

LightTrans' Talk at LASER 2019

Physical-Optical Analysis of Lightguide Coupling Setup and Systematic Design Strategy

LASER World of Photonics Congress | EDO19 | DOT101

Session time: 25 June 2019 | 11:40 - 12:00
Session 4: SPIE Europe Digital Optical Metrolog
Sub-Conference: Digital Optical Technologies II

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Abstract

Lightguide structures are widely applied in different applications, and, nowadays, they are drawing special interest in the field of near-to-eye display systems. Such systems are typically realized with either planar or curved lightguides together with gratings for coupling light out of or into the lightguides. For the application in display, the field of view (FOV) supported by the lightguide parts becomes an important issue for the system design. In this work, we analyze the behavior of typical gratings for lightguide coupling, especially with the angular dependency taken into consideration. It will be shown that to obtain uniformity and relatively high efficiency over large FOV is a challenging task. With the evolutionary algorithm, we firstly optimize the coupling grating structure to obtain balance between uniformity and average efficiency over the desired FOV. Furthermore, by taking the image generation unit into account, we present a systematic design concept for the lightguide coupling grating. In such a manner, the constrain on the uniformity of the grating diffraction efficiency can be released to certain degree, which brings additional freedom and possibilities into the design.