

Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Internuclear separation dependence of dipole-dipole interactions between excited sodium atoms BRIAN RICCONI, YAN XIAO, J. GARY EDEN, University of Illinois at Urbana Champaign — Wavepackets and parametric four-wave mixing (PFWM) was used to probe excited Na atoms with mean internuclear separations between 700 and 1100 Å. A pump-probe technique employing a nonlinear parametrically amplified oscillator to coherently probe the 4d and 5s energy states was used to observe the quantum beating at a frequency of 1348.1 cm⁻¹. Frequency analysis of the PFWM signal indicated the energy defect between the Na 5s-4d levels was perturbed and sidebands to the main frequency appeared. By monitoring the frequency difference between the perturbed and unperturbed oscillations, the sum of the interaction energies between one atom and all surrounding atoms may be obtained. Although two-body dipole-dipole interactions qualitatively account for the frequency spread, quantitative analysis shows that many-body interactions must be considered to be consistent with the observed splitting.

Brian Ricconi
University of Illinois at Urbana Champaign

Date submitted: 05 Feb 2007

Electronic form version 1.4