

Abstract Submitted
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Novel Techniques for Control and Detection of Ultracold Quantum Gases LOGAN W. CLARK, LI-CHUNG HA, ERIC L. HAZLETT, CHENG CHIN, University of Chicago — We report on the progress of three novel techniques for studying ultracold quantum gases. First, we discuss our technique for measuring the structure factor of a 2D quantum gas and our progress towards using such measurements to perform local detection of thermodynamic quantities in the gas. Second, in order to create a flat potential or any other arbitrary potential, we explore the use of a high resolution objective to project a blue detuned laser onto the gas. By spatially patterning the laser with a digital micromirror device we create arbitrary optical potentials with $\sim 1 \mu\text{m}$ resolution. In addition, we report a general method to modify the band structure in an optical lattice by shaking the lattice. Condensates in the lattice can form domains with long-range ferromagnetic order.

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