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Progress towards Bloch Oscillations of Yb in an optical lattice to search for ultra-light dark matter CHANDLER SCHLUPF, ROBERT NIEDERRITER, PAUL HAMILTON, University of California, Los Angeles — We present the latest developments of an atomic sensor sensitive to oscillating forces. The device consists of ytterbium atoms loaded into an in-vacuum optical cavity. The atoms undergo Bloch oscillations in the lattice potential driven by an external force such as gravity. Cavity parameters were optimized for efficient atom-light coupling, such that the output light of the cavity is modulated at the Bloch frequency [1]. New fields, such as ultra-light dark matter, can create oscillating forces which would be detected through oscillations in the Bloch frequency[2]. This technique allows for continuous measurements in a small volume over a long coherence time. We are currently developing a scheme to cool the Yb atoms into the ground state band of the lattice. [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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