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Precision Contrast Interferometry with Yb Bose-Einstein condensates for h/m and α[1] DANIEL GOCHNAUER, KATHERINE MCALPINE, BENJAMIN PLOTKIN-SWING, SUBHADEEP GUPTA, Univ of Washington —
Our ytterbium (Yb) Bose-Einstein condensate (BEC) contrast interferometer operates with standing-wave light pulses and is designed to make a precision measurement of the fine structure constant, α, via a direct measurement of h/m, where h is the Planck constant and m is the mass of Yb. The interferometer signal is insensitive to both magnetic fields, due to the non-magnetic Yb ground state, and mirror vibrations, due to the symmetry of the interferometer arms. We have recently extended this approach to momentum separation as large as 112 photon recoils between outer paths [1]. The interferometer phase evolution is quadratic with number of recoils, reaching a rate as high as 7×10^7 radians/s. Furthermore, we suppress undesired diffraction phases through careful choosing of and precise control over our atom optics parameters. We will discuss our theoretical model for these phases and compare to experimental results for various pulse parameters. The observed performance at large momentum separation indicates a favorable scaling of the interferometer towards a precision measurement of α.
[1] B. Plotkin-Swing et al, arXiv:1712.06738

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