Cotunneling drag effect in double quantum dots

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A key ingredient in quantum information processing is the measurement of the quantum state of a system. Unlike classical systems, backaction effects are unavoidable in the quantum realm. A relevant backaction phenomenon between Coulomb coupled conductors is the drag effect. In this effect, a current flowing in one conductor can induce a voltage across an adjacent conductor via the Coulomb interaction. The mechanisms yielding drag effects are not always understood, even though drag effects are sufficiently general to be seen in many low-dimensional systems. I will discuss the experimental observation for the Coulomb drag in a Coulomb-coupled double quantum dot and the theoretical arguments to explain it [1]. I will explain how cotunneling processes are the essential transport mechanism to obtain a correct qualitative understanding of the drag behavior in the experiments. This can be illustrated with a minimal model that leads to a purely quantum coherent drag effect and advances the possibility of engineering drag currents using band tailoring [2].

[1] A. J. Keller, J. S. Lim, D. Sanchez, R. Lopez, S. Amasha, J. A. Katine, H. Shtrikman, and D. Goldhaber-Gordon, Phys. Rev. Lett. 117, 066602 (2016).

[2] J. S. Lim, R. Lopez, and D. Sanchez, arXiv:1612.06627.