A detailed Numerical Analysis for High-T_c Superconductivity Phase Diagram Based on the Slave-Boson Representation of *t-J* Hamiltonian

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One of the major theoretical challenges in high-T_c superconductivity is to reproduce the observed phase diagrams which display the monotonously decreasing pseudgap temperature and the dome shaped superconducting transition temperature in the plane of temperature vs. hole concentration. Earlier Lee and Salk reported a successful reproduction of the phase diagram by introducing a realistic slave-boson approach to the Heisenberg term in the *t-J* Hamiltonian [1]. More recently, Shin et.al. present temperature and doping dependencies of magnetic susceptibility and spin pairing correlations involved with spin dynamics in high-T_c superconductivity. [2].

We perform a detailed numerical analysis of phase diagrams in the high-T_c superconductivity using U(1) slave-boson representations of the *t-J* Hamiltonian. For different values of J/t such as 3, 5, 7 and on the various lattice sizes such as 20x20, 30x30, 50x50, we see if calculated T_c values converge to the observed T_c value in high-T_c superconductivity phase diagram.

[1] S.-S. Lee and S.-H. S. Salk, Physical Review B 64, 052501(2001); Physical Review B 71, 134518 (2005).

[2] S. J. Shin, S.-S. Lee, K.-S. Kim, J.-G. Eom, J.-H. Eom, S.-H. S. Salk, Journal of Superconductivity and Novel Magnetism 23, 637 (2010).