Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Designing an optical lattice trap for ions MATT GRAU, CHRISTOPH FISCHER, OLIVER WIPFLI, JONATHAN HOME, ETH Zurich — Ions trapped in an optical lattice have the potential to realize interesting two and three-dimensional geometries with long range, tunable spin-spin couplings with application to quantum simulation of many-body spin Hamiltonians. We are constructing a new experiment to trap large numbers of ions at small ion-ion distances using a deep optical lattice in a high-finesse cavity. A MOT will act as a reservoir of neutral Magnesium atoms which will be loaded into the lattice, where the atom positions can be manipulated before resonant photoionization. Lattice spacing can be controlled by using an optical lattice at a second wavelength to create a spatially varying AC stark shift on a transition to an anti-trapped electronic state of the neutral atom. The lattice wavelength will be far detuned from the neutral and ion primary fluorescence transitions, which will result in low off-resonant scattering rates. Additionally, the optical lattice will be located in a cryo-cooled vacuum chamber to minimize the probability of collisions with background gas. We will report on the experimental progress of the MOT, high-finesse cavity, and optical trapping.

Matt Grau
ETH Zurich

Date submitted: 26 Jan 2017 Electronic form version 1.4