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Progress towards *in situ* observation of Yb Bloch oscillations in an optical lattice searching for ultra-light dark matter CHANDLER SCHLUPF, ROBERT NIEDERRITER, PAUL HAMILTON, University of California, Los Angeles — We present progress towards an atomic force sensor for measuring linear and oscillating forces on atoms via observation of Bloch oscillations. The experiment consists of ytterbium atoms suspended in an optical lattice formed by an in-vacuum optical cavity. We expect the coupling of the atoms and the cavity light will cause the transmission of the cavity to be modulated at the Bloch frequency [1], providing a way to measure the frequency *in situ*. Ultra-light dark matter, for example, would produce an oscillating force which could be detected through oscillations in the Bloch frequency [2]. We have shown the sensitivity of the atom-cavity coupling to changes in the atom spatial distribution by performing a fast ($< 10\ \mu s$) single-shot temperature measurement of our trapped atom sample. We continue to develop techniques to cool ^{171}Yb atoms to the ground band of the optical lattice which will enable optimal Bloch oscillation measurements. [1] B. Prasanna Venkatesh, M. Trupke, E. A. Hinds, and D. H. J. O'Dell, Atomic Bloch-Zener oscillations for sensitive force measurements in a cavity", Physical Review A 80, 063834 (2009). [2] A. Arvanitaki, J. Huang, and K. Van Tilburg, "Searching for dilaton dark matter with atomic clocks", Physical Review D 91, 015015 (2015).

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