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Structure and interference of ultracold atoms in circular waveguides MARTIN KANDES, OSCAR SALAZAR, MICHAEL BROMLEY, Department of Physics and Computational Science Research Center, San Diego State University, San Diego CA — Simple circular waveguides promise to be an ideal architecture for building high-precision matter-wave interferometers that exploit the coherent source of atoms provided by Bose-Einstein condensates (BECs). We perform numerical calculations of the time-dependent Gross-Pitaevskii equation in one and two dimensions to simulate gravity-induced quantum interference for counter-propagating BECs in a circular waveguide. The emphasis being on the role that nonlinear interactions have on the feasibility of interferometric measurements. Our results vividly illustrate the many challenges in performing the corresponding experiments.

Michael Bromley

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