Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Interference signatures of thermal and quantum phase fluctuations in the two dimensional Bose-Hubbard Model[1] MASON SWANSON, YEN LEE LOH, NANDINI TRIVEDI, The Ohio State University — Superfluidity in the Bose-Hubbard model is destroyed by the interplay of thermal and quantum phase fluctuations. In two dimensions, Berezinskii-Kosterlitz-Thouless theory predicts that deep in the superfluid phase quasi-long-range order is destroyed by the proliferation of thermally induced free vortices. As the Mott insulator regime is approached, the effect of quantum phase fluctuations must also be taken into account. By using a (2 + 1)-dimensional XY phase model, we investigate the signatures of thermal and quantum vortices in interference patterns. The possibility of extracting spatial and temporal correlation lengths from such interference images provides a new experimental probe for characterizing the state of ultracold atomic gases in 2D optical lattices.

[1]We acknowledge support from the NSF Graduate Research Fellowship Program and ARO/DARPA Grant No. W911NF-08-1-0338

Mason Swanson
The Ohio State University

Date submitted: 10 Dec 2010 Electronic form version 1.4