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Superconducting Proximity Effect in Semiconductor Films - Experiment SOREN FLEXNER, MICHAEL VISSERS, PAUL WELANDER, KEVIN INDERHEES, JIM ECKSTEIN, University of Illinois at Urbana-Champaign — Interface transparency and device topology together determine the information regarding the superconducting proximity effect that can be obtained from transport measurements. We have introduced a new three terminal device design and use junctions formed entirely in-situ between niobium(S) and a thin heavily doped InGaAs epitaxial layer(N). The junction design allows us to separately extract the junction conductance and the sheet resistance of the InGaAs from the two terminal and three terminal voltage readings at low bias currents. We see evidence for both fluctuating and phase-stiff superconductivity (SC) in the normal material. At temperatures below, but close to Tc of the niobium, SC fluctuations cause the spreading resistance, Rs, on the normal side of the junction to drop. At lower temperatures, phase-stiff SC emerges in the InGaAs, effectively stealing volume from the normal region. This makes Rs appear to increase as the SC order sets in. The specific junction conductance, Gc, rises to values much greater than the normal value. We propose this is caused by the N-S boundary moving into the semiconductor.

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