Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Enhancement of nearest neighbor spin-singlet correlations in d-wave SNS graphene Josephson junctions ANNICA BLACK-SCHAFFER, SEBASTIAN DONIACH, Stanford University — Using the self-consistent tight-binding Bogoliubov-de Gennes (BdG) formalism we investigate the effect of nearest neighbor spin-singlet bond (SB) correlations in a graphene SNS Josephson junction with d-wave superconducting contacts. All pπ-bonded planar organic molecules, of which graphene is the infinite extension, show a preference for SB over polar configurations, as originally captured by Pauling's idea of resonating valence bonds. At strong enough coupling and/or high doping levels, these correlations will give rise to a d-wave superconducting state. However, the estimated coupling strength in graphene would require a doping level not currently experimentally achievable by a gating bias. We demonstrate that by creating a graphene SNS Josephson junction with d-wave contacts, for example by depositing a high-Tc cuprate on top of the graphene, it should be possible to enhance the effect of the SB correlations and see clear signatures of d-wave pairing in proximity effect, superconducting decay length, and supercurrent.

Annica Black-Schaffer
Stanford University

Date submitted: 19 Nov 2008 Electronic form version 1.4