

From Antiferromagnetism to d-Wave Superconductivity: The Role of Bosonic Spin and Charge Excitations

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Abstract:

We review recent numerical studies of a quantum “projected” $SO(5)$ model, which aims at a unifying description of antiferromagnetism and superconductivity in the high- T_c cuprates, while properly taking into account the Mott insulating gap. The derivation of this model from a (contractor) renormalization-group mapping of the strong-coupling ($U=8t$) Hubbard model onto an effective low-energy bosonic model is discussed. Our numerical results, obtained by the Quantum Monte Carlo technique of Stochastic Series Expansion, show that this model can give a realistic description of the global phase diagram of the high- T_c superconductors and accounts for many of their physical properties.