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LED Lighting Technologies

International Winning Approaches

**27-29 SEPTEMBER 2011
BREGENZ | AUSTRIA**

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LED Technologies – Winning Approaches



The lighting industry is experiencing a radical change due to the emergence of LED technology. The advantages of Solid State Lighting are so important that LED solutions are being conceptualized and developed right through every branch and application area of light.

At the same time we are experiencing stupendous dynamics in the further development of LED light sources and the necessary components in the field like, for example, the optical elements, the electronic drives or the cooling systems.

In order to be able to design reliable, efficient and cost optimized LED solutions, it is necessary to keep up with the above mentioned dynamics and to choose the best technologies for each application.

The aim of the LED professional Symposium + Exhibition is to give the participants information about the newest technology trends, introduce technology solutions and to help create and/or expand their network of leading suppliers and research facilities.

The topics of the Symposium + Exhibition forge a bridge between the LED light source to the components and on to LED modules, lamps and luminaries, whereby the main emphasis lies in the areas of efficiency, reliability, costs, tests and standardization.

Please take note of the supplemental contributions relating to design methods. Conceptual methods for designing innovative LED lighting solutions efficiently.

I would like to take this opportunity to personally invite you to this event! You can expect to see Top LED lights, components, equipment and methodology experts as well as a first class exhibition put on by leading suppliers in a very unusual setting – the Bregenz Festival House. The Festival House or Festspielhaus is not only known for its performances on the lake stage but also for the James Bond movie that was filmed here and for its extraordinary architecture and features – all offered in an excellent structure.

Use this chance to get to know the Winning Approaches of LED Technologies.

I'm really looking forward to meeting you in the heart of Europe!

Best regards,

Siegfried Luger
Event Director
CEO Luger Research
Publisher LED professional

LED professional Symposium & Exhibition 2011



LpS 2011 (LED professional Symposium + Expo) aims to become Europe's foremost LED lighting technology meeting point for lighting-experts in industry and research. The symposium covers LED lighting technologies for luminaries, lamps and modules focusing on new system approaches, new components and the most up to date methodologies.



From September 27th to 29th, 2011, global key players from industry and research will be meeting in Bregenz, Austria. This is where you can get the latest information on the newest technologies and developments and resolve challenges with state-of-the-art solutions.

The international user-oriented symposium will cover LED lighting technologies and their applications. The LpS exhibition will run concurrently.

LED lighting technology has a big influence on the development of new lighting solutions and is applied in all stages of lighting, from light generation to optical systems and light measurements. The symposium, which is planned to become an annual event - offers a comprehensive program that deals with these topics.

Specialists from all over the world will present their latest, as yet, unpublished, technologies and products. They are also available for detailed technical discussions during the event.

The symposium offers an ideal platform for dialogue between research, industry, product development and application.

Topics covered:

- Evolution of LED lighting systems
- Technologies for increased efficiencies of white LED systems
- Technologies for mixing LED light
- Reliability of LED lighting systems
- Standardization & measurement of LED lighting systems
- Design approaches & tools of LED lighting systems
- Cost & production process improvements for LED lighting systems

System areas covered:

- LED light generation
- Primary & secondary optics
- Driver ICs
- Lighting driver modules
- Cooling devices
- Substrate, packaging & connection devices & materials
- Lighting control modules
- Lighting design tools & configurators covering optics, electronics & thermal components
- Measurement & calibrating equipment
- Production methodologies & manufacturing tools

Visitors Profile

The LED professional Symposium & Exhibition 2011 mainly targets interest groups that want information about LED lighting technology and its application in light modules and lighting elements. The symposium itself is technology oriented and is therefore ideal for people from the technical and technology fields.

The exhibition will present technologies, components, products and implementation solutions and is therefore also an ideal platform for an extended circle of people.



Main Target Groups of the LED professional Symposium & Exhibition 2011:

- Job Titles:**
- Executives
 - Technical directors
 - R&D managers and personnel
 - Technical sales and marketing personnel
 - Technical purchasers
 - IP managers and personnel
 - Technical application engineers
 - Technical consultants
 - Students of engineering subjects

- Organizations:**
- Lighting manufacturers
 - Component manufacturers
 - Module manufacturers
 - Test equipment manufacturers
 - Production equipment manufacturers
 - Research institutes
 - Testing laboratories
 - Approval laboratories
 - Lighting organizations

SYMPOSIUM SCHEDULE DAY 1 + 2



DAY 1 27.09.11

09:00 - 09:30	WORKSHOP REGISTRATION	
09:30 - 12:00	WORKSHOP PART I	Sergei Ikovenko, Prof. DDr. / Massachusetts Institute of Technology, USA Winning Approaches in LED Lighting - Disruptive Innovation Technology
12:00 - 13:00	LUNCH BREAK	
13:00 - 13:30	WORKSHOP PART II	Jamie Fox / IMS Research, UK Winning Approaches in LED Lighting - Latest LED Market Research
13:30 - 14:30	WORKSHOP PART III	Sergei Ikovenko, Prof. DDr. & Jamie Fox Workshop Discussion - Innovation and Market Drivers
14:00	SYMPOSIUM REGISTRATION	
15:00 - 16:30	SYMPOSIUM OPENING	Siegfried Luger, EMBE / LED professional, Austria Symposium Opening
	KEYNOTE SPEECHES	Klaus Vamberszky, DI / Zumtobel Group, Austria LED – Opportunities and Challenges for Luminaire Manufacturers
		Gerhard Kuhn, Dr. / OSRAM Opto Semiconductors, Germany Challenges of LED Lighting Systems
		Sergei Ikovenko, Prof. DDr. / Massachusetts Institute of Technology Technology Evolution in LED Lighting
16:30	EXPO OPENING	
18:30	COME TOGETHER BUFFET	

DAY 2 28.09.11

08:30 - 08:55	SESSION I LED Technologies I	Decai Sun, Dr. / Philips Lumileds Lighting Company, USA High Optical Power Warm White LED Technology for Illumination
08:55 - 09:20		Thomas Uhrmann, Dr. / EV Group Europe & Asia/Pacific GmbH, Austria Silicon-Based Wafer-Level Packaging for Cost Reduction of High Brightness LEDs
09:20 - 09:45		Thomas Zabel / e:lumix LED Technologie GmbH, Germany High-efficiency LED Technologies Combining Semiconductors and Phosphors
09:45 - 10:45	COFFEE BREAK / EXHIBITION & POSTER PRESENTATION	
10:45 - 11:10	SESSION II LED Technologies II	Mitch Sayers / Cree Europe GmbH, Germany Selection and Optimization of LED Component Platforms
11:10 - 11:35		Ku Chin Lin, Prof. PhD / Kun Shan University, Taiwan Optimization of Mixed White Light Color Rendering
11:35 - 12:00		Christian Sommer, DI Dr. / Joanneum Research Forschungsgesellschaft mbH, Austria The Impact of Phosphor Properties on the Light Quality of White LEDs
12:00 - 13:30	LUNCH BREAK / EXHIBITION & POSTER PRESENTATION	
13:30 - 13:55	SESSION III Optical Components	Luca Scodes / Khatod Optoelectronic S.r.l., Italy Improved Optical Designs for Cost-Effective High Quality LED Lighting Systems
13:55 - 14:20		Christian Véron, Dr. / Zett Optics GmbH, Germany The Impact of Fluctuations in Plastic Optical Elements in LED Lamps and Luminaires
14:20 - 14:45		Andrew Dennington / Polymer Optics Ltd., UK A Guide to Using Free-Form Optics for LED Lighting Systems
14:45 - 15:10		Stephan Malkmus, Dr. / OEC AG, Germany Tailored Optics for LED Luminaires – From Mass Production to Low Volume
15:10 - 16:15	COFFEE BREAK / EXHIBITION & POSTER PRESENTATION	
16:15 - 16:40	SESSION IV Electronic Components	Francesco Ferrazza / STMicroelectronics, Italy Off-Line Driver Technologies for Compact and Robust LED Controllers
16:40 - 17:05		Alfred Hesener / Fairchild Semiconductor GmbH, Germany Spectral Tuning for White LED-based Luminaires
17:05 - 17:30		Paul Fleming / Mean Well Europe B.V., The Netherlands Design Considerations for LED Power-Supplies
17:30 - 17:55		Stefan Hörth, DI / Häusermann GmbH, Austria Advanced Copper/FR4 Circuit Board Technology for LED Lighting Systems
17:55 - 20:00	EXHIBITION & POSTER PRESENTATION	
20:00	GALA DINNER	

SYMPOSIUM SCHEDULE DAY 3

DAY 3
29.09.11

08:30 - 08:55	SESSION V Measurement, Testing & Manufacturing	Peter Läßle / Instrument Systems Optische Messtechnik GmbH, Germany Metrology of White Light LEDs
08:55 - 09:20		Jürgen P. Weißhaar / opsira GmbH, Germany Calibration and Quality Control of Multi-Color LED Lighting Systems
09:20 - 09:45		András Poppe, PhD / Mentor Graphics & Budapest University of Technology and Economics, Hungary Measuring AC Thermal Impedance of LEDs and Assessment of LM80 Test Results
09:45 - 10:10		Marcel Freiermuth, DI / essemtec AG, Switzerland 3D LED Component Assembly Enables New Product Designs
10:10 - 11:00	COFFEE BREAK / EXHIBITION & POSTER PRESENTATION	
11:00 - 11:25	SESSION VI LED Lighting Systems	Stéphane Vasse / Tridonic GmbH & Co KG, Austria Overview and Evolution of LED Lighting Systems
11:25 - 11:50		Uri Neta, MSc / Uri Neta, Israel High-Intensity Optical LED Multiplexer
11:50 - 12:15		Jörg Baumgart, Prof. Dr. Ing. / IBH/IBK - Hochschule Ravensburg Weingarten, Germany State-of-the-Art Equipment for LED Research
12:15 - 13:45	LUNCH BREAK / EXHIBITION & POSTER PRESENTATION	
13:45 - 14:10	SESSION VII Standardization & Reliability	Martina Paul / International Commission on Illumination (CIE) CIE and the Strategy to SSL-Standardization – Bringing Stakeholders Together
14:10 - 14:35		Matei Stelian, Dr. Eng. / Electromagnetica SA, Romania Challenge of Standards and Norms for White LED Systems
14:35 - 15:00		Reinhard Pusch / RoodMicrotec Stuttgart GmbH, Germany Selection of LEDs for Different Applications Ensuring Quality and Reliability
15:00 - 15:10	SYMPOSIUM CLOSING	

Poster Presentation

DEL-KO GmbH, BioLedex	H. W. Diesing: "Optical Deflection System to Provide Even Circular Light Distribution Using a Spot Light Source"
Fraunhofer Institute	N. Pfanner: "Solar LED Lights – Investigations and Tests"
Kantonschule Zofingen	M. Marti & K. Ernst: "Concept, Construction and Analysis of a Sun-Simulator Using LEDs"
Optimal Optik Ltd	G. Szarvas: "Mirror Type Variable Optical System of LED Module for Street Lighting Luminaires"
Sharp Microelectronics Europe	U. Hock: "Evolution of LED for Lighting - From a Technology Driven to an Application Driven Industry"
STMicroelectronics	F. O. Lissoni: "Buck Converter Base LED Current Source - Application Design for Best Performance"
The Bergquist Company	S. Misra: "Thermal Interface Materials and Substrates for LED Thermal Management"
Tridonic & University of Applied Sciences Vorarlberg	M. Mayrhofer, M. Zimmermann, G. Kempter, W. Ritter: "Subjective Visual Impression of Illumination Quality from White LED Operated by Current-Sources having Different Modulation Content"

Workshop Winning Approaches in LED Lighting

September 27, 2011, 09:30 - 14:30, max. 50 attendees.

The workshop covers disruptive innovation technology, the latest LED market research and a final discussion session with the experts.

Part one introduces participants to framework and toolset development of disruptive technologies, with a focus on driving strategic front-end of innovation including Main Parameters of Value (MPV) discovery and problem identification methods.

Part Two presents the results of the latest LED market research and explains how to interpret statistical market data thoroughly and correctly. Part Three is a discussion of innovation and market drivers for LED lighting systems for a deeper understanding of the winning approaches.



Sergei Ikoenko, Prof. DDr.

*Director and Chief Specialist
Innovation Leadership Programs
Massachusetts Institute of Technology (MIT), USA*

27.09.11 | 09:30 - 12:00

Disruptive Innovation Technology

The most important objective from a business perspective is to identify hidden (latent) MPV that the consumer does not verbalize. If such an MPV is determined it can be a basis for a new business platform. The participants will discover the major direction of latent MPV.

The seminar is furnished with examples from the LED lighting area as well as from other engineering fields.

Highlights:

- Disruptive Technology Process
- Introduction to Pragmatic S-Curve Analysis
- Latent MPV Discovery
- Function Oriented Search



Jamie Fox

*Analyst and LED Research Manager
IMS Research, UK*

27.09.11 | 13:00 - 13:30

Latest LED Market Research

In the fast evolving field of LED lighting it is crucial to know about technology, market changes and value and supply chain developments. It is also essential to know and understand the singularities of the targeted market and region. Statistical market data, if interpreted thoroughly and correctly are very useful for finding answers to questions arising from this information. The workshop will help to understand the market drivers better while presenting the most recent data.

Highlights:

- Worldwide LED market overview – key trends, applications and developments
- Leading suppliers - supply chain data
- Packaged LED shipments market data – 2010 and the forecast for 2011
- General lighting in Europe market data, differences to other regions

Key Notes



Klaus Vamberszky, DI

*Executive Vice President of Technology
Zumtobel Group, Austria*

27.09.11 | 15:15 - 15:40

LED – Opportunities and Challenges for Luminaire Manufacturers

The LED will change the lighting industry forever – the ways and means of creating value will differ significantly from those of the past. The market will see the coming together of opposite forces: the fast-moving semiconductor industry and the slow, conservative lighting business. While the former masters the technology (technology push), the latter understands the application and controls distribution channels and markets (market pull).

This opens up opportunities for the luminaire manufacturer, but also some major challenges. Recent LED developments will be used to explain the implications. A comparison with other industries that have already stepped into the “digital era” will enable an outlook on future developments.



Gerhard Kuhn, Dr.

*Head of the worldwide Application team for the BU Solid State Lighting
OSRAM Opto Semiconductors, Germany*

27.09.11 | 15:40 - 16:05

Challenges of LED Lighting Systems

After introducing the features of LED illumination together with efficacy-figures of different lighting technologies, the author will focus on challenges of LED illumination systems. Both indoor and outdoor systems will be covered by discussing the respective requirements and challenges. Solutions will be given by considering experiences of realized projects or outlooks and roadmaps. Topics like the total cost of ownership and the reliability of LED technology

will increase trust of LED systems. The quality of light aspect will be discussed by showing different options and applications. Finally, the author will reflect new luminaire design possibilities as well as new light planning features in order to create healthy work spaces, convenient outdoor luminaires for street- and tunnel-lighting and comfortable and variable home illumination systems.



Sergei Ikovenko, Prof. DDr.

*Director and Chief Specialist, Innovation Leadership Programs
Massachusetts Institute of Technology (MIT), USA*

27.09.11 | 16:05 - 16:30

Technology Evolution in LED Lighting

To describe laws and trends of evolution of engineering systems is not a new issue – many scientists and philosophers have tried to do it in their works. One of the most interesting approaches to develop a detailed system of trends is derived from statistical analysis of the world's patent collection.

Laws and trends of engineering system evolution are analogous to Darwin's law of natural selection. There are a lot of factors that influence the development of engineering systems: accidental, financial, psychological, subjective, etc. But once created, engineering systems start competing with each other in a “Darwinian” way.

The competition is endless, and the analysis of the world's patent collection showed the common mistakes of “losers” and the shared strengths of “winners”. The trends of engineering system evolution

reflect common rules of “survival of the fittest” and, because of the fact that they were determined from the analysis of a big statistical database, those rules are generic for various kinds of engineering systems. For example, applying S-curve Trend Analysis explicitly shows that LED technologies are at the second stage of the S-curve for a number of its MPVs (Main Parameters of Value). This conclusion allows the formulation of major recommendations for the development of LED technologies as well as the definition of innovation strategies for the improvement of different MPVs for LED lighting systems.

The presentation shows the current position of LED technologies on a number of trends suggesting potential directions for the further development of LED lighting.

Speakers - Session I

LED Technologies I

Chair: Dr. Paul Hartmann, Joanneum Research



Decai Sun, Dr.

Senior Manager for Illumination Product Development
Philips Lumileds Lighting Company, USA

28.09.11 | 08:30 - 08:55

High Optical Power Warm White LED Technology for Illumination

High-power warm white LEDs capable of emitting over 1.000 lumens at an efficacy of 100lm/W are very desirable for general lighting applications. Explanation of a surface mount technology (SMT) type LED package design using a ceramic submount as the carrier and InGaN LED flip chips attached to a ceramic submount are given. The high power LED design and fabrication process under development will be described in detail, followed by discussion on device electrical, optical and reliability performances.

Highlights:

- High-power warm white LED technology capable of emitting over 1.000 lumens with very high efficacy values
- Characterization of the technology: CCT, CRI, temperature dependency, reliability
- Explanation of the color conversion element
- Insights into the fabrication process



Thomas Uhrmann, Dr.

Business Development Manager for Compound Semiconductor and Si-based Power Devices
EV Group Europe & Asia/Pacific GmbH, Austria

28.09.11 | 08:55 - 09:20

Silicon-Based Wafer-Level Packaging for Cost Reduction of High Brightness LEDs

Moving from die-level to wafer-level processes is one likely potential solution for reducing cost per lumen. Silicon-based wafer-level packaging offers high fabrication reliability, high yield and the direct integration of the driver IC in the package. The already small form factor of the presented technology can be further reduced using Through-Silicon-Vias, increasing the maximum amount of chips per wafer. Silicon wafer-level packaging offers superior thermal management and the integration of optical elements for an improved performance and reduced packaging costs.

The author will discuss the field proven solutions at each process step, from the formation of the silicon interposer, through the chip-to-wafer bonding, to the final imprinting of the wafer-level optics.

Highlights:

- Cost reduction with wafer-level packaging technology
- Direct integration of driver ICs and optical elements
- Fabrication reliability and performance parameters



Thomas Zabel

CTO
e:lumix LED Technologie GmbH, Germany

28.09.11 | 09:20 - 09:45

High-efficiency LED Technologies Combining Semiconductors and Phosphors

The current LED technologies are both limited by theoretical and practical boundaries that prevent them from further improvements needed toward efficiency and quality. Sometimes even physical boundaries limit the current state of the art. For the purpose of long-term basic research, fundamental limits have been considered in detail and some new parameters have been introduced.

In principle, the innovations can be classified in three technology groups: semiconductor, phosphorescent material, and control.

Highlights:

- Approaches for LED chip technologies
- Adoption of phosphorescent material and its CRI and efficiency trade-offs
- Selective controlling and selection of LEDs to increase the overall efficiency
- Concept of a 200 lm/W LED technology

Speakers - Session II

LED Technologies II

Chair: Nisa Khan PhD, LED Lighting Technologies



Mitch Sayers

Field Application Engineer
Cree Europe GmbH, Germany

28.09.11 | 10:45 - 11:10

Selection and Optimization of LED Component Platforms

Currently LED component platforms provide common overall chip footprints for various optical source sizes, but the different products deliver different features depending on various applications. Optimized LED platforms deliver high lumen per unit cost values and outputs range over an order of magnitude within the same single package and footprint. LED component platform optimizations will help make LED lighting systems more cost effective, quicker to develop, with higher quality, more efficient and robust over extremely long lifetimes.

Highlights:

- How to select LEDs with adequate properties for different lighting applications
- Methods and strategies to provide cost effective solutions
- Potentials and limitations of LED platform strategies
- Physical descriptions of the optimized platforms



Ku Chin Lin, Prof. PhD

Professor - Department of Mechanical Engineering
Kun Shan Univ, Taiwan

28.09.11 | 11:10 - 11:35

Optimization of Mixed White Light Color Rendering

A method is developed for optimization of color rendering for a light mixture. No derivatives of the rendering function are required. Constraints of correlated color temperature and approximate white can be incorporated. Applicability of the method for a mixture of four colors is demonstrated in this paper by simulation and experiment.

Highlights:

- Computational CRI optimization of light mixture
- Optimization of CRI for various CCT
- Comparison of simulation and experiment



Christian Sommer, DI Dr.

Researcher - Materials, Light and Optical Technologies
Joanneum Research Forschungsgesellschaft mbH, Austria

28.09.11 | 11:35 - 12:00

The Impact of Phosphor Properties on the Light Quality of White LEDs

The device performance in terms of light output and quality of the white light critically depends on the appropriate shape and arrangement of the color conversion element within the LED package. One important aspect in the context of white light quality is the highly accurate reproducibility of the desired correlated color temperature among individual LEDs, which for general lighting purposes should be within a 2-step MacAdam ellipse. It is therefore imperative to understand how variations of the extinction coefficient and the quantum efficiency affect the respective color conversion process. Based on an optical ray-tracing study the impact of materials parameters and their mutual interactions on the variations of the color temperature and the angular homogeneity of phosphor converted white LEDs will be discussed.

Highlights:

- Improved reproducibility of a desired correlated color temperature
- Wavelength variations of blue LED dice
- Shape and arrangement of color conversion elements
- Influence of the extinction coefficient and quantum efficiency to the respective color conversion process
- Ray tracing study to discuss impact of material parameters and interactions

Speakers - Session III

Optical Components

Chair: Dr. Günther Sejkora, Kompetenzzentrum Licht



Luca Scodes

*Optical Engineering Manager
Khatod Optoelectronic S.r.l., Italy*

28.09.11 | 13:30 - 13:55

Improved Optical Designs for Cost-Effective High Quality LED Lighting Systems

For LED lighting systems special optics have to be developed for various applications. It will be shown when reflectors would be useful and when one would use lenses. Examples for optical development using simulation tools will be given for various applications such as street lighting, backlighting, and adjustable office lighting.

Highlights:

- Selection of the appropriate optics – reflectors vs. lenses
- Adjustable Fresnel lenses to control the beam angle and the light focus
- Examples of optical simulation projects
- Modular optical systems for wide area lighting



Christian Véron, Dr.

*Team Leader Optics Design and Simulation
Zett Optics GmbH, Germany*

28.09.11 | 13:55 - 14:20

The Impact of Fluctuations in Plastic Optical Elements in LED Lamps and Luminaires

Plastic optical elements play an especially important role in the design of modern illumination systems as they are cheap, lightweight, versatile, can incorporate mechanical fixing elements and the optical surface can have nearly any form or shape, which is not the case for glass optics. Despite these advantages over glass optics, plastic optics have some limitations for the design of optical systems. When designing plastics based optical systems, the optics designer has to consider - besides the differences in material properties - the way plastic optical elements are produced.

In contrast to glass optics, plastic optics get their optical properties and geometrical shape in one single process: the molding process. This leads to a different way the optics designer has to account for tolerances.

Highlights:

- Analysis of system performance
- Manufacturing tolerances
- LED variations
- Optics misalignment
- Examples: Collimator system, light guide system



Andrew Dennington

*Optical Design Manager
Polymer Optics Ltd., UK*

28.09.11 | 14:20 - 14:45

A Guide to Using Free-Form Optics for LED Lighting Systems

LED based luminaires are increasingly being used for illuminating wide areas. Up until recently the optics for LEDs produced circular or elliptical beams. As most areas that require illumination are non-circular this has meant light has been wasted by over illumination. New advances in optical design and mold tool manufacturing have meant that it is now possible to avoid over illumination by using optical components that make use of free-form optical surfaces.

To apply the free-form optical technology properly it is necessary to know about the opportunities and limits. In addition, the correct LED selection is important. The question of how LED parameters such as source size and the variation in LED color temperature with angular output affect the beam quality, will be discussed.

Highlights:

- Opportunities and limits of the free-form optics technology
- Influence of LED parameters on light beam quality
- Selection of the appropriate light source
- Effects of future free form optics development on the LED luminaire market



Stephan Malkmus, Dr.

*Optical Design Engineer
OEC AG, Germany*

28.09.11 | 14:45 - 15:10

Tailored Optics for LED Luminaires – From Mass Production to Low Volume

Optical free form surfaces in combination with solid state light sources allow for almost any light distribution, e.g. strongly asymmetric light distribution, which makes it interesting in an extremely wide spectrum of applications.

As an example for high volume production, tailored optics are demonstrated for LED street lighting. High accuracy requirements are satisfied by ultra-precise injection molding.

In LED architectural lighting, the demands on light distribution are quite different and mainly aesthetical criteria play an important role. This opens the possibility of manufacturing free form optics with different methods such as milling or rapid prototyping in an economically competitive way – even in low volumes.

Highlights:

- Design of freeform optics
- Ultra-precise injection molding
- Examples of optical simulation projects
- Rapid prototyping

Speakers - Session IV

Electronic Components

Chair: Steve Roberts MSc, Recom



Francesco Ferrazza

*Application Engineer, Lighting & Converter BU
STMicroelectronics, Italy*

28.09.11 | 16:15 - 16:40

Off-Line Driver Technologies for Compact and Robust LED Controllers

LED retrofit bulbs supplied directly from AC mains exhibit the greatest chance of success thanks to the trend of cost and efficiency of the LED chips. Improving traditional flyback topology introduces some key features: It controls the mean value of the LED current directly from the primary side; It works in Quasi-Resonant operating mode that allows the reduction of both conduction and switching losses; It works at variable frequency and reduces the EMI level.

Highlights:

- General requirements for LED replacement bulbs
- Requirements for off-line LED drivers for LED replacement bulbs
- Flyback technology: Operating modes, efficiency values, reliability and cost considerations



Alfred Hesener

*Senior Director Marketing & Applications Europe
Fairchild Semiconductor GmbH, Germany*

28.09.11 | 16:40 - 17:05

Spectral Tuning for White LED-based Luminaires

A power supply circuit for LED-based luminaires is presented, that uses a multicolor sensor to detect changes in the spectral composition of the light, and controls LEDs of different colors to achieve a near-constant intensity and color. This allows using lower-cost, non-binned white LEDs, and ensures a stable light output in production and over lifetime of the luminaires. A practical implementation for a 40W office lighting system is shown, and test results demonstrate the stability expected from analysis.

Highlights:

- Low-cost, high efficiency LED power supply technology with multiple output channels
- Driving colored LEDs to adjust the spectral output of a luminaire
- LED color and brightness dependency on current, temperature and binning
- Multicolor sensors for measuring light color and intensity and driving LED accordingly
- Experimental results



Paul Fleming

Key Account Manager
Mean Well Europe B.V., Netherlands

28.09.11 | 17:05 - 17:30

Design Considerations for LED Power-Supplies

Design considerations for constant voltage, constant current and mixed mode switching power supplies, including switching topologies and power factor correction configurations, in driving LED lighting systems are presented. There will also be a look at mixed/dual mode power supplies which provide both constant current and constant voltage in a single unit, including the advantages and disadvantages of such a design.

Highlights:

- Switched Mode Power Supply topologies: Technology and application overview
- Selection guide for the appropriate technology
- Mixed/Dual mode power supplies

Stefan Hörth, DI

Product Manager
Häusermann GmbH, Austria

28.09.11 | 17:30 - 17:55



Advanced Copper/FR4 Circuit Board Technology for LED Lighting Systems

New PCB concepts and technologies based on FR4 and copper can deal with the increasingly demanding requirements for LED lighting systems. The increase of luminous flux, respectively usage of high-power LEDs as well as thermal stress caused by extensive thermo cycles require sophisticated heat management for optimized performance.

Besides these thermal aspects, the appliance of multidimensional all-in-one boards to support flexible optical design and simple integration of intelligent light management electronics are discussed.

Highlights:

- Requirements of Printed Circuit Boards for LED lighting applications
- Sophisticated thermal management for optimized performance
- Thermal concepts for high power LED applications
- 3D all-in-one board technology for flexible optics / intelligent light management

Speakers - Session V

Measurement,
Testing & Manufacturing

Chair: Prof. Johannes Edlinger, University of Applied Sciences Vorarlberg

Peter Läßle

Sales Manager
Instrument Systems Optische Messtechnik GmbH, Germany

29.09.11 | 08:30 - 08:55

Metrology of White Light LEDs

The achievement and the enduring safeguarding of the optical properties of LEDs and LED lighting products is still quite a challenging exercise. Due to the manufacturing process of LEDs, fluctuations in the photometric characteristics within LEDs of one batch are inevitable. To detect these uncertainties in order to take them into account for the intended development, the usage of conventional light measurement instrumentation is in most cases not sufficient anymore.

The intended presentation will introduce the different light measurement technologies and point out the advantages of the spectroradiometric approach. It will summarize the relevant optical properties of LEDs and will focus on the significant quality criteria of spectroradiometric light measurement instruments.

Highlights:

- Optical properties of the LED and basics of light metrology
- Comparison between photometer/colorimeter and spectroradiometer
- Technical requirements of spectroradiometric systems to measure LEDs with adequate accuracy



Jürgen P. Weißhaar

Managing Director
opsira GmbH, Germany

29.09.11 | 08:55 - 09:20

Calibration and Quality Control of Multi-Color LED Lighting Systems

LEDs typically suffer considerably from tolerances in their flux per current ratio as well as from tolerances in their spectral behavior. For example, a multi-color chip LED delivering different colors from different chips ends up in tolerances of the total luminous flux, the luminous intensity and the spectral distribution.

State of the art spectrometric measurement systems combined with sophisticated algorithms enable a quick and precise calibration of systems consisting of a number of multi-chip LEDs. Specific values like correlated color temperature, color coordinates or color rendition indices, which affect each other sometimes in a counter-productive way, can thus be adjusted automatically, inline, reproducibly and reliably.

Highlights:

- Methods for calibration and quality control
- Requirements for calibration and quality control
- Multicolor LED systems measurement and calibration
- Camera based photometric measurement for quality control



András Poppe, PhD

Marketing Manager, Professor
Mentor Graphics & Budapest University of Technology and Economics, Hungary

29.09.11 | 09:20 - 09:45

Measuring AC Thermal Impedance of LEDs and Assessment of LM80 Test Results

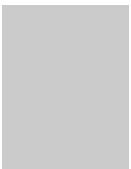
Thermal transient testing alone does not provide the real thermal resistance of LEDs. In order to obtain the actual physical value of the junction-to-ambient thermal resistance of a DC driven LED its thermal characterization has to be combined with the CIE 127:2007 compliant measurement of its light output.

This way, complete thermal impedance curves can be obtained. As a "by-product" the real junction temperature can be identified and if the cold-plate temperature is varied, light output characteristics such as luminous flux along with efficacy, color coordinates or correlated color temperature can be identified as a function of the real junction temperature.

In a recent experiment LM80 testing of LEDs from different vendors was performed. The observations, results and conclusions will be presented.

Highlights:

- Temperature controlled cold-plate measurements according to recent JEDEC LED testing standard proposal
- Measurement of on/off switching transients to calculate thermal impedance of the LED package
- Thermal impedance and its frequency dependency for AC driven LEDs
- Aging effects: Delamination from substrates; Parameter changes of TIM materials
- Luminous flux, efficacy and CCT's functional dependence on junction temperature



Marcel Freiermuth, DI

Manager Solutions
essemtec AG, Switzerland

29.09.11 | 09:45 - 10:10

3D LED Component Assembly Enables New Product Designs

Up until today, a lack of production technologies with sufficient accuracy or disproportional investments for special purpose machines was hindering the implementation of new applications and product ideas. A newly introduced 3D-MID-technology provides manufacturers of LED products with a great innovative potential to generate new and highly efficient products. With the development of this advanced 3D-pick-and-place machine that can be fully integrated in an automated assembly line, new design opportunities arise for the LED lighting industry. The technology, manufacturing process, handling issues as well as application examples will be discussed in detail.

Highlights:

- 3D component placement technology
- Integration in an automated assembly line
- New design approaches for the lighting industry
- Application examples and practical experiences

Speakers - Session VI

LED Lighting Systems

Chair: Dr. Eric Virey, Yole Développement



Stéphane Vasse

LED General Illumination Segment Manager
Tridonic GmbH & Co KG, Austria

29.09.11 | 11:00 - 11:25

Overview and Evolution of LED Lighting Systems

Since the beginning of the 21st century, Solid-State-Lighting technology has revolutionized the lighting market. Initially, LEDs were used in niche applications like signage. Today, market projections credit more than 30% of the general lighting market shares for this new lighting technology over the next 5 years. With the rapid evolution of this technology, systems using LEDs will improve further. It is important to understand the trends and limitations for next generation LED systems.

Highlights:

- Transition from LED component level to LED system level
- LED lighting systems: Key parameters, quality expectations, technological limits
- The future trends of LED lighting systems



Uri Neta, MSc

Owner, Manager
Uri Neta, Israel

29.09.11 | 11:25 - 11:50

High-Intensity Optical LED Multiplexer

In several applications high intensity per emitting area, a narrow beam and good heat dissipation are desired. The big problem is that it is almost impossible with the currently used approaches to fulfill all three requirements at the same time. To reach the desired luminous flux and to allow a cost-effective and efficient optical solution, several LEDs are usually placed very close to one another. This conventional design does not allow adequate heat dissipation without sacrificing the costs.

A new, surprisingly simple approach to solve these problems is presented and opens the way to new luminaire and lighting designs. The optical and thermal details will be disclosed, simulation results presented and examples for new applications will be discussed.

Highlights:

- Functional principle of the optical multiplexer
- Thermal and optical properties
- Technology comparison of the new approach with conventional solutions
- Applications



Jörg Baumgart, Prof.

Professor - Optical Systems Engineering
IBH/IBK - Hochschule Ravensburg Weingarten, Germany

29.09.11 | 11:50 - 12:15

State-of-the-Art Equipment for LED Research

The State of Baden Württemberg (Germany) has founded a new research center: the ZAFH LED-OASYS. Set up as collaboration between several Universities of Applied Sciences together with the Karlsruhe Institute of Technology (KIT), it offers a unique combination of capabilities and equipment for research and development in the field of LED applications. This includes non-sequential software for the design, sophisticated manufacturing such as robot polishing as well as measurement equipment for both the angular as well as spectral and thermal characteristics of luminaires. The first results can already demonstrate how these techniques act together in the design and realization of an LED illumination system.

Highlights:

- Areas of covered technologies
- Choice of measurement technologies
- Realization of an LED illumination system

Speakers - Session VII

Standardization &
Reliability

Chair: DI (FH) Alexander Wilm, Osram Opto Semiconductor



Martina Paul

General Secretary
International Commission on Illumination (CIE)

29.09.11 | 13:45 - 14:10

CIE and the Strategy to SSL-Standardization – Bringing Stakeholders Together

Science and technology of light and lighting are developing with tremendous speed, driven by energy efficiency and thus regulators. International standardization organizations, such as the CIE, have to face and to meet this challenge for the sake of the end-users and the general public.

The CIE has therefore chosen a new way to bring all stakeholders, scientists, metrologists and the end-users together by inviting them to the International Lighting Network. Its aim is to provide a forum of continuous dialog between science and industry, various partner organizations in standardization and the end users, such as lighting designers.

The most important international standardization bodies, their tasks and responsibilities will be highlighted.

Highlights:

- Standardization – importance, expectations and fields
- The role of CIE in standardization issues
- Overview of standardization bodies
- Progress in technical standardization



Matei Stelian, Dr. Eng.

Manager, Semiconductor Lighting Centre
Electromagnetica SA, Romania

29.09.11 | 14:10 - 14:35

Challenge of Standards and Norms for White LED Systems

Solid-state lighting differs fundamentally from traditional lighting technologies in terms of materials, drivers, system architecture, controls, and photometric properties. A multitude of new standards, norms and test procedures is needed to accommodate these technical differences.

In this presentation the reasons why new standards for LED lighting systems are necessary will be discussed.

Highlights:

- Reasons why standards for LED systems are needed
- SSL standards categories: communication standards, design standards, performance standards
- Focus on performance data for LED luminaires



Reinhard Pusch

Managing Director
RoodMicrotec Stuttgart GmbH, Germany

29.09.11 | 14:35 - 15:00

Selection of LEDs for Different Applications Ensuring Quality and Reliability

LEDs, especially high power and high brightness LEDs, become more important in an increasing number of applications. For example, general lighting, automotive, street lamps and displays. In all the applications it is important to select the right LED to obtain the quality and reliability requirement.

This presentation gives an overview of the different methods for selection. It begins with the right interpretation of the datasheet, characterization of the optical, electrical and thermal parameters and different qualification schemes to maintain the required reliability. Examples from the real world will demonstrate the effectiveness of the selection method.

Highlights:

- Relevant LED parameters and related datasheet figures
- Methods to evaluate datasheet parameters
- Qualification schemes to reach the reliability targets
- Selection process – practical examples and experiences

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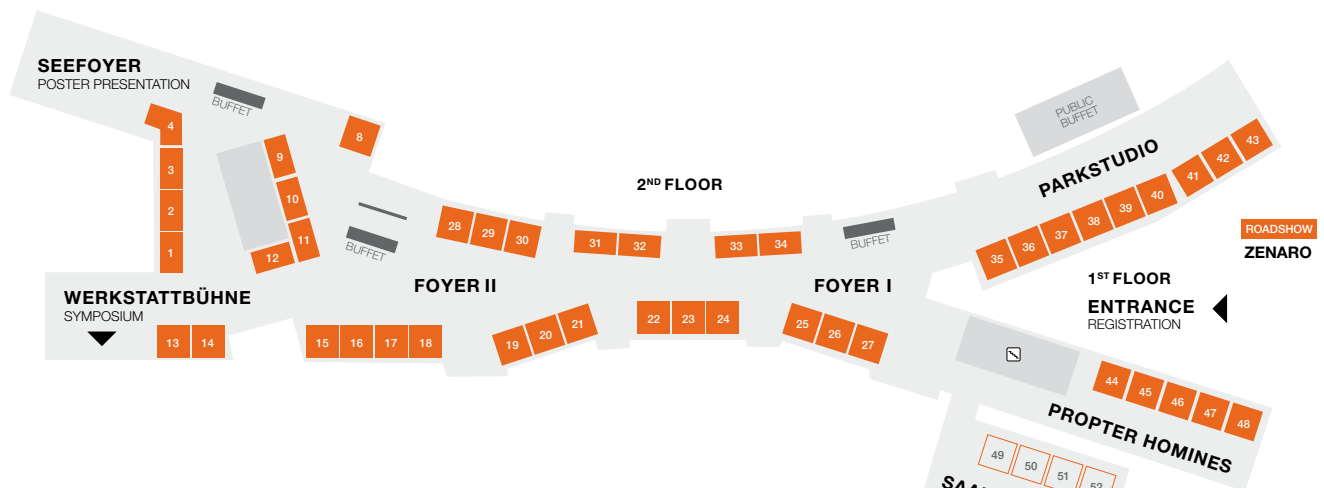
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