Impact of intra- and inter-orbital BCS pairing on electrical transport through carbon nanotube quantum dot

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A carbon nanotube quantum dot (CNTQD) with spin-orbit interaction, strongly hybridized with a side-attached superconducting lead and weakly coupled with normal electrodes, is considered. We focus on electrical transport properties of the CNTQD in an external magnetic field, using a two-orbital Anderson model. In the case an effective Hamiltonian describing a proximized CNTQD takes a form of the BCS type. Two cases are studied, where Cooper pairs on the CNTQD are formed between electrons from the same or different orbitals. We calculated the total conductance and its components: normal electron tunneling (ET), direct (DAR) and cross (CAR) Andreev reflections in the limit of low bias voltage. The total as well as the partial conductances were analyzed as functions of the gate voltage applied to CNTQD coupled to superconductor, in presence of external magnetic field and in the regimes of weak and strong Coulomb interactions, *i.e.* with and without Kondo correlations.