Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Monte Carlo studies of diamagnetism and charge density wave order in the cuprate pseudogap regime LAUREN HAYWARD SIERENS, ANDREW ACHKAR, DAVID HAWTHORN, University of Waterloo, ROGER MELKO, University of Waterloo / Perimeter Institute for Theoretical Physics, SUBIR SACHDEV, Harvard University / Perimeter Institute for Theoretical Physics
— The pseudogap regime of the hole-doped cuprate superconductors is often characterized experimentally in terms of a substantial diamagnetic response and, from another point of view, in terms of strong charge density wave (CDW) order. We introduce a dimensionless ratio, R, that incorporates both diamagnetic susceptibility and the correlation length of CDW order, and therefore reconciles these two fundamental characteristics of the pseudogap [PRB 90, 094515 (2014)]. We perform Monte Carlo simulations on a classical model that considers angular fluctuations of a six-dimensional order parameter [Science 343, 1336 (2014)], and compare our Monte Carlo results for R with existing data from torque magnetometry and x-ray scattering experiments on $YBa_2Cu_3O_{6+x}$. We achieve qualitative agreement, and also propose future experiments to further investigate the behaviour of this dimensionless ratio.

Lauren Hayward Sierens
University of Waterloo

Date submitted: 12 Nov 2014 Electronic form version 1.4