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### **Ab initio Study of Mirages and Magnetic Interactions in Quantum Corrals**

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We present the state of the art ab initio studies of mirages and magnetic interactions in quantum corrals. Our results demonstrate that quantum corrals could permit to manipulate the exchange interaction between magnetic adatoms on metal surfaces at large distances. We show that the spin-polarization of surface-state electrons can be projected to a remote location by quantum states of corrals. Our study gives a clear evidence that the 'spin-polarization transfer' takes place in a mirage experiment of Manoharan et al.,[2]. We find that the spin-polarization of surface-state electrons on transition metal surfaces[3] can be manipulated by quantum corrals. Our results reveal that an atomic motion in quantum corrals could be strongly affected by the quantum confinement of surface-state electrons. 1. V. S. Stepanyuk, L. Niebergall, W. Hergert, P. Bruno, Phys. Rev. Lett. 94, 187201 (2005). 2. H.C. Manoharan, C.P. Lutz, D.M. Eigler, Nature 403, 512 (2000). 3.L. Diekhöner, M.A. Schneider, A.N. Baranov, V.S. Stepanyuk, P. Bruno, K. Kern Phys. Rev. Lett. 90, 236801 (2003).