Nonequilibrium Kondo phenomena in single-electron transistors

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Abstract
We have measured the spin splitting in a parallel magnetic field of localized states in single-electron transistors (SETs) using a new method, inelastic spin-flip cotunneling. In the same devices we also measured the splitting with B of a Kondo peak. We have found that the Kondo peak splitting appears only above a threshold field as predicted by theory, but that the magnitude of the splitting is larger than predicted.

Zeeman splitting from spin-flip cotunneling

Inelastic spin-flip cotunneling

Inelastic spin-flip cotunneling

First Observation in SETs!
From Lambe and Jaksic (PR 165, 821 (1968)): dl/dVds = a + b\left(\frac{\mu}{k_B}\right) T_r\left(V_{ds} + \frac{\mu}{k_B}\right)

Kondo effect and Kondo splitting

Kondo temperature dependence of \(\Delta K\)

Conclusion

- We have made the first observation in the inelastic spin-flip cotunneling threshold in SETs.
- We have used inelastic spin-flip cotunneling to precisely measure the Zeeman splitting in an SET.
- We have measured the splitting of a Kondo peak in a magnetic field and found that the splitting appears only above a threshold field as predicted by theory. However, \(\Delta K > |g|\mu_B B\) in contradiction to theory.
- Future Plans: Further measurements to explore the dependence of \(\Delta K\) on \(T_k\) and B.

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