Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Towards quantum simulation using Rydberg-excited atoms in optical tweezer arrays[1] JACKSON ANGONGA, ZEJUN LIU, BRYCE GADWAY, University of Illinois at Urbana-Champaign — Trapped neutral atoms in optical tweezers present a versatile platform for quantum simulation, metrology and quantum information processing. We present a scheme where a synthetic dimension can be added to a one-dimensional array of individually trapped ^{39}K atoms by exciting them to Rydberg states. A synthetic lattice of coupled internal states is created by coupling multiple Rydberg levels using microwave fields. Enhanced dipole moments associated with atoms in Rydberg states lead to strong dipole-dipole interactions. These interactions and control of synthetic lattice parameters open up avenues for studying a wide range of quantum many-body phenomena. The near arbitrary ability to engineer a generic tight-binding Hamiltonian in the synthetic dimension allows new capabilities for the exploration of interaction effects in topological and disordered systems. Specifically, we will investigate formation of stable quantum strings which has been predicted to occur in such synthetic systems.

[1]This work was supported by the Office of Naval Research Science and Technology (ONR; Award N00014-16-1-2895)

Jackson Angonga
University of Illinois at Urbana-Champaign

Date submitted: 01 Feb 2019 Electronic form version 1.4