

Abstract Submitted
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Fast Quantum Control of Bose-Einstein Condensates for Inertial Sensing Applications¹ SKYLER A WRIGHT, CHRIS LARSON, EDWARD CARLO SAMSON, Miami University — We report on our numerical simulations of high-fidelity, fast quantum control of Bose-Einstein condensates (BECs) as we study the viability of using shortcuts-to-adiabaticity (STA) launching protocols for BEC transport and for use in applications of inertial sensing interferometry in 2D. Arbitrary and dynamic painting potentials are used to confine and control the spatial transport of the BECs. Counterdiabatic driving STA protocols are used because they provide fast quantum control while suppressing excitations from free energies. Our preliminary simulations address how STA protocols compare with more classical approaches to transport in terms of quantum coherence based on the depth of the potential trap used and the total time of transport. Using these tests as a baseline, we analyze the effects of STA protocols when used in BEC Mach-Zehnder interferometry.

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