

Abstract Submitted  
for the MAR05 Meeting of  
The American Physical Society

**Study of gossamer superconductivity and antiferromagnetism in the extended  $t$ - $J$ - $U$  model** FENG YUAN, QINGSHAN YUAN, C. S. TING, TCSAM and Department of Physics, University of Houston, Houston, TX 77204, T. K. LEE, Institute of Physics, Academia Sinica, Nankang, Taipei, Taiwan 11529 — We have analytically studied the d-wave superconductivity (dSC) and antiferromagnetism for a two dimensional extended  $t$ - $J$ - $U$  model, by use of a renormalized mean field theory with the Gutzwiller approximation. The purpose of introducing the  $U$  term is to partially impose the no double occupancy constraint. The phase diagrams as functions of doping  $\delta$  and  $U$  are studied. Using the standard value of  $t/J = 3.0$  and in the large  $U$  limit, we show that the antiferromagnetic order emerges and coexists with the dSC in the underdoped region below the doping  $\delta \sim 0.1$ . The dSC order parameter increases from zero as the doping increases and reaches a maximum near the optimal doping  $\delta \sim 0.15$ . In the small  $U$  limit, only the dSC order survives while the AF order disappears. The effect of the long-range hopping terms  $t'$  and  $t''$  on the dSC and antiferromagnetism is also discussed.

Feng Yuan  
TCSAM and Department of Physics, University of Houston, Houston, TX 77204

Date submitted: 30 Nov 2004

Electronic form version 1.4