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Effect of Intervalley Mixing on Qubit Operation in SiGe Quantum Dot Structures[1] A. A. KISELEV, R. S. ROSS, B. H. FONG, M. F. GYURE, HRL Laboratories, Malibu, CA 90265 — We analyze the effects of valley degeneracy and intervalley mixing on single- and multi-electron states in (001) SiGe heterostructures, including effect of interface steps and variations in interface quality. We focus on the structure of two-electron states in both single and double quantum dot structures in the presence of valley degeneracy in the host material and the oscillatory behavior of exchange coupling in the presence of nonplanar heterointerfaces. We present modeling and simulation results relevant to the design of SiGe based accumulation-mode quantum-dot structures, especially CI calculation in presence of the intervalley mixing.

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Andrey Kiselev
HRL Laboratories, Malibu, CA 90265

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