Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Highly excited state Rydberg recombination and consequences for ultracold neutral plasmas HOSSEIN SADEGHPOUR, THOMAS POHL, ITAMP, Harvard-Smithsonian Center for Astrophysics, DANIEL VRINCEANU, Los Alamos National Laboratory — Three-body recombination is a fundamental collision process for laboratory and astrophysical plasmas and in ultracold plasmas, it becomes the dominant formation mechanism, because of the inverse 9/2 dependence with temperature. In calculations and modeling of recombination and electron-impact excitation/de-excitation of Rydberg atoms, it is generally agreed that the level population of a Rydberg atom comes into thermodynamic equilibrium with the plasma electrons at kT. This is not strictly valid and will be discussed in the context of ionic microfield population of highest Rydberg levels. Plasma dynamics simulations of three-body recombination will be discussed which demonstrate that the recently measured rate of recombination in an ultracold plasma can be quantitatively described, only when the rates for electron-Rydberg atom scattering, as provided in literature, are revised.

Thomas Pohl
ITAMP, Harvard-Smithsonian Center for Astrophysics

Date submitted: 04 Feb 2008 Electronic form version 1.4