The 2nd International Symposium on Precision Opto-Mechatronics Technology (SPOMT 2016)

Conference Guide

Sponsor:
Beijing Institute of Control Devices (BICD)

Co-Sponsors:
CASC Science and Technology Committee
CASC International Cooperation Department

The 2nd International Symposium on Precision Opto-Mechatronics Technology (SPOMT 2016)

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Agenda

Thursday afternoon (14:00-20:00), 27th Oct. 2016
Registration
Venue: Holiday Inn Beijing Chang An West (Address: No.66 Yongding Road, Beijing)

Friday morning (9:00-10:00), 28th Oct. 2016
Opening Ceremony of the 2nd International Symposium on Precision Opto-Mechatronics Technology (SPOMT 2016)
Venue: Conference Room,3rd Floor,Holiday Inn Beijing Chang An West

Opening Ceremony (9:00-10:00)

Conference Host
Daping Chu, Director and Chairman of CAPE (Centre for Advanced Photonics and Electronics) and Director of Centre for Photonic Devices and Sensors Group in Cambridge University Engineering Department

Time	Events	
9:00-9:10	Introduce the Guests	
9:10-9:20	Welcoming Address	Wei Wang, Academician of Chinese Academy of Sciences Head of Beijing Institute of Control Devices, Chairman of the 2nd International Symposium on Precision Opto-Mechatronics Technology (SPOMT 2016)
9:20-9:45	Group Photo +Break	
9:45-11:45	Plenary Session (Details in Plenary Session)	Venue: Conference Room,3rd Floor,Holiday Inn Beijing Chang An West
11:45-13:30	Lunch	Florence Restaurant,2nd Floor,Holiday Inn Beijing Chang An West
13:30-15:00	Programme Session (Details in Programme Session)	Venue: Conference Room,3rd Floor,Holiday Inn Beijing Chang An West
15:00-15:15	Break	
15:15-18:15	Programme Session (Details in Programme Session)	Venue: Conference Room,3rd Floor,Holiday Inn Beijing Chang An West
18:30	Dinner	Florence Restaurant,2nd Floor,Holiday Inn Beijing Chang An West

Preliminary Conference for the Journal

Friday Evening (19:30-20:30), 28th Oct. 2016
Venue: Conference Room B, 3rd Floor, Holiday Inn Beijing Chang An West

Participants:Wei Wang, Daping Chu, Richard Penty, Tarik Bourouina,Xuefeng Wang

Plenary Session		
Friday morning (10:00-12:00), 28th Oct. 2016		
Venue: Conference Room, 3rd Floor, Holiday Inn Beijing Chang An West		
Time	Events	
9:45-10:15	Overview of Optical Systems Research at Cambridge University	Ian White, Deputy Vice Chancellor of the University and Head of the Photonic Research Group, comprising CMMPE, CPS and Photonics and Sensors, in the Engineering Department at the University of Cambridge
10:15-10:45	Overview of Beijing Institute of Control Devices (BICD)	Zede Jiao, Vice President of BICD,China
10:45-11:15	Encoding and Transmission of Monitoring Data in Information-efficient Radio Networks	Oleksandr Koval, Vice-rector of National Technical University of Ukraine "Kyiv Polytechnic Institute"
11:15-11:45	The Promise of MEMS Inertial Sensors to the Navigation and Mapping Communities	Naser El-Sheimy, Professor and former Head of the Department of Geomatics Engineering, the University of Calgary, Canada

4 Programme Session 1

Programme Session 1

Friday afternoon (13:30-18:15), 28th Oct. 2016
Venue: Conference Room, 3rd Floor, Holiday Inn Beijing Chang An West
Programme Session 1 Host
Xuefeng Wang, Director of Research and Development Center in BICD
Andrea Maria Di Lellis, General Manager of AMDL Co., Italy

Time	Report	Speaker	Host
13:30-14:00	Phase-only Spatial Light Modulators and Applications	Daping Chu, Director and Chairman of CAPE (Centre for Advanced Photonics and Electronics) and Director of Centre for Photonic Devices and Sensors Group in Cambridge University Engineering Department	Xuefeng Wang
14:00-14:30	Photonic MEMS for Chip Scale Optical Instrumentation	Tarik Bourouina, Professor of University Paris-Sud, Orsay, France	
14:30-15:00	High Reliability DPU (HIREL DPU)	Andrea Maria Di Lellis, General Manager of AMDL Co., Italy	
15:00-15:30	The Research Progress of Aerospace Quantum Technology	Yuanxing Liu, Assistant Director of Quantum Technology department in R&D Center, BICD, China	
15:30-15:45	Break		
15:45-16:15	Guided Wave and Free Space Visible Light Communications	Richard Penty,Professor of Photonics,University of Cambridge,UK	Andrea Maria Di Lellis
16:15-16:45	Hollow and Multicore Optical Fibres, from Laser Cutting to Astronomy and Medicine	William Wadsworth, Professor in the Department of Physics, University of Bath, UK	
16:45-17:15	Increasing of Q-Factors of Metal Shell Resonators by Avoidance of “Bad Sizes” Maximizing Thermo-Elastic Damping	Hui-Nam Rhee, Professor of Department of Mechanical and Aerospace Engineering, College of Engineering, Sunchon National University, Korea	
17:15-17:45	Sound Detection and Ranging- Drone Sensing Device	Giampietro Casasanta, Research fellow of Institute of Atmospheric Science and Climate, Italy	
17:45-18:15	High Power Fiber Laser and its Applications	Meng Jiang, Project Leader of Electrooptical Technology department in R&D Center, BICD ,China	

Programme Session 2

Friday afternoon (13:30-16:45), 28th Oct. 2016
Venue: Conference Room, 3rd Floor, Holiday Inn Beijing Chang An WestProgramme Session 2 Host
Gang Guo, Vice President of BICD
Vadym Avrutov, Professor of Spacecraft and Navigation Department, National Technical University of Ukraine (Kiev Polytechnic Institute)

Time	Report	Speaker	Host
13:30-14:00	High Speed Interferometric Method of Analysis of Large-erea Optical Surfaces	Gregory Toker, Former Senior Researcher in Israel Weizmann Institute, Incumbent Senior Consultant of companies in US and Israel	Gang Guo
14:00-14:30	Noncontact Position and Attitude Measurement Optoelectronic System of Real-time and Long Distance	Igor Gurevich, President of Advanced Micro-Optics System Company, Germany	
14:30-15:00	3D-Calibration of the Inertial Measurement Unit	Vadym Avrutov, Professor of Spacecraft and Navigation Department, National Technical University of Ukraine (Kiev Polytechnic Institute)	
15:00-15:30	Products and Applications about Mobile Satellite Communications	Yuanhang Chen, Associated Director of Mobile Satellite Communications Division, BICD , China	
15:30-15:45	Break		
15:45-16:15	Particularities of Development of Inertial Navigation Systems with Hemispherical Resonator Gyroscope	Sergii Ponomarenko, Professor of Spacecraft and Navigation Department, National Technical University of Ukraine (Kiev Polytechnic Institute)	Vadym Avrutov
16:15-16:45	Test and Motion Simulation Series Equipments for Inertial Components	Jianming Ma, Vice Director of Testing and Simulation Device Department, BICD, China	

Report, Abstract and Biography

Name: Wei Wang

Title: Academician President

Organization: Beijing Institute of Control Devices (BICD), China

Biography:

Professor Wei Wang is academician of Chinese Academy of Sciences. He is one of the leading scientists in the fields of inertial technology and optical fiber sensing technology in China. With nearly 30 years experience in this field, he has published over 49 professional papers, has been awarded 26 Patents, and authored and co-authored 3 technical books. Professor Wei Wang has ever been the presiding designer of kinds of optical fiber sensors, including FOG and its inertial system for various crafts, he has proposed new optical fiber sensor technology system, described the error mechanism and its suppression methods systemically, and has been appointed the chief scientist of inertial system and optical fiber sensor system for space application in Chinese Aerospace Science Corporation (CASC). Professor Wei Wang is also president of Beijing Institute of Control Devices of CASC, a precision optical mechatronics advanced information technology institute with more than 4000 employees, including 800 with Ph.D. degrees and M.D degrees.

Name: Ian White

Title: Deputy Vice Chancellor

Organization: University of Cambridge, UK

Report: Overview of Optical Systems Research at Cambridge University

Abstract:

This presentation will discuss research carried out on optoelectronic components and systems at the Centre for Photonic Systems at the University of Cambridge. After an overview of the research of the group, the presentation with report on two projects within the Centre for Advanced Photonics and Electronics which is sponsored by BIACD, paying particular attention to studies in radio signal distribution technology.

Research in Cambridge into RF over fibre technology originally grew out of studies into uncooled systems for Ethernet data links. Working with colleagues at University College London, it was shown that it was possible to transmit RF signals at carrier frequencies well beyond the bandwidth of multimode optical fibre, in one demonstration successful transmission of a signal with a carrier frequency of 20GHz being achieved through a fibre with a bandwidth specified at 500MHz. This work has resulted in a growing number of successful installations of the technology in high profile buildings such as the Emirates Stadium in London and the Yankee's Stadium in New York.

To date in-building Distributed Antenna Systems (DAS) systems have primarily been analogue and this results in limitations in the number of wireless channels, and hence the capacity, that can be transmitted over an individual optical fibre. In the past, if digital systems have been used, they have typically been configured for known, pre-determined, RF modulation formats and protocols, and require very high bandwidth digital links to transmit the signals. Up to now, this has been acceptable because conventional DAS systems have been used to ensure good coverage for mobile services with capacity requirements being relatively modest. For future systems therefore, where capacity will become as important as coverage, a different technology is required. Working with BIACD, we have been delighted to develop a system concept which is able to solve this problem. Indeed one which is able to use low bandwidth links such as twisted-pair cables. The technology also offers the creation of new service models which new companies could adopt, in effect creating the mobile service equivalent to 'cloud computing'. The presentation will describe this approach in detail.

Biography:

Professor Ian White is currently Master of Jesus College, van Eck Professor of Engineering, Deputy Vice-Chancellor and Head of Photonics Research at the Department of Engineering, University of Cambridge. Ian is originally from Northern Ireland, coming up to Jesus College in 1977 to read Engineering. He gained his BA and PhD degrees from the University of Cambridge in 1980 and 1984. He was then appointed as a Research Fellow and Assistant Lecturer at the University of Cambridge before becoming Professor of Physics at the University of Bath in 1990. He moved in 1996 to the University of Bristol, before returning to the University of Cambridge in October 2001. At Cambridge he has also previously held the roles of Head of the School of Technology and Pro-Vice-Chancellor for Institutional Affairs. Ian has contributed to a variety of research activities in photonics, ranging from short pulse laser diodes, optoelectronic components for signal processing and routing, high speed components for data communications, to techniques for transmitting digital and radio frequency signals over long distances of multimode optical fibre. He has published in excess of 900 journal and conference papers, and is co-founder of Zinwave Ltd and Pervasid Ltd. He is an editor of Electronics Letters and Nature Microsystems and Nanoengineering. Ian is a Fellow of the Royal Academy of Engineering, the Institution of Electrical Engineers and the Institute of Electrical and Electronics Engineers. He is heavily involved in policy development and administration of research and sits on a number of International Conference Committees. He was a Member of the Board of Governors of the IEEE Photonics Society (2008-2012).

Name: Zede Jiao

Title: Vice President

Organization: Beijing Institute of Control Devices (BICD), China

Report: The Development and Industrial Orientation of BICD

Abstract:

This report is an overview introduction of BICD. BICD was founded in 1960. Along the track of striving to be the most significant inertial technology and products development & production base, BICD has been given an irreplaceable role with the industry.

Through generations of endeavors in innovative development of inertial technology, BICD has made great breakthroughs in key technologies of critical importance to the next-generation inertial components in inertial platform systems, flexure gyro &inertia systems, optical gyro & inertial systems and other inertial systems, special test equipment, special photoelectric sensing information systems and other hi-tech products. Those products were successfully applied in multiple fields for the first time, giving a great impetus to the development of China aerospace industry and economy.

Biography:

Zede Jiao, Vice President of BICD, part-time Vice President of CASC IoT Technology Application Research Institute, Vice Chairman of China Association for Pharmaceutical Equipment. He was awarded the CASC Innovation Space Reward and first reward of China Machinery Industry Science and Technology. He is mainly responsible for the development and promotion of Space military and Civilian Integration of BICD.

Name: Oleksandr Koval

Title: Vice-rector

Organization: Encoding and transmission of monitoring data in information-efficient radio networks

Report: Encoding and transmission of monitoring data in information-efficient radio networks

Abstract:

Remote monitoring of the various nature objects, events, phenomena and the raw data transfer from sensors and video sensors including the monitoring data (MD), transfer from the mobile robots and unmanned plane are efficiently implemented using object system (ObS) sensor and local regional radio networks with self organization of the information packages (IP) transmitting and relaying to the long distance remote servers and subscribers. Since the monitoring radio networks ObS are oriented on long-time operation in continuous data acquisition mode, storage, MD transmission and powered by independent energy sources an important task of the ObS is to minimize the input monitoring data streams and convert them at the output protected (crypto- and noise-stable) IP data of which are subject to data accumulation means the ObS and transmission with entry rate or at the requests of a base station or radio remote ObS.

Improving the efficiency of the packet radio communications greatly depends on the methods and algorithms of encoding the raw data to be transmitted, algorithms, code-forming signal sequences (CSS) IP with consideration of the noise level in the channel and remote IP transmission to radio network subscribers by using the main and backup retransmission routes of packets. The quality of these algorithms depends largely on the radio system characteristics, including maximum speed of data transmission, efficiency, reliability and security of IP transmission to the remote subscribers. The submitted radio networks are called "highly informative" (high information) or "effective information" radio networks and a base foundation of effective functioning of the networks is formed by processing algorithms, coding and transmission optimized for speed and accuracy . Improving the efficiency of IP transmission in the information-efficient radio networks is achieved by minimizing of the IP number transfers by each ObS , decreasing their duration at high IP information capacity.

Achieving of high information efficiency of the existing and future radio networks based on the use of high-performance processors and the user's software and hardware implementation for various type (functionality) and level (complexity and performance of relevant techniques and algorithms) adaptive processes during input, processing, coding and data transmission.

Biography:

Alexander Koval is the head of department of the Institute of System Research and Information Technologies at the Academy of Technological Sciences of Ukraine. He works as a senior researcher at the Institute for Information Recording of National Academy of Sciencesof Ukraine (NASU IIR). The direction of research undertaken by Alexander Koval, is related to the development of theoretical and technological bases for the construction of complex information analysis systems (decision support systems), namely the methodology of analytical component. Concurrently he is an associate professor at the NTU “KPI" and lectures the course "Problem-oriented modeling and design of complex systems.”

The purpose of the PIAS ES is to ensure the preparation of the decisions of the President of Ukraine, Cabinet of Ministers of Ukraine and inform ing the Supreme Council of Ukraine and the National Security and Defense Council of Ukraine on prevention of emergency situations (ES) and response by addressing the problems of processing, analyzing and providing complete and accurate information on emergencies. Alexander Koval as the first deputy chief designer PIAS ES coordinates the work of implementing agencies involved in the creation of the National Assembly PIAS in order to control the quality and timing of development, observance of technical requirements, the introduction of standard design decisions when developing and implementing Ingredients PIAS ES.

Name: Naser El-Sheimy

Title: Professor and former Head of the Department of Geomatics Engineering

Organization: University of Calgary,Canada

Report: The Promise of MEMS Inertial Sensors to The Navigation and Mapping Communities

Abstract:

Navigation is a field that has been fascinating humankind for thousands of years and these pillars have been evolving with new technological advancements. The current market in positioning and navigation is clearly dominated by GNSS. Besides being globally available, it provides the whole range of navigation accuracies at very low cost. It is also highly portable, has low power consumption, and is well suited for integration with other sensors, communication links, and databases.

At this point in the development of navigation technology, the need for alternative positioning systems only arises because GNSS does not work in all environments. Furthermore, there has been a constant push to develop navigation systems that are accurate, continuous and easy to afford. Needless to say that cost and space constraints are currently driving manufacturers of Guidance, Navigation & Control systems to investigate and develop next generation of low cost and small size navigation systems to meet the fast growing indoor navigation and location services market demands. Advances in inertial navigation and more specifically Micro-Electro-Mechanical Systems (MEMS) technology have shown promising light towards the development of such systems. MEMS are integrated micro devices or systems combining electrical and mechanical components whose size ranges from micrometers to millimeters. MEMS is an enabling technology and the MEMS industry has a projected 10-20% annual growth rate to reach 240 billion US$ market by 2016. Advances in MEMS technology combined with the miniaturization of electronics, have made it possible to produce chip-based inertial sensor for use in measuring angular velocity and acceleration. These chips are small, lightweight, consumes very little power, and extremely reliable. It has therefore found a wide spectrum of applications in the automotive and other industrial applications. MEMS technology, therefore, can be used to develop next generation Guidance, Navigation & Control systems that are inexpensive, small, and consume low power (microwatt).

Biography:

Dr. Naser El-Sheimy is Professor and former Head of the Department of Geomatics Engineering, the University of Calgary. He hold a Canada Research Chair (CRC) in Geomatics Multi-sensor Systems and the scientific director of TECTERRA Centre of Excellence for Commercialization and Research. His research expertise includes Geomatics multi-sensor systems, GPS/INS integration, and mobile mapping systems.

Dr. El-Sheimy published two books, 6 book chapters and over 450 papers in academic journals, conference and workshop proceedings, in which he has received over 30 national and international paper awards. He supervised and graduated over 60 Masters and PhD students. He is the recipient of many national and international awards including the ASTech “Leadership in Alberta Technology” Award the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA) Educational Excellence Award. He also received the Schulich School of Engineering Research Excellence Award, the Schulich School of Engineering Teaching Excellence Award, The UoC Student Union Teaching Excellence Award, and 4 times the departmental teaching award, 2 times departmental research excellence award, and the department of Geomatics Engineering Graduate Educator Award. Dr. El-Sheimy is currently a member of the Editorial Board of Journal of Survey Review, Journal of Applied Geodesy, and Coordinates. He served as a member of the Alberta Geomatics Group Board of Directors, Geoide NCE Board of Directors, and Technical Committee Member of the ASPRS Direct Georeferencing Committee. He commercialized a number of technologies through the University of Calgary Commercialization office which brings close to $3M of funds to the University of Calgary.

Name: Daping Chu

Title: Director and Chairman of CAPE (Centre for Advanced Photonics and Electronics)

Organization: University of Cambridge, UK

Report: Phase-only Spatial Light Modulators and Applications

Abstract:

Phase-only liquid crystals on silicon (LCOS) devices as highly efficient spatial light modulators (SLMs) has been developed over the years. They combine the complexity of CMOS integrated circuit technology with an electro-optic material which could be switched by the low voltages available from this technology. The advantages of such reflective devices include: capitalizing on the development of silicon CMOS technology; integration of high performance driving circuitry on the silicon chip; high pixel fill factor; high quality process technology for excellent pixel mirror reflectivity; and scalability to smaller feature sizes/ higher pixel number. Examples of different applications will be given. It will be followed by a latest development of high resolution optically addressed spatial light modulators (OASLMs) using nano-particle photo conductors.

Biography:

Professor Daping Chu is currently Director and Chairman of CAPE (Centre for Advanced Photonics and Electronics) and Director of Centre for Photonic Devices and Sensors Group in Cambridge University Engineering Department. He gained his BSc and MSc degrees in physics from Nanjing University and his PhD degree from University of Warwick. He worked in the Institute of Physics, Chinese Academy of Sciences, from 1986-1991 and University of Warwick from 1991-1998. He moved to Cambridge University in 1998 and jointed the Epson Cambridge Laboratory of Epson in 1999 where he was the Executive Researcher until 2007 before returning to Cambridge University. He is a Fellow of Institute of Physics, UK, and of the Institution of Engineering and Technology. He is also a Chartered Physicist and a Chartered Engineer. He is the founder of Roadmap Systems Ltd and Camoptics Ltd. His current research interests include space light modulation and phase-only holography for future displays and optical communications, high brightness transreflective displays, laminated electro-active foils for solar shading and smart facade, printable/wearable electronics, high frequency tuneable dielectrics for GHz/THz applications, and development of low costs manufacturing processes.

Name: Tarik Bourouina

Title: Professor

Organization: ESIEE Paris, France

Report: Photonic MEMS for chip scale optical instrumentation

Abstract:

The integration of microactuators and elastic micro-suspensions within a silicon photonic chip gave rise to the field of optical micro-electromechanical systems (MEMS) that was originally driven by the Telecommunication and Display markets. Following the latter's bubble collapse in the beginning of the third millennium, new directions of research with considerable momentum appeared focusing on the realization and applications of miniaturized instrumentation with numerous new application areas in chemistry, biology, and materials science. At the heart of these applications light interferometry is a key optical phenomenon, in which miniaturized scanning interferometers are the manipulating optical devices. Monolithic free-space optical interferometers realized on a silicon chip take advantage of the recent progress in MEMS engineering and in the microfabrication technology that is enabling accurate control of the etching depth, the aspect ratio, the verticality and the curvature of the etched surfaces. The fabrication technology, the library of micro-optical and mechanical components, the realized architectures and their characterization are described, followed by a discussion of the foreseen challenges.

Biography:

Tarik Bourouina holds the Ph.D. degree (1991), and the Habilitation Degree (2000) from Université Paris-Sud, Orsay. His entire research career was devoted to the field of MEMS and Lab-On-Chip micro-instrumentation. He started research at ESIEE Paris in 1988 among the pioneers in MEMS-based silicon microphones, which he extended to acoustic-based gyroscopes. He had significant contributions in the area of optical MEMS and micro-photonics, among which the smallest MEMS-based FTIR Optical Spectrometer, jointly developed with Si-Ware-System and Hamamatsu Photonics, which was awarded the 2014 Prism award on photonics innovation. Among his contributions to the scientific community, he serves as Associate Editor for the journal Light: Science and Applications, co-published by Nature Publishing Group (NPG) and Chinese Institute for fine Optics and Mechanics and Physics (CIOMP).

Dr. Bourouina took several academic positions in France and in Japan, at the Université Paris-SudOrsay, at the French National Center for Scientific Research (CNRS) and at The University of Tokyo. Dr. Bourouina is full Professor at ESIEE Paris, Université Paris-Est since 2002, appointed as Dean for Research from 2012 and 2015. His current interests include optofluidics and analytical chemistry on-chip and micro-rheology on-chip, seeking new opportunities for MEMS in the areas of Sustainable Environment and Smart-Cities. He is the Co-Laureate of the French Excellence Grant for Large Equipments (EquipEx 'Sense-City'), gathering researchers from ESIEE Paris, IFSTTAR, CSTB and EcolePolytechnique.

Name: Andrea Maria Di Lellis

Title: General Manager

Organization: AMDL Co., Italy

Report: High Reliability Data Processing Unit (HIREL DPU)

Abstract:

In this talk the design of a high reliability DPU deeply studied in the frame Phase A/B of the Solar Wind Analyzer package on board Â the ESA Solar Orbiter Mission is presented. Its flexible architecture makes it ideal for covering a multitude of applications in space and in harsh environments. The design, working in a full cold redundancy configuration, was foreseeing the support of four sensor units.
For the first time in a flight design, it was introducing the outstanding Aeroflex dual Leon 3 core GR712RC part (ITAR FREE), just made available at that time and now fully qualified for the space market.
AMDL Srl has designed and realized the DPU representative model. This design can be easily upgraded to support a larger number of supported payloads, being the processor natively providing up to 6 complete Spacewire cores, plus a further number of standard I/F protocols. The two processors present in each active set of DPU (Main or Redundant) allow to extend up to 12 SpaceWire I/Fs simultaneously supported. As is shown in the picture reporting about the live test the power rate drawn is well below 2 Watts at the primary 28V power bus per board.

Biography:

AMDL Srl is small company, funded by Andrea M. Di Lellis in the late 1998. Thanks to his consolidated space research experience the company, since from its begin, has been involved in several Planetary Space Missions, supporting the development of on-board sensors and detectors.
AMDL is located in the new DHI business centre with all facilities for meetings, links etc. The business centre is in the research area of Tor Vergata very close to main research Institutes like INFN , CNR , INAF . Thanks to this strategic location AMDL can have daily contacts with the main research groups active in the pre-industrial experimental research.
AMDL patented electro/mechanical devices which allowed the company to be unique in the field of atomic cameras for neutral atom applied to the aerospace field.
Furthermore the company has got awards and certifications as solid business both by Italian Space Agency and European Space Agency.
AMDL Space is continuously addressing new space instrumentation and prototyping custom design solutions for Research Institutes and Universities.
AMDL Srl has in its assets the patent of the SERENA-ELENA shutter, being the first atomic camera with this kind of technology that will flown on the BepiColombo ESA Mercury mission. Here after a summary list of the attended space projects which have has been supported by AMDL with qualified H/W & S/W.

Name: Yuanxing Liu

Title: Assistant Director

Organization: Beijing Institute of Control Devices (BICD), China

Report: The Research Progress of Aerospace Quantum Technology

Abstract:

Quantum technology utilizes photon, electron, atom, etc. to measure specific physical parameters with their quantum characteristics, such as quantum entanglement, non-localized, superposition, spin, etc..It has been gradually used in secret communication, remote sense, imaging, navigation, etc.. for its specific advantage, and it becomes an important and hot researching area in aero-space research field. As its potential application, more and more researchers are attracted into this newly developing technology area.

This talk is mainly on the progress in aerospace quantum technology, especially in quantum inertia, quantum sense, quantum communication, and quantum imaging. We introduces the basic principle and characteristics of atomic gyroscope, atomic magnetometer, entangled light and quantum key distribution machine, single pixel camera, etc.. Atomic gyroscope utilizes atoms interference effect and spin effect to detect the rotation information of system, which would bring new applications in future for its high sensitive and small size. Atomic magnetometer, used in weak magnetic field detecting, would be widely used in medical imaging and magnetic object detecting. Entangled light and quantum key distribution machine would be used in secret communication. Single pixel camera, detecting objects with a single pixel, can be used in long distance imaging and measurement. Quantum technology is a very young technology field, but which has much potential in future applications. We discuss the key technologies in their research in this talk. At last, we present the research progress achieved by Beijing Institute of Aerospace Control Devices, mainly on atomic gyroscope, especially the atomic interference effect gyroscope and the atomic spin gyroscope, atomic magnetometer with CPT effect, entangled light and quantum key distribution machine, single pixel camera and quantum distance measuring instrument. Finally, we prospect the bright future of quantum technology in aerospace applications.

Biography:

Yuanxing Liu, senior engineer, is an assistant director in department of quantum technology in Beijing institute of control devices. He was awarded his Ph.D. degree for a thesis on controlling Copper plasma from Beijing University of technology in 2011. Then he began his postdoctoral research on manipulating NaI molecular pre-dissociation in Peking University from 2011 to 2013. In recent years he devotes to the research field of atomic spin gyroscope under the guidance of professor Wang Wei (academician of the Chinese academy of sciences) in Beijing institute of aerospace control devices. Now his group have been supported by the weapon and equipment fund, aerospace research fund and National natural science fund. A small prototype of nuclear magnetic resonance gyroscope has been developed by overcoming several key technologies, such as non-magnetic electric heating, small-size cell, atomic polarization and stabilization, weak signal acquisition and demodulation, etc.. He has published in excess of 30 patents and software copyright until now.

Name: Richard Penty

Title: Professor of Photonics

Organization: University of Cambridge, UK

Report: Guided Wave and Free Space Visible Light Communications

Abstract:

This talk will describe work at the University of Cambridge on Visible Light Communications. It will start by describing the area of VLC using the newly available visible LEDs which can both provide lighting but also modulated light to enable enhanced data rates transmission to mobile devices in the building. It will then move on to the work at Cambridge in this field. I will continue by discussing the application of VLC to guided wave systems. These include POF links for home networks and the development of a polymer waveguide technology for integrating with PCB to enable on-board / chip to chip communications for high performance circuit boards.

Biography:

Professor Richard Penty's first foray into the world of optical communications was via a sponsorship with the National Coal Board for whom he designed a 1Mb/s optical line card. He graduated from the University of Cambridge with a degree in Engineering and Electrical Sciences in 1986 and a PhD for research into nonlinear optical fibre devices in 1990. Richard was then an SERC IT research fellow at Cambridge until taking up a lectureship in physics at the University of Bath in 1990. In 1996 he moved to the University of Bristol as a lecturer in electrical and electronic engineering subsequently being promoted to Professor of Photonics. In 2001 he moved to the Cambridge University Engineering Department and was elected to a fellowship of Sidney Sussex College in 2002 and to the Mastership in 2013. He was elected a Fellow of the Royal Academy of Engineering and of the IET in 2012.

In terms of research, he has worked for many years on short reach photonic networks for in-building links. This included working on the ethernet standards and is now concentrating on advanced modulation format approaches to realising 100Gb/s photonic links using a single optical source. In parallel he has researched on polymer waveguide links and sub-systems for on-board and board to board, including backplane, applications. He is involved in research projects studying the energy efficiency of photonic networks and how these can be improved, in co-operation with higher layers in the network stack, to provide better energy efficiency for the internet. He has also worked on developing a generic foundry approach for InP based photonic integrated circuits via the EU PARADIGM project.

Name: William Wadsworth

Title: Professor in the Department of physics

Organization: University of Bath, UK

Report: Hollow and Multicore Optical Fibres, from Laser Cutting to Astronomy and Medicine

Abstract:

In an established field like optical fibre it is rare to see dramatic improvements in performance. The current generation of hollow optical fibres delivers a step change of performance by two or more orders of magnitude for high power / high intensity beam delivery and for mid-infrared transmission. This talk will cover the underlying reasons for this dramatic performance, and where we see the most important applications of the new technology. The other capabilities of our Centre will also be described, including mode-division multiplexers, multicore fibres, single photon sources and endoscope fibres for advanced medical diagnosis.

Biography:

William Wadsworth is a Professor in the Department of physics at the University of Bath. He joined the University in 1999 to work on the new photonic crystal fibres (PCFs) being developed at the time, and served as director of the Centre for Photonics and Photonic Materials from 2010-2015. His particular interests are in using PCFs for new lasers and light sources, with applications from fundamental metrology and quantum information to imaging for medical and life sciences. Current research is focused on design and applications of hollow optical fibres for high power laser beam delivery and for new lasers.

Name: Hui-Nam Rhee

Title: Professor of School of Mechanical and Aerospace Engineering

Organization: Sunchon National University, Korea

Report: Increasing of Q-Factors of Metal Shell Resonators by Avoidance of "Bad Sizes" Maximizing Thermo-Elastic Damping

Abstract:

The fundamental physical mechanism of thermo-elastic damping (TED) and corresponding Zener-type rheological models are well-known for description of mechanical losses ("intrinsic friction") during cyclic deformations of metallic alloys. In particular, Elinvar-type Fe-Ni alloys, mono-/poly- silicon, and many novel BMG-HEA materials with lower intrinsic damping can be described by such models. As a matter of principle, such a model can be generalized also for losses in metallic coating (Au or Pt with a corresponding sublayer) of quartz-glass resonators. The characteristic feature of such a model is essential dependence of total losses in a viscous-elastic body (and of its total Q-factor) on spacious distribution of strain-stress gradients for a given specific mode of body's oscillations.

Design process for metallic shell resonators used for different applications is usually related with maximization of their Q-factors. Let us underline that Q is a complex indicator of quality, it depends on: intrinsic bulk and at-surface losses inside the material, variants of resonator's fixture, transducers used for its electro-mechanical coupling (for read-out, excitation, and driving), acoustic losses in residual gas inside the cover of the sealed device, etc. Anyway, integral intrinsic losses inside the resonator pre-determine its maximally-achievable Q. Hence, a choice of reasonable design parameters of a resonator is much related with minimization of its "own" Q-factor, i.e., the Q determined by intrinsic losses only.

Let us consider the low-frequency eigen modes of shell resonators like a cantilevered: cylindrical, hemispherical, or quarter-toroidal shells often used as sensing elements of solid-state resonant gyroscopes (RRG, DRG, CRG, HRG, etc.). The operational modes for such a resonator can be approximated well, combining Rayleigh's model of inextensional (iso-geometric) flexural deformations of the shell midsurface and solutions obtained as boundary effects described by classic Kirchhoff-Love's Shell theory. The same effects can be obtained using direct numerical simulations by FEM, using some advanced methodology for that to avoid false (numerical) mismatches, etc.

Biography:

Mar 2001– present : School of Mechanical and Aerospace Engineering, Sunchon National University, Professor in Vibration and Acoustics Lab.

Jan 1997 – Feb 2001: Mechanical Engineering Department, Korea Power Engineering Company, Taejon, Korea, Principal Research Engineer and Team Leader in Reactor
Internals structural analysis

Mar 1985 – Dec 1996: Reactor Mechanical Engineering Department, Korea Atomic Energy Research Institute, Taejon, Korea, Principal Research Engineer in Reactor and Nuclear fuel mechanical design analysis

Mar 1995 – Jul 1995: Mechanical Engineering Department, Westinghouse (former ABB-CE) Inc, Windsor, CT, USA, Visiting Research Engineer for the Comprehensive Vibration Assessment Program of Reactor Internals

Dec 1986 – Mar 1989: Mechanical Engineering Department, Westinghouse (former ABB-CE) Inc, Windsor, CT, USA, Visiting Research Engineer in Reactor Structures and Nuclear Fuel Mechanical Design and Analysis

Jan 1983 – Mar 1983: Samsung Aerospace Co, Changwon, Korea, Mechanical Engineer for F-5 fighter jet engine production.

Name: Giampietro Casasanta

Title: Research Fellow

Organization: Institute of Atmospheric Science and Climate, Italy

Report: Sound Detection And Ranging- Drone Sensing Device

Abstract:

Drone's technology has improved so significantly that now the performances of such vehicles are becoming a serious issue from the security point of view. Their reduced size and relatively low noise and autonomous flight, the possibility of camouflaging combined with maximum flight time greater than 30 minutes and operating ranges greater that 1 km make them as ideal intruders. These aspects when combined with a relatively high payload capacity definitively make drones potential offensive weapons very difficult to be tracked and neutralized.
Can standard technology detect drones? Unfortunately they are small and similar to birds to be detected by radars, don‘t produce enough heat for a thermal detection. Video detection works only in daylight, good visibility and on very short distance. Finally radio frequency detection don’t really help if the drone has been programmed to fly unattended. Commercial sound detectors usually don’t work well in urban environments, because of the ambient noise.
Despite its limits, sound detection has been already used in the battlefield before the radar age. Nowadays, an acoustic remote sensing technique widely used in Atmospheric Physics can be redesigned and adapted to overcome the limits of the commercial sound detectors.
In this talk we present our SOund Detection And Ranging (SODAR) remote sensing device. The SODAR, working as the more famous SONAR, can specifically be adapted to detect and track drones. In atmospheric physics the SODAR is used as a wind profiler using the interaction that acoustic Waves have with the atmosphere. Its ability to detect very low signals backscattered from the atmosphere has been demonstrated to give the possibility to track drones even at an high altitude. Several experiments have been done operating the SODAR in passive (just listening) and active (sending sound pulses and listening to the echoes) mode. In both the modes a clear signature is shown in the sodar spectra at all the height events the drone is inside the field of view of the SODAR.
A suitable set of antennas configuration can be chosen in order to protect from drones intrusion.

Biography:

2012 – present Research fellow, Institute of Atmospheric Science and Climate, CNR, Rome, Italy.
Development of instruments for in situ and remote sensing observations of the Planetary Boundary Layer parameters.
2009 – 2010 Employer-coordinated freelance work, University of Salento, Physics Department, Lecce, Italy. Influence of aerosol on the radiation balance of the Mediterranean Sea.
Research interests are Acoustic and optical active remote sensing for the Planetary Boundary Layer investigation and the air quality monitoring, design and automation of instruments for the acoustic and optical remote sensing of the atmosphere, sea breeze characterization and rational calculus applied to radiative transfer problems.

Name: Meng Jiang

Title: Project Leader

Organization: Beijing Institute of Control Devices (BICD), China

Report: High power fiber laser and its applications

Abstract:

In this presentation, we report our recent works on high power laser and applications including laser cutting, punching, welding and cleaning. In addition, gas measurement with tunable diode laser in explosive and toxic exploration for safe is also introduced.

As a new type of industrial processing equipment, high power laser are widely used. We demonstrated the continuous, pulse at 1064nm, which will be extended to mid-infrared range from 3~5 and 8~12μm. We focused on beam combination and mode striping techniques to realize 1.5kW CW fiber laser engineering sample.

Due to rapidly economic development of China, air pollution has become an important issue. This talk describes recent progress in analyze of sulfur hexafluoride (SF6) measurement online, which is widely used as gas insolated switchgear (GIS) in power grid. We focus on high sensitivity, fast response gas absorption spectroscopy measurement, on line pipe methane leak monitoring, fire exhaust gas detection and early warning.

Biography:

Dr. Jiang Meng was born in China, in 1982. She received the B.S. degree and Ph.D. degree in Optics from Nankai University, Tianjin, China, in 2004 and 2010. Since 2012, she has been a Senior Engineer of the Institute of Beijing Aerospace Control Devices, CASTC. Her research interests include fiber sensing, gas absorption spectroscopy measurement, fiber laser researches and applications. She is the author of11 articles, and 5 inventions.

Name: Gregory Toker

Title: Senior Researcher

Organization: Israel Weizmann Institute

Report: High Speed Interferometric Method of Analysis of Large-erea Optical Surfaces

Abstract:

The examination on high quality polished surface is very important in production process of aerospace and atmospheres gyro instruments. Most production equipments have set the monitors inside to detect products' surface from beginning to end to observing defects in the first place. The basic request for observing defects is high resolution under micron level. The basic requests for surface monitoring are high sensibility, high speed of system operation, 100% examination on production parts. The examination system is able to recognize convex, concave and dust. We research and develop the high-speed surface monitoring system based on our mature laser canning technique.

Biography:

1981 – 1982, Research fellow in Pittsburgh University, USA
1982 – 1994, Senior Research fellow in Isarel Weizmann Institute
1994 – present, Senior Consultant in many companies in USA and Isarel.

Name: Igor Gurevich

Title: Senior Consultant

Organization: President of Advanced Micro-Optics System Company, Germany

Report: Real-time Long Distance Noncontact Position and Attitude Measurement Optoelectronic System

Abstract:

Noncontact Position and Attitude Measurement of Real-time and Long Distance is widely utilized in monitoring and motion control science, such as long distance control of UAV's takeoff and landing, robots control, etc. In the report, it describes a measuring system with high speed, high precision, high imaging quality and noncontact 6 DOF. The system is made by several micro light sources which are located in motion carrier and high speed cameras. According to different surface of set motion carrier, the camera and light source could be adjusted in the optoelectronic system. As for special motion carrier, the system monitors through carriers' geometrical feature, not light source.
The system makes requests on optics imaging to reach the highest measuring precision, those are, distortion of optics imaging is less than 1 pixel and optical lens are space symmetry.

Biography:

Igor Gurevich is the president and Senior Counselor of German Micro-Optics System Company. The company has complete technology on projection and film lens system, high power lens of microscope, focusing system for laser machine, laser system for medical, etc.

Name: Vadym Avrutov

Title: Associate Professor

Organization: National Technical University of Ukraine (Kiev Polytechnic Institute)

Report: 3D-Calibration of the Inertial Measurement Unit

Abstract:

A new calibration method for Inertial Measurement Unit of strapdown inertial technology is presented. Inertial Measurement Unit is composed of accelerometers, gyroscopes and a circuit of signal processing. Normally, a rate transfer test and multi-position tests are using for Inertial Measurement Unit calibration. The new calibration method is based on whole angle rotation or finite rotation. In fact it is suggested to turn over Inertial Measurement Unit about three axes simultaneously. In order to solve the equation of calibration, it is necessary to provide an equality of a rank of basic matrix to degree of basic matrix. In case of some difficulties, it is proposed other way of problem solving. The results of simulated IMU data are presented to demonstrate the performance of the new calibration method.

Biography:

Vadym Avrutov is the associate professor of the National Technical University of Ukraine (Kiev Polytechnic Institute), Spacecraft & Navigation Dept. In 1984 – 1991, he was involved to cooperation between Kiev Polytechnic Institute and Central Scientific Research Institute 'Dolfin' (Moscow) for researching & developing of marine gyrocompasses. He was an inventor of the first Ukrainian marine gyrocompass CRUISE.

Name: Yuanhang Chen

Title: Associate Director

Organization: Beijing Institute of Control Devices (BICD), China

Report: Products and Applications about Mobile Satellite Communications

Abstract:

The article discussed the mobile satellite communication, which includes the short introduction of the technical development worldwide; the invention of new solution applied the inertial technology developed by our institute; the detail of system-level products, and their application fields in china.

Biography:

Mainly focused on the research of Mobile Satellite Communication System, in charge of the project management and market development;
Organized several national communication projects, such as the project of mobile stations of the National Emergence Broadband Satellite Communication Network, the project of ship-board Satcom-on-the-Move of Coast Guard, Projects of Equipment Upgrading of China's three Mobile Communication Operators and Ministry of Industry and Information;
Published several articles on China New Telecommunications;
Gained the First Prize for Scientific and Technological Progress of CASC;
Young Expert of Central Enterprises.

Name: Ponomarenko Sergii

Title: Associate Professor

Organization: National Technical University of Ukraine (Kiev Polytechnic Institute)

Report: Particularities of Development of Inertial Navigation Systems with Hemispherical Resonator Gyroscope

Abstract:

A new calibration method for Inertial Measurement Unit of strapdown inertial technology is presented. Inertial Measurement Unit is composed of accelerometers, gyroscopes and a circuit of signal processing. Normally, a rate transfer test and multi-position tests are using for Inertial Measurement Unit calibration. The new calibration method is based on whole angle rotation or finite rotation. In fact it is suggested to turn over Inertial Measurement Unit about three axes simultaneously. In order to solve the equation of calibration, it is necessary to provide an equality of a rank of basic matrix to degree of basic matrix. In case of some difficulties, it is proposed other way of problem solving. The results of simulated IMU data are presented to demonstrate the performance of the new calibration method.

Biography:

1994 – 2002 Scientific Center / Air Force of Ukraine, Kyiv Aircraft Weapons, Equipment Development & Modernization Div. Senior Researcher
2002 – 2012 State R&D Inst. of Aviation, Kyiv Aircraft Equipment Development & Modernization Dept., Avionics & Aerial Reconnaissance Systems Development & Modernization Section Chief of R&D Lab
2013 - to present National Technical University of Ukraine 'Kyiv Polytechnic Institute' (NTUU 'KPI'), Aircraft & Space Systems Faculty, Aircraft Control Devices & Systems Dept. Associate Professor ("Docent").

Name: Jianming Ma

Title: Vice Director

Organization: Beijing Institute of Control Devices, China

Report: Test and Motion Simulation Series Equipments for Inertial Components

Abstract:

Abstract: Testing and Simulation Device Department of Beijing Institute of Control Devices, as an affiliate of China aerospace science and technology corporation, is the only corporation in China which has been engaged in both the inertial components and the test and motion simulation equipments for 55 years. With a large amount of experience in engineering practice, Testing and Simulation Device Department of Beijing Institute of Control Devices has provided the test and motion simulation systems for all kinds of carrier rockets and other equipments in China for a long time and has accomplished all the tasks excellently in the launch missions of the manned space flight project.

With the development for 55 years, Testing and Simulation Device Department of Beijing Institute Of Control Devices can produce more than 200 equipments used in the test and motion simulation of all kinds of inertial components each year. The products include one-axis table, two-axis table, three-axis table, flight simulation system with five degree of freedoms, motion simulator with six degree of freedoms, motion simulation equipments and test system with multiple degrees of freedom, angular vibration table, centrifugal machine and others related to the test and motion simulation of the inertial components. The products are widely used in the fields of aerospace, aviation, navigation, energy sources and transportation by a lot of universities, institutes and corporations.

Biography:

Jianming Ma born in 1980, is currently a Senior Engineer and Vice Director of Testing and Simulation Device Department of Beijing Institute of Control Devices. He gained his BSc degrees in Harbin University of Science and Technology and his MSc and PhD degree from Harbin Institute of Technology. He worked in the Simulation Device Department of Beijing Institute of Control Devices from 2010. His current research interests include test and motion simulation equipments, parallel manipulator and motion system of flight simulator.

The Agenda of Project Matching in SPOMT 2016

No.	Experts	Organization	Title	Time of Project Matching	Contacts	Content	Place
Project 1	Igor Gurevich	Advanced Micro System Company, Ltd.	Senior Consultant	9:00am,29th,Oct.	Rong Duan	Process and Testing Technology of Special Material	Conference Room B,3rd Floor
	Gregory Toker	Israel Weizmann Institute	Senior Consultant				
Project 2	Hui-Nam Rhee	Sunchon National University	Associate Professor	9:00am,29th,Oct.	Ming Yang	The HRG Technology	Conference Room ,1st Floor,137
Project 3				18:00pm,27th,Oct.	Chaoyang Xing	The Micro HRG Technology	
Project 4	Naser Mahmoud EL-Sheimy	University of Calgary	Associate Professor	9:00am,29th,Oct.	Chaoyang Xing	Design and Process Technology of MEMS Instrument	Conference Room C,3rd Floor
Project 5					Yuliang Wang	Testing Method of MEMS Inertial Measurement	
Project 6				13:30pm,29th,Oct.	Jinqiao Xia	MEMS Inertial Measurement	
Project 7&8	Oleksandr Koval	National Technical University Of Ukraine 'Kyiv Polytechnic Institute'	Vice-rector	9:00am,29th,Oct.	Wenpeng Yu	Optical Fibre Sensing System	Conference Room D,3rd Floor
	Vadym Avrutov		Associate Professor	13:30pm,29th,Oct.	Zhanli Ji	Calibration of Inertial Measurement	
Project 9	Giampietro Casasanta	Institute Of Atmospheric Science and Climate	Project Leader	9:00am,29th,Oct.	Weiwei Zhu	Environmental Monitoring System Based on Wireless Sensor Network,etc.	Conference Room E,3rd Floor
Project 10	Andrea Maria Di Lellis	AMDL Srl	General Manager	9:00am,29th,Oct.	jizhuo Men	Cooperation Project	Conference Room A,3rd Floor
	Giulio Sfoglietti	MICROLAB	General Manager	13:30pm,29th,Oct.	Yating Zhang		
Project 11	Enrico De Marinis	DUNE	Project Manager	27th-29th,Oct.	Xuyang Hou	Pedestrian Tracking and Navigation System	Conference Room ,2nd Floor,137
Project 12	William John Wadsworth	University Of Bath	Professor	9:00am,27th,Oct.	Jing Li	Optical Fibre Technology	Conference Room ,1st Floor,137
Project 13	Andrey Golovan	Moscow State University	Head of Research and Teaching Lab	9:00am,31st,Oct.	Dongming Li	Detection Algorithm Technology of Gravimeter	Conference Room ,1st Floor,137
				9:00am,2nd,Nov.	Xiangtao Meng	Algorithm of Inertial Navigation System	
				13:30pm,2nd,Nov.	Zhanli Ji	Algorithm of Inertial Navigation System	
Project 14	Igor Konyakhin	ITMO University	Director of Optics R&D Center	13:30pm,3rd,Nov.	Haoting Liu	Deformation Measurement Testing Technology	Conference Room ,1st Floor,137
	Valery Korotaev		Director		Xiangming Xing	Experts Employment	
Project 15	Evgenii Krivtcov	Mendeleev Metrology Institute	Vice President	13:30am,2nd,Nov.	Dandong Li	Test Simulation Technology	Reporting Room 1st Floor 137
	Aleksandr Iankovskii		Head of Department of Lowfrequency Mechanical Motion Quantities				
Project 16	Richard Penty	University of Cambridge	Professor	16:30pm,29th,Oct.	Enyi Guan	Wireless CommunicationTest Simulation	Conference Room E,3rd Floor

Organicing Committee Contact：

Yating Zhang 18911070357

Xiangming Xing 15300027216

Mengxing Liu 15321998724

Mao Luo 17710042943

Wenjing Zhang 17710550031

Boyang Liu 17710045699