

The 46th International Spring Seminar On Electronics Technology

10th – 14th May 2023, Timișoara, Romania

"Revolutionizing the Electronics Ecosystems – Chiplet and Heterogeneous Integration"



Keynote speaker:

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Title of the presentation:

Multi-domain digital twins of LEDs and luminaires for supporting design and operation of lighting infrastructures

Short CV:

András POPPE was born in 1962 in Budapest, Hungary. He obtained his MSc degree in electrical engineering in 1986 from the Technical University of Budapest (BME), Faculty of Electrical Engineering. In 1996 he obtained his PhD from BME. In 2019 he became a full-time professor at BME, heading the Department of Electron Devices. In 1997 he was one of the co-founders of MicReD (now part of SIEMENS Industry Software). Today he is also a part time technical advisor at SIEMENS Industry Software, STS Strategic Innovation group. His research interests include modelling and simulation of electronic system, with a focus on thermal issues, especially in case of LEDs.

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Abstract:

LEDification has changed the modern lighting industry greatly. Part of this transformation is taking over practices from the electronics industry, such as setting up efficient simulation models on component, module and system level. It is widely known that LEDs' operation is strongly affected by the temperature, having a direct effect on their efficiency and expected lifetime/reliability. Therefore, so-called multi-domain simulation models are needed that describe the mutual dependence of LED operation in the electrical, thermal and optical domains. The European project Delphi4LED (www.delphi4LED.org) proposed multi-domain models of LED packages that in a SPICE-like simulation environment allow creating system level simulation of complete LED luminaires. This kind of virtual prototyping of LED based lighting solutions speeds up the luminaire design and development process and significantly reduces the associated costs. The recently launched new European R&D project AI-TWILIGHT (ai-twilight.eu), as a follow-up action, aims to achieve that the Delphi4LED become industrial reality. This requires, among others, that these LED models – LED digital twins as used in an Industry 4.0 context – should become widely accessible; LED vendors should be able to easily generate them as a kind of an e-datasheet to replace the classical paper-based ones. On the other hand, the AI-TWILIGHT project also aims to extend these LED digital twins with the description of LED ageing during field operation in order to be able to predict e.g. the remaining useful lifetime of an LED luminaire. For the related testing and modelling processes the project aims to use artificial intelligence (AI) techniques using much shorter and partial series of data, even from field tests, for LED lifetime prediction. The talk will introduce the process of creating multi-domain digital twins of LED luminaires and the issues related to extending them with the reliability and life-time aspects.