THERMINIC 2016

PROGRAM

ORGANIZED BY:

SPONSORED BY:

CONTENT

PREFACE

WELCOME TO THERMINIC 2016!

This 22nd edition of THERMINIC is again the main European event for academics and industry to share recent advancements in thermal issues of electronics and microelectronics, including problems of nano-scale heat-transfer, thermal modeling and simulation issues in solid-state lighting as well as cooling issues of power electronics.

Following the workshops held in Grenoble (1995), Budapest (1996), Cannes (1997 and 1998), Rome (1999), Budapest (2000), Paris (2001), Madrid (2002), Aix-en-Provence (2003), Sophia Antipolis (2004), Belgirate (2005), Nice (2006), Budapest (2007), Rome (2008), Leuven (2009), Barcelona (2010), Paris (2011), Budapest (2012), Berlin (2013), Greenwhich (2014), and Paris (2015) the workshop is back again to the Hungarian capital, 20 years after THERMINIC was held in Budapest for the first time.

The 22nd THERMINIC Workshop will once more propose a strong technical program, with 44 oral and 19 poster presentations organized in 12 oral sessions and two poster introduction sessions. Almost 100 conference delegates from 20 countries are joining us this year.

This program booklet has been designed as a navigator for your conference participation. It includes not just all the sessions, presentations and evening events, but also the timetable and crucial information to help make the most of your stay in Budapest. Note that the days have been color-coded for easier handling.

Each day starts with a keynote by a global player from industry or academia. Thomas Brunschwiler (IBM Research Zurich, Switzerland), Samson Melamed (National Institute of Advanced Industrial Science and Technol-

ogy, Japan) and Ferenc Szabó (University of Pannonia, Hungary) will share their insights on new materials aimed for improving thermal management, thermal issues of 3D integrated electronics and thermal problems related to human centric solid-state lighting.

Wednesday morning through to Friday morning are dedicated to technological and scientific sessions, which have been organized into 11 main thermal topics. A review on the progresses of the QuantiHeat European network along with nano-scale heat transfer problems will be presented in Thursday morning while Friday morning is dedicated to Delphi4LED, a new H2020 European project on compact modeling of LEDs and other thermal issues of LEDs and photonic devices.

Do not forget the workshop's evening program. The cocktail reception on Wednesday evening in the poster area will be an opportunity to start discussions on new potential and exciting recent projects.

While the workshop is organized at the foot of the Castle Hill of Buda, the late seat of the Hungarian kings, the gala dinner will be held in an ancient cellar in the district of Óbuda, the late city of the mediaeval Hungarian queens.

We hope that THERMINIC 2016 will be an intense moment of knowledge sharing and exciting encounters with new or trusted colleagues. Please bring your ideas, comments and suggestions – anything at all that you feel will help us provide a better service to you.

We look forward to sharing with you a great "Indian summer" conference in Budapest at THERMINIC 2016.

András Poppe
Program Chair

Chris Bailey
General Chair

Sebastian Volz
Vice General Chair

András Poppe
Program Chair

John Parry
Publicity Chair

THERMINIC 20156 SCIENTIFIC COMMITTEE

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Sebastian Volz, CNRS, Ecole Centrale Paris, France

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P.O. Chapuis	CNRS - INSA Lyon, France

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S. Volz	CNRS, France
B. Wunderle	TU Chemnitz, Germany
T. Zahner	OSRAM Opto Semiconductors, Germany

GENERAL INFORMATION

WORKSHOP VENUE

The Workshop will be held at art'otel Budapest in Viziváros at the foot of the Buda Castle Hill, right on the bank of the Danube. The workshop venue is easy to access by public transport; it is in front of the stop of trams 19 and 41 and it is a 5-minute-walk from the Batthyány sq. station of the M2 metro line.

ART'OTEL BUDAPEST

Bem rakpart. 16-19, 1011 Budapest
www.artotels.com/budapest-hotel-hu-h-1011/hunbuart

HOW TO FIND YOUR WAY AROUND

We have booked the hotel's conference facilities for the THERMINIC 2016 Workshop. The plenary sessions will take place in the main conference room (Tapestry room) and the session overviews are designed to help you find your way around. Coffee breaks will be offered outside the main session room in the exhibition and poster viewing area (Garden & River rooms). Lunch will be served in the restaurant on the first floor.

WORKSHOP REGISTRATION

The workshop registration fee includes admission to all workshop sessions and the two poster ones. The conference package includes a download link for the electronic proceedings, a list of registered conference participants and authors, lunch and refreshments during breaks. Regular participants have free admission to the conference dinner. For accompanying persons extra tickets can be purchased for this event.

THE REGISTRATION DESK IS OPEN

Tuesday, September 20, 2016	6.00 pm – 8.00 pm
Wednesday, September 21, 2016	8.00 am – 6.30 pm
Thursday, September 22, 2016	8.30 am – 6.30 pm
Friday, September 223, 2016	8.00 am – 4.30 pm

DOOR REGISTRATION FEES

Workshop Participation: € 690
Gala Dinner (limited availability): € 70

PAYMENT

The registration fee must be credited towards the conference account no later than September 19, 2016. All transfer charges must be covered by the participant's bank. If payments are not received by September 19, 2016; you can pay by credit card at the workshop site.

CONTACT INFORMATION AND ASSISTANCE DURING THE CONFERENCE

Do not hesitate to approach us at the registration desk if you have any questions or requests. Our aim is to help you make the most of your conference participation.

DIETARY REQUIREMENTS

The rich buffet lunch is designed to cater for a wide variety of dietary requirements and tastes. When in doubt, please consult one of the chefs serving the food, they will be able to give you detailed information.

INTERNET ACCESS

The hotel kindly provides all conference delegates with free wireless Internet access throughout the conference. Login-information is available at the registration counter.

Please remember to log out when not using the Internet in order to avoid jammed lines.

CONFERENCE LANGUAGE AND PROCEEDINGS

The official language of all presentations is English. The electronic workshop proceedings will be made available as a download link to paprticipants before the conference.

WORKSHOP VENUE

ART'OTEL BUDAPEST

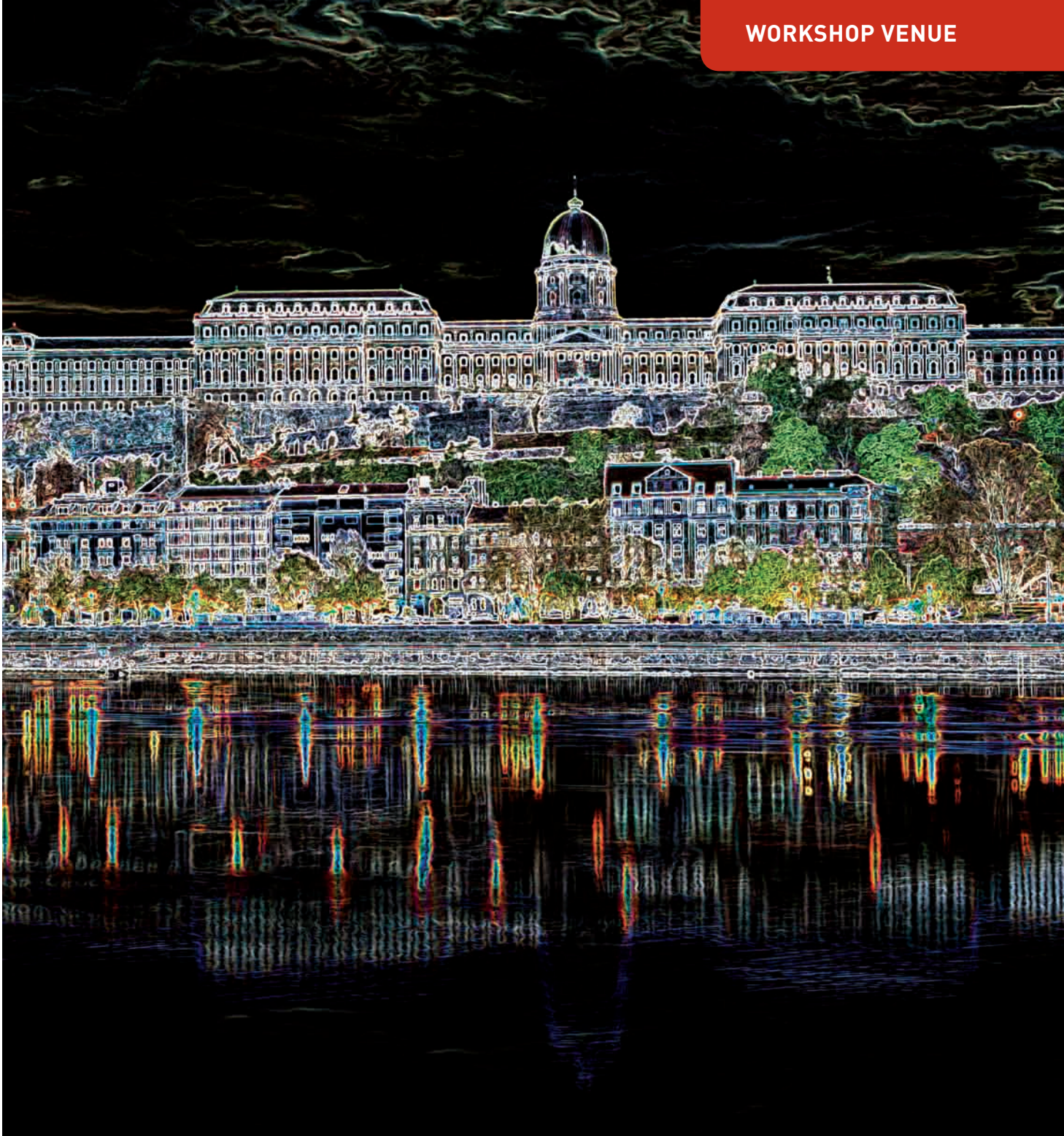
Bem rakpart. 16-19, 1011 Budapest
www.artotels.com/budapest-hotel-hu-h-1011/hunbuart

PUBLIC TRANSPORT

Both the workshop venue at Art'otel Budapest as well as the social event location can easily reached by public transport.

Detailed map of the public transport network: http://bkk.hu/apps/docs/terkep/buda.pdf
Up-to-date public transport information: http://bkk.hu/en/main-page/news/

WORKSHOP VENUE

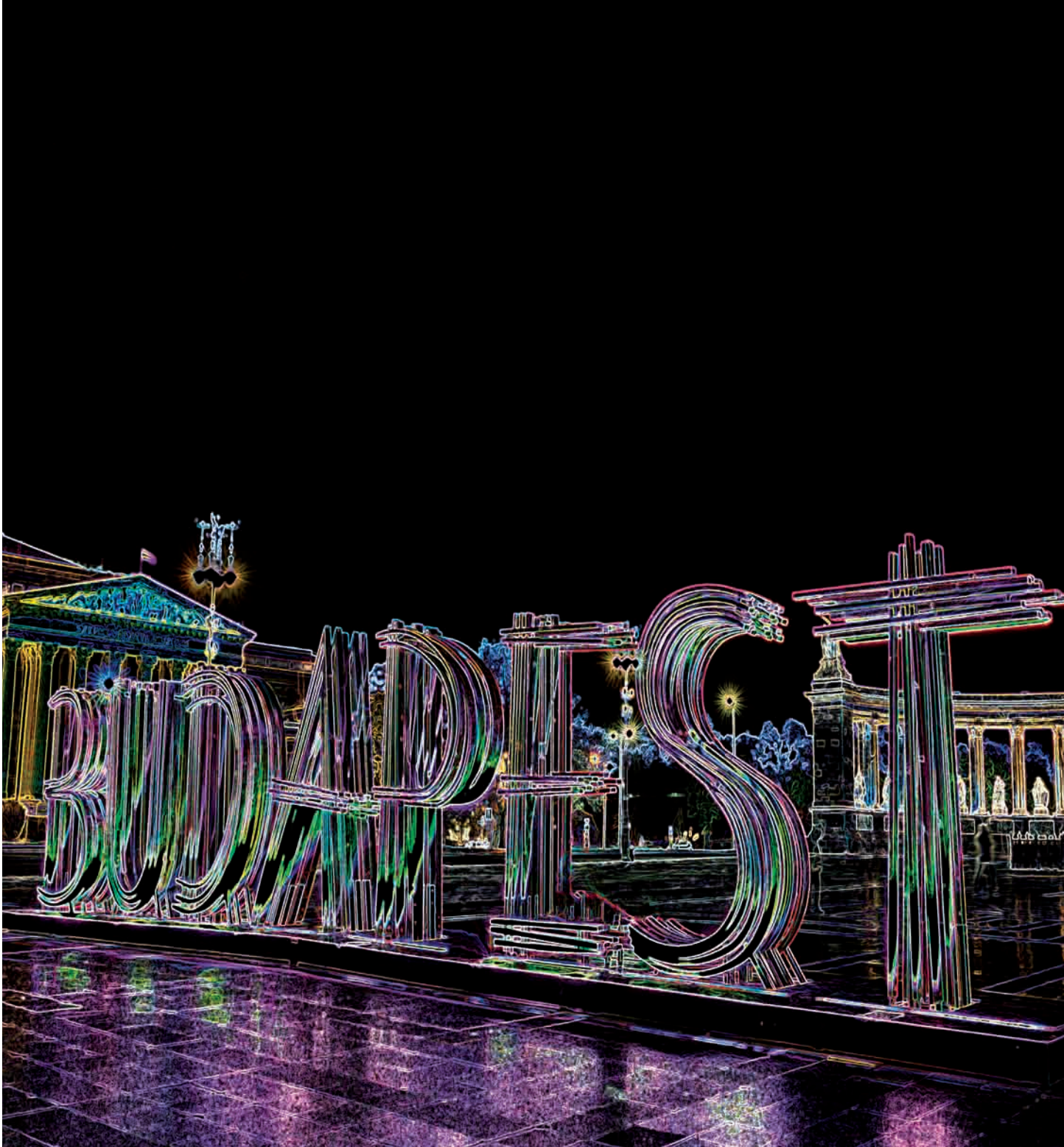


VENDOR PRESENTATIONS

HUAWEI
5G Cooling Challenges and Opportunities
Vadim Tsoi, Huawei, Sweden

MENTOR GRAPHICS
Latest Developments in Thermal Characterization and Reliability Testing
Robin Bornoff, Mentor Graphics, UK

iTHERM
Main Highlights from iTherm 2016
Thomas Brunschwiler, Technical Program Chair of ITHERM 2017


BUDAPEST

SPONSORS

The organizers would like to express their thanks to the following companies for their support.

MENTOR GRAPHICS

Mentor Graphics' electronics thermal design software FloTHERM®, FloTHERM® PCB, FloTHERM® XT Ultra and FloEFD™ help to predict airflow, temperature and heat transfer in components, boards and complete systems, found in the automotive, aerospace, consumer, computing, and telecom industries. These software solutions are complemented by T3Ster®, a range of thermal characterization hardware measuring the thermal resistances and capacitances in the heat flow path from the die junction to the ambient, identifying material properties and interfacial resistances. Options include characterization of high power applications like IGBTs, photo-thermal characterization of HB LEDs and accurate measurement of TIMs, complemented by active power cycling hardware for reliability testing.

Contact: john_parry@mentor.com | mentor.com

HUAWEI TECHNOLOGIES

Huawei is a global leader of ICT solutions. Continuously innovating based on customer needs, we are committed to enhancing customer experiences and creating maximum value for telecom carriers, enterprises, and consumers. Our telecom network equipment, IT products and solutions, and smart devices are used in 170 countries and regions. Huawei ranked 228th on the Global Fortune 500 based on its revenue in 2015. In 2015, the company's revenue reached approximately USD 60,8 billion. We invest over 10% of our annual sales revenue into R&D and more than 45% of our 170,000 employees engage in R&D. Leveraging our experience and expertise in the ICT sector, we help bridge the digital divide and promote high-quality broadband connectivity for all. Huawei thermal team was founded in 2000, today consist of 120 engineers & researchers, contributing to the sustainable and green solutions that enable customers to reduce power consumption, carbon emissions, and resource costs, continuously explore higher performance and efficient cooling innovation, such as liquid cooling, enhanced natural convection, reliable forced air cooling and noise management.

Contact: vadim.tsoi@huawei.com | huawei.com

KEYNOTE SPEAKERS

THOMAS BRUNSCHWILER
IBM Research – Zurich, Switzerland

Thomas Brunschwiler is a research staff member of the Advanced Micro- Integration team at IBM Research – Zurich. He conducts physical research and coordinates governmental and joint projects. In this respect he is pushing the frontiers in 3D integration with respect to scalable heat removal and power delivery, supporting performance and efficiency scaling of high end servers. He performed his Ph.D. in Electrical Engineering at the Technical University of Berlin, entitled "Interlayer Thermal Management of High-Performance Microprocessor Chip Stacks". Currently, he is coordinating two European funded research projects named HyperConnect.eu and CarrICool.eu with the goal to provide percolating thermal underfills, all-copper interconnects and a silicon-interposer with heat-removal, voltage regulation and optical communication capabilities. In addition, Thomas Brunschwiler supported the lab director of IBM Research – Zurich as a technical assistant on strategic matters. He also authored and co-authored over 80 publications, two book chapters and over 50 patents. Currently, he is the program chair of ITHERM, is a Senior Member of IEEE and in the board of the Swiss Physical Society.

SAMSON MELAMED
National Institute of Advanced Industrial Science and Technology, Japan

Samson Melamed received the B.S. degree in computer engineering from the University of Maryland, Baltimore County, Baltimore, USA, in 2004, and the M.S. and Ph.D. degrees in electrical engineering from North Carolina State University, Raleigh, USA in 2007 and 2011,

respectively. He is currently a Post-Doctoral Fellow with the National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba, Japan. His research interests include thermal simulation, thermal modeling, and circuit design strategies for 3D integrated circuits.


Thomas Brunschwiler

FERENC SZABÓ
University of Pannonia, Hungary

Ferenc Szabo is an associate professor at University of Pannonia, Veszprém Hungary. He is leader of the Light and Colour Science Research Laboratory at the University of Pannonia, Veszprém, Hungary. He holds a PhD in information Sciences (2012). He is expert in new colour quality metrics based on Harmony Rendering of light sources. He has participated as expert in EU projects SSL4EU, LED4ART and HI-LED. His fields of research are colour quality of light sources, mesopic vision, street lighting, human centric lighting and museum lighting. He has participated in the reconstruction of the LED lighting of the frescoes of the Sistine Chapel.


Samson Melamed


Ferenc Szabó

WEDNESDAY OVERVIEW

Wednesday, September 21, 2016

Registration
🕐 8.00 am – 9.00 am

Welcome
🕐 9.00 am – 9.15 am

Keynote I:
Review of Percolating and Neck-based Underfills with Thermal Conductivities up to 3 W/m-K
Thomas Brunschwiler, IBM Research - Zurich, Switzerland
Chair: Bernhard Wunderle, TU Chemnitz
🕐 9.15 am – 10.00 am

➔ **Session 1:**
Advanced Thermal Management
🕐 10.00 am – 11.00 am

Coffee Break
🕐 11.00 am – 11.15 am

➔ **Session 2:**
Thermo-mechanical Reliability
🕐 11.15 am – 12.15 am

Vendor Session
12.15 am – 1.00 pm

Lunch
1.00 am – 2.00 pm

➔ **Poster Introduction 1**
2.00 pm – 3.00 pm

Coffee Break
3.00 pm – 3.35 pm

➔ **Session 3:**
Power Electronics 1: Design
3.35 pm – 4.35 pm

Coffee Break
4.35 pm – 5.00 pm

➔ **Session 4:**
Compact Thermal Modeling
5.00 pm – 6.20 pm

Poster Viewing Session & Cocktails
6.20 pm –8.00 pm

SESSIONS 1 – 2

Session 1:
Advanced Thermal Management

🕐 10.00 am – 11.00 am

➔ *Chair: Andrzej Napieralski, Technical University of Lodz*

10.00 am **Fabrication Of A Micro-Thermoelectric Cooler (μ-TEC) For Room Temperature Applications By Template Assisted Electrodeposition**

Javier García Fernández[1,2], Nicolás Pérez Rodriguez[1], Melanie Mohn[1], Tom Sieger[1], Heike Schlörb[1], Heiko Reith[1], Gabi Schierning[1], Kornelius Nielsch[1]

[1]Institute for Metallic Materials, IFW Dresden, Germany; [2]Institute of Nanostructure and Solid-State-Physics, University of Hamburg, Germany

10.20 am **Thermo-Mechanical Assessment of Copper and Graphite Heat Spreaders for Compact Packages**

Rafael Prieto[1,2,3], Jean-Philippe Colonna[2,3], Perceval Coudrain[1], Norbert Chevrier[1], Severine Cheramy[2,3], Alexis Farcy[1]

[1]ST Microelectronics, France; [2]Univ. Grenoble Alpes, France; [3]CEA, LETI, MINATEC Campus, France

10.40 am **Optimal Thermal Design of CMOS for Direct Integration of Carbon Nanotubes**

Avisek Roy[1], Ferenc Ender[2], Mehdi Azadmehr[1], Knut E. Aasmundtveit[1]

[1]Høgskolen i Sørøst-Norge, Norway; [2]Budapest University of Technology and Economics, Hungary

Coffee Break

🕐 11.00 pm – 11.15 pm

Session 2:
Thermo-mechanical Reliability
11.15 am – 12.35 pm

➔ *Chair: Xavier Jorda, IMB-CNM(CSIC)*

11.15 am **Location Resolved Transient Thermal Analysis to Investigate Crack Growth in Solder Joints**
E Liu[1], Thomas Zahner[2], Sebastian Besold[2], Gordon Elger[1]
[1]Technische Hochschule Ingolstadt, Germany; [2]OSRAM Opto Semiconductors GmbH, Germany

11.35 pm **Collapse of a Liquid Solder Bump under Load**
Wendy Luiten, Co van Veen
Philips Research Lighting, The Netherlands

11.55 pm **Determination of Bond Wire Failure Probabilities in Microelectronic Packages**
Thorben Casper[1,2], Ulrich Römer[1,2], Sebastian Schöps[1,2]
[1]Graduate School of Computational Engineering, Technische Universität Darmstadt, Germany; [2]Institut für Theorie Elektromagnetischer Felder, Technische Universität Darmstadt, Germany

Vendor Session
12.15 pm – 1.00 pm

Lunch
1.00 pm – 2.00 pm

Poster Introduction 1

2.00 pm – 3.00 pm

➔ *Chair: Marta Rencz, Budapest University of Technology & Economics*

01 **Fabrication and Characterization of Microscale Heat Sinks**
Gábor Takács, György Bognár, Enikő Bándy, Gábor Rózsás, Péter Gábor Szabó
Budapest University of Technology and Economics, Hungary

02 **Reliability assessment of Wafer Level Chip Scale Package (WLCSP) based on Distance-to-Neutral point (DNP)**
Tung Ching Lui, Balaji Nandhivarm Muthuraman
Dialog Semiconductor GmBH, Germany

03 **Investigation on Solder Voids in Flip-Chip Light-Emitting Diodes Using Thermal Transient Response**
Byungjin Ma[1], Chang Wan Kim[2], Kun Hyung Lee[3], Won-Bae Suh[3], Kwanhun Lee[1]
[1]*Korea Electronics Technology Institute, Republic of South Korea;* [2]*CTL, Inc.;* [3]*Shinhan Trade, Republic of South Korea*

04 **Digital Thermal Sensor Based on Ring-Oscillators in Zynq SoC Technology**
Charles-Alexis Lefebvre, Leire Rubio, Jose Luis Montero
IK4-Ikerlan, Spain

05 **Peltiér Cells Cooling System for Switch Mode Power Supply**
Giovanni Casano, Stefano Piva
Universita' di Ferrara, Italy

06 **Dynamical Phase Transitions on Nanoscale**
György Kocsis, Ferenc Márkus
Budapest University of Technology and Economics, Hungary

07 **Cost-efficient In-situ End-of-life Prognostics of Power Dies and LEDs by Junction Temperature Measurement**
Sergey Sheva[1], Raul Mroßko[1], Jens Heilmann[2], Bernhard Wunderle[2], Gusztáv Hantos[3], Sander Noijen[4], Jürgen Keller[1]
[1]AMIC Angewandte Micro-Messtechnik GmbH, Berlin, Germany; [2]Technical University Chemnitz, Germany; [3]Budapest University of Technology and Economics, Budapest, Hungary; [4]Philips Applied Technologies, Einhoven, the Netherlands

08 **Modelling of Vanadium-dioxide Based Thermal-electrical Devices**
Soma Ur, János Mizsei, László Pohl
Budapest University of Technology and Economics, Hungary

09 **Influence of the Photoactive Layer Thickness on the Device Parameters and their Temperature Dependence in Thin Crystalline Silicon Photovoltaic Devices**
Balázs Plesz, János Mizsei
Budapest University of Technology and Economics, Hungary

Coffee Break
3.00 pm – 3.35 pm

SESSIONS 3

Session 3:
Power Electronics 1: Design

🕐 3.35 pm – 4.35 pm

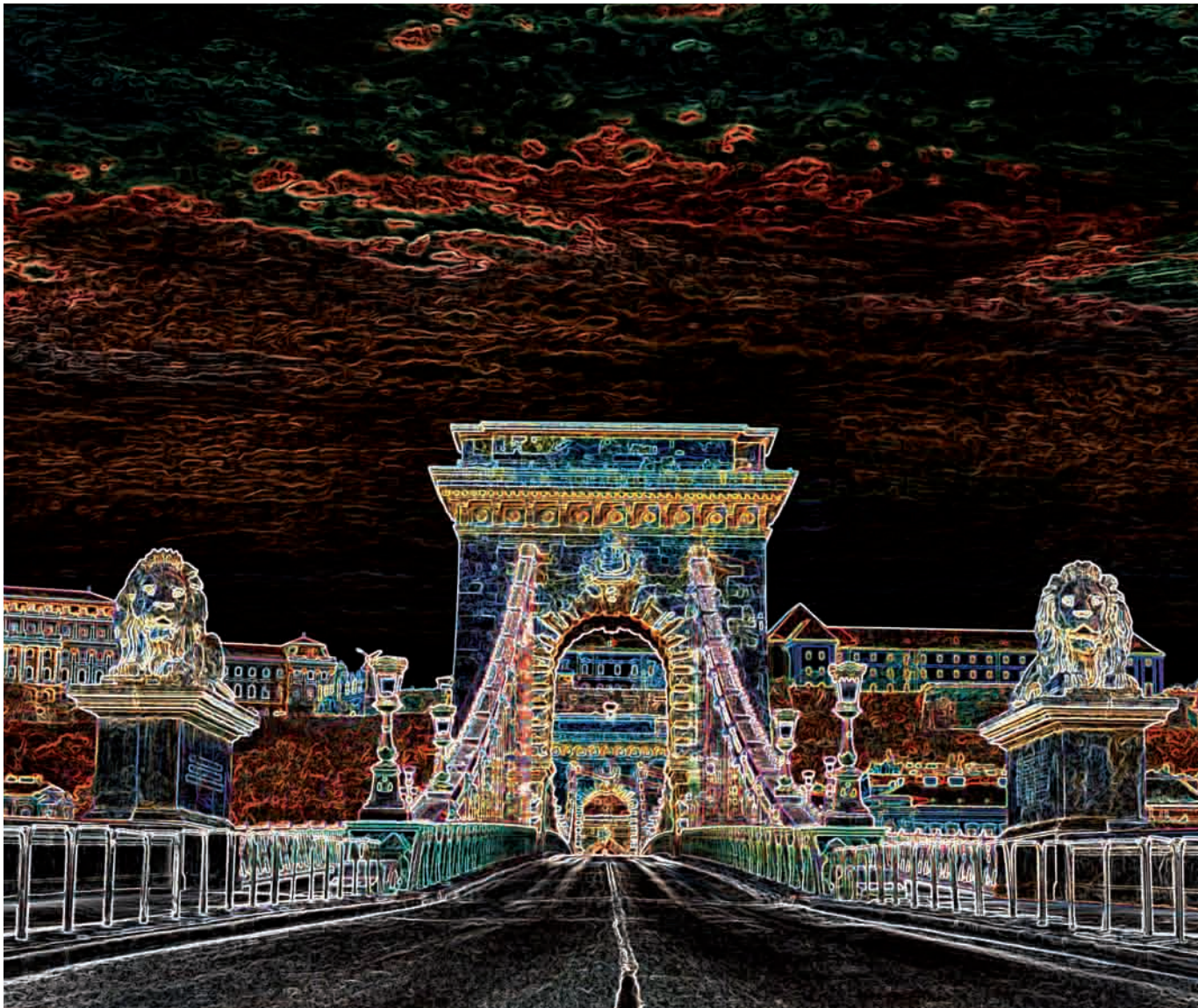
➔ *Chair: Chris Bailey, University of Greenwich*

3.35 pm **Design Methodology for Over-Temperature Protection of an LDO Voltage Regulator by Using Electro-thermal Simulations**
Cosmin-Sorin Plesa[1], Marius Neag[1], Cristian Boianceanu[2], Andrei Negoita[2]
[1]Technical University Cluj-Napoca, Romania; [2]INFINEON Technologies, Romania

3.55 pm **Smaller Size and Higher Reliability for Vertical Chip Mount Type IGBT Module**
Naoki Yamanari, Toshiharu Ohbu, Hiroaki Ito, Shinichiro Matsuyama
Toshiba Corporation, Japan

4.15 pm **Electro-Thermal Simulation for High Power IGBTs for Automotive Applications**
Asantha Kempitiya, Wibawa Chou
Infineon Technologies Americas Corp., United States of America

Coffee break
4.35 pm – 5.00 pm



SESSION 4

Session 4:
Compact Thermal Modeling
🕐 5.00 pm – 6.20 pm

➔ *Chair: John David Parry, Mentor Graphics*

5.00 pm **Model Order Reduction in Inductors for Rapid Virtual Prototyping in Power Electronics**
Chris Bailey, Catherine Tony
University of Greenwich, United Kingdom

5.20 pm **Calibration of Detailed Thermal Models by Parametric Dynamic Compact Thermal Models**
Lorenzo Codecasa[1], Vincenzo d'Alessandro[2], Alessandro Magnani[2], Niccolò Rinaldi[2]
[1]Politecnico di Milano, Italy; [2]Università Federico II, Italy

5.40 pm **Evolution of the DELPHI Compact Thermal Modeling Method: an Investigation on the Boundary Conditions Scenarios**
Eric Monier-Vinard[1], Valentin Bissuel[1], Brice Rogie[1,2], Najib Laraqi[2], Olivier Daniel[1], Marie-Cécile Kotelon[1,3]
[1]Thales Corporate Engineering, France; [2]Université Paris Ouest, Laboratoire Thermique Interfaces Environnement, France; [3]Université Paris XIII, Sorbonne Paris Cité, France

6.00 pm **Novel Partition-Based Approach to Dynamic Compact Thermal Modeling**
Lorenzo Codecasa[1], Vincenzo d'Alessandro[2], Alessandro Magnani[2], Niccolò Rinaldi[2]
[1]Politecnico di Milano, Italy; [2]Università Federico II, Italy

Poster Viewing Session & Cocktails
🕐 6.20 pm – 8.00 pm

Wednesday, September 21, 2016

5.00 pm – 8.00 pm

THURSDAY OVERVIEW

Thursday, September 22, 2016

Keynote II:
The Challenges of Going Vertical: Thermal Management and Analysis in 3D ICs
Samson Melamed, National Institute of Advanced Industrial Science and Technology, Japan
Chair: Marta Rencz, Budapest University of Technology & Economics
🕐 9.15 am – 10.00 am

➔ **Session 5:**
Session 5: 3D IC / Packaging
🕐 10.00 am – 10.40 am

Coffee Break
🕐 10.40 am – 11.05 am

➔ **Session 6:**
Quantiheat Project / Nano-scale Thermal Investigations
🕐 11.05 am – 12.45 pm

Lunch
🕐 12.45 pm – 1.45 pm

➔ **Poster Introduction 2**
1.45 pm – 2.45 pm

Coffee Break
2.45 pm – 3.00 pm

➔ **Session 7:**
Power Electronics 2: Testing
3.00 pm – 4.00 pm

Poster Viewing 2 & Coffee Break
4.00 pm – 4.30 pm

➔ **Session 8:**
Thermal Design with CFD Simulation
4.30 pm – 6.10 pm

Social Event: Renaissance Dinner in the 220 years old cellar of the SYMBOL restaurant in Óbuda
7.30 pm – 10.00 pm

Session 5:
3D IC / Packaging

🕐 10.00 am – 10.40 am

➔ *Chair: Andrew Tay, Singapore University of Technology and Design*

10.00 am **Analysis of the Impact of Power Distribution on the Efficiency of Microchannel Cooling in 3D ICs**
Piotr Zajac, Cezary Maj, Andrzej Napieralski
Lodz University of Technology, Poland

10.20 am **Closing the Power Delivery/Heat Removal Cycle for Heterogeneous Multi-Scale Systems**
Mircea Stan, Kevin Skadron, Ke Wang
University of Virginia, United States of America

Coffee break

🕐 10.40 am – 11.05 am

Session 6:
Quantiheat Project / Nano-scale Thermal Investigations
11.05 am – 12.45 pm

➔ *Chairs: Marcin Janicki, Lodz University of Technology*
Mohamad Abo Ras, Berliner Nanotest und Design GmbH

11.05 am **QUANTIHEAT Project: Main Progresses**
Séverine Gomès[1,2], QuantiHeat Consortium[2]
[1]Centre d'Energétique et de Thermique de Lyon, France; [2]QuantiHeat Consortium members, Europe

11.25 am **Calibration Methodologies for Scanning Thermal Microscopy**
Eloïse Guen[1], David Renahy[1], Mouhannad Massoud[2], Jean-Marie Bluet[2], Pierre-Olivier Chapuis[1], Séverine Gomes[1]
[1]Université de Lyon, CETHIL-UMR5008, CNRS, INSA Lyon, France; [2]Université de Lyon, Institut des Nanotechnologies de Lyon, CNRS, INSA Lyon, France

11.45 am **Thermal Analysis of Advanced Microelectronic Devices Using Thermoreflectance Thermography**
Dustin Kendig[1], Andrew Tay[2], Ali Shakouri[3]
[1]Microsanj LLC; United States; [2]Singapore University of Technology and Design, Singapore; [3]Purdue University, United States

12.05 pm **Modeling and Measurement of the Thermal Conductivity of Composites with Silver Particles**
Jose Ordonez-Miranda[1], Mohamad Abo Ras[2], Bernhard Wunderle[3], Sebastian Volz[1]
[1]CNRS, Paris, France; [2]Berliner Nanotest und Design GmbH, Germany; [3]Technical University of Chemnitz, Germany

12.25 pm **DPL Thermal Model of Test Microchip Structure without Cavity Dedicated to Estimation of Nanoelectronic Circuits Thermal Properties**
Tomasz Raszkowski, Mariusz Zubert, Agnieszka Samson, Marcin Janicki, Andrzej Napieralski
Lodz University of Technology, Poland

Lunch break
12.45 pm – 1.45 pm

Poster Introduction 2

🕐 1.45 pm – 2.45 pm

➔ *Chair: Peter Gabor Szabo, Budapest University of Technology and Economics*

01 **Electronic Module for the Thermal Monitoring of a Li-ion Battery Cell through the Electrochemical Impedance Estimation**
Marco Ranieri, Diego Alberto, Hélène Piret, Viviane Cattin
CEA - Grenoble, France

02 **Multi-objective Optimization of Fin Array Heat Sinks**
Reijo Karvinen, Kaj Lampio
Tampere University of Technology, Finland

03 **Large Area SThM/IR Device**
Petr Klapetek, Miroslav Valtr, Jan Martinek, Radek Šlesinger
Czech Metrology Institute, Czech Republic

04 **Improved Method for Logi-Thermal Simulation with Temperature Dependent Signal Delay**
Lázár Jani, András Poppe
Budapest University of Technology and Economics, Hungary

05 **A Study of Electrolytic Capacitors Thermal Conductivity, Behavior and Measurement**
Zhigang Na
Lenovo, People's Republic of China

06 **Effect of Flow and Geometry Parameters on Performance of Solar Air Heater**
Ram Subhash Maurya, Zaid A J Ansari
Sardar Patel College of Engineering, India

07 **Mathematical Modelling of Coupled Heat and Mass Transport into an Electronic Enclosure**
Zygimantas Staliulionis[1], Mirmasoud Jabbari[1,2], Jesper Henri Hattel[1]
[1]Technical University of Denmark, Denmark; [2]University of Warwick, United Kingdom

08 **Simulation of the Thermal Behavior of a Composite Conductive Adhesive**
Stéphane Lefèvre, Aylin Yuksel-Gungor, Séverine Gomès
Centre d'Energétique et de Thermique de Lyon, France

09 **Modelling of Thermal Processes in Heat Flux Sensors**
Alexander Kozlov
Omsk State Technical University, Russian Federation

10 **Fabrication, Performance and Reliability of a Thermally Enhanced Wafer Level Fan Out Demonstrator with Integrated Heatsink**
André Gil Cardoso[1], Hugo Barros[1], Gusztav Hantos[2]
[1]NANIUM SA, Vila do Conde, Portugal; [2]Budapest University of Technology and Economics, Budapest, Hungary

Coffee Break
2:45 pm – 3:00 pm

Session 7:
Power Electronics 2: Testing

🕐 3.00 pm – 4.00 pm

➔ *Chair: Gabor Farkas, Mentor Graphics MAD MicReD Division*

3.00 pm **Extracting Structure Functions of Power Devices in Induction Motor Drives**
Attahir Murtala Aliyu, Alberto Castellazzi
University of Nottingham, United Kingdom

3.20 pm **Characterization of Thermal Interface Materials for IGBT Inverter Applications**
Xavier Jordà[1], Xavier Perpiñà[1], Miquel Vellvehi[1], Manuel Fernández[1], Sergio Llorente[2], Sandra Aranda[2]
[1]*IMB-CNM(CSIC), Spain;* [2]*BSH Electrodomésticos, Spain*

2.40 pm **Difficulties in Characterizing Transient Thermal Resistance of SiC MOSFETs**
Tsuyoshi Funaki, Shuhei Fukunaga
Osaka University, Japan

Poster Viewing 2 and Coffee Break

🕐 4.00 pm – 4.30 pm

Session 8:
Thermal Design with CFD Simulation

4.30 pm – 6.10 pm

➔ *Chair: Vadim Tsoi, Huawei Technologies Sweden AB*

4.30 pm **A Novel Approach to Heatsink Mass Minimisation**
Robin Bornoff, John Parry, John Wilson
Mentor Graphics, United Kingdom

4.50 pm **Flexible CFD Simulation Model Of A Thin Vapor Chamber For Mobile Applications**
Lauri Petteri Niittymäki[1], Catharina R Biber[2]
[1]*Intel Finland Oy, Finland;* [2]*Intel Corporation, United States*

5.10 pm **Heat Transfer Enhancement in Micro-scale Air Flows**
Moshe Rosenfeld, Efi Zemach
Tel Aviv University, Israel

5.30 pm **Detailed Analysis of IC Packages Using Thermal Transient Testing and CFD Modelling for Communication Device Applications**
Yake Fang[1], Gang Wang[2], Andras Vass-Varnai[3]
[1]*Huawei Technologies Co., Ltd., P.R.China;* [2]*Mentor Graphics Shanghai, P. R. China;* [3]*Mentor Graphics, Republic of Korea (South Korea)*

5.50 pm **Methodology to Achieve the Thermal Management of a 6U Conducted-cooled Board with 130 W Power Dissipation and an Operating Temperature of 85 °C**
Jérôme Maquet
CES, Switzerland

Social Event:
Renaissance Dinner in the 220 years old cellar of the SYMBOL restaurant in Óbuda

🕐 7.30 pm – 10.00 pm

The workshop takes place in the Buda district called Viziváros, at the foot of the Buda Castle Hill which was the seat of the Hungarian kings. In medieval Europe Buda with its roughly 8000 inhabitants was among the continent's major cities and it was also a major cultural center, especially the court of king Mathias with its world famous library of Corvinas.

The workshop dinner will take place in the III. district of Budapest, also known as Óbuda which in the medieval times was the city of the Hungarian queens. With a renaissance dinner and music we shall commemorate the golden age of medieval Hungary under the reign of Mathias and his wife Queen Beatrix.

The dinner will be in a 220 years old cellar which today is an attraction of the SYMBOL Restaurant, located at No. 65 Bécsi út (the major road towards Vienna). The present form of the restaurant's neighbourhood dates back to the XVIII century when German winemakers and they vineyards dominated the hills around Buda, so this section of the Bécsi út was full with cellars and small restaurants. As of today only a small number of these restaurants remained in their original form, but about two decades ago this section of Bécsi út was revitalized to bring back the XVIII century streetview and some of the atmosphere of the old Óbuda and its Újlak district. Nowdays this district is one of the most popular nightlife neghbourhoods of Budapest with lots of bars and clubs.

The restaurant can be best reached from the workshop venue by Tram 19 or 41 (northbound): it is less than 5 minutes walk from the Kollossy tér (Újlak) stop of the trams.

After 20.00 pm tram no. 19 leaves the Kolossy tér stop towards art'otel at every 2, 22, 42 minutes of the hour, until 23.42 pm. The last tram no. 41 leaves this stop at 23.32 pm. Please validate your BKK ticket immediately after boarding a tram.

http://www.bkk.hu/en/timetables/#19
http://www.bkk.hu/en/timetables/#41

Start:	8:00 pm
Return	10.00 pm
Address	III. district, Bécsi út 65

FRIDAY OVERVIEW

Friday, September 23, 2016

Keynote III:
Keynote III: Human Centric Lighting with Tuneable LED Luminaires: Innovation and Thermal Challenges
Ferenc Szabó, University of Pannonia, Hungary
Chair: András Poppe, Budapest University of Technology and Economics
🕐 9.00 am – 9.45 am

➔ **Session 9:**
DELPHI4LED Special Session
🕐 9.45 am – 11.05 am

Coffee Break
🕐 11.05 am – 11.30 am

➔ **Session 10:**
LEDs and LED Lamps
🕐 11.30 am – 12.30 pm

Lunch
🕐 12.30 pm – 1.40 pm

➔ **Session 11:**
Reliability Investigations
1.40 pm – 2.40 pm

Coffee Break
2.40 pm – 3.00 pm

➔ **Session 12:**
Thermal Characterization and Modeling
3.00 pm – 4.20 pm

➔ **Closing Remarks & Best Paper / Best Poster Awards**
4.20 pm – 4.30 pm

Session 9:
DELPHI4LED Special Session

🕐 9.45 am – 11.05 am

➔ *Chair: Thomas Zahner, OSRAM Opto Semiconductors GmbH*

9.45 am **Delphi4LED - From Measurements to Standardized Multi-Domain Compact Models of LEDs: a New European R&D Project for Predictive and Efficient Multi-domain Modeling and Simulation of LEDs at all Integration Levels Along the SSL Supply Chain**

Robin Bornoff[1], Volker Hildenbrand[2], Sangye Lugten[3], Genevieve Martin[2], Christophe Marty[4], Andras Poppe[5], Marta Rencz[6], Wil Schilders[3], Joan Yu[2]

[1]Mentor Graphics, UK; [2]Philips Lighting, The Netherlands; [3]Technical University Eindhoven, The Netherlands; [4]Ingelux, France; [5]Budapest University of Technology and Economics, Hungary; [6]Mentor Graphics, Hungary

10.05 am **Multi-domain Modelling of Power LEDs Based on Measured Isothermal and Transient I-V-L Characteristics**

Gábor Farkas, Márton C. Bein, Lajos Gaál

Mentor Graphics MAD MicReD, Hungary

10.25 am **LED Module Multi-physic Approach**

Theo Renaudin, Julien Joly, Benoit Hamon, Benoit Tothe

Philips Lighting, France

10.45 am **Investigation of the Temperature-Dependent Heat Path of an LED Module by Thermal Simulation and Design of Experiments**

Lisa Mitterhuber, Stefan Defregger, Elke Kraker, Julien Magnien, René Hammer

Material Center Leoben, Austria

Coffee Break

🕐 11.05 am – 11.30 am

Session 10:
LEDs and LED Lamps
11.30 am – 12.30 pm

➔ *Chair: Genevieve Martin, Philips Lighting*

11.30 am **Modelling LED Lamps with Thermal Phenomena Taken into Account**
Krzysztof Górecki, Przemysław Ptak
Gdynia Maritime University, Poland

11.50 am **Embedded Multi-domain LED Model for Adaptive Dimming of Streetlighting Luminaires**
János Hegedüs[1], Gusztav Hantos[1], András Poppe[2]
[1]*Budapest University of Technology and Economics, Hungary;* [2]*Mentor Graphics, Hungary*

12.10 pm **Experimental Study of Electroluminescence and Temperature Distribution in High-power AlGaInN LEDs & LED Matrixes**
Anton Chernyakov[1], Andrey Aladov[1], Ivan Kalashnikov[1], Aleksander Zakgeim[1], Michael Mizerov[2]
[1]*Submicron Heterostructures for Microelectronics Research and Engineering Center of RAS, Russian Federation;* [2]*University ITMO, Russian Federation*

Lunch Break
12.30 pm – 1.40 pm

SESSION 11– 12
CLOSING REMARKS

Session 11:
Reliability Investigations

🕐 1.40 pm – 2.40 pm

➔ *Chair: John Janssen, NXP Semiconductors*

1.40 pm **Aging Tendencies of Power MOSFETs – A Reliability Testing Method Combined with Thermal Performance Monitoring**
Gusztav Hantos[1], Janos Hegedus[1], Marta Rencz[2], Andras Poppe[3]
[1]BME, Hungary; [2]Mentor Graphics Mechanical Analysis Division; [3]BME VIKING Nonprofit Plc.

2.00 pm **Implementation of Moisture Diffusion Model in Multi-material System Including Air Cavities**
Norbert Péter, Péter Tóth, Boldizsár Kovács, Gergely Kristóf
CFD.HU Ltd., Hungary

2.20 pm **In-situ Monitoring of Interface Delamination by Local Thermal Transducers Exemplified for a Flip-chip Package**
Bernhard Wunderle[1], Daniel May[1], Mohamad Abo Ras[2], Sergey Sheva[3], Marcus Schulz[3], Markus Woehrmann[4], Joerg Bauer[4], Juergen Keller[4]
[1]Technical University of Chemnitz, Germany; [2]Berliner Nanotest und Design GmbH, Germany; [3]Amic, Germany; [4]Fraunhofer IZM, Germany

Coffee Break

🕐 2.40 pm – 3.00 pm

Session 12:
Thermal Characterization and Modeling
3.00 pm – 4.20 pm

➔ *Chair: Wendy Luiten, Philips*

3.00 pm **Design of Heated-micro-Resonator Rings**
Shenghui Lei[1], Ryan Enright[1], Alexandre Shen[2]
[1]Bell Labs, Nokia, Ireland; [2]III-V Lab, a joint lab of Nokia, Thales and CEA, France

3.20 pm **Novel Test Stand for Thermal Diffusivity Measurement of Bulk and Thin Films**
Mohamad Abo Ras[1,2], Daniel May[1,3], Bernhard Wunderle[2,3]
[1]Berliner Nanotest und Design GmbH, Germany; [2]Fraunhofer Institute for Electronic Nano Systems ENAS, Germany; [3]Technische Universität Chemnitz, Germany

3.40 pm **Temperature Characterization of Small-Scale SOI MOSFETs in the Extended Range (to 300°C)**
Konstantin O. Petrosyants[1,2], Sergey V. Lebedev[3], Lev M. Sambursky[1,2], Veniamin G. Stakhin[3], Igor A. Kharitonov[1]
[1]National Research University Higher School of Economics, Russian Federation; [2]Institute for Design Problems in Microelectronics, Russian Academy of Sciences, Russian Federation; [3]National Research University MIET, Design Centre, Russian Federation

4.00 pm **Investigation of Heat Transfer Coefficient Variation in Air Cooled Hybrid Electronic Circuits**
Marcin Janicki
Lodz University of Technology, Poland

Closing Remarks & Best Paper / Best Poster Awards
4:20 pm

CONTACT

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