Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

**Anomalous Recombination Rates in Ultracold Plasmas** ROBERT FLETCHER, XIANLI ZHANG, STEVEN ROLSTON, University of Maryland —
Three-body recombination, one of the major loss processes in plasmas, has been studied over a range of densities and temperatures, resulting in a widely accepted expression for the three-body recombination rate that scales as $T^{-4.5}$. We present experimental measurements of Rydberg atom formation in ultracold plasmas ($T < 20K$) that calls this into question. By applying a pair of short (200 ns) microwave pulses at 2.4 GHz, we ionize and detect Rydberg atoms in a quasineutral ultracold xenon plasma without destroying the plasma. Varying the delay between the two pulses, we measure the refill rate of Rydberg atoms in the plasma. The observed rates are much larger than three-body recombination theory predicts using temperature measurements from prior experiment and simulation results. This implies that either the ultracold plasma temperature is much lower than previously thought, or currently accepted three-body recombination theory fails below $\sim$20K.

Robert Fletcher
University of Maryland

Date submitted: 05 Feb 2007

Electronic form version 1.4