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Ytterbium Bose-Einstein condensate interferometer: current results and new construction[1] BENJAMIN PLOTKIN-SWING, ALAN JAMISON, SUBHADEEP GUPTA, Univ of Washington — We present the first ytterbium matter-wave interferometer using a Bose-Einstein condensate (BEC) source in a contrast interferometer geometry. We measured h/m, where h is Planck's constant and m is the mass of an ytterbium atom, in order to determine the fine structure constant α. We demonstrate theoretical understanding and experimental control over our two main sources of systematic error: atomic interactions and diffraction phases. Based on our findings, we present our plans for increasing the precision of our α measurement to the level of one part in ten billion. We also observed that the interferometer signal is sensitive to the condensate critical temperature, and we propose BEC interferometry as a tool for studying phase transitions. We will describe some of the features of a new apparatus for our next generation of measurements that is currently under construction.

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