Redistribution of atomic population among nearly degenerate Rydberg states through dipole-dipole interactions\textsuperscript{1} THOMAS J. CARROLL, Ursinus College, DONALD P. FAHEY, MICHAEL W. NOEL, Bryn Mawr College, ALEX MELLUS, JON WARD, Ursinus College — Ultra-cold highly-excited atoms in a magneto-optical trap are strongly coupled by the dipole-dipole interaction. Rubidium atoms that have been excited to the $32\text{d}_{5/2}$, $|m_j|=1/2$ sublevel can exchange energy when an applied static electric field tunes the Stark states into resonance. They do so via the densely packed set of resonant interactions $32\text{d} + 32\text{d} \rightarrow 34\text{p} + 30\text{g}$ near 0.3 V/cm. Atoms that have exchanged energy and are now in the final p and manifold states can be coupled to a resonance involving $32\text{d}_{5/2}$, $|m_j|=3/2$ and $1/2$ states, which redistributes population among the $|m_j|$ sublevels. We present experimental and computational studies that investigate this redistribution.

\textsuperscript{1}This work was supported by the National Science Foundation (grant no. 0653544) and through the Extreme Science and Engineering Discovery Environment (supported by NSF grant no. OCI-1053575).

Thomas Carroll
Ursinus College

Date submitted: 27 Jan 2012

Electronic form version 1.4