

Abstract Submitted
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Quantum Phase Transition in Quadruple Quantum Dots DONG E. LIU, SHAILESH CHANDRASEKHARAN, HAROLD U. BARANGER, Duke University — We find a quantum phase transition between an Ising symmetry broken phase and an $SU(4)$ Kondo screened phase in quadruple quantum dots. The dots are in a square configuration and coupled only capacitively. In response to tuning the inter-dot interaction, a Kosterlitz-Thouless (KT) type transition between the two phases occurs when the 4 dots are occupied by 2 spin polarized electrons. The $SU(4)$ Kondo screened state is an orbital Kondo state described by the 6-dimensional representation of $SU(4)$. In the Ising symmetry broken phase, the two electrons reside in dots at opposite diagonals. A similar quantum phase transition is also found in a spinfull system with a different configuration in which there is non-zero electron tunneling between the two pairs of dots. Quantum Monte Carlo simulation with directed loop update along with finite size scaling analysis is employed to obtain the thermodynamic properties of the system. We determine the range of experimentally realizable parameters where the system exhibits such a KT type quantum phase transition.

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