SUPERCONDUCTOR 3D NANOARCHITECTURES

Vladimir M. Fomin[1,2]
Institute for Emerging Electronic Technologies, Leibniz IFW Dresden,
Helmholtzstraße 20, D-01069 Dresden, Germany
Faculty of Physics and Engineering, Moldova State University,
strada A. Mateevici 60, MD-2009 Chişinău, Republic of Moldova

Advances of high-tech fabrication techniques have allowed for generating geometrically and topologically nontrivial manifolds at the nanoscale, which determine novel electronic, magnetic, optical and transport properties of such objects due to their complex geometry and non-trivial topology [1]. 3D superconductor (SC) nanoarchitectures, with unconventional vortex configurations, are promising for the future efficient and multifunctional technologies. A topological transition between the vortex and phase-slip regimes determines the magnetic-field–voltage characteristics revealing a nontrivial topology of SC screening currents. An abrupt switch-on of the transport current triggers the transition from the vortex to phase-slip regime. A novel hysteresis effect is unveiled in the current–voltage characteristics of SC open nanotubes [2]. Dynamic topological transitions in SC open nanotubes take place under a combined dc+ac transport current [3]. Various vortex chains, vortex jets, phase-slip regimes [4] occur in SC open nanotubes due to the inhomogeneity of the normal magnetic field component. Efficient steering of vortex chains and jets in SC open nanotubes is provided by tilting of the magnetic field [5].

I am grateful to I. A. Bogush, R. Córdoba, O. V. Dobrovolskiy, and R. O. Rezaev for fruitful collaboration. The study was supported by the E-COST via Action #CA21144 "Superconducting Nanodevices and Quantum Materials for Coherent Manipulation".

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Corresponding author: Prof. Dr. Vladimir M. Fomin
Institute for Emerging Electronic Technologies, Leibniz IFW Dresden,
Helmholtzstraße 20, D-01069 Dresden, Germany
e-mail: v.fomin@ifw-dresden.de
ORCID: 0000-0002-8959-4831