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Magnetism and superconductivity in the t-t'-J model FEDERICO BECCA, LEONARDO SPANU, MASSIMO LUGAS, SANDRO SORELLA, CNR-INFM Democritos and SISSA (Trieste) — We present a systematic study of the phase diagram of the $t-t'-J$ model by using the Green's function Monte Carlo (GFMC) technique, implemented within the fixed-node (FN) approximation and a wave function that contains both antiferromagnetism and d-wave pairing. This enables us to study the interplay between these two kinds of order and compare the GFMC results with the ones obtained by the simple variational approach. By using a generalization of the forward-walking technique, we are able to calculate true FN ground-state expectation values of the pair-pair correlation functions. In the case of $t' = 0$, there is a large region with a coexistence of superconductivity and antiferromagnetism, that survives up to $\delta_c \sim 0.10$ for $J/t = 0.2$ and $\delta_c \sim 0.13$ for $J/t = 0.4$. The presence of a finite $t'/t < 0$ induces a strong suppression of both magnetic (with $\delta_c \lesssim 0.03$, for $J/t = 0.2$ and $t'/t = -0.2$) and pairing correlations. In particular, the latter ones are depressed both in the low-doping regime and around $\delta \sim 0.25$, where strong size effects are present.

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