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VirtualLab FUSION

FAST PHYSICAL OPTICS SOFTWARE

LightTrans' talk at SPIE Photonics Europe 2018

A physical-optics based concept for geometric and diffractive light shaping

Light Shaping Focus Session

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The manipulation, by suitable components, of the light generated by a source or an illuminated object is the essential task in the design of imaging and non-imaging optical systems. Typically, both the modeling and the design of such systems is performed with ray optics. However, recent developments in optical modeling facilitate a fast physical-optics model which also provides a deeper insight into optical design, thus enabling the formulation of powerful design techniques for light shaping by both diffractive and freeform components.

In physical optics light is represented by electromagnetic fields. A single field can exist, depending on its characteristics at different planes in space, in different zones, e.g. the far field zone. We therefore introduce the concept of geometric and diffractive zones of fields. Light shaping can be carried out by means of both smooth freeform surfaces and micro-structured surfaces (aka diffractive elements). Both types of light-shaping elements (smooth and micro-structured) may be applied in both types of zones (diffractive and geometric) of an electromagnetic field, depending on the desired effect. We describe and demonstrate design techniques for different applications of light shaping, including smooth and micro-structured surfaces, for different types of sources. The modeling is done vectorially in full and it therefore includes polarization and non-paraxial effects as well. The examples are demonstrated using the fast-physical optics software VirtualLab Fusion.