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Spectra of Accumulation-Mode Few-Electron Si/SiGe Quantum Dots R.S. ROSS, A.A. KISELEV, M.G. BORSELLI, B.M. MAUNE, A.T. HUNTER, M.F. GYURE, HRL Laboratories, LLC, 3011 Malibu Canyon Road, Malibu, CA 90265, C.R. ANDERSON, Dep't of Math, UCLA, Los Angeles, CA 90095 — We present the results of electronic structure calculations of the ground and excited state spectra of accumulation-mode semiconductor quantum dots (QD) in both the Si/SiGe and InAlAs/InGaAs material systems. Devices are modeled using a real-space Poisson-Schrödinger code coupled to a full configuration interaction (FCI) method in which both spin and valley degrees of freedom are explicitly included. Good agreement is found with measured ground state addition spectra allowing us to conclude that valleys play an essential role in Si QDs and that we have conclusively demonstrated single electron quantum dots in Si/SiGe. Calculations of the multi-electron excited-state spectra for both III-V and Si/SiGe accumulation-mode quantum dots will be presented along with predictions for transverse magneto-spectroscopy and comparisons with recent experimental data. Sponsored by United States Department of Defense Approved for Public Release, Distribution Unlimited.

Richard Ross
HRL Laboratories, LLC

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