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Two-Stage Kondo effect and singlet-triplet crossover in a four-electron artificial atom GHISLAIN GRANGER, MARC A. KASTNER, Massachusetts Institute of Technology, MICAH P. HANSON, ARTHUR C. GOSSARD, University of California, Santa Barbara — An artificial atom of 400 nm lithographic size is defined on an AlGaAs/GaAs heterostructure. With four electrons on the quantum dot, a gate-voltage-induced singlet-triplet crossover is observed. On the triplet side, a Kondo peak with a narrow dip at drain-source voltage V_{ds}=0 is seen. The low energy scale V^*_{ds} characterizing the dip is a signature of the two-stage Kondo effect. On the singlet side, we see a Kondo enhanced feature at nonzero V_{ds} due to inelastic cotunneling processes leaving the dot in the triplet excited state. The excitation energy increases as the gate voltage V_g is tuned away from the crossover region. The effects of both the temperature T and the magnetic field B parallel to the two-dimensional electron gas are also presented. The low energy scales T^* and B^* are extracted from the behavior of the linear conductance and are compared to the low energy scale V^*_{ds} obtained from the differential conductance.

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