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Multiphoton Raman Atom Optics with Frequency-Swept Adiabatic Passage KRISH KOTRU, Draper, DAVID BUTTS, None, JOSEPH KINAST, RICHARD STONER, Draper — Light-pulse atom interferometry is a promising candidate for future inertial navigators, gravitational wave detectors, and measurements of fundamental physical constants. The sensitivity of this technique, however, is often limited by the small momentum separations created between interfering atom wave packets (typically $\sim 2\hbar k$). We address this issue using light-pulse atom optics derived from stimulated Raman transitions and frequency-swept adiabatic rapid passage (ARP). In experiments, these Raman ARP atom optics have generated up to $30\hbar k$ photon recoil momenta in an acceleration-sensitive atom interferometer, thereby enhancing the phase shift per unit acceleration by a factor of 15. Since this approach forgoes evaporative cooling and velocity selection, it could enable large-area atom interferometry at higher data rates, while also lowering the atom shot-noise-limited measurement uncertainty.

Krish Kotru
Draper

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