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LeRoy Apker Award (2005): Tunable Nonlocal Spin Control in a Coupled Quantum Dot System

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The effective interaction between magnetic impurities in metals that can lead to various magnetic ground states often competes with a tendency for electrons near impurities to screen the local moment (known as the Kondo effect). The simplest system exhibiting the richness of this competition, the two-impurity Kondo system, was realized experimentally in the form of two quantum dots coupled through an open conducting region. We demonstrate nonlocal spin control by suppressing and splitting Kondo resonances in one quantum dot by changing the electron number and coupling of the other dot. The results suggest an approach to nonlocal spin control that may be relevant to quantum information processing.