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Theoretical analysis of cold atom interferometers with optical control of dynamics JAMES STICKNEY, WPI, DANA Z. ANDERSON, University of Colorado and National Institute of Standards and Technology, ALEX ZOZULYA, WPI — Atom interferometers using Bose-Einstein condensate that is confined in a waveguide and manipulated by optical pulses have been limited by their short coherence times. We present a theoretical model that offers a physically simple explanation for the loss of contrast for both a single-pass and double-pass interferometers. For the case of a singles-pass device, we propose the method for increasing the fringe contrast by recombining the atoms at a different time. A simple, quantitatively accurate, analytical expression for the optimized recombination time is presented and used to place limits on the physical parameters for which the contrast may be recovered. For the case of a double-pass interferometer, we place an upper limit on the device's coherence time.

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