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**Transport properties of a two impurity system: a theoretical approach.** IGNACIO J. HAMAD, Departamento de Fisica, PUC Rio de Janeiro, 22453-900, Brazil, LAERCIO COSTA RIBEIRO, Centro Federal de Educacao Tecnologica Celso Suckow da Fonseca (CEFET-RJ/UnED-NI), RJ, Brazil, GEORGE MARTINS, Department of Physics, Oakland University, Rochester, MI 48309, USA, ENRIQUE V. ANDA, Departamento de Fisica, PUC Rio de Janeiro, 22453-900, Brazil — Double magnetic-impurity systems have attracted great attention due to their rich physics and possible technological applications. A system of two interacting Co atoms has been studied in a recent STM experiments (Nature Physics **7**, 901 (2011)). The precise control of the inter-impurity distance made it possible to explore in detail the transport properties of the system as a function of the impurities' interaction with each other. We explain, for all the parameter range studied, the physics observed in the experiments using a microscopic model, based on the two impurity Anderson model, including a two-path geometry for charge transport. The many-body system is treated in the finite-U Slave Boson Mean Field Approximation. Other results obtained using the Logarithmic Discretization Embedded Cluster Approximation are also discussed. We physically characterize the system and show that, as in the experiments, the features observed in the transport properties depend on the presence of two impurities but also on the existence of two conducting channels for electron transport. In particular, we obtain a splitting in the differential conductance, compatible with the one observed in the experiments, as a result of the superposition of the many-body Kondo states of each impurity.

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