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Charging of Ge/Si Dots SOURABH SINHA, SUTHARSAN KETHARANATHAN, JEFF DRUCKER, JOHN SHUMWAY, Arizona State University — We have modeled the charging of Ge/Si dots with path integrals for comparison with C-V experiments. The experimental samples have small Ge huts or larger Ge-Si domes embedded in n-doped Si. By applying a negative gate voltage and measuring capacitance, we can count the number of electrons that sit on the quantum dots. In our theoretical analysis, we model the system as thermal equilibrium between electrons bound to the dots and electrons in the bulk, doped Si. Since the electrons sit in quantized energy states on the dots, we model the thermodynamics with a Feynman path integral. The electrons feel an attractive potential from the strained Si and below the dot, which we have modeled with atomistic strain calculations and an effective mass model. Using Monte Carlo sampling, we can directly sample the charge density for different temperatures, doping densities, and dot structures; allowing us to count the number of electrons on the dot and compare directly to experiments.

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