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ABSTRACT BOOK

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BOOK OF ABSTRACTS

Features of the motion of an Abrikosov's vortex in the vicinity of resonant frequencies

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Recently, studying the motion of the isolated Abrikosov's vortex in hard type II superconductors has gained considerable attention [1]. The vortex is the main nanoscale structural element of a mixed state; it can be considered as an isolated object in the region of weak magnetic fields, which slightly exceed the first critical field ($H_{c1} < H << H_{c2}$). In the proposed work, the forced oscillations of the vortex under the action of an external periodic in the plane and damping inside the sample force are investigated. In the energy absorption spectrum two resonant maxima are present corresponding to the natural frequencies of the vortex oscillation. The action of all forces, which act on the vortex in the superconductor, is taken into account: viscosity, Lorentz, pinning, and elasticity. The role of each of the forces in a wide range of external force frequencies is analyzed. It is shown that the shape of the vortex trajectory is determined by the Lorentz force; the oscillation amplitude is determined by the elastic force. The inertia of the vortex begins to play a significant role in the frequency range $\omega \geq 10^{10}$ Hz. The effect of all forces on the shape and size of the vortex trajectory near the resonant frequencies is analyzed in detail: the viscosity force and vortex inertia play important role, which causes changes of the vortex displacement amplitude by several orders of magnitude. Vortex trajectories in a narrow frequency range near the resonant values have a nearly symmetrical shape.

1. L. Embon et al. Nature communications 8, 85 (2017), DOI:10.1038/s41467-017-00089-3.

Autor Index