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Renormalization-group treatment of the large-N t-J model ANTONIO H. CASTRO NETO, SHAN-WEN TSAI, Boston University, ZIQIANG WANG, Boston College, DAVID K. CAMPBELL, Boston University — Renormalization-group techniques for interacting electrons [1] are applicable to systems where the interactions are small compared to the Fermi energy, $U < E_F$. This condition is not satisfied in some systems of interest, such as the cuprates. The limit of large U has been studied by starting from the t-J model and applying slave-boson techniques to project out double occupied states. The resulting action can then be solved by saddle point calculations. We start from the Fermi liquid solution[2] and employ the renormalization-group approach to treat the leading order fluctuations of the bosonic fields in the $1/N$ expansion. We use a recently developed method[3] that allows electron-electron and electron-boson interactions to be treated on an equal footing. With this starting point, the renormalization-group approach can be safely applied since the interaction terms involving the fluctuations are of order $1/N$, and therefore much smaller than the Fermi energy. We study the self-energy corrections and the instabilities of this system, including the energy scale for the transitions.

[1]R. Shankar, Rev. Mod. Phys. **66** 129 (1994)
[2]M. Grilli and G. Kotliar, Phys. Rev. Lett. **64**, 1170 (1990)
[3]S.-W. Tsai, A. H. Castro Neto, R. Shankar, and D. K. Campbell, "*Renormalization Group Approach to Strong-Coupled Superconductors*," cond-mat/0406174

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