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**Scaling up the precision in a ytterbium Bose-Einstein condensate interferometer** KATHERINE MCALPINE, BENJAMIN PLOTKIN-SWING, DANIEL GOCHNAUER, BRENDAN SAXBERG, SUBHADEEP GUPTA, University of Washington — We report on progress toward a high-precision ytterbium (Yb) Bose-Einstein condensate (BEC) interferometer, with the goal of measuring h/m and thus the fine structure constant $\alpha$. Here h is Planck's constant and m is the mass of a Yb atom. The use of the non-magnetic Yb atom makes our experiment insensitive to magnetic field noise. Our chosen symmetric 3-path interferometer geometry [1] suppresses errors from vibration, rotation, and acceleration. The precision scales with the phase accrued due to the kinetic energy difference between the interferometer arms, resulting in a quadratic sensitivity to the momentum difference. We are installing and testing the laser pulses for large momentum transfer via Bloch oscillations. We will report on Yb BEC production in a new apparatus and progress toward realizing the atom optical elements for high precision measurements. We will also discuss approaches to mitigate two important systematics: (i) atom interaction effects can be suppressed by creating the BEC in a dynamically shaped optical trap to reduce the density; (ii) diffraction phase effects from the various atom-optical elements can be accounted for through an analysis of the light-atom interaction for each pulse. [1] A.Jamison, B.Plotkin-Swing, S.Gupta, PRA 90, 063606 (2014).

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