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Few-electron states in SiGe double quantum dot structures with non-planar interfaces[1] A.A. KISELEV, R.S. ROSS, M.F. GYURE, HRL Laboratories LLC, 3011 Malibu Canyon Road, Malibu CA 90265 — Valley-orbit effects of planar, non-planar, and imperfect heterointerfaces (both on the intra- and inter-dot scale) are directly captured in numerical simulations and analyzed theoretically for electrostatically defined accumulation mode (001) SiGe multi-dot structures. Our modeling is facilitated by explicitly allowing for an arbitrary and spatially inhomogeneous stacking of heterolayers in the active area of the device. Here we focus on results obtained for a double quantum dot (DQD) system, establishing the detailed structure of few-electron states, and, for two electrons, their spin- and valley-selective dynamics when the system is driven by pulse-modulating dot gate potentials. We identify valley-related avoided crossings and evaluate their strength affecting adiabaticity of applied bias sweeps. We consider a number of experimentally relevant scenarios stemming from (i) macroscopic interface imperfections, e.g., interface steps, and (ii) randomness of the substitutional solid solution in the SiGe barrier layers. Our findings are critically compared with results available for single valley III-V DQDs.

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Andrey Kiselev
HRL Laboratories, LLC

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