DAMOP09-2009-000488

Abstract for an Invited Paper
for the DAMOP09 Meeting of
the American Physical Society

Simulations of a strongly interacting Rydberg gas[1]

FRANCIS ROBICHEAUX, Auburn University

We have performed simulations of a gas of Rydberg atoms where the atom-atom interaction is strong enough to generate interesting correlations between atoms. Results will be presented on different aspects of this system. As an example, we simplified the Rydberg-Rydberg interaction so that the interaction was so strong that the probability for finding pairs of Rydberg atoms was 0 for distances less than R and the interaction between atoms was 0 for distances greater than R. We found correlation between atoms separated by several multiples of R even though there was no direct interaction between the atoms, but that the correlation appeared to be classical. In calculations with realistic Rydberg-Rydberg interactions, we found that the line width of photo-excitation from the ground state into the Rydberg state more strongly depended on density fluctuations in the gas than on diffusion of the Rydberg excitation; this result is in contrast to previous interpretations of experiments. We also performed calculations where the laser transition from ground to Rydberg state mimics a spin-echo arrangement.

[1]With Bo Sun and Jesus Hernandez