LightTrans' Talks at SPIE Photonics West 2020

A k-Domain Method for Fast Propagation of Electromagnetic Field Through Graded-Index Media

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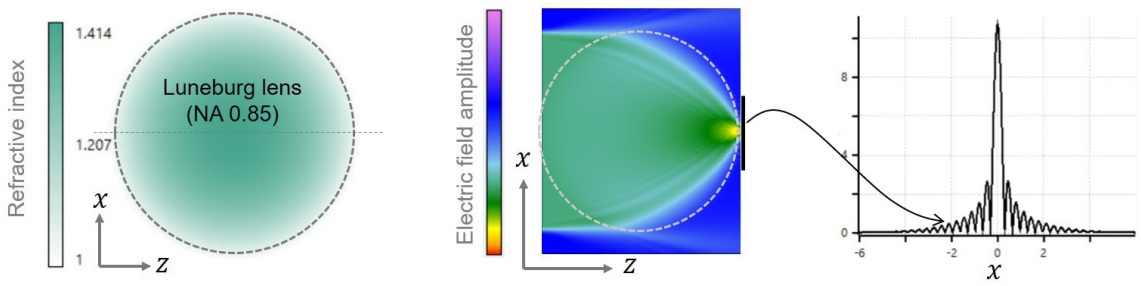
Graded-index (GRIN) media appears in many different optical devices and systems. Modeling of light propagation through such media could be quite challenging. When the modulation of refractive index is on the micro- or nanometer level, it may require rigorous methods, like finite-difference in frequency or time domain, to solve the Maxwell's equations. In this work we discuss a rigorous k-domain (spatial frequency domain) method for fast calculation of electromagnetic fields propagating through GRIN media. It is potentially fast because of two reasons: (1) in the k-domain, Maxwell's equations can be formulated in the form of a set of ordinary differential equations, which can be solved with Runge-Kutta-type (RK-type) mathematical approaches which are a group of well-established numerical algorithm; (2) taking advantage of fast Fourier transform algorithms, the convolution calculation (O(N2)) within the differential equations can be converted into multiplication (O(N)). Several advantages will be shown by comparing with the widely applied split-step method by numerical examples.



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