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Layer interdependence of transport in an undoped electron-hole bilayer[1] CHRISTIAN MORATH, JOHN SEAMONS, JOHN RENO, MIKE LILLY, Sandia National Lab — Recently interest in the layer interdependence of a bilayer's transport has emerged. To examine this dependence the layer transport properties in an undoped electron-hole bilayer (uEHBL) device were measured as a function of density, inter-layer electric field and temperature. The uEHBL device consisted of a tunable, independently-contacted two-dimensional electron gas (2DEG) and two-dimensional hole gas (2DHG) induced in distinct GaAs quantum wells separated by a 30 nm $Al_{.9}Ga_{.1}$ As barrier. At T = 0.3 K, the 2DHG mobility increased with increasing 2DEG density, while the opposite effect was not observed. Decreasing the inter-layer electric field also increased 2DHG mobility without affecting the 2DEG mobility. This also decreased 2DHG Coulomb drag suggesting the inter-layer separation was increased. Distinct temperature dependencies were also measured for each layer's density and resistivity.

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