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Valley Kondo Effect in Silicon Quantum Dots SHIUEYUAN SHIAU, SUCISMITA CHUTIA, ROBERT JOYNT, Physics Department, UW-Madison — Recent progress in the fabrication of quantum dots using silicon opens the prospect of observing the Kondo effect associated with the valley degree of freedom. We compute the dot density of states using an Anderson model with infinite Coulomb interaction U. The density of states is obtained as a function of temperature and applied magnetic field in the Kondo regime using an equation-of-motion approach to obtain the Green's functions of the electrons. We predict the appearance of a very complex peak structure near the Fermi energy, much richer than the one or two peaks of the usual spin Kondo effect. We also show that the valley index is typically not conserved when electrons tunnel into a silicon dot. Analysis of the conductance should enable experimenters to understand the interplay of Zeeman splitting and valley splitting, as well as the dependence of tunneling on the valley degree of freedom.

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