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Scattering mechanisms in shallow undoped Si/SiGe quantum wells DOMINIQUE LAROCHE, Sandia Natl Labs, SHIH-HSIEN HUANG, National Taiwan University and National Nano Device Laboratories, ERIK NIELSEN, Sandia Natl Labs, YEN CHUANG, JIUN-YUN LI, CHIH-WEN LIU, National Taiwan University and National Nano Device Laboratories, TZU-MING LU, Sandia Natl Labs — We report the magneto-transport and scattering mechanism analysis of a series of increasingly shallow Si/SiGe quantum wells with the shallowest 2DEG located only $\sim$ 10 nm away from the surface. The peak mobility increases with increasing depth, suggesting that charge centers near the oxide/semiconductor interface is the main source of disorder. The power-law exponent of the mobility versus density curve, $\mu \propto n^{\alpha}$, is extracted as a function of the depth. At intermediate densities, the power-law dependence is characterized by $\alpha \sim 2.3$ while at the highest achievable densities for devices with intermediate depth, an exponent $\alpha \sim 5$ is observed. We propose, and show by simulations, that this increase in α is explained by a non-equilibrium model where electrons migrating to the surface smooth out the potential landscape seen by the 2DEG. This work has been supported by the Division of Materials Sciences and Engineering, Office of Basic Energy Sciences, U.S. Department of Energy (DOE). Sandia National Laboratories is a multi program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. DOEs National Nuclear Security Administration under contract DE-AC04-94AL

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