



# ABSTRACT BOOK

International research  
and practice conference:

**NANOTECHNOLOGY  
AND NANOMATERIALS  
(NANO-2018)**

27-30 August 2018  
Kyiv, Ukraine

dedicated to the 100th Anniversary  
of the National Academy of Sciences of Ukraine

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**BOOK OF ABSTR  
ACTS**

## Forced oscillations of an Abrikosov's vortex in superconductors

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Superconductors type II, in magnetic fields ( $H_{c1} < H < H_{c2}$ ), contain quantized nanosize whirlpools of electrons, called Abrikosov vortices. Dynamical properties of single vortex line in  $\text{YBa}_2\text{Cu}_3\text{O}_{6.991}$  single crystal (hard superconductors) were investigated experimentally with the aid of magnetic force microscopy (MFM) [1]. Here the image, motion and deformation of individual vortices were presented. The simple theory of this experiment considering the dragging force, the pinning force, and an elastic force were built in [2]. In the present report, we consider single Abrikosov vortex line ( $H \geq H_{c1}$ ) dynamics under the action external force, which varies in the plane and decays into the interior of the sample  $\vec{f}(x, y, z) = \vec{i}f_0 e^{-z/\lambda} \cos \omega t + \vec{j}k e^{-z/\lambda} \sin \Omega t$ , ( $\Omega \ll \omega$ ), taking into account additionally inertial properties of the vortex [3] and Lorentz force. Different scenarios of vortex line trajectories in two-dimensional model were considered. The data obtained make it possible to qualitatively explain the experimental results of manipulations of a single vortex, presented in [1]. The influence of each of the forces on the shape of the vortex trajectory is analyzed, and it is shown that the Lorentz force plays the most important role.

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