Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Construction of a Dye Laser for Use in Detecting Ultracold RbCa[1] HAYLEY WHITSON, ALEXANDRIA PARSAGIAN, MICHAELA KLEINERT, Willamette University — Ultracold heteronuclear molecules have seen increasing interest in the scientific community over the last few years. By controlling their ro-vibrational energy levels, ultracold molecules can be used for high precision spectroscopy, to study cold collisions with rich internal dynamics, as model systems for condensed matter physics, and as qubits in quantum information processing. We study the novel combination RbCa. In addition to a permanent electric dipole moment, it also possesses a permanent magnetic dipole moment. This makes it an ideal candidate to study strong long-range dipole-dipole interactions. A dye laser system will be used to ionize RbCa through resonantly enhanced multi-photon ionization (REMPI). We use a Nd:YAG pulsed laser to pump a dye solution in a quartz glass cell. The linewidth of the dye laser is narrowed through use of a diffraction grating in Littman-Metcalf configuration. We have performed *ab initio* calculations to calculate the electronic energy levels of RbCa, and Franck-Condon factors to determine the best wavelength for REMPI. These data will be used to optimize further calculations of molecular energy levels.

[1]This work has been support by the National Science Foundation, the M.J. Murdock Charitable Trust, and Willamette University.

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Date submitted: 26 Jan 2012 Electronic form version 1.4