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Enhanced pairing in the checkerboard Hubbard ladder GEORGE KARAKONSTANTAKIS, EREZ BERG, STEVEN KIVELSON, STEVEN WHITE — We study the repulsive Hubbard two-leg ladder model with various forms of inhomogeneity using the density matrix renormalization group method. For instance, we consider the case in which the hopping matrix elements t_{ij} are periodically modulated so that the ladder consists of an array of 2×2 plaquettes with couplings $t_{ij} = t$ within a plaquette and $t_{ij} = t' \leq t$ between plaquettes. In this "checkerboard" case, both the spin gap and the pair binding energy are maximized for an intermediate value of the inter-plaquette coupling, $t' \sim t/2$. This enhancement of the pairing signatures seems to be special to breaking the ladder into plaquettes, and does not occur for other forms of inhomogeneity which were explored, e.g. a site-centered charge density wave. The Luttinger exponent K_c is found to be nearly independent of the inter-plaquette coupling. For an array of weakly coupled Hubbard ladders, this implies that the superconducting critical temperature T_c can be increased by breaking each ladder into plaquettes.

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