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Resistance in One-Dimensional Superconducting Epitaxial Niobium Nanowires TIMOTHY MCARDLE, KEVIN INDERHEES, PAUL WELANDER, ALLISON DOVE, JAMES ECKSTEIN, Univ of Illinois Urbana-Champaign — Thermally activated phase slips cause resistance in one-dimensional superconducting wires near the critical temperature. However, this description of a thermally activated process is not able to explain additional resistance observed in extremely narrow nanowires well below Tc. We fabricate nanowires using electron beam lithography from single-crystal niobium films grown by ultra-high vacuum molecular beam epitaxy. Since the films are single crystal, the role of disorder is reduced and neither weak links nor grains are present. The films are 10 to 20 nm thick, have transition temperatures ranging from 7.2 to 9.2 K, and residual resistance ratios of 5 to 10, typical for ultra-thin single-crystal niobium films. The wires are 10 μm long and range in width from 35 to 200 nm. Transport measurements on the nanowires show two distinct regions of temperature dependence below Tc. This work was supported by the DOE BES at the F. Seitz Materials Research Laboratory at the University of Illinois, Urbana.

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