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Self-consistent Eliashberg theory, T_c, and the gap function in electron-doped cuprates DHANANJAY DHOKARH, ANDREY CHUBUKOV, University of Wisconsin, Madison — We consider normal state properties, the pairing instability temperature, and the structure of the pairing gap in electron-doped cuprates. We assume that the pairing is mediated by collective spin excitations, with antiferromagnetism emerging with the appearance of hot spots. We use a low-energy spin-fermion model and Eliashberg theory up to two-loop order. We justify ignoring vertex corrections by extending the model to $N >> 1$ fermionic flavors, with $1/N$ playing the role of a small Eliashberg parameter. We argue, however, that it is still necessary to solve coupled integral equations for the frequency dependent fermionic and bosonic self-energies, both in the normal and superconducting state. Using the solution of the coupled equations, we find an onset of $d-$wave pairing at $T_c \sim 30$ K. To obtain the momentum and frequency dependent d-wave superconducting gap, $\Delta(\vec{k}_F, \omega_n)$, we derive and solve the non-linear gap equation. We find that $\Delta(\vec{k}_F, \omega_n)$ is a non-monotonic function of momentum along the Fermi surface, with its node along the zone diagonal and its maximum some distance away from it. We obtain $2\Delta_{\max}(T \to 0)/T_c \sim 4$. We argue that the value of T_c, the non-monotonicity of the gap, and $2\Delta_{\max}/T_c$ ratio are all in good agreement with the experimental data on electron-doped cuprates.

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