Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Si as an acceptor in (110) GaAs for high mobility p-type heterostructures F. FISCHER, M. GRAYSON, D. SCHUH, M. BICHLER, G. ABSTREITER, Walter Schottky Institut, TU-Muenchen, K. NEUMAIER, Walther-Meissner-Institut, BADW — We implement metallic layers of Si-doped (110) GaAs as modulation doping in high mobility p-type heterostructures, changing to p-growth conditions for the doping layer alone. The strongly auto-compensated doping is first characterized in bulk samples, identifying the metal-insulator transition density and confirming classic hopping conduction in the insulating regime. To overcome the poor morphology inherent to Si p-type (110) growth, heterostructures are fabricated with only the modulation doping layer grown under p-type conditions. Such heterostructures show a hole mobility of $\mu = 1.75 \times 10^5$ cm^2/Vs at density $p = 2.4 \times 10^{11}$ cm^{-2}. We identify the zero field spin-splitting characteristic of p-type heterostructures, but observe a remarkably isotropic mobility and a persistent photoconductivity unusual for p- heterojunctions grown using other doping techniques. This new modulated growth technique is particularly relevant for p-type cleaved-edge overgrowth and for III-V growth chambers where Si is the only dopant.

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Date submitted: 01 Dec 2004 Electronic form version 1.4