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Controlling Hysteresis in Superconducting Weak Links and μ-Superconducting Quantum Interference Devices.[1] NIKHIL KUMAR, Department of Physics, Indian Institute of Technology,Kanpur,India-208016, C.B. WINKELMANN, Institute Neel, CNRS and University Joseph Fourier,25 Avenue des Martyrs, BP 166, 38042, Grenoble, France, SOURAV BISWAS, Department of Physics, Indian Institute of Technology,Kanpur,India-208016, H. COURTOIS, Institute Neel, CNRS and University Joseph Fourier,25 Avenue des Martyrs, BP 166, 38042, Grenoble, France, ANJAN K. GUPTA, Department of Physics, Indian Institute of Technology,Kanpur,India-208016 — We have fabricated and studied the current-voltage characteristics of a number of niobium film based weak-link devices and μ-SQUIDs showing a critical current and two re-trapping currents. We have proposed a new understanding for the re-trapping currents in terms of thermal instabilities in different portions of the device. We also find that the superconducting proximity effect and the phase-slip processes play an important role in dictating the temperature dependence of the critical current in the non-hysteretic regime. The proximity effect helps in widening the temperature range of hysteresis-free characteristics. Finally we demonstrate control on temperature-range with hysteresis-free characteristics in two ways: 1) By using a parallel shunt resistor in close vicinity of the device, and 2) by reducing the weak-link width. Thus we get non-hysteretic behavior down to 1.3 K temperature in some of the studied devices.

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Nikhil Kumar
Department of Physics, Indian Institute of Technology,Kanpur,India-208016

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