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Few-electron physics in Double quantum dots in carbon nanotubes[1] JAVIER VON STECHER, JILA and Department of Physics, University of Colorado, Boulder, Colorado, BERNHARD WUNSCH, MIKAHIL LUKIN, EUGENE DEMLER, Physics Department, Harvard University, Cambridge-MA, 20138, ANA MARIA REY, JILA and Department of Physics, University of Colorado, Boulder, Colorado — Recent experimental progress on few-electron quantum dots (also known as artificial atoms) has allowed the controllable manipulation of the spin degrees of freedom of the confined electrons. Such control is at the heart of semiconductor-based spintronics and quantum-information proposals. Double-well quantum dot in semiconducting carbon nanotubes exhibit rich physics due to the additional valley degree of freedom. Here, we study the few-electron spectrum of a carbon-nanotube double quantum dot with spin-orbit coupling. We find that Coulomb interactions can cause strong correlation effects which lead to different ground state transitions. In particular, we show that such strong correlations can produce the disappearance of the Pauli blockade in transport experiments and an interaction-induced ferromagnetic ground state.

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