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Spin-fermion model with overlapping hot spots and charge modulation in cuprates. PAVEL A. VOLKOV, Ruhr-Universitt Bochum, KONSTANTIN B. EFETOV, Ruhr-Universitt Bochum; National University of Science and Technology "MISiS", Moscow — We study particle-hole instabilities in the framework of the spin-fermion model. In contrast to previous studies, we assume that adjacent hot spots can overlap due to a shallow dispersion of the electron spectrum in the antinodal region and take the effects of a remnant Coulomb interaction into account. We demonstrate that at sufficiently small values $|\varepsilon(\pi, 0) - E_F| < \Gamma$, where Γ is a characteristic energy of the fermion-fermion interaction due to the paramagnons, the leading particle-hole instability is a d-form factor Fermi surface deformation rather than the charge modulation along the Brillouin zone diagonals. At lower temperatures, we find that the deformed Fermi surface is further unstable to formation of a d-form factor charge density wave (CDW) with a wave vector along one of the Brillouin zone axes. These findings can explain the robustness of this order in hole-doped cuprates. The approximations made are justified by a small parameter that allows one an Eliashberg-like treatment. Comparison with experiments suggests that in many cuprate compounds the prerequisites for the proposed scenario are indeed fulfilled and the results obtained may explain important features of the charge modulations observed recently.

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