

SWISS PHOTONICS

Intelligent efficient solid-state lighting Pantheon Muttenz, December 12th 2016



**Dr. Christian
Bosshard**

Vice-President Center Muttenz of CSEM SA, 4132 Muttenz BL
www.csem.ch | bosshard@swissphotonics.net

Dr. Christian Bosshard is Vice-President of the CSEM Center in Muttenz. He received his degree in Physics (1986) and his doctorate (1991, Silver medal award) from ETH. Christian Bosshard is a Fellow of the Optical Society of America (OSA), coordinator for CSEM in the Heterogeneous Technology Alliance (HTA), Managing Director and board member of Swissphotonics.

Introduction and Welcome



**Dr. Christoph
Klöpfer**

CEO BaselArea.swiss, 4010 Basel
www.baselarea.swiss | christof.kloepper@baselarea.swiss

Christof Klöpfer is CEO of BaselArea.swiss, the agency for promoting innovation and inward investment in the Basel region. He was previously Managing Director at i-net from 2012 until the end of 2015. Before this Christof Klöpfer was among others CEO at i-net and Technologiepark Basel AG. He studied economic geography and economics in Germany and in the USA and obtained a doctorate at the University of Basel.

How innovative companies are supported in Basel

BaselArea.swiss is a unique initiative for innovation and economic promotion by the cantons of Basel-Stadt, Basel-Landschaft and Jura. It supports entrepreneurs and companies with 4 services:

1. Invest in Basel Region facilitates settlement,
2. Connecting Innovators provides easy networking by over 60 events annually,
3. Supporting Entrepreneurs offers start-ups solid support,
4. Accessing China facilitates exchange from and to China.



Dr. Rudolf Fryček

Business Innovation consultant, CEO Amires Sàrl, 2000 Neuchâtel
amires.eu | frycek@amires.eu

Rudolf Fryček has more than 15 years' experience in the European project management and consultancy. After his experience at the DG RTD of the European Commission, he founded private consulting company AMIRES focused on EU funded development and innovation projects. The company is now managing projects with overall budget over 60 Mio. €. Rudolf is also a cooperation coach of Platinn, with mission to increase innovation capacity of SMEs.

Moderation Session 1 (am): Large Area Intelligent Efficient SSL EU LASSIE-FP7



Dr. Rolando Ferrini

Section Head Integrated Light Management, CSEM SA, 4132 Muttenz BL

www.csem.ch | rolando.ferrini@csem.ch

Since 2012, Dr. Ferrini is heading the Integrated Light Management Group at CSEM. In 1999, he obtained his PhD in Physics in Pavia (Italy). From 2000 to 2004 at IPEQ-EPFL, he studied the optical properties of photonic crystal devices. From 2004 to 2011 at LOMM-EPFL, he was in charge of the activities on optics, photonics and lighting in collaboration with ILFORD Imaging GmbH.

LASSIE-FP7 Highlight

This communication will present the main results and highlights of the European project LASSIE-FP7, whose objective is to implement large-area intelligent SSL modules with high efficiency and high lighting quality, while assessing their environmental footprint.



Dr. Oscar Fernández

Senior Project Leader at CSEM SA, 4132 Muttenz BL

www.csem.ch | oscar.fernandez@csem.ch

Oscar Fernández received his MSc and PhD degrees in Physics from the University of Valladolid (Spain) in 2000, and the University of North Wales, Bangor (UK) in 2004, respectively. After finishing his PhD he started his postdoctoral research in the Molecular Electronics Group in Bangor where he investigated the interfacial origins of threshold voltage instabilities in organic thin-film transistors (OTFT). In 2006 he joined Cambridge Display Technology (CDT) where he led the device physics activities in the lighting program. In 2011 he joined Polymer Vision BV in Eindhoven (Netherlands) where he worked on the development of OLED processing and characterization for oxide TFT-based rollable OLED displays. Since May 2012 Oscar is part of the Integrated Light Management Group at CSEM in Muttenz.

Efficient high quality light management

CSEM presents a roll-to-roll compatible thin-film solution to efficiently homogenize light from LED arrays. It is based on the use of thin-films with replicated beam-shaping optical microstructures pixels. Ray-tracing optical simulations indicates that this solution allows the realization of ultrathin direct-lit modules with high efficiency and luminance spatial uniformity.



Dr. Stephan Junger

Senior Scientist Department Integrated Circuits and Systems, Fraunhofer Institut für Integrierte Schaltungen IIS, 91058 Erlangen, Germany

www.iis.fraunhofer.de | stephan.junger@iis.fraunhofer.de

Stephan Junger received the Diploma degree and the Dr. rer. nat. degree in physics from the University of Erlangen-Nürnberg, Germany, in 1994 and 2000, respectively. He has been working on holographic bragg grating couplers with submicron grating periods and on miniaturised optoelectronic sensor systems for spectroscopic applications. Since 2000 he is with Fraunhofer IIS where his research interests as a senior scientist include optoelectronic components, optical sensors, and optical nanostructures where he authored or co-authored more than 25 journal and conference papers and holds 5 patents. He received the Georg-Waerber-Innovation Award in 2012.

Sensors for intelligent light management

LED sources are enabling spectrally tunable and smart lighting systems. Luminaires become more complex due to the required *color mixing*, and temperature and aging effects of LEDs and other components result in unwanted colors shifts. The multispectral sensors presented enable color feedback control for luminaires in order to achieve color stability and color consistency.



Dr. Kimmo Keränen

Senior Scientist at VTT Technical Research Center of Finland Ltd., Espoo, Otaniemi, Finland

www.vttresearch.com | kimmo.keranen@vtt.fi

Dr. Kimmo Keränen received his MSc, Lic. Sc. and D. Sc (Tech.) degrees in electrical engineering from the University of Oulu, Finland in 1992, 2002 and 2008, respectively. He is Senior Scientist in Sensing and Integration research area at VTT. His main research interest is large area flexible lighting system R2R processing. He is author and co-author of over 15 refereed journal and over 30 reviewed conference papers.

Large area heat management for efficient SSL

R2R manufacturing process based on rotary screen printed polymer substrates and R2R bonding of LEDs on substrates has enabled high throughput manufacturing of large area flexible lighting elements cost-effectively. However, polymer substrate forms thermal barrier to LED excess heat. Heat management challenge is tackled by developing efficient heat management structures based on thermal vias and slugs to the substrate.



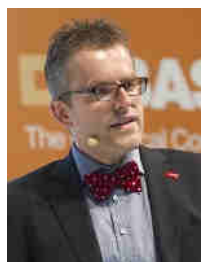
Leire Barruetabeña

Responsable de Equipo, Gestión Ambiental, Gaiker, 48.170 Zamudio, Bilbao, Spain
gaiker.academia.edu | barruetabeña@gaiker.es

Responsible of the Environmental Management Technological Field, within the Environment and Recycling Area of Gaiker. 20 years working on environmental projects supporting the companies to improve their sustainability. Deeply experienced in Ecodesign and Life Cycle Assessment (LCA), applying it to select clean technologies, evaluate waste treatment options and End of Life processes, and develop sustainable products.

Eco- and Cost-sustainability of large area SSL

In LASSIE-FP7 project, environmental and economic aspects were continuously monitored to evaluate the different design options developed. This monitoring was carried out from a life cycle perspective, with a LCA to evaluate main impacts during the life cycle of the module, a recyclability assessment and an economic evaluation. The results were also compared to conventional lighting systems.



Dr. Adrian von Mühlengen

Senior Innovation Manager, Biological & Effect System Research, Technology Incubator, BASF Schweiz AG, 4057 Basel
www.basf.com/ch | adrian.von-muehlenen@basf.com

Dr. Adrian von Mühlengen heads a technology incubation team within applied materials and systems research at BASF. Since 2012 he is part of the core team setting up technology incubation in one out of four competence centers within BASF. Previously, as founding member of a Research and Technology Organization satellite in the Basel area, he and his team delivering proof of concept in high risk and high uncertainty projects in industrial and publically funded projects. Dr. von Mühlengen earned a dipl. Ing. and a PhD degree at the Swiss Federal Institute of Technology in Lausanne (EPFL).

Materials and technology for LED lighting applications

We profit from our chemical roots in dyes and pigments and formulation to provide a color conversion technology for large are LED lighting systems. Our film solution is suitable for general lighting and more since it can be composed of different dyes offering color temperatures from about 2000 to 6500 K and since it can adopt various shapes.



Dr. Christian Hochfilzer

Technical Director Regent Beleuchtungskörper AG, 4018 Basel
www.regent.ch | c.hochfilzer@regent.ch

Dr. Christian Hochfilzer is currently Technical Director and Member of the Management Board at Regent Lighting, a major European lighting company located in Switzerland. In this function he is responsible for the product development and realization process on luminaire, controls and system level. Mr. Hochfilzer's technical background encompasses physics and engineering in the field of solid state lighting and optoelectronics with more than twenty years of industrial experience. Prior to his current position he was Head of Research and Development at Tridonic Optoelectronics, a global pioneer in Chip on Board Solid State Light Sources and CEO of Lumitech, at that time an optoelectronic engineering start-up company. He has numerous publications in peer-reviewed journals and conference proceedings and holds several patents.

Christian Hochfilzer received his PhD in solid-state physics from the Technical University in Graz.

Inspiration versus Technology – LED was Yesterday

For more than a decade or so the lighting industry was desperately working first to understand and then to integrate solid state lighting in its luminary products. Today, astonishing new features of this digital lighting products emerge. In this presentation we will approach these new attributes from an application point of view as the technology is no longer the driving force behind this evolution.



Dr. Peter Bennich

Senior policy adviser (at the Swedish Energy Agency); chair of the IEA 4^E SSL annex
ssl.iea-4e.org | peter.bennich@energimyndigheten.se

Peter Bennich (b 1963) studied at the University of Uppsala, Sweden, where he received a PhD in surface science (physics) in 1996. After two years as lecturer at the Mid Sweden University, teaching courses in physics and electronics, he moved on to the Royal Institute of Technology (KTH), working with projects on power electronic based components in the electrical grid. He also worked as program manager for projects on distributed generation (wind power in particular). Since 2002 Dr. Bennich has been working with energy policies within the Swedish government, focussing on energy efficiency. In his present position at the Swedish energy agency, he is working with the EU directives on ecodesign (minimum energy performance standards) and energy labelling. He is covering the work on the lighting regulations in particular. Since October 2011 he is the Management Committee chair of the Solid State Lighting annex (SSL annex), part of the IEA implementing agreement on Energy Efficient End-use Equipment (4^E). See ssl.iea-4e.org for more information.

IEA 4^E SSL annex: providing governments with the tools to accelerate market adoption of SSL products

The presentation will describe how governments work together in the IEA 4^E SSL annex (described above) to understand and promote new lighting solutions based on solid state lighting. The annex connects with experts from academia and standardisation bodies, and working together in this way allows a faster transition to efficient and good lighting around the globe. The first term, 2010-2014, focussed on gathering information on performance requirements, evaluations of new test methods and harmonisation of accreditation schemes across different regions in the world. The first term was crowned by the world's so far largest interlaboratory comparison, the IC2013, in which 110 laboratories participated.

In the second term, 2014-2019, the work on performance requirements and evaluation of test methods will continue, with particular focus of life time and on tests using near field goniophotometers, and on assessing new lighting solutions such as smart lighting.



Carlos Lee

Director General European Photonics Industry Consortium (EPIC), 1040 Brussels, Belgium
www.epic-assoc.com | carlos.lee@epic-assoc.com

Carlos Lee brings with him a background in microelectronics which was acquired through several management positions held at the international association SEMI. He has been responsible in Europe for the SEMI International Standards program, managed technical and executive programs, and together with the advisory board advocated for a more competitive semiconductor and photovoltaic manufacturing industry. Carlos has a BBA in Finance and an MBA in Leadership & Change Management from United Business Institutes. He lives with his spouse and three children in Belgium.

Moderation Session 2 (pm): Smart & Human Centric Lighting



Dr. Marcus Dülk

CTO Exalos AG, 8952 Schlieren ZH
www.exalos.com | duelk@exalos.com

Marcus Dülk graduated from the Technical University of Berlin and with a PhD from ETH Zurich. In 2000, he joined Bell Labs/Lucent Technologies in the US. In 2007, Marcus became Chief Technology Officer (CTO) at EXALOS and has been directing the development of broadband and high-power Superluminescent Light Emitting Diode (SLED) devices, wavelength-tunable swept sources, and other advanced products.

New LED components for smart lighting, e.g. Blue SLEDs

A general overview of SLEDs, realized with III-V semiconductors, and their main applications is given. A comparison between GaAs- or InP-based devices operating in the near infrared and GaN-based SLEDs operating in the visible range is given. Clear advantages and disadvantages of the GaN SLEDs compared to GaN laser diodes (LDs) are illustrated.



Dr. Hani Kanaan

OLED Technology & Business expert, Technology Business Development, Laboratory of Technologies and Components for Visualisation, Commissariat à l'énergie atomique et aux énergies alternatives CEA, 38054 Grenoble, France
www.leti.fr | hani.kanaan@cea.fr

OLED technology expert, Hani Kanaan received his PhD degree in Electric Engineering from University of Toulouse (France) in February 2009, where he worked on electrical simulation and fabrication of OLED and organic photovoltaic devices. He then moved to Belgium to work at Materia Nova on OLED fabrication using metallic substrates with top configuration architecture. He has a large background in electro-optical characterization, device design, fabrication, and optimization. He joined the Leti Optics and Photonics Department in December 2010 where he worked on the development, optimization, and characterization of OLED for microdisplays and lighting applications. He had the opportunity to work on several European projects as a project leader, as well as a project coordinator (LEO project). Currently, he is heading the business development for Leti Optics and Photonics Department lighting activities.

New OLED components for smart lighting

Micro LED Matrix light source represents the next lighting generation that will allow mixing between lighting and displaying. Increasing the matrix resolution allows controlling the light distribution with the possibility to adapt illumination and contrast. Controlling the light distribution offers the best illumination to a driver without glaring other road users. In general lighting the LED matrix gives the possibility to reduce energy consumption, increases the lighting system functionality and enables color controlling. Within our presentation, we will show how to build a High definition Micro LED Matrix.



Dr. Erno Langendijk

Business Development & Program Manager for Flexible OLEDs at Holst Centre, TNO Holst Center, 5656 AE Eindhoven, The Netherlands
www.holstcentre.com | erno.langendijk@tno.nl

Erno Langendijk got his PhD in physics from Delft University. He worked at Philips Research on various display technologies as a Principal Scientist and in the TV business as a Director Program Manager and later joined Liquavista Amazon as an R&D Manager. Currently he is affiliated with the Holst Centre as Business Development & Program Manager for Flexible OLEDs.

PI-SCALE : European pilot line for customized flexible OLEDs

PI-SCALE (<http://pi-scale.eu>) is creating a European pilot line service to enable companies to quickly and cost effectively test and scale up their flexible OLED lighting or signage concepts and to prepare for mass production. The line will offer customised flexible OLED prototypes, which are energy efficient, ultra-thin, flexible, and lightweight, and assist with seamless integration of these into product forms.







Prof. Dr. Beat Ruhstaller

Professor at Institute of Computational Physics (ICP) at Zurich University of Applied Sciences (ZHAW) and Chairman at Fluxim AG, 8401 Winterthur ZH
www.zhaw.ch/de/engineering/institute-zentren/icp | www.fluxim.com | ruhb@zhaw.ch

Beat Ruhstaller is founder and CEO of Fluxim AG and professor at the Institute of Computational Physics at the ZHAW where he heads the organic electronics and photovoltaics research activity. He received his PhD in Physics from the University of California at Santa Cruz, USA, and an Executive MBA from ZHAW. During his PhD and Postdoc he worked at the IBM Almaden Research Center, USA, and the IBM Zurich Research Laboratory, respectively. He has performed research on optical, electronic and thermal processes in light-emitting and light-harvesting thin film semiconductor devices. He has been a principal investigator in several European and national research projects.

Design, Characterization and Optimization of OLEDs for Lighting

OLEDs are thin film large-area light sources with excellent spectral quality. The OLED thin film stack and additional light management structures can be optimized on the computer for high outcoupling efficiency leading to lower drive current at the desired luminance level. Light-outcoupling enhancement strategies and examples presented where model predictions were validated experimentally. Moreover, we illustrate approaches for achieving good brightness uniformity by use of large-area simulations of OLED panels.

	<p>Head Centre for Chronobiology, Psychiatric University Clinics, University of Basel, 4012 Basel www.chronobiology.ch christian.cajochen@upkbs.ch</p>
<p>Prof. Dr. Christian Cajochen</p>	<p>Prof. Christian Cajochen received his PhD in natural sciences from the ETH in Zürich, followed by a 3-y postdoctoral stay at the Harvard Medical School. He studies the influence of light on human cognition, circadian rhythms and sleep and has held a number of honours and has authored many original papers and reviews.</p> <p>Research on human centric lighting The discoveries of light's repercussions on the brain's sleep and wake-promoting regions and the advances in LED technology, will help designing human centric light devices for at home and in the work place environment. Thus, it should be possible to adapt our illuminated surroundings such that we do not jeopardize health but positively influence our sleep and well-being.</p>
	<p>ppa. Mag., Director Research, Member of the Management Board, Bartenbach GmbH, 6071 Aldrans, Tyrol, Austria www.bartenbach.com Wilfried.Pohl@bartenbach.com</p>
<p>Wilfried Pohl</p>	<p>Studied mathematics and physics, started 1985 at Bartenbach, since 1998 Member of Managing Board and Director Research, dealing with R&D for day- and artificial lighting, including visual perception and light and health.</p> <p>Leader of various international planning and R&D-projects in these fields, lecturer at different universities.</p> <p>View of a light design company on human centric lighting In our lighting design groups dynamic illuminations for various applications are planned and implemented on a day-to-day basis. The practical realization of such dynamic illuminations is often overburdening involved trades (e.g. electricians), is costly and time-consuming and at the same time their benefit is not based on enough scientific evidence yet. Bartenbach has started a research initiative for improving this evidence.</p>
	<p>Board of Directors EPIC, Head of Research Collaborations Zumtobel Group, Zumtobel Lighting GmbH, 6851 Dornbirn, Austria www.zumtobelgroup.com heinz.seyringer@zumtobel.com</p>
<p>Dr. Heinz Seyringer</p>	<p>Heinz Seyringer studied physics and mathematics at the ETH Zurich, became then managing director of Photeon Technologies and moved after 8 years to the Zumtobel Group. He is member of the board of directors of the EPIC, member of the executive board of the European photonics platform Photonics21, chairman of the Austrian photonics platform Photonics Austria.</p> <p>View of a light company on human centric lighting Good lighting can promote human wellbeing, creating the ideal setting for high performance, satisfaction and health. In this presentation it will be shown how lighting can influence the human behavior and which influence good lighting can have on human health.</p>
	<p>Director General EPIC www.epic-assoc.com carlos.lee@epic-assoc.com</p>
<p>Carlos Lee</p>	<p>Closing remarks</p>

