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Applications of chirped Raman adiabatic rapid passage to atom interferometry[1] KRISH KOTRU, DAVID L. BUTTS, C. S. Draper Laboratory, Inc., and MIT Dept. of Aeronautics and Astronautics, JOSEPH M. KINAST, DAVID M.S. JOHNSON, ANTONIJE M. RADOJEVIC, BRIAN P. TIMMONS, RICHARD E. STONER, C. S. Draper Laboratory, Inc. — We present robust atom optics, based on chirped Raman adiabatic rapid passage (ARP), in the context of atom interferometry. Such ARP light pulses drive coherent population transfer between two hyperfine ground states by sweeping the frequency difference of two fixed-intensity optical fields with large single photon detunings. Since adiabatic transfer is less sensitive to atom temperature and non-uniform Raman beam intensity than standard Raman pulses, this approach should improve the stability of atom interferometers operating in dynamic environments. In such applications, chirped Raman ARP may also provide advantages over the previously demonstrated stimulated Raman adiabatic passage (STIRAP) technique, which requires precise modulation of beam intensity and zeroing of the single photon detuning. We demonstrate a clock interferometer with chirped Raman ARP pulses, and compare its stability to that of a conventional Raman pulse interferometer. We also discuss potential improvements to inertially sensitive atom interferometers.

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