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Strong Spin-Orbit Interaction and Helical Hole States in Ge/Si Nanowires CHRISTOPH KLOEFFEL, University of Basel, MIRCEA TRIF, University of California, Los Angeles, DANIEL LOSS, University of Basel — We study theoretically the low-energy hole states of Ge/Si core/shell nanowires. The low-energy valence band is quasidegenerate, formed by two doublets of different orbital angular momenta, and can be controlled via the relative shell thickness and via external fields. We find that direct (dipolar) coupling to a moderate electric field leads to an unusually large spin-orbit interaction of Rashba type on the order of meV which gives rise to pronounced helical states enabling electrical spin control. The system allows for quantum dots and spin qubits with energy levels that can vary from nearly zero to several meV, depending on the relative shell thickness [1].

[1] C. Kloeffel, M. Trif, and D. Loss, Phys. Rev. B **84**, 195314 (2011).

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