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Atom Interferometry with Bose-Einstein condensates to measure α[1] ALAN JAMISON, BEN PLOTKIN-SWING, ANDERS HANSEN, ALEXANDER KHRAMOV, WILL DOWD, J. NATHAN KUTZ, SUBHADEEP GUPTA, University of Washington — The most precise measurement of the fine structure constant, α, comes from the electron $g-2$ measurement. This result relies on high orders of perturbation theory in QED. A complementary measurement of α with less dependence on theory would allow for extremely stringent tests of QED. Atomic recoil measurements, which measure h/m for a given atomic species, are a promising direction for such a measurement. We will report on our progress toward a Bose-Einstein condensate (BEC) interferometer to measure the atomic recoil of ytterbium (Yb) with high precision. Use of a BEC allows for long interrogation times and a robust signal. Using Yb eliminates magnetic fields as a potentially damaging systematic while allowing comparison of results for different isotopes. We have established key components of the interferometer with a ^{174}Yb BEC: diffraction with short laser pulses for momentum-state beam-splitting and with long pulses as mirrors. We are working on acceleration pulses to achieve large momenta in the different interferometer arms, necessary for a sub-ppb measurement of α.

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