Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Quantum simulations of quantum magnetism with hundreds of trapped ions KEVIN GILMORE, JILA, NIST, and Dept. Phys, U. Colorado, Boulder, CO, JUSTIN BOHNET, ELENA JORDAN, NIST, Boulder, CO, MARTIN GAERTTNER, ARGHAVAN SAFAVI-NAINI, ANA MARIA REY, JILA, NIST, and Dept. Phys, U. Colorado, Boulder, CO, JOHN BOLLINGER, NIST, Boulder, CO — Quantum simulators, where one well-controlled physical system mimics another complex system, may enable understanding of quantum many-body physics that cannot be fully studied using conventional techniques on classical computers. We describe quantum simulations of a network of interacting magnetic spins performed with 2-dimensional arrays of hundreds Be^+ ions crystallized in a Penning trap. We discuss how we engineer a tunable transverse Ising model, and explain how we generate and observe far-from-equilibrium quantum spin dynamics, including signatures of entanglement. We summarize progress exploring optimized adiabatic protocols for preparing low energy states of the transverse Ising Hamiltonian and implementing a sub-Doppler cooling scheme for the drumhead modes of the ion array.

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Date submitted: 27 Jan 2017 Electronic form version 1.4