# Non-BCS superconductivity for underdoped cuprates by spin-vortex attraction

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Abstract

Within a gauge approach to the *t-J* model, we propose a new, non-BCS mechanism of superconductivity for underdoped cuprates. The gluing force of the superconducting mechanism is an attraction between spin vortices on two different Néel sublattices, centered around the empty sites (holes), which can be described in terms of fermionic holons. The spin fluctuations are described by bosonic spinons with a gap originating also from the spin vortices. Due to the no-double occupation constraint, there is a gauge interaction between holon and spinon, through which the spin vortex attraction induces the formation of spin-singlet (RVB) spin pairs with a lowering of the spinon gap. Lowering the temperature there appear two crossover temperatures. At the higher crossover, a finite density of incoherent holon pairs are formed, and it is identified with the pseudogap temperature. At the lower crossover temperature, a finite density of incoherent spinon RVB pairs are formed, and it is identified with the appearance of the Nernst signal. The true superconducting transition occurs at an even lower temperature, via a 3D XY-type transition. The superconducting mechanism is not of BCS-type, and it involves a gain in kinetic energy (for spinons) coming from the spin interactions. The main features of this non-BCS description of superconductivity agree with the experimental results in underdoped cuprates, especially the contour plot of the Nernst signal.