Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Experiments on Quantum Matter Synthesizer MINGJIAMEI ZHANG, JONATHAN TRISNADI, CHENG CHIN, University of Chicago — Scalable atom-by-atom assembly of many-body states is a key progression in the direction of quantum simulation experiments. In this poster we detail the technical aspects of a new apparatus, the "Quantum Matter Synthesizer", which uses a pair of high-numerical aperture microscope objectives to both image and address atoms on single sites of a 2D lattice. Pre-cooled cesium atoms are first stochastically loaded into a magic-wavelength 2D triangle lattice and then simultaneously cooled and imaged. After detecting the initial site occupancy, an array of moving optical tweezers will re-arrange atoms into a pre-desired configuration. In this poster we report performance updates on the transport, trapping, and cooling of atoms at the microscope focus, as well as details on our implementation of a moving tweezer array. A future upgrade is integrating Optical Feshbach Resonance (OFR) technique into the system, which enables control of local interaction strength and potentially engineering of more exotic quantum phases.

Mingjiamei Zhang
University of Chicago

Date submitted: 31 Jan 2020 Electronic form version 1.4