

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Resistance in Superconducting Epitaxial Niobium Nanowires and Films¹ TIMOTHY MCARDLE, ALLISON DOVE, KEVIN INDERHEES, MITRABHANU SAHU, ALEXEY BEZRYADIN, PAUL GOLDBART, JAMES ECKSTEIN, Univ of Illinois, Urbana-Champaign — The thermally activated phase slip (TAPS) description of resistance in one-dimensional superconducting wires is unable to explain additional resistance observed in extremely narrow nanowires well below the critical temperature. We fabricate nanowires using electron beam lithography from single-crystal niobium films grown by ultra-high vacuum molecular beam epitaxy. Since the resulting wires are single crystal and homogenous, the role of disorder is reduced and neither weak links nor grains are present. The epitaxial films are 10 to 30 nm thick, while the finished wires range in length from 1 to 10 μm , and in width from 35 to 200 nm. Transport measurements on the nanowires of varying widths show a range of distinct temperature dependencies below the critical temperature that cannot be accounted for by the single exponential form of the TAPS model.

¹This work was supported by the DOE BES at the F. Seitz Materials Research Laboratory at the University of Illinois, Urbana.

Timothy McArdle
Univ of Illinois, Urbana-Champaign

Date submitted: 21 Nov 2008

Electronic form version 1.4