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Andreev states in the spin-symmetric solution of a quantum dot attached to superconducting leads VACLAV JANIS, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, VLADISLAV POKORNY, Institute of Physics, ASCR, Prague, Czech Republic — A quantum dot with Coulomb repulsion attached to left and right superconducting leads is studied via the perturbation expansion in the interaction strength. We use the Nambu formalism and the standard many-body diagrammatic representation of the impurity Green functions. We formulate the perturbation expansion in the spectral representation so that to be able to separate contributions from the isolated gap states (Andreev bound states) and from the continuous band states. We resolve exactly the spin-symmetric state in the asymptotic limit with Andreev states approaching the Fermi energy. We demonstrate that a spin-symmetric state reaches saturation at zero temperature at a critical interaction at which the Andreev states merge and freeze at the Fermi energy. There is no solution above this critical interaction with Andreev states split from the Fermi energy unless external magnetic field breaking the spin symmetry is applied and degeneracy of the ground state lifted.

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