MAR06-2005-003468

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

Effects of a strong magnetic field on superconducting nanowires.

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Effects of strong magnetic fields on superconducting Nb and MoGe nanowires with diameters 5-15 nm have been studied. We have found that the Langer-Ambegaokar-McCumber-Halperin (LAMH) theory of thermally activated phase slips is applicable in a wide range of magnetic fields and describes well the temperature dependence of the wire resistance, over 11 orders of magnitude. We do not observe any resistance in excess of the LAMH theory, even in wires, which are close to the critical point of the superconductor-insulator transition. This fact can be considered as an evidence of the absence of quantum phase slippage. In thicker wires the field dependence of the critical temperature agrees well with the theory of pair-breaking perturbations that takes into account both spin and orbital contributions. In the insulating-phase wires, the magnetic field has a little effect on electron transport, indicating that the superconductivity in the insulating-phase wires is completely suppressed and the Coulomb blockade is the dominant factor, which causes suppression of the charge transport. [1] A. Rogachev, A.T. Bollinger, and A. Bezryadin, Phys. Rev. Lett. 94, 017004 (2005).