北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Enhancement of the retrapping current of superconducting microbridges of finite length

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Time: 4:00pm, 29May, 2012 (Tuesday)

时间：2012年5月29日 （周二）下午4:00

Venue: Room 607, Conference Room A , Science Building 5

地点：理科五号楼607会议室

Abstract

It is theoretically shown that the resistance of a superconducting microbridge/nanowire decreases while the retrapping current Ir for the transition to the superconducting state increases when one suppresses the magnitude of the order parameter |\Delta| in the attached superconducting leads. This effect is a consequence of the increased energy interval for diffusion of the 'hot' nonequilibrium quasiparticles (induced by the oscillations of |\Delta| in the center of the microbridge) to the leads. The effect is absent in short microbridges(withlength less than the coherence length) and it is relatively weak in long microbridges (with length larger than the inelastic relaxation length of the nonequilibrium distribution function).A nonmonotonous dependence of Ir on the length of the microbridge is predicted. Our results are important for the explanation of the enhancement of the critical current and the appearance of negative magnetoresistance observed in many recent experiments on superconducting microbridges/nanowires.

About the speaker

Vodolazov Denis,the Senior Researcher in Institute for Physics of Microstructures (Russian Academy of Science) Nizhny Novgorod. His area of expertise includes theory of mixed state in type-II superconductors (including: vortex dynamics, magnetic and transport characteristics of mesoscopic superconductors), theory of resistive state and nonequilibrium phenomena in narrow superconducting wires and rings (phase slip centers/lines). And his study mainly adopts such methods as numerical and analytical solution of the stationary and time-dependent Ginzburg-Landau (nonlinear, diffusion like) equations; numerical and analytical solution of the Maxwell-London equations for thin films(stripes) and bulk superconductors; numerical solution of theUsadel and Boltzmann equations in quasi-one-dimensional limit.