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12b Metal-Insulator Transitions
Doped Semiconductors

Magnetic-Field-Induced Metal-Insulator Transition in Degenerately Doped n-type Ge. P.F. Hopkins, M.J. Burns†, R.M. Westervelt, Harvard University* -- An experimental study was made of the metal-insulator transition induced by strong magnetic fields (to 7 Tesla) at low T (to ~100mK) in uncompensated Ge degenerately doped with Sb donors to concentrations N_D up to twice the transition concentration n_c in zero field. The low temperature ($T < 1K$) transverse and longitudinal magnetoresistance increase strongly (by as much as a factor 10^3) and are thermally activated above a characteristic field H_c, ($H_c \sim 5$ Tesla for $N_D \sim 2n_c$). The measured Hall coefficient changes by less than a factor ~ 4 over the entire range of magnetic field, indicating that the apparent mobility decreases strongly above the transition while the apparent carrier concentration changes relatively little.
Measurements made on samples in both Hall bar (7x1x0.2mm) and Van der Pauw (5x5x0.7mm) geometries, including a special 8-contact Van der Pauw sample, as well as separate isotropy tests, argue against the possible influence of geometry and dopant inhomogeneities as an explanation of the transition behavior.
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1. R.M. Westervelt, M.J. Burns, P.F. Hopkins, and A.J. Rimberg, Proc. Univ. Tokyo Int. Sym. on Anderson Localization, (Springer-Verlag, 1987).

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