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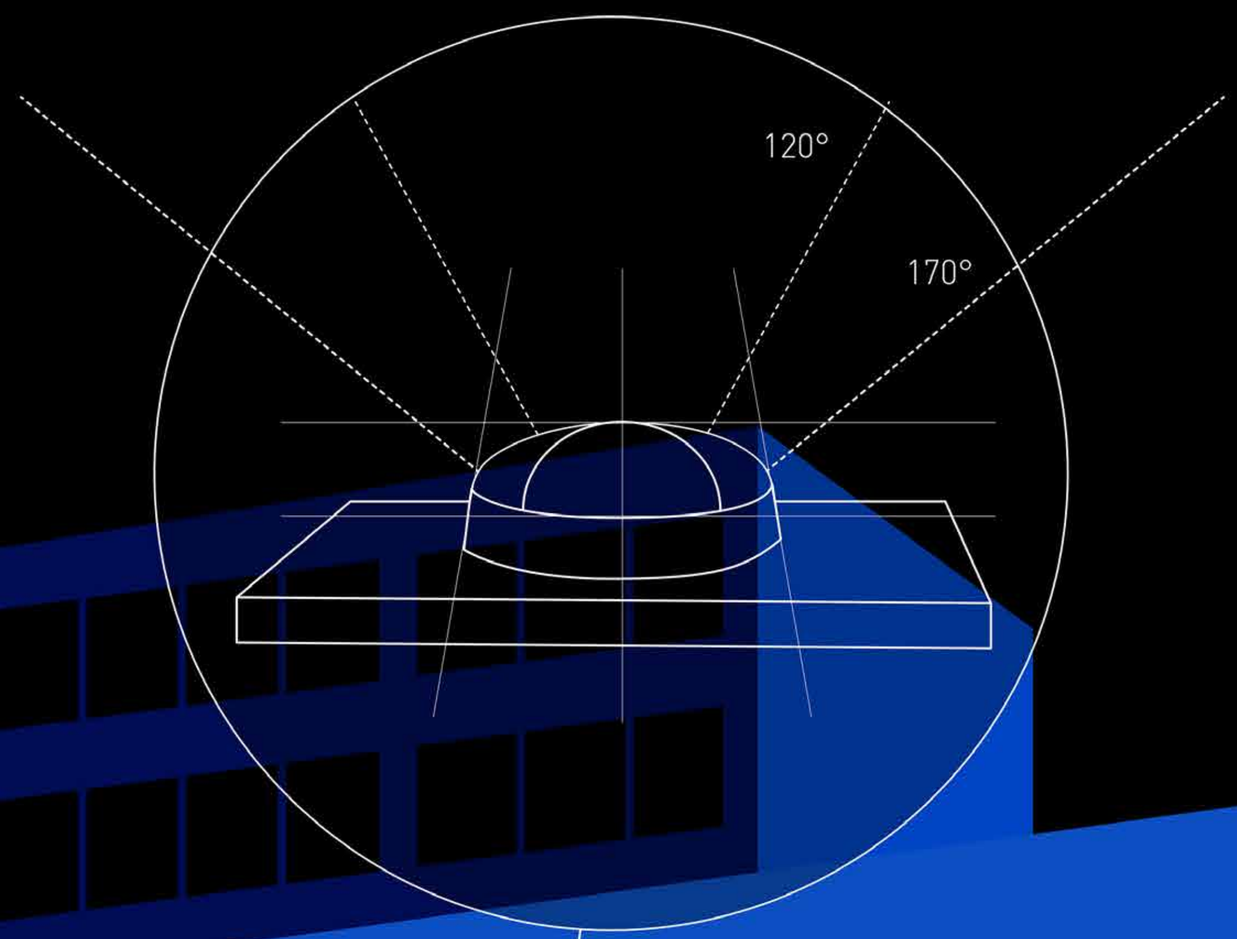

LENS ON CHIPS

LOC

ALTERNATIVE MANUFACTURE OF SECONDARY OPTICS FOR MID-POWER LEDS WITH ADDITIVE MANUFACTURING FOR THE ILLUMINATION OF ADVERTISEMENT BOARDS.

Weitere Infos:

Additively manufactured secondary optics for mid-power LED packages

(Project LOC – Lens on Chips)

Introduction

The use of LED light modules as backlight illumination for outdoor advertisement boards is the actual preferred method, thanks to its energy efficiency and high availability. Such modules comprise of an LED package, or an array of LEDs soldered to a PCB, which are then assembled afterwards with additional components, i.e. secondary optics, to increase the light distribution and light uniformity. Since large volumes are required, injection-moulded components made of PMMA, PC, or Silicones are the present commercial solutions. The production of PCBs and secondary optics is done overseas which leads to an increased lead time within the production process. In addition, global supply chains may suffer delays due to geopolitical instabilities.

Objective

Project LOC focuses on exploring an alternative manufacture method for secondary optics for mid-power LED packages. Additive manufacturing was chosen thanks to its flexibility to create complex geometries and reduced costs in comparison to injection moulding.

Methods

An initial solution comprised the combination of an additively manufacture support structure and a dispensed optical material to encapsulate the LED package. The target lens shape was based on a commercially available light module provided by one of the project partners. The manufacture process involves the printing of a support structure directly onto the PCB. The support consists of an internal dome which separates the optical material from the LED package and an external containment ring. The optical material will be dispensed in two steps. The first, creates a base layer to bond the support structure to the substrate and seals the interface PCB-support structure. Then the rest of the material is dispensed. An UV source is used to cure the lens.

Results

Different variations of the support structure were designed and evaluated regarding its influence over the optical properties of the light module, such as the correlated color temperature and light output distribution. In addition, the manufacture time of each variant was also recorded. Simulation results showed total internal reflection of some incident rays in the internal support structure. In addition, the internal geometries influenced the light distribution due to the unevenness of the external surface. Nevertheless, reaching the target shape without these geometries resulted challenging.

Further studies are focused on reducing the dependency of internal structures. These include the variation of the resin's viscosity or applying further post-processing steps to improve lens surface smoothness. Inspection methods to compare the theoretical profile to the fabricated samples are also considered.

Project members:

- Edward Olivera
- Markus Zankl

- Dr. Matthias Hien
- Mahmoud Beker (SHK)

Project Partners

- Technologie Campus Cham
- CR-3D
- Guttenberger & Partner GmbH

Sponsorship

Zentrales Innovationsprogramm Mittelstand (ZIM)

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