Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

d-wave correlated Bose liquid phases on multi-leg ladders with ring exchange R. V. MISHMASH, M. BLOCK, Dept. of Physics, UCSB, RIBHU K. KAUL, Microsoft Station Q, UCSB, D. N. SHENG, Dept. of Physics and Astronomy, California State Univ., Northridge, OLEXEI I. MOTRUNICH, MATTHEW P. A. FISHER, Dept. of Physics, Caltech — We discuss recent progress on the study of ladder descendants of a novel two-dimensional quantum phase of bosons moving on the square lattice which is characterized by singular surfaces in momentum space, namely the d-wave correlated Bose liquid (DBL). Using a combination of numerics (e.g., density matrix renormalization group, variational Monte Carlo, and exact diagonalization) and analytics (e.g., bosonization of a compact U(1) lattice gauge theory) we explore the existence and stability of ladder analogs of the DBL on N-leg ladders, with $N \geq 3$, in the context of a model of itinerant hard-core bosons with frustrating four-site ring exchange. As in the case of $N = 2$, see [1], we find numerical evidence for various strong-coupling DBL phases which can rather remarkably be understood within a slave-fermion picture in which the boson wave function is written as a product of two Slater determinants. The additional features and difficulties associated with taking $N > 2$ will be addressed. The boson ring model we consider has potential physical realizations in the contexts of low-dimensional frustrated quantum magnets and in ultracold quantum gases. [1] D. N. Sheng *et al.*, Phys. Rev. B **78**, 054520 (2008).

Ryan Mishmash
Department of Physics, University of California, Santa Barbara

Date submitted: 19 Nov 2009 Electronic form version 1.4