Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Development of a force sensor using atom interferometry to constrain theories on dark matter and dark energy CHANDLER SCHLUPF, ROBERT NIEDERRITER, ELIOT BOHR, SAMI KHAMIS, YOUNA PARK, ERIK SZWED, PAUL HAMILTON, Univ of California - Los Angeles — Atom interferometry has been used in many precision measurements such as Newton's gravitational constant, the fine structure constant, and tests of the equivalence principle. We will perform atom interferometry in an optical lattice to measure the force felt by an atom due to a test mass in search of new forces suggested by dark matter and dark energy theories [1]. We will be developing a new apparatus using laser-cooled ytterbium to continuously measure this force by observing their Bloch oscillations [2]. Interfering atoms in an optical lattice allows continuous measurements in a small volume over a long period of time, enabling our device to be sensitive to time-varying forces while minimizing vibrational noise. We present the details of this experiment and the progress on it thus far. [1] P. Hamilton, M. Jaffe, P. Haslinger, Q. Simmons, H. Muller, and J. Khoury, "Atom-interferometry Constraints on Dark Energy." Science, 349, 849-851 (2015). [2] 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).

Chandler Schlupf
Univ of California - Los Angeles

Date submitted: 11 Apr 2017 Electronic form version 1.4