Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

A scalable method for measuring entanglement entropy of quantum many-body systems ERIC TAI, ALEX LUKIN, PHILIPP PREISS, MATTHEW RISPOLI, RUICHAO MA, RAJIBUL ISLAM, MARKUS GREINER, Harvard University — Quantum many-body systems far from equilibrium are challenging to understand due to the spreading of quantum correlations among the constituents. Measuring the entanglement growth in such a system can serve to characterize the dynamical phases. We use high precision optical potentials in a quantum gas microscope to investigate quench dynamics and entanglement of a few-body bosonic system. The entanglement entropy is directly estimated by interfering two identically prepared copies of the same dynamical state, in a many-body extension of the two particle Hong-Ou-Mandel interference of bosons. This approach provides a versatile and scalable protocol for investigating the purity and entanglement growth of our system.

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Date submitted: 30 Jan 2015 Electronic form version 1.4