Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

**Observation of Controllable Excitation Suppression in Cold $^{87}$Rb Rydberg Atoms**[1] J.E. JOHNSON, I. ARAKELYAN, TAO HONG, S.L. ROLSTON, Joint Quantum Institute, Dept. of Physics, University of Maryland and National Institute of Standards and Technology, College Park, MD 20742, USA — Cold Rydberg atoms in ensembles and optical lattices offer the opportunity to study dipolar matter with controllable dipole-dipole interactions (DDIs). Varying an applied static electric field allows the excitation of Rydberg atoms ranging from those with no dipole moments to large permanent dipoles, which should greatly affect interactions within the sample. We have observed increased suppression of the CW excitation of a magneto-optical trap (MOT) of $^{87}$Rb atoms to the $56S_{1/2}$ Rydberg state as an applied external static electric field is increased. As the field increases, the atom-atom interactions transition from Van der Waals to dipole-dipole. The longer-range dipolar interaction should be more effective in blockading excitation of closely space atom pairs, reducing the excitation rate as observed.

[1]This work is partially supported by the NSF.

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Date submitted: 25 Jan 2010 Electronic form version 1.4