Solving The Paraxial Wave Equation

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Abstract

We will present a study of our attempt to solve the Paraxial Wave Equation to simulate propagation of various laser beams in vacuum as well as in a turbulent medium. Our approach is to explore the suite of partial differential equation solvers in COMSOL® and cast our problem as an initial-boundary value problem. Our goal is to discover the appropriate tool for simulating beam propagations with scales that agree with the experimental data collected in our laboratory. We begin with simulating the simplest Gaussian beam propagation in a cylinder and then move to modeling Gauss-Bessel, and Gauss-Laguerre beams. This study is motivated by our desire to understand the scope of the applicability of COMSOL® before applying it to the more challenging problem of simulating beam propagation in a turbulent medium.