Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Enhancement of Rydberg atom interactions using ac Stark shifts[1]
JOSEPH PETRUS, PARISA BOHLOULI-ZANJANI, JAMES MARTIN, Department of Physics and Astronomy and Institute for Quantum Computing, University of Waterloo, Waterloo, ON, N2L 3G1, Canada — A microwave dressing field was used to induce resonant energy transfer in translationally cold Rydberg atoms. The ^{85}Rb Rydberg atoms were obtained by laser excitation of cold atoms in a magneto-optical trap. When the amplitude of a 1.356 GHz dressing field was scanned, the two-atom dipole-dipole process $43d_{5/2} + 43d_{5/2} \rightarrow 45p_{3/2} + 41f_{5/2,7/2}$ was enhanced due to the induced degeneracy of the initial and final states. The resulting spectrum had a series of resonant field amplitudes corresponding to different magnetic sublevels possible for the states involved. The scanned field amplitude was calibrated using microwave spectroscopy of the $43d_{5/2} - 41f$ transition under the influence of non-resonant dressing fields. The calibrated resonant field amplitudes agree well with ac Stark shift calculations performed using the Floquet approach. This method for enhancing interactions is complementary to dc electric field induced resonant energy transfer, but benefits from the ability to shift energy levels in either direction by choice of frequency.

[1]Work supported by NSERC, CFI and OIT.

Joseph Petrus
Department of Physics and Astronomy and Institute for
Quantum Computing, University of Waterloo,
Waterloo, ON, N2L 3G1, Canada

Date submitted: 03 Feb 2007 Electronic form version 1.4