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FAST PHYSICAL OPTICS SOFTWARE

LightTrans' talks at SPIE Optical Systems Design 2018

Fast propagation of electromagnetic fields in graded-index media

Computational Optics
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Huiying Zhong, Site Zhang, Rui Shi, Christian Hellmann, Frank Wyrowski

Graded-index (GRIN) media are widely used for different situations: some components are designed with GRIN modulation in mind, e.g. multi-mode fibres, optical lenses or acousto-optical modulators; on the other hand, there are other components where the refractive-index variation is undesired due to, e.g., stress or heating; and finally, some effects in nature are characterized by a GRIN variation, like turbulence in air, or biological tissue. Modelling electromagnetic field propagation in GRIN media is then of high importance for optical simulation and design. Based on the concept of fast physical optics, we develop a theory to efficiently propagate the field in GRIN media, including the effect of polarization cross-talk. Here we emphasize that the field is general, i.e., it can be either in its diffractive (focus region, for instance) or geometric zones (e.g., the far-field zone). This theory and the resulting algorithms include established propagation techniques as special cases, e.g. the paraxial and scalar split-step method.

LightTrans International UG, Kahlaische Straße 4, 07745 Jena, Germany
++49.3641.53129-50 • www.lighttrans.com • service@lighttrans.com

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