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Superconductor-Insulator Transition in Epitaxial Niobium Nanowires TIMOTHY MCARDLE, KEVIN INDERHEES, PAUL WELANDER, JAMES ECKSTEIN, University of Illinois, Urbana — As the dimensions of a superconducting nanowire are reduced, it undergoes a transition from a superconductor to an insulator. Near Tc, thermally activated phase slips cause this insulating state, and it is believed that in extremely narrow wires quantum phase slips appear and become dominant at low temperature. However, the exact nature of the S-I transition, specifically what parameters control it, is not clear. We report on recent studies of nanowires fabricated 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. Our films are 100 angstroms thick, have transition temperatures near 7.2 K, and residual resistance ratios of around 5, typical for ultra-thin single-crystal niobium films. The wires are 10 μm long and range in width from 35 to 200 nm.
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