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2D Metal-insulator transition behavior in a high mobility strained Si quantum well K. LAI, D.C. TSUI, S. LYON, Princeton Univ., W. PAN, Sandia Natl. Labs, M. MUHLBERGER, F. SCHAFFLER, Univ. Linz — The apparent metal-insulator transition is observed in a high quality two-dimensional electron system (2DES) in the strained Si quantum well of a Si/$Si_{1-x}Ge_x$ heterostructure with mobility μ=1.9$\times$10^{5}cm^2/Vs at n=1.45 $\times$10^{11}cm^{-2}. The critical density n_c, where the thermal coefficient of low T resistivity changes sign, is 0.32$\times$10^{11}cm^{-2}, much smaller than the n_c of $\sim$0.8$\times$10^{11}cm^{-2} seen in clean Si-MOSFET's (usually with a peak $\mu\sim$4$\times$10^{4}cm^2/Vs). This result is consistent with previous observations in the GaAs systems that n_c decreases with increasing 2DES quality. Moreover, in low n range, for 0.27$\times$10^{11}cm^{-2}$<n<$0.35$\times$10^{11}cm^{-2}, close to the transition region, the conductivity increases roughly linearly with T around the Fermi temperature and, surprisingly, all the curves of different densities are parallel to each other for $T > 1.2K$. In the higher density range where the 2DES shows metallic-like behavior, the in-plane magnetoresistance ρ(B) first increases $\sim$B^2 and then saturates to a finite value ρ(B$_C$) for B>B$_C$. The full spin-polarization field B$_C$ decreases monotonically with n but appears to saturate to a finite value as $n\rightarrow$0. We find $\rho(B_C)/\rho(0)\sim$1.8 for all the densities ranging from 0.35 to 1.45$\times$10^{11}cm^{-2} and, when plotted versus B/B$_C$, collapse onto a single curve.

Keji Lai
Princeton Univ.

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