

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Boson-Fermion mixture and superconducting phases on the honeycomb lattice DORON BERGMAN, PETER ORTH, KARYN LE HUR, Yale University — We explore theoretically the different phases of a Boson-Fermion mixture in a honeycomb lattice model. With realistic band structure and interactions, we find that much like phonons in a solid, the bosonic atoms induce effective attractive interactions between the fermions. The attractive interactions can then lead to a number of superconducting phases, which we explore. Using a Bogoliubov and mean-field approach, as well as a full RG treatment, we derive the phase diagram. Possible phases of the system include s-wave as well as $p+ip$ superconducting states. We also analyze the nature of the vortices in the different superconducting states, as these are of great interest as a possible realization of emergent non-Abelian statistics. We explain how tuning between different superconducting phases can be achieved in a cold atomic gas realization of this system.

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Date submitted: 26 Nov 2007

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