Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Realization of anyonic Hubbard and lattice gauge models with Rydberg atoms[1] SIMON OHLER, University of Kaiserslautern, DAVID PETROSYAN, IESL, FORTH, MICHAEL FLEISCHHAUER, University of Kaiserslautern — We propose a scheme to realize a one-dimensional Hubbard model for anyons with tunable statistical exchange phase. The scheme utilizes the density-dependent Peierl's phase in the hopping amplitude of excitations of Rydberg atoms in a zig-zag lattice, as was recently realized experimentally in [1]. The obtained Hamiltonian for hard-core anyons contains nearest-neighbor hopping as well as next nearest neighbor density-dependent hopping that results from the combination of the direct and second-order dipole-dipole exchange interactions between the atoms in the Rydberg ns and np states. We show how the effective anyons in the lattice can be braided to reveal their exotic exchange statistics. As a second application of the same setup, we propose the realization of a lattice gauge theory using the density-dependent second-order hopping of the Rydberg excitations.

V. Lienhard *et al.*, *"Realization of a density-dependent Peierls phase in a synthetic, spin-orbit coupled Rydberg system"*, arxiv:2001.10357

[1]Deutsche Forschungsgemeinschaft

Michael Fleischhauer
University of Kaiserslautern

Date submitted: 30 Jan 2020 Electronic form version 1.4