Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Absence of Excitonic Mott Transition in InGaAs Quantum Wells in High Magnetic Fields G.T. NOE, J. KONO, Rice University, J. LEE, D.H. REITZE, C.J. STANTON, University of Florida, A.A. BELYANIN, Texas A&M University, G.S. SOLOMON, National Institute of Standards and Technology — Optically produced electron-hole pairs (excitons) provide a rich system to study carrier interaction in a highly controllable environment. Excitons are only stable in the dilute limit when the Bohr radius is much smaller than the interexciton distance. As the density of excitons increases, the Mott transition is expected to transform the insulating excitonic gas into a metallic electron-hole plasma. Here, we present emission and absorption properties of undoped $In_{0.2}Ga_{0.8}As$ quantum wells at low temperatures and in high magnetic fields for both the high and low density regimes. When a magnetic field is applied, each ns-state of a 2D exciton (n = 1,2, ...) experiences the diamagnetic shift and approaches the Nth Landau level (N = n-1) with increasing magnetic field. In the dilute limit, single-exciton states are clearly distinguishable in the PL spectra. In contrast, for high exciton density, all ns-states converge to a common value at zero field, which indicates complete screening of the exciton binding energy. At the same time, the dependence of the lowest Landau level as a function of field still shows a clear excitonic 1s-state character at all fields. These results indicate that there is no Mott transition to the metallic state in the high density regime when the magnetic field is applied.

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Date submitted: 08 Dec 2009 Electronic form version 1.4