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An apparent metal insulator transition in high mobility 2D InAs heterostructures JAVAD SHABANI, CHRIS PALMSTROM, University of California, Santa Barbara — We report on the first experimental observation of an apparent metal insulator transition in a 2D electron gas confined in an InAs quantum well. At high densities we find that the carrier mobility is limited by background charged impurities and the temperature dependence of the resistivity shows a metallic behavior with resistivity increasing with increasing temperature. At low densities we find an insulating behavior below a critical density of $n_c = 5 \times 10^{10}\text{cm}^{-2}$ with the resistivity decreasing with increasing temperature. We analyze this transition using a percolation model arising from the failure of screening in random background charged impurities [1]. We also examine the percolation transition experimentally by introducing remote ionized impurities at the surface. Using a bias during cool-down, we modify the screening charge at the surface which strongly affects the critical density. Our study shows that transition from a metallic to an insulating phase in our system is due to percolation transition.

[1] J. Shabani, S. Das Sarma, and C. J. Palmstrøm, Phys. Rev. B 90, 161303(R) (2014).

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