Electronic Spectral Function of Double Quantum Dots–Superconductors Nanoscopic Junction

Authors : Rajendra Kumar

Abstract : We study the Electronic spectral density of a double coupled quantum dots sandwich between superconducting leads, where one of the superconducting leads (QD1) are connected with left superconductor lead and (QD1) also connected right superconductor lead. (QD1) and (QD2) are coupling to each other. The electronic spectral density through a quantum dots between superconducting leads having s-wave symmetry of the superconducting order parameter. Such junction is called superconducting –quantum dot (S-QD-S) junction. For this purpose, we have considered a renormalized Anderson model that includes the double coupled of the superconducting leads with the quantum dots level and an attractive BCS-type effective interaction in superconducting leads. We employed the Green's function technique to obtain superconducting order parameter with the BCS framework and Ambegaoker-Baratoff formalism to analyze the electronic spectral density through such (S-QD-S) junction. It has been pointed out that electronic spectral density through such a junction is dominated by the attractive the paring interaction in the leads, energy of the level on the dot with respect to Fermi energy and also on the coupling parameter of the two in an essential way. On the basis of numerical analysis we have compared the theoretical results of electronic spectral density with the recent transport existing theoretical analysis. QDs is the charging energy that may give rise to effects based on the interplay of Coulomb repulsion and superconducting correlations. It is, therefore, an interesting question to ask how the discrete level spectrum and the charging energy affect the DC and AC Josephson transport between two superconductors coupled via a QD. In the absence of a bias voltage, a finite DC current can be sustained in such an S-QD-S by the DC Josephson effect.

Keywords : quantum dots, S-QD-S junction, BCS superconductors, Anderson model
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