The 2nd Announcement

ISPEMI 2018

10th International Symposium on Precision Engineering Measurements and Instrumentation

(ISPEMI 2018)

August 8-10 2018, Kunming, China

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International Committee on Measurements and Instrumentation (ICMI)
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High quality papers (six to ten pages) will be selected from all the submissions for inclusion in the proceedings of SPIE, ISPEMI 2018 to be published by SPIE. All papers included in the proceedings will be indexed in EI. The submission of an abstract means at least one delegate must be registered and present the paper at meeting, otherwise the manuscript will not be including in the proceedings by SPIE.

Critical Dates

Abstract Accepted Notice: **June 5, 2018**
Manuscript Due Date: **July 5, 2018**
Important notes: According to the agreement with SPIE, full length papers shall be in English and shall be six to ten pages long, single line spaced and single columned, please refer to the Template attached.

Time and Venue

Check-in time: **August 8, 2018**
Duration: **August 9-10, 2018**

Venue: *Kunming Wenhui Hotel* (Kunming, China) (In Chinese: 昆明文汇商务会议酒店)
Hotel Add: No. 253 Xuefu Road, Wuhua District, Kunming, China
Hotel Tel: 400-808-2562, Hotel Fax: +86-871-65189929
Website of Hotel: http://wenhuihotel.vip.lechengol.com/

Registration Fee

Registration fee:
3200 RMB per delegate before **July 5, 2018**, 430 € per delegate in euros.
3800 RMB per delegate after **July 5, 2018**, 510 € per delegate in euros.

Hotel Room Reservation

The conference provides the accommodation reservation at the Kunming Wenhui Hotel for the delegate with a special discount.

The hotel offers:

Double room (Two single beds)	320 RMB per room per night
King Room (One double bed)	320 RMB per room per night
Executive Room (One double bed)	390 RMB per room per night
Suite (One double bed, living room)	780 RMB per room per night

Reservation can be made before **July 5, 2018** with an advanced payment depending on the room charge per night.
(Through email ispemi-icmi@outlook.com with title 'Room Reservation')

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Plenary speakers

Professor K T V Grattan

President of the International Measurement Confederation (IMEKO)
Dean, City Graduate School
Royal Academy of Engineering - George Daniels Professor of Scientific Instrumentation
City University of London, United Kingdom

Professor Grattan graduated in Physics from Queen’s University Belfast with a BSc (First Class Honors) in 1974 and a PhD in Laser Physics. His research involved the use of laser-probe techniques for measurements on potential new laser systems.

Following Queen’s, in 1978 he became a Research Fellow at Imperial College of Science and Technology, sponsored by the Rutherford Laboratory to work on advanced photolytic drivers for novel laser systems. This involved detailed measurements of the characteristics and properties of novel laser species and a range of materials involved in systems calibration. In 1983 he joined City University as a “new blood” Lecturer in Physics, being appointed Professor of Measurement and Instrumentation in 1991 and Head of the Department of Electrical, Electronic and Information Engineering. He was appointed Dean of the Schools of Engineering & Mathematical Sciences and of Informatics in 2008, serving until 2012 when he became Dean of the newly formed City Graduate School.

His research interests include the use of fiber optic and optical systems in the measurement of a range of physical and chemical parameters. The work has been sponsored by a number of organizations including EPSRC, the EU, private industry and venture capital and he holds a number of patents for his work with industry. He obtained a DSc from City University in 1992 for his sensor work.

Professor Grattan is extensively involved with the work of the professional bodies having been Chairman of the Science, Education and Technology of the Institution of Electrical Engineers, the Applied Optics Division of the Institute of Physics and he was President of the

Institute of Measurement and Control during the year 2000. He was awarded the Callendar Medal of the Institute of Measurement and Control in 1992, the Hartley Medal of the same Institution in 2015 and the Honeywell Prize for work published in the Institute's journal as well the Institute of Physics Applied Optics Divisional Prize in 2010.

Professor Grattan had been Deputy Editor of the Journal Measurement Science and Technology for several years and currently serves on the Editorial Board of several major journals in his field in the USA and Europe. In January 2001 he was appointed Editor of the IMEKO Journal "Measurement" and now is Editor Emeritus of the Journal. After many years serving on their General Council, he was appointed the President of the International Measurement Confederation (IMEKO) in 2015. He is the author and co-author of about 1300 publications in major international journals and at conferences and is the co-editor (with Professor B T Meggitt) of a five volume topical series on Optical Fiber Sensor Technology. Professor Grattan was Dean of the School of Engineering & Mathematical Sciences and also Dean of the School of Informatics at City University from 2008 to 2012 and in that year was appointed as the Inaugural Dean of the new City Graduate School at the University.

Title: Optical Fiber Sensors for Industrial Applications

Abstract: Optical and optical fiber based techniques have been shown to be extremely useful in enabling measurements where conventional sensor systems either fail or prove to be too complex to use, yet where good measurement data are highly important. This presentation will review the principles and practice of optical fiber sensors for a range of applications in industry from our work at City University of London, showing the value of the techniques employed and the benefits to industrial partners that result.

Professor Heping Cheng

Leader of Institute of Molecular Medicine
Peking University
Fellow of the Chinese Academy of Sciences

Professor Heping (Peace) Cheng received his bachelor and master degrees in applied mathematics & mechanics and biomedical engineering, with physiology as his minor, from Peking University, China. Upon graduation, he served as a junior faculty member in the Department of Electrical Engineering at the same university before earning his Ph.D. degree in physiology in 1995 from the University of Maryland at Baltimore. He then joined the NIH Intramural Research Program as a senior staff fellow, was selected as a tenure-track investigator in 1998 and became the head of the Ca^{2+} Signaling Section in the Laboratory of Cardiovascular Science, National Institute of Aging, NIH. He was promoted to senior investigator in 2004. He is now a senior investigator heading the Laboratory of Ca^{2+} Signaling & Mitochondrial Biomedicine in the Institute of Molecular Medicine at Peking University. He was elected to the Chinese National Academy of Sciences in 2013.
Co-discovering "Ca^{2+} sparks" in 1993 and mitochondrial "superoxide flashes" in 2008, he strives to resolve elemental physiological signals in the pursuit of principles of cell signaling. Currently he is engaged in developing novel imaging technology for reverse engineering of brain information processing.

Professor Steven Cundiff

Fellow Adjoint of JILA. Harrison M. Randall Collegiate Professor of Physics, University of Michigan, Ann Arbor Fellow of the IEEE, Fellow of the APS, Fellow of the OSA, OSA Meggers Award, Humboldt Research Award

Professor Cundiff and his research group work on several aspects of ultrafast optics. One area involves generating and controlling ultrashort pulses, which, of course, provides the foundation for the field of ultrafast optics. However, the group is primarily interested in using ultrashort light pulses for a variety of scientific applications. A natural application is to use the very short duration of the pulses to study processes that occur on similar timescales, which is generally known as ultrafast spectroscopy. Ultrafast spectroscopy not only gives dynamical information, but it also provides information about the fundamentals of how light interacts with matter. One type of ultrafast spectroscopy, known as optical multidimensional coherent spectroscopy, has been developed over the last decade as has proven to be very powerful. The Cundiff group uses ultrafast spectroscopy, including multidimensional coherent spectroscopy, to study a range of system including semiconductors, semiconductor nanostructures and atomic vapors.

Title: Comb-based Multidimensional Coherent Spectroscopy

Abstract: Over the last 20 years, there have been two seemingly disconnected developments in optical spectroscopy: frequency combs and multidimensional coherent spectroscopy. Frequency combs revolutionized optical frequency metrology and enabled optical atomic clocks while multidimensional coherent spectroscopy became a powerful tool for studying dynamics on ultrafast time scales in atomic, molecular and solid-state systems. Inspired by a method known as “dual comb spectroscopy”, we have recently combined these two developments by demonstrating comb-based multidimensional coherent spectroscopy, which leverages the best aspects of both.

Dr. Christan Rothleitner

Leading scientist of the group mass metrology for Planck balances
Physikalisch-Technische Bundesanstaldt (PTB)
Member of German physical society DPG and American physical society

Dr. Christian Rothleitner studied physics in Germany, Italy and Venezuela. He received his PhD in experimental physics at the Max Planck Institute for the Science of Light, in Germany, about the development of two free-fall absolute gravimeters in the group of Prof. Lijun Wang (now at Tsinghua University, China). After he received his PhD he made a postdoctorate at the University of Luxembourg where he developed a free-fall experiment to measure the Newtonian constant of gravitation. Thereafter, he joined the German national metrology institute, the Physikalisch-Technische Bundesanstaldt (PTB), where he gained several years of experience in length metrology with a special focus on computed tomography. Now he is the leading scientist of the group mass metrology for Planck balances at PTB. In this position he is responsible for developing a high-precision weighing instrument that will allow to make primary realizations of the SI unit kilogram after its re-definition by end of 2018. This is done in collaboration with the Technical University of Ilmenau where Dr. Rothleitner is also doing his 'habilitation', a qualification as a lecturer. Dr. Rothleitner published more than 30 scientific articles in international peer reviewed journals. He is member of the German physical society DPG and of the American physical society APS.

Title: A novel high-precision mass measurement device for the new kilogram

Abstract: For almost 130 years the kilogram, i.e. the SI unit of the mass, is defined by a cylindrical artefact made from a platinum-iridium alloy, 39 mm in height and 39 mm in diameter, called the international prototype of the kilogram (IPK). This definition will most probably change by end of 2018, when the General Conference on Weights and Measures (CGPM) will decide on the redefinition of several base units of the international system of units SI, including the kilogram. From then the kilogram will be defined via Planck's constant, *h*. Currently two experiments can establish a link between the mass and Planck's constant

with a relative combined standard uncertainty of better than two parts in 108. One experiment, commonly called the x-ray crystal density (XRCD) method, realizes the kilogram via a highly isotopically enriched 28Si crystal, shaped into an almost perfect sphere of about 93.6 mm in diameter, and weighing almost exactly 1 kg. When the lattice parameter of the crystal is known, this experiment allows 'counting' the number of silicon atoms within the sphere. Originally designed to measure Avogadro's constant, the experiment allows a link to Planck's constant without loss of accuracy.

The second experiment is called Kibble balance (formerly Watt balance). This experiment compares the mechanical weight of a mass artefact with a compensating electromagnetic force. The link between the mass and the Planck constant is established via the voltage and resistance measurements that are traceable to quantum standards, containing the Planck constant.

After the redefinition the kilogram can be realized, in principle, for any mass value, unlike the current definition via the IPK. The PTB, in collaboration with the Technical University of Ilmenau, Germany, is currently developing the Planck-Balance, a high-precision weighing instrument for industrial applications, that works like the Kibble balance experiment, however for a continuous mass range of 1 mg to 1 kg.

In this talk a short overview of the redefinition will be given, and the principles of the XRCD and the Kibble balance will be explained before the concept of the Planck-Balance will be presented.

Professor Fu-Jen Kao

Professor, Institute of Biophotonics, National Yang-Ming University (2004-)
Association of Asia Pacific Physical Societies (2016-)

Professor Fu-Jen Gao is now in Institute of Biophotonics, National Yang-Ming University since 2004 and also the association of Asia Pacific Physical Societies. He was the president of Physics Society of ROC (2012-2014), vice president of Physics Society of ROC (2012-2014), associated Dean of Office of Research & Development, NYMU (2006-2011), and also the director, Institute of Biophotonics, NYMU (2004-2011). His research interests are in the field of Stimulated emission based pump-probe microscopy, 4-channel Stokes vector resolved SH polarization microscopy and biomedical optical instrument for endoscopy. During his academic career, the long working distance fluorescence and lifetime measurement via stimulated emission, and laser illumination for endoscopy are the two research highlights.
In the field of “long working distance fluorescence and lifetime measurement via stimulated emission”, Prof Gao and his team are focusing on the unique aspect of spatial coherence as a result of stimulated emission, which is utilized for long distance fluorescence detection and lifetime imaging. In contrast with the case of spontaneous emission, high numerical aperture optics is not required to collect the stimulated emission signal efficiently.
Meanwhile, in the field of “Laser illumination for endoscopy”, Prof Gao’s team have successfully established a novel ultra-compact endoscopic imaging system, which uses a miniature CMOS sensor (O.D. <1.0 mm) and a few multimode fiber for light delivery. Critically, the illumination is realized by coupling the output of a supercontinuum or RGB laser into the fiber. In this way, very high brightness is possible with extremely small footprint on the illumination part. As a result, the overall diameter (< 1.2 mm) of the endoscope can be much smaller than the currently used models.

Title: Time Resolved Imaging with Stimulated Emission in Pump-Probe Microscopy

Abstract: Pump-probe microscopy has become a common platform for imaging based on nonlinear optical processes, such as stimulated emission (SE), ground state depletion (GSD), and excited state depletion (ESD). The capacity includes molecular specificity, improved resolution, and enhanced penetration depth [Invited Review Article: Pump-probe microscopy,

Rev. Sci. Instrum.87, 031101 (2016). In the past years, stimulated emission based pump-probe microscopy has demonstrated dark chromophore detection[Imaging chromophores with undetectable fluorescence by stimulated emission microscopy, Nature 461, 1105-1109 (2009) and fluorescence lifetime imaging [Long working distance fluorescence lifetime imaging with stimulated emission and electronic time delay, Optics express 20, 11445-11450 (2012).

In this work, a pump-probe microscope is configured for the simultaneous detection of stimulated gain and spontaneous loss. We have used a pulsed diode laser, λ_{pu} = 635 nm as the pump (excitation) beam and a mode-locked Ti-sapphire laser, λ_{pr} = 780 nm, as the probe (stimulation) beam. The time delay (τ) between the pump and probe pulses are precisely controlled by adjusting the length of the triggering cables and setting the delay generator. The probe beam pulses are passed through two 15-cm long dispersive glass rods (SF-6) for extending into a pulse width of 1.5 ps. Both beams are coupled into the scanner and focused on the sample by an objective lens (10X, NA=0.3).

For stimulated gain, the pump beam is modulated at a frequency, f_1, and the probe beam is demodulated accordingly to extract the signal in the transmission direction with a photodiode as the detector (PDA 36A, Thorlabs). For spontaneous loss, the probe beam is modulated at frequency, f_2, the spontaneous loss signal is than demodulated from the fluorescence detected in the reflection mode by a PMT. In all cases, a high performance lock-in amplifier (HF2LI, Zurich Instruments) is used. The output signal of the lock-in amplifier is then fed to the A/D channel of the scanning unit for image reconstruction. The scan rate is set at a frequency 500 Hz, to match the time constant (1.99 ms) of the lock-in amplifier.

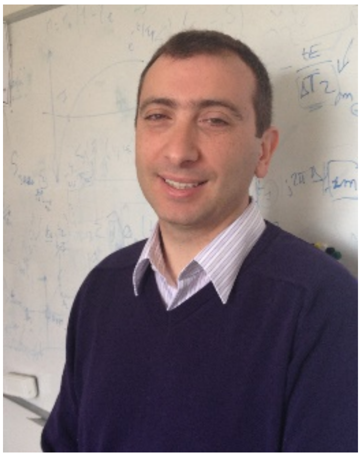
By demodulating fluorescence signal, the fluorescence lifetime and optical section images can be obtained with greatly reduced background, in which shot noise is attributed. Additionally, this technique improves signal-to-noise ratio and enhances penetration depth like multiphoton microscopy, without expansive femtosecond lasers.

Professor Nigel M Jennett

Professor of Materials, Mechanics and Measurement at Coventry University
Chairs of the BSI indentation hardness committee

Professor Nigel M Jennett BSc (Hons) (Physics), PhD (Physics), CSci CPhys MinstP has over 25 years' experience of fabrication and characterization of nano-structured materials and 20 years' developing nano-mechanical test methods. He is: Professor of Materials, Mechanics and Measurement at Coventry University, visiting Professor of Engineering at Leicester University, Associate Editor of Philosophical Magazine (and Philos. Mag. Letters), international chair of VAMAS Technical Working Area 22 'Mechanical properties measurement of thin films and coatings', UK technical expert on the CIPM consultative committee hardness working group (CCM-WGH), chairs the BSI indentation hardness committee, leads the UK delegation for ISO working groups drafting standards for indentation-based test methods. Nigel has also served two terms (six years) on the European Commission Certification Advisory Panel for Physical and Physicochemical Properties.
Nigel studied Physics at Bristol University (Physics Laboratory prize in 1984 and 1986, and the Raychem prize in 1985). He spent six years researching magnetic multilayers (1990 PhD, 1991 Chartered Physicist), before moving to NPL (1992) to develop traceable Scanned Probe Microscopy and nano-mechanical measurements. In 1998 he created his own research group focused on surfaces, coatings and nano-mechanics and was awarded a Glazebrook Fellowship in 2003 and the NPL Rayleigh award in 2010. Nigel is an experienced leader of projects (Government, Industry and European Commission), and is a regular invited speaker at international conferences.

Dr. Olivier Beuf



Senior CNRS research scientist
Team leader “NMR and optics: From measure to biomarker”
Director of the CREATIS lab (CNRS UMR5220, INSERM U1206)

Dr. Olivier Beuf is the senior CNRS research scientist in France. He obtained his PH.D in physics from Université Claude Bernard Lyon 1 in 1998. Dr. Beuf has widely research interests in the field of MR imaging, RF coils, multi-parameters quantitative imaging, liver analysis, cartilage ultra-structure and morphology, and so on.
He published more than 80 peer reviewed international journal articles and 8 book chapters. His research works are 1105 citations in WOS and the h-index is as high as 19. Meanwhile, the transfer of technology are 3 patents. Dr. Beuf is also the supervisor of 17 PhD students (14 defended and 3 still supervised). Dr. Beuf is the chairman of the “journées scientifiques sur les nouvelles méthodologies en imagerie du vivant”, Lyon, France (300 delegates). He is the distinguished reviewer of Journal of Magnetic Resonance Imaging (2011 and 2014) and Magna Cum Laude Merit Award of the 30th Meeting of the International Society for Magnetic Resonance in Medicine (2012).

Title: Innovative techniques for contrast, spectrometric and viscoelastic measurements in small animal MRI

Abstract: Given superior tissue contrast and sensitivity to tissue composition, Magnetic Resonance Imaging (MRI) has a tremendous potential in every day medical practice as well as in biomedical and preclinical research.
Small animal models are commonly used to better understand physiopathology of some diseases, to characterize evolution of pathology or follow therapeutic strategies. Compared to MRI for the clinic, small animal MRI is usually performed at higher magnetic fields (4.7 T and more) to improve signal to noise ratio. However, this is modifying image contrast. In addition, the spatial resolution requirements may limit the effectiveness of imaging methods requiring gradient oscillations such as for Elastography by MR (ERM) and chemical-shift encoding.
Several of these aspects will be illustrated for fat content and composition quantifications in the context of the development of worldwide obesity. Dedicated development based on Optimal Control theory applied to tissue contrast and ERM will be presented.

Professor M. Selim Ünlü

Distinguished Professor of Engineering appointed in electrical and computer engineering, biomedical engineering, physics, and graduate medical sciences. Boston University
IEEE *Fellow* and OSA *Fellow*
Editor-in-Chief for *IEEE Journal of Quantum Electronics*
Contact Information: selim@bu.edu www.bu.edu/OCN

Professor M. Selim Ünlü received theB.S. degree from the Middle East Technical University, Ankara, Turkey, in 1986, and the M.S.E.E. (1988) and Ph.D. (1992) degrees from the University of Illinois at Urbana-Champaign, all in electrical engineering. Since 1992, he has been a professor at Boston University. He is currently a Distinguished Professor of Engineering appointed in electrical and computer engineering, biomedical engineering, physics, and graduate medical sciences. He has also served as the Associate Dean for Research and Graduate Programs in engineering. His research interests are in the areas of nanophotonics and biophotonics focusing on high-resolution solid immersion lens microscopy of integrated circuits and development of biological detection and imaging techniques, particularly in high-throughput digital biosensors based on detection of individual nanoparticles and viruses.

Dr. Ünlü was the recipient of the NSF CAREER and ONR Young Investigator Awards in 1996. He has been selected as a *Photonics Society Distinguished Lecturer* for 2005-2007 and Australian Research Council Nanotechnology Network (ARCNN) *Distinguished Lecturer* for 2007. He has been elevated to IEEE *Fellow* rank in 2007 for his "*contributions to optoelectronic devices"* and OSA *Fellow* rank in 2017 for his "*for pioneering contributions in utilization of optical interference in enhanced photodetectors and biological sensing and imaging*." In 2008, he was awarded the Science Award by the Turkish Scientific Foundation. His professional service includes serving as the chair of the Annual Meeting for IEEE Photonics Society and Editor-in-Chief for *IEEE Journal of Quantum Electronics*.

Title: Interferometric Microscopy for Detection and Visualization of Biological Nanoparticles

Abstract: Nearly four hundred years ago, invention of the microscope offered a glimpse into the previously unknown details of insects and minerals. Advent of optical microscopy has provided detailed visualization and study of biological specimens including parasites, fungi, and bacteria. Biological nanoparticles such as viruses and exosomes are important

biomarkers for a range of medical conditions, from infectious disease to cancer. Biological sensors that detect whole viruses and exosomes with high specificity, yet without chemical labeling, are promising because they generally reduce the amount and complexity of sample preparation required by molecular amplification methods and may improve measurement quality by retaining information about nanoscale biological structure. Unlike fluorescence-based super-resolution techniques, conventional light scattering microscopy cannot discern details that are closer than half of the wavelength of light. We developed an optical sensing technology, Interferometric Reflectance Imaging Sensor (IRIS), a multifunctional platform for quantitative, label-free and dynamic detection [1]. In high-magnification modality, Single-Particle IRIS (SP-IRIS) has the ability to detect and characterize individual biological nanoparticles. In SP-IRIS, the interference of light reflected from the sensor surface is modified by the presence of particles producing a distinct signal that reveals the size of the particle that is not otherwise visible under a conventional microscope. Using this instrument platform, we have demonstrated label-free identification and visualization of various viruses in multiplexed format in complex samples in a disposable cartridge [2]. Recently, our technology was applied to detection of exosomes [3] and accurate quantitative measurements of biological nanoparticles [4]. We are currently focusing on various biological applications as well as further improvement of the technique using pupil function engineering [5].

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Title: Changes in quality and measurement during intelligent manufacturing

Abstract: Quality is always one of the most important things manufacturing industry cares and tries hard to improve.

As QC means and digital expression of product, measurement is the key to the development and manufacturing of products, and so, while manufacturing is being made intelligent, measurement Technology automation scheme QC method management and information technologies data and software techniques are well integrated so that new applications are introduced in the quality and measurement field to fulfill the requirements in quality cost and efficiency.