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Single-electron transport in a magnetic quantum-dot molecule

JAVIER ROMERO, EDUARDO MUCCIOLO, University of Central Florida — We study single-electron transport in a magnetic quantum-dot molecule by using a stationary rate equation approach. In the molecule, two quantum dots play the roles of magnetic ions and are connected to each other through a third quantum dot which plays the role of a nonmagnetic ion. The magnetic quantum dots are coupled to ideal metallic leads and a back gate voltage is applied to the molecule, forming a field-effect transistor setup. A hopping Hamiltonian, which includes on-site repulsion and magnetic anisotropies, is employed to describe this molecule, resulting in an energy spectrum similar to that of single molecule magnets in the giant spin approximation. An external, in-plane magnetic field is then used to drive the molecule to a diabolical point, where states with maximum total spin with opposite directions are degenerated. Both linear and nonlinear transport are evaluated near the diabolical point, showing features that can be attributed to Berry-phase interference of spin tunneling paths.

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