Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Correlated electron transport through double quantum dots coupled to normal and superconducting leads YOICHI TANAKA, Condensed Matter Theory Laboratory, RIKEN, NORIO KAWAKAMI, Department of Physics, Kyoto University, AKIRA OGURI, Department of Physics, Osaka City University
— We study Andreev transport through double quantum dots connected in series to normal and superconducting leads, using the numerical renormalization group. We show that the ground state of this system shows a crossover among a local Cooper-pairing singlet, a Kondo singlet and an inter-dot coupling singlet. The difference between these singlet states is clearly reflected in the transport properties; the conductance for the local Cooper-pairing singlet has a peak with the unitary-limit value $4e^2/h$, while the Andreev reflection is suppressed in the Kondo singlet region by the Coulomb interaction. Furthermore, we find that the conductance has two successive peaks near the crossover between the local Cooper-pairing singlet and the Kondo singlet. It is further elucidated that the gate voltage gives a different variation into the crossover. Specifically, as the energy level of the dot adjacent to the normal lead varies, the Kondo screening cloud around the double dots is deformed to a long-range singlet bond.

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Date submitted: 16 Nov 2009 Electronic form version 1.4