# SUPERCONDUCTIVITY IN STRONGLY CORRELATED SYSTEMS AND COMPARISON TO EXPERIMENT

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We overview first the t-J model of superconductivity in strongly correlated systems in a historical prospective, i.e., the spin-singlet pairing induced by the kinetic exchange interactions, a purely magnetic, real-space mechanism. Second, high-temperature superconductivity in the cuprate oxides is analyzed using the method developed recently in our group, the so-called statistically consistent Gutzwiller-Fukushima method for the extended t-J model [1]. The following results are compared to experiment: (i) the upper critical concentration for the disappearance of superconductivity; (ii) the doping dependence of the superconducting quasi-particle energy in the antinodal direction; and (iii) the Fermi velocity as a function of doping. The conclusion we draw is that the t-J model in the newly devised mean-field version reflects the overall features of the high-temperature superconductors, at least in the unconventional-Fermi-liquid regime. Finally, we discuss briefly the superconductivity of model heavy-fermion system within the same mechanism of pairing and in particular, our recent analysis of the phase diagram including the Fulde-Ferrell-Larkin-Ovchinnikov phase [2].

[1] J. Jędrak and J. Spałek, Phys. Rev. B **83**, 104512 (2011); ibid., **81**, 073108 (2010).

[2] J. Kaczmarczyk and J. Spałek, Phys. Rev. B **79**, 214519 (2009); J.Phys.: Condens. Matter **22**, 355702 (2010).