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Renormalization Group approach to anisotropic-pairing superconductivity RAFAEL ROLDAN, Instituto de Ciencia de Materiales de Madrid, CSIC, Spain, SHAN-WEN TSAI, Physics Dept., Univ. of California, Riverside — The Renormalization Group (RG) approach to interacting fermions [R. Shankar, *Rev. Mod. Phys.* **66** 129 (1994)] has been extended to the case where both electron-electron and electron-phonon interactions are present [S.-W. Tsai *et al*, *Phys. Rev. B* **72** 054531 (2005)]; [S.-W. Tsai *et al*, cond- mat/0505426] . There Eliashberg's equations are derived for the case of a two dimensional Hubbard model with a circular Fermi surface (FS) in the presence of isotropic Einstein phonons. However, there are materials where the isotropic electron-phonon coupling is not a good approximation. In this work we study the problem of superconductivity mediated by anisotropic electron-phonon couplings, and derive a generalization of the Eliashberg's equations for this case. We solve, for the case of a circular FS, the flow equations for the interaction vertices in the particle-particle channel up to one loop, taking into account the retardation effects due to the presence of phonons. Retardation effects lead to important corrections to the imaginary part of the self-energy. For a generic anisotropic electron- phonon coupling these corrections are momentum dependent and the RG flow equations for superconducting couplings with different symmetries become coupled. We find an instability of the Fermi liquid state towards superconductivity for various momentum-dependent el-ph couplings, with competition between superconducting channels with different symmetries of the order parameter.

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