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Valley Splitting Theory for Silicon 2DEGs Grown on a Vicinal Surface[1] MARK FRIESEN, S. CHUTIA, SRIJIT GOSWAMI, M. A. ERIKSSON, S. N. COPPERSMITH, University of Wisconsin-Madison, Madison WI 53706 — We develop a theory for the energy splitting of the two-fold degenerate conduction valleys of a silicon 2DEG. We assume that the quantum well is not perfectly aligned with the crystallographic axes, as consistent with typical experimental conditions. Under these general conditions, the valley splitting can be suppressed by many orders of magnitude from its theoretical upper bound. However, the confined electrons are able to recover some of their valley splitting, and thus lower their total energy, by a variety of means. We discuss two recovery methods, which apply to the cases of zero and nonzero magnetic fields, respectively. The results show a linear dependence of the valley splitting on the magnetic field, as consistent with the experimental data.

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