Cooper pair splitting efficiency in double quantum dot in cotunneling regime.

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Quantum communication is one of the most intensively developing areas of science. The important step is to get entangled state of electrons in solid state device. One of the solutions is the use of Cooper pairs as a source of entangled electrons and separating them in Double Quantum Dot (DQD) system. Operation of Cooper pair splitting device is based on Coulomb interactions between electrons. We considered two systems: DQD connected to two superconducting leads and DQD connected to superconducting and normal leads. In both systems we studied a flow of electrons in a cotunneling regime (simultaneous tunneling of Cooper pairs through the whole system). We calculated Cooper pair splitting (CPS) efficiency for different ground states of quantum dots. We were able to show several kinds of tunneling processes that are possible in these systems. Calculations were made with use of the 4-th order perturbation theory.