SES12-2012-000126

Abstract for an Invited Paper
for the SES12 Meeting of
the American Physical Society

Controlled Dipole-Dipole Interactions in a Cold Rydberg Gas[1]

ROBERT JONES, University of Virginia

The great spatial extent of highly-excited Rydberg atoms endows them with large dipole moments and electric polarizabilities, making them extremely sensitive to external fields and neighboring atoms. We use cold diffuse ensembles of Rydberg atoms to explore few-and many-body dipole-dipole interactions at long range. Such systems are of potential interest for quantum computing platforms. We focus on time-domain methods and utilize pulsed lasers and electric fields to create specific electronic superposition states and control the evolution of the excited atoms. We have confirmed that electronic coherence can persist for long times (> 10 μs in our samples and have evidence that the coherence may be extended through the application of the appropriate control fields. We are exploring methods which exploit the dipole-dipole coupling to transport electronic coherence between atoms and to manipulate the relative positions of atoms in a magneto optical trap.

[1]This work is supported by the National Science Foundation.