

Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

The 2D Metal-Insulator Transition: A percolative Monte Carlo study DONALD PRIOUR JR., University of Missouri, Kansas City, SANKAR DAS SARMA, University of Maryland, College Park — We examine the metal-insulator transition (MIT) in two dimensional electronic systems (e.g. n doped GaAs heterostructures) in the presence of a long-range Coulombic random potential set up by a nearby layer of charged impurities. An iterative scheme taking into account nonlinear screening is used to obtain the inhomogeneous “landscape” of electron-rich and electron-depleted regions. The percolation (or not) of electron rich areas (in the regime of electronic densities n where linear screening breaks down) is determined by a variant of the Hoshen Kopelman algorithm. Identifying the percolation transition as the metal-insulator transition, we calculate the critical electron density n_c as a function of the concentration of charged impurities, the separation d of the impurity layer from the electronic layer, and the thickness of the impurity rich region; the effect of correlated impurity positions is also examined. Using finite size scaling analysis, we calculate the critical exponent δ for the asymptotic scaling $\sigma \propto (n - n_c)^\delta$ in the vicinity of the MIT. We acknowledge support from US-ONR and NRI-NSF.

Donald Priour Jr.
University of Missouri, Kansas City

Date submitted: 27 Nov 2007

Electronic form version 1.4