showed that it was an oblong pits with terra-cotta warriors and horses. Again in 1976 , two pits were discovered 20meters and 25meters north of the former one respectively . They were named pit1, pit2, and pit3 by order of discovery . The three pits cover a total area of 22,780 square meters. The museum of first Qin emperor ,one of the top ten places of historical interest in China ,was listed as the world heritage by the UNESCO about a decade ago. Pit 1 takes an oblong shape. It is 230 meters long ,62 meters wide and 5meters deep, it covers an area of 14,260 square meters. The terra-cotta warriors horse in pit 1 are arrayed in battle formation .According to the density of the formation in each trial , it is assumed that more than 6,000 terra-cotta warriors and horses could be unearthed from pit 1,most of which are infantrymen . pit 2 is measured 6,000square meters ,L-shaped and consists of four different mixed military forces in four array as .It is estimated that there are over 1,000 terra-cotta figsure , 500horse-drawn chariots and saddled horses. Pit 3 is concave shape , totaling about 520square meters .One chariot ,four terra-cotta horses and 68 clay armored warriors were unearthed from it. Unerathed in this pit were a remaining deer-horn and animal bones .This is probably the place where sacrificial offerings and war prayer were pratised .Judgeing by the layout of pit 3 ,this is most likely the headquarters directing the mighty underground army.