Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Two-photon Direct Frequency Comb Spectroscopy of Alkali Atoms[1] KHOA NGUYEN, San Jose State University, TRINITY PRADHANANGA, CHRISTOPHER PALM, California State University - East Bay, JASON STALNAKER, Oberlin College, DEREK JACKSON KIMBALL, California State University - East Bay — We are using direct frequency comb spectroscopy to study transition frequencies and excited state hyperfine structure in potassium and rubidium using 2-photon transitions excited directly with the frequency-doubled output of a erbium fiber optical frequency comb. The frequency comb output is directed in two counterpropagating directions through a vapor cell containing the atomic vapor of interest. A pair of optical filters is used to select teeth of the comb in order to identify the transition wavelengths. A photomultiplier tube (PMT) measures fluorescence from a decay channel wavelength selected with another optical filter. Using different combinations of filters enables a wide range of transitions to be investigated. By scanning the repetition rate, a Doppler-free spectrum can be obtained enabling kHz-resolution spectral measurements. The thermal motion of the atoms in the vapor cell actually eliminates the need to fine-tune the offset frequency and repetition rate, alleviating a somewhat challenging requirement for spectroscopy of cold atoms. Our investigations are laying the groundwork for a long-term research program to use direct frequency comb spectroscopy to understand the complex spectra of rare-earth atoms.

[1]National Science Foundation Grant PHY-0958749

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Date submitted: 27 Jan 2012 Electronic form version 1.4