Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Superconducting Proximity Effect in Thin Semiconducting Films
MICHAEL VISSERS, SOREN FLEXNER, PAUL WELANDER, KEVIN INDERHEES, JAMES ECKSTEIN, University of Illinois at Urbana Champaign — The superconducting proximity effect changes both the transport properties of the N-layer as well as the conductance between the N and S layers. We use a novel 3 terminal device structure to probe this which provides two resistance measurements allowing us to measure both the N-layer sheet resistance, Rs, as well as the junction conductance, Gc. When the N-layer is a degenerate semiconductor, the changes in these quantities are large. Gc increases much more than the factor of 2 that Andreev reflection theory predicts, and both Rs as well as Gc exhibit reentrance as a function of temperature. We interpret these changes as the N-S boundary moving into the semiconductor increasing Gc while simultaneously removing volume in the N-layer that had been used in normal transport. Magnetic fields applied both parallel and perpendicular to the junction cause the maximum conductance to increase while the sheet resistance rises. The magnitude of the necessary field implies a local proximity effect. This work was supported by the DOE BES at the F. Seitz Materials Research Laboratory at the University of Illinois, Urbana.

Michael Vissers
University of Ilinois at Urbana Champaign

Date submitted: 20 Nov 2006 Electronic form version 1.4