Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Cuprate Superconductors with Applied Current, a Variational Study LILACH GOREN, EHUD ALTMAN, The Weizmann Institute of Science — We investigate the properties of cuprate superconductors subject to applied current, using modified Gutzwiller projected d-wave BCS states. The parent wave-functions include quasi-particle and quasi- hole pockets of variationally determined size, generated by the current. The pockets, growing with increasing current, contribute to the reduction of the superfluid stiffness and its eventual destruction. We identify two different mechanisms which determine the critical current: at high hole doping ($x > 0.15$) it occurs when the pockets completely destroy the gap, i.e. the standard BCS mechanism; at lower doping the critical current is set by a maximal phase twist, which destroys the superfluid stiffness with pairing still intact. The critical current follows a dome shaped curve, similar to the well known dependence of T_c on doping. Finally we discuss how signatures of current induced Fermi pockets can be seen in ARPES measurements.

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Date submitted: 06 Jan 2010 Electronic form version 1.4