Efficiency of the Cooper pair splitter driven by the Zeeman effect and by spin-flip processes

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The Andreev reflection processes are investigated theoretically for mesoscopic systems based on a number of quantum dots coupled to ferromagnetic and superconducting external electrodes. The method of equation of motion for the nonequilibrium Green function is used to describe transport characteristics for the system. The influence of external magnetic field applied in the vicinity of quantum dots is examined in the context of the system working as the Cooper pair splitter. Consequently, phenomena due to splitting of the dots discrete levels involved by the Zeeman effect as well as by the spin-flip scattering processes are analyzed in detail. In particular, it is found that the presence of magnetic field may lead to enhancement of the efficiency of the Cooper pair splitting, which becomes crucial in case the considered system is designed to work as an effective source of electrons in entangled quantum states.

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