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Valley Splitting in Different Landau Levels of a Si/SiGe Quantum Point Contact LISA MCGUIRE, University of Wisconsin-Madison, K.A. SLINKER, MARK FRIESEN, University of Wisconsin-Madison, SRIJIT GOSWAMI, J.O. CHU, IBM Research Divison-T.J. Watson Research Center, ROBERT JOYNT, S.N. COPPERSMITH, MARK A. ERIKSSON, University of Wisconsin-Madison — Si/SiGe is an interesting platform for spin physics and quantum information due to the weak spin-orbit coupling in Si and the presence of nuclear spin zero isotopes. However, silicon has a near degeneracy of orbital states in the conduction band arising from multiple valley minima, which could enhance decoherence rates and complicate qubit operation. Recent measurements in a quantum point contact have shown that the valley splitting is large, of order 0.5 - 2 meV[1]. Here, we investigate fundamental mechanisms of valley splitting by taking into account the valley couplings between Landau levels. We also account for the dependence of valley splitting on materials parameters such as miscut angle and device orientation. From our data, we are able to extract distinct valley splittings from the lowest two Landau levels, which vary similarly as a function of gate voltage (i.e., channel width). We are further able to place bounds on local variations of the tilt angle of the quantum well interface. Work supported by ARO, NSA, and NSF.
1 S. Goswami et al., Nature Physics 3 (1): 41-45 JAN 2007.

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