

Abstract Submitted  
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**Interference, focusing and excitation of ultracold atoms**<sup>1</sup> M.C. KANDES<sup>2</sup>, B.M. FAHY, S.R. WILLIAMS, C.H. TALLY IV<sup>3</sup>, M.W.J. BROMLEY, Department of Physics and Computational Science Research Center, San Diego State University, San Diego CA — One of the pressing technological challenges in atomic physics is to go orders-of-magnitude beyond the limits of photon-based optics by harnessing the wave-nature of dilute clouds of ultracold atoms. We have developed parallelised algorithms to perform numerical calculations of the Gross-Pitaevskii equation in up to three dimensions and with up to three components to simulate Bose-Einstein condensates. A wide-ranging array of the physics associated with atom optics-based systems will be presented including BEC-based Sagnac interferometry in circular waveguides, the focusing of BECs using Laguerre-Gauss beams, and the interactions between BECs and Ince-Gaussian laser beams and their potential applications.

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