

6 Publishable summary

The European lighting industry aims at reducing cost, at continuously improving product performance while reducing time to market and enlarging the product portfolio.

The main challenge for the design in of LED components into lighting systems is the temperature and current dependence of their performance. The detailed LED package information is understandably proprietary knowledge of suppliers and cannot be expected to be publicly shared.

In order to achieve a good design of LED systems, a modular, multi-physics based modelling approach (multi-domain compact LED model) is needed – this way allowing the freedom for LED component integrators, e.g. luminaire manufacturers, to use such models in any kind of luminaire designs. In order to overcome those key challenges, seamless integration of the first link, i.e. LED, in the product development chain is necessary. For that a communication bridge, in the form of standardization, has to be established between two different industries (semiconductor industry, LED component integrators).

In order to increase the accuracy and accelerate the design process of modules and LED luminaires the following tools are essential:

- Generic, multi-domain model of LED chips
- compact thermal model of the LED chips' environment
- providing proper modelling interface towards the luminaire

Over two decades ago there has been a precedent for such an approach in the conventional semiconductor world, resulting in new thermal measurement solutions, thermal modelling and simulation solutions, most of which got standardized. This project, by gathering key players in precedent projects, aims at speeding the implementation of LED compact models, which has the additional challenge of combining thermal-electrical-optical aspects.

The goal of the project is to develop a standardized method to create multi-domain LED compact models from testing data. To ensure the success of the project, a multidisciplinary approach is chosen.

The objectives are:

- Develop a standardized method to extract compact model of LEDs and modules from testing.
- Define appropriate set of LED model equations that can be implemented into a FEM/CFD tool, for the purpose of self-consistent multi-domain simulation of LEDs thermal, electrical and light output characteristics.
- Provide interfacing between measurement tools, modelling tools and simulation tools on package, module and system level in order to allow the application of the compact LED models (chip and/or package models) and associated parameters in order to further perform simulations at module or system levels.
- Prove the benefits of the use of compact models in the development process to reduce development times and cost.

This will lead to an industry standard in the lighting industry.

Achievement of this project is expected to boost time to market of LED products cut by 1/3, cut development cost by 50%, reduce Cost of Non-quality by 25%. The European lighting industry is offered a unique competitive advantage, necessary to catch the 30-40% speed of growth of its LED market and tape into potential new markets. This unique technical leadership paves the way toward digitalisation of product and development process.

Contact:

Genevieve Martin
Philips Lighting B.V.
genevieve.martin@philips.com

The logo for DELPHI4LED, featuring the text "DELPHI4LED" in a bold, yellow, sans-serif font, set against a blue rounded rectangular background.